



October 09, 2009

Mr. Frank Hagar
Northgate Environmental Management, Inc.
1100 Quail St., Suite 102
Newport Beach, California 92660

Re: Tronox Henderson
Work Order: 236817

Dear Mr. Hagar:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 09, 2009, September 10, 2009 and September 11, 2009. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4453.

Sincerely,

Edith Kent
Project Manager

Chain of Custody: 2027.001.00701, 2027.001.00711, 2027.001.00713, 2027.001.00715, 2027.001.00717,
2027.001.00719 and 2027.001.00740
Enclosures

Tronox LLC
Tronox Henderson
SDG:236817

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Case Narrative

CASE NARRATIVE
for
Tronox LLC
Tronox Henderson
SDG:236817

October 09, 2009

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary

Sample receipt

The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 09, 2009, September 10, 2009 and September 11, 2009 for analysis. Shipping container temperatures were checked, documented, and within specifications. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Items of Note

All samples under this SDG were logged as an open SDG until a sufficient amount of samples were received by the lab. The client was notified that the SDG was closed on September 11, 2009 and the turnaround time would start from then.

QC Issues

The following samples did not meet the Tronox QA program sample result uncertainty limit of <30% for Ra-226 with the results between 2 and 5 times the MDA and were counted for the maximum time: and 236817015. The following samples did not meet the Tronox QA program sample result uncertainty limit of <30% for Alpha Spec Uranium with the results between 2 and 5 times the MDA and were counted for the maximum time: 236817014, 236817016 and 236817020. The following samples did not meet the Tronox QA program sample tracer yield requirements of 70-120% for Alpha Spec Uranium due to matrix issues: 236817001, 236817002, 236817003, 236817005, 236817006, 236817007, 236817008, 236817009, 236817010, 236817011, 236817014, 236817015, 236817016, 236817018, 236817019 and 236817020. The following samples did not meet the Tronox QA program sample tracer yield requirements of 70-120% for Alpha Spec Thorium due to matrix issues: 236817007, 236817016 and 236817020. The following samples did not meet the Tronox QA program sample result uncertainty limit of <30% for Alpha Spec Uranium with the results greater than 5 times the MDA and were counted for the maximum time: and 236817013. The following samples did not meet the Tronox QA program required detection limits for Alpha Spec Uranium due to limited sample volume and were counted for the maximum time: 236817001, 236817002, 236817003, 236817005, 236817006, 236817009, 236817010, 236817015, 236817019 and 236817021. Sample 236817013 did not meet the Tronox QA program detection limit requirements for Ra-228 and was counted the maximum possible count time. For the soil Thorium batch, the method blank did not meet the Tronox QA program detection limit requirements due to keeping the blank volume consistent with the other sample aliquots. Please refer to the attached e-mail for further details on QA issues.

Sample Identification

The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
236817001	SA50-12B

236817002	SA50009-12B
236817003	SA50-25B
236817004	SA50-36B
236817005	SA135-0.5B
236817006	SA135-10B
236817007	SA135009-10B
236817008	SA135-25B
236817009	SA135-37B
236817010	SA170-0.5B
236817011	SA170-10B
236817012	SA170-20B
236817013	SA170-31B
236817014	EB090809-SO1
236817015	SA45-10B
236817016	SA45-25B
236817017	SA45-36B
236817018	SA186-10B
236817019	SA186-25B
236817020	SA186-37B
236817021	SA126-40B

Case Narrative

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

Data Package

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

This data package, to the best of my knowledge, is in compliance with technical and administrative requirements.



Edith Kent

Project Manager

**Chain of Custody
and
Supporting
Documentation**



1100 Quail Street, Suite 102, Newport Beach, CA 92660
(949) 260-9293

236817%

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate.

COC No. 2027.001.00701

Page: 1 of 1
Cooler # 1 of 1
Collection Area: II

Required Ship to Lab:				Required Project Information:				Required Invoice Information:				TAT: Standard 30 day <input type="checkbox"/> Rush <input checked="" type="checkbox"/>		Mark One					
Lab Name: GEL Laboratories, LLC		Site ID #: TRONOX LLC, HENDERSON		Send Invoice to: Susan Crowley		City/State: HENDERSON, NV 89009		Phone #: (949) 260-9293		Special EPA Stage		Special	EPA Stage		Mark one				
Address: 2040 Savage Road		Project #: 2027.001		Address: PO Box 55		City/State: HENDERSON, NV 89009		Phone #: (949) 260-9293		QC level Required: Standard		QC level Required: Standard	Special		EPA Stage	Mark one			
Charleston, SC 29407		Lab P/N: Edith M. Kent		Site Address: 560 W. Lake Mead Drive		City/State: HENDERSON, NV		Reimbursement project? <input checked="" type="checkbox"/>		Non-reimbursement project?		Non-reimbursement project?	Mark one						
Phone/Fax: (843) 556-8171		Site PM Name: Derrick Willis		State: NV		Send EDD to: Frank Hagar Northgate Environmental Management, Inc		Send EDD to: frank.hagar@ngem.com		CC Hardcopy report to: PDF Electronic Version Only		MA MCP Cert? <input type="checkbox"/>		CT RCP Cert? <input type="checkbox"/>		Mark One			
Lab PM email: emk@gel.com		Phone/Fax: (949) 375-7004		Site PM Email: derrick.willis@ngem.com		CC Hardcopy report to:		CC Hardcopy report to:		Lab Project ID (lab use)		Requested		Analyses		Comments/Lab Sample I.D.			
ITEM #	SAMPLE ID	MATRIX	MATRIX CODES	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	#OF CONTAINERS	FIELD FILTERED? (Y/N)	PRESERVATIVES	OTHER	DATE	TIME	TEMP IN OC	SAMPLE ON	SAMPLE INTACT?	TRIP BLANK?			
1	SA50-12B	GROUNDWATER SURFACE WATER WASTE WATER WASTE PRODUCT SLURRY SOIL SLUDGE BIOMASS AERIAL PARTICLES SLURRY	WG SW WW WP SO SL SS AB AP SLA SLS	G=GRAB C=COMP	9/8/2009	10:34	1	N	UNPRESERVED		9/8/2009	08:58:22		Y/N	Y/N				
2	SA50009-12B			G	9/8/2009	10:34	1	N						Y/N	Y/N				
3	SA50-25B			G	9/8/2009	11:01	1	N						Y/N	Y/N				
4	SA50-36B			G	9/8/2009	11:27	1	N						Y/N	Y/N				
5-13																			
RELINQUISHED BY / AFFILIATION													ACCEPTED BY / AFFILIATION			DATE		TIME	
B... GS 78 1700													C...			9/8/09		08:58:22	
ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS:																			
FULL DIGESTION SPECIFICATION Radionuclides includes Thorium (isotopic) and Uranium (isotopic) by EML HASL 300 modified (alpha spectroscopy)																			
All PDF reports and EDDs will be uploaded to: Northgate Environmental Management, Inc. FTP site address provided to labs Notifications provided to: cindy.arnold@ngem.com & frank.hagar@ngem.com																			



SAMPLE RECEIPT & REVIEW FORM

Client: <u>TRONOX</u>		SDG/ARCOC/Work Order: <u>2368171</u>	
Received By: <u>C. Duffy</u>		Date Received: <u>9/9/09</u>	
Suspected Hazard Information	Yes	No	*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.
COC/Samples marked as radioactive?		X	Maximum Counts Observed*: <u>60</u>
Classified Radioactive II or III by RSO?		X	
COC/Samples marked containing PCBs?		X	
Shipped as a DOT Hazardous?		X	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		X	

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	X			Circle Applicable: seals broken damaged container leaking container other (describe)
2	Samples requiring cold preservation within 0 ≤ 6 deg. C?		X		Preservation Method: ice bags blue ice dry ice none other (describe) <u>21°</u>
3	Chain of custody documents included with shipment?	X			
4	Sample containers intact and sealed?	X			Circle Applicable: seals broken damaged container leaking container other (describe)
5	Samples requiring chemical preservation at proper pH?		X		Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?		X		Sample ID's and containers affected:
7	Are Encore containers present?			X	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	X			Id's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			Sample ID's affected:
11	Number of containers received match number indicated on COC?	X			Sample ID's affected:
12	COC form is properly signed in relinquished/received sections?	X			

Comments: 7979 1456 1855

PM (or PMA) review: Initials ED Date 9/9/09



1100 Quail Street, Suite 102, Newport Beach, CA 92660
(949) 260-9293

CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate.

COC No. 2027.001.00715
Page: 1 of 1
Cooler # 1 of 1
Collection Area: IV

Required Ship to Lab:			Required Project Information:			Required Invoice Information:			TAT: Standard 30 day		Rush	Mark One		
Lab Name:	GEL Laboratories, LLC	Site ID #:	TRONOX LLC, HENDERSON	Send Invoice to:	Susan Crowley	If Rush, Date due		TAT: Standard 30 day		X	Rush	Mark One		
Address:	2040 Savage Road	Project #:	2027.001	Address:	PO Box 65	QC level Required: Standard		Special		EPA Stage 4	Mark one			
City:	Charleston, SC 29407	Site Address:	560 W. Lake Mead Drive	City/State:	Henderson, NV 89009	Phone #:	(949)260-9293	NJ Reduced Deliverable Package?						
Lab PI:	Edith M. Kent	City:	Henderson	State:	NV	Reimbursement project?	X	Non-reimbursement project?						
Phone/Fax:	(843)856-9171	Site PM Name:	Derrick Willis	Send EDD to:	Frank Hagar	Frank Hagar Northgate Environmental Management, Inc frank.hagar@ngem.com		MA MCP Cert?		CT RCP Cert?	Mark One			
Lab PI email:	emk@gel.com	Phone/Fax:	949-375-7004	CC Hardcopy report to:	PDF Electronic Version Only	Lab Project ID (lab use)								
Applicable Lab Quote #:		Site PM Email:	derrick.willis@ngem.com	CC Hardcopy report to:	see additional comments below									
ITEM #	SAMPLE ID	Matrix Code	MATRIX	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	MOF CONTAINERS	FIELD FILTERED? (YM)	Preservatives	Request	Analyses	Comments/Lab		
1	SA135-0-5B	W WP D U O A Z	WATER WATER WATER WATER WATER WATER WATER	G	9/8/2009	8:02	1	N	X	Requested	EPA 821 EPA 823 EPA 824 EPA 825 EPA 826 EPA 827 EPA 828 EPA 829 EPA 830 EPA 831 EPA 832 EPA 833 EPA 834 EPA 835 EPA 836 EPA 837 EPA 838 EPA 839 EPA 840 EPA 841 EPA 842 EPA 843 EPA 844 EPA 845 EPA 846 EPA 847 EPA 848 EPA 849 EPA 850 EPA 851 EPA 852 EPA 853 EPA 854 EPA 855 EPA 856 EPA 857 EPA 858 EPA 859 EPA 860 EPA 861 EPA 862 EPA 863 EPA 864 EPA 865 EPA 866 EPA 867 EPA 868 EPA 869 EPA 870 EPA 871 EPA 872 EPA 873 EPA 874 EPA 875 EPA 876 EPA 877 EPA 878 EPA 879 EPA 880 EPA 881 EPA 882 EPA 883 EPA 884 EPA 885 EPA 886 EPA 887 EPA 888 EPA 889 EPA 890 EPA 891 EPA 892 EPA 893 EPA 894 EPA 895 EPA 896 EPA 897 EPA 898 EPA 899 EPA 900 EPA 901 EPA 902 EPA 903 EPA 904 EPA 905 EPA 906 EPA 907 EPA 908 EPA 909 EPA 910 EPA 911 EPA 912 EPA 913 EPA 914 EPA 915 EPA 916 EPA 917 EPA 918 EPA 919 EPA 920 EPA 921 EPA 922 EPA 923 EPA 924 EPA 925 EPA 926 EPA 927 EPA 928 EPA 929 EPA 930 EPA 931 EPA 932 EPA 933 EPA 934 EPA 935 EPA 936 EPA 937 EPA 938 EPA 939 EPA 940 EPA 941 EPA 942 EPA 943 EPA 944 EPA 945 EPA 946 EPA 947 EPA 948 EPA 949 EPA 950 EPA 951 EPA 952 EPA 953 EPA 954 EPA 955 EPA 956 EPA 957 EPA 958 EPA 959 EPA 960 EPA 961 EPA 962 EPA 963 EPA 964 EPA 965 EPA 966 EPA 967 EPA 968 EPA 969 EPA 970 EPA 971 EPA 972 EPA 973 EPA 974 EPA 975 EPA 976 EPA 977 EPA 978 EPA 979 EPA 980 EPA 981 EPA 982 EPA 983 EPA 984 EPA 985 EPA 986 EPA 987 EPA 988 EPA 989 EPA 990 EPA 991 EPA 992 EPA 993 EPA 994 EPA 995 EPA 996 EPA 997 EPA 998 EPA 999 EPA 1000	250 ml Plastic jar		
2	SA135-10B			G	9/8/2009	8:24	1	N	X			250 ml Plastic jar		
3	SA135009-10B			G	9/8/2009	8:24	1	N	X			250 ml Plastic jar		
4	SA135-25B			G	9/8/2009	9:25	1	N	X			250 ml Plastic jar		
5	SA135-37B			G	9/8/2009	9:51	1	N	X			250 ml Plastic jar		
6														
7														
8														
9														
10														
11														
12														
Additional Comments/Special Instructions:			SHIP TO: Dana R. Brown, NGEN 8:50p 9/8/09 GFS			DATE: 9/8/09 13:01			SIGNED: [Signature]			TEMP IN COOL: Y/N		
FULL DIGESTION SPECIFICATION			Radionuclides* includes Thorium (isotopic) and Uranium (isotopic) by EML			HASTL 300 modified(alpha spectroscopy)			Temp in COOL			Sample Receipt Conditions		
All PDF reports and EDDs will be uploaded to:			Northgate Environmental Management, Inc.			FTP site address provided to labs			Notifications provided to:			Trip Blank? Y/N		
cindy.armold@ngem.com & frank.hagar@ngem.com			DATE SIGNED: 9/8/2009			TIME: 13:01			DATE SIGNED: [Signature]			Sample Intact? Y/N		
UPS COURIER FEDEX			SIGNATURE OF SAMPLER: Dana R. Brown			DATE SIGNED: [Signature]			Temp in COOL			Sample Intact? Y/N		
US MAIL			SIGNATURE OF SAMPLER: [Signature]			DATE SIGNED: [Signature]			Temp in COOL			Sample Intact? Y/N		



1100 Quail Street, Suite 102, Newport Beach, CA 92660
(949) 260-9293

CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate.

COC No. 2027.001.00717
Page: 1 of 1
Cooler # 1 of 1
Collection Area: II

Required Ship to Lab:		Required Project Information:		Required Invoice Information:		Required Receipt Conditions	
Lab Name:	GEL Laboratories, LLC	Site ID #:	TRONOX LLC, HENDERSON	Send Invoice to:	Susan Crowley Tronox LLC	Temp in OC	Temp in Ice?
Address:	2040 Savage Road	Project #:	2027.001	Address:	PO Box 65	Y/N	Y/N
City/State:	Charleston, SC 29407	Site Address:	560 W. Lake Mead Drive	City/State:	Henderson, NV 89009	Y/N	Y/N
Lab P/I:	Edith M. Kent	City:	Henderson	State:	NV	Y/N	Y/N
Phone/Fax:	(843) 566-8171	Site P/I Name:	Derrick Willis	Send EDD to:	frank.hagar@ngem.com	Y/N	Y/N
Lab P/I email:	emk@gel.com	Phone/Fax:	(949) 375-7004	CC Hardcopy report to:	PDF Electronic Version Only	Y/N	Y/N
Applicable Lab Quote #:		Site P/I Email:	derrick.willis@ngem.com	CC Hardcopy report to:	see additional comments below	Y/N	Y/N

ITEM #	SAMPLE ID	MATRIX	G-GRAB CODE	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	FIELD FILTERED? (Y/N)	PRESERVATIVES					Comments/Lab Sample I.D.		
									Unpreserved	H2SO4	HNO3	HCl	NaOH		Na2S2O3	Methanol
1	SA170-0-5B	One		G	9/8/2009	11:20	1	N	X							250 ml Plastic jar
2	SA170-10B	One		G	9/8/2009	11:30	1	N	X							250 ml Plastic jar
3	SA170-20B	One		G	9/8/2009	12:00	1	N	X							250 ml Plastic jar
4	SA170-31B	One		G	9/8/2009	12:28	1	N	X							250 ml Plastic jar
5																
6																
7																
8																
9																
10																
11																
12																
13																

Additional Comments/Special Instructions:
FULL DIGESTION SPECIFICATION
Radionuclides* includes Thorium (isotopic) and Uranium (isotopic) by EML
HASL 300 modified(alpha spectroscopy)

All PDF reports and EDDs will be uploaded to:
 Northgate Environmental Management, Inc.
 FTP site address provided to labs
 Notifications provided to:
 cindy.arnold@ngem.com & frank.hagar@ngem.com



SAMPLE RECEIPT & REVIEW FORM

Client: <u>Tronox</u>		SDG/ARCOC/Work Order: <u>2368171</u>	
Received By: <u>C. Duffy</u>		Date Received: <u>9/9/09</u>	
Suspected Hazard Information	Yes	No	*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.
COC/Samples marked as radioactive?		X	Maximum Counts Observed*: <u>(0)</u>
Classified Radioactive II or III by RSO?		X	
COC/Samples marked containing PCBs?		X	
Shipped as a DOT Hazardous?		X	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		X	

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	X			Circle Applicable: seals broken damaged container leaking container other (describe)
2	Samples requiring cold preservation within 0 ≤ 6 deg. C?		X		ice bags blue ice dry ice <u>none</u> other (describe) <u>22°</u>
3	Chain of custody documents included with shipment?	X			
4	Sample containers intact and sealed?	X			Circle Applicable: seals broken damaged container leaking container other (describe)
5	Samples requiring chemical preservation at proper pH?		X		Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?		X		Sample ID's and containers affected:
7	Are Encore containers present?			X	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	X			Id's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			Sample ID's affected:
11	Number of containers received match number indicated on COC?	X			Sample ID's affected:
12	COC form is properly signed in relinquished/received sections?	X			

Comments: 7979 1456 1811

PM (or PMA) review: Initials em Date 9/9/09



Client: <u>Tronox</u>		SDG/ARCOC/Work Order: <u>2368171</u>	
Received By: <u>C. Duffy</u>		Date Received: <u>9/9/09</u>	
Suspected Hazard Information	Yes	No	*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.
COC/Samples marked as radioactive?		X	Maximum Counts Observed*: <u>60</u>
Classified Radioactive II or III by RSO?		X	
COC/Samples marked containing PCBs?		X	
Shipped as a DOT Hazardous?		X	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		X	

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	X			Circle Applicable: seals broken damaged container leaking container other (describe)
2	Samples requiring cold preservation within 0 ≤ 6 deg. C?		X		ice bags blue ice Preservation Method: dry ice <u>none</u> other (describe) <u>25°</u>
3	Chain of custody documents included with shipment?	X			
4	Sample containers intact and sealed?	X			Circle Applicable: seals broken damaged container leaking container other (describe)
5	Samples requiring chemical preservation at proper pH?	X			Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?		X		Sample ID's and containers affected:
7	Are Encore containers present?			X	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	X			Id's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			Sample ID's affected:
11	Number of containers received match number indicated on COC?	X			Sample ID's affected:
12	COC form is properly signed in relinquished/received sections?	X			

Comments: 7469 2698 9190

PM. (or PMA) review: Initials EM Date 9/9/09

2368171



1100 Quail Street, Suite 102, Newport Beach, CA 92660
(949) 250-9293

CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate.

COC No. 2027.001.00711
Page: 1 of 1
Cooler # 1 of 1
Collection Area: II

Required Ship to Lab: Lab Name: GEL Laboratories, LLC Address: 2040 Savage Road Charleston, SC 29407 Lab PM: Edith M. Kent Phone/Fax: (843) 556-8171 Lab PM email: emk@gel.com Applicable Lab Quote #:		Required Project Information: Site ID #: TRONOX LLC, HENDERSON Project #: 2027.001 Site Address: 560 W. Lake Mead Drive City: Henderson State: NV Site PM Name: Derrick Willis Phone/Fax: (949) 375-7004 Site PM Email: derrick.willis@ngem.com		Required Invoice Information: Send Invoice to: Susan Crowley Address: PO Box 85 City/State: Henderson, NV 89009 Phone #: (949) 260-9293 Reimbursement project? <input checked="" type="checkbox"/> Non-reimbursement project? <input type="checkbox"/> Send EDD to: frank.hagar@ngem.com CC Hardcopy report to: PDF Electronic Version Only CC Hardcopy report to: see additional comments below		TAT: Standard 30 day <input checked="" type="checkbox"/> Rush <input type="checkbox"/> If Rush, Date due: _____ QC level Required: Standard <input type="checkbox"/> Special <input type="checkbox"/> EPA Stage <input type="checkbox"/> Mark one NJ Reduced Deliverable Package? <input type="checkbox"/> MA MCP Cert? <input type="checkbox"/> CT RCP Cert? <input type="checkbox"/> Lab Project ID (lab use)									
#	ITEM	SAMPLE ID One Character per box. (A-Z, 0-9 / ') Samples IDs MUST BE UNIQUE	MATRIX	VALID MATRIX CODES	MATRIX	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	FIELD FILTERED? (Y/N)	PRESERVATIVES			Comments/Lab Sample I.D.	
											Unpreserved	H2SO4	HNO3		HCl
1		SA45-10B	GROUNDWATER	WG	W	G	9/9/2009	8:29	1	N	<input checked="" type="checkbox"/>				250 ml Plastic jar
2		SA45-25B	WASTE WATER	WW	W	G	9/9/2009	8:59	1	N	<input checked="" type="checkbox"/>				250 ml Plastic jar
3		SA45-36B	WASTE WATER	WW	W	G	9/9/2009	9:31	1	N	<input checked="" type="checkbox"/>				250 ml Plastic jar
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															

Additional Comments/Special Instructions:
 FULL DIGESTION SPECIFICATION
 Radionuclides* includes Thorium (isotopic) and Uranium (isotopic)
 by EML HASL 300 modified(alpha spectroscopy)

All PDF reports and EDDs will be uploaded to:
 Northgate Environmental Management, Inc.
 FTP site address provided to labs
 Notifications provided to:
 cindy.amold@ngem.com & frank.hagar@ngem.com

RELINQUISHED BY / AFFILIATION: *Patrick Ferring*
 DATE: 9-9-09
 TIME: 17:00
 ACCEPTED BY: *Mike Fisher*
 AFFILIATION: *oel*
 DATE: 9-9-09
 TIME: 09:00

SHIPPING METHOD: (mark as appropriate)
 UPS COURIER FEDEX
 SIGNATURE OF SAMPLER: *Patrick Ferring*
 PRINT NAME OF SAMPLER: Patrick Ferring
 DATE SIGNED: 9-9
 TIME: 1436

Temp in OC: _____
 Samples on: _____
 Sample Intact?: _____
 Trip Blank?: _____



SAMPLE RECEIPT & REVIEW FORM

Client: <u>Kerr / Nor Korte</u>		SDG/ARCO/Work Order: <u>231871</u>	
Received By: <u>MJK</u>		Date Received: <u>9-10-09</u>	
Suspected Hazard Information		Yes	No
*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.			
COC/Samples marked as radioactive?			<input checked="" type="checkbox"/>
		Maximum Counts Observed*: <u>cpm 10</u>	
Classified Radioactive II or III by RSO?			<input checked="" type="checkbox"/>
COC/Samples marked containing PCBs?			<input checked="" type="checkbox"/>
Shipped as a DOT Hazardous?			<input checked="" type="checkbox"/>
		Hazard Class Shipped: _____ UN#: _____	
Samples identified as Foreign Soil?			<input checked="" type="checkbox"/>

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: seals broken damaged container leaking container other (describe)
2	Samples requiring cold preservation within 0 ≤ 6 deg. C?		<input checked="" type="checkbox"/>		Preservation Method: ice bags blue ice dry ice <u>none</u> other (describe) <u>23°</u>
3	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			
4	Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: seals broken damaged container leaking container other (describe)
5	Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>		Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?		<input checked="" type="checkbox"/>		Sample ID's and containers affected:
7	Are Encore containers present?		<input checked="" type="checkbox"/>		(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	<input checked="" type="checkbox"/>			id's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Sample ID's affected:
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Sample ID's affected:
12	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			

Comments:

FX 7969 3098 9859

PM (or PMA) review: Initials AS Date 9-10-09

20090954069

2368179



1100 Quail Street, Suite 102, Newport Beach, CA 92660
(949) 290-9233

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate.

COC No. 2027.001.00740
Page: 1 of 1
Cooler # _____ of _____
Collection Area: II

Required Ship to Lab:		Required Project Information:		Required Invoice Information:		TAT: Standard 30 day		Rush	Mark One									
Lab Name:	GEL Laboratories, LLC	Site ID #:	TRONOX LLC, HENDERSON	Send Invoice to:	Susan Crowley Tronox LLC	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
Address:	2040 Savage Road Charleston, SC 29407	Project #:	2027.001	Address:	PO Box 66	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
Lab PM:	Edith M. Kent (843) 866-9171	City:	Henderson	Reimbursement project?	X	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
Lab PM email:	emk@gel.com	State:	NV	Send EDD to:	Frank Hegar Northgate Environmental Management, Inc frank.hegar@ngem.com	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
Phone/Fax:	(843) 866-9171	Site PM Name:	Derrick Willis	CC Hardcopy report to:	PDF Electronic Version Only	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
Lab PM email:	emk@gel.com	Phone/Fax:	(849) 374-7004	CC Hardcopy report to:	see additional comments below	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
Applicable Lab Quote #:		Site PM Email:	derrick.willis@ngem.com	CC Hardcopy report to:	see additional comments below	City/State:	Henderson, NV 89009	Phone #:	(949) 290-9233	QC level Required: Standard	Special EPA Stage 1	Mark one						
VALID MATRIX CODES		MATRIX		MATRIX CODE		SAMPLE TYPE		SAMPLE DATE		SAMPLE TIME		# OF CONTAINERS	FIELD FILTERED? (Y/N)	Preservatives	Requested	Analyses	Lab Project ID (lip use)	Comments/Lab Sample ID.
1	SA126-0.5B	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	07:10		07:10	1	N	X	X	X	X	250 mL Bioshielder	802
2	SA126-10B	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	07:25		07:25	1	N	X	X	X	X	250 mL Bioshielder	802
3	SA126-18B	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	07:40		07:40	1	N	X	X	X	X	250 mL Bioshielder	Glass
4	SA126-25B	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	07:59		07:59	1	N	X	X	X	X	250 mL Bioshielder	Jar
5	SA126-40B	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	08:30		08:30	1	N	X	X	X	X	250 mL Bioshielder	
6	SA126-40BMS	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	08:30		08:30	1	N	X	X	X	X	250 mL Bioshielder	
7	SA126-40BMSD	One	Character per box. (A-Z, 0-9, /, -) Samples IDs MUST BE UNIQUE	SO	G	G	9/10/2009	08:30		08:30	1	N	X	X	X	X	250 mL Bioshielder	
8																		
9																		
10																		
11																		
12																		
13																		

Additional Comments/Special Instructions:
FULL DIGESTION SPECIFICATION
 Radionuclides* includes Thorium (isotopic) and Uranium (isotopic) by EML
 HASL 300 modified(alpha spectroscopy)

All PDF reports and EDDs will be uploaded to:
 Northgate Environmental Management, Inc.
 FTP site address provided to labs
 Notifications provided to:
 cindy.armold@ngem.com & frank.hegar@ngem.com

DATE OF SAMPLE COLLECTION: 9/10/2009
 TIME: 1400
 DATE OF ANALYSIS: 9/10/09
 TIME: 0910

DATE OF SAMPLER: 9/10/2009

Temp in OC: Y/N
 Samples on Ice?: Y/N
 Sample Intact?: Y/N
 Trip Blank?: Y/N



SAMPLE RECEIPT & REVIEW FORM

Client: Kerr/NORTHgate SDG/ARCOC/Work Order: 236871

Received By: MK Date Received: 9-11-09

Suspected Hazard Information	Yes	No	*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.
COC/Samples marked as radioactive?		<input checked="" type="checkbox"/>	Maximum Counts Observed*: <u>CR-20</u>
Classified Radioactive II or III by RSO?		<input checked="" type="checkbox"/>	
COC/Samples marked containing PCBs?		<input checked="" type="checkbox"/>	
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		<input checked="" type="checkbox"/>	

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: seals broken damaged container leaking container other (describe)
2 Samples requiring cold preservation within 0 ≤ 6 deg. C?		<input checked="" type="checkbox"/>		ice bags blue ice Preservation Method: dry ice <u>none</u> other (describe) <u>23°</u>
3 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			
4 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: seals broken damaged container leaking container other (describe)
5 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>		Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6 VOA vials free of headspace (defined as < 6mm bubble)?		<input checked="" type="checkbox"/>		Sample ID's and containers affected:
7 Are Encore containers present?			<input checked="" type="checkbox"/>	(If yes, immediately deliver to Volatiles laboratory)
8 Samples received within holding time?	<input checked="" type="checkbox"/>			Id's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			Sample ID's and containers affected:
10 Date & time on COC match date & time on bottles?			<input checked="" type="checkbox"/>	Sample ID's affected: <u>* see below</u>
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Sample ID's affected:
12 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			

Comments: NO DATE OR TIME ON SAMPLES

* SA124009-10B
SA125009-39B

FX 7979 2289 4224

PM (or PMA) review: Initials CR Date 9/11/09

Subject: GEL Closed SDGs 236817 and 236938

From: Heather Shaffer <Heather.Shaffer@gel.com>

Date: Fri, 11 Sep 2009 15:40:07 -0400

To: Cindy Arnold <Cindy.Arnold@ngem.com>, Frank Hagar <Frank.Hagar@ngem.com>, Edie Kent <emk@gel.com>, Derrick Willis <Derrick.Willis@ngem.com>

CC: Heather Shaffer <hea01394@gel.com>

With today's receipts, we closed soil SDGs 236817 and 236938. Attached is a list of the samples in the SDGs. As soon as we have completed the login review, you will receive the full receipt package for these SDGs.

Thank you,
Heather

--
Heather Shaffer
Project Manager Assistant
GEL Laboratories, LLC
2040 Savage Road
Charleston, SC (USA) 29407
Main: 843.556.8171 x 4505
Fax: 843.766.1178
E-mail: heather.shaffer@gel.com
Web: www.gel.com

236817.xls	Content-Type: application/msexcel Content-Encoding: base64
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236938.xls	Content-Type: application/msexcel Content-Encoding: base64
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Subject: SDG 236817 QC Issues - Alpha Spec Th, Alpha Spec U, Ra-226

From: Edie Kent <emk@gel.com>

Date: Fri, 09 Oct 2009 10:14:50 -0400

To: Cindy Arnold <Cindy.Arnold@ngem.com>, Frank Hagar <Frank.Hagar@ngem.com>, Derrick Willis <Derrick.Willis@ngem.com>, Team Kent <Team.Kent@gel.com>

CC: Martha Harrison <Martha.Harrison@gel.com>

The following are the QC issues regarding this SDG for Alpha Spec Th, Alpha Spec U and Ra 226:

Soil Ra 226 Issues:

Sample 236817015 did not meet the Tronox QA program sample result uncertainty limit of <30% with activity between 2 and 5 times the MDA and were counted the maximum possible count time.

Soil Ra 228 Issues:

Sample 236817013 did not meet the Tronox QA program detection limit requirements and was counted the maximum possible count time.

Soil Thorium Issues:

The following samples did not meet the Tronox QA program tracer yield requirements of 70-120% due to the matrix of the samples: 236817007, 236817016, 236817020. The samples met GEL's standard tracer yield requirements, the program detection limits were met, and the method blank and LCS met the contract tracer yield requirements.

The method blank did not meet the Tronox QA program detection limit requirements for Th-228 and Th-230 due to keeping the blank volume consistent with the other sample aliquots. All other samples met the required detection limits.

Soil Uranium Issues:

The following samples did not meet the Tronox QA program detection limit requirements for U-235/236 as a result of the low tracer yields: 236817001, 236817002, 236817003, 236817005, 236817006, 236817009, 236817010, 236817015, 236817019, 236817021. The absence of significant U-235 activity in the samples impacts being able to meet the detection limit. If the samples were to be prepped with larger aliquots to improve the uncertainty and lower the MDA, this would result in tailing from the U-233/234 region of interest into the U-235 region of interest especially due to the levels of U-233/234 activity being much higher than the U-235 levels in each sample and also likely lower the tracer yield recoveries. The samples were counted the maximum possible count time in order to achieve the lowest possible MDA.

Sample 236817013 did not meet the Tronox QA program sample result uncertainty limit of <30% for U-235/236 with activity greater than 5 times the MDA and was counted the maximum possible count time.

The following samples do not meet the Tronox QA program sample result uncertainty limit of <30% for U-235/236 with activity between 2 and 5 times the MDA and were counted the maximum possible count time: 236817016, 236817020.

The following samples did not meet the Tronox QA program tracer yield requirements of 70-120% but did meet GEL's standard tracer yield requirements: 236817001, 236817002, 236817003, 236817005, 236817006, 236817007, 236817008, 236817009, 236817010, 236817011, 236817015, 236817016, 236817018, 236817019, 236817020. The method blank and the LCS met the contract tracer yield requirements.

***Water Uranium Issues*:**

Sample 236817014 did not meet the Tronox QA program sample result uncertainty limit of <30% for U-235/236 and U-238 with activity between 2 and 5 times the MDA and was counted the maximum possible count time.

Sample 236817014 did not meet the Tronox QA program tracer yield

requirements of 70-120% but did meet GEL's standard tracer yield requirements at 69.5%.

This will be noted in the case narrative.

Edie

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Edith M. Kent
Project Manager
GEL Laboratories, LLC
2040 Savage Road
Charleston, SC (USA) 29407
Direct: 843.769.7385 x4453
Main: 843.556.8171
Fax: 843.766.1178
E-mail: emk@gel.com
Web: www.gel.com

Laboratory Certifications

List of current GEL Certifications as of 08 October 2009

State	Certification
Arizona	AZ0668
Arkansas	88-0651
CLIA	42D0904046
California – NELAP	01151CA
Colorado	GEL
Connecticut	PH-0169
Dept. of Navy	NFESC 413
EPA Region 5	WG-15J
Florida – NELAP	E87156
Georgia	E87156 (FL/NELAP)
Georgia DW	967
Hawaii	N/A
ISO 17025	2567.01
Idaho	SC00012
Illinois – NELAP	200029
Indiana	C-SC-01
Kansas – NELAP	E-10332
Kentucky	90129
Louisiana – NELAP	03046
Maryland	270
Massachusetts	M-SC012
Nevada	SC00012
New Jersey – NELAP	SC002
New Mexico	FL NELAP E87156
New York – NELAP	11501
North Carolina	233
North Carolina DW	45709
Oklahoma	9904
Pennsylvania – NELAP	68-00485
South Carolina	10120001/10120002
Tennessee	TN 02934
Texas – NELAP	T104704235-07B-TX
U.S. Dept. of Agriculture	S-52597
Utah – NELAP	GEL
Vermont	VT87156
Virginia	00151
Washington	C1641

RADIOLOGICAL ANALYSIS

**Radiochemistry Case Narrative
Tronox LLC (KERR)
SDG 236817**

Method/Analysis Information

Product: Alphaspec Th, Liquid
Analytical Method: DOE EML HASL-300, Th-01-RC Modified
Analytical Batch Number: 905546

Sample ID	Client ID
236817014	EB090809-SO1
1201930820	Method Blank (MB)
1201930821	Laboratory Control Sample (LCS)
1201930822	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-038 REV# 12.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volumes in this batch.

Designated QC

A laboratory duplicate was not run with the analytical batch since it was designated by the client as a field QC. A laboratory control sample duplicate was analyzed for precision. 1201930821 (LCS) and

1201930822 (LCSD).

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

Samples 1201930820 (MB) and 236817014 (EB090809-SO1) were recounted due to high MDAs.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A nonconformance report (NCR) was not generated for this SDG.

Manual Integration

No manual integrations were performed on data in this batch.

Additional Comments

The Th-228 blank result is greater than the MDA but less than the RDL.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product:	Alphaspec Th, Solid
Analytical Method:	DOE EML HASL-300, Th-01-RC Modified
Prep Method:	Dry Soil Prep
Analytical Batch Number:	906319
Prep Batch Number:	902339

Sample ID	Client ID
236817001	SA50-12B
236817002	SA50009-12B
236817003	SA50-25B
236817004	SA50-36B
236817005	SA135-0.5B
236817006	SA135-10B
236817007	SA135009-10B
236817008	SA135-25B
236817009	SA135-37B
236817010	SA170-0.5B
236817011	SA170-10B
236817012	SA170-20B
236817013	SA170-31B
236817015	SA45-10B
236817016	SA45-25B
236817017	SA45-36B
236817018	SA186-10B
236817019	SA186-25B
236817020	SA186-37B
236817021	SA126-40B
1201932680	Method Blank (MB)
1201932681	236817021(SA126-40B) Sample Duplicate (DUP)
1201932682	236817021(SA126-40B) Matrix Spike (MS)
1201932683	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-038 REV# 12.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volumes in this batch.

Designated QC

The following sample was used for QC: 236817021 (SA126-40B).

QC Information

Refer to Non-Conformance Report.

Technical Information:**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

Samples were recounted due to a suspected blank false positive.

Miscellaneous Information:**NCR Documentation**

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following NCR was generated for this SDG: NCR 743500 was generated due to RDL less than MDA, Failed Recovery for Surrogate or Tracer and Container scanning event for custody missed. 1. Container scanning event for custody missed for sample 236817021. 2. Samples 236817007, 236817016, and 2368171020 do not meet the client tracer yield requirements of 70 to 120 percent due to the matrix of the samples. 3. The Method blank does not meet the detection limits for Th-228 and Th-230. 1. The samples The analyst did not scan samples into his/her custody. The analyst had physical custody of the sample during the analysis. Reporting results. 2. The samples do meet the GEL standard tracer yield requirements of 15 to 125 percent, the detection limits were met, Uncertainty requirements were met, and the Method blank and LCS do meet the client tracer yield requirements. PM notified, reporting results. 3. The blank does not meet the detection limits due to keeping the blank aliquot consistent with the sample aliquots. All samples did meet the requested detection limits and were counted for the maximum count time of 1000 minutes. PM notified, reporting results.

Manual Integration

Manual integrations of alpha spectroscopy spectra 1201932682 (SA126-40B) and 1201932683 (LCS) were performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

Additional comments were not required for this sample set.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product:	Alphaspec U, Liquid
Analytical Method:	DOE EML HASL-300, U-02-RC Modified
Analytical Batch Number:	905548

Sample ID	Client ID
236817014	EB090809-SO1
1201930842	Method Blank (MB)
1201930843	Laboratory Control Sample (LCS)
1201930844	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 17.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume in this batch.

Designated QC

A laboratory duplicate was not run with the analytical batch since it was designated by the client as a field QC. A laboratory control sample duplicate was analyzed for precision. 1201930843 (LCS) and 1201930844 (LCSD).

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

Sample 236817014 (EB090809-SO1) was recounted due to high MDA.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following NCR was generated for this SDG: NCR 742719 was generated due to Failed Recovery for Surrogate or Tracer and Other. 1. Sample 236817014 has Uranium-233/234 and U-238 activity between two and five times the MDA and uncertainty greater than 30% of that respective activity. 2. Sample 236817014 does not meet the client tracer yield requirements. 1. Samples were all counted the maximum count time of 1000 minutes to achieve the best possible uncertainties. PM notified, reporting results. 2. Sample 236817014 has a tracer yield of 69.5%, which does not meet the client tracer yield requirements of 70 to 120%, however it does meet the GEL standard tracer yield requirements of 15 to 125%. PM notified, reporting results.

Manual Integration

No manual integrations were performed on data in this batch.

Additional Comments

Additional comments were not required for this sample set.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product:	Alphaspec U, Solid
Analytical Method:	DOE EML HASL-300, U-02-RC Modified
Prep Method:	Dry Soil Prep
Analytical Batch Number:	906320
Prep Batch Number:	902339

Sample ID	Client ID
236817001	SA50-12B
236817002	SA50009-12B
236817003	SA50-25B
236817004	SA50-36B
236817005	SA135-0.5B
236817006	SA135-10B
236817007	SA135009-10B
236817008	SA135-25B
236817009	SA135-37B
236817010	SA170-0.5B
236817011	SA170-10B
236817012	SA170-20B
236817013	SA170-31B
236817015	SA45-10B
236817016	SA45-25B
236817017	SA45-36B
236817018	SA186-10B
236817019	SA186-25B
236817020	SA186-37B
236817021	SA126-40B
1201932690	Method Blank (MB)
1201932691	236817021(SA126-40B) Sample Duplicate (DUP)
1201932692	236817021(SA126-40B) Matrix Spike (MS)
1201932693	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-011 REV# 17.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume in this batch.

Designated QC

The following sample was used for QC: 236817021 (SA126-40B).

QC Information

Refer to Non-Conformance Report.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

Samples 236817001 (SA50-12B), 236817006 (SA135-10B), 236817009 (SA135-37B), 236817010 (SA170-0.5B), 236817011 (SA170-10B) and 236817013 (SA170-31B) were given an additional clean up step and recounted due to poor resolution.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following NCR was generated for this SDG: NCR 743252 was generated due to RDL less than MDA, Failed Recovery for Surrogate or Tracer, Container scanning event for custody missed and Other. 1. Samples 236817001, 236817002, 236817003, 236817005, 236817006, 236817007, 236817008, 236817009, 236817010, 236817011, 236817015, 236817016, 236817018, 236817019 and 236817020 do not meet the client's tracer yield requirement of 70 - 120%. 2. Samples 236817001, 236817002, 236817003, 236817005, 236817006, 236817009, 236817010, 236817015, 236817019 and 236817021 do not meet the required detection limit for U235/236 due to the low tracer yields. The blank, 1201932690, does not meet the required detection limit for U233/234 due to keeping the blank aliquot size equal to the samples. 3. Sample 236817013 has Uranium-235/236 activity greater than five times the MDA and uncertainty greater than 30% of that activity. Samples 236817016 and 236817020 have Uranium-235/236 activity between two and five times the MDA and uncertainty greater than 30% of that respective activity. 4. The analyst did not scan sample 236817021 into the batch prior to analysis, however the samples did remain in their custody at all times. The error has been corrected and the analyst has been instructed on proper scanning procedures. 1. The blank and LCS meet the client's tracer requirement, and all samples meet the GEL standard tracer yield requirements. PM notified, reporting results. 2. Samples counted 1000 minutes to achieve the best possible MDA values. PM notified, reporting results. 3. Samples were all counted the maximum count time of 1000 minutes to achieve the best possible uncertainties. PM notified, reporting results. 4. Reporting results.

Manual Integration

No manual integrations were performed on data in this batch.

Additional Comments

Additional comments were not required for this sample set.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product: GFPC, Ra228, Liquid
Analytical Method: EPA 904.0/SW846 9320 Modified
Analytical Batch Number: 902602

Sample ID	Client ID
236817014	EB090809-SO1
1201923559	Method Blank (MB)
1201923560	Laboratory Control Sample (LCS)
1201923561	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-009 REV# 15.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume in this batch.

Designated QC

A laboratory duplicate was not run with the analytical batch since it was designated by the client as a field QC. A laboratory control sample duplicate was analyzed for precision. 1201923560 (LCS) and 1201923561 (LCSD).

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

None of the samples in this sample set required reprep or reanalysis.

Chemical Recoveries

All chemical recoveries meet the required acceptance limits for this sample set.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A nonconformance report (NCR) was not generated for this SDG.

Additional Comments

The blank result 1201923559 (MB) is greater than the MDC but less than the detection limit.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product:	Gas Flow Radium 228
Analytical Method:	EPA 904.0/SW846 9320 Modified
Prep Method:	Dry Soil Prep
Analytical Batch Number:	905310
Prep Batch Number:	902339

Sample ID	Client ID
236817001	SA50-12B
236817002	SA50009-12B
236817003	SA50-25B
236817004	SA50-36B
236817005	SA135-0.5B
236817006	SA135-10B
236817007	SA135009-10B
236817008	SA135-25B
236817009	SA135-37B
236817010	SA170-0.5B
236817011	SA170-10B
236817012	SA170-20B
236817013	SA170-31B
236817015	SA45-10B
236817016	SA45-25B
236817017	SA45-36B
236817018	SA186-10B
236817019	SA186-25B
236817020	SA186-37B
236817021	SA126-40B
1201930277	Method Blank (MB)
1201930278	236817021(SA126-40B) Sample Duplicate (DUP)
1201930279	236817021(SA126-40B) Matrix Spike (MS)
1201930280	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-009 REV# 15.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume in this batch.

Designated QC

The following sample was used for QC: 236817021 (SA126-40B).

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:**Holding Time**

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

Samples 1201930279 (SA126-40B) and 1201930280 (LCS) were recounted due to low recovery. Samples were re-eluted due to high MDA. Samples 236817001 (SA50-12B), 236817011 (SA170-10B), 236817013 (SA170-31B) and 236817020 (SA186-37B) were recounted due to client uncertainty requirement.

Chemical Recoveries

All chemical recoveries meet the required acceptance limits for this sample set.

Miscellaneous Information:**NCR Documentation**

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following NCR was generated for this SDG: NCR 743551 was generated due to RDL less than MDA. 1. The minimum detectable activity for sample 236817013 was above the required detection limit. Sample counted for maximum count time of 380 minutes. 1. Reporting results.

Additional Comments

Additional comments were not required for this sample set.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product: Lucas Cell, Ra226, liquid

Analytical Method: EPA 903.1 Modified

Analytical Batch Number: 904649

Sample ID	Client ID
236817014	EB090809-SO1
1201928562	Method Blank (MB)
1201928563	Laboratory Control Sample (LCS)
1201928564	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-008 REV# 12.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume in this batch.

Designated QC

A laboratory duplicate was not run with the analytical batch since it was designated by the client as a field QC. A laboratory control sample duplicate was analyzed for precision. 1201928563 (LCS) and 1201928564 (LCSD).

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

None of the samples in this sample set required reprep or reanalysis.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following NCR was generated for this SDG:

NCR 738448 was generated due to Other. 1. Sample, 236077019, has activity between 2 and 5 times the MDA and uncertainty is greater than 30 percent. Samples counted the maximum count time. 1. Reporting results

Additional Comments

The laboratory control sample and the laboratory control sample duplicate, 1201928563 (LCS) and 1201928564 (LCSD), did not meet the relative percent difference requirement, however they do meet the relative error ratio requirement with value of 1.5683.

Qualifier information

Manual qualifiers were not required.

Method/Analysis Information

Product:	Lucas Cell, Ra226, solid
Analytical Method:	EPA 903.1 Modified
Prep Method:	Dry Soil Prep
Analytical Batch Number:	905689
Prep Batch Number:	902339

Sample ID	Client ID
236817001	SA50-12B
236817002	SA50009-12B
236817003	SA50-25B
236817004	SA50-36B
236817005	SA135-0.5B
236817006	SA135-10B
236817007	SA135009-10B
236817008	SA135-25B
236817009	SA135-37B
236817010	SA170-0.5B
236817011	SA170-10B
236817012	SA170-20B
236817013	SA170-31B
236817015	SA45-10B
236817016	SA45-25B
236817017	SA45-36B
236817018	SA186-10B
236817019	SA186-25B
236817020	SA186-37B
236817021	SA126-40B
1201931149	Method Blank (MB)
1201931150	236817021(SA126-40B) Sample Duplicate (DUP)
1201931151	236817021(SA126-40B) Matrix Spike (MS)
1201931152	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-008 REV# 12.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume in this batch.

Designated QC

The following sample was used for QC: 236817021 (SA126-40B).

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Sample Re-prep/Re-analysis

Samples 236817004 (SA50-36B), 236817008 (SA135-25B) and 236817012 (SA170-20B) were degassed and recounted to verify sample results. Second counts being reported.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following NCR was generated for this SDG: NCR 741657 was generated due to Other. 1. Sample 236817015 has activity between 2 and 5 times the MDA. Uncertainty is greater than 30 percent and the sample counted the maximum count time of 30 minutes. 1. PM notified, reporting results.

Additional Comments

Additional comments were not required for this sample set.

Qualifier information

Manual qualifiers were not required.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer/Date: _____  10/8/09

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr. 25-SEP-09	Division: Radiochemistry	Quality Criteria: Specifications	Type: Process
Instrument Type: LUCAS CELL DETECTOR	Test / Method: EPA 903.1 Modified	Matrix Type: Liquid	Client Code: KERR
Batch ID: 904649	Sample Numbers: See Below		
Potentially affected work order(s)(SDG): 236077,236699,236817,236938,237010,237170,237343			
Application Issues: Other			
Specification and Requirements Nonconformance Description:		NRG Disposition:	
1. Sample, 236077019, has activity between 2 and 5 times the MDA and uncertainty is greater than 30 percent. Samples counted the maximum count time.		1. Reporting results	

Originator's Name:
Takesha Mungo 25-SEP-09

Data Validator/Group Leader:
Layota Yom 25-SEP-09

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr. 05-OCT-09	Division: Radiochemistry	Quality Criteria: Specifications	Type: Process
Instrument Type: LUCAS CELL DETECTOR	Test / Method: EPA 903.1 Modified	Matrix Type: Solid	Client Code: KERR
Batch ID: 905689	Sample Numbers: See below		
Potentially affected work order(s)(SDG): 236817			
Application Issues: Other			
Specification and Requirements Nonconformance Description:		NRG Disposition:	
1. Sample 236817015 has activity between 2 and 5 times the MDA. Uncertainty is greater than 30 percent and the sample counted the maximum count time of 30 minutes.		1. PM notified, reporting results.	

Originator's Name:
Lyndsey Pace 05-OCT-09

Data Validator/Group Leader:
Lesley Anderson 05-OCT-09

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr. 07-OCT-09	Division: Radiochemistry	Quality Criteria: Specifications	Type: Process
Instrument Type: ALPHA SPECTROMETER	Test / Method: DOE EML HASL-300, U-02-RC Modified	Matrix Type: %Null%	Client Code: KERR
Batch ID: 905548	Sample Numbers: See Below		

Potentially affected work order(s)(SDG): 236699,236817,236938,237010,237170,237343,237521

Application Issues:

Failed Recovery for Surrogate or Tracer

Other

Specification and Requirements Nonconformance Description:	NRG Disposition:
<ol style="list-style-type: none"> Sample 236817014 has Uranium-233/234 and U-238 activity between two and five times the MDA and uncertainty greater than 30% of that respective activity. Sample 236817014 does not meet the client tracer yield requirements. 	<ol style="list-style-type: none"> Samples were all counted the maximum count time of 1000 minutes to achieve the best possible uncertainties. PM notified, reporting results. Sample 236817014 has a tracer yield of 69.5%, which does not meet the client tracer yield requirements of 70 to 120%, however it does meet the GEL standard tracer yield requirements of 15 to 125%. PM notified, reporting results.

Originator's Name:

Jessica Downey 07-OCT-09

Data Validator/Group Leader:

Jessica Downey

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr. 08-OCT-09	Division: Radiochemistry	Quality Criteria: Specifications	Type: Process
Instrument Type: ALPHA SPECTROMETER	Test / Method: DOE EML HASL-300, U-02-RC Modified	Matrix Type: Solid	Client Code: KERR
Batch ID: 906320	Sample Numbers: See Below		

Potentially affected work order(s)(SDG): 236817

Application Issues:

- RDL less than MDA
- Failed Recovery for Surrogate or Tracer
- Other
- Container scanning event for custody missed

**Specification and Requirements
Nonconformance Description:**

NRG Disposition:

1. Samples 236817001, 236817002, 236817003, 236817005, 236817006, 236817007, 236817008, 236817009, 236817010, 236817011, 236817015, 236817016, 236817018, 236817019 and 236817020 do not meet the client's tracer yield requirement of 70 - 120%.
2. Samples 236817001, 236817002, 236817003, 236817005, 236817006, 236817009, 236817010, 236817015, 236817019 and 236817021 do not meet the required detection limit for U235/236 due to the low tracer yields. The blank, 1201932690, does not meet the required detection limit for U233/234 due to keeping the blank aliquot size equal to the samples.
3. Sample 236817013 has Uranium-235/236 activity greater than five times the MDA and uncertainty greater than 30% of that activity. Samples 236817016 and 236817020 have Uranium-235/236 activity between two and five times the MDA and uncertainty greater than 30% of that respective activity.
4. The analyst did not scan sample 236817021 into the batch prior to analysis, however the samples did remain in their custody at all times. The error has been corrected and the analyst has been instructed on proper scanning procedures.

1. The blank and LCS meet the client's tracer requirement, and all samples meet the GEL standard tracer yield requirements. PM notified, reporting results.
2. Samples counted 1000 minutes to achieve the best possible MDA values. PM notified, reporting results.
3. Samples were all counted the maximum count time of 1000 minutes to achieve the best possible uncertainties. PM notified, reporting results.
4. Reporting results.

Originator's Name:

Joseph Moulden 08-OCT-09

Data Validator/Group Leader:

Jessica Downey 08-OCT-09

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr. 08-OCT-09	Division: Radiochemistry	Quality Criteria: Specifications	Type: Process
Instrument Type: ALPHA SPECTROMETER	Test / Method: DOE EML HASL-300, Th-01-RC Modified	Matrix Type: Solid	Client Code: KERR
Batch ID: 906319	Sample Numbers: See Below		

Potentially affected work order(s)(SDG): 236817

Application Issues:

RDL less than MDA
Failed Recovery for Surrogate or Tracer
Container scanning event for custody missed

**Specification and Requirements
Nonconformance Description:**

1. Container scanning event for custody missed for sample 236817021.
2. Samples 236817007, 236817016, and 2368171020 do not meet the client tracer yield requirements of 70 to 120 percent due to the matrix of the samples.
3. The Method blank does not meet the detection limits for Th-228 and Th-230.

NRG Disposition:

1. The samples The analyst did not scan samples into his/her custody. The analyst had physical custody of the sample during the analysis. Reporting results.
2. The samples do meet the GEL standard tracer yield requirements of 15 to 125 percent, the detection limits were met, Uncertainty requirements were met, and the Method blank and LCS do meet the client tracer yield requirements. PM notified, reporting results.
3. The blank does not meet the detection limits due to keeping the blank aliquot consistent with the sample aliquots. All samples did meet the requested detection limits and were counted for the maximum count time of 1000 minutes. PM notified, reporting results.

Originator's Name:

Jessica Downey 08-OCT-09

Data Validator/Group Leader:

Kate Gellatly 08-OCT-09

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr. 08-OCT-09	Division: Radiochemistry	Quality Criteria: Specifications	Type: Process
Instrument Type: GFPC	Test / Method: EPA 904.0/SW846 9320 Modified	Matrix Type: Solid	Client Code: KERR
Batch ID: 905310	Sample Numbers: See Below		
Potentially affected work order(s)(SDG): 236817			
Application Issues: RDL less than MDA			
Specification and Requirements Nonconformance Description:		NRG Disposition:	
1. The minimum detectable activity for sample 236817013 was above the required detection limit. Sample counted for maximum count time of 380 minutes.		1. Reporting results.	

Originator's Name:
Spencer Collins 08-OCT-09

Data Validator/Group Leader:
Lesley Anderson 08-OCT-09

SAMPLE DATA SUMMARY

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis Report for

KERR003 Tronox LLC

Client SDG: 236817 GEL Work Order: 236817

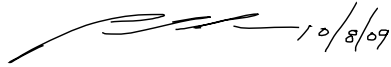
The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a surrogate compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the detection limit.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Edith Kent.



Reviewed by

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID: SA50-12B
Sample ID: 236817001
Matrix: SO
Collect Date: 08-SEP-09 10:34
Receive Date: 09-SEP-09
Collector: Client

Project: KERRHenderson
Client ID: KERR003

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.15	+/-0.200	0.145	0.050	pCi/g		MXE1	10/07/09	1818	906319	1
Thorium-230		0.693	+/-0.145	0.0729	0.050	pCi/g						
Thorium-232		1.08	+/-0.178	0.0228	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		0.865	+/-0.184	0.136	0.040	pCi/g		MXE1	10/06/09	2322	906320	2
Uranium-235/236	U	0.0219	+/-0.043	0.084	0.040	pCi/g						
Uranium-238		0.914	+/-0.177	0.0266	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.749	+/-0.325	0.515	0.500	pCi/g		MXS2	10/07/09	1158	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.89	+/-0.390	0.238	0.500	pCi/g		KSD1	10/02/09	1700	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			87.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			41.2	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			84.6	(25%-125%)

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA50009-12B	Project:	KERRHenderson
Sample ID:	236817002	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 10:34		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.63	+/-0.245	0.137	0.050	pCi/g		MXE1	10/07/09	1818	906319	1
Thorium-230		0.659	+/-0.148	0.026	0.050	pCi/g						
Thorium-232		1.43	+/-0.222	0.0959	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.03	+/-0.199	0.092	0.040	pCi/g		MXE1	10/02/09	2024	906320	2
Uranium-235/236	U	0.0356	+/-0.052	0.0908	0.040	pCi/g						
Uranium-238		0.816	+/-0.183	0.129	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.898	+/-0.424	0.626	0.500	pCi/g		MXS2	10/07/09	0759	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.10	+/-0.284	0.253	0.500	pCi/g		KSD1	10/02/09	1700	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			83.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			35.7	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			92.5	(25%-125%)

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA50-25B	Project:	KERRHenderson
Sample ID:	236817003	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 11:01		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.07	+/-0.208	0.168	0.050	pCi/g		MXE1	10/07/09	1818	906319	1
Thorium-230		0.961	+/-0.177	0.0255	0.050	pCi/g						
Thorium-232		0.986	+/-0.181	0.0651	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.05	+/-0.239	0.146	0.040	pCi/g		MXE1	10/02/09	2024	906320	2
Uranium-235/236	U	0.0979	+/-0.0904	0.125	0.040	pCi/g						
Uranium-238		0.858	+/-0.218	0.146	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		1.03	+/-0.501	0.744	0.500	pCi/g		MXS2	10/07/09	0759	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.19	+/-0.305	0.222	0.500	pCi/g		KSD1	10/02/09	1700	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			78.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			25.8	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			80.0	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental Management, Inc.
 Address : 1100 Quail St., Suite 102
 Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
 Project: **Tronox Henderson**

Client Sample ID:	SA50-36B	Project:	KERRHenderson
Sample ID:	236817004	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 11:27		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		0.736	+/-0.150	0.112	0.050	pCi/g		MXE1	10/07/09	1818	906319	1
Thorium-230		5.54	+/-0.379	0.0515	0.050	pCi/g						
Thorium-232		0.734	+/-0.138	0.0202	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		6.95	+/-0.306	0.0269	0.040	pCi/g		MXE1	10/02/09	2024	906320	2
Uranium-235/236		0.265	+/-0.0664	0.013	0.040	pCi/g						
Uranium-238		5.95	+/-0.284	0.0432	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.532	+/-0.296	0.427	0.500	pCi/g		MXS2	10/07/09	0759	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		6.56	+/-0.728	0.323	0.500	pCi/g		KSD1	10/05/09	0955	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			103	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			104	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			86.9	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA135-0.5B	Project:	KERRHenderson
Sample ID:	236817005	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 08:02		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.40	+/-0.207	0.132	0.050	pCi/g		MXE1	10/07/09	1818	906319	1
Thorium-230		1.06	+/-0.170	0.0664	0.050	pCi/g						
Thorium-232		1.21	+/-0.182	0.0664	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.35	+/-0.316	0.297	0.040	pCi/g		MXE1	10/02/09	2024	906320	2
Uranium-235/236	U	0.0742	+/-0.089	0.142	0.040	pCi/g						
Uranium-238		1.17	+/-0.266	0.144	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.753	+/-0.431	0.653	0.500	pCi/g		MXS2	10/07/09	0759	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.42	+/-0.375	0.314	0.500	pCi/g		KSD1	10/02/09	1700	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			96.0	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			23.3	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			77.6	(25%-125%)

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Company : Northgate Environmental
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Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA135-10B	Project:	KERRHenderson
Sample ID:	236817006	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 08:24		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.29	+/-0.206	0.147	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.01	+/-0.170	0.0691	0.050	pCi/g						
Thorium-232		1.19	+/-0.184	0.0691	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.36	+/-0.174	0.075	0.040	pCi/g		MXE1	10/06/09	2322	906320	2
Uranium-235/236	U	0.0484	+/-0.0407	0.0529	0.040	pCi/g						
Uranium-238		1.25	+/-0.165	0.0428	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.692	+/-0.358	0.529	0.500	pCi/g		MXS2	10/07/09	0759	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.78	+/-0.333	0.232	0.500	pCi/g		KSD1	10/02/09	1700	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			94.3	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			62.7	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			91.4	(25%-125%)

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Company : Northgate Environmental Management, Inc.
 Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
 Project: **Tronox Henderson**

Client Sample ID:	SA135009-10B	Project:	KERRHenderson
Sample ID:	236817007	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 08:24		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.30	+/-0.254	0.195	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.08	+/-0.215	0.102	0.050	pCi/g						
Thorium-232		1.12	+/-0.217	0.0818	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.47	+/-0.215	0.0965	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.097	+/-0.0658	0.0742	0.040	pCi/g						
Uranium-238		1.29	+/-0.201	0.0868	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		1.21	+/-0.472	0.669	0.500	pCi/g		MXS2	10/07/09	0759	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.47	+/-0.331	0.246	0.500	pCi/g		KSD1	10/02/09	1700	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			64.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			43.4	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			87.2	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
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Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA135-25B	Project:	KERRHenderson
Sample ID:	236817008	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 09:25		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.10	+/-0.181	0.126	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		5.87	+/-0.386	0.0199	0.050	pCi/g						
Thorium-232		0.835	+/-0.149	0.0732	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		7.12	+/-0.366	0.0653	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.404	+/-0.0967	0.0181	0.040	pCi/g						
Uranium-238		6.88	+/-0.359	0.0146	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.872	+/-0.462	0.700	0.500	pCi/g		MXS2	10/07/09	0800	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		6.57	+/-0.729	0.293	0.500	pCi/g		KSD1	10/05/09	0955	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			110	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			68.8	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			83.2	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA135-37B	Project:	KERRHenderson
Sample ID:	236817009	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 09:51		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.04	+/-0.230	0.216	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		2.79	+/-0.330	0.110	0.050	pCi/g						
Thorium-232		0.857	+/-0.181	0.0299	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		4.17	+/-0.370	0.0256	0.040	pCi/g		MXE1	10/06/09	2322	906320	2
Uranium-235/236	U	0.0948	+/-0.0744	0.101	0.040	pCi/g						
Uranium-238		3.68	+/-0.347	0.0256	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.706	+/-0.429	0.659	0.500	pCi/g		MXS2	10/07/09	0800	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		3.54	+/-0.489	0.265	0.500	pCi/g		KSD1	10/02/09	1745	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			71.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			41.1	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			80.1	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA170-0.5B	Project:	KERRHenderson
Sample ID:	236817010	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 11:20		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.20	+/-0.202	0.130	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.08	+/-0.182	0.0747	0.050	pCi/g						
Thorium-232		1.17	+/-0.190	0.0747	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.65	+/-0.212	0.0845	0.040	pCi/g		MXE1	10/06/09	2322	906320	2
Uranium-235/236	U	0.0339	+/-0.047	0.0813	0.040	pCi/g						
Uranium-238		1.15	+/-0.174	0.0206	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.768	+/-0.349	0.456	0.500	pCi/g		MXS2	10/07/09	0800	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.15	+/-0.307	0.278	0.500	pCi/g		KSD1	10/02/09	1745	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			87.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			51.1	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			74.0	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
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Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA170-10B	Project:	KERRHenderson
Sample ID:	236817011	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 11:30		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.60	+/-0.248	0.159	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.47	+/-0.223	0.0668	0.050	pCi/g						
Thorium-232		1.38	+/-0.217	0.0668	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.51	+/-0.174	0.0495	0.040	pCi/g		MXE1	10/06/09	2322	906320	2
Uranium-235/236		0.0703	+/-0.0451	0.0489	0.040	pCi/g						
Uranium-238		1.25	+/-0.159	0.0571	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228	U	0.171	+/-0.279	0.475	0.500	pCi/g		MXS2	10/07/09	1159	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.83	+/-0.363	0.264	0.500	pCi/g		KSD1	10/02/09	1745	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			79.0	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			66.3	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			87.5	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA170-20B	Project:	KERRHenderson
Sample ID:	236817012	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 12:00		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.12	+/-0.227	0.256	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		2.76	+/-0.298	0.199	0.050	pCi/g						
Thorium-232		1.09	+/-0.186	0.130	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		3.41	+/-0.218	0.0398	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.231	+/-0.0641	0.0341	0.040	pCi/g						
Uranium-238		2.87	+/-0.200	0.0276	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.642	+/-0.272	0.336	0.500	pCi/g		MXS2	10/07/09	0801	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		4.87	+/-0.667	0.223	0.500	pCi/g		KSD1	10/05/09	0955	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			94.0	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			101	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			91.8	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA170-31B	Project:	KERRHenderson
Sample ID:	236817013	Client ID:	KERR003
Matrix:	SO		
Collect Date:	08-SEP-09 12:28		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.31	+/-0.226	0.152	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.68	+/-0.242	0.107	0.050	pCi/g						
Thorium-232		1.33	+/-0.214	0.0835	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.65	+/-0.141	0.0444	0.040	pCi/g		MXE1	10/06/09	2322	906320	2
Uranium-235/236		0.080	+/-0.0342	0.0114	0.040	pCi/g						
Uranium-238		1.48	+/-0.133	0.0295	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228	U	0.321	+/-0.396	0.667	0.500	pCi/g		MXS2	10/07/09	1159	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		2.18	+/-0.374	0.243	0.500	pCi/g		KSD1	10/02/09	1825	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			79.0	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			112	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			73.0	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
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Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	EB090809-SO1	Project:	KERRHenderson
Sample ID:	236817014	Client ID:	KERR003
Matrix:	W		
Collect Date:	08-SEP-09 12:02		
Receive Date:	09-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Liquid "As Received"</i>												
Thorium-228		0.0432	+/-0.0228	0.0243	0.030	pCi/L		AXD2	10/05/09	2051	905546	1
Thorium-230	U	0.00	+/-0.00484	0.00741	0.030	pCi/L						
Thorium-232	U	0.00	+/-0.00484	0.00741	0.030	pCi/L						
<i>Alphaspec U, Liquid "As Received"</i>												
Uranium-233/234		0.023	+/-0.0169	0.00974	0.030	pCi/L		AXD2	10/05/09	2048	905548	2
Uranium-235/236	U	0.00803	+/-0.0111	0.012	0.030	pCi/L						
Uranium-238		0.0195	+/-0.0156	0.00974	0.030	pCi/L						
Rad Gas Flow Proportional Counting												
<i>GFPC, Ra228, Liquid "As Received"</i>												
Radium-228		2.39	+/-1.51	2.24	3.00	pCi/L		MXS2	09/18/09	1846	902602	3
Rad Radium-226												
<i>Lucas Cell, Ra226, liquid "As Received"</i>												
Radium-226	U	0.525	+/-0.375	0.540	1.00	pCi/L		KSD1	09/25/09	1005	904649	4

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Liquid "As Received"			89.6	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			69.5	(15%-125%)
Barium-133 Tracer	GFPC, Ra228, Liquid "As Received"			77.0	(15%-125%)

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Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA45-10B	Project:	KERRHenderson
Sample ID:	236817015	Client ID:	KERR003
Matrix:	SO		
Collect Date:	09-SEP-09 08:29		
Receive Date:	10-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.61	+/-0.238	0.153	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.17	+/-0.190	0.0241	0.050	pCi/g						
Thorium-232		1.49	+/-0.215	0.0615	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.22	+/-0.253	0.176	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236	U	0.0302	+/-0.0592	0.116	0.040	pCi/g						
Uranium-238		0.966	+/-0.221	0.135	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.849	+/-0.376	0.530	0.500	pCi/g		MXS2	10/07/09	0804	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		0.870	+/-0.261	0.256	0.500	pCi/g		KSD1	10/02/09	1745	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			85.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			29.3	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			88.4	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
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Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA45-25B	Project:	KERRHenderson
Sample ID:	236817016	Client ID:	KERR003
Matrix:	SO		
Collect Date:	09-SEP-09 08:59		
Receive Date:	10-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.88	+/-0.325	0.234	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.22	+/-0.268	0.236	0.050	pCi/g						
Thorium-232		1.33	+/-0.265	0.178	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.92	+/-0.301	0.131	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.117	+/-0.081	0.0438	0.040	pCi/g						
Uranium-238		1.87	+/-0.295	0.113	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.863	+/-0.361	0.473	0.500	pCi/g		MXS2	10/07/09	0804	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		2.19	+/-0.413	0.290	0.500	pCi/g		KSD1	10/02/09	1825	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			55.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			29.9	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			78.2	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA45-36B	Project:	KERRHenderson
Sample ID:	236817017	Client ID:	KERR003
Matrix:	SO		
Collect Date:	09-SEP-09 09:31		
Receive Date:	10-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.10	+/-0.192	0.132	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		2.52	+/-0.270	0.0227	0.050	pCi/g						
Thorium-232		0.990	+/-0.175	0.093	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		3.38	+/-0.219	0.084	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.113	+/-0.0527	0.0628	0.040	pCi/g						
Uranium-238		3.42	+/-0.217	0.0599	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		1.51	+/-0.394	0.383	0.500	pCi/g		MXS2	10/07/09	0804	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		3.65	+/-0.483	0.252	0.500	pCi/g		KSD1	10/02/09	1825	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			92.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			100	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			80.7	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
Management, Inc.
Address : 1100 Quail St., Suite 102
Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA186-10B	Project:	KERRHenderson
Sample ID:	236817018	Client ID:	KERR003
Matrix:	SO		
Collect Date:	09-SEP-09 10:28		
Receive Date:	10-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.52	+/-0.237	0.0896	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		0.990	+/-0.188	0.0695	0.050	pCi/g						
Thorium-232		1.62	+/-0.237	0.0272	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		0.890	+/-0.218	0.164	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.136	+/-0.0985	0.116	0.040	pCi/g						
Uranium-238		1.26	+/-0.248	0.117	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.743	+/-0.317	0.412	0.500	pCi/g		MXS2	10/07/09	0805	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		1.23	+/-0.323	0.289	0.500	pCi/g		KSD1	10/02/09	1825	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			76.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			28.5	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			89.2	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA186-25B	Project:	KERRHenderson
Sample ID:	236817019	Client ID:	KERR003
Matrix:	SO		
Collect Date:	09-SEP-09 10:55		
Receive Date:	10-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.45	+/-0.217	0.0796	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.73	+/-0.232	0.0242	0.050	pCi/g						
Thorium-232		0.928	+/-0.170	0.0242	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		2.54	+/-0.376	0.206	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236	U	-0.05	+/-0.098	0.240	0.040	pCi/g						
Uranium-238		2.02	+/-0.328	0.129	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.871	+/-0.378	0.533	0.500	pCi/g		MXS2	10/07/09	0805	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		2.87	+/-0.505	0.269	0.500	pCi/g		KSD1	10/02/09	1825	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			87.7	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			25.6	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			91.5	(25%-125%)

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Certificate of Analysis

Company : Northgate Environmental
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Address : 1100 Quail St., Suite 102
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Report Date: October 8, 2009

Contact: Mr. Frank Hagar
Project: **Tronox Henderson**

Client Sample ID:	SA186-37B	Project:	KERRHenderson
Sample ID:	236817020	Client ID:	KERR003
Matrix:	SO		
Collect Date:	09-SEP-09 11:21		
Receive Date:	10-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.51	+/-0.321	0.163	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.63	+/-0.322	0.0495	0.050	pCi/g						
Thorium-232		1.04	+/-0.257	0.0495	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		2.90	+/-0.421	0.149	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236		0.154	+/-0.107	0.0578	0.040	pCi/g						
Uranium-238		1.75	+/-0.335	0.192	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.592	+/-0.340	0.555	0.500	pCi/g		MXS2	10/07/09	1159	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		2.34	+/-0.392	0.228	0.500	pCi/g		KSD1	10/02/09	1825	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			43.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			22.1	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			94.9	(25%-125%)

GEL LABORATORIES LLC

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Certificate of Analysis

Company : Northgate Environmental Management, Inc.
 Address : 1100 Quail St., Suite 102
 Newport Beach, California 92660

Report Date: October 8, 2009

Contact: Mr. Frank Hagar
 Project: **Tronox Henderson**

Client Sample ID:	SA126-40B	Project:	KERRHenderson
Sample ID:	236817021	Client ID:	KERR003
Matrix:	SO		
Collect Date:	10-SEP-09 08:30		
Receive Date:	11-SEP-09		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
<i>Alphaspec Th, Solid "Dry Weight Corrected"</i>												
Thorium-228		1.22	+/-0.177	0.0714	0.050	pCi/g		MXE1	10/07/09	1819	906319	1
Thorium-230		1.36	+/-0.183	0.0601	0.050	pCi/g						
Thorium-232		1.22	+/-0.172	0.0188	0.100	pCi/g						
<i>Alphaspec U, Solid "Dry Weight Corrected"</i>												
Uranium-233/234		1.94	+/-0.186	0.0689	0.040	pCi/g		MXE1	10/02/09	2025	906320	2
Uranium-235/236	U	0.0612	+/-0.0499	0.0745	0.040	pCi/g						
Uranium-238		1.84	+/-0.182	0.0797	0.040	pCi/g						
Rad Gas Flow Proportional Counting												
<i>Gas Flow Radium 228 "Dry Weight Corrected"</i>												
Radium-228		0.746	+/-0.316	0.416	0.500	pCi/g		MXS2	10/07/09	0823	905310	3
Rad Radium-226												
<i>Lucas Cell, Ra226, solid "Dry Weight Corrected"</i>												
Radium-226		2.05	+/-0.398	0.285	0.500	pCi/g		KSD1	10/02/09	1900	905689	4

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	09/15/09	1353	902339

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Th-01-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	
3	EPA 904.0/SW846 9320 Modified	
4	EPA 903.1 Modified	

Surrogate/Tracer recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Actinium-227 Tracer	Alphaspec Th, Solid "Dry Weight Corrected"			110	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			77.2	(15%-125%)
Barium-133 Tracer	Gas Flow Radium 228 "Dry Weight Corrected"			96.2	(25%-125%)

QUALITY CONTROL DATA

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: October 8, 2009
Page 1 of 5

Northgate Environmental Management, Inc.
1100 Quail St., Suite 102
Newport Beach, California

Contact: Mr. Frank Hagar

Workorder: 236817

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	905546										
QC1201930821	LCS										
Thorium-228			U	0.0205 +/-0.0205	pCi/L				AXD2	10/02/09	09:19
Thorium-230	2.68			2.39 +/-0.137	pCi/L		89.2	(75%-125%)			
Thorium-232				0.0143 +/-0.0106	pCi/L			(75%-125%)			
QC1201930822	LCSD										
Thorium-228			U	0.00931 +/-0.019	pCi/L	75.0				10/02/09	09:19
Thorium-230	2.68			2.67 +/-0.138	pCi/L	11.2	99.6	(0%-20%)			
Thorium-232			U	0.00927 +/-0.0109	pCi/L	42.5*		(0%-20%)			
QC1201930820	MB										
Thorium-228				0.0287 +/-0.0168	pCi/L					10/05/09	20:51
Thorium-230			U	0.00439 +/-0.0086	pCi/L						
Thorium-232			U	0.00 +/-0.0043	pCi/L						
Batch	905548										
QC1201930843	LCS										
Uranium-233/234				2.89 +/-0.144	pCi/L				AXD2	10/02/09	13:49
Uranium-235/236				0.153 +/-0.0398	pCi/L						
Uranium-238	3.15			3.16 +/-0.151	pCi/L		100	(75%-125%)			
QC1201930844	LCSD										
Uranium-233/234				3.08 +/-0.151	pCi/L	6.43				10/02/09	13:49
Uranium-235/236				0.167 +/-0.0388	pCi/L	8.77					
Uranium-238	3.15			3.29 +/-0.156	pCi/L	3.97	104	(0%-20%)			
QC1201930842	MB										
Uranium-233/234			U	0.00785 +/-0.0134	pCi/L					10/02/09	13:49
Uranium-235/236			U	0.00669 +/-0.00978	pCi/L						
Uranium-238			U	0.0162	pCi/L						

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QC Summary

Workorder: 236817

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	905548										
Batch	906319			+/-0.0146							
QC1201932681	236817021	DUP									
Thorium-228				1.22	1.14	pCi/g	6.95	(0% - 20%)	MXE1	10/07/09	18:19
				+/-0.177	+/-0.214						
Thorium-230				1.36	1.20	pCi/g	13.0	(0% - 20%)			
				+/-0.183	+/-0.214						
Thorium-232				1.22	1.29	pCi/g	4.94	(0% - 20%)			
				+/-0.172	+/-0.224						
QC1201932683	LCS										
Thorium-228			U	0.00		pCi/g				10/07/09	18:19
				+/-0.0493							
Thorium-230	8.30			6.89		pCi/g	83	(75%-125%)			
				+/-0.409							
Thorium-232			U	-0.0125		pCi/g		(75%-125%)			
				+/-0.0423							
QC1201932680	MB										
Thorium-228			U	0.0793		pCi/g				10/07/09	18:19
				+/-0.0761							
Thorium-230			U	-0.0143		pCi/g					
				+/-0.0343							
Thorium-232			U	-0.0286		pCi/g					
				+/-0.0313							
QC1201932682	236817021	MS									
Thorium-228				1.22	1.38	pCi/g				10/07/09	18:19
				+/-0.177	+/-0.189						
Thorium-230	8.33			1.36	7.62	pCi/g	75.2	(75%-125%)			
				+/-0.183	+/-0.440						
Thorium-232				1.22	1.15	pCi/g		(75%-125%)			
				+/-0.172	+/-0.171						
Batch	906320										
QC1201932691	236817021	DUP									
Uranium-233/234				1.94	1.64	pCi/g	16.8	(0% - 20%)	MXE1	10/02/09	20:25
				+/-0.186	+/-0.152						
Uranium-235/236		U		0.0612	0.0564	pCi/g	8.16	(0% - 100%)			
				+/-0.0499	+/-0.039						
Uranium-238				1.84	1.81	pCi/g	1.64	(0% - 20%)			
				+/-0.182	+/-0.157						
QC1201932693	LCS										
Uranium-233/234					4.15	pCi/g				10/02/09	20:25
					+/-0.233						
Uranium-235/236					0.176	pCi/g					
					+/-0.0551						
Uranium-238	4.79				4.67	pCi/g	97.5	(75%-125%)			
					+/-0.244						

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QC Summary

Workorder: 236817

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	906320										
QC1201932690	MB										
Uranium-233/234			U	-0.0213	pCi/g				MXE1	10/02/09	20:25
				+/-0.0225							
Uranium-235/236			U	0.00415	pCi/g						
				+/-0.00814							
Uranium-238			U	0.00336	pCi/g						
				+/-0.0114							
QC1201932692	236817021	MS									
Uranium-233/234				1.94	pCi/g					10/02/09	20:25
				+/-0.186							
Uranium-235/236		U		0.0612	pCi/g						
				+/-0.0499							
Uranium-238	4.79			1.84	pCi/g		96	(75%-125%)			
				+/-0.182							
Rad Gas Flow											
Batch	902602										
QC1201923560	LCS										
Radium-228		11.4		11.5	pCi/L		100	(75%-125%)	MXS2	09/18/09	18:46
				+/-1.19							
QC1201923561	LCSD										
Radium-228		11.4		11.2	pCi/L	2.33	98.1	(0%-20%)		09/18/09	18:46
				+/-1.25							
QC1201923559	MB										
Radium-228				0.561	pCi/L					09/18/09	18:46
				+/-0.375							
Batch	905310										
QC1201930278	236817021	DUP									
Radium-228				0.746	pCi/g	19.7		(0% - 100%)	MXS2	10/07/09	08:23
				+/-0.316							
QC1201930280	LCS										
Radium-228		7.85		7.40	pCi/g		94.3	(75%-125%)		10/07/09	11:59
				+/-1.10							
QC1201930277	MB										
Radium-228			U	-0.114	pCi/g					10/07/09	08:23
				+/-0.225							
QC1201930279	236817021	MS									
Radium-228		78.7		0.746	pCi/g		104	(75%-125%)		10/07/09	11:59
				+/-0.316							
				+/-11.1							
Rad Ra-226											
Batch	904649										
QC1201928563	LCS										
Radium-226		24.2		20.4	pCi/L		84.3	(75%-125%)	KSD1	09/25/09	10:40
				+/-1.75							
QC1201928564	LCSD										
Radium-226		24.2		30.1	pCi/L	38.5*	124	(0%-20%)		09/25/09	10:40
				+/-2.30							
QC1201928562	MB										

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QC Summary

Workorder: 236817

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Ra-226											
Batch	904649										
Radium-226			U	0.419	pCi/L						09/25/09 10:40
				+/-0.325							
Batch	905689										
QC1201931150	236817021	DUP									
Radium-226		2.05		2.31	pCi/g	11.8		(0% - 20%)	KSD1	10/02/09 19:00	
		+/-0.398		+/-0.450							
QC1201931152	LCS										
Radium-226	11.3			10.4	pCi/g		91.4	(75%-125%)		10/02/09 19:00	
				+/-0.791							
QC1201931149	MB										
Radium-226			U	0.116	pCi/g					10/02/09 19:00	
				+/-0.121							
QC1201931151	236817021	MS									
Radium-226	11.5	2.05		13.4	pCi/g		98.6	(75%-125%)		10/02/09 19:00	
		+/-0.398		+/-0.937							

Notes:

The Qualifiers in this report are defined as follows:

- ** Analyte is a surrogate compound
- < Result is less than value reported
- > Result is greater than value reported
- A The TIC is a suspected aldol-condensation product
- B For General Chemistry and Organic analysis the target analyte was detected in the associated blank.
- BD Results are either below the MDC or tracer recovery is low
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of the sample
- F Estimated Value
- H Analytical holding time was exceeded
- J Value is estimated
- M M if above MDC and less than LLD
- M Matrix Related Failure
- N/A RPD or %Recovery limits do not apply.
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y QC Samples were not spiked with this compound

GEL LABORATORIES LLC

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QC Summary

Workorder: 236817

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
^										
RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h										
Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

RAW DATA

THORIUM

Radiochemistry Batch Checklist, Rev 9

Batch# 908846 Product: Th Date: 10/7/09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			NA
Samples have been blank corrected (if required)			NA
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	/		
Instrument source check is within limits.	/		
Instrument bkg check is within limits.	/		
Method RDL/ LLD has been met.	/		
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%.	/		
Or meets the client's required RER acceptance criteria.	/		
Tracer yield is 15-125% . Carrier yield 25-125%.	/		
Or meets the client's contract acceptance criteria.	/		
Method blank is less than the RDL/ LLD. (If rad samples, < 5% of lowest activity)	/		CASE NARRATIVE
Sample was run within hold time.	/		
Sample was correctly preserved if required.	/		
Smears Taken for Radioactive batches.			NA
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	/		
No blank spaces on data forms.	/		
All line outs initialed and dated.	/		
No transcription errors are apparent.	/		
Aux data is correct.			NA
Client Special requirements page has been checked.	/		
Raw Data and/ or spectrum are included and properly stated.	/		
QC data entered into QC database and batch is in REVW	/		
Hit notification complete (if necessary)			NA
Batch entered into Case Narrative.	/		
Batch non-conformances completed, if applicable.	/		NCH# 742701
Batch non-conformances second reviewed and disposition verified to be completed.	✓		NCH# 742701
Aliquot Correction completed if required.			NA
Review sample historical results if available (If REMP, results above MDC have been verified by historical results, recount or re-analysis.)	/		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By: [Signature] 10/7/09

Secondary Review Performed By: [Signature] 10/7/09

9/27 (10/8)
KERR

Thorium (Ac-227 Tracer) Que Sheet

23-SEP-09

Batch #: 905546

Analyst: AXD2

First Client Due Date: 08-OCT-09

Internal Due Date: 27-SEP-09

Tracer Isotope: Ac-227

Tracer Code: 887B-102

Expiration Date: 7/23/10

Vol: 0.1

LCS Isotope: Th-230

LCS Code: 12796-J

Expiration Date: 4/13/10

Vol: 0.1

Spike Isotope: Th-230

Spike Code: ---

Expiration Date: ---

Vol: ---

Prep Date: 9/29/09

Initials: AW

Pipet ID: 297058

Balance ID: 16750207

Witness: AW 9/25/09

Wet Dry

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Pos.	Label #	Aliquot (g) (1 f)	Th Det #
236699016-1	EB090309-SO2	SAMPLE		.03 pCi/L	WATER	KERR003	03-SEP-09	1	1	0.800	25 197
236817014-1	EB090809-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	08-SEP-09	2	2	0.800	26 198
236938020-1	EB091009-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	10-SEP-09	3	3	0.800	27 199
237010013-1	EB091009-SO2	SAMPLE		.03 pCi/L	WATER	KERR003	10-SEP-09	4	4	0.800	28 200
237170005-1	EB091409-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	14-SEP-09	5	5	0.800	29 201
237170020-1	EB091509-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	15-SEP-09	6	6	0.800	30 201
237343006-1	EB091609-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	16-SEP-09	7	7	0.800	31 202
237521010-1	EB091809-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	18-SEP-09	8	8	0.800	32 203
1201930820-1	MB for batch 905546	MB		.03 pCi/L	WATER	QC ACCOUNT	03-SEP-09	9	9	0.800	39 205
1201930821-1	LCS for batch 905546	LCS		.03 pCi/L	WATER	QC ACCOUNT	03-SEP-09	10	10	0.800	40
1201930822-1	LCS for batch 905546	LCS		.03 pCi/L	WATER	QC ACCOUNT	03-SEP-09	11	11	0.800	41

AW 9/25/09

Solid Sample Dissolution by: LEACH or DIGESTION
Circle One

Choose SOP Used: GL-RAD-A-038

- GL-RAD-A-045
- GL-RAD-A-043
- GL-RAD-A-032

GEL Laboratories LLC, Radiochemistry Division

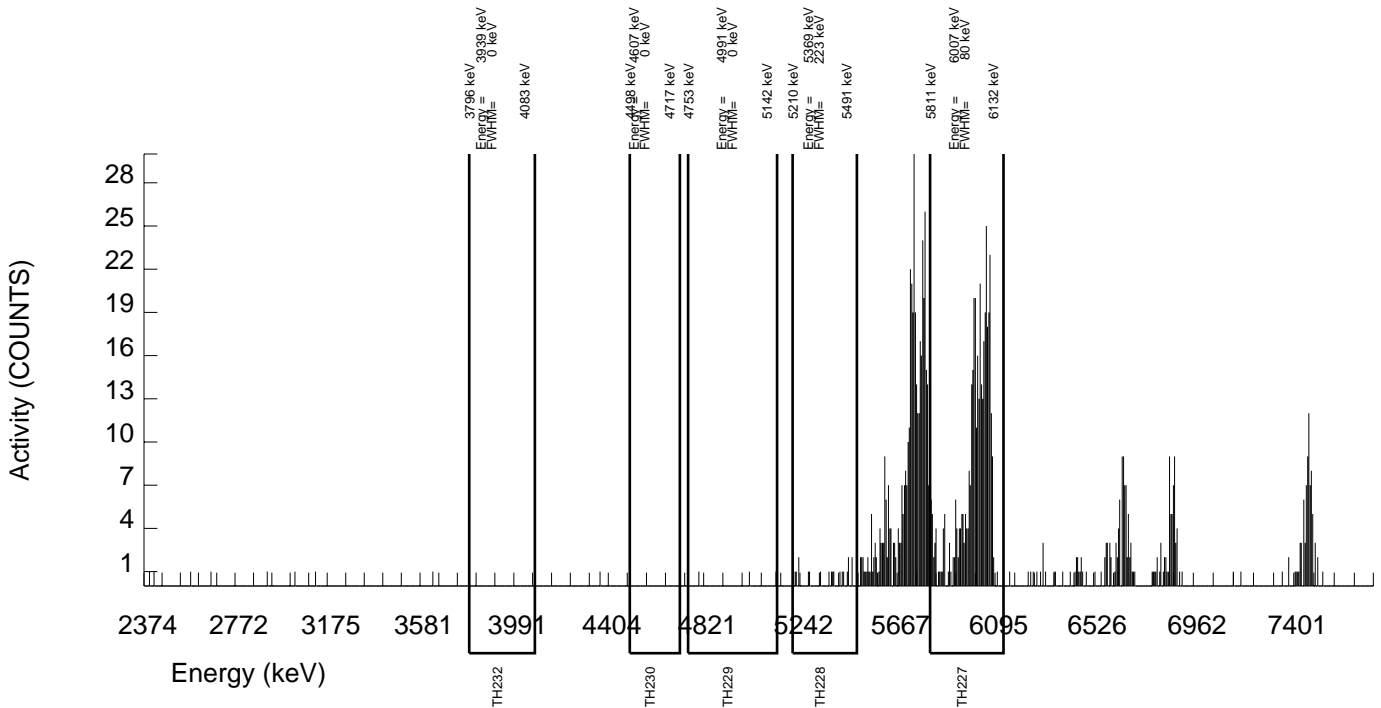
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905546 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 11:15:00		SAMPLE ID : S0236817014_TH SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :78895 AVERAGE %EFFICIENCY :25.4644 % YIELD : 89.550		COUNT DATE: 5-OCT-2009 20:51:28 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :AXD2	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90075 dpm RESULTS : 3.49312 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B198.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W198.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
AC-227	5994.040	419.000	413.000	6.000	2.4495	57.44000	2.20E+00	2.45E-01	7.66E-02	3.03E-02	2.15E-01
TH-228	5363.000	19.000	17.000	2.000	1.4142	99.94000	4.32E-02	2.29E-02	2.43E-02	8.36E-03	2.28E-02
TH229	4900.000	3.000	2.000	1.000	1.0000	99.52000	4.96E-03	9.73E-03	1.90E-02	5.77E-03	9.73E-03
TH-230	4625.000	0.000	0.000	0.000	0.0000	100.0000	0.00E+00	4.84E-03	7.41E-03	0.00E+00	4.84E-03
TH-232	3972.000	0.000	0.000	0.000	0.0000	100.0000	0.00E+00	4.84E-03	7.41E-03	0.00E+00	4.84E-03

NOTE: Ac-227 results decay corrected to separation date/time.



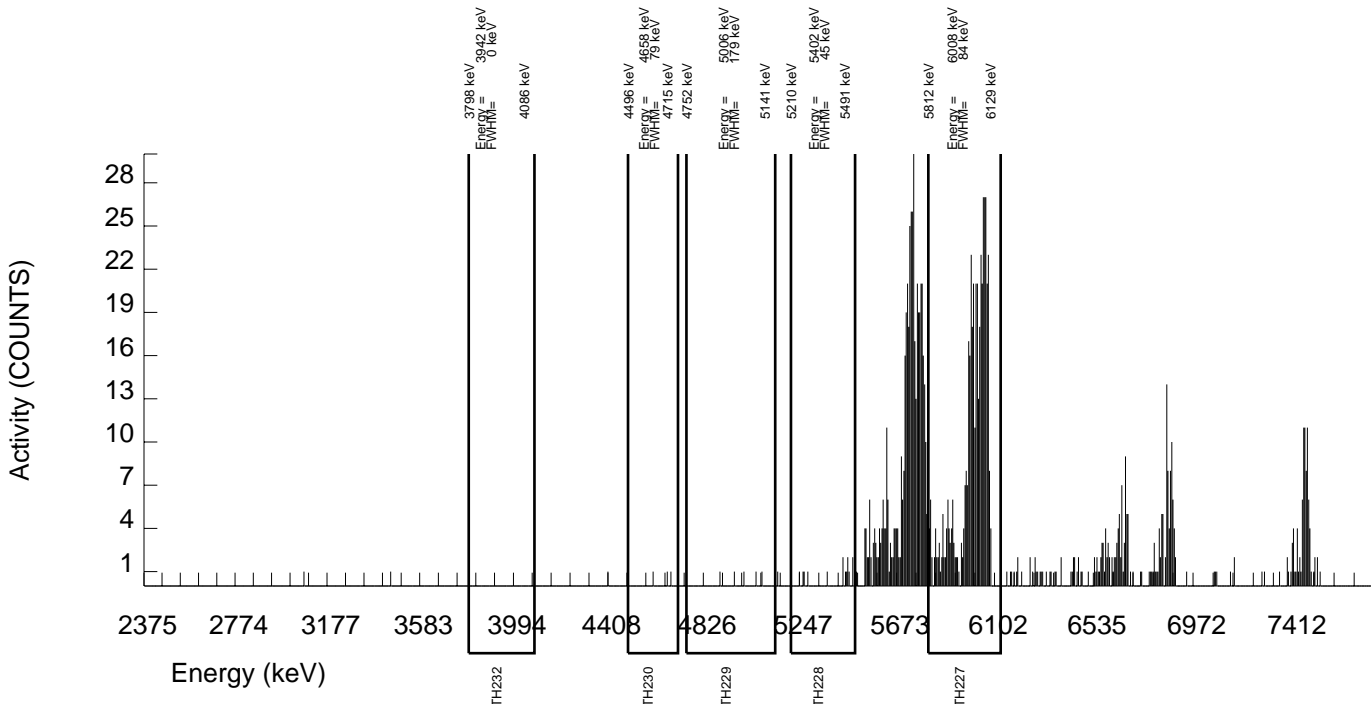
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905546 SAMPLE DATE : 29-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 11:15:00		SAMPLE ID : S1201930820_TH SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :78908 AVERAGE %EFFICIENCY :25.4940 % YIELD : 100.709		COUNT DATE: 5-OCT-2009 20:51:40 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :AXD2	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90075 dpm RESULTS : 3.92840 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B205.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W205.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
AC-227	5994.040	476.000	465.000	11.000	3.3166	57.44000	2.20E+00	2.36E-01	8.71E-02	3.64E-02	2.04E-01
TH-228	5363.000	14.000	13.000	1.000	1.0000	99.94000	2.87E-02	1.68E-02	1.69E-02	5.14E-03	1.68E-02
TH229	4900.000	5.000	3.000	2.000	1.4142	99.52000	6.61E-03	1.14E-02	2.11E-02	7.25E-03	1.14E-02
TH-230	4625.000	3.000	2.000	1.000	1.0000	100.0000	4.39E-03	8.60E-03	1.68E-02	5.10E-03	8.60E-03
TH-232	3972.000	0.000	0.000	0.000	0.0000	100.0000	0.00E+00	4.30E-03	6.58E-03	0.00E+00	4.30E-03

NOTE: Ac-227 results decay corrected to separation date/time.



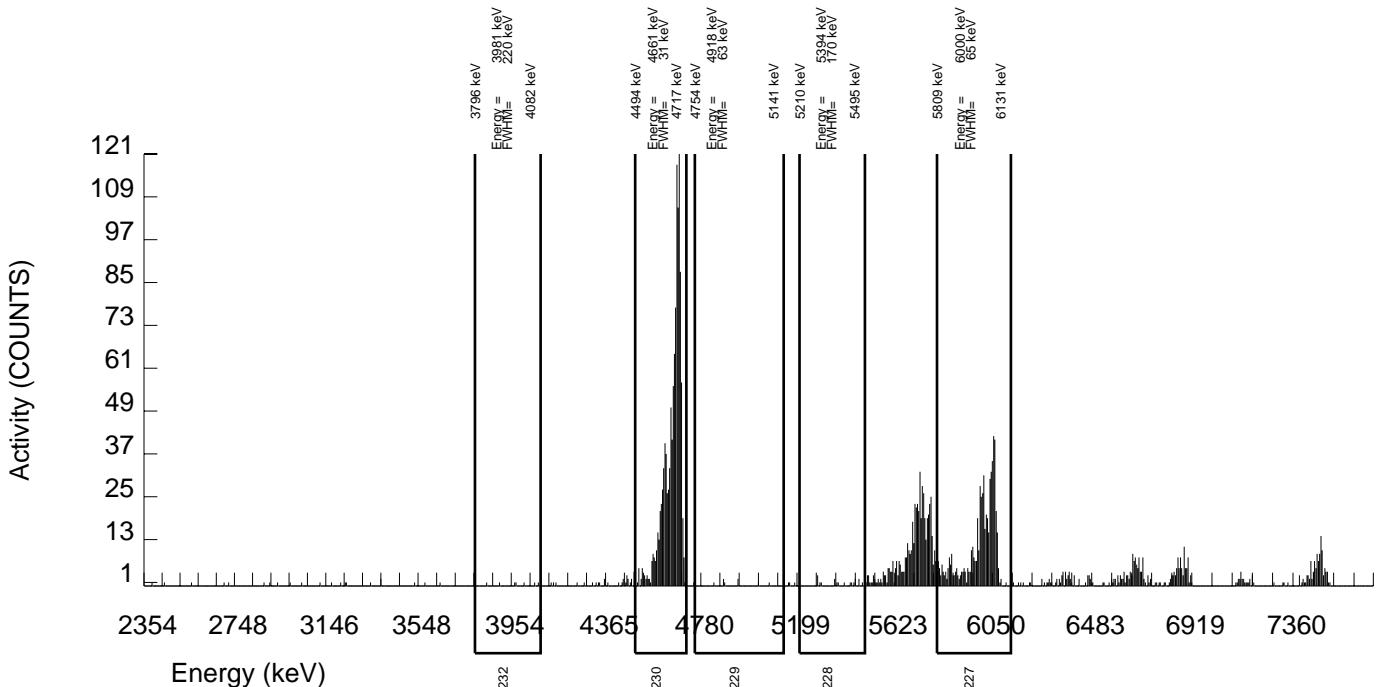
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905546 SAMPLE DATE : 29-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 11:15:00		SAMPLE ID : S1201930821_TH SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :78773 AVERAGE %EFFICIENCY :32.0737 % YIELD : 86.108		COUNT DATE: 2-OCT-2009 09:19:40 ELAPSED LIVE TIME(SEC): 59999.99 ANALYST :AXD2	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	TRACER ID : 0387-B-102 ISOTOPE : AC227 NOMINAL : 3.90075 dpm RESULTS : 3.35887 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B040.CNF;1072 BKG DATE : 27-SEP-2009 EFF FILE : W040.CNF;306 CAL DATE : 5-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
AC-227	5994.040	607.000	569.000	38.000	6.1644	57.44000	2.20E+00	2.26E-01	1.22E-01	5.54E-02	1.92E-01
TH-228	5363.000	18.000	10.000	8.000	2.8284	99.94000	2.05E-02	2.05E-02	3.31E-02	1.35E-02	2.05E-02
TH229	4900.000	9.000	4.000	5.000	2.2361	99.52000	8.19E-03	1.50E-02	2.75E-02	1.07E-02	1.50E-02
TH-230	4625.000	1174.000	1171.000	3.000	1.7321	100.0000	2.39E+00	1.88E-01	2.25E-02	8.21E-03	1.37E-01
TH-232	3972.000	7.000	7.000	0.000	0.0000	100.0000	1.43E-02	1.06E-02	6.12E-03	0.00E+00	1.06E-02

NOTE: Ac-227 results decay corrected to separation date/time.



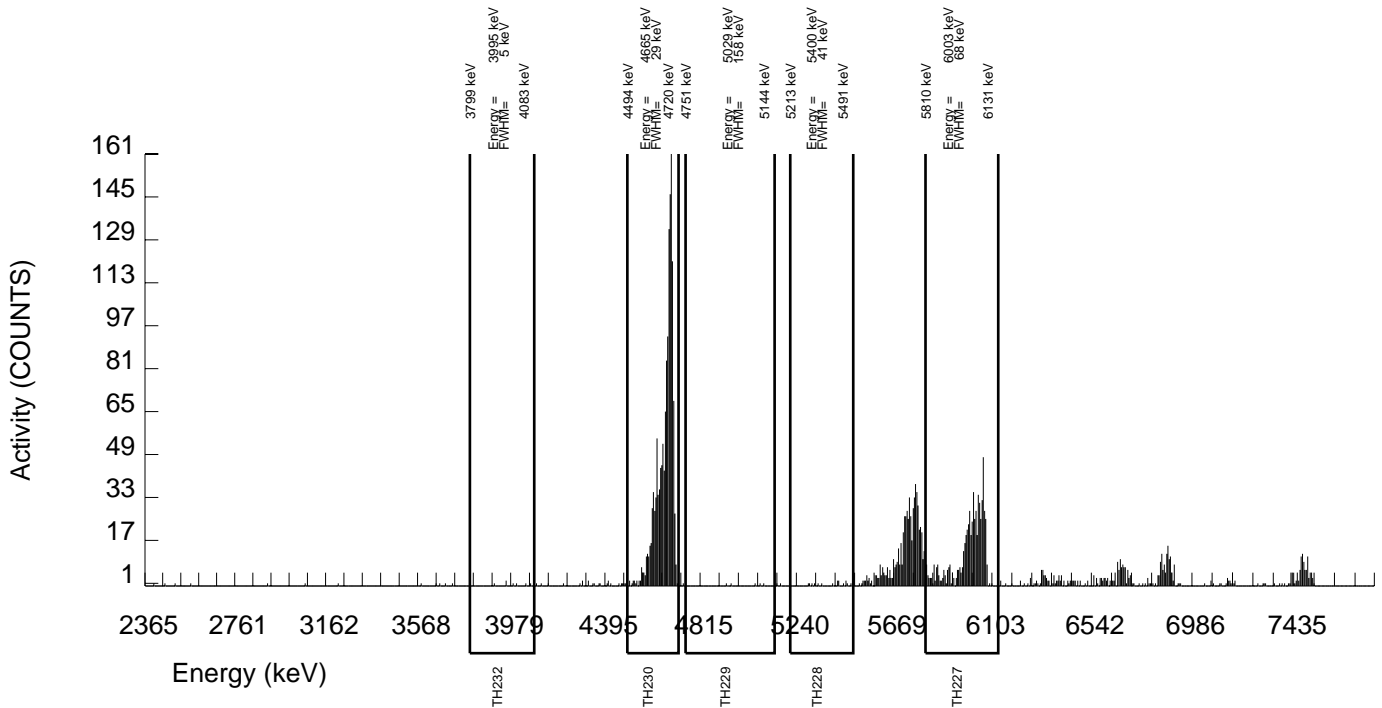
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905546 SAMPLE DATE : 29-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 11:15:00		SAMPLE ID : S1201930822_TH SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :78205 AVERAGE %EFFICIENCY :32.9883 % YIELD : 92.108		COUNT DATE: 2-OCT-2009 09:19:40 ELAPSED LIVE TIME(SEC): 59999.99 ANALYST :AXD2	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/L : 2.675E+00	TRACER ID : 0387-B-102 ISOTOPE : AC227 NOMINAL : 3.90075 dpm RESULTS : 3.59290 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B041.CNF;1065 BKG DATE : 27-SEP-2009 EFF FILE : W041.CNF;310 CAL DATE : 5-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
AC-227	5994.040	660.000	626.000	34.000	5.8310	57.44000	2.20E+00	2.17E-01	1.06E-01	4.76E-02	1.81E-01
TH-228	5363.000	16.000	5.000	11.000	3.3166	99.94000	9.31E-03	1.90E-02	3.43E-02	1.44E-02	1.90E-02
TH229	4900.000	5.000	-4.000	9.000	3.0000	99.52000	-7.45E-03	1.37E-02	3.16E-02	1.30E-02	1.37E-02
TH-230	4625.000	1447.000	1441.000	6.000	2.4495	100.0000	2.67E+00	2.00E-01	2.67E-02	1.06E-02	1.38E-01
TH-232	3972.000	7.000	5.000	2.000	1.4142	100.0000	9.27E-03	1.09E-02	1.78E-02	6.10E-03	1.09E-02

NOTE: Ac-227 results decay corrected to separation date/time.



Radiochemistry Batch Checklist, Rev 9

Batch# 900319 Product: Th Date: 10/8/09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			NA
Samples have been blank corrected (if required)			NA
If activity less 10* MDA/MDC, error is 150% or less of sample activity. If greater 10* MDA/MDC, error is 40% or less. If below the MDA/MDC, error is okay.	✓		
Instrument source check is within limits.	✓		
Instrument bkg check is within limits.		✓	
Method RDL/LLD has been met.			NC# 743500
If duplicate activities are less 5* MDA/MDC, then RPD is 100% or less. If greater 5* MDA/MDC, then RPD 20% or less. If below the MDA/MDC, the RPD is 0%.			
Or meets the client's required RER acceptance criteria.			
Tracer yield is 15-125% . Carrier yield 25-125%.		✓	
Or meets the client's contract acceptance criteria.			
Method blank is less than the RDL/LLD.	✓		
(If rad samples, < 5% of lowest activity)	✓		
Sample was run within hold time.	✓		
Sample was correctly preserved if required.			NA
Smears Taken for Radioactive batches.			NA
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms.	✓		
All line outs initialed and dated.	✓		
No transcription errors are apparent.	✓		
Aux data is correct.			NA
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly statused.	✓		
QC data entered into QC database and batch is in REWV	✓		
Hit notification complete (if necessary)			NA
Batch entered into Case Narrative.	✓		
Batch non-conformances completed, if applicable.			NC# 743500
Batch non-conformances second reviewed and disposition verified to be completed.	✓		NC# 743500
Aliquot Correction completed if required.			NA
Review sample historical results if available (If REMF, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By:

[Signature] 10/8/09

Secondary Review Performed By:

[Signature] 10/8/09

9/28/09
Kerr

Thorium (Ac-227 Tracer) Que Sheet

25-SEP-09

Batch #: 906319
 Analyst: MXE1
 First Client Due Date: 09-OCT-09
 Internal Due Date: 28-SEP-09
 Tracer Isotope: Ac-227
 Tracer Code: 0581-6-102
 Expiration Date: 1/23/10
 Vol: 0.1
 LCS Isotope: Th-230
 LCS Code: A2196-J
 Expiration Date: 4/13/10
 Vol: 0.1
 Spike Isotope: Th-230
 Spike Code: A2196-J
 Expiration Date: 4/13/10
 Vol: 0.1
 Prep Date: 9/24/09
 Initials: MWC
 Pipet ID: 211058
 Balance ID: 50460212
 Witness: MWC 07/25/09

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Pos.	Label #	Aliquot (g/l / f)	Th Det #
236817001-1	SA50-12B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	1	0.255	191	199
236817002-1	SA50009-12B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	2	0.251	197	180
236817003-1	SA50-25B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	3	0.262	198	181
236817004-1	SA50-36B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	4	0.253	199	172
236817005-1	SA135-05B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	5	0.259	200	183
236817006-1	SA135-10B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	6	0.256	207	184
236817007-1	SA135009-10B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	7	0.250	208	185
236817008-1	SA135-25B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	8	0.249	186	285
236817009-1	SA135-37B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	9	0.262	187	276
236817010-1	SA170-05B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	10	0.256	188	277
236817011-1	SA170-10B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	11	0.250	189	28
236817012-1	SA170-20B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	12	0.250	190	27
236817013-1	SA170-31B	SAMPLE		.05 pCi/g	SOIL	KERR003	08-SEP-09	13	0.240	191	30
236817015-1	SA45-10B	SAMPLE		.05 pCi/g	SOIL	KERR003	09-SEP-09	14	0.257	204	193
236817016-1	SA45-25B	SAMPLE		.05 pCi/g	SOIL	KERR003	09-SEP-09	15	0.253	206	193
236817017-1	SA45-36B	SAMPLE		.05 pCi/g	SOIL	KERR003	09-SEP-09	16	0.253	311	194
236817018-1	SA186-10B	SAMPLE		.05 pCi/g	SOIL	KERR003	09-SEP-09	17	0.258	37	197
236817019-1	SA186-25B	SAMPLE		.05 pCi/g	SOIL	KERR003	09-SEP-09	18	0.250	35	198
236817020-1	SA186-37B	SAMPLE		.05 pCi/g	SOIL	KERR003	09-SEP-09	19	0.253	36	199
236817021-1	SA126-40B	SAMPLE		.05 pCi/g	SOIL	KERR003	10-SEP-09	20	0.252	43	201
1201932680-1	MB for batch 906319	MB		.05 pCi/g	SOIL	QC ACCOUNT		21	0.258	44	200
1201932681-1	SA126-40B(236817021DUP)	DUP		.05 pCi/g	SOIL	QC ACCOUNT	10-SEP-09	22	0.252	46	202
1201932682-1	SA126-40B(236817021MS)	MS		.05 pCi/g	SOIL	QC ACCOUNT	10-SEP-09	23	0.257	47	203
1201932683-1	LCS for batch 906319	LCS		.05 pCi/g	SOIL	QC ACCOUNT		24	0.257	49	204

Choose SOP Used: GL-RAD-A-038
 GL-RAD-A-045 _____
 GL-RAD-A-043 _____
 GL-RAD-A-032 _____
 Solid Sample Dissolution by: LEACH or DIGESTION
 Circle One
 Data Reviewed By: Julia 10/10/09

GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 10-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S1201932682_TH SAMPLE QTY: 0.257 G	
DETECTOR NUMBER :78905 AVERAGE %EFFICIENCY :25.8288 % YIELD : 103.482		COUNT DATE: 7-OCT-2009 18:19:41 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.328E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.328E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.03648 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B203.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W203.CNF;39 CAL DATE : 21-SEP-2009

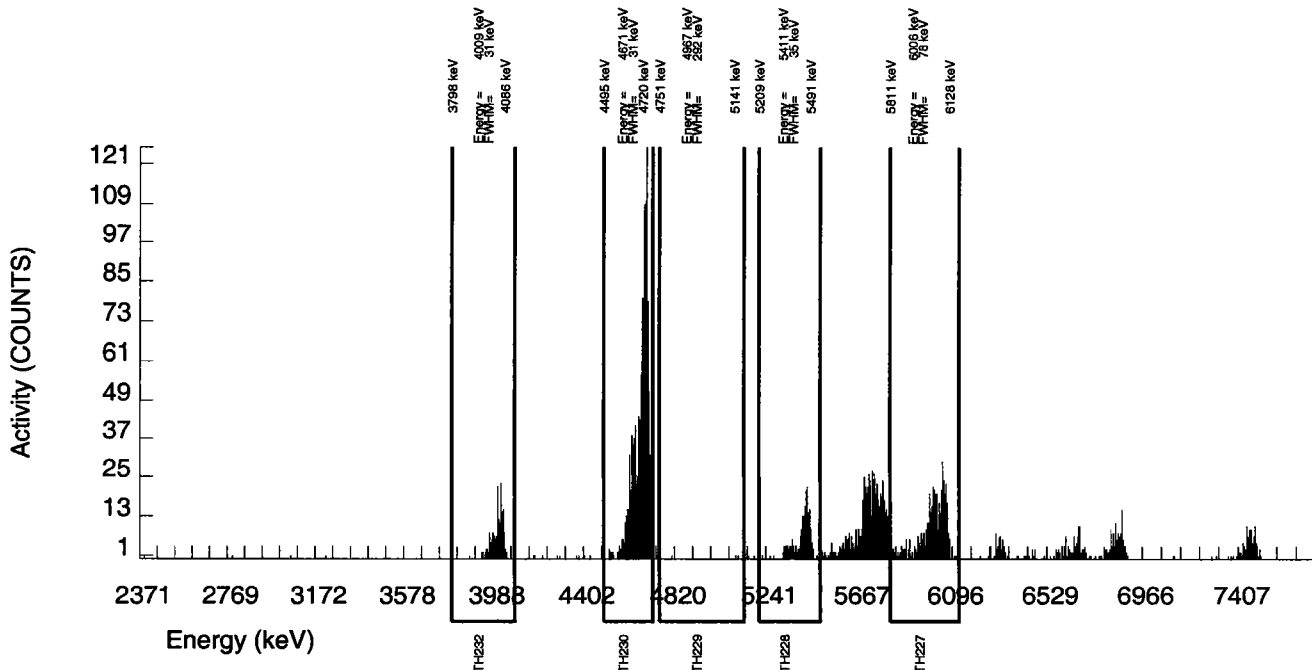
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	466.000	456.000	10.000	3.1623	57.44000	6.84E+00	7.59E-01	2.66E-01	1.10E-01	6.41E-01
TH-228	5363.000	205.000	205.000	0.000	0.0000	99.94000	1.38E+00	2.06E-01	2.02E-02	0.00E+00	1.89E-01
TH229	4900.000	4.000	-4.000	8.000	2.8284	99.52000	-2.64E-02	4.47E-02	1.06E-01	4.34E-02	4.47E-02
TH-230	4625.000	1166.000	1160.000	6.000	2.4495	100.0000	7.61E+00	6.31E-01	9.44E-02	3.74E-02	4.40E-01
TH-232	3972.000	176.000	176.000	0.000	0.0000	100.0000	1.15E+00	1.84E-01	1.97E-02	0.00E+00	1.71E-01

NOTE: Ac-227 results decay corrected to separation date/time.

Integrated

DO NOT REPORT



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 29-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S1201932683_TH SAMPLE QTY: 0.258 G	
DETECTOR NUMBER :78907 AVERAGE %EFFICIENCY :24.9619 % YIELD : 112.242		COUNT DATE: 7-OCT-2009 18:19:43 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.37817 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B204.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W204.CNF;38 CAL DATE : 21-SEP-2009

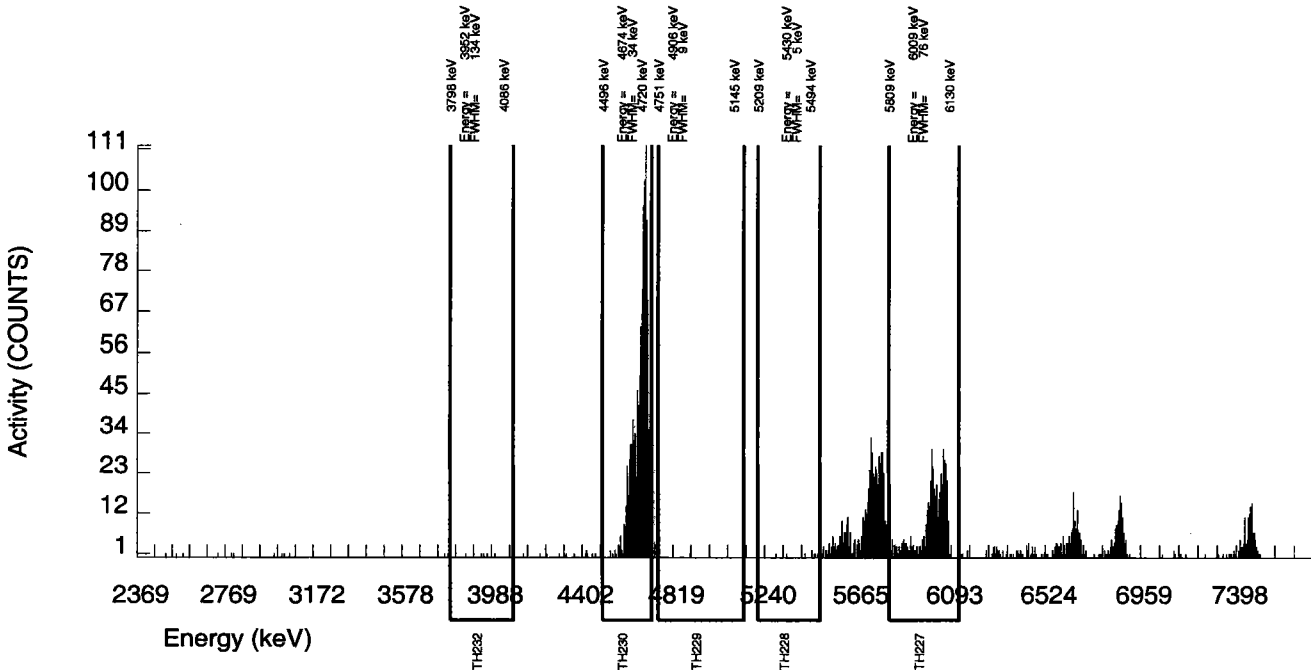
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	492.000	478.000	14.000	3.7417	57.44000	6.81E+00	7.47E-01	2.91E-01	1.24E-01	6.28E-01
TH-228	5363.000	8.000	0.000	8.000	2.8284	99.94000	0.00E+00	4.93E-02	1.02E-01	4.14E-02	4.93E-02
TH229	4900.000	2.000	-7.000	9.000	3.0000	99.52000	-4.38E-02	4.07E-02	1.06E-01	4.37E-02	4.07E-02
TH-230	4625.000	1106.000	1100.000	6.000	2.4495	100.00000	6.85E+00	5.76E-01	8.97E-02	3.55E-02	4.07E-01
TH-232	3972.000	5.000	-2.000	7.000	2.6458	100.00000	-1.25E-02	4.23E-02	9.54E-02	3.84E-02	4.23E-02

NOTE: Ac-227 results decay corrected to separation date/time.

DO NOT REPORT

Integrated



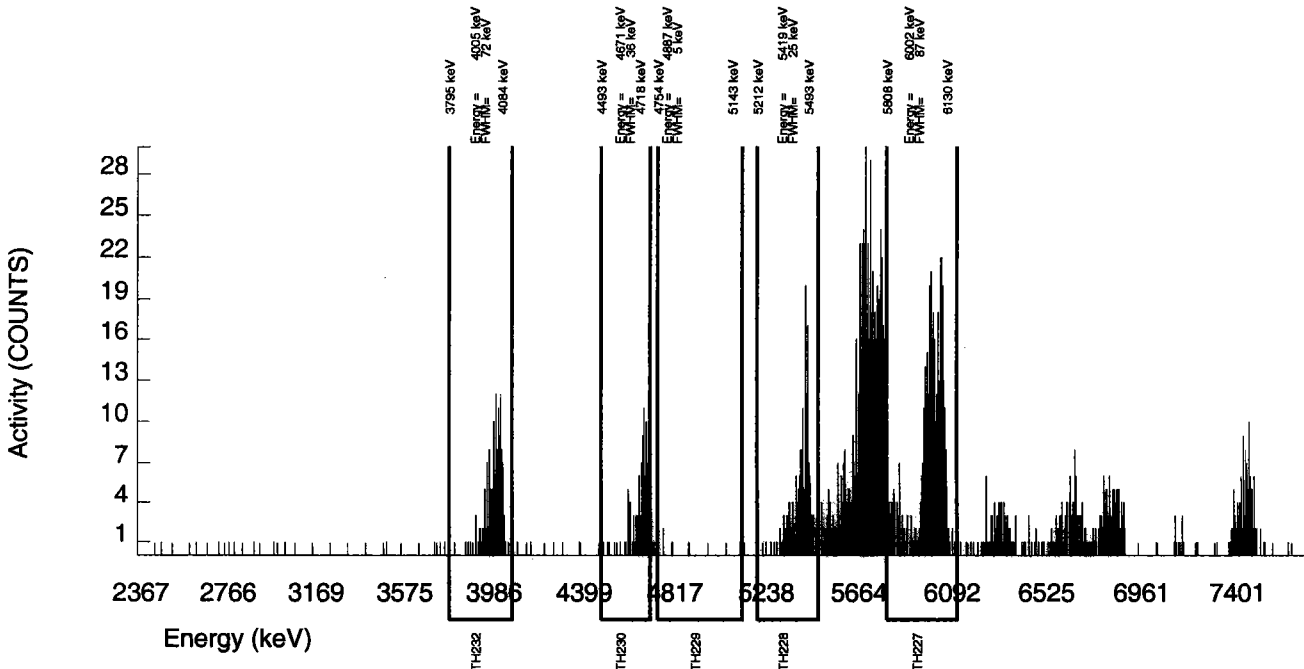
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817001_TH SAMPLE QTY: 0.255 G	
DETECTOR NUMBER :74437 AVERAGE %EFFICIENCY :26.5666 % YIELD : 87.368		COUNT DATE: 7-OCT-2009 18:18:50 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.393E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.393E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.40793 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B179.CNF;132 BKG DATE : 4-OCT-2009 EFF FILE : W179.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	408.000	396.000	12.000	3.4641	57.44000	6.89E+00	8.10E-01	3.33E-01	1.40E-01	6.99E-01
TH-228	5363.000	158.000	147.000	11.000	3.3166	99.94000	1.15E+00	2.11E-01	1.45E-01	6.05E-02	2.00E-01
TH229	4900.000	5.000	1.000	4.000	2.0000	99.52000	7.65E-03	4.50E-02	9.41E-02	3.56E-02	4.50E-02
TH-230	4625.000	93.000	91.000	2.000	1.4142	100.0000	6.93E-01	1.51E-01	7.29E-02	2.50E-02	1.45E-01
TH-232	3972.000	142.000	142.000	0.000	0.0000	100.0000	1.08E+00	1.89E-01	2.28E-02	0.00E+00	1.78E-01

NOTE: Ac-227 results decay corrected to separation date/time.



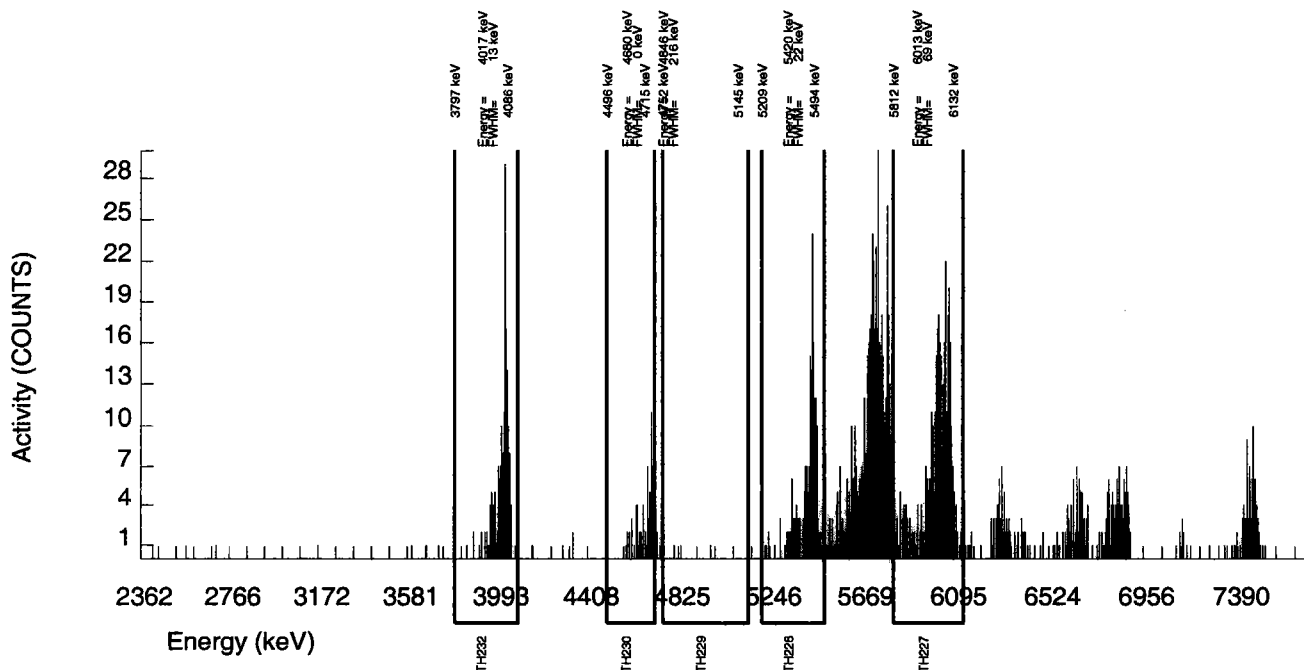
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817002_TH SAMPLE QTY: 0.251 G	
DETECTOR NUMBER :74438 AVERAGE %EFFICIENCY :24.8204 % YIELD : 83.361		COUNT DATE: 7-OCT-2009 18:18:52 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.527E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.527E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.25161 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B180.CNF;134 BKG DATE : 4-OCT-2009 EFF FILE : W180.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	364.000	353.000	11.000	3.3166	57.44000	7.00E+00	8.61E-01	3.66E-01	1.53E-01	7.53E-01
TH-228	5363.000	189.000	182.000	7.000	2.6458	99.94000	1.63E+00	2.64E-01	1.37E-01	5.50E-02	2.45E-01
TH229	4900.000	4.000	-5.000	9.000	3.0000	99.52000	-4.36E-02	6.16E-02	1.48E-01	6.08E-02	6.16E-02
TH-230	4625.000	76.000	76.000	0.000	0.0000	100.0000	6.59E-01	1.53E-01	2.60E-02	0.00E+00	1.48E-01
TH-232	3972.000	168.000	165.000	3.000	1.7321	100.0000	1.43E+00	2.38E-01	9.59E-02	3.49E-02	2.22E-01

NOTE: Ac-227 results decay corrected to separation date/time.



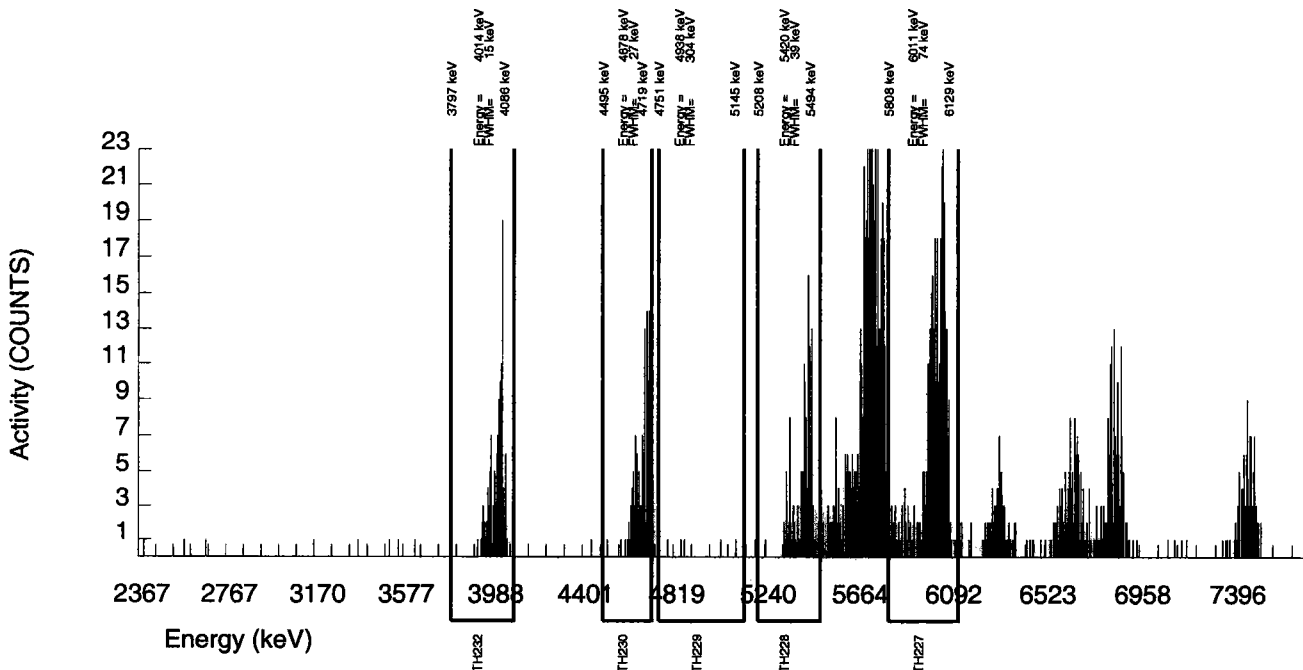
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817003_TH SAMPLE QTY: 0.262 G	
DETECTOR NUMBER :74439 AVERAGE %EFFICIENCY :25.6899 % YIELD : 78.714		COUNT DATE: 7-OCT-2009 18:18:54 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.169E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.169E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.07036 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B181.CNF;132 BKG DATE : 4-OCT-2009 EFF FILE : W181.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	357.000	345.000	12.000	3.4641	57.44000	6.71E+00	8.32E-01	3.72E-01	1.57E-01	7.32E-01
TH-228	5363.000	134.000	122.000	12.000	3.4641	99.94000	1.07E+00	2.17E-01	1.68E-01	7.06E-02	2.08E-01
TH229	4900.000	5.000	3.000	2.000	1.4142	99.52000	2.56E-02	4.43E-02	8.18E-02	2.81E-02	4.43E-02
TH-230	4625.000	113.000	113.000	0.000	0.0000	100.0000	9.61E-01	1.86E-01	2.55E-02	0.00E+00	1.77E-01
TH-232	3972.000	117.000	116.000	1.000	1.0000	100.0000	9.86E-01	1.90E-01	6.51E-02	1.98E-02	1.81E-01

NOTE: Ac-227 results decay corrected to separation date/time.



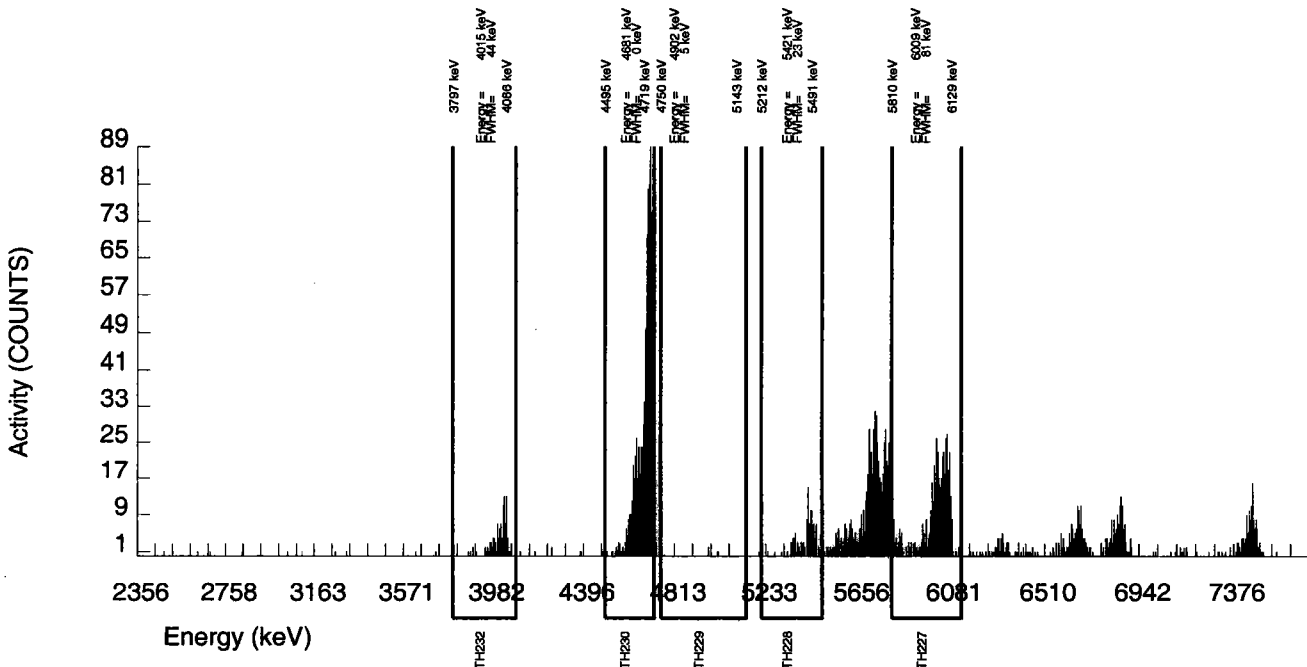
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817004_TH SAMPLE QTY: 0.253 G	
DETECTOR NUMBER :74440 AVERAGE %EFFICIENCY :25.5522 % YIELD : 103.453		COUNT DATE: 7-OCT-2009 18:18:57 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.03536 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B182.CNF;132 BKG DATE : 4-OCT-2009 EFF FILE : W182.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	467.000	451.000	16.000	4.0000	57.44000	6.94E+00	7.82E-01	3.33E-01	1.43E-01	6.63E-01
TH-228	5363.000	114.000	106.000	8.000	2.8284	99.94000	7.36E-01	1.57E-01	1.12E-01	4.57E-02	1.50E-01
TH229	4900.000	7.000	4.000	3.000	1.7321	99.52000	2.71E-02	4.20E-02	7.48E-02	2.73E-02	4.19E-02
TH-230	4625.000	823.000	822.000	1.000	1.0000	100.0000	5.54E+00	5.02E-01	5.15E-02	1.57E-02	3.79E-01
TH-232	3972.000	109.000	109.000	0.000	0.0000	100.0000	7.34E-01	1.45E-01	2.02E-02	0.00E+00	1.38E-01

NOTE: Ac-227 results decay corrected to separation date/time.



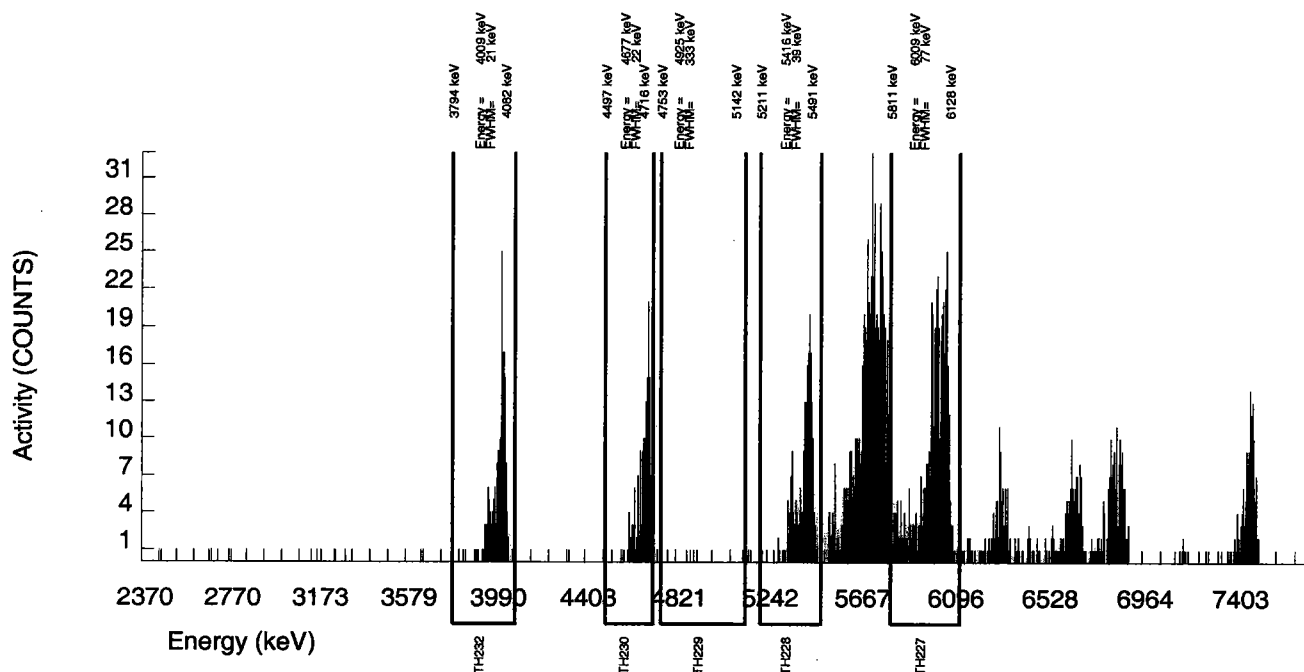
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817005_TH SAMPLE QTY: 0.259 G	
DETECTOR NUMBER :74441 AVERAGE %EFFICIENCY :26.1199 % YIELD : 96.044		COUNT DATE: 7-OCT-2009 18:18:59 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.263E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.263E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.74634 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B183.CNF;132 BKG DATE : 4-OCT-2009 EFF FILE : W183.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	441.000	428.000	13.000	3.6056	57.44000	6.78E+00	7.74E-01	3.13E-01	1.33E-01	6.62E-01
TH-228	5363.000	207.000	196.000	11.000	3.3166	99.94000	1.40E+00	2.23E-01	1.32E-01	5.51E-02	2.07E-01
TH229	4900.000	5.000	-1.000	6.000	2.4495	99.52000	-6.97E-03	4.53E-02	1.00E-01	3.97E-02	4.53E-02
TH-230	4625.000	155.000	153.000	2.000	1.4142	100.0000	1.06E+00	1.81E-01	6.64E-02	2.28E-02	1.70E-01
TH-232	3972.000	177.000	175.000	2.000	1.4142	100.0000	1.21E+00	1.95E-01	6.64E-02	2.28E-02	1.82E-01

NOTE: Ac-227 results decay corrected to separation date/time.



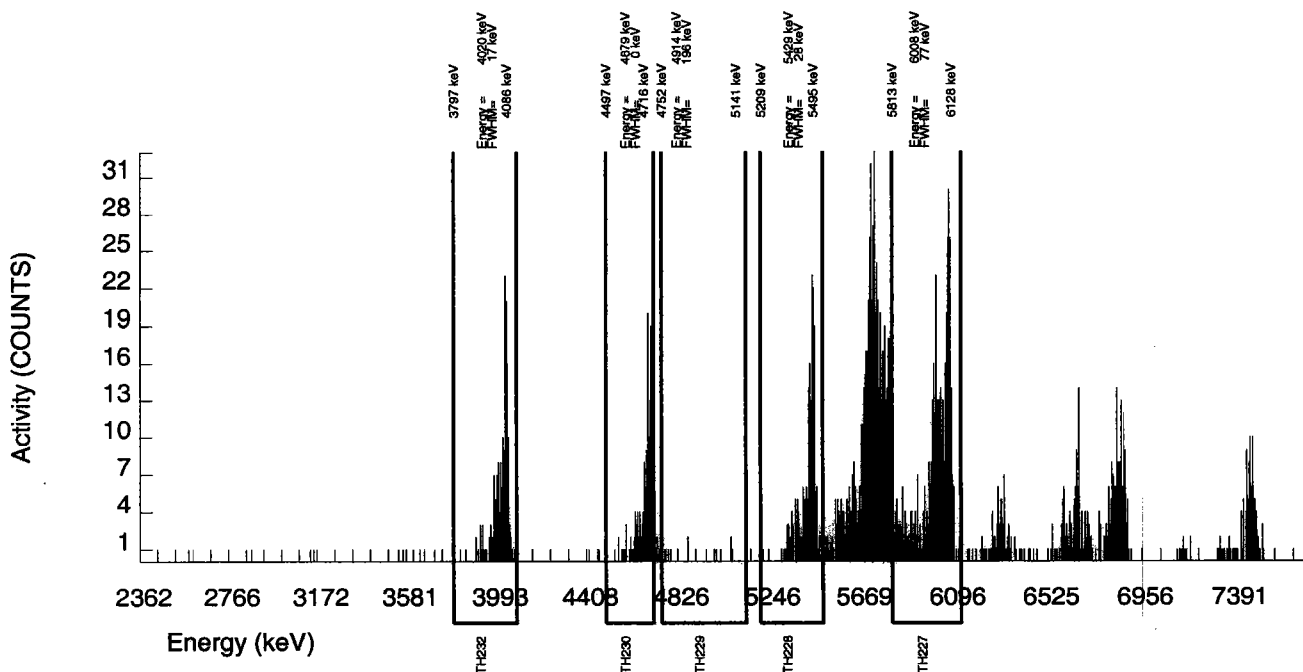
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817006_TH SAMPLE QTY: 0.256 G	
DETECTOR NUMBER :74442 AVERAGE %EFFICIENCY :25.8458 % YIELD : 94.341		COUNT DATE: 7-OCT-2009 18:19:01 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.360E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.360E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.67991 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B184.CNF;134 BKG DATE : 4-OCT-2009 EFF FILE : W184.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	428.000	416.000	12.000	3.4641	57.44000	6.86E+00	7.91E-01	3.15E-01	1.33E-01	6.78E-01
TH-228	5363.000	187.000	174.000	13.000	3.6056	99.94000	1.29E+00	2.20E-01	1.47E-01	6.24E-02	2.06E-01
TH229	4900.000	11.000	5.000	6.000	2.4495	99.52000	3.63E-02	5.86E-02	1.04E-01	4.13E-02	5.86E-02
TH-230	4625.000	142.000	140.000	2.000	1.4142	100.0000	1.01E+00	1.80E-01	6.91E-02	2.37E-02	1.70E-01
TH-232	3972.000	167.000	165.000	2.000	1.4142	100.0000	1.19E+00	1.97E-01	6.91E-02	2.37E-02	1.84E-01

NOTE: Ac-227 results decay corrected to separation date/time.



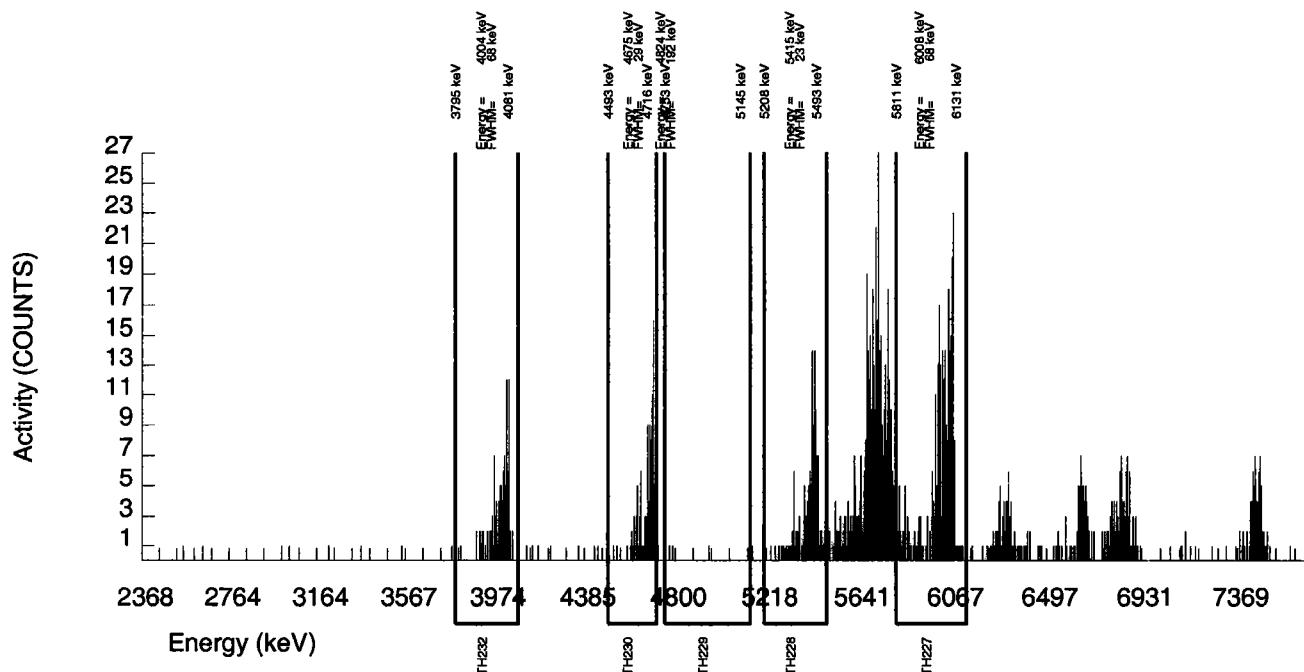
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817007_TH SAMPLE QTY: 0.255 G	
DETECTOR NUMBER :68615 AVERAGE %EFFICIENCY :25.7805 % YIELD : 64.114		COUNT DATE: 7-OCT-2009 18:19:03 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.393E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.393E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 2.50088 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B185.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W185.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	297.000	282.000	15.000	3.8730	57.44000	6.89E+00	9.40E-01	5.14E-01	2.20E-01	8.46E-01
TH-228	5363.000	128.000	118.000	10.000	3.1623	99.94000	1.30E+00	2.65E-01	1.95E-01	8.11E-02	2.54E-01
TH229	4900.000	4.000	0.000	4.000	2.0000	99.52000	0.00E+00	5.95E-02	1.32E-01	5.00E-02	5.95E-02
TH-230	4625.000	103.000	101.000	2.000	1.4142	100.0000	1.08E+00	2.24E-01	1.02E-01	3.52E-02	2.15E-01
TH-232	3972.000	106.000	105.000	1.000	1.0000	100.0000	1.12E+00	2.27E-01	8.18E-02	2.49E-02	2.17E-01

NOTE: Ac-227 results decay corrected to separation date/time.



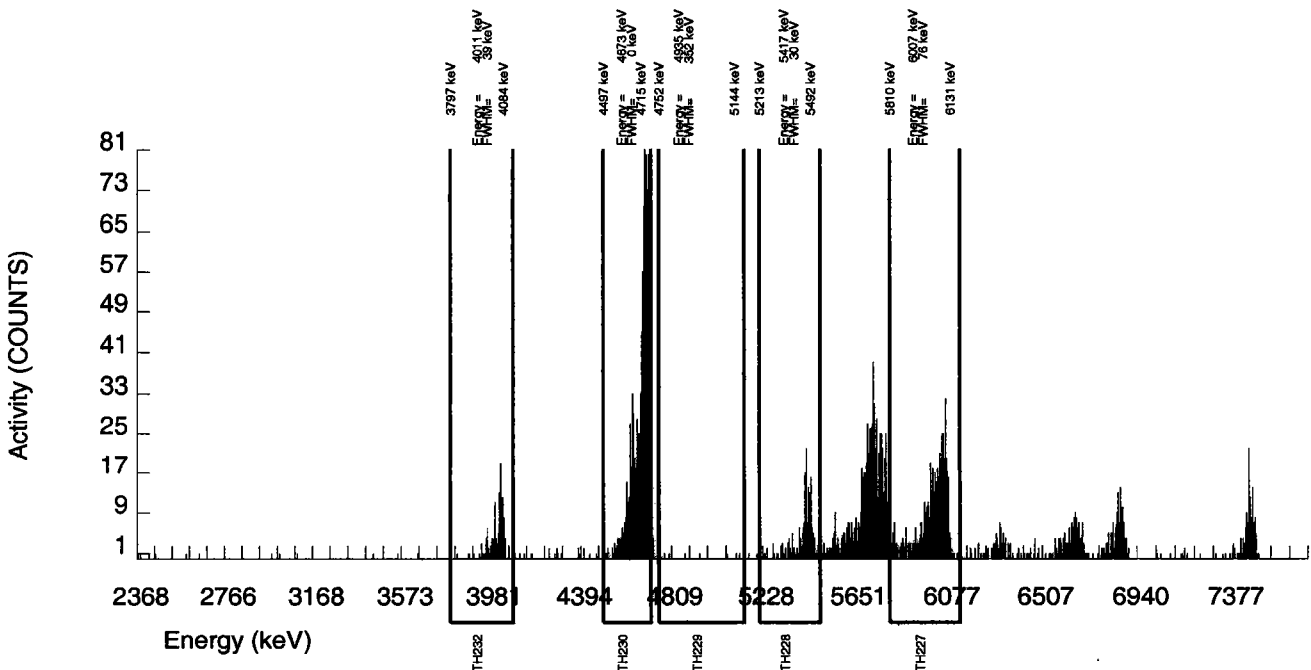
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817008_TH SAMPLE QTY: 0.249 G	
DETECTOR NUMBER :68616 AVERAGE %EFFICIENCY :24.8843 % YIELD : 109.763		COUNT DATE: 7-OCT-2009 18:19:06 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.595E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.595E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.28149 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B186.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W186.CNF;42 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	475.000	466.000	9.000	3.0000	57.44000	7.06E+00	7.78E-01	2.57E-01	1.06E-01	6.53E-01
TH-228	5363.000	172.000	161.000	11.000	3.3166	99.94000	1.10E+00	1.93E-01	1.26E-01	5.27E-02	1.81E-01
TH229	4900.000	8.000	7.000	1.000	1.0000	99.52000	4.66E-02	3.92E-02	5.09E-02	1.55E-02	3.91E-02
TH-230	4625.000	886.000	886.000	0.000	0.0000	100.0000	5.87E+00	5.22E-01	1.99E-02	0.00E+00	3.86E-01
TH-232	3972.000	129.000	126.000	3.000	1.7321	100.0000	8.35E-01	1.57E-01	7.32E-02	2.67E-02	1.49E-01

NOTE: Ac-227 results decay corrected to separation date/time.



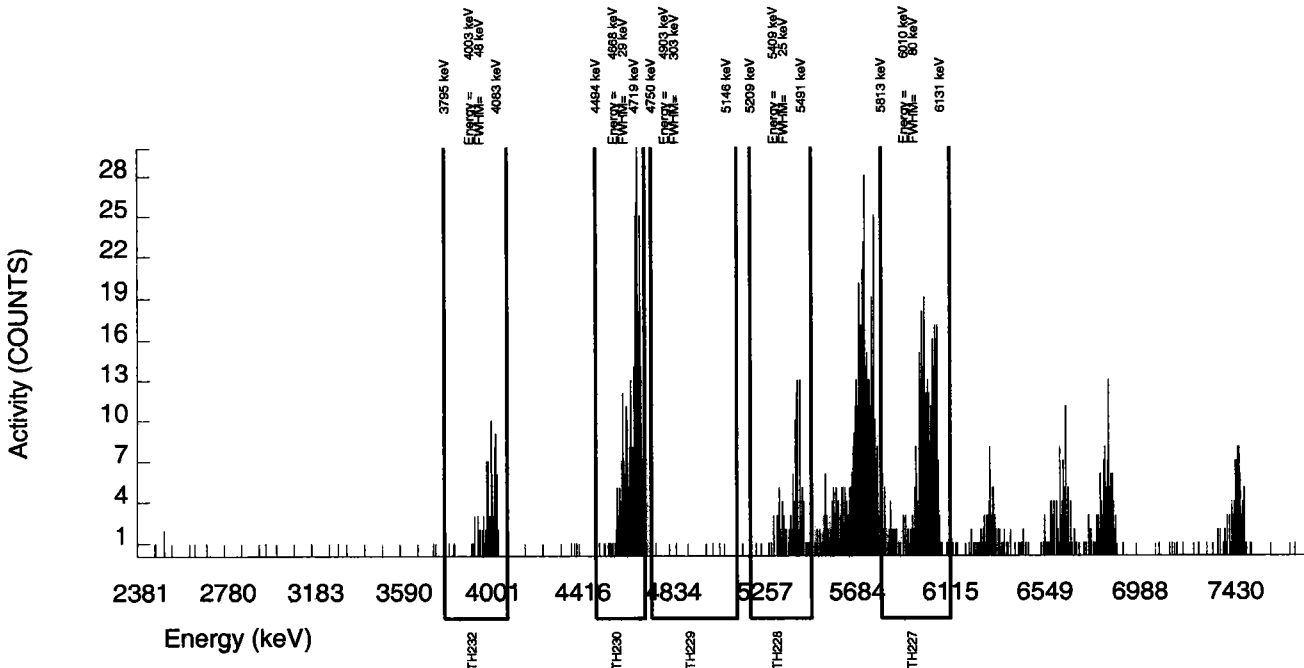
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817009_TH SAMPLE QTY: 0.252 G	
DETECTOR NUMBER :68620 AVERAGE %EFFICIENCY :25.0014 % YIELD : 71.739		COUNT DATE: 7-OCT-2009 18:19:08 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.493E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.493E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 2.79829 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B187.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W187.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	312.000	306.000	6.000	2.4495	57.44000	6.97E+00	9.09E-01	3.28E-01	1.30E-01	7.96E-01
TH-228	5363.000	116.000	101.000	15.000	3.8730	99.94000	1.04E+00	2.40E-01	2.16E-01	9.26E-02	2.30E-01
TH229	4900.000	5.000	-1.000	6.000	2.4495	99.52000	-1.00E-02	6.51E-02	1.44E-01	5.71E-02	6.51E-02
TH-230	4625.000	283.000	280.000	3.000	1.7321	100.00000	2.79E+00	3.74E-01	1.10E-01	4.02E-02	3.30E-01
TH-232	3972.000	86.000	86.000	0.000	0.0000	100.00000	8.57E-01	1.89E-01	2.99E-02	0.00E+00	1.81E-01

NOTE: Ac-227 results decay corrected to separation date/time.



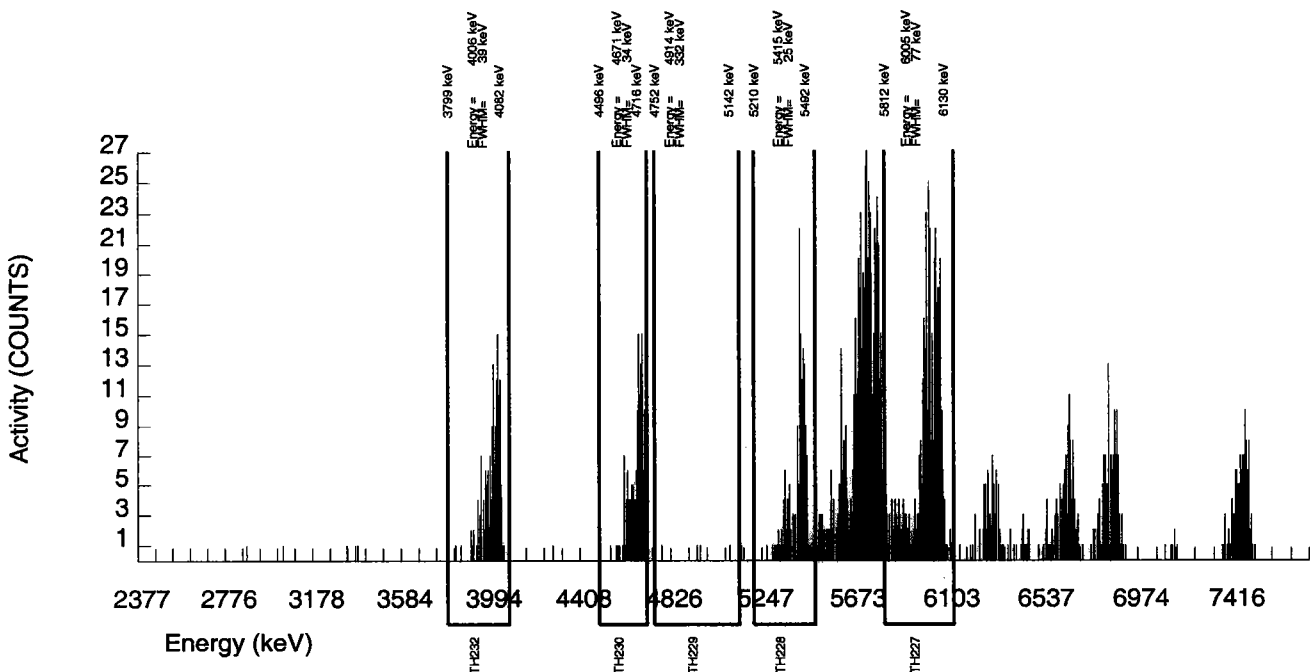
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817010_TH SAMPLE QTY: 0.256 G	
DETECTOR NUMBER :68621 AVERAGE %EFFICIENCY :25.7368 % YIELD : 87.681		COUNT DATE: 7-OCT-2009 18:19:10 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.360E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.360E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.42013 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B188.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W188.CNF;43 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	399.000	385.000	14.000	3.7417	57.44000	6.86E+00	8.19E-01	3.64E-01	1.55E-01	7.10E-01
TH-228	5363.000	157.000	149.000	8.000	2.8284	99.94000	1.20E+00	2.15E-01	1.30E-01	5.29E-02	2.02E-01
TH229	4900.000	5.000	2.000	3.000	1.7321	99.52000	1.57E-02	4.34E-02	8.66E-02	3.16E-02	4.34E-02
TH-230	4625.000	140.000	138.000	2.000	1.4142	100.0000	1.08E+00	1.93E-01	7.47E-02	2.57E-02	1.82E-01
TH-232	3972.000	152.000	150.000	2.000	1.4142	100.0000	1.17E+00	2.02E-01	7.47E-02	2.57E-02	1.90E-01

NOTE: Ac-227 results decay corrected to separation date/time.



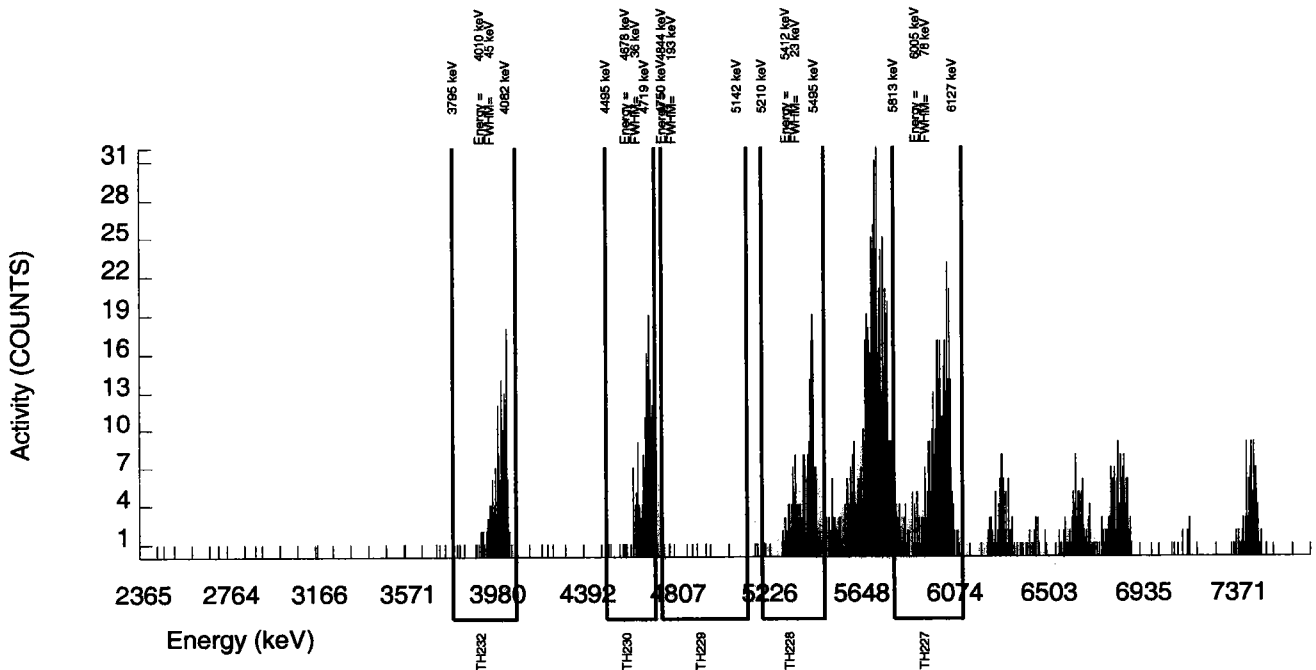
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817011_TH SAMPLE QTY: 0.250 G	
DETECTOR NUMBER :68622 AVERAGE %EFFICIENCY :26.1313 % YIELD : 78.955		COUNT DATE: 7-OCT-2009 18:19:12 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.561E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.561E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.07977 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B189.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W189.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	370.000	352.000	18.000	4.2426	57.44000	7.03E+00	8.88E-01	4.54E-01	1.97E-01	7.71E-01
TH-228	5363.000	188.000	178.000	10.000	3.1623	99.94000	1.60E+00	2.68E-01	1.59E-01	6.62E-02	2.48E-01
TH229	4900.000	6.000	0.000	6.000	2.4495	99.52000	0.00E+00	5.96E-02	1.26E-01	5.00E-02	5.96E-02
TH-230	4625.000	169.000	168.000	1.000	1.0000	100.00000	1.47E+00	2.41E-01	6.68E-02	2.03E-02	2.23E-01
TH-232	3972.000	159.000	158.000	1.000	1.0000	100.00000	1.38E+00	2.33E-01	6.68E-02	2.03E-02	2.17E-01

NOTE: Ac-227 results decay corrected to separation date/time.



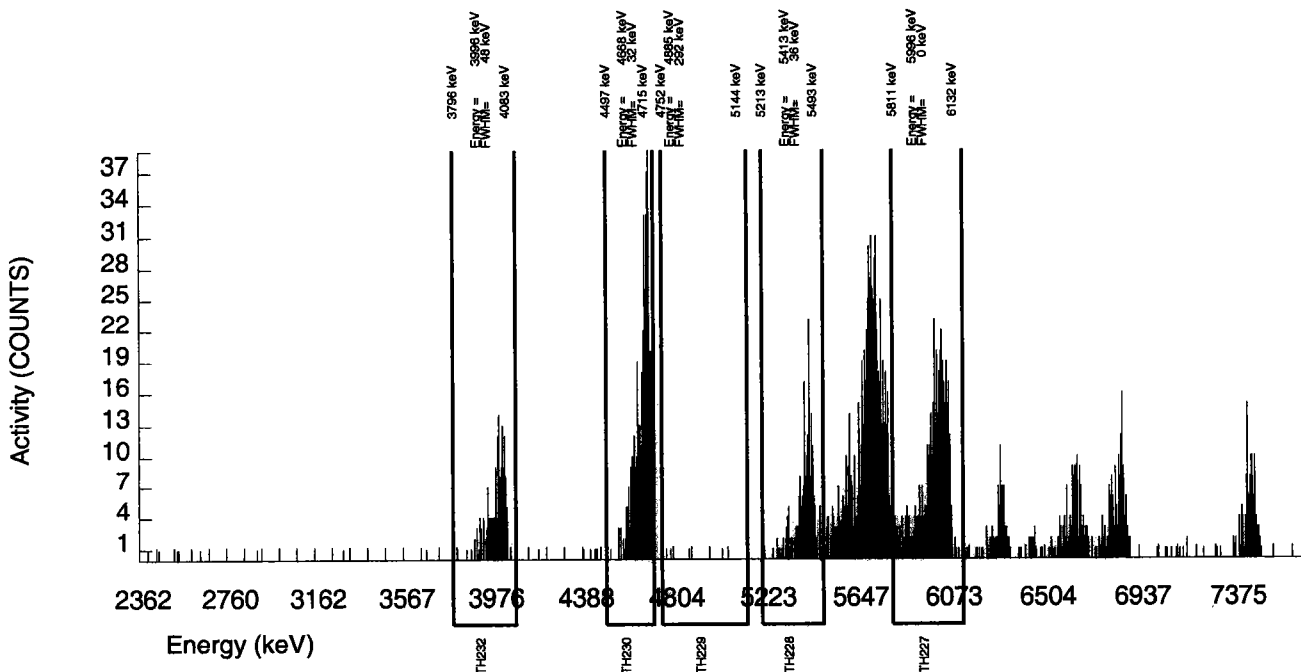
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817012_TH SAMPLE QTY: 0.250 G	
DETECTOR NUMBER :68623 AVERAGE %EFFICIENCY :26.1986 % YIELD : 93.966		COUNT DATE: 7-OCT-2009 18:19:15 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.561E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.561E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.66528 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B190.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W190.CNF;42 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	444.000	420.000	24.000	4.8990	57.44000	7.03E+00	8.25E-01	4.32E-01	1.91E-01	7.10E-01
TH-228	5363.000	192.000	148.000	44.000	6.6332	99.94000	1.12E+00	2.37E-01	2.56E-01	1.16E-01	2.27E-01
TH229	4900.000	6.000	-44.000	50.000	7.0711	99.52000	-3.24E-01	1.08E-01	2.64E-01	1.21E-01	1.08E-01
TH-230	4625.000	404.000	377.000	27.000	5.1962	100.0000	2.76E+00	3.40E-01	1.99E-01	8.85E-02	2.98E-01
TH-232	3972.000	159.000	149.000	10.000	3.1623	100.0000	1.09E+00	1.98E-01	1.30E-01	5.38E-02	1.86E-01

NOTE: Ac-227 results decay corrected to separation date/time.



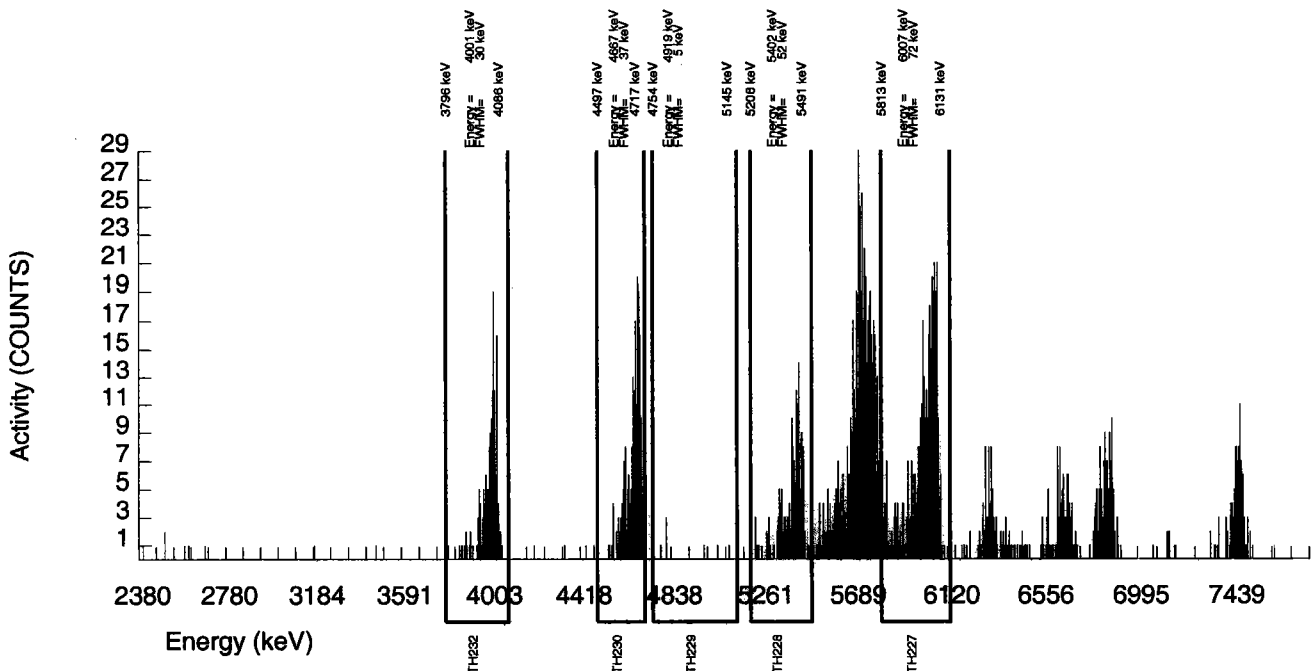
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 8-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817013_TH SAMPLE QTY: 0.249 G	
DETECTOR NUMBER :68624 AVERAGE %EFFICIENCY :26.2560 % YIELD : 79.027		COUNT DATE: 7-OCT-2009 18:19:17 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.595E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.595E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.08256 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B191.CNF;116 BKG DATE : 4-OCT-2009 EFF FILE : W191.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	370.000	354.000	16.000	4.0000	57.44000	7.06E+00	8.87E-01	4.31E-01	1.85E-01	7.68E-01
TH-228	5363.000	155.000	146.000	9.000	3.0000	99.94000	1.31E+00	2.40E-01	1.52E-01	6.27E-02	2.26E-01
TH229	4900.000	7.000	5.000	2.000	1.4142	99.52000	4.38E-02	5.16E-02	8.39E-02	2.88E-02	5.15E-02
TH-230	4625.000	197.000	193.000	4.000	2.0000	100.0000	1.68E+00	2.64E-01	1.07E-01	4.06E-02	2.42E-01
TH-232	3972.000	155.000	153.000	2.000	1.4142	100.0000	1.33E+00	2.30E-01	8.35E-02	2.87E-02	2.14E-01

NOTE: Ac-227 results decay corrected to separation date/time.



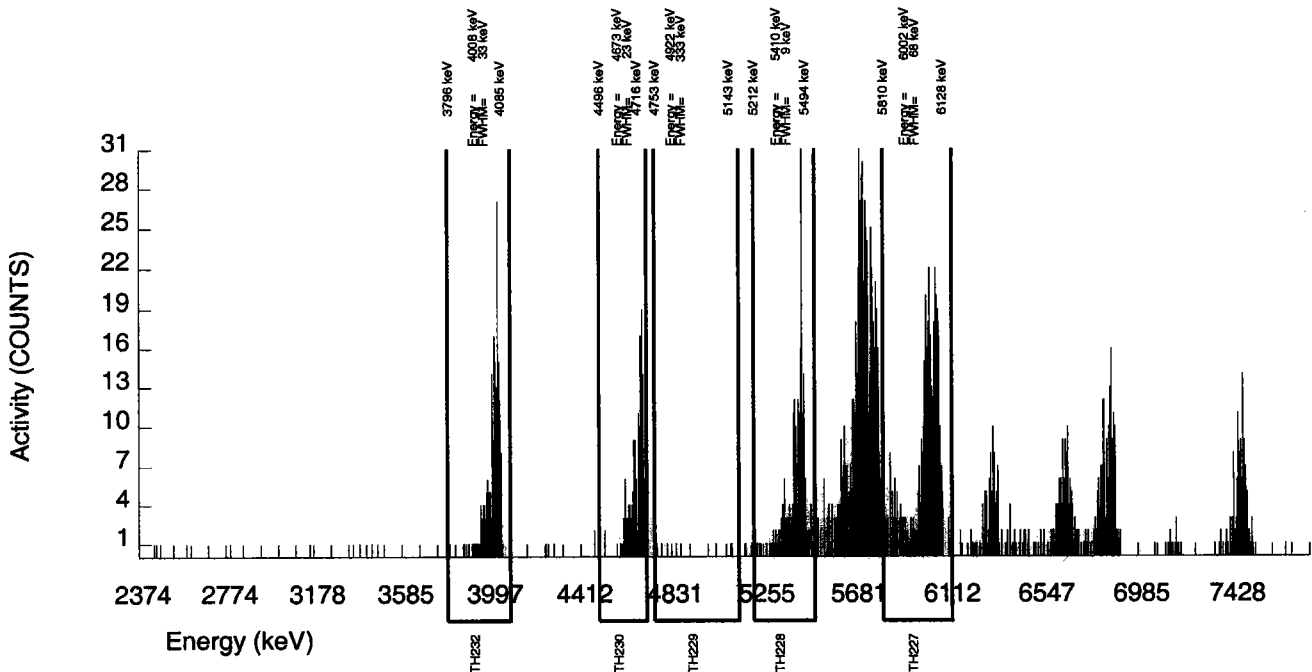
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 9-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817015_TH SAMPLE QTY: 0.257 G	
DETECTOR NUMBER :74430 AVERAGE %EFFICIENCY :25.4458 % YIELD : 85.690		COUNT DATE: 7-OCT-2009 18:19:19 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.328E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.328E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.34245 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B192.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W192.CNF;48 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	388.000	372.000	16.000	4.0000	57.44000	6.84E+00	8.30E-01	3.97E-01	1.71E-01	7.24E-01
TH-228	5363.000	205.000	194.000	11.000	3.3166	99.94000	1.61E+00	2.57E-01	1.53E-01	6.39E-02	2.38E-01
TH229	4900.000	8.000	1.000	7.000	2.6458	99.52000	8.08E-03	6.13E-02	1.24E-01	4.97E-02	6.13E-02
TH-230	4625.000	145.000	145.000	0.000	0.0000	100.0000	1.17E+00	2.02E-01	2.41E-02	0.00E+00	1.90E-01
TH-232	3972.000	186.000	185.000	1.000	1.0000	100.0000	1.49E+00	2.33E-01	6.15E-02	1.87E-02	2.15E-01

NOTE: Ac-227 results decay corrected to separation date/time.



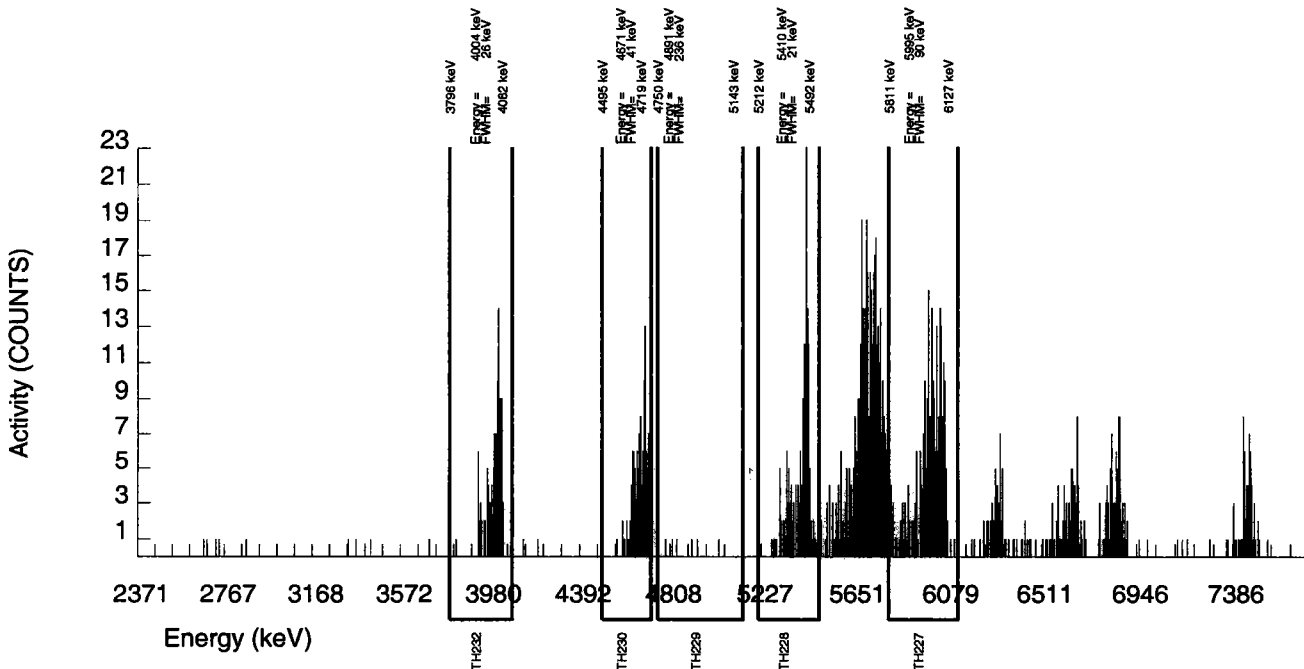
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 9-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817016_TH SAMPLE QTY: 0.253 G	
DETECTOR NUMBER :68627 AVERAGE %EFFICIENCY :26.1520 % YIELD : 55.135		COUNT DATE: 7-OCT-2009 18:19:22 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 2.15064 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B193.CNF;116 BKG DATE : 4-OCT-2009 EFF FILE : W193.CNF;40 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	260.000	246.000	14.000	3.7417	57.44000	6.94E+00	1.01E+00	5.76E-01	2.46E-01	9.16E-01
TH-228	5363.000	159.000	148.000	11.000	3.3166	99.94000	1.88E+00	3.46E-01	2.34E-01	9.81E-02	3.25E-01
TH229	4900.000	6.000	-13.000	19.000	4.3589	99.52000	-1.61E-01	1.22E-01	2.89E-01	1.26E-01	1.22E-01
TH-230	4625.000	111.000	99.000	12.000	3.4641	100.0000	1.22E+00	2.79E-01	2.36E-01	9.95E-02	2.68E-01
TH-232	3972.000	114.000	108.000	6.000	2.4495	100.0000	1.33E+00	2.78E-01	1.78E-01	7.04E-02	2.65E-01

NOTE: Ac-227 results decay corrected to separation date/time.



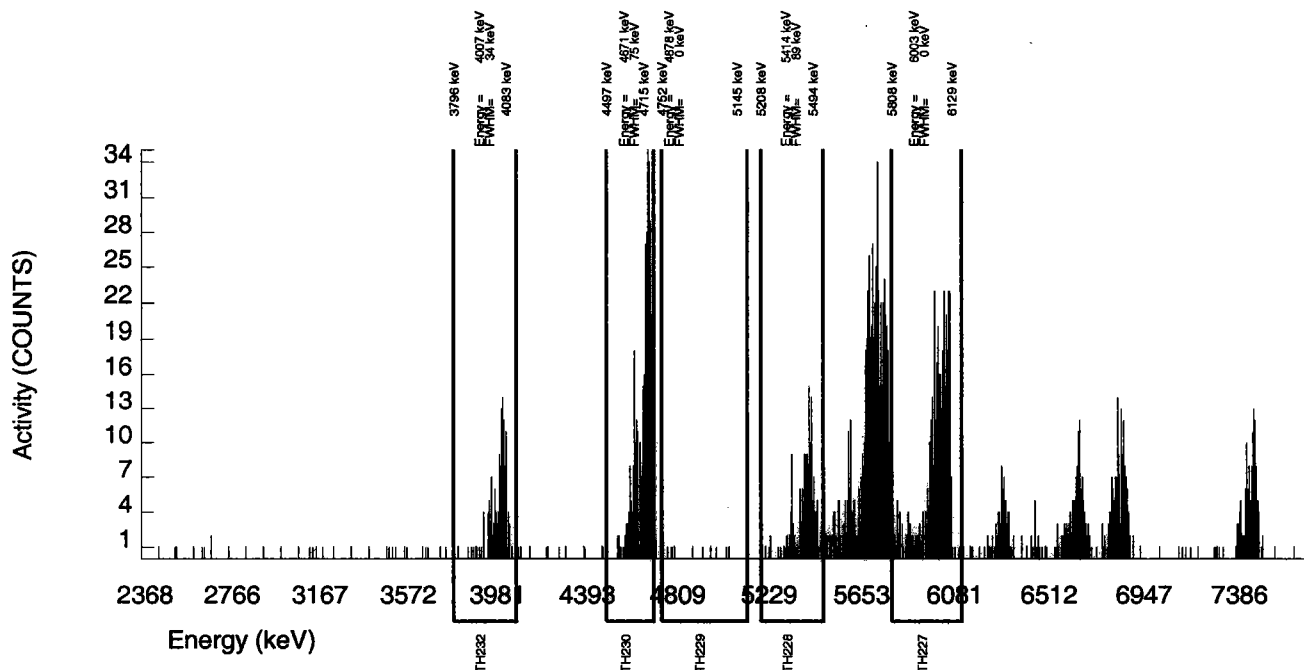
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 9-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817017_TH SAMPLE QTY: 0.253 G	
DETECTOR NUMBER :68635 AVERAGE %EFFICIENCY :25.4223 % YIELD : 92.685		COUNT DATE: 7-OCT-2009 18:19:24 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.61534 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B194.CNF;114 BKG DATE : 4-OCT-2009 EFF FILE : W194.CNF;41 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	413.000	402.000	11.000	3.3166	57.44000	6.94E+00	8.11E-01	3.18E-01	1.33E-01	6.97E-01
TH-228	5363.000	150.000	141.000	9.000	3.0000	99.94000	1.10E+00	2.03E-01	1.32E-01	5.43E-02	1.92E-01
TH229	4900.000	7.000	7.000	0.000	0.0000	99.52000	5.31E-02	3.95E-02	2.28E-02	0.00E+00	3.94E-02
TH-230	4625.000	333.000	333.000	0.000	0.0000	100.00000	2.52E+00	3.09E-01	2.27E-02	0.00E+00	2.70E-01
TH-232	3972.000	135.000	131.000	4.000	2.0000	100.00000	9.90E-01	1.84E-01	9.30E-02	3.52E-02	1.75E-01

NOTE: Ac-227 results decay corrected to separation date/time.



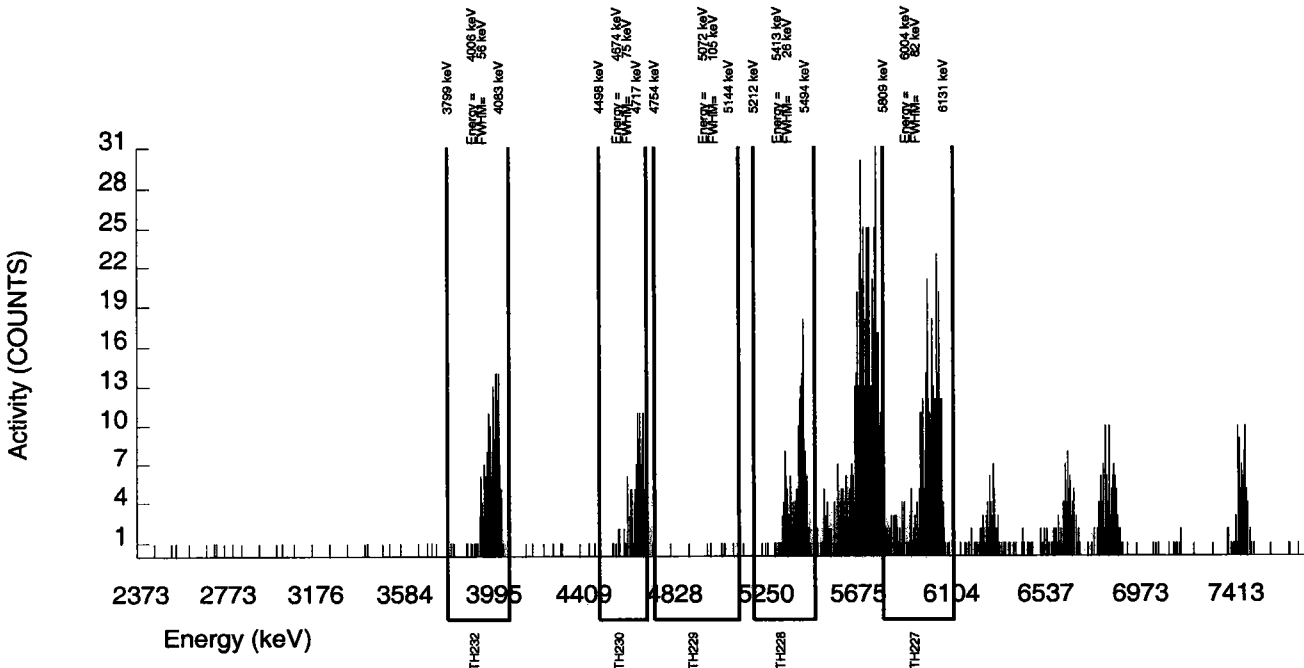
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 9-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817018_TH SAMPLE QTY: 0.258 G	
DETECTOR NUMBER :78894 AVERAGE %EFFICIENCY :25.2483 % YIELD : 76.145		COUNT DATE: 7-OCT-2009 18:19:26 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 2.97017 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B197.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W197.CNF;40 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	340.000	328.000	12.000	3.4641	57.44000	6.81E+00	8.64E-01	3.97E-01	1.67E-01	7.64E-01
TH-228	5363.000	165.000	163.000	2.000	1.4142	99.94000	1.52E+00	2.54E-01	8.96E-02	3.08E-02	2.37E-01
TH229	4900.000	4.000	2.000	2.000	1.4142	99.52000	1.83E-02	4.38E-02	8.74E-02	3.00E-02	4.38E-02
TH-230	4625.000	110.000	109.000	1.000	1.0000	100.0000	9.90E-01	1.97E-01	6.95E-02	2.11E-02	1.88E-01
TH-232	3972.000	178.000	178.000	0.000	0.0000	100.0000	1.62E+00	2.56E-01	2.72E-02	0.00E+00	2.37E-01

NOTE: Ac-227 results decay corrected to separation date/time.



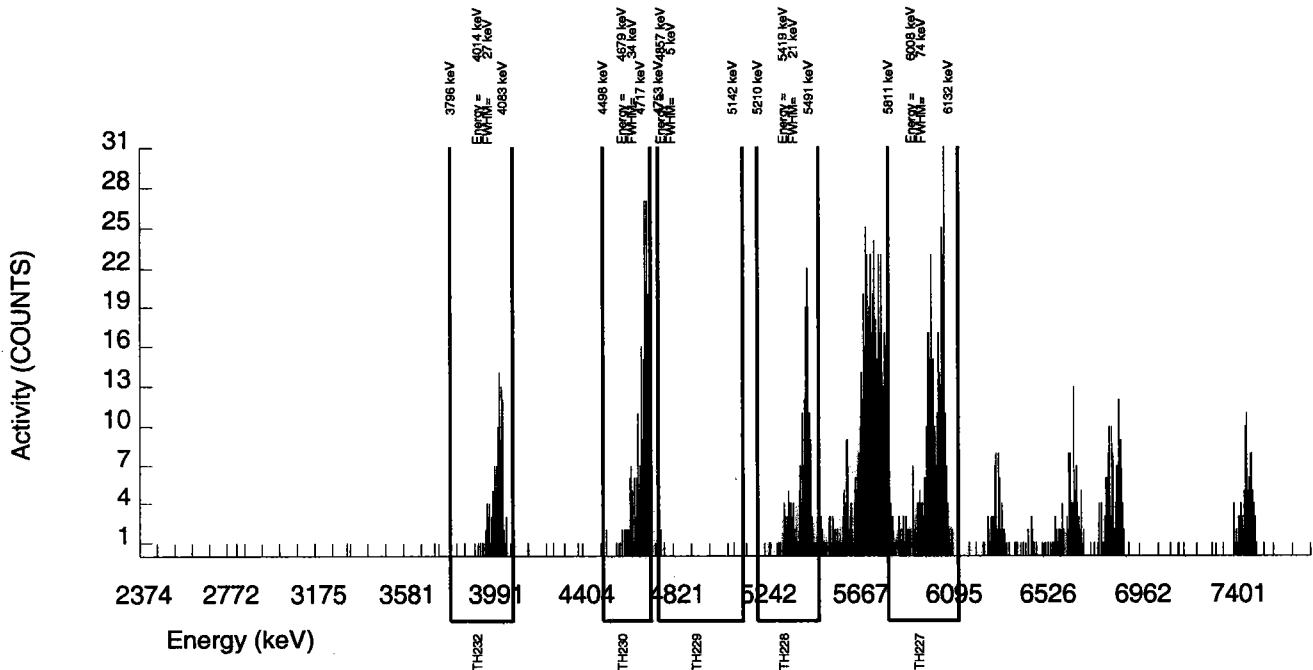
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 9-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817019_TH SAMPLE QTY: 0.250 G	
DETECTOR NUMBER :78895 AVERAGE %EFFICIENCY :25.4644 % YIELD : 87.699		COUNT DATE: 7-OCT-2009 18:19:29 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.561E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.561E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.42082 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B198.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W198.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	387.000	381.000	6.000	2.4495	57.44000	7.03E+00	8.31E-01	2.66E-01	1.05E-01	7.17E-01
TH-228	5363.000	176.000	174.000	2.000	1.4142	99.94000	1.45E+00	2.34E-01	7.96E-02	2.73E-02	2.17E-01
TH229	4900.000	4.000	3.000	1.000	1.0000	99.52000	2.43E-02	3.56E-02	6.20E-02	1.89E-02	3.55E-02
TH-230	4625.000	215.000	215.000	0.000	0.0000	100.0000	1.73E+00	2.54E-01	2.42E-02	0.00E+00	2.32E-01
TH-232	3972.000	115.000	115.000	0.000	0.0000	100.0000	9.28E-01	1.78E-01	2.42E-02	0.00E+00	1.70E-01

NOTE: Ac-227 results decay corrected to separation date/time.



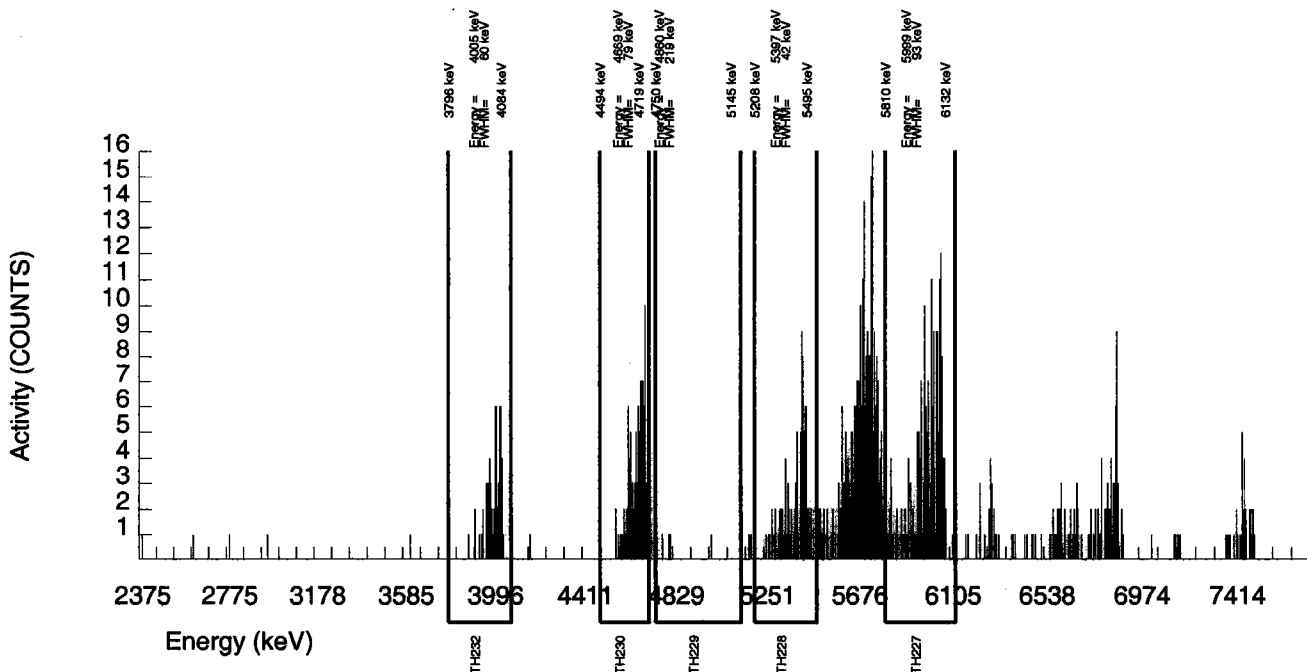
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 9-SEP-2009 00:00:00. AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817020_TH SAMPLE QTY: 0.253 G	
DETECTOR NUMBER :78896 AVERAGE %EFFICIENCY :25.0185 % YIELD : 43.108		COUNT DATE: 7-OCT-2009 18:19:30 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.459E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 1.68149 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B199.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W199.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	192.000	184.000	8.000	2.8284	57.44000	6.94E+00	1.13E+00	6.10E-01	2.48E-01	1.05E+00
TH-228	5363.000	91.000	89.000	2.000	1.4142	99.94000	1.51E+00	3.34E-01	1.63E-01	5.59E-02	3.21E-01
TH229	4900.000	4.000	3.000	1.000	1.0000	99.52000	4.98E-02	7.28E-02	1.27E-01	3.86E-02	7.27E-02
TH-230	4625.000	99.000	99.000	0.000	0.0000	100.0000	1.63E+00	3.36E-01	4.95E-02	0.00E+00	3.22E-01
TH-232	3972.000	63.000	63.000	0.000	0.0000	100.0000	1.04E+00	2.64E-01	4.95E-02	0.00E+00	2.57E-01

NOTE: Ac-227 results decay corrected to separation date/time.



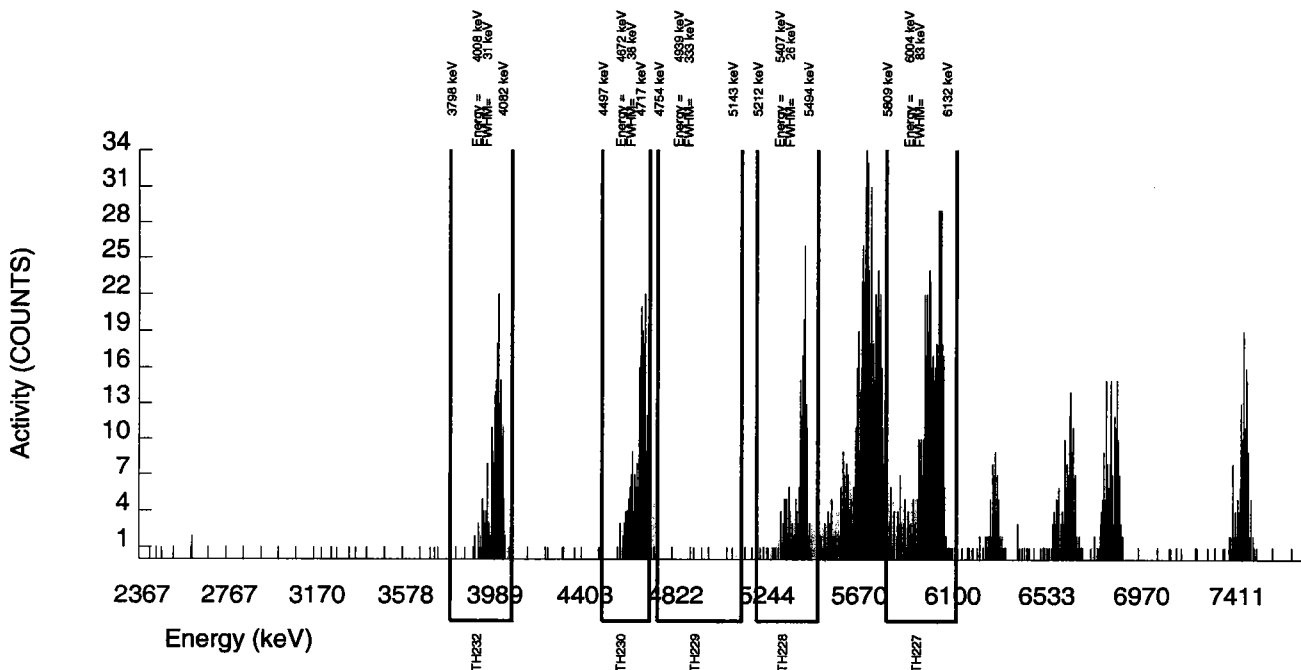
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 10-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S0236817021_TH SAMPLE QTY: 0.252 G	
DETECTOR NUMBER :78902 AVERAGE %EFFICIENCY :25.8989 % YIELD : 109.991		COUNT DATE: 7-OCT-2009 18:19:36 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.493E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.493E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.29038 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B201.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W201.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	491.000	486.000	5.000	2.2361	57.44000	6.97E+00	7.52E-01	1.92E-01	7.46E-02	6.26E-01
TH-228	5363.000	192.000	189.000	3.000	1.7321	99.94000	1.22E+00	1.91E-01	7.14E-02	2.60E-02	1.77E-01
TH229	4900.000	4.000	4.000	0.000	0.0000	99.52000	2.52E-02	2.48E-02	1.89E-02	0.00E+00	2.47E-02
TH-230	4625.000	219.000	217.000	2.000	1.4142	100.0000	1.36E+00	2.00E-01	6.01E-02	2.06E-02	1.83E-01
TH-232	3972.000	195.000	195.000	0.000	0.0000	100.0000	1.22E+00	1.87E-01	1.88E-02	0.00E+00	1.72E-01

NOTE: Ac-227 results decay corrected to separation date/time.



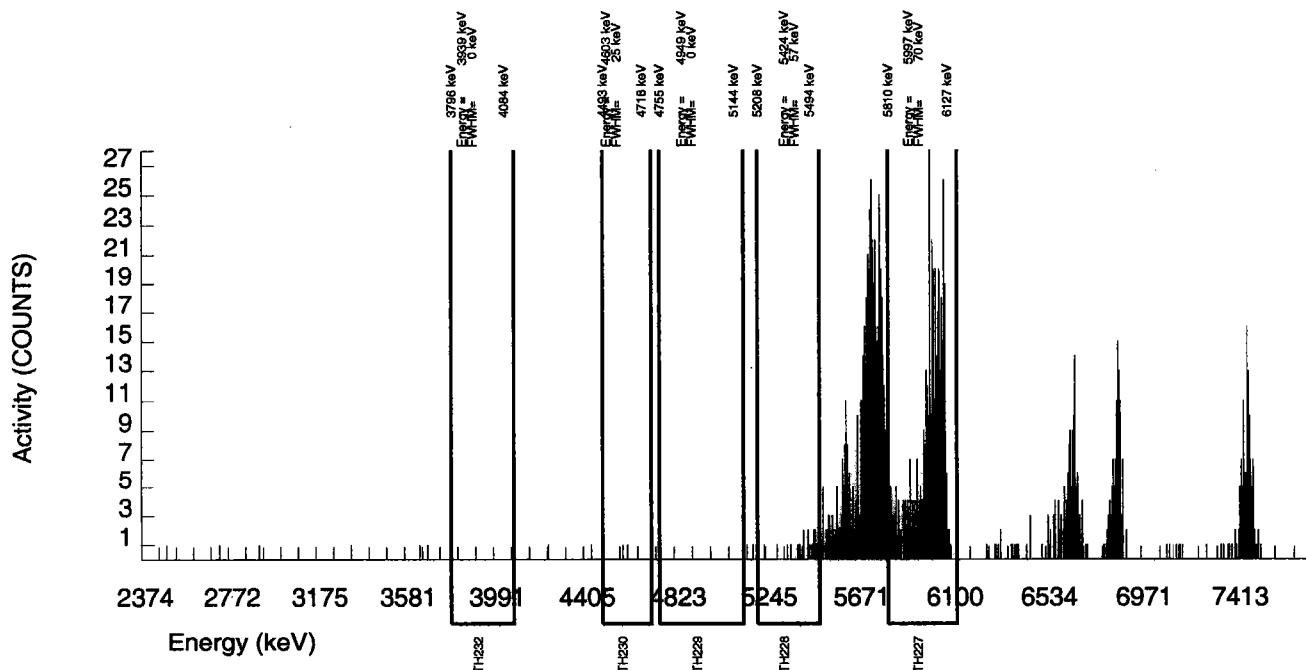
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 29-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S1201932680_TH SAMPLE QTY: 0.258 G	
DETECTOR NUMBER :78900 AVERAGE %EFFICIENCY :26.8240 % YIELD : 91.120		COUNT DATE: 7-OCT-2009 18:19:33 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 3.55429 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B200.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W200.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	434.000	417.000	17.000	4.1231	57.44000	6.81E+00	7.91E-01	3.62E-01	1.57E-01	6.80E-01
TH-228	5363.000	20.000	11.000	9.000	3.0000	99.94000	7.93E-02	7.63E-02	1.22E-01	5.03E-02	7.61E-02
TH229	4900.000	0.000	-7.000	7.000	2.6458	99.52000	-5.02E-02	3.98E-02	1.10E-01	4.42E-02	3.98E-02
TH-230	4625.000	2.000	-2.000	4.000	2.0000	100.0000	-1.43E-02	3.43E-02	8.79E-02	3.32E-02	3.43E-02
TH-232	3972.000	0.000	-4.000	4.000	2.0000	100.0000	-2.86E-02	3.13E-02	8.79E-02	3.32E-02	3.13E-02

NOTE: Ac-227 results decay corrected to separation date/time.



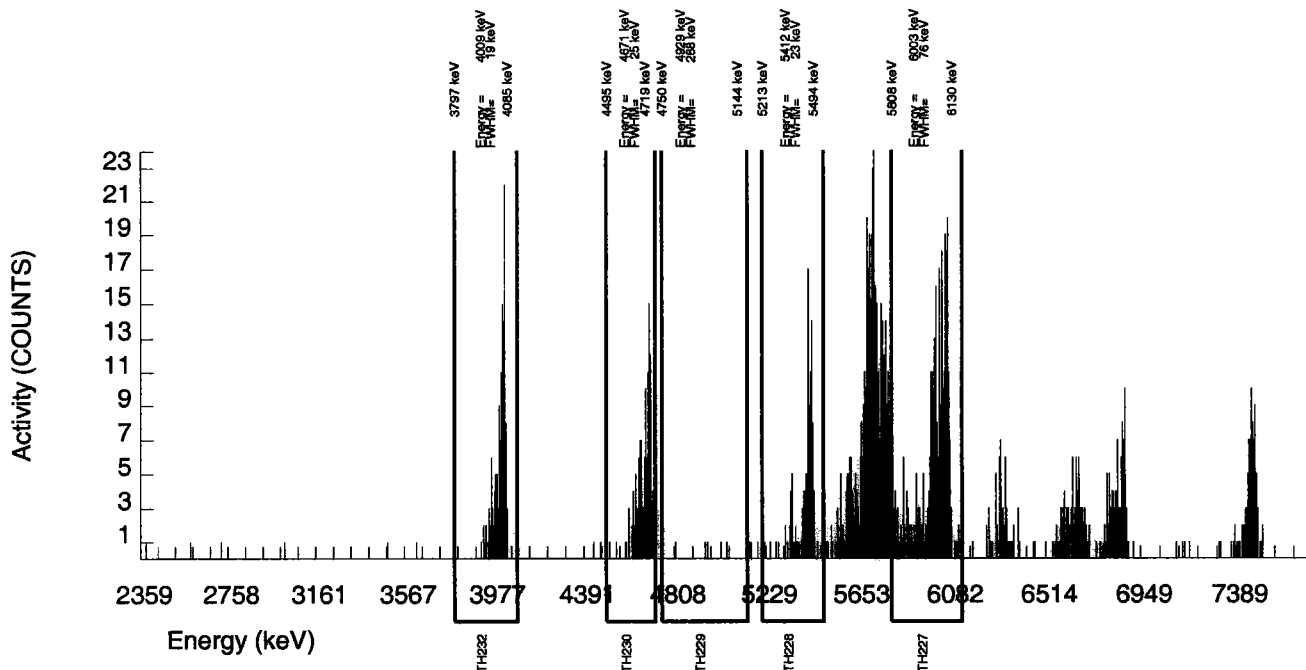
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 10-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S1201932681_TH SAMPLE QTY: 0.252 G	
DETECTOR NUMBER :78903 AVERAGE %EFFICIENCY :26.6527 % YIELD : 67.295		COUNT DATE: 7-OCT-2009 18:19:38 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.493E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.493E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 2.62496 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B202.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W202.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	313.000	306.000	7.000	2.6458	57.44000	6.97E+00	9.01E-01	3.49E-01	1.40E-01	7.99E-01
TH-228	5363.000	112.000	111.000	1.000	1.0000	99.94000	1.14E+00	2.24E-01	7.85E-02	2.39E-02	2.14E-01
TH229	4900.000	6.000	6.000	0.000	0.0000	99.52000	6.01E-02	4.82E-02	3.00E-02	0.00E+00	4.81E-02
TH-230	4625.000	120.000	120.000	0.000	0.0000	100.0000	1.20E+00	2.26E-01	2.99E-02	0.00E+00	2.14E-01
TH-232	3972.000	130.000	129.000	1.000	1.0000	100.0000	1.29E+00	2.36E-01	7.63E-02	2.32E-02	2.24E-01

NOTE: Ac-227 results decay corrected to separation date/time.



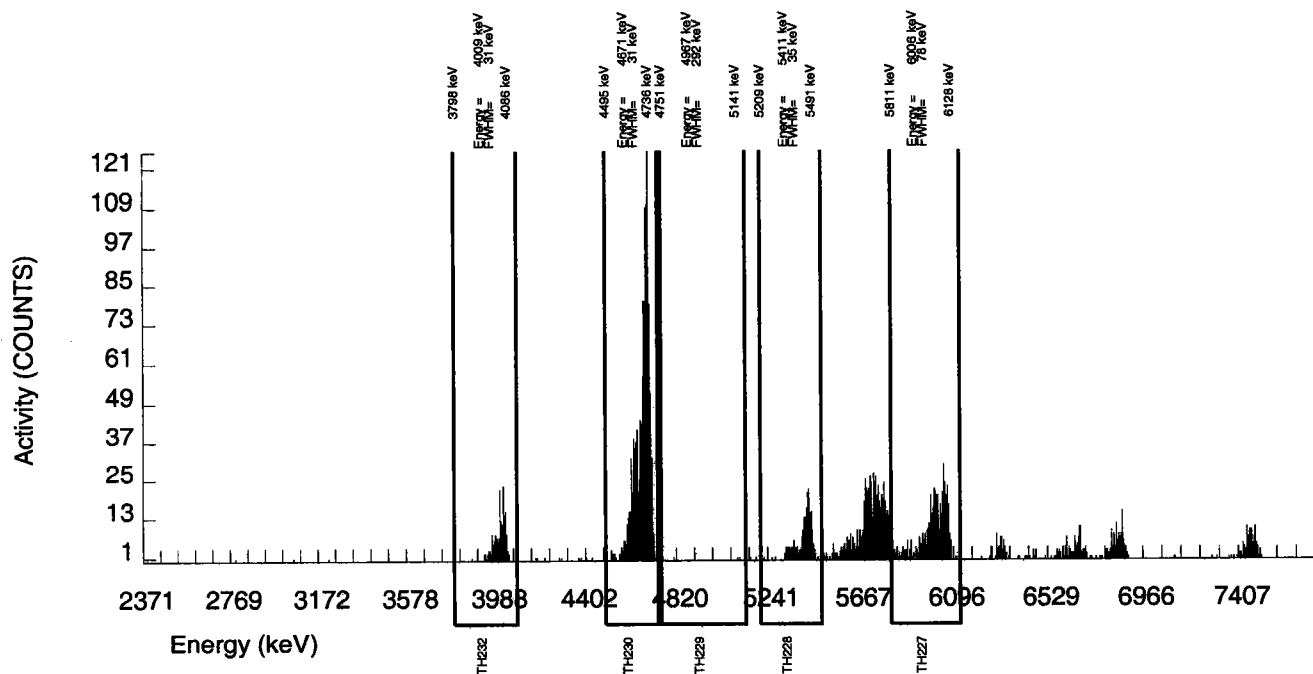
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 10-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S1201932682_TH SAMPLE QTY: 0.257 G	
DETECTOR NUMBER :78905 AVERAGE %EFFICIENCY :25.8288 % YIELD : 103.482		COUNT DATE: 7-OCT-2009 18:19:41 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.328E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.328E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.03648 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B203.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W203.CNF;39 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	466.000	456.000	10.000	3.1623	57.44000	6.84E+00	7.59E-01	2.66E-01	1.10E-01	6.41E-01
TH-228	5363.000	205.000	205.000	0.000	0.0000	99.94000	1.38E+00	2.06E-01	2.02E-02	0.00E+00	1.89E-01
TH229	4900.000	4.000	-4.000	8.000	2.8284	99.52000	-2.64E-02	4.47E-02	1.06E-01	4.34E-02	4.47E-02
TH-230	4625.000	1168.000	1162.000	6.000	2.4495	100.0000	7.62E+00	6.32E-01	9.44E-02	3.74E-02	4.40E-01
TH-232	3972.000	176.000	176.000	0.000	0.0000	100.0000	1.15E+00	1.84E-01	1.97E-02	0.00E+00	1.71E-01

NOTE: Ac-227 results decay corrected to separation date/time.



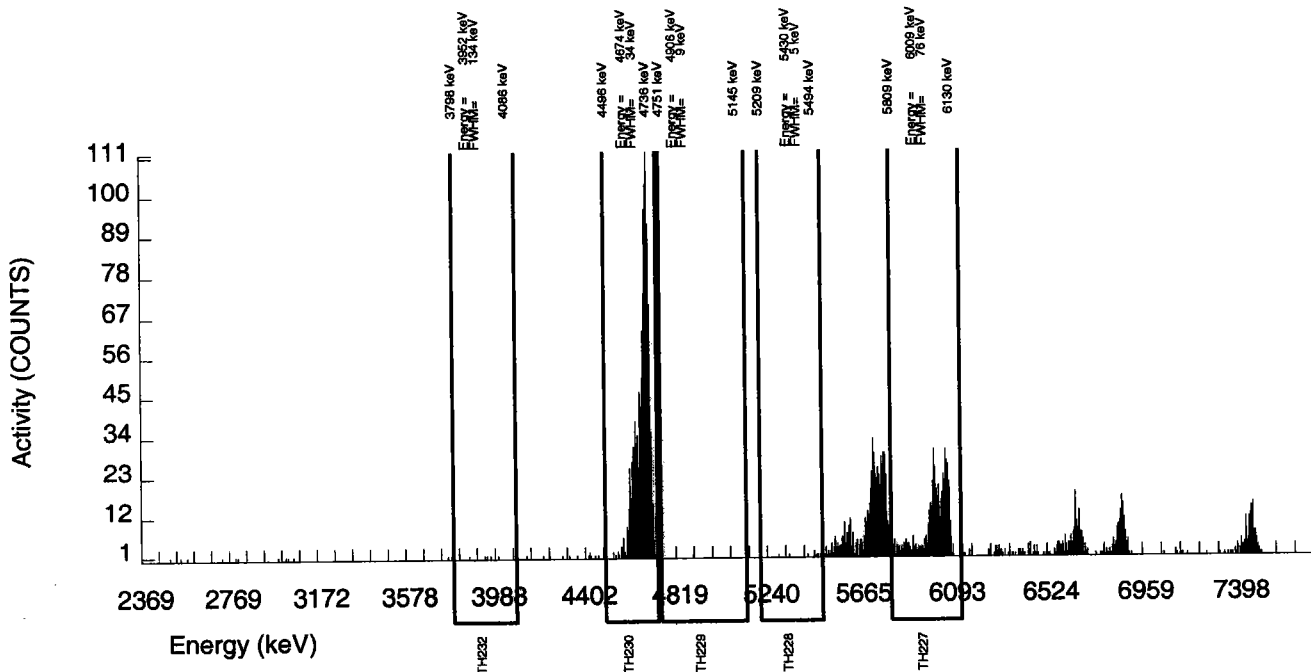
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906319 SAMPLE DATE : 29-SEP-2009 00:00:00 AC-227 SEPARATION : 30-SEP-2009 18:00:00		SAMPLE ID : S1201932683_TH SAMPLE QTY: 0.258 G	
DETECTOR NUMBER :78907 AVERAGE %EFFICIENCY :24.9619 % YIELD : 112.242		COUNT DATE: 7-OCT-2009 18:19:43 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	LCS/LCSD ID : A2796-J ISOTOPE : TH-230 PCI/G : 8.295E+00	TRACER ID : 0387-B-102 ISOTOPE : AC-227 NOMINAL : 3.90066 dpm RESULTS : 4.37817 dpm	LIB FILE : ENV_ALPHA_TH.N BKG FILE : B204.CNF;60 BKG DATE : 4-OCT-2009 EFF FILE : W204.CNF;38 CAL DATE : 21-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
AC-227	5994.040	492.000	478.000	14.000	3.7417	57.44000	6.81E+00	7.47E-01	2.91E-01	1.24E-01	6.28E-01
TH-228	5363.000	8.000	0.000	8.000	2.8284	99.94000	0.00E+00	4.93E-02	1.02E-01	4.14E-02	4.93E-02
TH229	4900.000	2.000	-7.000	9.000	3.0000	99.52000	-4.38E-02	4.07E-02	1.06E-01	4.37E-02	4.07E-02
TH-230	4625.000	1112.000	1105.000	7.000	2.6458	100.0000	6.89E+00	5.78E-01	9.54E-02	3.84E-02	4.09E-01
TH-232	3972.000	5.000	-2.000	7.000	2.6458	100.0000	-1.25E-02	4.23E-02	9.54E-02	3.84E-02	4.23E-02

NOTE: Ac-227 results decay corrected to separation date/time.



URANIUM

Radiochemistry Batch Checklist, Rev 9

Batch# 908848 Product: 4 Date: 10/7/09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			NA
Samples have been blank corrected (if required)			NA
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	/		
Instrument source check is within limits.	/		
Instrument bkg check is within limits.	/		
Method RDL/ LLD has been met.	/		
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%.	/		
Or meets the client's required RER acceptance criteria.			
Tracer yield is 15-125% . Carrier yield 25-125%.		/	NCH# 742719
Or meets the client's contract acceptance criteria.			
Method blank is less than the RDL/ LLD. (If rad samples, < 5% of lowest activity)	/		
	/		
Sample was run within hold time.	/		
Sample was correctly preserved if required.	/		
Smears Taken for Radioactive batches.			NA
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	/		
No blank spaces on data forms.	/		
All line outs initialed and dated.	/		
No transcription errors are apparent.			
Aux data is correct.			NA
Client Special requirements page has been checked.	/		
Raw Data and/ or spectrum are included and properly stasured.	/		
QC data entered into QC database and batch is in REVW	/		
Hit notification complete (if necessary)			NA
Batch entered into Case Narrative.	/		
Batch non-conformances completed, if applicable.	/		NCH# 742719
Batch non-conformances second reviewed and disposition verified to be completed.			NCH# 742719
Aliquot Correction completed if required.			NA
Review sample historical results if available (if REMP, results above MDC have been verified by historical results, recount or re-analysis.)	/		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By: [Signature] 10/7/09

Secondary Review Performed By: [Signature] 10/7/09

9/22 (10/8)
KEROL

Uranium Que Sheet

23-SEP-09

Batch #: 905548 Analyst: AXD2 First Client Due Date: 08-OCT-09 Internal Due Date: 27-SEP-09

Tracer Isotope: U-232U-236 Tracer Code: 1283-E Expiration Date: 1/15/10 Vol: 0.1
 LCS Isotope: U-238 LCS Code: 1163-G Expiration Date: 4/10/10 Vol: 0.1
 Spike Isotope: U-238 Spike Code: Expiration Date: Vol:
 Prep Date: 9/29/09 Initials: APW Pipet ID: 2971058 Balance ID: 16750207

Witness: MARK B 9/29/09

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Pos.	Label #	Wet/Dry Aliquot (g/Df)	Det #
236699016-1	EB090309-SO2	SAMPLE		.03 pCi/L	WATER	KERR003	03-SEP-09	1	1	0.800	114
236817014-1	EB090809-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	08-SEP-09	2	2	0.800	113
236938020-1	EB091009-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	10-SEP-09	3	3	0.800	145
237010013-1	EB091009-SO2	SAMPLE		.03 pCi/L	WATER	KERR003	10-SEP-09	4	4	0.800	146
237170005-1	EB091409-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	14-SEP-09	5	5	0.800	13a
237170020-1	EB091509-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	15-SEP-09	6	6	0.800	135
237343006-1	EB091609-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	16-SEP-09	7	7	0.800	161
237521010-1	EB091809-SO1	SAMPLE		.03 pCi/L	WATER	KERR003	18-SEP-09	8	8	0.800	162
1201930842-1	MB for batch 905548	MB		.03 pCi/L	WATER	QC ACCOUNT	03-SEP-09	9	9	0.800	22
1201930843-1	LCS for batch 905548	LCS		.03 pCi/L	WATER	QC ACCOUNT	03-SEP-09	10	10	0.800	23
1201930844-1	LCS for batch 905548	LCS		.03 pCi/L	WATER	QC ACCOUNT	03-SEP-09	11	11	0.800	24

APW 9/29/09

APW 9/29/09

Data Reviewed By:

Solid Sample Dissolution by: LEACH or DIGESTION
 Circle One

Choose SOP used: GL-RAD-A-011
 GL-RAD-A-038
 GL-RAD-A-045
 GL-RAD-A-043

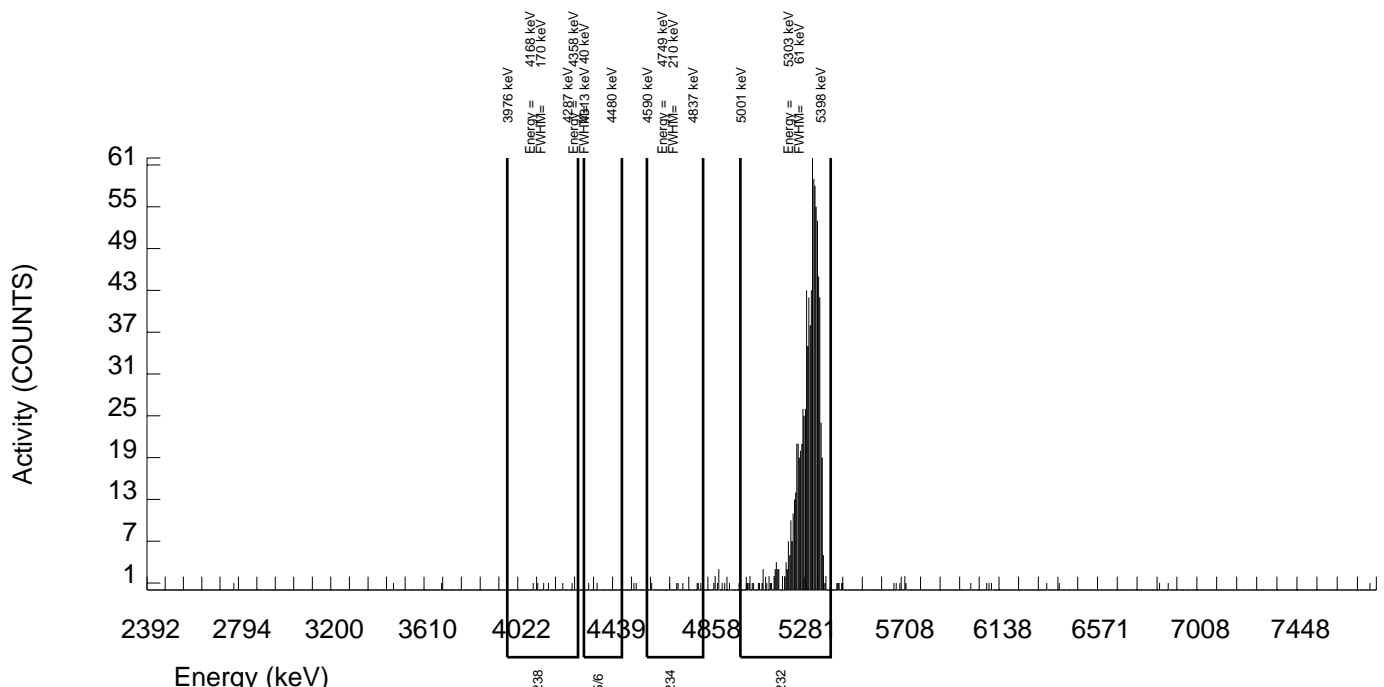
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905548 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817014_UU SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :45-111B4 AVERAGE %EFFICIENCY :24.9366 % YIELD : 69.524		COUNT DATE: 5-OCT-2009 20:48:17 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :AXD2	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/L : 3.149E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/L : 3.149E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 3.65598 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B113.CNF;400 BKG DATE : 4-OCT-2009 EFF FILE : W113.CNF;114 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
U-3/4	4763.020	8.000	7.082	0.000	0.0000	100.0000	2.30E-02	1.72E-02	9.74E-03	0.00E+00	1.69E-02
U232	5302.100	917.000	911.000	6.000	2.4495	100.0000	2.96E+00	4.59E-01	4.68E-02	1.85E-02	1.94E-01
U-235	4391.000	2.000	2.000	0.000	0.0000	80.90000	8.03E-03	1.12E-02	1.20E-02	0.00E+00	1.11E-02
U-238	4184.730	6.000	6.000	0.000	0.0000	100.0000	1.95E-02	1.58E-02	9.74E-03	0.00E+00	1.56E-02

NOTE: Corrections made to U-3/4 net area due to tracer impurity



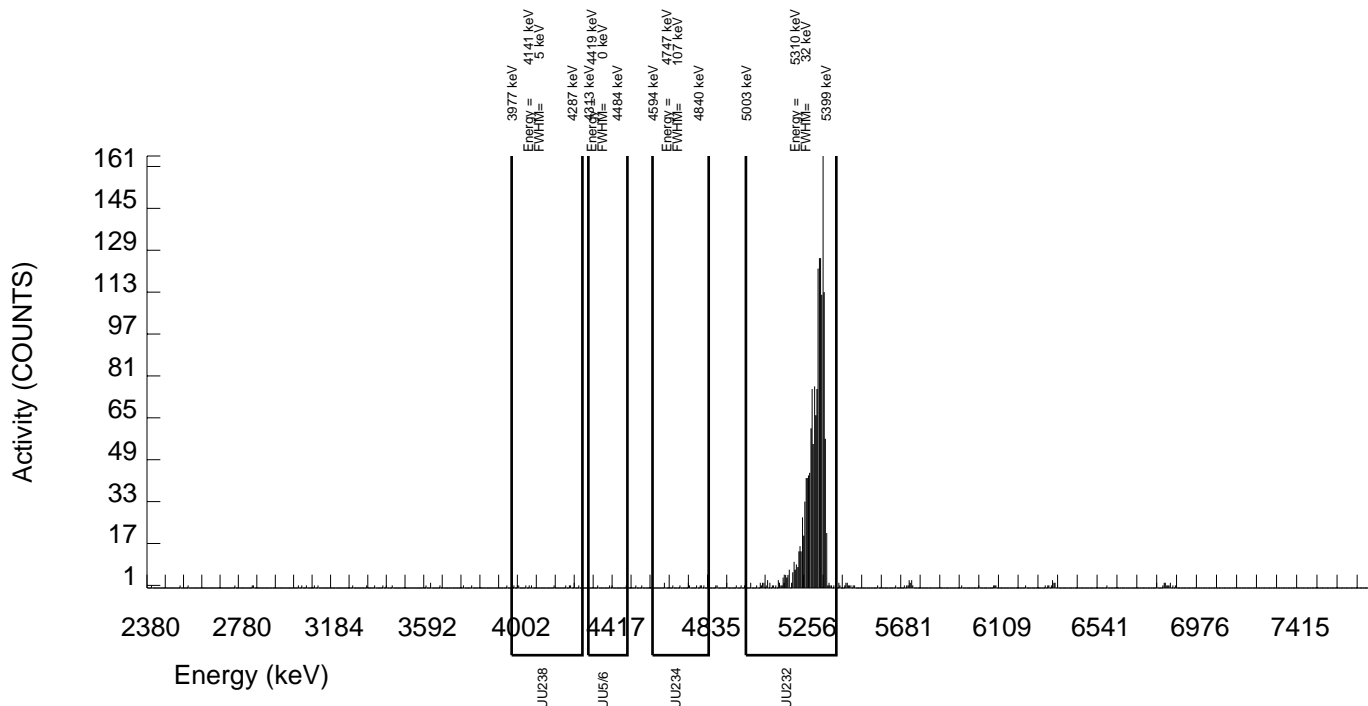
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905548 SAMPLE DATE : 29-SEP-2009 00:00:00		SAMPLE ID : S1201930842_UU SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :72530 AVERAGE %EFFICIENCY :31.6755 % YIELD : 98.463		COUNT DATE: 2-OCT-2009 13:49:11 ELAPSED LIVE TIME(SEC): 59999.99 ANALYST :AXD2	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/L : 3.149E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/L : 3.149E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25568 dpm RESULTS : 5.17488 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B022.CNF;1063 BKG DATE : 27-SEP-2009 EFF FILE : W022.CNF;304 CAL DATE : 4-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
U-3/4	4763.020	11.000	4.348	5.000	2.2361	100.0000	7.85E-03	1.34E-02	2.42E-02	9.39E-03	1.34E-02
U232	5302.100	1651.000	1639.000	12.000	3.4641	100.0000	2.96E+00	4.21E-01	3.45E-02	1.46E-02	1.44E-01
U-235	4391.000	4.000	3.000	1.000	1.0000	80.90000	6.69E-03	9.82E-03	1.71E-02	5.19E-03	9.78E-03
U-238	4184.730	13.000	9.000	4.000	2.0000	100.0000	1.62E-02	1.47E-02	2.22E-02	8.40E-03	1.46E-02

NOTE: Corrections made to U-3/4 net area due to tracer impurity



GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905548
SAMPLE DATE : 29-SEP-2009 00:00:00

SAMPLE ID : S1201930843_UU
SAMPLE QTY: 0.800 L

DETECTOR NUMBER :78264
AVERAGE %EFFICIENCY :33.1983
% YIELD : 91.825

COUNT DATE: 2-OCT-2009 13:49:11
ELAPSED LIVE TIME(SEC): 59999.99
ANALYST :AXD2

MS/MSD
ID : 1163-G
ISOTOPE : U-238
PCI/L : 3.149E+00

LCS/LCSD
ID : 1163-G
ISOTOPE : U-238
PCI/L : 3.149E+00

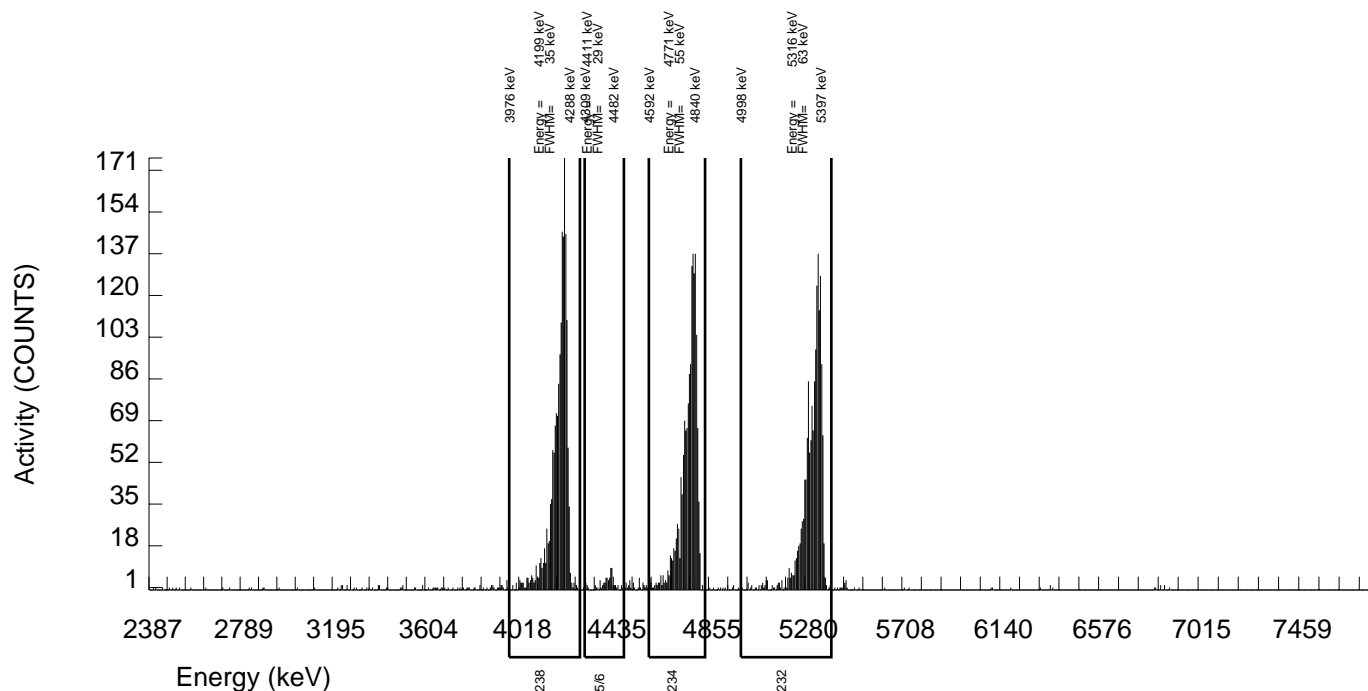
TRACER
ID : 1283-E
ISOTOPE : U232
NOMINAL : 5.25568 dpm
RESULTS : 4.82605 dpm

LIB FILE : ENV_ALPHA_UU.N
BKG FILE : B023.CNF;1065
BKG DATE : 27-SEP-2009
EFF FILE : W023.CNF;290
CAL DATE : 4-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
U-3/4	4763.020	1577.000	1565.385	10.000	3.1623	100.0000	2.89E+00	4.12E-01	3.27E-02	1.36E-02	1.44E-01
U232	5302.100	1612.000	1602.000	10.000	3.1623	100.0000	2.96E+00	4.21E-01	3.27E-02	1.36E-02	1.46E-01
U-235	4391.000	73.000	67.000	6.000	2.4495	80.90000	1.53E-01	4.47E-02	3.29E-02	1.30E-02	3.98E-02
U-238	4184.730	1726.000	1712.000	14.000	3.7417	100.0000	3.16E+00	4.49E-01	3.77E-02	1.61E-02	1.51E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



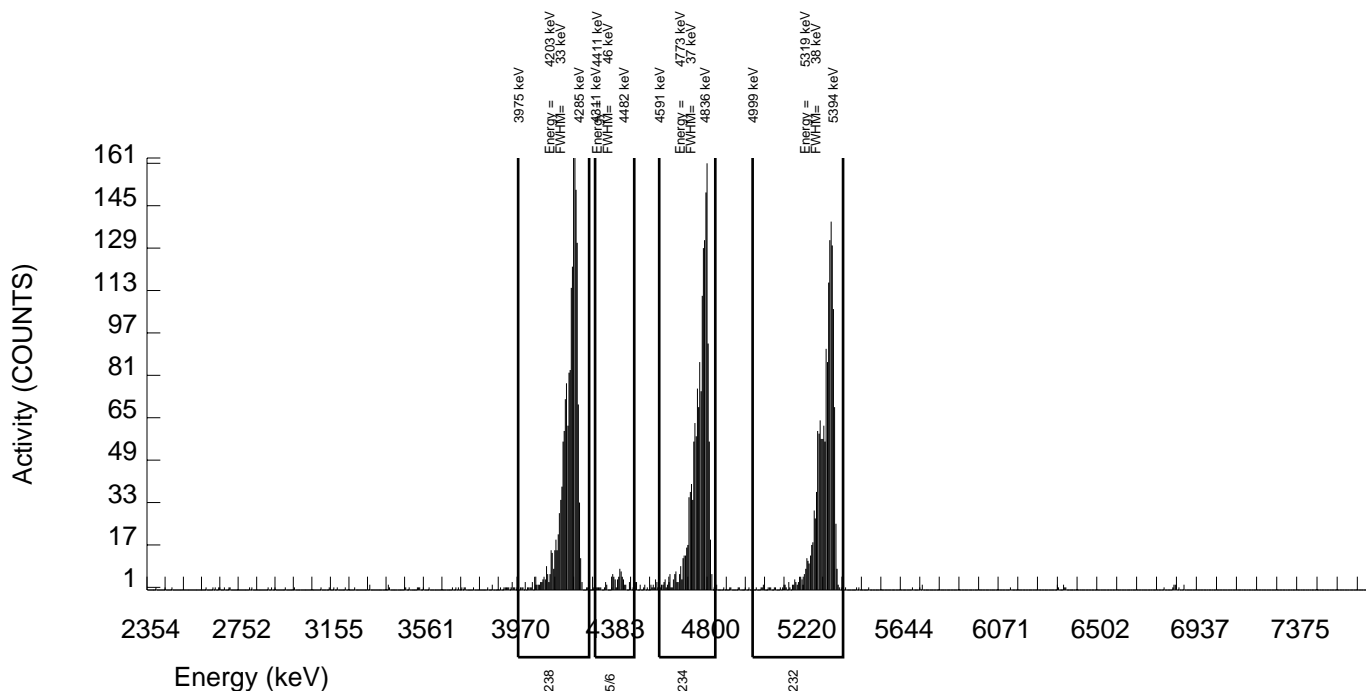
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 905548 SAMPLE DATE : 29-SEP-2009 00:00:00		SAMPLE ID : S1201930844_UU SAMPLE QTY: 0.800 L	
DETECTOR NUMBER :76542 AVERAGE %EFFICIENCY :32.8288 % YIELD : 90.135		COUNT DATE: 2-OCT-2009 13:49:11 ELAPSED LIVE TIME(SEC): 59999.99 ANALYST :AXD2	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/L : 3.149E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/L : 3.149E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25568 dpm RESULTS : 4.73719 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B024.CNF;1058 BKG DATE : 27-SEP-2009 EFF FILE : W024.CNF;289 CAL DATE : 4-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/L	TPU 1.96-SIGMA	MDA pCi/L	Lc pCi/L	UNC pCi/L
U-3/4	4763.020	1629.000	1620.433	7.000	2.6458	100.0000	3.08E+00	4.40E-01	2.91E-02	1.17E-02	1.51E-01
U232	5302.100	1563.000	1555.000	8.000	2.8284	100.0000	2.96E+00	4.23E-01	3.08E-02	1.25E-02	1.48E-01
U-235	4391.000	71.000	71.000	0.000	0.0000	80.90000	1.67E-01	4.48E-02	7.06E-03	0.00E+00	3.88E-02
U-238	4184.730	1737.000	1729.000	8.000	2.8284	100.0000	3.29E+00	4.67E-01	3.08E-02	1.25E-02	1.56E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



Radiochemistry Batch Checklist, Rev 9

Batch# 906320 Product: U Date: 10/8/09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			N/A
Samples have been blank corrected (if required)			N/A
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	✓		
Instrument source check is within limits. Instrument bkg check is within limits.	✓		
Method RDL/ LLD has been met.		✓	NCR 743252
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%. Or meets the client's required RER acceptance criteria.	✓		
Tracer yield is 15-125% . Carrier yield 25-125%. Or meets the client's contract acceptance criteria.		✓	NCR 743252
Method blank is less than the RDL/ LLD. (If rad samples, < 5% of lowest activity)	✓		
Sample was run within hold time.	✓		
Sample was correctly preserved if required.			N/A
Smears Taken for Radioactive batches.			N/A
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms. All line outs initialed and dated. No transcription errors are apparent.	✓		
Aux data is correct.			N/A
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly stated.	✓		
QC data entered into QC database and batch is in REVW	✓		
Hit notification complete (if necessary)			N/A
Batch entered into Case Narrative.	✓		
Batch non-conformances completed, if applicable.	✓		NCR 743252
Batch non-conformances second reviewed and disposition verified to be completed.	✓		NCR 743252
Aliquot Correction completed if required.			N/A
Review sample historical results if available (if REMP, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By: _____

J. L. Miller 10/8/09
[Signature] 10/8/09

Secondary Review Performed By: _____

9/28 10/9

VSR

Uranium Que Sheet

25-SEP-09

Batch #: 906320 Analyst: MXE1 Internal Due Date: 28-SEP-09
 Tracer Isotope: U-232 U-236 Tracer Code: 1283-E Expiration Date: 1/15/10 Vol: 0.1
 LCS Isotope: U-238 LCS Code: 1103-G Expiration Date: 4/16/10 Vol: 0.1
 Spike Isotope: U-238 Spike Code: 1103-G Expiration Date: 4/16/10 Vol: 0.1
 Prep Date: 9/29/09 Initials: MME Pipet ID: 291058 Balance ID: 60410272

Witness: J. J. 09/21/09

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Pos.	Label #	Aliquot (g/l/f)	U Det #
236817001-1	SA50-12B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	1	1	0.504	46 149
236817002-1	SA50009-12B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	2	2	0.517	117
236817003-1	SA50-25B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	3	3	0.517	118
236817004-1	SA50-36B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	4	4	0.502	121
236817005-1	SA135-0.5B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	5	5	0.514	122
236817006-1	SA135-10B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	6	6	0.514	123 150
236817007-1	SA135009-10B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	7	7	0.514	124
236817008-1	SA135-25B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	8	8	0.520	125
236817009-1	SA135-37B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	9	9	0.520	126 151
236817010-1	SA170-0.5B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	10	10	0.510	127 152
236817011-1	SA170-10B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	11	11	0.520	128 153
236817012-1	SA170-20B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	12	12	0.501	130
236817013-1	SA170-31B	SAMPLE		.04 pCi/g	SOIL	KERR003	08-SEP-09	13	13	0.510	131 154
236817015-1	SA45-10B	SAMPLE		.04 pCi/g	SOIL	KERR003	09-SEP-09	14	14	0.508	132
236817016-1	SA45-25B	SAMPLE		.04 pCi/g	SOIL	KERR003	09-SEP-09	15	15	0.528	133
236817017-1	SA45-36B	SAMPLE		.04 pCi/g	SOIL	KERR003	09-SEP-09	16	16	0.521	134
236817018-1	SA186-10B	SAMPLE		.04 pCi/g	SOIL	KERR003	09-SEP-09	17	17	0.511	135
236817019-1	SA186-25B	SAMPLE		.04 pCi/g	SOIL	KERR003	09-SEP-09	18	18	0.524	136
236817020-1	SA186-37B	SAMPLE		.04 pCi/g	SOIL	KERR003	09-SEP-09	19	19	0.520	137
236817021-1	SA126-40B	SAMPLE		.04 pCi/g	SOIL	KERR003	10-SEP-09	20	20	0.507	138
1201932690-1	MB for batch 906320	MB		.04 pCi/g	SOIL	QC ACCOUNT		21	21	0.526	139
1201932691-1	SA126-40B(236817021DUP)	DUP		.04 pCi/g	SOIL	QC ACCOUNT	10-SEP-09	22	22	0.503	140
1201932692-1	SA126-40B(236817021MS)	MS		.04 pCi/g	SOIL	QC ACCOUNT	10-SEP-09	23	23	0.526	141
1201932693-1	LCS for batch 906320	LCS		.04 pCi/g	SOIL	QC ACCOUNT		24	24	0.526	142

Data Reviewed By: J. J. M. S. - 10/8/09

Solid Sample Dissolution by: LEACH or DIGESTION

Choose SOP used: GL-RAD-A-011
 GL-RAD-A-038
 GL-RAD-A-045
 GL-RAD-A-043

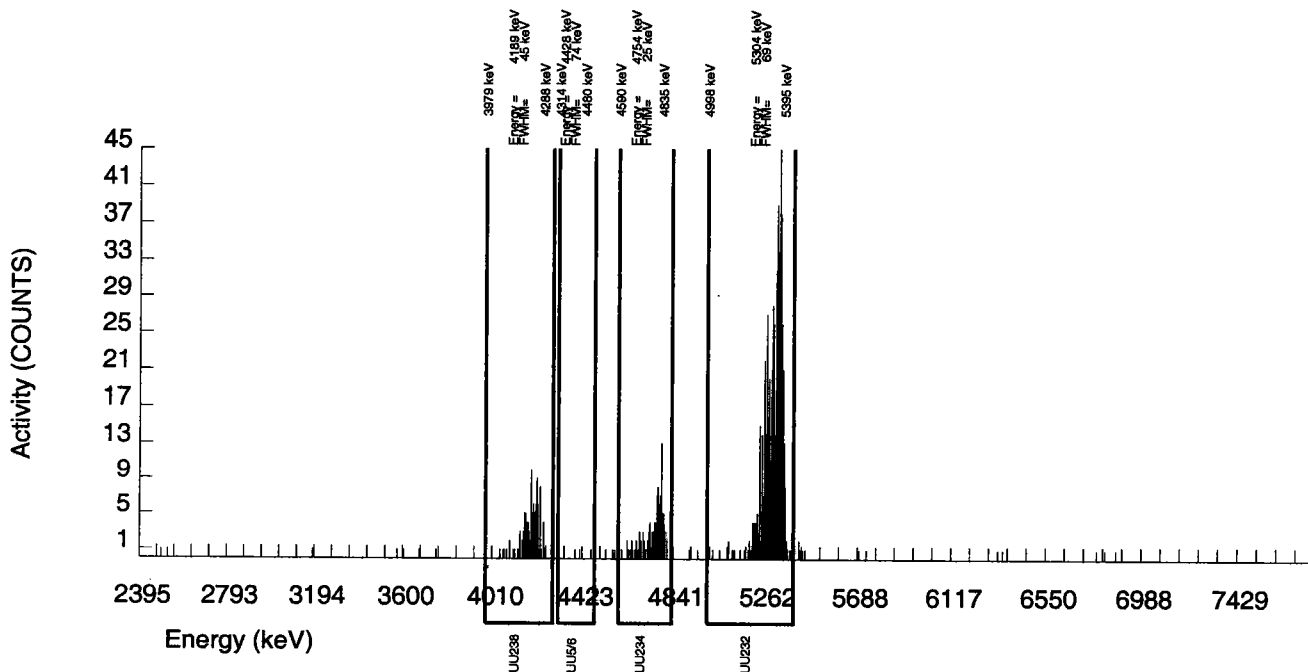
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817001_UU SAMPLE QTY: 0.504 G	
DETECTOR NUMBER :33449 AVERAGE %EFFICIENCY :24.4275 % YIELD : 41.214		COUNT DATE: 6-OCT-2009 23:22:34 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.998E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.998E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 2.16727 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B149.CNF;360 BKG DATE : 4-OCT-2009 EFF FILE : W149.CNF;104 CAL DATE : 15-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	105.000	97.467	7.000	2.6458	100.0000	8.65E-01	2.26E-01	1.36E-01	5.46E-02	1.84E-01
U232	5302.100	537.000	529.000	8.000	2.8284	100.0000	4.70E+00	8.22E-01	1.44E-01	5.85E-02	4.07E-01
U-235	4391.000	3.000	2.000	1.000	1.0000	80.90000	2.19E-02	4.31E-02	8.40E-02	2.55E-02	4.30E-02
U-238	4184.730	103.000	103.000	0.000	0.0000	100.0000	9.14E-01	2.25E-01	2.66E-02	0.00E+00	1.77E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



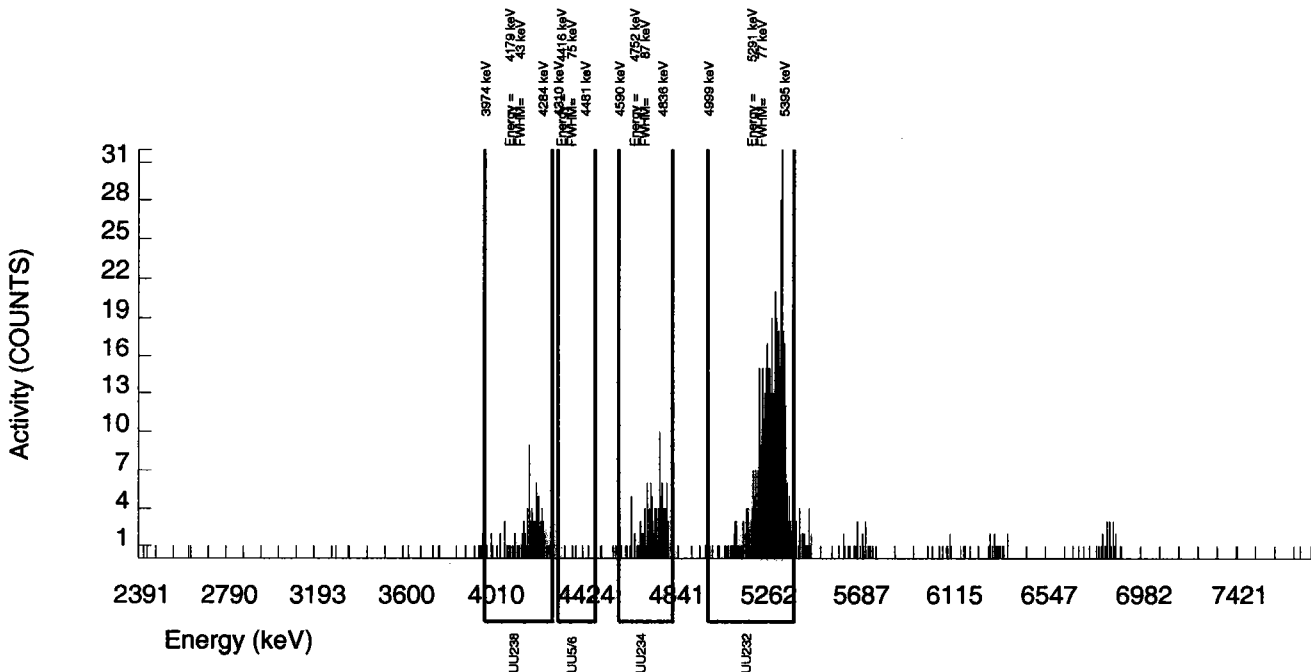
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817002_UU SAMPLE QTY: 0.517 G	
DETECTOR NUMBER :33450 AVERAGE %EFFICIENCY :25.3933 % YIELD : 35.745		COUNT DATE: 2-OCT-2009 20:24:48 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.872E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.872E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 1.87970 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B117.CNF;403 BKG DATE : 28-SEP-2009 EFF FILE : W117.CNF;110 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	110.000	107.519	2.000	1.4142	100.0000	1.03E+00	2.55E-01	9.20E-02	3.16E-02	1.99E-01
U232	5302.100	484.000	477.000	7.000	2.6458	100.0000	4.58E+00	8.22E-01	1.47E-01	5.91E-02	4.17E-01
U-235	4391.000	4.000	3.000	1.000	1.0000	80.90000	3.56E-02	5.23E-02	9.08E-02	2.76E-02	5.20E-02
U-238	4184.730	90.000	85.000	5.000	2.2361	100.0000	8.16E-01	2.23E-01	1.29E-01	4.99E-02	1.83E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



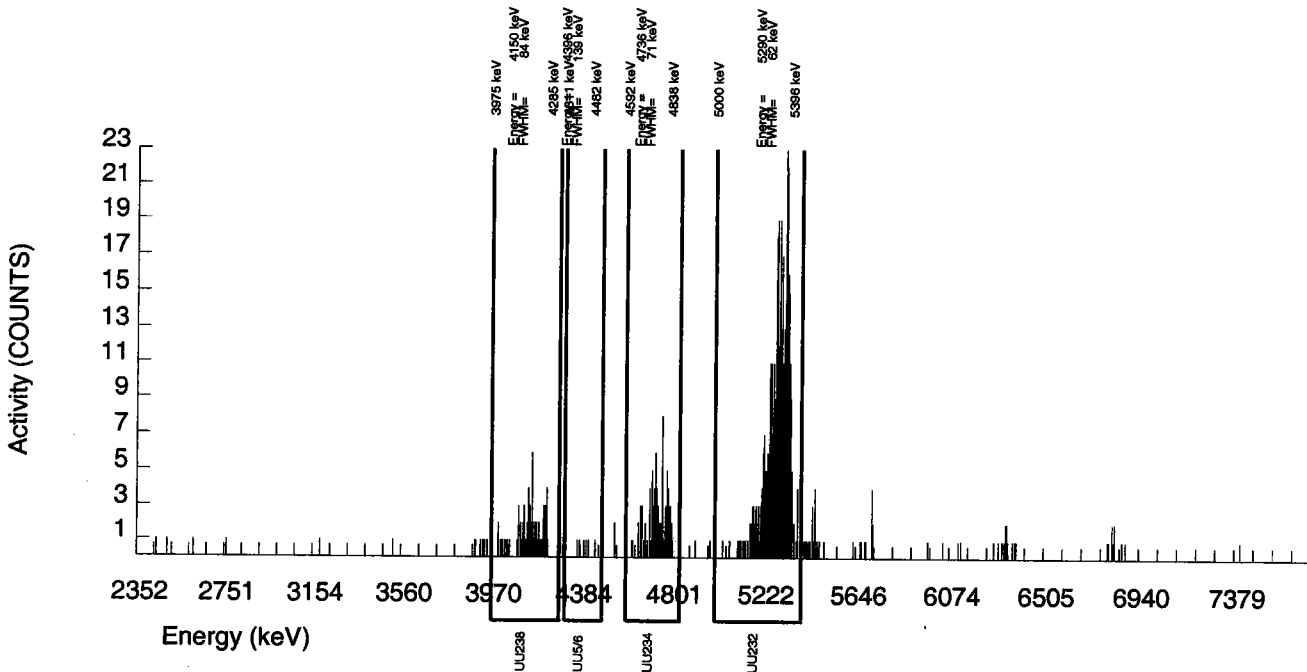
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817003_UU SAMPLE QTY: 0.517 G	
DETECTOR NUMBER :75544 AVERAGE %EFFICIENCY :25.6202 % YIELD : 25.773		COUNT DATE: 2-OCT-2009 20:24:52 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.872E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.872E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 1.35530 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B118.CNF;402 BKG DATE : 28-SEP-2009 EFF FILE : W118.CNF;107 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	83.000	79.650	3.000	1.7321	100.0000	1.05E+00	2.95E-01	1.46E-01	5.32E-02	2.39E-01
U232	5302.100	352.000	347.000	5.000	2.2361	100.0000	4.58E+00	8.97E-01	1.77E-01	6.87E-02	4.89E-01
U-235	4391.000	7.000	6.000	1.000	1.0000	80.90000	9.79E-02	9.18E-02	1.25E-01	3.79E-02	9.04E-02
U-238	4184.730	68.000	65.000	3.000	1.7321	100.0000	8.58E-01	2.59E-01	1.46E-01	5.32E-02	2.18E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



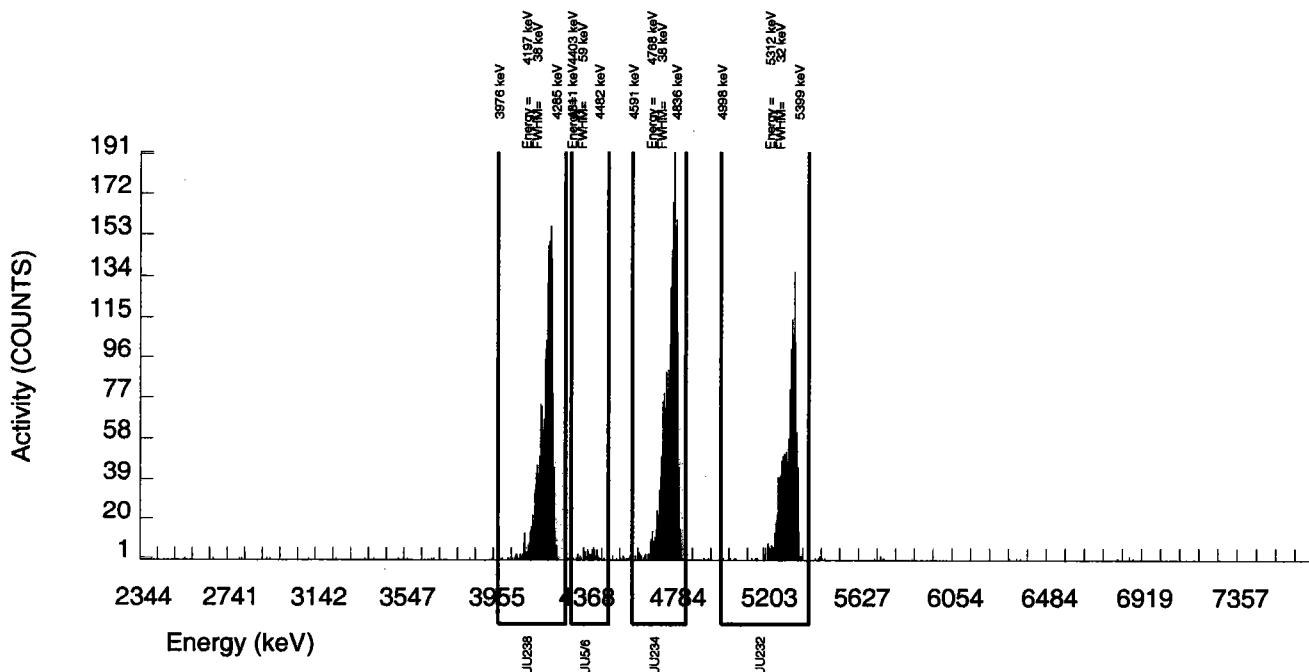
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817004_UU SAMPLE QTY: 0.502 G	
DETECTOR NUMBER :75545 AVERAGE %EFFICIENCY :24.5110 % YIELD : 104.342		COUNT DATE: 2-OCT-2009 20:24:55 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.018E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.018E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 5.48690 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B121.CNF;398 BKG DATE : 28-SEP-2009 EFF FILE : W121.CNF;108 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	1982.000	1979.645	1.000	1.0000	100.0000	6.95E+00	9.93E-01	2.68E-02	8.16E-03	3.06E-01
U232	5302.100	1350.000	1344.000	6.000	2.4495	100.0000	4.72E+00	6.90E-01	5.05E-02	2.00E-02	2.53E-01
U-235	4391.000	61.000	61.000	0.000	0.0000	80.90000	2.65E-01	7.55E-02	1.30E-02	0.00E+00	6.64E-02
U-238	4184.730	1701.000	1697.000	4.000	2.0000	100.0000	5.95E+00	8.58E-01	4.32E-02	1.63E-02	2.84E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



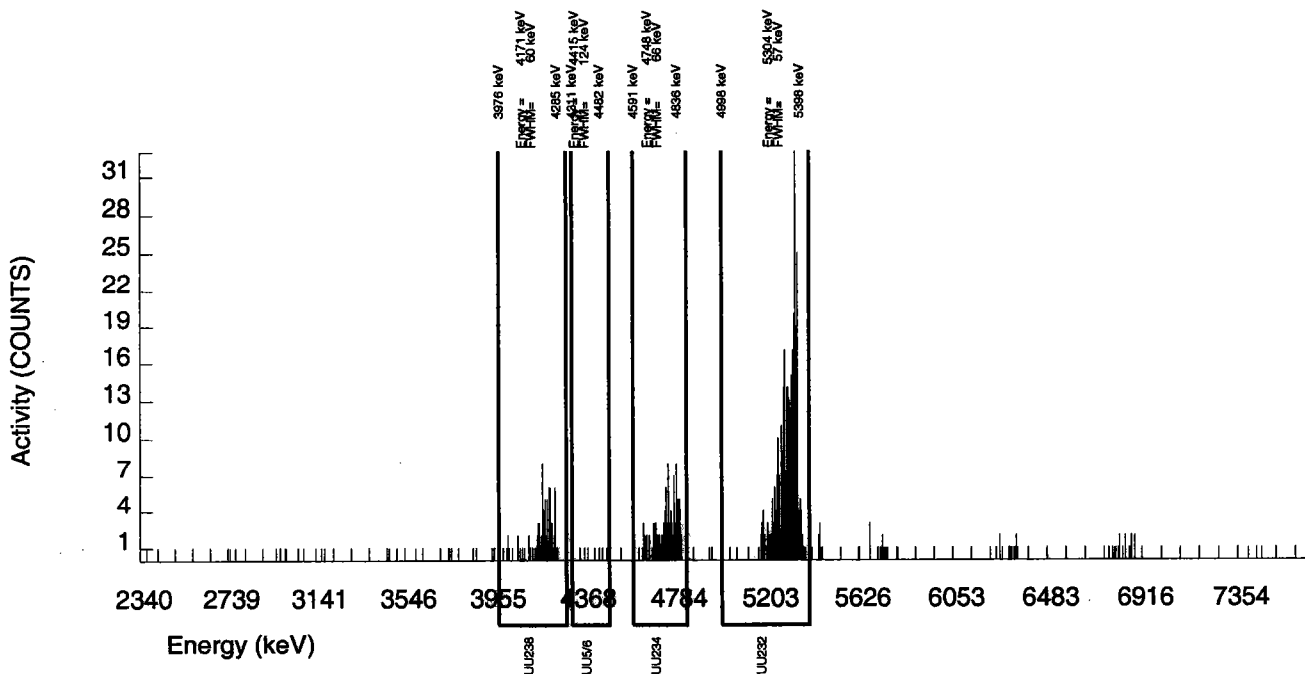
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817005_UU SAMPLE QTY: 0.514 G	
DETECTOR NUMBER :75546 AVERAGE %EFFICIENCY :25.1121 % YIELD : 23.264		COUNT DATE: 2-OCT-2009 20:24:57 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.901E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.901E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 1.22333 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B122.CNF;400 BKG DATE : 28-SEP-2009 EFF FILE : W122.CNF;111 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	103.000	89.691	13.000	3.6056	100.0000	1.35E+00	3.92E-01	2.97E-01	1.26E-01	3.16E-01
U232	5302.100	325.000	307.000	18.000	4.2426	100.0000	4.61E+00	9.62E-01	3.41E-01	1.48E-01	5.45E-01
U-235	4391.000	5.000	4.000	1.000	1.0000	80.90000	7.42E-02	8.99E-02	1.42E-01	4.31E-02	8.90E-02
U-238	4184.730	80.000	78.000	2.000	1.4142	100.0000	1.17E+00	3.34E-01	1.44E-01	4.94E-02	2.66E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



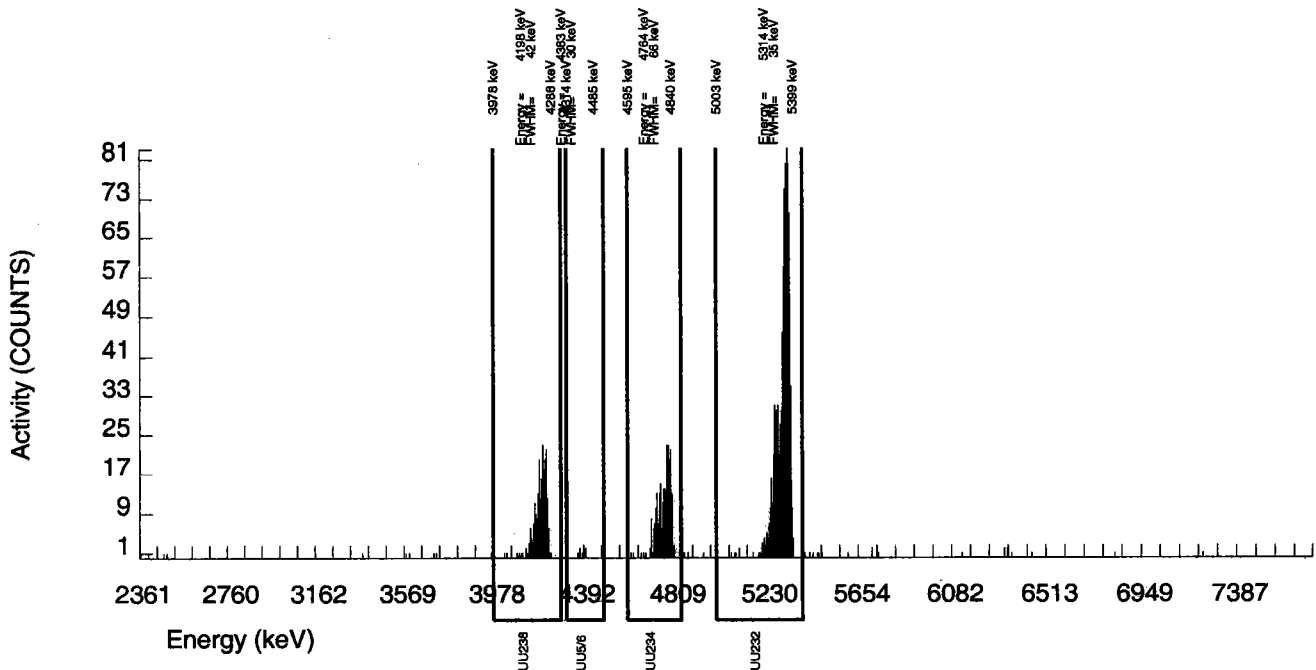
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817006_UU SAMPLE QTY: 0.514 G	
DETECTOR NUMBER :75552 AVERAGE %EFFICIENCY :24.9777 % YIELD : 62.707		COUNT DATE: 6-OCT-2009 23:22:36 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.901E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.901E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 3.29748 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B150.CNF;361 BKG DATE : 4-OCT-2009 EFF FILE : W150.CNF;112 CAL DATE : 15-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	248.000	242.170	5.000	2.2361	100.0000	1.35E+00	2.60E-01	7.50E-02	2.91E-02	1.74E-01
U232	5302.100	833.000	823.000	10.000	3.1623	100.0000	4.61E+00	7.31E-01	9.92E-02	4.12E-02	3.19E-01
U-235	4391.000	8.000	7.000	1.000	1.0000	80.90000	4.84E-02	4.13E-02	5.29E-02	1.61E-02	4.07E-02
U-238	4184.730	224.000	223.000	1.000	1.0000	100.0000	1.25E+00	2.43E-01	4.28E-02	1.30E-02	1.64E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



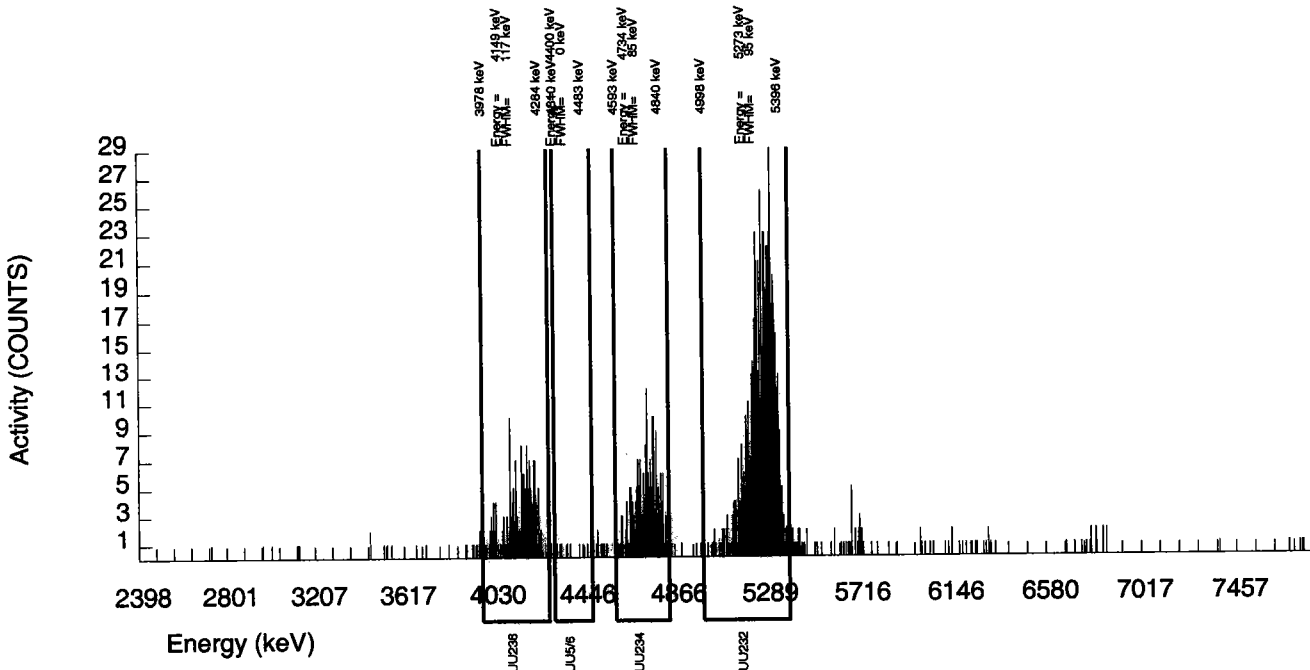
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817007_UU SAMPLE QTY: 0.514 G	
DETECTOR NUMBER :45-142V2 AVERAGE %EFFICIENCY :25.7305 % YIELD : 43.412		COUNT DATE: 2-OCT-2009 20:25:02 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.901E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.901E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 2.28285 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B124.CNF;394 BKG DATE : 28-SEP-2009 EFF FILE : W124.CNF;103 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	192.000	187.408	4.000	2.0000	100.0000	1.47E+00	3.07E-01	9.65E-02	3.65E-02	2.15E-01
U232	5302.100	590.000	587.000	3.000	1.7321	100.0000	4.61E+00	7.82E-01	8.68E-02	3.16E-02	3.75E-01
U-235	4391.000	11.000	10.000	1.000	1.0000	80.90000	9.70E-02	6.74E-02	7.42E-02	2.26E-02	6.58E-02
U-238	4184.730	167.000	164.000	3.000	1.7321	100.0000	1.29E+00	2.77E-01	8.68E-02	3.16E-02	2.00E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



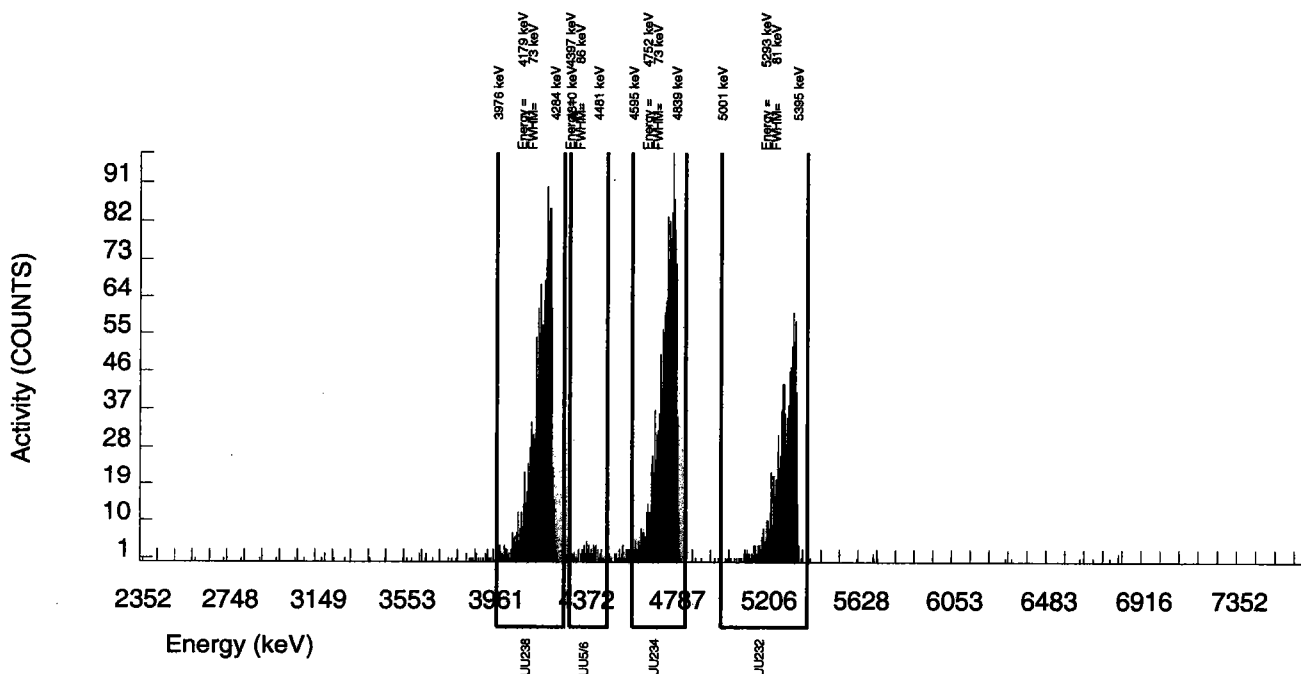
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817008_UU SAMPLE QTY: 0.520 G	
DETECTOR NUMBER :75547 AVERAGE %EFFICIENCY :25.8247 % YIELD : 68.823		COUNT DATE: 2-OCT-2009 20:25:04 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25858 dpm RESULTS : 3.61910 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B125.CNF;404 BKG DATE : 28-SEP-2009 EFF FILE : W125.CNF;121 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	1466.000	1460.059	5.000	2.2361	100.0000	7.12E+00	1.06E+00	6.53E-02	2.54E-02	3.66E-01
U232	5302.100	936.000	934.000	2.000	1.4142	100.0000	4.56E+00	7.03E-01	4.67E-02	1.60E-02	2.93E-01
U-235	4391.000	67.000	67.000	0.000	0.0000	80.90000	4.04E-01	1.12E-01	1.81E-02	0.00E+00	9.67E-02
U-238	4184.730	1411.000	1411.000	0.000	0.0000	100.0000	6.88E+00	1.03E+00	1.46E-02	0.00E+00	3.59E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



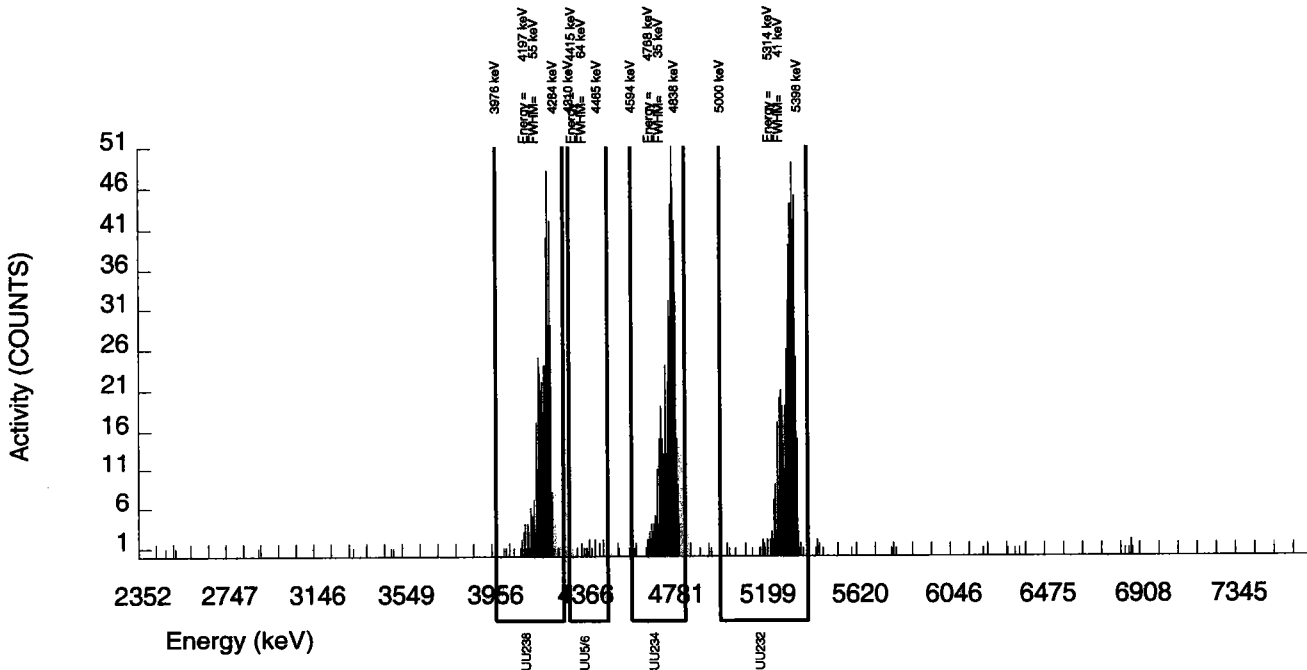
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817009_UU SAMPLE QTY: 0.526 G	
DETECTOR NUMBER :75556 AVERAGE %EFFICIENCY :24.4597 % YIELD : 41.082		COUNT DATE: 6-OCT-2009 23:22:39 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 2.16032 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B151.CNF;356 BKG DATE : 4-OCT-2009 EFF FILE : W151.CNF;110 CAL DATE : 15-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	490.000	489.468	0.000	0.0000	100.0000	4.17E+00	7.33E-01	2.56E-02	0.00E+00	3.70E-01
U232	5302.100	532.000	528.000	4.000	2.0000	100.0000	4.50E+00	7.85E-01	1.05E-01	3.97E-02	3.87E-01
U-235	4391.000	11.000	9.000	2.000	1.4142	80.90000	9.48E-02	7.58E-02	1.01E-01	3.47E-02	7.44E-02
U-238	4184.730	432.000	432.000	0.000	0.0000	100.0000	3.68E+00	6.58E-01	2.56E-02	0.00E+00	3.47E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



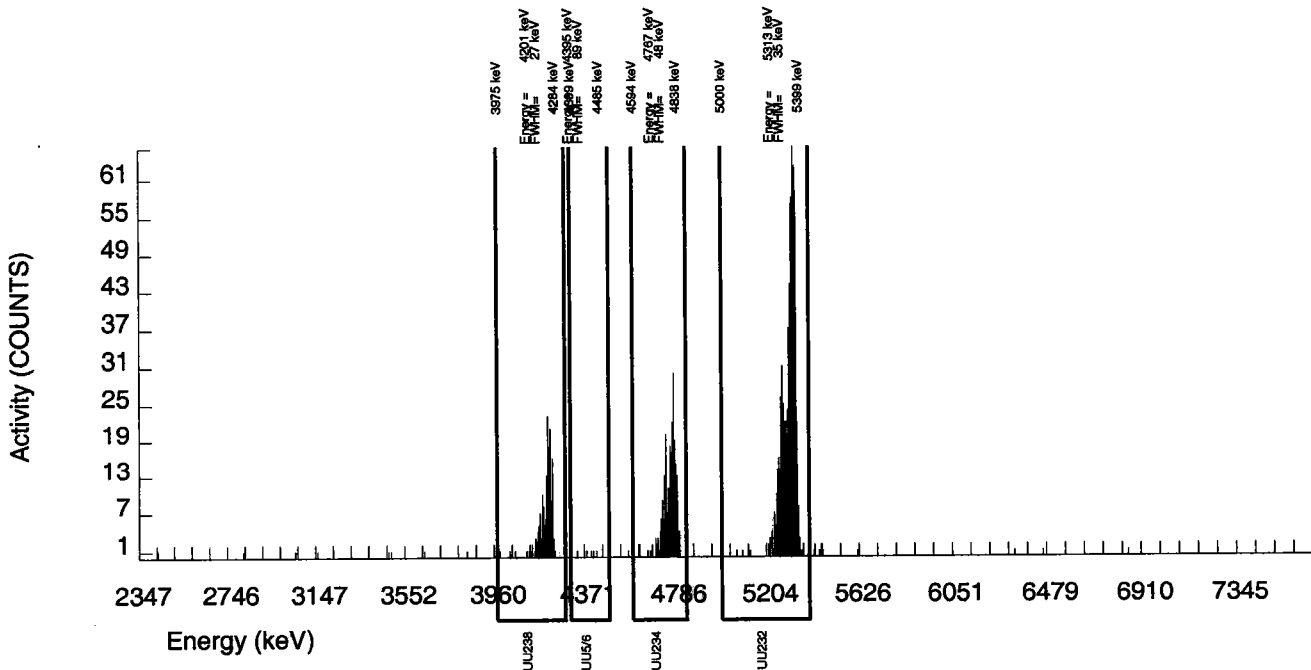
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817010_UU SAMPLE QTY: 0.520 G	
DETECTOR NUMBER :76222 AVERAGE %EFFICIENCY :24.6765 % YIELD : 51.132		COUNT DATE: 6-OCT-2009 23:22:42 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25858 dpm RESULTS : 2.68884 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B152.CNF;353 BKG DATE : 4-OCT-2009 EFF FILE : W152.CNF;97 CAL DATE : 15-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	245.000	240.332	4.000	2.0000	100.0000	1.65E+00	3.22E-01	8.45E-02	3.19E-02	2.12E-01
U232	5302.100	668.000	663.000	5.000	2.2361	100.0000	4.56E+00	7.54E-01	9.21E-02	3.57E-02	3.49E-01
U-235	4391.000	6.000	4.000	2.000	1.4142	80.90000	3.39E-02	4.73E-02	8.13E-02	2.79E-02	4.70E-02
U-238	4184.730	167.000	167.000	0.000	0.0000	100.0000	1.15E+00	2.42E-01	2.06E-02	0.00E+00	1.74E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



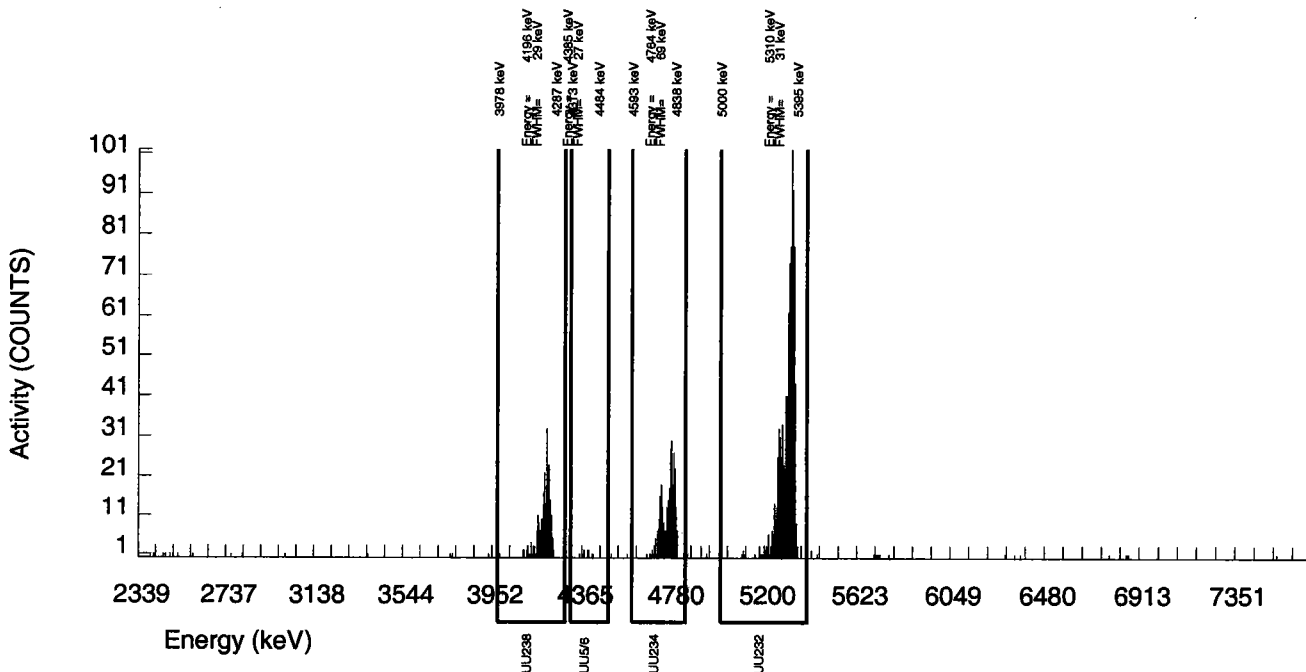
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817011_UU SAMPLE QTY: 0.520 G	
DETECTOR NUMBER :76223 AVERAGE %EFFICIENCY :25.3061 % YIELD : 66.255		COUNT DATE: 6-OCT-2009 23:22:44 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 3.48406 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B153.CNF;348 BKG DATE : 4-OCT-2009 EFF FILE : W153.CNF;100 CAL DATE : 15-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	295.000	292.112	2.000	1.4142	100.0000	1.51E+00	2.76E-01	4.95E-02	1.70E-02	1.74E-01
U232	5302.100	900.000	881.000	19.000	4.3589	100.0000	4.56E+00	7.16E-01	1.20E-01	5.24E-02	3.07E-01
U-235	4391.000	12.000	11.000	1.000	1.0000	80.90000	7.02E-02	4.62E-02	4.89E-02	1.49E-02	4.51E-02
U-238	4184.730	244.000	241.000	3.000	1.7321	100.0000	1.25E+00	2.38E-01	5.71E-02	2.08E-02	1.59E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



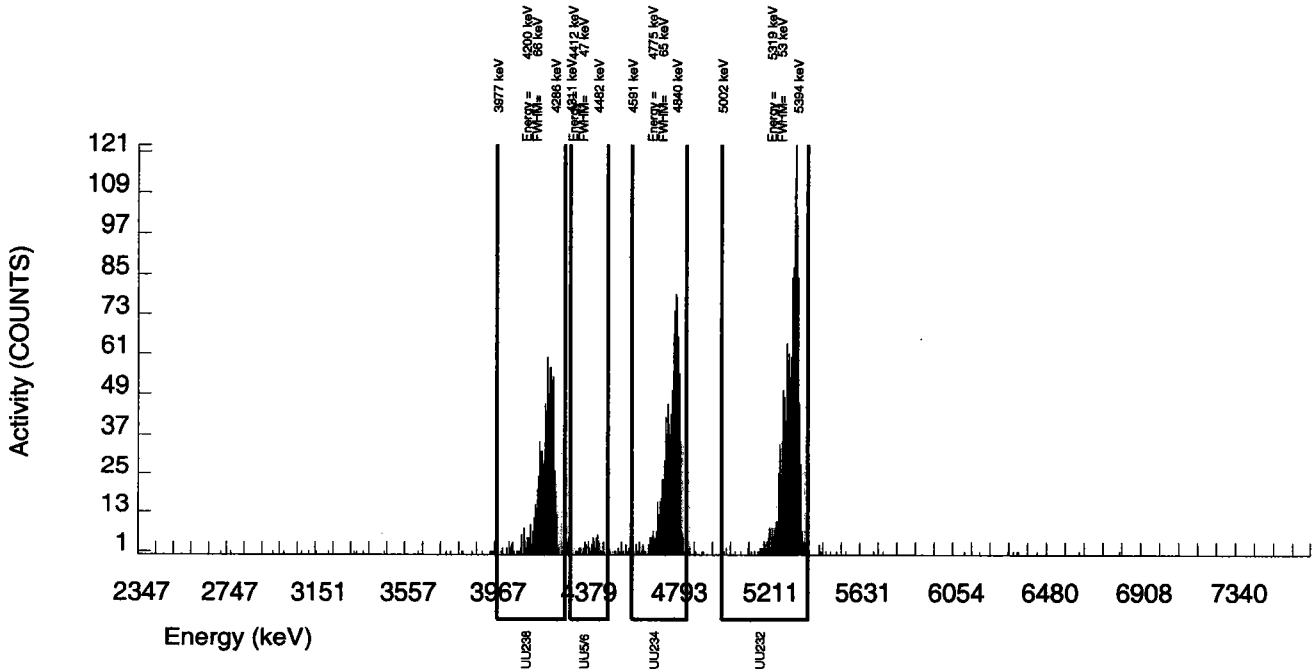
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817012_UU SAMPLE QTY: 0.501 G	
DETECTOR NUMBER :76228 AVERAGE %EFFICIENCY :24.8338 % YIELD : 100.533		COUNT DATE: 2-OCT-2009 20:25:14 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.028E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.028E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 5.28663 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B130.CNF;402 BKG DATE : 28-SEP-2009 EFF FILE : W130.CNF;121 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	952.000	947.678	3.000	1.7321	100.0000	3.41E+00	5.14E-01	3.98E-02	1.45E-02	2.18E-01
U232	5302.100	1319.000	1312.000	7.000	2.6458	100.0000	4.73E+00	6.94E-01	5.52E-02	2.22E-02	2.57E-01
U-235	4391.000	53.000	52.000	1.000	1.0000	80.90000	2.31E-01	7.15E-02	3.41E-02	1.04E-02	6.41E-02
U-238	4184.730	798.000	797.000	1.000	1.0000	100.0000	2.87E+00	4.39E-01	2.76E-02	8.38E-03	2.00E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



