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Estimates of Linear Energy Transfer from Solar Energetic Particles in Earth's Upper Atmosphere to Human Tissue in Aluminium Aircraft

Michael Ian Hall
mhall40@utk.edu

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Estimates of Linear Energy Transfer from Solar Energetic Particles in Earth's Upper Atmosphere to Human Tissue in Aluminium Aircraft

A Thesis Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Michael Ian Hall
May 2011

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ABSTRACT

Radiation from extraterrestrial sources is a concern for the safety of passengers and crew in high altitude aircraft. Cosmic radiation and solar particles constantly bombard the atmosphere with energy. Radiation levels from these sources can vary considerably depending on solar activity cycles and energetic particle events such as solar flares. In order to predict the effects of such events the nature of the radiation spectrum must be characterized, and the individual effects of each radiation type understood. The background radiation spectrum is known to good accuracy [1] and prediction of radiation levels due to specific solar events is currently under investigation [2]. This work begins the task of calculating the expected effects upon human tissue from these radiation sources with intervening air and aluminum. Proton and alpha radiation of 3000 MeV/nucleon and less is simulated using a software package called the High Energy Transport Code – Human Exploration and Development in Space (HETC-HEDS), and linear energy transfer to tissue surrogate is tabulated.

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Introduction

Extraterrestrial radiation is a serious concern for astronauts and those aboard high altitude aircraft. There are two primary sources of extraterrestrial radiation that are of interest to human safety, galactic cosmic rays and solar particle events.

Galactic cosmic rays (GCR) are a background radiation that exists throughout known space. The origin of this radiation is currently uncertain. This background radiation has very diverse composition. It primarily includes heavy ions from hydrogen to nickel, and particle energies from a few MeV/nucleon up to 30,000 MeV/nucleon [1]. It is believed that the intensity of this radiation is constant in interstellar space, however the intensity of cosmic rays measured at earth varies according to solar cycles. Cosmic ray intensity is strongest at solar minimum, when the solar wind and magnetic field generated by the sun are weakest. This distribution is often modeled as a power law with three fitting parameters per ion species and a time-dependent solar strength parameter. This model is known as the Badwar-O'Neill model [1]. An example of this distribution is shown in Figure 1 showing distribution of Carbon and Iron, two of the more common ions, at solar minimum and solar maximum.

Solar particle events (SPE) however, are intermittent events caused by specific solar activities such as coronal mass ejections and solar flares. They arise from solar material that is flung into space due to fluctuations in the sun's magnetic field. As they are composed of solar material,

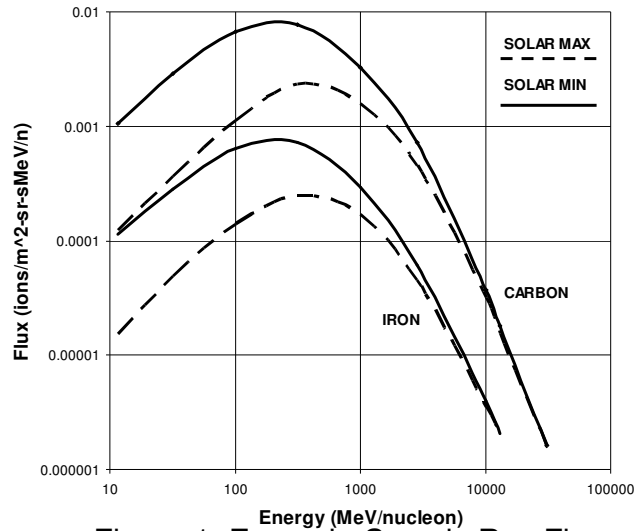


Figure 1: Example Cosmic Ray Flux Spectrum

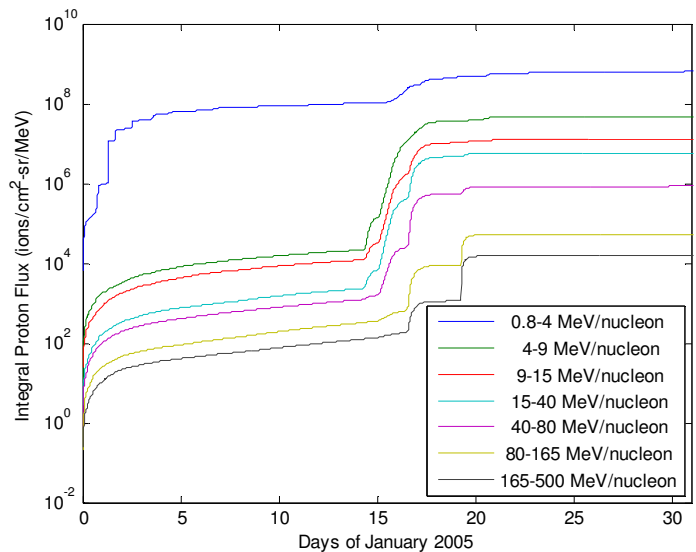


Figure 2: Integral Flux of the January 2005 Solar Particle Event

solar particle events typically contain high proportions of proton and alpha particle radiation. The kinetic energies of these particles is typically lower than for cosmic rays, but the flux can be much higher [3]. An example of a typical solar particle event is shown in Figure 2. The event shown occurred in January of 2005 and generated large, visible auroras as the particles interacted with the atmosphere and magnetic field. The chart shows the integral particle flux divided into groups by particle energy over the course of January. Integral flux is the total number of particles since the beginning of the measured period, which in this case is the beginning of January 1st, 2005. The flux shown before January 14th is due to background galactic cosmic ray protons.

Both of these radiation sources are shielded by Earth's magnetic field and by the atmosphere, and most of the energy does not impact the surface of Earth. High altitude aircraft however, do not benefit from the shielding properties of the atmosphere to the same degree since there is less intervening air. Prediction of radiation doses to passengers and crew of these aircraft is important, and since the radiation environment can change rapidly and dramatically, it is necessary to understand the entire range of radiation that occurs. Large solar particle events are known to cause substantial increases in the radiation level, and could increase the radiation received at high altitudes to unsafe levels. In order to predict the effects this radiation has to humans in high altitude aircraft the effects of every particle type contained within the event must be known. This analysis focuses on the particle types typical of solar particle events: proton and alpha particles.

Methods

The software used for this study, High Energy Transport Code – Human Exploration and Development in Space (HETC-HEDS), performs three dimensional Monte Carlo simulations [4]. HETC-HEDS has not yet been publicly released.

Monte Carlo methods simulate particle interactions using randomly chosen results for each interaction possibility. A particle is tracked from its origin through any interactions it experiences until its eventual exit from the system, destruction, or until it slows to a negligible velocity. Secondary particles created by interactions are also tracked in the same manner. HETC-HEDS tracks all secondary protons, neutrons, heavy ions, pions, and muons. Production of other particles such as photons is recorded for transport by other simulation packages. Secondary particle interactions are simulated in the same manner as primary particles, including additional particles generated by their interactions. By performing this simulation repeatedly, using different randomly generated results, a composite view of particle interactions is constructed.

Particle interactions are simulated using well documented physics models [4]. Interaction of charged particles with atomic electrons is modeled using the Bethe-Bloch stopping power formula. Multiple Coulomb scattering is modeled with Fermi's joint distribution function and with Rutherford's cross-section formula. Pion and Muon decay is simulated using known lifetimes for these particles. Pion production in hydrogen collisions is based on the model of Sternheimer and Lindenbaum. Elastic and inelastic nuclear collisions, both for hydrogen and heavy ions, are also modeled [4].

The most important of these physics models is the Bethe-Bloch stopping power formula. This formula calculates the average energy loss of a heavy charged particle passing through matter, the stopping power. The Bethe-Bloch formula is shown here as Equation 1.

$$\text{Equation 1: } -\frac{dE}{dx} = \frac{4\pi k_0^2 z^2 e^4 n}{mc^2 \beta^2} \left[\ln \frac{2mc^2 \beta^2}{I(1-\beta^2)} - \beta^2 \right]$$

dE/dx is the change in particle energy over a differential element of space, known as the stopping power. This equation depends on the properties of both the charged particle and of the material it is passing through. z is the atomic number (charge) of the heavy charged particle and β [beta] is the speed of the particle relative to c . n is the electron density, the number of electrons per unit volume within the material; I is the mean excitation energy of the material, the amount of energy it takes to excite an electron out of its bound state. There are several constants involved in this equation as well: k_0 is a constant equal to $8.99 \times 10^9 \text{ N m}^2/\text{C}^2$, e is the electron charge, $-1.6022 \times 10^{-19} \text{ C}$, m is equal to the electron rest mass, and c is the speed of light in a vacuum.

If the only interactions the charged particle experiences were with the atomic electrons, then this equation would be a reasonable model for the Linear Energy Transfer of the particle. However, other particle interaction types are necessary for an accurate calculation of the LET. Nuclear interactions can cause significant differences between the Bethe-Bloch formula and actual rates of energy loss.

All relevant data about each interaction of the particle and any secondary particles are stored in a data file for later analysis. A separate analysis program is then used to collect whatever data is needed for the calculation desired. For this research, this program iterates through each particle and interaction and computes the total energy lost by the particles inside of the materials.

Detailed information about the incident radiation and target are supplied by the user. Particle species, energy, initial position and direction are supplied within a FORTRAN script that is modified for each simulation condition. The geometry of the system and the material composition are specified within input files read by the main program.

A more detailed description of the inner workings and validation tests is available from published papers including [5-18].

Since the specific geometric conditions of any person aboard an aircraft can vary, it is necessary to generalize the geometry. For this study incoming radiation is transported through a layer of air, a layer of aluminum, and a layer of water as a tissue substitute. Water is used as a substitute because hydrogen and oxygen comprise 90% of the body [22]. The LET value of a particle in water is also used in calculations of the biological effectiveness of radiation. The layers were modeled as a set of stacked right circular cylinders, as shown in Figure 3 (figure not to scale). The cylinders have a radius that is almost 10 times the thickness of the stack in the primary direction of radiation transport. This ensures that scattered particles will remain within the simulation and not leak out the sides.

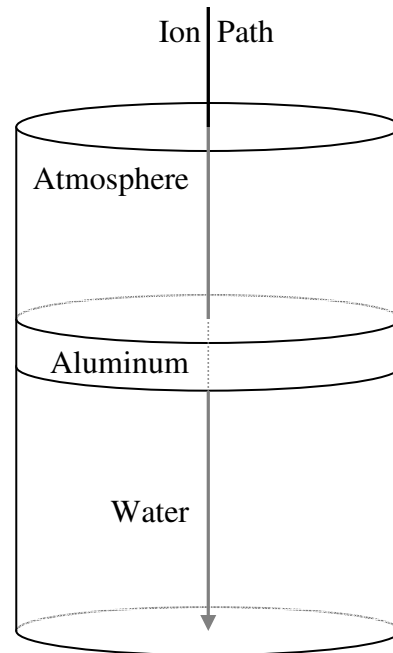


Figure 3: Diagram of Model Geometry (Not to Scale)

The radiation source before interaction with the atmosphere is assumed to be isotropic. That is, equal in energy and intensity from every direction. Radiation that comes straight down towards the aircraft will have less air to pass through than radiation that comes in at an angle. This effect is visualized in Figure 4. A particle at 45° to the vertical will pass through 40% more air than it would vertically. A particle at 80° will pass through 4 to 5 times as much air depending on altitude and atmosphere model. All of these diagonal particles from 0° to 90° can be modeled as particles passing vertically through a greater thickness of air. Particles

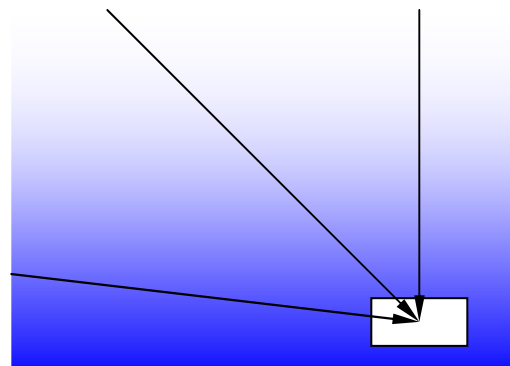


Figure 4: Visualization of Diagonal Radiation Within the Atmosphere

at much greater than 90° from the vertical will be blocked by the surface of the Earth.

Eight different thicknesses of air were simulated in this study, as shown in Table 1. Air was approximated as a mixture of 78% Nitrogen, 21% Oxygen, and 1% Argon. This accounts for all but 0.039% of the atmosphere [19] and can be considered to be an adequate approximation.

Table 1: Air Thicknesses Used and Equivalent Altitudes

g/cm ² Air	243	151	93	58	26	12	5	0
Equivalent Altitude (ft)	35000	45000	55000	65000	82000	98000	118000	High

Two thicknesses of aluminum shielding were used, 1 g/cm² and 0.5 g/cm². These are equivalent to 0.37 cm and 0.185 cm of solid aluminum. This is representative of standard commercial aircraft wall thickness [20]. The water layer used has a thickness of 170 cm. This was chosen because it is the height of the reference man [21], and thus is the maximum useful depth of water for organ dose calculations. Energy deposition within each water layer was recorded for each 1cm thickness separately.

For both proton and alpha radiation, a spectrum of particle energies was simulated. Simulations were performed at 18 different particle energies as defined below.

20-100 MeV/nucleon in 20 MeV/nucleon increments

100 to 1000 MeV/nucleon in 100 MeV/nucleon increments

1000 to 3000 MeV/nucleon in 500 MeV/nucleon increments

100,000 simulations were used for each particle energy and geometric configuration. Linear energy transfer (LET) to the water is found using Equation 2.

Equation 2:
$$LET = \sum_{i=1}^n \frac{(E_{Initial} - E_{Final})_i}{n \times L}$$

In this equation *i* enumerates the incoming particles, which may be primary or secondary particles. $E_{Initial}$ is the energy the incoming particle had before having a collision within the water volume, E_{Final} is the energy the particle(s) has(have) after the collision within the water volume. *L* is the length of the water volume of interest. *n* is the number of particle simulations.

The HETC-HEDS code does not propagate heavy charged particles with less than 1 MeV of energy, so secondary particles and primary particles slowed

to under that energy are taken to be stopped at that point, depositing all of their remaining energy. Theoretically the particle could have actually left the volume of interest and deposited the energy in another region. However, this should not influence the results significantly. The range of protons at 1 MeV/nucleon in water is only 0.01 cm, and the range of alpha particles is below 0.001 cm [22, p129]. Since the water is subdivided into 1cm segments, only a small fraction of the particles would have had a chance to leave each volume.

Delta electrons leaving the volume of interest are of more note, since HETC-HEDS does not propagate electrons. The maximum possible delta electron energy is found using Equation 3 [22, p112].

Equation 3:
$$Q_{\max} = \frac{2\gamma^2 mV^2}{1 + 2\gamma m / M + m^2 / M^2}$$

Where M is the mass of the incoming particle, m is the mass of the electron, and γ is the Lorentz factor on the incoming particle. This makes the maximum delta electron energy for our simulations to be 17 MeV. Since electrons at 17 MeV have a range in water of around 6 cm [22, p142] the assumption of localized energy deposition from the electrons is not valid. However, since all of the water volumes with exception of the first few are bounded by additional water of thickness in excess of the delta electron range, a state of electronic equilibrium is approximated within the water.

Secondary photons are also not propagated through the material, so energy loss that creates photons will be incorrectly assumed to be deposited locally. However, the amount of energy loss by photon production is very small. The heavy primary particles lose a very small portion to photons, and all but the fastest delta electrons produce a very small amount of photons as well. The maximum energy delta electron yields 6% of its energy loss in photons [22, p127]. Since only a small portion of the energy lost to deltas will be close to this maximum and the photon yield drops off to near zero very rapidly, the amount of energy lost by this mechanism should be negligible.

A second set of simulations was performed to estimate the production of proton and alpha radiation within the atmosphere due to heavy ion interactions. This simulation is useful because it can be compared with data collected by high altitude balloons for validation purposes. For this simulation, a larger portion of the GCR spectrum was simulated. Ions from hydrogen to iron, with energies from 20 MeV/nucleon to 30000 MeV/nucleon were simulated. These ions were transported through only 4.58 g/cm² of air. This thickness of air was used because it matches the thickness of air above the balloon-based experiment which the data will be compared to. After this air layer the number and energy of proton and alpha particles were tabulated. The incidence on the atmosphere by each particle was estimated using the Badwar-O'Neill model [1] described earlier, and using the solar modulation parameter that had been measured at the time of

the BESS balloon flight. A geomagnetic rigidity cutoff was used that resulted in all protons of lower than 3000 MeV/nucleon being blocked by the Earth's magnetic field.

Rigidity is a concept that describes how easily deflected a particle is by a magnetic field. Rigidity is defined as the momentum of a particle divided by its charge. Particles with a higher rigidity will be deflected less by a magnetic field than particles of lower rigidity. In the context of the earth's magnetic field, a high rigidity allows a particle to penetrate the field and reach the atmosphere. Particles with insufficient rigidity will be deflected back into space and do not reach the atmosphere. The rigidity required to penetrate varies depending on the magnetic field strength and on the angle of the particle to the field. In order to simplify the calculation, an assumption that all the particles are incident at 90° to the surface of the earth was used. This is known as a straight-down approximation. This causes all particles under a specific rigidity cutoff value to be deflected. This cutoff would vary based on location within the earth's magnetic field, and upon the field strength at that time. Measured data on the magnetic field strength and the location of the BESS balloon were used to estimate the cutoff value.

By multiplying the expected flux of each incident particle by the production rate of protons and summing for all incident particles an expected spectrum of protons is generated. The production rate of protons due to ion species j at energy k is given by Equation 4. l is the simulation number and i is the total number of simulations at each species-energy pair, which for this research was 100,000.

$$\text{Equation 4: } \quad \textit{productionRate}_{jk} = \frac{\sum_{l=1}^i H_{kl}}{i}$$

Equation 5 provides the total proton flux after the air layer within the energy band k .

$$\text{Equation 5: } \quad \textit{HydrogenFlux}_k = \sum_j \left(\sum_k (F_{jk} * \textit{productionRate}_{jk}) \right)$$

F_{jk} is the incoming flux of particle species j within energy band k . This equation is repeated for each k . The k energy bands are equal to the 20 energy bands used in the BESS experiment. The expected fluxes for alpha particles are calculated in the same manner. Results from this calculation are presented in the next section along with measured data.

Results

All results of the first simulation are plotted in Appendix A and tabulated in Appendix B. In Appendix A, the linear energy transfer in MeV/cm is plotted on a vertical logarithmic axis with depth through the water on the horizontal axis. Each colored line represents a different thickness of air as indicated by the legend. Each graph presents the data for one combination of aluminum thickness, particle species, and particle energy. Figure 5 shows an example in which 400 MeV protons were transported through 1.0 g/cm^2 of aluminum.

Several features visible in Figure 5 are worth noting. First is the pronounced Bragg peaks visible between 30 and 90 cm of water depth. The measured range of protons of 400 MeV in water is 80.9 cm [4, p127], and the location of the peak in this simulation is the slab of water between 81 and 82 cm. The thin layer of aluminum appears to have little effect on this, as the peak is found to be the same for the 0.5 and 1.0 g/cm^2 simulations. The linear energy transfer at the peak is on the order of 10 times the level it is prior to the peak. These peaks are caused as the primary particle energy drops to near zero which causes the stopping power to increase dramatically. Most of the primary particles have lost all of their energy at this point. In this example the three simulations with the most air do not show this peak because the primary particles have lost all of their energy before entering the water, either in the air or the aluminum layers. Linear energy transfer after the peak is much lower than before, since only secondary particles and a few range straggling primary particles remain.

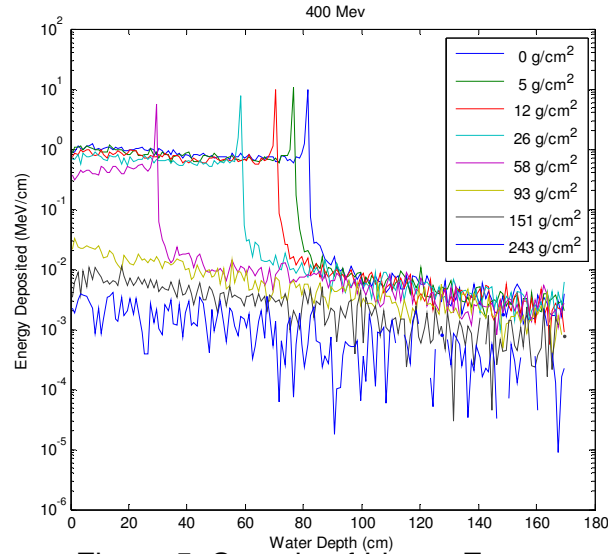


Figure 5: Sample of Linear Energy Transfer Results: Results for 400 MeV Protons Through 1g/cm^2 Al and All Atmospheric Depths

As particle energy increases the range of the primary particle increases as well, and this can be seen in the plots of higher energy ions. As the range of the particle increases, it is seen that the intensity of the peak diminishes. This is caused by an increase in the number of collisions and in the fraction of primary particles that have undergone collisions that cause high deflection from the straight path. This effect is easily seen in Figure 6. Figure 6 shows simulations of varying proton energy while keeping air and aluminum thickness constant at 12g/cm^2 and 1g/cm^2 respectively.

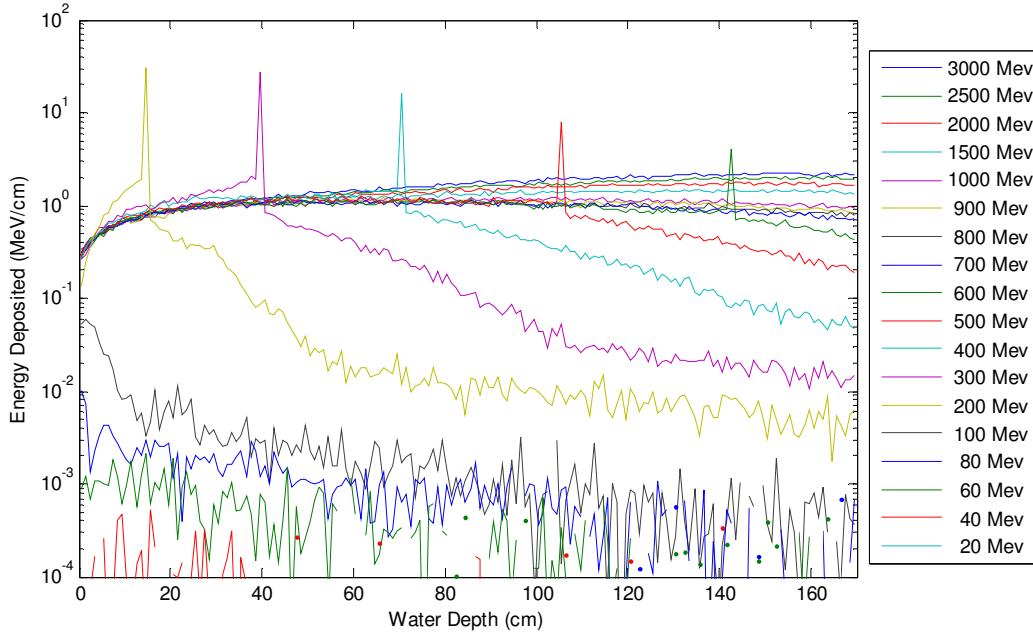


Figure 6: Sample of Linear Energy Transfer results showing decrease in peak height. Protons through 1g/cm² Al and 12g/cm² Air.

There is very little difference between the 1.0 g/cm² and 0.5 g/cm² aluminum shielding values. One example is shown in Figure 7 for Hydrogen at 300 MeV/nucleon with no air shielding. On average, over all runs and water depths the increase in aluminum causes a reduction in LET of 0.8%. This does not represent how the additional shielding would serve in all situations, because the radiation spectrum of that particular situation would need to be used. For example, the estimated dose at 1 cm of depth in water due to the January 2005 event mentioned earlier is reduced 10% by the thicker Aluminum layer at 35000ft, but actually increases the estimated dose in space by 12%.

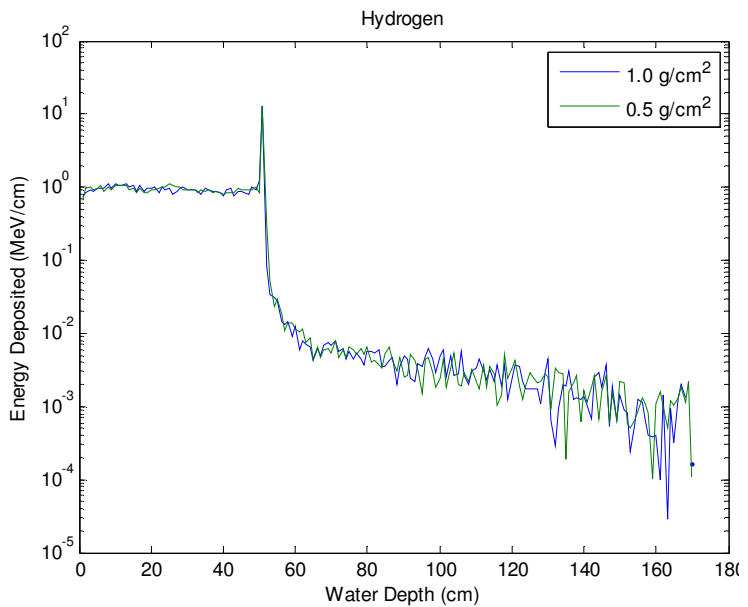


Figure 7: Sample of Linear Energy Transfer Results Showing Similarity Between 1g/cm² and .5 g/cm² Aluminum

Tabulated results in Appendix B have been averaged over centered 2cm increments for water depths from 2 to 10 cm and over centered 10 cm increments from 20 to 160 cm. The LET value tabulated for 0 cm of water is the LET recorded between 0 and 1 cm depth; the LET value tabulated for 170cm of water is the average over 165 to 170 cm water depth. The value tabulated at 13 cm is averaged over a centered 4 cm section of water from 11 to 15 cm water depth. This averaging was done both to make the table more practical for use in dose estimations and to reduce the random error fluctuations visible in the graphs in Appendix A. An example graph of the tabulated data is shown in Figure 8. This is the same simulation as is shown above in Figure 4.

In order to make these data more easily useable, curve fits of the LET were made. LET at depths of 1 cm and 10 cm in water are of particular use in estimating biological effects of radiation, so LET at these two depths are fit as a function of initial

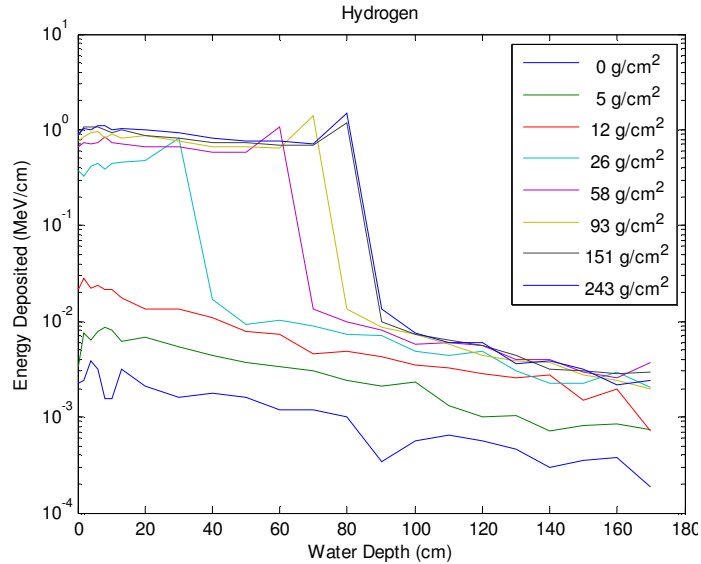


Figure 8: Sample of Linear Energy Transfer Results with Grouped Average Linear Energy Transfer Values

particle energy and separately as a function of atmospheric depth. The curve-fit parameters for fits of constant air depth are shown in Table 2. The curve-fit parameters for fits of constant particle energy are shown in Tables 3 and 4. For the constant-air-depth-fits a third degree polynomial was used. The equation is shown here as Equation 6. In Equation 6, p1 through p4 are the fitting parameters and E is the particle energy in MeV/nucleon.

$$\text{Equation 6: } LET(x) = p1 * E^3 + p2 * E^2 + p3 * E + p4$$

Two curve-fit equations were used for the constant-energy curves, a third degree polynomial shown here as Equation 7, and an exponential curve, Equation 8. Each energy curve used the equation that better fit the data over the range of the data. In equation 8, a and b are fitting parameters; in both 7 and 8 T is the thickness of shielding air in g/cm².

$$\text{Equation 7: } LET(x) = p1 * T^3 + p2 * T^2 + p3 * T + p4$$

$$\text{Equation 8: } LET(x) = a * \exp(b * T)$$

Table 2: Polynomial curve-fit constants for linear energy transfer as function of particle energy

Air Depth (g/cm ²)	p1	p2	p3	p4
LET of Protons at 1 cm water depth				
243	-6.1331E-12	2.9093E-08	8.6443E-06	-3.0524E-04
151	5.1146E-12	-1.8357E-08	1.1015E-04	-2.7349E-03
93	2.0206E-11	-1.2143E-07	3.7823E-04	-9.0987E-03
58	-4.4286E-11	-7.2255E-09	6.3122E-04	-1.4244E-02
2	1.0779E-10	-7.1236E-07	1.6892E-03	-3.2157E-02
12	1.3323E-10	-9.5757E-07	2.2007E-03	-4.3126E-02
5	1.7700E-10	-1.1852E-06	2.5832E-03	-4.3033E-02
0	-1.1236E-10	3.9219E-07	1.3545E-04	7.8209E-01
LET of Protons at 10 cm water depth				
243	-1.0437E-11	5.8463E-08	5.9503E-06	-3.1319E-04
151	-1.1059E-11	3.8037E-08	1.3830E-04	-3.5990E-03
93	1.4137E-11	-1.1277E-07	4.8185E-04	-1.1652E-02
58	-3.8963E-11	-4.0408E-08	7.5370E-04	-1.6959E-02
2	1.3138E-10	-7.7959E-07	1.8189E-03	-3.8109E-02
12	1.5375E-10	-1.0298E-06	2.3806E-03	-4.5842E-02
5	2.0503E-10	-1.2751E-06	2.7213E-03	-5.3307E-02
0	2.4282E-10	-1.4206E-06	2.8328E-03	-2.3284E-02
LET of Alphas at 1 cm water depth				
243	-4.2204E-11	2.0586E-07	7.9406E-05	-2.4017E-03
151	-3.4972E-11	1.0824E-07	3.0897E-04	-7.7109E-03
93	1.8276E-11	-1.6178E-07	5.8972E-04	-1.3486E-02
58	5.7850E-11	-3.4732E-07	7.2243E-04	-1.5393E-02
2	1.0770E-10	-5.6087E-07	8.6484E-04	-1.5411E-02
12	1.0906E-10	-5.6747E-07	8.5450E-04	-1.6344E-02
5	1.1517E-10	-5.9754E-07	8.7032E-04	-1.2422E-02
0	2.8636E-11	-1.6331E-07	2.6631E-04	1.9716E-01
LET of Alphas at 10 cm water depth				
243	-1.0543E-10	4.6818E-07	1.5830E-04	-1.8581E-02
151	-1.1395E-11	-7.6579E-08	9.8528E-04	-6.8609E-02
93	9.2985E-11	-6.2494E-07	1.5751E-03	-8.7472E-02
58	1.8223E-10	-1.0005E-06	1.7899E-03	-8.0791E-02
2	2.4599E-10	-1.2757E-06	1.9324E-03	-5.4519E-02
12	2.9836E-10	-1.4893E-06	2.0633E-03	-1.4355E-02
5	2.6776E-10	-1.3681E-06	1.9423E-03	-2.1562E-02
0	2.1756E-10	-1.1050E-06	1.5391E-03	1.4430E-01

Table 3: Exponential curve-fit constants for linear energy transfer as function of atmospheric depth

Particle Energy MeV/Nucleon		
	a	b
LET of Protons at 1 cm water depth		
20	0	0
40	1.361964	-1.11048
60	0.865416	-0.85936
80	1.020653	-0.47842
100	0.949922	-0.10721
200	0.942775	-0.02723
300	0.887679	-0.02688
400	1.00577	-0.02087
500	0.999093	-0.01818
600	1.113613	-0.01734
700	1.190734	-0.01815
800	1.197507	-0.0146
900	1.341846	-0.01596
1000	1.3699	-0.01508
1500	1.745411	-0.01397
2000	1.779009	-0.01286
2500	1.98463	-0.01246
3000	1.714259	-0.01091
LET of Protons at 10 cm water depth		
20	0	0
40	0.000494	-0.01405
60	0.003165	-0.01889
80	0.014611	-0.06854
100	0.039633	-0.15654
200	1.080452	-0.04765
300	1.130354	-0.02939
400	1.077123	-0.01985
500	1.191311	-0.01892
600	1.225156	-0.01723
700	1.311901	-0.0172
800	1.294569	-0.0131
900	1.424132	-0.01329
1000	1.627561	-0.0137
1500	1.934374	-0.01207
2000	1.923553	-0.01055
2500	2.191252	-0.0097
3000	2.116668	-0.00866
LET of Alphas at 1 cm water depth		
20	0	0

Table 3 Continued: Exponential curve-fit constants for linear energy transfer as function of atmospheric depth

40	0	0.707253
60	0.411449	-0.63157
80	0.295824	-0.12251
100	0.3185	-0.07085
LET of Alphas at 10 cm water depth		
20	0	0
40	0.000312	-0.20255
60	0.001291	-0.01339
80	0.035647	-0.47335
100	0.303804	-0.32796
200	1.198487	-0.02901
300	0.936807	-0.01519

Table 4: Polynomial curve-fit constants for linear energy transfer as function of atmospheric depth

Particle Energy MeV/Nucleon	p1	p2	p3	p4
LET of Alphas at 1 cm water depth				
200	7.94E-08	-2.09E-05	-0.00051	0.231398
300	1.01E-07	-3.07E-05	0.000425	0.270066
400	9.45E-08	-3.26E-05	0.001202	0.298852
500	3.37E-08	-1.49E-05	0.000558	0.306245
600	1.27E-08	-1.03E-05	0.000893	0.307178
700	2.35E-08	-1.47E-05	0.001611	0.296297
800	1.01E-08	-1.12E-05	0.001683	0.301106
900	1.50E-08	-1.32E-05	0.001974	0.313285
1000	-3.02E-09	-7.79E-06	0.001845	0.316264
1500	-3.80E-08	1.30E-06	0.002501	0.313329
2000	-6.01E-08	4.63E-06	0.003856	0.27871
2500	-6.11E-08	2.92E-06	0.005072	0.267587
3000	-6.56E-08	6.34E-06	0.005126	0.283861
LET of Alphas at 10 cm water depth				
400	2.97E-07	-0.0001	0.004546	0.741041
500	1.76E-07	-7.51E-05	0.005368	0.680168
600	-6.83E-09	-1.50E-05	0.001973	0.674041
700	-1.94E-08	-8.93E-06	0.001822	0.659649
800	-3.58E-08	-1.88E-06	0.001505	0.671159
900	-2.15E-08	-1.30E-05	0.0039	0.61847
1000	-2.48E-08	-1.17E-05	0.003967	0.639237
1500	-1.13E-07	1.31E-05	0.00479	0.627843
2000	-1.15E-07	1.19E-05	0.006751	0.596851
2500	-1.00E-07	5.02E-06	0.008945	0.57284
3000	-1.73E-07	2.78E-05	0.008638	0.599787

There is a degree of random error caused by the nature of Monte Carlo simulation that can be seen as variation in the lines on the plots of energy deposition in the water, particularly at lower LET values. In order to form an estimate of the level of random error, a selected set of runs was repeated using different seed values. Seed values were randomly generated using [23] and constrained to being 5 digits in length and odd. This source for random numbers uses atmospheric radio noise in combination with an algorithm to generate random values.

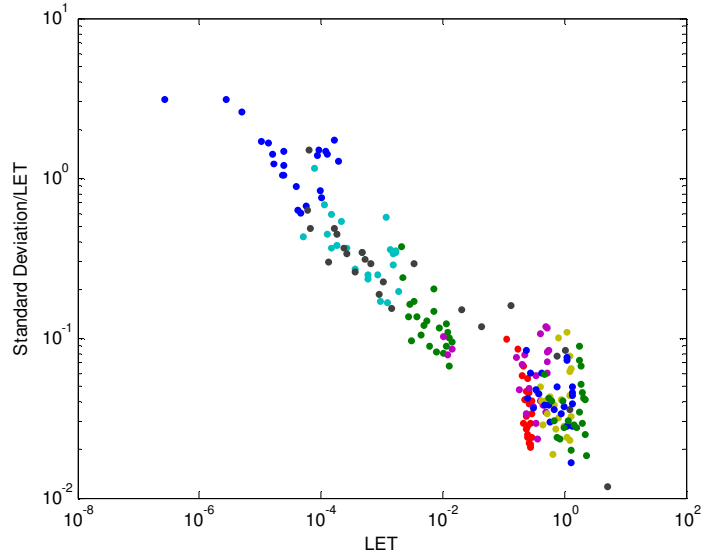


Figure 9: Plot of Linear Energy Transfer (LET) (MeV/cm) vs. Standard Deviation/LET as a measure of Relative Statistical Error

All combinations of 243, 58, and 0 g/cm² air; 100 MeV/nucleon, 700 MeV/nucleon, and 3000 MeV/nucleon; 1 g/cm² Aluminum; were run with ten different random seeds. Since the LET graphs appears to indicate that there is more error at lower LET values, Figure 9 compares the standard deviations of this test set with the average LET of the set on a log-log scale. This graph supports the idea that there is more error at lower LET values. Estimating from this graph, a 95% confidence interval for our main data set should range from 20% at an LET of 1 MeV/cm to 200% at an LET of 0.0001. The greater relative error at lower LET values is caused by their being fewer particle interactions that deposited energy in those locations. Since the effective sample size is smaller in these cases the estimate of statistical error is larger.

The results of the second set of simulations, those estimating proton and alpha particle production inside the atmosphere are presented in Figures 10 and 11 along with the data collected by the BESS experiment. For both protons and alphas an overestimation of flux can be seen above the rigidity cutoff, an underestimation just below the rigidity cutoff, and overestimation again far below the cutoff. The accuracy of the simulated proton spectrum is fairly close to experimental results, but the simulated alpha spectrum is quite inaccurate. A substantial portion of this inaccuracy can be attributed to the straight down approximation used as the rigidity cutoff. Some portion of the diagonal particles under the cutoff would have penetrated the field, and are seen in the BESS data just below the peak. This approximation also leads to neglect of the increased atmosphere seen by diagonal particles. Some portion of the incoming particles

would have experienced more atmosphere during their transit due to being at an angle relative to the vertical dimension. This would result in fewer particles reaching the detector at energies just above the cutoff value, as is seen in the BESS data.

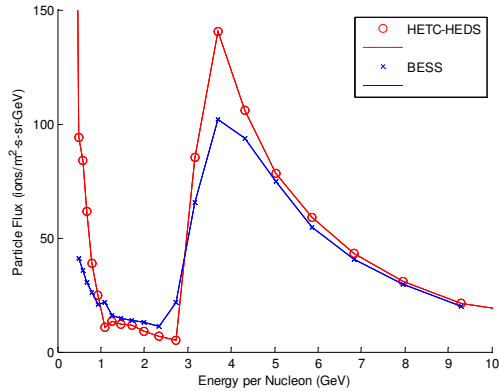


Figure 10: Proton Flux in upper Atmosphere; Measured and Calculated

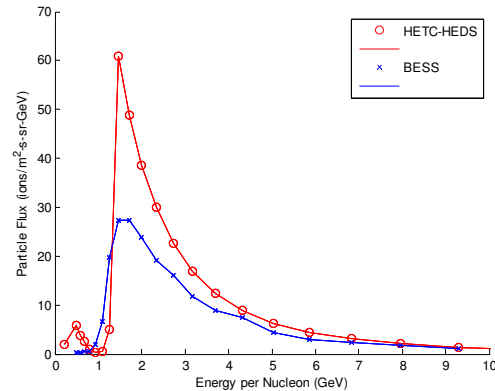


Figure 11: Alpha Particle Flux in upper Atmosphere; Measured and Calculated

Summary and Future Work

A generalized geometric model of radiation incident on passengers in high altitude craft was developed. Calculations for LET of proton and alpha radiation were described. Simulation software HETC-HEDS was briefly described. Calculated LET values were presented and an error analysis performed.

Possible further work to enhance the usefulness of these calculations includes expanding the particle type to other components of the cosmic ray spectrum up to iron, higher particle energies up to 30,000 MeV/nucleon, and thicker air layers up to or exceeding 1035 g/cm².

