Twelve tables for case 1 with 2.6 mr and case 3 with 3.8 mr vertical acceptance

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This is an addendum to reference [1]. There are 12 tables, in 3 groups of 4. Each group contains results for a 2.6 mr, and for a 3.8 mr vertical angle acceptance. The numbers represent intensities outside the indicated regions at 14 m from the target, for 10^{14} protons per pulse. The first group gives the number of neutrons, calculated starting with 50 million in a large phase space. This number is then normalized to obtain the absolute number per pulse, for the second group. The third group gives the fraction of the total number of neutrons.

Each group of 4 has 2 tables for case 1, and 2 tables for case 3. The first table is the result of a calculation for neutrons starting with a momentum above 750 MeV/c, and allowing a final energy down to 10 MeV. The second table is for a calculation starting with momenta lower than 750 MeV/c, but above 10 MeV in energy. The normalization of the low and high energy results to absolute numbers is explained in reference [1].

There was a question about the vertical distribution at 18 m, only for those neutrons that went through a vertical hole at 14 m. The figures 1 and 2 at the end of this note, try to answer that question for the high energy calculation..

References

[1] The neutron halos for 2 different x-y aspect ratios, for the initial energy between 10 MeV and 260 MeV, and for the initial energy above 260 MeV http://www.triumf.ca/people/doornbos/halocomplow.ps

Table 1: Number of calculated neutrons outside the indicated areas. For instance, y 6cm and x 90 cm means the central area of 12 by 180 cm. This is for the high energy calculation of case 1.

	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	90	100	110	120
6	2,527	2,426	2,386	2363
7	1,249	1,136	1,093	1068
8	740	619	571	543
9	551	425	376	347
10	415	288	235	202
11	348	220	166	133
12	328	199	144	111
13	314	184	129	95
14	307	177	121	86
15	299	169	113	78
16	293	163	107	72
17	293	163	106	71

Table 2: Number of calculated neutrons outside the indicated areas. For instance, y 6cm and x 90 cm means the central area of 12 by 180 cm. This is for the low energy calculation of case 1.

	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	90	100	110	120
6	981	797	719	674
7	617	423	337	292
8	468	272	183	133
9	423	226	135	84
10	400	200	108	57
11	385	185	91	40
12	381	181	86	35
13	380	180	85	34
14	377	177	82	31
15	377	177	82	31
16	377	177	82	31
17	376	176	81	30

Table 3: Number of calculated neutrons outside the indicated areas. For instance, y 10 cm and x 90 cm means the central area of 20 by 180 cm^2. This is for the high energy calculation of case 3.

	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	70	80	90	100	110	120
10	2,192	1,933	1,838	1,803	1,791	1,788
11	1,538	1,267	1,166	1,129	1,116	1,113
12	1,155	878	775	735	720	717
13	923	638	531	489	474	471
14	778	488	378	335	319	316
15	690	397	286	242	225	222
16	658	360	246	202	184	181
17	632	333	217	173	155	151

Table 4: Number of calculated neutrons outside the indicated areas. For instance, y 10 cm and x 90 cm means the central area of 20 by 180 cm^2. This is for the low energy calculation of case 3.

	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	70	80	90	100	110	120
10	930	642	514	489	484	484
11	767	470	337	310	304	304
12	644	340	201	172	166	165
13	592	288	149	119	113	112
14	548	241	100	69	63	62
15	533	226	81	50	44	43
16	525	218	73	42	36	35
17	523	216	71	40	34	33

Table 5: Absolute number of neutrons per pulse in units of K outside the indicated areas. For instance, y 6cm and x 90 cm means the central area of 12 by 180 cm. This is for the high energy calculation of case 1

	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	90	100	110	120
6	9,350	8,976	8,828	8743
7	4,621	4,203	4,044	3952
8	2,738	2,290	2,113	2009
9	2,039	1,572	1,391	1284
10	1,535	1,066	869	747
11	1,288	814	614	492
12	1,214	736	533	411
13	1,162	681	477	351
14	1,136	655	448	318
15	1,106	625	418	289
16	1,084	603	396	266
17	1,084	603	392	263

