

Time (min)	L	B/B <sub>0</sub>	>11MeV	>12MeV	>13MeV	>14MeV	>16MeV	>17MeV	>18MeV	>19MeV	>21MeV	>22MeV	>23MeV	>24MeV	>26MeV	>27MeV	>28MeV	>29MeV	>31MeV	TOTAL RADS	
5	1.44168	2.14962	2.847E+02 (0.01336rad, 0.00080rad)	2.822E+02 (0.01445rad, 0.00087rad)	2.796E+02 (0.01551rad, 0.00093rad)	2.772E+02 (0.01656rad, 0.00099rad)	2.719E+02 (0.01856rad, 0.00111rad)	2.692E+02 (0.01953rad, 0.00117rad)	2.665E+02 (0.02047rad, 0.00123rad)	2.638E+02 (0.02139rad, 0.00128rad)	2.596E+02 (0.02326rad, 0.00140rad)	2.579E+02 (0.02421rad, 0.00145rad)	2.563E+02 (0.02515rad, 0.00151rad)	2.547E+02 (0.02608rad, 0.00156rad)	2.516E+02 (0.02791rad, 0.00167rad)	2.500E+02 (0.02880rad, 0.00173rad)	2.484E+02 (0.02968rad, 0.00178rad)	2.469E+02 (0.03055rad, 0.00183rad)	2.436E+02 (0.03222rad, 0.00193rad)	0.38769rad, 0.02324rad	
6	1.51254	2.50334	4.771E+02 (0.02239rad, 0.00134rad)	4.730E+02 (0.02422rad, 0.00145rad)	4.688E+02 (0.02600rad, 0.00156rad)	4.647E+02 (0.02776rad, 0.00167rad)	4.575E+02 (0.03123rad, 0.00187rad)	4.543E+02 (0.03295rad, 0.00198rad)	4.511E+02 (0.03464rad, 0.00208rad)	4.480E+02 (0.03632rad, 0.00218rad)	4.412E+02 (0.03953rad, 0.00237rad)	4.376E+02 (0.04108rad, 0.00246rad)	4.340E+02 (0.04259rad, 0.00256rad)	4.305E+02 (0.04408rad, 0.00264rad)	4.235E+02 (0.04698rad, 0.00282rad)	4.200E+02 (0.04838rad, 0.00290rad)	4.165E+02 (0.04976rad, 0.00299rad)	4.131E+02 (0.05111rad, 0.00307rad)	4.055E+02 (0.05363rad, 0.00322rad)	0.65266rad, 0.03916rad	
7	1.62236	2.90373	1.280E+03 (0.06007rad, 0.00360rad)	1.235E+03 (0.06323rad, 0.00379rad)	1.191E+03 (0.06606rad, 0.00396rad)	1.149E+03 (0.06863rad, 0.00412rad)	1.078E+03 (0.07359rad, 0.00442rad)	1.048E+03 (0.07601rad, 0.00456rad)	1.020E+03 (0.07834rad, 0.00470rad)	9.918E+02 (0.08040rad, 0.00482rad)	9.491E+02 (0.08504rad, 0.00510rad)	9.337E+02 (0.08764rad, 0.00526rad)	9.186E+02 (0.09015rad, 0.00541rad)	9.037E+02 (0.09254rad, 0.00555rad)	8.747E+02 (0.09703rad, 0.00582rad)	8.606E+02 (0.09914rad, 0.00595rad)	8.466E+02 (0.10114rad, 0.00607rad)	8.329E+02 (0.10306rad, 0.00618rad)	8.092E+02 (0.10703rad, 0.00642rad)	1.26787rad, 0.08573rad	
8	1.73976	3.34539	1.753E+03 (0.08227rad, 0.00494rad)	1.624E+03 (0.08315rad, 0.00499rad)	1.504E+03 (0.08342rad, 0.00501rad)	1.394E+03 (0.08327rad, 0.00500rad)	1.227E+03 (0.08376rad, 0.00503rad)	1.167E+03 (0.08465rad, 0.00508rad)	1.109E+03 (0.08517rad, 0.00511rad)	1.055E+03 (0.08553rad, 0.00513rad)	9.731E+02 (0.08710rad, 0.00523rad)	9.423E+02 (0.08845rad, 0.00531rad)	9.135E+02 (0.08964rad, 0.00538rad)	8.855E+02 (0.09068rad, 0.00544rad)	8.321E+02 (0.09231rad, 0.00554rad)	8.066E+02 (0.09292rad, 0.00558rad)	7.819E+02 (0.09341rad, 0.00560rad)	7.580E+02 (0.09379rad, 0.00563rad)	7.191E+02 (0.09511rad, 0.00571rad)	1.31917rad, 0.08971rad	
9	1.86325	3.82043	2.396E+03 (0.11245rad, 0.00675rad)	2.130E+03 (0.10906rad, 0.00654rad)	1.894E+03 (0.10505rad, 0.00630rad)	1.684E+03 (0.10059rad, 0.00555rad)	1.381E+03 (0.09428rad, 0.00566rad)	1.275E+03 (0.09248rad, 0.00555rad)	1.177E+03 (0.09039rad, 0.00542rad)	1.086E+03 (0.08804rad, 0.00528rad)	9.509E+02 (0.08520rad, 0.00511rad)	9.020E+02 (0.08467rad, 0.00508rad)	8.557E+02 (0.08387rad, 0.00505rad)	8.118E+02 (0.08313rad, 0.00504rad)	7.305E+02 (0.08104rad, 0.00499rad)	6.930E+02 (0.07983rad, 0.00479rad)	6.574E+02 (0.07854rad, 0.00471rad)	6.327E+02 (0.07829rad, 0.00470rad)	5.719E+02 (0.07564rad, 0.00455rad)	1.52255rad, 0.09137rad	
