ALS Paragon

Strontium-90

Case Narrative

Los Alamos National Laboratory SMO

Rock -- 09-476

Work Order Number: 0812153

1. This report consists of the analytical results and supporting documentation for one solid sample received by ALS Paragon on 12/16/08.

2. This sample was prepared according to procedure SOP707R10, with procedure modifications outlined in QASS 365780. In order to reserve volume and due to possible matrix interferences, a reduced sample equivalent aliquot of ~0.5g was taken from the gamma digestate.

3. This sample was analyzed for the presence of ^{90}Sr according to procedure SOP724R10. The analysis was completed on 02/08/09.

4. Total radio-strontium is reported as ^{90}Sr. The presence of other radioisotopes of strontium may cause positive bias in the measured strontium concentration.

5. The analysis results for this sample are reported on an 'as received' basis in units of pCi/gram.

6. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.

7. For this analysis the alpha count rate is monitored for high energy contamination. This sample was initially analyzed on 01/30/09. The sample had an alpha count rate greater than ten times the alpha background count rate, indicating contamination of the ^{90}Sr analysis. The sample and batch QC were submitted for a clean-up procedure per QASS 323388. The sample and batch QC were recounted on 02/08/09. The alpha activity seen in the first count was removed. Results are submitted from the recount on 02/08/09 without further qualification. Please refer to NCR #11164 in section 6 of this report.

8. The requested MDC of 0.06 pCi/gram was not met for the sample and associated method blank following an extended count time of 1000 minutes. The reported activity for the sample is greater than the achieved MDC, as indicated by the "M3" qualifier on the final reports. The achieved MDC for the method blank is less than one fifth the activity for the associated sample. The method blank is

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Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

ALS Paragon

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0812153
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Rock
Client Project Number: 09-476
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
CAPU-09-1656	0812153-1		SOLID	09-Dec-08	

0812153

Wednesday, December 10, 2008

REQUEST NUMBER: 09-476

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere
Paragon Analytics, Inc.
225 Commerce
Fort Collins, CO 80524

These Samples are on:
LANL Request Number:09-476
Per Agreement Number:1-800-443-1511
Project Cost Code: WEPR13110300

Please analyse the enclosed samples according to the schedule indicated:

SHIP DATE: 12/10/2008
TURNAROUND/REPORT DUE: 1/9/2009
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Unscreened
LAB REQUEST COMMENTS: Please Send results, invoice and questions to Keith greene at LANL.

LANL ER SMO CONTACT:
Signature:

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	EPA:901.1	1	CAPU-09-1656	S	12/9/2008		
	EPA:905.0	1	CAPU-09-1656	S	12/9/2008		
	HASL-300:AM-241	1	CAPU-09-1656	S	12/9/2008		
	HASL-300:ISOPU	1	CAPU-09-1656	S	12/9/2008		
	HASL-300:ISOU	1	CAPU-09-1656	S	12/9/2008		

Final Page of REQUEST NUMBER 09-476

0812153

Wednesday, December 10, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 09-476C

REQUEST NUMBER: 09-476

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 1/9/2009

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Please Send results, invoice and questions to Keith greene at LANL.

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	CAPU-09-1656	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S

Relinquished By:		Date	Time	Received By:		Date	Time
M. Kaltofen	[signature]	Dec. 15, 2008	10 AM	Cheryl Trimble	Cheryl Trimble	12-16-08	1015
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By:		Date	Time	Remarks:
Printed Name	Signature			

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: LANL Workorder No: 0812153

Project Manager: LS Initials: CDT Date: 12-16-08

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3.	Are Custody seals on **sample containers** intact?	NONE	(YES)	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?	CT 12-16-08	~~YES~~	(NO)
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9.	Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10.	Is there **sufficient sample** for the requested analyses?		(YES)	NO
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17.	Were the samples **shipped on ice**?		YES	(NO)
18.	Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1							
Temperature (°C):	~~22.8~~ 22.3 CT 12-16-08							
No. of custody seals on cooler:	3							
DOT Survey/ Acceptance Information — External µR/hr reading:	13							
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

No time listed on COC or label

Limited volume: 1 rock ~ 1.89g.

If applicable, was the client contacted? (YES) / NO / NA Contact: Keith G. Date/Time: 12/19/08

Project Manager Signature / Date: 12/19/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r21.xls (7/30/08)

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Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Strontium-90 Analysis by GFPC Sample Results Summary

Client Name: Los Alamos National Laboratory SMO
Client Project Name: Rock
Client Project Number: 09-476

Laboratory Name: ALS Paragon
PAI Work Order: 0812153

Reported on: Thursday, February 12, 2009 11:22:17 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 1 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0812153-1	CAPU-09-1656	Sample	Sr-90	21.4 +/- 2.5	0.3	pCi/g	SOLID	SR090123-1	2/8/2009	M3

Comments:

Data Package ID: *SR0812153-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

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Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Method Blank Results

Lab Name: **ALS Paragon**
Work Order Number: 0812153
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Rock 09-476

Lab ID: SR090123-1MB

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 23-Jan-09
Date Prepared: 23-Jan-09
Date Analyzed: 08-Feb-09

Prep Batch: SR090123-1
QCBatchID: SR090123-1-1
Run ID: SR090123-1A
Count Time: 1000 minutes

Final Aliquot: 0.504 g
Result Units: pCi/g
File Name: SRA0208

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	0.38 +/- 0.10	0.29	0.06	B,M

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1104	953.7	ug	86.4	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *SR0812153-1*

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Laboratory Control Sample(s)

Lab Name: **ALS Paragon**
Work Order Number: 0812153
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Rock 09-476

Lab ID: SR090123-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 23-Jan-09
Date Prepared: 23-Jan-09
Date Analyzed: 08-Feb-09

Prep Batch: SR090123-1
QCBatchID: SR090123-1-1
Run ID: SR090123-1A
Count Time: 1000 minutes

Final Aliquot: 0.504 g
Result Units: pCi/g
File Name: SRA0208

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	21.4 +/- 2.5	0.3	21.6	98.8	75 - 125	P,M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1108	962.9	ug	86.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *SR0812153-1*

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Laboratory Control Sample(s)

Lab Name: **ALS Paragon**
Work Order Number: 0812153
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Rock 09-476

Lab ID: SR090123-1LCSD

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 23-Jan-09
Date Prepared: 23-Jan-09
Date Analyzed: 08-Feb-09

Prep Batch: SR090123-1
QCBatchID: SR090123-1-1
Run ID: SR090123-1A
Count Time: 1000 minutes

Final Aliquot: 0.504 g
Result Units: pCi/g
File Name: SRA0208

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	23.0 +/- 2.7	0.3	21.6	107	75 - 125	P,M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1118	896.1	ug	80.2	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *SR0812153-1*

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Duplicate Sample Results (DER)

Lab Name:
Work Order Number: 0812153
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Rock 09-476

Field ID:	
Lab ID:	SR090123-1LCSD

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 23-Jan-09
Date Prepared: 23-Jan-09
Date Analyzed: 08-Feb-09

Prep Batch: SR090123-1
QCBatchID: SR090123e
Run ID: SR090123-1A
Count Time: 1000 minutes

Final Aliquot: 0.504 g
Md:t3835 Tcvf0 Tc 8

Radiochemistry Data Package

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Section 4

INDIVIDUAL SAMPLE RESULTS

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: **ALS Paragon**
Work Order Number: 0812153
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Rock 09-476

Field ID: CAPU-09-1656
Lab ID: 0812153-1

Analysis ReqCode: **GPC-A-012**

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 09-Dec-08
Date Prepared: 23-Jan-09
Date Analyzed: 08-Feb-09

Prep Batch: SR090123-1
QCBatchID: SR090123-1-1
Run ID: SR090123-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.504 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: SRA0208

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	21.4 +/- 2.5	0.3	0.06	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1284	1124	ug	87.6	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *SR0812153-1*

Radiochemistry Data Package

Section 5

RAW DATA

Strontium-90 Analysis by GFPC Raw Data Report

Laboratory Name: **ALS Paragon**
PAI Work Order: 0812153

Prep SOP: PAI 707
Analytical SOP: PAI 724

Reported on: Monday, February 09, 2009
11:22:51 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	GrossCPM BkgCPM	BaseEff ProgEff	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0812153-1	Sr-90	12/9/2008	SR090123-1	2/03/2009	NA	SOLID	0.511 g	LB4100-A	SR090123-1A	2/8/2009	16.860	41.40%	1000	21.4	0.3	pCi/g	NA	
SMP	Trg. Analyte		SR090123-1-1	4:15:00 PM	NA	NA	0.504 g	A1	SRA0208	1:20 PM	2.030	NA	87.6%	2.5	NA	As Received	NA	M3
SR090123-1	Sr-90	1/23/2009	SR090123-1	2/03/2009	NA	SOLID	0.511 g	LB4100-A	SR090123-1A	2/8/2009	2.065	41.25%	1000	0.38	0.29	pCi/g	NA	
MB	Trg. Analyte	6:16:48 AM	SR090123-1-1	4:15:00 PM	NA	NA	0.504 g	A2	SRA0208	1:20 PM	1.805	NA	86.4%	0.10	NA	As Received	NA	B,M
SR090123-1	Sr-90	1/23/2009	SR090123-1	2/03/2009	NA	SOLID	0.511 g	LB4100-A	SR090123-1A	2/8/2009	16.625	40.84%	1000	21.4	0.3	pCi/g	NA	98.8
LCS	Trg. Analyte	6:16:48 AM	SR090123-1-1	4:15:00 PM	NA	NA	0.504 g	A3	SRA0208	1:20 PM	2.059	NA	86.9%	2.5	NA	As Received	NA	P,M3
SR090123-1	Sr-90	1/23/2009	SR090123-1	2/03/2009	NA	SOLID	0.511 g	LB4100-A	SR090123-1A	2/8/2009	16.728	41.39%	1000	23.0	0.3	pCi/g	0.22	107
LCSD	Trg. Analyte	6:16:48 AM	SR090123-1-1	4:15:00 PM	NA	NA	0.504 g	A4	SRA0208	1:20 PM	2.044	NA	80.2%	2.7	NA	As Received	NA	P,M3

Comments:

Data Package ID: *SR0812153-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

PAI - Gas Flow Proportional Sample Analysis LB4100-A

Unit Type: LB4100-A/W
Counting Unit ID: Orange
High Voltage Mode: Simultaneous
Application Revision: C
Application Version: PA
Rev.12/29/03 JE

Data file name: SRA0208
Batch ID: SR090123-1
Count Preset (m): 1000
Batch Ended: 2/9/09 5:56

Background logfile: BKGAB
Date of Bkg. Cal: 2/5/09
Alpha efficiency logfile: Th230-10/08
Alpha attenuation calibration: Am-241-10/08
Beta efficiency logfile: Sr90F-10/08
Beta attenuation calibration: Sr1008

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.10000	Beta b=	1.0793
m=	0.99190	m=	0.9998
a=	0.9665	a=	1.0006
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b*m^-x		Beta to Alpha X-talk y = b*mass + m	
a ->b xtalk b=	0.1995	b ->a xtalk b=	-2.000E-06
a ->b xtalk m=	0.9975	b ->a xtalk m=	0.0021

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
A1	0812153-1	2/9/09 5:56	1000.00	0.0	0.122	0.092	0.031	0.1773	1.100	n/a	n/a	16.860	2.030	0.0060	0.4140	1.079	n/a	n/a
A2	SR090123-1MB	2/9/09 5:56	1000.00	0.0	0.078	0.092	0.001	0.1736	1.100	n/a	n/a	2.065	1.805	0.0000	0.4125	1.079	n/a	n/a
A3	SR090123-1LCS	2/9/09 5:56	1000.00	0.0	0.130	0.086	0.031	0.1761	1.100	n/a	n/a	16.625	2.059	0.0088	0.4084	1.079	n/a	n/a
A4	SR090123-1LCSD	2/9/09 5:56	1000.00	0.0	0.159	0.091	0.031	0.1780	1.100	n/a	n/a	16.728	2.044	0.0136	0.4139	1.079	n/a	n/a

JP 2/9/09

Date 2/8/09

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JP	P			JP	P			P
2	↓	↓			↓	↓			↓
3									
4									
5	OL								
6									
7							JP 2/8/09		
8									
9	JP	P			JP	P			P
10	↓	↓			↓	↓			↓
11									
12									
13	OL								
14									
15								JP 2/8/09	
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA0204W / BKA0205W			
Dr B	OL			
Dr C	BKA0204W			
Dr D	OL			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	2000	Dr A	0.15
	↓	Dr B	↓
Tank 2	900	Dr C	
	↓	Dr D	

Date 2/8/09

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4,9-12	Daily Eff	—	—	30	11:47	JP	EFA0208	JP
1-4,9-12	Daily Bkg	—	—	60	12:03	JP	BKA0208	JP
1	08121153-1	SR090123-1	5,90	1000	13:12	JP	SRA0208	JP
2	SR090123-MB	↓	↓	↓	↓	↓	↓	↓
3	LCS	↓	↓	↓	↓	↓	↓	↓
4	LCSD	↓	↓	↓	↓	↓	↓	↓

JP 2/9/09

Radiochemistry ICP Worksheet

Prep Batch: SR090123-1

Reviewed By: JRK 2/5 Review Date: 2/5/2009

STRONTIUM Recovery Results

r q	Ref Carr ICP Dil Vol	Ref Carr ICP Run	Ref Carr ICP Conc
	10	IR090129-1A1	0.5328997

ICP Vol ml)	Pre-Con Vol (ml)	Post Con Vol (ml)	Pre-Sep Vol (ml)	Post Sep Vol (ml)	Fin ICP Alq (ml)	Fin ICP Dil Vol (ml)	Initial ICP Run	Final ICP Run	Init ICP Conc (ug/ml)	Fin ICP Conc (ug/ml)	Init Samp Mass (ug)	Ref Mass (ug)	Flag	Fin Samp Mass (ug)	% Yield	Final Sample Alq
10	309.5	20	19.9	20	0.1	10	IR090129-1A1	IR090205-1A1	0.41681	0.562065	1283.579	1059.698		1124.129	87.58%	0.5040
10	309.5	20	19.9	20	0.1	10	IR090129-1A1	IR090205-1A1	0.35835	0.476868	1103.547	1059.698		953.7366	86.42%	0.5040
10	310	20	19.9	20	0.1	10	IR090129-1A1	IR090205-1A1	0.35922	0.481445	1107.999	1059.703		962.8893	86.90%	0.5040
10	310	20	19.9	20	0.1	10	IR090129-1A1	IR090205-1A1	0.36236	0.448036	1117.686	1059.703		896.0713	80.17%	0.5040

IR090129-1A1

Al	Ba	Ca	Fe	K	Mg	Na	Pb	Sr	Y
06	0.5116	51.8083	21.2321	20.4435	51.1251	14.1813	0.4930	0.5111	10.1469
78	0.0002	0.0169	0.0143	0.0298	0.0116	2.0752	0.0006	0.0001	0.0039
93	1.0548	70.8404	43.1025	15.0577	19.3748	13.8902	0.5752	0.3675	0.0295
27	0.0138	18.2491	0.0141	0.0398	-0.0044	6.8284	0.8626	0.0795	-0.0059
01	0.0675	2.8069	1.7142	4.1927	0.1950	3.4278	0.0389	0.4168	-0.0020
58	0.0017	-0.0059	-0.0143	-0.0129	-0.0203	0.1055	-0.0026	0.6179	-0.0060
75	0.0186	-0.0191	-0.0150	0.0277	-0.0201	0.0661	0.0076	0.3584	-0.0061
16	0.0024	-0.0228	-0.0144	-0.0492	-0.0258	0.0646	-0.0020	0.5093	-0.0062
37	0.0186	-0.0191	-0.0065	0.0048	-0.0192	0.0560	0.0058	0.3592	-0.0061
10	0.0012	-0.0231	-0.0011	-0.0094	-0.0199	0.0527	-0.0034	0.5123	-0.0061
25	0.0326	-0.0095	0.0070	0.0185	-0.0229	0.0758	0.0182	0.3624	-0.0061
03	0.0022	-0.0259	-0.0109	-0.0438	-0.0245	0.0439	-0.0024	0.5200	-0.0062
60	0.5112	51.1167	21.0755	20.4660	51.2096	20.5164	0.4912	0.5075	10.0959
37	0.0002	0.0160	0.0082	0.0263	0.0098	0.0903	0.0004	0.0002	0.0035
08	0.0001	-0.0105	-0.0058	0.0215	-0.0162	0.0452	-0.0009	0.5329	-0.0043
61	0.3999	61.2318	-0.0166	10.6446	32.7893	204.1322	0.0375	10.4716	0.0143
00	0.0770	0.0536	-0.0161	0.0591	0.0238	3.5646	0.0015	0.0430	-0.0054
69	0.0160	6.5637	-0.0275	0.5980	3.4330	8.3064	-0.0029	0.2892	-0.0055
26	0.0599	-0.0139	-0.0145	0.0489	-0.0120	2.1710	0.0379	0.0031	-0.0057
62	0.0046	19.5531	0.0989	0.4496	10.6532	7.0464	-0.0029	0.1356	-0.0059
02	0.0669	0.0086	-0.0154	0.0446	-0.0009	2.0767	0.0553	0.0018	-0.0058
36	0.0048	8.8868	0.0006	0.3059	4.6991	6.5337	-0.0035	0.0480	-0.0058
66	0.0656	-0.0148	-0.0178	0.0457	-0.0159	2.0139	0.0537	0.0005	-0.0058
67	0.0079	12.1522	-0.0270	0.2653	4.1190	4.0269	-0.0038	0.0665	-0.0059
64	0.0643	-0.0055	-0.0189	0.0992	-0.0116	1.9247	0.0554	0.0007	-0.0058
38	0.5084	52.2431	21.4172	20.1236	51.3557	20.3642	0.4953	0.5046	10.1494
32	0.0002	0.0237	0.0104	0.0532	0.0166	0.0787	0.0008	0.0003	0.0046
21	0.0080	12.4189	-0.0241	0.2833	4.1756	4.0802	-0.0026	0.0672	-0.0049
35	0.0648	-0.0179	-0.0197	0.0728	-0.0175	1.8867	0.0543	0.0005	-0.0054
89	0.0203	32.3063	-0.0017	0.3935	12.2607	10.4254	-0.0035	0.1751	-0.0056
91	0.0629	-0.0080	-0.0215	0.1177	-0.0124	1.8677	0.0488	0.0010	-0.0056
91	0.0129	61.2081	0.0101	0.5246	14.3059	19.3052	-0.0031	0.2424	-0.0056
27	0.0647	0.0320	-0.0179	0.0938	-0.0094	1.9286	0.0487	0.0014	-0.0058
71	0.0120	6.6111	-0.0170	0.3314	1.5922	4.4265	-0.0028	0.0307	-0.0058
33	0.0660	-0.0231	-0.0094	0.0968	-0.0205	1.9388	0.0558	0.0001	-0.0059
17	0.0029	14.8316	-0.0207	2.6317	21.9832	6.8590	-0.0032	3.6097	-0.0060
45	0.4916	53.0095	21.5160	19.2472	50.9523	19.6171	0.4924	0.4918	10.0406
64	0.0002	0.0240	0.0044	0.1102	0.0175	0.0656	0.0011	0.0005	0.0043
19	0.0677	-0.0188	-0.0214	0.0970	-0.0085	1.9312	0.0605	0.0387	-0.0043
72	0.0039	7.7300	-0.0040	0.3217	4.7738	3.7756	-0.0021	0.0574	-0.0052
39	0.0643	-0.0231	-0.0189	0.0957	-0.0142	1.9081	0.0542	0.0005	-0.0055
65	0.0039	7.7722	-0.0233	0.3139	4.8009	3.8218	-0.0030	0.0576	-0.0056
05	0.0643	-0.0185	-0.0303	0.0672	-0.0162	1.9115	0.0539	0.0005	-0.0055
23	0.0117	42.1040	-0.0084	2.2068	16.6735	59.2705	0.0001	1.0224	-0.0053

90205-1A1

009 15:44:23 Page 1

Sr	Y
4986	9.9554
0001	0.0039
5621	-0.0029
4769	-0.0043
4814	-0.0052
4480	-0.0055
1341	-0.0029
5632	-0.0064
3733	-0.0064
6705	-0.0068
2088	-0.0068
5779	-0.0068
4890	9.7535
0004	0.0017
3145	-0.0037
6520	-0.0057
4125	-0.0010
6772	-0.0067
2935	-0.0068
6154	-0.0069
2706	-0.0071
6139	-0.0070
2615	-0.0071
5608	-0.0070
4874	9.7032
0007	0.0021
3284	-0.0057
6376	-0.0063
2859	-0.0060
6207	-0.0067
5533	-0.0068
7724	-0.0069
3034	-0.0069
6335	-0.0070
2290	-0.0070
5965	-0.0071
4857	9.7326
0008	0.0028
2785	-0.0043
6066	-0.0067
0450	-0.0064
4513	-0.0067
3007	-0.0068
6035	-0.0069

Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH Generic ^{90}Sr
TEST ^{90}Sr
METHOD Prep
SOP/REV (PREP) 707 R9
SOP/REV (ANAL) _____

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

DCB 4/19/07

Due to matrix interference in these samples, the following procedure was performed:

STRONTIUM PROCEDURE MODIFICATION TO REMOVE INTERFERING ALPHA ACTIVITY

The following changes may be utilized at the technician's discretion for samples believed to have elevated actinides, especially Pu.

