

29B USNRDL-TR-1102 29C
9 21 November 1966 10

AD 644 273

3 CHARGED PARTICLE TRACKS IN POLYMERS: 29A
NO. 3 - RANGE AND ENERGY LOSS TABLES 6DD

by
R. P. Henke
E. V. Benton

29. NASA Order A-65315-29A

FACILITY FORM	N 67-20193 (ACCESSION NUMBER)	(THRU)
	39 (PAGES)	3 (CODE)
	AD-644273 (NASA CR OR TMX OR AD NUMBER)	24 (CATEGORY)
	CR-83033	

**U.S. NAVAL RADIOLOGICAL
DEFENSE LABORATORY**

SAN FRANCISCO • CALIFORNIA • 94135

Acquisitioned Document
901

RADIOLOGICAL PHYSICS BRANCH
E. Tochilin, Head

PHYSICAL SCIENCES DIVISION
W. E. Kreger, Head

ADMINISTRATIVE INFORMATION

This report was sponsored and funded by the National Aeronautics and Space Administration (Reg. A-65315#1).

ACKNOWLEDGMENT

The authors wish to thank Dr. Harry H. Heckman of the University of California Lawrence Radiation Laboratory for the reading of the manuscript and for making useful suggestions.

DDC AVAILABILITY NOTICE

Distribution of this document is unlimited.

Eugene P. Cooper

Eugene P. Cooper
Technical Director

D.C. Campbell

D.C. Campbell, CAPT USN
Commanding Officer and Director

ABSTRACT

The range and energy loss rate for the ions ^1H , ^4He , ^{12}C , ^{16}O , ^{20}Ne , ^{28}Si , ^{40}Ar , ^{56}Fe , and ^{84}K are given in the energy/nucleon interval 0.1 - 1200 MeV/amu. These quantities are tabulated for the stopping materials cellulose nitrate, cellulose acetate butyrate, HBpaIT polyester, Lexan, Mylar, muscovite and phlogopite mica, soda lime and phosphate glass and olivine. The values for a given stopping material can be extended to other materials with similar values of the mean excitation potential by simple scaling. The computation involved a published mathematical method which was modified and extended to lower energies.

SUMMARY

The Problem

A new field of dosimetry has been developed using solid state materials to detect heavy charged nuclear particles. The range and energy loss data pertinent to the investigation and the use of these new detectors has not been thoroughly presented in the literature, thus creating a need for a machine computation of this information.

The Findings

Computed values of the range and energy loss for a wide spectrum of particles and particle energies is presented for the most commonly used detecting materials. An estimation of the accuracy of the results for solid state detecting materials is made by comparison of the computed results with experimental results for more common materials.

INTRODUCTION

The recent development and use of solid-state nuclear track detectors in a variety of applications in nuclear physics and dosimetry has created a need for accurate range-energy and energy loss relations.¹⁻⁵ Tracks are delineated in these materials as a result of a preferential removal, by etching, of the high chemical reactivity material along the particle trajectory.

Range-energy relations and the associated derivative relations of dE/dx - energy have been measured and calculated extensively for protons and alpha particles in many common materials. However, many of the solid state detecting materials, such as cellulose nitrate, Lexan, and Mica do not have comprehensive range-energy data available. Such information is essential for the investigation of the properties of these detectors since: (1) the energy loss rate, (dE/dx), plays a critical role in particle registration efficiency and (2) the length of tracks, location of maximum energy deposition, etc., are dependent upon the ranges of particles.

It is the goal of this report to provide range-energy relations for a wide variety of particles and a broad energy spectrum. For very low energy, heavy particles this has only been achieved, however, by sacrificing a certain amount of accuracy.

METHOD OF CALCULATION

To achieve a broad coverage of the spectrum of particles, energies, and stopping materials, the fits to range-energy data published by Barkas and Berger⁶ have been modified and extended to lower energies. Particle ranges in gm/cm² and energy loss rates in MeV cm²/gm are calculated as functions of the four parameters, A/Z, I_{adj}, z, and E. The ratio A/Z is the atomic mass per electron of the stopping material in amu/electron; I_{adj} is the mean value of the ionization energy for the stopping material adjusted by assuming that the shell correction for relativistic particles is zero;⁶ z and E are the atomic number and energy of the incident ion. The quantity A/Z can be calculated for an arbitrary stopping material, and if Bragg's rule⁶ is assumed, I_{adj} can also be calculated for this material.

For a velocity of βc the range, R, of a particle of mass M and charge z relative to a proton is given by:

$$R = \frac{M}{z^2} \left[\lambda(\beta) + B_z(\beta) \right]. \quad 1$$

For the stopping material in question $\lambda(\beta)$ is the range of an ideal proton with velocity βc , and $B_z(\beta)$ is the extension of the range caused by the neutralization of the moving ion's charge by charge pick-up near the stopping end of the trajectory. An ideal proton is entirely ionized during the energy loss process in contrast to an actual proton which incurs charge pick-up. The subscript, z, on $B_z(\beta)$ indicates that the range extension is dependent upon the atomic number of the moving ion.

Barkas and Berger have made fits for λ of the form:

$$\log \lambda = \log \frac{A}{Z} + \sum_{mn} a_{mn} (\log I_{adj})^m (\log E)^n, \quad 2$$

where E is the energy of the proton corresponding to velocity βc . The quoted regions of validity of their two fits are 1 - 9 MeV and

7 - 1200 MeV. They represent $B_z(\beta)$ by a linear function of β for $\frac{137\beta}{z} < 2.0$ and an asymptotic value independent of β for $\frac{137\beta}{z} > 2.0$.

The representation of Barkas and Berger has been modified as follows:

1. A least squares fit of the form given above (Equation 2) was made to all of the low energy range-energy points given by Whaling⁷ up to 0.95 MeV also points from the fit of Barkas and Berger at 1, 2, and 3 MeV were included to insure a smooth connection in this region. The ideal proton's range was calculated by subtracting the range extension from the real range.

2. The fits in the different energy ranges have been connected at the appropriate points, functions of I_{adj} , which provide a minimum discontinuity in both λ and its derivative.

3. The range extension expression for emulsion measured by Heckman, et al.⁸ and Henke and Benton⁹ has been scaled to other materials to provide a smooth replacement of the $B_z(\beta)$ given. This was achieved by scaling the range extension for emulsion to correspond to the extension given by Barkas and Berger in the asymptotic, high energy region. In the lower energy region the scaled emulsion expression agrees quite well with B_z given by Barkas and Berger; the scaled emulsion range extension, however, has a continuous first derivative, which is the requirement for continuity in the calculated energy loss rate curve.

The values of I_{adj} are those recommended by the National Academy of Sciences subcommittee on penetration of charged particles.¹⁰ In materials for which I_{adj} is not listed it is calculated assuming the validity of Bragg's rule of the additivity of stopping effects. In this case the I_{adj} for the constituent ions in the compound form is used when it is listed; otherwise I_{adj} is computed from a fit to the recommended values of I_{adj} . This function, $I_{adj}(z)$, is given by Barkas and Berger.⁶

DISCUSSION

The R.M.S. dispersions of the input range energy points about the computed points for the high (7 - 1200 MeV/nuc.) and medium (1 - 9 MeV/nuc.) energy regions are 0.6% and 2% respectively.⁶ For the high energy region the spread of the stopping power values is 1.3%. The R.M.S. spread of Whaling's data about the computed values for the low energy region are given in Table I for several values of the proton energy.

The error in the smoothed relations may be considerably smaller since the error quoted largely represents fluctuation of the data, not the poorness of the fit. There are only 16 stopping materials involved, however; hence the error of the smoothed curve probably exceeds $1/\sqrt{16}$ of the quoted spreads. A large contributor to the extreme spread of the data about the smoothed relations seems to be the integration constants used by Whaling.⁷ His range-energy curves were obtained by the integration of energy loss rate data. Another possible contributor is the questionable practice of using I_{adj} as the smoothing parameter for this low energy region.

The range extension, $B_z(\beta)$, is given by the following expression:⁶

$$B_z(\rho) = \int_0^{\beta} \left[(z/z^*)^2 - 1 \right] (d\lambda/d\beta) d\beta \quad 3$$

where z^* is the effective charge of the moving ion with atomic number z . We obtain $B_z(\beta)$ by scaling the corresponding experimental expression for emulsion to other materials. It can be seen from Equation 3 that this procedure relies on two assumptions: (1) the effective charge, z^* , is only a function of β and z , not a function of the stopping material, (2) the proton range expression, $\lambda(\beta)$, can be scaled for different stopping materials.

The validity of the first assumption, that z^*/z is independent of the stopping material, seems to be demonstrated experimentally except for very low incident particle energy and very low stopping material density.⁸

The second assumption is approximately true for small values of β . Barkas and Berger have used the expression:

Table I
SMOOTHNESS OF LOW ENERGY DATA

Energy (MeV)	R.M.S. Spread in Range %	R.M.S. Spread in Energy Loss Rate (%)
0.1	28.2	23.3
0.2	17.1	14.5
0.5	8.5	5.2
1.0	4.8	2.3
2.0	4.4	1.7

$$\lambda = (11.1 + 1.34 I_{adj}^{5/8}) (A/Z) \beta^{10/3} \text{ gm/cm}^2 \quad 4$$

We have retained the $(1 + 0.121 I_{adj}^{5/8})$ dependence of the range-energy relation and hence of B_z , but have used the experimental results for emulsion to obtain the universal function that is to be scaled. Deriving B_z in this fashion is an improvement over the use of the simplified analytic expression obtained from Equations 3 and 4, but still does not take into account the slight dependence of the shape of the curve $\lambda(\beta)$ upon the stopping material. Thus an error will be introduced when I_{adj} of the material deviates significantly from I_{adj} for emulsion if $B_z(\beta)/\lambda(\beta)$ is not small. This situation is encountered when β is small and z is large.

Various parameters for the stopping materials for which range-energy relations were calculated are given in Table II. The chemical formulae used are taken from Fleisher, et al.,¹¹ and may not be representative of all the commercial materials available under a given name. The differences are due to such factors as the amount and type of plasticizers used, the degree of nitration, etc., and the method of sample preparation (solvents used, amount of drying, etc.).

For energies in excess of approximately 500 MeV/nuc. the probability for a nuclear interaction becomes significant. In such situations the full range given in the table may not be achieved. The probabilities for these inelastic interactions for protons have been calculated by Janni.¹²

The energy loss rate relations have been obtained by taking the derivative of Equation 1. This procedure essentially reproduces the experimental data and for lower energies has been considered superior to using the equation:

$$\left(\frac{dE}{dx} \right)_{\beta} = \left[z^*(\beta) \right]^2 \left(\frac{dE_p}{dx} \right)_{\beta} \quad 5$$

where $z^*(\beta)$ is the effective charge of the heavy ion⁸ and $\left(\frac{dE_p}{dx} \right)$ is

the energy loss rate for the ideal proton. For $\beta > 2 \frac{137}{z}$ the two approaches give identical results.

Table II
PARAMETERS OF THE STOPPING MATERIALS

Material	I_{adj}	A/Z	Composition
Cellulose nitrate	81.1	1.939	$C_6H_8O_9N_2$
Cellulose acetate butyrate	63.4	1.835	$C_{20}H_{32}O_5$
HBpaIt polyester	72.5	1.931	$C_{17}H_9O_2$
Bisphenol-A poly- carbonate (Lexan)	69.5	1.896	$C_{16}H_{14}O_3$
Polyethylene tereph- thalate (Mylar)	73.2	1.915	$C_{19}H_{16}O_7$
Muscovite mica	128.3	2.011	$KAl_3Si_3O_{10}(OH)_2$
Phlogopite mica	129.4	2.009	$KMg_2Al_2Si_3O_{10}(OH)_2$
Soda lime glass	131.6	2.014	$67SiO_2:14Na_2O:14CaO:5Al_2O_3$
Phosphate glass	196.8	2.138	$63P_2O_5:11UO_2:8Al_2O_3:9Ag_2O:9K_2O$
Olivine	158.9	2.050	$MgFeSiO_4$

REFERENCES

1. D. A. Young, *Nature* 182, 375 (1958).
2. R. L. Fleischer, P. B. Price and R. M. Walker, *Phys. Rev.* 133, A1443 (1964).
3. J. H. Davies and R. W. Darmitzel, *Nucleonics* 23, 86 (July 1965).
4. D. Engelkemeir and G. N. Walton, Atomic Energy Research Establishment, Harwell, England, AERE-R4716 (1964).
5. J. W. N. Tuyn, Stichting Reactor Centrum Nederland Krito, Memo No. 34 (1965).
6. W. H. Barkas and M. J. Berger, National Academy of Sciences - National Research Council Publication - 1133, 103 (1964).
7. W. Whaling, *Encyclopedia of Physics*, 34, 193, Fluegge, S., Ed., Springer-Verlag, Berlin (1958).
8. H. H. Heckman, B. L. Perkins, W. G. Simon, F. M. Smith and W. H. Barkas, *Phys. Rev.* 117, 544 (1960).
9. R. P. Henke and E. V. Benton, *Phys. Rev.* 139, A2017 (1965).
10. J. E. Turner, National Academy of Sciences - National Research Council Publication - 1133, 99 (1964).
11. R. L. Fleischer, P. B. Price and R. M. Walker, G. E. Research Lab. Report No. 65-41-3933M (1965).
12. J. F. Janni, Calculations of Energy Loss, Range, Path Length, Straggling, Multiple Scattering and the Probability of Inelastic Nuclear Collisions for 0.1 to 1000 MeV Protons, Air Force Weapons Laboratory, Albuquerque, New Mexico, AFWL-TR-65-150 (1966).

