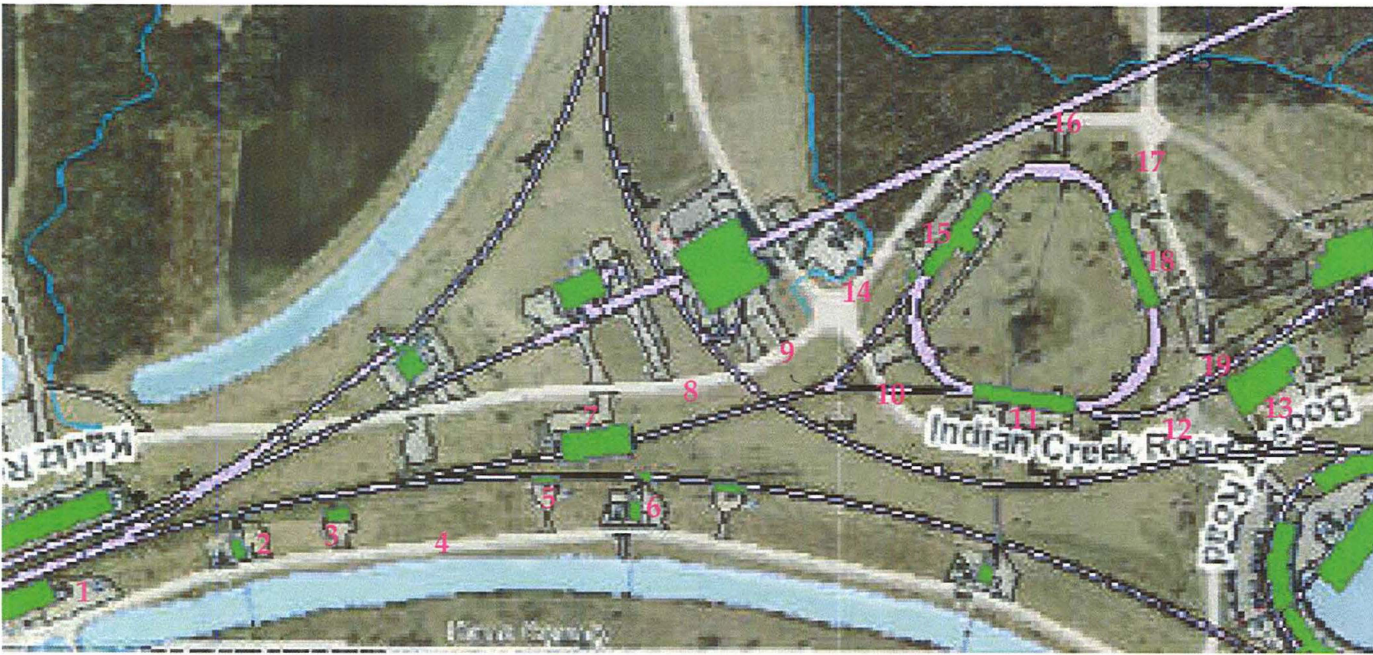


Muon Campus Beam On Survey

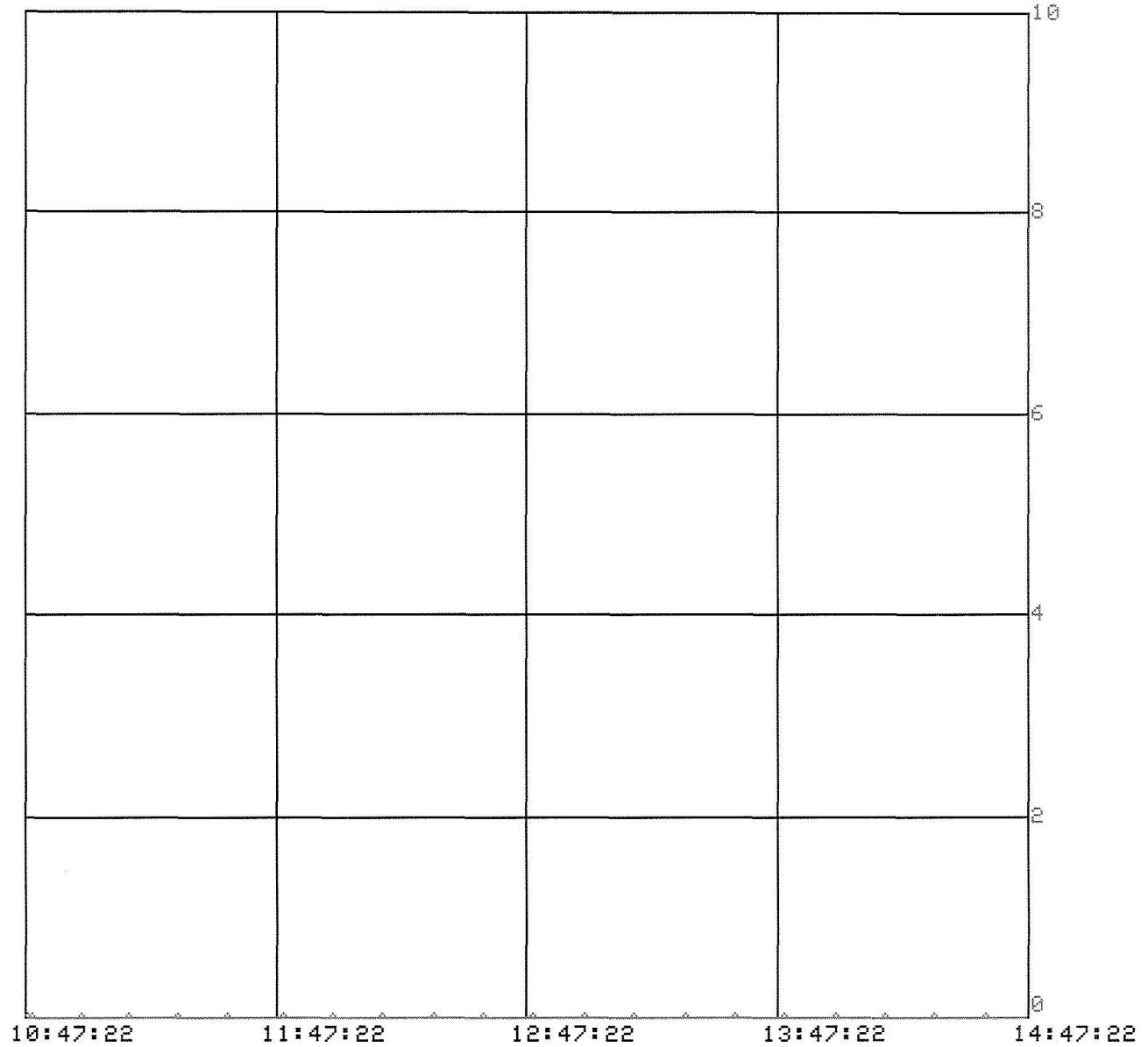
Created Dec 12, 2020

location	Gamma cpm	Neutron mrem/min
1	1001	N/A
2	1146	
3	1221	
4	1326	
5	1286	
6	1228	
7	1308	
8	1337	
9	1349	
10	1308	
11	1343	
12	1393	
13	1082	
14	1243	
15	1207	
16	1272	
17	1314	
18	1243	
19	1107	



All Areas < <u>N/A</u> mR/hr@1foot (Unless otherwise indicated)		Highest Dose Rate Found: <u>N/A</u> mR/hr@1foot	
Radiation Instruments Used		Bkgd _____ cpm	
Inst Type: <u>BICM/HPM51</u>	/	Wipe #	Reading
Inst No: <u>#33</u>	/		
Batt/Source Chk: <u>SW/PAT</u>	/		
Cal. Due Date: <u>AUG 2021</u>	/		
Background: <u>SEE BOOK</u>	/		
LEGEND		Wipe # Reading Wipe # Reading _____ ccpm _____ ccpm _____ ccpm _____ ccpm _____ ccpm _____ ccpm _____ ccpm _____ ccpm _____ ccpm _____ ccpm	
# - Dose Rate in mR/hr @ 1 ft. * - Unlabeled Radioactive Material		Comments: <u>READINGS ARE 1 MINUTE INTEGRATIONS</u> <u>No neutron background taken due to no source from beam</u>	
#R - Radioactive Material Wipe # - Wipe #F - Floor Wipe		Surveyed By: <u>[Signature]</u> Reviewed By: <u>Maddie Schoell, UID:maddiew</u> <small>Digitally signed by Maddie Schoell, UID:maddiew Date: 2021.01.25 14:49:51 -0600</small>	