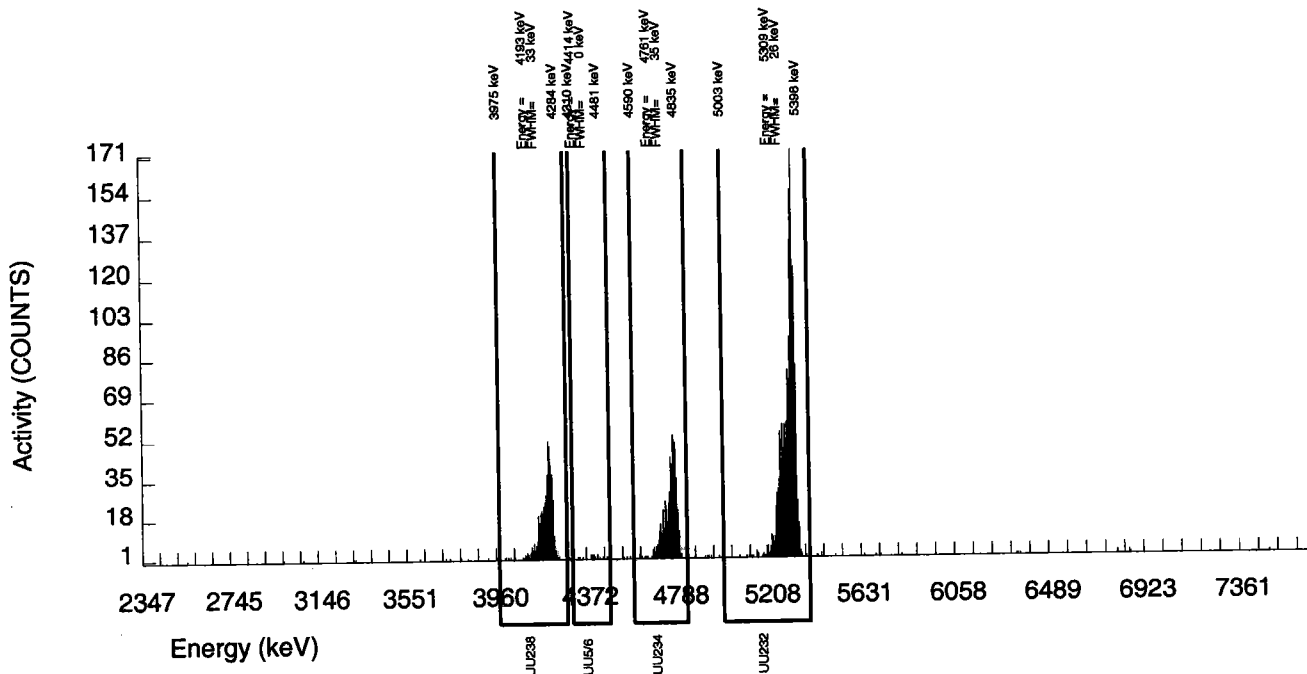
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 8-SEP-2009 00:00:00.		SAMPLE ID : S0236817013_UU SAMPLE QTY: 0.510 G	
DETECTOR NUMBER :76224 AVERAGE %EFFICIENCY :25.6606 % YIELD : 111.619		COUNT DATE: 6-OCT-2009 23:22:47 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.939E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.939E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25859 dpm RESULTS : 5.86956 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B154.CNF;350 BKG DATE : 4-OCT-2009 EFF FILE : W154.CNF;98 CAL DATE : 15-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	541.000	533.483	6.000	2.4495	100.0000	1.65E+00	2.63E-01	4.44E-02	1.76E-02	1.41E-01
U232	5302.100	1508.000	1505.000	3.000	1.7321	100.0000	4.64E+00	6.69E-01	3.41E-02	1.24E-02	2.35E-01
U-235	4391.000	21.000	21.000	0.000	0.0000	80.90000	8.00E-02	3.59E-02	1.14E-02	0.00E+00	3.42E-02
U-238	4184.730	481.000	479.000	2.000	1.4142	100.0000	1.48E+00	2.39E-01	2.95E-02	1.01E-02	1.33E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



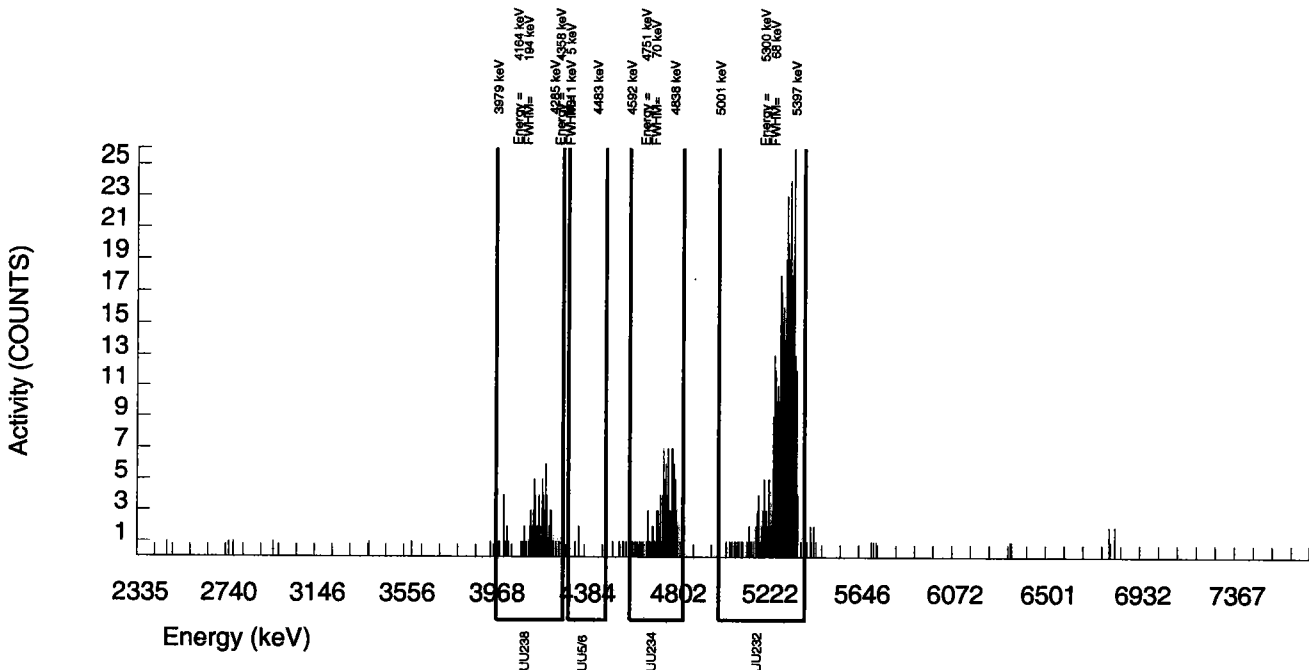
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 9-SEP-2009 00:00:00.		SAMPLE ID : S0236817015_UU SAMPLE QTY: 0.503 G	
DETECTOR NUMBER :67579 AVERAGE %EFFICIENCY :25.0258 % YIELD : 29.275		COUNT DATE: 2-OCT-2009 20:25:19 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.008E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.008E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25845 dpm RESULTS : 1.53939 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B132.CNF;394 BKG DATE : 28-SEP-2009 EFF FILE : W132.CNF;121 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	106.000	99.612	6.000	2.4495	100.0000	1.22E+00	3.21E-01	1.76E-01	6.97E-02	2.53E-01
U232	5302.100	398.000	385.000	13.000	3.6056	100.0000	4.71E+00	9.05E-01	2.42E-01	1.03E-01	4.86E-01
U-235	4391.000	3.000	2.000	1.000	1.0000	80.90000	3.02E-02	5.94E-02	1.16E-01	3.52E-02	5.92E-02
U-238	4184.730	82.000	79.000	3.000	1.7321	100.0000	9.66E-01	2.71E-01	1.35E-01	4.93E-02	2.21E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



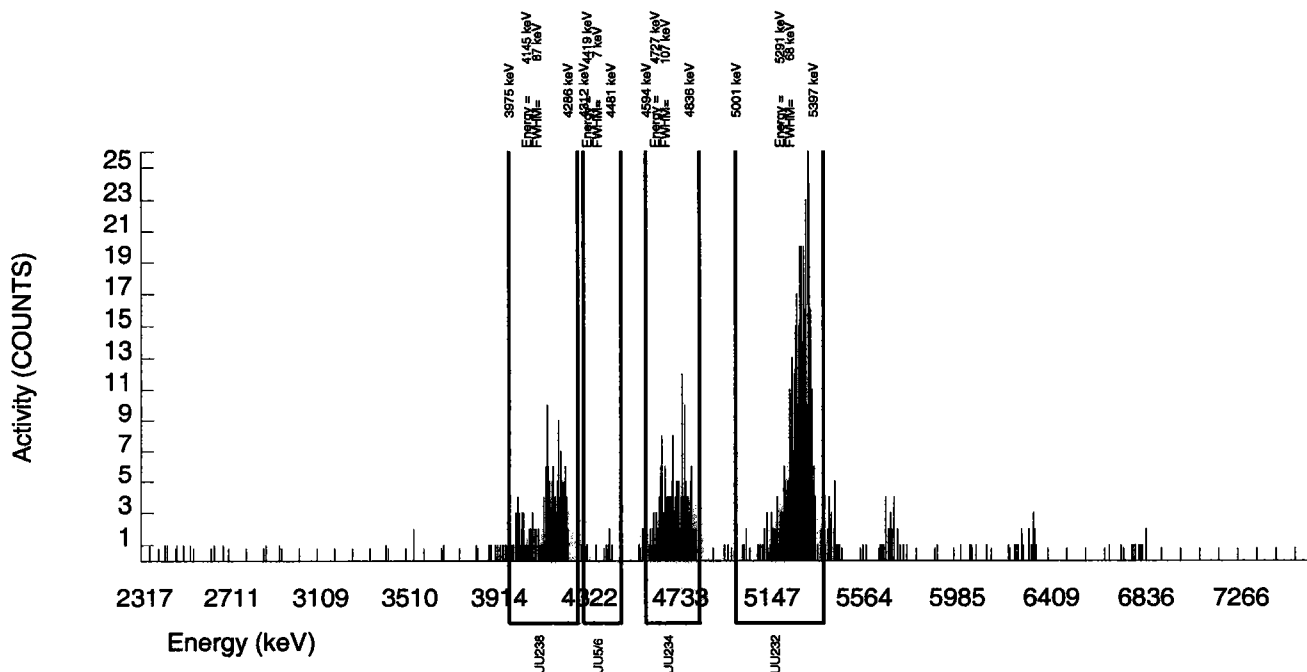
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 9-SEP-2009 00:00:00.		SAMPLE ID : S0236817016_UU SAMPLE QTY: 0.523 G	
DETECTOR NUMBER :76229 AVERAGE %EFFICIENCY :24.3808 % YIELD : 29.893		COUNT DATE: 2-OCT-2009 20:25:21 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.816E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.816E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25845 dpm RESULTS : 1.57191 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B133.CNF;386 BKG DATE : 27-SEP-2009 EFF FILE : W133.CNF;113 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	166.000	162.614	3.000	1.7321	100.0000	1.92E+00	4.32E-01	1.31E-01	4.76E-02	3.01E-01
U232	5302.100	389.000	383.000	6.000	2.4495	100.0000	4.53E+00	8.63E-01	1.70E-01	6.74E-02	4.61E-01
U-235	4391.000	8.000	8.000	0.000	0.0000	80.90000	1.17E-01	8.31E-02	4.38E-02	0.00E+00	8.10E-02
U-238	4184.730	160.000	158.000	2.000	1.4142	100.0000	1.87E+00	4.21E-01	1.13E-01	3.89E-02	2.95E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



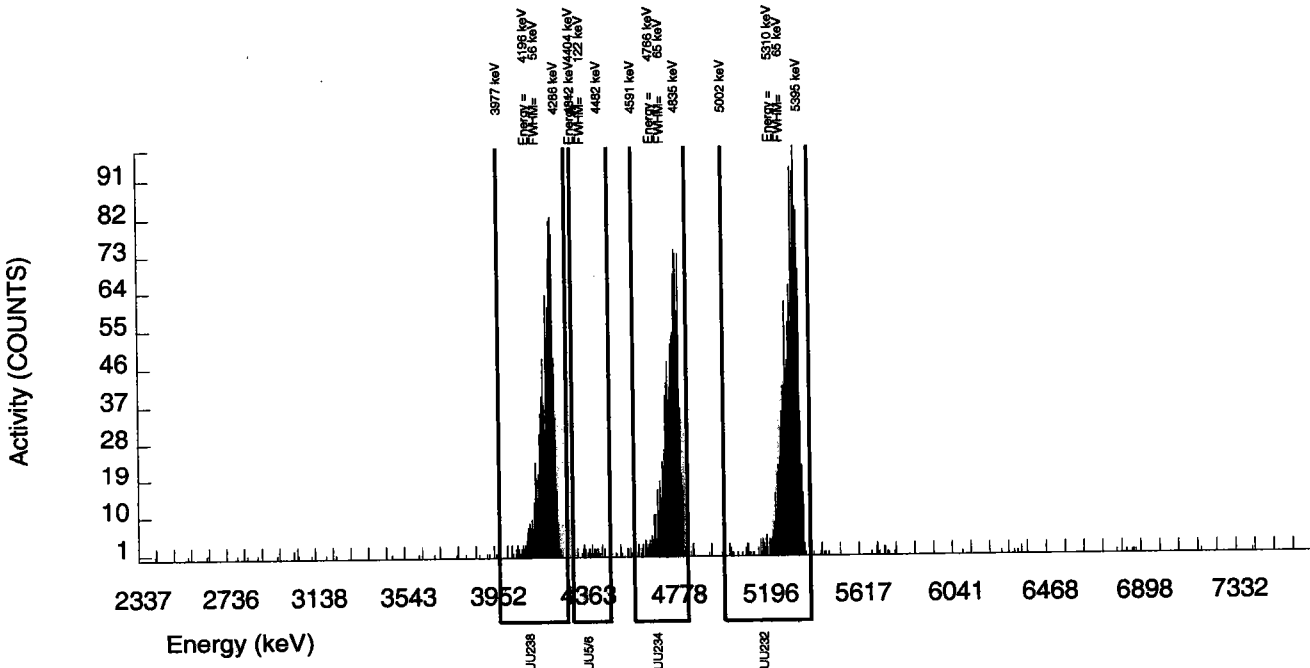
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 9-SEP-2009 00:00:00.		SAMPLE ID : S0236817017_UU SAMPLE QTY: 0.521 G	
DETECTOR NUMBER :76230 AVERAGE %EFFICIENCY :24.4453 % YIELD : 100.185		COUNT DATE: 2-OCT-2009 20:25:24 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.835E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.835E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25845 dpm RESULTS : 5.26817 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B134.CNF;385 BKG DATE : 27-SEP-2009 EFF FILE : W134.CNF;117 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	979.000	957.703	20.000	4.4721	100.0000	3.38E+00	5.11E-01	8.40E-02	3.67E-02	2.19E-01
U232	5302.100	1303.000	1287.000	16.000	4.0000	100.0000	4.55E+00	6.70E-01	7.63E-02	3.29E-02	2.51E-01
U-235	4391.000	32.000	26.000	6.000	2.4495	80.90000	1.13E-01	5.50E-02	6.28E-02	2.49E-02	5.27E-02
U-238	4184.730	979.000	970.000	9.000	3.0000	100.0000	3.42E+00	5.16E-01	5.99E-02	2.46E-02	2.17E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



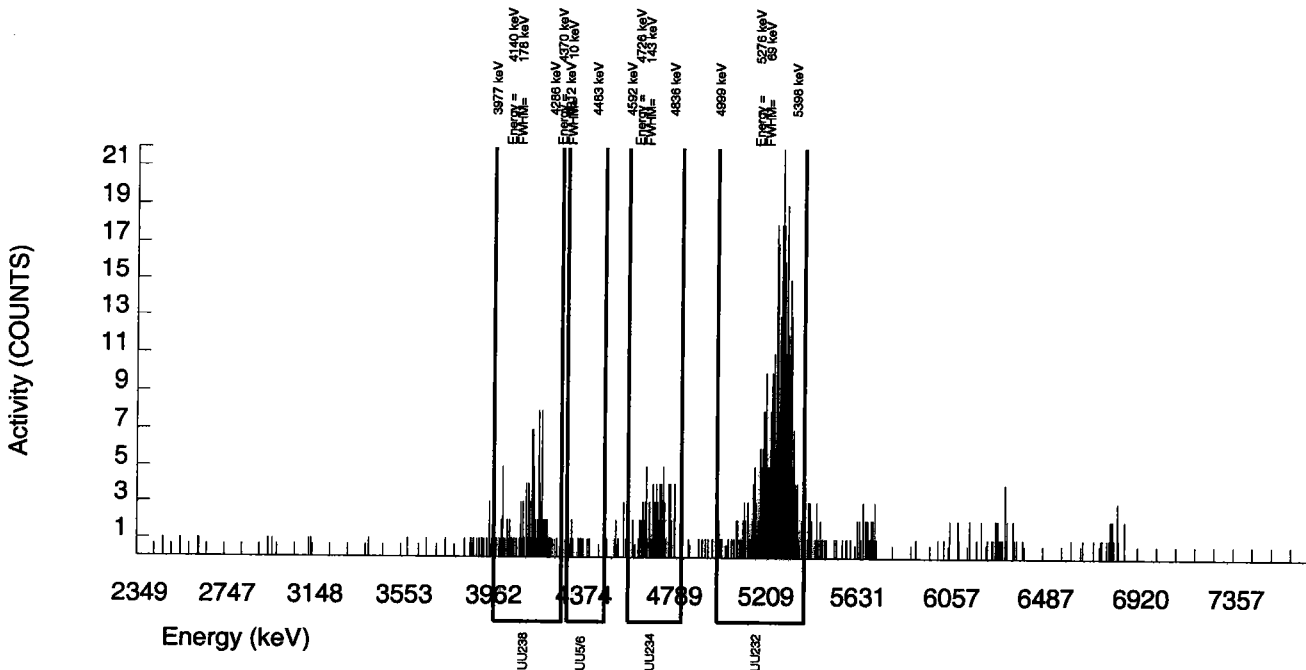
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 9-SEP-2009 00:00:00.		SAMPLE ID : S0236817018_UU SAMPLE QTY: 0.511 G	
DETECTOR NUMBER :64270 AVERAGE %EFFICIENCY :25.2651 % YIELD : 28.470		COUNT DATE: 2-OCT-2009 20:25:26 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.929E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.929E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25845 dpm RESULTS : 1.49709 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B135.CNF;397 BKG DATE : 27-SEP-2009 EFF FILE : W135.CNF;128 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	78.000	72.619	5.000	2.2361	100.0000	8.90E-01	2.62E-01	1.64E-01	6.38E-02	2.18E-01
U232	5302.100	387.000	378.000	9.000	3.0000	100.0000	4.64E+00	8.90E-01	2.08E-01	8.56E-02	4.78E-01
U-235	4391.000	10.000	9.000	1.000	1.0000	80.90000	1.36E-01	1.01E-01	1.16E-01	3.52E-02	9.85E-02
U-238	4184.730	105.000	103.000	2.000	1.4142	100.0000	1.26E+00	3.22E-01	1.17E-01	4.03E-02	2.48E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



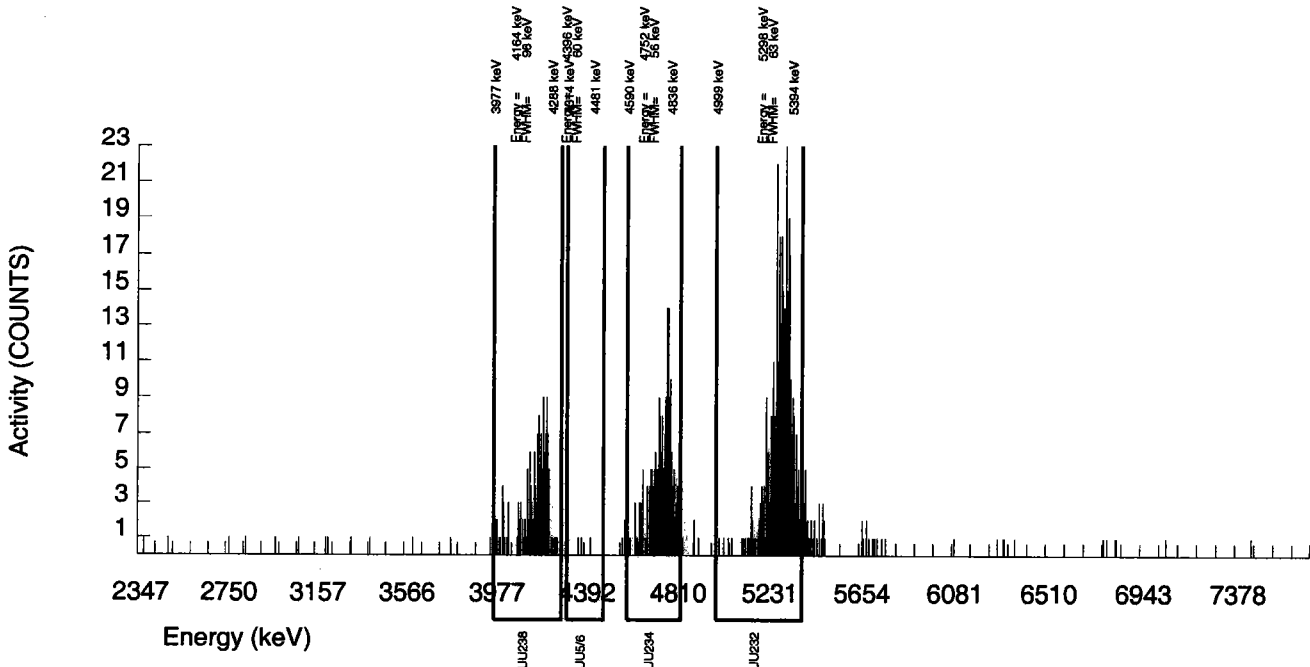
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 9-SEP-2009 00:00:00.		SAMPLE ID : S0236817019_UU SAMPLE QTY: 0.524 G	
DETECTOR NUMBER :68549 AVERAGE %EFFICIENCY :24.8579 % YIELD : 25.645		COUNT DATE: 2-OCT-2009 20:25:28 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.807E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.807E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25845 dpm RESULTS : 1.34852 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B136.CNF;396 BKG DATE : 27-SEP-2009 EFF FILE : W136.CNF;129 CAL DATE : 17-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	196.000	188.662	7.000	2.6458	100.0000	2.54E+00	5.73E-01	2.06E-01	8.30E-02	3.76E-01
U232	5302.100	360.000	335.000	25.000	5.0000	100.0000	4.52E+00	9.26E-01	3.54E-01	1.57E-01	5.19E-01
U-235	4391.000	3.000	-3.000	6.000	2.4495	80.90000	-5.00E-02	9.81E-02	2.40E-01	9.50E-02	9.80E-02
U-238	4184.730	152.000	150.000	2.000	1.4142	100.0000	2.02E+00	4.75E-01	1.29E-01	4.44E-02	3.28E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



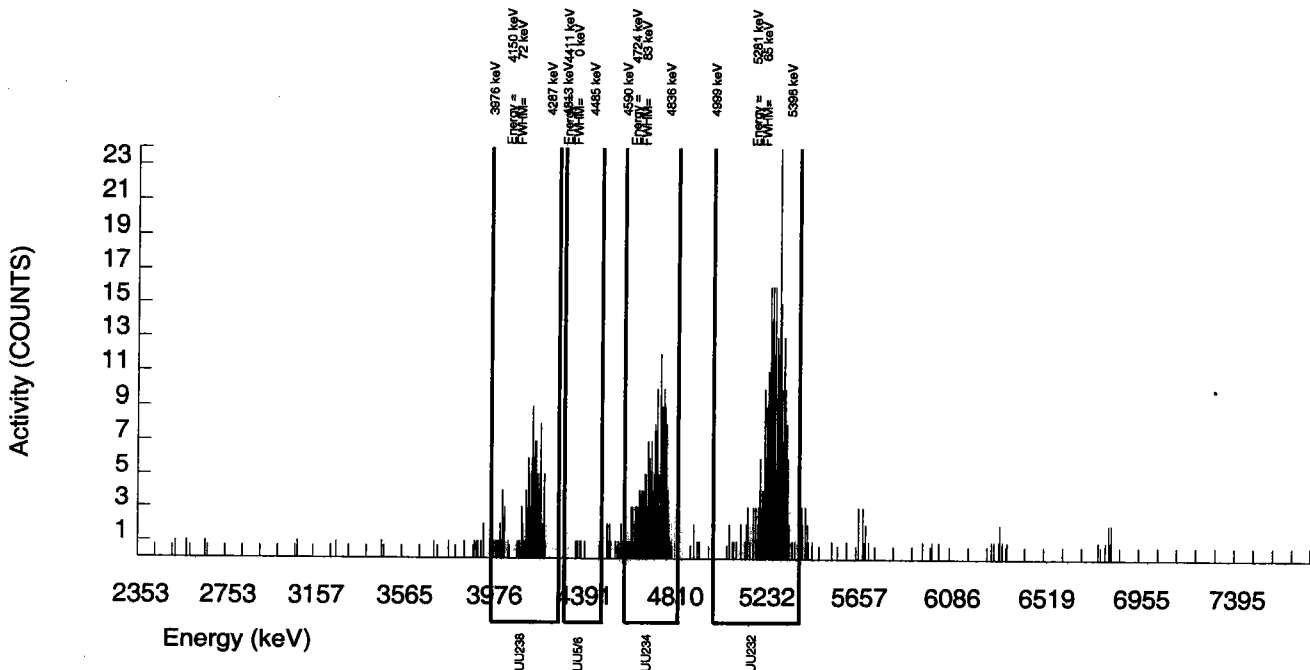
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 9-SEP-2009 00:00:00.		SAMPLE ID : S0236817020_UU SAMPLE QTY: 0.520 G	
DETECTOR NUMBER :79467 AVERAGE %EFFICIENCY :25.0900 % YIELD : 22.146		COUNT DATE: 2-OCT-2009 20:25:30 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.844E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25845 dpm RESULTS : 1.16455 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B137.CNF;351 BKG DATE : 27-SEP-2009 EFF FILE : W137.CNF;102 CAL DATE : 29-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	188.000	185.706	2.000	1.4142	100.0000	2.90E+00	6.47E-01	1.49E-01	5.13E-02	4.21E-01
U232	5302.100	292.000	292.000	0.000	0.0000	100.0000	4.56E+00	9.33E-01	4.68E-02	0.00E+00	5.22E-01
U-235	4391.000	8.000	8.000	0.000	0.0000	80.90000	1.54E-01	1.10E-01	5.78E-02	0.00E+00	1.07E-01
U-238	4184.730	116.000	112.000	4.000	2.0000	100.0000	1.75E+00	4.47E-01	1.92E-01	7.25E-02	3.35E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



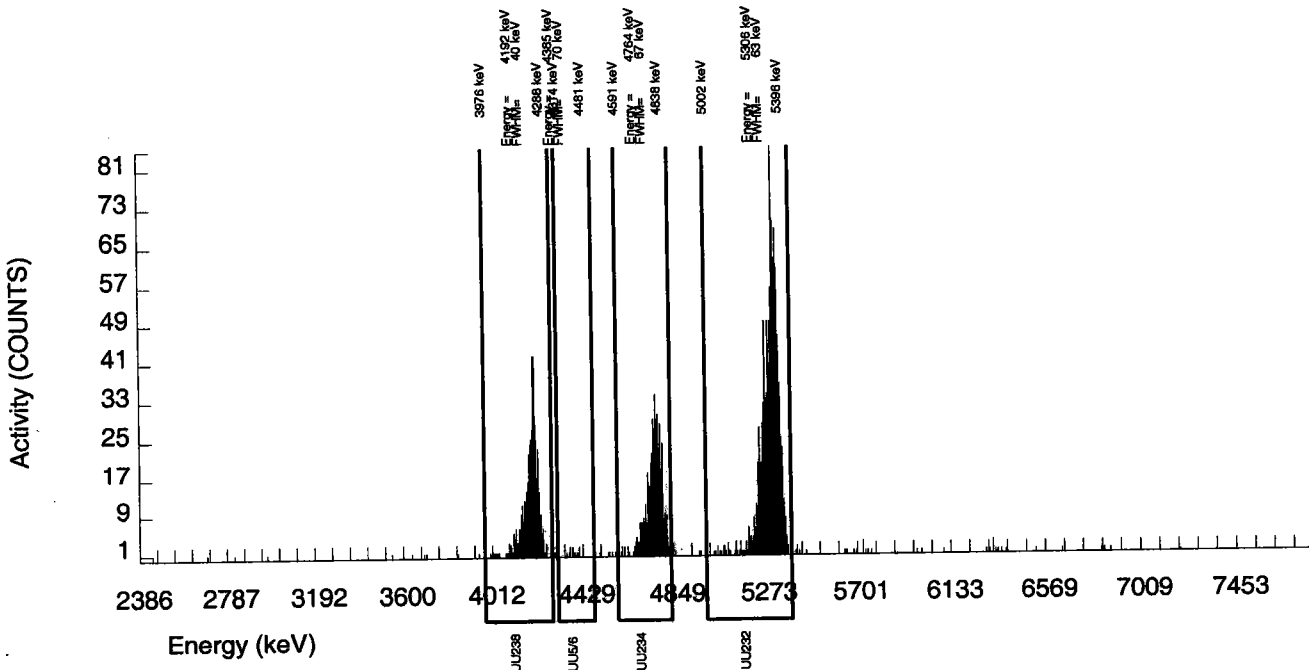
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 10-SEP-2009 00:00:00		SAMPLE ID : S0236817021_UU SAMPLE QTY: 0.507 G	
DETECTOR NUMBER :65877 AVERAGE %EFFICIENCY :25.6005 % YIELD : 77.156		COUNT DATE: 2-OCT-2009 20:25:33 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.968E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.968E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25831 dpm RESULTS : 4.05709 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B138.CNF;356 BKG DATE : 27-SEP-2009 EFF FILE : W138.CNF;94 CAL DATE : 16-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	440.000	431.954	7.000	2.6458	100.0000	1.94E+00	3.28E-01	6.89E-02	2.77E-02	1.86E-01
U232	5302.100	1042.000	1038.000	4.000	2.0000	100.0000	4.67E+00	7.10E-01	5.54E-02	2.09E-02	2.85E-01
U-235	4391.000	16.000	11.000	5.000	2.2361	80.90000	6.12E-02	5.07E-02	7.45E-02	2.89E-02	4.99E-02
U-238	4184.730	418.000	408.000	10.000	3.1623	100.0000	1.84E+00	3.14E-01	7.97E-02	3.31E-02	1.82E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



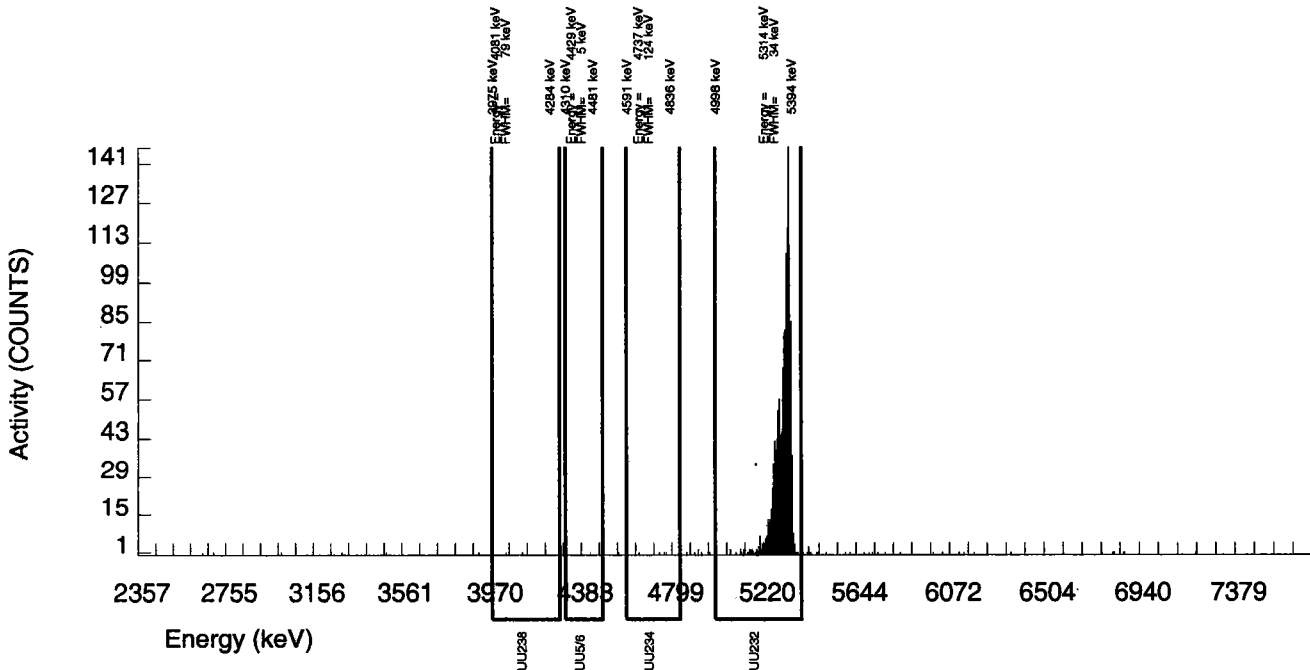
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 29-SEP-2009 00:00:00		SAMPLE ID : S1201932690_UU SAMPLE QTY: 0.526 G	
DETECTOR NUMBER :76231 AVERAGE %EFFICIENCY :24.9287 % YIELD : 102.288		COUNT DATE: 2-OCT-2009 20:25:36 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25567 dpm RESULTS : 5.37592 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B139.CNF;353 BKG DATE : 27-SEP-2009 EFF FILE : W139.CNF;94 CAL DATE : 16-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	4.000	-6.351	9.000	3.0000	100.0000	-2.13E-02	2.25E-02	5.70E-02	2.34E-02	2.25E-02
U232	5302.100	1347.000	1340.000	7.000	2.6458	100.0000	4.50E+00	6.70E-01	5.14E-02	2.07E-02	2.42E-01
U-235	4391.000	1.000	1.000	0.000	0.0000	80.90000	4.15E-03	8.16E-03	1.25E-02	0.00E+00	8.14E-03
U-238	4184.730	2.000	1.000	1.000	1.0000	100.0000	3.36E-03	1.14E-02	2.57E-02	7.81E-03	1.14E-02

NOTE: Corrections made to U-3/4 net area due to tracer impurity



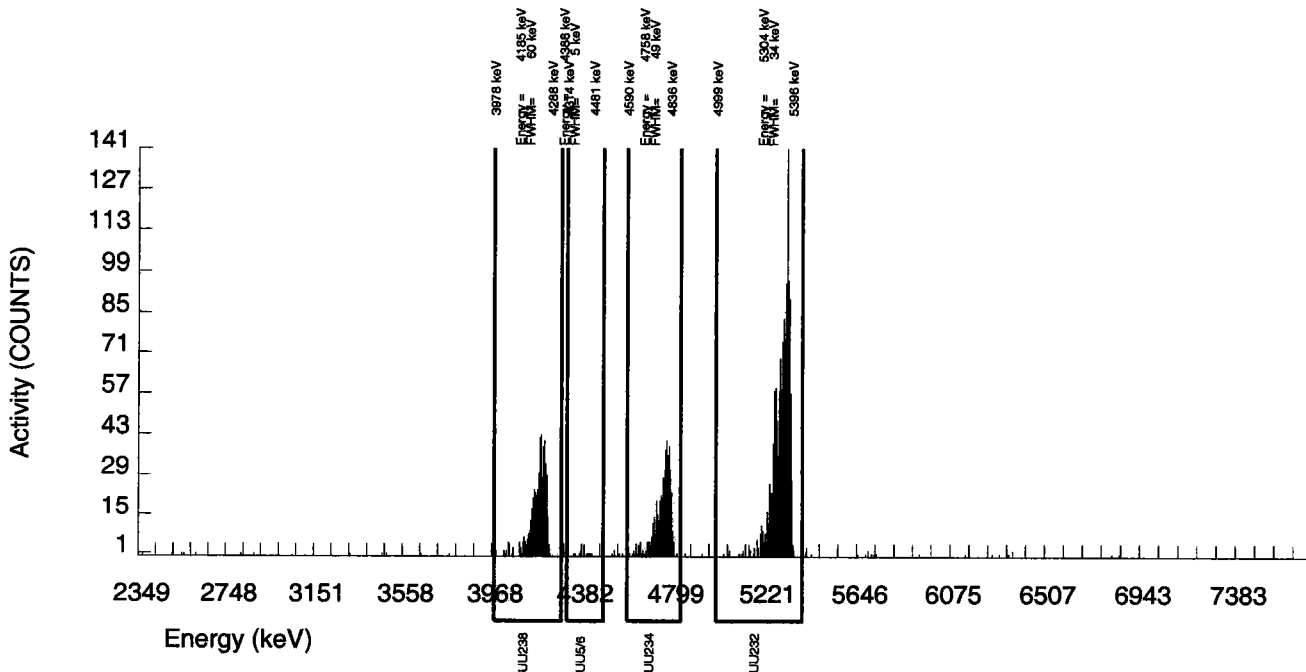
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 10-SEP-2009 00:00:00		SAMPLE ID : S1201932691_UU SAMPLE QTY: 0.503 G	
DETECTOR NUMBER :78771 AVERAGE %EFFICIENCY :25.2649 % YIELD : 100.927		COUNT DATE: 2-OCT-2009 20:25:38 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.008E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 5.008E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25831 dpm RESULTS : 5.30703 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B140.CNF;353 BKG DATE : 27-SEP-2009 EFF FILE : W140.CNF;99 CAL DATE : 16-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	478.000	467.649	9.000	3.0000	100.0000	1.64E+00	2.70E-01	5.96E-02	2.45E-02	1.52E-01
U232	5302.100	1343.000	1340.000	3.000	1.7321	100.0000	4.71E+00	6.89E-01	3.89E-02	1.42E-02	2.53E-01
U-235	4391.000	17.000	13.000	4.000	2.0000	80.90000	5.64E-02	3.97E-02	5.34E-02	2.02E-02	3.90E-02
U-238	4184.730	518.000	514.000	4.000	2.0000	100.0000	1.81E+00	2.92E-01	4.32E-02	1.63E-02	1.57E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



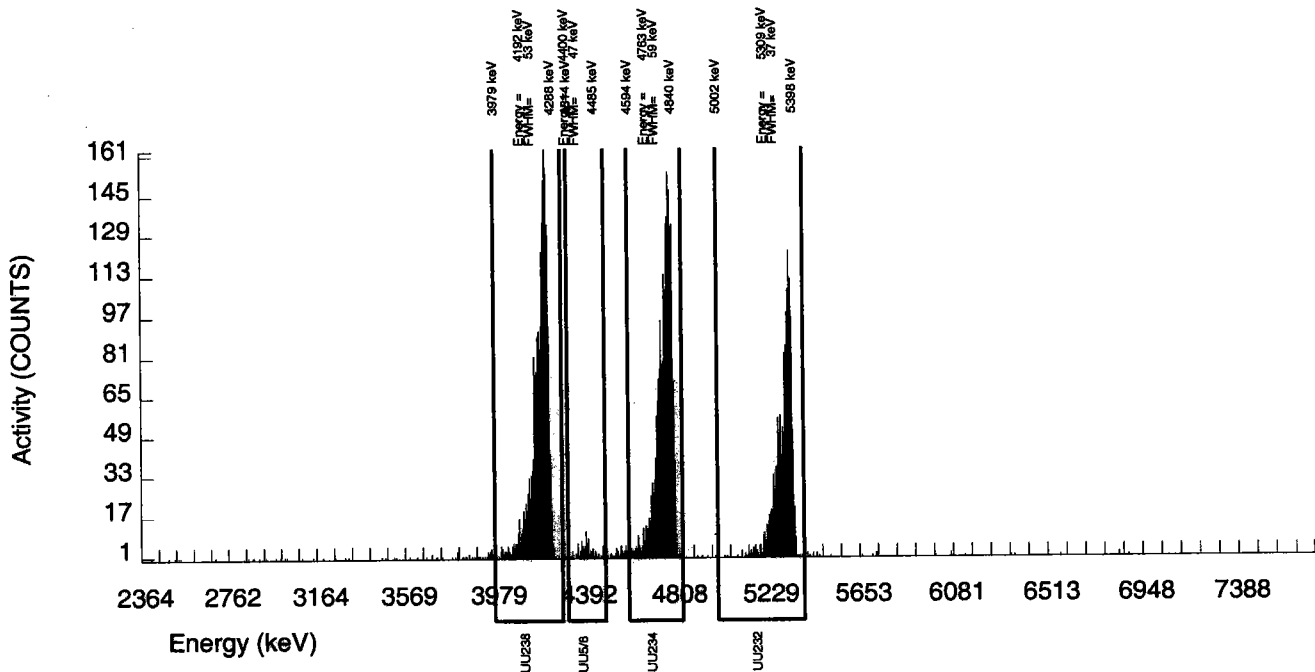
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 10-SEP-2009 00:00:00		SAMPLE ID : S1201932692_UU SAMPLE QTY: 0.526 G	
DETECTOR NUMBER :76232 AVERAGE %EFFICIENCY :25.4745 % YIELD : 103.682		COUNT DATE: 2-OCT-2009 20:25:41 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25831 dpm RESULTS : 5.45190 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B141.CNF;356 BKG DATE : 27-SEP-2009 EFF FILE : W141.CNF;97 CAL DATE : 16-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	1978.000	1970.601	6.000	2.4495	100.0000	6.39E+00	9.29E-01	4.67E-02	1.85E-02	2.83E-01
U232	5302.100	1393.000	1388.000	5.000	2.2361	100.0000	4.50E+00	6.67E-01	4.35E-02	1.69E-02	2.38E-01
U-235	4391.000	89.000	87.000	2.000	1.4142	80.90000	3.49E-01	8.91E-02	3.84E-02	1.32E-02	7.49E-02
U-238	4184.730	1990.000	1985.000	5.000	2.2361	100.0000	6.44E+00	9.35E-01	4.35E-02	1.69E-02	2.84E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



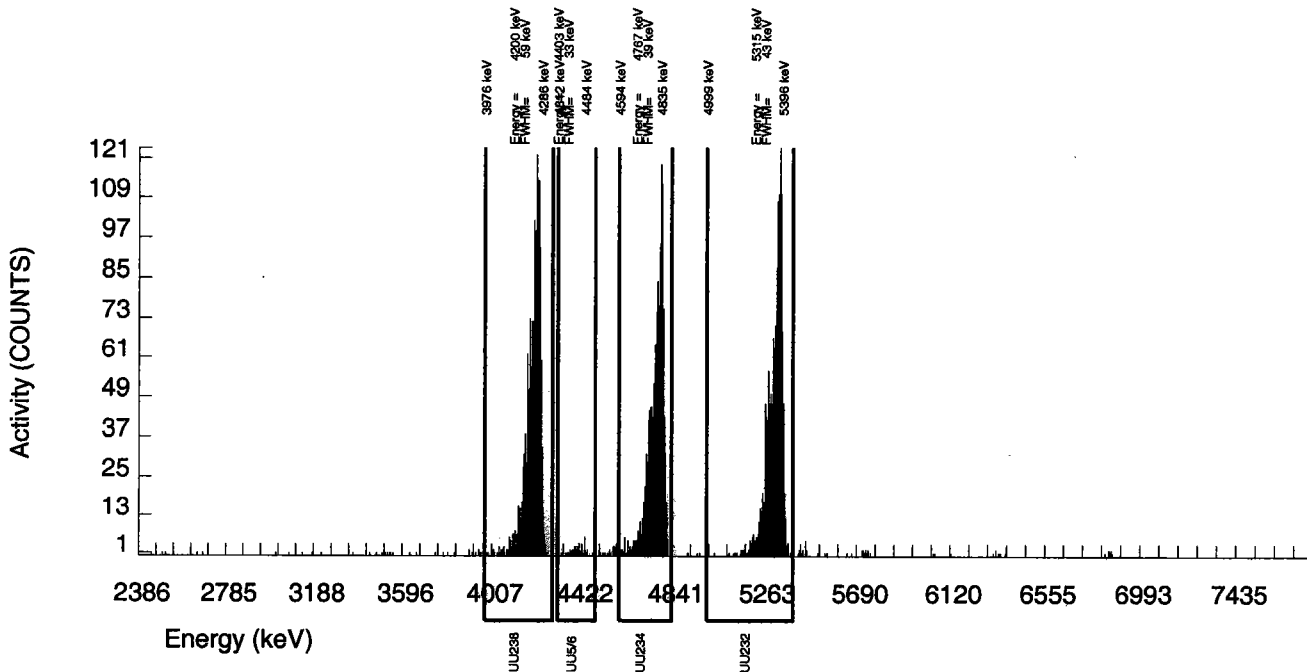
GEL Laboratories LLC
ALPHA SPECTROSCOPY REPORT

BATCH NUMBER: 906320 SAMPLE DATE : 29-SEP-2009 00:00:00		SAMPLE ID : S1201932693_UU SAMPLE QTY: 0.526 G	
DETECTOR NUMBER :64261 AVERAGE %EFFICIENCY :26.0384 % YIELD : 99.098		COUNT DATE: 2-OCT-2009 20:25:43 ELAPSED LIVE TIME(SEC): 60000.00 ANALYST :MXE1	
MS/MSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	LCS/LCSD ID : 1163-G ISOTOPE : U-238 PCI/G : 4.789E+00	TRACER ID : 1283-E ISOTOPE : U232 NOMINAL : 5.25568 dpm RESULTS : 5.20827 dpm	LIB FILE : ENV_ALPHA_UU.N BKG FILE : B142.CNF;350 BKG DATE : 27-SEP-2009 EFF FILE : W142.CNF;101 CAL DATE : 16-SEP-2009

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	GROSS AREA	NET AREA	BKG AREA	BKG Sg	%ABUN	ACTIVITY pCi/G	TPU 1.96-SIGMA	MDA pCi/G	Lc pCi/G	UNC pCi/G
U-3/4	4763.020	1266.000	1249.633	15.000	3.8730	100.0000	4.15E+00	6.10E-01	6.98E-02	2.99E-02	2.33E-01
U232	5302.100	1372.000	1356.000	16.000	4.0000	100.0000	4.50E+00	6.59E-01	7.17E-02	3.09E-02	2.42E-01
U-235	4391.000	45.000	43.000	2.000	1.4142	80.90000	1.76E-01	6.01E-02	3.93E-02	1.35E-02	5.51E-02
U-238	4184.730	1409.000	1406.000	3.000	1.7321	100.0000	4.67E+00	6.80E-01	3.67E-02	1.34E-02	2.44E-01

NOTE: Corrections made to U-3/4 net area due to tracer impurity



RADIUM 228

Radiochemistry Batch Checklist, Rev 9

Batch# 902602 Product: RA-228 Date: 9.23.09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			N/A
Samples have been blank corrected (if required)			N/A
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	✓		
Instrument source check is within limits.	✓		
Instrument bkg check is within limits.	✓		
Method RDL/ LLD has been met.	✓		
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%.			N/A
Or meets the client's required RER acceptance criteria.			
Tracer yield is 15-125% . Carrier yield 25-125%.	✓		
Or meets the client's contract acceptance criteria.	✓		
Method blank is less than the RDL/ LLD.	✓		
(If rad samples, < 5% of lowest activity)	✓		
Sample was run within hold time.	✓		
Sample was correctly preserved if required.	✓		
Smears Taken for Radioactive batches.			N/A
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms.	✓		
All line outs initialed and dated.	✓		
No transcription errors are apparent.	✓		
Aux data is correct.			N/A
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly stated.	✓		
QC data entered into QC database and batch is in REVW	✓		
Hit notification complete (if necessary)			N/A
Batch entered into Case Narrative.	✓		
Batch non-conformances completed, if applicable.			N/A
Batch non-conformances second reviewed and disposition verified to be completed.			N/A
Alliquot Correction completed if required.			N/A
Review sample historical results if available (If REMP, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By: Rhyan Brantley

Secondary Review Performed By: [Signature]

KERR
9.30

Radium-228 Que Sheet

Batch #: 902602 Analyst: MXS2 First Client Due Date: 09/30/2009 Internal Due Date: 09/19/2009
 Spike Isotope: Radium-228 Spike Code: _____ Expiration Date: _____ Vol: _____
 LCS Isotope: Radium-228 LCS Code: 0503-6 Expiration Date: 9-11-10 Vol: 0.1 mL
 Tracer Isotope: Barium-133 Tracer Code: 0112-3 Expiration Date: 2-17-10 Vol: 0.1 mL
 Prep Date: 9-15-09 Initials: H5 Pipet ID: 2164953 Balance ID: 17955160
 Ac-228 Ingrow: 9-16-09 / 1105
 Ac-228 Separation Date/Time: 9-18-09 / 16:40
 Witness: MCB 9-15-09

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collect Date & Time	Pos. #	Vol (mL)	Det #	Ba Yield (%)	Gamma Det. #
236077013-1	EB082709-SO1	SAMPLE		3 pCi/L	WATER	KERR003	27-AUG-09 10:00 AM	1	200	SA	72.15	
236077019-1	EB083109-SO1	SAMPLE		3 pCi/L	WATER	KERR003	31-AUG-09 10:00 AM	2	200	SC	84.83	
236077021-1	EB090109-SO1	SAMPLE		3 pCi/L	WATER	KERR003	01-SEP-09 12:50 PM	3	200	SD	82.09	
236238008-1	FB082809-SO	SAMPLE		3 pCi/L	WATER	KERR003	28-AUG-09 10:01 AM	4	200	SA	72.28	
236534011-1	EB090209-SO1	SAMPLE		3 pCi/L	WATER	KERR003	02-SEP-09 01:33 PM	5	200	SA	72.59	
236699016-1	EB090309-SO2	SAMPLE		3 pCi/L	WATER	KERR003	03-SEP-09 01:50 PM	6	200	7A	74.49	
236817014-1	EB090809-SO1	SAMPLE		3 pCi/L	WATER	KERR003	08-SEP-09 12:02 PM	7	200	7B	77.03	
236934020-1	Rinsate-1	SAMPLE		1 pCi/L	WATER	BRCM001	09-SEP-09 02:00 PM	8	700	7C	47.96	
1201923559-1	MB for batch 902602	MB		1 pCi/L	WATER	QC ACCOUNT	27-AUG-09 10:00 AM	9	700	7D	81.49	
1201923560-1	LCS for batch 902602	LCS		1 pCi/L	WATER	QC ACCOUNT	27-AUG-09 10:00 AM	10	700	8A	81.55	
1201923561-1	LCS for batch 902602	LCS		1 pCi/L	WATER	QC ACCOUNT	27-AUG-09 10:00 AM	11	700	8B	82.84	

09/22/09
DAIRY ✓

AD 9/22/09
Data Reviewed By: _____

N/A

Comments: _____

Instrument Used: (Circle One) PIC S/N: 10751-4

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.2.4

Batch : 902602
 Analyst : MXS2
 Prep Date : 9/15/2009

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dipm/ml): N/A
 Spike Volume Added: N/A

Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml
 Pipet, 1 ml Stdev : +/- 0.005480 ml

LCS S/N : 0503-B
 LCS Exp Date : 9/11/2010
 LCS Activity (dipm/ml): 177.90
 LCS Volume Added: 0.10

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 1 pCi/L

Tracer S/N : 0112-J
 Tracer Exp Date : 2/17/2010
 Tracer Volume Added: 0.10

Half-life of Ra-228 : 5.75 years
 Half-life of Ac-228 : 6.13 hours
 Batch counted on : PIC
 BKG Count time : 500 min

Ra-228 Abundance : 1
 Ra-228 Method Uncertainty : 0.1268

Calibration Date : 7/2/2009
 Calibration Due Date : 7/31/2010
 Geometry: CeF on 25mm Filter

Pos.	Sample Characteristics			Sample			Tracer Calculations			Tracer Samp.		
	Sample ID	Sample Aliquot L	Sample Aliquot L	Sample Aliquot L	Sample StDev.	Sample Date/Time	Tracer Concentration (Ba-133 Ref.) (cpm)	Tracer Count	Tracer Ref. Count	Tracer Concentration (Ba-133 Samp.) (cpm)	Tracer Count	Tracer Aliquot (mL)
1	236077013.1	0.2000	1.6007E-05	1.6007E-05	8/27/2009 10:00	311.7	3.47%	3.47%	224.9	4.17%	0.1	0.000701
2	236077019.1	0.2000	1.6007E-05	1.6007E-05	8/31/2009 10:00	311.7	3.47%	3.47%	264.4	3.81%	0.1	0.000701
3	236077021.1	0.2000	1.6007E-05	1.6007E-05	9/1/2009 12:50	311.7	3.47%	3.47%	251.5	3.92%	0.1	0.000701
4	236238008.1	0.2000	1.6007E-05	1.6007E-05	8/28/2009 10:01	311.7	3.47%	3.47%	225.3	4.17%	0.1	0.000701
5	236534011.1	0.2000	1.6007E-05	1.6007E-05	9/2/2009 13:33	311.7	3.47%	3.47%	235.6	4.06%	0.1	0.000701
6	236689016.1	0.2000	1.6007E-05	1.6007E-05	9/3/2009 13:50	311.7	3.47%	3.47%	232.2	4.10%	0.1	0.000701
7	236817014.1	0.2000	1.6007E-05	1.6007E-05	9/8/2009 12:02	311.7	3.47%	3.47%	240.1	4.02%	0.1	0.000701
8	236934020.1	0.7000	2.0772E-05	2.0772E-05	9/9/2009 14:00	311.7	3.47%	3.47%	149.5	5.31%	0.1	0.000701
9	1201923559.1	0.7000	2.0772E-05	2.0772E-05	9/15/2009 0:00	311.7	3.47%	3.47%	254.0	3.89%	0.1	0.000701
10	1201923560.1	0.7000	2.0772E-05	2.0772E-05	9/15/2009 0:00	311.7	3.47%	3.47%	254.2	3.89%	0.1	0.000701
11	1201923561.1	0.7000	2.0772E-05	2.0772E-05	9/15/2009 0:00	311.7	3.47%	3.47%	258.2	3.86%	0.1	0.000701

Counting		Gross Counts		Beta		Detector Efficiency (cpm/dpm)		Detector Efficiency Error (cpm/dpm)		Weekly Bkg		Separation		Count		Ra-228 Decay		Ac-228 Decay		Ac-228 Count Correction		Calculated Sample Recovery %		Sample Recovery Error %	
Pos.	Detector ID	Time (min.)	Alpha	Beta	Beta cpm	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	cpm	Count Time (min.)	Date/Time	Date/Time	Start Date/Time	Decay	Decay	Count	Correction	%	Sample Recovery %	Error %						
1	5A	60	5	35	0.583	0.6258	0.00816	0.564	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.993	0.789	1.058	72.15%	72.15%	2.89%							
2	5C	60	14	85	1.417	0.6368	0.00816	0.948	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.994	0.789	1.058	84.83%	84.83%	2.76%							
3	5D	60	14	110	1.833	0.6237	0.00816	1.204	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.994	0.789	1.058	80.69%	80.69%	2.80%							
4	6A	60	9	112	1.867	0.6221	0.00816	1.300	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.993	0.789	1.058	72.28%	72.28%	2.89%							
5	6B	60	15	71	1.183	0.6163	0.00816	0.818	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.995	0.789	1.058	75.59%	75.59%	2.85%							
6	7A	60	8	45	0.750	0.6180	0.00816	0.368	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.995	0.788	1.058	74.49%	74.49%	2.86%							
7	7B	60	6	51	0.850	0.6280	0.00816	0.468	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.997	0.788	1.058	77.03%	77.03%	2.83%							
8	7C	60	7	45	0.750	0.6178	0.00816	0.256	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.997	0.788	1.058	47.96%	47.96%	3.32%							
9	7D	60	6	43	0.717	0.6257	0.00816	0.386	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.999	0.788	1.058	81.49%	81.49%	2.79%							
10	8A	60	17	453	7.550	0.6247	0.00816	0.776	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.999	0.788	1.058	81.55%	81.55%	2.79%							
11	8B	60	6	523	8.717	0.6332	0.00816	1.904	500	9/18/2009 16:40	9/18/2009 16:40	9/18/2009 18:46	0.999	0.788	1.058	82.84%	82.84%	2.78%							

- Notes:
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level		Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA Counting Uncertainty	2 SIGMA Total Prop. Uncertainty	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	pCi/L	pCi/L															
1	1.6114	1.1376	3	2.6123	0.1303	5.3879	0.0193	0.1042	1.3761	1.3765	SAMPLE						
2	1.7439	1.2312	3	2.7438	2.6370	0.3420	0.4687	0.1597	1.7613	1.8851	SAMPLE						
3	2.1087	1.4887	3	3.2793	3.7991	0.2900	0.6293	0.1816	2.1482	2.3566	SAMPLE						
4	2.4559	1.7839	3	3.8061	3.8342	0.3254	0.5667	0.1836	2.4350	2.6245	SAMPLE						
5	1.8772	1.3253	3	2.9766	2.3820	0.4011	0.3653	0.1461	1.8676	1.9641	SAMPLE						
6	1.2738	0.8993	3	2.1284	2.5197	0.3026	0.3820	0.1150	1.4874	1.6205	SAMPLE						
7	1.3649	0.9636	3	2.2406	2.3942	0.3231	0.3820	0.1229	1.5096	1.6286	SAMPLE						
8	0.4707	0.3323	1	0.8107	1.4436	0.2334	0.4940	0.1141	0.6533	0.7516	SAMPLE						
9	0.3353	0.2367	1	0.5582	0.5605	0.3423	0.3307	0.1128	0.3747	0.4010	MB					11.4479	100.4%
10	0.4757	0.3359	1	0.7566	11.4921	0.0602	6.7740	0.3569	1.1868	3.1613	LCS					11.4479	98.1%
11	0.7239	0.5111	1	1.1045	11.2269	0.0636	6.8127	0.3861	1.2471	3.1219	LCS			2.3%			

902602

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine
236077013	5A	60	5	35	9/18/2009 18:46	9/18/2009 19:46	Protean
236077019	5C	60	14	85	9/18/2009 18:46	9/18/2009 19:46	Protean
236077021	5D	60	14	110	9/18/2009 18:46	9/18/2009 19:46	Protean
236238008	6A	60	9	112	9/18/2009 18:46	9/18/2009 19:46	Protean
236534011	6B	60	15	71	9/18/2009 18:46	9/18/2009 19:46	Protean
236699016	7A	60	8	45	9/18/2009 18:46	9/18/2009 19:46	Protean
236817014	7B	60	6	51	9/18/2009 18:46	9/18/2009 19:46	Protean
236934020	7C	60	7	45	9/18/2009 18:46	9/18/2009 19:46	Protean
1201923559	7D	60	6	43	9/18/2009 18:46	9/18/2009 19:46	Protean
1201923560	8A	60	17	453	9/18/2009 18:46	9/18/2009 19:46	Protean
1201923561	8B	60	6	523	9/18/2009 18:46	9/18/2009 19:46	Protean

ASSAY 16-Sep-09 16:45:49

Protocol id 9 228_REC2
Time limit 180
Count limit 50000
Isotope Ba-133
Protocol date 9-Apr-07 10:02:22
Run id. 61

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	87	1	180	1026	311.7	3.47		16:45:56
2	87	2	180	766	224.9	4.17	72.15	16:49:07
3	87	3	180	884	264.4	3.81	84.83	16:52:19
4	87	4	180	846	251.5	3.92	80.69	16:55:30
5	87	5	180	767	225.3	4.17	72.28	16:58:41
6	68	6	180	798	235.6	4.06	75.59	17:02:06
7	68	7	180	788	232.2	4.1	74.49	17:05:17
8	68	8	180	811	240.1	4.02	77.03	17:08:29
9	68	9	180	540	149.5	5.31	47.96	17:11:40
10	68	10	180	853	254	3.89	81.49	17:14:51
11	70	11	180	854	254.2	3.89	81.55	17:18:16
12	70	12	180	866	258.2	3.86	82.84	17:21:28

END OF ASSAY

Radiochemistry Batch Checklist, Rev 9

Batch# 905310 Product: Ra-228 Date: 10/8/09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			N/A
Samples have been blank corrected (if required)			N/A
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	✓		
Instrument source check is within limits.	✓		
Instrument bkg check is within limits.	✓		
Method RDL/ LLD has been met.	✓	✓	NCR 743551
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%. Or meets the client's required RER acceptance criteria.	✓		
Tracer yield is 15-125% . Carrier yield 25-125%. Or meets the client's contract acceptance criteria.	✓		
Method blank is less than the RDL/ LLD. (If rad samples, < 5% of lowest activity)	✓		
Sample was run within hold time.	✓		
Sample was correctly preserved if required.			N/A
Smears Taken for Radioactive batches.			N/A
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms. All line outs initialed and dated. No transcription errors are apparent.	✓		
Aux data is correct.			N/A
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly stated.	✓		
QC data entered into QC database and batch is in REVW	✓		
Hit notification complete (if necessary)			N/A
Batch entered into Case Narrative.	✓		
Batch non-conformances completed, if applicable.	✓		NCR 743551
Batch non-conformances second reviewed and disposition verified to be completed.	✓		NCR 743551
Aliquot Correction completed if required.			N/A
Review sample historical results if available (If REMF, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By:  10/8/09

Secondary Review Performed By:  10/8/09

KERR
10/9

Radium-228 Que Sheet

General Engineering Laboratories, Radiochemistry Division
09/23/2009

Batch #: 905310 Analyst: MXS2 First Client Due Date: 10/09/2009 Internal Due Date: 09/28/2009
 Spike Isotope: Radium-228 Spike Code: 0503-6 Expiration Date: 9-11-10 Vol: 0.1 mL Ac-228 Ingrow: 10-2-09 / 1015
 LCS Isotope: Radium-228 LCS Code: 0503-6 Expiration Date: 9-11-10 Vol: 0.1 mL
 Tracer Isotope: Barium-133 Tracer Code: 0112-J Expiration Date: 2-17-10 Vol: 0.1 mL Ac-228 Separation Date/Time: 10-5-09 / 1150
 Prep Date: 9-29-09 Initials: MS Pipet ID: 2766953 Balance ID: 1755460 MS 9-23-09 Witness: SF 9-29-09

Pos. # Vol (mL) Ba Yield (%) Gamma Det. #

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collect Date & Time	Pos. #	Vol (mL)	Ba Yield (%)	Gamma Det. #
236817001-1	SA50-12B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 10:34 AM	1	1.005	4L	75.72
236817002-1	SA50009-12B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 10:34 AM	2	1.016	4D	93.83
236817003-1	SA50-25B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 11:01 AM	3	1.012	5A	84.12
236817004-1	SA50-36B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 11:27 AM	4	1.015	5B	73.18
236817005-1	SA135-0.5B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 08:02 AM	5	1.003	5C	80.08
236817006-1	SA135-10B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 08:24 AM	6	1.009	5D	80.86
236817007-1	SA135009-10B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 08:24 AM	7	1.004	6A	84.99
236817008-1	SA135-25B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 09:25 AM	8	1.005	6B	78.92
236817009-1	SA135-37B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 09:51 AM	9	1.016	6D	81.58
236817010-1	SA170-0.5B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 11:20 AM	10	1.004	7A	79.04
236817011-1	SA170-10B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 11:30 AM	11	1.005	7B	82.49
236817012-1	SA170-20B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 12:00 PM	12	1.007	7C	90.04
236817013-1	SA170-31B	SAMPLE		.5 pCi/g	SOIL	KERR003	08-SEP-09 12:28 PM	13	1.005	7B	94.86
236817015-1	SA45-10B	SAMPLE		.5 pCi/g	SOIL	KERR003	09-SEP-09 08:29 AM	14	1.016	9L	86.84
236817016-1	SA45-25B	SAMPLE		.5 pCi/g	SOIL	KERR003	09-SEP-09 08:59 AM	15	1.015	6A	83.08
236817017-1	SA45-36B	SAMPLE		.5 pCi/g	SOIL	KERR003	09-SEP-09 09:31 AM	16	1.016	10B	82.64
236817018-1	SA186-10B	SAMPLE		.5 pCi/g	SOIL	KERR003	09-SEP-09 10:28 AM	17	1.003	11D	84.81
236817019-1	SA186-25B	SAMPLE		.5 pCi/g	SOIL	KERR003	09-SEP-09 10:55 AM	18	1.009	12B	83.77
236817020-1	SA186-37B	SAMPLE		.5 pCi/g	SOIL	KERR003	09-SEP-09 11:21 AM	19	1.012	12C	88.28
236817021-1	SA126-40B	SAMPLE		.5 pCi/g	SOIL	KERR003	10-SEP-09 08:30 AM	20	1.008	12D	86.87
1201930277-1	MB for batch 905310	MB		.5 pCi/g	SOIL	QC ACCOUNT		21	1.016	18	72.53
1201930278-1	SA126-40B(236817021DUP)	DUP		.5 pCi/g	SOIL	QC ACCOUNT	10-SEP-09 08:30 AM	22	1.003	1C	83.11
1201930279-1	SA126-40B(236817021MS)	MS		.5 pCi/g	SOIL	QC ACCOUNT	10-SEP-09 08:30 AM	23	0.102	1D	77.66
1201930280-1	LCS for batch 905310	LCS		.5 pCi/g	SOIL	QC ACCOUNT		24	1.016	2A	76.87

MS 9-23-09 148/09 Data Reviewed By: *[Signature]*

Instrument Used: (Circle One) PIC S/N: 10751-4

Radium 228 Re-Elute / Reprecipitate

Batch # 905310
 Ra 228 Spike Code 0503-B
 LCS Code 0503-B
 Ba-133 Tracer Code 0112-J

Prep Date 9-29-09
 Spike Vol (mls) 0.1mL
 LCS Vol (mls) 0.1mL
 Tracer Vol (mls) 0.1mL
10-6-09

Initials JLC
 Ingrow Start Time: 10-5-09 / 1150
 Separation Time: 10-7-09 / 0530

Sample ID	Bkr #	Vol. ⁹⁰ (mls)	Det #	% Yield	Gamma Det #
236817001	1	1.005	* 3C 13D	84.62	
236817002	2	1.016	3D	92.54	
236817003	3	1.012	4D	80.04	
236817004	4	1.015	5A	86.94	
236817005	5	1.003	5B	77.62	
236817006	6	1.009	5C	91.38	
236817007	7	1.004	5D	87.18	
236817008	8	1.005	6A	83.15	
236817009	9	1.016	6D	80.07	
236817010	10	1.004	7A	73.98	
236817011	11	1.005	* 7B 14A	87.53	
236817012	12	1.007	7C	91.80	
236817013	13	1.005	* 7D 14B	72.99	
236817015	14	1.016	8A	88.44	
236817016	15	1.015	8C	78.18	
236817017	16	1.016	10A	80.67	
236817018	17	1.003	10B	89.18	
236817019	18	1.009	10D * 14D	91.49	
236817020	19	1.012	14D * 14D	94.85	
236817021	20	1.008	1D	96.18	
1201930277	21	1.016	2A	83.71	
1201930278	22	1.003	2C	83.40	
1201930279	23	0.102	* 2D 11C	79.40	
1201930280	24	1.016	* 3A 11D	75.20	

9-14-09

* 9-10-09

Radium-228 Solid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.2.5

Spike S/N : 0503-B
 Spike Exp Date : 9/11/2010
 Spike Activity (dpm/ml): 177.08
 Spike Volume Added: 0.10

Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml
 Pipet, 1 ml Stdev : +/- 0.005480 ml

LCS S/N : 0503-B
 LCS Exp Date : 9/11/2010
 LCS Activity (dpm/ml): 177.08
 LCS Volume Added: 0.10

Ra-228 Abundance : 1
 Ra-228 Method Uncertainty : 0

Procedure Code : GFC28RAS
 Parname : Radium-228
 Required MDA : 0.5 pCi/G
 Half-life of Ra-228 : 5.75 years
 Half-life of Ac-228 : 6.13 hours

Tracer S/N : 0112-J
 Tracer Exp Date : 2/17/2010
 Tracer Volume Added: 0.10

Geometry: CeF on 25mm Filter

Pos.	Sample Characteristics			Tracer Calculations			Tracer Samp.			Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
	Sample ID	Sample Aliquot G	Sample Aliquot StDev. G	Tracer Concentration (cpm) (Ba-133 Ref.)	Tracer Ref. Count Uncertainty (cpm)	Tracer Concentration (cpm) (Ba-133 Samp.)	Tracer Count Uncertainty (cpm)	Tracer Count Uncertainty (cpm)			
1	236817001.3	1.0050	3.3239E-03	319.2	3.43%	241.7	4.01%	0.1	0.000701		
2	236817002.2	1.0160	3.3250E-03	319.2	3.43%	299.5	3.55%	0.1	0.000701		
3	236817003.2	1.0120	3.3248E-03	319.2	3.43%	268.5	3.77%	0.1	0.000701		
4	236817004.1	1.0150	3.3249E-03	319.2	3.43%	233.6	4.08%	0.1	0.000701		
5	236817005.2	1.0030	3.3237E-03	319.2	3.43%	255.6	3.88%	0.1	0.000701		
6	236817006.1	1.0090	3.3243E-03	319.2	3.43%	258.1	3.86%	0.1	0.000701		
7	236817007.2	1.0040	3.3238E-03	319.2	3.43%	271.3	3.75%	0.1	0.000701		
8	236817008.1	1.0050	3.3239E-03	319.2	3.43%	251.9	3.91%	0.1	0.000701		
9	236817009.2	1.0160	3.3250E-03	319.2	3.43%	260.4	3.84%	0.1	0.000701		
10	236817010.2	1.0040	3.3238E-03	319.2	3.43%	252.3	3.91%	0.1	0.000701		
11	236817011.2	1.0050	3.3239E-03	319.2	3.43%	263.3	3.82%	0.1	0.000701		
12	236817012.1	1.0070	3.3241E-03	319.2	3.43%	287.4	3.63%	0.1	0.000701		
13	236817013.3	1.0050	3.3239E-03	319.2	3.43%	302.8	3.53%	0.1	0.000701		
14	236817015.1	1.0160	3.3250E-03	319.2	3.43%	277.2	3.71%	0.1	0.000701		
15	236817016.1	1.0150	3.3249E-03	319.2	3.43%	265.2	3.80%	0.1	0.000701		
16	236817017.1	1.0160	3.3250E-03	319.2	3.43%	263.8	3.81%	0.1	0.000701		
17	236817018.1	1.0030	3.3237E-03	319.2	3.43%	277.1	3.71%	0.1	0.000701		
18	236817019.1	1.0090	3.3243E-03	319.2	3.43%	305.7	3.51%	0.1	0.000701		
19	236817020.2	1.0120	3.3246E-03	319.2	3.43%	281.8	3.67%	0.1	0.000701		
20	236817021.2	1.0080	3.3242E-03	319.2	3.43%	277.3	3.71%	0.1	0.000701		
21	1201930277.1	1.0160	3.3250E-03	319.2	3.43%	231.5	4.11%	0.1	0.000701		
22	1201930278.1	1.0030	3.3237E-03	319.2	3.43%	265.3	3.80%	0.1	0.000701		
23	1201930279.2	0.1020	3.2297E-03	319.2	3.43%	247.9	3.95%	0.1	0.000701		
24	1201930280.2	1.0160	3.3250E-03	319.2	3.43%	245.2	3.97%	0.1	0.000701		

Count raw Data										Calibration Data										Calculated									
Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Beta cpm	Count Start Date/Time	Separation Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Count Correction	Sample Recovery %	Sample Recovery Error %	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Weekly Bkg Count Time (min.)	cpm	Weekly Bkg Count Time (min.)										
1	13D	380	66	1.126	10/7/2009 11:58	10/7/2009 5:30	0.990	0.481	1.400	84.62%	2.82%	PIC	7/2/2009	7/31/2010	0.6377	0.00816	500	0.820	500										
2	3D	60	123	2.050	10/7/2009 7:59	10/7/2009 5:30	0.991	0.755	1.058	92.54%	2.66%	PIC	7/2/2009	7/31/2010	0.5994	0.00464	500	1.256	500										
3	4D	60	12	2.033	10/7/2009 7:59	10/7/2009 5:30	0.991	0.755	1.058	80.04%	2.73%	PIC	7/2/2009	7/31/2010	0.5873	0.00816	500	1.264	500										
4	5A	60	10	0.967	10/7/2009 7:59	10/7/2009 5:30	0.991	0.754	1.058	86.94%	2.84%	PIC	7/2/2009	7/31/2010	0.6258	0.00816	500	0.506	500										
5	5B	60	9	1.583	10/7/2009 7:59	10/7/2009 5:30	0.990	0.754	1.058	77.62%	2.77%	PIC	7/2/2009	7/31/2010	0.6280	0.00816	500	1.006	500										
6	5C	60	9	1.583	10/7/2009 7:59	10/7/2009 5:30	0.990	0.754	1.058	91.38%	2.77%	PIC	7/2/2009	7/31/2010	0.6368	0.00816	500	0.946	500										
7	5D	60	10	2.383	10/7/2009 7:59	10/7/2009 5:30	0.990	0.754	1.058	87.18%	2.73%	PIC	7/2/2009	7/31/2010	0.6237	0.00816	500	1.350	500										
8	6A	60	14	2.050	10/7/2009 8:00	10/7/2009 5:30	0.990	0.754	1.058	83.15%	2.78%	PIC	7/2/2009	7/31/2010	0.6221	0.00816	500	1.340	500										
9	6D	60	8	1.617	10/7/2009 8:00	10/7/2009 5:30	0.990	0.753	1.058	80.07%	2.76%	PIC	7/2/2009	7/31/2010	0.6120	0.00816	500	1.066	500										
10	7A	60	10	0.933	10/7/2009 8:00	10/7/2009 5:30	0.991	0.752	1.058	73.98%	2.78%	PIC	7/2/2009	7/31/2010	0.6180	0.00816	500	0.382	500										
11	14A	380	86	0.818	10/7/2009 11:59	10/7/2009 5:30	0.990	0.480	1.400	87.53%	2.75%	PIC	7/2/2009	7/31/2010	0.6393	0.00816	500	0.746	500										
12	7C	60	6	0.883	10/7/2009 8:01	10/7/2009 5:30	0.991	0.752	1.058	91.80%	2.69%	PIC	7/2/2009	7/31/2010	0.6178	0.00816	500	0.310	500										
13	14B	380	99	1.105	10/7/2009 11:59	10/7/2009 5:30	0.990	0.480	1.400	72.99%	2.65%	PIC	7/2/2009	7/31/2010	0.6266	0.00816	500	0.994	500										
14	8A	60	10	1.583	10/7/2009 8:04	10/7/2009 5:30	0.991	0.748	1.058	88.44%	2.71%	PIC	7/2/2009	7/31/2010	0.6247	0.00816	500	0.842	500										
15	8C	60	4	1.183	10/7/2009 8:04	10/7/2009 5:30	0.991	0.748	1.058	78.18%	2.74%	PIC	7/2/2009	7/31/2010	0.6339	0.00816	500	0.508	500										
16	10A	60	10	1.567	10/7/2009 8:04	10/7/2009 5:30	0.991	0.747	1.058	80.87%	2.75%	PIC	7/2/2009	7/31/2010	0.6389	0.00816	500	0.338	500										
17	10B	60	5	1.063	10/7/2009 8:05	10/7/2009 5:30	0.991	0.747	1.058	89.18%	2.71%	PIC	7/2/2009	7/31/2010	0.6137	0.00816	500	0.450	500										
18	10D	60	29	1.717	10/7/2009 8:05	10/7/2009 5:30	0.991	0.746	1.058	91.49%	2.65%	PIC	7/2/2009	7/31/2010	0.6320	0.00816	500	0.928	500										
19	14D	380	77	1.479	10/7/2009 11:59	10/7/2009 5:30	0.991	0.480	1.400	94.85%	2.70%	PIC	7/2/2009	7/31/2010	0.6326	0.00816	500	1.208	500										
20	1D	60	8	1.150	10/7/2009 8:23	10/7/2009 5:30	0.991	0.721	1.058	96.18%	2.71%	PIC	7/2/2009	7/31/2010	0.6043	0.00511	500	0.494	500										
21	2A	60	26	0.433	10/7/2009 8:23	10/7/2009 5:30	0.997	0.721	1.058	83.71%	2.85%	PIC	7/2/2009	7/31/2010	0.6172	0.00349	500	0.524	500										
22	2C	60	6	0.867	10/7/2009 8:23	10/7/2009 5:30	0.991	0.721	1.058	83.40%	2.74%	PIC	7/2/2009	7/31/2010	0.5969	0.00575	500	0.408	500										
23	11C	60	27	4.950	10/7/2009 11:59	10/7/2009 5:30	0.991	0.480	1.058	79.40%	2.80%	PIC	7/2/2009	7/31/2010	0.6352	0.00816	500	0.698	500										
24	11D	60	11	4.400	10/7/2009 11:59	10/7/2009 5:30	0.997	0.480	1.058	75.20%	2.80%	PIC	7/2/2009	7/31/2010	0.6348	0.00816	500	0.792	500										

- Notes:
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level		Critical Level	Required MDA	MDA	Sample Act. Conc.	Sample Act. Error	Net Count Rate	Net Count Rate Error	2 SIGMA		Sample QC	Sample Type	RPD	REF	Nominal	Recovery
	pCi/G	pCi/G								Counting Uncertainty	Total Prop. Uncertainty						
1	0.3510	0.2478	0.2478	0.5	0.5149	0.7487	0.2235	0.3063	0.0679	0.3251	0.3279		SAMPLE				
2	0.4034	0.2848	0.2848	0.5	0.6261	0.8977	0.2427	0.7940	0.1915	0.4244	0.4271		SAMPLE				
3	0.4795	0.3385	0.3385	0.5	0.7440	1.0307	0.2497	0.7693	0.1908	0.5011	0.5044		SAMPLE				
4	0.2614	0.1846	0.1846	0.5	0.4269	0.5318	0.2856	0.4607	0.1309	0.2961	0.2977		SAMPLE				
5	0.4164	0.2940	0.2940	0.5	0.6532	0.7530	0.2933	0.5773	0.1685	0.4308	0.4330		SAMPLE				
6	0.3364	0.2375	0.2375	0.5	0.5293	0.6924	0.2655	0.6373	0.1682	0.3581	0.3603		SAMPLE				
7	0.4322	0.3052	0.3052	0.5	0.6688	1.2076	0.2014	1.0333	0.2060	0.4718	0.4766		SAMPLE				
8	0.4525	0.3195	0.3195	0.5	0.7003	0.8718	0.2719	0.7100	0.1920	0.4620	0.4647		SAMPLE				
9	0.4215	0.2976	0.2976	0.5	0.6593	0.7062	0.3110	0.5507	0.1705	0.4286	0.4305		SAMPLE				
10	0.2740	0.1934	0.1934	0.5	0.4565	0.7678	0.2335	0.5513	0.1277	0.3487	0.3514		SAMPLE				
11	0.3231	0.2281	0.2281	0.5	0.4749	0.1709	0.8342	0.0724	0.0604	0.2792	0.2794		SAMPLE				
12	0.1985	0.1401	0.1401	0.5	0.3362	0.6420	0.2179	0.5733	0.1239	0.2719	0.2742		SAMPLE				
13	0.4563	0.3222	0.3222	0.5	0.6671	0.3211	0.6295	0.1113	0.0700	0.3959	0.3963		SAMPLE				
14	0.3345	0.2361	0.2361	0.5	0.5295	0.8489	0.2278	0.7413	0.1675	0.3760	0.3790		SAMPLE				
15	0.2900	0.2048	0.2048	0.5	0.4734	0.8632	0.2152	0.6753	0.1440	0.3608	0.3641		SAMPLE				
16	0.2275	0.1607	0.1607	0.5	0.3828	1.5106	0.1363	1.2287	0.1637	0.3944	0.4036		SAMPLE				
17	0.2505	0.1769	0.1769	0.5	0.4124	0.7429	0.2193	0.6333	0.1377	0.3165	0.3193		SAMPLE				
18	0.3386	0.2391	0.2391	0.5	0.5333	0.8708	0.2231	0.7887	0.1745	0.3777	0.3807		SAMPLE				
19	0.3807	0.2688	0.2688	0.5	0.5548	0.5918	0.2945	0.2709	0.0794	0.3400	0.3416		SAMPLE				
20	0.2545	0.1797	0.1797	0.5	0.4162	0.7461	0.2182	0.6560	0.1420	0.3165	0.3191		SAMPLE				
21	0.2909	0.2054	0.2054	0.5	0.4739	-0.1145	1.0034	-0.0907	0.0909	0.2250	0.2250		MB	19.7%			
22	0.2716	0.1917	0.1917	0.5	0.4503	0.6126	0.2708	0.4587	0.1235	0.3234	0.3252	236817021.2	DUP			78.6843	104.3%
23	5.1783	3.6559	3.6559	0.5	8.2854	82.7872	0.0806	4.2520	0.2896	11.0534	13.0740	236817021.2	MS			7.8509	94.3%
24	0.5814	0.4105	0.4105	0.5	0.9236	7.4046	0.0814	3.6080	0.2737	1.1010	1.1807		LCS				

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine
236817001	13D	380	66	428	10/7/2009 11:58	10/7/2009 18:18	PIC
236817002	3D	60	10	123	10/7/2009 7:59	10/7/2009 8:59	PIC
236817003	4D	60	12	122	10/7/2009 7:59	10/7/2009 8:59	PIC
236817004	5A	60	10	58	10/7/2009 7:59	10/7/2009 8:59	PIC
236817005	5B	60	9	95	10/7/2009 7:59	10/7/2009 8:59	PIC
236817006	5C	60	9	95	10/7/2009 7:59	10/7/2009 8:59	PIC
236817007	5D	60	10	143	10/7/2009 7:59	10/7/2009 8:59	PIC
236817008	6A	60	14	123	10/7/2009 8:00	10/7/2009 9:00	PIC
236817009	6D	60	8	97	10/7/2009 8:00	10/7/2009 9:00	PIC
236817010	7A	60	10	56	10/7/2009 8:00	10/7/2009 9:00	PIC
236817011	14A	380	86	311	10/7/2009 11:59	10/7/2009 18:19	PIC
236817012	7C	60	6	53	10/7/2009 8:01	10/7/2009 9:01	PIC
236817013	14B	380	99	420	10/7/2009 11:59	10/7/2009 18:19	PIC
236817015	8A	60	10	95	10/7/2009 8:04	10/7/2009 9:04	PIC
236817016	8C	60	4	71	10/7/2009 8:04	10/7/2009 9:04	PIC
236817017	10A	60	10	94	10/7/2009 8:04	10/7/2009 9:04	PIC
236817018	10B	60	5	65	10/7/2009 8:05	10/7/2009 9:05	PIC
236817019	10D	60	29	103	10/7/2009 8:05	10/7/2009 9:05	PIC
236817020	14D	380	77	562	10/7/2009 11:59	10/7/2009 18:19	PIC
236817021	1D	60	8	69	10/7/2009 8:23	10/7/2009 9:23	PIC
1201930277	2A	60	6	26	10/7/2009 8:23	10/7/2009 9:23	PIC
1201930278	2C	60	6	52	10/7/2009 8:23	10/7/2009 9:23	PIC
1201930279	11C	60	27	297	10/7/2009 11:59	10/7/2009 12:59	PIC
1201930280	11D	60	11	264	10/7/2009 11:59	10/7/2009 12:59	PIC

ASSAY 6-Oct-09 18:48:08

Protocol id 8 228_REC
Time limit 180
Count limit 50000
Isotope Ba-133
Protocol date 9-Apr-07 10:03:07
Run id. 32

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
1	98	1	180	948	285.5	3.65		18:48:16
2	98	2	180	816	241.6	4.01	84.62	18:51:27
3	98	3	180	884	264.2	3.81	92.54	18:54:39
4	98	4	180	777	228.5	4.14	80.04	18:57:50
5	98	5	180	836	248.2	3.95	86.94	19:01:01
6	66	6	180	756	221.6	4.21	77.62	19:04:26
7	66	7	180	874	260.9	3.84	91.38	19:07:38
8	66	8	180	838	248.9	3.94	87.18	19:10:49
9	66	9	180	803	237.4	4.05	83.15	19:14:00
10	66	10	180	777	228.6	4.14	80.07	19:17:12
11	92	11	180	725	211.2	4.33	73.98	19:20:37
12	92	12	180	841	249.9	3.93	87.53	19:23:48
13	92	13	180	877	262.1	3.83	91.80	19:26:59
14	92	14	180	716	208.4	4.36	72.99	19:30:11
15	92	15	180	849	252.5	3.91	88.44	19:33:22
16	88	16	180	761	223.2	4.19	78.18	19:36:47
17	88	17	180	782	230.3	4.12	80.67	19:39:58
18	88	18	180	855	254.6	3.89	89.18	19:43:10
19	88	19	180	875	261.2	3.83	91.49	19:46:21
20	88	20	180	904	270.8	3.76	94.85	19:49:33
21	99	21	180	915	274.6	3.73	96.18	19:52:57
22	99	22	180	808	239	4.03	83.71	19:56:08
23	99	23	180	806	238.1	4.04	83.40	19:59:20
24	99	24	180	771	226.7	4.16	79.40	20:02:31
25	99	25	180	735	214.7	4.29	75.20	20:05:43

END OF ASSAY

RADIUM 226

Radiochemistry Batch Checklist, Rev 9

Batch# 904649 Product: Radium 226 Date: 9-25-09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			NA
Samples have been blank corrected (if required)			NA
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	✓		
Instrument source check is within limits.	✓		
Instrument bkg check is within limits.	✓		
Method RDL/ LLD has been met.			
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%.		✓	See case narrative
Or meets the client's required REF acceptance criteria.			
Tracer yield is 15-125% . Carrier yield 25-125%.			NA
Or meets the client's contract acceptance criteria.			
Method blank is less than the RDL/ LLD. (If rad samples, < 5% of lowest activity)	✓		
Sample was run within hold time.	✓		
Sample was correctly preserved if required.			NA
Smears Taken for Radioactive batches.			NA
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms.	✓		
All line outs initialed and dated.	✓		
No transcription errors are apparent.			
Aux data is correct.			NA
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly stasured.	✓		
QC data entered into QC database and batch is in REVW	✓		
Hit notification complete (if necessary)			NA
Batch entered into Case Narrative.	✓		
Batch non-conformances completed, if applicable.	✓		NCR 738448
Batch non-conformances second reviewed and disposition verified to be completed.	✓		GEL 738448
Aliquot Correction completed if required.			NA
Review sample historical results if available (If REMF, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By: [Signature]

Secondary Review Performed By: [Signature] 9/25/09

KERR 9-30-09

Radium-226 Que Sheet

21-SEP-09

GEL Laboratories, Radiochemistry Division

Batch #: 904649 Analyst: KSDI First Client Due Date: 09/30/2009 Internal Due Date: 09/19/2009
 Spike Isotope: Radium-226 Spike Code: 0028-H Expiration Date: 7/1/10 Vol: 1
 LCS Isotope: Radium-226 LCS Code: 0028-H Expiration Date: 7/1/10 Vol: 1
 Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 9/25/09
 Pipet ID: 012109 Balance ID: 51204802 Initials: KD Witness: MS 9-22-09

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
236077013-1	EB082709-SO1	SAMPLE		WATER	1 pCi/L	KERR003	1	500	0605	930	505	5	8	13
236077019-1	EB083109-SO1	SAMPLE		WATER	1 pCi/L	KERR003	2	500	0605	930	605	6	8	53
236077021-1	EB090109-SO1	SAMPLE		WATER	1 pCi/L	KERR003	3	500	0630	1005	107	1	8	21
236699016-1	EB090309-SO2	SAMPLE		WATER	1 pCi/L	KERR003	4	500	0630	1030	207	2	8	17
236817014-1	EB090809-SO1	SAMPLE		WATER	1 pCi/L	KERR003	5	500	0630	1005	305	3	8	20
236938020-1	EB091009-SO1	SAMPLE		WATER	1 pCi/L	KERR003	6	500	0630	1005 ²⁴⁰	411	4	8	21
237010013-1	EB091009-SO2	SAMPLE		WATER	1 pCi/L	KERR003	7	500	0630	1005	506	5	8	23
237170005-1	EB091409-SO1	SAMPLE		WATER	1 pCi/L	KERR003	8	500	0630	1005	601	4	8	17
237170020-1	EB091509-SO1	SAMPLE		WATER	1 pCi/L	KERR003	9	500	0650	1040	112	1	8	27
237343006-1	EB091609-SO1	SAMPLE		WATER	1 pCi/L	KERR003	10	500	0650	1040 ¹¹¹⁰	209	2	8	10
1201928562-1	MB for batch 904649	MB		WATER	1 pCi/L	QC ACCOUNT	11	500	0650	1040	301	3	4	15
1201928563-1	LCS for batch 904649	LCS		WATER	1 pCi/L	QC ACCOUNT	12	500	0650	1040	409	4	8	547
1201928564-1	LCS for batch 904649	LCS		WATER	1 pCi/L	QC ACCOUNT	13	500	0650	1040	507	5	4	669

✓
dailies

Comments: _____
 Data Reviewed By: JAN 9-25-09 Page 1 of 1

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.2.4

Pipet, 0.1 ml Stddev : +/- 0.000701 ml
 Pipet, 0.5 ml Stddev : +/- 0.002564 ml
 Pipet, 1 ml Stddev : +/- 0.005480 ml

Batch : 904649
 Analyst : KSD1
 Prep Date : 9/22/2009
 Ra-226 Abundance : 1
 Ra-226 Method Uncertainty : 0.0918

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Halflife of Rn-222 : 3.823 days
 Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics			Count Raw Data				Weekly Background					
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StdDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Counts	CPM	Count Time (min.)	Detector Efficiency (cpm/dpm)
1	236077013.1	0.5000	2.0256E-05	8/27/2009 10:00	505	30	13	0.433	8	0.267	30	2.3310
2	236077019.1	0.5000	2.0256E-05	8/31/2009 10:00	605	30	53	1.767	8	0.267	30	2.1490
3	236077021.1	0.5000	2.0256E-05	9/1/2009 12:50	107	30	21	0.700	8	0.267	30	1.9810
4	236699016.1	0.5000	2.0256E-05	9/3/2009 13:50	207	30	17	0.567	8	0.267	30	2.1460
5	236817014.1	0.5000	2.0256E-05	9/8/2009 12:02	305	30	20	0.667	6	0.200	30	2.0570
6	236939020.1	0.5000	2.0256E-05	9/10/2009 10:37	411	30	21	0.700	8	0.267	30	1.8240
7	237010013.1	0.5000	2.0256E-05	9/10/2009 11:53	506	30	23	0.767	8	0.267	30	2.0040
8	237170005.1	0.5000	2.0256E-05	9/14/2009 9:54	601	30	17	0.567	8	0.267	30	2.1810
9	237170020.1	0.5000	2.0256E-05	9/15/2009 10:16	112	30	27	0.900	8	0.267	30	1.9310
10	237343006.1	0.5000	2.0256E-05	9/16/2009 8:46	209	30	10	0.333	8	0.267	30	2.2910
11	1201928562.1	0.5000	2.0256E-05	9/22/2009 0:00	301	30	15	0.500	4	0.133	30	2.0210
12	1201928563.1	0.5000	2.0256E-05	9/22/2009 0:00	409	30	547	18.233	8	0.267	30	2.0360
13	1201928564.1	0.5000	2.0256E-05	9/22/2009 0:00	507	30	669	22.300	4	0.133	30	1.7010

Detector Efficiency Error (cpm/dpm)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth		Count Start Date/Time	Rn-222 Corrections		Ra-226 Decay
				End Date/Time	De-Gas to Ingrowth		Ingrowth to Count	During Count	
0.14377	3/25/2009	3/25/2010	9/22/2009 11:00	9/25/2009 6:05	9/25/2009 9:30	0.398	0.975	1.002	1.000
0.06605	8/4/2009	8/4/2010	9/22/2009 11:00	9/25/2009 6:05	9/25/2009 9:30	0.398	0.975	1.002	1.000
0.05303	8/31/2009	8/31/2010	9/22/2009 11:00	9/25/2009 6:30	9/25/2009 10:05	0.399	0.973	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/22/2009 11:00	9/25/2009 6:30	9/25/2009 10:30	0.399	0.970	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/22/2009 11:00	9/25/2009 6:30	9/25/2009 10:05	0.399	0.973	1.002	1.000
0.12371	3/2/2009	3/2/2010	9/22/2009 11:00	9/25/2009 6:30	9/25/2009 12:40	0.399	0.954	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/22/2009 11:00	9/25/2009 6:30	9/25/2009 10:05	0.399	0.973	1.002	1.000
0.06605	8/4/2009	8/4/2010	9/22/2009 11:00	9/25/2009 6:30	9/25/2009 10:05	0.399	0.973	1.002	1.000
0.05303	8/31/2009	8/31/2010	9/22/2009 11:00	9/25/2009 6:50	9/25/2009 10:40	0.401	0.971	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/22/2009 11:00	9/25/2009 6:50	9/25/2009 11:10	0.401	0.968	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/22/2009 11:00	9/25/2009 6:50	9/25/2009 10:40	0.401	0.971	1.002	1.000
0.12371	3/2/2009	3/2/2010	9/22/2009 11:00	9/25/2009 6:50	9/25/2009 10:40	0.401	0.971	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/22/2009 11:00	9/25/2009 6:50	9/25/2009 10:40	0.401	0.971	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error pCi/L	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
									Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.3093	0.2184	1	0.5363	0.1659	0.9277	0.1667	0.1528	0.2981	0.3032		SAMPLE				
2	0.3355	0.2369	1	0.5818	1.6200	0.1857	1.5000	0.2603	0.5511	0.6578		SAMPLE				
3	0.3627	0.2561	1	0.6289	0.5059	0.4176	0.4333	0.1795	0.4108	0.4240		SAMPLE				
4	0.3359	0.2371	1	0.5824	0.3243	0.5609	0.3000	0.1667	0.3532	0.3613		SAMPLE				
5	0.3025	0.2136	1	0.5396	0.5247	0.3693	0.4667	0.1700	0.3746	0.3913		SAMPLE				
6	0.4017	0.2836	1	0.6965	0.5603	0.4323	0.4333	0.1795	0.4549	0.4853		SAMPLE				
7	0.3585	0.2531	1	0.6217	0.5771	0.3981	0.5000	0.1856	0.4198	0.4620		SAMPLE				
8	0.3294	0.2326	1	0.5712	0.3181	0.5595	0.3000	0.1667	0.3464	0.3535		SAMPLE				
9	0.3714	0.2622	1	0.6440	0.7571	0.3159	0.6333	0.1972	0.4621	0.4881		SAMPLE				
10	0.3142	0.2218	1	0.5448	0.0674	2.1227	0.0667	0.1414	0.2804	0.2808		SAMPLE				
11	0.2509	0.1771	1	0.4685	0.4188	0.4009	0.3667	0.1453	0.3253	0.3376		MB			24.1645	84.3%
12	0.3522	0.2487	1	0.6107	20.3707	0.1312	17.9667	0.7853	1.7451	6.3933		LCS		1.5683	24.1645	124.5%
13	0.2981	0.2105	1	0.5567	30.0824	0.1490	22.1667	0.8647	2.3001	10.3172		LCSD	38.5%			

Radiochemistry Batch Checklist, Rev 9

Batch# 905689 Product: TA-226 Date: 10/5/09

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			NA
Samples have been blank corrected (if required)			NA
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	✓		
Instrument source check is within limits.	✓		
Instrument bkg check is within limits.	✓		
Method RDL/ LLD has been met.	✓		
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%.	✓		
Or meets the client's required RER acceptance criteria.			
Tracer yield is 15-125% . Carrier yield 25-125%.			NA
Or meets the client's contract acceptance criteria.			
Method blank is less than the RDL/ LLD. (If rad samples, < 5% of lowest activity)	✓		
Sample was run within hold time.	✓		
Sample was correctly preserved if required.			NA
Smears Taken for Radioactive batches.			NA
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms.			
All line outs initialed and dated.	✓		
No transcription errors are apparent.	✓		
Aux data is correct.			NA
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly stasured.	✓		
QC data entered into QC database and batch is in REVW	✓		
Hit notification complete (if necessary)			NA
Batch entered into Case Narrative.	✓		
Batch non-conformances completed, if applicable.	✓		NCR 741657
Batch non-conformances second reviewed and disposition verified to be completed.	✓		NCR - 741657
Aliquot Correction completed if required.			NA
Review sample historical results if available (If REMP, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

revised 8/1/08

Primary Review Performed By:

Lindsay Pace

KERR 10/9/09

Secondary Review Performed By:

Lance 10/5/09

Radium-226 Que Sheet

24-SEP-09

GEL Laboratories, Radiochemistry Division

Batch #: 905689 Analyst: KSD1 First Client Due Date: 10/09/2009 Internal Due Date: 09/28/2009
 Spike Isotope: Radium-226 Spike Code: 0638-H Expiration Date: 7/17/10 Vol: 0.1 End Initial/Degas Date/Time: 9/19/09 1120
 LCS Isotope: Radium-226 LCS Code: 0638-H Expiration Date: 7/17/10 Vol: 0.1 End LN De-em Date: 10/12/09
 Bkg Count Time: 30 (Min) Sample Count Time: 30 (Min) Start Count Date: 10/2/09
 Pipet ID: 141206 Balance ID: 5646272 Initials: KH Witness: KH 9/25/09

Sample I	Client Description	Hazard Code	Type	Matrix	Min CRDL	Client	Position (Label)	Aliquot (mL or g)	End LN De-em Time	Start Count Time	Cell #	Det #	Bkg counts	Total Counts
236817001-1	SA50-12B		SAMPLE	SOIL	.5 pCi/g	KERR003	1	1.003	1400	1700	106	1	4	102
236817002-1	SA50009-12B		SAMPLE	SOIL	.5 pCi/g	KERR003	2	1.006	1400	1700	206	2	8	78
236817003-1	SA50-25B		SAMPLE	SOIL	.5 pCi/g	KERR003	3	1.019	1400	1700	307	3	4	70
236817004-1	SA50-36B		SAMPLE	SOIL	.5 pCi/g	KERR003	4	1.003	1400	1700	414	4	8	361
236817005-1	SA135-0.5B		SAMPLE	SOIL	.5 pCi/g	KERR003	5	1.011	1400	1700	514	5	6	71
236817006-1	SA135-10B		SAMPLE	SOIL	.5 pCi/g	KERR003	6	1.011	1400	1700	607	6	8	132
236817007-1	SA135009-10B		SAMPLE	SOIL	.5 pCi/g	KERR003	7	1.025	1400	1700	714	7	6	92
236817008-1	SA135-25B		SAMPLE	SOIL	.5 pCi/g	KERR003	8	1.009	1425	1745	106	1	8	443
236817009-1	SA135-37B		SAMPLE	SOIL	.5 pCi/g	KERR003	9	1.009	1425	1745	107	2	8	224
236817010-1	SA170-0.5B		SAMPLE	SOIL	.5 pCi/g	KERR003	10	1.060	1425	1745	308	3	8	75
236817011-1	SA170-10B		SAMPLE	SOIL	.5 pCi/g	KERR003	11	1.025	1425	1745	401	4	8	120
236817012-1	SA170-20B		SAMPLE	SOIL	.5 pCi/g	KERR003	12	1.001	1425	1745	507	5	6	241
236817013-1	SA170-31B		SAMPLE	SOIL	.5 pCi/g	KERR003	13	1.010	1425	1825	606	6	8	153
236817015-1	SA45-10B		SAMPLE	SOIL	.5 pCi/g	KERR003	14	1.065	1425	1745	709	7	8	163
236817016-1	SA45-25B		SAMPLE	SOIL	.5 pCi/g	KERR003	15	1.025	1445	1825	111	1	8	130
236817017-1	SA45-36B		SAMPLE	SOIL	.5 pCi/g	KERR003	16	1.037	1445	1825	214	2	8	242
236817018-1	SA186-10B		SAMPLE	SOIL	.5 pCi/g	KERR003	17	1.058	1445	1825	304	3	8	77
236817019-1	SA186-25B		SAMPLE	SOIL	.5 pCi/g	KERR003	18	1.013	1445	1825	503	5	4	135
236817020-1	SA186-37B		SAMPLE	SOIL	.5 pCi/g	KERR003	19	1.004	1445	1825	714	7	6	154
236817021-1	SA126-40B		SAMPLE	SOIL	.5 pCi/g	KERR003	20	1.011	1510	1900	107	1	8	124
1201931149-1	MB for batch 905689		MB	QC ACCOUNT	.5 pCi/g	QC ACCOUNT	21	1.065	1510	1900	204	2	5	13
1201931150-1	SA126-40B(236817021DUP)		DUP	QC ACCOUNT	.5 pCi/g	QC ACCOUNT	22	1.010	1510	1900	306	3	8	123
1201931151-1	SA126-40B(236817021MS)		MS	QC ACCOUNT	.5 pCi/g	QC ACCOUNT	23	1.053	1510	1900	506	5	8	805
1201931152-1	LCS for batch 905689		LCS	QC ACCOUNT	.5 pCi/g	QC ACCOUNT	24	1.065	1510	1900	710	7	4	673

106

Comments: * see attached verification sheet

Data Reviewed By: Timothy Pale 10/5/09
 Page 1 of 1

Sample count time 30 min

Re-226 Verification Sheet

Sample ID	Volume (mL) (D)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
4 236817004	1.003	10/2/09 1400	10/5/09 0700	10/5/09 955	202	2	8	336
8 236817008	1.003	10/2/09 1425	10/5/09 0700	10/5/09 955	309	3	6	329
12 236817012	1.001	10/2/09 1425	10/5/09 0700	10/5/09 955	508	5	2	211
MB	1.0	10/1/09 1340	10/5/09 0700	10/5/09 955	606	4	8	29
LCS	1.0	10/1/09 1405	10/5/09 0700	10/5/09 955	706	7	1	25805

219
10/5/09

Radium-226 Solid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.2.4

Spike S/N : 0638-H
 Spike Exp Date : 7/17/2010
 Spike Activity (dpm/ml): 268.22
 Spike Volume Added: 0.10

Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml
 Pipet, 1 ml Stdev : +/- 0.005480 ml

Batch : 905689

Analyst : KSD1

Prep Date : 9/25/2009

Ra-226 Abundance : 1

Ra-226 Method Uncertainty : 0.1153

Procedure Code : LUC26RAS

Parname : Radium-226

Required MDA : 0.5 pCi/g

Half-life of Ra-226 : 1600 years

Half-life of Rn-222: 3.823 days

Batch counted on : LUCAS CELL DETECTOR

BKG Count time : 30 min

Sample Characteristics			Counting			Weekly Background			Detector			
Pos.	Sample ID	Sample Aliquot G	Sample Aliquot S/Dev. G	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Counts	CPM	Count Time (min.)	Efficiency (cpm/dpm)
1	236817001.1	1.0030	3.3237E-03	9/8/2009 10:34	106	30	102	3.400	4	0.133	30	1.8360
2	236817002.1	1.0060	3.3240E-03	9/8/2009 10:34	206	30	78	2.600	8	0.267	30	2.2590
3	236817003.1	1.0190	3.3253E-03	9/8/2009 11:01	307	30	70	2.333	4	0.133	30	1.9310
4	236817004.1	1.0030	3.3237E-03	9/8/2009 11:27	202	30	336	11.200	8	0.267	30	1.9670
5	236817005.1	1.0110	3.3245E-03	9/8/2009 8:02	504	30	71	2.367	6	0.200	30	1.6150
6	236817006.1	1.0110	3.3245E-03	9/8/2009 8:24	607	30	132	4.400	8	0.267	30	2.4500
7	236817007.1	1.0250	3.3259E-03	9/8/2009 8:24	702	30	92	3.067	6	0.200	30	2.0330
8	236817008.1	1.0030	3.3237E-03	9/8/2009 9:25	309	30	329	10.967	6	0.200	30	1.9460
9	236817009.1	1.0090	3.3243E-03	9/8/2009 9:51	207	30	224	7.467	8	0.267	30	2.1460
10	236817010.1	1.0600	3.3296E-03	9/8/2009 11:20	308	30	75	2.500	8	0.267	30	1.9500
11	236817011.1	1.0250	3.3259E-03	9/8/2009 11:30	402	30	120	4.000	8	0.267	30	2.1180
12	236817012.1	1.0010	3.3234E-03	9/8/2009 12:00	508	30	211	7.033	2	0.067	30	1.7010
13	236817013.1	1.0100	3.3244E-03	9/8/2009 12:28	606	30	153	5.100	8	0.267	30	2.3480
14	236817015.1	1.0650	3.3301E-03	9/9/2009 8:29	705	30	63	2.100	8	0.267	30	2.1070
15	236817016.1	1.0250	3.3259E-03	9/9/2009 8:59	112	30	130	4.333	8	0.267	30	1.9310
16	236817017.1	1.0370	3.3272E-03	9/9/2009 9:31	204	30	242	8.067	8	0.267	30	2.1930
17	236817018.1	1.0580	3.3294E-03	9/9/2009 10:28	309	30	77	2.567	8	0.267	30	1.8770
18	236817019.1	1.0130	3.3247E-03	9/9/2009 10:55	503	30	135	4.500	4	0.133	30	1.6010
19	236817020.1	1.0040	3.3238E-03	9/9/2009 11:21	704	30	154	5.133	6	0.200	30	2.2350
20	236817021.1	1.0110	3.3245E-03	9/10/2009 8:30	107	30	124	4.133	8	0.267	30	1.9810
21	1201931149.1	1.0650	3.3301E-03	9/25/2009 0:00	209	30	13	0.433	5	0.167	30	2.2910
22	1201931150.1	1.0100	3.3244E-03	9/10/2009 8:30	306	30	123	4.100	8	0.267	30	1.7470
23	1201931151.1	1.0530	3.3289E-03	9/10/2009 8:30	506	30	805	26.833	8	0.267	30	2.0040
24	1201931152.1	1.0650	3.3301E-03	9/25/2009 0:00	706	30	673	22.433	4	0.133	30	2.1420

Detector Efficiency Error (cpm/dpm)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth		Count Start Date/Time	Rn-222 Corrections		Ra-226 Decay
				End Date/Time	De-Gas to Ingrowth		Ingrowth to Count	During Count	
0.05303	8/31/2009	8/31/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.12371	3/2/2009	3/2/2010	10/2/2009 14:00	10/5/2009 7:00	10/5/2009 9:55	0.388	0.978	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.06605	8/4/2009	8/4/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.05303	8/31/2009	8/31/2010	10/2/2009 14:25	10/5/2009 7:00	10/5/2009 9:55	0.386	0.975	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.12371	3/2/2009	3/2/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.14377	3/25/2009	3/25/2010	10/2/2009 14:25	10/5/2009 7:00	10/5/2009 9:55	0.386	0.978	1.002	1.000
0.06605	8/4/2009	8/4/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 18:25	0.433	0.975	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 18:25	0.433	0.975	1.002	1.000
0.05303	8/31/2009	8/31/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.05303	8/31/2009	8/31/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000

- Notes:
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level		Critical Level	Required MDA	MDA pCi/G	Sample Act. Conc. pCi/G	Sample Act. Error pCi/G	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/G	Recovery
	pCi/G	MDA pCi/G								Counting Uncertainty pCi/G	Total Prop. Uncertainty pCi/G						
1	0.1273	0.0898	0.0898	0.5	0.2376	1.8924	0.1177	3.2667	0.3432	0.3897	0.6112	SAMPLE					
2	0.1458	0.1030	0.1030	0.5	0.2529	1.0953	0.1534	2.3333	0.3091	0.2844	0.4120	SAMPLE					
3	0.1191	0.0841	0.0841	0.5	0.2224	1.1928	0.1439	2.2000	0.2867	0.3047	0.4310	SAMPLE					
4	0.1865	0.1317	0.1317	0.5	0.3234	6.5646	0.1361	10.9333	0.6182	0.7276	2.2946	SAMPLE					
5	0.1758	0.1241	0.1241	0.5	0.3136	1.4157	0.1972	2.1667	0.2925	0.3746	0.6339	SAMPLE					
6	0.1338	0.0945	0.0945	0.5	0.2320	1.7802	0.1161	4.1333	0.3944	0.3329	0.5709	SAMPLE					
7	0.1377	0.0972	0.0972	0.5	0.2457	1.4676	0.1323	2.8667	0.3300	0.3311	0.5049	SAMPLE					
8	0.1641	0.1159	0.1159	0.5	0.2927	6.5669	0.0777	10.7667	0.6101	0.7294	1.7894	SAMPLE					
9	0.1528	0.1079	0.1079	0.5	0.2650	3.5416	0.1046	7.2000	0.5077	0.4895	1.0808	SAMPLE					
10	0.1601	0.1130	0.1130	0.5	0.2776	1.1508	0.1490	2.2333	0.3037	0.3067	0.4249	SAMPLE					
11	0.1524	0.1076	0.1076	0.5	0.2643	1.8316	0.1597	3.7333	0.3771	0.3626	0.7072	SAMPLE					
12	0.1086	0.0767	0.0767	0.5	0.2233	4.8709	0.1599	6.9667	0.4865	0.6667	1.8818	SAMPLE					
13	0.1402	0.0990	0.0990	0.5	0.2431	2.1817	0.1097	4.8333	0.4230	0.3742	0.6805	SAMPLE					
14	0.1475	0.1041	0.1041	0.5	0.2557	0.8702	0.1665	1.8333	0.2809	0.2613	0.3455	SAMPLE					
15	0.1670	0.1179	0.1179	0.5	0.2896	2.1867	0.1100	4.0667	0.3916	0.4127	0.6829	SAMPLE					
16	0.1454	0.1026	0.1026	0.5	0.2521	3.6503	0.1027	7.8000	0.5270	0.4834	1.1045	SAMPLE					
17	0.1665	0.1175	0.1175	0.5	0.2887	1.2326	0.1468	2.3000	0.3073	0.3228	0.4510	SAMPLE					
18	0.1442	0.1018	0.1018	0.5	0.2692	2.8655	0.1696	4.3667	0.3930	0.5055	1.1520	SAMPLE					
19	0.1276	0.0901	0.0901	0.5	0.2276	2.3398	0.1075	4.9333	0.4216	0.3920	0.7231	SAMPLE					
20	0.1646	0.1162	0.1162	0.5	0.2854	2.0489	0.1124	3.8667	0.3830	0.3977	0.6466	SAMPLE					
21	0.1068	0.0754	0.0754	0.5	0.1943	0.1160	0.5359	0.2667	0.1414	0.1206	0.1246	MB		11.8%			
22	0.1869	0.1319	0.1319	0.5	0.3240	2.3056	0.1167	3.8333	0.3815	0.4498	0.7413	DUP				11.4743	98.6%
23	0.1562	0.1103	0.1103	0.5	0.2709	13.3608	0.1482	26.5667	0.9504	0.9369	4.9169	MS				11.3448	91.4%
24	0.1022	0.0721	0.0721	0.5	0.1908	10.3741	0.0760	22.3000	0.8673	0.7908	2.8076	LCS					

Radium-226 Solid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.2.4

Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml
 Pipet, 1 ml Stdev : +/- 0.005480 ml

Spike S/N : 0638-H
 Spike Exp Date : 7/17/2010
 Spike Activity (dpm/ml): 268.22
 Spike Volume Added: 0.10

Batch : 905689
 Analyst : KSD1
 Prep Date : 9/25/2009
 Ra-226 Abundance : 1
 Ra-226 Method Uncertainty : 0.1153

Procedure Code : LUC26RAS
 Parmname : Radium-226
 Required MDA : 0.5 pCi/g
 Halflife of Ra-226 : 1600 years
 Halflife of Rn-222: 3.823 days
 Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics			Counting Data			Weekly Background			Detector Efficiency		
Pos.	Sample ID	Sample Aliquot G	Sample Aliquot StDev. G	Sample Date/Time	Cell Number	Gross Counts	Gross CPM	Counts	CPM	Count Time (min.)	Detector Efficiency (cpm/dpm)
1	236817001.1	1.0030	3.3237E-03	9/8/2009 10:34	106	102	3.400	4	0.133	30	1.8360
2	236817002.1	1.0060	3.3240E-03	9/8/2009 10:34	206	78	2.600	8	0.267	30	2.2590
3	236817003.1	1.0190	3.3253E-03	9/8/2009 11:01	307	70	2.333	4	0.133	30	1.9310
4	236817004.1	1.0030	3.3237E-03	9/8/2009 11:27	202	336	11.200	8	0.267	30	1.9670
5	236817005.1	1.0110	3.3245E-03	9/8/2009 8:02	504	71	2.367	6	0.200	30	1.6150
6	236817006.1	1.0110	3.3245E-03	9/8/2009 8:24	607	132	4.400	8	0.267	30	2.4500
7	236817007.1	1.0250	3.3259E-03	9/8/2009 8:24	702	92	3.067	6	0.200	30	2.0330
8	236817008.1	1.0090	3.3237E-03	9/8/2009 9:25	309	329	10.967	6	0.200	30	1.9460
9	236817009.1	1.0090	3.3243E-03	9/8/2009 9:51	207	30	7.467	8	0.267	30	2.1460
10	236817010.1	1.0600	3.3296E-03	9/8/2009 11:20	308	75	2.500	8	0.267	30	1.9500
11	236817011.1	1.0250	3.3259E-03	9/8/2009 11:30	402	120	4.000	8	0.267	30	2.1180
12	236817012.1	1.0010	3.3234E-03	9/8/2009 12:00	508	211	7.033	2	0.067	30	1.7010
13	236817013.1	1.0100	3.3244E-03	9/8/2009 12:28	606	153	5.100	8	0.267	30	2.3480
14	236817015.1	1.0650	3.3301E-03	9/8/2009 8:29	705	63	2.100	8	0.267	30	2.1070
15	236817016.1	1.0250	3.3259E-03	9/9/2009 8:59	112	130	4.333	8	0.267	30	1.9310
16	236817017.1	1.0370	3.3272E-03	9/9/2009 9:31	204	242	8.067	8	0.267	30	2.1930
17	236817018.1	1.0580	3.3294E-03	9/9/2009 10:28	309	77	2.567	8	0.267	30	1.8770
18	236817019.1	1.0130	3.3247E-03	9/9/2009 10:55	503	135	4.500	4	0.133	30	1.6010
19	236817020.1	1.0040	3.3238E-03	9/9/2009 11:21	704	154	5.133	6	0.200	30	2.2350
20	236817021.1	1.0110	3.3245E-03	9/10/2009 8:30	107	124	4.133	8	0.267	30	1.9810
21	1201931149.1	1.0650	3.3301E-03	9/25/2009 0:00	606	29	0.967	8	0.267	30	2.2910
22	1201931150.1	1.0100	3.3244E-03	9/10/2009 8:30	306	123	4.100	8	0.267	30	1.7470
23	1201931151.1	1.0530	3.3289E-03	9/10/2009 8:30	506	805	26.833	8	0.267	30	2.0040
24	1201931152.1	1.0650	3.3301E-03	9/25/2009 0:00	706	805	26.833	1	0.033	30	2.1420

VERIFICATION ONLY

Detector Efficiency Error (cpm/dpm)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow		Count Start Date/Time	Rn-222 Corrections		Ra-226 Decay
				End Date/Time	De-Gas to Ingrowth		Ingrowth to Count	During Count	
0.05303	8/31/2009	8/31/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.12371	3/2/2009	3/2/2010	10/2/2009 14:00	10/5/2009 7:00	10/5/2009 9:55	0.388	0.978	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.06605	8/4/2009	8/4/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 14:00	10/2/2009 17:00	0.431	0.978	1.002	1.000
0.05303	8/31/2009	8/31/2010	10/2/2009 14:25	10/5/2009 7:00	10/5/2009 9:55	0.386	0.975	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.12371	3/2/2009	3/2/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.14377	3/25/2009	3/25/2010	10/2/2009 14:25	10/5/2009 7:00	10/5/2009 9:55	0.386	0.978	1.002	1.000
0.06605	8/4/2009	8/4/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 18:25	0.433	0.970	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 14:25	10/2/2009 17:45	0.433	0.975	1.002	1.000
0.05303	8/31/2009	8/31/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.07722	12/19/2008	12/19/2009	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.06519	9/30/2009	9/30/2010	9/29/2009 11:20	10/2/2009 14:45	10/2/2009 18:25	0.434	0.973	1.002	1.000
0.05303	8/31/2009	8/31/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.07722	12/19/2008	12/19/2009	10/1/2009 13:40	10/5/2009 7:00	10/5/2009 9:55	0.491	0.978	1.002	1.000
0.06082	2/4/2009	2/4/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.14377	3/25/2009	3/25/2010	9/29/2009 11:20	10/2/2009 15:10	10/2/2009 19:00	0.436	0.971	1.002	1.000
0.06519	9/30/2009	9/30/2010	10/1/2009 14:05	10/5/2009 7:00	10/5/2009 9:55	0.489	0.978	1.002	1.000

VERIFICATION ONLY

- Notes:
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level pCi/G	Critical Level pCi/G	Required MDA pCi/G	MDA pCi/G	Sample Act. Conc. pCi/G	Sample Act. Error pCi/G	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/G	Recovery
									Counting Uncertainty pCi/G	Total Prop. Uncertainty pCi/G						
1	0.1273	0.0898	0.5	0.2376	1.8924	0.1177	3.2667	0.3432	0.3897	0.6112		SAMPLE				
2	0.1458	0.1030	0.5	0.2529	1.0953	0.1534	2.3333	0.3091	0.2844	0.4120		SAMPLE				
3	0.1191	0.0841	0.5	0.2224	1.1928	0.1439	2.2000	0.2867	0.3047	0.4310		SAMPLE				
4	0.1865	0.1317	0.5	0.3234	6.5646	0.1361	10.9333	0.6182	0.7276	2.2946		SAMPLE				
5	0.1758	0.1241	0.5	0.3136	1.4157	0.1972	2.1667	0.2925	0.3746	0.6339		SAMPLE				
6	0.1338	0.0945	0.5	0.2320	1.7802	0.1161	4.1333	0.3944	0.3329	0.5709		SAMPLE				
7	0.1377	0.0972	0.5	0.2457	1.4676	0.1323	2.8667	0.3300	0.3311	0.5049		SAMPLE				
8	0.1641	0.1159	0.5	0.2927	6.5669	0.0777	10.7667	0.6101	0.7294	1.7894		SAMPLE				
9	0.1528	0.1079	0.5	0.2650	3.5416	0.1046	7.2000	0.5077	0.4895	1.0808		SAMPLE				
10	0.1601	0.1130	0.5	0.2776	1.1508	0.1490	2.2333	0.3037	0.3067	0.4249		SAMPLE				
11	0.1524	0.1076	0.5	0.2643	1.8316	0.1597	3.7333	0.3771	0.3626	0.7072		SAMPLE				
12	0.1086	0.0767	0.5	0.2233	4.8709	0.1599	6.9667	0.4865	0.6667	1.8818		SAMPLE				
13	0.1402	0.0990	0.5	0.2431	2.1817	0.1097	4.8333	0.4230	0.3742	0.6805		SAMPLE				
14	0.1475	0.1041	0.5	0.2557	0.8702	0.1665	1.8333	0.2809	0.2613	0.3455		SAMPLE				
15	0.1670	0.1179	0.5	0.2896	2.1867	0.1100	4.0667	0.3916	0.4127	0.6829		SAMPLE				
16	0.1454	0.1026	0.5	0.2521	3.6503	0.1027	7.8000	0.5270	0.4834	1.1045		SAMPLE				
17	0.1665	0.1175	0.5	0.2887	1.2326	0.1468	2.3000	0.3073	0.3228	0.4510		SAMPLE				
18	0.1442	0.1018	0.5	0.2692	2.8655	0.1696	4.3667	0.3930	0.5055	1.1520		SAMPLE				
19	0.1276	0.0901	0.5	0.2276	2.3398	0.1075	4.9333	0.4216	0.3920	0.7231		SAMPLE				
20	0.1646	0.1162	0.5	0.2854	2.0489	0.1124	3.8667	0.3830	0.3977	0.6466		SAMPLE				
21	0.1192	0.0842	0.5	0.2068	0.2687	0.2998	0.7000	0.2028	0.1525	0.1691		MB				
22	0.1869	0.1319	0.5	0.3240	2.3056	0.1167	3.8333	0.3815	0.4498	0.7413		DUP	11.8%		11.4743	98.6%
23	0.1562	0.1103	0.5	0.2709	13.3608	0.1482	26.5667	0.9504	0.9369	4.9169		MS			11.3448	97.3%
24	0.0452	0.0319	0.5	0.1051	11.0383	0.0742	26.8000	0.9463	0.7640	2.9664		LCS				

VERIFICATION ONLY

METHOD CALIBRATION DATA

ALPHA SPECTROSCOPY

Alpha Spectroscopy Calibration Sources

The following is a summary of the procedure performed for preparing mixed alpha calibration standards:

A calibration stock solution was prepared by combining the following in a volumetric flask and diluting to 50 ml (51.4561 grams). These individual standards were first verified by direct precipitation of small aliquots of each standard (as described in Attachment I).

Isotope	Serial #	amount used (g)	dpm (note 1)
Gd-148	64445-278	0.2471	212.159287
Np-237	4341	1.8075	204.438594
Cm-244	4320A	7.2704	240.144737

Note 1: Dpm values are decay corrected to 2/7/2003.

Forty one weighted aliquots were then directly precipitated using Neodymium Flouride /HF system. The sources were then mounted on 0.1Poly-propylene filters and taped securely to 1 inch stainless steel planchettes for counting in an Alpha Spectroscopy system. The liquid fraction that passes through the filter is collected, traced with Am-241 and prepared for counting using the identical procedure. These samples are counted to ensure there is no more than 1% loss in the filtering processes. All sources pass this requirement. The DPM information for each source is listed in attachment II.

Certificate files were then created on the Alpha system used for acquisition and processing of data. Each source is assigned a name (AESS-001 through AESS-041). The information for the source activities is entered into the certificate files appropriate for the detector being used.

For example: If source AESS-001 is used for calibrating detector 25, the source data is entered into the certificate file name [env_alpha.cer]U025.cer.

The computer software uses these certificate files to calculate an energy calibration and determine the efficiency of the detector after counting the source.

Ante Hill
4/1/03

2002 Alpha Eff Source Stock Verification

Curium-244

Isotope	Value pCi/g
SSTOCK2002A2_AM	106.000
SSTOCK2002B2_AM	106.000
SSTOCK2002C2_AM	106.000

Mean Value (Counting) = 106.000 98.04%
 Stdev = 0

Target = 108.1230 pCi/g
 Lower Limit = 106
 Upper Limit = 106
 Rule 1 Pass/Fail Pass
 Two sigma = 0
 10 % of Mean = 10.6
 Rule 2 (Pass/Fail) Pass

PASS
 Fair 3/2/0

Neptunium-237

Isotope	Value pCi/g
SSTOCK2002A2_AM	90.100
SSTOCK2002B2_AM	87.200
SSTOCK2002C2_AM	93.500

Mean Value (Counting) = 90.267 98.02%
 Stdev = 3.153305144

Target = 92.0900 pCi/g
 Lower Limit = 83.96005638
 Upper Limit = 96.57327696
 Rule 1 Pass/Fail Pass
 Two sigma = 6.306610289
 10 % of Mean = 9.026666667
 Rule 2 (Pass/Fail) Pass

Gadolinium-148

Isotope	Value pCi/g
SSTOCK2002A2_AM	95.080
SSTOCK2002B2_AM	93.750
SSTOCK2002C2_AM	96.560

Mean Value (Counting) = 95.463 99.81%
 Stdev = 1.503074627

Target = 95.6460 pCi/g
 Lower Limit = 92.45718408
 Upper Limit = 98.46848259
 Rule 1 Pass/Fail Pass
 Two sigma = 3.006148253
 10 % of Mean = 9.546333333
 Rule 2 (Pass/Fail) Pass

The analyst prepared three standard verification sources for the mixed alpha stock standard using 0.1030 g for source #1, 0.1035 g for source #2 and 0.1028 g for source #3. Each standard was combined with 1.0 mL of Am-243 standard 0454-A and 0.1 mL of Nd carrier in a disposable centrifuge tube. Four mL of 2 M HCl was added to each standard and then diluted with 4 mL of DI water. 5 mL of ascorbic acid was added to each sample then one mL of 48% HF was added to precipitate Nd (and Curium) fluoride. After 30 minutes, each sample was filtered following routine procedures for alpha spectroscopy source preparation. Each source was counted using routine alpha spec procedures. pCi/L values for the Mixed Alpha Stock were calculated and compared to Am-243 certified values.

① The rule failed because the 3 results from 3 sources were the same. Therefore, the stdev was zero. The intent of this rule is to ensure an appropriate amount of counts are achieved for proper determinations. ~~Surfaces~~ For each standard the # of counts achieved was just under 10000 which has a counting error of nearly 1%. Because the standard's bias is < 2% from the known value the standard is acceptable.

Robertson 02/20/03

Attachment II

Mixed alpha Reference date = 2/7/2003		Stock Dpm/g	Reference date	Half-life (years)	amount used for mixed	Dpm/g mixed	Decay corr dpm/g
isotope	Source						
Gd-148	64445-278 (0502)	44354.59289	9/5/2002	74.60	0.2471	212.9974853	212.159287
Np-237	Srm 4341 (0493)	5820	3/1/1992	2.14E+06	1.8075	204.4393182	204.438594
Cm-244	SRM 4320a (0490)	2223.6	2/1/1996	18.1	7.2704	314.1796879	240.144737
Source	Amount of standard used	dpm Gd-148	dpm Np-237	dpm Cm-244	dps Gd-148	dps Np-237	dps Cm-244
AESS-001	1.0362	219.839	211.839	248.838	3.664	3.531	4.147
AESS-002	1.0344	219.458	211.471	248.406	3.658	3.525	4.140
AESS-003	1.034	219.373	211.390	248.310	3.656	3.523	4.138
AESS-004	1.0331	219.182	211.206	248.094	3.653	3.520	4.135
AESS-005	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-006	1.0331	219.182	211.206	248.094	3.653	3.520	4.135
AESS-007	1.0348	219.542	211.553	248.502	3.659	3.526	4.142
AESS-008	1.0363	219.861	211.860	248.862	3.664	3.531	4.148
AESS-009	1.0352	219.627	211.635	248.598	3.660	3.527	4.143
AESS-010	1.0346	219.500	211.512	248.454	3.658	3.525	4.141
AESS-011	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-012	1.0367	219.946	211.941	248.958	3.666	3.532	4.149
AESS-013	1.0396	220.561	212.534	249.654	3.676	3.542	4.161
AESS-014	1.0368	219.967	211.962	248.982	3.666	3.533	4.150
AESS-015	1.0363	219.861	211.860	248.862	3.664	3.531	4.148
AESS-016	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-017	1.0356	219.712	211.717	248.694	3.662	3.529	4.145
AESS-018	1.0359	219.776	211.778	248.766	3.663	3.530	4.146
AESS-019	1.0349	219.564	211.574	248.526	3.659	3.526	4.142
AESS-020	1.0361	219.818	211.819	248.814	3.664	3.530	4.147
AESS-021	1.0348	219.542	211.553	248.502	3.659	3.526	4.142
AESS-022	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-023	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-024	1.0343	219.436	211.451	248.382	3.657	3.524	4.140
AESS-025	1.0364	219.882	211.880	248.886	3.665	3.531	4.148
AESS-026	1.0336	219.288	211.308	248.214	3.655	3.522	4.137
AESS-027	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-028	1.0366	219.924	211.921	248.934	3.665	3.532	4.149

Attachment II

AESS-029	1.0355	219.691	211.696	248.670	3.662	3.528	4.144
AESS-030	1.0349	219.564	211.574	248.526	3.659	3.526	4.142
AESS-031	1.0343	219.436	211.451	248.382	3.657	3.524	4.140
AESS-032	1.0326	219.076	211.103	247.973	3.651	3.518	4.133
AESS-033	1.0308	218.694	210.735	247.541	3.645	3.512	4.126
AESS-034	1.0314	218.821	210.858	247.685	3.647	3.514	4.128
AESS-035	1.0303	218.588	210.633	247.421	3.643	3.511	4.124
AESS-036	1.0343	219.436	211.451	248.382	3.657	3.524	4.140
AESS-037	1.0353	219.649	211.655	248.622	3.661	3.528	4.144
AESS-038	1.0373	220.073	212.064	249.102	3.668	3.534	4.152
AESS-039	1.0334	219.245	211.267	248.166	3.654	3.521	4.136
AESS-040	1.0346	219.500	211.512	248.454	3.658	3.525	4.141
AESS-041	1.0352	219.627	211.635	248.598	3.660	3.527	4.143



0490
0491

National Institute of Standards & Technology

Certificate

Standard Reference Material 4320A Curium-244 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive curium-244 nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains curium-244 with a total activity of approximately 200 Bq. Curium-244 decays by alpha-particle emission to plutonium-240, which also decays by alpha-particle emission. None of the alpha particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 40 keV to 1100 keV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least February 2006.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
February 1996 (Text only revised November 1997)

Thomas E. Gills, Chief
Standard Reference Materials Program

Recommended Procedure for Opening the SRM Ampoule

- 1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.
- 2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.
- 3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.
- 4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.
- 5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.
- 6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.
- 7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.
- 8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle.
NEVER PIPETTE BY MOUTH
- 9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

PROPERTIES OF SRM 4320A
(Certified values are shown in bold type)

Source identification number	NIST SRM 4320A		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm	
	Wall Thickness	(0.60 ± 0.04) mm	
	Barium content	Less than 2.5%	
	Lead-oxide content	Less than 0.02%	
	Other heavy elements	Trace quantities	
Solution density	(1.030 ± 0.002) g·mL ⁻¹ at 22.8 °C [b]*		
Solution mass	Approximately 5.15 g		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L ⁻¹)	Mass Fraction (g·g ⁻¹)
	H ₂ O	54	0.94
	HNO ₃	1.0	0.06
	HCl	<0.001	<4 × 10 ⁻⁵
	²⁴⁴ Cm +3	5 × 10 ⁻¹¹	1 × 10 ⁻¹¹
Radiological Properties:			
Radionuclide	Curium-244		
Reference time	1230 EST, 1 February 1996 [c]		
Massic activity of the solution [d]	37.06 Bq·g ⁻¹ 24.12 Bq·g ⁻¹		
Relative expanded uncertainty (k=2)	0.68% [e] [f]		
Alpha-particle-emitting daughters	Plutonium-240: (0.22 ± 0.11) Bq·g ⁻¹ [b] [c]		
Alpha-particle-emitting impurities	Curium-243: (0.005 ± 0.004) Bq·g ⁻¹ [b] [g]		
Photon-emitting impurities	None detected [h]		
Half lives used in the decay corrections	Curium-244: (18.10 ± 0.02) a [i] Plutonium-240: (6563 ± 7) a [i]		
Calibration method	Two 4π liquid-scintillation counting systems		

37.06 x 2 2004
6

- [i] The stated uncertainty is the standard uncertainty. See reference [5].
- [j] Relative standard uncertainty of the input quantity x_i .
- [k] The relative change in the output quantity y divided by the relative change in the input quantity x_i . If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y . If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y .
- [m] Relative component of combined standard uncertainty of output quantity y , rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.
- [n] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.
- [p] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$
- [q] The live time is determined by counting the pulses from a gated oscillator.
- [r] The standard uncertainty given is for the detected Cm-243 impurity. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of Cm-244})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of Cm-244})\}$.
- [s] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of Cm-244})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of Cm-244})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

- [1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.
- [2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)
- [3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.
- [4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.
- [5] Evaluated Nuclear Structure Data File (ENSDF), February 1996.



CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

64445-278

Gd-148 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ISOTOPE:	Gd-148
ACTIVITY (dps):	<u>3.759 E3</u>
HALF-LIFE:	<u>74.6 years</u>
CALIBRATION DATE:	September 5, 2002 12:00 EST
TOTAL UNCERTAINTY*:	2.7%
SYSTEMATIC:	1.9%
RANDOM:	0.8%

99% confidence level.

5.08493 grams 0.1M HCl solution.

P O NUMBER 3207RD, Item 1

SOURCE PREPARED BY:

M.D. Currie
M.D. Currie, Radiochemist

Q A APPROVED:

100. [Signature] 9-6-02

25
31
30
31
31
7:

0493



National Institute of Standards & Technology

Certificate

Standard Reference Material 4341 Radioactivity Standard

Radionuclide	Neptunium-237
Source identification	SRM 4341
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule ^{(1)*}
Solution mass	Approximately 5 grams
Solution composition	Neptunium-237 in 2 mol·L ⁻¹ nitric acid
Reference time	March 1992
Radioactivity concentration	97.0 Bq·g ⁻¹
Overall uncertainty	1.28 percent ⁽²⁾
Photon-emitting impurities	None detected ⁽³⁾
Alpha-particle-emitting impurities	None detected ⁽⁴⁾
Half life	(2.14 ± 0.11) × 10 ⁶ years ⁽⁵⁾
Measuring instrument	NIST "0.8π" α defined-solid-angle counter with scintillation detector

This standard reference material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M. Robin Hutchinson, Acting Group Leader.

Gaithersburg, MD
January 1993

William P. Reed, Chief
Standard Reference Materials Program

*Notes on back

NOTES

(1) Approximately five milliliters of solution. Ampoule specifications:

body diameter	16.5 ± 0.5 mm
wall thickness	0.60 ± 0.04 mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

(2) The overall uncertainty was formed by taking three times the quadratic combination of the standard deviations of the mean, or approximations thereof, for the following:

a) alpha-particle-emission-rate measurements	0.34 percent
b) background	0.01 percent
c) livetime	0.10 percent
d) detection efficiency	0.16 percent
e) count-rate-vs-energy extrapolation to zero energy	0.10 percent
f) half life	0.00 percent
g) gravimetric measurements	0.10 percent
h) alpha-emitting impurities	0.10 percent

(3) The protactinium-233 daughter of neptunium-237 is approximately in equilibrium.
The limit of detection for photon-emitting impurities is

$0.19 \text{ } \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 30 and 307 keV and
 $0.01 \text{ } \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 317 and 1750 keV,

provided that the impurity photons are separated in energy by 5 keV or more from photons emitted in the decay of neptunium-237 and progeny.

(4) The limit of detection for alpha-particle-emitting impurities is

$0.10 \text{ } \alpha \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 1.0 and 4.3 MeV and
 $0.05 \text{ } \alpha \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 4.9 and 10 MeV.

(5) Evaluated Nuclear Structure Data File (ENSDF), February 1990.

For further information please contact Dr. J.M. Robin Hutchinson at NIST.
Telephone: (301) 975-5532
FAX: (301) 926-7416

Subsection 1: Energy Calibration

The Energy Calibration energy=Cal_Zero+(e1*C)+(e2*C^2)

where : Cal_Zero = Energy Calibration Zero
 e1 = Energy Calibration Slope
 e2 = Energy Calibration Quadratic
 C = Channel

Instrument : CHAMBER 001
 Detector : 78788
 Calibration Date/Time : 4-SEP-2009 12:35:32
 Calibration Source Id : AESS-001

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.226
NP-237	4341	2/28/10	4768.800	4768.853
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2535.497
 Energy Calibration Slope : 5.123575
 Energy Calibration Quadratic : 3.5177087E-04
 Energy Calibration Range : 8151.000

Instrument : CHAMBER 002
 Detector : 78266
 Calibration Date/Time : 4-SEP-2009 12:35:41
 Calibration Source Id : AESS-002

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3181.913
NP-237	4341	2/28/10	4768.800	4768.018
CM-244	4320A	2/28/10	5795.020	5794.179

Energy/Channel Equation : see above
 Energy Calibration Zero : 2471.037
 Energy Calibration Slope : 5.125078
 Energy Calibration Quadratic : 3.3477767E-04
 Energy Calibration Range : 8070.000

Instrument : CHAMBER 003
 Detector : 67617
 Calibration Date/Time : 4-SEP-2009 12:35:49
 Calibration Source Id : AESS-003

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.431
NP-237	4341	2/28/10	4768.800	4767.487
CM-244	4320A	2/28/10	5795.020	5793.671

Energy/Channel Equation : see above
 Energy Calibration Zero : 2603.599
 Energy Calibration Slope : 5.520661
 Energy Calibration Quadratic : 3.8628373E-04
 Energy Calibration Range : 8662.000

Instrument : CHAMBER 004
 Detector : 64279
 Calibration Date/Time : 4-SEP-2009 12:35:56
 Calibration Source Id : AESS-004
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.248
 NP-237 4341 2/28/10 4768.800 4768.163
 CM-244 4320A 2/28/10 5795.020 5794.666
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2539.883
 Energy Calibration Slope : 5.106114
 Energy Calibration Quadratic : 3.6220285E-04
 Energy Calibration Range : 8148.000

Instrument : CHAMBER 005
 Detector : 67612
 Calibration Date/Time : 4-SEP-2009 12:36:04
 Calibration Source Id : AESS-005
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.596
 NP-237 4341 2/28/10 4768.800 4768.626
 CM-244 4320A 2/28/10 5795.020 5794.885
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2389.695
 Energy Calibration Slope : 5.003819
 Energy Calibration Quadratic : 3.1809139E-04
 Energy Calibration Range : 7847.000

Instrument : CHAMBER 006
 Detector : 67613
 Calibration Date/Time : 4-SEP-2009 12:36:12
 Calibration Source Id : AESS-006
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.970
 CM-244 4320A 2/28/10 5795.020 5795.230
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2372.089
 Energy Calibration Slope : 4.968963
 Energy Calibration Quadratic : 2.9746475E-04
 Energy Calibration Range : 7772.000

Instrument : CHAMBER 007
 Detector : 67607
 Calibration Date/Time : 4-SEP-2009 12:36:20
 Calibration Source Id : AESS-007

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3194.223
NP-237	4341	2/28/10	4768.800	4774.131
CM-244	4320A	2/28/10	5795.020	5795.286

Energy/Channel Equation : see above
 Energy Calibration Zero : 2411.533
 Energy Calibration Slope : 5.136289
 Energy Calibration Quadratic : 3.6015504E-04
 Energy Calibration Range : 8049.000

Instrument : CHAMBER 008
 Detector : 78788
 Calibration Date/Time : 4-SEP-2009 12:36:40
 Calibration Source Id : AESS-008

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.947
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2374.892
 Energy Calibration Slope : 4.958869
 Energy Calibration Quadratic : 3.2790817E-04
 Energy Calibration Range : 7797.000

Instrument : CHAMBER 009
 Detector : 72528
 Calibration Date/Time : 4-SEP-2009 12:36:51
 Calibration Source Id : AESS-009

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.331
NP-237	4341	2/28/10	4768.800	4768.908
CM-244	4320A	2/28/10	5795.020	5795.229

Energy/Channel Equation : see above
 Energy Calibration Zero : 2369.859
 Energy Calibration Slope : 4.969983
 Energy Calibration Quadratic : 3.0930861E-04
 Energy Calibration Range : 7783.000

Instrument : CHAMBER 010
 Detector : 72529
 Calibration Date/Time : 4-SEP-2009 12:37:00
 Calibration Source Id : AESS-010
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.738
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2375.295
 Energy Calibration Slope : 4.946028
 Energy Calibration Quadratic : 2.9286626E-04
 Energy Calibration Range : 7747.000

Instrument : CHAMBER 011
 Detector : 72531
 Calibration Date/Time : 4-SEP-2009 12:37:27
 Calibration Source Id : AESS-011
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.151
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2351.281
 Energy Calibration Slope : 4.995483
 Energy Calibration Quadratic : 3.1063837E-04
 Energy Calibration Range : 7792.000

Instrument : CHAMBER 012
 Detector : 67594
 Calibration Date/Time : 4-SEP-2009 12:37:37
 Calibration Source Id : AESS-012
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.665
 CM-244 4320A 2/28/10 5795.020 5794.701
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2380.536
 Energy Calibration Slope : 4.954679
 Energy Calibration Quadratic : 2.8732172E-04
 Energy Calibration Range : 7755.000

Instrument : CHAMBER 013
 Detector : 78790
 Calibration Date/Time : 4-SEP-2009 12:37:47
 Calibration Source Id : AESS-013

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.702
NP-237	4341	2/28/10	4768.800	4769.527
CM-244	4320A	2/28/10	5795.020	5795.398

Energy/Channel Equation : see above
 Energy Calibration Zero : 2358.963
 Energy Calibration Slope : 4.909760
 Energy Calibration Quadratic : 2.9884593E-04
 Energy Calibration Range : 7700.000

Instrument : CHAMBER 014
 Detector : 67616
 Calibration Date/Time : 4-SEP-2009 12:37:57
 Calibration Source Id : AESS-014

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.690
NP-237	4341	2/28/10	4768.800	4768.619
CM-244	4320A	2/28/10	5795.020	5794.719

Energy/Channel Equation : see above
 Energy Calibration Zero : 2351.225
 Energy Calibration Slope : 4.953602
 Energy Calibration Quadratic : 3.2283107E-04
 Energy Calibration Range : 7762.000

Instrument : CHAMBER 015
 Detector : 61581
 Calibration Date/Time : 4-SEP-2009 12:38:32
 Calibration Source Id : AESS-015

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.566
NP-237	4341	2/28/10	4768.800	4769.887
CM-244	4320A	2/28/10	5795.020	5795.771

Energy/Channel Equation : see above
 Energy Calibration Zero : 2340.391
 Energy Calibration Slope : 4.902360
 Energy Calibration Quadratic : 2.9459049E-04
 Energy Calibration Range : 7669.000

Instrument : CHAMBER 016
 Detector : 78774
 Calibration Date/Time : 4-SEP-2009 12:39:14
 Calibration Source Id : AESS-016

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.862
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2352.881
 Energy Calibration Slope : 4.887459
 Energy Calibration Quadratic : 3.1538753E-04
 Energy Calibration Range : 7688.000

Instrument : CHAMBER 017
 Detector : 78791
 Calibration Date/Time : 4-SEP-2009 12:39:56
 Calibration Source Id : AESS-017

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.864
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2360.881
 Energy Calibration Slope : 4.992493
 Energy Calibration Quadratic : 2.7980251E-04
 Energy Calibration Range : 7767.000

Instrument : CHAMBER 018
 Detector : 78782
 Calibration Date/Time : 4-SEP-2009 12:40:11
 Calibration Source Id : AESS-018

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5794.892

Energy/Channel Equation : see above
 Energy Calibration Zero : 2354.269
 Energy Calibration Slope : 4.957198
 Energy Calibration Quadratic : 3.2317592E-04
 Energy Calibration Range : 7769.000

Instrument : CHAMBER 019
 Detector : 78786
 Calibration Date/Time : 4-SEP-2009 12:40:24
 Calibration Source Id : AESS-019

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.321
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.765
 Energy Calibration Slope : 5.052913
 Energy Calibration Quadratic : 2.4091676E-04
 Energy Calibration Range : 7774.000

Instrument : CHAMBER 020
 Detector : 78787
 Calibration Date/Time : 4-SEP-2009 12:40:33
 Calibration Source Id : AESS-020

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.527
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2338.013
 Energy Calibration Slope : 4.982131
 Energy Calibration Quadratic : 2.9908412E-04
 Energy Calibration Range : 7753.000

Instrument : CHAMBER 021
 Detector : 67047
 Calibration Date/Time : 4-SEP-2009 12:40:41
 Calibration Source Id : AESS-021

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2273.506
 Energy Calibration Slope : 4.978734
 Energy Calibration Quadratic : 2.7200553E-04
 Energy Calibration Range : 7657.000

Instrument : CHAMBER 022
 Detector : 72530
 Calibration Date/Time : 4-SEP-2009 12:40:50
 Calibration Source Id : AESS-022

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.361
NP-237	4341	2/28/10	4768.800	4769.133
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2375.240
 Energy Calibration Slope : 4.980961
 Energy Calibration Quadratic : 2.7447013E-04
 Energy Calibration Range : 7764.000

Instrument : CHAMBER 023
 Detector : 78264
 Calibration Date/Time : 4-SEP-2009 12:40:59
 Calibration Source Id : AESS-023

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.015
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5794.708

Energy/Channel Equation : see above
 Energy Calibration Zero : 2381.774
 Energy Calibration Slope : 5.002218
 Energy Calibration Quadratic : 2.9209474E-04
 Energy Calibration Range : 7810.000

Instrument : CHAMBER 024
 Detector : 76542
 Calibration Date/Time : 4-SEP-2009 12:41:10
 Calibration Source Id : AESS-024

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2348.764
 Energy Calibration Slope : 4.960187
 Energy Calibration Quadratic : 2.8149344E-04
 Energy Calibration Range : 7723.000

Instrument : CHAMBER 025
 Detector : 45-149AA5
 Calibration Date/Time : 5-SEP-2009 13:36:12
 Calibration Source Id : AESS-025

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.301
NP-237	4341	2/28/10	4768.800	4769.169
CM-244	4320A	2/28/10	5795.020	5795.134

Energy/Channel Equation : see above
 Energy Calibration Zero : 2313.345
 Energy Calibration Slope : 4.853284
 Energy Calibration Quadratic : 3.0770546E-04
 Energy Calibration Range : 7606.000

Instrument : CHAMBER 026
 Detector : 78204
 Calibration Date/Time : 5-SEP-2009 13:36:22
 Calibration Source Id : AESS-026

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.929
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2358.057
 Energy Calibration Slope : 4.920322
 Energy Calibration Quadratic : 3.5937896E-04
 Energy Calibration Range : 7773.000

Instrument : CHAMBER 027
 Detector : 42484
 Calibration Date/Time : 5-SEP-2009 13:36:31
 Calibration Source Id : AESS-027

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.819
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2363.651
 Energy Calibration Slope : 4.963936
 Energy Calibration Quadratic : 3.2873321E-04
 Energy Calibration Range : 7791.000

Instrument : CHAMBER 028
 Detector : 78792
 Calibration Date/Time : 5-SEP-2009 13:36:41
 Calibration Source Id : AESS-028

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.019

Energy/Channel Equation : see above
 Energy Calibration Zero : 2311.599
 Energy Calibration Slope : 4.936965
 Energy Calibration Quadratic : 3.4681335E-04
 Energy Calibration Range : 7731.000

Instrument : CHAMBER 029
 Detector : 33454
 Calibration Date/Time : 5-SEP-2009 13:36:49
 Calibration Source Id : AESS-029

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.046
NP-237	4341	2/28/10	4768.800	4768.273
CM-244	4320A	2/28/10	5795.020	5794.838

Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.906
 Energy Calibration Slope : 4.889407
 Energy Calibration Quadratic : 2.9813289E-04
 Energy Calibration Range : 7666.000

Instrument : CHAMBER 030
 Detector : 33447
 Calibration Date/Time : 5-SEP-2009 13:36:58
 Calibration Source Id : AESS-030

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2376.621
 Energy Calibration Slope : 4.959564
 Energy Calibration Quadratic : 3.0966211E-04
 Energy Calibration Range : 7780.000

Instrument : CHAMBER 031
 Detector : 67042
 Calibration Date/Time : 5-SEP-2009 13:37:09
 Calibration Source Id : AESS-031

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.344
NP-237	4341	2/28/10	4768.800	4769.750
CM-244	4320A	2/28/10	5795.020	5795.848

Energy/Channel Equation : see above
 Energy Calibration Zero : 2358.347
 Energy Calibration Slope : 4.922678
 Energy Calibration Quadratic : 3.3807335E-04
 Energy Calibration Range : 7754.000

Instrument : CHAMBER 032
 Detector : 67041
 Calibration Date/Time : 5-SEP-2009 13:37:21
 Calibration Source Id : AESS-032

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3082.708
NP-237	4341	2/28/10	4768.800	4596.952
CM-244	4320A	2/28/10	5795.020	5590.557

Energy/Channel Equation : see above
 Energy Calibration Zero : 2480.957
 Energy Calibration Slope : 5.431309
 Energy Calibration Quadratic :
 Energy Calibration Range : 8043.000

Instrument : CHAMBER 033
 Detector : 78785
 Calibration Date/Time : 5-SEP-2009 13:37:30
 Calibration Source Id : AESS-033

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.293
NP-237	4341	2/28/10	4768.800	4768.798
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2371.628
 Energy Calibration Slope : 4.957000
 Energy Calibration Quadratic : 3.2105893E-04
 Energy Calibration Range : 7784.000

Instrument : CHAMBER 034
 Detector : 61586
 Calibration Date/Time : 5-SEP-2009 13:37:40
 Calibration Source Id : AESS-034

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3048.128
NP-237	4341	2/28/10	4768.800	4505.317
CM-244	4320A	2/28/10	5795.020	5654.358

Energy/Channel Equation : see above
 Energy Calibration Zero : 2505.085
 Energy Calibration Slope : 5.306273
 Energy Calibration Quadratic :
 Energy Calibration Range : 7939.000

Instrument : CHAMBER 035
 Detector : 78202
 Calibration Date/Time : 5-SEP-2009 13:37:51
 Calibration Source Id : AESS-035

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.195
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2331.502
 Energy Calibration Slope : 4.956956
 Energy Calibration Quadratic : 3.3284936E-04
 Energy Calibration Range : 7756.000

Instrument : CHAMBER 036
 Detector : 78203
 Calibration Date/Time : 5-SEP-2009 13:38:00
 Calibration Source Id : AESS-036

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.261
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.112

Energy/Channel Equation : see above
 Energy Calibration Zero : 2349.949
 Energy Calibration Slope : 4.931112
 Energy Calibration Quadratic : 3.3396695E-04
 Energy Calibration Range : 7750.000

Instrument : CHAMBER 037
 Detector : 45-149BB5
 Calibration Date/Time : 5-SEP-2009 13:38:11
 Calibration Source Id : AESS-037

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4769.328
CM-244	4320A	2/28/10	5795.020	5795.274

Energy/Channel Equation : see above
 Energy Calibration Zero : 2377.698
 Energy Calibration Slope : 4.936130
 Energy Calibration Quadratic : 2.6397177E-04
 Energy Calibration Range : 7709.000

Instrument : CHAMBER 038
 Detector : 72532
 Calibration Date/Time : 5-SEP-2009 13:38:20
 Calibration Source Id : AESS-038

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.173

Energy/Channel Equation : see above
 Energy Calibration Zero : 2373.418
 Energy Calibration Slope : 4.945736
 Energy Calibration Quadratic : 3.1779311E-04
 Energy Calibration Range : 7771.000

Instrument : CHAMBER 039
 Detector : 45-149BB2
 Calibration Date/Time : 5-SEP-2009 13:38:28
 Calibration Source Id : AESS-039

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.413
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2383.597
 Energy Calibration Slope : 4.901721
 Energy Calibration Quadratic : 3.2673960E-04
 Energy Calibration Range : 7746.000

Instrument : CHAMBER 040
 Detector : 78773
 Calibration Date/Time : 5-SEP-2009 13:38:36
 Calibration Source Id : AESS-040
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.203
 NP-237 4341 2/28/10 4768.800 4768.877
 CM-244 4320A 2/28/10 5795.020 5795.021

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2349.601
 Energy Calibration Slope : 4.890684
 Energy Calibration Quadratic : 3.3607692E-04
 Energy Calibration Range : 7710.000

Instrument : CHAMBER 041
 Detector : 78205
 Calibration Date/Time : 5-SEP-2009 13:38:44
 Calibration Source Id : AESS-041
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.316
 NP-237 4341 2/28/10 4768.800 4768.914
 CM-244 4320A 2/28/10 5795.020 5795.124

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2359.603
 Energy Calibration Slope : 4.927306
 Energy Calibration Quadratic : 3.6796945E-04
 Energy Calibration Range : 7791.000

Instrument : CHAMBER 042
 Detector : 78793
 Calibration Date/Time : 5-SEP-2009 13:38:52
 Calibration Source Id : AESS-042
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.945
 CM-244 4320A 2/28/10 5795.020 5795.068

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2375.562
 Energy Calibration Slope : 4.905127
 Energy Calibration Quadratic : 3.3096116E-04
 Energy Calibration Range : 7745.000

Instrument : CHAMBER 043
 Detector : 76543
 Calibration Date/Time : 5-SEP-2009 13:38:59
 Calibration Source Id : AESS-043

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.008
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.285

Energy/Channel Equation : see above
 Energy Calibration Zero : 2370.828
 Energy Calibration Slope : 4.912446
 Energy Calibration Quadratic : 3.4794814E-04
 Energy Calibration Range : 7766.000

Instrument : CHAMBER 044
 Detector : 79459
 Calibration Date/Time : 5-SEP-2009 13:39:07
 Calibration Source Id : AESS-044

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.899
CM-244	4320A	2/28/10	5795.020	5795.019

Energy/Channel Equation : see above
 Energy Calibration Zero : 2357.678
 Energy Calibration Slope : 4.935909
 Energy Calibration Quadratic : 3.3428424E-04
 Energy Calibration Range : 7763.000

Instrument : CHAMBER 045
 Detector : 78783
 Calibration Date/Time : 5-SEP-2009 13:39:15
 Calibration Source Id : AESS-045

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2362.021
 Energy Calibration Slope : 4.936533
 Energy Calibration Quadratic : 3.2874785E-04
 Energy Calibration Range : 7762.000

Instrument : CHAMBER 046
 Detector : 76544
 Calibration Date/Time : 5-SEP-2009 13:39:23
 Calibration Source Id : AESS-046
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.265
 NP-237 4341 2/28/10 4768.800 4768.973
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2361.969
 Energy Calibration Slope : 4.880176
 Energy Calibration Quadratic : 3.5064379E-04
 Energy Calibration Range : 7727.000

Instrument : CHAMBER 047
 Detector : 46-089B1
 Calibration Date/Time : 5-SEP-2009 13:39:31
 Calibration Source Id : AESS-047
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.348
 NP-237 4341 2/28/10 4768.800 4768.802
 CM-244 4320A 2/28/10 5795.020 5795.019
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2352.118
 Energy Calibration Slope : 4.961685
 Energy Calibration Quadratic : 3.1629670E-04
 Energy Calibration Range : 7765.000

Instrument : CHAMBER 048
 Detector : 42483
 Calibration Date/Time : 5-SEP-2009 13:39:40
 Calibration Source Id : AESS-048
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.138
 NP-237 4341 2/28/10 4768.800 4768.944
 CM-244 4320A 2/28/10 5795.020 5795.069
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2374.542
 Energy Calibration Slope : 4.945658
 Energy Calibration Quadratic : 2.9861915E-04
 Energy Calibration Range : 7752.000

Subsection 2: Background Calibration

Instrument : CHAMBER 001
 Detector : 78788
 Background Analysis Date/Time : 30-AUG-2009 16:15:10
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.095	3301.491	2.000000	0.4800001	70.71068	95.00000
NP-237	4436.328	4901.460	12.00000	2.880001	28.86751	95.00000
CM-244	5531.570	5886.270	6.000000	1.440000	40.82483	95.00000

Instrument : CHAMBER 002
 Detector : 78266
 Background Analysis Date/Time : 30-AUG-2009 16:15:10
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.085	3299.620	1.000000	0.2400001	100.0000	95.00000
NP-237	4434.644	4904.846	7.000000	1.680000	37.79645	95.00000
CM-244	5534.154	5882.659	0.000000E+00	0.000000E+00	0.000000E+00	95.00000

Instrument : CHAMBER 003
 Detector : 67617
 Background Analysis Date/Time : 30-AUG-2009 16:15:10
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.938	3299.717	3.000000	0.7200001	57.73503	95.00000
NP-237	4432.844	4902.827	10.00000	2.400001	31.62278	95.00000
CM-244	5531.440	5887.803	4.000000	0.9600002	50.00000	95.00000

Instrument : CHAMBER 004
 Detector : 64279
 Background Analysis Date/Time : 30-AUG-2009 16:15:10
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.026	3298.308	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4435.760	4905.548	7.000000	1.680000	37.79645	95.00000
CM-244	5534.947	5883.809	2.000000	0.4800001	70.71068	95.00000

Instrument : CHAMBER 005
 Detector : 67612
 Background Analysis Date/Time : 30-AUG-2009 16:15:10
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.654	3300.689	4.000000	0.9600002	50.00000	95.00000
NP-237	4436.859	4901.997	5.000000	1.200000	44.72136	95.00000
CM-244	5533.435	5885.045	2.000000	0.4800001	70.71068	95.00000

Instrument : CHAMBER 006
 Detector : 67613
 Background Analysis Date/Time : 30-AUG-2009 16:15:10
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.771	3301.528	3.000000	0.7200001	57.73503	95.00000
NP-237	4433.310	4904.612	10.00000	2.400001	31.62278	95.00000
CM-244	5535.175	5883.158	9.000000	2.160001	33.33334	95.00000

Instrument : CHAMBER 007
 Detector : 67607
 Background Analysis Date/Time : 30-AUG-2009 16:15:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.315	3300.370	2.000000	0.4799997	70.71068	95.00000
NP-237	4436.975	4905.147	7.000000	1.679999	37.79645	95.00000
CM-244	5533.959	5885.477	23.00000	5.519996	20.85144	95.00000

Instrument : CHAMBER 008
 Detector : 78788
 Background Analysis Date/Time : 30-AUG-2009 16:15:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.794	3298.426	2.000000	0.4799997	70.71068	95.00000
NP-237	4437.020	4904.595	6.000000	1.439999	40.82483	95.00000
CM-244	5532.536	5882.336	4.000000	0.9599993	50.00000	95.00000

Instrument : CHAMBER 009
 Detector : 72528
 Background Analysis Date/Time : 30-AUG-2009 16:15:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.892	3299.892	4.000000	0.9599993	50.00000	95.00000
NP-237	4433.436	4905.789	10.00000	2.399998	31.62278	95.00000
CM-244	5532.687	5887.081	9.000000	2.159998	33.33334	95.00000

Instrument : CHAMBER 010
 Detector : 72529
 Background Analysis Date/Time : 30-AUG-2009 16:15:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.087	3300.334	3.000000	0.7199995	57.73503	95.00000
NP-237	4436.842	4905.812	6.000000	1.439999	40.82483	95.00000
CM-244	5533.178	5884.706	6.000000	1.439999	40.82483	95.00000

Instrument : CHAMBER 011
 Detector : 72531
 Background Analysis Date/Time : 30-AUG-2009 16:15:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.718	3301.411	3.000000	0.7199995	57.73503	95.00000
NP-237	4435.900	4905.463	15.00000	3.599998	25.81989	95.00000
CM-244	5535.617	5886.431	10.00000	2.399998	31.62278	95.00000

Instrument : CHAMBER 012
 Detector : 67594
 Background Analysis Date/Time : 30-AUG-2009 16:15:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.283	3301.924	2.000000	0.4799997	70.71068	95.00000
NP-237	4434.309	4903.502	10.00000	2.399998	31.62278	95.00000
CM-244	5531.028	5882.575	10.00000	2.399998	31.62278	95.00000

Instrument : CHAMBER 013
 Detector : 78790
 Background Analysis Date/Time : 30-AUG-2009 16:15:12
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.309	3297.583	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4432.512	4904.184	11.00000	2.640001	30.15113	95.00000
CM-244	5533.734	5883.657	4.000000	0.9600002	50.00000	95.00000

Instrument : CHAMBER 014
 Detector : 67616
 Background Analysis Date/Time : 30-AUG-2009 16:15:12
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.575	3298.988	3.000000	0.7200001	57.73503	95.00000
NP-237	4436.470	4903.458	8.000000	1.920000	35.35534	95.00000
CM-244	5530.496	5885.133	26.00000	6.240001	19.61161	95.00000

Instrument : CHAMBER 015
 Detector : 61581
 Background Analysis Date/Time : 30-AUG-2009 16:15:12
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.656	3297.520	3.000000	0.7200001	57.73503	95.00000
NP-237	4435.901	4901.612	9.000000	2.160001	33.33334	95.00000
CM-244	5535.255	5884.514	26.00000	6.240001	19.61161	95.00000

Instrument : CHAMBER 016
 Detector : 78774
 Background Analysis Date/Time : 30-AUG-2009 16:15:12
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.611	3297.891	1.000000	0.2400001	100.0000	95.00000
NP-237	4435.494	4901.479	2.000000	0.4800001	70.71068	95.00000
CM-244	5530.741	5886.030	3.000000	0.7200001	57.73503	95.00000

Instrument : CHAMBER 017
 Detector : 78791
 Background Analysis Date/Time : 30-AUG-2009 16:15:12
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.315	3299.165	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4433.955	4905.994	7.000000	1.680000	37.79645	95.00000
CM-244	5531.756	5885.157	1.000000	0.2400001	100.0000	95.00000

Instrument : CHAMBER 018
 Detector : 78782
 Background Analysis Date/Time : 30-AUG-2009 16:15:12
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.045	3297.645	5.000000	1.200000	44.72136	95.00000
NP-237	4435.824	4903.103	6.000000	1.440000	40.82483	95.00000
CM-244	5530.534	5885.395	5.000000	1.200000	44.72136	95.00000

Instrument : CHAMBER 019
 Detector : 78786
 Background Analysis Date/Time : 30-AUG-2009 16:15:13
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.371	3300.084	2.000000	0.4800001	70.71068	95.00000
NP-237	4432.711	4901.697	6.000000	1.440000	40.82483	95.00000
CM-244	5534.730	5883.386	3.000000	0.7200001	57.73503	95.00000

Instrument : CHAMBER 020
 Detector : 78787
 Background Analysis Date/Time : 30-AUG-2009 16:15:13
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.745	3300.511	3.000000	0.7200001	57.73503	95.00000
NP-237	4436.191	4903.850	11.00000	2.640001	30.15113	95.00000
CM-244	5531.198	5885.719	4.000000	0.9600002	50.00000	95.00000

Instrument : CHAMBER 021
 Detector : 67047
 Background Analysis Date/Time : 30-AUG-2009 16:15:13
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.027	3300.488	2.000000	0.4800001	70.71068	95.00000
NP-237	4433.390	4904.438	6.000000	1.440000	40.82483	95.00000
CM-244	5534.035	5886.544	16.00000	3.840001	25.00000	95.00000

Instrument : CHAMBER 022
 Detector : 72530
 Background Analysis Date/Time : 30-AUG-2009 16:15:13
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.050	3301.029	39.00000	9.360003	16.01282	95.00000
NP-237	4437.549	4902.815	18.00000	4.320001	23.57022	95.00000
CM-244	5531.706	5883.854	12.00000	2.880001	28.86751	95.00000

Instrument : CHAMBER 023
 Detector : 78264
 Background Analysis Date/Time : 30-AUG-2009 16:15:13
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.319	3301.853	1.000000	0.2400001	100.0000	95.00000
NP-237	4434.632	4902.993	6.000000	1.440000	40.82483	95.00000
CM-244	5531.100	5885.960	8.000000	1.920000	35.35534	95.00000

Instrument : CHAMBER 024
 Detector : 76542
 Background Analysis Date/Time : 30-AUG-2009 16:15:13
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.280	3301.361	1.000000	0.2400001	100.0000	95.00000
NP-237	4434.951	4904.473	14.00000	3.360001	26.72612	95.00000
CM-244	5532.286	5883.922	5.000000	1.200000	44.72136	95.00000

Instrument : CHAMBER 025
 Detector : 45-149AA5
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.958	3301.287	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4436.686	4904.740	7.000000	1.680000	37.79645	95.00000
CM-244	5534.991	5882.562	76.00000	18.24000	11.47079	95.00000

Instrument : CHAMBER 026
 Detector : 78204
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.735	3300.836	2.000000	0.4800001	70.71068	95.00000
NP-237	4435.801	4902.784	4.000000	0.9600002	50.00000	95.00000
CM-244	5530.708	5886.284	60.00000	14.40000	12.90994	95.00000

Instrument : CHAMBER 027
 Detector : 42484
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.280	3298.316	9.000000	2.160000	33.33334	95.00000
NP-237	4433.196	4906.637	9.000000	2.160000	33.33334	95.00000
CM-244	5535.439	5885.723	61.00000	14.64000	12.80369	95.00000

Instrument : CHAMBER 028
 Detector : 78792
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.441	3297.640	2.000000	0.4800001	70.71068	95.00000
NP-237	4435.847	4903.788	13.00000	3.120001	27.73501	95.00000
CM-244	5532.676	5883.223	65.00000	15.60000	12.40347	95.00000

Instrument : CHAMBER 029
 Detector : 33454
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.567	3301.667	2.000000	0.4800001	70.71068	95.00000
NP-237	4432.493	4902.470	13.000000	3.120001	27.73501	95.00000
CM-244	5535.032	5883.746	87.000000	20.88000	10.72113	95.00000

Instrument : CHAMBER 030
 Detector : 33447
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.332	3299.665	1.000000	0.2400000	100.0000	95.00000
NP-237	4436.037	4902.215	13.000000	3.120001	27.73501	95.00000
CM-244	5533.195	5886.933	97.000000	23.28000	10.15346	95.00000

Instrument : CHAMBER 031
 Detector : 67042
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.980	3300.809	8.000000	1.919999	35.35534	95.00000
NP-237	4433.475	4904.204	10.000000	2.399998	31.62278	95.00000
CM-244	5535.021	5883.627	87.000000	20.87999	10.72113	95.00000

Instrument : CHAMBER 032
 Detector : 67041
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.500	3301.085	2.000000	0.4799997	70.71068	95.00000
NP-237	4436.228	4903.321	14.000000	3.359998	26.72612	95.00000
CM-244	5533.353	5886.388	25.000000	5.999996	20.00000	95.00000

Instrument : CHAMBER 033
 Detector : 78785
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.232	3299.661	3.000000	0.7199996	57.73503	95.00000
NP-237	4437.092	4904.010	7.000000	1.679999	37.79645	95.00000
CM-244	5530.913	5885.453	49.00000	11.75999	14.28572	95.00000

Instrument : CHAMBER 034
 Detector : 61586
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.956	3301.026	2.000000	0.4799997	70.71068	95.00000
NP-237	4436.568	4903.521	30.00000	7.199996	18.25742	95.00000
CM-244	5534.967	5885.181	31.00000	7.439995	17.96053	95.00000

Instrument : CHAMBER 035
 Detector : 78202
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.620	3300.593	2.000000	0.4799997	70.71068	95.00000
NP-237	4435.499	4903.774	16.00000	3.839998	25.00000	95.00000
CM-244	5532.763	5883.199	70.00000	16.79999	11.95229	95.00000

Instrument : CHAMBER 036
 Detector : 78203
 Background Analysis Date/Time : 30-AUG-2009 16:15:14
 Background Count Time : 59999.99

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.620	3298.917	2.000000	0.4799997	70.71068	95.00000
NP-237	4433.050	4904.263	7.000000	1.679999	37.79645	95.00000
CM-244	5535.616	5884.466	51.00000	12.23999	14.00280	95.00000

Instrument : CHAMBER 037
 Detector : 45-149BB5
 Background Analysis Date/Time : 30-AUG-2009 16:15:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.836	3299.917	5.000000	1.199999	44.72136	95.00000
NP-237	4435.582	4906.557	19.00000	4.559997	22.94157	95.00000
CM-244	5534.307	5882.810	72.00000	17.27999	11.78511	95.00000

Instrument : CHAMBER 038
 Detector : 72532
 Background Analysis Date/Time : 30-AUG-2009 16:15:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.576	3299.256	2.000000	0.4799997	70.71068	95.00000
NP-237	4433.771	4904.686	10.00000	2.399998	31.62278	95.00000
CM-244	5535.244	5883.467	79.00000	18.95999	11.25088	95.00000

Instrument : CHAMBER 039
 Detector : 45-149BB2
 Background Analysis Date/Time : 30-AUG-2009 16:15:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.453	3301.599	1.000000	0.2399998	100.0000	95.00000
NP-237	4432.722	4905.688	12.00000	2.879998	28.86751	95.00000
CM-244	5532.346	5883.894	84.00000	20.15999	10.91089	95.00000

Instrument : CHAMBER 040
 Detector : 78773
 Background Analysis Date/Time : 30-AUG-2009 16:15:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.070	3301.002	6.000000	1.439999	40.82483	95.00000
NP-237	4437.116	4905.104	4.000000	0.9599993	50.00000	95.00000
CM-244	5532.249	5884.180	66.00000	15.83999	12.30915	95.00000

Instrument : CHAMBER 041
 Detector : 78205
 Background Analysis Date/Time : 30-AUG-2009 16:15:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.305	3298.942	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4436.425	4904.659	10.00000	2.399998	31.62278	95.00000
CM-244	5534.452	5885.748	82.00000	19.67999	11.04315	95.00000

Instrument : CHAMBER 042
 Detector : 78793
 Background Analysis Date/Time : 30-AUG-2009 16:15:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.887	3299.366	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4437.123	4905.630	11.00000	2.639998	30.15113	95.00000
CM-244	5533.333	5885.512	81.00000	19.43999	11.11111	95.00000

Instrument : CHAMBER 043
 Detector : 76543
 Background Analysis Date/Time : 30-AUG-2009 16:15:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.321	3301.623	1.000000	0.2400000	100.0000	95.00000
NP-237	4433.027	4903.519	5.000000	1.200000	44.72136	95.00000
CM-244	5534.268	5882.956	61.00000	14.64000	12.80369	95.00000

Instrument : CHAMBER 044
 Detector : 79459
 Background Analysis Date/Time : 30-AUG-2009 16:15:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.930	3302.506	5.000000	1.200000	44.72136	95.00000
NP-237	4437.594	4903.934	14.00000	3.360001	26.72612	95.00000
CM-244	5530.392	5884.844	80.00000	19.20000	11.18034	95.00000

Instrument : CHAMBER 045
 Detector : 78783
 Background Analysis Date/Time : 30-AUG-2009 16:15:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.243	3301.709	2.000000	0.4800001	70.71068	95.00000
NP-237	4436.057	4901.945	5.000000	1.200000	44.72136	95.00000
CM-244	5533.013	5887.031	74.00000	17.76000	11.62476	95.00000

Instrument : CHAMBER 046
 Detector : 76544
 Background Analysis Date/Time : 30-AUG-2009 16:15:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.377	3301.861	2.000000	0.4800001	70.71068	95.00000
NP-237	4437.291	4905.414	7.000000	1.680000	37.79645	95.00000
CM-244	5533.098	5885.505	74.00000	17.76000	11.62476	95.00000

Instrument : CHAMBER 047
 Detector : 46-089B1
 Background Analysis Date/Time : 30-AUG-2009 16:15:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.396	3301.175	5.000000	1.200000	44.72136	95.00000
NP-237	4434.358	4901.480	17.00000	4.080001	24.25356	95.00000
CM-244	5533.889	5883.104	83.00000	19.92000	10.97643	95.00000

Instrument : CHAMBER 048
 Detector : 42483
 Background Analysis Date/Time : 30-AUG-2009 16:15:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.395	3299.708	1.000000	0.2400000	100.0000	95.00000
NP-237	4436.890	4906.295	16.00000	3.840001	25.00000	95.00000
CM-244	5534.380	5886.375	85.00000	20.40000	10.84652	95.00000

Subsection 3: Efficiency Calibration

Instrument : CHAMBER 001
 Detector : 78788
 Standard ID : AESS-001
 Standard Reference Date : 20-FEB-2008 09:54:53
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:39
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:35:32
 Average Efficiency : 0.3122659
 Average Efficiency Error : 8.6114258E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	208.6698	28-FEB-2010	2989.095	3301.491	15006.00	0.3039177	1.3064248E-02	58.79536
NP-237	171.0024	28-FEB-2010	4436.328	4901.460	12916.00	0.3146430	1.5974019E-02	71.14886
CM-244	158.1060	28-FEB-2010	5531.570	5886.270	11555.00	0.3229480	1.6424600E-02	57.32594

Instrument : CHAMBER 002
 Detector : 78266
 Standard ID : AESS-002
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:39
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:35:41
 Average Efficiency : 0.3090980
 Average Efficiency Error : 8.5114390E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.1144	28-FEB-2010	2992.085	3299.620	14650.00	0.3094049	1.3305944E-02	45.54427
NP-237	200.4990	28-FEB-2010	4434.644	4904.846	15015.00	0.3119993	1.5806440E-02	68.48380
CM-244	196.5558	28-FEB-2010	5534.154	5882.659	13603.00	0.3058844	1.5517467E-02	51.44160

Instrument : CHAMBER 003
 Detector : 67617
 Standard ID : AESS-003
 Standard Reference Date : 15-FEB-2008 13:12:27
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:39
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:35:49
 Average Efficiency : 0.3361934
 Average Efficiency Error : 9.2456024E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.9740	28-FEB-2010	2991.938	3299.717	15919.00	0.3314925	1.4234867E-02	68.71011
NP-237	203.2080	28-FEB-2010	4432.844	4902.827	16799.00	0.3444051	1.7424129E-02	74.30300
CM-244	197.2236	28-FEB-2010	5531.440	5887.803	14947.00	0.3350840	1.6976947E-02	62.51212

Instrument : CHAMBER 004
 Detector : 64279
 Standard ID : AESS-004
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:39
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:35:56
 Average Efficiency : 0.3331009
 Average Efficiency Error : 9.1593768E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.1222	28-FEB-2010	2992.026	3298.308	16101.00	0.3301861	1.4176016E-02	53.22534
NP-237	204.2586	28-FEB-2010	4435.760	4905.548	16353.00	0.3335505	1.6880305E-02	62.94835
CM-244	198.8100	28-FEB-2010	5534.947	5883.809	15145.00	0.3368652	1.7064264E-02	54.23564

Instrument : CHAMBER 005
 Detector : 67612
 Standard ID : AESS-005
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:39
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:36:04
 Average Efficiency : 0.2950116
 Average Efficiency Error : 8.1236903E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	210.7452	28-FEB-2010	2989.654	3300.689	14685.00	0.2945226	1.2665418E-02	52.17361
NP-237	209.5938	28-FEB-2010	4436.859	4901.997	14804.00	0.2942757	1.4911278E-02	59.02256
CM-244	202.7478	28-FEB-2010	5533.435	5885.045	13592.00	0.2964495	1.5039029E-02	52.51872

Instrument : CHAMBER 006
 Detector : 67613
 Standard ID : AESS-006
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:39
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:36:12
 Average Efficiency : 0.3072436
 Average Efficiency Error : 8.4615378E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.6952	28-FEB-2010	2987.771	3301.528	14462.00	0.3000935	1.2908642E-02	53.74769
NP-237	204.7038	28-FEB-2010	4433.310	4904.612	15292.00	0.3112141	1.5762975E-02	64.28081
CM-244	195.0060	28-FEB-2010	5535.175	5883.158	13852.00	0.3140766	1.5929047E-02	53.04362

Instrument : CHAMBER 007
 Detector : 67607
 Standard ID : AESS-007
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:40
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 4-SEP-2009 12:36:20
 Average Efficiency : 0.2367712
 Average Efficiency Error : 6.6109751E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.7342	28-FEB-2010	2991.315	3300.370	13798.00	0.2821096	1.2145956E-02	48.72938
NP-237	205.0260	28-FEB-2010	4436.975	4905.147	11957.00	0.2429639	1.2349783E-02	65.83331
CM-244	199.6806	28-FEB-2010	5533.959	5885.477	9051.000	0.2003213	1.0235304E-02	52.23785

Instrument : CHAMBER 008
 Detector : 78788
 Standard ID : AESS-008
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:40
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 4-SEP-2009 12:36:40
 Average Efficiency : 0.3205987
 Average Efficiency Error : 8.8198772E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.0418	28-FEB-2010	2989.794	3298.426	15461.00	0.3171742	1.3626882E-02	47.98743
NP-237	209.2716	28-FEB-2010	4437.020	4904.595	16084.00	0.3202048	1.6208146E-02	61.69046
CM-244	199.6488	28-FEB-2010	5532.536	5882.336	14721.00	0.3260421	1.6522150E-02	43.41613

Instrument : CHAMBER 009
 Detector : 72528
 Standard ID : AESS-009
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:40
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 4-SEP-2009 12:36:51
 Average Efficiency : 0.3402912
 Average Efficiency Error : 9.3554687E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.3736	28-FEB-2010	2990.892	3299.892	16250.00	0.3376825	1.4495632E-02	49.34795
NP-237	204.0192	28-FEB-2010	4433.436	4905.789	16617.00	0.3393191	1.7169004E-02	62.72510
CM-244	197.2128	28-FEB-2010	5532.687	5887.081	15400.00	0.3450909	1.7477276E-02	53.13368

Instrument : CHAMBER 010
 Detector : 72529
 Standard ID : AESS-010
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:40
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 4-SEP-2009 12:37:00
 Average Efficiency : 0.3139585
 Average Efficiency Error : 8.6422609E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.0008	28-FEB-2010	2988.087	3300.334	14912.00	0.3120262	1.3414358E-02	49.22013
NP-237	202.9926	28-FEB-2010	4436.842	4905.812	15310.00	0.3142270	1.5915314E-02	60.15851
CM-244	196.2330	28-FEB-2010	5533.178	5884.706	14044.00	0.3164504	1.6046330E-02	53.33372

Instrument : CHAMBER 011
 Detector : 72531
 Standard ID : AESS-011
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:40
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 4-SEP-2009 12:37:27
 Average Efficiency : 0.2979373
 Average Efficiency Error : 8.2009137E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	212.8284	28-FEB-2010	2990.718	3301.411	14912.00	0.2961519	1.2731905E-02	50.71152
NP-237	214.4868	28-FEB-2010	4435.900	4905.463	15442.00	0.2999101	1.5188582E-02	60.36610
CM-244	208.4184	28-FEB-2010	5535.617	5886.431	14071.00	0.2985013	1.5135813E-02	50.96436

Instrument : CHAMBER 012
 Detector : 67594
 Standard ID : AESS-012
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:40
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 4-SEP-2009 12:37:37
 Average Efficiency : 0.2994823
 Average Efficiency Error : 8.2469489E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.2200	28-FEB-2010	2989.283	3301.924	14660.00	0.3004818	1.2922071E-02	52.00318
NP-237	205.8930	28-FEB-2010	4434.309	4903.502	14933.00	0.3021517	1.5308659E-02	64.10130
CM-244	203.1954	28-FEB-2010	5531.028	5882.575	13584.00	0.2955756	1.4994888E-02	57.14846

Instrument : CHAMBER 013
 Detector : 78790
 Standard ID : AESS-013
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:41
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:37:47
 Average Efficiency : 0.3441789
 Average Efficiency Error : 9.4585977E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.6544	28-FEB-2010	2992.309	3297.583	16707.00	0.3467621	1.4878578E-02	47.93691
NP-237	210.2526	28-FEB-2010	4432.512	4904.184	17205.00	0.3409068	1.7242415E-02	63.48001
CM-244	201.9108	28-FEB-2010	5533.734	5883.657	15707.00	0.3439779	1.7416557E-02	53.05471

Instrument : CHAMBER 014
 Detector : 67616
 Standard ID : AESS-014
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:41
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:37:57
 Average Efficiency : 0.3126531
 Average Efficiency Error : 8.6011579E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	214.7088	28-FEB-2010	2990.575	3298.988	15569.00	0.3064544	1.3164708E-02	48.59332
NP-237	211.7160	28-FEB-2010	4436.470	4903.458	16179.00	0.3183725	1.6114254E-02	68.41453
CM-244	207.3882	28-FEB-2010	5530.496	5885.133	14842.00	0.3161798	1.6020818E-02	54.78078

Instrument : CHAMBER 015
 Detector : 61581
 Standard ID : AESS-015
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:41
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:38:32
 Average Efficiency : 0.3250474
 Average Efficiency Error : 8.9431657E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.0270	28-FEB-2010	2987.656	3297.520	15498.00	0.3210663	1.3793531E-02	58.50532
NP-237	200.6460	28-FEB-2010	4435.901	4901.612	15878.00	0.3296820	1.6690506E-02	70.32646
CM-244	195.9270	28-FEB-2010	5535.255	5884.514	14460.00	0.3262195	1.6535265E-02	60.28641

Instrument : CHAMBER 016
 Detector : 78774
 Standard ID : AESS-016
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:41
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:39:14
 Average Efficiency : 0.3337179
 Average Efficiency Error : 9.1785332E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.0534	28-FEB-2010	2988.611	3297.891	15952.00	0.3304393	1.4189126E-02	48.70612
NP-237	199.3962	28-FEB-2010	4435.494	4901.479	16393.00	0.3425452	1.7334972E-02	61.52191
CM-244	198.6402	28-FEB-2010	5530.741	5886.030	14827.00	0.3300566	1.6723992E-02	56.19504

Instrument : CHAMBER 017
 Detector : 78791
 Standard ID : AESS-017
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:41
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:39:56
 Average Efficiency : 0.2932511
 Average Efficiency Error : 8.0763726E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	210.0798	28-FEB-2010	2989.315	3299.165	14535.00	0.2924541	1.2578820E-02	44.96824
NP-237	208.5846	28-FEB-2010	4433.955	4905.994	14930.00	0.2982117	1.5109048E-02	56.65096
CM-244	205.5828	28-FEB-2010	5531.756	5885.157	13466.00	0.2896459	1.4695838E-02	49.42458

Instrument : CHAMBER 018
 Detector : 78782
 Standard ID : AESS-018
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:41
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:40:11
 Average Efficiency : 0.3229291
 Average Efficiency Error : 8.8838805E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.1856	28-FEB-2010	2989.045	3297.645	15448.00	0.3229351	1.3874616E-02	44.39913
NP-237	208.8990	28-FEB-2010	4435.824	4903.103	16130.00	0.3216979	1.6283154E-02	64.50001
CM-244	198.1458	28-FEB-2010	5530.534	5885.395	14527.00	0.3241743	1.6430404E-02	51.39432

Instrument : CHAMBER 019
 Detector : 78786
 Standard ID : AESS-019
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:42
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:40:24
 Average Efficiency : 0.2905655
 Average Efficiency Error : 8.0145085E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.6468	28-FEB-2010	2992.371	3300.084	13452.00	0.2778059	1.1966659E-02	44.41962
NP-237	202.9140	28-FEB-2010	4432.711	4901.697	14988.00	0.3077365	1.5590836E-02	62.76942
CM-244	199.3140	28-FEB-2010	5534.730	5883.386	13290.00	0.2946945	1.4954864E-02	50.33946

Instrument : CHAMBER 020
 Detector : 78787
 Standard ID : AESS-020
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:42
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:40:33
 Average Efficiency : 0.3434685
 Average Efficiency Error : 9.4453506E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	205.5870	28-FEB-2010	2990.745	3300.511	16134.00	0.3317050	1.4240759E-02	49.47922
NP-237	203.4984	28-FEB-2010	4436.191	4903.850	17194.00	0.3519965	1.7803436E-02	60.99994
CM-244	197.1096	28-FEB-2010	5531.198	5885.719	15755.00	0.3534269	1.7894309E-02	50.27258

Instrument : CHAMBER 021
 Detector : 67047
 Standard ID : AESS-021
 Standard Reference Date : 19-FEB-2008 15:31:52
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:42
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:40:41
 Average Efficiency : 0.3053718
 Average Efficiency Error : 8.4061036E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	208.3608	28-FEB-2010	2991.027	3300.488	14910.00	0.3024271	1.3001683E-02	54.25101
NP-237	210.1548	28-FEB-2010	4433.390	4904.438	15336.00	0.3040332	1.5398674E-02	66.84158
CM-244	200.7390	28-FEB-2010	5534.035	5886.544	14134.00	0.3111110	1.5774274E-02	53.45971

Instrument : CHAMBER 022
 Detector : 72530
 Standard ID : AESS-022
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:42
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:40:50
 Average Efficiency : 0.3167550
 Average Efficiency Error : 8.7174345E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	209.6724	28-FEB-2010	2992.050	3301.029	15236.00	0.3069546	1.3191545E-02	48.80446
NP-237	206.8830	28-FEB-2010	4437.549	4902.815	16171.00	0.3256005	1.6480263E-02	64.55595
CM-244	203.0208	28-FEB-2010	5531.706	5883.854	14838.00	0.3231215	1.6372502E-02	53.46963

Instrument : CHAMBER 023
 Detector : 78264
 Standard ID : AESS-023
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:42
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:40:59
 Average Efficiency : 0.3319828
 Average Efficiency Error : 9.1288136E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	207.4764	28-FEB-2010	2991.319	3301.853	16017.00	0.3263104	1.4010864E-02	47.06707
NP-237	207.4998	28-FEB-2010	4434.632	4902.993	16663.00	0.3345701	1.6928136E-02	62.52299
CM-244	199.8804	28-FEB-2010	5531.100	5885.960	15271.00	0.3377988	1.7109787E-02	47.13729

Instrument : CHAMBER 024
 Detector : 76542
 Standard ID : AESS-024
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 4-SEP-2009 07:36:42
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 4-SEP-2009 12:41:10
 Average Efficiency : 0.3282878
 Average Efficiency Error : 9.0300748E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.5218	28-FEB-2010	2988.280	3301.361	15578.00	0.3235334	1.3898253E-02	49.01440
NP-237	205.6662	28-FEB-2010	4434.951	4904.473	16364.00	0.3314564	1.6774241E-02	73.72572
CM-244	198.3060	28-FEB-2010	5532.286	5883.922	14893.00	0.3320678	1.6824935E-02	56.15541

Instrument : CHAMBER 025
 Detector : 45-149AA5
 Standard ID : AESS-025
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:08
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:36:12
 Average Efficiency : 0.3276502
 Average Efficiency Error : 9.0310313E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.5670	28-FEB-2010	2988.958	3301.287	15226.00	0.3290954	1.4142862E-02	57.79382
NP-237	167.9916	28-FEB-2010	4436.686	4904.740	13253.00	0.3286704	1.6679743E-02	71.75627
CM-244	157.2432	28-FEB-2010	5534.991	5882.562	11563.00	0.3246800	1.6513394E-02	67.10056

Instrument : CHAMBER 026
 Detector : 78204
 Standard ID : AESS-026
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:08
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:36:22
 Average Efficiency : 0.3213052
 Average Efficiency Error : 9.4170934E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	199.5072	28-FEB-2010	2988.735	3300.836	15089.00	0.3196830	1.6195688E-02	50.04417
NP-237	168.0294	28-FEB-2010	4435.801	4902.784	13239.00	0.3282672	1.6659509E-02	56.07543
CM-244	160.5822	28-FEB-2010	5530.708	5886.284	11504.00	0.3164098	1.6093958E-02	50.89248

Instrument : CHAMBER 027
 Detector : 42484
 Standard ID : AESS-027
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:08
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:36:31
 Average Efficiency : 0.3385510
 Average Efficiency Error : 9.9218553E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	193.4238	28-FEB-2010	2989.280	3298.316	15261.00	0.3334595	1.6891224E-02	44.29322
NP-237	161.6154	28-FEB-2010	4433.196	4906.637	13292.00	0.3426305	1.7387481E-02	57.33553
CM-244	148.1754	28-FEB-2010	5535.439	5885.723	11402.00	0.3398517	1.7288936E-02	52.16496

Instrument : CHAMBER 028
 Detector : 78792
 Standard ID : AESS-028
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:08
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:36:41
 Average Efficiency : 0.3044925
 Average Efficiency Error : 8.9324238E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	199.6542	28-FEB-2010	2989.441	3297.640	14137.00	0.2992923	1.5175839E-02	43.30858
NP-237	168.1992	28-FEB-2010	4435.847	4903.788	12490.00	0.3093279	1.5712239E-02	58.21876
CM-244	156.7614	28-FEB-2010	5532.676	5883.223	10835.00	0.3052154	1.5540821E-02	45.24567

Instrument : CHAMBER 029
 Detector : 33454
 Standard ID : AESS-029
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:08
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:36:49
 Average Efficiency : 0.3151154
 Average Efficiency Error : 9.2400359E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	201.5742	28-FEB-2010	2987.567	3301.667	14598.00	0.3061087	1.5514722E-02	59.98596
NP-237	169.7700	28-FEB-2010	4432.493	4902.470	13008.00	0.3191791	1.6202597E-02	64.76778
CM-244	154.8234	28-FEB-2010	5535.032	5883.746	11258.00	0.3209674	1.6332163E-02	52.83419

Instrument : CHAMBER 030
 Detector : 33447
 Standard ID : AESS-030
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:08
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:36:58
 Average Efficiency : 0.3203139
 Average Efficiency Error : 9.3901874E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	198.9792	28-FEB-2010	2991.332	3299.665	14751.00	0.3133562	1.5879847E-02	54.85928
NP-237	166.3758	28-FEB-2010	4436.037	4902.215	13026.00	0.3261414	1.6555686E-02	71.82014
CM-244	157.1856	28-FEB-2010	5533.195	5886.933	11469.00	0.3220125	1.6380262E-02	58.73045

Instrument : CHAMBER 031
 Detector : 67042
 Standard ID : AESS-031
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:09
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:37:09
 Average Efficiency : 0.3353133
 Average Efficiency Error : 9.2432722E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	193.6650	28-FEB-2010	2988.980	3300.809	15051.00	0.3284457	1.4117910E-02	62.13078
NP-237	162.9186	28-FEB-2010	4433.475	4904.204	13378.00	0.3420834	1.7358093E-02	78.83074
CM-244	153.1968	28-FEB-2010	5535.021	5883.627	11764.00	0.3388719	1.7230390E-02	60.52183

Instrument : CHAMBER 032
 Detector : 67041
 Standard ID : AESS-032
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:09
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:37:21
 Average Efficiency : 0.2159665
 Average Efficiency Error : 6.2416224E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.2364	28-FEB-2010	2991.500	3301.085	12930.00	0.2799107	1.2067080E-02	108.5704
NP-237	165.9822	28-FEB-2010	4436.228	4903.321	11857.00	0.2975635	1.5127208E-02	150.4912
CM-244	153.7938	28-FEB-2010	5533.353	5886.388	5601.000	0.1608285	8.3242906E-03	0.0000000E+00

Instrument : CHAMBER 033
 Detector : 78785
 Standard ID : AESS-033
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:09
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:37:30
 Average Efficiency : 0.3134830
 Average Efficiency Error : 8.6526405E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	192.4158	28-FEB-2010	2991.232	3299.661	14169.00	0.3112248	1.3392622E-02	46.76679
NP-237	161.7816	28-FEB-2010	4437.092	4904.010	12161.00	0.3131624	1.5913626E-02	60.14054
CM-244	147.2670	28-FEB-2010	5530.913	5885.453	10575.00	0.3170980	1.6152723E-02	52.75375

Instrument : CHAMBER 034
 Detector : 61586
 Standard ID : AESS-034
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:09
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:37:40
 Average Efficiency : 5.4748973E-05
 Average Efficiency Error : 8.9538866E-05
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.5488	28-FEB-2010	2987.956	3301.026	9319.000	0.1963924	8.5345702E-03	80.18852
NP-237	167.2962	28-FEB-2010	4436.568	4903.521	7134.000	0.1774998	9.1209533E-03	0.0000000E+00
CM-244	154.4388	28-FEB-2010	5534.967	5885.181	8.000000	1.6030130E-05	6.59548113E-05	5.306273

Instrument : CHAMBER 035
 Detector : 78202
 Standard ID : AESS-035
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:09
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:37:51
 Average Efficiency : 0.3050995
 Average Efficiency Error : 8.4187118E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	198.6666	28-FEB-2010	2991.620	3300.593	14168.00	0.3014163	1.2970550E-02	45.14441
NP-237	168.2934	28-FEB-2010	4435.499	4903.774	12515.00	0.3097561	1.5733534E-02	52.82528
CM-244	158.8128	28-FEB-2010	5532.763	5883.199	11004.00	0.3058464	1.5568729E-02	51.98632

Instrument : CHAMBER 036
 Detector : 78203
 Standard ID : AESS-036
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:09
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:00
 Average Efficiency : 0.3236991
 Average Efficiency Error : 8.9239618E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	201.3204	28-FEB-2010	2991.620	3298.917	15082.00	0.3166323	1.3609574E-02	51.84582
NP-237	167.4312	28-FEB-2010	4433.050	4904.263	13282.00	0.3304925	1.6771674E-02	66.46858
CM-244	156.4188	28-FEB-2010	5535.616	5884.466	11603.00	0.3275855	1.6659884E-02	53.86180

Instrument : CHAMBER 037
 Detector : 45-149BB5
 Standard ID : AESS-037
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:11
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:11
 Average Efficiency : 0.3527313
 Average Efficiency Error : 9.7141266E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.7372	28-FEB-2010	2988.836	3299.917	16029.00	0.3425954	1.4709930E-02	69.97938
NP-237	167.1294	28-FEB-2010	4435.582	4906.557	14502.00	0.3614331	1.8319361E-02	87.55756
CM-244	154.7664	28-FEB-2010	5534.307	5882.810	12611.00	0.3597120	1.8269511E-02	71.60854

Instrument : CHAMBER 038
 Detector : 72532
 Standard ID : AESS-038
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:11
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:20
 Average Efficiency : 0.3374661
 Average Efficiency Error : 9.2953844E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.1408	28-FEB-2010	2991.576	3299.256	15782.00	0.3332799	1.4313720E-02	52.53116
NP-237	170.0886	28-FEB-2010	4433.771	4904.686	13898.00	0.3404015	1.7263360E-02	67.00319
CM-244	157.7460	28-FEB-2010	5535.244	5883.467	12174.00	0.3406372	1.7310385E-02	53.71938

Instrument : CHAMBER 039
 Detector : 45-149BB2
 Standard ID : AESS-039
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:11
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:28
 Average Efficiency : 0.3630306
 Average Efficiency Error : 9.9983541E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	192.2418	28-FEB-2010	2991.453	3301.599	16042.00	0.3526957	1.5143363E-02	60.09052
NP-237	159.1506	28-FEB-2010	4432.722	4905.688	14315.00	0.3747012	1.8995127E-02	78.06614
CM-244	151.7142	28-FEB-2010	5532.346	5883.894	12631.00	0.3674615	1.8662771E-02	63.39179

Instrument : CHAMBER 040
 Detector : 78773
 Standard ID : AESS-040
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:11
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:36
 Average Efficiency : 0.3207370
 Average Efficiency Error : 8.8450955E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.4828	28-FEB-2010	2991.070	3301.002	14629.00	0.3178972	1.3671570E-02	46.05933
NP-237	166.8174	28-FEB-2010	4437.116	4905.104	12857.00	0.3211111	1.6303439E-02	59.80341
CM-244	155.0100	28-FEB-2010	5532.249	5884.180	11394.00	0.3244938	1.6507916E-02	47.50864

Instrument : CHAMBER 041
 Detector : 78205
 Standard ID : AESS-041
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:11
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:44
 Average Efficiency : 0.3298833
 Average Efficiency Error : 9.0887686E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.9034	28-FEB-2010	2991.305	3298.942	15596.00	0.3232844	1.3887258E-02	46.32725
NP-237	171.2268	28-FEB-2010	4436.425	4904.659	13704.00	0.3334179	1.6912539E-02	62.94285
CM-244	159.5796	28-FEB-2010	5534.452	5885.748	12158.00	0.3362667	1.7088668E-02	51.06727

Instrument : CHAMBER 042
 Detector : 78793
 Standard ID : AESS-042
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:11
 Calibration Count Time : 239.9998
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:52
 Average Efficiency : 0.3262490
 Average Efficiency Error : 8.9996839E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	188.7090	28-FEB-2010	2988.887	3299.366	14425.00	0.3230868	1.3898331E-02	45.61874
NP-237	159.6558	28-FEB-2010	4437.123	4905.630	12564.00	0.3278245	1.6650224E-02	58.62441
CM-244	150.5208	28-FEB-2010	5533.333	5885.512	11230.00	0.3292493	1.6754221E-02	49.02582

Instrument : CHAMBER 043
 Detector : 76543
 Standard ID : AESS-043
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:12
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:38:59
 Average Efficiency : 0.3388386
 Average Efficiency Error : 9.3338015E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.7708	28-FEB-2010	2990.321	3301.623	15716.00	0.3358650	1.4425773E-02	53.08127
NP-237	168.7422	28-FEB-2010	4433.027	4903.519	13744.00	0.3393443	1.7212395E-02	71.29913
CM-244	156.3252	28-FEB-2010	5534.268	5882.956	12132.00	0.3426539	1.7413609E-02	49.48456

Instrument : CHAMBER 044
 Detector : 79459
 Standard ID : AESS-044
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:12
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:39:07
 Average Efficiency : 0.3461110
 Average Efficiency Error : 9.5328372E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.4510	28-FEB-2010	2989.930	3302.506	16084.00	0.3495771	1.5008831E-02	49.84488
NP-237	166.6248	28-FEB-2010	4437.594	4903.934	13869.00	0.3467283	1.7584775E-02	67.30765
CM-244	155.8290	28-FEB-2010	5530.392	5884.844	12036.00	0.3408923	1.7326539E-02	50.42044

Instrument : CHAMBER 045
 Detector : 78783
 Standard ID : AESS-045
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:12
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:39:15
 Average Efficiency : 0.3386171
 Average Efficiency Error : 9.3369978E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	186.9936	28-FEB-2010	2989.243	3301.709	15126.00	0.3418811	1.4694056E-02	41.09813
NP-237	160.8066	28-FEB-2010	4436.057	4901.945	12808.00	0.3318377	1.6849035E-02	59.62828
CM-244	145.8384	28-FEB-2010	5533.013	5887.031	11276.00	0.3412594	1.7364025E-02	48.59882

Instrument : CHAMBER 046
 Detector : 76544
 Standard ID : AESS-046
 Standard Reference Date : 19-FEB-2008 19:35:48
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:12
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:39:23
 Average Efficiency : 0.3428833
 Average Efficiency Error : 9.4477413E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.7474	28-FEB-2010	2992.377	3301.861	15517.00	0.3367483	1.4466916E-02	50.54656
NP-237	164.6658	28-FEB-2010	4437.291	4905.414	13709.00	0.3468411	1.7593319E-02	60.02387
CM-244	151.3824	28-FEB-2010	5533.098	5885.505	11938.00	0.3480568	1.7692965E-02	49.85977

Instrument : CHAMBER 047
 Detector : 46-089B1
 Standard ID : AESS-047
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:12
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:39:31
 Average Efficiency : 0.3414553
 Average Efficiency Error : 9.4057210E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.4804	28-FEB-2010	2992.396	3301.175	15755.00	0.3371730	1.4481370E-02	53.45372
NP-237	168.3948	28-FEB-2010	4434.358	4901.480	13876.00	0.3432392	1.7407728E-02	75.59270
CM-244	154.6032	28-FEB-2010	5533.889	5883.104	12119.00	0.3459478	1.7581582E-02	61.01867

Instrument : CHAMBER 048
 Detector : 42483
 Standard ID : AESS-048
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 5-SEP-2009 09:03:12
 Calibration Count Time : 240.0000
 Efficiency Calibration Date/Time : 5-SEP-2009 13:39:40
 Average Efficiency : 0.3165880
 Average Efficiency Error : 8.7361159E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	191.8350	28-FEB-2010	2992.395	3299.708	14224.00	0.3133849	1.3484558E-02	54.26610
NP-237	161.5530	28-FEB-2010	4436.890	4906.295	12281.00	0.3166445	1.6088169E-02	68.16459
CM-244	151.1856	28-FEB-2010	5534.380	5886.375	11007.00	0.3212399	1.6352450E-02	58.44775

Subsection 1: Energy Calibration

The Energy Calibration energy=Cal_Zero+(e1*C)+(e2*C^2)

where : Cal_Zero = Energy Calibration Zero
 e1 = Energy Calibration Slope
 e2 = Energy Calibration Quadratic
 C = Channel

Instrument : CHAMBER 113
 Detector : 45-111B4
 Calibration Date/Time : 17-SEP-2009 15:08:33
 Calibration Source Id : AESS-001

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.774
CM-244	4320A	2/28/10	5795.020	5794.950

Energy/Channel Equation : see above
 Energy Calibration Zero : 2386.732
 Energy Calibration Slope : 5.009326
 Energy Calibration Quadratic : 2.6770448E-04
 Energy Calibration Range : 7797.000

Instrument : CHAMBER 114
 Detector : 78258
 Calibration Date/Time : 17-SEP-2009 15:08:44
 Calibration Source Id : AESS-007

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.722
NP-237	4341	2/28/10	4768.800	4768.568
CM-244	4320A	2/28/10	5795.020	5794.894

Energy/Channel Equation : see above
 Energy Calibration Zero : 2339.893
 Energy Calibration Slope : 4.993507
 Energy Calibration Quadratic : 2.3911390E-04
 Energy Calibration Range : 7704.000

Instrument : CHAMBER 115
 Detector : 45-132FF4
 Calibration Date/Time : 17-SEP-2009 15:08:54
 Calibration Source Id : AESS-002

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5794.872

Energy/Channel Equation : see above
 Energy Calibration Zero : 2361.262
 Energy Calibration Slope : 5.000648
 Energy Calibration Quadratic : 2.6309560E-04
 Energy Calibration Range : 7758.000

Instrument : CHAMBER 116
 Detector : 45-132FF2
 Calibration Date/Time : 17-SEP-2009 15:09:06
 Calibration Source Id : AESS-008

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2359.730
 Energy Calibration Slope : 4.985509
 Energy Calibration Quadratic : 2.6726534E-04
 Energy Calibration Range : 7745.000

Instrument : CHAMBER 117
 Detector : 33450
 Calibration Date/Time : 17-SEP-2009 15:09:16
 Calibration Source Id : AESS-003

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.491
NP-237	4341	2/28/10	4768.800	4768.339
CM-244	4320A	2/28/10	5795.020	5794.819

Energy/Channel Equation : see above
 Energy Calibration Zero : 2385.651
 Energy Calibration Slope : 4.970261
 Energy Calibration Quadratic : 2.8056922E-04
 Energy Calibration Range : 7769.000

Instrument : CHAMBER 118
 Detector : 75544
 Calibration Date/Time : 17-SEP-2009 15:09:28
 Calibration Source Id : AESS-009

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.819
 Energy Calibration Slope : 4.967181
 Energy Calibration Quadratic : 2.8012006E-04
 Energy Calibration Range : 7727.000

Instrument : CHAMBER 119
 Detector : 74429
 Calibration Date/Time : 2-FEB-2009 15:15:38
 Calibration Source Id : AESS-004

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3112.902
NP-237	4341	2/28/10	4768.800	4669.281
CM-244	4320A	2/28/10	5795.020	5706.875

Energy/Channel Equation : see above
 Energy Calibration Zero : 2437.949
 Energy Calibration Slope : 5.036866
 Energy Calibration Quadratic :
 Energy Calibration Range : 7596.000

Instrument : CHAMBER 120
 Detector : 74430
 Calibration Date/Time : 17-SEP-2009 15:09:40
 Calibration Source Id : AESS-010

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.710
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2314.428
 Energy Calibration Slope : 4.966161
 Energy Calibration Quadratic : 2.5640638E-04
 Energy Calibration Range : 7669.000

Instrument : CHAMBER 121
 Detector : 75545
 Calibration Date/Time : 17-SEP-2009 15:09:49
 Calibration Source Id : AESS-005

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2338.861
 Energy Calibration Slope : 4.942947
 Energy Calibration Quadratic : 2.9029930E-04
 Energy Calibration Range : 7705.000

Instrument : CHAMBER 122
 Detector : 75546
 Calibration Date/Time : 17-SEP-2009 15:09:59
 Calibration Source Id : AESS-011

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5794.807

Energy/Channel Equation : see above
 Energy Calibration Zero : 2335.373
 Energy Calibration Slope : 4.957498
 Energy Calibration Quadratic : 2.7508504E-04
 Energy Calibration Range : 7700.000

Instrument : CHAMBER 123
 Detector : 45-142V3
 Calibration Date/Time : 17-SEP-2009 15:10:08
 Calibration Source Id : AESS-006

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.112

Energy/Channel Equation : see above
 Energy Calibration Zero : 2378.713
 Energy Calibration Slope : 4.974333
 Energy Calibration Quadratic : 2.5756090E-04
 Energy Calibration Range : 7743.000

Instrument : CHAMBER 124
 Detector : 45-142V2
 Calibration Date/Time : 17-SEP-2009 15:10:17
 Calibration Source Id : AESS-012

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.748
NP-237	4341	2/28/10	4768.800	4768.555
CM-244	4320A	2/28/10	5795.020	5794.792

Energy/Channel Equation : see above
 Energy Calibration Zero : 2392.695
 Energy Calibration Slope : 5.013852
 Energy Calibration Quadratic : 2.6642549E-04
 Energy Calibration Range : 7806.000

Instrument : CHAMBER 125
 Detector : 75547
 Calibration Date/Time : 17-SEP-2009 15:10:26
 Calibration Source Id : AESS-013
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.724
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.597
 Energy Calibration Slope : 4.937986
 Energy Calibration Quadratic : 2.8199228E-04
 Energy Calibration Range : 7699.000

Instrument : CHAMBER 126
 Detector : 75548
 Calibration Date/Time : 17-SEP-2009 15:10:43
 Calibration Source Id : AESS-019
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.630
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2351.075
 Energy Calibration Slope : 5.037023
 Energy Calibration Quadratic : 1.9564512E-04
 Energy Calibration Range : 7714.000

Instrument : CHAMBER 127
 Detector : 78770
 Calibration Date/Time : 17-SEP-2009 15:10:52
 Calibration Source Id : AESS-014
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.015
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2339.960
 Energy Calibration Slope : 4.959275
 Energy Calibration Quadratic : 2.7139953E-04
 Energy Calibration Range : 7703.000

Instrument : CHAMBER 128
 Detector : 75549
 Calibration Date/Time : 17-SEP-2009 15:11:01
 Calibration Source Id : AESS-020

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.687
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2332.893
 Energy Calibration Slope : 5.000373
 Energy Calibration Quadratic : 2.3169331E-04
 Energy Calibration Range : 7696.000

Instrument : CHAMBER 129
 Detector : 76227
 Calibration Date/Time : 17-SEP-2009 15:11:11
 Calibration Source Id : AESS-015

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.775
NP-237	4341	2/28/10	4768.800	4768.764
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2349.422
 Energy Calibration Slope : 4.954164
 Energy Calibration Quadratic : 2.6775626E-04
 Energy Calibration Range : 7703.000

Instrument : CHAMBER 130
 Detector : 76228
 Calibration Date/Time : 17-SEP-2009 15:11:20
 Calibration Source Id : AESS-021

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.546
NP-237	4341	2/28/10	4768.800	4768.433
CM-244	4320A	2/28/10	5795.020	5794.777

Energy/Channel Equation : see above
 Energy Calibration Zero : 2341.580
 Energy Calibration Slope : 4.993090
 Energy Calibration Quadratic : 2.1626826E-04
 Energy Calibration Range : 7681.000

Instrument : CHAMBER 131
 Detector : 33448
 Calibration Date/Time : 17-SEP-2009 15:11:29
 Calibration Source Id : AESS-016
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.958
 NP-237 4341 2/28/10 4768.800 4768.209
 CM-244 4320A 2/28/10 5795.020 5794.532

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2411.500
 Energy Calibration Slope : 4.968785
 Energy Calibration Quadratic : 2.8956254E-04
 Energy Calibration Range : 7803.000

Instrument : CHAMBER 132
 Detector : 67579
 Calibration Date/Time : 17-SEP-2009 15:11:39
 Calibration Source Id : AESS-022
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.807
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2330.434
 Energy Calibration Slope : 5.033886
 Energy Calibration Quadratic : 2.1528341E-04
 Energy Calibration Range : 7711.000

Instrument : CHAMBER 133
 Detector : 76229
 Calibration Date/Time : 17-SEP-2009 15:11:48
 Calibration Source Id : AESS-017
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.772
 NP-237 4341 2/28/10 4768.800 4768.493
 CM-244 4320A 2/28/10 5795.020 5795.019

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2312.054
 Energy Calibration Slope : 4.909425
 Energy Calibration Quadratic : 2.5591909E-04
 Energy Calibration Range : 7608.000

Instrument : CHAMBER 134
 Detector : 76230
 Calibration Date/Time : 17-SEP-2009 15:11:57
 Calibration Source Id : AESS-023

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.690
CM-244	4320A	2/28/10	5795.020	5794.888

Energy/Channel Equation : see above
 Energy Calibration Zero : 2332.446
 Energy Calibration Slope : 4.965801
 Energy Calibration Quadratic : 2.4601555E-04
 Energy Calibration Range : 7675.000

Instrument : CHAMBER 135
 Detector : 64270
 Calibration Date/Time : 17-SEP-2009 15:12:06
 Calibration Source Id : AESS-018

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.697
NP-237	4341	2/28/10	4768.800	4768.428
CM-244	4320A	2/28/10	5795.020	5794.686

Energy/Channel Equation : see above
 Energy Calibration Zero : 2343.759
 Energy Calibration Slope : 4.952811
 Energy Calibration Quadratic : 2.7405450E-04
 Energy Calibration Range : 7703.000

Instrument : CHAMBER 136
 Detector : 68549
 Calibration Date/Time : 17-SEP-2009 15:12:16
 Calibration Source Id : AESS-024

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.402
NP-237	4341	2/28/10	4768.800	4769.943
CM-244	4320A	2/28/10	5795.020	5797.448

Energy/Channel Equation : see above
 Energy Calibration Zero : 2342.322
 Energy Calibration Slope : 5.020517
 Energy Calibration Quadratic : 2.2833873E-04
 Energy Calibration Range : 7723.000

Instrument : CHAMBER 137
 Detector : 64288
 Calibration Date/Time : 16-SEP-2009 12:25:39
 Calibration Source Id : AESS-025
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.831
 NP-237 4341 2/28/10 4768.800 4768.466
 CM-244 4320A 2/28/10 5795.020 5794.813

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2384.608
 Energy Calibration Slope : 5.017363
 Energy Calibration Quadratic : 3.1012692E-04
 Energy Calibration Range : 7848.000

Instrument : CHAMBER 138
 Detector : 65877
 Calibration Date/Time : 16-SEP-2009 12:25:51
 Calibration Source Id : AESS-031
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3182.721
 NP-237 4341 2/28/10 4768.800 4768.624
 CM-244 4320A 2/28/10 5795.020 5795.020

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2381.507
 Energy Calibration Slope : 4.981775
 Energy Calibration Quadratic : 3.0701407E-04
 Energy Calibration Range : 7805.000

Instrument : CHAMBER 139
 Detector : 76231
 Calibration Date/Time : 16-SEP-2009 12:26:02
 Calibration Source Id : AESS-026
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.667
 CM-244 4320A 2/28/10 5795.020 5795.021

 Energy/Channel Equation : see above
 Energy Calibration Zero : 2352.536
 Energy Calibration Slope : 4.942561
 Energy Calibration Quadratic : 2.9986945E-04
 Energy Calibration Range : 7728.000

Instrument : CHAMBER 140
 Detector : 78771
 Calibration Date/Time : 16-SEP-2009 12:26:12
 Calibration Source Id : AESS-032

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.880
NP-237	4341	2/28/10	4768.800	4768.746
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2344.410
 Energy Calibration Slope : 4.964199
 Energy Calibration Quadratic : 2.9030148E-04
 Energy Calibration Range : 7732.000

Instrument : CHAMBER 141
 Detector : 76232
 Calibration Date/Time : 16-SEP-2009 12:26:23
 Calibration Source Id : AESS-027

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.756
NP-237	4341	2/28/10	4768.800	4768.664
CM-244	4320A	2/28/10	5795.020	5794.921

Energy/Channel Equation : see above
 Energy Calibration Zero : 2359.530
 Energy Calibration Slope : 4.949186
 Energy Calibration Quadratic : 2.9451301E-04
 Energy Calibration Range : 7736.000

Instrument : CHAMBER 142
 Detector : 64261
 Calibration Date/Time : 16-SEP-2009 12:26:33
 Calibration Source Id : AESS-033

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.702
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2380.580
 Energy Calibration Slope : 4.968856
 Energy Calibration Quadratic : 3.0223309E-04
 Energy Calibration Range : 7786.000

Instrument : CHAMBER 143
 Detector : 65882
 Calibration Date/Time : 16-SEP-2009 12:26:43
 Calibration Source Id : AESS-028
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2353.411
 Energy Calibration Slope : 4.964171
 Energy Calibration Quadratic : 2.8231755E-04
 Energy Calibration Range : 7733.000

Instrument : CHAMBER 144
 Detector : 75551
 Calibration Date/Time : 16-SEP-2009 12:26:53
 Calibration Source Id : AESS-034
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.045
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2347.296
 Energy Calibration Slope : 4.959377
 Energy Calibration Quadratic : 2.8099009E-04
 Energy Calibration Range : 7720.000

Instrument : CHAMBER 145
 Detector : 72526
 Calibration Date/Time : 16-SEP-2009 12:27:03
 Calibration Source Id : AESS-029
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2354.857
 Energy Calibration Slope : 4.970427
 Energy Calibration Quadratic : 2.8643355E-04
 Energy Calibration Range : 7745.000

Instrument : CHAMBER 146
 Detector : 72527
 Calibration Date/Time : 16-SEP-2009 12:27:13
 Calibration Source Id : AESS-035
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.019
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2349.628
 Energy Calibration Slope : 4.953955
 Energy Calibration Quadratic : 2.6576858E-04
 Energy Calibration Range : 7701.000

Instrument : CHAMBER 147
 Detector : 75550
 Calibration Date/Time : 16-SEP-2009 12:27:23
 Calibration Source Id : AESS-030
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.748
 Energy Calibration Slope : 4.969914
 Energy Calibration Quadratic : 2.5925279E-04
 Energy Calibration Range : 7708.000

Instrument : CHAMBER 148
 Detector : 74429
 Calibration Date/Time : 16-SEP-2009 12:27:33
 Calibration Source Id : AESS-036
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.190
 Energy Calibration Slope : 4.957554
 Energy Calibration Quadratic : 2.8058770E-04
 Energy Calibration Range : 7717.000

Instrument : CHAMBER 149
 Detector : 33449
 Calibration Date/Time : 15-SEP-2009 13:29:50
 Calibration Source Id : AESS-037

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.962
CM-244	4320A	2/28/10	5795.020	5795.120

Energy/Channel Equation : see above
 Energy Calibration Zero : 2390.249
 Energy Calibration Slope : 4.945051
 Energy Calibration Quadratic : 3.1025134E-04
 Energy Calibration Range : 7779.000

Instrument : CHAMBER 150
 Detector : 75552
 Calibration Date/Time : 15-SEP-2009 13:30:04
 Calibration Source Id : AESS-043

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2355.846
 Energy Calibration Slope : 4.963627
 Energy Calibration Quadratic : 2.8320536E-04
 Energy Calibration Range : 7736.000

Instrument : CHAMBER 151
 Detector : 75556
 Calibration Date/Time : 15-SEP-2009 13:30:37
 Calibration Source Id : AESS-038

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.876
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2346.769
 Energy Calibration Slope : 4.917734
 Energy Calibration Quadratic : 2.9527576E-04
 Energy Calibration Range : 7692.000

Instrument : CHAMBER 152
 Detector : 76222
 Calibration Date/Time : 15-SEP-2009 13:30:48
 Calibration Source Id : AESS-044

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.772
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2342.471
 Energy Calibration Slope : 4.955277
 Energy Calibration Quadratic : 2.6035175E-04
 Energy Calibration Range : 7690.000

Instrument : CHAMBER 153
 Detector : 76223
 Calibration Date/Time : 15-SEP-2009 13:31:00
 Calibration Source Id : AESS-039

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.192
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2333.990
 Energy Calibration Slope : 4.951685
 Energy Calibration Quadratic : 2.7959119E-04
 Energy Calibration Range : 7698.000

Instrument : CHAMBER 154
 Detector : 76224
 Calibration Date/Time : 15-SEP-2009 13:31:26
 Calibration Source Id : AESS-045

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2342.016
 Energy Calibration Slope : 4.948280
 Energy Calibration Quadratic : 2.8570730E-04
 Energy Calibration Range : 7709.000

Instrument : CHAMBER 155
 Detector : 75553
 Calibration Date/Time : 15-SEP-2009 13:31:39
 Calibration Source Id : AESS-040

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.184
NP-237	4341	2/28/10	4768.800	4768.936
CM-244	4320A	2/28/10	5795.020	5795.140

Energy/Channel Equation : see above
 Energy Calibration Zero : 2366.281
 Energy Calibration Slope : 4.966718
 Energy Calibration Quadratic : 2.9833001E-04
 Energy Calibration Range : 7765.000

Instrument : CHAMBER 156
 Detector : 75554
 Calibration Date/Time : 15-SEP-2009 13:31:49
 Calibration Source Id : AESS-046

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3189.446
NP-237	4341	2/28/10	4768.800	5162.066
CM-244	4320A	2/28/10	5795.020	5800.248

Energy/Channel Equation : see above
 Energy Calibration Zero : 2363.858
 Energy Calibration Slope : 4.985206
 Energy Calibration Quadratic : 2.8685082E-04
 Energy Calibration Range : 7769.000

Instrument : CHAMBER 157
 Detector : 75555
 Calibration Date/Time : 15-SEP-2009 13:32:00
 Calibration Source Id : AESS-041

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2360.555
 Energy Calibration Slope : 4.963046
 Energy Calibration Quadratic : 2.9731516E-04
 Energy Calibration Range : 7754.000

Instrument : CHAMBER 158
 Detector : 33451
 Calibration Date/Time : 15-SEP-2009 13:32:11
 Calibration Source Id : AESS-047

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2391.673
 Energy Calibration Slope : 4.990663
 Energy Calibration Quadratic : 3.2096857E-04
 Energy Calibration Range : 7839.000

Instrument : CHAMBER 159
 Detector : 76225
 Calibration Date/Time : 15-SEP-2009 13:32:21
 Calibration Source Id : AESS-042

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3182.819
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2354.535
 Energy Calibration Slope : 4.988183
 Energy Calibration Quadratic : 2.8453415E-04
 Energy Calibration Range : 7761.000

Instrument : CHAMBER 160
 Detector : 76226
 Calibration Date/Time : 15-SEP-2009 13:32:31
 Calibration Source Id : AESS-048

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.745
CM-244	4320A	2/28/10	5795.020	5794.943

Energy/Channel Equation : see above
 Energy Calibration Zero : 2354.507
 Energy Calibration Slope : 5.015394
 Energy Calibration Quadratic : 2.5826940E-04
 Energy Calibration Range : 7761.000

Subsection 2: Background Calibration

Instrument : CHAMBER 113
 Detector : 45-111B4
 Background Analysis Date/Time : 13-SEP-2009 12:07:37
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.706	3302.190	1.000000	0.3000000	100.0000	95.00000
NP-237	4433.295	4905.578	9.000000	2.700000	33.33334	95.00000
CM-244	5531.363	5884.629	11.00000	3.300000	30.15113	95.00000

Instrument : CHAMBER 114
 Detector : 78258
 Background Analysis Date/Time : 13-SEP-2009 12:07:42
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.034	3302.376	1.000000	0.3000000	100.0000	95.00000
NP-237	4432.616	4901.658	1.000000	0.3000000	100.0000	95.00000
CM-244	5533.073	5883.287	3.000000	0.9000000	57.73503	95.00000

Instrument : CHAMBER 115
 Detector : 45-132FF4
 Background Analysis Date/Time : 13-SEP-2009 12:07:47
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.454	3300.485	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.893	4906.309	7.000000	2.100000	37.79645	95.00000
CM-244	5530.846	5883.358	10.00000	3.000000	31.62278	95.00000

Instrument : CHAMBER 116
 Detector : 45-132FF2
 Background Analysis Date/Time : 13-SEP-2009 12:07:52
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.147	3301.366	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4433.104	4903.545	7.000000	2.100000	37.79645	95.00000
CM-244	5532.219	5884.159	18.00000	5.400000	23.57022	95.00000

Instrument : CHAMBER 117
 Detector : 33450
 Background Analysis Date/Time : 13-SEP-2009 12:07:56
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.160	3299.532	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.233	4904.181	9.000000	2.700000	33.33334	95.00000
CM-244	5532.536	5884.461	14.00000	4.200000	26.72612	95.00000

Instrument : CHAMBER 118
 Detector : 75544
 Background Analysis Date/Time : 13-SEP-2009 12:08:02
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.246	3300.695	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.648	4905.687	4.000000	1.200000	50.00000	95.00000
CM-244	5534.149	5886.128	10.00000	3.000000	31.62278	95.00000

Instrument : CHAMBER 119
 Detector : 74429
 Background Analysis Date/Time : 13-SEP-2009 12:08:06
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.004	3299.253	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4432.548	4906.013	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
CM-244	5530.584	5883.165	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000

Instrument : CHAMBER 120
 Detector : 74430
 Background Analysis Date/Time : 13-SEP-2009 12:08:12
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.533	3297.646	2.000000	0.6000000	70.71068	95.00000
NP-237	4435.084	4903.407	2.000000	0.6000000	70.71068	95.00000
CM-244	5534.300	5884.438	2.000000	0.6000000	70.71068	95.00000

Instrument : CHAMBER 121
 Detector : 75545
 Background Analysis Date/Time : 13-SEP-2009 12:08:17
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.369	3298.608	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.997	4903.847	3.000000	0.9000000	57.73503	95.00000
CM-244	5530.990	5882.362	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 122
 Detector : 75546
 Background Analysis Date/Time : 13-SEP-2009 12:08:22
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.526	3302.417	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4434.926	4903.828	13.00000	3.900000	27.73501	95.00000
CM-244	5530.663	5887.014	17.00000	5.100000	24.25356	95.00000

Instrument : CHAMBER 123
 Detector : 45-142V3
 Background Analysis Date/Time : 13-SEP-2009 12:08:27
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.415	3297.641	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4435.564	4904.117	4.000000	1.200000	50.00000	95.00000
CM-244	5535.344	5885.681	8.000000	2.400000	35.35534	95.00000

Instrument : CHAMBER 124
 Detector : 45-142V2
 Background Analysis Date/Time : 13-SEP-2009 12:08:33
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.039	3298.711	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4435.637	4902.902	5.000000	1.500000	44.72136	95.00000
CM-244	5534.267	5882.317	5.000000	1.500000	44.72136	95.00000

Instrument : CHAMBER 125
 Detector : 75547
 Background Analysis Date/Time : 13-SEP-2009 12:08:38
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.290	3300.040	2.000000	0.6000000	70.71068	95.00000
NP-237	4434.085	4901.751	2.000000	0.6000000	70.71068	95.00000
CM-244	5532.412	5882.738	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 126
 Detector : 75548
 Background Analysis Date/Time : 13-SEP-2009 12:08:44
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.846	3299.840	2.000000	0.6000000	70.71068	95.00000
NP-237	4433.552	4902.802	10.00000	3.000000	31.62278	95.00000
CM-244	5533.398	5882.628	5.000000	1.500000	44.72136	95.00000

Instrument : CHAMBER 127
 Detector : 78770
 Background Analysis Date/Time : 13-SEP-2009 12:08:49
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.252	3302.146	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.433	4903.142	2.000000	0.6000000	70.71068	95.00000
CM-244	5534.926	5885.739	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000

Instrument : CHAMBER 128
 Detector : 75549
 Background Analysis Date/Time : 13-SEP-2009 12:08:54
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.918	3301.506	2.000000	0.6000000	70.71068	95.00000
NP-237	4437.567	4901.469	5.000000	1.500000	44.72136	95.00000
CM-244	5532.764	5882.821	1.000000	0.3000000	100.0000	95.00000

Instrument : CHAMBER 129
 Detector : 76227
 Background Analysis Date/Time : 13-SEP-2009 12:08:58
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.942	3300.379	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.988	4903.888	7.000000	2.100000	37.79645	95.00000
CM-244	5534.503	5884.627	4.000000	1.200000	50.00000	95.00000

Instrument : CHAMBER 130
 Detector : 76228
 Background Analysis Date/Time : 13-SEP-2009 12:09:04
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.288	3298.075	3.000000	0.9000000	57.73503	95.00000
NP-237	4435.444	4902.612	12.00000	3.600000	28.86751	95.00000
CM-244	5530.953	5884.486	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000

Instrument : CHAMBER 131
 Detector : 33448
 Background Analysis Date/Time : 13-SEP-2009 12:09:09
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.775	3300.047	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.944	4905.225	5.000000	1.500000	44.72136	95.00000
CM-244	5534.242	5886.644	5.000000	1.500000	44.72136	95.00000

Instrument : CHAMBER 132
 Detector : 67579
 Background Analysis Date/Time : 13-SEP-2009 12:09:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.478	3299.760	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.728	4906.447	7.000000	2.100000	37.79645	95.00000
CM-244	5534.199	5884.992	3.000000	0.9000000	57.73503	95.00000

Instrument : CHAMBER 133
 Detector : 76229
 Background Analysis Date/Time : 13-SEP-2009 12:09:19
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.448	3299.164	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.532	4903.111	3.000000	0.9000000	57.73503	95.00000
CM-244	5532.731	5884.588	5.000000	1.500000	44.72136	95.00000

Instrument : CHAMBER 134
 Detector : 76230
 Background Analysis Date/Time : 13-SEP-2009 12:09:24
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.219	3300.010	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.624	4902.916	35.00000	10.50000	16.90309	95.00000
CM-244	5532.171	5886.589	7.000000	2.100000	37.79645	95.00000

Instrument : CHAMBER 135
 Detector : 64270
 Background Analysis Date/Time : 13-SEP-2009 12:09:28
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.256	3299.743	1.000000	0.3000000	100.0000	95.00000
NP-237	4436.015	4904.361	7.000000	2.100000	37.79645	95.00000
CM-244	5530.434	5886.345	10.00000	3.000000	31.62278	95.00000

Instrument : CHAMBER 136
 Detector : 68549
 Background Analysis Date/Time : 13-SEP-2009 12:09:33
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.690	3299.356	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4433.911	4904.417	19.00000	5.700000	22.94157	95.00000
CM-244	5532.210	5883.186	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 137
 Detector : 64288
 Background Analysis Date/Time : 13-SEP-2009 12:09:37
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.157	3297.781	3.000000	0.9000000	57.73503	95.00000
NP-237	4435.908	4901.616	4.000000	1.200000	50.00000	95.00000
CM-244	5533.626	5885.457	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 138
 Detector : 65877
 Background Analysis Date/Time : 13-SEP-2009 12:09:42
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.797	3298.359	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4433.795	4901.574	16.00000	4.800000	25.00000	95.00000
CM-244	5534.629	5884.088	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 139
 Detector : 76231
 Background Analysis Date/Time : 13-SEP-2009 12:09:46
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.097	3302.448	7.000000	2.100000	37.79645	95.00000
NP-237	4434.583	4904.027	9.000000	2.700000	33.33334	95.00000
CM-244	5532.194	5884.250	7.000000	2.100000	37.79645	95.00000

Instrument : CHAMBER 140
 Detector : 78771
 Background Analysis Date/Time : 13-SEP-2009 12:09:51
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.623	3298.088	3.000000	0.9000000	57.73503	95.00000
NP-237	4433.734	4904.340	8.000000	2.400000	35.35534	95.00000
CM-244	5533.806	5886.466	1.000000	0.3000000	100.0000	95.00000

Instrument : CHAMBER 141
 Detector : 76232
 Background Analysis Date/Time : 13-SEP-2009 12:09:56
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.803	3300.386	27.00000	8.100000	19.24501	95.00000
NP-237	4433.014	4902.508	26.00000	7.800000	19.61161	95.00000
CM-244	5530.609	5882.563	14.00000	4.200000	26.72612	95.00000

Instrument : CHAMBER 142
 Detector : 64261
 Background Analysis Date/Time : 13-SEP-2009 12:10:00
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.279	3300.003	3.000000	0.9000000	57.73503	95.00000
NP-237	4437.328	4903.684	13.00000	3.900000	27.73501	95.00000
CM-244	5534.720	5883.018	16.00000	4.800000	25.00000	95.00000

Instrument : CHAMBER 143
 Detector : 65882
 Background Analysis Date/Time : 13-SEP-2009 12:10:05
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.414	3301.724	9.000000	2.700000	33.33334	95.00000
NP-237	4436.178	4906.076	12.00000	3.600000	28.86751	95.00000
CM-244	5534.405	5886.338	8.000000	2.400000	35.35534	95.00000

Instrument : CHAMBER 144
 Detector : 75551
 Background Analysis Date/Time : 13-SEP-2009 12:10:09
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.731	3299.721	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4433.065	4902.473	11.00000	3.300000	30.15113	95.00000
CM-244	5535.430	5887.007	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 145
 Detector : 72526
 Background Analysis Date/Time : 13-SEP-2009 12:10:13
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.721	3299.421	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.677	4906.422	5.000000	1.500000	44.72136	95.00000
CM-244	5530.652	5883.277	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 146
 Detector : 72527
 Background Analysis Date/Time : 13-SEP-2009 12:10:17
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.088	3300.474	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.771	4903.488	6.000000	1.800000	40.82483	95.00000
CM-244	5533.810	5883.749	15.00000	4.500000	25.81989	95.00000

Instrument : CHAMBER 147
 Detector : 75550
 Background Analysis Date/Time : 13-SEP-2009 12:10:22
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.181	3300.391	5.000000	1.500000	44.72136	95.00000
NP-237	4433.176	4901.748	17.00000	5.100000	24.25356	95.00000
CM-244	5533.043	5883.438	7.000000	2.100000	37.79645	95.00000

Instrument : CHAMBER 148
 Detector : 74429
 Background Analysis Date/Time : 13-SEP-2009 12:10:27
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.384	3298.254	7.000000	2.100000	37.79645	95.00000
NP-237	4436.330	4905.591	5.000000	1.500000	44.72136	95.00000
CM-244	5533.038	5884.458	5.000000	1.500000	44.72136	95.00000

Instrument : CHAMBER 149
 Detector : 33449
 Background Analysis Date/Time : 13-SEP-2009 12:10:31
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.123	3300.525	5.000000	1.500000	44.72136	95.00000
NP-237	4433.492	4903.565	7.000000	2.100000	37.79645	95.00000
CM-244	5532.823	5885.611	8.000000	2.400000	35.35534	95.00000

Instrument : CHAMBER 150
 Detector : 75552
 Background Analysis Date/Time : 13-SEP-2009 12:10:36
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.795	3299.018	4.000000	1.200000	50.00000	95.00000
NP-237	4433.345	4903.215	6.000000	1.800000	40.82483	95.00000
CM-244	5531.531	5883.467	8.000000	2.400000	35.35534	95.00000

Instrument : CHAMBER 151
 Detector : 75556
 Background Analysis Date/Time : 13-SEP-2009 12:10:41
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.065	3301.859	4.000000	1.200000	50.00000	95.00000
NP-237	4433.320	4905.527	3.000000	0.9000000	57.73503	95.00000
CM-244	5530.408	5885.912	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 152
 Detector : 76222
 Background Analysis Date/Time : 13-SEP-2009 12:10:46
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.057	3298.427	2.000000	0.6000000	70.71068	95.00000
NP-237	4433.408	4906.063	4.000000	1.200000	50.00000	95.00000
CM-244	5530.659	5885.565	7.000000	2.100000	37.79645	95.00000

Instrument : CHAMBER 153
 Detector : 76223
 Background Analysis Date/Time : 13-SEP-2009 12:10:51
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.484	3300.080	6.000000	1.800000	40.82483	95.00000
NP-237	4437.092	4905.894	12.000000	3.600000	28.86751	95.00000
CM-244	5532.708	5883.766	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 154
 Detector : 76224
 Background Analysis Date/Time : 13-SEP-2009 12:10:55
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.121	3297.561	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4434.389	4903.288	1.000000	0.3000000	100.0000	95.00000
CM-244	5530.382	5887.013	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 155
 Detector : 75553
 Background Analysis Date/Time : 13-SEP-2009 12:11:00
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.782	3300.412	1.000000	0.3000000	100.0000	95.00000
NP-237	4437.153	4903.167	6.000000	1.800000	40.82483	95.00000
CM-244	5533.649	5886.970	10.00000	3.000000	31.62278	95.00000

Instrument : CHAMBER 156
 Detector : 75554
 Background Analysis Date/Time : 13-SEP-2009 12:11:05
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.491	3301.031	8.000000	2.400000	35.35534	95.00000
NP-237	4435.135	4901.821	15.00000	4.500000	25.81989	95.00000
CM-244	5532.917	5886.438	4.000000	1.200000	50.00000	95.00000

Instrument : CHAMBER 157
 Detector : 75555
 Background Analysis Date/Time : 13-SEP-2009 12:11:09
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.619	3299.042	2.000000	0.6000000	70.71068	95.00000
NP-237	4434.971	4905.888	4.000000	1.200000	50.00000	95.00000
CM-244	5530.610	5883.642	4.000000	1.200000	50.00000	95.00000

Instrument : CHAMBER 158
 Detector : 33451
 Background Analysis Date/Time : 13-SEP-2009 12:11:14
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.107	3300.392	6.000000	1.800000	40.82483	95.00000
NP-237	4434.046	4903.553	8.000000	2.400000	35.35534	95.00000
CM-244	5533.886	5884.921	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 159
 Detector : 76225
 Background Analysis Date/Time : 13-SEP-2009 12:11:19
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2987.563	3302.370	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4437.078	4903.944	7.000000	2.100000	37.79645	95.00000
CM-244	5535.224	5883.443	3.000000	0.9000000	57.73503	95.00000

Instrument : CHAMBER 160
 Detector : 76226
 Background Analysis Date/Time : 13-SEP-2009 12:11:23
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.547	3301.417	2.000000	0.6000000	70.71068	95.00000
NP-237	4433.329	4905.681	15.00000	4.500000	25.81989	95.00000
CM-244	5531.326	5884.399	7.000000	2.100000	37.79645	95.00000

Subsection 3: Efficiency Calibration

Instrument : CHAMBER 113
 Detector : 45-111B4
 Standard ID : AESS-001
 Standard Reference Date : 20-FEB-2008 09:54:53
 Calibration Analysis Date/Time : 17-SEP-2009 07:22:34
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:08:33
 Average Efficiency : 0.2493664
 Average Efficiency Error : 6.8753385E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	208.6698	28-FEB-2010	2991.706	3302.190	15200.00	0.2463616	1.0587734E-02	67.05293
NP-237	171.0024	28-FEB-2010	4433.295	4905.578	12844.00	0.2503200	1.2709484E-02	68.82748
CM-244	158.1060	28-FEB-2010	5531.363	5884.629	11294.00	0.2528249	1.2863314E-02	69.69121

Instrument : CHAMBER 114
 Detector : 78258
 Standard ID : AESS-007
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 17-SEP-2009 07:22:42
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:08:44
 Average Efficiency : 0.2549134
 Average Efficiency Error : 7.0137801E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.7342	28-FEB-2010	2988.034	3302.376	15415.00	0.2522229	1.0836960E-02	47.39108
NP-237	205.0260	28-FEB-2010	4432.616	4901.658	15874.00	0.2580762	1.3065383E-02	60.20995
CM-244	199.6806	28-FEB-2010	5533.073	5883.287	14411.00	0.2556491	1.2958678E-02	47.07045

Instrument : CHAMBER 115
 Detector : 45-132FF4
 Standard ID : AESS-002
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 17-SEP-2009 07:22:48
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:08:54
 Average Efficiency : 0.2607451
 Average Efficiency Error : 7.1741594E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.1144	28-FEB-2010	2990.454	3300.485	15582.00	0.2633568	1.1313187E-02	59.06649
NP-237	200.4990	28-FEB-2010	4434.893	4906.309	15600.00	0.2593181	1.3131134E-02	67.99342
CM-244	196.5558	28-FEB-2010	5530.846	5883.358	14362.00	0.2586598	1.3111949E-02	66.45667

Instrument : CHAMBER 116
 Detector : 45-132FF2
 Standard ID : AESS-008
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 17-SEP-2009 07:22:54
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:09:06
 Average Efficiency : 0.2642209
 Average Efficiency Error : 7.2657783E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.0418	28-FEB-2010	2992.147	3301.366	15928.00	0.2614976	1.1229084E-02	58.63169
NP-237	209.2716	28-FEB-2010	4433.104	4903.545	16584.00	0.2641209	1.3364404E-02	67.71608
CM-244	199.6488	28-FEB-2010	5532.219	5884.159	15127.00	0.2683146	1.3592103E-02	63.73655

Instrument : CHAMBER 117
 Detector : 33450
 Standard ID : AESS-003
 Standard Reference Date : 15-FEB-2008 13:12:27
 Calibration Analysis Date/Time : 17-SEP-2009 07:22:59
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:09:16
 Average Efficiency : 0.2539330
 Average Efficiency Error : 6.9886767E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.9740	28-FEB-2010	2991.160	3299.532	15096.00	0.2515729	1.0813041E-02	72.94815
NP-237	203.2080	28-FEB-2010	4434.233	4904.181	15475.00	0.2538008	1.2853066E-02	68.32410
CM-244	197.2236	28-FEB-2010	5532.536	5884.461	14342.00	0.2575089	1.3053890E-02	66.10744

Instrument : CHAMBER 118
 Detector : 75544
 Standard ID : AESS-009
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:06
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:09:28
 Average Efficiency : 0.2562016
 Average Efficiency Error : 7.0496872E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.3736	28-FEB-2010	2992.246	3300.695	15488.00	0.2575730	1.1065898E-02	48.08698
NP-237	204.0192	28-FEB-2010	4435.648	4905.687	15474.00	0.2527997	1.2802343E-02	51.47660
CM-244	197.2128	28-FEB-2010	5534.149	5886.128	14364.00	0.2578340	1.3070064E-02	51.26923

Instrument : CHAMBER 119
 Detector : 74429
 Standard ID : AESS-004
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:12
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 2-FEB-2009 15:15:38
 Average Efficiency : 0.2936279
 Average Efficiency Error : 1.2630888E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.1222	28-FEB-2010	2992.004	3299.253	14305.00	0.2936279	1.2630888E-02	65.91196
NP-237	204.2586	28-FEB-2010	4432.548	4906.013	0.0000000E+00	0.0000000E+00	0.0000000E+00	0.0000000E+00
CM-244	198.8100	28-FEB-2010	5530.584	5883.165	0.0000000E+00	0.0000000E+00	0.0000000E+00	0.0000000E+00

Instrument : CHAMBER 120
 Detector : 74430
 Standard ID : AESS-010
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:19
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:09:40
 Average Efficiency : 0.2607642
 Average Efficiency Error : 7.1738800E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.0008	28-FEB-2010	2989.533	3297.646	15530.00	0.2600539	1.1171980E-02	51.65312
NP-237	202.9926	28-FEB-2010	4435.084	4903.407	15890.00	0.2609192	1.3209156E-02	58.42772
CM-244	196.2330	28-FEB-2010	5534.300	5884.438	14492.00	0.2616084	1.3259737E-02	53.52900

Instrument : CHAMBER 121
 Detector : 75545
 Standard ID : AESS-005
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:26
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:09:49
 Average Efficiency : 0.2451099
 Average Efficiency Error : 6.7468924E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	210.7452	28-FEB-2010	2991.369	3298.608	14990.00	0.2406018	1.0342800E-02	48.96049
NP-237	209.5938	28-FEB-2010	4434.997	4903.847	15464.00	0.2459217	1.2454119E-02	62.72179
CM-244	202.7478	28-FEB-2010	5530.990	5882.362	14372.00	0.2510890	1.2728020E-02	56.59771

Instrument : CHAMBER 122
 Detector : 75546
 Standard ID : AESS-011
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:33
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:09:59
 Average Efficiency : 0.2511206
 Average Efficiency Error : 6.9071823E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	212.8284	28-FEB-2010	2989.526	3302.417	15637.00	0.2485339	1.0675786E-02	50.53908
NP-237	214.4868	28-FEB-2010	4434.926	4903.828	16238.00	0.2522937	1.2769196E-02	58.55772
CM-244	208.4184	28-FEB-2010	5530.663	5887.014	14930.00	0.2536814	1.2853005E-02	49.92265

Instrument : CHAMBER 123
 Detector : 45-142V3
 Standard ID : AESS-006
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:40
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:10:08
 Average Efficiency : 0.2596290
 Average Efficiency Error : 7.1429913E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.6952	28-FEB-2010	2989.415	3297.641	15549.00	0.2582173	1.1092825E-02	65.43886
NP-237	204.7038	28-FEB-2010	4435.564	4904.117	15822.00	0.2576210	1.3042886E-02	67.03554
CM-244	195.0060	28-FEB-2010	5535.344	5885.681	14523.00	0.2637896	1.3369960E-02	69.14881

Instrument : CHAMBER 124
 Detector : 45-142V2
 Standard ID : AESS-012
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:47
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:10:17
 Average Efficiency : 0.2573053
 Average Efficiency Error : 7.0782932E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.2200	28-FEB-2010	2988.039	3298.711	15522.00	0.2546119	1.0938271E-02	67.72288
NP-237	205.8930	28-FEB-2010	4435.637	4902.902	16168.00	0.2617298	1.3247415E-02	71.34655
CM-244	203.1954	28-FEB-2010	5534.267	5882.317	14734.00	0.2568478	1.3015599E-02	72.65984

Instrument : CHAMBER 125
 Detector : 75547
 Standard ID : AESS-013
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 17-SEP-2009 07:23:54
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:10:26
 Average Efficiency : 0.2582467
 Average Efficiency Error : 7.1037016E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.6544	28-FEB-2010	2988.290	3300.040	15695.00	0.2606819	1.1196902E-02	49.19345
NP-237	210.2526	28-FEB-2010	4434.085	4901.751	16039.00	0.2542721	1.2871174E-02	57.62983
CM-244	201.9108	28-FEB-2010	5532.412	5882.738	14766.00	0.2590335	1.3125989E-02	51.15325

Instrument : CHAMBER 126
 Detector : 75548
 Standard ID : AESS-019
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:03
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:10:43
 Average Efficiency : 0.2528757
 Average Efficiency Error : 6.9609745E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.6468	28-FEB-2010	2988.846	3299.840	14908.00	0.2463797	1.0592219E-02	51.21568
NP-237	202.9140	28-FEB-2010	4433.552	4902.802	15759.00	0.2588291	1.3104737E-02	56.16846
CM-244	199.3140	28-FEB-2010	5533.398	5882.628	14458.00	0.2568124	1.3017087E-02	52.26496

Instrument : CHAMBER 127
 Detector : 78770
 Standard ID : AESS-014
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:09
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:10:52
 Average Efficiency : 0.2474696
 Average Efficiency Error : 6.8085734E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	214.7088	28-FEB-2010	2989.252	3302.146	15471.00	0.2437071	1.0470388E-02	48.16148
NP-237	211.7160	28-FEB-2010	4434.433	4903.142	15929.00	0.2507826	1.2695607E-02	58.40179
CM-244	207.3882	28-FEB-2010	5534.926	5885.739	14624.00	0.2496737	1.2653272E-02	52.79491

Instrument : CHAMBER 128
 Detector : 75549
 Standard ID : AESS-020
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:16
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:01
 Average Efficiency : 0.2534627
 Average Efficiency Error : 6.9763800E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	205.5870	28-FEB-2010	2991.918	3301.506	15064.00	0.2478480	1.0653354E-02	48.72564
NP-237	203.4984	28-FEB-2010	4437.567	4901.469	15680.00	0.2568161	1.3003596E-02	61.32889
CM-244	197.1096	28-FEB-2010	5532.764	5882.821	14387.00	0.2585539	1.3106194E-02	50.94863

Instrument : CHAMBER 129
 Detector : 76227
 Standard ID : AESS-015
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:21
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:11
 Average Efficiency : 0.2630869
 Average Efficiency Error : 7.2373999E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.0270	28-FEB-2010	2987.942	3300.379	15637.00	0.2592492	1.1136069E-02	51.14825
NP-237	200.6460	28-FEB-2010	4435.988	4903.888	16067.00	0.2668864	1.3509459E-02	61.16219
CM-244	195.9270	28-FEB-2010	5534.503	5884.627	14653.00	0.2649124	1.3425237E-02	55.22726

Instrument : CHAMBER 130
 Detector : 76228
 Standard ID : AESS-021
 Standard Reference Date : 19-FEB-2008 15:31:52
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:25
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:20
 Average Efficiency : 0.2483380
 Average Efficiency Error : 6.8345908E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	208.3608	28-FEB-2010	2989.288	3298.075	15085.00	0.2448552	1.0524444E-02	49.62173
NP-237	210.1548	28-FEB-2010	4435.444	4902.612	15873.00	0.2517098	1.2743165E-02	56.97301
CM-244	200.7390	28-FEB-2010	5530.953	5884.486	14177.00	0.2500546	1.2677893E-02	51.59090

Instrument : CHAMBER 131
 Detector : 33448
 Standard ID : AESS-016
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:30
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:29
 Average Efficiency : 0.2501664
 Average Efficiency Error : 6.8896543E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.0534	28-FEB-2010	2991.775	3300.047	14580.00	0.2416933	1.0394993E-02	94.70427
NP-237	199.3962	28-FEB-2010	4434.944	4905.225	15408.00	0.2575527	1.3043756E-02	97.00230
CM-244	198.6402	28-FEB-2010	5534.242	5886.644	14360.00	0.2560634	1.2980316E-02	84.26888

Instrument : CHAMBER 132
 Detector : 67579
 Standard ID : AESS-022
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:36
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:39
 Average Efficiency : 0.2502582
 Average Efficiency Error : 6.8874490E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	209.6724	28-FEB-2010	2988.478	3299.760	15157.00	0.2445240	1.0509308E-02	47.44493
NP-237	206.8830	28-FEB-2010	4435.728	4906.447	15902.00	0.2561820	1.2969248E-02	59.39411
CM-244	203.0208	28-FEB-2010	5534.199	5884.992	14501.00	0.2530044	1.2823543E-02	54.36437

Instrument : CHAMBER 133
 Detector : 76229
 Standard ID : AESS-017
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:41
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:48
 Average Efficiency : 0.2438080
 Average Efficiency Error : 6.7106839E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	210.0798	28-FEB-2010	2989.448	3299.164	15021.00	0.2418610	1.0396539E-02	54.98614
NP-237	208.5846	28-FEB-2010	4434.532	4903.111	15484.00	0.2474312	1.2530360E-02	61.05153
CM-244	205.5828	28-FEB-2010	5532.731	5884.588	14106.00	0.2430393	1.2323108E-02	54.34287

Instrument : CHAMBER 134
 Detector : 76230
 Standard ID : AESS-023
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:46
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:11:57
 Average Efficiency : 0.2444534
 Average Efficiency Error : 6.7299884E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	207.4764	28-FEB-2010	2992.219	3300.010	14779.00	0.2409492	1.0360401E-02	46.56962
NP-237	207.4998	28-FEB-2010	4435.624	4902.916	15337.00	0.2462044	1.2469973E-02	55.22544
CM-244	199.8804	28-FEB-2010	5532.171	5886.589	13986.00	0.2478311	1.2567575E-02	48.04740

Instrument : CHAMBER 135
 Detector : 64270
 Standard ID : AESS-018
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:53
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:12:06
 Average Efficiency : 0.2526507
 Average Efficiency Error : 6.9530043E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.1856	28-FEB-2010	2992.256	3299.743	15152.00	0.2534960	1.0894979E-02	56.63107
NP-237	208.8990	28-FEB-2010	4436.015	4904.361	15645.00	0.2496088	1.2639027E-02	67.14091
CM-244	198.1458	28-FEB-2010	5530.434	5886.345	14246.00	0.2546374	1.2909472E-02	60.82066

Instrument : CHAMBER 136
 Detector : 68549
 Standard ID : AESS-024
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 17-SEP-2009 07:24:58
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 17-SEP-2009 15:12:16
 Average Efficiency : 0.2485794
 Average Efficiency Error : 6.8427753E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.5218	28-FEB-2010	2988.690	3299.356	14903.00	0.2476970	1.0648914E-02	56.69555
NP-237	205.6662	28-FEB-2010	4433.911	4904.417	15511.00	0.2513022	1.2726229E-02	83.91869
CM-244	198.3060	28-FEB-2010	5532.210	5883.186	13838.00	0.2471603	1.2535414E-02	66.08641

Instrument : CHAMBER 137
 Detector : 64288
 Standard ID : AESS-025
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:27
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:25:39
 Average Efficiency : 0.2528386
 Average Efficiency Error : 6.9739525E-03
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.5670	28-FEB-2010	2991.157	3297.781	14785.00	0.2557061	1.0994853E-02	66.23147
NP-237	167.9916	28-FEB-2010	4435.908	4901.616	12861.00	0.2551677	1.2955310E-02	79.15361
CM-244	157.2432	28-FEB-2010	5533.626	5885.457	10964.00	0.2468996	1.2568292E-02	71.74486

Instrument : CHAMBER 138
 Detector : 65877
 Standard ID : AESS-031
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:32
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:25:51
 Average Efficiency : 0.2560047
 Average Efficiency Error : 7.0619099E-03
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	193.6650	28-FEB-2010	2988.797	3298.359	14674.00	0.2562743	1.1020770E-02	57.98399
NP-237	162.9186	28-FEB-2010	4433.795	4901.574	12708.00	0.2599091	1.3198568E-02	62.78986
CM-244	153.1968	28-FEB-2010	5534.629	5884.088	10904.00	0.2519520	1.2826724E-02	60.43048

Instrument : CHAMBER 139
 Detector : 76231
 Standard ID : AESS-026
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:37
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:26:02
 Average Efficiency : 0.2492872
 Average Efficiency Error : 7.3094456E-03
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	199.5072	28-FEB-2010	2990.097	3302.448	14822.00	0.2512630	1.2732445E-02	51.16375
NP-237	168.0294	28-FEB-2010	4434.583	4904.027	12686.00	0.2516089	1.2777339E-02	56.09538
CM-244	160.5822	28-FEB-2010	5532.194	5884.250	11118.00	0.2451757	1.2477465E-02	51.18374

Instrument : CHAMBER 140
 Detector : 78771
 Standard ID : AESS-032
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:42
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:26:12
 Average Efficiency : 0.2526492
 Average Efficiency Error : 6.9693825E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.2364	28-FEB-2010	2989.623	3298.088	14531.00	0.2517187	1.0826853E-02	46.10829
NP-237	165.9822	28-FEB-2010	4433.734	4904.340	12513.00	0.2512438	1.2761484E-02	54.69451
CM-244	153.7938	28-FEB-2010	5533.806	5886.466	11096.00	0.2554495	1.3000681E-02	47.20534

Instrument : CHAMBER 141
 Detector : 76232
 Standard ID : AESS-027
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:47
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:26:23
 Average Efficiency : 0.2547455
 Average Efficiency Error : 7.4726613E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	193.4238	28-FEB-2010	2987.803	3300.386	14389.00	0.2514884	1.2749074E-02	55.20152
NP-237	161.6154	28-FEB-2010	4433.014	4902.508	12459.00	0.2568074	1.3045154E-02	58.63324
CM-244	148.1754	28-FEB-2010	5530.609	5882.563	10718.00	0.2560930	1.3041621E-02	54.14653

Instrument : CHAMBER 142
 Detector : 64261
 Standard ID : AESS-033
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:52
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:26:33
 Average Efficiency : 0.2603842
 Average Efficiency Error : 7.1830968E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	192.4158	28-FEB-2010	2991.279	3300.003	14554.00	0.2558129	1.1002630E-02	53.68588
NP-237	161.7816	28-FEB-2010	4437.328	4903.684	12703.00	0.2616512	1.3287083E-02	68.08553
CM-244	147.2670	28-FEB-2010	5534.720	5883.018	11068.00	0.2659896	1.3537915E-02	58.50507

Instrument : CHAMBER 143
 Detector : 65882
 Standard ID : AESS-028
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 16-SEP-2009 07:03:57
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:26:43
 Average Efficiency : 0.2438162
 Average Efficiency Error : 7.1521485E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	199.6542	28-FEB-2010	2988.414	3301.724	14343.00	0.2429526	1.2316748E-02	45.85791
NP-237	168.1992	28-FEB-2010	4436.178	4906.076	12465.00	0.2469572	1.2544546E-02	55.41743
CM-244	156.7614	28-FEB-2010	5534.405	5886.338	10698.00	0.2416553	1.2306704E-02	49.25873

Instrument : CHAMBER 144
 Detector : 75551
 Standard ID : AESS-034
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 16-SEP-2009 07:04:02
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:26:53
 Average Efficiency : 0.2432079
 Average Efficiency Error : 6.7124735E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.5488	28-FEB-2010	2991.731	3299.721	14149.00	0.2386236	1.0268736E-02	49.42162
NP-237	167.2962	28-FEB-2010	4433.065	4902.473	12333.00	0.2456661	1.2481030E-02	52.43185
CM-244	154.4388	28-FEB-2010	5535.430	5887.007	10803.00	0.2476103	1.2607776E-02	51.75169

Instrument : CHAMBER 145
 Detector : 72526
 Standard ID : AESS-029
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 16-SEP-2009 07:04:08
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:27:03
 Average Efficiency : 0.2494907
 Average Efficiency Error : 7.3155323E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	201.5742	28-FEB-2010	2990.721	3299.421	14837.00	0.2489683	1.2615955E-02	50.61446
NP-237	169.7700	28-FEB-2010	4435.677	4906.422	12664.00	0.2486207	1.2625882E-02	55.75652
CM-244	154.8234	28-FEB-2010	5530.652	5883.277	10970.00	0.2509164	1.2772597E-02	53.06380

Instrument : CHAMBER 146
 Detector : 72527
 Standard ID : AESS-035
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 16-SEP-2009 07:04:13
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:27:13
 Average Efficiency : 0.2521794
 Average Efficiency Error : 6.9540716E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	198.6666	28-FEB-2010	2988.088	3300.474	14792.00	0.2518262	1.0827903E-02	50.57500
NP-237	168.2934	28-FEB-2010	4435.771	4903.488	12795.00	0.2533910	1.2866129E-02	58.62805
CM-244	158.8128	28-FEB-2010	5533.810	5883.749	11284.00	0.2514743	1.2794847E-02	52.59344

Instrument : CHAMBER 147
 Detector : 75550
 Standard ID : AESS-030
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 16-SEP-2009 07:04:19
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:27:23
 Average Efficiency : 0.2462009
 Average Efficiency Error : 7.2221002E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	198.9792	28-FEB-2010	2992.181	3300.391	14151.00	0.2405333	1.2196311E-02	44.26603
NP-237	166.3758	28-FEB-2010	4433.176	4901.748	12552.00	0.2513769	1.2767726E-02	56.17089
CM-244	157.1856	28-FEB-2010	5533.043	5883.438	10973.00	0.2472064	1.2583700E-02	52.54537

Instrument : CHAMBER 148
 Detector : 74429
 Standard ID : AESS-036
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 16-SEP-2009 07:04:24
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 16-SEP-2009 12:27:33
 Average Efficiency : 0.2474463
 Average Efficiency Error : 6.8263425E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	201.3204	28-FEB-2010	2990.384	3298.254	14523.00	0.2439571	1.0493157E-02	54.37553
NP-237	167.4312	28-FEB-2010	4436.330	4905.591	12624.00	0.2512974	1.2762434E-02	58.03280
CM-244	156.4188	28-FEB-2010	5533.038	5884.458	10990.00	0.2487361	1.2661190E-02	52.85587

Instrument : CHAMBER 149
 Detector : 33449
 Standard ID : AESS-037
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:20
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:29:50
 Average Efficiency : 0.2442746
 Average Efficiency Error : 6.7418939E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.7372	28-FEB-2010	2988.123	3300.525	14041.00	0.2401365	1.0335403E-02	63.60672
NP-237	167.1294	28-FEB-2010	4433.492	4903.565	12391.00	0.2470920	1.2552506E-02	63.37567
CM-244	154.7664	28-FEB-2010	5532.823	5885.611	10826.00	0.2475891	1.2606204E-02	58.70196

Instrument : CHAMBER 150
 Detector : 75552
 Standard ID : AESS-043
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:25
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:30:04
 Average Efficiency : 0.2497773
 Average Efficiency Error : 6.8896711E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.7708	28-FEB-2010	2990.795	3299.018	14579.00	0.2492991	1.0722128E-02	50.95595
NP-237	168.7422	28-FEB-2010	4433.345	4903.215	12583.00	0.2485292	1.2622490E-02	60.02569
CM-244	156.3252	28-FEB-2010	5531.531	5883.467	11119.00	0.2517459	1.2811826E-02	53.55379

Instrument : CHAMBER 151
 Detector : 75556
 Standard ID : AESS-038
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:30
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:30:37
 Average Efficiency : 0.2445973
 Average Efficiency Error : 6.7483815E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.1408	28-FEB-2010	2991.065	3301.859	14594.00	0.2466028	1.0605961E-02	51.54713
NP-237	170.0886	28-FEB-2010	4433.320	4905.527	12551.00	0.2459524	1.2492075E-02	61.04260
CM-244	157.7460	28-FEB-2010	5530.408	5885.912	10724.00	0.2406166	1.2253285E-02	55.41215

Instrument : CHAMBER 152
 Detector : 76222
 Standard ID : AESS-044
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:36
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:30:48
 Average Efficiency : 0.2467650
 Average Efficiency Error : 6.8100104E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.4510	28-FEB-2010	2991.057	3298.427	14281.00	0.2483825	1.0686823E-02	51.43459
NP-237	166.6248	28-FEB-2010	4433.408	4906.063	12493.00	0.2498989	1.2693445E-02	55.87722
CM-244	155.8290	28-FEB-2010	5530.659	5885.565	10640.00	0.2416724	1.2308771E-02	51.92970

Instrument : CHAMBER 153
 Detector : 76223
 Standard ID : AESS-039
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:41
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:31:00
 Average Efficiency : 0.2530614
 Average Efficiency Error : 6.9837277E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	192.2418	28-FEB-2010	2992.484	3300.080	14284.00	0.2512709	1.0811096E-02	45.25198
NP-237	159.1506	28-FEB-2010	4437.092	4905.894	12330.00	0.2581708	1.3116390E-02	53.88176
CM-244	151.7142	28-FEB-2010	5532.708	5883.766	10746.00	0.2507173	1.2767147E-02	50.96059

Instrument : CHAMBER 154
 Detector : 76224
 Standard ID : AESS-045
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:46
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:31:26
 Average Efficiency : 0.2566059
 Average Efficiency Error : 7.0827994E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	186.9936	28-FEB-2010	2990.121	3297.561	14209.00	0.2569968	1.1058494E-02	47.64388
NP-237	160.8066	28-FEB-2010	4434.389	4903.288	12086.00	0.2505226	1.2731740E-02	51.56582
CM-244	145.8384	28-FEB-2010	5530.382	5887.013	10826.00	0.2627504	1.3378122E-02	46.75677

Instrument : CHAMBER 155
 Detector : 75553
 Standard ID : AESS-040
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:52
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:31:39
 Average Efficiency : 0.2586447
 Average Efficiency Error : 7.1315672E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.4828	28-FEB-2010	2991.782	3300.412	14971.00	0.2603490	1.1191908E-02	52.31090
NP-237	166.8174	28-FEB-2010	4437.153	4903.167	12889.00	0.2575112	1.3073887E-02	61.10300
CM-244	155.0100	28-FEB-2010	5533.649	5886.970	11275.00	0.2574479	1.3098875E-02	53.76326

Instrument : CHAMBER 156
 Detector : 75554
 Standard ID : AESS-046
 Standard Reference Date : 19-FEB-2008 19:35:48
 Calibration Analysis Date/Time : 15-SEP-2009 07:17:57
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:31:49
 Average Efficiency : 0.2458351
 Average Efficiency Error : 6.7870235E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.7474	28-FEB-2010	2991.491	3301.031	12844.31	0.2400144	1.0333307E-02	49.77089
NP-237	164.6658	28-FEB-2010	4435.135	4901.821	97.08801	0.2506796	1.2734897E-02	61.19961
CM-244	151.3824	28-FEB-2010	5532.917	5886.438	10151.71	0.0000000E+00	0.0000000E+00	52.61485

Instrument : CHAMBER 157
 Detector : 75555
 Standard ID : AESS-041
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 15-SEP-2009 07:18:03
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:32:00
 Average Efficiency : 0.2474201
 Average Efficiency Error : 6.8232059E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.9034	28-FEB-2010	2990.619	3299.042	14777.00	0.2450977	1.0538791E-02	51.15771
NP-237	171.2268	28-FEB-2010	4434.971	4905.888	12804.00	0.2492367	1.2655036E-02	55.90152
CM-244	159.5796	28-FEB-2010	5530.610	5883.642	11223.00	0.2489554	1.2667720E-02	51.75545

Instrument : CHAMBER 158
 Detector : 33451
 Standard ID : AESS-047
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 15-SEP-2009 07:18:08
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:32:11
 Average Efficiency : 0.2493795
 Average Efficiency Error : 6.8797250E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.4804	28-FEB-2010	2990.107	3300.392	14422.00	0.2469665	1.0623971E-02	68.44221
NP-237	168.3948	28-FEB-2010	4434.046	4903.553	12588.00	0.2491289	1.2652891E-02	70.67268
CM-244	154.6032	28-FEB-2010	5533.886	5884.921	11059.00	0.2531897	1.2886493E-02	68.82631

Instrument : CHAMBER 159
 Detector : 76225
 Standard ID : AESS-042
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 15-SEP-2009 07:18:13
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:32:21
 Average Efficiency : 0.2508302
 Average Efficiency Error : 6.9238753E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	188.7090	28-FEB-2010	2987.563	3302.370	14009.00	0.2510785	1.0806765E-02	45.91304
NP-237	159.6558	28-FEB-2010	4437.078	4903.944	12079.00	0.2521446	1.2814357E-02	56.71059
CM-244	150.5208	28-FEB-2010	5535.224	5883.443	10596.00	0.2491983	1.2692972E-02	51.46926

Instrument : CHAMBER 160
 Detector : 76226
 Standard ID : AESS-048
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 15-SEP-2009 07:18:19
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 15-SEP-2009 13:32:31
 Average Efficiency : 0.2441046
 Average Efficiency Error : 6.7402101E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	191.8350	28-FEB-2010	2990.547	3301.417	13828.00	0.2437831	1.0495425E-02	76.67180
NP-237	161.5530	28-FEB-2010	4433.329	4905.681	11940.00	0.2462660	1.2518029E-02	87.79373
CM-244	151.1856	28-FEB-2010	5531.326	5884.399	10356.00	0.2424449	1.2354254E-02	77.67188

Subsection 1: Energy Calibration

The Energy Calibration energy=Cal_Zero+(e1*C)+(e2*C^2)

where : Cal_Zero = Energy Calibration Zero
 e1 = Energy Calibration Slope
 e2 = Energy Calibration Quadratic
 C = Channel

Instrument : CHAMBER 161
 Detector : 70321
 Calibration Date/Time : 21-SEP-2009 14:45:33
 Calibration Source Id : AESS-001

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.798
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2376.675
 Energy Calibration Slope : 4.903314
 Energy Calibration Quadratic : 3.3071014E-04
 Energy Calibration Range : 7744.000

Instrument : CHAMBER 162
 Detector : 70323
 Calibration Date/Time : 21-SEP-2009 14:45:43
 Calibration Source Id : AESS-007

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2372.249
 Energy Calibration Slope : 4.921350
 Energy Calibration Quadratic : 3.0858925E-04
 Energy Calibration Range : 7735.000

Instrument : CHAMBER 163
 Detector : 70324
 Calibration Date/Time : 21-SEP-2009 14:46:06
 Calibration Source Id : AESS-002

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2383.315
 Energy Calibration Slope : 4.921310
 Energy Calibration Quadratic : 3.3110939E-04
 Energy Calibration Range : 7770.000

Instrument : CHAMBER 164
 Detector : 70325
 Calibration Date/Time : 21-SEP-2009 14:46:16
 Calibration Source Id : AESS-008
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2381.492
 Energy Calibration Slope : 4.935361
 Energy Calibration Quadratic : 3.1875577E-04
 Energy Calibration Range : 7770.000

Instrument : CHAMBER 165
 Detector : 72544
 Calibration Date/Time : 21-SEP-2009 14:46:29
 Calibration Source Id : AESS-003
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2386.890
 Energy Calibration Slope : 4.958474
 Energy Calibration Quadratic : 2.9448030E-04
 Energy Calibration Range : 7773.000

Instrument : CHAMBER 166
 Detector : 74545
 Calibration Date/Time : 21-SEP-2009 14:47:27
 Calibration Source Id : AESS-009
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2376.522
 Energy Calibration Slope : 4.921530
 Energy Calibration Quadratic : 3.3686910E-04
 Energy Calibration Range : 7769.000

Instrument : CHAMBER 167
 Detector : 72546
 Calibration Date/Time : 21-SEP-2009 14:48:04
 Calibration Source Id : AESS-004
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2378.613
 Energy Calibration Slope : 4.924971
 Energy Calibration Quadratic : 3.2533024E-04
 Energy Calibration Range : 7763.000

Instrument : CHAMBER 168
 Detector : 72547
 Calibration Date/Time : 21-SEP-2009 14:48:25
 Calibration Source Id : AESS-010
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2381.283
 Energy Calibration Slope : 4.946027
 Energy Calibration Quadratic : 3.0436489E-04
 Energy Calibration Range : 7765.000

Instrument : CHAMBER 169
 Detector : 72548
 Calibration Date/Time : 21-SEP-2009 14:48:47
 Calibration Source Id : AESS-005
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.001
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2384.302
 Energy Calibration Slope : 4.926007
 Energy Calibration Quadratic : 3.2111545E-04
 Energy Calibration Range : 7765.000

Instrument : CHAMBER 170
 Detector : 72549
 Calibration Date/Time : 21-SEP-2009 14:49:16
 Calibration Source Id : AESS-011
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2384.736
 Energy Calibration Slope : 4.931669
 Energy Calibration Quadratic : 3.3333997E-04
 Energy Calibration Range : 7784.000

Instrument : CHAMBER 171
 Detector : 78260
 Calibration Date/Time : 21-SEP-2009 14:49:40
 Calibration Source Id : AESS-006
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.120
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2375.901
 Energy Calibration Slope : 4.923372
 Energy Calibration Quadratic : 3.1892414E-04
 Energy Calibration Range : 7752.000

Instrument : CHAMBER 172
 Detector : 78772
 Calibration Date/Time : 21-SEP-2009 14:49:54
 Calibration Source Id : AESS-012
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2374.003
 Energy Calibration Slope : 4.928030
 Energy Calibration Quadratic : 3.2592146E-04
 Energy Calibration Range : 7762.000

Instrument : CHAMBER 173
 Detector : 74431
 Calibration Date/Time : 21-SEP-2009 14:50:04
 Calibration Source Id : AESS-013
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2368.870
 Energy Calibration Slope : 4.977422
 Energy Calibration Quadratic : 2.7764533E-04
 Energy Calibration Range : 7757.000

Instrument : CHAMBER 174
 Detector : 74432
 Calibration Date/Time : 21-SEP-2009 14:50:13
 Calibration Source Id : AESS-019
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2361.911
 Energy Calibration Slope : 5.039232
 Energy Calibration Quadratic : 2.0001861E-04
 Energy Calibration Range : 7732.000

Instrument : CHAMBER 175
 Detector : 74433
 Calibration Date/Time : 21-SEP-2009 14:50:24
 Calibration Source Id : AESS-014
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.019
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2364.263
 Energy Calibration Slope : 4.969145
 Energy Calibration Quadratic : 2.8674255E-04
 Energy Calibration Range : 7753.000

Instrument : CHAMBER 176
 Detector : 74434
 Calibration Date/Time : 21-SEP-2009 14:50:36
 Calibration Source Id : AESS-020

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2359.390
 Energy Calibration Slope : 5.025916
 Energy Calibration Quadratic : 2.3010977E-04
 Energy Calibration Range : 7747.000

Instrument : CHAMBER 177
 Detector : 74435
 Calibration Date/Time : 21-SEP-2009 14:50:46
 Calibration Source Id : AESS-015

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2363.896
 Energy Calibration Slope : 4.971116
 Energy Calibration Quadratic : 2.8296176E-04
 Energy Calibration Range : 7751.000

Instrument : CHAMBER 178
 Detector : 74436
 Calibration Date/Time : 21-SEP-2009 14:50:57
 Calibration Source Id : AESS-021

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2357.960
 Energy Calibration Slope : 4.995038
 Energy Calibration Quadratic : 2.5281982E-04
 Energy Calibration Range : 7738.000

Instrument : CHAMBER 179
 Detector : 74437
 Calibration Date/Time : 21-SEP-2009 14:51:07
 Calibration Source Id : AESS-016
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2362.475
 Energy Calibration Slope : 4.962544
 Energy Calibration Quadratic : 2.9229760E-04
 Energy Calibration Range : 7751.000

Instrument : CHAMBER 180
 Detector : 74438
 Calibration Date/Time : 21-SEP-2009 14:51:16
 Calibration Source Id : AESS-022
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2357.168
 Energy Calibration Slope : 5.024229
 Energy Calibration Quadratic : 2.2182068E-04
 Energy Calibration Range : 7735.000

Instrument : CHAMBER 181
 Detector : 74439
 Calibration Date/Time : 21-SEP-2009 14:51:26
 Calibration Source Id : AESS-017
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.800
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2361.833
 Energy Calibration Slope : 4.977290
 Energy Calibration Quadratic : 2.7170058E-04
 Energy Calibration Range : 7743.000

Instrument : CHAMBER 182
 Detector : 74440
 Calibration Date/Time : 21-SEP-2009 14:51:42
 Calibration Source Id : AESS-023

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.675
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2351.365
 Energy Calibration Slope : 5.006705
 Energy Calibration Quadratic : 2.3110739E-04
 Energy Calibration Range : 7721.000

Instrument : CHAMBER 183
 Detector : 74441
 Calibration Date/Time : 21-SEP-2009 14:51:54
 Calibration Source Id : AESS-018

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2365.306
 Energy Calibration Slope : 4.968304
 Energy Calibration Quadratic : 2.8504903E-04
 Energy Calibration Range : 7752.000

Instrument : CHAMBER 184
 Detector : 74442
 Calibration Date/Time : 21-SEP-2009 14:52:17
 Calibration Source Id : AESS-024

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2357.045
 Energy Calibration Slope : 5.026213
 Energy Calibration Quadratic : 2.2053947E-04
 Energy Calibration Range : 7735.000

Instrument : CHAMBER 185
 Detector : 68615
 Calibration Date/Time : 21-SEP-2009 14:52:26
 Calibration Source Id : AESS-025
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.020
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2363.439
 Energy Calibration Slope : 4.921171
 Energy Calibration Quadratic : 2.9912216E-04
 Energy Calibration Range : 7716.000

Instrument : CHAMBER 186
 Detector : 68616
 Calibration Date/Time : 21-SEP-2009 14:52:35
 Calibration Source Id : AESS-031
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2362.841
 Energy Calibration Slope : 4.954493
 Energy Calibration Quadratic : 2.7342763E-04
 Energy Calibration Range : 7723.000

Instrument : CHAMBER 187
 Detector : 68620
 Calibration Date/Time : 21-SEP-2009 14:52:45
 Calibration Source Id : AESS-026
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2375.999
 Energy Calibration Slope : 4.962572
 Energy Calibration Quadratic : 3.0889659E-04
 Energy Calibration Range : 7782.000

Instrument : CHAMBER 188
 Detector : 68621
 Calibration Date/Time : 21-SEP-2009 14:57:16
 Calibration Source Id : AESS-032

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2372.483
 Energy Calibration Slope : 4.952415
 Energy Calibration Quadratic : 3.0726261E-04
 Energy Calibration Range : 7766.000

Instrument : CHAMBER 189
 Detector : 68622
 Calibration Date/Time : 21-SEP-2009 14:53:03
 Calibration Source Id : AESS-027

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2360.450
 Energy Calibration Slope : 4.959707
 Energy Calibration Quadratic : 2.6419348E-04
 Energy Calibration Range : 7716.000

Instrument : CHAMBER 190
 Detector : 68623
 Calibration Date/Time : 21-SEP-2009 14:53:12
 Calibration Source Id : AESS-033

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2356.994
 Energy Calibration Slope : 4.952447
 Energy Calibration Quadratic : 2.7996209E-04
 Energy Calibration Range : 7722.000

Instrument : CHAMBER 191
 Detector : 68624
 Calibration Date/Time : 21-SEP-2009 14:53:21
 Calibration Source Id : AESS-028

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2375.194
 Energy Calibration Slope : 4.970817
 Energy Calibration Quadratic : 3.1015038E-04
 Energy Calibration Range : 7791.000

Instrument : CHAMBER 192
 Detector : 74430
 Calibration Date/Time : 21-SEP-2009 14:53:32
 Calibration Source Id : AESS-034

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2368.673
 Energy Calibration Slope : 4.975485
 Energy Calibration Quadratic : 3.0052042E-04
 Energy Calibration Range : 7779.000

Instrument : CHAMBER 193
 Detector : 68627
 Calibration Date/Time : 21-SEP-2009 14:53:41
 Calibration Source Id : AESS-029

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2366.307
 Energy Calibration Slope : 4.926867
 Energy Calibration Quadratic : 3.0849138E-04
 Energy Calibration Range : 7735.000

Instrument : CHAMBER 194
 Detector : 68635
 Calibration Date/Time : 21-SEP-2009 14:53:50
 Calibration Source Id : AESS-035
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.001
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2363.136
 Energy Calibration Slope : 4.944215
 Energy Calibration Quadratic : 2.9438949E-04
 Energy Calibration Range : 7735.000

Instrument : CHAMBER 195
 Detector : 68636
 Calibration Date/Time : 21-SEP-2009 14:53:59
 Calibration Source Id : AESS-030
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2364.925
 Energy Calibration Slope : 4.962630
 Energy Calibration Quadratic : 2.7555652E-04
 Energy Calibration Range : 7736.000

Instrument : CHAMBER 196
 Detector : 68637
 Calibration Date/Time : 21-SEP-2009 14:54:08
 Calibration Source Id : AESS-036
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.798
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2367.455
 Energy Calibration Slope : 4.936808
 Energy Calibration Quadratic : 2.9704699E-04
 Energy Calibration Range : 7734.000

Instrument : CHAMBER 197
 Detector : 78894
 Calibration Date/Time : 21-SEP-2009 14:42:21
 Calibration Source Id : AESS-037

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2367.634
 Energy Calibration Slope : 4.977818
 Energy Calibration Quadratic : 2.8380580E-04
 Energy Calibration Range : 7763.000

Instrument : CHAMBER 198
 Detector : 78895
 Calibration Date/Time : 21-SEP-2009 14:54:28
 Calibration Source Id : AESS-043

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2368.665
 Energy Calibration Slope : 4.961154
 Energy Calibration Quadratic : 2.8666743E-04
 Energy Calibration Range : 7749.000

Instrument : CHAMBER 199
 Detector : 78896
 Calibration Date/Time : 21-SEP-2009 14:54:37
 Calibration Source Id : AESS-038

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.801
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2369.988
 Energy Calibration Slope : 4.975040
 Energy Calibration Quadratic : 2.8448759E-04
 Energy Calibration Range : 7763.000

Instrument : CHAMBER 200
 Detector : 78900
 Calibration Date/Time : 21-SEP-2009 14:54:46
 Calibration Source Id : AESS-044

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2368.958
 Energy Calibration Slope : 4.954888
 Energy Calibration Quadratic : 3.0549458E-04
 Energy Calibration Range : 7763.000

Instrument : CHAMBER 201
 Detector : 78902
 Calibration Date/Time : 21-SEP-2009 14:54:55
 Calibration Source Id : AESS-039

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.799
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2361.867
 Energy Calibration Slope : 4.974102
 Energy Calibration Quadratic : 2.9147897E-04
 Energy Calibration Range : 7761.000

Instrument : CHAMBER 202
 Detector : 78903
 Calibration Date/Time : 21-SEP-2009 14:55:05
 Calibration Source Id : AESS-045

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2354.252
 Energy Calibration Slope : 4.963346
 Energy Calibration Quadratic : 2.8640320E-04
 Energy Calibration Range : 7737.000

Instrument : CHAMBER 203
 Detector : 78905
 Calibration Date/Time : 21-SEP-2009 14:55:14
 Calibration Source Id : AESS-040
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2365.971
 Energy Calibration Slope : 4.956215
 Energy Calibration Quadratic : 3.0086067E-04
 Energy Calibration Range : 7757.000

Instrument : CHAMBER 204
 Detector : 78907
 Calibration Date/Time : 21-SEP-2009 14:55:23
 Calibration Source Id : AESS-046
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.801
 CM-244 4320A 2/28/10 5795.020 5795.019
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2364.131
 Energy Calibration Slope : 4.970463
 Energy Calibration Quadratic : 2.7864033E-04
 Energy Calibration Range : 7746.000

Instrument : CHAMBER 205
 Detector : 78908
 Calibration Date/Time : 21-SEP-2009 14:55:32
 Calibration Source Id : AESS-041
 Cal. Isotopes Source Id Expiration Date Standard Energy Actual Energy
 GD-148 6445-278 2/28/10 3183.000 3183.000
 NP-237 4341 2/28/10 4768.800 4768.799
 CM-244 4320A 2/28/10 5795.020 5795.021
 Energy/Channel Equation : see above
 Energy Calibration Zero : 2369.855
 Energy Calibration Slope : 4.963379
 Energy Calibration Quadratic : 2.9518205E-04
 Energy Calibration Range : 7762.000

Instrument : CHAMBER 206
 Detector : 78909
 Calibration Date/Time : 21-SEP-2009 14:55:41
 Calibration Source Id : AESS-047

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2367.801
 Energy Calibration Slope : 4.940775
 Energy Calibration Quadratic : 3.1145863E-04
 Energy Calibration Range : 7754.000

Instrument : CHAMBER 207
 Detector : 78910
 Calibration Date/Time : 21-SEP-2009 14:55:50
 Calibration Source Id : AESS-042

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.020

Energy/Channel Equation : see above
 Energy Calibration Zero : 2367.063
 Energy Calibration Slope : 4.985894
 Energy Calibration Quadratic : 2.7485727E-04
 Energy Calibration Range : 7761.000

Instrument : CHAMBER 208
 Detector : 78911
 Calibration Date/Time : 21-SEP-2009 14:56:00
 Calibration Source Id : AESS-048

Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy
GD-148	6445-278	2/28/10	3183.000	3183.000
NP-237	4341	2/28/10	4768.800	4768.800
CM-244	4320A	2/28/10	5795.020	5795.021

Energy/Channel Equation : see above
 Energy Calibration Zero : 2366.635
 Energy Calibration Slope : 4.964264
 Energy Calibration Quadratic : 3.0284186E-04
 Energy Calibration Range : 7768.000

Subsection 2: Background Calibration

Instrument : CHAMBER 161
 Detector : 70321
 Background Analysis Date/Time : 20-SEP-2009 15:51:51
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.771	3300.133	1.000000	0.3000000	100.0000	95.00000
NP-237	4437.452	4905.776	11.00000	3.300000	30.15113	95.00000
CM-244	5533.229	5885.267	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 162
 Detector : 70323
 Background Analysis Date/Time : 20-SEP-2009 15:51:55
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.239	3298.296	1.000000	0.3000000	100.0000	95.00000
NP-237	4436.702	4904.841	3.000000	0.9000000	57.73503	95.00000
CM-244	5531.500	5882.828	10.00000	3.000000	31.62278	95.00000