RANGE AND ENERGY LOSS RATE TABLES

In the following tables the ranges in gm/cm^2 and the (dE/dx) values in $\text{MeV cm}^2/\text{gm}$ are listed for nine representative ions in each stopping material. The intervals between the forty-eight energy points have been chosen such that a linear interpolation contributes less than 1% error. The values of I_{adj} are labeled by a non-subscripted I for typographical reasons. More places of precision are given than are significant to eliminate rounding errors and for the sake of differential measurements.

RANGE IN CELLULOSE NITRATE (GM/CM2) I = 81.1 A/Z = 1.939

ENRG./NUC. (MEV/AMU)	1	H	4	12	C	16	O	20	NE	28	SI	40	AR	56	FE	84	KR
0.10	1.396E-04	2.427E-04	2.328E-04	2.427E-04	2.598E-04	2.598E-04	2.598E-04	2.764E-04	3.058E-04	3.455E-04	3.455E-04	3.723E-04	3.723E-04	4.228E-04	4.228E-04	5.367E-04	5.367E-04
0.12	1.667E-04	2.770E-04	2.739E-04	2.770E-04	2.951E-04	2.951E-04	2.951E-04	3.132E-04	3.455E-04	3.455E-04	3.455E-04	4.183E-04	4.183E-04	4.720E-04	4.720E-04	5.967E-04	5.967E-04
0.15	2.104E-04	3.269E-04	3.361E-04	3.269E-04	3.458E-04	3.458E-04	3.458E-04	3.656E-04	4.025E-04	4.025E-04	4.025E-04	4.838E-04	4.838E-04	5.412E-04	5.412E-04	6.803E-04	6.803E-04
0.20	2.911E-04	4.424E-04	4.424E-04	4.076E-04	4.263E-04	4.263E-04	4.263E-04	4.479E-04	4.905E-04	4.905E-04	4.905E-04	5.866E-04	5.866E-04	6.480E-04	6.480E-04	8.079E-04	8.079E-04
0.25	3.817E-04	5.526E-04	5.526E-04	4.867E-04	5.039E-04	5.039E-04	5.039E-04	5.262E-04	5.727E-04	5.727E-04	5.727E-04	6.842E-04	6.842E-04	7.477E-04	7.477E-04	9.254E-04	9.254E-04
0.30	4.816E-04	6.671E-04	6.671E-04	5.800E-04	5.800E-04	5.800E-04	5.800E-04	6.020E-04	6.511E-04	6.511E-04	6.511E-04	7.783E-04	7.783E-04	8.425E-04	8.425E-04	1.033E-03	1.033E-03
0.40	7.076E-04	9.095E-04	9.095E-04	7.231E-04	7.231E-04	7.231E-04	7.231E-04	7.495E-04	8.007E-04	8.007E-04	8.007E-04	9.489E-04	9.489E-04	1.022E-03	1.022E-03	1.244E-03	1.244E-03
0.50	9.670E-04	1.173E-03	1.173E-03	8.837E-04	8.837E-04	8.837E-04	8.837E-04	8.945E-04	9.444E-04	9.444E-04	9.444E-04	1.113E-03	1.113E-03	1.194E-03	1.194E-03	1.436E-03	1.436E-03
0.60	1.258E-03	1.465E-03	1.465E-03	1.049E-03	1.049E-03	1.049E-03	1.049E-03	1.039E-03	1.079E-03	1.079E-03	1.079E-03	1.270E-03	1.270E-03	1.359E-03	1.359E-03	1.621E-03	1.621E-03
0.70	1.580E-03	1.878E-03	1.878E-03	1.219E-03	1.219E-03	1.219E-03	1.219E-03	1.185E-03	1.224E-03	1.224E-03	1.224E-03	1.425E-03	1.425E-03	1.513E-03	1.513E-03	1.799E-03	1.799E-03
0.80	1.931E-03	2.139E-03	2.139E-03	1.394E-03	1.394E-03	1.394E-03	1.394E-03	1.332E-03	1.363E-03	1.363E-03	1.363E-03	1.577E-03	1.577E-03	1.665E-03	1.665E-03	1.973E-03	1.973E-03
1.00	2.720E-03	2.928E-03	2.928E-03	1.763E-03	1.763E-03	1.763E-03	1.763E-03	1.633E-03	1.640E-03	1.640E-03	1.640E-03	1.877E-03	1.877E-03	1.959E-03	1.959E-03	2.312E-03	2.312E-03
1.20	3.621E-03	3.830E-03	3.830E-03	2.157E-03	2.157E-03	2.157E-03	2.157E-03	1.945E-03	1.922E-03	1.922E-03	1.922E-03	2.177E-03	2.177E-03	2.246E-03	2.246E-03	2.642E-03	2.642E-03
1.50	5.177E-03	5.385E-03	5.385E-03	2.796E-03	2.796E-03	2.796E-03	2.796E-03	2.437E-03	2.357E-03	2.357E-03	2.357E-03	2.631E-03	2.631E-03	2.670E-03	2.670E-03	3.102E-03	3.102E-03
2.00	8.299E-03	8.507E-03	8.507E-03	3.997E-03	3.997E-03	3.997E-03	3.997E-03	3.330E-03	3.124E-03	3.124E-03	3.124E-03	3.413E-03	3.413E-03	3.374E-03	3.374E-03	3.857E-03	3.857E-03
2.50	1.200E-02	1.221E-02	1.221E-02	5.349E-03	5.349E-03	5.349E-03	5.349E-03	4.306E-03	3.941E-03	3.941E-03	3.941E-03	4.230E-03	4.230E-03	4.086E-03	4.086E-03	4.559E-03	4.559E-03
3.00	1.625E-02	1.646E-02	1.646E-02	6.850E-03	6.850E-03	6.850E-03	6.850E-03	5.366E-03	4.813E-03	4.813E-03	4.813E-03	5.088E-03	5.088E-03	4.815E-03	4.815E-03	5.399E-03	5.399E-03
3.50	2.109E-02	2.130E-02	2.130E-02	8.513E-03	8.513E-03	8.513E-03	8.513E-03	6.521E-03	5.749E-03	5.749E-03	5.749E-03	5.996E-03	5.996E-03	5.569E-03	5.569E-03	6.089E-03	6.089E-03
4.00	2.650E-02	2.670E-02	2.670E-02	1.034E-02	1.034E-02	1.034E-02	1.034E-02	7.772E-03	6.749E-03	6.749E-03	6.749E-03	6.956E-03	6.956E-03	6.351E-03	6.351E-03	6.853E-03	6.853E-03
5.00	3.902E-02	3.923E-02	3.923E-02	1.453E-02	1.453E-02	1.453E-02	1.453E-02	1.057E-02	8.953E-03	8.953E-03	8.953E-03	9.043E-03	9.043E-03	8.013E-03	8.013E-03	8.436E-03	8.436E-03
6.00	5.382E-02	5.403E-02	5.403E-02	2.516E-02	2.516E-02	2.516E-02	2.516E-02	1.946E-02	1.376E-02	1.376E-02	1.376E-02	1.136E-02	1.136E-02	9.815E-03	9.815E-03	1.011E-02	1.011E-02
7.00	7.089E-02	7.109E-02	7.109E-02	4.039E-02	4.039E-02	4.039E-02	4.039E-02	2.813E-02	1.420E-02	1.420E-02	1.420E-02	1.392E-02	1.392E-02	1.177E-02	1.177E-02	1.189E-02	1.189E-02
8.00	9.023E-02	9.044E-02	9.044E-02	5.044E-02	5.044E-02	5.044E-02	5.044E-02	3.161E-02	1.726E-02	1.726E-02	1.726E-02	1.673E-02	1.673E-02	1.388E-02	1.388E-02	1.377E-02	1.377E-02
10.00	1.350E-01	1.352E-01	1.352E-01	6.520E-02	6.520E-02	6.520E-02	6.520E-02	4.652E-02	3.602E-02	3.602E-02	3.602E-02	3.001E-02	3.001E-02	2.363E-02	2.363E-02	2.227E-02	2.227E-02
12.00	1.864E-01	1.866E-01	1.866E-01	8.366E-02	8.366E-02	8.366E-02	8.366E-02	6.084E-02	3.191E-02	3.191E-02	3.191E-02	3.01E-02	3.01E-02	2.493E-02	2.493E-02	2.227E-02	2.227E-02
15.00	2.776E-01	2.778E-01	2.778E-01	9.408E-02	9.408E-02	9.408E-02	9.408E-02	5.912E-02	4.540E-02	4.540E-02	4.540E-02	4.211E-02	4.211E-02	3.233E-02	3.233E-02	2.966E-02	2.966E-02
20.00	4.659E-01	4.661E-01	4.661E-01	1.568E-01	1.568E-01	1.568E-01	1.568E-01	5.677E-02	7.271E-02	7.271E-02	7.271E-02	6.642E-02	6.642E-02	4.957E-02	4.957E-02	4.409E-02	4.409E-02
25.00	6.974E-01	6.976E-01	6.976E-01	2.340E-01	2.340E-01	2.340E-01	2.340E-01	1.431E-01	1.059E-01	1.059E-01	1.059E-01	9.577E-02	9.577E-02	7.015E-02	7.015E-02	6.105E-02	6.105E-02
30.00	9.705E-01	9.707E-01	9.707E-01	3.250E-01	3.250E-01	3.250E-01	3.250E-01	1.977E-01	1.449E-01	1.449E-01	1.449E-01	1.300E-01	1.300E-01	9.396E-02	9.396E-02	8.049E-02	8.049E-02
35.00	1.284E+00	1.284E+00	1.284E+00	4.294E-01	4.294E-01	4.294E-01	4.294E-01	2.603E-01	1.897E-01	1.897E-01	1.897E-01	1.589E-01	1.589E-01	1.209E-01	1.209E-01	1.024E-01	1.024E-01
40.00	1.635E+00	1.635E+00	1.635E+00	5.466E-01	5.466E-01	5.466E-01	5.466E-01	3.306E-01	2.399E-01	2.399E-01	2.399E-01	2.124E-01	2.124E-01	1.509E-01	1.509E-01	1.266E-01	1.266E-01
50.00	2.449E+00	2.449E+00	2.449E+00	8.179E-01	8.179E-01	8.179E-01	8.179E-01	4.934E-01	3.562E-01	3.562E-01	3.562E-01	3.130E-01	3.130E-01	2.197E-01	2.197E-01	1.818E-01	1.818E-01
60.00	3.403E+00	3.403E+00	3.403E+00	1.136E+00	1.136E+00	1.136E+00	1.136E+00	6.842E-01	4.925E-01	4.925E-01	4.925E-01	4.308E-01	4.308E-01	2.997E-01	2.997E-01	2.458E-01	2.458E-01
70.00	4.490E+00	4.490E+00	4.490E+00	1.498E+00	1.498E+00	1.498E+00	1.498E+00	9.016E-01	6.478E-01	6.478E-01	6.478E-01	5.650E-01	5.650E-01	3.904E-01	3.904E-01	3.181E-01	3.181E-01
80.00	5.703E+00	5.703E+00	5.703E+00	1.902E+00	1.902E+00	1.902E+00	1.902E+00	1.144E+00	8.210E-01	8.210E-01	8.210E-01	7.147E-01	7.147E-01	4.911E-01	4.911E-01	3.982E-01	3.982E-01
100.00	8.482E+00	8.482E+00	8.482E+00	2.829E+00	2.829E+00	2.829E+00	2.829E+00	1.700E+00	1.218E+00	1.218E+00	1.218E+00	1.058E+00	1.058E+00	7.216E-01	7.216E-01	5.808E-01	5.808E-01
120.00	1.170E+01	1.170E+01	1.170E+01	3.901E+00	3.901E+00	3.901E+00	3.901E+00	2.344E+00	1.678E+00	1.678E+00	1.678E+00	1.455E+00	1.455E+00	9.883E-01	9.883E-01	7.910E-01	7.910E-01
150.00	1.727E+01	1.727E+01	1.727E+01	5.759E+00	5.759E+00	5.759E+00	5.759E+00	3.458E+00	2.447E+00	2.447E+00	2.447E+00	2.143E+00	2.143E+00	1.456E+00	1.456E+00	1.154E+00	1.154E+00
200.00	2.822E+01	2.822E+01	2.822E+01	9.441E+00	9.441E+00	9.441E+00	9.441E+00	5.666E+00	4.052E+00	4.052E+00	4.052E+00	3.505E+00	3.505E+00	2.365E+00	2.365E+00	1.871E+00	1.871E+00
250.00	4.127E+01	4.127E+01	4.127E+01	1.376E+01	1.376E+01	1.376E+01	1.376E+01	8.257E+00	5.902E+00	5.902E+00	5.902E+00	5.05E+00	5.05E+00	3.438E+00	3.438E+00	2.710E+00	2.710E+00
300.00	5.855E+01	5.855E+01	5.855E+01	1.862E+01	1.862E+01	1.862E+01	1.862E+01	1.117E+01	7.984E+00	7.984E+00	7.984E+00	6.905E+00	6.905E+00	4.643E+00	4.643E+00	3.655E+00	3.655E+00
400.00	8.908E+01	8.908E+01	8.908E+01	2.969E+01	2.969E+01	2.969E+01	2.969E+01	1.773E+01	1.273E+01	1.273E+01	1.273E+01	1.101E+01	1.101E+01	7.398E+00	7.398E+00	5.809E+00	5.809E+00
500.00	1.267E+02	1.267E+02	1.267E+02	4.224E+01	4.224E+01	4.224E+01	4.224E+01	2.535E+01	1.811E+01	1.811E+01	1.811E+01	1.565E+01	1.565E+01	1.022E+01	1.022E+01	8.249E+00	8.249E+00
600.00	1.678E+02	1.678E+02	1.678E+02	5.595E+01	5.595E+01	5.595E+01	5.595E+01	3.335E+01	2.398E+01	2.398E+01	2.398E+01	2.073E+01	2.073E+01	1.392E+01	1.392E+01	1.091E+01	1.091E+01
700.00	2.118E+02	2.118E+02	2.118E+02	7.059E+01	7.059E+01	7.059E+01	7.059E+01	4.236E+01	3.026E+01	3.026E+01	3.026E+01	2.616E+01	2.616E+01	1.756E+01	1.756E+01	1.376E+01	1.376E+01
800.00	2.580E+02	2.580E+02	2.580E+02	8.599E+01	8.599E+01	8.599E+01	8.599E+01	5.166E+01	3.686E+01	3.686E+01	3.686E+01	3.186E+01	3.186E+01	2.139E+01	2.139E+01	1.676E+01	1.676E+01
1000.00	3.556E+02	3.556E+02	3.556E+02	1.185E+02	1.185E+02	1.185E+02	1.185E+02	7.113E+01	5.081E+01	5.081E+01	5.081E+01	4.391E+01	4.391E+01	2.948E+01	2.948E+01	2.309E+01	2.309E+01
1200.00	4.583E+02	4.583E+02	4.583E+02	1.528E+02	1.528E+02	1.528E+02	1.528E+02	9.166E+01	6.548E+01	6.548E+01	6.548E+01	5.659E+01	5.659E+01	3.798E+01	3.798E+01	2.974E+01	2.97

