

1726 Wooddale Court  
Baton Rouge LA 70806

## COC/Lab Request #:

2013-948

Page 1 of 1

**Client Contact:**

**Lab Agreement # : 63641-001-10**

**Site Name:** Los Alamos National Laboratory

Project Number :

**Analysis Turnaround Time:**

24 Hour - ☐ Other - ☐

☒ 7 Day - ☐

**14 Day - ☐**

**21 Day - ☐**

**28 Day - ☒**

**Rad Screening Info:**

**Yes, Below Background**

**Lab Reporting Limit Type:**

**Special Instructions:**

Field Sample ID

**Sample  
Date**

**Sample  
Time**

### Sample Matrix

CALA-13-33427

Jun 11 2013

9:47

**W**

**WSP-LL-H-3**

1

**Special Instructions:**

Relinquished by:

Print Name: \_\_\_\_\_

Date/Time:

Received by:

Print Name:	
-------------	--

Date/Time:

Relinquished by:

Print Name: \_\_\_\_\_

Date/Time:

Received by:

Print Name:	
-------------	--

Date/Time:

Relinquished by:

Print Name: \_\_\_\_\_

Date/Time:

Received by:

Print Name:	
-------------	--

Date/Time:

## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 4234 EVENT NAME: LA/Pueblo (TA-21 and General Surveillance Monitoring Group)  
Q3 MY2013 Sampling Event

SAMPLE ID: CALA-13-33427 WORK ORDER: NA

	<u>AS PLANNED</u>	<u>AS COLLECTED</u>		<u>AS PLANNED</u>	<u>AS COLLECTED</u>
DATE COLLECTED (MM/DD/YYYY):		06/11/2013	FIELD MATRIX:	WG	
TIME COLLECTED (HH:MM):		0947	MEDIA:	UA	
PRS ID:		ok	SAMPLE TECH CODE:	UA	6/11/13 GSP PP
LOCATION ID: Vine Tree Spring			FIELD PREP:	UF	ok
LOCATION TYPE: SPR			FIELD QC TYPE:	REG	
PORT:			SAMPLE USAGE:	INV	

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
MA	WSP-8260B-VOA	40 ML SEPTUM AMBER GLASS	2	HCL	1X	MA
	WSP-GrossA/B	1 LITER POLY	1	NONE		
	WSP-LL-H-3	1 LITER POLY	1	NONE		
	WSP-RAD	1 GAL POLY	1	HNO3		
	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4		

## SAMPLE COMMENTS:

## LOCATION COMMENTS:

## FIELD PARAMETERS:

Dissolved Oxygen 6.99 mg/L Oxidation-Reduction Potential NA MV pH 7.71 SU  
Specific Conductance 311 uS/cm Temperature 14.20 deg C Turbidity 0.7 NTU

COLLECTED BY (PRINT) W. Shaw &amp; D. Fellenz

RELINQUISHED BY (Printed Name) <u>W. Shaw</u> (Signature) <u>[Signature]</u>	Date/Time <u>6/11/13</u> <u>1245</u>	RECEIVED BY (Printed Name) <u>S. Sherwood</u> (Signature) <u>[Signature]</u>	Date/Time <u>6/11/13</u> <u>1245</u>
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date 05/29/2013

## Data Validation Report

Chain Of Custody No. 2013-948

## 1. Distribution Of Samples In EDD.

	Analytical	Regular	Field	Trip	Field	Equipment
SDG	Method	Samples	Duplicates	Blanks	Blanks	Blanks
ARS1-13-01179	Generic:Low_Level_Tritium	1				

	Analytical	Analysis	Prep	Regular	Field	Trip	Field	Equipment	Method	Matrix	Matrix
SDG	Method	Lot ID	Lot ID	Samples	Duplicates	Blanks	Blanks	Blanks	Blanks	Spikes	Spike Dups
ARS1-13-01179	Generic:Low_Level_Tritium	ARS1-B13-01361	ARS1-B13-01361	1					1		

## 2. Distribution Of Analytes In EDD.

Analytical Method	Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spikes	TICS
Generic:Low_Level_Tritium	RAD	CALA-13-33427	ARS1-B13-01361-08	REG	1	0	0	0
Generic:Low_Level_Tritium	RAD	LCS	ARS1-B13-01361-01	LCS	0	0	1	0
Generic:Low_Level_Tritium	RAD	LCSD	ARS1-B13-01361-02	LCSD	0	0	1	0
Generic:Low_Level_Tritium	RAD	MB	ARS1-B13-01361-03	MB	1	0	0	0

## 3. Are any analytes missing?

No.

## 4. Were any holding times exceeded?

No.

## 5. Any contaminants in blanks?

No.

Any samples affected by the presence of contaminants in blanks?

No.

## 6. Any surrogate recoveries outside the control limits?

No.

## 7. Any MS/MSD recoveries or RPDs outside the control limits?

No.

## 8. Any LCS/LCSD or BS/BSD recoveries or RPDs outside the control limits?

LCS	LCSD	Analytical	Parameter	Lab	Analysis	Sample	LCS	LCSD	Upper	Lower	Lower Reject
-----	------	------------	-----------	-----	----------	--------	-----	------	-------	-------	--------------

Analytical	Post-Digestion	Lab Control	Lab Control	Blank	Blank	Lab	Storage	Preparation	Reagent
Spikes	Spikes	Samples	Sample Dups	Spikes	Spike Dups	Duplicates	Blanks	Blanks	Blanks
		1	1						

Sample ID	Sample ID	Method	Name	Lot ID	Date	Matrix	Recovery	Recovery	Limit	Limit	Limit
ARS1-B13-01361-01	ARS1-B13-01361-02	Generic:Low_Level_Tritium	Tritium	ARS1-B13-01361	7/19/2013	W	79	66	120	80	10

## 9. Any Field Duplicate RPDs outside the desired limits?

No.

## 10. Any Lab Duplicate RPDs outside the desired limits?

No.

## 11. Any required reporting limits exceeded?

No.

## 12. Additional Validator's Comments.

None.

## 13. Display Flagged Data.

Location ID	Chain Of Custody No	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Parameter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detected
Vine Tree Spring	2013-948	CALA-13-33427	REG	INIT	RAD	Generic:Low_Level_Tritium	Tritium		J-	R12a	Y

## Reason Code Description

R12a The LCS percent recovery was &lt;the LAL but &gt;10%. Follow the external laboratory limits located within the associated data package.

## 14. Useable Result Count.

Field	Location	Sample	Analytical	No. Unuseable	Total No. Of
Sample ID	ID	Purpose	Method	Records	Records
CALA-13-33427	Vine Tree Spring	REG	Generic:Low_Level_Tritium	0	1

Limit	RPD	Limit
	17.9966	

Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent Moisture	Analysis Lot ID	Validation Status Code	Use Flag
55.25	pCi/L	55.25	pCi/L	2.7	8.44	W	6/11/2013		ARS1-B13-01361	VAL	Y



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

# **Request Number: 2013-948**



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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory  
Request: 2013-948**

# **Original COC**







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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory  
Request: 2013-948**

# **Case Narrative**



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July 24, 2013

LANL  
Keith Greene  
PO Box 1663 MS M992  
Los Alamos, NM 87545

Request Number: **2013-948**  
LANL Sample ID: **CALA-13-33427**

Dear Mr. Greene;

On June 13, 2013, ARS International received one (1) water sample to be analyzed for Low Level Tritium.

The sample underwent enrichment and was counted using the appropriate counting equipment and QA/QC for this type of analysis. Results of the analysis and QA/QC are attached in the data package.

The client and QA/QC samples were counted with a count time sufficient to meet quality control parameters for counting equipment and were within acceptance criteria and statistical sound detection limits.

If you have any questions please do not hesitate to call at 225.381.2991 or email [LANL@amrad.com](mailto:LANL@amrad.com).

Sincerely,

A handwritten signature in black ink, appearing to read 'James D. Lu', is written over a horizontal line.

Laboratory Management  
**ARS International**



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## COVER PAGE

**PROJECT SAMPLE IDENTIFICATION  
CROSS-REFERENCE  
TO ARS SAMPLE LABORATORY IDs**  
Subcontract (LANL Agreement Number) 63641-001-10

Request Number	LANL PROJECT SAMPLE ID NUMBER	American Radiation Services SAMPLE ID NUMBER(S)
2013-948	CALA-13-33427	ARS1-13-01179-001

### ANALYTICAL METHODS

Tritium analyses were performed using **ARS-040 Tritium Assay in Water Samples Using Electrolytic Enrichment**.

### ANALYTICAL RESULTS

The result data that are flagged with "U" indicate that the activity is below the MDC. LCS recovery is slightly low at 79%. All other QC criteria were met.

### **American Radiation Services Project Manager/Laboratory Director's Comments:**

*"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."*

*"I certify that this electronic image and all hardcopies produced from this image accurately represent the data and is in compliance with the LANL specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."*

  
Signature

Laboratory Management, ARS International  
Title

07-24-13  
Date



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Low Level Tritium by Low Level Liquid Scintillation Counting**

ARS Sample Delivery Group: ARS1-13-01179

Client Sample ID: CALA-13-33427

Sample Collection Date: 06/11/13

Sample Matrix: Aqueous

Request or PO Number: 2013-948

ARS Sample ID: ARS1-13-01179-001

Date Received: 06/13/13

Report Date: 07/24/13

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Enriched H-3	55.250	8.440	2.700	1.300		pCi/L	ARS-040	07/23/13 05:38	PDS	NA
NOTES: Lab Agreement 63641-001-10										



Project Manager Review

**Notes:** American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the American Radiation Services, Inc.

LELAP Certificate# 01949



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## QC Results Report

Sample Delivery Group: ARS1-13-01179

Date Received: 6/13/2013

### Laboratory Control Sample Evaluation

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (1s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Percent Recovery (%)	LCS Acceptance Range
ARS1-B13-01361	LCS	H3	19.260	3.030	2.020	24.485		pCi/L	ARS-040	7/19/13 6:09	PDS	79	80%-120%

### Blank Evaluation

Analysis Batch	QC Type	Analyte	Analysis Results	CSU 1 (1s)	MDC	Expected Value	Qual	Report Units	Analysis Test Method	Analysis Date/Time	Analysis Technician
ARS1-B13-01361	MBL	H3	1.010	0.610	1.930	NA	U	pCi/L	ARS-040	7/19/13 6:09	PDS

### Sample RER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (1s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	RER	RER Acceptance Range
ARS1-B13-01361	LCSD	H3	19.260	3.030	16.080	2.590		pCi/L	ARS-040	7/19/13 6:09	PDS	0.57	< 1

### Sample DER Duplicate Evaluation

Analysis Batch	QC Type	Analysis Description	Result 1	CSU 1 (1s)	Result 2	CSU 2 (1s)	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	DER	DER Acceptance Range
ARS1-B13-01361	LCSD	H3	19.260	3.030	16.080	2.590		pCi/L	ARS-040	7/19/13 6:09	PDS	1.60	< 3

Project Manager Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of ARS International.

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NELAP Certificate # E87558

**QC Evaluation**  
EPA Method: ARS-040  
Batch ID: ARS1-B13-01361  
SDG's: ARS1-13-01121; 1179

LCS	<u>19.2600</u>	CSU (2s)	<u>5.9500</u>
LCSD	<u>16.0800</u>	CSU-D (2s)	<u>5.0800</u>

$$DER = \frac{\text{abs}(LSC-LSCD)}{\text{sqr}((2s \text{ CSU}/2)^2 + ((2s \text{ CSU-D}/2)^2) \text{ at } 1 \text{ sigma}} = < 3$$

$$DER = \frac{3.18}{3.911806} = 0.812924 < 3$$

$$\% RPD = \frac{\text{ABS}(LCS - LCSD)}{(LCS+LCSD)/2} * 100 = < 25\%$$

$$\%RPD = \frac{3.18}{17.67} * 100 = 17.9966 < 25\%$$

The *RPD* shall be less than 25% or other client-applied criteria

$$RER = \frac{\text{abs}((LCS-LCSD))}{(CSU)+(CSD) \text{ at } 2 \text{ sigma}} = < 1 \quad \text{<--LANL Requirement}$$

$$RER = \frac{3.18}{11.0300} = 0.288304624 < 1$$

**Blank Information**

	Act	CSU(2s)	MDA	Act>MDA
AM-241				
U-234				
U-235				
U-238				
Pu-238				
Pu-239/240				
Th-228				
Th-230				
Th-232				
H3	1.01	1.19	1.93	
Ra-226				
Ra-228				
Total U				
Pb-210				
Po-209				
Sr-90				
TC-99				
NI-63				

\*MDA should be below RDL  
\*Blank activity must be below MDA  
\*Blank activity must be < 1.65\*CSU (DOE only)

ACT = 1.01  
CSU = 1.19  
Is ACT<1.65\*CSU? **YES**





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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

**Low Level Tritium**

**by**

**Low Level Liquid  
Scintillation Counting**

**Samples**

## ARS Tritium Enrichment Calculations

lambda	1.5403E-04	ACF (def. = 1)	1
Syserror (%)	15%	Reporting Units	pCi
Coverage Factor	1	UCF	2.22