Instrument : CHAMBER 163
 Detector : 70324
 Background Analysis Date/Time : 20-SEP-2009 15:52:00
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.643	3300.046	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4435.946	4905.743	20.00000	6.000000	22.36068	95.00000
CM-244	5535.155	5882.911	12.00000	3.600000	28.86751	95.00000

Instrument : CHAMBER 164
 Detector : 70325
 Background Analysis Date/Time : 20-SEP-2009 15:52:04
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.351	3300.390	2.000000	0.6000000	70.71068	95.00000
NP-237	4432.597	4902.599	13.00000	3.900000	27.73501	95.00000
CM-244	5531.973	5884.930	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 165
 Detector : 72544
 Background Analysis Date/Time : 20-SEP-2009 15:52:09
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.177	3299.087	2.000000	0.6000000	70.71068	95.00000
NP-237	4432.981	4902.991	5.000000	1.500000	44.72136	95.00000
CM-244	5531.772	5884.104	7.000000	2.100000	37.79645	95.00000

Instrument : CHAMBER 166
 Detector : 74545
 Background Analysis Date/Time : 20-SEP-2009 15:52:13
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.972	3298.535	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.387	4905.732	7.000000	2.100000	37.79645	95.00000
CM-244	5530.676	5884.311	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 167
 Detector : 72546
 Background Analysis Date/Time : 20-SEP-2009 15:52:18
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.306	3300.867	1.000000	0.3000000	100.0000	95.00000
NP-237	4436.966	4901.435	16.00000	4.800000	25.00000	95.00000
CM-244	5530.518	5883.394	9.000000	2.700000	33.33334	95.00000

Instrument : CHAMBER 168
 Detector : 72547
 Background Analysis Date/Time : 20-SEP-2009 15:52:22
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.229	3301.657	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4434.347	4904.144	14.00000	4.200000	26.72612	95.00000
CM-244	5532.888	5885.320	10.00000	3.000000	31.62278	95.00000

Instrument : CHAMBER 169
 Detector : 72548
 Background Analysis Date/Time : 20-SEP-2009 15:52:26
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.054	3301.559	7.000000	2.100000	37.79645	95.00000
NP-237	4437.192	4906.601	22.000000	6.600000	21.32007	95.00000
CM-244	5535.250	5882.471	13.000000	3.900000	27.73501	95.00000

Instrument : CHAMBER 170
 Detector : 72549
 Background Analysis Date/Time : 20-SEP-2009 15:52:31
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.361	3298.395	1.000000	0.3000000	100.0000	95.00000
NP-237	4436.739	4902.328	14.000000	4.200000	26.72612	95.00000
CM-244	5533.108	5887.023	12.000000	3.600000	28.86751	95.00000

Instrument : CHAMBER 171
 Detector : 78260
 Background Analysis Date/Time : 20-SEP-2009 15:52:36
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.303	3297.640	3.000000	0.9000000	57.73503	95.00000
NP-237	4432.543	4901.594	10.000000	3.000000	31.62278	95.00000
CM-244	5535.033	5887.339	8.000000	2.400000	35.35534	95.00000

Instrument : CHAMBER 172
 Detector : 78772
 Background Analysis Date/Time : 20-SEP-2009 15:52:40
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.091	3301.893	2.000000	0.6000000	70.71068	95.00000
NP-237	4433.700	4903.740	15.000000	4.500000	25.81989	95.00000
CM-244	5533.343	5886.514	6.000000	1.800000	40.82483	95.00000

Instrument : CHAMBER 173
 Detector : 74431
 Background Analysis Date/Time : 20-SEP-2009 15:52:45
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.339	3299.195	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.469	4905.977	7.000000	2.100000	37.79645	95.00000
CM-244	5534.997	5887.255	28.00000	8.400001	18.89822	95.00000

Instrument : CHAMBER 174
 Detector : 74432
 Background Analysis Date/Time : 20-SEP-2009 15:52:49
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.852	3301.015	5.000000	1.500000	44.72136	95.00000
NP-237	4435.608	4905.341	7.000000	2.100000	37.79645	95.00000
CM-244	5531.406	5886.389	21.00000	6.300000	21.82179	95.00000

Instrument : CHAMBER 175
 Detector : 74433
 Background Analysis Date/Time : 20-SEP-2009 15:52:53
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.886	3298.444	3.000000	0.9000000	57.73503	95.00000
NP-237	4434.203	4904.756	10.00000	3.000000	31.62278	95.00000
CM-244	5534.062	5886.590	23.00000	6.900000	20.85144	95.00000

Instrument : CHAMBER 176
 Detector : 74434
 Background Analysis Date/Time : 20-SEP-2009 15:52:58
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.225	3302.172	2.000000	0.6000000	70.71068	95.00000
NP-237	4432.630	4903.602	3.000000	0.9000000	57.73503	95.00000
CM-244	5532.053	5883.416	19.00000	5.700000	22.94157	95.00000

Instrument : CHAMBER 177
 Detector : 74435
 Background Analysis Date/Time : 20-SEP-2009 15:53:02
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.707	3298.313	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4434.012	4904.435	5.000000	1.500000	44.72136	95.00000
CM-244	5533.475	5885.809	18.00000	5.400000	23.57022	95.00000

Instrument : CHAMBER 178
 Detector : 74436
 Background Analysis Date/Time : 20-SEP-2009 15:53:06
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.348	3300.873	3.000000	0.9000000	57.73503	95.00000
NP-237	4432.820	4902.942	9.000000	2.700000	33.33334	95.00000
CM-244	5530.837	5887.508	19.00000	5.700000	22.94157	95.00000

Instrument : CHAMBER 179
 Detector : 74437
 Background Analysis Date/Time : 20-SEP-2009 15:53:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2992.396	3300.692	2.000000	0.6000000	70.71068	95.00000
NP-237	4435.850	4906.313	3.000000	0.9000000	57.73503	95.00000
CM-244	5535.639	5882.885	32.00000	9.600000	17.67767	95.00000

Instrument : CHAMBER 180
 Detector : 74438
 Background Analysis Date/Time : 20-SEP-2009 15:53:16
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.663	3299.349	1.000000	0.3000000	100.0000	95.00000
NP-237	4433.569	4903.757	13.00000	3.900000	27.73501	95.00000
CM-244	5530.967	5886.867	29.00000	8.700001	18.56953	95.00000

Instrument : CHAMBER 181
 Detector : 74439
 Background Analysis Date/Time : 20-SEP-2009 15:53:20
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.239	3302.087	2.000000	0.6000000	70.71068	95.00000
NP-237	4432.597	4902.658	3.000000	0.9000000	57.73503	95.00000
CM-244	5530.942	5882.719	27.00000	8.100000	19.24501	95.00000

Instrument : CHAMBER 182
 Detector : 74440
 Background Analysis Date/Time : 20-SEP-2009 15:53:24
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.945	3300.794	1.000000	0.3000000	100.0000	95.00000
NP-237	4432.572	4902.020	5.000000	1.500000	44.72136	95.00000
CM-244	5533.775	5884.077	33.00000	9.900001	17.40777	95.00000

Instrument : CHAMBER 183
 Detector : 74441
 Background Analysis Date/Time : 20-SEP-2009 15:53:29
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.798	3299.272	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4434.624	4904.963	5.000000	1.500000	44.72136	95.00000
CM-244	5533.945	5886.272	42.00000	12.60000	15.43033	95.00000

Instrument : CHAMBER 184
 Detector : 74442
 Background Analysis Date/Time : 20-SEP-2009 15:53:33
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.768	3299.551	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.041	4904.303	1.000000	0.3000000	100.0000	95.00000
CM-244	5531.580	5887.500	28.00000	8.400001	18.89822	95.00000

Instrument : CHAMBER 185
 Detector : 68615
 Background Analysis Date/Time : 20-SEP-2009 15:53:38
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.255	3299.191	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4436.568	4904.026	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
CM-244	5534.840	5885.460	35.00000	10.50000	16.90309	95.00000

Instrument : CHAMBER 186
 Detector : 68616
 Background Analysis Date/Time : 20-SEP-2009 15:53:42
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.448	3298.893	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.968	4903.217	3.000000	0.9000000	57.73503	95.00000
CM-244	5534.439	5884.968	30.00000	9.000000	18.25742	95.00000

Instrument : CHAMBER 187
 Detector : 68620
 Background Analysis Date/Time : 20-SEP-2009 15:53:46
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.069	3299.571	4.000000	1.200000	50.00000	95.00000
NP-237	4436.508	4902.892	10.00000	3.000000	31.62278	95.00000
CM-244	5534.129	5882.618	35.00000	10.50000	16.90309	95.00000

Instrument : CHAMBER 188
 Detector : 68621
 Background Analysis Date/Time : 20-SEP-2009 15:53:50
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.307	3299.196	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4433.812	4904.473	3.000000	0.9000000	57.73503	95.00000
CM-244	5534.433	5887.575	21.00000	6.300000	21.82179	95.00000

Instrument : CHAMBER 189
 Detector : 68622
 Background Analysis Date/Time : 20-SEP-2009 15:53:55
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.567	3302.212	2.000000	0.6000000	70.71068	95.00000
NP-237	4433.165	4906.352	5.000000	1.500000	44.72136	95.00000
CM-244	5531.737	5887.138	29.00000	8.700001	18.56953	95.00000

Instrument : CHAMBER 190
 Detector : 68623
 Background Analysis Date/Time : 20-SEP-2009 15:53:59
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.470	3297.949	3.000000	0.9000000	57.73503	95.00000
NP-237	4434.559	4903.208	45.00000	13.50000	14.90712	95.00000
CM-244	5535.128	5886.122	75.00000	22.50000	11.54701	95.00000

Instrument : CHAMBER 191
 Detector : 68624
 Background Analysis Date/Time : 20-SEP-2009 15:54:03
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.297	3300.325	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4434.026	4906.466	4.000000	1.200000	50.00000	95.00000
CM-244	5533.499	5882.588	39.00000	11.70000	16.01282	95.00000

Instrument : CHAMBER 192
 Detector : 74430
 Background Analysis Date/Time : 20-SEP-2009 15:54:07
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.254	3299.423	1.000000	0.3000000	100.0000	95.00000
NP-237	4433.037	4905.173	6.000000	1.800000	40.82483	95.00000
CM-244	5531.571	5885.579	27.00000	8.100000	19.24501	95.00000

Instrument : CHAMBER 193
 Detector : 68627
 Background Analysis Date/Time : 20-SEP-2009 15:54:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.990	3298.419	3.000000	0.9000000	57.73503	95.00000
NP-237	4433.001	4901.628	20.00000	6.000000	22.36068	95.00000
CM-244	5534.240	5885.963	35.00000	10.50000	16.90309	95.00000

Instrument : CHAMBER 194
 Detector : 68635
 Background Analysis Date/Time : 20-SEP-2009 15:54:15
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.781	3297.998	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
NP-237	4434.565	4903.602	2.000000	0.6000000	70.71068	95.00000
CM-244	5531.095	5882.711	16.00000	4.800000	25.00000	95.00000

Instrument : CHAMBER 195
 Detector : 68636
 Background Analysis Date/Time : 20-SEP-2009 15:54:19
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.560	3297.508	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.548	4904.654	6.000000	1.800000	40.82483	95.00000
CM-244	5531.770	5882.945	25.00000	7.500000	20.00000	95.00000

Instrument : CHAMBER 196
 Detector : 68637
 Background Analysis Date/Time : 20-SEP-2009 15:54:23
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.197	3301.025	2.000000	0.6000000	70.71068	95.00000
NP-237	4436.299	4904.887	12.00000	3.600000	28.86751	95.00000
CM-244	5531.851	5883.206	21.00000	6.300000	21.82179	95.00000

Instrument : CHAMBER 197
 Detector : 78894
 Background Analysis Date/Time : 20-SEP-2009 15:54:27
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.248	3298.244	0.000000E+00	0.000000E+00	0.000000E+00	95.00000
NP-237	4435.410	4906.453	2.000000	0.6000000	70.71068	95.00000
CM-244	5531.008	5883.783	22.00000	6.600000	21.32007	95.00000

Instrument : CHAMBER 198
 Detector : 78895
 Background Analysis Date/Time : 20-SEP-2009 15:54:30
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.256	3301.357	1.000000	0.3000000	100.0000	95.00000
NP-237	4435.341	4905.168	3.000000	0.9000000	57.73503	95.00000
CM-244	5533.514	5885.508	20.00000	6.000000	22.36068	95.00000

Instrument : CHAMBER 199
 Detector : 78896
 Background Analysis Date/Time : 20-SEP-2009 15:54:35
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.267	3300.107	3.000000	0.9000000	57.73503	95.00000
NP-237	4436.748	4902.339	6.000000	1.800000	40.82483	95.00000
CM-244	5531.913	5884.562	27.00000	8.100000	19.24501	95.00000

Instrument : CHAMBER 200
 Detector : 78900
 Background Analysis Date/Time : 20-SEP-2009 15:54:38
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.062	3301.136	2.000000	0.6000000	70.71068	95.00000
NP-237	4436.203	4901.740	14.00000	4.200000	26.72612	95.00000
CM-244	5531.761	5884.914	26.00000	7.800000	19.61161	95.00000

Instrument : CHAMBER 201
 Detector : 78902
 Background Analysis Date/Time : 20-SEP-2009 15:54:42
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2988.184	3302.217	1.000000	0.3000000	100.0000	95.00000
NP-237	4434.609	4905.994	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
CM-244	5531.184	5884.407	20.00000	6.000000	22.36068	95.00000

Instrument : CHAMBER 202
 Detector : 78903
 Background Analysis Date/Time : 20-SEP-2009 15:54:47
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.216	3297.484	1.000000	0.3000000	100.0000	95.00000
NP-237	4437.369	4902.276	0.0000000E+00	0.0000000E+00	0.0000000E+00	95.00000
CM-244	5530.984	5883.177	24.00000	7.200000	20.41241	95.00000

Instrument : CHAMBER 203
 Detector : 78905
 Background Analysis Date/Time : 20-SEP-2009 15:54:51
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.199	3298.236	9.000000	2.700000	33.33334	95.00000
NP-237	4432.988	4903.526	7.000000	2.100000	37.79645	95.00000
CM-244	5533.164	5886.048	26.00000	7.800000	19.61161	95.00000

Instrument : CHAMBER 204
 Detector : 78907
 Background Analysis Date/Time : 20-SEP-2009 15:54:55
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.792	3298.277	15.00000	4.500000	25.81989	95.00000
NP-237	4433.265	4903.277	16.00000	4.800000	25.00000	95.00000
CM-244	5531.668	5883.589	51.00000	15.30000	14.00280	95.00000

Instrument : CHAMBER 205
 Detector : 78908
 Background Analysis Date/Time : 20-SEP-2009 15:54:58
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.853	3298.183	1.000000	0.3000000	100.0000	95.00000
NP-237	4433.644	4904.311	4.000000	1.200000	50.00000	95.00000
CM-244	5533.979	5886.811	26.00000	7.800000	19.61161	95.00000

Instrument : CHAMBER 206
 Detector : 78909
 Background Analysis Date/Time : 20-SEP-2009 15:55:02
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.264	3297.560	2.000000	0.6000000	70.71068	95.00000
NP-237	4435.483	4905.550	2.000000	0.6000000	70.71068	95.00000
CM-244	5534.828	5887.642	15.00000	4.500000	25.81989	95.00000

Instrument : CHAMBER 207
 Detector : 78910
 Background Analysis Date/Time : 20-SEP-2009 15:55:07
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2989.540	3298.860	2.000000	0.6000000	70.71068	95.00000
NP-237	4436.642	4902.427	8.000000	2.400000	35.35534	95.00000
CM-244	5532.022	5884.565	36.00000	10.80000	16.66667	95.00000

Instrument : CHAMBER 208
 Detector : 78911
 Background Analysis Date/Time : 20-SEP-2009 15:55:11
 Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2991.900	3300.465	2.000000	0.6000000	70.71068	95.00000
NP-237	4437.256	4903.414	3.000000	0.9000000	57.73503	95.00000
CM-244	5534.200	5882.369	22.00000	6.600000	21.32007	95.00000

Subsection 3: Efficiency Calibration

Instrument : CHAMBER 161
 Detector : 70321
 Standard ID : AESS-001
 Standard Reference Date : 20-FEB-2008 09:54:53
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:18
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:45:33
 Average Efficiency : 0.3689128
 Average Efficiency Error : 1.0123267E-02
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	208.6698	28-FEB-2010	2989.771	3300.133	21764.00	0.3527895	1.5079973E-02	62.09401
NP-237	171.0024	28-FEB-2010	4437.452	4905.776	19466.00	0.3793849	1.9163225E-02	75.59914
CM-244	158.1060	28-FEB-2010	5533.229	5885.267	17188.00	0.3849835	1.9471968E-02	61.24743

Instrument : CHAMBER 162
 Detector : 70323
 Standard ID : AESS-007
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:25
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:45:43
 Average Efficiency : 0.3711489
 Average Efficiency Error : 1.0169771E-02
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.7342	28-FEB-2010	2992.239	3298.296	21845.00	0.3574707	1.5279390E-02	61.21131
NP-237	205.0260	28-FEB-2010	4436.702	4904.841	23392.00	0.3802952	1.9176660E-02	80.07285
CM-244	199.6806	28-FEB-2010	5531.500	5882.828	21627.00	0.3837951	1.9366477E-02	60.40187

Instrument : CHAMBER 163
 Detector : 70324
 Standard ID : AESS-002
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:32
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:46:06
 Average Efficiency : 0.3784813
 Average Efficiency Error : 1.0368052E-02
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.1144	28-FEB-2010	2988.643	3300.046	21830.00	0.3690017	1.5772363E-02	62.20918
NP-237	200.4990	28-FEB-2010	4435.946	4905.743	23254.00	0.3865025	1.9490723E-02	75.42545
CM-244	196.5558	28-FEB-2010	5535.155	5882.911	21361.00	0.3848922	1.9424047E-02	59.52460

Instrument : CHAMBER 164
 Detector : 70325
 Standard ID : AESS-008
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:39
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:46:16
 Average Efficiency : 0.3791597
 Average Efficiency Error : 1.0381414E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.0418	28-FEB-2010	2988.351	3300.390	22809.00	0.3744951	1.5998594E-02	58.40551
NP-237	209.2716	28-FEB-2010	4432.597	4902.599	23895.00	0.3805439	1.9185850E-02	71.09055
CM-244	199.6488	28-FEB-2010	5531.973	5884.930	21669.00	0.3846071	1.9407105E-02	56.87473

Instrument : CHAMBER 165
 Detector : 72544
 Standard ID : AESS-003
 Standard Reference Date : 15-FEB-2008 13:12:27
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:46
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:46:29
 Average Efficiency : 0.3786044
 Average Efficiency Error : 1.0371909E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.9740	28-FEB-2010	2991.177	3299.087	21994.00	0.3665624	1.5666667E-02	68.94492
NP-237	203.2080	28-FEB-2010	4432.981	4902.991	23569.00	0.3865909	1.9492906E-02	76.46336
CM-244	197.2236	28-FEB-2010	5531.772	5884.104	21676.00	0.3894331	1.9650551E-02	69.10842

Instrument : CHAMBER 166
 Detector : 74545
 Standard ID : AESS-009
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:52
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:47:27
 Average Efficiency : 0.3925645
 Average Efficiency Error : 1.0746635E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.3736	28-FEB-2010	2991.972	3298.535	23250.00	0.3867014	1.6516251E-02	56.08769
NP-237	204.0192	28-FEB-2010	4435.387	4905.732	24303.00	0.3970365	2.0014562E-02	79.13438
CM-244	197.2128	28-FEB-2010	5530.676	5884.311	22089.00	0.3967021	2.0013960E-02	55.09056

Instrument : CHAMBER 167
 Detector : 72546
 Standard ID : AESS-004
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 21-SEP-2009 09:28:59
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:48:04
 Average Efficiency : 0.3871779
 Average Efficiency Error : 1.0602054E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.1222	28-FEB-2010	2989.306	3300.867	22941.00	0.3765221	1.6084069E-02	55.09563
NP-237	204.2586	28-FEB-2010	4436.966	4901.435	24233.00	0.3953844	1.9931784E-02	76.26476
CM-244	198.8100	28-FEB-2010	5530.518	5883.394	22180.00	0.3953461	1.9944822E-02	56.09549

Instrument : CHAMBER 168
 Detector : 72547
 Standard ID : AESS-010
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:07
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:48:25
 Average Efficiency : 0.3895916
 Average Efficiency Error : 1.0669101E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.0008	28-FEB-2010	2989.229	3301.657	22631.00	0.3790159	1.6193239E-02	61.00068
NP-237	202.9926	28-FEB-2010	4434.347	4904.144	24065.00	0.3951014	1.9918641E-02	83.09320
CM-244	196.2330	28-FEB-2010	5532.888	5885.320	22172.00	0.4003809	2.0198891E-02	61.18747

Instrument : CHAMBER 169
 Detector : 72548
 Standard ID : AESS-005
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:13
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:48:47
 Average Efficiency : 0.3742271
 Average Efficiency Error : 1.0248713E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	210.7452	28-FEB-2010	2990.054	3301.559	22666.00	0.3638192	1.5543718E-02	59.25828
NP-237	209.5938	28-FEB-2010	4437.192	4906.601	23965.00	0.3810294	1.9209908E-02	71.80399
CM-244	202.7478	28-FEB-2010	5535.250	5882.471	21940.00	0.3834514	1.9346640E-02	60.12471

Instrument : CHAMBER 170
 Detector : 72549
 Standard ID : AESS-011
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:20
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:49:16
 Average Efficiency : 0.3642089
 Average Efficiency Error : 9.9735176E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	212.8284	28-FEB-2010	2991.361	3298.395	22497.00	0.3575987	1.5279310E-02	63.36363
NP-237	214.4868	28-FEB-2010	4436.739	4902.328	23611.00	0.3668730	1.8498441E-02	80.98635
CM-244	208.4184	28-FEB-2010	5533.108	5887.023	21846.00	0.3714186	1.8740255E-02	58.50939

Instrument : CHAMBER 171
 Detector : 78260
 Standard ID : AESS-006
 Standard Reference Date : 14-FEB-2008 09:35:18
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:26
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:49:40
 Average Efficiency : 0.3810605
 Average Efficiency Error : 1.0438851E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.6952	28-FEB-2010	2991.303	3297.640	22193.00	0.3685752	1.5750948E-02	59.60153
NP-237	204.7038	28-FEB-2010	4432.543	4901.594	23828.00	0.3879591	1.9560140E-02	73.97815
CM-244	195.0060	28-FEB-2010	5535.033	5887.339	21671.00	0.3938129	1.9871602E-02	62.27898

Instrument : CHAMBER 172
 Detector : 78772
 Standard ID : AESS-012
 Standard Reference Date : 14-FEB-2008 13:39:25
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:32
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:49:54
 Average Efficiency : 0.3822589
 Average Efficiency Error : 1.0466043E-02
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	206.2200	28-FEB-2010	2990.091	3301.893	22979.00	0.3769604	1.6102478E-02	57.80247
NP-237	205.8930	28-FEB-2010	4433.700	4903.740	24203.00	0.3917651	1.9749530E-02	76.25694
CM-244	203.1954	28-FEB-2010	5533.343	5886.514	21835.00	0.3808052	1.9213919E-02	58.76520

Instrument : CHAMBER 173
 Detector : 74431
 Standard ID : AESS-013
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:38
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:50:04
 Average Efficiency : 0.2602993
 Average Efficiency Error : 7.1600322E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.6544	28-FEB-2010	2990.339	3299.195	15911.00	0.2643020	1.1349737E-02	50.51283
NP-237	210.2526	28-FEB-2010	4435.469	4905.977	15987.00	0.2534239	1.2828780E-02	57.29033
CM-244	201.9108	28-FEB-2010	5534.997	5887.255	14946.00	0.2621880	1.3283902E-02	53.12511

Instrument : CHAMBER 174
 Detector : 74432
 Standard ID : AESS-019
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:43
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:50:13
 Average Efficiency : 0.2533270
 Average Efficiency Error : 6.9733807E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.6468	28-FEB-2010	2989.852	3301.015	14930.00	0.2467540	1.0608066E-02	48.02879
NP-237	202.9140	28-FEB-2010	4435.608	4905.341	15850.00	0.2603388	1.3180215E-02	57.62176
CM-244	199.3140	28-FEB-2010	5531.406	5886.389	14432.00	0.2563750	1.2995369E-02	54.02073

Instrument : CHAMBER 175
 Detector : 74433
 Standard ID : AESS-014
 Standard Reference Date : 19-FEB-2008 11:05:22
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:50
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:50:24
 Average Efficiency : 0.2543943
 Average Efficiency Error : 6.9960668E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	214.7088	28-FEB-2010	2989.886	3298.444	16030.00	0.2525296	1.0842831E-02	50.61414
NP-237	211.7160	28-FEB-2010	4434.203	4904.756	16439.00	0.2587745	1.3095257E-02	57.23130
CM-244	207.3882	28-FEB-2010	5534.062	5886.590	14808.00	0.2528055	1.2810053E-02	51.72563

Instrument : CHAMBER 176
 Detector : 74434
 Standard ID : AESS-020
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 21-SEP-2009 09:29:58
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:50:36
 Average Efficiency : 0.2547762
 Average Efficiency Error : 7.0115663E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	205.5870	28-FEB-2010	2991.225	3302.172	15206.00	0.2502103	1.0753103E-02	46.19209
NP-237	203.4984	28-FEB-2010	4432.630	4903.602	15838.00	0.2594141	1.3133497E-02	58.51922
CM-244	197.1096	28-FEB-2010	5532.053	5883.416	14295.00	0.2569134	1.3024328E-02	51.87393

Instrument : CHAMBER 177
 Detector : 74435
 Standard ID : AESS-015
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:03
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:50:46
 Average Efficiency : 0.2659749
 Average Efficiency Error : 7.3150843E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.0270	28-FEB-2010	2989.707	3298.313	15952.00	0.2645041	1.1357911E-02	48.05111
NP-237	200.6460	28-FEB-2010	4434.012	4904.435	16053.00	0.2666638	1.3498317E-02	54.07773
CM-244	195.9270	28-FEB-2010	5533.475	5885.809	14787.00	0.2673737	1.3548458E-02	55.83525

Instrument : CHAMBER 178
 Detector : 74436
 Standard ID : AESS-021
 Standard Reference Date : 19-FEB-2008 15:31:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:10
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:50:57
 Average Efficiency : 0.2584701
 Average Efficiency Error : 7.1088150E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	208.3608	28-FEB-2010	2991.348	3300.873	15813.00	0.2566991	1.1024418E-02	46.60859
NP-237	210.1548	28-FEB-2010	4432.820	4902.942	16293.00	0.2583858	1.3076977E-02	58.74612
CM-244	200.7390	28-FEB-2010	5530.837	5887.508	14803.00	0.2611073	1.3230741E-02	51.69608

Instrument : CHAMBER 179
 Detector : 74437
 Standard ID : AESS-016
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:16
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:51:07
 Average Efficiency : 0.2656665
 Average Efficiency Error : 7.3066968E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	204.0534	28-FEB-2010	2992.396	3300.692	16018.00	0.2655541	1.1402219E-02	48.47999
NP-237	199.3962	28-FEB-2010	4435.850	4906.313	16096.00	0.2690641	1.3619361E-02	58.18980
CM-244	198.6402	28-FEB-2010	5535.639	5882.885	14727.00	0.2625763	1.3306193E-02	54.75912

Instrument : CHAMBER 180
 Detector : 74438
 Standard ID : AESS-022
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:22
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:51:16
 Average Efficiency : 0.2482043
 Average Efficiency Error : 6.8309689E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	209.6724	28-FEB-2010	2988.663	3299.349	15136.00	0.2442104	1.0496107E-02	47.14516
NP-237	206.8830	28-FEB-2010	4433.569	4903.757	15632.00	0.2518027	1.2750288E-02	52.81374
CM-244	203.0208	28-FEB-2010	5530.967	5886.867	14358.00	0.2504804	1.2697529E-02	50.18464

Instrument : CHAMBER 181
 Detector : 74439
 Standard ID : AESS-017
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:28
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:51:26
 Average Efficiency : 0.2568994
 Average Efficiency Error : 7.0653898E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	210.0798	28-FEB-2010	2988.239	3302.087	16106.00	0.2593535	1.1134949E-02	50.88416
NP-237	208.5846	28-FEB-2010	4432.597	4902.658	16106.00	0.2573713	1.3027404E-02	57.22441
CM-244	205.5828	28-FEB-2010	5530.942	5882.719	14695.00	0.2531832	1.2830525E-02	53.69027

Instrument : CHAMBER 182
 Detector : 74440
 Standard ID : AESS-023
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:34
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:51:42
 Average Efficiency : 0.2555217
 Average Efficiency Error : 7.0314407E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	207.4764	28-FEB-2010	2990.945	3300.794	15263.00	0.2488660	1.0694612E-02	45.64035
NP-237	207.4998	28-FEB-2010	4432.572	4902.020	16228.00	0.2606671	1.3193036E-02	52.09262
CM-244	199.8804	28-FEB-2010	5533.775	5884.077	14703.00	0.2605115	1.3201850E-02	48.97062

Instrument : CHAMBER 183
 Detector : 74441
 Standard ID : AESS-018
 Standard Reference Date : 14-FEB-2008 17:45:04
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:39
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:51:54
 Average Efficiency : 0.2611987
 Average Efficiency Error : 7.1849022E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	202.1856	28-FEB-2010	2990.798	3299.272	15703.00	0.2627467	1.1285488E-02	47.53299
NP-237	208.8990	28-FEB-2010	4434.624	4904.963	16100.00	0.2568786	1.3002539E-02	53.88460
CM-244	198.1458	28-FEB-2010	5533.945	5886.272	14750.00	0.2635892	1.3357328E-02	53.93570

Instrument : CHAMBER 184
 Detector : 74442
 Standard ID : AESS-024
 Standard Reference Date : 14-FEB-2008 21:55:55
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:45
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:52:17
 Average Efficiency : 0.2584583
 Average Efficiency Error : 7.1114316E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.5218	28-FEB-2010	2988.768	3299.551	15277.00	0.2539344	1.0912240E-02	50.31911
NP-237	205.6662	28-FEB-2010	4434.041	4904.303	16050.00	0.2601255	1.3167357E-02	58.63404
CM-244	198.3060	28-FEB-2010	5531.580	5887.500	14754.00	0.2635180	1.3353555E-02	51.04471

Instrument : CHAMBER 185
 Detector : 68615
 Standard ID : AESS-025
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:51
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:52:26
 Average Efficiency : 0.2578048
 Average Efficiency Error : 7.1078530E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.5670	28-FEB-2010	2988.255	3299.191	14889.00	0.2575537	1.1072870E-02	57.86859
NP-237	167.9916	28-FEB-2010	4436.568	4904.026	13054.00	0.2590211	1.3147981E-02	60.38557
CM-244	157.2432	28-FEB-2010	5534.840	5885.460	11412.00	0.2569523	1.3071318E-02	57.79462

Instrument : CHAMBER 186
 Detector : 68616
 Standard ID : AESS-031
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 21-SEP-2009 09:30:57
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:52:35
 Average Efficiency : 0.2488432
 Average Efficiency Error : 6.8683540E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	193.6650	28-FEB-2010	2991.448	3298.893	14023.00	0.2449313	1.0542010E-02	55.63848
NP-237	162.9186	28-FEB-2010	4434.968	4903.217	12465.00	0.2550169	1.2953850E-02	61.88278
CM-244	153.1968	28-FEB-2010	5534.439	5884.968	10759.00	0.2485880	1.2658793E-02	53.78214

Instrument : CHAMBER 187
 Detector : 68620
 Standard ID : AESS-026
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:03
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:52:45
 Average Efficiency : 0.2500139
 Average Efficiency Error : 7.3307389E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	199.5072	28-FEB-2010	2991.069	3299.571	14686.00	0.2490046	1.2619531E-02	51.85893
NP-237	168.0294	28-FEB-2010	4436.508	4902.892	12870.00	0.2552532	1.2959577E-02	54.96236
CM-244	160.5822	28-FEB-2010	5534.129	5882.618	11163.00	0.2461146	1.2524742E-02	53.45123

Instrument : CHAMBER 188
 Detector : 68621
 Standard ID : AESS-032
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:08
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:57:16
 Average Efficiency : 0.2573678
 Average Efficiency Error : 7.0972578E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.2364	28-FEB-2010	2991.307	3299.196	14948.00	0.2589918	1.1133890E-02	51.99499
NP-237	165.9822	28-FEB-2010	4433.812	4904.473	12790.00	0.2568368	1.3041135E-02	63.01558
CM-244	153.7938	28-FEB-2010	5534.433	5887.575	11106.00	0.2556783	1.3012402E-02	52.96853

Instrument : CHAMBER 189
 Detector : 68622
 Standard ID : AESS-027
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:15
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:03
 Average Efficiency : 0.2613129
 Average Efficiency Error : 7.6623494E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	193.4238	28-FEB-2010	2989.567	3302.212	14738.00	0.2577560	1.3062426E-02	55.08699
NP-237	161.6154	28-FEB-2010	4433.165	4906.352	12695.00	0.2618049	1.3294927E-02	59.92243
CM-244	148.1754	28-FEB-2010	5531.737	5887.138	11072.00	0.2645886	1.3466716E-02	57.86366

Instrument : CHAMBER 190
 Detector : 68623
 Standard ID : AESS-033
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:22
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:12
 Average Efficiency : 0.2619864
 Average Efficiency Error : 7.2268778E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	192.4158	28-FEB-2010	2990.470	3297.949	14602.00	0.2566898	1.1039688E-02	51.16143
NP-237	161.7816	28-FEB-2010	4434.559	4903.208	12864.00	0.2647705	1.3443264E-02	59.23622
CM-244	147.2670	28-FEB-2010	5535.128	5886.122	11129.00	0.2671734	1.3597734E-02	49.90292

Instrument : CHAMBER 191
 Detector : 68624
 Standard ID : AESS-028
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:28
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:21
 Average Efficiency : 0.2625601
 Average Efficiency Error : 7.6934313E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	199.6542	28-FEB-2010	2991.297	3300.325	15252.00	0.2584319	1.3090833E-02	50.79485
NP-237	168.1992	28-FEB-2010	4434.026	4906.466	13308.00	0.2637113	1.3382300E-02	58.03377
CM-244	156.7614	28-FEB-2010	5533.499	5882.588	11769.00	0.2657853	1.3513734E-02	53.41747

Instrument : CHAMBER 192
 Detector : 74430
 Standard ID : AESS-034
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:34
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:32
 Average Efficiency : 0.2544576
 Average Efficiency Error : 7.0170104E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.5488	28-FEB-2010	2990.254	3299.423	14893.00	0.2511986	1.0799594E-02	50.05982
NP-237	167.2962	28-FEB-2010	4433.037	4905.173	12941.00	0.2578104	1.3088287E-02	62.20525
CM-244	154.4388	28-FEB-2010	5531.571	5885.579	11163.00	0.2558767	1.3021424E-02	54.21256

Instrument : CHAMBER 193
 Detector : 68627
 Standard ID : AESS-029
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:40
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:41
 Average Efficiency : 0.2615199
 Average Efficiency Error : 7.6632542E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	201.5742	28-FEB-2010	2991.990	3298.419	15396.00	0.2583720	1.3086254E-02	50.38469
NP-237	169.7700	28-FEB-2010	4433.001	4901.628	13286.00	0.2607451	1.3232258E-02	58.19065
CM-244	154.8234	28-FEB-2010	5534.240	5885.963	11618.00	0.2656835	1.3511403E-02	53.47323

Instrument : CHAMBER 194
 Detector : 68635
 Standard ID : AESS-035
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:45
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:50
 Average Efficiency : 0.2542233
 Average Efficiency Error : 7.0097935E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	198.6666	28-FEB-2010	2990.781	3297.998	14819.00	0.2523236	1.0848935E-02	51.65903
NP-237	168.2934	28-FEB-2010	4434.565	4903.602	13013.00	0.2577325	1.3083202E-02	59.92809
CM-244	158.8128	28-FEB-2010	5531.095	5882.711	11369.00	0.2534982	1.2896180E-02	53.05344

Instrument : CHAMBER 195
 Detector : 68636
 Standard ID : AESS-030
 Standard Reference Date : 15-FEB-2008 09:06:52
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:51
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:53:59
 Average Efficiency : 0.2554399
 Average Efficiency Error : 7.4881674E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	198.9792	28-FEB-2010	2989.560	3297.508	14812.00	0.2518228	1.2760897E-02	51.28571
NP-237	166.3758	28-FEB-2010	4435.548	4904.654	12878.00	0.2579744	1.3097576E-02	59.53444
CM-244	157.1856	28-FEB-2010	5531.770	5882.945	11394.00	0.2567084	1.3059122E-02	52.18182

Instrument : CHAMBER 196
 Detector : 68637
 Standard ID : AESS-036
 Standard Reference Date : 18-FEB-2008 11:28:15
 Calibration Analysis Date/Time : 21-SEP-2009 09:31:58
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:54:08
 Average Efficiency : 0.2560611
 Average Efficiency Error : 7.0601865E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	201.3204	28-FEB-2010	2989.197	3301.025	14971.00	0.2515414	1.0813317E-02	54.46194
NP-237	167.4312	28-FEB-2010	4436.299	4904.887	13068.00	0.2600951	1.3202412E-02	58.47227
CM-244	156.4188	28-FEB-2010	5531.851	5883.206	11431.00	0.2587482	1.3162114E-02	55.12206

Instrument : CHAMBER 197
 Detector : 78894
 Standard ID : AESS-037
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:04
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:42:21
 Average Efficiency : 0.2524827
 Average Efficiency Error : 6.9639706E-03
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.7372	28-FEB-2010	2989.248	3298.244	14631.00	0.2502923	1.0764122E-02	53.79660
NP-237	167.1294	28-FEB-2010	4435.410	4906.453	12637.00	0.2520285	1.2799331E-02	65.84109
CM-244	154.7664	28-FEB-2010	5531.008	5883.783	11198.00	0.2561660	1.3035372E-02	58.58810

Instrument : CHAMBER 198
 Detector : 78895
 Standard ID : AESS-043
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:10
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:54:28
 Average Efficiency : 0.2546443
 Average Efficiency Error : 7.0217522E-03
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.7708	28-FEB-2010	2988.256	3301.357	14781.00	0.2528079	1.0870277E-02	53.58070
NP-237	168.7422	28-FEB-2010	4435.341	4905.168	12907.00	0.2549473	1.2943417E-02	60.79170
CM-244	156.3252	28-FEB-2010	5533.514	5885.508	11347.00	0.2569917	1.3074390E-02	55.00752

Instrument : CHAMBER 199
 Detector : 78896
 Standard ID : AESS-038
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:15
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:54:37
 Average Efficiency : 0.2501853
 Average Efficiency Error : 6.8995738E-03
 Confidence : 95.00000

Cal. Isteps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	200.1408	28-FEB-2010	2991.267	3300.107	14889.00	0.2516318	1.0818291E-02	52.50020
NP-237	170.0886	28-FEB-2010	4436.748	4902.339	12711.00	0.2490705	1.2648016E-02	63.29102
CM-244	157.7460	28-FEB-2010	5531.913	5884.562	11110.00	0.2493175	1.2688680E-02	53.66205

Instrument : CHAMBER 200
 Detector : 78900
 Standard ID : AESS-044
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:21
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:54:46
 Average Efficiency : 0.2682398
 Average Efficiency Error : 7.3923203E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.4510	28-FEB-2010	2988.062	3301.136	15568.00	0.2708094	1.1633540E-02	50.91508
NP-237	166.6248	28-FEB-2010	4436.203	4901.740	13553.00	0.2710442	1.3750886E-02	57.22134
CM-244	155.8290	28-FEB-2010	5531.761	5884.914	11543.00	0.2622247	1.3336830E-02	45.01981

Instrument : CHAMBER 201
 Detector : 78902
 Standard ID : AESS-039
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:27
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:54:55
 Average Efficiency : 0.2589892
 Average Efficiency Error : 7.1445713E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	192.2418	28-FEB-2010	2988.184	3302.217	14648.00	0.2577410	1.1084234E-02	45.65341
NP-237	159.1506	28-FEB-2010	4434.609	4905.994	12631.00	0.2645504	1.3435334E-02	55.65960
CM-244	151.7142	28-FEB-2010	5531.184	5884.407	10948.00	0.2554961	1.3006385E-02	45.41114

Instrument : CHAMBER 202
 Detector : 78903
 Standard ID : AESS-045
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:32
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:55:05
 Average Efficiency : 0.2665268
 Average Efficiency Error : 7.3516225E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	186.9936	28-FEB-2010	2989.216	3297.484	14828.00	0.2682285	1.1532663E-02	43.97738
NP-237	160.8066	28-FEB-2010	4437.369	4902.276	12547.00	0.2600848	1.3209904E-02	52.01093
CM-244	145.8384	28-FEB-2010	5530.984	5883.177	11169.00	0.2711185	1.3796896E-02	50.67951

Instrument : CHAMBER 203
 Detector : 78905
 Standard ID : AESS-040
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:39
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:55:14
 Average Efficiency : 0.2582881
 Average Efficiency Error : 7.1221651E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.4828	28-FEB-2010	2990.199	3298.236	14936.00	0.2597386	1.1166240E-02	50.45560
NP-237	166.8174	28-FEB-2010	4432.988	4903.526	12999.00	0.2597034	1.3183516E-02	56.72982
CM-244	155.0100	28-FEB-2010	5533.164	5886.048	11164.00	0.2549590	1.2974691E-02	53.05425

Instrument : CHAMBER 204
 Detector : 78907
 Standard ID : AESS-046
 Standard Reference Date : 19-FEB-2008 19:35:48
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:45
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:55:23
 Average Efficiency : 0.2496188
 Average Efficiency Error : 6.8885502E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	194.7474	28-FEB-2010	2989.792	3298.277	14212.00	0.2467715	1.0618629E-02	52.28694
NP-237	164.6658	28-FEB-2010	4433.265	4903.277	12386.00	0.2506330	1.2732573E-02	55.30292
CM-244	151.3824	28-FEB-2010	5531.668	5883.589	10818.00	0.2527654	1.2870559E-02	51.63226

Instrument : CHAMBER 205
 Detector : 78908
 Standard ID : AESS-041
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:51
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:55:32
 Average Efficiency : 0.2549397
 Average Efficiency Error : 7.0272260E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	203.9034	28-FEB-2010	2989.853	3298.183	15200.00	0.2521578	1.0836856E-02	49.40310
NP-237	171.2268	28-FEB-2010	4433.644	4904.311	13124.00	0.2554664	1.2966554E-02	56.83091
CM-244	159.5796	28-FEB-2010	5533.979	5886.811	11652.00	0.2584914	1.3144889E-02	54.55809

Instrument : CHAMBER 206
 Detector : 78909
 Standard ID : AESS-047
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 21-SEP-2009 09:32:57
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:55:41
 Average Efficiency : 0.2541434
 Average Efficiency Error : 7.0085586E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	197.4804	28-FEB-2010	2990.264	3297.560	14794.00	0.2533972	1.0895449E-02	48.44042
NP-237	168.3948	28-FEB-2010	4435.483	4905.550	12839.00	0.2541331	1.2903095E-02	60.11407
CM-244	154.6032	28-FEB-2010	5534.828	5887.642	11143.00	0.2552143	1.2987950E-02	53.79968

Instrument : CHAMBER 207
 Detector : 78910
 Standard ID : AESS-042
 Standard Reference Date : 18-FEB-2008 15:31:47
 Calibration Analysis Date/Time : 21-SEP-2009 09:33:03
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:55:50
 Average Efficiency : 0.2573462
 Average Efficiency Error : 7.1005006E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	188.7090	28-FEB-2010	2989.540	3298.860	14353.00	0.2572728	1.1068305E-02	52.62569
NP-237	159.6558	28-FEB-2010	4436.642	4902.427	12327.00	0.2573162	1.3072978E-02	61.37923
CM-244	150.5208	28-FEB-2010	5532.022	5884.565	10951.00	0.2574795	1.3107520E-02	49.75304

Instrument : CHAMBER 208
 Detector : 78911
 Standard ID : AESS-048
 Standard Reference Date : 19-FEB-2008 00:32:27
 Calibration Analysis Date/Time : 21-SEP-2009 09:33:08
 Calibration Count Time : 300.0000
 Efficiency Calibration Date/Time : 21-SEP-2009 14:56:00
 Average Efficiency : 0.2510063
 Average Efficiency Error : 6.9273296E-03
 Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	191.8350	28-FEB-2010	2991.900	3300.465	14140.00	0.2493222	1.0729297E-02	51.69543
NP-237	161.5530	28-FEB-2010	4437.256	4903.414	12240.00	0.2525304	1.2831211E-02	60.66938
CM-244	151.1856	28-FEB-2010	5534.200	5882.369	10757.00	0.2518900	1.2826865E-02	52.12144

Subsection 1: Energy Calibration

The Energy Calibration energy=Cal_Zero+(e1*C)+(e2*C^2)

where : Cal_Zero = Energy Calibration Zero
e1 = Energy Calibration Slope
e2 = Energy Calibration Quadratic
C = Channel

	Instrument	:	CHAMBER 137		
	Detector	:	64288		
	Calibration Date/Time	:	29-SEP-2009 07:09:48		
	Calibration Source Id	:	AESS-025		
Cal. Isotopes	Source Id	Expiration Date	Standard Energy	Actual Energy	
GD-148	6445-278	2/28/10	3183.000	3183.000	
NP-237	4341	2/28/10	4768.800	4768.799	
CM-244	4320A	2/28/10	5795.020	5795.166	

Energy/Channel Equation	:	see above
Energy Calibration Zero	:	2347.665
Energy Calibration Slope	:	4.984977
Energy Calibration Quadratic	:	2.7776926E-04
Energy Calibration Range	:	7744.000

Subsection 2: Background Calibration

Instrument : CHAMBER 137
Detector : 64288
Background Analysis Date/Time : 27-SEP-2009 18:42:40
Background Count Time : 60000.00

Cal. Isotopes	Start Energy	End Energy	Counts in 1000 min	Counts during Cal	% Error	Confidence
GD-148	2990.293	3299.748	1.000000	0.3000000	100.0000	95.00000
NP-237	4432.986	4904.334	3.000000	0.9000000	57.73503	95.00000
CM-244	5534.468	5887.346	2.000000	0.6000000	70.71068	95.00000

Subsection 3: Efficiency Calibration

Instrument : CHAMBER 137
Detector : 64288
Standard ID : AESS-025
Standard Reference Date : 15-FEB-2008 09:06:52
Calibration Analysis Date/Time : 28-SEP-2009 12:47:21
Calibration Count Time : 300.0000
Efficiency Calibration Date/Time : 29-SEP-2009 07:09:48
Average Efficiency : 0.2508998
Average Efficiency Error : 6.9208592E-03
Confidence : 95.00000

Cal. Istps	DPM	Exp. Date	Start Engy	End Engy	Counts	EFF.	EFF Err	Resolution
GD-148	195.5670	28-FEB-2010	2990.293	3299.748	14585.00	0.2523354	1.0852666E-02	47.12407
NP-237	167.9916	28-FEB-2010	4432.986	4904.334	12708.00	0.2521377	1.2803786E-02	61.68194
CM-244	157.2432	28-FEB-2010	5534.468	5887.346	10986.00	0.2477600	1.2611548E-02	51.22959

LUCAS CELL COUNTERS

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414
 (843)556-8171

Lucas Cell Calibration Package

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate? the secondard standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	✓		
	✓		
	✓		
	✓		
2) Is the efficiency calibration report included ?	✓		
3) Is the raw count data included for: Cell constant determination? Plateau generation?	✓		
	✓		
4) Are the calibration verifications included?	✓		
5) Are the instrument settings included: HVPS settings?	✓		
6) Has the CELLEFF.xls file been updated ?	✓		
7) Have the calibration dates been updated in ALPHALIMS ?	✓		

Prepared By: Kelli S. Dume

Date: 8/31/09

Reviewed By: Angela G

Date: 8/31/09

Effective Date: 8/31/09

Ra-226 Cell Constants

standard ID: 0299-H
 Volume added (mL): 0.1
 Standard Reference Activity (DPM/mL): 2483.21

Lucas cell #	Cell constant	Standard Source	Date/Time of count	Date/Time flushed to cell	Date/Time end of degas	Bkg Counts cpm	total counts	count time min	Known activity dpm	t1 (days) end-degas to flush	t2 (days) end-flush to count	t3 (days) Std Ref Date to count	Decay from Std Ref Date to count
101	1.846	cal 7	8/27/2009 16:35	8/27/2009 13:30	8/21/2009 11:30	4479	15	298.60	248.32	6.08333	0.12847	3544	0.9958
101	1.960	cal 9	8/24/2009 14:20	8/24/2009 9:30	8/18/2009 13:40	4581	15	305.40	248.32	5.82639	0.20139	3541	0.9958
101	2.060	cal 1	8/21/2009 15:00	8/21/2009 9:30	8/18/2009 13:40	2945	15	196.33	248.32	2.82639	0.22917	3538	0.9958
102	1.862	cal 5	8/27/2009 15:50	8/27/2009 12:40	8/21/2009 10:50	4510	15	300.67	248.32	6.07639	0.13194	3544	0.9958
102	1.850	cal 10	8/24/2009 14:45	8/24/2009 9:55	8/18/2009 13:40	4330	15	288.67	248.32	5.84375	0.20139	3541	0.9958
102	1.853	cal 2	8/21/2009 15:20	8/21/2009 9:50	8/18/2009 13:40	2659	15	177.27	248.32	2.84028	0.22917	3538	0.9958

104	2.073	Average	1.972	cal 1	8/27/2009 14:25	8/27/2009 9:35	8/24/2009 11:00	3070	15	204.67	248.32	2.94097	0.20139	3544	0.9958
104	1.855	Stdev	0.110	cal 11	8/24/2009 15:15	8/24/2009 10:15	8/18/2009 13:40	4343	15	289.53	248.32	5.85764	0.20833	3541	0.9958
104	1.987	cal 3	8/21/2009 15:50	8/21/2009 10:10	8/18/2009 13:40	2858	15	190.53	248.32	2.85417	0.23611	3538	0.9958		

106	1.985	Average	1.836	cal 2	8/27/2009 14:55	8/27/2009 10:00	8/24/2009 11:20	2940	15	196.00	248.32	2.94444	0.20466	3544	0.9958
106	1.738	Stdev	0.131	cal 12	8/24/2009 15:35	8/24/2009 10:40	8/18/2009 13:40	4078	15	271.87	248.32	5.87500	0.20466	3541	0.9958
106	1.786	cal 4	8/21/2009 16:30	8/21/2009 10:30	8/18/2009 13:40	2572	15	171.47	248.32	2.86806	0.25000	3538	0.9958		
107	2.025	Average	1.981	cal 8	8/27/2009 16:55	8/27/2009 13:50	8/21/2009 11:55	4910	15	327.33	248.32	6.07986	0.12847	3544	0.9958
107	2.054	Stdev	0.102	cal 1	8/24/2009 15:55	8/24/2009 11:00	8/21/2009 10:50	3090	15	206.00	248.32	3.00694	0.20466	3541	0.9958
107	1.864	cal 5	8/21/2009 16:45	8/21/2009 10:50	8/18/2009 13:40	2696	15	179.73	248.32	2.88194	0.24653	3538	0.9958		
108	1.906	Average	1.946	cal 6	8/27/2009 16:05	8/27/2009 13:05	8/21/2009 11:15	4623	15	308.20	248.32	6.07639	0.12500	3544	0.9958
108	1.975	Stdev	0.036	cal 2	8/24/2009 16:25	8/24/2009 11:20	8/21/2009 10:50	2978	15	198.53	248.32	3.02083	0.21181	3541	0.9958
108	1.957	cal 6	8/21/2009 17:00	8/21/2009 11:15	8/18/2009 13:40	2846	15	189.73	248.32	2.89931	0.23958	3538	0.9958		

111	2.162	Average	2.024	cal 3	8/27/2009 15:12	8/27/2009 10:20	8/24/2009 12:25	3177	15	211.80	248.32	2.91319	0.20278	3544	0.9958
111	2.051	Stdev	0.153	cal 3	8/24/2009 17:00	8/24/2009 12:25	8/21/2009 10:50	3139	15	209.27	248.32	3.06597	0.19097	3541	0.9958
111	1.859	cal 7	8/21/2009 17:15	8/21/2009 11:30	8/18/2009 13:40	2712	15	180.80	248.32	2.90972	0.23958	3538	0.9958		
112	1.962	Average	1.931	cal 4	8/27/2009 15:30	8/27/2009 10:50	8/24/2009 12:40	2895	15	193.00	248.32	2.92361	0.19444	3544	0.9958
112	1.967	Stdev	0.059	cal 4	8/24/2009 17:15	8/24/2009 12:40	8/21/2009 10:50	3019	15	201.27	248.32	3.07639	0.19097	3541	0.9958
112	1.863	cal 8	8/21/2009 17:35	8/21/2009 11:55	8/18/2009 13:40	2731	15	182.07	248.32	2.92708	0.23611	3538	0.9958		

EffErr 0.053028 <- Put in Machines.xls (Lucas Cell Tab)

8/13/09

VW 8/13/109

Ra-226 Calibration Sheet

Standard ID: 0119-H

Volume Added (mL): 0.1

Expiration Date: 8/1/10

$\frac{219}{8/13/09} = 900$
 $\frac{219}{8/13/09}$
 $\frac{219}{8/13/09}$
 * count time 15 min

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 1	500	8/18/09 1340	8/21/09 0930	1500 1410 8/21/09 1230	101	1	3142 4050
Cal 2	500	8/18/09 1340	8/21/09 0950	1500 1425 8/21/09 1305	102	1	2778
Cal 3	500	8/18/09 1340	8/21/09 1010	1550 8/21/09 1445	104	1	2182 2190
Cal 4	500	8/18/09 1340	8/21/09 1030	8/21/09 1630	106	1	2572
Cal 5	500	8/18/09 1340	8/21/09 1050	8/21/09 1645	107	1	2696
Cal 6	500	8/18/09 1340	8/21/09 1115	8/21/09 1700	108	1	2846
Cal 7	500	8/18/09 1340	8/21/09 1130	8/21/09 1715	111	1	2712
Cal 8	500	8/18/09 1340	8/21/09 1155	8/21/09 1735	112	1	2731
Cal 9							
Cal 10							
Cal 11							
Cal 12							

$\frac{2945}{8/21/09}$
 $\frac{2659}{8/21/09}$
 $\frac{2858}{8/21/09}$

WSP/BSM

8/13/09

8/28/09

Voltage - 0.9

Ra-226 Calibration Sheet

Standard ID: Q226-A
 Volume Added (mL): 0.1
 Expiration Date: 07/11/10
 Count time = 15 mins

4581

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 9	500	8/18/09 1340	8/24/09 1120	8/24/09 1335 ¹⁷²⁰	101	1	8434
Cal 10	500	8/18/09 1340	8/24/09 1155	8/24/09 1305 ¹⁴⁴⁵	102	1	8447 4330
Cal 11	500	8/18/09 1340	8/24/09 1015	8/24/09 1405 ¹⁵¹⁵	104	1	4343
Cal 12	500	8/18/09 1340	8/24/09 1040	8/24/09 1535	106	1	4078
Cal 1	500	8/24/09 1050	8/24/09 1100	8/24/09 1555	107	1	3090
Cal 2	500	8/24/09 1050	8/24/09 1120	8/24/09 1625	108	1	2978
Cal 3	500	8/24/09 1050	8/24/09 1125	8/24/09 1700	111	1	3139
Cal 4	500	8/24/09 1050	8/24/09 1140	8/24/09 1715	112	1	3019
10009.026 AM							

8/31/09

10081820105

Voltage - 0.9

Ra-226 Calibration Sheet

Standard ID: D44-H
 Volume Added (mL): 1.1
 Expiration Date: 8/1/10

* 15 min counts

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 1	500	8/24/09 1100	8/27/09 0435	8/27/09 1425	104	1	3070
Cal 2	500	8/24/09 1120	8/27/09 1000	8/27/09 1455	106	1	2940
Cal 3	500	8/24/09 1125	8/27/09 1020	8/27/09 1512	111	1	3177
Cal 4	500	8/24/09 1240	8/27/09 1050	8/27/09 1530	112	1	2895
Cal 5	500	8/24/09 1050	8/27/09 1240	8/27/09 1550	102	1	4510
Cal 6	500	8/24/09 1115	8/27/09 1305	8/27/09 1605	108	1	4623
Cal 7	500	8/24/09 1130	8/27/09 1330	8/27/09 1635	101	1	4479
Cal 8	500	8/24/09 1155	8/27/09 1350	8/27/09 1655	107	1	4910

W0827109

8/28/09

11/28/05

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GL-RAD-A-008 Isotope RA-226
 Date Standards Prepared 4/5/05 Cocktail Type Used NA
 Standard ID 0799-H Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 NA
 Standard Activity (DPM/g or ml) 2483.233 Type of Scintillation Vial NA
 Reference Date 12/15/99 Pipette ID Used 1429303
 Expiration Date 8/1/10 Balance ID Used 38080204
 Residue/Carrier Agent D-IMHCl Quenching Agent NA

	Standard Number	Quenching Vol (uL)/ Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Cal 1				
2	Cal 2				
3	Cal 3				
4	Cal 4				
5	Cal 5				
6	Cal 6				
7	Cal 7				
8	Cal 8				
9	Cal 9				
10	Cal 10				
11	Cal 11				
12	Cal 12				
	100502105				

Prepared By: Kelli Dorego Date 8/31/09
 Reviewed By: Angela J Gh Date 8/31/09

eev

8-21-00

Nycomed Amersham plc
Amersham Laboratories

0299



CALIBRATION
No. 0140



ISSUED BY: Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED FOR: AEA Technology plc
Isotrak
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

Description Principal radionuclide: Radium-226

Product code: RAY44
Solution number: R4/131/89

Measurement Reference time: 1200 GMT on 15 December 1999

Nuclear data Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

Expression of uncertainties The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which for a t -distribution with $v_{eff} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21)	-	6.5 ± 2.1
6.54(21)	-	6.54 ± 0.21
6.543(21)	-	6.543 ± 0.021


Approved
Signature

Date of issue 29

17th December 1999

VO 8131105

Nycomed



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0299
Prepared By:	Angela Johnson
Carrier Conc:	0.5 M HCL
Reference Date:	12/15/1999
Ampoule Mass (g):	5.0368 g
Uncertainty:	+/- 2.5 %
LogBook No:	RC S 027 128

A Solution Material Info	
Isotope:	Radium-226
Prepared By:	Angela Johnson
Prep Date:	09/15/2000
Verification Date:	01/23/2008
Expiration Date:	01/23/2009
Primary Code:	0299-A
Dilution (mL):	100 mL
Mass of Parent(g):	4.6634 g
Density(g/mL):	1.0012
Balance ID:	

Calculations Converting parent activity to dpm/mL/dpm/g

$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 122414.2500 \text{ dpm/mL}$
$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0012 \text{ g/mL}) / (100 \text{ mL}) = 122273.3377 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/26/2003	Angela Johnson	1.9909	100	0299-E	2434.34 dpm/mL	11/04/2004	11/04/2005
08/26/2003	Angela Johnson	1.9872	100	0299-F	2429.82 dpm/mL	08/26/2004	08/26/2005
04/05/2005	Amanda Fehr	5.0018	250	0299-G	2446.3471 dpm/mL	01/26/2009	01/26/2010
08/07/2009	Mary Aders	5.0767	250	0299-H	2483.2133 dpm/mL	08/07/2009	08/07/2010

GEL Laboratories LLC
Version 1.0 9/18/2000

W. Spina

Voltage Curve Ludlum #1

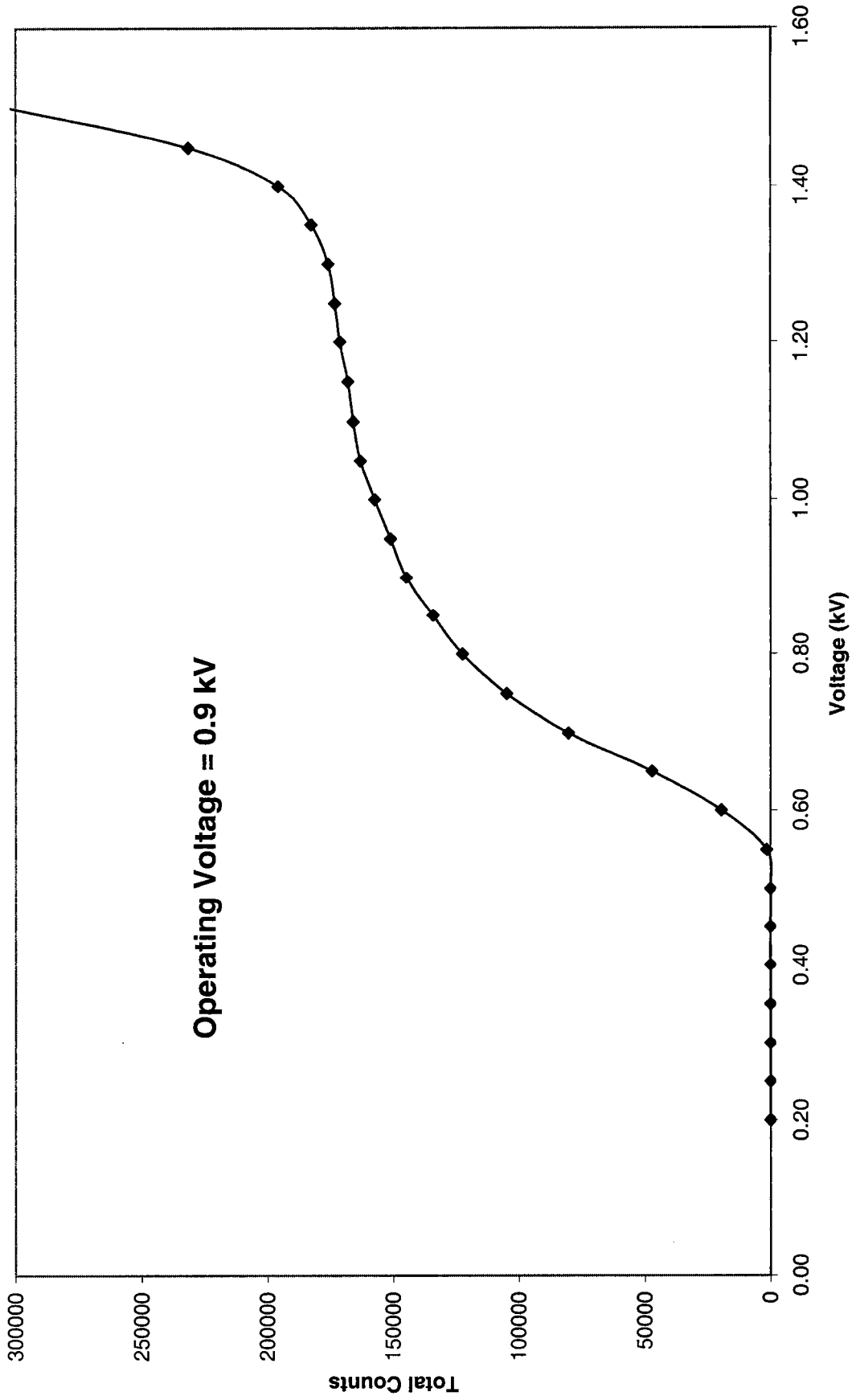
Voltage (kV)	Count Time (min)	Counts	Date/Time
0.20	1.00	0	8/21/09 13:20
0.25	1.00	0	8/21/09 13:21
0.30	1.00	0	8/21/09 13:22
0.35	1.00	0	8/21/09 13:23
0.40	1.00	0	8/21/09 13:24
0.45	1.00	0	8/21/09 13:25
0.50	1.00	0	8/21/09 13:26
0.55	1.00	1534	8/21/09 13:27
0.60	1.00	19637	8/21/09 13:28
0.65	1.00	47206	8/21/09 13:29
0.70	1.00	80410	8/21/09 13:30
0.75	1.00	104945	8/21/09 13:31
0.80	1.00	122514	8/21/09 13:32
0.85	1.00	134160	8/21/09 13:33
0.90	1.00	144753	8/21/09 13:34
0.95	1.00	151057	8/21/09 13:35
1.00	1.00	157429	8/21/09 13:36
1.05	1.00	163110	8/21/09 13:37
1.10	1.00	166034	8/21/09 13:38
1.15	1.00	168121	8/21/09 13:39
1.20	1.00	171347	8/21/09 13:40
1.25	1.00	173388	8/21/09 13:41
1.30	1.00	175958	8/21/09 13:42
1.35	1.00	182719	8/21/09 13:43
1.40	1.00	195871	8/21/09 13:44
1.45	1.00	231584	8/21/09 13:45
1.50	1.00	303021	8/21/09 13:46
1.55	1.00	387838	8/21/09 13:47

Detector set to operate at 0.90 kV

Handwritten: 8/31/09

Ludlum Detector Voltage Curve

—◆— Voltage Curve Ludlum #1



8/13/09

Control Limits for Lucas Cell Counter #1

Analyst: KSD1
Date: 8/31/2009

Count #	Detector #1
1	138383
2	138269
3	141307
4	140521
5	132825
6	135924
7	139231
8	138298
9	135342
10	138056
11	138123
12	139159
13	138410
14	138251
15	138438
16	138080
17	137814
18	137961
19	137248
20	137477

Average = 137955.9
Std. Dev. = 1775.5

+3 S. D. = 143282.4266
+2 S. D. = 141506.901
Mean = 137955.9
-2 S. D. = 134404.799
-3 S. D. = 132629.2734

Control Limits **8/31/2009** * Operating Voltage changed to 0.9 kV
 Detector #1
Upper Limit **143282**
Lower Limit **132629**

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8/31/09

	Eff	Cal Date
101	1.956	8/31/2009
102	1.855	8/31/2009
104	1.972	8/31/2009
106	1.836	8/31/2009
107	1.981	8/31/2009
108	1.946	8/31/2009
111	2.024	8/31/2009
112	1.931	8/31/2009

Lucas	Ra-226	
Oldest Cal	01/23/2008	
Detector	Eff Error	Cal Date
1	0.0530	8/31/2009
2	0.0772	12/19/2008
3	0.0608	1/23/2008
4	0.1237	3/2/2009
5	0.1438	3/25/2009
6	0.0661	8/4/2009
7	0.0855	11/21/2008

Ra-226 WATER

Batch : LCSVER
 Date : 8/20/2008
 Analyst : KSD1

Procedure Code : LUC26RAL
 Parmname : Radium-226
 MDA : 1 pCi/L
 Instrument Used : LUCAS CELL DETECTOR

Bkg Count Time: 30 min

Sample ID	Sample Vol L	Count Time min	Gross counts cts	Cell # num	Cell Const. num	BKG cpm	Ra-226 MDA pCi/L	Ra-226 RESULT pCi/L	Ra-226 ERROR pCi/L	COUNT DATE/TIME
Ver 2	0.500	30	689	101	1.956	0.267	0.5907	25.3156	1.9236	8/31/2009 14:35
Ver 6	0.500	30	697	102	1.855	0.133	0.4721	27.1986	2.0367	8/31/2009 15:05
Ver 2	0.500	30	656	104	1.972	0.267	0.6303	25.7021	2.0032	8/28/2009 14:00
Ver 4	0.500	30	638	106	1.836	0.267	0.6304	24.9919	1.9762	8/31/2009 15:40
Ver 7	0.500	30	629	107	1.981	0.267	0.6257	24.4533	1.9479	8/28/2009 17:50
Ver 5	0.500	30	693	108	1.946	0.267	0.5959	25.6861	1.9459	8/31/2009 16:15
Ver 3	0.500	30	672	111	2.024	0.267	0.6129	25.6096	1.9713	8/28/2009 14:35
Ver 4	0.500	30	631	112	1.931	0.267	0.6411	25.1365	1.9990	8/28/2009 15:10

JLQ
8/31/09

Sample ID	Sample Dup	Det #	Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
Ver 2		1	8/31/2009 14:35	LCS	0638-H	24.17	pCi/L	105%
Ver 3		1	8/31/2009 15:05	LCS	0638-H	24.17	pCi/L	113%
Ver 2		1	8/28/2009 14:00	LCS	0638-H	24.17	pCi/L	106%
Ver 4		1	8/31/2009 15:40	LCS	0638-H	24.17	pCi/L	103%
Ver 7		1	8/28/2009 17:50	LCS	0638-H	24.17	pCi/L	101%
Ver 8		1	8/31/2009 16:15	LCS	0638-H	24.17	pCi/L	106%
Ver 3		1	8/28/2009 14:35	LCS	0638-H	24.17	pCi/L	106%
Ver 4		1	8/28/2009 15:10	LCS	0638-H	24.17	pCi/L	104%

DEGASSING DATE/TIME	DE-EMAN. DATE/TIME	DEGASS-DE-EM	dE-EM-COUNT	constant	constant	constant	Net CPM	Ingrowth constant
8/28/2009 10:20	8/31/2009 11:10	72.83	3.42	0.4230	0.9745	1.0019	22.7000	0.4130
8/28/2009 10:40	8/31/2009 11:30	72.83	3.58	0.4230	0.9733	1.0019	23.1000	0.4125
8/25/2009 16:00	8/28/2009 10:20	66.33	3.67	0.3940	0.9727	1.0019	21.6000	0.3839
8/28/2009 11:00	8/31/2009 11:55	72.92	3.75	0.4234	0.9721	1.0019	21.0000	0.4123
8/25/2009 16:00	8/28/2009 12:00	68.00	5.83	0.4015	0.9569	1.0019	20.7000	0.3850
8/28/2009 11:20	8/31/2009 12:15	72.92	4.00	0.4234	0.9703	1.0019	22.8333	0.4115
8/25/2009 16:00	8/28/2009 10:40	66.67	3.92	0.3955	0.9709	1.0019	22.1333	0.3847
8/25/2009 16:00	8/28/2009 11:00	67.00	4.17	0.3970	0.9690	1.0019	20.7667	0.3854

Handwritten signature and date: 8/31/09

062584 CAP: 11/11/10

Ra-226 Verification Sheet

* | .9 voltage

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
VEN 1	500	8/28/09 1600	8/28/09 0655	8/28/09 1310	101	1	8	525
VEN 2	500	8/28/09 1600	8/28/09 1020	8/28/09 1400	104	1	8	654
VEN 3	500	8/28/09 1600	8/28/09 1040	8/28/09 1435	111	1	8	672
VEN 4	500	8/28/09 1600	8/28/09 1100	8/28/09 1510	112	1	8	631
VEN 5	500	8/28/09 1600	8/28/09 1120	8/28/09 1510	106	1	8	678
VEN 6	500	8/28/09 1600	8/28/09 1140	8/28/09 1610	107	1	4	654
VEN 7	500	8/28/09 1600	8/28/09 1200	8/28/09 1750	107	1	8	629
VEN 8	500	8/28/09 1600	8/28/09 1305	8/28/09 1820	108	1	8	736
VEN 2	500	8/28/09 1020	8/28/09 1110	8/28/09 1435	101	1	8	689
VEN 3	500	8/28/09 1040	8/28/09 1130	8/28/09 1505	102	1	4	697
VEN 4	500	8/28/09 1050	8/28/09 1155	8/28/09 1540	106	1	8	638
VEN 5	500	8/28/09 1120	8/28/09 1215	8/28/09 1615	108	1	8	693

W 8/30/09
W 8/31/09

W 8/31/09

W 8/31/09

W 8/31/09
338

W 8/31/09

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number UL-DAD-A-1056 Isotope U-238

Date Standards Prepared 7/23/08 Cocktail Type Used NA

Standard ID OC38-H Matrix of Vial/Planchett NA

Amount Used (g or mL) 0.1 Type of Scintillation Vial NA

Standard Activity (DPM/g or mL) 66.4108 268.8845 20817119 Pipette ID Used 1429203

Reference Date 1/23/04 Balance ID Used 38080104

Expiration Date 7/17/10 Quenching Agent NA

Residue/Carrier Agent NA

	Standard Number	Quenching Vol (uL)/ Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Ver 1				
2	Ver 2				
3	Ver 3				
4	Ver 4				
5	Ver 5				
6	Ver 6				
7	Ver 7				
8	Ver 8				

Prepared By: Kelli S. Deane Date: 8/31/09

Reviewed By: Angela J. Ghera Date: 8/31/09

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

0638

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

67519-278

Ra-226 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

Analytics maintains traceability to the National Institute of Standards and Technology through participation in a Measurements Assurance Program as described in USNRC Reg. Guide 4.15, Revision 1, February 1979.

ISOTOPE:	Ra-226
ACTIVITY (dps):	2.353 E4
HALF-LIFE:	1.600 E3 years
CALIBRATION DATE:	January 23, 2004 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	3.3%

Impurities: γ -impurities (other than decay products) <0.1%

5.01065 grams 0.1M HCl solution with 50 μ g/g Ba carrier.

P O NUMBER 3231RD, Item 5

SOURCE PREPARED BY:

M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED:

ACUWA 1/26/04

W 8731105

Standard Traceability Log Rad

WARNING! Training must be completed!!

Alphalims will be locked out if training is not completed within 1 week of assignment Contact Quality if additional time is needed to complete training

Source Material Info	
Parent Code:	0638
Prepared By:	Amanda Fehr
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2004
Ampoule Mass (g):	5.01065 g
Uncertainty:	+/- 3.3 %
LogBook No:	RC-S-037-037

A Solution Material Info	
Isotope:	Radium-226
Prepared By:	Amanda Fehr
Prep Date:	01/16/2006
Verification Date:	04/09/2009
Expiration Date:	04/09/2010
Primary Code:	0638-A
Dilution(mL):	100 mL
Mass of Parent(g):	4.8398 g
Density(g/mL):	1.0266
Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$$(\text{Mass of parent(g)}) * (\text{Parent Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)}) * (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)}) * (\text{Parent Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)}) * (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$$

$$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) * (100 \text{ mL}) = 13636.6133 \text{ dpm/mL}$$

$$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0266 \text{ g/mL}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13282.9676 \text{ dpm/g}$$

W 8/28/09

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
01/17/2006	Amanda Fehr	2.1041	100	0638-B	279.0211 dpm/mL	01/17/2007	01/17/2008
07/17/2006	Mary Aders	2.1313	100	0638-C	282.6281 dpm/mL	07/26/2006	07/26/2007
03/28/2007	Daniel Roy	2.1025	100	0638-D	279.2744 dpm/ml	04/08/2007	04/08/2008
03/28/2007	Daniel Roy	45.468	250	0638-E	2415.7999 dpm/ml	04/09/2009	04/09/2010
12/18/2007	Daniel Roy	2.014	100	0638-F	267.519 dpm/ml	02/02/2009	02/02/2010
02/12/2008	Daniel Roy	.5004	100	0638-G	66.468 dpm/ml	03/02/2009	03/02/2010
07/23/2008	Daniel Roy	5.0607	250	0638-H	268.8845 dpm/ml	07/17/2009	07/17/2010

GEL Laboratories LLC
Version 1.0 9/18/2000

10/13/09

Verification for Ra-226 Standard 0638-H

D. Roy 7/23/2008	Isotope	Value	Uncertainty
	0638-H	11.852	1.1079
	0638-H	12.092	1.1141
	0638-H	12.372	1.1216
Mean Value (Counting) =	12.106	100.13	Pass
Stdev =	0.260353631		Rule 3 (Pass/Fail)
Target =	12.09		
Lower Limit =	11.5848594		
Upper Limit =	12.62627393		
Rule 1 Pass/Fail	Pass		
Two sigma =	0.520707263		
10 % of Mean =	1.210556667		
Rule 2 (Pass/Fail)	Pass		

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0638-H by transferring portions of the degassed standard into tared glass liquid scintillation vials. 10 mL of DI Water and 10 mL of mineral oil were added to each vial and the vials were shaken. A Blank vial was prepared in a similar fashion using 10 mL of DI Water and 10 mL of mineral oil. The standard verification vials and Background source were dark adapted for two hours and counted on LSC RED using source standard verification. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

David D. Roy 8/14/08
Ver. L. Jones 8/14/08

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414
(843)556-8171

Lucas Cell Calibration Package

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate? the secondary standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	✓	✓	
	✓	✓	
	✓	✓	
	✓	✓	
2) Is the efficiency calibration report included?	✓	✓	
3) Is the raw count data included for: Cell constant determination? Plateau generation?	✓	✓	
	✓	✓	
4) Are the calibration verifications included?	✓	✓	
5) Are the instrument settings included: HVPS settings?	✓	✓	
	✓	✓	
6) Has the CELLEFF.xls file been updated?	✓	✓	
7) Have the calibration dates been updated in ALPHALIMS?	✓	✓	

Prepared By: Kelli Donnell

Date: 12/19/08

Reviewed By: Mark G. Adams

Date: 12/19/08

Effective Date: 12/19/08

NW 12/19/08

Ra-226 Cell Constants

Standard Reference date: 12/15/1999
standard ID: 0299-G
Volume added (mL): 0.1
Standard Reference Activity (DPM/mL): 2446.35

Table with columns: Lucas cell #, Cell constant, Standard Source, Date/Time of count, Date/Time flushed to cell, Date/Time end of degas, bkg cpm, total counts, count time min, Known activity dpm, 11 (days) end-degas to flush, 12 (days) end-flush to count, 13 (days) Std Ref Date to count, Decay from Std Ref Date to count.

12/19/08
12/19/08

NW

4CC 4
12/19/08

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degs Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal14	500	9/25/08 1000	9/25/08 0015	9/25/08 1935	201	2	0	5361
Cal13	500	9/22/08 1000	9/22/08 0015	9/25/08 2100	202	2	0	5845
Cal43	500	9/22/08 1000	9/22/08 1015	9/25/08 2100	203	2	0	6298
Cal15	500	9/22/08 1000						
Cal144	500	9/22/08 1000						
Cal146	500	9/22/08 1000						
Cal136	500	9/22/08 1000						
Cal130	500	9/22/08 1000						
Cal119	500	9/22/08 1000						
Cal147	500	9/22/08 1000						
Cal137	500	9/22/08 1000						
Cal142	500	9/22/08 1000						

140
171808

171808
2/11/08

171808

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 14	500	9/12/08 1320	9/15/08 1405	9/15/08 1545	201	2	8	5596
Cal 13	500	9/12/08 1320	9/15/08 0935	9/15/08 1620	202	2	8	6779
Cal 43	500	9/12/08 1320	9/15/08 1000	9.15.08 1650	203	2	8	6300
Cal 15	500	9/12/08 1320	9/15/08 1030	9.15.08 1725	204	2	8	6132
Cal 44	500	9/12/08 1320	9/15/08 1055	9.15.08 1805	205	2	5	6132
Cal 46	500	9/12/08 1320	9/15/08 1115	9.15.08 2110	206	2	7	6216
Cal 36	500	9/12/08 1320	9/15/08 1150	9.15.08 2140	207	2	8	6094
Cal 38	500	9/12/08 1320	9/15/08 1215	9.15.08 2215	208	2	8	6258
Cal 19	500	9/12/08 1320	9/15/08 1350	9.15.08 2245	209	2	1	7073
Cal 47	500	9/12/08 1320	9/15/08 1415	9.15.08 2315	210	2	1	6665
Cal 37	500	9/12/08 1320	9/15/08 1430	9.15.08 2350	211	2	1	6150
Cal 42	500	9/12/08 1320	9/15/08 1450	9.16.08 0020	212	2	1	6426

12/18/08

12/11/08

12/19/08
12/11/08

12/15/08

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Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
15	500	9/20/08 0945	9/20/08 0910	9/20/08 1405	204	2	4	7535
44	500	9/20/08 0945	9/20/08 0940	9/30/08 1445	205	2	5	7170
46	500	9/20/08 0945	9/30/08 1015	9/30/08 1520	206	2	8	8125
36	500	9/20/08 0945	9/30/08 1045	9/30/08 1410	207	2	7	7656
30	500	9/20/08 0945	9/30/08 1110	9/30/08 1635	208	2	1	7681
19	500	9/20/08 0945	9/30/08 1140	9.30.08 1725	209	2	3	8795
47	500	9/20/08 0945	9/30/08 1205	9.30.08 1800	210	2	1	8116
37	500	9/20/08 0945	9/30/08 1335	9.30.08 1830	211	2	3	7917
42	500	9/20/08 0945	9/30/08 1400	9.30.08 1950	212	2	8	8287

100 12/19/08

100 12/19/08
14/19/08
14/19/08

12/18/08
140

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 14	500	9/15/08 0945	9/18/08 0810	9/18/08 1300	201	2	8	59449
Cal 13	500	9/15/08 0935	9/18/08 0845	9/18/08 1350	202	2	8	6425
Cal 43	500	9/15/08 1000	9/18/08 0915	9/18/08 1425	203	2	8	6013
Cal 15	500	9/15/08 1030	9/18/08 0935	9/18/08 1455	204	2	8	6671
Cal 44	500	9/15/08 1055	9/18/08 1005	9/18/08 1600	205	2	5	4999
Cal 46	500	9/15/08 1125	9/18/08 1025	9/18/08 1635	206	2	8	6604
Cal 36	500	9/15/08 1150	9/18/08 1040	9/18/08 1755	207	2	8	6105
Cal 30	500	9/15/08 1215	9/18/08 1100	9/18/08 1830	208	2	4	6379
Cal 19	500	9/15/08 1350	9/18/08 1115	9/18/08 1915	209	2	2	6170
Cal 47	500	9/15/08 1415	9/18/08 1130	9/18/08 1945	210	2	3	6142
Cal 37	500	9/15/08 1430	9/18/08 1235	9/18/08 2230	211	2	4	6207
Cal 42	500	9/15/08 1450	9/18/08 1250	9/18/08 2255	212	2	8	6405

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12/19/08

9/18/08
100

Ra-226 Verification Sheet

100 12/19/08
12/28
12/19/08

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 14	500	10/18/08 1600	10/20/08 1345	10/21/08 1350 10/20/08 1350	202	2	8	9748
13	500	10/15/08 1600	10/20/08 1405	10/20/08 1430	205	2	8	1584
43								
44								
15								
36								
46								
30								
19								
47								
37								
42								

100
12/19/08

Verification for Ra-226 Standard 0299-G

Standard	Source DPM/G
Mass. Used (G)	2562.667649
0.5057	2545.935781
0.5056	2565.677715
0.5042	2558.093715
Average =	

Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Mass. Used (G)	Source DPM/G
0299-G N1	2536.9600	52.4000	2484.5600	1.917186	0.5057	2562.667649
0299-G N2	2520.2500	52.4000	2467.8500	1.917186	0.5056	2545.935781
0299-G N3	2532.5000	52.4000	2480.1000	1.917186	0.5042	2565.677715
Mean Value (Counting) =	2558.093715	104.944421	2480.1000	1.917186	Average =	2558.093715
Stdev =	10.63610098	0.00415782	0.00415782	Pass	Rule 3 (Pass/Fail)	

Certificate Value = 2437.6 dpm/mL
 Lower Limit = 2536.821513 dpm/mL
 Upper Limit = 2579.365917 dpm/mL
 Rule 1 Pass/Fail = Fail *exception taken due to full recovery of standard
 Two sigma = 21.27220197 dpm/mL
 10 % of Mean = 255.8093715 dpm/mL
 Rule 2 (Pass/Fail) = Pass

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 10% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0299-G by transferring portions of the standard into tared glass liquid scintillation vials. One mL of DI Water and ten mLs of Ready Gel liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 1 mL of DI water and 10 mL of Ready Gel cocktail. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Gold for Radium source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 4/02/08 using source 0024-A (Ra-226). Calibration data is recorded in this logbook under Ra-226 0024. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

BAD.SOP.M-001

M. V. T. 12/19/08
 W. V. 11/19/08
 Nancy E. Johnson 4/19/08
 Daniel D. King 4/10/08



Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0299	Isotope:	Radium-226
Prepared By:	Angela Johnson	Prepared By:	Angela Johnson
Carrier Conc:	0.5 M HCL	Prep Date:	09/15/2000
Reference Date:	12/15/1999	Verification Date:	01/23/2008
Ampoule Mass (g):	5.0368 g	Expiration Date:	01/23/2009
Uncertainty:	+/- 2.5 %	Primary Code:	0299-A
LogBook No:	RC S 027 128	Dilution(mL):	100 mL
		Mass of Parent(g):	4.6634 g
		Density(g/mL):	1.0012
		Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 122414.2500 \text{ dpm/mL}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0012 \text{ g/mL}) / (100 \text{ mL}) = 122273.3377 \text{ dpm/g}$$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/26/2003	Angela Johnson	1.9909	100	0299-E	2434.34 dpm/mL	11/04/2004	11/04/2005
08/26/2003	Angela Johnson	1.9872	100	0299-F	2429.82 dpm/mL	08/26/2004	08/26/2005
04/05/2005	Amanda Fehr	5.0018	250	0299-G	2446.3471 dpm/mL	04/02/2008	04/02/2009

GEL Laboratories LLC
Version 1.0 9/18/2000

all the 12/19/08
len 12/19/08

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number <u>GLRAD A-008</u>	Isotope <u>Ra-226</u>
Date Standards Prepared <u>4/5/08</u>	Cocktail Type Used <u>NA</u>
Standard ID <u>0299-G</u>	Matrix of Vial/Planchett <u>NA</u>
Amount Used (g or ml) <u>0.1</u>	<u>NA</u>
Standard Activity (DPM/g or ml) <u>2446.347</u>	Type of Scintillation Vial <u>NA</u>
Reference Date <u>12/15/99</u>	Pipette ID Used <u>1429303</u>
Expiration Date <u>4/2/09</u>	Balance ID Used <u>36040216</u>
Residue/Carrier Agent <u>0.5 M HCl</u>	Quenching Agent <u>NA</u>

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
14	Cal 14				
13	Cal 13				
43	Cal 43				
15	Cal 15				
44	Cal 44				
46	Cal 46				
36	Cal 36				
19	Cal 19				
47	Cal 47				
37	Cal 37				
42	Cal 42				

See table

Prepared By: Kelli S. Deroso Date: 12/19/08
 Reviewed By: M. G. Johnson Date: 12/19/08

Rev 1 RLM 9/10/97

0299

UKAS ACCREDITED CALIBRATION LABORATORY No. 0146

Reference time for solution number R4/131/89:	1200 GMT on 15 December 1999
Radioactive concentration of radium-226:	43.75 kilobecquerels per gram of solution
which is equivalent to:	1.183 microcuries per gram of solution
Mass of solution:	5.0368 grams
Total activity of radium-226:	220.4 kilobecquerels
which is equivalent to:	5.956 microcuries
Recommended half life:	1600 years

Method of measurement:
The activity of the solution was measured using a high pressure re-entrant ionisation chamber calibrated with a large number of absolutely standardised solutions.

Calibration date: 15 December 1999
The calibration date is provided for added information only, and must not be confused with the reference date on pages 1 and 2 of the certificate. It is the reference date that must be used in all calculations relating to the values of activity.

Expanded uncertainty in the radioactive concentration quoted above: $\pm 2.5\%$
Combined Type A uncertainty: $\pm 0.2\%$
Combined Type B uncertainty: $\pm 1.3\%$

Radiochemical The estimated activities of any radioactive impurities found by high-resolution gamma ray spectrometry, or in any other examination of the solution, are listed below expressed as percentages of the activity of the principal radionuclide at the reference time.

Carrier free in 0.5M HCl

This product meets the quality assurance requirements for achieving traceability to NIST as defined in ANSI N42.22-1995.

1 year = 365.25 days

At the reference date radium-226 was shown to be in radioactive equilibrium with its daughter nuclides down the decay chain to polonium-214 and thallium-210, the precursors of lead-210. The ionisation chamber was calibrated using a standard supplied by the National Institute of Standards and Technology, Washington DC, USA.

Handwritten: 12/19/99
12/19/98

Ra-226 WATER

Batch : LCSVER
Date : 10/31/2008
Analyst : KSD1

Procedure Code : LUC26RAL

Parname : Radium-226

MDA : 1 pCi/L

Instrument Used : LUCAS CELL DETECTOR

Bkg Count Time: 30 min

Sample ID	Sample Vol L	Count Time min	Gross counts cts	Cell # num	Cell Const. num	BKG cpm	Ra-226 MDA pCi/L	Ra-226 RESULT pCi/L	Ra-226 ERROR pCi/L	COUNT DATE/TIME
VER 1	0.500	30	1014	201	1.993	0.267	0.3504	22.1841	1.3817	11/17/2008 15:10
VER 2	0.500	30	1056	202	2.261	0.267	0.3089	20.3702	1.2427	11/17/2008 15:45
VER 3	0.500	30	726	203	2.254	0.267	0.5419	24.4866	1.8110	10/30/2008 16:05
VER 4	0.500	30	737	204	2.193	0.267	0.5519	25.3188	1.8580	10/30/2008 18:20
VER 5	0.500	30	937	205	1.799	0.267	0.3882	22.6936	1.4718	11/17/2008 16:20
VER 6	0.500	30	780	206	2.259	0.267	0.5373	26.1045	1.8604	10/30/2008 20:20
VER 7	0.500	30	711	207	2.146	0.267	0.5705	25.2245	1.8858	10/30/2008 22:00
VER 3	0.500	30	593	208	2.283	0.267	0.5132	16.9552	1.4723	11/20/2008 16:40
VER 9	0.500	30	630	209	2.291	0.133	0.4042	21.0513	1.6596	10/30/2008 23:40
VER 10	0.500	30	691	210	2.253	0.033	0.2527	23.7356	1.7736	10/31/2008 1:15
VER 11	0.500	30	1067	211	2.171	0.267	0.3314	22.0840	1.3401	11/17/2008 21:55
VER 12	0.500	30	648	212	2.322	0.133	0.4223	22.6294	1.7586	10/31/2008 9:15

12/19/08
KSD

12/19/08
KSD

Sample ID	Sample Dup	Det #	Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
201		2	11/17/2008 10:20	LCS	0638-F	24.10	pCi/L	92%
202		2	11/17/2008 10:45	LCS	0638-F	24.10	pCi/L	85%
203		2	10/30/2008 11:05	LCS	0638-F	24.10	pCi/L	102%
204		2	10/30/2008 12:30	LCS	0638-F	24.10	pCi/L	105%
205		2	11/17/2008 11:10	LCS	0638-F	24.10	pCi/L	94%
206		2	10/30/2008 13:10	LCS	0638-F	24.10	pCi/L	108%
207		2	10/30/2008 13:25	LCS	0638-F	24.10	pCi/L	105%
208		2	11/20/2008 11:45	LCS	0638-F	24.10	pCi/L	70% <i>W</i>
209		2	10/30/2008 14:05	LCS	0638-F	24.10	pCi/L	87% <i>W</i>
210		2	10/30/2008 14:25	LCS	0638-F	24.10	pCi/L	98% <i>W</i>
211		2	11/17/2008 12:20	LCS	0638-F	24.10	pCi/L	92%
212		2	10/30/2008 14:55	LCS	0638-F	24.10	pCi/L	94%

W
12/18/08

DEGASSING DATE/TIME	DE-EMAN. DATE/TIME	DEGASS-DE-EM	dE-EM-COUNT	constant	constant	constant	Net CPM	Ingrowth constant
11/10/2008 15:35	11/17/2008 10:20	162.75	4.83	0.7073	0.9642	1.0019	33.5333	0.6833
11/10/2008 15:35	11/17/2008 10:45	163.17	5.00	0.7083	0.9630	1.0019	34.9333	0.6833
10/27/2008 14:20	10/30/2008 11:05	68.75	5.00	0.4049	0.9630	1.0019	23.9333	0.3907
10/27/2008 14:20	10/30/2008 12:30	70.17	5.83	0.4113	0.9569	1.0019	24.3000	0.3943
11/10/2008 15:35	11/17/2008 11:10	163.58	5.17	0.7092	0.9617	1.0019	30.9667	0.6833
10/27/2008 14:20	10/30/2008 13:10	70.83	7.17	0.4142	0.9473	1.0019	25.7333	0.3931
10/27/2008 14:20	10/30/2008 13:25	71.08	8.58	0.4153	0.9373	1.0019	23.4330	0.3900
11/17/2008 11:10	11/20/2008 11:45	72.58	4.92	0.4219	0.9696	1.0019	17.5900	0.4073
10/27/2008 14:20	10/30/2008 14:05	71.75	9.58	0.4182	0.9302	1.0019	20.8670	0.3898
10/27/2008 14:20	10/30/2008 14:25	72.08	10.83	0.4197	0.9215	1.0019	23.0003	0.3875
11/10/2008 15:35	11/17/2008 12:20	164.75	9.58	0.7117	0.9302	1.0019	35.3000	0.6633
10/27/2008 14:20	10/30/2008 14:55	72.58	18.33	0.4219	0.8707	1.0019	21.4670	0.3681

W
12/18/08

W
12/19/08
W
12/18/08

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
VCW 1	500	1110108 1535 1110108 1535	1111108 1020	1111108 1510	201	2	8	1014
2	500	11110108 1535	1111108 1045	1111108 1545	202	2	8	1056
3	500	11110108 1535	1111108 1110	1111108 1020	205	2	8	937
4	500	11110108 1535	1111108 1135	1111708 2050	208	2	8	786
5	500	11110108 1535	1111108 1150	1111708 2120	209	2	8	1200
6	500	11110108 1535	1111108 1200	1111708 2155	211	2	8	1067
7	500	11110108 1535	1111108 1845	1111108 1330	701	1	8	982
8	500	11110108 1535	1111108 0900	1111108 1405	708	7	8	1194
9	500	11110108 1535	1111108 0900	1111108 1435	705	7	8	1110
10								
11								
12			VCW 2					
VCW 3	500	11110108 1110	11110108 1145	11110108 1140	208	2	8	533
							VCW	
							11110108	

12/18/08 VCW 357

VCW 12/18/08 VCW 12/18/08 VCW 12/18/08 VCW 11/21/08

VCW 12/19/08

VCW 12/19/08 VCW 12/18/08

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
VEN 1	500	10/21/08 1420	10/20/08 1045	10/30/08 1500	201	2	4	152
VEN 2	500	10/21/08 1420	10/20/08 1005	10/30/08 1535	202	2	4	189
VEN 3	500	10/21/08 1420	10/20/08 1105	10/30/08 1605	203	2	8	726
VEN 4	500	10/21/08 1420	10/20/08 1230	10/30/08 1820	204	2	8	737
VEN 5	500	10/21/08 1420	10/20/08 1050	10/30/08 1900	205	2	6	663
VEN 6	500	10/21/08 1420	10/20/08 1310	10/30/08 2020	206	2	8	780
VEN 7	500	10/21/08 1420	10/20/08 1425	10/30/08 2200	207	2	8	711
VEN 8	500	10/21/08 1420	10/20/08 1545	10/30/08 2300	208	2	4	497
VEN 9	500	10/21/08 1420	10/20/08 1405	10/30/08 2340	209	2	4	630
VEN 10	500	10/21/08 1420	10/20/08 1425	10/31/08 0115	210	2	1	691
VEN 11	500	10/21/08 1420	10/20/08 1440	10/31/08 0835	211	2	3	423
VEN 12	500	10/21/08 1420	10/20/08 1455	10/31/08 0915	212	2	4	648

VP
12/18/08

12/18/08

12/18/08

12/18/08

12/18/08

12/18/08

Verification for Ra-226 Standard 0638-F

D Roy
12/27/2007

Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff Mass. Used (mL)	Source DPM/mL
0638-F N1	1239.9000	31.5000	1208.4000	4.624018	261.3311626
0638-F N2	1222.8000	31.5000	1191.3000	4.624018	257.6330801
0638-F N3	1219.4000	31.5000	1187.9000	4.624018	256.8977889
					Average = 258.6206772

Mean Value (Counting) = 258.6206772
Stdev = 2.375965421

Certificate Value = 267.1
Lower Limit = 253.8687464
Upper Limit = 263.3726081
Rule 1 Pass/Fail Fail
Two sigma = 4.751930843
10 % of Mean = 25.86206772
Rule 2 (Pass/Fail) Pass

*exception taken due to full recovery of standard

96.8384646 Pass
0.00918707 Rule 3 (Pass/Fail)

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0638-F by transferring portions of the standard into tared glass liquid scintillation vials. One mL of DI Water and 10 mL Ready Gel liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 1 mL of DI water and 10 mL of Ready Gel cocktail. The standard verification vials and Background source were dark adapted for two hours and counted on LSC YELLOW using source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 12/27/07 using source 0024-A (Ra-226). Calibration data is recorded in this logbook under Ra-226 (0024-A). Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

12/19/08

Handwritten signature and date:
1/4/07
Amanda L. Fehe 1/4/07

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GE-RIAD-A-008 Isotope RA-226
 Date Standards Prepared 12/18/07 Cocktail Type Used NA
 Standard ID 0635-F Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 NA
 Standard Activity (DPM/g or mL) 1127.519 Type of Scintillation Vial NA
 Reference Date 1/23/04 Pipette ID Used 1429303
 Expiration Date 12/20/08 Balance ID Used 3604046
 Residue/Carrier Agent 0.1M HCl Quenching Agent NA

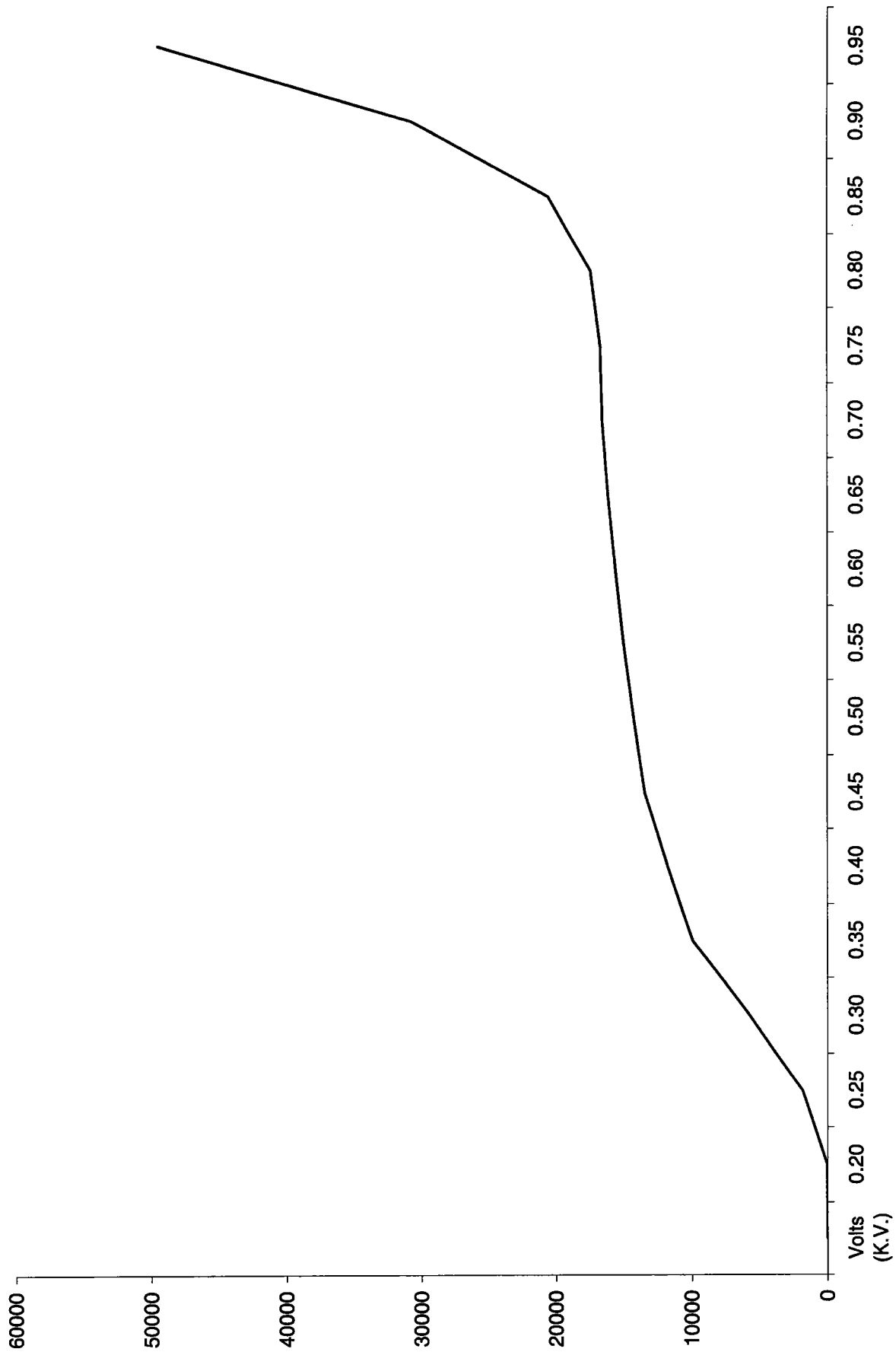
	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Ver 1				
2	Ver 2				
3	Ver 3				
4	Ver 4				
5	Ver 5				
6	Ver 6				
7	Ver 7				
8	Ver 8				
9	Ver 9				
10	Ver 10				
11	Ver 11				
12	Ver 12				

12/19/08

Prepared By: Kelli Dieriel Date: 12/19/08
 Reviewed By: Mary Jo Adams Date: 12/19/08

Voltage Curve Ludlum # 2				
Volts (K.V.)	Counts	Date	Time	Detector
0.20	0	9/19/2008	10:00	2
0.25	0	9/19/2008	10:00	2
0.30	0	9/19/2008	10:00	2
0.35	0	9/19/2008	10:00	2
0.40	0	9/19/2008	10:00	2
0.45	36	9/19/2008	10:00	2
0.50	1860	9/19/2008	10:00	2
0.55	5751	9/19/2008	10:00	2
0.60	9916	9/19/2008	10:00	2
0.65	11761	9/19/2008	10:00	2
0.70	13431	9/19/2008	10:00	2
0.75	14254	9/19/2008	10:00	2
0.80	14984	9/19/2008	10:00	2
0.85	15598	9/19/2008	10:00	2
0.90	16129	9/19/2008	10:00	2
0.95	16562	9/19/2008	10:00	2
1.00	16711	9/19/2008	10:00	2
1.05	17428	9/19/2008	10:00	2
1.10	20558	9/19/2008	10:00	2
1.15	30722	9/19/2008	10:00	2
1.20	49527	9/19/2008	10:00	2
1.25	71509	9/19/2008	10:00	2
1.30	115018	9/19/2008	10:00	2

W 12/19/08
U 12/19/08



mut 12/19/08
VW 12/19/08

201	1.993	12/19/2008
202	2.261	12/19/2008
203	2.254	12/19/2008
204	2.193	12/19/2008
205	1.799	12/19/2008
206	2.259	12/19/2008
207	2.146	12/19/2008
209	2.291	12/19/2008
210	2.253	12/19/2008
211	2.171	12/19/2008
212	2.322	12/19/2008

Next
12/19/08

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414

(843)556-8171

Lucas Cell Calibration Package

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate? the second standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	✓		
	✓		
	✓		
	✓		
2) Is the efficiency calibration report included ?	✓		
3) Is the raw count data included for: Cell constant determination? Plateau generation?	✓		
	✓		
4) Are the calibration verifications included?	✓		
5) Are the instrument settings included: HVPS settings?	✓		
6) Has the CELLEFF.xls file been updated ?	✓		
7) Have the calibration dates been updated in ALPHALIMS ?	✓		

Prepared By: Kellipanel

Date: 2/3/09

Reviewed By: M. G. Hens

Date: 2/4/09

Effective Date: 2/4/09

Ra-226 Cell Constants

Standard Reference date: 12/15/1999
standard ID: 0299-G
Volume added (mL): 0.1
Standard Reference Activity (DPM/mL): 2446.35

Lucas cell #	Cell constant	Standard Source	Date/Time of count	Date/Time flushed to cell	Date/Time end of degas	bkg cpm	total counts	count time min	Known activity dpm	t1 (days) end-degas to flush	t2 (days) end-flush to count	t3 (days) Std Ref Date to count	Decay from Std Ref Date to count
301	1.867	Average	1/20/2009 11:05	1/19/2009 10:10	1/19/2009 15:45	0.267	9355	30	311.83	9.76736	1.03819	3324	0.9961
301	2.184	Stdev	1/29/2009 11:50	1/29/2009 8:50	1/28/2009 13:00	0.267	6239	30	207.97	2.82639	0.12500	3333	0.9961
301	2.011		1/26/2009 14:35	1/26/2009 9:25	1/22/2009 9:10	0.267	7282	30	242.73	4.01042	0.21528	3331	0.9961
302	2.082	Average	1/30/2009 11:30	1/30/2009 8:30	1/28/2009 13:00	0.267	7401	30	246.70	3.81250	0.12500	3334	0.9961
302	2.225	Stdev	1/29/2009 13:30	1/29/2009 9:20	1/28/2009 13:00	0.233	6335	30	211.17	2.84722	0.17361	3334	0.9961
302	2.086		1/26/2009 15:30	1/26/2009 9:55	1/22/2009 9:10	0.267	7555	30	251.83	4.03125	0.23264	3331	0.9961
303	1.958	Average	1/20/2009 13:40	1/19/2009 11:00	1/19/2009 15:45	0.267	9695	30	323.17	9.80208	1.11111	3325	0.9961
303	2.218	Stdev	1/22/2009 20:35	1/22/2009 10:05	1/19/2009 15:00	0.267	5938	30	197.93	2.79514	0.43750	3327	0.9961
303	2.231		1/26/2009 17:20	1/26/2009 10:25	1/22/2009 9:10	0.267	8028	30	267.60	4.05208	0.28819	3331	0.9961

305	1.897	Average	1/20/2009 14:50	1/19/2009 11:35	1/19/2009 15:45	0.200	9357	30	311.90	9.82639	1.13542	3325	0.9961
305	2.191	Stdev	1/22/2009 21:50	1/22/2009 11:05	1/19/2009 15:00	0.267	5921	30	197.37	2.83681	0.44792	3327	0.9961
305	2.083		1/26/2009 23:00	1/26/2009 11:20	1/22/2009 9:10	0.267	7280	30	242.67	4.09028	0.48611	3331	0.9961
306	1.730	Average	1/20/2009 15:20	1/19/2009 11:50	1/19/2009 15:45	0.167	8521	30	284.03	9.83681	1.14593	3325	0.9961
306	1.891	Stdev	1/29/2009 14:30	1/29/2009 10:20	1/28/2009 13:00	0.233	4869	30	162.30	2.88889	0.17361	3334	0.9961
306	1.821		1/26/2009 23:30	1/26/2009 11:50	1/22/2009 9:10	0.267	6387	30	212.90	4.11111	0.48611	3331	0.9961
307	1.818	Average	1/20/2009 15:50	1/19/2009 12:05	1/19/2009 15:45	0.267	8944	30	298.13	9.84722	1.15625	3325	0.9961
307	2.095	Stdev	1/30/2009 12:55	1/30/2009 9:10	1/28/2009 13:00	0.267	7442	30	248.07	3.84028	0.15625	3335	0.9961
307	1.881		1/27/2009 0:05	1/26/2009 12:10	1/22/2009 9:10	0.267	6598	30	219.93	4.12500	0.49653	3331	0.9961
308	2.129	Average	1/29/2009 15:50	1/29/2009 11:05	1/28/2009 13:00	0.133	6149	30	204.97	2.92014	0.19792	3334	0.9961
308	1.858	Stdev	1/23/2009 9:35	1/22/2009 13:45	1/19/2009 15:00	0.267	4829	30	160.97	2.94792	0.82639	3327	0.9961
308	1.862		1/27/2009 8:30	1/26/2009 13:15	1/22/2009 9:10	0.267	6226	30	207.53	4.17014	0.80208	3331	0.9961
309	1.857	Average	1/20/2009 17:20	1/19/2009 13:35	1/19/2009 15:45	0.033	9149	30	304.97	9.90972	1.15625	3325	0.9961
309	1.964	Stdev	1/23/2009 10:30	1/22/2009 14:05	1/19/2009 15:00	0.267	5100	30	170.00	2.96181	0.85069	3327	0.9961
309	1.810		1/27/2009 9:05	1/26/2009 13:30	1/22/2009 9:10	0.267	6046	30	201.53	4.18056	0.81597	3331	0.9961

311	2.140	Average	1/29/2009 16:40	1/29/2009 11:20	1/28/2009 13:00	0.267	6176	30	205.87	2.93056	0.22222	3334	0.9961
311	2.212	Stdev	1/23/2009 12:20	1/22/2009 14:25	1/19/2009 15:00	0.267	5698	30	189.93	2.97569	0.91319	3328	0.9961
311	1.988		1/27/2009 10:15	1/26/2009 13:45	1/22/2009 9:10	0.267	6607	30	220.23	4.19097	0.85417	3331	0.9961
312	1.871	Average	1/20/2009 19:16	1/19/2009 14:10	1/19/2009 15:45	0.100	9135	30	304.50	9.93403	1.21250	3325	0.9961
312	2.014	Stdev	1/29/2009 17:10	1/29/2009 11:35	1/28/2009 13:00	0.167	5814	30	193.80	2.94097	0.23264	3334	0.9961
312	1.946		1/27/2009 11:10	1/26/2009 14:00	1/22/2009 9:10	0.267	6446	30	214.87	4.20139	0.88194	3331	0.9961

K0 2/3/09

Ra-226 Verification Sheet

3

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 13	500	1126109 1300	1120109 0820	1120109 1130	302	3	8	1401
Cal 28	500	1126109 1300	1120109 0855	1120109 1200	304	3	8	1101
Cal 34	500	1126109 1300	1120109 0910	1120109 1255	307	3	8	1442

Cal 213109

Cal 213109

Cal 214109
Cal 213109

Ra-226 Verification Sheet

#3

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 13	500	1/26/09 1300	1/26/09 0850	1/29/09 1150	301	3	8	6239
Cal 17	500	1/26/09 1300	1/26/09 0920	1/26/09 1330	302	3	7	6335
Cal 19	500	1/26/09 1300	1/26/09 0450	1/29/09 1450	304	3	2	6472
Cal 30	500	1/26/09 1300	1/26/09 1020	1/26/09 1430	306	3	7	4809
Cal 42	500	1/26/09 1300	1/26/09 1045	1/29/09 1515	307	3	3	6648
Cal 44	500	1/26/09 1300	1/26/09 1105	1/26/09 1550	308	3	4	6149
Cal 15	500	1/26/09 1300	1/26/09 1120	1/29/09 1640	311	3	8	6176
Cal 14	500	1/26/09 1300	1/26/09 1135	1/29/09 1710	312	3	5	5814
Cal 13	500	1/26/09 1300						
Cal 28	500	1/26/09 1300						
Cal 36	500	1/26/09 1300						
Cal 37	500	1/26/09 1300						

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2/4/09

W 2/3/09

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 43	500	11/9/09 1545	11/9/09 1010	11/20/09 1105	301	3	8	9355
Cal 44	500	11/9/09 1545	11/9/09 1040	11/20/09 1150	302	3	8	8433
Cal 49	500	11/9/09 1545	11/9/09 1100	11/20/09 1340	303	3	8	9095
Cal 50	500	11/9/09 1545	11/9/09 1140	11/20/09 1440	304	3	8	1050
Cal 42	500	11/9/09 1545	11/9/09 1135	11/20/09 1450	305	3	5	9957
Cal 44	500	11/9/09 1545	11/9/09 1150	11/20/09 1520 1440	306	3	7	8521
Cal 15	500	11/9/09 1545	11/9/09 1205	11/20/09 1550	307	3	8	8944
Cal 14	500	11/9/09 1545	11/9/09 1315	11/20/09 1645	308	3	3	6938
Cal 13	500	11/9/09 1545	11/9/09 1325	11/20/09 1720	309	3	1	9149
Cal 28	500	11/9/09 1545	11/9/09 1355	11/20/09 1840	311	3	8	8648
Cal 36	500	11/9/09 1545	11/9/09 1410	11/20/09 1916	312	3	1	9135
Cal 37	500	11/9/09 1545						

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Ra-226 Verification Sheet

Call for #3

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Ca143	500	1122109 0910	1126109 0955	1126109 1455	301	3	8	7282
Ca147	500	1122109 0910	1126109 0955	1126109 1530	302	3	8	1555
Ca119	500	1122109 0910	1126109 1025	1126109 1600	303	3	8	8028
Ca130	500	1122109 0910	1126109 1050	1.26.09 1645	304	3		5162
Ca142	500	1122109 0910	1126109 1100	1.26.09 2300	305	3	8	7280
Ca141	500	1122109 0910	1126109 1150	1.26.09 2330	306	3	8	6387
Ca115	500	1122109 0910	1126109 1210	1.27.09 0005	307	3	8	6598
Ca114	500	1122109 0910	1126109 1315	1127109 0830	308	3	8	6226
Ca113	500	1122109 0910	1126109 1330	1127109 0905	309	3	8	6046
Ca128	500	1122109 0910	1126109 1345	1127109 1015	311	3	8	6607
Ca136	500	1122109 1510	1126109 1400	1127109 1110	312	3	8	6446
Ca137								

Ko 213109

Ko 213109

Ko 213109
Kc 214159

Verification for Ra-226 Standard 0299-G

4/2/2008	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Standard Mass. Used (G)	Source DPM/G
D. Roy	0299-G N1	2536.9600	52.4000	2484.5600	1.917186	0.5057	2562.667649
	0299-G N2	2520.2500	52.4000	2467.8500	1.917186	0.5056	2545.935781
	0299-G N3	2532.5000	52.4000	2480.1000	1.917186	0.5042	2565.677715
						Average =	2558.093715

Mean Value (Counting) = 2558.093715
 Stdev = 10.63610098

104.944421 Pass
 0.00415782 Rule 3 (Pass/Fail)

Certificate Value = 2437.6 dpm/mL
 Lower Limit = 2536.821513 dpm/mL
 Upper Limit = 2579.365917 dpm/mL
 Rule 1 Pass/Fail Fail *exception taken due to full recovery of standard
 Two sigma = 21.27220197 dpm/mL
 10 % of Mean = 255.8093715 dpm/mL
 Rule 2 (Pass/Fail) Pass

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 10% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0299-G by transferring portions of the standard into tared glass liquid scintillation vials. One mL of DI Water and ten mLs of Ready Gel liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 1 mL of DI water and 10 mL of Ready Gel cocktail. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Gold for Radium source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 4/02/08 using source 0024-A (Ra-226). Calibration data is recorded in this logbook under Ra-226 0024. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

IRAD-SOP-M-001

Handwritten notes:
 5/10/08
 LSC 2310
 1.5 ml water for 3 vials



Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0299	Isotope:	Radium-226
Prepared By:	Angela Johnson	Prepared By:	Angela Johnson
Carrier Conc:	0.5 M HCL	Prep Date:	09/15/2000
Reference Date:	12/15/1999	Verification Date:	01/23/2008
Ampoule Mass (g):	5.0368 g	Expiration Date:	01/23/2009
Uncertainty:	+/- 2.5 %	Primary Code:	0299-A
LogBook No:	RC S 027 128	Dilution(mL):	100 mL
		Mass of Parent(g):	4.6634 g
		Density(g/mL):	1.0012
		Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 122414.2500 \text{ dpm/mL}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0012 \text{ g/mL}) / (100 \text{ mL}) = 122273.3377 \text{ dpm/g}$$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/26/2003	Angela Johnson	1.9909	100	0299-E	2434.34 dpm/mL	11/04/2004	11/04/2005
08/26/2003	Angela Johnson	1.9872	100	0299-F	2429.82 dpm/mL	08/26/2004	08/26/2005
04/05/2005	Amanda Fehr	5.0018	250	0299-G	2446.3471 dpm/mL	04/02/2008	04/02/2009

GEL Laboratories LLC
Version 1.0 9/18/2000

LD 2/3/09
ALLA 2/4/09

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GL RAD-A 008 Isotope RA 221
 Date Standards Prepared 4/15/09 Cocktail Type Used NA
 Standard ID 02896 Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 NA
 Standard Activity (DPM/g or mL) 2446.347 Type of Scintillation Vial NA
 Reference Date 12/15/99 Pipette ID Used 1429303
 Expiration Date 4/12/09 Balance ID Used 30040216
 Residue/Carrier Agent 0.5 M HCl Quenching Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
43	Cal 43				
47	Cal 47				
19	Cal 19				
30	Cal 30				
42	Cal 42				
44	Cal 44				
15	Cal 15				
14	Cal 14				
13	Cal 13				
28	Cal 28				
36	Cal 36				

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 2/3/09

Prepared By: Kelli Brown Date: 2/3/09
 Reviewed By: Raymond Jones Date: 2/4/09

0299

UKAS ACCREDITED CALIBRATION LABORATORY No. 0146

Reference time for solution number R4/131/89:	1200 GMT on 15 December 1999
Radioactive concentration of radium-226:	43.75 kilobecquerels per gram of solution
which is equivalent to:	1.183 microcuries per gram of solution
Mass of solution:	5.0368 grams
Total activity of radium-226:	220.4 kilobecquerels
which is equivalent to:	5.956 microcuries
Recommended half life:	1600 years

Method of measurement:
The activity of the solution was measured using a high pressure re-entrant ionisation chamber calibrated with a large number of absolutely standardised solutions.

Calibration date: 15 December 1999

The calibration date is provided for added information only, and must not be confused with the reference date on pages 1 and 2 of the certificate. It is the reference date that must be used in all calculations relating to the values of activity.

Expanded uncertainty in the radioactive concentration quoted above: $\pm 2.5\%$

Combined Type A uncertainty: $\pm 0.2\%$

Combined Type B uncertainty: $\pm 1.3\%$

Radiochemical The estimated activities of any radioactive impurities found by high-resolution gamma ray spectrometry, or in any other examination of the solution, are listed below expressed as percentages of the activity of the principal radionuclide at the reference time.

Chemical Carrier free in 0.5M HCL

Remarks This product meets the quality assurance requirements for achieving traceability to NIST as defined in ANSI N42.22-1995.

1 year = 365.25 days

At the reference date radium-226 was shown to be in radioactive equilibrium with its daughter nuclides down the decay chain to polonium-214 and thallium-210, the precursors of lead-210. The ionisation chamber was calibrated using a standard supplied by the National Institute of Standards and Technology, Washington DC, USA.

KV 21/3/09
WMA 21/11/09

Ra-226 WATER

Batch : LCSVER

Date : 1/2/2009

Analyst : KSD1

Procedure Code : LUC26RAL

Parname : Radium-226

MDA : 1 pCi/L

Instrument Used : LUCAS CELL DETECTOR

Bkg Count Time: 30 min

Sample ID	Sample Vol L	Count Time min	Gross counts cts	Cell # num	Cell Const. num	BKG cpm	Ra-226 MDA pCi/L	Ra-226 RESULT pCi/L	Ra-226 ERROR pCi/L	COUNT DATE/TIME
1	0.500	30	656	301	2.021	0.267	0.4919	20.0589	1.5634	1/30/2009 15:05
1	0.500	30	655	302	2.131	0.267	0.5554	22.6149	1.7640	2/2/2009 13:40
2	0.500	30	914	303	2.136	0.267	0.4647	26.4838	1.7397	1/30/2009 15:40
3	0.500	30	791	305	2.057	0.267	0.4845	23.8718	1.6891	1/30/2009 17:05
4	0.500	30	768	306	1.747	0.267	0.5709	27.2885	1.9605	1/30/2009 17:37
2	0.500	30	720	307	1.931	0.267	0.6113	27.3779	2.0335	2/2/2009 14:15
5	0.500	30	730	308	1.950	0.267	0.5149	23.3957	1.7254	1/30/2009 19:05
6	0.500	30	764	309	1.877	0.267	0.5908	28.0944	2.0238	1/31/2009 10:20
7	0.500	30	594	311	2.114	0.267	0.5510	20.3087	1.6667	1/31/2009 17:20
8	0.500	30	542	312	1.944	0.267	0.8009	26.8983	2.3154	2/2/2009 8:25

601112
OK

Handwritten signature

Sample ID	Cell #	Det #	Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
1	301	3	1/30/2009 10:40	LCS	0638-F	24.10	pCi/L	83%
2	302	3	2/2/2009 9:15	LCS	0638-F	24.10	pCi/L	94%
2	303	3	1/30/2009 11:05	LCS	0638-F	24.10	pCi/L	110%
3	305	3	1/30/2009 11:30	LCS	0638-F	24.10	pCi/L	99%
4	306	3	1/30/2009 11:45	LCS	0638-F	24.10	pCi/L	113%
2	307	3	2/2/2009 9:40	LCS	0638-F	24.10	pCi/L	114%
5	308	3	1/30/2009 12:00	LCS	0638-F	24.10	pCi/L	97%
3	309	3	1/30/2009 13:05	LCS	0638-F	24.10	pCi/L	117%
7	311	3	1/30/2009 13:20	LCS	0638-F	24.10	pCi/L	84%
8	312	3	1/30/2009 13:40	LCS	0638-F	24.10	pCi/L	112%

DEGASSING DATE/TIME	DE-EMAN. DATE/TIME	DEGASS-DE-EM	dE-EM-COUNT	constant	constant	Net CPM	Ingrowth constant
1/26/2009 16:05	1/30/2009 10:40	90.58	4.42	0.9672	1.0019	21.6000	0.4800
1/30/2009 10:00	2/2/2009 9:15	71.25	4.42	0.9672	1.0019	21.5667	0.4032
1/26/2009 16:05	1/30/2009 11:05	91.00	4.58	0.9660	1.0019	30.1997	0.4809
1/26/2009 16:05	1/30/2009 11:30	91.42	5.58	0.9587	1.0019	26.1000	0.4788
1/26/2009 16:05	1/30/2009 11:45	91.67	5.87	0.9567	1.0019	25.3330	0.4787
1/30/2009 10:00	2/2/2009 9:40	71.67	4.58	0.9660	1.0019	23.7330	0.4044
1/26/2009 16:05	1/30/2009 12:00	91.92	7.08	0.9479	1.0019	24.0667	0.4753
1/26/2009 16:05	1/30/2009 13:05	93.00	21.25	0.8518	1.0019	25.1997	0.4305
1/26/2009 16:05	1/30/2009 13:20	93.25	28.00	0.8095	1.0019	19.5330	0.4099
1/26/2009 16:05	1/30/2009 13:40	93.58	66.75	0.6041	1.0019	17.7997	0.3067

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 071
 LEWA 2141.04

Ra-226 Verification Sheet

#3

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
VER 1	500	1126109 1605	1126109 1040	1126109 1505	301	3	8	656
VER 2	500	1126109 1605	1126109 1105	1126109 1540	303	3	8	914
VER 3	500	1126109 1605	1126109 1130	1130109 1705	305	3	8	791
VER 4	500	1126109 1605	1126109 1145	1130109 1737 1.31.09 1737	306	3	8	768
VER 5	500	1126109 1605	1126109 1200	1130109 1905 1.31.09 1905	308	3	8	730
VER 6	500	1126109 1605	1126109 1305	1.31.09 1820	309	3	8	764
VER 7	500	1126109 1605	1126109 1320	131.09 1720	311	3	8	594
VER 8	500	1126109 1605	1126109 1340	1126109 0805	312	3	8	542
VER 9	500	1126109 1605						
VER 10	500	1126109 1605						
VER 11	500	1126109 1605						
VER 12	500	1126109 1605						

VER 9
1126109

1126109

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
VUN 1	500	11/20/09 1000	2/2/09 0915	2/2/09 1340	304	3	8	655
VUN 2	500	11/20/09 1000	2/2/09 0940	2/2/09 1415	307	3	8	120
VUN 3	500	11/20/09 1000	2/2/09 1115	2/2/09 1450	309	3	8	754

LW 2/13/09

LW 2/13/09

LW 2/13/09

Verification for Ra-226 Standard 0638-F

D. Roy 2/2/2009	Isotope	Value	Uncertainty
	0638-F #1	24.629	1.7426
	0638-F #2	24.438	1.7557
	0638-F #3	22.791	1.6808
Mean Value (Counting) =	23.953	99.60	Pass
Stdev =	1.010781096		Rule 3 (Pass/Fail)
Target =	24.05		
Lower Limit =	21.93100448		
Upper Limit =	25.97412886		
Rule 1 Pass/Fail	Pass		
Two sigma =	2.021562191		
10 % of Mean =	2.395256667		
Rule 2 (Pass/Fail)	Pass		

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements**
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.**
- Rule 3 = The determined mean value shall be within 5% of the certificate value.**

The analyst prepared three standard verification sources for standard 0638-F using 0.1 mL for each source. Each source was counted using routine Lucas cell procedures. Calibration for 0299-G was used in this verification.

140 24109
[Signature] 2/2/09
 Amanda L. Lehn
 2/4/09

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GL-RAD-008 Isotope Po-226
 Date Standards Prepared ^{2/11/09} 2/13/2007 Cocktail Type Used N/A
 Standard ID 0630-F Matrix of Vial/Planchett N/A
 Amount Used (g or ml) 0.1 ml Type of Scintillation Vial N/A
 Standard Activity (DPM/g or mL) 267.519 dpm/ml Pipette ID Used 1429303
 Reference Date 1/23/2004 Balance ID Used N/A
 Expiration Date 2/14/09 Quenching Agent N/A
 Residue/Carrier Agent 0.1 ml H₂O

	Standard Number	Quenching Vol (uL)/ Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Ver 1				
2	Ver 2				
3	Ver 3				
4	Ver 4				
5	Ver 5				
6	Ver 6				
7	Ver 7				
8	Ver 8				
9	Ver 9				
10	Ver 10				
11	Ver 11				
12	Ver 12				

LO 2/13/09

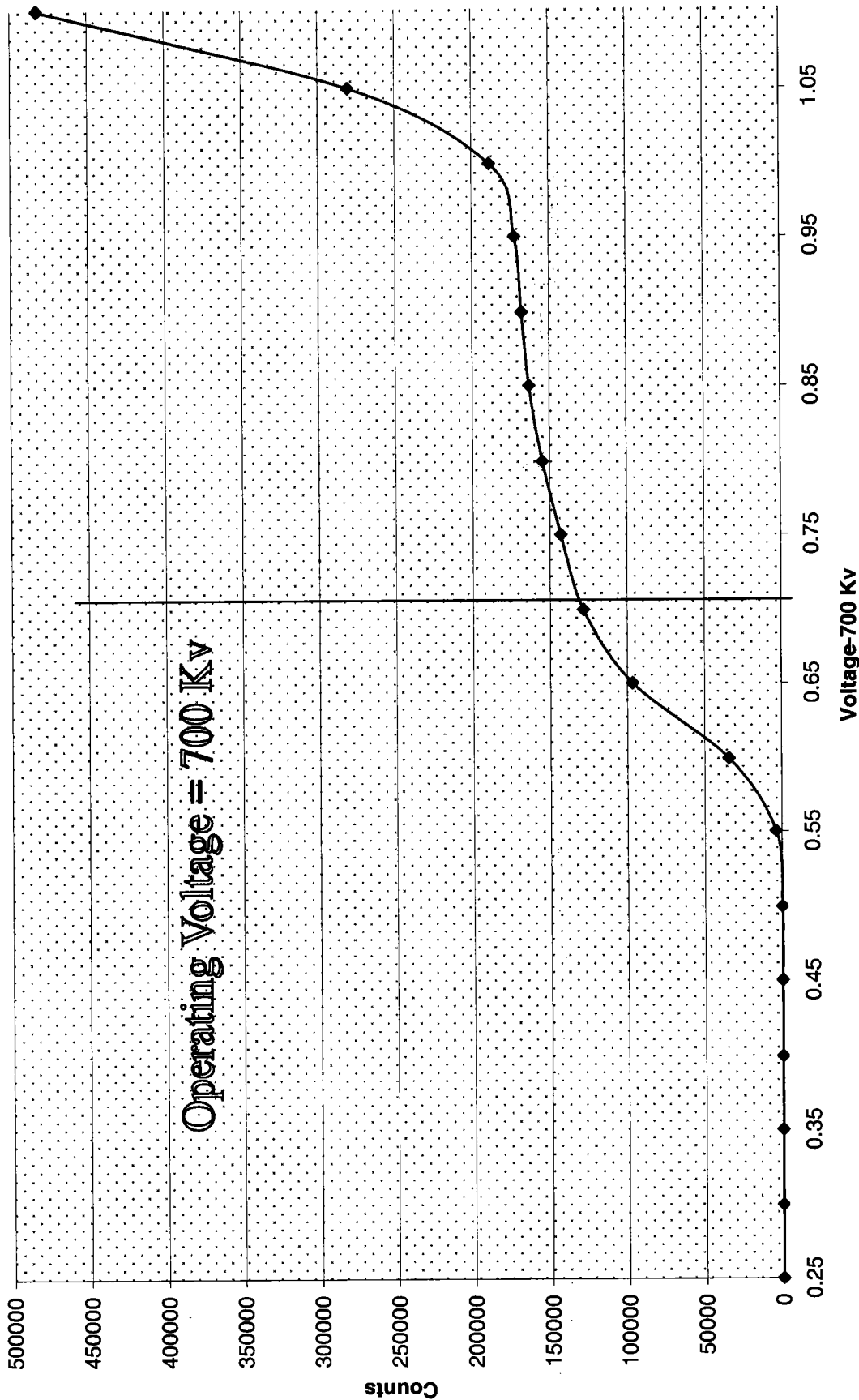
Prepared By: Kelli Brunell Date 2/13/09
 Reviewed By: [Signature] Date 2/14/09

Voltage Curve 1-09

Voltage Curve Ludlum # 3				
Volts	Counts	Date	Time	Detector
0.00	0	1/20/2009	13:45	3
0.05	0	1/20/2009	13:46	3
0.10	0	1/20/2009	13:47	3
0.15	0	1/20/2009	13:48	3
0.20	0	1/20/2009	13:49	3
0.25	0	1/20/2009	14:00	3
0.30	0	1/20/2009	14:01	3
0.35	0	1/20/2009	14:02	3
0.40	0	1/20/2009	14:03	3
0.45	0	1/20/2009	14:04	3
0.50	0	1/20/2009	14:05	3
0.55	3914	1/20/2009	14:06	3
0.60	34392	1/20/2009	14:07	3
0.65	96643	1/20/2009	14:08	3
0.70	128361	1/20/2009	14:09	3
0.75	142888	1/20/2009	14:10	3
0.80	154583	1/20/2009	14:11	3
0.85	163087	1/20/2009	14:12	3
0.90	167801	1/20/2009	14:13	3
0.95	172317	1/20/2009	14:14	3
1.00	188508	1/20/2009	14:15	3

LLA 2/4/09
 LW
 2/3/09

Ludlum 3 Voltage Curve



LCM
2/11/09

KO 213109

301	2.021	2/4/2009
302	2.131	2/4/2009
303	2.136	2/4/2009
305	2.057	2/4/2009
306	1.747	2/4/2009
307	1.931	2/4/2009
308	1.950	2/4/2009
309	1.877	2/4/2009
311	2.114	2/4/2009
312	1.944	2/4/2009

RE UT
2/4/09

~~RE UT~~
2/4/09
RE UT
2/4/09

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414

(843)556-8171

Lucas Cell Calibration Package

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate? the secondary standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	✓		
	✓		
	✓		
	✓		
2) Is the efficiency calibration report included?	✓		
3) Is the raw count data included for: Cell constant determination? Plateau generation?	✓		
	✓		
4) Are the calibration verifications included?	✓		
5) Are the instrument settings included: HVPS settings?	✓		
6) Has the CELLEFF.xls file been updated?	✓		
7) Have the calibration dates been updated in ALPHALIMS?	✓		

Prepared By: Kelli Dorrel

Date: 2/28/09

Reviewed By: Angela Johnson

Date: 3/2/09

Effective Date: 3/2/09

Ra-226 Cell Constants

Standard Reference date : 12/15/1999
 standard ID : 0.299-G
 Volume added (mL) : 0.1
 Standard Reference Activity (DPM/mL) : 2446.35

Lucas cell #	Call constant	Standard Source	Date/Time of count	Date/Time flushed to cell	Date/Time end of degas	bkg cpm	total counts	count time min	cpm	Known activity dpm	11 (days) end-degas to flush	12 (days) end-flush to count	13 (days) Std Ref Date to count	Decay from Std Ref Date to count
401	1.689	Average	2/23/2009 16:15	2/23/2009 10:30	2/20/2009 17:25	0.267	4580	30	152.67	243.66	2.71181	0.23958	3359	0.9960
401	1.585	Stdev	2/27/2009 13:15	2/27/2009 9:00	2/23/2009 16:05	0.267	5474	30	182.47	243.66	3.70486	0.17708	3363	0.9960
401	1.448		2/25/2009 14:40	2/25/2009 7:55	2/20/2009 17:25	0.267	5677	30	189.23	243.66	4.60417	0.28125	3361	0.9960
402	2.133	Average	2/23/2009 16:55	2/23/2009 11:05	2/20/2009 17:25	0.267	5817	30	193.90	243.66	2.73611	0.24306	3359	0.9960
402	2.173	Stdev	2/27/2009 14:10	2/27/2009 9:30	2/23/2009 16:05	0.267	7507	30	250.23	243.66	3.72569	0.19444	3363	0.9960
402	2.048		2/25/2009 15:25	2/25/2009 8:15	2/20/2009 17:25	0.267	8017	30	267.23	243.66	4.61806	0.29861	3361	0.9960
403	1.475	Average	2/23/2009 18:30	2/23/2009 11:30	2/20/2009 17:25	0.267	4011	30	133.70	243.66	2.75347	0.29167	3359	0.9960
403	1.495	Stdev	2/27/2009 14:50	2/27/2009 10:00	2/23/2009 16:05	0.267	5182	30	172.73	243.66	3.74853	0.20139	3363	0.9960
403	1.419		2/25/2009 15:55	2/25/2009 8:35	2/20/2009 17:25	0.267	5582	30	185.40	243.66	4.63194	0.30556	3361	0.9960
404	1.792	Average	2/23/2009 19:05	2/23/2009 13:10	2/20/2009 17:25	0.267	5005	30	166.83	243.66	2.82292	0.24653	3359	0.9960
404	2.142	Stdev	2/27/2009 15:25	2/27/2009 10:30	2/23/2009 16:05	0.267	7443	30	248.10	243.66	3.76736	0.20486	3363	0.9960
404	1.859		2/25/2009 20:20	2/25/2009 8:55	2/20/2009 17:25	0.267	7075	30	235.83	243.66	4.64583	0.47569	3361	0.9960
405	2.066	Average	3/2/2009 13:40	3/2/2009 10:30	2/25/2009 14:00	0.267	8602	30	286.73	243.66	4.85417	0.13194	3366	0.9960
405	1.899	Stdev	2/27/2009 16:00	2/27/2009 10:55	2/23/2009 16:05	0.267	6612	30	220.40	243.66	3.78472	0.21181	3363	0.9960
405	1.745		2/25/2009 20:55	2/25/2009 10:10	2/20/2009 17:25	0.267	6721	30	224.03	243.66	4.69792	0.44792	3361	0.9960
409	1.805	Average	2/24/2009 0:30	2/23/2009 15:20	2/20/2009 17:25	0.267	5039	30	167.97	243.66	2.91319	0.38194	3359	0.9960
409	2.153	Stdev	2/3/2009 21:10	2/3/2009 15:00	1/30/2009 10:50	0.267	7949	30	264.97	243.67	4.17361	0.25694	3339	0.9960
409	2.149		2/27/2009 16:35	2/27/2009 11:30	2/23/2009 16:05	0.267	7516	30	250.53	243.66	3.80903	0.21181	3363	0.9960
410	1.869	Average	2/26/2009 8:50	2/25/2009 13:05	2/20/2009 17:25	0.267	6838	30	227.93	243.66	4.31944	0.82292	3361	0.9960
410	1.965	Stdev	2/4/2009 8:30	2/3/2009 15:30	1/30/2009 10:50	0.267	6708	30	223.60	243.67	4.19444	0.70853	3339	0.9960
410	1.824		2/24/2009 8:00	2/23/2009 15:40	2/20/2009 17:25	0.267	4840	30	161.33	243.66	2.92708	0.68056	3359	0.9960
411	1.824	Average	2/24/2009 8:40	2/23/2009 15:55	2/20/2009 17:25	0.267	4839	30	161.30	243.66	2.93750	0.69792	3359	0.9960
411	1.911	Stdev	2/27/2009 17:45	2/27/2009 12:20	2/23/2009 16:05	0.267	6357	30	211.90	243.66	3.84375	0.22569	3363	0.9960
411	1.836		2/26/2009 9:30	2/25/2009 13:40	2/20/2009 17:25	0.267	6734	30	224.47	243.66	4.84375	0.82639	3361	0.9960
412	1.947	Average	2/26/2009 10:15	2/25/2009 14:05	2/20/2009 17:25	0.267	7137	30	237.90	243.66	4.86111	0.84028	3361	0.9960
412	2.131	Stdev	2/27/2009 18:20	2/27/2009 12:45	2/23/2009 16:05	0.267	7495	30	249.83	243.66	3.86111	0.23264	3363	0.9960
412	1.822		2/24/2009 9:40	2/23/2009 16:10	2/20/2009 17:25	0.267	4818	30	160.60	243.66	2.94792	0.72917	3359	0.9960

EffErr 0.123705 <- Put in Machines.xls (Lucas Cell Tab)

Angela J. ... 3/2/09
Miki Davel 3/2/09

401	1.574	3/2/2009
402	2.118	3/2/2009
403	1.463	3/2/2009
404	1.931	3/2/2009
405	1.903	3/2/2009
409	2.036	3/2/2009
410	1.886	3/2/2009
411	1.824	3/2/2009
412	1.967	3/2/2009

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GLRAD-A-008 Isotope Pu-239
 Date Standards Prepared 4/15/09 Cocktail Type Used NA
 Standard ID 02996 Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 Type of Scintillation Vial NA
 Standard Activity (DPM/g or mL) 2446.347 Pipette ID Used 1429303
 Reference Date 4/15/09 Balance ID Used 3604026
 Expiration Date 4/15/09 Quenching Agent NA
 Residue/Carrier Agent 0.5M HCl

	Standard Number	Quenching Vol (uL) Residue Volume(mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
3	CA13				
43	CA143				
7	CA17				
42	CA142				
13	CA143				
44	CA144				
30	CA130				
48	CA148				
36	CA136				
35	CA135				
38	CA138				
15	CA115				
14	CA114				
46	CA146				
47	CA147				

W 3/2/09

Prepared By: Kell Deneo Date: 3/2/09
 Reviewed By: Angie J. Ghera Date: 3/2/09

Rev 1 RLM 9/10/97

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GL-PAD-008 Isotope RA-226
 Date Standards Prepared 4/5/09 Cocktail Type Used NA
 Standard ID 0299G Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.103109 Matrix of Vial/Planchett NA
 Standard Activity (DPM/g or ml) 2.446347 Type of Scintillation Vial NA
 Reference Date 12/5/99 Pipette ID Used 1429305
 Expiration Date 4/2/09 Balance ID Used 3604026
 Residue/Carrier Agent 0.5M HCl Quenching Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
16	CA116				
25	CA125				
23	CA123				
28	CA128				
9	CA19				
34	CA134				

Prepared By: Valli Perera Date: 3/2/09
 Reviewed By: Aylee A. G... Date: 3/2/09
 Rev 1 RLM 9/10/97

Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0299	Isotope:	Radium-226
Prepared By:	Angela Johnson	Prepared By:	Angela Johnson
Carrier Conc:	0.5 M HCL	Prep Date:	09/15/2000
Reference Date:	12/15/1999	Verification Date:	01/23/2008
Ampoule Mass (g):	5.0368 g	Expiration Date:	01/23/2009
Uncertainty:	+/- 2.5 %	Primary Code:	0299-A
LogBook No:	RC S 027 128	Dilution(mL):	100 mL
		Mass of Parent(g):	4.6634 g
		Density(g/mL):	1.0012
		Balance ID:	

389

Calculations Converting parent activity to dpm/mL|dpm/g

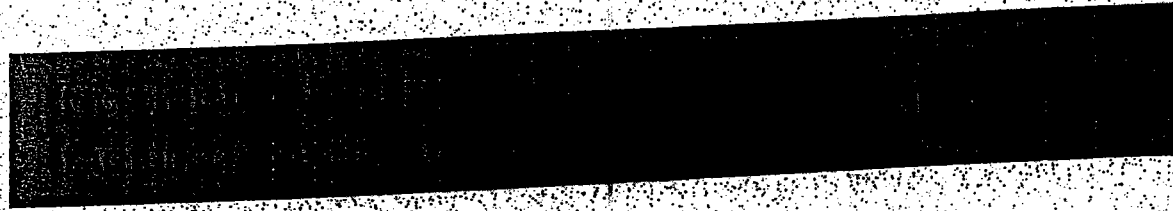
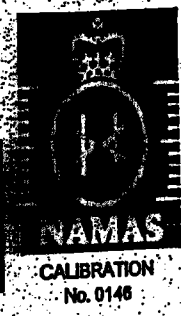
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 122414.2500 \text{ dpm/mL}$
$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0012 \text{ g/mL}) / (100 \text{ mL}) = 122273.3377 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/26/2003	Angela Johnson	1.9909	100	0299-E	2434.34 dpm/mL	11/04/2004	11/04/2005
08/26/2003	Angela Johnson	1.9872	100	0299-F	2429.82 dpm/mL	08/26/2004	08/26/2005
04/05/2005	Amanda Fehr	5.0018	250	0299-G	2446.3471 dpm/mL	04/02/2008	04/02/2009

8-21-00
Nycomed Amersham plc
Amersham Laboratories

0299



Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED
FOR:

AEA Technology plc
Isotrak
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ion Principal radionuclide: Radium-226

Product code: RAY44
Solution number: R4/131/89

ment Reference time: 1200 GMT on 15 December 1999

data Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

ion of The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which
inties for a t -distribution with $\nu_{eff} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately
95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard
uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21)	-	6.5 ± 2.1
6.54(21)	-	6.54 ± 0.21
6.543(21)	-	6.543 ± 0.021

ved
ory

Date of
issue 390 17th December 1999

Nycomed
Amersham
Via 31/10/99

Verification for Ra-226 Standard 0299-G

4/2/2008	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Standard Mass. Used (G)	Source DPM/G
D. Roy	0299-G N1	2536.9600	52.4000	2484.5600	1.917186	0.5057	2562.667649
	0299-G N2	2520.2500	52.4000	2467.8500	1.917186	0.5056	2545.935781
	0299-G N3	2532.5000	52.4000	2480.1000	1.917186	0.5042	2565.677715
						Average =	2558.093715

Mean Value (Counting) = 2558.093715 **Pass**
 Stdev = 10.63610098 0.00415782 **Rule 3 (Pass/Fail)**

Certificate Value = 2437.6 dpm/mL
 Lower Limit = 2536.821513 dpm/mL
 Upper Limit = 2579.365917 dpm/mL
Rule 1 Pass/Fail *exception taken due to full recovery of standard
 Two sigma = 21.27220197 dpm/mL
 10 % of Mean = 255.8093715 dpm/mL
Rule 2 (Pass/Fail) **Pass**

Verification Rules

- Rule 1 =** The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 =** The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 =** The determined mean value shall be within 10% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0299-G by transferring portions of the standard into tared glass liquid scintillation vials. One mL of DI Water and ten mLs of Ready Gel liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 1 mL of DI water and 10 mL of Ready Gel cocktail. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Gold for Radium source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 4/02/08 using source 0024-A (Ra-226). Calibration data is recorded in this logbook under Ra-226 0024. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

RAD.SOP.M-001

Henry St. Johnson 4/19/08
David Dwyer 4/10/08
WMS

Ra-226 Verification Sheet

Cal #4

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
40	1120/09	1050	2/2/09 1455	2-3-09 1710	401	4	8	6763
41	1120/09	1050	2/3/09 1310	2-3-09 1820	402	4	8	9067
42	1120/09	1050	2/3/09 1335	2-3-09 1840	403	4	8	7092
43	1120/09	1050	2/3/09 1400	2-3-09 1915	404	4	8	7877
44	1120/09	1050	2/3/09 1425	2-3-09 2035	405	4	8	8700
45	1120/09	1050	2/3/09 1500	2-3-09 2110	409	4	8	7949
46	1120/09	1050	2/3/09 1530	2-4-09 0830	410	4	8	6108
47	1120/09	1050	2/3/09 1545	2-4-09 1115	411	4	8	7582
48	1120/09	1050	2/3/09 1600	2-4-09 1100	412	4	8	9523
49								
50								
51								
52								
53								
54								
55								
56								
57								
58								
59								
60								

160 3/2/09

160 3/2/09

160 3/2/09

160 3/2/09

160 3/2/09

160 3/2/09

160 3/2/09

160 3/2/09

Ra-226 Verification Sheet

Cal #4

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 3	500	2/20/09 1725	2/23/09 1030	2/23/09 1615	401	4	0	4580
43	500	2/20/09 1725	2/23/09 1105	2/23/09 1655	402	4	0	5877 4877
7	500	2/20/09 1725	2/23/09 1130	2.23.09 1930	403	4	0	4011
42	500	2/20/09 1725	2/23/09 1310	2.23.09 1908	404	4	0	5005
13	500	2/20/09 1725	2/23/09 1340	2.23.09 1955	405	4	0	4224
3A	500	2/20/09 1725	2/23/09 1405	2.23.09 2250	406	4	0	2355
44	500	2/20/09 1725	2/23/09 1435	2.23.09 2330	407	4	0	2359
49	500	2/20/09 1725	2/23/09 1455	2.24.09 00:00	408	4	0	2598
30	500	2/20/09 1725	2/23/09 1540	2.24.09 00:30	409	4	8	5887 5887
48	500	2/20/09 1725	2/23/09 1540	2/24/09 0800 2/24/09 0800	410	4	8	4840
30	500	2/20/09 1725	2/23/09 1555	2/24/09 0840	411	4	8	4829
35	500	2/20/09 1725	2/23/09 1610	2/24/09 0940	412	4	8	4878

K40 2/23/09

K40 2/18/09

K40 2/22/09

2/28/09-140

K40 2/18/09

K40 2/24/09

K40 2/12/09

K40 3/12/09

K40 2/25/09

30

Re-226 Verification Sheet

#4

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 28	500	2/20/09 1725	2/25/09 0755	2/25/09 1440	401	4	8	5677
15	500	2/20/09 1725	2/25/09 0815	2/25/09 1525	402	4	8	8017
14	500	2/20/09 1725	2/25/09 0835	2/25/09 1555	403	4	8	5562
40	500	2/20/09 1725	2/25/09 0855	2.25.09 20:20	404	4	8	7075
47	500	2/20/09 1725	2/25/09 1010	2.25.09 20:55	405	4	8	6721
10	500	2/20/09 1725	2/25/09 1040	2.26.09 09:22	406	4	8	7094
25	500	2/20/09 1725	2/25/09 1110	2.25.09 22:05	407	4	8	2827
23	500	2/20/09 1725	2/25/09 1145	2.25.09 22:45	408	4	8	5137
29	500	2/20/09 1725	2/25/09 1210	2/26/09 0810	409	4	8	5169
28	500	2/20/09 1725	2/25/09 1305	2/26/09 0850	410	4	8	6838
9	500	2/20/09 1725	2/25/09 1310	2/26/09 0930	411	4	8	6734
34	500	2/20/09 1725	2/25/09 1405	2/26/09 1015	412	4	8	7137

#9 3/2/09
 #10 3/2/09
 #11 3/2/09
 #12 3/2/09
 #13 3/2/09
 #14 3/2/09
 #15 3/2/09

160 3/2/09

160 3/2/09

160 3/2/09

NO RECORDS

Ra-226 Verification Sheet

Cal # 4

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 13	500	2/23/09 16:05	2/27/09 09:30	2/27/09 12:15	401	4	8	5474
Cal 14	500	2/23/09 16:05	2/27/09 10:30	2/27/09 14:16	402	4	8	7507
Cal 7	500	2/23/09 16:05	2/27/09 10:30	2/27/09 14:50	403	4	8	5182
Cal 42	500	2/23/09 16:05	2/27/09 10:30	2/27/09 15:25	404	4	8	7443
Cal 13	500	2/23/09 16:05	2/27/09 10:30	2/27/09 16:00	405	4	8	6612
Cal 44	500	2/23/09 16:05	2/27/09 11:30	2/27/09 16:35	409	4	8	7516
Cal 9	500	2/23/09 16:05	2/27/09 11:50	2/27/09 17:15	410	4	8	7850
Cal 40	500	2/23/09 16:05	2/27/09 12:20	2/27/09 17:15	411	4	8	2357
Cal 40	500	2/23/09 16:05	2/27/09 12:45	2/27/09 18:20	412	4	8	7495

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NO WORK

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Ra-226 Verification Sheet

Cal #4

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 38	500	1/25/09 14:00	3/2/09 10:30	3/1/09 13:40	405	4	8	8602

AT 3/2/09

160 3/2/09

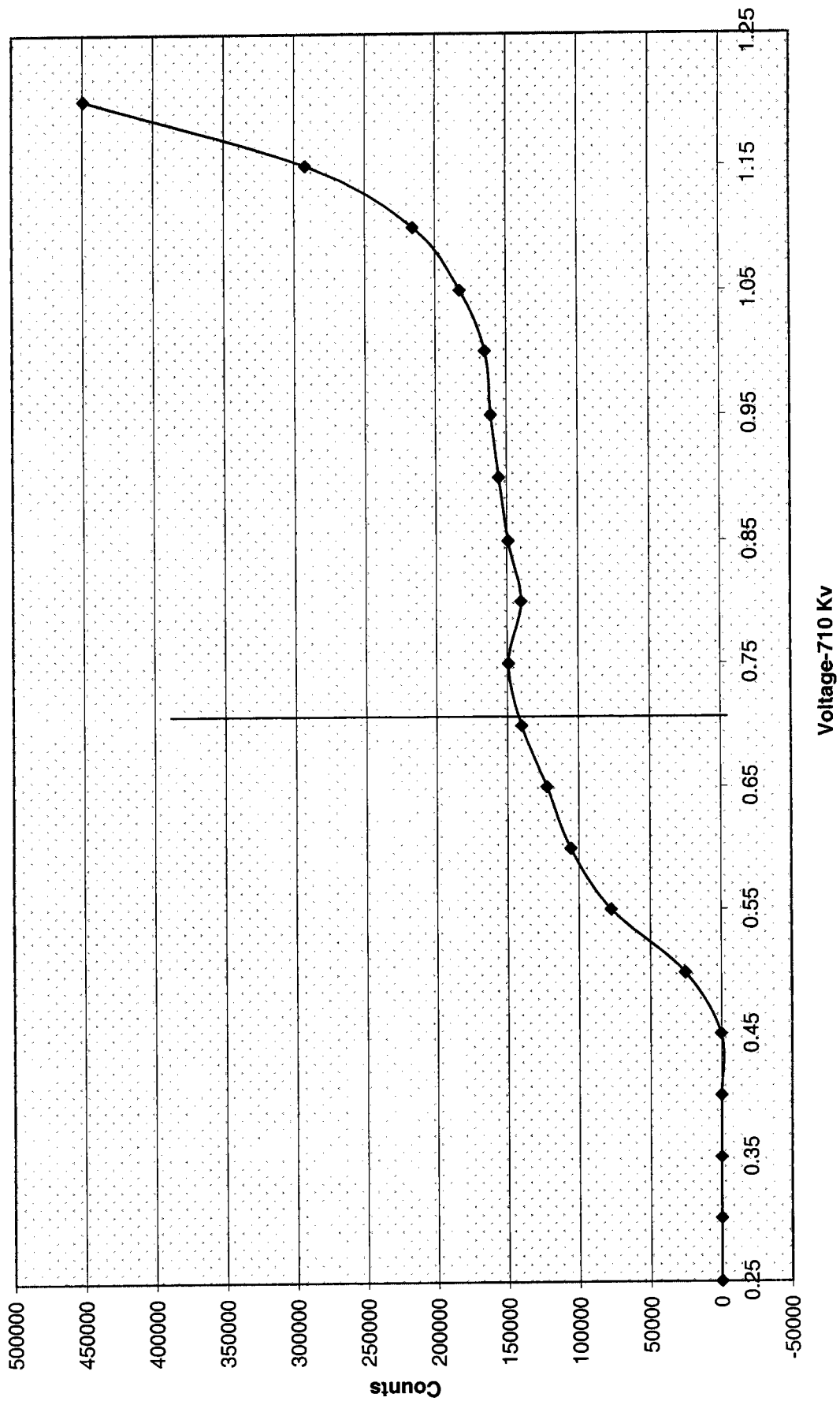
voltage curve -09

Voltage Curve Ludlum # 4				
Volts (K.V.)	Counts	Date	Time	Detector
0.20	0	2/2/2009	9:00	4
0.25	0	2/2/2009	9:00	4
0.30	0	2/2/2009	9:00	4
0.35	0	2/2/2009	9:00	4
0.40	0	2/2/2009	9:00	4
0.45	473	2/2/2009	9:00	4
0.50	25577	2/2/2009	9:00	4
0.55	77365	2/2/2009	9:00	4
0.60	105618	2/2/2009	9:00	4
0.65	122379	2/2/2009	9:00	4
0.70	140073	2/2/2009	9:00	4
0.75	149183	2/2/2009	9:00	4
0.80	140046	2/2/2009	9:00	4
0.85	149183	2/2/2009	9:00	4
0.90	155553	2/2/2009	9:00	4
0.95	161020	2/2/2009	9:00	4
1.00	165182	2/2/2009	9:00	4
1.05	182720	2/2/2009	9:00	4
1.10	215932	2/2/2009	9:00	4
1.15	292211	2/2/2009	9:00	4
1.20	449383	2/2/2009	9:00	4

JK
3/2/09

1/m 3/2/09

Ludlum 4 Voltage Curve



10/3/04

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414
(843)556-8171

Lucas Cell Calibration Package (501-512)

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate? the secondary standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
2) Is the efficiency calibration report included?	<input checked="" type="checkbox"/>		
3) Is the raw count data included for: Cell constant determination? Plateau generation?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
4) Are the calibration verifications included?	<input checked="" type="checkbox"/>		
5) Are the instrument settings included: HVPS settings?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
6) Has the CELLEFF.xls file been updated?	<input checked="" type="checkbox"/>		
7) Have the calibration dates been updated in ALPHALIMS?	<input checked="" type="checkbox"/>		

Prepared By: Kelli S. Dancer

Date: 3/24/09

Reviewed By: Angela J. Johnson

Date: 3/25/09

Effective Date: 3/25/09

Ra-226 Cell Constants

standard ID: 0299-E
Volume added (mL): 0.1
Standard Reference Activity (DPM/mL): 2434.34

Lucas cell #	Cell constant	Standard Source	Date/Time of count	Date/time flushed to cell	Date/time end of degas	total counts	count time min	Known activity dpm	t1 (days) end-degas to flush	t2 (days) end-flush to count	t3 (days) Std Ref Date to count	Decay from Std Ref Date to count	
501	1.927	15	3/6/2009 7:50	3/3/2009 8:15	2/25/2009 14:00	5281	30	176.03	243.03	5.76042	2.98264	3369	0.9960
501	2.086	9	3/11/2009 10:40	3/10/2009 12:50	3/5/2009 14:00	7611	30	253.70	243.03	4.95139	0.90972	3374	0.9960
501	2.247	42	3/12/2009 13:30	3/12/2009 9:10	3/6/2009 15:25	10210	30	340.33	243.03	5.73958	0.18056	3376	0.9960
502	1.772	16	3/18/2009 8:25	3/17/2009 12:50	3/10/2009 14:00	7951	30	265.03	243.03	6.95739	0.81597	3381	0.9960
502	2.045	14	3/11/2009 11:15	3/10/2009 13:20	3/5/2009 14:00	7474	30	249.13	243.03	4.97222	0.91319	3374	0.9960
502	1.816	19	3/12/2009 14:20	3/12/2009 9:35	3/6/2009 15:25	8243	30	274.77	243.03	5.75694	0.19792	3376	0.9960
503	1.581	46	3/6/2009 9:20	3/5/2009 9:20	2/25/2009 14:00	7250	30	241.67	243.03	7.80556	1.00000	3369	0.9960
503	1.633	42	3/19/2009 20:15	3/19/2009 15:15	3/12/2009 12:10	8282	30	276.07	243.03	7.12847	0.20833	3383	0.9960
503	1.588	44	3/12/2009 14:50	3/12/2009 10:00	3/6/2009 15:25	7214	30	240.47	243.03	5.77431	0.20139	3378	0.9960
504	1.592	47	3/6/2009 10:30	3/5/2009 9:40	2/25/2009 14:00	7262	30	242.07	243.03	7.81944	1.03472	3369	0.9960
504	1.611	34	3/11/2009 12:30	3/10/2009 14:05	3/5/2009 14:00	5889	30	196.30	243.03	5.00347	0.93403	3375	0.9960
504	1.641	19	3/19/2009 20:50	3/19/2009 15:30	3/12/2009 12:10	8310	30	277.00	243.03	7.13889	0.22222	3383	0.9960
505	2.364	16	3/6/2009 12:40	3/5/2009 10:05	2/25/2009 14:00	10654	30	355.13	243.03	7.83681	1.10764	3370	0.9960
505	2.438	23	3/11/2009 13:00	3/10/2009 14:30	3/5/2009 14:00	8924	30	297.47	243.03	5.02083	0.93750	3375	0.9960
505	2.190	7	3/12/2009 17:01	3/12/2009 10:50	3/6/2009 15:25	9884	30	329.47	243.03	5.80903	0.25764	3376	0.9960
506	1.902	25	3/6/2009 13:10	3/5/2009 10:30	2/25/2009 14:00	8576	30	285.87	243.03	7.85417	1.11111	3370	0.9960
506	2.124	47	3/11/2009 13:30	3/10/2009 15:05	3/5/2009 14:00	7804	30	260.13	243.03	5.04514	0.93403	3375	0.9960
506	1.965	13	3/12/2009 17:40	3/12/2009 11:15	3/6/2009 15:25	8954	30	298.47	243.03	5.82639	0.26736	3376	0.9960
507	1.708	23	3/6/2009 13:45	3/5/2009 10:55	2/25/2009 14:00	7695	30	256.50	243.03	7.87153	1.11806	3370	0.9960
507	1.722	25	3/11/2009 14:20	3/10/2009 15:27	3/5/2009 14:00	6315	30	210.50	243.03	5.06042	0.95347	3375	0.9960
507	1.674	43	3/12/2009 18:30	3/12/2009 11:35	3/6/2009 15:25	7535	30	251.17	243.03	5.84028	0.28819	3376	0.9960
508	1.605	39	3/6/2009 14:20	3/5/2009 11:25	2/25/2009 14:00	7236	30	241.20	243.03	7.89236	1.12153	3370	0.9960
508	1.497	44	3/19/2009 21:30	3/19/2009 15:45	3/12/2009 12:10	7581	30	252.03	243.03	7.14931	0.23958	3383	0.9960
508	1.499	3	3/12/2009 20:45	3/12/2009 12:10	3/6/2009 15:25	6680	30	222.67	243.03	5.86458	0.35764	3376	0.9960
509	1.730	28	3/6/2009 14:50	3/5/2009 11:45	2/25/2009 14:00	7795	30	259.83	243.03	7.90625	1.12847	3370	0.9960
509	1.857	39	3/11/2009 15:25	3/10/2009 16:05	3/5/2009 14:00	6810	30	227.00	243.03	5.08681	0.97222	3375	0.9960
509	1.806	36	3/12/2009 21:20	3/12/2009 12:35	3/6/2009 15:25	8049	30	268.30	243.03	5.88194	0.36458	3376	0.9960
510	1.460	9	3/6/2009 15:25	3/5/2009 12:10	2/25/2009 14:00	6578	30	219.27	243.03	7.92361	1.13542	3370	0.9960
510	1.433	28	3/11/2009 16:05	3/10/2009 16:20	3/5/2009 14:00	5246	30	174.87	243.03	5.09722	0.98958	3375	0.9960
510	1.481	35	3/12/2009 21:55	3/12/2009 12:50	3/6/2009 15:25	6589	30	219.63	243.03	5.89236	0.37847	3376	0.9960
511	1.839	34	3/6/2009 16:30	3/5/2009 13:20	2/25/2009 14:00	8316	30	277.20	243.03	7.97222	1.13194	3370	0.9960
511	1.995	46	3/12/2009 16:50	3/10/2009 16:35	3/5/2009 14:00	7283	30	242.77	243.03	5.10764	1.01042	3375	0.9960
511	2.041	37	3/12/2009 22:40	3/12/2009 13:10	3/6/2009 15:25	9088	30	302.27	243.03	5.90625	0.39583	3376	0.9960
512	1.796	48	3/11/2009 17:35	3/10/2009 16:50	3/5/2009 14:00	6542	30	218.07	243.03	5.11806	1.03125	3375	0.9960
512	2.100	38	3/12/2009 23:15	3/12/2009 13:30	3/6/2009 15:25	9322	30	310.73	243.03	5.92014	0.40625	3376	0.9960
512	1.972	48	3/18/2009 13:00	3/17/2009 14:00	3/6/2009 14:00	8653	30	288.43	243.03	7.00000	0.95833	3382	0.9960

ERR 0.143768 <- Put in Machines.xls (Lucas Cell Tab) *Backgrounds are not significant enough to be considered in calculations. ANSI N42.25-1997 (B.2).

Calibration
Ra-226 Verification-Sheet
3/14/09

Cal # 5

no 3124109
3119109

3/19/09

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 15	500	2/25/09 1400	3/3/09 0815	3/6/09 0750	501	5	8	5781
Cal 14	500	2/25/09 1400	2/26/09 0845	3/6/09 0840	502	5	1	4700
		2/25/09 1400	3/3/09		503	5	100 313109	6800
Cal 46	500	2/25/09 1400	3/5/09 0920	3/6/09 0900	503	5	3	7250
Cal 47	500	2/25/09 1400	3/5/09 0940	3/6/09 1030	504	5	1	7262
Cal 48	500	2/25/09 1400	3/5/09 1005	3/6/09 1040	505	5	3	10654
Cal 45	500	2/25/09 1400	3/5/09 1030	3/6/09 1016	506	5	8	8576
Cal 23	500	2/25/09 1400	3/5/09 1055	3/6/09 1345	507	5	4	7695
Cal 39	500	2/25/09 1400	3/5/09 1125	3/6/09 1420	508	5	1	7236
Cal 28	500	2/25/09 1400	3/5/09 1145	3/6/09 1450	509	5	8	7795
Cal 9	500	2/25/09 1400	3/5/09 1210	3/6/09 1525	510	5	2	6578
Cal 34	500	2/25/09 1400	3/5/09 1220	3/6/09 1630	511	5	6	8316

Calibration

Ra-226 Verification Sheet

219 3116109

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 9	500	3/5/09 1400	3/10/09 1250	3/11/09 1040	501	5	8	7611
Cal 14	500	3/5/09 1400	3/10/09 1370	3/11/09 1115	502	5	5	7474
Cal 15	500	3/5/09 1400	3/10/09 1345	3/11/09 1155	503	5	8	7352
Cal 16	500	3/5/09 1400	3/10/09 1405	3/11/09 1230	504	5	4	5889
Cal 17	500	3/5/09 1400	3/10/09 1430	3/11/09 1280	505	5	2	8924
Cal 17	500	3/5/09 1400	3/10/09 1505	3/11/09 1530	506	5	8	7804
Cal 18	500	3/5/09 1400	3/10/09 1527	3/11/09 1410	507	5	4	6315
Cal 19	500	3/5/09 1400	3/10/09 1550	3/11/09 1455	508	5	4	6443
Cal 29	500	3/5/09 1400	3/10/09 1605	3/11/09 1525	509	5	8	6810
Cal 28	500	3/5/09 1400	3/10/09 1620	3/11/09 1610	510	5	3	5246
Cal 44	500	3/5/09 1400	3/10/09 1635	3/11/09 1650	511	5	8	7283
Cal 48	500	3/5/09 1400	3/10/09 1650	3/11/09 1735	512	5	8	6542

219 3124109

219 3124109

219 3124109

219 3116109

Calibration
 Ra-226 Verification Sheet
 3/25/109

Cal # 5's

✓ 3/24/109
 ✓ 3/25/109

3/25/109

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
Cal 114	500	3/10/09 1400	3/17/09 1250	3/18/09 0825	502	5	5	7451
Cal 129	500	3/16/09 1400	3/17/09 1325	3/18/09 0855	503	5		6855
Cal 128	500	3/10/09 1400	3/17/09 1345	3/18/09 1005	504	5		6804
Cal 140	500	3/10/09 1400	3/17/09 1400	3/18/09 1300	512	5	8	8053
Cal 125	500	3/5/09 1400	3/10/09 1527	3/11/09 1420	507	5	4	6315
3/25/109								

Ra-226 Calibration Sheet

Standard ID: 0124109

Volume Added (mL): 1.1

Expiration Date: 4/12/09

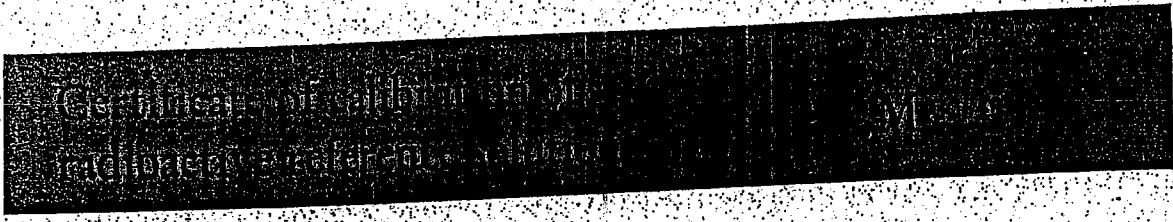
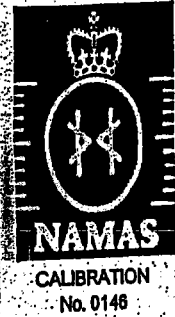
Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 42	500	3/12/09 1210	3/14/09 1515	3/19/09 2015	503	85	8282
Cal 19	500	3/12/09 1210	3/14/09 1530	3/19/09 2030	504	5	8310
Cal 44	500	3/12/09 1210	3/14/09 1545	3/19/09 2130	508	5	7561
Cal 30	500	3/12/09 1210	3/14/09 1600	3/19/09 2200	509	5	9442

3/25/09
3/25/09

8-21-00

Nycomed Amersham plc
Amersham Laboratories

0299



Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED
FOR:

AEA Technology plc
Isotrak
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ion Principal radionuclide: Radium-226

Product code: RAY44
Solution number: R4/131/89

ment Reference time: 1200 GMT on 15 December 1999

data Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

ion of The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which
inties for a t -distribution with $\nu_{eff} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately
95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard
uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21)	-	6.5 ± 2.1
6.54(21)	-	6.54 ± 0.21
6.543(21)	-	6.543 ± 0.021

ved

Date of 406 17th December 1999



Standard Traceability Log Rad

Source Material Info	
Parent Code:	0299
Prepared By:	Angela Johnson
Carrier Conc:	0.5 M HCL
Reference Date:	12/15/1999
Ampoule Mass (g):	5.0368 g
Uncertainty:	+/- 2.5 %
LogBook No:	RC S 027 128

A Solution Material Info	
Isotope:	Radium-226
Prepared By:	Angela Johnson
Prep Date:	09/15/2000
Verification Date:	01/23/2008
Expiration Date:	01/23/2009
Primary Code:	0299-A
Dilution(mL):	100 mL
Mass of Parent(g):	4.6634 g
Density(g/mL):	1.0012
Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 122414.2500 \text{ dpm/mL}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0012 \text{ g/mL}) / (100 \text{ mL}) = 122273.3377 \text{ dpm/g}$$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/26/2003	Angela Johnson	1.9909	100	0299-E	2434.34 dpm/mL	11/04/2004	11/04/2005
08/26/2003	Angela Johnson	1.9872	100	0299-F	2429.82 dpm/mL	08/26/2004	08/26/2005
04/05/2005	Amanda Fehr	5.0018	250	0299-G	2446.3471 dpm/mL	04/02/2008	04/02/2009

GEL Laboratories LLC
Version 1.0 9/18/2000

Kelli Dorell

Verification for Ra-226 Standard 0299-G

4/2/2008	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff	Standard Mass. Used (G)	Source DPM/G
D. Roy	0299-G N1	2536.9600	52.4000	2484.5600	1.917186	0.5057	2562.667649
	0299-G N2	2520.2500	52.4000	2467.8500	1.917186	0.5056	2545.935781
	0299-G N3	2532.5000	52.4000	2480.1000	1.917186	0.5042	2565.677715
						Average =	2558.093715

Mean Value (Counting) = 2558.093715
 Stdev = 10.63610098

Certificate Value = 2437.6 dpm/mL
 Lower Limit = 2536.821513 dpm/mL
 Upper Limit = 2579.365917 dpm/mL
 Rule 1 Pass/Fail = **Fail** *exception taken due to full recovery of standard
 Two sigma = 21.27220197 dpm/mL
 10 % of Mean = 255.8093715 dpm/mL
 Rule 2 (Pass/Fail) = **Pass**

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 10% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0299-G by transferring portions of the standard into tared glass liquid scintillation vials. One mL of DI Water and ten mLs of Ready Gel liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 1 mL of DI water and 10 mL of Ready Gel cocktail. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Gold for Radium source standard verification. The Ra-226 efficiency calibration which was used for verification calculations was performed on 4/02/08 using source 0024-A (Ra-226). Calibration data is recorded in this logbook under Ra-226 0024. Each verification source calculation was performed as follows:

Source dpm/g = (A - B)/(C)(D)

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

BAD.SOP.M-001

Handwritten notes:
 New Source 3/24/09
 4/19/08
 David Dwyer 4/10/08

General Engineering Laboratories
Verification Source Preparation Sheet
Calibration

Applicable SOP Number GL RAD-A-008 Isotope RA-226
 Date Standards Prepared 4/15/09 Cocktail Type Used NA
 Standard ID 0249-G Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 NA
 Standard Activity (DPM/g or ml) 2446.347 Type of Scintillation Vial NA
 Reference Date 12/15/99 Pipette ID Used 1429303
 Expiration Date 4/2/09 Balance ID Used 36240216
 Residue/Carrier Agent D.5M HCl Quenching Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
15	Ca115				
46	Ca146				
47	Ca147				
16	Ca116				
25	Ca125				
23	Ca123				
39	Ca139				
28	Ca128				
9	Ca19				
34	Ca134				
42	Ca142				
19	Ca119				
44	Ca144				
7	Ca17				
13	Ca113				

VLD 3/24/09

Prepared By: Kelli D'Amico Date 3/24/09
 Reviewed By: _____ Date _____

Rev 1 RLM 9/10/97

General Engineering Laboratories
Verification Source Preparation Sheet
3/25/09 Calibration

Applicable SOP Number GLDMP-A-008 Isotope DIA 226
 Date Standards Prepared 4/5/09 Cocktail Type Used NA
 Standard ID 02996 Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 Type of Scintillation Vial NA
 Standard Activity (DPM/g or mL) 2146.347 Pipette ID Used 1429303
 Reference Date 12/15/99 Balance ID Used 3604026
 Expiration Date 4/2/09 Quenching Agent NA
 Residue/Carrier Agent 0.5M HCl

	Standard Number	Quenching Vol (uL)/ Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
43	Cal 43				
3	Cal 3				
46	Cal 36				
35	Cal 35				
37	Cal 37				
38	Cal 38				

160 3/25/09

Prepared By: Kelli Deese Date 3/24/09
 Reviewed By: _____ Date _____

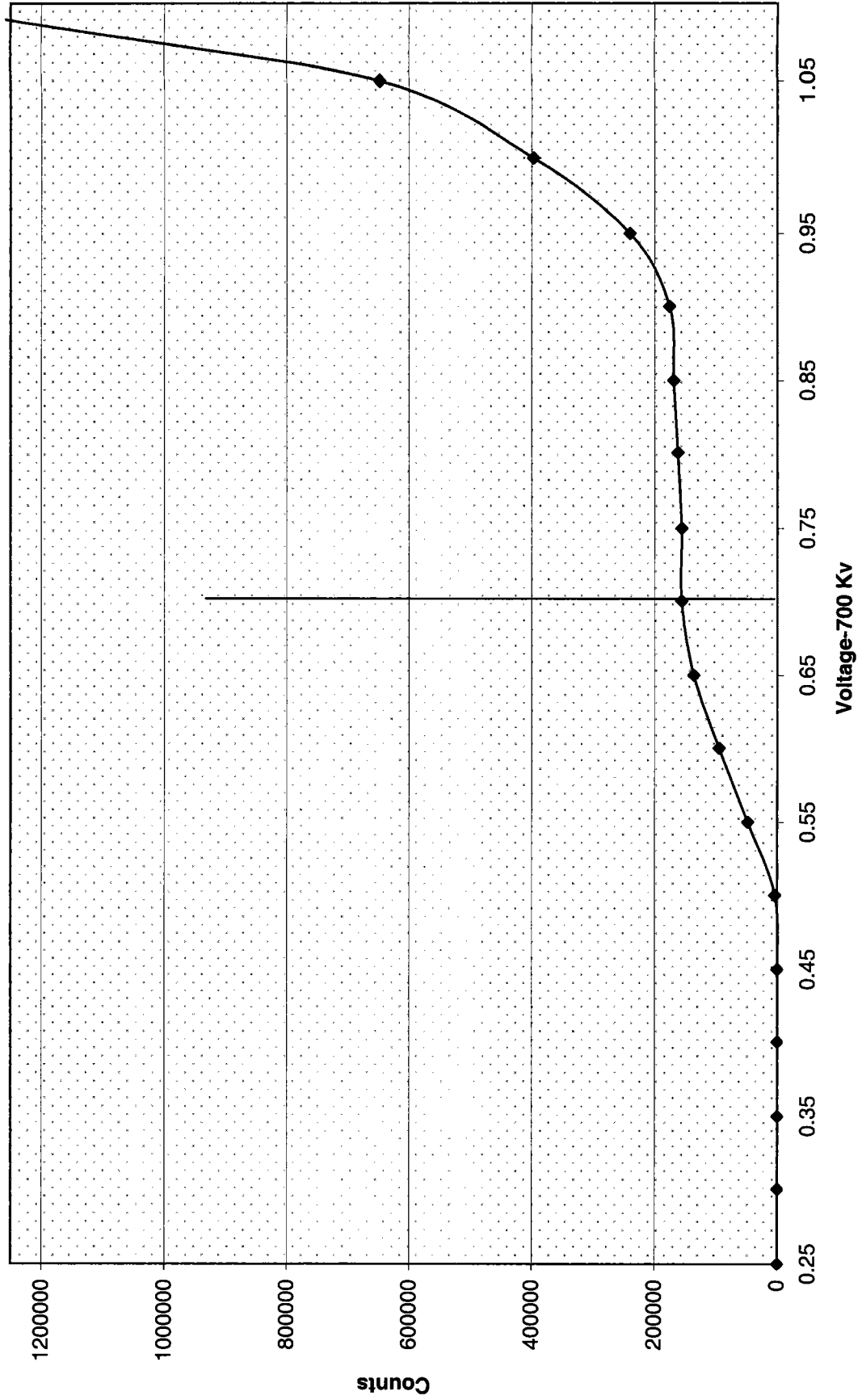
Rev 1 RLM.9/10/97

Voltage

Voltage Curve Ludlum # 5				
Volts	Counts	Date	Time	Detector
0.00	0	2/25/2009	9:20	5
0.05	0	2/25/2009	9:20	5
0.10	0	2/25/2009	9:20	5
0.15	0	2/25/2009	9:20	5
0.20	0	2/25/2009	9:20	5
0.25	0	2/25/2009	9:20	5
0.30	0	2/25/2009	9:20	5
0.35	0	2/25/2009	9:20	5
0.40	0	2/25/2009	9:20	5
0.45	0	2/25/2009	9:20	5
0.50	3611	2/25/2009	9:20	5
0.55	47984	2/25/2009	9:20	5
0.60	94752	2/25/2009	9:20	5
0.65	135854	2/25/2009	9:20	5
0.70	155952	2/25/2009	9:20	5
0.75	155696	2/25/2009	9:20	5
0.80	161972	2/25/2009	9:20	5
0.85	168840	2/25/2009	9:20	5
0.90	175598	2/25/2009	9:20	5
0.95	239969	2/25/2009	9:20	5
1.00	397249	2/25/2009	9:20	5

UD 3/25/09

Ludlum 5 Voltage Curve



KAP 3/24/09

Ra-226 WATER

Batch : LCSVER
 Date : 2/20/2008
 Analyst : DXM2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 MDA : 1 pCi/L

Bkg Count Time: 30 min Instrument Used : LUCAS CELL DETECTOR

Sample ID	Sample Vol L	Count Time min	Gross counts cts	Cell # num	Cell Const. num	BKG cpm	Ra-226 MDA pCi/L	Ra-226 RESULT pCi/L	Ra-226 ERROR pCi/L	COUNT DATE/TIME
Ver 1	0.500	30	766	501	2.087	0.267	0.6041	28.8142	2.0728	3/16/2009 15:10
Ver 2	0.500	30	537	502	1.878	0.167	0.5682	23.0223	1.9747	3/16/2009 19:25
Ver 3	0.500	30	518	503	1.601	0.267	0.8071	25.9035	2.2832	3/16/2009 20:20
Ver 4	0.500	30	701	504	1.615	0.267	0.6021	26.2570	1.9774	3/20/2009 19:00
Ver 5	0.500	30	680	505	2.331	0.033	0.2559	23.5744	1.7758	3/16/2009 22:00
Ver 6	0.500	30	893	506	2.004	0.267	0.4859	27.0593	1.7988	3/20/2009 19:40
Ver 7	0.500	30	488	507	1.701	0.267	0.7287	22.0004	2.0008	3/16/2009 23:00
Ver 8	0.500	30	544	508	1.534	0.033	0.3760	27.7023	2.3344	3/16/2009 23:30
Ver 9	0.500	30	768	509	1.798	0.267	0.5430	25.9694	1.8657	3/20/2009 20:50
Ver 10	0.500	30	432	510	1.458	0.033	0.3700	21.6379	2.0476	3/17/2009 5:00
Ver 11	0.500	30	577	511	1.959	0.267	0.5934	21.2369	1.7694	3/17/2009 5:35
Ver 12	0.500	30	723	512	1.956	0.267	0.5945	26.7349	1.9815	3/17/2009 6:10

Sample ID	Sample Dup	Det #	Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
501		5	3/16/2009 15:10	LCS	0638-F	24.05	pCi/L	120%
502		5	3/16/2009 19:25	LCS	0638-F	24.05	pCi/L	96%
503		5	3/16/2009 20:20	LCS	0638-F	24.05	pCi/L	108%
504		5	3/20/2009 19:00	LCS	0638-F	24.05	pCi/L	109%
505		5	3/16/2009 22:00	LCS	0638-F	24.05	pCi/L	98%
506		5	3/20/2009 19:40	LCS	0638-F	24.05	pCi/L	113%
507		5	3/16/2009 23:00	LCS	0638-F	24.05	pCi/L	91%
508		5	3/16/2009 23:30	LCS	0638-F	24.05	pCi/L	115%
509		5	3/20/2009 20:50	LCS	0638-F	24.05	pCi/L	108%
510		5	3/17/2009 5:00	LCS	0638-F	24.05	pCi/L	90%
511		5	3/17/2009 5:35	LCS	0638-F	24.05	pCi/L	88%
512		5	3/17/2009 6:10	LCS	0638-F	24.05	pCi/L	111%

DEGASSING DATE/TIME	DE-EMAN. DATE/TIME	DEGASS-DE-EM	dE-EM-COUNT	constant	constant	constant	Net CPM	Ingrowth constant
3/13/2009 15:30	3/16/2009 9:45	66.25	5.42	0.3936	0.9599	1.0019	25.2667	0.3785
3/13/2009 15:30	3/16/2009 10:10	66.67	9.25	0.3955	0.9325	1.0019	17.7333	0.3695
3/13/2009 15:30	3/16/2009 10:30	67.00	9.83	0.3970	0.9284	1.0019	17.0000	0.3693
3/16/2009 14:00	3/20/2009 13:05	95.08	5.92	0.5122	0.9563	1.0019	23.1000	0.4908
3/13/2009 15:30	3/16/2009 11:25	67.92	10.58	0.4012	0.9232	1.0019	22.6333	0.3711
3/16/2009 14:00	3/20/2009 13:20	95.33	6.33	0.5131	0.9533	1.0019	29.5000	0.4901
3/13/2009 15:30	3/16/2009 13:50	70.33	9.17	0.4120	0.9331	1.0019	15.9997	0.3852
3/13/2009 15:30	3/16/2009 13:50	70.33	9.67	0.4120	0.9296	1.0019	18.1000	0.3837
3/16/2009 14:00	3/20/2009 13:45	95.75	7.08	0.5147	0.9479	1.0019	25.3333	0.4888
3/13/2009 5:30	3/16/2009 14:25	80.92	14.58	0.4571	0.8957	1.0019	14.3667	0.4103
3/13/2009 5:30	3/16/2009 14:45	81.25	14.83	0.4585	0.8941	1.0019	18.9663	0.4107
3/13/2009 5:30	3/16/2009 15:00	81.50	15.17	0.4595	0.8918	1.0019	23.8330	0.4106

Ra-226 Verification Sheet

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
NUN 1	500	3/16/09 1530	3/16/09 0945	3/16/09 1510 3/16/09 1510 SEE 3/16/09	501	5	8	766
NUN 2	500	3/13/09 1530	3/16/09 1010	3/16/09 1925	502	5	85 140 3/12/09	537
NUN 3	500	3/13/09 1530	3/16/09 1030	3/16/09 2020	503	5	8	518
NUN 4	500	3/13/09 1530	3/16/09 1100	3/16/09 2115	504	5	8	577
NUN 5	500	3/13/09 1530	3/16/09 1125	3/16/09 2200	505	5	8 140 3/12/09	680
NUN 6	500	3/13/09 1530	3/16/09 1155	3/16/09 2230	506	5	8	707
NUN 7	500	3/13/09 1530	3/16/09 1320	3/16/09 2300	507	5	8	488
NUN 8	500	3/13/09 1530	3/16/09 1350	3/16/09 2330	508	5	8 140 3/12/09	544
NUN 9	500	3/13/09 1530	3/16/09 1410	3/17/09 0445 0345 0345 0345	509	5	8	640
NUN 10	500	3/13/09 1530	3/16/09 1415	3/17/09 0500 0500 0500	510	5	8 140 3/12/09	432
NUN 11	500	3/13/09 1530	3/16/09 1445	3/17/09 0535	511	5	8	577
NUN 12	500	3/13/09 1530	3/16/09 1500	3/17/09 0610	512	5	8	723

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3/24/09

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3/24/09

3/25/09
3/25/09

3/17/09
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Ra-226 Verification Sheet

Standard ID: 0638F

Volume Added (mL): 0.1

Expiration Date: 12/10

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Background Counts	Total Counts
VEN 1	500	3/16/09 1400	3/20/09 1245	3/20/09 1820	501	5	8	70
VEN 2	500	3/16/09 1400	3/20/09 1305	3/20/09 1900	504	5	8	701
VEN 3	500	3/16/09 1400	3/20/09 1320	3/30/09 1940	506	5	8	893
VEN 4	500	3/16/09 1400	3/20/09 1345	3/30/09 2050	509	5	8	768

60172126

AV 3124105

KNO 3124105

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GL-APP-D-008 Isotope PA 226
 Date Standards Prepared 11/6/09 Cocktail Type Used NA
 Standard ID 0638-F Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 NA
 Standard Activity (DPM/g or mL) 267.519 Type of Scintillation Vial NA
 Reference Date 11/23/04 Pipette ID Used 1429303
 Expiration Date 2/2/10 Balance ID Used 38080204
 Residue/Carrier Agent NA Quenching Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume(mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Ver 1				
2	Ver 2				
3	Ver 3				
4	Ver 4				
5	Ver 5				
6	Ver 6				
7	Ver 7				
8	Ver 8				
9	Ver 9				
10	Ver 10				
11	Ver 11				
12	Ver 12				

Handwritten note: 11/0 3/25/09

Prepared By: Kelli Daniels Date: 3/24/09
 Reviewed By: Angela A. G... Date: 3/25/09

GEL Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0638	Isotope:	Radium-226
Prepared By:	Amanda Fehr	Prepared By:	Amanda Fehr
Carrier Conc:	0.1M HCl	Prep Date:	01/16/2006
Reference Date:	01/23/2004	Verification Date:	03/04/2007
Ampoule Mass (g):	5.01065 g	Expiration Date:	03/04/2008
Uncertainty:	+/- 3.3 %	Primary Code:	0638-A
LogBook No:	RC-S-037-037	Dilution(mL):	100 mL
		Mass of Parent(g):	4.8398 g
		Density(g/mL):	1.0266
		Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13636.6133 \text{ dpm/mL}$
$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0266 \text{ g/mL}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13282.9676 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
01/17/2006	Amanda Fehr	2.1041	100	0638-B	279.0211 dpm/mL	01/17/2007	01/17/2008
07/17/2006	Mary Aders	2.1313	100	0638-C	282.6281 dpm/mL	07/26/2006	07/26/2007
03/28/2007	Daniel Roy	2.1025	100	0638-D	279.2744 dpm/ml	04/08/2007	04/08/2008
03/28/2007	Daniel Roy	45.468	250	0638-E	2415.7999 dpm/ml	04/09/2008	04/08/2009
12/18/2007	Daniel Roy	2.014	100	0638-F	267.519 dpm/ml	02/02/2009	02/02/2010
02/12/2008	Daniel Roy	.5004	100	0638-G	66.468 dpm/ml	03/04/2008	03/04/2009
07/23/2008	Daniel Roy	5.0607	250	0638-H	268.8845 dpm/ml	07/23/2008	07/23/2009

Verification for Ra-226 Standard 0638-F

D. Roy 2/2/2009	Isotope	Value	Uncertainty
	0638-F #1	24.629	1.7426
	0638-F #2	24.438	1.7557
	0638-F #3	22.791	1.6808
Mean Value (Counting) =	23.953	99.60	Pass
Stdev =	1.010781096		Rule 3 (Pass/Fail)
Target =	24.05		
Lower Limit =	21.93100448		
Upper Limit =	25.97412886		
Rule 1 Pass/Fail	Pass		
Two sigma =	2.021562191		
10 % of Mean =	2.395256667		
Rule 2 (Pass/Fail)	Pass		

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for standard 0638-F using 0.1 mL for each source. Each source was counted using routine Lucas cell procedures. Calibration for 0299-G was used in this verification.

140 3124109

.. C. T. 2/2/09

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414
(843)556-8171

Lucas Cell Calibration Package

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate?	✓		
the second standard(s) documentation?	✓		
standard preparation information?	✓		
standard < 1 Year old or verified?	✓		
2) Is the efficiency calibration report included ?	✓		
3) Is the raw count data included for: Cell constant determination?	✓		
Plateau generation?	✓		
4) Are the calibration verifications included?	✓		
5) Are the instrument settings included: HVPS settings?	✓		
6) Has the CELLEFF.xls file been updated ?	✓		
7) Have the calibration dates been updated in ALPHALIMS ?	✓		

Prepared By: KDD 8/14/09

Date: 8/14/09

Reviewed By: Angela D. Jones

Date: 8/16/09

Effective Date: 8/14/09

KD 8/16/09

Ra-226 Cell Constants

Standard Reference date: 12/15/1999
 Standard ID: 0299-G
 Volume added (mL): 0.1
 Standard Reference Activity (DPM/mL): 2446.3471

Lucas cell #	Cell constant	Standard Source	Date/Time of count	Date/time flushed to cell	Date/time end of degas	total counts	count time min	Known activity dpm	t1 (days) end-degas to flush	t2 (days) end-flush to count	t3 (days) Std Ref Date to count	Decay from Std Ref Date to count			
													cpm	cpm	cpm
601	2.164	Average	2.181	9	5/26/2009 13:30	5/26/2009 9:30	5/19/2009 14:00	10883	30	362.77	244.63	6.81250	0.16667	3451	0.9959
601	2.253	Stdev	0.065	1	5/22/2009 12:55	5/22/2009 9:15	5/19/2009 14:00	6378	30	212.60	244.63	2.80208	0.15278	3447	0.9959
601	2.126			5	5/29/2009 14:45	5/29/2009 9:50	5/22/2009 10:45	10735	30	357.83	244.63	6.96181	0.20486	3454	0.9959
602	2.007	Average	2.168	6	5/29/2009 15:20	5/29/2009 10:15	5/22/2009 10:45	10133	30	337.77	244.63	6.97917	0.21181	3454	0.9959
602	2.194	Stdev	0.150	10	5/26/2009 14:05	5/26/2009 9:55	5/19/2009 14:00	11033	30	367.77	244.63	6.82986	0.17361	3451	0.9959
602	2.304			5	6/2/2009 14:45	6/2/2009 11:30	5/29/2009 9:50	8575	30	285.83	244.63	4.06944	0.13542	3458	0.9959
604	2.244	Average	2.133	6	6/2/2009 15:50	6/2/2009 11:50	5/29/2009 9:50	8321	30	277.37	244.63	4.08333	0.16667	3458	0.9959
604	2.076	Stdev	0.096	7	5/29/2009 15:55	5/29/2009 10:45	5/22/2009 12:00	10451	30	348.37	244.63	6.94792	0.21528	3454	0.9959
604	2.079			11	5/26/2009 15:45	5/26/2009 10:20	5/19/2009 14:00	10372	30	345.73	244.63	6.84722	0.22569	3451	0.9959
605	2.096	Average	2.149	12	5/26/2009 16:15	5/26/2009 10:50	5/19/2009 14:00	10474	30	349.13	244.63	6.86806	0.22569	3451	0.9959
605	2.228	Stdev	0.070	4	5/22/2009 16:25	5/22/2009 10:45	5/19/2009 14:00	6318	30	210.60	244.63	2.86458	0.23611	3447	0.9959
605	2.122			8	5/29/2009 17:15	5/29/2009 11:05	5/22/2009 12:50	10587	30	352.90	244.63	6.92708	0.25694	3454	0.9959
606	2.543	Average	2.348	9	5/29/2009 17:45	5/29/2009 13:10	5/26/2009 9:30	7816	30	260.53	244.63	3.15278	0.19097	3454	0.9959
606	2.202	Stdev	0.176	1	5/26/2009 16:45	5/26/2009 12:25	5/22/2009 12:00	8057	30	268.57	244.63	4.01736	0.18056	3451	0.9959
606	2.298			7	6/2/2009 18:20	6/2/2009 12:55	5/29/2009 9:50	8495	30	283.17	244.63	4.12847	0.22569	3458	0.9959
607	2.454	Average	2.450	8	6/2/2009 19:00	6/2/2009 13:10	5/29/2009 9:50	9057	30	301.90	244.63	4.13889	0.24306	3458	0.9959
607	2.572	Stdev	0.123	10	5/29/2009 19:00	5/29/2009 13:25	5/26/2009 9:55	7832	30	261.07	244.63	3.14583	0.23264	3454	0.9959
607	2.325			2	5/26/2009 17:15	5/26/2009 12:50	5/22/2009 12:00	8527	30	284.23	244.63	4.03472	0.18403	3451	0.9959
609	2.277	Average	2.316	3	5/26/2009 19:20	5/26/2009 13:10	5/22/2009 12:00	8261	30	275.37	244.63	4.04861	0.25694	3451	0.9959
609	2.280	Stdev	0.066	7	5/22/2009 19:20	5/22/2009 12:00	5/19/2009 14:00	6473	30	215.77	244.63	2.91667	0.30556	3447	0.9959
609	2.392			11	5/29/2009 19:40	5/29/2009 13:45	5/26/2009 10:20	7261	30	242.03	244.63	3.14236	0.24653	3454	0.9959
611	2.488	Average	2.307	12	5/29/2009 20:20	5/29/2009 14:00	5/26/2009 10:50	7510	30	250.33	244.63	3.13194	0.26389	3454	0.9959
611	2.245	Stdev	0.160	4	5/26/2009 22:00	5/26/2009 13:25	5/22/2009 12:00	8010	30	267.00	244.63	4.05903	0.35764	3451	0.9959
611	2.187			9	6/2/2009 19:50	6/2/2009 13:25	5/29/2009 9:50	8052	30	268.40	244.63	4.14931	0.26736	3458	0.9959

EffErr 0.066051 ← Put in Machines.xls (Lucas Cell Tab)

Backgrounds are not significant enough to be included in calculations ANSI N42.25-1997 (B.2).

Original of 9/16/09
WJ 8/16/09

601	2.181	8/4/2009
602	2.168	8/4/2009
604	2.133	8/4/2009
605	2.149	8/4/2009
606	2.348	8/4/2009
607	2.45	8/4/2009
609	2.316	8/4/2009
611	2.307	8/4/2009

Lucas	Ra-226	
Oldest Cal	01/23/2008	
Detector	Eff Error	Cal Date
1	0.0958	8/29/2008
2	0.0772	12/19/2008
3	0.0608	1/23/2008
4	0.1237	3/2/2009
5	0.1438	3/25/2009
6	0.0661	8/4/2009
7	0.0855	11/21/2008

**General Engineering Laboratories
Calibration Source Preparation Sheet**

Applicable SOP Number GL-RAD-A-008

Isotope Ra226

Date Standards Prepared 4/5/05

Cocktail Type Used NA

Standard ID 0299-G

Matrix of Vial/Planchett NA

Amount Used (g or ml) 0.1

NA
NA

Standard Activity (DPM/g or mL) 2446.3471

Type of Scintillation Vial NA

Reference Date 12/15/99

Pipette ID Used 1429303

Expiration Date 1/26/10

Balance ID Used 38080204

Residue/Carrier Agent 0.1M HCl

Quenching Agent NA

	Standard Number	Quenching Vol (uL)/ Residue Volume(mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	cal 1				
2	cal 2				
3	cal 3				
4	cal 4				
5	cal 5				
6	cal 6				
7	cal 7				
8	cal 8				
9	cal 9				
10	cal 10				
11	cal 11				
12	cal 12				

JBG
8/4/09

JBG
8/4/09

Prepared By: Kelli Rowell Date 8/4/09

Reviewed By: Angela Gh... Date 8/4/09

Rev 1 RLM 9/10/97

Ra-226 Calibration Sheet

Standard ID: ~~0299-G~~ 0299-G
 Volume Added (mL): 0.1 *19814109

Expiration Date: ~~4/11/10~~ *19814109

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 5	500	5/22/09 1045	5/24/09 0950	5/29/09 14:45	601	6	10735
Cal 6	500	5/22/09 1045	5/24/09 1015	5/29/09 15:20	602	6	10133
Cal 7	500	5/22/09 1200	5/24/09 1045	5/29/09 15:55	604	6	10451
Cal 8	500	5/22/09 1250	5/24/09 1105	5/29/09 17:15 17:20	605	6	10587
Cal 9	500	5/24/09 0930	5/24/09 1310	5/29/09 17:45	606	6	7816
Cal 10	500	5/24/09 0955	5/24/09 1325	5/29/09 19:00	607	6	7832
Cal 11	500	5/24/09 1000	5/24/09 1345	5/29/09 19:40	609	6	7261
Cal 12	500	5/24/09 1050	5/24/09 1400	5/29/09 20:20	611	6	7510
					608	6	
					610	6	
					612	6	

*19814109
 *19814109

Ra-226 Calibration Sheet

Standard ID: ~~0299-6~~ 0299-6
 Volume Added (mL): 0.1 ~~1126110~~ 1126110
 Expiration Date: ~~1126110~~ 1126110

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 1	500	5/19/09 1400	5/22/09 0915	5/20/09 1255	601	6	6318
Cal 2	500	5/19/09 1400	5/22/09 0945	5/22/09 1325	602	6	6358
Cal 3	500	5/19/09 1400	5/22/09 1010	5/22/09 1420	604	6	4600
Cal 4	500	5/19/09 1400	5/22/09 1045	5/22/09 1625	605	6	6318
Cal 5	500	5/19/09 1400	5/22/09 1115	5/22/09 1700	606	6	6494
Cal 6	500	5/19/09 1400	5/22/09 1140	5/22/09 1735	607	6	6428
Cal 7	500	5/19/09 1400	5/22/09 1200	5/22/09 1920	609	6	6473
Cal 8	500	5/19/09 1400	5/22/09 1250	5/22/09 2035	611	6	6455
Cal 9							
Cal 10							
Cal 11							
Cal 12							

100 814109
100 814109

100 814109
100 814109

6162-100
814109

100 814109

100 814109

100 816109

Ra-226 Calibration Sheet

Standard ID: ~~00307E~~ 0299-G
 Volume Added (mL): 0.1 mg x14109
 Expiration Date: 4/4/10 1/26/10
 x19 x14109

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 5	500	5/26/09 0450	6/12/09 1130	6/20/09 1445	602	6	8575
Cal 6	500	5/26/09 0450	6/12/09 1150	6/20/09 1650	604	6	8321
Cal 7	500	5/26/09 0450	6/12/09 1255	6.2.09 1820	606	6	8495
Cal 8	500	5/26/09 0450	6/12/09 1310	6.2.09 1900	607	6	9057
Cal 9	500	5/26/09 0450	6/12/09 1325	6.2.09 1950	611	6	8052

MA 81109

8114109
 8114109
 8114109

Ra-226 Calibration Sheet

Standard ID: ~~10386~~ 0299-G
 Volume Added (mL): 0.1 419 814101
 Expiration Date: ~~11/26/10~~ 419 514109

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 9	500	5/19/09 1400	5/26/09 1430	5/26/09 1330	601	6	10883
Cal 10	500	5/19/09 1400	5/26/09 1455	5/26/09 1405	602	6	11033
Cal 11	500	5/19/09 1400	5/26/09 1020	5/26/09 1545	604	6	10372
Cal 12	500	5/19/09 1400	5/26/09 1050	5/26/09 1615	605	6	10474
Cal 1	500	5/22/09 1200	5/26/09 1725	5/26/09 1645	606	6	8557
Cal 2	500	5/22/09 1200	5/26/09 1750	5/26/09 1715	607	6	8527
Cal 3	500	5/22/09 1200	5/26/09 1310	5/26/09 1920	609	6	8261
Cal 4	500	5/22/09 1200	5/26/09 1325	5/26/09 2200	611	6	8010
				608			

419 814109
 419 814109

EEC

8-21-00

Nycomed Amersham plc
Amersham Laboratories

0299

CALIBRATION
No. 0146

ISSUED
BY: Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED
FOR: AEA Technology plc
Isotrak
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

Description Principal radionuclide: Radium-226

Product code: RAY44
Solution number: R4/131/89

Measurement Reference time: 1200 GMT on 15 December 1999

Nuclear data Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

Expression of uncertainties The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which for a t -distribution with $\nu_{eff} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21)	-	6.5 ± 2.1
6.54(21)	-	6.54 ± 0.21
6.543(21)	-	6.543 ± 0.021

Approved
Signature

Date of
issue

17th December 1999

Verification for Ra-226 Standard 0299-G

M. Aders 1/26/2009	Isotope	Value DPM	Uncertainty
	0299-A #1	220.970	0.2670
	0299-A #2	241.730	0.2670
	0299-A #3	257.470	0.2670
Mean Value (Counting) =	240.057	98.52	Pass
Stdev =	18.30744475		Rule 3 (Pass/Fail)
Target =	243.67		
Lower Limit =	203.4417772		
Upper Limit =	276.6715562		
Rule 1 Pass/Fail	Pass		
Two sigma =	36.6148895		
10 % of Mean =	24.00566667		
Rule 2 (Pass/Fail)	Fail	*exception taken due to full recovery of standard	

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements**
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.**
- Rule 3 = The determined mean value shall be within 5% of the certificate value.**

The analyst prepared three standard verification sources for standard 0299-A using 0.1 mL for each source. Each standard was degassed and transferred according to SOP GL-RAD-A-008. Each source was counted using Ra-226 procedures.

M. Aders 241.730
August 9th 8/4/09

Ra-226 Cell Constants

Standard Reference date: 12/15/1999
standard ID: 0299-G
Volume added (mL): 0.1
Standard Reference Activity (DPM/mL): 2446.35

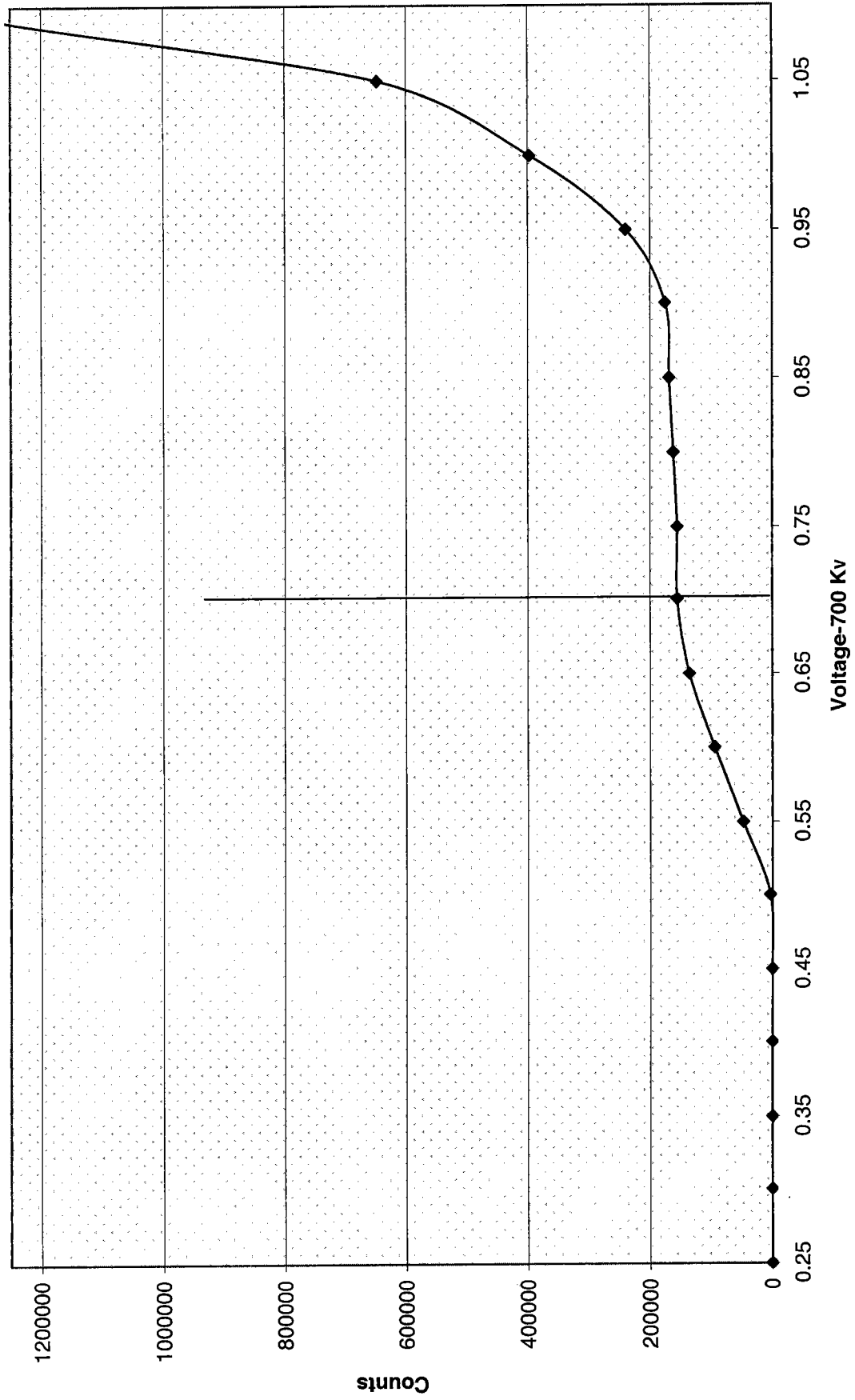
Lucas cell #	Cell constant	Standard Source	Date/Time of count	Date/Time flushed to cell	Date/Time end of degas	bkg cpm	total counts	count time min	cpm	Known activity dpm	t1 (days) end-degas to flush	t2 (days) end-flush to count	t3 (days) Std Ref Date to count	Decay from Std Ref Date to count
301	2.021	43	39839.60764	39839.39236	39835.38194	0.267	7282	30	242.73	243.6698	4.01041667	0.2152778	3330.607639	0.996055555
302	2.131	47	39839.64583	39839.41319	39835.38194	0.267	7555	30	251.83	243.6698	4.03125	0.2326389	3330.645833	0.996055551
303	2.136	19	39839.72222	39839.43403	39835.38194	0.267	8028	30	267.60	243.6697	4.05208333	0.2881944	3330.722222	0.996055419

VOLTAGE CURVE 3_08

Voltage Curve Ludlum # 6				
Volts	Counts	Date	Time	Detector
0.00	0	5/20/2009	9:00	6
0.05	0	5/20/2009	9:01	6
0.10	0	5/20/2009	9:02	6
0.15	0	5/20/2009	9:03	6
0.20	0	5/20/2009	9:04	6
0.25	0	5/20/2009	9:05	6
0.30	0	5/20/2009	9:06	6
0.35	0	5/20/2009	9:07	6
0.40	0	5/20/2009	9:08	6
0.45	512	5/20/2009	9:09	6
0.50	3625	5/20/2009	9:10	6
0.55	47990	5/20/2009	9:11	6
0.60	94752	5/20/2009	9:12	6
0.65	135854	5/20/2009	9:13	6
0.70	155952	5/20/2009	9:14	6
0.75	155700	5/20/2009	9:15	6
0.80	161972	5/20/2009	9:16	6
0.85	168860	5/20/2009	9:17	6
0.90	175598	5/20/2009	9:18	6
0.95	239969	5/20/2009	9:19	6
1.00	397270	5/20/2009	9:20	6

M 8/4/09

Ludlum 6 Voltage Curve



WGS

Ra-226 WATER

Batch : LCSVER
Date : 6/2/2009
Analyst : KSD1

Procedure Code : LUC26RAL
Parmname : Radium-226
MDA : 1 pCi/L

Instrument Used : LUCAS CELL DETECTOR

Bkg Count Time: 30 min

Sample ID	Sample Vol L	Count Time min	Gross counts cts	Cell # num	Cell Const. num	BKG cpm	Ra-226 MDA pCi/L	Ra-226 RESULT pCi/L	Ra-226 ERROR pCi/L	COUNT DATE/TIME
ver 1	0.800	30	1018	601	2.181	0.267	0.2115	13.4431	0.8356	6/8/2009 15:35
ver 2	0.800	30	994	602	2.168	0.100	0.1442	13.2563	0.8279	6/8/2009 16:05
ver 3	0.800	30	955	604	2.133	0.167	0.1786	12.9119	0.8254	6/8/2009 16:40
ver 4	0.800	30	1144	605	2.149	0.267	0.2143	15.3201	0.8971	6/8/2009 17:15
ver 5	0.800	30	1046	606	2.348	0.233	0.1867	12.8971	0.7895	6/8/2009 18:30
ver 6	0.800	30	1001	607	2.450	0.267	0.1893	11.8239	0.7413	6/8/2009 19:15
ver 7	0.800	30	1060	609	2.316	0.267	0.2007	13.2848	0.8089	6/8/2009 20:05
ver 8	0.800	30	943	611	2.307	0.267	0.2053	12.0754	0.7806	6/8/2009 23:10

Handwritten notes: 28/6/09 and 10/8/05

Sample ID	Cell #	Det #	Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
ver 1	601	6	6/8/2009 15:35	LCS	0638-F	15.03	pCi/L	89%
ver 2	602	6	6/8/2009 16:05	LCS	0638-F	15.03	pCi/L	88%
ver 3	604	6	6/8/2009 16:40	LCS	0638-F	15.03	pCi/L	86%
ver 4	605	6	6/8/2009 17:15	LCS	0638-F	15.03	pCi/L	102%
ver 5	606	6	6/8/2009 18:30	LCS	0638-F	15.03	pCi/L	86%
ver 6	607	6	6/8/2009 19:15	LCS	0638-F	15.03	pCi/L	79%
ver 7	609	6	6/8/2009 20:05	LCS	0638-F	15.03	pCi/L	88%
ver 8	611	6	6/8/2009 23:10	LCS	0638-F	15.03	pCi/L	80%

DEGASSING DATE/TIME	DE-EMAN. DATE/TIME	DEGASS-DE-EM	dE-EM-COUNT	constant	constant	constant	Net CPM	Ingrowth constant
6/2/2009 12:40	6/8/2009 12:15	143.58	3.33	0.6618	0.9751	1.0019	33.6667	0.6466
6/2/2009 12:40	6/8/2009 12:40	144.00	3.42	0.6628	0.9745	1.0019	33.0333	0.6472
6/2/2009 12:40	6/8/2009 13:05	144.42	3.58	0.6639	0.9733	1.0019	31.6663	0.6474
6/2/2009 12:40	6/8/2009 13:30	144.83	3.75	0.6650	0.9721	1.0019	37.8667	0.6476
6/2/2009 12:40	6/8/2009 13:50	145.17	4.67	0.6658	0.9654	1.0019	34.6333	0.6440
6/2/2009 12:40	6/8/2009 14:15	145.58	5.00	0.6668	0.9630	1.0019	33.0997	0.6434
6/2/2009 12:40	6/8/2009 14:35	145.92	5.50	0.6677	0.9593	1.0019	35.0667	0.6417
6/2/2009 12:40	6/8/2009 15:00	146.33	8.17	0.6687	0.9402	1.0019	31.1663	0.6299

Handwritten notes:
 8/16/09
 11/18/10/09

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GLP-1234-008 A W 8/4/09
 Date Standards Prepared 11/16/09
 Standard ID 6038-F
 Amount Used (g or ml) 0.1
 Standard Activity (DPM/g or ml) 267.519
 Reference Date 1/23/04
 Expiration Date 2/1/10
 Residue/Carrier Agent NA

Isotope Yt-91
 Cocktail Type Used NA
 Matrix of Vial/Planchett NA
 Type of Scintillation Vial NA
 Pipette ID Used 1125203
 Balance ID Used 38080104
 Quenching Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Ver 1				
2	Ver 2				
3	Ver 3				
4	Ver 4				
5	Ver 5				
6	Ver 6				
7	Ver 7				
8	Ver 8				

Prepared By: Willi + Dave Date: 8/4/09
 Reviewed By: Angela J... Date: 8/4/09

Rev 1 RLM.9/10/97

0638

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

67519-278

Ra-226 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

Analytics maintains traceability to the National Institute of Standards and Technology through participation in a Measurements Assurance Program as described in USNRC Reg. Guide 4.15, Revision 1, February 1979.

ISOTOPE:	Ra-226
ACTIVITY (dps):	2.353 E4
HALF-LIFE:	1.600 E3 years
CALIBRATION DATE:	January 23, 2004 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	3.3%

Impurities: γ -impurities (other than decay products) <0.1%

5.01065 grams 0.1M HCl solution with 50 μ g/g Ba carrier.

P O NUMBER 3231RD, Item 5

SOURCE PREPARED BY:

M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED:

RCUW 1/26/04

Standard Traceability Log Rad

Source Material Info	
Parent Code:	0638
Prepared By:	Amanda Fehr
Carrier Conc:	0.1M HCl
Reference Date:	01/23/2004
Ampoule Mass (g):	5.01065 g
Uncertainty:	+/- 3.3 %
LogBook No:	RC-S-037-037

A Solution Material Info	
Isotope:	Radium-226
Prepared By:	Amanda Fehr
Prep Date:	01/16/2006
Verification Date:	04/09/2009
Expiration Date:	04/09/2010
Primary Code:	0638-A
Dilution(mL):	100 mL
Mass of Parent(g):	4.8398 g
Density(g/mL):	1.0266
Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$$

$$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13636.6133 \text{ dpm/mL}$$

$$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0266 \text{ g/mL}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13282.9676 \text{ dpm/g}$$

WMO 8/14/09

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
01/17/2006	Amanda Fehr	2.1041	100	0638-B	279.0211 dpm/mL	01/17/2007	01/17/2008
07/17/2006	Mary Aders	2.1313	100	0638-C	282.6281 dpm/mL	07/26/2006	07/26/2007
03/28/2007	Daniel Roy	2.1025	100	0638-D	279.2744 dpm/ml	04/08/2007	04/08/2008
03/28/2007	Daniel Roy	45.468	250	0638-E	2415.7999 dpm/ml	04/09/2009	04/09/2010
12/18/2007	Daniel Roy	2.014	100	0638-F	267.519 dpm/ml	02/02/2009	02/02/2010
02/12/2008	Daniel Roy	.5004	100	0638-G	66.468 dpm/ml	03/02/2009	03/02/2010
07/23/2008	Daniel Roy	5.0607	250	0638-H	268.8845 dpm/ml	07/17/2009	07/17/2010

GEL Laboratories LLC
Version 1.0 9/18/2000

W084116

Verification for Ra-226 Standard 0638-F

D. Roy 2/2/2009	Isotope	Value	Uncertainty
	0638-F #1	24.629	1.7426
	0638-F #2	24.438	1.7557
	0638-F #3	22.791	1.6808
Mean Value (Counting) =	23.953	99.60	Pass
Stdev =	1.010781096		Rule 3 (Pass/Fail)
Target =	24.05		
Lower Limit =	21.93100448		
Upper Limit =	25.97412886		
Rule 1 Pass/Fail	Pass		
Two sigma =	2.021562191		
10 % of Mean =	2.395256667		
Rule 2 (Pass/Fail)	Pass		

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for standard 0638-F using 0.1 mL for each source. Each source was counted using routine Lucas cell procedures. Calibration for 0299-G was used in this verification.

Handwritten notes:
 0638-F #1
 2/2/2009
 Amanda [Signature]

Radium-226 Que Sheet

General Engineering Laboratories, Radiochemistry Division

02/03/2009

Analyst: KSDI

First Client Due Date:

Internal Due Date: 02/07/2009

Batch #: 838839

Spike Isotope: Radium-226 Spike Code: 0003-1

Expiration Date: 12/27/08 Vol: 1

Nom Conc:

LCS Isotope: Radium-226 LCS Code: 003000

Expiration Date: 12/27/08 Vol: 1

Nom Conc:

Prep Date: 12/27/08

Pipet ID: _____

Initials: VSD

Witness: _____

Sample Count Time: 30 (Min)

Bkg Count Time: 30 (Min)

Sample I	Client Description	Type	Hazard Code	Matrix	Min CRDL	Client	Vol (mL)	End Init Degas Date/Tin	End LN Date/Time	De-em Date/Time	Start Count Date/Time	Cell #	Det #	Bkg counts	Total Counts
1201770521-1	LCS for batch 838839	LCS	GROUND	WAJ 1	1 pCi/L	QC ACCOUNT	500	1/26/09 10:05	1/26/09 11:30	1/26/09 13:10	1/26/09 17:05	305	3	9	741
1201770522-1	LCS for batch 838839	LCS	GROUND	WAJ 1	1 pCi/L	QC ACCOUNT	500	1/26/09 10:05	1/26/09 11:45	1/26/09 13:10	1/26/09 17:57	304	3	9	748
1201770523-1	LCS for batch 838839	LCS	GROUND	WAJ 1	1 pCi/L	QC ACCOUNT	500	1/26/09 10:05	1/26/09 12:00	1/26/09 13:10	1/26/09 19:05	305	3	9	743

Comments:

Instrument ID's:

LUCAS-5028, LUCAS-13617, LUCAS-90899, LUCAS-162753, LUCAS-132286, LUC-6-17055

Data Reviewed By:

WJ Slivers

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.2.3

Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml
 Pipet, 1 ml Stdev : +/- 0.005480 ml

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml): N/A
 Spike Volume Added: N/A

Batch : 838839

Analyst : KSD1

Prep Date : 1/26/2009

Ra-226 Abundance : 1

Ra-226 Method Uncertainty : 0.0918

Procedure Code : LUC26RAL

Parname : Radium-226

Required MDA : 1 pCi/L

Half-life of Ra-226 : 1600 years

Half-life of Rn-222: 3.823 days

Batch counted on : LUCAS CELL DETECTOR

BKG Count time : 30 min

Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Count Raw Data			Weekly Background			Detector Efficiency (cpm/dpm)
				Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Counts	CPM	
1201770521.1	0.5000	2.0256E-05	1/26/2009 0:00	305	30	791	26.367	8	0.267	1.9930
1201770522.1	0.5000	2.0256E-05	1/26/2009 0:00	306	30	768	25.600	8	0.267	1.9500
1201770523.1	0.5000	2.0256E-05	1/26/2009 0:00	308	30	730	24.333	8	0.267	2.0010

Handwritten notes:
 UNSM105
 1/26/09

Detector Efficiency Error (cpm/dpm)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow		Count Start Date/Time	Rn-222 Corrections		Ra-226 Decay
				End Date/Time	De-Gas to Ingrowth		Ingrowth to Count	During Count	
0.06082	1/23/2008	1/22/2009	1/26/2009 16:05	1/30/2009 11:30	1/30/2009 17:05	0.499	0.959	1.002	1.000
0.06082	1/23/2008	1/22/2009	1/26/2009 16:05	1/30/2009 11:45	1/30/2009 17:37	0.500	0.957	1.002	1.000
0.06082	1/23/2008	1/22/2009	1/26/2009 16:05	1/30/2009 12:00	1/30/2009 19:05	0.501	0.948	1.002	1.000

K0816104
04/21/09

- Notes.
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Results Decision Level pCi/L	Critical Level pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error pCi/L	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
							Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
0.2932	0.2070	0.5083	24.6287	0.0707	26.1000	0.9422	1.7426	5.5940		LCS			24.0486	102.4%
0.2997	0.2116	0.5196	24.4384	0.0710	25.3333	0.9286	1.7557	5.5591		LCS			24.0486	101.6%
0.2942	0.2077	0.5101	22.7906	0.0715	24.0667	0.9055	1.6808	5.1982		LCS			24.0486	94.8%

11/28/10
(15)

General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414
(843)556-8171

Lucas Cell Calibration Package

(701-712)

	YES	NO	Comments
1) Is all calibration standard information enclosed for: the primary standard certificate? the second standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
2) Is the efficiency calibration report included ?	<input checked="" type="checkbox"/>		
3) Is the raw count data included for: Cell constant determination? Plateau generation?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
4) Are the calibration verifications included?	<input checked="" type="checkbox"/>		
5) Are the instrument settings included: HVPS settings?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
6) Has the CELLEFF.xls file been updated ?	<input checked="" type="checkbox"/>		
7) Have the calibration dates been updated in ALPHALIMS ?	<input checked="" type="checkbox"/>		

Prepared By: Kelli Spence

Date: 9/30/09

Reviewed By: Angela G

Date: 9/30/09

Effective Date: 9/30/09

Ra-226 Cell Constants

Standard Reference date : 12/15/1999
 standard ID : 0299-H
 Volume added (mL) : 0.1
 Standard Reference Activity (DPM/mL) : 2483.21

Lucas cell #	Cell constant	Standard Source	Date/Time of count	Date/Time flushed to cell	Date/Time end of degas	cpm	total counts	count time min	Known activity dpm	t1 (days) end-degas to flush	t2 (days) end-flush to count	t3 (days) Std Ref Date to count	Decay from Std Ref Date to count		
701	2.180	Average	2.107	Cal 12	9/21/2009 17:00	9/21/2009 12:55	9/18/2009 17:00	6158	30	205.27	243.02	2.82986	0.17014	3569	0.9958
701	2.025	Sidev	0.078	Cal 1	9/15/2009 17:45	9/15/2009 13:45	9/12/2009 10:30	6595	15	439.67	243.02	14.13542	0.16667	3563	0.9958
701	2.117			Cal 1	9/18/2009 18:15	9/18/2009 13:20	9/15/2009 10:00	3219	15	214.60	243.02	3.13889	0.20486	3566	0.9958
702	2.101	Average	2.033	Cal 2	9/24/2009 18:05	9/24/2009 14:05	9/21/2009 17:00	3014	15	200.93	243.02	2.87847	0.16667	3572	0.9958
702	2.020	Sidev	0.063	Cal 2	9/15/2009 18:10	9/15/2009 14:10	9/12/2009 10:30	6583	15	438.87	243.02	14.15278	0.16667	3563	0.9958
702	1.977			Cal 11	9/21/2009 17:25	9/21/2009 13:20	9/18/2009 17:00	5611	30	187.03	243.02	2.84722	0.17014	3569	0.9958
703	2.218	Average	2.221	Cal 10	9/21/2009 18:00	9/21/2009 13:45	9/18/2009 17:00	6317	30	210.57	243.02	2.86458	0.17708	3569	0.9958
703	2.279	Sidev	0.057	Cal 3	9/24/2009 18:25	9/24/2009 14:35	9/21/2009 17:00	3282	15	219.47	243.02	2.89931	0.15972	3572	0.9958
703	2.165			Cal 3	9/18/2009 19:00	9/18/2009 14:55	9/15/2009 10:00	3364	15	224.27	243.02	3.20486	0.17014	3566	0.9958
704	2.302	Average	2.235	Cal 9	9/21/2009 18:35	9/21/2009 14:20	9/18/2009 17:00	6599	30	219.97	243.02	2.89889	0.17708	3569	0.9958
704	2.255	Sidev	0.079	Cal 4	9/24/2009 18:45	9/24/2009 15:00	9/21/2009 17:00	3274	15	218.27	243.02	2.91667	0.15625	3572	0.9958
704	2.148			Cal 4	9/18/2009 19:15	9/18/2009 15:20	9/15/2009 10:00	3356	15	223.73	243.02	3.22222	0.16319	3566	0.9958
705	2.032	Average	2.107	Cal 5	9/18/2009 19:40	9/18/2009 15:45	9/15/2009 10:00	3187	15	212.47	243.02	3.23958	0.16319	3566	0.9958
705	2.090	Sidev	0.084	Cal 5	9/24/2009 19:05	9/24/2009 15:25	9/21/2009 17:00	3050	15	203.33	243.02	2.93403	0.15278	3572	0.9958
705	2.198			Cal 8	9/21/2009 19:10	9/21/2009 14:45	9/18/2009 17:00	6321	30	210.70	243.02	2.90625	0.18403	3569	0.9958
706	2.093	Average	2.142	Cal 7	9/21/2009 20:07	9/21/2009 15:05	9/18/2009 17:00	6013	30	200.43	243.02	2.92014	0.20972	3569	0.9958
706	2.109	Sidev	0.071	Cal 6	9/24/2009 19:25	9/24/2009 15:45	9/21/2009 17:00	3089	15	205.93	243.02	2.94792	0.15278	3572	0.9958
706	2.223			Cal 6	9/18/2009 19:55	9/18/2009 16:10	9/15/2009 10:00	3505	15	233.67	243.02	3.25694	0.15625	3566	0.9958
707	2.154	Average	2.275	Cal 7	9/18/2009 20:15	9/18/2009 16:30	9/15/2009 10:00	3406	15	227.07	243.02	3.27083	0.15625	3566	0.9958
707	2.386	Sidev	0.116	Cal 7	9/24/2009 19:45	9/24/2009 16:05	9/21/2009 17:00	3506	15	233.73	243.02	2.96181	0.15278	3572	0.9958
707	2.287			Cal 6	9/21/2009 20:35	9/21/2009 15:25	9/18/2009 17:00	6586	30	219.53	243.02	2.93403	0.21528	3569	0.9958
708	2.253	Average	2.188	Cal 8	9/24/2009 20:00	9/24/2009 16:30	9/21/2009 17:00	3330	15	222.00	243.02	2.97917	0.14583	3572	0.9958
708	2.110	Sidev	0.180	Cal 1	9/28/2009 18:35	9/28/2009 15:05	9/24/2009 17:00	7591	30	253.03	243.02	3.92014	0.14583	3576	0.9958
708	1.923			Cal 8	9/18/2009 20:25	9/18/2009 16:50	9/15/2009 10:00	3055	15	203.67	243.02	3.28472	0.14931	3566	0.9958
709	2.088	Average	2.285	Cal 9	9/18/2009 21:03	9/18/2009 17:15	9/15/2009 10:00	3324	15	221.60	243.02	3.30208	0.15833	3566	0.9958
709	2.352	Sidev	0.168	Cal 4	9/21/2009 21:50	9/21/2009 16:20	9/18/2009 17:00	6823	30	227.43	243.02	2.97222	0.22917	3569	0.9958
709	2.400			Cal 9	9/24/2009 20:20	9/24/2009 16:45	9/21/2009 17:00	3554	15	236.93	243.02	2.98958	0.14931	3572	0.9958
710	2.512	Average	2.409	Cal 3	9/21/2009 22:21	9/21/2009 16:35	9/18/2009 17:00	7291	30	243.03	243.02	2.98284	0.24028	3569	0.9958
710	2.436	Sidev	0.119	cal 10	9/24/2009 20:50	9/24/2009 17:00	9/21/2009 17:00	3611	15	240.73	243.02	3.00000	0.15972	3572	0.9958
710	2.279			Cal 10	9/18/2009 21:20	9/18/2009 17:30	9/15/2009 10:00	3635	15	242.39	243.02	3.31250	0.15972	3566	0.9958
711	2.212	Average	2.242	Cal 11	9/18/2009 21:37	9/18/2009 17:45	9/15/2009 10:00	3536	15	235.73	243.02	3.32292	0.16111	3566	0.9958
711	2.302	Sidev	0.052	Cal 11	9/24/2009 22:05	9/24/2009 17:15	9/21/2009 17:00	3395	15	226.33	243.02	3.01042	0.20139	3572	0.9958
711	2.211			Cal 2	9/21/2009 22:52	9/21/2009 16:55	9/18/2009 17:00	6432	30	214.40	243.02	2.99653	0.24792	3569	0.9958
712	2.292	Average	2.069	Cal 1	9/21/2009 23:40	9/21/2009 17:10	9/18/2009 17:00	6657	30	221.90	243.02	3.00694	0.27083	3569	0.9958
712	1.928	Sidev	0.195	Cal 11	9/15/2009 22:15	9/15/2009 17:35	9/12/2009 10:30	6263	15	417.53	243.02	14.29514	0.19444	3563	0.9958
712	1.989			Cal 12	9/24/2009 22:27	9/24/2009 17:30	9/21/2009 17:00	2998	15	195.87	243.02	3.02083	0.20625	3572	0.9958

EffEr 0.065186 <- Put in Machines.xls (Lucas Cell Tab)

A19
9/30/09

#7

Ra-226 Calibration Sheet

Standard ID: 0299-H

Volume Added (mL): 0.1

Expiration Date: 8/1/10 @ 15 min

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 1	500	9/11/09 10:30	9/15/09 13:45	9/15/09 17:45	701	7	6595
Cal 2	500	9/11/09 10:30	9/15/09 14:10	9/15/09 18:10	702	7	6583
Cal 3	500	9/11/09 10:30	9/15/09 14:35	9/15/09 18:45	703	7	5672
Cal 4		9/11/09 10:30	9/15/09 15:15	9/15/09 19:00	704	7	6039
Cal 5		9/11/09 10:30	9/15/09 15:40	9/15/09 19:15	705	7	5579
Cal 6		9/11/09 10:30	9/15/09 16:05	9/15/09 19:45	706	7	5347
Cal 7		9/11/09 10:30	9/15/09 16:30	9/15/09 2:00	707	7	5376
Cal 8		9/11/09 10:30	9/15/09 16:45	9/15/09 2:30	708	7	6203
Cal 9		9/11/09 10:30	9/15/09 17:05	9/15/09 2:11	709	7	6458
Cal 10		9/11/09 10:30	9/15/09 17:20	9/15/09 2:55	710	7	5935
Cal 11	500	9/11/09 10:30	9/15/09 17:35	9/15/09 2:25	711	7	6263

9/13/09

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9/13/09

9/13/09

Ra-226 Calibration Sheet

Standard ID: 6M-4
 Volume Added (mL): 0.1
 Expiration Date: 6/11/10

* 15min

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 1	500	9/15/09 9/15/09	9/18/09 1320	9/18/09 1815	101	7	3219
Cal 2	500	9/15/09 1000	9/18/09 1425	9/18/09 1835	102	7	3420
Cal 3	500	9/15/09 1000	9/18/09 1455	9/18/09 1900	103	7	3364
Cal 4	500	9/15/09 1000	9/18/09 1520	9/18/09 1915	104	7	3356
Cal 5	500	9/15/09 1000	9/18/09 1545	9/18/09 1940	105	7	3187
Cal 6	500	9/15/09 1000	9/18/09 1610	9/18/09 1965	106	7	3505
Cal 7	500	9/15/09 1000	9/18/09 1630 1630	9/18/09 2015	107	7	3406
Cal 8	500	9/15/09 1000	9/18/09 1650	9/18/09 2025	108	7	3055
Cal 9	500	9/15/09 1000	9/18/09 1715	9/18/09 2103	109	7	3324
Cal 10	500	9/15/09 1000	9/18/09 1730	9/18/09 2120	110	7	3635
Cal 11	500	9/15/09 1000	9/18/09 1745	9/18/09 2137 2142	111	7	3536
Cal 12	500	9/11/09 1000	9/18/09 1800	9/18/09 2218	112	7	5663

10/1/09

11/09/130105

* 9/30/09

11/09/130105

Ra-226 Calibration Sheet

Standard ID: 02944

Volume Added (mL): 0.1

Expiration Date: 9/1/10

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 17	500	9/18/09 1700	9/21/09 1555	9/21/09 1700	701	7	6158
Cal 11	500	9/18/09 1700	9/21/09 1520	9/21/09 1725	702	7	5611
Cal 10	500	9/18/09 1700	9/21/09 1545	9/21/09 1800	703	7	6317
Cal 9	500	9/18/09 1700	9/21/09 1420	9/21/09 1835	704	7	6599
Cal 8	500	9/18/09 1700	9/21/09 1445	9/21/09 1910	705	7	6321
Cal 7	500	9/18/09 1700	9/21/09 1505	9/21/09 2007	706	7	6013
Cal 6	500	9/18/09 1700	9/21/09 1525	9/21/09 2035	707	7	6586
Cal 5	500	9/18/09 1700	9/21/09 1505	9/21/09 2112	708	7	7155
Cal 4	500	9/18/09 1700	9/21/09 1620	9/21/09 2150	709	7	6823
Cal 3	500	9/18/09 1700	9/21/09 1635	9/21/09 2221	710	7	7291
Cal 2	500	9/18/09 1700	9/21/09 1655	9/21/09 2252	711	7	6432
Cal 1	500	9/18/09 1700	9/21/09 1710	9/21/09 2340	712	7	6657

9/21/09

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9/30/09

Ra-226 Calibration Sheet

Standard ID: 01199-1

Volume Added (mL): 0.1

Expiration Date: 07/10

* 15 min counts

Sample ID	Volume (mL)	End Degas Date/Time	End De-em Date/Time	Start Count Date/Time	Cell #	Det #	Total Counts
Cal 1	500	01/21/09 1700	01/21/09 1730	01/24/09 1745	701	7	3125
Cal 2	500	01/21/09 1700	01/21/09 1705	01/24/09 1805	702	7	3014
Cal 3	500	01/21/09 1700	01/21/09 1735	01/24/09 1825	703	7	3292
Cal 4	500	01/21/09 1700	01/21/09 1900	01/24/09 1845	704	7	3274
Cal 5	500	01/21/09 1700	01/21/09 1525	01/24/09 1905	705	7	3050
Cal 6	500	01/21/09 1700	01/21/09 1945	01/24/09 1925	706	7	3089
Cal 7	500	01/21/09 1700	01/21/09 1605	01/24/09 1945	707	7	3506
Cal 8	500	01/21/09 1700	01/21/09 1630	01/24/09 2000	708	7	3330
Cal 9	500	01/21/09 1700	01/21/09 1645	01/24/09 2020	709	7	3554
Cal 10	500	01/21/09 1700	01/21/09 1700	01/24/09 2050	710	7	3611
Cal 11	500	01/21/09 1700	01/21/09 1715	01/24/09 2205	711	7	3395
Cal 12	500	01/21/09 1700	01/21/09 1730	01/24/09 2227	712	7	2938

01/21/09

01/20/09

01/30/09

410
9/30/09

General Engineering Laboratories Verification Source Preparation Sheet Calibration

Applicable SOP Number GL RAD-A-208 Isotope RA-226
Date Standards Prepared 4/5/05 Cocktail Type Used NA
Standard ID 0219-H Matrix of Vial/Planchett NA
Amount Used (g or ml) 0.1 Matrix of Vial/Planchett NA
Standard Activity (DPM/g or mL) 2403.2133 Matrix of Vial/Planchett NA
Reference Date 12/15/99 Type of Scintillation Vial NA
Expiration Date 8/1/10 Pipette ID Used 1429303
Residue/Carrier Agent 0.1 M HCl Balance ID Used 38080204
Quenching Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	Cal 1				
2	Cal 2				
3	Cal 3				
4	Cal 4				
5	Cal 5				
6	Cal 6				
7	Cal 7				
8	Cal 8				
9	Cal 9				
10	Cal 10				
11	Cal 11				
12	Cal 12				

NO 9/30/09

Prepared By: Kelli S. Dorsey Date: 9/30/09
Reviewed By: Angela Johnson Date: 9/30/09

Rev 1 RLM 9/10/97

ee'd

8-21-00

Nycomed Amersham plc
Amersham Laboratories

0299



CALIBRATION
No. 0148



ISSUED
BY:

Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED
FOR:

AEA Technology plc
Isotrak
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

Description Principal radionuclide: Radium-226

Product code: RAY44
Solution number: R4/131/89

Measurement Reference time: 1200 GMT on 15 December 1999

Nuclear data Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

Expression of uncertainties The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which for a t -distribution with $\nu_{eff} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21)	-	6.5 ± 2.1
6.54(21)	-	6.54 ± 0.21
6.543(21)	-	6.543 ± 0.021

Approved
Signature

Date of
issue

17th December 1999

WD91280109

Nycomed

GEL Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0299	Isotope:	Radium-226
Prepared By:	Angela Johnson	Prepared By:	Angela Johnson
Carrier Conc:	0.5 M HCL	Prep Date:	09/15/2000
Reference Date:	12/15/1999	Verification Date:	01/23/2008
Ampoule Mass (g):	5.0368 g	Expiration Date:	01/23/2009
Uncertainty:	+/- 2.5 %	Primary Code:	0299-A
LogBook No:	RC S 027 128	Dilution(mL):	100 mL
		Mass of Parent(g):	4.6634 g
		Density(g/mL):	1.0012
		Balance ID:	

Calculations Converting parent activity to dpm/mL/dppm/g

$$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)}) * (\text{Parent Activity (kBq/g)}) * (\text{conversion dpm to kBq}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (100 \text{ mL}) = 122414.2500 \text{ dpm/mL}$$

$$(4.6634 \text{ g}) * (43.75 \text{ kBq/g}) * (60000 \text{ dpm/kBq}) / (1.0012 \text{ g/mL}) / (100 \text{ mL}) = 122273.3377 \text{ dpm/g}$$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
08/26/2003	Angela Johnson	1.9909	100	0299-E	2434.34 dpm/mL	11/04/2004	11/04/2005
08/26/2003	Angela Johnson	1.9872	100	0299-F	2429.82 dpm/mL	08/26/2004	08/26/2005
04/05/2005	Amanda Fehr	5.0018	250	0299-G	2446.3471 dpm/mL	01/26/2009	01/26/2010
08/07/2009	Mary Aders	5.0767	250	0299-H	2483.2133 dpm/mL	08/07/2009	08/07/2010

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-226 Standard 0299-H

M. Aders 8/7/2009	Isotope	Value	Uncertainty
	0299-H	111.440	2.5408
	0299-H	115.924	2.5878
	0299-H	111.780	2.5407
Mean Value (Counting) =	113.048	101.49	Pass
Stdev =	2.496414563		Rule 3 (Pass/Fail)
Target =	111.39		
Lower Limit =	108.0550709		
Upper Limit =	118.0407291		
Rule 1 Pass/Fail	Pass		
Two sigma =	4.992829126		
10 % of Mean =	11.30479		
Rule 2 (Pass/Fail)	Pass		

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0299-H by transferring portions of the degassed standard into tared glass liquid scintillation vials. 10 mL of DI Water and 10 mL of mineral oil were added to each vial and the vials were shaken. A Blank vial was prepared in a similar fashion using 10 mL of DI Water and 10 mL of mineral oil. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Red using source standard verification. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

Handwritten signature: Amanda L. Fein 8/13/09

Radon-222 Liquid

Filename : RN222.XLS
 File type : Excel
 Version # : 1.2.4

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml) : N/A
 Spike Volume Added : N/A
 Spike Date/Time : 8/7/2009 14:00

LCS S/N : 0299-H
 LCS Exp Date : 8/7/2010
 LCS Activity (dpm/ml) : 2472.85
 LCS Volume Added : 0.10

Batch : 891920
 Analyst : MLA
 Prep Date : 8/7/2009

Procedure Code : LSC222RNL
 Parname : Radon-222
 Required MDA : 200 pCi/L
 Half-life of Radon-222 : 3.823 days

Rn-222 Abundance : 1
 Rn-222 Method Uncertainty : 0.1111
 Geometry : 10ML MINERAL OIL/10ML
 Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml

Sample Characteristics			Count raw Data								
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Background Count Time (min.)	Count Start Date/Time	Sample Decay	
1	1201897268.1	1.0000	2.0399E-05	8-2	15	43.3	517.53	8.47	15	8/12/2009 7:48	0.380
2	1201897269.1	1.0000	2.0399E-05	8-3	15	44.6	538.8	8.47	15	8/12/2009 8:04	0.380
3	1201897270.1	1.0000	2.0399E-05	8-4	15	45	520.6	8.47	15	8/12/2009 8:20	0.379

0.379

Calibration Data				Backgrounds				Correction Factors			Net Sample
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Rack Position #	Count Start Date/Time	Spike Date/Time	Rn-222 Ingrowth	Rn-222 Count Correction	Activity for MS pCi/L
1	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	8-1	8/12/2009 7:31	8/7/2009 14:00	0.577	0.577	
2	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	8-1	8/12/2009 7:31	8/7/2009 14:00	0.578	0.578	
3	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	8-1	8/12/2009 7:31	8/7/2009 14:00	0.579	0.579	

6/24/09
8/13/09

- Notes:
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error pCi/L	Net Count Rate CPM	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
										Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.5420	0.3827	200	0.8092	111.4397	0.0141	509.0600	592.17	5.9217	2.5408	24.4606		LCS			111.3896	100.0%
2	0.5412	0.3821	200	0.8080	115.9238	0.0139	530.3300	6.0403	6.0403	2.5678	25.4391		LCS			111.3896	104.1%
3	0.5404	0.3816	200	0.8068	111.7802	0.0140	512.1300	5.9390	5.9390	2.5407	24.5345		LCS			111.3896	100.4%

REV 2/13/04

ID: R14-232

12 AUG 2009 07:48

USER: IC

COMMENT: RED

PRESET TIME : 15.00

DATA CALC : CPM HH : YES SAMPLE REPEATS : 1 PRINTER : EDIT

COUNT BLANK : NO ICW : NO REPLICATES : 1 RS232 : EDIT

TWO PHASE : NO AQW : NO CYCLE REPEATS : 1 DISK : OFF

SCINTILLATOR : LIQUID LUMEX : NO LOW SAMPLE RES : 0

LOW LEVEL : YES HALF LIFE CORRECTION DATE : none

CHAN: 600.0 - 975.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

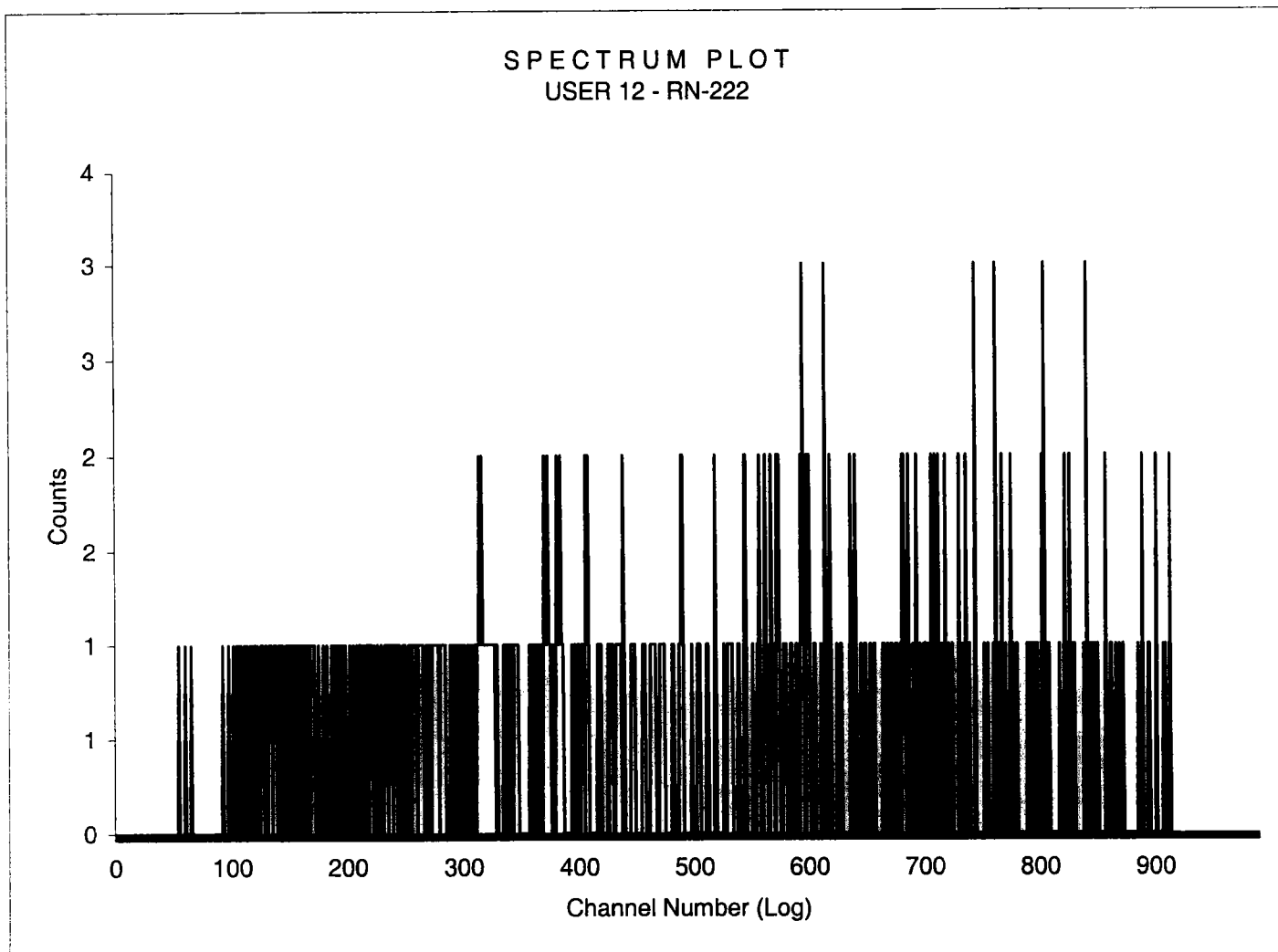
CHAN: 0.0 - 900.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

ALPHA-BETA DISCRIMINATION: NO

SAM NO	POS	TIME MIN	HH	WIND1 RAW CPM	WIND2 RAW CPM	WIND1		WIND2		LUMEX %	ELAPSED TIME
						CPM	%ERROR	CPM	%ERROR		
1	3-1	15.00	39.1	9.47	27.73	9.47	17.75	27.73	9.81	0.67	15.00
2	3-2	15.00	43.3	517.53	607.33	517.53	2.27	607.33	2.10	0.97	15.00
3	3-3	15.00	44.6	538.80	628.67	538.80	2.22	628.67	2.06	0.97	15.00
4	3-4	15.00	45.0	520.60	610.00	520.60	2.26	610.00	2.09	0.97	15.00

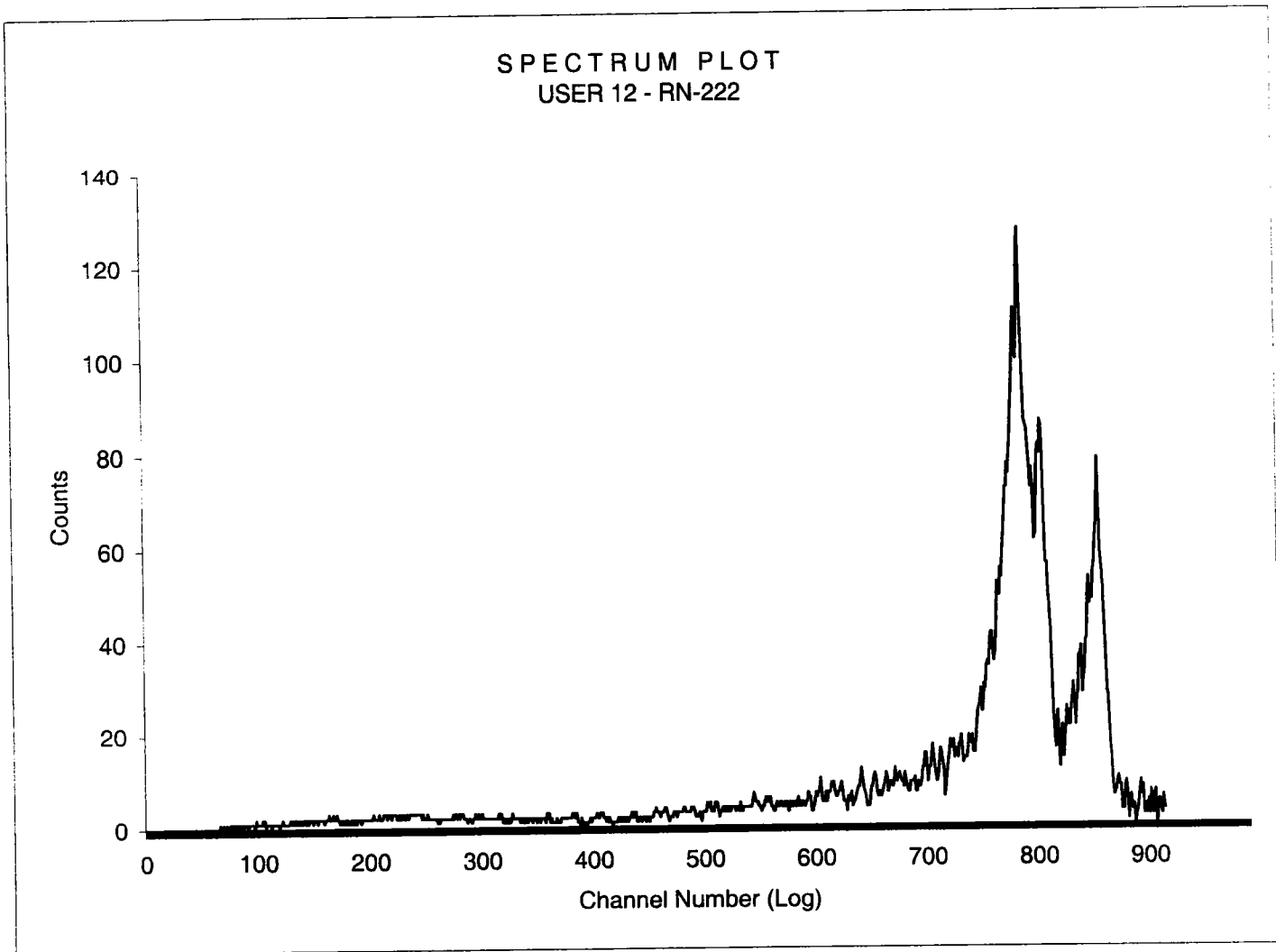
COX

Sample Count Start Time:	12 Aug 2009 07:31:52		
Data Capture Date	12 Aug 2009 07:47:25		
User Filename	S12081208-1A.XLS		
	U12081208-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	1	8-1	15.00
H#, Total Counts:	39.1	422	
Start, End, X-Axis:	0	990	Channel Number



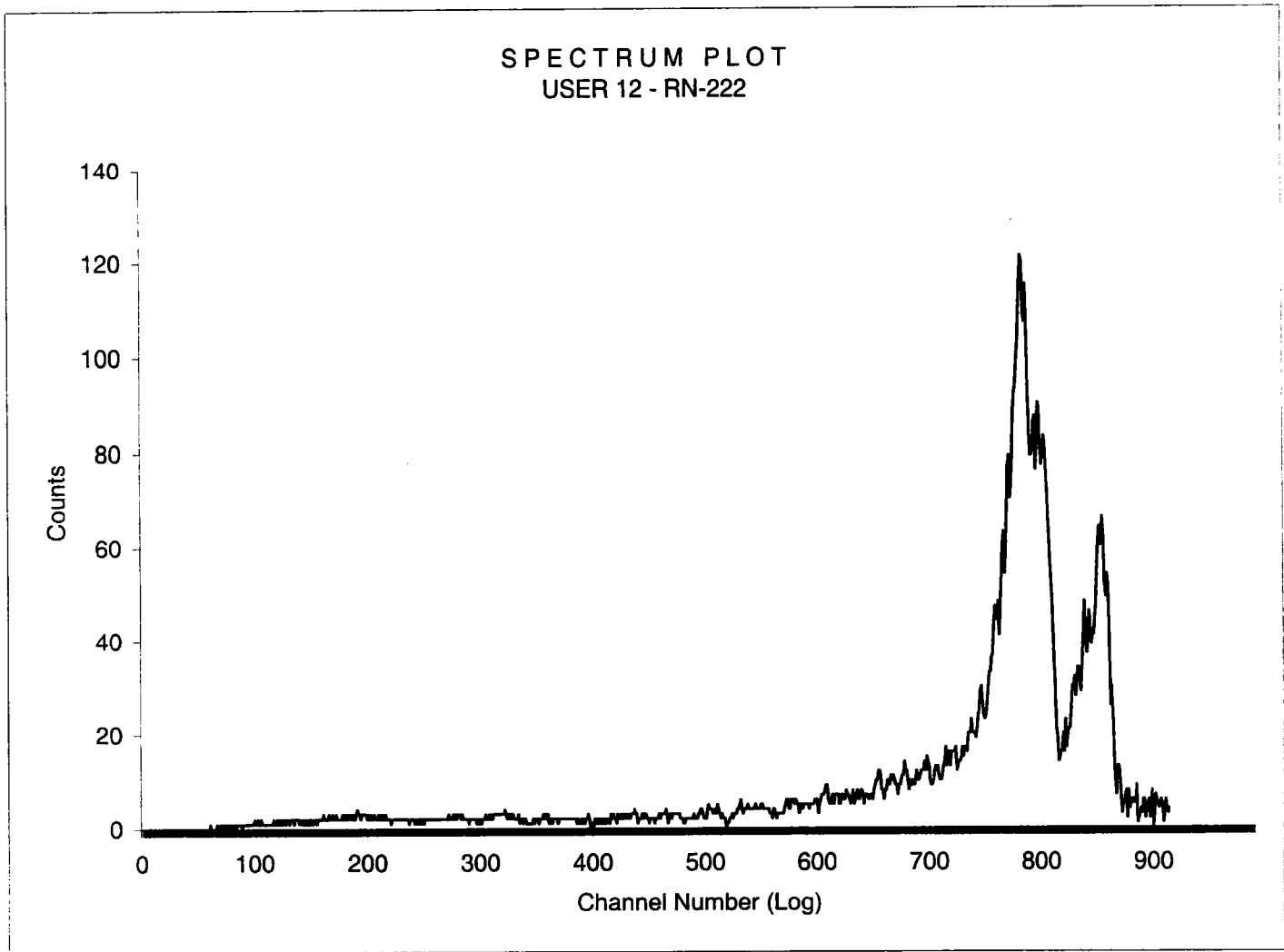
Handwritten: 07:31:52

Sample Count Start Time: 12 Aug 2009 07:48:04
Data Capture Date: 12 Aug 2009 08:03:28
User Filename: S12081208-2A.XLS
U12081208-1A.XLS
Spectrum Type: Log Counts
User Number: 12
User Id: RN-222
User Comment: RED
Isotope Name: ^{14}C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 2 8-2 15.00
H#, Total Counts: 43.3 9166
Start, End, X-Axis: 0 990 Channel Number

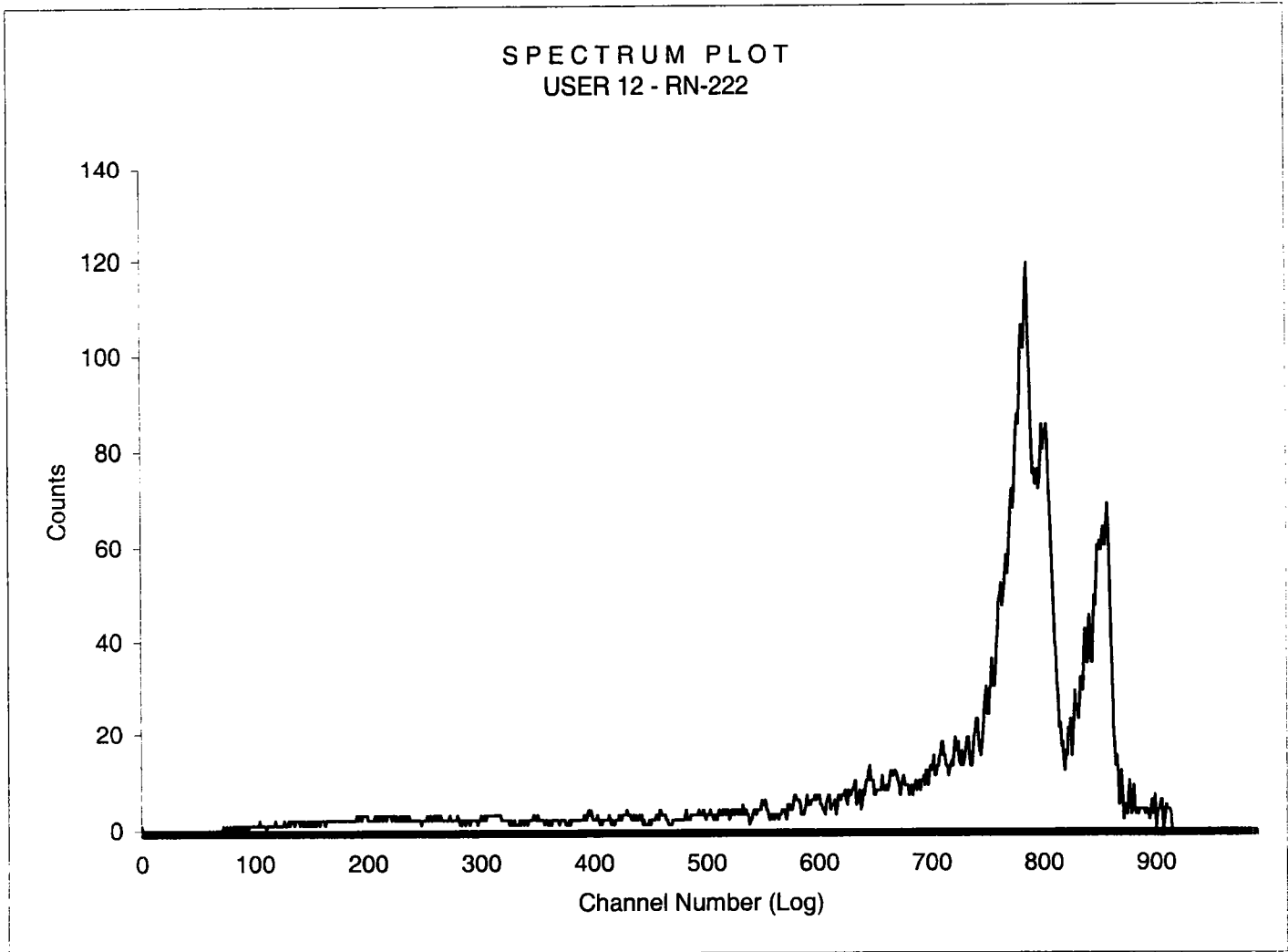


Handwritten:
3/13/07

Sample Count Start Time: 12 Aug 2009 08:04:11
Data Capture Date 12 Aug 2009 08:19:35
User Filename S12081208-3A.XLS
U12081208-1A.XLS
Spectrum Type Log Counts
User Number 12
User Id RN-222
User Comment RED
Isotope Name ^{14}C
Scintillator LIQUID
Sample, Rack-Pos, Time: 3 8-3 15.00
H#, Total Counts: 44.6 9492
Start, End, X-Axis: 0 990 Channel Number



Sample Count Start Time: 12 Aug 2009 08:20:17
Data Capture Date: 12 Aug 2009 08:35:41
User Filename: S12081208-4A.XLS
U12081208-1A.XLS
Spectrum Type: Log Counts
User Number: 12
User Id: RN-222
User Comment: RED
Isotope Name: 14C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 4 8-4 15.00
H#, Total Counts: 45.0 9197
Start, End, X-Axis: 0 990 Channel Number



Handwritten signature

Radon 222 Que Sheet

08/07/2009

Batch #: 891920 Analyst: MLA First Client Due Date: 08/17/2009
 Spike Isotope: Radium-226 Spike Code: 0299-A Expiration Date: 02/15/10 Vol: 1
 LCS Isotope: Radium-226 LCS Code: 0299-A Expiration Date: 02/15/10 Vol: 1
 Prep Date: 07/20/09 Pipet ID: 270968 Initials: MLA Witness:

Comments

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Label	Wet/Dry Sample Mass (g/mL)	LSC Rack #	Time Spike Added
1201897268-1	LCS for batch 891920	LCS	.2 pCi/mL	DRINKING WATQC ACCOUNT	20-JUL-09 12:00 PM						1400
1201897269-1	LCS for batch 891920	LCS	.2 pCi/mL	DRINKING WATQC ACCOUNT	20-JUL-09 12:00 PM						1400
1201897270-1	LCS for batch 891920	LCS	.2 pCi/mL	DRINKING WATQC ACCOUNT	20-JUL-09 12:00 PM						1400

Bkg Rack #:

465

Comments: _____ Data Reviewed By: _____

Instrument Used: LS6000 (Red) 7065155, LS6500 (Black) 7069123, LS6500 (Blue) 7067083, LS6500 (Green) 7067404
 Wallac (Yellow) 4040127, Wallac (Pink) 2200082, Purple 7069123, Silver 7060656

GEL Laboratories LLC, Radiochemistry Division

08/12/09

Voltage Curve Ludlum #7

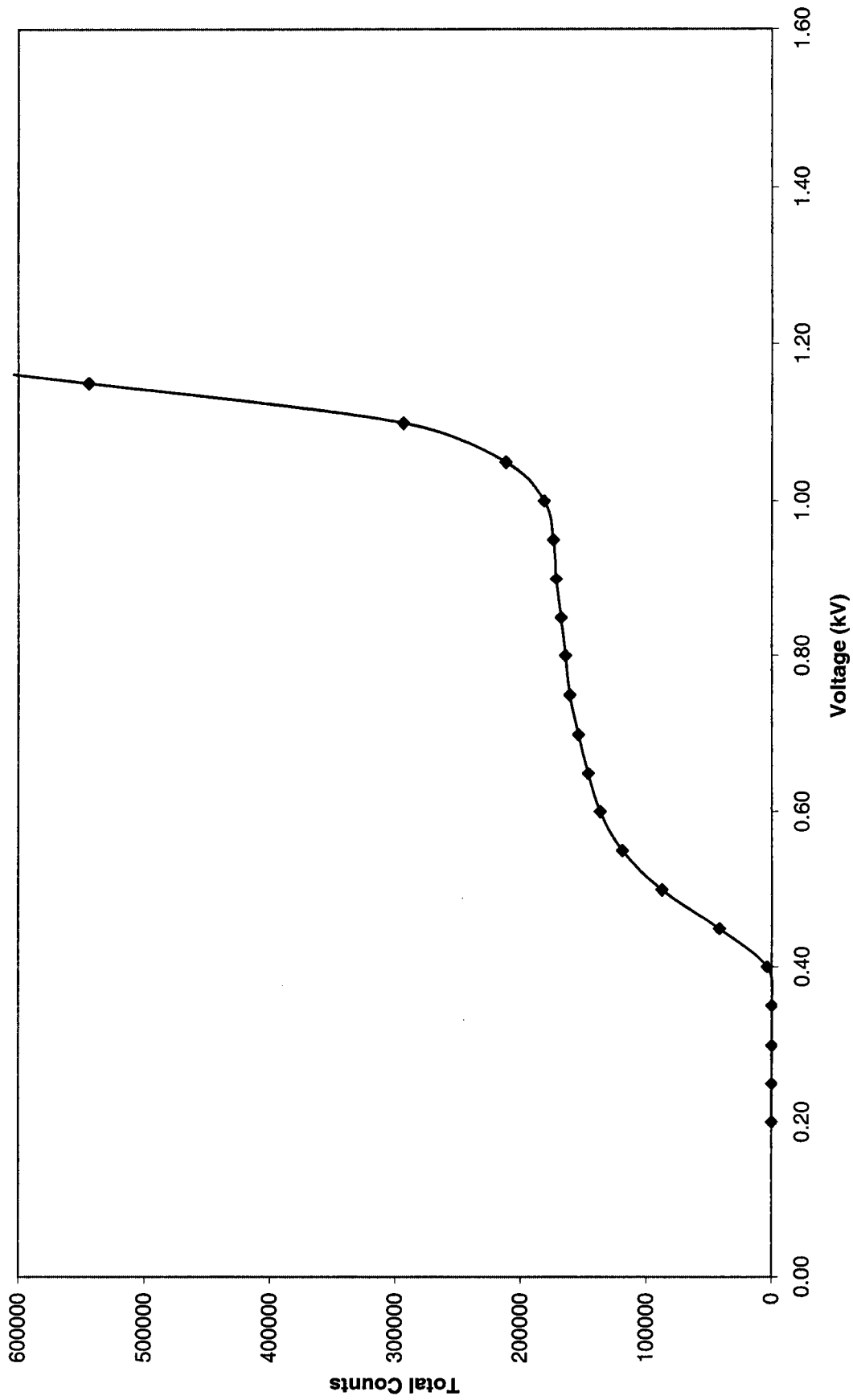
Voltage (kV)	Count Time (min)	Counts	Date/Time
0.20	1.00	0	9/15/09 12:13
0.25	1.00	0	9/15/09 12:14
0.30	1.00	0	9/15/09 12:15
0.35	1.00	0	9/15/09 12:16
0.40	1.00	3788	9/15/09 12:17
0.45	1.00	41827	9/15/09 12:18
0.50	1.00	87578	9/15/09 12:19
0.55	1.00	119153	9/15/09 12:20
0.60	1.00	136757	9/15/09 12:21
0.65	1.00	146242	9/15/09 12:22
0.70	1.00	154066	9/15/09 12:23
0.75	1.00	160997	9/15/09 12:24
0.80	1.00	164506	9/15/09 12:25
0.85	1.00	168023	9/15/09 12:26
0.90	1.00	171900	9/15/09 12:27
0.95	1.00	174082	9/15/09 12:28
1.00	1.00	181331	9/15/09 12:29
1.05	1.00	211928	9/15/09 12:30
1.10	1.00	293552	9/15/09 12:31
1.15	1.00	544079	9/15/09 12:32
1.20	1.00	827973	9/15/09 12:33
1.25	1.00	1214090	9/15/09 12:34

Detector set to operate at 0.70 kV

JK
9/30/09

Ludlum Detector Voltage Curve

—◆— Voltage Curve Ludlum #7



JKG
9/30/09

DAILY CALIBRATION RANGE

Trial	Counts	Date	Time	Detector
1	154335	9/15/2009	13:30	7
2	153698	9/15/2009	13:31	7
3	153933	9/15/2009	13:32	7
4	154196	9/15/2009	13:33	7
5	154114	9/15/2009	13:34	7
6	153766	9/15/2009	13:35	7
7	154409	9/15/2009	13:36	7
8	154086	9/15/2009	13:37	7
9	153833	9/15/2009	13:38	7
10	153689	9/15/2009	13:39	7
11	148183	9/16/2009	10:25	7
12	148142	9/16/2009	10:35	7
13	148193	9/16/2009	10:36	7
14	147463	9/16/2009	10:37	7
15	147251	9/16/2009	10:39	7
16	146697	9/17/2009	4:25	7
17	146925	9/17/2009	5:45	7
18	147238	9/17/2009	6:00	7
19	147239	9/17/2009	6:15	7
20	146836	9/17/2009	6:30	7

STATISTICS	
Average	150711.30
St. Dev.	3407.47
+ 3 S.D.	160933.72
+ 2 S.D.	157526.25
Average	150711.30
- 2 S.D.	143896.35
- 3 S.D.	140488.88
UPPER	160934
LOWER	140489

Handwritten: 712
9/30/09

701	2.107	9/30/2009
702	2.033	9/30/2009
703	2.221	9/30/2009
704	2.235	9/30/2009
705	2.107	9/30/2009
706	2.142	9/30/2009
707	2.275	9/30/2009
708	2.188	9/30/2009
709	2.285	9/30/2009
710	2.409	9/30/2009
711	2.242	9/30/2009
712	2.069	9/30/2009

Handwritten signature and date: 9/30/09

Ra-226 WATER

Batch : LCSVER
 Date : 9/22/2009
 Analyst : KSD1

Procedure Code : LUC26RAL

Parmname : Radium-226

MDA : 1 pCi/L

Instrument Used : LUCAS CELL DETECTOR

Bkg Count Time: 30 min

Sample ID	Sample Vol L	Count Time min	Gross counts cts	Cell # num	Cell Const. num	BKG cpm	Ra-226 MDA pCi/L	Ra-226 RESULT pCi/L	Ra-226 ERROR pCi/L	COUNT DATE/TIME
VER 1	0.500	15	636	701	2.107	0.267	0.5512	24.6163	1.9283	9/30/2009 9:20
VER 2	0.500	15	625	702	2.033	0.267	0.5247	27.0835	2.1404	9/29/2009 16:10
VER 3	0.500	15	625	703	2.221	0.267	0.4811	24.8342	1.9627	9/29/2009 16:45
VER 4	0.500	15	587	704	2.235	0.267	0.4786	23.1944	1.8925	9/29/2009 17:15
VER 5	0.500	15	511	705	2.107	0.267	0.5081	21.4146	1.8751	9/29/2009 17:50
VER 6	0.500	15	580	706	2.142	0.267	0.4998	23.9310	1.9645	9/29/2009 18:25
VER 7	0.500	15	539	707	2.275	0.267	0.4643	20.6372	1.7586	9/29/2009 18:40
VER 8	0.500	15	525	708	2.188	0.267	0.4816	20.8572	1.8013	9/29/2009 19:00
VER 9	0.500	15	559	709	2.285	0.267	0.4615	21.2888	1.7807	9/29/2009 19:40
VER 10	0.500	15	694	710	2.409	0.267	0.4093	23.4767	1.7593	9/30/2009 9:50
VER 11	0.500	15	537	711	2.242	0.267	0.4690	20.7776	1.7739	9/29/2009 20:20
VER 12	0.500	15	552	712	2.069	0.267	0.5096	23.2132	1.9542	9/29/2009 21:10

Handwritten signature and date: 9/30/09

Sample ID	Det #	Run Date	Sample Type	Standard ID	NC	NC units	Recovery/RPD
701	7	9/29/2009 15:35	LCS	0638-F	24.05	pCi/L	102%
702	7	9/29/2009 16:10	LCS	0638-F	24.05	pCi/L	113%
703	7	9/29/2009 16:45	LCS	0638-F	24.05	pCi/L	103%
704	7	9/29/2009 17:15	LCS	0638-F	24.05	pCi/L	96%
705	7	9/29/2009 17:50	LCS	0638-F	24.05	pCi/L	89%
706	7	9/29/2009 18:25	LCS	0638-F	24.05	pCi/L	100%
707	7	9/29/2009 18:40	LCS	0638-F	24.05	pCi/L	86%
708	7	9/29/2009 19:00	LCS	0638-F	24.05	pCi/L	87%
709	7	9/29/2009 19:40	LCS	0638-F	24.05	pCi/L	89%
710	7	9/29/2009 20:00	LCS	0638-F	24.05	pCi/L	98%
711	7	9/29/2009 20:20	LCS	0638-F	24.05	pCi/L	86%
712	7	9/29/2009 21:10	LCS	0638-F	24.05	pCi/L	97%

DEGASSING DATE/TIME	DE-EMAN. DATE/TIME	DEGASS-DE-EM	dE-EM-COUNT	constant	constant	Net CPM	Ingrowth constant
9/22/2009 14:30	9/30/2009 6:00	183.50	3.33	0.7498	0.9751	42.1333	0.7318
9/22/2009 14:30	9/29/2009 10:00	163.50	6.17	0.7090	0.9545	41.4000	0.6774
9/22/2009 14:30	9/29/2009 10:15	163.75	6.50	0.7095	0.9521	41.4000	0.6762
9/22/2009 14:30	9/29/2009 10:30	164.00	6.75	0.7101	0.9503	38.8667	0.6755
9/22/2009 14:30	9/29/2009 10:50	164.33	7.00	0.7108	0.9485	33.8000	0.6749
9/22/2009 14:30	9/29/2009 11:15	164.75	7.17	0.7117	0.9473	38.4000	0.6749
9/22/2009 14:30	9/29/2009 12:45	166.25	5.92	0.7150	0.9563	35.6663	0.6844
9/22/2009 14:30	9/29/2009 13:10	166.67	5.83	0.7159	0.9569	34.7333	0.6857
9/22/2009 14:30	9/29/2009 13:35	167.08	6.08	0.7168	0.9551	37.0000	0.6852
9/22/2009 14:30	9/30/2009 6:30	184.00	3.33	0.7507	0.9751	46.0000	0.7328
9/22/2009 14:30	9/29/2009 14:20	167.83	6.00	0.7184	0.9557	35.5333	0.6872
9/22/2009 14:30	9/29/2009 14:40	168.17	6.50	0.7191	0.9521	36.5333	0.6853

Handwritten signature and date: 9/30/09

Re-226 Verification Sheet

VNS #7

count time: 15 min

Sample ID	Volume (mL)	End Degas Date/Time	End De-rem Date/Time	Start Count Date/Time	Cell #	Det #	Background CPM	Total Counts
VN1	500	9/29/09 1430	9/29/09 1040	9/29/09 1535	701	7	8	488
VN2	500	9/29/09 1430	9/29/09 1000	9/29/09 1610	702	7	8	685
VN3	500	9/29/09 1430	9/29/09 1015	9/29/09 1645	703	7	1	625
VN4	500	9/29/09 1430	9/29/09 1030	9/29/09 1715	704	7	3	587
VN5	500	9/29/09 1430	9/29/09 1050	9/29/09 1750	705	7	1	511
VN6	500	9/29/09 1430	9/29/09 1115	9/29/09 1825	706	7	6	580
VN7	500	9/29/09 1430	9/29/09 1145	9/29/09 1840	707	7	1	539
VN8	500	9/29/09 1430	9/29/09 1310	9/29/09 1900	708	7	6	525
VN9	500	9/29/09 1430	9/29/09 1335	9/29/09 1940	709	7	5	559
VN10	500	9/29/09 1430	9/29/09 1400	9/29/09 2000	710	7	4	322
VN11	500	9/29/09 1430	9/29/09 1420	9/29/09 2020	711	7	7	537
VN12	500	9/29/09 1430	9/29/09 1440	9/29/09 2110	712	7	3	552

419
9/30/09

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9/30/09

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9/30/09

General Engineering Laboratories Verification Source Preparation Sheet

Applicable SOP Number GL RAD-A-008 Isotope RA 226
 Date Standards Prepared 7/31/09 Cocktail Type Used NA
 Standard ID DL2814 Matrix of Vial/Planchett NA
 Amount Used (g or ml) 0.1 Type of Scintillation Vial NA
 Standard Activity (DPM/g or mL) 268.8845 Pipette ID Used 1429303
 Reference Date 11/23/04 Balance ID Used 38080104
 Expiration Date 7/17/10 Quenching Agent NA
 Residue/Carrier Agent NA

	Standard Number	Quenching Vol (uL) Residue Volume (mL)	Initial Wt. (g)	Final Wt. (g)	Net Wt. (mg)
1	VEN 1				
2	VEN 2				
3	VEN 3				
4	VEN 4				
5	VEN 5				
6	VEN 6				
7	VEN 7				
8	VEN 8				
9	VEN 9				
10	VEN 10				
11	VEN 11				
12	VEN 12				
13	VEN 16				
14	VEN 17				

~~/~~

9/30/09

Prepared By: Kelli & Deuce Date: 9/30/09
 Reviewed By: Aggie & Jk Date: 9/30/09

Rev 1 RLM 9/10/97

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 - U.S.A.

0638

Phone (404) 352-8677

Fax (404) 352-2837

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

67519-278

Ra-226 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

Analytics maintains traceability to the National Institute of Standards and Technology through participation in a Measurements Assurance Program as described in USNRC Reg. Guide 4.15, Revision 1, February 1979.

ISOTOPE:	Ra-226
ACTIVITY (dps):	2.353 E4
HALF-LIFE:	1.600 E3 years
CALIBRATION DATE:	January 23, 2004 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	3.3%

Impurities: γ -impurities (other than decay products) <0.1%

5.01065 grams 0.1M HCl solution with 50 μ g/g Ba carrier.

P O NUMBER 3231RD, Item 5

SOURCE PREPARED BY:

M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED:

MCW 1/26/04

Standard Traceability Log Rad

WARNING! Training must be completed!!
Alphalims will be locked out if training is not completed within 1 week of assignment Contact
Quality if additional time is needed to complete training

Source Material Info		A Solution Material Info	
Parent Code:	0638	Isotope:	Radium-226
Prepared By:	Amanda Fehr	Prepared By:	Amanda Fehr
Carrier Conc:	0.1M HCl	Prep Date:	01/16/2006
Reference Date:	01/23/2004	Verification Date:	04/09/2009
Ampoule Mass (g):	5.01065 g	Expiration Date:	04/09/2010
Uncertainty:	+/- 3.3 %	Primary Code:	0638-A
LogBook No:	RC-S-037-037	Dilution(mL):	100 mL
		Mass of Parent(g):	4.8398 g
		Density(g/mL):	1.0266
		Balance ID:	38080204

Calculations Converting parent activity to dpm/mL|dpm/g

$$(\text{Mass of parent(g)} * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$$

$$(\text{Mass of parent(g)} * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$$

$$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13636.6133 \text{ dpm/mL}$$

$$(4.8398 \text{ g}) * (23530 \text{ dps}) * (60 \text{ dpm/dps}) / (1.0266 \text{ g/mL}) / (5.01065 \text{ g} * 100 \text{ mL}) = 13282.9676 \text{ dpm/g}$$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
01/17/2006	Amanda Fehr	2.1041	100	0638-B	279.0211 dpm/mL	01/17/2007	01/17/2008
07/17/2006	Mary Aders	2.1313	100	0638-C	282.6281 dpm/mL	07/26/2006	07/26/2007
03/28/2007	Daniel Roy	2.1025	100	0638-D	279.2744 dpm/ml	04/08/2007	04/08/2008
03/28/2007	Daniel Roy	45.468	250	0638-E	2415.7999 dpm/ml	04/09/2009	04/09/2010
12/18/2007	Daniel Roy	2.014	100	0638-F	267.519 dpm/ml	02/02/2009	02/02/2010
02/12/2008	Daniel Roy	.5004	100	0638-G	66.468 dpm/ml	03/02/2009	03/02/2010
07/23/2008	Daniel Roy	5.0607	250	0638-H	268.8845 dpm/ml	07/17/2009	07/17/2010

GEL Laboratories LLC
Version 1.0 9/18/2000

VN 61260106

Verification for Ra-226 Standard 0638-H

M. Aders 7/17/2009	Isotope 0638-H 0638-H 0638-H	Value 12.025 10.739 12.348	Uncertainty 1.2237 1.1752 1.2298
Mean Value (Counting) =	11.704	96.86	Pass
Stdev =	0.85081728		Rule 3 (Pass/Fail)
Target =	12.08		
Lower Limit =	10.00223211		
Upper Limit =	13.40550123		
Rule 1 Pass/Fail	Pass		
Two sigma =	1.701634559		
10 % of Mean =	1.170386667		
Rule 2 (Pass/Fail)	Fail		*Exception taken due to full recovery of standard

Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements

Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.

Rule 3 = The determined mean value shall be within 5% of the certificate value.

