

Time (min)	L	B/B <sub>0</sub>	>1MeV (skin dose, depth dose)	>8MeV (skin dose, depth dose)	>9MeV (skin dose, depth dose)	>10MeV (rad)	>15MeV	>20MeV	>25MeV	>30MeV (rad)	>35MeV	>40MeV	>45MeV (rad)	>50MeV (rad)	>55MeV	>60MeV	>65MeV	>70MeV	TOTAL RADS	TOTALS RADS (<8MeV excluded)	
5	1.44168	2.14962	3.256E+02 (0.00139rad, 0.00008rad)	2.953E+02 (0.01008rad, 0.00060rad)	2.913E+02 (0.01119rad, 0.00067rad)	2.873E+02 (0.01226rad, 0.00074rad)	2.747E+02 (0.01758rad, 0.00105rad)	2.612E+02 (0.02229rad, 0.00134rad)	2.531E+02 (0.02700rad, 0.00162rad)	2.453E+02 (0.03140rad, 0.00188rad)	2.369+02 (0.03538rad, 0.00212rad)	2.288E+02 (0.03905rad, 0.00234rad)	2.210E+02 (0.04243rad, 0.00255rad)	2.134E+02 (0.04553rad, 0.00273rad)	2.061E+02 (0.04836rad, 0.00290rad)	1.990E+02 (0.05094rad, 0.00306rad)	1.916E+02 (0.05314rad, 0.00319rad)	1.845E+02 (0.05510rad, 0.00331rad)	0.50312rad, 0.03018rad	0.50173rad, 0.03010rad	
6	1.51254	2.50334	5.69E+02 (0.00248rad, 0.00015rad)	5.008E+02 (0.01709rad, 0.00103rad)	4.910E+02 (0.01885rad, 0.00113rad)	4.813E+02 (0.02054rad, 0.00123rad)	4.607E+02 (0.02948rad, 0.00171rad)	4.449E+02 (0.03793rad, 0.00228rad)	4.270E+02 (0.04555rad, 0.00315rad)	4.097E+02 (0.05244rad, 0.00348rad)	3.889E+02 (0.05808rad, 0.00378rad)	3.690E+02 (0.06298rad, 0.00387rad)	3.502E+02 (0.06728rad, 0.00403rad)	3.324E+02 (0.07091rad, 0.00425rad)	3.178E+02 (0.07458rad, 0.00447rad)	3.039E+02 (0.07779rad, 0.00467rad)	2.888E+02 (0.08009rad, 0.00481rad)	2.746E+02 (0.08201rad, 0.00492rad)	0.79808rad, 0.04554rad	0.79560rad, 0.04539rad	
7	1.62236	2.90373	2.179E+03 (0.00929rad, 0.00056rad)	1.478E+03 (0.05045rad, 0.00303rad)	1.401E+03 (0.05379rad, 0.00323rad)	1.327E+03 (0.05662rad, 0.00339rad)	1.108E+03 (0.07091rad, 0.00425rad)	9.647E+02 (0.08232rad, 0.00494rad)	8.891E+02 (0.09484rad, 0.00569rad)	8.195E02 (0.10489rad, 0.00629rad)	7.695E+02 (0.11491rad, 0.00689rad)	7.225E+02 (0.12331rad, 0.00739rad)	6.785E+02 (0.13027rad, 0.00782rad)	6.371E02 (0.13591rad, 0.00815rad)	5.97E+02 (0.14009rad, 0.00841rad)	5.94E+02 (0.15206rad, 0.00912rad)	5.199E+02 (0.15528rad, 0.00865rad)	4.831E+02 (0.14429rad, 0.00866rad)	1.50432rad, 0.09647rad	1.49503rad, 0.09591rad	
8	1.73976	3.34539	5.368E+03 (0.02290rad, 0.00137rad)	2.388E+03 (0.08151rad, 0.00489rad)	2.126E+03 (0.08164rad, 0.00489rad)	1.892E+03 (0.08073rad, 0.00484rad)	1.291E+03 (0.08262rad, 0.00496rad)	1.003E+03 (0.08559rad, 0.00514rad)	8.584E+02 (0.09156rad, 0.00549rad)	7.348E02 (0.09405rad, 0.00564rad)	6.596E+02 (0.09850rad, 0.00591rad)	5.921E02 (0.10105rad, 0.00606rad)	5.315E+02 (0.10205rad, 0.00612rad)	4.771E+02 (0.10178rad, 0.00611rad)	4.294E+02 (0.10077rad, 0.00605rad)	3.864E+02 (0.09892rad, 0.00594rad)	3.449E+02 (0.09565rad, 0.00574rad)	3.078E+02 (0.09193rad, 0.00552rad)	1.41125rad, 0.10474rad	1.38835rad, 0.10337rad	