Enrichment Factor	a	8.978E-01
Curve coeff. - Power	b	-9.611E-01
		$y = a \cdot x^b$

Procedures	ARS File ID Number	ARS Batch ID Number
ARS-040 , ARS-060	ARS1-13-01121: 1179	ARS1-B13-01361

[illegible]

5DT 7-24-13

## ARS Tritium Enrichment Calculations

[illegible]



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Low Level Tritium by Low Level Liquid Scintillation Counting Laboratory Records**

# Analysis Batch Report

Analysis Batch ID <b>ARS1-B13-01361</b>													
 AMERICAN RADIATION SERVICES, LLC	Analysis Batch ID <b>ARS1-B13-01361</b>												
	Method		ARS-040		Analysis				LSC-A-022		Matrix		AQ
	Description			Low Level Tritium by Electrolytic Enrichment									
	Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline			
ARS1-B13-01361-01	LCS	B-15648											
ARS1-B13-01361-02	LCSD	B-15649											
ARS1-B13-01361-03	MBL												
ARS1-B13-01361-04	TRG								STD	07/02/13			
ARS1-B13-01361-05	TRG								STD	07/02/13			
ARS1-B13-01361-06	TRG								STD	07/02/13			
ARS1-B13-01361-07	TRG								STD	07/02/13			
ARS1-B13-01361-08	TRG								STD	07/09/13			

LCS Report  
Analytical Batch: ARS1-B13-01361

BinID	ABatch	ABatchSampleID	BinID/Group	SKID	Isotope	ExpectedAddition	ExpectedValue	EmptyWt	GrossWt	NetWt	UserID	ModDate	ExpectedValue_CT	MidPointCountDate	KnownValue
B-15648	ARS1-B13-01361	ARS1-B13-01361-01	B-H3	S-0279	H-3	5	2.462949612	13.2833	18.3712	5.0879	AMRAD\BSTEFFENS	7/3/2013			
B-15649	ARS1-B13-01361	ARS1-B13-01361-02	B-H3	S-0279	H-3	5	2.462949612	13.2021	18.2707	5.0686	AMRAD\BSTEFFENS	7/3/2013			

S07_GrossWt	C_RecoveredWa	S08_TearWtLSCVial	S09_VialPlusSmpl	C_NetSample	S10_1_WtVisiSmplDrWatFill
109.35	12.45	6.51	16.52	10.01	0
114.48	12.32	6.47	16.52	10.05	0
120.13	11.96	6.54	16.57	10.03	0
120.66	12.3	6.68	16.73	10.05	0
133.71	11.54	6.49	16.56	10.07	0
121.64	13.95	6.48	16.53	10.05	0
108.93	14.19	6.61	16.63	10.02	0
121.07	10.68	6.58	16.61	10.03	0

C_NetDeadWaterAdded	C_TareWtBFCocktail	S10_2_GrossWtVSC	C_NetWtCocktailAdded	UserID	ModDate
0	16.52	26.79	10.27	AMRAD\PSIMS	07/18/2013 11:58:57
0	16.52	26.76	10.24	AMRAD\PSIMS	07/18/2013 12:03:17
0	16.57	26.84	10.27	AMRAD\PSIMS	07/18/2013 12:07:56
0	16.73	26.99	10.26	AMRAD\PSIMS	07/18/2013 12:09:58
0	16.56	26.81	10.25	AMRAD\PSIMS	07/18/2013 13:59:48
0	16.53	26.78	10.25	AMRAD\PSIMS	07/18/2013 14:02:16
0	16.63	26.91	10.28	AMRAD\PSIMS	07/18/2013 14:04:24
0	16.61	26.9	10.29	AMRAD\PSIMS	07/18/2013 14:07:13



ID_31001_040	ABatch	AnalysisCode	ABatchSampleID	ClientID	IC_ID	S01_1_EnrichCellNo	S01_2_TareCell
676	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-01			85	335.57
677	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-02			25	329.18
678	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-03			65	334.02
679	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-04	CALA-13-33425		83	338.03
680	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-05	CALA-13-33426		8	332.71
681	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-06	CALA-13-33409		1	326.52
682	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-07	CALA-13-33411		45	330.13
683	ARS1-B13-01361	LSC-A-022	ARS1-B13-01361-08	CALA-13-33427		3	330.97

S04_3_StartBathC	S05_1_ElectroIED	S05_2_EndBathC	S05_3_EndCellWt	C_GrossSmpIRec	C_EnrichmentF	S06_TareWt
2	07/17/2013 07:20:00	2	565.3	15.5	32.92322581	96.9
2	07/17/2013 07:23:00	2	564	16.36	30.58435208	102.16
2	07/17/2013 07:26:00	2	568.06	15.05	33.22657807	108.17
2	07/17/2013 07:30:00	2	545.87	14.72	25.49388587	108.36
2	07/17/2013 10:24:00	2	528.72	14.57	25.46739876	122.17
2	07/17/2013 10:27:00	2	553	16.96	23.3384434	107.69
2	07/18/2013 10:28:00	2	551.76	17	22.74941176	94.74
2	07/18/2013 10:30:00	2	541.62	15.14	24.15125495	110.39

S01_3_TareResv	S02_GrossWtResv	S03_1_WtNa2O2	C_GrossSampleAdded	S04_1_ElectrolSD	S04_2_StartAmp
214.23	724.54	2.03	510.31	07/05/2013 12:52:00	5
218.46	718.82	2.02	500.36	07/05/2013 12:52:00	5
218.99	719.05	2	500.06	07/05/2013 12:52:00	5
193.12	568.39	1.5	375.27	07/05/2013 12:52:00	5
181.44	552.5	1.48	371.06	07/05/2013 12:52:00	5
209.52	605.34	1.6	395.82	07/05/2013 12:52:00	5
204.63	591.37	1.54	386.74	07/05/2013 12:52:00	5
195.51	561.16	1.46	365.65	07/05/2013 12:52:00	5

Assay Definition-

Assay Description:

LLH3 Assay in DPM Mode

Assay Type: DPM (Single)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130719\_0149

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130719\_0149\20130719\_0149.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130719\_0149\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130719\_0149\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Level H3.lsa

Count Conditions-

Nuclide: Low Level H3

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: ARS LL H3 10mL

Count Time (min): 240.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions Half Life

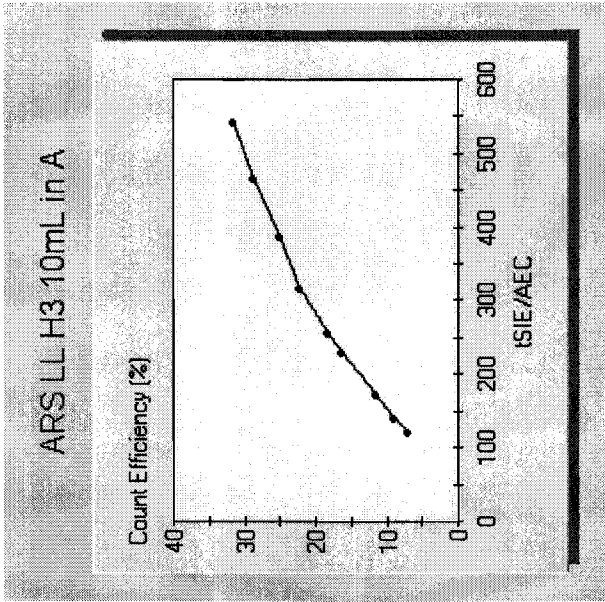
Units

Reference Date

Reference Time

A  
B  
C

Cycle 1 Results  
Quench Curve Block Data



Date Acquired: 11/20/2012  
Date Modified:  
ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
543.57	31.51
466.44	28.74
387.42	24.95
316.48	22.21
257.14	18.18
229.94	16.37
172.56	11.68
142.07	9.08
121.26	7.13

P#	S#	SMPL_ID	CPMA	DPM1	tsIE	Eff	Nucl	In A	Count	Time	DATE	TIME	MESSAGES
2	1	BACKGROUND	1.025	4.19	375.29			24.48	240.00		7/19/2013	1:58:13 AM	
2	2	B13-01361-01	4.030	16.20	385.43			24.87	240.00		7/19/2013	6:09:10 AM	
2	3	B13-01361-02	3.320	13.54	376.23			24.52	240.00		7/19/2013	10:20:08 AM	
2	4	B13-01361-03	1.461	5.92	380.84			24.69	240.00		7/19/2013	2:31:06 PM	
2	5	B13-01361-04	1.294	5.23	381.52			24.72	240.00		7/19/2013	6:42:00 PM	
2	6	B13-01361-05	1.396	5.63	383.27			24.79	240.00		7/19/2013	10:52:57 PM	

Assay Definition-

Assay Description:  
 LLH3 Assay in DPM Mode

Assay Type: DPM (Single)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130722\_0835

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130722\_0835\20130722\_0835.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130722\_0835\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\20130722\_0835\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Level H3.1sa

Count Conditions-

Nuclide: Low Level H3

Quench Indicator: tsIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: ARS LL H3 10mL

Count Time (min): 240.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma % Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Half Life-

Luminescence Correction: Off

Heterogeneity Monitor: Off

Delay Before Burst (nsec): 75

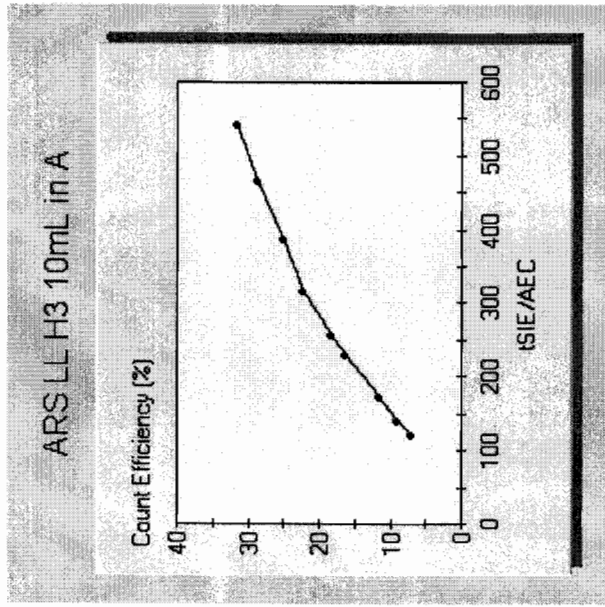
Half Life Correction: Off

Regions Half Life

Units Reference Date Reference Time

A  
B  
C

Cycle 1 Results  
Quench Curve Block Data



Date Acquired: 11/20/2012  
Date Modified:  
ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
543.57	31.51
466.44	28.74
387.42	24.95
316.48	22.21
257.14	18.18
229.94	16.37
172.56	11.68
142.07	9.08
121.26	7.13



P#	S#	SMPL_ID	CPMA	DPM1	tsIE	Eff Nucl	In A	Count Time	DATE	TIME	MESSAGES
2	1	BACKGROUND	1.088	4.36	386.95		24.93	240.00	7/22/2013	8:43:50 AM	
2	2	B13-01361-01R	3.733	14.95	387.93		24.97	240.00	7/22/2013	12:54:47 PM	
2	3	B13-01361-02R	3.374	13.51	388.11		24.98	240.00	7/22/2013	5:05:41 PM	
2	4	B13-01361-06	1.129	4.51	389.88		25.07	240.00	7/22/2013	9:16:37 PM	
2	5	B13-01361-07	1.148	4.54	394.06		25.27	240.00	7/23/2013	1:27:30 AM	
2	6	B13-01361-08	7.739	30.12	403.00		25.70	240.00	7/23/2013	5:38:32 AM	

P#	S#	SMPL_ID	CPMA	DPM1	tsIE	Eff Nucl	In A	Count	Time	DATE	TIME	MESSAGES
2	1	B13-01361-03R	1.258	4.99	393.03		25.22	240.00		7/23/2013	11:54:27 AM	

ARS Batch Number:

ARS1-B13 - 01361

Enter these values for LCS	Current ACT	5.4518
	NetWt	5.0879
	Aliquot	0.5103

Report Name	Field Name on the Report
Standards Report	ACT at Date Above (dpm/g)
LCS Report	NetWt
Tritium Enrichment Data	Gross Sample Added/1000

Enter these values for LCS	Current ACT	5.4518
	NetWt	5.0686
	Aliquot	0.5004

Report Name	Field Name on the Report
Standards Report	ACT at Date Above (dpm/g)
LCS Report	NetWt
Tritium Enrichment Data	Gross Sample Added/1000

### Expected Value Calculations

ARS Batch Number:

ARS1-B11 - 01361

LCS      CALCULATED  
            EXPECTED VALUE

$$= \frac{24.485}{\text{Range}} = \frac{19.588}{29.381}$$

LCSD      CALCULATED  
            EXPECTED VALUE

$$= \frac{24.877}{\text{Range}} = \frac{19.901}{29.852}$$



Standards Activity as of: 07/22/13 12:54

Active	Std ID	Isotope	PSCLT	Verification Date	Exp Date	Status	Ref Date	Ref ACT (dpm)	ACT at Date Above (dpm/g)	Half-life (days)	Parent ID
A	S-0279	H-3	SL	09/10/12	09/10/13	OK	09/07/12	5.7255E+00	5.4518	4.500E+03	S-0237