The analyst prepared three standard verification sources for Ra-226 source 0638-H by transferring portions of the degassed standard into tared glass liquid scintillation vials. 10 mL of DI Water and 10 mL of mineral oil were added to each vial and the vials were shaken. A Blank vial was prepared in a similar fashion using 10 mL of DI Water and 10 mL of mineral oil. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Green using source standard verification. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

Angela D. H. 7/30/09
Henry J. Adams 7/20/09
Nancy M. Hart 7/15/09

Radon-222 Liquid

Filename : RN222.XLS
 File type : Excel
 Version # : 1.2.4

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml) : N/A
 Spike Volume Added : N/A
 Spike Date/Time : 7/17/2009 15:00

LCS S/N : 0638-H
 LCS Exp Date : 7/23/2009
 LCS Activity (dpm/ml) : 268.25
 LCS Volume Added : 0.10

Batch : 886194
 Analyst : MLA
 Prep Date : 7/17/2009

Procedure Code : LSC99TCL
 Parmname : Radon-222
 Required MDA : 50
 Half-life of Radon-222 : 3.823 days

Rn-222 Abundance : 1
 Rn-222 Method Uncertainty : 0.0556
 Geometry : 10ML MINERAL OIL/10ML SAMPLE

Pipet, 0.1 ml Stdev : +/- 0.000701 ml
 Pipet, 0.5 ml Stdev : +/- 0.002564 ml

Sample Characteristics			Count raw Data			Background			Sample Decay	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Count Time (min.)	Count Start Date/Time	Sample Decay
1	1201883284.1	1.0000	2.0399E-05	22-2	15	50.3	43.73	15	7/20/2009 11:53	0.594
2	1201883285.1	1.0000	2.0399E-05	22-3	15	50	38.2	15	7/20/2009 12:09	0.592
3	1201883286.1	1.0000	2.0399E-05	22-4	15	49.1	45.4	15	7/20/2009 12:26	0.591

Calibration Data				Backgrounds				Correction Factors			Net Sample Activity for MS pCi/L	
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Rack Position #	Count Start Date/Time	Spike Date/Time	Rn-222 Ingrowth	Rn-222 Count Correction	Net Sample Activity for MS pCi/L	
1	LSCGREEN	3/25/2009	3/31/2010	3.4365	0.00792	22-1	7/20/2009 11:36	7/17/2009 15:00	0.406	0.406	0.406	
2	LSCGREEN	3/25/2009	3/31/2010	3.4365	0.00792	22-1	7/20/2009 11:36	7/17/2009 15:00	0.408	0.408	0.408	
3	LSCGREEN	3/25/2009	3/31/2010	3.4365	0.00792	22-1	7/20/2009 11:36	7/17/2009 15:00	0.409	0.409	0.409	

- Notes:
 1 - Results are decay corrected to Sample Date/Time
 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
 3 - Spike Nominals are decay corrected to Sample Date/Time

Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error pCi/L	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
									Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.8104	0.5722	50	1.2114	12.0246	0.0525	35.8600	1.8619	1.2237	1.8026		LCS			12.0832	99.5%
2	0.8078	0.5703	50	1.2075	10.7393	0.0564	32.1300	1.7939	1.1752	1.6669		LCS			12.0832	88.9%
3	0.8053	0.5685	50	1.2037	12.3477	0.0514	37.0600	1.8833	1.2298	1.8330		LCS			12.0832	102.2%

Radon 222 Que Sheet

07/17/2009

Batch #: 886194 Analyst: MLA First Client Due Date: _____ Internal Due Date: 07/22/2009
 Spike Isotope: Radium-226 Spike Code: C03281 Expiration Date: 7/23/09 Vol: 0.1 Nom Conc: _____
 LCS Isotope: Radium-226 LCS Code: _____ Expiration Date: _____ Vol: _____ Nom Conc: _____
 Prep Date: 7/17/09 Pipet ID: 2971055 Initials: MLA Witness: _____ Comments

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Label	Wet/Dry Sample Mass (g/mL)	LSC Rack #	Time Spike Added
1201883284-1	LCS for batch 886194	LCS	50	pCi/L	WATER	QC ACCOUNT	15-JUL-09 10:45 AM	1		22-2	
1201883285-1	LCS for batch 886194	LCS	50	pCi/L	WATER	QC ACCOUNT	15-JUL-09 10:45 AM	2		22-3	
1201883286-1	LCS for batch 886194	LCS	50	pCi/L	WATER	QC ACCOUNT	15-JUL-09 10:45 AM	3		22-4	

Bkg Rack #: 22-1

Comments: _____ Data Reviewed By: _____

Instrument Used: LS6000 (Red) 7065155, LS6500 (Black) 7069123, LS6500 (Blue) 7067083, LS6500 (Green) 7067404
 Wallac (Yellow) 4040127, Wallac (Pink) 2200082, Purple 7069123, Silver 7060656
 GEL Laboratories LLC, Radiochemistry Division

ID: RIV-222

20 JUL 2009 11:46

USER: LA COMMENT: GREEN

PRESET TIME: 15.00

DATA CALC :	CPM	H#	: YES	SAMPLE REPEATS :	1	PRINTER	: EDIT
COUNT BLANK :	NO	IC#	: NO	REPLICATES :	1	RS232	: EDIT
T&D PHASE :	NO	ADC	: NO	CYCLE REPEATS :	1	DISK	: OFF
SCINTILLATOR :	LIQUID	LUMEX :	YES	LOW SAMPLE REJ :	0	RWM LIST	: OFF
LOW LEVEL :	YES	HALF LIFE CORRECTION DATE :				none	

CHAN: 600.0 - 875.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

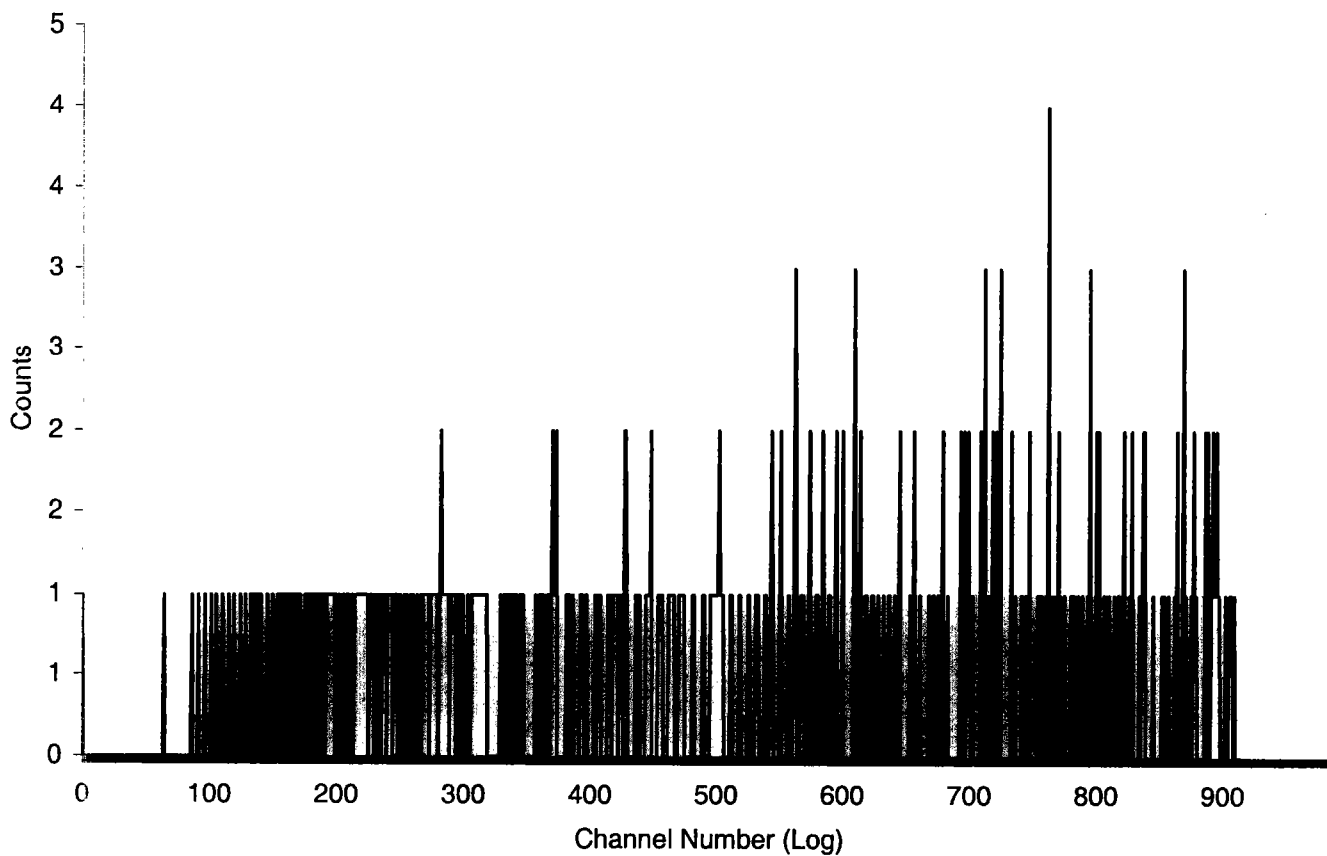
CHAN: 300.0 - 900.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

ALPHA-BETA DISCRIMINATION: NO

SAM NO	POS	TIME MIN	H#	WIND1		WIND2		LUMEX %	ELAPSED TIME
				CPM	%ERROR	CPM	%ERROR		
1	20-1	15.00	47.9	8.20	18.03	19.13	11.81	0.38	15.92
2	20-2	15.00	50.3	43.73	7.81	60.67	6.63	0.16	32.28
3	20-3	15.00	50.0	38.20	8.36	52.27	7.14	0.17	48.66
4	20-4	15.00	49.1	45.40	7.66	62.93	6.51	0.15	65.03

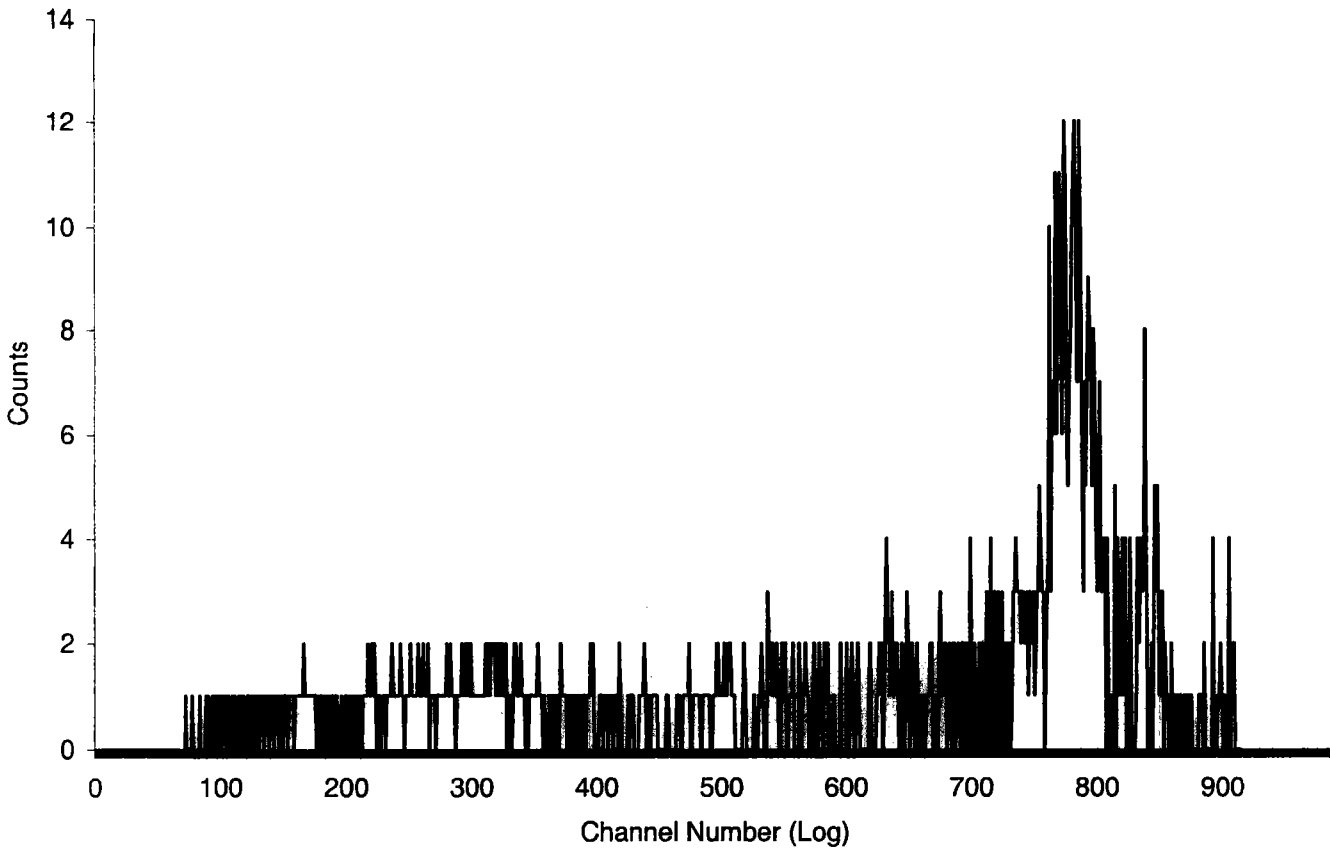
Sample Count Start Time:	20 Jul 2009 11:36:58		
Data Capture Date	20 Jul 2009 11:52:21		
User Filename	S16072022-1B.XLS		
	U16072022-1B.XLS		
Spectrum Type	Log Counts		
User Number	16		
User Id	RN-222		
User Comment	GREEN		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	1	22-1	15.00
H#, Total Counts:	47.9	412	
Start, End, X-Axis:	0	990	Channel Number

SPECTRUM PLOT
USER 16 - RN-222



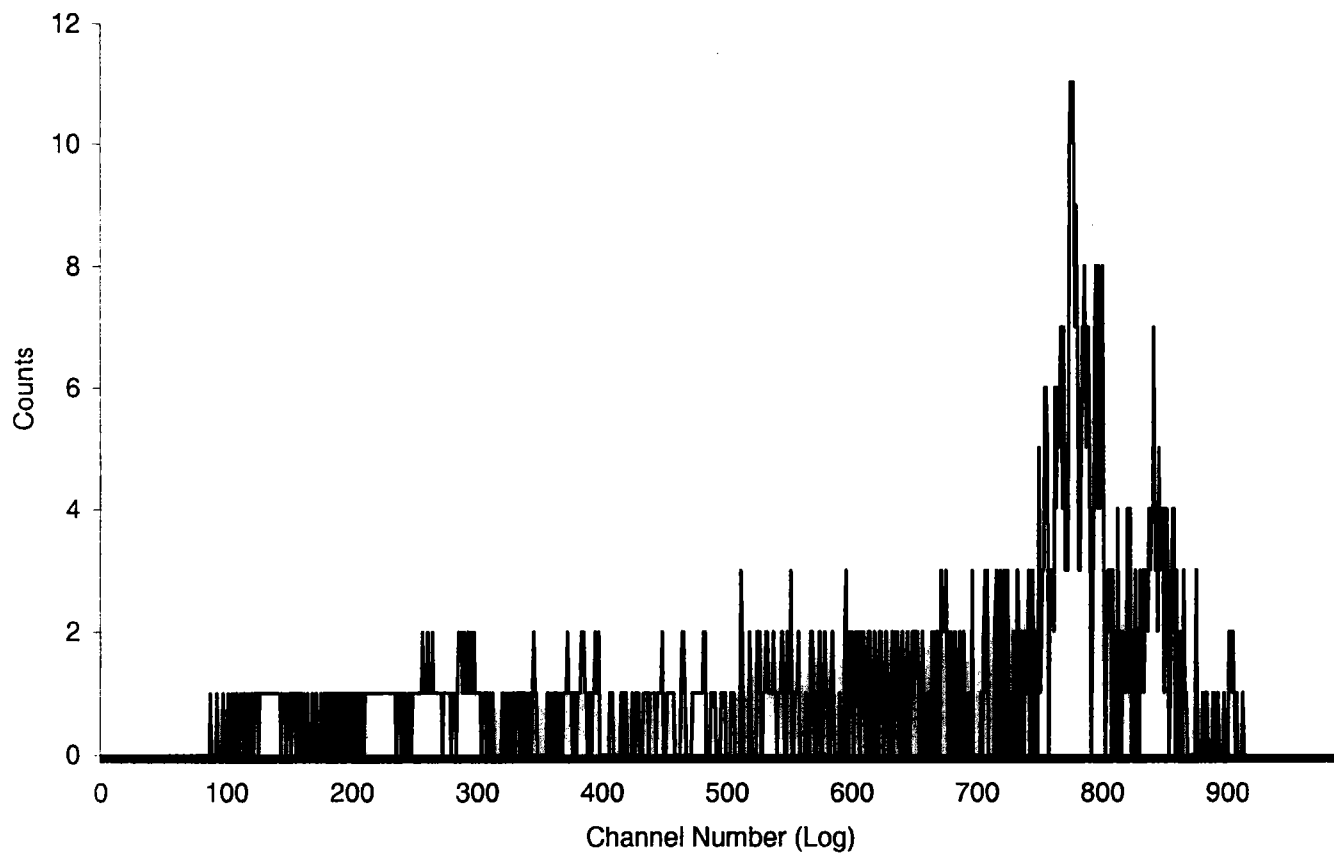
Sample Count Start Time: 20 Jul 2009 11:53:20
Data Capture Date: 20 Jul 2009 12:08:43
User Filename: S16072022-2B.XLS
U16072022-1B.XLS
Spectrum Type: Log Counts
User Number: 16
User Id: RN-222
User Comment: GREEN
Isotope Name: 14C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 2 22-2 15.00
H#, Total Counts: 50.3 1100
Start, End, X-Axis: 0 990 Channel Number

SPECTRUM PLOT
USER 16 - RN-222



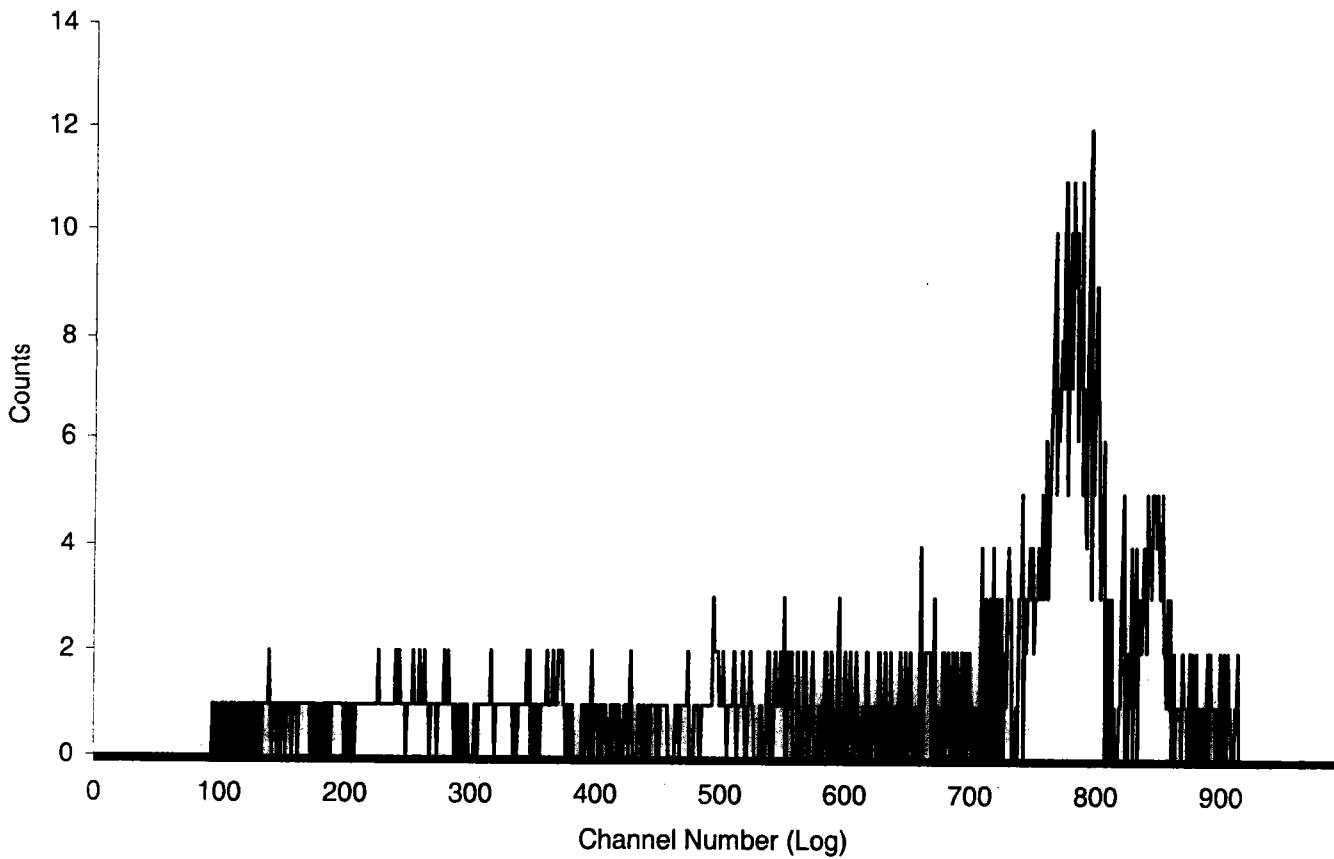
Sample Count Start Time: 20 Jul 2009 12:09:43
Data Capture Date: 20 Jul 2009 12:25:05
User Filename: S16072022-3B.XLS
U16072022-1B.XLS
Spectrum Type: Log Counts
User Number: 16
User Id: RN-222
User Comment: GREEN
Isotope Name: ^{14}C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 3 22-3 15.00
H#, Total Counts: 50.0 956
Start, End, X-Axis: 0 990 Channel Number

SPECTRUM PLOT
USER 16 - RN-222



Sample Count Start Time: 20 Jul 2009 12:26:05
Data Capture Date: 20 Jul 2009 12:41:28
User Filename: S16072022-4B.XLS
U16072022-1B.XLS
Spectrum Type: Log Counts
User Number: 16
User Id: RN-222
User Comment: GREEN
Isotope Name: 14C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 4 22-4 15.00
H#, Total Counts: 49.1 1123
Start, End, X-Axis: 0 990 Channel Number

SPECTRUM PLOT
USER 16 - RN-222



GAS FLOW PROPORTIONAL COUNTERS


General Engineering Laboratories

2040 Savage Road, Charleston, SC 29414
(843)556-8171

Gas Flow Proportional Counter Calibration Package

Method: Ra-228 (AC)

	YES	NO	Comments
1) Is all calibration standard information enclosed for: primary standard certificate? secondard standard(s) documentation? standard preparation information? standard < 1 Year old or verified?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
2) Are the detector graphs included? beta absorption curves? beta plateau?			Average Efficiency
	<input checked="" type="checkbox"/>		
3) Is the raw count data included for: the plateau generation? the absorption curve generation? the calibration verification? the crosstalk calculations?	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
	<input checked="" type="checkbox"/>		
4) Are the calibration verification calculations included? are verification recoveries 100% +/- 25%	<input checked="" type="checkbox"/>		
5) Is the method Carrier Standardization included?			N/A

Prepared By: 

Date: 7/2/09

Reviewed By: 

Date: 7/2/09

Effective Date: 7/2/09

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time
1 1A		3	126	13564	7/1/2009 13:36	7/1/2009 13:39
2 1A		3	136	12775	7/1/2009 13:52	7/1/2009 13:55
3 1A		3	135	12750	7/1/2009 13:48	7/1/2009 13:51
4 1A		3	142	12410	7/1/2009 13:41	7/1/2009 13:44
1 1B		3	115	13292	7/1/2009 13:41	7/1/2009 13:44
2 1B		3	136	13274	7/1/2009 13:36	7/1/2009 13:39
3 1B		3	131	12699	7/1/2009 13:52	7/1/2009 13:55
4 1B		3	129	12072	7/1/2009 13:48	7/1/2009 13:51
1 1C		3	207	12813	7/1/2009 13:48	7/1/2009 13:51
2 1C		3	221	12979	7/1/2009 13:41	7/1/2009 13:44
3 1C		3	189	12755	7/1/2009 13:36	7/1/2009 13:39
4 1C		3	179	11917	7/1/2009 13:52	7/1/2009 13:55
1 1D		3	558	12473	7/1/2009 13:52	7/1/2009 13:55
2 1D		3	582	12484	7/1/2009 13:48	7/1/2009 13:51
3 1D		3	632	12289	7/1/2009 13:41	7/1/2009 13:44
4 1D		3	568	12115	7/1/2009 13:36	7/1/2009 13:39
1 2A		3	424	12499	7/1/2009 13:57	7/1/2009 14:00
2 2A		3	449	12103	7/1/2009 14:15	7/1/2009 14:18
3 2A		3	419	11968	7/1/2009 14:09	7/1/2009 14:12
4 2A		3	417	11855	7/1/2009 14:02	7/1/2009 14:05
1 2B		3	42	12471	7/1/2009 14:02	7/1/2009 14:05
2 2B		3	39	12492	7/1/2009 13:57	7/1/2009 14:00
3 2B		3	54	11892	7/1/2009 14:15	7/1/2009 14:18
4 2B		3	69	11539	7/1/2009 14:09	7/1/2009 14:12
1 2C		3	504	12050	7/1/2009 14:08	7/1/2009 14:11
2 2C		3	527	11914	7/1/2009 14:02	7/1/2009 14:05
3 2C		3	496	11994	7/1/2009 13:58	7/1/2009 14:01
4 2C		3	499	10889	7/1/2009 14:15	7/1/2009 14:18
1 2D		3	543	12010	7/1/2009 14:15	7/1/2009 14:18
2 2D		3	508	12124	7/1/2009 14:08	7/1/2009 14:11
3 2D		3	542	12168	7/1/2009 14:02	7/1/2009 14:05
4 2D		3	544	11692	7/1/2009 13:58	7/1/2009 14:01
1 3A		3	1397	11194	7/1/2009 14:19	7/1/2009 14:22
2 3A		4	1809	14227	7/1/2009 14:35	7/1/2009 14:39
3 3A		4	1757	14180	7/1/2009 14:30	7/1/2009 14:34
4 3A		4	1725	13754	7/1/2009 14:25	7/1/2009 14:29
1 3B		4	914	15370	7/1/2009 14:25	7/1/2009 14:29
2 3B		3	731	11695	7/1/2009 14:20	7/1/2009 14:23
3 3B		4	960	14905	7/1/2009 14:35	7/1/2009 14:39
4 3B		4	922	14220	7/1/2009 14:30	7/1/2009 14:34
1 3C		4	671	15644	7/1/2009 14:29	7/1/2009 14:33
2 3C		4	722	15964	7/1/2009 14:25	7/1/2009 14:29
3 3C		3	558	11701	7/1/2009 14:20	7/1/2009 14:23
4 3C		4	647	14729	7/1/2009 14:35	7/1/2009 14:39
1 3D		4	651	15152	7/1/2009 14:35	7/1/2009 14:39
2 3D		4	722	15168	7/1/2009 14:30	7/1/2009 14:34
3 3D		4	684	15295	7/1/2009 14:25	7/1/2009 14:29
4 3D		3	466	10942	7/1/2009 14:20	7/1/2009 14:23
1 4A		4	412	15298	7/1/2009 14:40	7/1/2009 14:44
2 4A		4	407	14897	7/1/2009 15:00	7/1/2009 15:04
3 4A		4	389	15050	7/1/2009 14:53	7/1/2009 14:57

419
7/2/09

4 4A	4	417	14462	7/1/2009 14:48	7/1/2009 14:52
1 4B	4	58	15335	7/1/2009 14:48	7/1/2009 14:52
2 4B	4	61	15513	7/1/2009 14:41	7/1/2009 14:45
3 4B	4	53	14521	7/1/2009 15:00	7/1/2009 15:04
4 4B	4	72	14328	7/1/2009 14:53	7/1/2009 14:57
1 4C	4	532	14733	7/1/2009 14:53	7/1/2009 14:57
2 4C	4	545	14902	7/1/2009 14:48	7/1/2009 14:52
3 4C	4	486	14856	7/1/2009 14:41	7/1/2009 14:45
4 4C	4	540	13733	7/1/2009 15:00	7/1/2009 15:04
1 4D	4	1158	14167	7/1/2009 15:00	7/1/2009 15:04
2 4D	4	1192	14204	7/1/2009 14:53	7/1/2009 14:57
3 4D	4	1136	14131	7/1/2009 14:48	7/1/2009 14:52
4 4D	4	1149	13978	7/1/2009 14:41	7/1/2009 14:45
1 5A	4	424	14870	7/1/2009 15:06	7/1/2009 15:10
2 5A	4	395	14487	7/1/2009 15:21	7/1/2009 15:25
3 5A	4	403	14259	7/1/2009 15:17	7/1/2009 15:21
4 5A	4	389	13957	7/1/2009 15:12	7/1/2009 15:16
1 5B	4	428	14869	7/1/2009 15:12	7/1/2009 15:16
2 5B	4	440	14821	7/1/2009 15:06	7/1/2009 15:10
3 5B	4	420	14289	7/1/2009 15:21	7/1/2009 15:25
4 5B	4	414	13809	7/1/2009 15:17	7/1/2009 15:21
1 5C	4	436	14676	7/1/2009 15:17	7/1/2009 15:21
2 5C	4	443	15122	7/1/2009 15:12	7/1/2009 15:16
3 5C	4	433	14958	7/1/2009 15:07	7/1/2009 15:11
4 5C	4	416	13831	7/1/2009 15:21	7/1/2009 15:25
1 5D	4	451	14321	7/1/2009 15:21	7/1/2009 15:25
2 5D	4	452	14642	7/1/2009 15:17	7/1/2009 15:21
3 5D	4	444	14443	7/1/2009 15:12	7/1/2009 15:16
4 5D	4	414	13954	7/1/2009 15:07	7/1/2009 15:11
1 6A	4	272	14018	7/1/2009 15:27	7/1/2009 15:31
2 6A	3.5	246	12283	7/1/2009 15:40	7/1/2009 15:44
3 6A	3.5	231	12111	7/1/2009 15:36	7/1/2009 15:40
4 6A	3.5	229	11598	7/1/2009 15:32	7/1/2009 15:35
1 6B	3.5	540	12151	7/1/2009 15:32	7/1/2009 15:36
2 6B	4	592	14371	7/1/2009 15:27	7/1/2009 15:31
3 6B	3.5	498	11705	7/1/2009 15:40	7/1/2009 15:44
4 6B	3.5	498	11388	7/1/2009 15:36	7/1/2009 15:40
1 6C	3.5	462	12161	7/1/2009 15:36	7/1/2009 15:40
2 6C	3.5	468	12083	7/1/2009 15:32	7/1/2009 15:36
3 6C	4	534	13638	7/1/2009 15:27	7/1/2009 15:31
4 6C	3.5	455	11218	7/1/2009 15:40	7/1/2009 15:44
1 6D	3.5	456	11987	7/1/2009 15:40	7/1/2009 15:44
2 6D	3.5	468	12183	7/1/2009 15:36	7/1/2009 15:40
3 6D	3.5	496	11882	7/1/2009 15:32	7/1/2009 15:36
4 6D	4	525	13018	7/1/2009 15:27	7/1/2009 15:31
1 7A	3.5	466	12007	7/1/2009 15:46	7/1/2009 15:50
2 7A	3.5	491	11655	7/1/2009 16:00	7/1/2009 16:04
3 7A	3.5	444	11445	7/1/2009 15:56	7/1/2009 15:59
4 7A	3.5	477	11121	7/1/2009 15:50	7/1/2009 15:54
1 7B	3.5	418	11968	7/1/2009 15:51	7/1/2009 15:54
2 7B	3.5	448	12050	7/1/2009 15:46	7/1/2009 15:50
3 7B	3.5	460	11675	7/1/2009 16:00	7/1/2009 16:04

4 7B	3.5	413	11271	7/1/2009 15:56	7/1/2009 16:00
1 7C	3.5	471	11781	7/1/2009 15:56	7/1/2009 16:00
2 7C	3.5	457	11760	7/1/2009 15:51	7/1/2009 15:54
3 7C	3.5	454	11766	7/1/2009 15:46	7/1/2009 15:50
4 7C	3.5	406	10888	7/1/2009 16:00	7/1/2009 16:04
1 7D	3.5	359	11605	7/1/2009 16:00	7/1/2009 16:04
2 7D	3.5	391	11920	7/1/2009 15:56	7/1/2009 16:00
3 7D	3.5	386	11933	7/1/2009 15:51	7/1/2009 15:55
4 7D	3.5	400	11305	7/1/2009 15:46	7/1/2009 15:50
1 8A	3.5	348	11673	7/1/2009 16:06	7/1/2009 16:09
2 8A	3.5	340	11172	7/1/2009 16:19	7/1/2009 16:22
3 8A	3.5	298	11258	7/1/2009 16:15	7/1/2009 16:18
4 8A	3.5	327	10977	7/1/2009 16:10	7/1/2009 16:13
1 8B	3.5	124	11583	7/1/2009 16:10	7/1/2009 16:13
2 8B	3.5	112	11758	7/1/2009 16:06	7/1/2009 16:09
3 8B	3.5	110	11499	7/1/2009 16:19	7/1/2009 16:23
4 8B	3.5	102	10844	7/1/2009 16:15	7/1/2009 16:18
1 8C	3.5	202	11539	7/1/2009 16:15	7/1/2009 16:18
2 8C	3.5	196	11774	7/1/2009 16:10	7/1/2009 16:14
3 8C	3.5	203	11611	7/1/2009 16:06	7/1/2009 16:09
4 8C	3.5	207	10809	7/1/2009 16:19	7/1/2009 16:23
1 8D	3.5	240	11301	7/1/2009 16:19	7/1/2009 16:23
2 8D	3.5	248	11412	7/1/2009 16:15	7/1/2009 16:18
3 8D	3.5	233	11660	7/1/2009 16:10	7/1/2009 16:14
4 8D	3.5	235	10918	7/1/2009 16:06	7/1/2009 16:10
1 9A	3.5	39	11605	7/1/2009 16:24	7/1/2009 16:28
2 9A	3.5	49	11281	7/1/2009 16:42	7/1/2009 16:46
3 9A	3.5	47	11301	7/1/2009 16:33	7/1/2009 16:36
4 9A	3.5	64	10987	7/1/2009 16:29	7/1/2009 16:32
1 9B	3.5	53	11151	7/1/2009 16:29	7/1/2009 16:32
2 9B	3.5	39	11462	7/1/2009 16:24	7/1/2009 16:28
3 9B	3.5	45	11004	7/1/2009 16:42	7/1/2009 16:46
4 9B	3.5	51	10581	7/1/2009 16:33	7/1/2009 16:36
1 9C	3.5	49	11026	7/1/2009 16:33	7/1/2009 16:36
2 9C	3.5	49	11281	7/1/2009 16:29	7/1/2009 16:32
3 9C	3.5	40	11016	7/1/2009 16:24	7/1/2009 16:28
4 9C	3.5	60	10297	7/1/2009 16:42	7/1/2009 16:46
1 9D	3.5	65	11135	7/1/2009 16:38	7/1/2009 16:41
2 9D	3.5	53	11412	7/1/2009 16:33	7/1/2009 16:37
3 9D	3.5	54	11340	7/1/2009 16:29	7/1/2009 16:32
4 9D	3.5	77	10912	7/1/2009 16:24	7/1/2009 16:28
1 10A	3.5	71	10991	7/1/2009 16:47	7/1/2009 16:51
2 10A	4	106	11959	7/1/2009 17:12	7/1/2009 17:16
3 10A	3.5	70	10553	7/1/2009 16:58	7/1/2009 17:01
4 10A	3.5	95	10338	7/1/2009 16:53	7/1/2009 16:56
1 10B	4	139	11110	7/1/2009 17:03	7/1/2009 17:07
2 10B	3.5	102	10812	7/1/2009 16:47	7/1/2009 16:51
3 10B	4	103	11422	7/1/2009 17:12	7/1/2009 17:16
4 10B	3.5	110	9967	7/1/2009 16:58	7/1/2009 17:01
1 10C	3.5	74	10482	7/1/2009 16:58	7/1/2009 17:01
2 10C	3.5	79	10535	7/1/2009 16:53	7/1/2009 16:57
3 10C	3.5	87	10723	7/1/2009 16:47	7/1/2009 16:51

4 10C	4	95	11066	7/1/2009 17:13	7/1/2009 17:17
1 10D	4	102	12021	7/1/2009 17:13	7/1/2009 17:17
2 10D	3.5	75	10614	7/1/2009 16:58	7/1/2009 17:01
3 10D	3.5	78	10643	7/1/2009 16:53	7/1/2009 16:57
4 10D	3.5	81	10064	7/1/2009 16:48	7/1/2009 16:51
1 11A	3	31	14773	7/1/2009 11:56	7/1/2009 11:59
2 11A	3	23	14429	7/1/2009 12:08	7/1/2009 12:11
3 11A	3	33	14454	7/1/2009 12:04	7/1/2009 12:07
4 11A	3	49	14013	7/1/2009 12:00	7/1/2009 12:03
1 11B	3	43	16203	7/1/2009 12:00	7/1/2009 12:03
2 11B	3	53	16106	7/1/2009 11:56	7/1/2009 11:59
3 11B	3	46	15643	7/1/2009 12:08	7/1/2009 12:11
4 11B	3	42	15133	7/1/2009 12:04	7/1/2009 12:07
1 11C	3	27	15637	7/1/2009 12:04	7/1/2009 12:07
2 11C	3	38	15919	7/1/2009 12:00	7/1/2009 12:03
3 11C	3	33	16452	7/1/2009 11:56	7/1/2009 11:59
4 11C	3	46	14887	7/1/2009 12:08	7/1/2009 12:11
1 11D	3	43	15607	7/1/2009 12:08	7/1/2009 12:11
2 11D	3	42	15944	7/1/2009 12:04	7/1/2009 12:07
3 11D	3	32	16098	7/1/2009 12:00	7/1/2009 12:03
4 11D	3	39	15191	7/1/2009 11:56	7/1/2009 11:59
1 12A	3	29	15450	7/1/2009 12:15	7/1/2009 12:18
2 12A	3	28	15016	7/1/2009 12:28	7/1/2009 12:31
3 12A	3	31	14984	7/1/2009 12:24	7/1/2009 12:27
4 12A	3	46	14530	7/1/2009 12:20	7/1/2009 12:23
1 12B	3	26	15404	7/1/2009 12:20	7/1/2009 12:23
2 12B	3	31	15607	7/1/2009 12:15	7/1/2009 12:18
3 12B	3	34	15060	7/1/2009 12:28	7/1/2009 12:31
4 12B	3	49	14553	7/1/2009 12:24	7/1/2009 12:27
1 12C	3	24	15183	7/1/2009 12:24	7/1/2009 12:27
2 12C	3	44	15651	7/1/2009 12:20	7/1/2009 12:23
3 12C	3	46	15216	7/1/2009 12:15	7/1/2009 12:18
4 12C	3	60	14117	7/1/2009 12:28	7/1/2009 12:31
1 12D	3	48	15174	7/1/2009 12:28	7/1/2009 12:31
2 12D	3	37	15137	7/1/2009 12:24	7/1/2009 12:27
3 12D	3	25	15418	7/1/2009 12:20	7/1/2009 12:23
4 12D	3	59	14566	7/1/2009 12:15	7/1/2009 12:18
1 13A	3	50	15230	7/1/2009 12:33	7/1/2009 12:36
2 13A	3	36	14784	7/1/2009 12:50	7/1/2009 12:53
3 13A	3	41	14851	7/1/2009 12:41	7/1/2009 12:44
4 13A	3	49	14183	7/1/2009 12:37	7/1/2009 12:40
1 13B	3	39	15625	7/1/2009 12:37	7/1/2009 12:40
2 13B	3	41	15450	7/1/2009 12:33	7/1/2009 12:36
3 13B	3	37	14689	7/1/2009 12:50	7/1/2009 12:53
4 13B	3	47	14377	7/1/2009 12:41	7/1/2009 12:44
1 13C	3	54	15426	7/1/2009 12:41	7/1/2009 12:44
2 13C	3	41	15315	7/1/2009 12:37	7/1/2009 12:40
3 13C	3	36	15288	7/1/2009 12:33	7/1/2009 12:36
4 13C	3	34	14222	7/1/2009 12:50	7/1/2009 12:53
1 13D	3	47	14492	7/1/2009 12:50	7/1/2009 12:53
2 13D	3	50	14858	7/1/2009 12:46	7/1/2009 12:49
3 13D	3	43	14873	7/1/2009 12:37	7/1/2009 12:40

4 13D	3	47	14389	7/1/2009 12:33	7/1/2009 12:36
1 14A	3	44	14463	7/1/2009 12:54	7/1/2009 12:57
2 14A	3	41	14137	7/1/2009 13:17	7/1/2009 13:20
3 14A	3	45	14022	7/1/2009 13:13	7/1/2009 13:16
4 14A	3	51	13451	7/1/2009 13:02	7/1/2009 13:05
1 14B	3	42	14039	7/1/2009 13:01	7/1/2009 13:04
2 14B	3	36	14398	7/1/2009 12:54	7/1/2009 12:57
3 14B	3	47	13475	7/1/2009 13:17	7/1/2009 13:20
4 14B	3	47	13077	7/1/2009 13:13	7/1/2009 13:16
1 14C	3	26	14116	7/1/2009 13:12	7/1/2009 13:15
2 14C	3	35	14187	7/1/2009 13:02	7/1/2009 13:05
3 14C	3	37	14409	7/1/2009 12:55	7/1/2009 12:58
4 14C	3	38	13229	7/1/2009 13:17	7/1/2009 13:20
1 14D	3	16	13927	7/1/2009 13:17	7/1/2009 13:20
2 14D	3	32	14089	7/1/2009 13:12	7/1/2009 13:15
3 14D	3	16	13912	7/1/2009 13:02	7/1/2009 13:05
4 14D	3	47	13545	7/1/2009 12:55	7/1/2009 12:58

Radium-228 Liquid

ver09.xls

Filename: RA228.XLS
Spike S/N: N/A
Spike Exp Date: N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N: 0503-B
LCS Exp Date: 9/13/2009
LCS Activity (dpm/ml): 182.42
LCS Volume Added: 2.00

Tracer S/N: 0112-J
Tracer Exp Date: 2/17/2010
Tracer Volume Added: 0.10

Procedure Code: GFC90SRL
Pararm: Radium-228
Required MDA: 1 pCi/L
Half-life of Ra-228: 5.75 years
Half-life of Ac-228: 6.13 hours
Batch counted on: PIC
BKG Count time: 500 min

Pipet, 0.1 ml Stdev: +/- 0.000701 ml
Pipet, 0.5 ml Stdev: +/- 0.002564 ml
Pipet, 1 ml Stdev: +/- 0.005480 ml

Table with columns: Pos., Sample Characteristics, Sample Aliquot, Sample ID, Count raw Data (Detector, Pos., ID), Counting Time, Gross Counts (Alpha, Beta), Detector Efficiency Error (cpm/dpm), Weekly Bkg Count (min.), Separation Date/Time, Count Start Date/Time, Ra-228 Decay, Ac-228 Correction, Calculated Sample Recovery %, Sample Recovery Error %, Results Pos.

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Normalis are Decay corrected to Sample Date/Time

* indicates results calculated at 100% recovery

Decision Level	Critical Level	Required MDA	MDA	Sample Act. Conc.		Sample Error	Net Count Rate	Net Count Rate	Net Count Rate	2 SIGMA Counting		Total Prop. Uncertainty	Sample Type	Nominal pCi/L	Recovery
				pCi/L	Conc.					CPM	CPM				
0.3471	0.2451	1	0.6937	134.0279	0.0254	131.6880	2.9666	5.9178	21.6466	LCS	164.3409	81.6%			
0.3647	0.2575	1	0.7192	133.0399	0.0251	130.2590	2.9508	5.9071	21.4655	LCS	164.3409	81.0%			
0.5889	0.3790	1	0.9659	145.2921	0.0243	139.8173	3.0611	6.2347	23.3752	LCS	164.3409	88.4%			
0.4695	0.3314	1	0.8755	159.8828	0.0239	150.4760	3.1730	6.6057	25.6756	LCS	164.3409	97.3%			
0.4261	0.3008	1	0.8097	127.0000	0.0257	122.0633	2.8583	5.8279	20.5368	LCS	164.3409	77.3%			
0.7599	0.5395	1	1.2813	141.0616	0.0247	135.4387	3.0211	6.1673	22.7300	LCS	164.3409	85.8%			
0.3798	0.2681	1	0.7515	141.8559	0.0253	131.7993	2.9681	6.2613	22.9053	LCS	164.3409	86.3%			
0.4150	0.2830	1	0.8072	145.8182	0.0251	131.8887	2.9696	6.4352	23.5274	LCS	164.3409	88.7%			
0.6347	0.4481	1	1.1943	129.9854	0.0284	108.9047	2.7042	6.3116	21.1935	LCS	164.3409	78.9%			
0.9035	0.6379	1	1.5022	135.4510	0.0266	119.6900	2.8455	6.3115	21.9803	LCS	164.3409	82.4%			
0.6078	0.4291	1	1.0779	141.2594	0.0255	128.6447	2.9382	6.3235	22.8259	LCS	164.3409	86.0%			
0.5473	0.3864	1	0.9887	155.5960	0.0247	137.7700	3.0378	6.7244	25.0636	LCS	164.3409	94.7%			
0.6283	0.4436	1	1.1054	135.5336	0.0264	124.2433	2.8986	6.1761	21.9739	LCS	164.3409	83.3%			
0.9036	0.6379	1	1.4942	136.9155	0.0254	125.4287	2.9134	6.2333	22.1127	LCS	164.3409	88.8%			
0.7676	0.5419	1	1.3079	145.9826	0.0252	130.3400	2.9624	6.5032	23.5621	LCS	164.3409	90.0%			
0.7520	0.5309	1	1.3000	147.9661	0.0266	124.2633	2.8910	6.7471	24.0105	LCS	164.3409	82.1%			
0.4809	0.3395	1	0.9027	134.9611	0.0269	120.7040	2.8427	6.2312	21.9265	LCS	164.3409	80.0%			
0.8974	0.4924	1	1.2076	131.4742	0.0271	117.9500	2.8170	6.1544	21.3797	LCS	164.3409	89.0%			
0.6530	0.4610	1	1.1419	148.2299	0.0259	132.9873	2.9884	6.4406	23.6659	LCS	164.3409	95.2%			
0.7661	0.5409	1	1.3064	156.3706	0.0255	139.2187	3.0605	6.7377	25.2668	LCS	164.3409	81.7%			
0.6889	0.4871	1	1.1997	134.1863	0.0270	118.9960	2.8288	6.2523	21.8127	LCS	164.3409	83.4%			
0.6079	0.4292	1	1.0862	137.0396	0.0269	120.3027	2.8412	6.3436	22.2643	LCS	164.3409	88.8%			
0.9509	0.6713	1	1.5725	146.0056	0.0264	127.0307	2.9317	6.6044	23.6775	LCS	164.3409	88.0%			
0.4376	0.3090	1	0.8562	144.5849	0.0275	113.7227	2.7577	6.3803	21.8573	LCS	164.3409	88.0%			
0.4227	0.2984	1	0.8330	134.2390	0.0276	118.4887	2.8152	6.4094	22.3723	LCS	164.3409	92.4%			
0.4360	0.3079	1	0.8480	137.6373	0.0270	118.4887	2.8152	6.7858	24.6088	LCS	164.3409	92.6%			
0.3962	0.2797	1	0.7956	151.8935	0.0262	128.6313	2.9319	6.6518	23.4785	LCS	164.3409	77.8%			
0.4480	0.3163	1	0.8657	152.1131	0.0261	130.4707	2.9539	6.7499	24.6318	LCS	164.3409	82.2%			
0.8917	0.6931	1	1.1278	127.8251	0.0279	109.4120	2.7108	6.2072	20.8618	LCS	164.3409	89.2%			
0.6179	0.4080	1	1.1617	135.1471	0.0273	117.2540	2.8197	6.3699	21.9896	LCS	164.3409	86.1%			
0.5779	0.3694	1	1.0463	146.5864	0.0263	127.3240	2.9214	6.5922	23.7610	LCS	164.3409	86.1%			
0.8422	0.5946	1	1.4301	141.4935	0.0272	117.4880	2.8147	6.6441	23.0149	LCS	164.3409	79.4%			
0.4379	0.3091	1	0.8509	130.5505	0.0276	112.2200	2.7400	6.2478	21.2682	LCS	164.3409	81.4%			
0.7972	0.5629	1	1.3635	133.7974	0.0277	112.5273	2.7540	6.4182	21.9026	LCS	164.3409	87.8%			
0.4475	0.3159	1	0.8728	144.2924	0.0269	119.7633	2.8301	6.6832	23.4437	LCS	164.3409	91.8%			
0.8154	0.5757	1	1.3863	150.8313	0.0263	128.3747	2.9406	6.7718	24.4459	LCS	164.3409	81.8%			
0.4063	0.2868	1	0.8104	134.4151	0.0285	119.5507	2.7553	6.3927	21.8871	LCS	164.3409	82.2%			
0.4205	0.2969	1	0.8358	146.9063	0.0268	121.4093	2.8489	6.7565	23.8548	LCS	164.3409	89.4%			
0.4437	0.3182	1	0.8728	144.8386	0.0271	117.5853	2.8041	6.7699	23.5500	LCS	164.3409	86.1%			
0.3432	0.2423	1	0.6763	135.4546	0.0253	141.3227	3.0733	5.7736	21.8705	LCS	164.3409	80.1%			
0.3289	0.2322	1	0.6397	131.6931	0.0247	150.2887	3.1684	5.4434	21.2189	LCS	164.3409	80.1%			
0.2949	0.2082	1	0.5922	148.9038	0.0237	169.2980	3.3626	5.7929	23.8966	LCS	164.3409	92.4%			
0.3379	0.2365	1	0.6530	151.8473	0.0235	172.6707	3.3968	5.8549	24.3615	LCS	164.3409	80.1%			
0.4616	0.3400	1	0.8577	131.6889	0.0249	148.2120	3.2186	5.4891	21.2301	LCS	164.3409	82.1%			
0.7498	0.5287	1	1.2332	134.8566	0.0246	153.3873	3.3053	5.6282	23.8982	LCS	164.3409	90.6%			
0.4447	0.3140	1	0.8052	148.8317	0.0238	167.9907	3.3595	5.8232	23.1384	LCS	164.3409	87.8%			
0.6180	0.4363	1	1.0494	143.9479	0.0241	162.8880	3.3080	5.7315	23.1384	LCS	164.3409	82.2%			
0.3427	0.2420	1	0.6680	135.0873	0.0248	148.3533	3.1490	5.6202	21.7752	LCS	164.3409	78.9%			
0.5997	0.4234	1	1.0256	129.5009	0.0251	144.7940	3.1202	5.4687	20.8960	LCS	164.3409	88.8%			
0.6469	0.4602	1	1.0649	146.0021	0.0240	163.4967	3.3053	5.7852	23.4616	LCS	164.3409	88.8%			
0.3316	0.2341	1	0.6459	159.6717	0.0235	174.3747	3.4225	6.1425	25.6134	LCS	164.3409	97.2%			
0.6355	0.4487	1	1.0805	159.6717	0.0235	144.5507	3.1078	5.5650	21.3060	LCS	164.3409	80.4%			
0.3136	0.2214	1	0.6255	132.0625	0.0251	145.4707	3.1861	5.8215	22.7970	LCS	164.3409	82.5%			
1.4618	1.0321	1	2.2506	135.6135	0.0254	154.5427	3.1861	5.7718	21.9000	LCS	164.3409	86.2%			
0.3185	0.2249	1	0.6330	141.6298	0.0245	154.5427	3.2153	5.7718	21.9000	LCS	164.3409	86.2%			
0.3327	0.2349	1	0.6546	146.7439	0.0242	158.8520	3.2579	5.8988	23.6017	LCS	164.3409	89.3%			

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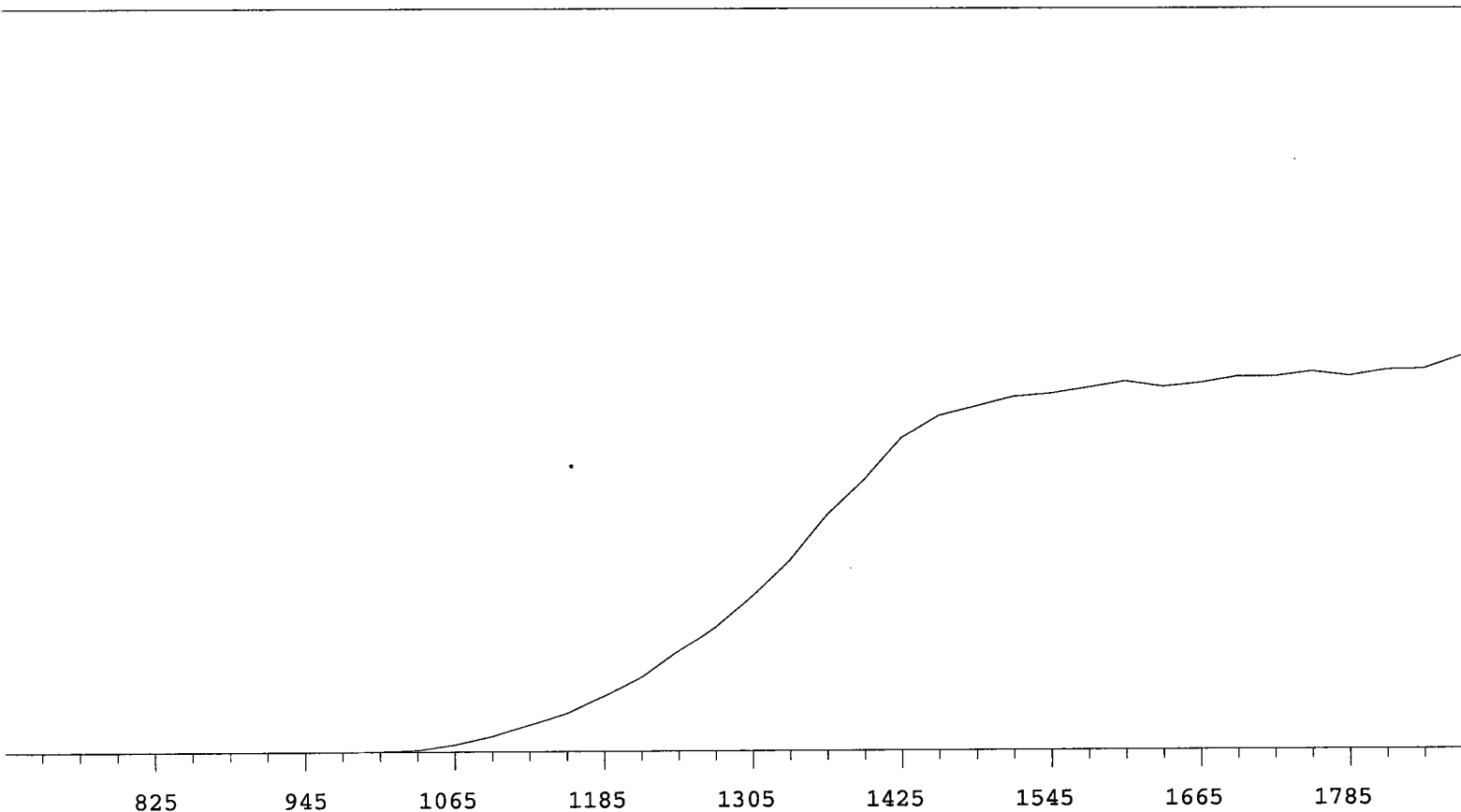
SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine
1	1A	15	36	1980	7/2/2009 8:39	7/2/2009 8:54	Protean
2	1B	15	27	1959	7/2/2009 8:40	7/2/2009 8:55	Protean
3	1C	15	44	2108	7/2/2009 8:40	7/2/2009 8:55	Protean
4	1D	15	108	2265	7/2/2009 8:40	7/2/2009 8:55	Protean
5	2A	15	69	1838	7/2/2009 8:40	7/2/2009 8:55	Protean
6	2B	15	8	2053	7/2/2009 8:40	7/2/2009 8:55	Protean
7	2C	15	96	1982	7/2/2009 8:40	7/2/2009 8:55	Protean
8	2D	15	93	1984	7/2/2009 9:08	7/2/2009 9:23	Protean
1	3A	15	233	1645	7/2/2009 9:08	7/2/2009 9:23	Protean
2	3B	15	99	1821	7/2/2009 9:08	7/2/2009 9:23	Protean
3	3C	15	96	1942	7/2/2009 9:08	7/2/2009 9:23	Protean
4	3D	15	90	2076	7/2/2009 9:08	7/2/2009 9:23	Protean
5	4A	15	79	1877	7/2/2009 9:08	7/2/2009 9:23	Protean
6	4B	15	13	1909	7/2/2009 9:08	7/2/2009 9:23	Protean
7	4C	15	97	1974	7/2/2009 9:09	7/2/2009 9:24	Protean
8	4D	15	181	1880	7/2/2009 9:25	7/2/2009 9:40	Protean
1	5A	15	53	1818	7/2/2009 9:26	7/2/2009 9:41	Protean
2	5B	15	59	1785	7/2/2009 9:26	7/2/2009 9:41	Protean
3	5C	15	43	2009	7/2/2009 9:26	7/2/2009 9:41	Protean
4	5D	15	59	2107	7/2/2009 9:26	7/2/2009 9:41	Protean
5	6A	15	35	1800	7/2/2009 9:27	7/2/2009 9:42	Protean
6	6B	15	71	1816	7/2/2009 9:27	7/2/2009 9:42	Protean
7	6C	15	81	1933	7/2/2009 9:27	7/2/2009 9:42	Protean
8	6D	15	81	1826	7/2/2009 9:47	7/2/2009 10:02	Protean
1	7A	15	75	1711	7/2/2009 9:48	7/2/2009 10:03	Protean
2	7B	15	59	1783	7/2/2009 9:48	7/2/2009 10:03	Protean
3	7C	15	74	1934	7/2/2009 9:48	7/2/2009 10:03	Protean
4	7D	15	83	1963	7/2/2009 9:48	7/2/2009 10:03	Protean
5	8A	15	49	1653	7/2/2009 9:48	7/2/2009 10:03	Protean
6	8B	15	20	1788	7/2/2009 9:48	7/2/2009 10:03	Protean
7	8C	15	34	1920	7/2/2009 9:48	7/2/2009 10:03	Protean
8	8D	15	45	1782	7/2/2009 10:07	7/2/2009 10:22	Protean
1	9A	15	17	1689	7/2/2009 10:06	7/2/2009 10:21	Protean
2	9B	15	13	1706	7/2/2009 10:06	7/2/2009 10:21	Protean
3	9C	15	13	1802	7/2/2009 10:06	7/2/2009 10:21	Protean
4	9D	15	15	1945	7/2/2009 10:06	7/2/2009 10:21	Protean
5	10A	15	10	1708	7/2/2009 10:07	7/2/2009 10:22	Protean
6	10B	15	19	1743	7/2/2009 10:07	7/2/2009 10:22	Protean
7	10C	15	15	1826	7/2/2009 10:07	7/2/2009 10:22	Protean
8	10D	15	14	1769	7/2/2009 10:22	7/2/2009 10:37	Protean
1	11A	15	19	2125	7/2/2009 7:26	7/2/2009 7:41	Protean
2	11B	15	22	2260	7/2/2009 7:26	7/2/2009 7:41	Protean
3	11C	15	13	2544	7/2/2009 7:26	7/2/2009 7:41	Protean
4	11D	15	14	2596	7/2/2009 7:26	7/2/2009 7:41	Protean
5	12A	15	17	2235	7/2/2009 7:26	7/2/2009 7:41	Protean
6	12B	15	10	2330	7/2/2009 7:26	7/2/2009 7:41	Protean
7	12C	15	16	2530	7/2/2009 7:26	7/2/2009 7:41	Protean
8	12D	15	10	2463	7/2/2009 7:26	7/2/2009 7:41	Protean
1	13A	15	11	2231	7/2/2009 7:49	7/2/2009 8:04	Protean
2	13B	15	13	2190	7/2/2009 7:49	7/2/2009 8:04	Protean
3	13C	15	11	2458	7/2/2009 7:49	7/2/2009 8:04	Protean

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7/2/09

4	13D	15	12	2635	7/2/2009 7:50	7/2/2009 8:05	Protean
5	14A	15	11	2173	7/2/2009 7:50	7/2/2009 8:05	Protean
6	14B	15	11	2281	7/2/2009 7:50	7/2/2009 8:05	Protean
7	14C	15	14	2323	7/2/2009 7:50	7/2/2009 8:05	Protean
8	14D	15	14	2388	7/2/2009 7:50	7/2/2009 8:05	Protean

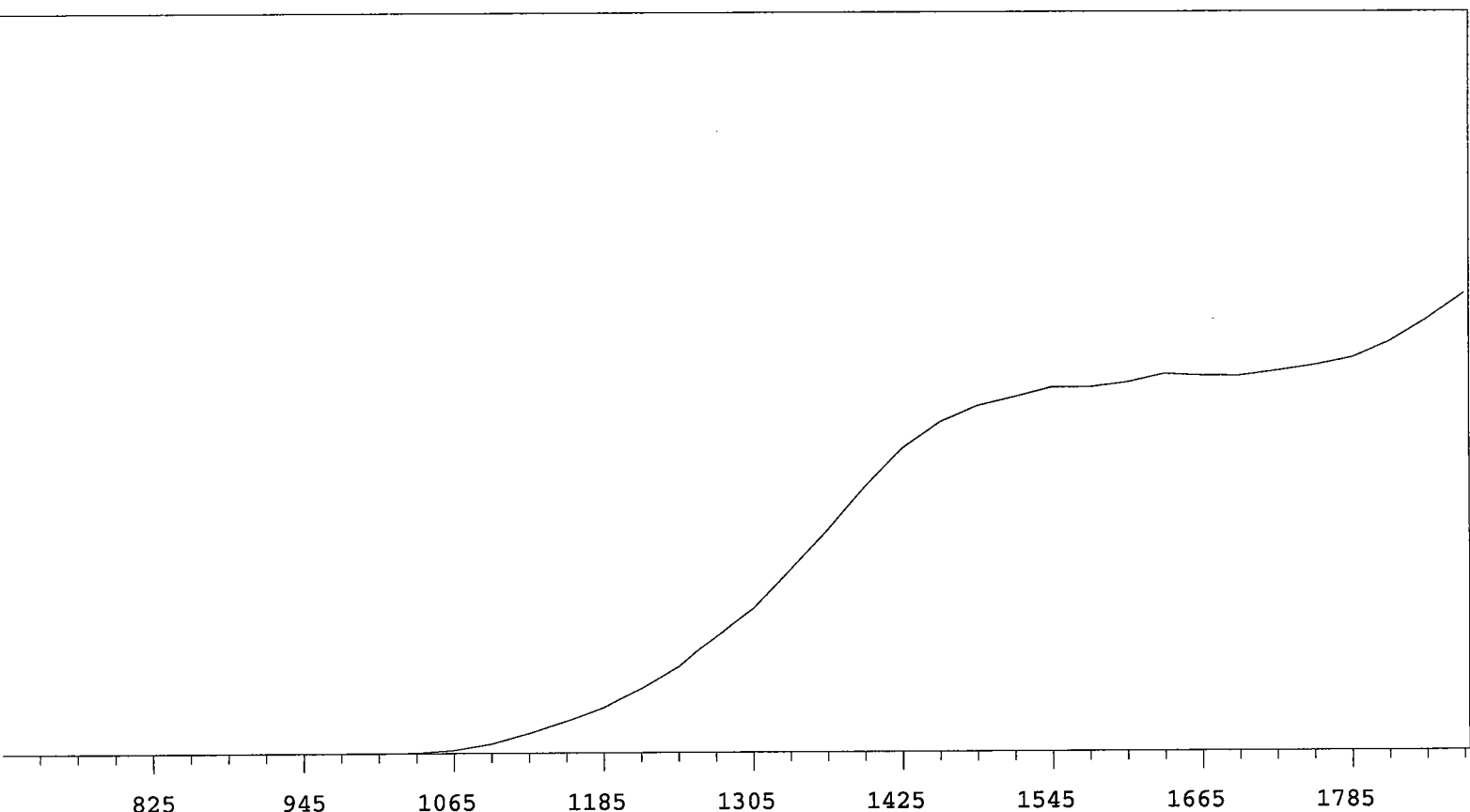
Ra-228 Protean	Cal Date A0	7/2/2009 A1	Exp Date A2	7/31/2009 A3	A4
1A	6.30258E-01				
1B	6.28221E-01				
1C	6.17615E-01				
1D	6.04341E-01				
2A	6.17224E-01				
2B	6.16681E-01				
2C	5.96919E-01				
2D	6.11886E-01				
3A	5.68218E-01				
3B	5.98041E-01				
3C	6.16431E-01				
3D	5.99405E-01				
4A	6.20765E-01				
4B	6.20459E-01				
4C	6.05183E-01				
4D	5.87325E-01				
5A	6.25790E-01				
5B	6.28027E-01				
5C	6.36802E-01				
5D	6.23741E-01				
6A	6.22050E-01				
6B	6.16280E-01				
6C	6.11053E-01				
6D	6.12043E-01				
7A	6.17961E-01				
7B	6.27962E-01				
7C	6.17791E-01				
7D	6.25720E-01				
8A	6.24723E-01				
8B	6.33167E-01				
8C	6.33890E-01				
8D	6.28089E-01				
9A	6.496412E-01				
9B	6.356321E-01				
9C	6.273008E-01				
9D	6.432553E-01				
10A	6.389066E-01				
10B	6.137441E-01				
10C	6.249999E-01				
10D	6.319781E-01				
11A	5.82502E-01				
11B	6.37172E-01				
11C	6.35171E-01				
11D	6.34840E-01				
12A	6.28566E-01				
12B	6.35234E-01				
12C	6.30366E-01				
12D	6.31956E-01				
13A	6.40953E-01				

13B	6.52643E-01
13C	6.53798E-01
13D	6.37701E-01
14A	6.39290E-01
14B	6.26611E-01
14C	6.37531E-01
14D	6.32609E-01



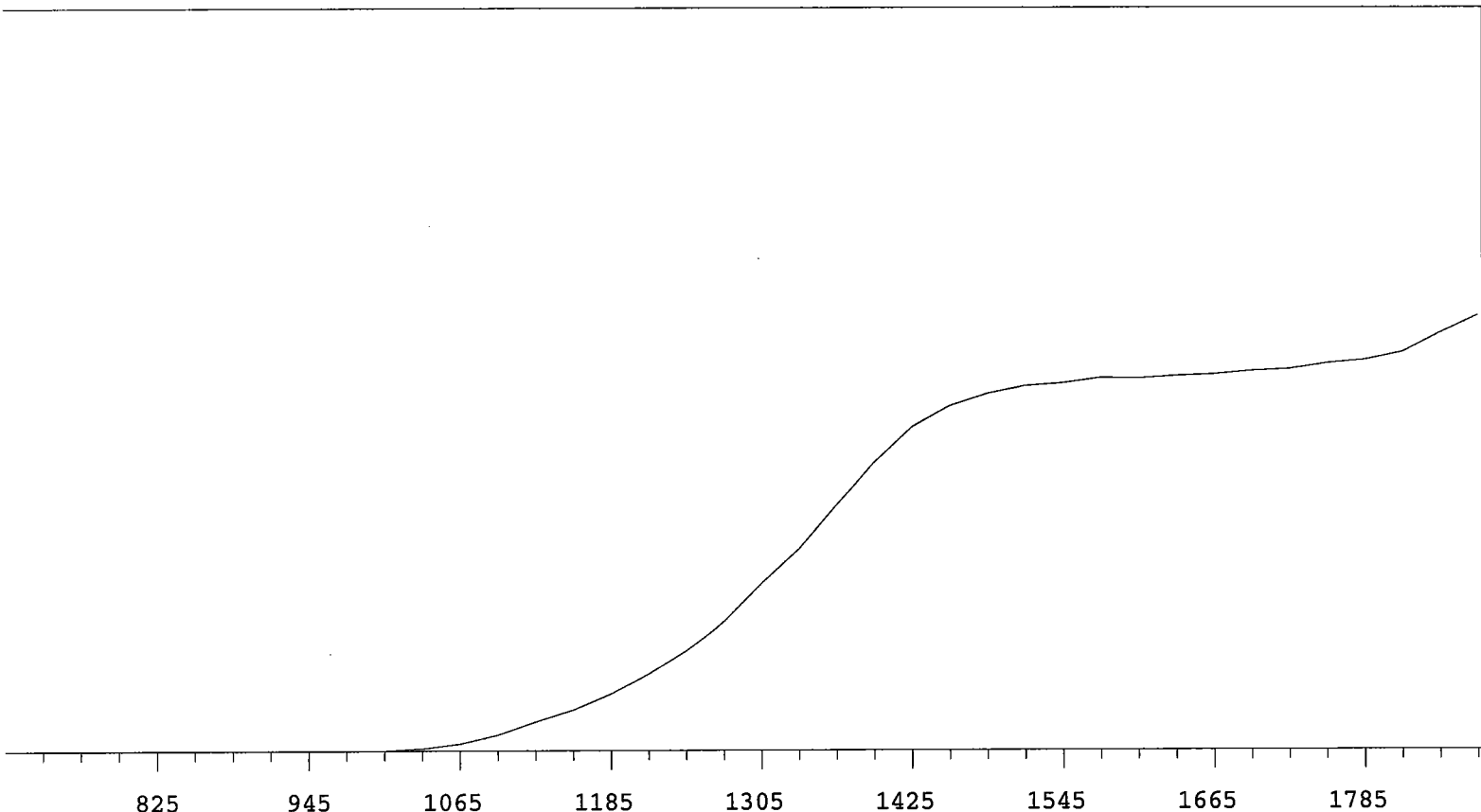
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	11640	+69.78
735	1		1335	14241	+62.88
765	0		1365	17534	+55.91
795	0	+0.00	1395	20127	+45.04
825	0	>100	1425	23254	+31.29
855	1	>100	1455	24902	+20.41
885	0	+55.56	1485	25605	+10.49
915	2	+66.67	1515	26310	+6.44
945	0	>100	1545	26535	+5.31
975	2	>100	1575	26953	+2.79
1005	42	>100	1605	27399	+1.83
1035	145	>100	1635	27000	+1.71
1065	544	>100	1665	27255	+1.62
1095	1136	>100	1695	27723	+3.14
1125	1967	>100	1725	27705	+1.56
1155	2845	>100	1755	28072	+1.15
1185	4078	>100	1785	27729	+1.43
1215	5483	+93.18	1815	28194	+3.24
1245	7400	+83.35	1845	28243	
1275	9328	+75.40	1875	29191	

Alpha Volts: 1575 Beta Volts: 1575

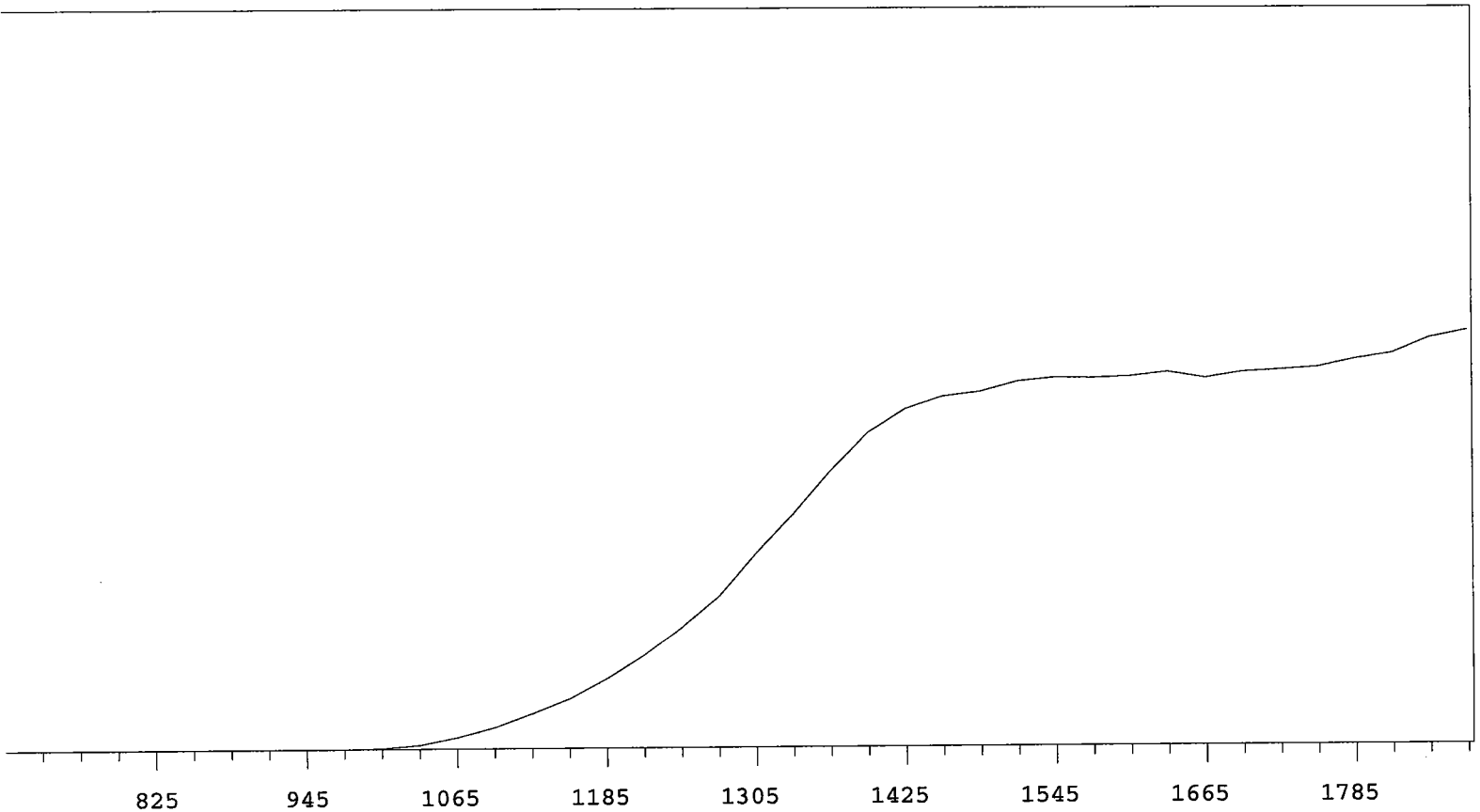


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	13188	+75.92
735	0		1335	16818	+67.60
765	0	+55.56	1365	20420	+59.86
795	1	+83.33	1395	24341	+47.85
825	1	+55.56	1425	27854	+35.51
855	0	>100	1455	30288	+23.26
885	1	+0.00	1485	31798	+14.54
915	0	+0.00	1515	32622	+8.32
945	1	>100	1545	33496	+5.11
975	0	>100	1575	33475	+4.43
1005	4	>100	1605	33903	+3.09
1035	56	>100	1635	34654	+2.46
1065	292	>100	1665	34485	+1.74
1095	890	>100	1695	34445	+1.84
1125	1841	>100	1725	34908	+3.91
1155	2936	>100	1755	35401	+6.80
1185	4179	>100	1785	36062	+10.27
1215	5837	>100	1815	37505	+14.30
1245	7821	+91.28	1845	39508	
1275	10638	+83.88	1875	41843	

Alpha Volts: 1575 Beta Volts: 1575



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	14817	+71.06
735	0		1335	17823	+63.34
765	1	+0.00	1365	21704	+53.63
795	0	>100	1395	25422	+42.55
825	1	-55.56	1425	28424	+29.21
855	1	+55.56	1455	30244	+18.11
885	0	>100	1485	31305	+10.10
915	1	>100	1515	31989	+6.07
945	0	>100	1545	32223	+3.43
975	4	>100	1575	32671	+2.15
1005	32	>100	1605	32621	+1.68
1035	206	>100	1635	32837	+1.52
1065	639	>100	1665	32961	+2.01
1095	1416	>100	1695	33249	+2.64
1125	2551	>100	1725	33409	+3.21
1155	3619	>100	1755	33931	+4.07
1185	5037	+98.68	1785	34234	+7.20
1215	6875	+91.19	1815	34909	+10.28
1245	8915	+85.53	1845	36660	
1275	11519	+77.28	1875	38205	

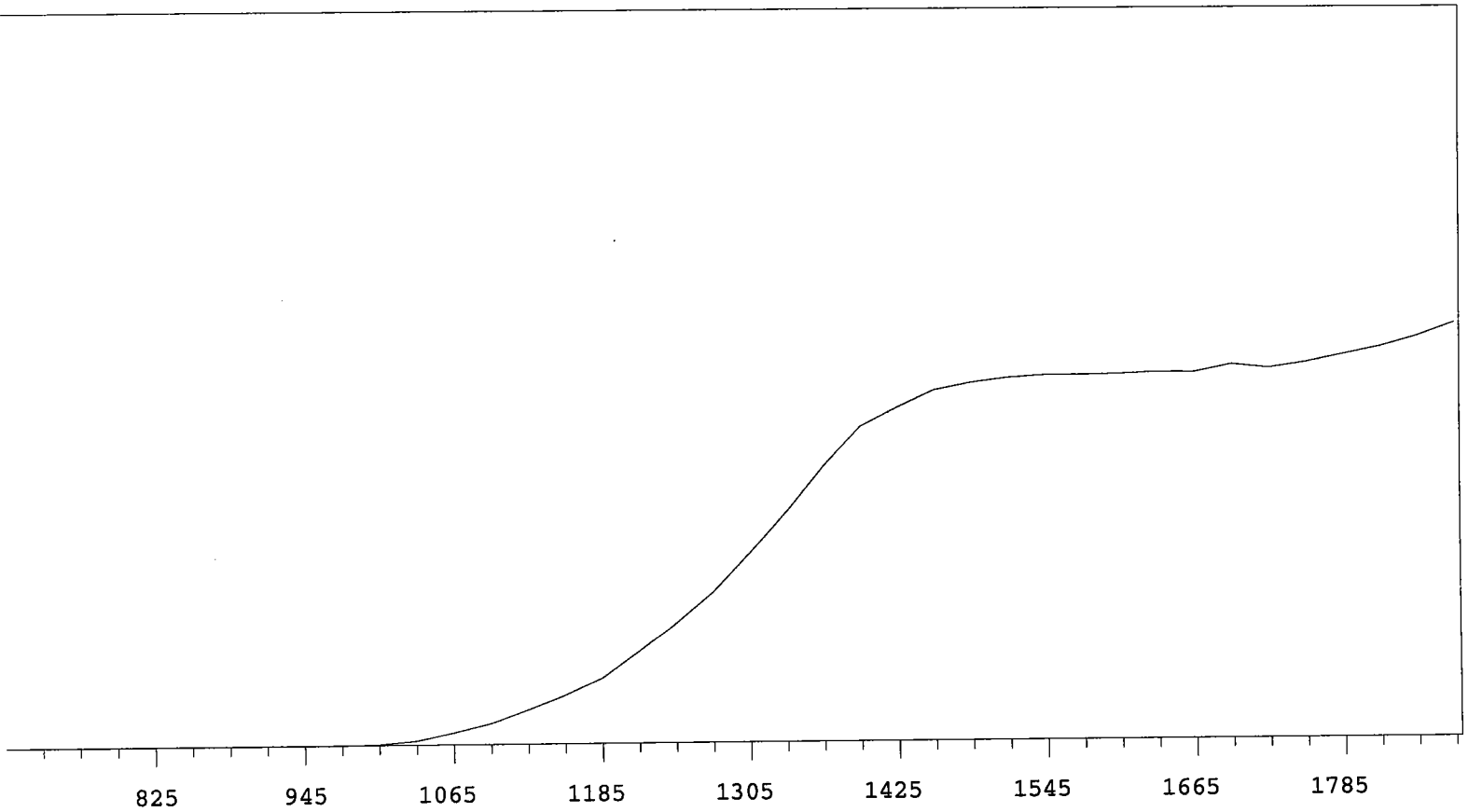


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	15202	+66.36
735	1		1335	18216	+57.86
765	0	+0.00	1365	21597	+45.58
795	1	+0.00	1395	24648	+32.96
825	0	+0.00	1425	26505	+19.92
855	1	>100	1455	27475	+11.42
885	0	>100	1485	27836	+7.08
915	0	>100	1515	28609	+4.51
945	0	>100	1545	28896	+2.93
975	8	>100	1575	28862	+1.66
1005	75	>100	1605	28969	+0.36
1035	303	>100	1635	29292	+0.80
1065	872	>100	1665	28836	+1.06
1095	1656	>100	1695	29279	+1.48
1125	2729	>100	1725	29439	+3.59
1155	3862	>100	1755	29642	+4.07
1185	5425	+98.19	1785	30243	+6.51
1215	7256	+88.82	1815	30699	+7.79
1245	9510	+81.89	1845	31876	
1275	11944	+74.07	1875	32444	

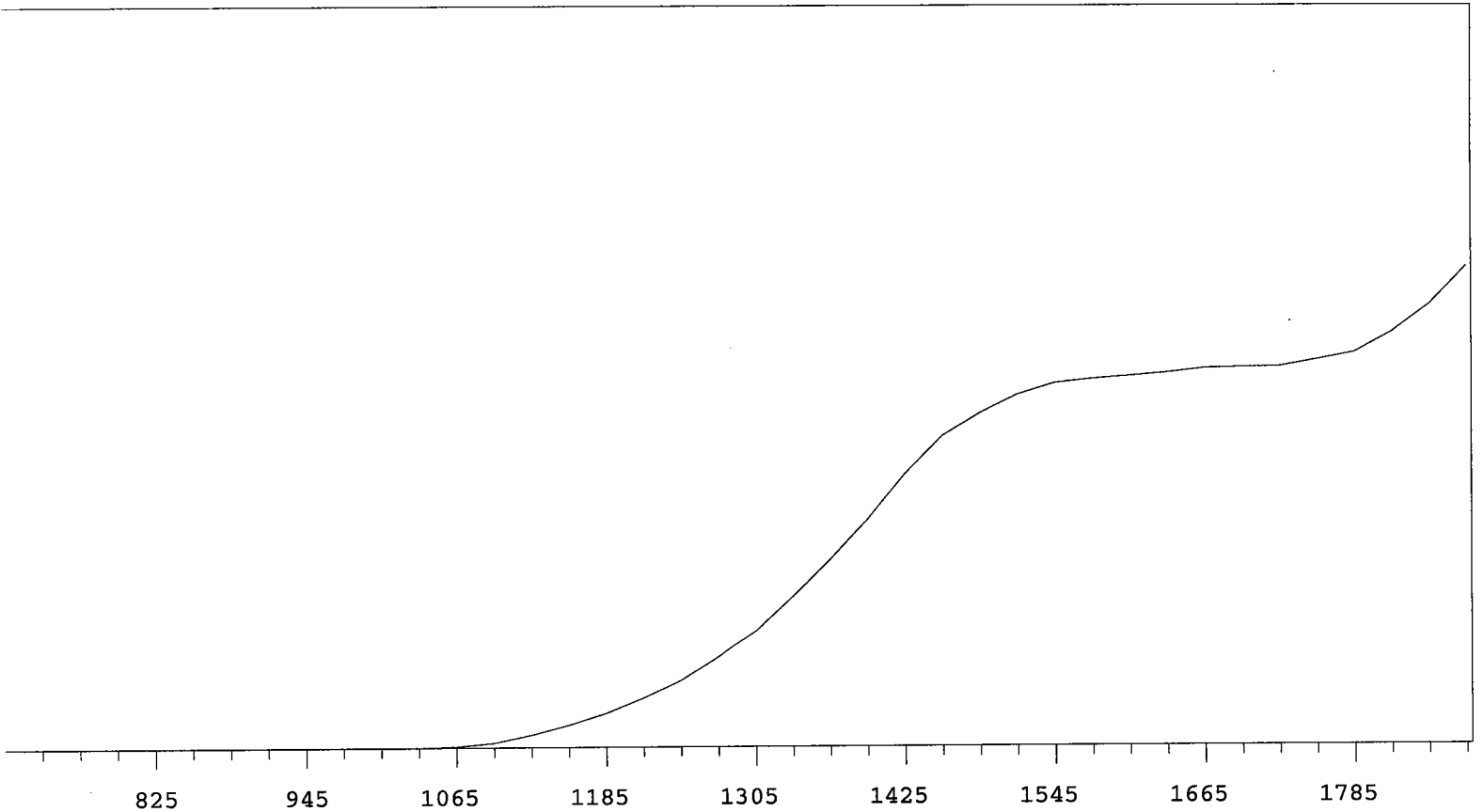
MPC 9600 Plateau
 Alpha Volts: 705

Instrument 2 MPC 9604 Detector A
 Beta Volts: 1575

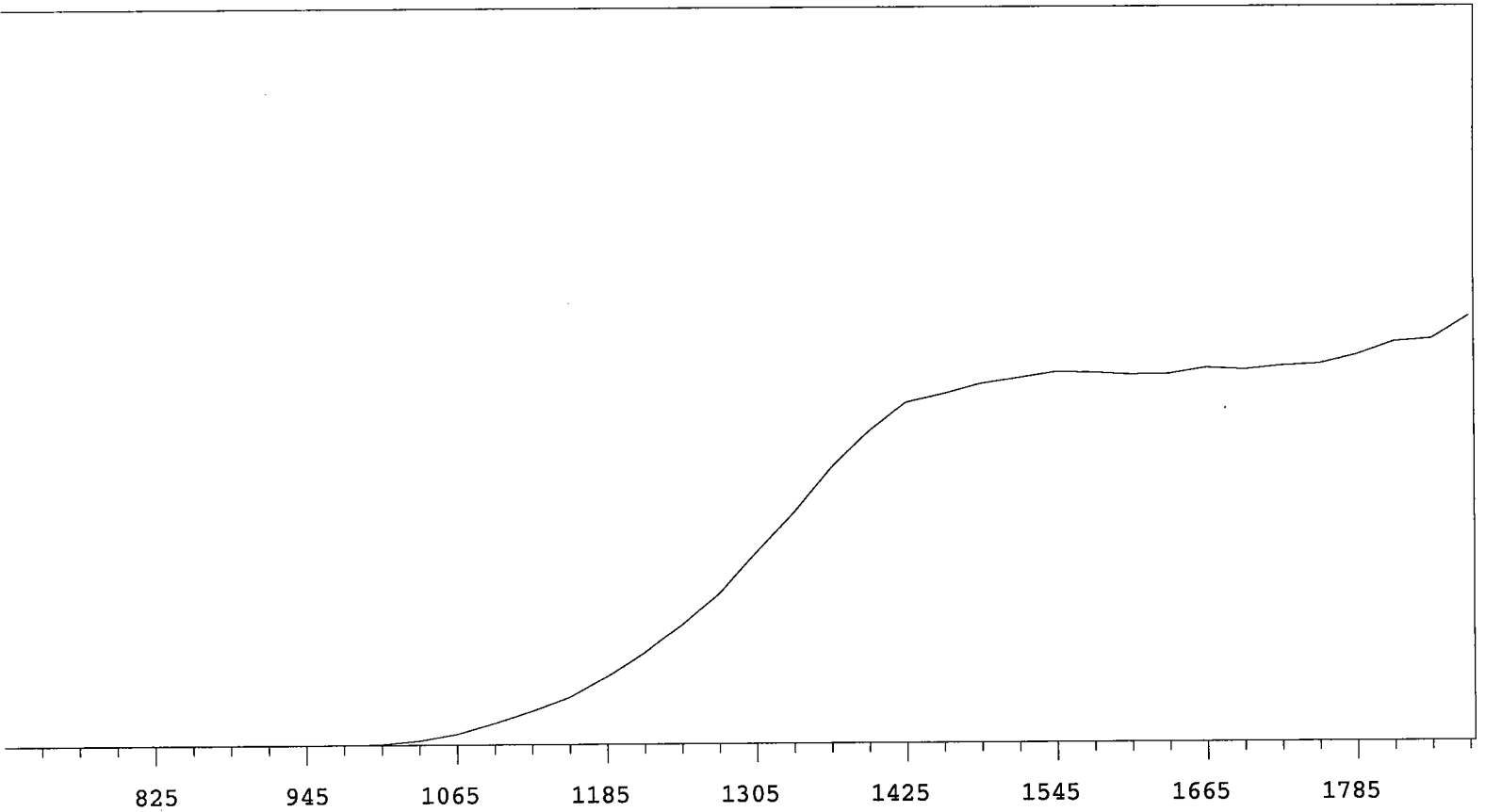
7/1/2009



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	19017	+67.45
735	1		1335	23157	+59.23
765	0	+83.33	1365	27625	+45.78
795	0	-83.33	1395	31465	+32.72
825	1	>100	1425	33352	+20.41
855	0	>100	1455	35084	+11.74
885	1	+100.00	1485	35819	+7.11
915	1	>100	1515	36292	+3.35
945	2	>100	1545	36527	+1.63
975	12	>100	1575	36540	+0.87
1005	91	>100	1605	36585	+0.48
1035	421	>100	1635	36742	+1.76
1065	1239	>100	1665	36691	+1.53
1095	2155	>100	1695	37461	+1.89
1125	3527	>100	1725	37073	+3.07
1155	4974	>100	1755	37603	+4.02
1185	6647	+97.44	1785	38346	+6.58
1215	9250	+89.00	1815	39111	+7.95
1245	12041	+82.15	1845	40115	
1275	15094	+73.81	1875	41409	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	12541	+83.18
735	1		1335	16192	+74.48
765	0		1365	20083	+67.17
795	0	>100	1395	24273	+58.43
825	0	>100	1425	29090	+46.86
855	0	>100	1455	33223	+34.56
885	0	>100	1485	35608	+22.67
915	0	>100	1515	37581	+13.63
945	1	>100	1545	38762	+8.18
975	2	>100	1575	39185	+4.42
1005	3	>100	1605	39484	+3.06
1035	14	>100	1635	39806	+2.61
1065	127	>100	1665	40264	+2.03
1095	500	>100	1695	40353	+2.32
1125	1332	>100	1725	40431	+3.28
1155	2373	>100	1755	41127	+7.09
1185	3614	>100	1785	41882	+12.40
1215	5227	>100	1815	44049	+18.52
1245	7060	+97.33	1845	46950	
1275	9574	+90.30	1875	51097	

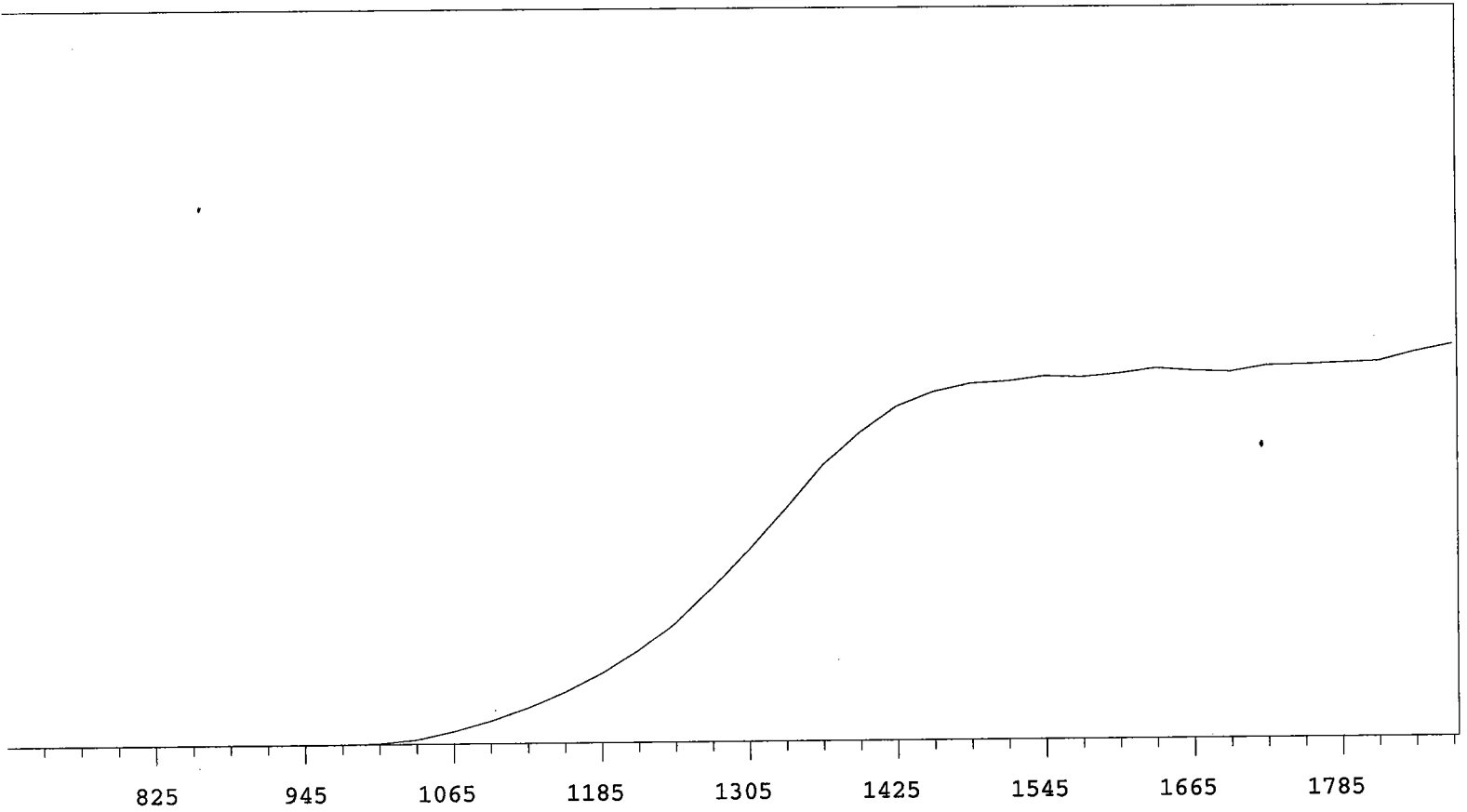


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	18216	+67.74
735	0		1335	21995	+58.11
765	0		1365	26173	+46.11
795	0	>100	1395	29479	+32.75
825	0	>100	1425	32186	+20.62
855	0	>100	1455	33022	+12.13
885	0	>100	1485	33981	+7.22
915	1	>100	1515	34520	+4.95
945	0	>100	1545	35095	+2.07
975	17	>100	1575	35014	+0.38
1005	87	>100	1605	34812	+0.55
1035	438	>100	1635	34859	+1.11
1065	1055	>100	1665	35460	+1.94
1095	2114	>100	1695	35273	+1.95
1125	3282	>100	1725	35629	+2.73
1155	4625	>100	1755	35811	+5.77
1185	6554	+97.66	1785	36656	+6.44
1215	8743	+88.09	1815	37896	+9.21
1245	11345	+81.31	1845	38145	
1275	14261	+74.60	1875	40283	

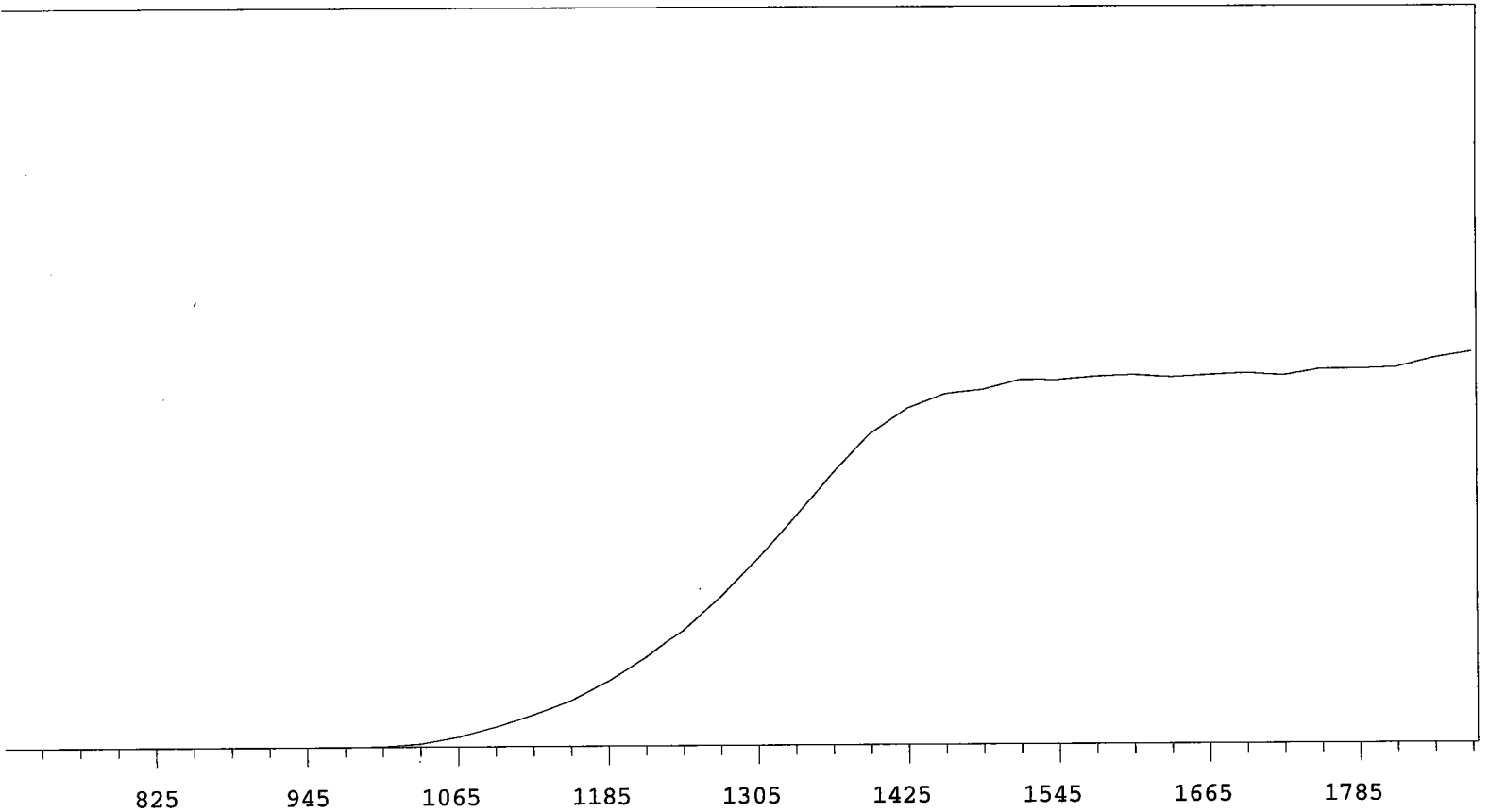
MPC 9600 Plateau
Alpha Volts: 705

Instrument 2 MPC 9604 Detector D
Beta Volts: 1575

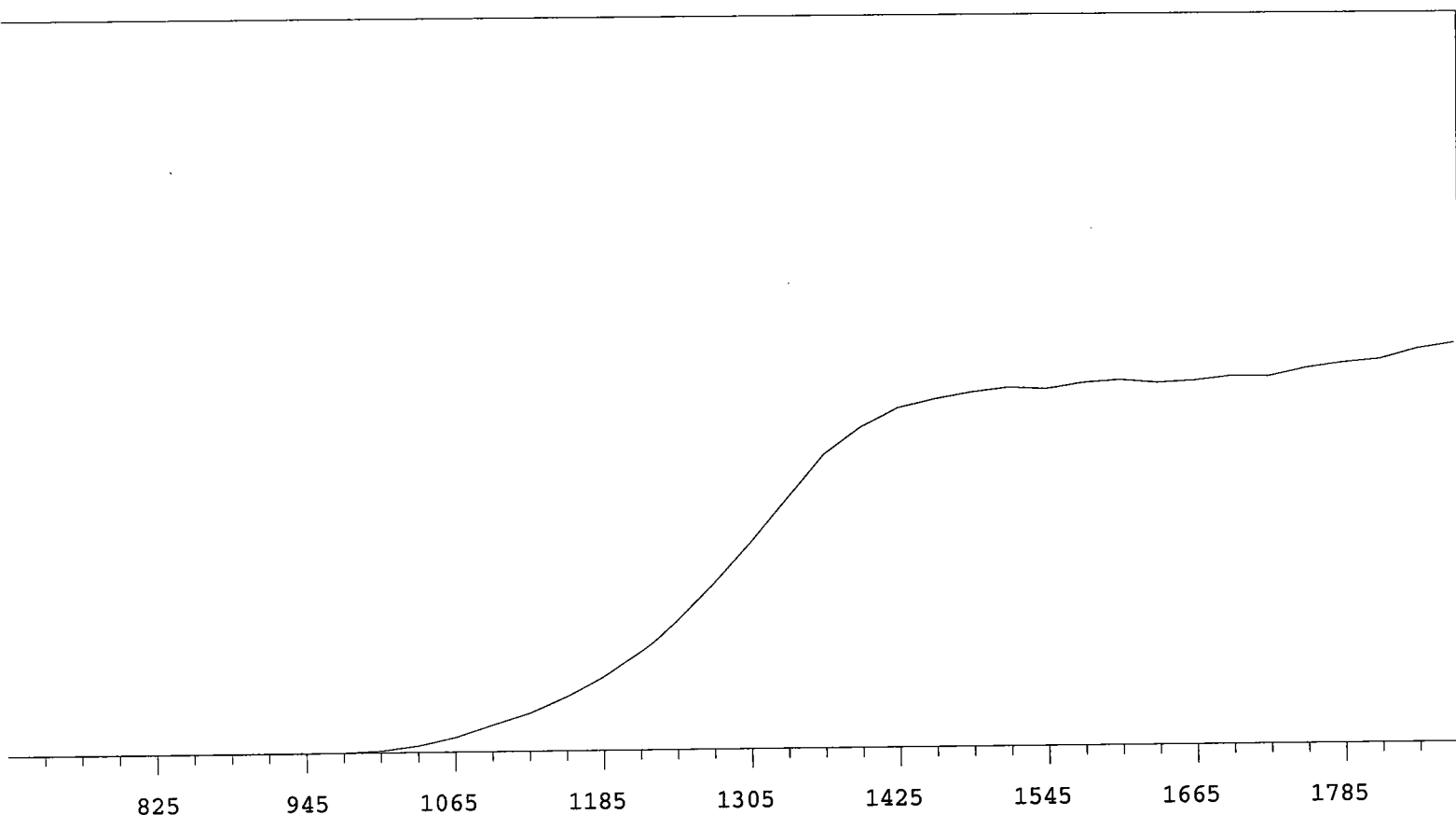
7/1/2009



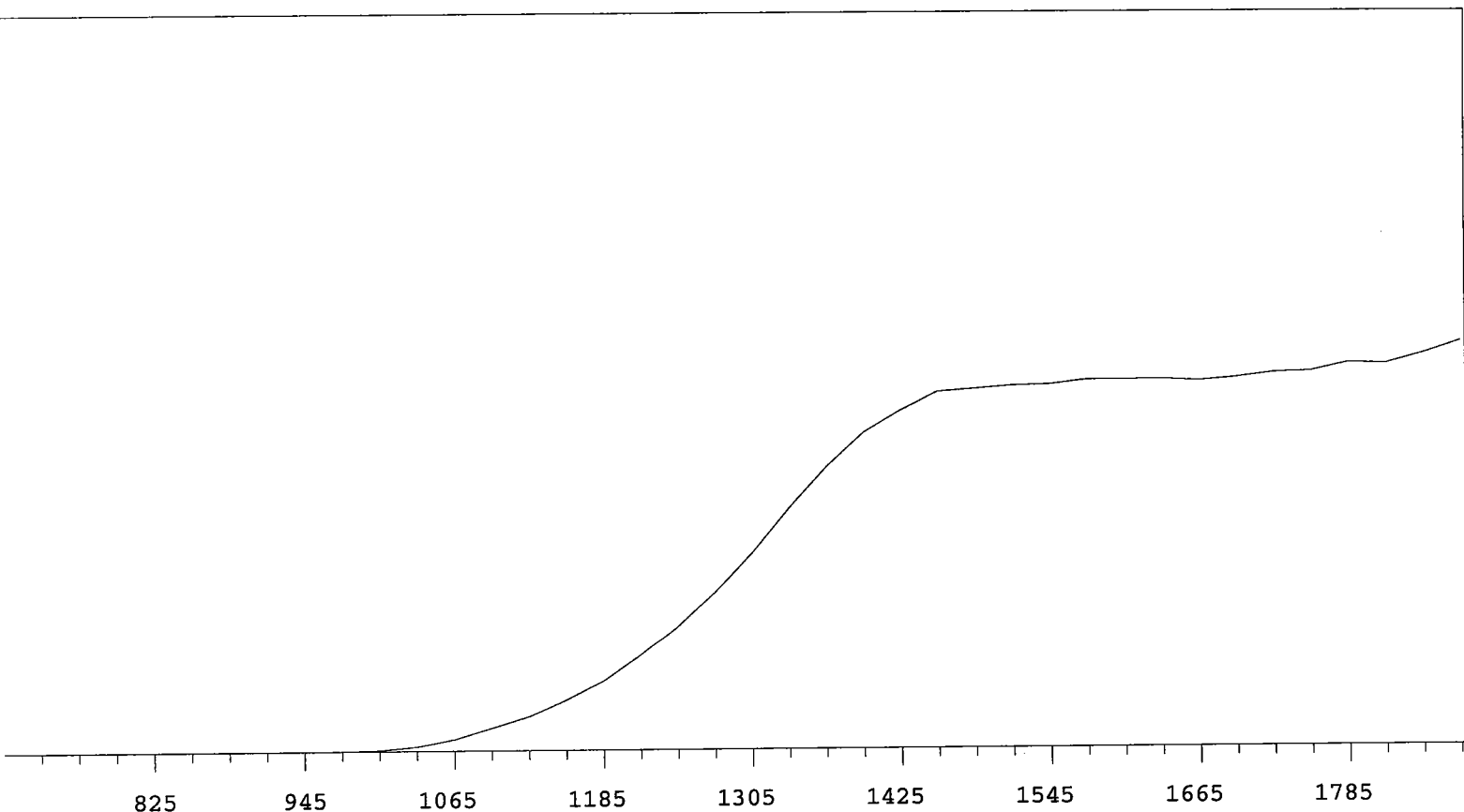
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	18675	+65.94
735	0		1335	22620	+55.69
765	0	+83.33	1365	26869	+44.63
795	2	+55.56	1395	29957	+32.08
825	1	>100	1425	32494	+20.49
855	0	>100	1455	33836	+11.98
885	0	>100	1485	34627	+6.45
915	0	>100	1515	34849	+3.22
945	2	>100	1545	35298	+1.98
975	9	>100	1575	35180	+2.37
1005	89	>100	1605	35503	+1.57
1035	439	>100	1635	36006	+0.99
1065	1198	>100	1665	35722	+0.89
1095	2164	>100	1695	35597	+0.93
1125	3436	>100	1725	36188	+1.86
1155	4917	>100	1755	36272	+1.90
1185	6762	+96.59	1785	36389	+2.55
1215	9006	+89.14	1815	36529	+4.39
1245	11800	+81.34	1845	37459	
1275	15132	+73.59	1875	38170	



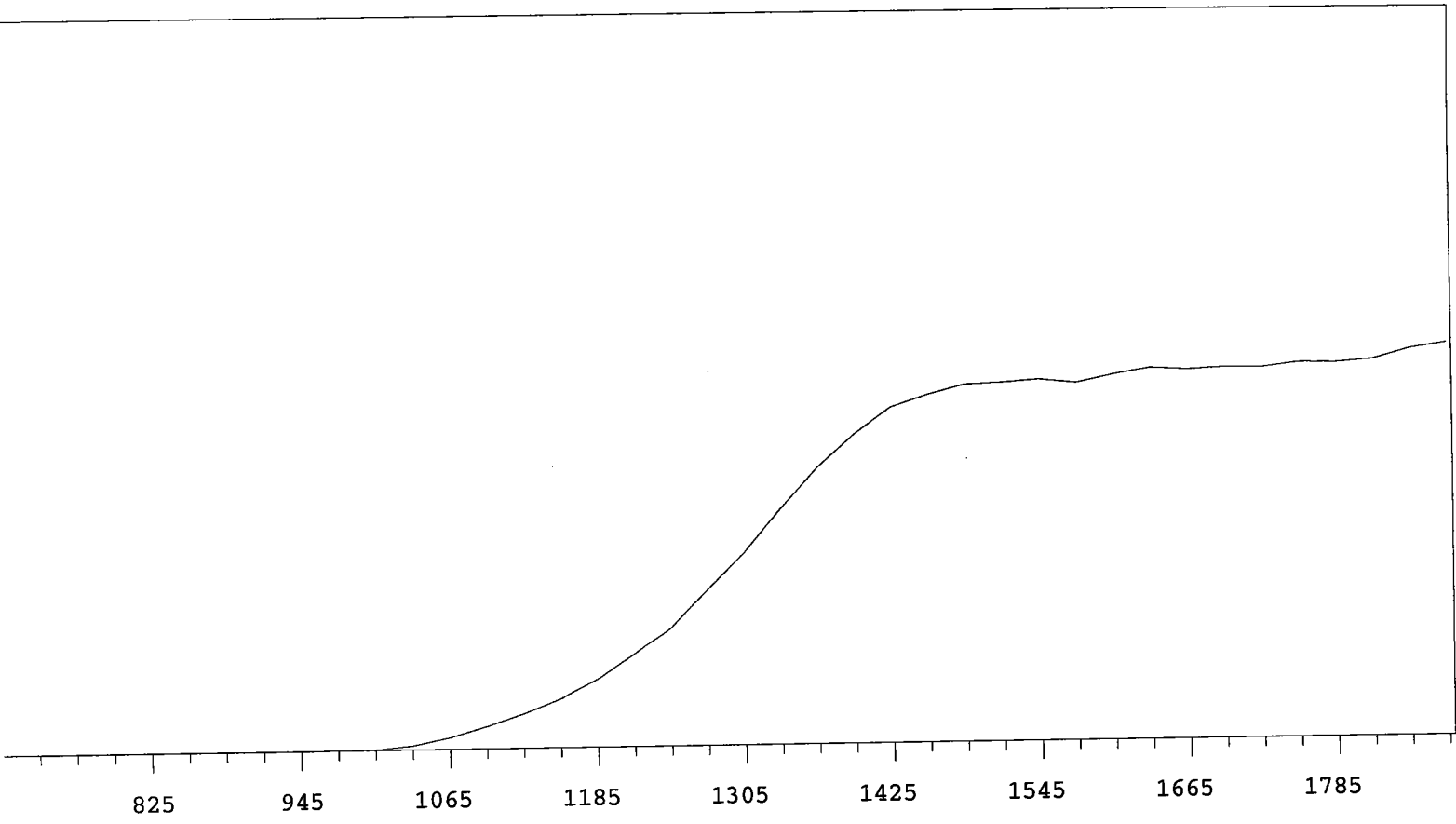
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	16654	+68.57
735	0		1335	20416	+59.26
765	0	+55.56	1365	24191	+47.28
795	1	>100	1395	27643	+34.04
825	1	+0.00	1425	29891	+21.08
855	1	>100	1455	31183	+12.30
885	0	>100	1485	31558	+6.67
915	0	>100	1515	32444	+4.05
945	0	>100	1545	32413	+2.90
975	9	>100	1575	32704	+0.81
1005	53	>100	1605	32837	+0.71
1035	302	>100	1635	32629	+0.49
1065	878	>100	1665	32797	+0.16
1095	1805	>100	1695	32964	+1.32
1125	2887	>100	1725	32746	+1.40
1155	4163	>100	1755	33308	+1.56
1185	5842	+99.81	1785	33318	+3.21
1215	7959	+90.90	1815	33456	+3.92
1245	10323	+83.03	1845	34283	
1275	13250	+75.91	1875	34815	



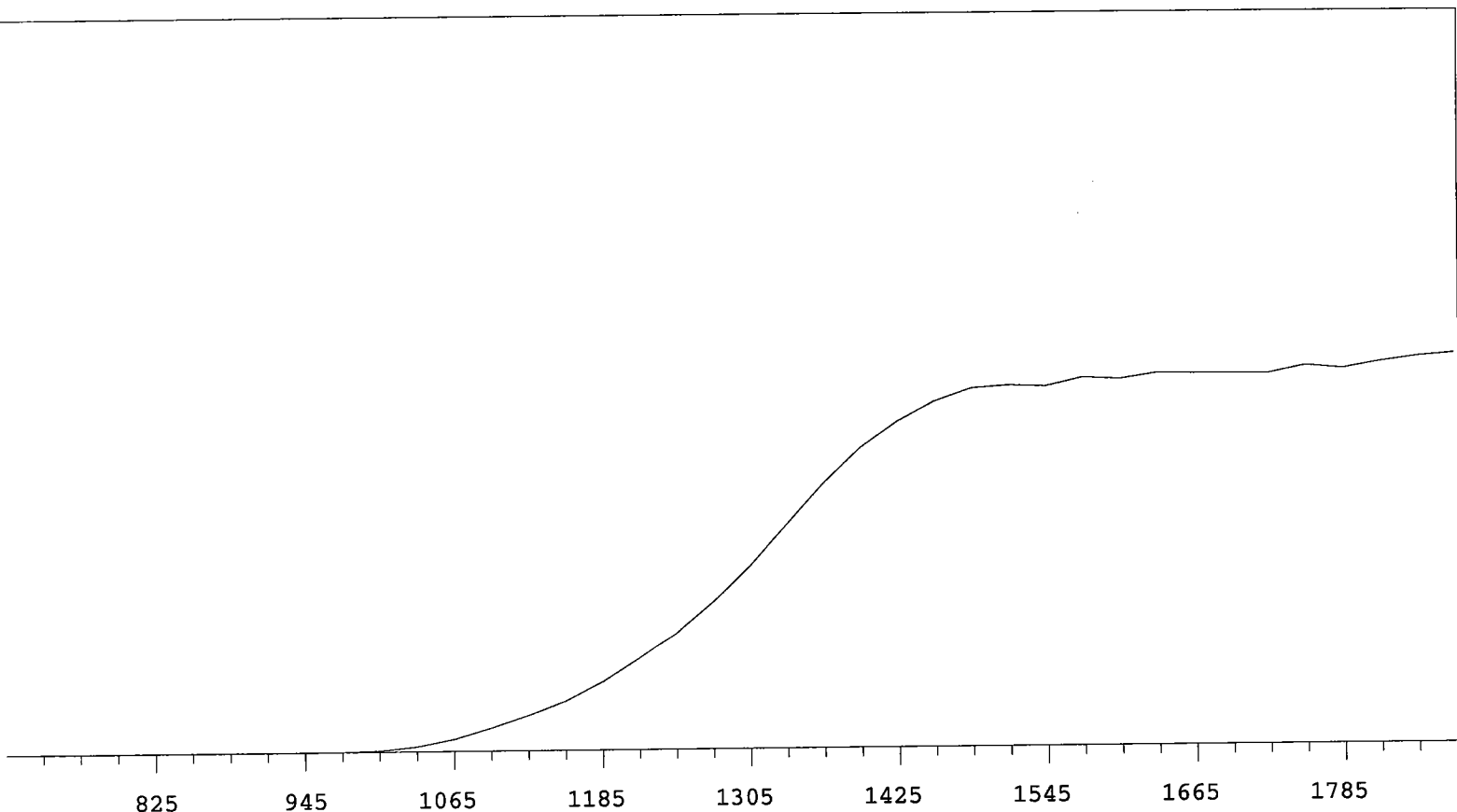
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	19810	+64.73
735	1		1335	23962	+52.62
765	0	-55.56	1365	28091	+39.27
795	0	>100	1395	30594	+25.61
825	1	>100	1425	32381	+14.86
855	3	+33.33	1455	33206	+8.91
885	0	+0.00	1485	33832	+4.41
915	1	>100	1515	34260	+3.01
945	2	>100	1545	34071	+2.33
975	29	>100	1575	34623	+1.34
1005	165	>100	1605	34848	+1.22
1035	613	>100	1635	34564	+0.89
1065	1394	>100	1665	34733	+1.01
1095	2558	>100	1695	35144	+2.76
1125	3702	>100	1725	35084	+3.66
1155	5222	>100	1755	35839	+3.97
1185	7161	+96.06	1785	36332	+5.39
1215	9507	+89.18	1815	36654	+5.35
1245	12552	+81.52	1845	37609	
1275	16030	+73.64	1875	38164	



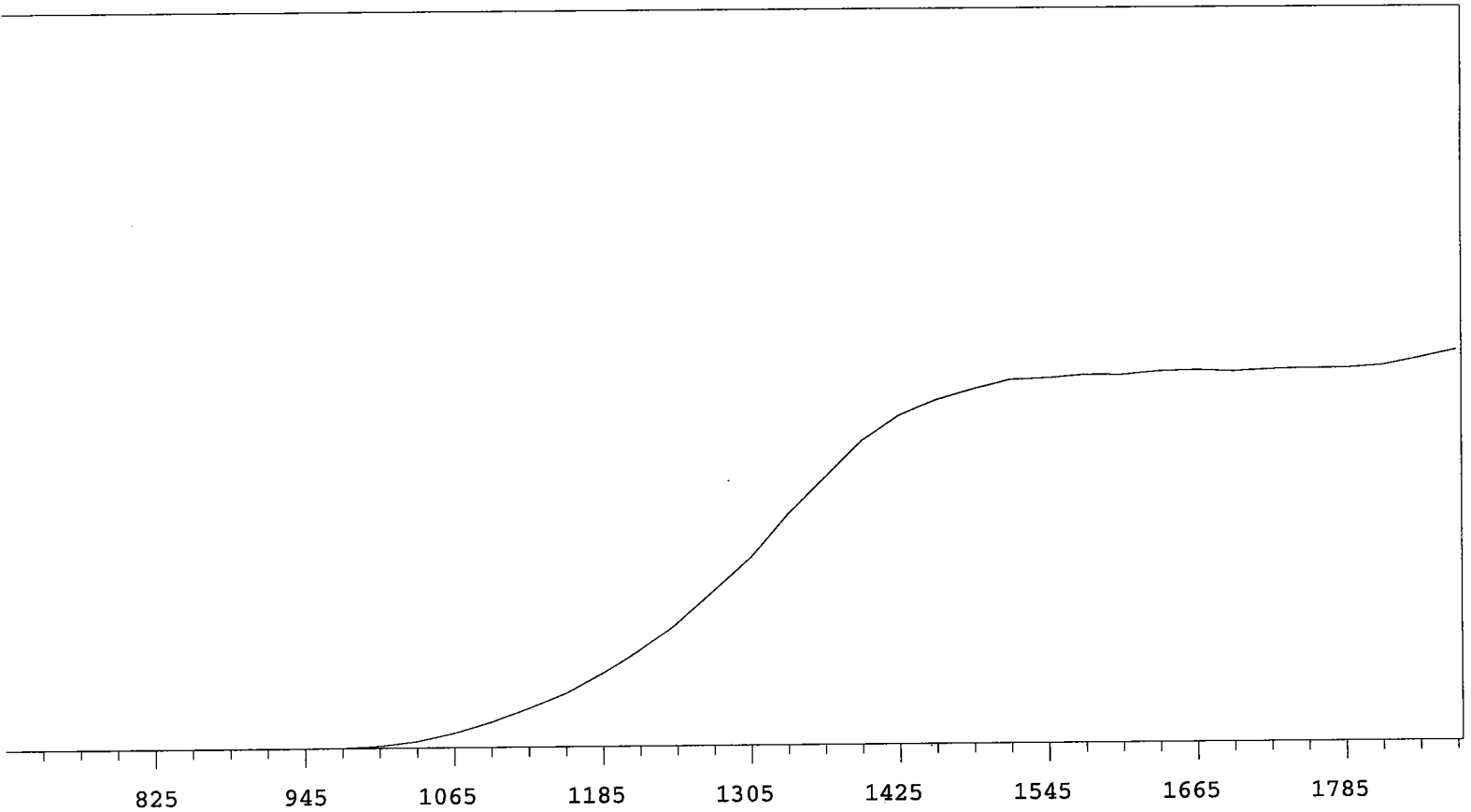
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	21412	+66.80
735	1		1335	26262	+56.32
765	1		1365	30679	+43.71
795	0	>100	1395	34466	+31.61
825	0	+0.00	1425	36949	+20.14
855	0	>100	1455	38998	+11.16
885	1	>100	1485	39313	+5.34
915	1	>100	1515	39625	+2.44
945	1	>100	1545	39751	+2.04
975	17	>100	1575	40227	+1.45
1005	122	>100	1605	40228	+0.56
1035	533	>100	1635	40255	+0.13
1065	1287	>100	1665	40075	+1.22
1095	2493	>100	1695	40384	+1.95
1125	3753	>100	1725	40900	+3.50
1155	5482	>100	1755	41028	+3.05
1185	7538	+99.39	1785	41899	+3.71
1215	10305	+90.31	1815	41767	+5.64
1245	13415	+82.57	1845	42852	
1275	17141	+75.13	1875	44132	



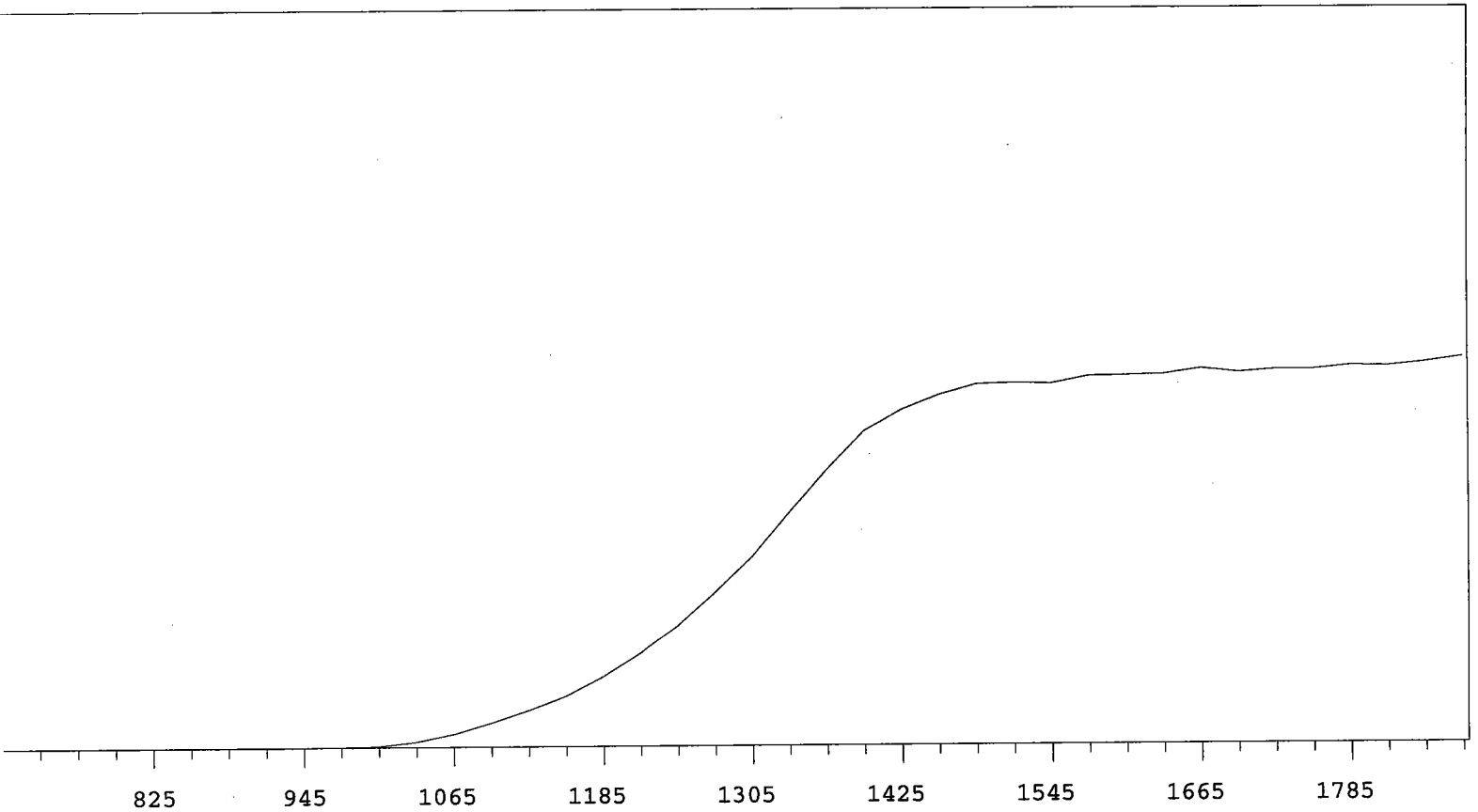
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	14171	+66.45
735	1		1335	17362	+54.90
765	0	+0.00	1365	20310	+43.83
795	1	>100	1395	22647	+30.82
825	0	+83.33	1425	24551	+20.19
855	0	-83.33	1455	25440	+11.69
885	1	>100	1485	26124	+5.90
915	0	>100	1515	26245	+2.21
945	1	>100	1545	26428	+1.39
975	12	>100	1575	26151	+2.69
1005	51	>100	1605	26721	+2.72
1035	298	>100	1635	27168	+2.80
1065	848	>100	1665	27007	+0.87
1095	1649	>100	1695	27135	+0.70
1125	2535	>100	1725	27089	+1.24
1155	3602	>100	1755	27414	+1.43
1185	5036	+98.31	1785	27373	+3.21
1215	6880	+91.37	1815	27581	+4.34
1245	8822	+82.29	1845	28332	
1275	11546	+74.61	1875	28750	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16442	+66.24
735	0		1335	20146	+57.40
765	0		1365	23769	+46.40
795	0	>100	1395	26926	+34.68
825	2	+55.56	1425	29276	+24.40
855	1	>100	1455	31037	+15.28
885	0	-55.56	1485	32197	+7.91
915	3	>100	1515	32425	+4.33
945	0	>100	1545	32314	+2.14
975	16	>100	1575	33071	+2.66
1005	114	>100	1605	32918	+2.52
1035	451	>100	1635	33435	+1.02
1065	1100	>100	1665	33382	+0.73
1095	2068	>100	1695	33349	+1.07
1125	3189	>100	1725	33324	+1.28
1155	4386	>100	1755	34001	+2.26
1185	6094	+94.81	1785	33701	+3.08
1215	8184	+87.09	1815	34304	+2.97
1245	10489	+78.88	1845	34744	
1275	13273	+72.66	1875	35012	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	15747	+62.38
735	1		1335	19230	+54.19
765	0	+0.00	1365	22255	+44.46
795	1	>100	1395	25299	+32.45
825	0	>100	1425	27370	+22.24
855	0	>100	1455	28625	+14.10
885	0	>100	1485	29467	+8.56
915	0	>100	1515	30213	+5.29
945	2	>100	1545	30326	+2.77
975	31	>100	1575	30564	+1.57
1005	176	>100	1605	30548	+1.52
1035	550	>100	1635	30820	+0.85
1065	1218	>100	1665	30898	+0.79
1095	2114	>100	1695	30779	+0.44
1125	3212	>100	1725	30934	+0.45
1155	4416	>100	1755	31008	+0.96
1185	6066	+92.28	1785	30991	+2.01
1215	7936	+85.60	1815	31196	+3.80
1245	10288	+76.79	1845	31781	
1275	13020	+70.59	1875	32406	

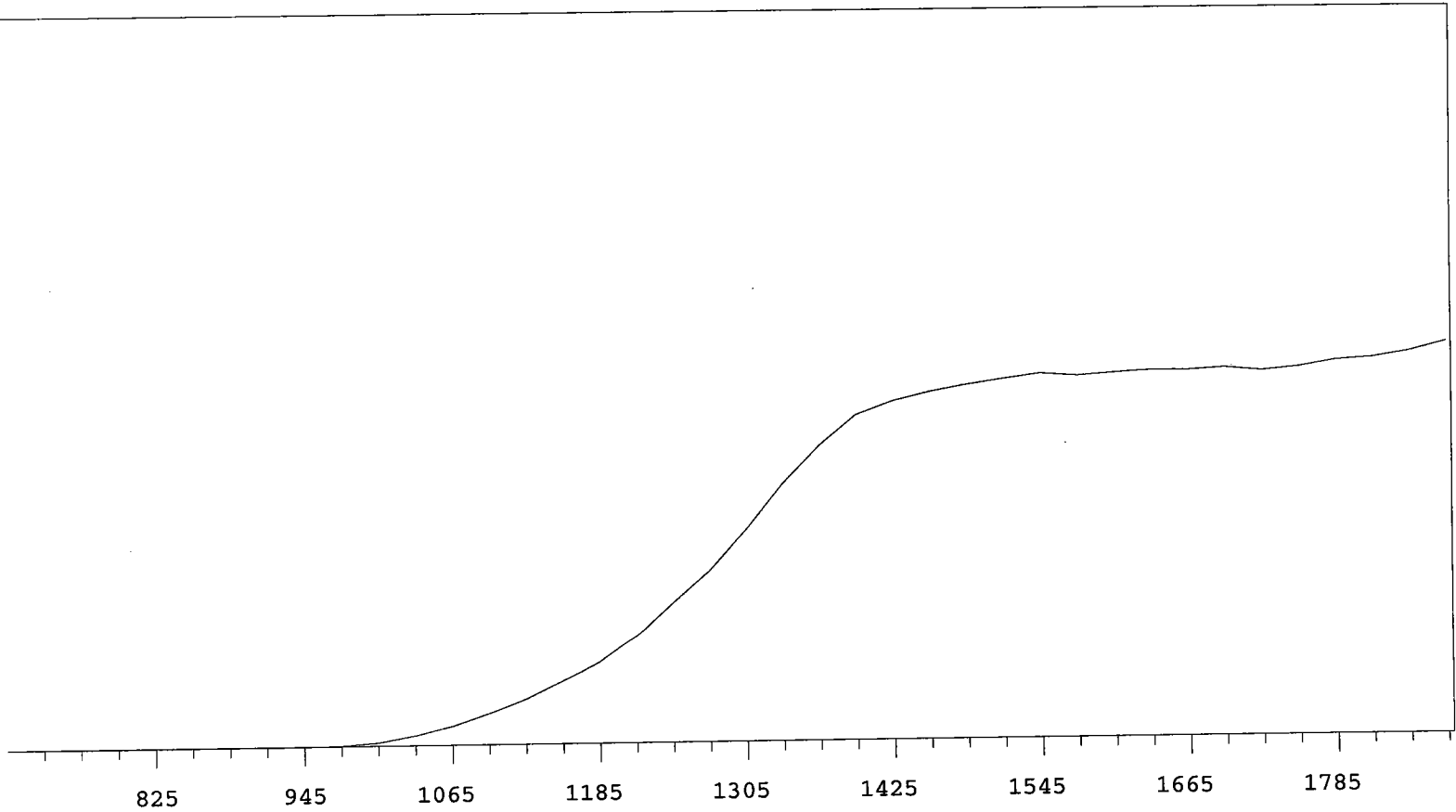


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	19796	+65.77
735	1		1335	24338	+57.55
765	0	+55.56	1365	28686	+45.86
795	2	+0.00	1395	32750	+32.27
825	0	-55.56	1425	34919	+20.83
855	1	>100	1455	36434	+11.45
885	0	>100	1485	37487	+5.80
915	0	>100	1515	37623	+3.32
945	2	>100	1545	37528	+2.07
975	24	>100	1575	38277	+2.12
1005	134	>100	1605	38338	+2.70
1035	558	>100	1635	38426	+1.12
1065	1361	>100	1665	39007	+1.06
1095	2511	>100	1695	38592	+0.64
1125	3762	>100	1725	38870	+0.63
1155	5246	>100	1755	38868	+1.30
1185	7268	+96.29	1785	39238	+1.45
1215	9733	+88.98	1815	39169	+2.34
1245	12701	+79.94	1845	39570	
1275	16176	+73.13	1875	40086	

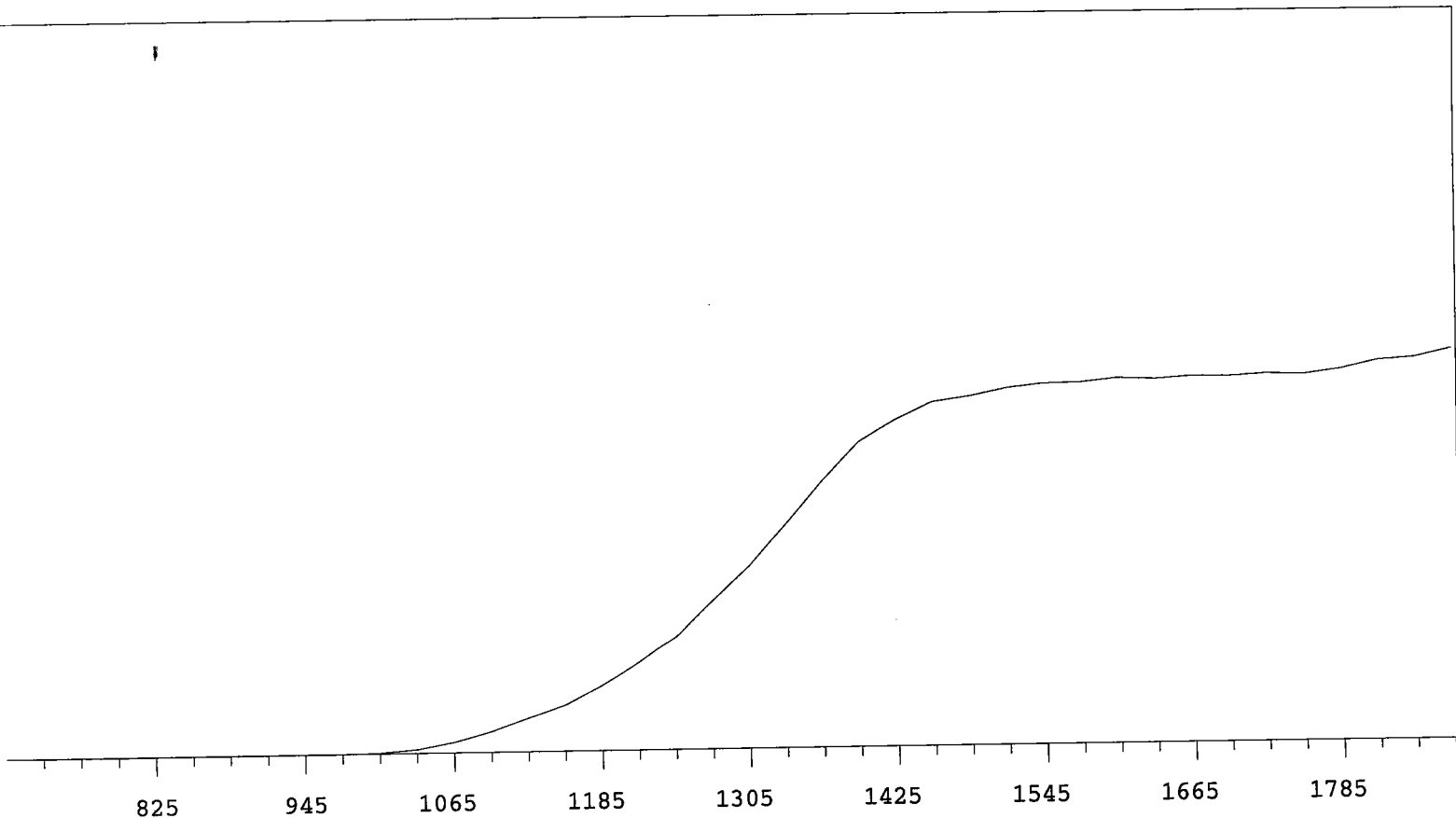
MPC 9600 Plateau
Alpha Volts: 705

Instrument 4 MPC 9604 Detector D
Beta Volts: 1575

7/1/2009



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	18491	+61.09
735	0		1335	22444	+51.56
765	0	+0.00	1365	25756	+37.44
795	0	>100	1395	28379	+23.82
825	1	+83.33	1425	29517	+14.00
855	1	+55.56	1455	30309	+8.08
885	0	+0.00	1485	30874	+6.03
915	1	>100	1515	31345	+3.66
945	1	>100	1545	31782	+2.17
975	60	>100	1575	31567	+1.31
1005	297	>100	1605	31789	+0.78
1035	855	>100	1635	31963	+1.34
1065	1647	>100	1665	31956	+0.29
1095	2700	>100	1695	32123	+0.20
1125	3921	>100	1725	31850	+1.46
1155	5471	+96.54	1755	32114	+2.39
1185	7042	+90.21	1785	32665	+3.95
1215	9405	+82.23	1815	32876	+4.96
1245	12266	+76.33	1845	33399	
1275	14989	+69.38	1875	34206	

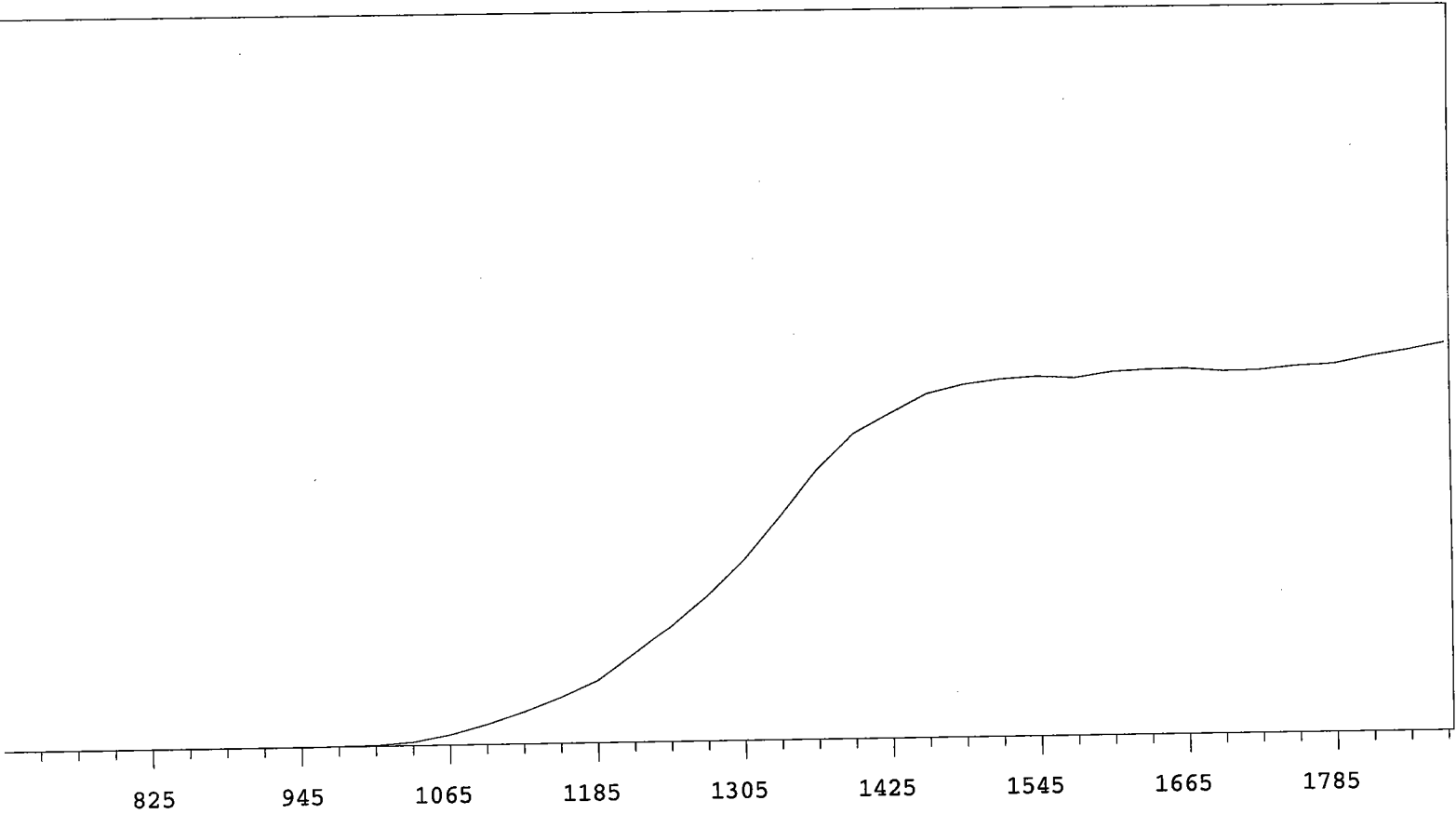


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	13974	+68.00
735	0		1335	17170	+58.62
765	1		1365	20456	+47.04
795	1	+83.33	1395	23332	+33.83
825	1	-83.33	1425	24996	+21.10
855	1	>100	1455	26290	+12.40
885	0	-55.56	1485	26683	+7.74
915	0	>100	1515	27270	+4.43
945	1	>100	1545	27590	+3.48
975	9	>100	1575	27635	+1.71
1005	76	>100	1605	27932	+1.20
1035	308	>100	1635	27807	+0.88
1065	814	>100	1665	28006	+0.62
1095	1600	>100	1695	27964	+0.63
1125	2598	>100	1725	28112	+0.98
1155	3596	>100	1755	28020	+2.84
1185	5065	+96.05	1785	28392	+3.76
1215	6773	+90.23	1815	29028	+5.17
1245	8717	+81.43	1845	29220	
1275	11391	+74.83	1875	29849	

MPC 9600 Plateau
 Alpha Volts: 705

Instrument 5 MPC 9604 Detector B
 Beta Volts: 1575

7/1/2009

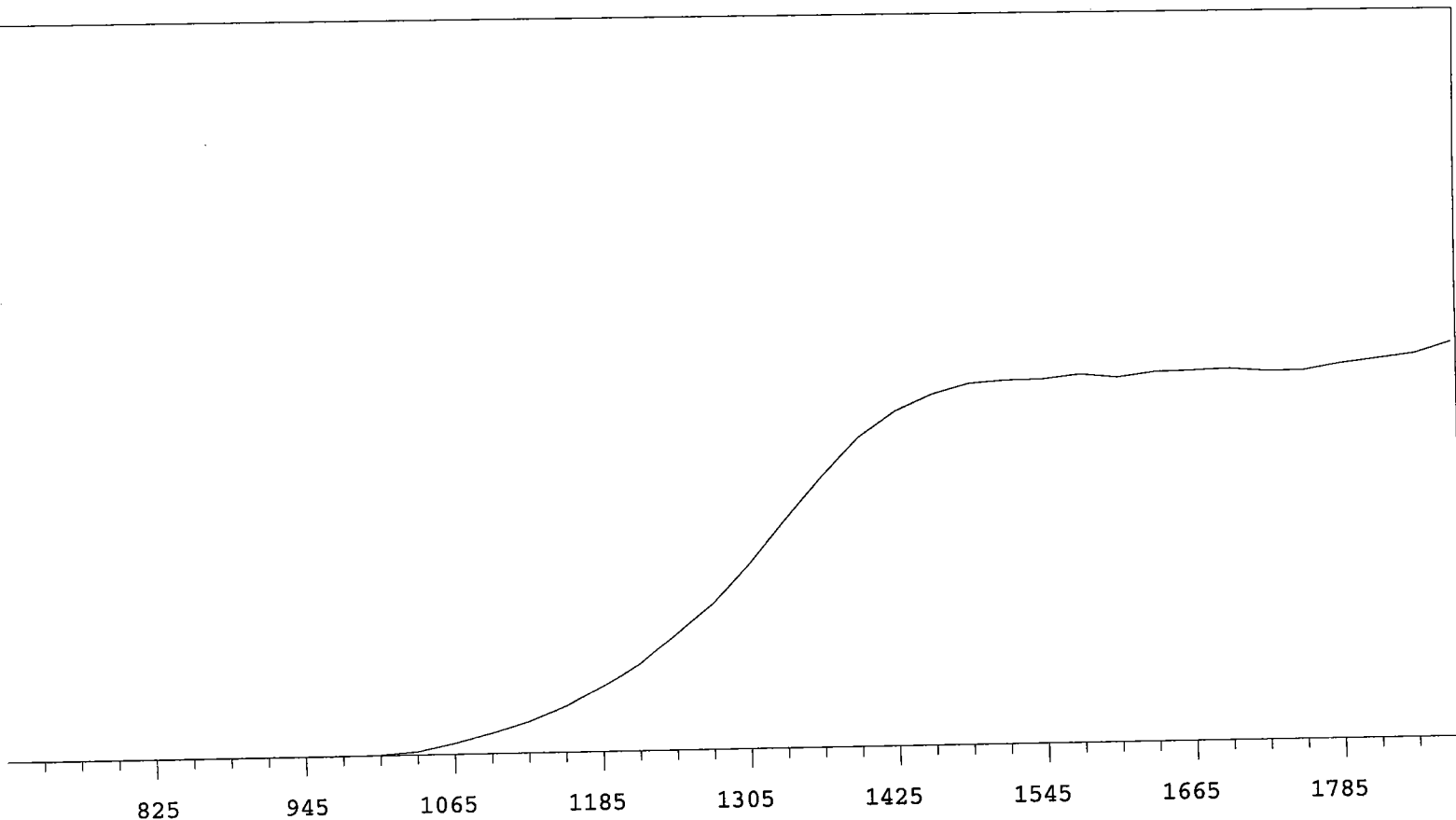


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	17414	+68.46
735	0		1335	21540	+59.98
765	0		1365	25854	+46.75
795	0	>100	1395	29222	+33.38
825	1	>100	1425	31128	+21.52
855	1	+41.67	1455	32995	+13.26
885	2	-33.33	1485	33846	+8.09
915	0	>100	1515	34289	+3.25
945	1	>100	1545	34528	+2.00
975	17	>100	1575	34311	+1.78
1005	87	>100	1605	34866	+1.78
1035	336	>100	1635	35046	+1.14
1065	1010	>100	1665	35087	-0.26
1095	1955	>100	1695	34795	+0.11
1125	3124	>100	1725	34857	+0.93
1155	4486	>100	1755	35220	+2.81
1185	6017	>100	1785	35363	+3.98
1215	8507	+91.20	1815	36028	+4.79
1245	11148	+82.59	1845	36577	
1275	14003	+74.21	1875	37207	

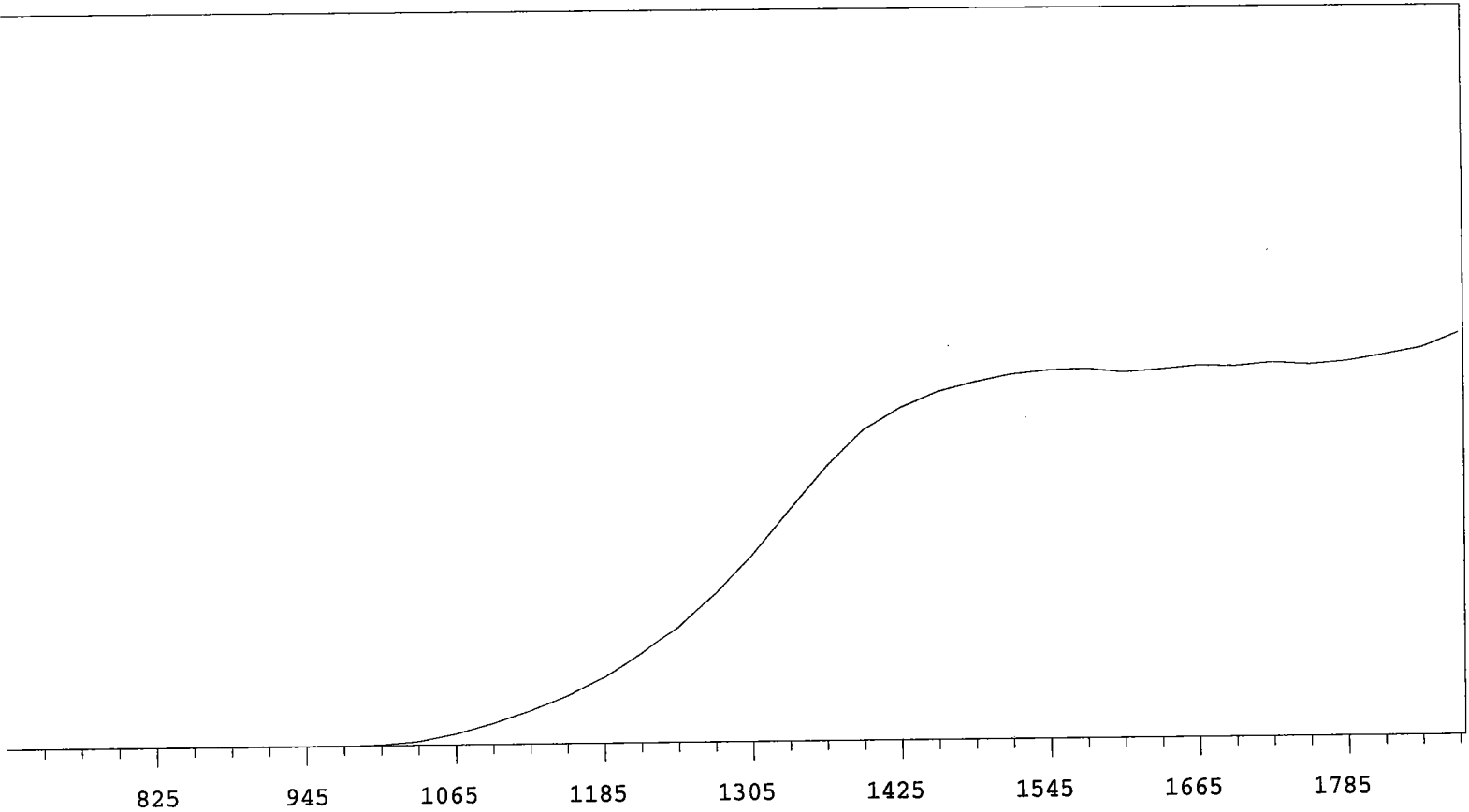
MPC 9600 Plateau
Alpha Volts: 705

Instrument 5 MPC 9604 Detector C
Beta Volts: 1575

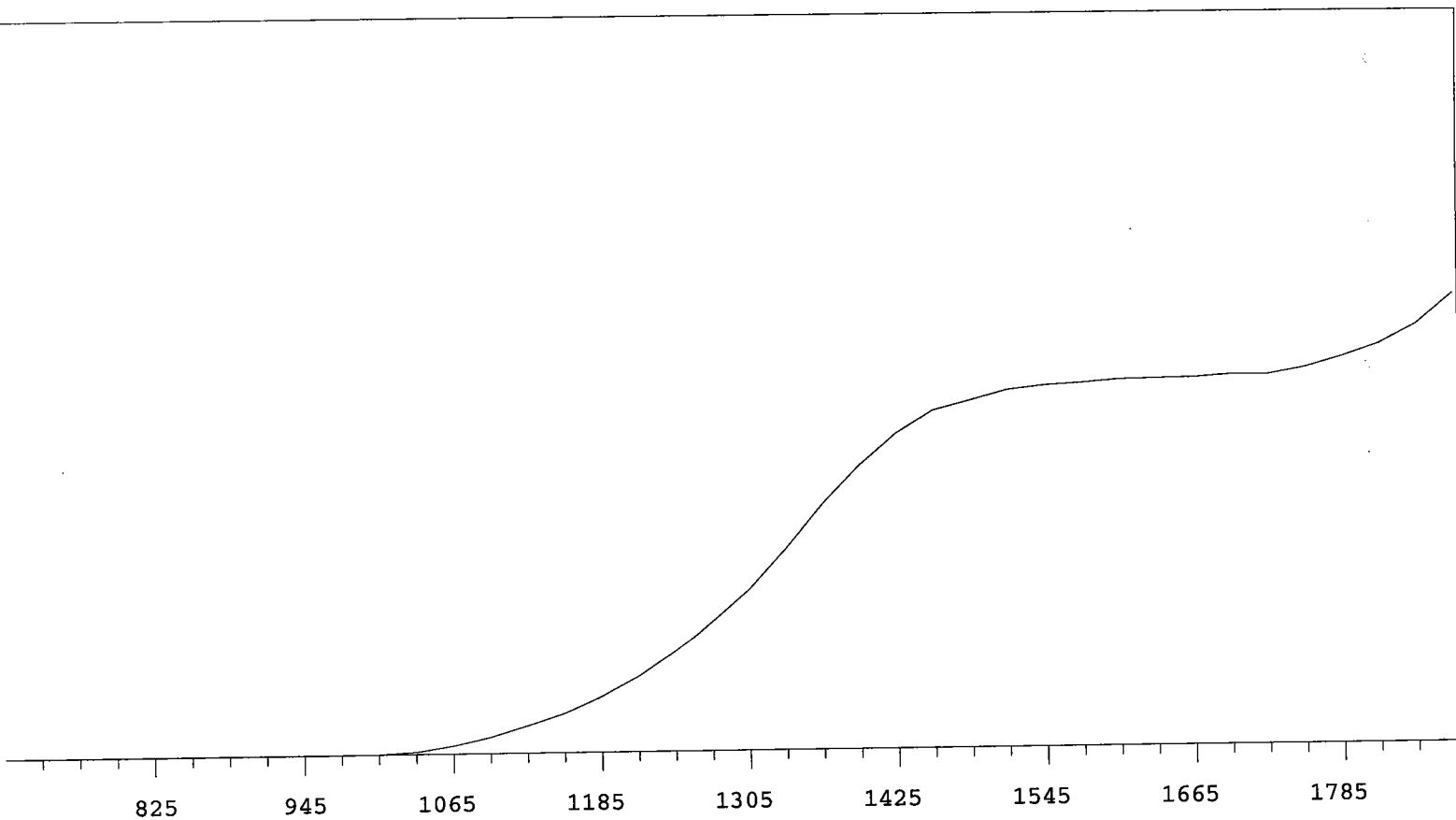
7/1/2009



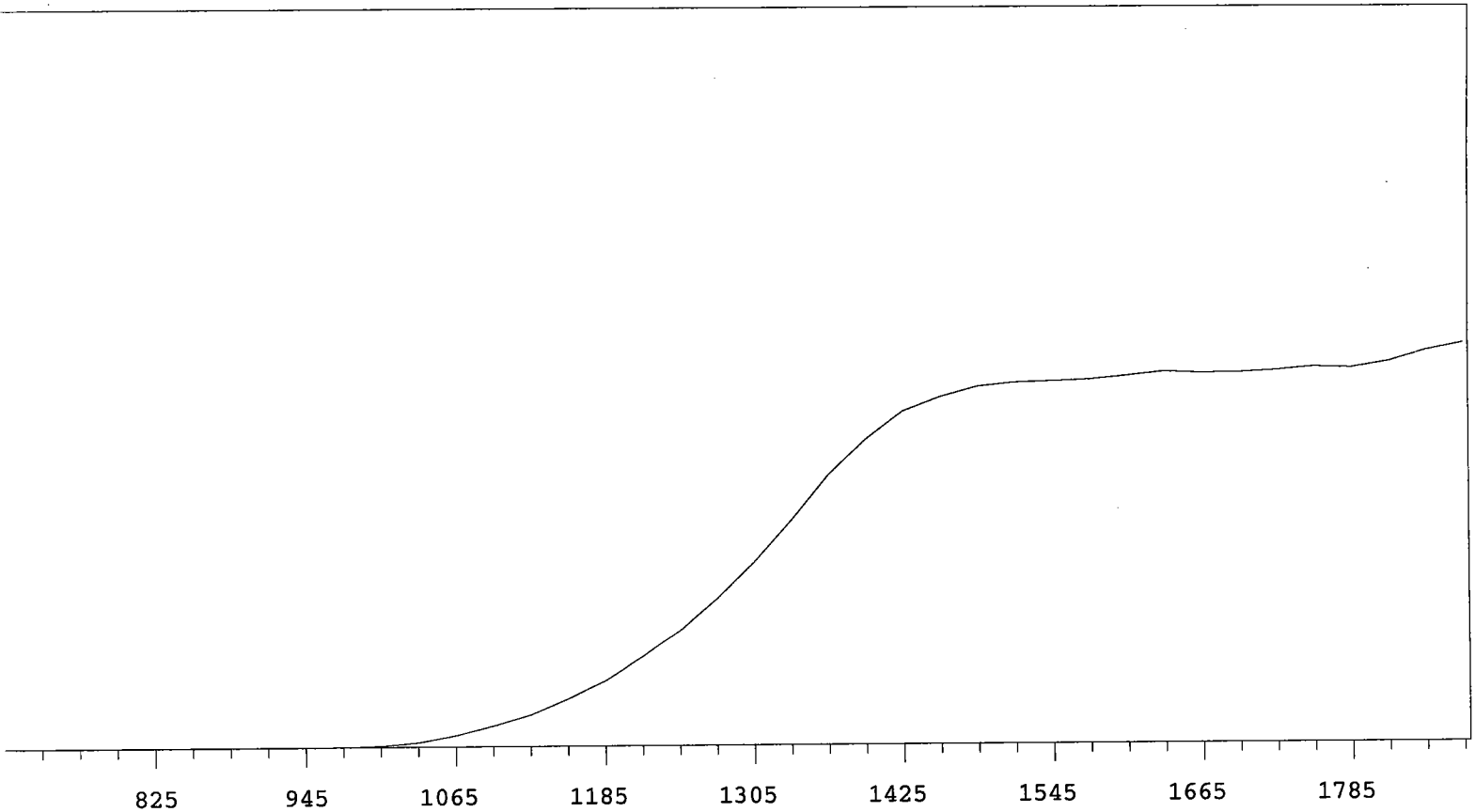
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	17085	+68.24
735	0		1335	21135	+59.99
765	0		1365	25066	+47.39
795	0	>100	1395	28530	+33.93
825	0	>100	1425	30823	+22.30
855	1	>100	1455	32287	+12.93
885	0	>100	1485	33217	+6.71
915	1	>100	1515	33474	+3.57
945	2	>100	1545	33517	+1.17
975	7	>100	1575	33921	+1.13
1005	56	>100	1605	33584	+1.27
1035	305	>100	1635	34014	+1.12
1065	982	>100	1665	34116	+0.98
1095	1874	>100	1695	34225	-0.22
1125	2890	>100	1725	33980	+0.58
1155	4260	>100	1755	33971	+1.96
1185	6001	>100	1785	34541	+3.64
1215	8050	+91.54	1815	34954	+5.38
1245	10895	+82.98	1845	35375	
1275	13556	+76.26	1875	36384	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	15025	+68.87
735	0		1335	18640	+58.97
765	0		1365	22048	+45.84
795	0	>100	1395	24877	+32.08
825	0	>100	1425	26653	+20.83
855	0	>100	1455	27899	+13.08
885	0	>100	1485	28670	+8.43
915	0	>100	1515	29257	+5.13
945	0	>100	1545	29568	+2.06
975	6	>100	1575	29683	+0.52
1005	81	>100	1605	29362	+0.57
1035	318	>100	1635	29589	+0.80
1065	897	>100	1665	29870	+1.82
1095	1710	>100	1695	29783	+0.90
1125	2714	>100	1725	30077	+0.75
1155	3925	>100	1755	29889	+2.02
1185	5395	+97.31	1785	30152	+3.33
1215	7282	+88.49	1815	30656	+6.54
1245	9426	+81.36	1845	31211	
1275	12007	+75.65	1875	32389	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16217	+71.57
735	0		1335	20184	+63.76
765	0		1365	24605	+53.98
795	0	>100	1395	28528	+41.40
825	0	>100	1425	31675	+28.02
855	0	>100	1455	33899	+17.93
885	0	>100	1485	34826	+10.65
915	0	>100	1515	35815	+6.13
945	0	>100	1545	36225	+4.15
975	7	>100	1575	36456	+2.28
1005	31	>100	1605	36747	+1.47
1035	238	>100	1635	36801	+1.26
1065	810	>100	1665	36859	+0.85
1095	1637	>100	1695	37095	+1.85
1125	2743	>100	1725	37072	+4.01
1155	3932	>100	1755	37724	+6.65
1185	5579	>100	1785	38802	+10.33
1215	7602	+94.41	1815	40036	+14.71
1245	10078	+84.86	1845	41975	
1275	13091	+77.67	1875	45123	

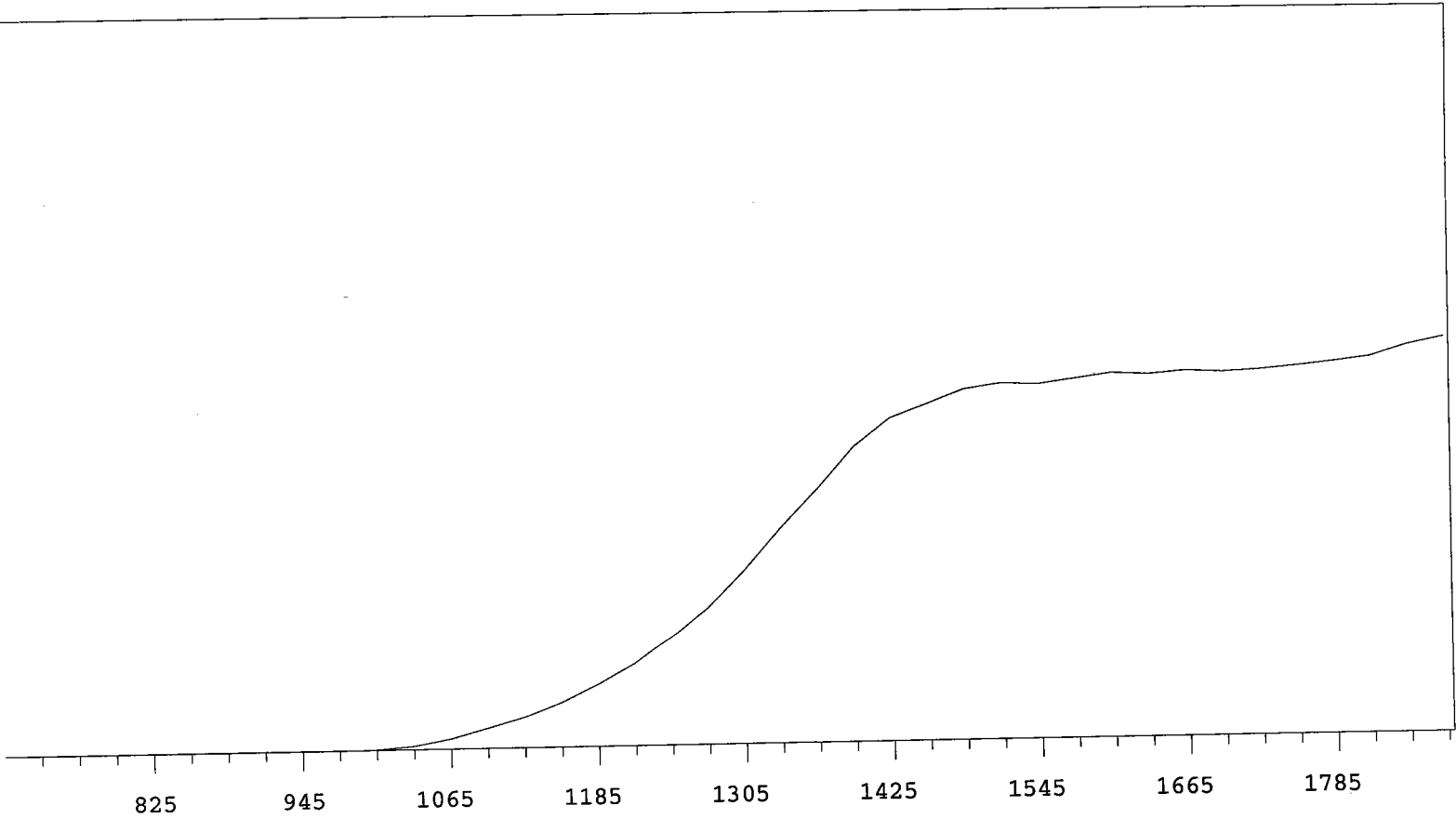


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	20094	+68.67
735	0		1335	24665	+59.40
765	0		1365	29591	+47.86
795	0	>100	1395	33376	+34.51
825	1	+83.33	1425	36440	+22.50
855	1	-83.33	1455	38024	+13.58
885	0	>100	1485	39187	+7.04
915	0	>100	1515	39608	+3.63
945	5	>100	1545	39722	+2.10
975	18	>100	1575	39894	+2.32
1005	125	>100	1605	40298	+2.09
1035	482	>100	1635	40711	+1.41
1065	1255	>100	1665	40574	+0.80
1095	2318	>100	1695	40608	+1.02
1125	3540	>100	1725	40839	+1.28
1155	5288	>100	1755	41201	+1.97
1185	7168	+98.51	1785	41065	+3.74
1215	9760	+88.48	1815	41711	+5.42
1245	12656	+81.52	1845	42917	
1275	16065	+74.58	1875	43699	

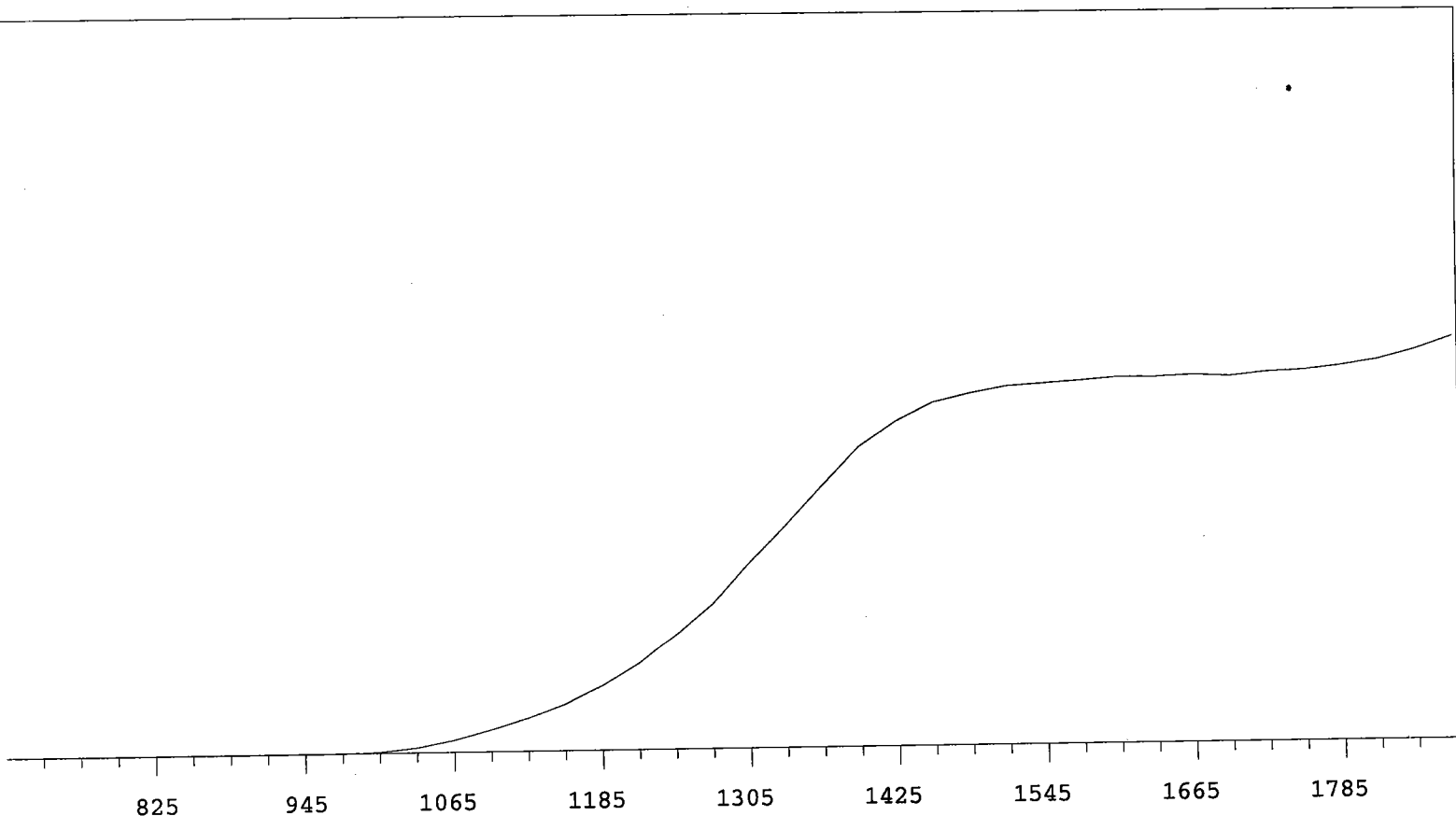
MPC 9600 Plateau
 Alpha Volts: 705

Instrument 6 MPC 9604 Detector C
 Beta Volts: 1575

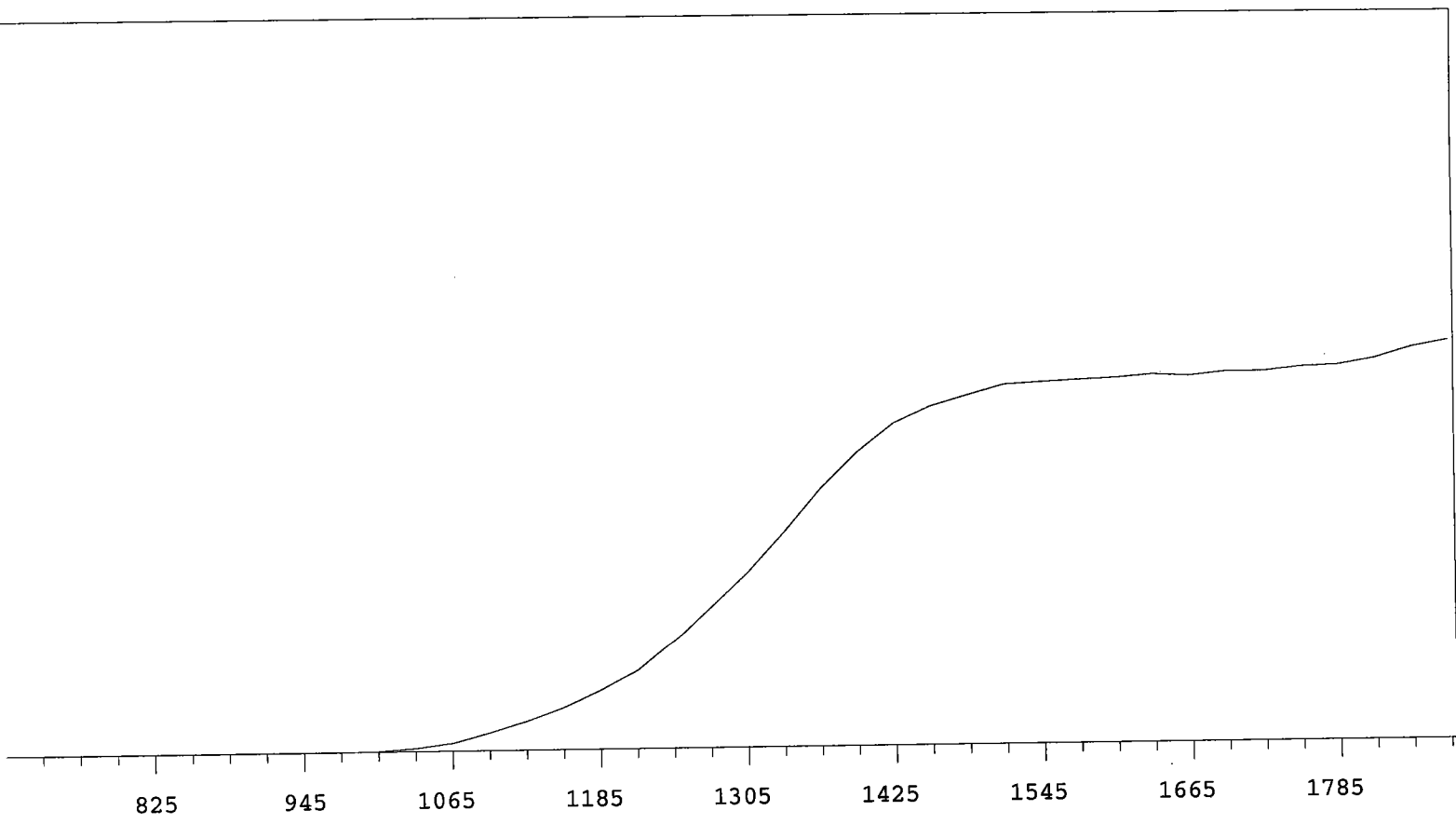
7/1/2009



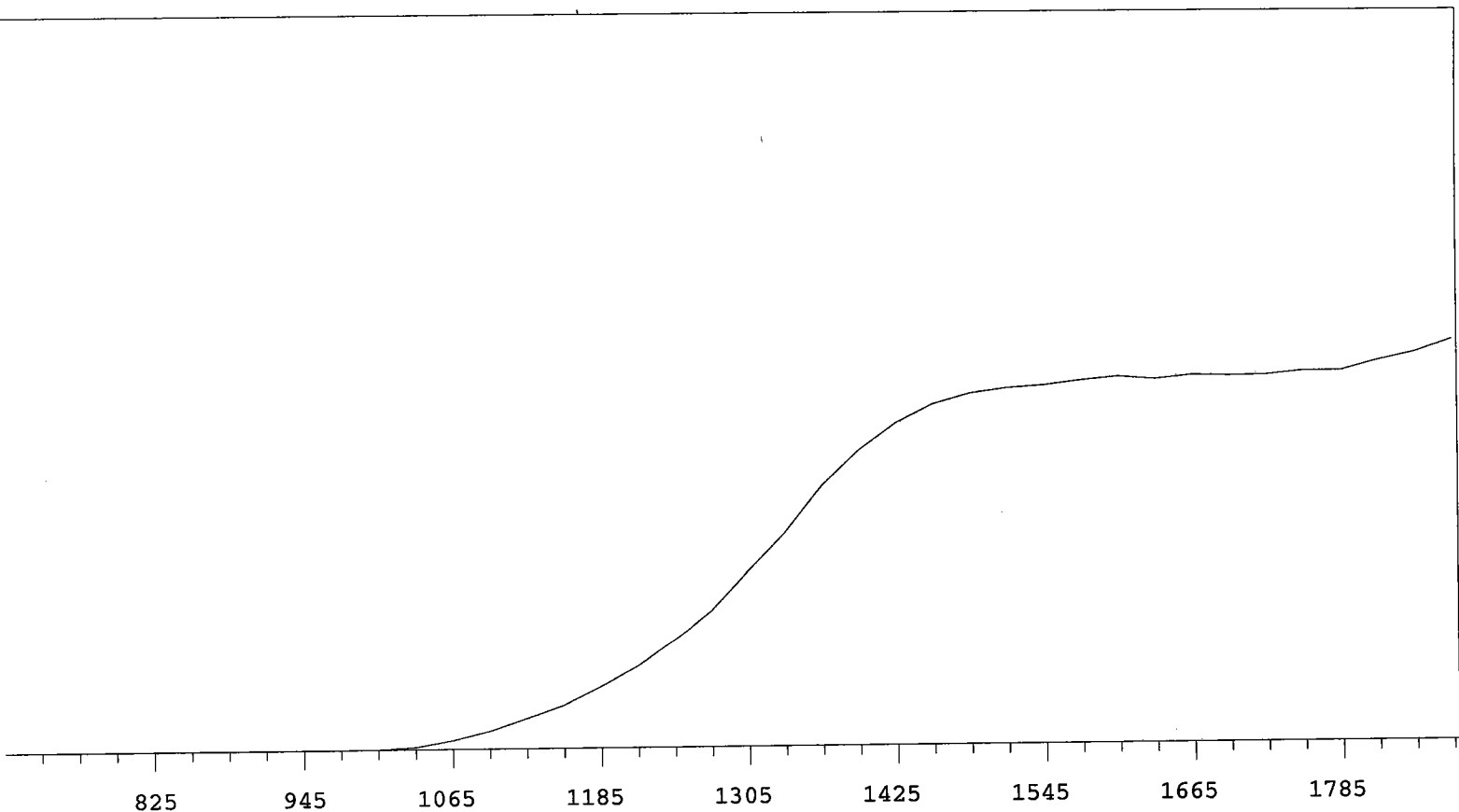
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	17350	+67.80
735	0		1335	21371	+60.27
765	1	+0.00	1365	25084	+49.32
795	0	>100	1395	29177	+36.15
825	0	+0.00	1425	31927	+24.86
855	0	>100	1455	33217	+14.70
885	1	>100	1485	34545	+7.74
915	1	>100	1515	35097	+4.64
945	2	>100	1545	34927	+2.96
975	8	>100	1575	35439	+2.21
1005	70	>100	1605	35939	+2.41
1035	353	>100	1635	35763	+0.94
1065	990	>100	1665	36053	+0.35
1095	1956	>100	1695	35886	+1.15
1125	3024	>100	1725	36066	+1.77
1155	4400	>100	1755	36379	+3.03
1185	6173	+99.75	1785	36768	+4.80
1215	8230	+89.85	1815	37193	+6.14
1245	10904	+82.36	1845	38320	
1275	13747	+76.18	1875	39061	



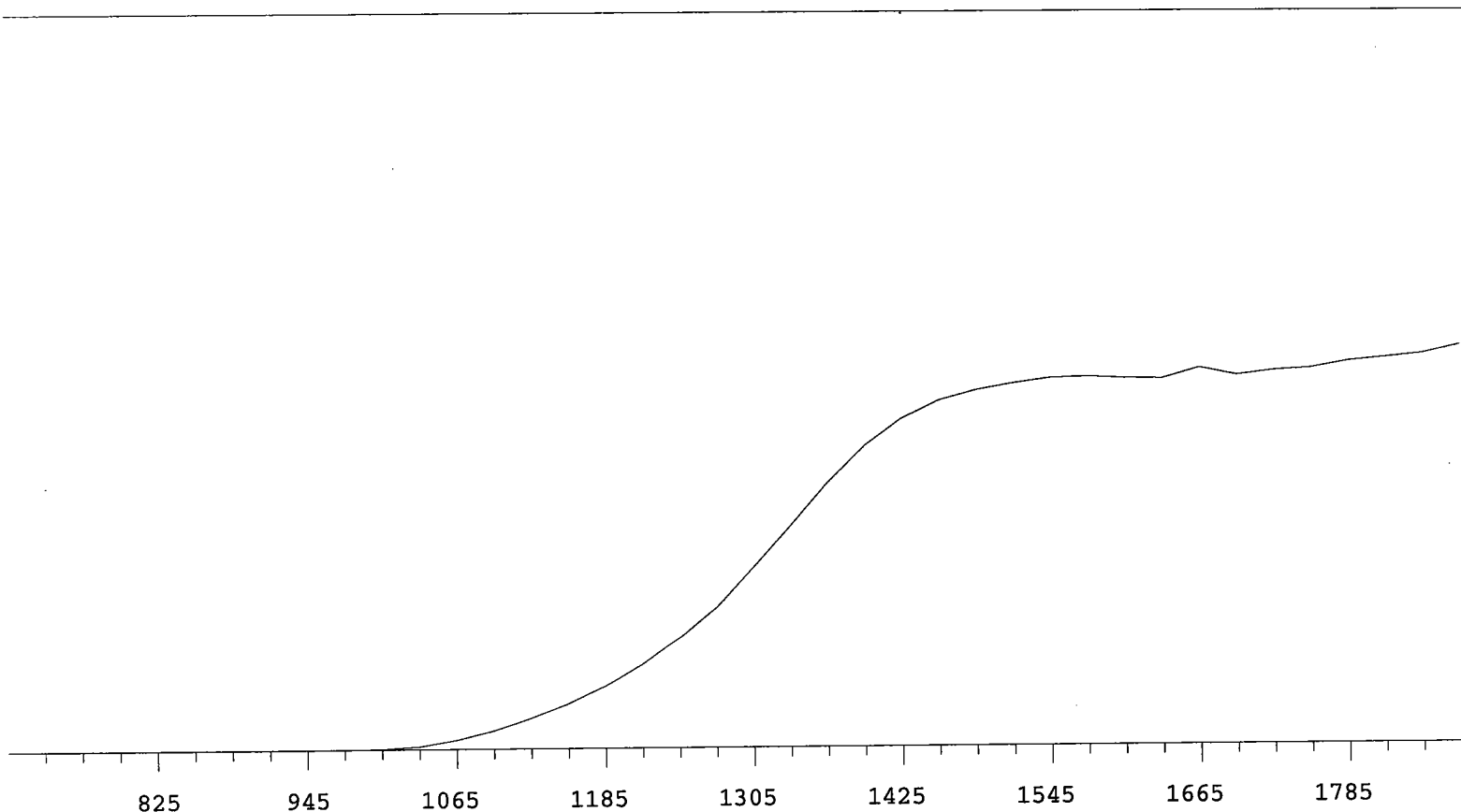
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	17954	+65.82
735	0		1335	21482	+57.64
765	0		1365	25373	+45.78
795	1	+0.00	1395	29042	+34.80
825	0	>100	1425	31373	+23.29
855	0	+0.00	1455	33143	+14.25
885	0	>100	1485	34006	+8.49
915	1	>100	1515	34662	+4.71
945	0	>100	1545	34892	+3.14
975	14	>100	1575	35129	+1.86
1005	109	>100	1605	35411	+1.49
1035	481	>100	1635	35380	+0.62
1065	1177	>100	1665	35554	+0.65
1095	2133	>100	1695	35385	+1.18
1125	3243	>100	1725	35755	+1.89
1155	4554	>100	1755	35907	+3.26
1185	6285	+98.38	1785	36305	+4.62
1215	8468	+89.75	1815	36870	+6.98
1245	11266	+83.13	1845	37807	
1275	14088	+74.43	1875	39047	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	13228	+70.36
735	0		1335	16271	+60.12
765	0		1365	19506	+49.19
795	0	>100	1395	22188	+36.46
825	1	+83.33	1425	24373	+24.43
855	1	-83.33	1455	25649	+15.99
885	0	-55.56	1485	26433	+9.58
915	0	>100	1515	27195	+5.74
945	1	>100	1545	27367	+3.24
975	3	>100	1575	27490	+1.86
1005	42	>100	1605	27608	+1.22
1035	242	>100	1635	27841	+1.33
1065	613	>100	1665	27695	+1.11
1095	1353	>100	1695	27999	+1.42
1125	2213	>100	1725	27992	+2.04
1155	3256	>100	1755	28289	+2.52
1185	4474	>100	1785	28408	+4.56
1215	5932	+94.10	1815	28863	+5.70
1245	8072	+87.32	1845	29664	
1275	10579	+79.61	1875	30148	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16978	+70.97
735	0		1335	20569	+61.39
765	0		1365	24989	+48.97
795	0	>100	1395	28389	+36.69
825	0	>100	1425	30977	+24.05
855	0	>100	1455	32727	+14.93
885	0	>100	1485	33697	+8.42
915	1	>100	1515	34195	+4.89
945	1	>100	1545	34437	+3.49
975	3	>100	1575	34850	+2.11
1005	34	>100	1605	35174	+1.62
1035	221	>100	1635	34923	+0.68
1065	825	>100	1665	35250	+0.35
1095	1709	>100	1695	35171	+1.24
1125	2873	>100	1725	35237	+1.02
1155	4078	>100	1755	35584	+2.79
1185	5858	>100	1785	35587	+4.59
1215	7809	+91.82	1815	36485	+6.74
1245	10336	+85.02	1845	37270	
1275	13215	+77.79	1875	38453	

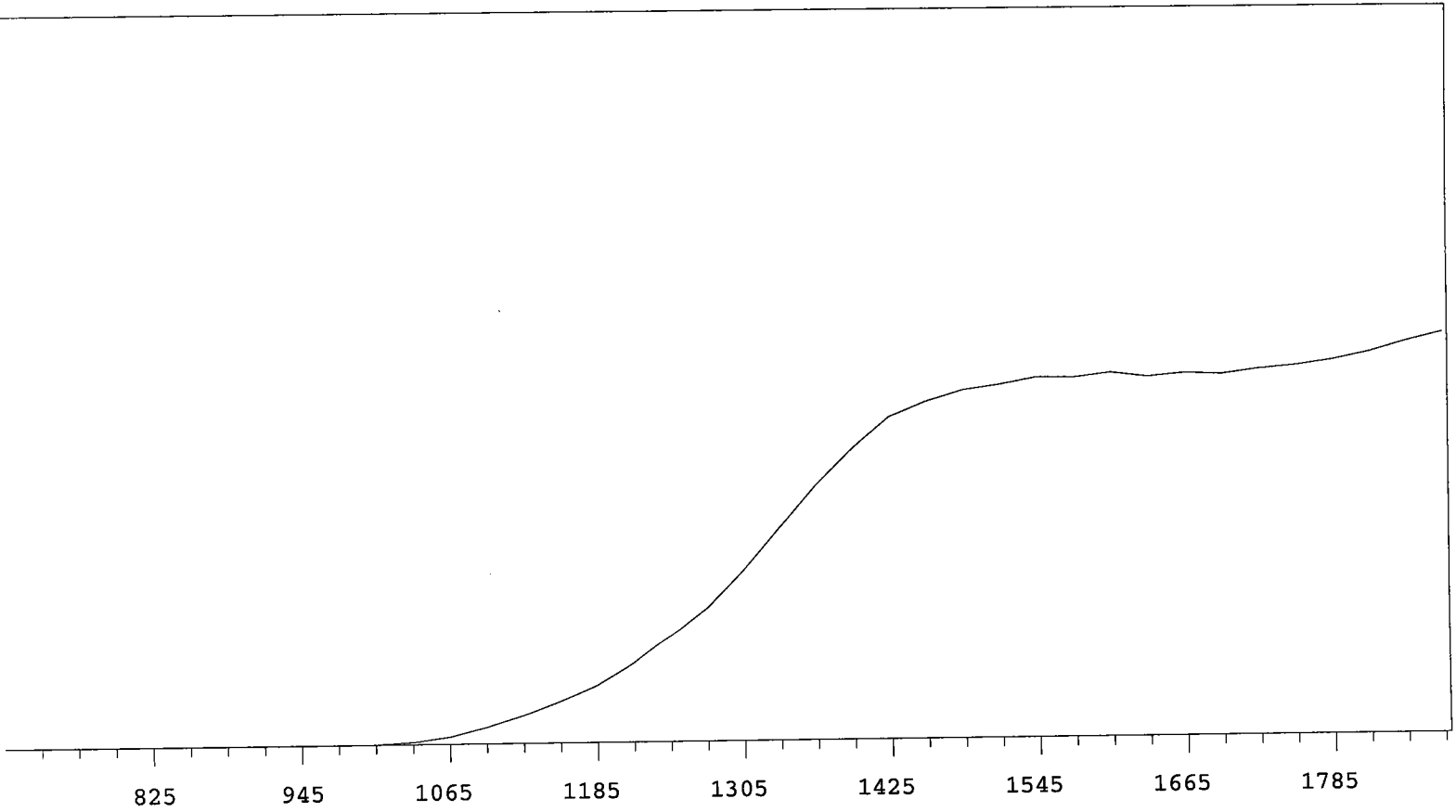


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16543	+70.03
735	0		1335	20257	+60.71
765	0		1365	24245	+48.17
795	0	>100	1395	27602	+35.50
825	0	>100	1425	30019	+23.48
855	0	>100	1455	31614	+14.53
885	0	>100	1485	32522	+8.91
915	0	>100	1515	33103	+5.28
945	0	>100	1545	33572	+2.60
975	4	>100	1575	33695	+0.70
1005	57	>100	1605	33525	+1.48
1035	277	>100	1635	33477	+0.99
1065	817	>100	1665	34432	+1.49
1095	1666	>100	1695	33745	+1.43
1125	2766	>100	1725	34149	+1.60
1155	4077	>100	1755	34350	+3.69
1185	5667	>100	1785	34955	+3.62
1215	7694	+91.50	1815	35251	+4.44
1245	10209	+84.83	1845	35592	
1275	12950	+77.50	1875	36382	

MPC 9600 Plateau
 Alpha Volts: 705

Instrument 7 MPC 9604 Detector D
 Beta Volts: 1575

7/1/2009

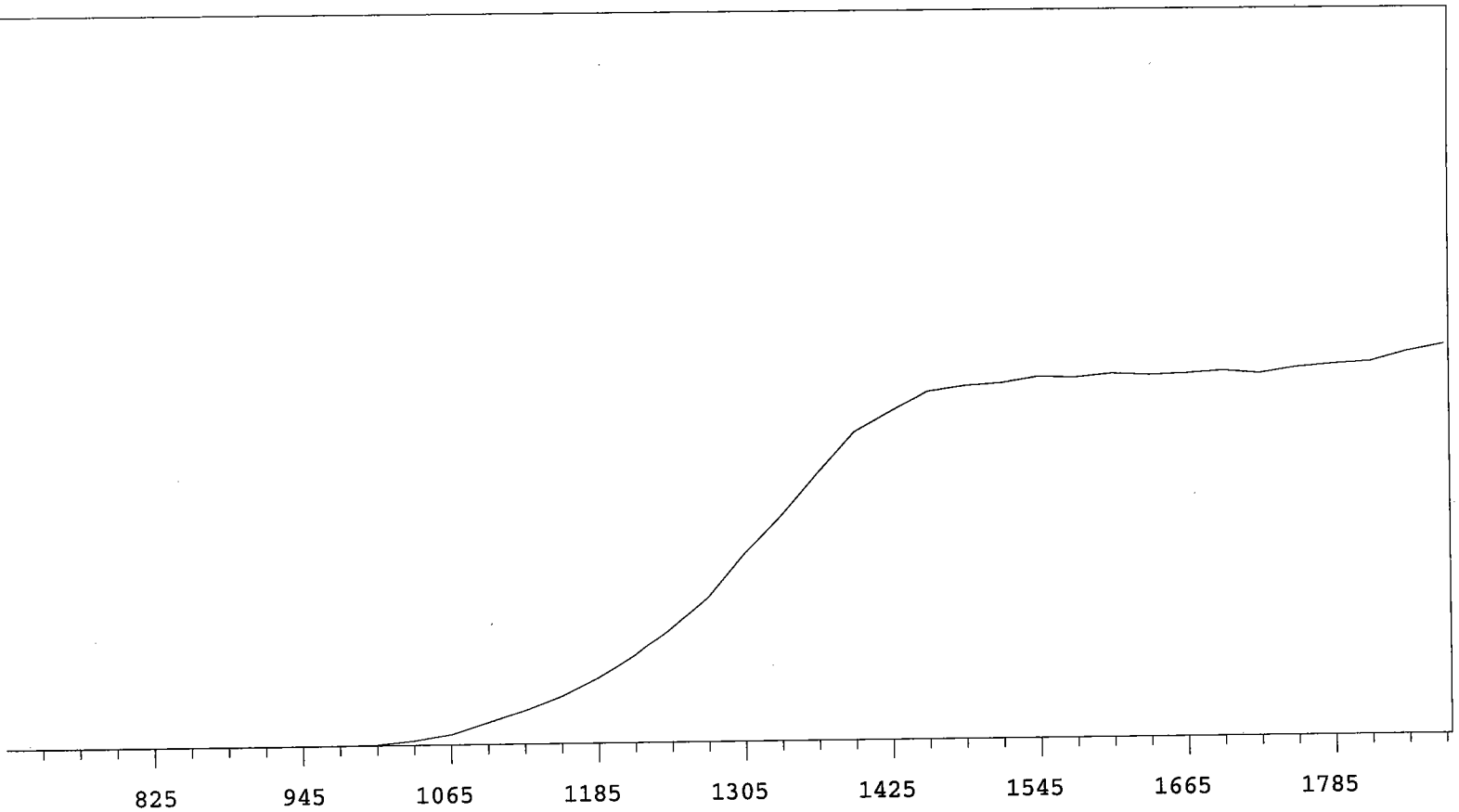


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	14016	+71.42
735	0		1335	17436	+62.21
765	0		1365	20814	+50.32
795	0	>100	1395	23760	+36.91
825	0	>100	1425	26302	+24.91
855	0	>100	1455	27519	+15.17
885	0	>100	1485	28410	+8.91
915	0	>100	1515	28843	+5.41
945	0	>100	1545	29396	+3.58
975	5	>100	1575	29357	+1.54
1005	29	>100	1605	29719	+0.51
1035	204	>100	1635	29358	+0.23
1065	609	>100	1665	29623	+0.57
1095	1354	>100	1695	29509	+2.12
1125	2316	>100	1725	29896	+2.84
1155	3418	>100	1755	30165	+4.42
1185	4654	>100	1785	30570	+5.65
1215	6455	+92.99	1815	31180	+6.95
1245	8669	+86.45	1845	31995	
1275	10931	+79.15	1875	32717	

MPC 9600 Plateau
Alpha Volts: 705

Instrument 8 MPC 9604 Detector A
Beta Volts: 1575

7/1/2009

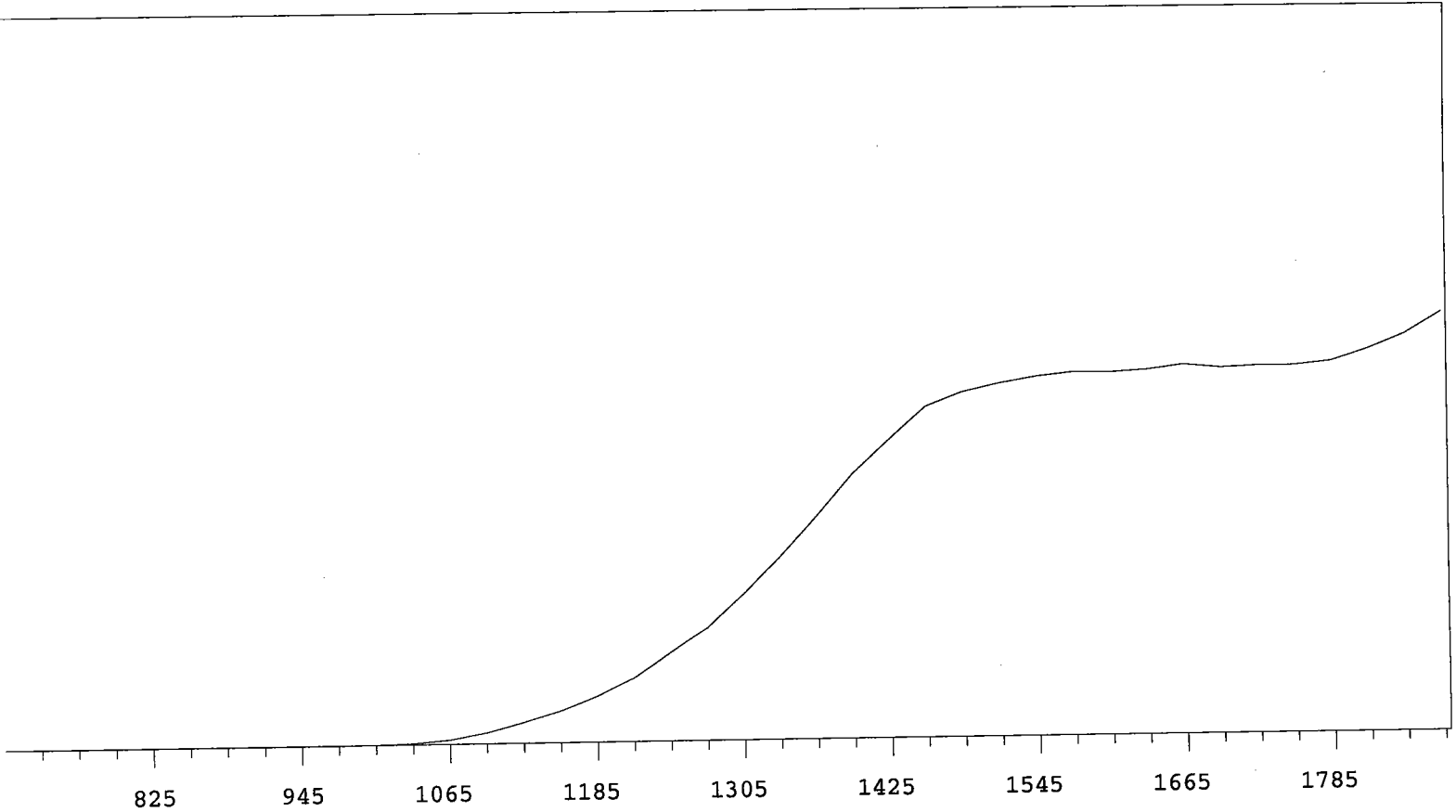


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	19482	+67.45
735	0		1335	23344	+59.35
765	0		1365	27793	+45.86
795	0	>100	1395	31916	+34.29
825	0	>100	1425	33979	+21.61
855	0	>100	1455	35993	+11.71
885	0	>100	1485	36530	+7.04
915	0	>100	1515	36796	+3.11
945	1	>100	1545	37393	+2.44
975	9	>100	1575	37279	+1.41
1005	96	>100	1605	37650	+0.49
1035	468	>100	1635	37458	+0.91
1065	1084	>100	1665	37579	+0.12
1095	2286	>100	1695	37828	+1.10
1125	3479	>100	1725	37535	+1.72
1155	4912	>100	1755	38104	+2.18
1185	6819	+98.23	1785	38416	+4.12
1215	9153	+89.05	1815	38633	+4.92
1245	12105	+83.21	1845	39649	
1275	15122	+75.24	1875	40366	

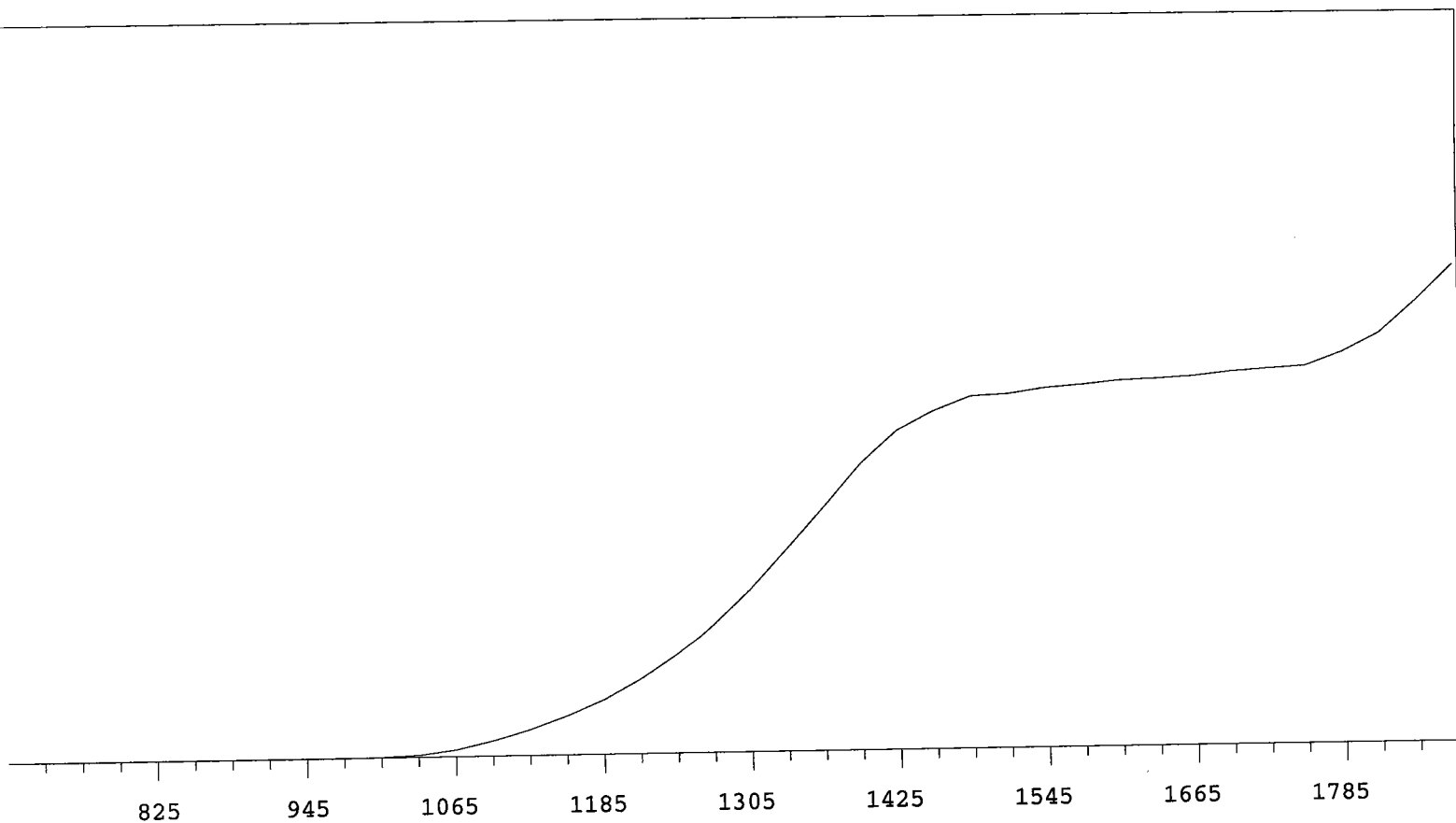
MPC 9600 Plateau
 Alpha Volts: 705

Instrument 8 MPC 9604 Detector B
 Beta Volts: 1575

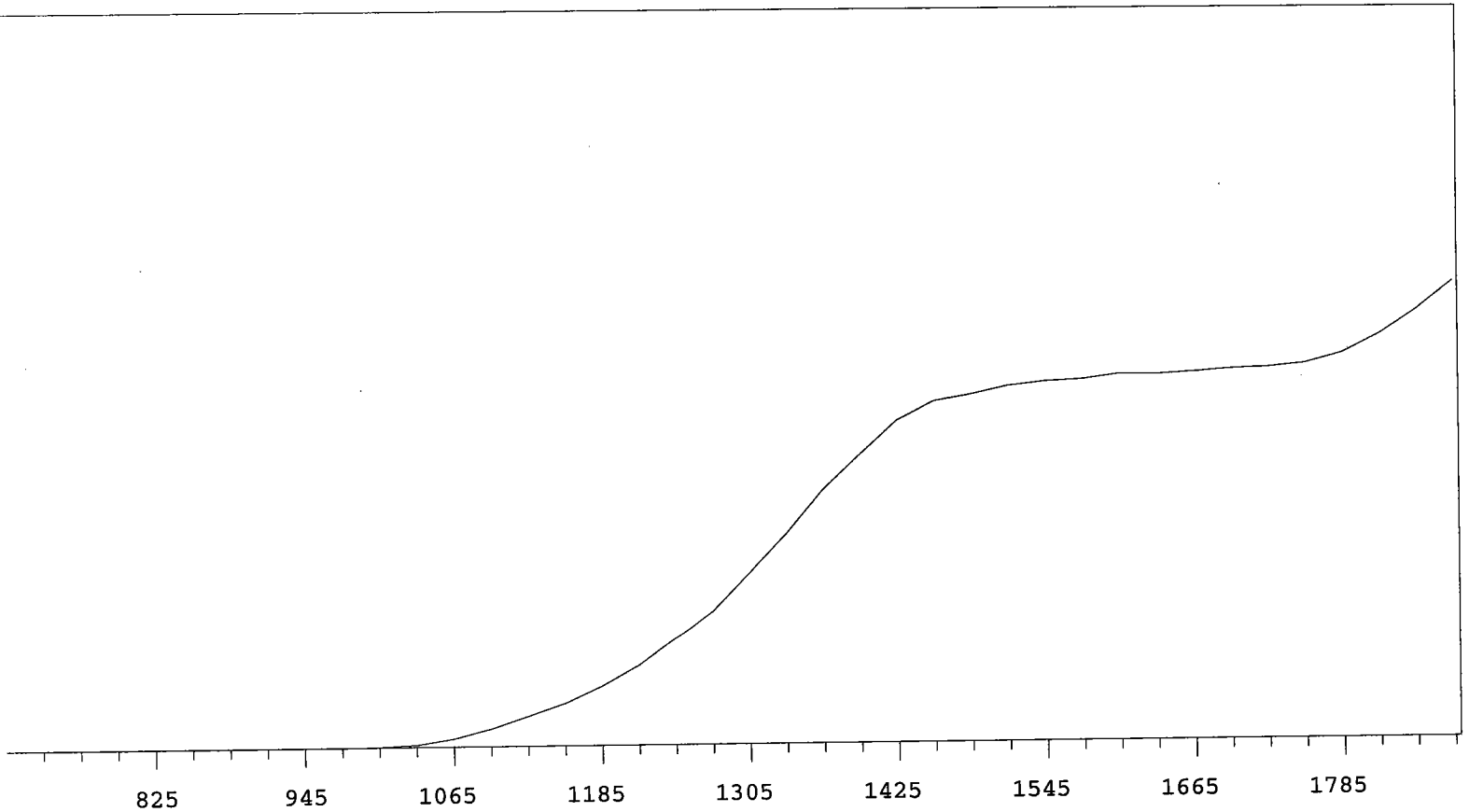
7/1/2009



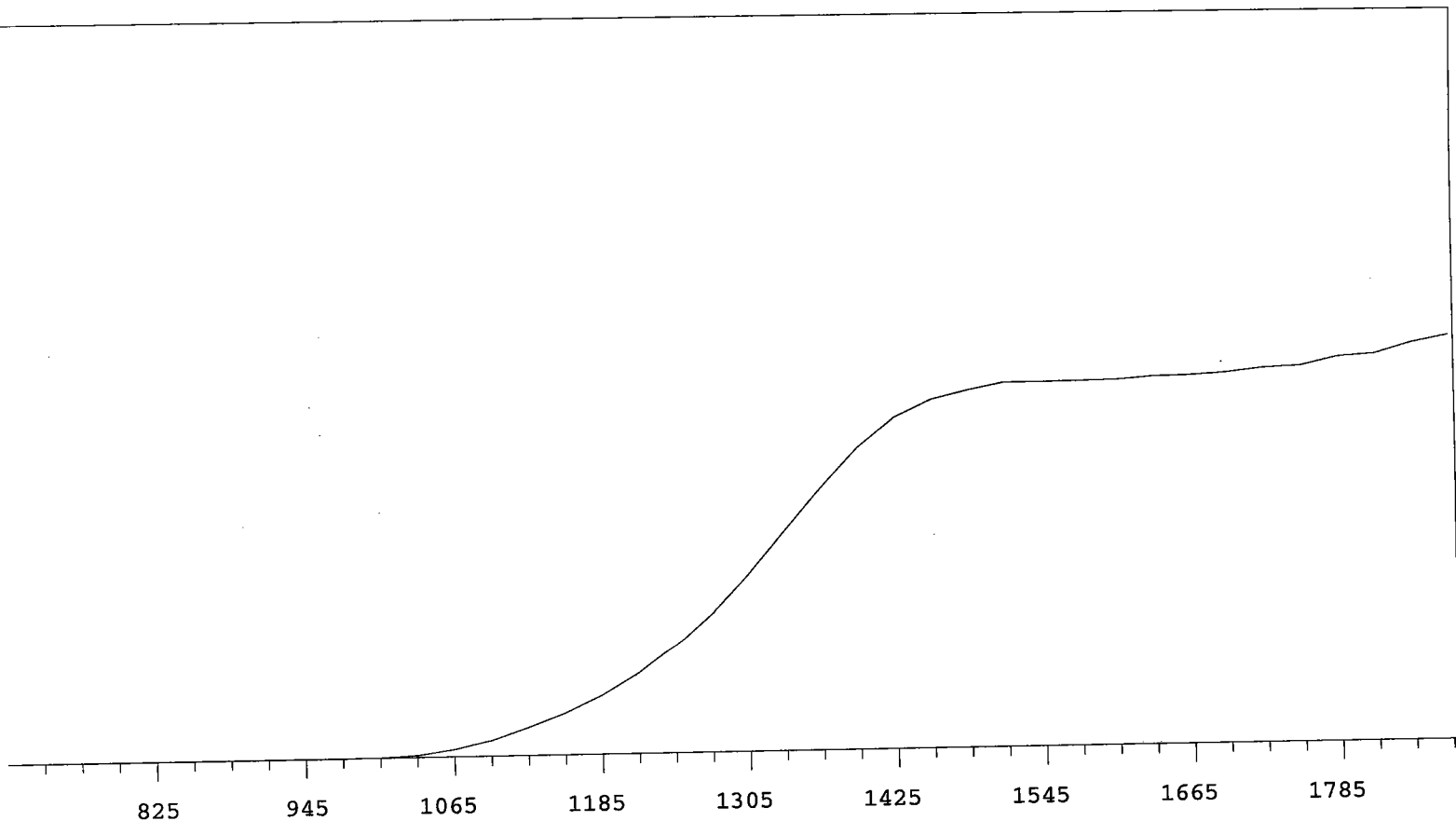
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16337	+74.91
735	0		1335	20471	+68.07
765	0		1365	25012	+57.86
795	0	>100	1395	29694	+47.48
825	0	>100	1425	33409	+35.17
855	0	>100	1455	37013	+23.27
885	0	>100	1485	38629	+14.35
915	0	>100	1515	39529	+7.69
945	0	>100	1545	40284	+4.34
975	0	>100	1575	40711	+2.52
1005	20	>100	1605	40642	+1.97
1035	122	>100	1635	40879	+1.11
1065	511	>100	1665	41405	+0.98
1095	1263	>100	1695	41011	+0.30
1125	2390	>100	1725	41182	+0.41
1155	3641	>100	1755	41178	+3.28
1185	5246	>100	1785	41573	+6.47
1215	7212	+98.32	1815	42858	+10.82
1245	9897	+89.80	1845	44440	
1275	12742	+82.40	1875	46780	



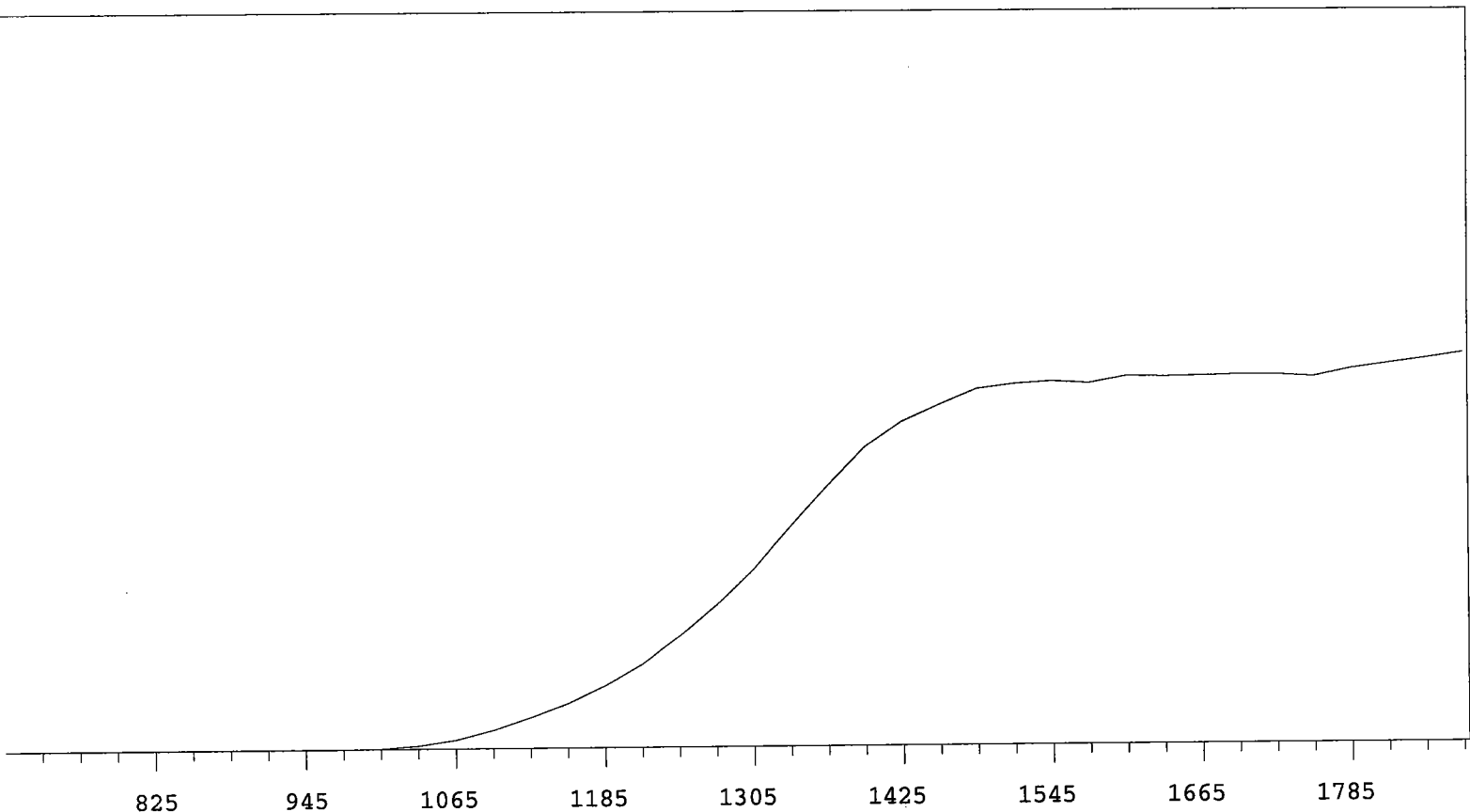
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16303	+72.82
735	0		1335	20309	+64.32
765	0		1365	24364	+53.82
795	0	>100	1395	28527	+40.95
825	0	>100	1425	31774	+28.74
855	0	>100	1455	33631	+16.87
885	0	>100	1485	35030	+9.25
915	0	>100	1515	35208	+5.21
945	0	>100	1545	35741	+3.27
975	4	>100	1575	36019	+2.95
1005	46	>100	1605	36373	+2.21
1035	202	>100	1635	36484	+2.27
1065	697	>100	1665	36713	+2.28
1095	1532	>100	1695	37093	+2.46
1125	2614	>100	1725	37325	+4.17
1155	3953	>100	1755	37543	+7.52
1185	5474	>100	1785	38833	+13.43
1215	7466	+93.09	1815	40656	+19.49
1245	9842	+86.73	1845	43753	
1275	12814	+80.29	1875	47246	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16889	+70.18
735	0		1335	20600	+61.29
765	1	+0.00	1365	24824	+50.40
795	0	>100	1395	28208	+38.85
825	0	>100	1425	31539	+25.79
855	0	>100	1455	33391	+16.06
885	0	>100	1485	33991	+8.60
915	0	>100	1515	34782	+5.01
945	0	>100	1545	35201	+4.10
975	5	>100	1575	35380	+2.50
1005	47	>100	1605	35849	+1.87
1035	243	>100	1635	35784	+1.79
1065	792	>100	1665	36000	+1.43
1095	1744	>100	1695	36269	+2.10
1125	2933	>100	1725	36381	+3.46
1155	4123	>100	1755	36733	+6.86
1185	5780	>100	1785	37669	+11.78
1215	7791	+91.58	1815	39465	+16.64
1245	10478	+84.93	1845	41803	
1275	13118	+77.50	1875	44665	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16226	+71.71
735	0		1335	20083	+61.95
765	1	+0.00	1365	23913	+49.99
795	0	>100	1395	27526	+36.97
825	0	>100	1425	30193	+24.54
855	0	>100	1455	31747	+14.71
885	0	>100	1485	32544	+7.71
915	0	>100	1515	33198	+3.66
945	0	>100	1545	33188	+1.51
975	2	>100	1575	33227	+0.73
1005	33	>100	1605	33278	+1.04
1035	203	>100	1635	33518	+1.38
1065	668	>100	1665	33565	+1.95
1095	1403	>100	1695	33774	+1.99
1125	2545	>100	1725	34135	+3.30
1155	3800	>100	1755	34244	+3.67
1185	5363	>100	1785	35022	+4.84
1215	7355	+95.00	1815	35229	+5.93
1245	9807	+87.69	1845	36179	
1275	12700	+80.28	1875	36821	

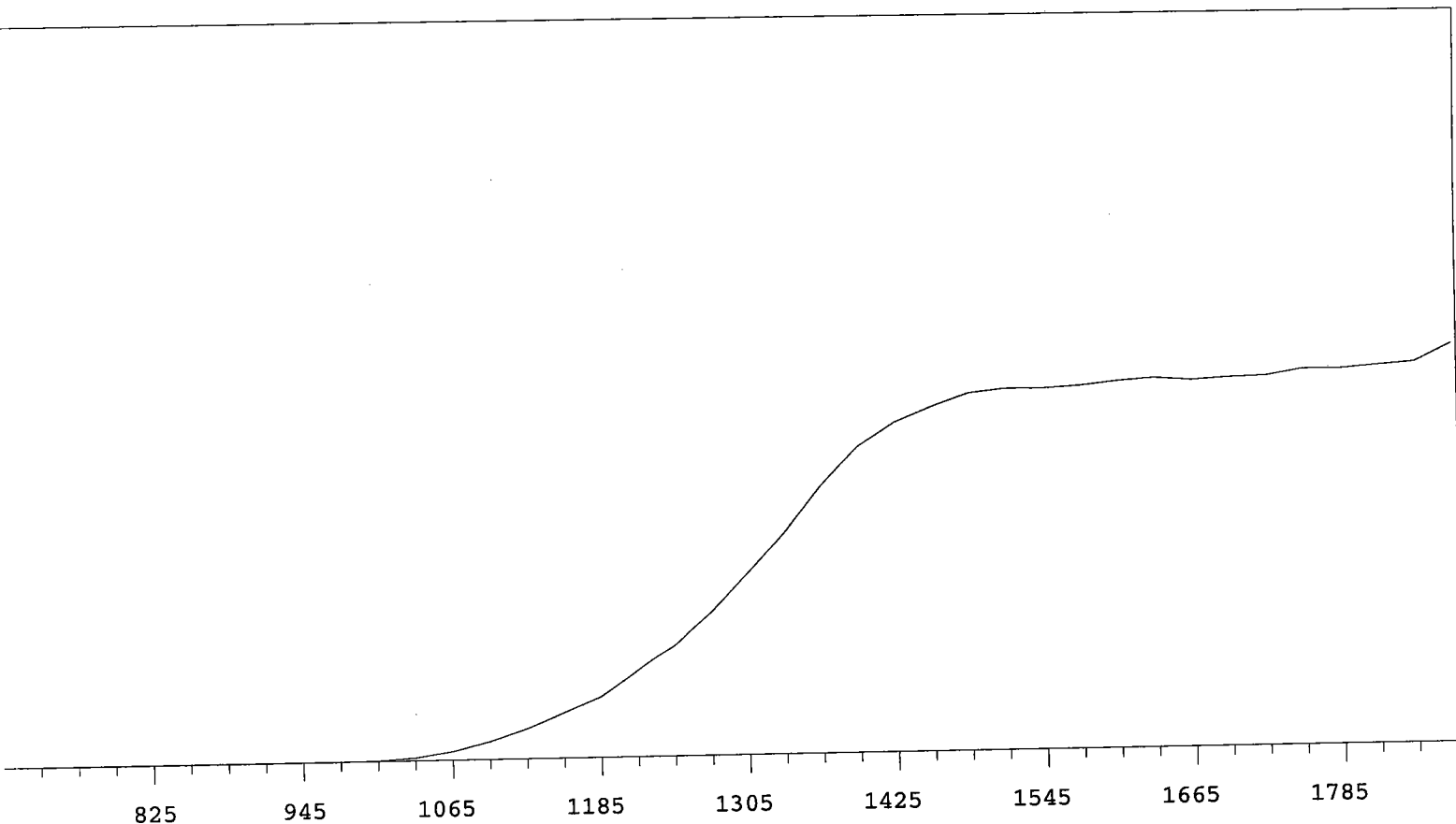


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16723	+68.78
735	0		1335	20749	+60.55
765	0		1365	24686	+48.78
795	0	>100	1395	28343	+35.24
825	0	>100	1425	30657	+24.31
855	0	>100	1455	32208	+15.22
885	0	>100	1485	33662	+9.32
915	0	>100	1515	34098	+4.47
945	0	>100	1545	34326	+2.17
975	4	>100	1575	34133	+1.60
1005	45	>100	1605	34758	+1.41
1035	300	>100	1635	34706	+1.35
1065	836	>100	1665	34769	+0.30
1095	1742	>100	1695	34830	-0.10
1125	2896	>100	1725	34850	+0.90
1155	4198	>100	1755	34613	+2.41
1185	5849	>100	1785	35351	+3.87
1215	7887	+92.20	1815	35849	+4.97
1245	10561	+83.55	1845	36285	
1275	13442	+76.62	1875	36814	

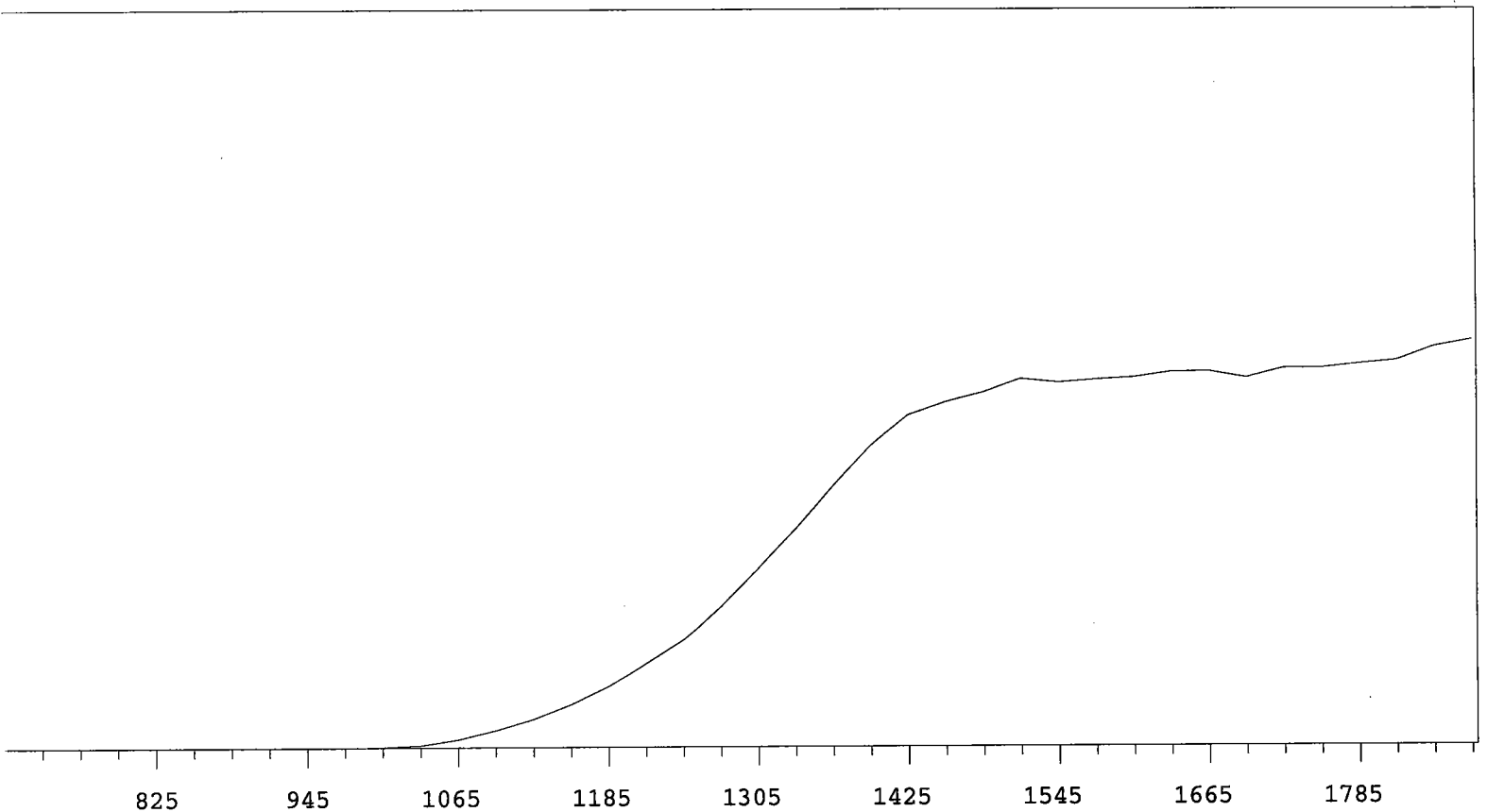
MPC 9600 Plateau
Alpha Volts: 870

Instrument 9 MPC 9604 Detector C
Beta Volts: 1530

7/1/2009



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	20192	+70.39
735	0		1335	24524	+60.97
765	0		1365	29650	+48.44
795	0	>100	1395	33904	+35.09
825	0	>100	1425	36549	+22.73
855	0	>100	1455	38217	+13.58
885	1	>100	1485	39628	+7.51
915	1	>100	1515	40035	+3.73
945	2	>100	1545	40020	+1.92
975	3	>100	1575	40236	+2.06
1005	64	>100	1605	40680	+1.62
1035	349	>100	1635	40953	+1.03
1065	970	>100	1665	40643	+0.43
1095	1982	>100	1695	40882	+1.41
1125	3328	>100	1725	40979	+2.18
1155	5012	>100	1755	41654	+2.20
1185	6669	>100	1785	41602	+2.27
1215	9448	+92.67	1815	41935	+4.50
1245	12293	+86.58	1845	42259	
1275	15917	+76.99	1875	44183	

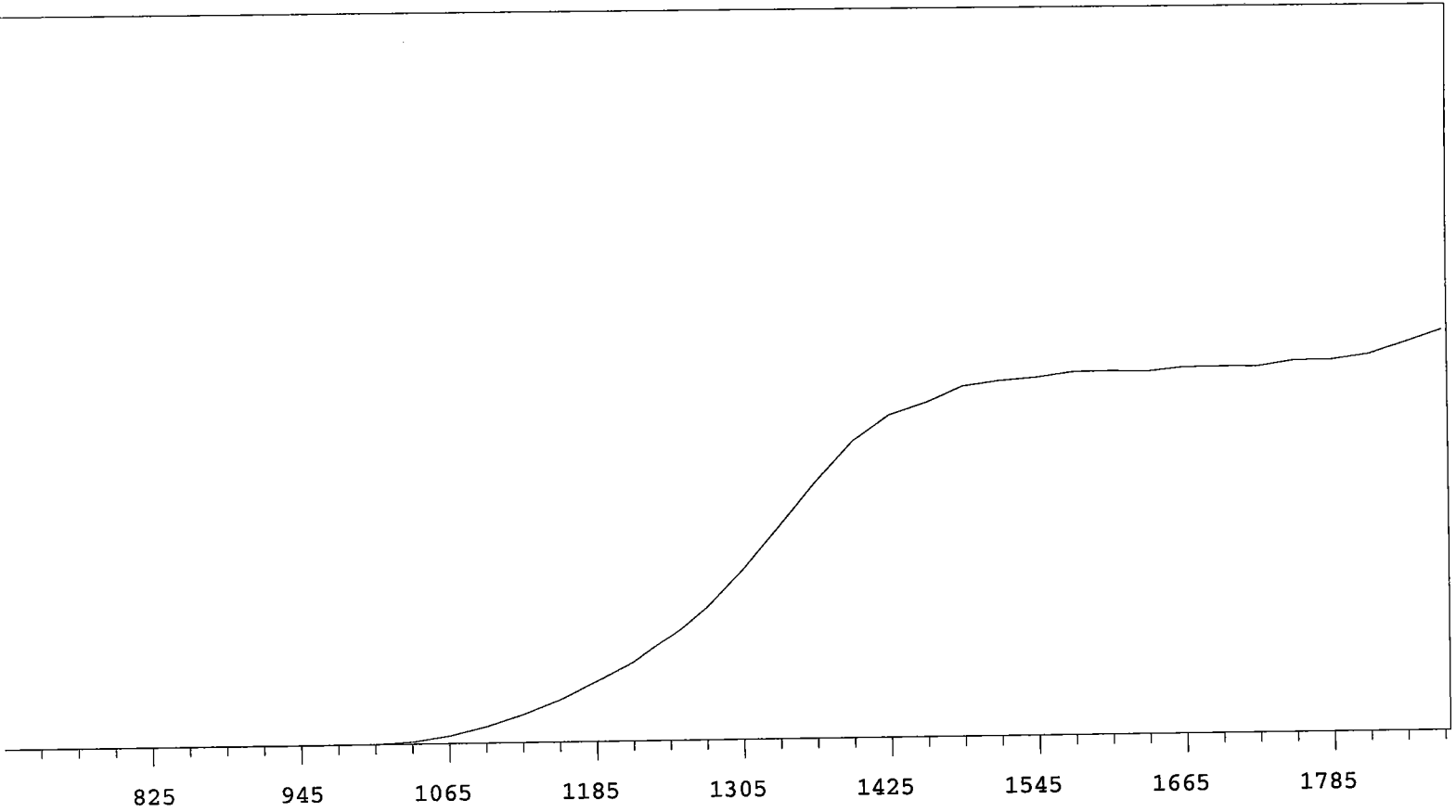


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	13319	+70.94
735	0		1335	16319	+61.35
765	0		1365	19577	+50.27
795	0	>100	1395	22498	+36.85
825	0	>100	1425	24782	+23.90
855	0	>100	1455	25761	+15.37
885	0	>100	1485	26486	+8.38
915	1	>100	1515	27503	+5.11
945	0	>100	1545	27223	+2.67
975	5	>100	1575	27453	+1.71
1005	35	>100	1605	27604	+2.70
1035	186	>100	1635	28021	+0.78
1065	618	>100	1665	28059	+1.05
1095	1280	>100	1695	27548	+0.90
1125	2141	>100	1725	28280	+2.16
1155	3268	>100	1755	28290	+3.51
1185	4659	>100	1785	28600	+4.46
1215	6343	+90.68	1815	28879	+6.35
1245	8064	+83.46	1845	29913	
1275	10497	+77.03	1875	30417	

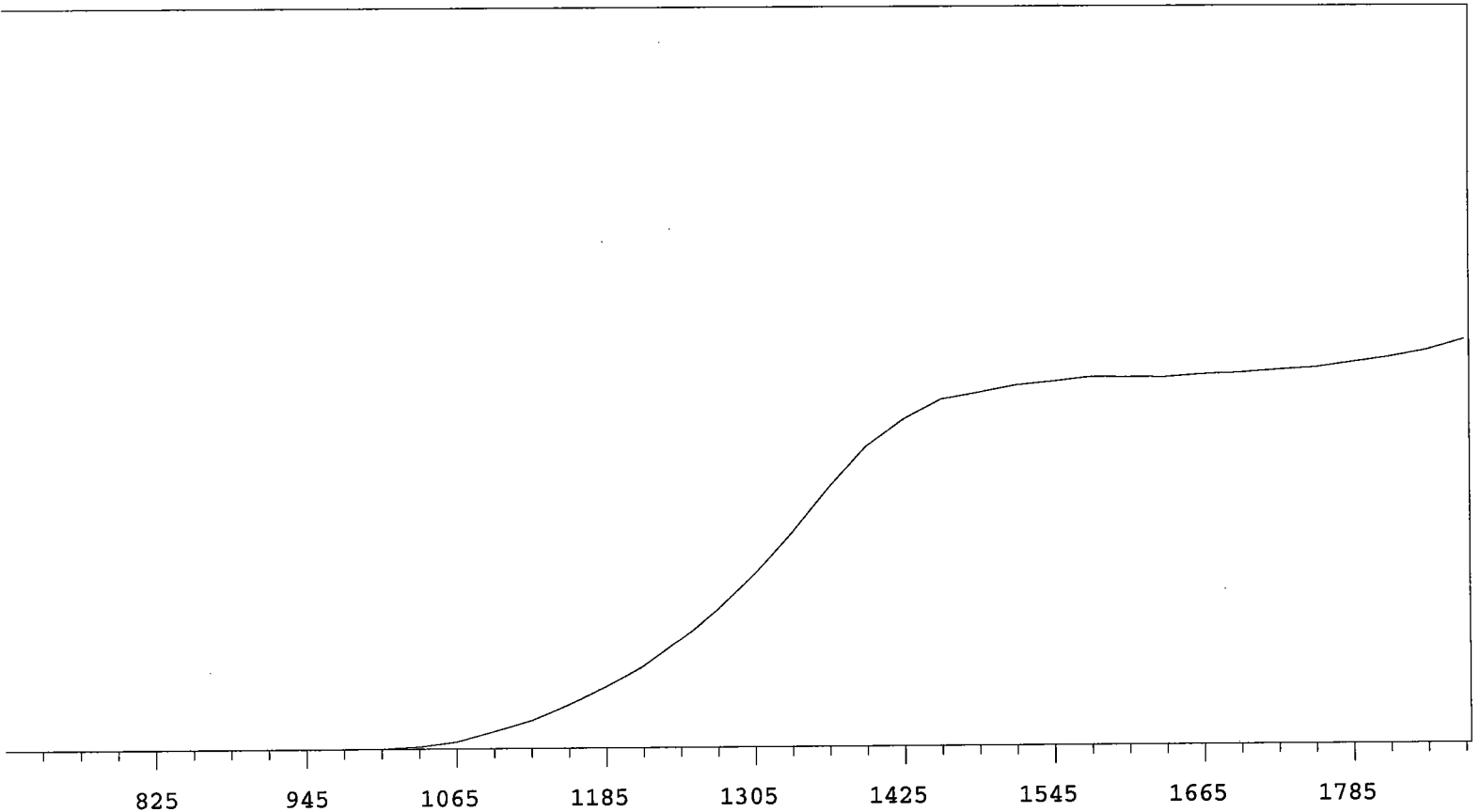
MPC 9600 Plateau
Alpha Volts: 870

Instrument 10 MPC 9604 Detector A
Beta Volts: 1552

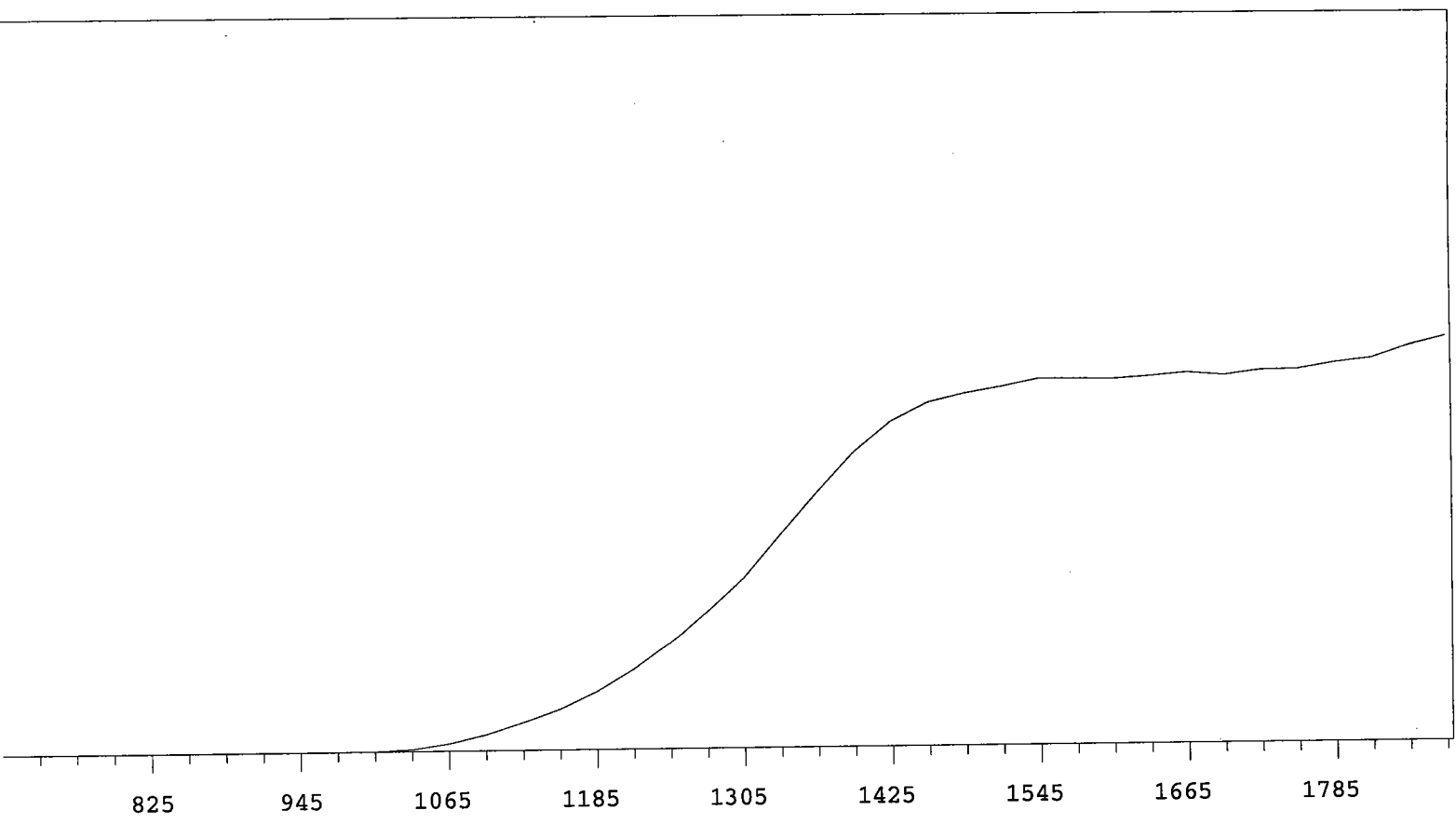
7/1/2009



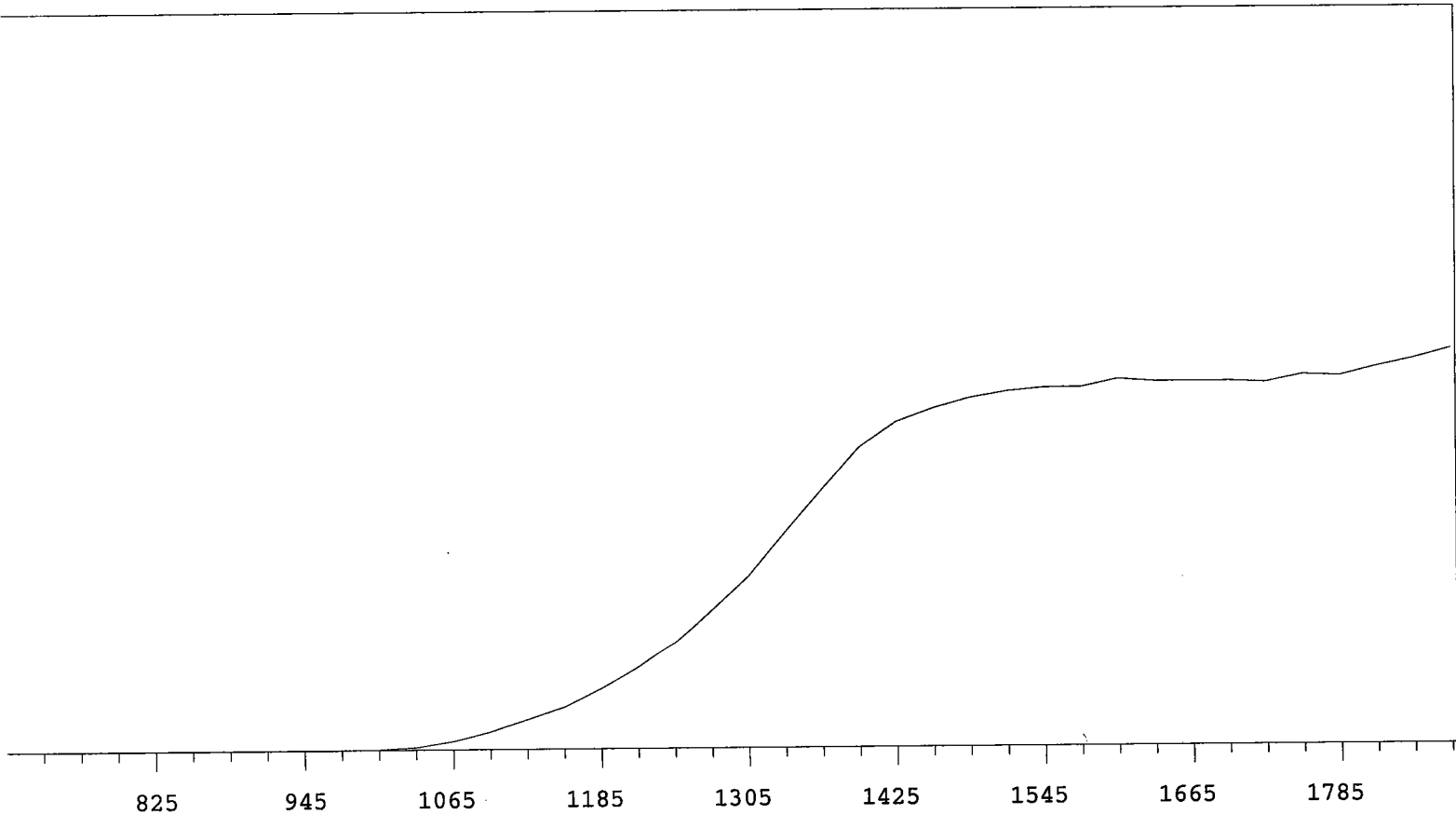
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	16076	+72.76
735	1		1335	19985	+63.85
765	0		1365	24102	+50.95
795	0	>100	1395	27819	+36.01
825	0	>100	1425	30228	+23.86
855	0	>100	1455	31343	+14.40
885	0	>100	1485	32811	+8.77
915	0	>100	1515	33243	+6.10
945	0	>100	1545	33518	+3.25
975	1	>100	1575	34010	+1.98
1005	37	>100	1605	34061	+1.59
1035	198	>100	1635	33973	+0.97
1065	687	>100	1665	34346	+0.93
1095	1491	>100	1695	34366	+1.72
1125	2580	>100	1725	34341	+1.54
1155	3920	>100	1755	34860	+2.47
1185	5588	>100	1785	34897	+4.50
1215	7384	+91.32	1815	35377	+6.60
1245	9794	+84.81	1845	36458	
1275	12572	+79.73	1875	37630	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	14469	+71.08
735	0		1335	17904	+63.07
765	0		1365	21677	+51.20
795	0	>100	1395	25027	+38.06
825	0	>100	1425	27237	+24.55
855	0	>100	1455	28914	+14.61
885	0	>100	1485	29480	+8.48
915	0	>100	1515	30075	+5.06
945	1	>100	1545	30374	+3.42
975	7	>100	1575	30738	+1.68
1005	28	>100	1605	30703	+1.08
1035	190	>100	1635	30679	+0.77
1065	597	>100	1665	30902	+1.46
1095	1474	>100	1695	30992	+1.89
1125	2383	>100	1725	31224	+2.40
1155	3680	>100	1755	31397	+3.27
1185	5131	>100	1785	31826	+4.13
1215	6808	+89.95	1815	32236	+5.59
1245	8990	+83.03	1845	32782	
1275	11493	+77.30	1875	33632	

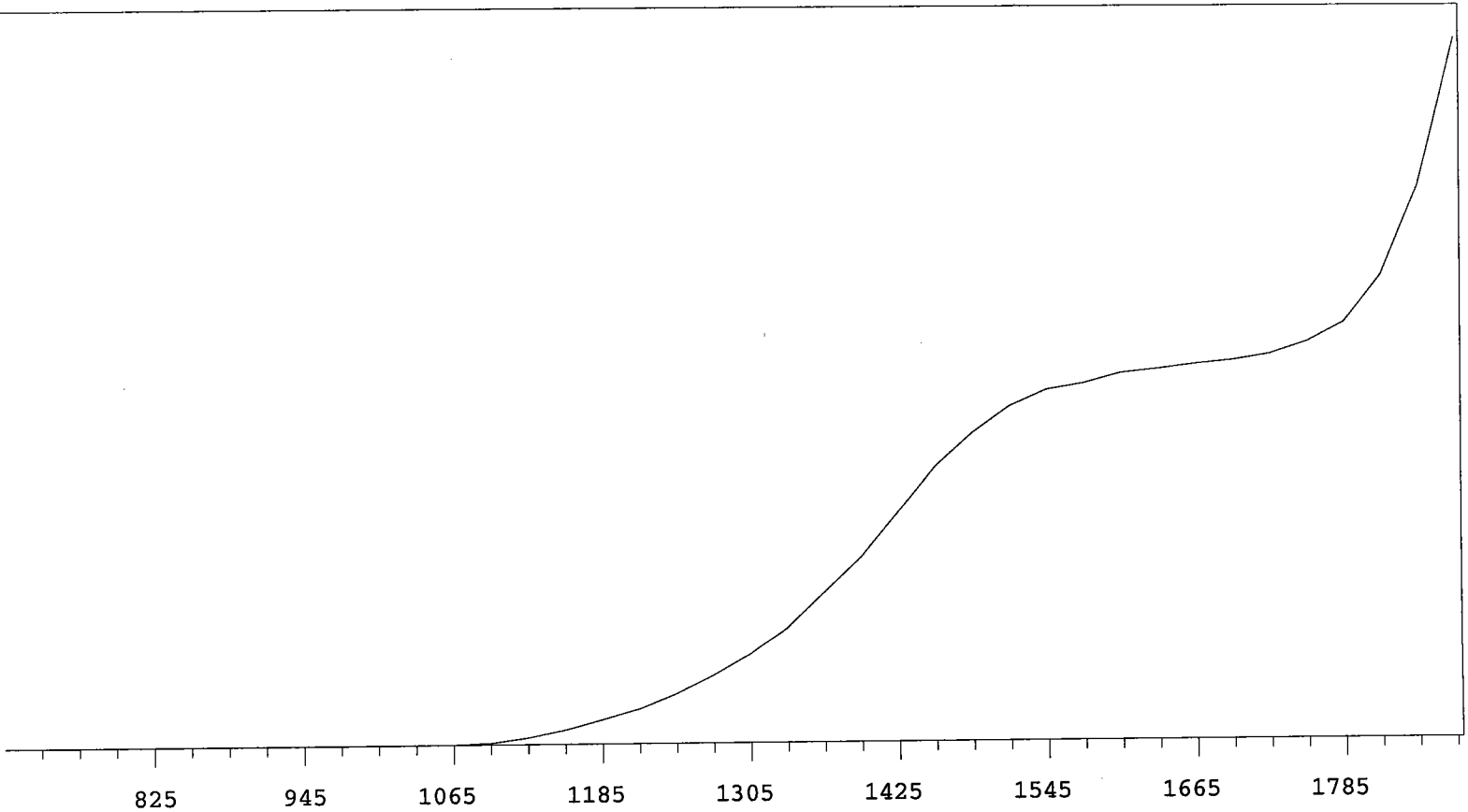


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	18051	+71.16
735	0		1335	22586	+62.34
765	0		1365	26973	+51.47
795	0	>100	1395	31137	+38.24
825	0	>100	1425	34321	+25.70
855	0	>100	1455	36267	+15.37
885	1	>100	1485	37197	+9.21
915	0	>100	1515	37851	+5.38
945	2	>100	1545	38622	+3.00
975	2	>100	1575	38600	+1.55
1005	36	>100	1605	38538	+1.03
1035	220	>100	1635	38786	+0.91
1065	780	>100	1665	39129	+1.38
1095	1712	>100	1695	38832	+1.20
1125	2926	>100	1725	39323	+2.00
1155	4297	>100	1755	39390	+3.35
1185	6097	>100	1785	40031	+4.86
1215	8397	+95.11	1815	40466	+6.64
1245	11155	+85.84	1845	41713	
1275	14430	+78.79	1875	42620	

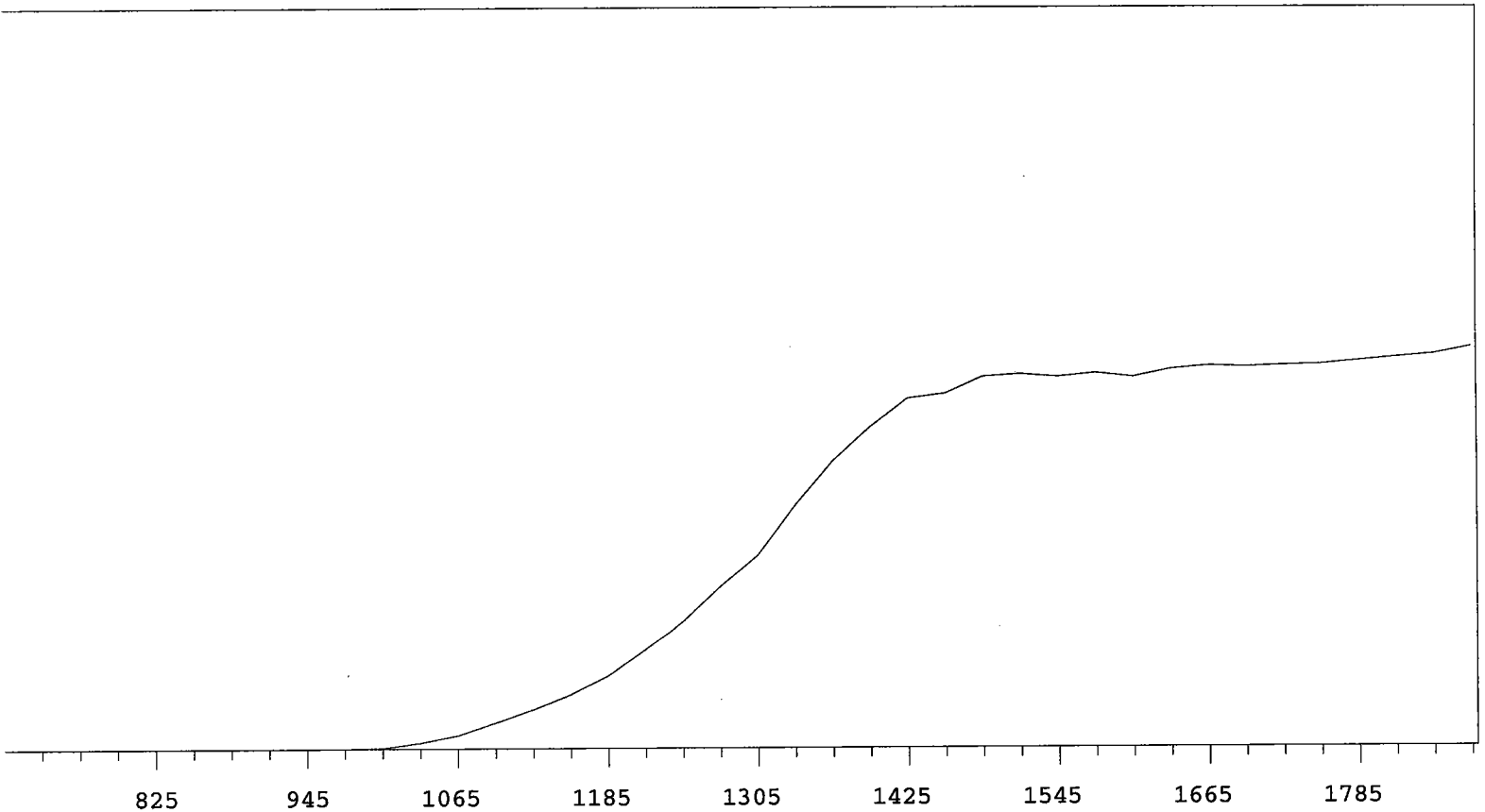


VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	15430	+69.87
735	0		1335	19258	+61.49
765	0		1365	23018	+50.06
795	0	>100	1395	26562	+35.34
825	0	>100	1425	28750	+22.67
855	0	>100	1455	29911	+13.20
885	0	>100	1485	30798	+8.01
915	0	>100	1515	31375	+4.83
945	0	>100	1545	31684	+3.74
975	3	>100	1575	31721	+2.38
1005	49	>100	1605	32398	+1.44
1035	244	>100	1635	32154	+0.64
1065	764	>100	1665	32157	-0.77
1095	1584	>100	1695	32152	+0.99
1125	2677	>100	1725	32029	+1.41
1155	3763	>100	1755	32699	+3.00
1185	5395	>100	1785	32566	+4.71
1215	7350	+93.71	1815	33351	+5.92
1245	9655	+83.52	1845	34031	
1275	12504	+76.82	1875	34941	

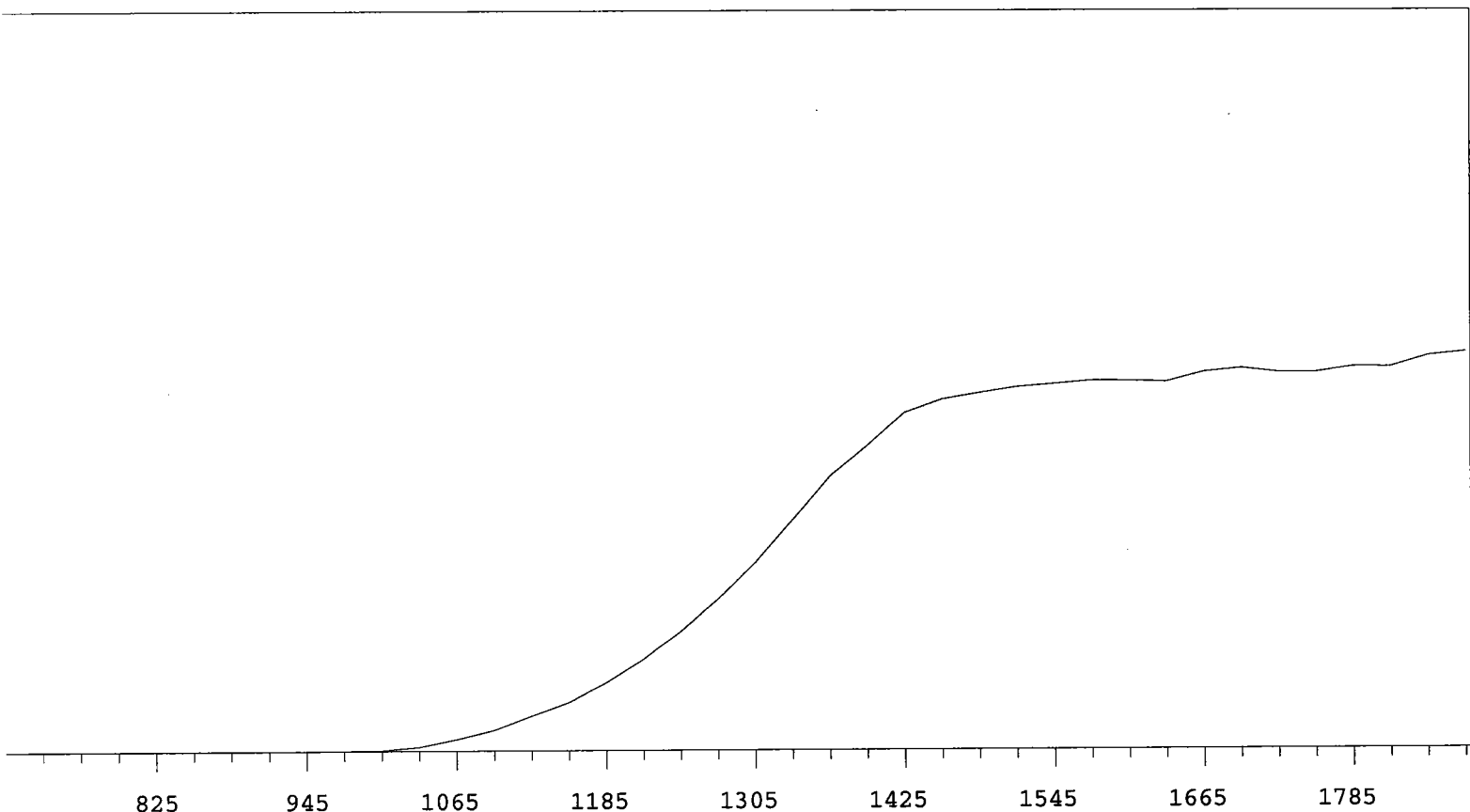
Alpha Volts: 1515 Beta Volts: 1515



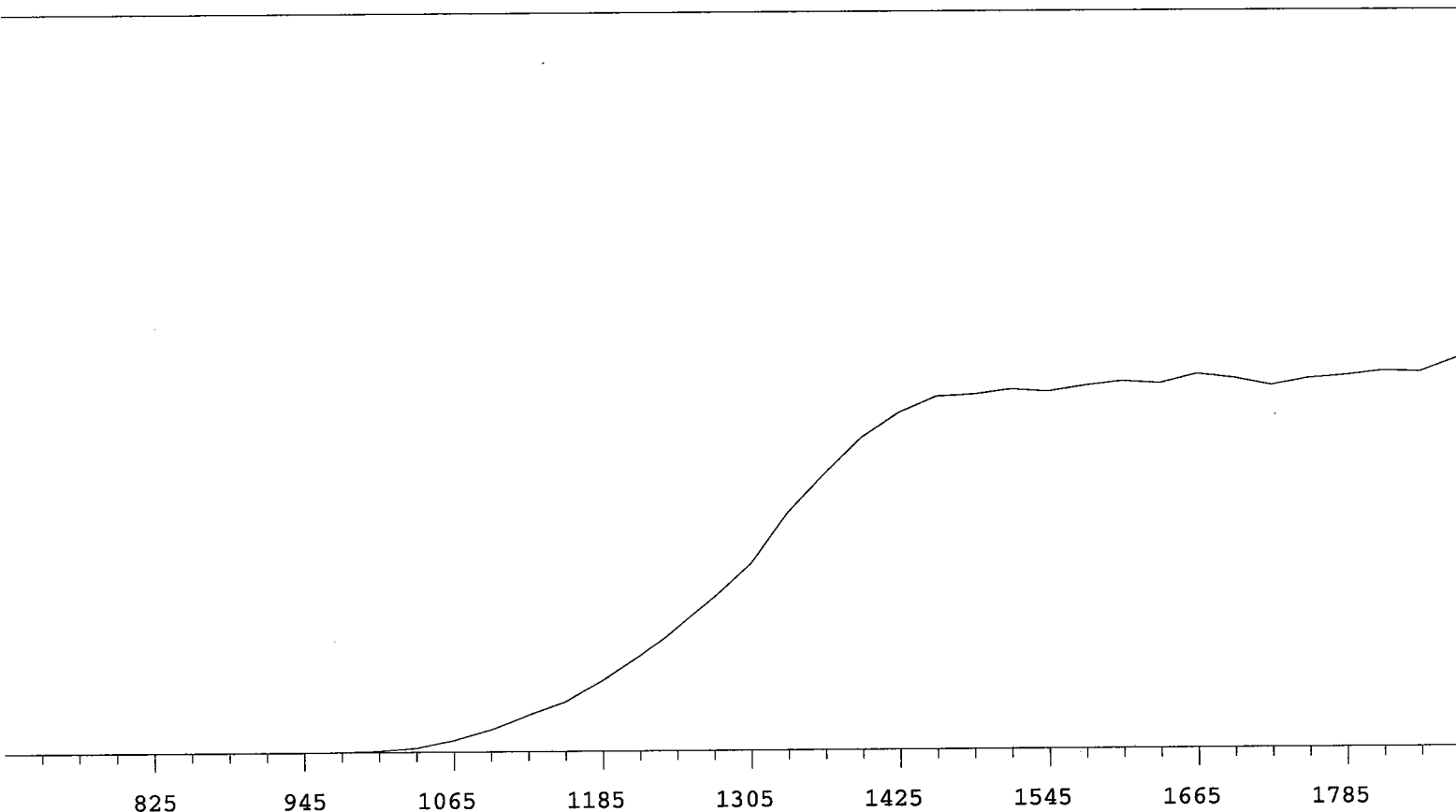
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	3225	+87.64
735	1		1335	4189	+80.15
765	0		1365	5428	+75.12
795	0	>100	1395	6662	+68.60
825	0	>100	1425	8241	+58.14
855	0	>100	1455	9857	+46.65
885	0	>100	1485	11018	+33.24
915	0	>100	1515	11953	+21.01
945	1	+0.00	1545	12538	+13.57
975	0	>100	1575	12760	+8.35
1005	0	>100	1605	13114	+5.84
1035	2	>100	1635	13258	+4.78
1065	9	>100	1665	13430	+3.99
1095	61	>100	1695	13551	+5.46
1125	248	>100	1725	13771	+8.65
1155	528	>100	1755	14204	+16.44
1185	882	>100	1785	14916	+30.03
1215	1270	>100	1815	16579	+48.74
1245	1786	>100	1845	19717	
1275	2478	+93.67	1875	25029	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	8947	+65.63
735	0		1335	11238	+56.58
765	0		1365	13246	+46.66
795	0	>100	1395	14838	+30.69
825	0	>100	1425	16166	+20.11
855	0	>100	1455	16396	+11.95
885	0	>100	1485	17161	+5.61
915	1	>100	1515	17274	+3.59
945	0	>100	1545	17144	-0.00
975	11	>100	1575	17323	+0.80
1005	47	>100	1605	17136	+2.21
1035	280	>100	1635	17484	+1.94
1065	610	>100	1665	17638	+2.16
1095	1192	>100	1695	17580	+0.85
1125	1789	>100	1725	17655	+1.05
1155	2466	>100	1755	17700	+1.98
1185	3337	+94.91	1785	17857	+2.38
1215	4526	+88.85	1815	18006	+3.36
1245	5885	+78.40	1845	18140	
1275	7518	+72.09	1875	18468	



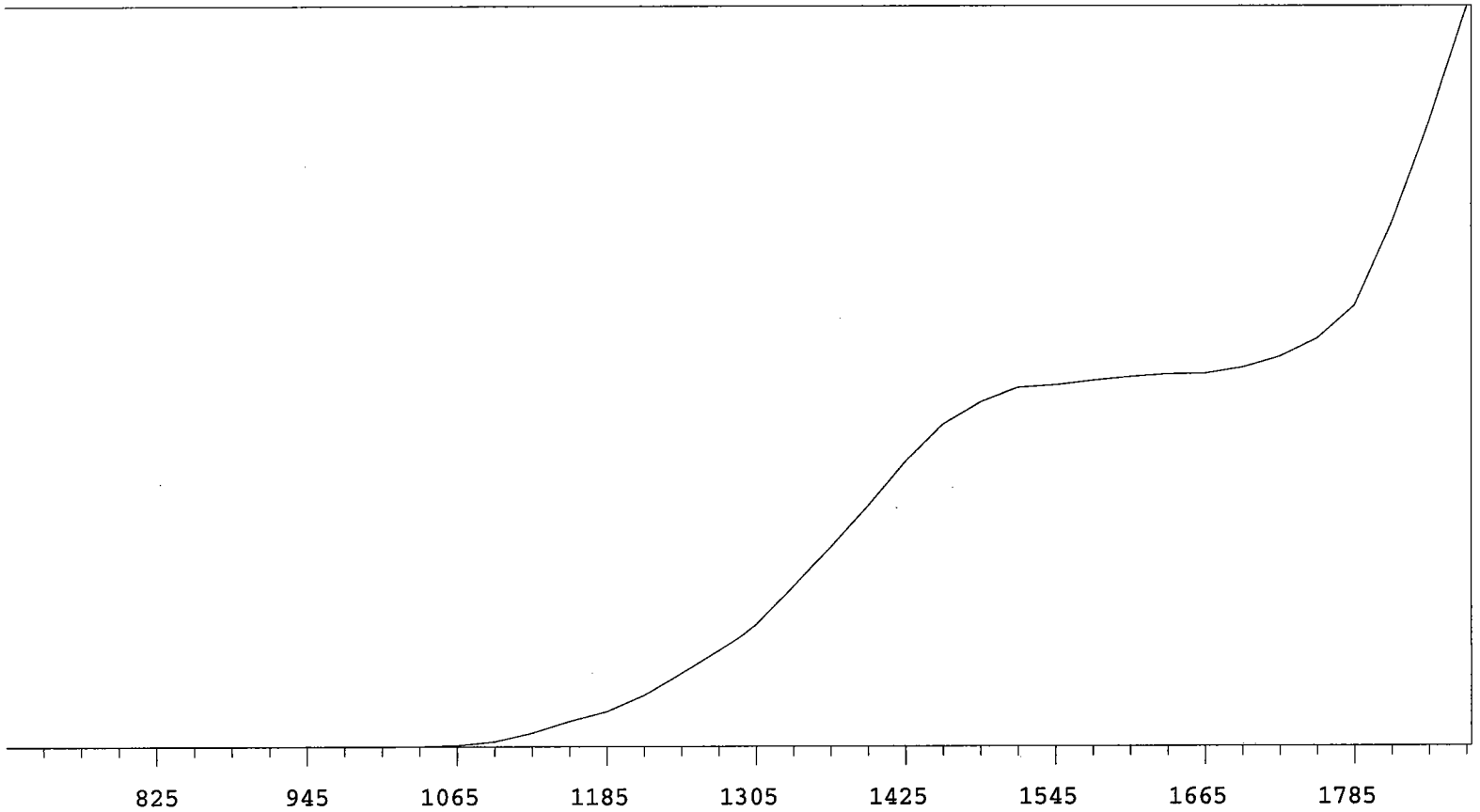
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	8636	+66.44
735	0		1335	10593	+56.56
765	0	+0.00	1365	12582	+46.23
795	0	>100	1395	13957	+33.45
825	1	+0.00	1425	15443	+21.49
855	0	>100	1455	16048	+13.14
885	0	+0.00	1485	16331	+6.45
915	0	>100	1515	16603	+4.19
945	1	>100	1545	16736	+2.73
975	7	>100	1575	16884	+1.11
1005	46	>100	1605	16875	+1.91
1035	191	>100	1635	16813	+2.86
1065	540	>100	1665	17257	+2.60
1095	957	>100	1695	17425	+1.58
1125	1597	>100	1725	17238	+0.49
1155	2217	>100	1755	17230	+0.63
1185	3154	+98.74	1785	17482	+3.27
1215	4239	+89.75	1815	17468	+4.46
1245	5550	+79.98	1845	17977	
1275	6980	+73.12	1875	18163	



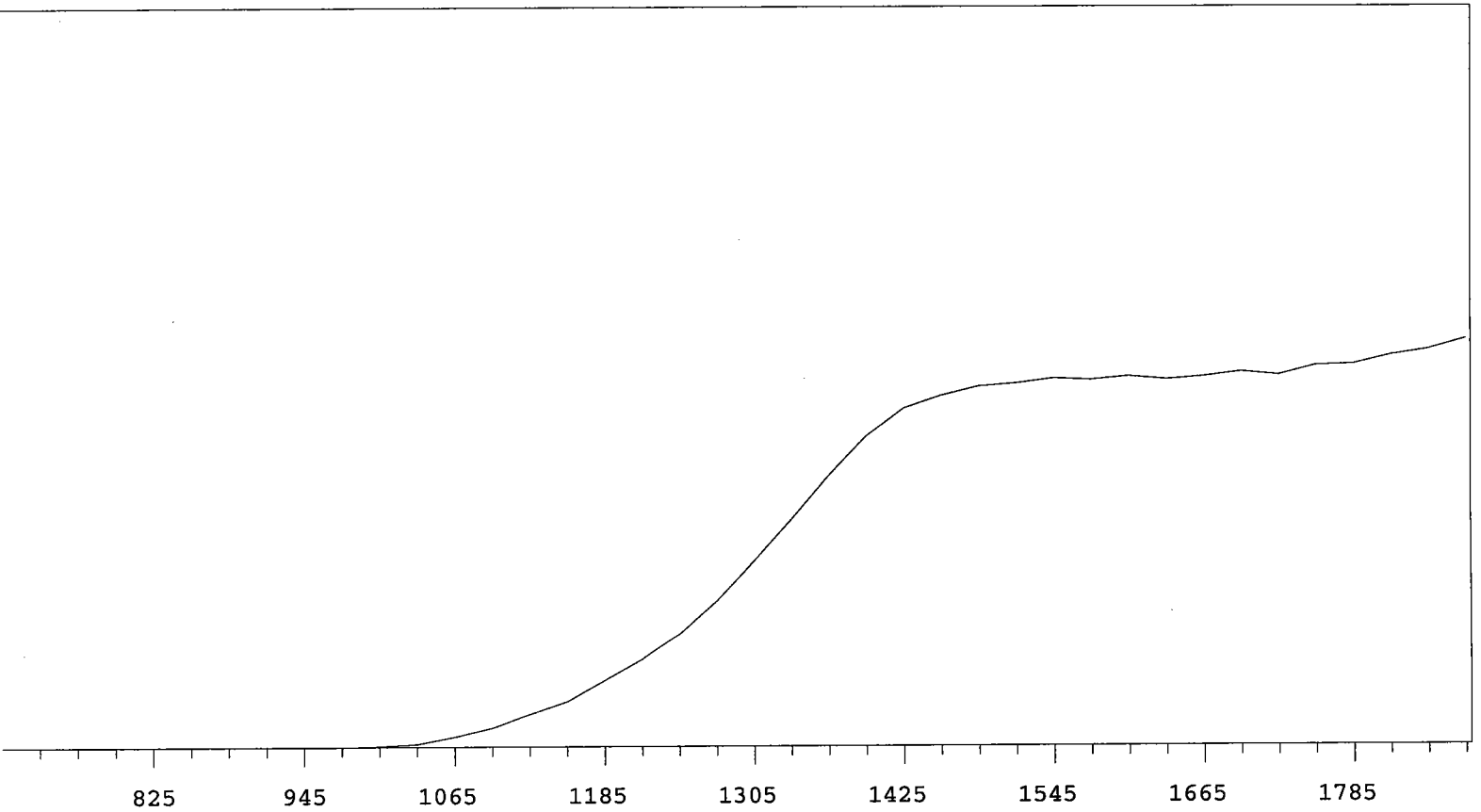
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	7679	+65.97
735	0		1335	9737	+57.57
765	0		1365	11301	+45.87
795	0	>100	1395	12767	+31.71
825	0	>100	1425	13767	+19.90
855	1	+83.33	1455	14399	+10.72
885	1	+55.56	1485	14467	+4.38
915	0	>100	1515	14671	+2.12
945	1	>100	1545	14576	+2.61
975	9	>100	1575	14808	+1.80
1005	60	>100	1605	14974	+3.15
1035	173	>100	1635	14872	+1.76
1065	480	>100	1665	15248	-0.41
1095	911	>100	1695	15067	-0.27
1125	1508	>100	1725	14784	-0.43
1155	2024	>100	1755	15044	+2.01
1185	2872	+97.38	1785	15163	+2.82
1215	3858	+89.30	1815	15333	+3.61
1245	5070	+78.02	1845	15278	
1275	6322	+73.30	1875	15817	

Alpha Volts: 705

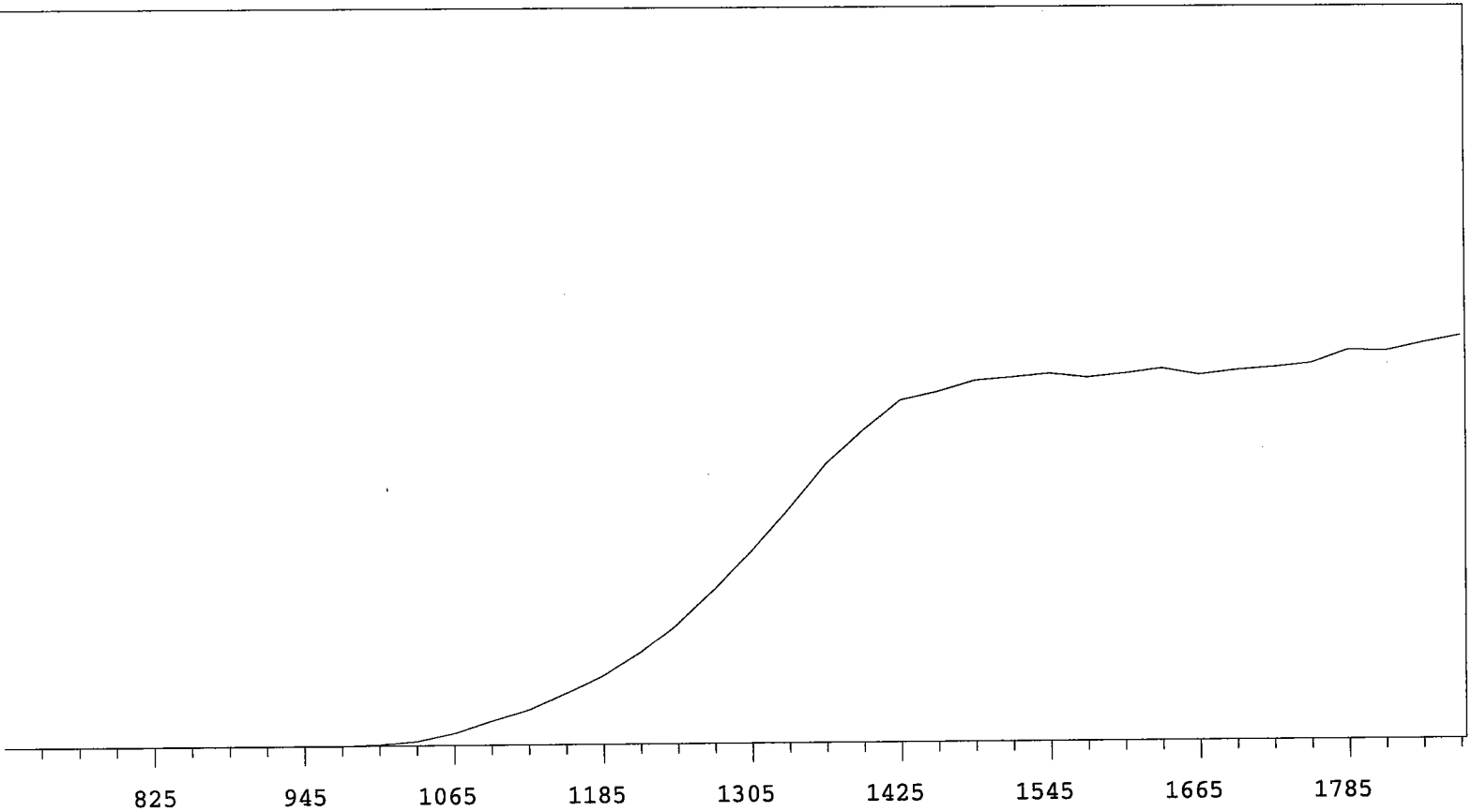
Beta Volts: 1515



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	6302	+80.03
735	1		1335	8191	+73.78
765	0		1365	10140	+66.18
795	0	>100	1395	12247	+55.83
825	0	>100	1425	14468	+43.92
855	0	>100	1455	16303	+31.28
885	0	>100	1485	17411	+18.64
915	0	>100	1515	18150	+9.87
945	0	>100	1545	18275	+5.30
975	1	>100	1575	18496	+3.16
1005	3	>100	1605	18685	+2.66
1035	17	>100	1635	18820	+2.63
1065	84	>100	1665	18855	+4.16
1095	267	>100	1695	19152	+7.70
1125	709	>100	1725	19706	+13.90
1155	1299	>100	1755	20640	+26.51
1185	1813	>100	1785	22308	+40.92
1215	2638	>100	1815	26460	+51.46
1245	3777	+96.47	1845	31616	
1275	4915	+87.98	1875	37348	



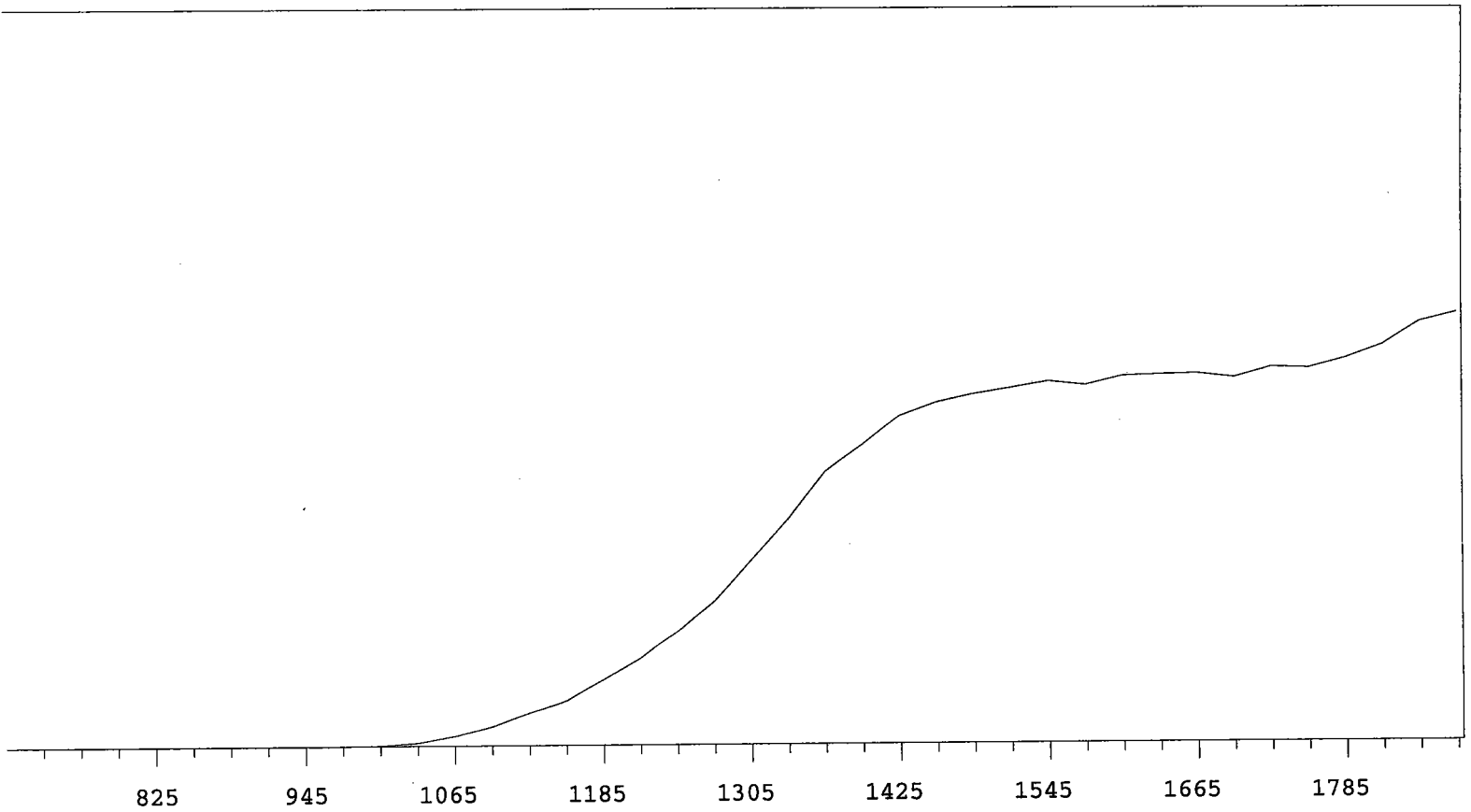
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	10207	+70.42
735	0		1335	12473	+60.75
765	0		1365	14900	+48.87
795	0	>100	1395	17101	+35.36
825	0	>100	1425	18643	+22.53
855	1	+83.33	1455	19350	+12.34
885	1	-83.33	1485	19848	+6.68
915	0	-55.56	1515	20014	+3.51
945	0	>100	1545	20278	+2.03
975	1	>100	1575	20186	+0.80
1005	43	>100	1605	20375	+0.32
1035	165	>100	1635	20209	+1.36
1065	557	>100	1665	20364	+0.83
1095	1055	>100	1695	20607	+2.43
1125	1775	>100	1725	20429	+2.51
1155	2470	>100	1755	20924	+3.64
1185	3617	+98.46	1785	20984	+5.11
1215	4757	+90.95	1815	21470	+5.63
1245	6186	+83.59	1845	21773	
1275	8021	+77.85	1875	22346	



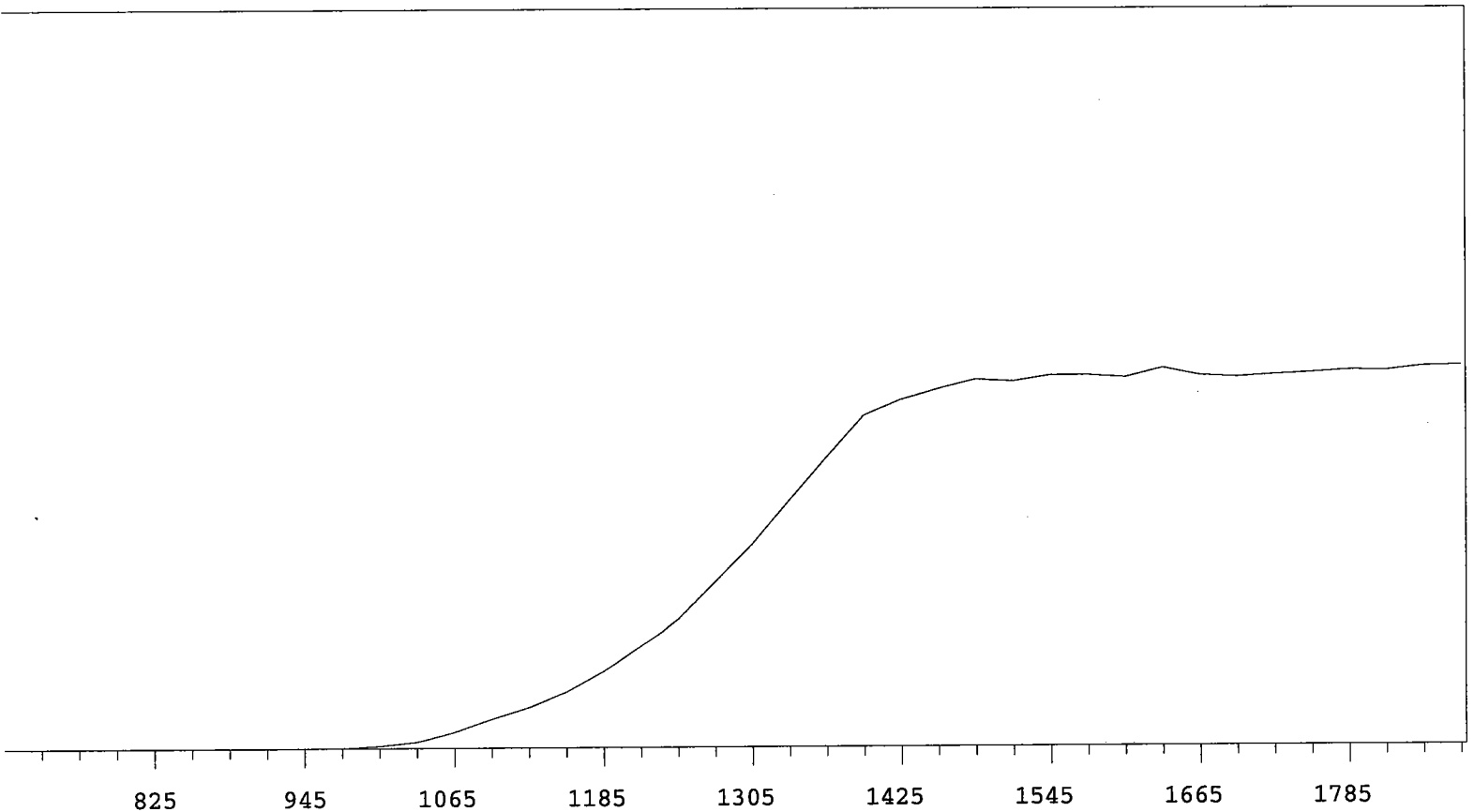
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	9543	+67.01
735	0		1335	11617	+56.47
765	0		1365	13791	+45.47
795	0	>100	1395	15387	+31.66
825	0	>100	1425	16819	+20.02
855	0	>100	1455	17210	+11.63
885	1	+0.00	1485	17742	+6.05
915	0	>100	1515	17892	+3.04
945	0	>100	1545	18070	+1.09
975	7	>100	1575	17856	+1.43
1005	52	>100	1605	18054	+0.42
1035	214	>100	1635	18287	+1.06
1065	590	>100	1665	17969	+0.78
1095	1201	>100	1695	18187	+1.48
1125	1759	>100	1725	18317	+4.89
1155	2569	>100	1755	18518	+4.76
1185	3440	+95.13	1785	19156	+5.18
1215	4583	+87.74	1815	19100	+5.18
1245	5985	+81.67	1845	19496	
1275	7682	+74.54	1875	19842	

Alpha Volts: 705

Beta Volts: 1515



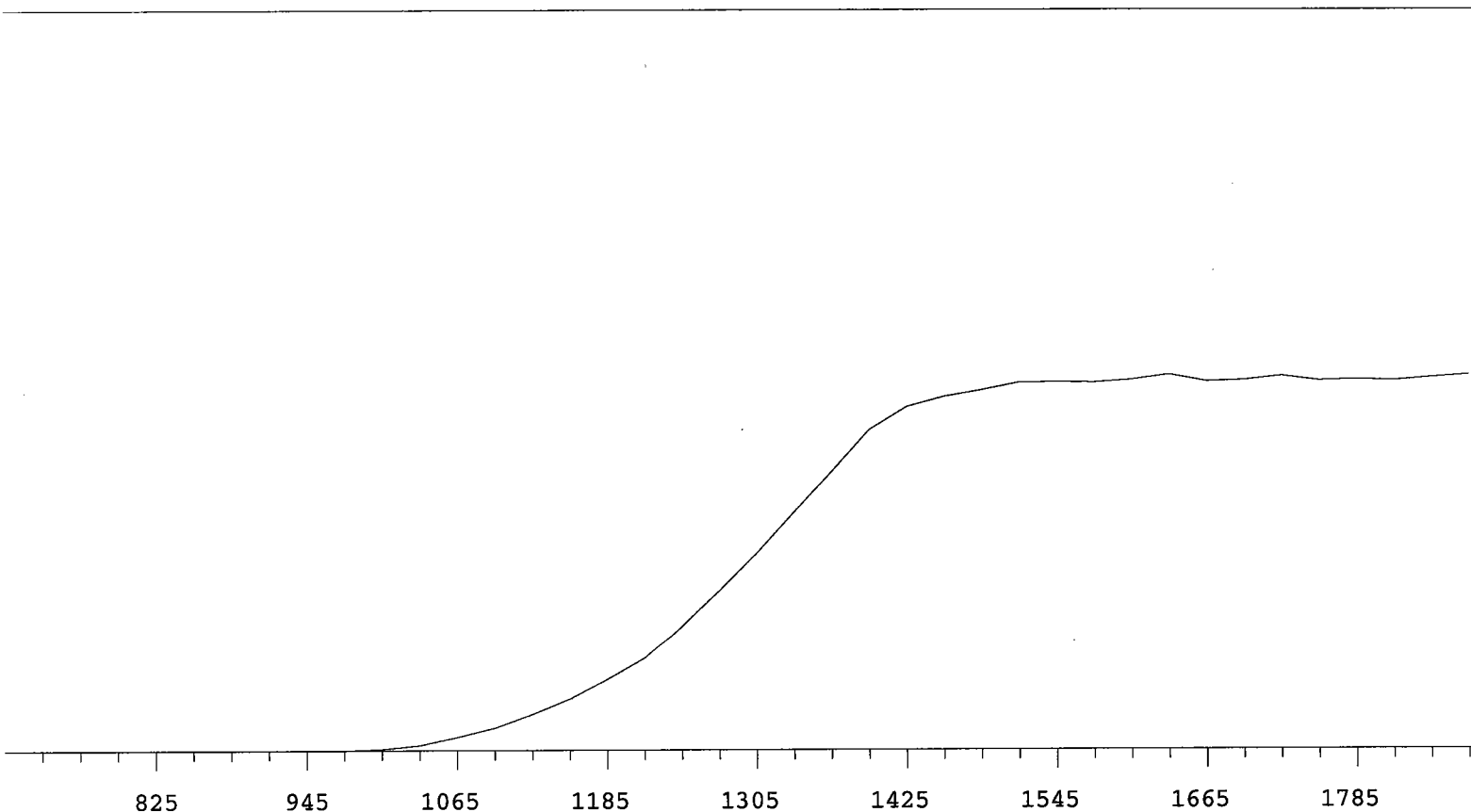
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	9144	+69.92
735	0		1335	11120	+58.43
765	0		1365	13399	+45.40
795	0	>100	1395	14711	+32.57
825	0	>100	1425	16134	+20.69
855	0	>100	1455	16805	+13.46
885	0	>100	1485	17209	+7.90
915	0	>100	1515	17500	+4.31
945	0	>100	1545	17812	+3.48
975	4	>100	1575	17629	+2.80
1005	26	>100	1605	18066	+2.23
1035	169	>100	1635	18122	+1.44
1065	483	>100	1665	18166	+1.20
1095	955	>100	1695	17967	+1.60
1125	1639	>100	1725	18469	+3.41
1155	2233	>100	1755	18409	+6.35
1185	3262	+98.61	1785	18884	+9.47
1215	4306	+89.77	1815	19535	+11.98
1245	5662	+82.36	1845	20630	
1275	7113	+76.36	1875	21076	



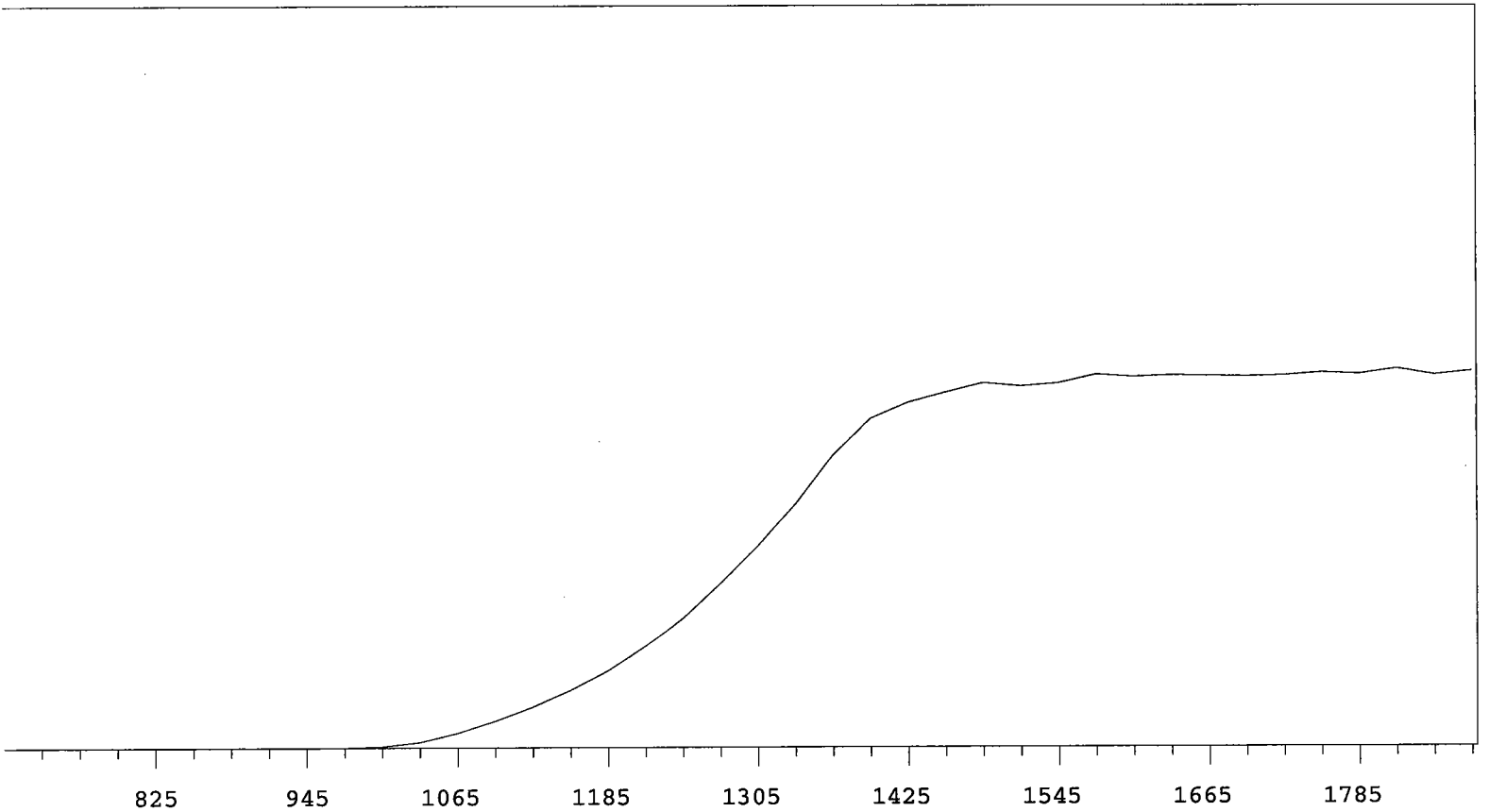
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	9209	+64.55
735	1		1335	11200	+55.94
765	0	+55.56	1365	13123	+43.27
795	2	>100	1395	14957	+29.04
825	0	+0.00	1425	15658	+17.41
855	0	>100	1455	16123	+8.01
885	1	>100	1485	16530	+4.92
915	0	>100	1515	16437	+2.71
945	1	>100	1545	16704	+0.83
975	14	>100	1575	16707	+2.14
1005	104	>100	1605	16602	+0.55
1035	281	>100	1635	17024	-0.28
1065	720	>100	1665	16684	-0.42
1095	1302	>100	1695	16597	-0.85
1125	1834	>100	1725	16711	+1.27
1155	2544	>100	1755	16796	+1.51
1185	3485	+92.28	1785	16903	+1.57
1215	4624	+85.50	1815	16880	+1.46
1245	5878	+77.82	1845	17066	
1275	7515	+71.49	1875	17085	

Alpha Volts: 705

Beta Volts: 1515



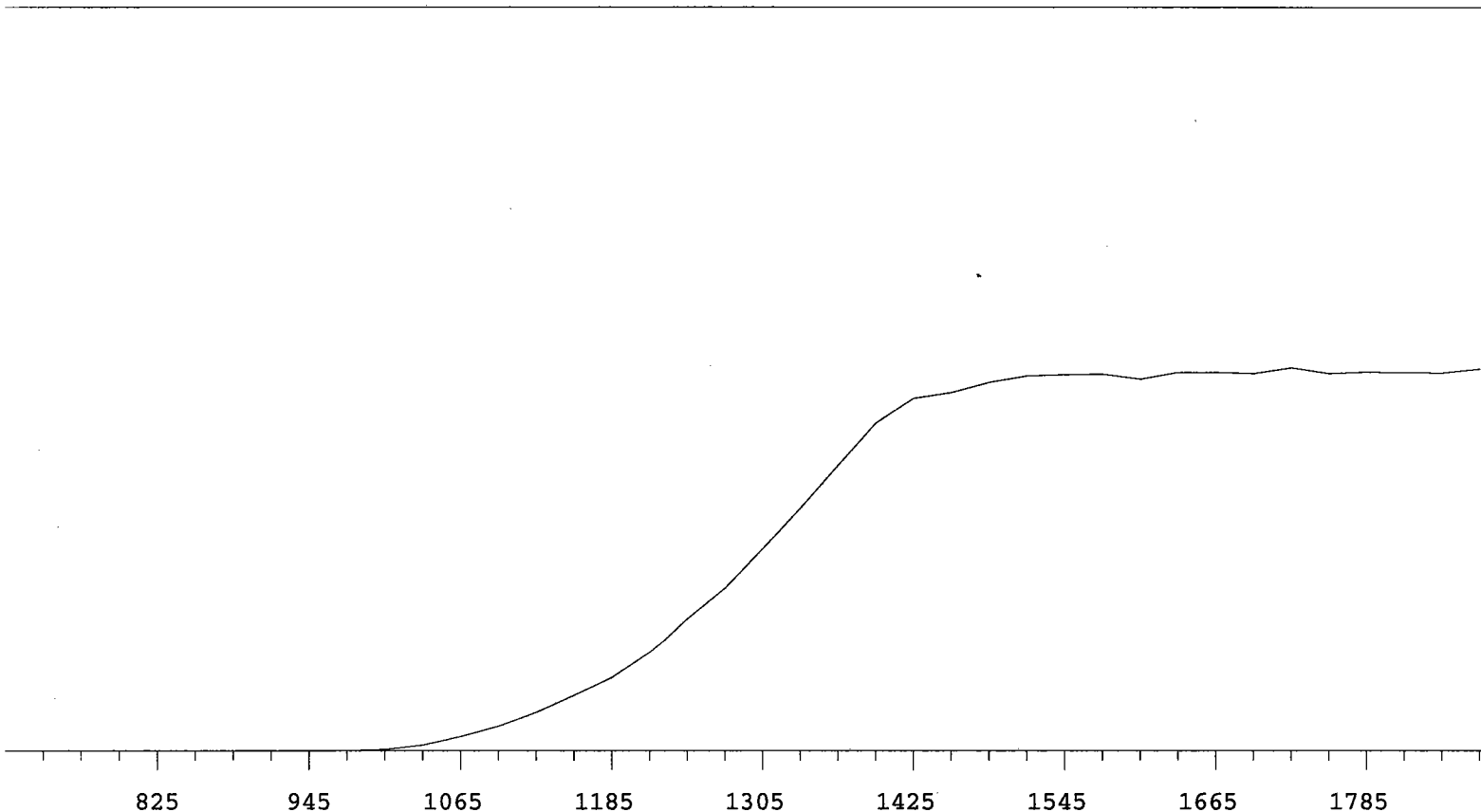
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	9666	+64.39
735	0		1335	11722	+55.91
765	0		1365	13680	+44.91
795	0	>100	1395	15677	+31.56
825	0	>100	1425	16786	+19.46
855	0	>100	1455	17283	+10.57
885	0	>100	1485	17608	+5.95
915	1	>100	1515	17972	+3.32
945	0	>100	1545	18006	+1.84
975	4	>100	1575	17970	+1.58
1005	70	>100	1605	18104	+0.74
1035	257	>100	1635	18351	+0.24
1065	648	>100	1665	18016	+0.16
1095	1116	>100	1695	18080	-0.63
1125	1784	>100	1725	18283	+0.29
1155	2560	>100	1755	18047	-0.47
1185	3531	+96.11	1785	18110	-0.32
1215	4568	+89.22	1815	18040	+1.17
1245	6137	+81.65	1845	18200	
1275	7855	+74.42	1875	18320	



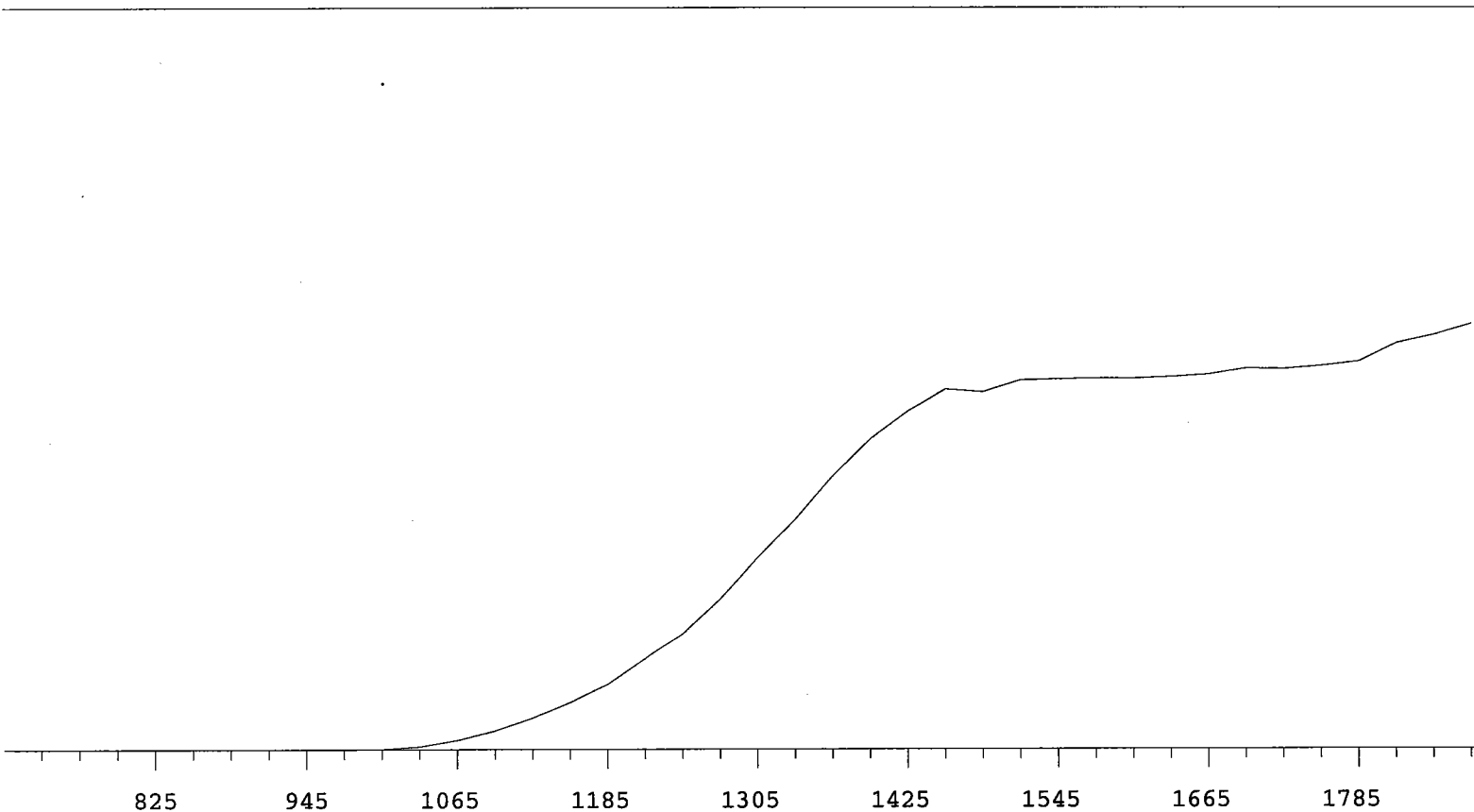
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	11573	+64.95
735	0		1335	13929	+56.47
765	0		1365	16726	+43.82
795	0	>100	1395	18834	+29.38
825	0	>100	1425	19743	+16.84
855	0	>100	1455	20314	+7.95
885	0	>100	1485	20860	+4.16
915	0	>100	1515	20670	+3.23
945	0	>100	1545	20844	+2.09
975	9	>100	1575	21330	+2.48
1005	93	>100	1605	21188	+1.16
1035	325	>100	1635	21280	-0.32
1065	834	>100	1665	21237	+0.08
1095	1525	>100	1695	21202	+0.42
1125	2318	>100	1725	21254	+0.60
1155	3233	>100	1755	21406	+1.41
1185	4357	+92.07	1785	21326	+0.42
1215	5755	+85.64	1815	21619	+0.16
1245	7438	+78.35	1845	21282	
1275	9463	+70.89	1875	21478	

Alpha Volts: 705

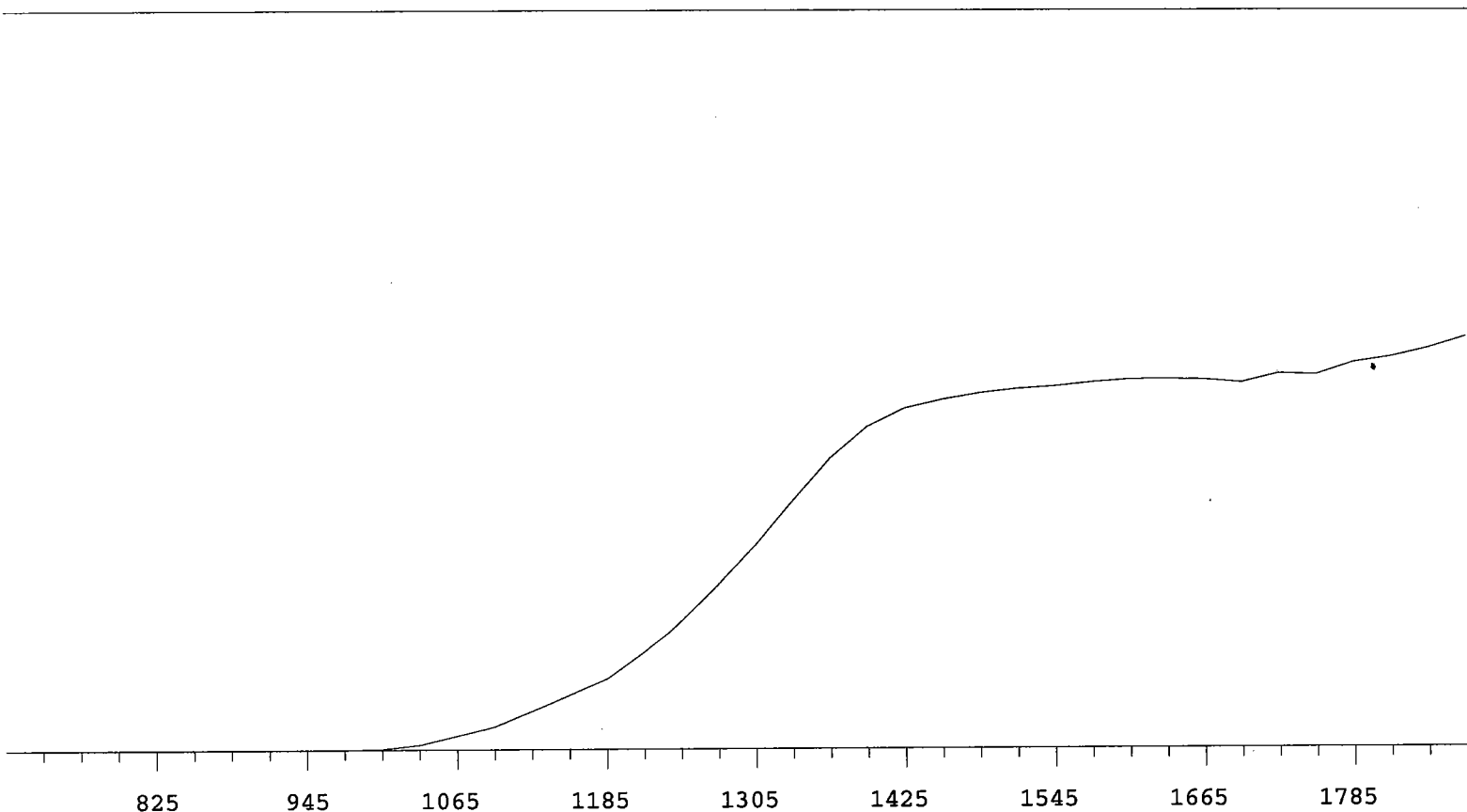
Beta Volts: 1515



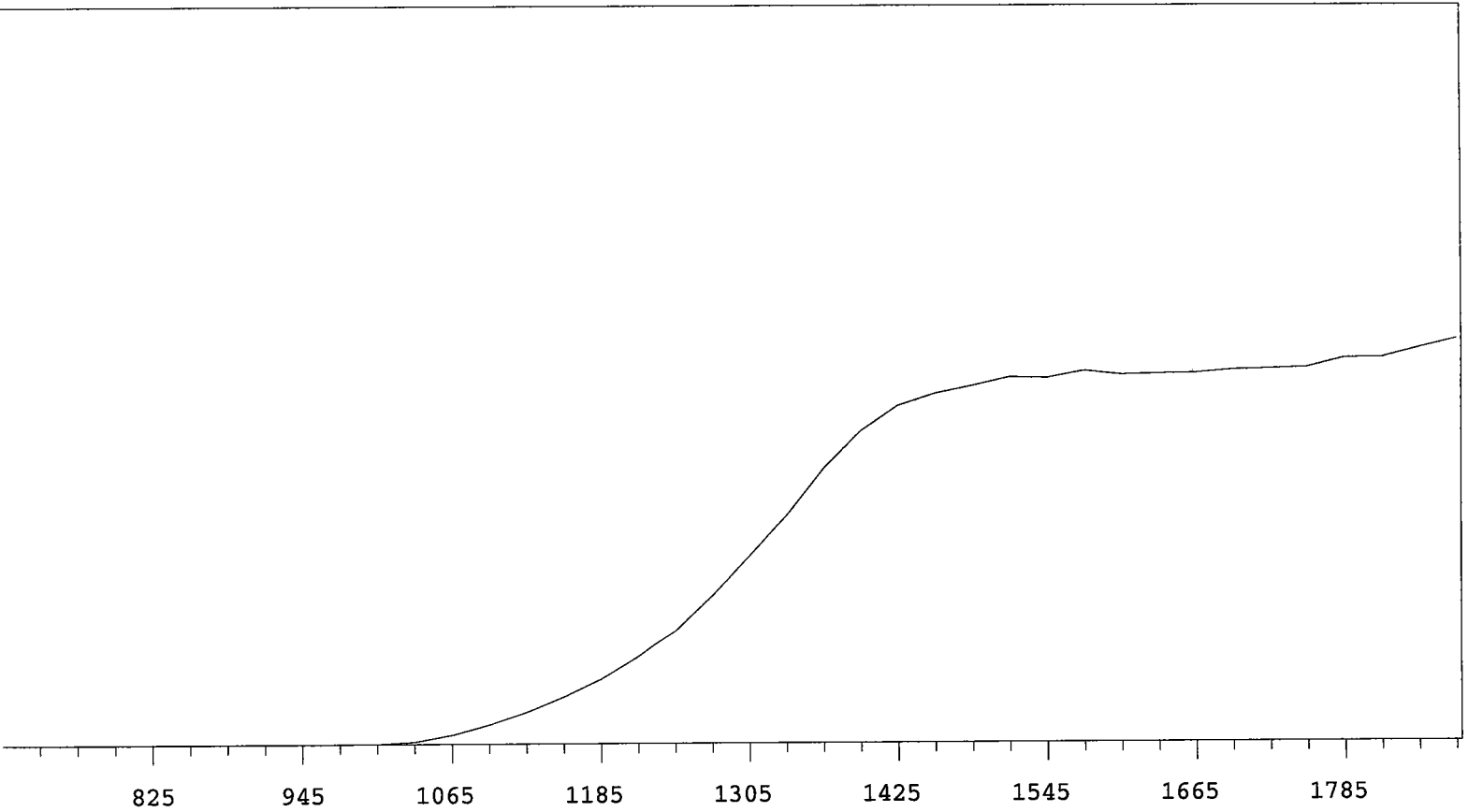
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	1		1305	7524	+61.93
735	0		1335	9002	+55.36
765	0		1365	10542	+44.70
795	0	>100	1395	12064	+31.21
825	0	>100	1425	12981	+19.20
855	0	>100	1455	13192	+10.41
885	0	>100	1485	13570	+5.93
915	0	>100	1515	13820	+4.08
945	0	>100	1545	13866	+0.75
975	9	>100	1575	13880	+0.21
1005	58	>100	1605	13695	+0.59
1035	228	>100	1635	13950	+0.77
1065	544	>100	1665	13954	+1.92
1095	936	>100	1695	13911	+0.19
1125	1468	>100	1725	14116	+0.02
1155	2110	>100	1755	13908	-0.24
1185	2770	+94.71	1785	13960	-0.81
1215	3670	+85.91	1815	13939	+0.71
1245	4937	+79.46	1845	13931	
1275	6066	+70.79	1875	14071	



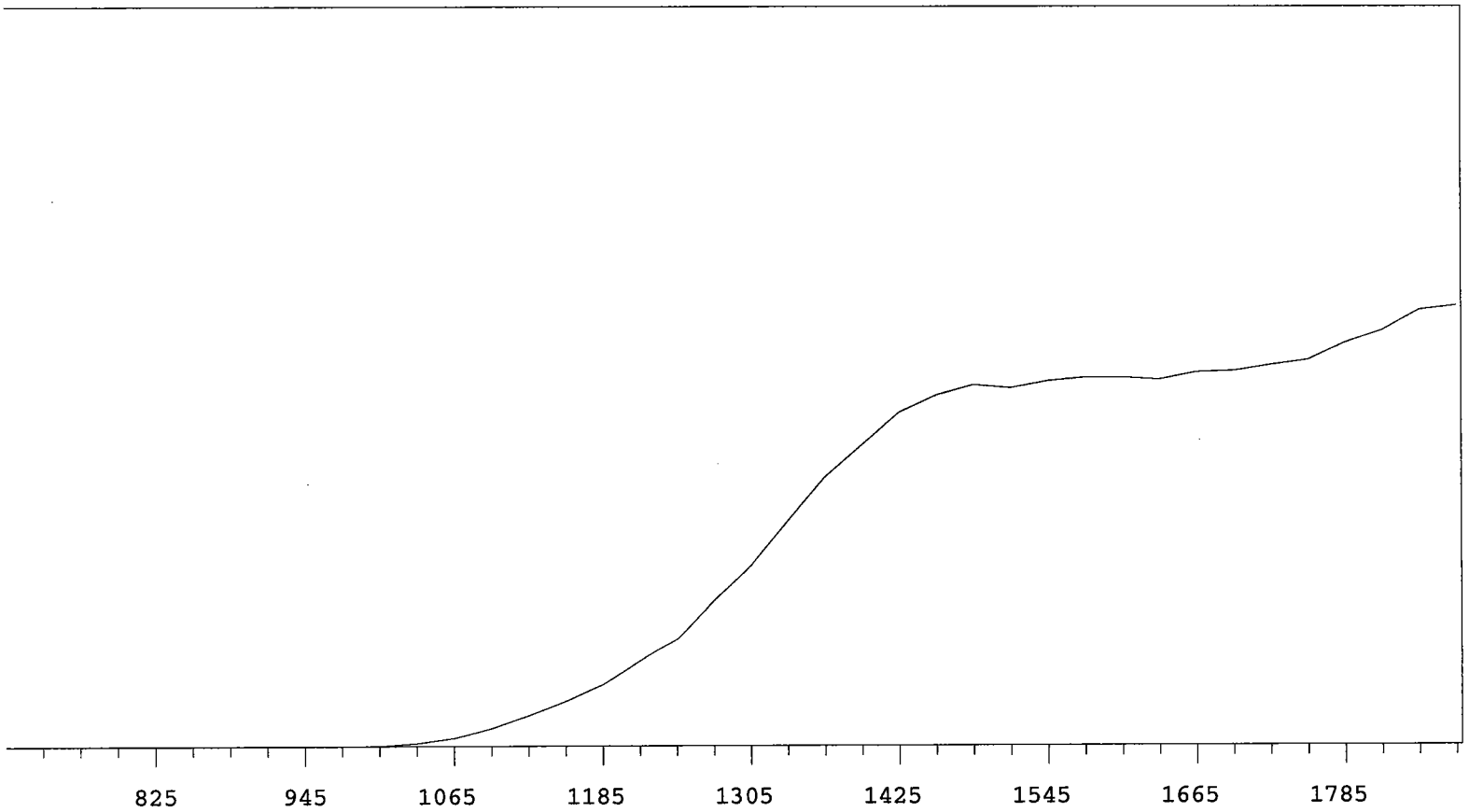
VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	8778	+67.49
735	0		1335	10502	+57.68
765	0		1365	12516	+46.36
795	0	>100	1395	14215	+35.88
825	0	>100	1425	15472	+22.01
855	0	>100	1455	16469	+12.99
885	1	+0.00	1485	16342	+6.70
915	0	>100	1515	16874	+3.07
945	0	>100	1545	16918	+2.53
975	0	>100	1575	16950	+0.58
1005	18	>100	1605	16943	+0.95
1035	137	>100	1635	17008	+2.13
1065	430	>100	1665	17130	+2.45
1095	865	>100	1695	17403	+2.43
1125	1444	>100	1725	17377	+2.43
1155	2151	>100	1755	17515	+4.88
1185	2981	>100	1785	17710	+7.54
1215	4168	+92.14	1815	18533	+9.04
1245	5377	+84.73	1845	18905	
1275	6924	+74.92	1875	19415	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	8797	+65.44
735	0		1335	10726	+54.47
765	0		1365	12570	+41.11
795	0	>100	1395	13917	+26.79
825	0	>100	1425	14687	+15.44
855	1	+0.00	1455	15048	+8.47
885	0	>100	1485	15318	+5.00
915	0	>100	1515	15494	+3.76
945	0	>100	1545	15606	+3.04
975	3	>100	1575	15776	+2.35
1005	40	>100	1605	15889	+1.44
1035	210	>100	1635	15907	-0.16
1065	590	>100	1665	15881	+0.64
1095	983	>100	1695	15741	+1.21
1125	1645	>100	1725	16124	+3.63
1155	2342	>100	1755	16076	+5.41
1185	3045	+96.43	1785	16588	+5.79
1215	4201	+90.42	1815	16830	+7.53
1245	5579	+83.64	1845	17185	
1275	7121	+74.44	1875	17682	



VOLTS	COUNTS	%/100 Volts	VOLTS	COUNTS	%/100 Volts
705	0		1305	10118	+69.76
735	0		1335	12269	+59.65
765	0		1365	14810	+47.35
795	0	>100	1395	16773	+33.46
825	0	>100	1425	18104	+20.13
855	0	>100	1455	18720	+11.98
885	1	+0.00	1485	19122	+6.50
915	0	>100	1515	19580	+4.77
945	0	>100	1545	19527	+2.48
975	2	>100	1575	19902	+0.81
1005	21	>100	1605	19690	+0.53
1035	132	>100	1635	19739	+0.23
1065	491	>100	1665	19765	+1.29
1095	1036	>100	1695	19932	+1.40
1125	1698	>100	1725	19976	+2.72
1155	2517	>100	1755	20051	+2.92
1185	3468	>100	1785	20523	+4.26
1215	4721	+91.83	1815	20542	+5.57
1245	6175	+85.13	1845	21035	
1275	8025	+76.82	1875	21528	



VOLTS	COUNTS	%/100 Volts
705	0	
735	0	
765	0	
795	0	>100
825	0	>100
855	0	>100
885	0	>100
915	0	>100
945	0	>100
975	1	>100
1005	14	>100
1035	130	>100
1065	363	>100
1095	785	>100
1125	1357	>100
1155	1996	>100
1185	2735	+99.45
1215	3785	+94.20
1245	4857	+86.43
1275	6571	+78.80
1305	8095	+71.16
1335	10052	+58.38
1365	11990	+47.92
1395	13400	+35.01
1425	14808	+23.58
1455	15554	+13.45
1485	15987	+6.39
1515	15861	+3.45
1545	16156	+2.18
1575	16297	+1.72
1605	16297	+1.33
1635	16208	+1.62
1665	16526	+2.92
1695	16581	+3.94
1725	16832	+5.91
1755	17039	+8.68
1785	17800	+11.53
1815	18351	+11.46
1845	19265	
1875	19468	

VOLTS	COUNTS	%/100 Volts
1305	8095	+71.16
1335	10052	+58.38
1365	11990	+47.92
1395	13400	+35.01
1425	14808	+23.58
1455	15554	+13.45
1485	15987	+6.39
1515	15861	+3.45
1545	16156	+2.18
1575	16297	+1.72
1605	16297	+1.33
1635	16208	+1.62
1665	16526	+2.92
1695	16581	+3.94
1725	16832	+5.91
1755	17039	+8.68
1785	17800	+11.53
1815	18351	+11.46
1845	19265	
1875	19468	

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

66002-278

Ra-228 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Ra-228
ACTIVITY (dps):	2.367 E4
HALF-LIFE:	5.75 years
CALIBRATION DATE:	April 23, 2003 12:00 EST
TOTAL UNCERTAINTY*:	2.4%

*95% Confidence Level

Impurities: γ -impurities (other than decay products) <0.1%,
Ra-226 <0.1%

5.31628 grams 4M HCl solution with 100 μ g/g Ba carrier.