Table 6: Absolute number of neutrons per pulse in units of K outside the indicated areas. For instance, y 6 cm and x 90 cm means the central area of 12 by 180 cm. This is for the low energy calculation of case 1

	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	90	100	110	120
6	7357	5977	5392	5055
7	4627	3172	2527	2190
8	3510	2040	1372	997
9	3172	1695	1012	630
10	3000	1500	810	427
11	2887	1387	682	300
12	2857	1357	645	262
13	2850	1350	637	255
14	2827	1327	615	232
15	2827	1327	615	232
16	2827	1327	615	232
17	2820	1320	607	225

Table 7: Absolute number of neutrons per pulse in units of K outside the indicated areas. For instance, y 10 cm and x 90 cm means the central area of 20 by 180 cm^2. This is for the high energy calculation of case 3

	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	70	80	90	100	110	120
10	8,110	7,152	6,801	6,671	6,627	6,616
11	5,691	4,688	4,314	4,177	4,129	4,118
12	4,273	3,249	2,867	2,719	2,664	2,653
13	3,415	2,361	1,965	1,809	1,754	1,743
14	2,879	1,806	1,399	1,239	1,180	1,169
15	2,553	1,469	1,058	895	832	821
16	2,435	1,332	910	747	681	670
17	2,338	1,232	803	640	573	559

Table 8: Absolute number of neutrons per pulse in units of K outside the indicated areas. For instance, y 10 cm and x 90 cm means the central area of 20 by 180 cm^2. This is for the low energy calculation of case 3

	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	70	80	90	100	110	120
10	6975	4815	3855	3667	3630	3630
11	5752	3525	2527	2325	2280	2280
12	4830	2550	1507	1290	1245	1237
13	4440	2160	1117	892	847	840
14	4110	1807	750	517	472	465
15	3997	1695	607	375	330	322
16	3937	1635	547	315	270	262
17	3922	1620	532	300	255	247

Table 9: Fraction of total neutrons in units of 10^{-6} outside the indicated areas. For instance, y 6 cm and x 90 cm means the central area of 12 by 180 cm. This is for the high energy calculation of case 1.

	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	90	100	110	120
6	632	606	596	591
7	312	284	273	267
8	185	155	143	136
9	138	106	94	87
10	104	72	59	50
11	87	55	41	33
12	82	50	36	28
13	78	46	32	24
14	77	44	30	21
15	75	42	28	19
16	73	41	27	18
17	73	41	26	18

Table 10: Fraction of total neutrons in units of 10^{-6} outside the indicated areas. For instance, y 6 cm and x 90 cm means the central area of 12 by 180 cm. This is for the low energy calculation of case 1.

	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	90	100	110	120
6	343	279	252	236
7	216	148	118	102
8	164	95	64	47
9	148	79	47	29
10	140	70	38	20
11	135	65	32	14
12	133	63	30	12
13	133	63	30	12
14	132	62	29	11
15	132	62	29	11
16	132	62	29	11
17	132	62	28	11

Table 11: Fraction of total neutrons in units of 10^{-6} outside the indicated areas. For instance, y 10 cm and x 90 cm means the central area of 20 by 180 cm^2. This is for the high energy calculation of case 3.

	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	70	80	90	100	110	120
10	548	483	459	451	448	447
11	384	317	291	282	279	278
12	289	219	194	184	180	179
13	231	159	133	122	118	118
14	194	122	94	84	80	79
15	172	99	71	60	56	55
16	164	90	61	50	46	45
17	158	83	54	43	39	38

Table 12: Fraction of total neutrons in units of 10^{-6} outside the indicated areas. For instance, y 10 cm and x 90 cm means the central area of 20 by 180 cm^2. This is for the low energy calculation of case 3.