9	1.86325	3.82043	1.676E+04 (0.07151rad, 0.00429rad)	3.736E+03 (0.12752rad, 0.00765rad)	3.173E03 (0.12184rad, 0.00731rad)	2.695E03 (0.11499rad, 0.00689rad)	1.497E+03 (0.09581rad, 0.00575rad)	1.002E+03 (0.08550rad, 0.00513rad)	7.701E+02 (0.08214rad, 0.00493rad)	5.916E02 (0.07572rad, 0.00454rad)	4.992E+02 (0.07455rad, 0.00447rad)	4.214E+02 (0.07192rad, 0.00432rad)	3.556E+02 (0.06828rad, 0.00410rad)	3.001E+02 (0.06402rad, 0.00384rad)	2.595E+02 (0.06090rad, 0.00365rad)	2.243E+02 (0.05742rad, 0.00345rad)	1.948E+02 (0.05402rad, 0.00324rad)	1.691E+02 (0.05050rad, 0.00303rad)	1.27664rad, 0.11589rad	1.20513rad, 0.10167rad	
10	1.99131	4.31882	5.555E+04 (0.23701rad, 0.01422rad)	5.468E+03 (0.18664rad, 0.01119rad)	4.381E+03 (0.16823rad, 0.01009rad)	3.510E+03 (0.14976rad, 0.00899rad)	1.637E+03 (0.10477rad, 0.00628rad)	9.573E+02 (0.08169rad, 0.00490rad)	6.785E+02 (0.07237rad, 0.00434rad)	4.809E+02 (0.06156rad, 0.00369rad)	3.850E+02 (0.05749rad, 0.00345rad)	3.082E+02 (0.05259rad, 0.00364rad)	2.467E+02 (0.04737rad, 0.00284rad)	1.975E+02 (0.04213rad, 0.00253rad)	1.651E+02 (0.03874rad, 0.00232rad)	1.380E+02 (0.03533rad, 0.00212rad)	1.181E+02 (0.03275rad, 0.00197rad)	1.011E+02 (0.03019rad, 0.00181rad)	1.39862rad, 0.08438rad	1.16161rad, 0.07016rad	
11	2.12248	4.82912	1.123E+05 (0.47915rad, 0.02875rad)	5.747E+03 (0.19616rad, 0.01177rad)	4.433E+03 (0.17023rad, 0.01021rad)	3.420E+03 (0.14529rad, 0.00876rad)	1.329E+03 (0.08506rad, 0.00510rad)	6.77E+02 (0.05777rad, 0.00347rad)	4.190E+02 (0.04469rad, 0.00268rad)	2.592E+02 (0.03318rad, 0.00199rad)	1.947E+02 (0.02998rad, 0.00174rad)	1.462E+02 (0.02495rad, 0.00149rad)	1.099E+02 (0.02110rad, 0.00127rad)	8.252E+01 (0.01760rad, 0.00106rad)	6.762E+01 (0.01587rad, 0.00095rad)	5.540E+01 (0.01418rad, 0.00085rad)	4.638E+01 (0.01284rad, 0.00077rad)	3.883E+01 (0.00958rad, 0.00070rad)	1.45966rad, 0.08156rad	0.98651rad, 0.05281rad	
12	2.25532	5.33932	1.768E+05 (0.75435rad, 0.04526rad)	4.740E+03 (0.16179rad, 0.00971rad)	3.587E+03 (0.13774rad, 0.00826rad)	2.714E+03 (0.11579rad, 0.00695rad)	9.118E+02 (0.05836rad, 0.00350rad)	4.206E+02 (0.03589rad, 0.00215rad)	2.416E+02 (0.02577rad, 0.00157rad)	1.388E+02 (0.01777rad, 0.00107rad)	9.806E+01 (0.01464rad, 0.00088rad)	6.927E+01 (0.01182rad, 0.00071rad)	4.894E+01 (0.00940rad, 0.00056rad)	3.458E+01 (0.00738rad, 0.00044rad)	2.684E+01 (0.00630rad, 0.00038rad)	2.084E+01 (0.00534rad, 0.00032rad)	1.693E+01 (0.00470rad, 0.00028rad)	1.375E+01 (0.00411rad, 0.00025rad)	1.37115rad, 0.08227rad	0.61680rad, 0.03701rad	