P O NUMBER 3219 RD, Item 1

SOURCE PREPARED BY:

M. Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED:

J.M. Muth 4-23-03



Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0553-A	Isotope:	Radium-228 SPIKE
Prepared By:	Lonnie Morris	Prepared By:	Lonnie Morris
Carrier Conc:	0.5M HCl	Prep Date:	04/25/2003
Reference Date:	04/23/2003	Verification Date:	04/27/2005
Ampoule Mass (g):	5.0235 g	Expiration Date:	04/27/2006
Uncertainty:	+/-	Primary Code:	0553-B
LogBook No:	RC-S-035-068	Dilution(mL):	1000 mL
		Mass of Parent(g):	30.535 g
		Density(g/mL):	
		Balance ID:	

Calculations Converting parent activity to dpm/mL|dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dpm/mL)}) * (\text{conversion dpm to dpm}) / (\text{Dilution Vol}) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dpm/mL)}) * (\text{conversion dpm to dpm}) / \text{Density (g/mL)} / (\text{Dilution Vol}) = \text{Parent Activity (dpm/g)}$
$(30.535 \text{ g}) * (13419.8626 \text{ dpm/mL}) * (1 \text{ dpm/dpm}) / (1000 \text{ mL}) = 409.7755 \text{ dpm/mL}$
$(30.535 \text{ g}) * (13419.8626 \text{ dpm/mL}) * (1 \text{ dpm/dpm}) / (\text{g/mL}) / (1000 \text{ mL}) = \text{dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date

GEL Laboratories LLC
Version 1.0 9/18/2000

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

64673-278

Ra-228 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Ra-228
ACTIVITY (dps):	1.939 E4
HALF-LIFE:	5.75 years
CALIBRATION DATE:	October 1, 2002 12:00 EST
TOTAL UNCERTAINTY*:	3.6%
SYSTEMATIC:	3.4%
RANDOM:	1.1%

*99% Confidence Level

Impurities: γ -impurities <0.1%5.02617 grams 0.1M HCl solution with 110 $\mu\text{g/g}$ Ba carrier.

P O NUMBER 3208RD, Item 2

SOURCE PREPARED BY: M. Taskaeva
M. Taskaeva, RadiochemistQ A APPROVED: M. Mty 10202



Standard Traceability Log Rad

Source Material Info		A Solution Material Info	
Parent Code:	0503	Isotope:	Radium-228
Prepared By:	Angela Johnson	Prepared By:	Angela Johnson
Carrier Conc:	0.1 M HCL	Prep Date:	02/20/2003
Reference Date:	10/01/2002	Verification Date:	04/09/2004
Ampoule Mass (g):	5.02617 g	Expiration Date:	04/09/2005
Uncertainty:	+/- 3.6 %	Primary Code:	0503-A
LogBook No:	RC S 035 018	Dilution(mL):	100 mL
		Mass of Parent(g):	4.4737 g
		Density(g/mL):	0.9992
		Balance ID:	

Calculations Converting parent activity to dpm/mL/dpm/g

$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / (\text{Ampoule Mass(g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/mL)}$
$(\text{Mass of parent(g)}) * (\text{Parm Activity (dps)}) * (\text{conversion dpm to dps}) / \text{Density} / (\text{Ampoule Mass (g)} * (\text{Dilution Vol})) = \text{Parent Activity (dpm/g)}$
$(4.4737 \text{ g}) * (19390 \text{ dps}) * (60 \text{ dpm/dps}) / (5.02617 \text{ g} * 100 \text{ mL}) = 10355.2060 \text{ dpm/mL}$
$(4.4737 \text{ g}) * (19390 \text{ dps}) * (60 \text{ dpm/dps}) / (0.9992 \text{ g/mL}) / (5.02617 \text{ g} * 100 \text{ mL}) = 10363.0820 \text{ dpm/g}$

Secondary Standards

Prep Date	Preparer	Mass Primary	Dilution (mL)	Code	Conc dpm/mL	Verification Date	Expiration Date
04/02/2003	Lonnie Morris	39.71	1000	0503-B	411.518 dpm/mL	09/13/2008	09/13/2009

GEL Laboratories LLC
Version 1.0 9/18/2000

Verification for Ra-228 Standard 0503-B

D. Roy 9/13/2008	Isotope	Detector CPM	BKG CPM	NET CPM	Detector Eff. Mass. Used (mL)	Standard Source DPM/mL
	0503-B	1962.0000	45.6000	1916.4000	9.263763	1.0000 206.8705773
	0503-B	1983.2000	45.6000	1937.6000	9.263763	1.0000 209.1590642
	0503-B	1927.0000	45.6000	1881.4000	9.263763	1.0000 203.092415

Mean Value (Counting) = 206.3740189 dpm/mL 102.890426 Pass
 Stdev = 3.063655617 dpm/mL 0.01484516 Rule 3 (Pass/Fail)

Certificate Value = 200.596 dpm/mL
 Lower Limit = 200.2467076 dpm/mL
 Upper Limit = 212.5013301 dpm/mL
 Rule 1 Pass/Fail Pass
 Two sigma = 6.127311233
 10 % of Mean = 20.63740189
 Rule 2 (Pass/Fail) Pass

Verification Rules

- Rule 1 = The certificate value (NOT including any uncertainty) shall lie within the 95% confidence interval determined from the mean and two sigma standard deviation of the three measurements
- Rule 2 = The two sigma value used for the 95% confidence interval shall not exceed 10% of the mean value of the three verification measurements.
- Rule 3 = The determined mean value shall be within 10% of the certificate value.

The analyst prepared three standard verification sources for Ra-228 source 0503-B by transferring portions of the standard into glass liquid scintillation vials. Ten mL of Ready Gel liquid scintillation cocktail was added to each vial and the vials were shaken to mix. A Blank vial was prepared in a similar fashion using 1 mL of DI water and 10 mL of Ready Gel cocktail. The standard verification vials and Background source were dark adapted for two hours and counted on LSC Gold for Ra-228 source standard verification. The Ra-228 efficiency calibration which was used for verification calculations was performed on 9/13/08 using source 0683-A (Ra-228). Calibration data is recorded in this logbook under Ra-228 0683-A. Each verification source calculation was performed as follows:

$$\text{Source dpm/g} = (A - B)/(C)(D)$$

where:

- A = Ver. source cpm,
- B = BKG cpm,
- C = System efficiency, (cpm/dpm), and
- D = mass used for standard verification.

Reference RAD SOP M-001

David D. Perry 9/16/08
Angela Johnson 9/17/08

5/19/16

16 SEP 2008 16:24

ID: TOTAL ACTIVITY

COMMENT: GOLD

USER: 11

PRESET TIME : 5.00

DATA CALC : CPM H# : YES SAMPLE REPEATS: 1 PRINTER : STD

COUNT BLANK : NO IC# : NO REPLICATES : 1 RS232 : EDIT

TWO PHASE : NO AQC : NO CYCLE REPEATS : 1 DISK : OFF

SCINTILLATOR: LIQUID LUMEX: YES LOW SAMPLE REJ: 0

LOW LEVEL : NO HALF LIFE CORRECTION DATE: none

CHAN: 0.0 - 990.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

CHAN: 0.0 - 1000.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

SAM NO	POS	TIME MIN	H#	WIND1		WIND2		LUMEX %	ELAPSED TIME
				CPM	%ERROR	CPM	%ERROR		
1	11-1	5.00	98.2	50.40	12.60	54.00	12.17	0.41	5.55
2	11-2	1.30	99.3	7802.31	1.99	7803.08	1.99	0.00	7.81
3	11-3	1.30	100.4	7782.31	1.99	7786.15	1.99	0.00	10.14
4	11-4	1.35	99.2	7581.48	1.98	7585.19	1.98	0.01	12.51
5	11-5	5.00	97.9	45.60	13.25	47.20	13.02	0.43	18.61
6	11-6	5.00	110.7	1962.00	2.02	1964.80	2.02	0.01	24.65
7	11-7	5.00	110.8	1983.20	2.01	1984.80	2.01	0.01	30.75
8	11-8	5.00	110.7	1927.00	2.04	1927.80	2.04	0.02	36.85

8/16/08
228

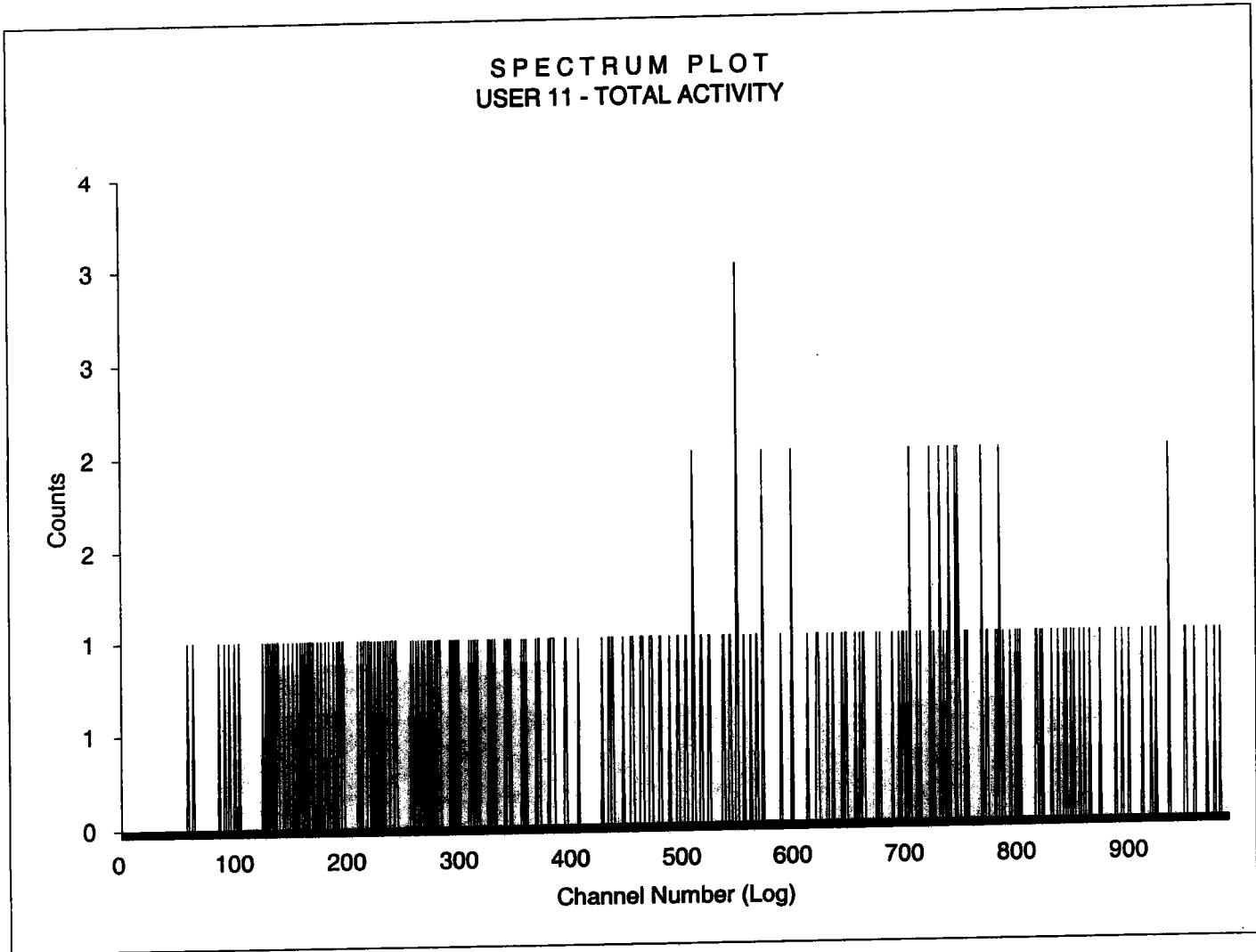
Sample Count Start Time:
Data Capture Date:
User Filename:

16 Sep 2008 16:46:59

9/16/2008 16:52:01
S11091611-5A.WK1
U11091611-1A.WK1

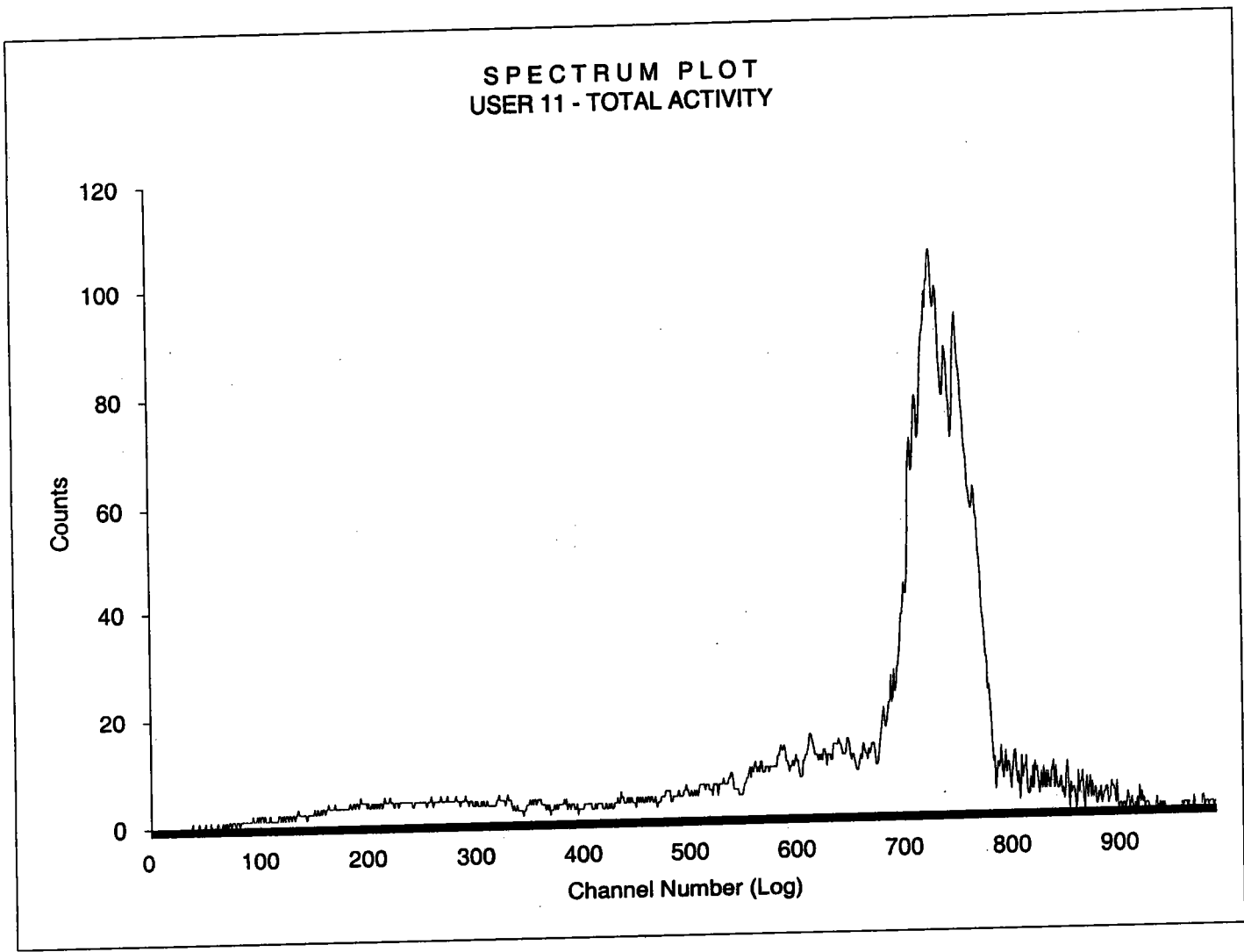
Spectrum Type
User Number:
User Id:
User Comment:
Isotope Name:
Scintillator:
Sample, Rack-Pos, Time:
H#, Total Counts:
Start, End, X-Axis:

Log Counts
11
TOTAL ACTIVITY
GOLD
14C
LIQUID
5 11-5 5.00
97.9 69
0 990 Channel Number



50/9/16
25

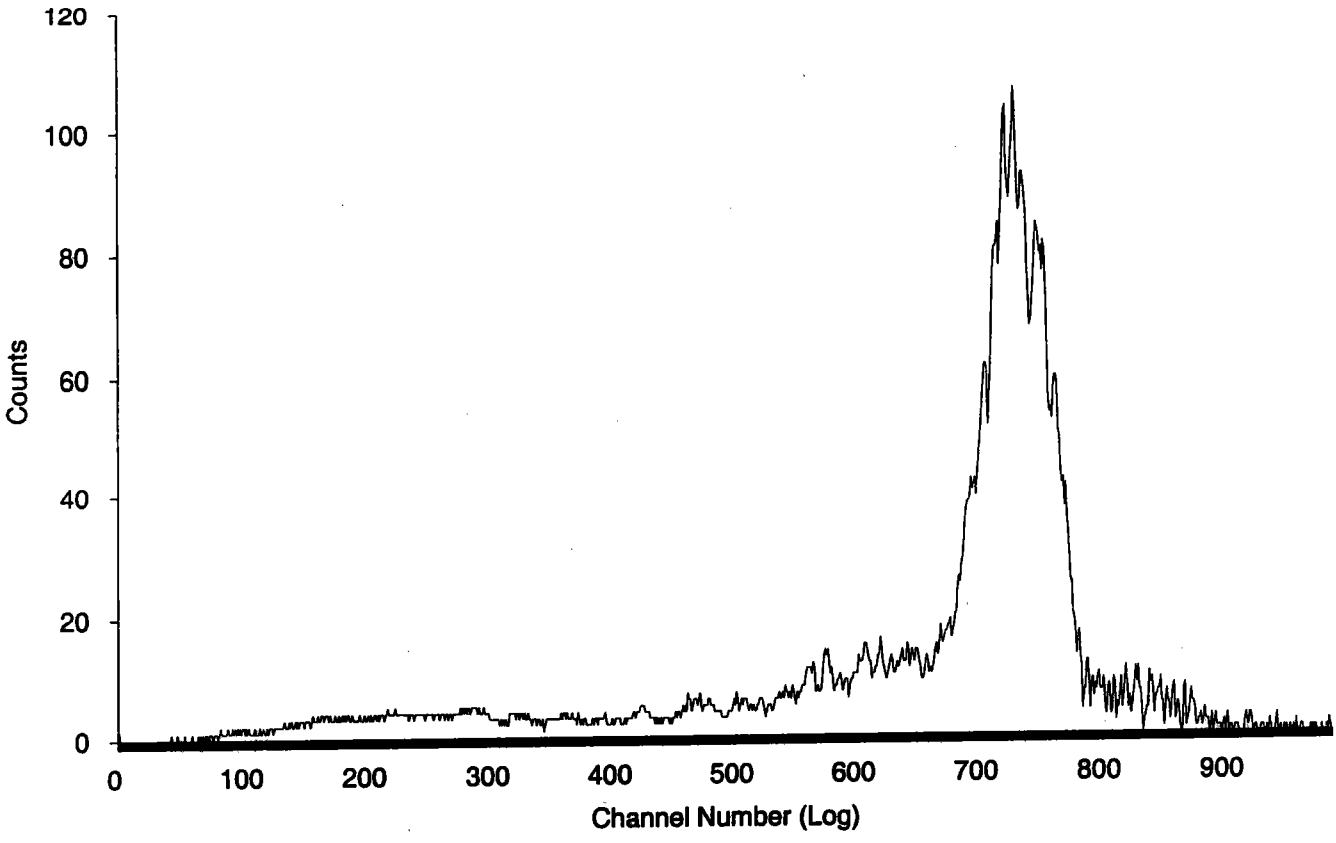
Sample Count Start Time: 16 Sep 2008 16:53:01
Data Capture Date: 9/16/2008 16:58:06
User Filename: S11091611-6A.WK1
U11091611-1A.WK1
Spectrum Type: Log Counts
User Number: 11
User Id: TOTAL ACTIVITY
User Comment: GOLD
Isotope Name: 14C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 6 11-6 5.00
H#, Total Counts: 110.7 7666
Start, End, X-Axis: 0 990 Channel Number



8/16/08
SLS

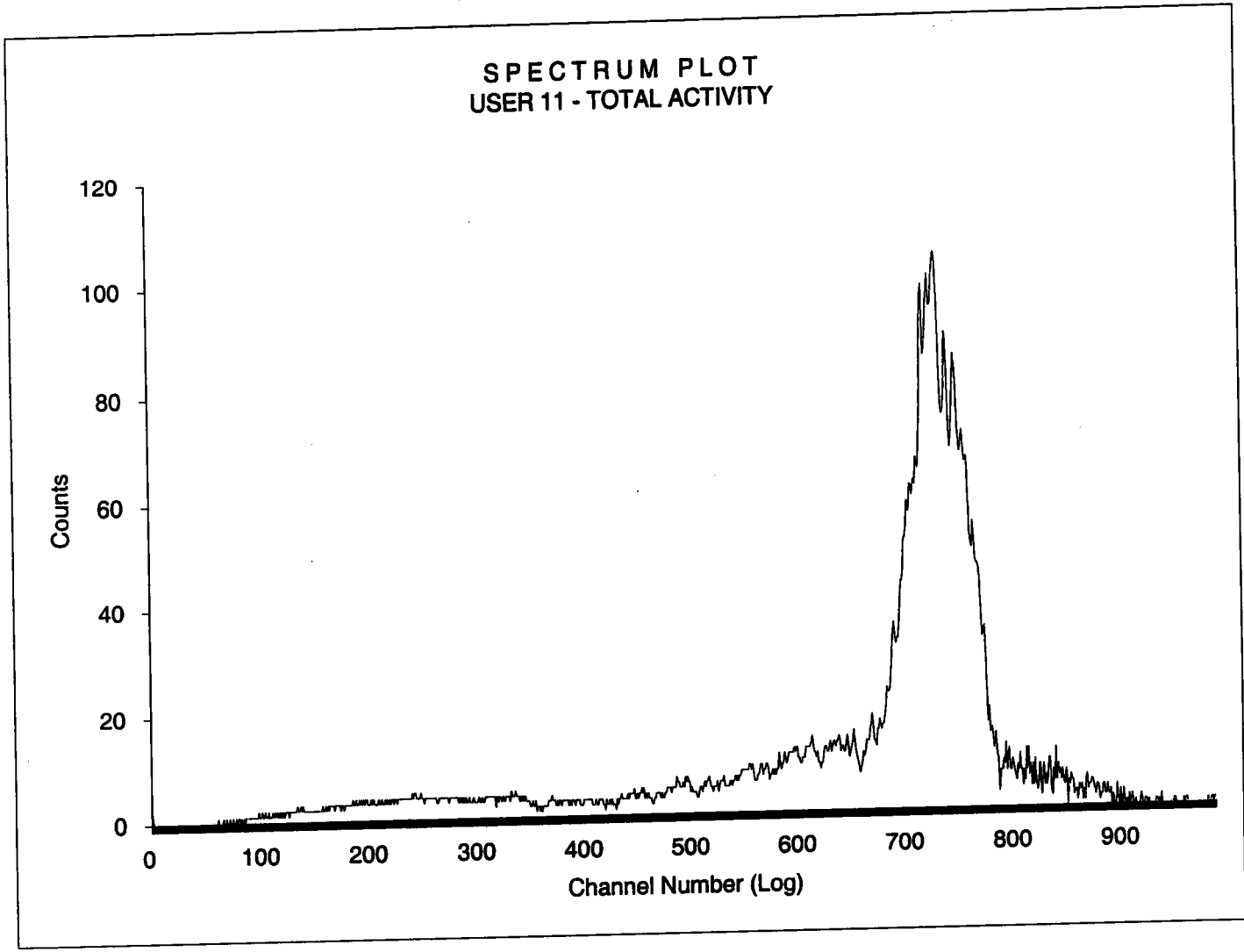
Sample Count Start Time: 16 Sep 2008 16:59:07
Data Capture Date: 9/16/2008 17:04:12
User Filename: S11091611-7A.WK1
U11091611-1A.WK1
Spectrum Type: Log Counts
User Number: 11
User Id: TOTAL ACTIVITY
User Comment: GOLD
Isotope Name: 14C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 7 11-7 5.00
H#, Total Counts: 110.8 7726
Start, End, X-Axis: 0 990 Channel Number

SPECTRUM PLOT
USER 11 - TOTAL ACTIVITY



9/16/08
11-8

Sample Count Start Time: 16 Sep 2008 17:05:13
Data Capture Date: 9/16/2008 17:10:18
User Filename: S11091611-8A.WK1
U11091611-1A.WK1
Spectrum Type: Log Counts
User Number: 11
User Id: TOTAL ACTIVITY
User Comment: GOLD
Isotope Name: 14C
Scintillator: LIQUID
Sample, Rack-Pos, Time: 8 11-8 5.00
H#, Total Counts: 110.7 7557
Start, End, X-Axis: 0 990 Channel Number



Radium-228 Que Sheet

SR 6/30/09

Batch #: 881540 Analyst: DXM2 Internal Due Date: 07/03/2009
 Spike Isotope: Radium-228 Spike Code: NA Ac-228 Ingrow: 2025 6/30/09
 LCS Isotope: Radium-228 LCS Code: 0503-B Expiration Date: 9/13/09
 Tracer Isotope: Barium-133 Tracer Code: 0112-J Expiration Date: 2/17/10
 Prep Date: 6/30/09 Initials: SR Pipet ID: 1734212 Balance ID: NA
 Ac-228 Separation Date/Time: 7-2-09 0540 Witness: ADG 6/30/09

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collect Date & Time	Pos. #	Vol (mL)	Det #	Ba Yield (%)	Gamma Det. #
1201872112-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	1	20		100.83	↑
1201872113-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	2	20		108.20	
1201872114-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	3	20		114.22	
1201872115-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	4	20		120.58	WZAL
1201872116-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	5	20		105.84	
1201872117-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	6	20		102.70	
1201872118-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	7	20		112.82	
1201872119-1	LCS for batch 881540	LCS		3 pCi/L	GROUND WATI	QC ACCOUNT	16-JUN-09 03:56 PM	8	20		111.91	↓

7/2/09

SLC 7/2/09

Comments: _____ Data Reviewed By: _____

ASSAY 30-Jun-09 19:32:06

Protocol id 8 228_REC
Time limit 180
Count limit 50000
Isotope Ba-133
Protocol date 9-Apr-07 10:03:07
Run id. 54

POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT	TIME
1	97	1	180	779	229.3	4.13			19:32:13
2	97	2	180	785	231.2	4.11	100.83		19:35:24
3	97	3	180	835	248.1	3.95	108.20		19:38:35
4	97	4	180	877	261.9	3.83	114.22		19:41:47
5	97	5	180	921	276.5	3.71	120.58		19:44:58
6	72	6	180	819	242.7	4	105.84		19:48:17
7	72	7	180	798	235.5	4.07	102.70		19:51:28
8	72	8	180	867	258.7	3.85	112.82		19:54:40
9	72	9	180	861	256.6	3.87	111.91		19:57:51

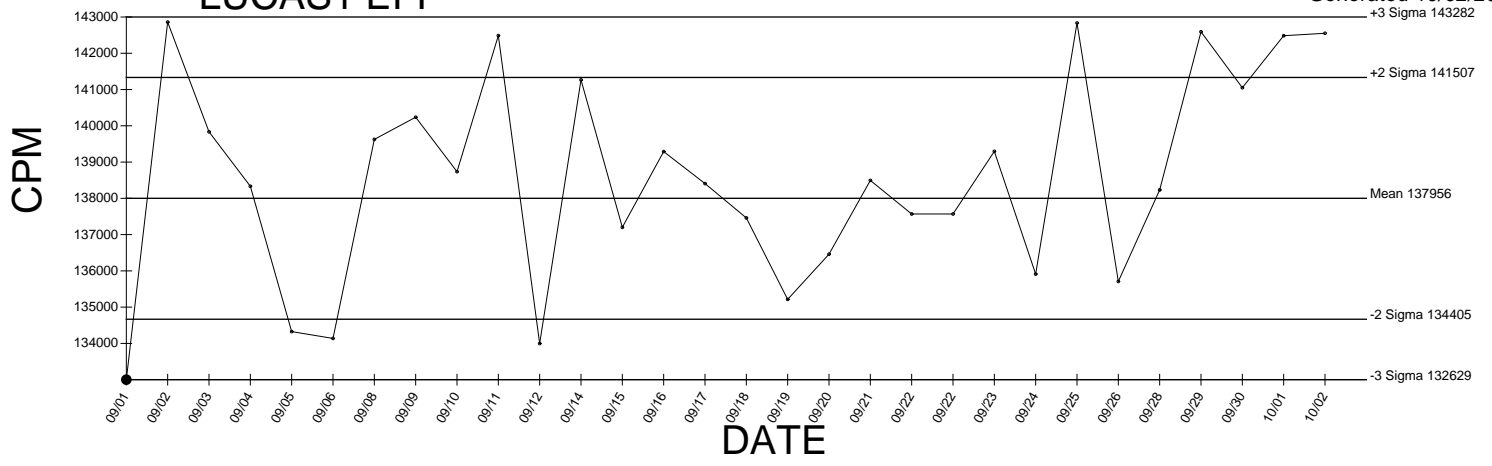
END OF ASSAY

[Handwritten signature]
7/2/09

BACKGROUND AND EFFICIENCY DATA

LUCAS1 EFF

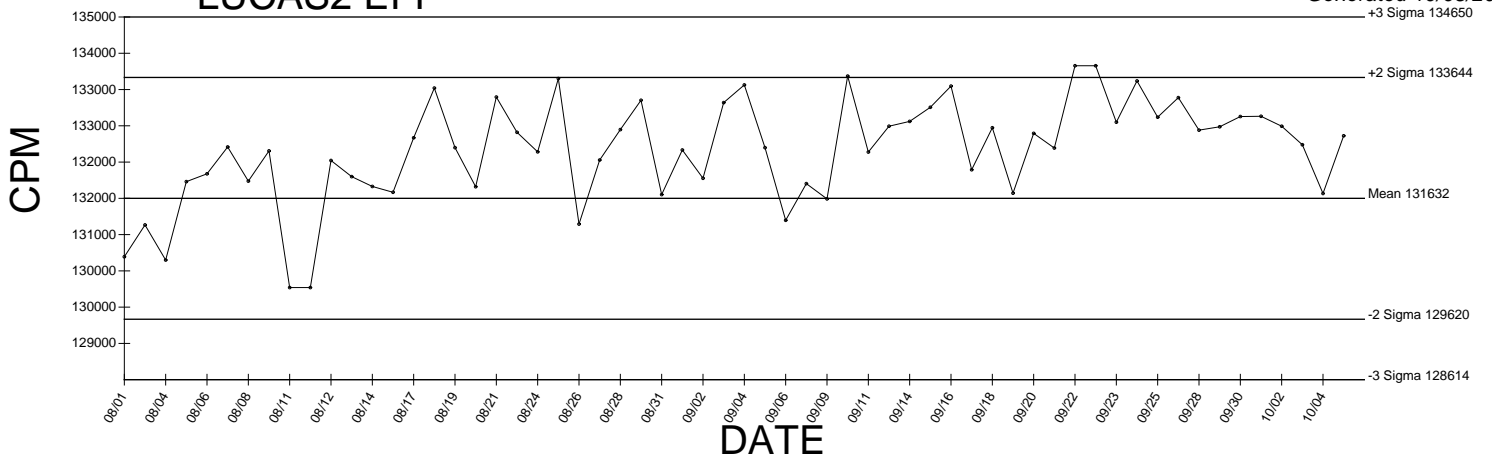
Generated 10/02/2009



● Denotes Outlier

LUCAS2 EFF

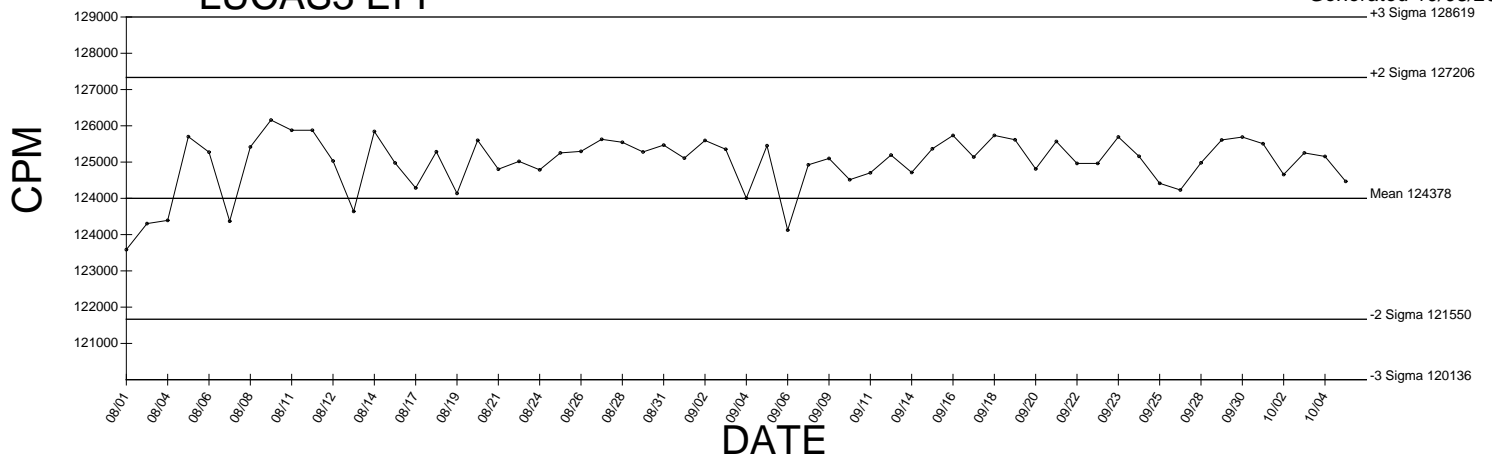
Generated 10/05/2009



● Denotes Outlier

LUCAS3 EFF

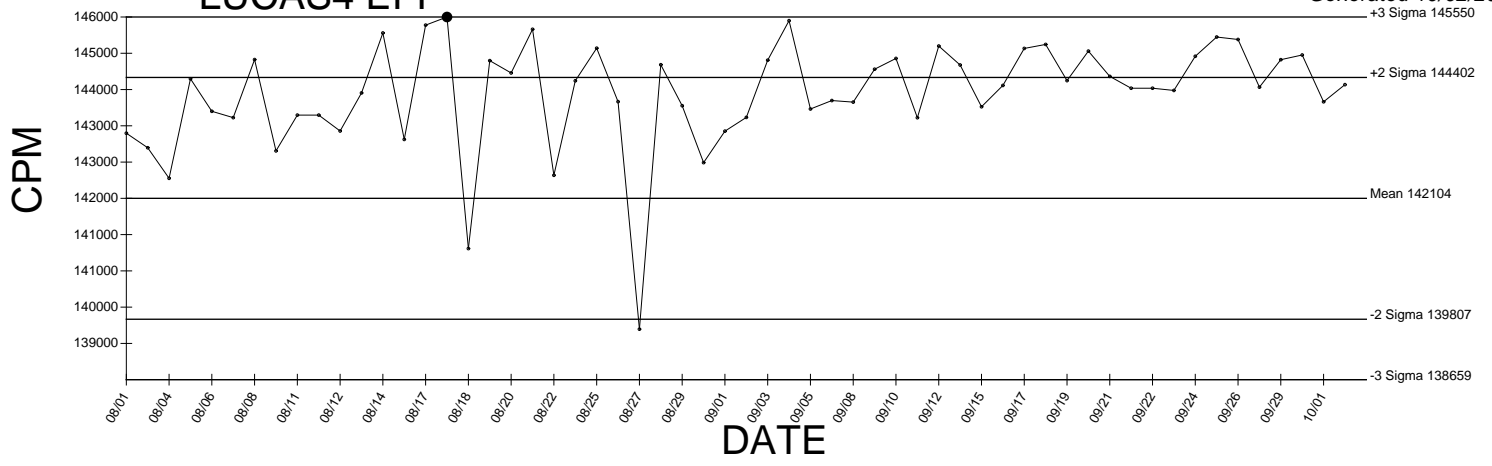
Generated 10/05/2009



● Denotes Outlier

LUCAS4 EFF

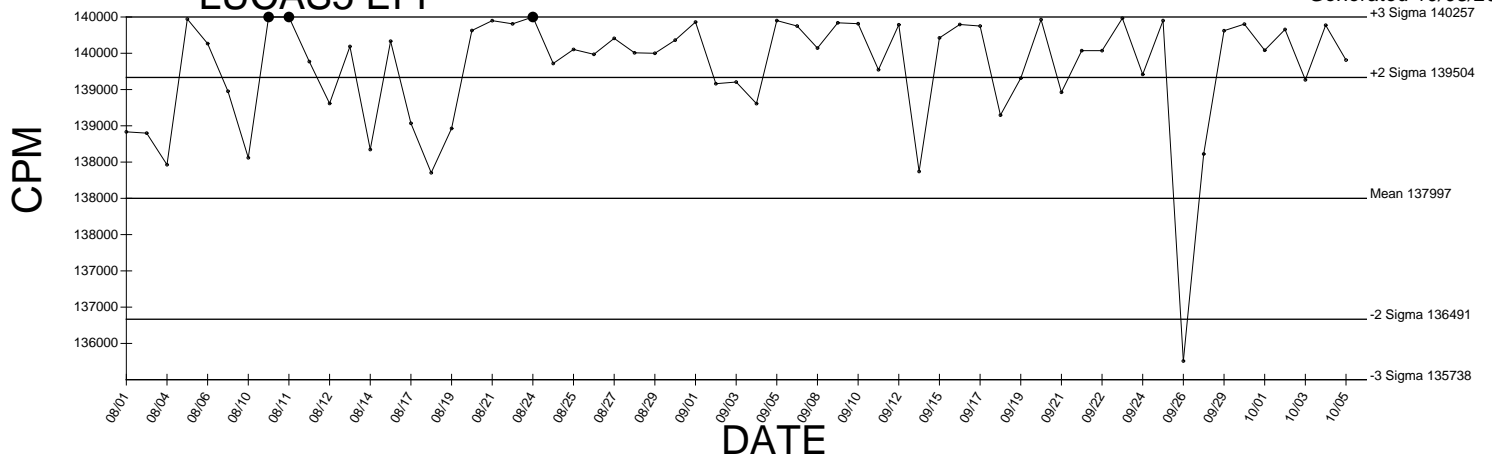
Generated 10/02/2009



● Denotes Outlier

LUCAS5 EFF

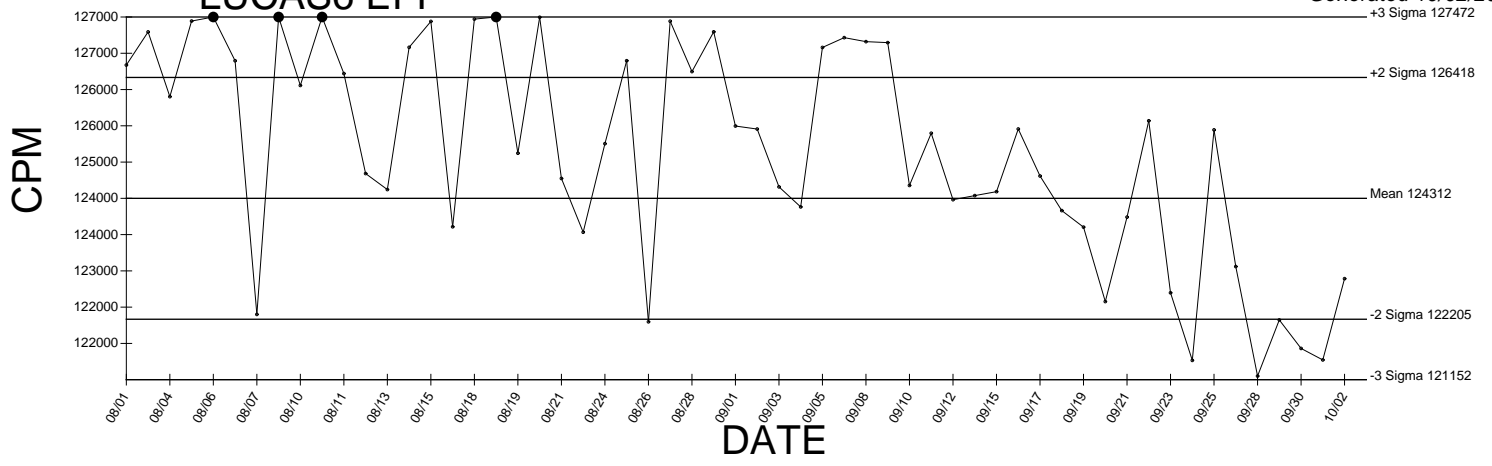
Generated 10/05/2009



● Denotes Outlier

LUCAS6 EFF

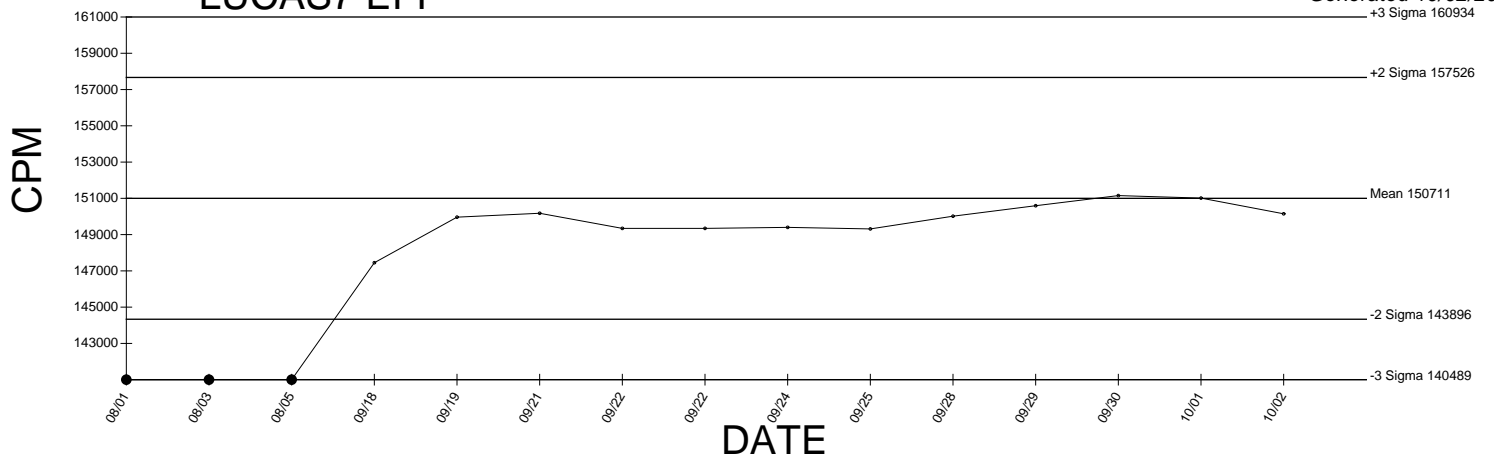
Generated 10/02/2009



● Denotes Outlier

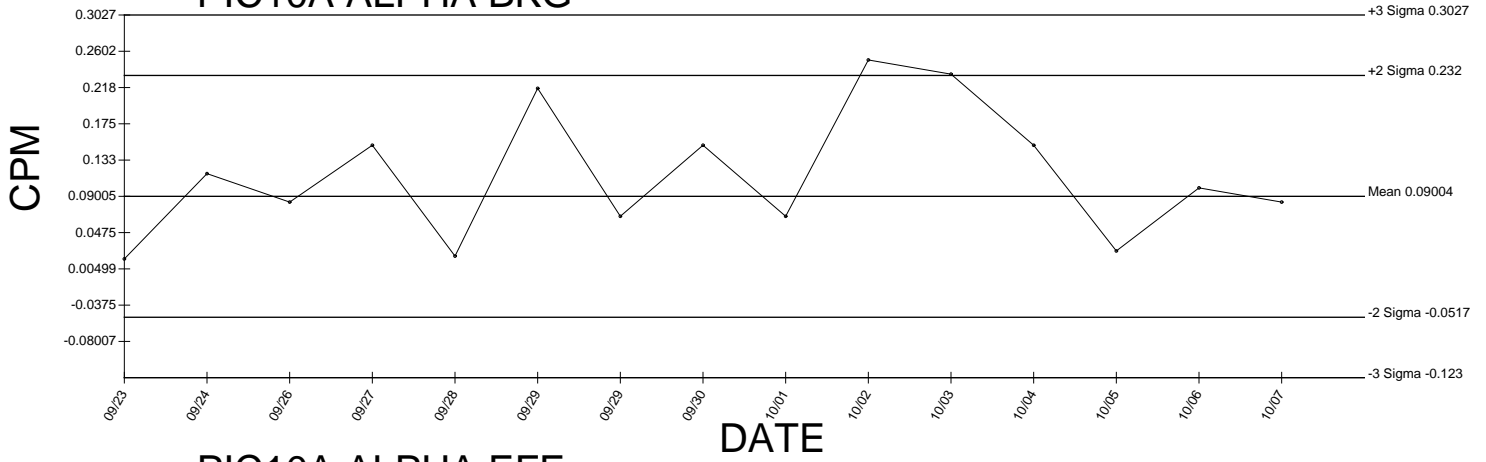
LUCAS7 EFF

Generated 10/02/2009

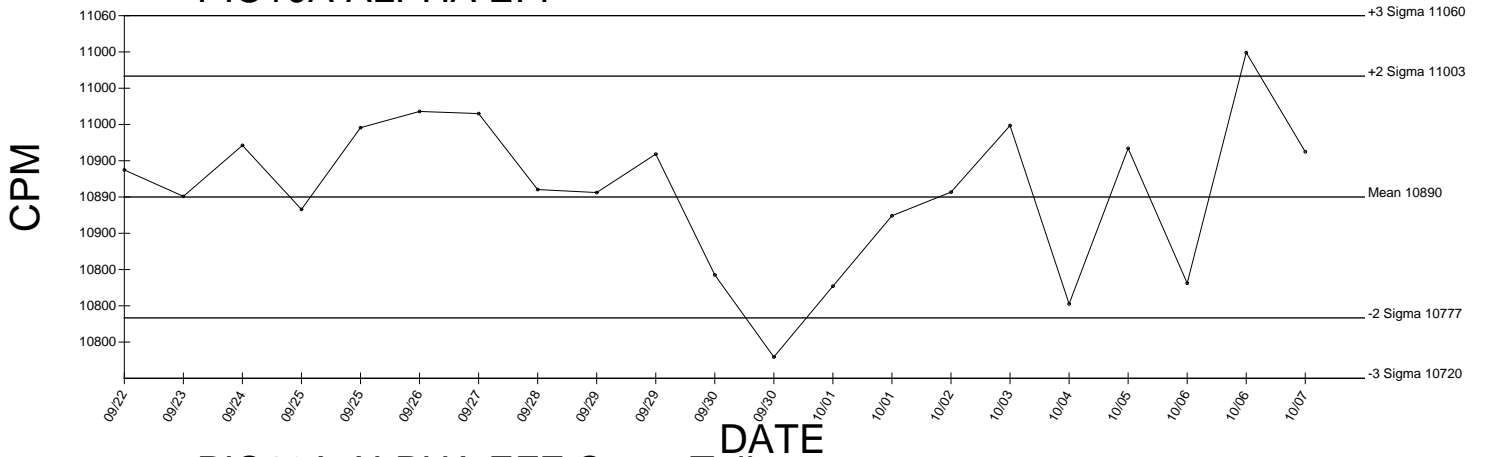


● Denotes Outlier

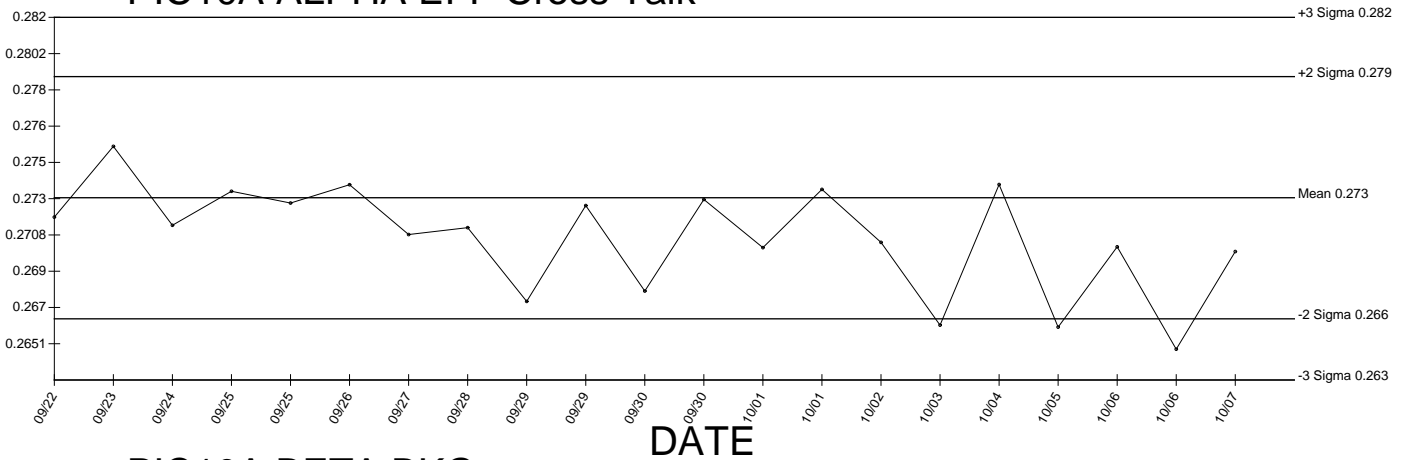
PIC10A ALPHA BKG



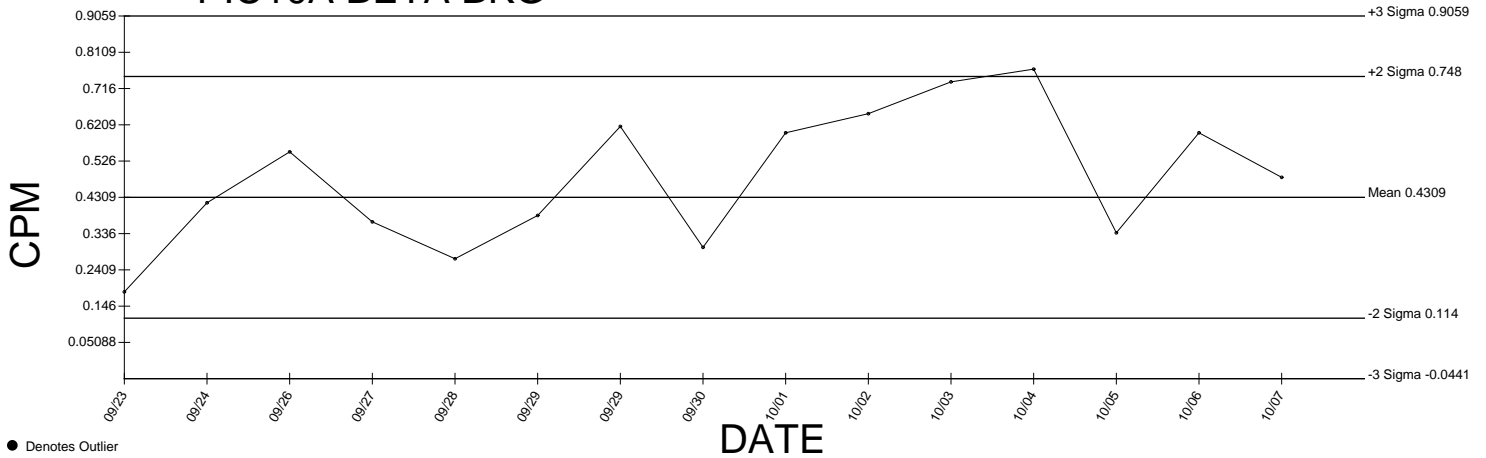
PIC10A ALPHA EFF



PIC10A ALPHA EFF Cross Talk



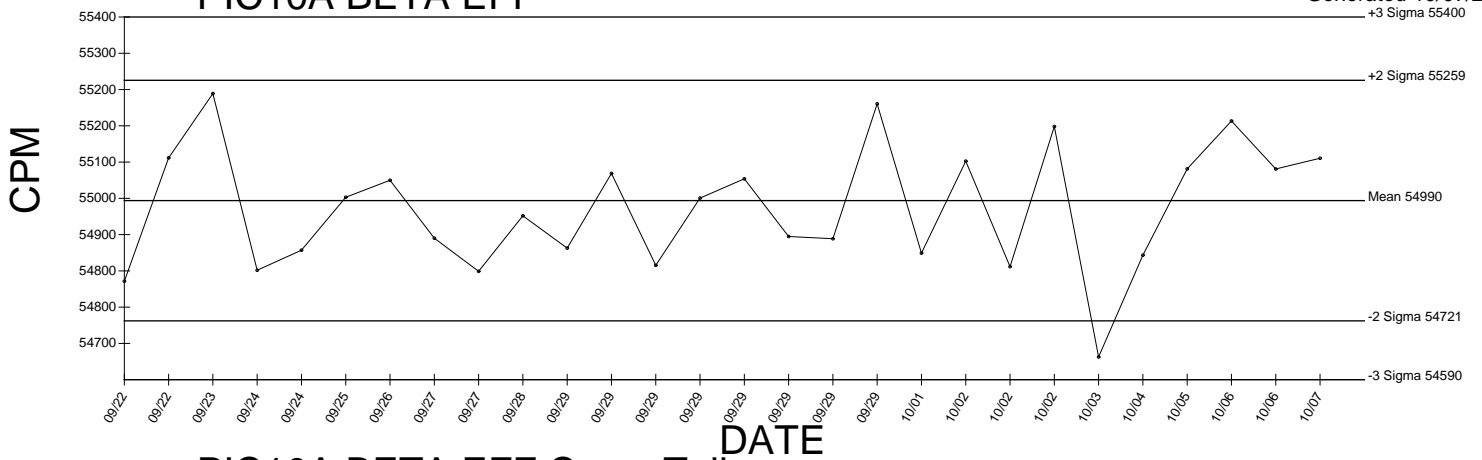
PIC10A BETA BKG



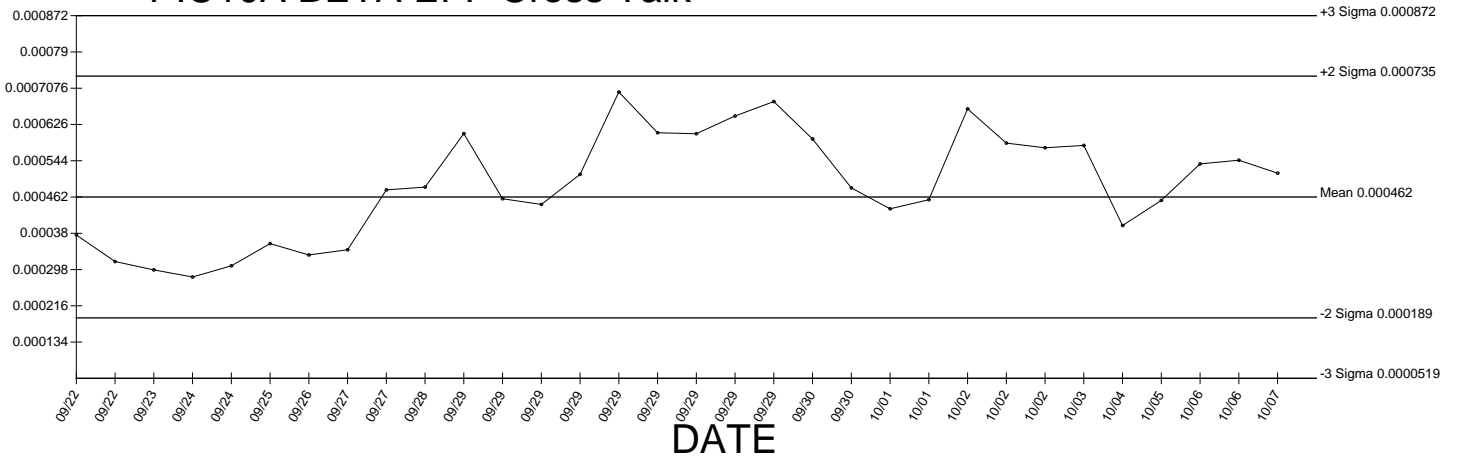
● Denotes Outlier

PIC10A BETA EFF

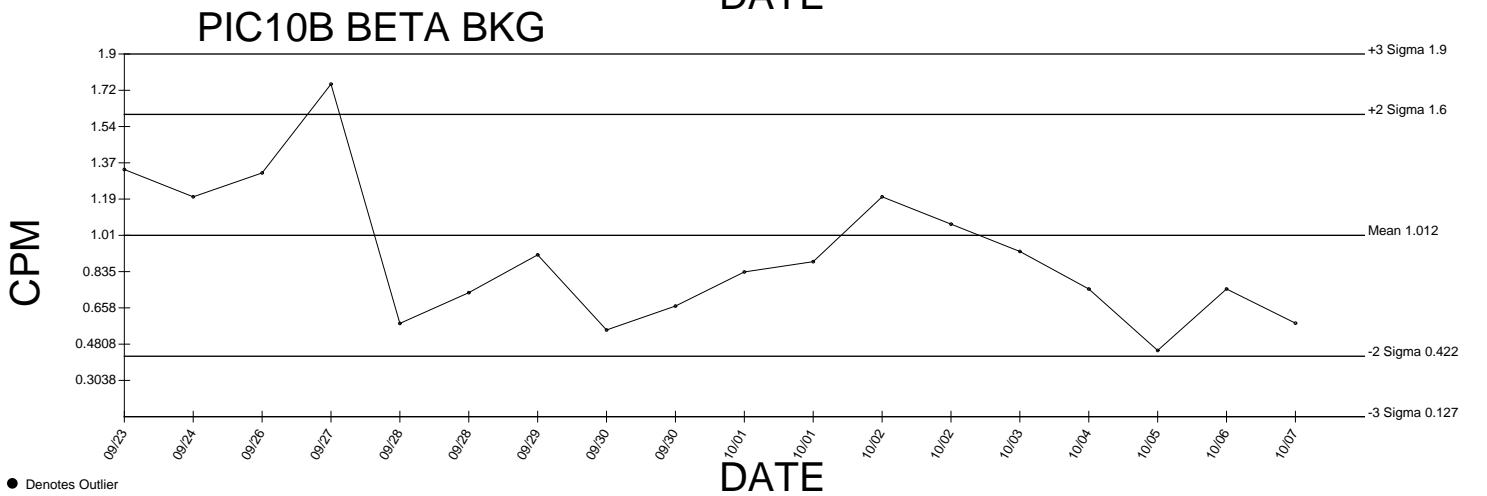
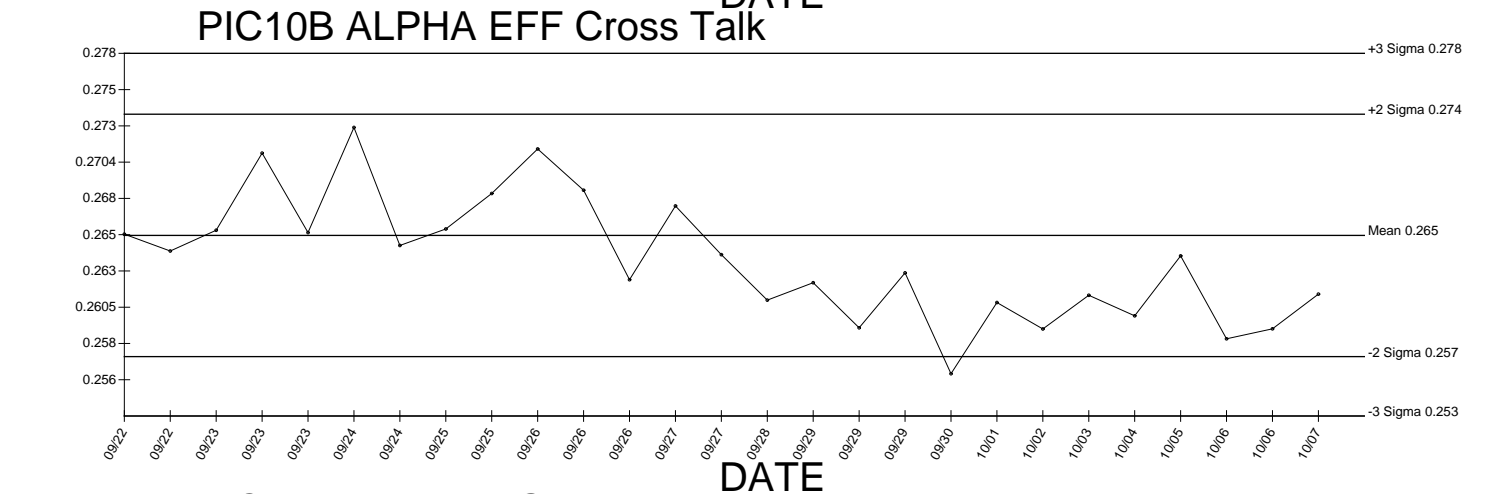
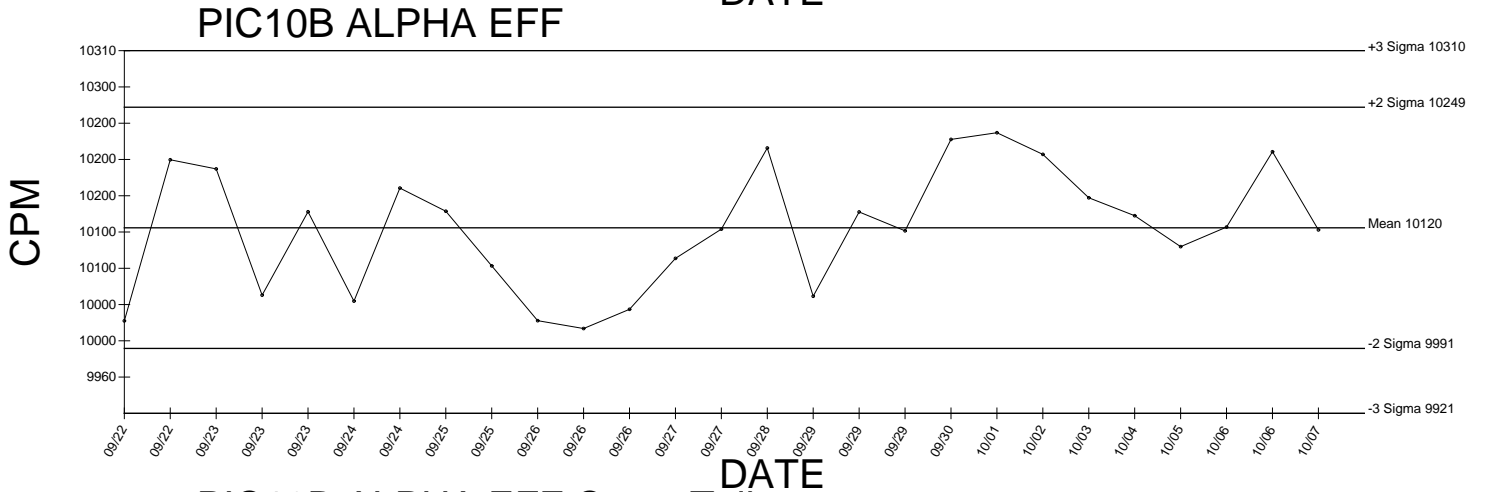
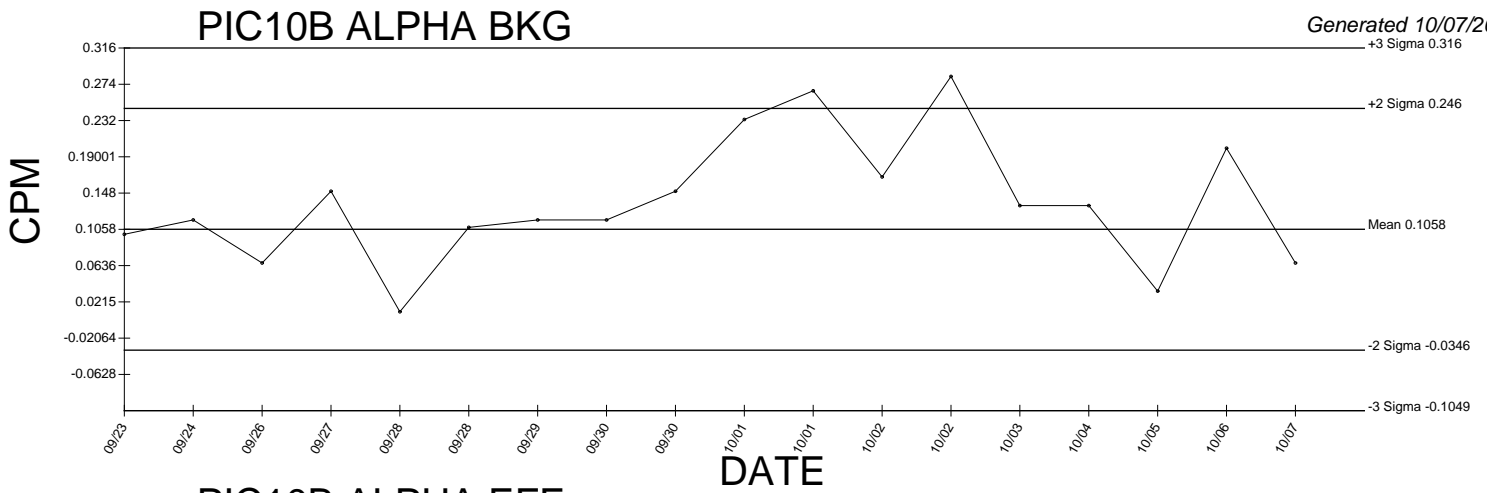
Generated 10/07/2009



PIC10A BETA EFF Cross Talk



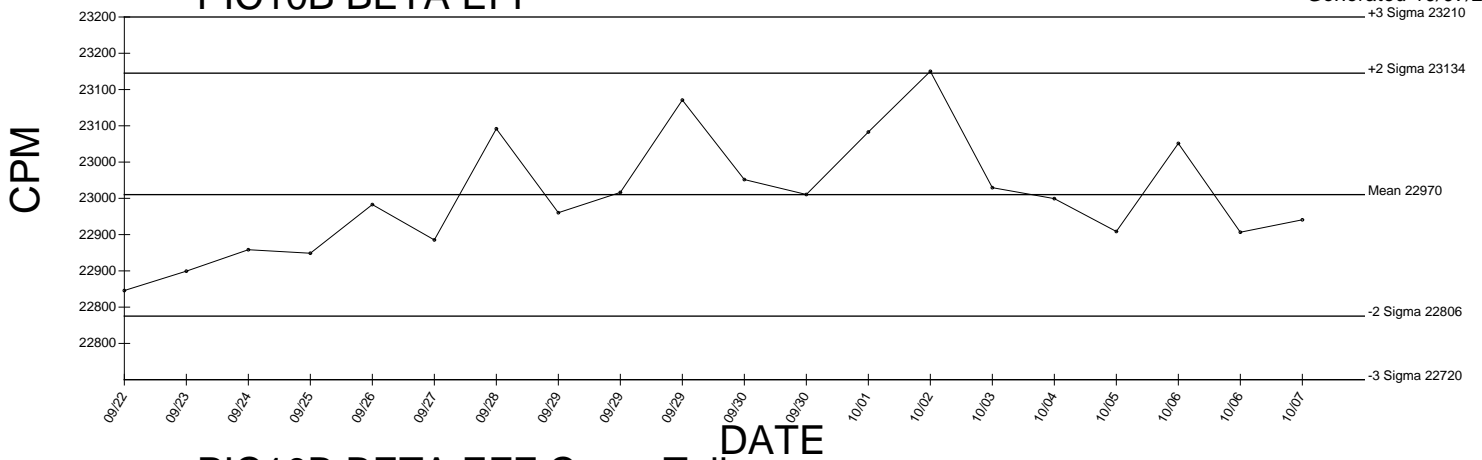
● Denotes Outlier



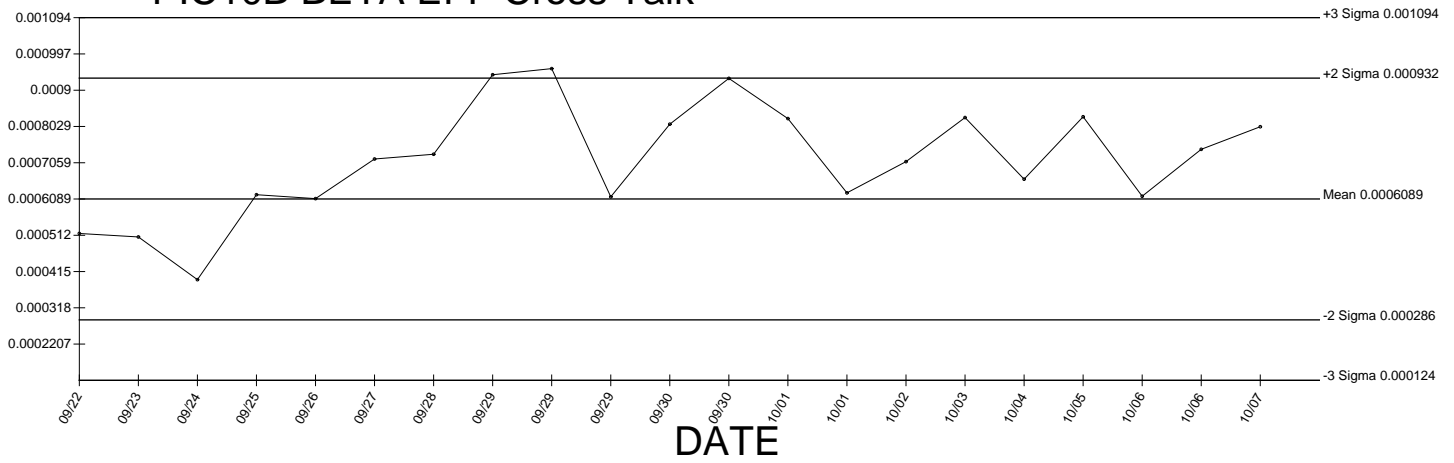
● Denotes Outlier

PIC10B BETA EFF

Generated 10/07/2009



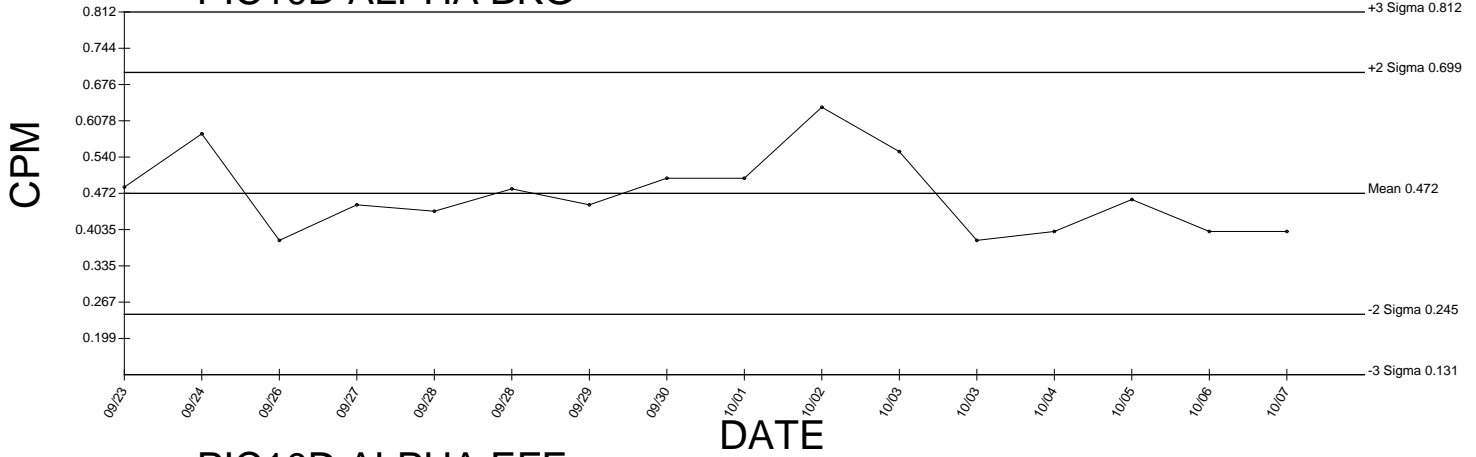
PIC10B BETA EFF Cross Talk



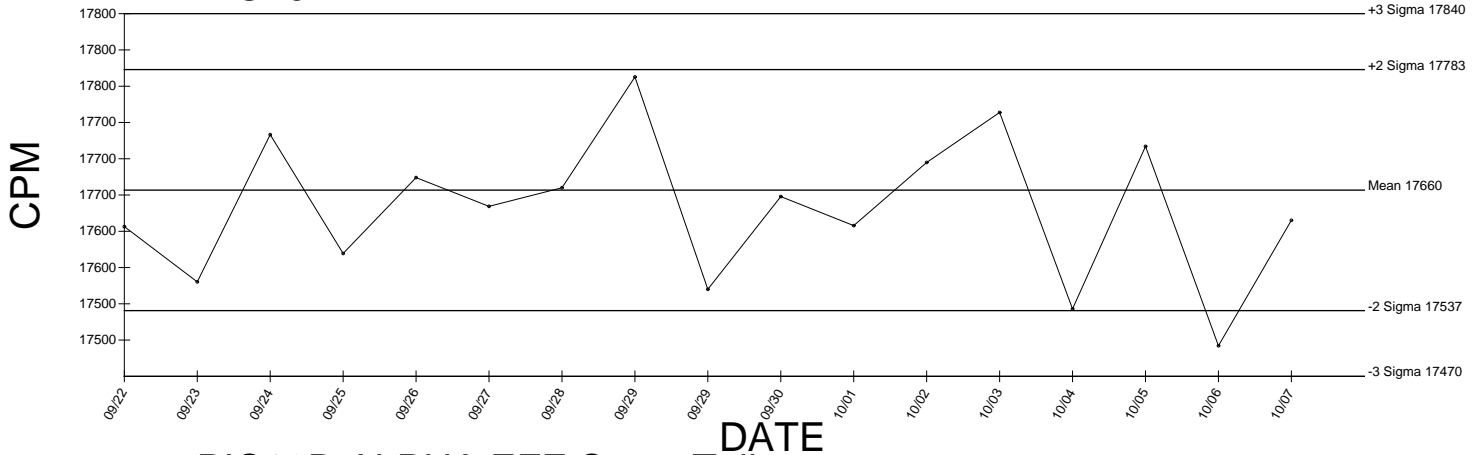
● Denotes Outlier

PIC10D ALPHA BKG

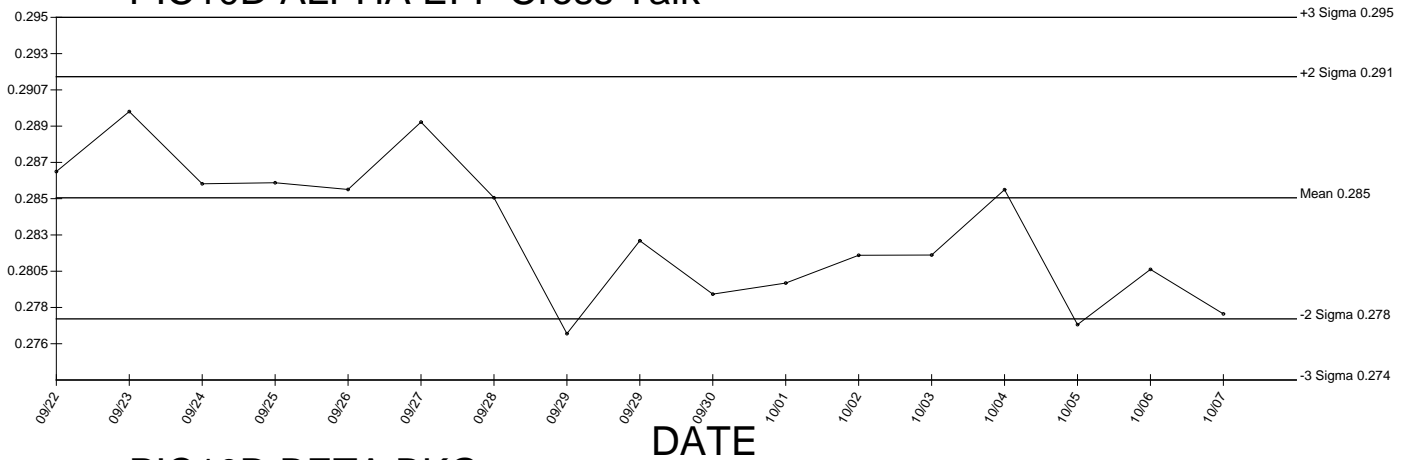
Generated 10/07/2009



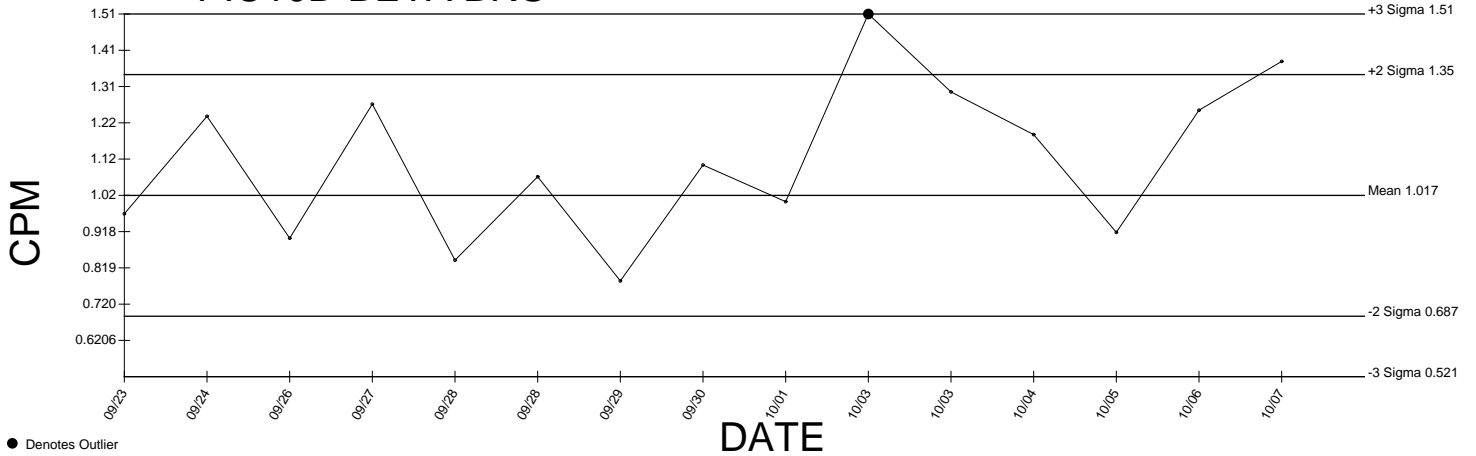
PIC10D ALPHA EFF



PIC10D ALPHA EFF Cross Talk



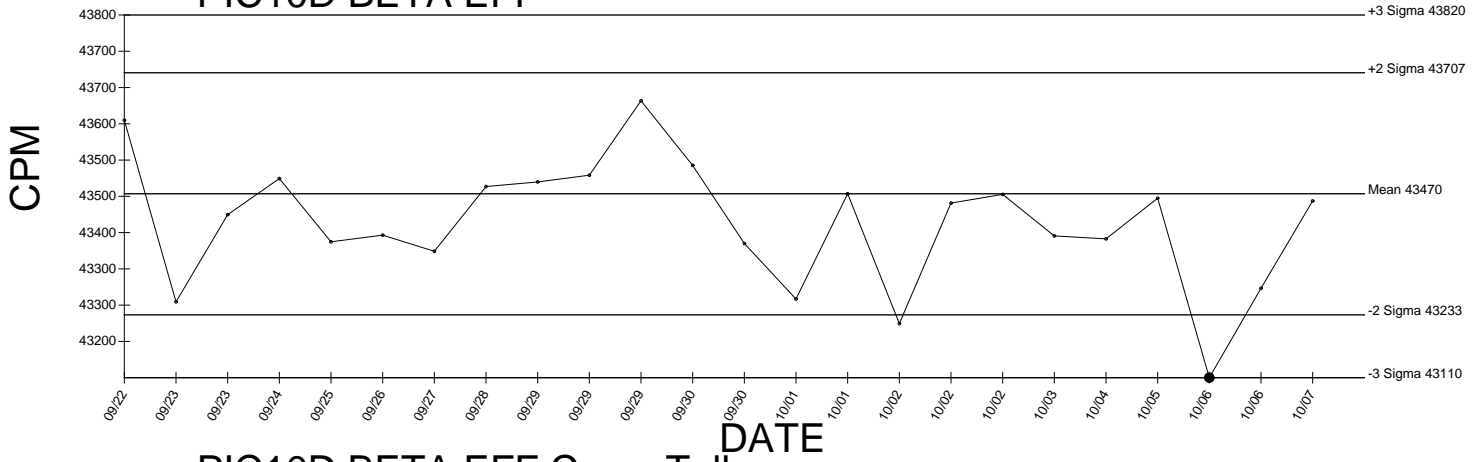
PIC10D BETA BKG



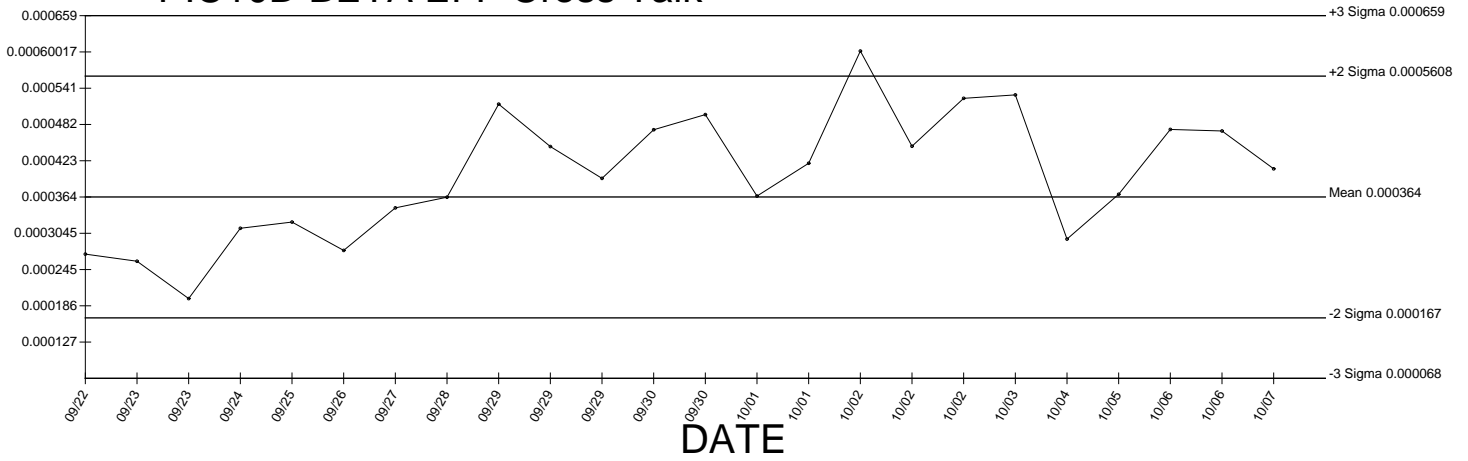
● Denotes Outlier

PIC10D BETA EFF

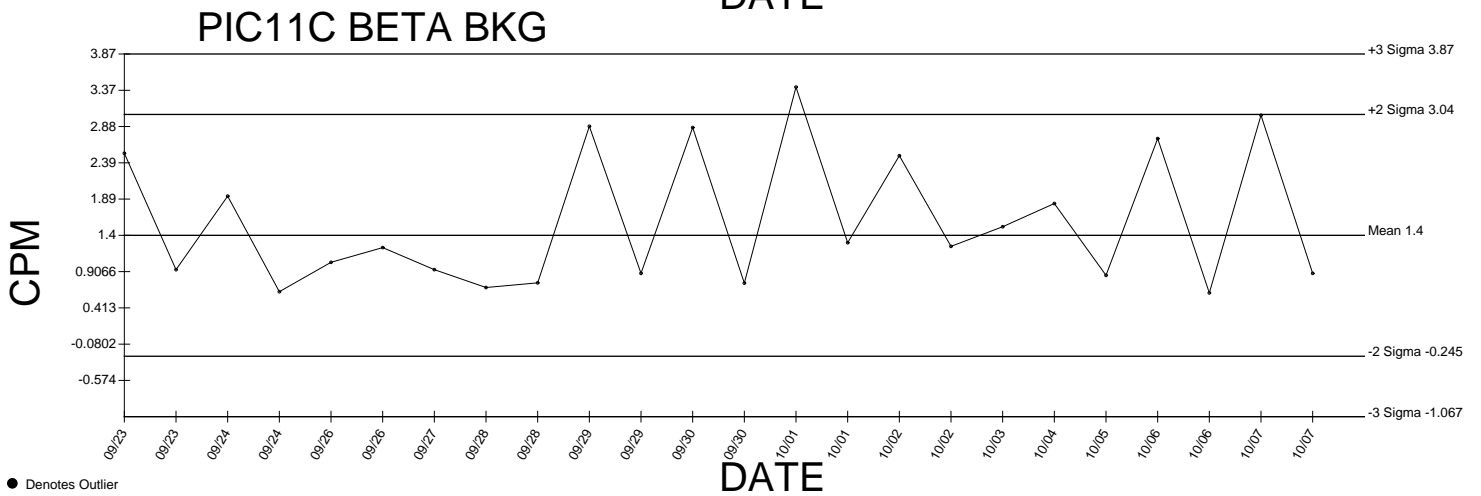
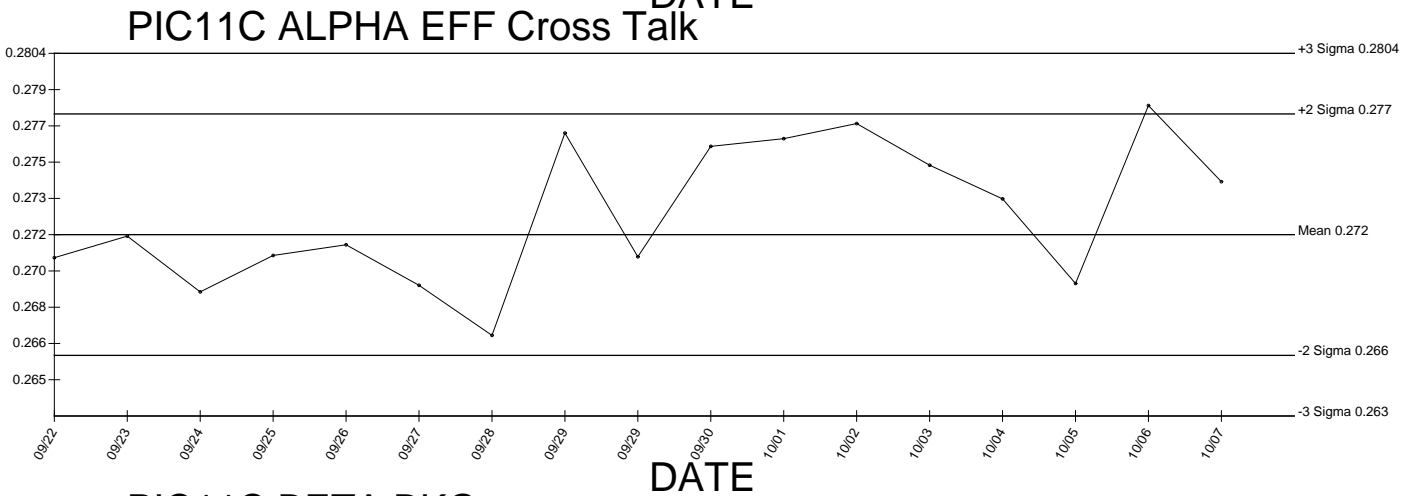
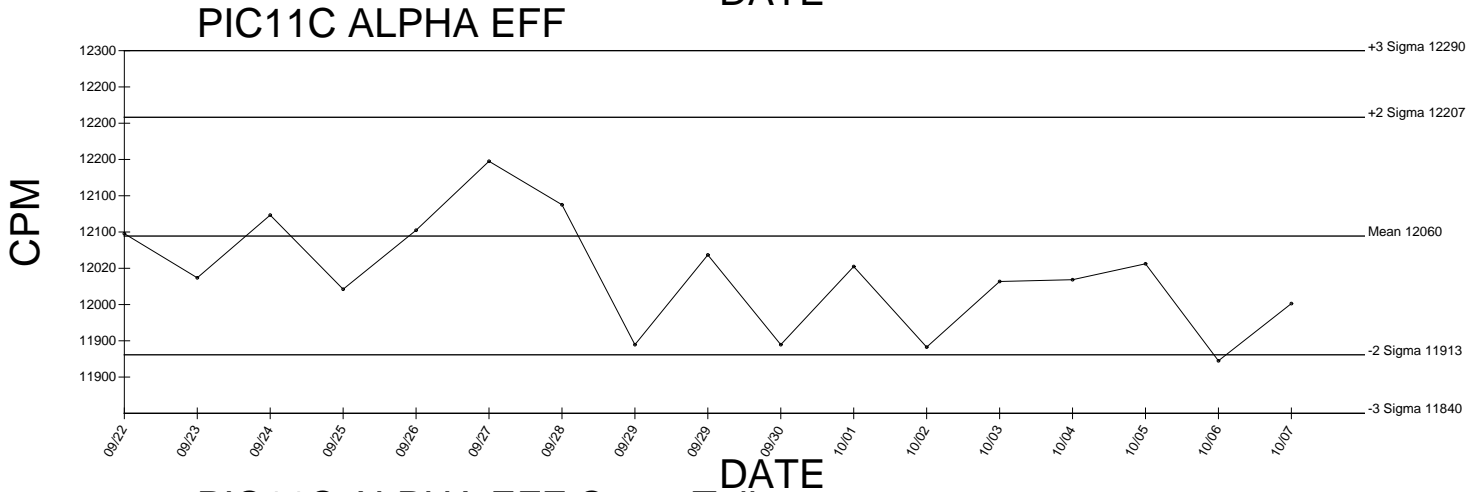
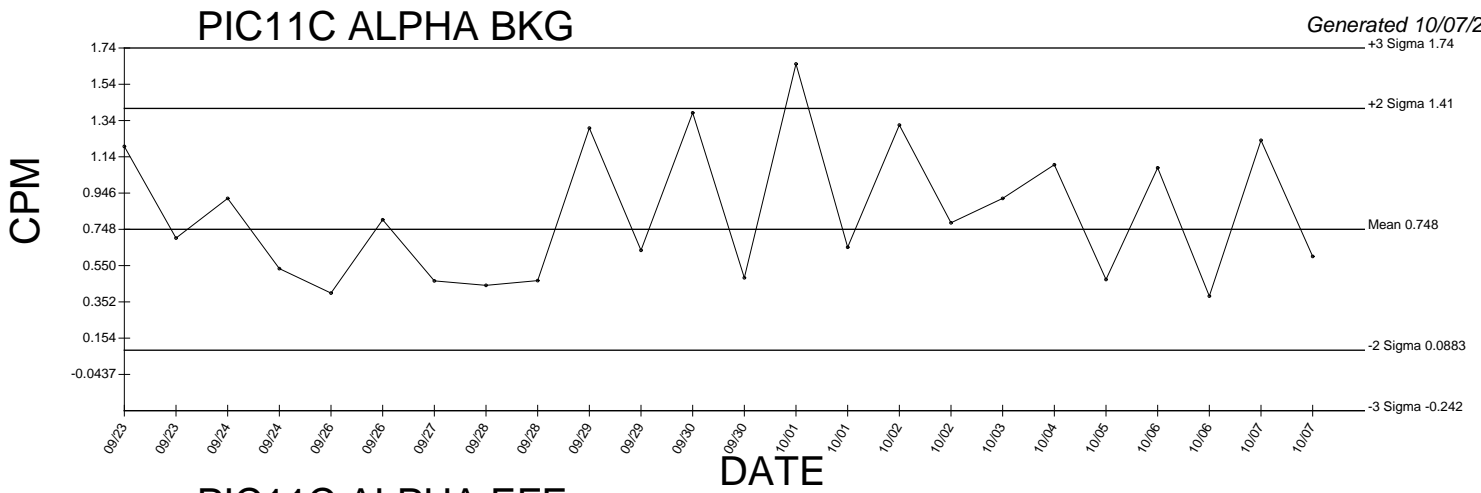
Generated 10/07/2009



PIC10D BETA EFF Cross Talk



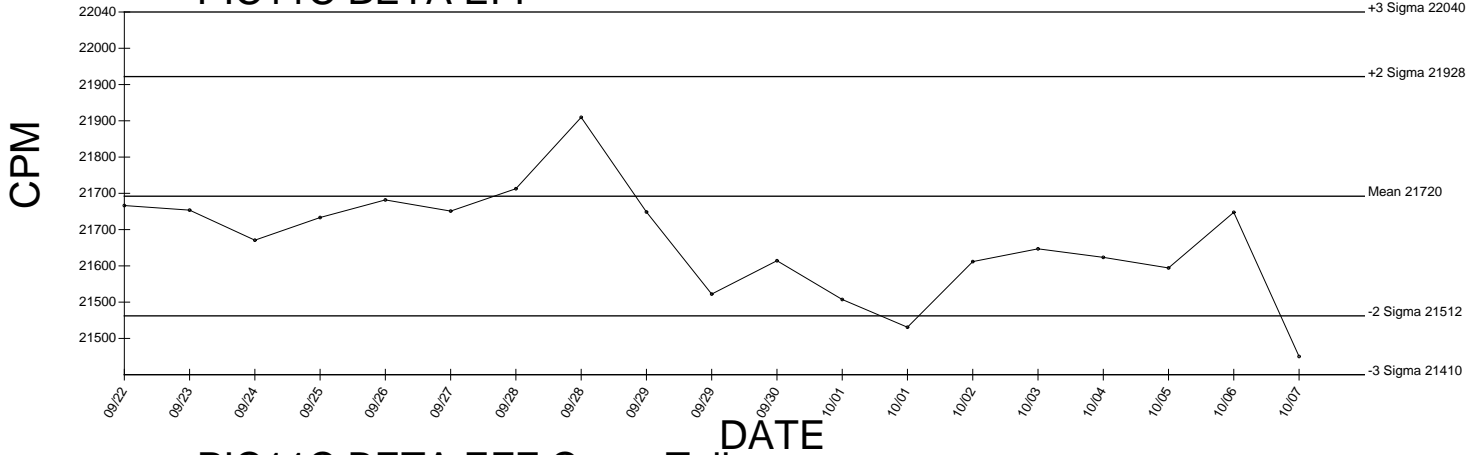
● Denotes Outlier



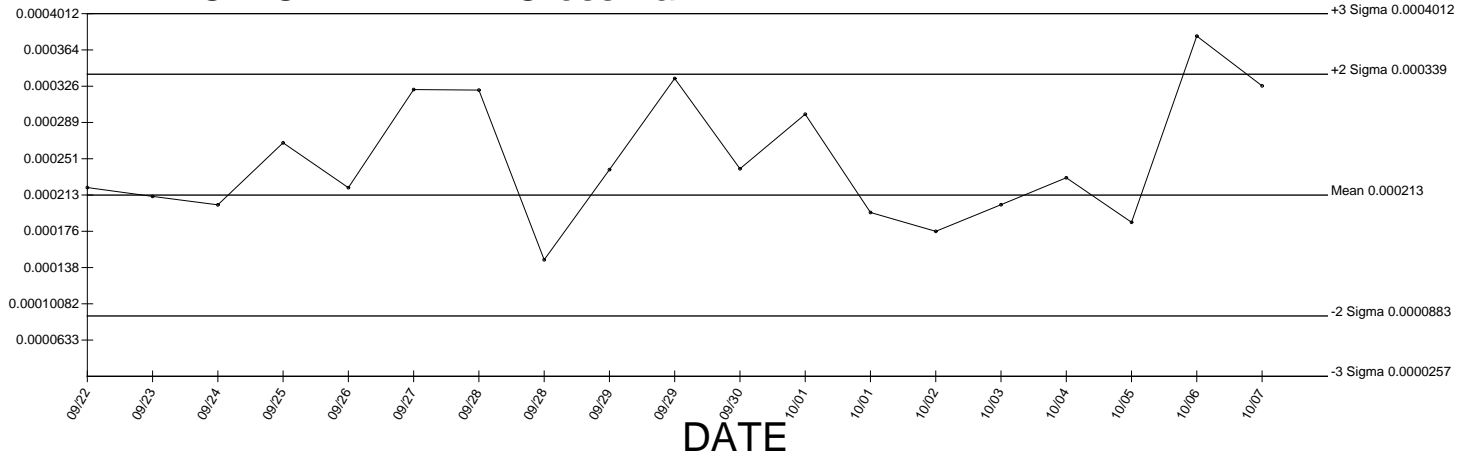
● Denotes Outlier

PIC11C BETA EFF

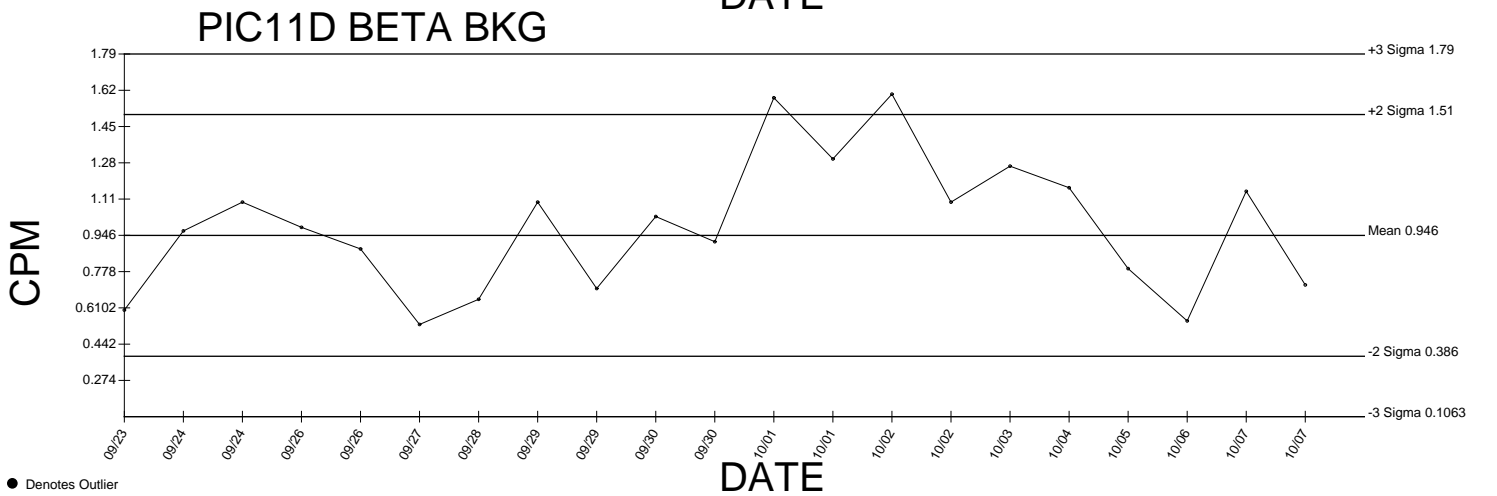
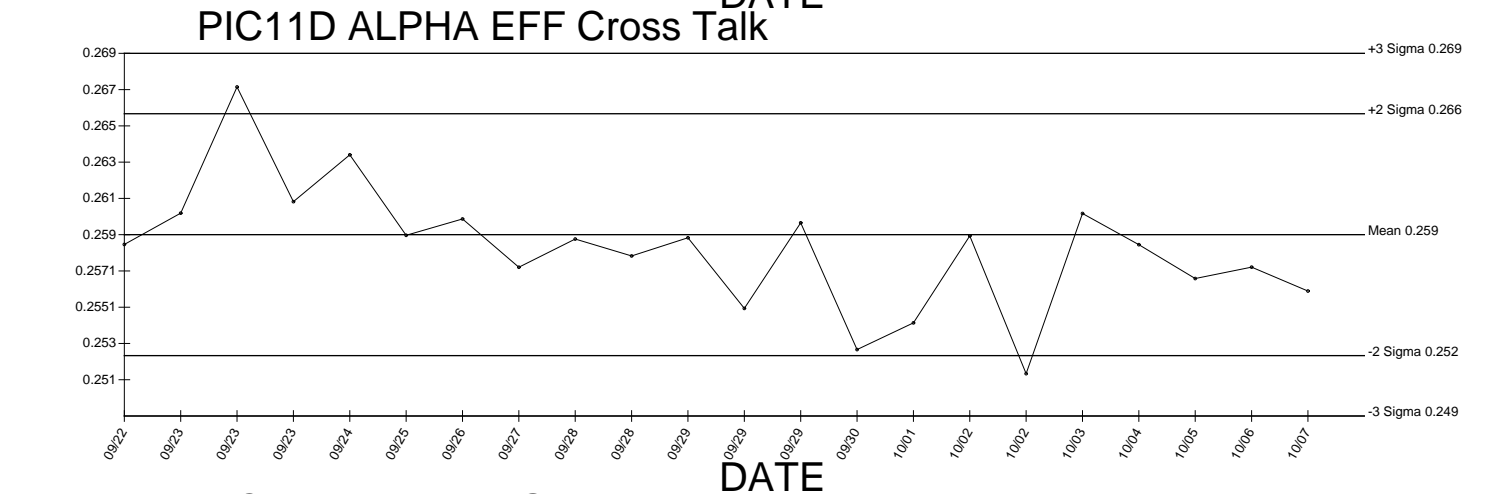
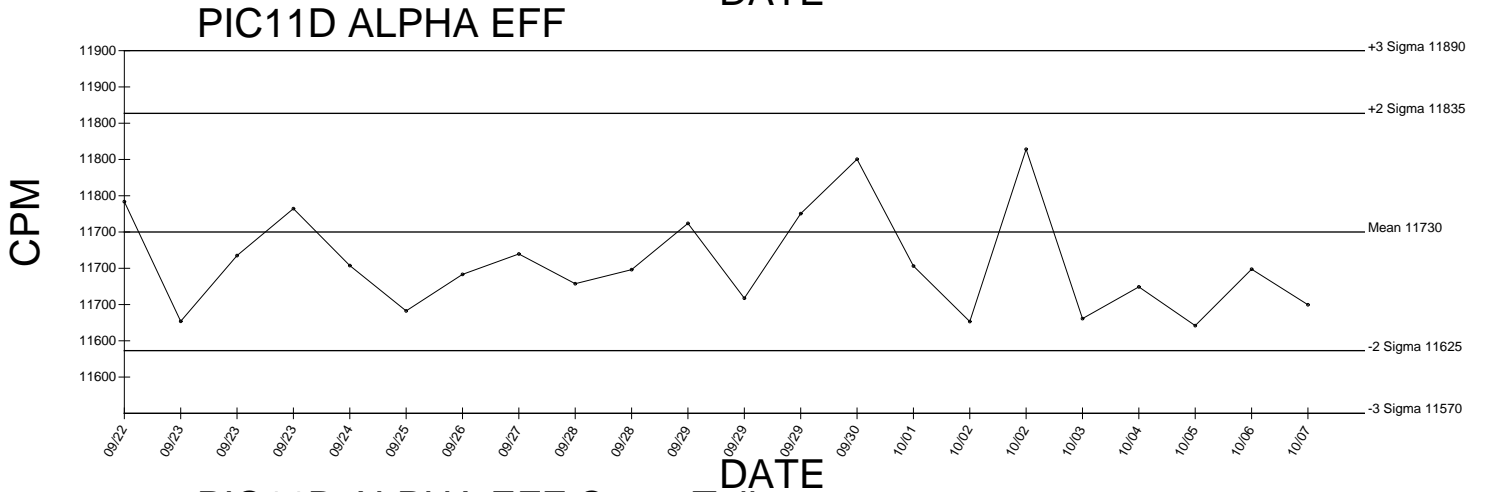
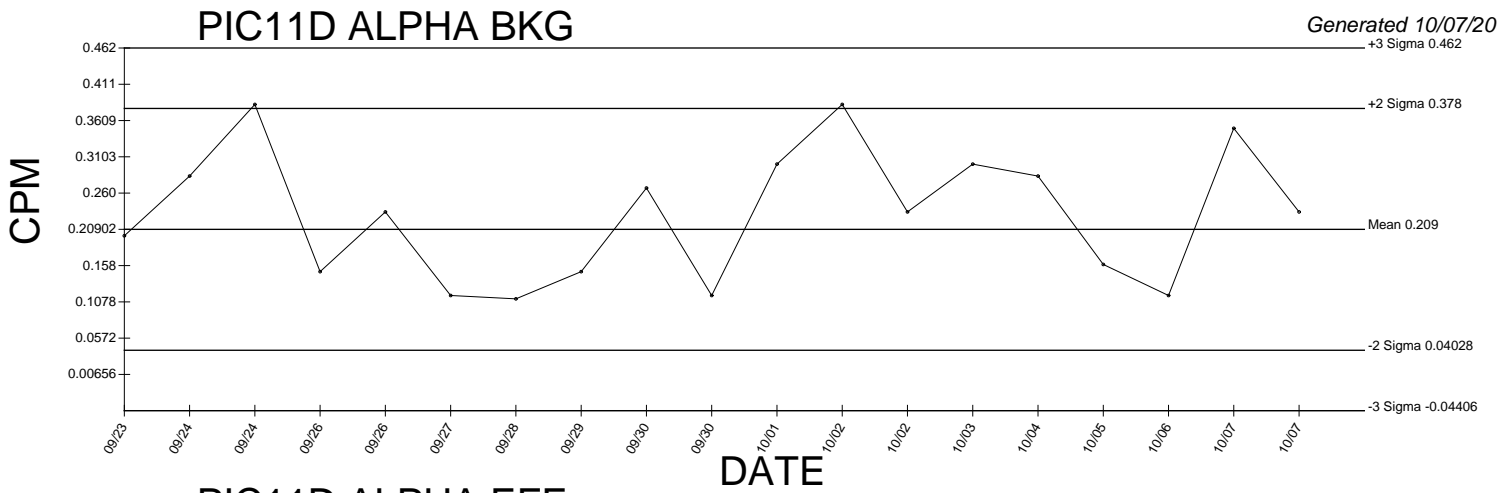
Generated 10/07/2009



PIC11C BETA EFF Cross Talk



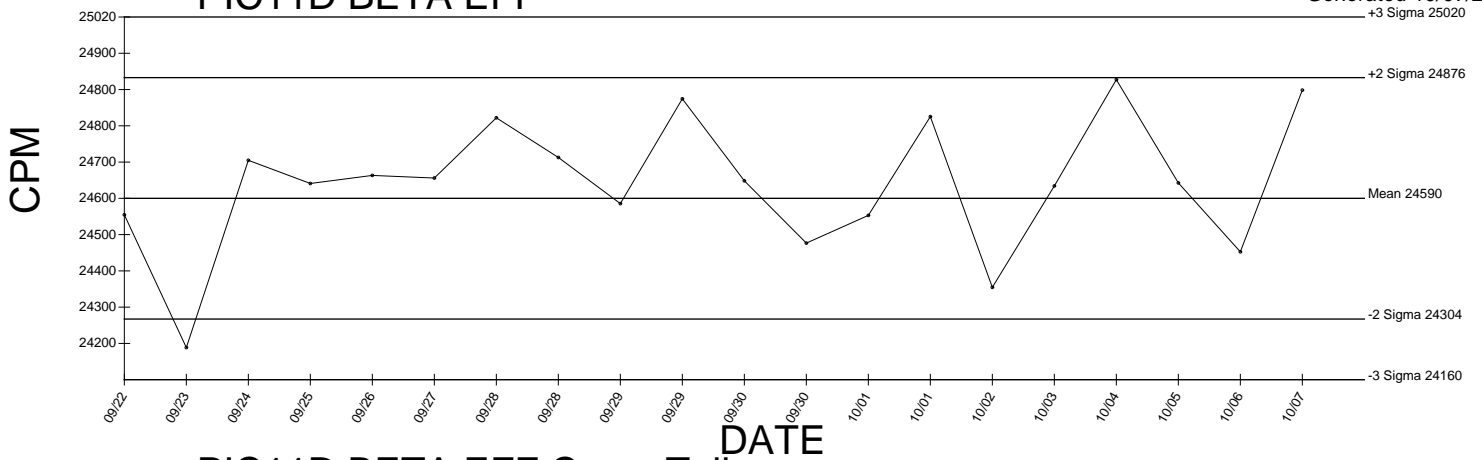
● Denotes Outlier



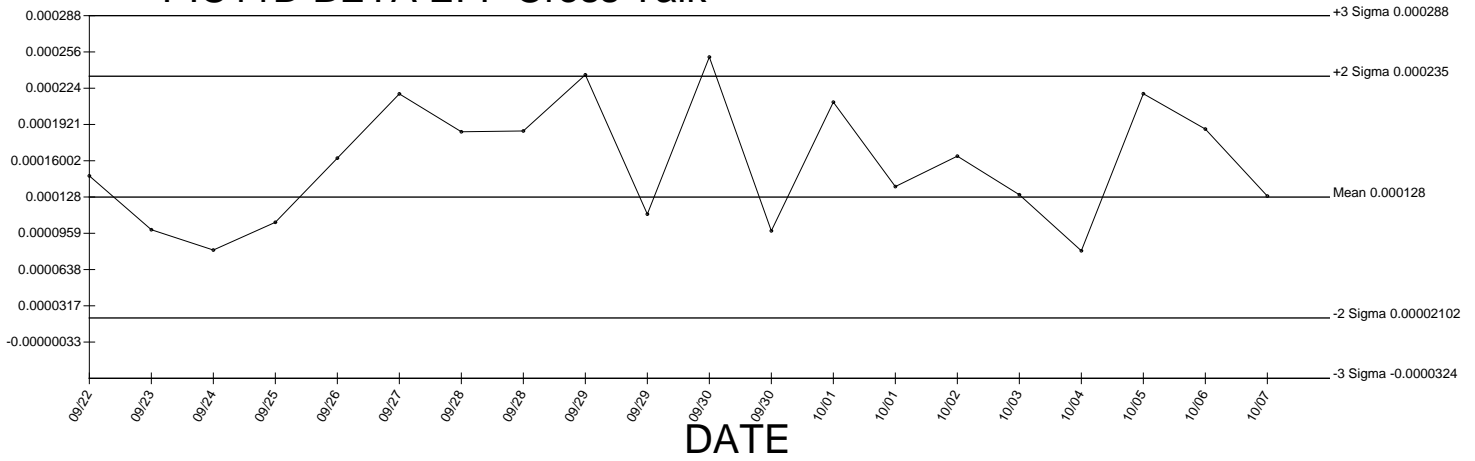
● Denotes Outlier

PIC11D BETA EFF

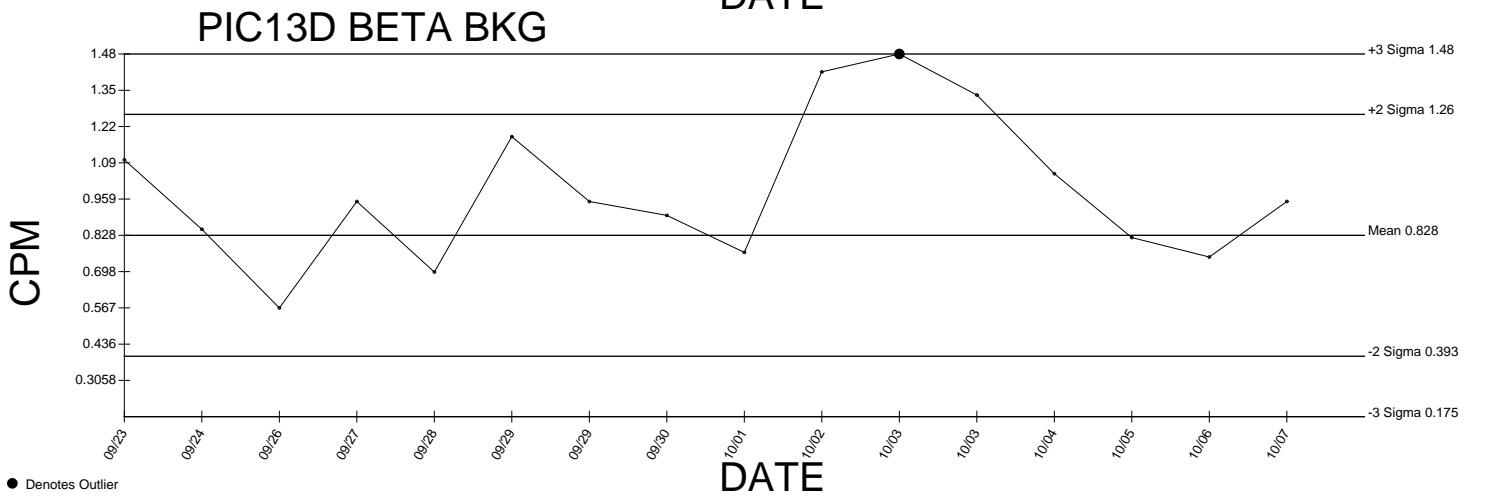
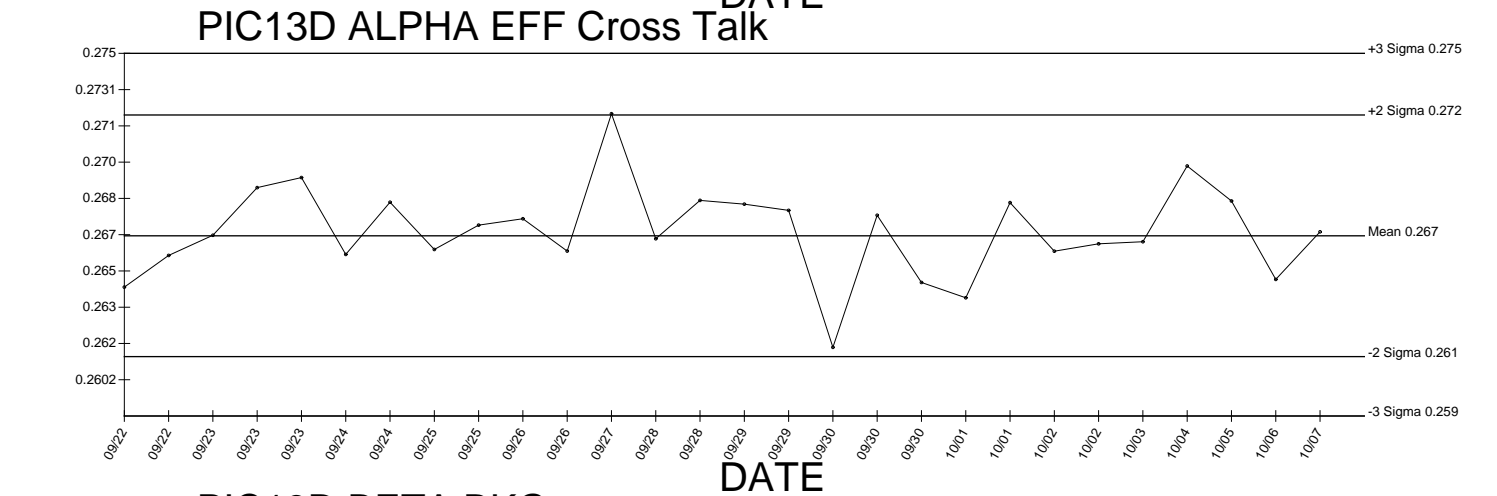
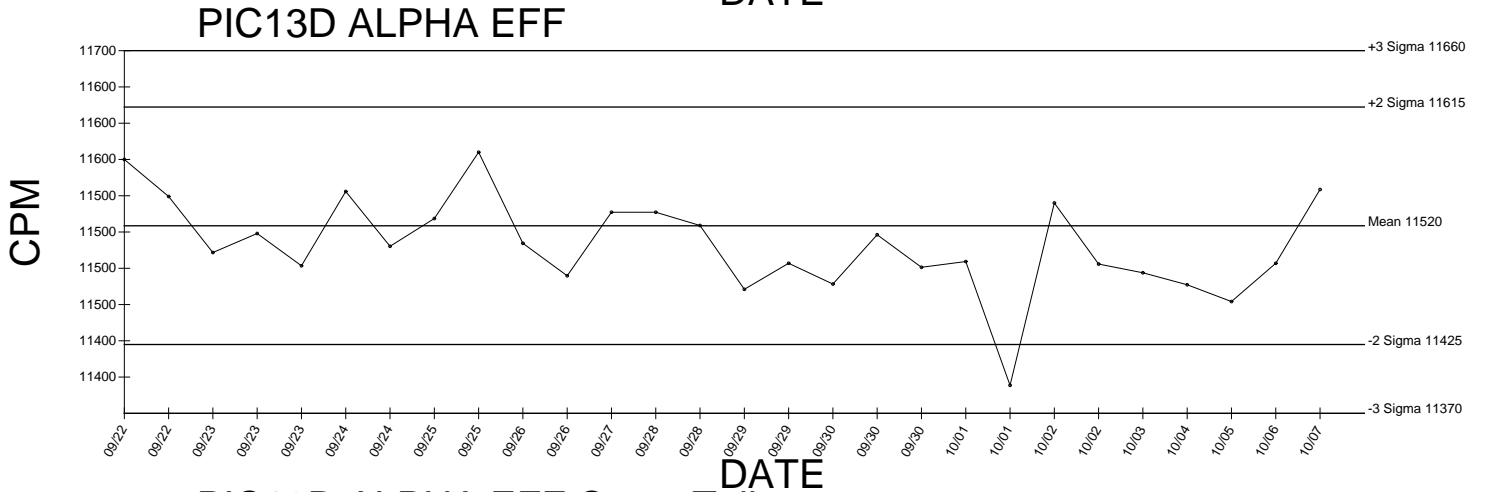
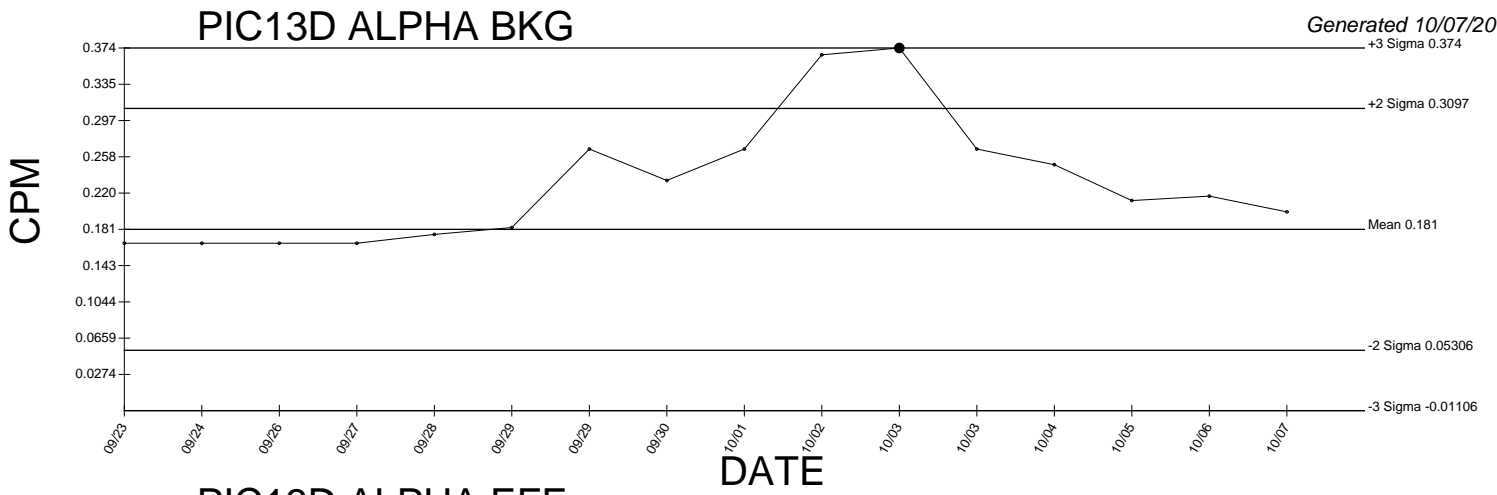
Generated 10/07/2009



PIC11D BETA EFF Cross Talk



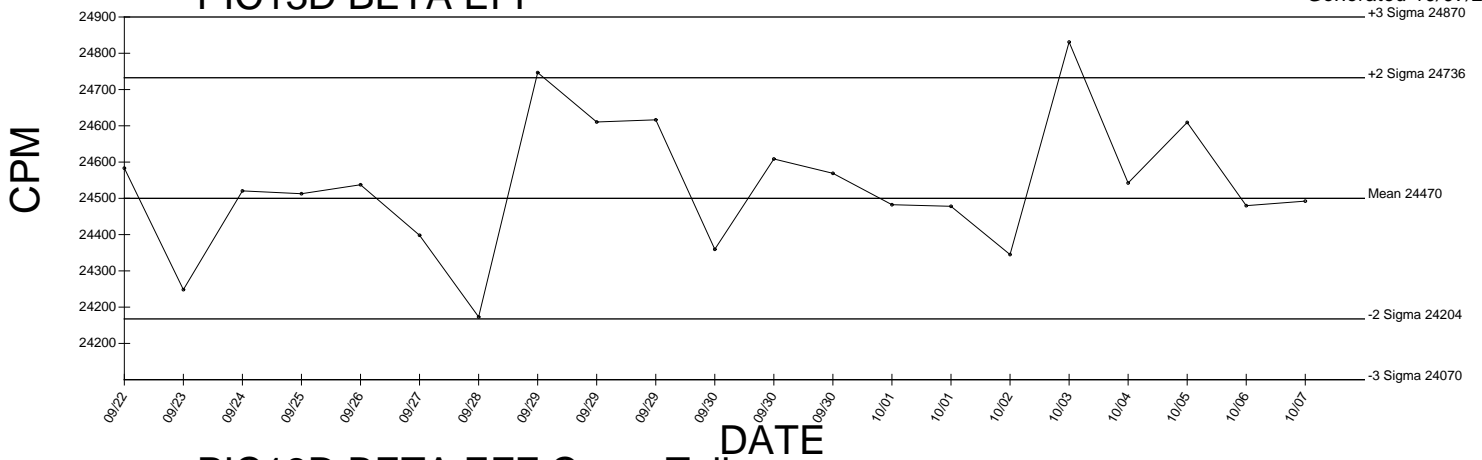
● Denotes Outlier



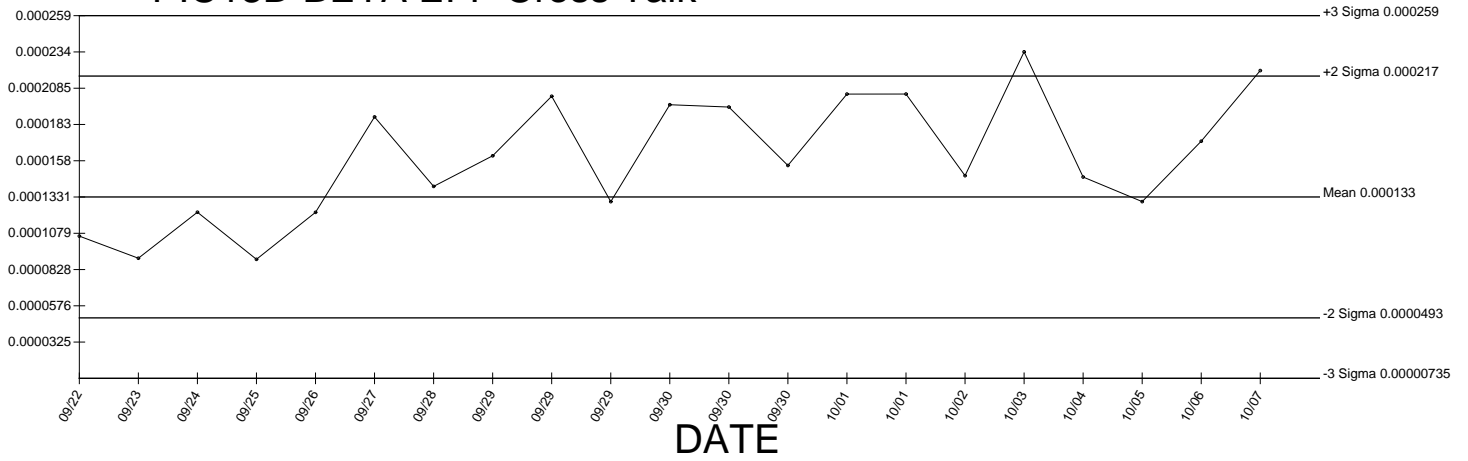
● Denotes Outlier

PIC13D BETA EFF

Generated 10/07/2009

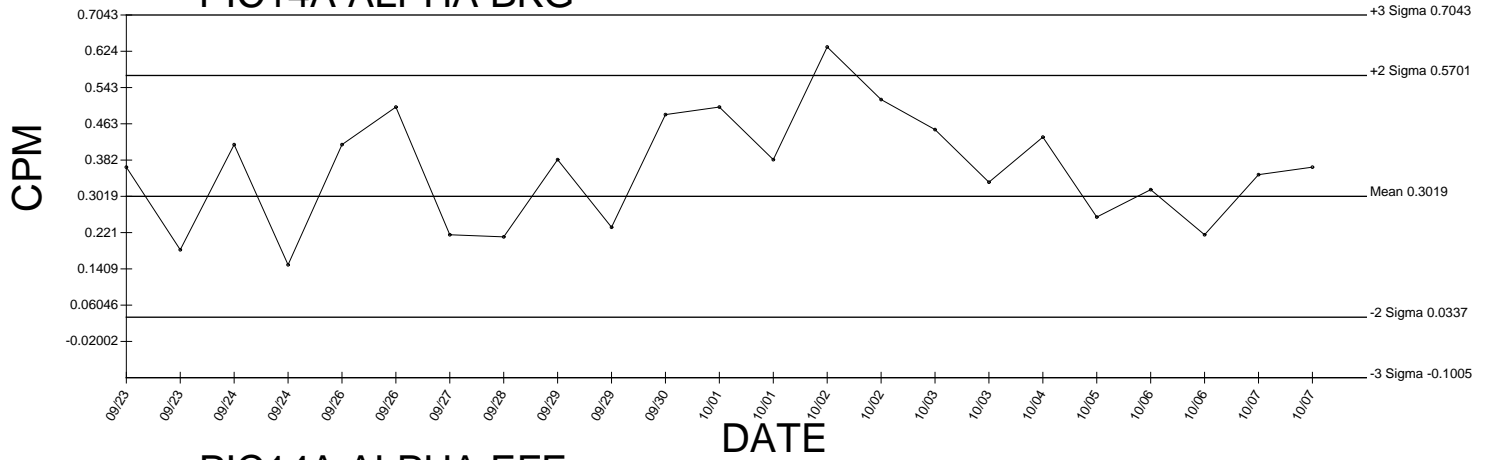


PIC13D BETA EFF Cross Talk

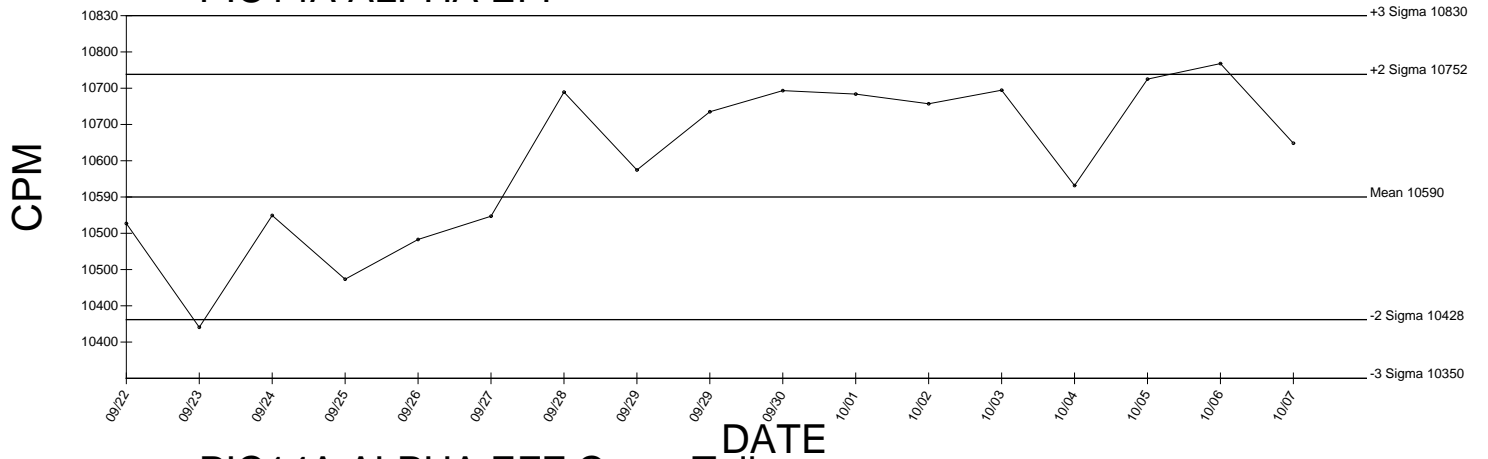


● Denotes Outlier

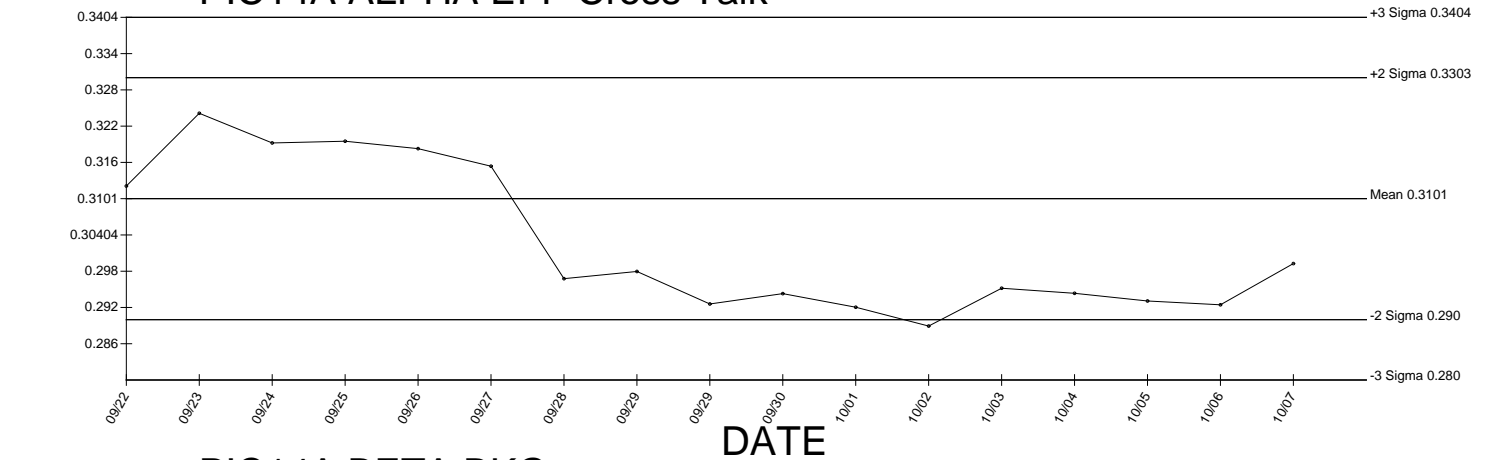
PIC14A ALPHA BKG



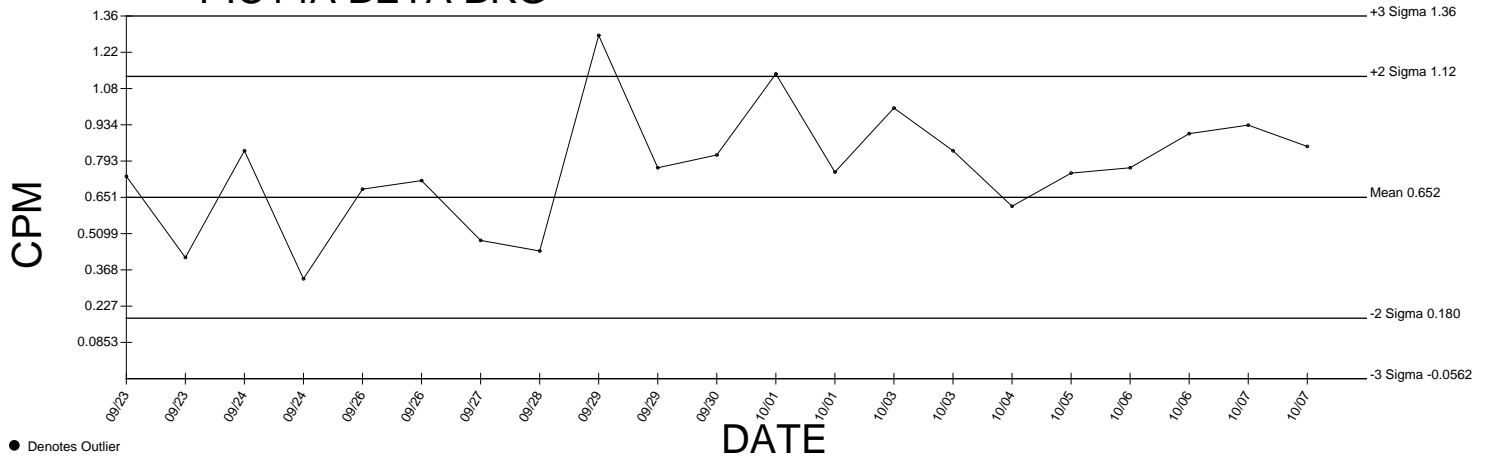
PIC14A ALPHA EFF



PIC14A ALPHA EFF Cross Talk



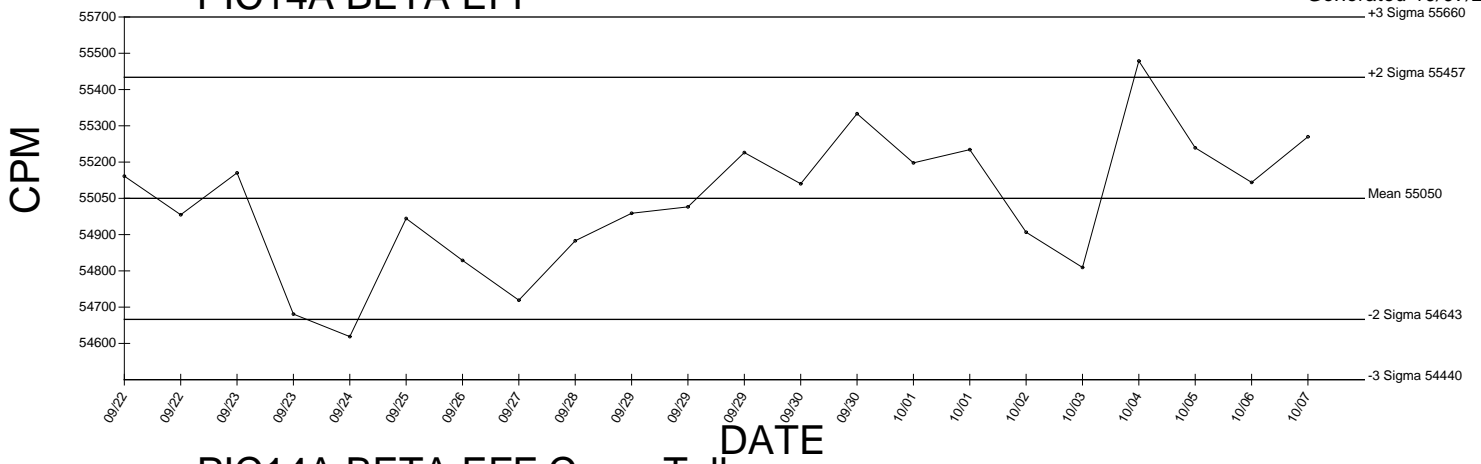
PIC14A BETA BKG



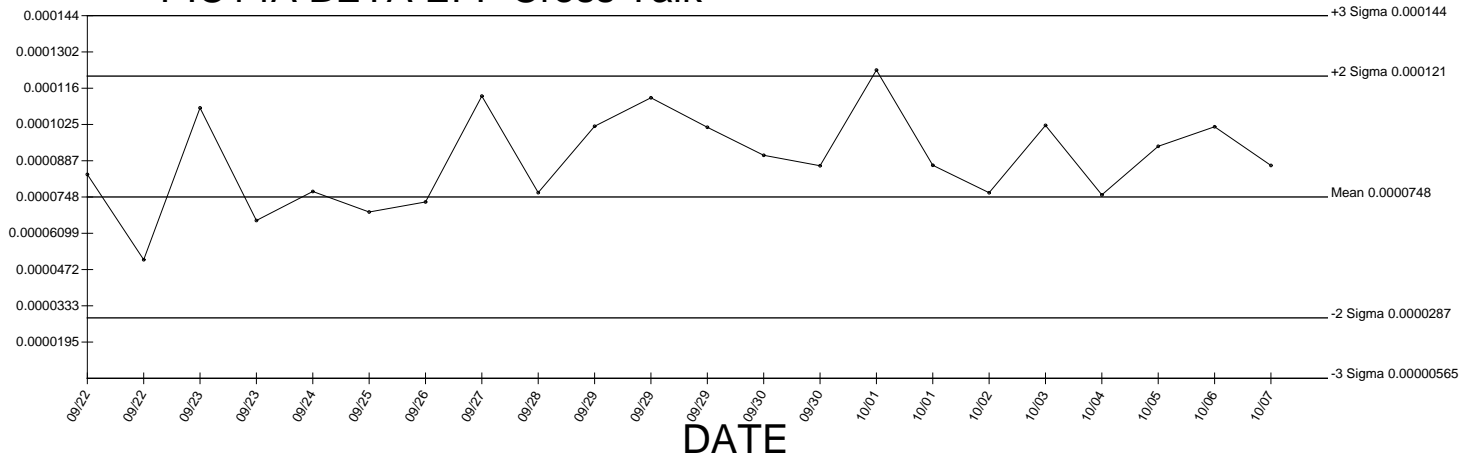
● Denotes Outlier

PIC14A BETA EFF

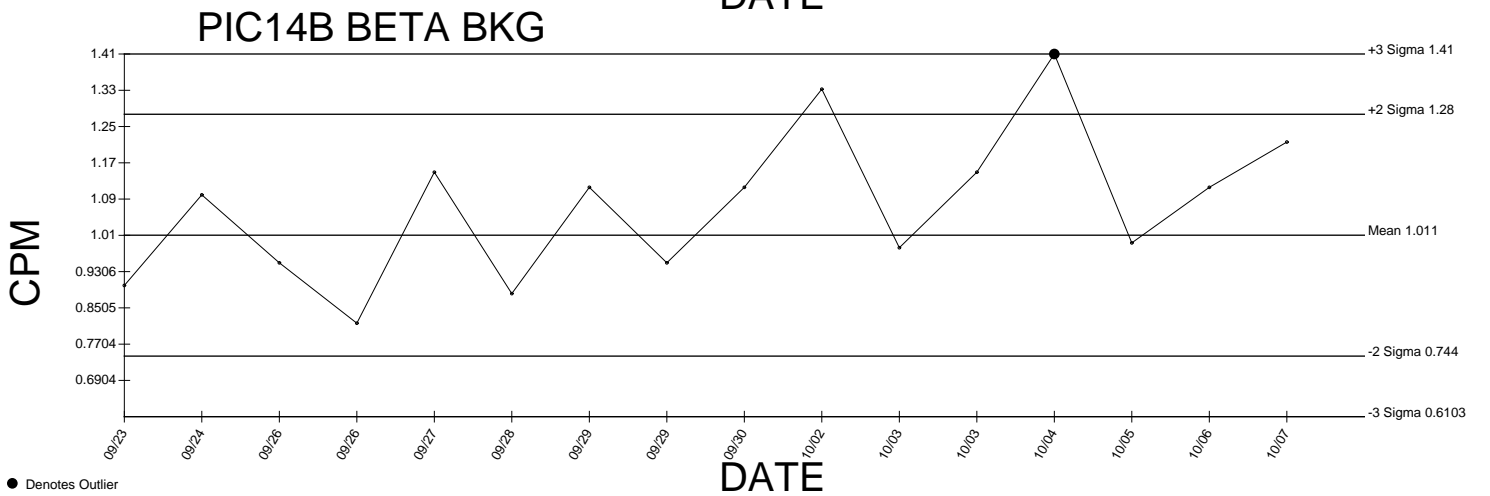
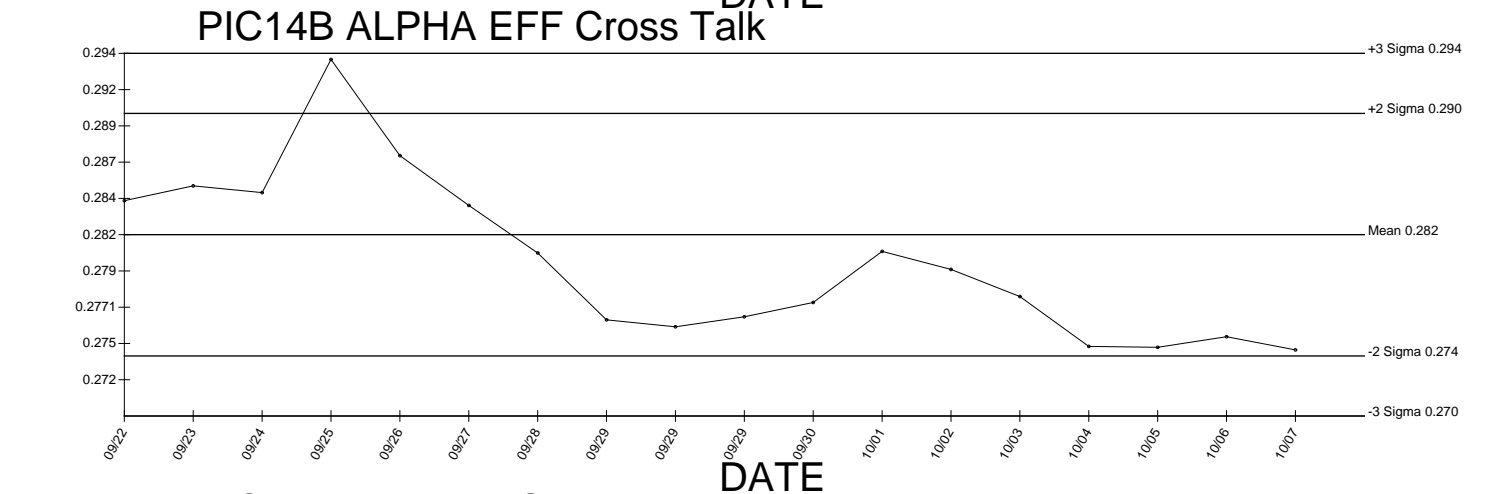
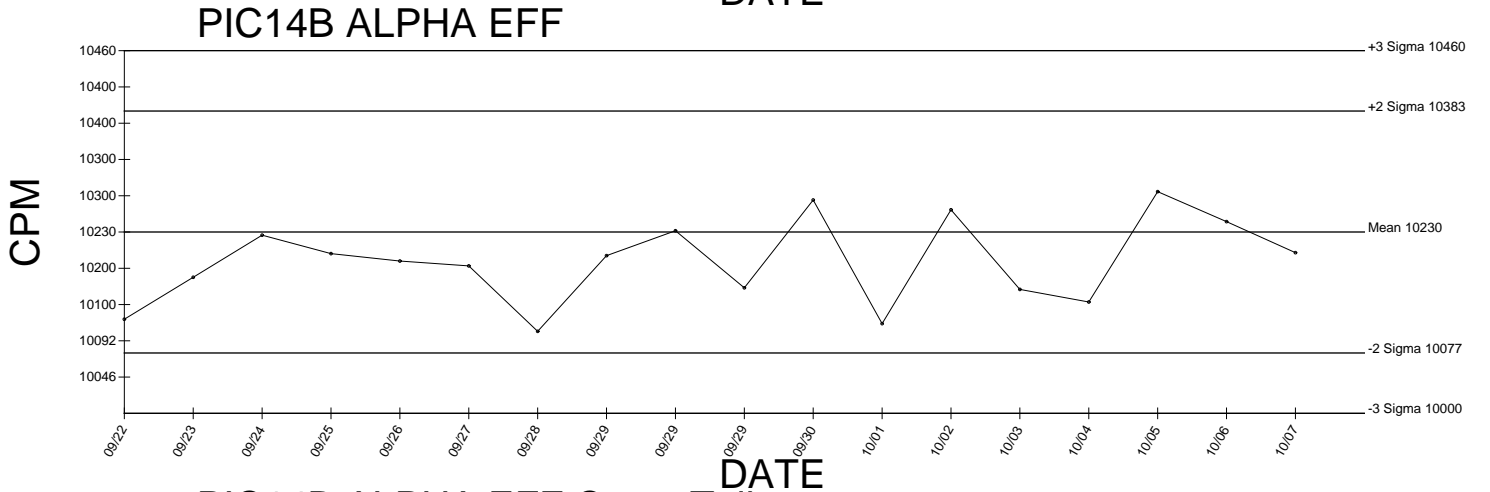
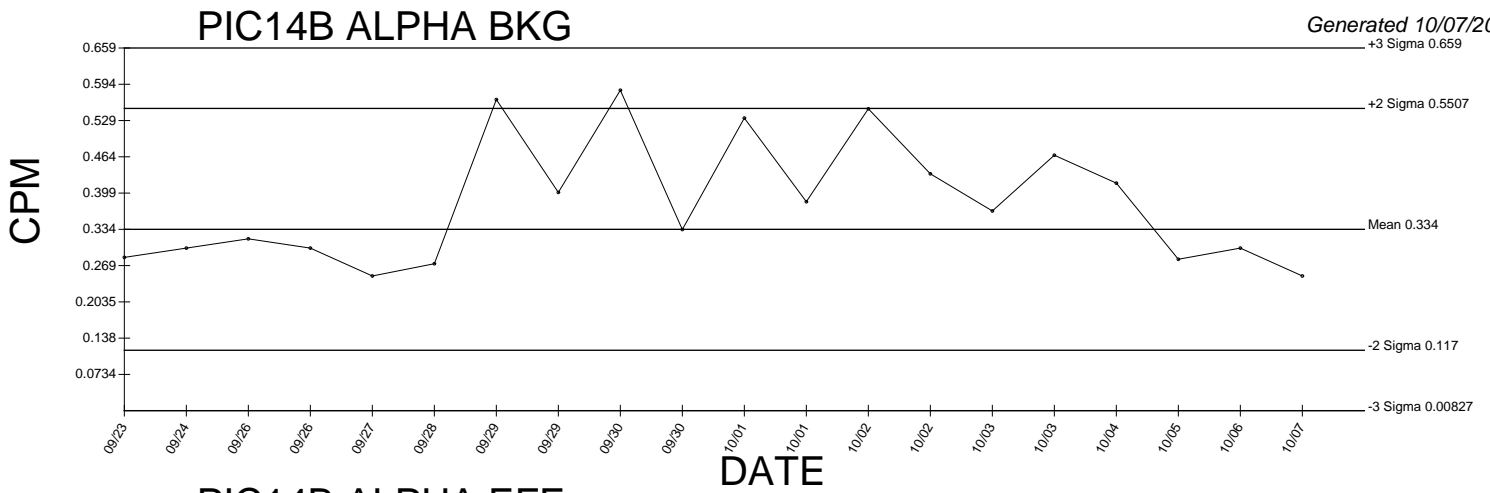
Generated 10/07/2009



PIC14A BETA EFF Cross Talk



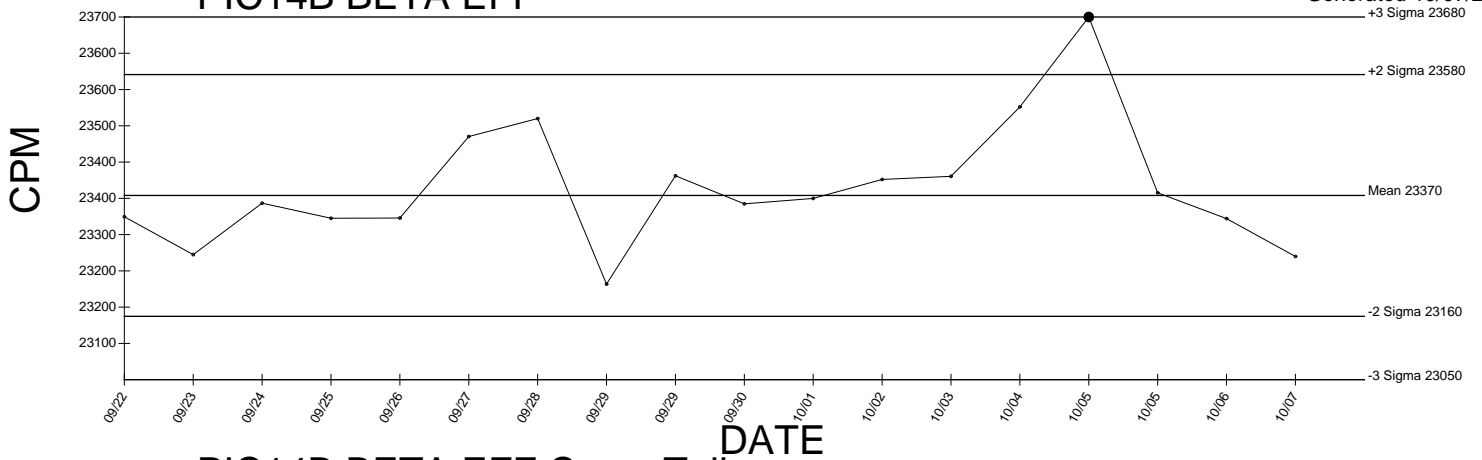
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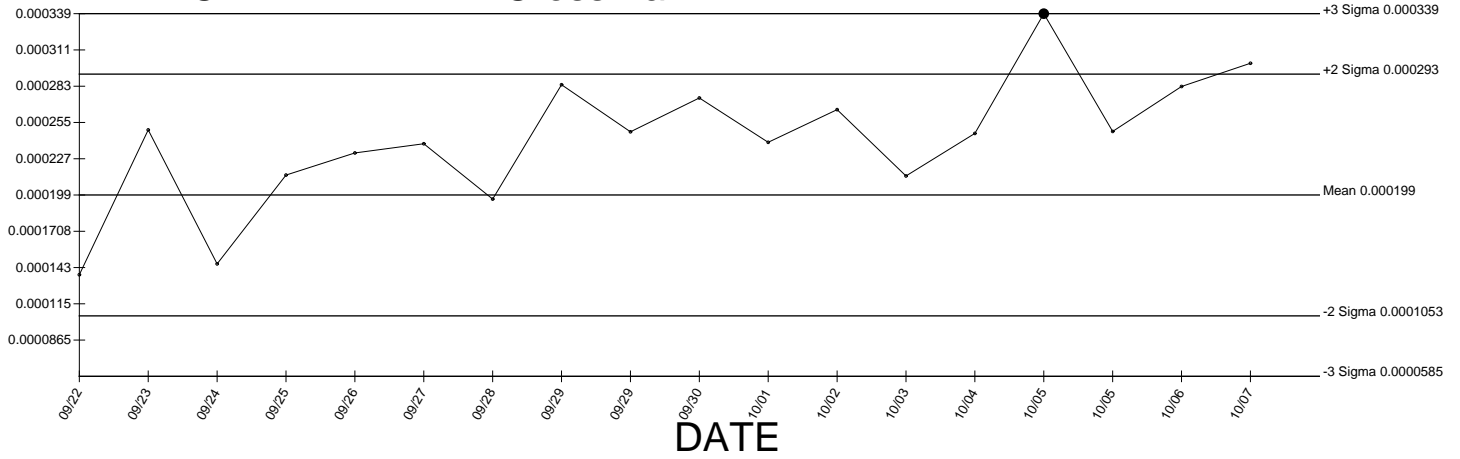
● Denotes Outlier

PIC14B BETA EFF

Generated 10/07/2009

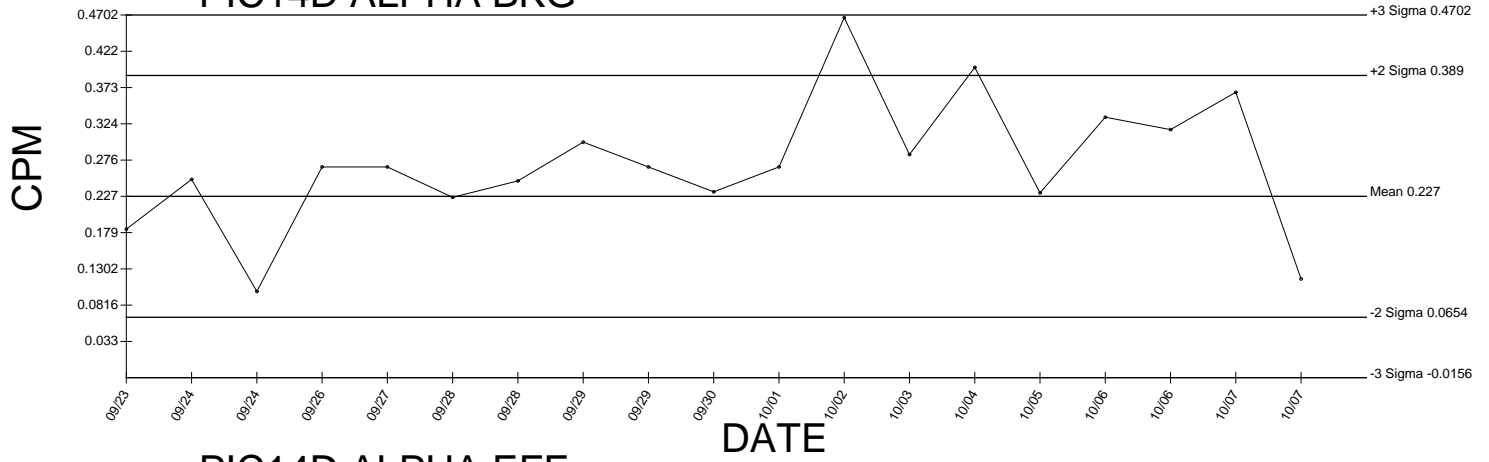


PIC14B BETA EFF Cross Talk

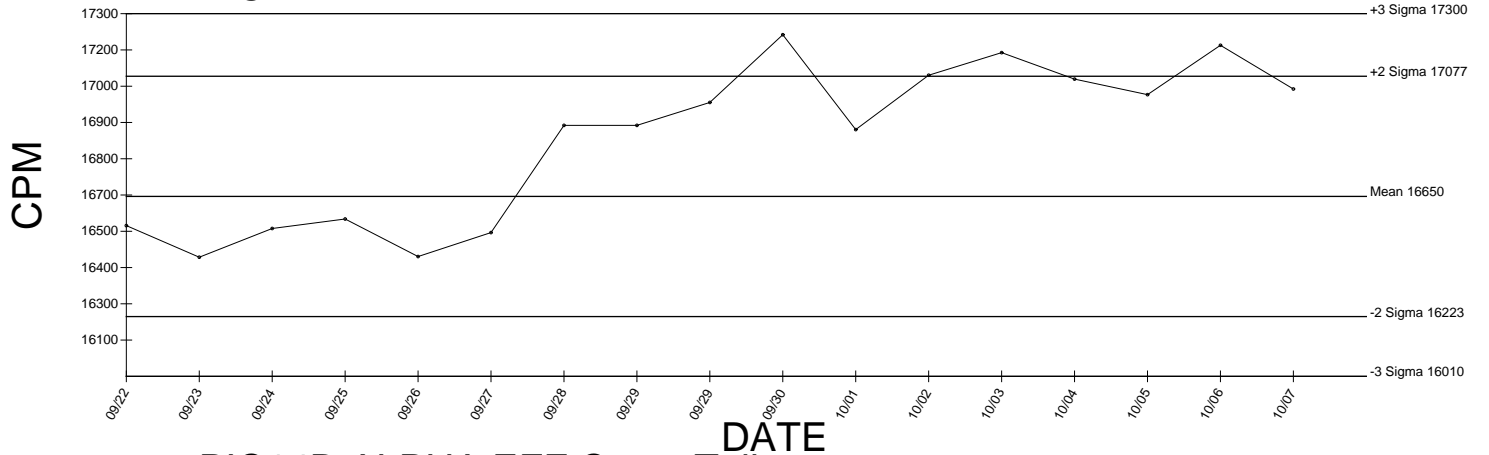


● Denotes Outlier

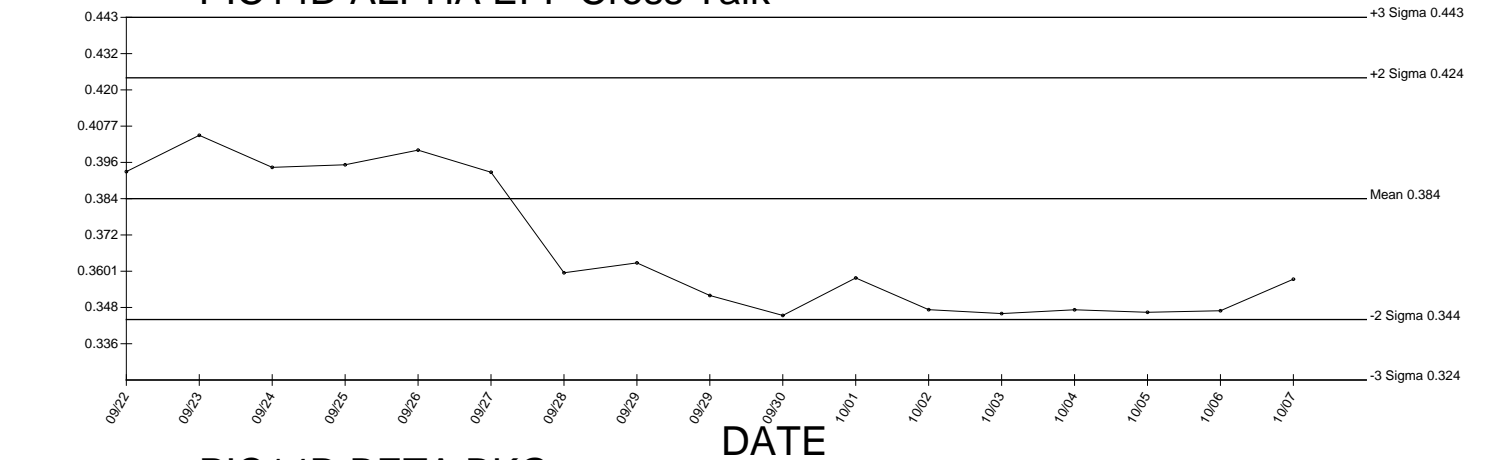
PIC14D ALPHA BKG



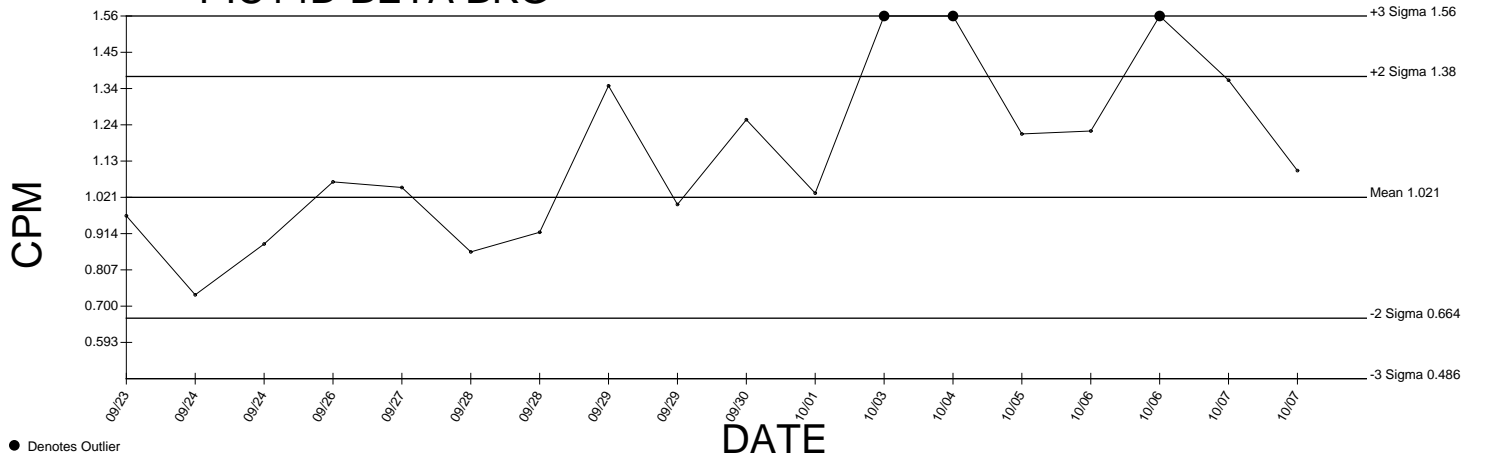
PIC14D ALPHA EFF



PIC14D ALPHA EFF Cross Talk



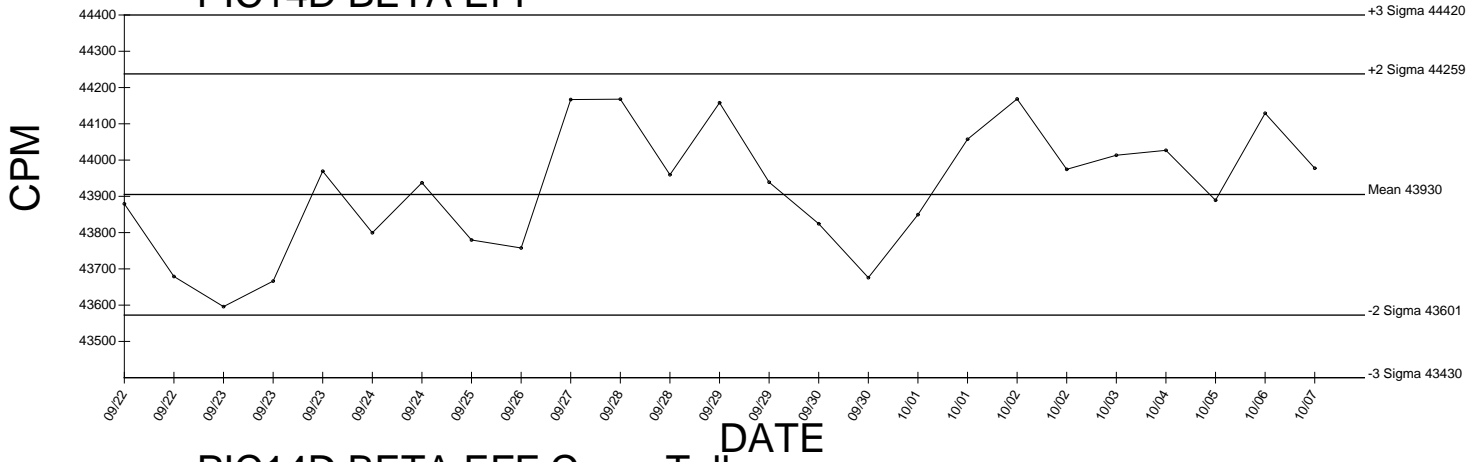
PIC14D BETA BKG



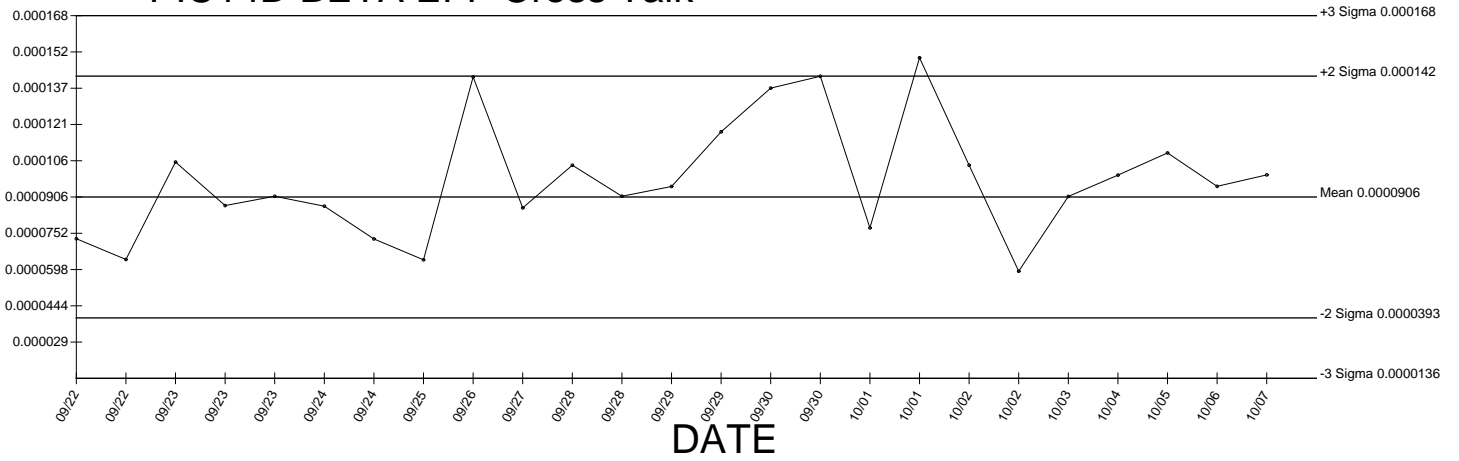
● Denotes Outlier

PIC14D BETA EFF

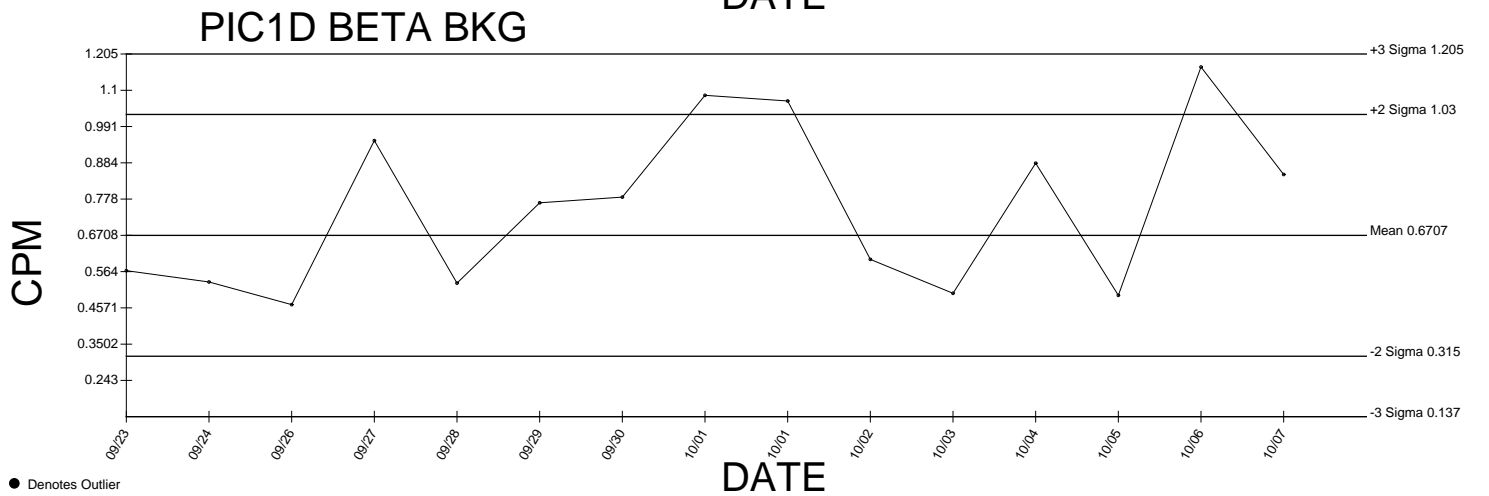
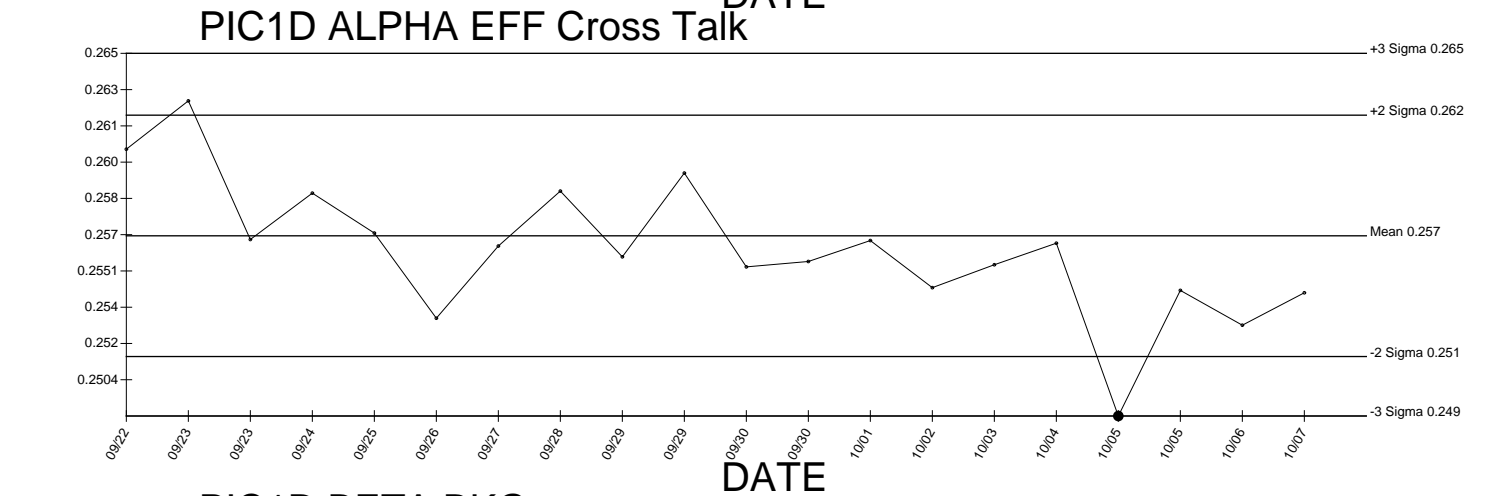
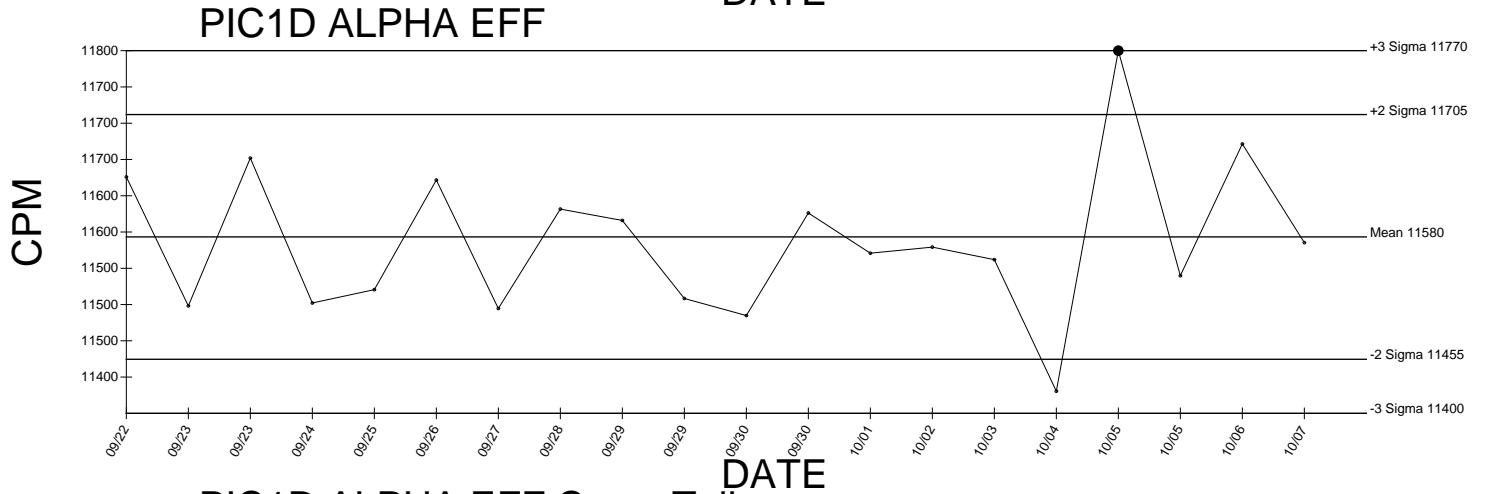
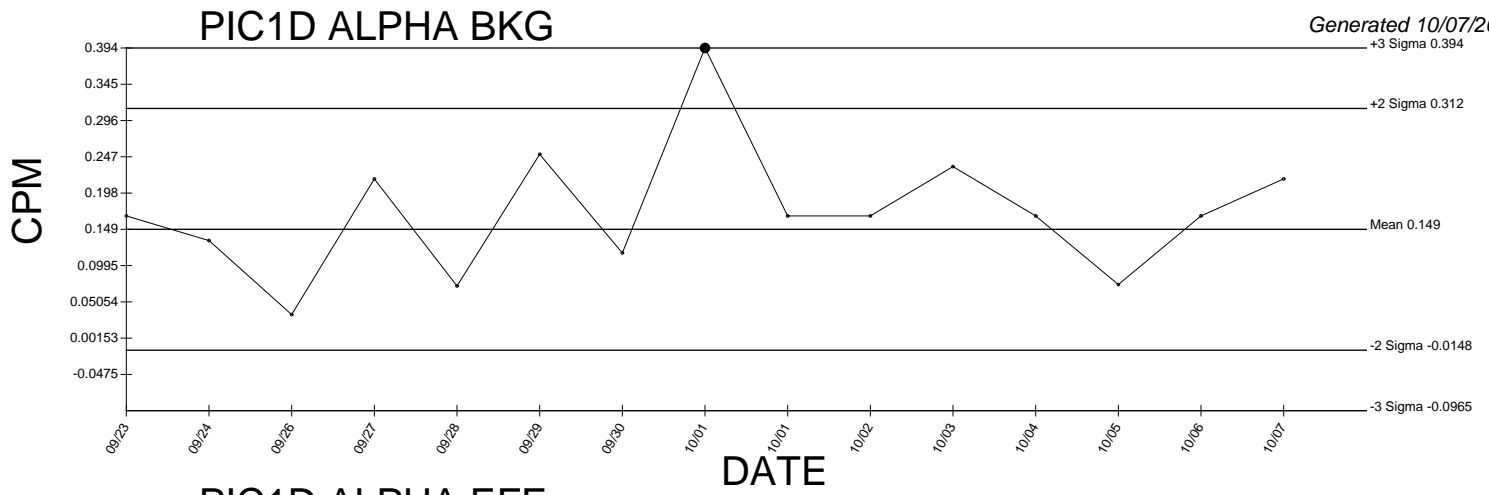
Generated 10/07/2009



PIC14D BETA EFF Cross Talk



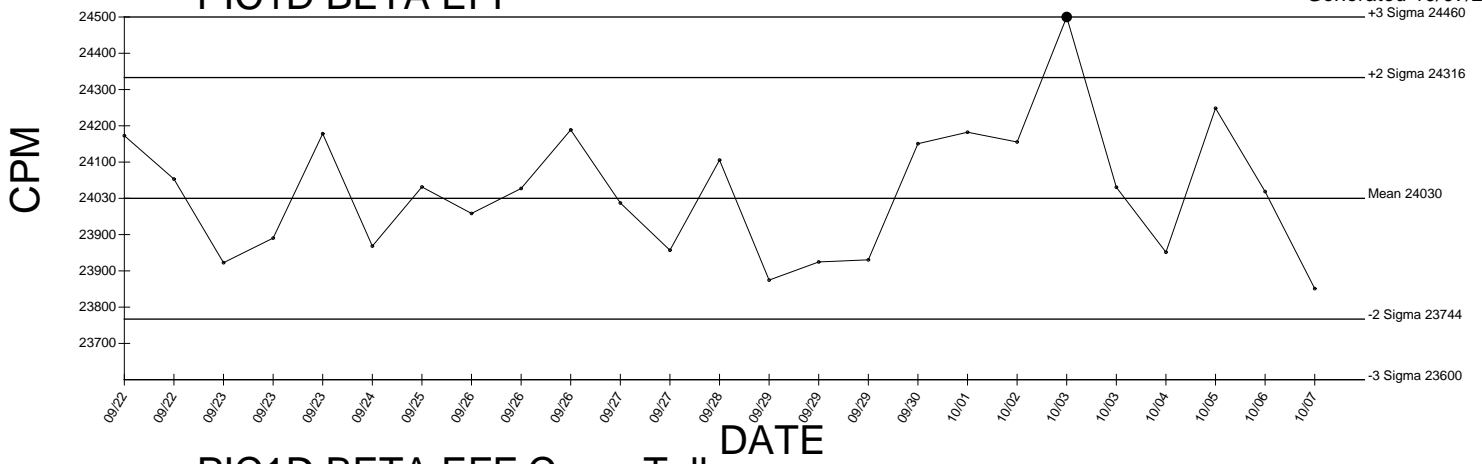
● Denotes Outlier



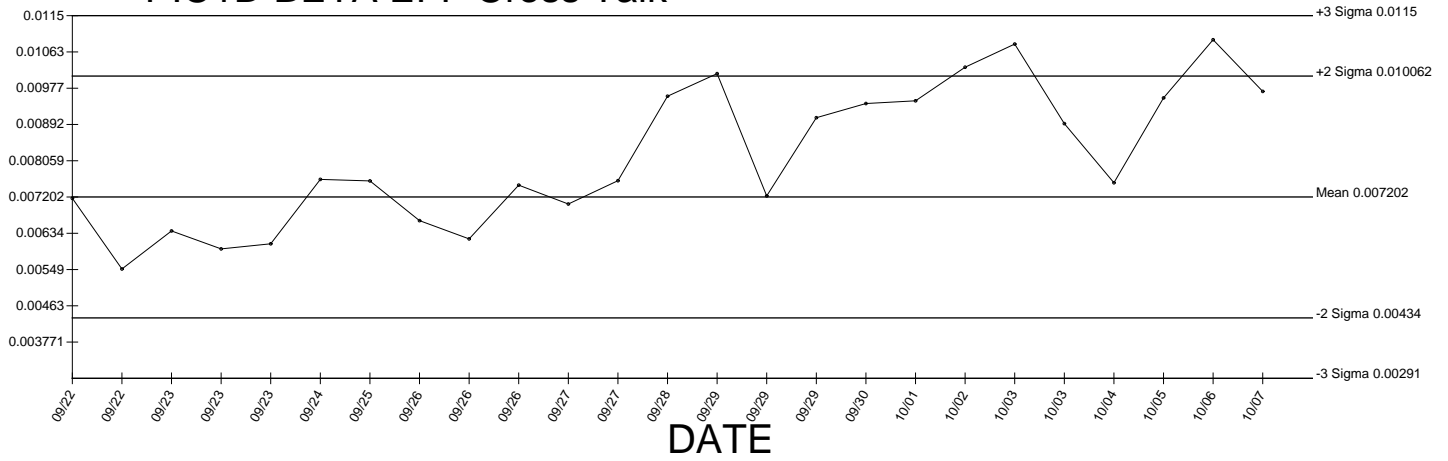
● Denotes Outlier

PIC1D BETA EFF

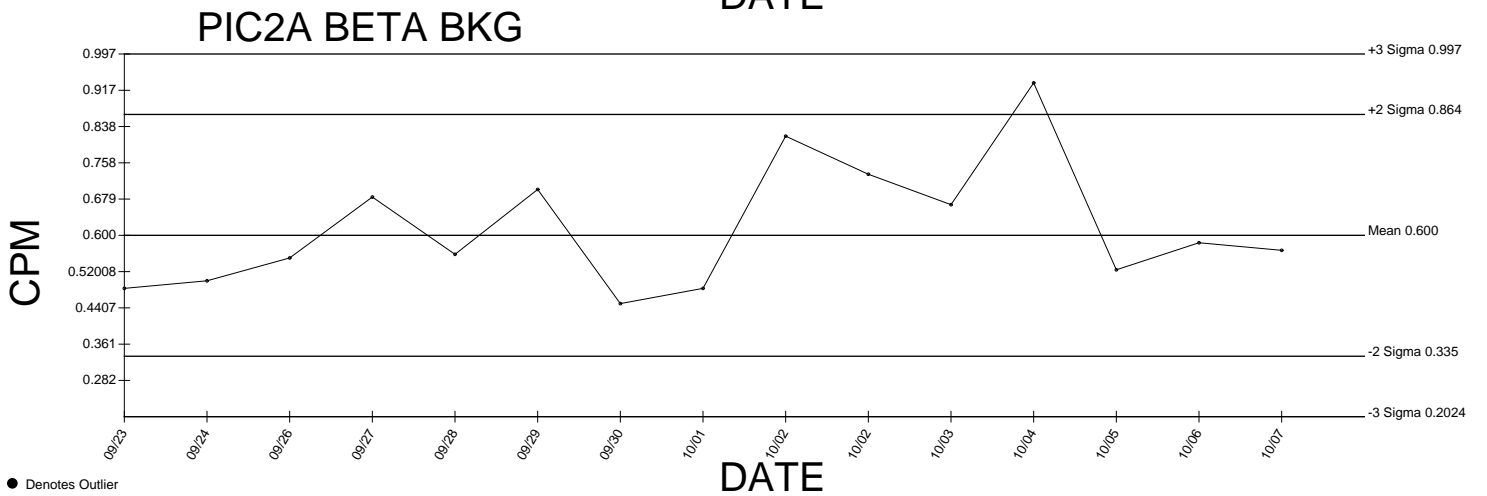
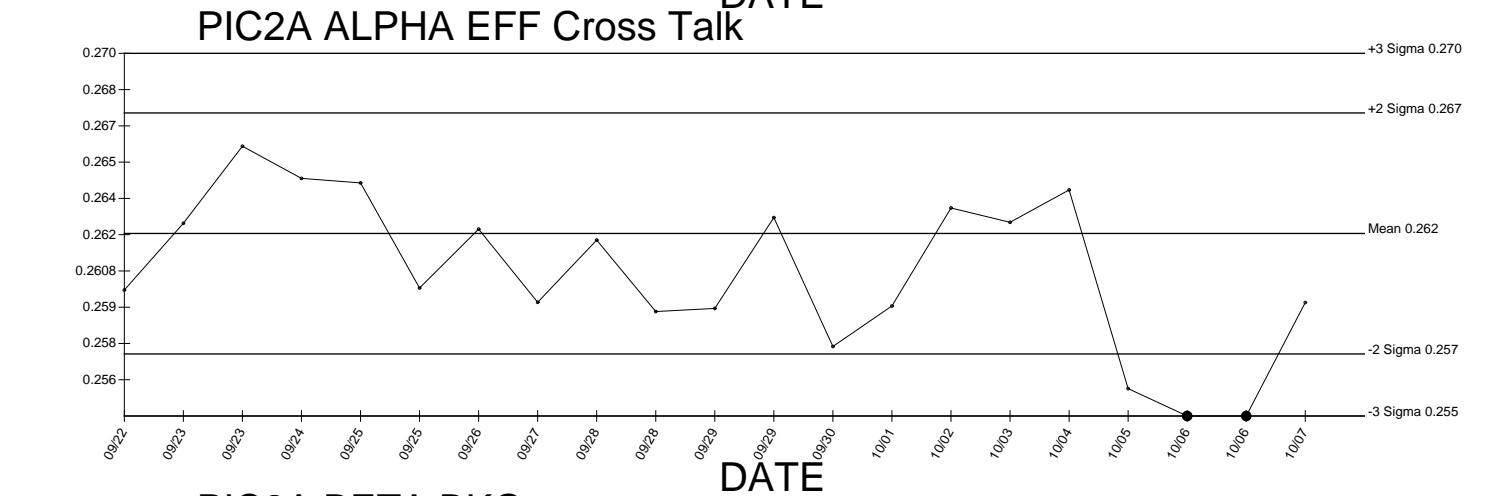
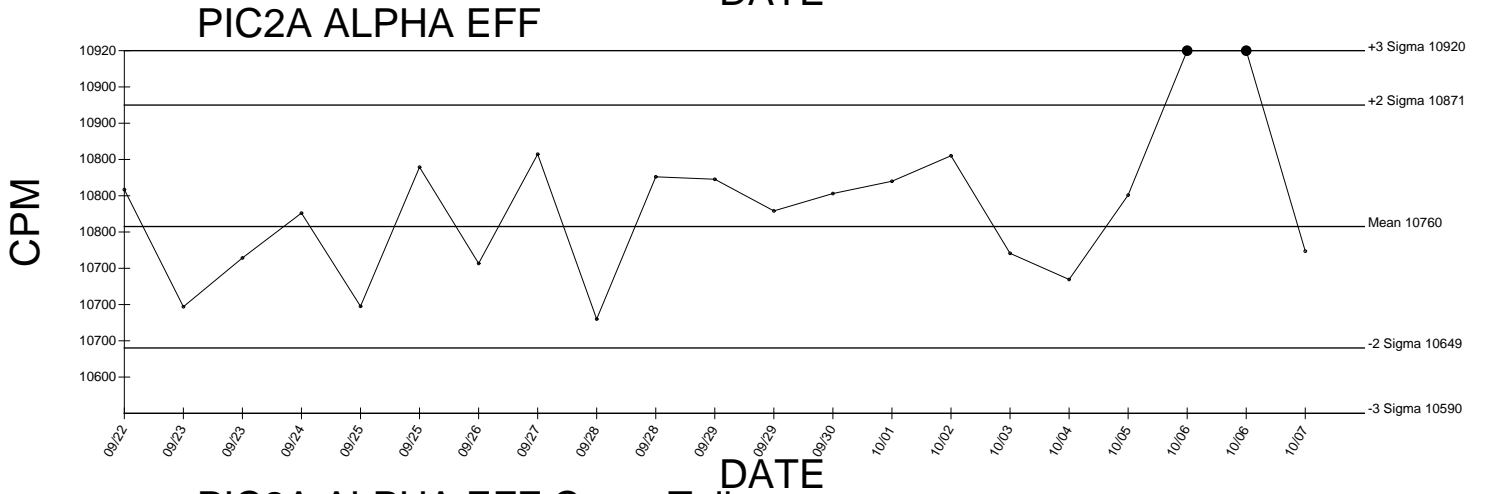
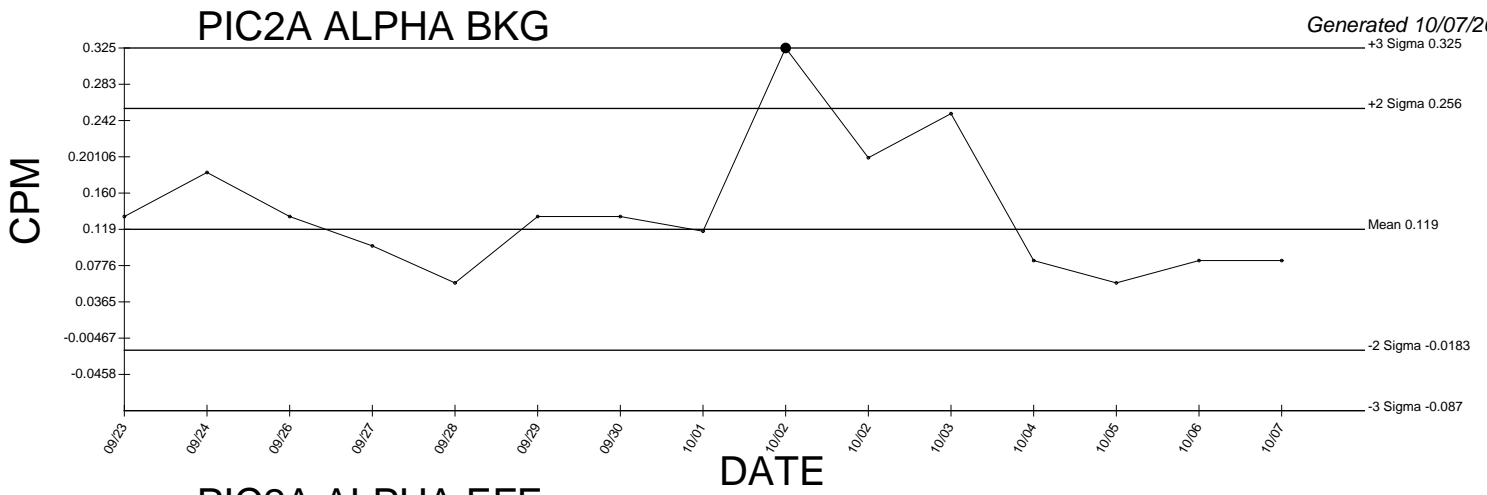
Generated 10/07/2009



PIC1D BETA EFF Cross Talk



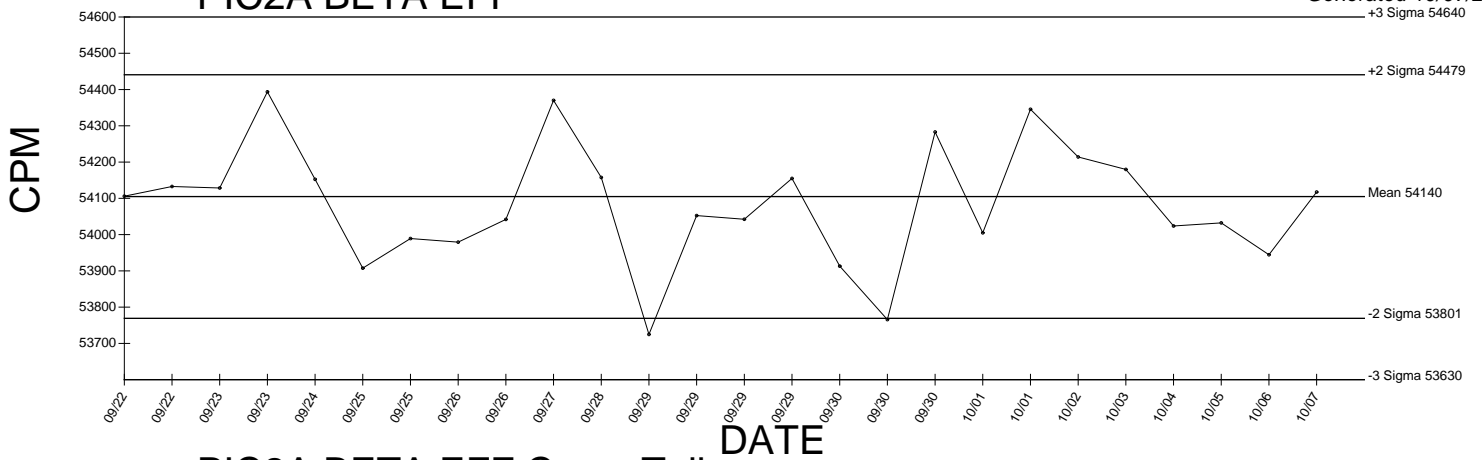
● Denotes Outlier



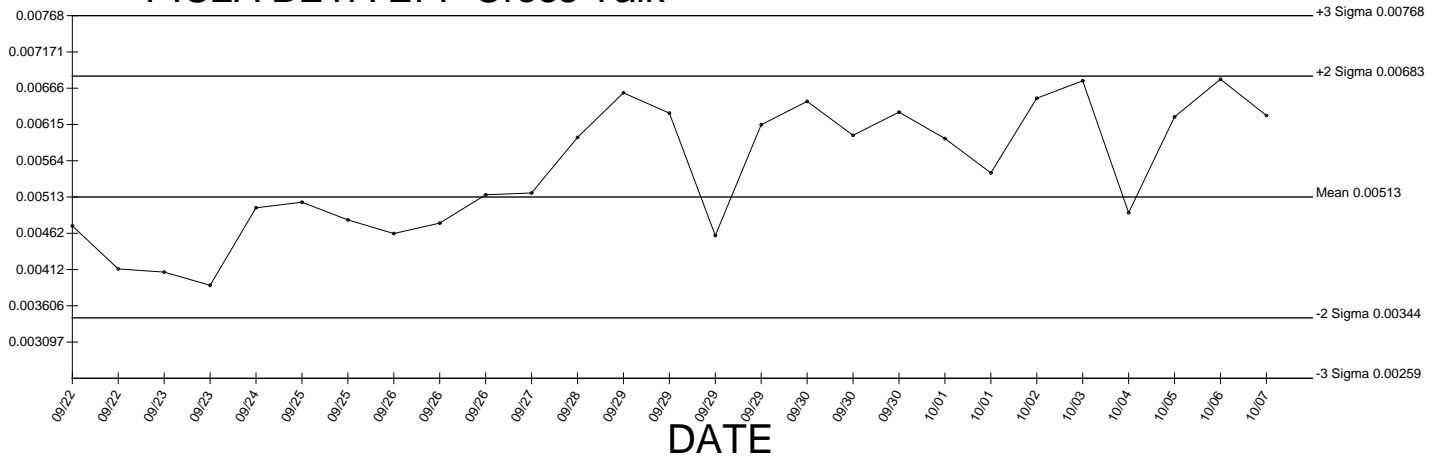
● Denotes Outlier

PIC2A BETA EFF

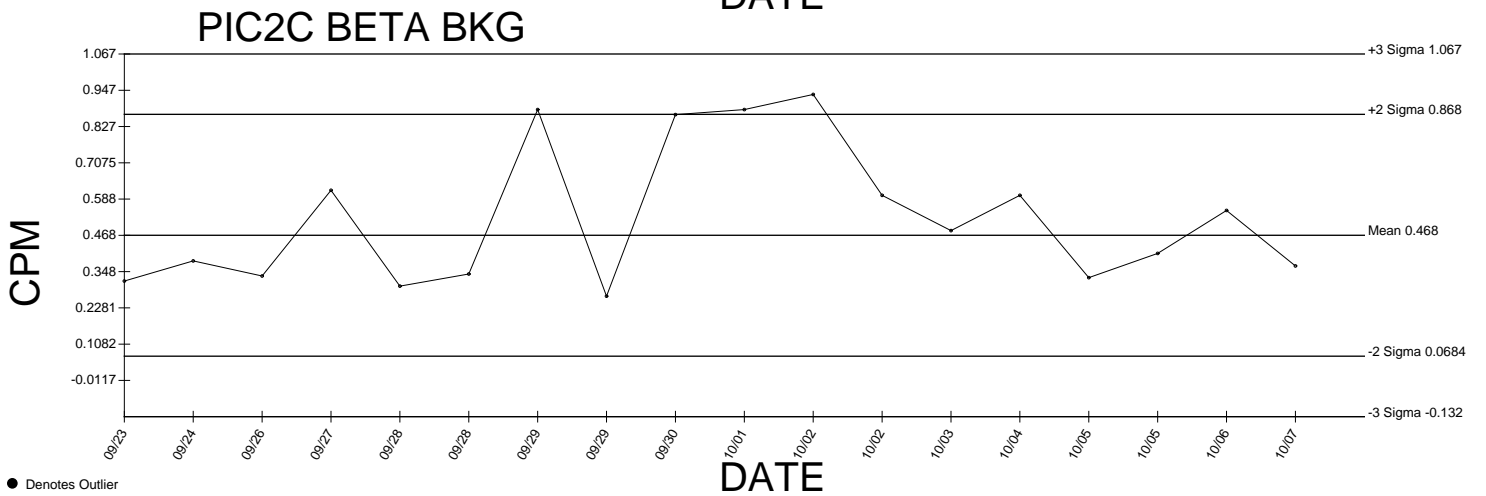
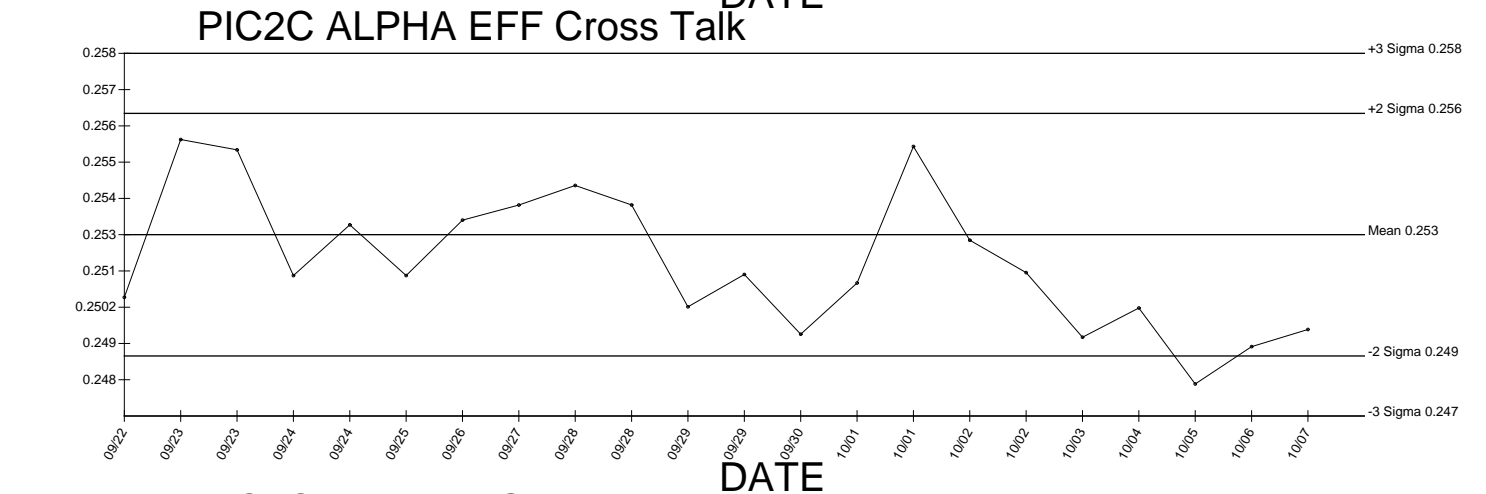
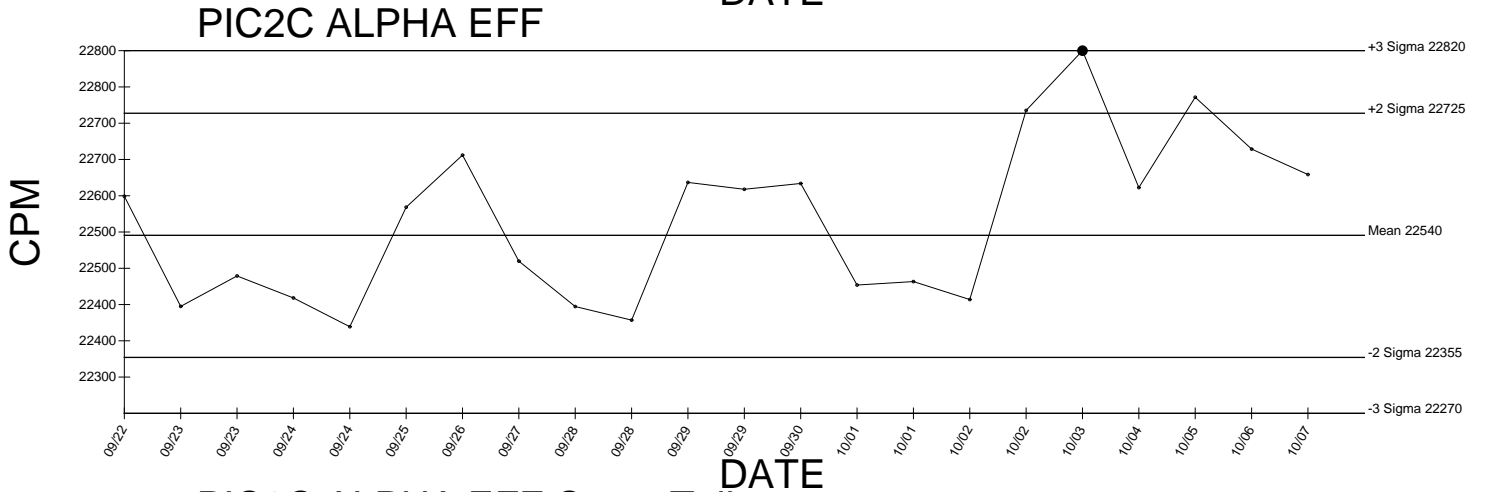
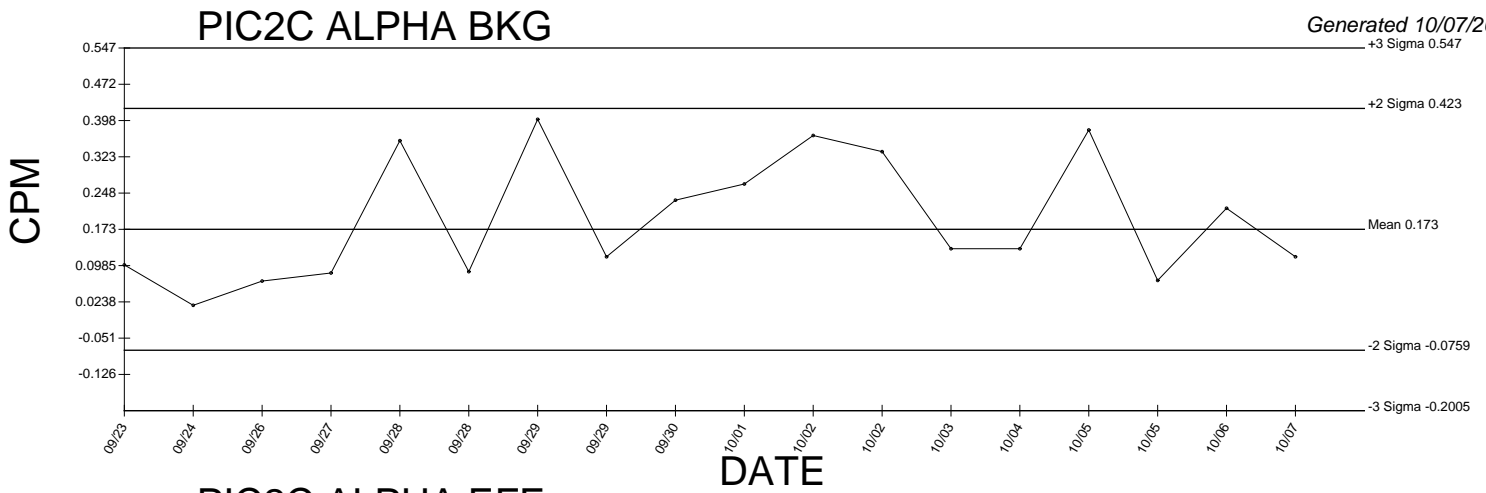
Generated 10/07/2009



PIC2A BETA EFF Cross Talk



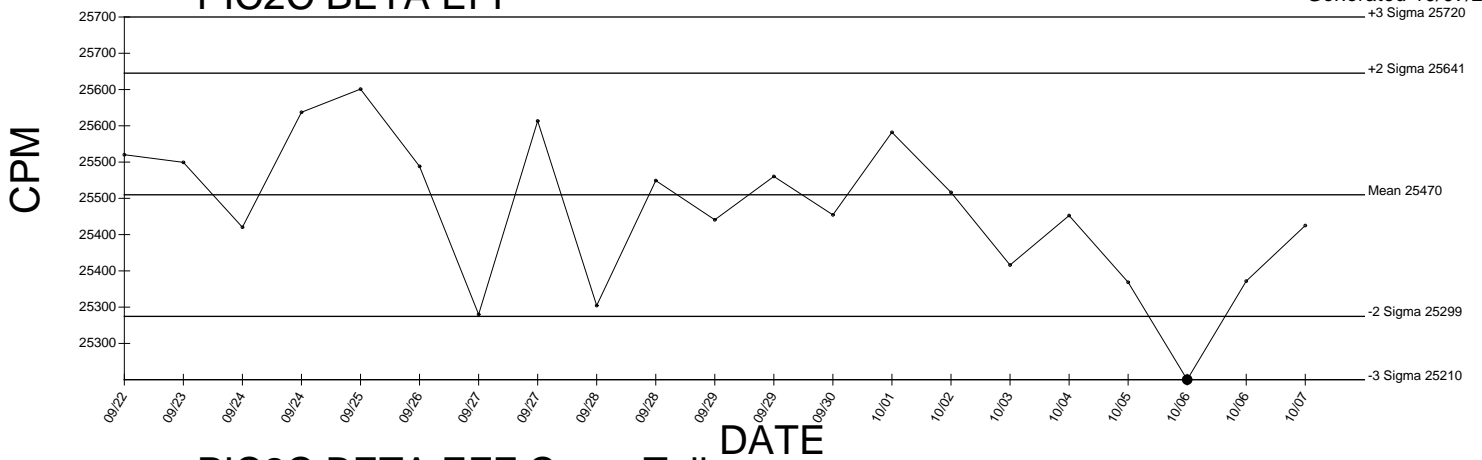
● Denotes Outlier



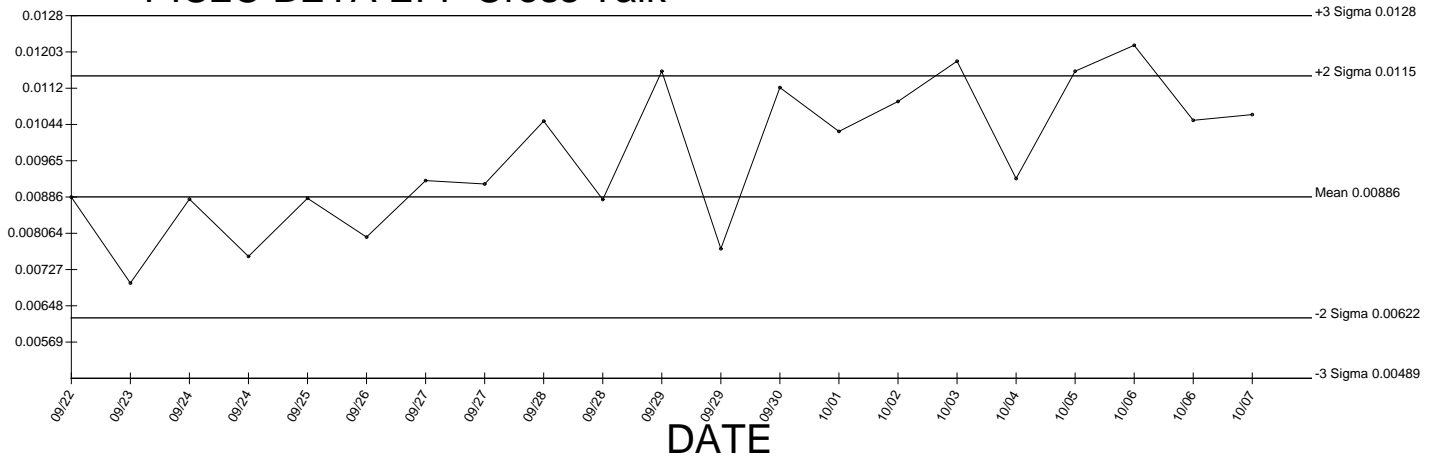
● Denotes Outlier

PIC2C BETA EFF

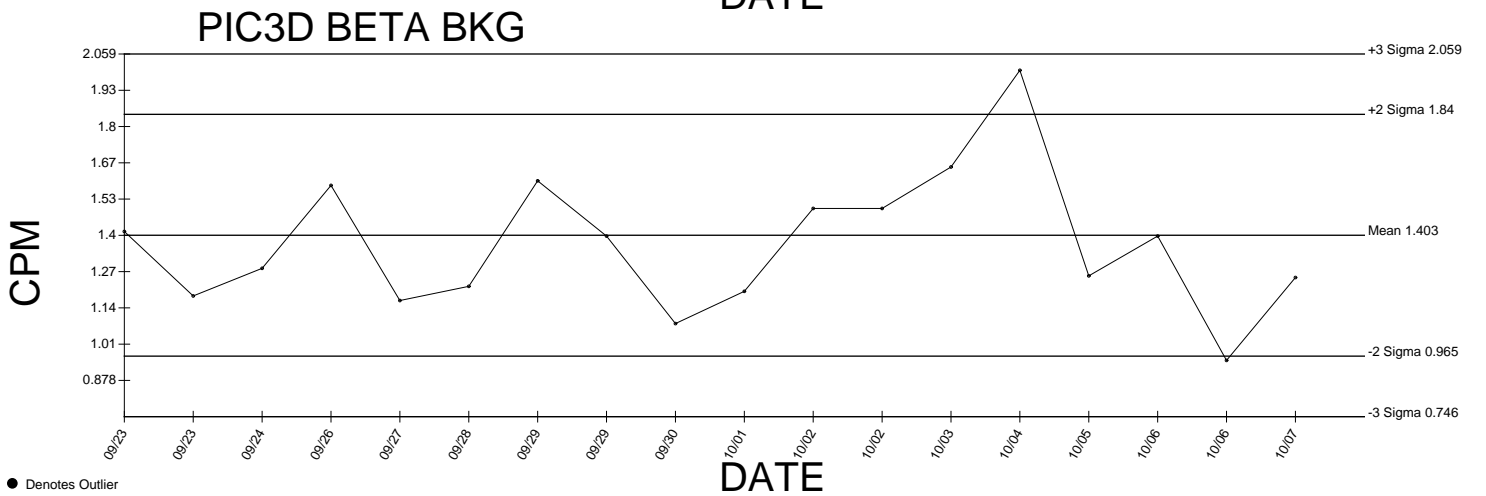
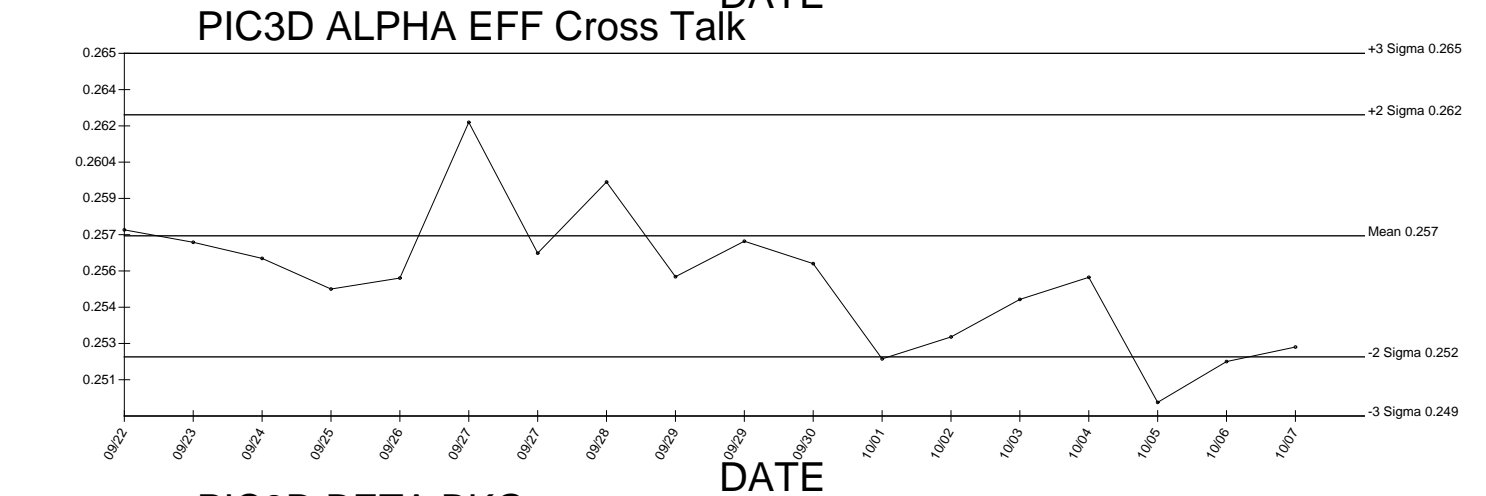
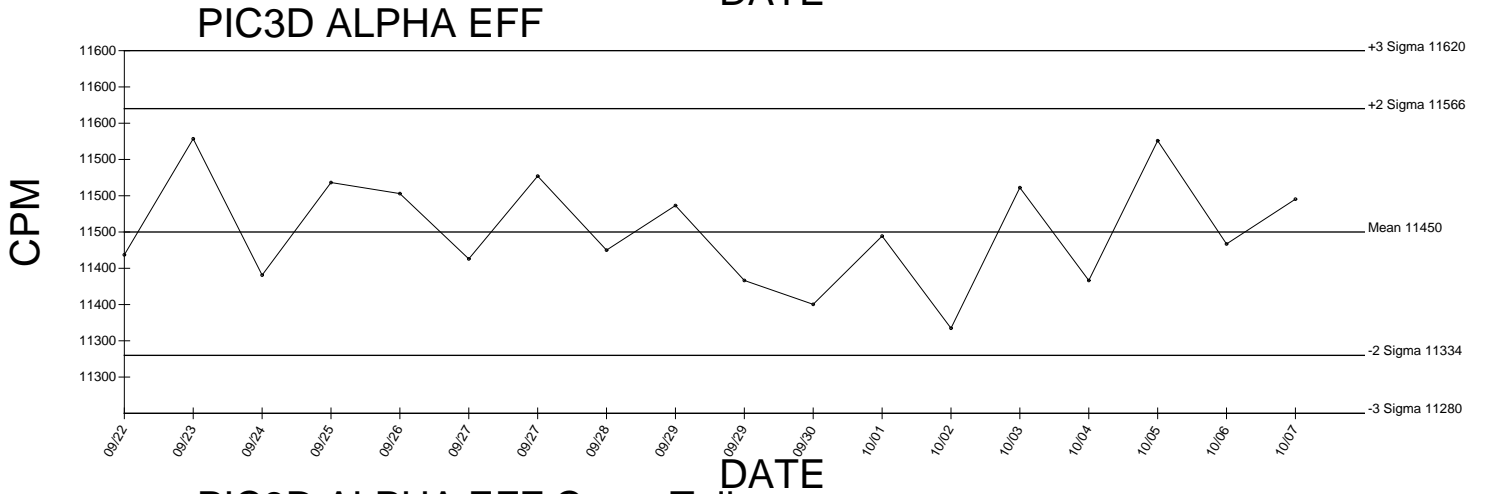
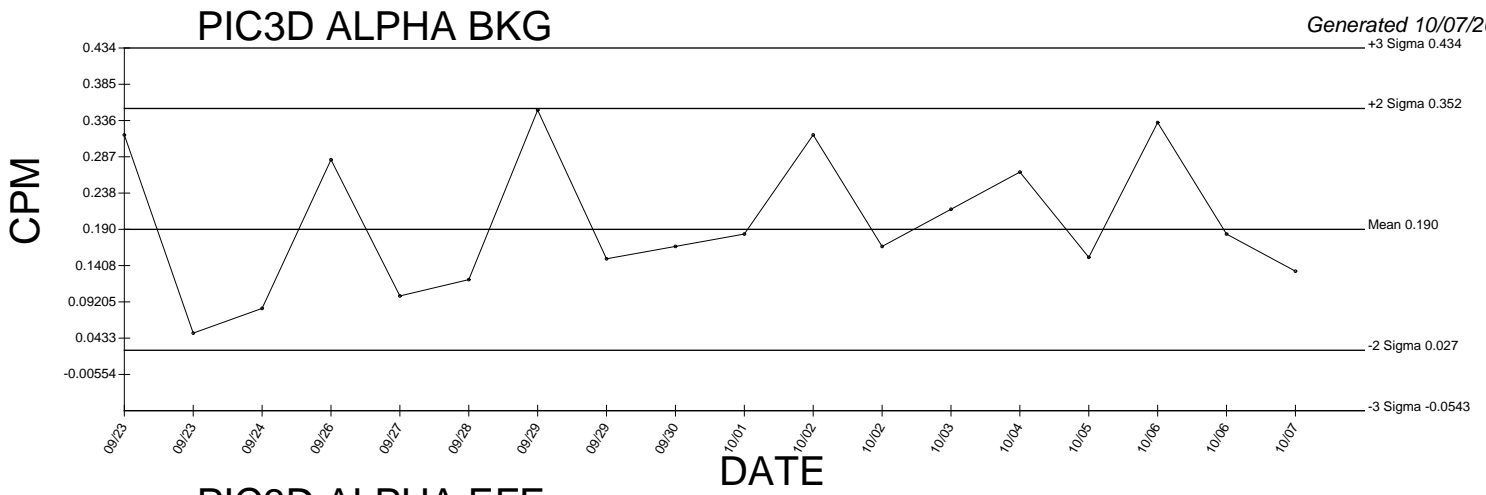
Generated 10/07/2009



PIC2C BETA EFF Cross Talk



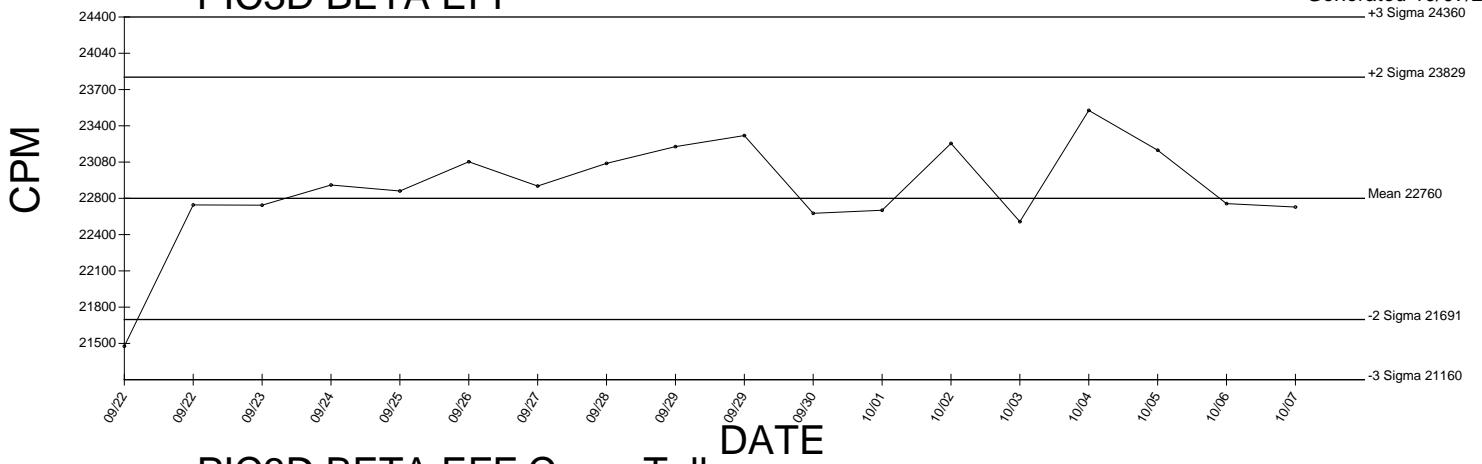
● Denotes Outlier



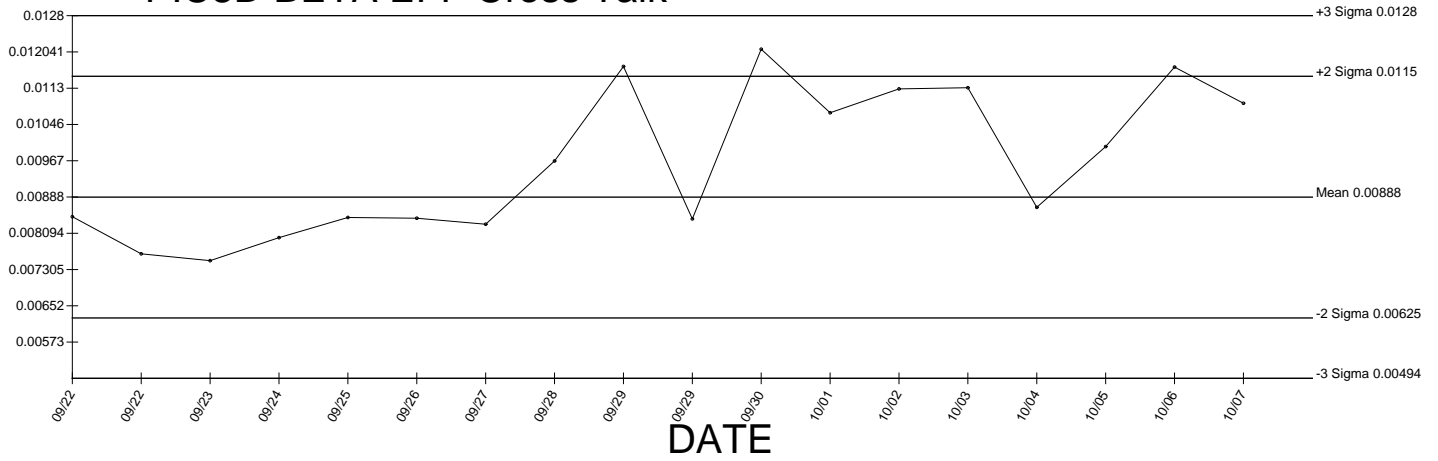
● Denotes Outlier

PIC3D BETA EFF

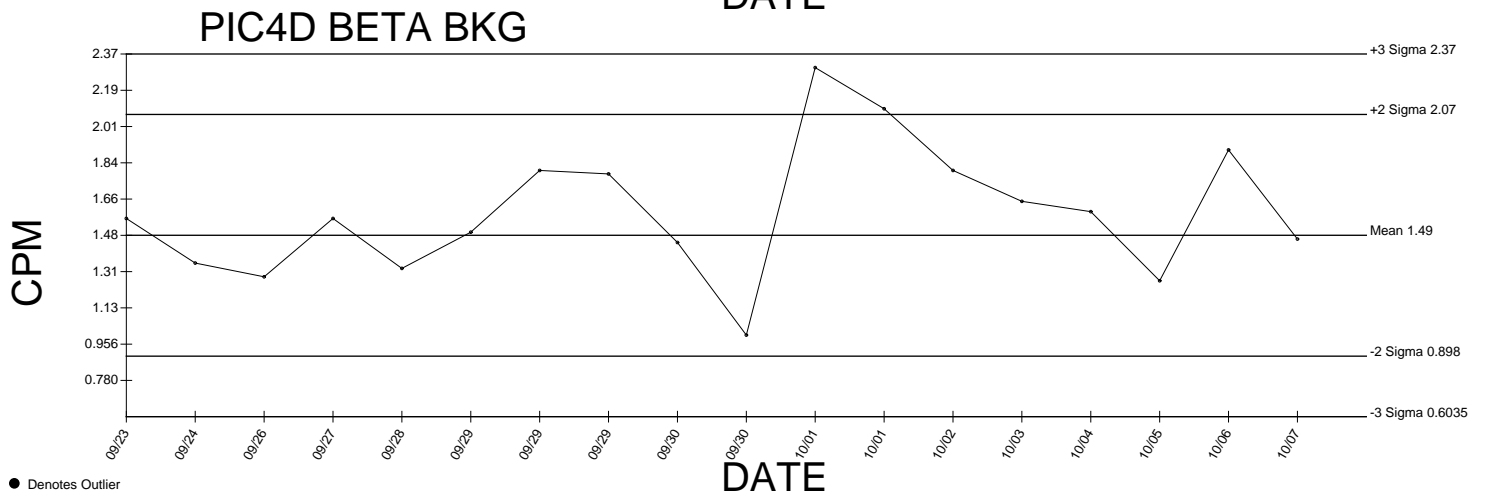
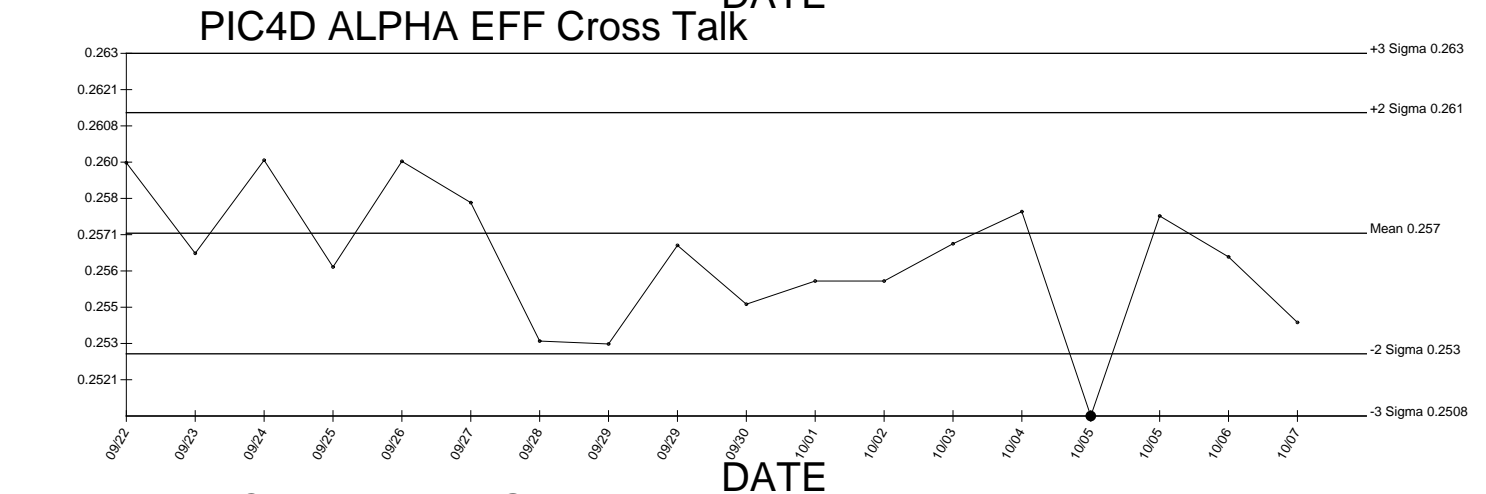
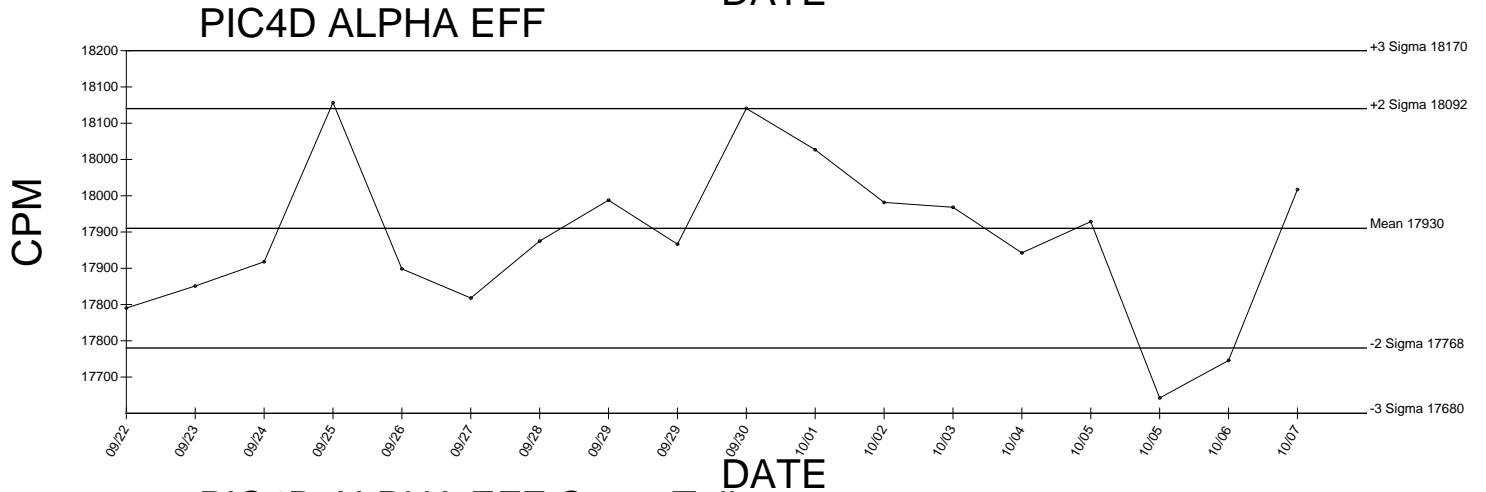
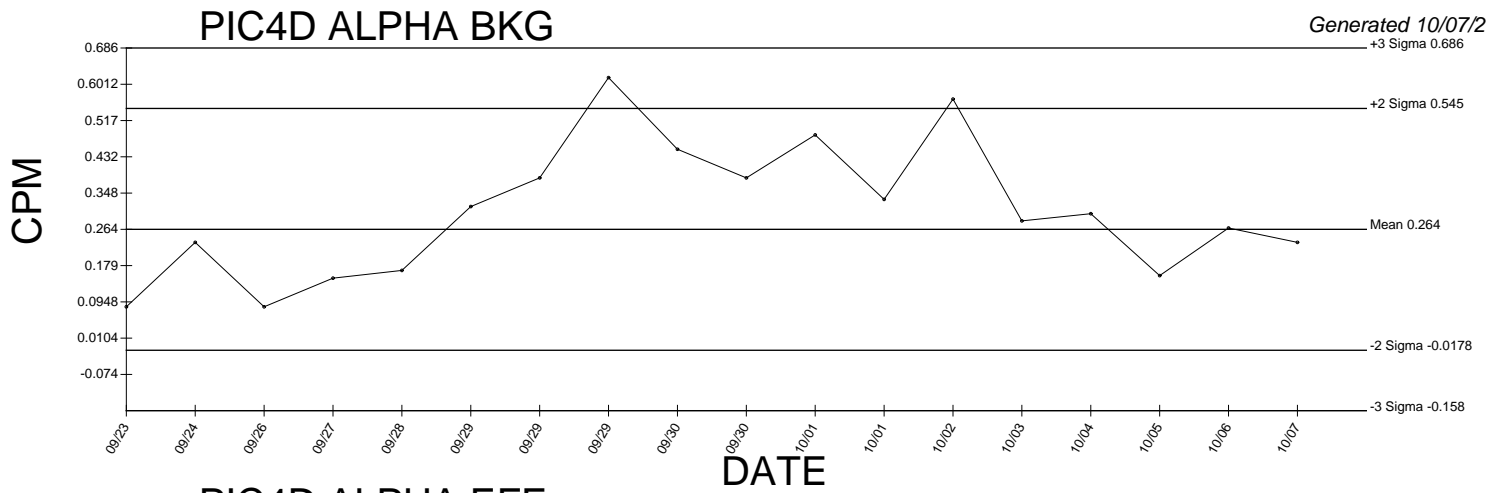
Generated 10/07/2009



PIC3D BETA EFF Cross Talk



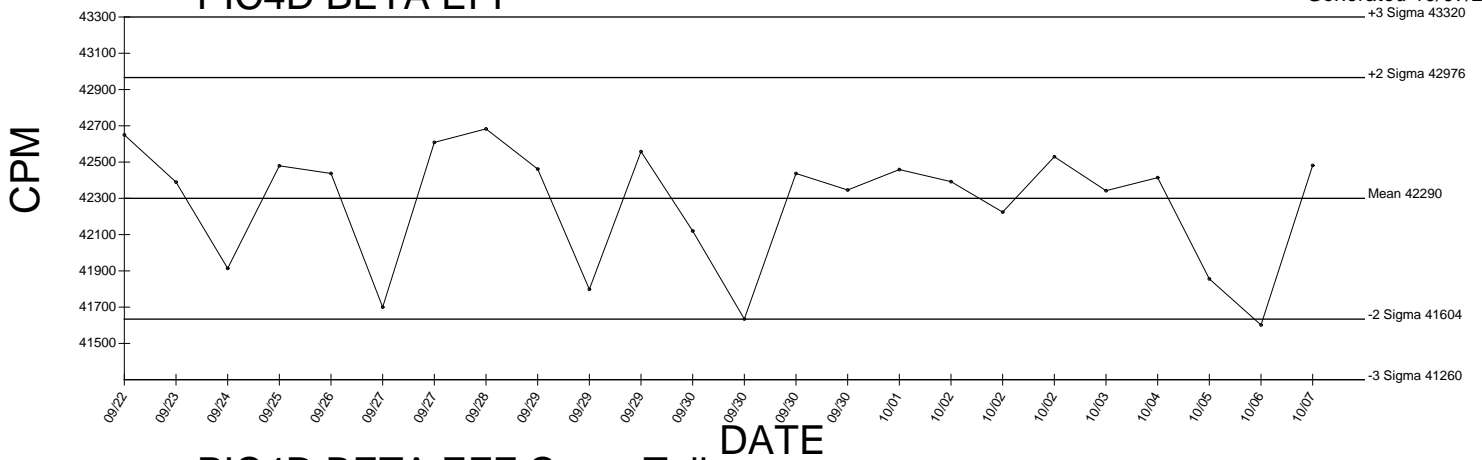
● Denotes Outlier



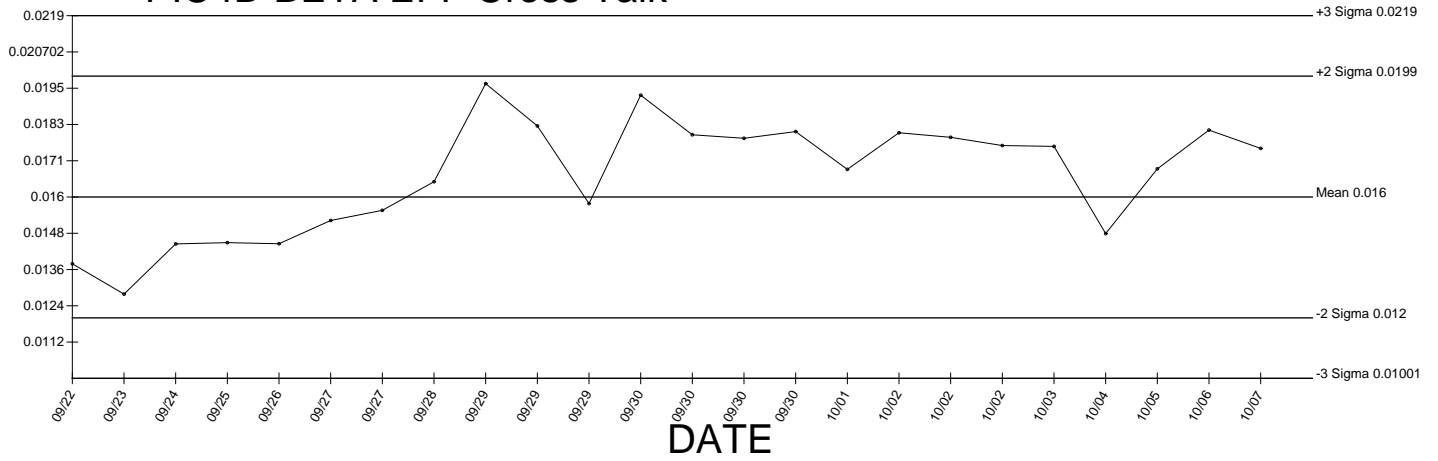
● Denotes Outlier

PIC4D BETA EFF

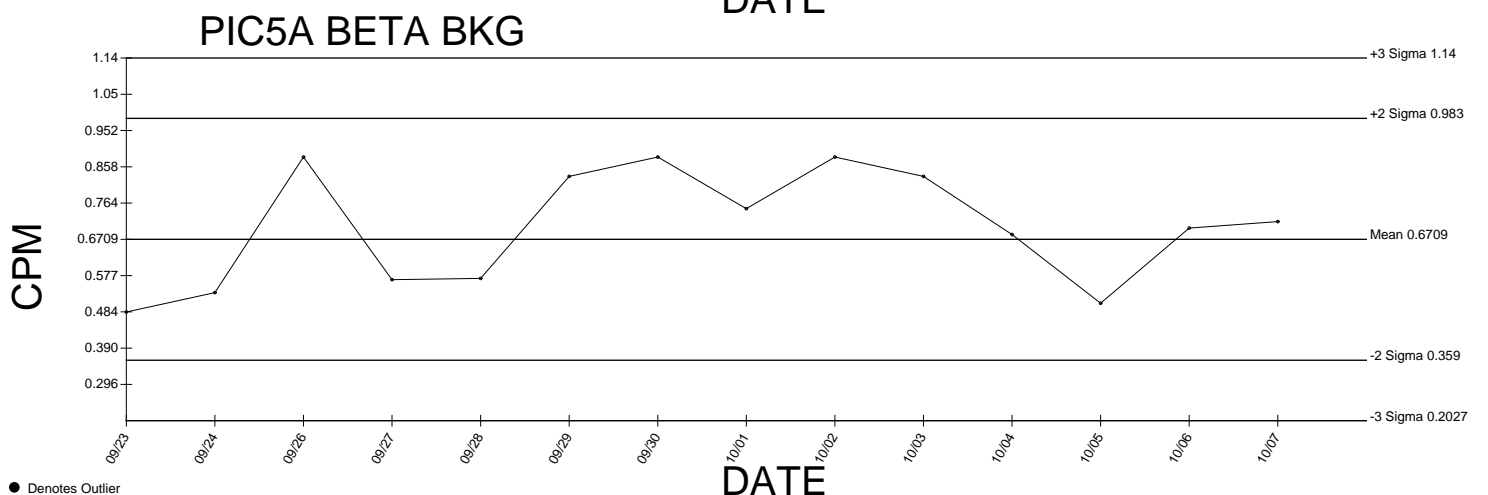
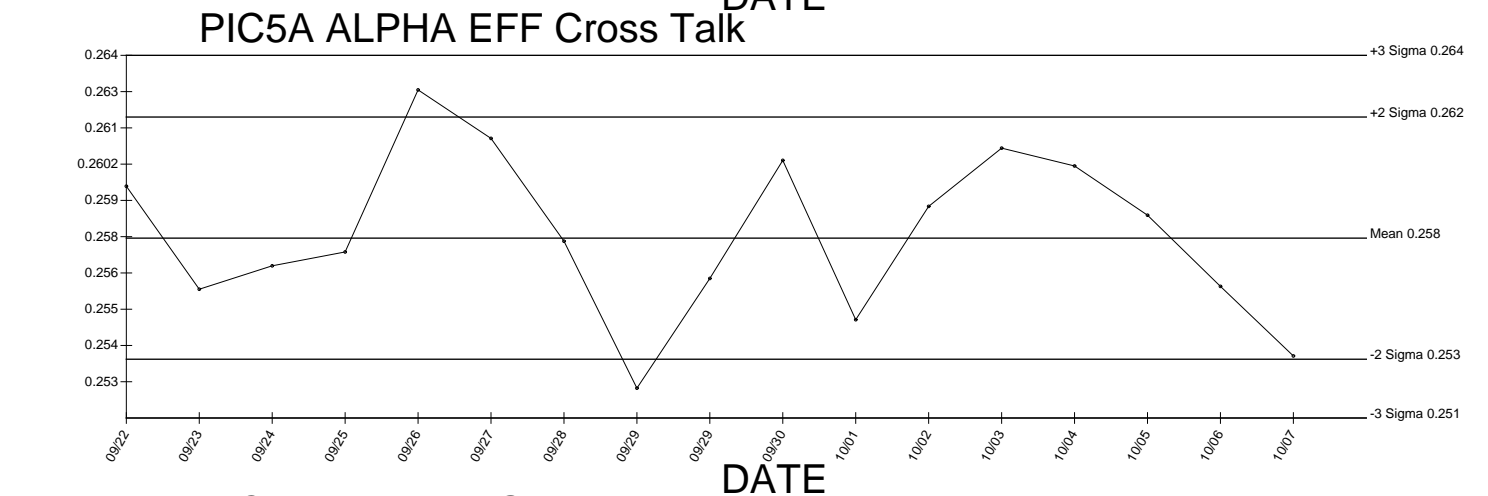
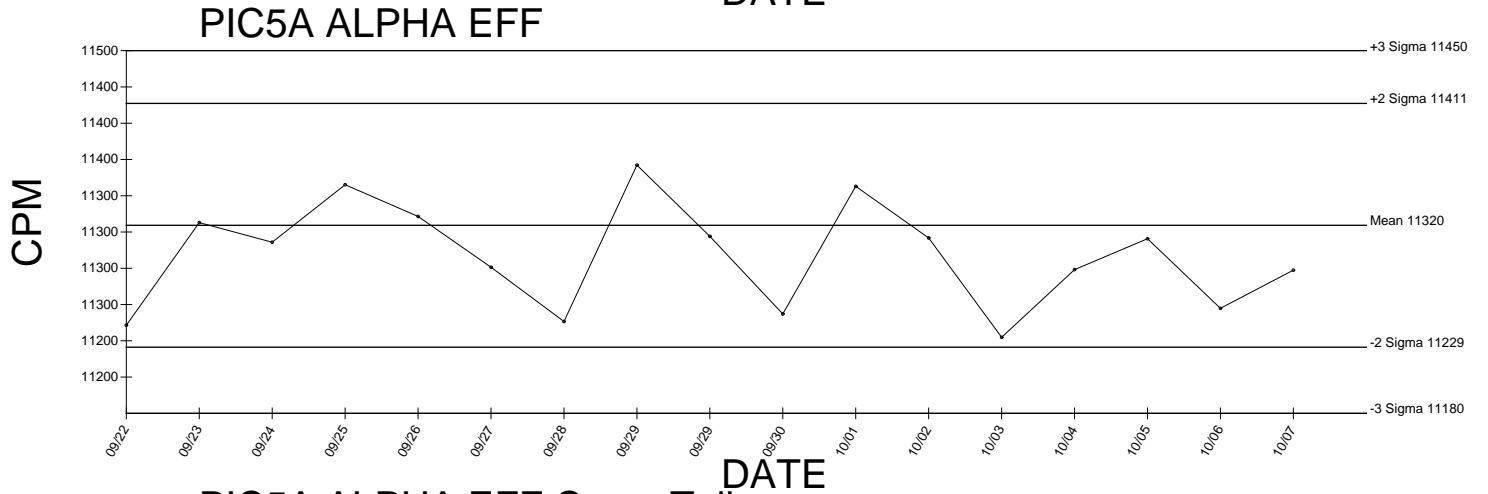
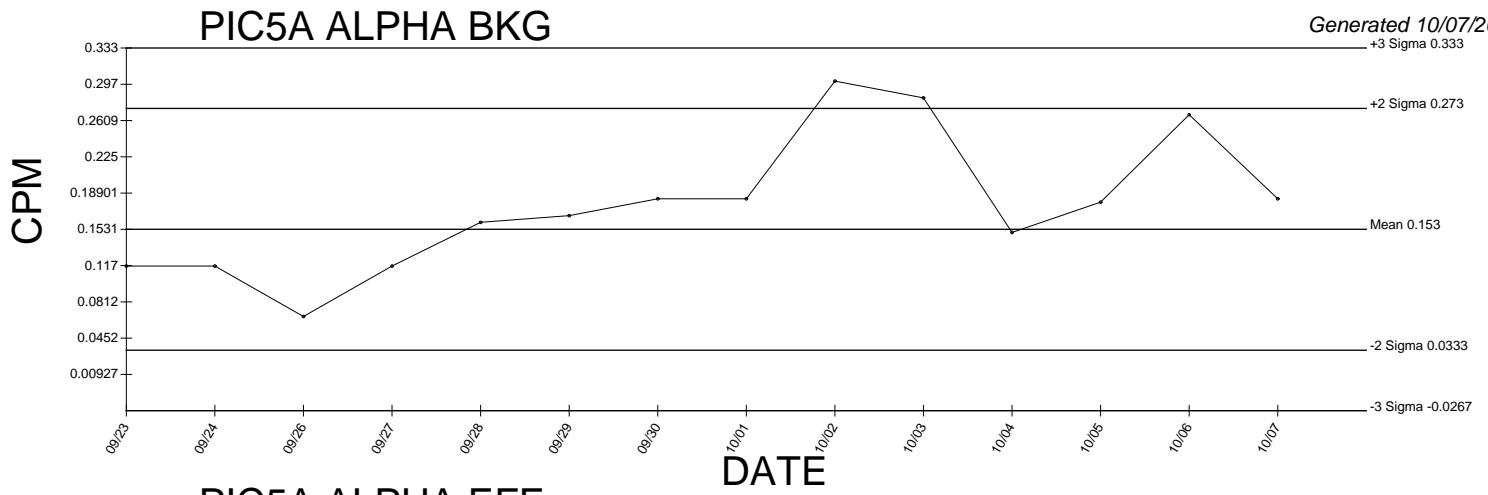
Generated 10/07/2009