10	1.99131	4.31882	3.013E+03 (0.14141rad, 0.00848rad)	2.587E+03 (0.13245rad, 0.00795rad)	2.221E+03 (0.12319rad, 0.00739rad)	1.907E+03 (0.11391rad, 0.00683rad)	1.470E+03 (0.10035rad, 0.00602rad)	1.321E+03 (0.09582rad, 0.00575rad)	1.186E+03 (0.09108rad, 0.00547rad)	1.066E+03 (0.08642rad, 0.00519rad)	8.936E+02 (0.08007rad, 0.00480rad)	8.342E+02 (0.07830rad, 0.00470rad)	7.787E+02 (0.07642rad, 0.00458rad)	7.269E+02 (0.07443rad, 0.00447rad)	6.334E+02 (0.07027rad, 0.00421rad)	5.912E+02 (0.06811rad, 0.00409rad)	5.159E+02 (0.06163rad, 0.00370rad)	5.152E+02 (0.06375rad, 0.00382rad)	4.600E+02 (0.06084rad, 0.00365rad)	1.42263rad, 0.08563rad	
11	2.12248	4.82912	2.831E+03 (0.13287rad, 0.00797rad)	2.343E+03 (0.11996rad, 0.00720rad)	1.940E+03 (0.10761rad, 0.00646rad)	1.606E+03 (0.09593rad, 0.00576rad)	1.162E+03 (0.07933rad, 0.00476rad)	1.015E+03 (0.07362rad, 0.00442rad)	8.871E+02 (0.06813rad, 0.00417rad)	7.752E+02 (0.06284rad, 0.00331rad)	6.154E+02 (0.05514rad, 0.00315rad)	5.590E+02 (0.05247rad, 0.00299rad)	5.078E+02 (0.04983rad, 0.00283rad)	4.613E+02 (0.04724rad, 0.00253rad)	3.806E+02 (0.04222rad, 0.00239rad)	3.458E+02 (0.03984rad, 0.00225rad)	3.141E+02 (0.03752rad, 0.00225rad)	2.853E+02 (0.03530rad, 0.00212rad)	2.448E+02 (0.03238rad, 0.00194rad)	1.13223rad, 0.06834rad	
12	2.25532	5.33932	2.182E+03 (0.10241rad, 0.00614rad)	1.754E+03 (0.08980rad, 0.00539rad)	1.411E+03 (0.07826rad, 0.00470rad)	1.134E+03 (0.06774rad, 0.00406rad)	7.811E+02 (0.05332rad, 0.00320rad)	6.691E+02 (0.04853rad, 0.00291rad)	5.732E+02 (0.04402rad, 0.00264rad)	4.910E+02 (0.03980rad, 0.00239rad)	3.765E+02 (0.03373rad, 0.00202rad)	3.370E+02 (0.03163rad, 0.00190rad)	3.016E+02 (0.02960rad, 0.00178rad)	2.699E+02 (0.02764rad, 0.00166rad)	2.163E+02 (0.02399rad, 0.00144rad)	1.936E+02 (0.02230rad, 0.00134rad)	1.733E+02 (0.02070rad, 0.00115rad)	1.551E+02 (0.01919rad, 0.00103rad)	1.295E+02 (0.01713rad, 0.00103rad)	0.74979rad, 0.04499rad	
13	2.38857	5.83768	1.454E+03 (0.06824rad, 0.00409rad)	1.144E+03 (0.05857rad, 0.00351rad)	9.000E+02 (0.04992rad, 0.00300rad)	7.082E+02 (0.04230rad, 0.00254rad)	4.714E+02 (0.03218rad, 0.00193rad)	3.988E+02 (0.02893rad, 0.00174rad)	3.374E+02 (0.02591rad, 0.00155rad)	2.854E+02 (0.02314rad, 0.00139rad)	2.145E+02 (0.01922rad, 0.00115rad)	1.906E+02 (0.01789rad, 0.00107rad)	1.694E+02 (0.01662rad, 0.00100rad)	1.505E+02 (0.01541rad, 0.00092rad)	1.188E+02 (0.01318rad, 0.00079rad)	1.056E+02 (0.01217rad, 0.00073rad)	9.382E+01 (0.01121rad, 0.00067rad)	8.336E+01 (0.01031rad, 0.00062rad)	6.852E+01 (0.00906rad, 0.00054rad)	0.45426rad, 0.02724rad	