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APPENDIX

Appendix A

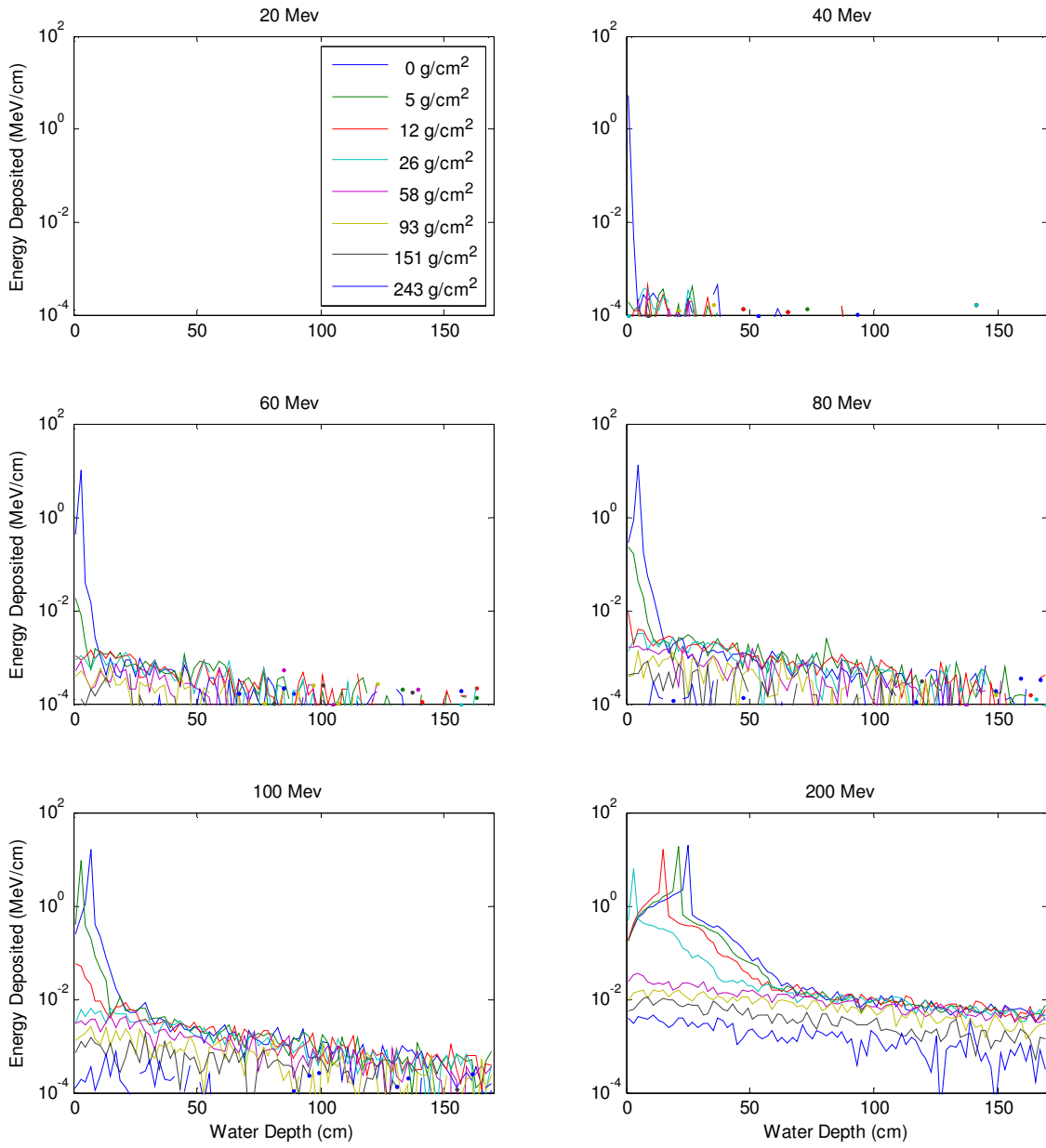


Figure 12. LET Results
Alpha particle energy deposition after 1.0 g/cm² Aluminum (1 of 3)
with lines for each thickness of air.

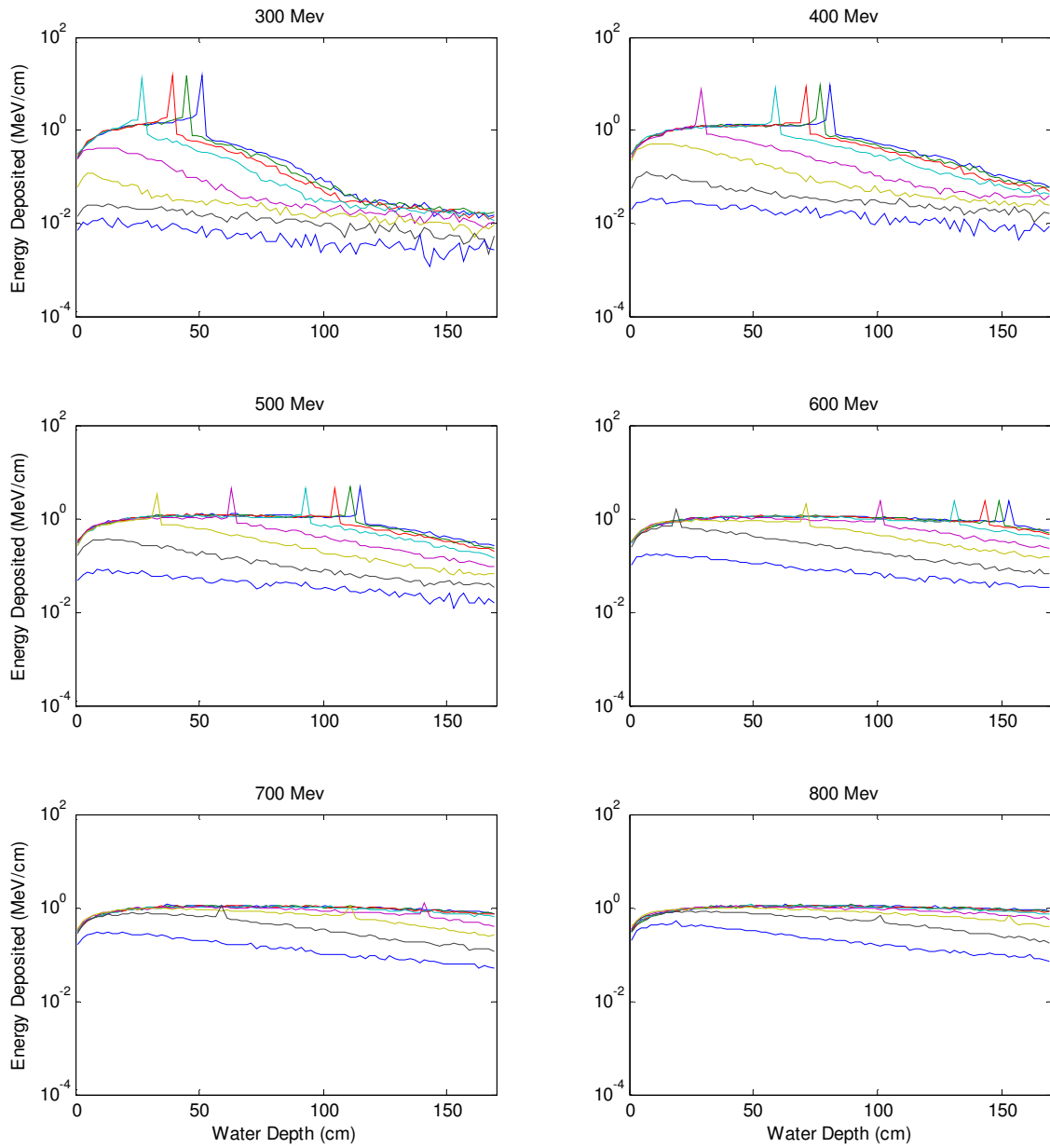


Figure 12. LET Results cont.

Alpha particle energy deposition after 1.0 g/cm^2 Aluminum (2 of 3)
with lines for each thickness of air.

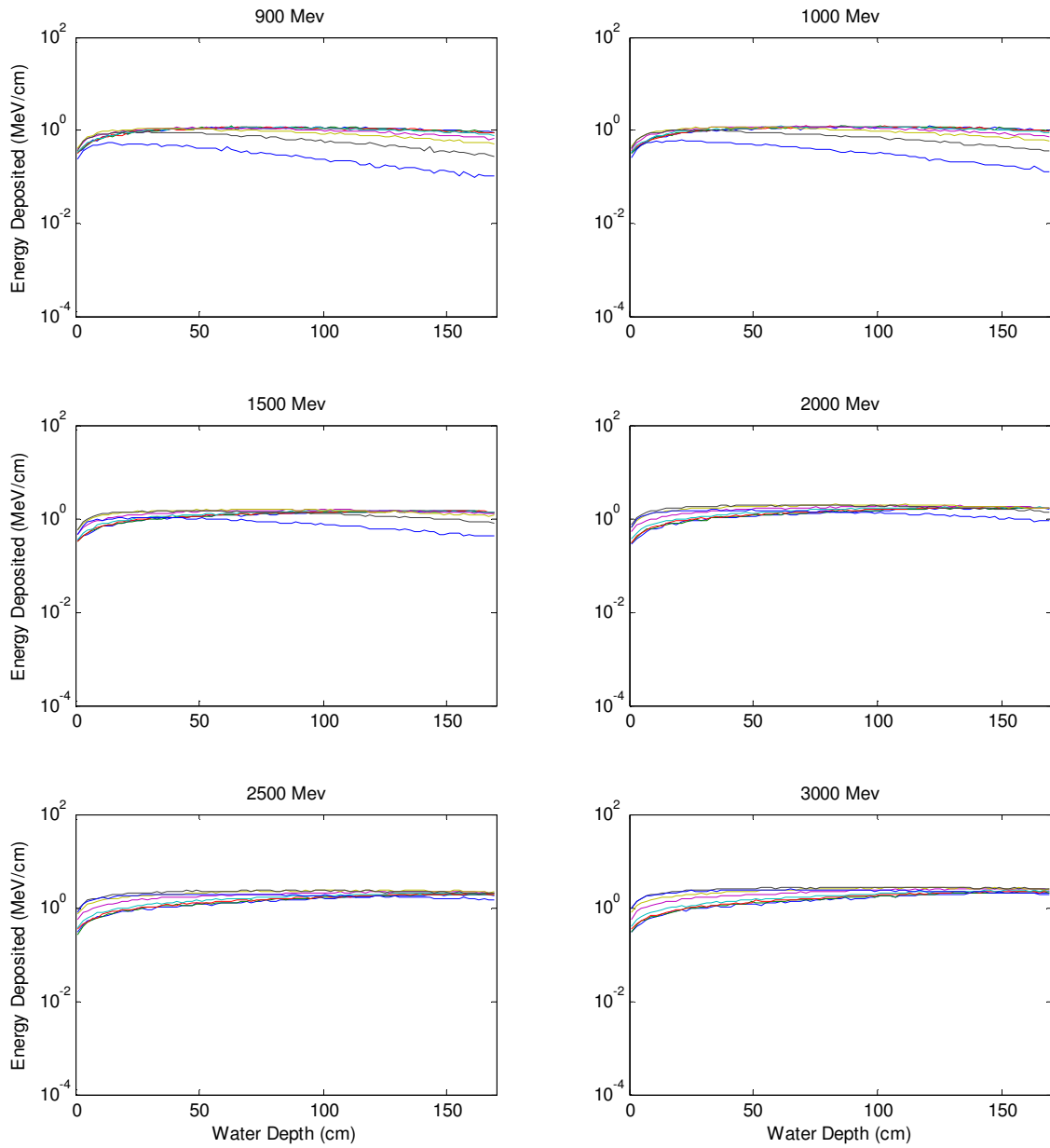


Figure 12. LET Results cont.

Alpha particle energy deposition after 1.0 g/cm^2 Aluminum (3 of 3)
with lines for each thickness of air.

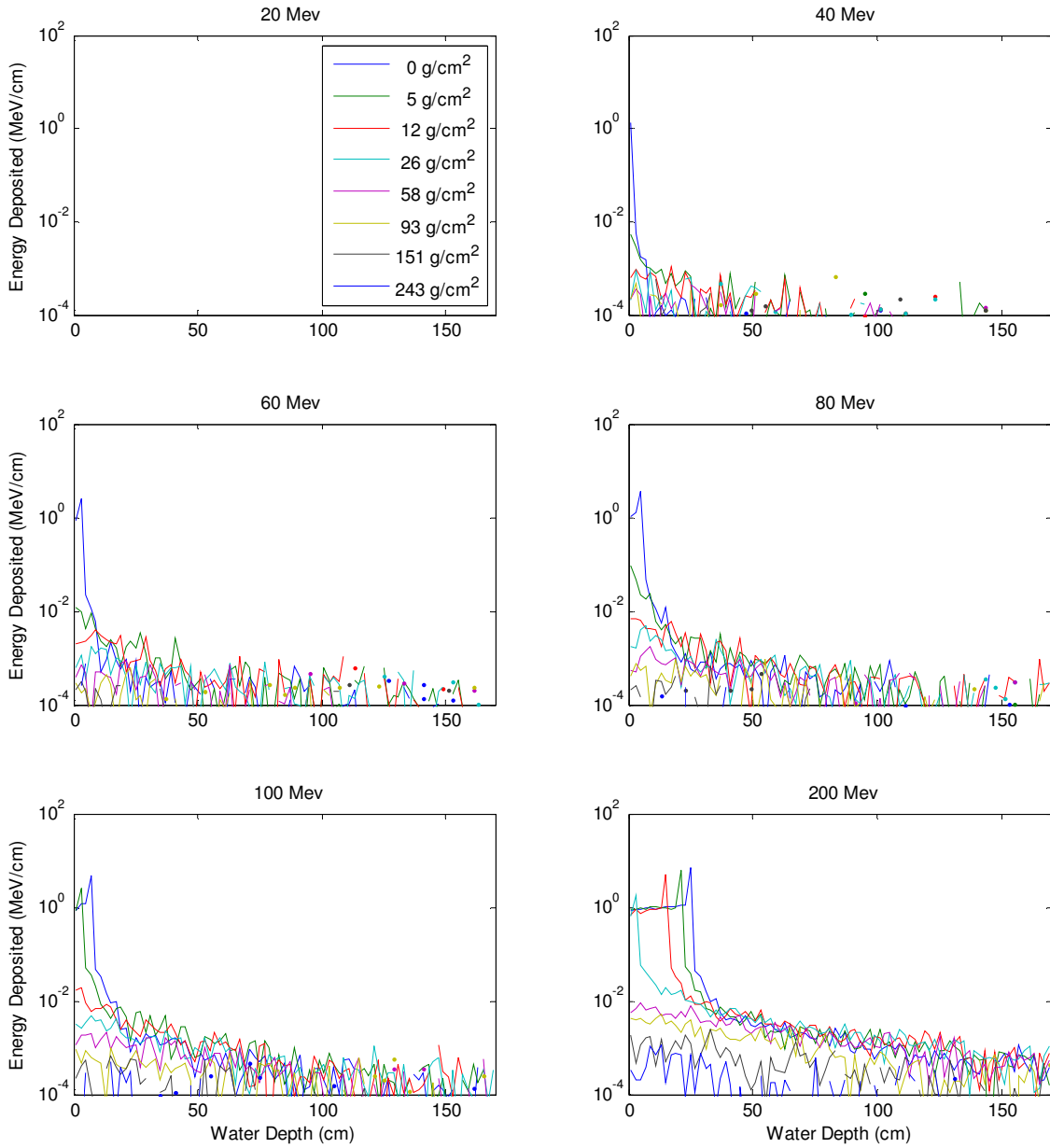


Figure 12. LET Results cont.

Proton energy deposition after 1.0 g/cm² Aluminum (1 of 3)
with lines for each thickness of air.

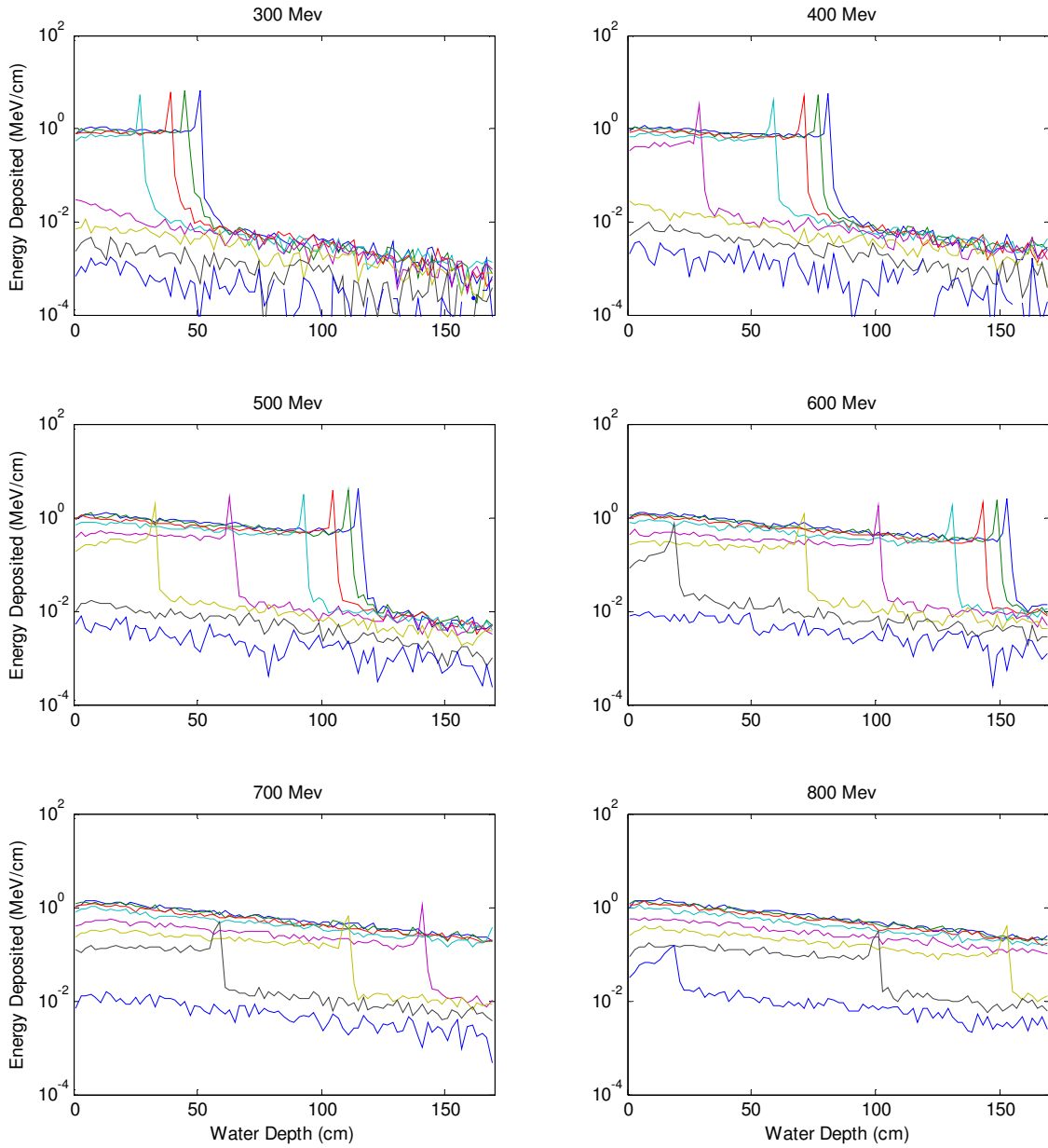


Figure 12. LET Results cont.

Proton energy deposition after 1.0 g/cm^2 Aluminum (2 of 3)
with lines for each thickness of air.

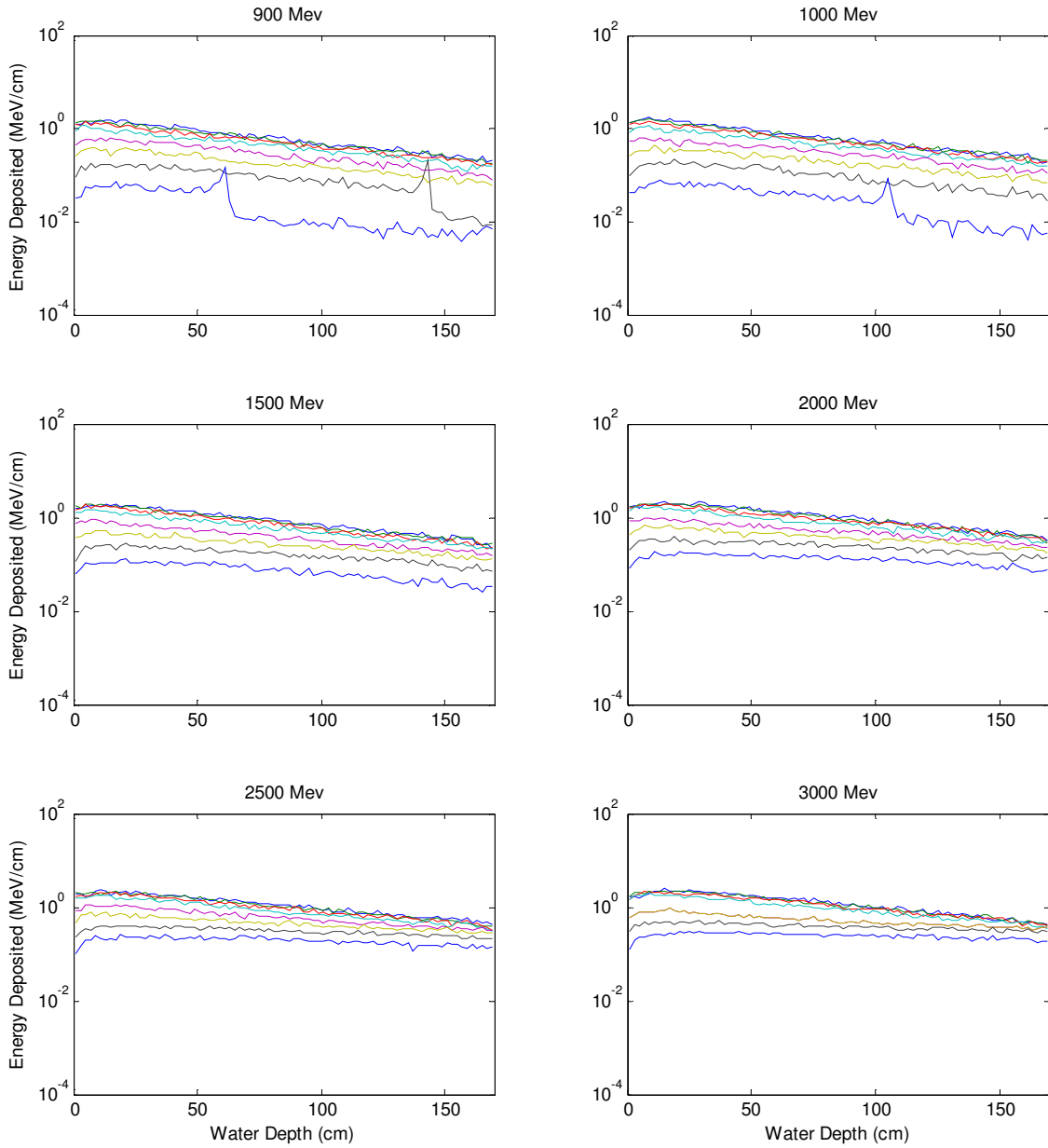


Figure 12. LET Results cont.

Proton energy deposition after 1.0 g/cm^2 Aluminum (3 of 3)
with lines for each thickness of air.

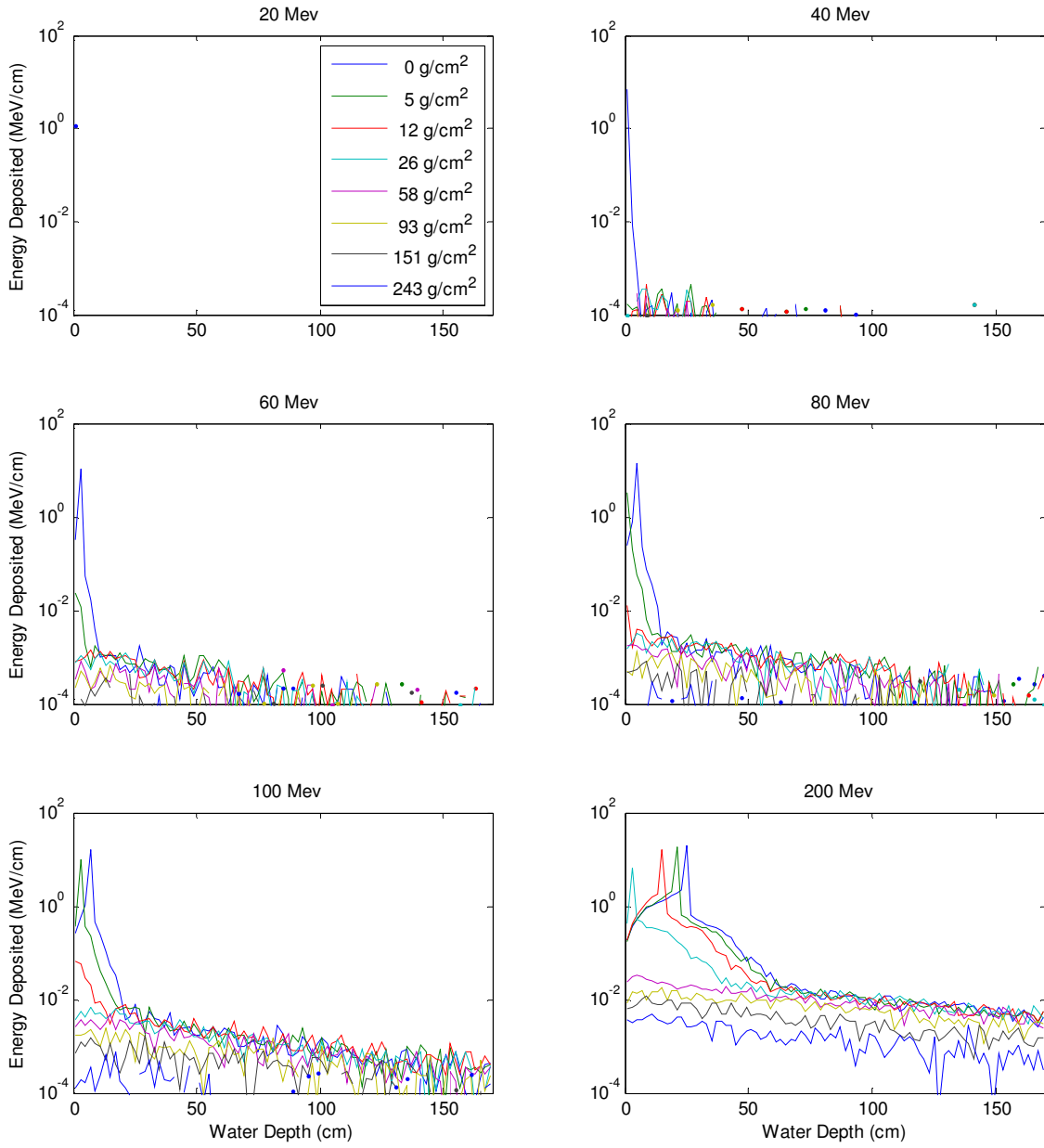


Figure 12. LET Results cont.

Alpha particle energy deposition after 0.5 g/cm² Aluminum (1 of 3)
with lines for each thickness of air.

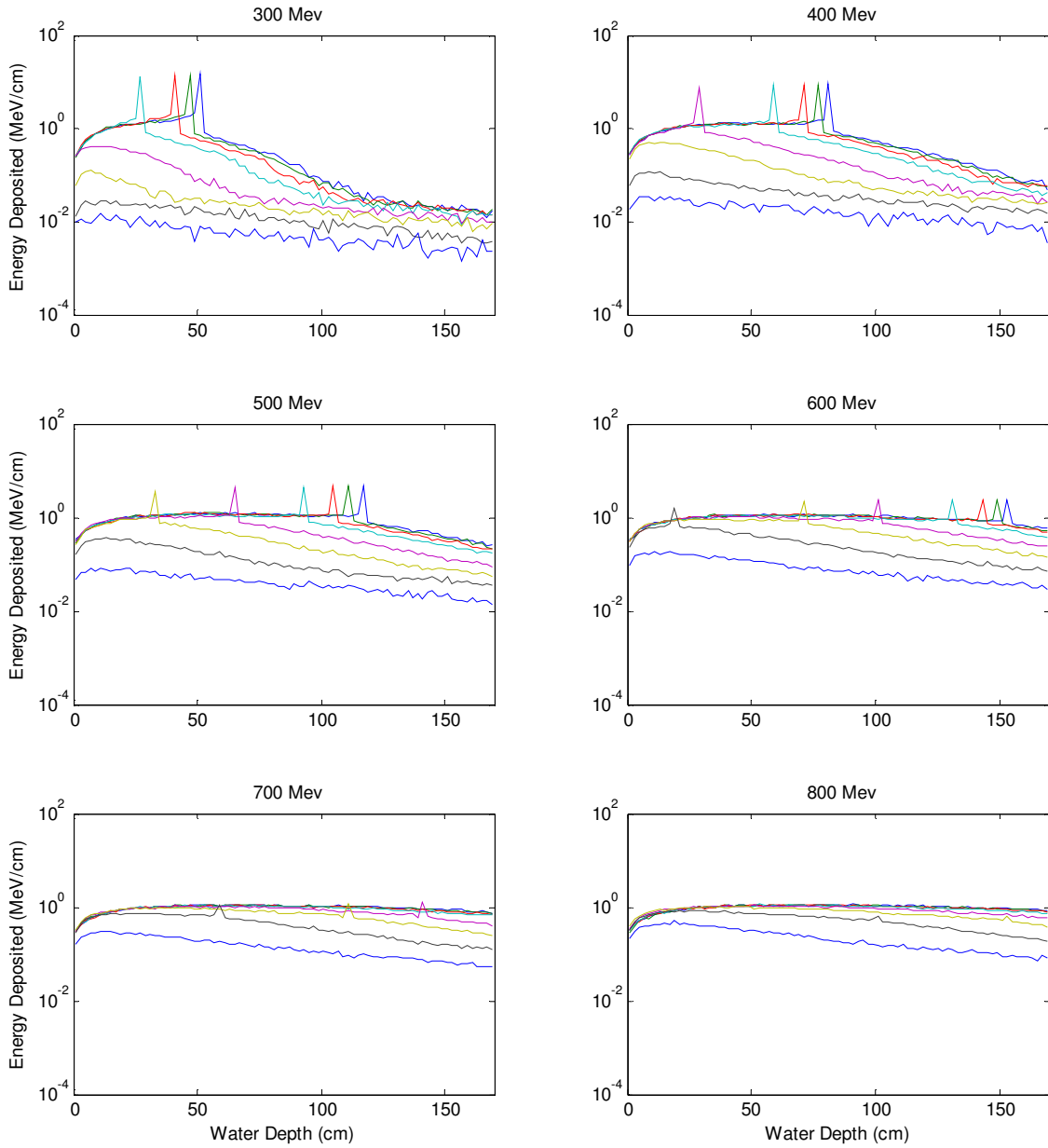


Figure 12. LET Results cont.

Alpha particle energy deposition after 0.5 g/cm^2 Aluminum (2 of 3)
with lines for each thickness of air.

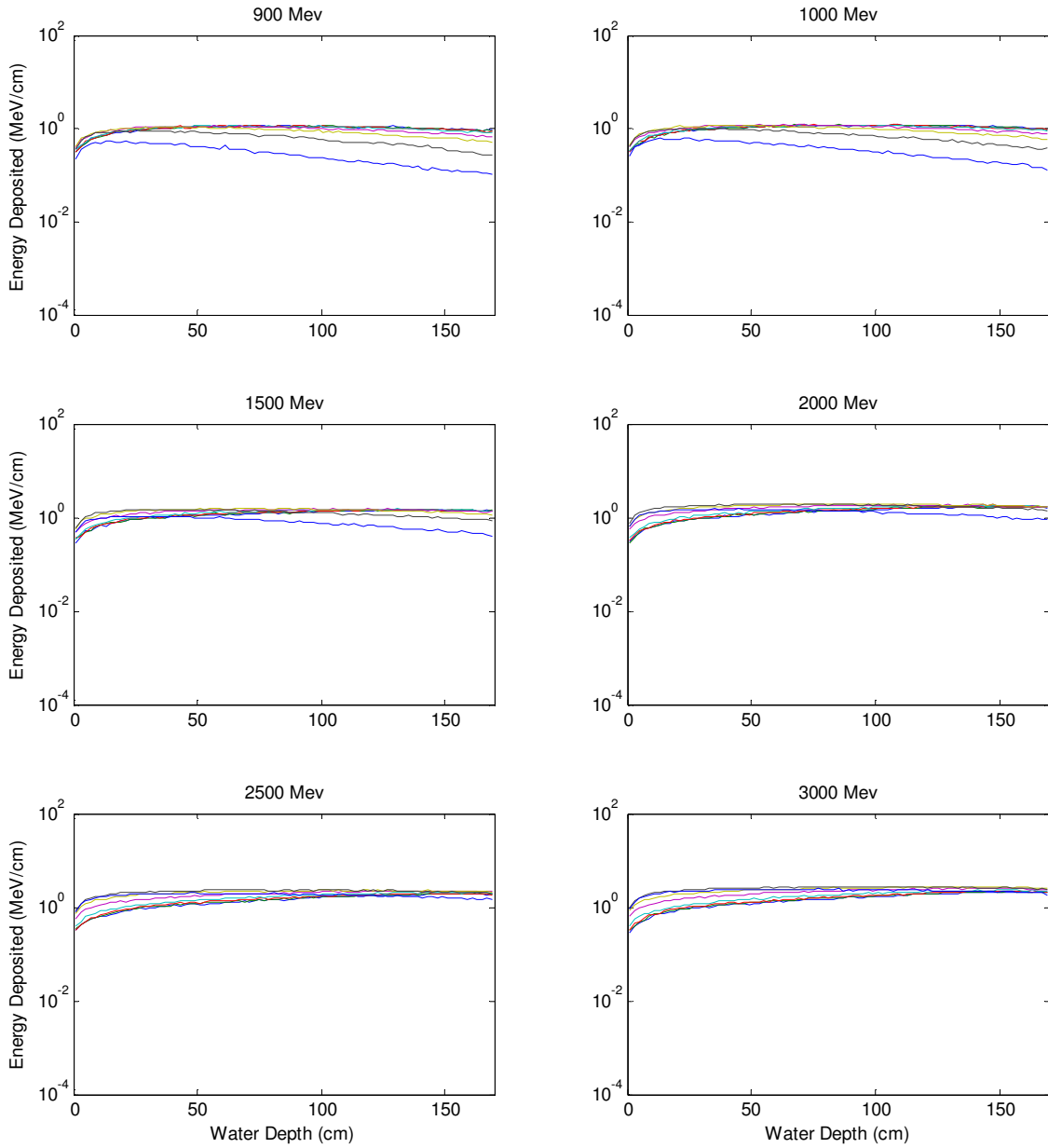


Figure 12. LET Results cont.

Alpha particle energy deposition after 0.5 g/cm^2 Aluminum (3 of 3)
with lines for each thickness of air.

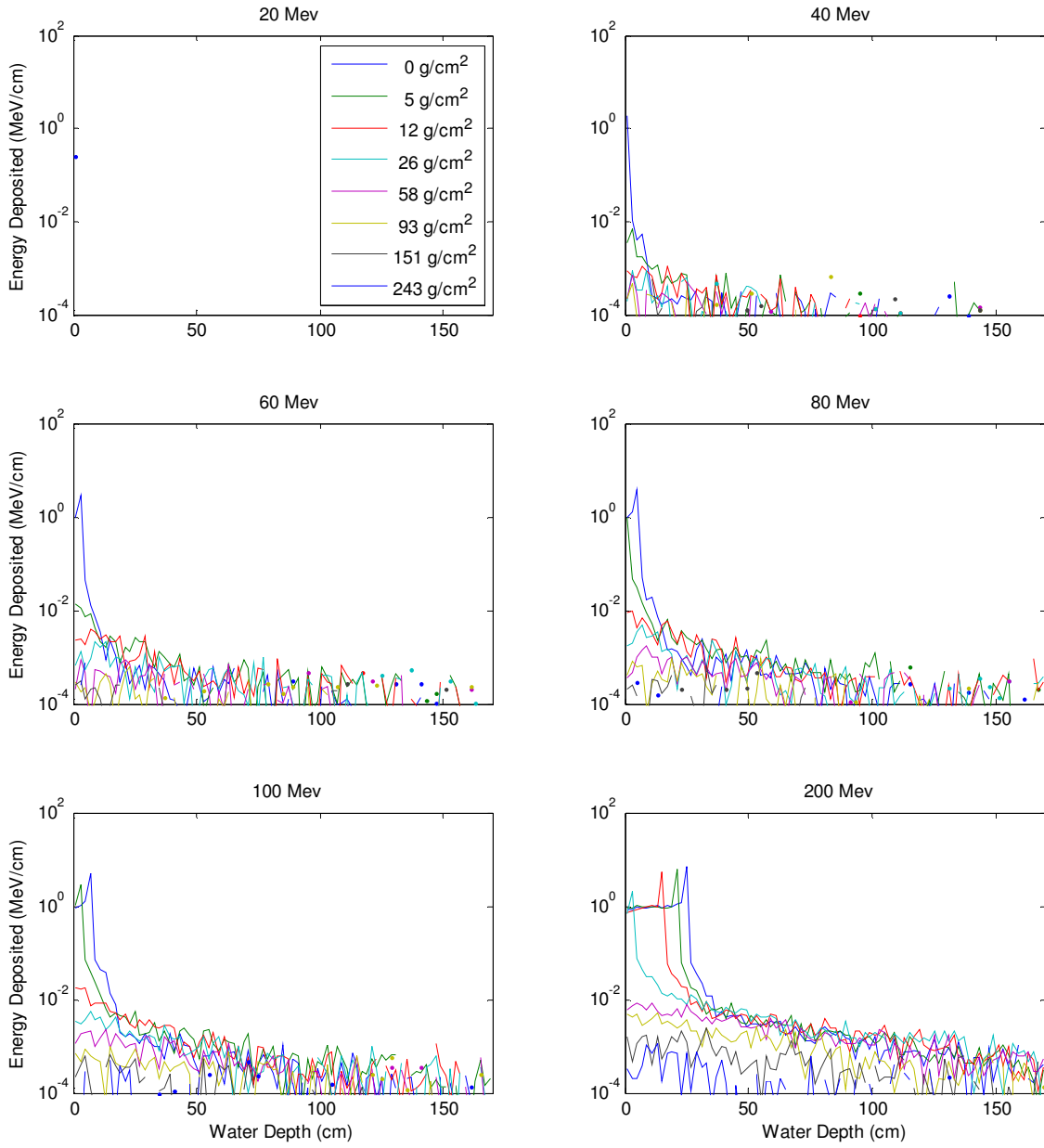


Figure 12. LET Results cont.

Proton energy deposition after 0.5 g/cm² Aluminum (1 of 3)
with lines for each thickness of air.