PIC4D BETA EFF Cross Talk



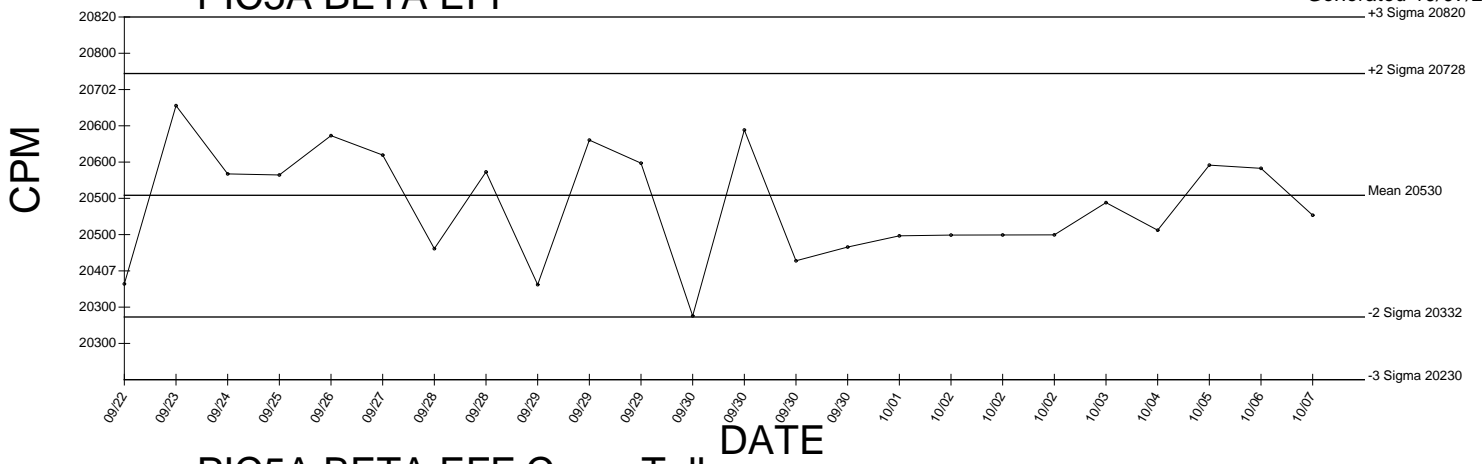
● Denotes Outlier



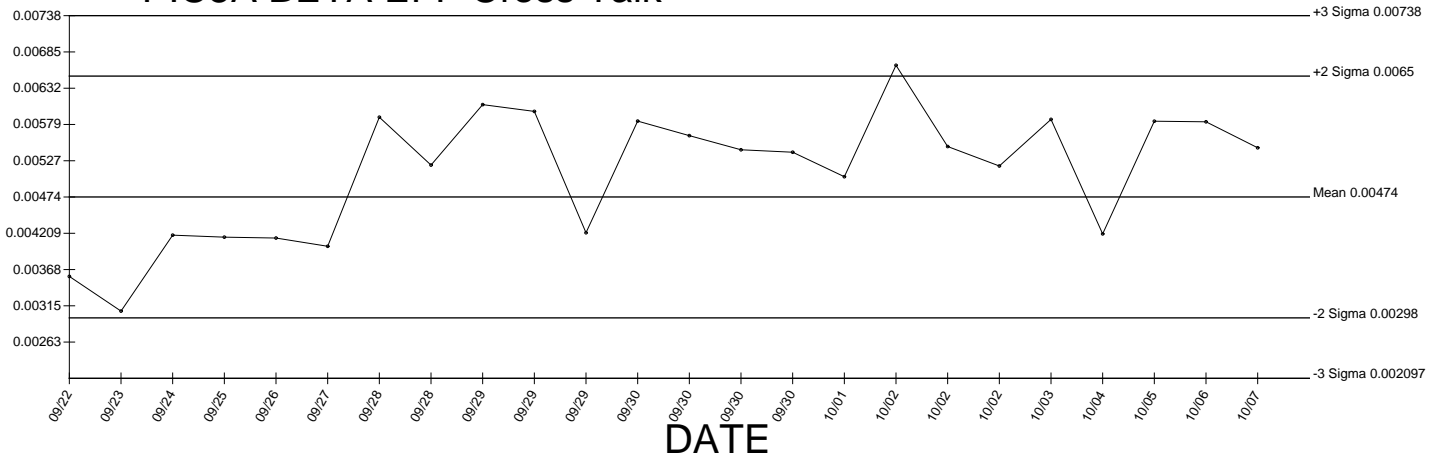
● Denotes Outlier

PIC5A BETA EFF

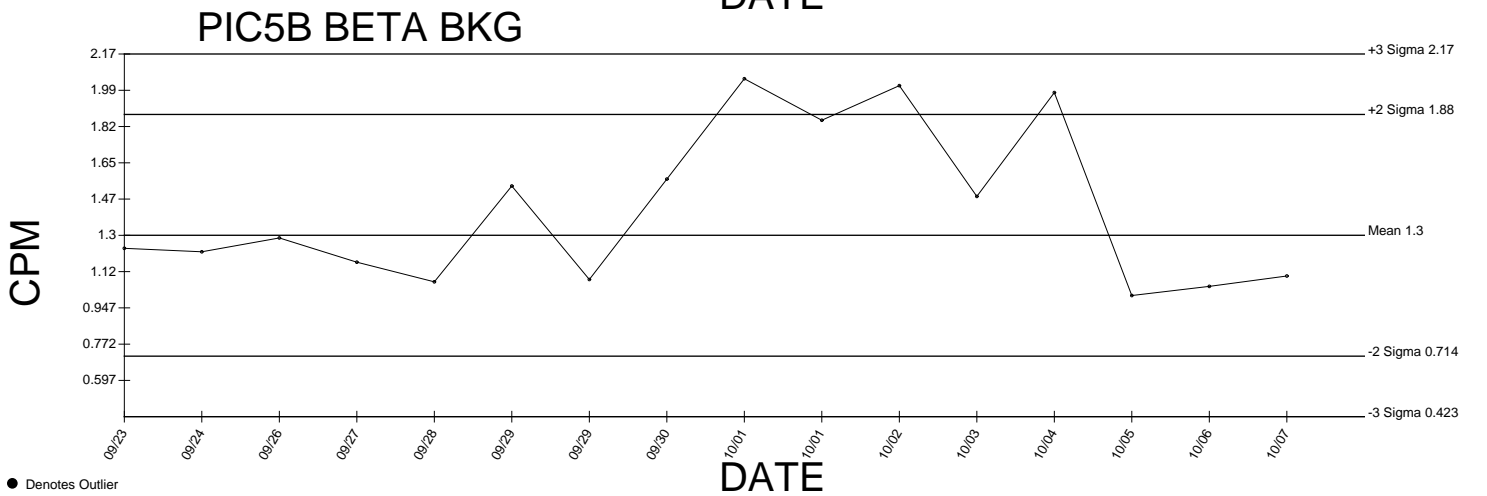
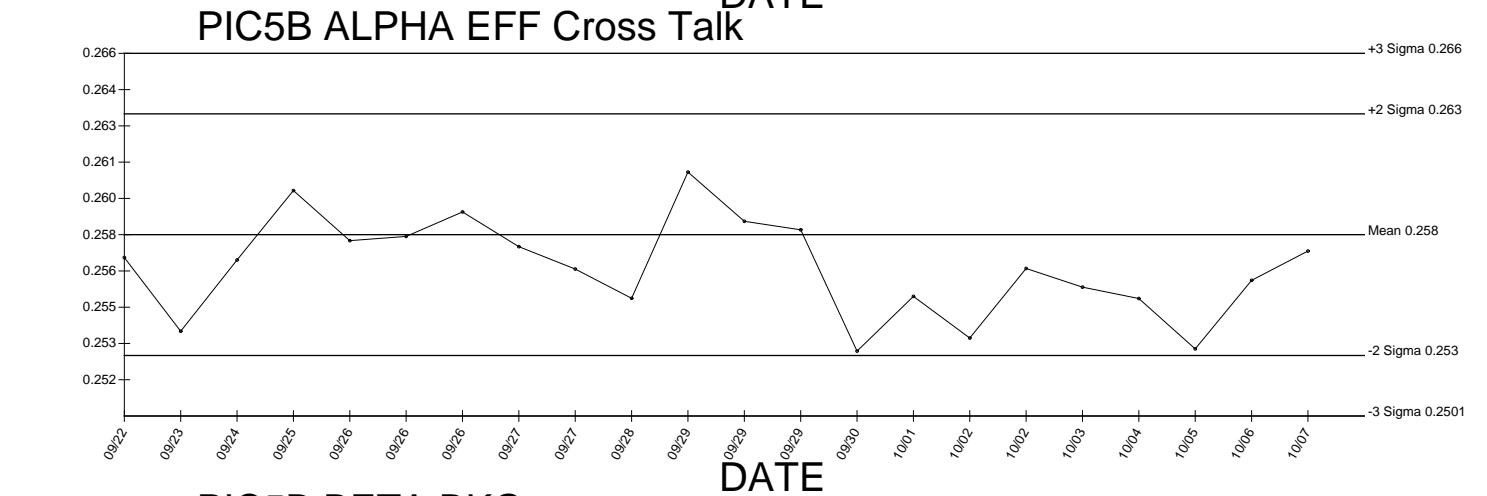
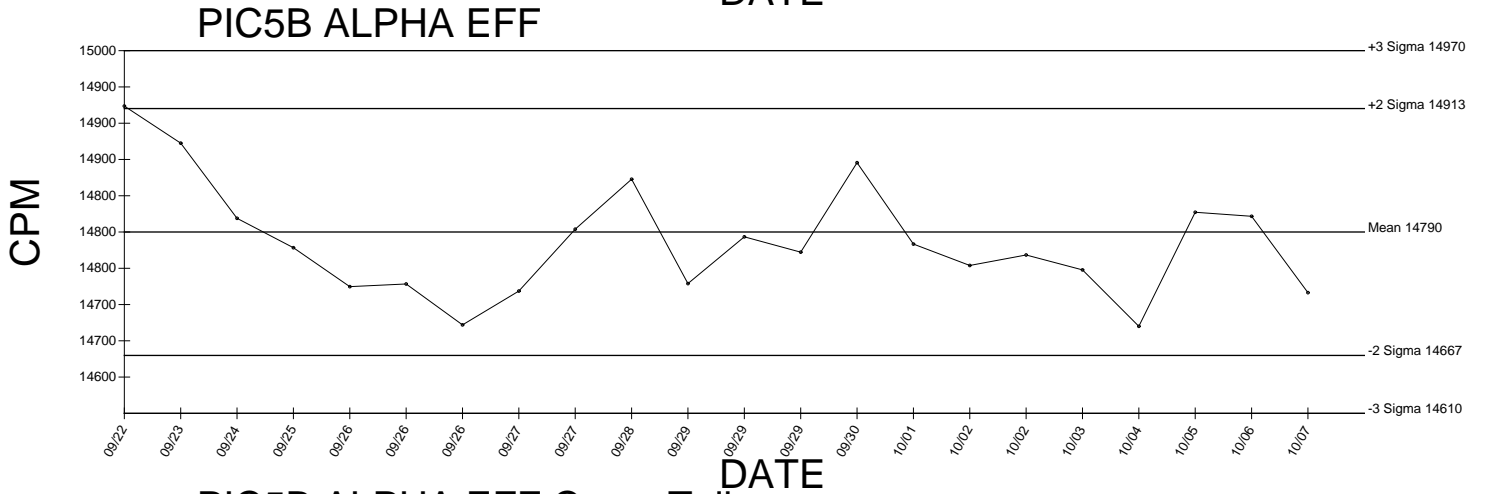
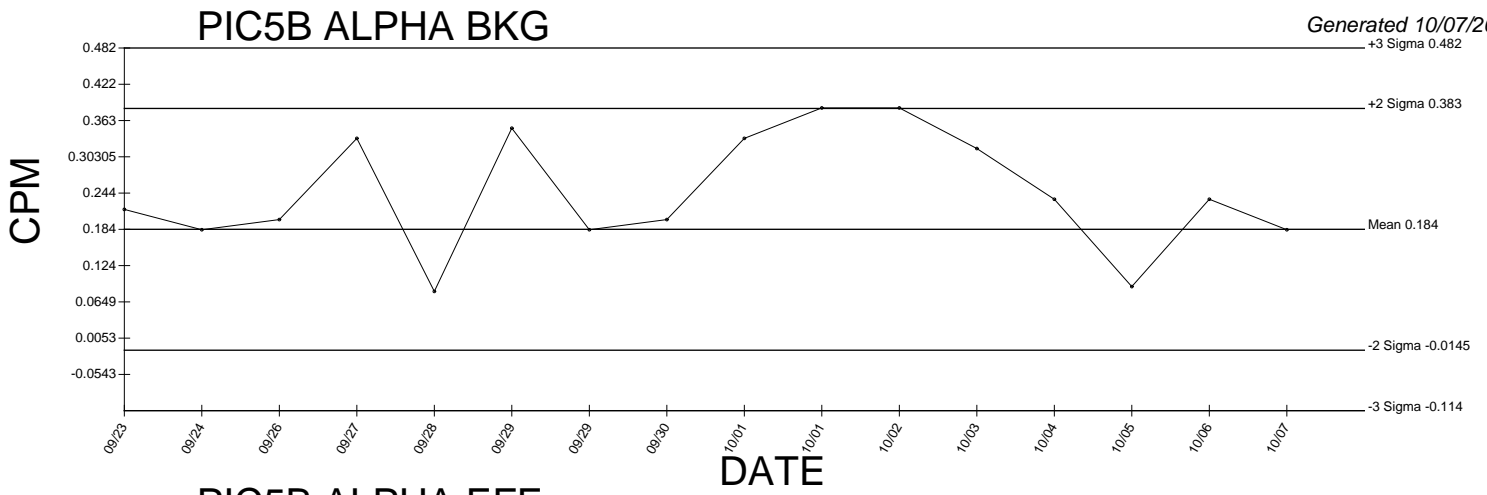
Generated 10/07/2009



PIC5A BETA EFF Cross Talk



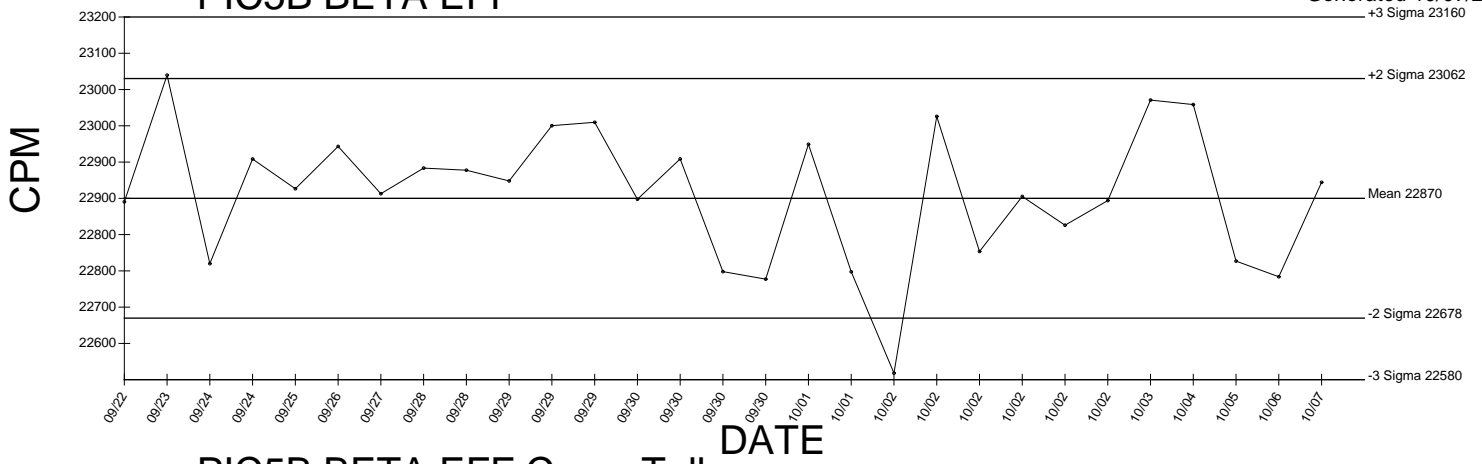
● Denotes Outlier



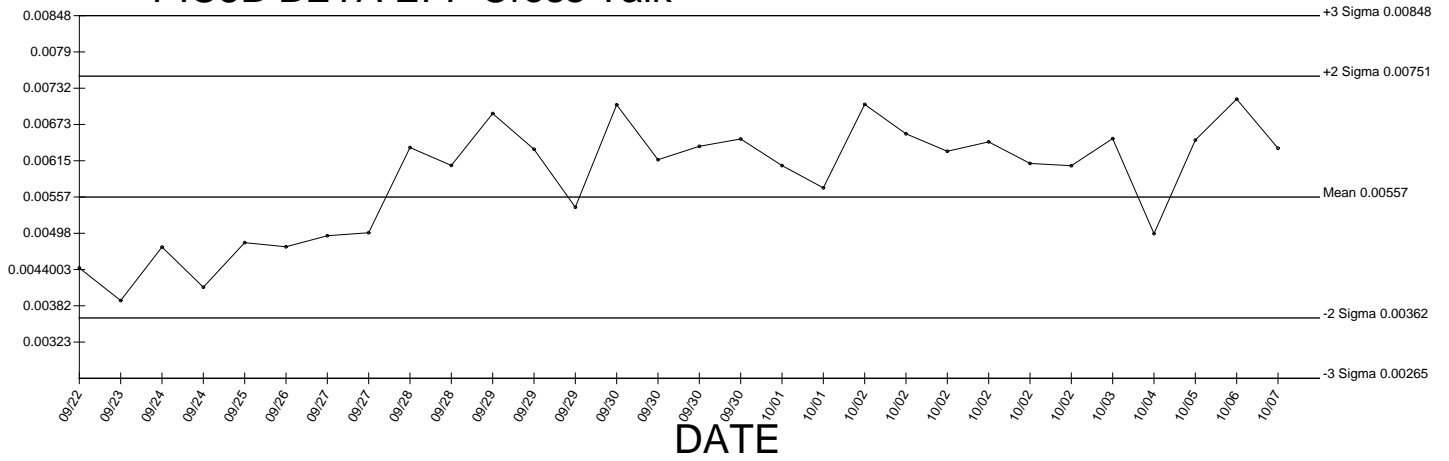
● Denotes Outlier

PIC5B BETA EFF

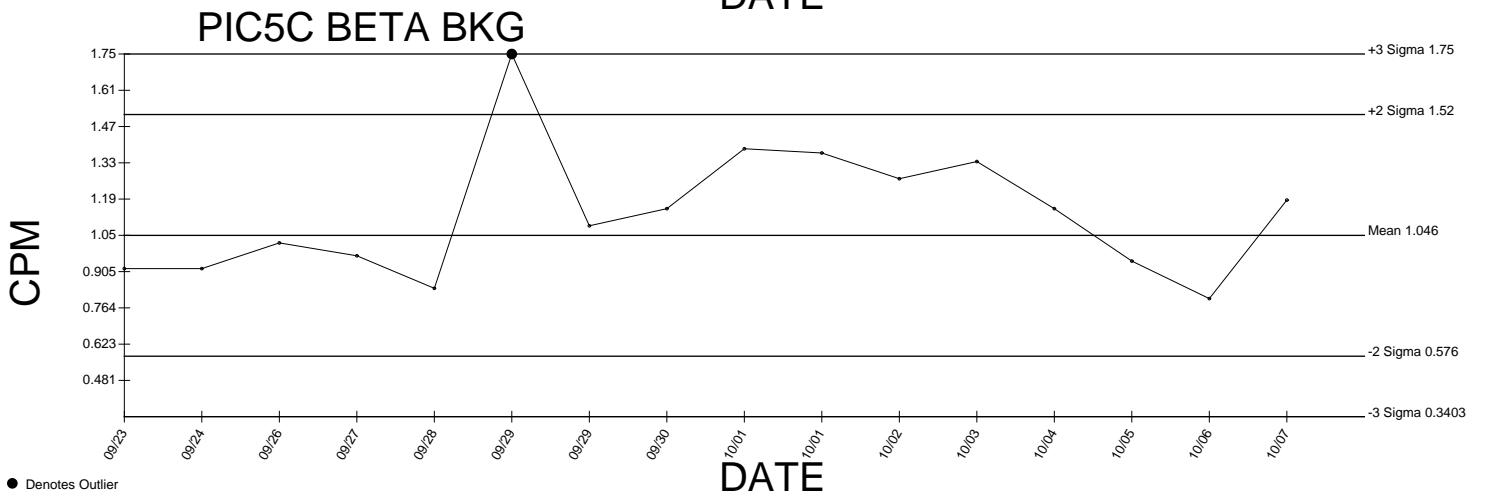
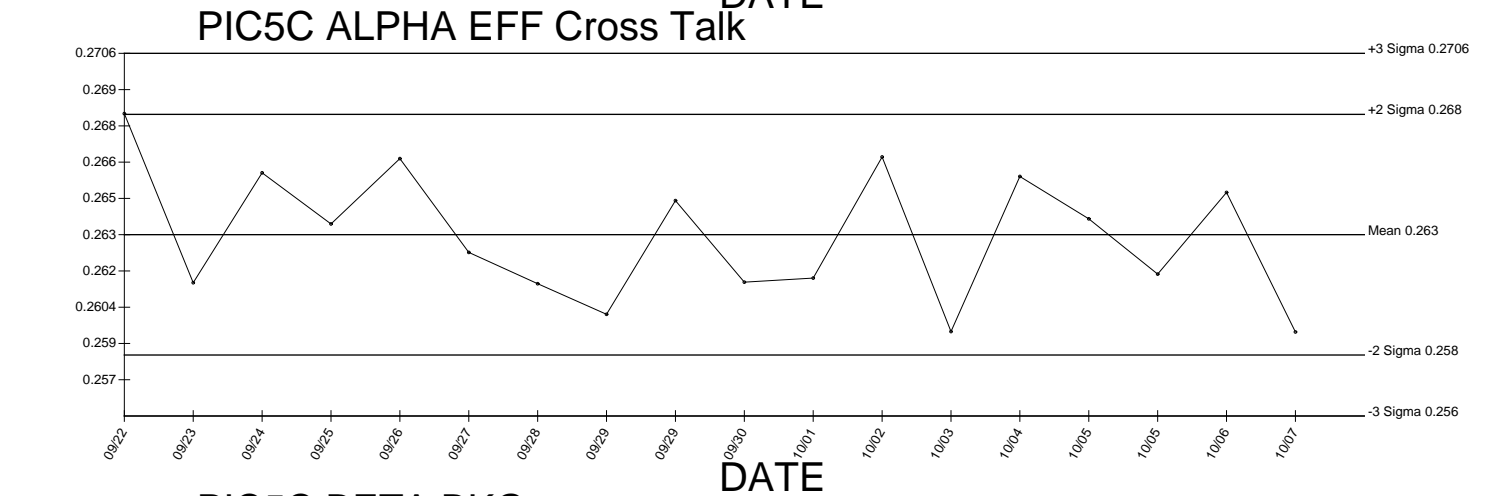
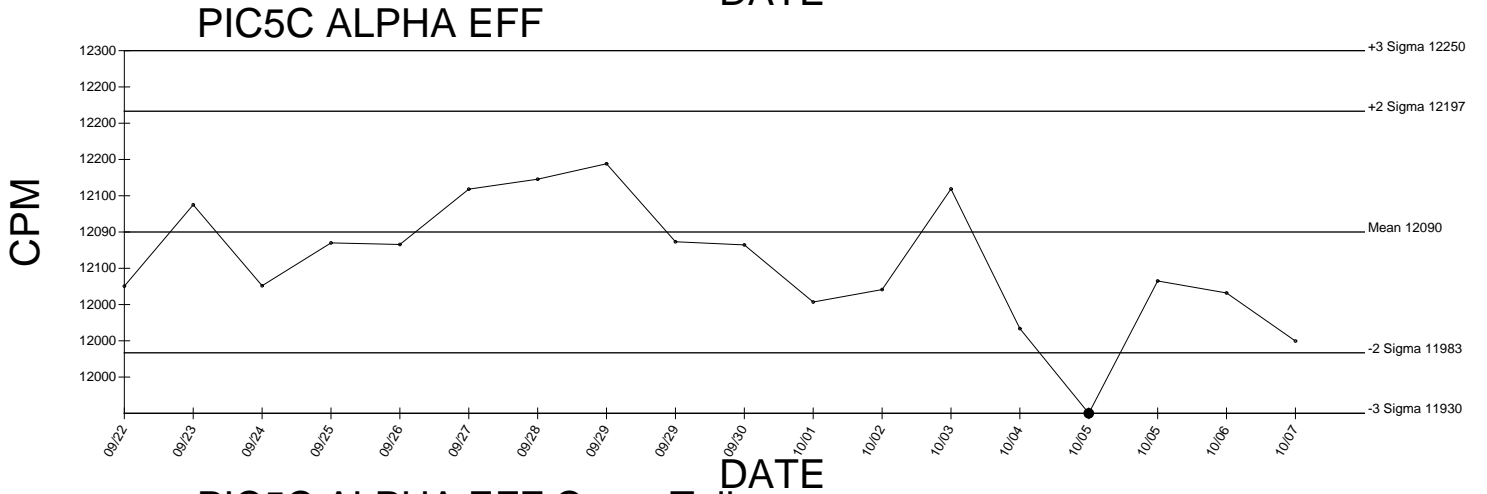
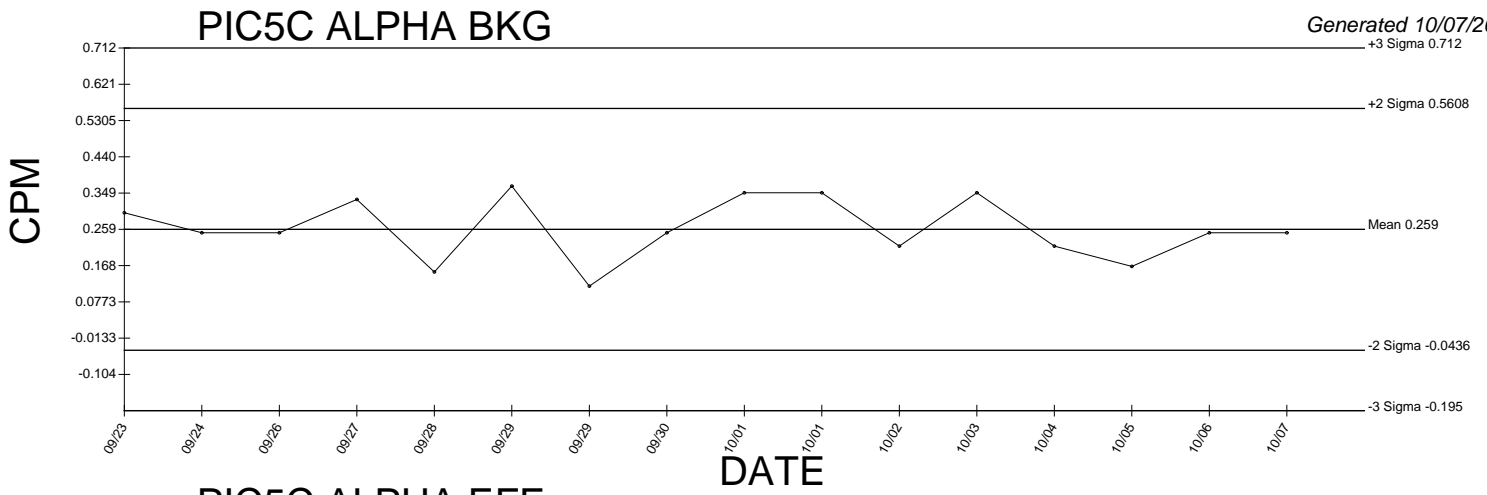
Generated 10/07/2009



PIC5B BETA EFF Cross Talk



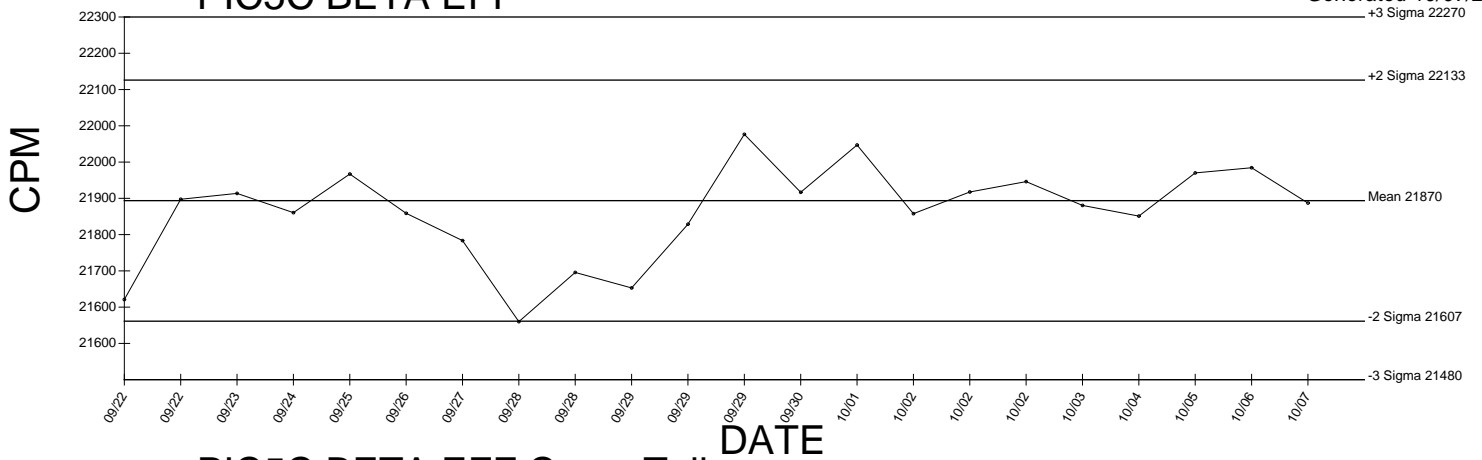
● Denotes Outlier



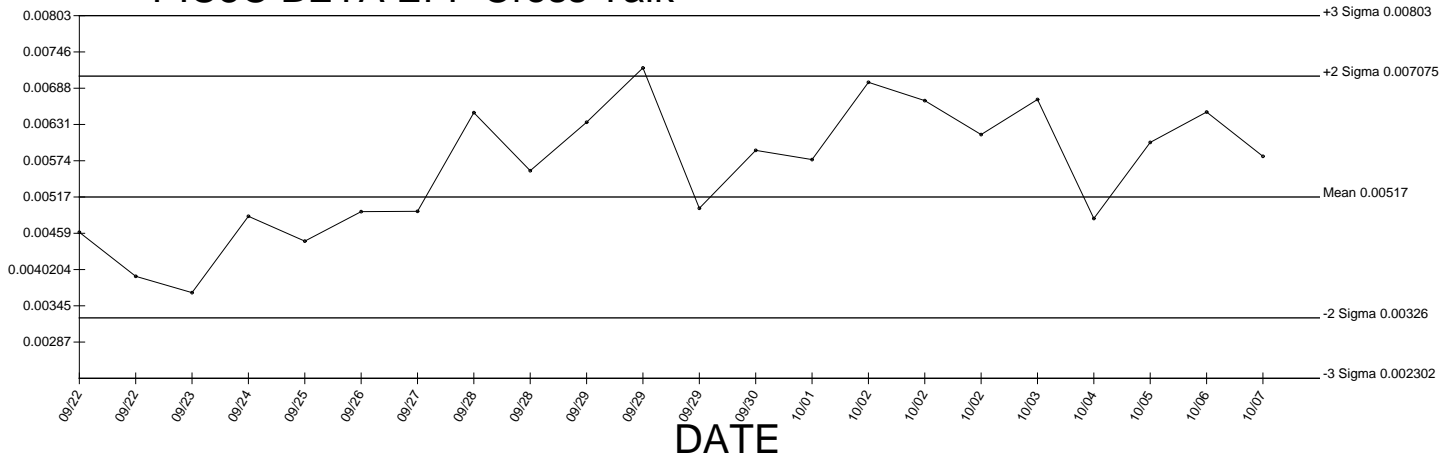
● Denotes Outlier

PIC5C BETA EFF

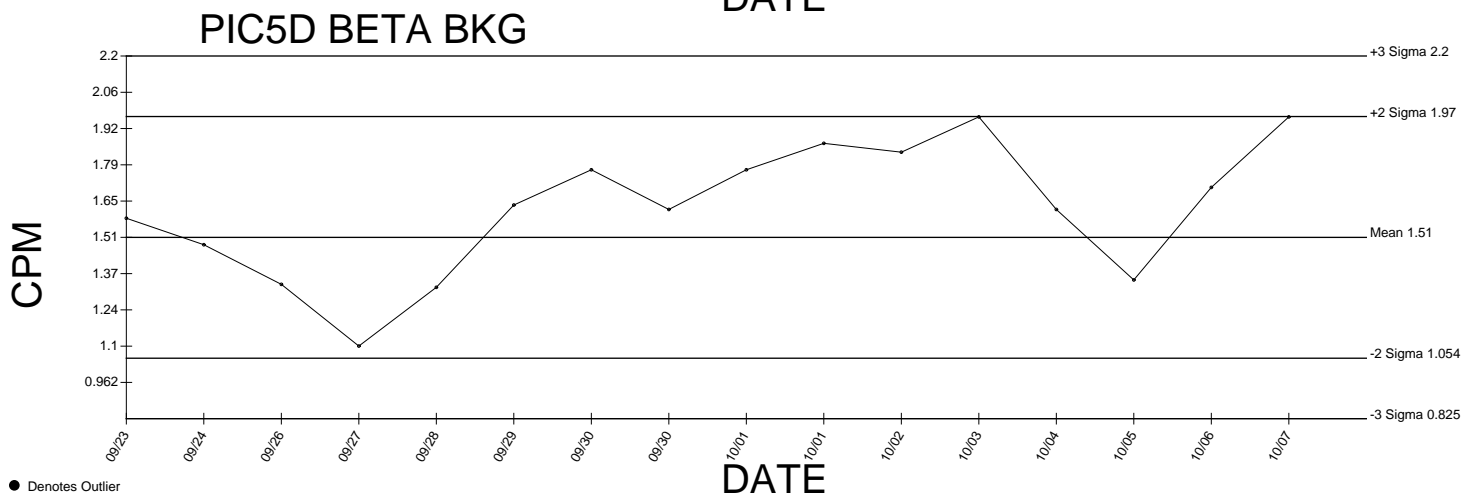
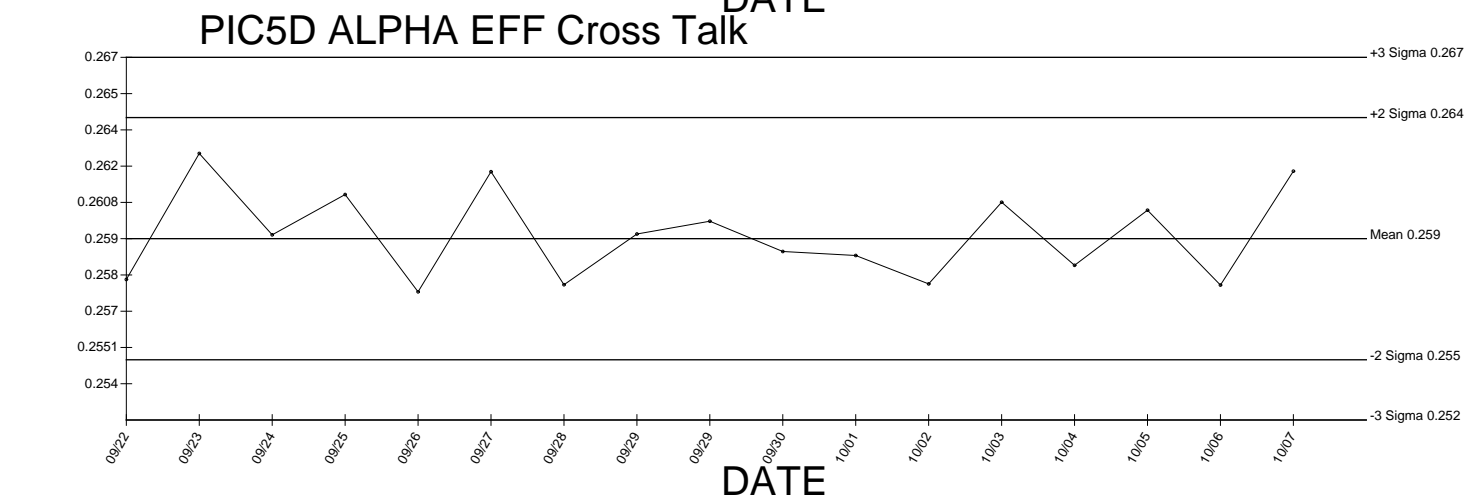
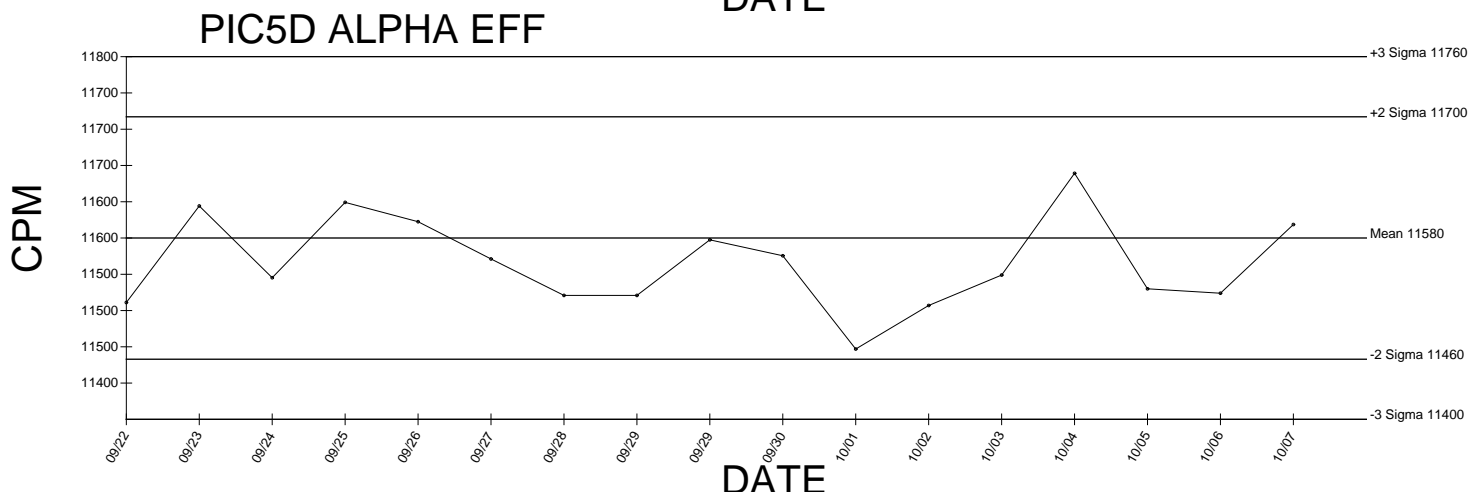
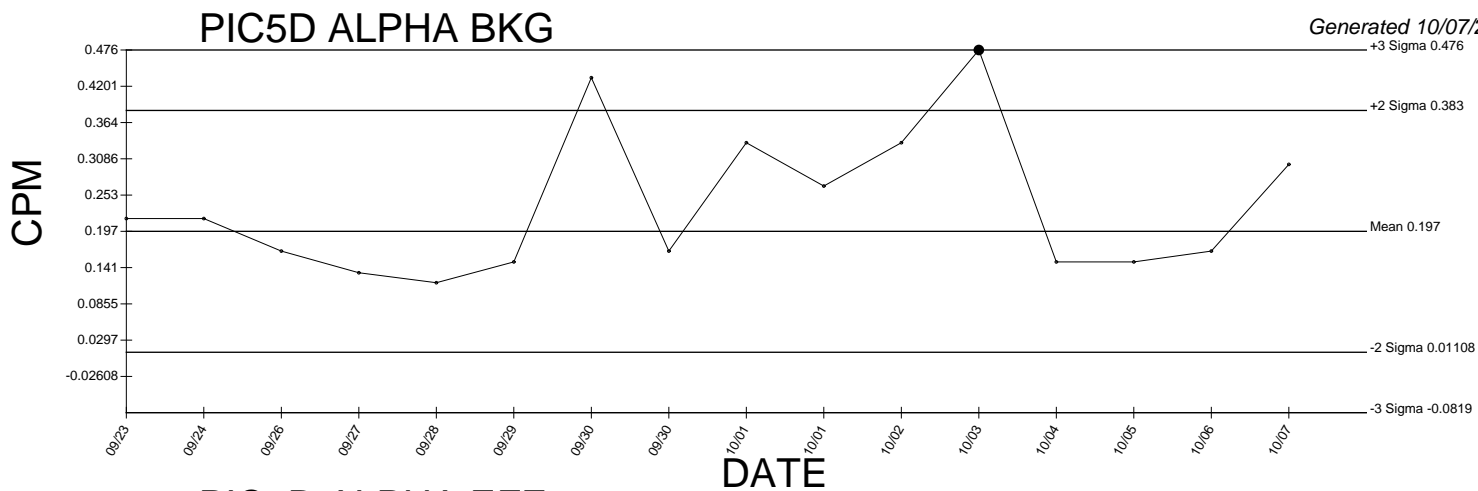
Generated 10/07/2009



PIC5C BETA EFF Cross Talk



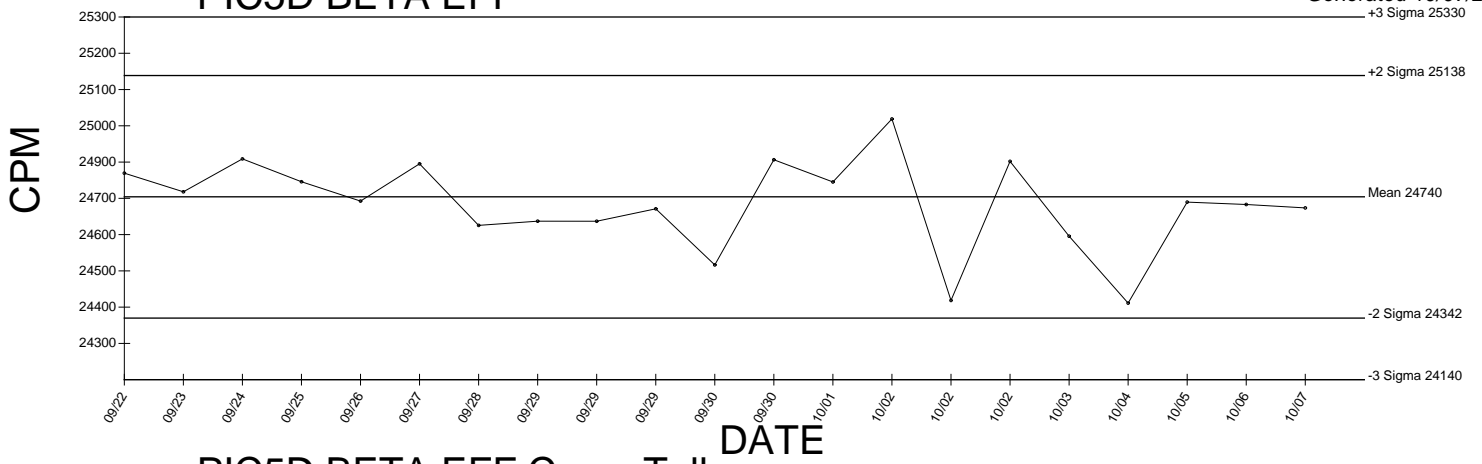
● Denotes Outlier



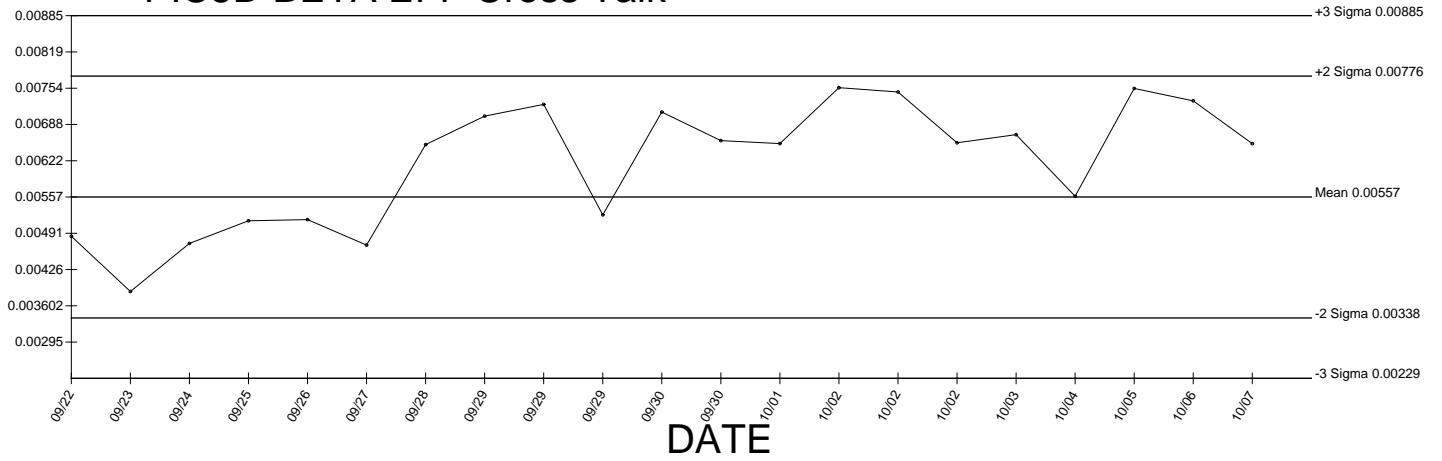
● Denotes Outlier

PIC5D BETA EFF

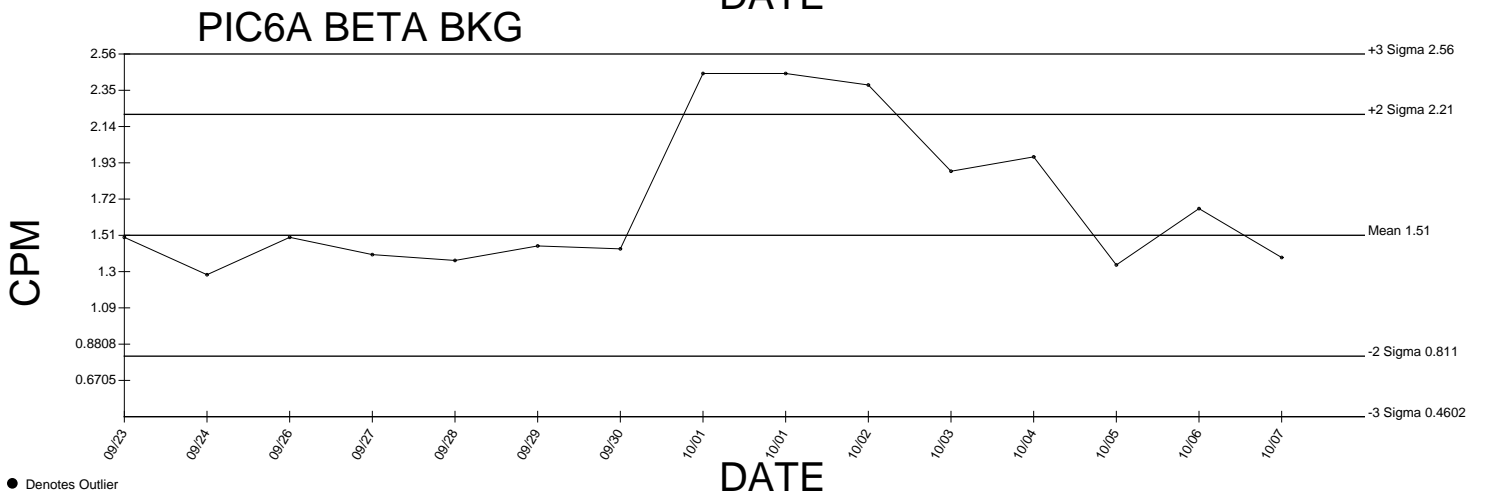
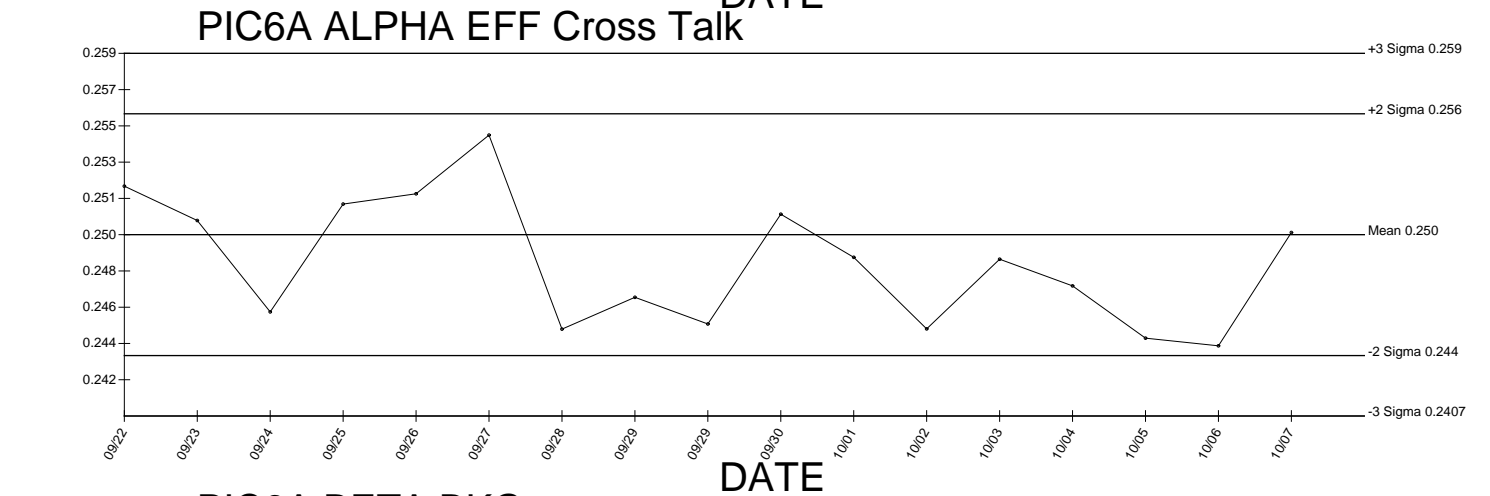
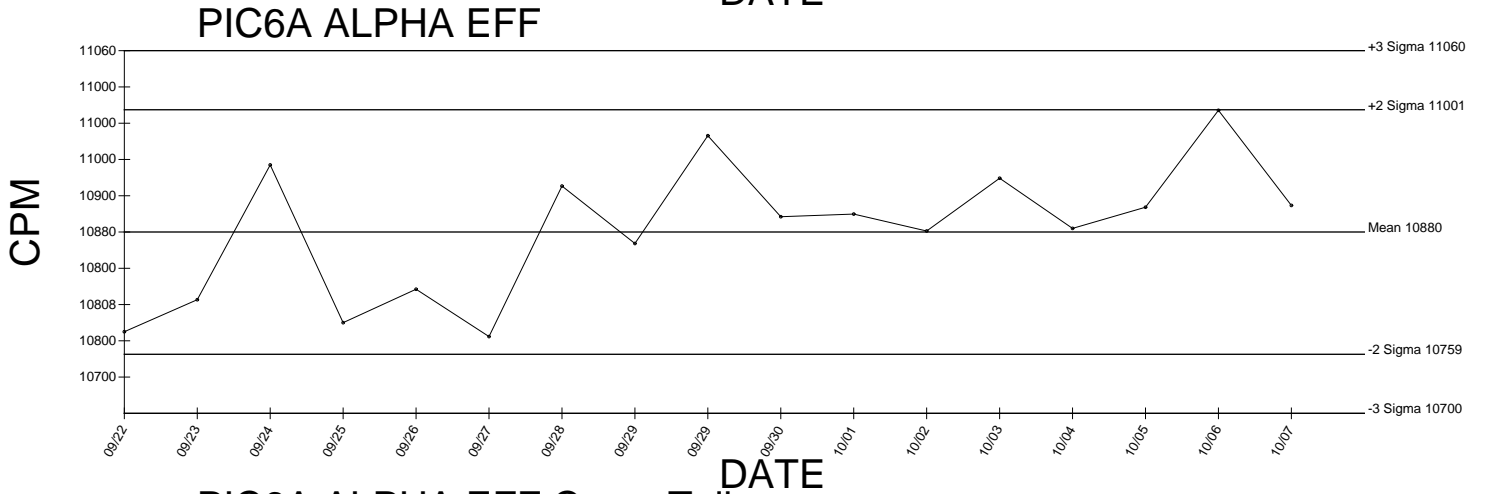
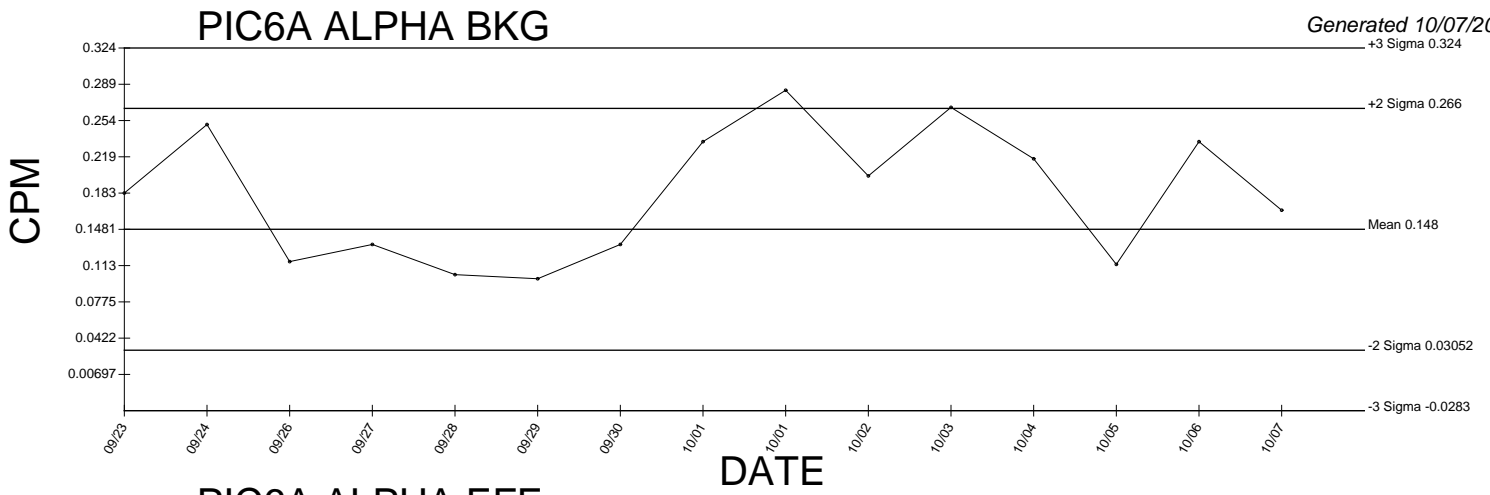
Generated 10/07/2009



PIC5D BETA EFF Cross Talk



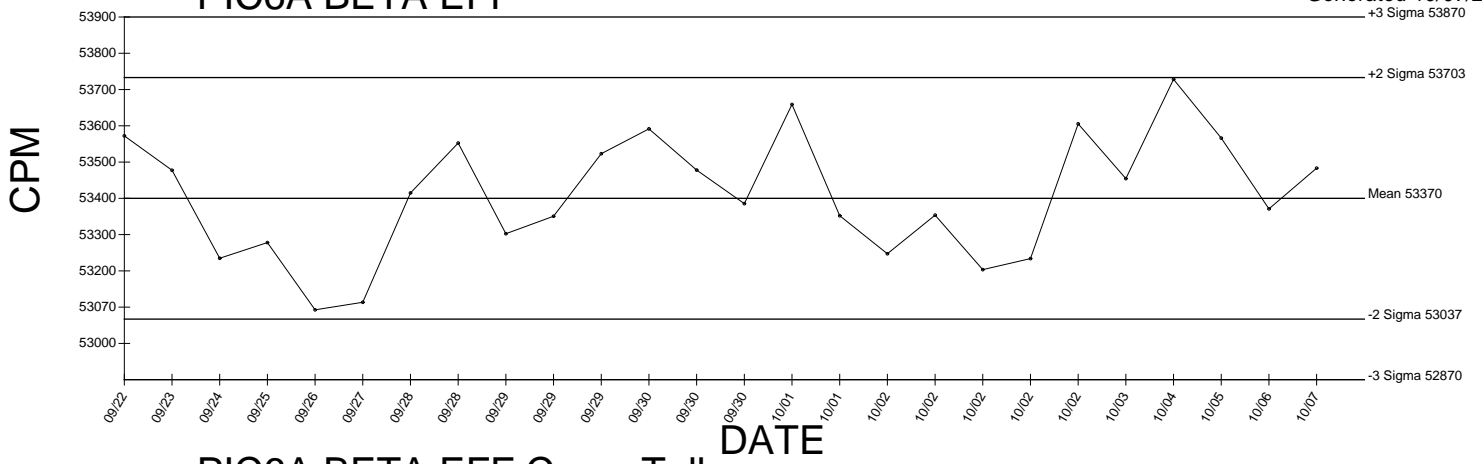
● Denotes Outlier



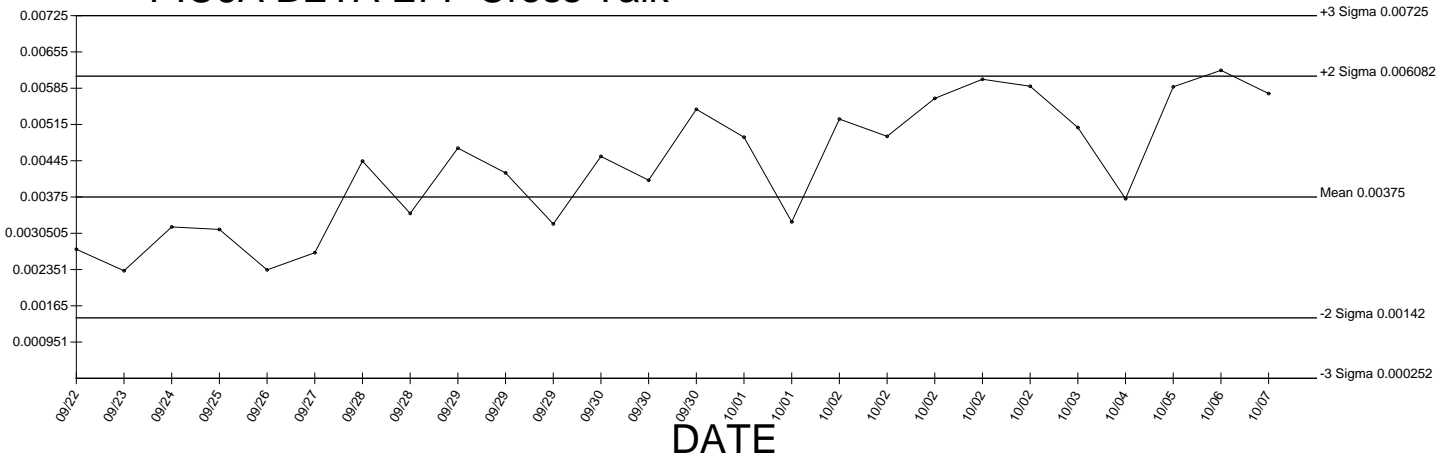
● Denotes Outlier

PIC6A BETA EFF

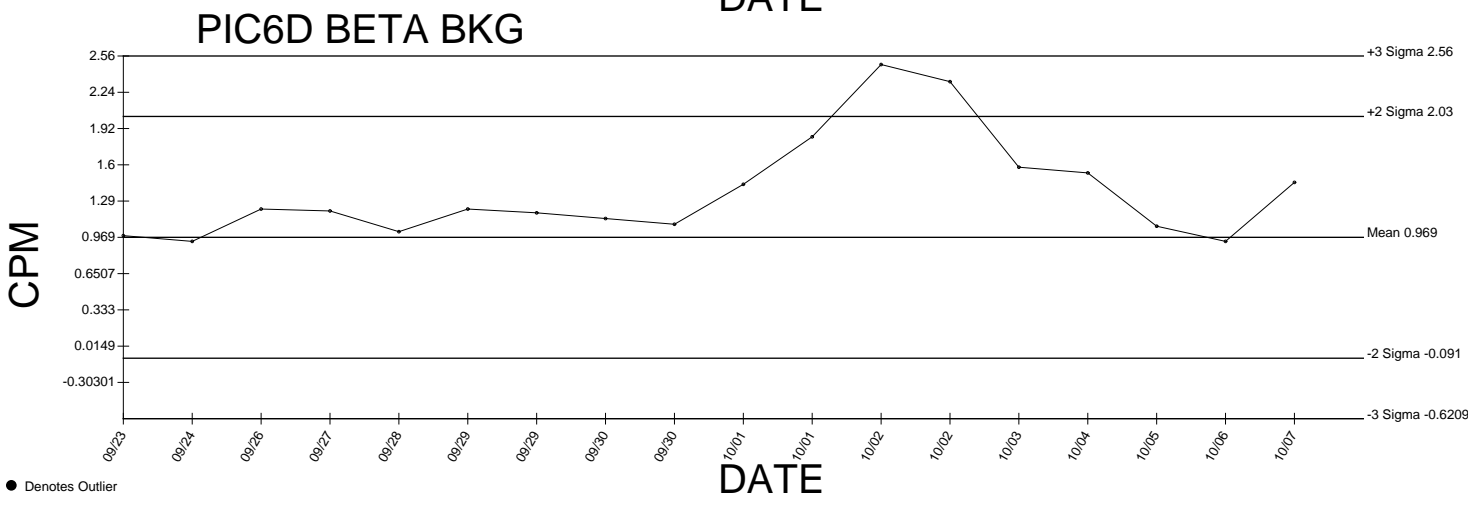
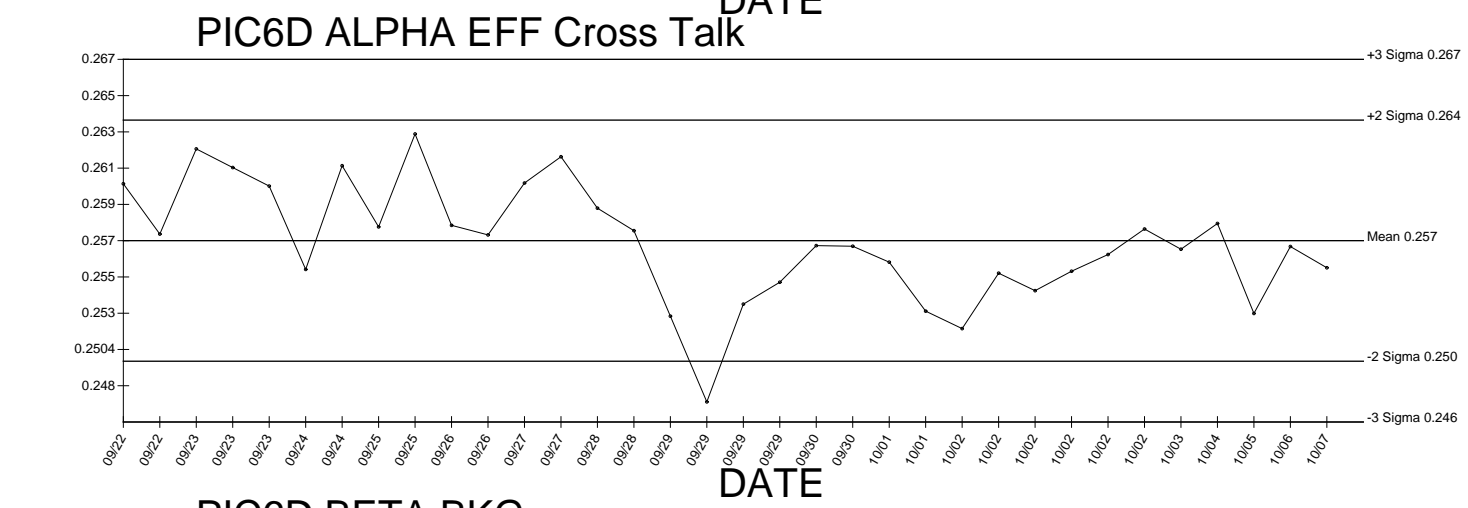
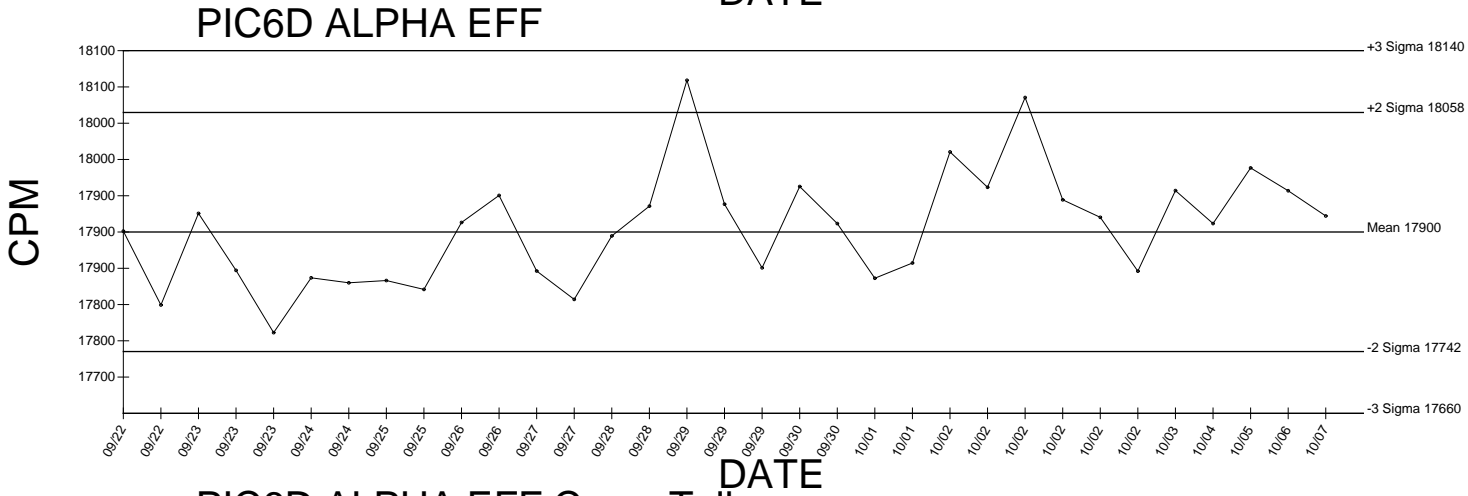
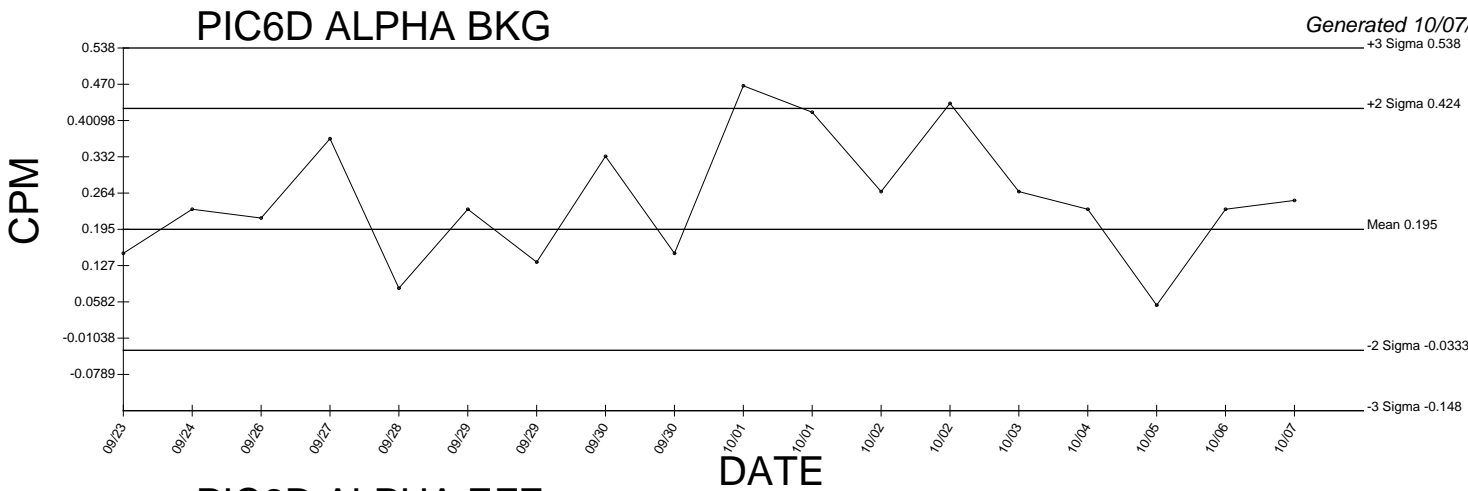
Generated 10/07/2009



PIC6A BETA EFF Cross Talk



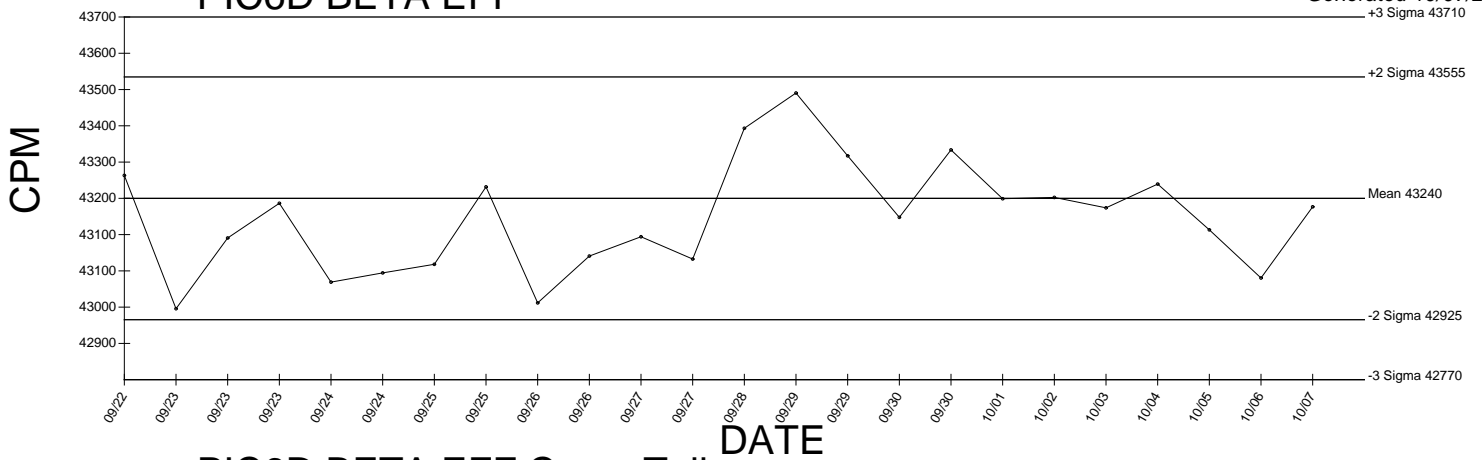
● Denotes Outlier



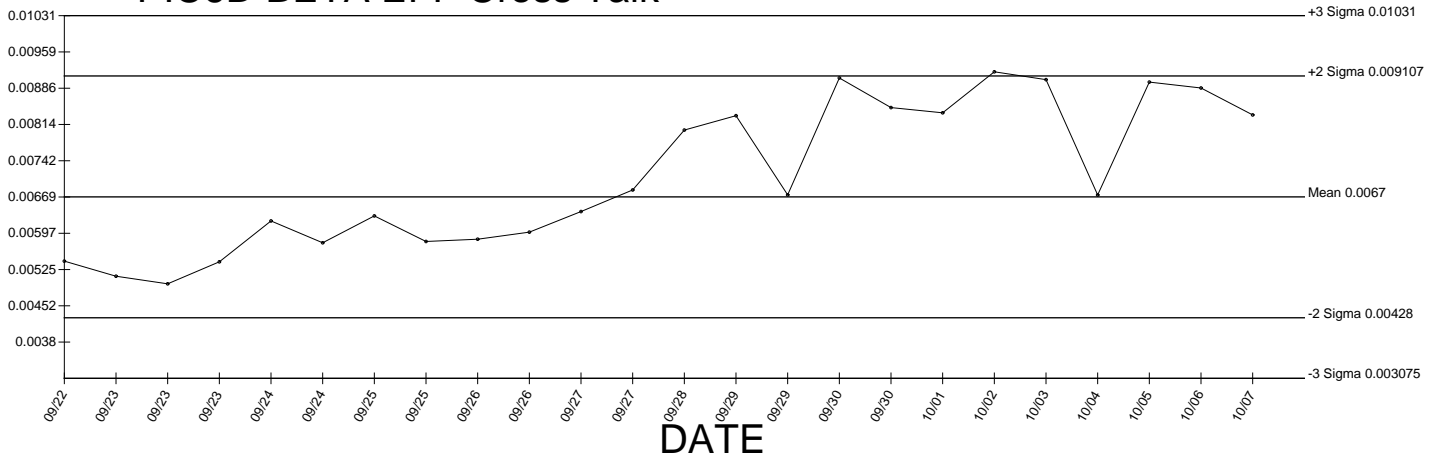
● Denotes Outlier

PIC6D BETA EFF

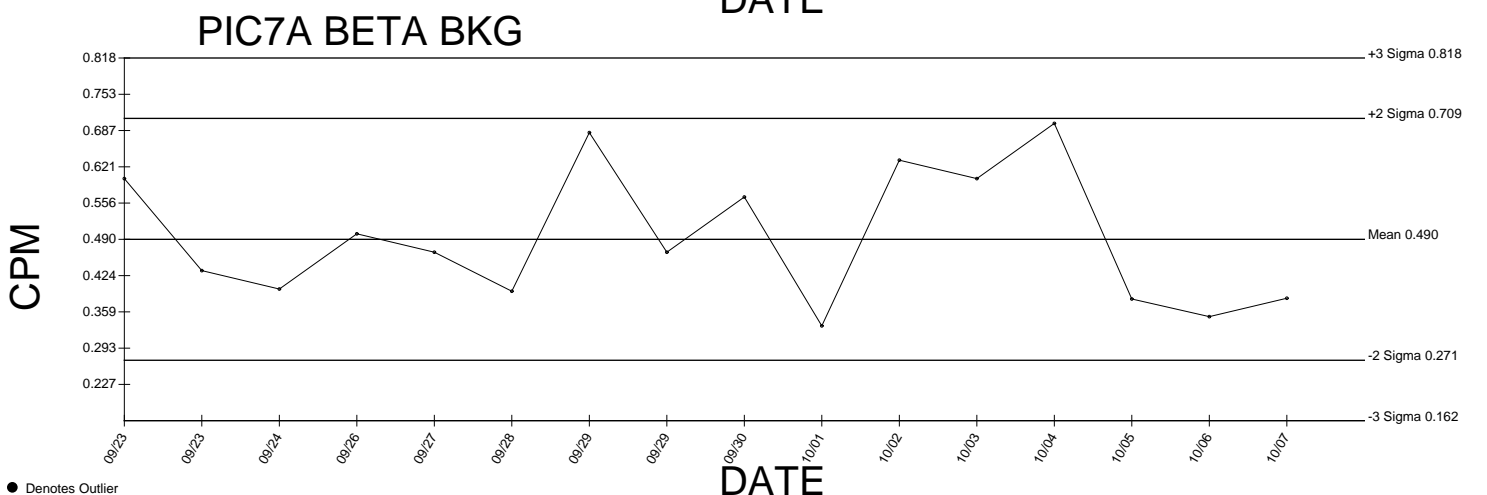
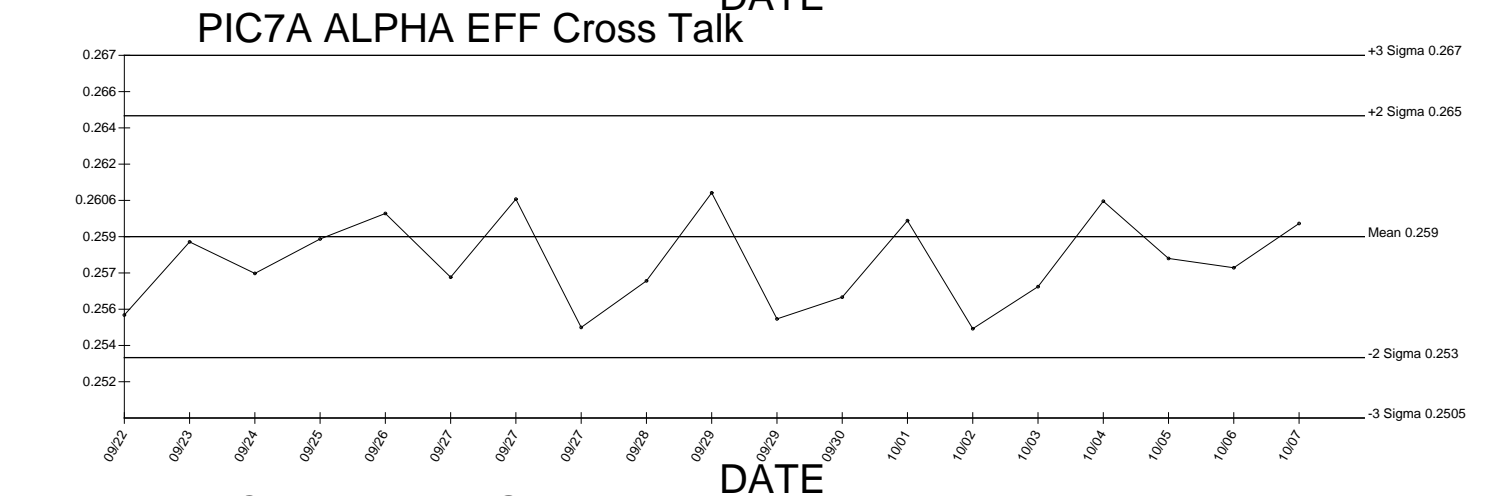
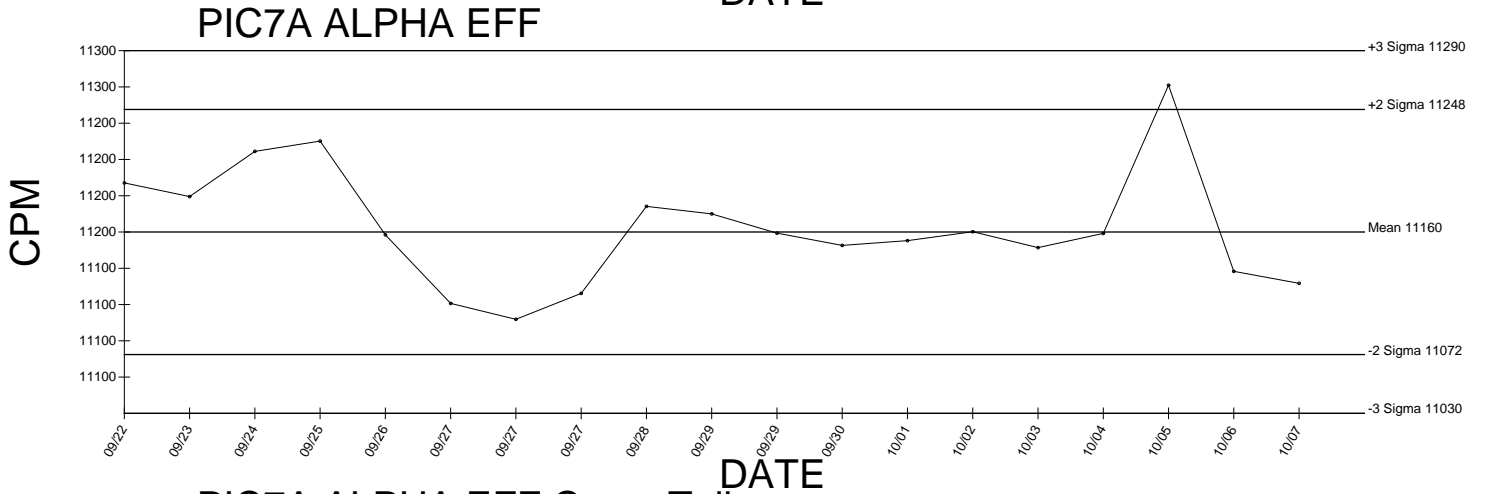
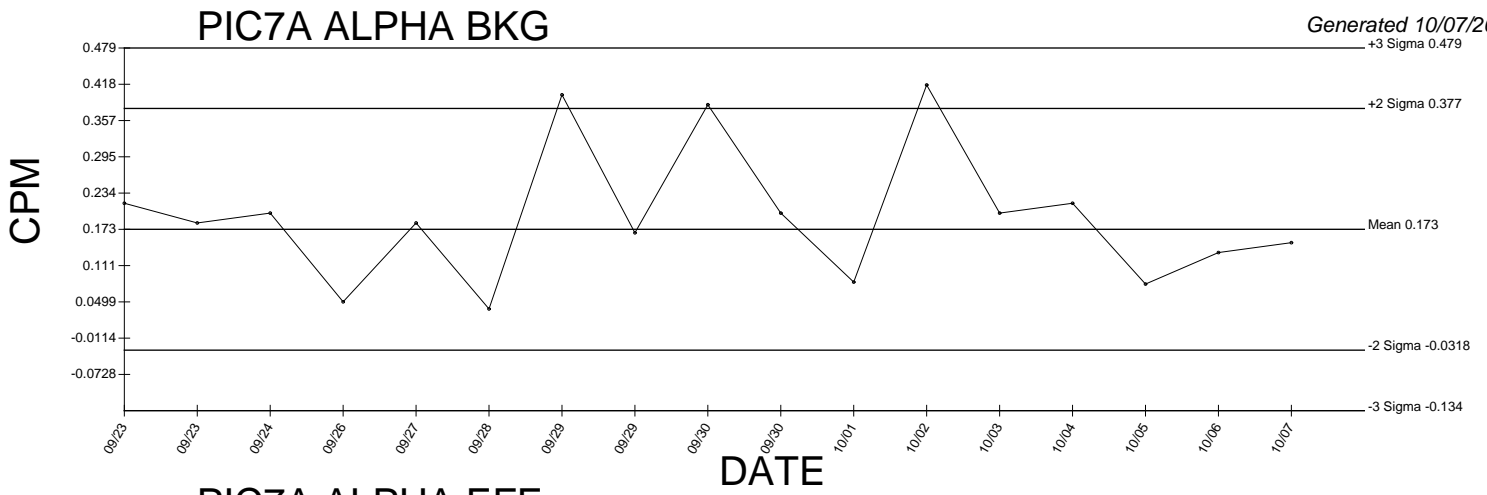
Generated 10/07/2009



PIC6D BETA EFF Cross Talk



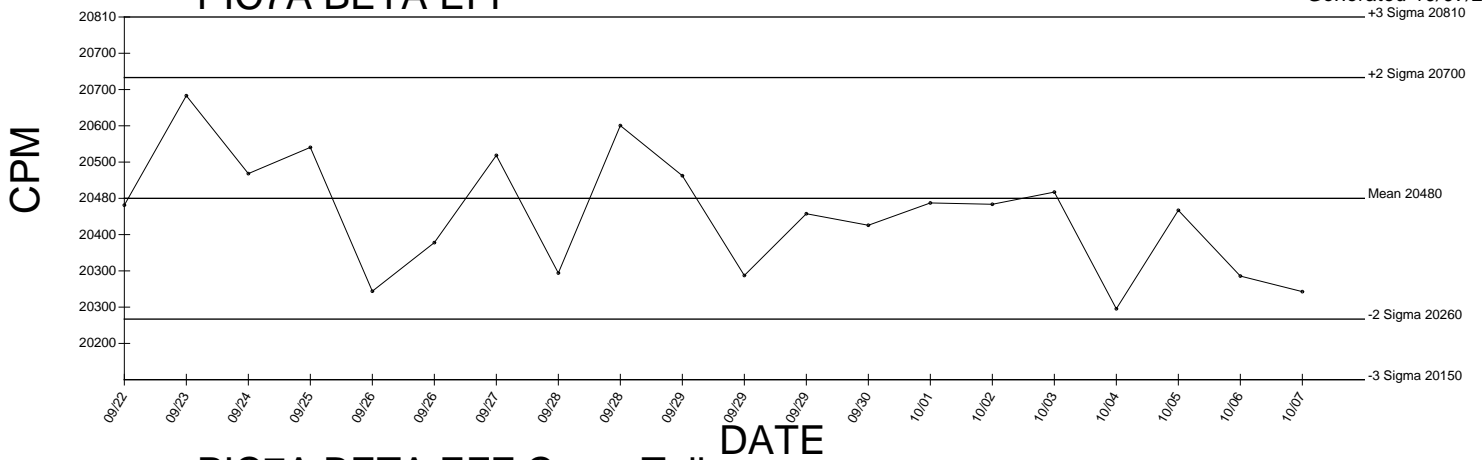
● Denotes Outlier



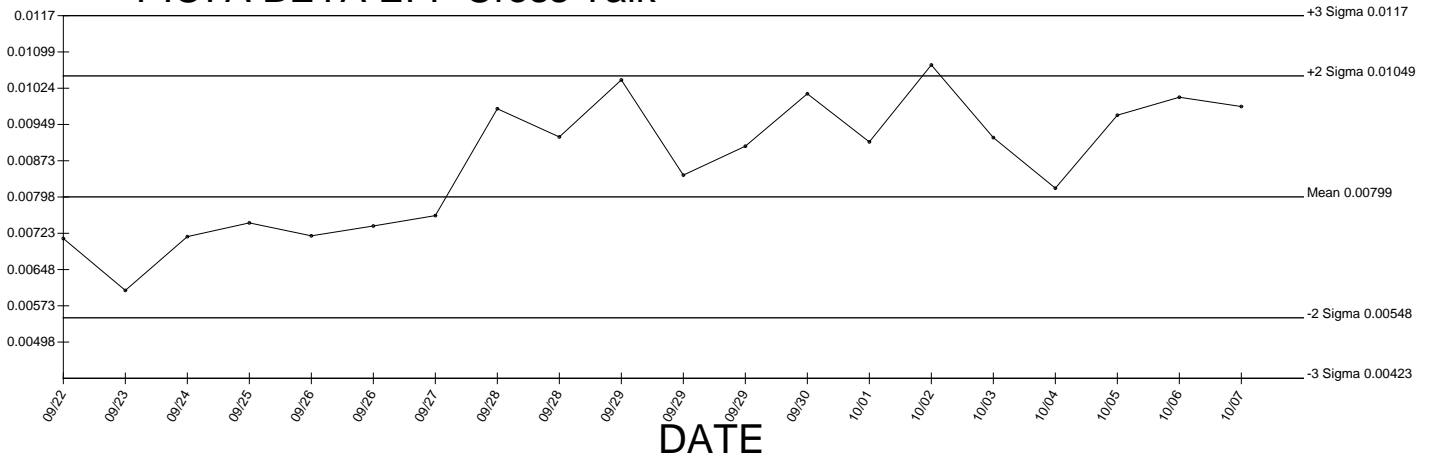
● Denotes Outlier

PIC7A BETA EFF

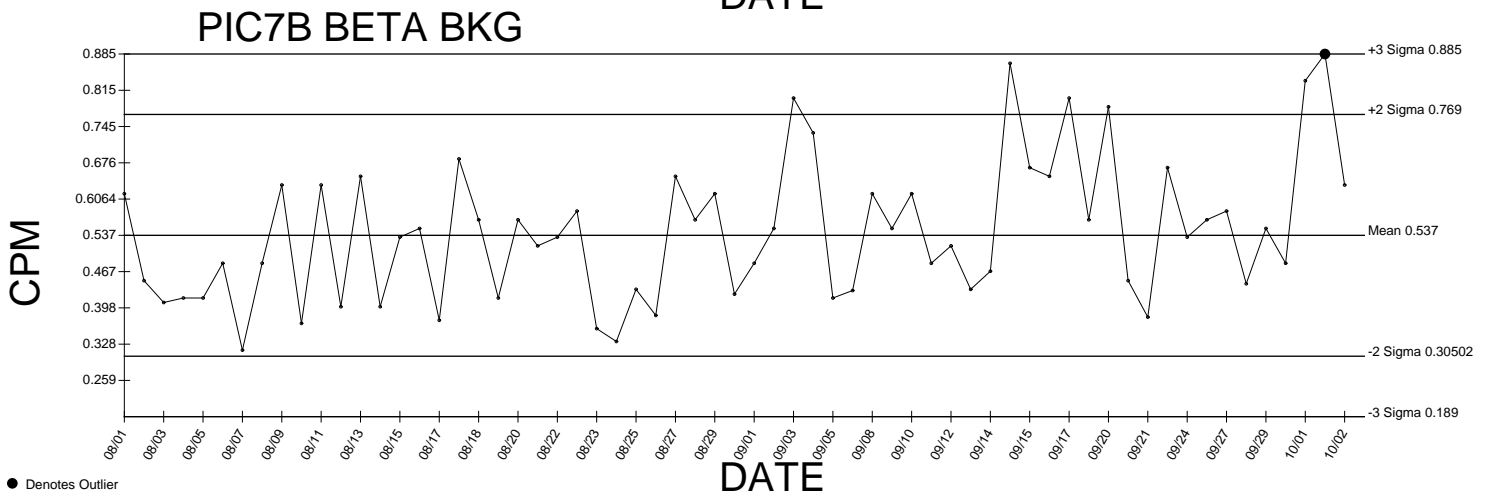
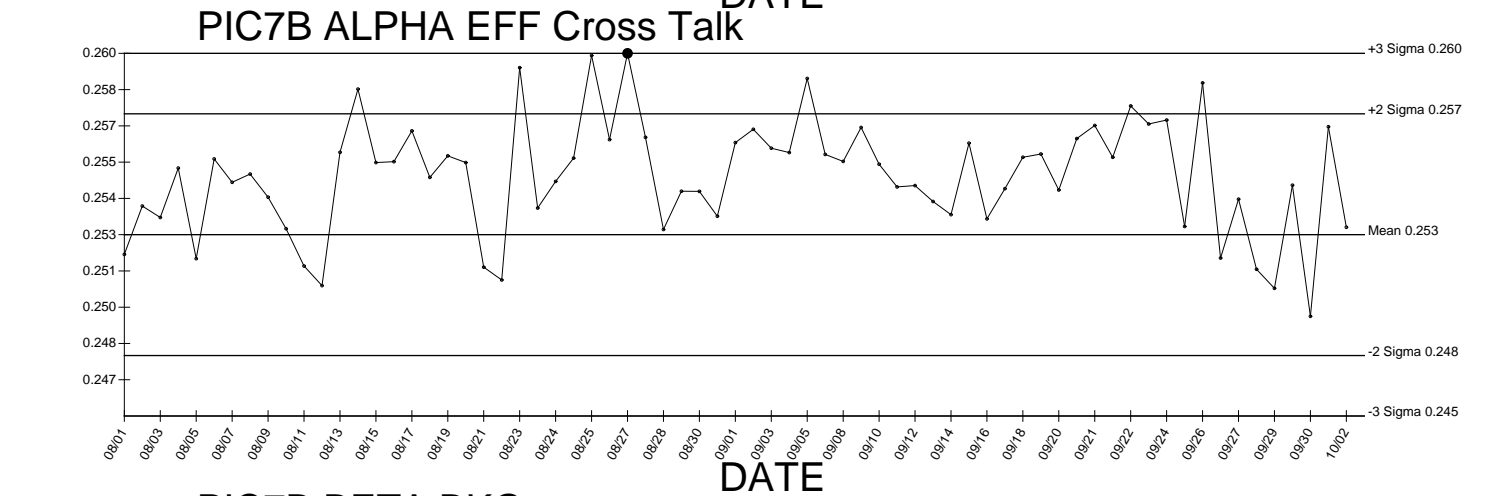
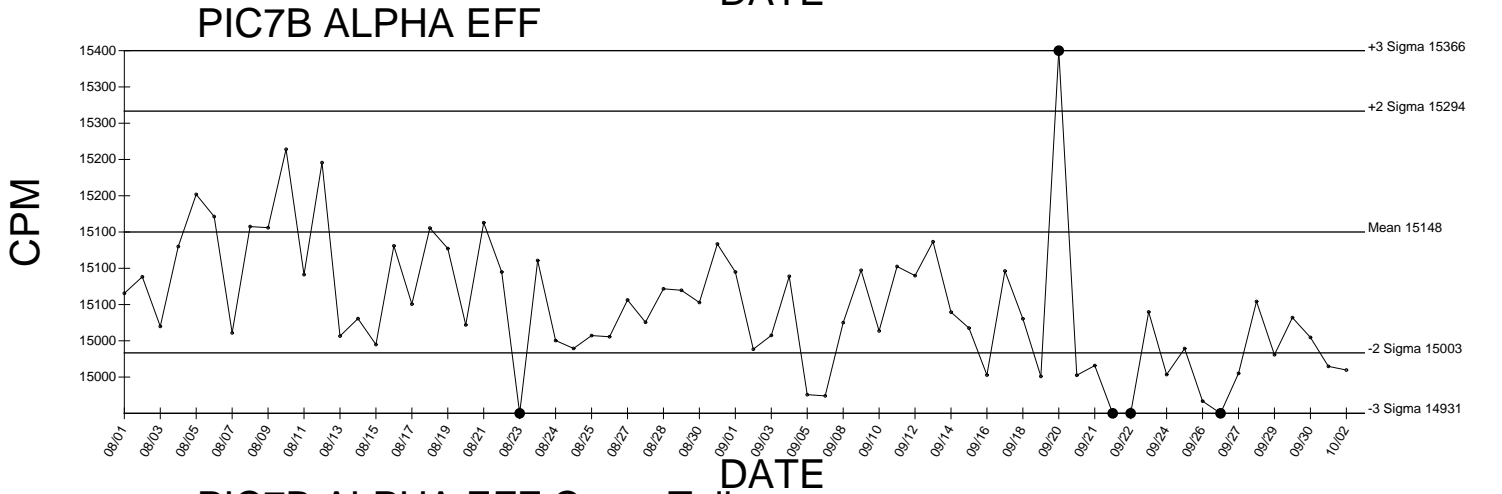
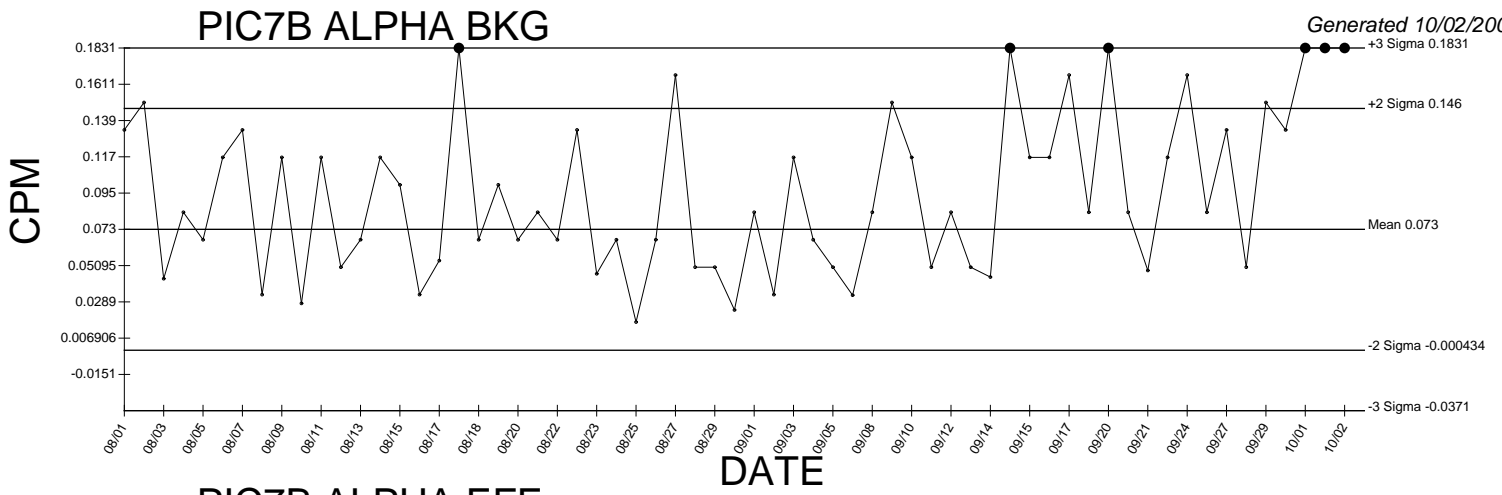
Generated 10/07/2009



PIC7A BETA EFF Cross Talk



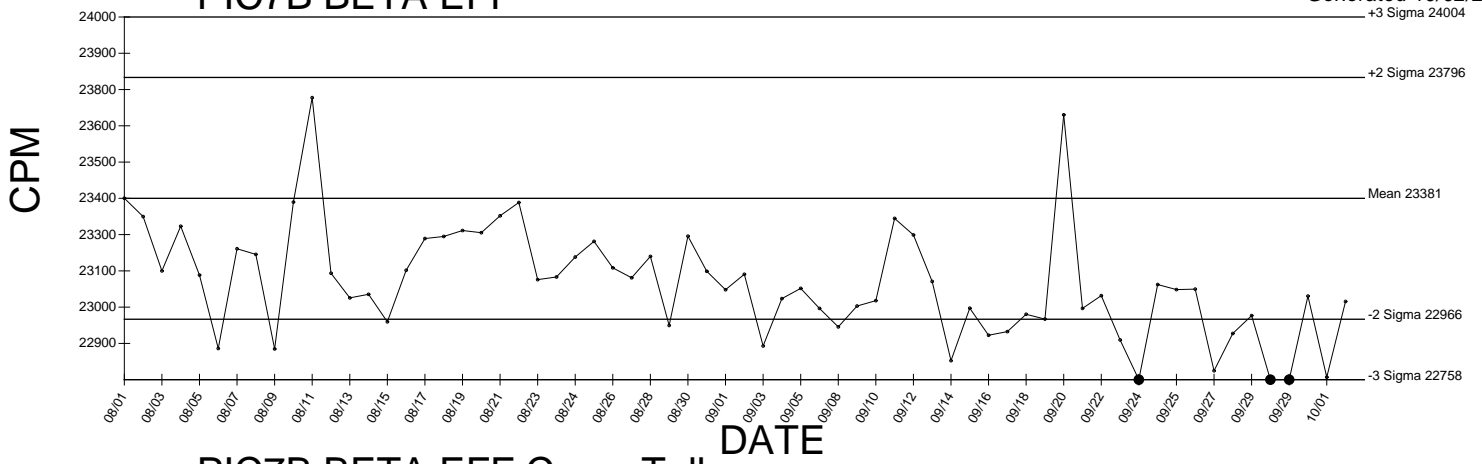
● Denotes Outlier



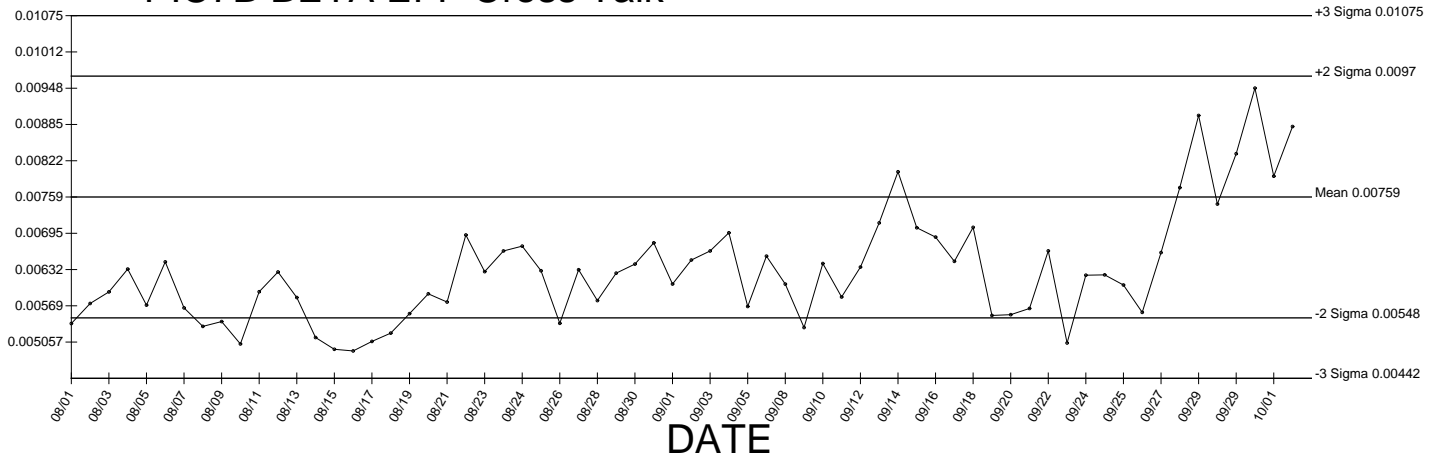
● Denotes Outlier

PIC7B BETA EFF

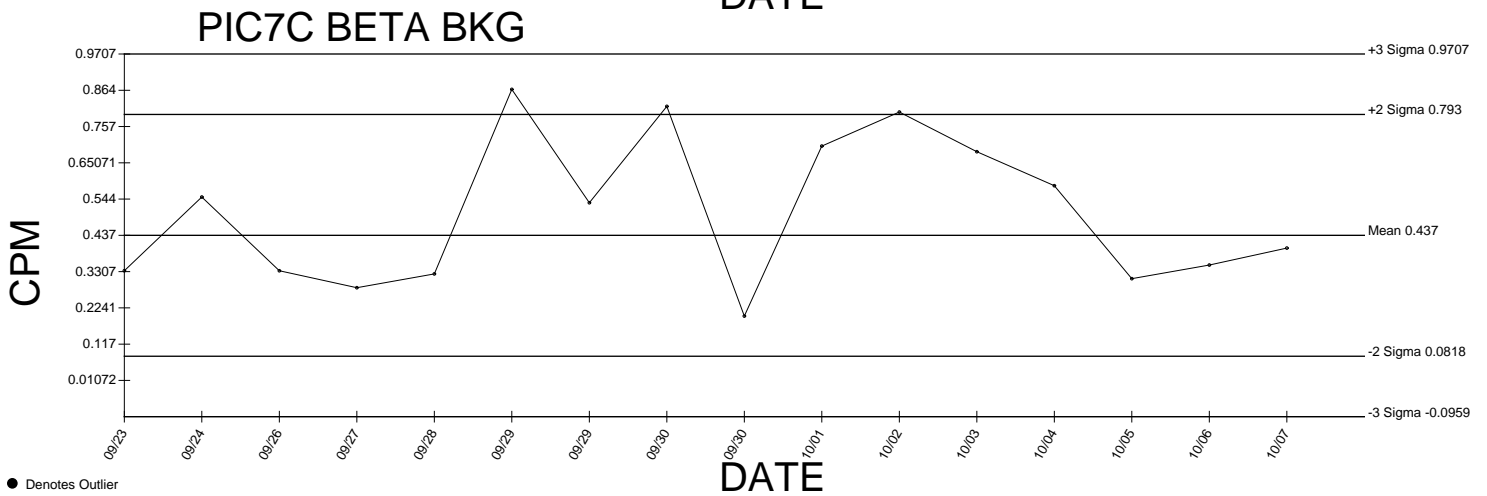
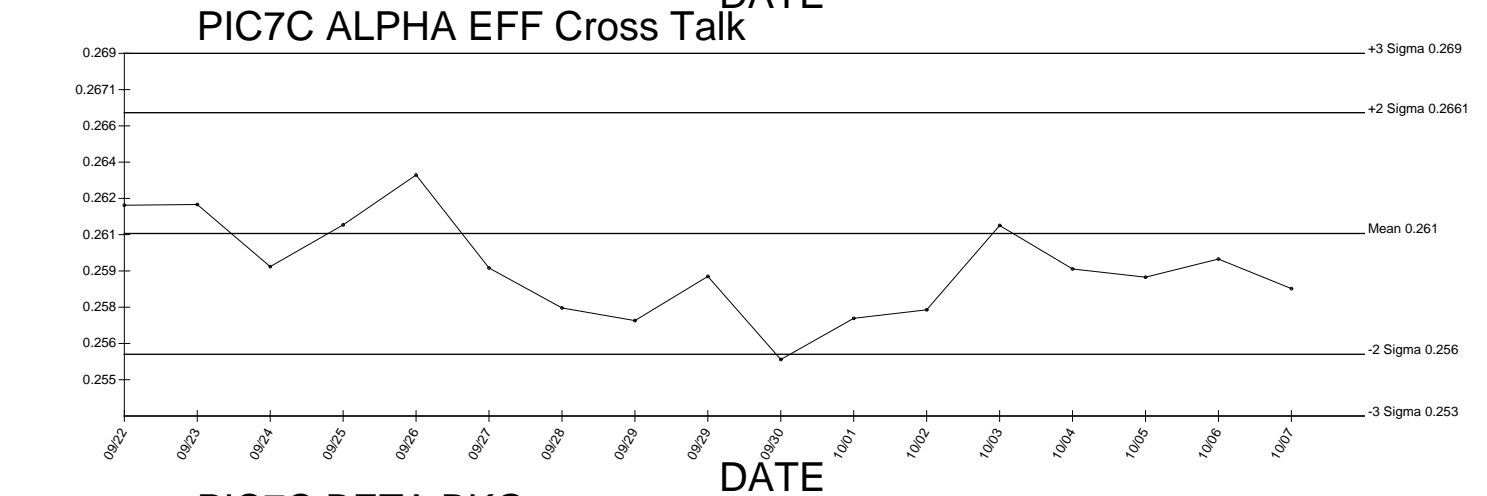
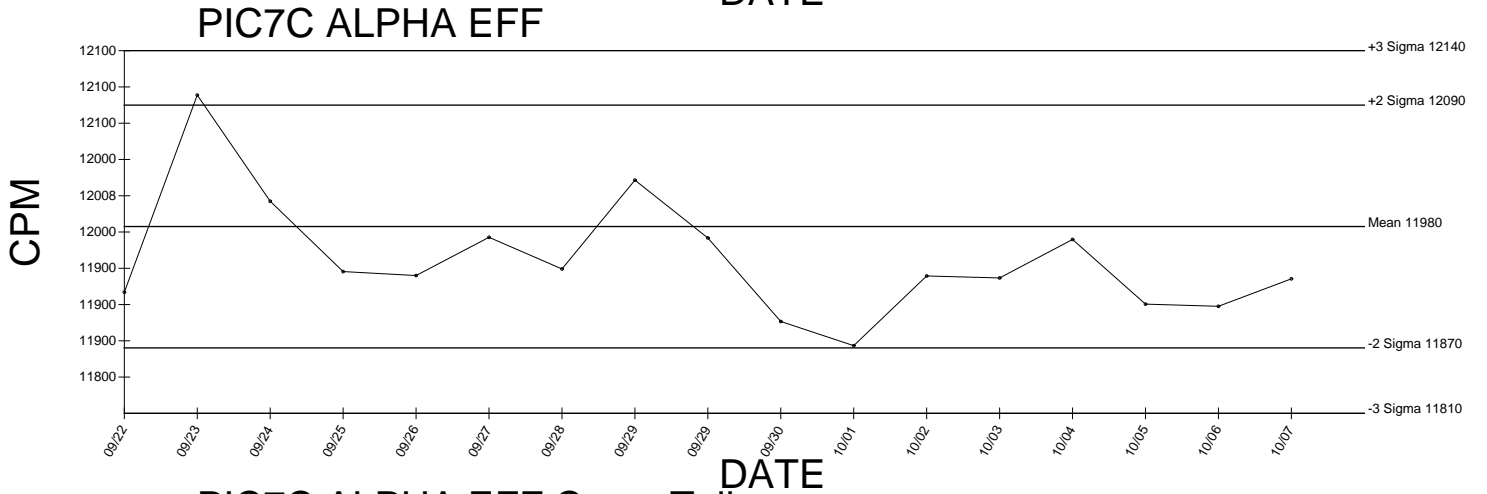
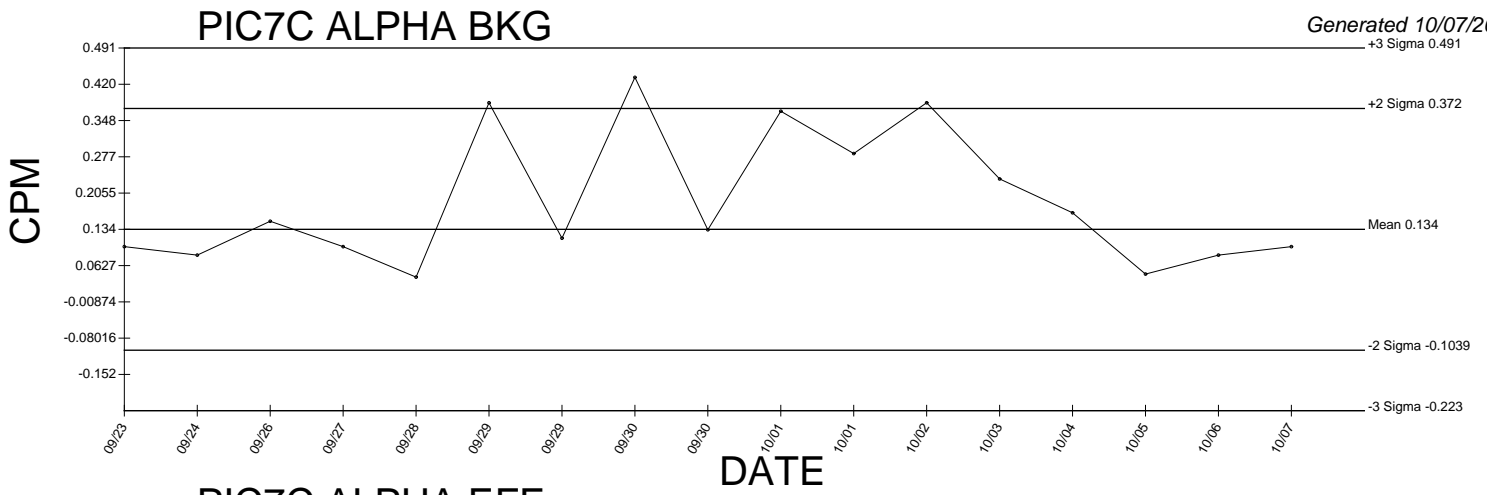
Generated 10/02/2009



PIC7B BETA EFF Cross Talk



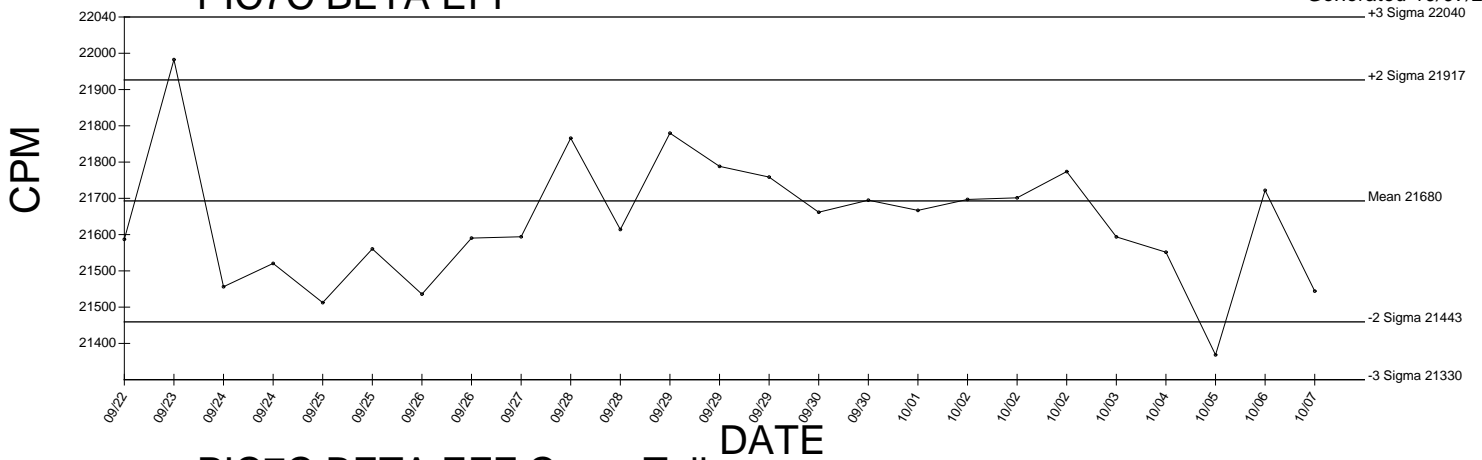
● Denotes Outlier



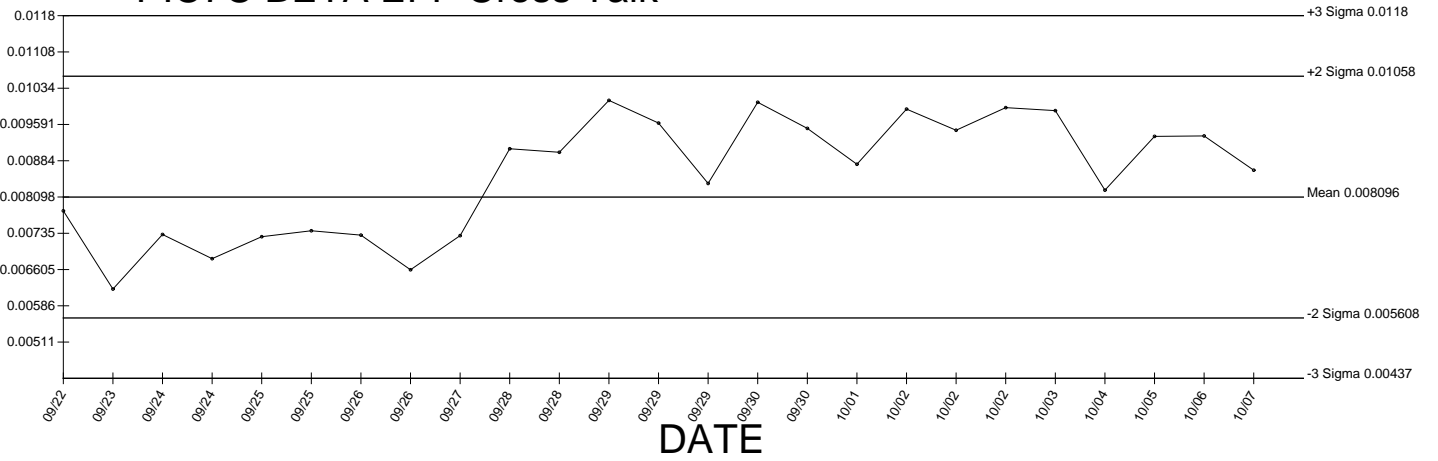
● Denotes Outlier

PIC7C BETA EFF

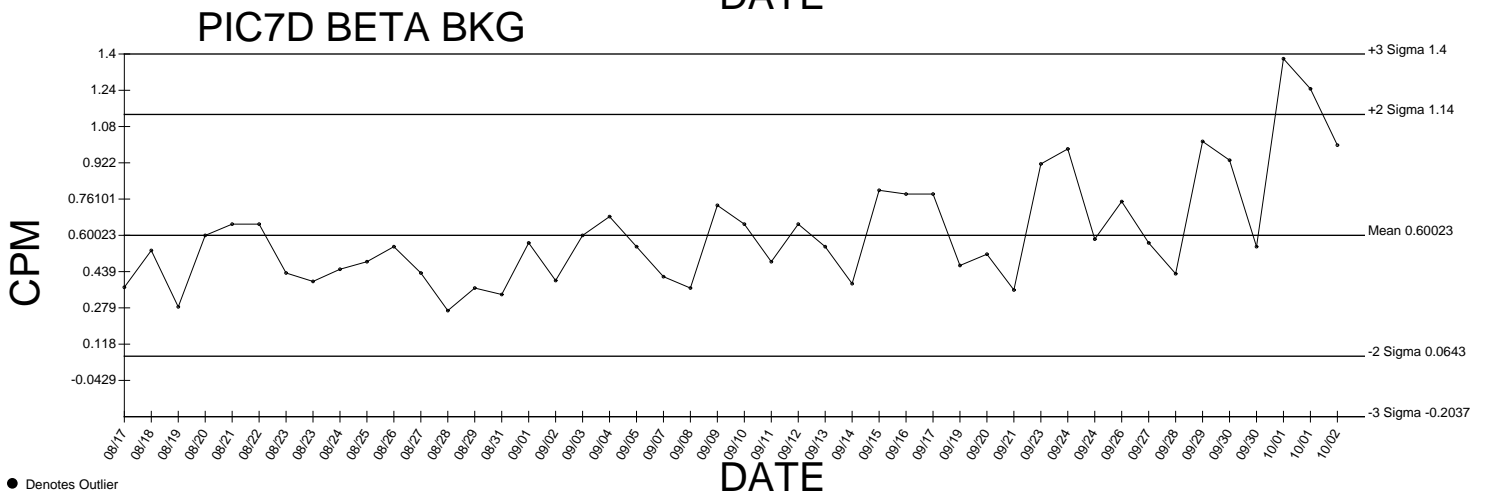
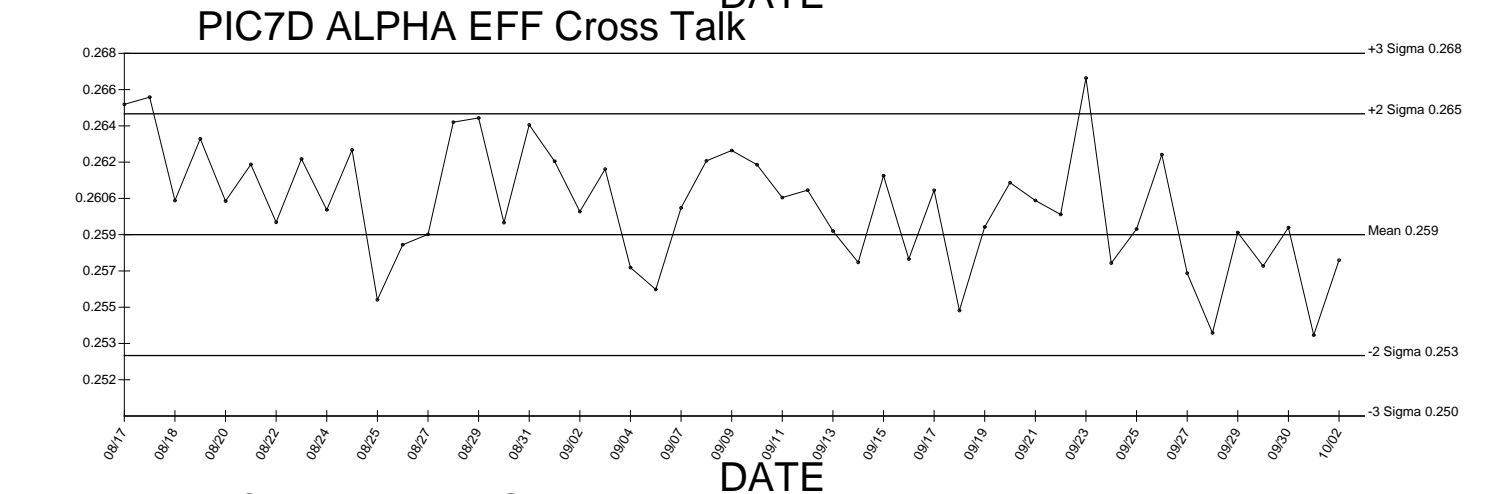
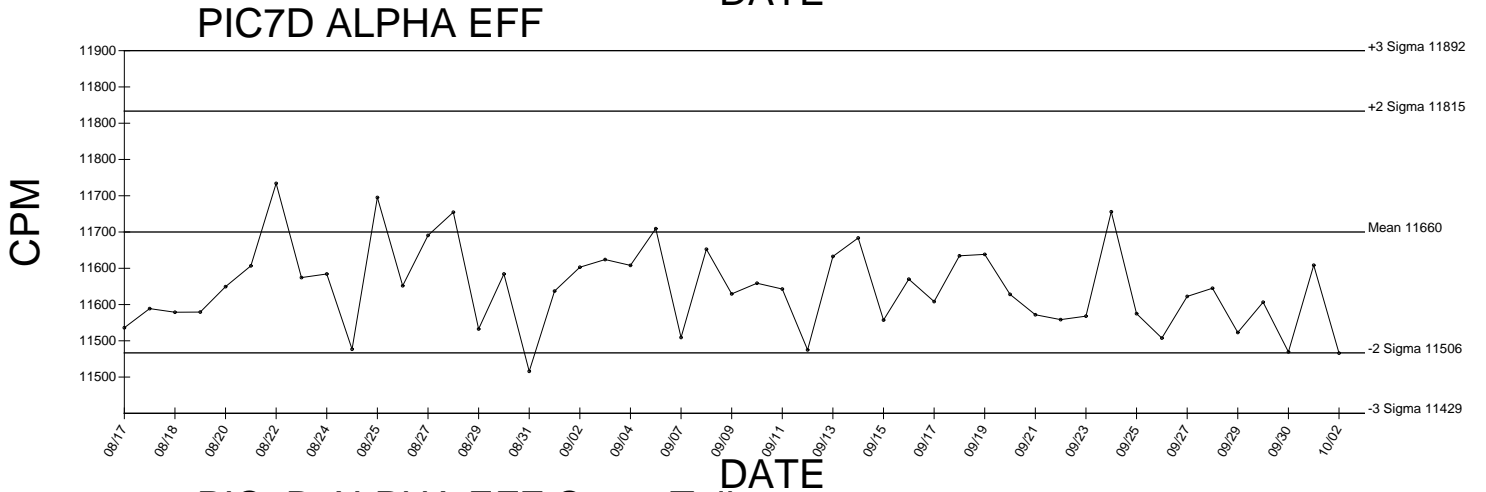
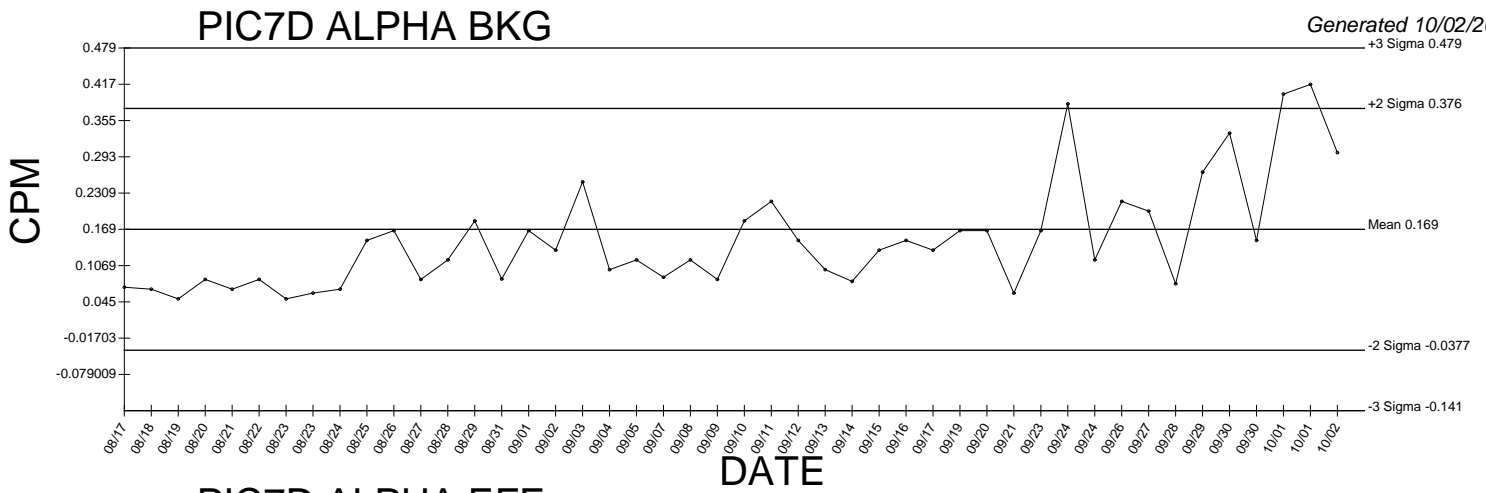
Generated 10/07/2009



PIC7C BETA EFF Cross Talk



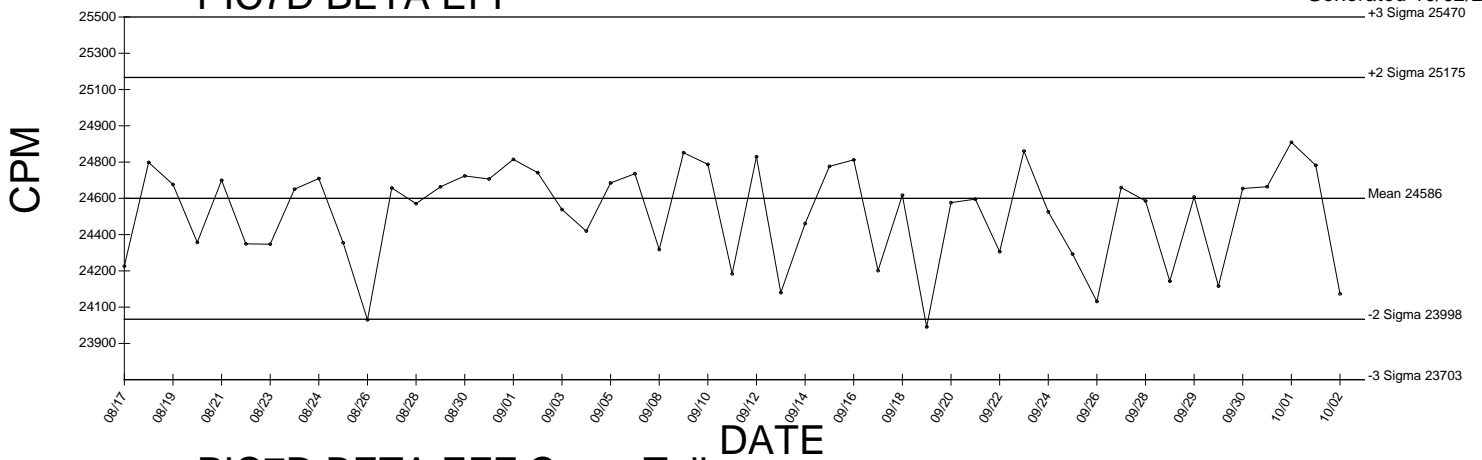
● Denotes Outlier



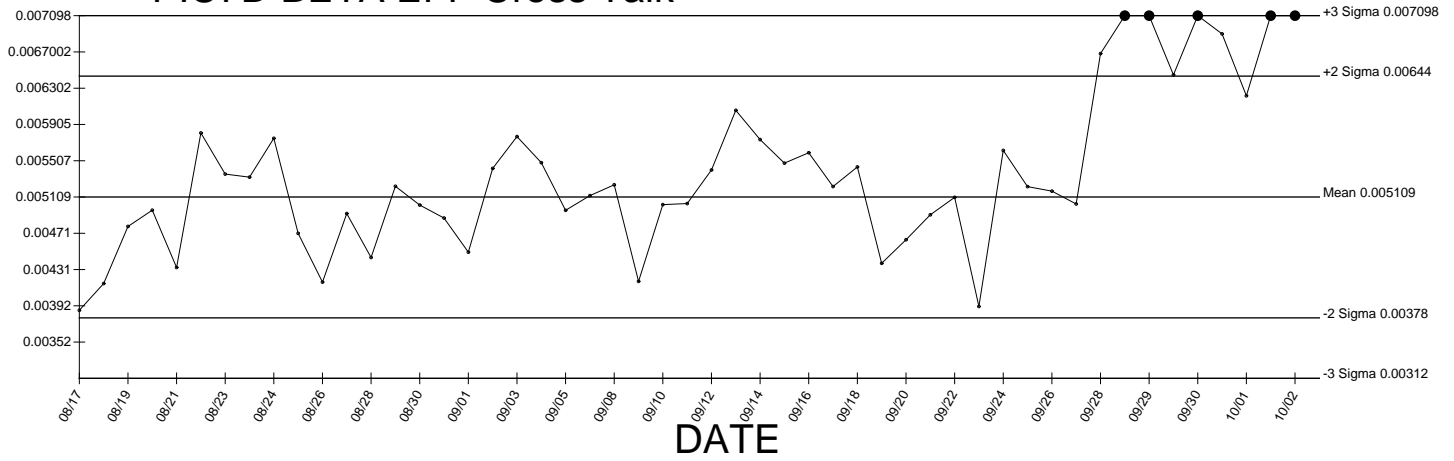
● Denotes Outlier

PIC7D BETA EFF

Generated 10/02/2009



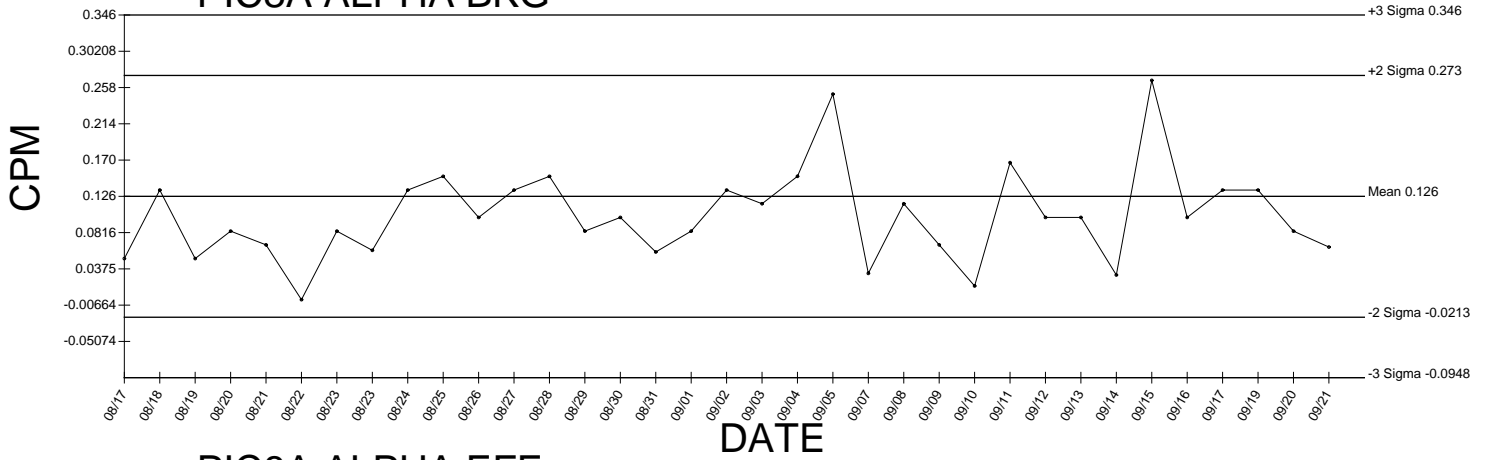
PIC7D BETA EFF Cross Talk



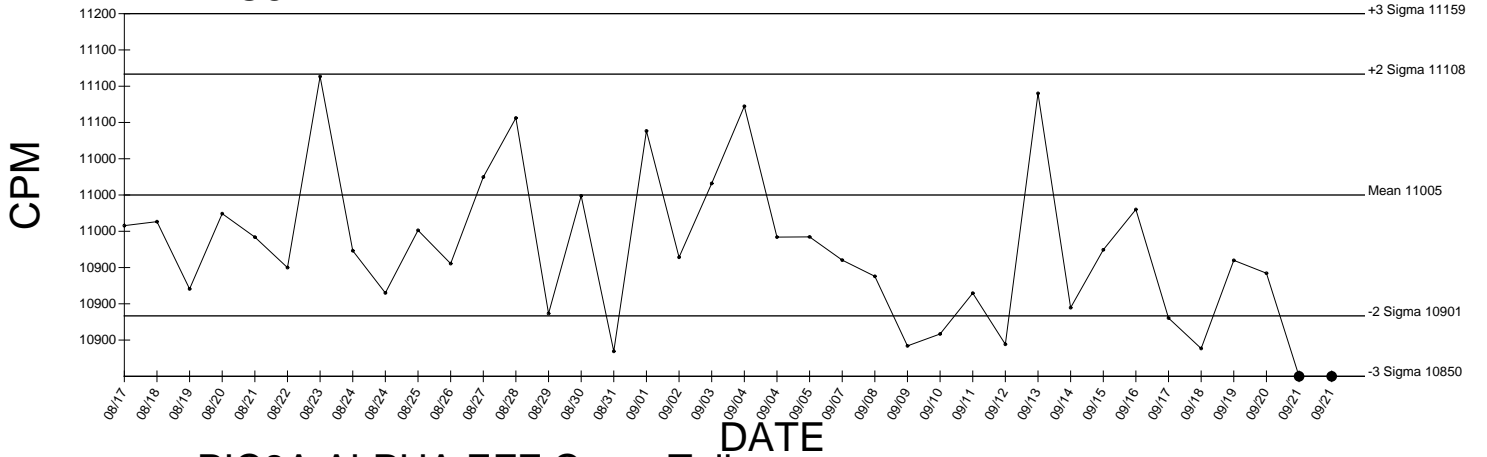
● Denotes Outlier

PIC8A ALPHA BKG

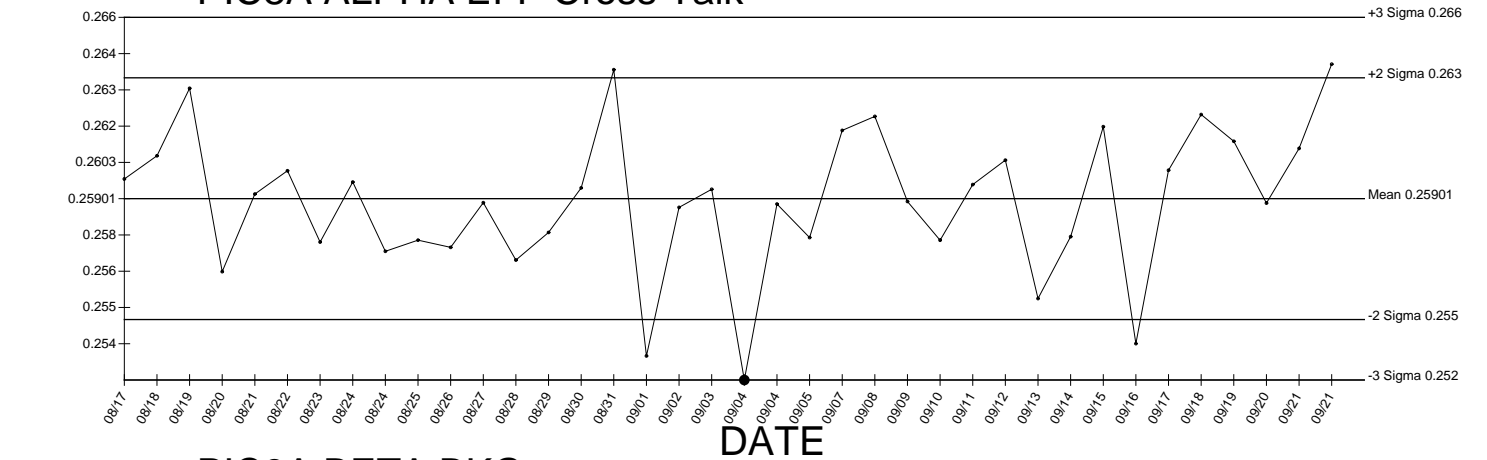
Generated 09/21/2009



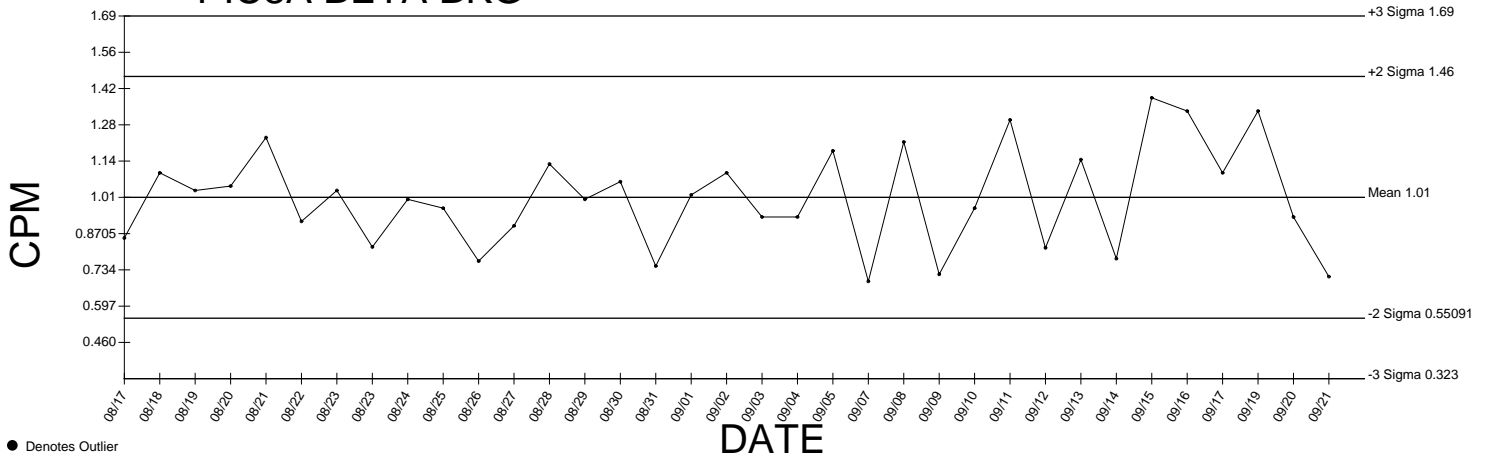
PIC8A ALPHA EFF



PIC8A ALPHA EFF Cross Talk



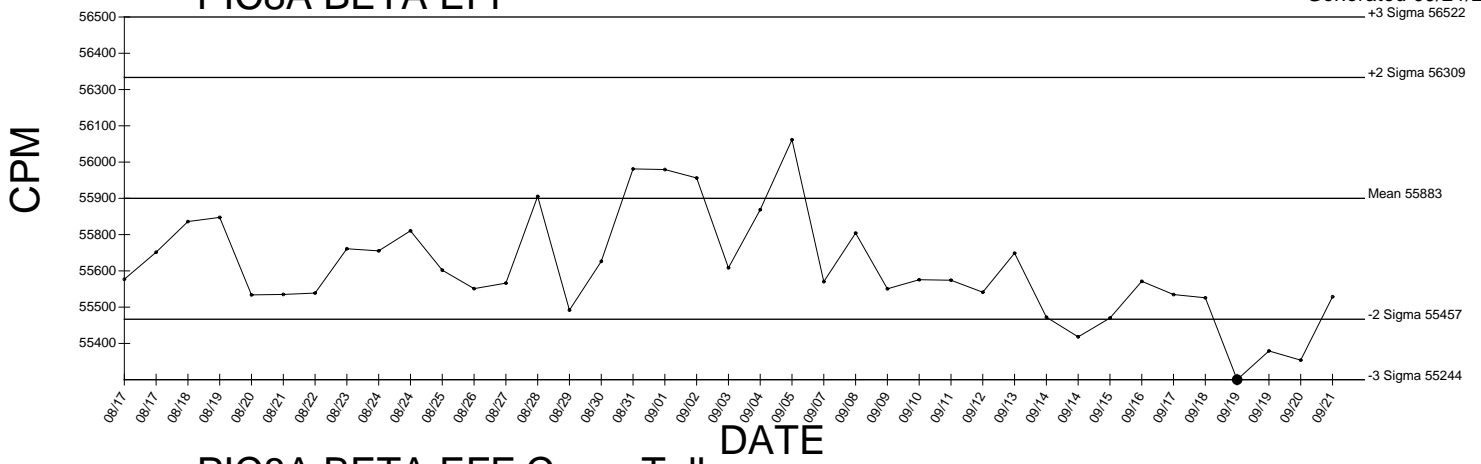
PIC8A BETA BKG



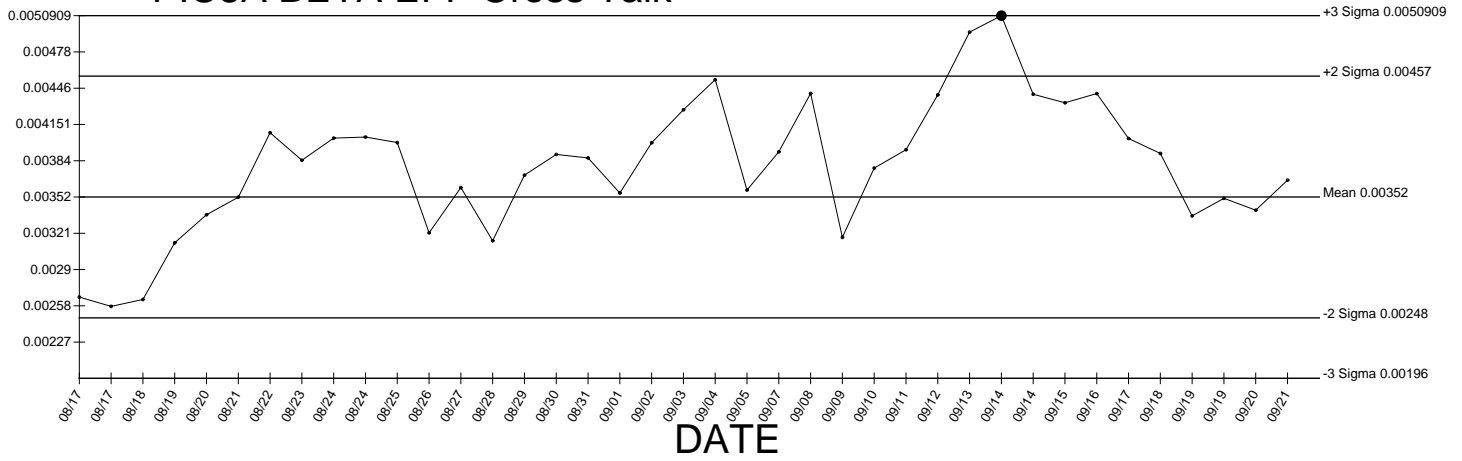
● Denotes Outlier

PIC8A BETA EFF

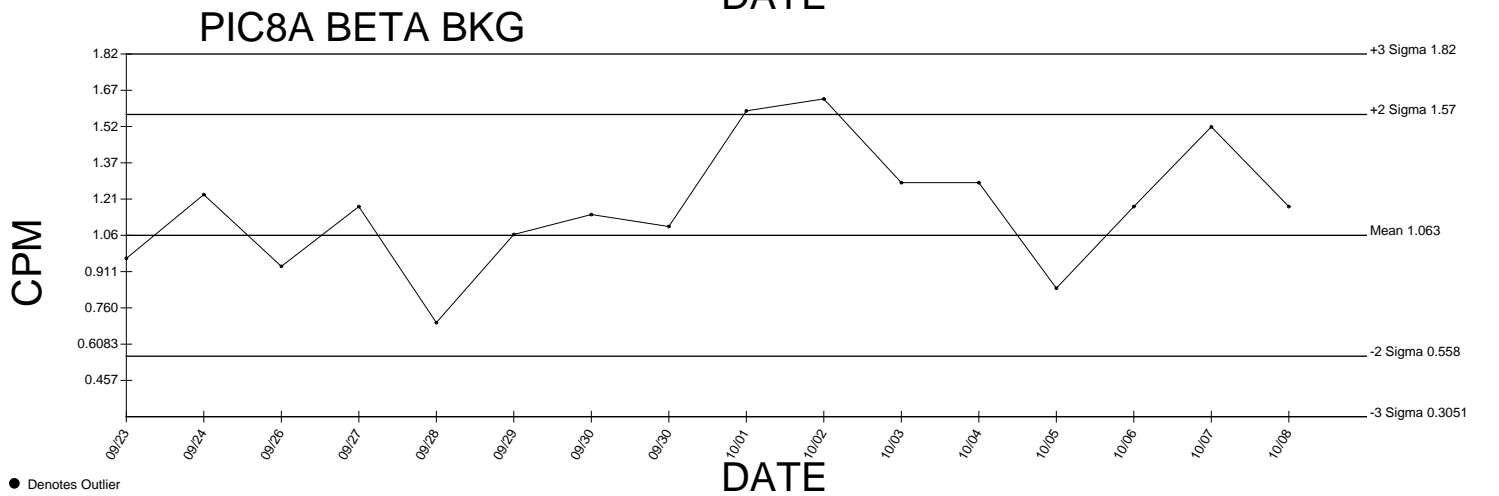
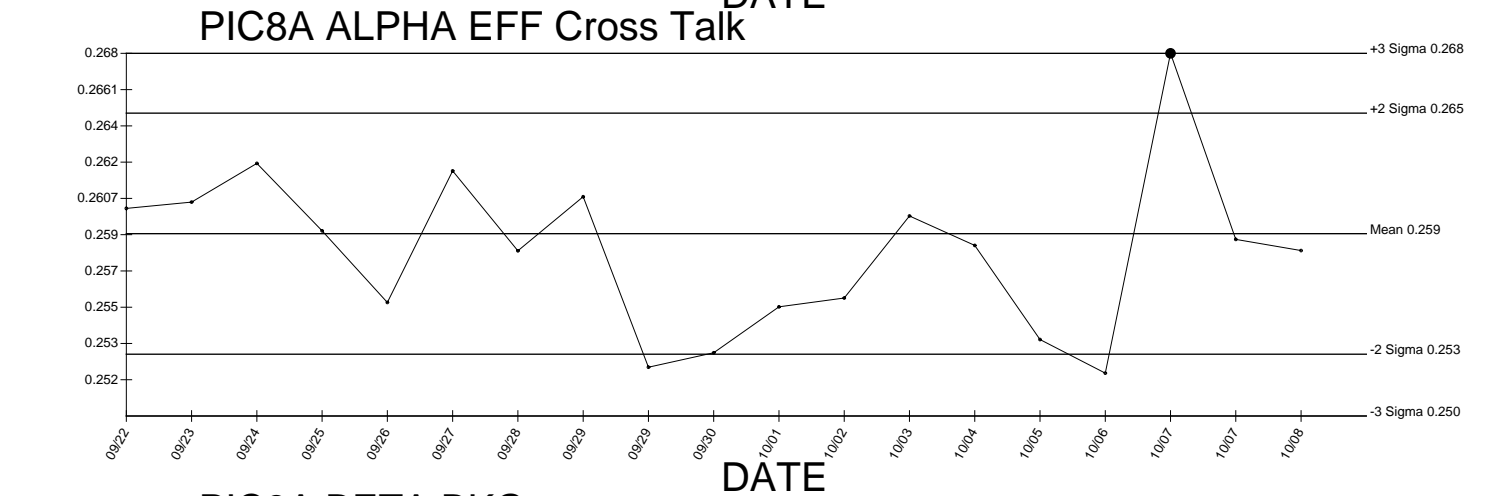
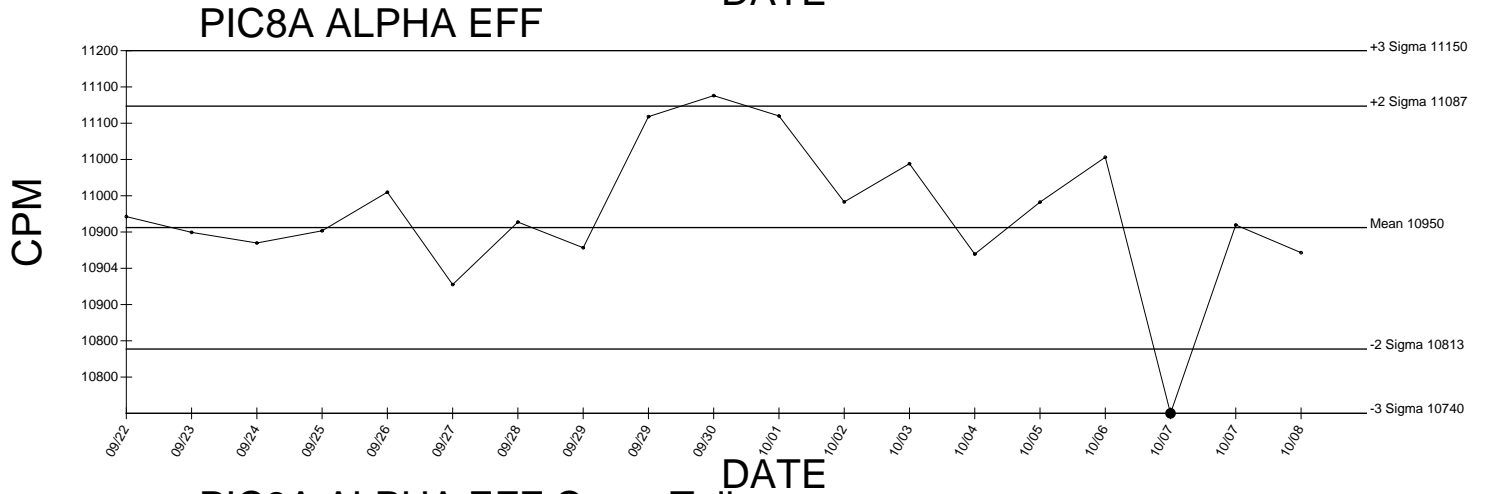
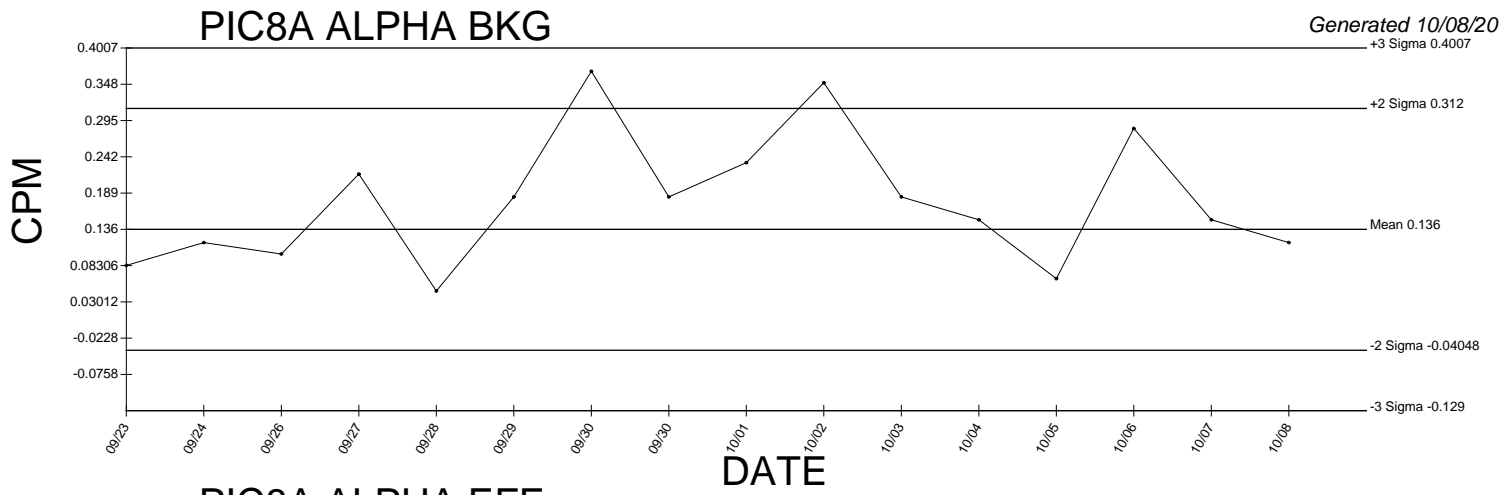
Generated 09/21/2009



PIC8A BETA EFF Cross Talk



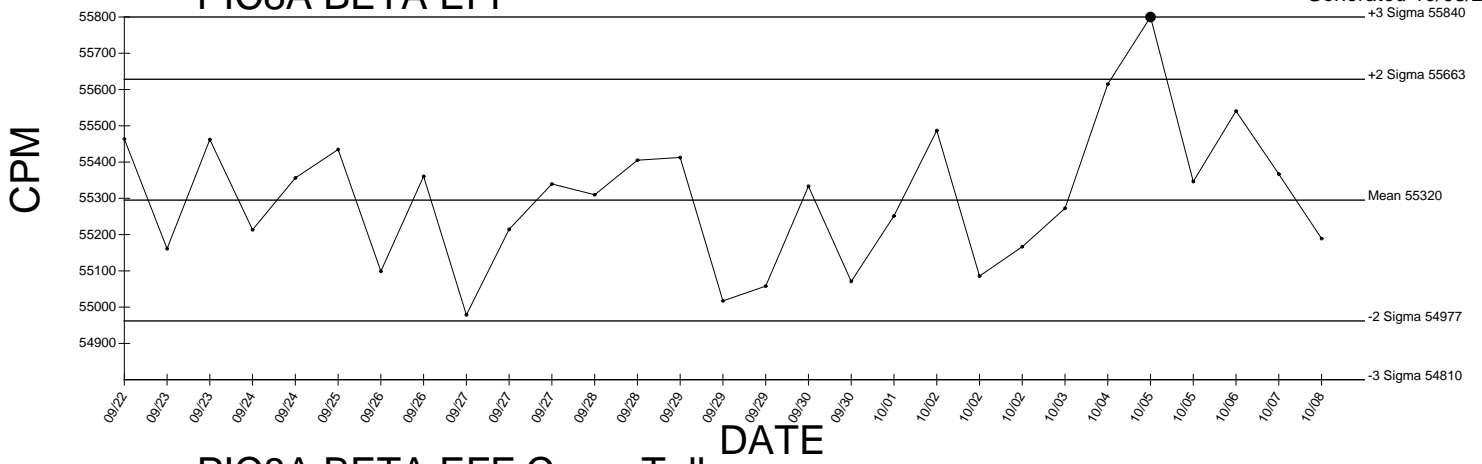
● Denotes Outlier



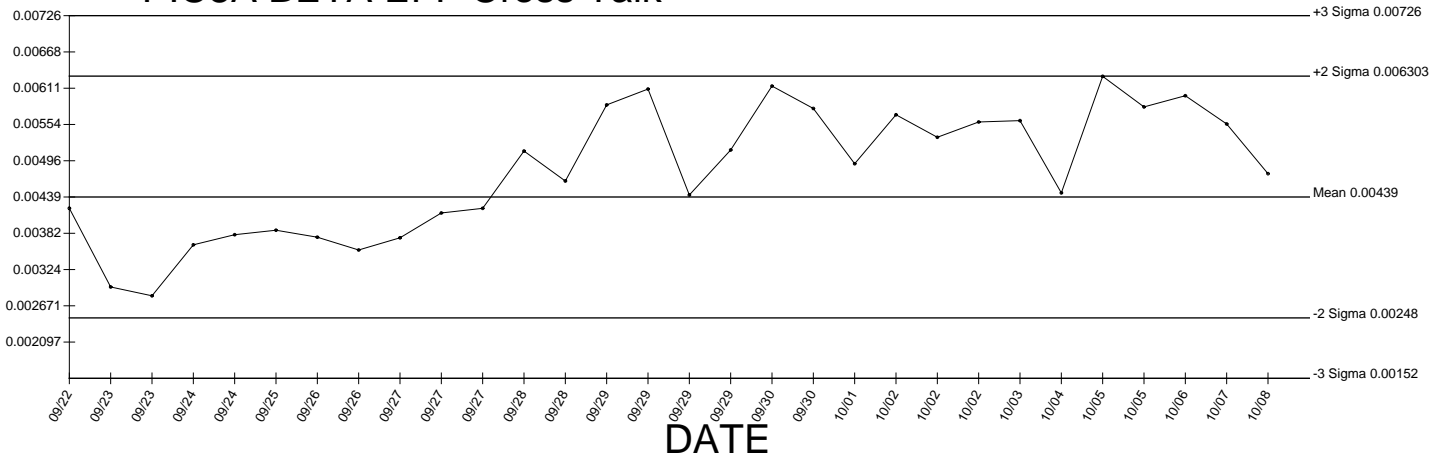
● Denotes Outlier

PIC8A BETA EFF

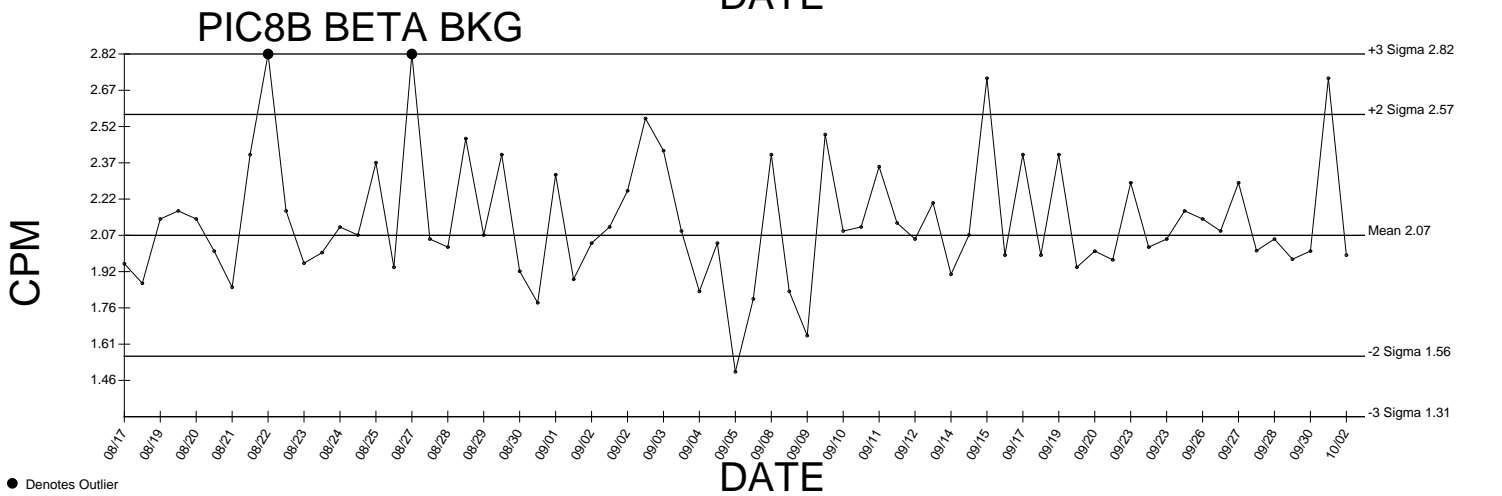
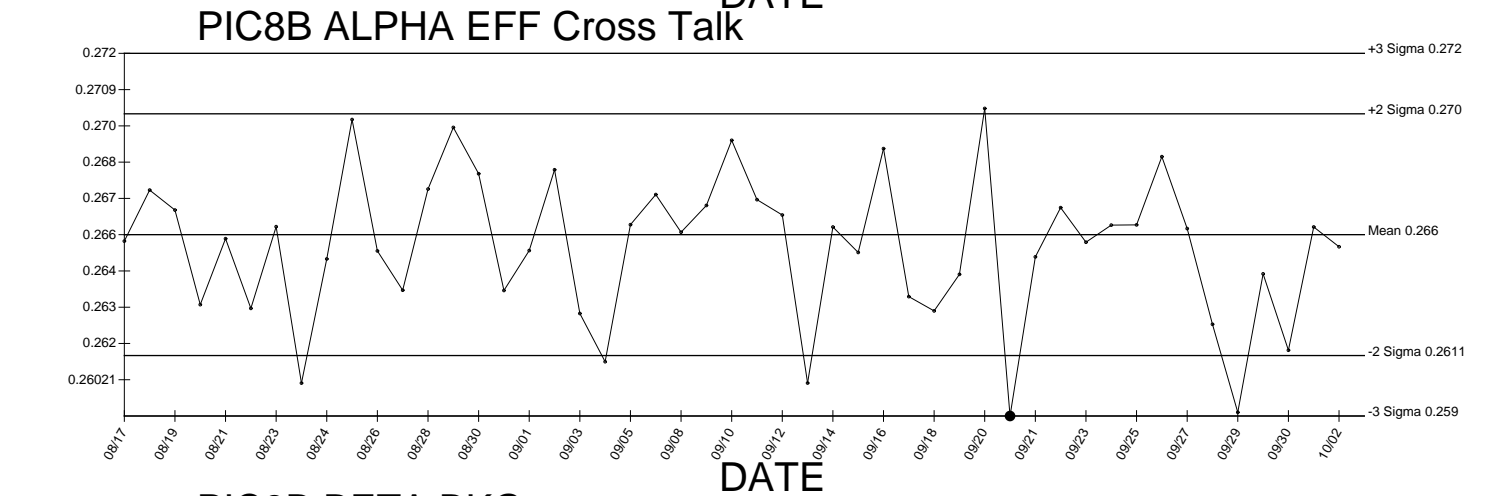
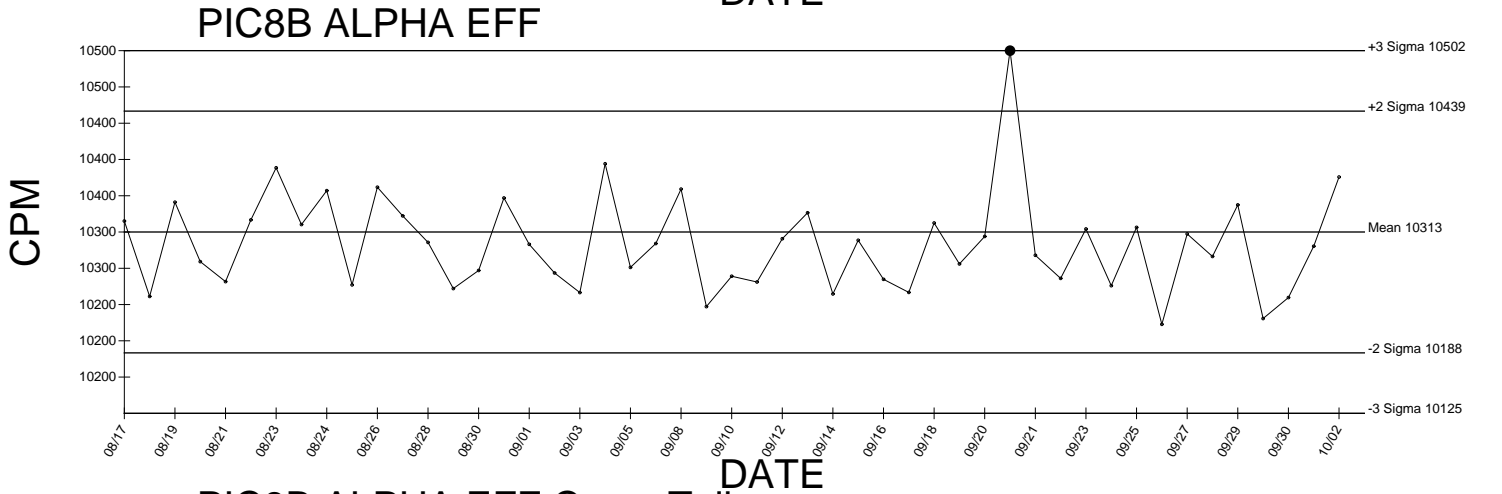
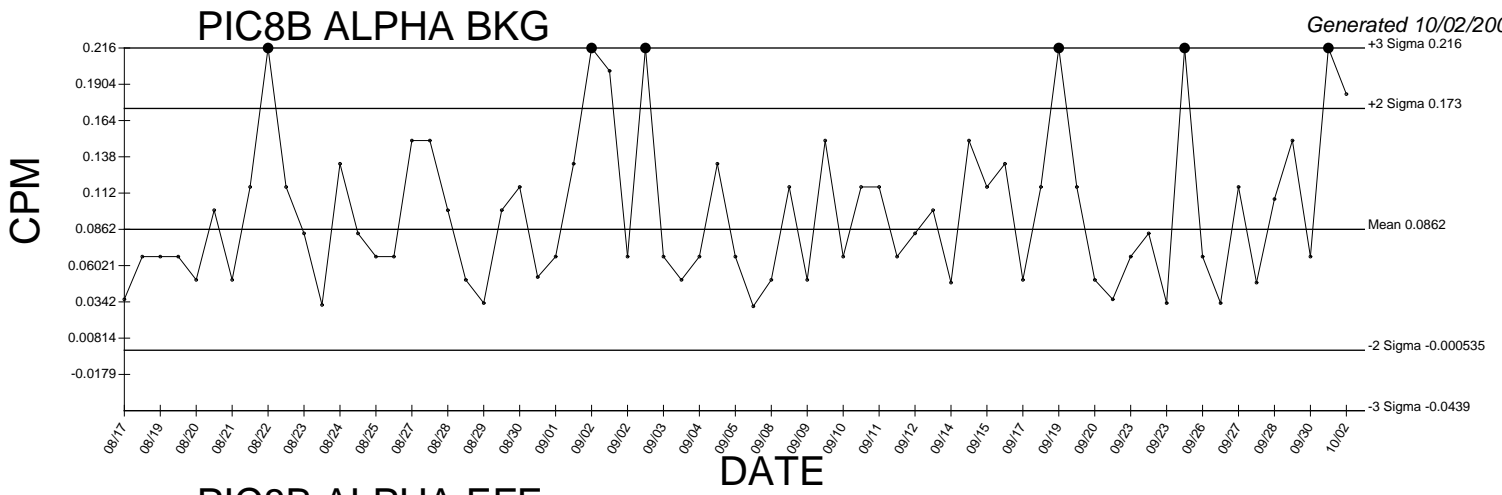
Generated 10/08/2009



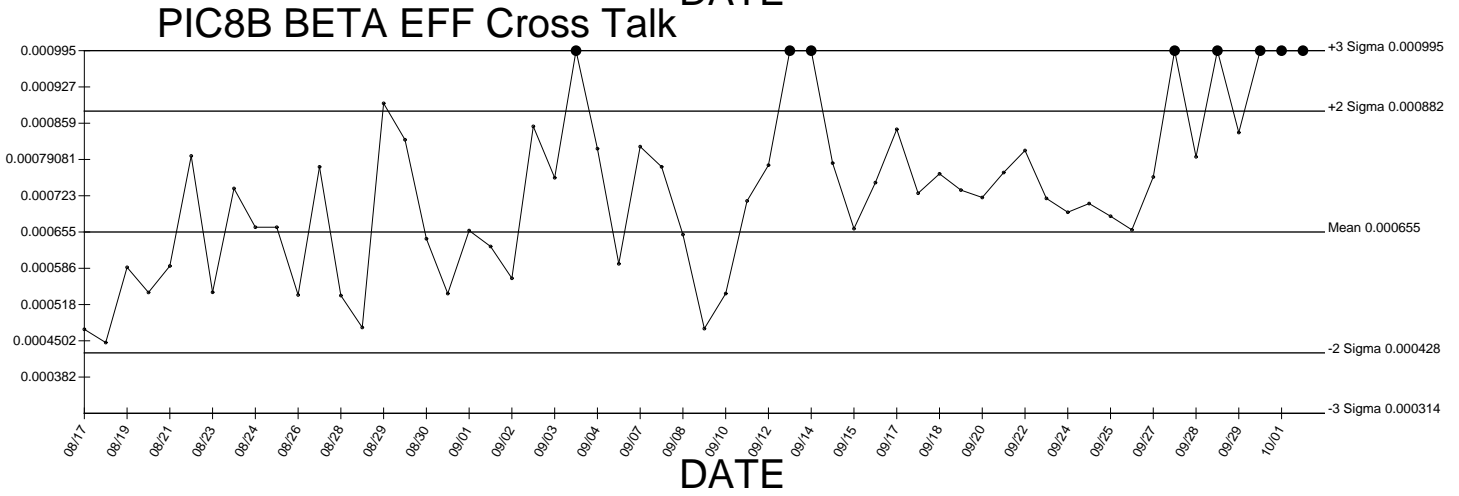
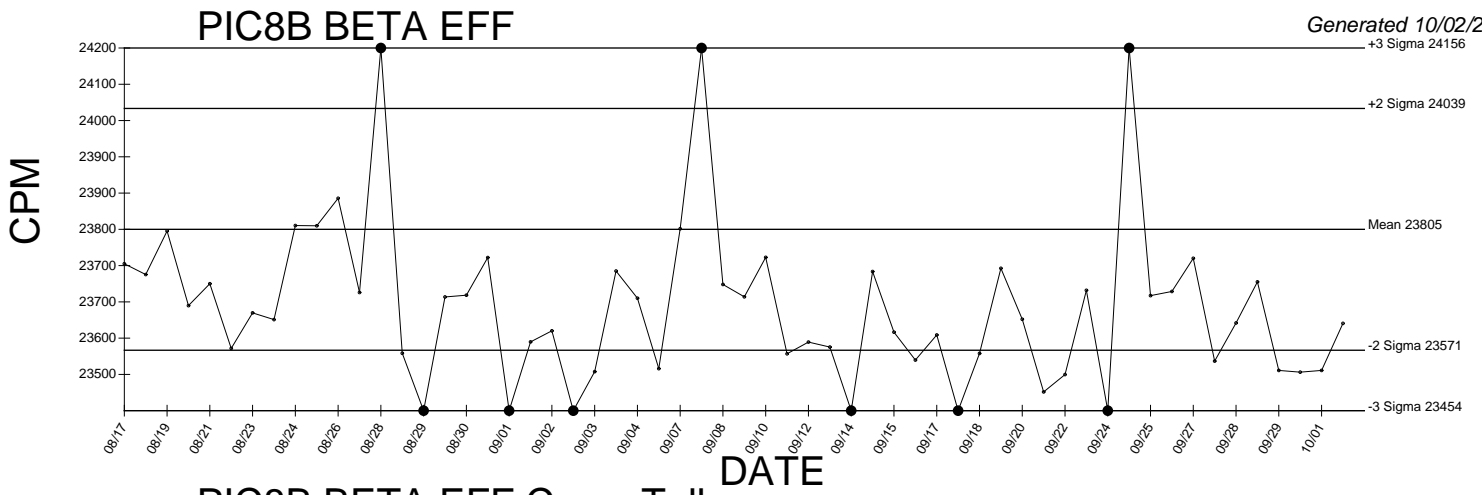
PIC8A BETA EFF Cross Talk



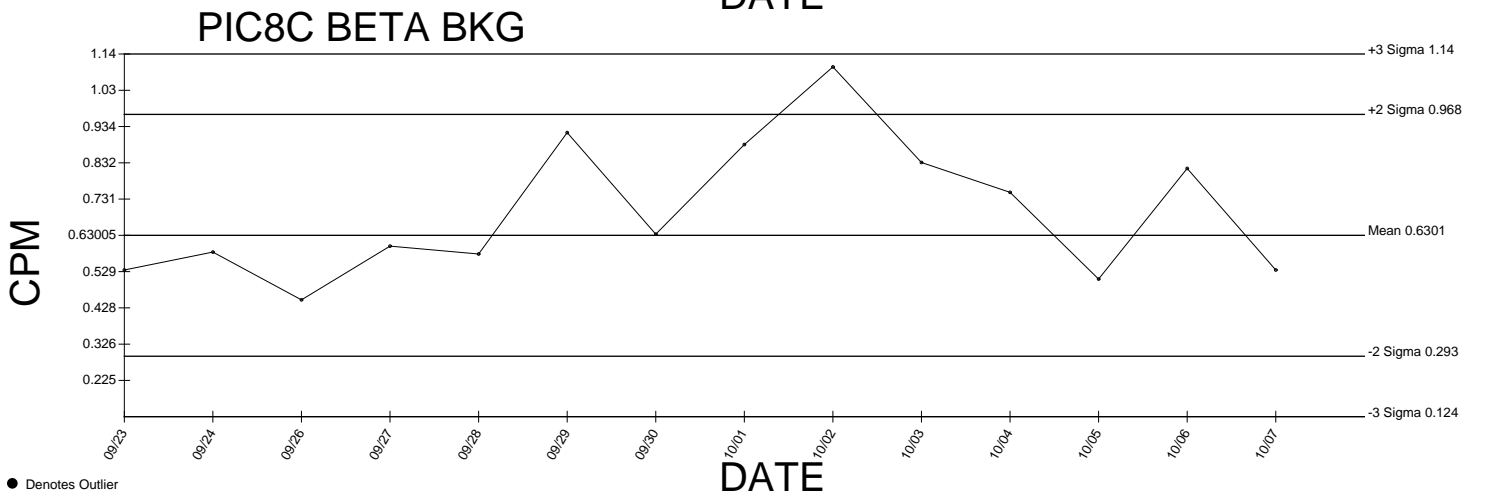
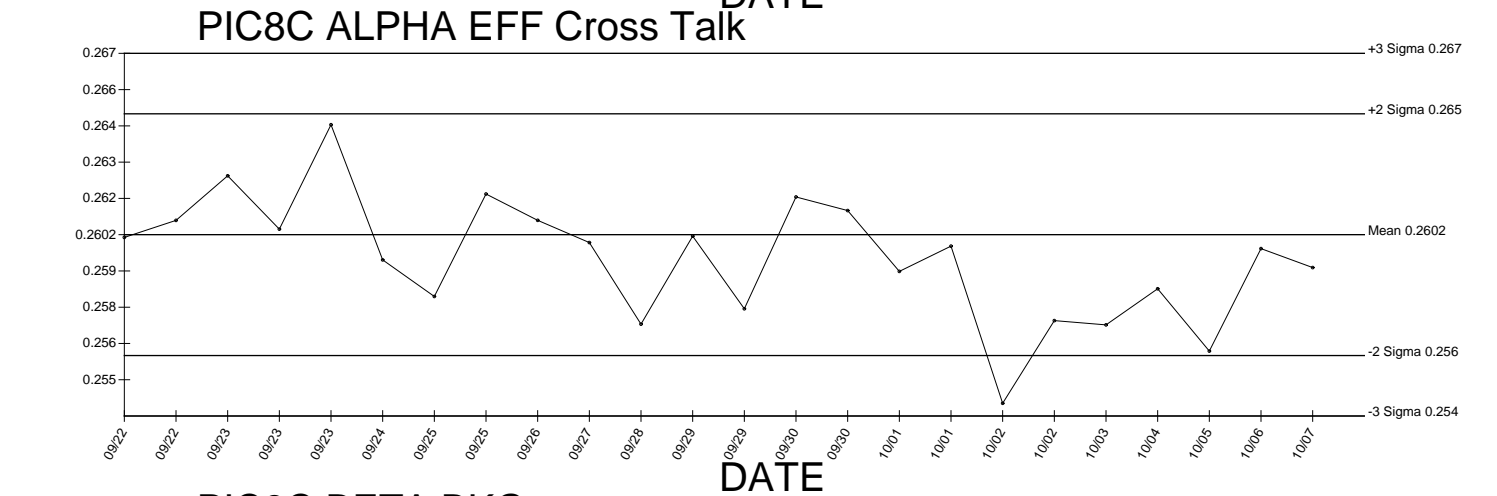
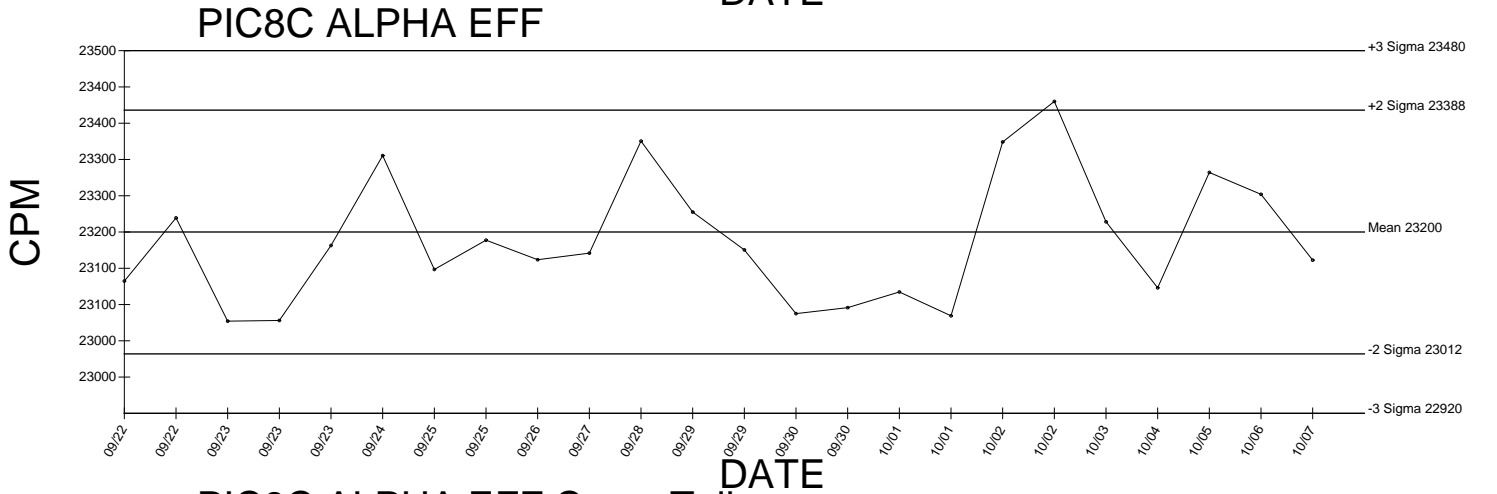
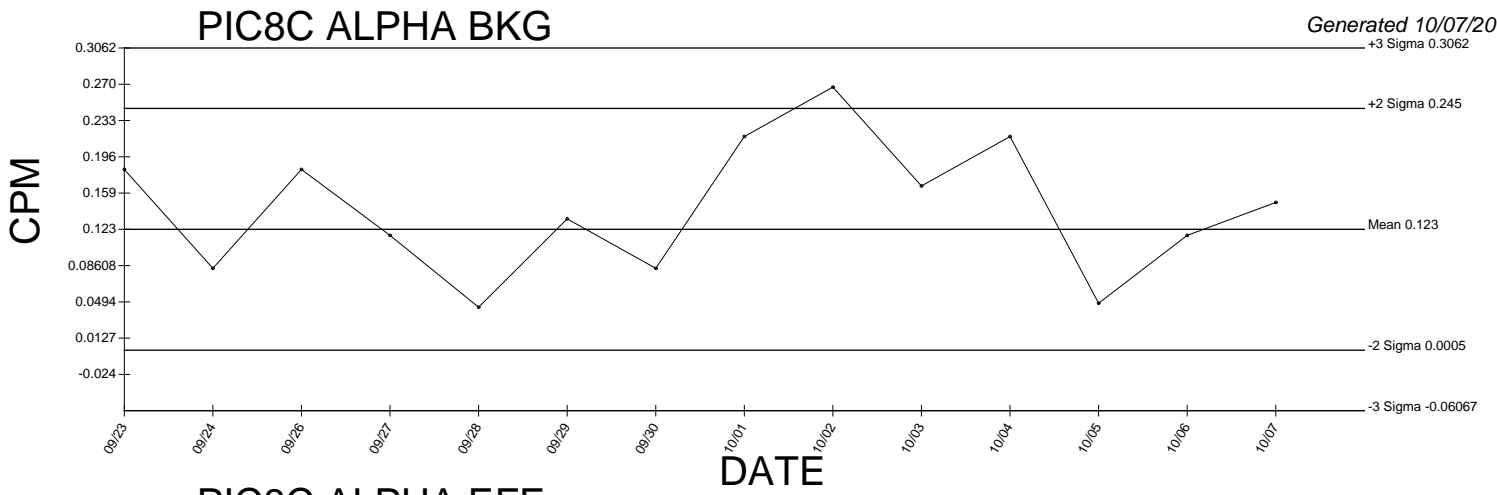
● Denotes Outlier



● Denotes Outlier



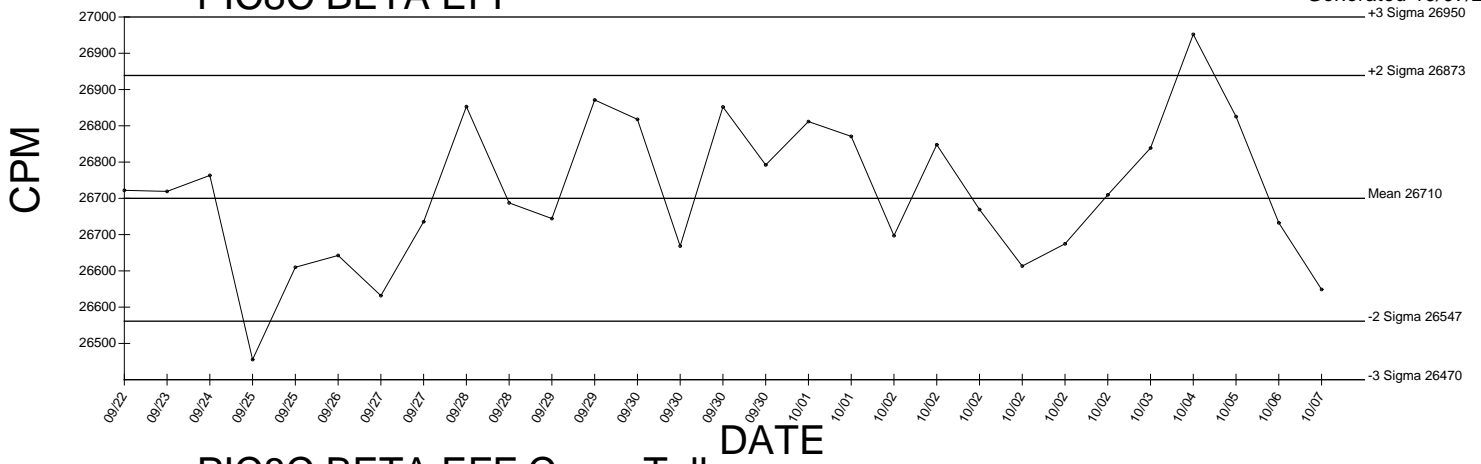
● Denotes Outlier



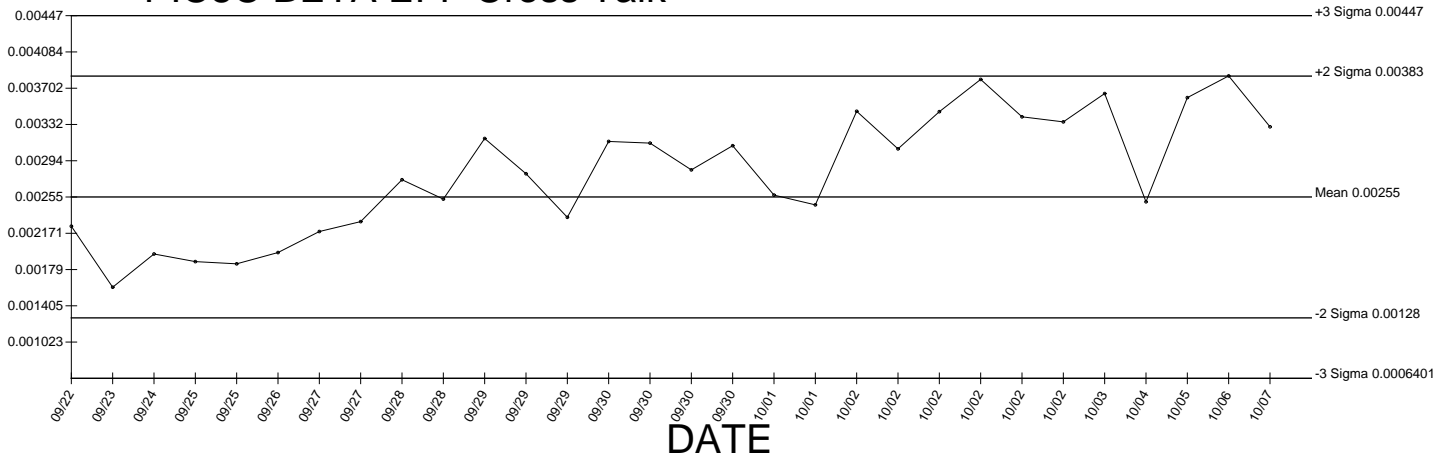
● Denotes Outlier

PIC8C BETA EFF

Generated 10/07/2009

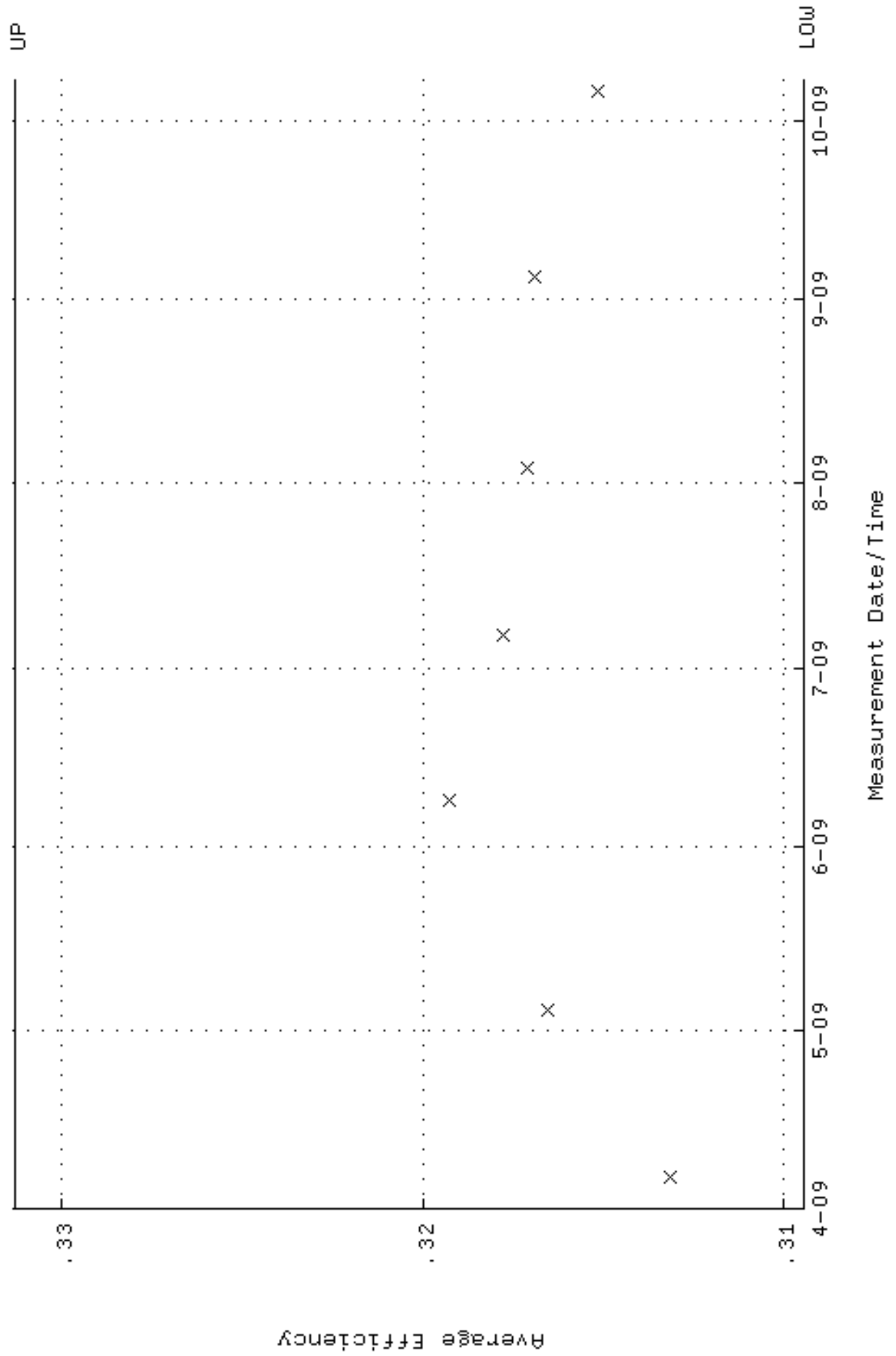


PIC8C BETA EFF Cross Talk

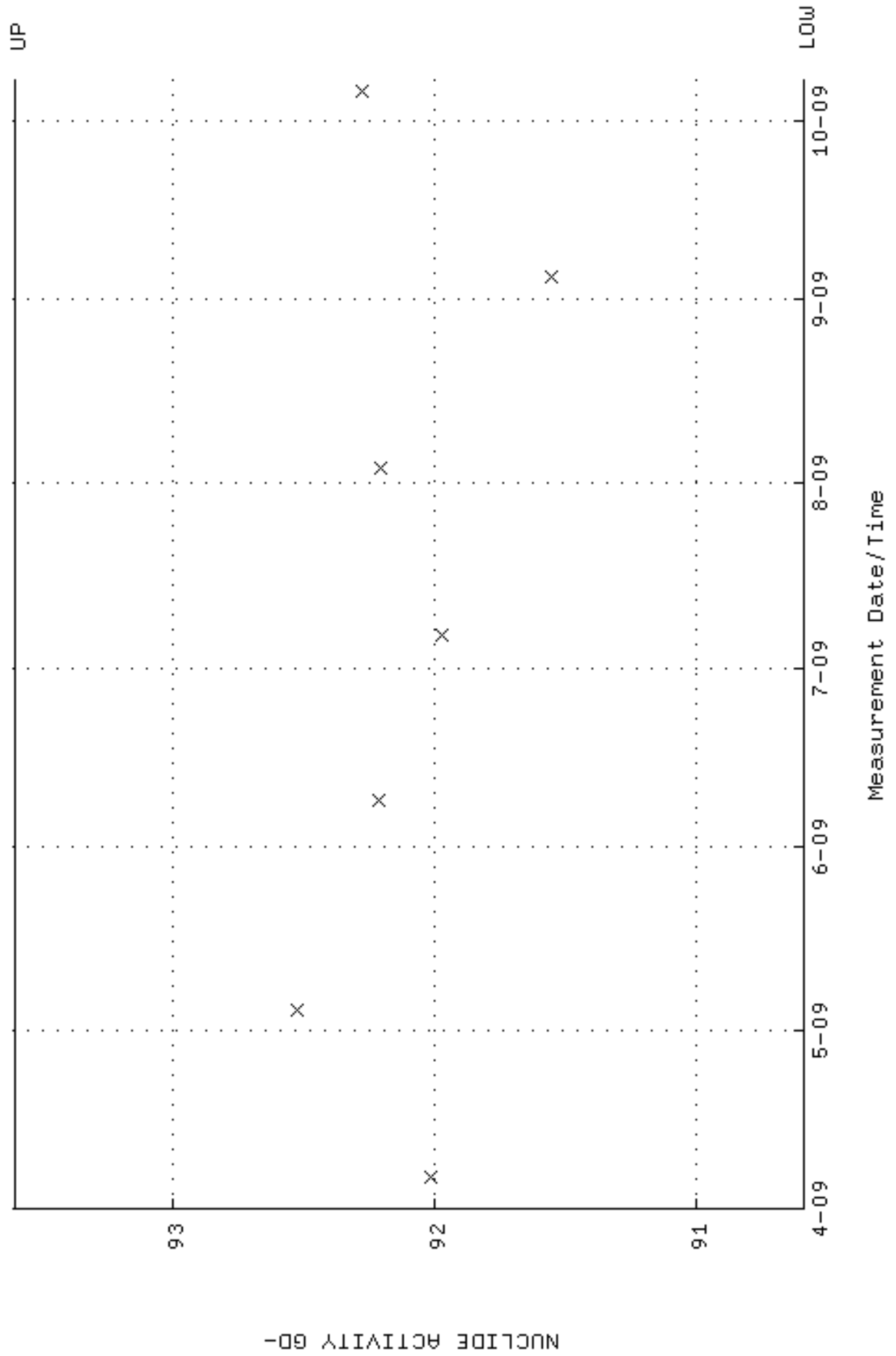


● Denotes Outlier

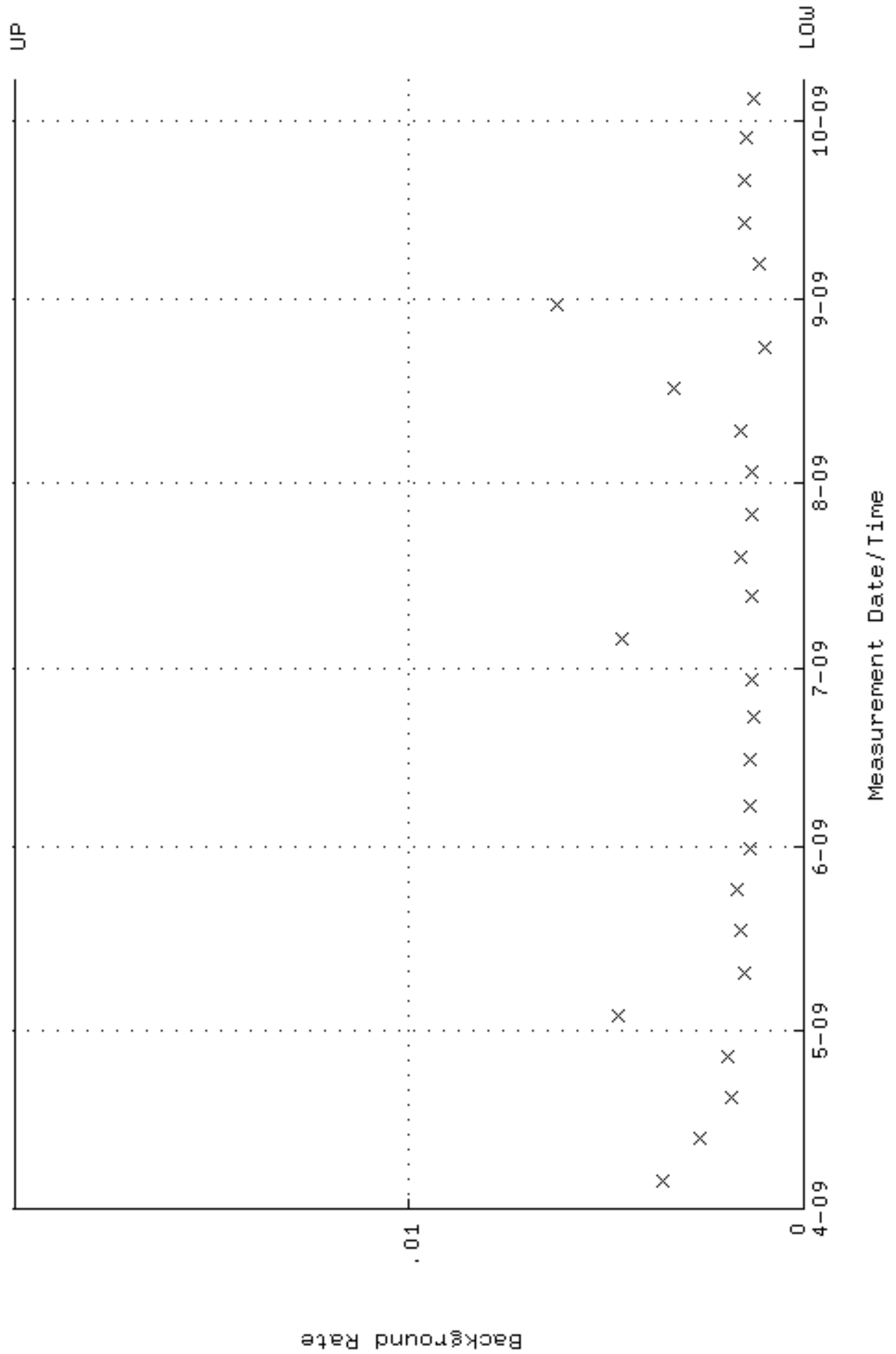
QA filename : DKA100:[ENV_ALPHA.QA.W]W022.QAF;5
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 6-APR-2009 08:44:03 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.309441 through 0.331295



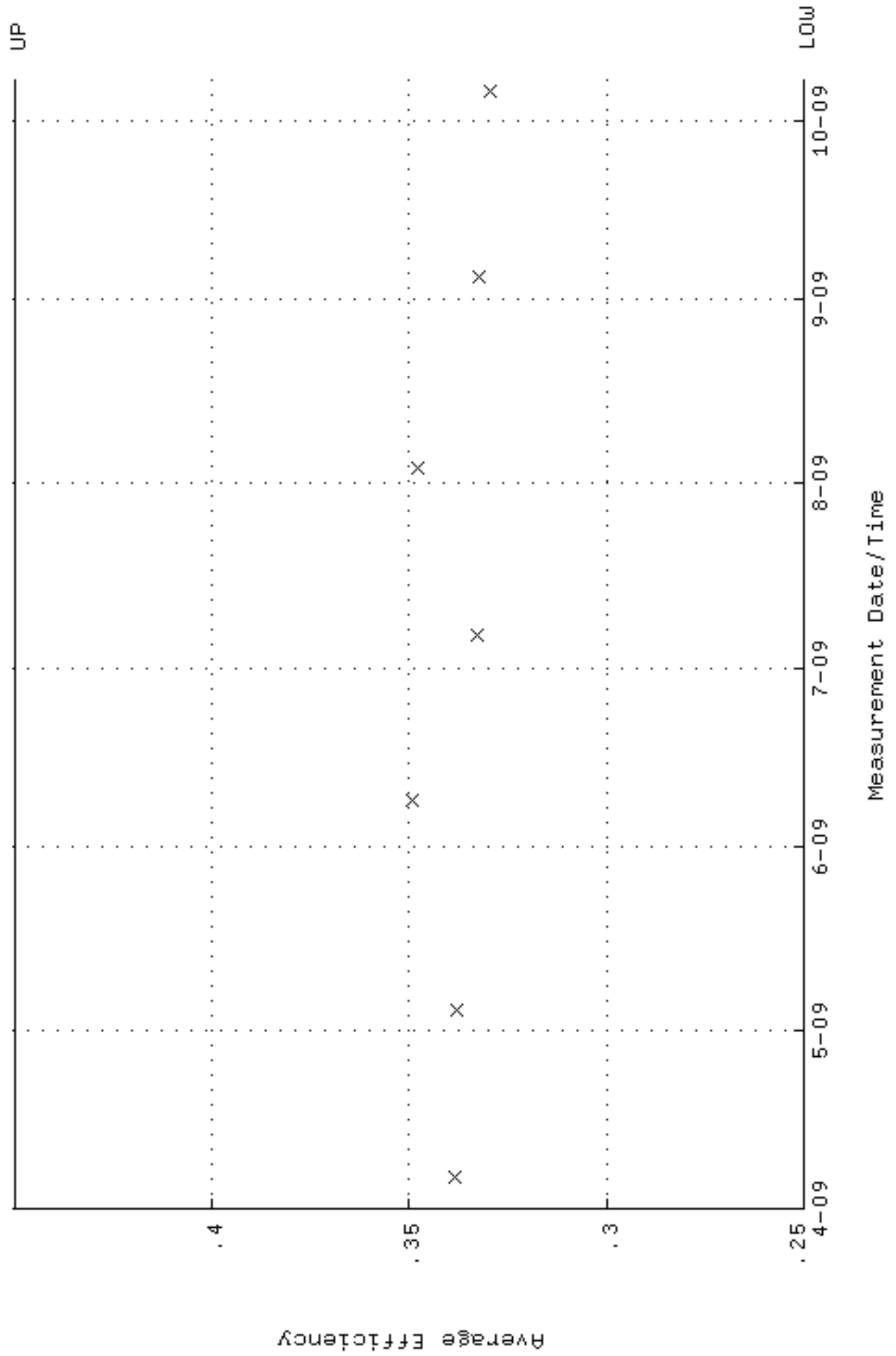
QA filename : DKA100:[ENV_ALPHA.QA.W]w022.QAF;5
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 6-APR-2009 08:44:03 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 90.5909 through 93.6045



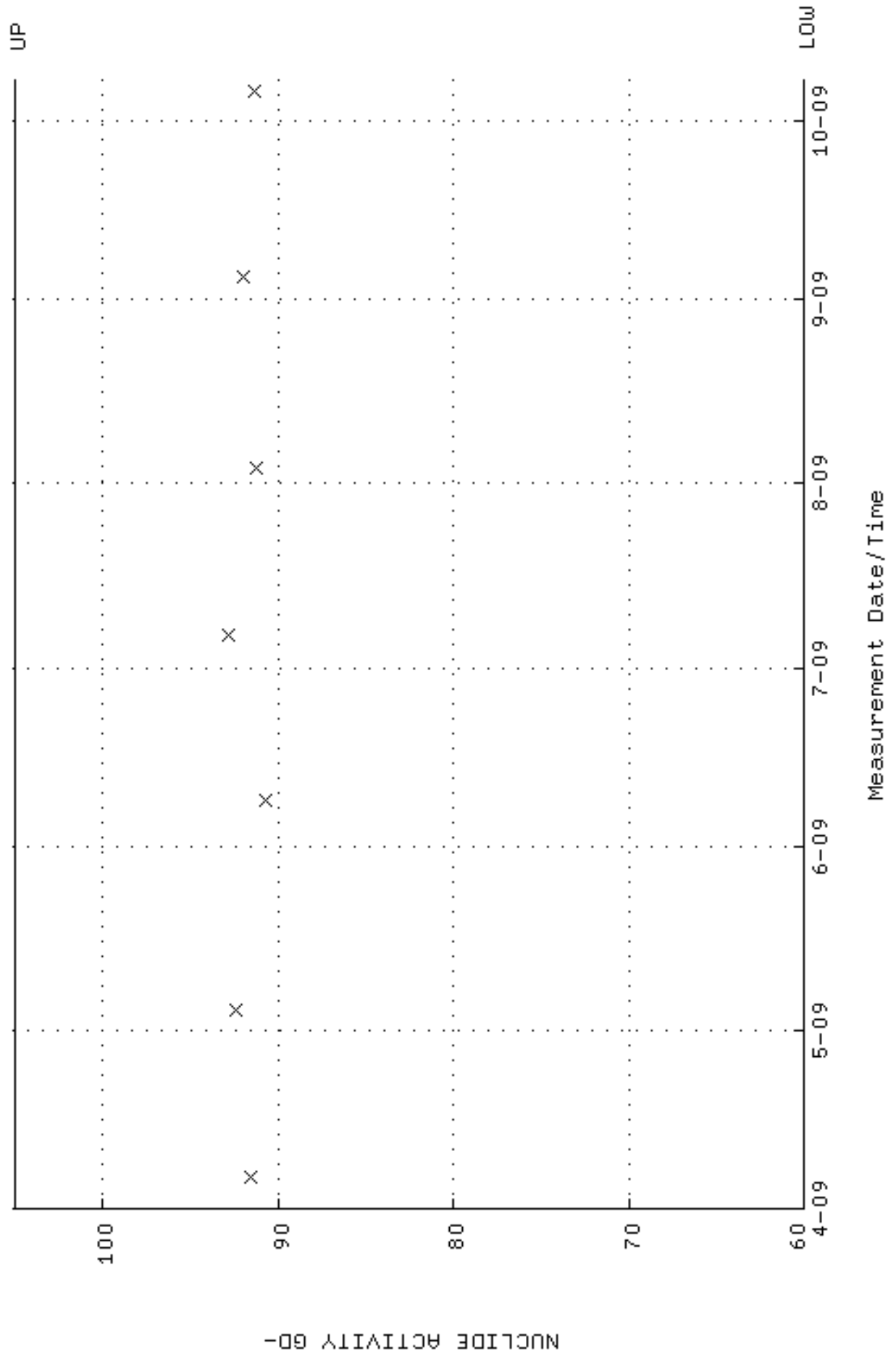
QA filename : DKA100:[ENV_ALPHA.QA.B]B022.QAF;2
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 5-APR-2009 15:33:10 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



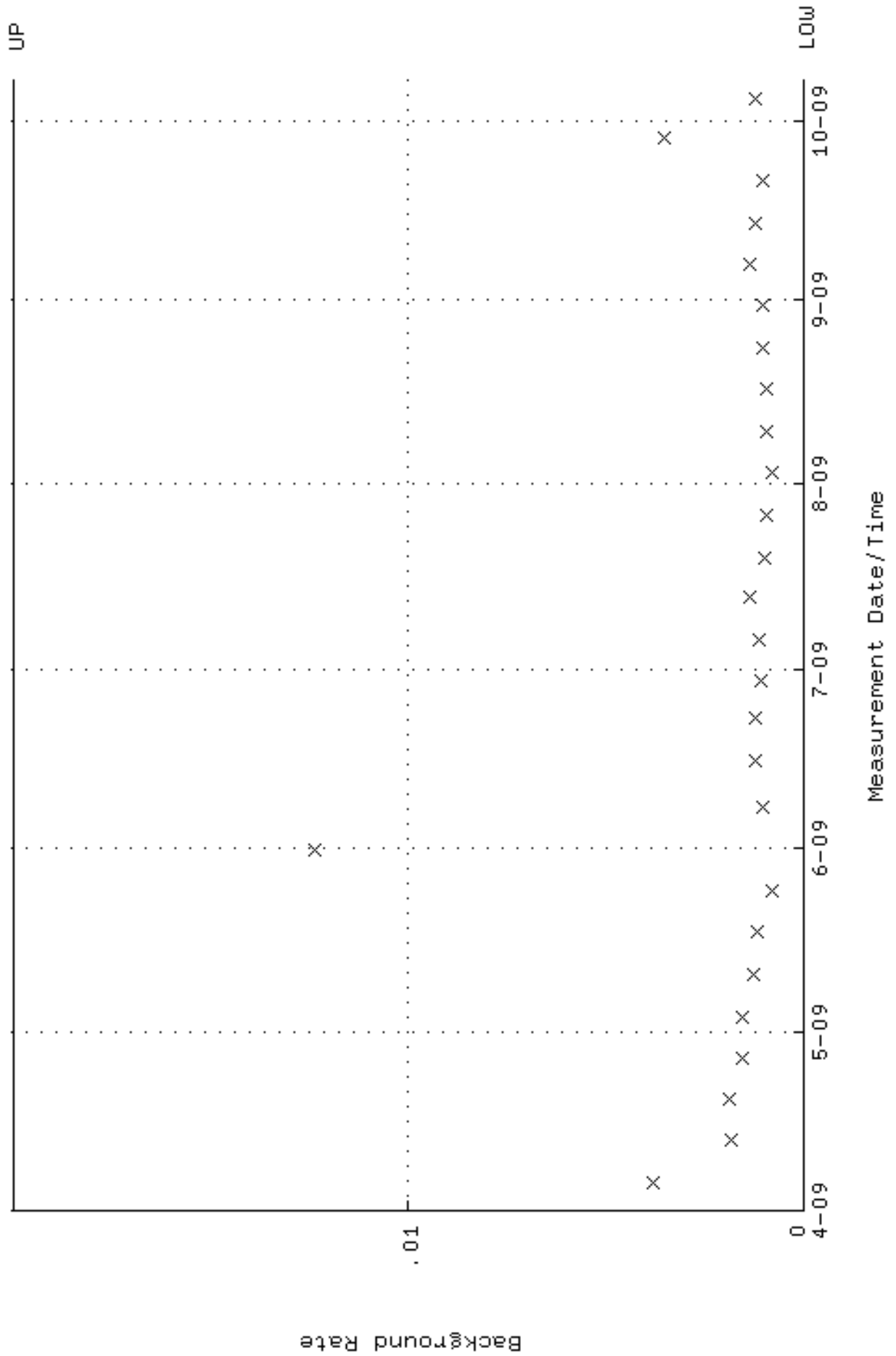
QA filename : DKA100:[ENV_ALPHA.QA.W]W023.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 6-APR-2009 08:44:03 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.250000 through 0.450000



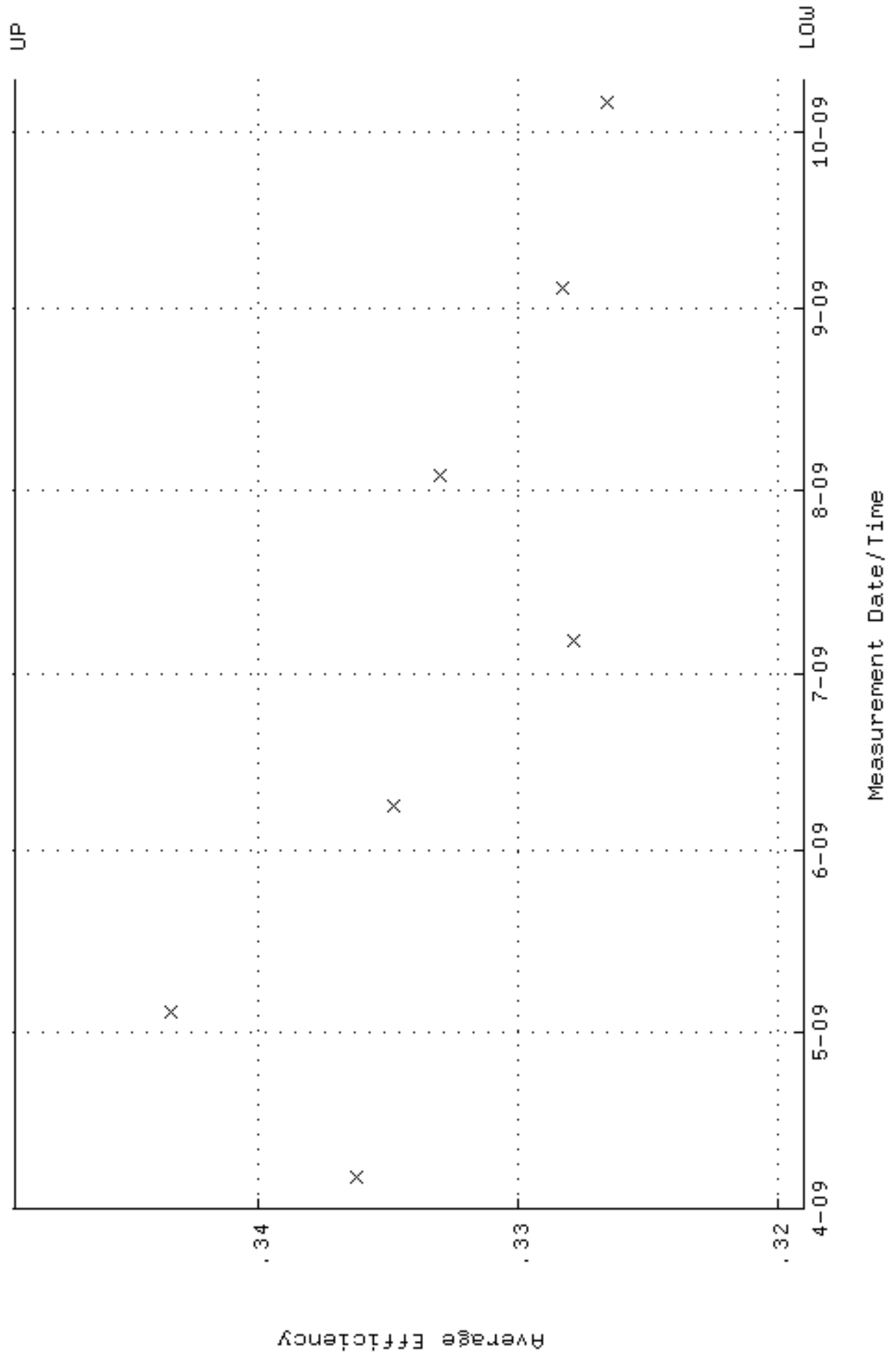
QA filename : DKA100:[ENV_ALPHA.QA.W]W023.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 6-APR-2009 08:44:03 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 60.0000 through 105.0000



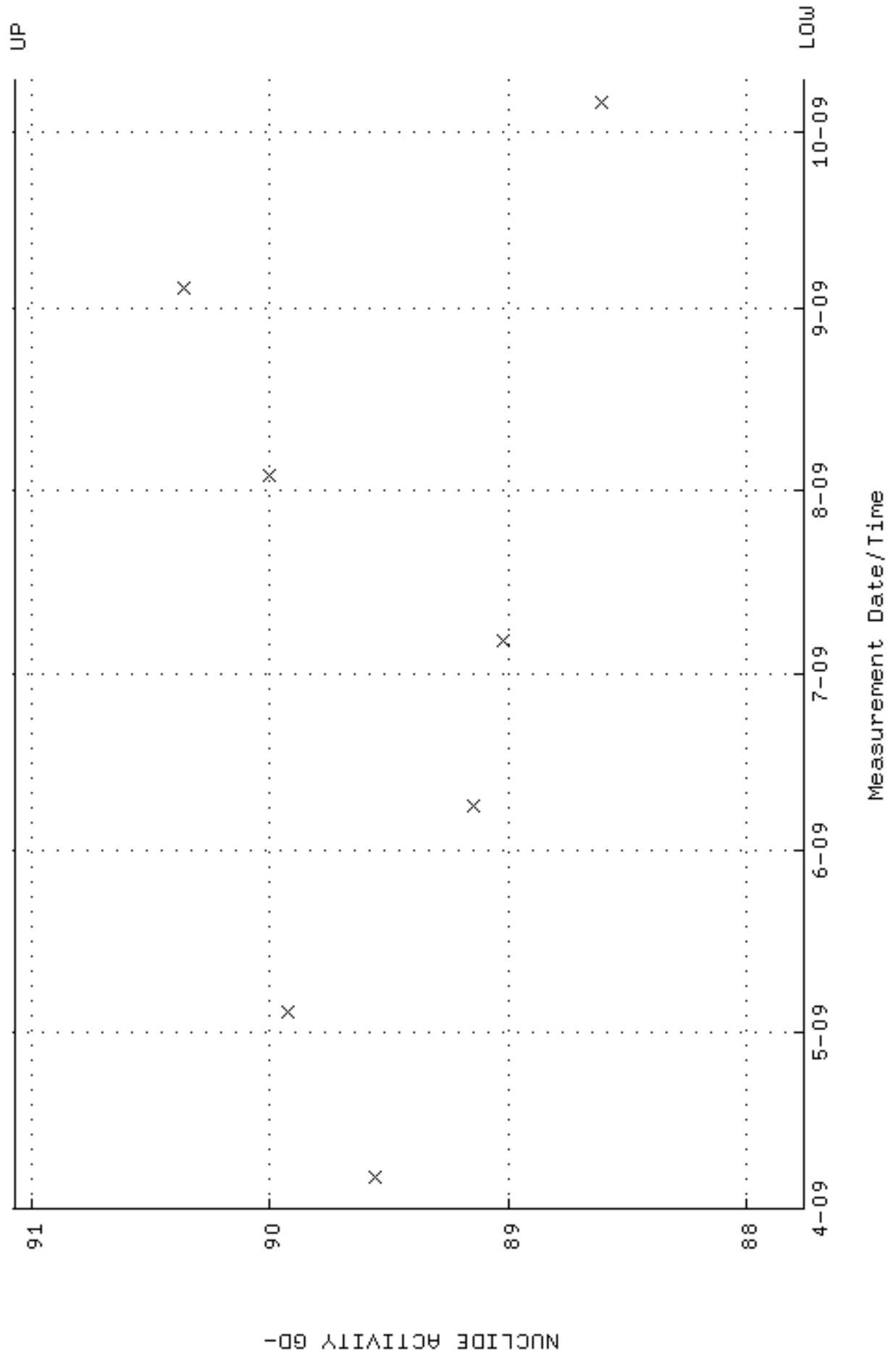
QA filename : DKA100:[ENV_ALPHA.QA.B]B023.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 5-APR-2009 15:33:10 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



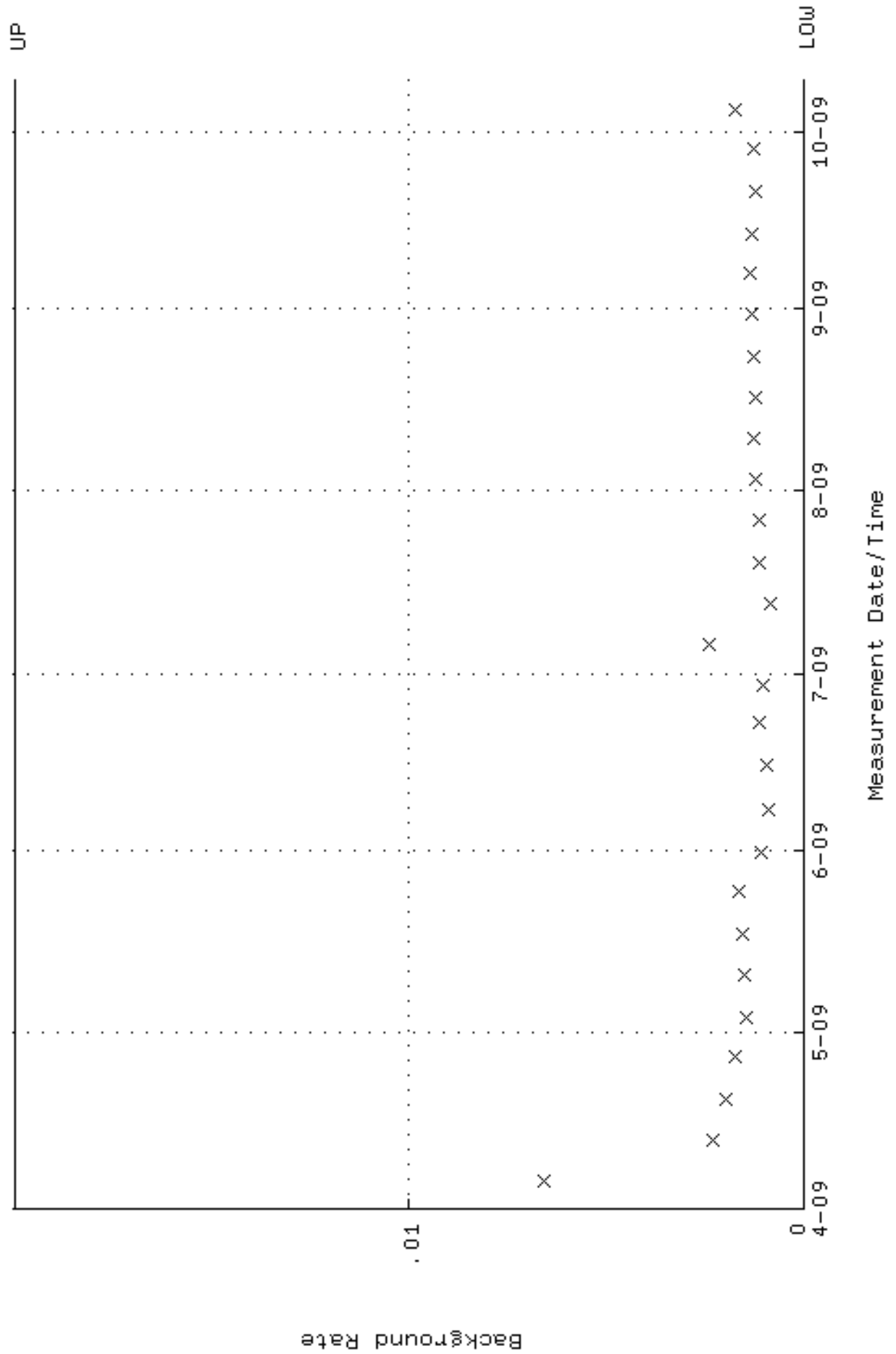
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;2
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 6-APR-2009 08:44:03 through 9-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.319004 through 0.349372



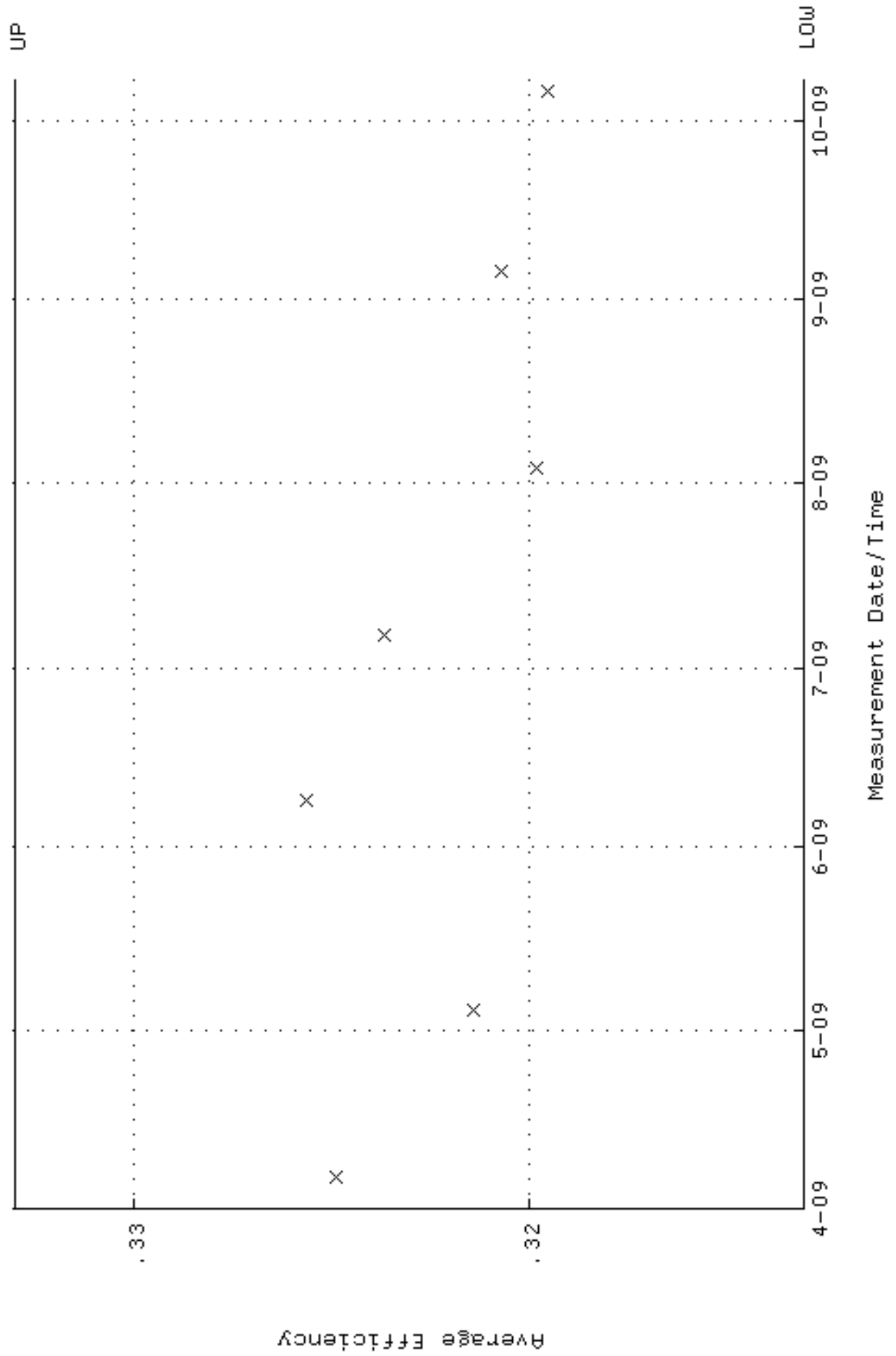
QA filename : DKA100:[ENV_ALPHA.QA.W]W024.QAF;2
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 6-APR-2009 08:44:03 through 9-OCT-2009 12:00:00
 Lower/Upper Lmts: 87.7616 through 91.0672



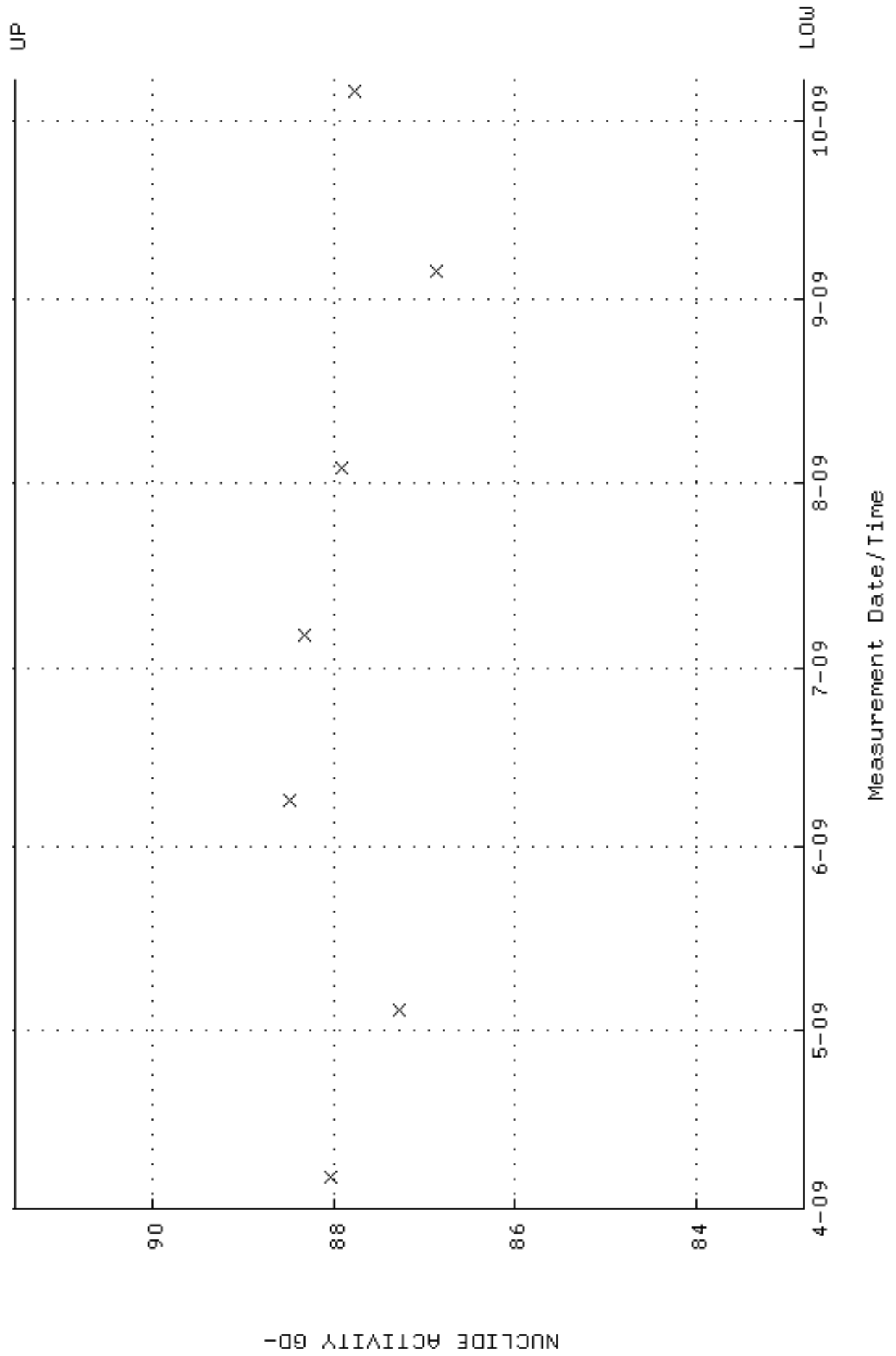
QA filename : DKA100:[ENV_ALPHA.QA.B]B024.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 5-APR-2009 15:33:10 through 9-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



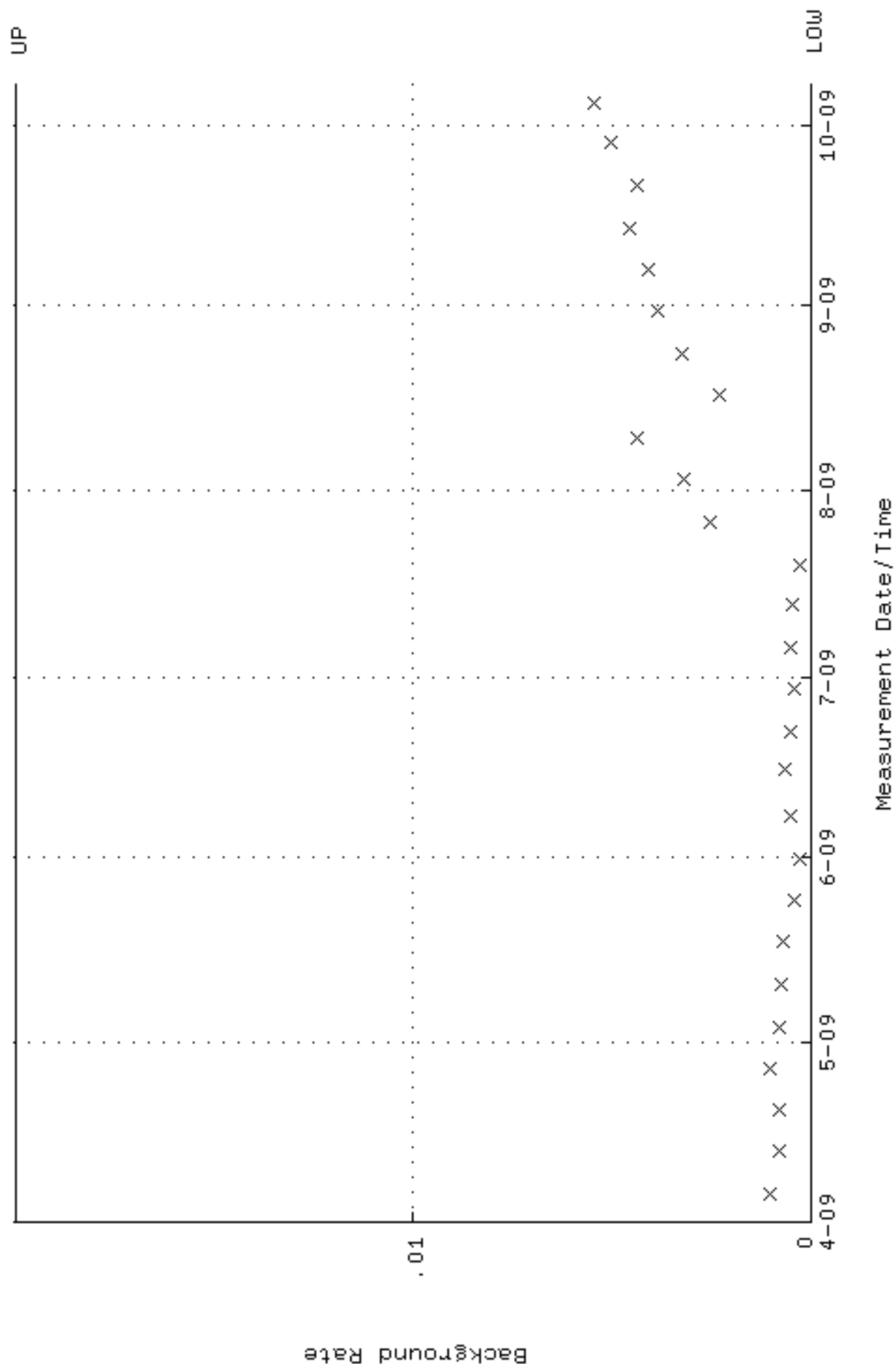
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;3
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 6-APR-2009 08:44:06 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.313016 through 0.333016



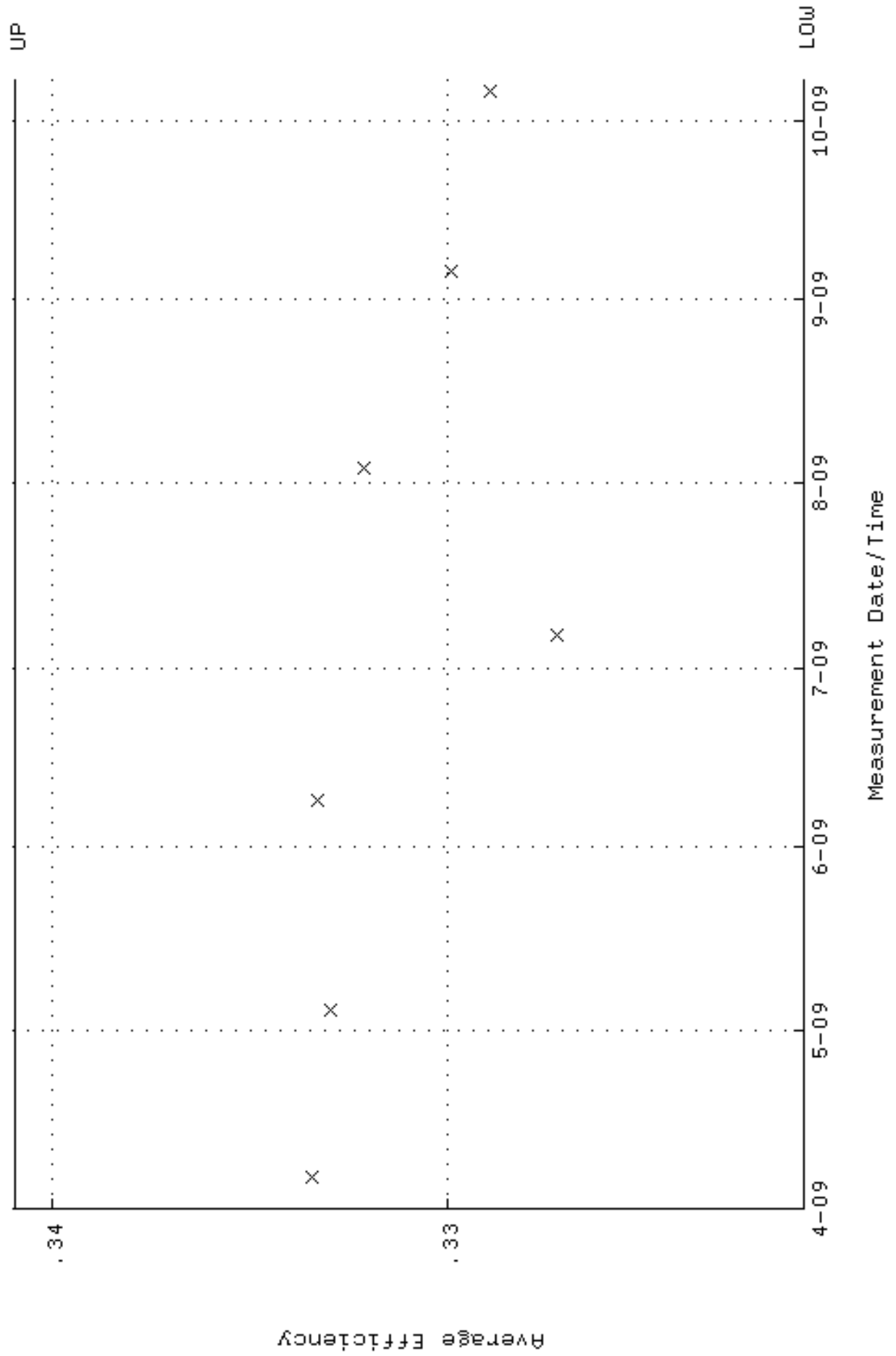
QA filename : DKA100:[ENV_ALPHA.QA.W]W040.QAF;3
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 6-APR-2009 08:44:06 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 82.8065 through 91.5229



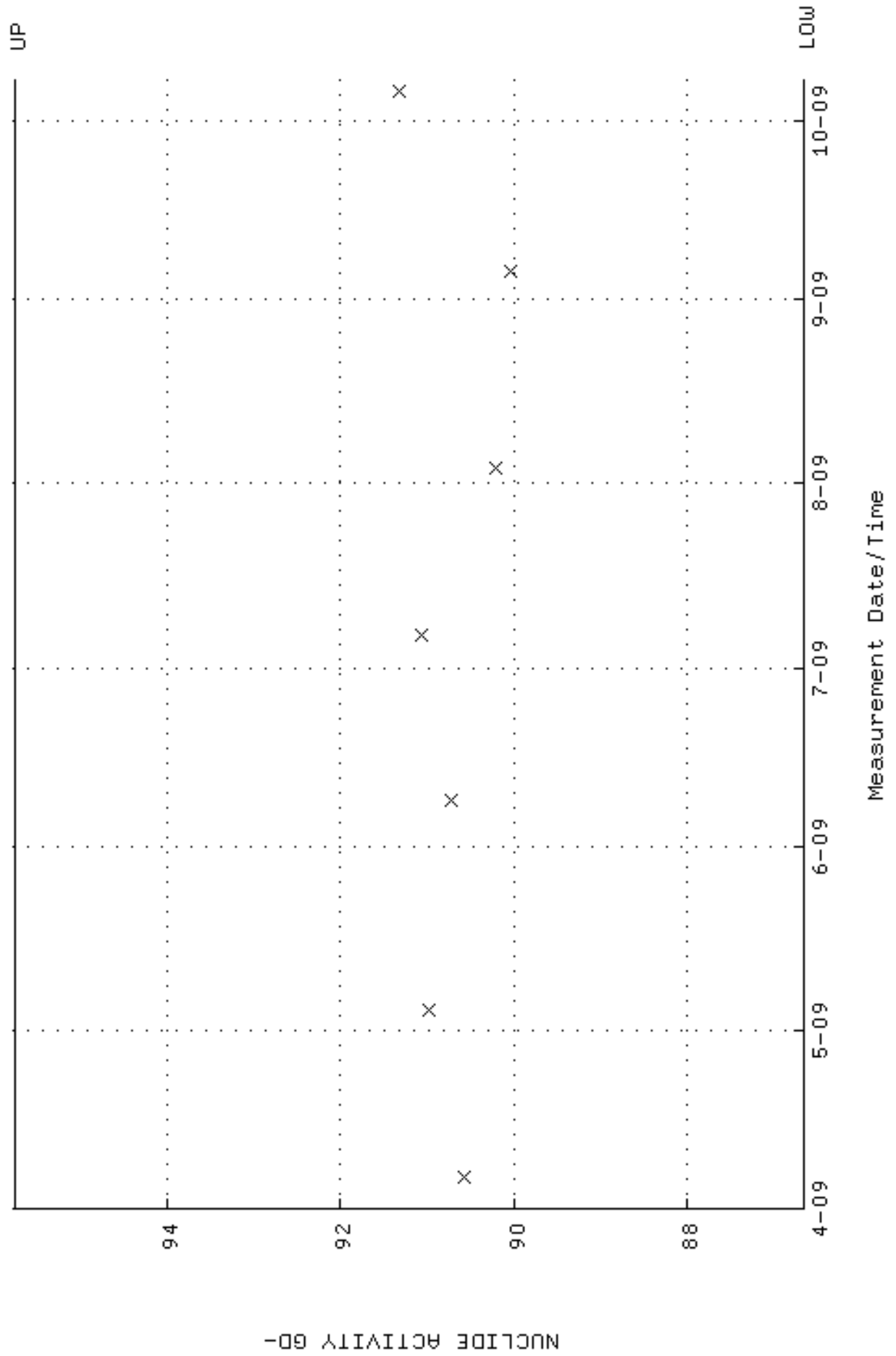
QA filename : DKA100:[ENV_ALPHA.QA.B]B040.QAF;1
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 5-APR-2009 15:33:13 through 7-OCT-2009 12:00:00
Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



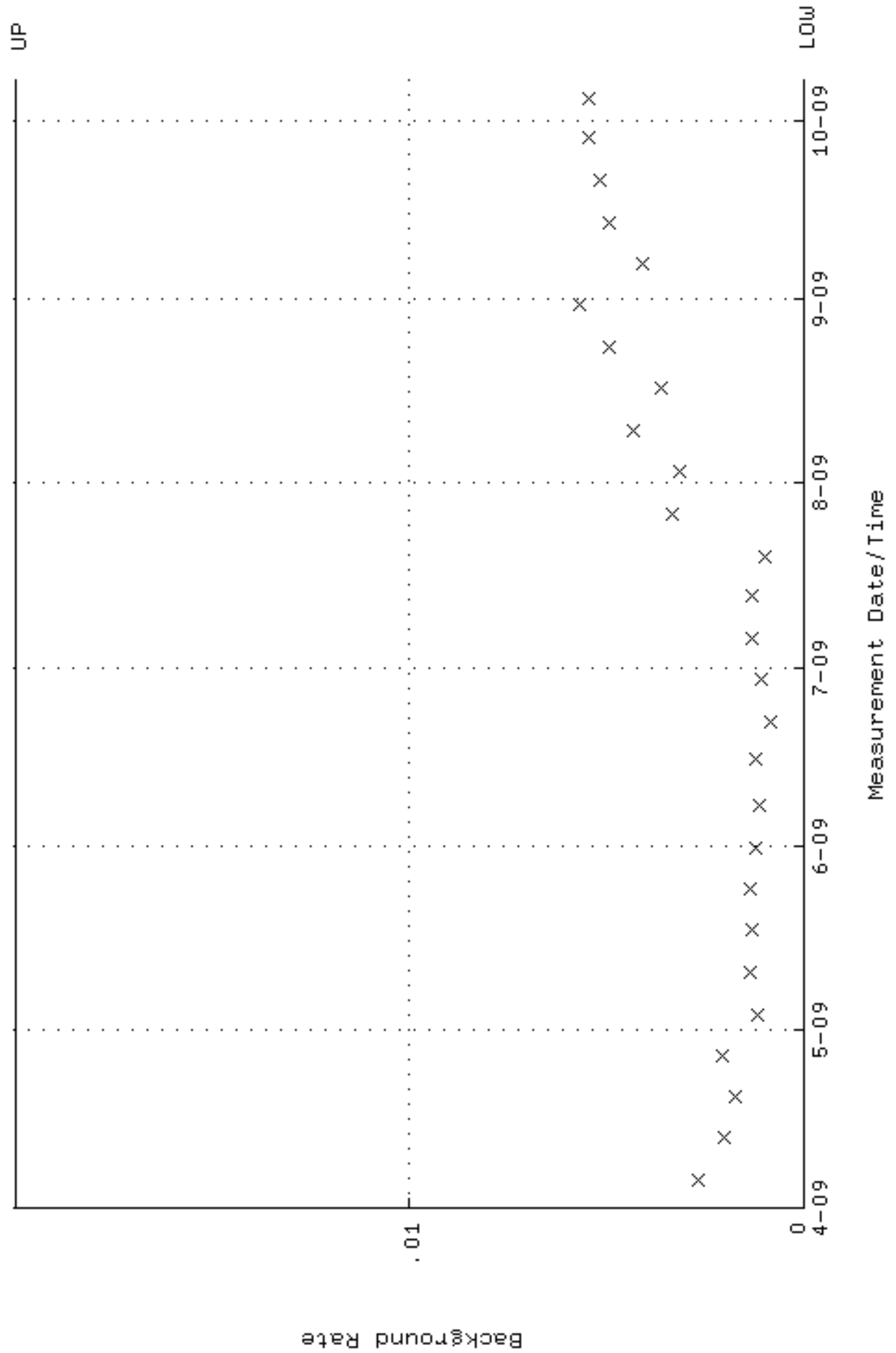
QA filename : DKA100:[ENV_ALPHA.QA.W]W041.QAF;5
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 6-APR-2009 08:44:06 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.320943 through 0.340943



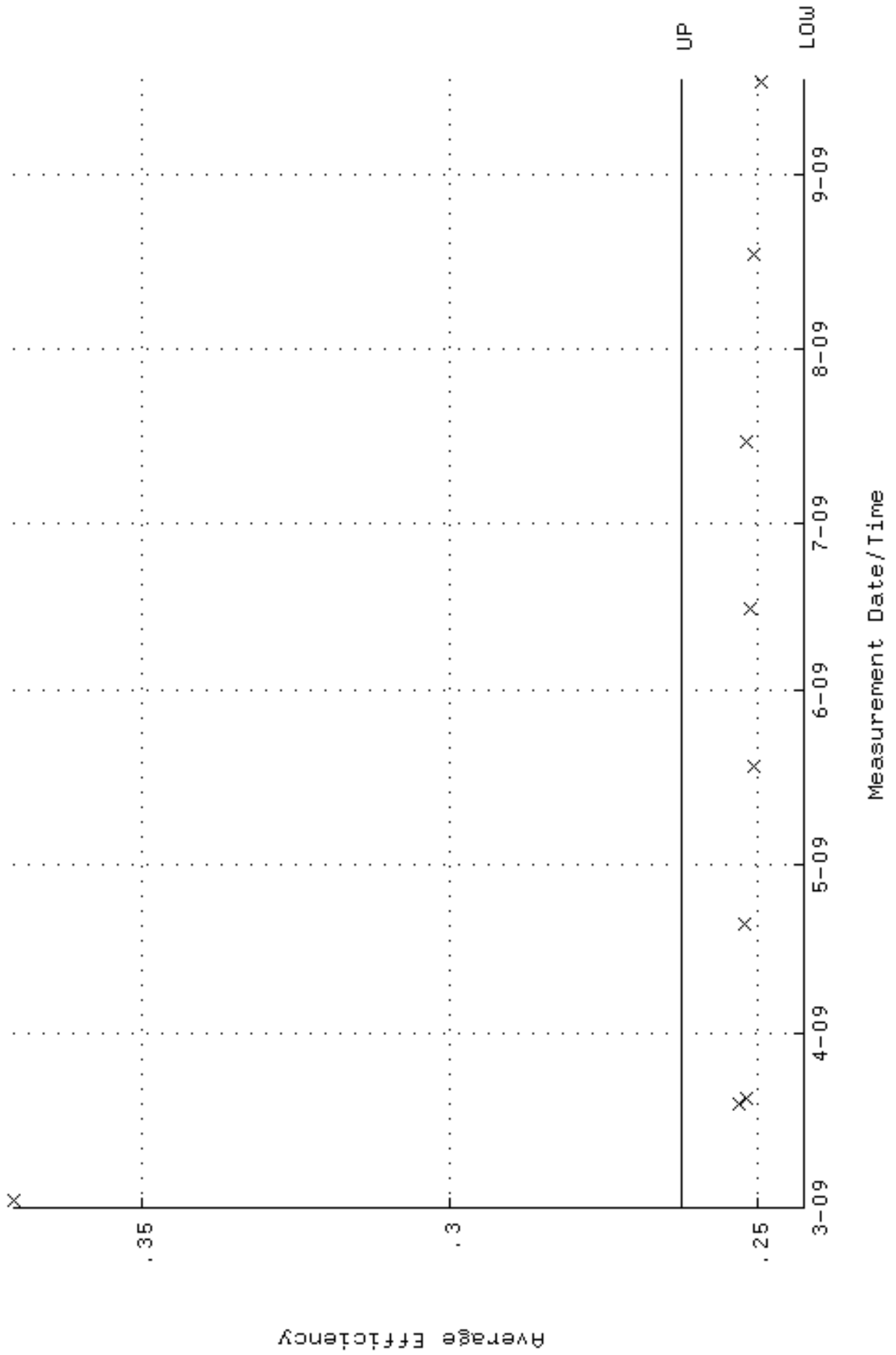
QA filename : DKA100:[ENV_ALPHA.QA.W]w041.QAF;5
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 6-APR-2009 08:44:06 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 86.6435 through 95.7639



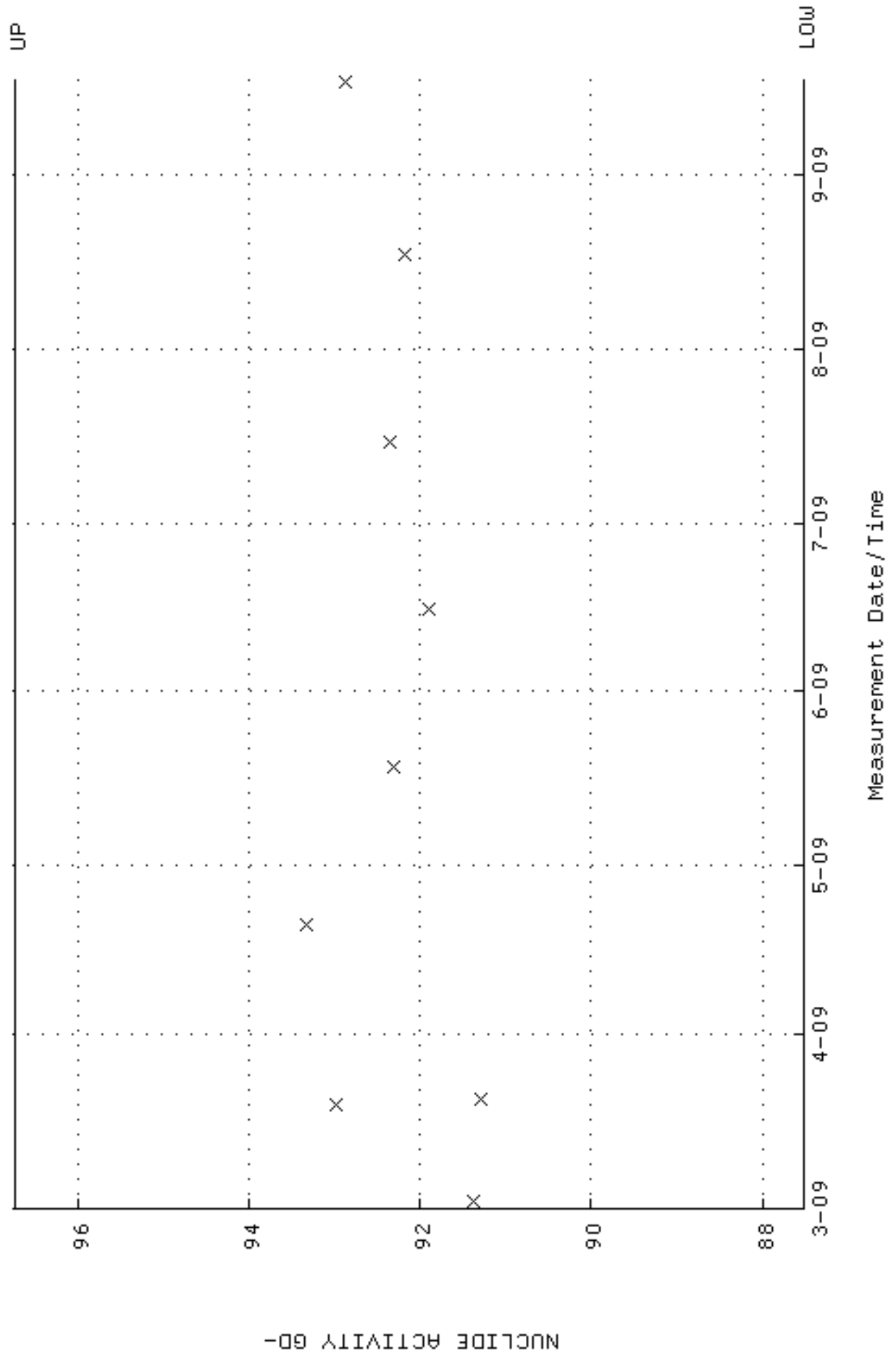
QA filename : DKA100:[ENV_ALPHA.QA.B]B041.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 5-APR-2009 15:33:13 through 7-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 2.000000E-02



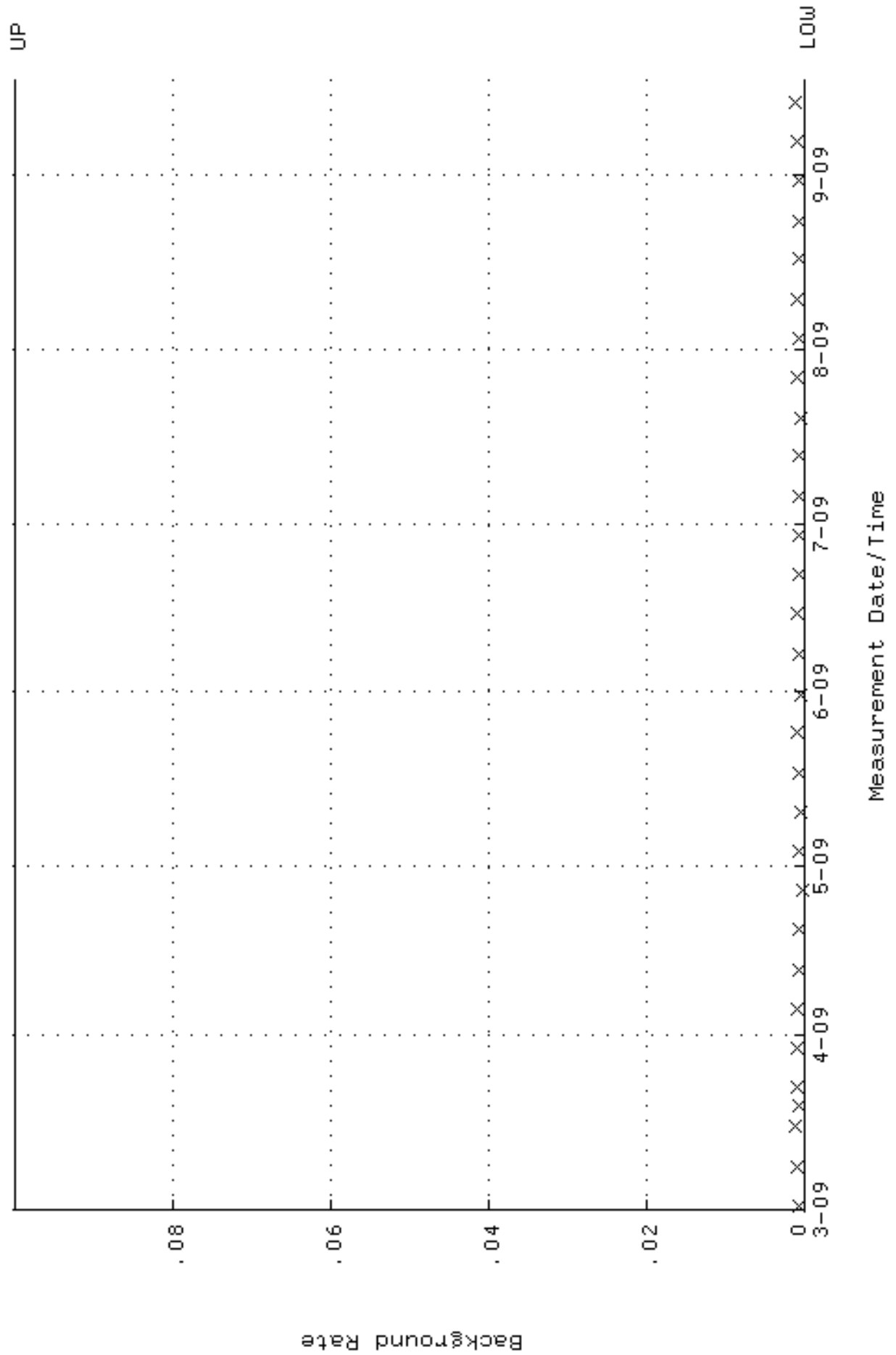
QA filename : DKA100:[ENV_ALPHA.QA.W]W113.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:07:45 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242598 through 0.262598



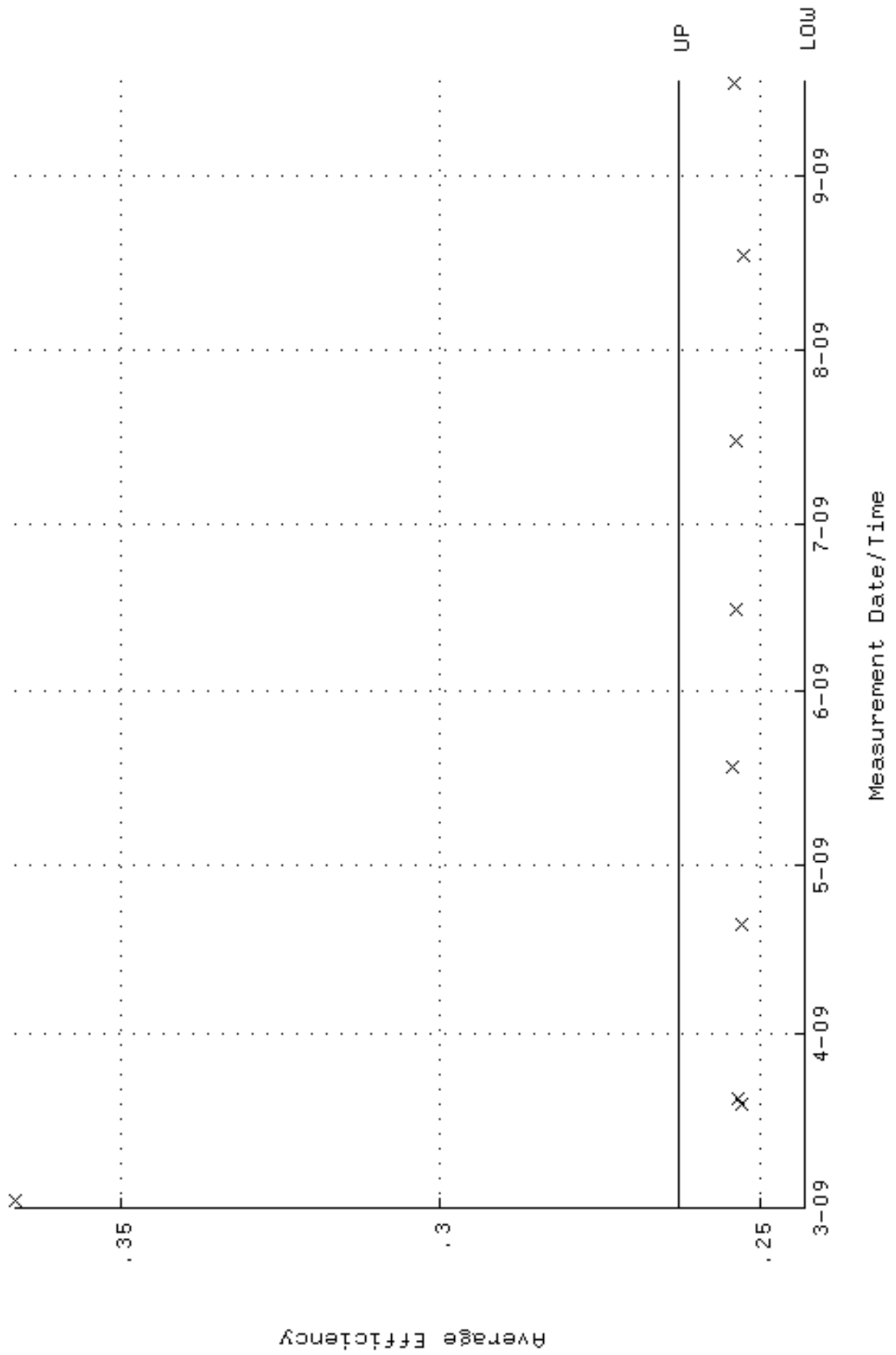
QA filename : DKA100:[ENV_ALPHA.QA.W]w113.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:07:45 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.5172 through 96.7296



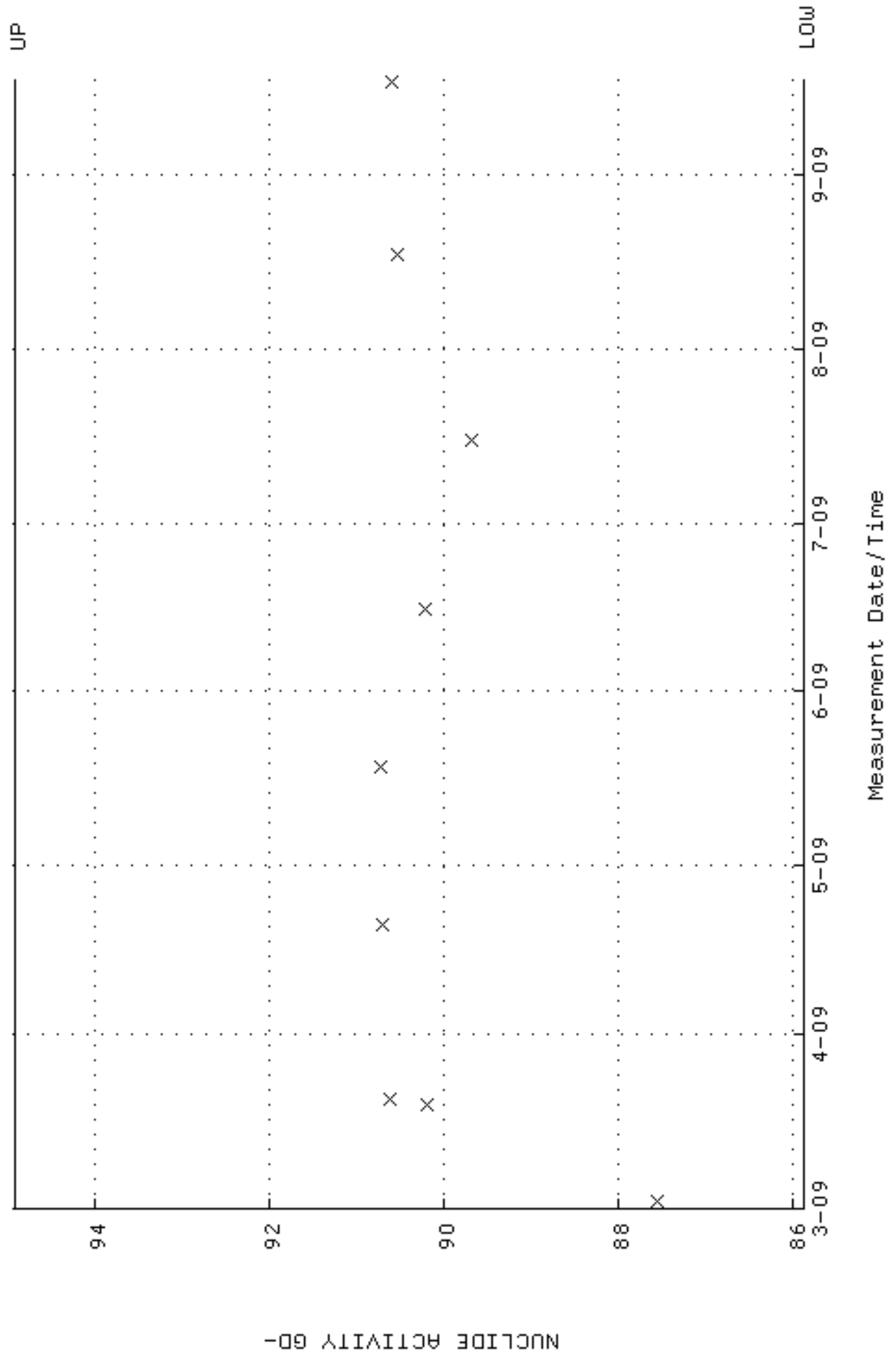
QA filename : DKA100:[ENV_ALPHA.QA.B]B113.QAF;2
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:17:42 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



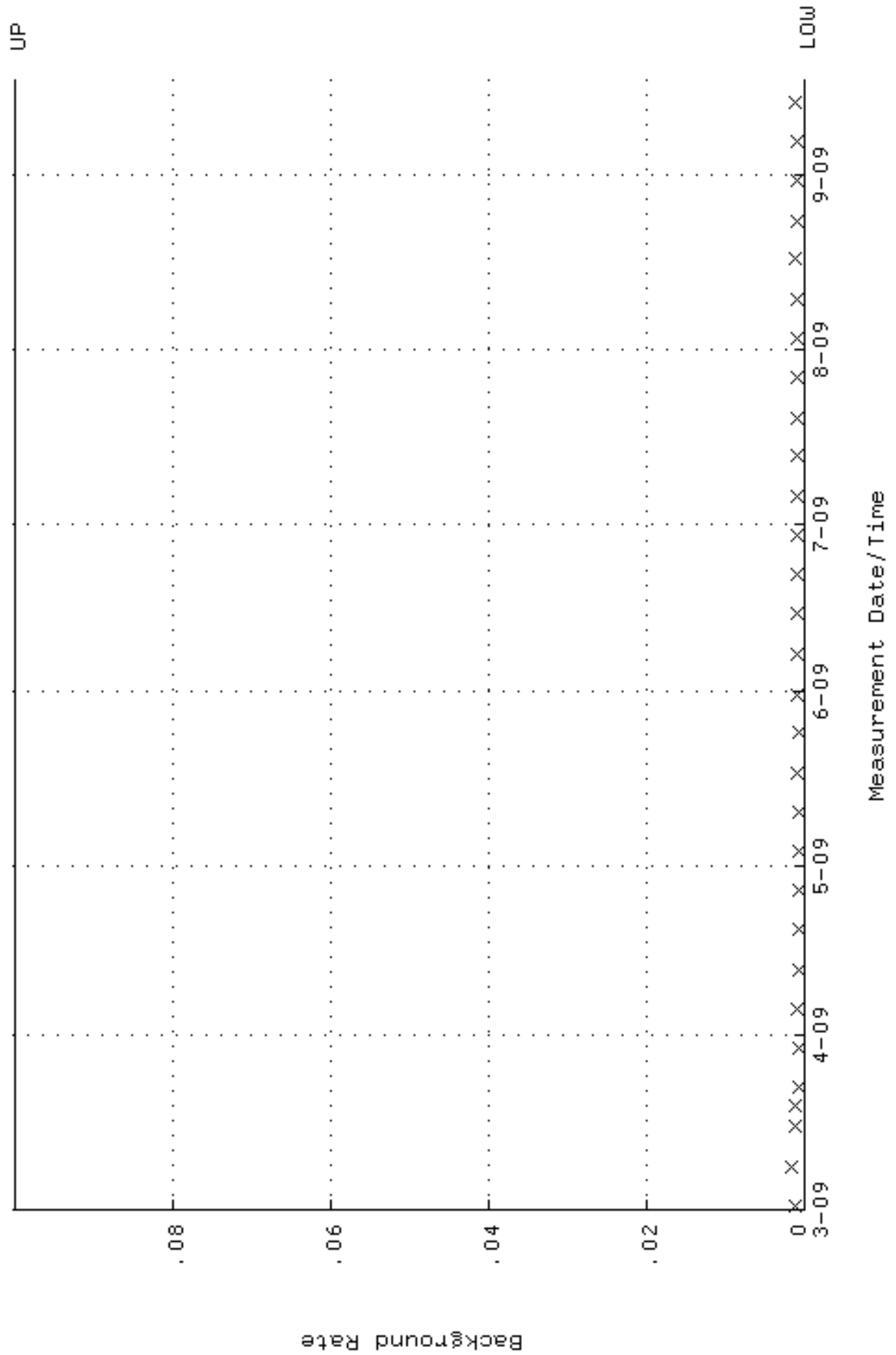
QA filename : DKA100:[ENV_ALPHA.QA.W]W117.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:08:13 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242940 through 0.262940



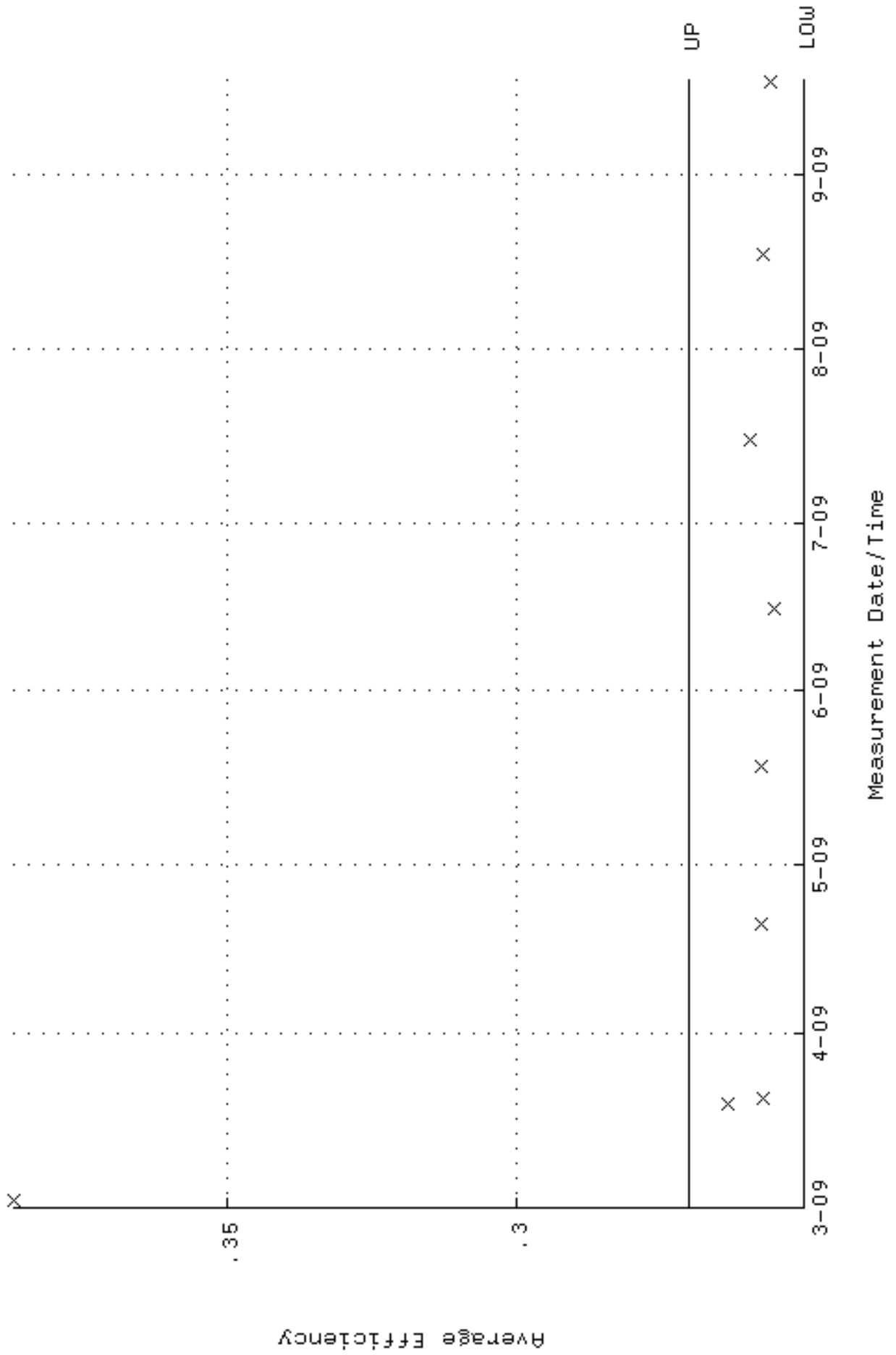
QA filename : DKA100:[ENV_ALPHA.QA.W]w117.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:08:13 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 85.8693 through 94.9081



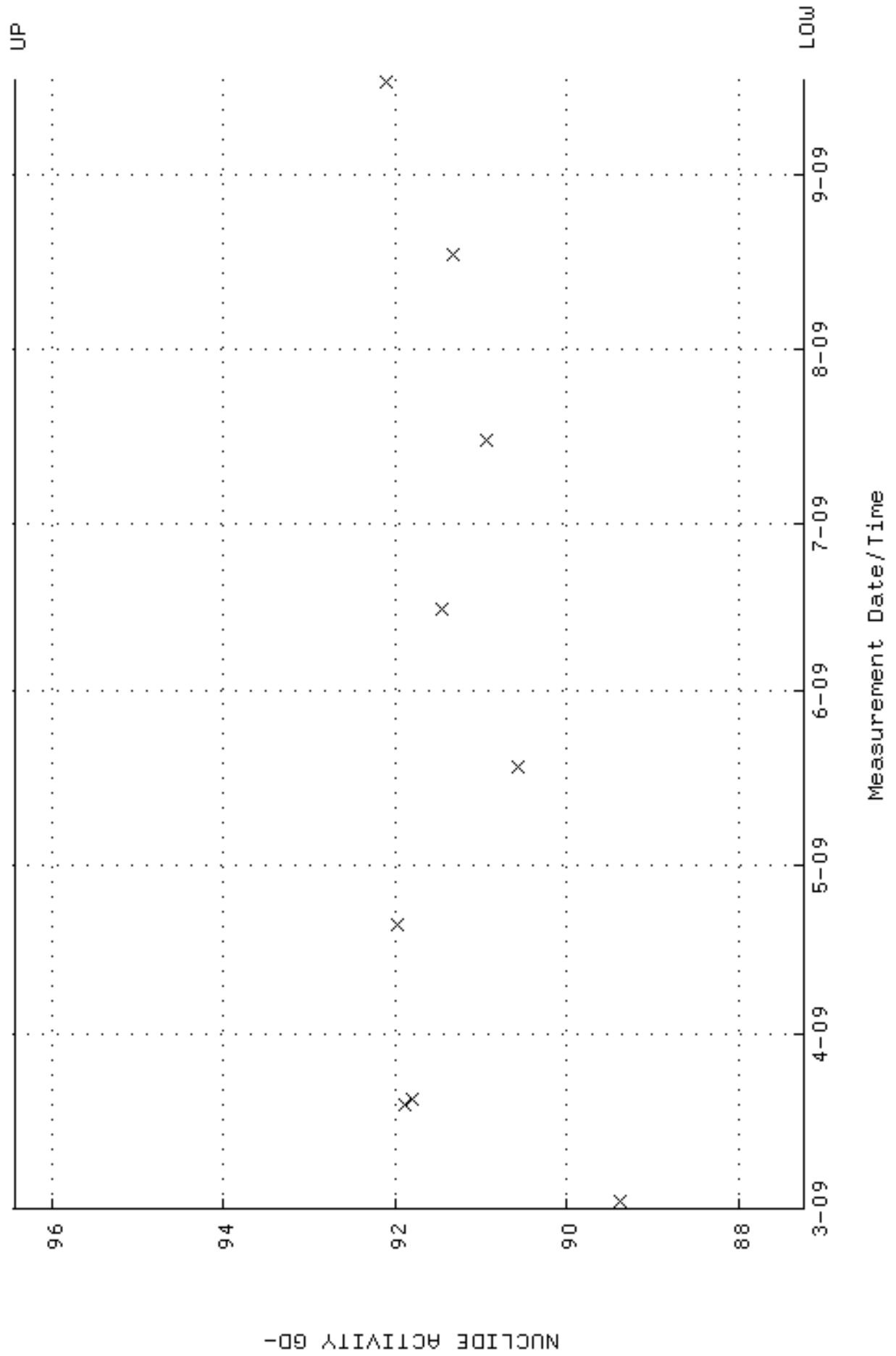
QA filename : DKA100:[ENV_ALPHA.QA.B]B117.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:18:05 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



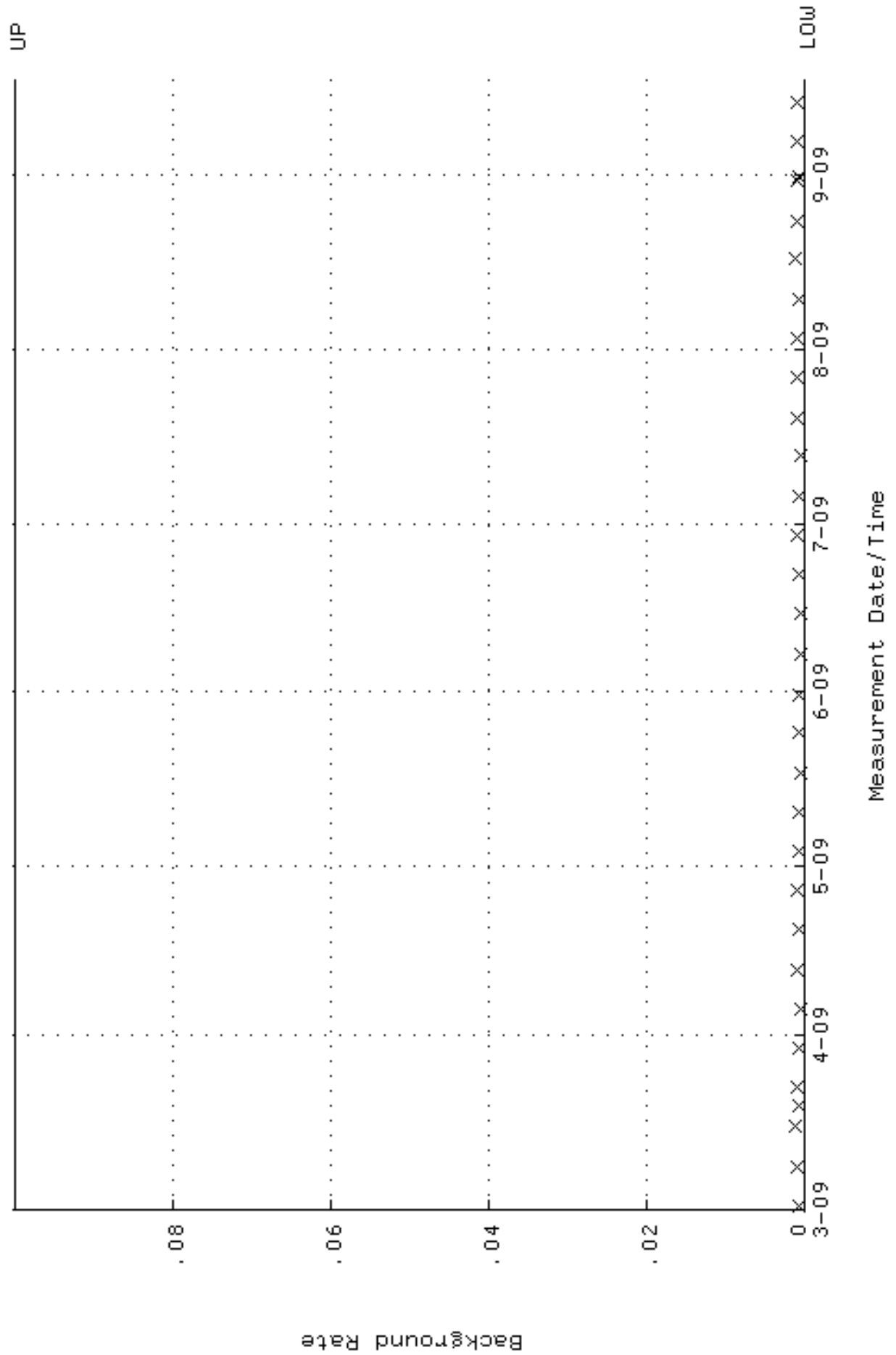
QA filename : DKA100:[ENV_ALPHA.QA.W]w118.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:08:21 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.250490 through 0.270490



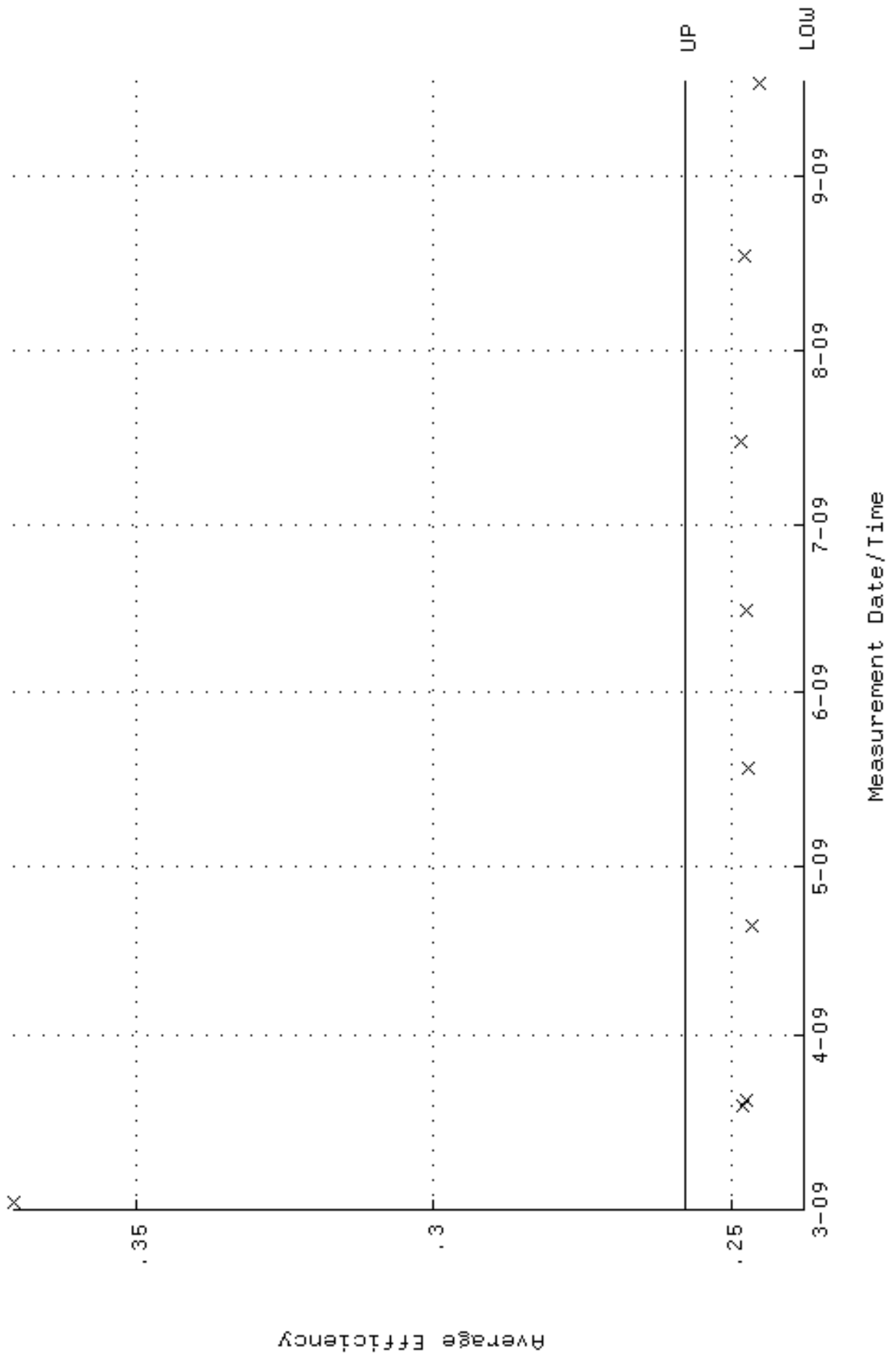
QA filename : DKA100:[ENV_ALPHA.QA.W]w118.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:08:21 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.2440 through 96.4276



