

Nemours

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Q-5

December 11, 2013

Ms Betsy Ullrich
Commercial and R&D Branch
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission – Region 1
2100 Renaissance Boulevard, Suite 100
King of Prussia, PA 19406-2713

License Amendment 07-16199-01
Docket No. 03010568
Control No. 582452
License amendment

REC'D 12/16/13 AM 11:00

Dear Ms. Ullrich:

Please amend our NRC license 07-16199-01 as follows:

1. Remove the Administration and Research Building, 1600 Rockland Road, Wilmington, Delaware, as a location of use.

We provided the additional supporting information regarding the instrumentation used for surveys (letter dated 9/23/13). Mr. Marc Felice, our health physicist consultant, has provided the three attached tables containing the information requested about the manufacturer and model of the instrumentation used for the surveys, efficiency for radionuclides of interest and calibration date, and calculation of the minimum detectable sensitivity of the scan survey instrumentation for radionuclides of interest. Further, we have repeated wipe tests of the hoods in ARB270, and results are in the fourth attached table. Locations for the wipe tests are as indicated on the map of ARB270 provided with our letter dated September 23, 2013. Note that the results include counts of the two standards that were used for the calibration of the scintillation counter showing that counts of the standards have not changed significantly since the counter was calibrated for the attached table.

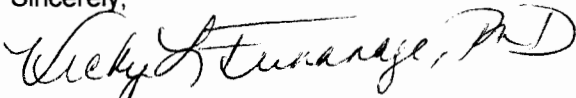
2. Remove Ayyappan K. Rajasekaran, Ph.D. from the list of people authorized to use radioactive materials in #11 of our license.

Dr. Rajasekaran is no longer working at Nemours/Alfred I. duPont Hospital for Children.

3. Change the certifying official and address from Kevin Churchwell, M.D., to me, Vicky L. Funanage, Ph.D., Director of Biomedical Research of the Nemours Foundation, Alfred I. duPont Hospital for Children, 1600 Rockland Road, Wilmington, DE 19803.

Dr. Churchwell is no longer working at Nemours/Alfred I. duPont Hospital for Children.

Sincerely,



Vicky L. Funanage, Ph.D.
Director of Biomedical Research of the Nemours Foundation

cc: Grace M. Hobson, Ph.D., Radiation Safety Officer
Gunsel Acikgoz, M.D., Chair, Radiation Safety Committee
Marc Felice, Consultant

582452
NM99/RGN1 MATERIAL-002

CERTIFICATE OF CALIBRATION

METER INFORMATION					
Licensee:	Nemours Al duPont			ID:	1
	Type	Manufacturer	Model	Serial #	Condition
	Meter	Survey	LU DLUM	26	PF001070 New

G-M DETECTOR RESPONSE					
Scan dwell time (s):		5			
		Detector/Radiation flux angle: Perpendicular			
Isotope	Background	SI-32/P-32	CI-36	Tc-99	C-14
Serial #	NA	728-32	DY 866	DY 867	185
Manufacturer	NA	Isotope Products	Amersham	Amersham	Picker
Reference Activity	NA	0.0988 uCi	0.0668 uCi	0.0914 uCi	0.139 uCi
Reference Date	NA	8/15/2000	8/12/1994	8/12/1994	10/1/1964
Activity (dpm)	NA	219336	148200	202800	308580
Energy (keV)	NA	224.5, 1710	712	290	156
Distance	at contact	at contact	at contact	at contact	at contact
Reading (cpm)	44	70000	30000	35000	1500
Efficiency	NA	0.32	0.20	0.17	0.0049
Distance	1.0 cm	1.0 cm	1.0 cm	1.0 cm	1.0 cm
Reading (cpm)	44	48000	21900	16800	820
Efficiency (cpm/dpm)	NA	0.22	0.15	0.08	0.0027
Scanning MDA (dpm)	NA	337	499	499	27757
Minimum Detectable Concentration MDC (dpm/100cm2)	NA	2247	3328	3328	185048

Ratemeter MODE					
Isotope	C-14	P-32	S-35	Ca-45	Co-57
Energy (keV)	156	1710	167	256.8	836
Abundance	1	1	1	1	1
Efficiency	0.27%	21.88%	0.92%	6.30%	17.00%
Scanning MDA (dpm)	27757	337	7983	1171	434
Minimum Detectable Concentration MDC (dpm/100cm2)	185,048	2,247	53,221	7,809	2,893

Count Rate at MDC: 492 cpm above background

SCALER MODE					
Isotope	Background	SI-32/P-32	CI-36	Tc-99	C-14
Serial #	NA	728-32	DY 866	DY 867	185
Distance	NA	1.0 cm	1.0 cm	1.0 cm	1.0 cm
Count #1	44	70040	26100	17900	1013
	44				
	32				
	38				
	49				
	54				
	41				
	43				
	50				
	46				
Average	44	70040	26100	17900	1013
Efficiency	NA	31.9%	17.6%	8.8%	0.33%
Wipe MDA (dpm)	NA	105	194	388	10433

SCALER MODE EFFICIENCIES & Minimum Detectable Concentration					
Isotope	C-14	P-32	S-35	Ca-45	Co-57
Energy (keV)	156	1710	167	256.8	836
Abundance	1	1	1	1	1
Efficiency	0.33%	18.50%	1.03%	6.72%	18.50%
MDA (dpm)	10232	182	3274	500	182
Minimum Detectable Concentration MDC (dpm/100cm2)	68,214	1,210	21,828	3,332	1,210

Net Counts in 1 minute at MDA: 224 counts in 1 minute above Background

CHECK SOURCE					
Isotope	Cs-137	Reading (kcpm)	Range (kcpm)	Source Lid	kcpm/μCi of Cs-137
Ref. Activity (μCi)	1.0	N/A	N/A	N/A	#VALUE!
Ref. Date	Jun-04	10.6	8.5 - 12.7	Open	13.1
Current Activity	0.8				

Tested by:	Marc A. Felice	Date:	9/5/2013
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CERTIFICATE OF CALIBRATION

METER INFORMATION					
Licensee:	Nemours Al duPont			ID:	2
	Type	Manufacturer	Model	Serial #	Condition
	Meter	Survey	LUDLUM	26	PF001167 New

G-M DETECTOR RESPONSE					
	Scan dwell time (s):		5		
	Detector/Radiation flux angle: Perpendicular				
Isotope	Background	Si-32/P-32	Cl-36	Tc-99	C-14
Serial #	NA	728-32	DY 866	DY 867	185
Manufacturer	NA	Isotope Products	Amersham	Amersham	Picker
Reference Activity	NA	0.0988 uCi	0.0668 uCi	0.0914 uCi	0.139 uCi
Reference Date	NA	8/15/2000	8/12/1994	8/12/1994	10/1/1964
Activity (dpm)	NA	219336	148200	202800	308580
Energy (keV)	NA	224.5, 1710	712	290	156
Distance	at contact	at contact	at contact	at contact	at contact
Reading (cpm)	44	70000	30000	35000	1500
Efficiency	NA	0.32	0.20	0.17	0.0049
Distance	1.0 cm	1.0 cm	1.0 cm	1.0 cm	1.0 cm
Reading (cpm)	44	48000	2400	1700	840
Efficiency (cpm/dpm)	NA	0.22	0.02	0.01	0.0027
Scanning MDA (dpm)	NA	337	4555	4555	27096
Minimum Detectable Concentration MDC (dpm/100cm ²)	NA	2247	30365	30365	180642

Ratemeter MODE					
Isotope	C-14	P-32	S-35	Ca-45	Co-57
Energy (keV)	156	1710	167	256.8	836
Abundance	1	1	1	1	1
Efficiency	0.27%	21.88%	0.32%	0.70%	17.00%
Scanning MDA (dpm)	27096	337	23145	10567	434
Minimum Detectable Concentration MDC (dpm/100cm ²)	180,642	2,247	154,303	70,447	2,893

Count Rate at MDC: 492 cpm above background

SCALER MODE					
Isotope	Background	Si-32/P-32	Cl-36	Tc-99	C-14
Serial #	NA	728-32	DY 866	DY 867	185
Distance	NA	1.0 cm	1.0 cm	1.0 cm	1.0 cm
Count #1	53	72400	2680	1840	1037
	55				
	51				
	52				
	54				
	49				
	52				
	42				
	48				
	46				
Average	50	72400	26100	17900	1013
Efficiency	NA	33.0%	17.6%	8.8%	0.33%
Wipe MDA (dpm)	NA	108	194	388	10433