I = 81.1 A/Z = 1.939

I = 81.1 A/Z = 1.939

(MEV CM2/GM)

DE/DX IN CELLULOSE NITRATE

ENRG./NUC.
(MEV/AMU)

	1	H	4	HE	12	C	16	O	20	NE	28	SI	40	AR	56	FE	84	KR	
0.10	7.560E+02	1.954E+03	6.869E+03	8.864E+03	1.058E+04	1.380E+04	1.695E+04	1.970E+04	2.388E+04	2.820E+04	3.329E+04	3.920E+04	4.632E+04	5.483E+04	6.453E+04	7.555E+04	8.820E+04	1.030E+05	
0.12	7.163E+02	1.942E+03	7.090E+03	9.247E+03	1.112E+04	1.438E+04	1.780E+04	2.147E+04	2.546E+04	2.985E+04	3.564E+04	4.285E+04	5.158E+04	6.194E+04	7.400E+04	8.785E+04	1.037E+05	1.225E+05	1.439E+05
0.15	6.607E+02	1.912E+03	7.320E+03	9.680E+03	1.176E+04	1.504E+04	1.881E+04	2.281E+04	2.714E+04	3.191E+04	3.724E+04	4.414E+04	5.271E+04	6.318E+04	7.555E+04	8.988E+04	1.062E+05	1.257E+05	1.477E+05
0.20	5.827E+02	1.849E+03	7.534E+03	1.015E+04	1.251E+04	1.653E+04	2.004E+04	2.404E+04	2.854E+04	3.354E+04	3.914E+04	4.634E+04	5.514E+04	6.561E+04	7.794E+04	9.227E+04	1.087E+05	1.282E+05	1.507E+05
0.25	5.248E+02	1.781E+03	7.624E+03	1.044E+04	1.301E+04	1.748E+04	2.104E+04	2.504E+04	2.954E+04	3.454E+04	4.014E+04	4.734E+04	5.614E+04	6.661E+04	7.894E+04	9.327E+04	1.102E+05	1.307E+05	1.532E+05
0.30	4.791E+02	1.713E+03	7.640E+03	1.060E+04	1.330E+04	1.820E+04	2.180E+04	2.580E+04	3.030E+04	3.530E+04	4.190E+04	4.910E+04	5.790E+04	6.837E+04	8.070E+04	9.493E+04	1.117E+05	1.332E+05	1.567E+05
0.40	4.115E+02	1.605E+03	7.550E+03	1.070E+04	1.372E+04	1.917E+04	2.280E+04	2.680E+04	3.130E+04	3.630E+04	4.290E+04	5.010E+04	5.890E+04	6.937E+04	8.170E+04	9.693E+04	1.142E+05	1.367E+05	1.622E+05
0.50	3.631E+02	1.440E+03	7.378E+03	1.064E+04	1.380E+04	2.006E+04	2.380E+04	2.780E+04	3.230E+04	3.730E+04	4.490E+04	5.310E+04	6.290E+04	7.437E+04	8.770E+04	1.029E+05	1.204E+05	1.409E+05	1.644E+05
0.60	3.263E+02	1.302E+03	7.171E+03	1.049E+04	1.368E+04	2.020E+04	2.400E+04	2.800E+04	3.300E+04	3.800E+04	4.660E+04	5.580E+04	6.660E+04	7.917E+04	9.350E+04	1.094E+05	1.289E+05	1.514E+05	1.769E+05
0.70	2.971E+02	1.188E+03	6.950E+03	1.030E+04	1.351E+04	2.022E+04	2.400E+04	2.800E+04	3.300E+04	3.800E+04	4.660E+04	5.580E+04	6.660E+04	7.917E+04	9.350E+04	1.094E+05	1.289E+05	1.514E+05	1.769E+05
0.80	2.733E+02	1.092E+03	6.728E+03	1.008E+04	1.331E+04	2.004E+04	2.380E+04	2.780E+04	3.230E+04	3.730E+04	4.590E+04	5.510E+04	6.590E+04	7.847E+04	9.280E+04	1.087E+05	1.282E+05	1.507E+05	1.762E+05
1.00	2.365E+02	9.460E+02	6.299E+03	9.599E+03	1.306E+04	1.969E+04	2.366E+04	2.766E+04	3.216E+04	3.666E+04	4.526E+04	5.446E+04	6.426E+04	7.563E+04	8.860E+04	1.033E+05	1.208E+05	1.413E+05	1.648E+05
1.20	2.097E+02	8.387E+02	5.913E+03	9.139E+03	1.259E+04	1.906E+04	2.306E+04	2.706E+04	3.156E+04	3.606E+04	4.466E+04	5.386E+04	6.366E+04	7.503E+04	8.790E+04	1.026E+05	1.201E+05	1.406E+05	1.641E+05
1.50	1.810E+02	7.241E+02	5.428E+03	8.520E+03	1.190E+04	1.906E+04	2.306E+04	2.706E+04	3.156E+04	3.606E+04	4.466E+04	5.386E+04	6.366E+04	7.503E+04	8.790E+04	1.026E+05	1.201E+05	1.406E+05	1.641E+05
2.00	1.483E+02	5.934E+02	4.757E+03	7.612E+03	1.081E+04	1.784E+04	2.184E+04	2.584E+04	3.034E+04	3.484E+04	4.344E+04	5.264E+04	6.244E+04	7.381E+04	8.670E+04	1.004E+05	1.189E+05	1.394E+05	1.629E+05
2.50	1.262E+02	5.047E+02	4.224E+03	6.853E+03	9.858E+03	1.663E+04	2.063E+04	2.463E+04	2.913E+04	3.363E+04	4.223E+04	5.143E+04	6.123E+04	7.260E+04	8.549E+04	9.992E+04	1.154E+05	1.339E+05	1.554E+05
3.00	1.100E+02	4.400E+02	3.793E+03	6.218E+03	9.031E+03	1.550E+04	1.950E+04	2.350E+04	2.800E+04	3.250E+04	4.110E+04	5.030E+04	6.010E+04	7.147E+04	8.436E+04	9.879E+04	1.140E+05	1.325E+05	1.540E+05
3.50	9.764E+01	3.905E+02	3.439E+03	5.684E+03	8.317E+03	1.447E+04	1.847E+04	2.247E+04	2.697E+04	3.147E+04	4.007E+04	4.927E+04	5.907E+04	7.044E+04	8.333E+04	9.776E+04	1.127E+05	1.312E+05	1.527E+05
4.00	8.783E+01	3.513E+02	3.138E+03	5.228E+03	7.698E+03	1.354E+04	1.754E+04	2.154E+04	2.604E+04	3.054E+04	3.914E+04	4.834E+04	5.814E+04	6.951E+04	8.240E+04	9.683E+04	1.114E+05	1.299E+05	1.514E+05
5.00	7.320E+01	2.928E+02	2.600E+03	4.497E+03	6.682E+03	1.196E+04	1.596E+04	1.996E+04	2.446E+04	2.896E+04	3.756E+04	4.676E+04	5.656E+04	6.793E+04	8.082E+04	9.525E+04	1.100E+05	1.285E+05	1.500E+05
6.00	6.314E+01	2.526E+02	2.272E+03	3.959E+03	5.922E+03	1.073E+04	1.473E+04	1.853E+04	2.303E+04	2.753E+04	3.613E+04	4.533E+04	5.513E+04	6.650E+04	7.939E+04	9.382E+04	1.084E+05	1.269E+05	1.484E+05
7.00	5.592E+01	2.237E+02	2.013E+03	3.556E+03	5.345E+03	9.769E+03	1.349E+04	1.729E+04	2.179E+04	2.629E+04	3.489E+04	4.409E+04	5.389E+04	6.526E+04	7.815E+04	9.258E+04	1.066E+05	1.251E+05	1.466E+05
8.00	5.028E+01	2.011E+02	1.809E+03	3.203E+03	4.874E+03	8.970E+03	1.270E+04	1.650E+04	2.070E+04	2.490E+04	3.350E+04	4.270E+04	5.250E+04	6.387E+04	7.676E+04	9.119E+04	1.050E+05	1.235E+05	1.450E+05
10.00	4.200E+01	1.680E+02	1.512E+03	2.687E+03	4.151E+03	7.719E+03	1.112E+04	1.492E+04	1.912E+04	2.332E+04	3.192E+04	4.112E+04	5.092E+04	6.129E+04	7.318E+04	8.651E+04	1.004E+05	1.189E+05	1.394E+05
12.00	3.620E+01	1.448E+02	1.303E+03	2.317E+03	3.608E+03	6.784E+03	9.784E+03	1.284E+04	1.704E+04	2.124E+04	2.984E+04	3.904E+04	4.884E+04	5.921E+04	7.110E+04	8.443E+04	9.926E+04	1.150E+05	1.365E+05
15.00	3.015E+01	1.206E+02	1.085E+03	1.929E+03	3.013E+03	5.758E+03	8.258E+03	1.075E+04	1.495E+04	1.915E+04	2.775E+04	3.695E+04	4.675E+04	5.712E+04	6.801E+04	8.044E+04	9.447E+04	1.100E+05	1.315E+05
20.00	2.379E+01	9.214E+01	8.563E+02	1.522E+03	2.378E+03	4.625E+03	6.285E+03	8.375E+03	1.105E+04	1.425E+04	2.285E+04	3.205E+04	4.185E+04	5.222E+04	6.311E+04	7.454E+04	8.743E+04	1.017E+05	1.232E+05
25.00	1.979E+01	7.918E+01	7.126E+02	1.267E+03	1.979E+03	3.873E+03	5.463E+03	7.493E+03	1.005E+04	1.325E+04	2.185E+04	3.105E+04	4.085E+04	5.122E+04	6.211E+04	7.354E+04	8.643E+04	1.000E+05	1.215E+05
30.00	1.705E+01	6.819E+01	6.137E+02	1.091E+03	1.705E+03	3.340E+03	4.625E+03	6.465E+03	8.865E+03	1.185E+04	1.805E+04	2.665E+04	3.585E+04	4.565E+04	5.602E+04	6.691E+04	7.934E+04	9.327E+04	1.087E+05
35.00	1.504E+01	6.014E+01	5.413E+02	9.623E+02	1.502E+03	2.947E+03	4.055E+03	5.655E+03	7.855E+03	1.065E+04	1.675E+04	2.535E+04	3.455E+04	4.435E+04	5.472E+04	6.561E+04	7.804E+04	9.207E+04	1.070E+05
40.00	1.350E+01	5.399E+01	4.859E+02	8.639E+02	1.350E+03	2.645E+03	3.665E+03	5.065E+03	7.065E+03	9.465E+03	1.305E+04	1.915E+04	2.775E+04	3.755E+04	4.735E+04	5.772E+04	6.965E+04	8.308E+04	9.801E+04
50.00	1.129E+01	4.518E+01	4.066E+02	7.228E+02	1.129E+03	2.214E+03	3.065E+03	4.145E+03	5.545E+03	7.345E+03	1.015E+04	1.525E+04	2.285E+04	3.145E+04	4.025E+04	4.905E+04	5.885E+04	6.974E+04	8.217E+04
60.00	9.787E+00	3.915E+01	3.523E+02	6.284E+02	9.787E+02	1.918E+03	2.618E+03	3.598E+03	4.898E+03	6.598E+03	9.098E+03	1.248E+04	1.758E+04	2.358E+04	3.058E+04	3.858E+04	4.738E+04	5.698E+04	6.748E+04
70.00	8.689E+00	3.476E+01	3.128E+02	5.561E+02	8.689E+02	1.703E+03	2.303E+03	3.183E+03	4.383E+03	5.983E+03	8.083E+03	1.098E+04	1.508E+04	2.008E+04	2.608E+04	3.308E+04	4.008E+04	4.808E+04	5.708E+04
80.00	7.852E+00	3.141E+01	2.827E+02	5.035E+02	7.852E+02	1.539E+03	2.039E+03	2.739E+03	3.639E+03	4.839E+03	6.439E+03	8.539E+03	1.113E+04	1.473E+04	1.973E+04	2.573E+04	3.273E+04	4.073E+04	4.973E+04
100.00	6.656E+00	2.662E+01	2.336E+02	4.260E+02	6.656E+02	1.305E+03	1.705E+03	2.305E+03	3.005E+03	3.905E+03	5.105E+03	6.605E+03	8.405E+03	1.060E+04	1.380E+04	1.800E+04	2.300E+04	2.800E+04	3.400E+04
120.00	5.840E+00	2.336E+01	2.102E+02	3.738E+02	5.840E+02	1.145E+03	1.545E+03	2.045E+03	2.745E+03	3.645E+03	4.745E+03	6.045E+03	7.645E+03	9.545E+03	1.184E+04	1.504E+04	1.924E+04	2.424E+04	2.924E+04
150.00	5.006E+00	2.003E+01	1.802E+02	3.204E+02	5.006E+02	9.812E+02	1.312E+03	1.712E+03	2.212E+03	2.912E+03	3.812E+03	4.912E+03	6.212E+03	7.812E+03	9.712E+03	1.191E+04	1.511E+04	1.931E+04	2.431E+04
200.00	4.150E+00	1.660E+01	1.494E+02	2.656E+02	4.150E+02	8.134E+02	1.104E+03	1.404E+03	1.804E+03	2.304E+03	3.004E+03	3.904E+03	5.004E+03	6.304E+03	7.804E+03	9.504E+03	1.144E+04	1.444E+04	1.844E+04
250.00	3.622E+00	1.449E+01	1.304E+02	2.318E+02	3.622E+02	7.100E+02	9.600E+02	1.240E+03	1.640E+03	2.140E+03	2								