- Follow SOP 707 R9 through step 8.2.14. (if the matrix is soil) or 8.3.9 (if the matrix is water) and evaporate samples to dryness on the steam bath.
- Add 5 mL of 8 N HNO_3 and dissolve the salts on the steam bath until dry.
- Dissolve the salts in 5 mL of **3N** instead of 8N nitric acid. Ensure the entire sample residue is in solution.
- Remove samples from the steam bath and allow to cool.
- While samples are cooling, prepare an ascorbic acid solution with a concentration of 200mg / mL. **Ascorbic acid solution must be made fresh daily.**
- Add 1 mL of the ascorbic acid solution to each sample. Swirl gently.
- Load the samples onto the Sr column that has been preconditioned with 2 mL of 3N nitric acid (instead of 8 N).
- Rinse the cup as stated in sections 8.5.3-8.5.5 substituting 3N nitric for 8N nitric

DCB 4/19/07

DCB 4/19/07

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH 0812153
TEST γ
METHOD Prep
SOP/REV (PREP) 739/9
SOP/REV (ANAL)

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

TE 12/30/08

1. Sample 0812153-1 consisted of a small rock that was placed into a Ziploc bag and crushed with a rubber mallet. The crushed rock was then transferred to a 220mL polypropylene cup and weighed.
2. A three acid digestion was performed by adding 25mL each of HNO_3, HCl, and HF to the sample cup. A MB, LCS, and LCSD were created at this time by adding all three acids to empty 220mL cups. TE 12/30/08
3. Following digestion, the sample was taken to dryness and then brought up in 10ml HNO_3 and ~150ml DI water. TE 12/30/08
4. The sample was filtered through qualitative fluted filter paper, diluted to 1000ml with DI water, and packed for a geometry 1 gamma analysis.
5. Following gamma analysis, the sample will be released for all remaining rad analyses.

TE 12/30/08

TE 12/30/08

TECHNICIAN/ANALYST T Elliot DATE 12/30/08

DEPARTMENT MANAGER Crystal Sheaffer DATE 12/30/08

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PARAGON ANALYTICS
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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

ALS

NCR #: 11164

CONTROLLED
NON-CONFORMANCE REPORT

Non-Conformance

Initiated By: John C. Petrovic on 2/2/2009

Event Type: elevated alpha activity

Event Explanation: Sample 0812153-1 has alpha cpm greater than 10 times the level of the bkg cpm.

Action To Prevent Reccurence: N/A - sample constituents (matrix) issue

Corrective Action

Corrective Action: Submit for Clean-up
Department Manager Approval: Renee Gallegos
Approval Date: 2/3/2009
Corrective Action Comments:

Workorders Affected

0812153 – SR90	No client contact information.	Lance R. Steere	2/3/2009

Associated Batches

The samples were originally associated with the following Batch(es):

SR090123-1 created on 1/23/2009

All rework was completed in the following Batch(es):

SR090123-1 created on 1/23/2009
Outcome: The alpha activity seen in the first count has been removed following an ascorbic acid clean-up procedure. The requested MDC of 0.06 pCi/gram was not met for the sample or method blank (MB) and the method blank has Sr-90 activity above the requested MDC of 0.06 pCi/gram at 0.38 pCi/gram. However, the sample has 21.4 pCi/gram of Sr-90

CONTROLLED
NON-CONFORMANCE REPORT

Project Manager Approval: LRS on 2/10/2009

Department Manager Approval: Renee Gallegos on 2/9/2009
QA Manager Approval: Deb Scheib on 2/10/2009

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Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Radiochemistry Instrument Worksheet

ALS Paragon

Prep Batch: SR090123-1

Prep Procedure: SR90

Analytical QASS / NCR? Y / (N) ~~TH 64~~ NA JP 2/9/09

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0812153-1	SMP	0.5107	0.504	g	pCi/g	0	SRA0208	1	JP							
1	SR090123-1	MB	0.5107	0.504	g	pCi/g	0		2								
1	SR090123-1	LCS	0.5107	0.504	g	pCi/g	0		3								JP 2/9/09
1	SR090123-1	LCSD	0.5107	0.504	g	pCi/g	0		4								

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247970	2,005.457	ppm	NA	0.5	ppm	RS-003

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3610.01	49.056	DPM/ml	01/23/09	0.5	ml	RS-003

Reporting Units

LabID:	TstGrpName:	RptUnits:
0812153-1	Sr90_LANL_1s_low	pCi/g

Sample Barcodes

0812153-1
SR090123-1PS1

SR090123-1MB
SR090123-1PS2

SR090123-1LCS
SR090123-1PS3

SR090123-1LCSD
SR090123-1PS4

SR090123-1CAR
SR090123-1PS5

Radiochemistry Instrument Worksheet

ALS Paragon

Prep Batch: SR090123-1

Prep Procedure: SR90

Analytical QASS NCR? Y N 11164

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0812153-1	SMP	0.5107	0.5065	g	pCi/g	0	SRC0129A	1	JP							
1	SR090123-1	MB	0.5107	0.5065	g	pCi/g	0		2								
1	SR090123-1	LCS	0.5107	0.5065	g	pCi/g	0		3								
1	SR090123-1	LCSD	0.5107	0.5065	g	pCi/g	0		4								

~~DATA NOT USED~~ JP 2/9/09

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247970	2,005.457	ppm	NA	0.5	ppm	RS-003

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3610.01	49.056	DPM/ml	01/23/09	0.5	ml	RS-003

~~Alpha Activity~~ JP 2/9/09

Reporting Units

LabID:	TstGrpName:	RptUnits:
0812153-1	Sr90_LANL_1s_low	pCi/g

Sample Barcodes

0812153-1
SR090123-1PS1

SR090123-1MB
SR090123-1PS2

SR090123-1LCS
SR090123-1PS3

SR090123-1LCSD
SR090123-1PS4

SR090123-1CAR
SR090123-1PS5

Prep Batch: SR090123-1

Review Date: 2/5/2009

S / NCR? (Y) / N 364782, 323388

Prep Notes

59

mited sample, an LCSD was prepped instead of a sample

e	Aliquot	Units	Pipet ID
9	0.5	ml	RS-003

Supersedes: 1/30/09 9:31

Radiochemistry Prep Worksheet

ALS Paragon

Prep Batch: SR090123-1

Prep Procedure: SR90

Reviewed By: JRK **Review Date:** 1/30/2009

Non-Routine Pre-Treatment? (Y) / N **Batch:** QASS: 365782 **Re-Prep?** Y / (N) **Batch:** NA **Prep** (QASS) / **NCR?** (Y) N 365782

Prep SOP: PAI 707 **Rev:** 10
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Jeff Kujawa
Prep Date: 1/23/2009
Prep Dept: RS

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
1	1	0812153-1	SMP		0.510678	0.506488	As Received	11283	01/28/09 17:55	T1	
2	1	SR090123-1	MB		0.510678	0.506488	As Received	11344	01/28/09 17:55	T1	
3	1	SR090123-1	LCS		0.510678	0.506491	As Received	11347	01/28/09 17:55	T1,S1	
4	1	SR090123-1	LCSD		0.510678	0.506491	As Received	11350	01/28/09 17:55	T1,S1	

Comments

In order to reserve volume and due to possible matrix interferences, a reduced sample equivalent aliquot of ~0.5g was taken from the gamma digestate. Due to limited sample, an LCSD was prepped instead of a sample duplicate.

Spiked By: Jeff Kujawa **Date:** 1/26/2009

Witnessed By: Gabriel D. Wagner **Date:** 1/26/2009

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247970	2,005.457	ppm	NA	0.5	ppm	RS-003

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3610.01	49.056	DPM/ml	01/23/09	0.5	ml	RS-003

aragon

Radiochemistry Prep Worksheet

Prep Batch: SR090123-1

ocedure: SR90

Prep Batch Not Validated!!!

Reviewed By: Review Date:

tine Pre-Treatment? Y / N Batch: _____ Re-Prep? Y / N Batch: _____ Prep QASS / NCR? Y / N _____

SOP: PAI 707 Rev: 10
SOP: NONE
ass: solid

Prep Analyst: Jeff Kujawa
Prep Date: 1/23/2009
Prep Dept: RS

Balance:
Balance:

p n	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Column #	Ingrowth Date/Time	Standards	AA Prep	Ingrowth	Prep Notes
	0812153-1	SMP		0.510678		As Received	11253	1/25/09	T1	11415	2/3/09	
	SR090123-1	MB		0.510678		As Received	11344	17:55	T1	11416	16:15	
	SR090123-1	LCS		0.510678		As Received	11347		T1,S1	11417		
	SR090123-1	LCSD		0.510678		As Received	11350		T1,S1	11419		

ents

to reserve volume and due to possible matrix interferences, a reduced sample equivalent aliquot of ~0.5g was taken from the gamma digestate. Due to limited sample, an LCSD was prepped instead of a sample

d By: [illegible] Date: 1/26/09
d By: GPW Date: 1-26-09

Tracer/Carrier Solution Information

clide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
NTIUM	247970	2,005.457	ppm	NA	0.5	ppm	RS-003

exp. 8/29/09

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3610.01	49.056	DPM/ml	01/23/09	0.5	ml	RS-003

exp. 4/9/09

ICP
310.5 - Sr
311 - LCS
200.5 - RC
1 L
10.1 final vol

Supersedes: ~~AA~~ 12/30/08 9:37 12/23/09

Radiochemistry Prep Worksheet

ALS Paragon

Prep Batch: GS081229-1

Prep Procedure: GAMMASCAN

Reviewed By: tde TDE **Review Date:** 12/30/2008

Non-Routine Pre-Treatment? (Y) / N **Batch:** See QASS **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** (Y) / N 365782

Prep SOP: PAI 739 **Rev:** 9
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart
Prep Date: 12/29/2008
Prep Dept: GM

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Geometry	Standards	Prep Notes
1	1	0812153-1	SMP		1.6212	1.6212	As Received	01		TC 12/30/08
2	1	0812153-1	DUP		1.6212	1.6212	As Received	01	TC 12/30/08	Count Dup, Insuff Sample
3	1	GS081229-1	MB		1.6212	1.6212	As Received	01		TC 12/30/08
4	1	GS081229-1	LCS		1000	1000	As Received	01	S1	

Comments

Spiked By: N/A **Date:** N/A

Witnessed By: N/A **Date:** N/A

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Am-241	824	220.230	DPM/ml	12/29/08	1000	ml	
S1	Co-60	824	102.627	DPM/ml	12/29/08	1000	ml	
S1	Cs-137	824	83.585	DPM/ml	12/29/08	1000	ml	

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Stable Chemistry Solution Report

Solution Id:	247970	**Name:**	Strontium Carrier+1<5>	**Type:**	IS
		Lot:	multiple	**Vendor Name:**	multiple

Final Vol:	1000	**Dept:**	RS	**Prep By**	DBC	**on**	8/29/2008	**Reviewed By**	tde	**on**	9/15/2008
Units:	mL	**Location:**	SR/RA	**Opened By**		**on**		**Verified By**	DBC	**on**	8/29/2008
Matrix:	LIQUID	**ExpireDate:**	8/29/2009	**Received By**		**on**		**Deactivated By**		**on**	

Comment:

Component Name	Component ID	Volume Added	Units
Strontium Stable Carrier Source<1>	8256 Y07595	4.8441	g

Constituent Name	Conc of Primary Soln	FinalConc	Summed Conc	Units
STRONTIUM	414000	2005.457		ppm

Associated Parent IDs

8256 Y07595

Abbreviations: NC = Not Calculated for reagents when the volume added is not entered.
NE = Not Entered

Prepare a working standard from intermediate dilution standard 600.2613.30 of approximately 50 dpm/ml

1) Determine density of 0.1 M HCl
diluent Lot # 068438 Bal. ID
Mass of volumetric flask: 68.2969 g #12
Mass of flask with 100ml diluent: 168.1454 g
Net Mass of diluent: 99.8485 g
$\rho = 0.9985$ g/ml

2) Determine mass of standard 600.2613.30
Mass of empty Nalgene without lid: 74.6622 g #12
Mass of Nalgene and standard: 77.2779 g
Net mass of standard: ~~1073.3 g~~ 2.6157 g
DC 4/4/08

3) Dilute with acid
Mass of empty Nalgene without lid: 74.6622 g #12
Mass of Nalgene, standard, & diluent: 1073.3 g #26
Net mass of standard & diluent: 998.6398 g

4) Final activity calculation:
22,279.914
$\frac{(\cancel{2,390.967}\ \text{dpm/g})(2.6157\text{g})(0.9985\text{g/ml})}{998.6398\text{g}} = \cancel{58.56}\ \text{dpm/ml}$ 58.269
MC 7/10/08

Stnd ID: 600.3610.01
MC 7/10/08

Description: Sr-90
Expiration: 4/9/2009
Activity: 58.27 dpm/mL
MC 7/10/08
2s Uncertainty: 2.91 dpm/mL
Ref. Date: 12/1/2001
Ref Time: N/A
Prep Date: 4/7/2008 Prep by: dc
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01

Reverification Log		
Analysis Date	Initials	Expiration Date

MC 7/10/08

MC 7/10/08

Continued on Page

Read and Understood By

Signed 4/7/08 Date Signed 7/10/08 Date

30
PROJECT 600.2613.30 Sr-90 Notebook No. 2613

Continued From Page

Transfer contents of ampoule 600 to a 125 mL glass bottle for a 1° solution.

1) Transfer ampoule 600 to a 125 mL bottle

mass of open ampoule + std.	139.6110 g
mass of empty ampoule	89.5551 g
Net mass of std.	50.0559 g

Bal #12

SD 12/10/03 Density from following page P = 0.9978 g/mL

2) Final Activity Calculation

$$\frac{(1.868\times10^4\ dps)(60\ dpm/dps)}{\cancel{50.0559}\ 50.3054\ g} = \left(\frac{\cancel{22,390.967}\ \cancel{22,279.914}\ 22,279.914\ dpm}{g}\right)(0.9978\ g/mL)$$

CW 12/10/03

$$= \cancel{22,311.707}\ \cancel{22,230.898}\ 22,230.898\ dpm/mL$$

CW 12/10/03 SD 12/10/03

CW 12/11/03

SD 12/11/03

ANALYTICS
1380 Seaboard Ind Blvd * Atlanta, GA 30318 * USA * 404-352-8677
Sr-90
SRS 62751-307 Amount 0.505 µCi QA MN
Date 12/01/01 12:00 EST Exp. ------
PO # 001703, Item 1
50.3054 g 0.1M HCl solution
CAUTION RADIOACTIVE MATERIAL
CW 12/1/03

Stnd ID: 600.2613.30
Description: Sr-90
Expiration: 12/2/04 MC 7/10/08
Activity: ~~22341.74~~ dpm/mL
22,230.898
2s Uncertainty: ~~744.72~~ MC dpm/mL 1/11
Ref. Date: 12/1/01 7/10/08
Ref Time: N/A
Prep Date: 12/1/03 Prep by: CW
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01
SD 12/11/03

Stnd ID: 600.2613.30
Description: Sr-90
Expiration: 11/29/05 22,230.898
Activity: ~~22341.71~~ dpm/mL
REQUIRES NCR FOR ICPT WORK
2s Uncertainty: ~~744.72~~ dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 12/1/03 Prep by: CRW
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01
12/1/03 RG 12/13/04

Stnd ID: 600.2613.30
Description: Sr-90
Expiration: 2/27/07 MC 7/10/08
Activity: ~~22341.74~~ 22,230.898 dpm/mL
2s Uncertainty: ~~744.72~~ 1/11 dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 12/1/03 Prep by: CRW
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01
RG 3/9/06

Stnd ID: 600.2613.30
Description: Sr-90
Expiration: 12/28/05 MC 7/10/08
Activity: ~~22341.71~~ 22,230.898 dpm/mL
2s Uncertainty: ~~744.72~~ 1/11 dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 12/1/03 Prep by: CRW
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01
Requires NCR for ICPT Work
RG 4/26/05

Continued on Page

Read and Understood By

Chad Wangler 12/1/03 RG 12/13/04 — Signed — Date

12/10/03 — Signed — Date

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI 00600
rec'd 12-05-01

62751-307

Sr-90 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25931.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. 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:	Sr-90
ACTIVITY (dps):	1.868 E4
HALF-LIFE:	28.79 years
CALIBRATION DATE:	December 1, 2001 12:00 EST
TOTAL UNCERTAINTY*:	5.0%

*99% Confidence Level

Impurities: γ-impurities <0.1%

50.3054 grams 0.1M HCl solution with 30 μg/g Sr carrier.