SCALER MODE EFFICIENCIES & Minimum Detectable Concentration					
Isotope	C-14	P-32	S-35	Ca-45	Co-57
Energy (keV)	156	1710	167	256.8	836
Abundance	1	1	1	1	1
Efficiency	0.33%	18.50%	1.03%	6.72%	18.50%
MDA (dpm)	10862	193	3476	531	193
Minimum Detectable Concentration MDC (dpm/100cm ²)	72,411	1,285	23,171	3,537	1,285

Net Counts in 1 minute at MDA: 238 counts in 1 minute above Background

CHECK SOURCE					
Isotope	Cs-137	Reading (kcpm)	Range (kcpm)	Source Lid	kcpm/μCi of Cs-137
Ref. Activity (μCi)	1.0	N/A	N/A	N/A	#VALUE!
Ref. Date	Jun-04	10.6	8.5 - 12.7	Open	13.1
Current Activity	0.8				

Tested by: Marc A. Felice Date: 9/5/2013

Liquid Scintillation Counter Calibration Certificate Nemours Al duPont Hospital for Children

Calibration date: 30-Aug-2013
Manufacturer: Beckman
Model: LS 6000 LC

Serial No: 7065927

Nuclide	H-3	C-14
Half Life (days)	4492.58	2.09E+06
Max. Beta Energy (keV)	18.591	156.475
Beta Abundance	100.0%	100.0%
Initial Activity (dpm)	100858	42056
Ref Date	21-Aug-92	21-Aug-92
Measurement Date	30-Aug-13	30-Aug-13
elapsed days	7679	7679
Corrected Source Activity (dpm)	30844	41949
CPM	20868	41213
Background Counts (1 min.)	22	22
Net CPM	20846	41191
Efficiency (cpm/dpm)	67.6%	98.2%

Nuclide	H-3	C-14	
Energy	18.6 keV	156 keV	
Source Initial Activity (dpm)	100858	42056	
Measured Gross cpm	20868	41213	
Background	22 dpm	22 dpm	
Efficiency	67.6%	98.2%	

Efficiencies and Minimum Detectable Activities						
Nuclide	H-3	C-14	P-32	Ca-45	Co-57	
Efficiency	67.6%	98.2%	98.2%	98.2%	98.2%	
MDA, 1 min. count (dpm)	35.3	25.2	25.2	25.2	25.2	
MDA, 1 min. count (nCi)	0.016	0.011	0.011	0.011	0.011	

Marc Felice, MS, DABR

Wipe test, ARB 270 Hoods, 11/2013

Samples (& stds) counted for 3mins with WIDE window, 11/14/13

3H efficiency: 67.6% minimum detectable activity: 35.3dpm
14C efficiency: 98.2% minimum detectable activity: 25.2dpm

<u>Sample#</u>	<u>cpm</u>	<u>H-3 dpm</u>	<u>C-14 dpm</u>
1	34.67	51.29	35.31
2	27.00	39.94	27.49
3	19.00	28.11	19.35
4	45.67	67.56	46.51
5	24.67	36.49	25.12
6	36.00	53.25	36.66
7	31.33	46.35	31.90
8	25.00	36.98	25.46
9	25.33	37.47	25.79
10	25.00	36.98	25.46
11	28.33	41.91	28.85
12	20.67	30.58	21.05
13	23.67	35.01	24.10
14	27.33	40.43	27.83
15	35.67	52.77	36.32
16	17.67	26.14	17.99
17	24.00	35.50	24.44
18	64.67	95.67	65.86
19	27.33	40.43	27.83
20	23.00	34.02	23.42
21	29.33	43.39	29.87
22	20.67	30.58	21.05
23	26.33	38.95	26.81

REF 21AUG92

	<u>cpm</u>	<u>dpm</u>	<u>lot</u>
3H std	20492	100858	HEX2313
14C std	40929	42056	CEX0914
BKG	28		BEX3507