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.167E-04	1.967E-04	2.071E-04	2.221E-04	2.364E-04	2.618E-04	3.189E-04	3.623E-04	4.601E-04
0.12	1.385E-04	2.304E-04	2.361E-04	2.520E-04	2.677E-04	2.956E-04	3.582E-04	4.044E-04	5.114E-04
0.15	1.739E-04	2.817E-04	2.782E-04	2.949E-04	3.122E-04	3.442E-04	4.141E-04	4.636E-04	5.830E-04
0.20	2.399E-04	3.697E-04	3.463E-04	3.632E-04	3.822E-04	4.192E-04	5.019E-04	5.549E-04	6.922E-04
0.25	3.150E-04	4.132E-04	4.132E-04	4.291E-04	4.487E-04	4.894E-04	5.852E-04	6.402E-04	7.927E-04
0.30	3.985E-04	4.576E-04	4.799E-04	4.937E-04	5.133E-04	5.563E-04	6.657E-04	7.213E-04	8.874E-04
0.40	5.898E-04	7.629E-04	6.144E-04	6.217E-04	6.393E-04	6.842E-04	8.117E-04	8.753E-04	1.064E-03
0.50	8.120E-04	9.886E-04	7.521E-04	7.501E-04	7.637E-04	8.074E-04	9.520E-04	1.022E-03	1.230E-03
0.60	1.064E-03	1.241E-03	8.942E-04	8.804E-04	8.881E-04	9.283E-04	1.088E-03	1.165E-03	1.389E-03
0.70	1.343E-03	1.522E-03	1.041E-03	1.013E-03	1.014E-03	1.048E-03	1.220E-03	1.297E-03	1.542E-03
0.80	1.651E-03	1.829E-03	1.194E-03	1.150E-03	1.141E-03	1.168E-03	1.351E-03	1.427E-03	1.692E-03
1.00	2.345E-03	2.523E-03	1.516E-03	1.433E-03	1.403E-03	1.408E-03	1.611E-03	1.681E-03	1.983E-03
1.20	3.141E-03	3.319E-03	1.871E-03	1.733E-03	1.675E-03	1.654E-03	1.871E-03	1.929E-03	2.268E-03
1.50	4.518E-03	4.697E-03	2.424E-03	2.212E-03	2.106E-03	2.033E-03	2.266E-03	2.296E-03	2.653E-03
2.00	7.269E-03	7.447E-03	3.478E-03	3.094E-03	2.886E-03	2.700E-03	2.945E-03	2.906E-03	3.313E-03
2.50	1.053E-02	1.071E-02	4.666E-03	4.074E-03	3.740E-03	3.414E-03	3.657E-03	3.524E-03	3.959E-03
3.00	1.432E-02	1.450E-02	6.001E-03	5.162E-03	4.678E-03	4.182E-03	4.410E-03	4.161E-03	4.603E-03
3.50	1.864E-02	1.881E-02	7.484E-03	6.359E-03	5.702E-03	5.009E-03	5.210E-03	4.821E-03	5.257E-03
4.00	2.347E-02	2.365E-02	9.113E-03	7.668E-03	6.814E-03	5.895E-03	6.058E-03	5.509E-03	5.922E-03
5.00	3.468E-02	3.486E-02	1.287E-02	1.062E-02	9.305E-03	7.652E-03	7.906E-03	6.973E-03	7.314E-03
6.00	4.794E-02	4.812E-02	1.729E-02	1.403E-02	1.216E-02	1.006E-02	9.856E-03	8.565E-03	8.786E-03
7.00	6.342E-02	6.342E-02	2.239E-02	1.790E-02	1.538E-02	1.253E-02	1.224E-02	1.029E-02	1.035E-02
8.00	8.058E-02	8.076E-02	2.817E-02	2.225E-02	1.897E-02	1.526E-02	1.474E-02	1.216E-02	1.202E-02
10.00	1.212E-01	1.214E-01	4.171E-01	3.242E-02	2.725E-02	2.149E-02	2.040E-02	1.633E-02	1.566E-02
12.00	1.678E-01	1.680E-01	5.725E-02	4.408E-02	3.662E-02	2.850E-02	2.672E-02	2.092E-02	1.962E-02
15.00	2.507E-01	2.509E-01	8.487E-02	6.480E-02	5.222E-02	4.073E-02	3.766E-02	2.877E-02	2.627E-02
20.00	4.220E-01	4.221E-01	1.420E-01	1.076E-01	8.748E-02	6.556E-02	5.974E-02	4.437E-02	3.927E-02
25.00	6.331E-01	6.333E-01	2.123E-01	1.604E-01	1.297E-01	9.581E-02	8.645E-02	6.306E-02	5.462E-02
30.00	8.824E-01	8.826E-01	2.954E-01	2.227E-01	1.796E-01	1.315E-01	1.177E-01	8.473E-02	7.228E-02
35.00	1.168E+00	1.169E+00	3.908E-01	2.942E-01	2.368E-01	1.723E-01	1.532E-01	1.093E-01	9.217E-02
40.00	1.490E+00	1.490E+00	4.980E-01	3.746E-01	3.011E-01	2.183E-01	1.930E-01	1.367E-01	1.142E-01
50.00	2.235E+00	2.235E+00	7.463E-01	5.608E-01	4.501E-01	3.247E-01	2.850E-01	1.996E-01	1.647E-01
60.00	3.109E+00	3.109E+00	1.038E+00	7.794E-01	6.249E-01	4.496E-01	3.930E-01	2.728E-01	2.231E-01
70.00	4.105E+00	4.105E+00	1.370E+00	1.028E+00	8.241E-01	5.919E-01	5.159E-01	3.559E-01	2.892E-01
80.00	5.217E+00	5.217E+00	1.740E+00	1.306E+00	1.047E+00	7.507E-01	6.532E-01	4.482E-01	3.626E-01
100.00	7.767E+00	7.767E+00	2.590E+00	1.944E+00	1.557E+00	1.115E+00	9.681E-01	6.597E-01	5.300E-01
120.00	1.072E+01	1.072E+01	3.575E+00	2.682E+00	2.147E+00	1.537E+00	1.333E+00	9.045E-01	7.225E-01
150.00	1.584E+01	1.584E+01	5.285E+00	3.962E+00	3.171E+00	2.268E+00	1.928E+00	1.328E+00	1.056E+00
200.00	2.599E+01	2.599E+01	8.665E+00	6.500E+00	5.201E+00	3.718E+00	3.218E+00	2.169E+00	1.715E+00
250.00	3.789E+01	3.789E+01	1.263E+01	9.476E+00	7.582E+00	5.419E+00	4.687E+00	3.156E+00	2.486E+00
300.00	5.130E+01	5.130E+01	1.710E+01	1.283E+01	1.026E+01	7.334E+00	6.343E+00	4.266E+00	3.355E+00
400.00	8.188E+01	8.188E+01	2.730E+01	2.047E+01	1.638E+01	1.170E+01	1.012E+01	6.800E+00	5.338E+00
500.00	1.165E+02	1.165E+02	3.885E+01	2.914E+01	2.331E+01	1.665E+01	1.440E+01	9.671E+00	7.584E+00
600.00	1.544E+02	1.544E+02	5.148E+01	3.861E+01	3.089E+01	2.207E+01	1.907E+01	1.281E+01	1.004E+01
700.00	1.949E+02	1.949E+02	6.498E+01	4.873E+01	3.899E+01	2.785E+01	2.407E+01	1.616E+01	1.266E+01
800.00	2.375E+02	2.375E+02	7.918E+01	5.939E+01	4.751E+01	3.394E+01	2.933E+01	1.969E+01	1.543E+01
1000.00	3.277E+02	3.277E+02	1.092E+02	8.192E+01	6.553E+01	4.681E+01	4.046E+01	2.716E+01	2.127E+01
1200.00	4.225E+02	4.225E+02	1.408E+02	1.056E+02	8.450E+01	6.036E+01	5.217E+01	3.502E+01	2.741E+01

DE/DX IN CELLULOSE ACETATE BUTYRATE (MEV CM2/GM) I = 63.4 A/Z = 1.835

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	9.429E+02	2.379E+03	8.144E+03	1.046E+04	1.245E+04	1.620E+04	1.985E+04	2.581E+04	3.160E+04
0.12	8.887E+02	2.361E+03	8.406E+03	1.092E+04	1.309E+04	1.687E+04	2.085E+04	2.739E+04	3.379E+04
0.15	8.128E+02	2.317E+03	8.675E+03	1.142E+04	1.384E+04	1.765E+04	2.204E+04	2.935E+04	3.657E+04
0.20	7.077E+02	2.227E+03	8.913E+03	1.197E+04	1.472E+04	1.939E+04	2.347E+04	3.186E+04	4.027E+04
0.25	6.305E+02	2.130E+03	8.996E+03	1.238E+04	1.528E+04	2.049E+04	2.447E+04	3.375E+04	4.318E+04
0.30	5.704E+02	2.035E+03	8.990E+03	1.245E+04	1.566E+04	2.131E+04	2.520E+04	3.523E+04	4.556E+04
0.40	4.830E+02	1.884E+03	8.833E+03	1.251E+04	1.603E+04	2.239E+04	2.788E+04	3.737E+04	4.923E+04
0.50	4.218E+02	1.673E+03	8.585E+03	1.239E+04	1.611E+04	2.299E+04	2.907E+04	3.881E+04	5.191E+04
0.60	3.761E+02	1.501E+03	8.303E+03	1.217E+04	1.601E+04	2.339E+04	2.986E+04	3.978E+04	5.395E+04
0.70	3.405E+02	1.361E+03	8.013E+03	1.189E+04	1.583E+04	2.341E+04	3.037E+04	4.229E+04	5.551E+04
0.80	3.118E+02	1.246E+03	7.729E+03	1.160E+04	1.558E+04	2.339E+04	3.067E+04	4.334E+04	5.673E+04
1.00	2.682E+02	1.073E+03	7.195E+03	1.100E+04	1.500E+04	2.309E+04	3.085E+04	4.476E+04	5.841E+04
1.20	2.388E+02	9.552E+02	6.769E+03	1.049E+04	1.447E+04	2.279E+04	3.080E+04	4.566E+04	5.953E+04
1.50	2.052E+02	8.206E+02	6.181E+03	9.729E+03	1.362E+04	2.189E+04	3.027E+04	4.619E+04	6.362E+04
2.00	1.672E+02	6.689E+02	5.382E+03	8.538E+03	1.230E+04	2.038E+04	2.890E+04	4.584E+04	6.529E+04
2.50	1.418E+02	5.670E+02	4.758E+03	7.742E+03	1.117E+04	1.891E+04	2.734E+04	4.470E+04	6.547E+04
3.00	1.233E+02	4.933E+02	4.259E+03	7.002E+03	1.019E+04	1.756E+04	2.577E+04	4.321E+04	6.460E+04
3.50	1.093E+02	4.371E+02	3.852E+03	6.384E+03	9.354E+03	1.635E+04	2.429E+04	4.158E+04	6.362E+04
4.00	9.818E+01	3.927E+02	3.509E+03	5.862E+03	8.650E+03	1.527E+04	2.291E+04	3.991E+04	6.215E+04
5.00	8.172E+01	3.269E+02	2.936E+03	5.029E+03	7.488E+03	1.345E+04	2.049E+04	3.668E+04	5.680E+04
6.00	7.004E+01	2.801E+02	2.521E+03	4.396E+03	6.589E+03	1.198E+04	1.846E+04	3.375E+04	5.533E+04
7.00	6.201E+01	2.480E+02	2.232E+03	3.945E+03	5.940E+03	1.089E+04	1.692E+04	3.141E+04	5.239E+04
8.00	5.566E+01	2.227E+02	2.002E+03	3.552E+03	5.404E+03	9.977E+03	1.560E+04	2.932E+04	4.958E+04
10.00	4.638E+01	1.855E+02	1.670E+03	2.567E+03	4.582E+03	8.529E+03	1.350E+04	2.584E+04	4.465E+04
12.00	3.991E+01	1.596E+02	1.437E+03	2.154E+03	3.979E+03	7.497E+03	1.192E+04	2.310E+04	4.005E+04
15.00	3.317E+01	1.327E+02	1.194E+03	2.123E+03	3.314E+03	6.344E+03	1.015E+04	1.995E+04	3.556E+04
20.00	2.611E+01	1.044E+02	9.399E+02	1.871E+03	2.611E+03	5.079E+03	8.189E+03	1.632E+04	2.961E+04
25.00	2.169E+01	8.678E+01	7.810E+02	1.388E+03	2.169E+03	4.245E+03	6.899E+03	1.387E+04	2.543E+04
30.00	1.866E+01	7.465E+01	6.719E+02	1.194E+03	1.856E+03	3.656E+03	5.987E+03	1.210E+04	2.236E+04
35.00	1.645E+01	6.579E+01	5.921E+02	1.053E+03	1.645E+03	3.224E+03	5.312E+03	1.077E+04	2.001E+04
40.00	1.476E+01	5.902E+01	5.312E+02	9.444E+02	1.476E+03	2.892E+03	4.773E+03	9.073E+03	1.815E+04
50.00	1.233E+01	4.934E+01	4.440E+02	7.894E+02	1.233E+03	2.418E+03	3.992E+03	8.217E+03	1.541E+04
60.00	1.068E+01	4.273E+01	3.845E+02	6.836E+02	1.068E+03	2.094E+03	3.461E+03	7.158E+03	1.347E+04
70.00	9.478E+00	3.791E+01	3.441E+02	6.066E+02	9.478E+02	1.858E+03	3.071E+03	6.377E+03	1.203E+04
80.00	8.561E+00	3.424E+01	3.082E+02	5.479E+02	8.561E+02	1.678E+03	2.773E+03	5.778E+03	1.092E+04
100.00	7.252E+00	2.901E+01	2.611E+02	4.642E+02	7.252E+02	1.471E+03	2.350E+03	4.900E+03	9.308E+03
120.00	6.361E+00	2.544E+01	2.290E+02	4.071E+02	6.361E+02	1.276E+03	2.061E+03	4.299E+03	8.194E+03
150.00	5.450E+00	2.180E+01	1.962E+02	3.488E+02	5.450E+02	1.088E+03	1.766E+03	3.684E+03	7.044E+03
200.00	4.515E+00	1.806E+01	1.625E+02	2.890E+02	4.515E+02	8.849E+02	1.465E+03	3.052E+03	5.848E+03
250.00	3.939E+00	1.576E+01	1.418E+02	2.521E+02	3.939E+02	7.771E+02	1.276E+03	2.663E+03	5.104E+03
300.00	3.548E+00	1.419E+01	1.277E+02	2.271E+02	3.548E+02	6.954E+02	1.150E+03	2.399E+03	4.598E+03
400.00	3.050E+00	1.220E+01	1.092E+02	1.952E+02	3.050E+02	5.979E+02	9.880E+02	2.062E+03	3.953E+03
500.00	2.748E+00	1.099E+01	9.892E+01	1.759E+02	2.748E+02	5.366E+02	8.903E+02	1.857E+03	3.561E+03
600.00	2.546E+00	1.018E+01	9.154E+01	1.629E+02	2.546E+02	4.999E+02	8.248E+02	1.721E+03	3.299E+03
700.00	2.402E+00	9.610E+00	8.649E+01	1.538E+02	2.402E+02	4.709E+02	7.848E+02	1.624E+03	3.114E+03
800.00	2.297E+00	9.188E+00	8.269E+01	1.470E+02	2.297E+02	4.502E+02	7.442E+02	1.555E+03	2.977E+03
1000.00	2.156E+00	8.622E+00	7.760E+01	1.380E+02	2.156E+02	4.225E+02	6.984E+02	1.451E+03	2.794E+03
1200.00	2.070E+00	8.279E+00	7.451E+01	1.325E+02	2.070E+02	4.057E+02	6.706E+02	1.399E+03	2.682E+03