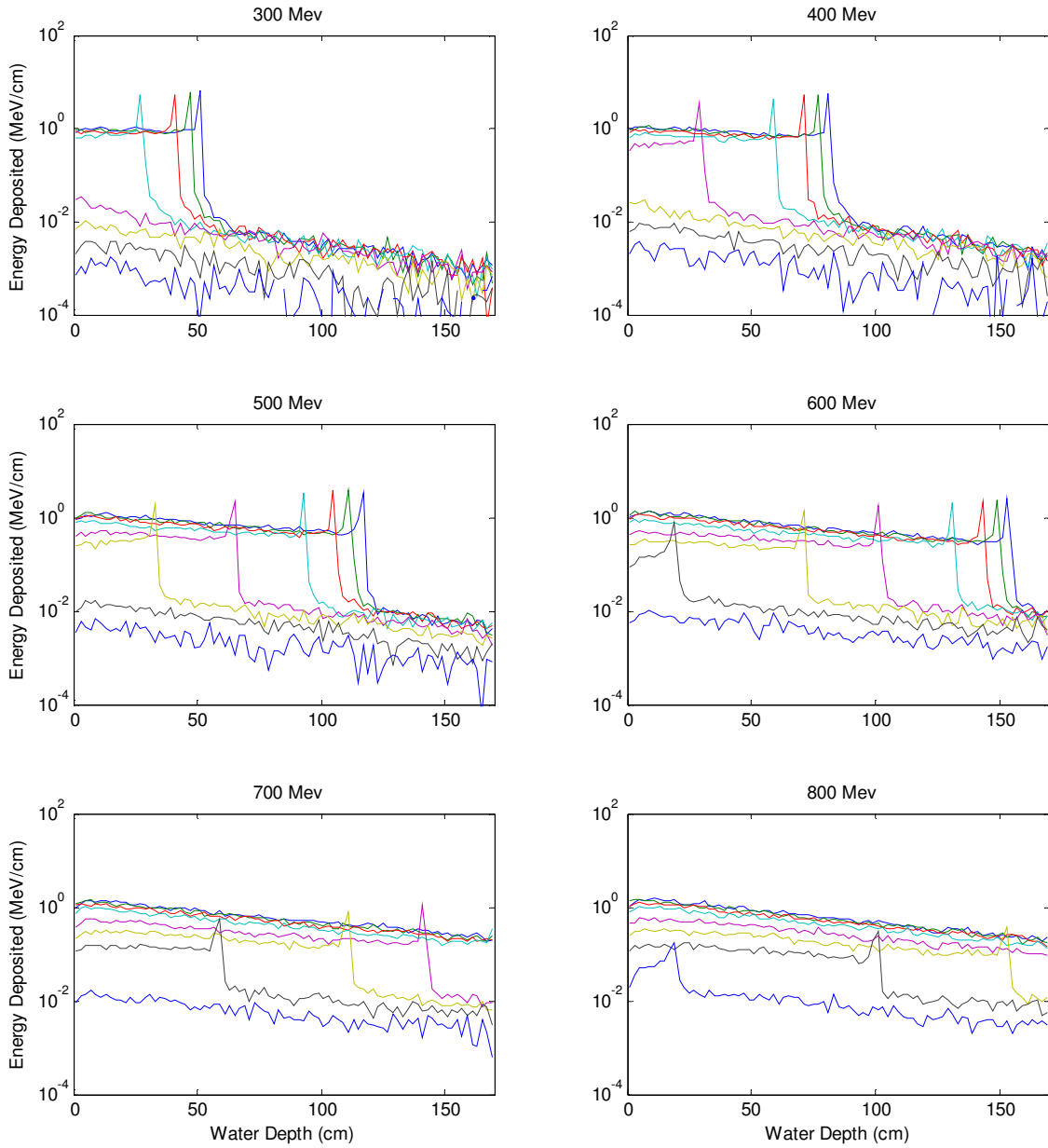


Figure 12. LET Results cont.

Proton energy deposition after 0.5 g/cm^2 Aluminum (2 of 3)
with lines for each thickness of air.

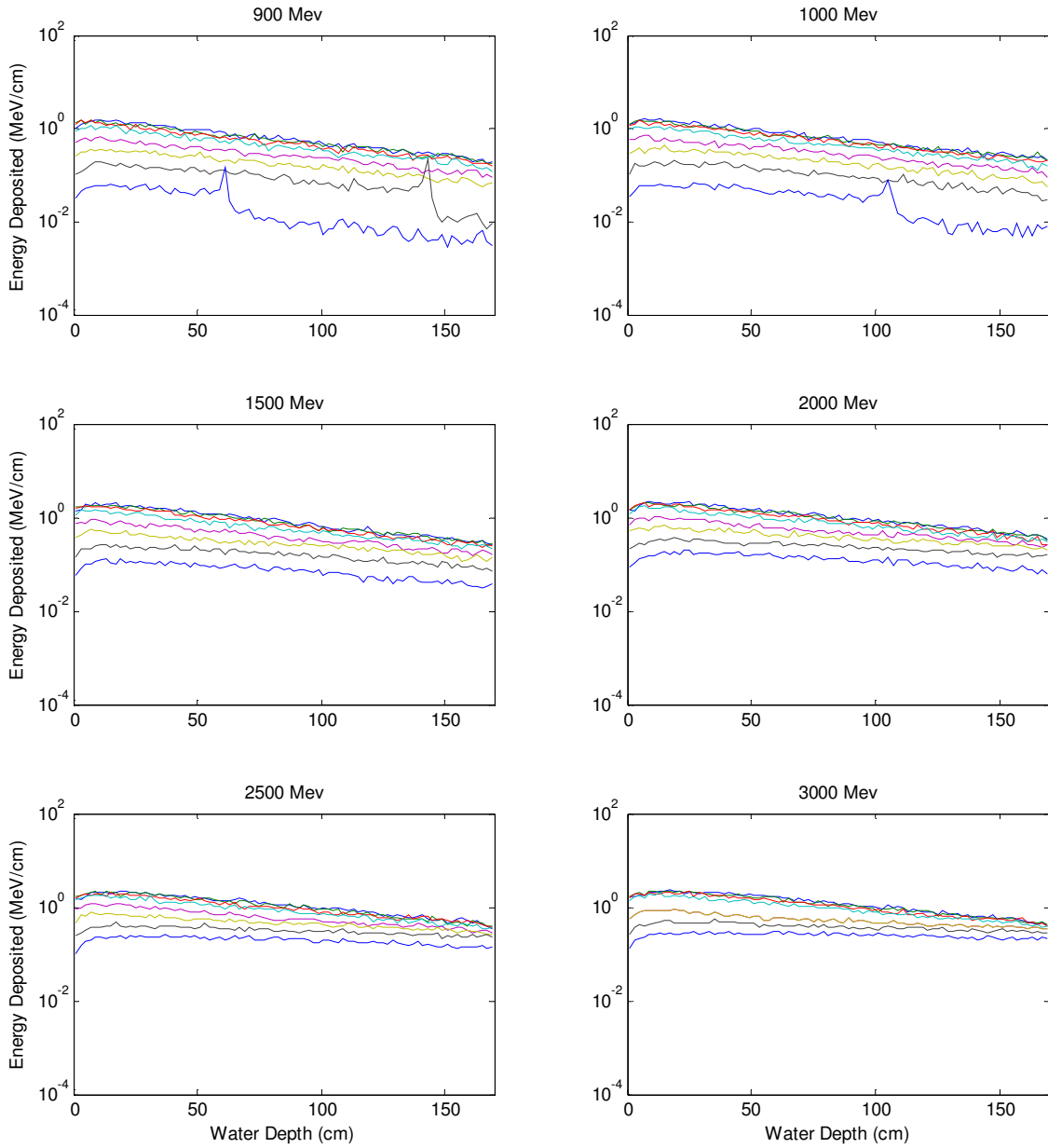


Figure 12. LET Results cont.

Proton energy deposition after 0.5 g/cm^2 Aluminum (2 of 3)
with lines for each thickness of air.

Appendix B

Table 5: Calculated LET Values

Particle Z	Al g/cm ²	Air g/cm ²	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)												
				0	2	4	6	8	10	13	20	30	40	50	60			
1	1	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	60	0.00E+0	0.00E+0	8.08E-4	1.86E-4	0.00E+0	7.41E-5	1.06E-5	1.42E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	80	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.85E-5	6.03E-5	0.00E+0	5.17E-5	1.61E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	100	0.00E+0	4.99E-5	1.94E-4	9.73E-5	0.00E+0	1.08E-4	1.03E-4	2.49E-4	1.45E-5	4.15E-5	7.90E-5	5.32E-5	5.32E-5	5.32E-5	5.32E-5
1	1	243	200	2.15E-4	3.97E-4	1.97E-4	2.57E-4	7.81E-4	6.53E-4	8.55E-4	5.12E-4	4.50E-4	2.09E-4	8.01E-5	1.27E-4	1.27E-4	1.27E-4	1.27E-4
1	1	243	300	3.77E-4	1.19E-3	7.26E-4	1.76E-3	1.07E-3	1.15E-3	1.38E-3	1.25E-3	5.25E-4	5.77E-4	3.48E-4	4.55E-4	4.55E-4	4.55E-4	4.55E-4
1	1	243	400	2.27E-3	2.43E-3	3.82E-3	3.20E-3	1.56E-3	1.54E-3	3.11E-3	2.11E-3	1.63E-3	1.75E-3	1.63E-3	1.19E-3	1.19E-3	1.19E-3	1.19E-3
1	1	243	500	4.43E-3	6.30E-3	6.14E-3	4.10E-3	4.62E-3	4.64E-3	4.57E-3	5.12E-3	3.75E-3	2.67E-3	2.83E-3	3.13E-3	3.13E-3	3.13E-3	3.13E-3
1	1	243	600	6.04E-3	9.01E-3	8.54E-3	7.24E-3	8.22E-3	1.04E-2	7.37E-3	7.30E-3	7.33E-3	6.51E-3	5.59E-3	4.38E-3	4.38E-3	4.38E-3	4.38E-3
1	1	243	700	5.53E-3	1.10E-2	1.27E-2	1.50E-2	1.05E-2	1.10E-2	1.27E-2	9.80E-3	1.15E-2	1.01E-2	6.66E-3	6.18E-3	6.18E-3	6.18E-3	6.18E-3
1	1	243	800	2.22E-2	4.00E-2	4.96E-2	6.50E-2	6.47E-2	5.76E-2	7.61E-2	7.80E-2	1.51E-2	1.32E-2	1.15E-2	9.80E-3	9.80E-3	9.80E-3	9.80E-3
1	1	243	900	3.34E-2	3.10E-2	4.53E-2	4.95E-2	5.73E-2	5.87E-2	5.64E-2	6.32E-2	5.18E-2	4.77E-2	4.79E-2	6.95E-2	6.95E-2	6.95E-2	6.95E-2
1	1	243	1000	3.27E-2	4.65E-2	4.53E-2	5.80E-2	5.26E-2	6.69E-2	7.75E-2	6.36E-2	6.17E-2	5.90E-2	4.53E-2	4.14E-2	4.14E-2	4.14E-2	4.14E-2
1	1	243	1500	5.06E-2	7.83E-2	9.50E-2	9.73E-2	9.90E-2	1.08E-1	1.08E-1	1.14E-1	1.11E-1	1.04E-1	1.01E-1	1.01E-1	1.01E-1	1.01E-1	1.01E-1
1	1	243	2000	5.54E-2	1.08E-1	1.32E-1	1.32E-1	1.39E-1	1.53E-1	1.71E-1	1.64E-1	1.67E-1	1.55E-1	1.57E-1	1.45E-1	1.45E-1	1.45E-1	1.45E-1
1	1	243	2500	8.83E-2	1.32E-1	1.64E-1	2.00E-1	2.22E-1	2.13E-1	2.05E-1	2.27E-1	2.27E-1	2.24E-1	2.18E-1	2.15E-1	2.15E-1	2.15E-1	2.15E-1
1	1	243	3000	1.08E-1	1.68E-1	2.20E-1	2.28E-1	2.54E-1	2.65E-1	2.49E-1	2.77E-1	2.87E-1	2.86E-1	2.81E-1	2.74E-1	2.74E-1	2.74E-1	2.74E-1
1	1	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	151	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.36E-4	2.86E-4	1.40E-5	1.25E-4	0.00E+0	4.48E-5	1.18E-5	1.18E-5	1.18E-5	1.18E-5
1	1	151	60	1.46E-4	4.36E-4	0.00E+0	1.95E-4	2.54E-4	1.23E-4	2.30E-5	1.33E-4	6.80E-5	2.65E-5	8.39E-6	1.41E-5	1.41E-5	1.41E-5	1.41E-5
1	1	151	80	3.52E-4	7.69E-5	3.24E-4	2.89E-4	2.14E-5	3.13E-4	1.81E-4	1.97E-4	2.10E-4	9.22E-5	1.37E-4	3.05E-5	3.05E-5	3.05E-5	3.05E-5
1	1	151	100	1.76E-4	4.04E-4	5.77E-4	2.07E-4	0.00E+0	7.17E-5	3.12E-4	3.95E-4	2.05E-4	7.82E-5	1.32E-4	2.58E-4	2.58E-4	2.58E-4	2.58E-4
1	1	151	200	1.53E-3	1.36E-3	8.73E-4	1.14E-3	1.51E-3	1.36E-3	9.61E-4	1.18E-3	1.21E-3	7.92E-4	2.76E-4	4.24E-4	4.24E-4	4.24E-4	4.24E-4
1	1	151	300	1.86E-3	3.41E-3	3.67E-3	3.46E-3	3.94E-3	3.40E-3	2.77E-3	2.73E-3	2.43E-3	1.90E-3	1.48E-3	1.49E-3	1.49E-3	1.49E-3	1.49E-3
1	1	151	400	3.40E-3	7.53E-3	6.50E-3	7.94E-3	8.77E-3	8.06E-3	6.08E-3	6.79E-3	5.41E-3	4.42E-3	3.68E-3	3.33E-3	3.33E-3	3.33E-3	3.33E-3
1	1	151	500	7.75E-3	1.19E-2	1.58E-2	1.74E-2	1.46E-2	1.43E-2	1.51E-2	1.17E-2	8.68E-3	9.08E-3	7.64E-3	7.65E-3	7.65E-3	7.65E-3	7.65E-3
1	1	151	600	7.11E-2	8.14E-2	1.35E-1	1.15E-1	1.41E-1	1.51E-1	1.66E-1	2.46E-1	2.04E-2	1.30E-2	1.25E-2	1.34E-2	1.34E-2	1.34E-2	1.34E-2
1	1	151	700	7.78E-2	1.29E-1	1.23E-1	1.56E-1	1.29E-1	1.14E-1	1.49E-1	1.36E-1	1.41E-1	1.25E-1	1.28E-1	1.76E-1	1.76E-1	1.76E-1	1.76E-1
1	1	151	800	7.11E-2	1.20E-1	1.27E-1	1.38E-1	1.67E-1	1.56E-1	1.39E-1	1.52E-1	1.37E-1	1.27E-1	1.20E-1	1.06E-1	1.06E-1	1.06E-1	1.06E-1
1	1	151	900	8.16E-2	1.30E-1	1.47E-1	1.46E-1	1.69E-1	1.62E-1	1.61E-1	1.61E-1	1.53E-1	1.44E-1	1.31E-1	1.16E-1	1.16E-1	1.16E-1	1.16E-1
1	1	151	1000	9.07E-2	1.07E-1	1.38E-1	1.59E-1	1.87E-1	1.79E-1	1.82E-1	1.85E-1	1.66E-1	1.52E-1	1.53E-1	1.33E-1	1.33E-1	1.33E-1	1.33E-1
1	1	151	1500	9.62E-2	1.48E-1	2.44E-1	2.10E-1	2.10E-1	2.42E-1	2.64E-1	2.44E-1	2.32E-1	2.22E-1	2.02E-1	1.92E-1	1.92E-1	1.92E-1	1.92E-1
1	1	151	2000	1.72E-1	2.36E-1	2.54E-1	3.57E-1	2.93E-1	3.34E-1	3.26E-1	3.32E-1	2.97E-1	2.96E-1	2.97E-1	2.87E-1	2.87E-1	2.87E-1	2.87E-1
1	1	151	2500	2.07E-1	2.65E-1	3.33E-1	3.44E-1	3.46E-1	3.90E-1	3.89E-1	3.92E-1	3.76E-1	3.81E-1	3.59E-1	3.54E-1	3.54E-1	3.54E-1	3.54E-1

Table 5: Calculated LET Values

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)											
				70	80	90	100	110	120	130	140	150	160	170			
				1	1	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	60	0.00E+0	0.00E+0	3.09E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.78E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	243	80	5.63E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.09E-5
1	1	243	100	9.54E-5	4.57E-5	7.55E-5	3.20E-5	0.00E+0	0.00E+0	0.00E+0	1.60E-5	0.00E+0	0.00E+0	0.00E+0	2.71E-5	0.00E+0	0.00E+0
1	1	243	200	1.16E-4	1.22E-4	1.00E-4	3.82E-5	2.04E-4	8.21E-5	5.03E-5	1.14E-5	0.00E+0	0.00E+0	4.94E-6	0.00E+0	0.00E+0	0.00E+0
1	1	243	300	5.47E-4	3.16E-4	3.46E-4	1.72E-4	2.94E-4	1.56E-4	1.05E-4	6.43E-5	9.51E-5	1.51E-4	4.33E-4	3.76E-4	1.87E-4	1.87E-4
1	1	243	400	1.20E-3	1.01E-3	3.42E-4	5.69E-4	6.53E-4	5.71E-4	4.59E-4	3.02E-4	3.52E-4	3.76E-4	1.87E-4	1.87E-4	1.87E-4	1.87E-4
1	1	243	500	1.70E-3	1.19E-3	2.26E-3	2.22E-3	1.55E-3	9.63E-4	9.90E-4	1.31E-3	5.46E-4	7.27E-4	4.83E-4	4.83E-4	4.83E-4	4.83E-4
1	1	243	600	4.37E-3	3.84E-3	2.73E-3	3.27E-3	2.33E-3	2.18E-3	3.21E-3	2.28E-3	1.20E-3	1.65E-3	1.33E-3	1.33E-3	1.33E-3	1.33E-3
1	1	243	700	6.43E-3	5.89E-3	4.17E-3	3.84E-3	2.99E-3	3.46E-3	3.01E-3	2.65E-3	2.20E-3	2.51E-3	1.27E-3	1.27E-3	1.27E-3	1.27E-3
1	1	243	800	8.46E-3	9.29E-3	7.09E-3	7.34E-3	6.36E-3	5.62E-3	4.54E-3	3.33E-3	3.10E-3	3.31E-3	3.65E-3	3.65E-3	3.65E-3	3.65E-3
1	1	243	900	1.16E-2	1.07E-2	9.40E-3	8.92E-3	9.18E-3	6.68E-3	6.65E-3	6.08E-3	5.44E-3	5.34E-3	7.59E-3	7.59E-3	7.59E-3	7.59E-3
1	1	243	1000	3.84E-2	3.40E-2	3.17E-2	3.29E-2	2.31E-2	1.13E-2	9.14E-3	8.03E-3	6.08E-3	6.71E-3	5.93E-3	5.93E-3	5.93E-3	5.93E-3
1	1	243	1500	8.49E-2	7.76E-2	6.78E-2	6.60E-2	5.92E-2	5.52E-2	4.29E-2	4.30E-2	3.84E-2	3.33E-2	3.12E-2	3.12E-2	3.12E-2	3.12E-2
1	1	243	2000	1.43E-1	1.43E-1	1.28E-1	1.28E-1	1.25E-1	1.08E-1	1.04E-1	9.58E-2	8.42E-2	8.11E-2	7.23E-2	7.23E-2	7.23E-2	7.23E-2
1	1	243	2500	2.30E-1	2.11E-1	2.00E-1	1.91E-1	1.77E-1	1.75E-1	1.71E-1	1.43E-1	1.59E-1	1.47E-1	1.41E-1	1.41E-1	1.41E-1	1.41E-1
1	1	243	3000	2.66E-1	2.48E-1	2.51E-1	2.45E-1	2.32E-1	2.45E-1	2.18E-1	2.15E-1	2.12E-1	2.11E-1	1.81E-1	1.81E-1	1.81E-1	1.81E-1
1	1	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	151	40	1.62E-6	1.13E-5	0.00E+0	0.00E+0	4.28E-5	0.00E+0	9.08E-6	2.60E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	151	60	2.37E-6	3.64E-6	0.00E+0	0.00E+0	1.33E-4	1.51E-6	0.00E+0	1.27E-5	4.10E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	151	80	7.79E-5	0.00E+0	1.74E-5	0.00E+0	0.00E+0	5.09E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	151	100	1.41E-4	0.00E+0	9.84E-6	8.68E-5	1.17E-5	3.49E-5	1.58E-5	3.36E-5	0.00E+0	3.11E-6	4.06E-6	4.06E-6	4.06E-6	4.06E-6
1	1	151	200	6.65E-4	4.81E-4	2.26E-4	2.53E-4	3.28E-4	9.97E-5	2.09E-4	2.85E-4	1.38E-4	5.15E-5	2.11E-4	2.11E-4	2.11E-4	2.11E-4
1	1	151	300	1.14E-3	4.72E-4	1.14E-3	1.08E-3	4.01E-4	3.81E-4	4.52E-4	3.94E-4	5.21E-4	1.24E-4	2.35E-4	2.35E-4	2.35E-4	2.35E-4
1	1	151	400	3.05E-3	2.42E-3	2.10E-3	2.36E-3	1.32E-3	1.00E-3	1.05E-3	7.12E-4	8.31E-4	8.44E-4	7.46E-4	7.46E-4	7.46E-4	7.46E-4
1	1	151	500	6.73E-3	5.01E-3	4.71E-3	3.62E-3	3.19E-3	2.72E-3	2.34E-3	1.93E-3	1.06E-3	1.33E-3	1.02E-3	1.02E-3	1.02E-3	1.02E-3
1	1	151	600	8.64E-3	8.67E-3	5.90E-3	6.02E-3	6.22E-3	5.60E-3	4.79E-3	3.41E-3	4.30E-3	3.78E-3	2.69E-3	2.69E-3	2.69E-3	2.69E-3
1	1	151	700	1.47E-2	1.39E-2	1.15E-2	1.13E-2	9.47E-3	7.79E-3	7.80E-3	6.60E-3	5.05E-3	5.69E-3	4.34E-3	4.34E-3	4.34E-3	4.34E-3
1	1	151	800	9.53E-2	8.54E-2	8.37E-2	1.31E-1	1.35E-2	1.28E-2	1.03E-2	9.02E-3	7.18E-3	8.88E-3	6.86E-3	6.86E-3	6.86E-3	6.86E-3
1	1	151	900	1.04E-1	9.07E-2	7.99E-2	7.35E-2	6.95E-2	5.62E-2	5.08E-2	8.21E-2	1.39E-2	1.16E-2	8.19E-3	8.19E-3	8.19E-3	8.19E-3
1	1	151	1000	1.08E-1	1.06E-1	9.31E-2	6.86E-2	6.85E-2	5.89E-2	5.37E-2	4.89E-2	3.91E-2	4.09E-2	3.47E-2	3.47E-2	3.47E-2	3.47E-2
1	1	151	1500	1.85E-1	1.73E-1	1.52E-1	1.39E-1	1.38E-1	1.30E-1	1.21E-1	1.07E-1	9.71E-2	8.34E-2	7.46E-2	7.46E-2	7.46E-2	7.46E-2
1	1	151	2000	2.74E-1	2.53E-1	2.48E-1	2.24E-1	2.21E-1	1.94E-1	1.83E-1	1.65E-1	1.61E-1	1.40E-1	1.45E-1	1.45E-1	1.45E-1	1.45E-1
1	1	151	2500	3.32E-1	3.19E-1	3.04E-1	2.77E-1	2.92E-1	2.74E-1	2.69E-1	2.49E-1	2.50E-1	2.20E-1	2.16E-1	2.16E-1	2.16E-1	2.16E-1