## Recount / Reprep Form

Date Initiated: 7-3-13 Action Needed  
(Check appropriate box)

Initiated By: VM Recount ☐

Management Approval: \_\_\_\_\_ Reprep/Recount ☒

ARS Procedure(s): ARS-040

SDG & Aliquot #(s): ARSL-13-01121-001 thru 004 ; ARSL-13-01179-001

Analytes: LL<sup>3</sup>H

Reason for required action: low LCS/LCSD recovery

Reprep? Yes ☒ No ☐

Action Recommended: \_\_\_\_\_

Action Taken: \_\_\_\_\_

Responsible Party: \_\_\_\_\_

Date Completed: \_\_\_\_\_ Signature: \_\_\_\_\_

Recount? Yes ☒ No ☐

Recount initiated in TRAX ☒

Action Recommended: \_\_\_\_\_

Action Taken: \_\_\_\_\_

Responsible Party: \_\_\_\_\_

Date Completed: \_\_\_\_\_ Signature: \_\_\_\_\_



## Rerun Report

SDG	ARS1-13-01179
Analysis	LSC-A-022
Run	2

Fraction	Client ID	Rerun Reason	Comments	Original Deadline	Rerun Deadline
001	CALA-13-33427	LCS		07/12/13	07/19/13

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
7-18-13	14:10	B13-01361-02	B13-01361	0149	Prj
+	+	B13-01361-03	+	+	Prj
+	+	B13-01361-04	+	+	Prj
+	+	B13-01361-05	+	+	Prj
+	+	B13-01361-06	+	+	Prj
+	+	B13-01361-07	+	+	Prj
+	+	B13-01361-08	+	+	Prj
7-19-13	7:56	Background	B13-01462	0255	Prj
+	+	B13-01462-04	+	+	Prj
+	+	B13-01462-10	+	+	Prj
+	+	B13-01462-11	+	+	Prj
+	+	SNC 16	QA	QA	Prj
7-22-13	7:08	SNC 16	QA	QA	Prj
+	7:36	Background	B13-01361	0835	Prj
+	+	B13-01361-01	+	+	Prj
+	+	B13-01361-02	+	+	Prj
+	+	B13-01361-06	+	+	Prj
+	+	B13-01361-07	+	+	Prj
+	+	B13-01361-08	+	+	Prj
7-23-13	11:30	B13-01361-03	+	0835	Prj

\* Instrument malfunctioned so samples will need to be counted, since instrument did not count. for 7.22.13  
 Page 78 of 200  
 CE-13  
 Reviewed By: SOE Date: 7-24-13  
 Initials



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# **American Radiation Services Analytical Reports**

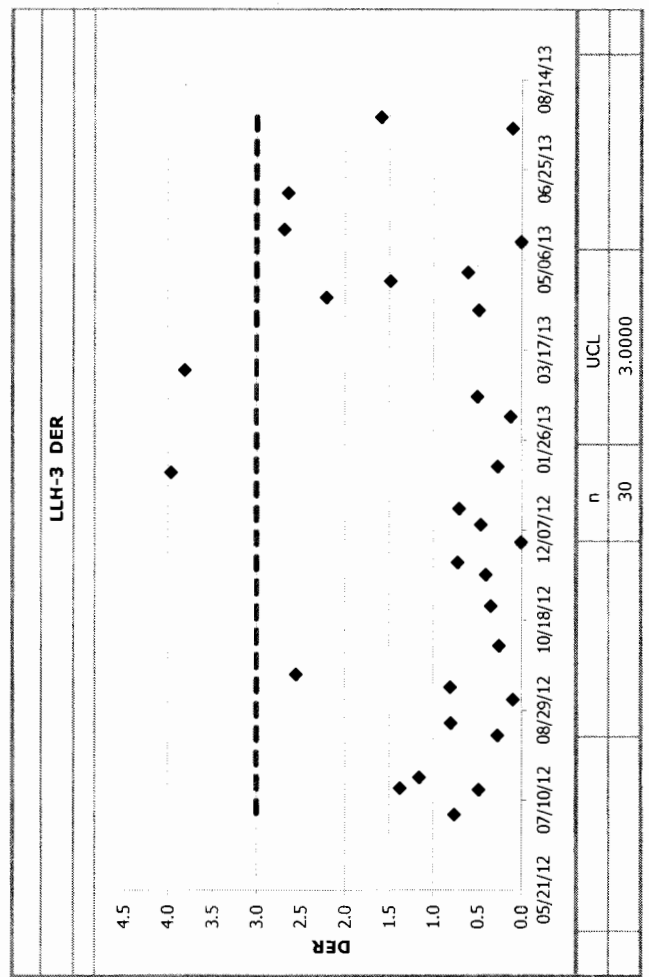
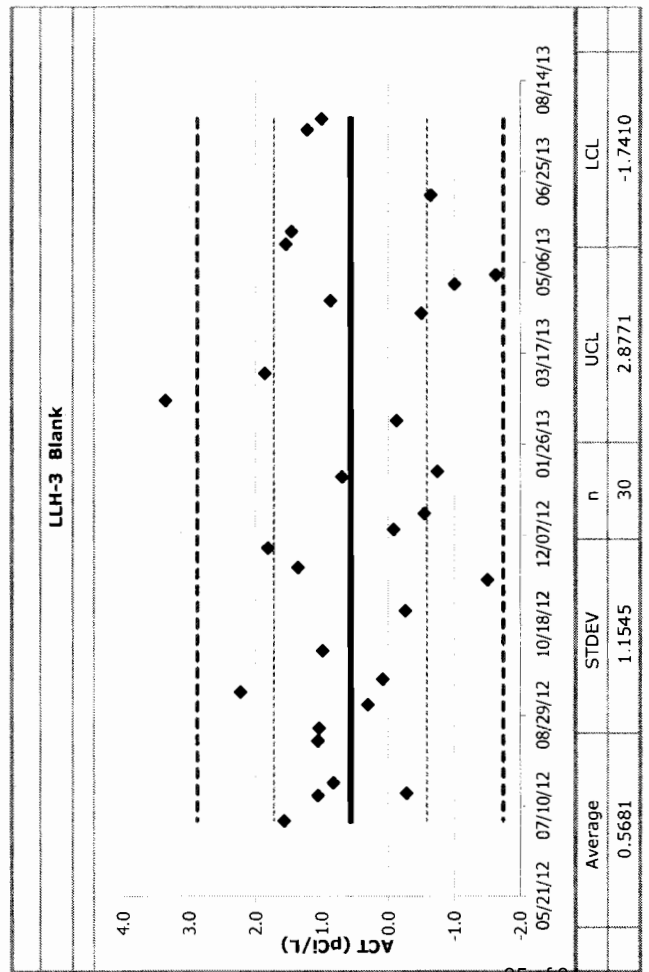
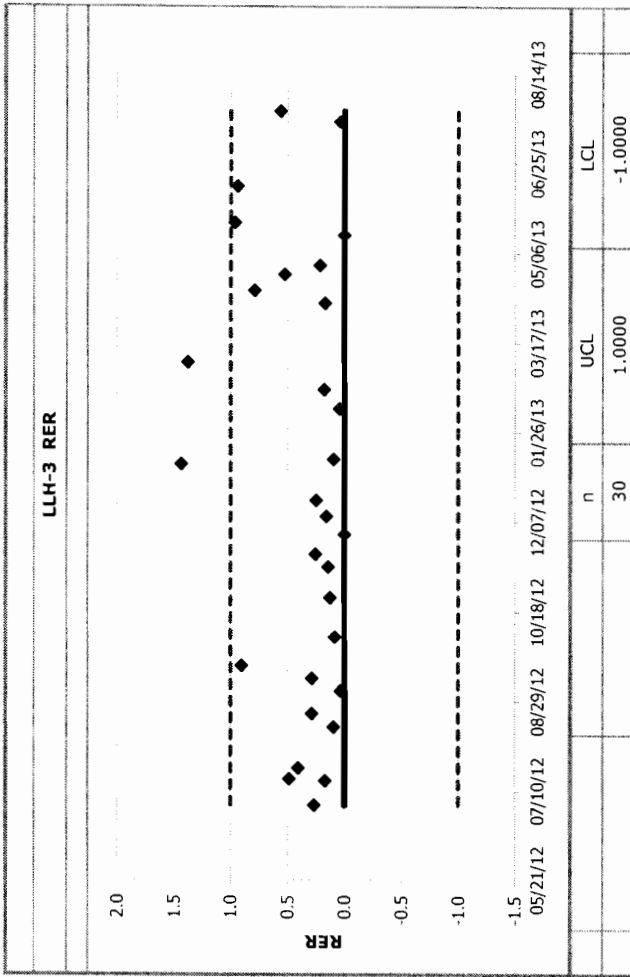
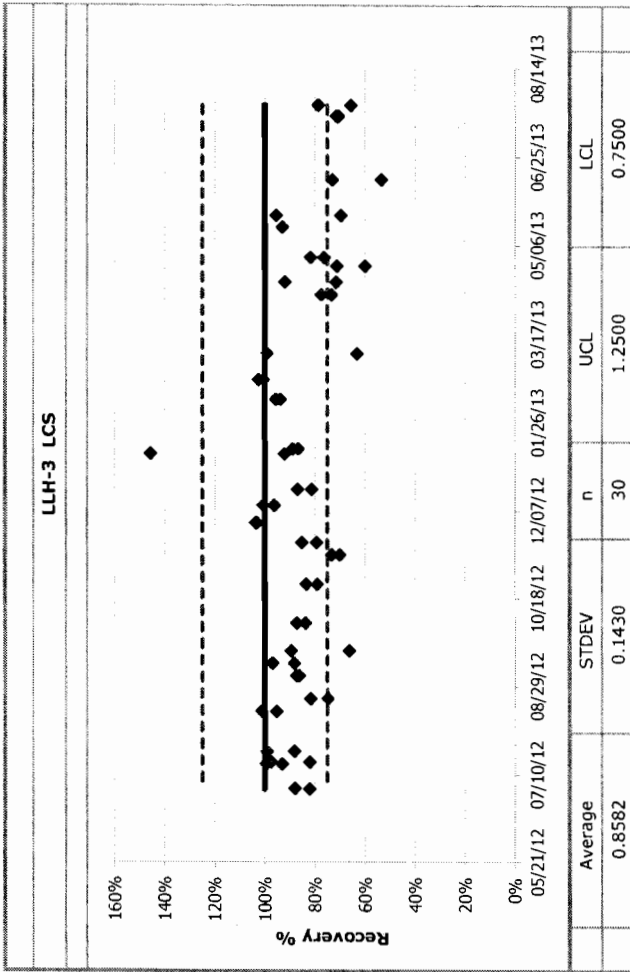
for