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.314E-04	2.201E-04	2.304E-04	2.469E-04	2.627E-04	2.907E-04	3.541E-04	4.021E-04	5.105E-04
0.12	1.565E-04	2.584E-04	2.629E-04	2.803E-04	2.976E-04	3.284E-04	3.977E-04	4.489E-04	5.675E-04
0.15	1.969E-04	3.166E-04	3.100E-04	3.282E-04	3.472E-04	3.835E-04	4.599E-04	5.146E-04	6.470E-04
0.20	2.721E-04	4.161E-04	3.862E-04	4.044E-04	4.252E-04	4.659E-04	5.575E-04	6.161E-04	7.683E-04
0.25	3.570E-04	5.195E-04	4.510E-04	4.779E-04	4.990E-04	5.460E-04	6.502E-04	7.109E-04	8.800E-04
0.30	4.509E-04	6.274E-04	5.354E-04	5.650E-04	5.713E-04	6.184E-04	7.396E-04	8.010E-04	9.850E-04
0.40	6.647E-04	8.568E-04	6.851E-04	6.923E-04	7.113E-04	7.605E-04	9.018E-04	9.719E-04	1.181E-03
0.50	9.114E-04	1.107E-03	8.379E-04	8.348E-04	8.497E-04	8.973E-04	1.057E-03	1.135E-03	1.366E-03
0.60	1.189E-03	1.387E-03	9.952E-04	9.791E-04	9.872E-04	1.031E-03	1.208E-03	1.293E-03	1.541E-03
0.70	1.498E-03	1.695E-03	1.158E-03	1.126E-03	1.126E-03	1.164E-03	1.355E-03	1.439E-03	1.711E-03
0.80	1.835E-03	2.033E-03	1.326E-03	1.267E-03	1.267E-03	1.296E-03	1.500E-03	1.584E-03	1.877E-03
1.00	2.595E-03	2.793E-03	1.679E-03	1.588E-03	1.555E-03	1.562E-03	1.787E-03	1.865E-03	2.200E-03
1.20	3.464E-03	3.662E-03	2.054E-03	1.916E-03	1.854E-03	1.832E-03	2.073E-03	2.138E-03	2.515E-03
1.50	4.966E-03	5.164E-03	2.674E-03	2.442E-03	2.327E-03	2.248E-03	2.508E-03	2.543E-03	2.954E-03
2.00	7.989E-03	8.187E-03	3.834E-03	3.441E-03	3.187E-03	2.985E-03	3.258E-03	3.218E-03	3.676E-03
2.50	1.154E-02	1.173E-02	5.129E-03	4.484E-03	4.120E-03	3.757E-03	4.039E-03	3.898E-03	4.383E-03
3.00	1.566E-02	1.585E-02	6.580E-03	5.669E-03	5.144E-03	4.677E-03	4.864E-03	4.597E-03	5.092E-03
3.50	2.034E-02	2.054E-02	8.191E-03	6.972E-03	6.259E-03	5.509E-03	5.738E-03	5.321E-03	5.811E-03
4.00	2.558E-02	2.578E-02	9.958E-03	8.394E-03	7.469E-03	6.475E-03	6.664E-03	6.074E-03	6.544E-03
5.00	3.774E-02	3.794E-02	1.403E-02	1.160E-02	1.018E-02	8.606E-03	8.679E-03	7.674E-03	8.066E-03
6.00	5.210E-02	5.230E-02	1.882E-02	1.530E-02	1.327E-02	1.101E-02	1.032E-02	9.412E-03	9.677E-03
7.00	6.868E-02	6.888E-02	2.434E-02	1.949E-02	1.676E-02	1.369E-02	1.340E-02	1.130E-02	1.139E-02
8.00	8.747E-02	8.766E-02	3.061E-02	2.420E-02	2.066E-02	1.665E-02	1.612E-02	1.335E-02	1.321E-02
10.00	1.312E-01	1.314E-01	4.518E-02	3.515E-02	2.957E-02	2.338E-02	2.223E-02	1.785E-02	1.717E-02
12.00	1.814E-01	1.816E-01	6.192E-02	4.771E-02	3.967E-02	2.947E-02	2.905E-02	2.281E-02	2.145E-02
15.00	2.705E-01	2.707E-01	9.164E-02	7.000E-02	5.753E-02	4.411E-02	4.085E-02	3.129E-02	2.865E-02
20.00	4.546E-01	4.548E-01	1.530E-01	1.160E-01	9.435E-02	7.081E-02	6.460E-02	4.811E-02	4.269E-02
25.00	6.813E-01	6.815E-01	2.286E-01	1.727E-01	1.397E-01	1.033E-01	9.331E-02	6.821E-02	5.923E-02
30.00	9.488E-01	9.490E-01	3.177E-01	2.396E-01	1.932E-01	1.415E-01	1.268E-01	9.150E-02	7.823E-02
35.00	1.256E+00	1.256E+00	4.200E-01	3.162E-01	2.454E-01	1.854E-01	1.649E-01	1.179E-01	9.961E-02
40.00	1.600E+00	1.600E+00	5.349E-01	4.024E-01	3.235E-01	2.346E-01	2.076E-01	1.473E-01	1.233E-01
50.00	2.398E+00	2.399E+00	8.009E-01	6.019E-01	4.831E-01	3.486E-01	3.062E-01	2.147E-01	1.774E-01
60.00	3.334E+00	3.335E+00	1.113E+00	8.360E-01	6.703E-01	4.824E-01	4.218E-01	2.931E-01	2.401E-01
70.00	4.401E+00	4.401E+00	1.468E+00	1.103E+00	8.836E-01	6.347E-01	5.535E-01	3.821E-01	3.110E-01
80.00	5.591E+00	5.591E+00	1.865E+00	1.400E+00	1.122E+00	8.048E-01	7.005E-01	4.810E-01	3.896E-01
100.00	8.320E+00	8.320E+00	2.775E+00	2.082E+00	1.667E+00	1.195E+00	1.037E+00	7.073E-01	5.687E-01
120.00	1.148E+01	1.148E+01	3.828E+00	2.872E+00	2.259E+00	1.646E+00	1.427E+00	9.691E-01	7.752E-01
150.00	1.695E+01	1.695E+01	5.653E+00	4.241E+00	3.394E+00	2.428E+00	2.103E+00	1.423E+00	1.132E+00
200.00	2.781E+01	2.781E+01	9.271E+00	6.954E+00	5.565E+00	3.979E+00	3.443E+00	2.322E+00	1.833E+00
250.00	4.053E+01	4.053E+01	1.351E+01	8.110E+00	6.110E+00	5.796E+00	5.014E+00	3.376E+00	2.663E+00
300.00	5.486E+01	5.486E+01	1.829E+01	1.372E+01	1.098E+01	7.844E+00	6.783E+00	4.563E+00	3.599E+00
400.00	8.754E+01	8.754E+01	2.918E+01	2.189E+01	1.751E+01	1.251E+01	1.082E+01	7.270E+00	5.707E+00
500.00	1.246E+02	1.246E+02	4.152E+01	3.114E+01	2.491E+01	1.780E+01	1.539E+01	1.034E+01	8.107E+00
600.00	1.650E+02	1.650E+02	5.501E+01	4.126E+01	3.301E+01	2.358E+01	2.038E+01	1.369E+01	1.073E+01
700.00	2.082E+02	2.082E+02	6.941E+01	5.206E+01	4.165E+01	2.975E+01	2.572E+01	1.727E+01	1.393E+01
800.00	2.537E+02	2.537E+02	8.457E+01	6.343E+01	4.916E+01	3.625E+01	3.133E+01	2.104E+01	1.648E+01
1000.00	3.498E+02	3.498E+02	1.166E+02	8.746E+01	6.997E+01	4.998E+01	4.320E+01	2.900E+01	2.271E+01
1200.00	4.509E+02	4.509E+02	1.503E+02	1.127E+02	9.019E+01	6.443E+01	5.456E+01	3.737E+01	2.926E+01