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)										
				0	2	4	6	8	10	13	20	30	40	50	60	
				1	1	151	3000	2.45E-1	4.10E-1	4.25E-1	4.26E-1	4.51E-1	4.65E-1	4.73E-1	4.56E-1	4.63E-1
1	1	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	1	93	40	0.00E+0	3.15E-4	4.28E-4	0.00E+0	2.59E-4	2.65E-4	8.54E-5	1.09E-4	6.91E-5	3.47E-5	5.84E-5	1.01E-5	
1	1	93	60	4.17E-5	3.99E-4	1.42E-4	1.65E-4	1.47E-4	1.26E-4	3.59E-4	3.10E-4	1.75E-4	6.36E-5	3.93E-5	8.58E-5	
1	1	93	80	2.70E-5	8.03E-4	5.45E-4	7.03E-4	4.01E-4	1.31E-4	3.86E-4	5.55E-4	3.55E-4	9.88E-5	4.32E-4	1.09E-4	
1	1	93	100	0.00E+0	1.22E-3	8.43E-4	2.91E-4	7.07E-4	3.45E-4	4.57E-4	5.96E-4	4.55E-4	4.06E-4	2.44E-4	3.69E-4	
1	1	93	200	3.09E-3	4.39E-3	4.25E-3	3.91E-3	3.38E-3	3.39E-3	4.68E-3	3.02E-3	2.33E-3	1.82E-3	1.82E-3	1.37E-3	
1	1	93	300	5.82E-3	7.76E-3	9.26E-3	8.29E-3	6.68E-3	7.22E-3	7.38E-3	6.49E-3	6.22E-3	4.69E-3	4.68E-3	3.96E-3	
1	1	93	400	2.14E-2	2.82E-2	2.23E-2	2.39E-2	2.15E-2	2.16E-2	1.76E-2	1.36E-2	1.35E-2	1.09E-2	7.81E-3	7.38E-3	
1	1	93	500	1.72E-1	2.22E-1	2.31E-1	2.41E-1	2.66E-1	2.75E-1	3.15E-1	3.19E-1	6.39E-1	1.97E-2	1.45E-2	1.29E-2	
1	1	93	600	2.60E-1	2.42E-1	2.95E-1	3.09E-1	3.07E-1	3.24E-1	2.72E-1	2.79E-1	2.69E-1	2.43E-1	2.24E-1	2.31E-1	
1	1	93	700	2.52E-1	2.39E-1	3.27E-1	2.74E-1	3.24E-1	2.94E-1	3.29E-1	3.04E-1	2.82E-1	2.40E-1	2.34E-1	2.14E-1	
1	1	93	800	2.18E-1	2.73E-1	3.34E-1	3.20E-1	3.96E-1	3.35E-1	3.57E-1	3.10E-1	2.70E-1	2.64E-1	2.45E-1	2.10E-1	
1	1	93	900	2.25E-1	3.19E-1	3.29E-1	4.00E-1	3.53E-1	3.70E-1	3.37E-1	3.44E-1	3.33E-1	2.69E-1	2.70E-1	2.08E-1	
1	1	93	1000	2.37E-1	2.65E-1	3.56E-1	3.63E-1	3.28E-1	3.84E-1	3.58E-1	3.49E-1	3.37E-1	3.08E-1	2.55E-1	2.41E-1	
1	1	93	1500	3.13E-1	4.03E-1	4.01E-1	5.14E-1	4.30E-1	5.07E-1	4.90E-1	4.41E-1	4.09E-1	3.83E-1	3.42E-1	3.06E-1	
1	1	93	2000	4.63E-1	4.37E-1	5.52E-1	6.71E-1	6.56E-1	5.76E-1	5.94E-1	6.16E-1	5.52E-1	5.00E-1	4.42E-1	4.41E-1	
1	1	93	2500	3.79E-1	5.62E-1	7.17E-1	7.15E-1	7.35E-1	7.07E-1	7.45E-1	6.69E-1	6.47E-1	5.80E-1	5.40E-1	5.13E-1	
1	1	93	3000	4.96E-1	7.17E-1	7.00E-1	8.22E-1	7.35E-1	8.10E-1	8.44E-1	8.41E-1	7.40E-1	6.84E-1	6.25E-1	5.97E-1	
1	1	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	1	58	40	0.00E+0	2.15E-4	6.36E-4	3.11E-5	1.48E-5	2.40E-4	2.26E-4	1.57E-4	1.85E-4	1.30E-4	5.93E-5	5.03E-5	
1	1	58	60	3.17E-4	8.75E-4	3.57E-4	1.50E-4	4.26E-4	4.44E-4	3.57E-4	5.62E-4	3.75E-4	2.03E-4	2.30E-4	2.03E-4	
1	1	58	80	3.98E-4	7.55E-4	7.64E-4	1.34E-3	1.17E-3	1.73E-3	7.34E-4	7.56E-4	6.18E-4	6.14E-4	5.35E-4	2.68E-4	
1	1	58	100	1.14E-3	1.61E-3	2.36E-3	1.13E-3	1.48E-3	1.54E-3	1.67E-3	1.23E-3	9.81E-4	1.07E-3	5.26E-4	6.03E-4	
1	1	58	200	5.20E-3	6.14E-3	8.58E-3	7.21E-3	6.59E-3	7.43E-3	5.58E-3	5.56E-3	4.06E-3	3.74E-3	2.76E-3	2.45E-3	
1	1	58	300	2.26E-2	3.46E-2	2.67E-2	2.37E-2	2.00E-2	2.25E-2	1.84E-2	1.47E-2	8.66E-3	7.94E-3	6.58E-3	5.14E-3	
1	1	58	400	3.69E-1	3.33E-1	4.21E-1	4.43E-1	3.89E-1	4.43E-1	4.57E-1	4.81E-1	8.14E-1	1.67E-2	9.39E-3	1.03E-2	
1	1	58	500	3.30E-1	4.75E-1	4.46E-1	4.20E-1	4.80E-1	4.42E-1	4.93E-1	4.37E-1	4.33E-1	3.97E-1	3.87E-1	8.24E-1	
1	1	58	600	3.75E-1	5.07E-1	5.18E-1	4.49E-1	3.51E-1	4.33E-1	4.72E-1	4.60E-1	4.26E-1	3.48E-1	3.21E-1	3.40E-1	
1	1	58	700	4.02E-1	3.76E-1	4.83E-1	4.98E-1	4.85E-1	5.28E-1	5.29E-1	4.80E-1	4.53E-1	3.90E-1	3.60E-1	3.01E-1	
1	1	58	800	5.78E-1	5.40E-1	5.10E-1	5.61E-1	5.34E-1	5.52E-1	5.47E-1	5.28E-1	4.71E-1	4.47E-1	3.74E-1	3.16E-1	
1	1	58	900	4.35E-1	4.73E-1	5.92E-1	5.67E-1	5.52E-1	6.00E-1	5.96E-1	5.59E-1	5.10E-1	4.76E-1	4.08E-1	3.84E-1	
1	1	58	1000	5.76E-1	4.73E-1	6.04E-1	6.53E-1	5.71E-1	5.67E-1	5.88E-1	5.19E-1	4.95E-1	4.54E-1	4.13E-1	3.99E-1	
1	1	58	1500	7.24E-1	7.64E-1	8.27E-1	7.93E-1	8.96E-1	8.87E-1	8.09E-1	7.11E-1	6.53E-1	5.74E-1	5.37E-1	4.87E-1	
1	1	58	2000	8.53E-1	8.79E-1	8.35E-1	8.97E-1	9.79E-1	9.85E-1	9.42E-1	8.45E-1	7.85E-1	7.10E-1	6.52E-1	5.98E-1	
1	1	58	2500	6.72E-1	9.49E-1	9.74E-1	1.09E+0	1.10E+0	1.06E+0	1.07E+0	1.07E+0	9.31E-1	8.82E-1	7.86E-1	7.17E-1	
1	1	58	3000	4.96E-1	7.17E-1	7.00E-1	8.22E-1	7.35E-1	8.10E-1	8.44E-1	8.41E-1	7.40E-1	6.84E-1	6.25E-1	5.97E-1	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				1	1	151	3000	4.07E-1	3.88E-1	3.79E-1	3.82E-1	3.38E-1	3.53E-1	3.52E-1	3.21E-1
1	1	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	1	93	40	2.67E-5	1.35E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.60E-5	0.00E+0	0.00E+0	0.00E+0	
1	1	93	60	7.03E-5	5.39E-5	8.06E-5	1.22E-4	4.68E-5	4.94E-5	0.00E+0	1.27E-5	0.00E+0	4.71E-5	0.00E+0	
1	1	93	80	2.03E-4	1.89E-4	1.31E-4	1.18E-5	3.91E-5	7.34E-5	1.28E-5	4.44E-5	0.00E+0	0.00E+0	1.64E-4	
1	1	93	100	7.50E-5	4.00E-4	1.25E-4	1.98E-4	1.48E-4	1.72E-4	1.40E-4	3.78E-5	1.55E-5	1.23E-5	1.18E-4	
1	1	93	200	1.23E-3	1.06E-3	4.23E-4	5.91E-4	3.48E-4	2.47E-4	1.62E-4	2.04E-4	4.15E-4	2.49E-4	1.72E-4	
1	1	93	300	3.10E-3	1.51E-3	1.54E-3	1.97E-3	1.84E-3	1.06E-3	1.04E-3	1.09E-3	8.31E-4	4.03E-4	6.37E-4	
1	1	93	400	4.61E-3	4.83E-3	4.26E-3	3.47E-3	3.29E-3	2.80E-3	2.53E-3	2.77E-3	1.53E-3	1.99E-3	7.16E-4	
1	1	93	500	1.12E-2	1.05E-2	9.11E-3	6.44E-3	5.49E-3	4.88E-3	4.03E-3	3.90E-3	3.81E-3	2.23E-3	4.03E-3	
1	1	93	600	4.30E-1	1.57E-2	1.47E-2	1.10E-2	9.65E-3	7.72E-3	7.14E-3	7.65E-3	6.34E-3	5.94E-3	4.81E-3	
1	1	93	700	1.96E-1	1.74E-1	1.73E-1	1.56E-1	2.50E-1	1.33E-2	1.15E-2	1.14E-2	9.96E-3	8.55E-3	8.94E-3	
1	1	93	800	1.81E-1	1.65E-1	1.59E-1	1.45E-1	1.21E-1	9.62E-2	9.65E-2	9.10E-2	1.79E-1	1.33E-2	1.14E-2	
1	1	93	900	1.82E-1	1.68E-1	1.62E-1	1.50E-1	1.30E-1	1.19E-1	1.09E-1	8.79E-2	8.27E-2	7.41E-2	6.50E-2	
1	1	93	1000	2.23E-1	1.93E-1	1.74E-1	1.56E-1	1.55E-1	1.27E-1	1.22E-1	1.00E-1	9.43E-2	8.84E-2	6.93E-2	
1	1	93	1500	3.05E-1	2.62E-1	2.41E-1	2.34E-1	2.27E-1	1.98E-1	1.82E-1	1.68E-1	1.58E-1	1.35E-1	1.28E-1	
1	1	93	2000	4.18E-1	3.83E-1	3.64E-1	3.17E-1	3.31E-1	3.07E-1	2.93E-1	2.60E-1	2.27E-1	2.22E-1	1.85E-1	
1	1	93	2500	4.87E-1	4.43E-1	4.59E-1	3.94E-1	3.74E-1	3.66E-1	3.34E-1	3.29E-1	3.43E-1	2.91E-1	2.89E-1	
1	1	93	3000	5.47E-1	5.27E-1	4.62E-1	4.63E-1	4.44E-1	4.32E-1	4.10E-1	3.92E-1	3.68E-1	3.59E-1	3.54E-1	
1	1	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	1	58	40	0.00E+0	0.00E+0	9.50E-6	1.20E-4	2.33E-5	0.00E+0	0.00E+0	2.96E-5	0.00E+0	0.00E+0	0.00E+0	
1	1	58	60	5.76E-5	1.29E-4	1.32E-4	1.40E-4	3.82E-5	0.00E+0	5.72E-5	0.00E+0	5.15E-6	3.98E-5	0.00E+0	
1	1	58	80	2.17E-4	1.90E-4	6.47E-5	2.09E-4	3.27E-4	5.02E-5	1.26E-4	8.41E-5	0.00E+0	6.37E-5	0.00E+0	
1	1	58	100	4.51E-4	4.22E-4	1.73E-4	1.60E-4	2.53E-4	1.08E-4	1.70E-4	9.04E-5	8.00E-5	3.23E-5	2.40E-4	
1	1	58	200	1.99E-3	1.54E-3	1.11E-3	1.52E-3	7.65E-4	7.89E-4	8.11E-4	4.10E-4	4.30E-4	6.22E-4	3.28E-4	
1	1	58	300	4.78E-3	3.67E-3	2.72E-3	2.85E-3	2.54E-3	1.83E-3	1.14E-3	1.06E-3	9.67E-4	1.05E-3	9.49E-4	
1	1	58	400	9.00E-3	7.34E-3	7.01E-3	4.88E-3	4.40E-3	4.90E-3	3.02E-3	2.28E-3	2.27E-3	2.94E-3	2.01E-3	
1	1	58	500	1.85E-2	1.34E-2	1.16E-2	8.98E-3	9.38E-3	6.45E-3	7.27E-3	5.68E-3	4.46E-3	4.75E-3	3.08E-3	
1	1	58	600	3.03E-1	2.64E-1	2.59E-1	5.06E-1	1.57E-2	1.21E-2	9.68E-3	1.02E-2	8.88E-3	6.90E-3	5.87E-3	
1	1	58	700	2.97E-1	2.70E-1	2.30E-1	2.13E-1	2.02E-1	1.78E-1	1.44E-1	3.28E-1	1.36E-2	1.13E-2	8.41E-3	
1	1	58	800	2.93E-1	2.64E-1	2.44E-1	2.09E-1	2.08E-1	1.84E-1	1.62E-1	1.40E-1	1.18E-1	1.21E-1	1.05E-1	
1	1	58	900	3.13E-1	2.71E-1	2.32E-1	2.07E-1	2.14E-1	1.76E-1	1.61E-1	1.43E-1	1.30E-1	1.03E-1	9.39E-2	
1	1	58	1000	3.52E-1	3.11E-1	2.80E-1	2.50E-1	2.44E-1	2.16E-1	1.68E-1	1.53E-1	1.41E-1	1.20E-1	1.23E-1	
1	1	58	1500	4.55E-1	3.91E-1	3.50E-1	3.09E-1	2.72E-1	2.43E-1	2.48E-1	2.20E-1	1.97E-1	1.87E-1	1.56E-1	
1	1	58	2000	5.44E-1	5.16E-1	4.91E-1	4.72E-1	4.03E-1	3.85E-1	3.46E-1	3.27E-1	2.91E-1	2.64E-1	2.22E-1	
1	1	58	2500	6.71E-1	6.19E-1	5.79E-1	5.18E-1	4.67E-1	4.49E-1	4.18E-1	3.88E-1	3.55E-1	3.47E-1	3.32E-1	
1	1	58	3000	5.47E-1	5.27E-1	4.62E-1	4.63E-1	4.44E-1	4.32E-1	4.10E-1	3.92E-1	3.68E-1	3.59E-1	3.54E-1	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)												
				0	2	4	6	8	10	13	20	30	40	50	60			
1	1	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	26	40	1.47E-4	1.60E-4	1.12E-3	1.11E-4	2.62E-4	8.33E-4	2.03E-4	2.75E-4	1.11E-4	1.27E-4	2.93E-4	2.32E-5			
1	1	26	60	6.15E-4	8.16E-4	8.69E-4	3.76E-4	2.08E-3	1.51E-3	1.32E-3	5.14E-4	4.77E-4	5.68E-4	2.71E-4	4.73E-4			
1	1	26	80	9.69E-4	2.49E-3	1.28E-3	4.67E-3	4.39E-3	2.12E-3	2.53E-3	9.12E-4	1.02E-3	8.72E-4	6.03E-4	5.68E-4			
1	1	26	100	2.02E-3	3.81E-3	3.12E-3	3.55E-3	4.37E-3	4.20E-3	3.09E-3	2.19E-3	1.48E-3	1.59E-3	8.90E-4	9.76E-4			
1	1	26	200	7.11E-1	2.10E+0	7.06E-2	4.55E-2	3.24E-2	3.35E-2	1.61E-2	1.38E-2	7.39E-3	5.70E-3	4.69E-3	2.58E-3			
1	1	26	300	5.44E-1	6.34E-1	5.87E-1	7.17E-1	7.15E-1	7.17E-1	6.77E-1	7.14E-1	1.15E+0	1.13E-2	7.15E-3	5.84E-3			
1	1	26	400	6.73E-1	7.47E-1	7.12E-1	7.45E-1	8.28E-1	7.46E-1	7.14E-1	6.74E-1	6.65E-1	5.88E-1	5.85E-1	1.08E+0			
1	1	26	500	6.39E-1	7.62E-1	7.48E-1	8.00E-1	8.32E-1	7.80E-1	7.05E-1	7.44E-1	6.43E-1	5.82E-1	5.92E-1	5.20E-1			
1	1	26	600	8.20E-1	6.95E-1	8.37E-1	7.81E-1	9.43E-1	8.70E-1	8.52E-1	7.48E-1	7.10E-1	5.99E-1	5.79E-1	5.24E-1			
1	1	26	700	7.62E-1	8.57E-1	8.95E-1	9.47E-1	9.93E-1	9.09E-1	9.02E-1	8.38E-1	6.69E-1	6.34E-1	5.97E-1	5.19E-1			
1	1	26	800	1.11E+0	9.16E-1	1.05E+0	9.92E-1	9.95E-1	8.63E-1	9.20E-1	8.37E-1	7.48E-1	6.92E-1	5.80E-1	5.33E-1			
1	1	26	900	8.87E-1	9.76E-1	1.14E+0	1.04E+0	9.86E-1	9.92E-1	9.46E-1	8.69E-1	7.43E-1	6.31E-1	6.01E-1	5.60E-1			
1	1	26	1000	7.14E-1	9.17E-1	1.12E+0	1.04E+0	1.04E+0	1.11E+0	9.74E-1	8.66E-1	8.34E-1	6.96E-1	6.31E-1	6.33E-1			
1	1	26	1500	1.22E+0	1.32E+0	1.39E+0	1.38E+0	1.50E+0	1.34E+0	1.35E+0	1.22E+0	1.08E+0	9.29E-1	8.70E-1	7.29E-1			
1	1	26	2000	1.31E+0	1.58E+0	1.54E+0	1.67E+0	1.63E+0	1.46E+0	1.67E+0	1.45E+0	1.35E+0	1.06E+0	1.01E+0	8.95E-1			
1	1	26	2500	1.44E+0	1.48E+0	1.61E+0	1.58E+0	1.66E+0	1.86E+0	1.75E+0	1.54E+0	1.44E+0	1.34E+0	1.21E+0	1.00E+0			
1	1	26	3000	1.25E+0	1.82E+0	1.76E+0	1.86E+0	2.00E+0	1.88E+0	1.80E+0	1.75E+0	1.59E+0	1.46E+0	1.29E+0	1.13E+0			
1	1	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	12	40	5.25E-4	4.76E-4	1.04E-3	6.62E-4	1.12E-3	2.08E-4	5.26E-4	5.66E-4	2.39E-4	2.63E-4	1.83E-4	2.34E-4			
1	1	12	60	2.11E-3	1.61E-3	2.15E-3	3.52E-3	2.95E-3	2.97E-3	3.02E-3	1.45E-3	1.12E-3	6.07E-4	3.24E-4	3.22E-4			
1	1	12	80	4.35E-3	7.62E-3	5.86E-3	7.26E-3	3.24E-3	4.10E-3	2.54E-3	3.74E-3	1.50E-3	1.47E-3	6.40E-4	7.01E-4			
1	1	12	100	1.10E-2	2.12E-2	1.33E-2	8.66E-3	5.55E-3	7.32E-3	7.54E-3	3.48E-3	2.78E-3	2.14E-3	9.70E-4	1.15E-3			
1	1	12	200	6.17E-1	8.02E-1	8.09E-1	7.68E-1	9.10E-1	8.82E-1	3.24E+0	3.44E-2	8.56E-3	5.27E-3	4.72E-3	3.09E-3			
1	1	12	300	7.90E-1	8.11E-1	7.38E-1	8.69E-1	8.01E-1	8.12E-1	8.45E-1	7.94E-1	7.98E-1	1.54E+0	1.17E-2	6.88E-3			
1	1	12	400	7.51E-1	8.36E-1	9.37E-1	9.77E-1	8.07E-1	9.11E-1	8.08E-1	8.74E-1	7.55E-1	6.73E-1	6.71E-1	6.50E-1			
1	1	12	500	8.90E-1	9.64E-1	1.09E+0	1.05E+0	9.85E-1	9.38E-1	8.99E-1	8.63E-1	7.99E-1	7.03E-1	6.39E-1	5.73E-1			
1	1	12	600	1.00E+0	1.01E+0	1.03E+0	1.10E+0	1.18E+0	1.02E+0	9.83E-1	9.53E-1	8.43E-1	7.32E-1	6.87E-1	5.92E-1			
1	1	12	700	1.11E+0	1.10E+0	1.07E+0	1.18E+0	1.24E+0	1.16E+0	1.03E+0	1.02E+0	8.88E-1	7.77E-1	6.93E-1	6.41E-1			
1	1	12	800	1.13E+0	1.08E+0	1.12E+0	1.29E+0	1.27E+0	1.11E+0	1.13E+0	1.08E+0	9.33E-1	8.05E-1	7.50E-1	6.48E-1			
1	1	12	900	1.10E+0	1.20E+0	1.31E+0	1.35E+0	1.23E+0	1.31E+0	1.26E+0	1.13E+0	9.35E-1	8.27E-1	7.00E-1	6.72E-1			
1	1	12	1000	1.30E+0	1.21E+0	1.31E+0	1.39E+0	1.31E+0	1.32E+0	1.29E+0	1.15E+0	1.03E+0	8.80E-1	7.98E-1	6.91E-1			
1	1	12	1500	1.41E+0	1.64E+0	1.62E+0	1.83E+0	1.63E+0	1.79E+0	1.76E+0	1.53E+0	1.33E+0	1.23E+0	1.08E+0	9.38E-1			
1	1	12	2000	1.41E+0	1.72E+0	1.80E+0	1.91E+0	1.87E+0	1.71E+0	1.85E+0	1.80E+0	1.55E+0	1.34E+0	1.19E+0	1.11E+0			
1	1	12	2500	1.48E+0	1.93E+0	1.75E+0	1.63E+0	1.84E+0	2.10E+0	1.99E+0	1.87E+0	1.75E+0	1.53E+0	1.32E+0	1.23E+0			
1	1	12	3000	1.18E+0	1.71E+0	2.00E+0	2.01E+0	2.11E+0	1.88E+0	2.13E+0	1.90E+0	1.86E+0	1.68E+0	1.50E+0	1.44E+0			
1	1	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)											
				70	80	90	100	110	120	130	140	150	160	170			
				1	1	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	26	40	1.11E-5	4.45E-5	5.70E-5	7.55E-5	2.25E-5	4.52E-5	0.00E+0	4.04E-5	0.00E+0	1.08E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	26	60	9.84E-5	2.16E-4	1.84E-4	2.83E-4	1.89E-4	1.10E-4	2.35E-4	1.19E-4	1.45E-4	3.60E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	26	80	4.18E-4	2.26E-4	3.20E-4	1.63E-4	1.91E-4	6.68E-5	1.48E-4	1.17E-4	7.47E-5	6.68E-5	3.24E-4	0.00E+0	0.00E+0	0.00E+0
1	1	26	100	4.04E-4	4.52E-4	3.01E-4	2.49E-4	2.49E-4	4.01E-4	2.53E-4	1.66E-4	2.72E-4	1.03E-4	2.95E-4	0.00E+0	0.00E+0	0.00E+0
1	1	26	200	2.90E-3	1.96E-3	2.03E-3	1.34E-3	1.71E-3	1.12E-3	1.24E-3	5.46E-4	5.71E-4	5.53E-4	7.31E-4	0.00E+0	0.00E+0	0.00E+0
1	1	26	300	4.39E-3	3.69E-3	4.14E-3	2.75E-3	2.97E-3	1.64E-3	1.81E-3	1.96E-3	1.43E-3	8.28E-4	1.53E-3	0.00E+0	0.00E+0	0.00E+0
1	1	26	400	1.36E-2	9.95E-3	8.21E-3	5.79E-3	5.88E-3	5.50E-3	4.06E-3	4.01E-3	2.94E-3	2.62E-3	3.70E-3	0.00E+0	0.00E+0	0.00E+0
1	1	26	500	4.43E-1	4.49E-1	9.90E-1	1.66E-2	9.68E-3	9.13E-3	7.07E-3	6.97E-3	5.17E-3	5.15E-3	4.90E-3	0.00E+0	0.00E+0	0.00E+0
1	1	26	600	4.13E-1	3.93E-1	3.47E-1	3.47E-1	2.86E-1	3.01E-1	5.72E-1	1.15E-2	9.05E-3	8.60E-3	1.02E-2	0.00E+0	0.00E+0	0.00E+0
1	1	26	700	4.74E-1	4.34E-1	3.99E-1	3.55E-1	3.15E-1	2.48E-1	2.25E-1	2.31E-1	1.83E-1	1.77E-1	2.78E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	800	4.40E-1	3.99E-1	3.57E-1	3.21E-1	2.74E-1	2.66E-1	2.46E-1	2.00E-1	1.97E-1	1.67E-1	1.60E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	900	4.79E-1	4.49E-1	3.69E-1	3.35E-1	3.07E-1	2.84E-1	2.47E-1	2.08E-1	1.82E-1	1.45E-1	1.52E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	1000	4.93E-1	4.42E-1	4.02E-1	3.56E-1	3.19E-1	2.70E-1	2.56E-1	2.23E-1	2.15E-1	1.77E-1	1.54E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	1500	6.58E-1	5.94E-1	5.45E-1	4.69E-1	4.03E-1	3.56E-1	3.21E-1	3.16E-1	2.98E-1	2.47E-1	2.13E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	2000	7.87E-1	7.42E-1	7.41E-1	5.98E-1	5.59E-1	5.02E-1	4.61E-1	3.95E-1	3.92E-1	3.32E-1	3.00E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	2500	9.20E-1	8.13E-1	7.16E-1	6.82E-1	6.44E-1	5.63E-1	5.13E-1	4.90E-1	4.23E-1	4.20E-1	3.36E-1	0.00E+0	0.00E+0	0.00E+0
1	1	26	3000	1.06E+0	9.24E-1	8.44E-1	7.77E-1	6.94E-1	6.25E-1	5.43E-1	5.39E-1	4.83E-1	4.49E-1	3.66E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	12	40	1.23E-4	5.70E-5	7.33E-5	6.21E-5	3.70E-5	5.54E-5	0.00E+0	2.60E-5	2.38E-6	1.08E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	12	60	4.18E-4	3.81E-4	9.36E-5	2.24E-4	4.43E-4	1.03E-4	1.83E-4	4.38E-5	4.39E-5	7.27E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	12	80	4.51E-4	4.00E-4	2.29E-4	2.19E-4	3.21E-4	9.12E-5	1.54E-4	1.33E-4	1.36E-4	2.16E-4	2.91E-4	0.00E+0	0.00E+0	0.00E+0
1	1	12	100	7.90E-4	5.15E-4	2.37E-4	4.77E-4	1.98E-4	1.63E-4	1.73E-4	1.83E-4	4.75E-4	5.11E-5	8.46E-6	0.00E+0	0.00E+0	0.00E+0
1	1	12	200	2.57E-3	2.13E-3	1.79E-3	1.22E-3	1.40E-3	1.62E-3	1.23E-3	4.81E-4	6.18E-4	3.19E-4	5.68E-4	0.00E+0	0.00E+0	0.00E+0
1	1	12	300	5.61E-3	4.68E-3	4.57E-3	3.39E-3	3.21E-3	1.92E-3	1.55E-3	1.38E-3	1.61E-3	7.46E-4	6.11E-4	0.00E+0	0.00E+0	0.00E+0
1	1	12	400	1.38E+0	1.32E-2	8.55E-3	7.31E-3	5.86E-3	4.34E-3	3.87E-3	3.68E-3	2.78E-3	2.37E-3	1.99E-3	0.00E+0	0.00E+0	0.00E+0
1	1	12	500	5.52E-1	4.73E-1	4.97E-1	5.98E-1	6.44E-1	1.03E-2	7.57E-3	7.90E-3	4.90E-3	5.31E-3	4.40E-3	0.00E+0	0.00E+0	0.00E+0
1	1	12	600	5.61E-1	4.96E-1	4.51E-1	4.33E-1	3.56E-1	3.25E-1	2.92E-1	6.60E-1	1.15E-2	9.62E-3	8.63E-3	0.00E+0	0.00E+0	0.00E+0
1	1	12	700	5.64E-1	4.94E-1	4.29E-1	4.12E-1	3.54E-1	3.00E-1	2.97E-1	2.57E-1	2.39E-1	2.08E-1	1.96E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	800	5.74E-1	5.33E-1	4.68E-1	3.77E-1	3.52E-1	3.17E-1	2.81E-1	2.72E-1	2.17E-1	2.10E-1	1.66E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	900	6.01E-1	5.32E-1	4.54E-1	3.87E-1	3.62E-1	3.27E-1	2.65E-1	2.49E-1	2.33E-1	1.83E-1	1.72E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	1000	6.09E-1	5.23E-1	5.00E-1	4.25E-1	3.92E-1	3.58E-1	2.94E-1	2.71E-1	2.34E-1	2.16E-1	1.86E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	1500	8.17E-1	7.63E-1	6.38E-1	5.44E-1	4.67E-1	4.26E-1	3.97E-1	3.29E-1	3.26E-1	2.81E-1	2.26E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	2000	1.00E+0	9.04E-1	8.09E-1	7.35E-1	7.23E-1	6.37E-1	5.65E-1	4.97E-1	4.44E-1	3.73E-1	3.40E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	2500	1.05E+0	9.81E-1	9.01E-1	7.78E-1	7.14E-1	6.40E-1	6.28E-1	5.39E-1	4.80E-1	4.76E-1	3.46E-1	0.00E+0	0.00E+0	0.00E+0
1	1	12	3000	1.29E+0	1.16E+0	9.20E-1	9.02E-1	7.90E-1	6.79E-1	6.72E-1	6.06E-1	5.59E-1	4.56E-1	4.20E-1	0.00E+0	0.00E+0	0.00E+0
1	1	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				0	2	4	6	8	10	13	20	30	40	50	60
				1	1	5	40	2.82E-3	5.01E-3	2.29E-3	1.48E-3	1.35E-3	7.63E-4	6.84E-4	6.92E-4
1	1	5	60	9.75E-3	1.31E-2	5.99E-3	7.22E-3	5.29E-3	3.79E-3	2.14E-3	1.47E-3	1.50E-3	1.07E-3	1.95E-4	3.01E-4
1	1	5	80	1.33E-1	5.03E-2	3.31E-2	1.79E-2	2.17E-2	1.38E-2	5.93E-3	2.16E-3	1.81E-3	1.42E-3	9.96E-4	4.84E-4
1	1	5	100	8.89E-1	2.95E+0	6.98E-2	3.24E-2	3.07E-2	1.64E-2	4.86E-3	4.89E-3	4.11E-3	2.33E-3	1.24E-3	1.26E-3
1	1	5	200	8.03E-1	9.11E-1	9.33E-1	9.64E-1	9.88E-1	9.78E-1	9.54E-1	1.73E+0	1.34E-2	5.19E-3	4.39E-3	1.92E-3
1	1	5	300	7.44E-1	8.84E-1	9.57E-1	8.89E-1	9.13E-1	9.46E-1	9.14E-1	8.46E-1	7.95E-1	8.77E-1	1.32E+0	7.21E-3
1	1	5	400	8.62E-1	1.05E+0	1.07E+0	1.08E+0	9.84E-1	9.43E-1	9.89E-1	8.85E-1	8.20E-1	7.42E-1	7.33E-1	6.82E-1
1	1	5	500	8.97E-1	9.76E-1	1.16E+0	1.19E+0	1.08E+0	9.95E-1	9.88E-1	1.05E+0	8.70E-1	8.28E-1	7.11E-1	6.55E-1
1	1	5	600	1.11E+0	1.06E+0	1.15E+0	1.19E+0	1.14E+0	1.05E+0	1.01E+0	1.02E+0	9.81E-1	8.36E-1	7.71E-1	6.48E-1
1	1	5	700	1.19E+0	1.18E+0	1.34E+0	1.14E+0	1.30E+0	1.13E+0	1.18E+0	1.15E+0	9.95E-1	8.66E-1	7.94E-1	6.94E-1
1	1	5	800	1.21E+0	1.23E+0	1.32E+0	1.35E+0	1.26E+0	1.28E+0	1.17E+0	1.15E+0	1.05E+0	9.39E-1	7.90E-1	7.47E-1
1	1	5	900	1.42E+0	1.31E+0	1.50E+0	1.42E+0	1.40E+0	1.44E+0	1.44E+0	1.22E+0	1.10E+0	9.89E-1	8.25E-1	7.57E-1
1	1	5	1000	1.29E+0	1.39E+0	1.45E+0	1.58E+0	1.54E+0	1.61E+0	1.42E+0	1.28E+0	1.17E+0	1.01E+0	8.55E-1	7.65E-1
1	1	5	1500	1.82E+0	1.78E+0	1.69E+0	1.88E+0	1.77E+0	2.00E+0	1.70E+0	1.69E+0	1.51E+0	1.25E+0	1.14E+0	1.01E+0
1	1	5	2000	1.74E+0	1.63E+0	1.82E+0	1.96E+0	1.84E+0	1.91E+0	1.93E+0	1.89E+0	1.76E+0	1.54E+0	1.48E+0	1.23E+0
1	1	5	2500	1.66E+0	2.13E+0	1.97E+0	1.87E+0	2.07E+0	2.00E+0	2.00E+0	1.93E+0	1.84E+0	1.73E+0	1.55E+0	1.36E+0
1	1	5	3000	1.73E+0	1.88E+0	2.14E+0	1.86E+0	2.03E+0	2.16E+0	2.10E+0	2.17E+0	1.98E+0	1.85E+0	1.72E+0	1.47E+0
1	1	0	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	1	0	40	2.70E+0	1.26E-2	5.50E-3	8.65E-4	7.16E-4	3.60E-5	1.67E-4	1.46E-4	1.03E-4	7.93E-5	2.27E-5	7.45E-5
1	1	0	60	8.68E-1	2.99E+0	3.55E-2	1.33E-2	8.48E-3	2.47E-3	1.30E-3	7.44E-4	2.71E-4	1.85E-4	2.05E-4	1.39E-4
1	1	0	80	8.52E-1	1.25E+0	4.15E+0	7.13E-2	3.16E-2	1.32E-2	9.40E-3	1.73E-3	7.54E-4	7.47E-4	4.24E-4	5.68E-4
1	1	0	100	6.76E-1	1.03E+0	1.26E+0	5.09E+0	1.08E-1	4.02E-2	1.58E-2	4.20E-3	1.54E-3	1.37E-3	6.53E-4	5.03E-4
1	1	0	200	7.66E-1	8.60E-1	8.79E-1	1.03E+0	9.69E-1	9.12E-1	9.52E-1	1.12E+0	1.27E+0	5.02E-3	3.55E-3	2.78E-3
1	1	0	300	7.20E-1	8.70E-1	9.38E-1	9.86E-1	1.03E+0	1.09E+0	1.07E+0	9.46E-1	9.02E-1	8.68E-1	1.77E+0	9.46E-3
1	1	0	400	9.10E-1	1.01E+0	1.00E+0	1.11E+0	1.10E+0	9.94E-1	1.03E+0	1.00E+0	9.20E-1	8.08E-1	7.50E-1	7.56E-1
1	1	0	500	8.98E-1	8.69E-1	1.15E+0	1.18E+0	1.14E+0	1.23E+0	1.18E+0	1.04E+0	9.32E-1	8.71E-1	8.02E-1	7.29E-1
1	1	0	600	1.01E+0	9.82E-1	1.37E+0	1.26E+0	1.17E+0	1.22E+0	1.14E+0	1.15E+0	1.03E+0	9.03E-1	8.05E-1	6.77E-1
1	1	0	700	1.04E+0	9.80E-1	1.30E+0	1.37E+0	1.36E+0	1.25E+0	1.25E+0	1.23E+0	1.04E+0	9.67E-1	8.63E-1	7.62E-1
1	1	0	800	1.05E+0	1.01E+0	1.47E+0	1.29E+0	1.44E+0	1.30E+0	1.52E+0	1.26E+0	1.07E+0	1.02E+0	8.33E-1	8.09E-1
1	1	0	900	1.16E+0	1.18E+0	1.39E+0	1.39E+0	1.35E+0	1.29E+0	1.50E+0	1.40E+0	1.23E+0	1.08E+0	9.48E-1	7.81E-1
1	1	0	1000	1.52E+0	1.21E+0	1.46E+0	1.58E+0	1.67E+0	1.68E+0	1.53E+0	1.48E+0	1.23E+0	1.08E+0	9.61E-1	7.92E-1
1	1	0	1500	1.68E+0	1.51E+0	1.54E+0	1.74E+0	1.88E+0	1.78E+0	1.81E+0	1.80E+0	1.60E+0	1.41E+0	1.28E+0	1.13E+0
1	1	0	2000	1.64E+0	1.62E+0	1.65E+0	1.86E+0	1.87E+0	1.90E+0	2.04E+0	1.93E+0	1.96E+0	1.75E+0	1.50E+0	1.30E+0
1	1	0	2500	1.64E+0	2.05E+0	1.76E+0	1.72E+0	1.98E+0	2.18E+0	2.13E+0	2.02E+0	1.96E+0	1.78E+0	1.55E+0	1.42E+0
1	1	0	3000	1.66E+0	1.71E+0	1.61E+0	1.59E+0	1.90E+0	2.15E+0	2.25E+0	2.19E+0	2.15E+0	1.98E+0	1.75E+0	1.54E+0
1	0.5	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				1	1	5	40	1.52E-4	3.26E-5	5.02E-5	1.14E-4	5.04E-5	1.27E-5	9.96E-5	9.18E-5
1	1	5	60	3.76E-4	2.48E-4	2.54E-4	2.39E-4	1.67E-4	1.55E-4	2.37E-4	1.10E-4	1.11E-4	6.13E-5	0.00E+0	
1	1	5	80	6.90E-4	4.42E-4	3.81E-4	3.74E-4	2.69E-4	1.43E-4	1.24E-4	1.17E-4	3.68E-5	1.14E-4	2.94E-5	
1	1	5	100	7.79E-4	7.39E-4	3.53E-4	4.87E-4	1.73E-4	2.25E-4	2.17E-4	2.69E-4	7.02E-5	2.13E-4	8.95E-5	
1	1	5	200	2.19E-3	1.91E-3	1.33E-3	1.72E-3	1.00E-3	7.82E-4	1.10E-3	4.26E-4	4.71E-4	5.85E-4	3.09E-4	
1	1	5	300	5.89E-3	4.06E-3	2.78E-3	2.97E-3	2.59E-3	2.22E-3	2.02E-3	1.64E-3	1.43E-3	7.44E-4	1.00E-3	
1	1	5	400	6.97E-1	1.19E+0	9.89E-3	7.36E-3	6.34E-3	5.50E-3	4.42E-3	3.18E-3	3.04E-3	2.87E-3	2.92E-3	
1	1	5	500	6.38E-1	5.55E-1	4.75E-1	4.56E-1	1.05E+0	1.49E-2	9.86E-3	7.86E-3	6.52E-3	4.38E-3	5.30E-3	
1	1	5	600	6.10E-1	5.25E-1	5.00E-1	4.58E-1	4.06E-1	3.47E-1	3.71E-1	3.40E-1	6.22E-1	1.06E-2	1.00E-2	
1	1	5	700	6.31E-1	5.66E-1	4.36E-1	4.31E-1	4.23E-1	3.52E-1	3.13E-1	2.89E-1	2.44E-1	2.35E-1	1.86E-1	
1	1	5	800	6.28E-1	5.48E-1	5.12E-1	4.44E-1	4.07E-1	3.56E-1	3.42E-1	2.82E-1	2.30E-1	2.06E-1	2.01E-1	
1	1	5	900	6.56E-1	5.78E-1	4.69E-1	4.49E-1	3.88E-1	3.69E-1	3.26E-1	2.91E-1	2.47E-1	2.16E-1	1.91E-1	
1	1	5	1000	6.50E-1	5.66E-1	5.25E-1	4.67E-1	4.30E-1	3.73E-1	3.45E-1	3.20E-1	2.67E-1	2.34E-1	2.17E-1	
1	1	5	1500	9.31E-1	8.25E-1	7.08E-1	6.05E-1	5.25E-1	4.87E-1	4.44E-1	3.88E-1	3.59E-1	3.41E-1	2.65E-1	
1	1	5	2000	1.13E+0	9.93E-1	8.72E-1	7.93E-1	7.43E-1	6.10E-1	5.60E-1	5.20E-1	4.59E-1	4.16E-1	3.10E-1	
1	1	5	2500	1.21E+0	1.02E+0	9.67E-1	9.00E-1	7.74E-1	7.18E-1	6.30E-1	5.58E-1	5.39E-1	4.36E-1	3.93E-1	
1	1	5	3000	1.30E+0	1.19E+0	1.07E+0	9.54E-1	8.32E-1	7.96E-1	6.83E-1	6.37E-1	5.64E-1	4.96E-1	4.30E-1	
1	1	0	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	1	0	40	0.00E+0	3.42E-5	0.00E+0	2.59E-5	0.00E+0	2.62E-6	3.64E-6	4.95E-6	7.88E-6	6.39E-6	0.00E+0	
1	1	0	60	2.41E-4	2.53E-5	3.31E-4	1.56E-5	9.81E-5	2.76E-5	1.26E-4	6.28E-5	4.66E-5	3.00E-6	1.38E-5	
1	1	0	80	2.54E-4	1.68E-4	2.25E-4	2.60E-4	1.34E-4	3.28E-6	1.53E-5	2.54E-5	9.85E-5	0.00E+0	5.73E-5	
1	1	0	100	4.87E-4	3.78E-4	3.23E-4	2.78E-4	3.25E-4	4.28E-5	9.52E-5	1.85E-4	9.94E-5	1.02E-4	0.00E+0	
1	1	0	200	1.66E-3	1.82E-3	1.24E-3	9.24E-4	8.96E-4	7.01E-4	5.33E-4	3.72E-4	5.52E-4	5.67E-4	2.45E-4	
1	1	0	300	6.23E-3	4.76E-3	3.57E-3	4.23E-3	3.22E-3	2.59E-3	1.80E-3	1.73E-3	1.20E-3	5.78E-4	9.70E-4	
1	1	0	400	7.03E-1	1.49E+0	1.36E-2	7.46E-3	5.89E-3	5.99E-3	3.62E-3	3.89E-3	3.15E-3	2.15E-3	2.38E-3	
1	1	0	500	6.54E-1	5.78E-1	5.43E-1	5.08E-1	5.62E-1	7.57E-1	9.51E-3	6.88E-3	5.38E-3	5.47E-3	4.62E-3	
1	1	0	600	7.06E-1	6.06E-1	5.07E-1	4.47E-1	4.28E-1	4.19E-1	3.55E-1	3.41E-1	7.65E-1	1.43E-2	1.42E-2	
1	1	0	700	6.67E-1	6.00E-1	5.24E-1	4.53E-1	4.57E-1	3.77E-1	3.27E-1	3.07E-1	2.50E-1	2.45E-1	2.06E-1	
1	1	0	800	7.15E-1	5.95E-1	5.24E-1	4.69E-1	4.11E-1	3.62E-1	3.23E-1	3.14E-1	2.42E-1	2.19E-1	2.12E-1	
1	1	0	900	6.95E-1	6.56E-1	5.50E-1	4.44E-1	4.34E-1	3.78E-1	3.49E-1	3.02E-1	2.58E-1	2.28E-1	2.01E-1	
1	1	0	1000	7.23E-1	6.49E-1	5.60E-1	5.23E-1	4.52E-1	3.57E-1	3.43E-1	2.95E-1	2.93E-1	2.49E-1	1.96E-1	
1	1	0	1500	1.01E+0	9.13E-1	7.44E-1	6.68E-1	6.30E-1	5.07E-1	4.63E-1	4.28E-1	3.75E-1	3.22E-1	2.46E-1	
1	1	0	2000	1.21E+0	1.08E+0	1.03E+0	8.44E-1	7.65E-1	7.01E-1	6.11E-1	5.22E-1	4.86E-1	4.23E-1	3.56E-1	
1	1	0	2500	1.29E+0	1.14E+0	1.04E+0	9.20E-1	8.13E-1	7.56E-1	6.94E-1	5.99E-1	5.81E-1	5.32E-1	4.54E-1	
1	1	0	3000	1.47E+0	1.30E+0	1.12E+0	9.69E-1	9.13E-1	7.86E-1	7.21E-1	6.60E-1	5.43E-1	4.86E-1	4.41E-1	
1	0.5	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	0.5	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)										
				0	2	4	6	8	10	13	20	30	40	50	60	
				1	0.5	243	60	0.00E+0	0.00E+0	8.08E-4	1.86E-4	0.00E+0	7.41E-5	1.06E-5	1.42E-5	0.00E+0
1	0.5	243	80	0.00E+0	0.00E+0	2.94E-4	0.00E+0	0.00E+0	0.00E+0	7.85E-5	1.41E-5	0.00E+0	5.17E-5	1.61E-5	0.00E+0	0.00E+0
1	0.5	243	100	0.00E+0	4.99E-5	1.94E-4	9.73E-5	0.00E+0	1.08E-4	1.03E-4	2.49E-4	1.45E-5	4.15E-5	7.90E-5	5.32E-5	0.00E+0
1	0.5	243	200	2.15E-4	3.97E-4	1.97E-4	2.57E-4	7.81E-4	6.53E-4	8.55E-4	5.12E-4	4.50E-4	2.09E-4	8.01E-5	1.27E-4	0.00E+0
1	0.5	243	300	3.99E-4	1.21E-3	6.32E-4	1.76E-3	1.15E-3	1.15E-3	1.34E-3	1.18E-3	4.82E-4	5.79E-4	3.61E-4	4.77E-4	0.00E+0
1	0.5	243	400	2.43E-3	2.59E-3	3.43E-3	3.06E-3	2.32E-3	1.75E-3	3.15E-3	2.42E-3	1.63E-3	1.91E-3	1.69E-3	1.25E-3	0.00E+0
1	0.5	243	500	3.80E-3	4.15E-3	5.82E-3	4.08E-3	5.76E-3	6.22E-3	4.31E-3	4.07E-3	3.97E-3	2.74E-3	2.97E-3	2.55E-3	0.00E+0
1	0.5	243	600	4.00E-3	7.11E-3	7.40E-3	8.43E-3	8.90E-3	1.11E-2	7.72E-3	7.09E-3	6.20E-3	5.66E-3	5.37E-3	5.80E-3	0.00E+0
1	0.5	243	700	8.22E-3	1.27E-2	1.10E-2	1.58E-2	1.39E-2	1.27E-2	1.33E-2	1.06E-2	1.10E-2	9.93E-3	6.93E-3	7.13E-3	0.00E+0
1	0.5	243	800	1.53E-2	2.77E-2	4.49E-2	4.81E-2	5.25E-2	5.47E-2	6.84E-2	7.66E-2	1.47E-2	1.31E-2	1.23E-2	1.13E-2	0.00E+0
1	0.5	243	900	3.58E-2	3.30E-2	5.26E-2	4.99E-2	6.04E-2	6.46E-2	6.19E-2	5.70E-2	5.84E-2	4.45E-2	4.37E-2	5.92E-2	0.00E+0
1	0.5	243	1000	3.28E-2	3.91E-2	5.58E-2	5.83E-2	5.62E-2	6.08E-2	6.10E-2	5.71E-2	6.30E-2	5.77E-2	4.78E-2	4.24E-2	0.00E+0
1	0.5	243	1500	4.32E-2	7.38E-2	8.48E-2	1.05E-1	1.12E-1	1.20E-1	1.20E-1	1.13E-1	1.09E-1	1.02E-1	9.36E-2	9.08E-2	0.00E+0
1	0.5	243	2000	6.14E-2	1.16E-1	1.15E-1	1.40E-1	1.40E-1	1.61E-1	1.73E-1	1.82E-1	1.72E-1	1.67E-1	1.61E-1	1.51E-1	0.00E+0
1	0.5	243	2500	8.41E-2	1.35E-1	1.68E-1	2.02E-1	1.87E-1	2.48E-1	2.16E-1	2.36E-1	2.32E-1	2.38E-1	2.23E-1	2.19E-1	0.00E+0
1	0.5	243	3000	1.09E-1	1.81E-1	2.09E-1	2.08E-1	2.45E-1	2.51E-1	2.73E-1	2.72E-1	2.85E-1	2.82E-1	2.62E-1	2.85E-1	0.00E+0
1	0.5	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.36E-4	2.86E-4	1.40E-5	1.25E-4	0.00E+0	4.48E-5	1.18E-5	0.00E+0
1	0.5	151	60	1.21E-4	4.88E-4	0.00E+0	1.28E-4	4.25E-4	1.23E-4	2.30E-5	1.33E-4	6.80E-5	2.65E-5	8.39E-6	1.41E-5	0.00E+0
1	0.5	151	80	3.52E-4	7.69E-5	3.24E-4	2.89E-5	2.14E-5	3.13E-4	1.81E-4	1.97E-4	2.10E-4	9.22E-5	1.37E-4	3.05E-5	0.00E+0
1	0.5	151	100	1.76E-4	4.04E-4	6.58E-4	2.07E-4	0.00E+0	7.17E-5	3.12E-4	3.51E-4	2.05E-4	7.82E-5	1.32E-4	2.58E-4	0.00E+0
1	0.5	151	200	1.71E-3	1.02E-3	8.73E-4	1.09E-3	1.53E-3	1.36E-3	1.03E-3	1.33E-3	1.20E-3	8.22E-4	3.71E-4	5.09E-4	0.00E+0
1	0.5	151	300	2.03E-3	2.56E-3	3.31E-3	3.30E-3	3.65E-3	3.20E-3	2.71E-3	3.03E-3	2.54E-3	1.94E-3	1.72E-3	1.38E-3	0.00E+0
1	0.5	151	400	4.21E-3	7.87E-3	7.62E-3	9.06E-3	8.03E-3	8.72E-3	6.59E-3	7.77E-3	5.37E-3	4.63E-3	4.02E-3	3.26E-3	0.00E+0
1	0.5	151	500	8.31E-3	1.15E-2	1.44E-2	1.65E-2	1.25E-2	1.54E-2	1.34E-2	1.23E-2	1.01E-2	8.89E-3	7.78E-3	7.01E-3	0.00E+0
1	0.5	151	600	6.69E-2	1.04E-1	1.00E-1	1.45E-1	1.61E-1	1.39E-1	1.75E-1	2.57E-1	1.73E-2	1.45E-2	1.19E-2	1.14E-2	0.00E+0
1	0.5	151	700	8.53E-2	1.28E-1	1.45E-1	1.43E-1	1.48E-1	1.47E-1	1.47E-1	1.39E-1	1.44E-1	1.29E-1	1.29E-1	1.86E-1	0.00E+0
1	0.5	151	800	1.04E-1	1.39E-1	1.32E-1	1.57E-1	1.54E-1	1.47E-1	1.47E-1	1.50E-1	1.48E-1	1.23E-1	1.23E-1	1.06E-1	0.00E+0
1	0.5	151	900	9.24E-2	1.07E-1	1.27E-1	1.57E-1	1.99E-1	1.77E-1	1.81E-1	1.60E-1	1.49E-1	1.33E-1	1.28E-1	1.18E-1	0.00E+0
1	0.5	151	1000	8.53E-2	1.48E-1	1.68E-1	1.49E-1	1.56E-1	1.96E-1	1.83E-1	1.78E-1	1.69E-1	1.70E-1	1.45E-1	1.29E-1	0.00E+0
1	0.5	151	1500	1.52E-1	1.61E-1	2.23E-1	1.91E-1	2.46E-1	2.54E-1	2.60E-1	2.27E-1	2.23E-1	2.21E-1	2.08E-1	1.96E-1	0.00E+0
1	0.5	151	2000	2.25E-1	2.10E-1	2.81E-1	2.74E-1	2.92E-1	3.07E-1	3.42E-1	3.35E-1	3.25E-1	2.86E-1	2.72E-1	2.77E-1	0.00E+0
1	0.5	151	2500	2.03E-1	2.62E-1	3.22E-1	3.44E-1	3.54E-1	3.68E-1	3.89E-1	4.14E-1	3.77E-1	3.79E-1	3.80E-1	3.43E-1	0.00E+0
1	0.5	151	3000	1.93E-1	3.51E-1	3.91E-1	4.12E-1	4.43E-1	4.24E-1	4.91E-1	4.74E-1	4.57E-1	4.86E-1	4.36E-1	4.08E-1	0.00E+0
1	0.5	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	93	40	0.00E+0	3.15E-4	4.28E-4	0.00E+0	2.59E-4	2.65E-4	8.54E-5	1.09E-4	6.91E-5	3.47E-5	5.84E-5	1.01E-5	0.00E+0
1	0.5	93	60	4.17E-5	3.99E-4	1.42E-4	1.65E-4	1.47E-4	1.26E-4	3.59E-4	3.10E-4	1.75E-4	6.36E-5	3.93E-5	8.58E-5	0.00E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)											
				70	80	90	100	110	120	130	140	150	160	170			
				1	0.5	243	60	0.00E+0	0.00E+0	3.09E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.78E-5
1	0.5	243	80	5.63E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.09E-5
1	0.5	243	100	9.54E-5	4.57E-5	7.55E-5	3.20E-5	0.00E+0	0.00E+0	0.00E+0	1.60E-5	0.00E+0	0.00E+0	0.00E+0	2.71E-5	0.00E+0	0.00E+0
1	0.5	243	200	1.16E-4	1.22E-4	1.00E-4	3.82E-5	2.04E-4	8.21E-5	5.03E-5	1.14E-5	0.00E+0	4.94E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	300	5.47E-4	3.49E-4	3.46E-4	1.72E-4	3.41E-4	1.56E-4	1.28E-4	6.43E-5	9.51E-5	1.51E-4	4.33E-4	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	400	1.04E-3	1.05E-3	3.85E-4	7.68E-4	5.07E-4	4.50E-4	4.46E-4	3.31E-4	5.25E-4	4.74E-4	1.41E-4	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	500	1.98E-3	1.15E-3	2.06E-3	1.84E-3	1.73E-3	1.02E-3	8.30E-4	1.25E-3	5.79E-4	8.77E-4	7.03E-4	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	600	4.28E-3	3.43E-3	2.71E-3	3.23E-3	2.31E-3	2.16E-3	2.34E-3	2.42E-3	1.48E-3	1.71E-3	1.74E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	700	6.53E-3	5.51E-3	4.36E-3	4.15E-3	3.21E-3	3.27E-3	3.28E-3	3.97E-3	2.72E-3	2.67E-3	2.02E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	800	9.99E-3	9.24E-3	6.44E-3	6.28E-3	5.31E-3	3.89E-3	4.84E-3	3.42E-3	3.26E-3	3.41E-3	3.06E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	900	1.53E-2	1.07E-2	9.02E-3	7.77E-3	9.79E-3	6.42E-3	6.30E-3	4.68E-3	4.32E-3	4.49E-3	3.68E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	1000	4.17E-2	3.59E-2	3.32E-2	3.74E-2	2.53E-2	1.08E-2	7.85E-3	7.88E-3	5.97E-3	6.57E-3	8.25E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	1500	9.17E-2	7.80E-2	7.60E-2	6.70E-2	6.13E-2	4.93E-2	4.63E-2	4.61E-2	4.02E-2	3.70E-2	3.47E-2	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	2000	1.43E-1	1.32E-1	1.22E-1	1.16E-1	1.16E-1	1.03E-1	9.16E-2	8.83E-2	8.01E-2	7.86E-2	6.61E-2	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	2500	2.19E-1	2.15E-1	2.11E-1	1.91E-1	1.85E-1	1.77E-1	1.71E-1	1.59E-1	1.48E-1	1.37E-1	1.40E-1	0.00E+0	0.00E+0	0.00E+0
1	0.5	243	3000	2.67E-1	2.74E-1	2.54E-1	2.60E-1	2.42E-1	2.40E-1	2.32E-1	2.20E-1	2.19E-1	2.14E-1	2.22E-1	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	40	1.62E-6	1.13E-5	0.00E+0	0.00E+0	4.28E-5	0.00E+0	9.08E-6	2.60E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	60	2.37E-6	3.64E-6	0.00E+0	0.00E+0	1.33E-4	1.51E-6	0.00E+0	1.27E-5	4.10E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	80	7.79E-5	0.00E+0	1.74E-5	0.00E+0	0.00E+0	5.09E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	100	1.41E-4	0.00E+0	9.84E-6	8.68E-5	1.17E-5	3.49E-5	1.58E-5	3.36E-5	0.00E+0	3.11E-6	4.06E-6	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	200	6.75E-4	4.79E-4	2.44E-4	2.22E-4	3.28E-4	9.97E-5	2.09E-4	2.85E-4	1.38E-4	5.15E-5	2.11E-4	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	300	1.20E-3	7.08E-4	1.11E-3	9.55E-4	3.84E-4	2.77E-4	5.40E-4	3.28E-4	4.65E-4	2.17E-4	2.35E-4	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	400	2.73E-3	2.43E-3	2.02E-3	2.23E-3	1.28E-3	9.73E-4	1.46E-3	1.03E-3	8.26E-4	9.82E-4	8.43E-4	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	500	5.69E-3	4.73E-3	4.74E-3	4.46E-3	3.67E-3	2.67E-3	1.97E-3	2.08E-3	1.49E-3	1.29E-3	1.44E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	600	9.35E-3	8.45E-3	7.35E-3	6.17E-3	6.03E-3	5.11E-3	5.19E-3	3.70E-3	3.85E-3	4.21E-3	4.84E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	700	1.49E-2	1.37E-2	9.98E-3	1.28E-2	8.55E-3	7.45E-3	6.23E-3	7.66E-3	5.97E-3	6.01E-3	5.23E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	800	1.07E-1	8.86E-2	7.91E-2	1.23E-1	1.33E-2	9.78E-3	9.45E-3	9.99E-3	8.68E-3	8.36E-3	6.33E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	900	1.13E-1	8.58E-2	7.95E-2	6.62E-2	6.10E-2	5.39E-2	4.76E-2	9.07E-2	1.29E-2	1.25E-2	8.41E-3	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	1000	1.09E-1	1.09E-1	9.12E-2	8.38E-2	7.89E-2	6.57E-2	5.53E-2	5.05E-2	4.73E-2	4.24E-2	2.98E-2	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	1500	1.89E-1	1.70E-1	1.62E-1	1.44E-1	1.39E-1	1.21E-1	1.09E-1	1.08E-1	1.01E-1	8.74E-2	7.31E-2	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	2000	2.67E-1	2.52E-1	2.37E-1	2.19E-1	2.03E-1	1.96E-1	1.85E-1	1.72E-1	1.62E-1	1.58E-1	1.55E-1	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	2500	3.42E-1	3.24E-1	3.02E-1	2.98E-1	3.04E-1	2.75E-1	2.78E-1	2.59E-1	2.45E-1	2.36E-1	2.48E-1	0.00E+0	0.00E+0	0.00E+0
1	0.5	151	3000	4.06E-1	3.89E-1	3.63E-1	3.49E-1	3.58E-1	3.53E-1	3.24E-1	3.14E-1	3.08E-1	3.03E-1	2.83E-1	0.00E+0	0.00E+0	0.00E+0
1	0.5	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	93	40	2.67E-5	1.35E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.60E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	93	60	7.03E-5	5.39E-5	8.06E-5	1.22E-4	4.68E-5	4.94E-5	0.00E+0	1.27E-5	0.00E+0	4.71E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)											
				Water Depth (cm)		4	6	8	10	13	20	30	40	50	60
				0	2										
1	0.5	93	80	2.70E-5	8.22E-4	6.23E-4	7.03E-4	4.01E-4	1.31E-4	3.98E-4	5.75E-4	3.55E-4	9.88E-5	4.32E-4	1.09E-4
1	0.5	93	100	0.00E+0	9.82E-4	8.43E-4	2.91E-4	7.07E-4	3.45E-4	4.57E-4	6.10E-4	4.40E-4	4.04E-4	2.57E-4	3.94E-4
1	0.5	93	200	3.61E-3	4.75E-3	4.58E-3	3.61E-3	3.30E-3	3.53E-3	4.46E-3	2.93E-3	2.16E-3	1.66E-3	1.76E-3	1.37E-3
1	0.5	93	300	5.89E-3	9.10E-3	8.41E-3	9.81E-3	7.29E-3	7.97E-3	6.82E-3	6.56E-3	5.59E-3	4.45E-3	4.99E-3	4.06E-3
1	0.5	93	400	2.49E-2	2.42E-2	2.69E-2	2.41E-2	2.62E-2	1.81E-2	1.73E-2	1.46E-2	1.22E-2	1.09E-2	7.79E-3	6.65E-3
1	0.5	93	500	2.13E-1	2.56E-1	2.68E-1	2.90E-1	2.84E-1	2.41E-1	2.97E-1	3.20E-1	6.66E-1	1.83E-2	1.42E-2	1.31E-2
1	0.5	93	600	2.46E-1	2.73E-1	2.91E-1	3.22E-1	3.04E-1	3.01E-1	3.02E-1	2.95E-1	2.91E-1	2.52E-1	2.30E-1	2.28E-1
1	0.5	93	700	1.85E-1	2.62E-1	2.61E-1	2.81E-1	2.91E-1	2.96E-1	3.11E-1	2.92E-1	2.84E-1	2.60E-1	2.29E-1	2.32E-1
1	0.5	93	800	2.27E-1	2.56E-1	3.36E-1	2.85E-1	3.65E-1	2.73E-1	3.32E-1	3.08E-1	2.80E-1	2.60E-1	2.56E-1	2.40E-1
1	0.5	93	900	2.43E-1	2.97E-1	3.10E-1	3.49E-1	3.64E-1	3.19E-1	3.44E-1	3.27E-1	3.13E-1	2.61E-1	2.63E-1	2.11E-1
1	0.5	93	1000	2.84E-1	3.10E-1	3.82E-1	3.44E-1	2.87E-1	4.10E-1	3.86E-1	3.27E-1	3.32E-1	3.01E-1	2.80E-1	2.45E-1
1	0.5	93	1500	3.68E-1	3.86E-1	4.40E-1	5.32E-1	4.96E-1	5.17E-1	5.06E-1	4.62E-1	4.16E-1	3.72E-1	3.44E-1	3.06E-1
1	0.5	93	2000	4.57E-1	5.48E-1	6.04E-1	5.41E-1	5.94E-1	5.93E-1	6.42E-1	5.87E-1	5.23E-1	5.50E-1	4.93E-1	4.13E-1
1	0.5	93	2500	4.15E-1	5.88E-1	6.44E-1	7.33E-1	8.09E-1	6.94E-1	7.00E-1	6.88E-1	6.36E-1	5.95E-1	5.45E-1	5.26E-1
1	0.5	93	3000	4.71E-1	5.99E-1	7.40E-1	7.76E-1	9.09E-1	7.87E-1	8.48E-1	8.42E-1	7.45E-1	6.95E-1	6.12E-1	5.88E-1
1	0.5	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	58	40	0.00E+0	2.15E-4	9.84E-4	3.11E-5	9.95E-5	2.40E-4	2.14E-4	1.97E-4	1.82E-4	1.30E-4	5.93E-5	2.32E-5
1	0.5	58	60	0.00E+0	8.75E-4	4.95E-4	1.50E-4	4.26E-4	4.56E-4	3.57E-4	5.89E-4	3.75E-4	2.03E-4	2.30E-4	2.03E-4
1	0.5	58	80	4.91E-4	5.13E-4	7.05E-4	1.34E-3	1.15E-3	1.40E-3	9.04E-4	7.89E-4	5.94E-4	6.14E-4	5.33E-4	2.47E-4
1	0.5	58	100	8.62E-4	1.62E-3	2.64E-3	1.31E-3	1.48E-3	1.54E-3	1.71E-3	1.24E-3	9.81E-4	1.05E-3	4.90E-4	6.62E-4
1	0.5	58	200	6.21E-3	6.58E-3	8.60E-3	7.46E-3	7.05E-3	7.76E-3	5.57E-3	5.64E-3	4.40E-3	3.72E-3	2.85E-3	2.83E-3
1	0.5	58	300	2.56E-2	3.80E-2	2.83E-2	2.69E-2	1.66E-2	1.78E-2	2.11E-2	1.56E-2	1.00E-2	7.94E-3	7.19E-3	4.97E-3
1	0.5	58	400	3.23E-1	4.02E-1	4.73E-1	4.30E-1	4.16E-1	4.54E-1	4.65E-1	4.90E-1	8.83E-1	1.75E-2	1.24E-2	1.00E-2
1	0.5	58	500	3.24E-1	4.88E-1	3.97E-1	4.55E-1	5.06E-1	4.80E-1	4.87E-1	4.52E-1	4.35E-1	3.84E-1	3.50E-1	8.59E-1
1	0.5	58	600	4.35E-1	4.65E-1	5.33E-1	5.34E-1	4.30E-1	4.71E-1	4.45E-1	4.50E-1	4.16E-1	4.06E-1	3.55E-1	3.19E-1
1	0.5	58	700	3.48E-1	3.78E-1	5.81E-1	5.59E-1	5.56E-1	5.03E-1	4.83E-1	4.99E-1	4.59E-1	3.72E-1	3.61E-1	3.26E-1
1	0.5	58	800	4.51E-1	5.07E-1	5.16E-1	5.76E-1	5.27E-1	5.45E-1	5.24E-1	5.22E-1	4.77E-1	4.35E-1	4.07E-1	3.56E-1
1	0.5	58	900	4.45E-1	5.88E-1	6.22E-1	5.63E-1	6.27E-1	6.55E-1	5.78E-1	5.46E-1	4.66E-1	4.15E-1	3.80E-1	3.54E-1
1	0.5	58	1000	5.62E-1	5.91E-1	5.72E-1	6.96E-1	7.08E-1	5.99E-1	5.89E-1	5.47E-1	5.07E-1	4.47E-1	4.16E-1	4.02E-1
1	0.5	58	1500	5.98E-1	7.90E-1	7.64E-1	8.73E-1	8.74E-1	8.67E-1	7.75E-1	7.52E-1	6.79E-1	6.36E-1	5.35E-1	5.10E-1
1	0.5	58	2000	6.38E-1	7.56E-1	9.82E-1	1.08E+0	8.33E-1	9.55E-1	1.02E+0	9.28E-1	8.59E-1	7.52E-1	6.65E-1	5.92E-1
1	0.5	58	2500	8.28E-1	9.11E-1	9.72E-1	1.15E+0	1.25E+0	1.15E+0	1.05E+0	1.11E+0	9.77E-1	8.93E-1	7.85E-1	7.22E-1
1	0.5	58	3000	4.71E-1	5.99E-1	7.40E-1	7.76E-1	9.09E-1	7.87E-1	8.48E-1	8.42E-1	7.45E-1	6.95E-1	6.12E-1	5.88E-1
1	0.5	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	26	40	1.20E-4	1.60E-4	1.12E-3	1.17E-4	4.77E-4	8.84E-4	2.03E-4	2.85E-4	1.17E-4	1.27E-4	3.27E-4	2.32E-5
1	0.5	26	60	6.15E-4	1.03E-3	8.78E-4	5.02E-4	2.10E-3	1.49E-3	1.71E-3	5.32E-4	5.54E-4	6.37E-4	2.66E-4	4.70E-4
1	0.5	26	80	1.16E-3	2.65E-3	1.35E-3	4.40E-3	4.86E-3	2.13E-3	2.89E-3	9.11E-4	1.05E-3	8.04E-4	6.62E-4	5.40E-4