P O NUMBER 001703, Item 1

SOURCE PREPARED BY: M Taskaeva
M. Taskaeva, Radiochemist

QA APPROVED: [signature] 12-4-01

Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

and Check

Beta			Detector
CL	UCL	Flag	ID
563	2.366	PASS	A1 (01)
760	2.037	PASS	A2 (02)
918	2.204	PASS	A3 (03)
846	2.152	PASS	A4 (04)
.809	122.121	#REF!	B1 (05)
.460	23.690	#REF!	B2 (06)
794	2.441	#REF!	B3 (07)
583	1.955	#REF!	B4 (08)
569	1.924	PASS	C1 (09)
535	1.865	PASS	C2 (10)
670	1.959	PASS	C3 (11)
671	1.967	PASS	C4 (12)
642	2.001	#REF!	D1 (13)
555	1.799	#REF!	D2 (14)
265	1.632	#REF!	D3 (15)
392	1.945	#REF!	D4 (16)

Date: 2/5/09

2/08

Printed 2/5/09 8:00 AM

LB4100-A Weekly Instrument Calibration and Check
Background Determinations

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	#REF!	0.0212	0.1232	**#REF!**	#REF!	1.663	2.366	**#REF!**	A1 (01)
A2 (02)	#REF!	0.0190	0.1142	**#REF!**	#REF!	1.760	2.037	**#REF!**	A2 (02)
A3 (03)	0.086	0.0385	0.1017	**PASS**	2.059	1.918	2.204	**PASS**	A3 (03)
A4 (04)	#REF!	0.0078	0.1008	**#REF!**	#REF!	1.846	2.152	**#REF!**	A4 (04)
B1 (05)	#REF!	-0.1229	0.3597	**#REF!**	#REF!	-54.809	122.121	**#REF!**	B1 (05)
B2 (06)	#REF!	0.0162	0.0891	**#REF!**	#REF!	-10.460	23.690	**#REF!**	B2 (06)
B3 (07)	#REF!	0.0383	0.1245	**#REF!**	#REF!	1.794	2.441	**#REF!**	B3 (07)
B4 (08)	#REF!	0.0299	0.1241	**#REF!**	#REF!	1.583	1.955	**#REF!**	B4 (08)
C1 (09)	#REF!	0.0310	0.0994	**#REF!**	#REF!	1.569	1.924	**#REF!**	C1 (09)
C2 (10)	#REF!	0.0238	0.1042	**#REF!**	#REF!	1.535	1.865	**#REF!**	C2 (10)
C3 (11)	#REF!	0.0146	0.1142	**#REF!**	#REF!	1.670	1.959	**#REF!**	C3 (11)
C4 (12)	#REF!	0.0273	0.1059	**#REF!**	#REF!	1.671	1.967	**#REF!**	C4 (12)
D1 (13)	#REF!	0.0247	0.1531	**#REF!**	#REF!	1.642	2.001	**#REF!**	D1 (13)
D2 (14)	#REF!	0.0089	0.1451	**#REF!**	#REF!	1.555	1.799	**#REF!**	D2 (14)
D3 (15)	#REF!	0.0187	0.1013	**#REF!**	#REF!	1.265	1.632	**#REF!**	D3 (15)
D4 (16)	#REF!	0.0288	0.1156	**#REF!**	#REF!	1.392	1.945	**#REF!**	D4 (16)

Reviewed by: JP Date: 2/6/09

Control Limits set 11/22/08
JCP 11/22/08

BKA0205W.XLD

Printed 2/6/09 8:08 AM

Gas o o io a Cou e

Qua i y Co o a a

ai y ackg ou C ecks

LB4100-A Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.083	-0.025	0.209	**PASS**	2.050	1.478	2.582	**PASS**	A1 (01)
A2 (02)	0.050	-0.025	0.209	**PASS**	1.817	1.285	2.325	**PASS**	A2 (02)
A3 (03)	0.067	-0.028	0.200	**PASS**	2.250	1.503	2.615	**PASS**	A3 (03)
A4 (04)	0.083	-0.026	0.208	**PASS**	2.233	1.490	2.598	**PASS**	A4 (04)
B1 (05)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B1 (05)
B2 (06)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B2 (06)
B3 (07)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B3 (07)
B4 (08)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B4 (08)
C1 (09)	0.050	-0.029	0.191	**PASS**	1.717	1.277	2.315	**PASS**	C1 (09)
C2 (10)	0.033	-0.027	0.201	**PASS**	1.750	1.210	2.226	**PASS**	C2 (10)
C3 (11)	0.067	-0.024	0.214	**PASS**	1.650	1.350	2.412	**PASS**	C3 (11)
C4 (12)	0.000	-0.030	0.184	**PASS**	2.050	1.276	2.314	**PASS**	C4 (12)
D1 (13)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D1 (13)
D2 (14)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D2 (14)
D3 (15)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D3 (15)
D4 (16)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D4 (16)

Reviewed by: JP Date: 2/9/09

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKA0204W Date: 2/4/09 Analyst: JCP
BKA0205W 2/5/09

LB4100-A Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.050	-0.025	0.209	**PASS**	2.200	1.478	2.582	**PASS**	A1 (01)
A2 (02)	0.083	-0.025	0.209	**PASS**	2.300	1.285	2.325	**PASS**	A2 (02)
A3 (03)	0.083	-0.028	0.200	**PASS**	2.300	1.503	2.615	**PASS**	A3 (03)
A4 (04)	0.067	-0.026	0.208	**PASS**	2.083	1.490	2.598	**PASS**	A4 (04)
B1 (05)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B1 (05)
B2 (06)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B2 (06)
B3 (07)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B3 (07)
B4 (08)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B4 (08)
C1 (09)	0.133	-0.029	0.191	**PASS**	1.967	1.277	2.315	**PASS**	C1 (09)
C2 (10)	0.100	-0.027	0.201	**PASS**	2.150	1.210	2.226	**PASS**	C2 (10)
C3 (11)	0.167	-0.024	0.214	**PASS**	1.783	1.350	2.412	**PASS**	C3 (11)
C4 (12)	0.100	-0.030	0.184	**PASS**	2.033	1.276	2.314	**PASS**	C4 (12)
D1 (13)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D1 (13)
D2 (14)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D2 (14)
D3 (15)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D3 (15)
D4 (16)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D4 (16)

Reviewed by: JP Date: 2/9/09

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKA0204W Date: 2/4/09 Analyst: JCP
BKA0205W 2/5/09

LB4100-A Daily Instrument Performance Check
Efficiency Determinations

Detector ID	Alpha Eff.	Alpha LCL	Alpha UCL	Alpha Flag	Beta Eff.	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.2517	0.2284	0.2536	**PASS**	0.3956	0.3689	0.4117	**PASS**	A1 (01)
A2 (02)	0.2383	0.2273	0.2487	**PASS**	0.3763	0.3711	0.4042	**PASS**	A2 (02)
A3 (03)	0.2588	0.2360	0.2650	**PASS**	0.4002	0.3739	0.4104	**PASS**	A3 (03)
A4 (04)	0.2292	0.2202	0.2440	**PASS**	0.3502	0.3377	0.3787	**PASS**	A4 (04)
B1 (05)	#VALUE!	0.2246	0.2470	**#VALUE!**	#VALUE!	0.3621	0.4456	**#VALUE!**	B1 (05)
B2 (06)	#VALUE!	0.2191	0.2451	**#VALUE!**	#VALUE!	0.3476	0.3828	**#VALUE!**	B2 (06)
B3 (07)	#VALUE!	0.2015	0.2486	**#VALUE!**	#VALUE!	0.3583	0.4011	**#VALUE!**	B3 (07)
B4 (08)	#VALUE!	0.2074	0.2671	**#VALUE!**	#VALUE!	0.3543	0.4114	**#VALUE!**	B4 (08)
C1 (09)	0.2346	0.2196	0.2492	**PASS**	0.3882	0.3593	0.4029	**PASS**	C1 (09)
C2 (10)	0.2459	0.2364	0.2633	**PASS**	0.4094	0.3985	0.4258	**PASS**	C2 (10)
C3 (11)	0.2532	0.2337	0.2623	**PASS**	0.4140	0.3940	0.4277	**PASS**	C3 (11)
C4 (12)	0.2437	0.2354	0.2537	**PASS**	0.4162	0.3969	0.4261	**PASS**	C4 (12)
D1 (13)	#VALUE!	0.2492	0.2571	**#VALUE!**	#VALUE!	0.3970	0.4253	**#VALUE!**	D1 (13)
D2 (14)	#VALUE!	0.2371	0.2511	**#VALUE!**	#VALUE!	0.4077	0.4300	**#VALUE!**	D2 (14)
D3 (15)	#VALUE!	0.1748	0.2406	**#VALUE!**	#VALUE!	0.3079	0.3945	**#VALUE!**	D3 (15)
D4 (16)	#VALUE!	0.2040	0.2649	**#VALUE!**	#VALUE!	0.3606	0.4318	**#VALUE!**	D4 (16)

Reviewed by: JP Date: 2/9/09

Drawer A Control Limits Established 12/13/07 by LJO
Drawer C Control Limits Established 10/29/08 by JCP

UCL	Flag	Detector ID
.4117	PASS	A1 (01)
.4042	PASS	A2 (02)
.4104	PASS	A3 (03)
.3787	PASS	A4 (04)
.4456	#VALUE!	B1 (05)
.3828	#VALUE!	B2 (06)
.4011	#VALUE!	B3 (07)
.4114	#VALUE!	B4 (08)
.4029	PASS	C1 (09)
.4258	PASS	C2 (10)
.4277	PASS	C3 (11)
.4261	PASS	C4 (12)
.4253	#VALUE!	D1 (13)
.4300	#VALUE!	D2 (14)
.3945	#VALUE!	D3 (15)
.4318	#VALUE!	D4 (16)

Date: 2/9/09

Printed 2/9/098:02 AM

Instrument: LB4100-A

Calibration: Sr-90 Flat Planchet

Date of Calibration: 10/01/08

Efficiency Log Files: Sr90F-10/08

Efficiency Files: ESF1001, ESF1001A

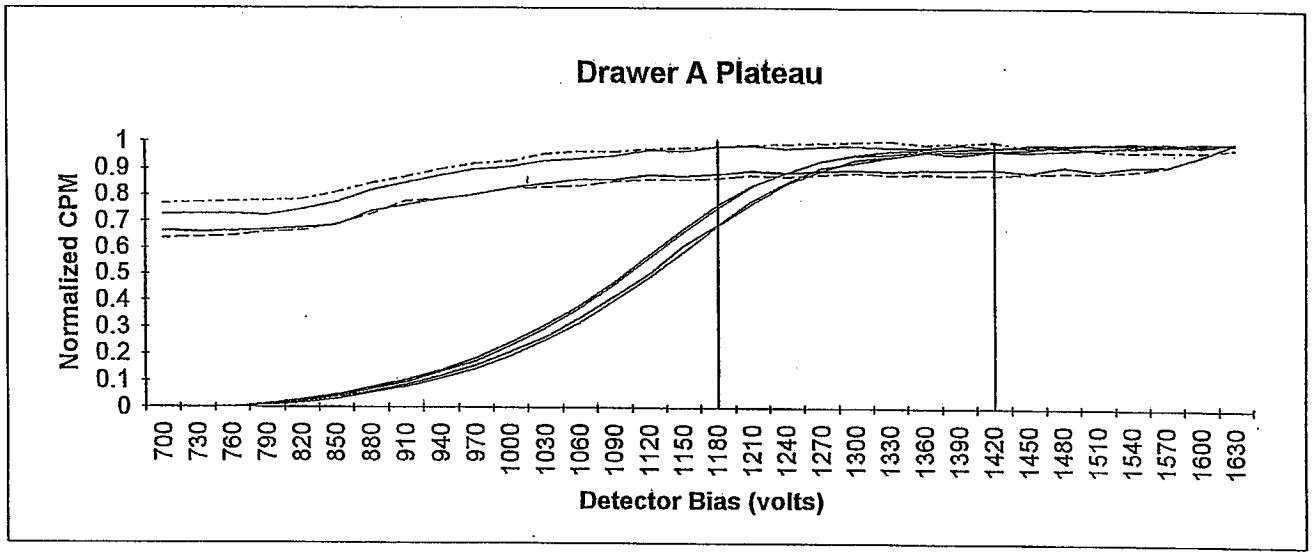
Source ID's: Sr-90 - 514.1572.73 (Efficiency)
Sr-90- 600.3020.50 (ICV's & ICB's)

BG 10/26/08

Instrument Plateaus

Unit Type: LB4100/W-A
Date Performed: 9/18/07 09:58
FileName: PTA0918A
Batch ID: PLATEAU

Unit Id: Orange
Application Revision: B
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1420

Optimum alpha only operating voltage: 1180

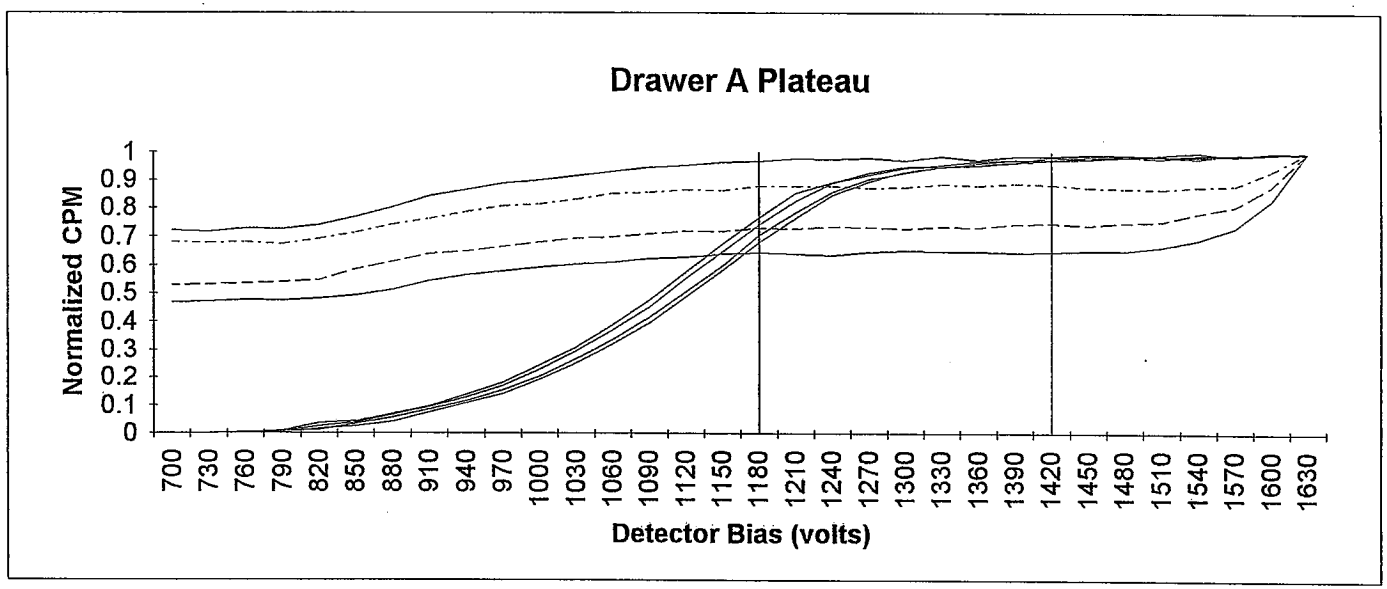
Archived
RG 10/15/08

	A1	A2	A3	A4
Beta slope at beta voltage	1.99%	1.77%	2.19%	0.99%
Alpha slope at beta voltage	0.06%	0.88%	0.76%	-0.99%
Alpha slope at alpha voltage	0.96%	1.53%	1.44%	1.63%

Printed 9/18/07 4:11 PM

Unit Type: LB4100/W-A
Date Performed: 9/9/08 09:15
FileName: PTA0909A
Batch ID: PLATEAU

Unit Id: Orange
Application Revision: B
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1417.5

Optimum alpha only operating voltage: 1177.5

	A1	A2	A3	A4
Beta slope at beta voltage	1.21%	1.85%	2.20%	2.88%
Alpha slope at beta voltage	1.37%	1.15%	0.41%	-1.37%
Alpha slope at alpha voltage	1.97%	1.67%	0.84%	1.50%

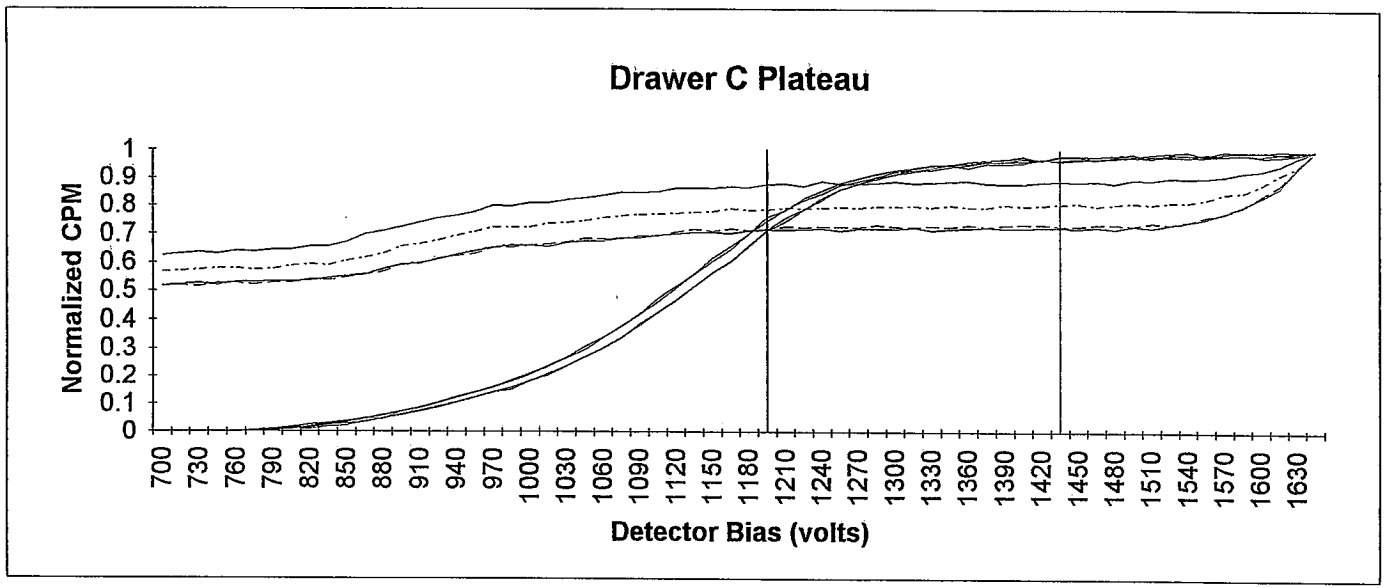
Plateau Check run 9/9/08.
All parameters in control.
Voltage and ROI's will
remain the same from
09/07 Calibration.