ENRG./NUC. (MEV/AMU)	DE/DX IN HBPAIT										(MEV CM2/GM)			I = 72.5		A/Z = 1.931	
	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR								
0.10	8.193E+02	2.095E+03	7.276E+03	9.365E+03	1.117E+04	1.455E+04	1.785E+04	2.323E+04	2.846E+04								
0.12	7.745E+02	2.081E+03	7.510E+03	9.774E+03	1.174E+04	1.516E+04	1.875E+04	2.465E+04	3.043E+04								
0.15	7.116E+02	2.046E+03	7.751E+03	1.023E+04	1.241E+04	1.586E+04	1.981E+04	2.641E+04	3.293E+04								
0.20	6.239E+02	1.973E+03	7.972E+03	1.073E+04	1.320E+04	1.742E+04	2.111E+04	2.867E+04	3.626E+04								
0.25	5.592E+02	1.894E+03	8.057E+03	1.101E+04	1.372E+04	1.842E+04	2.202E+04	3.038E+04	3.889E+04								
0.30	5.083E+02	1.816E+03	8.063E+03	1.117E+04	1.407E+04	1.916E+04	2.268E+04	3.073E+04	4.010E+04								
0.40	4.337E+02	1.692E+03	7.947E+03	1.128E+04	1.443E+04	2.016E+04	2.511E+04	3.367E+04	4.436E+04								
0.50	3.809E+02	1.510E+03	7.746E+03	1.118E+04	1.453E+04	2.074E+04	2.622E+04	3.499E+04	4.680E+04								
0.60	3.410E+02	1.361E+03	7.511E+03	1.109E+04	1.447E+04	2.104E+04	2.696E+04	3.589E+04	4.866E+04								
0.70	3.097E+02	1.238E+03	7.266E+03	1.078E+04	1.433E+04	2.117E+04	2.744E+04	3.618E+04	5.009E+04								
0.80	2.843E+02	1.136E+03	7.022E+03	1.053E+04	1.412E+04	2.117E+04	2.774E+04	3.618E+04	5.122E+04								
1.00	2.454E+02	9.814E+02	6.557E+03	1.001E+04	1.363E+04	2.094E+04	2.795E+04	4.049E+04	5.278E+04								
1.20	2.180E+02	8.721E+02	6.163E+03	9.535E+03	1.314E+04	2.059E+04	2.790E+04	4.049E+04	5.379E+04								
1.50	1.878E+02	7.513E+02	5.644E+03	8.871E+03	1.240E+04	1.989E+04	2.748E+04	4.185E+04	5.756E+04								
2.00	1.535E+02	6.141E+02	4.932E+03	7.903E+03	1.124E+04	1.858E+04	2.631E+04	4.162E+04	5.917E+04								
2.50	1.304E+02	5.215E+02	4.370E+03	7.092E+03	1.023E+04	1.728E+04	2.494E+04	4.067E+04	5.944E+04								
3.00	1.136E+02	4.542E+02	3.919E+03	6.432E+03	9.353E+03	1.608E+04	2.355E+04	3.938E+04	5.891E+04								
3.50	1.007E+02	4.028E+02	3.549E+03	5.872E+03	8.603E+03	1.499E+04	2.223E+04	3.794E+04	5.792E+04								
4.00	9.054E+01	3.632E+02	3.235E+03	5.397E+03	7.955E+03	1.402E+04	2.100E+04	3.647E+04	5.664E+04								
5.00	7.541E+01	3.016E+02	2.709E+03	4.636E+03	6.896E+03	1.236E+04	1.881E+04	3.358E+04	5.369E+04								
6.00	6.489E+01	2.596E+02	2.335E+03	4.071E+03	6.095E+03	1.106E+04	1.702E+04	3.102E+04	5.072E+04								
7.00	5.742E+01	2.237E+02	2.067E+03	3.622E+03	5.494E+03	1.006E+04	1.560E+04	2.889E+04	4.805E+04								
8.00	5.159E+01	2.063E+02	1.856E+03	3.291E+03	5.005E+03	9.224E+03	1.441E+04	2.700E+04	4.635E+04								
10.00	4.304E+01	1.722E+02	1.550E+03	2.752E+03	4.255E+03	7.923E+03	1.249E+04	2.386E+04	4.112E+04								
12.00	3.707E+01	1.483E+02	1.335E+03	2.372E+03	3.695E+03	6.955E+03	1.104E+04	2.136E+04	3.874E+04								
15.00	3.084E+01	1.234E+02	1.110E+03	1.974E+03	3.082E+03	5.894E+03	9.426E+03	1.849E+04	3.291E+04								
20.00	2.431E+01	9.723E+01	8.751E+02	1.556E+03	2.430E+03	4.728E+03	7.616E+03	1.515E+04	2.745E+04								
25.00	2.021E+01	8.086E+01	7.277E+02	1.294E+03	2.021E+03	3.955E+03	6.424E+03	1.290E+04	2.362E+04								
30.00	1.740E+01	6.960E+01	6.264E+02	1.144E+03	1.740E+03	3.409E+03	5.579E+03	1.127E+04	2.075E+04								
35.00	1.534E+01	6.137E+01	5.523E+02	9.818E+02	1.534E+03	3.007E+03	4.955E+03	1.004E+04	1.862E+04								
40.00	1.377E+01	5.507E+01	4.956E+02	8.811E+02	1.377E+03	2.698E+03	4.453E+03	9.076E+03	1.691E+04								
50.00	1.151E+01	4.606E+01	4.145E+02	7.369E+02	1.151E+03	2.257E+03	3.729E+03	7.667E+03	1.436E+04								
60.00	9.875E+00	3.990E+01	3.591E+02	6.384E+02	9.975E+02	1.955E+03	3.232E+03	6.683E+03	1.257E+04								
70.00	8.854E+00	3.541E+01	3.187E+02	5.646E+02	8.854E+02	1.735E+03	2.868E+03	5.956E+03	1.123E+04								
80.00	7.999E+00	3.199E+01	2.880E+02	5.119E+02	7.999E+02	1.539E+03	2.519E+03	5.398E+03	1.020E+04								
100.00	6.778E+00	2.711E+01	2.440E+02	4.338E+02	6.778E+02	1.329E+03	2.196E+03	4.579E+03	8.696E+03								
120.00	5.946E+00	2.379E+01	2.141E+02	3.806E+02	5.946E+02	1.165E+03	1.927E+03	4.019E+03	7.659E+03								
150.00	5.096E+00	2.038E+01	1.835E+02	3.262E+02	5.096E+02	9.988E+02	1.651E+03	3.445E+03	6.586E+03								
200.00	4.223E+00	1.689E+01	1.520E+02	2.703E+02	4.223E+02	8.277E+02	1.368E+03	2.854E+03	5.470E+03								
250.00	3.686E+00	1.474E+01	1.327E+02	2.339E+02	3.686E+02	7.224E+02	1.194E+03	2.491E+03	4.776E+03								
300.00	3.320E+00	1.328E+01	1.195E+02	2.135E+02	3.320E+02	6.508E+02	1.076E+03	2.245E+03	4.303E+03								
400.00	2.856E+00	1.142E+01	1.028E+02	1.828E+02	2.856E+02	5.597E+02	9.252E+02	1.930E+03	3.701E+03								
500.00	2.573E+00	1.029E+01	9.263E+01	1.647E+02	2.573E+02	5.043E+02	8.336E+02	1.739E+03	3.334E+03								
600.00	2.384E+00	9.538E+00	8.548E+01	1.526E+02	2.384E+02	4.673E+02	7.725E+02	1.612E+03	3.090E+03								
700.00	2.251E+00	9.004E+00	8.103E+01	1.444E+02	2.251E+02	4.412E+02	7.293E+02	1.522E+03	2.917E+03								
800.00	2.159E+00	8.611E+00	7.705E+01	1.378E+02	2.159E+02	4.219E+02	6.975E+02	1.455E+03	2.790E+03								
1000.00	2.021E+00	8.085E+00	7.276E+01	1.294E+02	2.021E+02	3.962E+02	6.549E+02	1.366E+03	2.620E+03								
1200.00	1.894E+00	7.767E+00	6.991E+01	1.243E+02	1.944E+02	3.806E+02	6.292E+02	1.313E+03	2.517E+03								

RANGE IN LEXAN (GM/CM2) I = 69.5 A/Z = 1.895

ENRGS./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.263E-04	2.120E-04	2.223E-04	2.382E-04	2.536E-04	2.807E-04	3.419E-04	3.883E-04	4.930E-04
0.12	1.503E-04	2.487E-04	2.536E-04	2.764E-04	2.871E-04	3.170E-04	3.840E-04	4.334E-04	5.488E-04
0.15	1.890E-04	3.045E-04	2.989E-04	3.166E-04	3.351E-04	3.692E-04	4.440E-04	4.969E-04	6.248E-04
0.20	2.610E-04	4.000E-04	3.723E-04	3.901E-04	4.102E-04	4.497E-04	5.382E-04	5.949E-04	7.418E-04
0.25	3.425E-04	4.994E-04	4.444E-04	4.609E-04	4.818E-04	5.250E-04	6.276E-04	6.863E-04	8.491E-04
0.30	4.328E-04	6.032E-04	5.161E-04	5.304E-04	5.511E-04	5.968E-04	7.139E-04	7.733E-04	9.510E-04
0.40	6.388E-04	8.243E-04	6.605E-04	6.678E-04	6.863E-04	7.340E-04	8.704E-04	9.383E-04	1.141E-03
0.50	8.770E-04	1.066E-03	8.081E-04	8.054E-04	8.196E-04	8.660E-04	1.021E-03	1.096E-03	1.318E-03
0.60	1.146E-03	1.336E-03	9.601E-04	9.448E-04	9.527E-04	9.954E-04	1.166E-03	1.248E-03	1.486E-03
0.70	1.444E-03	1.635E-03	1.117E-03	1.087E-03	1.087E-03	1.124E-03	1.308E-03	1.390E-03	1.653E-03
0.80	1.771E-03	1.962E-03	1.280E-03	1.232E-03	1.223E-03	1.251E-03	1.448E-03	1.529E-03	1.813E-03
1.00	2.508E-03	2.699E-03	1.623E-03	1.532E-03	1.492E-03	1.508E-03	1.726E-03	1.801E-03	2.125E-03
1.20	3.352E-03	3.543E-03	1.990E-03	1.852E-03	1.792E-03	1.770E-03	2.033E-03	2.066E-03	2.429E-03
1.50	4.810E-03	5.002E-03	2.587E-03	2.362E-03	2.250E-03	2.173E-03	2.424E-03	2.457E-03	2.853E-03
2.00	7.738E-03	7.929E-03	3.710E-03	3.303E-03	3.082E-03	2.886E-03	3.149E-03	3.109E-03	3.551E-03
2.50	1.118E-02	1.137E-02	4.967E-03	4.341E-03	3.988E-03	3.644E-03	3.798E-03	3.758E-03	4.235E-03
3.00	1.519E-02	1.538E-02	6.378E-03	5.492E-03	4.981E-03	4.459E-03	4.706E-03	4.645E-03	5.222E-03
3.50	1.974E-02	1.993E-02	7.944E-03	6.758E-03	6.055E-03	5.334E-03	5.544E-03	5.147E-03	5.618E-03
4.00	2.484E-02	2.503E-02	9.662E-03	8.140E-03	7.240E-03	6.273E-03	6.453E-03	5.677E-03	6.261E-03
5.00	3.667E-02	3.686E-02	1.362E-02	1.126E-02	9.871E-03	8.342E-03	8.009E-03	7.430E-03	7.804E-03
6.00	5.064E-02	5.084E-02	1.828E-02	1.486E-02	1.288E-02	1.068E-02	1.039E-02	9.117E-03	9.357E-03
7.00	6.677E-02	6.696E-02	2.366E-02	1.893E-02	1.628E-02	1.328E-02	1.239E-02	1.095E-02	1.103E-02
8.00	8.505E-02	8.524E-02	2.976E-02	2.352E-02	2.077E-02	1.617E-02	1.563E-02	1.293E-02	1.205E-02
10.00	1.277E-01	1.279E-01	4.397E-02	3.419E-02	2.876E-02	2.272E-02	2.159E-02	1.732E-02	1.654E-02
12.00	1.766E-01	1.768E-01	6.029E-02	4.643E-02	3.860E-02	3.009E-02	2.823E-02	2.215E-02	2.031E-02
15.00	2.636E-01	2.638E-01	8.926E-02	6.817E-02	5.601E-02	4.292E-02	3.974E-02	3.041E-02	2.792E-02
20.00	4.432E-01	4.433E-01	1.491E-01	1.131E-01	9.194E-02	6.697E-02	6.290E-02	4.685E-02	4.149E-02
25.00	6.644E-01	6.645E-01	2.229E-01	1.684E-01	1.336E-01	1.007E-01	9.000E-02	6.644E-02	5.762E-02
30.00	9.254E-01	9.256E-01	3.099E-01	2.336E-01	1.884E-01	1.380E-01	1.236E-01	8.912E-02	7.614E-02
35.00	1.225E+00	1.225E+00	4.097E-01	3.085E-01	2.483E-01	1.808E-01	1.608E-01	1.143E-01	9.700E-02
40.00	1.561E+00	1.562E+00	5.219E-01	3.926E-01	3.156E-01	2.289E-01	2.035E-01	1.433E-01	1.201E-01
50.00	2.341E+00	2.341E+00	7.817E-01	5.875E-01	4.715E-01	3.402E-01	2.988E-01	2.094E-01	1.729E-01
60.00	3.255E+00	3.255E+00	1.086E+00	8.160E-01	6.543E-01	4.708E-01	4.116E-01	2.860E-01	2.341E-01
70.00	4.297E+00	4.297E+00	1.434E+00	1.076E+00	8.626E-01	6.106E-01	5.403E-01	3.725E-01	3.033E-01
80.00	5.459E+00	5.459E+00	1.821E+00	1.367E+00	1.095E+00	7.857E-01	6.838E-01	4.695E-01	3.801E-01
100.00	8.125E+00	8.125E+00	2.710E+00	2.034E+00	1.628E+00	1.167E+00	1.013E+00	6.905E-01	5.551E-01
120.00	1.121E+01	1.121E+01	3.739E+00	2.805E+00	2.246E+00	1.608E+00	1.394E+00	9.463E-01	7.568E-01
150.00	1.656E+01	1.656E+01	5.522E+00	4.142E+00	3.315E+00	2.372E+00	2.054E+00	1.385E+00	1.105E+00
200.00	2.717E+01	2.717E+01	9.057E+00	6.794E+00	5.437E+00	3.887E+00	3.364E+00	2.268E+00	1.793E+00
250.00	3.960E+01	3.960E+01	1.320E+01	9.890E+00	7.924E+00	5.663E+00	4.899E+00	3.298E+00	2.599E+00
300.00	5.361E+01	5.361E+01	1.787E+01	1.340E+01	1.072E+01	7.664E+00	6.628E+00	4.458E+00	3.507E+00
400.00	8.554E+01	8.554E+01	2.851E+01	2.139E+01	1.711E+01	1.223E+01	1.057E+01	7.104E+00	5.577E+00
500.00	1.217E+02	1.217E+02	4.058E+01	3.043E+01	2.435E+01	1.739E+01	1.504E+01	9.722E+00	7.222E+00
600.00	1.613E+02	1.613E+02	5.376E+01	4.032E+01	3.226E+01	2.305E+01	1.992E+01	1.338E+01	1.049E+01
700.00	2.035E+02	2.035E+02	6.878E+01	5.089E+01	4.071E+01	2.908E+01	2.514E+01	1.688E+01	1.322E+01
800.00	2.4480E+02	2.4480E+02	8.267E+01	6.200E+01	4.960E+01	3.543E+01	3.053E+01	2.056E+01	1.611E+01
1000.00	3.4420E+02	3.4420E+02	1.140E+02	8.550E+01	6.840E+01	4.886E+01	4.223E+01	2.833E+01	2.220E+01
1200.00	4.4409E+02	4.4409E+02	1.470E+02	1.102E+02	8.818E+01	6.239E+01	5.444E+01	3.654E+01	2.861E+01