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				1	0.5	93	80	1.41E-4	1.89E-4	1.13E-4	1.18E-5	3.91E-5	7.34E-5	1.28E-5	4.44E-5
1	0.5	93	100	8.59E-5	4.00E-4	1.25E-4	1.98E-4	1.48E-4	1.72E-4	1.40E-4	3.78E-5	1.55E-5	1.23E-5	1.18E-4	
1	0.5	93	200	1.04E-3	1.06E-3	5.10E-4	4.81E-4	3.59E-4	2.01E-4	2.38E-4	2.04E-4	4.17E-4	2.63E-4	5.46E-5	
1	0.5	93	300	2.63E-3	1.55E-3	1.56E-3	1.61E-3	1.77E-3	1.16E-3	9.89E-4	8.44E-4	1.01E-3	4.67E-4	7.06E-4	
1	0.5	93	400	5.37E-3	4.84E-3	4.45E-3	3.91E-3	3.99E-3	1.84E-3	2.95E-3	2.90E-3	1.55E-3	1.85E-3	6.41E-4	
1	0.5	93	500	1.04E-2	7.43E-3	7.58E-3	6.92E-3	5.98E-3	6.21E-3	4.40E-3	3.55E-3	2.93E-3	3.00E-3	2.61E-3	
1	0.5	93	600	4.23E-1	1.62E-2	1.30E-2	1.24E-2	1.16E-2	8.08E-3	7.22E-3	6.15E-3	5.86E-3	5.66E-3	5.86E-3	
1	0.5	93	700	1.83E-1	1.70E-1	1.50E-1	1.50E-1	2.64E-1	1.53E-2	1.18E-2	1.10E-2	8.41E-3	8.52E-3	6.39E-3	
1	0.5	93	800	1.93E-1	1.62E-1	1.50E-1	1.35E-1	1.29E-1	1.16E-1	9.76E-2	1.05E-1	1.69E-1	1.19E-2	1.08E-2	
1	0.5	93	900	2.08E-1	1.68E-1	1.63E-1	1.50E-1	1.32E-1	1.13E-1	1.00E-1	9.27E-2	7.58E-2	7.71E-2	6.38E-2	
1	0.5	93	1000	2.22E-1	1.98E-1	1.74E-1	1.54E-1	1.36E-1	1.31E-1	1.15E-1	9.89E-2	9.04E-2	8.06E-2	6.67E-2	
1	0.5	93	1500	2.96E-1	2.82E-1	2.60E-1	2.47E-1	2.32E-1	2.08E-1	1.90E-1	1.67E-1	1.54E-1	1.34E-1	1.27E-1	
1	0.5	93	2000	4.37E-1	3.80E-1	3.72E-1	3.40E-1	2.99E-1	3.23E-1	2.71E-1	2.90E-1	2.42E-1	2.38E-1	2.13E-1	
1	0.5	93	2500	4.89E-1	4.42E-1	4.52E-1	4.21E-1	4.11E-1	3.65E-1	3.67E-1	3.29E-1	3.31E-1	3.05E-1	2.61E-1	
1	0.5	93	3000	5.42E-1	5.19E-1	5.13E-1	4.57E-1	4.61E-1	4.22E-1	4.15E-1	3.88E-1	3.84E-1	3.74E-1	3.54E-1	
1	0.5	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	0.5	58	40	0.00E+0	0.00E+0	9.50E-6	1.20E-4	2.33E-5	0.00E+0	0.00E+0	2.96E-5	0.00E+0	0.00E+0	0.00E+0	
1	0.5	58	60	5.76E-5	1.29E-4	1.42E-4	1.40E-4	3.82E-5	6.14E-5	8.18E-5	1.00E-6	5.15E-6	3.98E-5	0.00E+0	
1	0.5	58	80	2.17E-4	1.90E-4	6.47E-5	1.82E-4	3.43E-4	5.02E-5	7.37E-5	8.41E-5	0.00E+0	6.37E-5	0.00E+0	
1	0.5	58	100	3.62E-4	4.22E-4	1.65E-4	1.61E-4	2.37E-4	1.41E-4	1.91E-4	9.04E-5	8.00E-5	3.23E-5	2.40E-4	
1	0.5	58	200	1.92E-3	1.52E-3	1.21E-3	1.50E-3	7.98E-4	7.80E-4	8.83E-4	3.63E-4	5.11E-4	6.73E-4	3.33E-4	
1	0.5	58	300	5.61E-3	3.66E-3	3.08E-3	3.60E-3	2.46E-3	1.74E-3	1.23E-3	1.30E-3	9.64E-4	1.22E-3	9.80E-4	
1	0.5	58	400	8.74E-3	6.59E-3	5.71E-3	5.32E-3	4.79E-3	3.67E-3	2.96E-3	3.32E-3	2.01E-3	2.21E-3	2.10E-3	
1	0.5	58	500	1.99E-2	1.39E-2	1.15E-2	8.74E-3	7.94E-3	6.77E-3	6.01E-3	5.54E-3	4.29E-3	4.06E-3	2.64E-3	
1	0.5	58	600	3.11E-1	2.76E-1	2.41E-1	5.18E-1	1.46E-2	1.29E-2	1.06E-2	8.76E-3	7.01E-3	8.03E-3	4.75E-3	
1	0.5	58	700	2.71E-1	2.54E-1	2.51E-1	1.94E-1	2.06E-1	1.91E-1	1.67E-1	3.32E-1	1.28E-2	1.17E-2	8.85E-3	
1	0.5	58	800	3.12E-1	2.86E-1	2.34E-1	2.05E-1	2.01E-1	1.58E-1	1.62E-1	1.40E-1	1.25E-1	1.09E-1	9.88E-2	
1	0.5	58	900	2.98E-1	2.59E-1	2.57E-1	2.35E-1	2.22E-1	1.78E-1	1.54E-1	1.29E-1	1.21E-1	1.17E-1	9.69E-2	
1	0.5	58	1000	3.42E-1	2.99E-1	2.65E-1	2.47E-1	2.09E-1	1.86E-1	1.66E-1	1.56E-1	1.45E-1	1.29E-1	1.03E-1	
1	0.5	58	1500	4.67E-1	3.80E-1	3.38E-1	3.16E-1	2.94E-1	2.98E-1	2.35E-1	2.16E-1	1.91E-1	1.77E-1	1.83E-1	
1	0.5	58	2000	5.36E-1	4.94E-1	4.72E-1	4.44E-1	4.19E-1	4.07E-1	3.55E-1	3.30E-1	3.04E-1	2.72E-1	2.42E-1	
1	0.5	58	2500	6.41E-1	5.62E-1	5.64E-1	5.05E-1	4.73E-1	4.24E-1	4.23E-1	4.00E-1	3.70E-1	3.20E-1	3.08E-1	
1	0.5	58	3000	5.42E-1	5.19E-1	5.13E-1	4.57E-1	4.61E-1	4.22E-1	4.15E-1	3.88E-1	3.84E-1	3.74E-1	3.54E-1	
1	0.5	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	0.5	26	40	1.11E-5	4.45E-5	4.57E-5	7.55E-5	2.25E-5	0.00E+0	0.00E+0	4.04E-5	0.00E+0	0.00E+0	0.00E+0	
1	0.5	26	60	2.38E-4	2.25E-4	1.79E-4	2.94E-4	1.12E-4	1.34E-4	2.05E-4	1.12E-4	1.12E-4	3.60E-5	0.00E+0	
1	0.5	26	80	4.03E-4	2.26E-4	2.74E-4	1.81E-4	1.99E-4	6.68E-5	1.64E-4	1.17E-4	7.47E-5	6.68E-5	3.62E-4	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				0	2	4	6	8	10	13	20	30	40	50	60
				1	0.5	26	100	2.85E-3	3.97E-3	3.23E-3	3.54E-3	4.95E-3	4.78E-3	3.09E-3	2.29E-3
1	0.5	26	200	6.95E-1	2.43E+0	9.01E-2	5.78E-2	3.55E-2	3.02E-2	2.21E-2	1.18E-2	8.94E-3	5.67E-3	5.33E-3	3.43E-3
1	0.5	26	300	5.58E-1	6.65E-1	6.79E-1	7.22E-1	7.05E-1	6.48E-1	7.48E-1	7.73E-1	1.17E+0	1.20E-2	7.53E-3	6.03E-3
1	0.5	26	400	6.35E-1	7.00E-1	7.07E-1	7.98E-1	8.11E-1	7.03E-1	7.49E-1	6.84E-1	6.67E-1	5.90E-1	5.79E-1	1.09E+0
1	0.5	26	500	7.75E-1	8.51E-1	7.35E-1	8.38E-1	8.15E-1	8.88E-1	7.00E-1	7.28E-1	5.99E-1	5.79E-1	5.65E-1	4.89E-1
1	0.5	26	600	7.33E-1	8.50E-1	8.31E-1	8.97E-1	8.22E-1	8.68E-1	8.09E-1	7.22E-1	6.80E-1	6.10E-1	5.17E-1	4.91E-1
1	0.5	26	700	6.65E-1	9.27E-1	9.62E-1	8.89E-1	1.06E+0	9.22E-1	8.87E-1	8.40E-1	6.92E-1	6.65E-1	5.82E-1	5.32E-1
1	0.5	26	800	7.88E-1	7.87E-1	1.06E+0	9.77E-1	9.71E-1	9.56E-1	9.83E-1	9.00E-1	7.70E-1	6.50E-1	6.24E-1	5.57E-1
1	0.5	26	900	9.60E-1	8.45E-1	1.07E+0	1.06E+0	1.05E+0	1.01E+0	1.08E+0	9.45E-1	8.07E-1	7.00E-1	6.20E-1	5.42E-1
1	0.5	26	1000	8.75E-1	1.03E+0	1.02E+0	1.06E+0	1.05E+0	1.15E+0	1.01E+0	9.76E-1	8.40E-1	7.30E-1	6.03E-1	5.64E-1
1	0.5	26	1500	9.95E-1	1.26E+0	1.43E+0	1.36E+0	1.46E+0	1.38E+0	1.30E+0	1.21E+0	1.17E+0	8.99E-1	8.40E-1	7.41E-1
1	0.5	26	2000	1.18E+0	1.31E+0	1.59E+0	1.80E+0	1.62E+0	1.57E+0	1.65E+0	1.46E+0	1.21E+0	1.16E+0	1.02E+0	8.67E-1
1	0.5	26	2500	1.36E+0	1.58E+0	1.65E+0	1.67E+0	1.83E+0	1.82E+0	1.67E+0	1.57E+0	1.52E+0	1.27E+0	1.18E+0	1.05E+0
1	0.5	26	3000	1.29E+0	1.68E+0	1.69E+0	1.67E+0	1.84E+0	1.83E+0	1.91E+0	1.74E+0	1.53E+0	1.40E+0	1.32E+0	1.15E+0
1	0.5	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	12	40	1.05E-3	4.76E-4	7.90E-4	6.13E-4	1.64E-3	2.08E-4	5.26E-4	5.93E-4	2.39E-4	2.63E-4	2.17E-4	2.34E-4
1	0.5	12	60	3.35E-3	1.67E-3	2.11E-3	3.48E-3	2.43E-3	3.33E-3	3.03E-3	1.48E-3	1.16E-3	5.95E-4	3.73E-4	3.27E-4
1	0.5	12	80	5.45E-3	8.81E-3	8.67E-3	7.56E-3	3.41E-3	5.02E-3	2.50E-3	3.84E-3	1.59E-3	1.55E-3	7.29E-4	6.96E-4
1	0.5	12	100	1.43E-2	2.13E-2	1.66E-2	1.14E-2	7.71E-3	6.98E-3	8.35E-3	4.00E-3	3.16E-3	2.22E-3	1.10E-3	1.01E-3
1	0.5	12	200	6.11E-1	8.19E-1	8.31E-1	8.80E-1	9.40E-1	1.00E+0	3.33E+0	4.09E-2	7.33E-3	5.31E-3	3.98E-3	3.22E-3
1	0.5	12	300	7.95E-1	8.37E-1	8.47E-1	9.41E-1	8.10E-1	9.11E-1	8.07E-1	7.83E-1	8.15E-1	1.56E+0	1.33E-2	6.23E-3
1	0.5	12	400	8.95E-1	9.11E-1	9.19E-1	9.21E-1	9.01E-1	7.96E-1	8.32E-1	8.82E-1	7.55E-1	7.36E-1	6.90E-1	6.30E-1
1	0.5	12	500	1.00E+0	9.03E-1	1.03E+0	1.09E+0	1.08E+0	1.04E+0	8.95E-1	8.98E-1	7.84E-1	7.34E-1	6.86E-1	5.92E-1
1	0.5	12	600	8.00E-1	1.05E+0	1.10E+0	1.12E+0	1.16E+0	1.09E+0	9.14E-1	9.68E-1	8.41E-1	8.01E-1	6.66E-1	6.30E-1
1	0.5	12	700	1.07E+0	1.15E+0	1.13E+0	1.17E+0	1.14E+0	1.09E+0	1.10E+0	9.72E-1	9.02E-1	7.73E-1	7.22E-1	6.08E-1
1	0.5	12	800	1.05E+0	1.10E+0	1.27E+0	1.26E+0	1.10E+0	1.20E+0	1.19E+0	1.08E+0	9.98E-1	7.93E-1	7.31E-1	6.60E-1
1	0.5	12	900	1.20E+0	1.34E+0	1.52E+0	1.37E+0	1.45E+0	1.32E+0	1.23E+0	1.15E+0	9.95E-1	8.45E-1	7.46E-1	6.40E-1
1	0.5	12	1000	1.17E+0	1.20E+0	1.40E+0	1.43E+0	1.23E+0	1.28E+0	1.29E+0	1.13E+0	1.07E+0	9.35E-1	7.70E-1	7.14E-1
1	0.5	12	1500	1.33E+0	1.67E+0	1.75E+0	1.68E+0	1.71E+0	1.66E+0	1.61E+0	1.50E+0	1.45E+0	1.24E+0	1.02E+0	9.46E-1
1	0.5	12	2000	1.23E+0	1.66E+0	1.90E+0	1.98E+0	1.93E+0	1.77E+0	1.94E+0	1.83E+0	1.51E+0	1.43E+0	1.27E+0	1.12E+0
1	0.5	12	2500	1.30E+0	1.82E+0	1.96E+0	1.80E+0	1.89E+0	1.98E+0	1.81E+0	1.88E+0	1.69E+0	1.50E+0	1.43E+0	1.21E+0
1	0.5	12	3000	1.56E+0	1.85E+0	1.84E+0	1.81E+0	2.00E+0	2.03E+0	1.90E+0	2.04E+0	1.83E+0	1.73E+0	1.51E+0	1.36E+0
1	0.5	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	5	40	4.42E-3	5.81E-3	3.54E-3	1.50E-3	1.67E-3	9.54E-4	7.97E-4	6.75E-4	1.31E-4	3.72E-4	1.12E-4	2.45E-4
1	0.5	5	60	1.32E-2	1.39E-2	9.01E-3	6.37E-3	5.55E-3	4.03E-3	1.74E-3	1.93E-3	1.36E-3	9.91E-4	2.80E-4	2.58E-4
1	0.5	5	80	1.85E+0	7.79E-2	3.85E-2	2.11E-2	1.24E-2	5.66E-3	2.93E-3	3.55E-3	2.00E-3	1.25E-3	1.06E-3	9.75E-4
1	0.5	5	100	1.20E+0	3.30E+0	1.30E-1	5.10E-2	2.86E-2	2.04E-2	6.04E-3	4.11E-3	2.86E-3	1.79E-3	1.58E-3	1.15E-3

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				1	0.5	26	100	4.07E-4	4.49E-4	3.02E-4	2.57E-4	3.09E-4	3.79E-4	1.74E-4	1.43E-4
1	0.5	26	200	2.66E-3	2.02E-3	1.88E-3	1.61E-3	1.43E-3	1.65E-3	1.58E-3	7.10E-4	7.01E-4	7.64E-4	2.39E-4	
1	0.5	26	300	4.79E-3	5.10E-3	4.17E-3	2.57E-3	2.64E-3	2.02E-3	1.90E-3	2.26E-3	1.47E-3	7.36E-4	1.13E-3	
1	0.5	26	400	1.39E-2	9.47E-3	7.90E-3	6.41E-3	5.15E-3	4.72E-3	4.48E-3	2.88E-3	2.71E-3	2.27E-3	2.72E-3	
1	0.5	26	500	4.59E-1	4.53E-1	9.81E-1	1.70E-2	9.30E-3	9.39E-3	6.59E-3	6.15E-3	5.74E-3	5.17E-3	5.17E-3	
1	0.5	26	600	4.54E-1	4.11E-1	3.62E-1	3.36E-1	3.32E-1	2.85E-1	5.73E-1	1.31E-2	1.12E-2	8.31E-3	7.69E-3	
1	0.5	26	700	4.48E-1	4.26E-1	3.59E-1	3.40E-1	2.96E-1	2.60E-1	2.40E-1	2.24E-1	1.78E-1	1.88E-1	2.39E-1	
1	0.5	26	800	4.76E-1	4.17E-1	3.82E-1	3.51E-1	3.03E-1	2.57E-1	2.32E-1	2.00E-1	1.87E-1	1.64E-1	1.47E-1	
1	0.5	26	900	4.98E-1	4.12E-1	3.81E-1	3.42E-1	2.84E-1	2.64E-1	2.40E-1	2.34E-1	1.97E-1	1.64E-1	1.35E-1	
1	0.5	26	1000	4.79E-1	4.52E-1	4.00E-1	3.66E-1	3.12E-1	2.85E-1	2.45E-1	2.34E-1	2.05E-1	1.71E-1	1.63E-1	
1	0.5	26	1500	6.41E-1	5.96E-1	5.16E-1	4.84E-1	4.08E-1	3.65E-1	3.51E-1	3.17E-1	2.79E-1	2.48E-1	2.35E-1	
1	0.5	26	2000	8.82E-1	8.06E-1	6.91E-1	6.25E-1	5.53E-1	5.24E-1	4.50E-1	3.88E-1	3.92E-1	3.57E-1	3.17E-1	
1	0.5	26	2500	9.65E-1	8.58E-1	8.05E-1	7.05E-1	6.44E-1	5.87E-1	5.23E-1	4.89E-1	4.24E-1	4.23E-1	3.65E-1	
1	0.5	26	3000	1.07E+0	9.78E-1	8.39E-1	7.68E-1	7.23E-1	6.20E-1	5.62E-1	5.44E-1	4.93E-1	4.31E-1	4.03E-1	
1	0.5	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	0.5	12	40	1.23E-4	9.38E-5	7.33E-5	6.21E-5	3.70E-5	1.02E-5	0.00E+0	2.60E-5	2.38E-6	0.00E+0	0.00E+0	
1	0.5	12	60	3.44E-4	3.87E-4	9.36E-5	2.14E-4	2.86E-4	9.30E-5	1.83E-4	4.38E-5	6.27E-5	7.27E-5	0.00E+0	
1	0.5	12	80	4.29E-4	3.17E-4	2.67E-4	2.24E-4	2.53E-4	9.12E-5	1.65E-4	1.33E-4	1.66E-4	7.27E-5	5.67E-4	
1	0.5	12	100	6.77E-4	5.25E-4	2.81E-4	5.10E-4	1.35E-4	2.07E-4	2.54E-4	1.75E-4	4.64E-4	5.55E-5	8.46E-6	
1	0.5	12	200	2.45E-3	2.54E-3	1.59E-3	1.80E-3	1.42E-3	1.38E-3	1.07E-3	4.49E-4	6.71E-4	4.77E-4	2.30E-4	
1	0.5	12	300	6.37E-3	5.93E-3	3.42E-3	2.83E-3	3.20E-3	2.46E-3	2.19E-3	1.83E-3	1.22E-3	1.27E-3	5.20E-4	
1	0.5	12	400	1.38E+0	1.29E-2	8.93E-3	7.18E-3	5.32E-3	4.96E-3	4.33E-3	3.26E-3	2.61E-3	2.31E-3	1.86E-3	
1	0.5	12	500	5.66E-1	4.98E-1	4.46E-1	5.32E-1	7.05E-1	1.05E-2	9.04E-3	8.37E-3	5.78E-3	4.78E-3	4.65E-3	
1	0.5	12	600	5.68E-1	5.11E-1	4.64E-1	3.96E-1	3.44E-1	3.45E-1	2.99E-1	6.88E-1	1.31E-2	1.05E-2	8.42E-3	
1	0.5	12	700	5.89E-1	4.92E-1	4.42E-1	3.81E-1	3.58E-1	3.15E-1	3.13E-1	2.75E-1	2.15E-1	2.03E-1	2.04E-1	
1	0.5	12	800	5.74E-1	5.13E-1	4.64E-1	3.94E-1	3.47E-1	3.15E-1	2.82E-1	2.59E-1	2.35E-1	2.22E-1	1.61E-1	
1	0.5	12	900	6.07E-1	5.01E-1	4.79E-1	3.95E-1	3.52E-1	3.28E-1	2.71E-1	2.53E-1	2.34E-1	2.00E-1	1.71E-1	
1	0.5	12	1000	6.33E-1	5.67E-1	4.58E-1	4.35E-1	3.92E-1	3.31E-1	3.03E-1	2.56E-1	2.46E-1	2.11E-1	2.04E-1	
1	0.5	12	1500	8.75E-1	7.16E-1	6.51E-1	5.62E-1	4.88E-1	4.28E-1	3.83E-1	3.29E-1	2.87E-1	2.89E-1	2.40E-1	
1	0.5	12	2000	1.08E+0	8.82E-1	7.73E-1	7.46E-1	6.42E-1	5.75E-1	5.24E-1	4.77E-1	4.25E-1	3.52E-1	2.81E-1	
1	0.5	12	2500	1.03E+0	1.03E+0	8.99E-1	7.82E-1	7.10E-1	6.69E-1	5.69E-1	6.23E-1	5.35E-1	4.84E-1	3.81E-1	
1	0.5	12	3000	1.27E+0	1.12E+0	9.63E-1	8.61E-1	7.76E-1	6.76E-1	6.37E-1	5.82E-1	5.47E-1	5.21E-1	4.24E-1	
1	0.5	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	0.5	5	40	1.52E-4	6.94E-5	5.02E-5	1.14E-4	5.04E-5	1.27E-5	9.96E-5	9.18E-5	0.00E+0	0.00E+0	0.00E+0	
1	0.5	5	60	4.06E-4	2.58E-4	3.29E-4	2.54E-4	3.21E-4	1.16E-4	2.92E-4	5.70E-5	1.14E-4	6.13E-5	0.00E+0	
1	0.5	5	80	6.58E-4	4.39E-4	3.56E-4	5.84E-4	3.33E-4	9.58E-5	1.68E-4	1.89E-4	2.09E-4	1.73E-5	8.14E-5	
1	0.5	5	100	8.96E-4	5.98E-4	4.14E-4	5.33E-4	4.58E-4	3.55E-4	4.36E-4	2.65E-4	1.20E-4	7.34E-5	3.01E-4	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				0	2	4	6	8	10	13	20	30	40	50	60
1	0.5	5	200	7.99E-1	9.47E-1	9.70E-1	9.81E-1	9.82E-1	9.44E-1	9.46E-1	1.76E+0	1.39E-2	6.12E-3	3.37E-3	3.13E-3
1	0.5	5	300	8.83E-1	9.15E-1	9.46E-1	8.97E-1	8.63E-1	1.02E+0	9.08E-1	9.04E-1	8.68E-1	8.63E-1	1.33E+0	8.08E-3
1	0.5	5	400	9.59E-1	9.25E-1	1.08E+0	1.05E+0	1.10E+0	1.07E+0	9.35E-1	9.40E-1	8.95E-1	7.65E-1	7.26E-1	6.96E-1
1	0.5	5	500	9.62E-1	1.04E+0	1.15E+0	1.26E+0	1.21E+0	1.07E+0	1.02E+0	9.57E-1	8.81E-1	8.25E-1	7.45E-1	6.83E-1
1	0.5	5	600	1.04E+0	1.24E+0	1.21E+0	1.19E+0	1.34E+0	1.29E+0	1.09E+0	1.05E+0	1.01E+0	8.58E-1	7.87E-1	6.45E-1
1	0.5	5	700	1.23E+0	1.27E+0	1.25E+0	1.43E+0	1.27E+0	1.36E+0	1.21E+0	1.12E+0	9.95E-1	9.27E-1	7.57E-1	6.96E-1
1	0.5	5	800	1.23E+0	1.46E+0	1.37E+0	1.48E+0	1.28E+0	1.43E+0	1.29E+0	1.19E+0	1.03E+0	9.38E-1	8.11E-1	7.20E-1
1	0.5	5	900	1.30E+0	1.47E+0	1.46E+0	1.50E+0	1.36E+0	1.38E+0	1.35E+0	1.23E+0	1.11E+0	9.51E-1	8.11E-1	7.00E-1
1	0.5	5	1000	1.39E+0	1.31E+0	1.47E+0	1.50E+0	1.42E+0	1.48E+0	1.40E+0	1.28E+0	1.10E+0	9.88E-1	8.98E-1	7.28E-1
1	0.5	5	1500	1.76E+0	1.59E+0	1.68E+0	1.68E+0	1.77E+0	1.88E+0	1.76E+0	1.69E+0	1.58E+0	1.36E+0	1.18E+0	1.09E+0
1	0.5	5	2000	1.53E+0	1.46E+0	1.88E+0	1.92E+0	2.07E+0	1.99E+0	1.85E+0	1.80E+0	1.76E+0	1.50E+0	1.37E+0	1.30E+0
1	0.5	5	2500	1.55E+0	1.81E+0	1.81E+0	2.02E+0	2.17E+0	2.08E+0	2.04E+0	1.95E+0	1.95E+0	1.70E+0	1.53E+0	1.37E+0
1	0.5	5	3000	1.75E+0	1.78E+0	1.98E+0	1.91E+0	2.03E+0	2.19E+0	2.15E+0	2.17E+0	2.00E+0	1.75E+0	1.66E+0	1.55E+0
1	0.5	0	20	4.99E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
1	0.5	0	40	5.09E-1	1.69E+0	5.10E-3	5.45E-3	3.52E-3	3.81E-4	1.95E-4	1.86E-4	2.28E-4	8.04E-5	1.27E-4	7.76E-5
1	0.5	0	60	1.01E+0	3.33E+0	8.42E-2	1.53E-2	1.27E-2	3.71E-3	2.50E-3	6.34E-4	4.85E-4	1.86E-4	2.51E-4	3.13E-4
1	0.5	0	80	7.95E-1	1.20E+0	4.51E+0	9.02E-2	2.64E-2	2.47E-2	7.61E-3	1.63E-3	1.08E-3	8.03E-4	8.99E-4	6.19E-4
1	0.5	0	100	7.94E-1	9.80E-1	1.17E+0	1.14E+0	4.48E+0	5.66E-2	3.07E-2	4.34E-3	1.26E-3	1.19E-3	6.43E-4	4.88E-4
1	0.5	0	200	8.55E-1	8.61E-1	9.22E-1	9.82E-1	8.43E-1	9.52E-1	9.98E-1	1.06E+0	1.37E+0	5.21E-3	3.47E-3	3.12E-3
1	0.5	0	300	6.72E-1	9.94E-1	9.24E-1	9.57E-1	9.86E-1	1.06E+0	1.00E+0	9.41E-1	9.41E-1	8.61E-1	1.82E+0	1.11E-2
1	0.5	0	400	8.42E-1	1.05E+0	1.04E+0	1.06E+0	1.05E+0	1.04E+0	9.05E-1	9.88E-1	9.53E-1	9.01E-1	7.75E-1	7.27E-1
1	0.5	0	500	9.37E-1	8.58E-1	1.14E+0	9.54E-1	1.08E+0	1.10E+0	1.28E+0	1.05E+0	9.99E-1	9.04E-1	7.67E-1	7.05E-1
1	0.5	0	600	1.02E+0	1.02E+0	1.18E+0	1.24E+0	1.35E+0	1.34E+0	1.18E+0	1.21E+0	1.04E+0	8.64E-1	8.27E-1	7.25E-1
1	0.5	0	700	9.71E-1	1.11E+0	1.26E+0	1.39E+0	1.25E+0	1.36E+0	1.37E+0	1.25E+0	1.07E+0	9.34E-1	8.58E-1	6.98E-1
1	0.5	0	800	9.31E-1	1.19E+0	1.43E+0	1.35E+0	1.39E+0	1.46E+0	1.50E+0	1.27E+0	1.17E+0	1.00E+0	8.81E-1	8.04E-1
1	0.5	0	900	1.02E+0	1.11E+0	1.35E+0	1.41E+0	1.56E+0	1.46E+0	1.48E+0	1.38E+0	1.24E+0	1.04E+0	9.48E-1	8.12E-1
1	0.5	0	1000	1.25E+0	1.19E+0	1.42E+0	1.65E+0	1.51E+0	1.62E+0	1.49E+0	1.38E+0	1.23E+0	1.14E+0	9.61E-1	8.44E-1
1	0.5	0	1500	1.26E+0	1.49E+0	1.64E+0	1.82E+0	1.99E+0	1.80E+0	2.00E+0	1.81E+0	1.64E+0	1.51E+0	1.29E+0	1.16E+0
1	0.5	0	2000	1.46E+0	1.46E+0	1.53E+0	1.88E+0	2.17E+0	2.13E+0	1.97E+0	2.02E+0	1.85E+0	1.69E+0	1.48E+0	1.30E+0
1	0.5	0	2500	1.59E+0	1.52E+0	1.56E+0	1.84E+0	2.02E+0	2.19E+0	2.03E+0	2.13E+0	1.94E+0	1.78E+0	1.61E+0	1.40E+0
1	0.5	0	3000	1.46E+0	1.81E+0	1.74E+0	1.76E+0	1.86E+0	2.18E+0	2.17E+0	2.18E+0	1.99E+0	2.00E+0	1.83E+0	1.62E+0
2	1	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	1	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	1	243	60	0.00E+0	1.30E-5	0.00E+0	7.65E-6	0.00E+0	3.47E-5	8.70E-6	1.17E-5	7.17E-5	1.42E-5	0.00E+0	8.65E-6
2	1	243	80	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.69E-4	2.27E-4	4.98E-5	1.62E-4	0.00E+0	2.74E-5	3.01E-5
2	1	243	100	1.07E-4	2.11E-4	2.24E-4	2.52E-4	9.39E-5	1.08E-4	5.62E-4	2.34E-4	2.63E-4	1.88E-4	1.87E-4	8.62E-6
2	1	243	200	3.91E-3	3.40E-3	3.93E-3	3.68E-3	3.24E-3	4.54E-3	3.61E-3	3.25E-3	2.85E-3	2.94E-3	1.73E-3	1.62E-3