## **Los Alamos National Laboratory**

### **Low Level Tritium by Low Level Liquid Scintillation Counting Control Charts**



# QC Chart



## 3H Efficiency

Total # pts : 5656  
Valid # pts : 160  
Mean : 62.70  
SD : 0.25

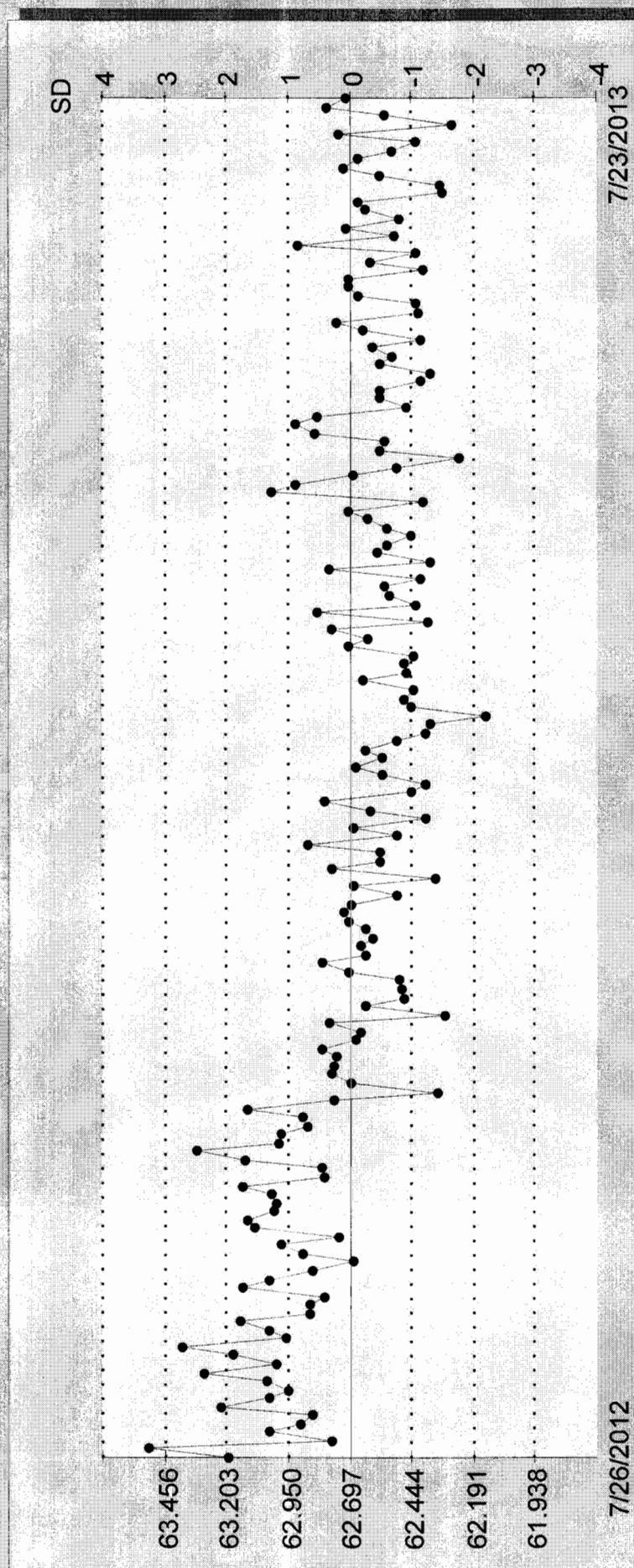
Date	Value	Valid Pt
Jul 26, 2012	63.19	X
Jul 27, 2012	63.52	X
Aug 09, 2012	62.77	X
Aug 13, 2012	63.03	X
Aug 14, 2012	62.90	X
Aug 16, 2012	62.85	X
Aug 17, 2012	63.22	X
Aug 18, 2012	63.03	X
Aug 21, 2012	62.94	X
Aug 22, 2012	63.04	X
Aug 26, 2012	63.29	X
Aug 27, 2012	62.99	X
Aug 27, 2012	63.17	X
Sep 05, 2012	63.39	X
Sep 09, 2012	62.96	X
Sep 11, 2012	63.03	X
Sep 17, 2012	63.15	X
Sep 18, 2012	62.86	X
Sep 20, 2012	62.86	X
Sep 20, 2012	62.80	X
Sep 24, 2012	63.14	X
Sep 28, 2012	63.03	X
Oct 01, 2012	62.85	X
Oct 04, 2012	62.68	X
Oct 05, 2012	62.88	X
Oct 06, 2012	62.98	X
Oct 11, 2012	62.74	X
Oct 12, 2012	63.08	X
Oct 13, 2012	63.12	X
Oct 17, 2012	63.00	X
Oct 19, 2012	63.00	X
Oct 22, 2012	63.02	X
Oct 23, 2012	63.13	X
Oct 23, 2012	62.80	X
Oct 23, 2012	62.81	X
Oct 23, 2012	63.13	X
Oct 25, 2012	63.32	X
Oct 27, 2012	62.99	X
Oct 31, 2012	62.98	X
Nov 02, 2012	62.87	X
Nov 02, 2012	62.89	X
Nov 04, 2012	63.11	X

Nov 05, 2012	62.76	X
Nov 10, 2012	62.33	X
Nov 12, 2012	62.69	X
Nov 12, 2012	62.77	X
Nov 13, 2012	62.76	X
Nov 14, 2012	62.75	X
Nov 15, 2012	62.81	X
Nov 18, 2012	62.68	X
Nov 19, 2012	62.65	X
Nov 19, 2012	62.78	X
Nov 20, 2012	62.30	X
Nov 21, 2012	62.63	X
Nov 23, 2012	62.47	X
Dec 04, 2012	62.48	X
Dec 08, 2012	62.49	X
Dec 12, 2012	62.70	X
Dec 14, 2012	62.81	X
Dec 15, 2012	62.63	X
Dec 21, 2012	62.66	X
Dec 21, 2012	62.60	X
Dec 31, 2012	62.63	X
Jan 02, 2013	62.70	X
Jan 09, 2013	62.72	X
Jan 10, 2013	62.69	X
Feb 01, 2013	62.50	X
Feb 02, 2013	62.68	X
Feb 06, 2013	62.34	X
Feb 08, 2013	62.77	X
Feb 08, 2013	62.57	X
Feb 15, 2013	62.57	X
Feb 17, 2013	62.87	X
Feb 18, 2013	62.50	X
Feb 20, 2013	62.68	X
Feb 21, 2013	62.38	X
Feb 22, 2013	62.61	X
Feb 28, 2013	62.80	X
Mar 01, 2013	62.45	X
Mar 01, 2013	62.39	X
Mar 01, 2013	62.56	X
Mar 04, 2013	62.67	X
Mar 04, 2013	62.57	X
Mar 06, 2013	62.64	X
Mar 08, 2013	62.50	X
Mar 08, 2013	62.39	X
Mar 14, 2013	62.36	X
Mar 15, 2013	62.14	X
Mar 18, 2013	62.45	X
Mar 22, 2013	62.47	X
Mar 22, 2013	62.43	X
Mar 23, 2013	62.64	X
Mar 28, 2013	62.47	X
Mar 29, 2013	62.47	X

Apr 05, 2013	62.70	X
Apr 07, 2013	62.62	X
Apr 11, 2013	62.77	X
Apr 12, 2013	62.38	X
Apr 15, 2013	62.83	X
Apr 16, 2013	62.42	X
Apr 16, 2013	62.53	X
Apr 16, 2013	62.55	X
Apr 16, 2013	62.41	X
Apr 16, 2013	62.78	X
Apr 16, 2013	62.37	X
Apr 18, 2013	62.59	X
Apr 19, 2013	62.54	X
Apr 22, 2013	62.44	X
Apr 24, 2013	62.54	X
Apr 24, 2013	62.62	X
Apr 25, 2013	62.71	X
Apr 25, 2013	62.40	X
Apr 27, 2013	63.02	X
Apr 29, 2013	62.92	X
May 01, 2013	62.68	X
May 03, 2013	62.51	X
May 06, 2013	62.24	X
May 07, 2013	62.57	X
May 09, 2013	62.56	X
May 09, 2013	62.84	X
May 09, 2013	62.92	X
May 09, 2013	62.83	X
May 09, 2013	62.46	X
May 10, 2013	62.57	X
May 14, 2013	62.57	X
May 15, 2013	62.40	X
May 16, 2013	62.37	X
May 17, 2013	62.57	X
May 17, 2013	62.52	X
May 17, 2013	62.60	X
May 17, 2013	62.41	X
May 21, 2013	62.65	X
May 22, 2013	62.75	X
May 24, 2013	62.41	X
May 24, 2013	62.42	X
May 29, 2013	62.66	X
Jun 07, 2013	62.70	X
Jun 07, 2013	62.70	X
Jun 09, 2013	62.40	X
Jun 10, 2013	62.61	X
Jun 13, 2013	62.43	X
Jun 15, 2013	62.91	X
Jun 17, 2013	62.51	X
Jun 18, 2013	62.71	X
Jun 19, 2013	62.50	X
Jun 21, 2013	62.64	X

Jun 27, 2013	62.32	X
Jun 28, 2013	62.33	X
Jul 01, 2013	62.58	X
Jul 03, 2013	62.72	X
Jul 11, 2013	62.66	X
Jul 15, 2013	62.53	X
Jul 17, 2013	62.43	X
Jul 17, 2013	62.74	X
Jul 18, 2013	62.28	X
Jul 20, 2013	62.55	X
Jul 22, 2013	62.79	X
Jul 23, 2013	62.71	X

3H Efficiency : 5656  
Total # pts : 160  
Valid # pts : 62.70  
Mean : 62.70  
SD : 0.25



3H Background

Total # pts : 5582  
Valid # pts : 160  
Mean : 2.11  
SD : 0.17

Date	Value	Valid Pt
Jul 26, 2012	2.33	X
Jul 27, 2012	2.36	X
Aug 09, 2012	1.88	X
Aug 13, 2012	2.16	X
Aug 14, 2012	1.78	X
Aug 16, 2012	2.46	X
Aug 17, 2012	2.06	X
Aug 18, 2012	2.21	X
Aug 21, 2012	2.16	X
Aug 22, 2012	2.13	X
Aug 26, 2012	2.12	X
Aug 27, 2012	2.25	X
Aug 27, 2012	1.99	X
Sep 05, 2012	2.44	X
Sep 09, 2012	2.34	X
Sep 11, 2012	2.11	X
Sep 17, 2012	2.14	X
Sep 18, 2012	1.85	X
Sep 20, 2012	1.83	X
Sep 20, 2012	1.96	X
Sep 24, 2012	2.60	X
Sep 28, 2012	2.29	X
Oct 01, 2012	2.20	X
Oct 04, 2012	2.26	X
Oct 05, 2012	2.13	X
Oct 06, 2012	2.14	X
Oct 11, 2012	2.05	X
Oct 12, 2012	2.15	X
Oct 13, 2012	2.19	X
Oct 17, 2012	2.04	X
Oct 19, 2012	2.29	X
Oct 22, 2012	2.29	X
Oct 23, 2012	1.99	X
Oct 23, 2012	2.06	X
Oct 23, 2012	1.98	X
Oct 23, 2012	2.01	X
Oct 25, 2012	2.00	X
Oct 27, 2012	1.95	X
Oct 31, 2012	1.89	X
Nov 02, 2012	1.85	X
Nov 02, 2012	2.11	X
Nov 04, 2012	2.11	X

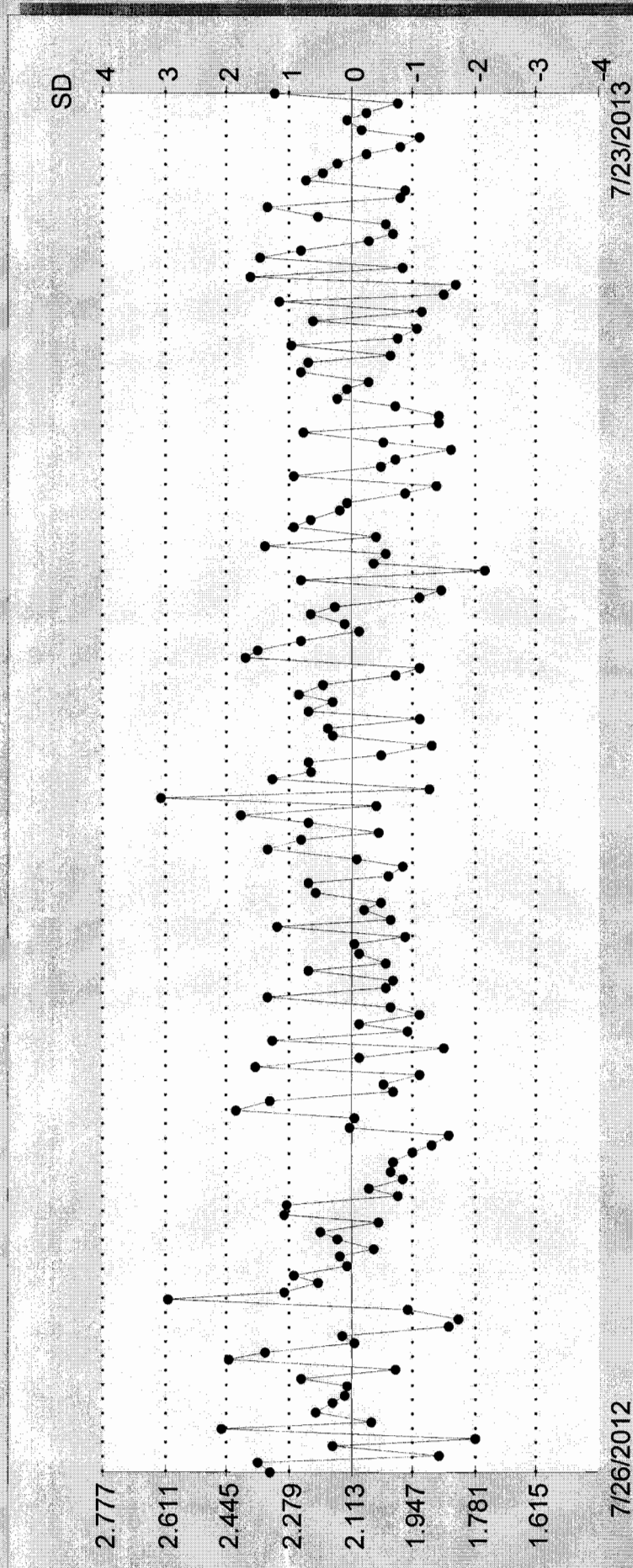
Nov 05, 2012 2.42 X  
Nov 10, 2012 2.33 X  
Nov 12, 2012 2.00 X  
Nov 12, 2012 2.02 X  
Nov 13, 2012 1.93 X  
Nov 14, 2012 2.37 X  
Nov 15, 2012 2.09 X  
Nov 18, 2012 1.86 X  
Nov 19, 2012 2.32 X  
Nov 19, 2012 1.96 X  
Nov 20, 2012 2.09 X  
Nov 21, 2012 1.93 X  
Nov 23, 2012 2.01 X  
Dec 04, 2012 2.34 X  
Dec 08, 2012 2.02 X  
Dec 12, 2012 2.00 X  
Dec 14, 2012 2.22 X  
Dec 15, 2012 2.02 X  
Dec 21, 2012 2.09 X  
Dec 21, 2012 2.10 X  
Dec 31, 2012 1.97 X  
Jan 02, 2013 2.31 X  
Jan 09, 2013 2.01 X  
Jan 10, 2013 2.08 X  
Feb 01, 2013 2.03 X  
Feb 02, 2013 2.21 X  
Feb 06, 2013 2.22 X  
Feb 08, 2013 2.01 X  
Feb 08, 2013 1.98 X  
Feb 15, 2013 2.10 X  
Feb 17, 2013 2.34 X  
Feb 18, 2013 2.25 X  
Feb 20, 2013 2.04 X  
Feb 21, 2013 2.23 X  
Feb 22, 2013 2.41 X  
Feb 28, 2013 2.04 X  
Mar 01, 2013 2.62 X  
Mar 01, 2013 1.90 X  
Mar 01, 2013 2.32 X  
Mar 04, 2013 2.22 X  
Mar 04, 2013 2.22 X  
Mar 06, 2013 2.04 X  
Mar 08, 2013 1.90 X  
Mar 08, 2013 2.16 X  
Mar 14, 2013 2.17 X  
Mar 15, 2013 1.93 X  
Mar 18, 2013 2.22 X  
Mar 22, 2013 2.16 X  
Mar 22, 2013 2.25 X  
Mar 23, 2013 2.19 X  
Mar 28, 2013 1.99 X  
Mar 29, 2013 1.93 X