DE/DX IN LEXAN
(MEV CM2/GM)

I = 69.5 A/Z = 1.896

ENRG./NUC.
(MEV/AMU)

	1	4	12	16	20	28	40	56	84
	H	HE	C	O	NE	SI	AR	FE	KR
0.10	8.582E+02	2.185E+03	7.555E+03	9.721E+03	1.158E+04	1.508E+04	1.850E+04	2.407E+04	2.948E+04
0.12	8.105E+02	2.170E+03	7.799E+03	1.014E+04	1.218E+04	1.571E+04	1.943E+04	2.554E+04	3.152E+04
0.15	7.437E+02	2.133E+03	8.049E+03	1.062E+04	1.288E+04	1.644E+04	2.053E+04	2.736E+04	3.411E+04
0.20	6.506E+02	2.054E+03	8.275E+03	1.113E+04	1.369E+04	1.806E+04	2.188E+04	2.971E+04	3.756E+04
0.25	5.820E+02	1.969E+03	8.360E+03	1.142E+04	1.423E+04	1.909E+04	2.281E+04	3.148E+04	4.028E+04
0.30	5.293E+02	1.887E+03	8.363E+03	1.159E+04	1.458E+04	1.986E+04	2.349E+04	3.286E+04	4.251E+04
0.40	4.496E+02	1.754E+03	8.234E+03	1.167E+04	1.495E+04	2.088E+04	2.601E+04	3.487E+04	4.594E+04
0.50	3.941E+02	1.563E+03	8.018E+03	1.157E+04	1.504E+04	2.178E+04	2.714E+04	3.623E+04	4.846E+04
0.60	3.524E+02	1.407E+03	7.769E+03	1.138E+04	1.497E+04	2.178E+04	2.790E+04	3.715E+04	5.037E+04
0.70	3.197E+02	1.278E+03	7.510E+03	1.114E+04	1.481E+04	2.190E+04	2.839E+04	3.952E+04	5.195E+04
0.80	2.933E+02	1.172E+03	7.253E+03	1.088E+04	1.460E+04	2.190E+04	2.869E+04	4.052E+04	5.391E+04
1.00	2.529E+02	1.011E+03	6.766E+03	1.033E+04	1.408E+04	2.164E+04	2.890E+04	4.188E+04	5.452E+04
1.20	2.249E+02	8.995E+02	6.362E+03	9.846E+03	1.358E+04	2.128E+04	2.885E+04	4.273E+04	5.566E+04
1.50	1.935E+02	7.742E+02	5.821E+03	9.153E+03	1.280E+04	2.055E+04	2.839E+04	4.326E+04	5.693E+04
2.00	1.581E+02	6.323E+02	5.081E+03	8.143E+03	1.159E+04	1.917E+04	2.716E+04	4.300E+04	6.117E+04
2.50	1.342E+02	5.356E+02	4.499E+03	7.312E+03	1.054E+04	1.782E+04	2.573E+04	4.199E+04	6.141E+04
3.00	1.158E+02	4.672E+02	4.032E+03	6.621E+03	9.631E+03	1.657E+04	2.429E+04	4.064E+04	6.094E+04
3.50	1.036E+02	4.142E+02	3.649E+03	6.042E+03	8.855E+03	1.544E+04	2.291E+04	3.914E+04	5.979E+04
4.00	9.308E+01	3.723E+02	3.326E+03	5.551E+03	8.185E+03	1.443E+04	2.163E+04	3.760E+04	5.845E+04
5.00	7.751E+01	3.100E+02	2.785E+03	4.767E+03	7.093E+03	1.272E+04	1.936E+04	3.461E+04	5.537E+04
6.00	6.654E+01	2.666E+02	2.398E+03	4.181E+03	6.263E+03	1.137E+04	1.750E+04	3.194E+04	5.226E+04
7.00	5.935E+01	2.358E+02	2.122E+03	3.750E+03	5.643E+03	1.033E+04	1.600E+04	2.922E+04	4.948E+04
8.00	5.295E+01	2.118E+02	1.903E+03	3.378E+03	5.138E+03	9.474E+03	1.480E+04	2.777E+04	4.698E+04
10.00	4.416E+01	1.766E+02	1.592E+03	2.823E+03	4.366E+03	8.133E+03	1.283E+04	2.452E+04	4.283E+04
12.00	3.829E+01	1.521E+02	1.369E+03	2.433E+03	3.790E+03	7.136E+03	1.134E+04	2.194E+04	3.864E+04
15.00	3.162E+01	1.255E+02	1.138E+03	2.024E+03	3.160E+03	6.045E+03	9.670E+03	1.898E+04	3.350E+04
20.00	2.491E+01	9.965E+01	8.969E+02	1.594E+03	2.491E+03	4.846E+03	7.809E+03	1.454E+04	2.817E+04
25.00	2.071E+01	8.285E+01	7.456E+02	1.328E+03	2.071E+03	4.053E+03	6.584E+03	1.322E+04	2.443E+04
30.00	1.783E+01	7.130E+01	6.417E+02	1.141E+03	1.783E+03	3.492E+03	5.716E+03	1.153E+04	2.172E+04
35.00	1.571E+01	6.286E+01	5.657E+02	1.006E+03	1.571E+03	3.080E+03	5.075E+03	1.029E+04	1.909E+04
40.00	1.410E+01	5.640E+01	5.076E+02	9.024E+02	1.410E+03	2.763E+03	4.561E+03	9.298E+03	1.733E+04
50.00	1.179E+01	4.716E+01	4.249E+02	7.544E+02	1.179E+03	2.311E+03	3.819E+03	7.852E+03	1.472E+04
60.00	1.021E+01	4.085E+01	3.677E+02	6.537E+02	1.021E+03	2.002E+03	3.309E+03	6.843E+03	1.237E+04
70.00	9.054E+00	3.626E+01	3.263E+02	5.801E+02	9.064E+02	1.777E+03	2.937E+03	6.098E+03	1.150E+04
80.00	8.199E+00	3.275E+01	2.948E+02	5.241E+02	8.189E+02	1.605E+03	2.653E+03	5.326E+03	1.044E+04
100.00	6.938E+00	2.775E+01	2.499E+02	4.441E+02	6.938E+02	1.360E+03	2.248E+03	4.688E+03	8.903E+03
120.00	6.086E+00	2.403E+01	2.191E+02	3.895E+02	6.086E+02	1.193E+03	1.972E+03	4.114E+03	7.839E+03
150.00	5.216E+00	2.036E+01	1.878E+02	3.333E+02	5.216E+02	1.022E+03	1.690E+03	3.526E+03	6.741E+03
200.00	4.372E+00	1.729E+01	1.556E+02	2.766E+02	4.372E+02	8.471E+02	1.400E+03	2.921E+03	5.598E+03
250.00	3.771E+00	1.509E+01	1.356E+02	2.414E+02	3.771E+02	7.392E+02	1.222E+03	2.549E+03	4.867E+03
300.00	3.397E+00	1.359E+01	1.223E+02	2.174E+02	3.397E+02	6.659E+02	1.101E+03	2.297E+03	4.403E+03
400.00	2.929E+00	1.169E+01	1.052E+02	1.870E+02	2.929E+02	5.726E+02	9.466E+02	1.975E+03	3.786E+03
500.00	2.632E+00	1.033E+01	9.476E+01	1.685E+02	2.632E+02	5.159E+02	8.528E+02	1.779E+03	3.411E+03
600.00	2.439E+00	9.756E+00	8.780E+01	1.561E+02	2.439E+02	4.780E+02	7.902E+02	1.649E+03	3.161E+03
700.00	2.302E+00	8.288E+00	8.288E+01	1.473E+02	2.302E+02	4.512E+02	7.459E+02	1.556E+03	2.964E+03
800.00	2.202E+00	8.806E+00	7.926E+01	1.409E+02	2.202E+02	4.315E+02	7.133E+02	1.448E+03	2.863E+03
1000.00	2.057E+00	8.267E+00	7.441E+01	1.323E+02	2.067E+02	4.051E+02	6.696E+02	1.397E+03	2.679E+03
1200.00	1.995E+00	7.941E+00	7.147E+01	1.271E+02	1.985E+02	3.891E+02	6.432E+02	1.342E+03	2.573E+03

RANGE IN MYLAR I = 73.2 A/Z = 1.915 (GM/CM2)

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.310E-04	2.192E-04	2.295E-04	2.458E-04	2.616E-04	2.895E-04	3.525E-04	4.004E-04	5.033E-04
0.12	1.560E-04	2.573E-04	2.618E-04	2.791E-04	2.963E-04	3.270E-04	3.960E-04	4.469E-04	5.651E-04
0.15	1.964E-04	3.155E-04	3.087E-04	3.268E-04	3.458E-04	3.809E-04	4.580E-04	5.124E-04	6.442E-04
0.20	2.714E-04	4.147E-04	3.846E-04	4.027E-04	4.234E-04	4.640E-04	5.551E-04	6.135E-04	7.650E-04
0.25	3.560E-04	5.178E-04	4.591E-04	4.778E-04	4.973E-04	5.417E-04	6.474E-04	7.078E-04	8.746E-04
0.30	4.494E-04	6.253E-04	5.332E-04	5.477E-04	5.689E-04	6.158E-04	7.365E-04	7.975E-04	9.808E-04
0.40	6.622E-04	8.538E-04	6.823E-04	6.895E-04	7.084E-04	7.573E-04	8.979E-04	9.678E-04	1.176E-03
0.50	9.082E-04	1.103E-03	8.345E-04	8.314E-04	8.458E-04	8.925E-04	1.053E-03	1.130E-03	1.360E-03
0.60	1.185E-03	1.381E-03	9.911E-04	9.750E-04	9.830E-04	1.027E-03	1.203E-03	1.287E-03	1.535E-03
0.70	1.492E-03	1.680E-03	1.153E-03	1.121E-03	1.121E-03	1.159E-03	1.349E-03	1.433E-03	1.704E-03
0.80	1.827E-03	2.074E-03	1.320E-03	1.271E-03	1.261E-03	1.290E-03	1.493E-03	1.577E-03	1.869E-03
1.00	2.583E-03	2.780E-03	1.672E-03	1.581E-03	1.548E-03	1.555E-03	1.779E-03	1.856E-03	2.150E-03
1.20	3.447E-03	3.645E-03	2.048E-03	1.907E-03	1.846E-03	1.823E-03	2.064E-03	2.129E-03	2.504E-03
1.50	4.941E-03	5.138E-03	2.661E-03	2.430E-03	2.316E-03	2.238E-03	2.496E-03	2.532E-03	2.941E-03
2.00	7.948E-03	8.146E-03	3.815E-03	3.398E-03	3.172E-03	2.971E-03	3.244E-03	3.203E-03	3.659E-03
3.00	1.557E-02	1.577E-02	5.646E-03	4.461E-03	4.100E-03	3.749E-03	4.020E-03	3.880E-03	4.333E-03
3.50	2.023E-02	2.042E-02	8.147E-03	6.935E-03	6.227E-03	5.481E-03	5.710E-03	5.296E-03	5.784E-03
4.00	2.544E-02	2.563E-02	9.903E-03	8.348E-03	7.430E-03	6.442E-03	6.631E-03	6.044E-03	6.513E-03
5.00	3.752E-02	3.771E-02	1.395E-02	1.154E-02	1.012E-02	8.560E-03	8.635E-03	7.636E-03	8.037E-03
6.00	5.179E-02	5.199E-02	1.871E-02	1.521E-02	1.320E-02	1.095E-02	1.086E-02	9.365E-03	9.650E-03
7.00	6.836E-02	6.846E-02	2.420E-02	1.937E-02	1.667E-02	1.361E-02	1.333E-02	1.124E-02	1.133E-02
8.00	8.694E-02	8.713E-02	3.043E-02	2.406E-02	2.054E-02	1.656E-02	1.632E-02	1.326E-02	1.314E-02
10.00	1.304E-01	1.305E-01	4.490E-02	3.493E-02	2.939E-02	2.324E-02	2.210E-02	1.775E-02	1.777E-02
12.00	1.802E-01	1.804E-01	6.104E-02	4.741E-02	3.942E-02	3.075E-02	2.888E-02	2.268E-02	2.134E-02
15.00	2.688E-01	2.690E-01	9.104E-02	6.955E-02	5.716E-02	4.383E-02	4.060E-02	3.111E-02	2.849E-02
20.00	4.516E-01	4.518E-01	1.520E-01	1.153E-01	9.373E-02	7.035E-02	6.419E-02	4.781E-02	4.243E-02
25.00	6.767E-01	6.769E-01	2.270E-01	1.715E-01	1.388E-01	1.026E-01	9.271E-02	6.778E-02	5.837E-02
30.00	9.423E-01	9.425E-01	3.156E-01	2.379E-01	1.919E-01	1.406E-01	1.260E-01	9.091E-02	7.774E-02
35.00	1.247E+00	1.247E+00	4.171E-01	3.141E-01	2.528E-01	1.841E-01	1.638E-01	1.171E-01	9.877E-02
40.00	1.589E+00	1.589E+00	5.312E-01	3.996E-01	3.212E-01	2.330E-01	2.062E-01	1.463E-01	1.235E-01
50.00	2.382E+00	2.382E+00	7.953E-01	5.978E-01	4.797E-01	3.462E-01	3.041E-01	2.132E-01	1.703E-01
60.00	3.311E+00	3.311E+00	1.103E+00	8.301E-01	6.656E-01	4.790E-01	4.189E-01	2.911E-01	2.335E-01
70.00	4.370E+00	4.370E+00	1.458E+00	1.093E+00	8.774E-01	6.303E-01	5.496E-01	3.795E-01	3.028E-01
80.00	5.552E+00	5.552E+00	1.852E+00	1.390E+00	1.114E+00	7.991E-01	6.955E-01	4.776E-01	3.869E-01
100.00	8.261E+00	8.261E+00	2.753E+00	2.068E+00	1.656E+00	1.186E+00	1.030E-01	7.023E-01	5.648E-01
120.00	1.140E+01	1.140E+01	3.801E+00	2.852E+00	2.283E+00	1.634E+00	1.417E+00	9.623E-01	7.697E-01
150.00	1.683E+01	1.683E+01	5.619E+00	4.219E+00	3.370E+00	2.411E+00	2.088E+00	1.412E+00	1.123E+00
200.00	2.761E+01	2.761E+01	9.202E+00	6.904E+00	5.525E+00	3.950E+00	3.419E+00	2.305E+00	1.823E+00
250.00	4.024E+01	4.024E+01	1.341E+01	1.008E+01	8.052E+00	5.755E+00	4.978E+00	3.352E+00	2.642E+00
300.00	5.447E+01	5.447E+01	1.816E+01	1.367E+01	1.090E+01	7.787E+00	6.734E+00	4.530E+00	3.564E+00
400.00	8.690E+01	8.690E+01	2.879E+01	2.173E+01	1.738E+01	1.242E+01	1.074E+01	7.217E+00	5.666E+00
500.00	1.236E+02	1.236E+02	4.122E+01	3.091E+01	2.473E+01	1.767E+01	1.527E+01	1.026E+01	8.048E+00
600.00	1.638E+02	1.638E+02	5.466E+01	4.095E+01	3.276E+01	2.341E+01	2.023E+01	1.359E+01	1.065E+01
700.00	2.067E+02	2.067E+02	6.891E+01	5.168E+01	4.033E+01	2.954E+01	2.553E+01	1.714E+01	1.343E+01
800.00	2.518E+02	2.518E+02	8.395E+01	6.296E+01	5.037E+01	3.598E+01	3.110E+01	2.088E+01	1.636E+01
1000.00	3.473E+02	3.473E+02	1.158E+02	8.682E+01	6.946E+01	4.961E+01	4.288E+01	2.879E+01	2.254E+01
1200.00	4.476E+02	4.476E+02	1.492E+02	1.119E+02	8.953E+01	6.393E+01	5.527E+01	3.710E+01	2.905E+01