Mon 11-JAN-2021 14:47:35



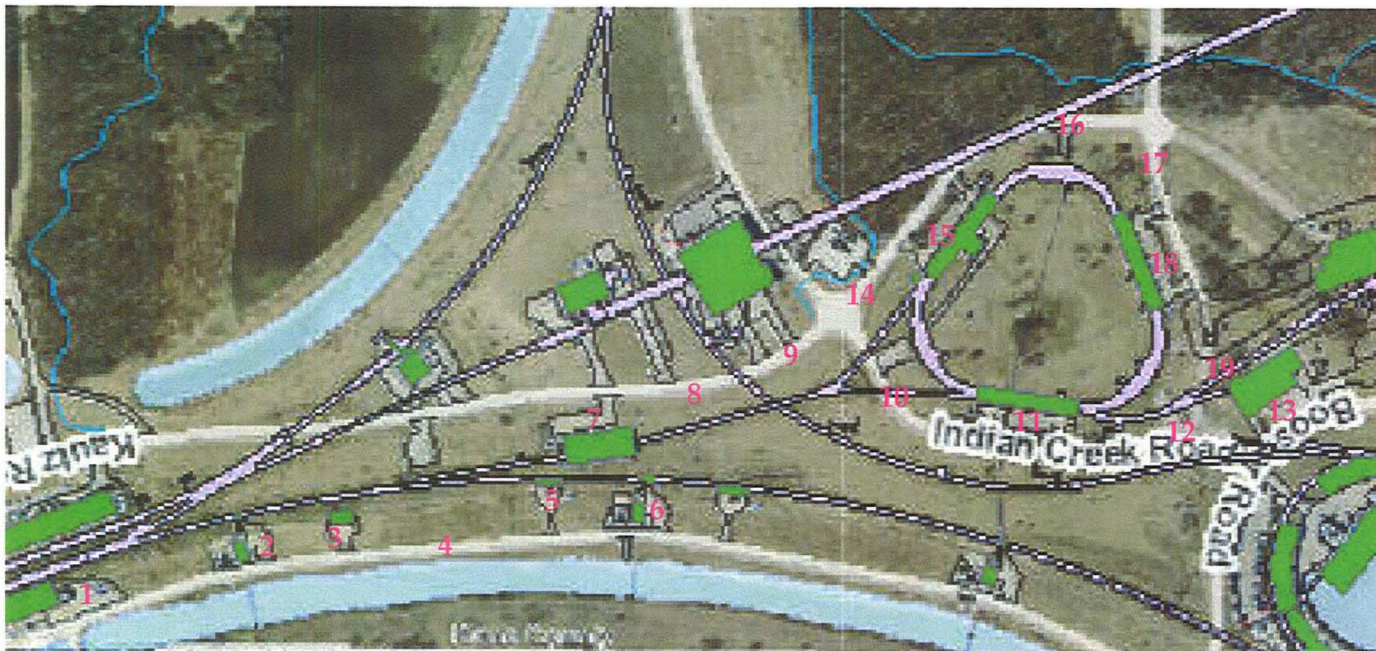
D:POTMIN
*Muon4 E14

T1 = 11-JAN-2021 10:47:22.000

T2 = 11-JAN-2021 14:47:22.000

Muon Campus Beam On Survey

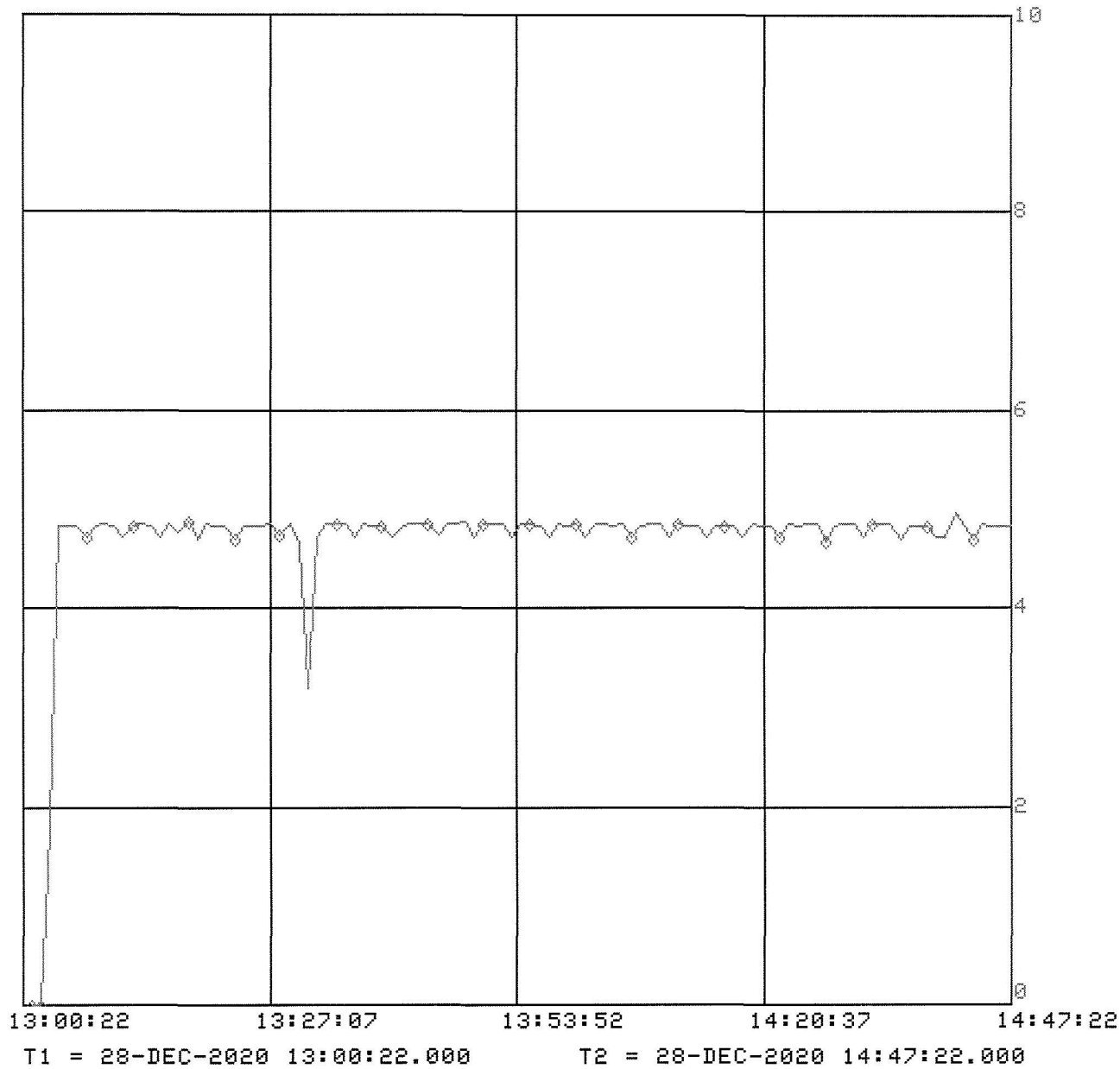
Created Dec 12, 2020



location	Gamma cpm	Neutron mrem/min
1	1041	0
2	1410	0
3	1352	0
4	1423	0
5	4064	0
6	3549	0
7	12180	0
8	3208	0
9	1542	0
10	1240	0.002
11	1080	0
12	1181	0
13	999	0
14	1212	0
15	938	0
16	1120	0
17	1188	0
18	1296	0
19	1019	0

All Areas < <u>N/A</u> mR/hr@1foot (Unless otherwise indicated)				Highest Dose Rate Found: <u>N/A</u> mR/hr@1foot			
Radiation Instruments Used				Bkgd _____ cpm			
Inst Type:	<u>Analyt</u>	<u>Rem 500</u>					
Inst No:	<u>26</u>	<u>1</u>					
Batt/Source Chk:	<u>SAT</u>	<u>SAT</u>		Wipe #	Reading	Wipe #	Reading
Cal. Due Date:	<u>5-21</u>	<u>10-21</u>		_____	_____ ccpm	_____	_____ ccpm
Background:	<u>N/A</u>	<u>N/A</u>		_____	_____ ccpm	_____	_____ ccpm
LEGEND				Comments:			
# - Dose Rate in mR/hr @ 1 ft. * - Unlabeled Radioactive Material							
#R - Radioactive Material Wipe # - Wipe #F - Floor Wipe				Surveyed By: <u>Fulgum</u>			
				Reviewed By: <u>Maddie Schoell, UID:maddiew</u> <small>Digitally signed by Maddie Schoell, UID:maddiew Date: 2021.01.21 12:09:18 -0600</small>			