13	2.38857	5.83768	2.615E+05 (1.11573rad, 0.06694rad)	3.416E+03 (0.11660rad, 0.00700rad)	2.512E+03 (0.09646rad, 0.00579rad)	1.847E+03 (0.07881rad, 0.00426rad)	5.573E+02 (0.03567rad, 0.00214rad)	2.415E+02 (0.02061rad, 0.00124rad)	1.337E+02 (0.01426rad, 0.00086rad)	7.407E+01 (0.00948rad, 0.00057rad)	5.018E+01 (0.00749rad, 0.00045rad)	3.400E+01 (0.00580rad, 0.00035rad)	2.304E+01 (0.00442rad, 0.00027rad)	1.561E+01 (0.00333rad, 0.00016rad)	1.166E+01 (0.00274rad, 0.00013rad)	8.712E+00 (0.00223rad, 0.00011rad)	6.861E+00 (0.00190rad, 0.00011rad)	5.404E+00 (0.00161rad, 0.00010rad)	1.51714rad, 0.09057rad	0.40141rad, 0.02363rad	
14	2.52112	6.31360	3.442E+05 (1.46857rad, 0.08812rad)	1.945E+03 (0.06639rad, 0.00398rad)	1.420E+03 (0.05453rad, 0.00327rad)	1.037E+03 (0.04425rad, 0.00265rad)	2.833E+02 (0.01813rad, 0.00109rad)	1.145E+02 (0.00977rad, 0.00059rad)	6.036E+01 (0.00644rad, 0.00039rad)	3.183E+01 (0.00407rad, 0.00024rad)	2.091E+01 (0.00312rad, 0.00019rad)	1.374E+01 (0.00234rad, 0.00014rad)	9.027E+00 (0.00173rad, 0.00010rad)	4.380E+00 (0.00093rad, 0.00006rad)	3.234E+00 (0.00076rad, 0.00005rad)	2.524E+00 (0.00065rad, 0.00004rad)	1.970E+00 (0.00055rad, 0.00003rad)	1.537E+00 (0.00046rad, 0.00003rad)	1.68269rad, 0.10097rad	0.21412rad, 0.01285rad	
15	2.65202	6.75809	4.150E+05 (1.77067rad, 0.10624rad)	9.746E+02 (0.03327rad, 0.00200rad)	6.899E+02 (0.02649rad, 0.00160rad)	4.884E+02 (0.02084rad, 0.00125rad)	1.251E+02 (0.00801rad, 0.00048rad)	4.448E+01 (0.00380rad, 0.00022rad)	2.080E+01 (0.00222rad, 0.00013rad)	9.729E+00 (0.00125rads, 0.00007rad)	5.985E+00 (0.00089rad, 0.00005rad)	3.681E+00 (0.00063rad, 0.00004rad)	2.264E+00 (0.00043rad, 0.00003rad)	1.393E+00 (0.00030rad, 0.00002rad)	0	0	0	0	1.86880rad, 0.11213rad	0.09813rad, 0.00589rad	
16	2.78052	7.16422	3.733E+05 (1.59275rad, 0.09556rad)	4.104E+02 (0.01401rad, 0.00084rad)	3.354E+02 (0.01288rad, 0.00077rad)	1.962E+02 (0.00837rad, 0.00050rad)	5.170E+01 (0.00330rad, 0.00020rad)	1.633E+01 (0.00139rad, 0.00008rad)	7.213E+00 (0.00077rad, 0.00005rad)	3.186E+00 (0.00041rad, 0.00002rad)	1.407E+00 (0.00021rad, 0.00001rad)	0	0	0	0	0	0	0	1.63409rad, 0.09803rad	0.04194rad, 0.00247rad	
17	2.90603	7.52720	4.795E+05 (2.04587rad, 0.12275rad)	2.332E+02 (0.00796rad, 0.00048rad)	1.510E+02 (0.00580rad, 0.00035rad)	9.780E+01 (0.00417rad, 0.00025rad)	1.788E+01 (0.00114rad, 0.00007rad)	5.188E+00 (0.00044rad, 0.00003rad)	1.505E+00 (0.00016rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	2.06527rad, 0.12394rad	0.01940rad, 0.00119rad	