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				1	0.5	5	200	2.68E-3	1.94E-3	1.56E-3	1.39E-3	1.29E-3	8.75E-4	8.27E-4	4.95E-4
1	0.5	5	300	5.62E-3	4.51E-3	3.86E-3	3.32E-3	3.18E-3	2.27E-3	2.22E-3	1.50E-3	1.42E-3	9.20E-4	1.14E-3	
1	0.5	5	400	7.11E-1	1.17E+0	9.90E-3	6.67E-3	6.34E-3	5.07E-3	4.50E-3	3.22E-3	3.47E-3	2.51E-3	1.59E-3	
1	0.5	5	500	6.23E-1	5.35E-1	4.93E-1	4.69E-1	1.05E+0	1.31E-2	9.09E-3	7.85E-3	6.56E-3	7.00E-3	3.62E-3	
1	0.5	5	600	5.79E-1	5.39E-1	4.77E-1	4.39E-1	4.17E-1	3.30E-1	3.38E-1	3.05E-1	6.25E-1	1.02E-2	7.70E-3	
1	0.5	5	700	6.21E-1	5.45E-1	4.84E-1	4.23E-1	3.84E-1	3.64E-1	3.18E-1	3.03E-1	2.44E-1	2.23E-1	2.12E-1	
1	0.5	5	800	6.22E-1	5.30E-1	4.80E-1	4.34E-1	3.98E-1	3.55E-1	3.15E-1	2.62E-1	2.40E-1	2.10E-1	1.92E-1	
1	0.5	5	900	6.80E-1	5.79E-1	5.16E-1	4.50E-1	3.96E-1	3.73E-1	3.49E-1	2.62E-1	2.67E-1	2.26E-1	1.85E-1	
1	0.5	5	1000	6.60E-1	6.37E-1	5.13E-1	4.55E-1	4.29E-1	3.64E-1	3.24E-1	3.04E-1	2.64E-1	2.54E-1	2.32E-1	
1	0.5	5	1500	9.34E-1	8.57E-1	6.91E-1	5.67E-1	5.55E-1	4.93E-1	4.60E-1	4.08E-1	3.48E-1	3.07E-1	2.77E-1	
1	0.5	5	2000	1.16E+0	1.01E+0	8.51E-1	8.05E-1	7.70E-1	6.93E-1	5.58E-1	5.19E-1	4.76E-1	4.22E-1	3.74E-1	
1	0.5	5	2500	1.24E+0	1.09E+0	1.05E+0	9.11E-1	7.88E-1	7.12E-1	5.97E-1	5.62E-1	4.92E-1	4.60E-1	4.13E-1	
1	0.5	5	3000	1.27E+0	1.20E+0	1.06E+0	9.13E-1	8.86E-1	8.08E-1	7.12E-1	6.09E-1	5.90E-1	4.82E-1	4.53E-1	
1	0.5	0	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
1	0.5	0	40	1.16E-4	1.60E-4	0.00E+0	5.42E-5	0.00E+0	0.00E+0	9.81E-5	1.94E-5	0.00E+0	0.00E+0	0.00E+0	
1	0.5	0	60	9.19E-5	2.59E-4	6.36E-5	5.93E-5	1.16E-4	1.89E-5	6.85E-5	4.72E-5	2.11E-5	0.00E+0	0.00E+0	
1	0.5	0	80	5.54E-4	2.46E-4	2.08E-4	1.75E-4	1.50E-4	1.20E-4	1.39E-4	4.86E-5	5.15E-5	2.57E-5	1.73E-5	
1	0.5	0	100	5.34E-4	4.08E-4	3.58E-4	2.09E-4	3.40E-4	1.49E-4	1.60E-4	9.61E-5	7.64E-5	7.03E-5	6.72E-6	
1	0.5	0	200	1.68E-3	1.89E-3	1.38E-3	1.12E-3	8.64E-4	7.44E-4	8.73E-4	4.44E-4	5.73E-4	3.47E-4	2.96E-4	
1	0.5	0	300	5.87E-3	4.95E-3	3.77E-3	3.36E-3	2.61E-3	2.56E-3	2.25E-3	1.65E-3	1.24E-3	9.71E-4	1.31E-3	
1	0.5	0	400	6.93E-1	1.58E+0	1.34E-2	7.80E-3	6.74E-3	5.35E-3	4.11E-3	3.79E-3	3.36E-3	1.90E-3	1.91E-3	
1	0.5	0	500	6.45E-1	5.99E-1	5.63E-1	5.25E-1	4.93E-1	7.95E-1	9.79E-3	7.42E-3	5.61E-3	6.15E-3	4.07E-3	
1	0.5	0	600	6.37E-1	5.61E-1	5.00E-1	4.54E-1	4.45E-1	3.84E-1	3.48E-1	3.02E-1	7.70E-1	1.72E-2	9.50E-3	
1	0.5	0	700	6.60E-1	5.84E-1	5.09E-1	5.02E-1	4.23E-1	4.15E-1	3.59E-1	3.21E-1	2.55E-1	2.56E-1	1.95E-1	
1	0.5	0	800	6.92E-1	5.99E-1	5.12E-1	4.82E-1	4.05E-1	3.33E-1	3.31E-1	2.93E-1	2.48E-1	2.36E-1	1.98E-1	
1	0.5	0	900	6.73E-1	6.47E-1	5.77E-1	4.79E-1	4.31E-1	3.90E-1	3.30E-1	3.06E-1	2.85E-1	2.24E-1	1.92E-1	
1	0.5	0	1000	7.34E-1	6.29E-1	5.82E-1	5.42E-1	4.19E-1	3.71E-1	3.39E-1	3.13E-1	2.84E-1	2.45E-1	2.33E-1	
1	0.5	0	1500	9.94E-1	8.83E-1	7.38E-1	6.52E-1	5.29E-1	5.18E-1	4.28E-1	4.07E-1	3.60E-1	3.09E-1	2.78E-1	
1	0.5	0	2000	1.18E+0	1.09E+0	9.42E-1	8.55E-1	7.69E-1	7.00E-1	6.26E-1	5.76E-1	4.46E-1	4.48E-1	3.76E-1	
1	0.5	0	2500	1.40E+0	1.18E+0	1.07E+0	9.14E-1	9.18E-1	7.75E-1	6.58E-1	6.19E-1	5.13E-1	5.26E-1	3.77E-1	
1	0.5	0	3000	1.44E+0	1.27E+0	1.13E+0	1.01E+0	9.57E-1	7.94E-1	7.38E-1	6.51E-1	5.88E-1	5.09E-1	4.30E-1	
2	1	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	243	60	3.34E-5	4.47E-5	3.47E-5	0.00E+0	1.26E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	243	80	4.51E-5	2.06E-5	0.00E+0	0.00E+0	2.08E-5	2.18E-5	1.42E-5	0.00E+0	0.00E+0	7.36E-5	0.00E+0	
2	1	243	100	7.70E-6	1.68E-5	2.27E-5	1.20E-4	1.16E-5	0.00E+0	4.38E-5	8.13E-5	1.58E-5	4.99E-5	1.13E-4	
2	1	243	200	1.73E-3	1.87E-3	1.20E-3	1.32E-3	1.26E-3	7.55E-4	8.88E-4	1.35E-3	4.57E-4	7.48E-4	4.87E-4	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)										
				0	2	4	6	8	10	13	20	30	40	50	60	
				2	1	243	300	7.91E-3	7.71E-3	1.05E-2	1.11E-2	1.08E-2	1.38E-2	9.17E-3	9.83E-3	9.45E-3
2	1	243	400	1.93E-2	2.46E-2	2.67E-2	2.74E-2	3.41E-2	3.23E-2	3.20E-2	2.89E-2	2.56E-2	2.33E-2	2.13E-2	1.65E-2	
2	1	243	500	3.98E-2	5.93E-2	6.21E-2	7.42E-2	7.53E-2	7.54E-2	7.43E-2	7.05E-2	6.41E-2	5.58E-2	5.03E-2	4.59E-2	
2	1	243	600	7.67E-2	1.29E-1	1.61E-1	1.53E-1	1.71E-1	1.70E-1	1.62E-1	1.58E-1	1.40E-1	1.29E-1	1.11E-1	1.00E-1	
2	1	243	700	1.35E-1	1.93E-1	2.55E-1	2.66E-1	2.92E-1	2.98E-1	3.01E-1	2.78E-1	2.63E-1	2.31E-1	1.99E-1	1.73E-1	
2	1	243	800	1.49E-1	2.69E-1	3.35E-1	3.92E-1	3.90E-1	4.14E-1	4.30E-1	4.44E-1	3.97E-1	3.57E-1	3.19E-1	2.74E-1	
2	1	243	900	1.81E-1	3.05E-1	3.98E-1	4.54E-1	4.67E-1	4.95E-1	5.18E-1	5.11E-1	4.91E-1	4.56E-1	4.29E-1	3.94E-1	
2	1	243	1000	2.11E-1	3.40E-1	4.52E-1	5.06E-1	5.48E-1	5.62E-1	5.69E-1	5.86E-1	5.58E-1	5.27E-1	4.93E-1	4.54E-1	
2	1	243	1500	3.59E-1	6.05E-1	7.58E-1	8.44E-1	9.14E-1	9.45E-1	9.68E-1	1.02E+0	1.04E+0	1.02E+0	9.88E-1	9.49E-1	
2	1	243	2000	5.08E-1	8.27E-1	1.03E+0	1.14E+0	1.22E+0	1.29E+0	1.38E+0	1.44E+0	1.50E+0	1.50E+0	1.50E+0	1.45E+0	
2	1	243	2500	6.76E-1	1.00E+0	1.26E+0	1.40E+0	1.51E+0	1.61E+0	1.63E+0	1.80E+0	1.87E+0	1.90E+0	1.93E+0	1.94E+0	
2	1	243	3000	7.64E-1	1.22E+0	1.48E+0	1.64E+0	1.79E+0	1.85E+0	1.98E+0	2.14E+0	2.27E+0	2.33E+0	2.35E+0	2.37E+0	
2	1	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	151	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.88E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.30E-6	2.80E-5	0.00E+0	
2	1	151	60	0.00E+0	1.25E-4	8.38E-5	8.95E-6	3.60E-4	2.35E-4	2.87E-4	8.76E-5	8.55E-5	3.33E-5	4.59E-5	8.89E-6	
2	1	151	80	4.24E-5	8.36E-4	1.38E-4	5.74E-4	1.11E-3	2.14E-4	4.21E-4	3.90E-4	3.56E-4	2.13E-4	2.13E-4	1.66E-4	
2	1	151	100	2.78E-4	1.13E-3	1.03E-3	1.38E-3	1.15E-3	1.38E-3	7.37E-4	6.79E-4	8.93E-4	6.20E-4	5.14E-4	5.11E-4	
2	1	151	200	3.77E-3	6.51E-3	7.58E-3	8.79E-3	1.08E-2	8.31E-3	9.04E-3	8.25E-3	6.58E-3	6.83E-3	4.75E-3	4.45E-3	
2	1	151	300	1.08E-2	1.73E-2	2.47E-2	2.29E-2	2.52E-2	2.31E-2	2.44E-2	2.21E-2	2.05E-2	1.88E-2	1.57E-2	1.34E-2	
2	1	151	400	4.63E-2	8.07E-2	1.03E-1	1.15E-1	1.21E-1	1.07E-1	1.02E-1	9.39E-2	7.30E-2	5.54E-2	5.02E-2	4.13E-2	
2	1	151	500	1.21E-1	2.12E-1	2.75E-1	3.01E-1	3.31E-1	3.60E-1	3.51E-1	3.28E-1	2.63E-1	2.29E-1	1.79E-1	1.48E-1	
2	1	151	600	1.84E-1	3.39E-1	4.36E-1	5.12E-1	5.78E-1	5.92E-1	6.58E-1	8.50E-1	5.70E-1	5.05E-1	4.22E-1	3.56E-1	
2	1	151	700	2.13E-1	3.88E-1	4.91E-1	5.65E-1	6.16E-1	6.51E-1	6.89E-1	7.31E-1	7.31E-1	7.07E-1	6.60E-1	7.06E-1	
2	1	151	800	2.71E-1	4.25E-1	5.37E-1	6.42E-1	6.64E-1	7.16E-1	7.61E-1	8.14E-1	8.16E-1	7.87E-1	7.48E-1	6.93E-1	
2	1	151	900	2.91E-1	4.75E-1	6.19E-1	6.93E-1	7.72E-1	8.15E-1	8.40E-1	8.97E-1	8.90E-1	8.87E-1	8.54E-1	8.07E-1	
2	1	151	1000	3.39E-1	5.23E-1	6.63E-1	7.88E-1	8.69E-1	8.65E-1	9.16E-1	9.87E-1	9.86E-1	9.66E-1	8.98E-1	8.60E-1	
2	1	151	1500	4.79E-1	7.36E-1	9.45E-1	1.04E+0	1.16E+0	1.23E+0	1.31E+0	1.36E+0	1.40E+0	1.44E+0	1.44E+0	1.41E+0	
2	1	151	2000	6.07E-1	9.43E-1	1.15E+0	1.29E+0	1.43E+0	1.47E+0	1.60E+0	1.70E+0	1.82E+0	1.87E+0	1.90E+0	1.89E+0	
2	1	151	2500	7.27E-1	1.11E+0	1.32E+0	1.48E+0	1.56E+0	1.66E+0	1.79E+0	1.96E+0	2.11E+0	2.23E+0	2.24E+0	2.24E+0	
2	1	151	3000	7.99E-1	1.22E+0	1.48E+0	1.69E+0	1.83E+0	1.94E+0	2.00E+0	2.22E+0	2.39E+0	2.51E+0	2.60E+0	2.65E+0	
2	1	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	93	40	0.00E+0	0.00E+0	1.18E-4	2.28E-5	1.08E-4	0.00E+0	0.00E+0	2.61E-5	2.27E-5	1.57E-5	0.00E+0	0.00E+0	
2	1	93	60	5.14E-5	6.22E-4	6.02E-4	2.22E-5	3.81E-4	3.67E-4	3.43E-4	3.14E-4	1.98E-4	2.27E-4	1.28E-4	1.34E-4	
2	1	93	80	3.38E-4	4.21E-4	7.72E-4	1.03E-3	5.58E-4	7.10E-4	9.20E-4	8.44E-4	6.70E-4	5.26E-4	3.81E-4	4.01E-4	
2	1	93	100	1.21E-3	1.87E-3	1.99E-3	1.79E-3	1.86E-3	1.66E-3	1.47E-3	1.69E-3	1.11E-3	8.93E-4	8.19E-4	9.05E-4	
2	1	93	200	5.09E-3	1.28E-2	1.57E-2	1.43E-2	1.21E-2	1.19E-2	1.56E-2	1.35E-2	1.12E-2	1.02E-2	9.91E-3	9.06E-3	
2	1	93	300	4.37E-2	8.53E-2	1.08E-1	1.15E-1	1.14E-1	9.63E-2	8.42E-2	6.74E-2	4.43E-2	3.37E-2	2.89E-2	2.82E-2	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				2	1	243	300	5.75E-3	4.49E-3	4.20E-3	3.77E-3	2.95E-3	3.45E-3	3.37E-3	2.75E-3
2	1	243	400	1.92E-2	1.57E-2	1.61E-2	1.22E-2	1.17E-2	1.10E-2	9.66E-3	9.43E-3	7.88E-3	7.64E-3	6.88E-3	
2	1	243	500	4.06E-2	4.03E-2	3.96E-2	3.18E-2	2.95E-2	2.97E-2	2.29E-2	2.10E-2	1.88E-2	1.83E-2	1.76E-2	
2	1	243	600	8.25E-2	7.89E-2	7.25E-2	6.33E-2	5.53E-2	5.21E-2	4.86E-2	4.18E-2	4.10E-2	3.48E-2	3.39E-2	
2	1	243	700	1.55E-1	1.39E-1	1.27E-1	1.03E-1	9.47E-2	8.55E-2	8.13E-2	7.38E-2	6.24E-2	5.87E-2	5.23E-2	
2	1	243	800	2.33E-1	2.04E-1	1.85E-1	1.59E-1	1.46E-1	1.23E-1	1.17E-1	1.00E-1	9.92E-2	8.75E-2	7.52E-2	
2	1	243	900	3.32E-1	3.05E-1	2.71E-1	2.30E-1	2.11E-1	1.75E-1	1.60E-1	1.43E-1	1.29E-1	1.10E-1	1.06E-1	
2	1	243	1000	4.14E-1	3.71E-1	3.38E-1	3.16E-1	2.95E-1	2.43E-1	2.14E-1	1.94E-1	1.71E-1	1.56E-1	1.30E-1	
2	1	243	1500	8.97E-1	8.26E-1	7.97E-1	7.50E-1	6.90E-1	6.20E-1	5.81E-1	5.31E-1	4.79E-1	4.32E-1	4.22E-1	
2	1	243	2000	1.43E+0	1.40E+0	1.34E+0	1.32E+0	1.24E+0	1.22E+0	1.14E+0	1.09E+0	1.01E+0	9.47E-1	9.02E-1	
2	1	243	2500	1.91E+0	1.90E+0	1.86E+0	1.80E+0	1.75E+0	1.73E+0	1.71E+0	1.66E+0	1.56E+0	1.55E+0	1.46E+0	
2	1	243	3000	2.37E+0	2.36E+0	2.34E+0	2.31E+0	2.29E+0	2.27E+0	2.23E+0	2.14E+0	2.11E+0	2.07E+0	1.97E+0	
2	1	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	151	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	151	60	6.76E-5	8.77E-5	8.09E-6	4.93E-5	0.00E+0	0.00E+0	9.31E-6	3.55E-5	0.00E+0	6.72E-6	0.00E+0	
2	1	151	80	1.02E-4	5.39E-5	5.83E-5	8.26E-5	8.39E-5	6.41E-5	4.30E-5	7.19E-5	0.00E+0	0.00E+0	3.07E-5	
2	1	151	100	4.11E-4	4.99E-4	3.02E-4	4.72E-4	2.15E-4	2.35E-4	1.08E-4	2.92E-4	3.94E-5	1.52E-5	5.38E-5	
2	1	151	200	3.52E-3	3.57E-3	3.37E-3	2.91E-3	1.84E-3	1.95E-3	2.20E-3	1.61E-3	1.53E-3	1.44E-3	1.17E-3	
2	1	151	300	1.36E-2	1.22E-2	1.13E-2	9.55E-3	7.47E-3	8.14E-3	7.65E-3	6.10E-3	5.04E-3	4.71E-3	3.78E-3	
2	1	151	400	3.61E-2	3.09E-2	3.02E-2	2.93E-2	2.81E-2	2.28E-2	1.99E-2	1.83E-2	1.85E-2	1.56E-2	1.75E-2	
2	1	151	500	1.26E-1	1.09E-1	8.64E-2	7.45E-2	6.37E-2	5.57E-2	4.95E-2	4.37E-2	4.22E-2	4.06E-2	3.71E-2	
2	1	151	600	3.00E-1	2.55E-1	2.21E-1	1.84E-1	1.55E-1	1.25E-1	1.17E-1	9.79E-2	8.47E-2	7.24E-2	7.02E-2	
2	1	151	700	5.10E-1	4.47E-1	3.87E-1	3.30E-1	2.79E-1	2.37E-1	1.97E-1	1.84E-1	1.62E-1	1.39E-1	1.23E-1	
2	1	151	800	6.43E-1	6.01E-1	5.43E-1	5.48E-1	4.34E-1	3.88E-1	3.35E-1	2.84E-1	2.48E-1	2.17E-1	1.85E-1	
2	1	151	900	7.53E-1	7.05E-1	6.33E-1	5.84E-1	5.37E-1	4.99E-1	4.47E-1	4.08E-1	3.46E-1	3.14E-1	2.92E-1	
2	1	151	1000	8.32E-1	7.92E-1	7.23E-1	6.89E-1	6.44E-1	5.87E-1	5.42E-1	4.87E-1	4.42E-1	3.97E-1	3.69E-1	
2	1	151	1500	1.37E+0	1.35E+0	1.33E+0	1.25E+0	1.24E+0	1.15E+0	1.08E+0	1.01E+0	9.72E-1	8.72E-1	8.16E-1	
2	1	151	2000	1.91E+0	1.89E+0	1.87E+0	1.86E+0	1.82E+0	1.76E+0	1.66E+0	1.64E+0	1.56E+0	1.50E+0	1.42E+0	
2	1	151	2500	2.30E+0	2.29E+0	2.29E+0	2.28E+0	2.29E+0	2.25E+0	2.20E+0	2.17E+0	2.13E+0	2.05E+0	2.03E+0	
2	1	151	3000	2.63E+0	2.69E+0	2.71E+0	2.74E+0	2.70E+0	2.71E+0	2.65E+0	2.63E+0	2.62E+0	2.59E+0	2.49E+0	
2	1	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	93	40	1.83E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	93	60	8.23E-5	7.90E-5	5.81E-5	4.99E-5	4.84E-5	5.31E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	93	80	3.44E-4	1.06E-4	1.26E-4	2.10E-4	1.82E-4	1.10E-4	1.72E-5	8.48E-5	3.16E-5	0.00E+0	2.86E-5	
2	1	93	100	6.64E-4	7.10E-4	1.52E-4	3.30E-4	3.72E-4	3.63E-4	2.47E-4	1.84E-4	1.85E-4	1.07E-4	3.35E-4	
2	1	93	200	7.50E-3	7.41E-3	6.14E-3	5.74E-3	4.83E-3	4.44E-3	3.86E-3	2.80E-3	3.01E-3	2.22E-3	2.94E-3	
2	1	93	300	2.51E-2	2.00E-2	1.59E-2	1.42E-2	1.54E-2	1.29E-2	1.17E-2	1.02E-2	9.49E-3	7.48E-3	8.60E-3	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)										
				0	2	4	6	8	10	13	20	30	40	50	60	
				2	1	93	400	1.74E-1	3.17E-1	3.85E-1	4.68E-1	4.74E-1	5.09E-1	5.00E-1	4.61E-1	3.67E-1
2	1	93	500	2.02E-1	3.53E-1	4.66E-1	5.67E-1	6.05E-1	7.16E-1	7.46E-1	8.56E-1	1.46E+0	7.17E-1	5.96E-1	4.88E-1	
2	1	93	600	2.80E-1	4.03E-1	5.16E-1	6.15E-1	6.61E-1	7.47E-1	8.19E-1	8.72E-1	9.19E-1	8.80E-1	8.84E-1	8.48E-1	
2	1	93	700	2.74E-1	4.54E-1	5.70E-1	6.29E-1	7.21E-1	7.60E-1	8.02E-1	9.08E-1	9.41E-1	9.51E-1	9.23E-1	8.85E-1	
2	1	93	800	3.31E-1	4.68E-1	5.96E-1	7.01E-1	7.51E-1	8.00E-1	8.71E-1	9.34E-1	9.84E-1	9.84E-1	9.77E-1	9.44E-1	
2	1	93	900	3.35E-1	5.28E-1	6.42E-1	7.37E-1	7.92E-1	9.09E-1	9.43E-1	1.01E+0	1.08E+0	1.08E+0	1.05E+0	1.00E+0	
2	1	93	1000	3.57E-1	5.56E-1	6.72E-1	7.84E-1	8.40E-1	9.28E-1	9.72E-1	1.06E+0	1.11E+0	1.15E+0	1.13E+0	1.13E+0	
2	1	93	1500	4.72E-1	6.89E-1	8.55E-1	9.69E-1	1.07E+0	1.15E+0	1.22E+0	1.35E+0	1.44E+0	1.49E+0	1.50E+0	1.52E+0	
2	1	93	2000	5.41E-1	8.13E-1	9.79E-1	1.11E+0	1.21E+0	1.28E+0	1.37E+0	1.51E+0	1.67E+0	1.74E+0	1.81E+0	1.85E+0	
2	1	93	2500	6.44E-1	8.86E-1	1.08E+0	1.21E+0	1.32E+0	1.44E+0	1.52E+0	1.67E+0	1.85E+0	1.96E+0	2.04E+0	2.16E+0	
2	1	93	3000	6.77E-1	9.99E-1	1.22E+0	1.35E+0	1.45E+0	1.51E+0	1.61E+0	1.82E+0	1.99E+0	2.15E+0	2.23E+0	2.38E+0	
2	1	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	58	40	0.00E+0	0.00E+0	2.16E-4	9.00E-6	3.18E-4	5.65E-5	1.00E-5	7.41E-5	4.65E-5	3.12E-5	0.00E+0	3.47E-5	
2	1	58	60	5.95E-5	7.15E-4	8.41E-4	1.48E-4	2.16E-4	5.78E-4	3.57E-4	4.00E-4	4.43E-4	1.74E-4	2.47E-4	1.81E-4	
2	1	58	80	6.09E-4	2.16E-3	1.40E-3	2.20E-3	1.53E-3	1.20E-3	1.19E-3	1.06E-3	9.33E-4	5.33E-4	9.40E-4	4.03E-4	
2	1	58	100	3.87E-3	2.41E-3	3.41E-3	3.11E-3	3.35E-3	3.49E-3	3.06E-3	3.47E-3	2.03E-3	1.87E-3	1.42E-3	9.75E-4	
2	1	58	200	1.67E-2	3.40E-2	3.21E-2	3.15E-2	2.56E-2	2.55E-2	2.13E-2	2.03E-2	1.98E-2	1.27E-2	1.42E-2	1.16E-2	
2	1	58	300	1.76E-1	3.15E-1	3.70E-1	4.04E-1	4.04E-1	4.06E-1	4.17E-1	3.52E-1	2.48E-1	1.49E-1	8.80E-2	5.42E-2	
2	1	58	400	2.04E-1	3.51E-1	4.65E-1	5.78E-1	6.35E-1	7.11E-1	8.09E-1	1.06E+0	2.23E+0	6.81E-1	5.26E-1	4.08E-1	
2	1	58	500	2.53E-1	4.06E-1	4.84E-1	6.38E-1	7.07E-1	7.69E-1	8.23E-1	9.39E-1	1.01E+0	1.02E+0	1.02E+0	1.69E+0	
2	1	58	600	2.77E-1	3.97E-1	5.03E-1	5.93E-1	6.84E-1	7.35E-1	7.67E-1	8.71E-1	9.95E-1	1.03E+0	1.02E+0	9.79E-1	
2	1	58	700	2.98E-1	4.05E-1	5.38E-1	5.99E-1	6.62E-1	7.31E-1	8.09E-1	8.93E-1	9.77E-1	1.00E+0	1.05E+0	9.99E-1	
2	1	58	800	2.85E-1	4.63E-1	5.69E-1	6.65E-1	7.07E-1	7.37E-1	8.06E-1	9.33E-1	1.01E+0	1.07E+0	1.04E+0	1.01E+0	
2	1	58	900	3.48E-1	4.82E-1	5.69E-1	7.03E-1	7.35E-1	7.59E-1	8.49E-1	9.75E-1	1.06E+0	1.10E+0	1.11E+0	1.09E+0	
2	1	58	1000	3.58E-1	4.63E-1	5.88E-1	6.79E-1	7.72E-1	8.18E-1	9.16E-1	9.97E-1	1.11E+0	1.16E+0	1.16E+0	1.19E+0	
2	1	58	1500	4.03E-1	5.70E-1	6.91E-1	8.01E-1	8.49E-1	9.11E-1	1.00E+0	1.13E+0	1.25E+0	1.34E+0	1.41E+0	1.45E+0	
2	1	58	2000	4.19E-1	6.44E-1	7.54E-1	8.27E-1	9.38E-1	9.85E-1	1.07E+0	1.24E+0	1.39E+0	1.49E+0	1.60E+0	1.65E+0	
2	1	58	2500	4.97E-1	6.54E-1	8.05E-1	9.12E-1	1.03E+0	1.06E+0	1.16E+0	1.36E+0	1.54E+0	1.68E+0	1.75E+0	1.85E+0	
2	1	58	3000	4.95E-1	7.32E-1	9.06E-1	1.00E+0	1.09E+0	1.16E+0	1.26E+0	1.45E+0	1.64E+0	1.78E+0	1.90E+0	2.01E+0	
2	1	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	26	40	1.89E-4	0.00E+0	1.18E-4	2.45E-4	4.32E-4	1.40E-4	1.25E-4	1.20E-4	1.31E-4	4.74E-5	5.86E-6	3.78E-6	
2	1	26	60	6.84E-4	1.00E-3	8.48E-4	9.53E-4	8.32E-4	9.10E-4	8.89E-4	8.73E-4	5.59E-4	4.16E-4	5.33E-4	3.94E-4	
2	1	26	80	1.17E-3	1.99E-3	2.73E-3	3.05E-3	2.21E-3	2.39E-3	1.80E-3	1.76E-3	1.88E-3	1.47E-3	9.49E-4	7.63E-4	
2	1	26	100	2.91E-3	4.31E-3	4.60E-3	6.63E-3	5.25E-3	3.89E-3	4.59E-3	4.69E-3	2.98E-3	2.94E-3	2.04E-3	1.62E-3	
2	1	26	200	2.63E-1	6.24E+0	5.36E-1	4.54E-1	4.03E-1	3.87E-1	3.28E-1	2.11E-1	7.19E-2	2.65E-2	1.91E-2	1.84E-2	
2	1	26	300	2.43E-1	3.70E-1	4.61E-1	5.47E-1	6.95E-1	8.22E-1	9.53E-1	1.34E+0	3.25E+0	5.54E-1	3.64E-1	2.58E-1	
2	1	26	400	2.65E-1	3.95E-1	5.10E-1	6.45E-1	7.09E-1	8.11E-1	8.94E-1	1.04E+0	1.16E+0	1.18E+0	1.29E+0	2.48E+0	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
2	1	93	400	1.00E-1	7.57E-2	6.06E-2	5.06E-2	4.22E-2	3.67E-2	3.57E-2	2.98E-2	2.68E-2	2.61E-2	2.71E-2	
2	1	93	500	3.89E-1	2.98E-1	2.54E-1	1.91E-1	1.61E-1	1.32E-1	1.07E-1	8.71E-2	7.70E-2	6.71E-2	6.58E-2	
2	1	93	600	1.04E+0	6.31E-1	5.45E-1	4.42E-1	3.72E-1	3.16E-1	2.65E-1	2.12E-1	1.92E-1	1.62E-1	1.47E-1	
2	1	93	700	8.51E-1	7.82E-1	7.48E-1	6.97E-1	7.46E-1	5.39E-1	4.71E-1	3.96E-1	3.37E-1	2.83E-1	2.64E-1	
2	1	93	800	9.12E-1	8.59E-1	8.25E-1	7.78E-1	7.40E-1	6.83E-1	6.40E-1	5.77E-1	5.62E-1	4.50E-1	3.93E-1	
2	1	93	900	9.81E-1	9.33E-1	8.96E-1	8.62E-1	8.24E-1	7.67E-1	7.12E-1	6.70E-1	6.11E-1	5.48E-1	5.25E-1	
2	1	93	1000	1.09E+0	1.04E+0	1.02E+0	9.62E-1	9.11E-1	8.60E-1	8.09E-1	7.57E-1	6.97E-1	6.51E-1	6.03E-1	
2	1	93	1500	1.55E+0	1.53E+0	1.52E+0	1.50E+0	1.46E+0	1.39E+0	1.37E+0	1.29E+0	1.25E+0	1.19E+0	1.15E+0	
2	1	93	2000	1.88E+0	1.93E+0	1.89E+0	1.90E+0	1.93E+0	1.90E+0	1.88E+0	1.81E+0	1.78E+0	1.72E+0	1.66E+0	
2	1	93	2500	2.19E+0	2.22E+0	2.27E+0	2.31E+0	2.27E+0	2.30E+0	2.28E+0	2.30E+0	2.26E+0	2.19E+0	2.14E+0	
2	1	93	3000	2.44E+0	2.49E+0	2.53E+0	2.59E+0	2.63E+0	2.65E+0	2.63E+0	2.62E+0	2.57E+0	2.56E+0	2.47E+0	
2	1	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	58	40	1.83E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	58	60	1.08E-4	1.06E-4	5.68E-5	9.57E-5	3.71E-5	8.78E-5	7.00E-6	5.48E-5	1.83E-6	0.00E+0	0.00E+0	
2	1	58	80	5.15E-4	1.88E-4	4.73E-4	2.53E-4	2.86E-4	1.67E-4	1.34E-4	9.68E-5	1.03E-4	5.44E-6	2.90E-5	
2	1	58	100	1.20E-3	6.68E-4	7.97E-4	7.08E-4	6.69E-4	3.76E-4	3.01E-4	4.60E-4	1.84E-4	1.79E-4	3.85E-4	
2	1	58	200	1.16E-2	8.82E-3	8.71E-3	6.80E-3	6.07E-3	5.83E-3	6.32E-3	4.52E-3	4.95E-3	4.40E-3	3.25E-3	
2	1	58	300	3.40E-2	2.93E-2	2.41E-2	1.97E-2	1.92E-2	1.64E-2	1.60E-2	1.24E-2	1.34E-2	1.11E-2	9.72E-3	
2	1	58	400	2.95E-1	2.06E-1	1.59E-1	1.02E-1	7.87E-2	5.79E-2	4.96E-2	4.01E-2	3.86E-2	3.74E-2	3.56E-2	
2	1	58	500	7.47E-1	6.03E-1	5.13E-1	4.00E-1	3.20E-1	2.50E-1	2.11E-1	1.59E-1	1.37E-1	1.14E-1	9.42E-2	
2	1	58	600	9.57E-1	9.17E-1	8.79E-1	1.11E+0	6.26E-1	5.51E-1	4.54E-1	3.70E-1	3.22E-1	2.63E-1	2.40E-1	
2	1	58	700	9.91E-1	9.63E-1	9.23E-1	8.65E-1	8.06E-1	7.74E-1	7.20E-1	8.07E-1	5.64E-1	4.84E-1	4.20E-1	
2	1	58	800	1.03E+0	9.85E-1	9.59E-1	9.46E-1	9.08E-1	8.54E-1	7.97E-1	7.68E-1	6.92E-1	6.41E-1	6.00E-1	
2	1	58	900	1.08E+0	1.08E+0	1.04E+0	9.97E-1	9.55E-1	9.20E-1	8.63E-1	8.13E-1	7.75E-1	7.25E-1	6.53E-1	
2	1	58	1000	1.18E+0	1.17E+0	1.13E+0	1.11E+0	1.06E+0	1.01E+0	9.62E-1	9.04E-1	8.40E-1	7.98E-1	7.49E-1	
2	1	58	1500	1.50E+0	1.49E+0	1.50E+0	1.51E+0	1.51E+0	1.46E+0	1.44E+0	1.41E+0	1.39E+0	1.33E+0	1.26E+0	
2	1	58	2000	1.72E+0	1.73E+0	1.80E+0	1.81E+0	1.85E+0	1.82E+0	1.85E+0	1.83E+0	1.82E+0	1.77E+0	1.71E+0	
2	1	58	2500	1.92E+0	1.98E+0	2.07E+0	2.07E+0	2.11E+0	2.17E+0	2.16E+0	2.19E+0	2.18E+0	2.16E+0	2.10E+0	
2	1	58	3000	2.13E+0	2.18E+0	2.27E+0	2.36E+0	2.41E+0	2.47E+0	2.47E+0	2.53E+0	2.52E+0	2.49E+0	2.44E+0	
2	1	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	26	40	1.83E-5	8.46E-6	0.00E+0	0.00E+0	1.72E-5	0.00E+0	0.00E+0	3.43E-5	0.00E+0	0.00E+0	0.00E+0	
2	1	26	60	1.35E-4	2.68E-4	1.61E-4	5.34E-5	1.47E-4	3.74E-5	1.58E-5	1.48E-5	4.00E-8	6.95E-5	8.56E-6	
2	1	26	80	6.31E-4	4.46E-4	6.00E-4	5.62E-4	3.46E-4	1.43E-4	3.56E-4	2.11E-4	6.69E-5	5.18E-5	3.90E-5	
2	1	26	100	1.27E-3	1.08E-3	9.52E-4	6.97E-4	7.22E-4	4.97E-4	5.00E-4	4.54E-4	4.06E-4	3.49E-4	2.05E-4	
2	1	26	200	1.18E-2	1.11E-2	1.04E-2	9.76E-3	9.76E-3	7.15E-3	6.38E-3	5.46E-3	5.37E-3	4.45E-3	4.81E-3	
2	1	26	300	1.41E-1	7.41E-2	4.81E-2	2.99E-2	2.56E-2	2.20E-2	2.08E-2	1.68E-2	1.74E-2	1.55E-2	1.38E-2	
2	1	26	400	6.53E-1	4.91E-1	3.82E-1	2.84E-1	2.19E-1	1.46E-1	1.05E-1	8.13E-2	6.31E-2	5.00E-2	4.26E-2	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)										
				0	2	4	6	8	10	13	20	30	40	50	60	
				2	1	26	500	2.47E-1	3.40E-1	4.79E-1	5.48E-1	6.25E-1	7.20E-1	8.21E-1	9.63E-1	1.08E+0
2	1	26	600	2.55E-1	3.82E-1	4.89E-1	5.73E-1	6.49E-1	6.95E-1	7.58E-1	8.86E-1	9.92E-1	1.07E+0	1.08E+0	1.11E+0	
2	1	26	700	2.63E-1	3.80E-1	5.18E-1	5.77E-1	6.07E-1	6.87E-1	7.75E-1	8.71E-1	1.00E+0	1.02E+0	1.05E+0	1.06E+0	
2	1	26	800	3.18E-1	3.83E-1	4.98E-1	6.02E-1	6.30E-1	6.80E-1	7.59E-1	9.02E-1	1.01E+0	1.04E+0	1.10E+0	1.09E+0	
2	1	26	900	3.01E-1	3.95E-1	4.67E-1	5.77E-1	6.58E-1	6.85E-1	7.36E-1	8.70E-1	1.01E+0	1.07E+0	1.08E+0	1.14E+0	
2	1	26	1000	3.25E-1	4.10E-1	5.24E-1	5.83E-1	6.35E-1	7.22E-1	7.77E-1	9.03E-1	1.03E+0	1.07E+0	1.11E+0	1.19E+0	
2	1	26	1500	3.35E-1	4.06E-1	5.25E-1	5.89E-1	6.73E-1	7.22E-1	8.12E-1	9.33E-1	1.06E+0	1.18E+0	1.22E+0	1.27E+0	
2	1	26	2000	3.35E-1	4.54E-1	5.46E-1	6.35E-1	7.19E-1	7.64E-1	8.18E-1	9.63E-1	1.09E+0	1.23E+0	1.33E+0	1.40E+0	
2	1	26	2500	3.35E-1	4.55E-1	5.81E-1	6.53E-1	7.34E-1	7.74E-1	8.60E-1	9.96E-1	1.18E+0	1.30E+0	1.41E+0	1.52E+0	
2	1	26	3000	3.93E-1	4.75E-1	5.97E-1	6.67E-1	7.85E-1	8.24E-1	9.00E-1	1.03E+0	1.20E+0	1.35E+0	1.48E+0	1.60E+0	
2	1	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	12	40	4.69E-5	4.09E-5	8.28E-5	1.39E-4	2.22E-4	2.68E-4	9.02E-5	1.23E-4	1.40E-4	3.71E-5	3.51E-5	3.78E-6	
2	1	12	60	8.88E-4	9.39E-4	1.07E-3	9.74E-4	1.51E-3	7.89E-4	1.42E-3	9.74E-4	5.89E-4	4.36E-4	5.41E-4	3.99E-4	
2	1	12	80	1.02E-2	4.34E-3	2.83E-3	4.29E-3	3.03E-3	2.04E-3	2.26E-3	1.99E-3	1.75E-3	1.75E-3	1.03E-3	8.55E-4	
2	1	12	100	5.34E-2	5.69E-2	4.18E-2	2.45E-2	1.37E-2	8.34E-3	5.72E-3	6.93E-3	3.19E-3	2.92E-3	2.53E-3	1.77E-3	
2	1	12	200	1.33E-1	2.98E-1	5.43E-1	8.15E-1	1.12E+0	1.40E+0	9.02E+0	4.97E-1	2.92E-1	8.88E-2	3.32E-2	1.76E-2	
2	1	12	300	2.68E-1	3.35E-1	5.26E-1	6.30E-1	7.23E-1	8.37E-1	9.85E-1	1.11E+0	1.45E+0	3.94E+0	5.51E-1	4.00E-1	
2	1	12	400	2.69E-1	3.83E-1	4.83E-1	5.97E-1	6.65E-1	7.71E-1	8.34E-1	1.06E+0	1.20E+0	1.23E+0	1.25E+0	1.34E+0	
2	1	12	500	2.89E-1	4.05E-1	4.80E-1	5.95E-1	6.24E-1	7.47E-1	8.02E-1	9.44E-1	1.07E+0	1.16E+0	1.19E+0	1.17E+0	
2	1	12	600	3.09E-1	3.52E-1	4.47E-1	5.35E-1	6.09E-1	6.92E-1	7.83E-1	9.02E-1	1.00E+0	1.07E+0	1.10E+0	1.07E+0	
2	1	12	700	3.18E-1	3.68E-1	4.65E-1	5.42E-1	5.91E-1	6.55E-1	7.55E-1	8.87E-1	1.01E+0	1.05E+0	1.06E+0	1.07E+0	
2	1	12	800	2.79E-1	3.74E-1	4.62E-1	5.64E-1	6.31E-1	6.87E-1	7.44E-1	8.79E-1	1.01E+0	1.04E+0	1.07E+0	1.07E+0	
2	1	12	900	2.98E-1	3.86E-1	4.68E-1	5.67E-1	6.01E-1	7.01E-1	7.30E-1	8.34E-1	9.94E-1	1.02E+0	1.07E+0	1.13E+0	
2	1	12	1000	3.37E-1	3.88E-1	4.79E-1	5.48E-1	6.04E-1	6.48E-1	7.22E-1	8.51E-1	9.78E-1	1.07E+0	1.10E+0	1.14E+0	
2	1	12	1500	2.64E-1	3.92E-1	4.67E-1	5.39E-1	6.16E-1	6.84E-1	7.17E-1	8.76E-1	1.01E+0	1.08E+0	1.15E+0	1.23E+0	
2	1	12	2000	2.78E-1	3.59E-1	4.74E-1	5.21E-1	6.15E-1	6.60E-1	7.19E-1	8.76E-1	1.01E+0	1.10E+0	1.22E+0	1.30E+0	
2	1	12	2500	3.44E-1	3.98E-1	4.72E-1	5.18E-1	6.10E-1	6.59E-1	7.67E-1	8.85E-1	1.04E+0	1.17E+0	1.26E+0	1.37E+0	
2	1	12	3000	3.13E-1	4.19E-1	4.79E-1	5.68E-1	5.90E-1	7.22E-1	7.29E-1	9.14E-1	1.08E+0	1.20E+0	1.33E+0	1.43E+0	
2	1	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	5	40	1.90E-4	1.34E-4	1.08E-4	2.03E-4	7.60E-6	2.12E-4	1.54E-4	1.49E-4	1.70E-4	4.19E-5	3.51E-5	3.78E-6	
2	1	5	60	1.48E-2	1.73E-2	2.32E-3	7.32E-4	1.02E-3	1.70E-3	1.13E-3	8.50E-4	6.80E-4	3.89E-4	7.14E-4	6.08E-4	
2	1	5	80	1.88E-1	2.30E-1	8.05E-2	2.94E-2	1.10E-2	3.11E-3	2.32E-3	2.07E-3	2.13E-3	1.66E-3	1.28E-3	9.60E-4	
2	1	5	100	1.77E-1	9.47E+0	3.93E-1	2.99E-1	1.21E-1	5.83E-2	2.13E-2	6.98E-3	5.30E-3	3.27E-3	2.28E-3	1.88E-3	
2	1	5	200	1.29E-1	2.78E-1	4.69E-1	6.91E-1	8.16E-1	1.03E+0	1.32E+0	4.80E+0	3.83E-1	1.80E-1	6.08E-2	2.10E-2	
2	1	5	300	2.20E-1	3.28E-1	4.76E-1	6.27E-1	6.96E-1	8.22E-1	1.00E+0	1.16E+0	1.37E+0	1.72E+0	3.52E+0	4.84E-1	
2	1	5	400	2.57E-1	3.78E-1	5.29E-1	6.07E-1	7.15E-1	7.67E-1	8.23E-1	1.03E+0	1.19E+0	1.26E+0	1.26E+0	1.29E+0	
2	1	5	500	2.73E-1	3.85E-1	5.04E-1	6.06E-1	6.85E-1	7.02E-1	7.93E-1	9.47E-1	1.11E+0	1.13E+0	1.18E+0	1.20E+0	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
2	1	26	500	1.06E+0	1.05E+0	1.77E+0	7.12E-1	5.93E-1	4.72E-1	3.83E-1	3.17E-1	2.34E-1	1.90E-1	1.55E-1	
2	1	26	600	1.08E+0	1.06E+0	1.01E+0	9.49E-1	8.90E-1	8.89E-1	1.13E+0	6.35E-1	5.25E-1	4.46E-1	3.85E-1	
2	1	26	700	1.03E+0	1.06E+0	1.02E+0	1.03E+0	9.54E-1	9.19E-1	8.55E-1	8.17E-1	7.66E-1	7.12E-1	6.72E-1	
2	1	26	800	1.08E+0	1.08E+0	1.03E+0	1.02E+0	9.87E-1	9.52E-1	9.41E-1	8.99E-1	8.34E-1	7.85E-1	7.37E-1	
2	1	26	900	1.14E+0	1.12E+0	1.10E+0	1.12E+0	1.06E+0	1.02E+0	9.90E-1	9.65E-1	9.15E-1	8.65E-1	8.13E-1	
2	1	26	1000	1.15E+0	1.17E+0	1.17E+0	1.16E+0	1.14E+0	1.11E+0	1.06E+0	1.05E+0	9.98E-1	9.41E-1	9.05E-1	
2	1	26	1500	1.37E+0	1.37E+0	1.43E+0	1.42E+0	1.47E+0	1.45E+0	1.47E+0	1.46E+0	1.42E+0	1.41E+0	1.34E+0	
2	1	26	2000	1.50E+0	1.57E+0	1.59E+0	1.67E+0	1.70E+0	1.75E+0	1.76E+0	1.77E+0	1.77E+0	1.76E+0	1.71E+0	
2	1	26	2500	1.58E+0	1.68E+0	1.74E+0	1.81E+0	1.89E+0	1.93E+0	2.02E+0	2.04E+0	2.06E+0	2.06E+0	2.03E+0	
2	1	26	3000	1.69E+0	1.81E+0	1.88E+0	1.99E+0	2.10E+0	2.17E+0	2.22E+0	2.27E+0	2.28E+0	2.31E+0	2.27E+0	
2	1	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	12	40	2.35E-5	0.00E+0	3.30E-5	0.00E+0	1.81E-5	1.50E-5	0.00E+0	3.43E-5	0.00E+0	0.00E+0	0.00E+0	
2	1	12	60	2.69E-4	2.33E-4	1.74E-4	1.87E-4	1.88E-4	6.88E-5	4.46E-5	4.08E-5	7.54E-5	1.02E-4	0.00E+0	
2	1	12	80	7.70E-4	7.46E-4	9.15E-4	5.77E-4	4.17E-4	1.81E-4	3.56E-4	2.35E-4	1.10E-4	4.20E-5	3.04E-4	
2	1	12	100	1.72E-3	1.52E-3	1.01E-3	1.03E-3	9.70E-4	5.71E-4	5.54E-4	4.43E-4	5.21E-4	4.55E-4	3.69E-4	
2	1	12	200	1.54E-2	1.16E-2	1.17E-2	9.75E-3	9.70E-3	7.40E-3	7.36E-3	6.93E-3	5.33E-3	4.83E-3	4.94E-3	
2	1	12	300	2.64E-1	1.58E-1	8.62E-2	5.02E-2	3.17E-2	2.63E-2	2.20E-2	2.07E-2	1.80E-2	1.51E-2	1.32E-2	
2	1	12	400	2.69E+0	6.87E-1	5.27E-1	4.06E-1	3.02E-1	2.21E-1	1.61E-1	1.03E-1	7.81E-2	6.13E-2	5.33E-2	
2	1	12	500	1.12E+0	1.09E+0	1.08E+0	1.10E+0	1.46E+0	6.17E-1	4.98E-1	4.12E-1	3.26E-1	2.52E-1	2.12E-1	
2	1	12	600	1.11E+0	1.09E+0	1.08E+0	9.95E-1	9.81E-1	8.87E-1	8.73E-1	1.16E+0	6.74E-1	5.61E-1	4.64E-1	
2	1	12	700	1.06E+0	1.05E+0	1.08E+0	1.03E+0	1.02E+0	1.02E+0	9.22E-1	8.72E-1	8.25E-1	7.77E-1	7.21E-1	
2	1	12	800	1.09E+0	1.09E+0	1.08E+0	1.03E+0	1.02E+0	9.98E-1	9.41E-1	9.48E-1	8.97E-1	8.49E-1	8.01E-1	
2	1	12	900	1.15E+0	1.11E+0	1.10E+0	1.10E+0	1.07E+0	1.06E+0	1.05E+0	1.01E+0	9.58E-1	9.06E-1	8.75E-1	
2	1	12	1000	1.17E+0	1.16E+0	1.18E+0	1.18E+0	1.17E+0	1.13E+0	1.10E+0	1.10E+0	1.03E+0	1.00E+0	9.59E-1	
2	1	12	1500	1.26E+0	1.31E+0	1.34E+0	1.39E+0	1.42E+0	1.43E+0	1.44E+0	1.44E+0	1.43E+0	1.44E+0	1.37E+0	
2	1	12	2000	1.36E+0	1.43E+0	1.49E+0	1.58E+0	1.61E+0	1.68E+0	1.68E+0	1.72E+0	1.73E+0	1.71E+0	1.68E+0	
2	1	12	2500	1.45E+0	1.55E+0	1.64E+0	1.68E+0	1.74E+0	1.83E+0	1.89E+0	1.95E+0	1.97E+0	1.99E+0	1.96E+0	
2	1	12	3000	1.55E+0	1.67E+0	1.79E+0	1.86E+0	1.95E+0	2.03E+0	2.13E+0	2.14E+0	2.20E+0	2.19E+0	2.17E+0	
2	1	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	5	40	5.14E-5	0.00E+0	3.30E-5	0.00E+0	1.72E-5	0.00E+0	0.00E+0	3.43E-5	0.00E+0	0.00E+0	0.00E+0	
2	1	5	60	2.16E-4	3.04E-4	1.22E-4	6.47E-5	1.53E-4	1.35E-4	9.51E-5	4.74E-5	4.12E-5	8.30E-5	8.56E-6	
2	1	5	80	7.30E-4	1.21E-3	6.25E-4	4.66E-4	4.58E-4	2.12E-4	4.30E-4	3.14E-4	2.63E-4	1.08E-4	3.20E-7	
2	1	5	100	1.49E-3	1.64E-3	1.34E-3	1.05E-3	8.32E-4	5.59E-4	5.20E-4	5.41E-4	4.43E-4	4.16E-4	5.03E-4	
2	1	5	200	1.40E-2	1.12E-2	9.80E-3	8.45E-3	8.53E-3	7.21E-3	6.10E-3	6.28E-3	5.38E-3	4.73E-3	6.10E-3	
2	1	5	300	3.31E-1	2.24E-1	1.09E-1	6.45E-2	4.25E-2	2.69E-2	2.58E-2	2.13E-2	1.99E-2	1.82E-2	1.61E-2	
2	1	5	400	1.37E+0	2.52E+0	6.23E-1	4.67E-1	3.46E-1	2.51E-1	1.92E-1	1.39E-1	8.60E-2	7.34E-2	5.92E-2	
2	1	5	500	1.16E+0	1.12E+0	1.10E+0	1.09E+0	1.77E+0	6.95E-1	5.76E-1	4.46E-1	3.48E-1	2.92E-1	2.40E-1	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				0	2	4	6	8	10	13	20	30	40	50	60
				2	1	5	600	2.61E-1	3.80E-1	4.89E-1	5.73E-1	6.29E-1	6.66E-1	7.59E-1	9.00E-1
2	1	5	700	3.14E-1	3.69E-1	4.44E-1	5.49E-1	6.44E-1	6.74E-1	7.95E-1	8.96E-1	9.81E-1	1.07E+0	1.08E+0	1.06E+0
2	1	5	800	2.60E-1	3.80E-1	4.51E-1	5.41E-1	6.11E-1	6.86E-1	7.28E-1	8.88E-1	1.00E+0	1.05E+0	1.06E+0	1.06E+0
2	1	5	900	2.72E-1	3.80E-1	4.58E-1	5.49E-1	6.19E-1	6.08E-1	7.49E-1	8.46E-1	9.75E-1	1.07E+0	1.09E+0	1.11E+0
2	1	5	1000	2.84E-1	3.51E-1	4.75E-1	4.89E-1	5.85E-1	6.41E-1	7.35E-1	8.60E-1	9.87E-1	1.06E+0	1.08E+0	1.12E+0
2	1	5	1500	2.64E-1	4.02E-1	4.47E-1	5.05E-1	5.74E-1	6.50E-1	7.24E-1	8.21E-1	9.45E-1	1.06E+0	1.12E+0	1.17E+0
2	1	5	2000	2.92E-1	3.64E-1	4.41E-1	5.29E-1	5.92E-1	6.51E-1	7.08E-1	8.21E-1	9.57E-1	1.08E+0	1.17E+0	1.23E+0
2	1	5	2500	2.59E-1	3.12E-1	4.41E-1	5.39E-1	5.81E-1	6.14E-1	7.08E-1	8.68E-1	9.98E-1	1.12E+0	1.19E+0	1.30E+0
2	1	5	3000	2.61E-1	3.70E-1	4.75E-1	5.24E-1	5.99E-1	6.25E-1	7.18E-1	8.67E-1	1.05E+0	1.13E+0	1.25E+0	1.37E+0
2	1	0	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	1	0	40	1.06E+1	1.20E-2	2.20E-3	1.87E-5	3.69E-4	2.55E-4	1.59E-4	5.38E-5	1.28E-4	1.10E-4	3.08E-5	5.81E-5
2	1	0	60	1.68E-1	1.01E+1	1.05E-1	2.24E-2	6.48E-3	1.10E-3	6.71E-4	6.41E-4	6.58E-4	4.20E-4	2.52E-4	2.06E-4
2	1	0	80	1.37E-1	5.22E-1	1.36E+1	3.18E-1	8.53E-2	3.57E-2	8.53E-3	1.84E-3	1.22E-3	1.10E-3	9.91E-4	9.56E-4
2	1	0	100	1.43E-1	4.22E-1	7.92E-1	1.65E+1	4.49E-1	3.04E-1	9.24E-2	1.21E-2	5.47E-3	2.61E-3	2.01E-3	2.00E-3
2	1	0	200	1.44E-1	2.62E-1	4.58E-1	6.63E-1	7.74E-1	9.32E-1	1.16E+0	1.80E+0	4.18E+0	2.72E-1	8.89E-2	3.28E-2
2	1	0	300	2.16E-1	3.38E-1	4.56E-1	5.69E-1	6.62E-1	8.36E-1	9.36E-1	1.20E+0	1.35E+0	1.53E+0	4.19E+0	5.56E-1
2	1	0	400	2.56E-1	3.88E-1	4.87E-1	5.88E-1	6.53E-1	7.37E-1	8.64E-1	1.06E+0	1.21E+0	1.28E+0	1.33E+0	1.25E+0
2	1	0	500	2.37E-1	3.77E-1	5.05E-1	5.68E-1	6.49E-1	7.02E-1	8.35E-1	9.48E-1	1.11E+0	1.14E+0	1.17E+0	1.21E+0
2	1	0	600	2.41E-1	3.83E-1	4.51E-1	5.91E-1	6.59E-1	7.03E-1	7.83E-1	9.26E-1	1.04E+0	1.07E+0	1.10E+0	1.12E+0
2	1	0	700	2.37E-1	3.63E-1	4.71E-1	5.64E-1	6.25E-1	6.81E-1	7.21E-1	8.84E-1	1.00E+0	1.09E+0	1.09E+0	1.07E+0
2	1	0	800	3.11E-1	3.51E-1	4.93E-1	5.76E-1	5.88E-1	6.83E-1	7.59E-1	8.59E-1	9.58E-1	1.07E+0	1.07E+0	1.09E+0
2	1	0	900	3.43E-1	3.55E-1	4.35E-1	5.44E-1	6.10E-1	6.36E-1	7.38E-1	8.66E-1	9.39E-1	1.04E+0	1.09E+0	1.09E+0
2	1	0	1000	3.08E-1	3.87E-1	4.50E-1	5.27E-1	6.38E-1	6.91E-1	7.03E-1	8.43E-1	9.50E-1	1.02E+0	1.08E+0	1.10E+0
2	1	0	1500	3.58E-1	3.78E-1	4.43E-1	4.88E-1	5.28E-1	6.55E-1	7.03E-1	8.26E-1	9.67E-1	1.02E+0	1.12E+0	1.16E+0
2	1	0	2000	2.62E-1	3.24E-1	4.08E-1	4.62E-1	5.77E-1	6.05E-1	6.80E-1	8.05E-1	9.72E-1	1.05E+0	1.13E+0	1.20E+0
2	1	0	2500	2.69E-1	3.50E-1	4.71E-1	5.25E-1	5.92E-1	6.14E-1	6.98E-1	8.30E-1	9.63E-1	1.06E+0	1.18E+0	1.24E+0
2	1	0	3000	3.04E-1	3.22E-1	4.45E-1	5.10E-1	5.90E-1	6.14E-1	6.98E-1	8.54E-1	9.86E-1	1.10E+0	1.19E+0	1.29E+0
2	0.5	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	243	60	0.00E+0	1.30E-5	0.00E+0	7.65E-6	0.00E+0	3.47E-5	8.70E-6	1.17E-5	7.17E-5	1.42E-5	0.00E+0	8.65E-6
2	0.5	243	80	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.69E-4	2.27E-4	4.98E-5	1.62E-4	0.00E+0	2.74E-5	2.27E-5
2	0.5	243	100	1.07E-4	2.11E-4	2.24E-4	2.52E-4	9.39E-5	1.08E-4	5.62E-4	2.34E-4	2.63E-4	1.88E-4	1.87E-4	8.62E-6
2	0.5	243	200	3.09E-3	3.78E-3	3.53E-3	3.44E-3	3.22E-3	4.97E-3	3.90E-3	3.65E-3	2.77E-3	2.79E-3	1.83E-3	1.56E-3
2	0.5	243	300	8.28E-3	1.10E-2	1.17E-2	9.22E-3	1.02E-2	1.47E-2	1.10E-2	1.10E-2	1.01E-2	7.57E-3	6.49E-3	6.23E-3
2	0.5	243	400	1.57E-2	2.36E-2	2.64E-2	3.44E-2	3.39E-2	3.02E-2	3.32E-2	3.03E-2	2.47E-2	2.36E-2	2.10E-2	2.13E-2
2	0.5	243	500	3.36E-2	6.22E-2	6.50E-2	7.08E-2	7.53E-2	7.83E-2	7.71E-2	7.60E-2	6.79E-2	5.59E-2	5.36E-2	4.71E-2
2	0.5	243	600	7.92E-2	1.27E-1	1.55E-1	1.65E-1	1.65E-1	1.66E-1	1.75E-1	1.68E-1	1.50E-1	1.35E-1	1.20E-1	1.02E-1