RG 10/15/08

Printed 10/6/08 10:46 AM

Unit Type: LB4100/W-A
Date Performed: 7/31/08 10:42
FileName: PTA0731C
Batch ID: PLATEAU

Unit Id: Orange
Application Revision: B
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1435

Optimum alpha only operating voltage: 1195

	C1	C2	C3	C4
Beta slope at beta voltage	1.87%	0.33%	1.16%	1.31%
Alpha slope at beta voltage	0.84%	-0.50%	1.55%	0.58%
Alpha slope at alpha voltage	2.46%	2.31%	1.43%	0.91%

Printed 8/8/08 9:43 AM

9/18/07 Plateaus for Drawers A and B
LJO

Source Used B	Detector	Source used A
Sr/Y 90 - 406	A1 B1	410 - Am 241
29,600 dpm - 407	A2 B2	411 - 17,800 dpm
9/15/92 - 408	A3 B3	412 - 2/06/95
↓ - 409	A4 B4	413 - ↓

Parameters
Starting Voltage - 700
Ending Voltage - 1650
30 Volts/step
5 min/step
40,000 count preset

Filenames:
PTA0918A
PTA0918B

9/18/07 A working voltage could not be found for Drawer B.
LJO Another plateau will be run using the same
source as above but different parameters

4/11/08 JH All pucks were cleaned with radiac wash and rinsed with D.I. water

5/27/08 JH Power Outage 5/~~27~~ 26/08 JH 5/27/08

7/24/08 Controller for Drawers C+D received from Canberra and put back into instrument. Gas line/flow for Drawer D does not appear to be working. Controller will be powered back down and the situation will be investigated
JP 7/25/08

7/25/08 All pucks were cleaned with radiac wash and rinsed with DI Water.
JP 7/25/08

7/31/08 Plateaus for Drawers C and D

Source Used β	Detectors	Source Used α
Sr/Y/90 - 406	C1 D1	410 - Am241
29,600 DPM - 407	C2 D2	411 - 17,800 dpm
9/15/92 - 408	C3 D3	412 - 2/06/95
↓ - 409	C4 D4	413 - ↓

Parameters:
Starting Voltage: 700
Ending Voltage: 1650
15 Volts/step
5 Min/step
50000 count preset

Filenames:
PTA0731C - Drawer C
PTA0731B - Drawer D

RG 10/8/08

8/5/06 Plateau's For Drawer D

Beta Sources Used		Detectors	Alpha Sources Used	
#406	Sr/Y/90	D1	#410	Am241
#407	29,600 DPM	D2	#411	17,800 DPM
#408	9/15/92	D3	#412	2/06/95
#409	↓	D4	#413	↓

Parameters:
Starting Voltage: 700
Ending Voltage: 1650
15 Volts/Step

Filename
PTD0805

SOP 724r 10

Date 9/18/07

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	☆								
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									LO 9/18/07
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	NA			
Dr B	↓			
Dr C	OL			
Dr D	↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	700	Dr A	0.15
	↓	Dr B	↓
Tank 2	1400	Dr C	
	↓	Dr D	

Comments: ☆ Drawers C & D are offline. Drawers A & B do not have a working calibration. LO 9/18/07

Page No.: 326262 A

Form 780r8.doc (6/23/06)

Reviewed By / Date V 9/19/07

Date 9/18/07

SOP 724r 1 6

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4	Plateaus	- -	-	5 step	954	LO	PTA0918A	LO
5-8	↓	-	-	↓	↓	↓	PTA0918B	↓

LO 9/18/07

Comments:

Page No.: 326262 B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date W.G. 9/19/07

Date 7/31/08 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	w	P			w	P			P
2	↓	↓			↓	↓			↓
3	↓	↓			↓	↓			↓
4	↓	↓			↓	↓			↓

Date 7/31/08 SOP 724r10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4	Daily EFF	-	-	30	850	ω	EFA0731	ω
1-4	Daily BKG	-	-	60	905	ω	BKA0731	ω
1	08071418-1	AB080721-3	αβ	240	1017	ω	ABA0731	ω
2	-1D	↓	↓	↓	↓	↓	↓	↓
3	↓ -1MS	↓	↓	60	1018	↓	ABA0731A	ω
4	AB080721-3LCS	↓	↓	↓	↓	↓	↓	↓
9-12	Alpha/Beta	Plateau	5/step	-	1037	ω	PTA0731C	ω
13-16	↓	↓	↓	-	↓	↓	PTA0731D	↓
1	08071052-1	SR080724-2	Sr 89	800	18:50	JRH	~~SR~~A0731	↓
2	↓ -1D	↓	↓	↓	↓	↓	SRA	↓
3	SR080729-2 MB	↓	↓	↓	↓	↓	↓	↓
4	↓ LCS	↓	↓	↓	↓	↓	↓	↓

JP 8/14/08

JP 8/1/08

Comments:

Page No.: 367322 B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By/Date: JP 8/1/08

Date 9/9/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JP	P			JP	P			P
2									
3									
4									
5	OL								
6									
7									
8									
9									
10									
11									
12									
13									
14									
15								JP 9/9/08	
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA0905W			
Dr B	OL			
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1700	Dr A	0.15
		Dr B	
Tank 2	900	Dr C	
		Dr D	

Comments:

Page No.: 367361 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JP 9/9/08

Date 9/9/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4	Daily Eff	—	—	30	7:30	JP	EFA0909	JP
1-4	Daily BKg	—	—	60	7:44	JP	BKA0909	JP
1-4	Alpha/Beta	Plateau	Plateau	5 Step	9:10	JP	PTA0909A	JP
3	08081391	TR080825-1	Ra226	30	17:42	JP	RDA0909	JP
4	-2							

JP 9/10/08

Comments:

Page No.: 367361 B

(cont. from page N/A B)

Form 780r8.doc (6/23/06)

Reviewed By/Date JP 9/10/08

Instrument ROIs

9/24/07 LO A working voltage could still not be found. It was assumed that the count preset was what governed how many counts were being recorded. Turns out that the plateau file was only gathering the counts for 5 minutes and not trying to hit the count preset. This was remedied by increasing the minutes per step to 15 minutes instead of 5 minutes. Two seperate plateaus were run (seperate alpha & beta ones) on 9/21/07 and 9/22/07.

Parameters
Starting Voltage: 300
Ending Voltage: 1800
15 Volts per step
15 min per step
50000 count preset ← over 1000 min

Filenames:
PTA0921 ⇒ alpha
PLAT0922 ⇒ beta
PTA0924B ⇒ both Archieved

9/26/07 LO ROIs set for drawer A and drawer B using the Sr/Y 90 Plateau sources.

9/27/07 LO Daily Efficiency
New "daily efficiency" Interim control limits using the efficiency run after new ROIs were set. (EFA0926) Historical control limits will be set after 30 data points have been accumulated.

Weekly & Daily Backgrounds
New "weekly background" Interim control limits using the weekly background run after new ROIs were set. (BKA0926W). Historical control limits will be set after 10 data points have been accumulated.

Continued on Page

Read and Understood By

Sara Urban — Signed — 9/24/07 — Date
Renee Allen — Signed — 10/15/08 — Date

8/5/08 Plateaus For Drawer D

Beta Sources Used		Detectors	Alpha Sources Used	
#406	Sr/Y/90	D1	#410	Am241
#407	29,600 DPM	D2	#411	17,800 DPM
#408	9/15/92	D3	#412	2/06/95
#409	↓	D4	#413	↓

Parameters:
Starting Voltage: 700
Ending Voltage: 1650
15 Volts/Step
5 Min/Step
50,000 Count Preset

Filename
PTD0805

8/8/08 ROI's Set for Drawer C using Sr/Y-90 Plateau Sources

9/9/08 Plateaus For Drawer A

Beta Sources Used		Detectors	Alpha Sources Used	
#406	Sr/Y-90	A1	#410	Am241
#407	26,900 dpm	A2	#411	17,800 dpm
#408	9/15/92	A3	#412	2/06/95
#409	↓	A4	#413	↓

Parameters

Starting Voltage: 700
Ending Voltage: 1650
30 Volts/Step

Filename
PTA0909A

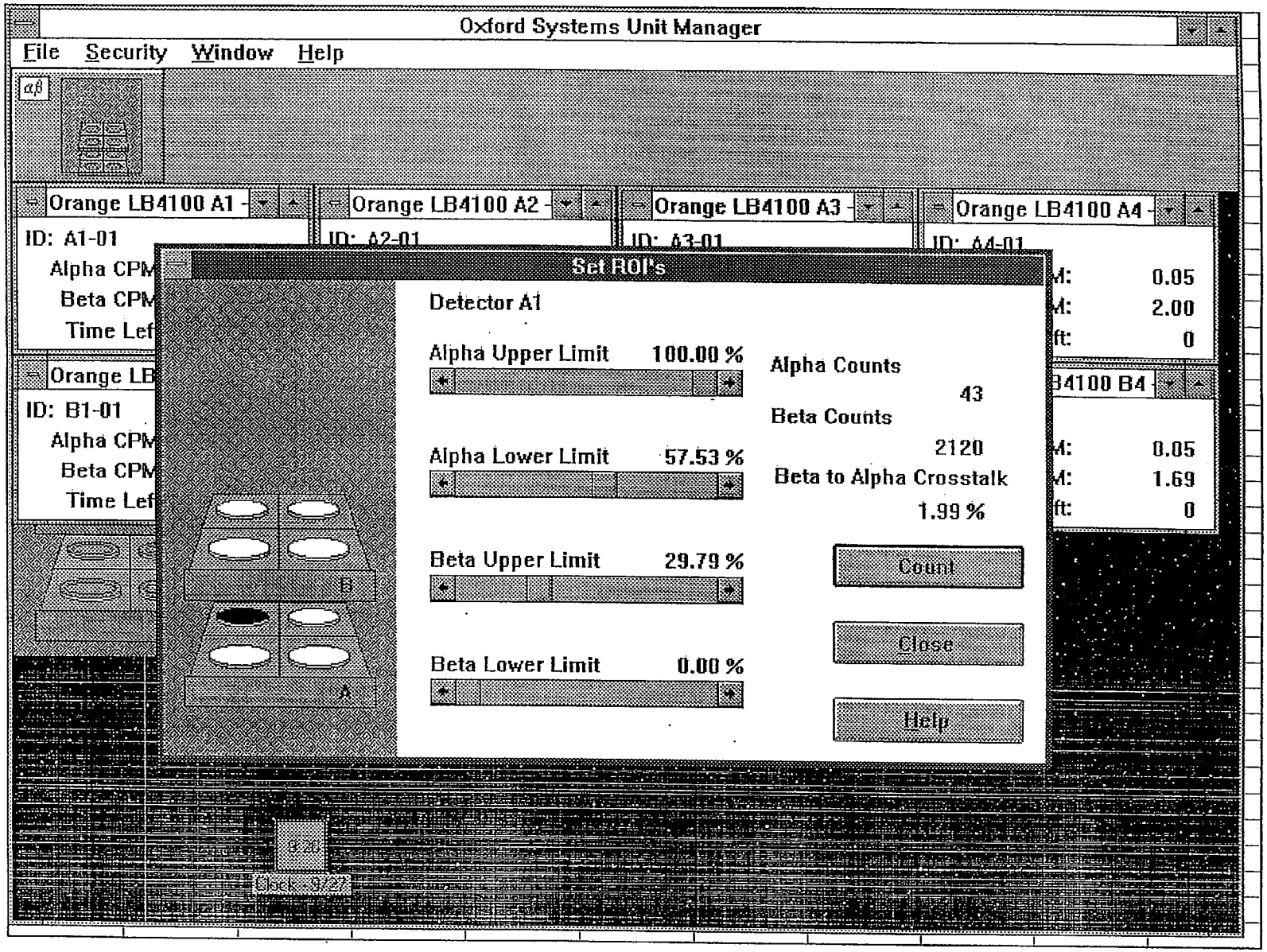
[redacted]

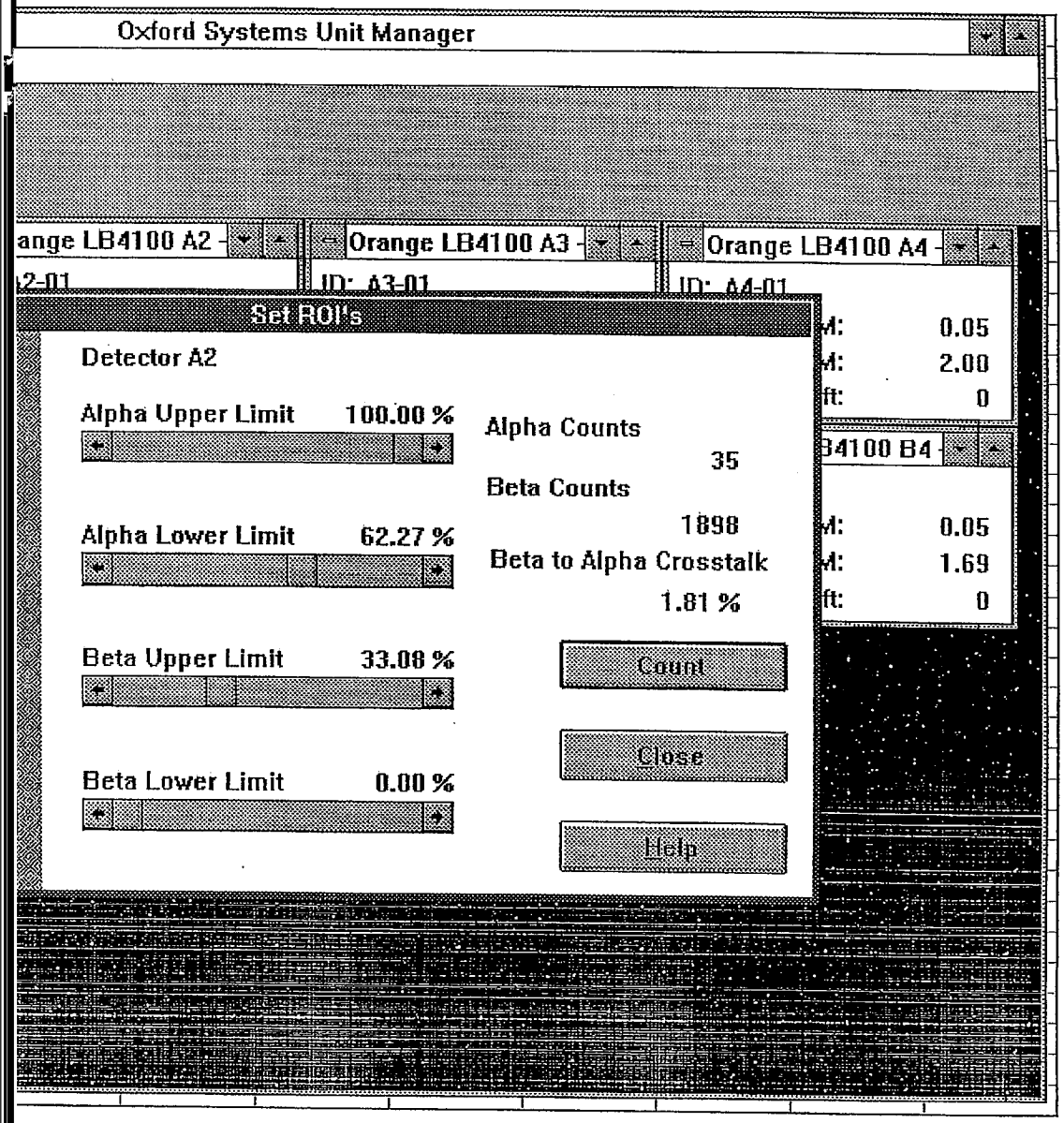
LB4100-A/W Sample Counting Parameters for LIMS

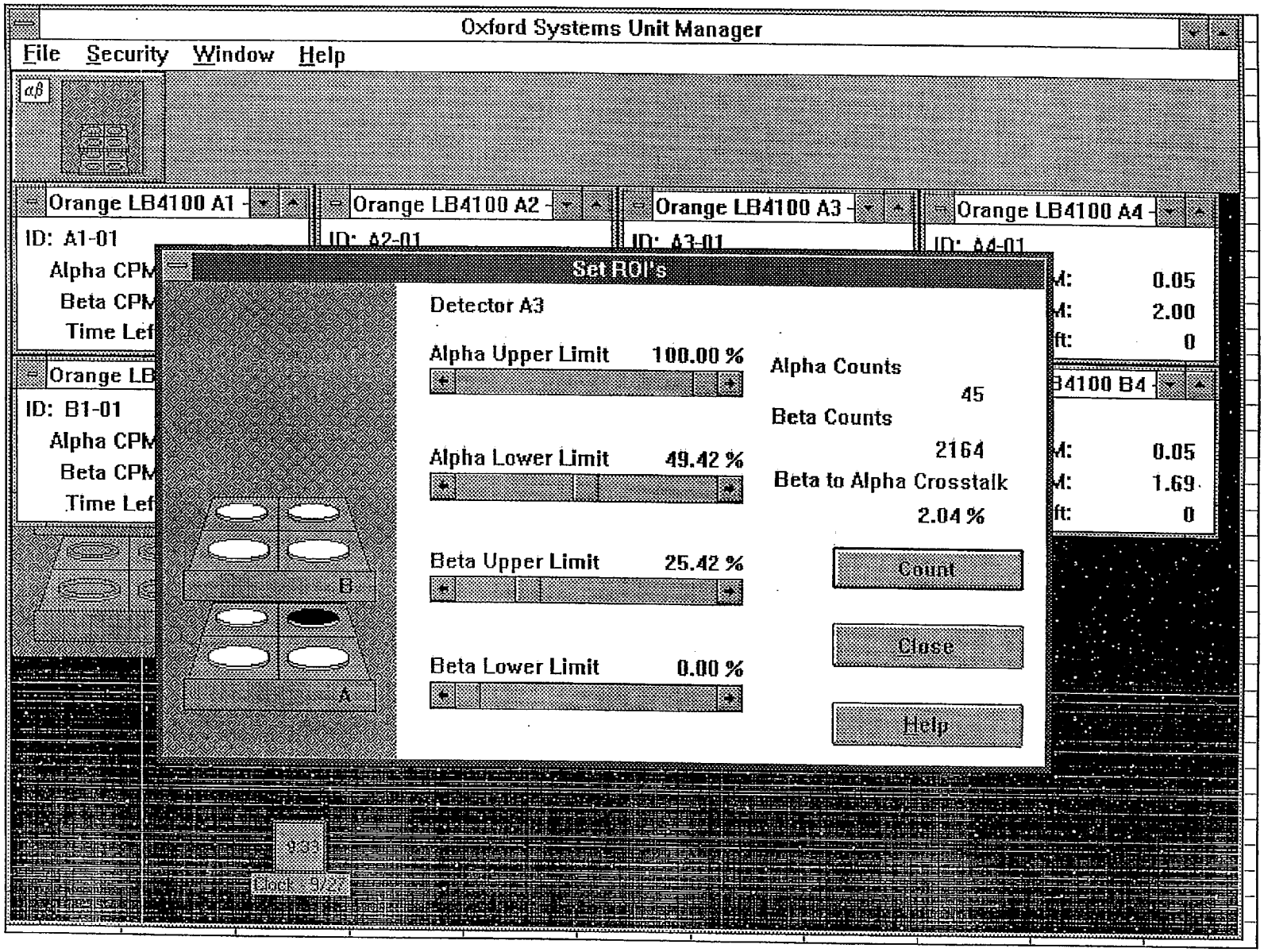
	Date/Time	Official	Bias	Step
A	9/18/07 9:58	TRUE	1420	0
B	9/24/07 12:21	TRUE	1500	0
C	7/31/08 10:42	TRUE	1435	0
D	8/5/08 11:19	TRUE	1500	0

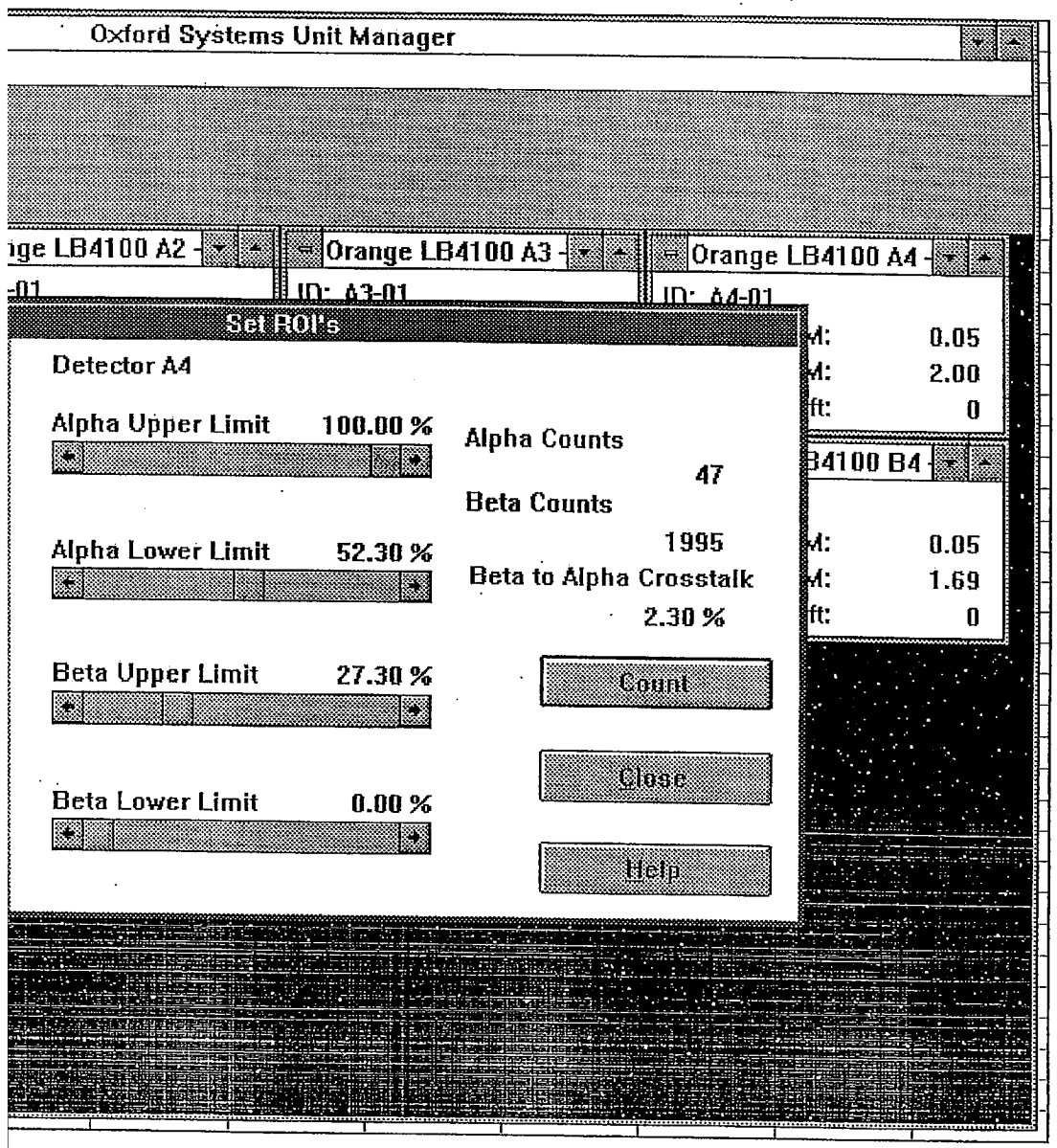
Detector Specific:

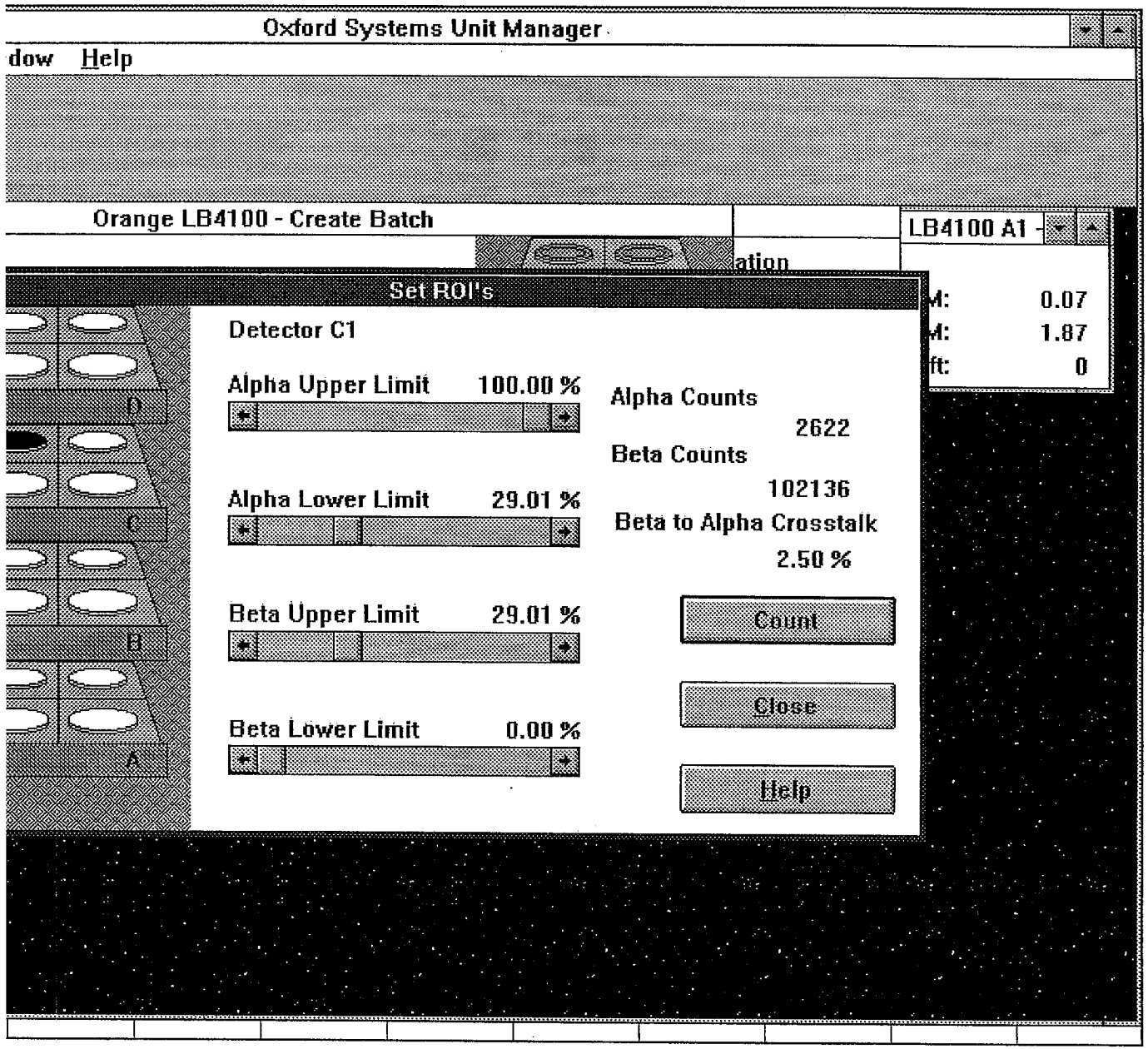
	Date/Time	Official	Threshold	bLL	bUL	aLL	aUL
A1	9/26/07 0:00	TRUE	0.1	0	29.79	57.53	100
A2	9/26/07 0:00	TRUE	0.1	0	33.08	62.27	100
A3	9/26/07 0:00	TRUE	0.1	0	25.42	49.42	100
A4	9/26/07 0:00	TRUE	0.1	0	27.3	52.3	100
B1	9/26/07 0:00	TRUE	0.1	0	48.74	90.2	100
B2	9/26/07 0:00	TRUE	0.1	0	17.26	39.75	100
B3	9/26/07 0:00	TRUE	0.1	0	17.53	37.8	100
B4	9/26/07 0:00	TRUE	0.1	0	15.75	35.31	100
C1	8/8/08 0:00	TRUE	0.1	0	29.01	56.19	100
C2	8/8/08 0:00	TRUE	0.1	0	30.94	58.19	100
C3	8/8/08 0:00	TRUE	0.1	0	35.84	69.27	100
C4	8/8/08 0:00	TRUE	0.1	0	33.67	64.05	100
D1	8/26/08 0:00	TRUE	0.1	0	58.82	59.48	100
D2	8/26/08 0:00	TRUE	0.1	0	55.92	55.92	100
D3	8/26/08 0:00	TRUE	0.1	0	8.76	8.74	100
D4	8/26/08 0:00	TRUE	0.1	0	12.89	12.89	100

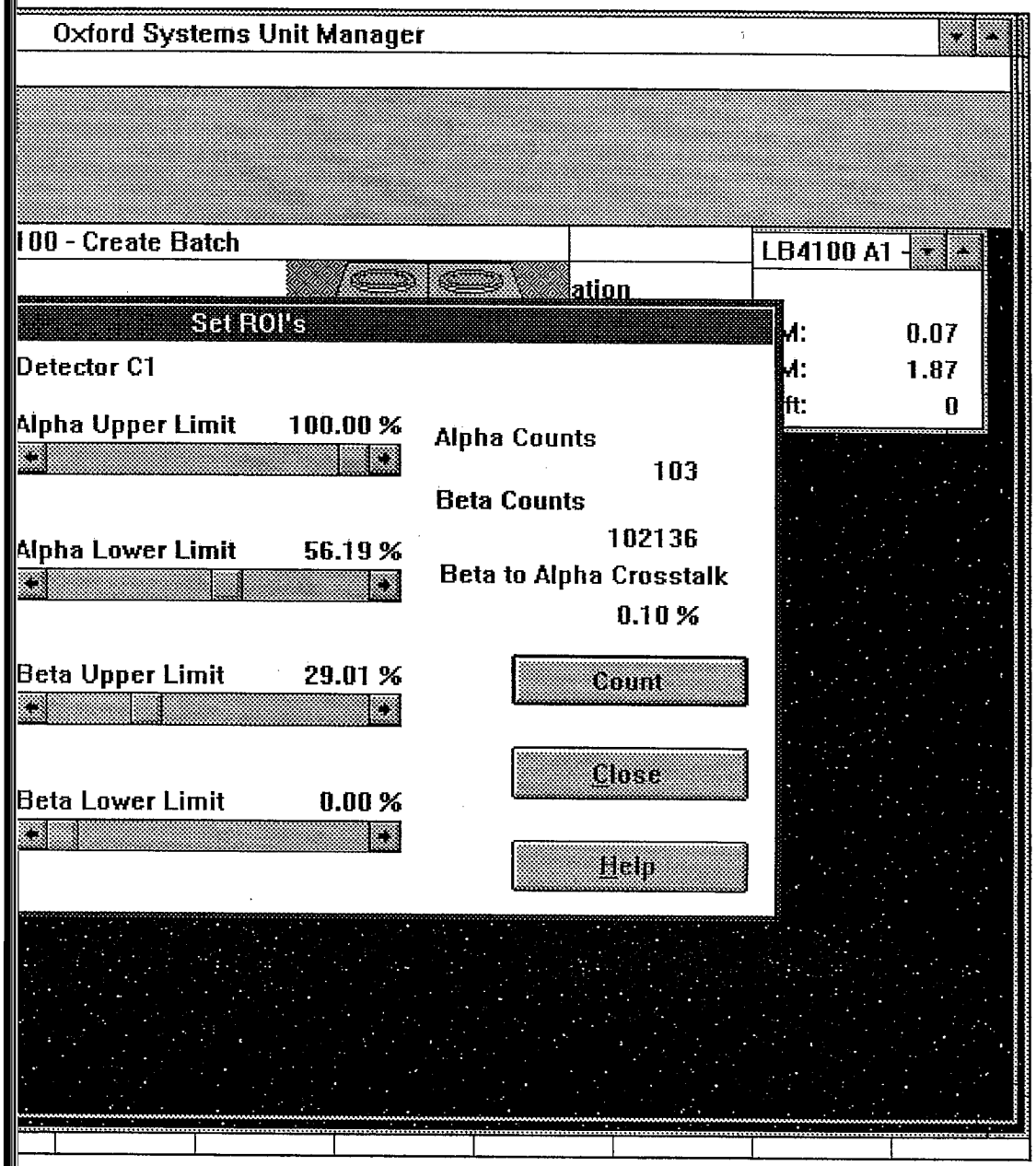

Oxford Systems Unit Manager
File
Security
Window
Help
Orange LB4100 A1
ID: A1-01
Alpha CPM
Beta CPM
Time Lef
Orange LB4100 A2
ID: A2-01
Orange LB4100 A3
ID: A3-01
Orange LB4100 A4
ID: A4-01
0.05
2.00
0
Orange LB
ID: B1-01
Alpha CPM
Beta CPM
Time Lef
B4100 B4
0.05
1.69
0
Set ROI's
Detector A1
Alpha Upper Limit 100.00 %
Alpha Lower Limit 57.53 %
Beta Upper Limit 29.79 %
Beta Lower Limit 0.00 %
Alpha Counts
43
Beta Counts
2120
Beta to Alpha Crosstalk
1.99 %
Count
Close
Help
B
A
9:20
Clock 9/27

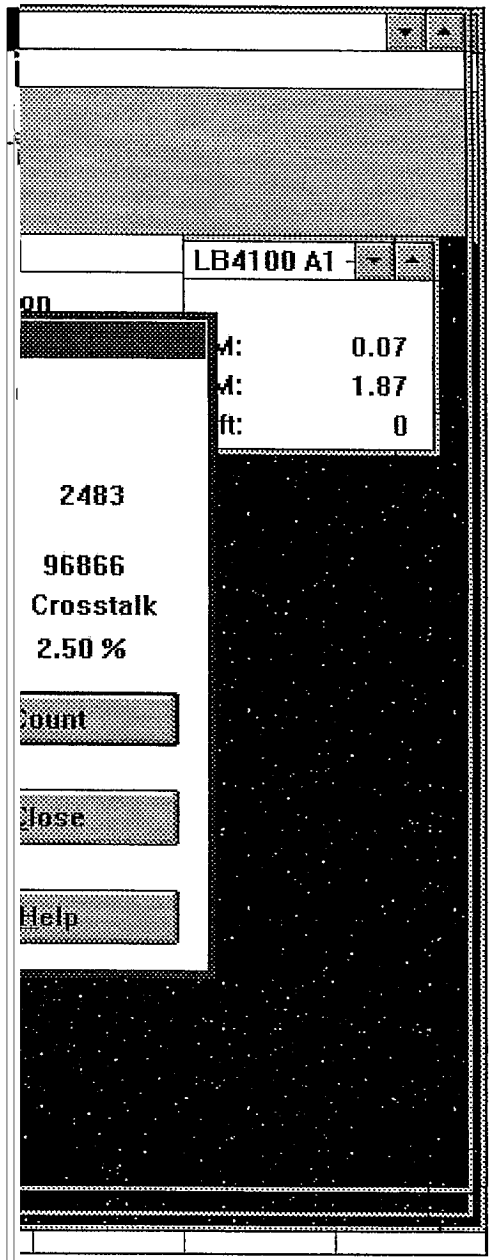

Oxford Systems Unit Manager
ange LB4100 A2
Orange LB4100 A3
Orange LB4100 A4
ID: A3-01
ID: A4-01
Set ROI's
Detector A2
Alpha Upper Limit 100.00 %
Alpha Lower Limit 62.27 %
Beta Upper Limit 33.08 %
Beta Lower Limit 0.00 %
Alpha Counts
35
Beta Counts
1898
Beta to Alpha Crosstalk
1.81 %
Count
Close
Help
0.05
2.00
0
B4100 B4
0.05
1.69
0

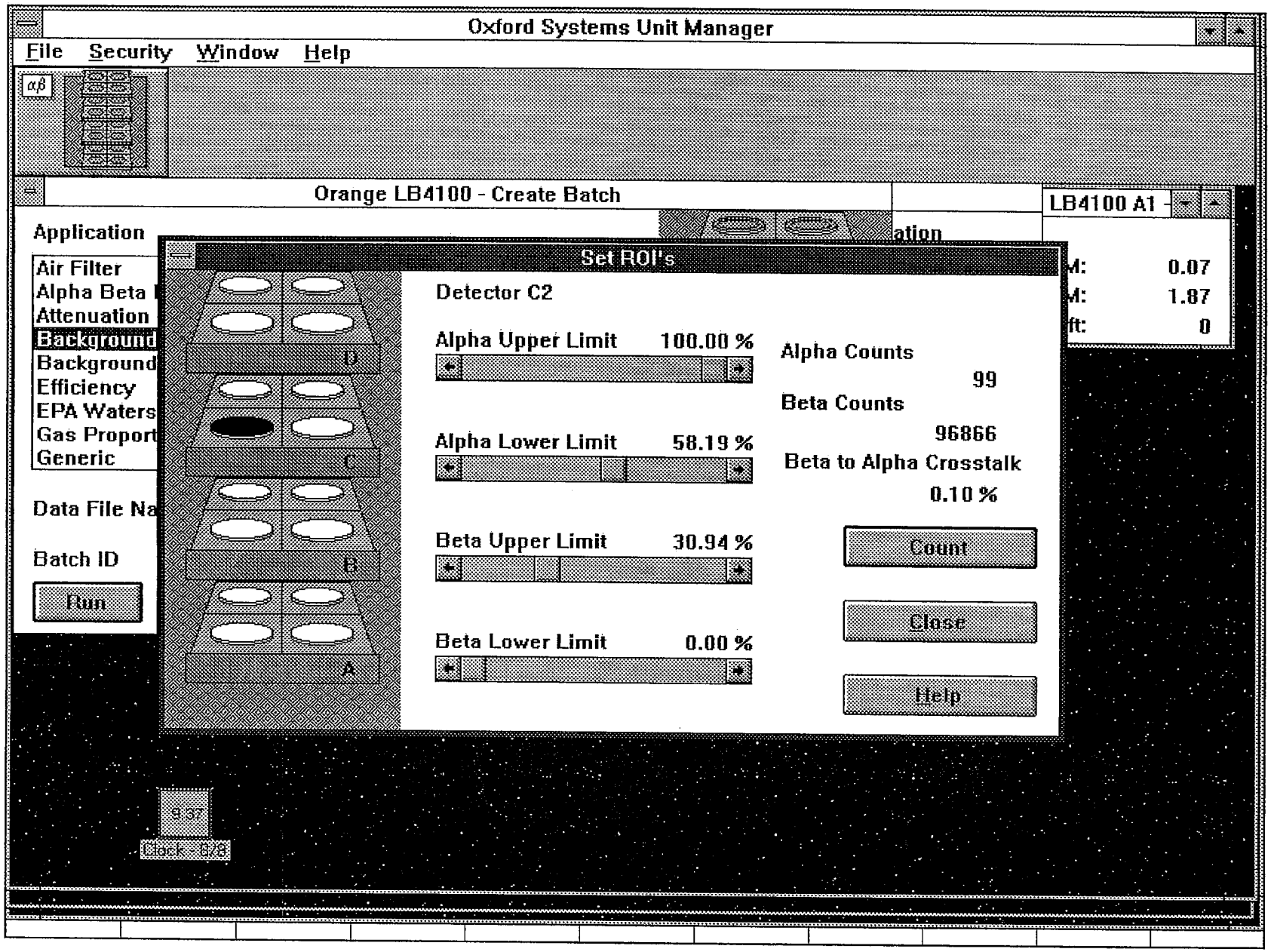

Oxford Systems Unit Manager
File Security Window Help
Orange LB4100 A1
ID: A1-01
Alpha CPM
Beta CPM
Time Lef
Orange LB4100 A2
ID: A2-01
Orange LB4100 A3
ID: A3-01
Orange LB4100 A4
ID: A4-01
0.05
2.00
0
Orange LB
ID: B1-01
Alpha CPM
Beta CPM
Time Lef
4100 B4
0.05
1.69
0
Set ROI's
Detector A3
Alpha Upper Limit 100.00 %
Alpha Lower Limit 49.42 %
Beta Upper Limit 25.42 %
Beta Lower Limit 0.00 %
Alpha Counts
45
Beta Counts
2164
Beta to Alpha Crosstalk
2.04 %
Count
Close
Help
B
A
933
Clock 9/27