18	3.02813	7.84429	4.662E+05 (1.98912rad, 0.11935rad)	9.548E+01 (0.00330rad, 0.00020rad)	5.794E+01 (0.00222rad, 0.00013rad)	3.516E+01 (0.00150rad, 0.00008rad)	5.234E+00 (0.00033rad, 0.00002rad)	1.315E+00 (0.00011rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	0	0	1.99658rad, 0.11979rad	0.00746rad, 0.00044rad
19	3.14654	8.11462	4.353E+05 (1.85728rad, 0.11144rad)	4.173E+01 (0.00142rad, 0.00009rad)	2.414E+01 (0.00093rad, 0.00006rad)	1.397E+01 (0.00060rad, 0.00006rad)	1.735E+00 (0.00011rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	0	0	0	1.86026rad, 0.11164rad	0.00298rad, 0.00020rad
20	3.26110	8.33885	3.747E+05 (1.59872rad, 0.09592rad)	1.973E+01 (0.00067rad, 0.00004rad)	1.074E+01 (0.00041rad, 0.00002rad)	5.847E+00 (0.00025rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	0	0	0	0	1.60005rad, 0.09599rad	0.00133rad, 0.00007rad
21	3.37175	8.51886	3.406E+05 (1.45322rad, 0.08719rad)	9.952E+00 (0.00034rad, 0.00002rad)	5.114E+00 (0.00019rad, 0.00001rad)	2.628E+00 (0.00011rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	0	0	0	0	1.45386rad, 0.08723rad	0.00064rad, 0.00004rad

22	3.47852	8.65742	2.873E+05 (1.22581rad, 0.07355rad)	4.556E+00 (0.00016rad, 0.00001rad)	2.425E+00 (0.00009rad, 0.00001rad)	1.290E+00 (0.00006rad, 0.00000rad)	0	0											1.22612rad, 0.07357rad	0.00031rad, 0.00002rad
23	3.58148	8.75784	2.474E+05 (1.05557rad, 0.06333rad)	1.946E+00 (0.00006rad, 0.00000rad)	0	0	0	0											1.05563rad, 0.06333rad	0.00006rad, 0.00000rad
24	3.68075	8.82380	2.152E+05 (0.91819rad, 0.05509rad)	0	0	0	0	0											0.91819rad, 0.05509rad	0.00000rad, 0.00000rad
TOTALS																			<b>28.60152rad, 1.77331rad</b>	<b>8.93854rad, 0.58322rad</b>

### Skin dose Calculations

$$\begin{aligned}
&(\text{Protons/cm}^2/\text{s}) * (100^2\text{cm}^2) * (3600\text{s/hr}) = \text{Protons/m}^2/\text{hr} \\
&(\text{Protons/m}^2/\text{hr}) * 2\text{m}^2 = \text{Protons/hr} \\
&\text{Protons/hr} * (\text{E MeV/Proton}) = \text{E MeV/hr} \\
&(\text{E MeV/hr}) * (1.6 * 10^{-13}/\text{MeV}) = \text{Joules/hr} \\
&(\text{Joules/hr}) / 4.5\text{kg} = \text{Gray/hr} \\
&(\text{Gray/hr}) * 100\text{rad/hr} = \text{rad/hr} \\
&\text{Rad/hr} * 1/60 = \text{rad/min}
\end{aligned}$$

### Depth dose Calculations

$$\begin{aligned}
&(\text{Protons/cm}^2/\text{s}) * (100^2\text{cm}^2) * (3600\text{s/hr}) = \text{Protons/m}^2/\text{hr} \\
&(\text{Protons/m}^2/\text{hr}) * 2\text{m}^2 = \text{Protons/hr} \\
&\text{Protons/hr} * (\text{E MeV/Proton}) = \text{E MeV/hr} \\
&(\text{E MeV/hr}) * (1.6 * 10^{-13}/\text{MeV}) = \text{Joules/hr} \\
&(\text{Joules/hr}) / 75\text{kg} = \text{Gray/hr} \\
&(\text{Gray/hr}) * 100\text{rad/hr} = \text{rad/hr} \\
&\text{Rad/hr} * 1/60 = \text{rad/min}
\end{aligned}$$