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				2	1	5	600	1.12E+0	1.10E+0	1.08E+0	1.05E+0	1.01E+0	9.43E-1	9.04E-1	8.55E-1
2	1	5	700	1.05E+0	1.08E+0	1.07E+0	1.02E+0	1.04E+0	9.80E-1	9.47E-1	8.90E-1	8.45E-1	7.97E-1	7.71E-1	
2	1	5	800	1.12E+0	1.07E+0	1.08E+0	1.07E+0	1.03E+0	1.01E+0	1.01E+0	9.46E-1	9.27E-1	8.74E-1	8.51E-1	
2	1	5	900	1.12E+0	1.11E+0	1.12E+0	1.09E+0	1.12E+0	1.07E+0	1.04E+0	1.00E+0	9.79E-1	9.48E-1	8.76E-1	
2	1	5	1000	1.15E+0	1.16E+0	1.19E+0	1.18E+0	1.15E+0	1.15E+0	1.15E+0	1.09E+0	1.08E+0	1.03E+0	9.94E-1	
2	1	5	1500	1.23E+0	1.28E+0	1.34E+0	1.35E+0	1.37E+0	1.40E+0	1.41E+0	1.42E+0	1.41E+0	1.42E+0	1.36E+0	
2	1	5	2000	1.31E+0	1.38E+0	1.44E+0	1.51E+0	1.55E+0	1.61E+0	1.64E+0	1.65E+0	1.69E+0	1.68E+0	1.65E+0	
2	1	5	2500	1.39E+0	1.48E+0	1.57E+0	1.64E+0	1.73E+0	1.76E+0	1.84E+0	1.90E+0	1.92E+0	1.93E+0	1.90E+0	
2	1	5	3000	1.46E+0	1.54E+0	1.67E+0	1.77E+0	1.84E+0	1.93E+0	2.05E+0	2.08E+0	2.12E+0	2.16E+0	2.09E+0	
2	1	0	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	1	0	40	1.68E-5	0.00E+0	2.07E-5	1.24E-6	4.19E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.95E-5	
2	1	0	60	1.85E-4	1.77E-4	3.47E-5	7.36E-5	3.14E-5	9.24E-5	8.19E-5	2.74E-5	1.73E-5	3.81E-5	1.26E-5	
2	1	0	80	5.24E-4	5.73E-4	4.46E-4	2.14E-4	3.45E-4	2.61E-4	1.98E-4	3.49E-4	1.21E-4	7.47E-5	1.32E-4	
2	1	0	100	1.50E-3	1.60E-3	1.30E-3	8.46E-4	5.54E-4	6.82E-4	6.16E-4	6.13E-4	3.78E-4	1.99E-4	1.24E-4	
2	1	0	200	1.65E-2	1.19E-2	1.07E-2	9.62E-3	8.26E-3	6.81E-3	5.50E-3	5.77E-3	6.34E-3	5.53E-3	4.09E-3	
2	1	0	300	3.92E-1	2.72E-1	1.57E-1	8.48E-2	4.30E-2	3.03E-2	2.48E-2	2.33E-2	1.73E-2	1.59E-2	1.49E-2	
2	1	0	400	1.29E+0	2.85E+0	6.88E-1	5.32E-1	3.99E-1	2.93E-1	2.22E-1	1.58E-1	1.03E-1	8.08E-2	6.48E-2	
2	1	0	500	1.18E+0	1.17E+0	1.10E+0	1.07E+0	1.11E+0	1.54E+0	6.20E-1	5.19E-1	4.01E-1	3.18E-1	2.67E-1	
2	1	0	600	1.09E+0	1.08E+0	1.12E+0	1.05E+0	1.03E+0	9.72E-1	9.24E-1	8.76E-1	1.16E+0	6.53E-1	5.63E-1	
2	1	0	700	1.07E+0	1.07E+0	1.06E+0	1.06E+0	1.03E+0	1.00E+0	9.43E-1	9.19E-1	8.58E-1	8.36E-1	7.61E-1	
2	1	0	800	1.10E+0	1.07E+0	1.09E+0	1.08E+0	1.06E+0	1.03E+0	9.96E-1	9.73E-1	9.23E-1	9.00E-1	8.66E-1	
2	1	0	900	1.12E+0	1.12E+0	1.14E+0	1.13E+0	1.10E+0	1.10E+0	1.09E+0	1.04E+0	9.82E-1	9.35E-1	9.04E-1	
2	1	0	1000	1.12E+0	1.14E+0	1.16E+0	1.14E+0	1.15E+0	1.16E+0	1.09E+0	1.12E+0	1.09E+0	1.04E+0	9.90E-1	
2	1	0	1500	1.18E+0	1.23E+0	1.27E+0	1.36E+0	1.37E+0	1.40E+0	1.40E+0	1.41E+0	1.45E+0	1.44E+0	1.39E+0	
2	1	0	2000	1.25E+0	1.37E+0	1.39E+0	1.44E+0	1.52E+0	1.59E+0	1.64E+0	1.64E+0	1.67E+0	1.65E+0	1.61E+0	
2	1	0	2500	1.32E+0	1.42E+0	1.48E+0	1.60E+0	1.67E+0	1.74E+0	1.80E+0	1.84E+0	1.89E+0	1.89E+0	1.85E+0	
2	1	0	3000	1.41E+0	1.49E+0	1.59E+0	1.70E+0	1.78E+0	1.88E+0	1.96E+0	2.04E+0	2.08E+0	2.08E+0	2.05E+0	
2	0.5	243	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	243	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	243	60	3.34E-5	4.47E-5	3.47E-5	0.00E+0	1.26E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	243	80	4.51E-5	2.06E-5	0.00E+0	0.00E+0	1.34E-5	2.18E-5	1.42E-5	0.00E+0	0.00E+0	7.36E-5	0.00E+0	
2	0.5	243	100	7.70E-6	1.68E-5	2.27E-5	1.20E-4	1.16E-5	0.00E+0	4.38E-5	8.13E-5	1.58E-5	4.99E-5	1.13E-4	
2	0.5	243	200	1.55E-3	1.81E-3	1.19E-3	1.25E-3	1.24E-3	7.74E-4	7.66E-4	1.19E-3	4.65E-4	6.65E-4	5.43E-4	
2	0.5	243	300	5.77E-3	4.82E-3	4.39E-3	4.74E-3	3.28E-3	3.27E-3	3.72E-3	3.17E-3	2.40E-3	2.30E-3	3.12E-3	
2	0.5	243	400	1.76E-2	1.73E-2	1.45E-2	1.13E-2	1.32E-2	1.05E-2	1.12E-2	9.00E-3	7.90E-3	7.71E-3	5.19E-3	
2	0.5	243	500	4.29E-2	3.71E-2	3.43E-2	3.49E-2	3.31E-2	2.76E-2	2.29E-2	2.38E-2	2.03E-2	1.67E-2	1.55E-2	
2	0.5	243	600	8.02E-2	7.80E-2	6.91E-2	6.34E-2	5.45E-2	5.10E-2	4.61E-2	4.02E-2	3.91E-2	3.54E-2	3.16E-2	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)											
				Water Depth (cm)		4	6	8	10	13	20	30	40	50	60
				0	2										
2	0.5	243	700	1.25E-1	2.03E-1	2.32E-1	2.78E-1	2.86E-1	3.02E-1	2.98E-1	2.74E-1	2.60E-1	2.29E-1	1.94E-1	1.74E-1
2	0.5	243	800	1.70E-1	2.66E-1	3.31E-1	3.91E-1	4.09E-1	4.20E-1	4.27E-1	4.54E-1	4.03E-1	3.56E-1	3.11E-1	2.79E-1
2	0.5	243	900	1.68E-1	3.17E-1	4.04E-1	4.32E-1	4.77E-1	4.82E-1	5.24E-1	5.10E-1	4.92E-1	4.58E-1	4.15E-1	3.81E-1
2	0.5	243	1000	2.05E-1	3.53E-1	4.56E-1	4.81E-1	5.39E-1	5.64E-1	6.00E-1	6.00E-1	5.71E-1	5.44E-1	5.02E-1	4.71E-1
2	0.5	243	1500	4.01E-1	6.04E-1	7.79E-1	8.63E-1	9.09E-1	9.71E-1	9.87E-1	1.03E+0	1.05E+0	1.02E+0	9.93E-1	9.68E-1
2	0.5	243	2000	4.91E-1	8.18E-1	9.93E-1	1.14E+0	1.21E+0	1.30E+0	1.36E+0	1.44E+0	1.48E+0	1.50E+0	1.48E+0	1.45E+0
2	0.5	243	2500	6.34E-1	9.94E-1	1.26E+0	1.39E+0	1.51E+0	1.60E+0	1.72E+0	1.83E+0	1.93E+0	1.95E+0	1.97E+0	1.95E+0
2	0.5	243	3000	7.69E-1	1.16E+0	1.43E+0	1.62E+0	1.70E+0	1.81E+0	1.95E+0	2.15E+0	2.26E+0	2.31E+0	2.34E+0	2.36E+0
2	0.5	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	151	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.88E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.30E-6	2.80E-5	0.00E+0
2	0.5	151	60	0.00E+0	1.25E-4	8.38E-5	8.95E-6	3.60E-4	2.35E-4	2.87E-4	8.76E-5	8.55E-5	3.33E-5	4.59E-5	8.89E-6
2	0.5	151	80	1.38E-4	8.90E-4	1.38E-4	6.79E-4	1.11E-3	2.14E-4	4.21E-4	3.90E-4	3.20E-4	1.48E-4	2.58E-4	1.66E-4
2	0.5	151	100	2.78E-4	1.13E-3	1.03E-3	1.47E-3	1.15E-3	1.40E-3	6.89E-4	6.79E-4	8.55E-4	6.03E-4	5.28E-4	5.27E-4
2	0.5	151	200	3.51E-3	8.30E-3	7.10E-3	1.02E-2	1.08E-2	1.03E-2	7.70E-3	8.40E-3	6.48E-3	6.70E-3	5.05E-3	4.56E-3
2	0.5	151	300	1.14E-2	1.61E-2	2.72E-2	2.61E-2	2.34E-2	2.44E-2	2.70E-2	2.46E-2	2.25E-2	2.01E-2	1.72E-2	1.57E-2
2	0.5	151	400	4.93E-2	7.69E-2	1.06E-1	1.14E-1	1.16E-1	1.10E-1	1.16E-1	8.87E-2	7.48E-2	6.30E-2	5.37E-2	4.70E-2
2	0.5	151	500	1.20E-1	2.17E-1	2.67E-1	3.15E-1	3.36E-1	3.68E-1	3.44E-1	3.31E-1	2.78E-1	2.39E-1	1.84E-1	1.55E-1
2	0.5	151	600	1.94E-1	3.05E-1	4.34E-1	5.27E-1	5.92E-1	5.74E-1	6.44E-1	8.23E-1	5.96E-1	4.98E-1	4.22E-1	3.64E-1
2	0.5	151	700	2.05E-1	3.85E-1	5.03E-1	5.81E-1	6.11E-1	6.65E-1	7.01E-1	7.18E-1	7.44E-1	6.94E-1	6.76E-1	7.06E-1
2	0.5	151	800	2.58E-1	4.32E-1	5.54E-1	6.17E-1	6.90E-1	7.17E-1	7.52E-1	8.10E-1	8.24E-1	7.87E-1	7.40E-1	6.93E-1
2	0.5	151	900	2.94E-1	4.95E-1	6.08E-1	7.04E-1	7.55E-1	8.15E-1	8.15E-1	8.79E-1	8.91E-1	8.58E-1	8.35E-1	7.80E-1
2	0.5	151	1000	3.47E-1	5.52E-1	6.55E-1	7.70E-1	8.36E-1	8.73E-1	9.30E-1	9.72E-1	9.71E-1	9.77E-1	9.33E-1	8.95E-1
2	0.5	151	1500	4.92E-1	7.81E-1	9.33E-1	1.08E+0	1.20E+0	1.24E+0	1.29E+0	1.40E+0	1.45E+0	1.46E+0	1.48E+0	1.44E+0
2	0.5	151	2000	6.38E-1	9.40E-1	1.17E+0	1.34E+0	1.43E+0	1.51E+0	1.57E+0	1.71E+0	1.81E+0	1.88E+0	1.92E+0	1.91E+0
2	0.5	151	2500	6.94E-1	1.08E+0	1.30E+0	1.51E+0	1.63E+0	1.71E+0	1.78E+0	1.98E+0	2.11E+0	2.19E+0	2.26E+0	2.33E+0
2	0.5	151	3000	7.93E-1	1.22E+0	1.47E+0	1.69E+0	1.83E+0	1.96E+0	2.06E+0	2.26E+0	2.39E+0	2.54E+0	2.58E+0	2.64E+0
2	0.5	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	93	40	0.00E+0	0.00E+0	1.18E-4	2.28E-5	1.08E-4	0.00E+0	0.00E+0	2.61E-5	2.27E-5	1.57E-5	0.00E+0	0.00E+0
2	0.5	93	60	1.23E-4	4.43E-4	6.02E-4	2.22E-5	3.81E-4	3.67E-4	3.43E-4	3.24E-4	2.20E-4	2.27E-4	1.29E-4	1.34E-4
2	0.5	93	80	5.73E-4	4.21E-4	7.72E-4	1.03E-3	5.58E-4	7.10E-4	9.03E-4	8.93E-4	6.74E-4	5.20E-4	3.34E-4	4.01E-4
2	0.5	93	100	1.58E-3	2.14E-3	2.07E-3	1.41E-3	2.18E-3	1.68E-3	1.52E-3	1.62E-3	1.17E-3	8.02E-4	7.12E-4	9.31E-4
2	0.5	93	200	6.16E-3	1.16E-2	1.55E-2	1.38E-2	1.29E-2	9.96E-3	1.58E-2	1.32E-2	1.12E-2	9.25E-3	1.01E-2	9.46E-3
2	0.5	93	300	4.28E-2	8.58E-2	1.09E-1	1.28E-1	1.18E-1	1.12E-1	9.45E-2	7.19E-2	4.56E-2	3.49E-2	3.00E-2	2.65E-2
2	0.5	93	400	1.62E-1	3.28E-1	3.87E-1	4.75E-1	4.80E-1	5.01E-1	5.05E-1	4.63E-1	3.70E-1	2.73E-1	2.02E-1	1.41E-1
2	0.5	93	500	2.04E-1	3.43E-1	4.77E-1	5.92E-1	6.17E-1	6.45E-1	7.49E-1	8.68E-1	1.49E+0	7.12E-1	5.89E-1	4.98E-1
2	0.5	93	600	2.45E-1	4.07E-1	5.14E-1	6.27E-1	7.05E-1	7.56E-1	7.92E-1	8.69E-1	9.08E-1	8.76E-1	8.64E-1	8.70E-1
2	0.5	93	700	2.57E-1	4.19E-1	5.32E-1	6.53E-1	7.03E-1	7.53E-1	7.89E-1	8.91E-1	9.50E-1	9.62E-1	9.42E-1	8.86E-1