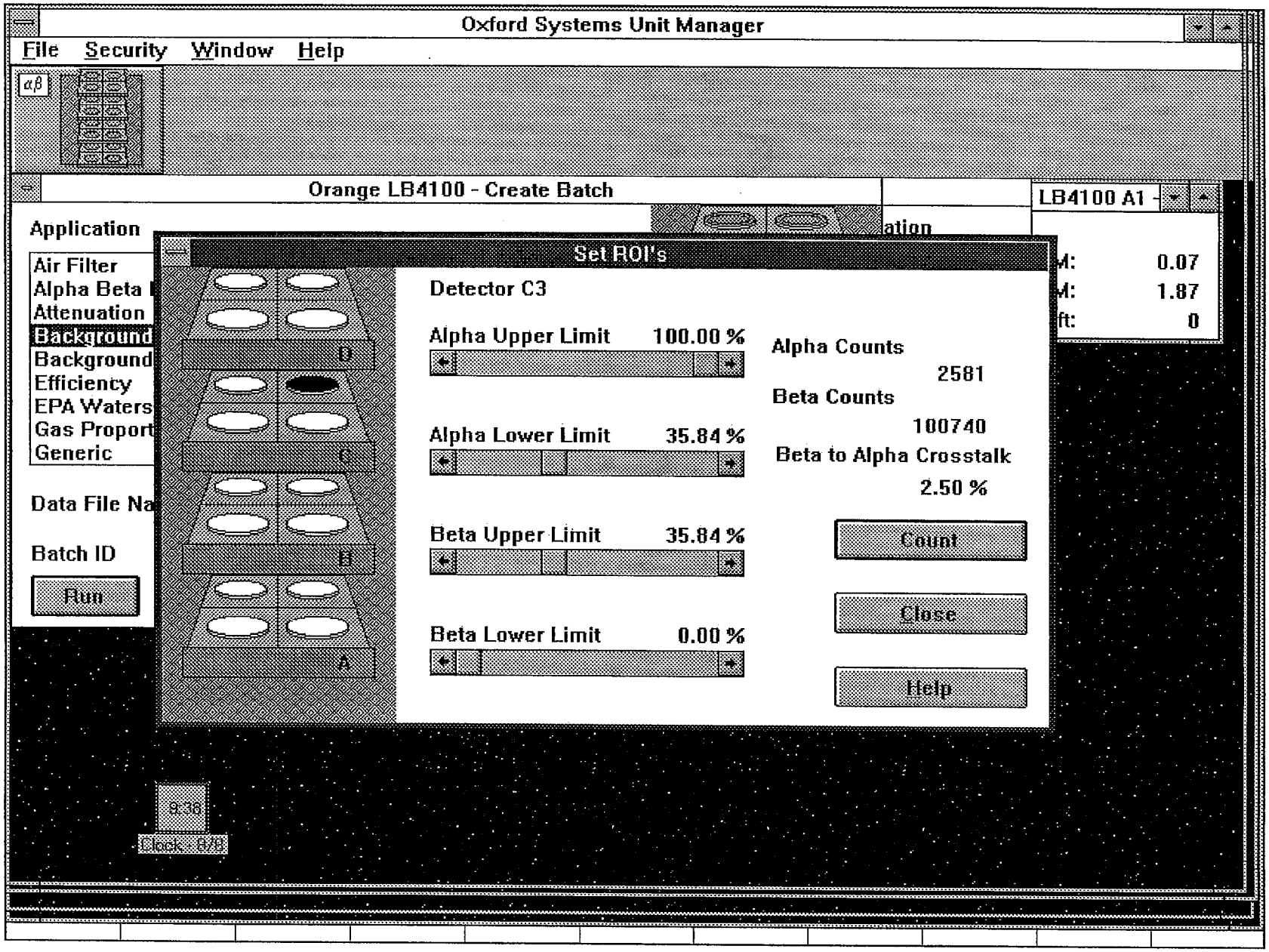

Oxford Systems Unit Manager
Orange LB4100 A3
ID: A3-01
Orange LB4100 A4
ID: A4-01
0.05
2.00
0
0.05
1.69
0
Set ROI's
Detector A4
Alpha Upper Limit 100.00 %
Alpha Lower Limit 52.30 %
Beta Upper Limit 27.30 %
Beta Lower Limit 0.00 %
Alpha Counts
47
Beta Counts
1995
Beta to Alpha Crosstalk
2.30 %
Count
Close
Help

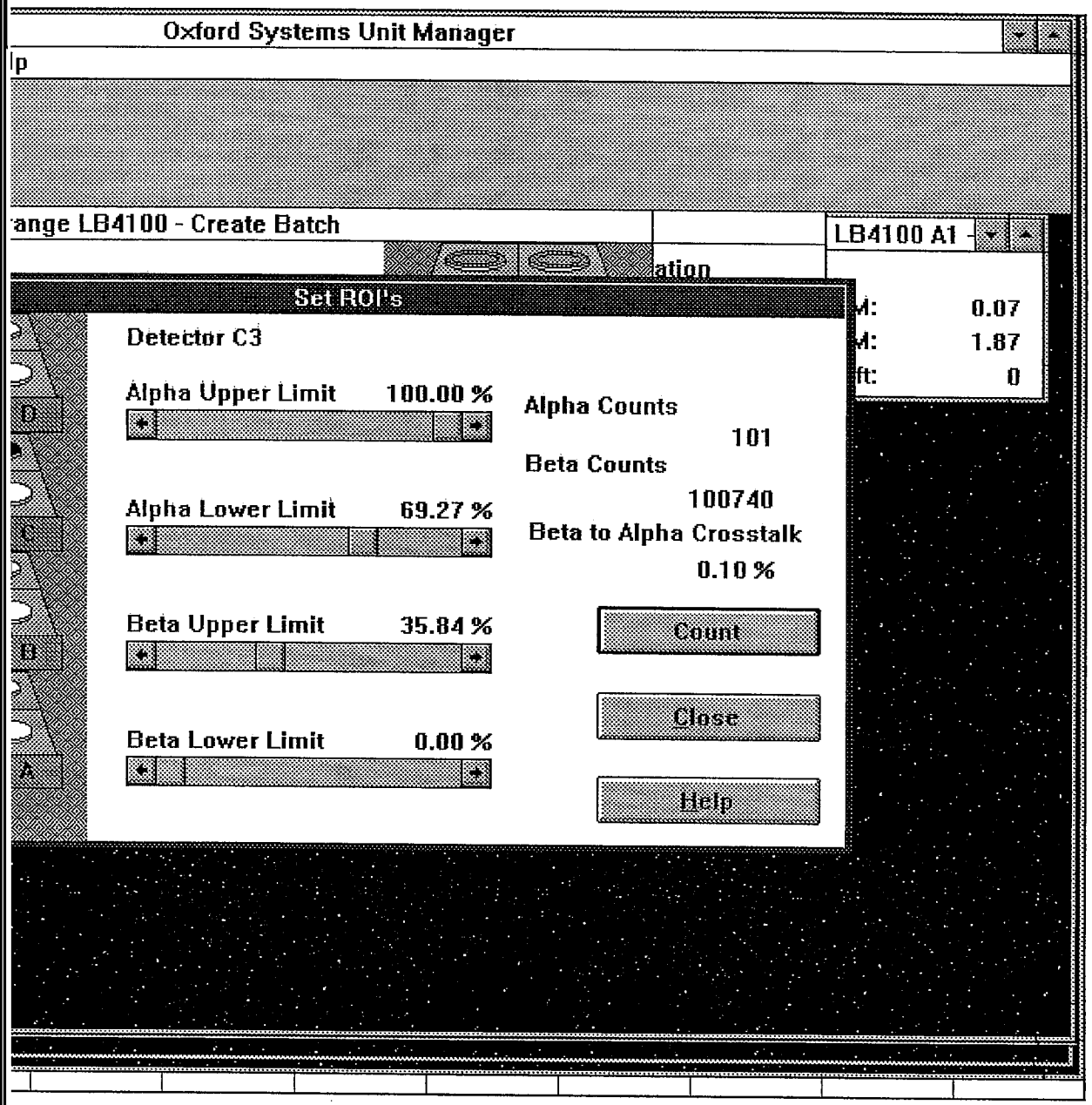

Oxford Systems Unit Manager
dow Help
Orange LB4100 - Create Batch
LB4100 A1
ation
M: 0.07
M: 1.87
ft: 0
Set ROI's
Detector C1
Alpha Upper Limit 100.00 %
Alpha Lower Limit 29.01 %
Beta Upper Limit 29.01 %
Beta Lower Limit 0.00 %
Alpha Counts
2622
Beta Counts
102136
Beta to Alpha Crosstalk
2.50 %
Count
Close
Help
D
C
B
A

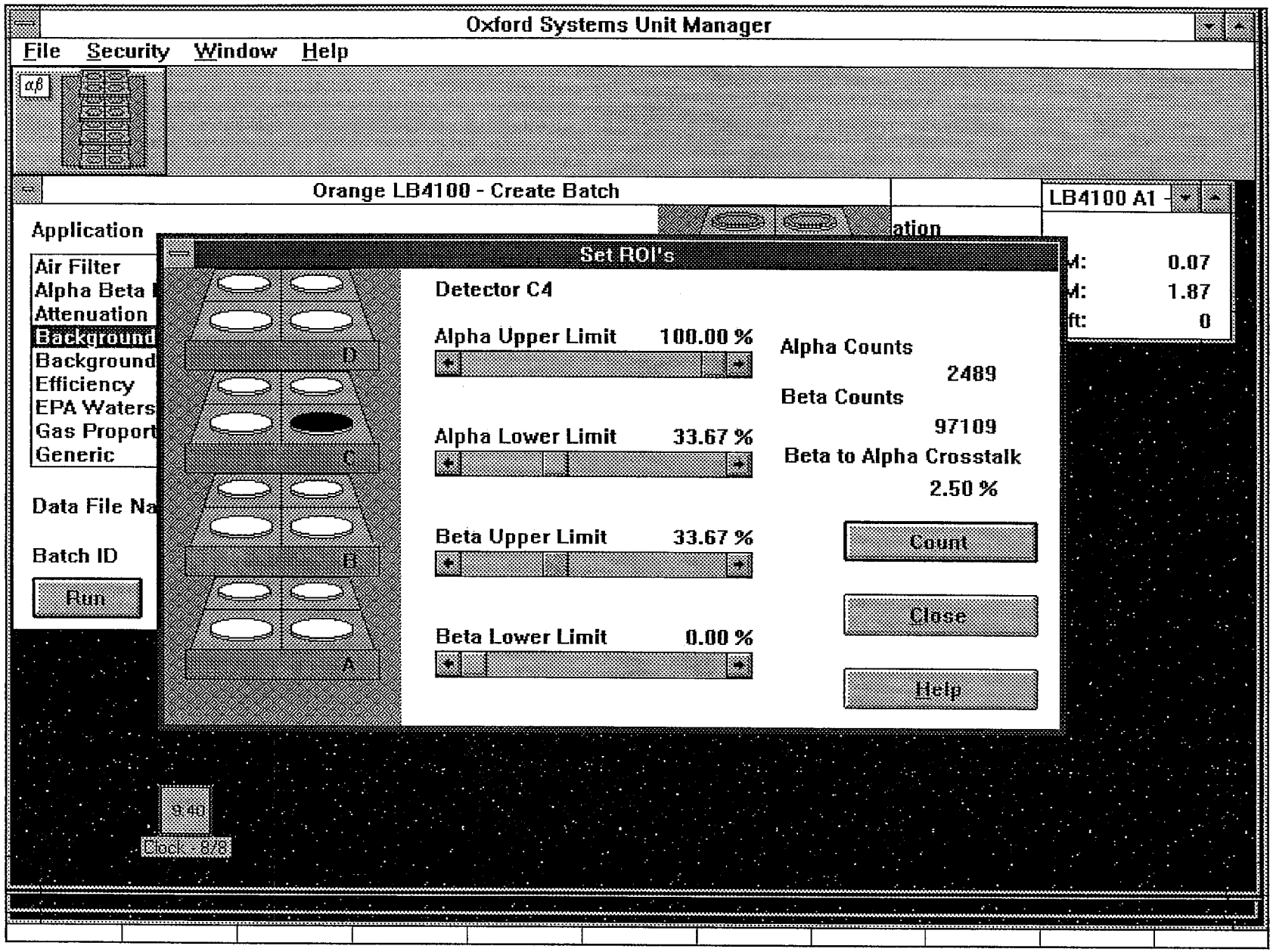

Oxford Systems Unit Manager
100 - Create Batch
LB4100 A1
ation
Set ROI's
Detector C1
Alpha Upper Limit 100.00 %
Alpha Lower Limit 56.19 %
Beta Upper Limit 29.01 %
Beta Lower Limit 0.00 %
Alpha Counts
103
Beta Counts
102136
Beta to Alpha Crosstalk
0.10 %
Count
Close
Help
M: 0.07
M: 1.87
ft: 0

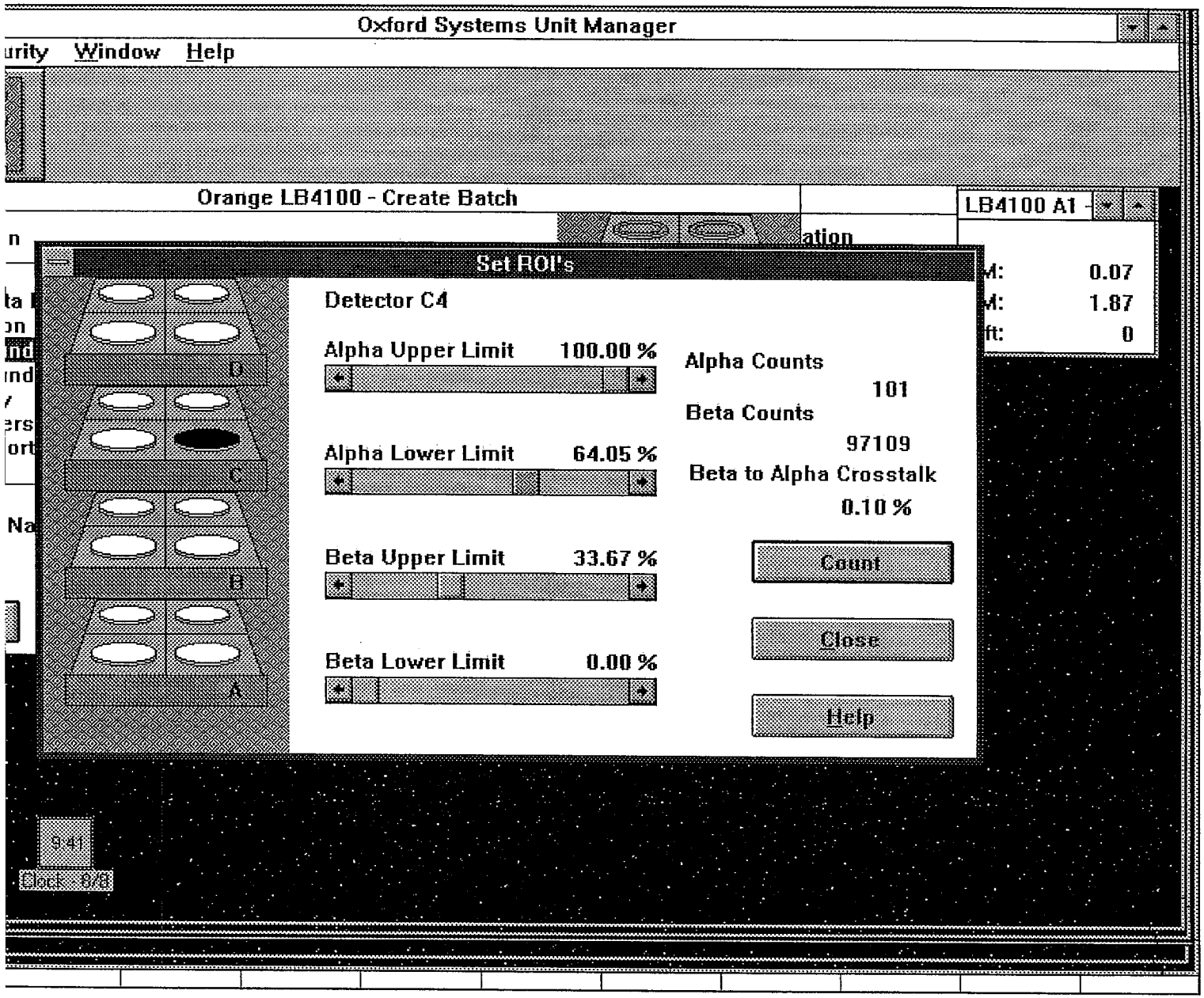

LB4100 A1
0.07
1.87
0
2483
96866
Crosstalk
2.50 %
Help


Oxford Systems Unit Manager
File Security Window Help
Orange LB4100 - Create Batch
Application
Air Filter
Alpha Beta
Attenuation
Background
Background
Efficiency
EPA Waters
Gas Proport
Generic
Data File Na
Batch ID
Run
LB4100 A1
M: 0.07
M: 1.87
ft: 0
Set ROI's
Detector C2
Alpha Upper Limit 100.00 %
Alpha Lower Limit 58.19 %
Beta Upper Limit 30.94 %
Beta Lower Limit 0.00 %
Alpha Counts
99
Beta Counts
96866
Beta to Alpha Crosstalk
0.10 %
Count
Close
Help
D
C
B
A
9:37
Clock - 6/8


Oxford Systems Unit Manager
File Security Window Help
Orange LB4100 - Create Batch
LB4100 A1
Application
Air Filter
Alpha Beta
Attenuation
Background
Background
Efficiency
EPA Waters
Gas Proport
Generic
Data File Na
Batch ID
Run
Set ROI's
Detector C3
Alpha Upper Limit 100.00 %
Alpha Lower Limit 35.84 %
Beta Upper Limit 35.84 %
Beta Lower Limit 0.00 %
Alpha Counts
2581
Beta Counts
100740
Beta to Alpha Crosstalk
2.50 %
Count
Close
Help
D
C
B
A
0.07
1.87
0
9:36
Clock : 6/8


Oxford Systems Unit Manager
lp
ange LB4100 - Create Batch
LB4100 A1
ation
Set ROI's
Detector C3
Alpha Upper Limit 100.00 %
Alpha Lower Limit 69.27 %
Beta Upper Limit 35.84 %
Beta Lower Limit 0.00 %
Alpha Counts
101
Beta Counts
100740
Beta to Alpha Crosstalk
0.10 %
Count
Close
Help
0.07
1.87
0


Oxford Systems Unit Manager
File Security Window Help
Orange LB4100 - Create Batch
LB4100 A1
Application
Air Filter
Alpha Beta
Attenuation
Background
Background
Efficiency
EPA Waters
Gas Proport
Generic
Data File Na
Batch ID
Run
0.07
1.87
0
Set ROI's
Detector C4
Alpha Upper Limit 100.00 %
Alpha Lower Limit 33.67 %
Beta Upper Limit 33.67 %
Beta Lower Limit 0.00 %
Alpha Counts
2489
Beta Counts
97109
Beta to Alpha Crosstalk
2.50 %
Count
Close
Help
D
C
B
A
9:40
Clock - 8/8


Oxford Systems Unit Manager
urity Window Help
Orange LB4100 - Create Batch
LB4100 A1
0.07
1.87
0
Set ROI's
Detector C4
Alpha Upper Limit 100.00 %
Alpha Lower Limit 64.05 %
Beta Upper Limit 33.67 %
Beta Lower Limit 0.00 %
Alpha Counts
101
Beta Counts
97109
Beta to Alpha Crosstalk
0.10 %
Count
Close
Help
D
C
B
A
9:41
Clock - 8/8

Calibration Efficiencies

Sr-90 FLAT Planchet Efficiency Calibration
LB4100-A
Date: 10/1/2008
Source ID: 1195

Det ID	A1	A2	A3	A4	B1	B2	B3	B4
File Name	ESF1001	ESF1001	ESF1001	ESF1001	N.A.	N.A.	N.A.	N.A.
Cnt Time	27.25	27.34	27.62	27.25	N.A.	N.A.	N.A.	N.A.
Tot Cnts	10006	10003	10006	10004	N.A.	N.A.	N.A.	N.A.
Bkg CPM	1.968	1.918	2.014	1.945	N.A.	N.A.	N.A.	N.A.
CPM	365.2247	363.9562	360.2597	365.1743	N.A.	N.A.	N.A.	N.A.
Alpha EFF	0.000251	0.000541	0.000292	0.000577	N.A.	N.A.	N.A.	N.A.
Beta EFF	0.413985	0.412547	0.408357	0.413928	N.A.	N.A.	N.A.	N.A.
Efficiency	**0.4140**	**0.4125**	**0.4084**	**0.4139**	N.A.	N.A.	N.A.	N.A.