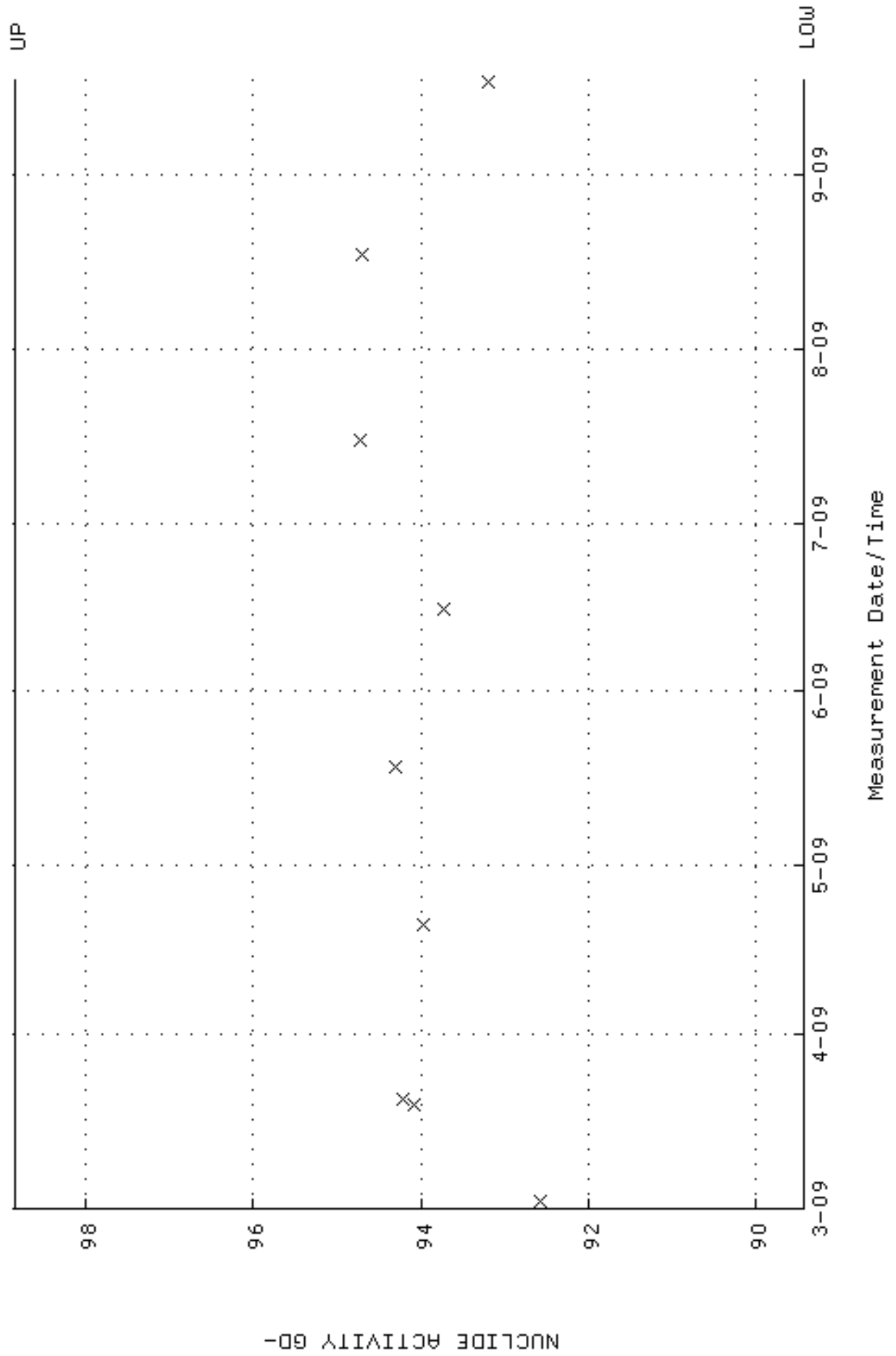
QA filename : DKA100:[ENV_ALPHA.QA.B]B118.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:18:09 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



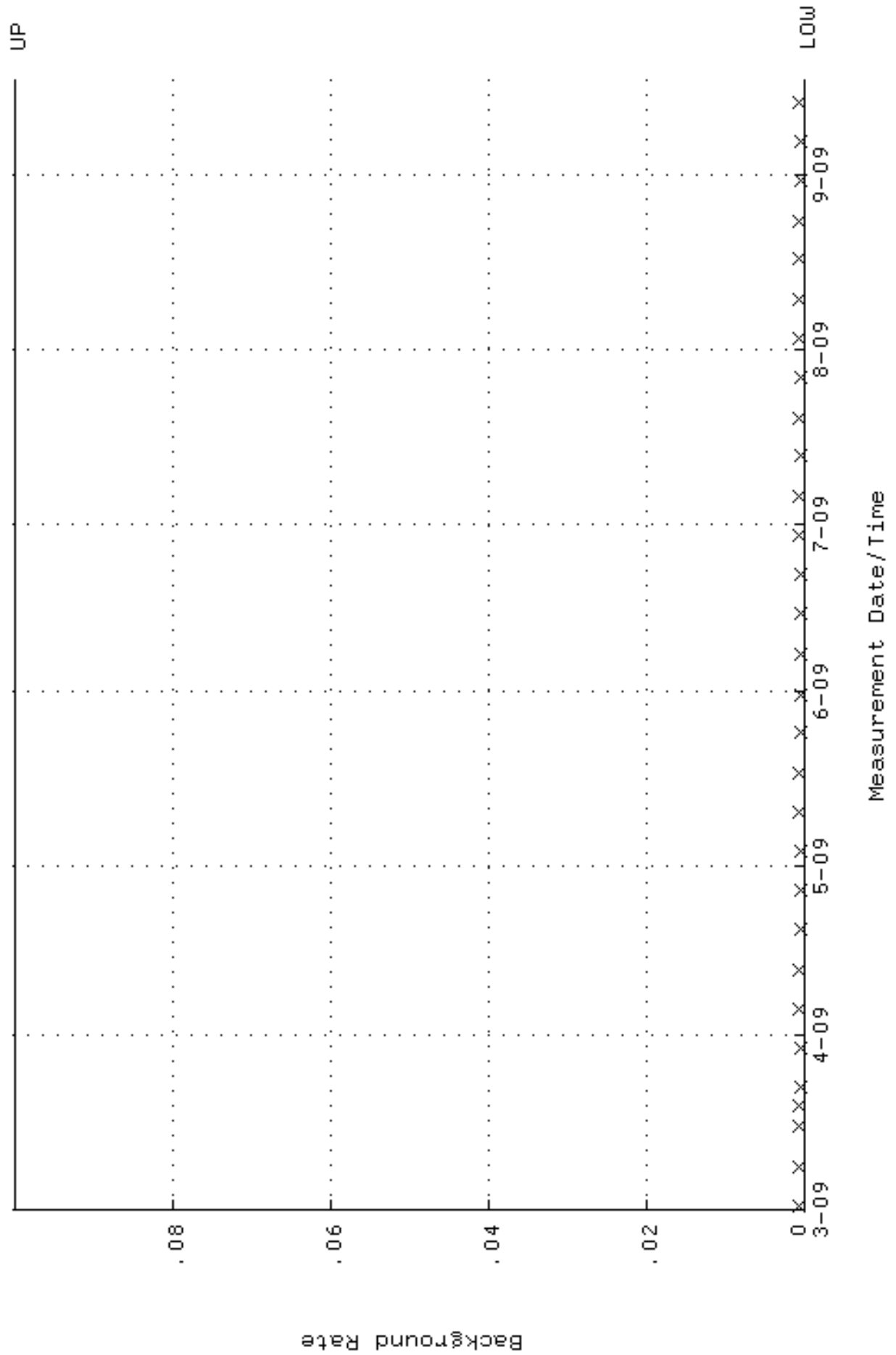
QA filename : DKA100:[ENV_ALPHA.QA.W]W121.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:08:28 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.237686 through 0.257686



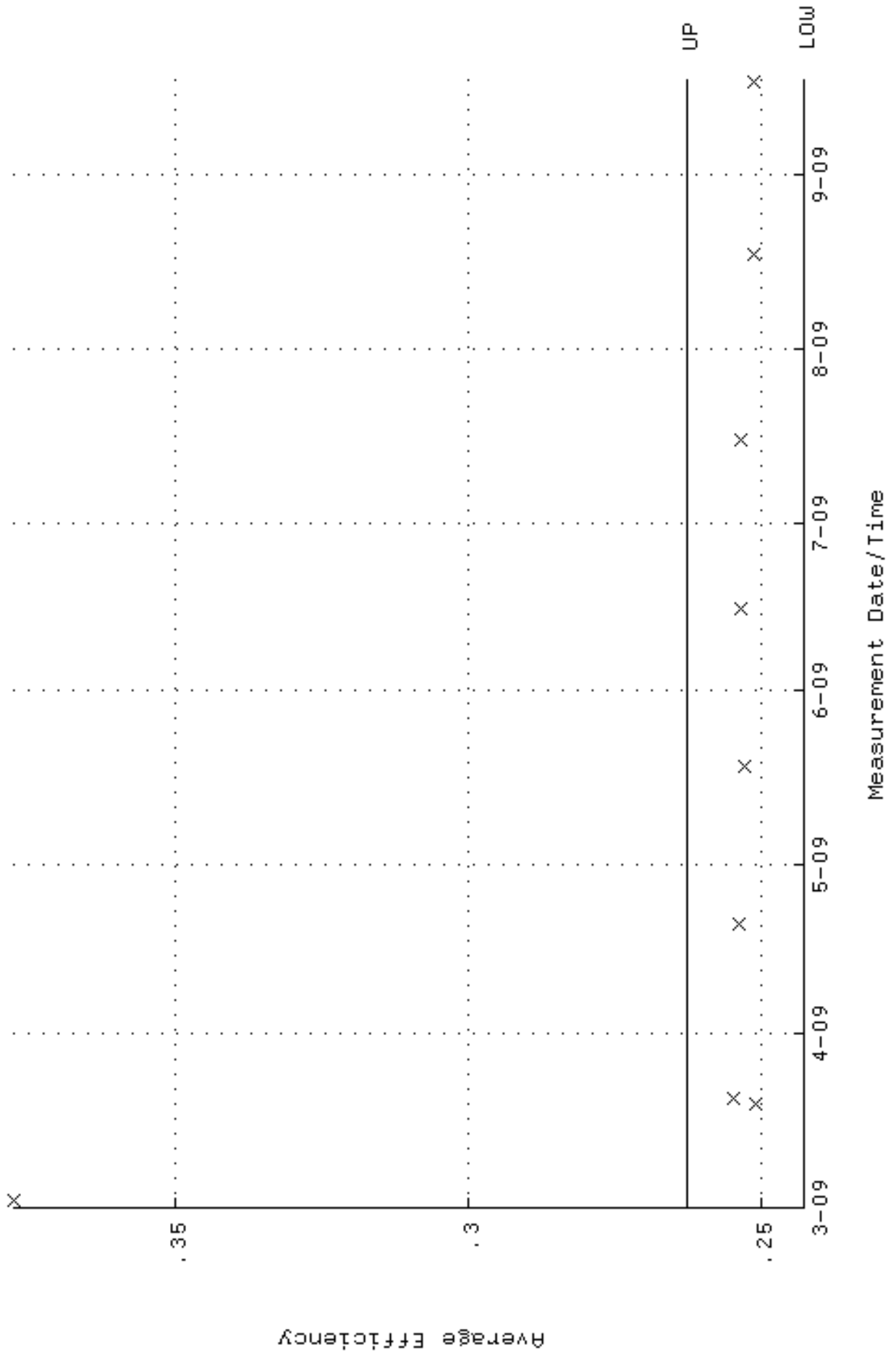
QA filename : DKA100:[ENV_ALPHA.QA.W]w121.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:08:28 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 89.4263 through 98.8395



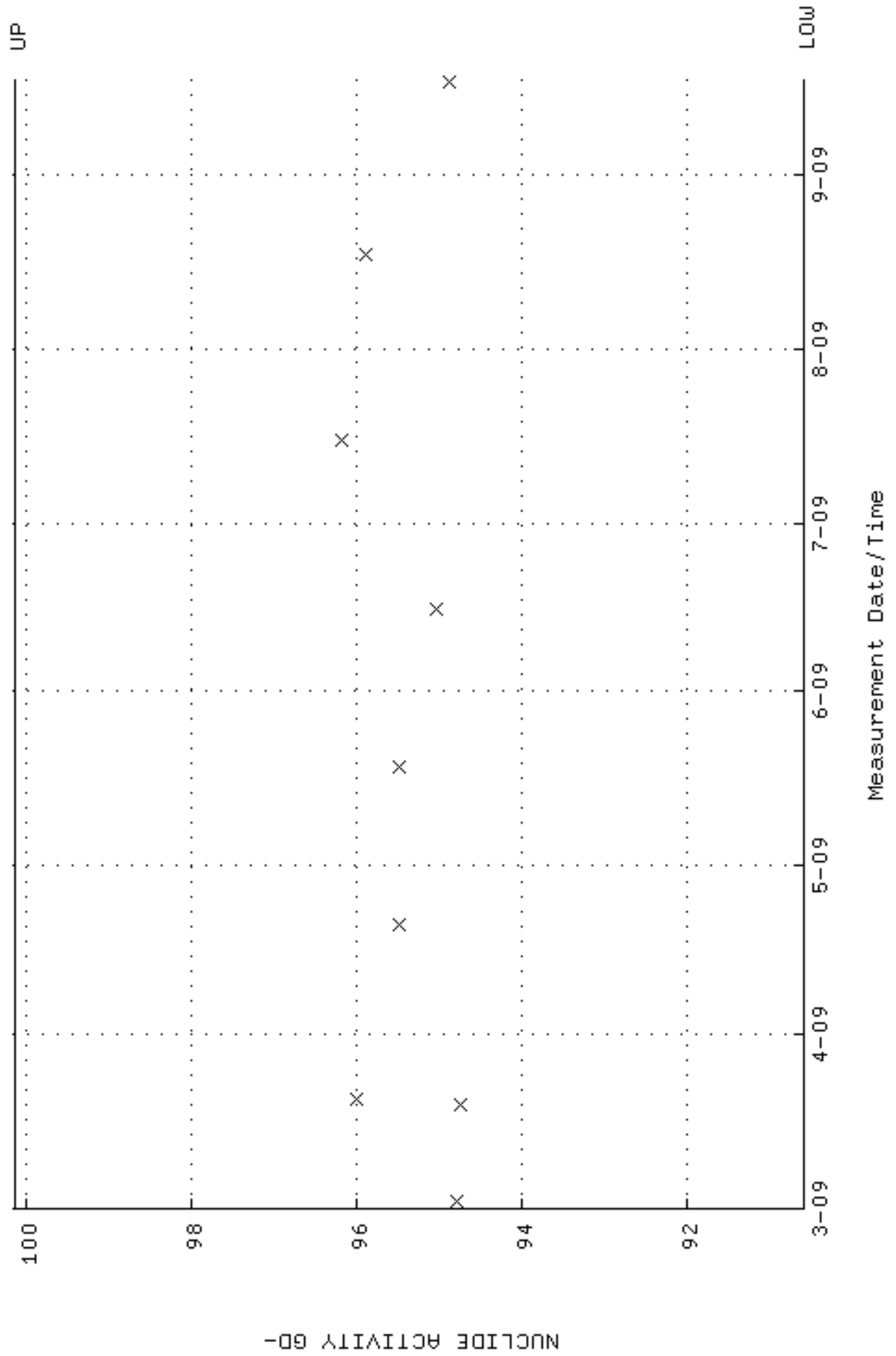
QA filename : DKA100:[ENV_ALPHA.QA.B]B121.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:18:21 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



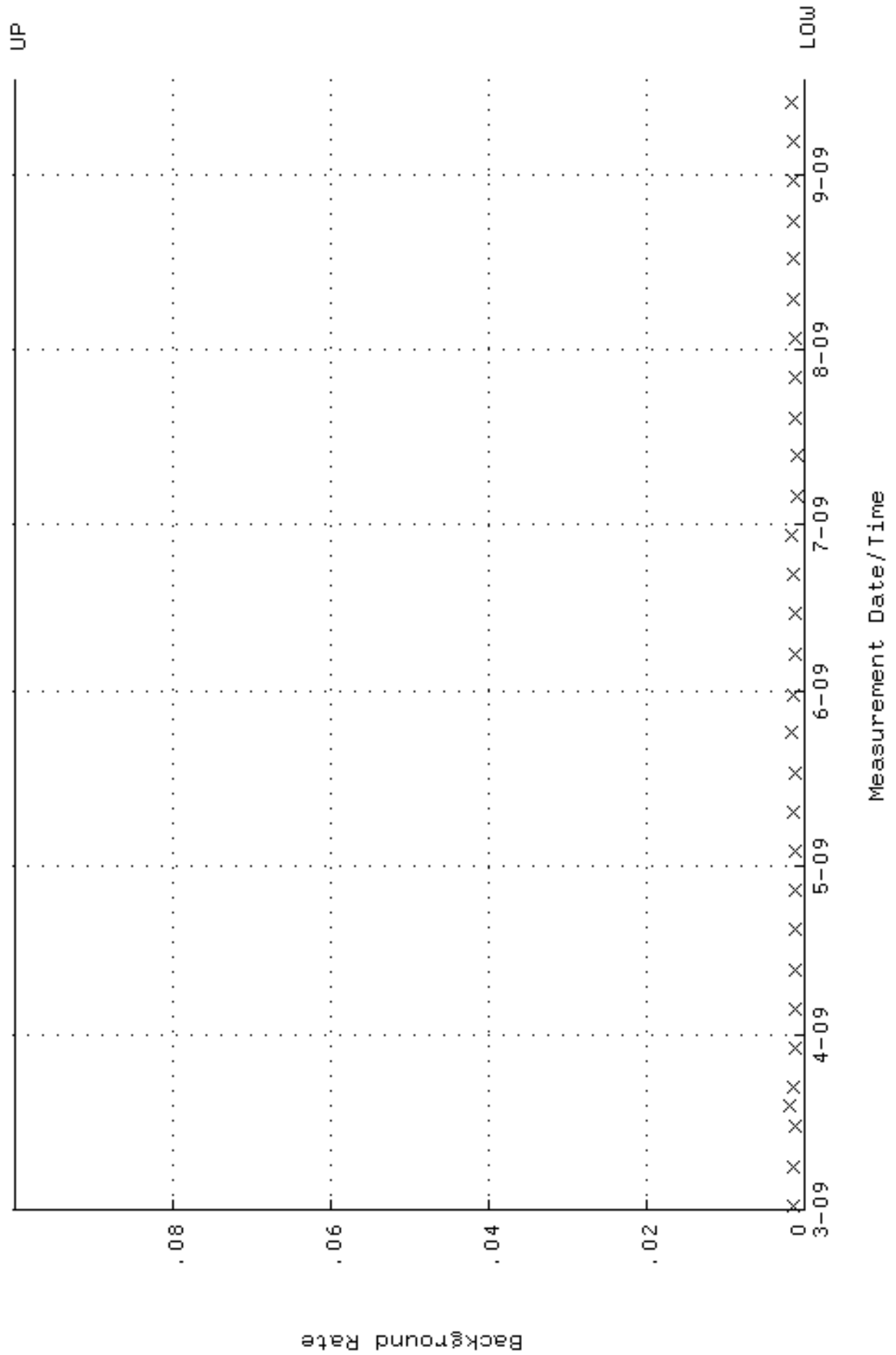
QA filename : DKA100:[ENV_ALPHA.QA.W]W122.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:08:34 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242659 through 0.262659



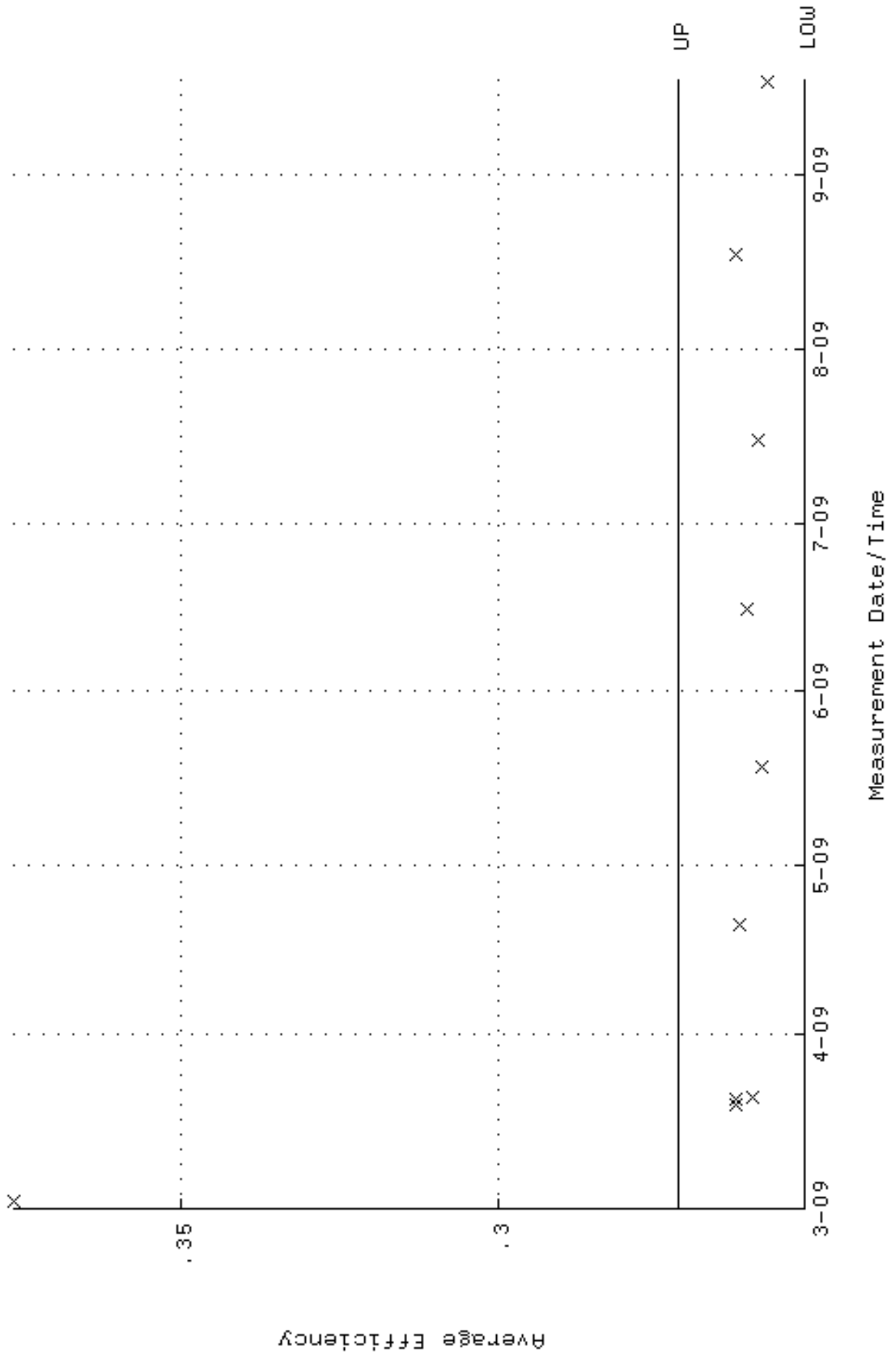
QA filename : DKA100:[ENV_ALPHA.QA.W]W122.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:08:34 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 90.5949 through 100.131



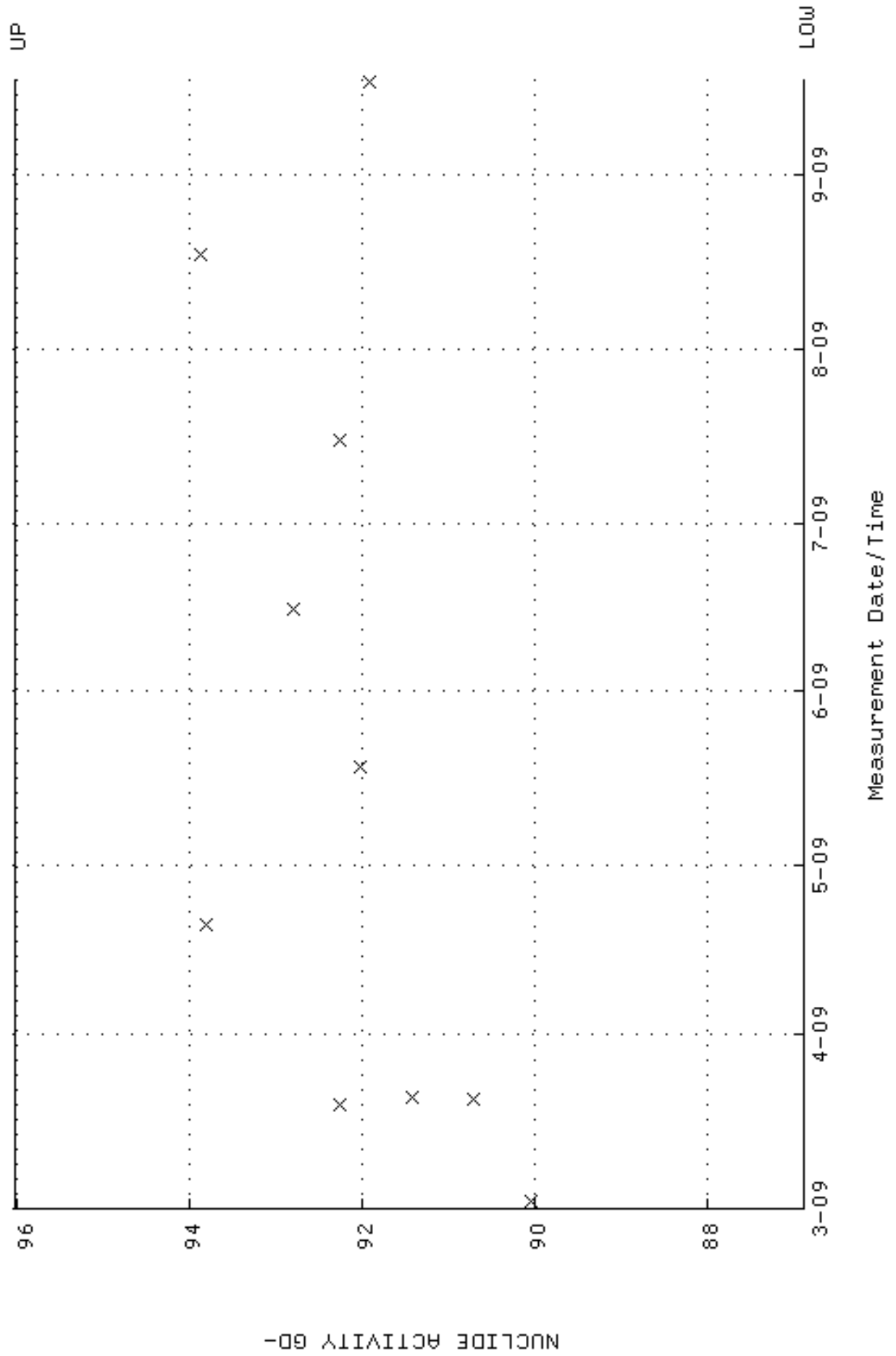
QA filename : DKA100:[ENV_ALPHA.QA.B]B122.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:18:26 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



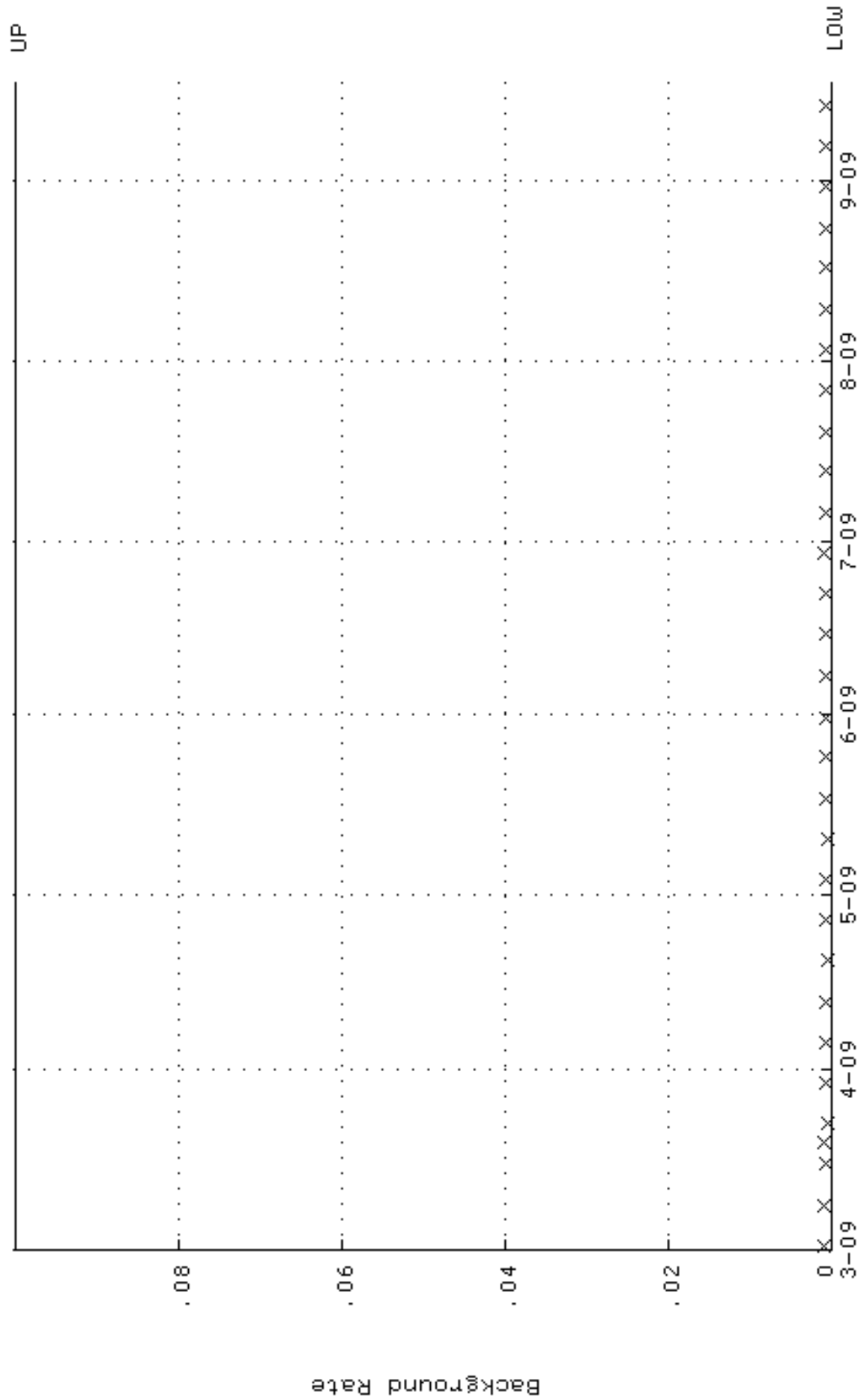
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;1
 Parameter Name : AVREFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:08:48 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.251398 through 0.271398



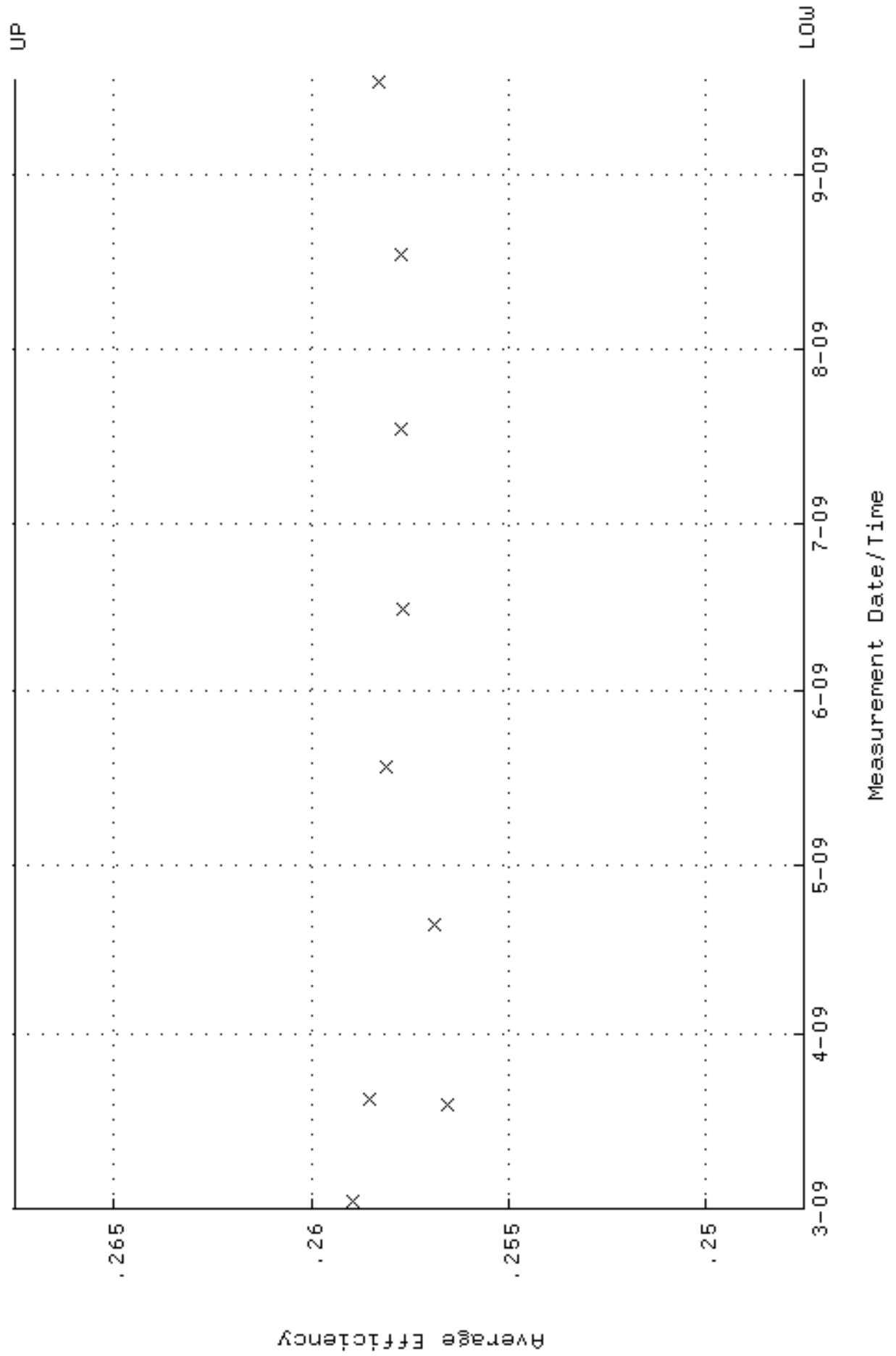
QA filename : DKA100:[ENV_ALPHA.QA.W]W124.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:08:48 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 86.8862 through 96.0322



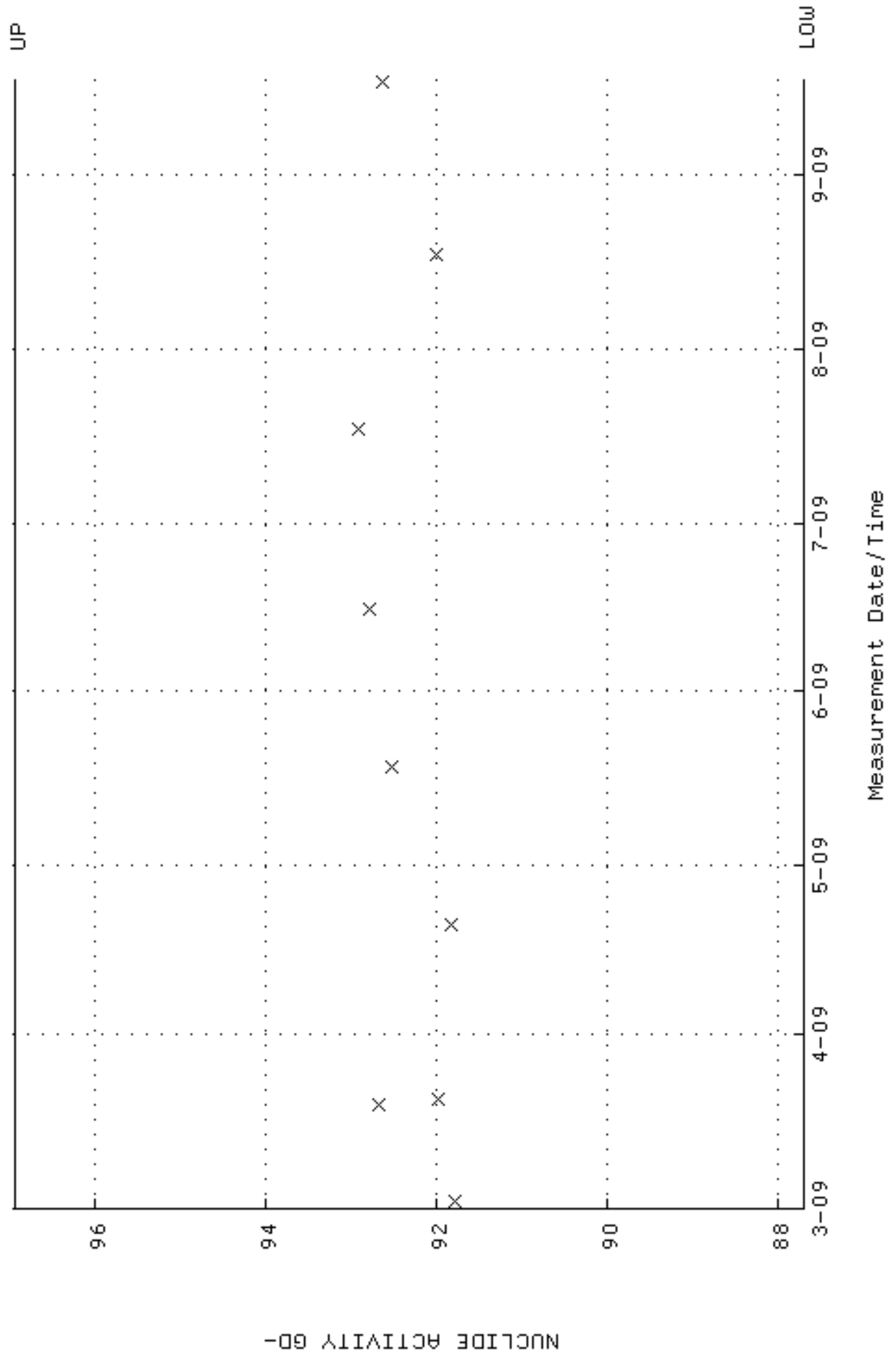
QA filename : DKA100:[ENV_ALPHA.QA.B]B124.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:18:33 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



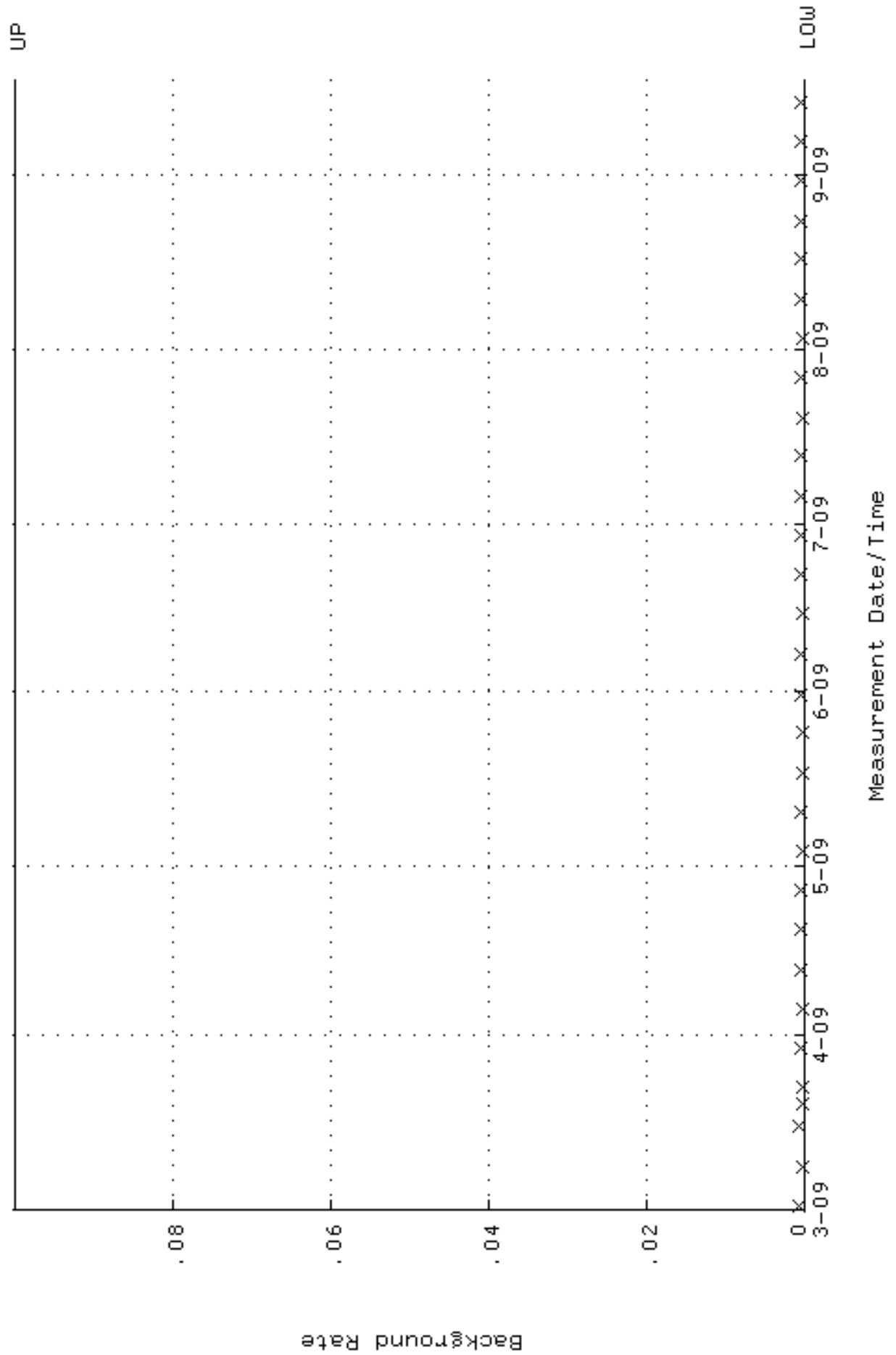
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:08:55 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.247512 through 0.267512



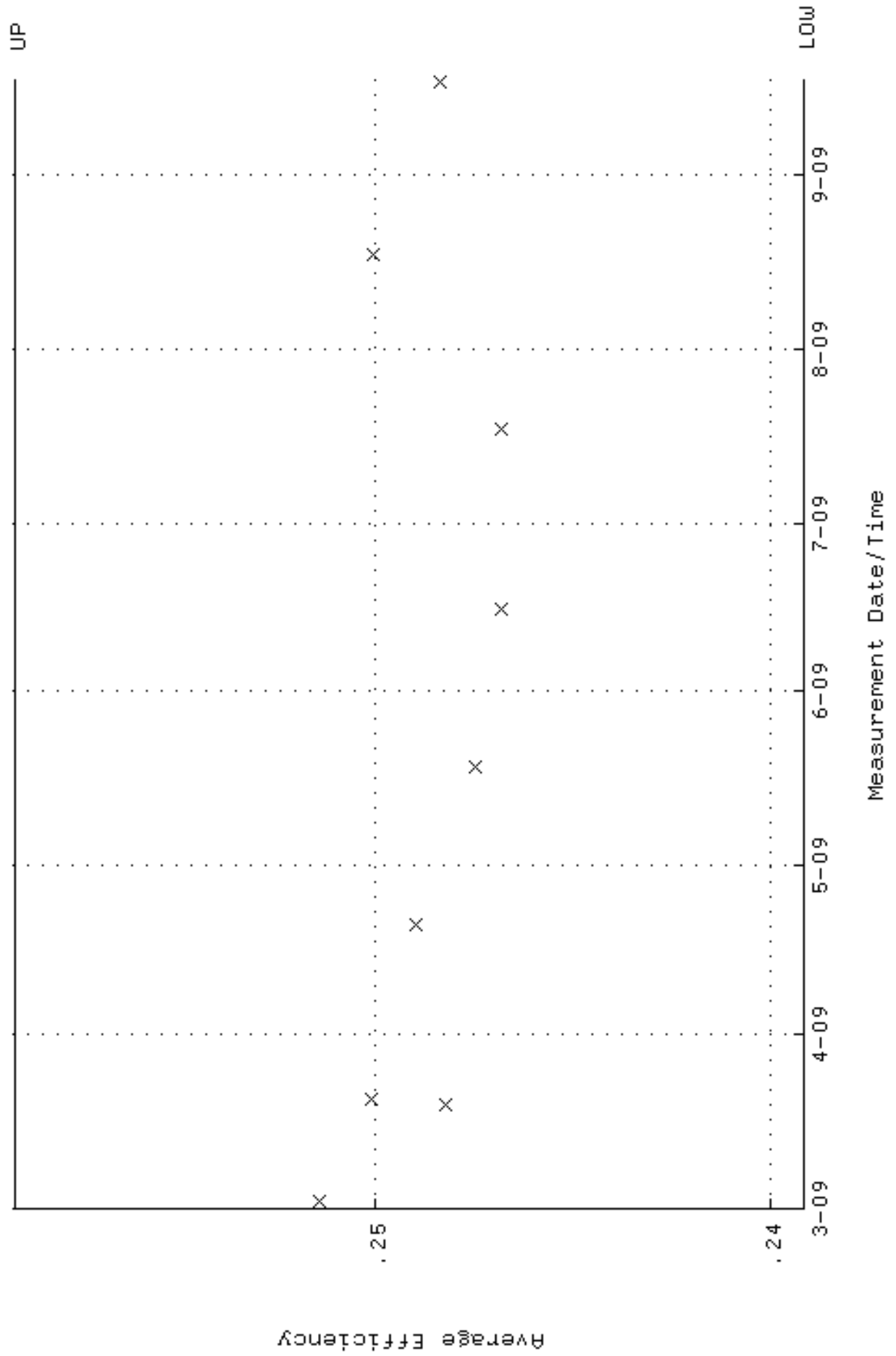
QA filename : DKA100:[ENV_ALPHA.QA.W]W125.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:08:55 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.6956 through 96.9268



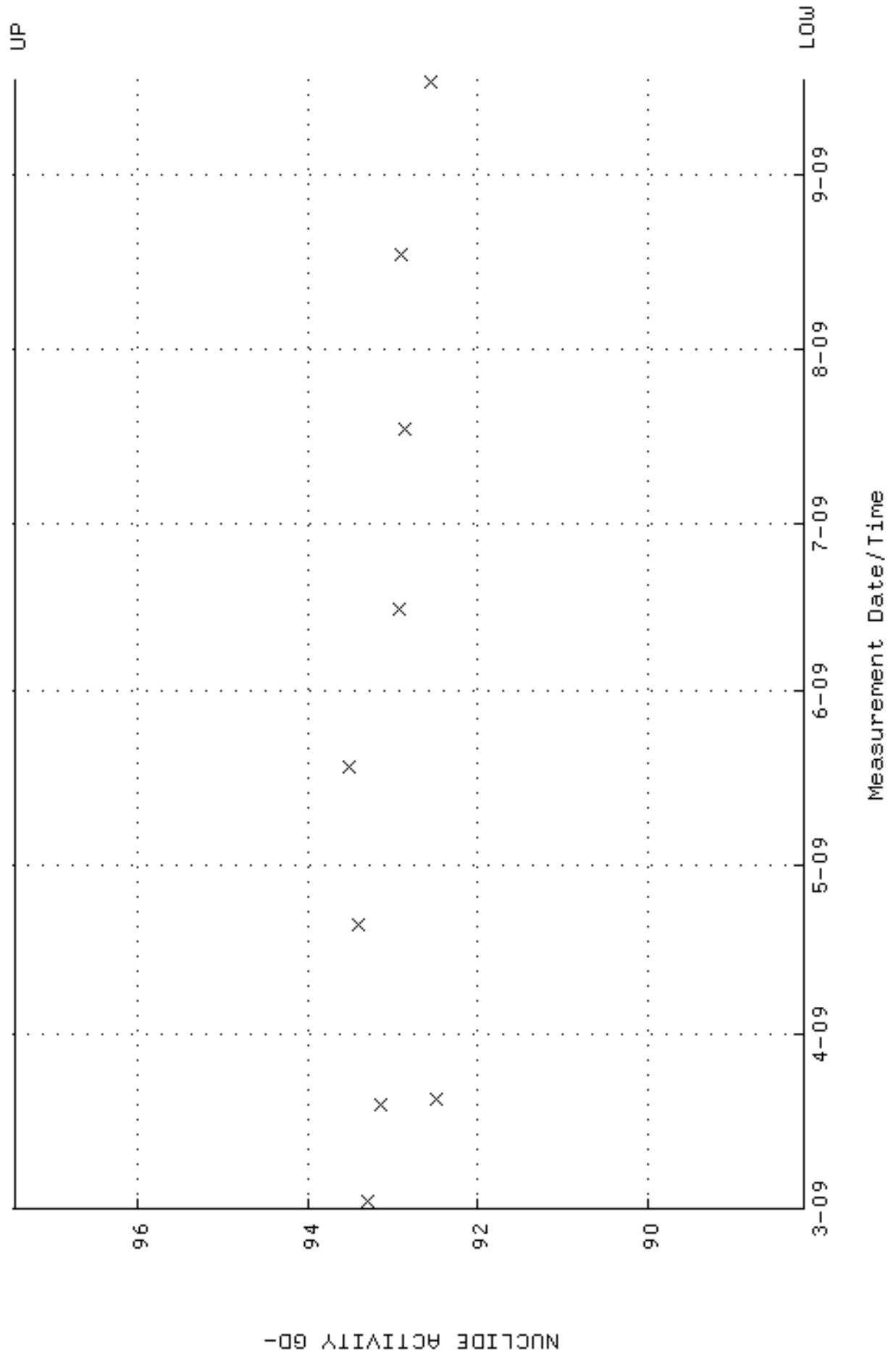
QA filename : DKA100:[ENV_ALPHA.QA.B]B125.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:18:39 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



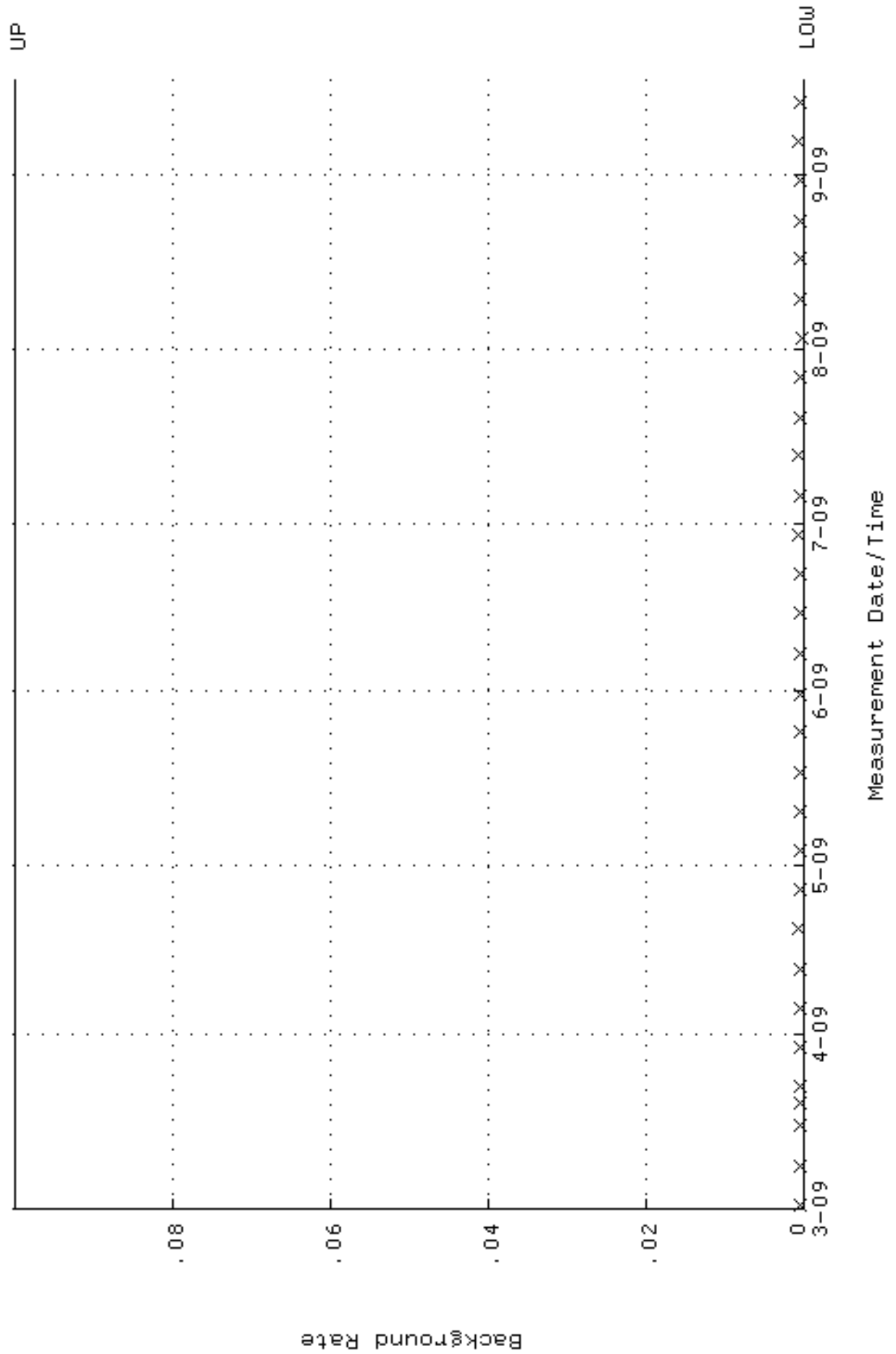
QA filename : DKA100:[ENV_ALPHA.QA.W]W130.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:09:26 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.239131 through 0.259131



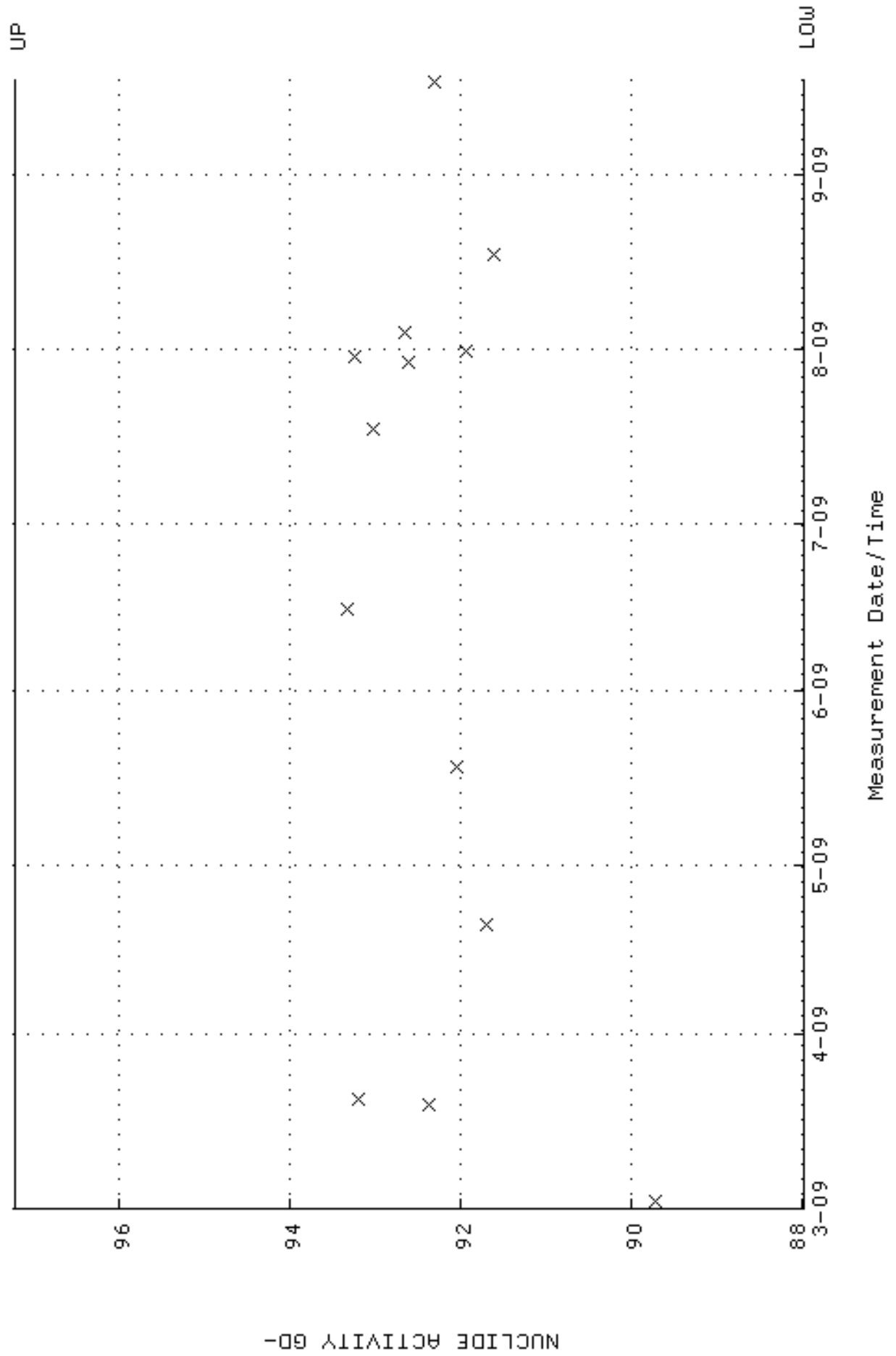
QA filename : DKA100:[ENV_ALPHA.QA.W]w130.QAF;1
 Parameter Name : NACTIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:09:26 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 88.1614 through 97.4416



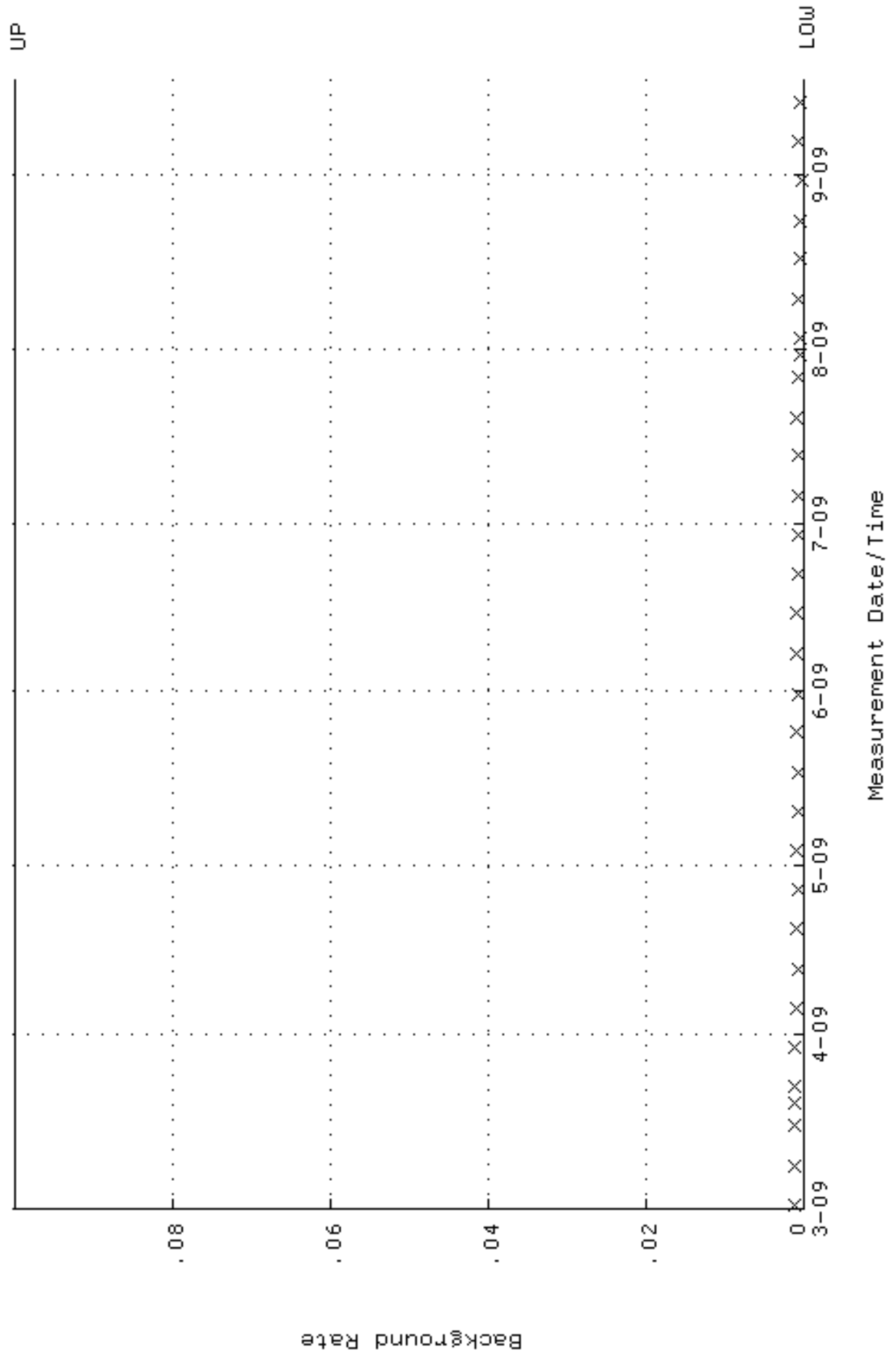
QA filename : DKA100:[ENV_ALPHA.QA.B]B130.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:00 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



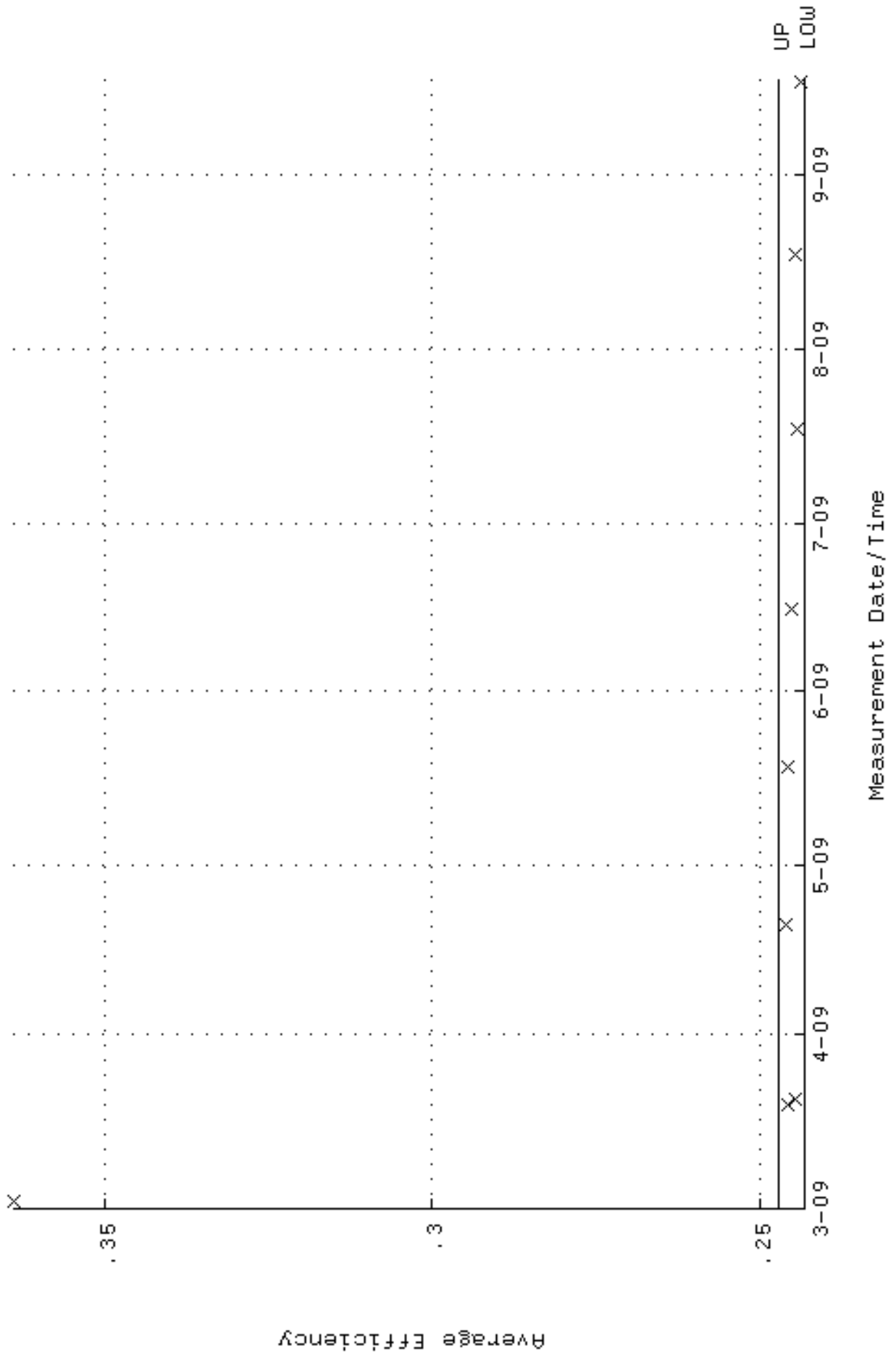
QA filename : DKA100:[ENV_ALPHA.QA.W]W132.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:09:38 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.9674 through 97.2272



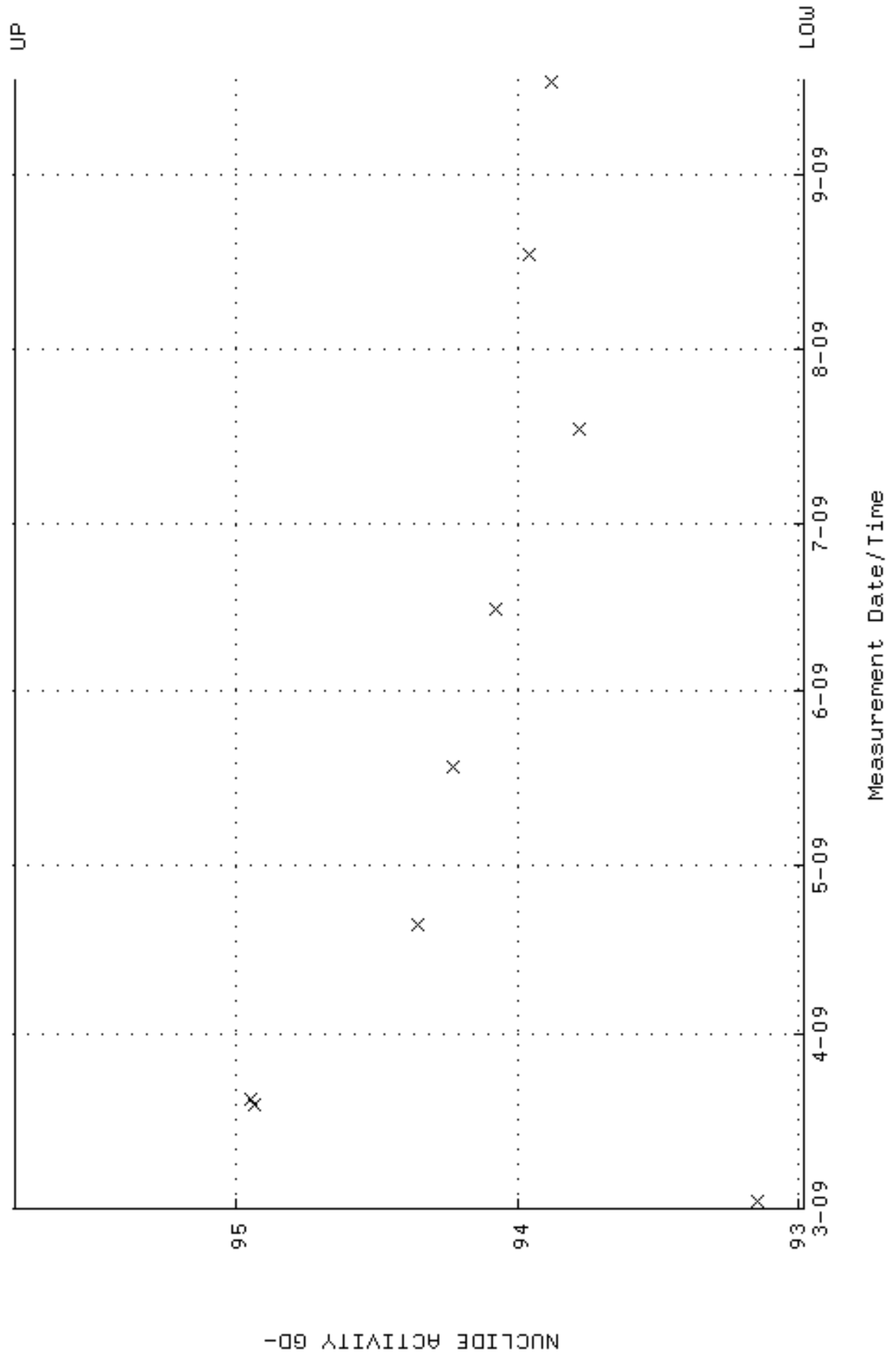
QA filename : DKA100:[ENV_ALPHA.QA.B]B132.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:08 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



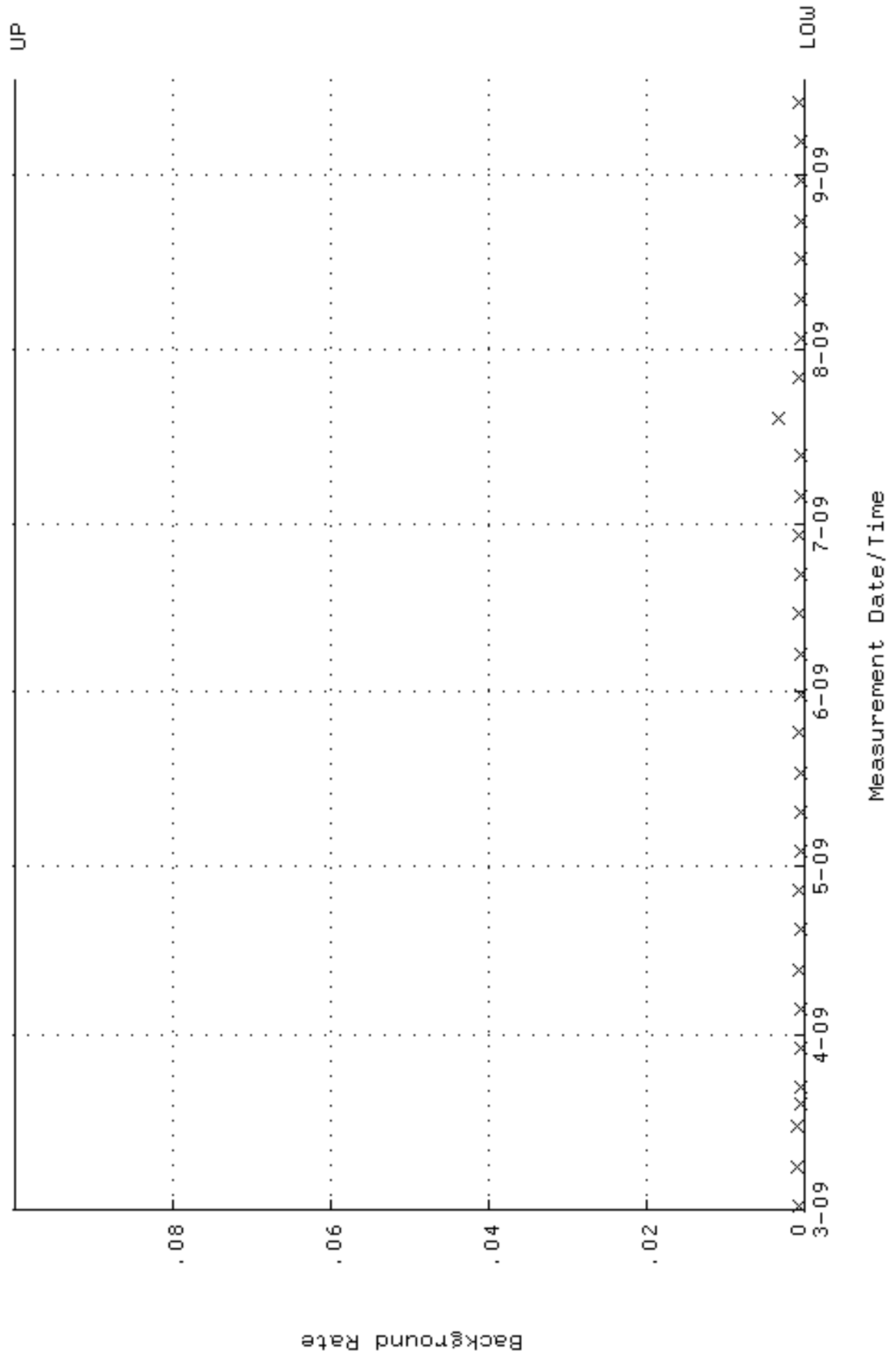
QA filename : DKA100:[ENV_ALPHA.QA.W]W133.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:09:43 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.243148 through 0.247324



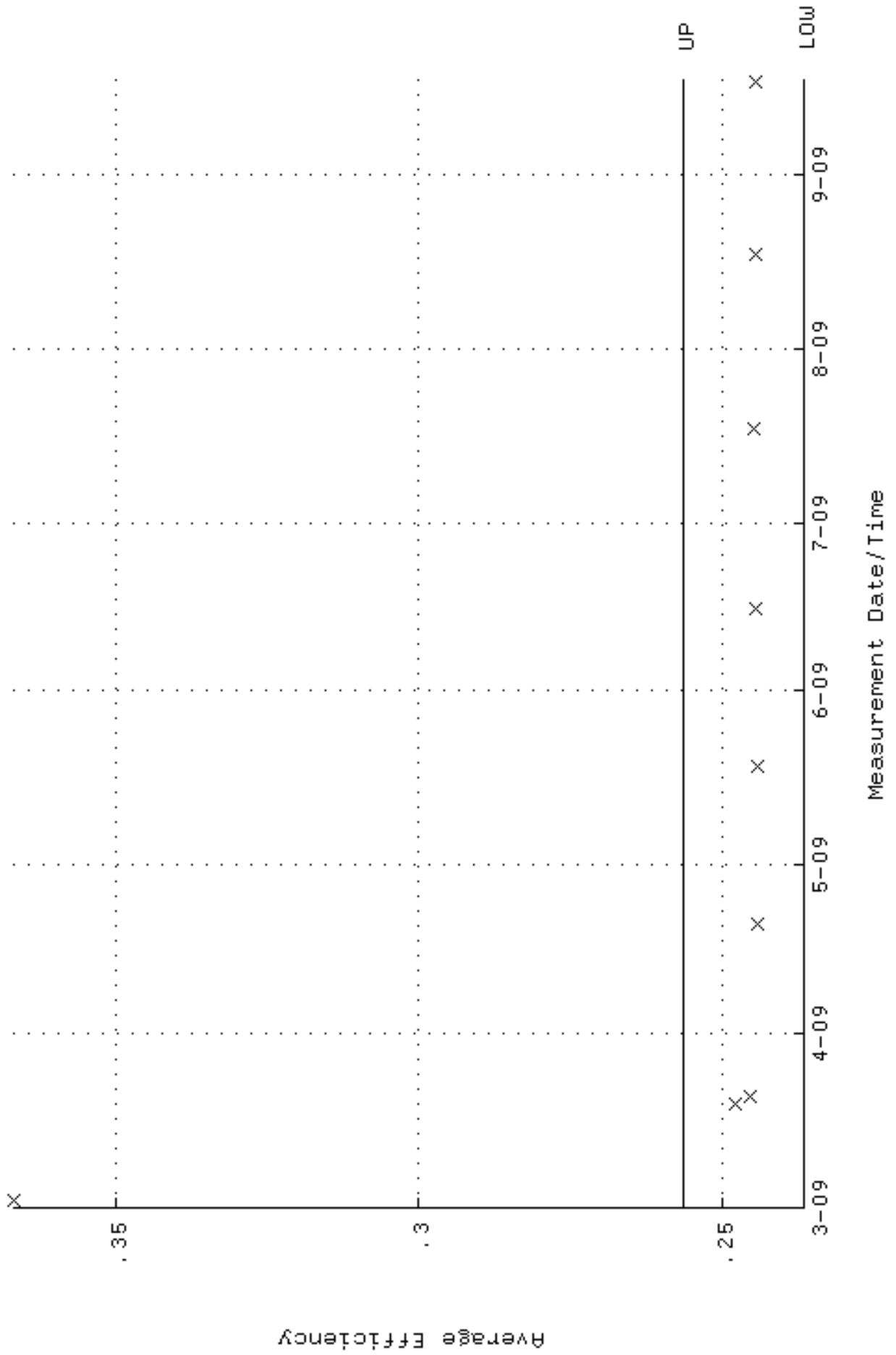
QA filename : DKA100:[ENV_ALPHA.QA.W]w133.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:09:43 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 92.9792 through 95.7898



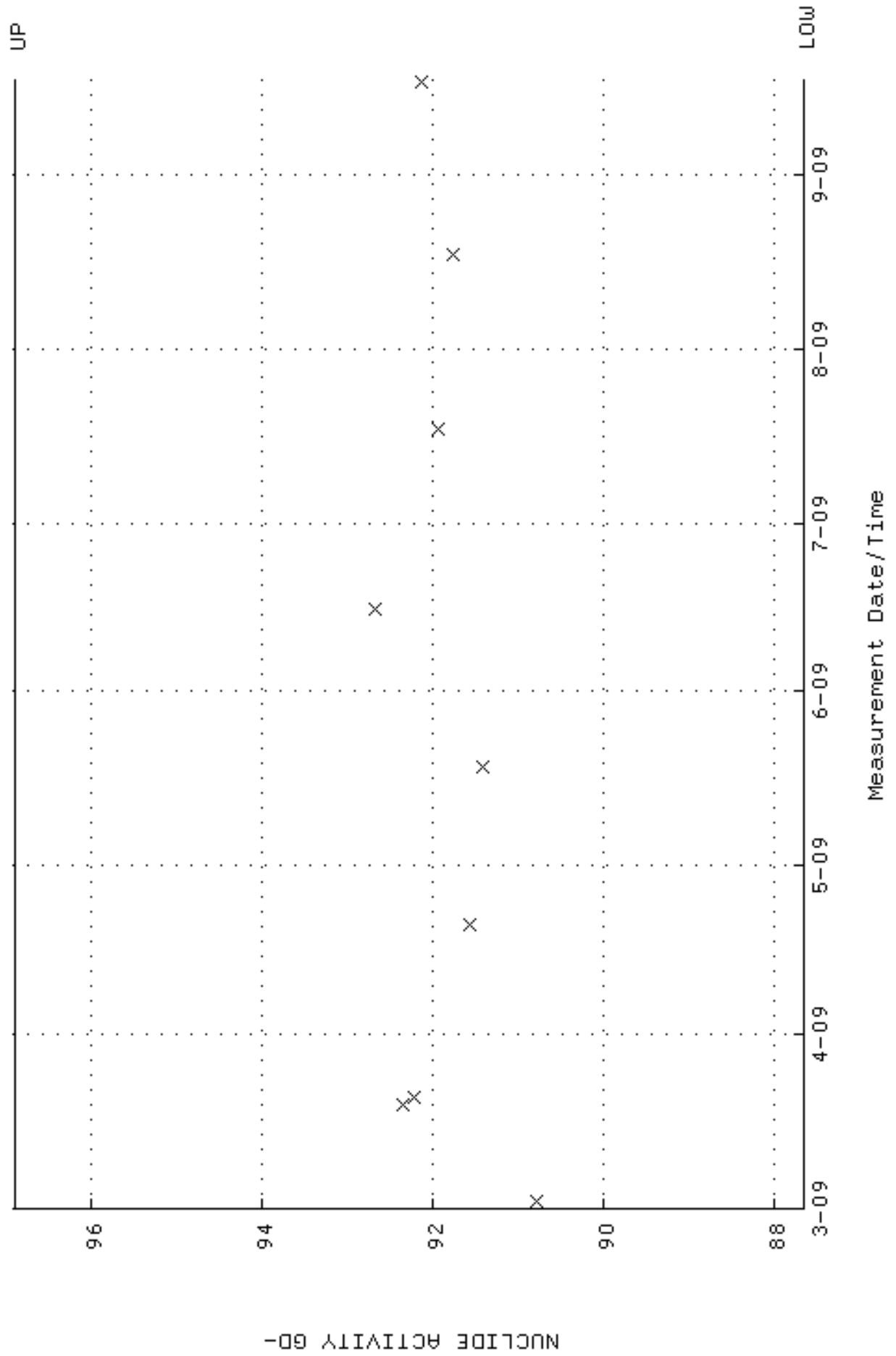
QA filename : DKA100:[ENV_ALPHA.QA.B]B133.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:12 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



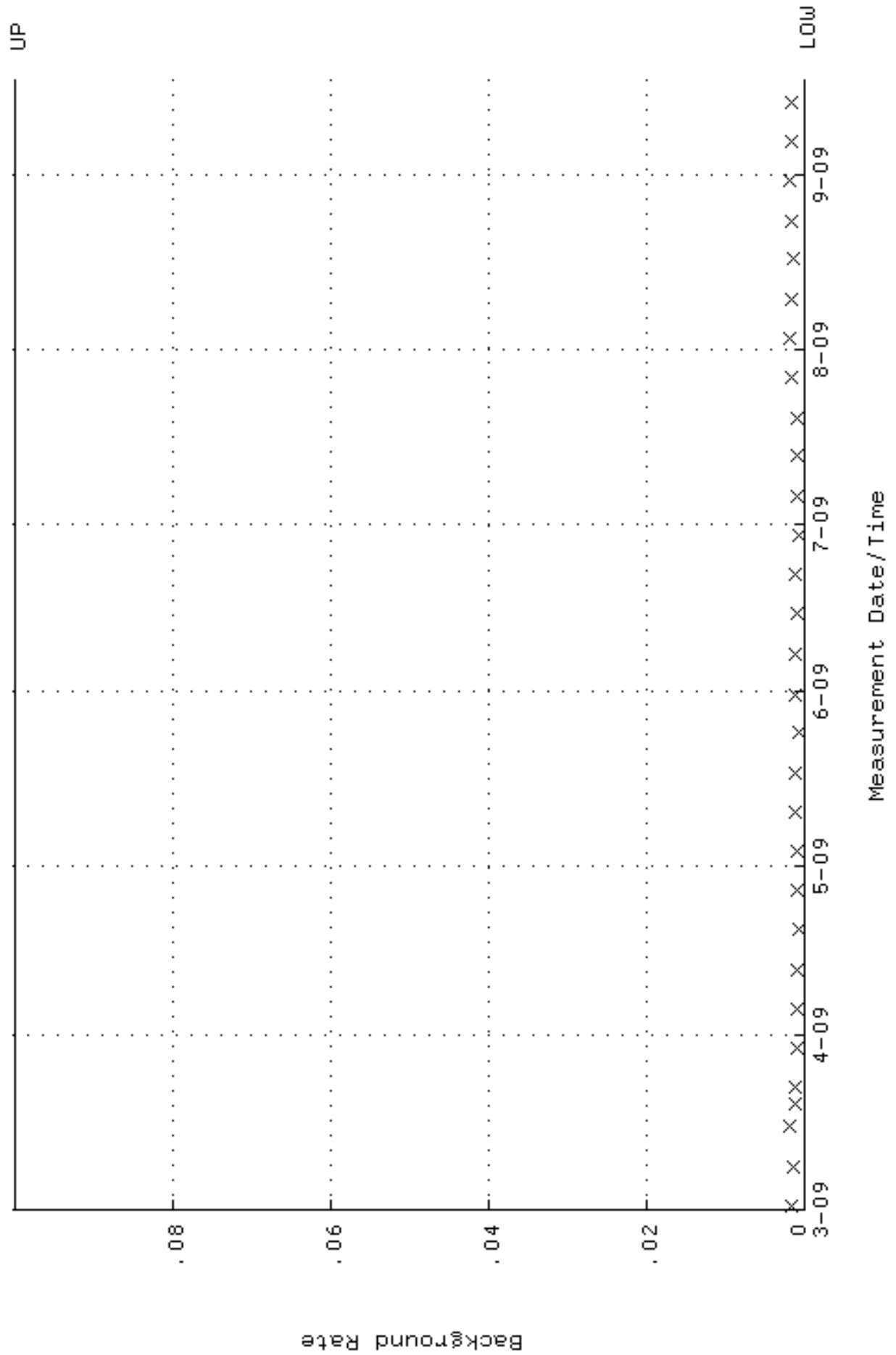
QA filename : DKA100:[ENV_ALPHA.QA.W]W134.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:09:48 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.236455 through 0.256455



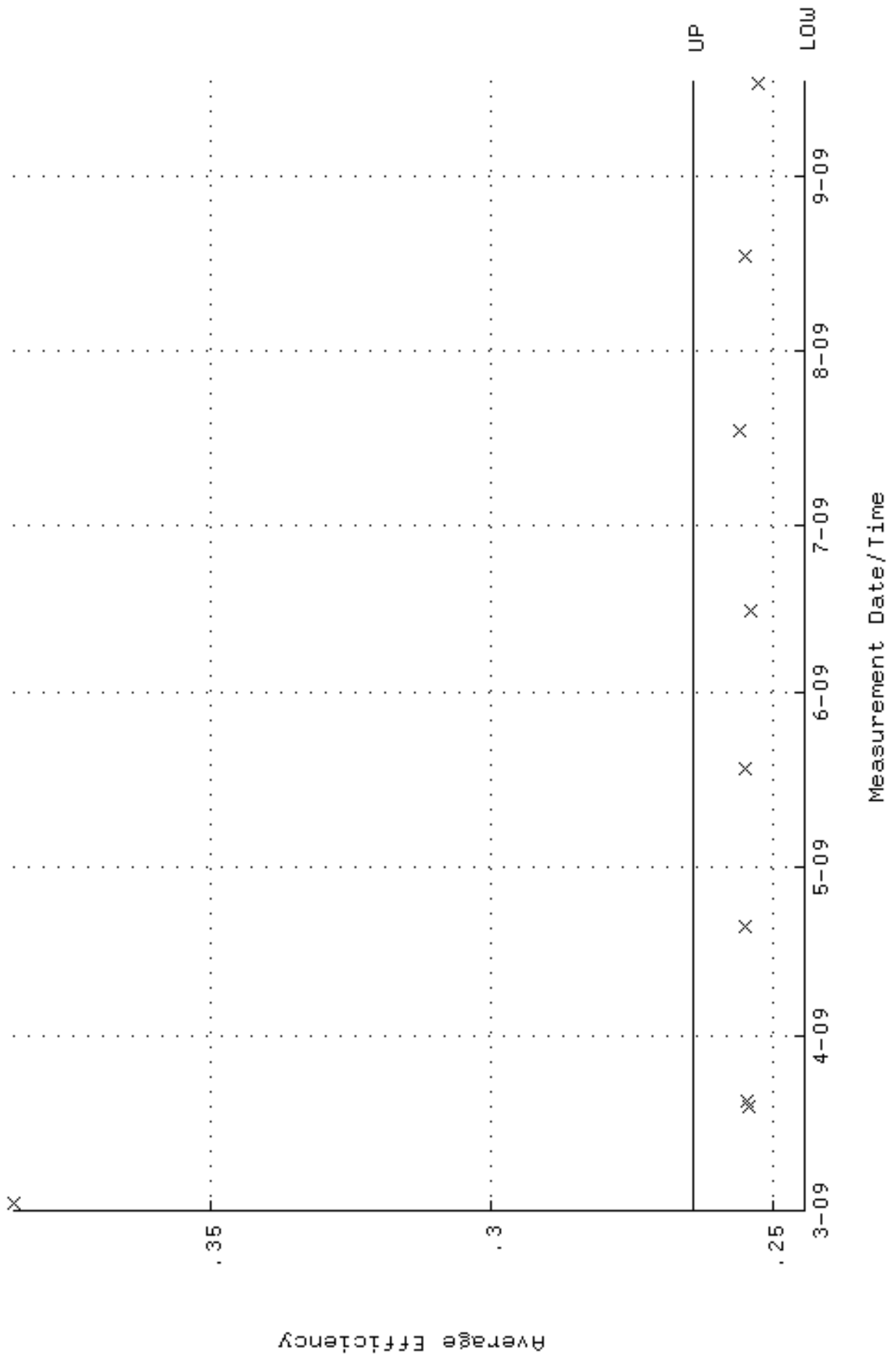
QA filename : DKA100:[ENV_ALPHA.QA.W]W134.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:09:48 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.6576 through 96.8848



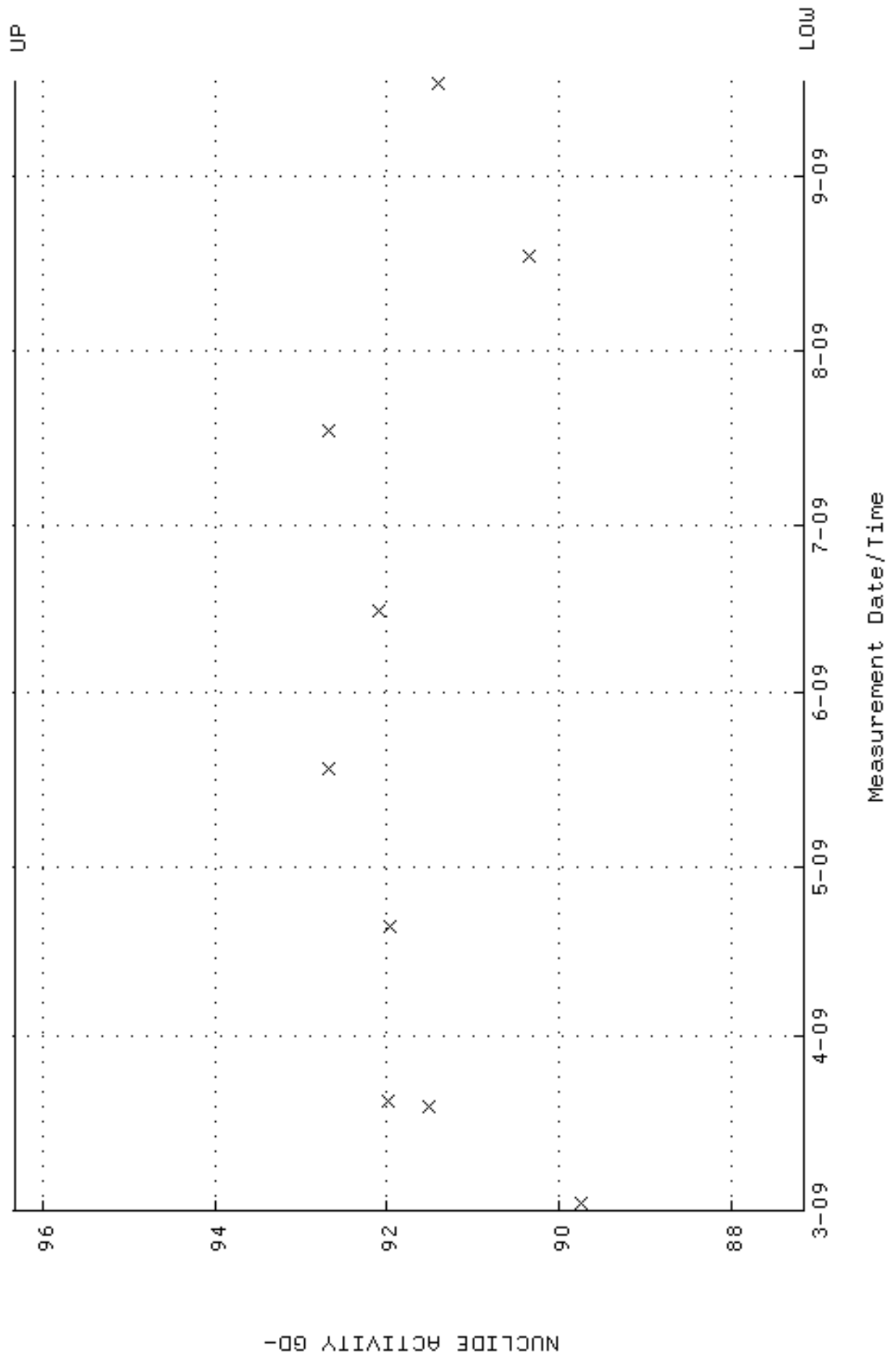
QA filename : DKA100:[ENV_ALPHA.QA.B]B134.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:16 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



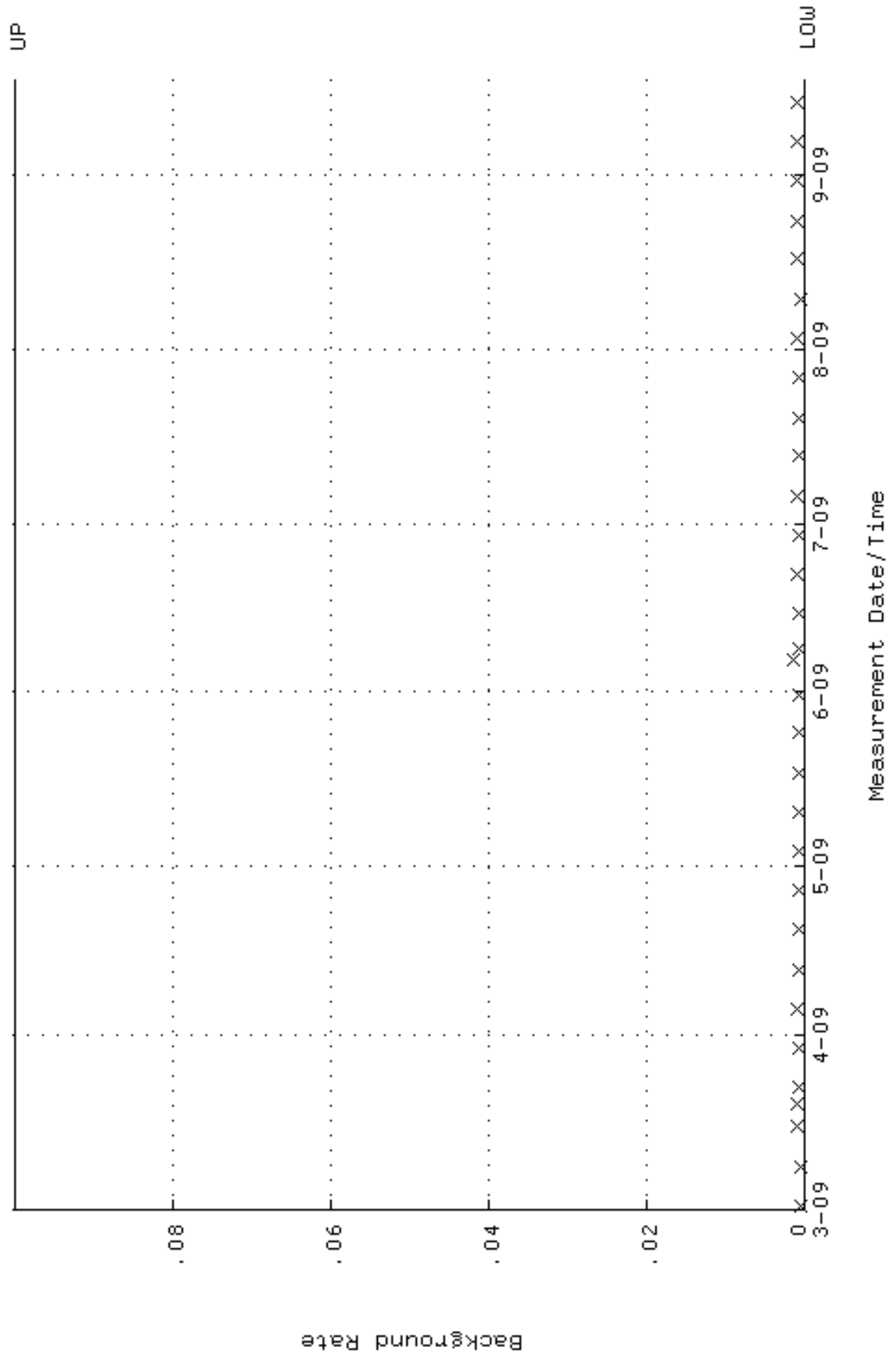
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;2
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:09:53 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.244305 through 0.264305



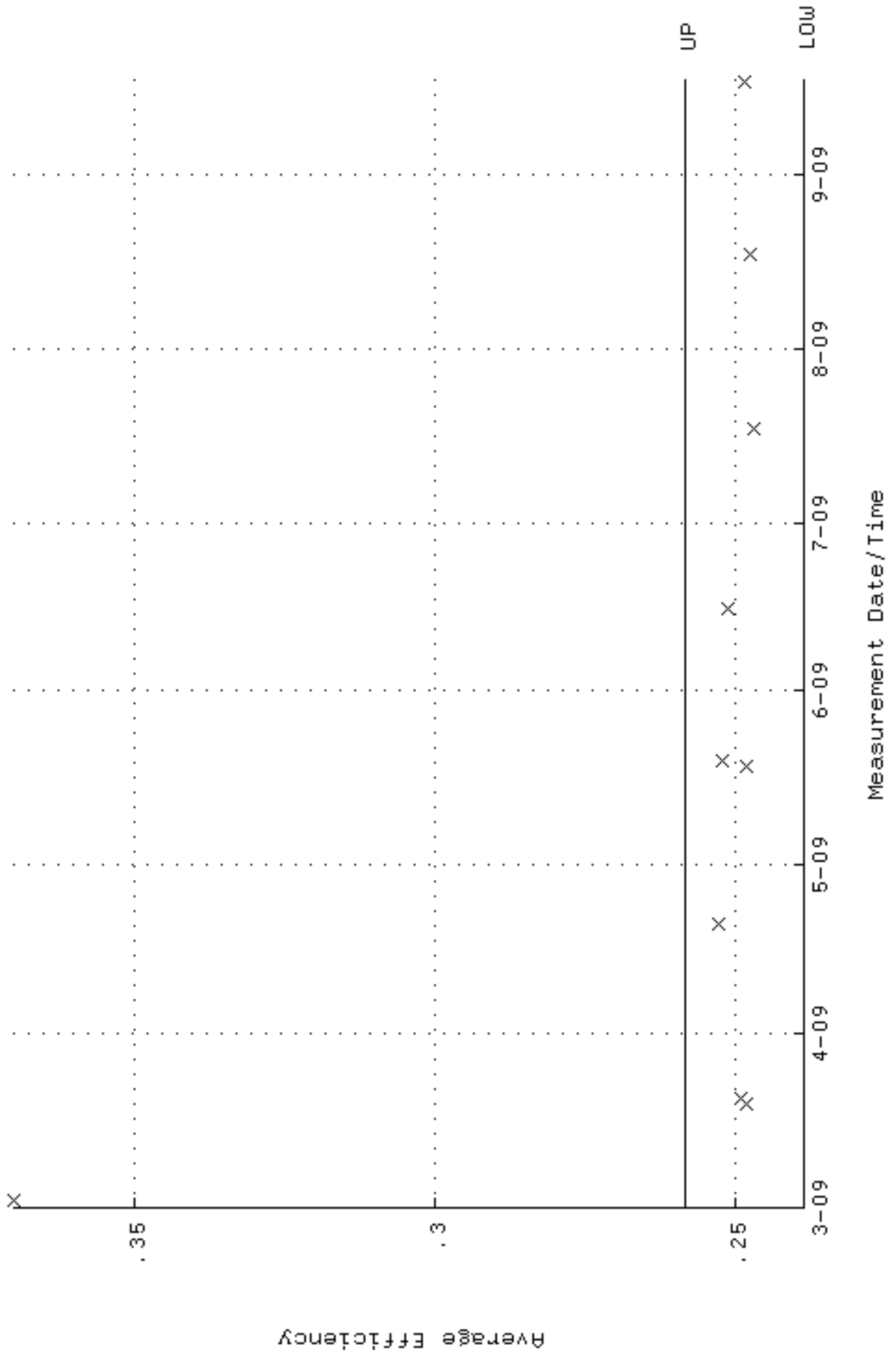
QA filename : DKA100:[ENV_ALPHA.QA.W]W135.QAF;2
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:09:53 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.1482 through 96.3217



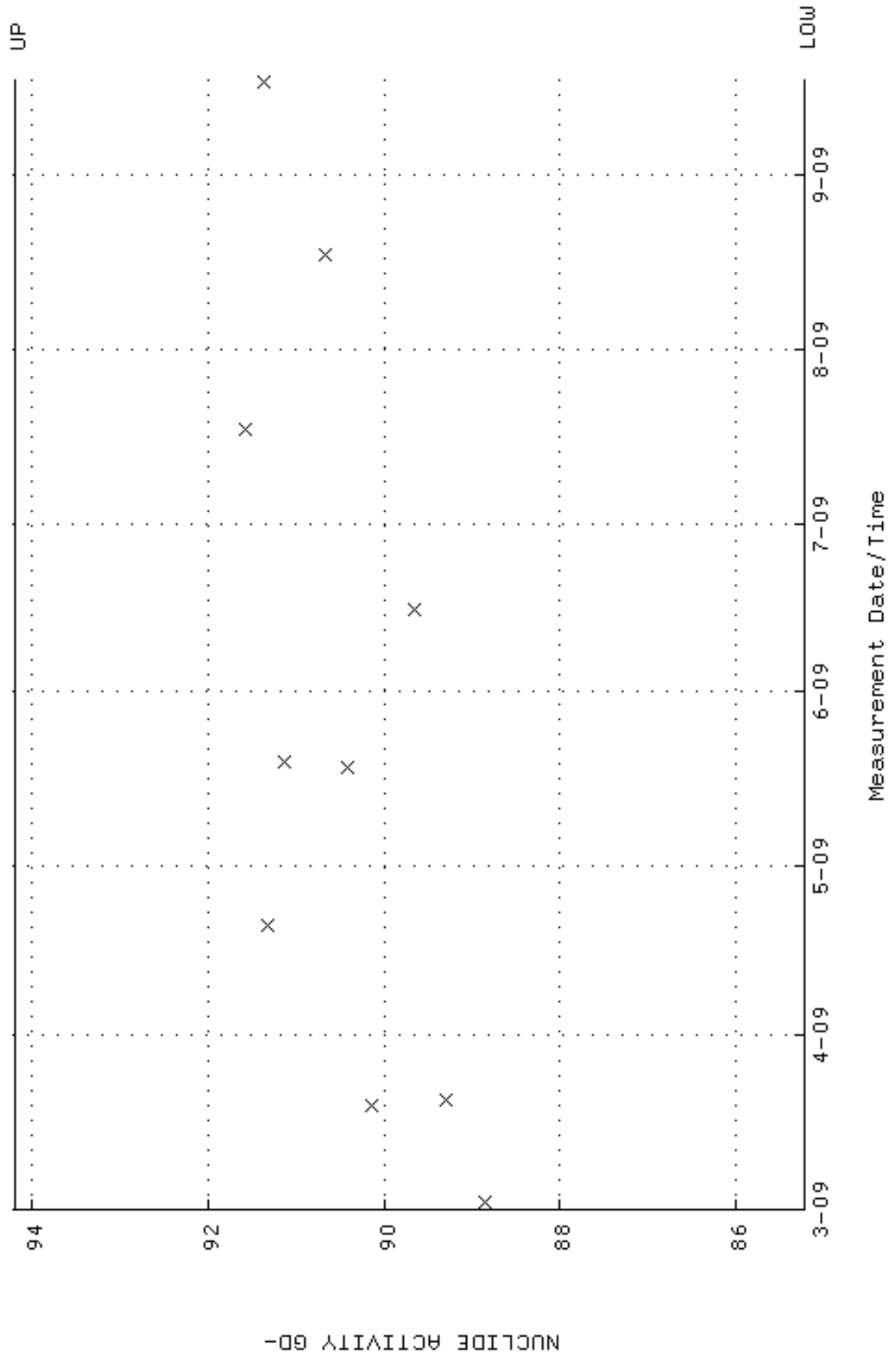
QA filename : DKA100:[ENV_ALPHA.QA.B]B135.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:21 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



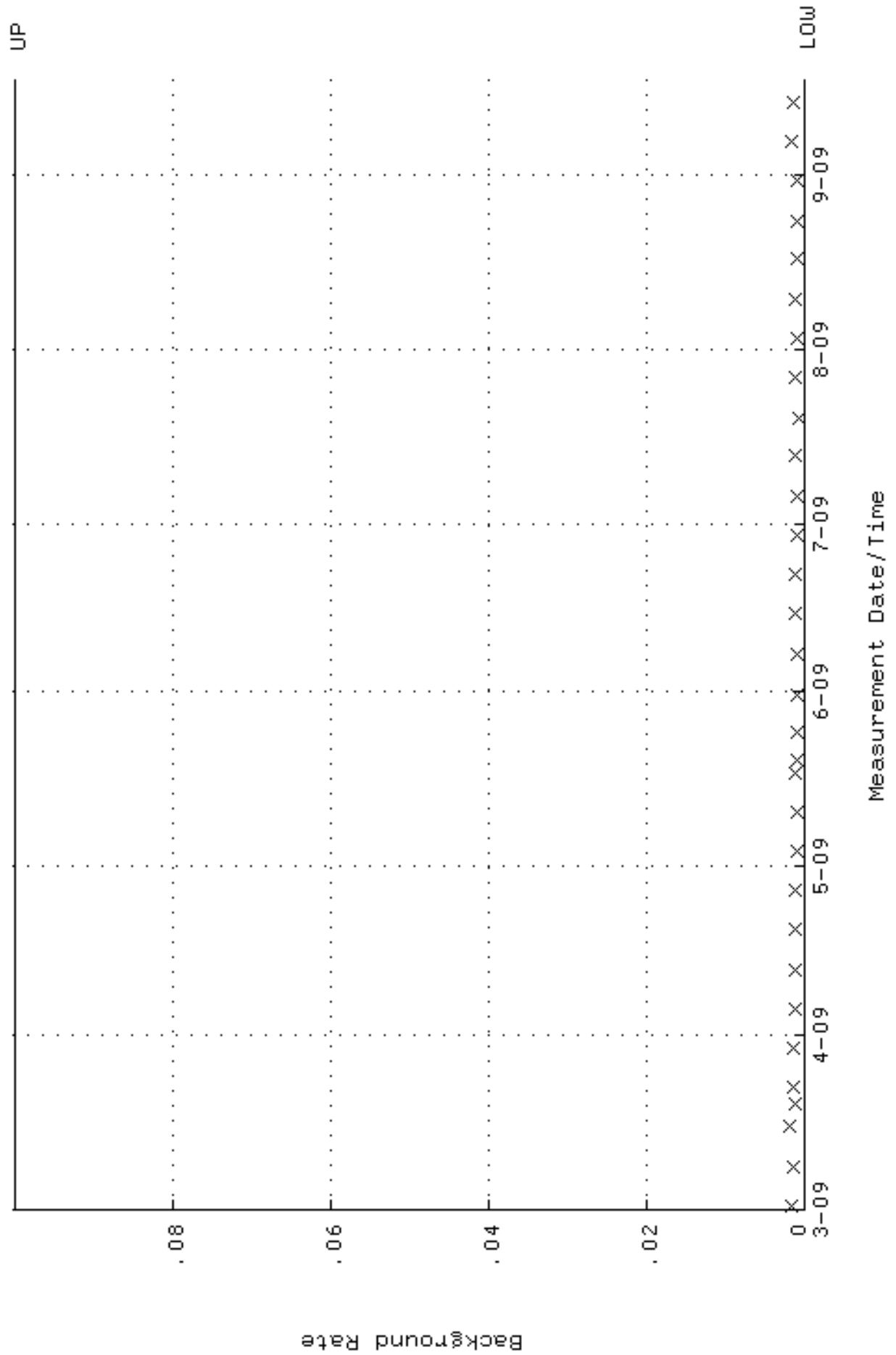
QA filename : DKA100:[ENV_ALPHA.QA.W]W136.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:09:58 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.238568 through 0.258568



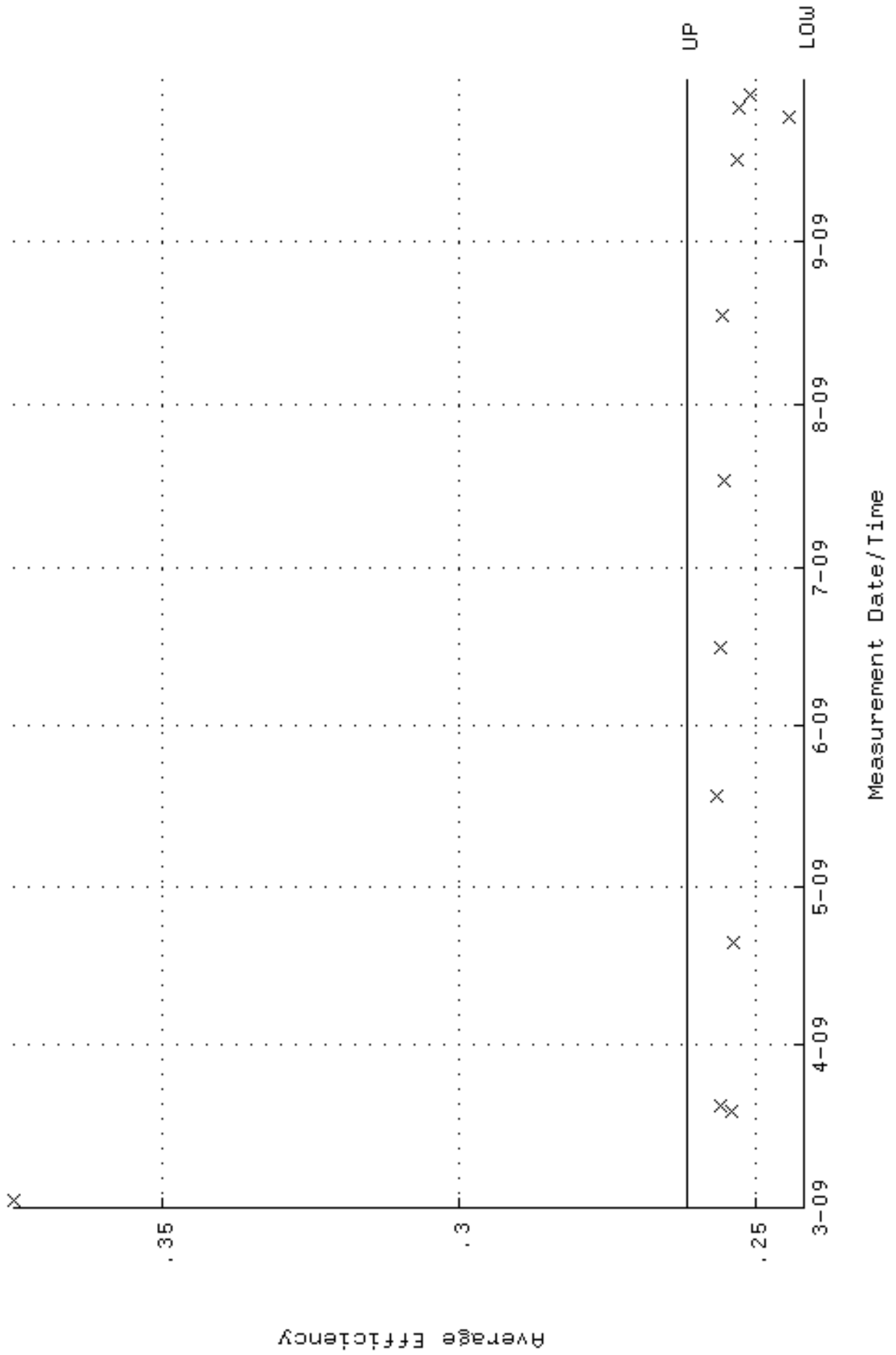
QA filename : DKA100:[ENV_ALPHA.QA.W]w136.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:09:58 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 85.2214 through 94.1920



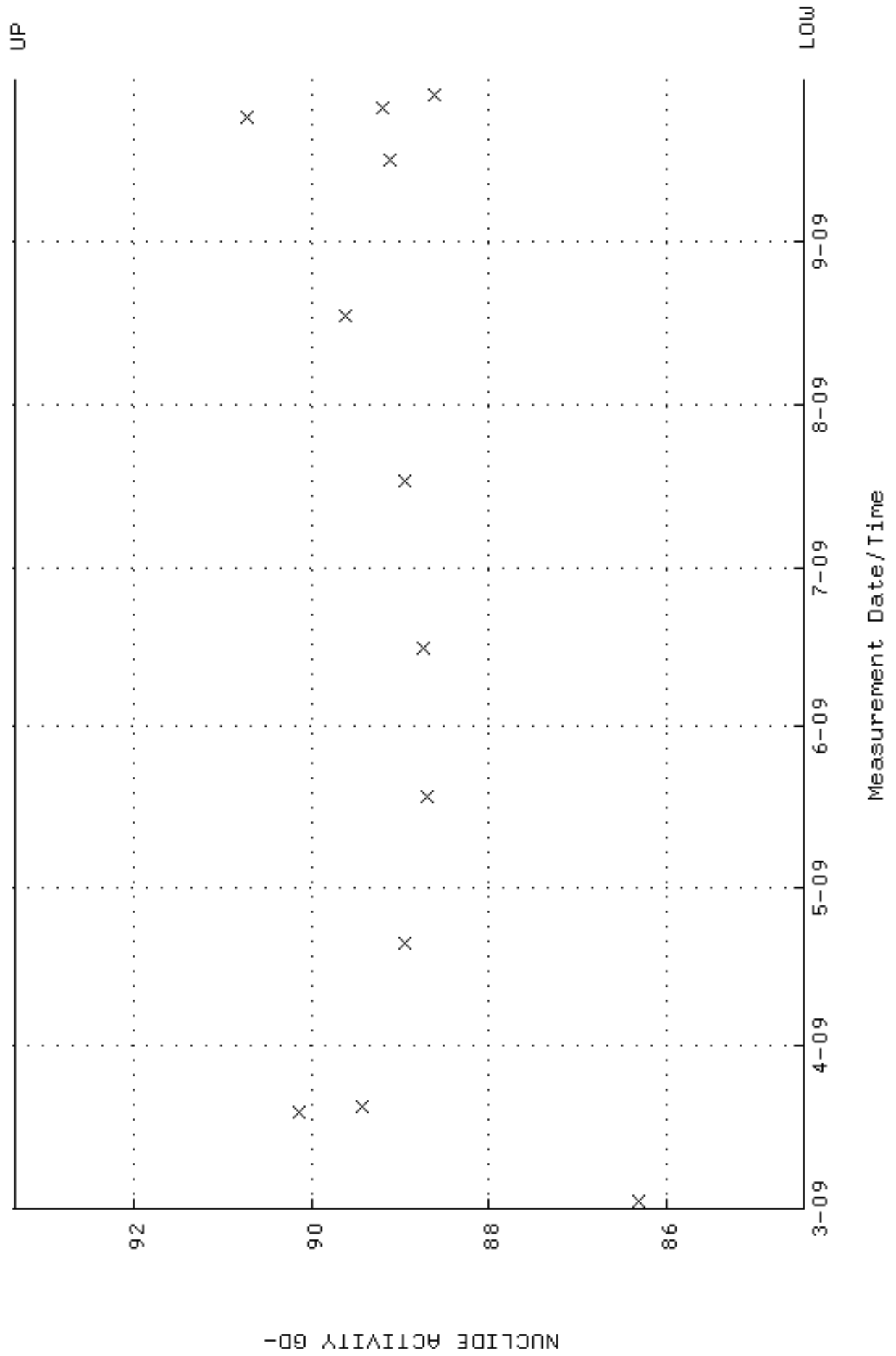
QA filename : DKA100:[ENV_ALPHA.QA.B]B136.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:24 through 17-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



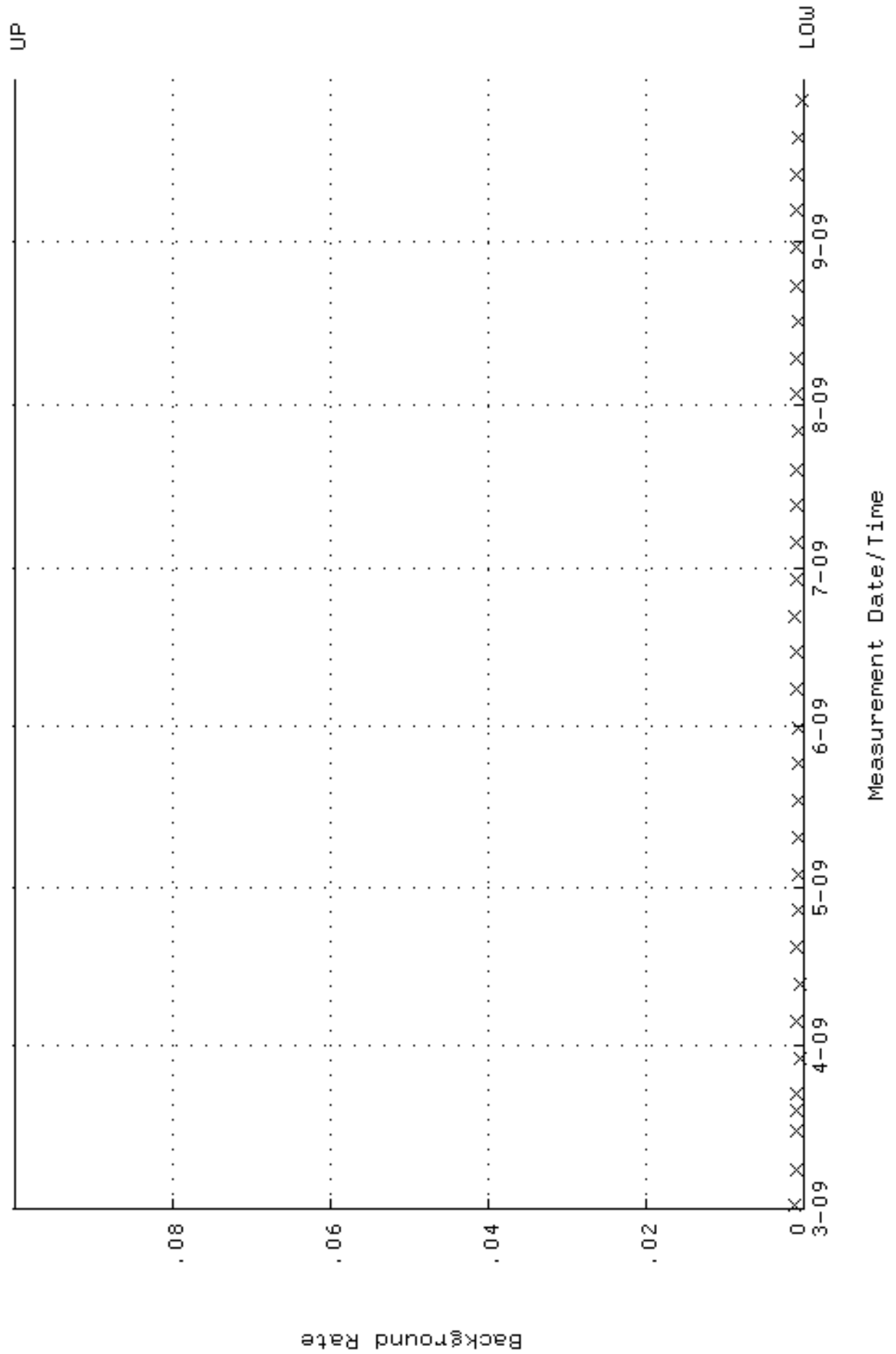
QA filename : DKA100:[ENV_ALPHA.QA.W]W137.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:10:03 through 1-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.241744 through 0.261744



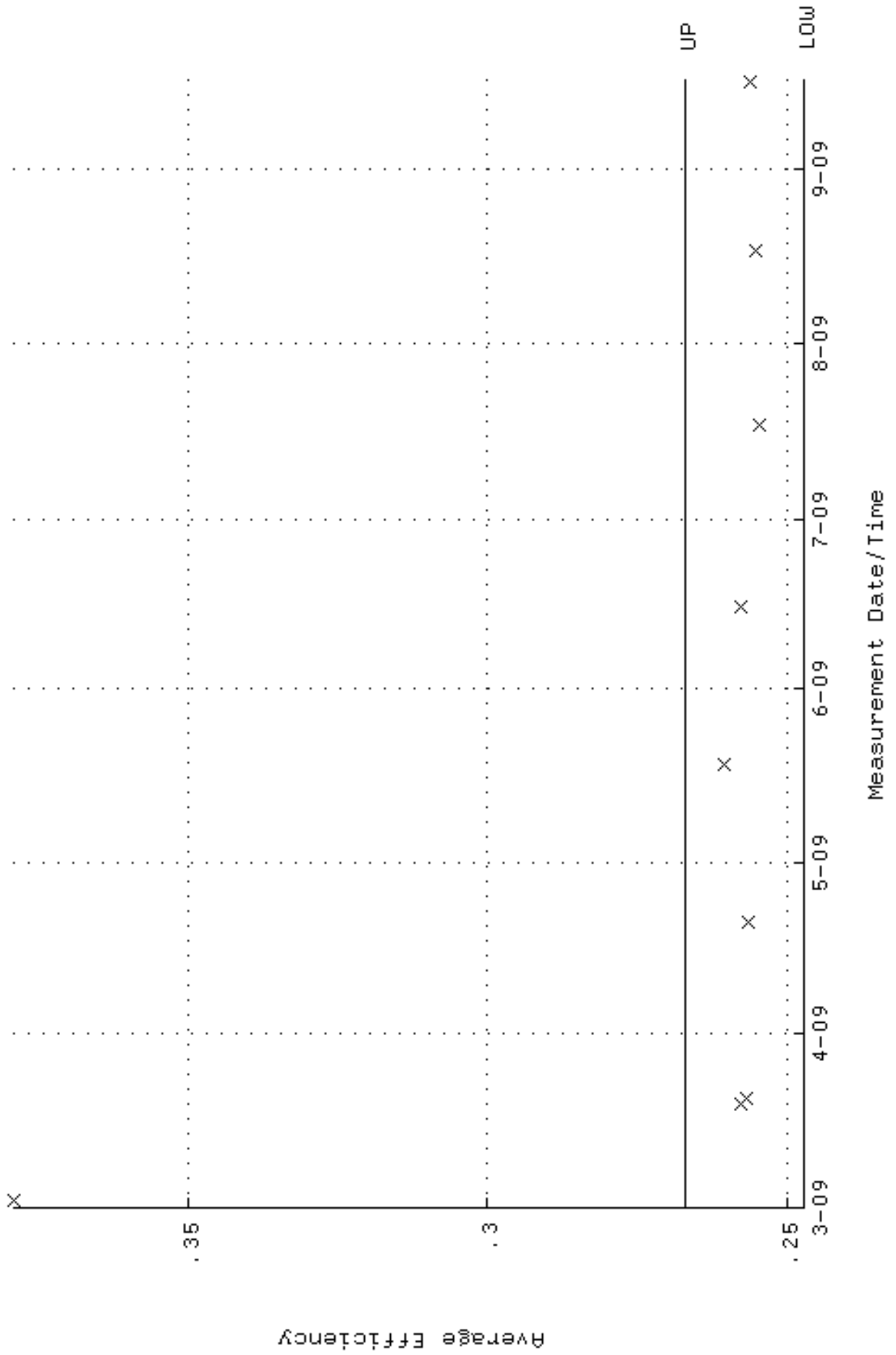
QA filename : DKA100:[ENV_ALPHA.QA.W]W137.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:10:03 through 1-OCT-2009 12:00:00
 Lower/Upper Lmts: 84.4530 through 93.3428



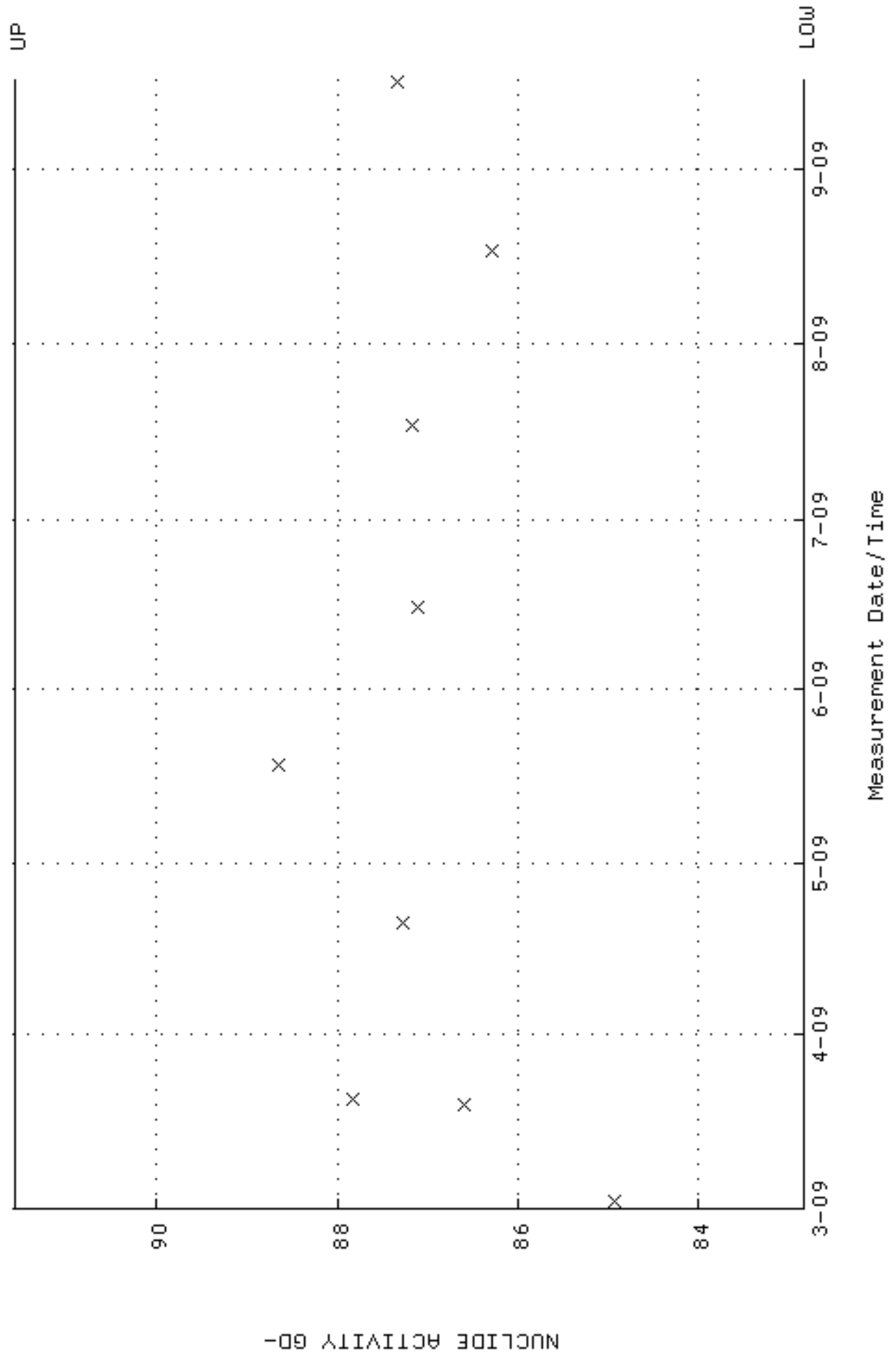
QA filename : DKA100:[ENV_ALPHA.QA.B]B137.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:28 through 1-OCT-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



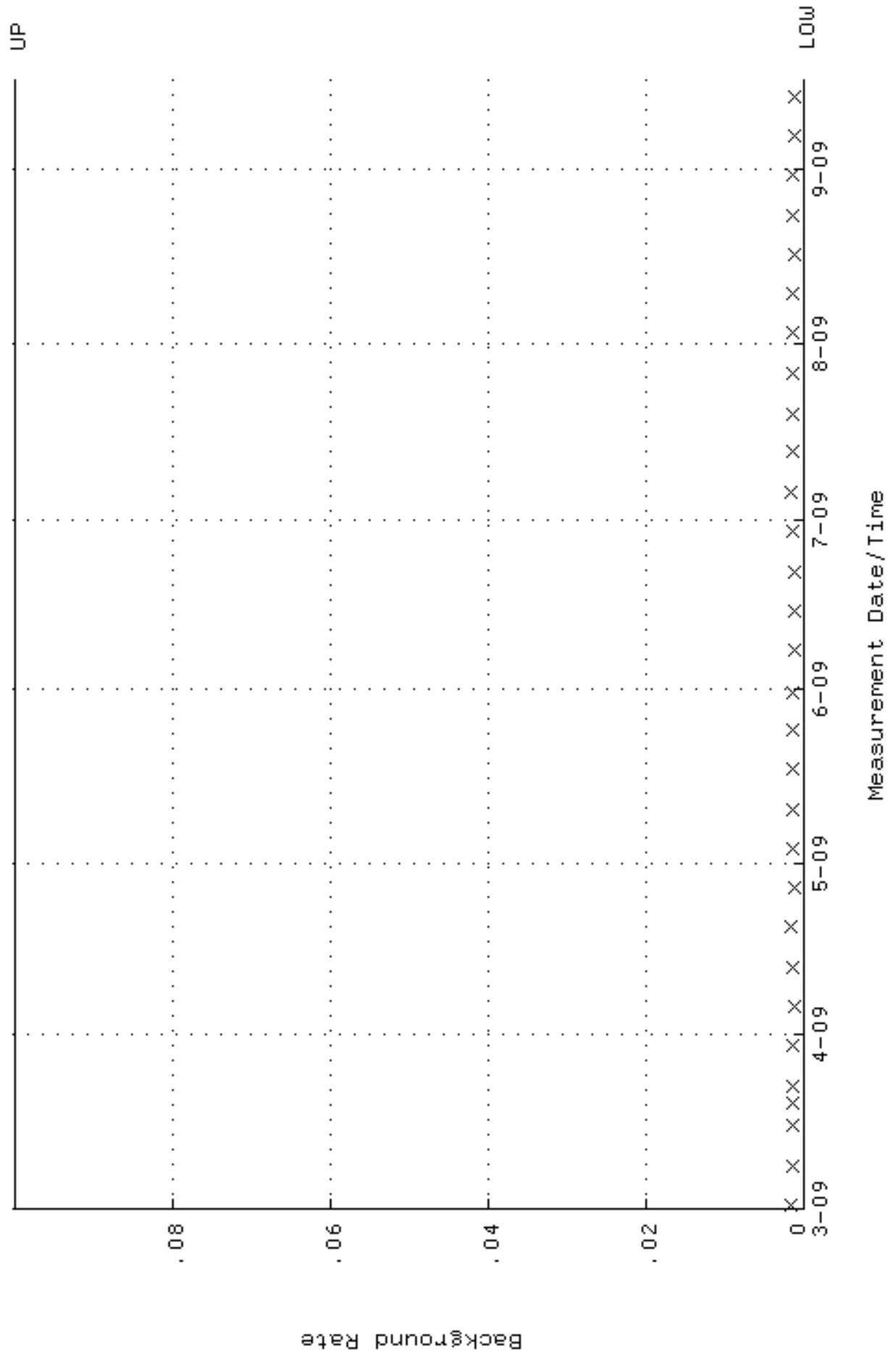
QA filename : DKA100:[ENV_ALPHA.QA.W]W138.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:10:08 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.247085 through 0.267085



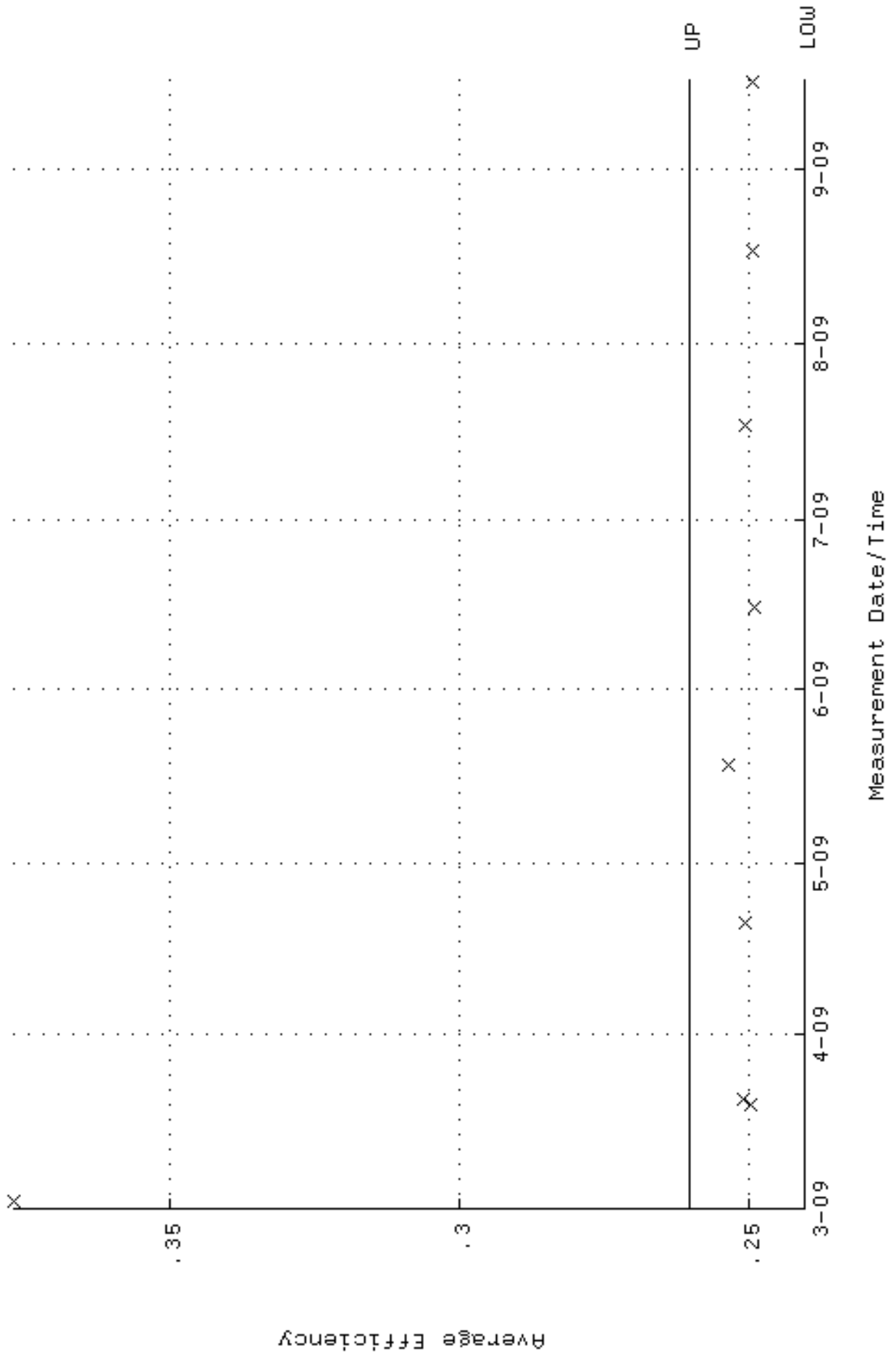
QA filename : DKA100:[ENV_ALPHA.QA.W]W138.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:10:08 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 82.8399 through 91.5599



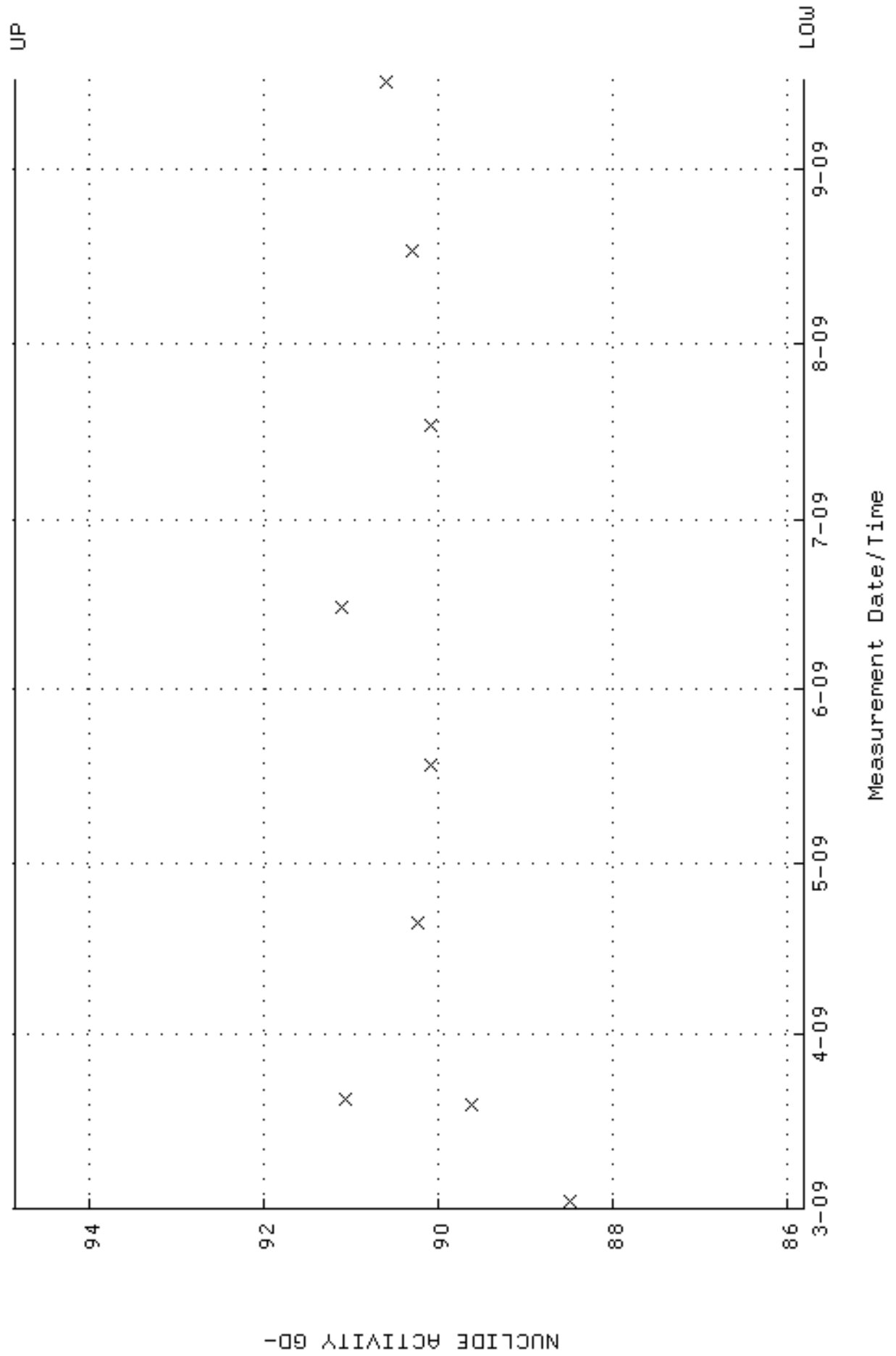
QA filename : DKA100:[ENV_ALPHA.QA.B]B138.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:32 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



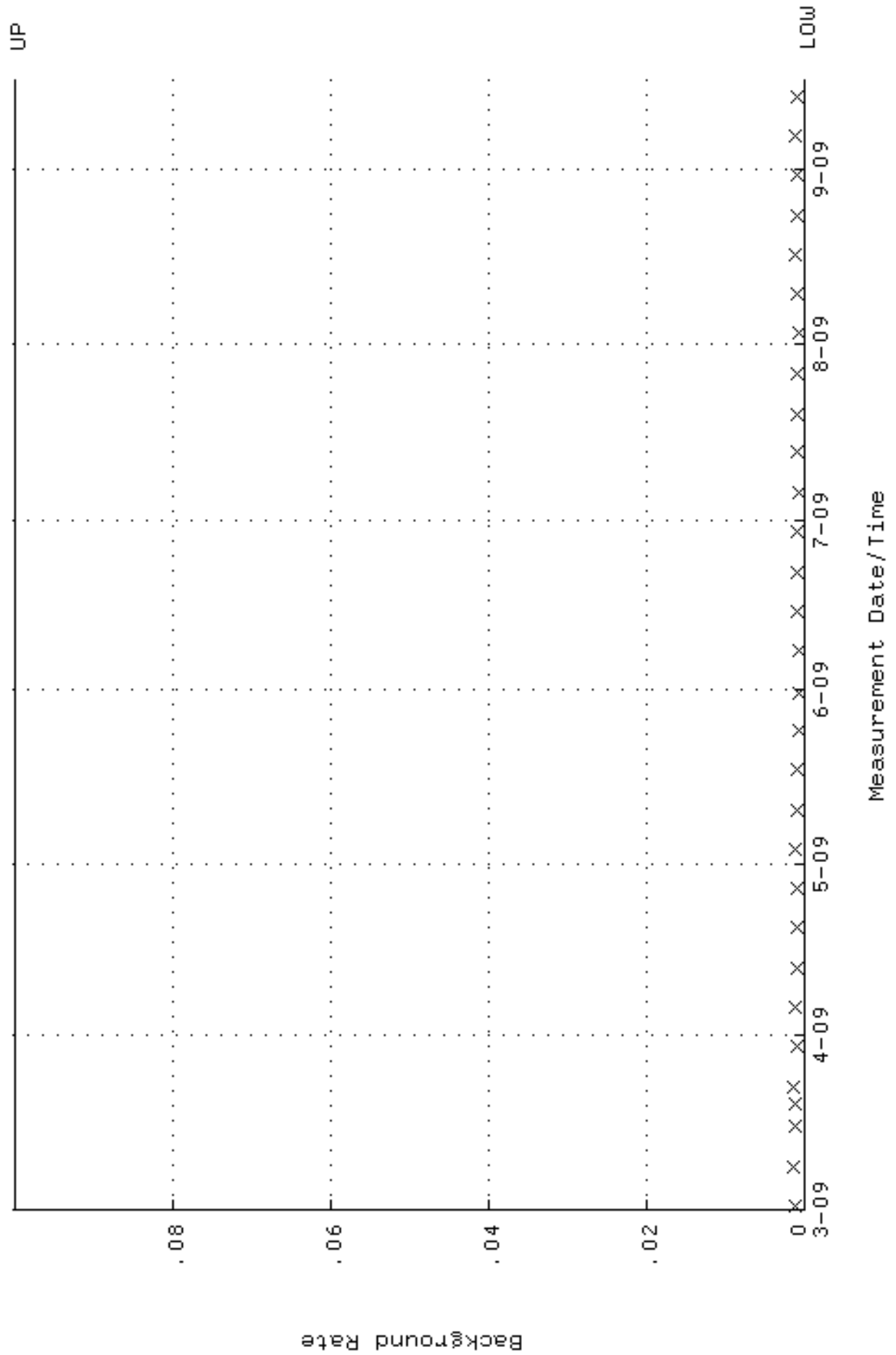
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:10:14 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.240299 through 0.260299



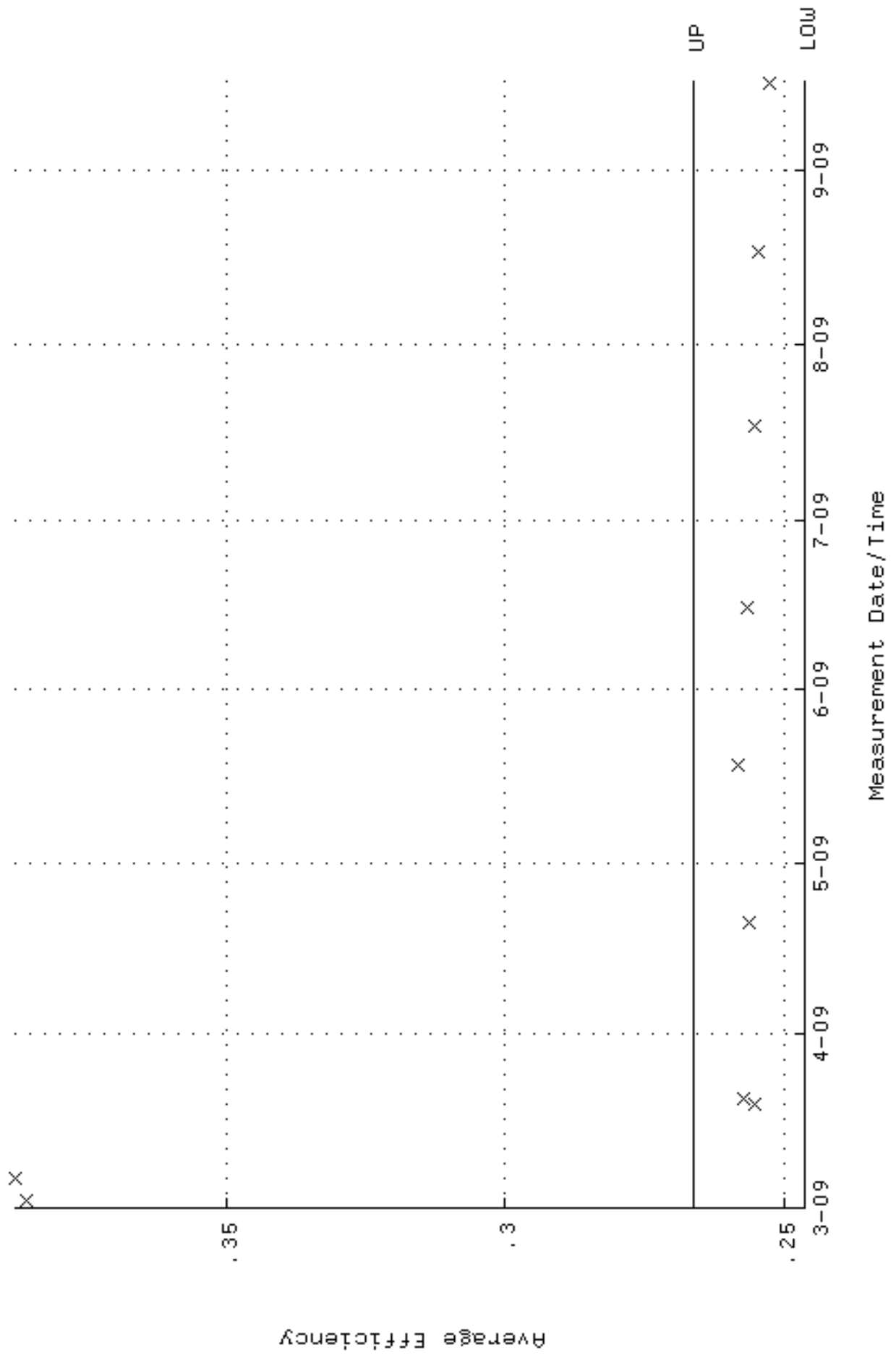
QA filename : DKA100:[ENV_ALPHA.QA.W]W139.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:10:14 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 85.8145 through 94.8477



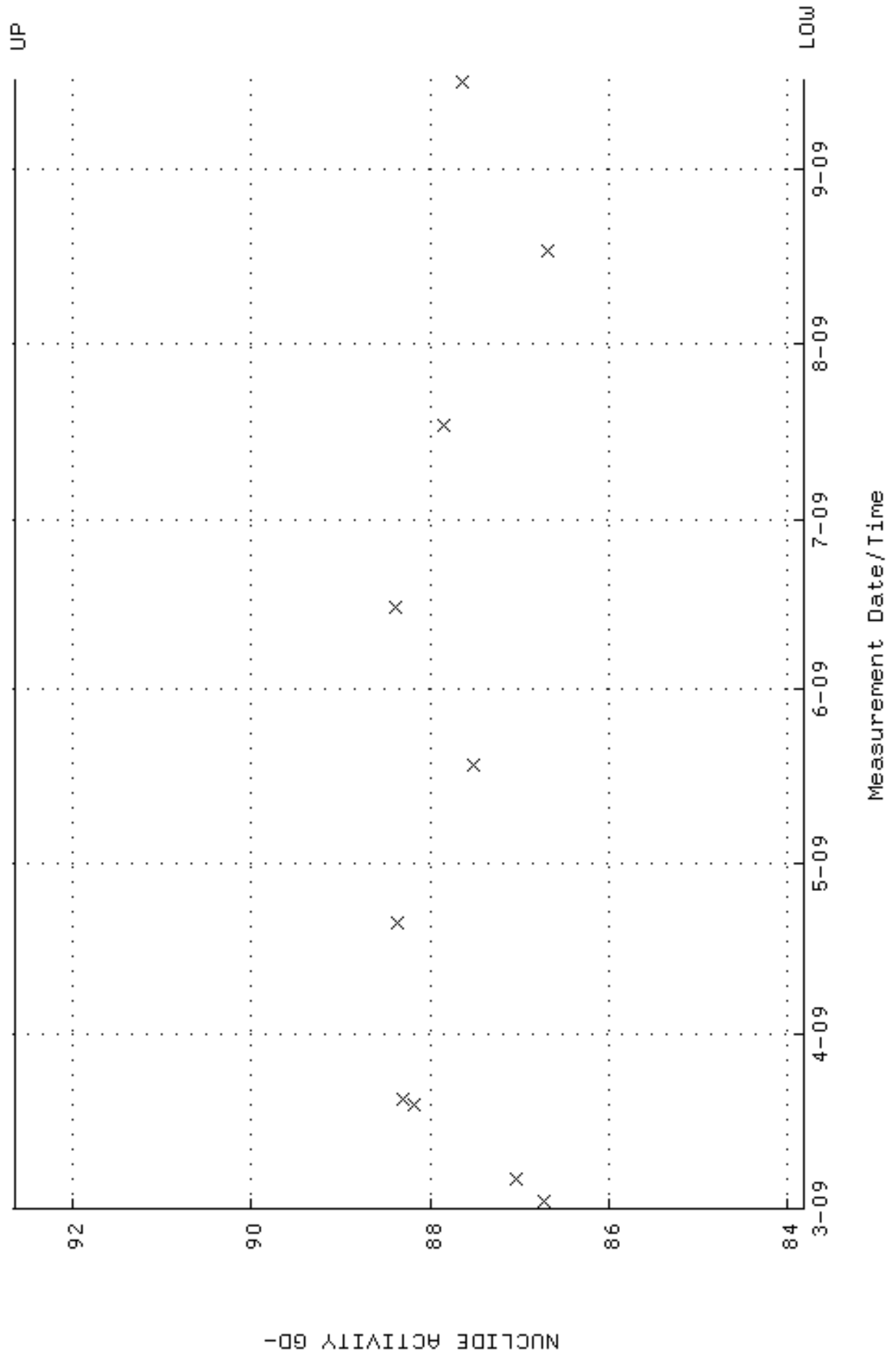
QA filename : DKA100:[ENV_ALPHA.QA.B]B139.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:37 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



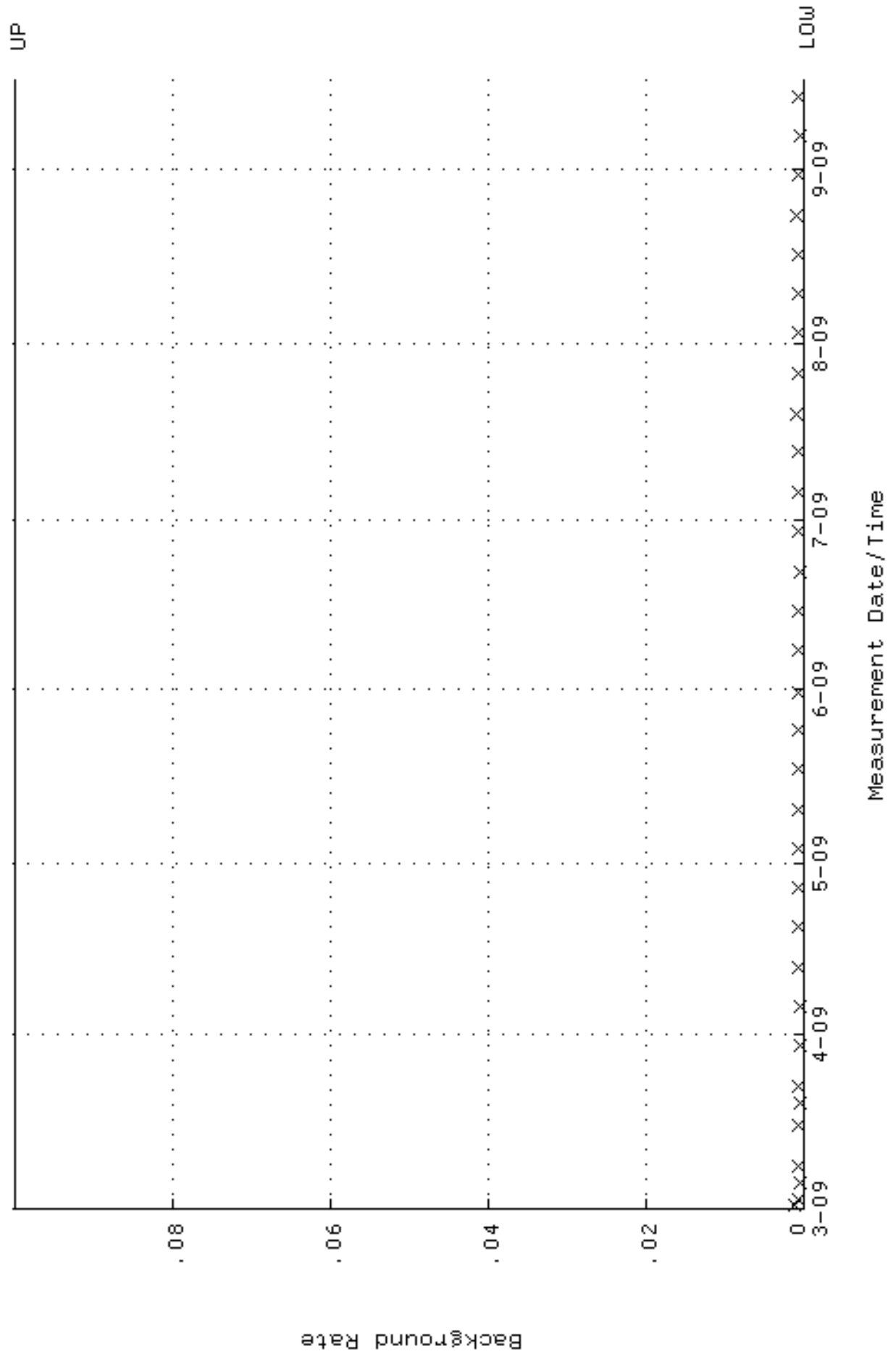
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:10:19 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.246178 through 0.266178



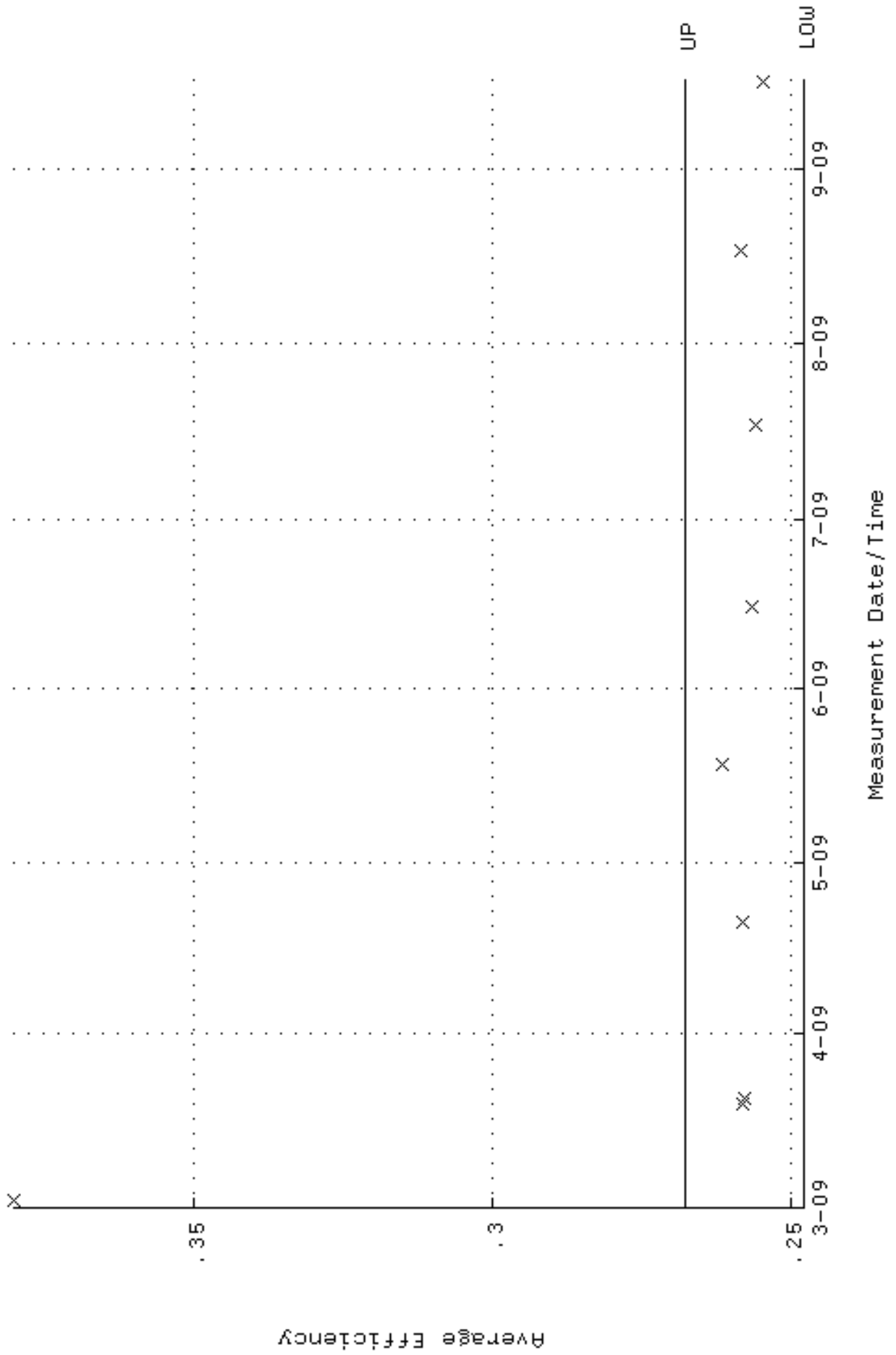
QA filename : DKA100:[ENV_ALPHA.QA.W]W140.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:10:19 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 83.8171 through 92.6399



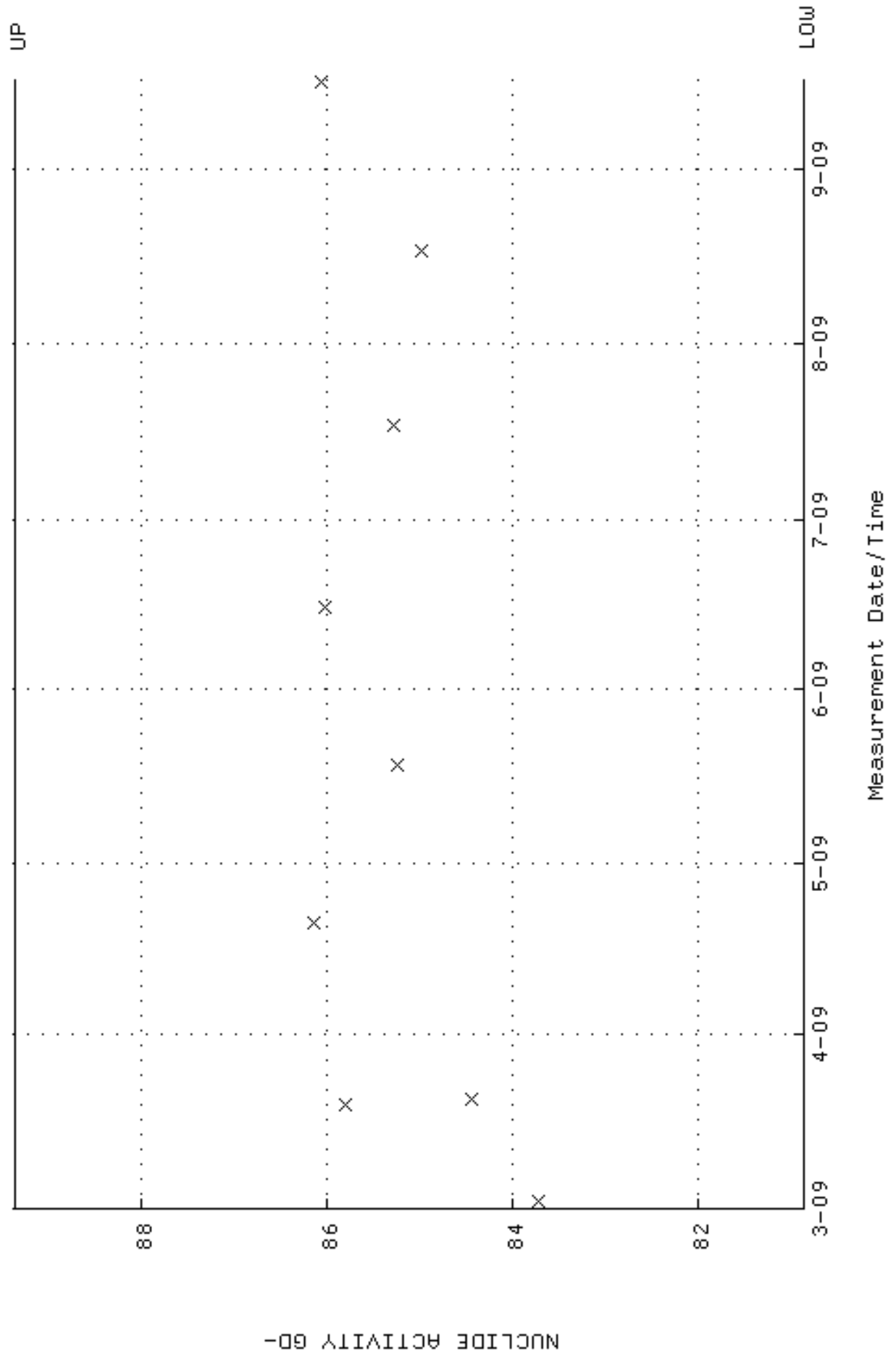
QA filename : DKA100:[ENV_ALPHA.QA.B]B140.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:41 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



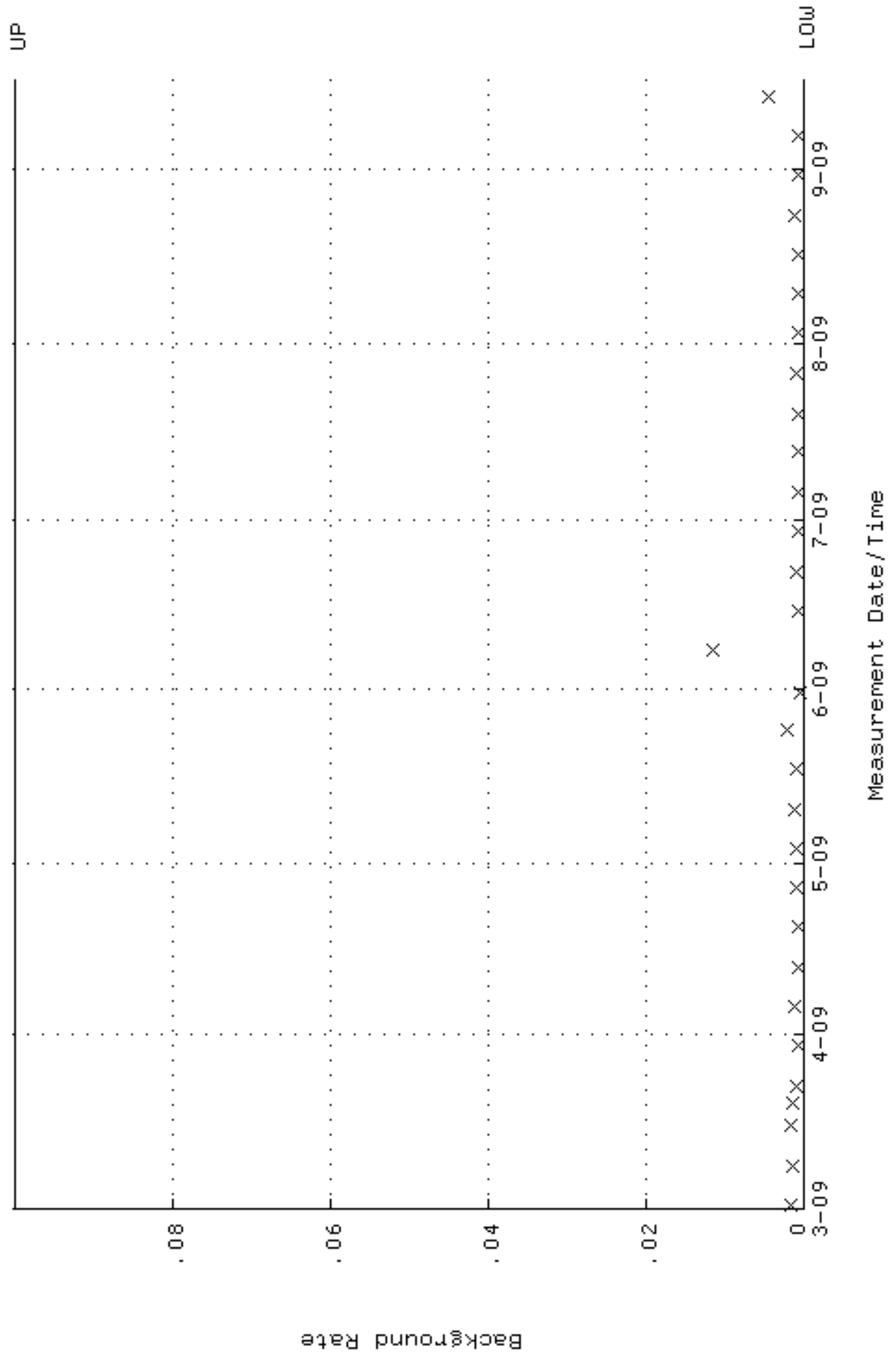
QA filename : DKA100:[ENV_ALPHA.QA.W]W141.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:10:24 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.247845 through 0.267845



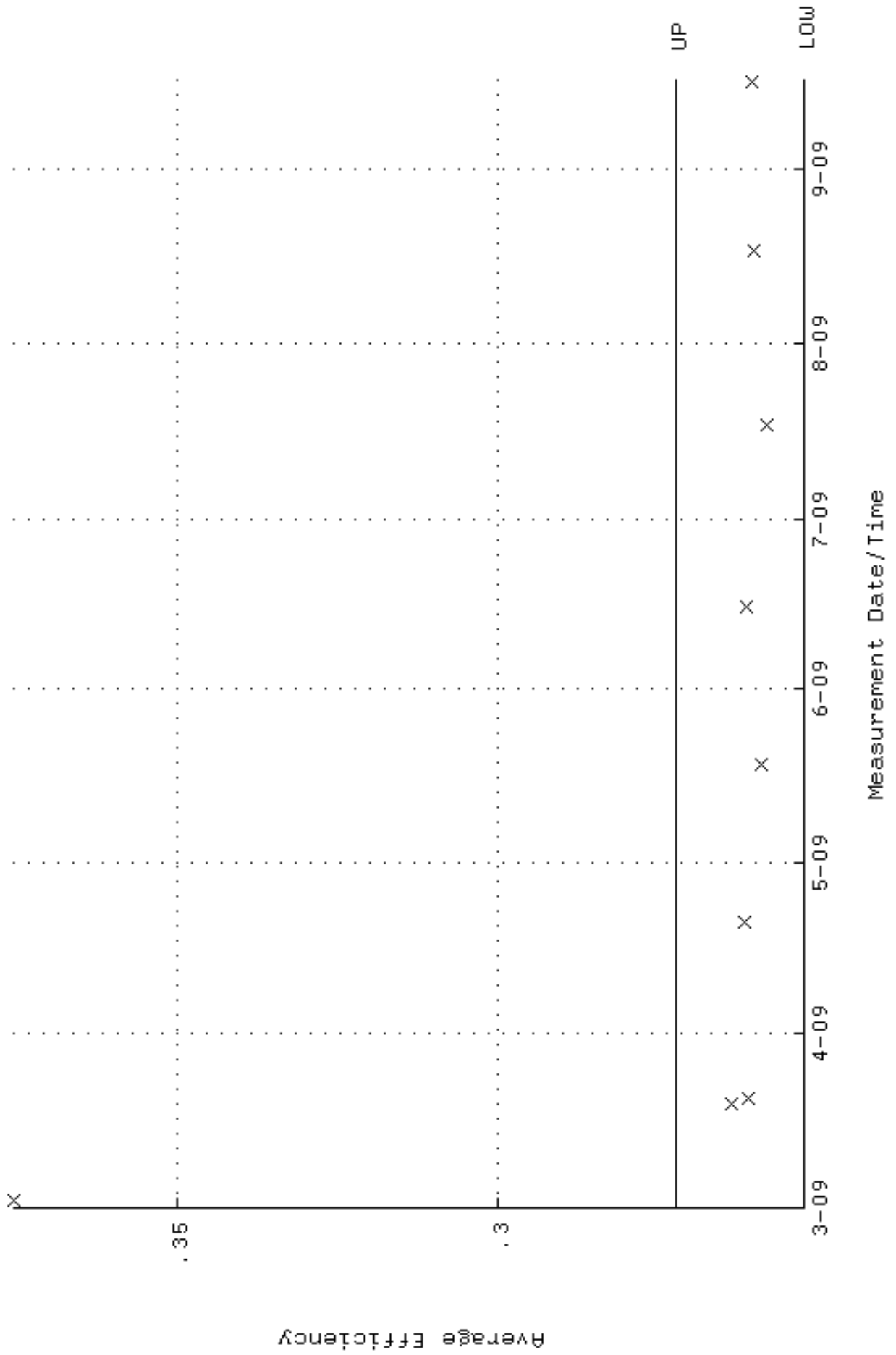
QA filename : DKA100:[ENV_ALPHA.QA.W]w141.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:10:24 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 80.8595 through 89.3711



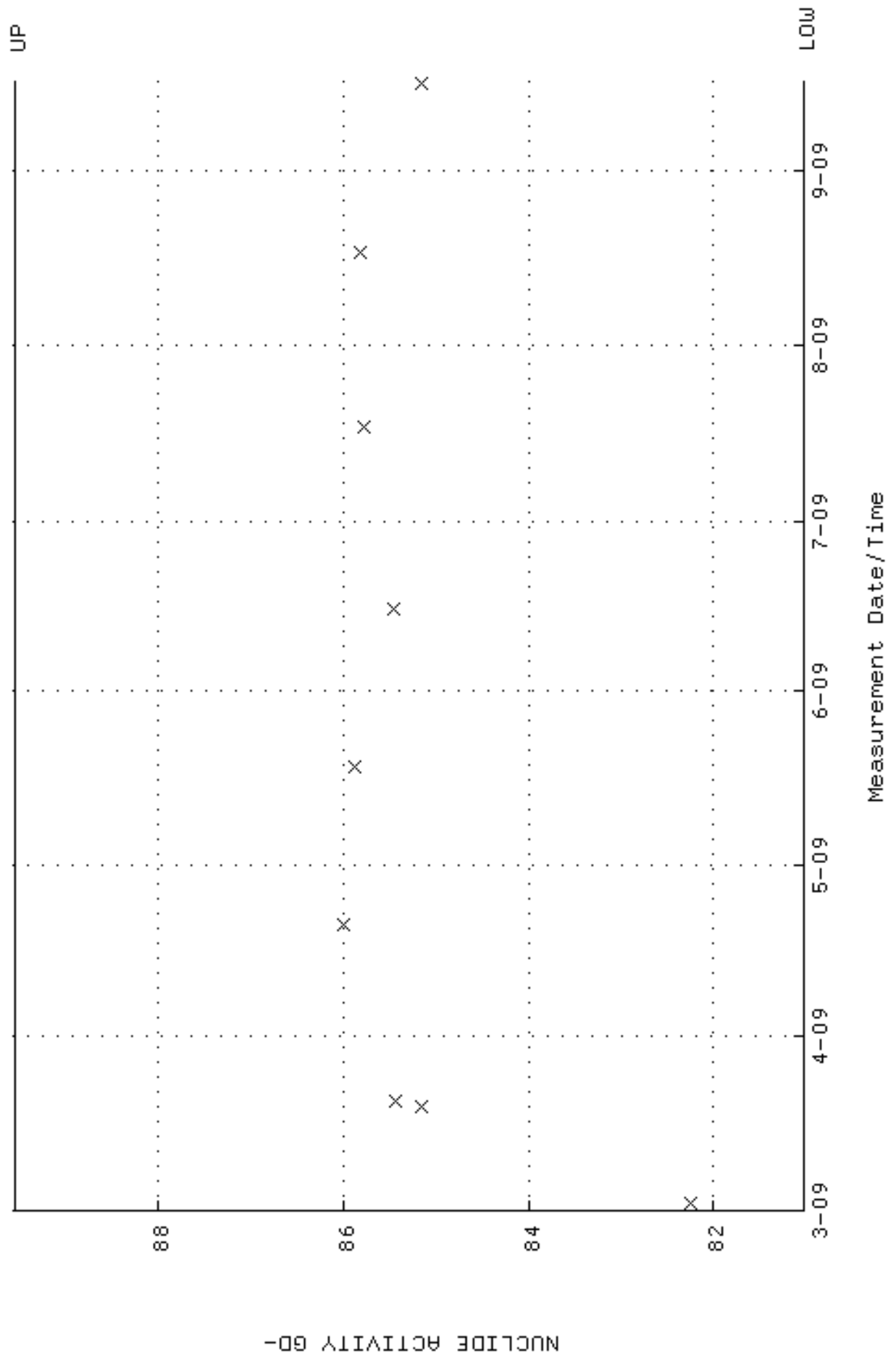
QA filename : DKA100:[ENV_ALPHA.QA.B]B141.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:45 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



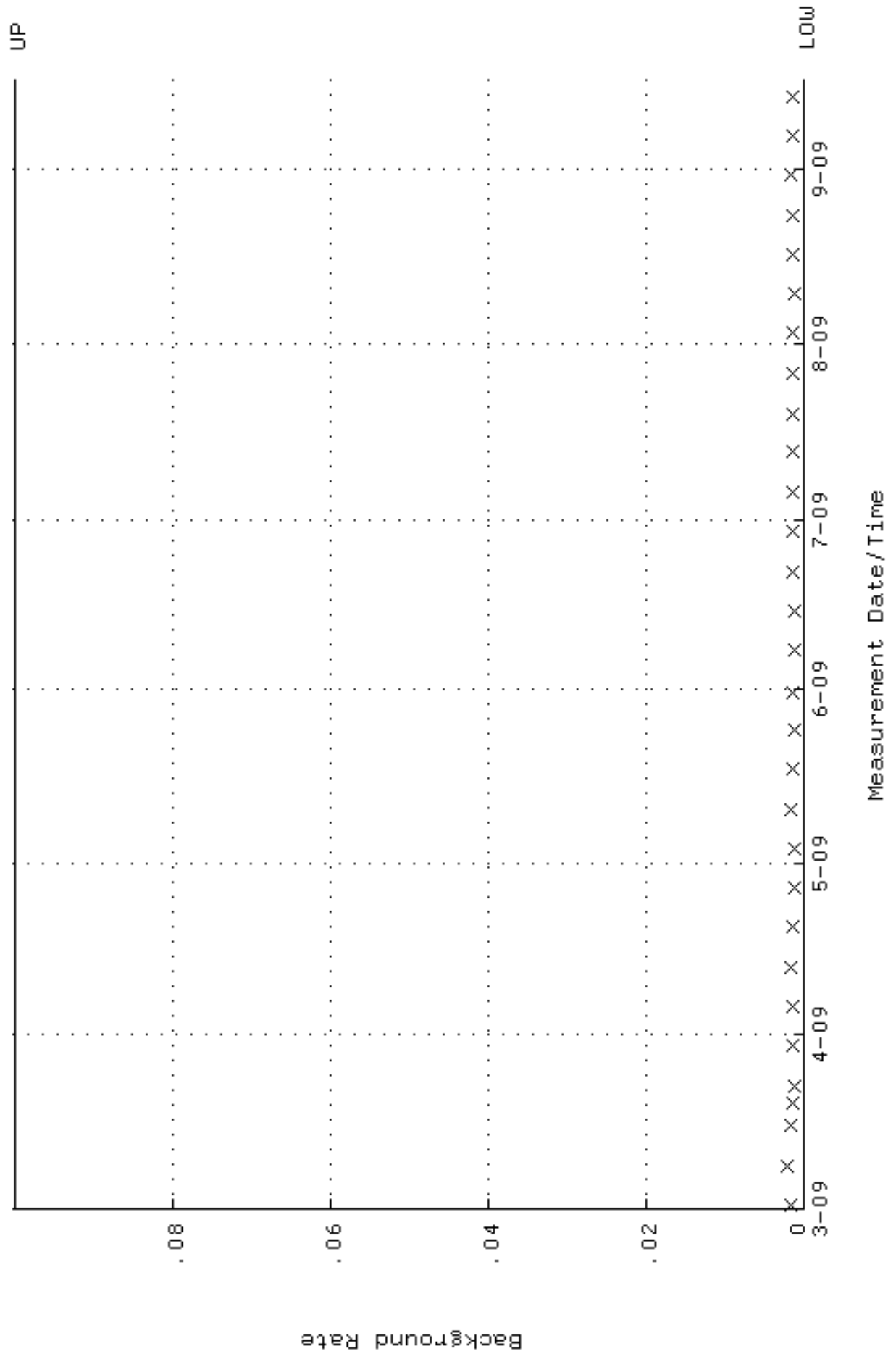
QA filename : DKA100:[ENV_ALPHA.QA.W]W142.QAF;2
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:10:30 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.252182 through 0.272182



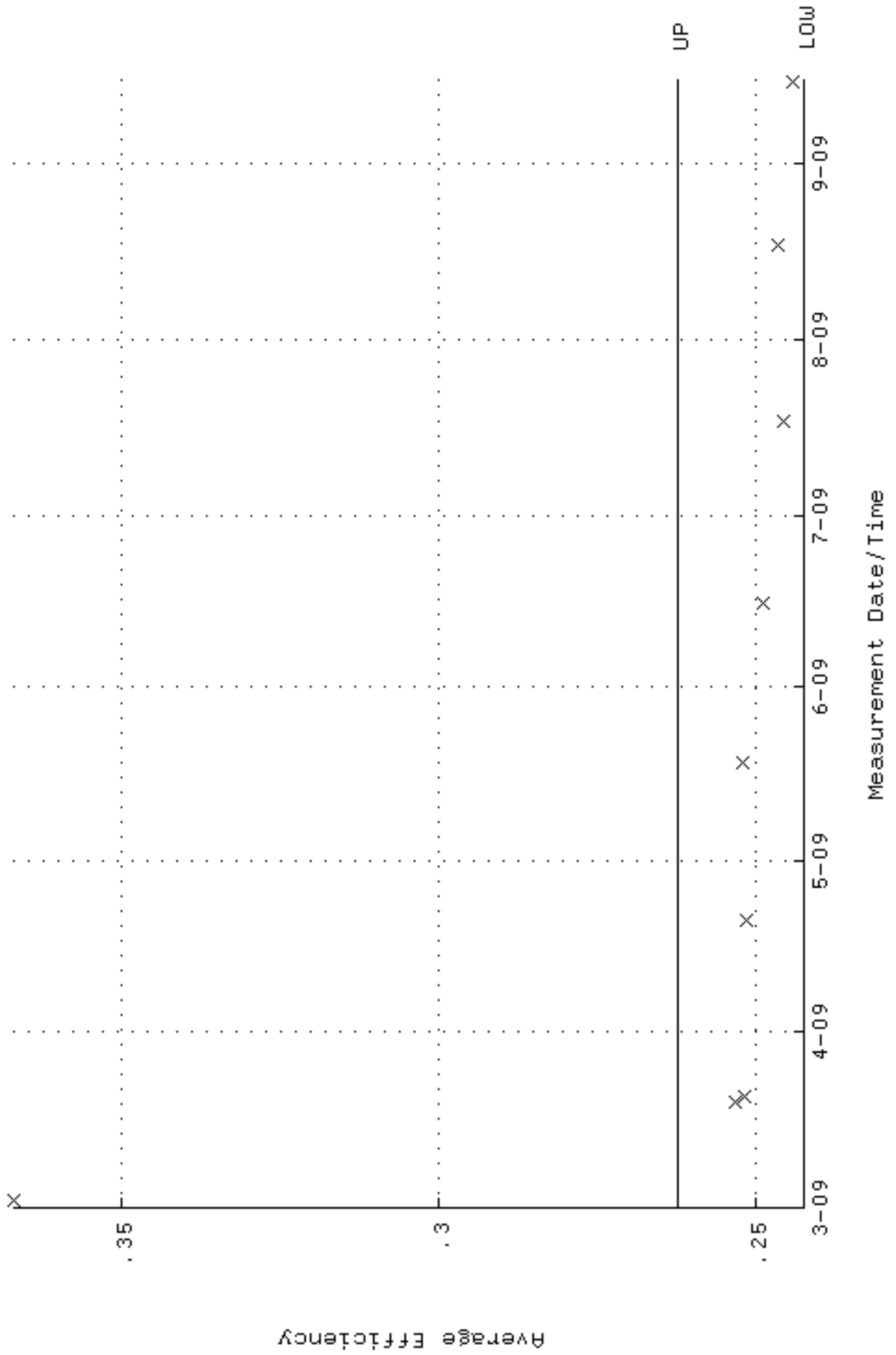
QA filename : DKA100:[ENV_ALPHA.QA.W]W142.QAF;2
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:10:30 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 81.0245 through 89.5533



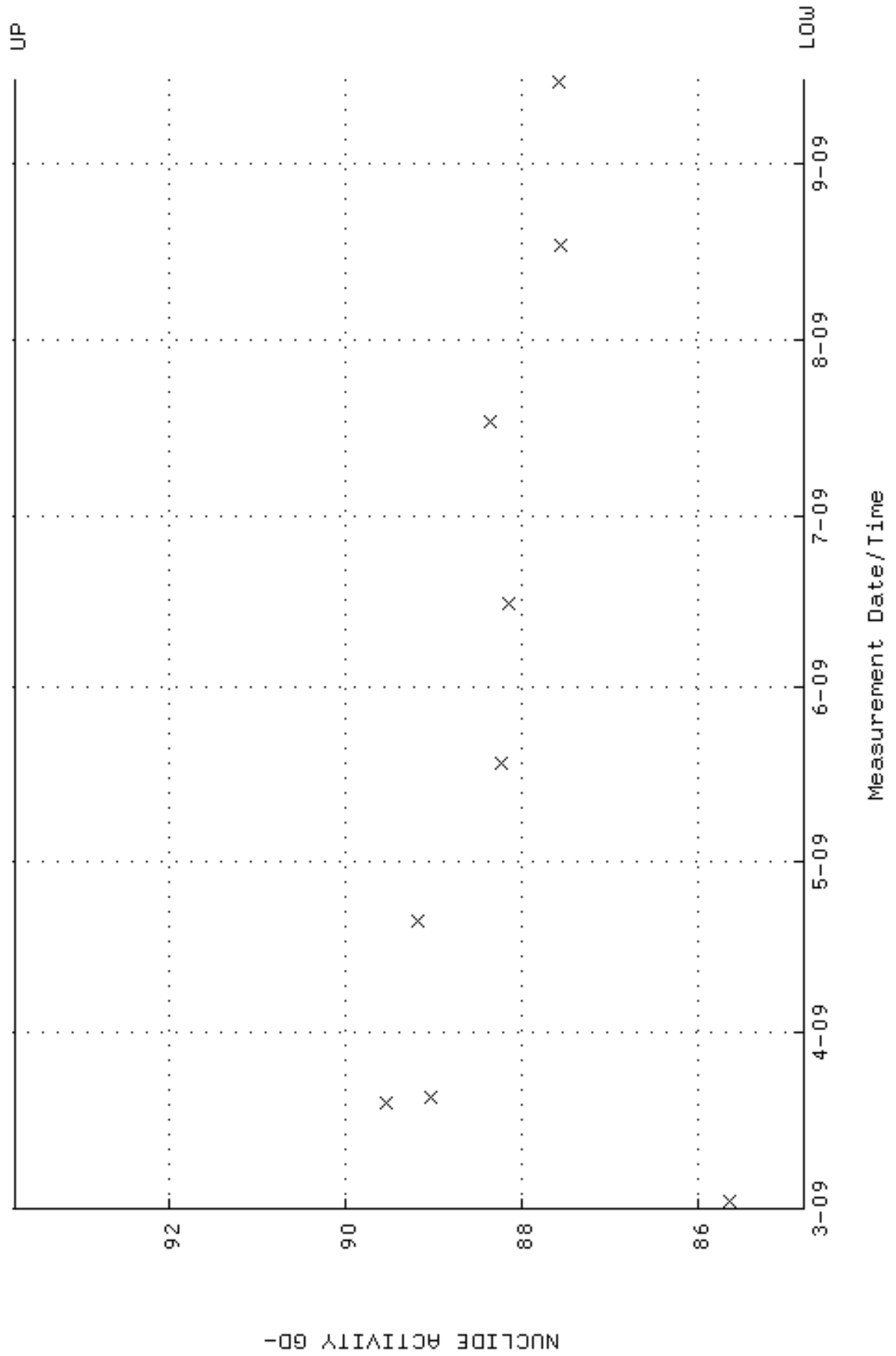
QA filename : DKA100:[ENV_ALPHA.QA.B]B142.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:19:49 through 16-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



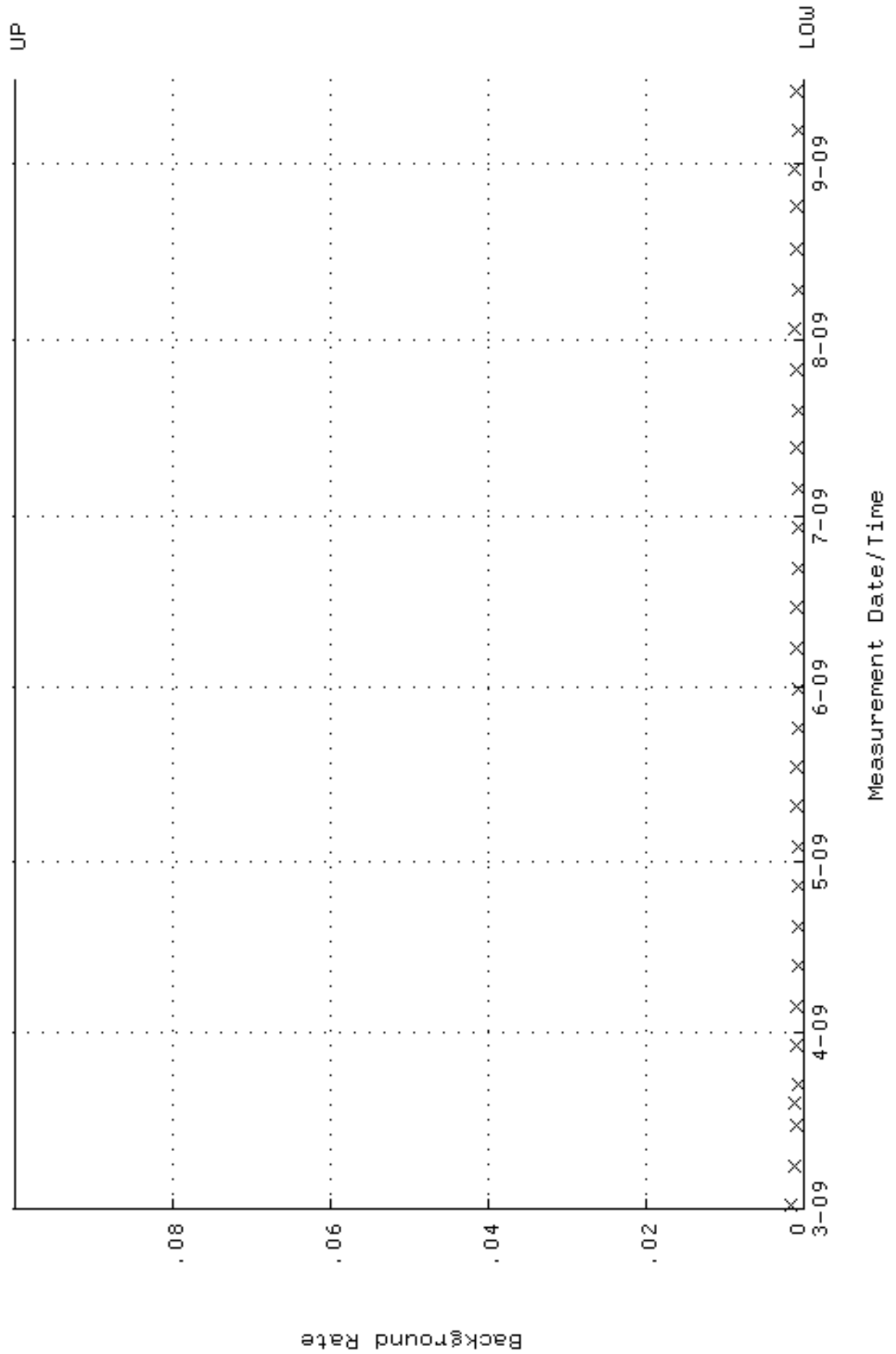
QA filename : DKA100:[ENV_ALPHA.QA.W]W149.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:11:08 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242495 through 0.262495



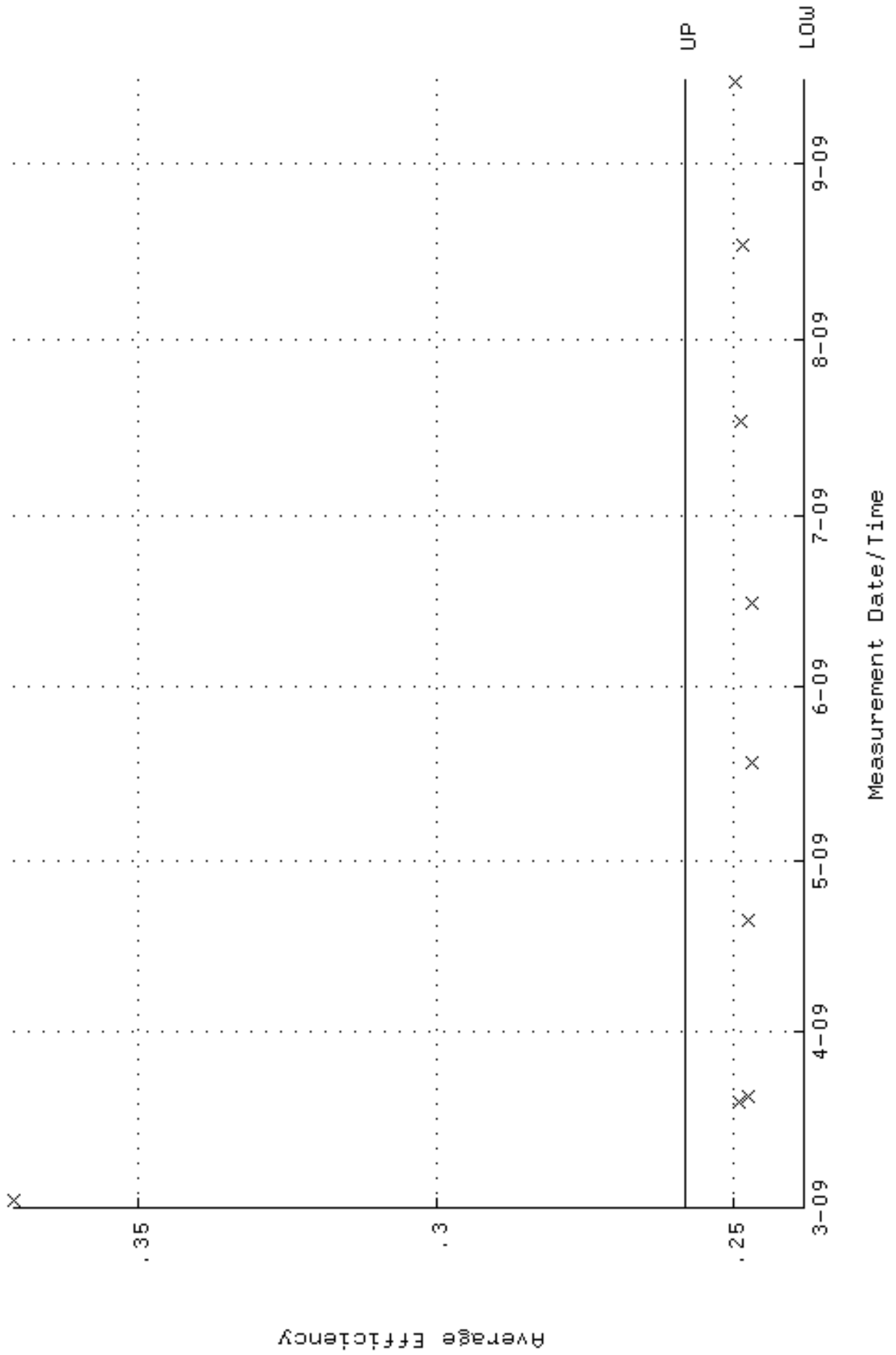
QA filename : DKA100:[ENV_ALPHA.QA.W]w149.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:11:08 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 84.8126 through 93.7402



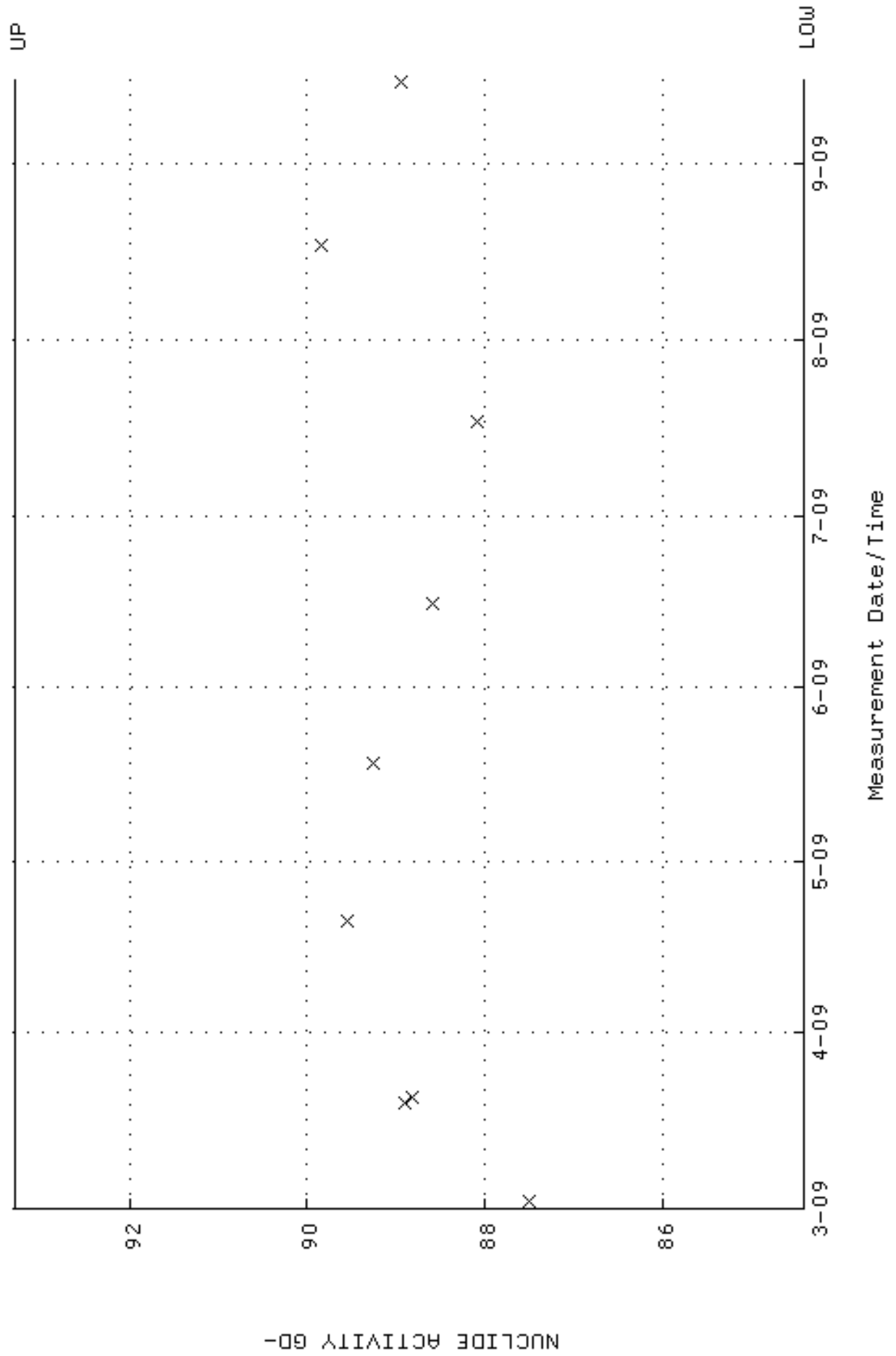
QA filename : DKA100:[ENV_ALPHA.QA.B]B149.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:20:17 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



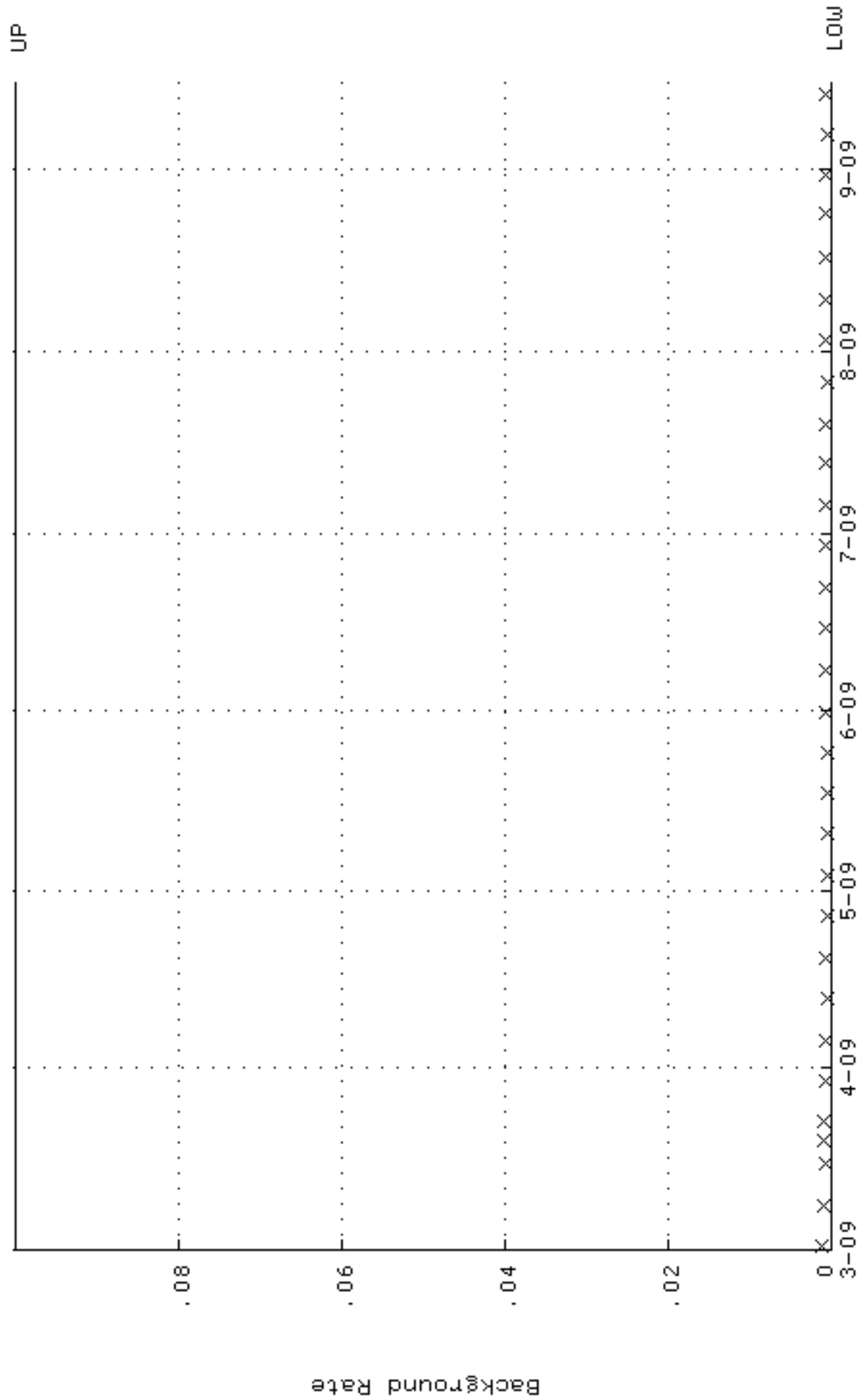
QA filename : DKA100:[ENV_ALPHA.QA.W]W150.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:11:14 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.238314 through 0.258314



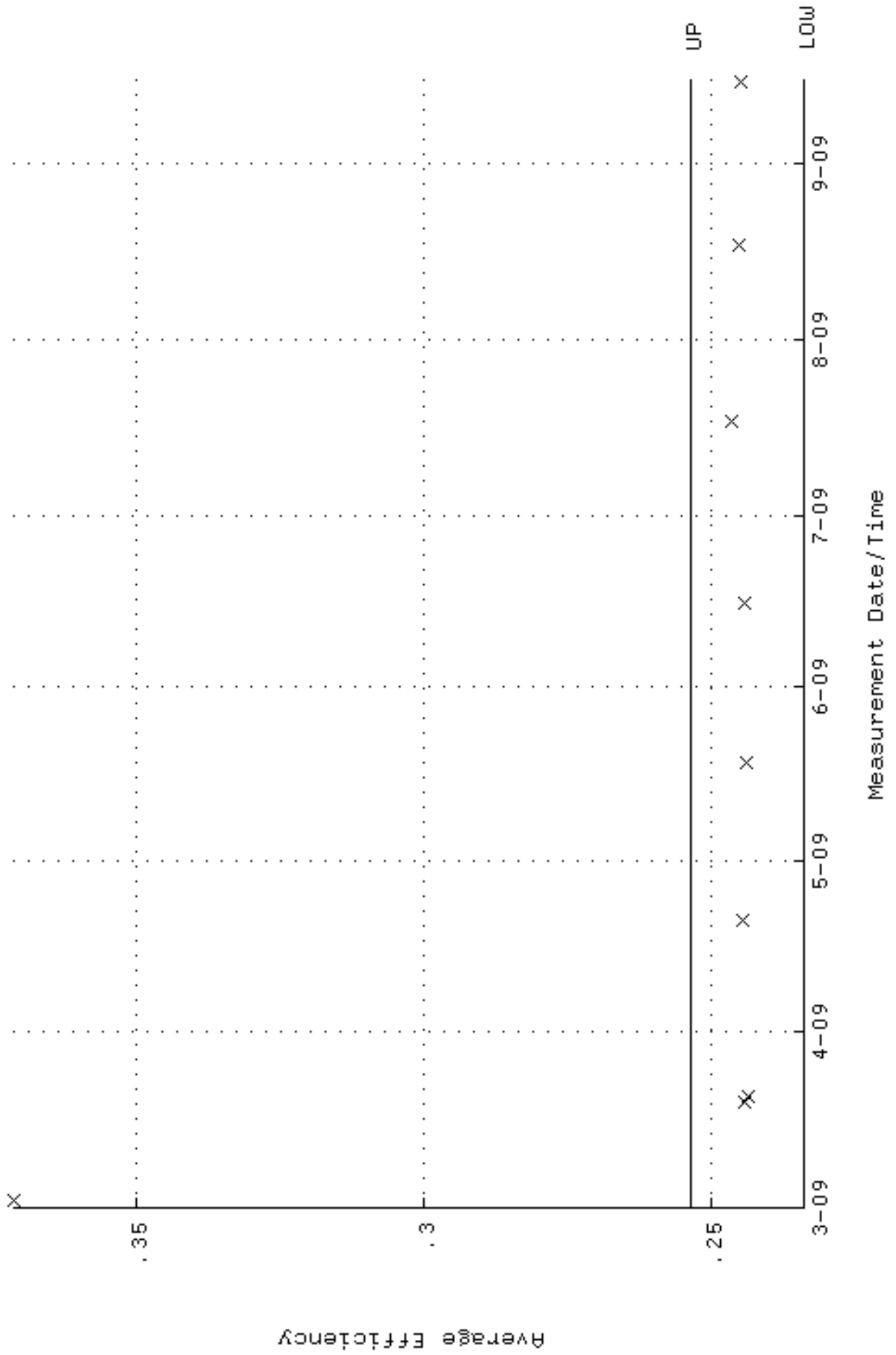
QA filename : DKA100:[ENV_ALPHA.QA.W]w150.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:11:14 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 84.4039 through 93.2885



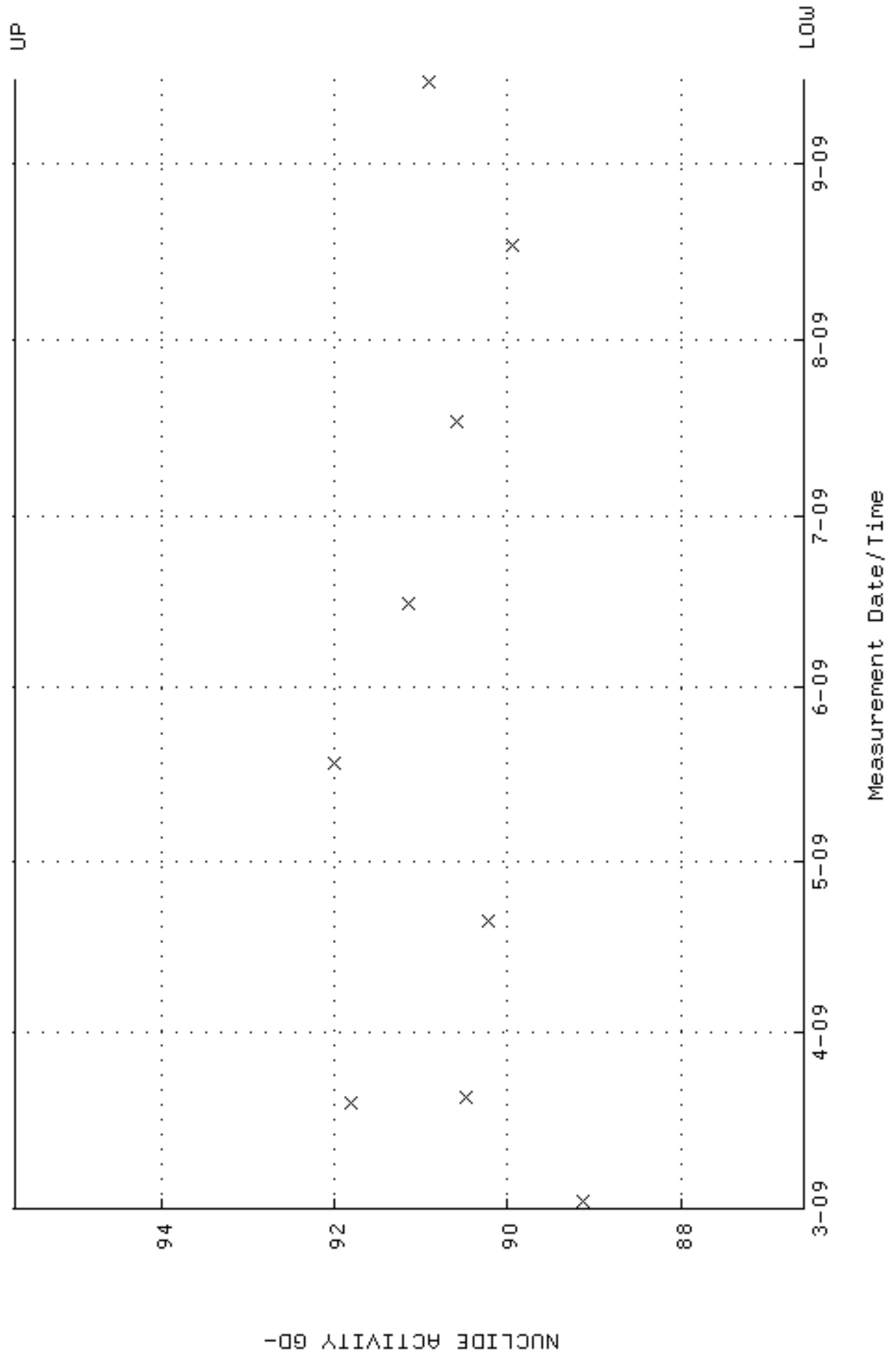
QA filename : DKA100:[ENV_ALPHA.QA.B]B150.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:20:21 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



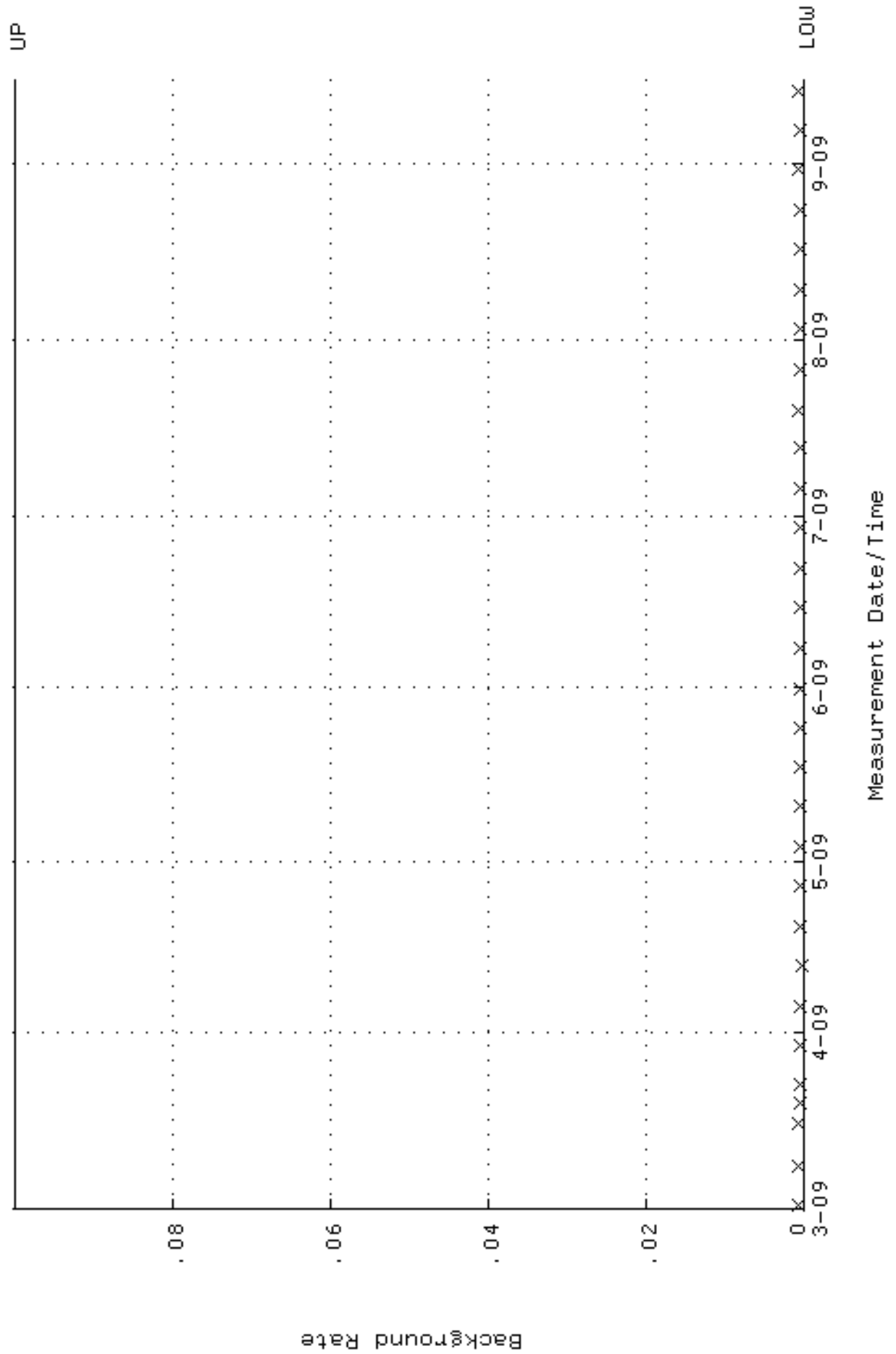
QA filename : DKA100:[ENV_ALPHA.QA.W]W151.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:11:19 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.233693 through 0.253693



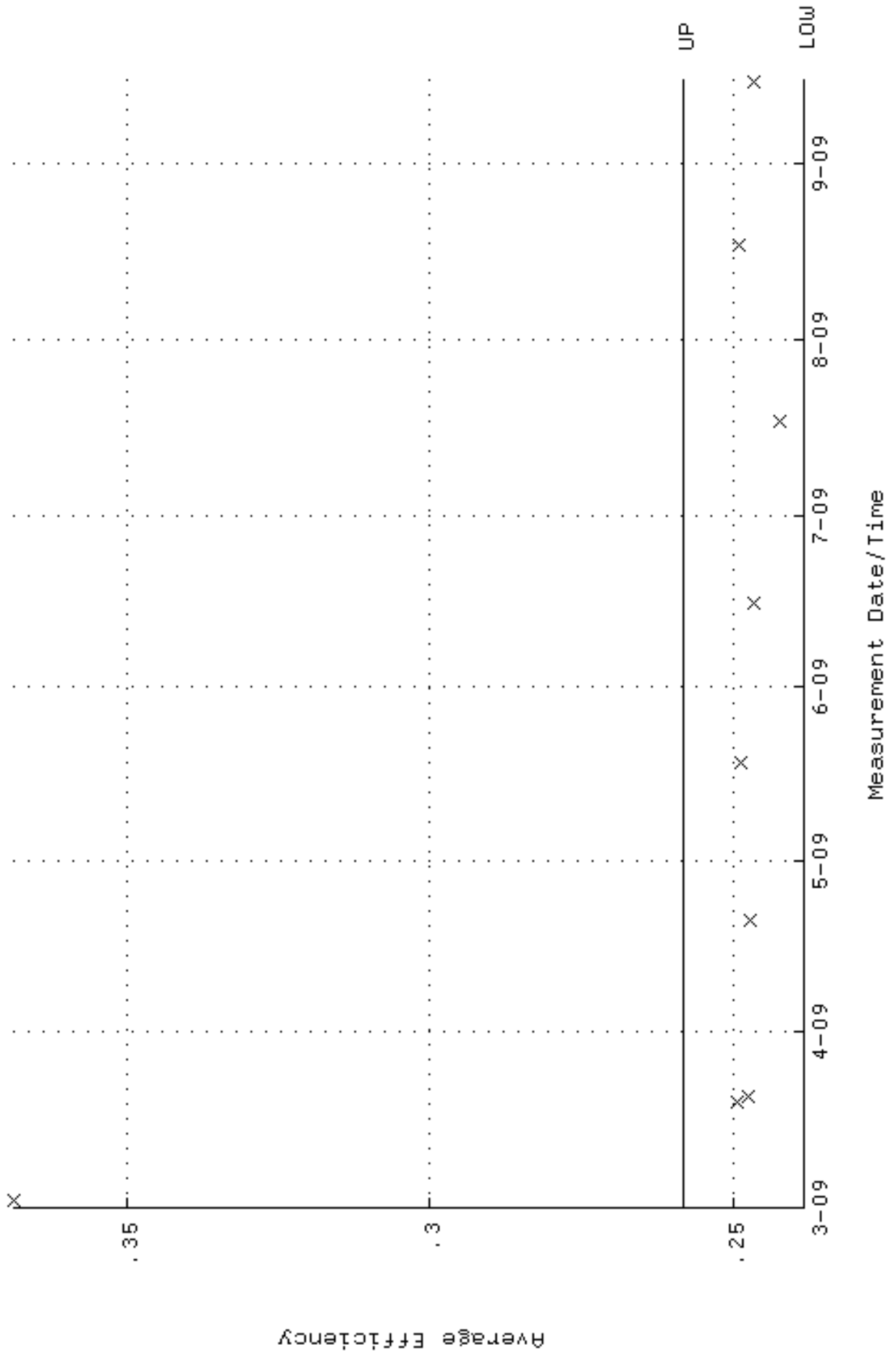
QA filename : DKA100:[ENV_ALPHA.QA.W]w151.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:11:19 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 86.5749 through 95.6881



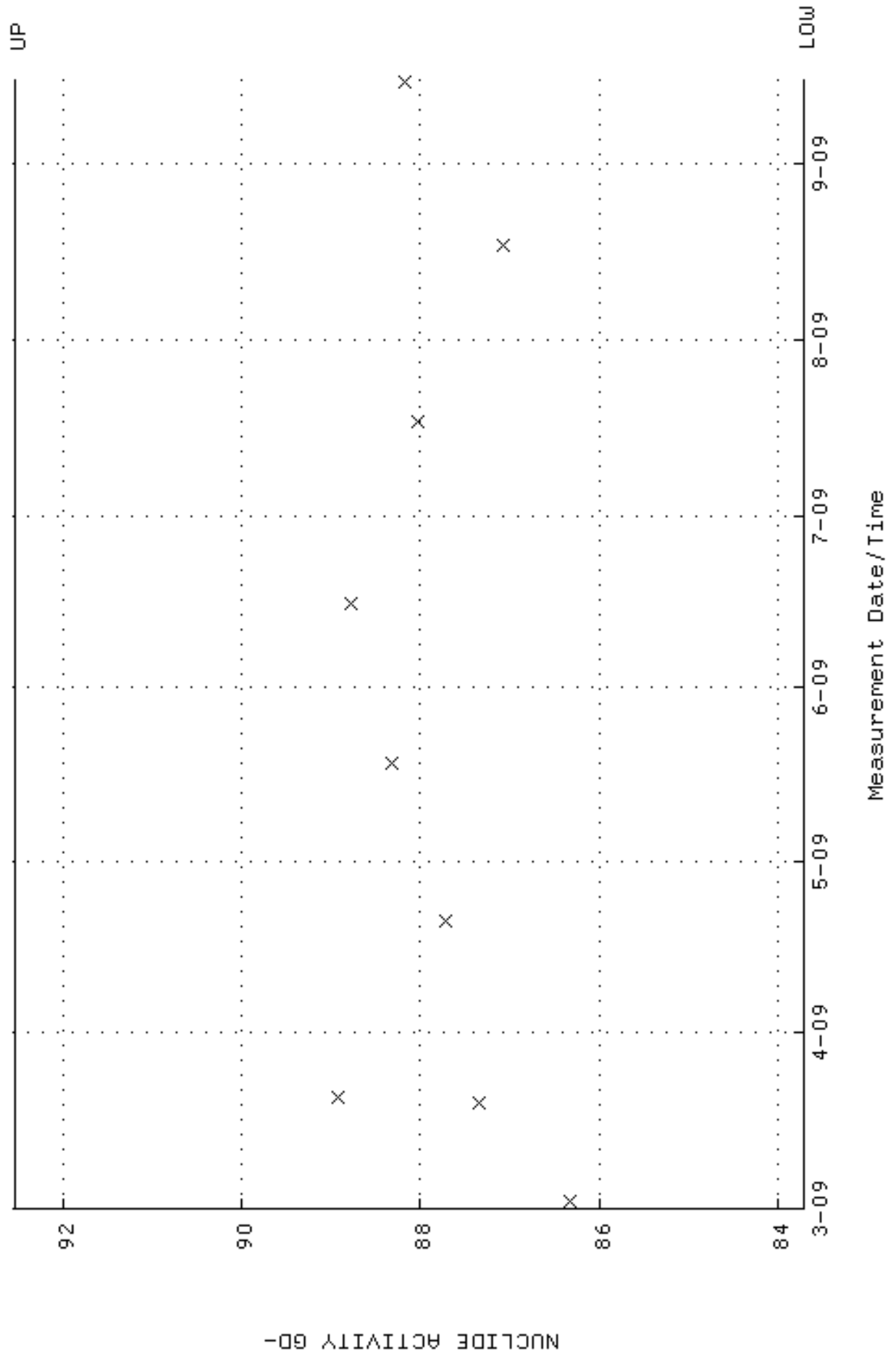
QA filename : DKA100:[ENV_ALPHA.QA.B]B151.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:20:25 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



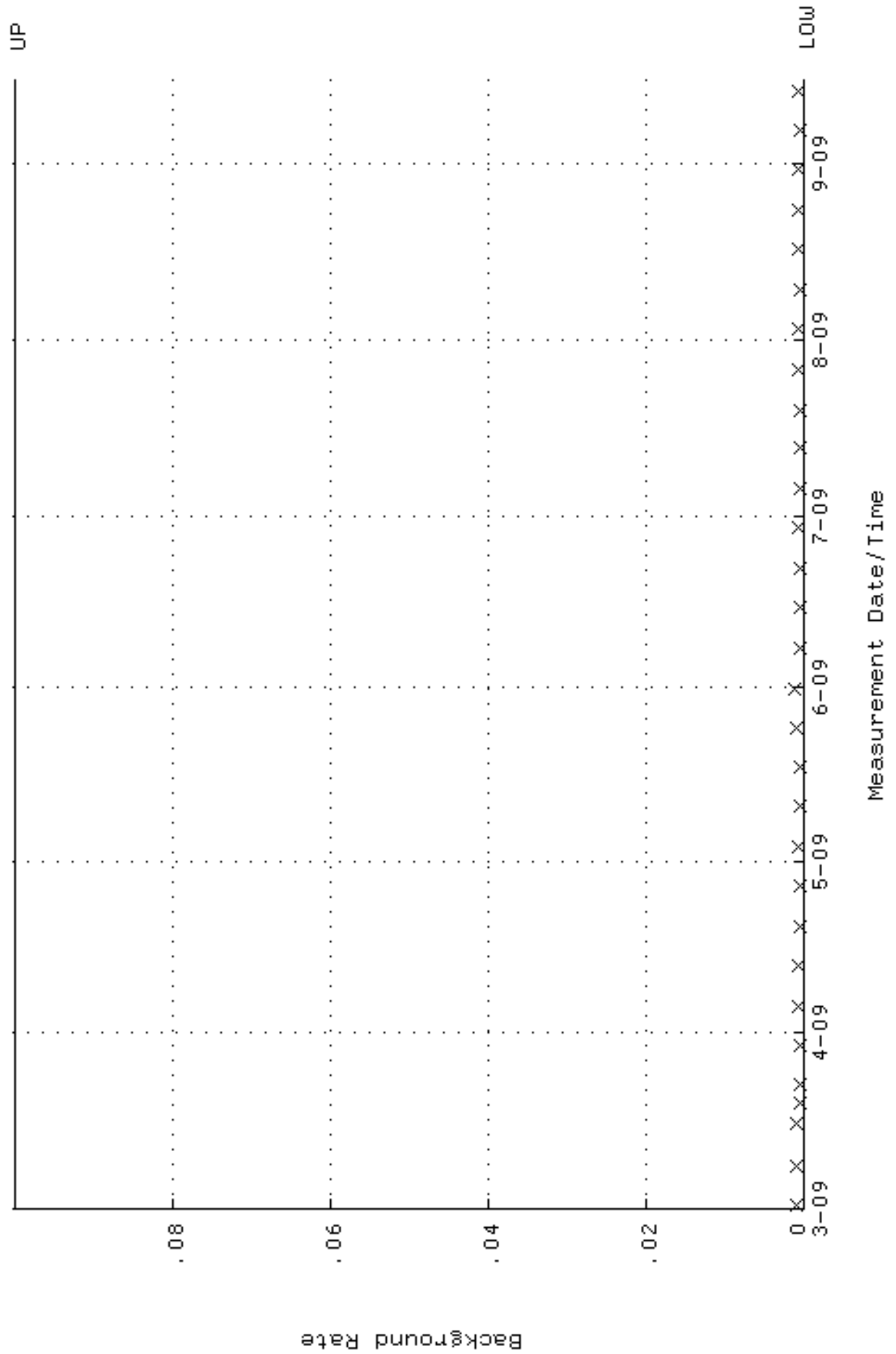
QA filename : DKA100:[ENV_ALPHA.QA.W]W152.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:11:24 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.238479 through 0.258479



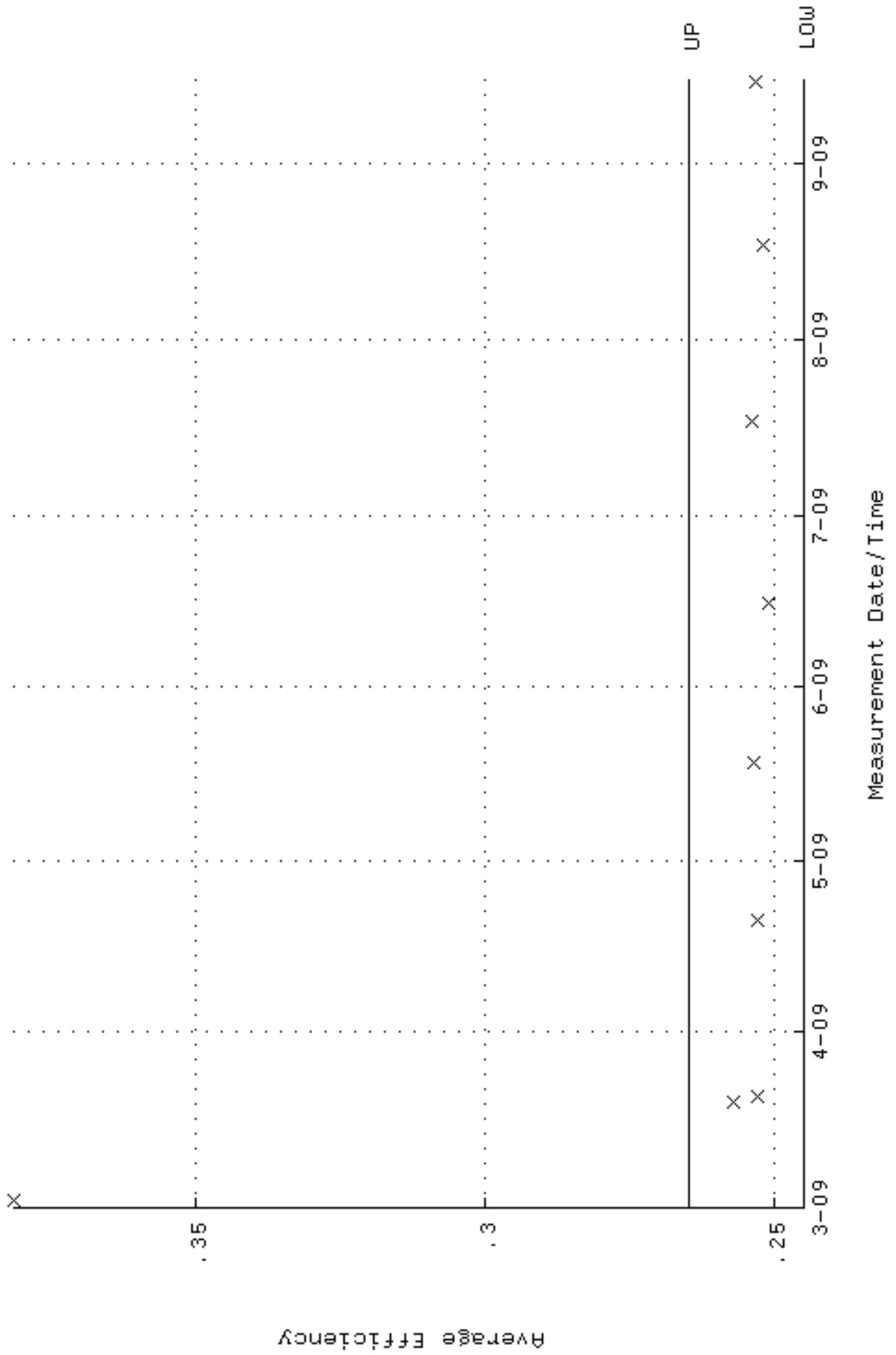
QA filename : DKA100:[ENV_ALPHA.QA.W]w152.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:11:24 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 83.7180 through 92.5304



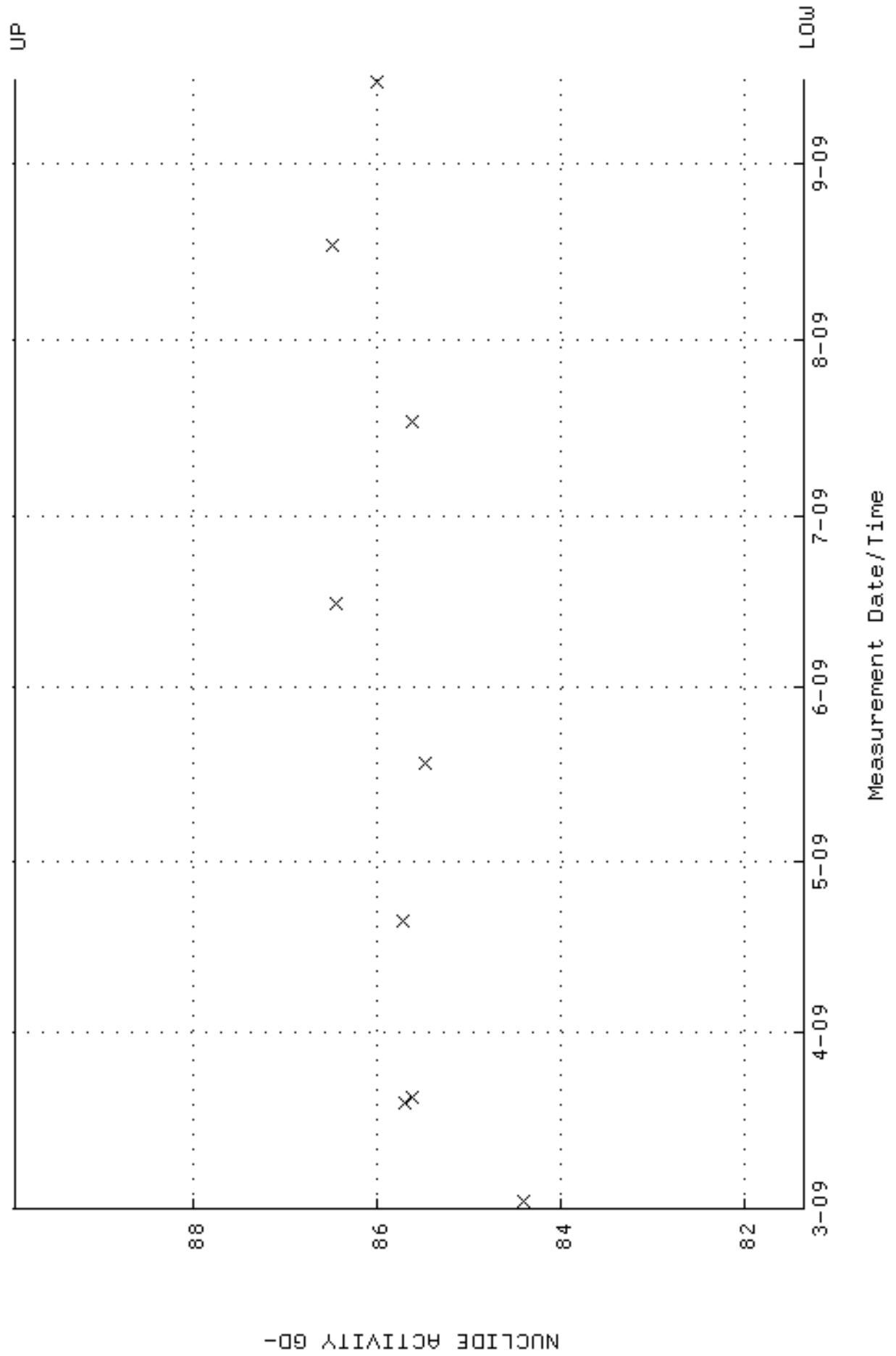
QA filename : DKA100:[ENV_ALPHA.QA.B]B152.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:20:28 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



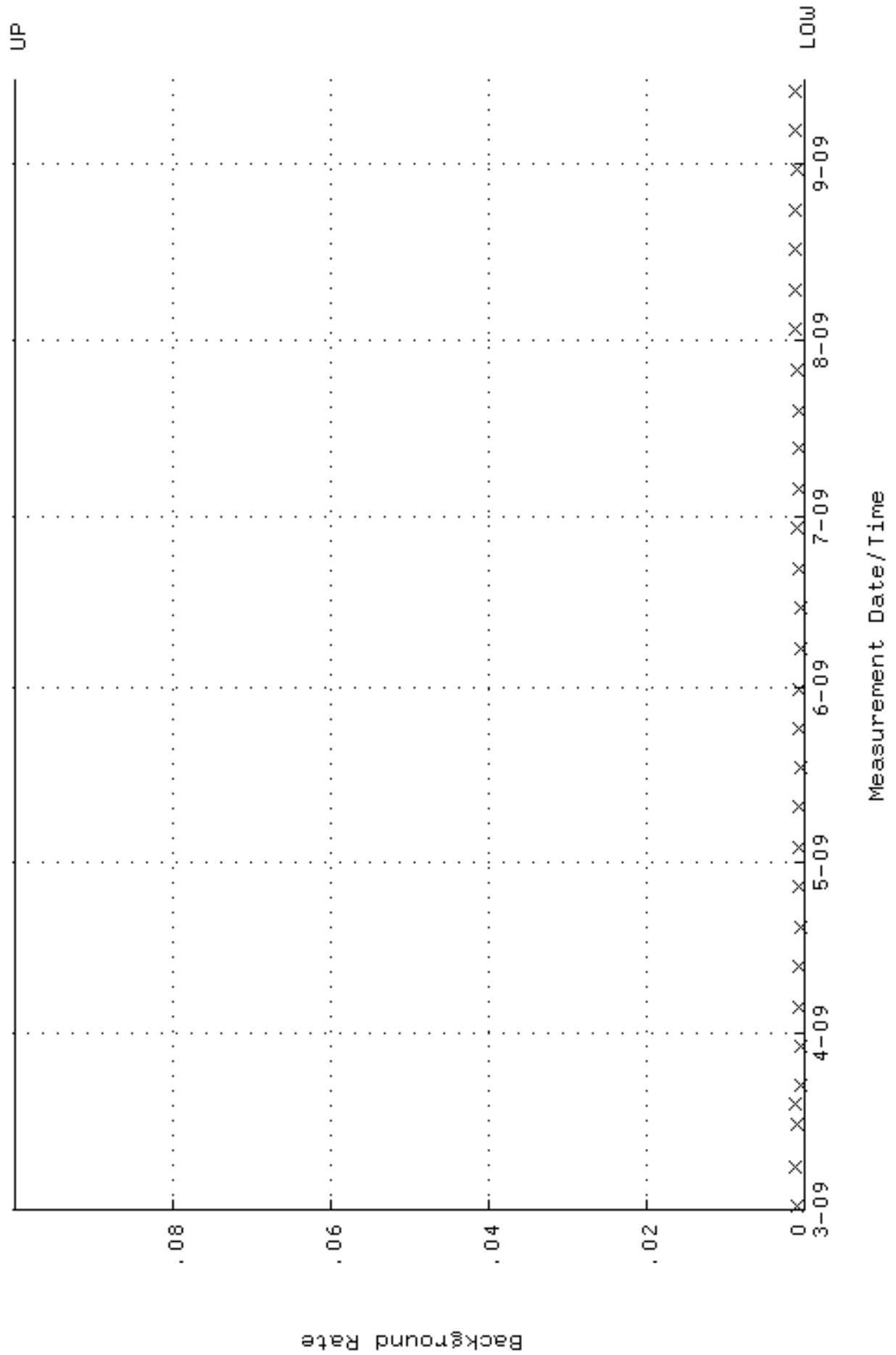
QA filename : DKA100:[ENV_ALPHA.QA.W]W153.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:11:30 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.244738 through 0.264738



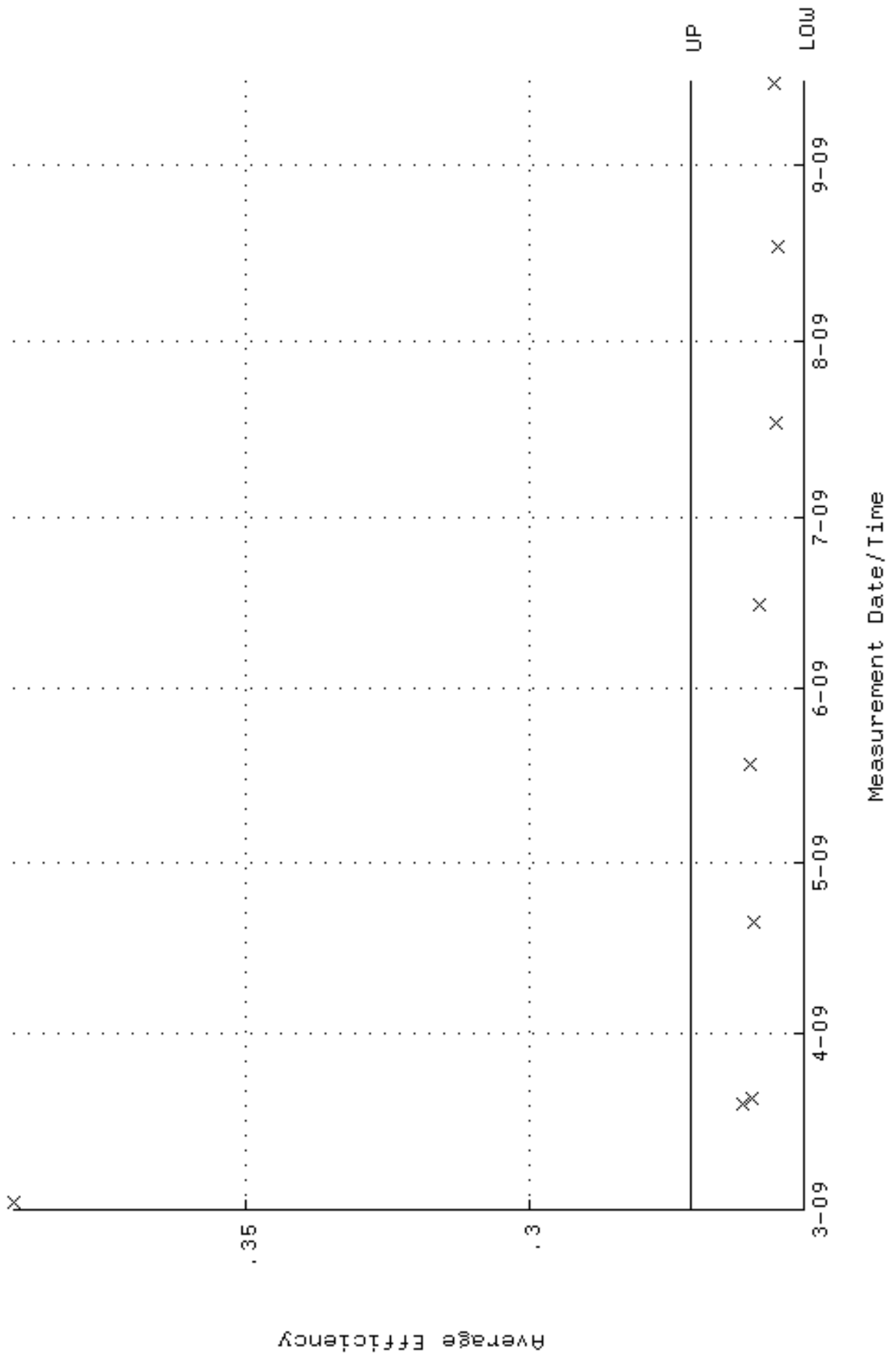
QA filename : DKA100:[ENV_ALPHA.QA.W]W153.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 2-MAR-2009 11:11:30 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 81.3634 through 89.9280



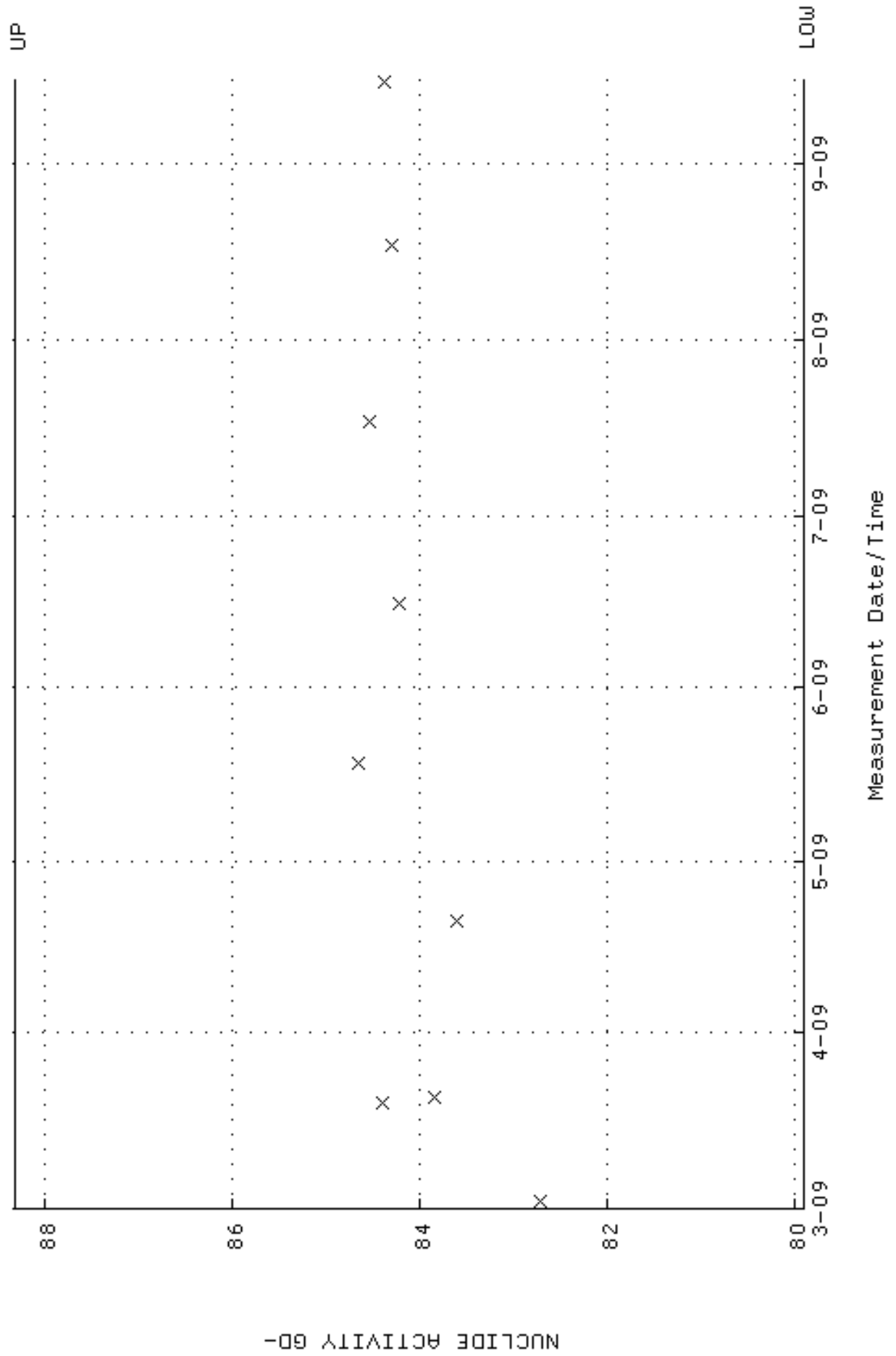
QA filename : DKA100:[ENV_ALPHA.QA.B]B153.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:20:32 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



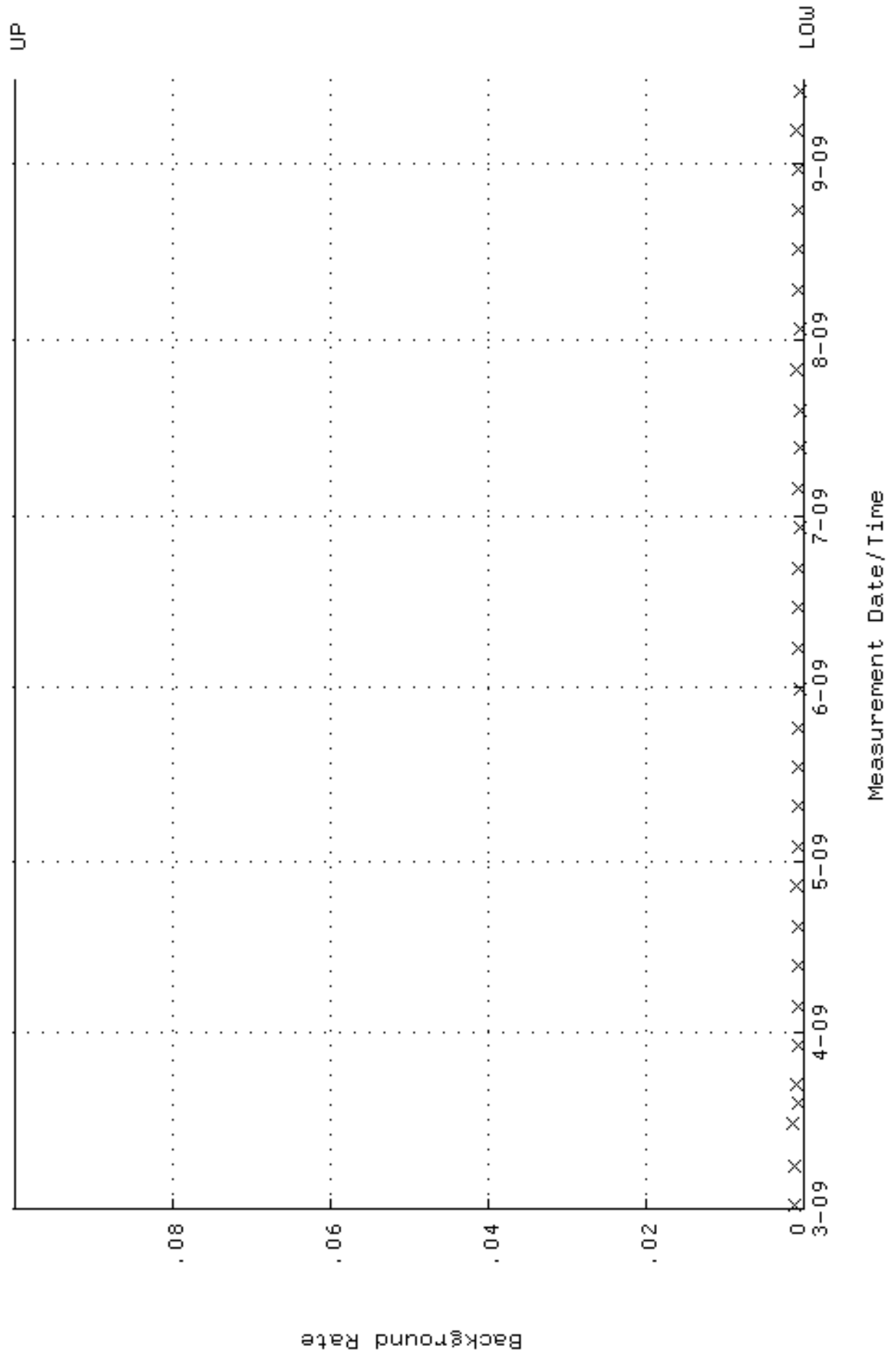
QA filename : DKA100:[ENV_ALPHA.QA.W]W154.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 2-MAR-2009 11:11:36 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.251386 through 0.271386



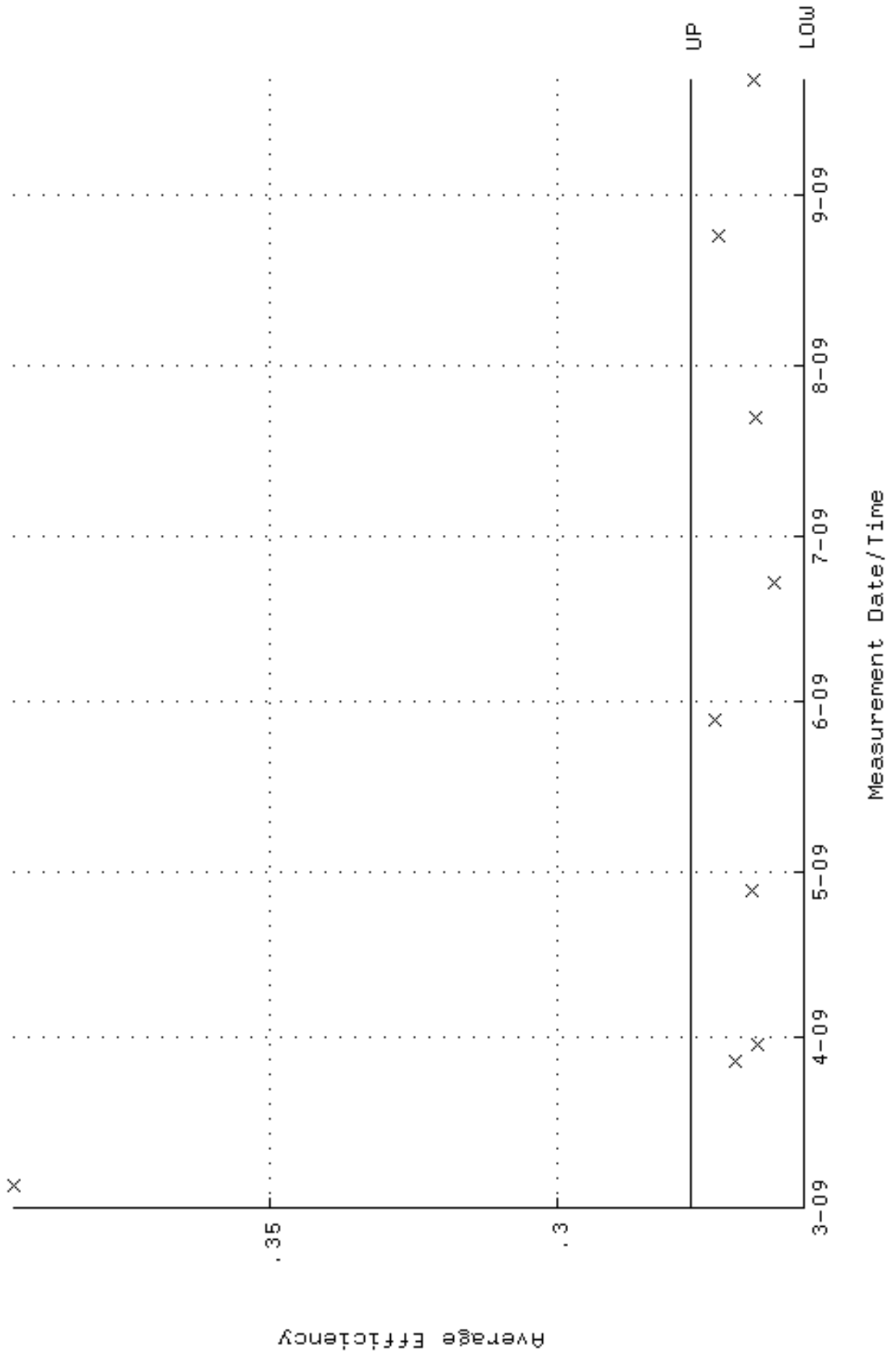
QA filename : DKA100:[ENV_ALPHA.QA.W]w154.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 2-MAR-2009 11:11:36 through 15-SEP-2009 12:00:00
Lower/Upper Lmts: 79.9003 through 88.3109



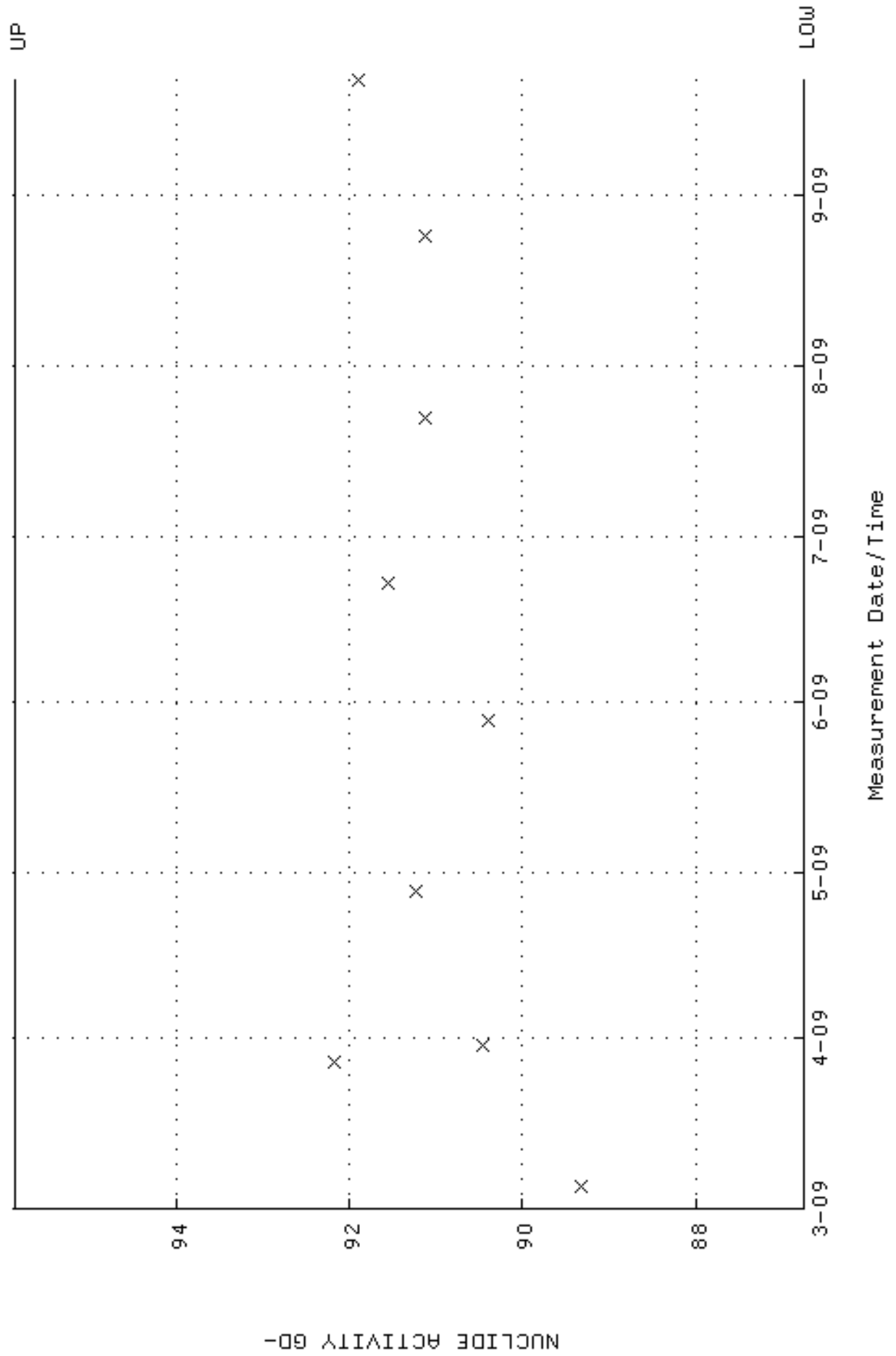
QA filename : DKA100:[ENV_ALPHA.QA.B]B154.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:20:36 through 15-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



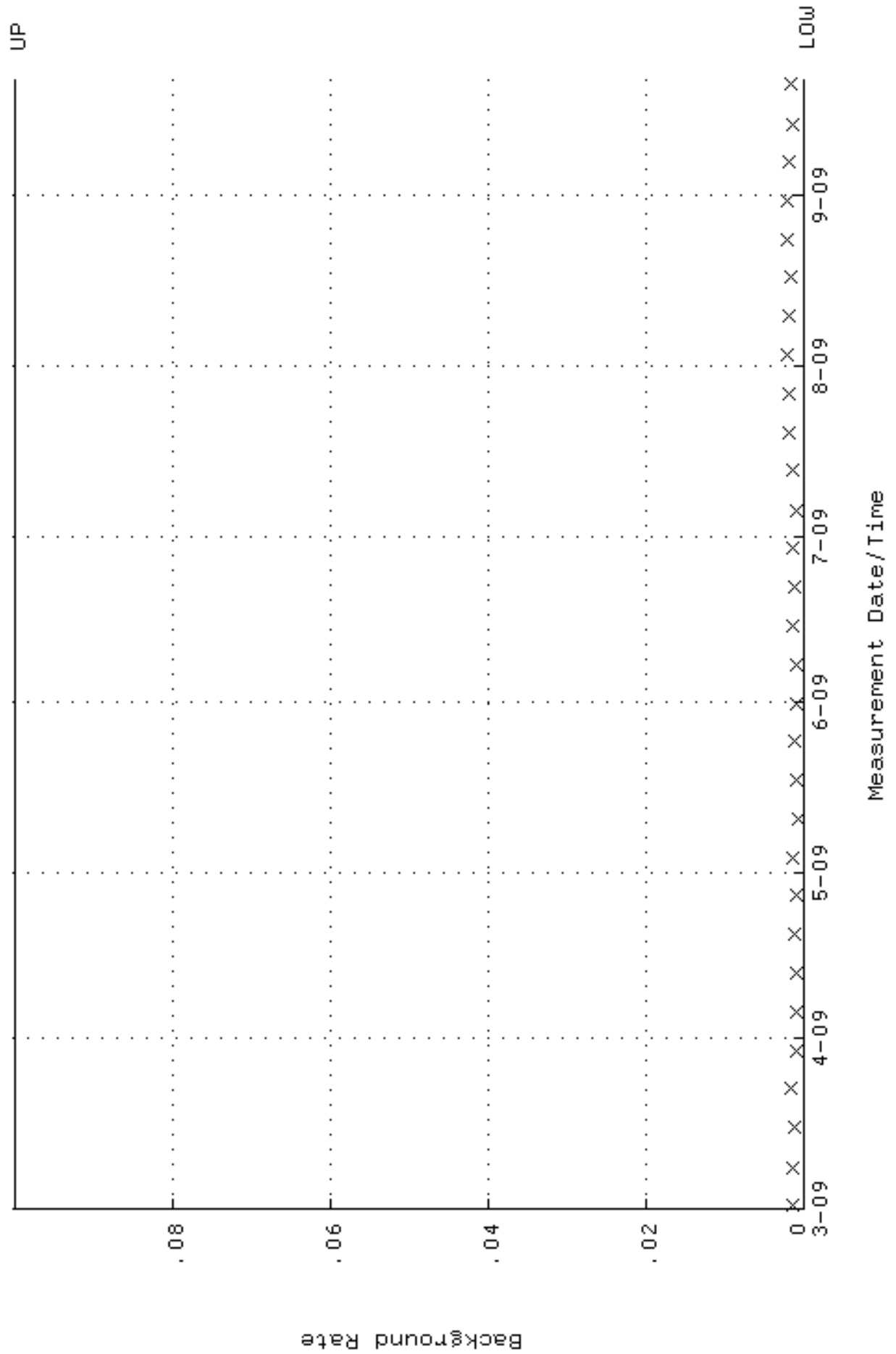
QA filename : DKA100:[ENV_ALPHA.QA.W]W179.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:38:54 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.256911 through 0.276911



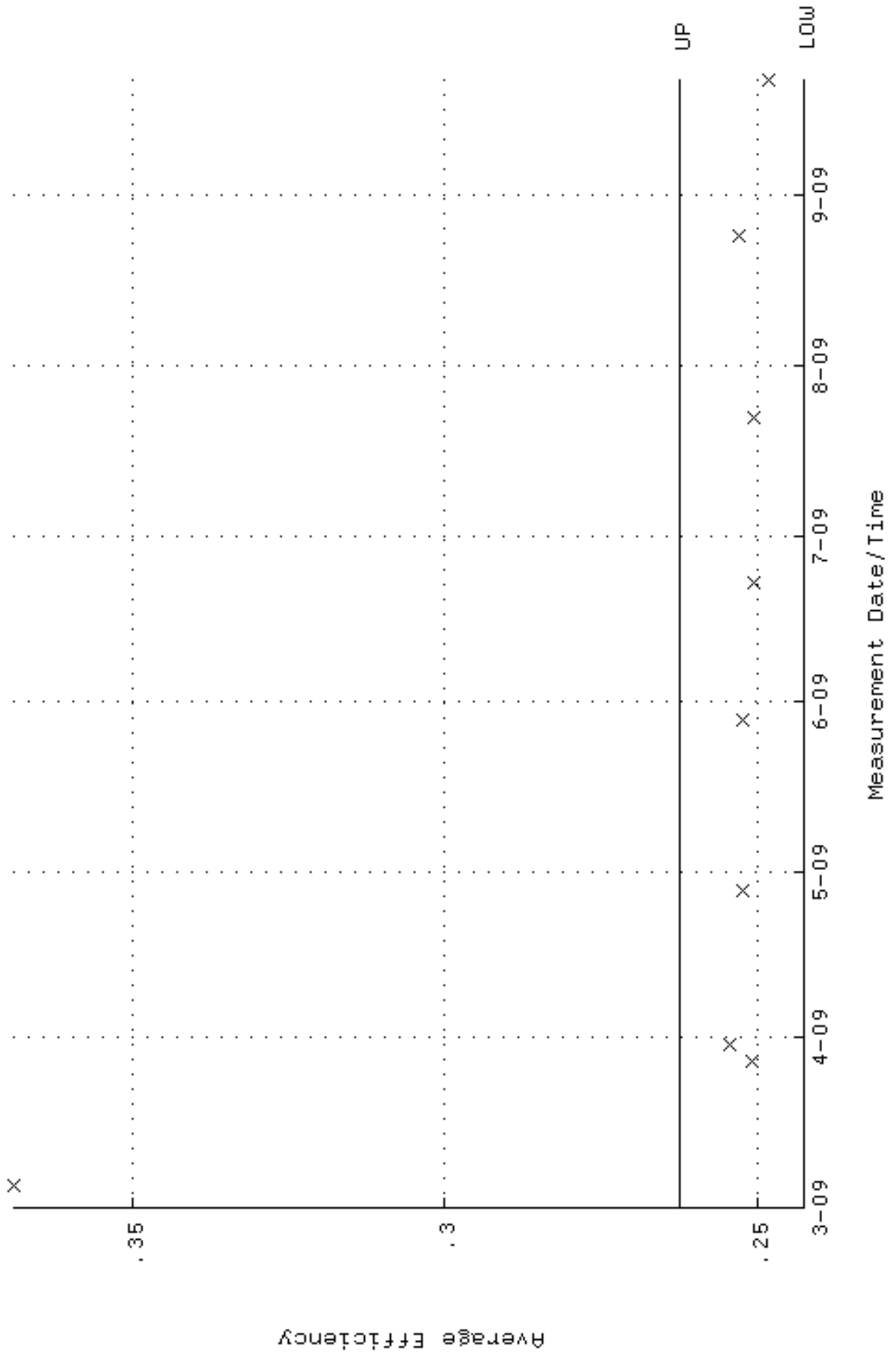
QA filename : DKA100:[ENV_ALPHA.QA.W]w179.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:38:54 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 86.7434 through 95.8742



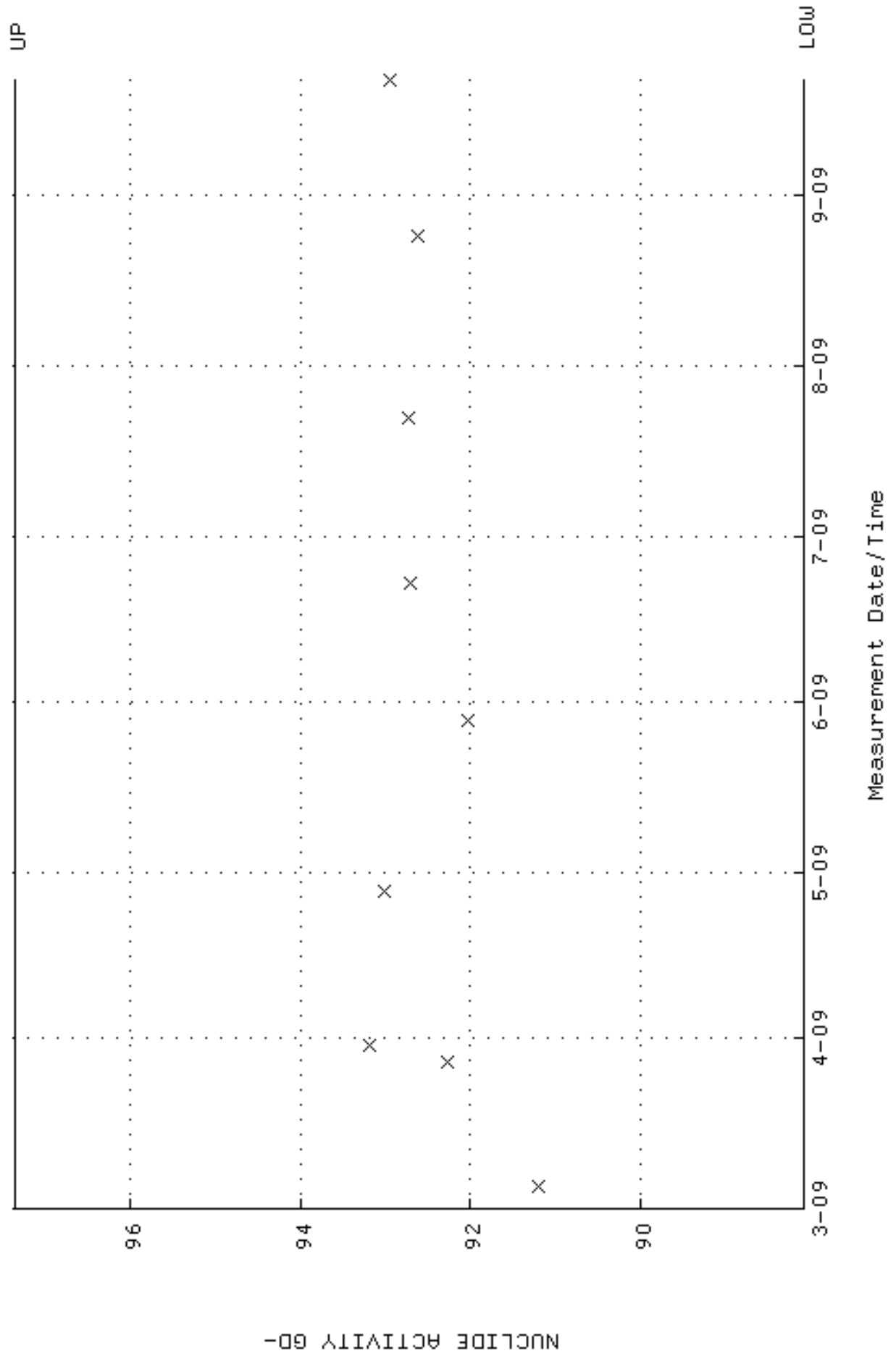
QA filename : DKA100:[ENV_ALPHA.QA.B]B179.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:09 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



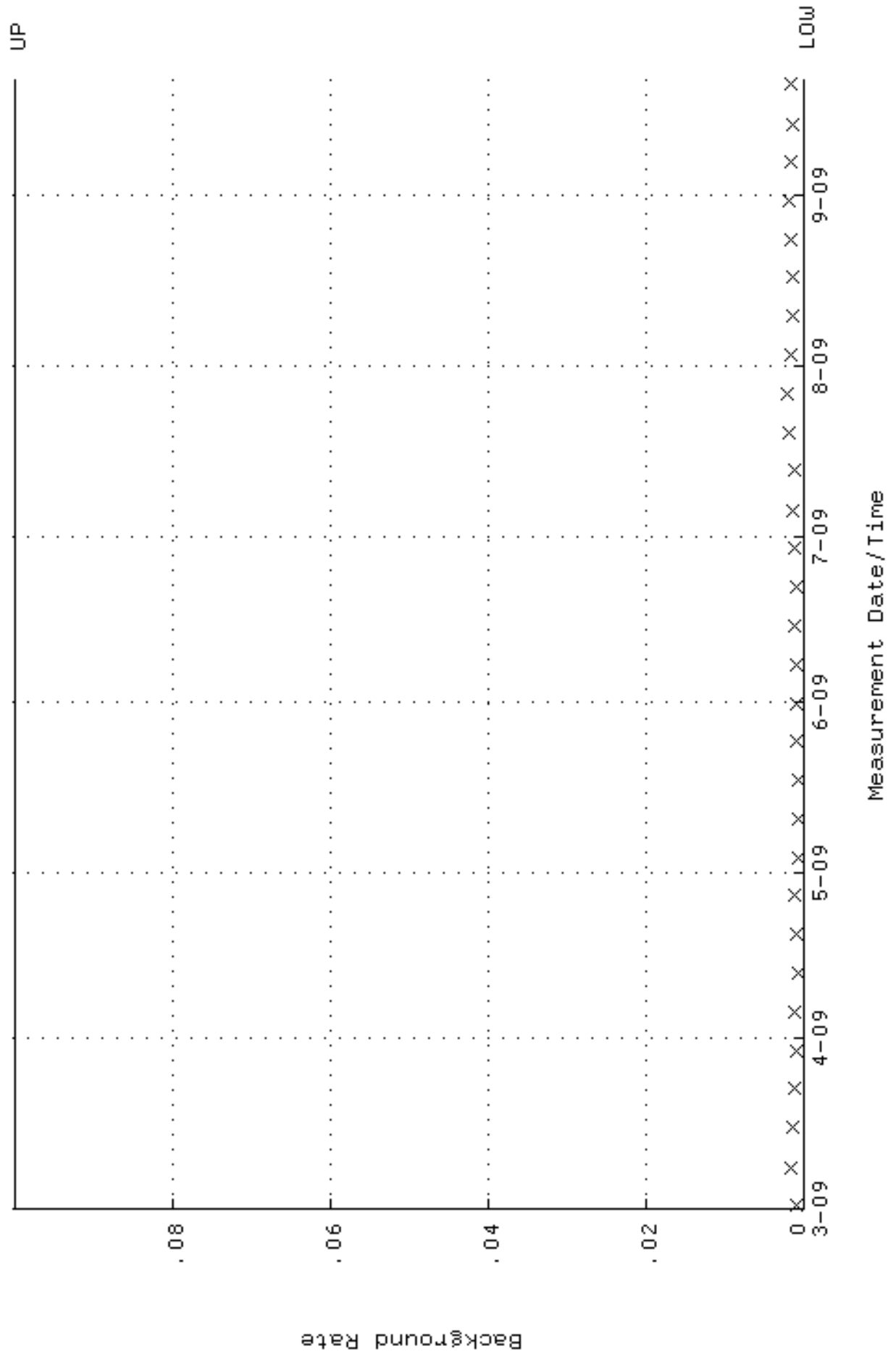
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:38:58 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242633 through 0.262633



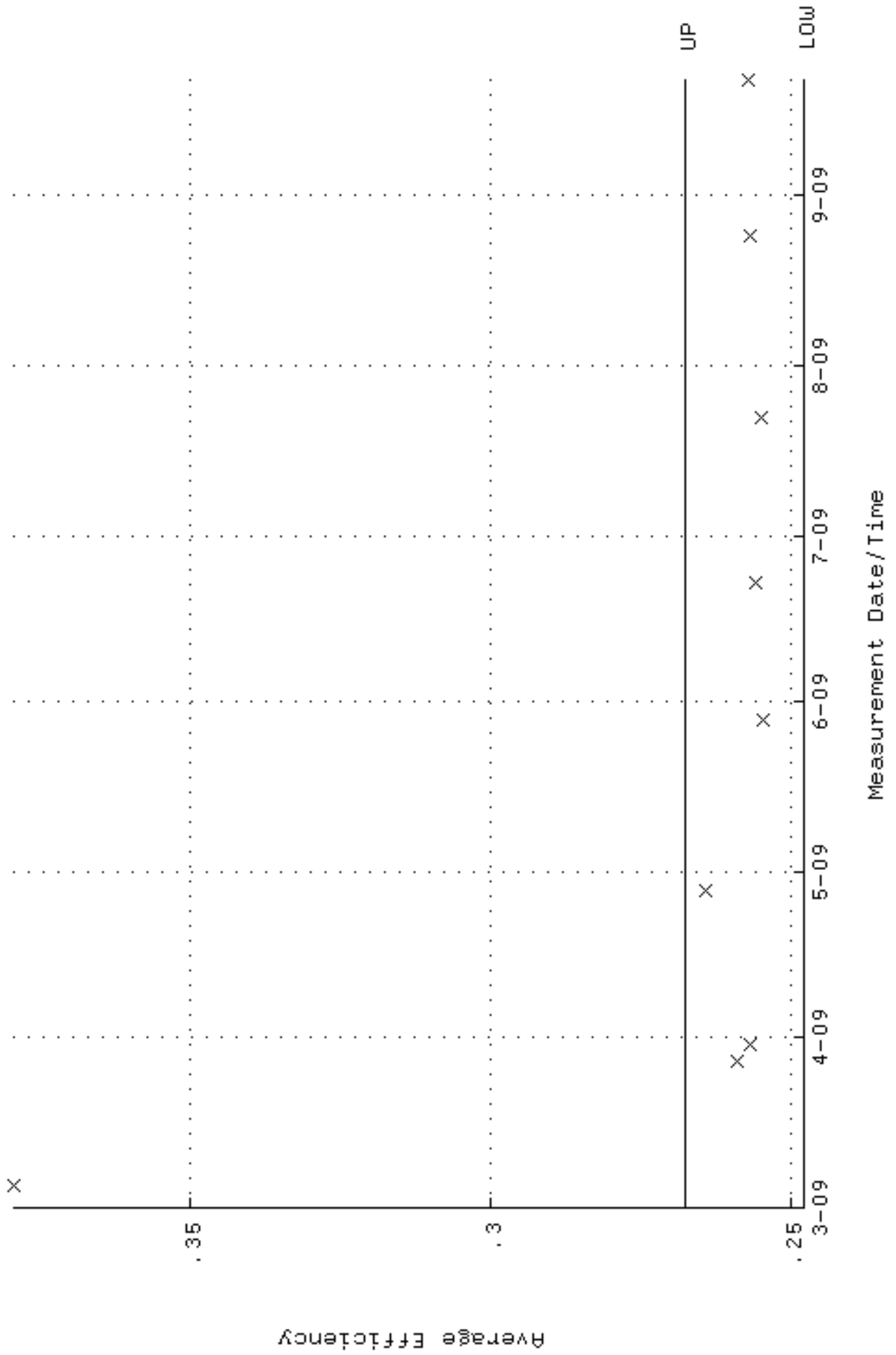
QA filename : DKA100:[ENV_ALPHA.QA.W]W180.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 4-MAR-2009 22:38:58 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 88.0803 through 97.3519



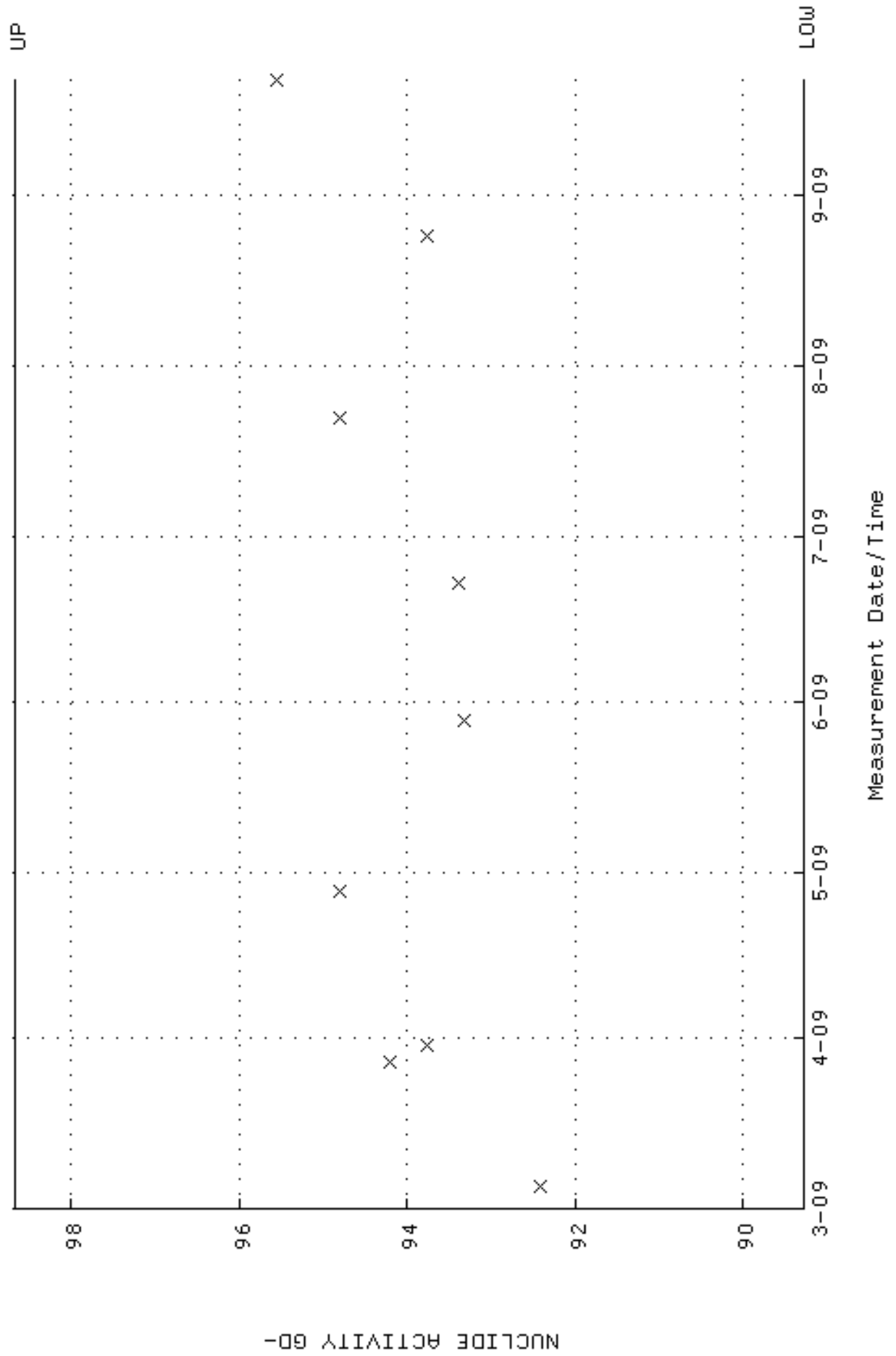
QA filename : DKA100:[ENV_ALPHA.QA.B]B180.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:13 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