Apr 05, 2013	2.36	X
Apr 07, 2013	2.25	X
Apr 11, 2013	2.09	X
Apr 12, 2013	2.13	X
Apr 15, 2013	2.22	X
Apr 16, 2013	2.16	X
Apr 16, 2013	1.93	X
Apr 16, 2013	1.87	X
Apr 16, 2013	2.24	X
Apr 16, 2013	1.75	X
Apr 16, 2013	2.05	X
Apr 18, 2013	2.02	X
Apr 19, 2013	2.34	X
Apr 22, 2013	2.04	X
Apr 24, 2013	2.26	X
Apr 24, 2013	2.22	X
Apr 25, 2013	2.14	X
Apr 25, 2013	2.13	X
Apr 27, 2013	1.97	X
Apr 29, 2013	1.89	X
May 01, 2013	2.26	X
May 03, 2013	2.04	X
May 06, 2013	1.99	X
May 07, 2013	1.84	X
May 09, 2013	2.03	X
May 09, 2013	2.24	X
May 09, 2013	1.88	X
May 09, 2013	1.88	X
May 09, 2013	1.99	X
May 10, 2013	2.15	X
May 14, 2013	2.12	X
May 15, 2013	2.06	X
May 16, 2013	2.25	X
May 17, 2013	2.23	X
May 17, 2013	2.01	X
May 17, 2013	2.27	X
May 17, 2013	1.99	X
May 21, 2013	1.94	X
May 22, 2013	2.21	X
May 24, 2013	1.92	X
May 24, 2013	2.31	X
May 29, 2013	1.86	X
Jun 07, 2013	1.83	X
Jun 07, 2013	2.38	X
Jun 09, 2013	1.97	X
Jun 10, 2013	2.35	X
Jun 13, 2013	2.24	X
Jun 15, 2013	2.06	X
Jun 17, 2013	2.00	X
Jun 18, 2013	2.02	X
Jun 19, 2013	2.20	X
Jun 21, 2013	2.34	X

Jun 27, 2013	1.96	X
Jun 28, 2013	2.23	X
Jul 01, 2013	2.19	X
Jul 03, 2013	2.15	X
Jul 11, 2013	2.07	X
Jul 15, 2013	1.98	X
Jul 17, 2013	1.93	X
Jul 17, 2013	2.08	X
Jul 18, 2013	2.13	X
Jul 20, 2013	2.07	X
Jul 22, 2013	1.99	X
Jul 23, 2013	2.32	X

3H Background  
Total # pts : 5582  
Valid # pts : 160  
Mean : 2.11  
SD : 0.17





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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

## **Tritium- Screening by Low Level Liquid Scintillation Counting**



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Samples**

**ARS-040**

**ARS-060**

**Procedures:**

**ARS File ID Numbers:** ARS1-13-01179

ARS1-13-01179

ARS Batch ID: ARS1-B13-01176

[illegible]



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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

# **Tritium-Screening by Low Level Liquid Scintillation Counting Laboratory Records**

# Analysis Batch Report

American Radiation Services, Inc.  
Baton Rouge Laboratory

Analysis Batch ID <b>ARS1-B13-01176</b>															
		Method		ARS-054		Analysis			LSC-A-021		Matrix		AQ		
		Description										Low Level Tritium Screening			
		Type	Blind Iso1	Blind Iso2	Blind Iso3	SDG	FR	Run	Client ID	Isotope Group	Lab Deadline				
ABatch Sample ID		ARS1-B13-01176-01	LCS												
		ARS1-B13-01176-02	LCS												
		ARS1-B13-01176-03	MBL												
		ARS1-B13-01176-04	TRG												
						<b>ARS1-13-01179</b>	001	1	CALA-13-33427	STD	07/09/13				





ID_31001_054	ABatch	ABatchSampleID	CientID	Aliquot1	AliquotUnits1	IC_ID1	Aliquot2	AliquotUnits2	IC_ID2	UserID	ModDate
12606	ARS1-B13-01176	ARS1-B13-01176-01		1 g						AMRAD\PSIMS	06/13/2013 12:14:44
12607	ARS1-B13-01176	ARS1-B13-01176-02		1 g						AMRAD\PSIMS	06/13/2013 12:14:44
12608	ARS1-B13-01176	ARS1-B13-01176-03		1 g						AMRAD\PSIMS	06/13/2013 12:14:44
12609	ARS1-B13-01176	ARS1-B13-01176-04	CALA-13-33427	10.03 g		138988				AMRAD\PSIMS	06/13/2013 12:14:44

Assay Definition-

Assay Description:

LLH3 Assay in DPM Mode

Assay Type: DPM (Single)

Report Name: Report1

Output Data Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_2\20130613\_1356

Raw Results Path: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_2\20130613\_1356\20130613\_1356.results

RTF File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_2\20130613\_1356\LLH3.rtf

Comma-Delimited File Name: C:\Packard\Tricarb\Results\H3 Low Level\Low Level H3\_2\20130613\_1356\LLH3 Results.csv

Assay File Name: C:\Packard\Tricarb\Assays\Low Level H3\_2.lsa

Count Conditions-

Nuclide: Low Level H3

Quench Indicator: tsIE/AEC

External Std Terminator (sec): 0.5 2s%

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: ARS LL H3 10mL

Count Time (min): 120.00

Count Mode: Low Level

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 2

Calculate % Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma % Terminator: On - Any Region

Regions	LL	UL	2Sigma	% Terminator
A	2.0	18.6		0.50
B	0.0	2000.0		0.00
C	0.0	2000.0		0.00

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions      Half Life

Units

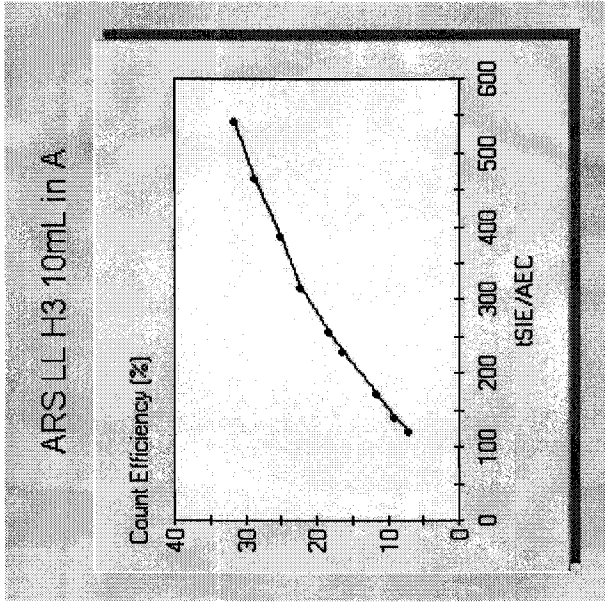
Reference Date

Reference Time

Protocol# 11 - Low Level H3 2.lsa

A
 B
 C

Cycle 1 Results
 Quench Curve Block Data



Date Acquired: 11/20/2012
 Date Modified:
 ARS LL H3 10mL in A

tSIE/AEC	Count Efficiency (%)
543.57	31.51
466.44	28.74
387.42	24.95
316.48	22.21
257.14	18.18
229.94	16.37
172.56	11.68
142.07	9.08
121.26	7.13

P#	S#	SMPL_ID	CPMA	DPM1	tSIE	Eff	Nucl	In A	Count	Time	DATE	TIME	MESSAGES
11	1	BACKGROUND	1.145	4.71	370.13			24.28	120.00		6/13/2013	2:05:45 PM	
11	1	BACKGROUND	1.062	4.35	373.09			24.39	120.00		6/13/2013	4:15:25 PM	
			1.103	4.53	371.61			24.34					A
11	2	B13-01176-04	1.597	6.47	380.24			24.67	120.00		6/13/2013	6:25:18 PM	
11	2	B13-01176-04	1.653	6.88	363.40			24.02	120.00		6/13/2013	8:34:58 PM	
			1.625	6.68	371.82			24.35					A

# Beta Liquid Scintillation Counter Log Book

Date	Time	ARS Sample I.D. Number	Batch Number	Liquid Scintillation File Number	Technician Initials
6-7-13	11:14	P13-01030-05	B13-0130	2103	PRJ
+	+	B13-01030-06	+	+	PRJ
+	+	B13-01030-09	+	+	PRJ
+	+	B13-01030-10	+	+	PRJ
6-10-13	9:00	SNCLC	Q14	Q14	PRJ
+	+	Background	B13-01124	1042	PRJ
+	+	B13-01124-05	+	+	PRJ
6-13-13	12:21	SNCLC	Q14	Q14	PRJ
+	+	Background	B13-01174	1356	PRJ
+	+	B13-01174-01	+	+	PRJ
+	13:50	Background	B13-01094	2236	PRJ
+	+	B13-01094-01	+	+	PRJ
+	+	+	+	+	PRJ
+	+	+	+	+	PRJ
+	+	+	+	+	PRJ
+	+	+	+	+	PRJ
+	+	+	+	+	PRJ
6-17-13	9:28	SNCLC	Q14	Q14	PRJ
+	+	Background	B13-01094	1163	PRJ
+	+	B13-01094-01	+	+	PRJ
+	+	B13-01094-02	+	+	PRJ



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# **American Radiation Services Analytical Reports**

for

**Los Alamos National Laboratory**

## **Tritium-Screening by Low Level Liquid Scintillation Counting Control Charts**

## 3H Efficiency

Total # pts : 5656  
Valid # pts : 160  
Mean : 62.70  
SD : 0.25

Date	Value	Valid Pt
Jul 26, 2012	63.19	X
Jul 27, 2012	63.52	X
Aug 09, 2012	62.77	X
Aug 13, 2012	63.03	X
Aug 14, 2012	62.90	X
Aug 16, 2012	62.85	X
Aug 17, 2012	63.22	X
Aug 18, 2012	63.03	X
Aug 21, 2012	62.94	X
Aug 22, 2012	63.04	X
Aug 26, 2012	63.29	X
Aug 27, 2012	62.99	X
Aug 27, 2012	63.17	X
Sep 05, 2012	63.39	X
Sep 09, 2012	62.96	X
Sep 11, 2012	63.03	X
Sep 17, 2012	63.15	X
Sep 18, 2012	62.86	X
Sep 20, 2012	62.86	X
Sep 20, 2012	62.80	X
Sep 24, 2012	63.14	X
Sep 28, 2012	63.03	X
Oct 01, 2012	62.85	X
Oct 04, 2012	62.68	X
Oct 05, 2012	62.88	X
Oct 06, 2012	62.98	X
Oct 11, 2012	62.74	X
Oct 12, 2012	63.08	X
Oct 13, 2012	63.12	X
Oct 17, 2012	63.00	X
Oct 19, 2012	63.00	X
Oct 22, 2012	63.02	X
Oct 23, 2012	63.13	X
Oct 23, 2012	62.80	X
Oct 23, 2012	62.81	X
Oct 23, 2012	63.13	X
Oct 25, 2012	63.32	X
Oct 27, 2012	62.99	X
Oct 31, 2012	62.98	X
Nov 02, 2012	62.87	X
Nov 02, 2012	62.89	X
Nov 04, 2012	63.11	X