Det ID	C1	C2	C3	C4	D1	D2	D3	D4
File Name	ESF1001A	ESF1001A	ESF1001A	ESF1001A	N.A.	N.A.	N.A.	N.A.
Cnt Time	26.64	25.63	26.18	25.18	N.A.	N.A.	N.A.	N.A.
Tot Cnts	10003	10005	10000	10002	N.A.	N.A.	N.A.	N.A.
Bkg CPM	1.771	1.808	1.752	1.757	N.A.	N.A.	N.A.	N.A.
CPM	373.7170	388.5549	380.2190	395.4630	N.A.	N.A.	N.A.	N.A.
Alpha EFF	0.000443	0.000358	0.000192	0.000162	N.A.	N.A.	N.A.	N.A.
Beta EFF	0.423611	0.440430	0.430981	0.448261	N.A.	N.A.	N.A.	N.A.
Efficiency	**0.4236**	**0.4404**	**0.4310**	**0.4483**	N.A.	N.A.	N.A.	N.A.

Sr-90 FLAT Planchet
LB4100-A

10/1/2008	Efficiency 2007	Efficiency 2008	% Diff
Det #			
A1	0.4075	0.4140	1.60
A2	0.4060	0.4125	1.60
A3	0.4077	0.4084	0.17
A4	0.4045	0.4139	2.32
C1	0.4060	0.4236	4.33
C2	0.4213	0.4404	4.53
C3	0.4260	0.4310	1.17
C4	0.4375	0.4483	2.47

Application Revision: A

ev	Date	Status	Alpha/Beta Archive File
10	6-Apr-04	PA	Am241Wipe-10/08
.20	10-Dec-01	PA	Sr90Wipe-10/08
71	6-Jun-01	PA	Am241-10/08
35	2-Dec-04	PA	Sr90R-10/08
0	18-Mar-99	PA	Sr90F-10/08
63	9-Jun-08	PA	Sr89-10/08
68	28-Jan-05	PA	TRA-10/08
37	13-Jul-04	PA	Th230-10/08

Date 10/1/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Daily Response Check Start 1	Status	Start 2	Status		Background Check Start 1	Status	Start 2	Status	Det. Status
1	JP	P			JP	P			P	
2										
3										

Date 10/1/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4,9-12	Daily Eff	—	—	30	7:23	JP	EFA1001	JP
1-4,9-12	Daily BKs	—	—	60	7:32	JP	BKA1001	JP
1	1191	Am Wipe Eff	α	30	8:59	JP	EAW1001 A	JP
2					9:06		B	JP
3					9:18		C	JP
4					9:28		D	JP
9					9:35		E	JP
10					9:48		F	JP
11					9:56		G	JP
12					10:03			JP
12	1192	Sr Wipe Eff	β	30	8:59	JP	ESW1001 A	JP
11					9:06		B	JP
10					9:18		C	JP
9					9:28		D	JP
4					9:35		E	JP
3					9:48		F	JP
2					9:56		G	JP
1					10:03			JP
1-4	1193	Am241 Eff	α	30	10:12	JP	EAM1001	JP

Date 10/2/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JP	P			JP	JP 10/2/08 ~~R~~ Hα	JP	P	P
2						P			
3									
4									
5	OL								
6									
7								JP 10/2/08	
8									
9	JP	P			JP	P			P
10						Hα	JP	P	
11						P			
12									
13	OL								
14									
15								JP 10/2/08	
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA0927W			
Dr B	OL			
Dr C	BKA0927W			
Dr D	OL			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1100	Dr A	0.15
		Dr B	
Tank 2	925	Dr C	
		Dr D	

Comments:

Page No.: 367383 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JP 10/2/08

Paragon Analytics

SAMPLES / Ra/Sr Lab

Sr _____ Analytical Batch _____

Superseded _____

Remarks	Det. No.	Filename	POS Ckd By

ate 12/15/04 QASS? (Y / N) No. _____

PIPET

Decay / rrected — Relinquished by / Date — Received by / Date

3-007	1	12/15/04	
1	2		

12/15/04

L79055 B

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Initials [illegible] Date 12/15/04 Method (SOP / Rev) 707R8 Matrix LIQUID

COMMENTS

^{90}Sr CALIBRATION

- ~2.5 ml 16N HNO_3 ADDED TO PLANCHETS
- SPIKE ADDED TO PLANCHETS
- DRIED ON HOTPLATE

[illegible] 12/15/04

Reviewed by / Date [illegible] 12/15/04

Sr-90 Calculatons

Sample ID	Sample D & T	Sep. D & T	Count D & T	Ct Dur	Init Vol	Calc Vol	Gross CPM	BKG CPM	Net CPM	Efficieny	Yield
0424028-S1	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 13:09	10	1.0000	0.980	406.500	1.453	405.047	0.4337	1.000
0424028-S2	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 14:50	10	1.0000	0.980	409.000	1.453	407.547	0.4337	1.000
0424028-S3	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 15:11	10	1.0000	0.980	411.200	1.453	409.747	0.4337	1.000
0424028-S4	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 15:27	10	1.0000	0.980	420.500	1.453	419.047	0.4337	1.000
0424028-S5	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 15:45	10	1.0000	0.980	396.200	1.453	394.747	0.4337	1.000

Sample ID	Spike Soln	Ref Date	Sr-90 Activity DPM/mL	Sr-90 Spike Vol mL	Sr-90 Act pCi Added
0424028-S1	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S2	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S3	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S4	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S5	514.1572.73	3/18/1999	55.50	10.0	249.992

Mean=	408.680		
StDev=	8.756		
2 Sig LCL=	391.168	1 Sig LCL=	399.924
2 Sig UCL=	426.192	1 Sig UCL=	417.436

0424028-S5 is rejected as the outlier

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision: 2
Application Version: Standard
Rev.12/29/03 JE

Data file name: SRB1111
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 13:19

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9998
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b *m^-mass		**Beta to Alpha X-talk y = b*mass + m**	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
A1	0424028-S1	11/11/06 13:19	10.00	0.0	0.500	0.052	0.203	0.2316	1.170	n/a	n/a	406.500	1.453	0.1159	0.4337	0.979	n/a	n/a

W 9/27/07

:ground logfile: BKGABW
ate of Bkg. Cal: 11/11/06
ficiency logfile: AmR-11/05
ion calibration: AM0106
ficiency logfile: Sr90R-11/05
ion calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^{a*(mass-x0)}		y = b*m^{a*(mass-x0)}	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9998
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

ity			Beta Activity						
Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
1.170	n/a	n/a	409.000	1.453	0.0927	0.4337	0.979	n/a	n/a

WO
9/27/07

ackground logfile: BKGABW
Date of Bkg. Cal: 11/11/06
efficiency logfile: AmR-11/05
uation calibration: AM0106
efficiency logfile: Sr90R-11/05
uation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^{a*(mass-x0)}		y = b*m^{a*(mass-x0)}	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9999
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

tivity				Beta Activity						
se f	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
16	1.170	n/a	n/a	411.200	1.453	0.2086	0.4337	0.979	n/a	n/a

nal Sample Analysis LB4100-B

pe: LB4100 -B
e ID: Aqua
de: Simultaneous
on: 2
ion: Standard
JE

Data file name: SRB1111F
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:37

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9996
a=	0.7986	a=	1.3059
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b *m^-mass		**Beta to Alpha X-talk y = b*mass + m**	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Beta Activity Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
	11/11/06 15:37	10.00	0.0	0.600	0.052	0.210	0.2316	1.170	n/a	n/a	420.500	1.453	0.1391	0.4337	0.979	n/a	n/a

6
1/22/07

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9998
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

Beta Activity					
Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
1.453	0.1391	0.4337	0.979	n/a	n/a

100

10
2/27/05

Date 11/11/06 SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1 ☆	Status	Start 2	Status	Det. Status
1	LO	P							P
2									Hα
3									P
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									Hα
15									P
16									Hβ

LO 11/11/06

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1110W	LO	2 HB	BKB1111W
Dr B				
Dr C				
Dr D		LO	14 P 16 HB	BKB1111W

Dr = Drawer

☆ Daily Bkg not run due to weekly Bkg run the

Gas Supply

P-10 Supply		P-10 Flow	
	2000	Dr A	6.15

Date 11/11/06

SOP 724r 9

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	1039	LO	EFB1111	LO
1	1156	Ra226 Eff	Ra226	30	1103	LO	ERA1111A	LO
2	↓	↓	↓	↓	↓	↓	↓	↓
3	↓	↓	↓	↓	↓	↓	↓	↓
4	↓	↓	↓	↓	↓	↓	↓	↓
5	1156	Ra226Eff	Ra226	30	1118	LO	ERA1111B	LO
6	↓	↓	↓	↓	↓	↓	↓	↓
7	↓	↓	↓	↓	↓	↓	↓	↓
8	↓	↓	↓	↓	↓	↓	↓	↓
9	1156	Ra226Eff	Ra226	30	1130	LO	ERA1111C	LO
10	↓	↓	↓	↓	↓	↓	↓	↓
11	↓	↓	↓	↓	↓	↓	↓	↓
12	↓	↓	↓	↓	↓	↓	↓	↓
13	1156	Ra226Eff	Ra226	30	1141	LO	ERA1111D	LO
14	↓	↓	↓	↓	↓	↓	↓	↓
15	↓	↓	↓	↓	↓	↓	↓	↓
16	↓	↓	↓	↓	↓	↓	↓	↓
1	Alpha	R01 Test	α	10	1117	LO	ABB1111	LO
7	Alpha	R01 Test	α	10	1130	LO	ABB1111A	LO
1	Beta	R01 Test	β	10	1143	LO	ABB1111B	LO
3	Alpha	↓	α	↓	↓	↓	↓	↓
9	Beta	R01 Test	β	10	1200	LO	ABB1111C	LO
4	Alpha	↓	α	↓	↓	↓	↓	↓
3	Beta	↓	↓	↓	1216	LO	ABB1111D	LO
5	Alpha	↓	↓	↓	↓	↓	↓	↓
1	0424028-S1	Outlier	Sr90	10	1308	LO	SRB1111	LO
5	0615044-S1	Outlier	α ~~β~~ LO 11/11/06	10	1310	LO	ABB1111E	↓
9	0614030-S1	Outlier	β	10	1312	LO	ABB1111F	↓
13	0615038-S1	Outlier	Sr89	10	1314	LO	SRB1111A	↓
LO 11/11/06 1	0~~6~~424028-S2	↓	Sr90	↓	1450	LO	SRB1111B	LO
5	0615044-S2	↓	α	↓	1451	↓	ABB1111G	↓
9	0614030-S2	↓	β	↓	1452	↓	ABB1111H	↓
13	0615038-S2	↓	Sr89	↓	1453	↓	SRB1111C	↓
LO 11/11/06 1	0~~6~~424028-S3	↓	Sr90	↓	1511	LO	SRB1111D	LO
LO 11/11/06 5	0615044-S~~2~~3	↓	α	↓	↓	↓	ABB1111I	↓
9	0614030-S3	↓	β	↓	1512	↓	ABB1111J	↓
13	0615038-S3	↓	Sr89	↓	↓	↓	SRB1111E	↓
1	0424028-S4	↓	Sr90	↓	1527	↓	SRB1111F	LO
5	0615044-S4	↓	α	↓	↓	↓	ABB1111K	↓
9	0614030-S4	↓	β	↓	1528	↓	ABB1111L	↓
13	0615038-S4	↓	Sr89	↓	↓	↓	SRB1111G	↓
1	0424028-S5	↓	Sr90	↓	1544	↓	SRB1111H	LO
5	0615044-S5	↓	α	↓	↓	↓	ABB1111M	↓
9	0614030-S5	↓	β	↓	1546	↓	ABB1111N	↓
13	0615038-S5	↓	Sr89	↓	↓	↓	SRB1111I	↓
								LO 11/11/06

Comments:

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(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date LO 11/12/06

PROJECT 514.1572.73 Notebook No. _____ 73

Continued From Page _____

Sr90 Working Standard

1) Transfer a fraction of std 514.1572.72 to a 500 ml poly bottle + dilute w/ 0.1M HCl to a final activity conc of approx 25 pCi/ml

a) 500 ml bottle empty 37.9693 g (Bal 12)
" + 1° std 40.5067
Net 1° std transferred 2.5374 g

b) 500 ml bottle empty 37.9693 g from above
bottle + std + 0.1M HCl 542.5 g (Bal 20)
Total diluted mass ~~216.5 g~~ DCB 3/30/99
504.5 g

2) Calculation

$$\frac{(4984.3\ pCi/g)(2.5374\ g)(.9971\ g/ml)}{504.5\ g\ \cancel{216.5\ g}\ 3/30/99} = \cancel{24.50\ pCi/ml}\ DCB\ 3/25/99$$

$$= 25.00\ pCi/ml\ DCB\ 3/30/99$$

Ref Date = 3/18/99
Exp Date = 3/23/04

Verified 3/25/99 DCB

Stnd ID: 514.1572.73 RE 12/13/04

RE 12/16/05 Standard reverified →

72
PROJECT 514.1572.72

Notebook No. _____
Continued From Page _____

S-90 Primary Standard

1) Transfer RSO#514 (Analytics 57370-307) to a a 250 ml poly bottle + dilute to final conc. of approx 5000 pCi/ml w/ 0.1 M HCl.

a) Ampule, full w/ beaker 36.5911 g (Bal 12)
Ampule, empty w/ beaker 31.7310
Net std transferred 4.8601 g

b) 250 ml poly, empty 26.4116 g (Bal 12)
bottle w/ std + 0.1 M HCl 223.6 g (Bal 16)
Total diluted std mass 197.2 g

2) Density of 0.1 M HCl using 100 ml class A flask.

99.7100 g / 100 ml = .9971 g/ml.

3) Calculations

orig. std. $\left(\frac{3.757E4 \text{ dpm}}{5.02081 \text{ g}}\right)\left(\frac{60 \text{ s/m}}{2.22 \text{ dpm/pCi}}\right) = 202,239.4$ pCi/g

del. std by mass $\frac{(202,239.4 \text{ pCi/g})(4.8601 \text{ g})}{(197.2 \text{ g})} = 4984.3$ pCi/g

del std by vol (4984.3 pCi/g)(.9971 g/ml) = 4969.8 pCi/ml

Ref Date = 3/18/99 Verified 3/25/99 DKS
Exp Date = 3/23/04

ANALYTICS

DAL 514
rec'd 3-23-99

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.
Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

57370-307

Sr-90 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 by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ISOTOPE:	Sr-90
ACTIVITY (dps):	3.757 E+04
HALF-LIFE:	28.74 years
CALIBRATION DATE:	March 18, 1999 12:00 EST
TOTAL UNCERTAINTY:	4.0%
SYSTEMATIC:	3.5%
RANDOM:	0.5%

5.02081 grams of solution 30 ppm Sr carrier in 0.1M HCl.

P O NUMBER 22170, Item 2

SOURCE PREPARED BY: _____ for
M. D. Currie, Radiochemist

Q A APPROVED: _____ 3-18-99

Internal Calculation Verifications

ICBs

&

ICVs

Sr-90 Calculatons ICV's AND ICB's

Det	Sample ID	Sample D & T	Sep. D & T	Count D & T	Ct Dur	Init Vol (L)	Calc Vol (L)	Gross CPM	BKG CPM	Net CPM	Efficieny	Yield	Decay	ngrowtl	k	Act pCi/L	1 sig CU	1 sig TPU	2 sig TPU	MDC	LCS Recov
A4	0714506-B1MB	2/20/2007 12:00	2/22/2007 15:07	10/1/2008 15:55	30	1	0.9801049	2.167	1.945	0.222	0.4139	0.943	0.9998597	2	1.6979	**0.13**	0.16	0.16	**0.32**	**0.75**	
C2	0714506-B2MB	2/20/2007 12:00	2/22/2007 15:07	10/1/2008 15:55	30	1	0.9801049	1.567	1.808	-0.241	0.4404	0.955	0.9998597	2	1.8304	**-0.13**	0.13	0.13	**0.26**	**0.67**	
C3	0714506-B3MB	2/20/2007 12:00	2/22/2007 15:07	10/1/2008 15:55	30	1	0.9801049	1.500	1.752	-0.252	0.4310	0.924	0.9998597	2	1.7318	**-0.15**	0.13	0.13	**0.26**	**0.70**	
A1	0714506-S1LCS	2/20/2007 12:00	2/22/2007 15:07	10/1/2008 15:55	30	1	0.9801049	16.733	1.968	14.765	0.4140	0.943	0.9998597	2	1.6992	**8.69**	0.44	1.10	**2.21**	**0.75**	86.1%
A2	0714506-S2LCS	2/20/2007 12:00	2/22/2007 15:07	10/1/2008 15:55	30	1	0.9801049	16.533	1.918	14.615	0.4125	0.913	0.9998597	2	1.6378	**8.92**	0.45	1.14	**2.27**	**0.77**	88.5%
C1	0714506-S3LCS	2/20/2007 12:00	2/22/2007 15:07	10/1/2008 15:55	30	1	0.9801049	16.800	1.771	15.029	0.4236	0.969	0.9998597	2	1.7867	**8.41**	0.42	1.07	**2.13**	**0.68**	83.4%

Ave Recovery = 86.0%

Sample ID	Spike Soln	Ref Date	Sr-90 Activity DPM/mL	Sr-90 Spike Vol mL	Sr-90 Act pCi/L Added
0714506-S1LCS	600.3020.50	12/1/2001	49.78	0.5	10.088
0714506-S2LCS			49.78	0.5	10.088
0714506-S3LCS			49.78	0.5	10.088

r:\inst\gfp\outliers and ICV's\Sr90InstA'08ICV

Sr 90 Flat Manual Calculation - ICV/ICB's

0714506-S3

% Yield

ICP_i = 1.0085 ug/ml; DF = $\frac{10}{10}$; Volume = 1001 ml

$(1.0085)(\frac{10}{10})(1001) = 1009.509$ ug

$(1009.509)(\frac{10-0.1}{10}) = \boxed{999.41 \text{ ug}}$ (999.424 ug)

ICP_{REF} = 1.0076 ug/ml; DF = $\frac{10}{10}$; Volume = 1000.5

$(1.0076)(\frac{10}{10})(1000.5) = 1008.104$ ug

$(1008.104)(\frac{10-0.1}{10}) = \boxed{998.023 \text{ ug}}$ (998.032)

ICP_F = 0.9688 ug/ml; DF = $\frac{10}{0.1}$; Volume = 10 ml

$(.9688)(\frac{10}{0.1})(10\text{ml}) = \boxed{968.8 \text{ ug}}$ (968.8)

% Yield = $\frac{968.8}{999.41} \times 100 \Rightarrow \boxed{96.94\%}$ (96.94%)

Ingrowth 10/1/08 15:55
2/22/07 15:07

1 yr 7 months 8 days 48 min = 13790.8 hrs $\Rightarrow 2 - e^{\ln \frac{1}{2}(\frac{13,790.8 \text{ hrs}}{64.1 \text{ hrs}})}$