Mon 11-JAN-2021 14:49:24



D:POTMIN
+Muon4 E14

Muon Campus

Gamma Survey Results

Bicron Results

Location	Background (cpm)	Gross Beam-On (cpm)	Net Beam-On (cpm)	Standard Deviation	Net ± St. Dev.	L _c	N _D
1	1001	1041	40	45.19	40 ± 45.19	73.591	149.920
2	1146	1410	264	50.56	264 ± 50.56	78.741 !	160.222
3	1221	1352	131	50.72	131 ± 50.72	81.277 !	165.295
4	1326	1423	97	52.43	97 ± 52.43	84.700 !	172.142
5	1286	4064	2778	73.14	2778 ± 73.14	83.412 !	169.566
6	1228	3549	2321	69.12	2321 ± 69.12	81.510 !	165.760
7	1308	12180	10872	116.14	10872 ± 116.14	84.123 !	170.988
8	1337	3208	1871	67.42	1871 ± 67.42	85.050 !	172.843
9	1349	1542	193	53.77	193 ± 53.77	85.431 !	173.605
10	1308	1240	-68	50.48	-68 ± 50.48	84.123	170.988
11	1343	1080	-263	49.22	-263 ± 49.22	85.241	173.224
12	1393	1181	-212	50.73	-212 ± 50.73	86.813	176.370
13	1082	999	-83	45.62	-83 ± 45.62	76.511	155.761
14	1243	1212	-31	49.55	-31 ± 49.55	82.006	166.753
15	1207	938	-269	46.31	-269 ± 46.31	80.810	164.360
16	1272	1120	-152	48.91	-152 ± 48.91	82.957	168.656
17	1314	1188	-126	50.02	-126 ± 50.02	84.315	171.373
18	1243	1296	53	50.39	53 ± 50.39	82.006	166.753
19	1107	1019	-88	46.11	-88 ± 46.11	77.390	157.519

Converted to mR/hr

Background (mR/hr)	Gross Beam-On (mR/hr)	Net Beam-On (mR/hr)	Standard Deviation	Net ± St. Dev.	D _D
0.005	0.005	0.000	0.0002	0 ± 0.0002	0.001
0.006	0.007	0.001	0.0003	0.001 ± 0.0003	0.001
0.006	0.007	0.001	0.0003	0.001 ± 0.0003	0.001
0.007	0.007	0.000	0.0003	0 ± 0.0003	0.001
0.006	0.020	0.014	0.0004	0.014 ± 0.0004	0.001
0.006	0.018	0.012	0.0003	0.012 ± 0.0003	0.001
0.007	0.061	0.054	0.0006	0.054 ± 0.0006	0.001
0.007	0.016	0.009	0.0003	0.009 ± 0.0003	0.001
0.007	0.008	0.001	0.0003	0.001 ± 0.0003	0.001
0.007	0.006	0.000	0.0003	0 ± 0.0003	0.001
0.007	0.005	0.000	0.0002	0 ± 0.0002	0.001
0.007	0.006	0.000	0.0003	0 ± 0.0003	0.001
0.005	0.005	0.000	0.0002	0 ± 0.0002	0.001
0.006	0.006	0.000	0.0002	0 ± 0.0002	0.001
0.006	0.005	0.000	0.0002	0 ± 0.0002	0.001
0.006	0.006	0.000	0.0002	0 ± 0.0002	0.001
0.007	0.006	0.000	0.0003	0 ± 0.0003	0.001
0.006	0.006	0.000	0.0003	0 ± 0.0003	0.001
0.006	0.005	0.000	0.0002	0 ± 0.0002	0.001