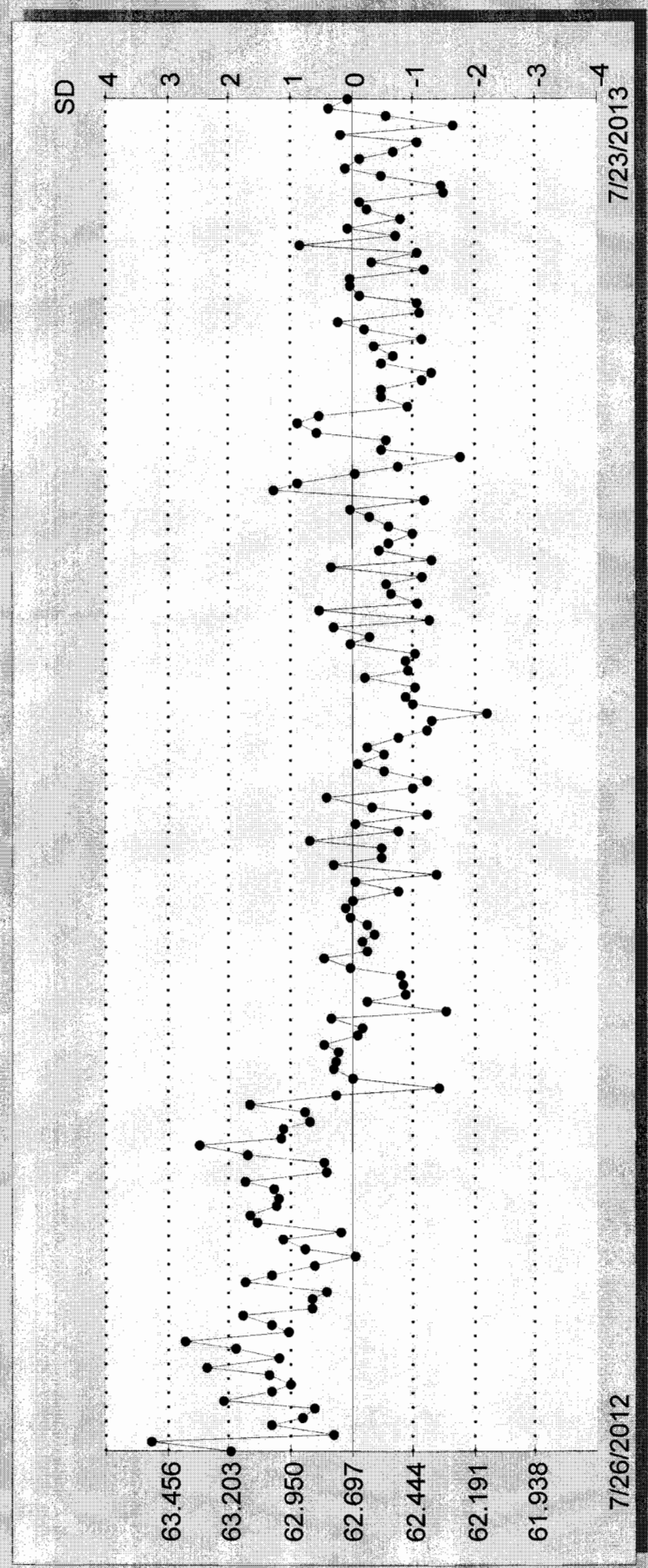
Nov 05, 2012 62.76 X  
Nov 10, 2012 62.33 X  
Nov 12, 2012 62.69 X  
Nov 12, 2012 62.77 X  
Nov 13, 2012 62.76 X  
Nov 14, 2012 62.75 X  
Nov 15, 2012 62.81 X  
Nov 18, 2012 62.68 X  
Nov 19, 2012 62.65 X  
Nov 19, 2012 62.78 X  
Nov 20, 2012 62.30 X  
Nov 21, 2012 62.63 X  
Nov 23, 2012 62.47 X  
Dec 04, 2012 62.48 X  
Dec 08, 2012 62.49 X  
Dec 12, 2012 62.70 X  
Dec 14, 2012 62.81 X  
Dec 15, 2012 62.63 X  
Dec 21, 2012 62.66 X  
Dec 21, 2012 62.60 X  
Dec 31, 2012 62.63 X  
Jan 02, 2013 62.70 X  
Jan 09, 2013 62.72 X  
Jan 10, 2013 62.69 X  
Jan 10, 2013 62.50 X  
Feb 01, 2013 62.68 X  
Feb 02, 2013 62.34 X  
Feb 06, 2013 62.77 X  
Feb 08, 2013 62.57 X  
Feb 08, 2013 62.57 X  
Feb 15, 2013 62.87 X  
Feb 17, 2013 62.50 X  
Feb 18, 2013 62.68 X  
Feb 20, 2013 62.38 X  
Feb 21, 2013 62.61 X  
Feb 22, 2013 62.80 X  
Feb 28, 2013 62.45 X  
Mar 01, 2013 62.39 X  
Mar 01, 2013 62.56 X  
Mar 01, 2013 62.67 X  
Mar 04, 2013 62.57 X  
Mar 04, 2013 62.64 X  
Mar 06, 2013 62.50 X  
Mar 08, 2013 62.39 X  
Mar 08, 2013 62.36 X  
Mar 14, 2013 62.14 X  
Mar 15, 2013 62.45 X  
Mar 18, 2013 62.47 X  
Mar 22, 2013 62.43 X  
Mar 22, 2013 62.64 X  
Mar 23, 2013 62.47 X  
Mar 28, 2013 62.47 X  
Mar 29, 2013 62.47 X



Apr 05, 2013	62.70	X
Apr 07, 2013	62.62	X
Apr 11, 2013	62.77	X
Apr 12, 2013	62.38	X
Apr 15, 2013	62.83	X
Apr 16, 2013	62.42	X
Apr 16, 2013	62.53	X
Apr 16, 2013	62.55	X
Apr 16, 2013	62.41	X
Apr 16, 2013	62.78	X
Apr 16, 2013	62.37	X
Apr 18, 2013	62.59	X
Apr 19, 2013	62.54	X
Apr 22, 2013	62.44	X
Apr 24, 2013	62.54	X
Apr 24, 2013	62.62	X
Apr 25, 2013	62.71	X
Apr 25, 2013	62.40	X
Apr 27, 2013	63.02	X
Apr 29, 2013	62.92	X
May 01, 2013	62.68	X
May 03, 2013	62.51	X
May 06, 2013	62.24	X
May 07, 2013	62.57	X
May 09, 2013	62.56	X
May 09, 2013	62.84	X
May 09, 2013	62.92	X
May 09, 2013	62.83	X
May 09, 2013	62.46	X
May 10, 2013	62.57	X
May 14, 2013	62.57	X
May 15, 2013	62.40	X
May 16, 2013	62.37	X
May 17, 2013	62.57	X
May 17, 2013	62.52	X
May 17, 2013	62.60	X
May 17, 2013	62.41	X
May 21, 2013	62.65	X
May 22, 2013	62.75	X
May 24, 2013	62.41	X
May 24, 2013	62.42	X
May 29, 2013	62.66	X
Jun 07, 2013	62.70	X
Jun 07, 2013	62.70	X
Jun 09, 2013	62.40	X
Jun 10, 2013	62.61	X
Jun 13, 2013	62.43	X
Jun 15, 2013	62.91	X
Jun 17, 2013	62.51	X
Jun 18, 2013	62.71	X
Jun 19, 2013	62.50	X
Jun 21, 2013	62.64	X

Jun 27, 2013	62.32	X
Jun 28, 2013	62.33	X
Jul 01, 2013	62.58	X
Jul 03, 2013	62.72	X
Jul 11, 2013	62.66	X
Jul 15, 2013	62.53	X
Jul 17, 2013	62.43	X
Jul 17, 2013	62.74	X
Jul 18, 2013	62.28	X
Jul 20, 2013	62.55	X
Jul 22, 2013	62.79	X
Jul 23, 2013	62.71	X

3H Efficiency  
Total # pts : 5656  
Valid # pts : 160  
Mean : 62.70  
SD : 0.25



3H Background

Total # pts : 5582  
Valid # pts : 160  
Mean : 2.11  
SD : 0.17

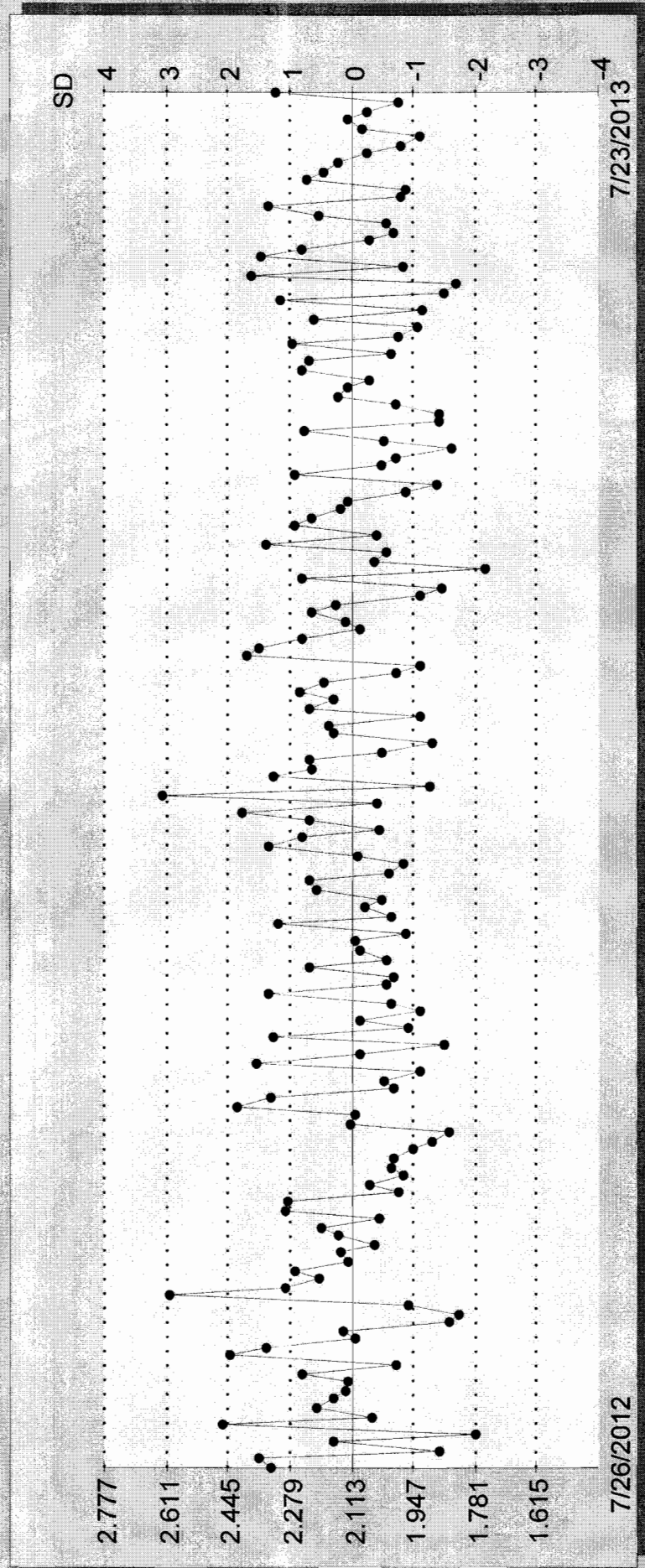
Date	Value	Valid Pt
Jul 26, 2012	2.33	X
Jul 27, 2012	2.36	X
Aug 09, 2012	1.88	X
Aug 13, 2012	2.16	X
Aug 14, 2012	1.78	X
Aug 16, 2012	2.46	X
Aug 17, 2012	2.06	X
Aug 18, 2012	2.21	X
Aug 21, 2012	2.16	X
Aug 22, 2012	2.13	X
Aug 26, 2012	2.12	X
Aug 27, 2012	2.25	X
Aug 27, 2012	1.99	X
Sep 05, 2012	2.44	X
Sep 09, 2012	2.34	X
Sep 11, 2012	2.11	X
Sep 17, 2012	2.14	X
Sep 18, 2012	1.85	X
Sep 20, 2012	1.83	X
Sep 20, 2012	1.96	X
Sep 24, 2012	2.60	X
Sep 28, 2012	2.29	X
Oct 01, 2012	2.20	X
Oct 04, 2012	2.26	X
Oct 05, 2012	2.13	X
Oct 06, 2012	2.14	X
Oct 11, 2012	2.05	X
Oct 12, 2012	2.15	X
Oct 13, 2012	2.19	X
Oct 17, 2012	2.04	X
Oct 19, 2012	2.29	X
Oct 22, 2012	2.29	X
Oct 23, 2012	1.99	X
Oct 23, 2012	2.06	X
Oct 23, 2012	1.98	X
Oct 23, 2012	2.01	X
Oct 25, 2012	2.00	X
Oct 27, 2012	1.95	X
Oct 31, 2012	1.89	X
Nov 02, 2012	1.85	X
Nov 02, 2012	2.11	X
Nov 04, 2012	2.11	X

Nov 05, 2012	2.42	X
Nov 10, 2012	2.33	X
Nov 12, 2012	2.00	X
Nov 12, 2012	2.02	X
Nov 13, 2012	1.93	X
Nov 14, 2012	2.37	X
Nov 15, 2012	2.09	X
Nov 18, 2012	1.86	X
Nov 19, 2012	2.32	X
Nov 19, 2012	1.96	X
Nov 20, 2012	2.09	X
Nov 21, 2012	1.93	X
Nov 23, 2012	2.01	X
Dec 04, 2012	2.34	X
Dec 08, 2012	2.02	X
Dec 12, 2012	2.00	X
Dec 14, 2012	2.22	X
Dec 15, 2012	2.02	X
Dec 21, 2012	2.09	X
Dec 21, 2012	2.10	X
Dec 31, 2012	1.97	X
Jan 02, 2013	2.31	X
Jan 09, 2013	2.01	X
Jan 10, 2013	2.08	X
Feb 01, 2013	2.03	X
Feb 02, 2013	2.21	X
Feb 06, 2013	2.22	X
Feb 08, 2013	2.01	X
Feb 08, 2013	1.98	X
Feb 15, 2013	2.10	X
Feb 17, 2013	2.34	X
Feb 18, 2013	2.25	X
Feb 20, 2013	2.04	X
Feb 21, 2013	2.23	X
Feb 22, 2013	2.41	X
Feb 28, 2013	2.04	X
Mar 01, 2013	2.62	X
Mar 01, 2013	1.90	X
Mar 01, 2013	2.32	X
Mar 04, 2013	2.22	X
Mar 04, 2013	2.22	X
Mar 06, 2013	2.04	X
Mar 08, 2013	1.90	X
Mar 08, 2013	2.16	X
Mar 14, 2013	2.17	X
Mar 15, 2013	1.93	X
Mar 18, 2013	2.22	X
Mar 22, 2013	2.16	X
Mar 22, 2013	2.25	X
Mar 23, 2013	2.19	X
Mar 28, 2013	1.99	X
Mar 29, 2013	1.93	X

Apr 05, 2013	2.36	X
Apr 07, 2013	2.25	X
Apr 11, 2013	2.09	X
Apr 12, 2013	2.13	X
Apr 15, 2013	2.22	X
Apr 16, 2013	2.16	X
Apr 16, 2013	1.93	X
Apr 16, 2013	1.87	X
Apr 16, 2013	2.24	X
Apr 16, 2013	1.75	X
Apr 16, 2013	2.05	X
Apr 18, 2013	2.02	X
Apr 19, 2013	2.34	X
Apr 22, 2013	2.04	X
Apr 24, 2013	2.26	X
Apr 24, 2013	2.22	X
Apr 25, 2013	2.14	X
Apr 25, 2013	2.13	X
Apr 27, 2013	1.97	X
Apr 29, 2013	1.89	X
May 01, 2013	2.26	X
May 03, 2013	2.04	X
May 06, 2013	1.99	X
May 07, 2013	1.84	X
May 09, 2013	2.03	X
May 09, 2013	2.24	X
May 09, 2013	1.88	X
May 09, 2013	1.88	X
May 09, 2013	1.99	X
May 10, 2013	2.15	X
May 14, 2013	2.12	X
May 15, 2013	2.06	X
May 16, 2013	2.25	X
May 17, 2013	2.23	X
May 17, 2013	2.01	X
May 17, 2013	2.27	X
May 17, 2013	1.99	X
May 21, 2013	1.94	X
May 22, 2013	2.21	X
May 24, 2013	1.92	X
May 24, 2013	2.31	X
May 29, 2013	1.86	X
Jun 07, 2013	1.83	X
Jun 07, 2013	2.38	X
Jun 09, 2013	1.97	X
Jun 10, 2013	2.35	X
Jun 13, 2013	2.24	X
Jun 15, 2013	2.06	X
Jun 17, 2013	2.00	X
Jun 18, 2013	2.02	X
Jun 19, 2013	2.20	X
Jun 21, 2013	2.34	X

Jun 27, 2013	1.96	X
Jun 28, 2013	2.23	X
Jul 01, 2013	2.19	X
Jul 03, 2013	2.15	X
Jul 11, 2013	2.07	X
Jul 15, 2013	1.98	X
Jul 17, 2013	1.93	X
Jul 17, 2013	2.08	X
Jul 18, 2013	2.13	X
Jul 20, 2013	2.07	X
Jul 22, 2013	1.99	X
Jul 23, 2013	2.32	X

3H Background  
Total # pts : 5582  
Valid # pts : 160  
Mean : 2.11  
SD : 0.17







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# **American Radiation Services Analytical Reports**

for

## **Los Alamos National Laboratory**

### **Low Level Liquid Scintillation Counting**

# **Calibration Information**



## QUALITY CONTROL PROGRAM

 AMERICAN RADIATION SERVICES  
 RADIOACTIVE REFERENCE SOLUTIONS

## ANNUAL ACTIVITY VERIFICATION

 VERIFICATION DATE 9/10/2012 20:16 date counted  
 STANDARD REFERENCE # S-0279

Principal Radionuclide

H-3

ENTER --&gt;

Half Life, Years

1.232E+01

OR --&gt;

Half Life, Days

4.4998E+034.4998E+03

Radionuclide

H-3

Dilution Reference Date

9/7/2012 10:40

Dilution Activity

2.58

pCi per gram ==&gt; dpm/g

5.73

Verif. Date Decay Corrected

2.58

pCi per gram ==&gt; dpm/g

5.72

## Minimum of 3 Required

Trial ID	Sample Counts	Count Time (min)	Detector	Efficiency	Bkg. (cpm)	Net Weight	Decay Corrected Activity Result (dpm/g)	Decay Corrected Activity Result (pCi/g)
S-0279-V1	15.91	1	LSC	0.3302	6.49	5.019	5.68	2.56
S-0279-V2	16.21	1	LSC	0.3291	6.49	5.018	5.89	2.65
S-0279-V3	15.76	1	LSC	0.3290	6.49	5.018	5.62	2.53
S-0279-V4	15.62	1	LSC	0.3293	6.49	5.008	5.54	2.49
S-0279-V5	15.76	1	LSC	0.3280	6.49	5.018	5.63	2.54

10% Max

PASS

Standard Deviation percent of known concentration

5% Max

PASS

Target Activity

% Diff

Average

Two Sigma Uncertainty

5.670.262.30%5.72-0.91%Verification Expiration Date: #####

Prepared &amp; Counted By

R. J. ShiffDate: 9/10/2012 20:16

Verified &amp; Approved By

V. J. MulliganDate: 9-11-12 0817

QC Approval

V. J. MulliganDate: 9-11-12 0817

S-0279



H-3

Verified

9/10/12

SL

Expires

9/10/13

Manufacturer

NIST SRM 4927F

Sol Matrix

H2O

Ref No

NIST SRM 4927F

Tech

Unknown

Parent ID

S-0237



RADIOACTIVE STANDARDS -- BATON ROUGE LABORATORY

### H-3 Standard Verification

Verifier's Name: Brian Steffens

Date: 9/7/2012

Pipettor ID: FJ40469

Pipettor ID: Auto-pipettor

Pipettor ID: na

Standard ID: S-0279

Standard ID: N/A

Standards brought up to ~5g with distilled dead water.

Standards made in glass vials.

Weight of Standard		
15mL of Ultima Gold added to standard	S-0279-V1	5.019 g
	S-0279-V2	5.018 g
	S-0279-V3	5.018 g
	S-0279-V4	5.008 g
	S-0279-V5	5.018 g
		Balance ID: H1331122173560P

Assay Definition-

Assay Description:  
H3 Normal Lvl

Assay Type: DPM (Single)

Report Name: Report1  
Output Data Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931  
Raw Results Path: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931\H3 Results.results  
RTF File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931\H3 Results.rtf  
Comma-Delimited File Name: C:\Packard\Tricarb\Results\ARS\H-3 Normal 3\20120910\_0931\H3 Results.csv  
Assay File Name: C:\Packard\Tricarb\Assays\H-3 Normal 3.lsa

Count Conditions-

Nuclide: H-3 Normal

Quench Indicator: tSIE/AEC

External Std Terminator (sec): 0.5 2s

Pre-Count Delay (min): 0.00

Quench Set:

Low Energy: UG STD H-3

Count Time (min): 120.00

Count Mode: Normal

Assay Count Cycles: 1

#Vials/Sample: 1

Repeat Sample Count: 1  
Calculate & Reference: Off

Background Subtract: Off

Low CPM Threshold: Off

2 Sigma & Terminator: On - Any Region

Regions	LL	UL	2Sigma & Terminator
A	2.0	18.6	0.50
B	0.0	2000.0	0.00
C	0.0	2000.0	0.00

Count Corrections-

Static Controller: On

Colored Samples: Off

Coincidence Time (nsec): 18

Half Life-

Luminescence Correction: Off  
Heterogeneity Monitor: Off  
Delay Before Burst (nsec): 75

Half Life Correction: Off  
Regions Half Life

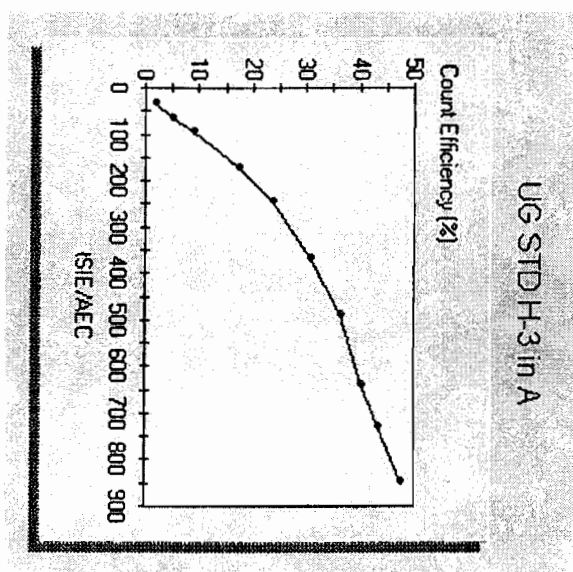
Units

Reference Date

Reference Time

A  
 B  
 C

Cycle 1 Results  
 Quench Curve Block Data



Date Acquired: 06/27/2012  
 Date Modified:  
 UG STD H-3 in A

tSIE/AEC	Count Efficiency (%)
846.90	47.58
730.85	43.21
639.47	40.08
487.78	36.36
365.41	30.73
244.81	23.69
169.28	17.31
95.01	8.79
64.60	4.97
34.32	1.64

P#	S#	SMPL_ID	CPMA	DPM1	tsIE	Eff Nucl In A	Count Time	DATE	TIME	MESSAGES
54	1	BACKGROUND	6.49	19.81	409.74	32.77	120.00	9/10/2012	9:36:46 AM	
54	2	S-0279-V1	15.91	48.18	415.20	33.02	120.00	9/10/2012	11:44:40 AM	
54	3	S-0279-V2	16.21	49.25	412.72	32.91	120.00	9/10/2012	1:52:36 PM	
54	4	S-0279-V3	15.76	47.89	412.56	32.90	120.00	9/10/2012	4:00:32 PM	
54	5	S-0279-V4	15.62	47.44	413.22	32.93	120.00	9/10/2012	6:08:27 PM	
54	6	S-0279-V5	15.76	48.04	410.40	32.80	120.00	9/10/2012	8:16:20 PM	

STD ID: S-0279

ARS INTERNATIONAL		Add/Edit Secondary Stds		Parent Standard Data			
Planning		Parent Solution Reference #		NIST SRM 4927F			
Planning Comments	Create a H3 LCS standard.	Parent Solution #		S-0237			
Target dpm/g (on dil. date)	5.5	Parent Principal Radionuclide		H-3	Half Life (Days)	4499.8080000	
Target Final volume mL	2000	Parent Reference Date		03/22/2010 10:10			
Appx mass g of Parent Sol'n	3.606433954	Parent Certified Act		3503.682716	Certf Act/Vol Units	dpm	g
Appx vol mL of Parent Sol'n	3.612937241	Parent Cert Act Uncert 1 Sigma		0.0036			
Expected Addition for Analysis g	5	Parent Sp. Gravity G/Ml		0.9982			
Standards Preparation / Dilution		Parent Supplier		NIST SRM 4927F			
Secondary Solution #	S-0279	Parent Date Recvd		01/02/00			
Dilution Date (New Ref Date)	09/07/2012 10:40	Parent Received By		Unknown			
Ampoule, Empty (g)		Parent Cert Exp Date					
Ampoule /Solution Gross (g)		Parent Matrix		H2O			
Net Wt Removed (g)		Certified dpm/g At Ref Date		3503.682716			
Transfer Container, empty (g)	13.144	Certified dpm/g on 08/07/2012 10:40		3050.10438			
Container Plus Solution (g)	16.89	Parent Comments		Intermediate level H-3 standard for creating LCS solutions and matrix spikes. Dilution performed as stated above by B Steffens. -BJS 3/22/10			
Net Wt Transferred (g)	3.746						
DPM Xferred on 09/07/2012 10:40	11425.69101						
Diluent/matrix	DI H2O	Parent Tech		Unknown			
Diluent Density Cont, empty (g)		Is_Primary		FALSE			
Test Mass of 5 mL of Diluent (g)		Is_LCS		TRUE			
Diluent Density Test - (g/mL)		Is_Tracer		FALSE			
Dilution Empty Container Mass (g)	473.93	Is_Calib		FALSE			
Dilution Full Cont g (if measured)	2469.52						
Dilution Final Volume mL (if measured)	2000						
Final Dilution Density (g/mL)	0.997795						
Final Dilution Measured Mass g	1995.59						
Comments	H3 LCS standard. Dilution performed as stated above by B Steffens. -BJS 9/7/12						
Final Dilution dpm/g	5.725470166						
Final Dil New Ref Date/Time	09/07/2012 10:40						