$= 2 - 1.717E\text{-}05 = \boxed{2.0}$

Decay Factors 2/22/07 15:07
*2/20/07 12:00 2 days 3 hrs 7 min $\Rightarrow$

~~5 yrs 2 months 21 days 3 hrs 7 min = 5.222 years~~

$e^{\ln \frac{1}{2}(\frac{\cancel{5.222}\ .0058 \text{ yrs}}{28.6 \text{ yrs}})} = \boxed{\cancel{0.8811}}$ $\boxed{.9998}$

$$\text{Sr 90 Activity} = \frac{16.800 - 1.771}{(2.22)(.4236)(.980)(.9694)(.9998)(2.0)} = \frac{15.029}{1.7864 = K}$$

$$\boxed{= 8.41\ \text{pCi/L}} \quad (8.41)$$

$$\text{Counting Uncertainty} = \frac{\sqrt{\frac{16.800}{30} + \frac{1.771}{1000}}}{1.7864} = \boxed{0.42} \quad (0.42)$$

$$1\sigma\ \text{TPV} = \sqrt{(0.42)^2 + (0.0561 \times 8.41)^2 + (0.\cancel{0565}\ .1022 \times 8.41)^2}$$

JP 10/9/07

$$\boxed{1\sigma\ \text{TPV} = 1.07\ \text{pCi/L};\ 2\sigma = 2.13\ \text{pCi/L}}$$

(2.13)

$$\text{MDC} = \frac{4.65\sqrt{(1.771)(30)} + 2.71}{\cancel{4.7}(1.7864)(30)} = \boxed{0.68\ \text{pCi/L}}$$

(0.68)

PAI - Gas Flow Proportional Sample Analysis LB4100-A

Unit Type: LB4100-A/W
Counting Unit ID: Orange
High Voltage Mode: Simultaneous
Application Revision: C
Application Version: PA
Rev.12/29/03 JE

Data file name: SRA1001
Batch ID: SR070220-1
Count Preset (m): 30
Batch Ended: 10/1/08 16:26

Background logfile: BKGAB
Date of Bkg. Cal: 9/28/08
Alpha efficiency logfile: Am241-10/08
Alpha attenuation calibration: Am0907
Beta efficiency logfile: Sr90F-10/08
Beta attenuation calibration: Sr0907

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.10120	Beta b=	1.0792
m=	0.99200	m=	0.9995
a=	1.0000	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b*m^-x		Beta to Alpha X-talk y = b*mass + m	
a ->b xtalk b=	0.1871	b ->a xtalk b=	-2.000E-06
a ->b xtalk m=	0.9983	b ->a xtalk m=	0.0021

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
A1	0714506-S1LCS	10/1/08 16:25	30.00	0.0	0.033	0.072	0.031	0.2095	1.101	n/a	n/a	16.733	1.968	0.0000	0.4140	1.079	n/a	n/a
A2	0714506-S2LCS	10/1/08 16:25	30.00	0.0	0.067	0.071	0.031	0.2475	1.101	n/a	n/a	16.533	1.918	0.0000	0.4125	1.079	n/a	n/a
A4	0714506-B1MB	10/1/08 16:25	30.00	0.0	0.067	0.041	0.000	0.2296	1.101	n/a	n/a	2.167	1.945	0.0048	0.4139	1.079	n/a	n/a
C1	0714506-S3LCS	10/1/08 16:26	30.00	0.0	0.000	0.060	0.032	0.2238	1.101	n/a	n/a	16.800	1.771	0.0000	0.4236	1.079	n/a	n/a
C2	0714506-B2MB	10/1/08 16:26	30.00	0.0	0.067	0.074	0.000	0.2609	1.101	n/a	n/a	1.567	1.808	0.0000	0.4404	1.079	n/a	n/a
C3	0714506-B3MB	10/1/08 16:26	30.00	0.0	0.000	0.060	0.000	0.2350	1.101	n/a	n/a	1.500	1.752	0.0000	0.4310	1.079	n/a	n/a

JP 10/8/08

10/1/08 Gross Alpha/Beta ICV's, ICB's (Am241 & Sr90) - Ringed Planchet

Sources (ICB)	Detectors	Sources (ICV's)	Filename
0815506-B1	A1 A3	0815506-S1	
B2	A2 C3	S2	ABA1001B
B3	C1 C4	S3	

10/1/08 Sr90 ICV's, ICB's (Sr90 on Flat Planchet)

Sources (ICB)	Detectors	Sources	Filename:
0714506-B1	A4 A1	0714506-S1	
B2	C2 A2	S2	SRA1001
B3	C3 C1	S3	

10/2/08 Th230 Calibration (Gross Alpha - DW Protocol) Ringed Planchet

Benchsheet: AB0606 19-3 Source ID: 1198 Logfile: Th230-10/08

Source	Detectors	Filenames:
0618014-1LCS	A1 C1	
2LCS	A2 C2	ETH1002
4LCS	A3 C3	ETH1002A
5LCS	A4 C4	

10/6/08 Sr89/Ra228 Calibration (Sr89 on Flat Planchet)

Benchsheet: RA081001-2 Source ID: 1196 Log File: Sr89-10/08

Sources	Detectors	Filenames:
0822001-1	A1 C1	
-2	A2 C2	ESE1006
-4	A3 C3	ESE1006A
-5	A4 C4	

BG 10/8/08

Continued on Page _____

Read and Understood By

Signed 10/07/08 Date

Signed 10/8/08 Date

Date 10/1/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JP	P			JP	P			P
2	↓	↓			↓	↓			↓
3									
4									
5									
6									
7	OL							JP 10/01/08	
8									
9	JP	P			JP	P			P
10	↓	↓			↓	↓			↓
11									
12									
13									
14	OL							JP 10/01/08	
15									
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Date 10/1/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4,9-12	Daily Eff	—	—	30	7:23	JP	EFA1001	JP
1-4,9-12	Daily BKs	—	—	60	7:32	JP	BKA1001	JP
1	1191	Am Wipe Eff	α	30	8:59	JP	EAW1001	JP
2					9:06		A	JP
3					9:18		B	JP
4					9:28		C	JP
9					9:35		D	JP
10					9:48		E	JP
11					9:56		F	JP
12					10:03		G	JP
12	1192	Sr Wipe Eff	β	30	8:59	JP	ESW1001	JP
11					9:06		A	JP
10					9:18		B	JP
9					9:28		C	JP
4					9:35		D	JP
3					9:48		E	JP
2					9:56		F	JP
1					10:03		G	JP
1-4	1193	Am241 Eff	α	30	10:12	JP	EAM1001	JP
9-12	1194	Sr90R Eff	β	30	10:13	JP	ESR1001	JP
9-12	1193	Am 241 Eff	α	30	10:30	JP	EAM1001A	JP
1-4	1194	Sr90R Eff	β	30	10:31	JP	ESR1001A	JP
1-4	1195	Sr90F Eff	β	30	10:51	JP	ESF1001	JP
~~9-12~~	~~1196~~	~~Sr89 Eff~~	~~β~~	~~30~~	~~10:51~~	~~JP~~	~~ESF1001~~	~~*~~ JP 10/1/08
9-12	1195	Sr90F Eff	β	30	11:23	JP	ESF1001A	JP
~~2~~	~~601~~	~~Wipe ICVs~~	~~α~~	~~10~~	~~12:10~~	~~JP~~	~~ABA1001~~	
~~4~~	~~729~~		~~β~~	~~10~~				JP 10/10/08
2	601	Wipe ICVs	α	10	14:56	JP	ABA1001	JP
4	729		β	10				
9	601	Wipe ICVs	α	10	15:08	JP	ABA1001A	JP
11	729		β	10				
1	0815506-B1MB	AB080311-1	α/β	30	15:18	JP	ABA1001B	JP
2	B2MB							
~~8~~ 9	B3MB							
13	S1LCS							
11	S2LCS							
12	S3LCS	JP 10/1/08						
1	0714506-S1LCS	~~SR08~~ SR070220-1	Sr90	30	15:55	JP	SRA1001	JP
2	S2LCS	SR070220-1						
9	S3LCS							
4	B1MB							
10	B2MB							
11	B3MB							

JP 10/10/08

JP 10/2/08

Comments: * Not enough activity on planchett. New Sr89 efficiency planchetts will

Date 10/2/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JP	P			JP	~~R~~ Hα JP 10/2/08	JP	P	P
2						P			
3									
4									
5	OL								
6									
7								JP 10/2/08	
8									
9	JP	P			JP	P			P
10						Hα	JP	P	
11						P			
12									
13	OL								
14									
15								JP 10/2/08	
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA0927W			
Dr B	OL			
Dr C	BKA0927W			
Dr D	OL			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1100	Dr A	0.15
		Dr B	
Tank 2	925	Dr C	
		Dr D	

Comments:

Page No.: 367383 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JP 10/2/08

Prep Batch: SR070220-1

Analytical QASS / NCR? Y / N NA

ile	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes

JP 10/8/07

ormation

Units	Prep Date	Aliquot	Units	Pipet ID
PM/ml	02/20/07	0.5	ml	RS004

Supersedes: N/A

et

Prep Batch: SR070220-1

Reviewed By: LNT DS **Review Date:** 2/25/2007

Prep QASS / NCR? Y (N) NA

Prep Notes

DS 2/25/07

ke Solution Information

Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
43.895	DPM/ml	02/20/07	0.5	ml	RS004

Supersedes: 2/20/07 11:44

Radiochemistry ICP Worksheet

Paragon Analytics

Prep Batch: SR070220-1

Prep Procedure: **SR90**

Reviewed By: **LNT** 25

Review Date: **2/25/2007**

STRONTIUM Recovery Results

Reference Carrier

LabID	QC Type	Carr Vol	Ref Carr Dil Vol	Ref Carr ICP Alq	Ref Carr ICP Dil Vol	Ref Carr ICP Run	Ref Carr ICP Conc
0714506-RC1	CAR	0.5	1000.5	10	10		1.0076

Samples

Prep Num	LabID	QC Type	Init Samp Alq (ml)	Car Vol (ml)	Samp Dil Vol (ml)	Init ICP Alq (ml)	Init ICP Dil Vol (ml)	Pre-Con Vol (ml)	Post Con Vol (ml)	Pre-Sep Vol (ml)	Post Sep Vol (ml)	Fin ICP Alq (ml)	Fin ICP Dil Vol (ml)	Initial ICP Run	Final ICP Run	Init ICP Conc (ug/ml)	Fin ICP Conc (ug/ml)	Init Samp Mass (ug)	Ref Mass (ug)	Flag	Fin Samp Mass (ug)	% Yield	Final Sample Alq
1	0714506-B1	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0101	0.9433	1000.504	998.0278		943.3	94.28%	980.1
1	0714506-B2	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0098	0.9554	1000.207	998.0278		955.4	95.52%	980.1
1	0714506-B3	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0211	0.934	1011.4	998.0278		934	92.35%	980.1
1	0714506-S1	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0108	0.9449	1001.703	998.0328		944.9	94.33%	980.1
1	0714506-S2	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0199	0.9223	1010.721	998.0328		922.2999	91.25%	980.1
1	0714506-S3	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0085	0.9688	999.4235	998.0328		968.8	96.94%	980.1

W 2/25/07

FLAG - LB: low bias (<= 15%) 15%: low bias (>15%)

Z: Negative init. conc. treated as zer

Supersedes: _____

Radiochemistry Prep Worksheet

lytics

Prep Batch: SR070220-1

e: SR90

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Treatment? Y / N Batch: _____ Re-Prep? Y / N Batch: _____ Prep QASS / NCR? Y / N _____

707 Rev: 9
JE
d

Prep Analyst: Lindsay Tearman LS
Prep Date: 2/20/2007
Prep Dept: RS

Balance:
Balance:

ID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
06-B1	MB		1000	980.1049	Unfiltered	8769	2/22/07	T1	
06-B2	MB		1000	980.1049	Unfiltered	8770	3:07 PM	T1	
06-B3	MB		1000	980.1049	Unfiltered	8771		T1	
06-S1	LCS		1000	980.1098	Unfiltered	8772		T1,S1	
06-S2	LCS		1000	980.1098	Unfiltered	8773		T1,S1	
06-S3	LCS		1000	980.1098	Unfiltered	8774		T1,S1	

say Tearman LS Date: 2/20/2007 2/20/07
NP Date: 2-20-07

Tracer/Carrier Solution Information

SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
247942	2,004.671	ppm	NA	0.5	ppm	RS004

ex: 5/8/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.50	43.895	DPM/ml	02/20/07	0.5	ml	RS004

ex: 11/8/07

DRAFT

Sample Id1	Ba	Sr	Y	Fe	Ni
I 0702098-16	0.2005	0.0682	0.0013	5.9108	2.1681
F 0702098-16	0.0010	-0.0002	-0.0063	0.0475	1.7754
I 0702098-17	0.2501	0.0601	0.0016	7.0286	2.1849
F 0702098-17	0.0009	-0.0003	-0.0065	0.0129	1.7377
I 0702098-18	0.2474	0.0565	0.0015	6.6862	2.1583
F 0702098-18	0.0010	-0.0002	-0.0068	0.0263	1.7442
I 0702098-19	0.1724	0.0898	0.0017	6.3755	2.1823
F 0702098-19	0.0009	-0.0002	-0.0066	0.0379	1.7561
CCV	0.4939	0.4973	10.0338	21.1606	0.5094
CCB	0.0002	0.0002	0.0042	0.0138	0.0013
I NI070220-1MB	0.0008	-0.0003	-0.0058	-0.0249	2.2212
F NI070220-1MB	0.0008	-0.0002	-0.0059	0.0056	1.7668
I NI070220-1LCS	0.0007	-0.0003	-0.0064	-0.0285	2.1777
F NI070220-1LCS	0.0009	-0.0002	-0.0063	0.0082	1.7655
NI070220-1RC	0.0008	-0.0003	-0.0064	-0.0137	2.1945
I 0702062-9	0.0085	0.1026	-0.0065	-0.0024	0.0071
F 0702062-9	0.0664	0.0010	-0.0067	-0.0012	0.0217
I 0702062-10	0.0051	1.0559	-0.0068	-0.0104	0.0327
F 0702062-10	0.0660	0.0064	-0.0068	-0.0118	0.0205
I 0702062-11	0.0079	0.5344	-0.0067	-0.0112	0.0063
CCV	0.4952	0.4982	10.0979	21.3844	0.5189
CCB	0.0004	0.0003	0.0047	0.0143	0.0017
F 0702062-11	0.0640	0.0030	-0.0059	0.0134	0.0206
I 0702062-12	0.0095	0.3182	-0.0061	-0.0096	0.0059
F 0702062-12	0.0640	0.0040	-0.0064	0.0103	0.0211
I 0702062-13	0.0084	0.0326	-0.0064	0.2255	0.0061
F 0702062-13	0.0633	0.0001	-0.0066	0.0038	0.0208
I 0702062-14	0.0040	0.1264	-0.0066	0.0348	0.0052
F 0702062-14	0.0642	0.0007	-0.0067	-0.0037	0.0208
I 0702062-15	0.0350	3.6667	-0.0068	-0.0222	0.0046
F 0702062-15	0.0673	0.0482	-0.0067	0.0092	0.0213
I 0702062-15D	0.0352	3.6486	-0.0066	0.0008	0.0054
CCV	0.4927	0.4942	10.0482	21.3325	0.5141
CCB	0.0003	0.0008	0.0050	0.0243	0.0009
F 0702062-15D	0.0653	0.0470	-0.0058	0.0187	0.0212
I TR070222-1MB	0.0000	0.0002	-0.0062	0.0050	0.0045
F TR070222-1MB	0.0627	0.0000	-0.0064	0.0091	0.0209
I TR070222-1LCS	0.0001	-0.0001	-0.0064	-0.0154	0.0101
F TR070222-1LCS	0.0642	-0.0002	-0.0066	-0.0010	0.0211
TR070222-1RC	1.6304	0.0003	-0.0066	-0.0157	0.0050
I 0714506-B1	0.0014	1.0101	-0.0066	-0.0127	0.0020
F 0714506-B1	0.0008	0.9433	-0.0067	-0.0181	0.0167
I 0714506-B2	0.0000	1.0098	-0.0068	-0.0277	0.0021
F 0714506-B2	0.0007	0.9554	-0.0067	-0.0158	0.0173

Sample Id1	Ba	Sr	Y	Fe	Ni
CCV	0.5036	0.5033	10.0724	20.9468	0.5057
CCB	0.0004	0.0010	0.0073	0.0085	0.0009
I 0714506-B3	-0.0002	1.0211	-0.0060	-0.0212	0.0016
F 0714506-B3	0.0007	0.9340	-0.0062	0.0175	0.0177
I 0714506-S1	-0.0001	1.0108	-0.0063	-0.0169	0.0039
F 0714506-S1	0.0007	0.9449	-0.0064	0.0130	0.0174
I 0714506-S2	-0.0002	1.0199	-0.0067	-0.0263	0.0026
F 0714506-S2	0.0006	0.9223	-0.0066	-0.0059	0.0173
I 0714506-S3	-0.0002	1.0085	-0.0066	-0.0106	0.0023
F 0714506-S3	0.0007	0.9688	-0.0065	0.0073	0.0183
0714506-RC	-0.0002	1.0076	-0.0068	-0.0065	0.0021
I 0702061-1	0.0075	0.0605	-0.0066	0.0078	0.0055
CCV	0.4947	0.4941	10.0385	21.1385	0.5077
CCB	0.0000	0.0005	0.0010	0.0109	-0.0004
F 0702061-1	0.0646	0.0005	-0.0057	0.0131	0.0281
I RE070222-1MB	0.0000	-0.0003	-0.0062	-0.0115	0.0052
F RE070222-1MB	0.0655	-0.0002	-0.0064	-0.0020	0.0204
I RE070222-1LCS	0.0000	-0.0003	-0.0064	-0.0037	0.0049
F RE070222-1LCS	0.0677	-0.0002	-0.0066	0.0115	0.0208
I RE070222-1LCSD	-0.0001	-0.0004	-0.0066	-0.0192	0.0048
F RE070222-1LCSD	0.0641	-0.0003	-0.0068	0.0022	0.0202
RE070222-1RC	1.6003	0.0000	-0.0066	-0.0034	0.0052
CCV	0.4948	0.4965	10.0858	21.2778	0.5112
CCB	0.0002	0.0004	0.0024	0.0168	0.0004
I 0702139-1	0.1697	1.0447	0.0304	7.8570	0.0260
F 0702139-1	0.0012	0.9955	-0.0066	0.0183	0.0213
I 0702139-1D	0.1706	1.0463	0.0296	7.9080	0.0256
F 0702139-1D	0.0013	0.9756	-0.0065	0.0189	0.0209
I 0702139-2	0.0354	0.9905	-0.0054	1.9375	0.0193
F 0702139-2	0.0009	0.9455	-0.0067	0.0133	0.0205
I SR070222-1MB	0.0006	0.9989	-0.0067	0.0021	0.0166
F SR070222-1MB	0.0008	0.9774	-0.0067	0.0066	0.0207
I SR070222-1LCS	0.0007	1.0168	-0.0067	0.0099	0.0166
F SR070222-1LCS	0.0007	0.9703	-0.0068	-0.0046	0.0200
CCV	0.4946	0.4932	10.0065	21.0050	0.5048
CCB	0.0001	0.0006	0.0025	0.0129	0.0007
SR070222-1RC	0.0008	1.0146	-0.0059	0.0058	0.0175
CCV	0.4964	0.4964	10.0640	21.2203	0.5090
CCB	0.0003	0.0007	0.0043	0.0150	0.0007

PROJECT 600.2613.30 Sr-90

Notebook No. 2613

Continued From Page —

Transfer contents of ampule 600 to a 125 mL glass bottle for a 1° solution.

3/9/06

Standard ID: 600.2613.30

Description: Sr-90

Preparation: 2/27/07

Activity: 22341.71 dpm/mL

Certainty: 744.72 dpm/mL

Exp Date: 12/1/01

Exp Time: N/A

Prep Date: 12/1/03

Prep by: CRW

Comp. 0.1 M HCl

Life (y): 2.88E+01

RC 3/9/06

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION