



IU SIMON CANCER CENTER

An IU School of Medicine & Clarian Health Partnership

Jose Macatangay
Materials Licensing Branch
U.S. Nuclear Regulatory Commission, Region III
2443 Warrenville Road, STE 210
Lisle, Illinois 60532-4352

re: Pending NRC License # 13032785-01, Control # 318883

Dear Mr. Macatangay:

The following information is submitted in response to your request dated 5/6/10 regarding our license application dated February 23, 2010:

1. For the adjacent areas where PET radionuclides are utilized, please provide documentation that the limits specified in 10 CFR 20.1301 will not be exceeded, i.e. shielding calculations, survey measurements, etc.

Attached are shielding calculations for the PET Suite and the Quiet Room. These calculations are based on 10 patients per week although the anticipated workload is on the order of 3 patients per week. While these calculations indicate that the anticipated annual exposure in unrestricted areas is < 100 mrem, once operational, measurements (survey meter, film badge) will be made to confirm the calculations and document compliance with 20.1301.

2. Please confirm if 10 CFR 35.100 or 35.200 byproduct materials other than those used in PET studies will be utilized, i.e. Tc-99m for bone scans or cardiac studies.

10 CFR 35.100 or 35.200 byproduct materials other than those used in PET studies will not be utilized.

If you need any further information, please let me know.

Sincerely,



John Kerstiens, CPA
Vice President Finance & CFO

RECEIVED MAY 13 2010

UPTAKE ROOM CALCULATIONS

Facility: MPRI

Date: 7/16/2009

Physicist: Robert T. Anger, Jr.

Room Number: Uptake Room

Enter

Administered Activity (Ao) (mCi)
15.0

Enter

Uptake Time (Tu) (min)
60

Enter

Studies per Week (Nw)
10

Decay Reduction Factor (Rtu)
0.832

Patient Attenuation Reduction Factor
0.64

Γ (uSv-m2/MBq-h)
0.143

Patient Dose Rate uSv-m2/MBq-h
0.092

Total Weekly Dose= 0.092 uSv m2 / MBq h x Nw x Ao(MBq) x Tu(h) x Rtu / d(m)2

Transmission Factor (B) = 10.9 x P x d(m)2 / (Nw x Ao(MBq) x Tu(h) x Rtu x T)

	South	West	East	North	Door	South	Ceiling
Adjacent Area	Control room	Hot Lab	Corridor	Hallway	hallway	Ped Recovery	Office
Occupancy Factor (T)	1	0.125	0.125	0.125	0.125	1	1
Exposure Limit (mrem) Annual	500	500	100	100	100	100	100
Distance (feet)	18	4	6	10	6	18	16.4
Exposure Limit (mrem) Weekly	10	10	2	2	2	2	2
Exposure Limit (uSv) Weekly (P)	100	100	20	20	20	20	20
Distance (m)	5.49	1.22	1.83	3.05	1.83	5.49	5.00
uSv per week (Eqn 2)	14.12	285.94	127.08	45.75	127.08	14.12	17.01
mrem per week	1.41	3.57	1.59	0.57	1.59	1.41	1.70
B* Transmission Factor	7.102	2.806	1.263	3.507	1.263	1.420	1.179
Pb Thickness (mm)	0	0	0	0	0	0	0
Concrete Thickness (mm)	None	None	None	None	None	None	None
Pb Thickness (in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Thickness (in)	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

* OF included in B but not in uSv per week

* OF included in mrem per week

MPRI
7/16/2009
Robert T. Anger, Jr.
Uptake Room

	South	West	East	North	Door	South	Ceiling
Pb Thickness (mm)	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year
0	70.60	178.71	79.43	28.59	79.43	70.60	85.05
1	62.92	159.27	70.79	25.48	70.79	62.92	75.80
2	55.58	140.70	62.53	22.51	62.53	55.58	66.96
3	48.75	123.40	54.84	19.74	54.84	48.75	58.73
4	42.51	107.60	47.82	17.22	47.82	42.51	51.21
5	36.90	93.41	41.52	14.95	41.52	36.90	44.46
6	31.93	80.81	35.92	12.93	35.92	31.93	38.46
7	27.56	69.75	31.00	11.16	31.00	27.56	33.19
8	23.74	60.08	26.70	9.61	26.70	23.74	28.59
9	20.42	51.68	22.97	8.27	22.97	20.42	24.60
10	17.54	44.41	19.74	7.11	19.74	17.54	21.13
12	12.93	32.72	14.54	5.24	14.54	12.93	15.57
14	9.51	24.07	10.70	3.85	10.70	9.51	11.46
16	6.99	17.69	7.86	2.83	7.86	6.99	8.42
18	5.14	13.01	5.78	2.08	5.78	5.14	6.19
20	3.78	9.56	4.25	1.53	4.25	3.78	4.55
25	1.74	4.41	1.96	0.71	1.96	1.74	2.10
30	0.80	2.04	0.91	0.33	0.91	0.80	0.97
40	0.17	0.43	0.19	0.07	0.19	0.17	0.20
50	0.04	0.09	0.04	0.01	0.04	0.04	0.04
Concrete Thickness (cm)	mrem / year						
0	70.60	178.71	79.43	28.59	79.43	70.60	85.05
1	67.66	171.26	76.11	27.40	76.11	67.66	81.50
2	64.16	162.41	72.18	25.99	72.18	64.16	77.29
3	60.15	152.24	67.66	24.36	67.66	60.15	72.45
4	55.70	140.98	62.66	22.56	62.66	55.70	67.10
5	50.96	128.99	57.33	20.64	57.33	50.96	61.39
6	46.09	116.66	51.85	18.67	51.85	46.09	55.52
7	41.25	104.40	46.40	16.70	46.40	41.25	49.69
8	36.57	92.57	41.14	14.81	41.14	36.57	44.06
9	32.18	81.46	36.20	13.03	36.20	32.18	38.77
10	28.15	71.25	31.67	11.40	31.67	28.15	33.91
12	21.24	53.76	23.89	8.60	23.89	21.24	25.58
14	15.84	40.08	17.82	6.41	17.82	15.84	19.08
16	11.73	29.70	13.20	4.75	13.20	11.73	14.14
18	8.66	21.93	9.75	3.51	9.75	8.66	10.44
20	6.38	16.16	7.18	2.58	7.18	6.38	7.69
25	2.96	7.49	3.33	1.20	3.33	2.96	3.56
30	1.37	3.47	1.54	0.55	1.54	1.37	1.65
40	0.30	0.75	0.33	0.12	0.33	0.30	0.36
50	0.06	0.16	0.07	0.03	0.07	0.06	0.08

IMAGING ROOM CALCULATIONS

Facility: MPRI

Date: 7/16/2009

Physicist: Robert T. Anger, Jr.

Room Number: PET-CT Suite

$$\text{Weekly Dose} = 0.092 \text{ uSv m}^2 / \text{MBq h} \times \text{Nw} \times \text{Ao(MBq)} \times \text{Sf} \times \text{Uf} \times \text{Fu} \times \text{tl(h)} \times \text{Rti} / \text{d(m)}^2$$

$$\text{Transmission Factor (B)} = 12.8 \times \text{P} \times \text{d(m)}^2 / \text{Nw} \times \text{Ao(MBq)} \times \text{Sf} \times \text{Fu} \times \text{tl(h)} \times \text{Rti} \times \text{T}$$

Enter

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Imaging Room Decay Factor (Fu)
0.685

Administered Activity (Ao) (mCi)
15.0

Imaging Time (ti) (min)
30

Uptake Time (Tu) (min)
60

Studies per Week (Nw)
10

Scanner Reduction Factor (Sf)
1.0 = No Reduction 0.85 = Reduction

Urine Void Reduction Factor (Uf)
0.850

Decay Reduction Factor (Rti)
0.911

Patient Dose Rate uSv-m ² /MBq-h
0.092

	West	South	East	North	NW	Floor	Ceiling
Adjacent Area	Control Room	Corridor	Mechanical	Lockers	Doors	Slab	Office
Occupancy Factor (T)	1	0.2	0.125	0.2	0.2	0	1
Exposure Limit (mrem) Annual	500	100	100	100	100	NA	100
Distance (feet)	18	10	12	12	18		16.4
Sf (scanner red. Factor)	1	0.85	1	0.85	1		0.85
Exposure Limit (mrem) Weekly	10	2	2	2	2	#VALUE!	2
Exposure Limit (uSv) Weekly (P)	100	20	20	20	20	#VALUE!	20
Distance (m)	5.49	3.05	3.66	3.66	5.49	0.00	5.00
uSv per week (Eqn 2)	4.50	12.39	10.13	8.61	4.50	#DIV/0!	4.61
mrem per week	0.45	0.25	0.13	0.17	0.09	#DIV/0!	0.46
B* Transmission Factor	17.930	6.511	12.750	9.375	17.930	#VALUE!	3.502
Pb Thickness (mm)	0	0	0	0	0	#VALUE!	0
Concrete Thickness (mm)	0	0	0	0	0	#VALUE!	0
Pb Thickness (in)	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00
Concrete Thickness (in)	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00

* OF included in B but not in uSv per week

* OF included in mrem per week

MPRI
7/16/2009
Robert T. Anger, Jr.
PET-CT Suite

	West	South	East	North	NW	Floor	Ceiling
Pb Thickness (mm)	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year
0	22.50	12.39	6.33	8.61	4.50	#DIV/0!	23.04
1	20.05	11.05	5.64	7.67	4.01	#DIV/0!	20.53
2	17.72	9.76	4.98	6.78	3.54	#DIV/0!	18.14
3	15.54	8.56	4.37	5.94	3.11	#DIV/0!	15.91
4	13.55	7.46	3.81	5.18	2.71	#DIV/0!	13.87
5	11.76	6.48	3.31	4.50	2.35	#DIV/0!	12.04
6	10.18	5.60	2.86	3.89	2.04	#DIV/0!	10.42
7	8.78	4.84	2.47	3.36	1.76	#DIV/0!	8.99
8	7.57	4.17	2.13	2.89	1.51	#DIV/0!	7.75
9	6.51	3.58	1.83	2.49	1.30	#DIV/0!	6.66
10	5.59	3.08	1.57	2.14	1.12	#DIV/0!	5.73
12	4.12	2.27	1.16	1.58	0.82	#DIV/0!	4.22
14	3.03	1.67	0.85	1.16	0.61	#DIV/0!	3.10
16	2.23	1.23	0.63	0.85	0.45	#DIV/0!	2.28
18	1.64	0.90	0.46	0.63	0.33	#DIV/0!	1.68
20	1.20	0.66	0.34	0.46	0.24	#DIV/0!	1.23
25	0.56	0.31	0.16	0.21	0.11	#DIV/0!	0.57
30	0.26	0.14	0.07	0.10	0.05	#DIV/0!	0.26
40	0.05	0.03	0.02	0.02	0.01	#DIV/0!	0.06
50	0.01	0.01	0.00	0.00	0.00	#DIV/0!	0.01
Concrete Thickness (cm)	mrem / year						
0	22.50	12.39	6.33	8.61	4.50	#DIV/0!	23.04
1	21.56	11.88	6.06	8.25	4.31	#DIV/0!	22.08
2	20.45	11.26	5.75	7.82	4.09	#DIV/0!	20.94
3	19.17	10.56	5.39	7.33	3.83	#DIV/0!	19.63
4	17.75	9.78	4.99	6.79	3.55	#DIV/0!	18.18
5	16.24	8.95	4.57	6.21	3.25	#DIV/0!	16.63
6	14.69	8.09	4.13	5.62	2.94	#DIV/0!	15.04
7	13.15	7.24	3.70	5.03	2.63	#DIV/0!	13.46
8	11.66	6.42	3.28	4.46	2.33	#DIV/0!	11.94
9	10.26	5.65	2.88	3.92	2.05	#DIV/0!	10.50
10	8.97	4.94	2.52	3.43	1.79	#DIV/0!	9.19
12	6.77	3.73	1.90	2.59	1.35	#DIV/0!	6.93
14	5.05	2.78	1.42	1.93	1.01	#DIV/0!	5.17
16	3.74	2.06	1.05	1.43	0.75	#DIV/0!	3.83
18	2.76	1.52	0.78	1.06	0.55	#DIV/0!	2.83
20	2.03	1.12	0.57	0.78	0.41	#DIV/0!	2.08
25	0.94	0.52	0.27	0.36	0.19	#DIV/0!	0.97
30	0.44	0.24	0.12	0.17	0.09	#DIV/0!	0.45
40	0.09	0.05	0.03	0.04	0.02	#DIV/0!	0.10
50	0.02	0.01	0.01	0.01	0.00	#DIV/0!	0.02