2609 North River Road • Port Allen, Louisiana 70767

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# **American Radiation Services Analytical Reports**

**for**

**Los Alamos National Laboratory**

# **Folder Duplicate**





## Report Compilation Checklist

ARS SDG: 13-01179 Client Name: LANL Sample Matrix: SO

### LEVEL 1 COMPONENTS

	1st Reviewer			
1) Cover Page Complete and Accurate (see ARS-059)?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
2) Technical Review Checklist(s) Complete and Accurate?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
3) Case Narrative Complete and Accurate (see ARS-059)?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
4) Form 1s Present for all Samples and Tests?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
5) Client Specific Components are Present and Complete?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A	

### LEVEL 2 COMPONENTS

	1st Reviewer			
6) Batch Quality Control Report is Present and Accurate?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
7) DQO Report is Present and Accurate?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
8) Client Specific Batch QC Components are Present and Complete?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A	

### LEVEL 3 COMPONENTS

	1st Reviewer			
9) Efficiencies are Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
10) Calibrations are Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
11) Backgrounds are Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
12) Spectrum Analysis is Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
13) Spectral Plots are Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
14) Plateaus are Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
15) Control Charts are Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
16) Other:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A	

### LEVEL 4 COMPONENTS

	1st Reviewer			
17) Preparation Raw Data Present, Signed and Complete?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
18) Instrument Raw Data Present and Complete?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
19) Calibration Certificates Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
20) Copies of Log Book Pages Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
21) Sample Receiving Documentation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
22) LIMS Reports Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
23) Applicable Correspondence Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
24) Other:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A	

*[Signature]*

Report Generator Signature

*7-24-13*

Date

*James D. [Signature]*

Management Review Signature

*7-24-13*

Date



## LSC Technical Review Checklist

ARS SDG ARS1-13-01179



Sample Matrix: AQ Aliquot (Circle One) : Dry As Received ☒ Filtered Other: \_\_\_\_\_

Required QC Samples (Mark all that apply): Blank LCS LCSD Sample Dup MS MSD

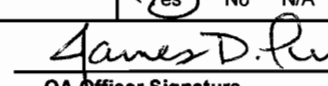


ARS A. Batch ID(s): Batch A: B13-01176 Batch B: N/A Batch C: N/A

Test Method(s): LSC-A-021 N/A N/A

### A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review
1) 100% of Manual Transcriptions Verified?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
2) 100% of Manual Calculations Verified?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A
3) Blank Composition/Configuration Matches Calibration?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A
4) Deviations from procedure are documented and verified?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A
5) Appropriate Cocktail Selected?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____		
 <u>6-14-13</u> Chemist Signature Date	 <u>6-14-13</u> Verifier Review Signature Date	

### B. ANALYSIS REVIEW


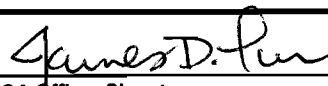
	Analyst Review	QA Officer Review
1) Calibrations Valid and Current?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
2) Backgrounds Valid and Current?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
3) Source Checks Completed and Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A
 <u>7-24-13</u> QA Officer Signature Date		
	Analyst Review	Technical Review
4) Background Checks Complete and Acceptable?	<input checked="" type="radio"/> Yes No N/A	Yes No <input checked="" type="radio"/> N/A
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="radio"/> Yes No N/A	Yes No <input checked="" type="radio"/> N/A
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="radio"/> Yes No N/A	Yes No <input checked="" type="radio"/> N/A
6) Test/Sample Specific Parameters (See ARS-059 for details)		
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	<input checked="" type="radio"/> Yes No N/A	Yes <input checked="" type="radio"/> No N/A
b) Spectra show no Evidence of Interferences?	<input checked="" type="radio"/> Yes No N/A	Yes <input checked="" type="radio"/> No N/A
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="radio"/> Yes No N/A	Yes <input checked="" type="radio"/> No N/A
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____		
 <u>6-14-13</u> Analyst Signature Date	 <u>N/A</u> Technical Reviewer Signature Date	



**LSC**  
**Technical Review Checklist**

Batch A: B13-01176

**C. BATCH QC VALIDATION**

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
2) RDL Criteria are Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
3) Method Blank Criterion Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
4) LCS/LCD Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
6) MS/MSD Criteria Met?	Yes   No <u>N/A</u>	Yes   No <u>N/A</u>
7) Batch QC Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes)   NCR # (If initiated): _____		
<u></u> Project Manager Signature	<u>7-24-13</u> Date	<u> 7-24-13</u> QA Officer Signature      Date

**GENERAL COMMENTS**



## LSC Technical Review Checklist

ARS SDG ARS1-13-01179

Sample Matrix: AQ Aliquot (Circle One): Dry As Received ☒ Filtered Other: \_\_\_\_\_

Required QC Samples (Mark all that apply): Blank ☒ LSC ☒ LSCD ☒ Sample Dup MS MSD

ARS A. Batch ID(s): Batch A: B13-01361 Batch B: N/A Batch C: N/A

Test Method(s): LSC-A-022 N/A N/A

### A. RADIOCHEMICAL PREPARATION REVIEW

	Chemist Review	Verifier Review	
1) 100% of Manual Transcriptions Verified?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
2) 100% of Manual Calculations Verified?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A	
3) Blank Composition/Configuration Matches Calibration?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
4) Deviations from procedure are documented and verified?	Yes No <input checked="" type="radio"/> N/A	Yes No <input checked="" type="radio"/> N/A	
5) Appropriate Cocktail Selected?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
6) Sample Prep Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes) NCR # (If initiated): _____			
<u>P. S. J.</u> Chemist Signature	<u>7-24-13</u> Date	<u>Jacob M. J.</u> Verifier Review Signature	<u>7-24-13</u> Date

### B. ANALYSIS REVIEW

	Analyst Review	QA Officer Review	
1) Calibrations Valid and Current?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
2) Backgrounds Valid and Current?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
3) Source Checks Completed and Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
<u>James D. J.</u> QA Officer Signature		<u>7-24-13</u> Date	
	Analyst Review	Technical Review	
4) Background Checks Complete and Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
5) 100% of Manually Entered Parameters Verified Accurate?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
6) Appropriate QC samples initiated at required frequency?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
6) Test/Sample Specific Parameters (See ARS-059 for details)			
a) Analysis Parameters Checked and Correct and Peak Shapes are Acceptable?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
b) Spectra show no Evidence of Interferences?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
c) Sample Quench for All Samples within Range of Quench Curve?	<input checked="" type="radio"/> Yes No N/A	<input checked="" type="radio"/> Yes No N/A	
7) Analysis Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Comments) NCR # (If initiated): _____			
<u>P. S. J.</u> Analyst Signature	<u>7-24-13</u> Date	<u>P. S. J.</u> Technical Reviewer Signature	<u>7-24-13</u> Date

Batch A: B13-01361

## LSC Technical Review Checklist

**C. BATCH QC VALIDATION**

	Proj. Mgr. Review	QA Officer Review
1) Activity + 3xCSU a Negative Number?	Yes <del>No</del> N/A	Yes <u>No</u> N/A
2) RDL Criteria are Met?	<del>Yes</del> No N/A	<u>Yes</u> No N/A
3) Method Blank Criterion Met?	<del>Yes</del> No N/A	<u>Yes</u> No N/A
4) LCS/LCD Criteria Met?	Yes <del>No</del> N/A	Yes <u>No</u> N/A
5) Duplicate (Sample Duplicate, LCSD, MSD) Criteria Met?	<del>Yes</del> No N/A	<u>Yes</u> No N/A
6) MS/MSD Criteria Met?	Yes No <del>N/A</del>	Yes No <u>N/A</u>
7) Batch QC Anomaly? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (See Tech Notes)    NCR # (If initiated): _____		
 Project Manager Signature	<u>7-24-13</u> Date	 QA Officer Signature
<div style="display: inline-block; width: 150px;"></div> <u>7-24-13</u> Date		

**GENERAL COMMENTS**

Analysis Code	Group	Isotope	Activity Units	Aliquot Units	ProcedureNo	RDL	LCS_LL	LCS_UL	MS_LL	MS_UL	RadY_LL	RadY_UL	GravY_LL	GravY_UL	RER	RPD	DilutionReq	RoughPrepReq	BlankCorrectionMDA	BlankCorrectionAll	CountTimeReq	AliquotRequired
LSC-A-021	STD	H-3	pCi	L	ARS-054	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	FALSE	FALSE	FALSE	FALSE		
LSC-A-022	STD	Enriched H-3	pCi	L	ARS-040	0.00E+00	75	125	60	140	30	110	40	110	1.00	25	FALSE	FALSE	FALSE	FALSE		

# SDG Report - Samples and Containers

## SDG Specific Data

SDG	ARS1-13-01179	TAT Days	30	Project Type	Environmental
Sample Count	Rpt Level 4	Date Received	6/13/2013	COC Number	2013-948
Client	Los Alamos National Laboratory	Client Deadline	7/12/2013	PO Number	63641-001-10
Client Code	114	Internal Deadline	7/11/2013	Job Number	
Profile Number	PN-00094	Lab Deadline	7/9/2013	Job Location	
Comments					

## Samples and Containers (→) Checked In Thus Far

FR	ClientID	Matrix	SampleStartDate	SampleEndDate	Disp	Hold	Arch	Storage	X	Units	Y	Units	Z	Units	Comments
001	CALA-13-33427	AQ	06/11/13 09:47 AM	06/11/13 09:47 AM	H	90	5	A3							
→	IC_ID	Cnt	Volume mL	WL 9	pH_Orig	pH_Final	CPH	UR_Hi	Storage	VOA	Head Sp	AP Units	AF Rate	AF Mins	AF Total Vol
	138982	1	1000.00				100	36		N	N/A				

### SDG Report - Analysis Assignments

Temp SDG	ARS1-13-01179	Sample Count	
Client	Los Alamos National Laboratory	Analysis Count	2-2

Samples Count Totals per Analysis		
Analysis Code	Analysis Description	Samples Count
LSC-A-021	Low Level Tritium Screen in (Aqueous)	1
LSC-A-022	Low Level Tritium by Enrichment Process in (Aqueous [AQ])	1

Analyses Assigned Per Fraction		
Fraction	Analysis Code	X = Assigned
001	LSC-A-021	X
001	LSC-A-022	X



# ARS FILE TRACKING SHEET

SDG: ARS1-13-01179

Task	Date / Time	Initials
Date & Time Samples Received	6-13-13/11:30	HLG
ICOC Initiated/Storage Location: <u>A3</u>	6-13-13/11:48	HLG
Technical Checks Performed	<i>See Batch</i>	
Report Written / EDD Generated <u>7-24-13/1129</u>   <u>SDA</u>	<u>7-24-13/1124</u>	<u>SDA</u>
Quality Assurance Checks Performed on Report	<u>7-24-13</u> <u>1216</u>	<u>JSD</u>
Management Checks Performed on Report		
<i>Preliminary Report Scan</i>		
Report E-mailed/Faxed		
Report Reviewed		
Report Mailed		
Invoice Completed      Invoice #: _____		
Report Imaged		

## SPECIAL REQUIREMENTS

Requirement	Yes	No
3 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
48 Hour Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10 Day Rush	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standard Oil/Gas Client (5 Day)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standard Turnaround	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### NOTES

SDG: ARSI-13-01179

## SHIPPING CONTAINER

### COC PRESENT WITH SAMPLES

COC ☒ Yes ☐ No

**SAMPLE CONTAINER(S)**

Good Condition	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Sec. Seals	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Seal Intact	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Radioactive	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
# Samples Rcv	1	
Matrix	[ AE AQ BI ]	

Exposure Rate Meter:	<u>M3242861</u>	Serial No.:	<u>PR264266</u>	Calibration Due Date:	<u>4/16/14</u>
Count Rate Meter:	<u>M3154859</u>	Serial No.:	<u>PR184559</u>	Calibration Due Date:	<u>4/16/14</u>
-----					
Background Exposure Rate (μR/hr)	<u>30</u>	Max. Exposure Rate on Shipping Containers Externals (Plus Bkgd)	<u>40</u>	μR/hr	
Background Count Rate (cpm)	<u>80</u>	Max. Removable Count Rate on Shipping Containers Externals (Plus Bkgd)	<u>80</u>	cpm	
		Max. Removable Count Rate on Shipping Containers Internals (Plus Bkgd)	<u>100</u>	cpm	

[illegible]

Date/Time Surveyed: 6-13-13 / 11:31