Muon Campus

Neutron Survey Results

Location	Average Background (mrem)	Average Background (mrem/hr)	Gross Beam-On (mrem/hr)	Net Beam-On (mrem/hr)	Sample Standard Deviation (mrem/hr)	Net \pm St. Dev. (mrem/hr)	L _{C,N}	D _{D,N}
1	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
2	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
3	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
4	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
5	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
6	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
7	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
8	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
9	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
10	0.01933	0.01933	0.120	0.101	1.08E-04	0.101 \pm 0.000108	2.52E-04	5.04E-04
11	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
12	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
13	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
14	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
15	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
16	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
17	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
18	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04
19	0.01933	0.01933	0.000	0.000	1.08E-04	0 \pm 0.000108	2.52E-04	5.04E-04

Muon Campus

Scaling Dose Rates to Operating Limit Intensity & Calculate Annual Dose

At Survey Intensity

Scaled to Operating Limit Intensity at Standard Beam Up-Time

Location	At Survey Intensity		Scaled to Operating Limit Intensity at Standard Beam Up-Time					
	Gamma Net Beam-On (mR/hr)	Neutron Net Beam-On (mrem/hr)	Gamma Net Beam-On (mR/hr)	Gamma 2,000 hr Working Year (mrem)	Gamma 24/7/365 (mrem)	Neutron Net Beam-On (mrem/hr)	Neutron 2,000 hr Working Year (mrem)	Neutron 24/7/365 (mrem)
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
2	0.001	0.000	0.004	8.640	25.617	0.000	0.000	0
3	0.001	0.000	0.004	8.640	25.617	0.000	0.000	0
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
5	0.014	0.000	0.060	120.960	358.637	0.000	0.000	0
6	0.012	0.000	0.052	103.680	307.403	0.000	0.000	0
7	0.054	0.000	0.233	466.560	1383.315	0.000	0.000	0
8	0.009	0.000	0.039	77.760	230.552	0.000	0.000	0
9	0.001	0.000	0.004	8.640	25.617	0.000	0.000	0
10	0.000	0.101	0.000	0.000	0.000	0.435	869.789	2578.857
11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0

Intensities (protons/hr)	
Survey	Op. Limit
1.00E+16	4.32E+16

Beam Up-Time	
# Weeks	44
Efficiency	80%
67.7%	

Muon Campus - Location 10 Repeat Survey

Repeat Muon Campus Location 10 Neutron Survey

Time	Count Time (min)	Dose (mrem)	Dose Rate (mrem/min)	Average Gross (mrem/min)	Average Gross (mrem/hr)	Sample Std. Dev. (mrem)	Sample Std. Dev. (mrem/min)	Sample Std. Dev (mrem/hr)
2/8/2021 13:29	1	0.000	0.000	0.010	0.6012	0.00017445	0.000174452	0.0104671
2/8/2021 13:29	2	0.023	0.012					
2/8/2021 13:32	1	0.032	0.032					
2/8/2021 13:33	5	0.033	0.007					
2/8/2021 13:38	10	0.000	0.000					

Muon Campus

Updated Neutron Survey Results for Location 10

Location	Average Background (mrem)	Average Background (mrem/hr)	Average Gross Beam-On (mrem/hr)	Net Beam-On (mrem/hr)	Sample Standard Deviation (mrem/hr)	Net \pm St. Dev. (mrem/hr)	L _{C,N}	D _{D,N}
10	0.01933	0.01933	0.601	0.582	1.05E-02	0.5819 \pm 0.010	2.43E-02	4.87E-02

Muon Campus - Location 10 Repeat Survey

Scaling Dose Rates to Operating Limit Intensity & Calculate Annual Dose

Location	At Survey Intensity		Scaled to Operating Limit Intensity at Standard Beam Up-Time					
	Gamma	Neutron	Gamma			Neutron		
	Net Beam-On (mR/hr)	Net Beam-On (mrem/hr)	Net Beam-On (mR/hr)	2,000 hr Working Year (mrem)	24/7/365 (mrem)	Net Beam-On (mrem/hr)	2,000 hr Working Year (mrem)	24/7/365 (mrem)
10	0.000	0.582	0.000	0.000	0.000	2.514	5027.357	14905.726

Intensities (protons/hr)		Beam Up-Time	
Survey	Op. Limit	# Weeks	Efficiency
1.00E+16	4.32E+16	44	80%
		67.7%	