MPRI
7/16/2009
Robert T. Anger, Jr.
PET-CT Suite

	West	South	East	North	NW	Floor	Ceiling
Pb Thickness (inches)	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year	mrem / year
1/32	20.55	11.32	5.78	7.86	4.11	#DIV/0!	21.04
1/16	18.66	10.28	5.25	7.14	3.73	#DIV/0!	19.11
3/32	16.86	9.29	4.74	6.45	3.37	#DIV/0!	17.27
1/8	15.18	8.36	4.27	5.80	3.04	#DIV/0!	15.54
3/16	12.17	6.70	3.42	4.65	2.43	#DIV/0!	12.46
1/4	9.67	5.32	2.72	3.70	1.93	#DIV/0!	9.90
5/16	7.64	4.21	2.15	2.92	1.53	#DIV/0!	7.82
3/8	6.01	3.31	1.69	2.30	1.20	#DIV/0!	6.15
7/16	4.72	2.60	1.33	1.81	0.94	#DIV/0!	4.83
1/2	3.70	2.04	1.04	1.42	0.74	#DIV/0!	3.79
5/8	2.27	1.25	0.64	0.87	0.45	#DIV/0!	2.33
3/4	1.39	0.77	0.39	0.53	0.28	#DIV/0!	1.43
7/8	0.85	0.47	0.24	0.33	0.17	#DIV/0!	0.87
1	0.52	0.29	0.15	0.20	0.10	#DIV/0!	0.54
1 1/32	0.46	0.25	0.13	0.18	0.09	#DIV/0!	0.47
1 1/16	0.41	0.23	0.12	0.16	0.08	#DIV/0!	0.42
1 3/32	0.36	0.20	0.10	0.14	0.07	#DIV/0!	0.37
1 1/8	0.32	0.18	0.09	0.12	0.06	#DIV/0!	0.33
1 3/16	0.25	0.14	0.07	0.10	0.05	#DIV/0!	0.26
1 1/4	0.20	0.11	0.06	0.08	0.04	#DIV/0!	0.20
Concrete Thickness (inches)	mrem / year						
1	19.85	10.93	5.58	7.59	3.97	#DIV/0!	20.33
2	16.27	8.96	4.58	6.22	3.25	#DIV/0!	16.66
3	12.43	6.84	3.50	4.75	2.49	#DIV/0!	12.72
4	9.01	4.97	2.54	3.45	1.80	#DIV/0!	9.23
5	6.35	3.50	1.78	2.43	1.27	#DIV/0!	6.50
6	4.40	2.42	1.24	1.68	0.88	#DIV/0!	4.50
7	3.03	1.67	0.85	1.16	0.61	#DIV/0!	3.10
8	2.08	1.14	0.58	0.79	0.42	#DIV/0!	2.13
9	1.42	0.78	0.40	0.54	0.28	#DIV/0!	1.46
10	0.97	0.54	0.27	0.37	0.19	#DIV/0!	1.00
11	0.67	0.37	0.19	0.25	0.13	#DIV/0!	0.68
12	0.46	0.25	0.13	0.17	0.09	#DIV/0!	0.47
13	0.31	0.17	0.09	0.12	0.06	#DIV/0!	0.32
14	0.21	0.12	0.06	0.08	0.04	#DIV/0!	0.22
15	0.15	0.08	0.04	0.06	0.03	#DIV/0!	0.15
16	0.10	0.05	0.03	0.04	0.02	#DIV/0!	0.10
17	0.07	0.04	0.02	0.03	0.01	#DIV/0!	0.07
18	0.05	0.03	0.01	0.02	0.01	#DIV/0!	0.05
19	0.03	0.02	0.01	0.01	0.01	#DIV/0!	0.03
20	0.02	0.01	0.01	0.01	0.00	#DIV/0!	0.02
25	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00
30	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00
35	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00
40	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00