	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)	x(cm)
y(cm)	70	80	90	100	110	120
10	326	225	180	171	169	169
11	268	165	118	109	106	106
12	225	119	70	60	58	58
13	207	101	52	42	40	39
14	192	84	35	24	22	22
15	187	79	28	18	15	15
16	184	76	26	15	13	12
17	183	76	25	14	12	12

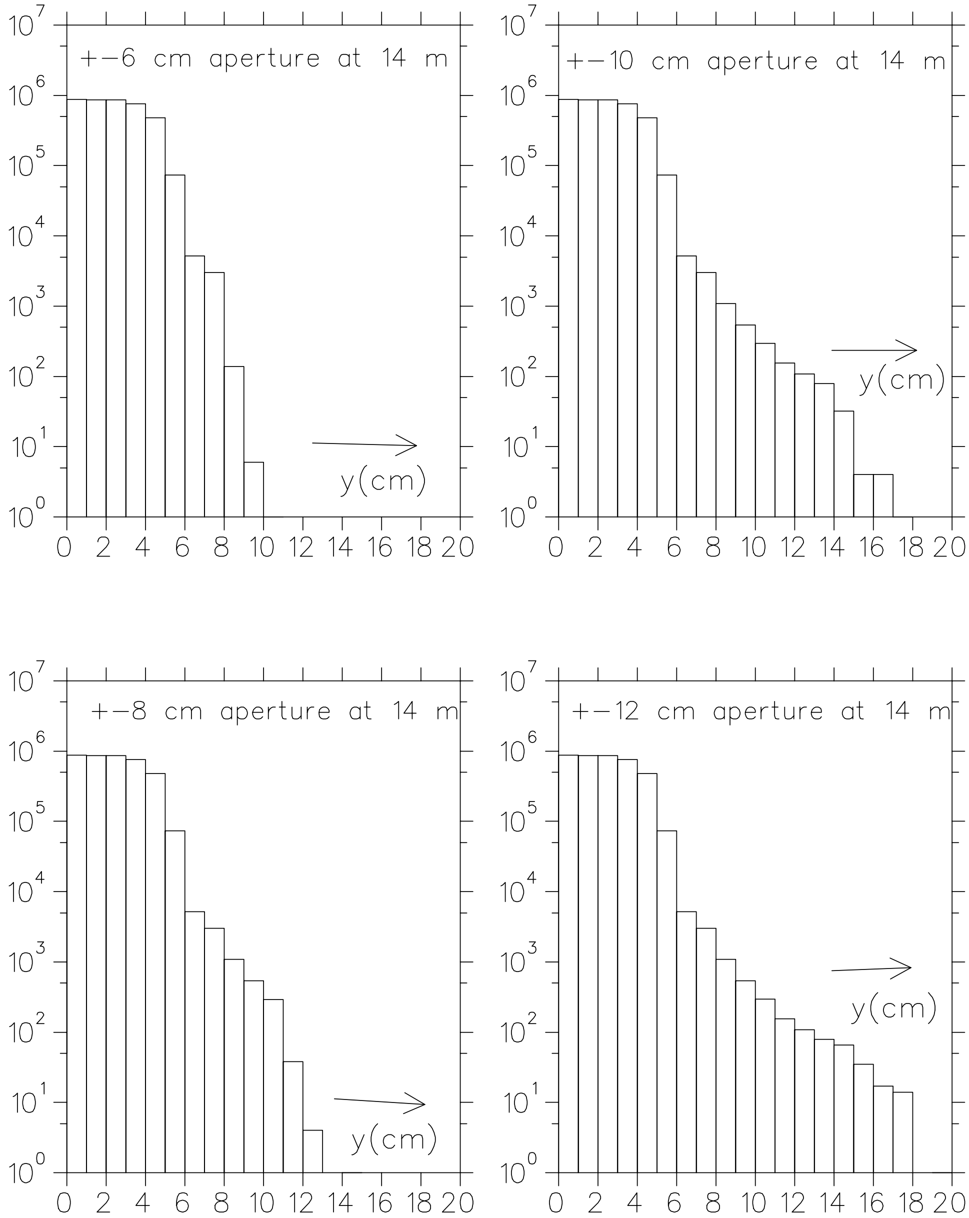

Figure 1: Vertical distribution at 18 m gated with ±6. ±8, ±10 and ±12 cm vertical aperture at 14 m. This is for case 1.