14	2.52112	6.31360	8.002E+02 (0.03756rad, 0.00225rad)	6.173E+02 (0.03161rad, 0.00190rad)	4.761E+02 (0.02641rad, 0.00158rad)	3.673E+02 (0.02194rad, 0.00132rad)	2.363E+02 (0.01613rad, 0.00097rad)	1.972E+02 (0.01430rad, 0.00086rad)	1.645E+02 (0.01263rad, 0.00076rad)	1.372E+02 (0.01112rad, 0.00067rad)	1.007E+02 (0.00902rad, 0.00054rad)	8.862E+01 (0.00832rad, 0.00050rad)	7.797E+01 (0.00765rad, 0.00046rad)	6.860E+01 (0.00702rad, 0.00042rad)	5.311E+01 (0.00589rad, 0.00035rad)	4.673E+01 (0.00538rad, 0.00032rad)	4.111E+01 (0.00491rad, 0.00029rad)	3.618E+01 (0.00448rad, 0.00027rad)	2.926E+01 (0.00387rad, 0.00023rad)	0.20630rad, 0.01369rad	
15	2.65202	6.75809	3.719E+02 (0.01745rad, 0.00105rad)	2.832E+02 (0.01450rad, 0.00087rad)	2.157E+02 (0.01196rad, 0.00072rad)	1.643E+02 (0.00981rad, 0.00059rad)	1.017E+02 (0.00694rad, 0.00042rad)	8.272E+01 (0.00600rad, 0.00036rad)	6.727E+01 (0.00517rad, 0.00031rad)	5.470E+01 (0.00443rad, 0.00027rad)	3.821E+01 (0.00342rad, 0.00021rad)	3.282E+01 (0.00308rad, 0.00018rad)	2.819E+01 (0.00277rad, 0.00017rad)	2.422E+01 (0.00248rad, 0.00015rad)	1.787E+01 (0.00198rad, 0.00012rad)	1.535E+01 (0.00177rad, 0.00011rad)	1.319E+01 (0.00158rad, 0.00009rad)	1.133E+01 (0.00140rad, 0.00008rad)	8.828E+00 (0.00117rad, 0.00007rad)	0.15591rad, 0.00577rad	
16	2.78052	7.16422	1.711E+02 (0.00803rad, 0.00048rad)	1.268E+02 (0.00649rad, 0.00039rad)	9.404E+01 (0.00522rad, 0.00031rad)	6.972E+01 (0.00416rad, 0.00025rad)	4.106E+01 (0.00280rad, 0.00017rad)	3.261E+01 (0.00237rad, 0.00014rad)	2.589E+01 (0.00199rad, 0.00012rad)	2.056E+01 (0.00167rad, 0.00010rad)	1.387E+01 (0.00124rad, 0.00007rad)	1.178E+01 (0.00111rad, 0.00007rad)	1.000E+01 (0.00098rad, 0.00006rad)	8.494E+00 (0.00087rad, 0.00005rad)	6.125E+00 (0.00068rad, 0.00004rad)	5.202E+00 (0.00060rad, 0.00004rad)	4.417E+00 (0.00053rad, 0.00003rad)	3.751E+00 (0.00046rad, 0.00002rad)	2.705E+00 (0.00036rad, 0.00002rad)	0.03965rad, 0.00023rad	
17	2.90603	7.52720	6.962E+01 (0.00327rad, 0.00020rad)	4.957E+01 (0.00254rad, 0.00015rad)	3.529E+01 (0.00196rad, 0.00012rad)	2.512E+01 (0.00150rad, 0.00009rad)	1.396E+01 (0.00095rad, 0.00006rad)	1.090E+01 (0.00079rad, 0.00005rad)	8.511E+00 (0.00065rad, 0.00004rad)	6.645E+00 (0.00054rad, 0.00003rad)	4.050E+00 (0.00036rad, 0.00002rad)	3.162E+00 (0.00030rad, 0.00002rad)	2.469E+00 (0.00024rad, 0.00001rad)	1.928E+00 (0.00020rad, 0.00001rad)	1.175E+00 (0.00013rad, 0.00001rad)	0	0	0	0	0.01343rad, 0.00081rad	
18	3.02813	7.84429	2.402E+01 (0.00113rad, 0.00007rad)	1.641E+01 (0.00084rad, 0.00005rad)	1.121E+01 (0.00062rad, 0.00004rad)	7.661E+00 (0.00046rad, 0.00003rad)	3.971E+00 (0.00027rad, 0.00002rad)	3.012E+00 (0.00022rad, 0.00001rad)	2.285E+00 (0.00018rad, 0.00001rad)	1.733E+00 (0.00014rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	0.00386rad, 0.00024rad	
19	3.14654	8.11462	9.204E+00 (0.00043rad, 0.00003rad)	6.065E+00 (0.00031rad, 0.00002rad)	3.996E+00 (0.00022rad, 0.00001rad)	2.633E+00 (0.00016rad, 0.00001rad)	1.143E+00 (0.00008rad, 0.00000rad)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00120rad, 0.00007rad
20	3.26110	8.33885	3.183E+00 (0.00015rad, 0.00001rad)	1.733E+00 (0.00009rad, 0.00001rad)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00024rad, 0.00002rad
21	3.37175	8.51886	1.351E+00 (0.00006rad, 0.00000rad)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00006rad, 0.00000rad
TOTALS																					9.32950rad, 0.57837rad