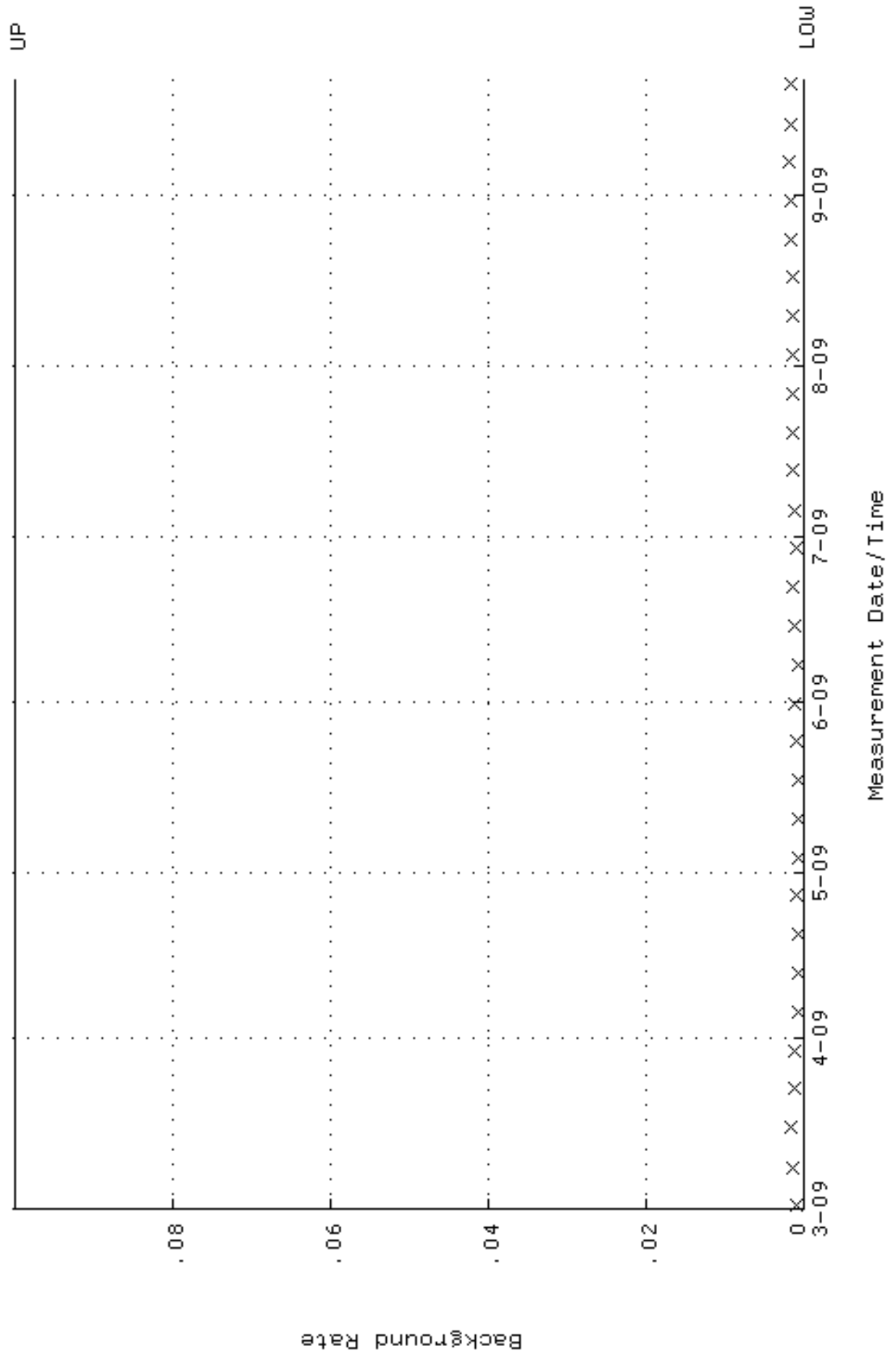
QA filename : DKA100:[ENV_ALPHA.QA.W]W181.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:03 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.247722 through 0.267722



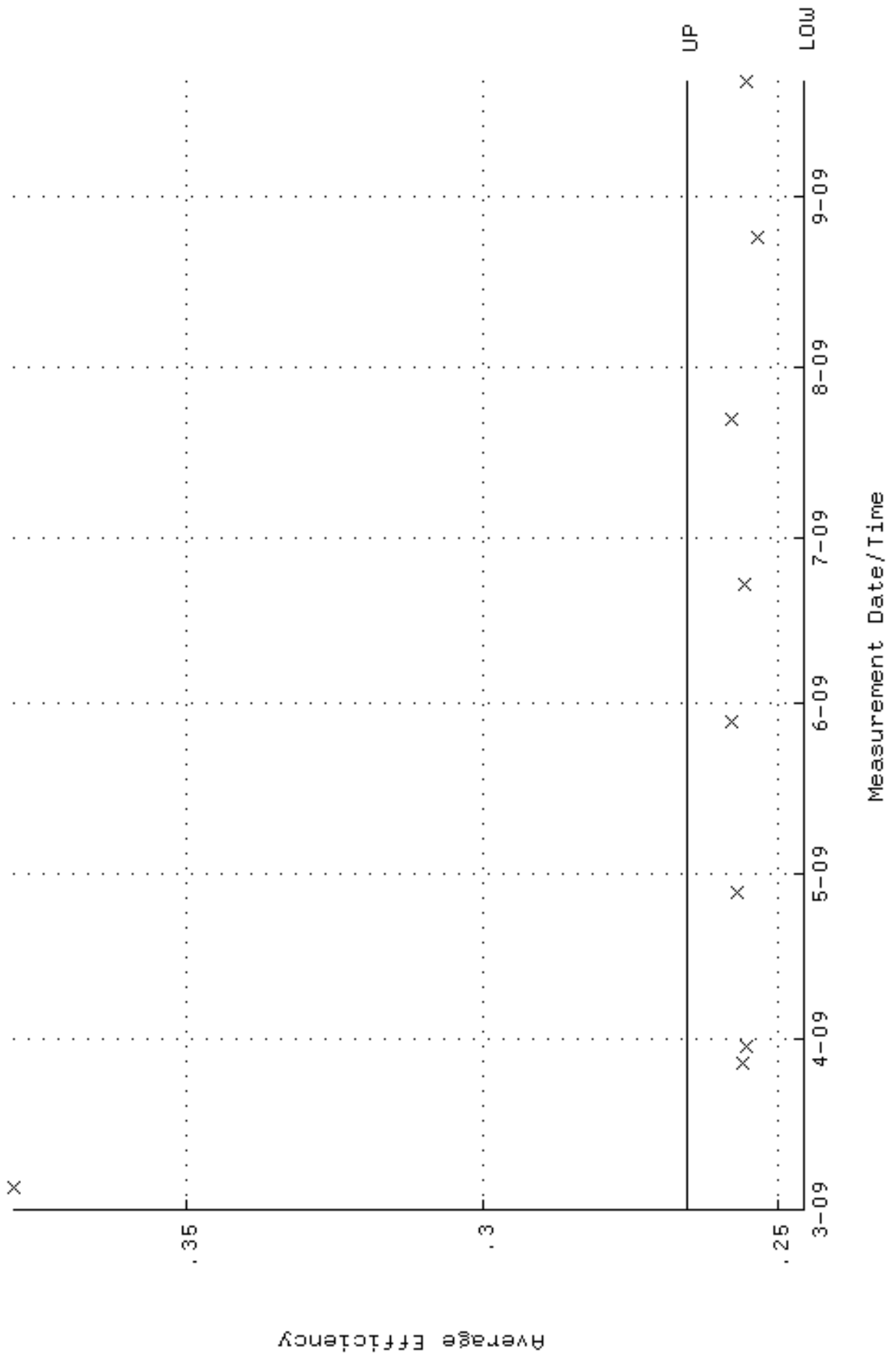
QA filename : DKA100:[ENV_ALPHA.QA.W]w181.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:03 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 89.2737 through 98.6709



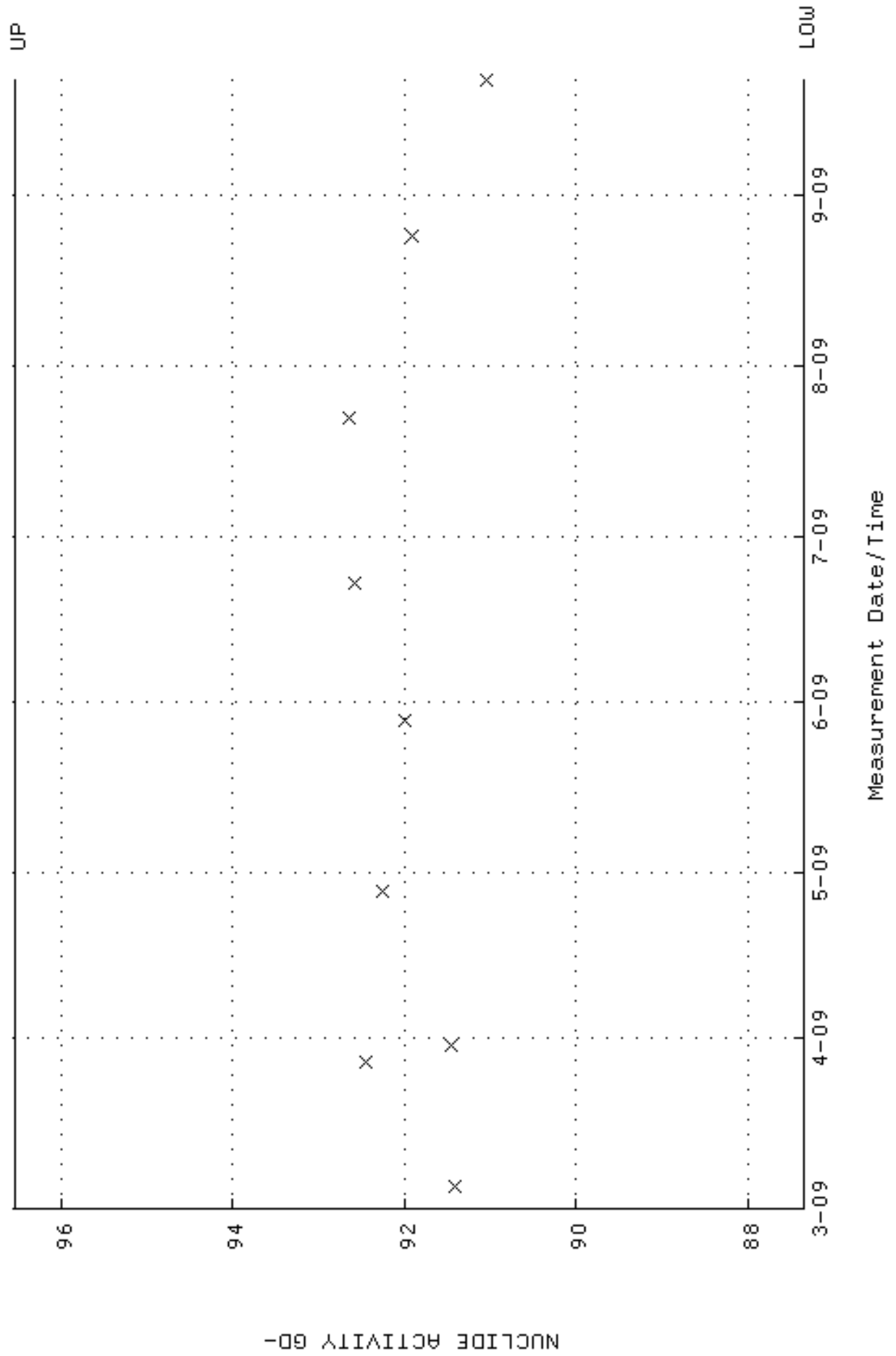
QA filename : DKA100:[ENV_ALPHA.QA.B]B181.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:17 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



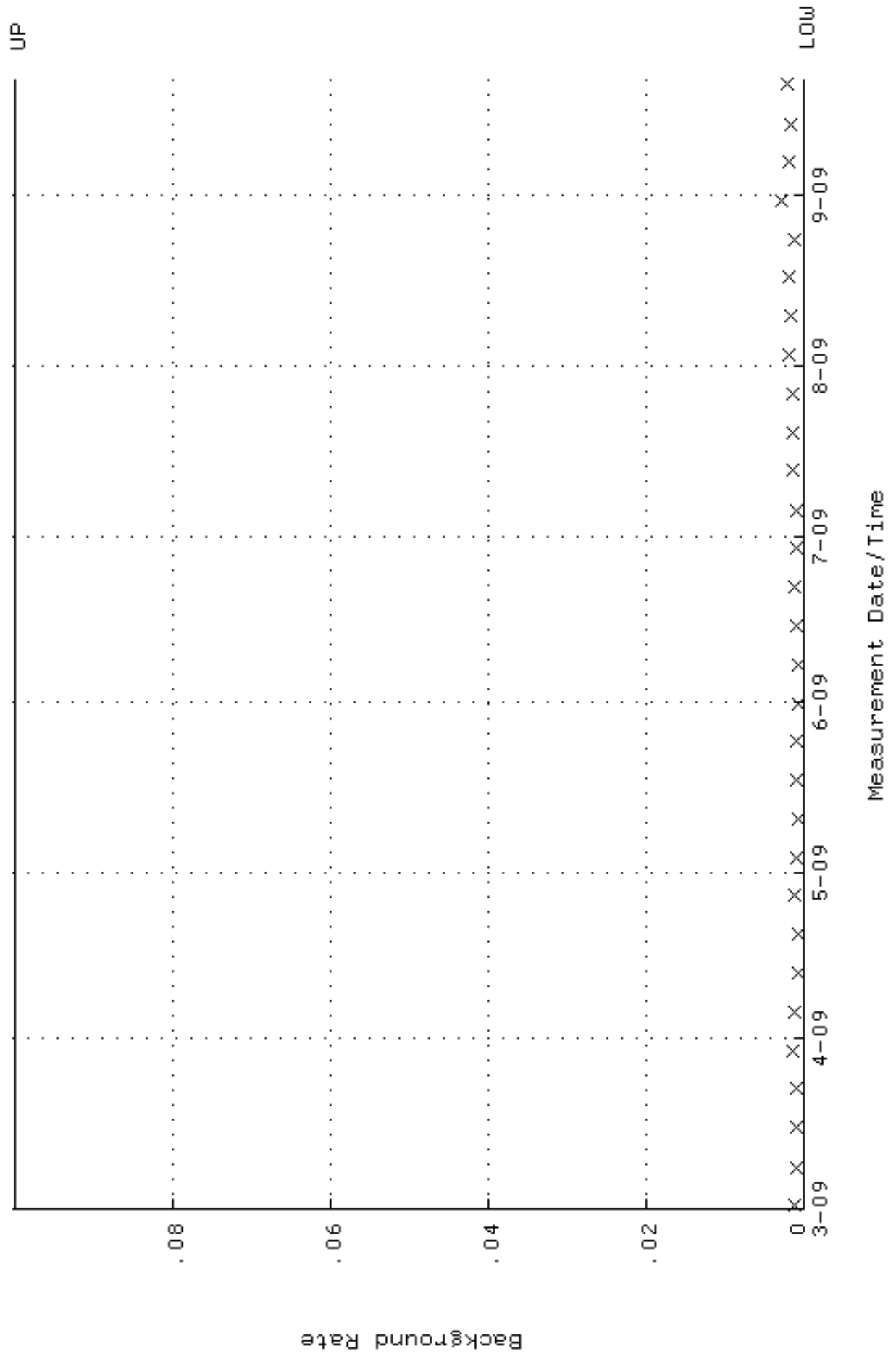
QA filename : DKA100:[ENV_ALPHA.QA.W]W182.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:07 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.245707 through 0.265707



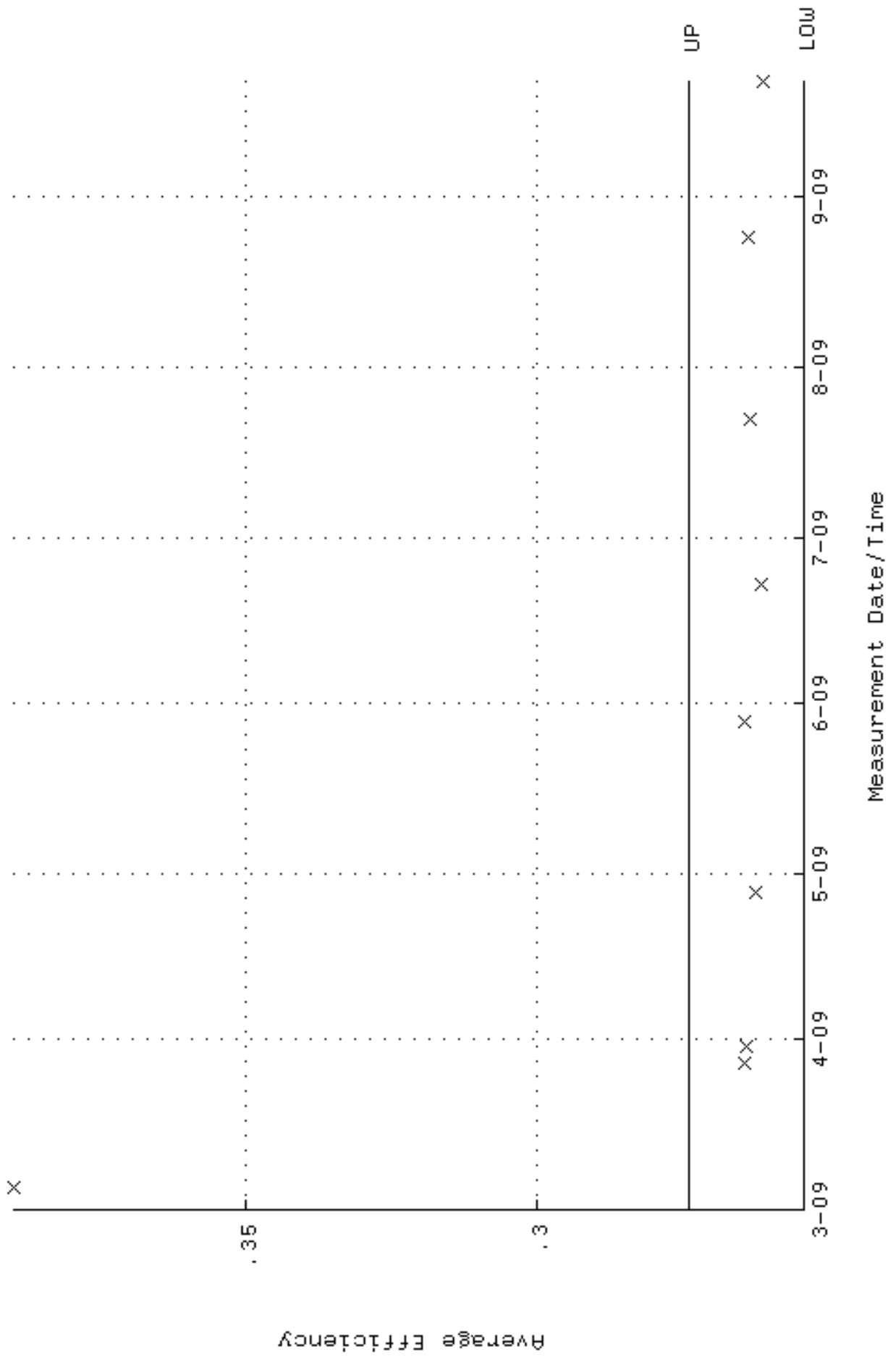
QA filename : DKA100:[ENV_ALPHA.QA.W]w182.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:07 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 87.3454 through 96.5396



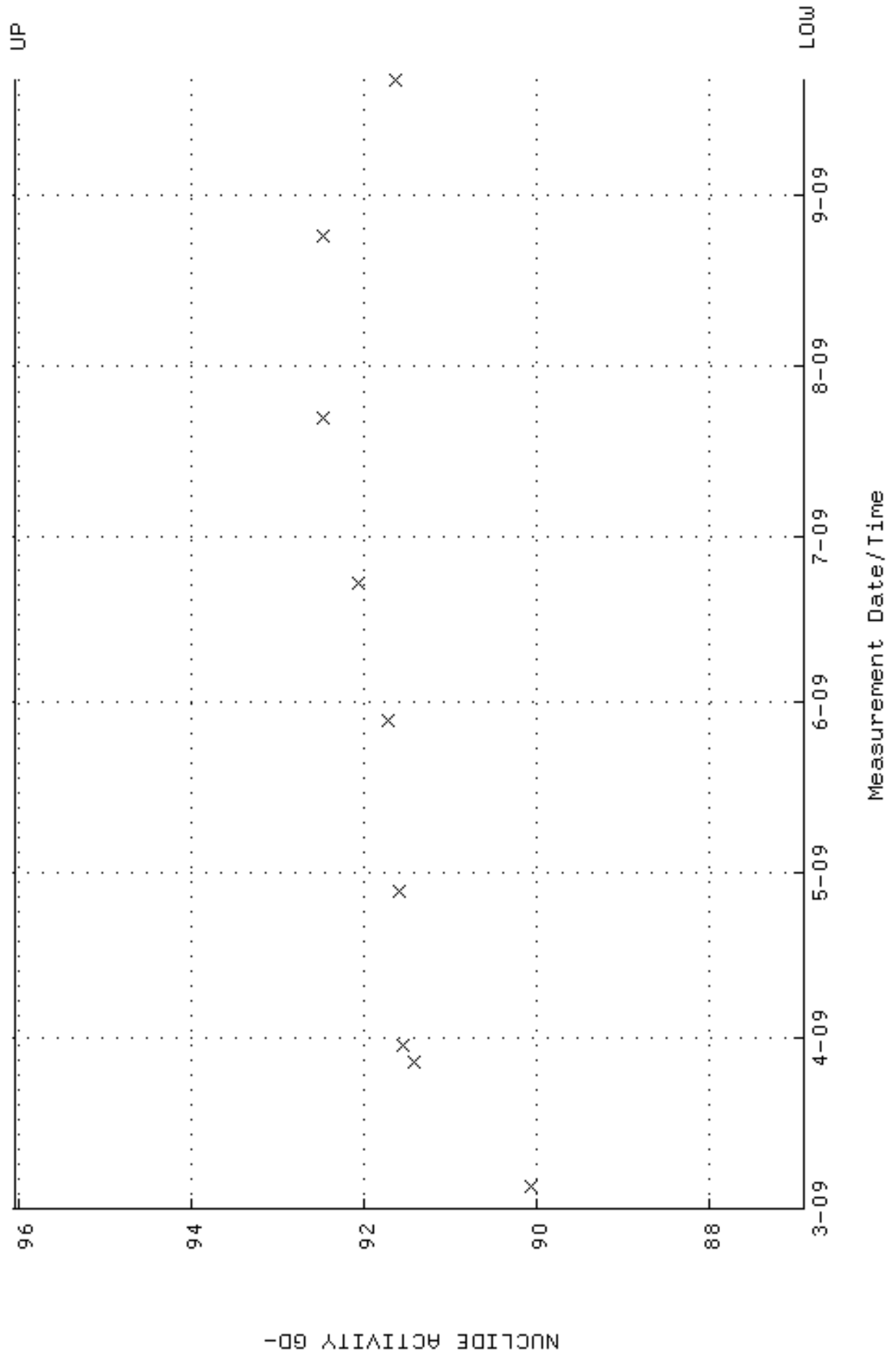
QA filename : DKA100:[ENV_ALPHA.QA.B]B182.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:20 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



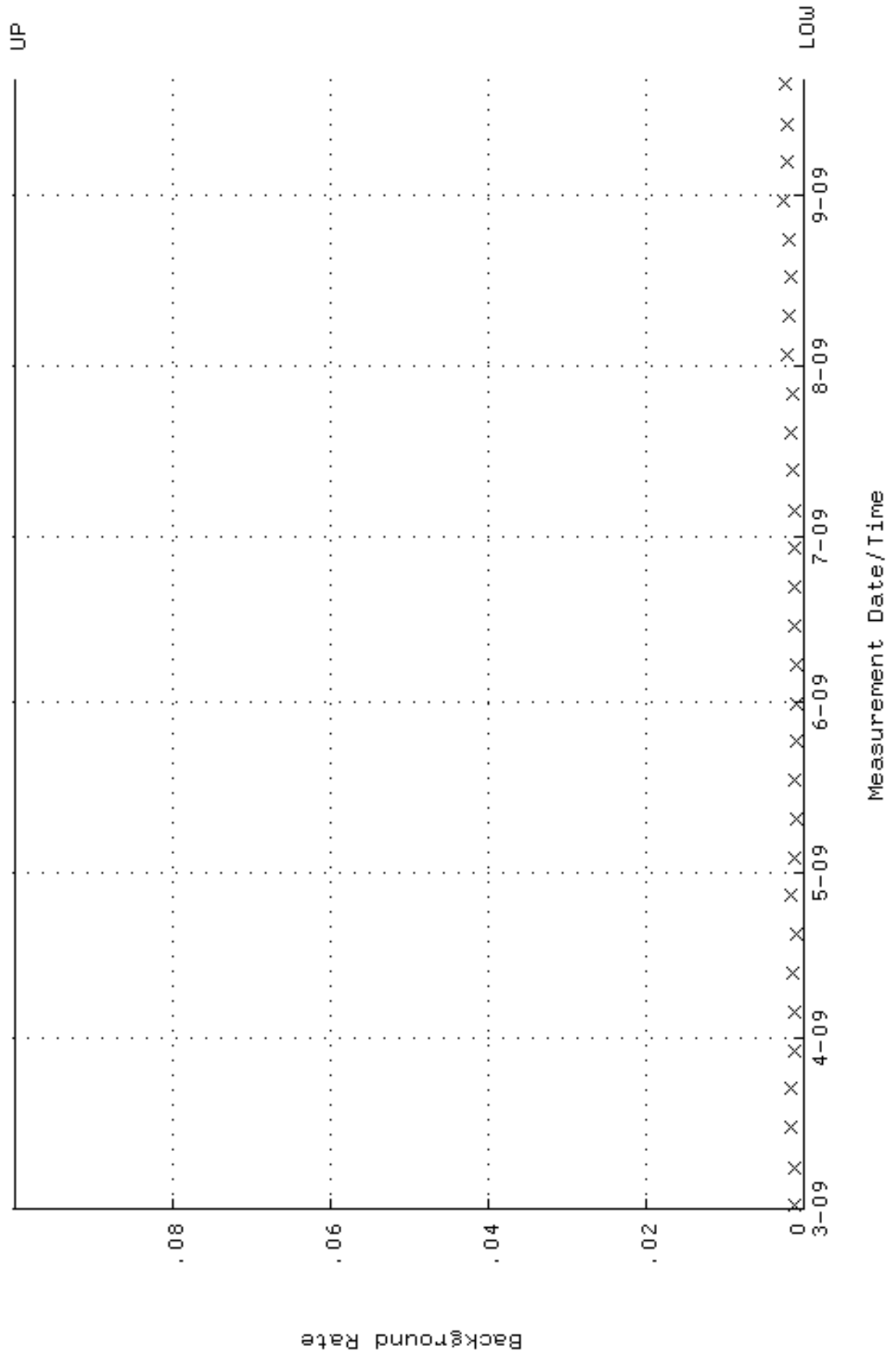
QA filename : DKA100:[ENV_ALPHA.QA.W]W183.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:11 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.254364 through 0.274364



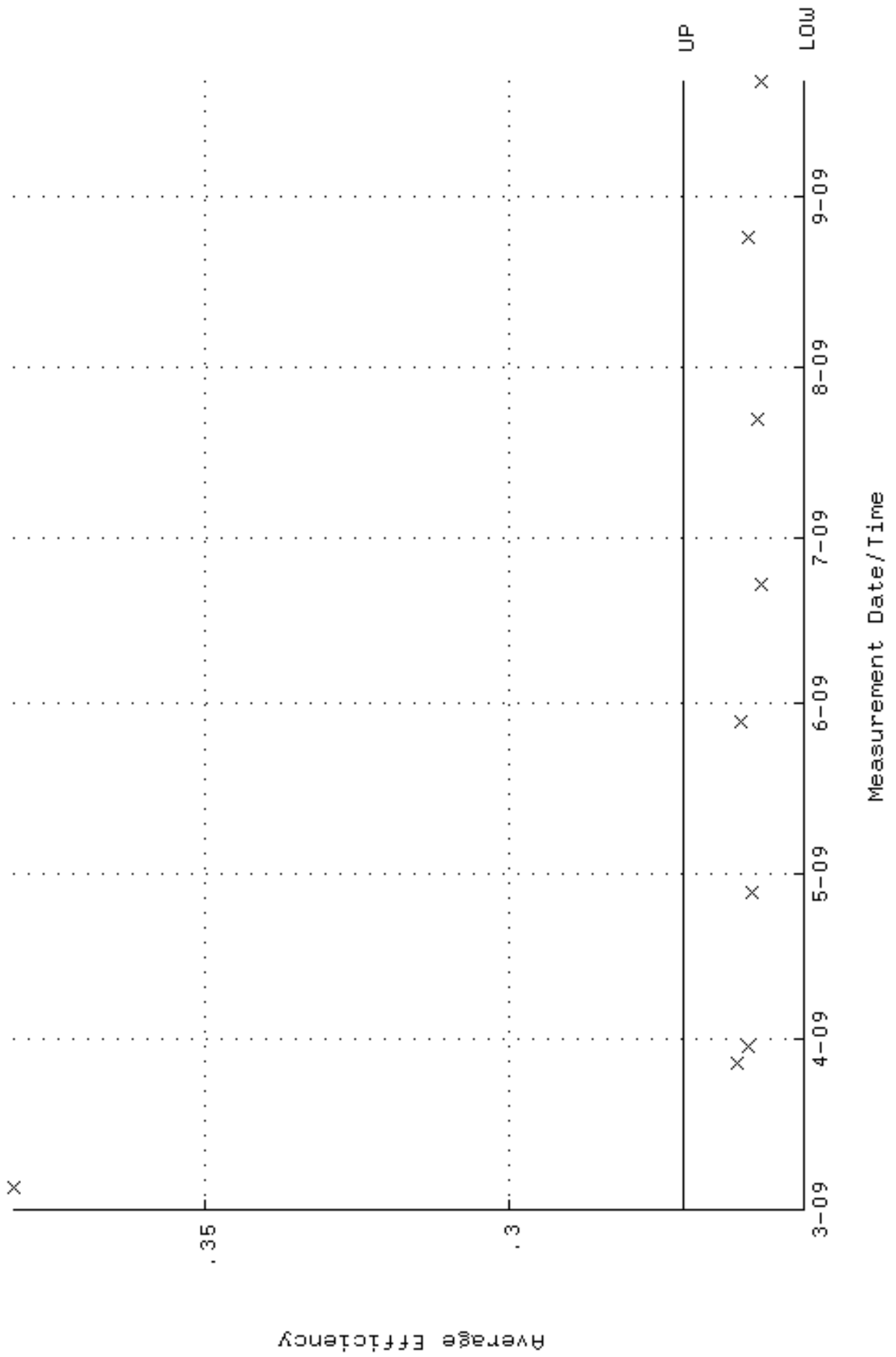
QA filename : DKA100:[ENV_ALPHA.QA.W]w183.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:11 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 86.8927 through 96.0393



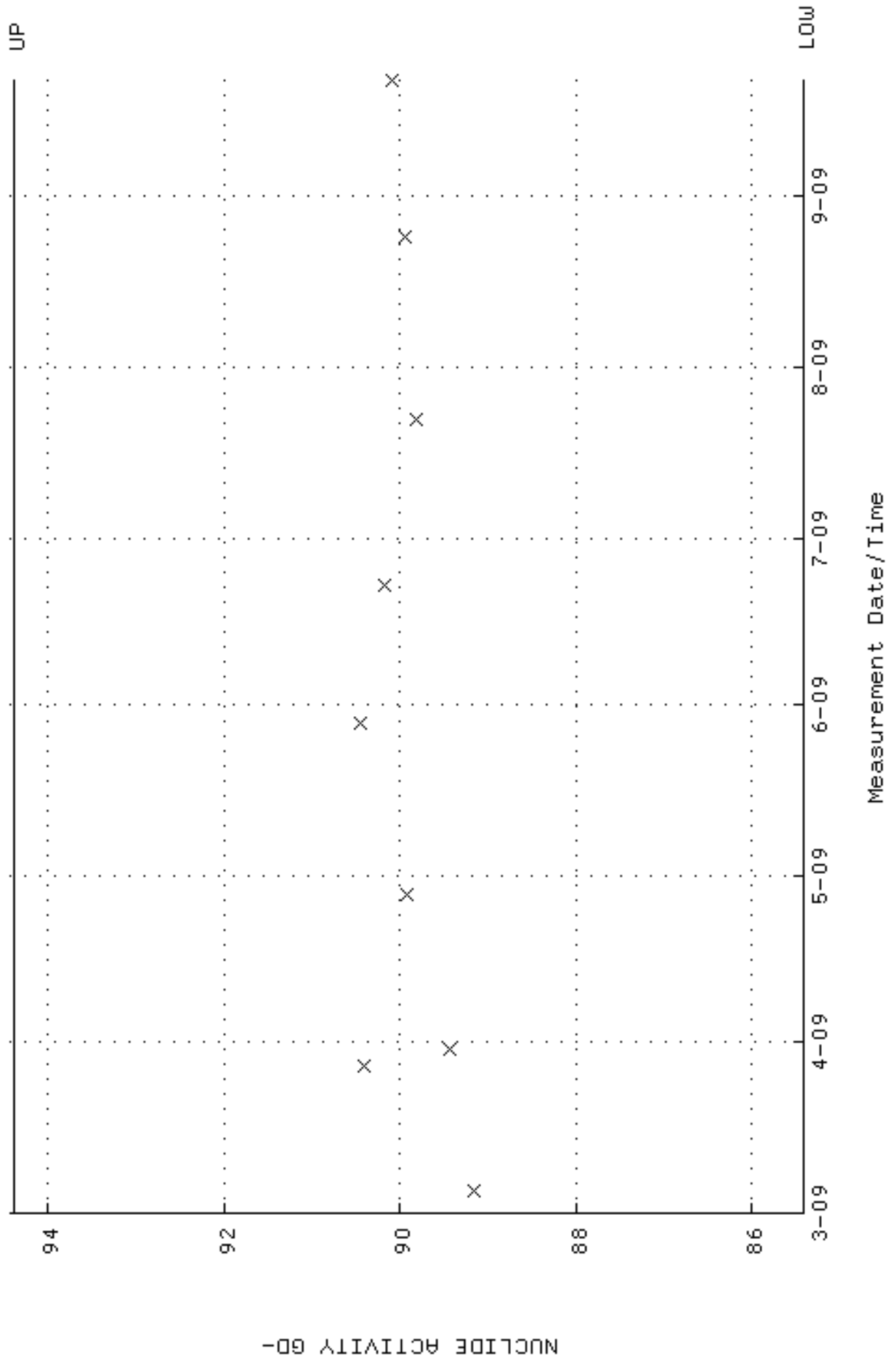
QA filename : DKA100:[ENV_ALPHA.QA.B]B183.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:24 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



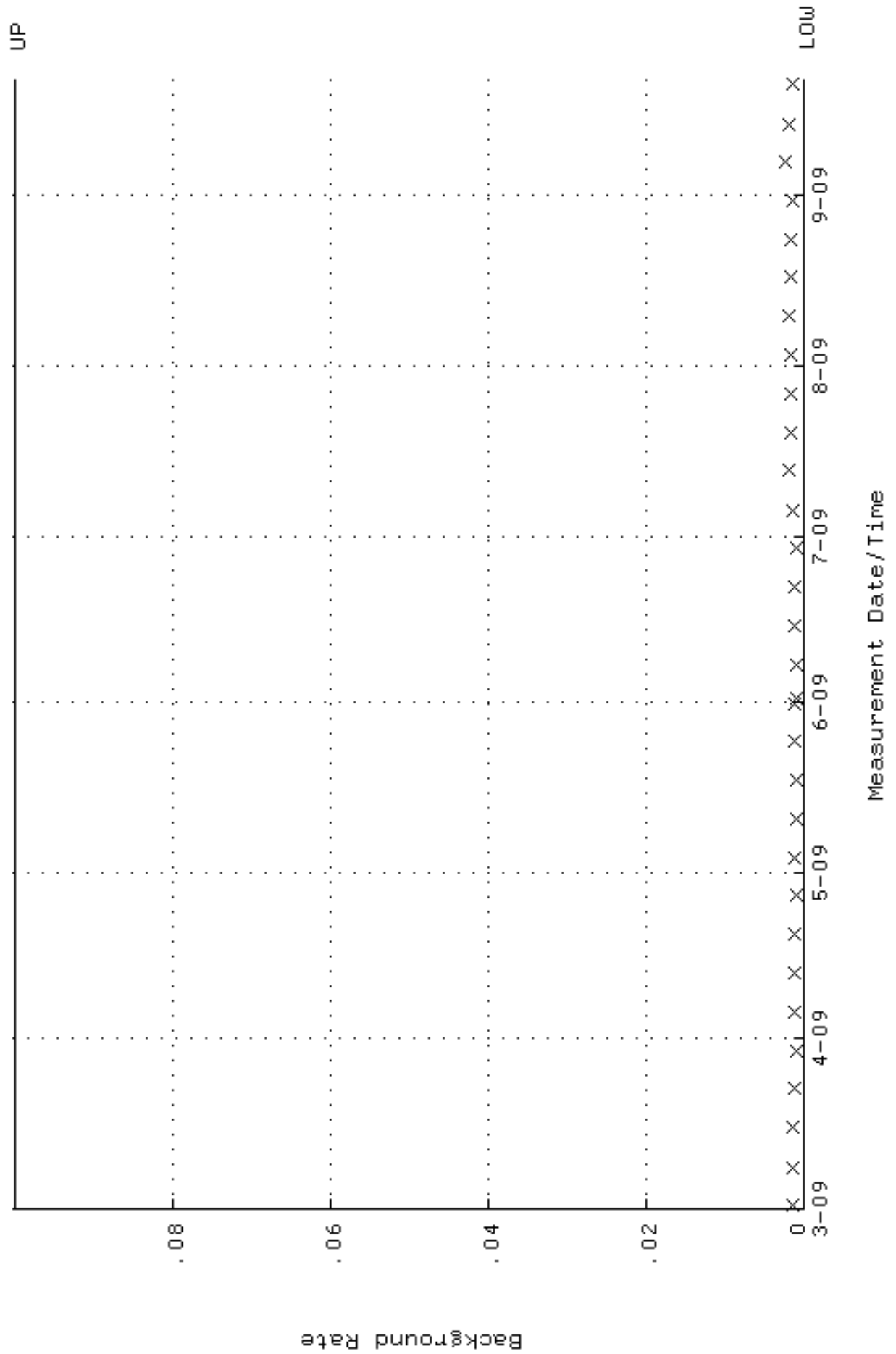
QA filename : DKA100:[ENV_ALPHA.QA.W]W184.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:15 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.251367 through 0.271367



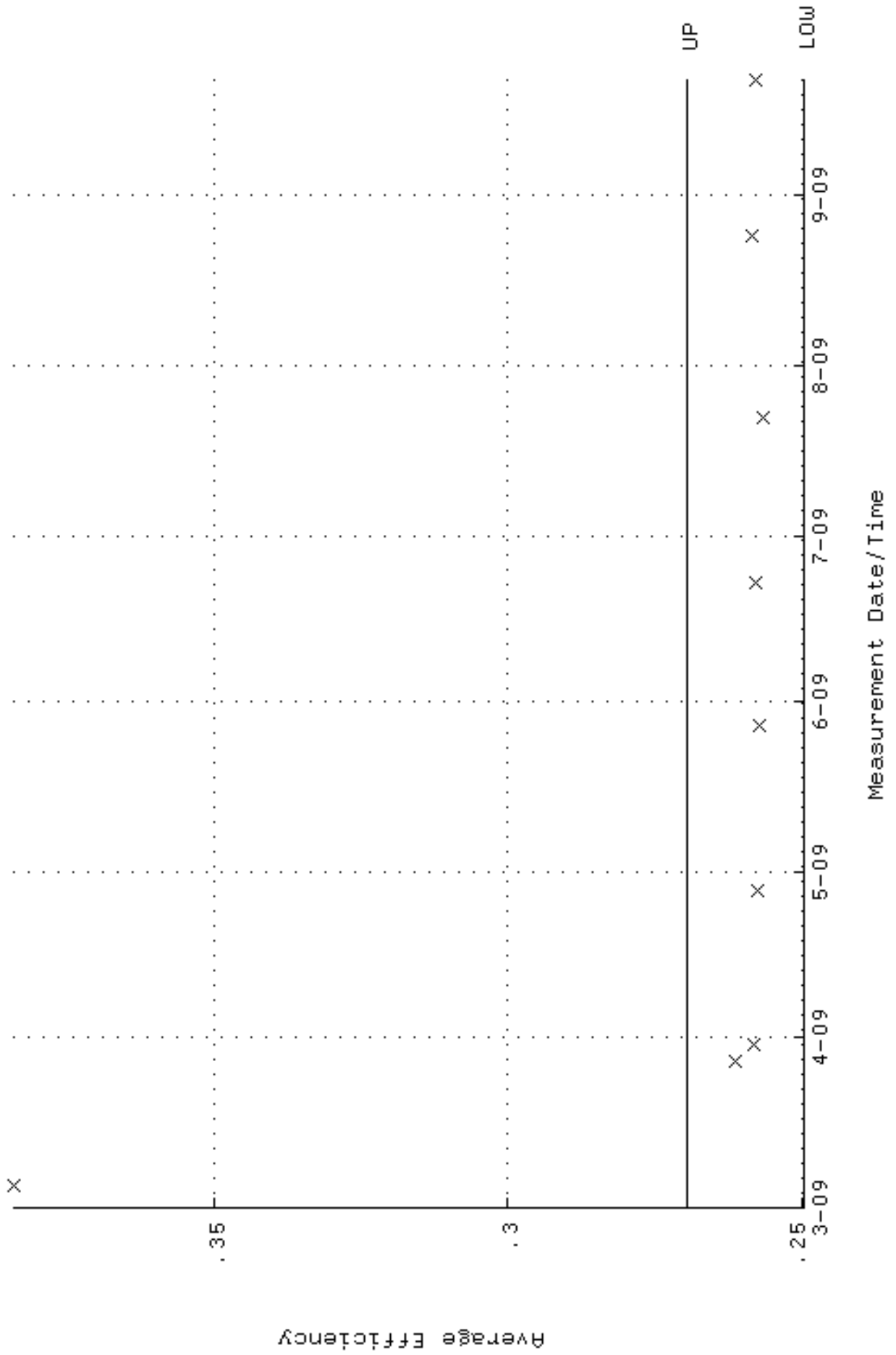
QA filename : DKA100:[ENV_ALPHA.QA.W]w184.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 4-MAR-2009 22:39:15 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 85.4139 through 94.4049



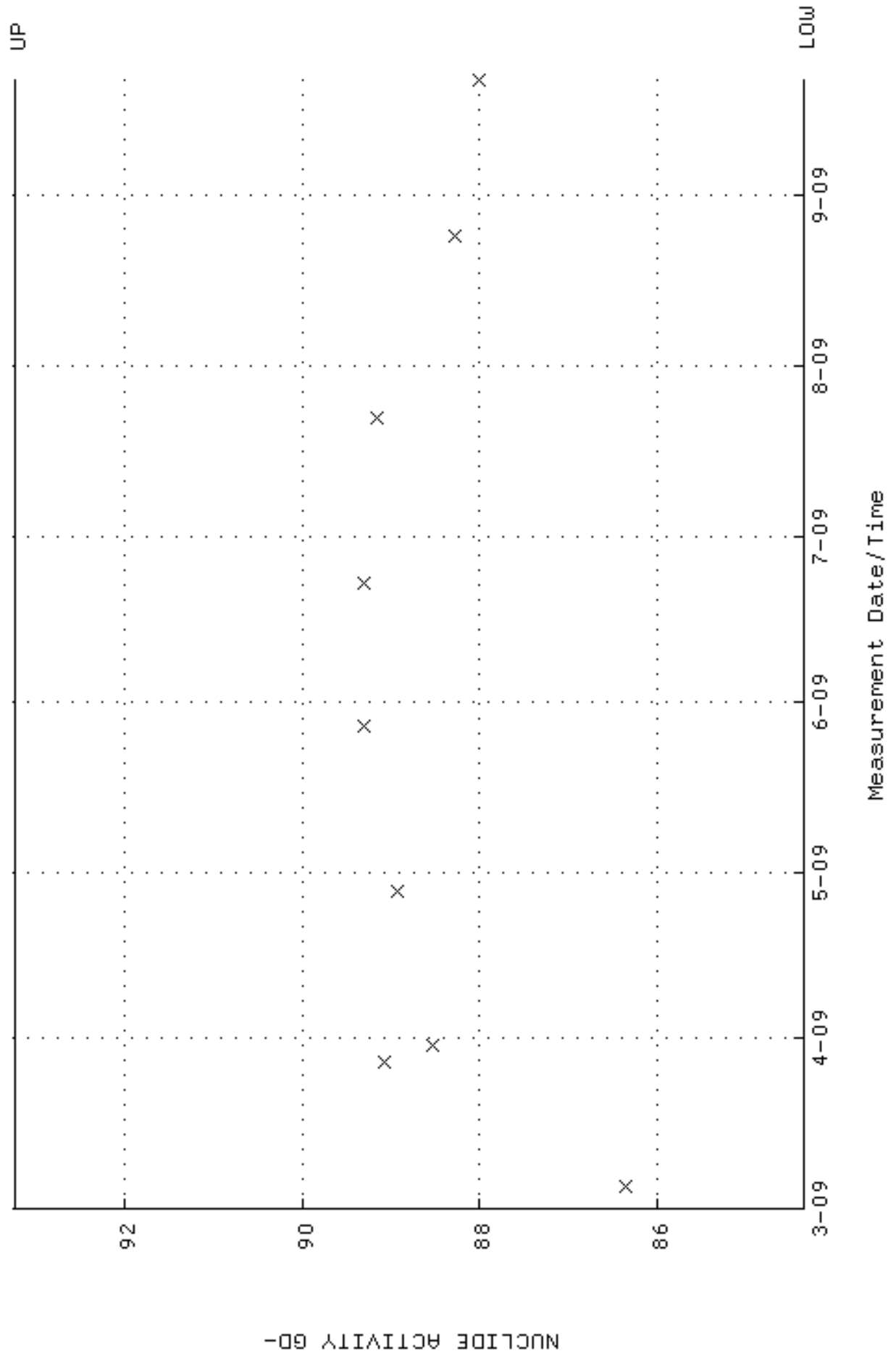
QA filename : DKA100:[ENV_ALPHA.QA.B]B184.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:28 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



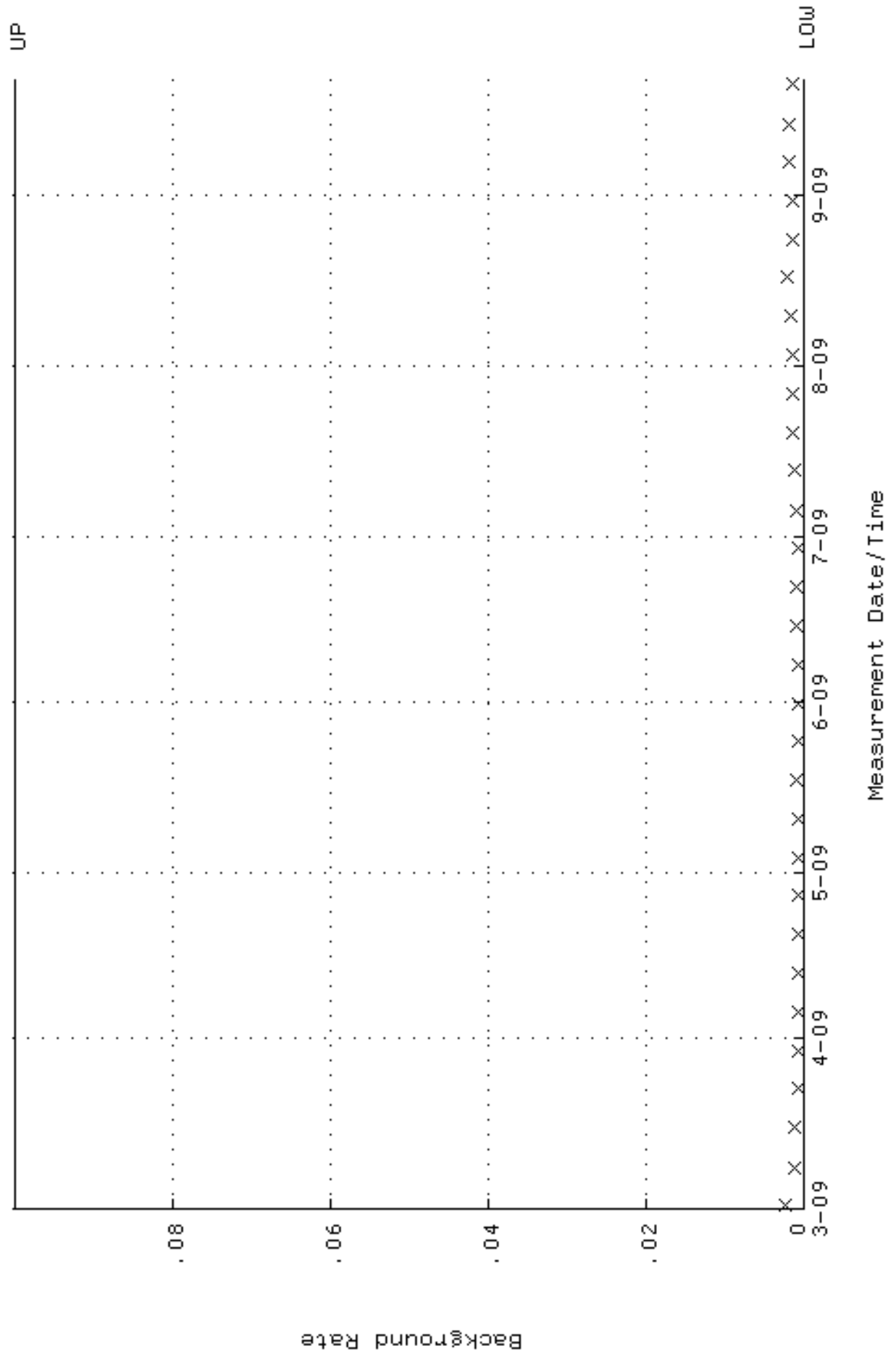
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:19 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.249628 through 0.269628



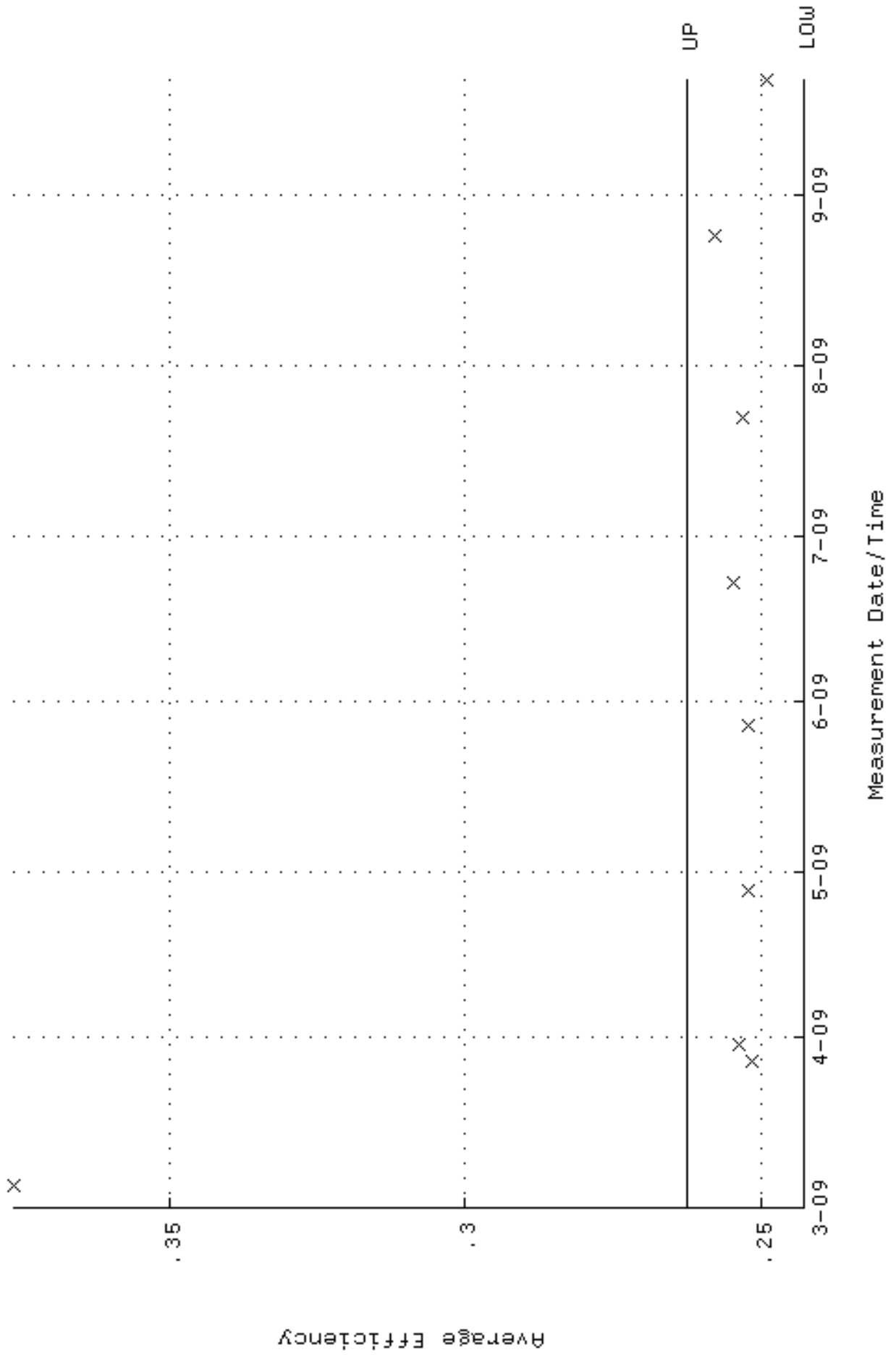
QA filename : DKA100:[ENV_ALPHA.QA.W]W185.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:19 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 84.3502 through 93.2292



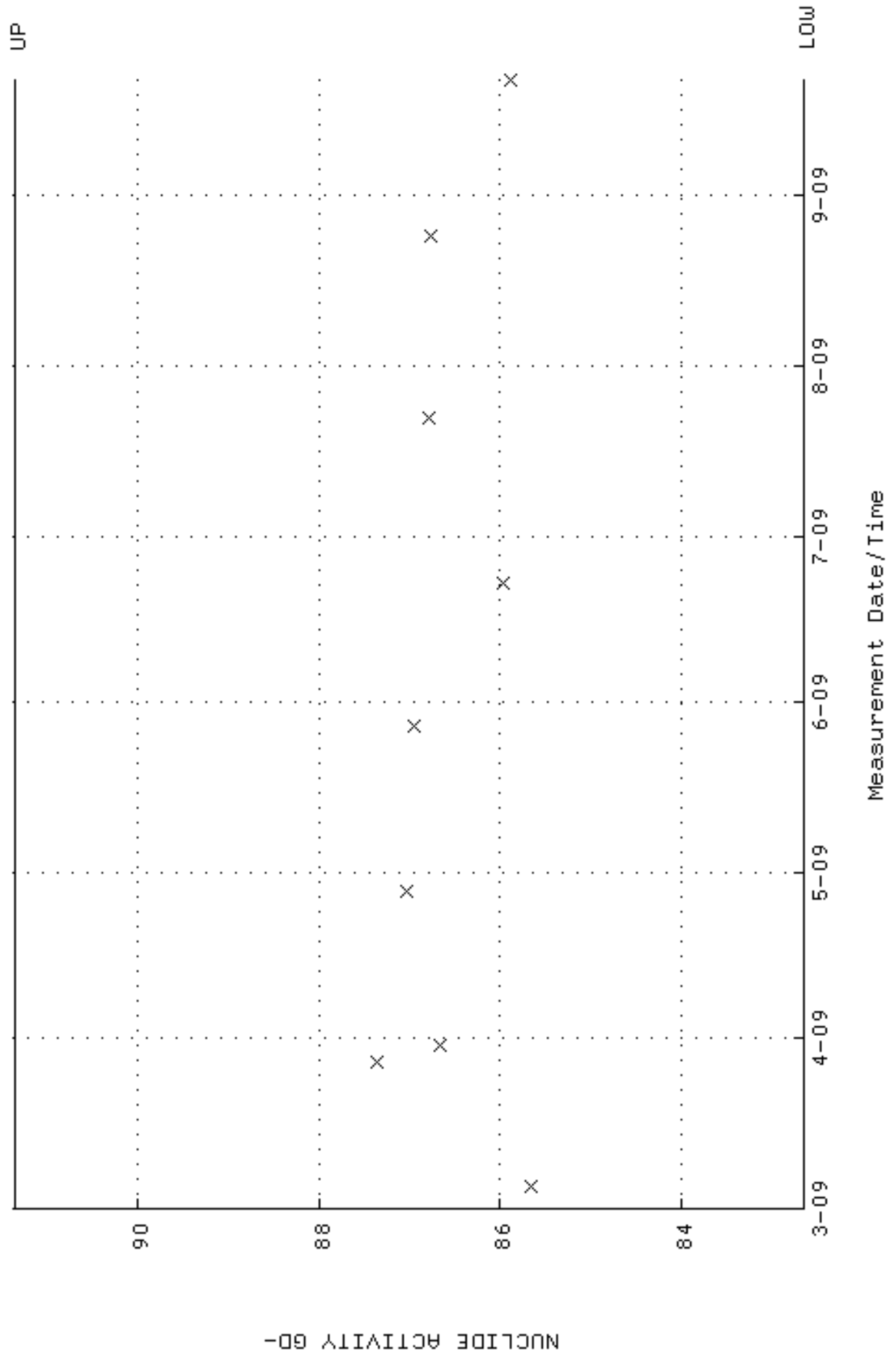
QA filename : DKA100:[ENV_ALPHA.QA.B]B185.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:31 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



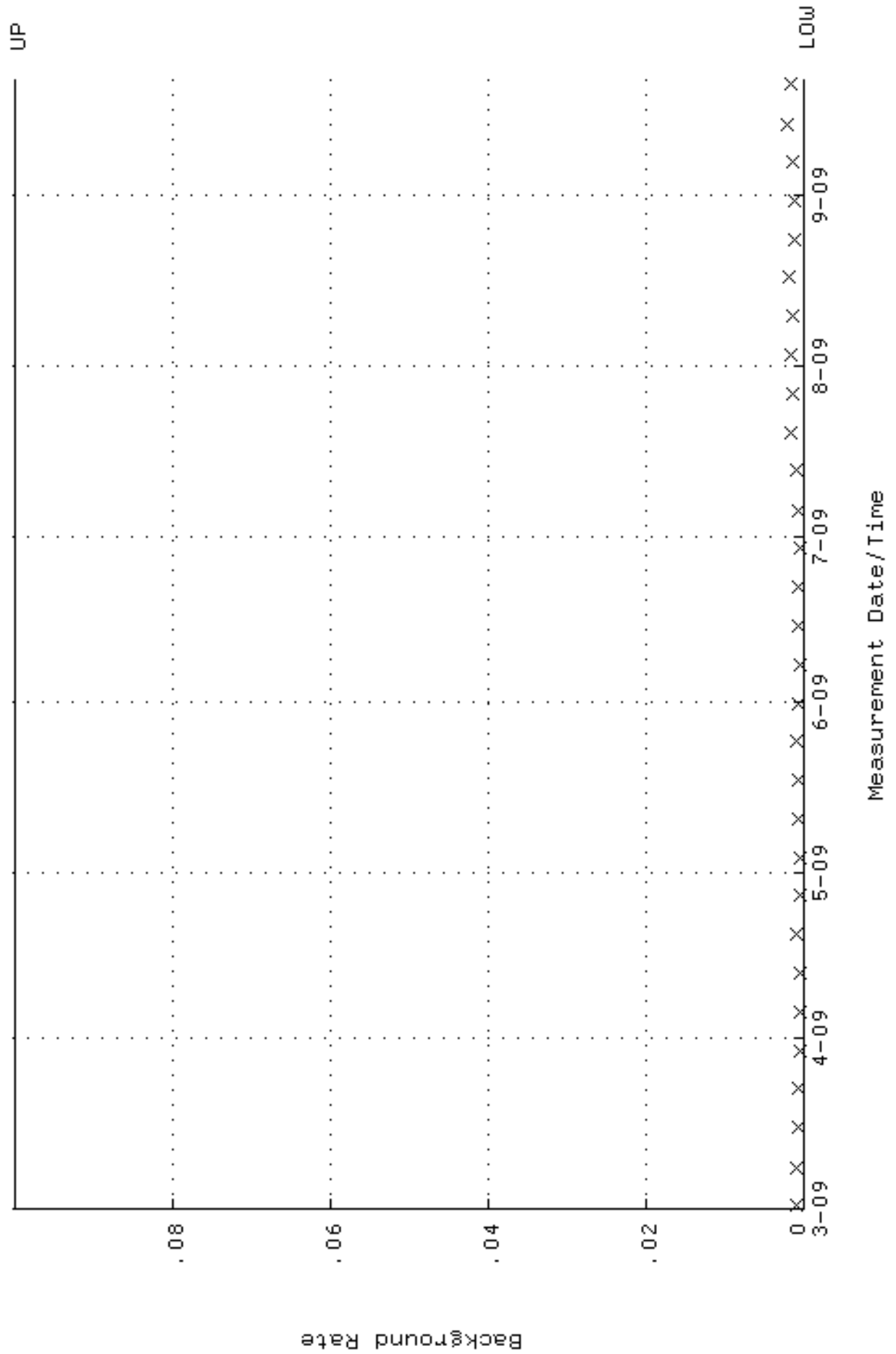
QA filename : DKA100:[ENV_ALPHA.QA.W]W186.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:23 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242649 through 0.262649



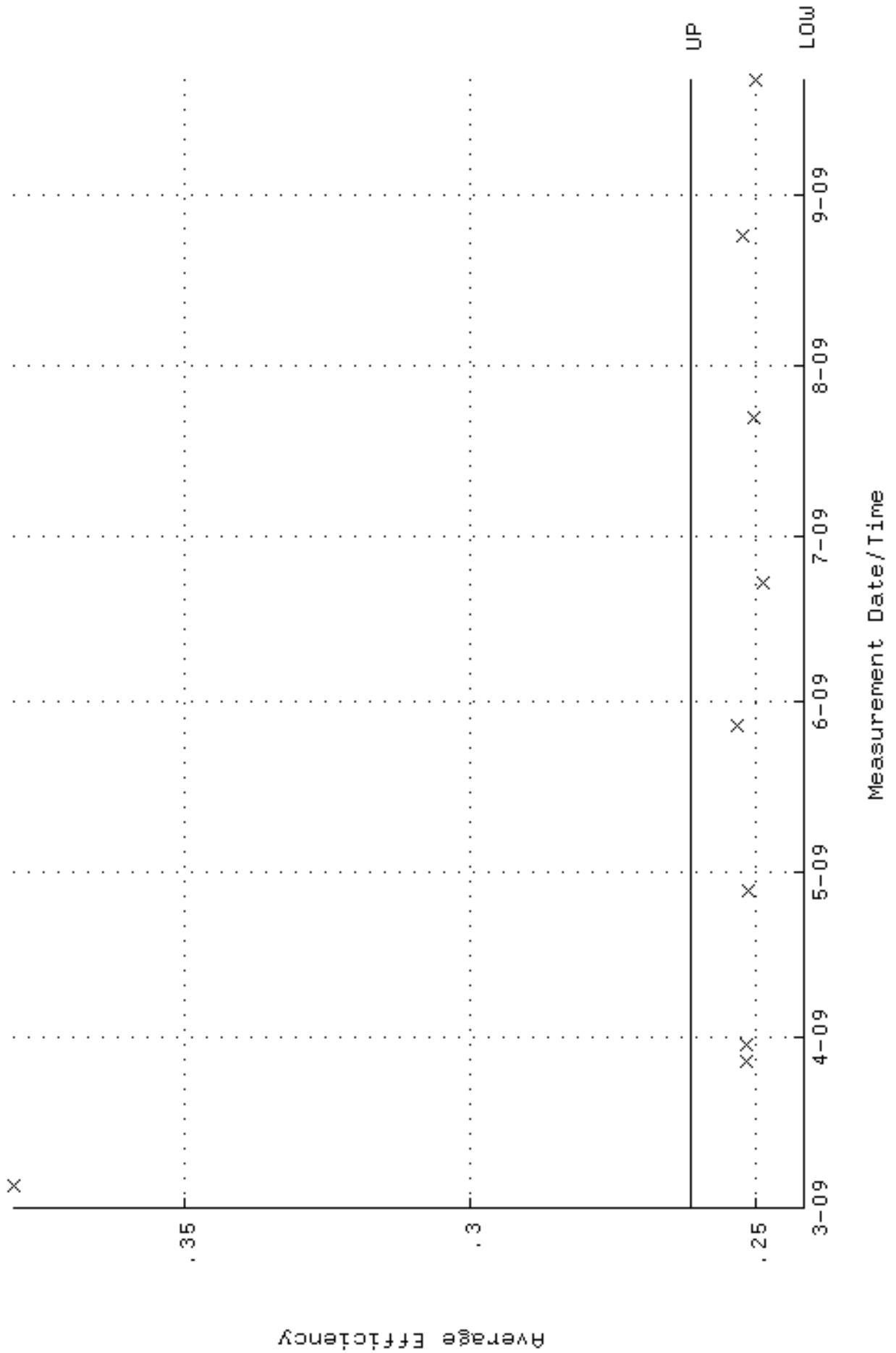
QA filename : DKA100:[ENV_ALPHA.QA.W]w186.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 4-MAR-2009 22:39:23 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 82.6495 through 91.3495



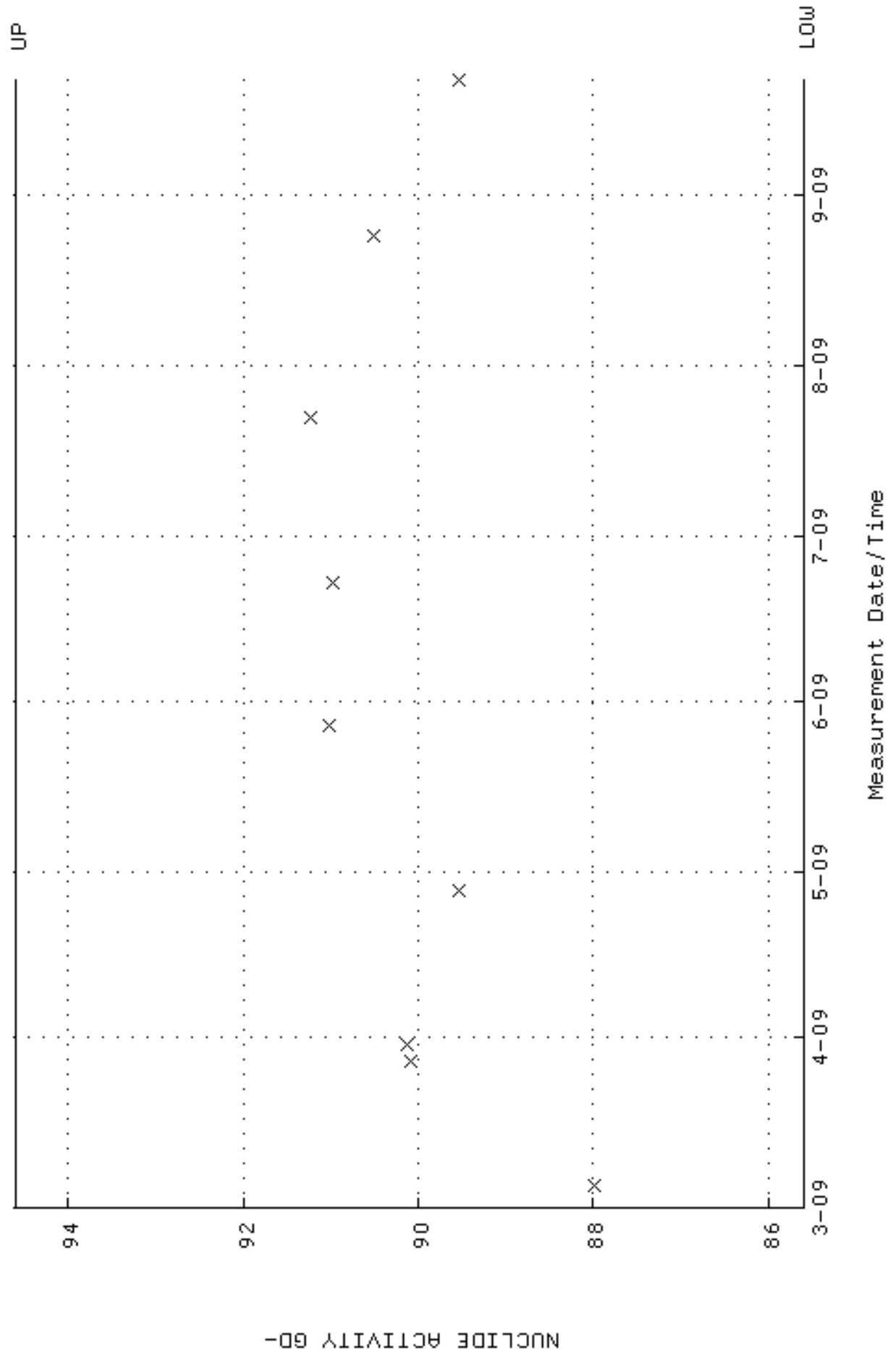
QA filename : DKA100:[ENV_ALPHA.QA.B]B186.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:35 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



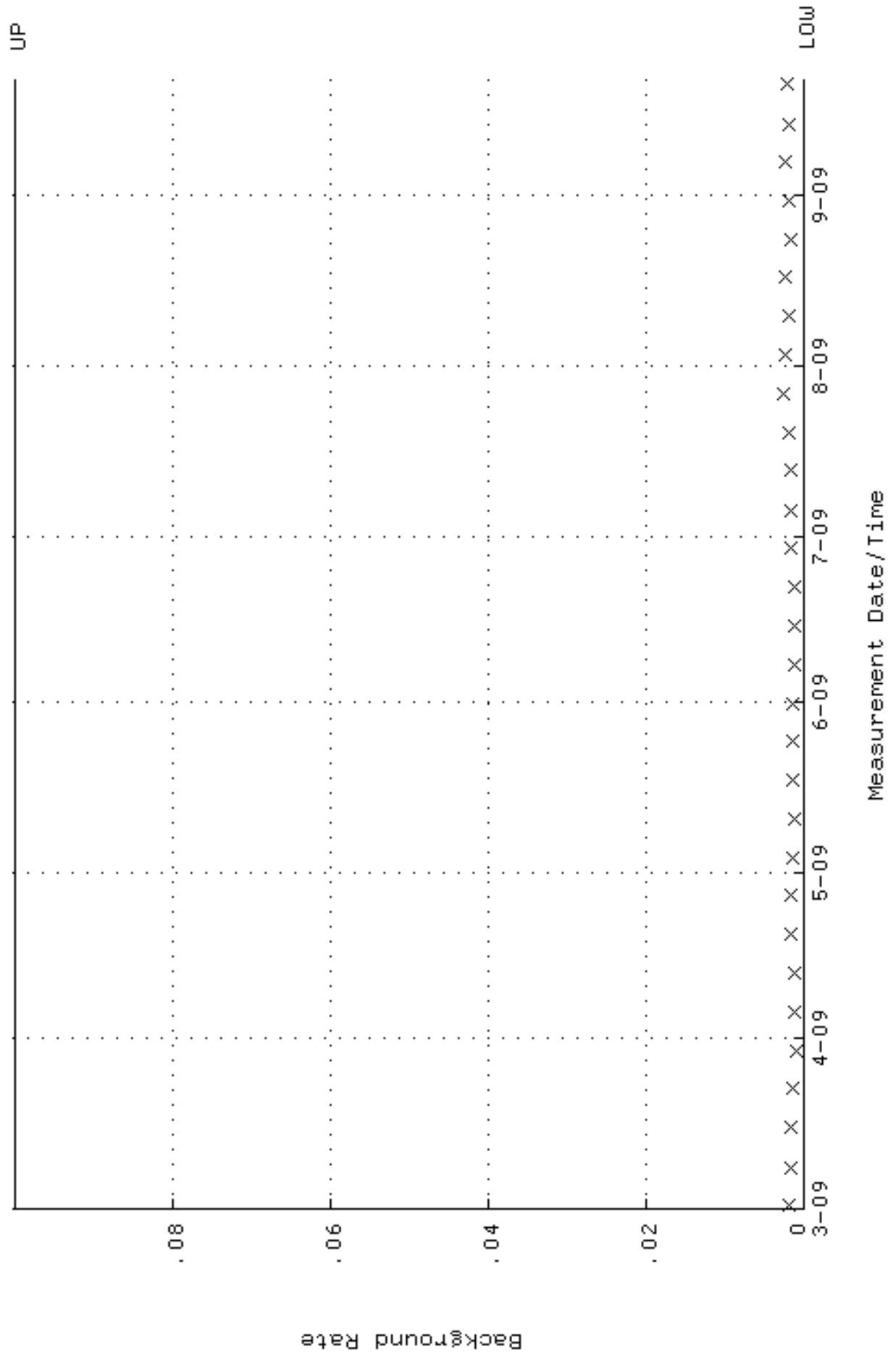
QA filename : DKA100:[ENV_ALPHA.QA.W]W187.QAF;1
Parameter Name : AVRGEFF (Average Efficiency)
Start/End Dates : 4-MAR-2009 22:39:27 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 0.241464 through 0.261464



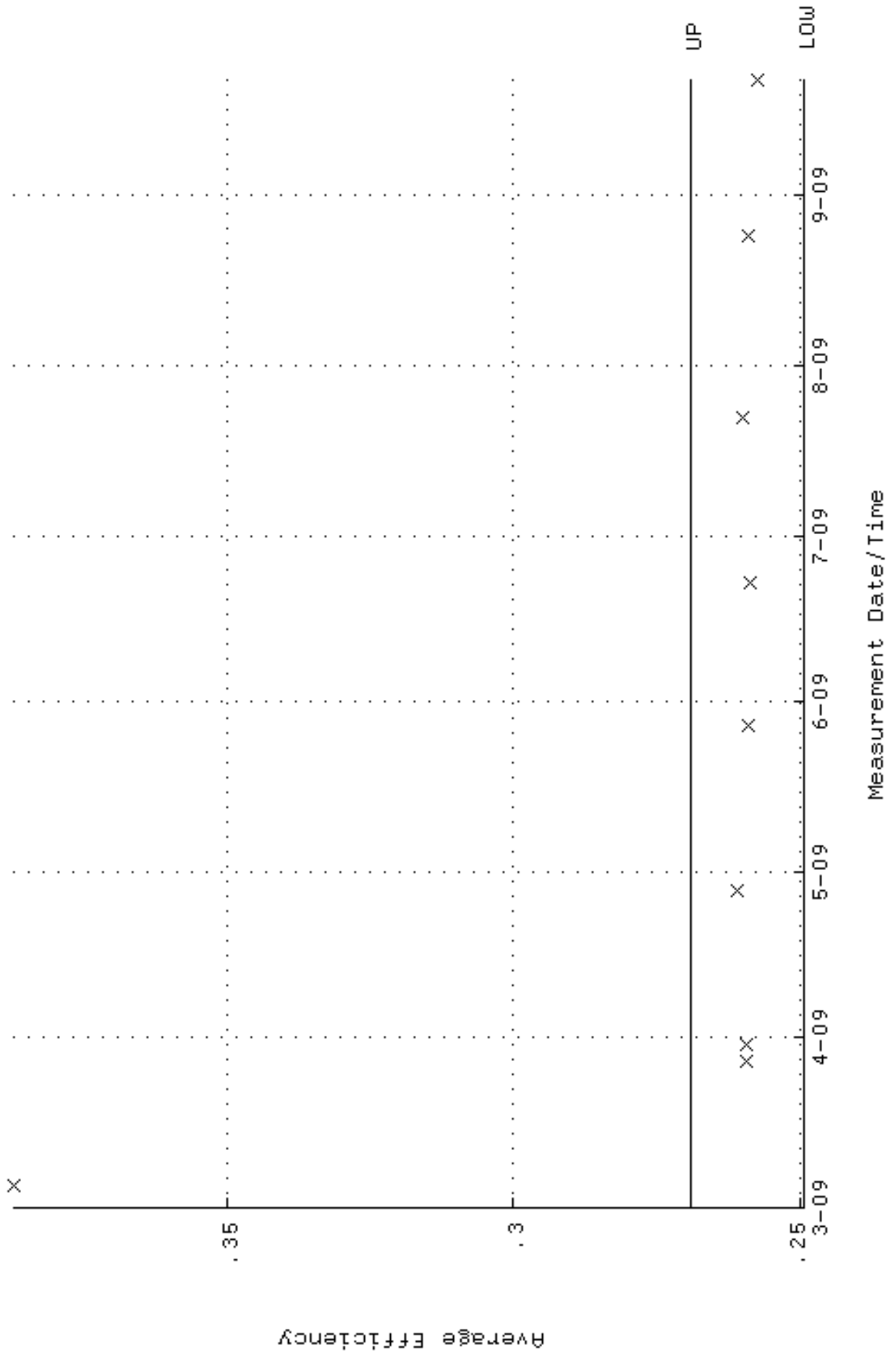
QA filename : DKA100:[ENV_ALPHA.QA.W]w187.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:27 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 85.5888 through 94.5982



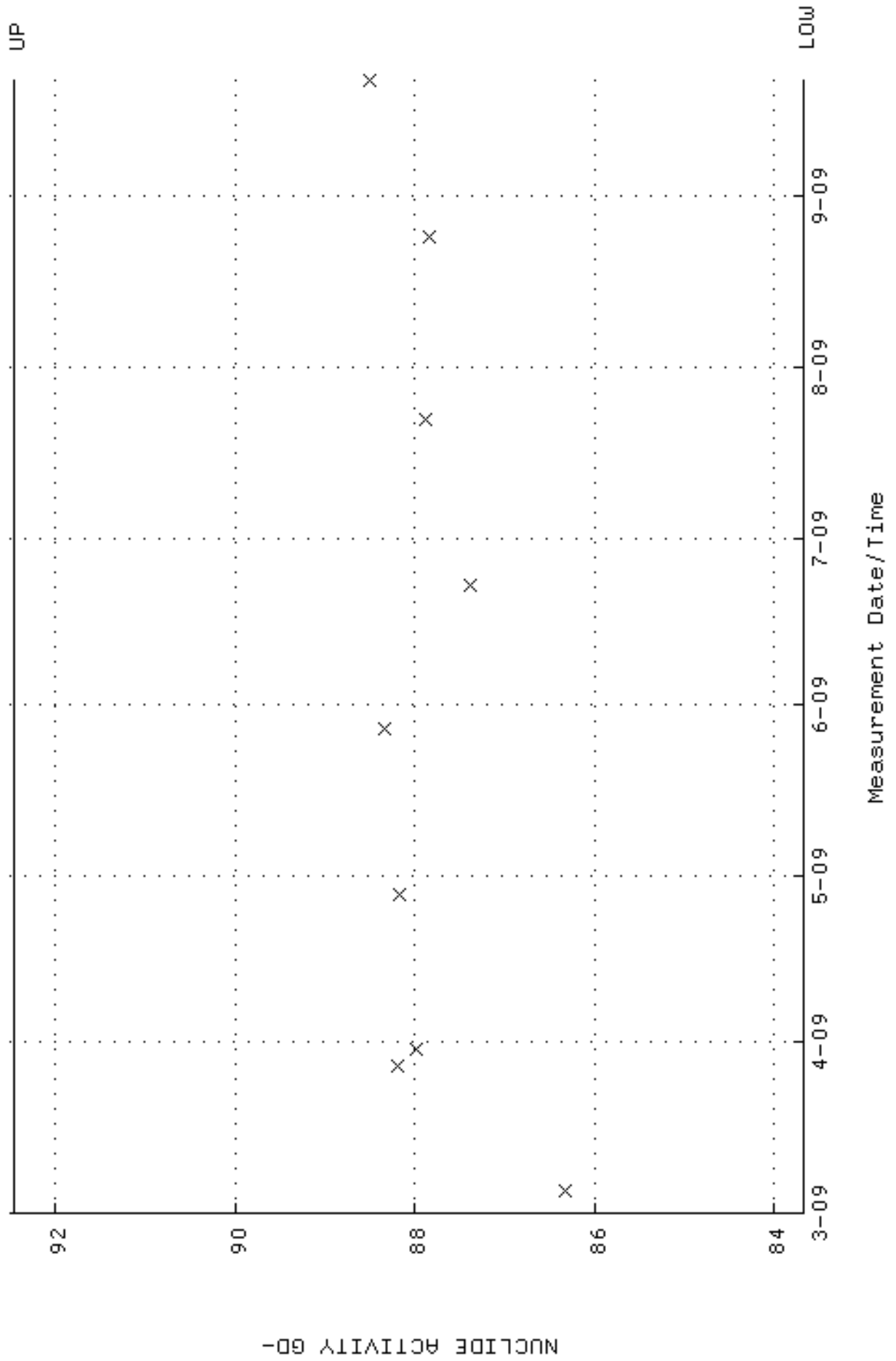
QA filename : DKA100:[ENV_ALPHA.QA.B]B187.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:38 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



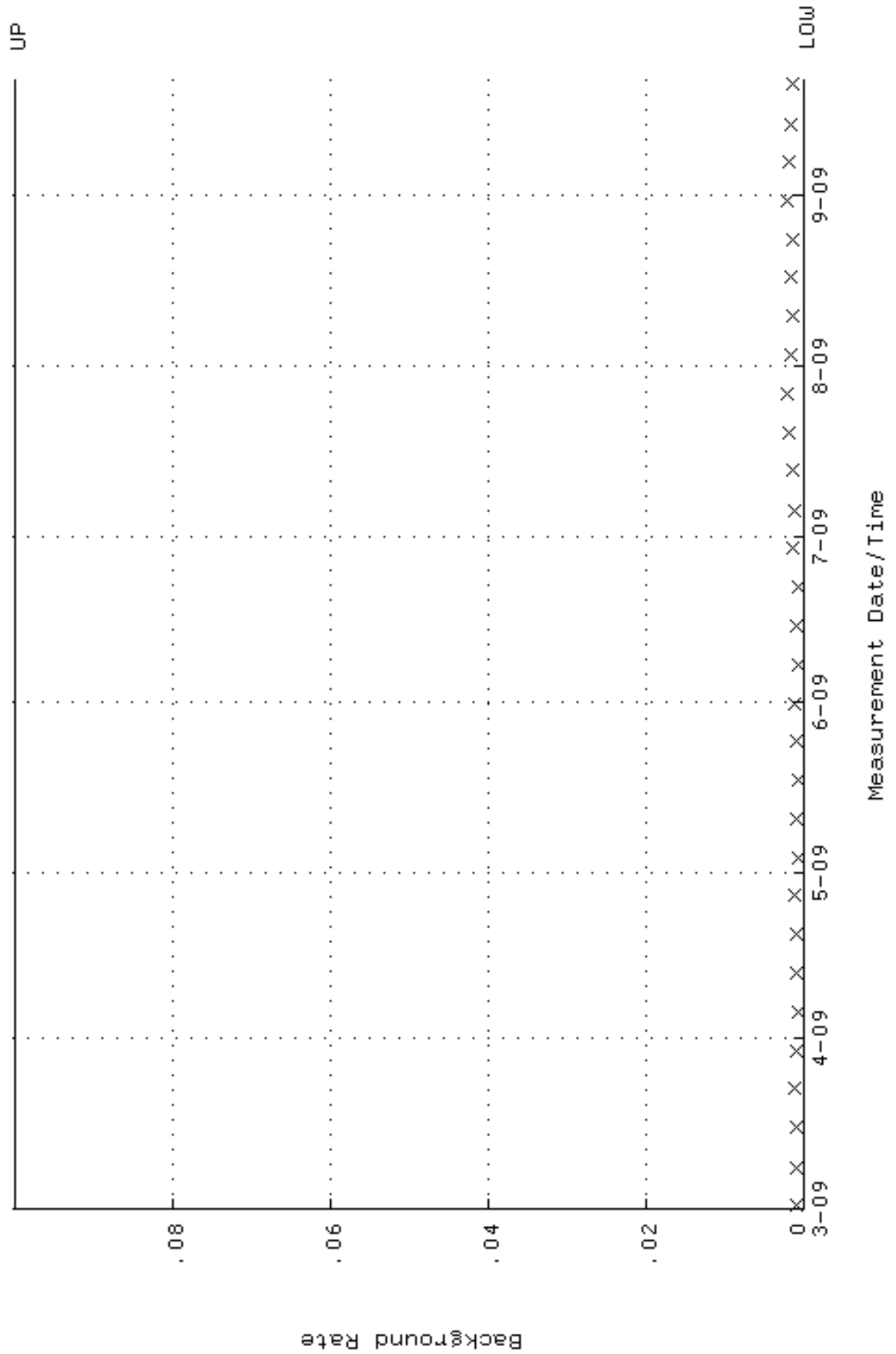
QA filename : DKA100:[ENV_ALPHA.QA.W]W188.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:30 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.249341 through 0.269341



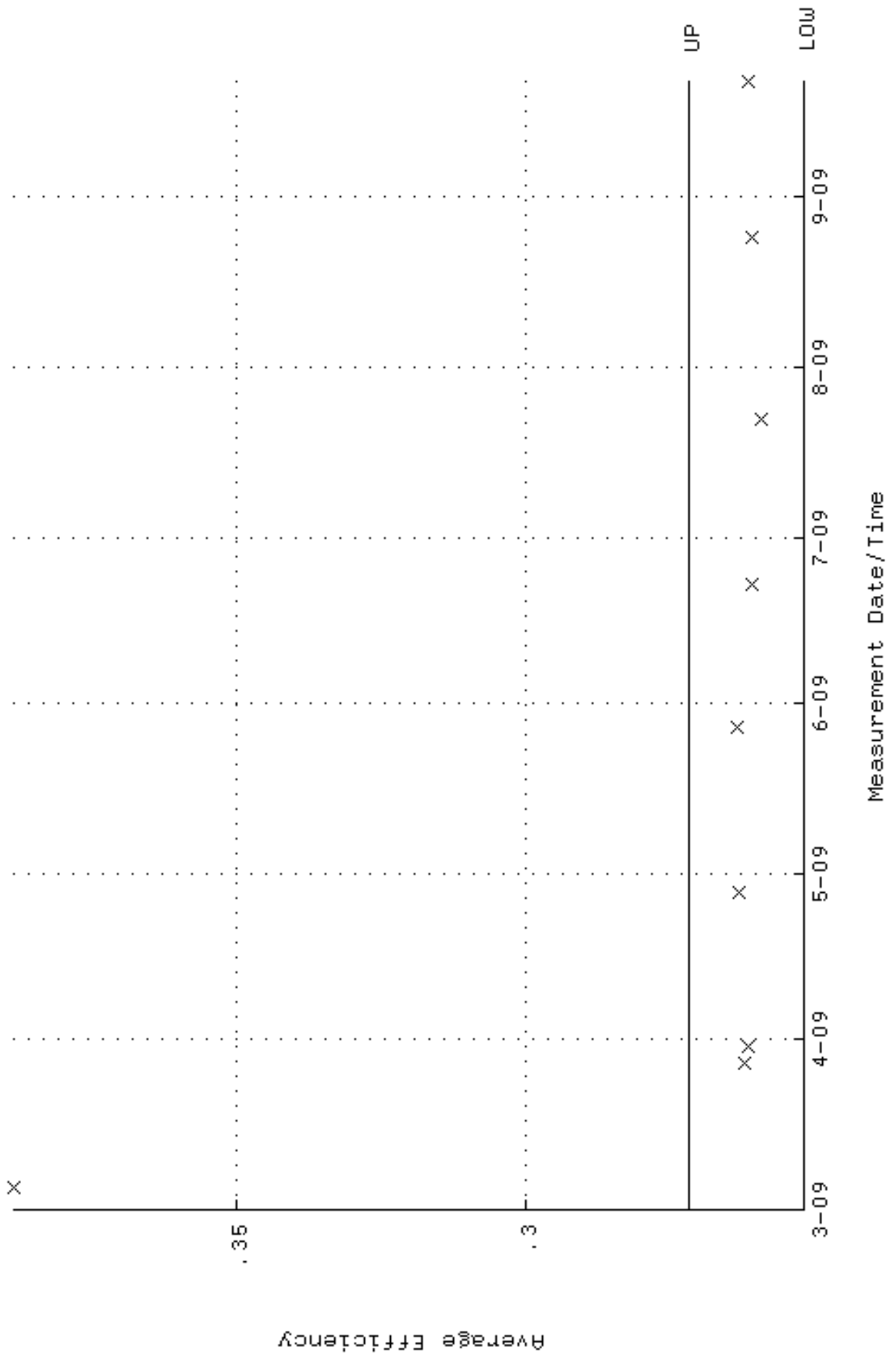
QA filename : DKA100:[ENV_ALPHA.QA.W]w188.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 4-MAR-2009 22:39:30 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 83.6747 through 92.4825



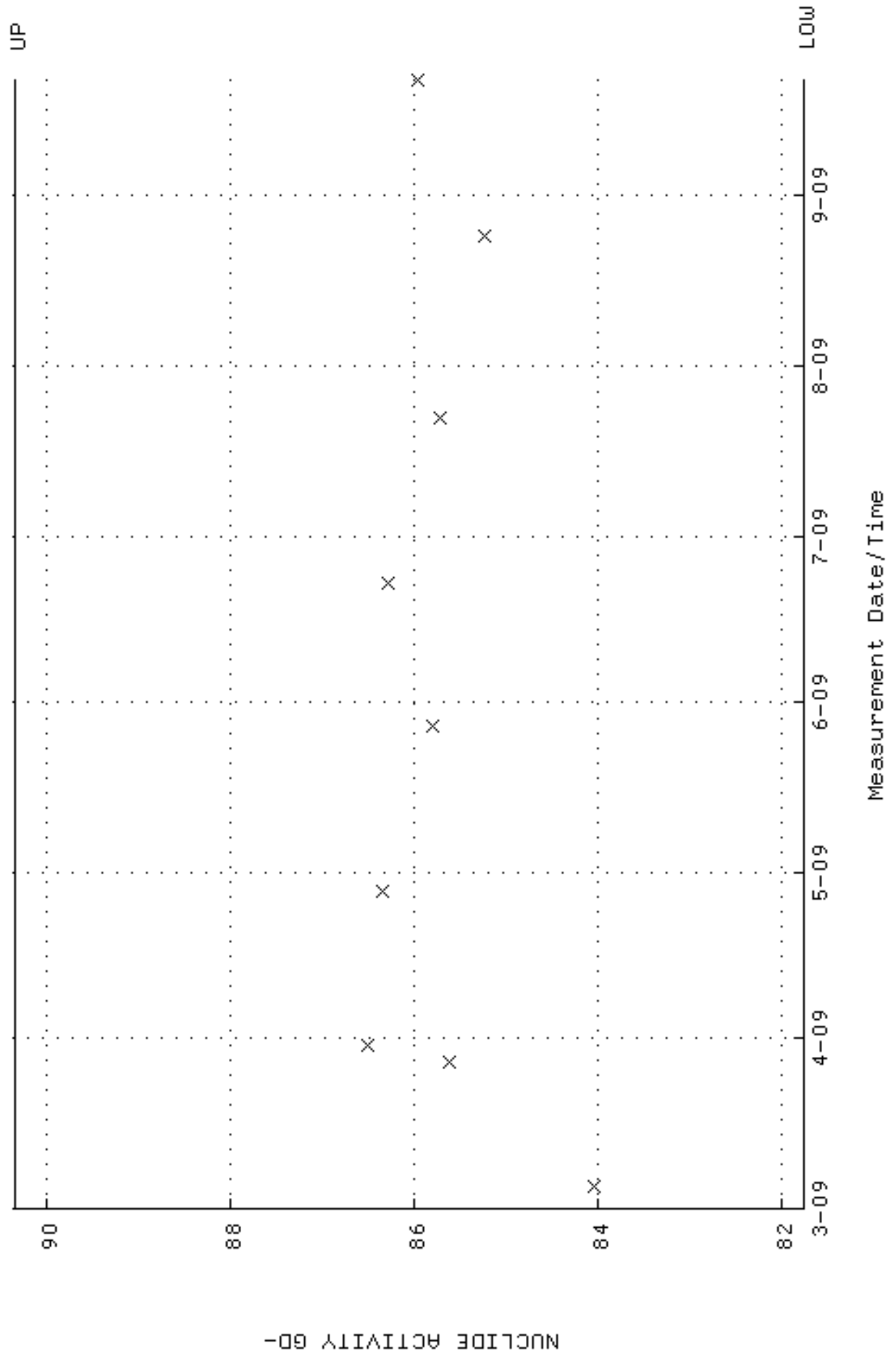
QA filename : DKA100:[ENV_ALPHA.QA.B]B188.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:42 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



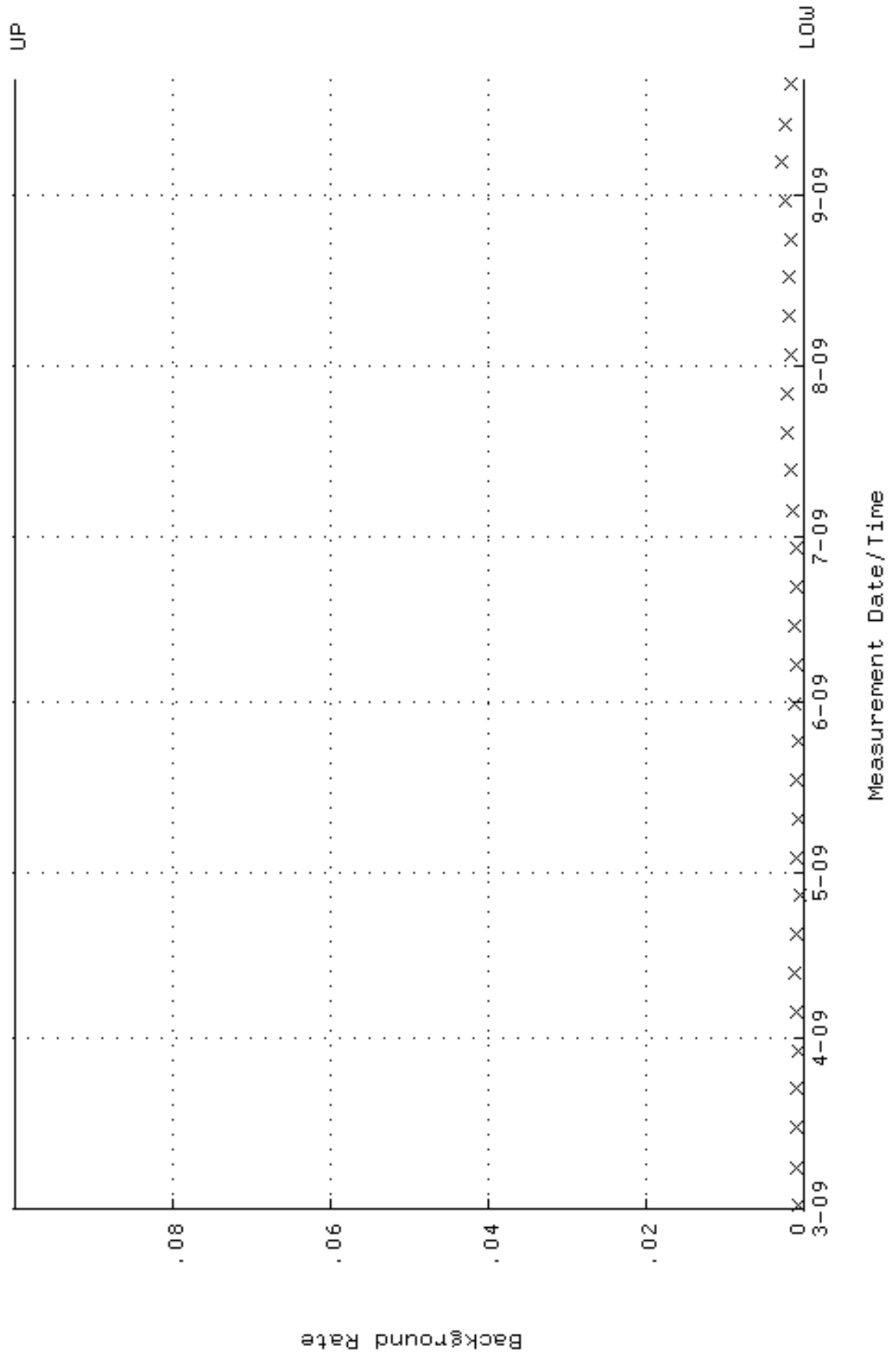
QA filename : DKA100:[ENV_ALPHA.QA.W]W189.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:34 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.251590 through 0.271590



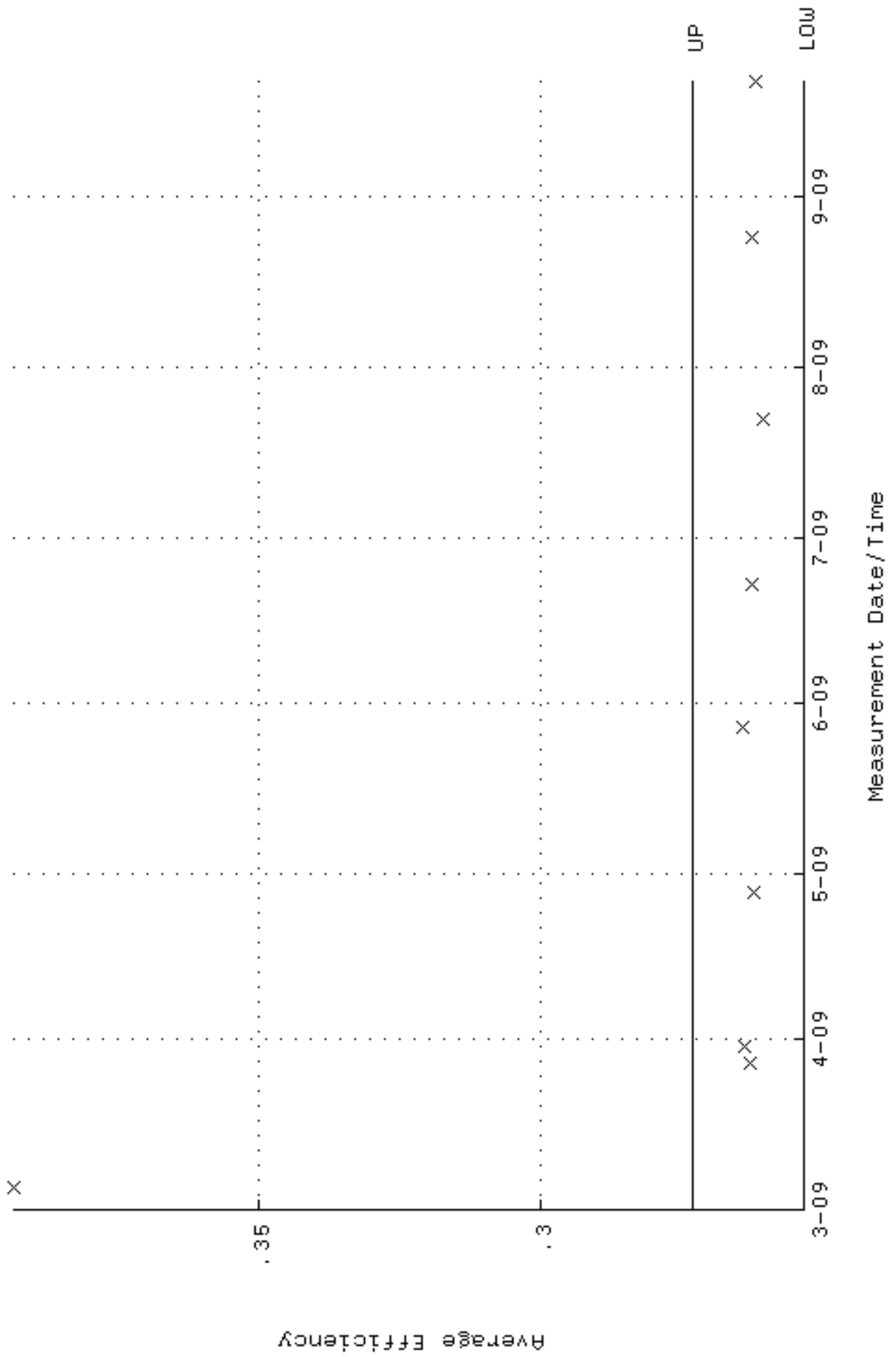
QA filename : DKA100:[ENV_ALPHA.QA.W]w189.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:34 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 81.7473 through 90.3523



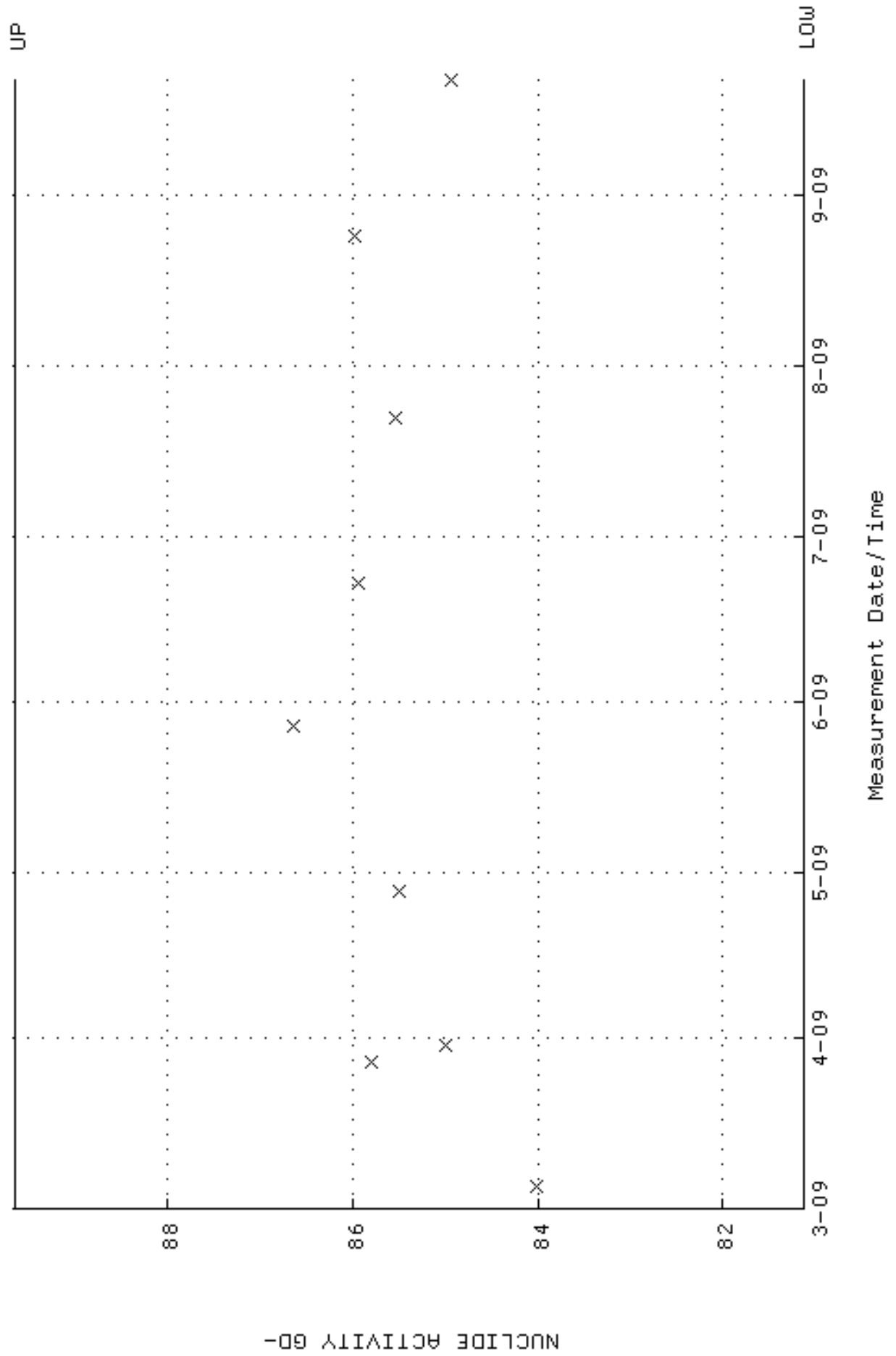
QA filename : DKA100:[ENV_ALPHA.QA.B]B189.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:46 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



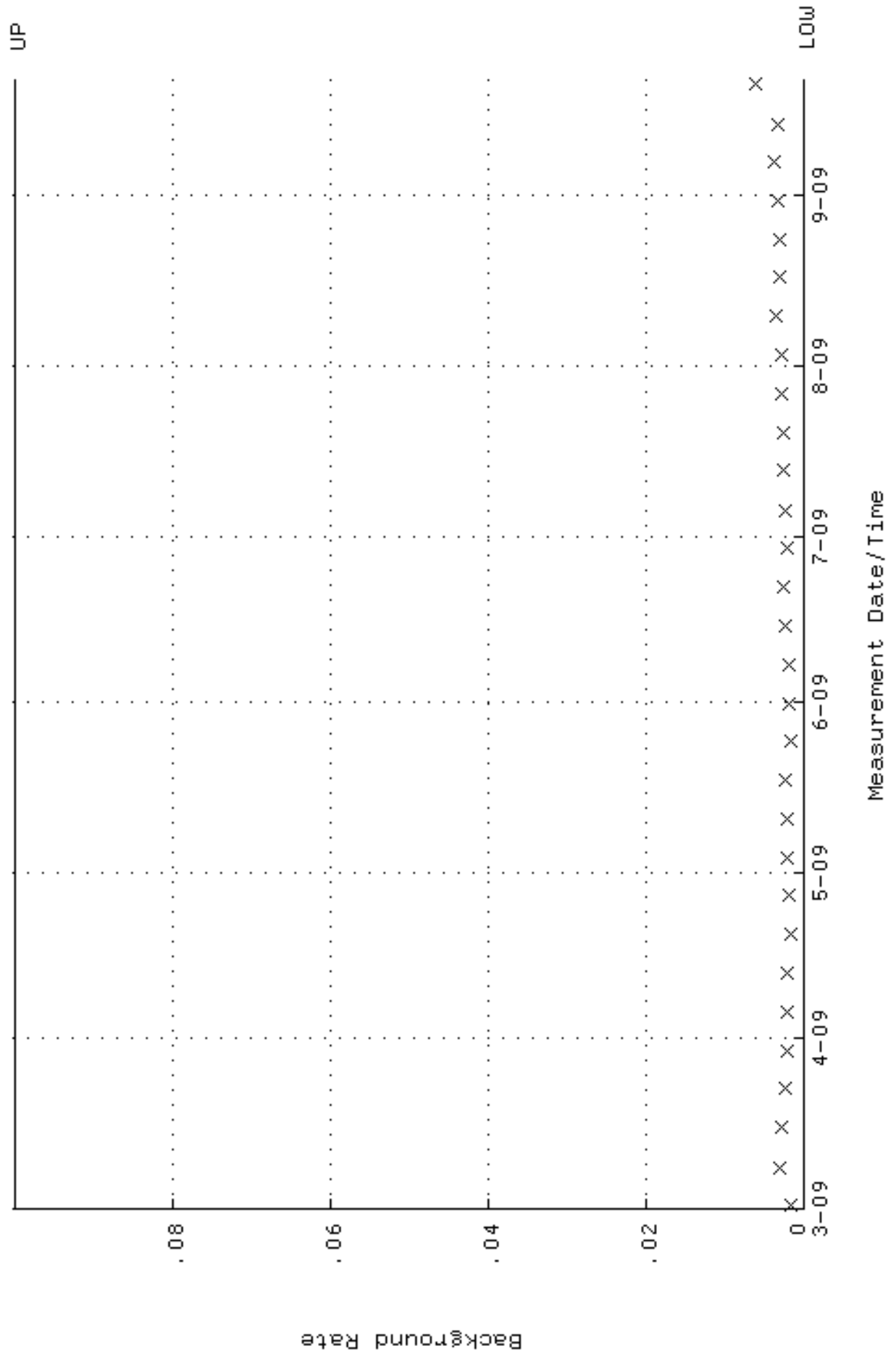
QA filename : DKA100:[ENV_ALPHA.QA.W]W190.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:38 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.253504 through 0.273504



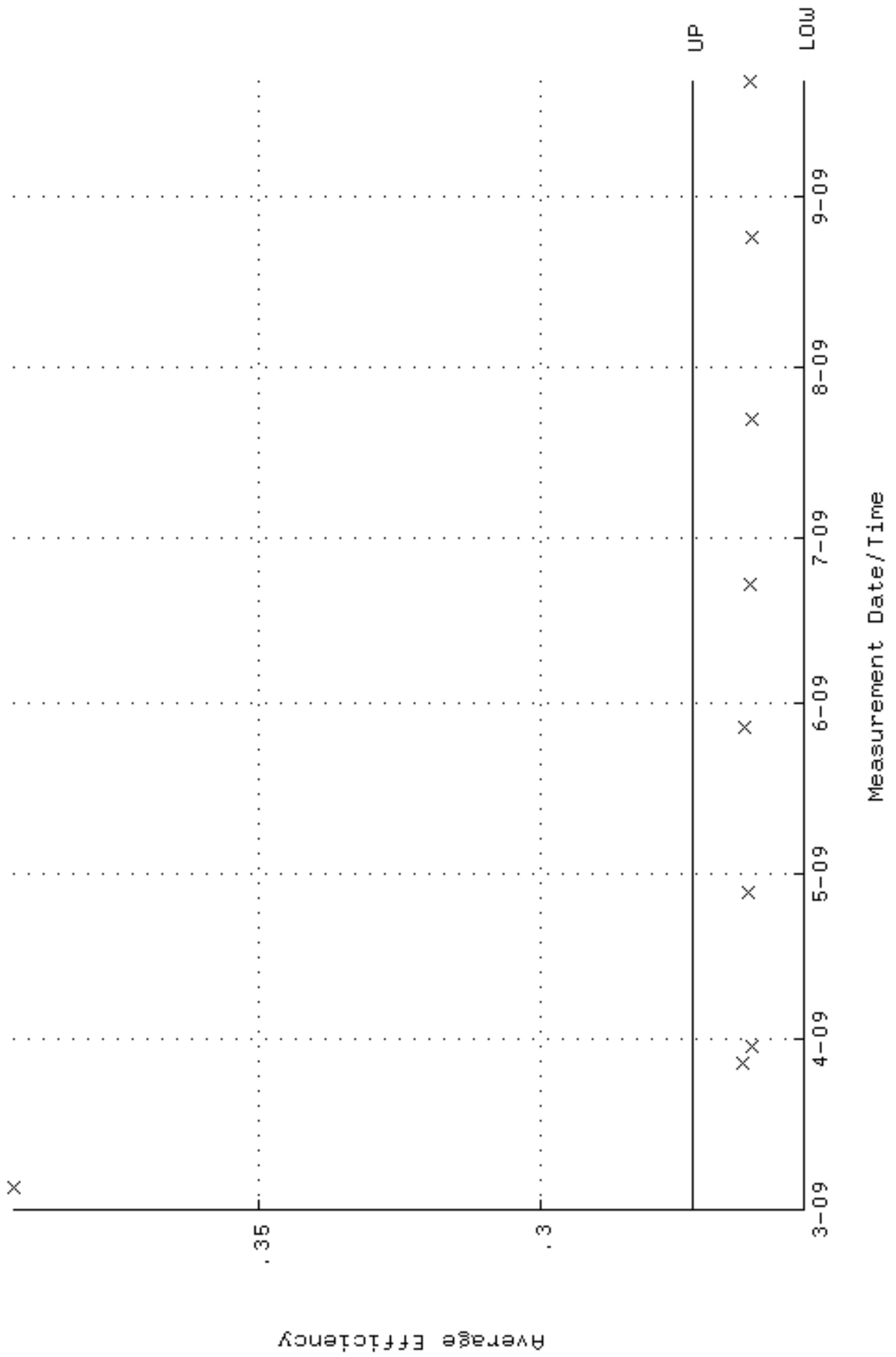
QA filename : DKA100:[ENV_ALPHA.QA.W]W190.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:38 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 81.1176 through 89.6562



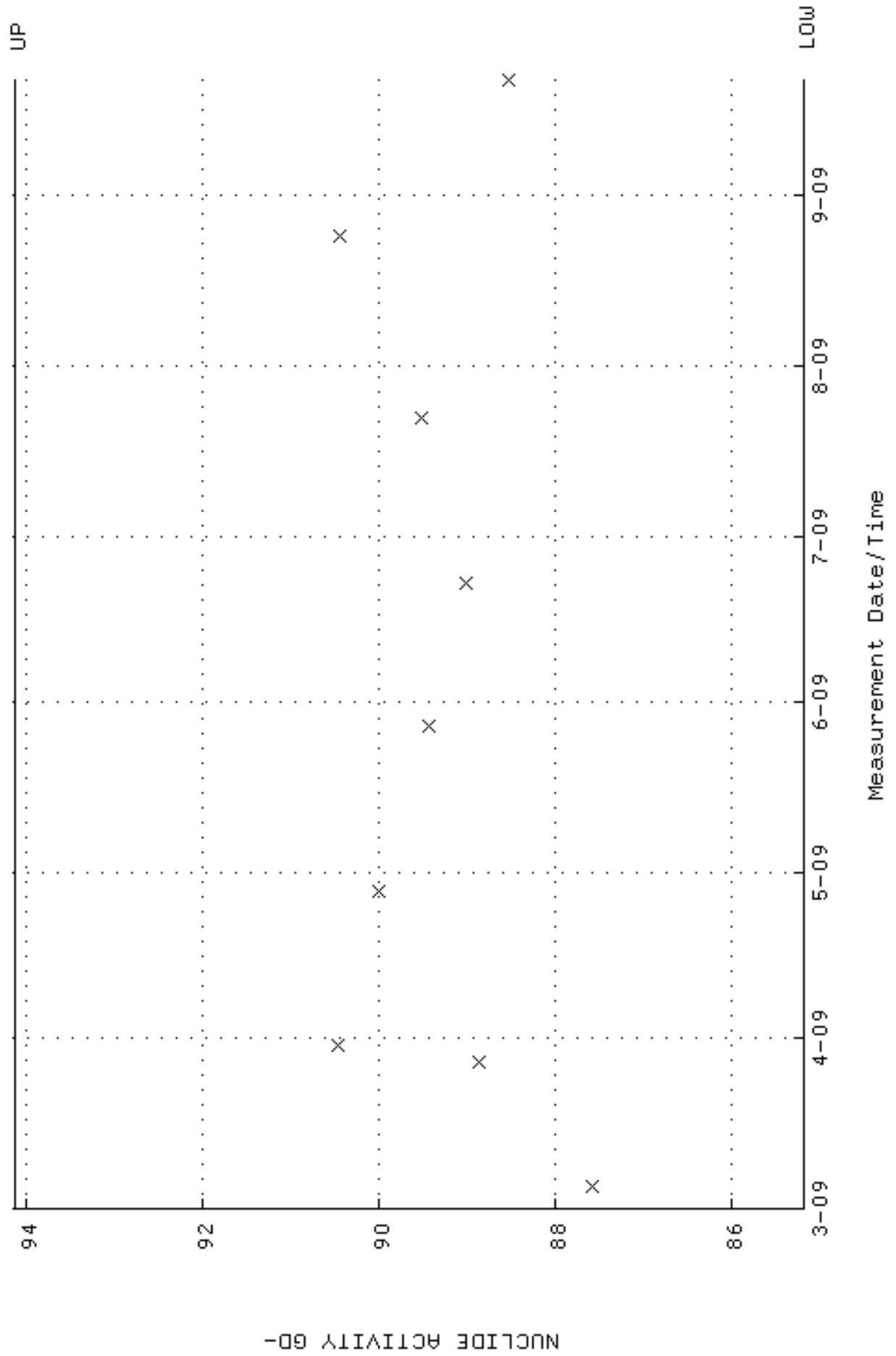
QA filename : DKA100:[ENV_ALPHA.QA.B]B190.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:50 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



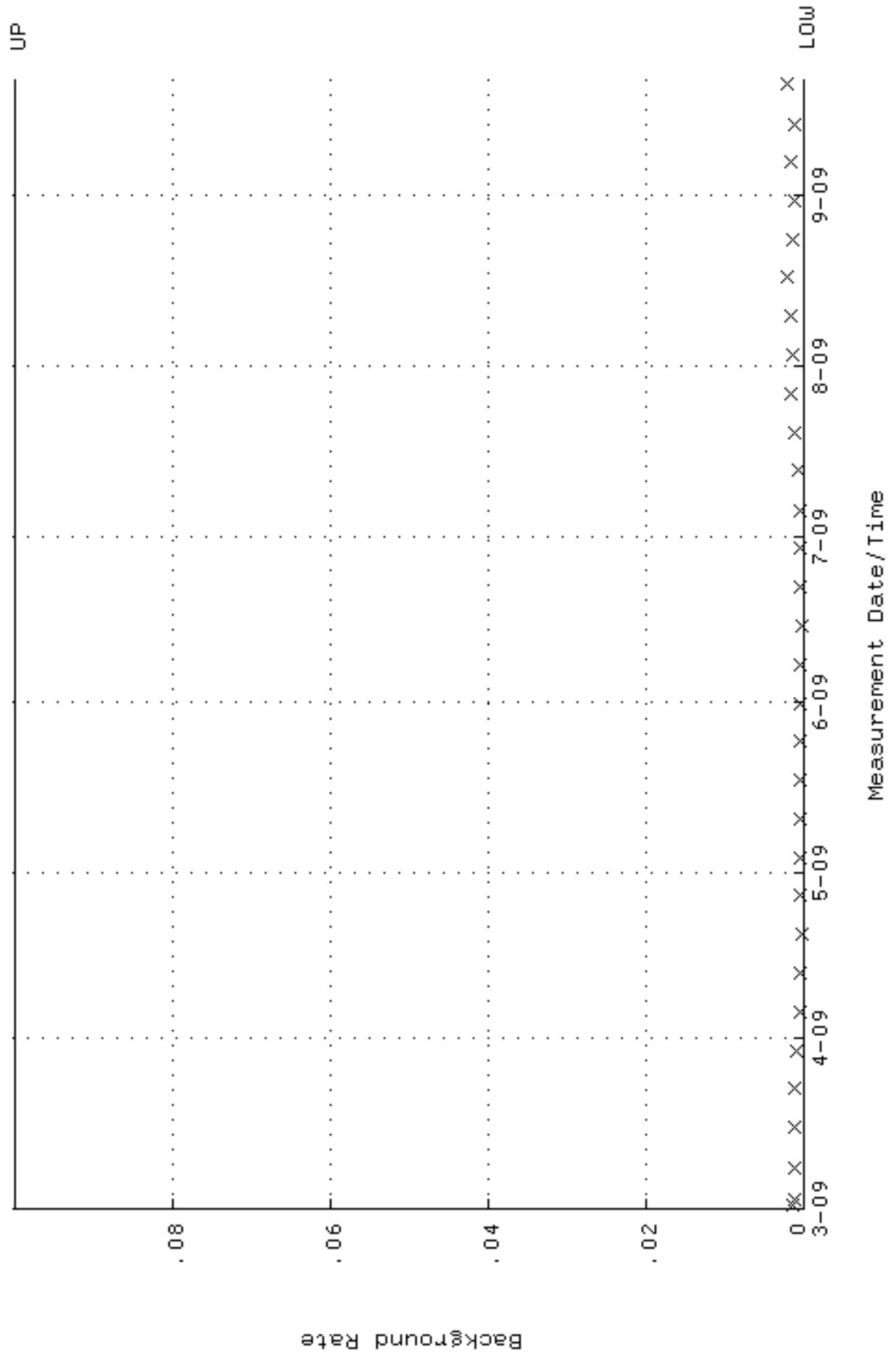
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:42 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.252993 through 0.272993



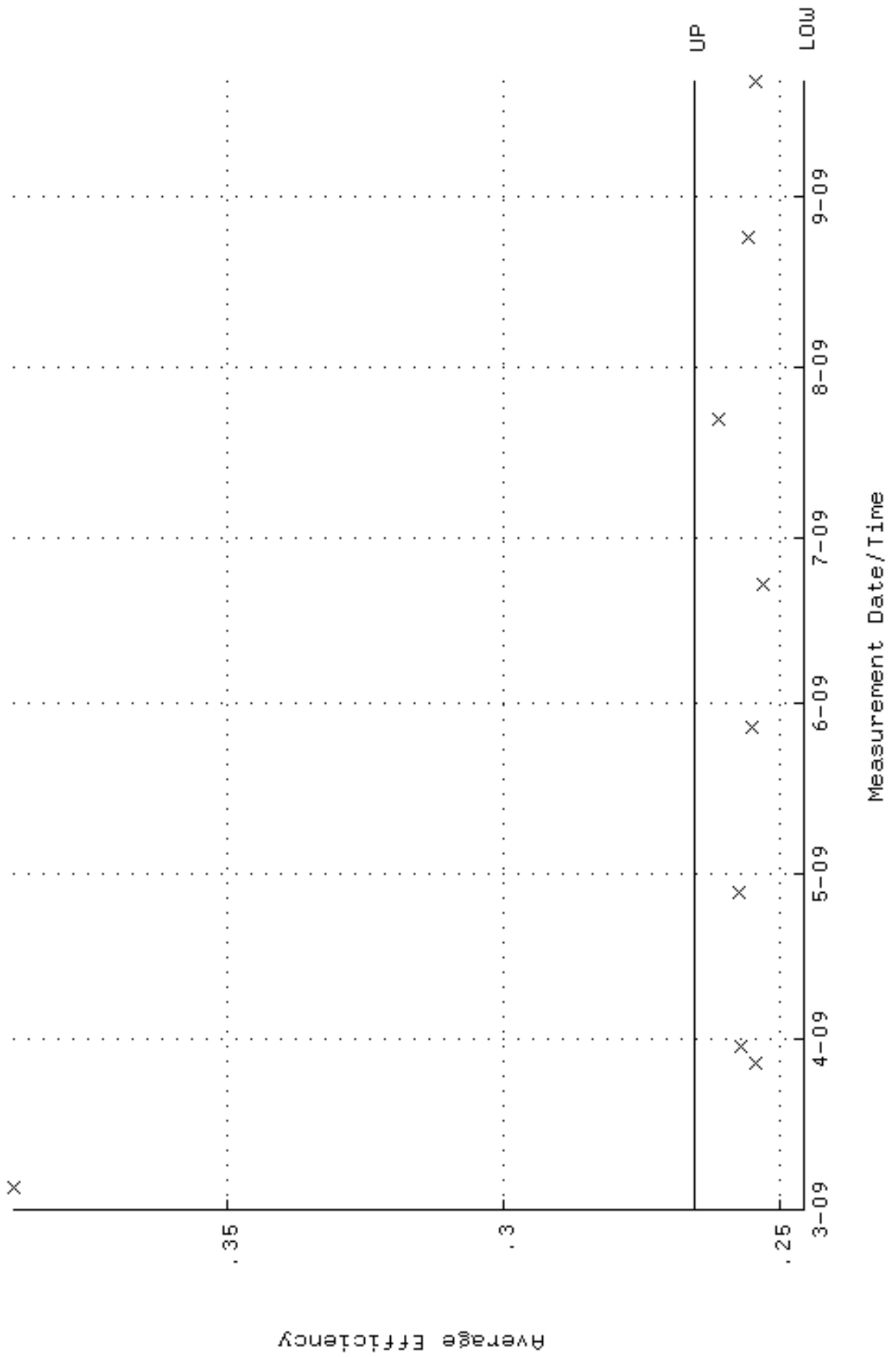
QA filename : DKA100:[ENV_ALPHA.QA.W]W191.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:42 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 85.1712 through 94.1366



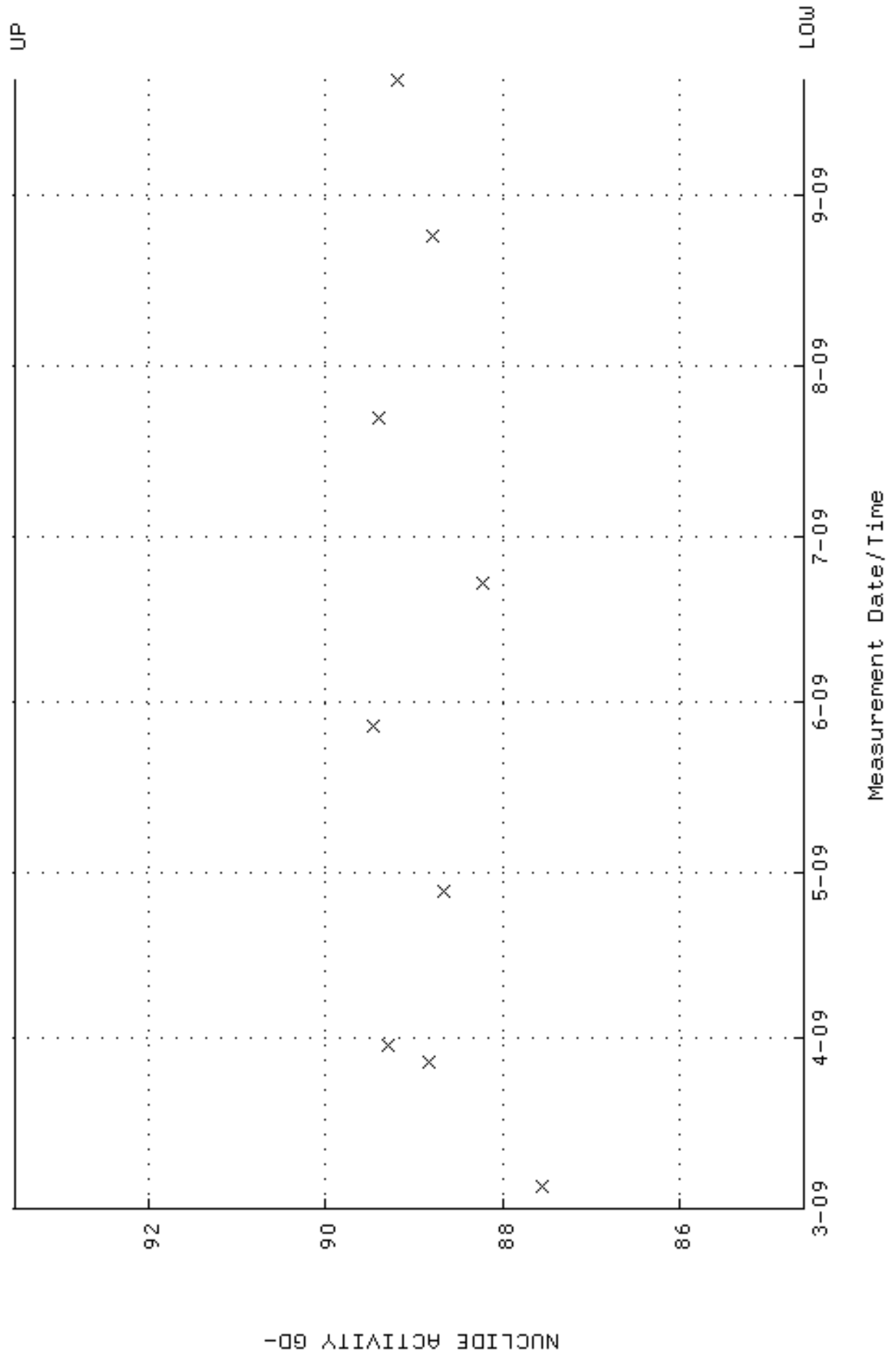
QA filename : DKA100:[ENV_ALPHA.QA.B]B191.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:54 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



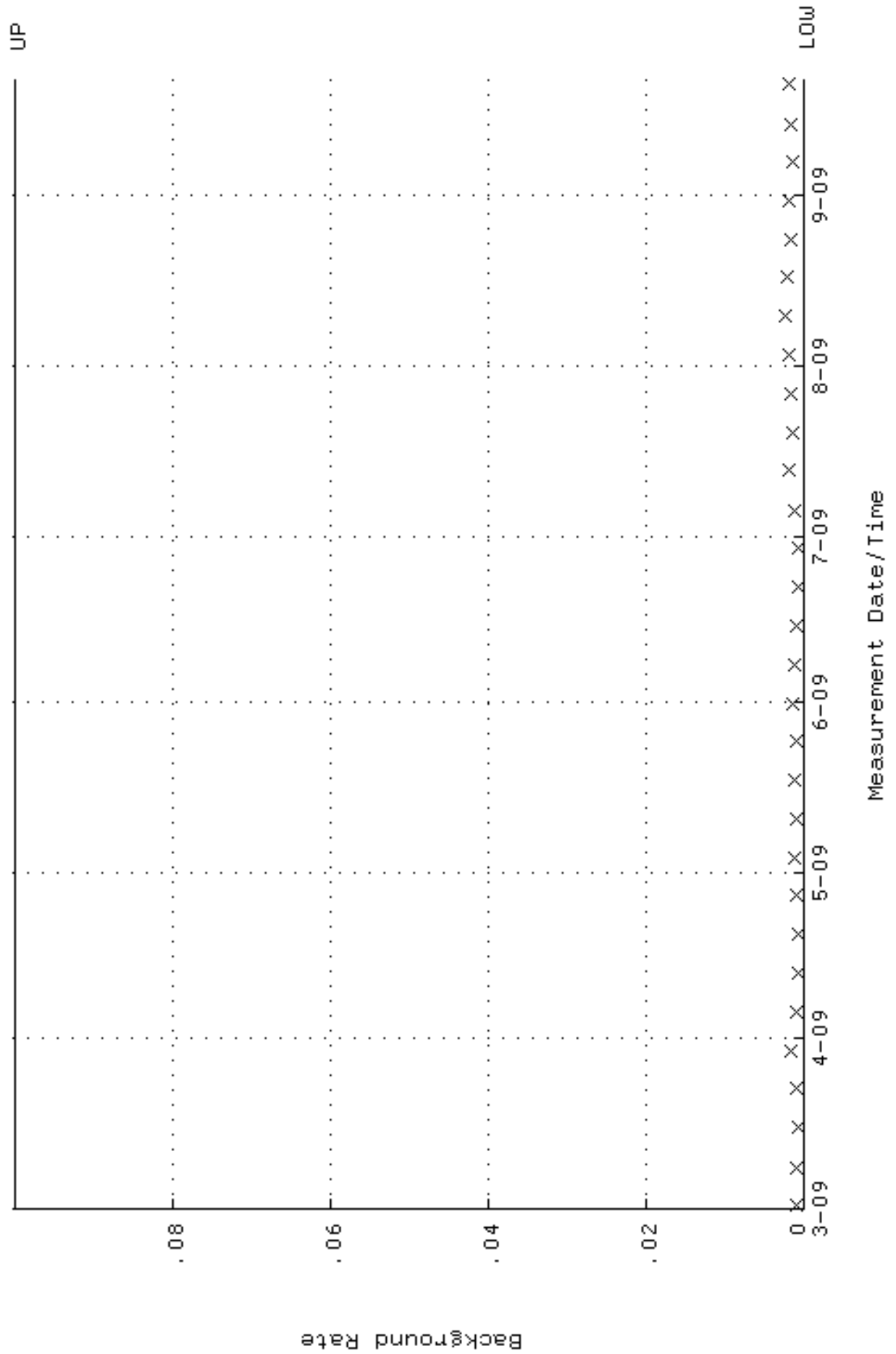
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:46 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.245663 through 0.265663



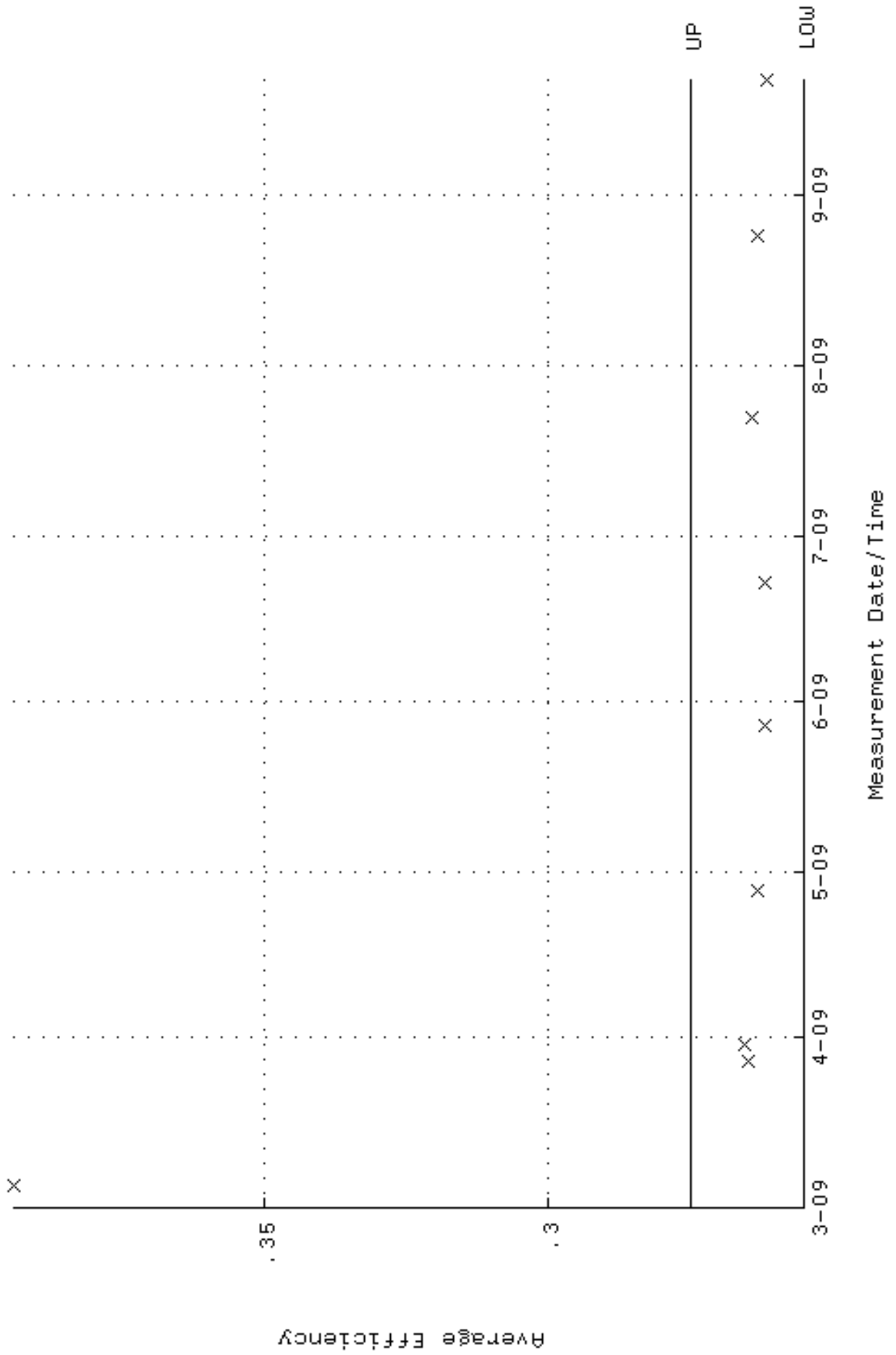
QA filename : DKA100:[ENV_ALPHA.QA.W]W192.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:46 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 84.6037 through 93.5093



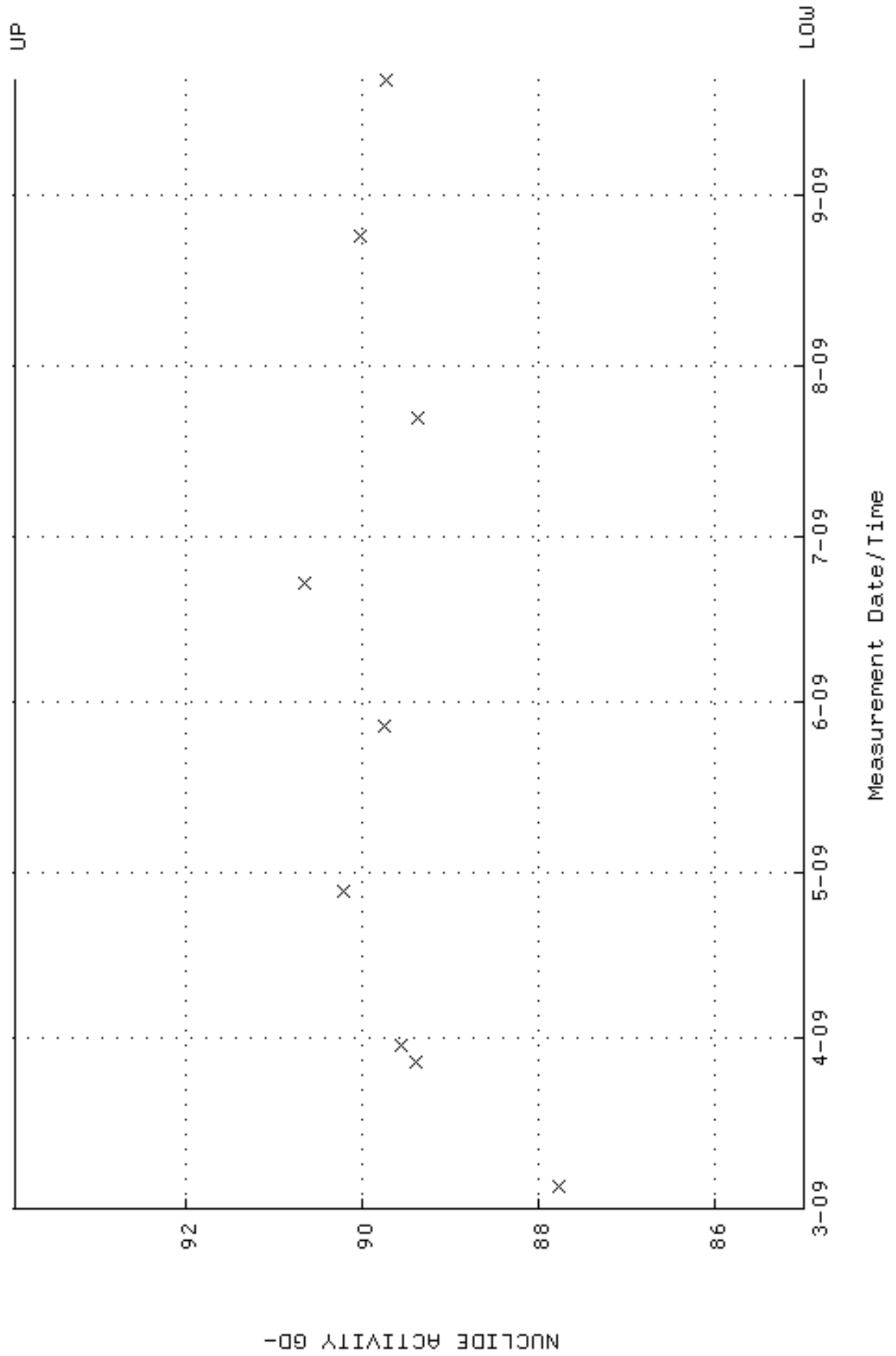
QA filename : DKA100:[ENV_ALPHA.QA.B]B192.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:22:57 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



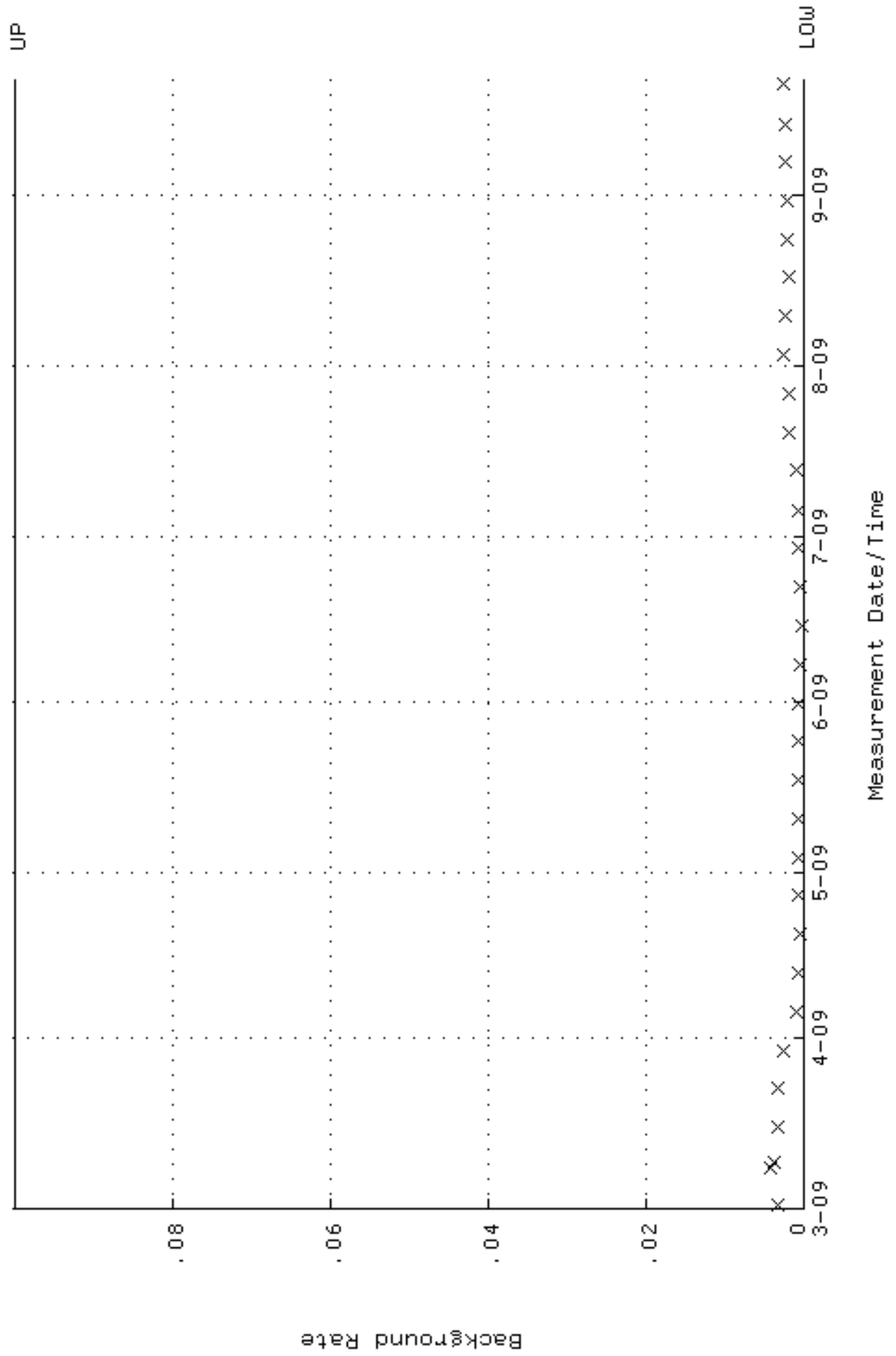
QA filename : DKA100:[ENV_ALPHA.QA.W]W193.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:50 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.254861 through 0.274861



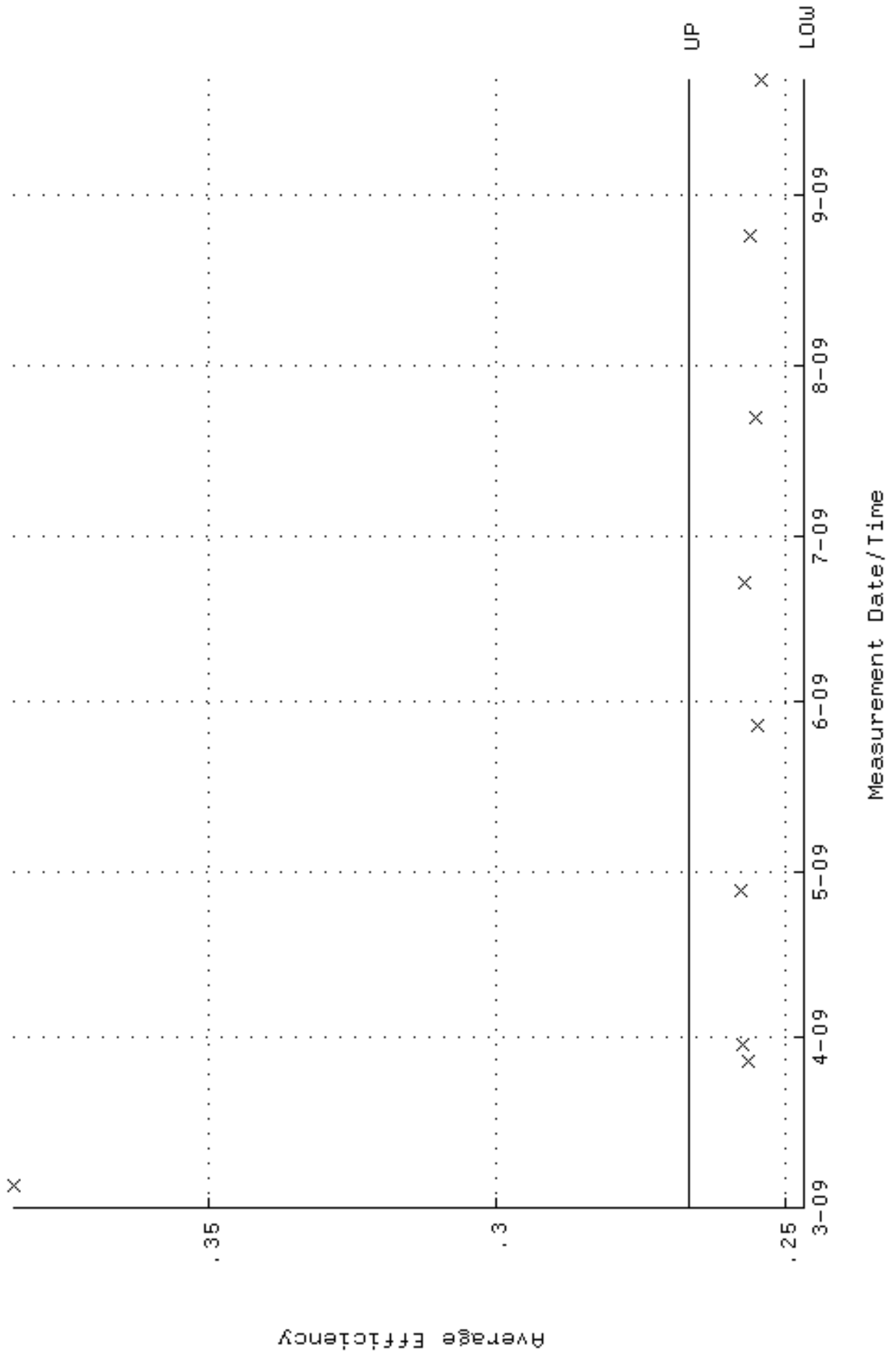
QA filename : DKA100:[ENV_ALPHA.QA.W]W193.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:50 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 84.9815 through 93.9269



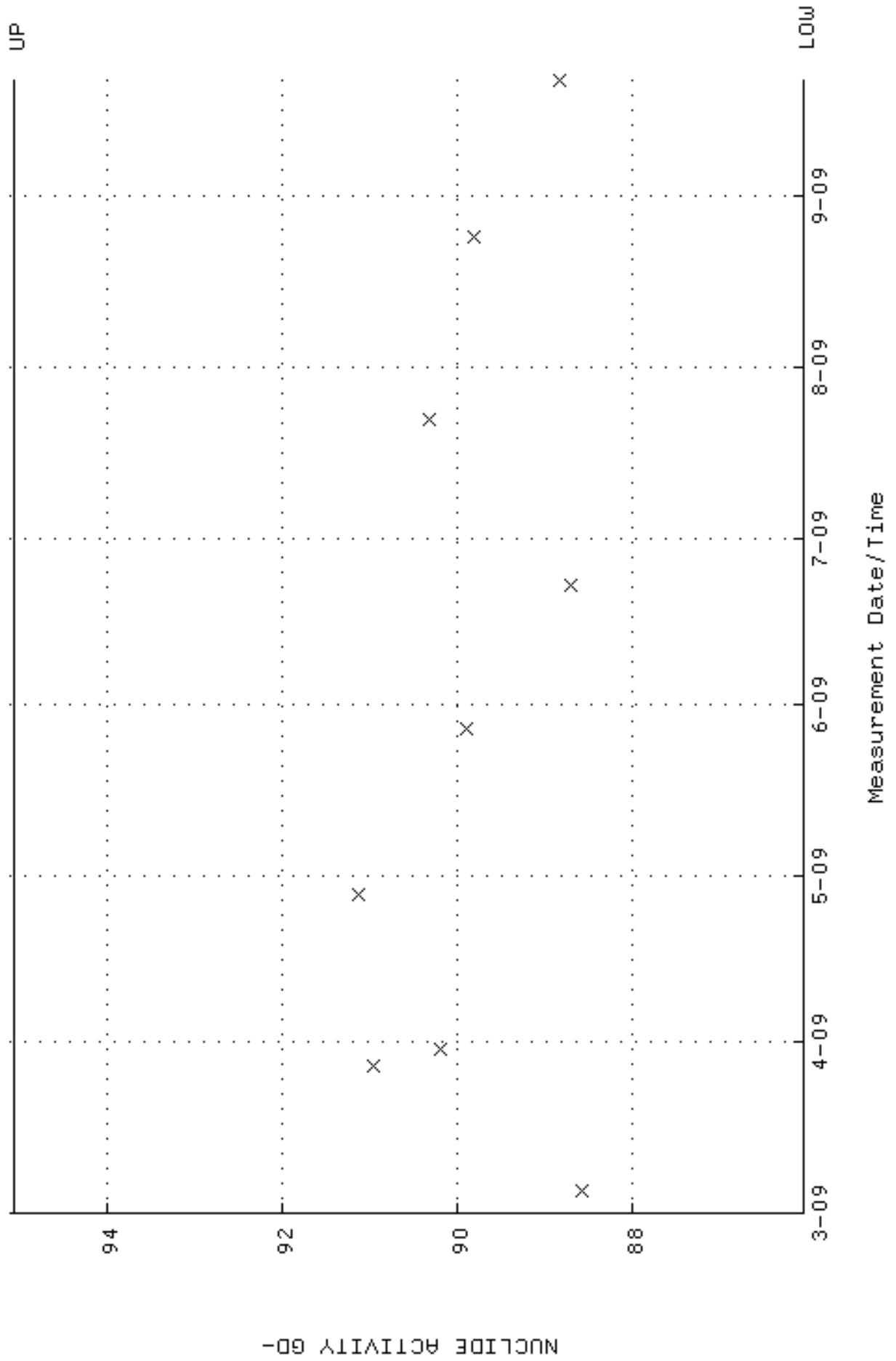
QA filename : DKA100:[ENV_ALPHA.QA.B]B193.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:23:01 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



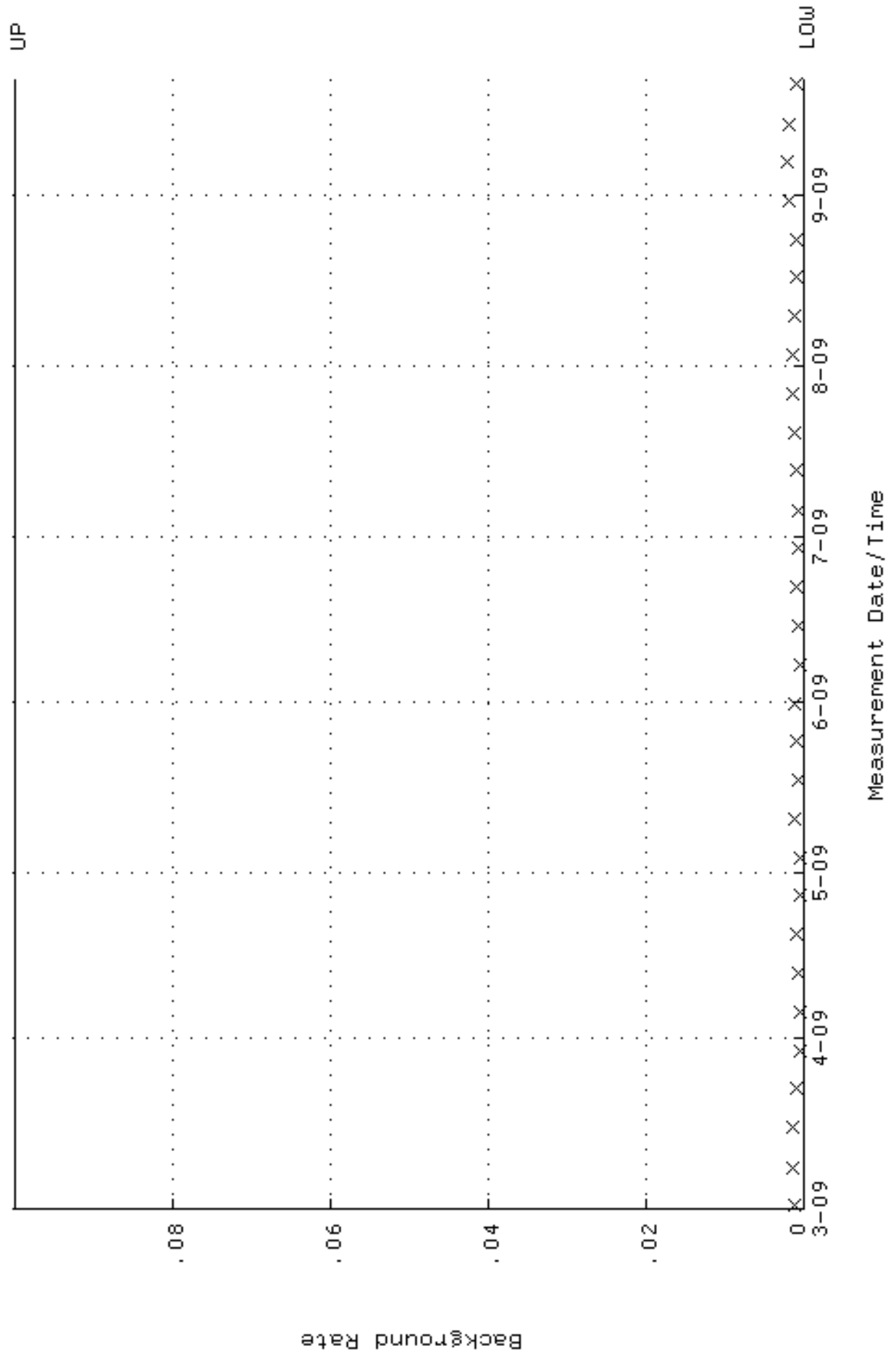
QA filename : DKA100:[ENV_ALPHA.QA.W]W194.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 4-MAR-2009 22:39:54 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.246760 through 0.266760



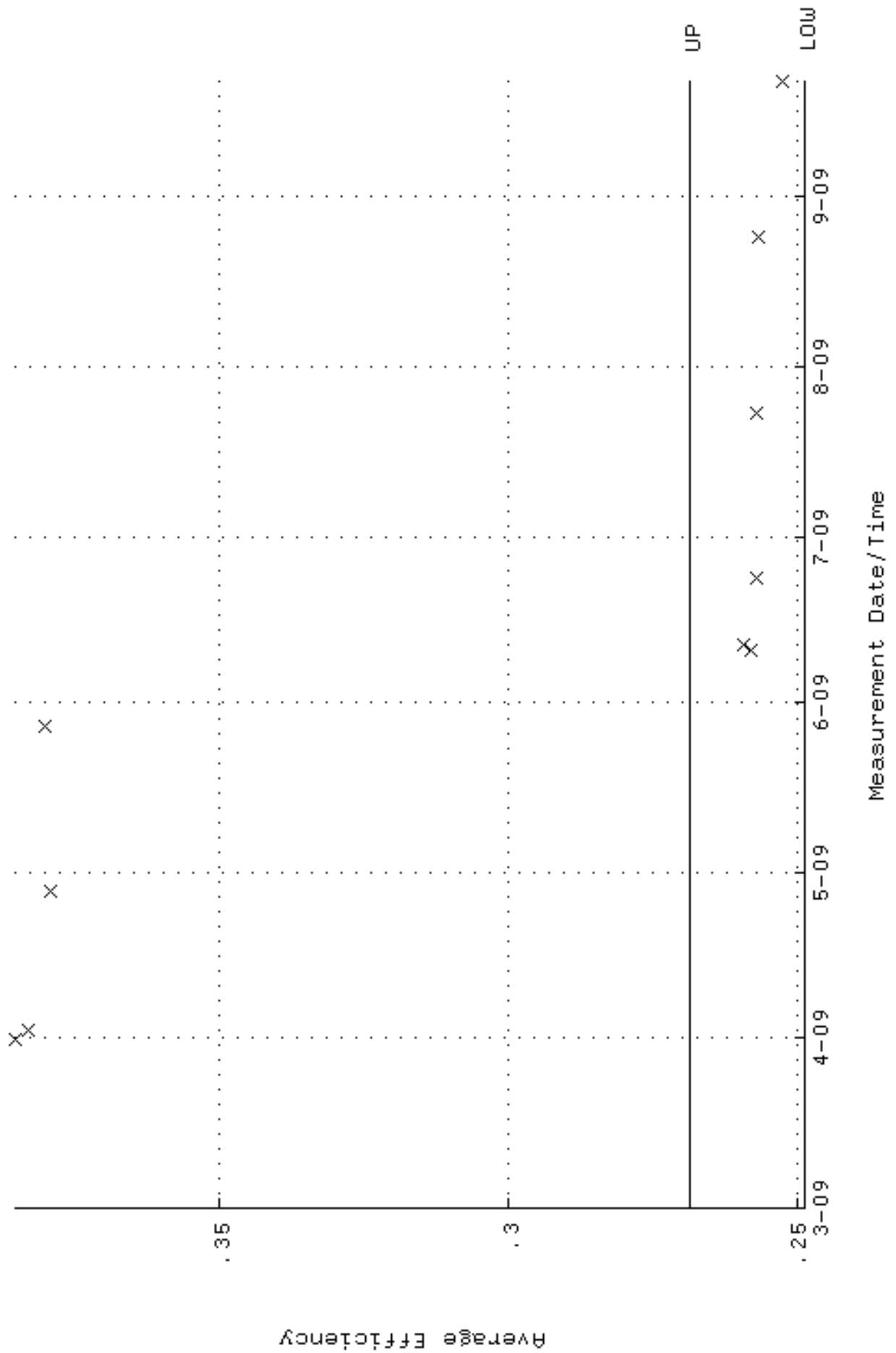
QA filename : DKA100:[ENV_ALPHA.QA.W]w194.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 4-MAR-2009 22:39:54 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 86.0376 through 95.0942



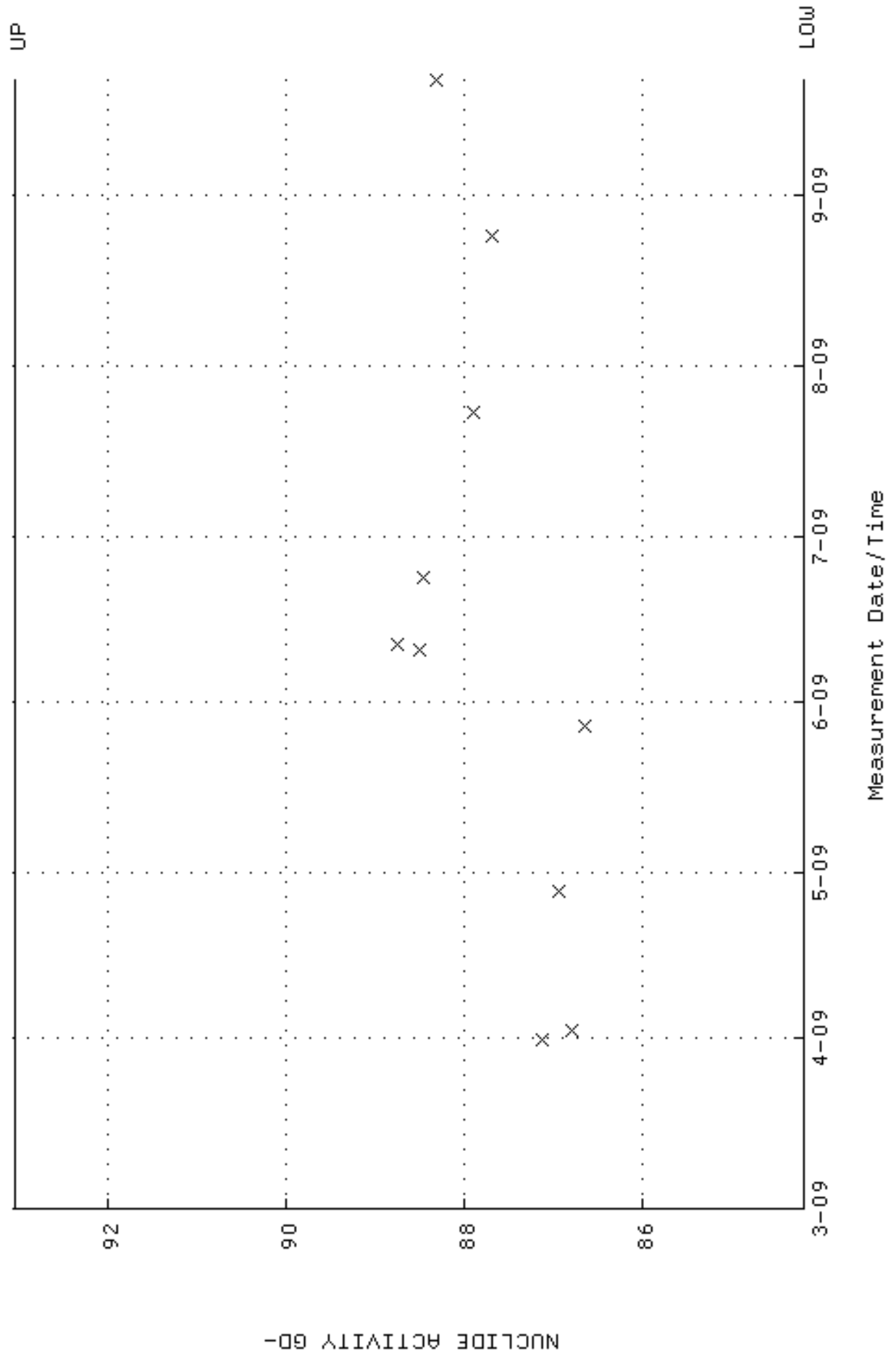
QA filename : DKA100:[ENV_ALPHA.QA.B]B194.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-MAR-2009 17:23:05 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



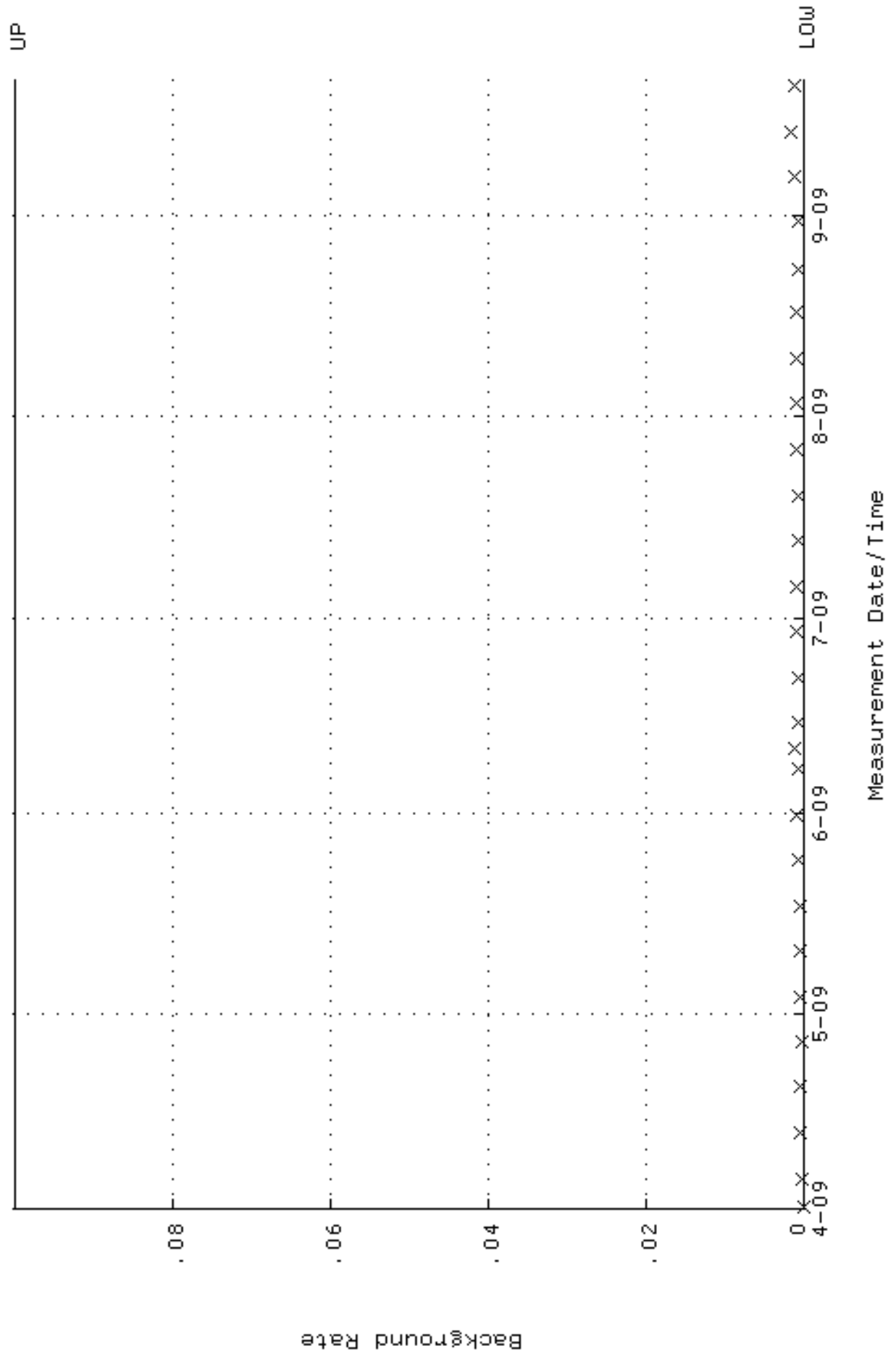
QA filename : DKA100:[ENV_ALPHA.QA.W]W197.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:03:56 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.248572 through 0.268572



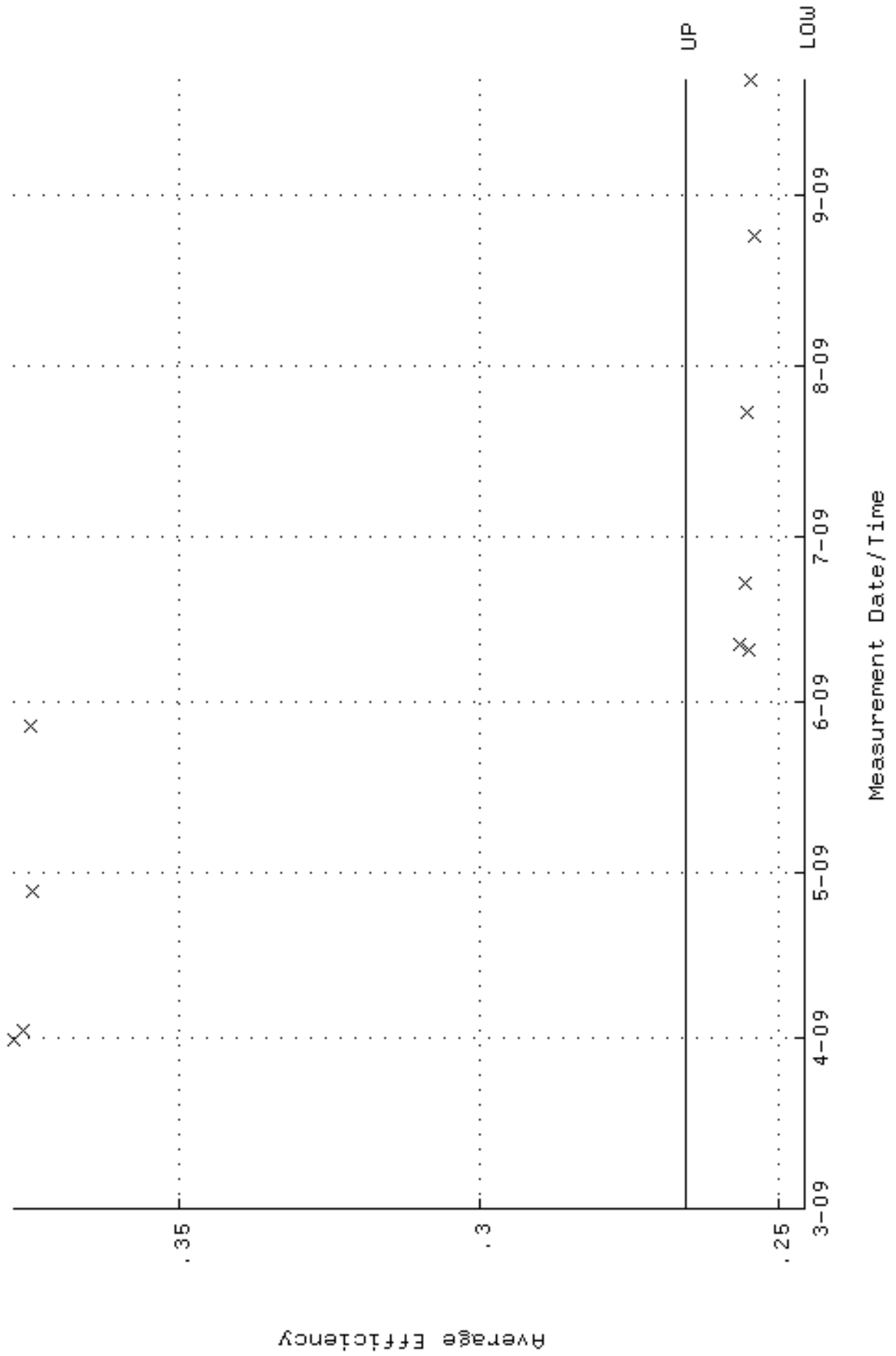
QA filename : DKA100:[ENV_ALPHA.QA.W]w197.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:03:56 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 84.1772 through 93.0380



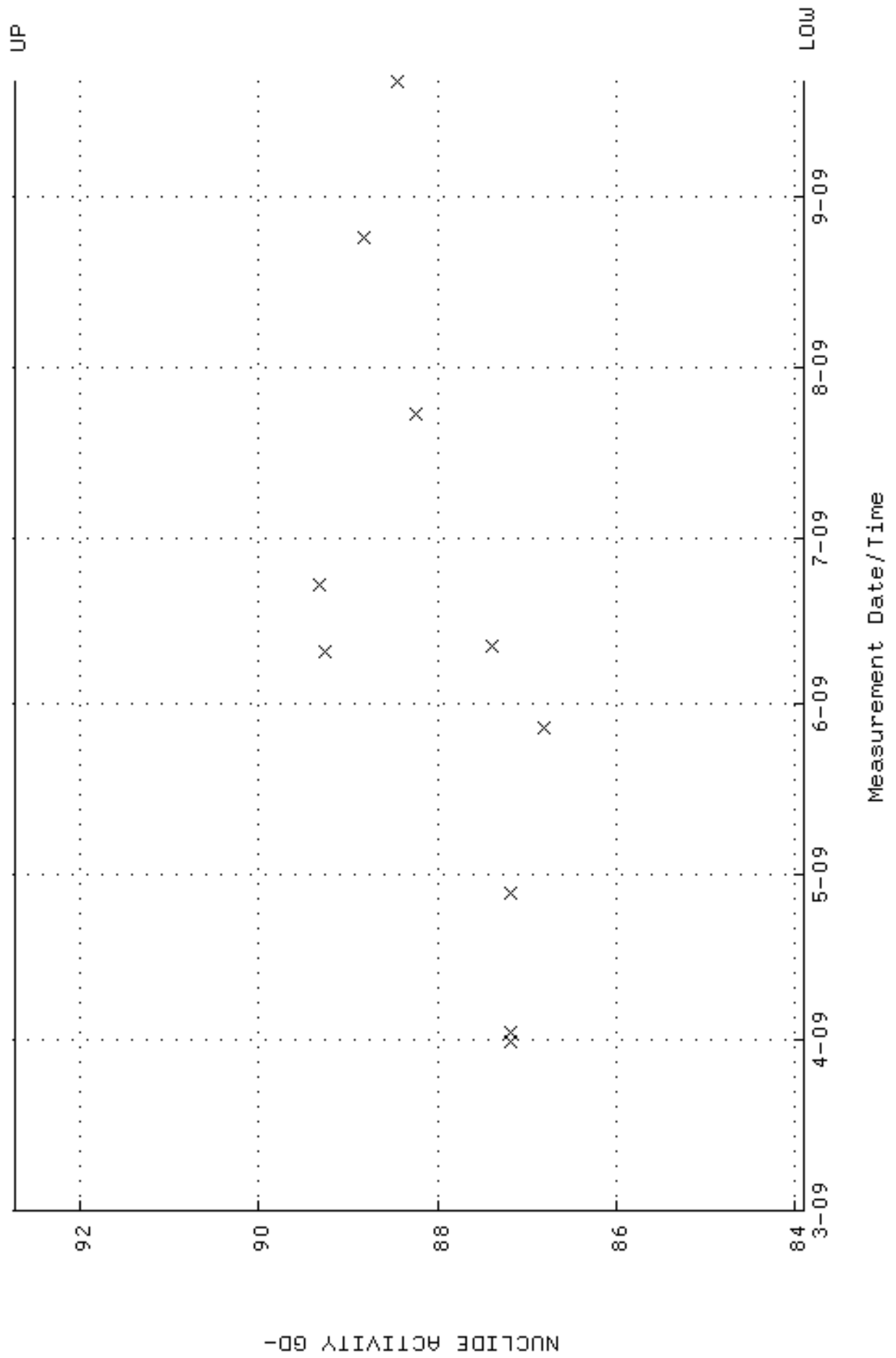
QA filename : DKA100:[ENV_ALPHA.QA.B]B197.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:18 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



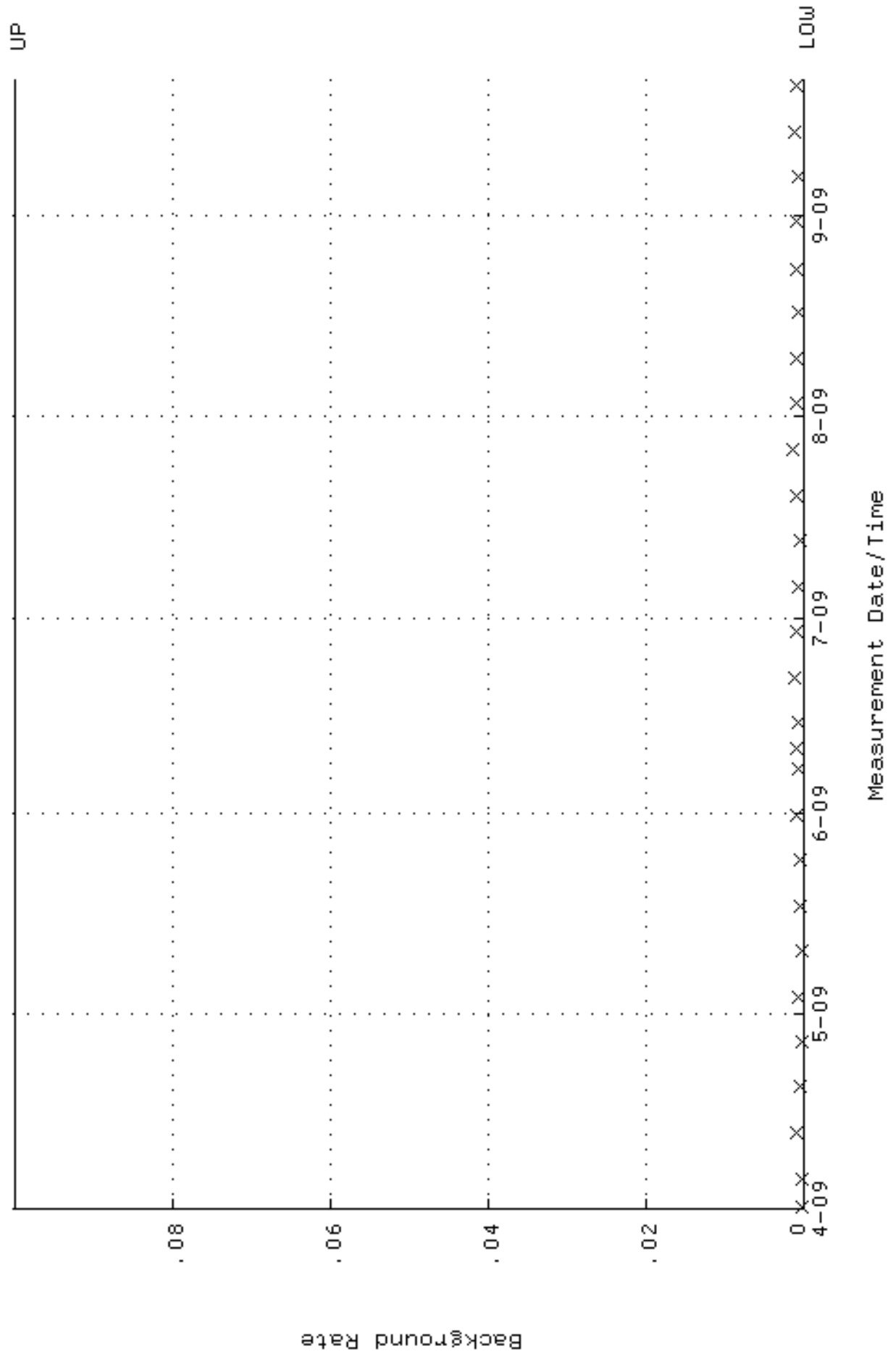
QA filename : DKA100:[ENV_ALPHA.QA.W]W198.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:06:01 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.245817 through 0.265817



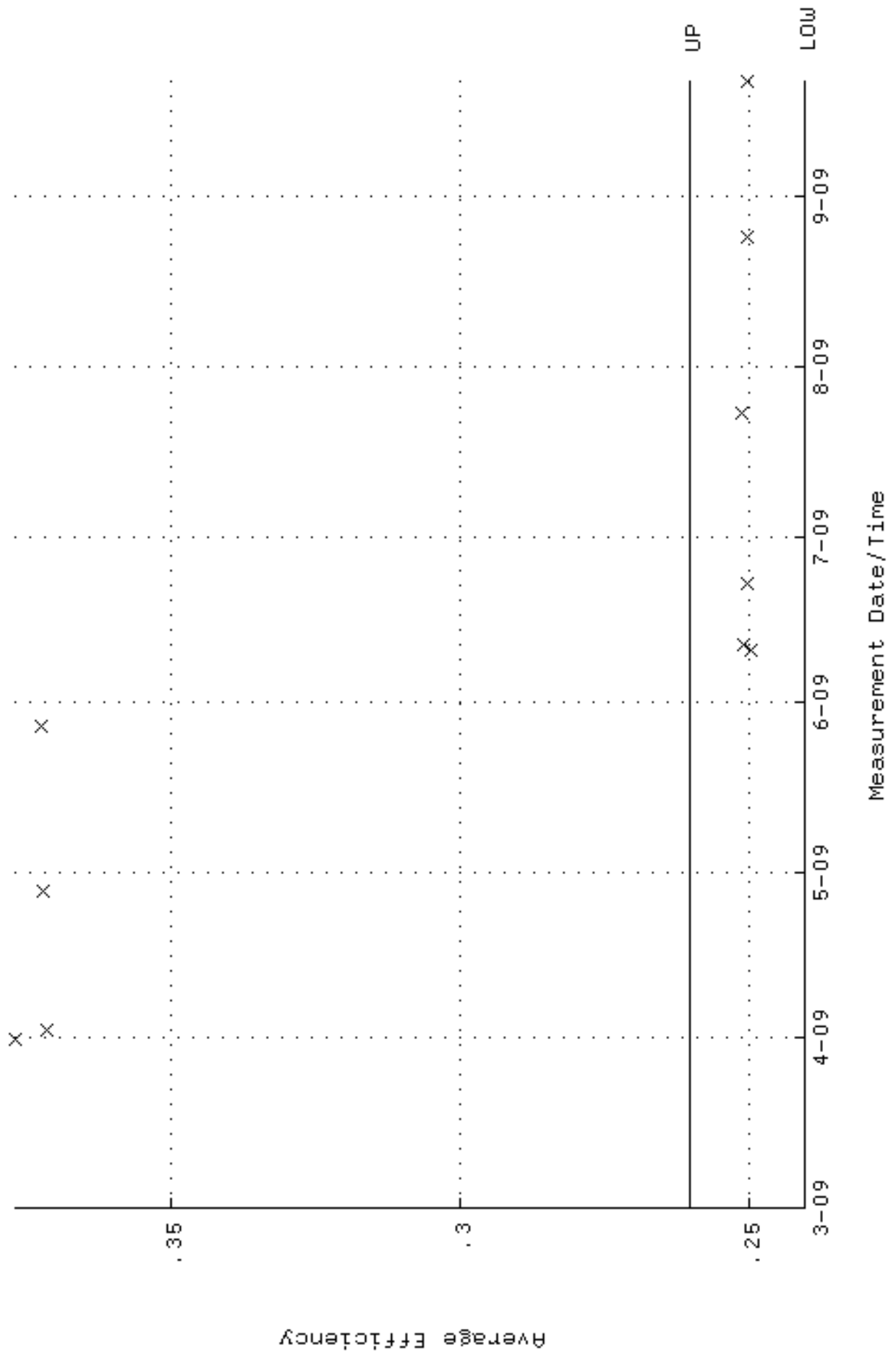
QA filename : DKA100:[ENV_ALPHA.QA.W]w198.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:06:01 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 83.8978 through 92.7292



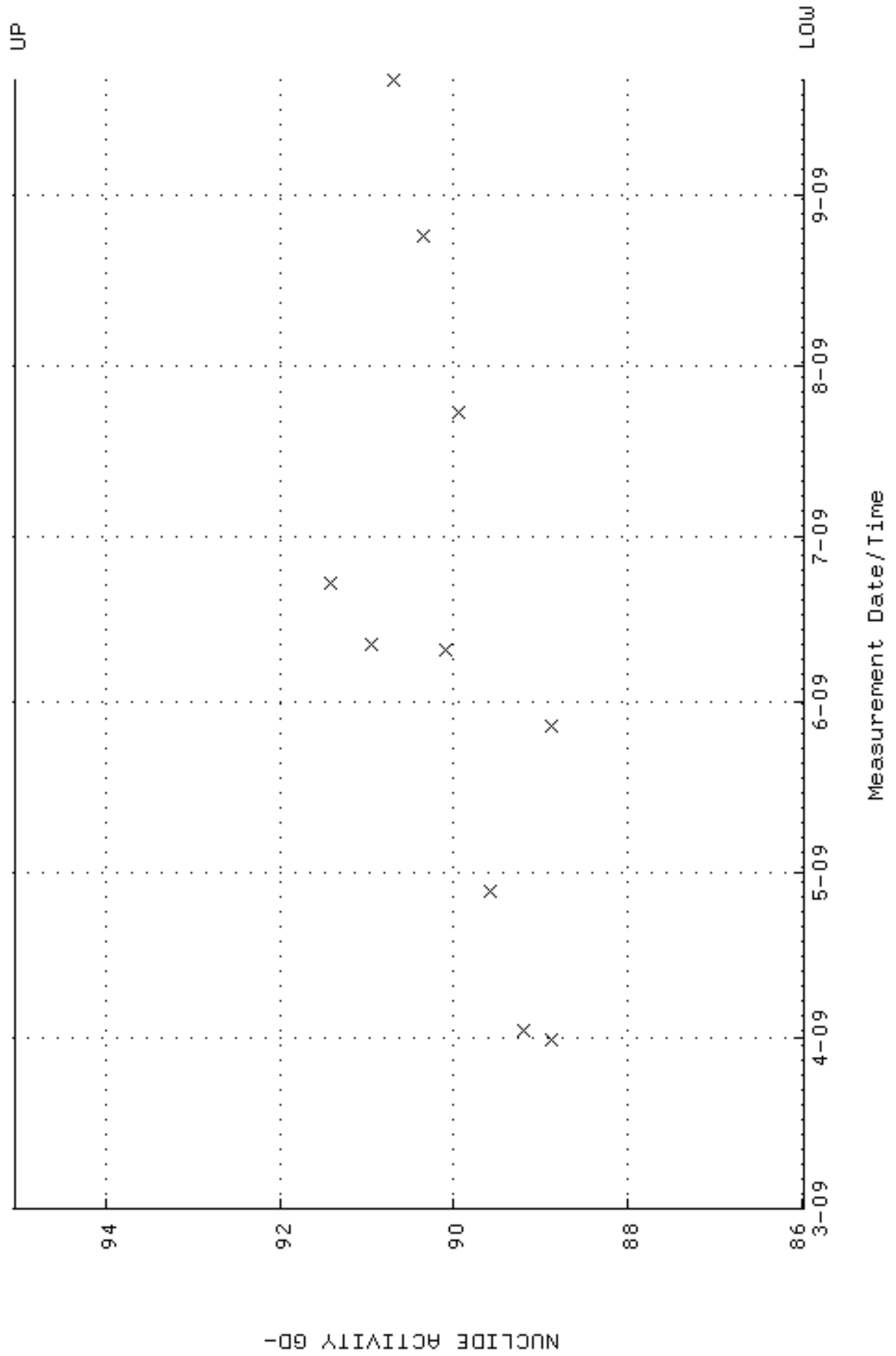
QA filename : DKA100:[ENV_ALPHA.QA.B]B198.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:23 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



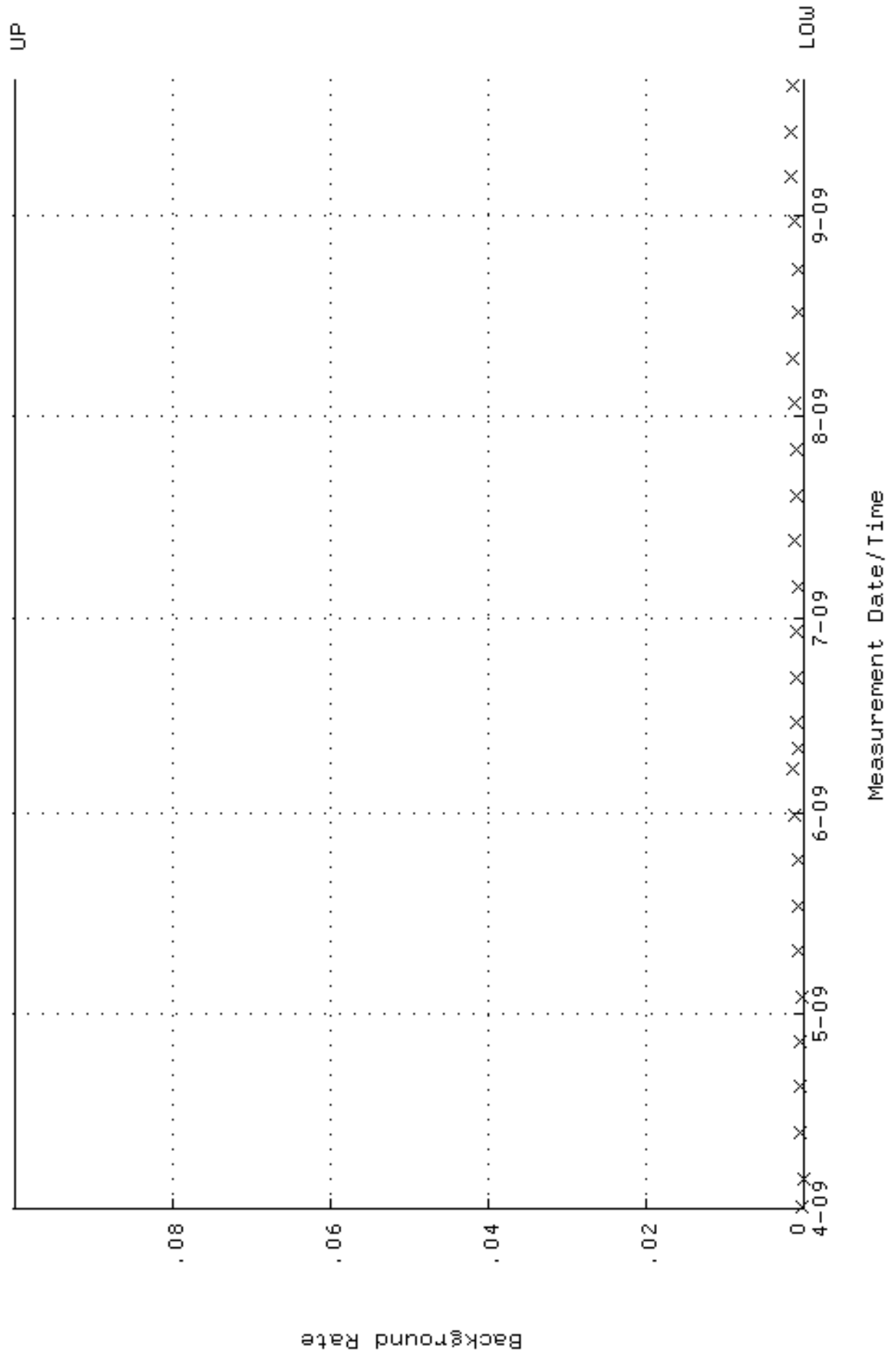
QA filename : DKA100:[ENV_ALPHA.QA.W]W199.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:22 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.240278 through 0.260278



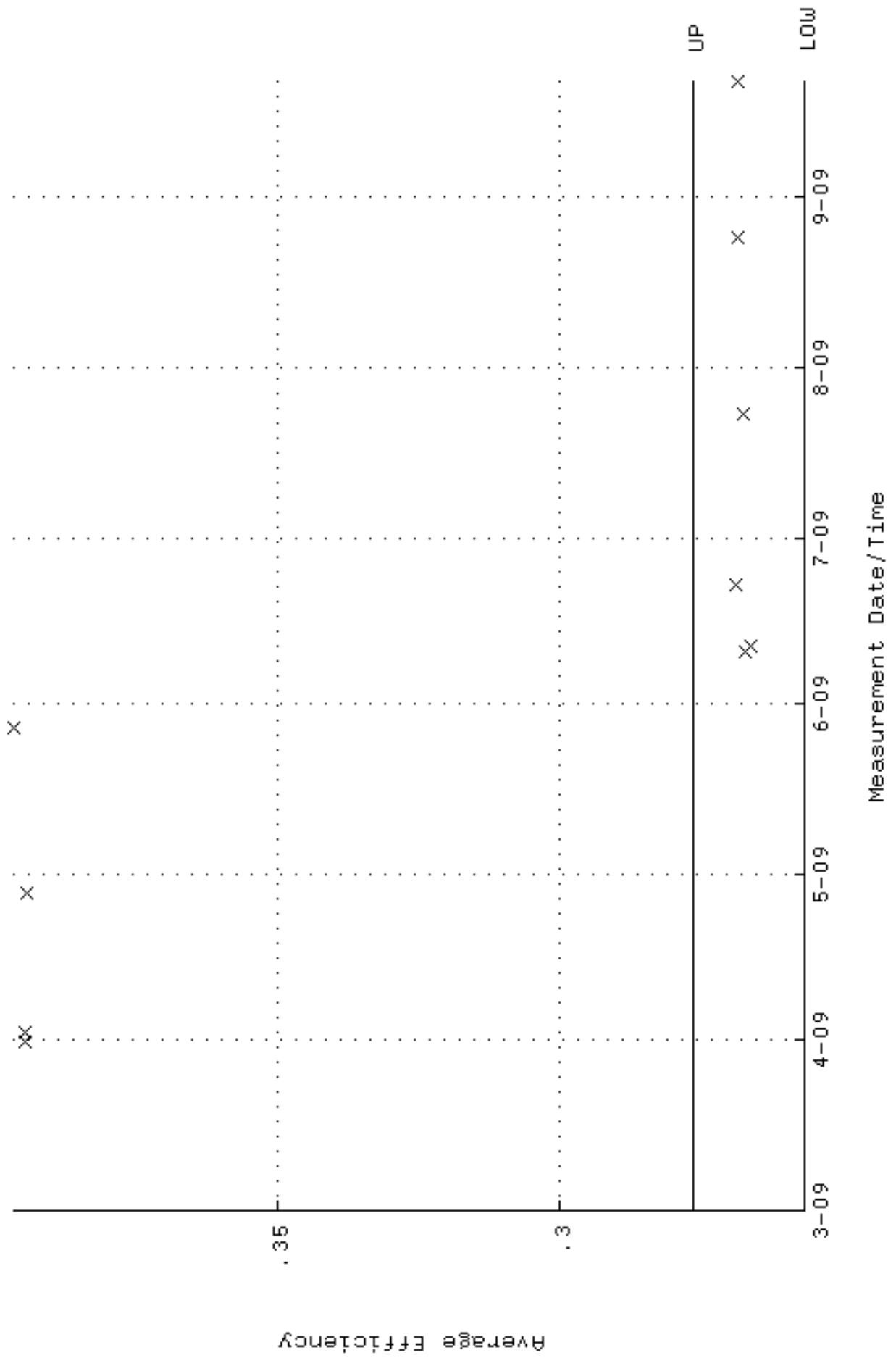
QA filename : DKA100:[ENV_ALPHA.QA.W]w199.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 31-MAR-2009 15:10:22 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 85.9853 through 95.0363



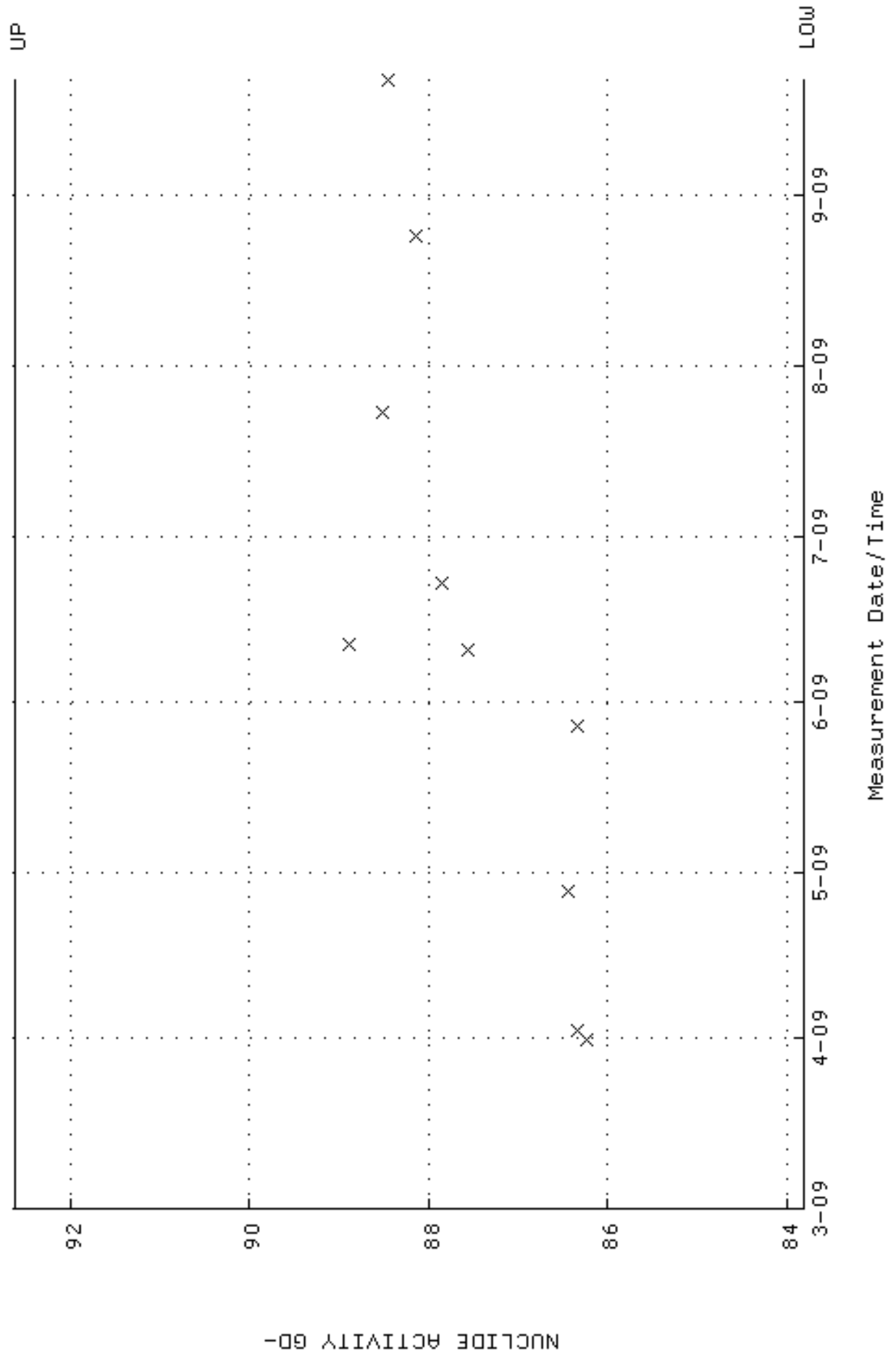
QA filename : DKA100:[ENV_ALPHA.QA.B]B199.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:28 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



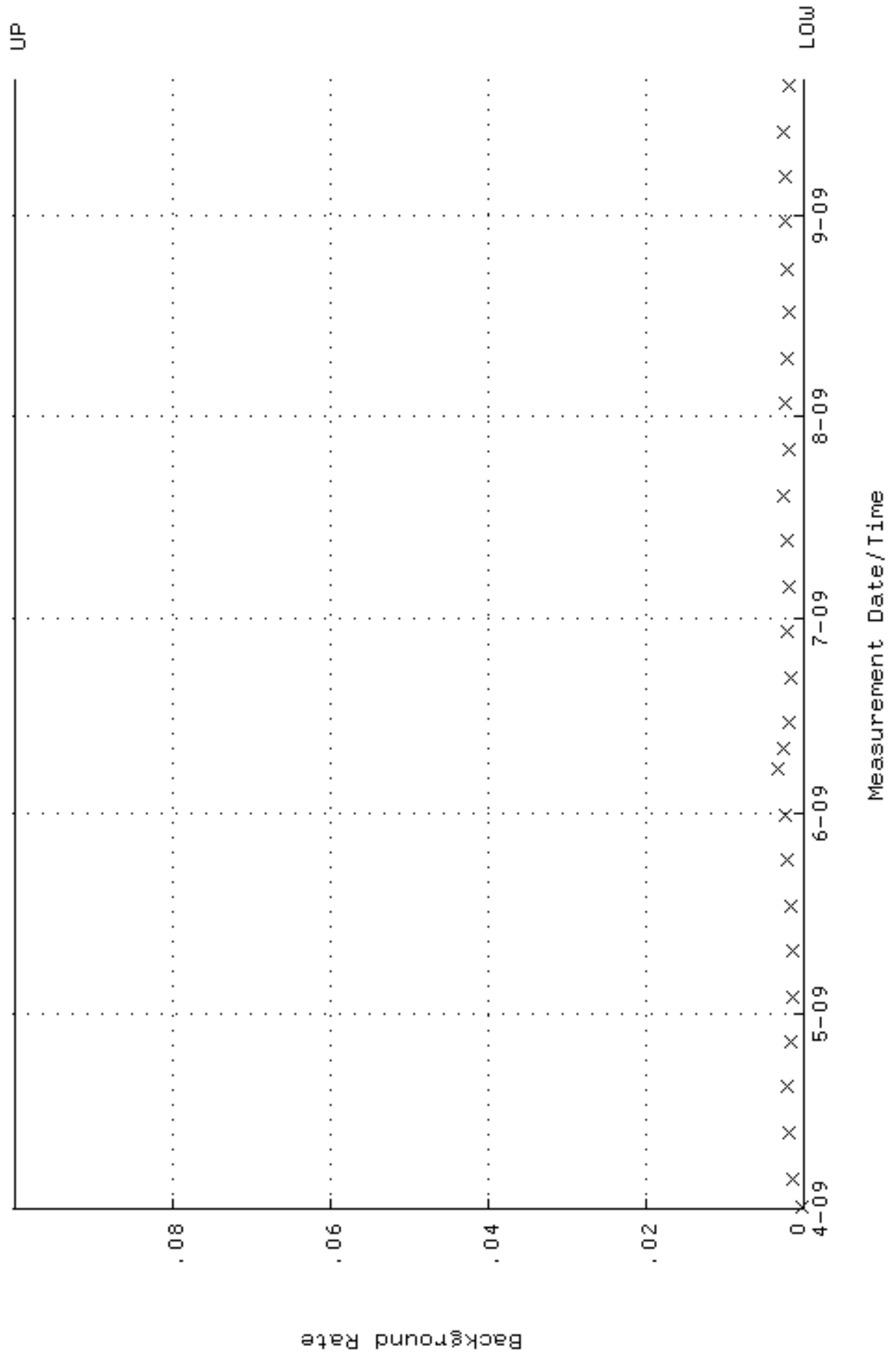
QA filename : DKA100:[ENV_ALPHA.QA.W]w200.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:24 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.256586 through 0.276586



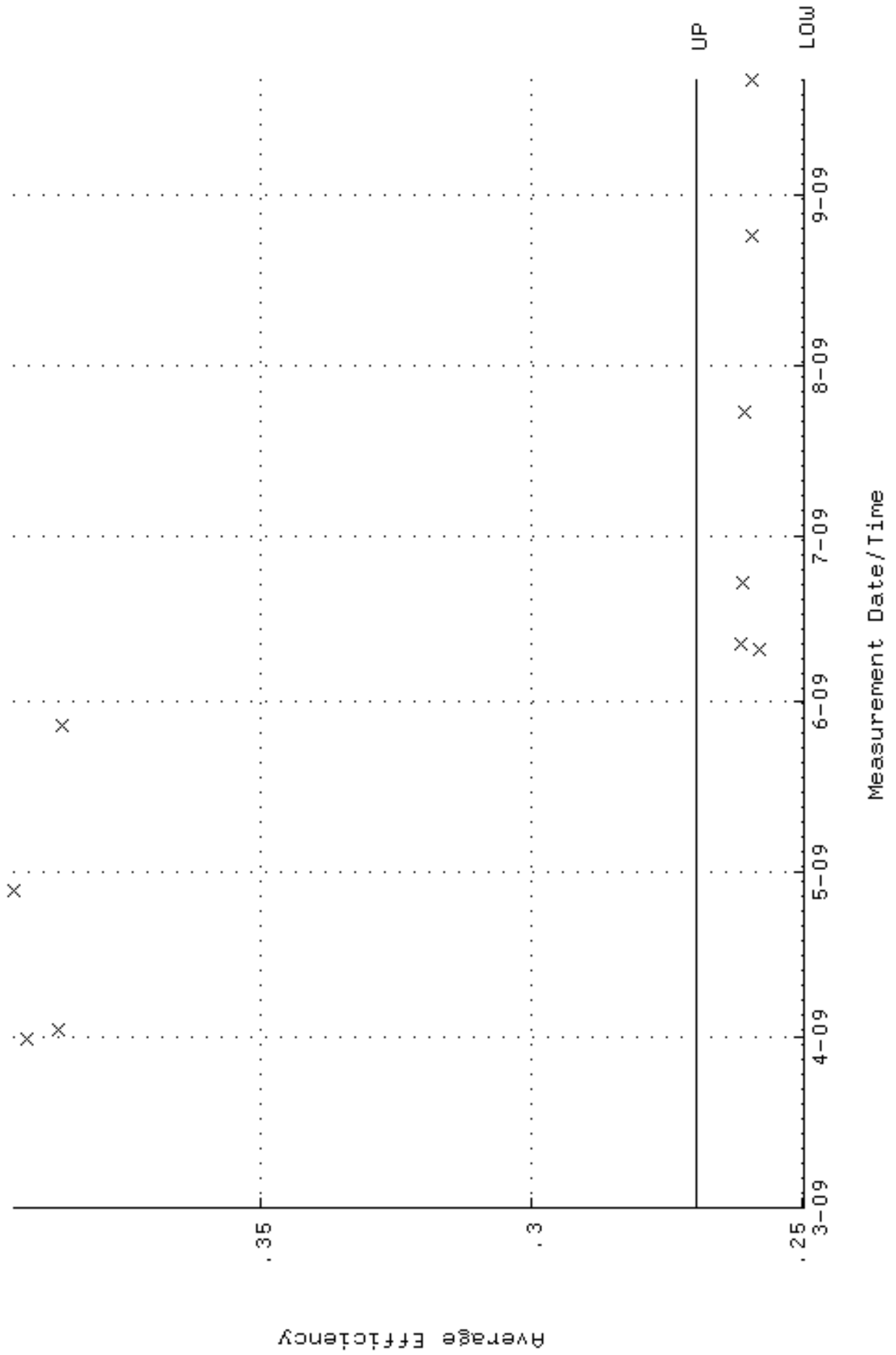
QA filename : DKA100:[ENV_ALPHA.QA.W]w200.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:10:24 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 83.8028 through 92.6242



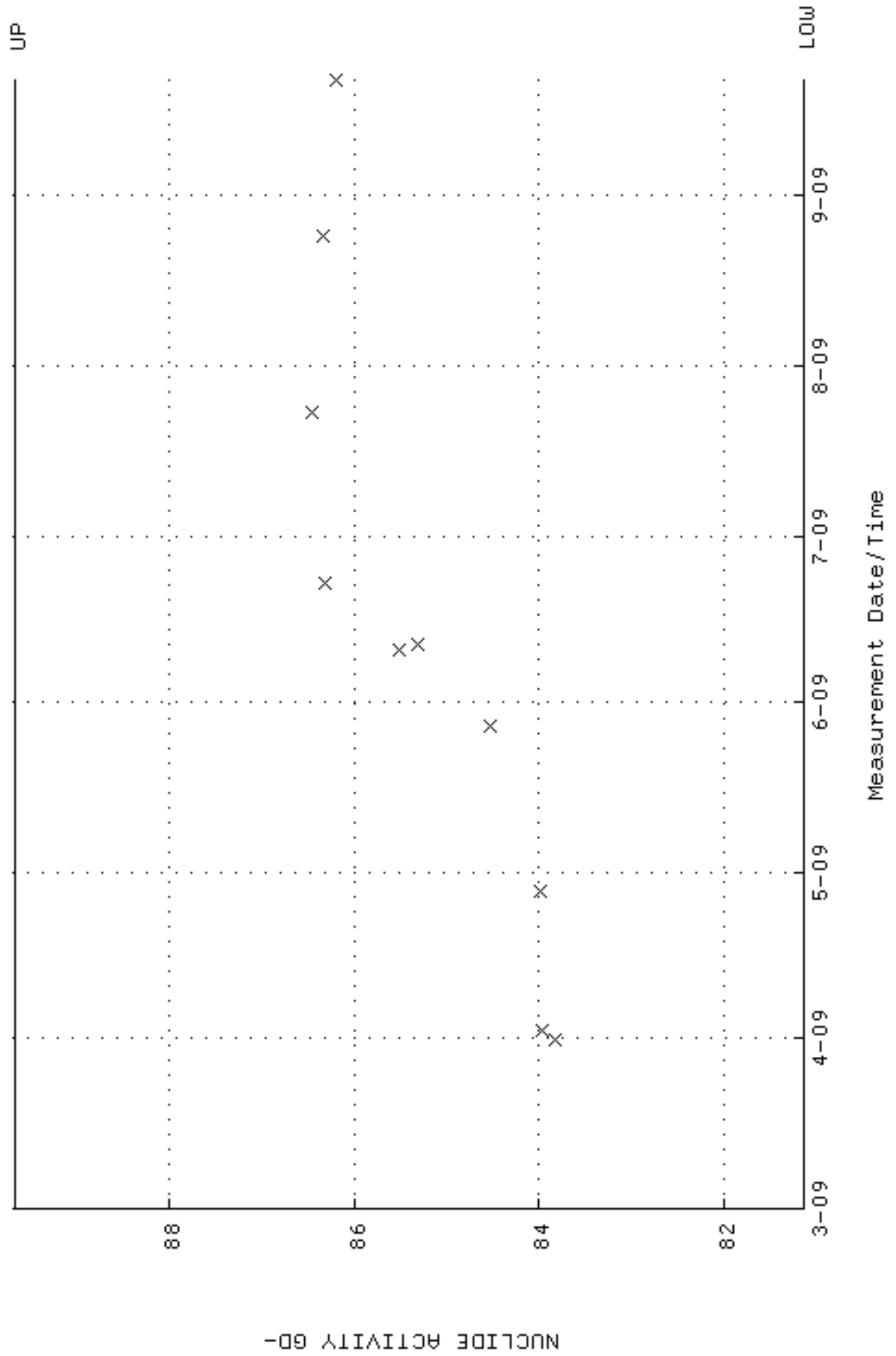
QA filename : DKA100:[ENV_ALPHA.QA.B]B200.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:33 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



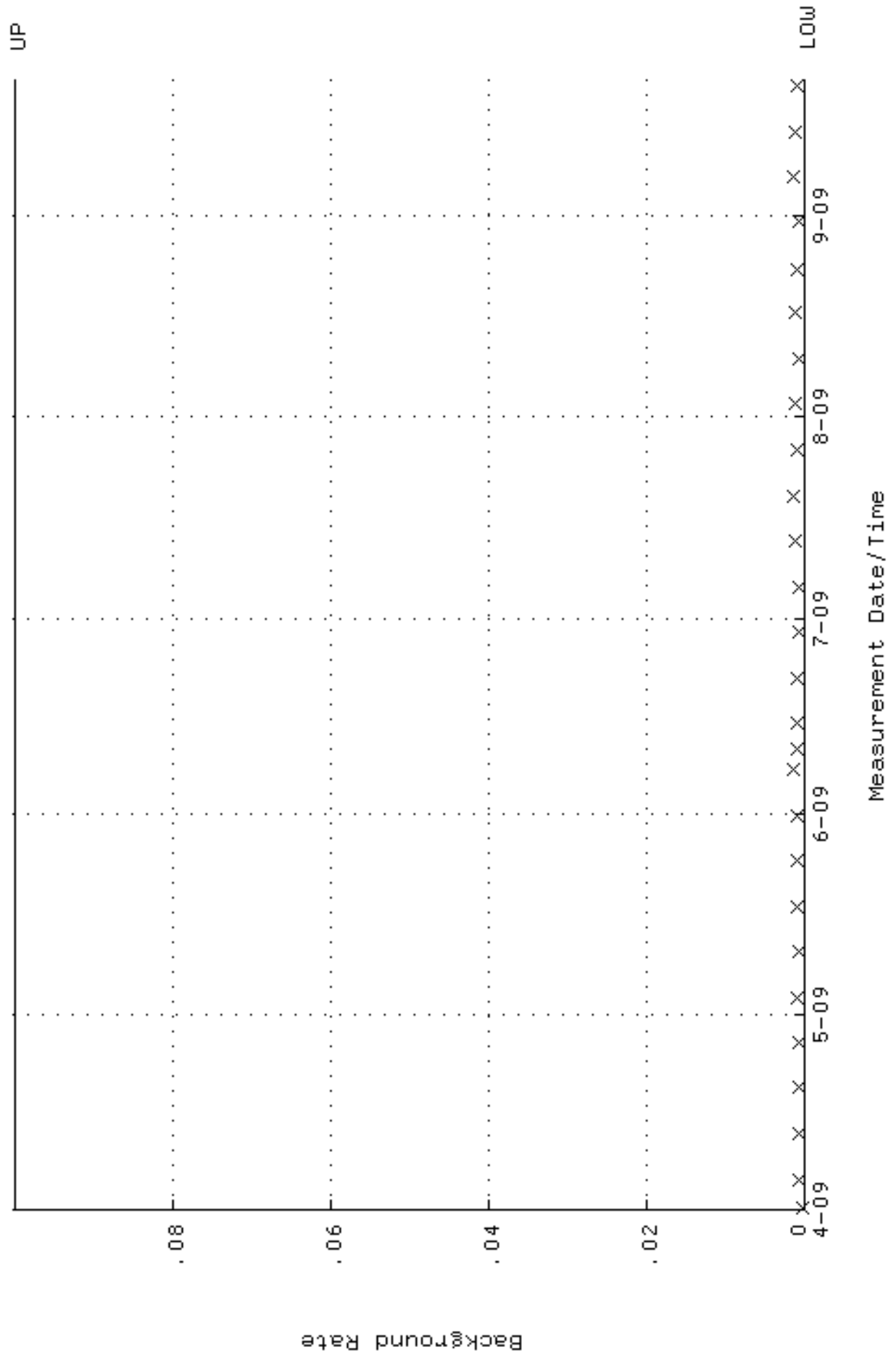
QA filename : DKA100:[ENV_ALPHA.QA.W]w201.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:26 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.249568 through 0.269568



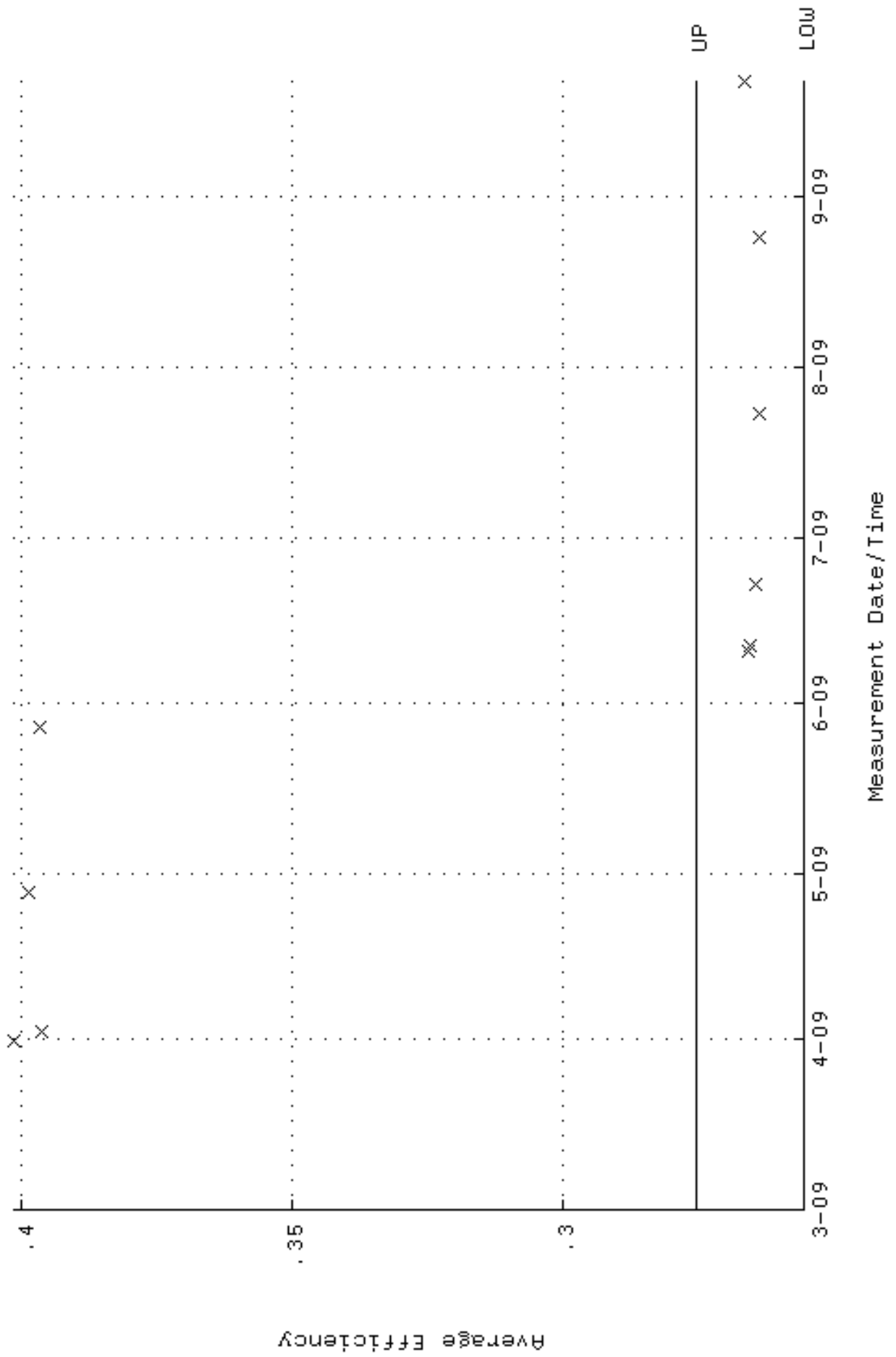
QA filename : DKA100:[ENV_ALPHA.QA.W]w201.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:10:26 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 81.1299 through 89.6699



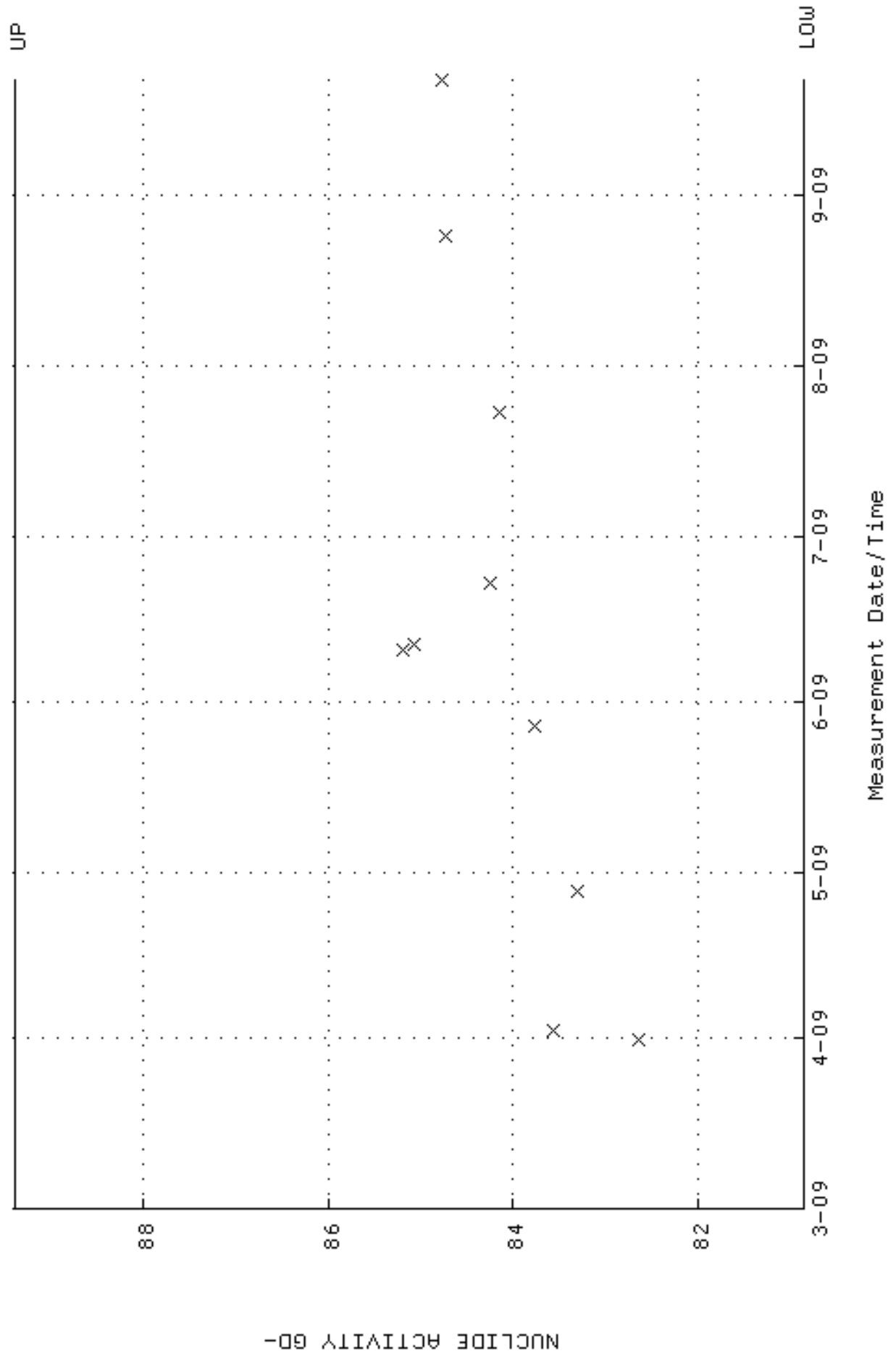
QA filename : DKA100:[ENV_ALPHA.QA.B]B201.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:39 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



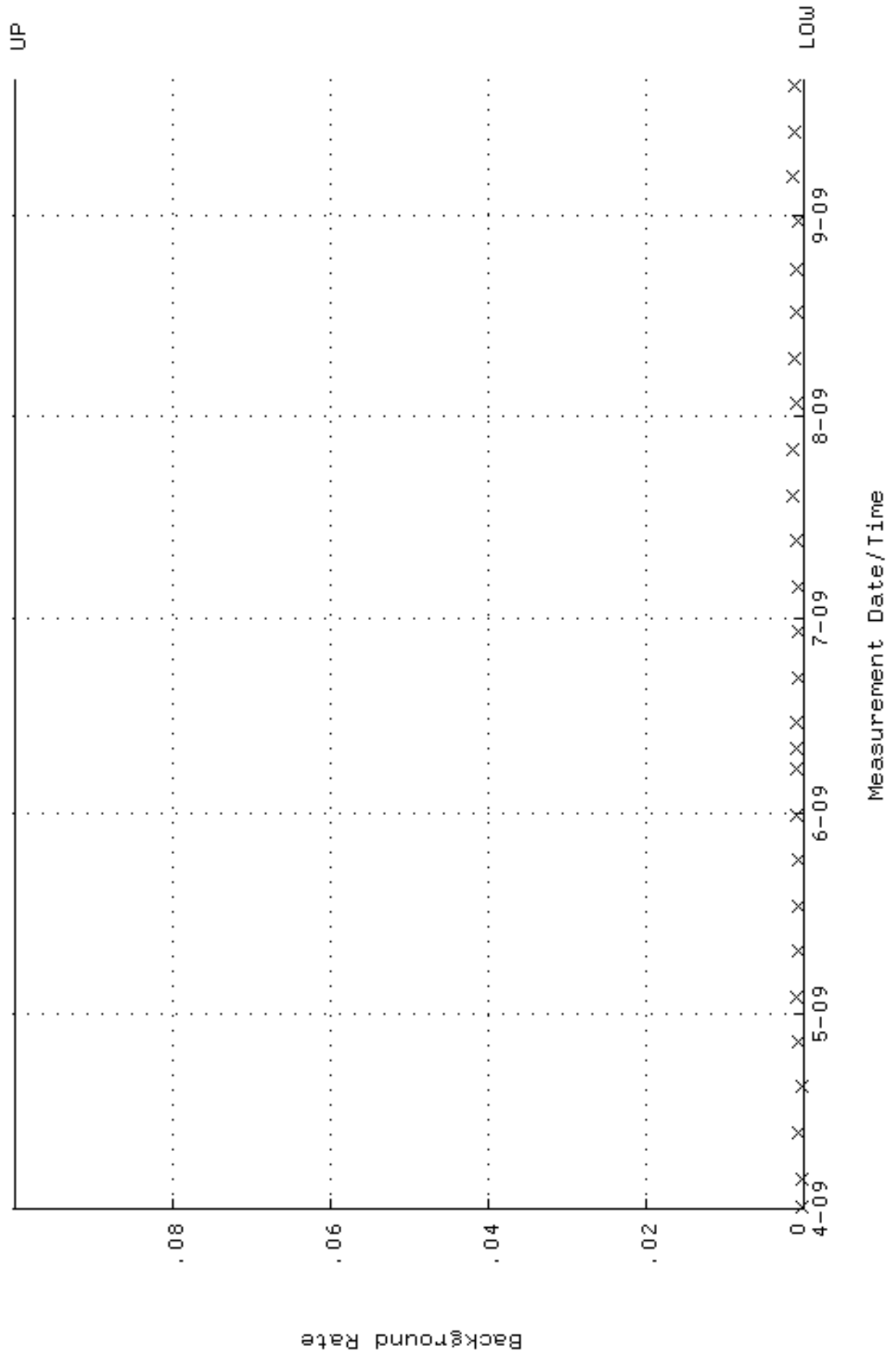
QA filename : DKA100:[ENV_ALPHA.QA.W]W202.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:28 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.255511 through 0.275511



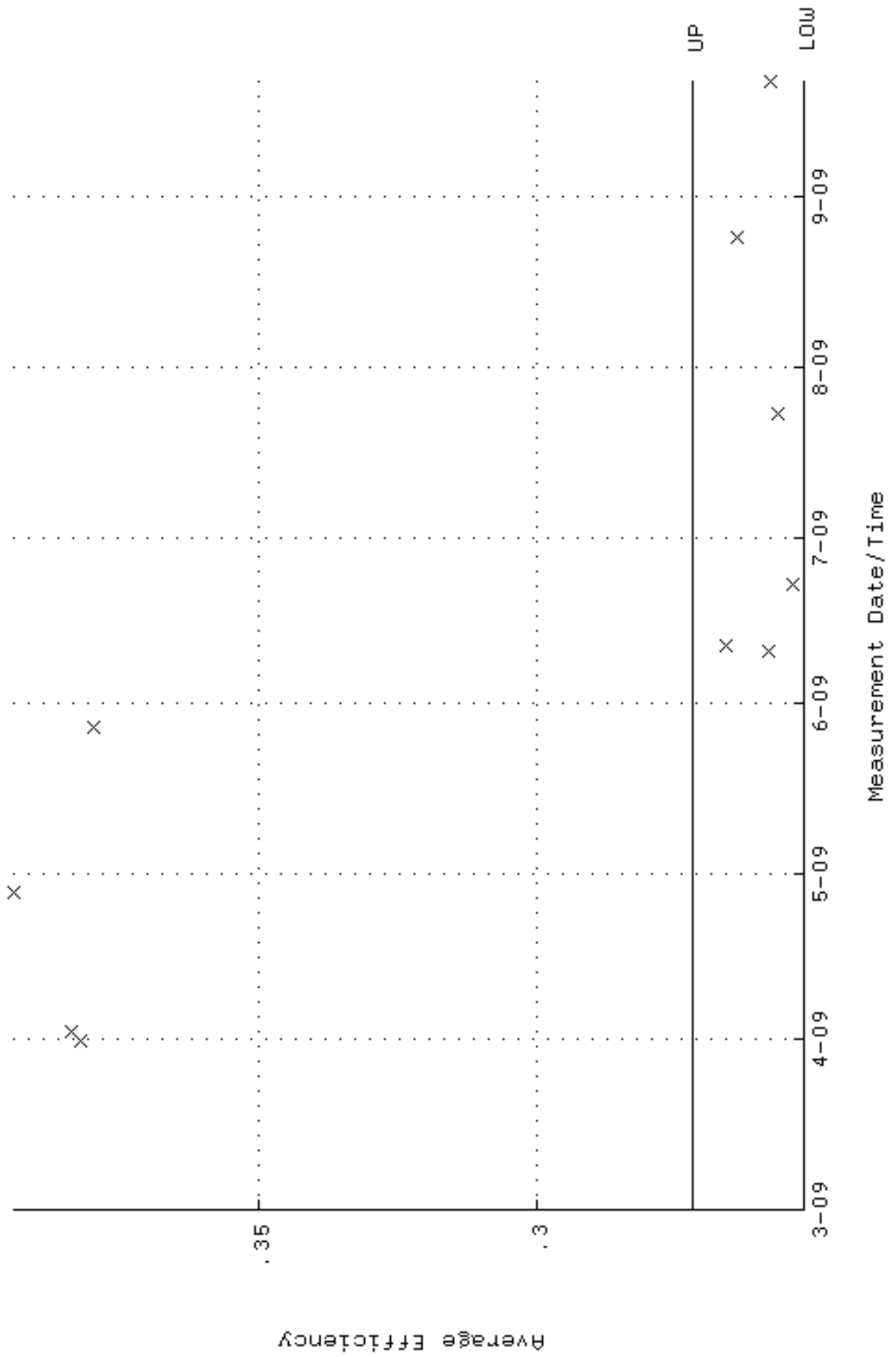
QA filename : DKA100:[ENV_ALPHA.QA.W]w202.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:10:28 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 80.8649 through 89.3769



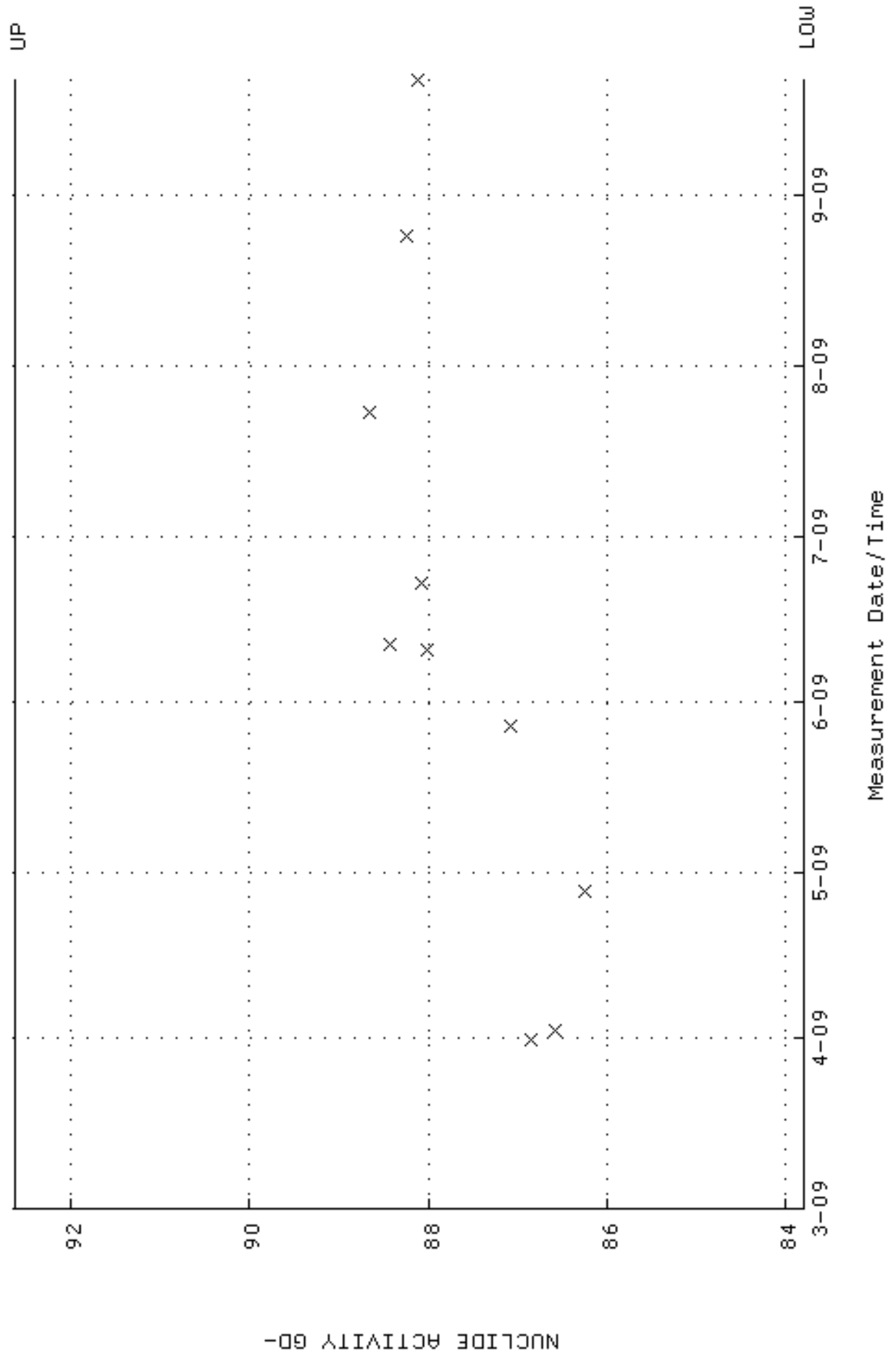
QA filename : DKA100:[ENV_ALPHA.QA.B]B202.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:44 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



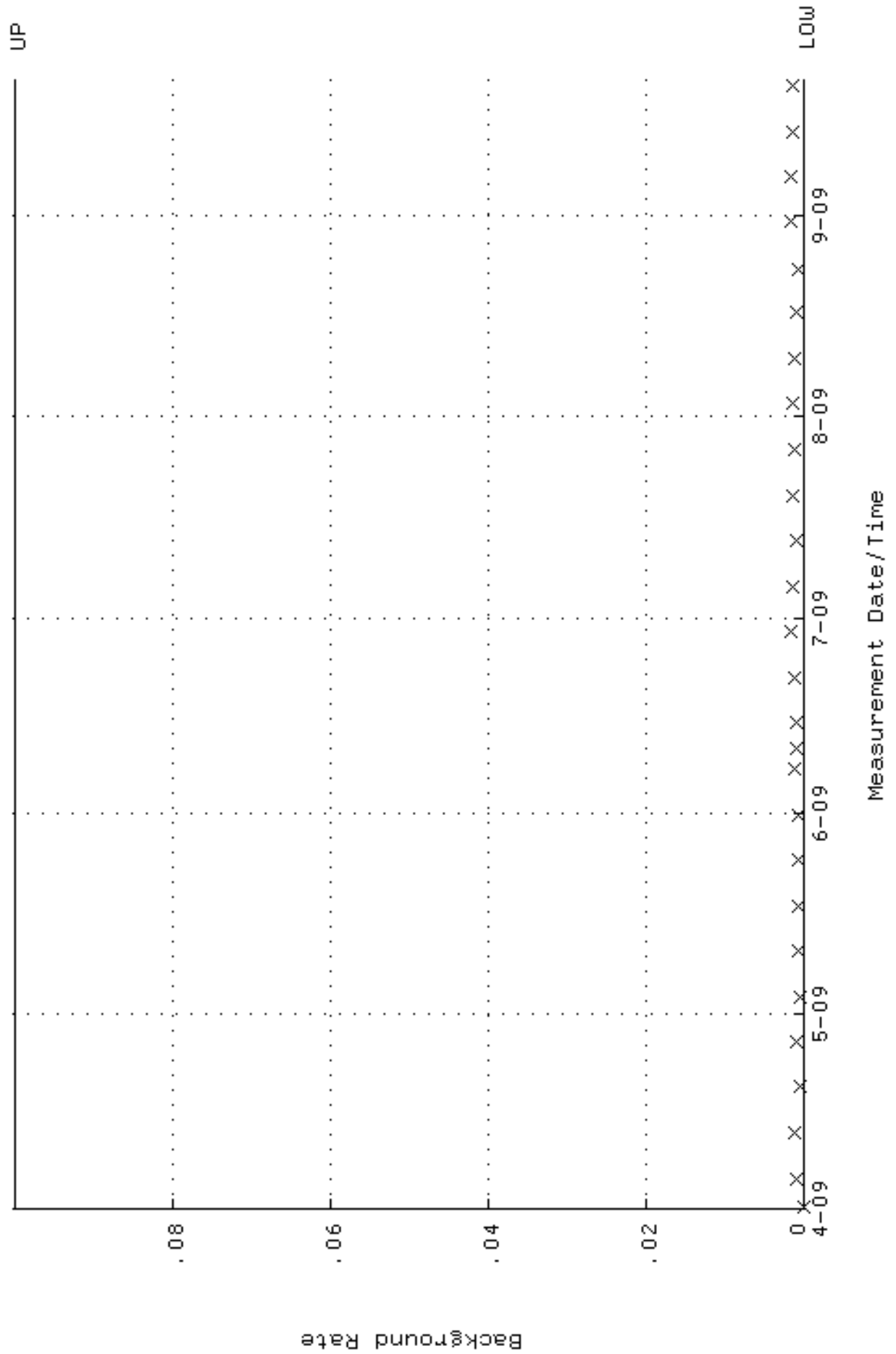
QA filename : DKA100:[ENV_ALPHA.QA.W]W203.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:29 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.252203 through 0.272203



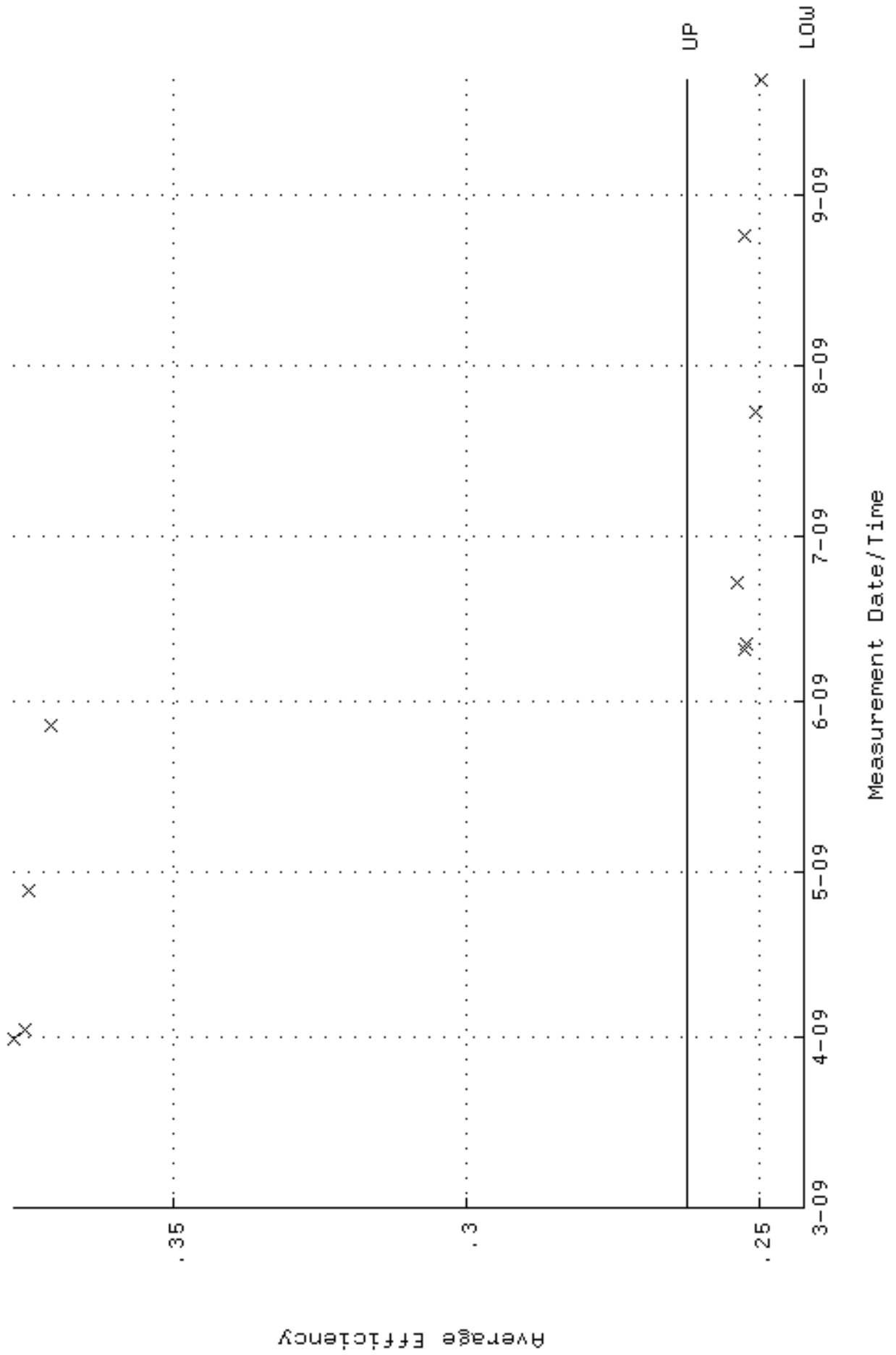
QA filename : DKA100:[ENV_ALPHA.QA.W]w203.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:10:29 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 83.7993 through 92.6203



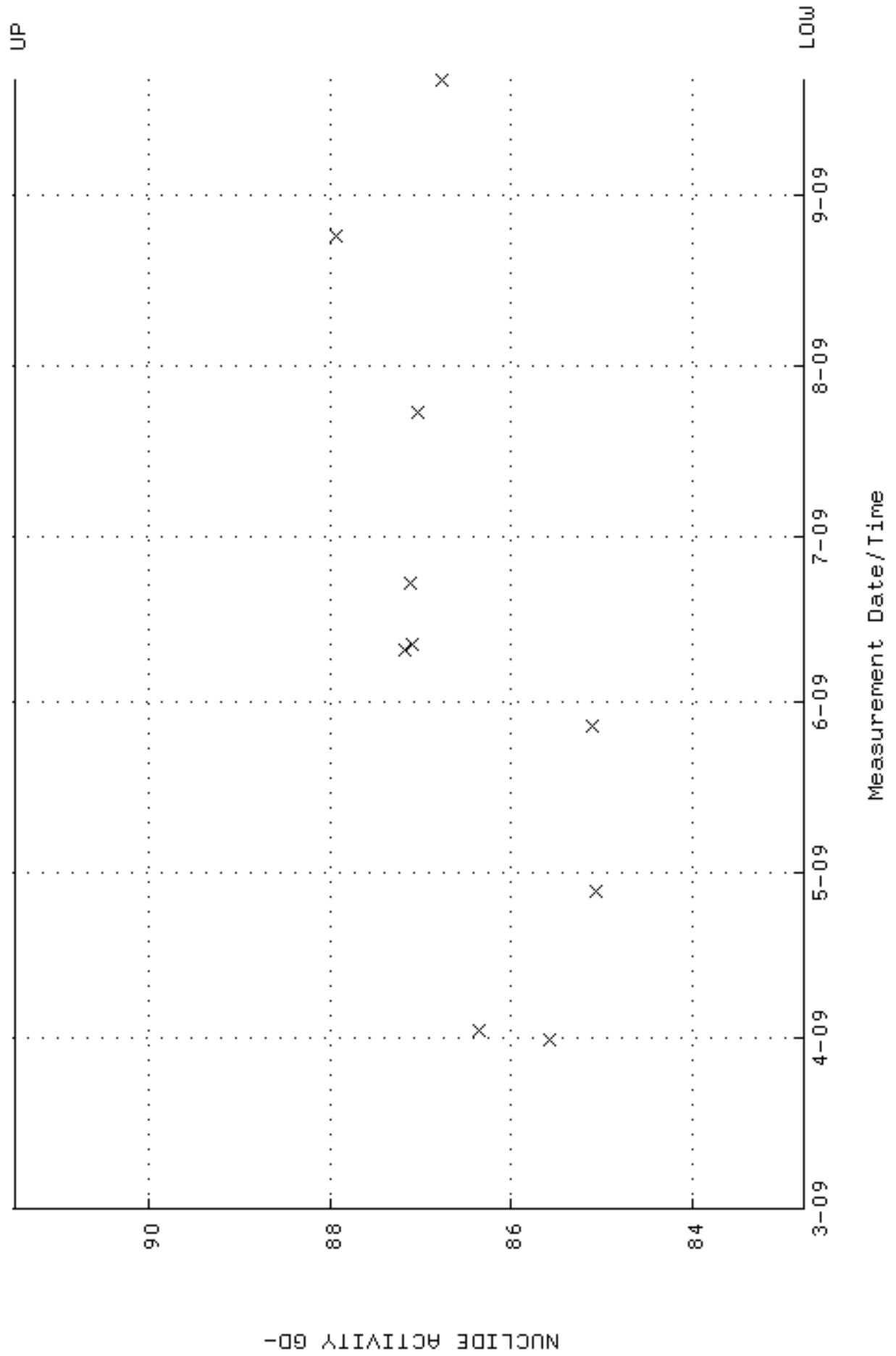
QA filename : DKA100:[ENV_ALPHA.QA.B]B203.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:49 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



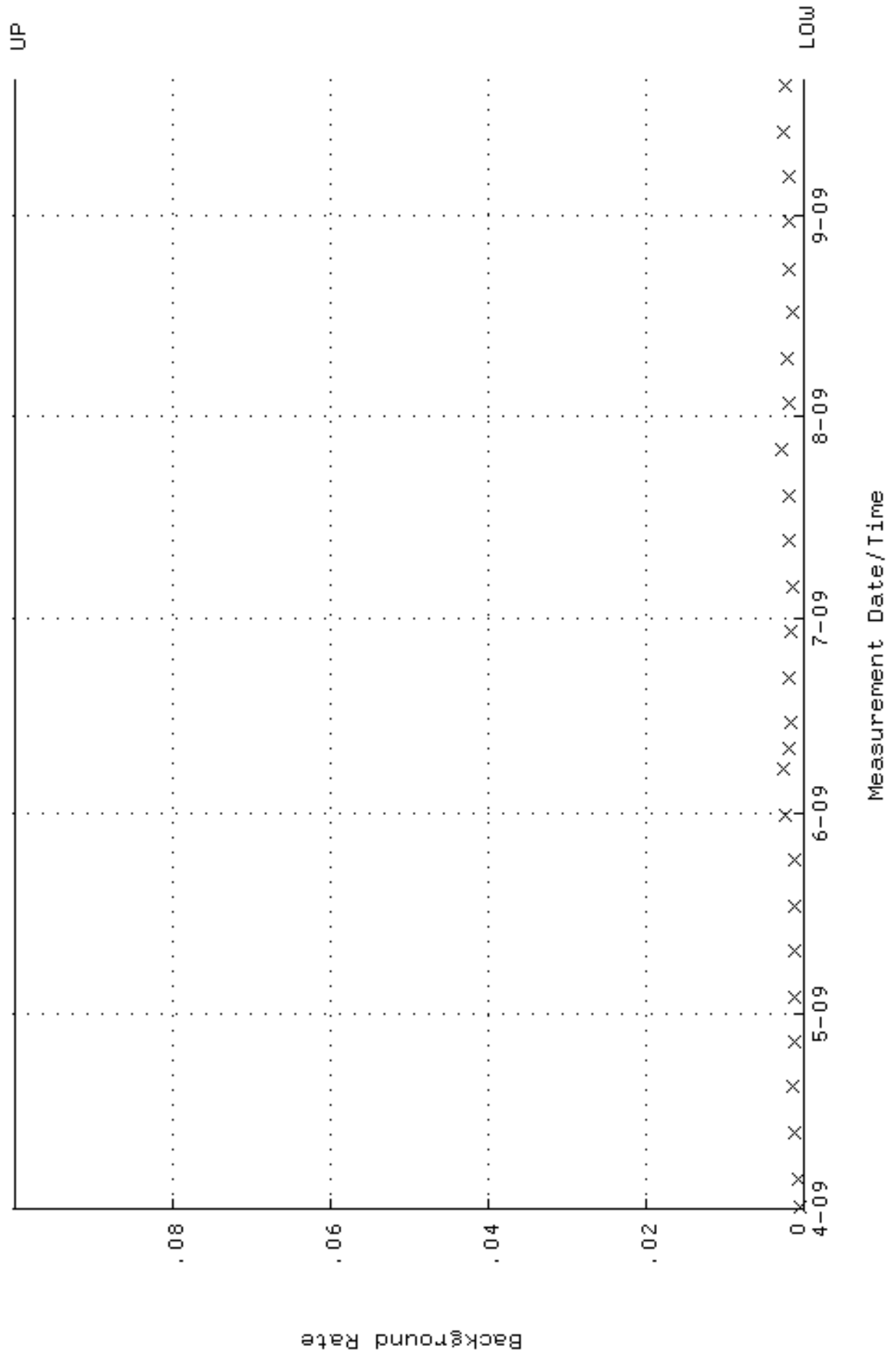
QA filename : DKA100:[ENV_ALPHA.QA.W]W204.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:31 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.242368 through 0.262368



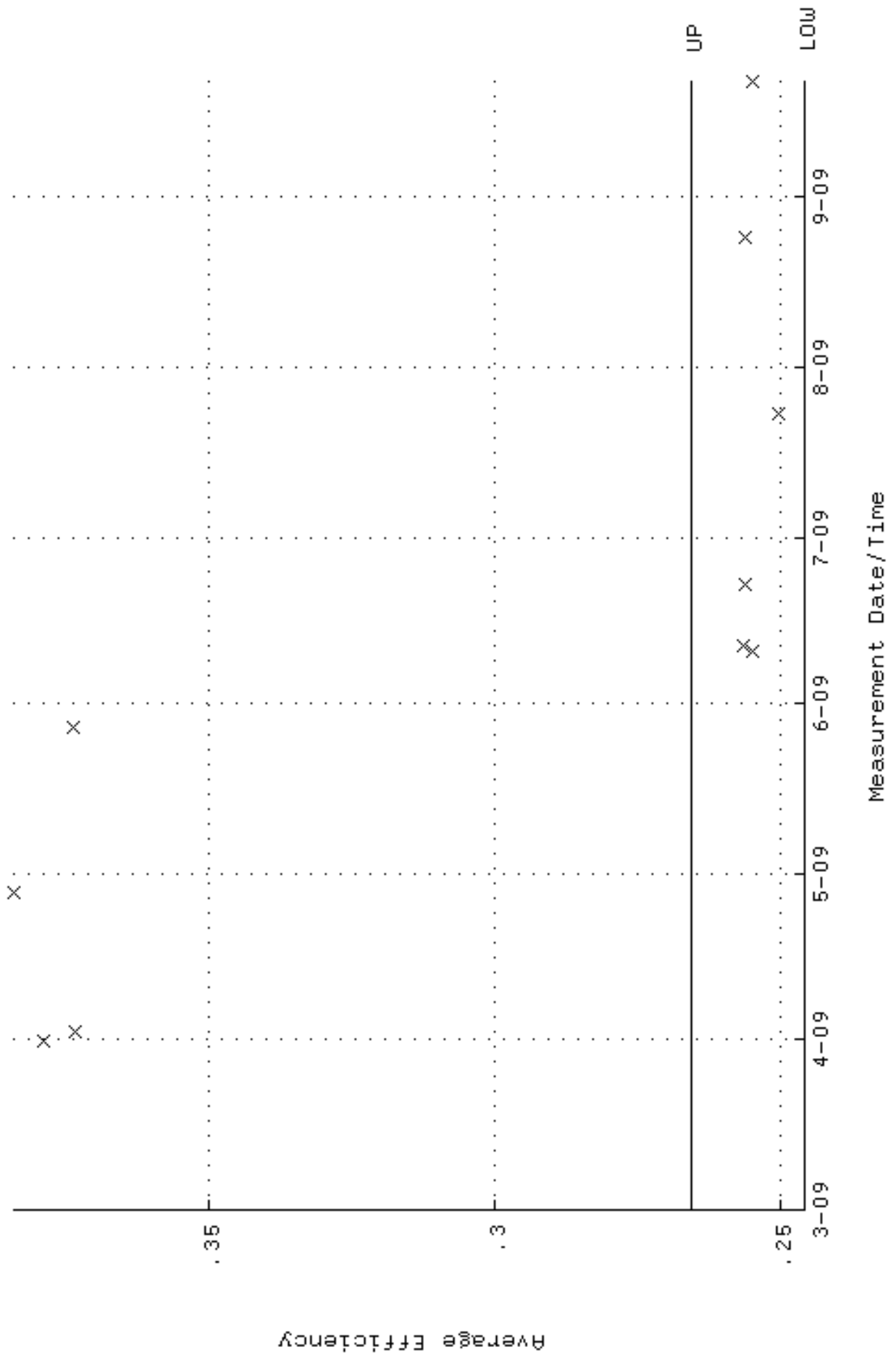
QA filename : DKA100:[ENV_ALPHA.QA.W]w204.QAF;1
Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
Start/End Dates : 31-MAR-2009 15:10:31 through 21-SEP-2009 12:00:00
Lower/Upper Lmts: 82.7661 through 91.4783



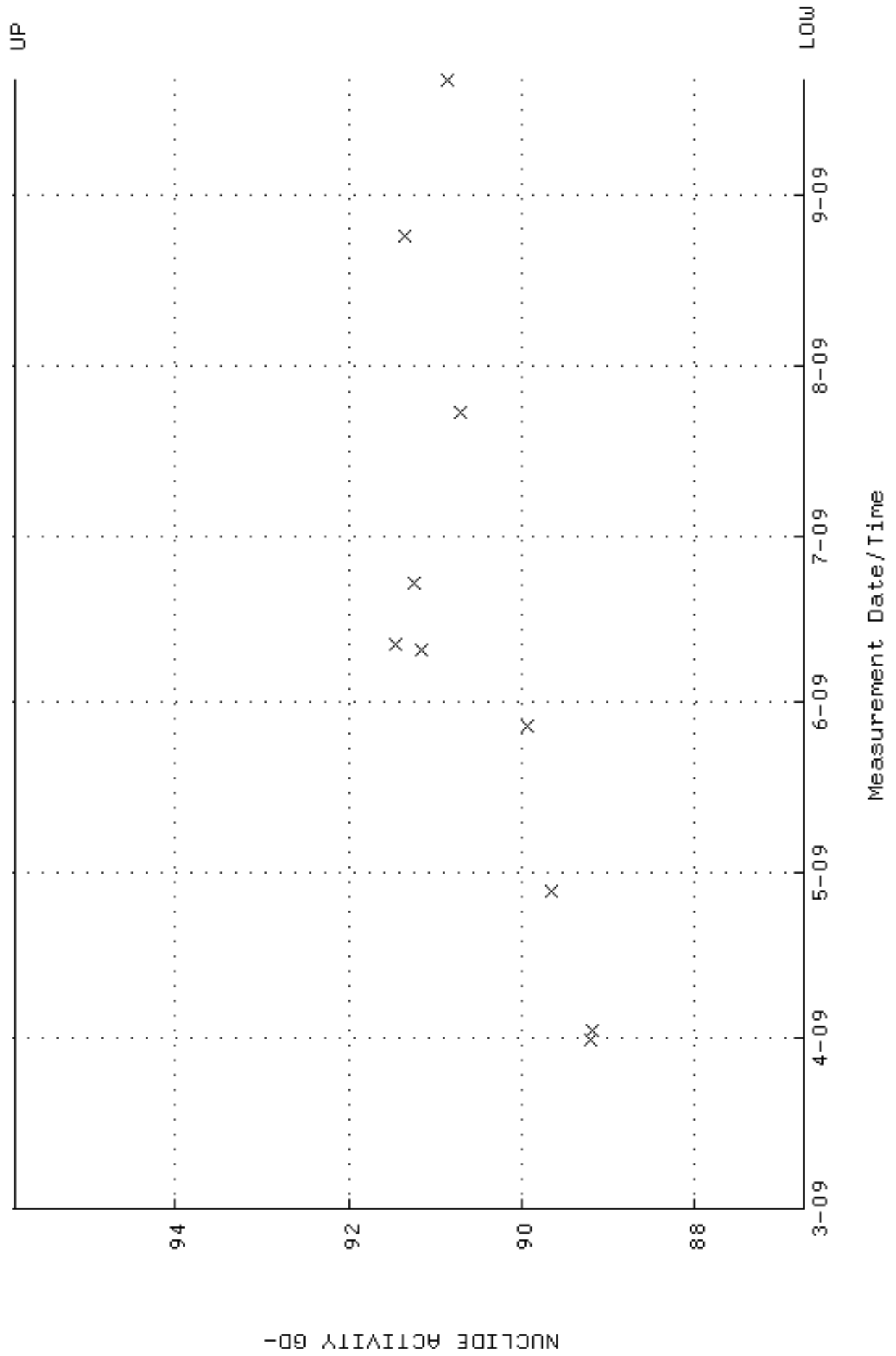
QA filename : DKA100:[ENV_ALPHA.QA.B]B204.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:02:55 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



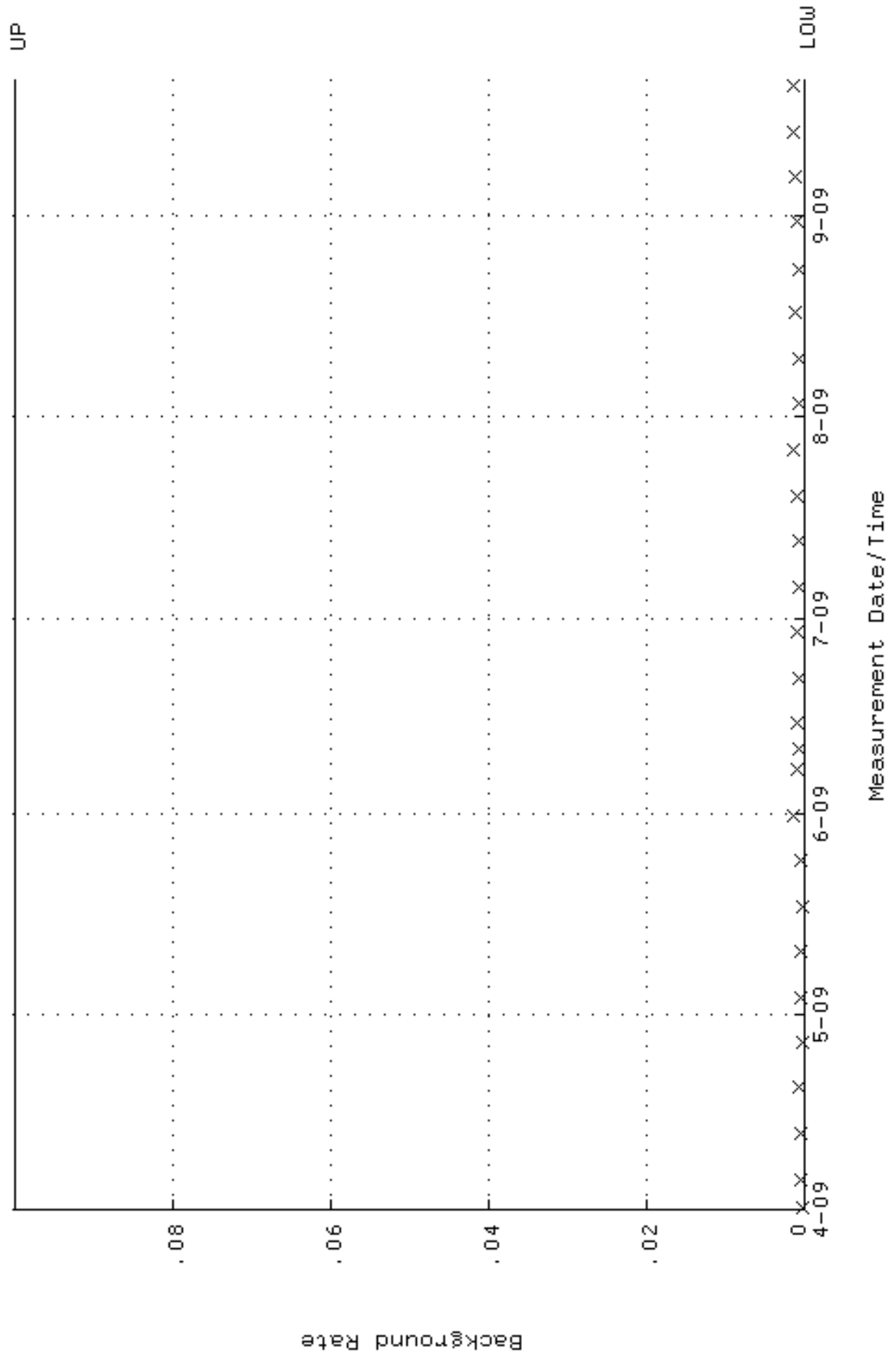
QA filename : DKA100:[ENV_ALPHA.QA.W]W205.QAF;1
 Parameter Name : AVRGEFF (Average Efficiency)
 Start/End Dates : 31-MAR-2009 15:10:33 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.245702 through 0.265702



QA filename : DKA100:[ENV_ALPHA.QA.W]w205.QAF;1
 Parameter Name : NLAIVITY-GD148 (NUCLIDE ACTIVITY GD-148)
 Start/End Dates : 31-MAR-2009 15:10:33 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 86.7285 through 95.8579



QA filename : DKA100:[ENV_ALPHA.QA.B]B205.QAF;1
 Parameter Name : BACKRATE (Background Rate)
 Start/End Dates : 1-APR-2009 08:03:01 through 21-SEP-2009 12:00:00
 Lower/Upper Lmts: 0.000000E+00 through 0.100000



RUNLOGS

Instrument Run Log

Instrument Type: GFPC

Batch ID: 902602

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236077013	SAMPLE	MXS2	PIC5A	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236077019	SAMPLE	MXS2	PIC5C	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236077021	SAMPLE	MXS2	PIC5D	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236238008	SAMPLE	MXS2	PIC6A	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236534011	SAMPLE	MXS2	PIC6B	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236699016	SAMPLE	MXS2	PIC7A	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817014	SAMPLE	MXS2	PIC7B	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236934020	SAMPLE	MXS2	PIC7C	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201923559	MB	MXS2	PIC7D	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201923560	LCS	MXS2	PIC8A	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201923561	LCSD	MXS2	PIC8B	18-SEP-09 18:46	DONE	CeF on 25mm Filter	02-JUL-09 00:00

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 904649

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236077013	SAMPLE	KSD1	LUCAS5	25-SEP-09 09:30	DONE	Lucas Cell	25-MAR-09 00:00
236077019	SAMPLE	KSD1	LUCAS6	25-SEP-09 09:30	DONE	Lucas Cell	04-AUG-09 00:00
236077021	SAMPLE	KSD1	LUCAS1	25-SEP-09 10:05	DONE	Lucas Cell	31-AUG-09 00:00
236817014	SAMPLE	KSD1	LUCAS3	25-SEP-09 10:05	DONE	Lucas Cell	04-FEB-09 00:00
237010013	SAMPLE	KSD1	LUCAS5	25-SEP-09 10:05	DONE	Lucas Cell	25-MAR-09 00:00
237170005	SAMPLE	KSD1	LUCAS6	25-SEP-09 10:05	DONE	Lucas Cell	04-AUG-09 00:00
236699016	SAMPLE	KSD1	LUCAS2	25-SEP-09 10:30	DONE	Lucas Cell	19-DEC-08 00:00
237170020	SAMPLE	KSD1	LUCAS1	25-SEP-09 10:40	DONE	Lucas Cell	31-AUG-09 00:00
1201928562	MB	KSD1	LUCAS3	25-SEP-09 10:40	DONE	Lucas Cell	04-FEB-09 00:00
1201928563	LCS	KSD1	LUCAS4	25-SEP-09 10:40	DONE	Lucas Cell	02-MAR-09 00:00
1201928564	LCSD	KSD1	LUCAS5	25-SEP-09 10:40	DONE	Lucas Cell	25-MAR-09 00:00
237343006	SAMPLE	KSD1	LUCAS2	25-SEP-09 11:10	DONE	Lucas Cell	19-DEC-08 00:00
236938020	SAMPLE	KSD1	LUCAS4	25-SEP-09 12:40	DONE	Lucas Cell	02-MAR-09 00:00

Instrument Run Log

Instrument Type: GFPC

Batch ID: 905310

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236817021	SAMPLE	MXS2	PIC12D	05-OCT-09 14:33	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817001	SAMPLE	MXS2	PIC4C	05-OCT-09 14:40	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817002	SAMPLE	MXS2	PIC4D	05-OCT-09 14:40	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817003	SAMPLE	MXS2	PIC5A	05-OCT-09 14:40	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817005	SAMPLE	MXS2	PIC5C	05-OCT-09 14:40	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817007	SAMPLE	MXS2	PIC6A	05-OCT-09 14:40	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817009	SAMPLE	MXS2	PIC6D	05-OCT-09 14:40	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817010	SAMPLE	MXS2	PIC8A	05-OCT-09 14:41	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817013	SAMPLE	MXS2	PIC9B	05-OCT-09 14:41	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817001	SAMPLE	MXS2	PIC3C	07-OCT-09 07:59	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817002	SAMPLE	MXS2	PIC3D	07-OCT-09 07:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817003	SAMPLE	MXS2	PIC4D	07-OCT-09 07:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817004	SAMPLE	MXS2	PIC5A	07-OCT-09 07:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817005	SAMPLE	MXS2	PIC5B	07-OCT-09 07:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817006	SAMPLE	MXS2	PIC5C	07-OCT-09 07:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817007	SAMPLE	MXS2	PIC5D	07-OCT-09 07:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817008	SAMPLE	MXS2	PIC6A	07-OCT-09 08:00	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817009	SAMPLE	MXS2	PIC6D	07-OCT-09 08:00	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817010	SAMPLE	MXS2	PIC7A	07-OCT-09 08:00	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817011	SAMPLE	MXS2	PIC7B	07-OCT-09 08:01	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817012	SAMPLE	MXS2	PIC7C	07-OCT-09 08:01	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817013	SAMPLE	MXS2	PIC7D	07-OCT-09 08:01	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817015	SAMPLE	MXS2	PIC8A	07-OCT-09 08:04	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817016	SAMPLE	MXS2	PIC8C	07-OCT-09 08:04	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817017	SAMPLE	MXS2	PIC10A	07-OCT-09 08:04	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817018	SAMPLE	MXS2	PIC10B	07-OCT-09 08:05	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817019	SAMPLE	MXS2	PIC10D	07-OCT-09 08:05	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817020	SAMPLE	MXS2	PIC1A	07-OCT-09 08:05	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817021	SAMPLE	MXS2	PIC1D	07-OCT-09 08:23	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201930277	MB	MXS2	PIC2A	07-OCT-09 08:23	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201930278	DUP	MXS2	PIC2C	07-OCT-09 08:23	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201930279	MS	MXS2	PIC2D	07-OCT-09 08:23	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
1201930280	LCS	MXS2	PIC3A	07-OCT-09 08:23	DUSE	CeF on 25mm Filter	02-JUL-09 00:00
236817001	SAMPLE	MXS2	PIC13D	07-OCT-09 11:58	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817011	SAMPLE	MXS2	PIC14A	07-OCT-09 11:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817013	SAMPLE	MXS2	PIC14B	07-OCT-09 11:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
236817020	SAMPLE	MXS2	PIC14D	07-OCT-09 11:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201930279	MS	MXS2	PIC11C	07-OCT-09 11:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00
1201930280	LCS	MXS2	PIC11D	07-OCT-09 11:59	DONE	CeF on 25mm Filter	02-JUL-09 00:00

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 905546

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236699016	SAMPLE	AXD2	1025	02-OCT-09 09:19	DUSE		
236938020	SAMPLE	AXD2	1027	02-OCT-09 09:19	DONE		
237010013	SAMPLE	AXD2	1028	02-OCT-09 09:19	DONE		
237170005	SAMPLE	AXD2	1029	02-OCT-09 09:19	DUSE		
237170020	SAMPLE	AXD2	1030	02-OCT-09 09:19	DUSE		
237343006	SAMPLE	AXD2	1037	02-OCT-09 09:19	DUSE		
237521010	SAMPLE	AXD2	1038	02-OCT-09 09:19	DUSE		
1201930820	MB	AXD2	1039	02-OCT-09 09:19	DUSE		
1201930821	LCS	AXD2	1040	02-OCT-09 09:19	DONE		
1201930822	LCSD	AXD2	1041	02-OCT-09 09:19	DONE		
236817014	SAMPLE	AXD2	1042	02-OCT-09 09:19	DUSE		
236699016	SAMPLE	AXD2	1197	05-OCT-09 20:51	DONE		
236817014	SAMPLE	AXD2	1198	05-OCT-09 20:51	DONE		
237170005	SAMPLE	AXD2	1199	05-OCT-09 20:51	DONE		
237170020	SAMPLE	AXD2	1201	05-OCT-09 20:51	DONE		
237343006	SAMPLE	AXD2	1202	05-OCT-09 20:51	DONE		
237521010	SAMPLE	AXD2	1203	05-OCT-09 20:51	DONE		
1201930820	MB	AXD2	1205	05-OCT-09 20:51	DONE		

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 905548

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1201930842	MB	AXD2	1022	02-OCT-09 13:49	DONE		
1201930843	LCS	AXD2	1023	02-OCT-09 13:49	DONE		
1201930844	LCSD	AXD2	1024	02-OCT-09 13:49	DONE		
236699016	SAMPLE	AXD2	1143	02-OCT-09 20:25	DUSE		
236817014	SAMPLE	AXD2	1144	02-OCT-09 20:25	DUSE		
236938020	SAMPLE	AXD2	1145	02-OCT-09 20:25	DONE		
237010013	SAMPLE	AXD2	1146	02-OCT-09 20:25	DUSE		
237170005	SAMPLE	AXD2	1147	02-OCT-09 20:25	DUSE		
237170020	SAMPLE	AXD2	1148	02-OCT-09 20:25	DUSE		
237343006	SAMPLE	AXD2	1161	02-OCT-09 20:26	DONE		
237521010	SAMPLE	AXD2	1162	02-OCT-09 20:26	DONE		
236817014	SAMPLE	AXD2	1113	05-OCT-09 20:48	DONE		
236699016	SAMPLE	AXD2	1114	05-OCT-09 20:48	DONE		
237010013	SAMPLE	AXD2	1117	05-OCT-09 20:48	DONE		
237170005	SAMPLE	AXD2	1132	05-OCT-09 20:48	DONE		
237170020	SAMPLE	AXD2	1135	05-OCT-09 20:48	DONE		

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 905689

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236817001	SAMPLE	KSD1	LUCAS1	02-OCT-09 17:00	DONE	Lucas Cell	31-AUG-09 00:00
236817002	SAMPLE	KSD1	LUCAS2	02-OCT-09 17:00	DONE	Lucas Cell	19-DEC-08 00:00
236817003	SAMPLE	KSD1	LUCAS3	02-OCT-09 17:00	DONE	Lucas Cell	04-FEB-09 00:00
236817005	SAMPLE	KSD1	LUCAS5	02-OCT-09 17:00	DONE	Lucas Cell	25-MAR-09 00:00
236817006	SAMPLE	KSD1	LUCAS6	02-OCT-09 17:00	DONE	Lucas Cell	04-AUG-09 00:00
236817007	SAMPLE	KSD1	LUCAS7	02-OCT-09 17:00	DONE	Lucas Cell	30-SEP-09 00:00
236817009	SAMPLE	KSD1	LUCAS2	02-OCT-09 17:45	DONE	Lucas Cell	19-DEC-08 00:00
236817010	SAMPLE	KSD1	LUCAS3	02-OCT-09 17:45	DONE	Lucas Cell	04-FEB-09 00:00
236817011	SAMPLE	KSD1	LUCAS4	02-OCT-09 17:45	DONE	Lucas Cell	02-MAR-09 00:00
236817015	SAMPLE	KSD1	LUCAS7	02-OCT-09 17:45	DONE	Lucas Cell	30-SEP-09 00:00
236817016	SAMPLE	KSD1	LUCAS1	02-OCT-09 18:25	DONE	Lucas Cell	31-AUG-09 00:00
236817017	SAMPLE	KSD1	LUCAS2	02-OCT-09 18:25	DONE	Lucas Cell	19-DEC-08 00:00
236817018	SAMPLE	KSD1	LUCAS3	02-OCT-09 18:25	DONE	Lucas Cell	04-FEB-09 00:00
236817019	SAMPLE	KSD1	LUCAS5	02-OCT-09 18:25	DONE	Lucas Cell	25-MAR-09 00:00
236817013	SAMPLE	KSD1	LUCAS6	02-OCT-09 18:25	DONE	Lucas Cell	04-AUG-09 00:00
236817020	SAMPLE	KSD1	LUCAS7	02-OCT-09 18:25	DONE	Lucas Cell	30-SEP-09 00:00
236817021	SAMPLE	KSD1	LUCAS1	02-OCT-09 19:00	DONE	Lucas Cell	31-AUG-09 00:00
1201931149	MB	KSD1	LUCAS2	02-OCT-09 19:00	DONE	Lucas Cell	19-DEC-08 00:00
1201931150	DUP	KSD1	LUCAS3	02-OCT-09 19:00	DONE	Lucas Cell	04-FEB-09 00:00
1201931151	MS	KSD1	LUCAS5	02-OCT-09 19:00	DONE	Lucas Cell	25-MAR-09 00:00
1201931152	LCS	KSD1	LUCAS7	02-OCT-09 19:00	DONE	Lucas Cell	30-SEP-09 00:00
236817004	SAMPLE	KSD1	LUCAS2	05-OCT-09 09:55	DONE	Lucas Cell	19-DEC-08 00:00
236817008	SAMPLE	KSD1	LUCAS3	05-OCT-09 09:55	DONE	Lucas Cell	04-FEB-09 00:00
236817012	SAMPLE	KSD1	LUCAS5	05-OCT-09 09:55	DONE	Lucas Cell	25-MAR-09 00:00

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 906319

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236817015	SAMPLE	MXE1	1204	02-OCT-09 09:09	DUSE		
236817016	SAMPLE	MXE1	1205	02-OCT-09 09:09	DUSE		
236817017	SAMPLE	MXE1	1031	02-OCT-09 09:19	DUSE		
236817018	SAMPLE	MXE1	1033	02-OCT-09 09:19	DUSE		
236817019	SAMPLE	MXE1	1035	02-OCT-09 09:19	DUSE		
236817020	SAMPLE	MXE1	1036	02-OCT-09 09:19	DUSE		
236817021	SAMPLE	MXE1	1043	02-OCT-09 09:19	DUSE		
1201932680	MB	MXE1	1044	02-OCT-09 09:19	DUSE		
1201932681	DUP	MXE1	1046	02-OCT-09 09:19	DUSE		
1201932682	MS	MXE1	1047	02-OCT-09 09:19	DUSE		
1201932683	LCS	MXE1	1048	02-OCT-09 09:19	DUSE		
236817001	SAMPLE	MXE1	1191	03-OCT-09 10:13	DUSE		
236817002	SAMPLE	MXE1	1197	03-OCT-09 10:13	DUSE		
236817003	SAMPLE	MXE1	1198	03-OCT-09 10:13	DUSE		
236817004	SAMPLE	MXE1	1199	03-OCT-09 10:13	DUSE		
236817005	SAMPLE	MXE1	1200	03-OCT-09 10:13	DUSE		
236817006	SAMPLE	MXE1	1207	03-OCT-09 10:13	DUSE		
236817007	SAMPLE	MXE1	1208	03-OCT-09 10:13	DUSE		
236817008	SAMPLE	MXE1	1025	03-OCT-09 11:52	DUSE		
236817009	SAMPLE	MXE1	1026	03-OCT-09 11:52	DUSE		
236817010	SAMPLE	MXE1	1027	03-OCT-09 11:52	DUSE		
236817011	SAMPLE	MXE1	1028	03-OCT-09 11:52	DUSE		
236817012	SAMPLE	MXE1	1029	03-OCT-09 11:52	DUSE		
236817013	SAMPLE	MXE1	1030	03-OCT-09 11:52	DUSE		
236817001	SAMPLE	MXE1	1179	07-OCT-09 18:18	DONE		
236817002	SAMPLE	MXE1	1180	07-OCT-09 18:18	DONE		
236817003	SAMPLE	MXE1	1181	07-OCT-09 18:18	DONE		
236817004	SAMPLE	MXE1	1182	07-OCT-09 18:18	DONE		
236817005	SAMPLE	MXE1	1183	07-OCT-09 18:18	DONE		
236817006	SAMPLE	MXE1	1184	07-OCT-09 18:19	DONE		
236817007	SAMPLE	MXE1	1185	07-OCT-09 18:19	DONE		
236817008	SAMPLE	MXE1	1186	07-OCT-09 18:19	DONE		
236817009	SAMPLE	MXE1	1187	07-OCT-09 18:19	DONE		
236817010	SAMPLE	MXE1	1188	07-OCT-09 18:19	DONE		
236817011	SAMPLE	MXE1	1189	07-OCT-09 18:19	DONE		
236817012	SAMPLE	MXE1	1190	07-OCT-09 18:19	DONE		
236817013	SAMPLE	MXE1	1191	07-OCT-09 18:19	DONE		
236817015	SAMPLE	MXE1	1192	07-OCT-09 18:19	DONE		
236817016	SAMPLE	MXE1	1193	07-OCT-09 18:19	DONE		
236817017	SAMPLE	MXE1	1194	07-OCT-09 18:19	DONE		
236817018	SAMPLE	MXE1	1197	07-OCT-09 18:19	DONE		
236817019	SAMPLE	MXE1	1198	07-OCT-09 18:19	DONE		
236817020	SAMPLE	MXE1	1199	07-OCT-09 18:19	DONE		
1201932680	MB	MXE1	1200	07-OCT-09 18:19	DONE		

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236817021	SAMPLE	MXE1	1201	07-OCT-09 18:19	DONE		
1201932681	DUP	MXE1	1202	07-OCT-09 18:19	DONE		
1201932682	MS	MXE1	1203	07-OCT-09 18:19	DONE		
1201932683	LCS	MXE1	1204	07-OCT-09 18:19	DONE		

Instrument Run Log

Instrument Type: ALPHA SPECTROMETER

Batch ID: 906320

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
236817001	SAMPLE	MXE1	1116	02-OCT-09 20:24	DUSE		
236817002	SAMPLE	MXE1	1117	02-OCT-09 20:24	DONE		
236817003	SAMPLE	MXE1	1118	02-OCT-09 20:24	DONE		
236817004	SAMPLE	MXE1	1121	02-OCT-09 20:24	DONE		
236817005	SAMPLE	MXE1	1122	02-OCT-09 20:24	DONE		
236817006	SAMPLE	MXE1	1123	02-OCT-09 20:24	DUSE		
236817007	SAMPLE	MXE1	1124	02-OCT-09 20:25	DONE		
236817008	SAMPLE	MXE1	1125	02-OCT-09 20:25	DONE		
236817009	SAMPLE	MXE1	1126	02-OCT-09 20:25	DUSE		
236817010	SAMPLE	MXE1	1127	02-OCT-09 20:25	DUSE		
236817011	SAMPLE	MXE1	1128	02-OCT-09 20:25	DUSE		
236817012	SAMPLE	MXE1	1130	02-OCT-09 20:25	DONE		
236817013	SAMPLE	MXE1	1131	02-OCT-09 20:25	DUSE		
236817015	SAMPLE	MXE1	1132	02-OCT-09 20:25	DONE		
236817016	SAMPLE	MXE1	1133	02-OCT-09 20:25	DONE		
236817017	SAMPLE	MXE1	1134	02-OCT-09 20:25	DONE		
236817018	SAMPLE	MXE1	1135	02-OCT-09 20:25	DONE		
236817019	SAMPLE	MXE1	1136	02-OCT-09 20:25	DONE		
236817020	SAMPLE	MXE1	1137	02-OCT-09 20:25	DONE		
236817021	SAMPLE	MXE1	1138	02-OCT-09 20:25	DONE		
1201932690	MB	MXE1	1139	02-OCT-09 20:25	DONE		
1201932691	DUP	MXE1	1140	02-OCT-09 20:25	DONE		
1201932692	MS	MXE1	1141	02-OCT-09 20:25	DONE		
1201932693	LCS	MXE1	1142	02-OCT-09 20:25	DONE		
236817001	SAMPLE	MXE1	1149	06-OCT-09 23:22	DONE		
236817006	SAMPLE	MXE1	1150	06-OCT-09 23:22	DONE		
236817009	SAMPLE	MXE1	1151	06-OCT-09 23:22	DONE		
236817010	SAMPLE	MXE1	1152	06-OCT-09 23:22	DONE		
236817011	SAMPLE	MXE1	1153	06-OCT-09 23:22	DONE		
236817013	SAMPLE	MXE1	1154	06-OCT-09 23:22	DONE		