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				2	0.5	243	700	1.62E-1	1.38E-1	1.24E-1	1.09E-1	9.62E-2	9.31E-2	8.43E-2	7.35E-2
2	0.5	243	800	2.49E-1	2.01E-1	1.79E-1	1.58E-1	1.47E-1	1.28E-1	1.20E-1	1.11E-1	9.62E-2	8.66E-2	8.33E-2	
2	0.5	243	900	3.40E-1	3.01E-1	2.62E-1	2.36E-1	2.02E-1	1.88E-1	1.69E-1	1.43E-1	1.29E-1	1.19E-1	1.09E-1	
2	0.5	243	1000	4.26E-1	3.94E-1	3.54E-1	3.16E-1	2.89E-1	2.57E-1	2.25E-1	2.01E-1	1.81E-1	1.63E-1	1.39E-1	
2	0.5	243	1500	8.99E-1	8.54E-1	8.04E-1	7.39E-1	7.05E-1	6.49E-1	6.09E-1	5.50E-1	5.08E-1	4.71E-1	4.14E-1	
2	0.5	243	2000	1.43E+0	1.39E+0	1.34E+0	1.30E+0	1.24E+0	1.18E+0	1.14E+0	1.10E+0	1.00E+0	9.17E-1	9.20E-1	
2	0.5	243	2500	1.93E+0	1.96E+0	1.87E+0	1.86E+0	1.84E+0	1.78E+0	1.72E+0	1.68E+0	1.60E+0	1.52E+0	1.51E+0	
2	0.5	243	3000	2.38E+0	2.44E+0	2.33E+0	2.34E+0	2.29E+0	2.27E+0	2.22E+0	2.17E+0	2.17E+0	2.06E+0	1.98E+0	
2	0.5	151	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	151	40	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	151	60	6.76E-5	8.77E-5	8.09E-6	4.93E-5	0.00E+0	0.00E+0	9.31E-6	3.55E-5	0.00E+0	6.72E-6	0.00E+0	
2	0.5	151	80	1.02E-4	5.39E-5	5.83E-5	8.26E-5	8.39E-5	6.41E-5	4.30E-5	7.19E-5	0.00E+0	0.00E+0	3.07E-5	
2	0.5	151	100	4.11E-4	4.99E-4	3.02E-4	4.72E-4	2.15E-4	2.35E-4	1.08E-4	2.92E-4	3.94E-5	1.52E-5	5.38E-5	
2	0.5	151	200	3.25E-3	3.42E-3	3.53E-3	2.79E-3	2.02E-3	1.96E-3	1.92E-3	1.50E-3	1.57E-3	1.58E-3	1.29E-3	
2	0.5	151	300	1.33E-2	1.19E-2	9.80E-3	8.17E-3	8.60E-3	7.70E-3	7.15E-3	5.28E-3	4.83E-3	4.38E-3	3.39E-3	
2	0.5	151	400	3.96E-2	3.41E-2	3.36E-2	2.85E-2	2.66E-2	2.53E-2	2.18E-2	1.84E-2	1.96E-2	1.72E-2	1.67E-2	
2	0.5	151	500	1.24E-1	1.02E-1	8.41E-2	7.54E-2	6.54E-2	5.90E-2	4.97E-2	4.89E-2	4.57E-2	4.04E-2	3.70E-2	
2	0.5	151	600	2.96E-1	2.63E-1	2.10E-1	1.80E-1	1.51E-1	1.30E-1	1.13E-1	1.02E-1	9.35E-2	7.87E-2	7.76E-2	
2	0.5	151	700	5.26E-1	4.57E-1	3.82E-1	3.31E-1	2.80E-1	2.50E-1	2.11E-1	1.78E-1	1.55E-1	1.41E-1	1.32E-1	
2	0.5	151	800	6.54E-1	5.98E-1	5.53E-1	5.40E-1	4.44E-1	3.87E-1	3.35E-1	2.89E-1	2.53E-1	2.19E-1	2.00E-1	
2	0.5	151	900	7.39E-1	7.16E-1	6.46E-1	5.81E-1	5.23E-1	4.99E-1	4.61E-1	4.14E-1	3.53E-1	3.11E-1	2.79E-1	
2	0.5	151	1000	8.25E-1	7.86E-1	7.34E-1	6.85E-1	6.43E-1	5.91E-1	5.47E-1	4.91E-1	4.45E-1	3.98E-1	3.60E-1	
2	0.5	151	1500	1.41E+0	1.36E+0	1.30E+0	1.25E+0	1.17E+0	1.12E+0	1.07E+0	1.03E+0	9.79E-1	9.12E-1	8.72E-1	
2	0.5	151	2000	1.89E+0	1.89E+0	1.86E+0	1.86E+0	1.83E+0	1.73E+0	1.66E+0	1.63E+0	1.58E+0	1.52E+0	1.44E+0	
2	0.5	151	2500	2.33E+0	2.29E+0	2.31E+0	2.29E+0	2.30E+0	2.27E+0	2.25E+0	2.15E+0	2.11E+0	2.04E+0	1.99E+0	
2	0.5	151	3000	2.69E+0	2.71E+0	2.70E+0	2.70E+0	2.68E+0	2.67E+0	2.64E+0	2.62E+0	2.61E+0	2.53E+0	2.44E+0	
2	0.5	93	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	93	40	1.83E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	93	60	1.00E-4	7.90E-5	5.81E-5	4.99E-5	4.84E-5	5.31E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	93	80	3.56E-4	1.06E-4	1.26E-4	2.10E-4	1.82E-4	1.10E-4	1.72E-5	8.87E-5	3.16E-5	0.00E+0	2.86E-5	
2	0.5	93	100	7.24E-4	7.48E-4	2.50E-4	3.54E-4	3.85E-4	4.01E-4	2.47E-4	1.84E-4	1.85E-4	1.08E-4	3.35E-4	
2	0.5	93	200	8.32E-3	7.80E-3	6.10E-3	6.07E-3	4.71E-3	3.97E-3	3.57E-3	3.06E-3	2.96E-3	2.43E-3	3.28E-3	
2	0.5	93	300	2.38E-2	1.91E-2	1.60E-2	1.64E-2	1.36E-2	1.37E-2	1.09E-2	1.07E-2	1.01E-2	8.66E-3	8.35E-3	
2	0.5	93	400	1.01E-1	7.78E-2	6.98E-2	5.02E-2	4.23E-2	4.11E-2	3.64E-2	3.16E-2	2.93E-2	2.80E-2	2.35E-2	
2	0.5	93	500	3.86E-1	3.18E-1	2.37E-1	1.91E-1	1.61E-1	1.31E-1	1.05E-1	8.56E-2	7.80E-2	6.79E-2	5.73E-2	
2	0.5	93	600	1.07E+0	6.50E-1	5.38E-1	4.56E-1	3.77E-1	3.13E-1	2.62E-1	2.28E-1	1.92E-1	1.65E-1	1.49E-1	
2	0.5	93	700	8.38E-1	8.02E-1	7.45E-1	7.13E-1	7.40E-1	5.44E-1	4.65E-1	4.09E-1	3.41E-1	2.93E-1	2.66E-1	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				0	2	4	6	8	10	13	20	30	40	50	60
2	0.5	93	800	3.18E-1	4.79E-1	6.20E-1	7.04E-1	7.34E-1	8.18E-1	8.65E-1	9.41E-1	9.96E-1	9.97E-1	9.83E-1	9.56E-1
2	0.5	93	900	3.52E-1	5.27E-1	6.53E-1	7.23E-1	8.29E-1	8.36E-1	9.06E-1	9.94E-1	1.05E+0	1.08E+0	1.05E+0	1.03E+0
2	0.5	93	1000	3.89E-1	5.58E-1	7.26E-1	7.77E-1	8.74E-1	9.15E-1	9.76E-1	1.07E+0	1.12E+0	1.17E+0	1.14E+0	1.12E+0
2	0.5	93	1500	4.63E-1	7.30E-1	8.89E-1	9.75E-1	1.02E+0	1.11E+0	1.21E+0	1.31E+0	1.40E+0	1.47E+0	1.50E+0	1.51E+0
2	0.5	93	2000	5.35E-1	8.12E-1	9.70E-1	1.09E+0	1.25E+0	1.27E+0	1.36E+0	1.51E+0	1.64E+0	1.73E+0	1.79E+0	1.83E+0
2	0.5	93	2500	5.88E-1	9.18E-1	1.08E+0	1.25E+0	1.35E+0	1.45E+0	1.48E+0	1.70E+0	1.88E+0	1.99E+0	2.08E+0	2.13E+0
2	0.5	93	3000	7.02E-1	1.01E+0	1.22E+0	1.35E+0	1.50E+0	1.55E+0	1.67E+0	1.86E+0	2.01E+0	2.14E+0	2.31E+0	2.38E+0
2	0.5	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	58	40	0.00E+0	0.00E+0	2.16E-4	8.11E-5	2.20E-4	5.65E-5	1.00E-5	7.41E-5	4.65E-5	3.12E-5	0.00E+0	3.47E-5
2	0.5	58	60	7.19E-5	5.36E-4	8.41E-4	2.90E-4	2.16E-4	5.78E-4	3.57E-4	4.00E-4	4.43E-4	1.74E-4	2.83E-4	1.81E-4
2	0.5	58	80	7.48E-4	2.37E-3	1.45E-3	2.20E-3	1.59E-3	9.63E-4	1.10E-3	1.06E-3	9.14E-4	5.85E-4	9.33E-4	4.03E-4
2	0.5	58	100	3.33E-3	2.47E-3	3.38E-3	3.07E-3	3.06E-3	3.30E-3	3.03E-3	3.34E-3	2.08E-3	2.04E-3	1.48E-3	8.76E-4
2	0.5	58	200	1.80E-2	2.98E-2	3.25E-2	3.41E-2	2.73E-2	2.44E-2	2.48E-2	1.93E-2	1.88E-2	1.48E-2	1.43E-2	1.10E-2
2	0.5	58	300	1.85E-1	3.28E-1	3.77E-1	4.15E-1	4.33E-1	4.17E-1	4.11E-1	3.55E-1	2.61E-1	1.55E-1	8.32E-2	5.71E-2
2	0.5	58	400	2.20E-1	3.50E-1	4.64E-1	5.52E-1	6.60E-1	7.23E-1	8.18E-1	1.02E+0	2.27E+0	6.77E-1	5.43E-1	3.98E-1
2	0.5	58	500	2.42E-1	3.86E-1	5.21E-1	6.30E-1	6.81E-1	7.85E-1	8.37E-1	9.38E-1	9.94E-1	1.01E+0	1.03E+0	1.76E+0
2	0.5	58	600	2.77E-1	3.95E-1	4.84E-1	5.81E-1	6.68E-1	7.20E-1	8.02E-1	9.00E-1	9.90E-1	1.01E+0	1.03E+0	9.97E-1
2	0.5	58	700	2.64E-1	3.90E-1	5.07E-1	6.22E-1	6.76E-1	7.37E-1	7.88E-1	9.00E-1	9.54E-1	1.03E+0	1.02E+0	1.02E+0
2	0.5	58	800	2.86E-1	4.35E-1	5.51E-1	6.47E-1	7.02E-1	7.85E-1	8.42E-1	9.21E-1	1.00E+0	1.04E+0	1.06E+0	1.03E+0
2	0.5	58	900	3.30E-1	4.94E-1	6.19E-1	6.65E-1	7.47E-1	8.27E-1	8.66E-1	9.72E-1	1.06E+0	1.10E+0	1.11E+0	1.12E+0
2	0.5	58	1000	3.69E-1	5.09E-1	6.44E-1	6.98E-1	7.70E-1	8.14E-1	8.75E-1	1.00E+0	1.10E+0	1.16E+0	1.18E+0	1.17E+0
2	0.5	58	1500	4.00E-1	5.87E-1	7.01E-1	7.86E-1	8.40E-1	9.35E-1	1.00E+0	1.14E+0	1.25E+0	1.36E+0	1.39E+0	1.45E+0
2	0.5	58	2000	4.78E-1	6.56E-1	8.23E-1	8.69E-1	9.60E-1	1.04E+0	1.11E+0	1.23E+0	1.41E+0	1.51E+0	1.59E+0	1.68E+0
2	0.5	58	2500	4.90E-1	6.92E-1	8.94E-1	9.32E-1	1.02E+0	1.09E+0	1.16E+0	1.34E+0	1.51E+0	1.64E+0	1.73E+0	1.85E+0
2	0.5	58	3000	5.42E-1	7.86E-1	8.95E-1	1.00E+0	1.09E+0	1.17E+0	1.29E+0	1.45E+0	1.64E+0	1.78E+0	1.90E+0	2.03E+0
2	0.5	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	26	40	1.89E-4	0.00E+0	1.18E-4	2.45E-4	4.32E-4	1.40E-4	1.25E-4	1.27E-4	1.31E-4	4.74E-5	5.86E-6	3.78E-6
2	0.5	26	60	7.68E-4	8.22E-4	8.48E-4	9.34E-4	8.32E-4	9.10E-4	8.89E-4	8.73E-4	5.59E-4	4.16E-4	4.94E-4	3.94E-4
2	0.5	26	80	1.42E-3	1.92E-3	2.73E-3	2.99E-3	1.93E-3	2.13E-3	1.80E-3	1.74E-3	1.90E-3	1.54E-3	9.82E-4	7.94E-4
2	0.5	26	100	2.81E-3	4.68E-3	4.00E-3	6.20E-3	6.58E-3	3.67E-3	4.67E-3	4.63E-3	2.83E-3	2.77E-3	2.01E-3	1.69E-3
2	0.5	26	200	2.52E-1	6.84E+0	5.49E-1	5.01E-1	3.98E-1	3.47E-1	3.19E-1	2.08E-1	7.38E-2	2.75E-2	1.98E-2	1.35E-2
2	0.5	26	300	2.22E-1	3.35E-1	4.49E-1	5.90E-1	6.82E-1	7.82E-1	9.53E-1	1.34E+0	3.29E+0	5.44E-1	3.81E-1	2.69E-1
2	0.5	26	400	2.38E-1	3.87E-1	5.09E-1	6.23E-1	6.85E-1	7.72E-1	8.95E-1	1.04E+0	1.13E+0	1.19E+0	1.32E+0	2.53E+0
2	0.5	26	500	2.77E-1	3.80E-1	4.79E-1	5.91E-1	6.66E-1	7.09E-1	8.10E-1	9.33E-1	1.06E+0	1.14E+0	1.14E+0	1.10E+0
2	0.5	26	600	3.04E-1	3.63E-1	4.96E-1	5.77E-1	6.37E-1	6.75E-1	7.53E-1	8.82E-1	9.87E-1	1.05E+0	1.07E+0	1.09E+0
2	0.5	26	700	3.22E-1	3.62E-1	4.85E-1	5.35E-1	6.18E-1	6.78E-1	7.62E-1	8.74E-1	9.91E-1	1.03E+0	1.08E+0	1.05E+0
2	0.5	26	800	2.72E-1	3.90E-1	4.83E-1	5.31E-1	6.45E-1	7.13E-1	7.50E-1	8.77E-1	9.84E-1	1.05E+0	1.07E+0	1.07E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
2	0.5	93	800	9.35E-1	8.74E-1	8.30E-1	7.83E-1	7.05E-1	6.77E-1	6.20E-1	5.72E-1	5.51E-1	4.56E-1	3.98E-1	
2	0.5	93	900	9.93E-1	9.57E-1	9.01E-1	8.70E-1	8.31E-1	7.76E-1	7.09E-1	6.59E-1	6.27E-1	5.64E-1	5.31E-1	
2	0.5	93	1000	1.09E+0	1.06E+0	1.03E+0	9.74E-1	9.24E-1	8.70E-1	8.24E-1	7.67E-1	7.16E-1	6.59E-1	5.98E-1	
2	0.5	93	1500	1.56E+0	1.52E+0	1.53E+0	1.48E+0	1.47E+0	1.45E+0	1.38E+0	1.33E+0	1.29E+0	1.20E+0	1.14E+0	
2	0.5	93	2000	1.89E+0	1.93E+0	1.92E+0	1.93E+0	1.93E+0	1.90E+0	1.83E+0	1.86E+0	1.82E+0	1.75E+0	1.68E+0	
2	0.5	93	2500	2.18E+0	2.22E+0	2.23E+0	2.26E+0	2.26E+0	2.30E+0	2.27E+0	2.23E+0	2.23E+0	2.19E+0	2.12E+0	
2	0.5	93	3000	2.44E+0	2.54E+0	2.55E+0	2.59E+0	2.63E+0	2.66E+0	2.66E+0	2.68E+0	2.64E+0	2.60E+0	2.52E+0	
2	0.5	58	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	58	40	1.83E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	58	60	1.26E-4	1.06E-4	5.68E-5	9.57E-5	3.71E-5	8.78E-5	7.00E-6	5.48E-5	1.83E-6	0.00E+0	0.00E+0	
2	0.5	58	80	5.27E-4	2.08E-4	3.71E-4	2.53E-4	2.86E-4	1.67E-4	1.34E-4	9.68E-5	1.26E-4	5.44E-6	2.90E-5	
2	0.5	58	100	1.18E-3	8.08E-4	8.57E-4	7.37E-4	6.32E-4	4.39E-4	2.33E-4	4.60E-4	1.84E-4	1.90E-4	3.85E-4	
2	0.5	58	200	1.05E-2	8.72E-3	8.18E-3	7.25E-3	5.89E-3	6.19E-3	6.06E-3	4.49E-3	5.10E-3	4.20E-3	2.49E-3	
2	0.5	58	300	3.40E-2	2.80E-2	2.44E-2	2.16E-2	1.93E-2	1.68E-2	1.48E-2	1.45E-2	1.33E-2	1.10E-2	1.09E-2	
2	0.5	58	400	2.88E-1	2.21E-1	1.70E-1	1.07E-1	8.33E-2	6.75E-2	5.22E-2	4.12E-2	4.13E-2	3.54E-2	2.86E-2	
2	0.5	58	500	7.30E-1	6.28E-1	4.95E-1	4.03E-1	3.30E-1	2.65E-1	2.09E-1	1.70E-1	1.30E-1	1.14E-1	9.34E-2	
2	0.5	58	600	9.26E-1	9.12E-1	8.73E-1	1.10E+0	6.52E-1	5.51E-1	4.57E-1	3.84E-1	3.24E-1	2.76E-1	2.41E-1	
2	0.5	58	700	1.00E+0	9.75E-1	9.42E-1	8.55E-1	8.08E-1	7.66E-1	7.08E-1	7.74E-1	5.42E-1	4.75E-1	4.23E-1	
2	0.5	58	800	1.03E+0	1.00E+0	9.87E-1	9.31E-1	9.01E-1	8.49E-1	7.82E-1	7.40E-1	6.99E-1	6.39E-1	6.14E-1	
2	0.5	58	900	1.09E+0	1.07E+0	1.06E+0	9.85E-1	9.53E-1	9.32E-1	8.84E-1	8.16E-1	7.87E-1	7.26E-1	6.77E-1	
2	0.5	58	1000	1.18E+0	1.15E+0	1.15E+0	1.10E+0	1.06E+0	1.03E+0	9.86E-1	9.24E-1	8.64E-1	8.19E-1	7.77E-1	
2	0.5	58	1500	1.47E+0	1.49E+0	1.48E+0	1.48E+0	1.49E+0	1.49E+0	1.48E+0	1.44E+0	1.38E+0	1.35E+0	1.31E+0	
2	0.5	58	2000	1.69E+0	1.80E+0	1.79E+0	1.83E+0	1.83E+0	1.81E+0	1.84E+0	1.83E+0	1.81E+0	1.77E+0	1.72E+0	
2	0.5	58	2500	1.92E+0	1.98E+0	2.03E+0	2.12E+0	2.13E+0	2.17E+0	2.20E+0	2.19E+0	2.19E+0	2.15E+0	2.13E+0	
2	0.5	58	3000	2.10E+0	2.21E+0	2.29E+0	2.34E+0	2.40E+0	2.45E+0	2.46E+0	2.49E+0	2.52E+0	2.46E+0	2.41E+0	
2	0.5	26	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	26	40	1.83E-5	8.46E-6	0.00E+0	0.00E+0	1.72E-5	0.00E+0	0.00E+0	0.00E+0	3.43E-5	0.00E+0	0.00E+0	
2	0.5	26	60	1.35E-4	2.68E-4	1.61E-4	5.34E-5	1.47E-4	3.74E-5	1.58E-5	1.48E-5	4.00E-8	6.95E-5	8.56E-6	
2	0.5	26	80	6.31E-4	4.46E-4	6.47E-4	5.96E-4	3.34E-4	1.44E-4	3.56E-4	2.11E-4	6.69E-5	5.18E-5	3.90E-5	
2	0.5	26	100	1.27E-3	1.20E-3	9.19E-4	7.19E-4	7.39E-4	5.92E-4	5.08E-4	4.54E-4	4.18E-4	3.81E-4	2.01E-4	
2	0.5	26	200	1.40E-2	1.24E-2	1.21E-2	1.01E-2	1.02E-2	7.86E-3	5.97E-3	6.39E-3	5.14E-3	4.59E-3	5.68E-3	
2	0.5	26	300	1.37E-1	7.52E-2	4.81E-2	3.33E-2	2.67E-2	2.25E-2	2.04E-2	1.92E-2	1.62E-2	1.36E-2	1.43E-2	
2	0.5	26	400	6.56E-1	5.16E-1	3.80E-1	2.83E-1	2.12E-1	1.47E-1	1.07E-1	7.57E-2	5.99E-2	4.68E-2	4.14E-2	
2	0.5	26	500	1.06E+0	1.06E+0	1.76E+0	7.17E-1	5.94E-1	4.85E-1	3.85E-1	3.17E-1	2.49E-1	1.96E-1	1.85E-1	
2	0.5	26	600	1.08E+0	1.07E+0	1.01E+0	9.56E-1	8.91E-1	8.63E-1	1.14E+0	6.47E-1	5.44E-1	4.60E-1	3.83E-1	
2	0.5	26	700	1.05E+0	1.04E+0	1.02E+0	1.01E+0	9.51E-1	9.15E-1	8.59E-1	8.27E-1	7.69E-1	7.02E-1	6.95E-1	
2	0.5	26	800	1.08E+0	1.07E+0	1.04E+0	1.04E+0	1.01E+0	9.58E-1	9.30E-1	8.90E-1	8.44E-1	7.91E-1	7.30E-1	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)										
				0	2	4	6	8	10	13	20	30	40	50	60	
				2	0.5	26	900	3.20E-1	4.11E-1	4.46E-1	5.85E-1	6.48E-1	6.69E-1	7.76E-1	8.90E-1	1.02E+0
2	0.5	26	1000	3.04E-1	3.93E-1	4.79E-1	6.00E-1	6.64E-1	6.86E-1	7.68E-1	8.90E-1	1.00E+0	1.09E+0	1.12E+0	1.13E+0	
2	0.5	26	1500	3.30E-1	3.95E-1	5.36E-1	5.81E-1	6.54E-1	6.89E-1	8.00E-1	9.14E-1	1.06E+0	1.15E+0	1.22E+0	1.29E+0	
2	0.5	26	2000	3.22E-1	4.34E-1	5.21E-1	6.08E-1	7.07E-1	7.53E-1	7.89E-1	9.59E-1	1.09E+0	1.22E+0	1.31E+0	1.40E+0	
2	0.5	26	2500	3.31E-1	4.73E-1	5.68E-1	6.43E-1	7.01E-1	7.98E-1	8.61E-1	9.88E-1	1.15E+0	1.30E+0	1.40E+0	1.53E+0	
2	0.5	26	3000	3.44E-1	4.70E-1	6.32E-1	6.81E-1	7.50E-1	7.80E-1	8.67E-1	1.03E+0	1.19E+0	1.36E+0	1.48E+0	1.59E+0	
2	0.5	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	12	40	4.69E-5	4.09E-5	8.28E-5	1.39E-4	2.22E-4	2.68E-4	9.02E-5	1.30E-4	1.40E-4	3.71E-5	3.51E-5	3.78E-6	
2	0.5	12	60	8.27E-4	7.60E-4	1.07E-3	9.74E-4	1.51E-3	7.89E-4	1.42E-3	9.36E-4	5.58E-4	4.36E-4	5.03E-4	3.99E-4	
2	0.5	12	80	1.32E-2	6.95E-3	2.52E-3	4.29E-3	2.94E-3	2.07E-3	2.27E-3	2.03E-3	1.77E-3	1.77E-3	1.00E-3	9.28E-4	
2	0.5	12	100	6.32E-2	7.08E-2	3.81E-2	2.57E-2	1.52E-2	7.22E-3	5.71E-3	6.41E-3	3.31E-3	2.91E-3	2.41E-3	2.00E-3	
2	0.5	12	200	1.34E-1	3.01E-1	5.55E-1	7.26E-1	1.12E+0	1.34E+0	9.08E+0	5.23E-1	2.96E-1	8.99E-2	3.22E-2	1.87E-2	
2	0.5	12	300	2.07E-1	3.63E-1	5.02E-1	6.51E-1	7.37E-1	8.56E-1	9.93E-1	1.14E+0	1.48E+0	3.85E+0	5.88E-1	4.05E-1	
2	0.5	12	400	2.39E-1	3.40E-1	5.11E-1	5.81E-1	7.08E-1	7.20E-1	8.63E-1	1.08E+0	1.17E+0	1.26E+0	1.25E+0	1.29E+0	
2	0.5	12	500	2.95E-1	3.67E-1	4.74E-1	5.63E-1	6.35E-1	6.70E-1	7.83E-1	9.35E-1	1.09E+0	1.14E+0	1.22E+0	1.17E+0	
2	0.5	12	600	2.79E-1	3.79E-1	4.65E-1	5.36E-1	6.24E-1	6.88E-1	7.43E-1	9.03E-1	1.02E+0	1.08E+0	1.07E+0	1.11E+0	
2	0.5	12	700	2.84E-1	3.68E-1	4.72E-1	5.20E-1	6.03E-1	6.38E-1	7.51E-1	8.96E-1	9.99E-1	1.05E+0	1.06E+0	1.07E+0	
2	0.5	12	800	2.91E-1	3.94E-1	4.82E-1	5.24E-1	5.90E-1	6.68E-1	7.59E-1	8.66E-1	9.58E-1	1.04E+0	1.09E+0	1.08E+0	
2	0.5	12	900	2.89E-1	3.72E-1	4.73E-1	5.73E-1	6.10E-1	6.82E-1	7.37E-1	8.78E-1	9.71E-1	1.04E+0	1.07E+0	1.10E+0	
2	0.5	12	1000	2.62E-1	3.63E-1	4.98E-1	5.57E-1	5.60E-1	6.41E-1	7.52E-1	8.65E-1	9.67E-1	1.05E+0	1.09E+0	1.12E+0	
2	0.5	12	1500	3.52E-1	3.91E-1	4.43E-1	5.30E-1	5.88E-1	6.83E-1	6.99E-1	8.64E-1	9.88E-1	1.07E+0	1.13E+0	1.23E+0	
2	0.5	12	2000	3.22E-1	3.71E-1	4.62E-1	5.56E-1	5.94E-1	6.49E-1	7.30E-1	8.73E-1	1.00E+0	1.13E+0	1.20E+0	1.30E+0	
2	0.5	12	2500	2.64E-1	4.03E-1	4.49E-1	5.22E-1	5.87E-1	6.49E-1	7.44E-1	8.81E-1	1.04E+0	1.18E+0	1.27E+0	1.36E+0	
2	0.5	12	3000	3.05E-1	3.91E-1	4.66E-1	5.77E-1	6.30E-1	6.66E-1	7.57E-1	9.26E-1	1.07E+0	1.22E+0	1.28E+0	1.40E+0	
2	0.5	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	5	40	1.37E-4	1.34E-4	1.08E-4	2.03E-4	7.60E-6	2.12E-4	1.54E-4	1.56E-4	1.89E-4	4.19E-5	3.51E-5	3.78E-6	
2	0.5	5	60	2.03E-2	2.23E-2	3.81E-3	6.50E-4	1.02E-3	1.81E-3	1.06E-3	8.75E-4	7.72E-4	4.49E-4	7.83E-4	6.21E-4	
2	0.5	5	80	6.54E+0	2.86E-1	1.02E-1	3.88E-2	1.62E-2	2.79E-3	2.62E-3	2.07E-3	1.75E-3	1.64E-3	1.01E-3	1.00E-3	
2	0.5	5	100	1.65E-1	1.02E+1	4.04E-1	3.10E-1	1.52E-1	5.80E-2	2.15E-2	7.32E-3	4.64E-3	2.70E-3	2.17E-3	1.88E-3	
2	0.5	5	200	1.48E-1	2.78E-1	4.53E-1	6.30E-1	8.22E-1	1.01E+0	1.27E+0	4.91E+0	3.83E-1	1.87E-1	5.82E-2	2.29E-2	
2	0.5	5	300	1.91E-1	3.24E-1	4.97E-1	6.00E-1	7.35E-1	7.99E-1	1.03E+0	1.16E+0	1.35E+0	1.72E+0	3.51E+0	5.14E-1	
2	0.5	5	400	2.60E-1	3.80E-1	4.70E-1	6.00E-1	7.03E-1	7.18E-1	8.74E-1	1.05E+0	1.21E+0	1.31E+0	1.24E+0	1.29E+0	
2	0.5	5	500	2.45E-1	3.74E-1	4.61E-1	5.53E-1	6.39E-1	7.16E-1	7.91E-1	9.72E-1	1.07E+0	1.12E+0	1.22E+0	1.19E+0	
2	0.5	5	600	2.98E-1	3.75E-1	4.69E-1	5.84E-1	6.55E-1	6.82E-1	7.56E-1	9.03E-1	1.03E+0	1.07E+0	1.07E+0	1.10E+0	
2	0.5	5	700	2.71E-1	3.74E-1	4.76E-1	5.59E-1	6.45E-1	6.95E-1	7.41E-1	8.85E-1	9.84E-1	1.05E+0	1.08E+0	1.09E+0	
2	0.5	5	800	2.73E-1	3.40E-1	4.58E-1	5.53E-1	5.80E-1	6.39E-1	7.29E-1	8.69E-1	9.85E-1	1.06E+0	1.08E+0	1.09E+0	
2	0.5	5	900	2.84E-1	3.47E-1	4.36E-1	5.73E-1	6.08E-1	6.44E-1	7.12E-1	8.83E-1	9.56E-1	1.05E+0	1.08E+0	1.12E+0	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
				2	0.5	26	900	1.12E+0	1.10E+0	1.09E+0	1.09E+0	1.05E+0	1.05E+0	1.01E+0	9.68E-1
2	0.5	26	1000	1.17E+0	1.17E+0	1.18E+0	1.16E+0	1.15E+0	1.10E+0	1.09E+0	1.05E+0	1.02E+0	9.54E-1	9.20E-1	
2	0.5	26	1500	1.31E+0	1.38E+0	1.43E+0	1.44E+0	1.46E+0	1.46E+0	1.50E+0	1.47E+0	1.46E+0	1.41E+0	1.35E+0	
2	0.5	26	2000	1.49E+0	1.53E+0	1.58E+0	1.64E+0	1.70E+0	1.74E+0	1.79E+0	1.78E+0	1.76E+0	1.79E+0	1.70E+0	
2	0.5	26	2500	1.59E+0	1.66E+0	1.79E+0	1.84E+0	1.88E+0	1.95E+0	2.00E+0	2.03E+0	2.05E+0	2.05E+0	2.00E+0	
2	0.5	26	3000	1.70E+0	1.81E+0	1.89E+0	1.96E+0	2.07E+0	2.14E+0	2.20E+0	2.26E+0	2.30E+0	2.30E+0	2.21E+0	
2	0.5	12	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	12	40	2.35E-5	0.00E+0	3.30E-5	0.00E+0	1.81E-5	1.50E-5	0.00E+0	3.43E-5	0.00E+0	0.00E+0	0.00E+0	
2	0.5	12	60	2.69E-4	2.33E-4	1.74E-4	1.87E-4	1.88E-4	6.88E-5	4.46E-5	4.08E-5	7.54E-5	1.02E-4	0.00E+0	
2	0.5	12	80	6.93E-4	7.63E-4	9.04E-4	5.78E-4	4.56E-4	1.96E-4	3.56E-4	2.04E-4	1.10E-4	7.01E-5	2.44E-4	
2	0.5	12	100	1.83E-3	1.53E-3	1.02E-3	1.05E-3	1.08E-3	7.10E-4	5.93E-4	4.84E-4	5.47E-4	4.77E-4	5.22E-4	
2	0.5	12	200	1.43E-2	1.22E-2	1.13E-2	9.50E-3	8.08E-3	7.69E-3	7.51E-3	5.41E-3	5.43E-3	5.05E-3	4.72E-3	
2	0.5	12	300	2.78E-1	1.55E-1	8.31E-2	5.42E-2	3.29E-2	2.76E-2	2.54E-2	2.07E-2	1.94E-2	1.71E-2	1.48E-2	
2	0.5	12	400	2.68E+0	7.01E-1	5.50E-1	4.04E-1	2.91E-1	2.23E-1	1.68E-1	1.08E-1	7.30E-2	6.32E-2	5.77E-2	
2	0.5	12	500	1.16E+0	1.08E+0	1.08E+0	1.12E+0	1.48E+0	6.40E-1	4.99E-1	4.01E-1	3.16E-1	2.55E-1	2.11E-1	
2	0.5	12	600	1.13E+0	1.09E+0	1.06E+0	1.02E+0	9.40E-1	9.15E-1	8.78E-1	1.17E+0	6.80E-1	5.75E-1	4.90E-1	
2	0.5	12	700	1.07E+0	1.07E+0	1.04E+0	1.04E+0	1.00E+0	9.72E-1	9.18E-1	8.62E-1	8.04E-1	7.56E-1	7.11E-1	
2	0.5	12	800	1.08E+0	1.07E+0	1.07E+0	1.06E+0	1.02E+0	9.82E-1	9.67E-1	9.36E-1	9.04E-1	8.42E-1	8.08E-1	
2	0.5	12	900	1.14E+0	1.10E+0	1.13E+0	1.09E+0	1.08E+0	1.06E+0	1.03E+0	1.00E+0	9.63E-1	9.06E-1	8.62E-1	
2	0.5	12	1000	1.16E+0	1.17E+0	1.16E+0	1.17E+0	1.16E+0	1.14E+0	1.10E+0	1.09E+0	1.03E+0	9.96E-1	9.76E-1	
2	0.5	12	1500	1.29E+0	1.32E+0	1.33E+0	1.38E+0	1.40E+0	1.44E+0	1.44E+0	1.44E+0	1.42E+0	1.39E+0	1.36E+0	
2	0.5	12	2000	1.37E+0	1.45E+0	1.51E+0	1.55E+0	1.62E+0	1.66E+0	1.66E+0	1.70E+0	1.73E+0	1.68E+0	1.67E+0	
2	0.5	12	2500	1.47E+0	1.56E+0	1.62E+0	1.69E+0	1.78E+0	1.83E+0	1.89E+0	1.95E+0	1.96E+0	1.98E+0	1.91E+0	
2	0.5	12	3000	1.52E+0	1.63E+0	1.72E+0	1.82E+0	1.90E+0	1.99E+0	2.03E+0	2.17E+0	2.18E+0	2.17E+0	2.13E+0	
2	0.5	5	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	5	40	5.14E-5	0.00E+0	3.30E-5	0.00E+0	1.72E-5	0.00E+0	0.00E+0	3.43E-5	0.00E+0	0.00E+0	0.00E+0	
2	0.5	5	60	1.92E-4	3.35E-4	1.45E-4	8.71E-5	1.74E-4	1.00E-4	1.35E-4	4.74E-5	4.12E-5	7.37E-5	8.56E-6	
2	0.5	5	80	8.50E-4	1.01E-3	5.25E-4	6.38E-4	4.08E-4	2.07E-4	3.26E-4	1.81E-4	1.74E-4	1.43E-4	2.51E-4	
2	0.5	5	100	1.43E-3	1.12E-3	1.48E-3	9.08E-4	8.15E-4	4.78E-4	4.92E-4	7.17E-4	5.03E-4	2.75E-4	3.29E-4	
2	0.5	5	200	1.54E-2	1.29E-2	1.25E-2	8.54E-3	8.48E-3	8.14E-3	6.94E-3	5.50E-3	4.80E-3	4.96E-3	4.34E-3	
2	0.5	5	300	3.47E-1	2.33E-1	1.22E-1	6.97E-2	4.36E-2	2.93E-2	2.46E-2	2.21E-2	1.85E-2	1.71E-2	1.62E-2	
2	0.5	5	400	1.35E+0	2.47E+0	6.49E-1	4.88E-1	3.74E-1	2.67E-1	2.06E-1	1.37E-1	9.18E-2	6.95E-2	5.90E-2	
2	0.5	5	500	1.16E+0	1.13E+0	1.08E+0	1.10E+0	1.72E+0	6.95E-1	5.80E-1	4.57E-1	3.66E-1	3.01E-1	2.39E-1	
2	0.5	5	600	1.11E+0	1.11E+0	1.08E+0	1.06E+0	9.95E-1	9.52E-1	8.99E-1	8.81E-1	1.09E+0	6.22E-1	5.24E-1	
2	0.5	5	700	1.09E+0	1.06E+0	1.05E+0	1.03E+0	1.03E+0	9.91E-1	9.51E-1	9.25E-1	8.61E-1	8.00E-1	7.60E-1	
2	0.5	5	800	1.08E+0	1.10E+0	1.08E+0	1.08E+0	1.03E+0	1.01E+0	9.95E-1	9.46E-1	9.10E-1	8.83E-1	8.22E-1	
2	0.5	5	900	1.14E+0	1.10E+0	1.12E+0	1.13E+0	1.09E+0	1.07E+0	1.06E+0	1.01E+0	9.84E-1	9.35E-1	8.93E-1	

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				0	2	4	6	8	10	13	20	30	40	50	60
2	0.5	5	1000	2.98E-1	3.70E-1	4.90E-1	4.98E-1	5.91E-1	6.61E-1	7.15E-1	8.48E-1	9.55E-1	1.03E+0	1.07E+0	1.11E+0
2	0.5	5	1500	3.23E-1	3.75E-1	4.50E-1	4.95E-1	5.96E-1	6.46E-1	7.15E-1	8.24E-1	9.38E-1	1.05E+0	1.10E+0	1.19E+0
2	0.5	5	2000	2.39E-1	3.37E-1	4.29E-1	5.49E-1	5.99E-1	6.18E-1	7.00E-1	8.23E-1	9.58E-1	1.08E+0	1.16E+0	1.25E+0
2	0.5	5	2500	2.94E-1	3.69E-1	4.80E-1	5.28E-1	5.92E-1	5.92E-1	6.76E-1	8.48E-1	1.02E+0	1.10E+0	1.18E+0	1.26E+0
2	0.5	5	3000	3.17E-1	3.49E-1	4.51E-1	5.04E-1	5.82E-1	6.92E-1	7.28E-1	8.65E-1	1.03E+0	1.16E+0	1.23E+0	1.35E+0
2	0.5	0	20	2.30E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2	0.5	0	40	3.63E-1	6.62E+0	2.94E-3	7.30E-4	1.69E-4	1.84E-4	1.24E-5	9.60E-5	8.38E-5	2.51E-5	9.40E-6	6.59E-5
2	0.5	0	60	1.50E-1	1.10E+1	1.51E-1	2.72E-2	1.14E-2	1.31E-3	1.05E-3	7.67E-4	7.87E-4	4.26E-4	3.55E-4	2.93E-4
2	0.5	0	80	1.29E-1	4.72E-1	1.43E+1	3.53E-1	1.34E-1	5.28E-2	1.13E-2	2.23E-3	1.67E-3	1.21E-3	9.07E-4	1.08E-3
2	0.5	0	100	1.50E-1	4.36E-1	7.71E-1	1.31E+0	1.61E+1	3.49E-1	1.19E-1	1.68E-2	4.47E-3	3.04E-3	2.11E-3	2.14E-3
2	0.5	0	200	1.55E-1	2.66E-1	4.54E-1	6.55E-1	7.85E-1	9.58E-1	1.16E+0	1.81E+0	4.29E+0	2.69E-1	8.34E-2	2.86E-2
2	0.5	0	300	2.40E-1	2.97E-1	4.91E-1	6.09E-1	6.99E-1	7.68E-1	9.99E-1	1.16E+0	1.37E+0	1.54E+0	4.19E+0	5.85E-1
2	0.5	0	400	2.42E-1	3.64E-1	5.10E-1	5.67E-1	6.87E-1	7.39E-1	8.42E-1	1.02E+0	1.22E+0	1.32E+0	1.29E+0	1.29E+0
2	0.5	0	500	2.91E-1	4.07E-1	4.64E-1	5.79E-1	6.22E-1	7.29E-1	8.10E-1	9.59E-1	1.08E+0	1.13E+0	1.20E+0	1.22E+0
2	0.5	0	600	2.86E-1	3.69E-1	4.71E-1	5.70E-1	6.45E-1	7.24E-1	8.19E-1	8.94E-1	1.03E+0	1.09E+0	1.12E+0	1.12E+0
2	0.5	0	700	2.48E-1	3.64E-1	4.55E-1	5.18E-1	6.73E-1	6.99E-1	7.72E-1	8.76E-1	9.85E-1	1.05E+0	1.10E+0	1.07E+0
2	0.5	0	800	3.00E-1	3.79E-1	5.08E-1	5.36E-1	6.01E-1	6.77E-1	7.63E-1	8.56E-1	9.92E-1	1.04E+0	1.07E+0	1.07E+0
2	0.5	0	900	2.85E-1	3.64E-1	4.53E-1	5.46E-1	6.36E-1	6.86E-1	7.24E-1	8.31E-1	9.65E-1	1.04E+0	1.08E+0	1.11E+0
2	0.5	0	1000	2.80E-1	3.68E-1	4.14E-1	5.17E-1	6.00E-1	6.64E-1	7.51E-1	8.47E-1	9.61E-1	1.03E+0	1.06E+0	1.11E+0
2	0.5	0	1500	2.50E-1	3.42E-1	4.51E-1	5.07E-1	5.50E-1	6.79E-1	6.81E-1	8.22E-1	9.54E-1	1.04E+0	1.10E+0	1.14E+0
2	0.5	0	2000	2.74E-1	3.50E-1	4.04E-1	5.02E-1	5.74E-1	6.29E-1	6.87E-1	8.06E-1	9.52E-1	1.04E+0	1.13E+0	1.17E+0
2	0.5	0	2500	2.95E-1	3.63E-1	4.47E-1	5.12E-1	5.93E-1	6.30E-1	6.62E-1	8.09E-1	9.61E-1	1.07E+0	1.14E+0	1.23E+0
2	0.5	0	3000	2.29E-1	3.53E-1	4.32E-1	4.93E-1	5.78E-1	6.10E-1	7.28E-1	8.38E-1	9.90E-1	1.13E+0	1.18E+0	1.29E+0

Particle Z	Al g/cm2	Air g/cm2	Energy Mev/n	LET(MeV/cm)		Water Depth (cm)									
				70	80	90	100	110	120	130	140	150	160	170	
2	0.5	5	1000	1.19E+0	1.17E+0	1.17E+0	1.16E+0	1.17E+0	1.17E+0	1.13E+0	1.10E+0	1.07E+0	1.03E+0	9.74E-1	
2	0.5	5	1500	1.24E+0	1.28E+0	1.28E+0	1.35E+0	1.39E+0	1.40E+0	1.43E+0	1.44E+0	1.41E+0	1.44E+0	1.37E+0	
2	0.5	5	2000	1.31E+0	1.40E+0	1.46E+0	1.50E+0	1.60E+0	1.63E+0	1.67E+0	1.64E+0	1.70E+0	1.69E+0	1.65E+0	
2	0.5	5	2500	1.37E+0	1.46E+0	1.55E+0	1.64E+0	1.68E+0	1.76E+0	1.83E+0	1.88E+0	1.91E+0	1.94E+0	1.89E+0	
2	0.5	5	3000	1.46E+0	1.56E+0	1.63E+0	1.74E+0	1.83E+0	1.91E+0	2.01E+0	2.05E+0	2.12E+0	2.13E+0	2.09E+0	
2	0.5	0	20	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	
2	0.5	0	40	4.58E-5	2.61E-5	2.07E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.79E-6	0.00E+0	0.00E+0	0.00E+0	
2	0.5	0	60	1.43E-4	1.79E-4	4.44E-5	1.75E-5	1.73E-4	2.56E-5	6.34E-5	0.00E+0	3.56E-5	2.43E-5	4.04E-5	
2	0.5	0	80	7.10E-4	6.79E-4	4.42E-4	2.14E-4	3.01E-4	2.46E-4	1.99E-4	2.75E-4	9.65E-5	4.30E-5	2.31E-4	
2	0.5	0	100	1.24E-3	1.42E-3	9.99E-4	1.16E-3	7.00E-4	4.18E-4	5.17E-4	3.99E-4	4.35E-4	2.48E-4	3.43E-4	
2	0.5	0	200	1.74E-2	1.29E-2	1.23E-2	9.63E-3	8.61E-3	8.80E-3	7.69E-3	7.49E-3	5.56E-3	4.78E-3	3.31E-3	
2	0.5	0	300	3.99E-1	2.80E-1	1.55E-1	8.06E-2	5.50E-2	3.36E-2	2.67E-2	2.26E-2	1.98E-2	1.85E-2	1.49E-2	
2	0.5	0	400	1.31E+0	2.87E+0	7.00E-1	5.39E-1	3.98E-1	3.09E-1	2.20E-1	1.57E-1	1.13E-1	7.34E-2	6.65E-2	
2	0.5	0	500	1.21E+0	1.15E+0	1.13E+0	1.08E+0	1.12E+0	1.54E+0	6.31E-1	5.16E-1	4.02E-1	3.17E-1	2.73E-1	
2	0.5	0	600	1.08E+0	1.10E+0	1.11E+0	1.06E+0	1.03E+0	9.66E-1	9.06E-1	8.78E-1	1.15E+0	6.61E-1	5.96E-1	
2	0.5	0	700	1.08E+0	1.08E+0	1.05E+0	1.04E+0	1.03E+0	1.01E+0	9.62E-1	9.26E-1	8.88E-1	8.13E-1	7.85E-1	
2	0.5	0	800	1.09E+0	1.11E+0	1.09E+0	1.08E+0	1.08E+0	1.05E+0	1.01E+0	9.80E-1	9.40E-1	9.12E-1	8.43E-1	
2	0.5	0	900	1.13E+0	1.13E+0	1.13E+0	1.10E+0	1.08E+0	1.08E+0	1.07E+0	1.01E+0	9.86E-1	9.55E-1	9.15E-1	
2	0.5	0	1000	1.11E+0	1.16E+0	1.15E+0	1.17E+0	1.17E+0	1.14E+0	1.14E+0	1.11E+0	1.08E+0	1.05E+0	9.73E-1	
2	0.5	0	1500	1.17E+0	1.24E+0	1.30E+0	1.33E+0	1.35E+0	1.39E+0	1.41E+0	1.43E+0	1.40E+0	1.40E+0	1.38E+0	
2	0.5	0	2000	1.31E+0	1.34E+0	1.40E+0	1.46E+0	1.55E+0	1.56E+0	1.63E+0	1.66E+0	1.66E+0	1.69E+0	1.62E+0	
2	0.5	0	2500	1.34E+0	1.44E+0	1.51E+0	1.63E+0	1.68E+0	1.76E+0	1.79E+0	1.84E+0	1.91E+0	1.90E+0	1.87E+0	
2	0.5	0	3000	1.38E+0	1.48E+0	1.59E+0	1.69E+0	1.76E+0	1.90E+0	1.94E+0	2.02E+0	2.06E+0	2.09E+0	2.05E+0	

VITA

Michael I Hall was born in Anchorage, Alaska in 1983. He graduated from Bartlett High School in 2001 and went on to Calvin College in Grand Rapids, MI. He graduated with a Bachelor of Science degree in Engineering with a concentration in Chemical Engineering in 2005. In 2009, he returned to school at the University of Tennessee, where he pursued a Masters of Science in Nuclear Engineering. He completed this degree in May of 2011.