### Skin dose Calculations

$$(\text{Protons/cm}^2/\text{s}) * (100^2\text{cm}^2) * (3600\text{s/hr}) = \text{Protons/m}^2/\text{hr}$$

$$(\text{Protons/m}^2/\text{hr}) * 2\text{m}^2 = \text{Protons/hr}$$

$$\text{Protons/hr} * (\text{E MeV/Proton}) = \text{E MeV/hr}$$

$$(\text{E MeV/hr}) * (1.6 * 10^{-13}/\text{MeV}) = \text{Joules/hr}$$

$$(\text{Joules/hr}) / 4.5\text{kg} = \text{Gray/hr}$$

$$(\text{Gray/hr}) * 100\text{rad/Gray} = \text{rad/hr}$$

$$\text{Rad/hr} * 1/60 = \text{rad/min}$$

### Depth dose Calculations

$$(\text{Protons/cm}^2/\text{s}) * (100^2\text{cm}^2) * (3600\text{s/hr}) = \text{Protons/m}^2/\text{hr}$$

$$(\text{Protons/m}^2/\text{hr}) * 2\text{m}^2 = \text{Protons/hr}$$

$$\text{Protons/hr} * (\text{E MeV/Proton}) = \text{E MeV/hr}$$

$$(\text{E MeV/hr}) * (1.6 * 10^{-13}/\text{MeV}) = \text{Joules/hr}$$

$$(\text{Joules/hr}) / 75\text{kg} = \text{Gray/hr}$$

$$(\text{Gray/hr}) * 100\text{rad/Gray} = \text{rad/hr}$$

$$\text{Rad/hr} * 1/60 = \text{rad/min}$$