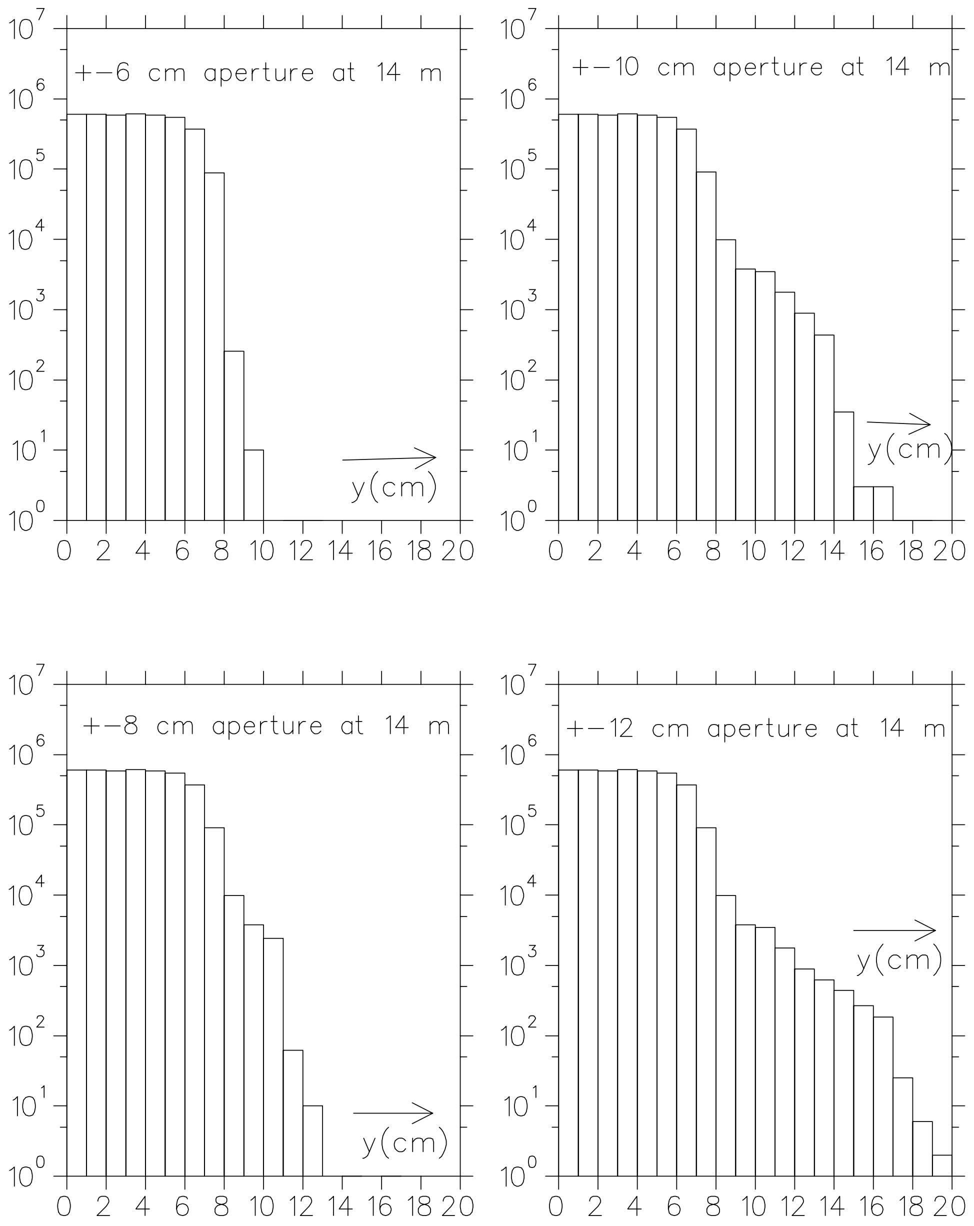

Figure 2: Vertical distribution at 18 m gated with ±6. ±8, ±10 and ±12 cm vertical aperture at 14 m. This is for case 3.