DE/DX IN MYLAR I = 73.2 A/Z = 1.915

(MEV CM2/GM)

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	8.205E+02	2.100E+03	7.302E+03	9.405E+03	1.121E+04	1.461E+04	1.793E+04	2.333E+04	2.858E+04
0.12	7.738E+02	2.086E+03	7.538E+03	9.812E+03	1.179E+04	1.522E+04	1.882E+04	2.478E+04	3.056E+04
0.15	7.131E+02	2.052E+03	7.780E+03	1.027E+04	1.246E+04	1.592E+04	1.990E+04	2.652E+04	3.307E+04
0.20	6.236E+02	1.978E+03	8.002E+03	1.077E+04	1.326E+04	1.750E+04	2.120E+04	2.880E+04	3.642E+04
0.25	5.609E+02	1.900E+03	8.088E+03	1.106E+04	1.378E+04	1.849E+04	2.211E+04	3.051E+04	3.906E+04
0.30	5.101E+02	1.823E+03	8.095E+03	1.122E+04	1.441E+04	1.924E+04	2.277E+04	3.186E+04	4.122E+04
0.40	4.355E+02	1.699E+03	7.980E+03	1.131E+04	1.443E+04	2.025E+04	2.522E+04	3.382E+04	4.455E+04
0.50	3.826E+02	1.517E+03	7.780E+03	1.123E+04	1.459E+04	2.083E+04	2.633E+04	3.514E+04	4.701E+04
0.60	3.427E+02	1.368E+03	7.546E+03	1.105E+04	1.454E+04	2.114E+04	2.708E+04	3.605E+04	4.887E+04
0.70	3.113E+02	1.245E+03	7.301E+03	1.083E+04	1.439E+04	2.127E+04	2.757E+04	3.835E+04	5.032E+04
0.80	2.858E+02	1.142E+03	7.057E+03	1.058E+04	1.419E+04	2.127E+04	2.787E+04	3.933E+04	5.145E+04
1.00	2.467E+02	9.869E+02	6.591E+03	1.006E+04	1.370E+04	2.105E+04	2.809E+04	4.068E+04	5.303E+04
1.20	2.192E+02	8.768E+02	6.195E+03	9.583E+03	1.321E+04	2.069E+04	2.804E+04	4.150E+04	5.403E+04
1.50	1.889E+02	7.554E+02	5.674E+03	8.917E+03	1.242E+04	1.999E+04	2.762E+04	4.205E+04	5.763E+04
2.00	1.544E+02	6.177E+02	4.960E+03	7.946E+03	1.130E+04	1.868E+04	2.644E+04	4.183E+04	5.946E+04
2.50	1.312E+02	5.248E+02	4.396E+03	7.140E+03	1.028E+04	1.737E+04	2.507E+04	4.088E+04	5.973E+04
3.00	1.142E+02	4.570E+02	3.942E+03	6.470E+03	9.406E+03	1.617E+04	2.368E+04	3.959E+04	5.921E+04
3.50	1.013E+02	4.053E+02	3.570E+03	5.907E+03	8.653E+03	1.508E+04	2.235E+04	3.815E+04	5.821E+04
4.00	9.110E+01	3.644E+02	3.255E+03	5.430E+03	8.002E+03	1.410E+04	2.111E+04	3.666E+04	5.694E+04
5.00	7.588E+01	3.035E+02	2.726E+03	4.665E+03	6.938E+03	1.243E+04	1.892E+04	3.377E+04	5.398E+04
6.00	6.521E+01	2.612E+02	2.350E+03	4.097E+03	6.133E+03	1.113E+04	1.712E+04	3.125E+04	5.102E+04
7.00	5.779E+01	2.312E+02	2.080E+03	3.676E+03	5.429E+03	1.012E+04	1.570E+04	2.906E+04	4.833E+04
8.00	5.193E+01	2.077E+02	1.868E+03	3.313E+03	5.037E+03	9.283E+03	1.450E+04	2.717E+04	4.582E+04
10.00	4.333E+01	1.733E+02	1.560E+03	2.772E+03	4.283E+03	7.973E+03	1.238E+04	2.401E+04	4.137E+04
12.00	3.732E+01	1.493E+02	1.344E+03	2.388E+03	3.720E+03	7.401E+03	1.112E+04	2.150E+04	3.763E+04
15.00	3.105E+01	1.242E+02	1.118E+03	1.987E+03	3.103E+03	5.934E+03	9.489E+03	1.861E+04	3.312E+04
20.00	2.448E+01	9.790E+01	8.811E+02	1.566E+03	2.447E+03	4.760E+03	7.669E+03	1.526E+04	2.763E+04
25.00	2.035E+01	8.142E+01	7.328E+02	1.303E+03	2.036E+03	3.983E+03	6.459E+03	1.299E+04	2.378E+04
30.00	1.752E+01	7.009E+01	6.308E+02	1.121E+03	1.752E+03	3.443E+03	5.619E+03	1.135E+04	2.094E+04
35.00	1.545E+01	6.180E+01	5.562E+02	9.888E+02	1.545E+03	3.028E+03	4.990E+03	1.011E+04	1.875E+04
40.00	1.387E+01	5.546E+01	4.992E+02	8.874E+02	1.387E+03	2.717E+03	4.485E+03	9.140E+03	1.703E+04
50.00	1.160E+01	4.639E+01	4.175E+02	7.422E+02	1.160E+03	2.273E+03	3.756E+03	7.721E+03	1.447E+04
60.00	1.005E+01	4.019E+01	3.617E+02	6.430E+02	1.005E+03	1.869E+03	3.255E+03	6.731E+03	1.266E+04
70.00	8.917E+00	3.567E+01	3.210E+02	5.707E+02	8.917E+02	1.748E+03	2.899E+03	5.998E+03	1.131E+04
80.00	8.057E+00	3.223E+01	2.900E+02	5.156E+02	8.057E+02	1.579E+03	2.610E+03	5.437E+03	1.027E+04
100.00	6.827E+00	2.731E+01	2.458E+02	4.370E+02	6.827E+02	1.338E+03	2.212E+03	4.613E+03	8.759E+03
120.00	5.990E+00	2.396E+01	2.156E+02	3.830E+02	5.990E+02	1.174E+03	1.941E+03	4.048E+03	7.714E+03
150.00	5.133E+00	2.053E+01	1.848E+02	3.285E+02	5.133E+02	1.006E+03	1.663E+03	3.470E+03	6.634E+03
200.00	4.254E+00	1.702E+01	1.531E+02	2.723E+02	4.254E+02	8.338E+02	1.378E+03	2.875E+03	5.510E+03
250.00	3.713E+00	1.485E+01	1.337E+02	2.376E+02	3.713E+02	7.277E+02	1.230E+03	2.510E+03	4.811E+03
300.00	3.345E+00	1.338E+01	1.204E+02	2.141E+02	3.345E+02	6.556E+02	1.084E+03	2.261E+03	4.335E+03
400.00	2.877E+00	1.151E+01	1.036E+02	1.841E+02	2.877E+02	5.638E+02	9.320E+02	1.945E+03	3.728E+03
500.00	2.592E+00	1.037E+01	9.331E+01	1.659E+02	2.592E+02	5.080E+02	8.398E+02	1.752E+03	3.359E+03
600.00	2.402E+00	9.608E+00	8.648E+01	1.537E+02	2.402E+02	4.708E+02	7.783E+02	1.624E+03	3.113E+03
700.00	2.264E+00	9.071E+00	8.154E+01	1.451E+02	2.264E+02	4.445E+02	7.347E+02	1.533E+03	2.939E+03
800.00	2.169E+00	8.675E+00	7.808E+01	1.388E+02	2.169E+02	4.251E+02	7.027E+02	1.466E+03	2.811E+03
1000.00	2.036E+00	8.146E+00	7.331E+01	1.303E+02	2.036E+02	3.991E+02	6.698E+02	1.377E+03	2.639E+03
1200.00	1.955E+00	7.826E+00	7.043E+01	1.252E+02	1.955E+02	3.835E+02	6.339E+02	1.323E+03	2.536E+03

RANGE IN MUSCOVITE (GM/CM2) I = 128.3 A/Z = 2.011

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.819E+04	2.996E+04	3.082E+04	3.293E+04	3.500E+04	3.867E+04	4.706E+04	5.341E+04	6.777E+04
0.12	2.203E+04	3.555E+04	3.529E+04	3.749E+04	3.973E+04	4.374E+04	5.252E+04	5.965E+04	7.536E+04
0.15	2.813E+04	4.399E+04	4.178E+04	4.403E+04	4.646E+04	5.102E+04	6.125E+04	6.843E+04	8.595E+04
0.20	3.920E+04	5.829E+04	5.226E+04	5.442E+04	5.701E+04	6.225E+04	7.433E+04	8.198E+04	1.021E+05
0.25	5.136E+04	7.293E+04	6.248E+04	6.439E+04	6.704E+04	7.273E+04	8.674E+04	9.462E+04	1.170E+05
0.30	6.452E+04	8.793E+04	7.258E+04	7.413E+04	7.672E+04	8.270E+04	9.869E+04	1.066E+05	1.310E+05
0.40	9.365E+04	1.191E+05	9.270E+04	9.320E+04	9.545E+04	1.017E+05	1.203E+05	1.244E+05	1.571E+05
0.50	1.263E+05	1.523E+05	1.130E+05	1.121E+05	1.137E+05	1.198E+05	1.409E+05	1.510E+05	1.815E+05
0.60	1.624E+05	1.885E+05	1.335E+05	1.310E+05	1.319E+05	1.374E+05	1.608E+05	1.719E+05	2.048E+05
0.70	2.017E+05	2.279E+05	1.546E+05	1.501E+05	1.509E+05	1.548E+05	1.801E+05	1.911E+05	2.272E+05
0.80	2.443E+05	2.706E+05	1.761E+05	1.695E+05	1.682E+05	1.720E+05	1.990E+05	2.102E+05	2.491E+05
1.00	3.391E+05	3.654E+05	2.211E+05	2.094E+05	2.052E+05	2.064E+05	2.363E+05	2.469E+05	2.915E+05
1.20	4.465E+05	4.728E+05	2.687E+05	2.509E+05	2.433E+05	2.411E+05	2.734E+05	2.832E+05	3.328E+05
1.50	6.315E+05	6.577E+05	3.456E+05	3.171E+05	3.032E+05	2.943E+05	3.293E+05	3.351E+05	3.900E+05
2.00	1.004E+06	1.030E+06	4.899E+05	4.389E+05	4.115E+05	3.880E+05	4.253E+05	4.222E+05	4.839E+05
2.50	1.454E+06	1.481E+06	6.550E+05	5.757E+05	5.314E+05	4.888E+05	5.264E+05	5.107E+05	5.765E+05
3.00	1.955E+06	1.981E+06	8.323E+05	7.215E+05	6.579E+05	5.937E+05	6.302E+05	5.997E+05	6.675E+05
3.50	2.521E+06	2.547E+06	1.028E+06	8.805E+05	7.949E+05	7.4054E+05	7.793E+05	7.612E+05	7.593E+05
4.00	3.152E+06	3.179E+06	1.241E+06	1.053E+06	9.425E+05	8.244E+05	8.542E+05	7.857E+05	8.524E+05
5.00	4.610E+06	4.636E+06	1.729E+06	1.440E+06	1.271E+06	1.085E+06	1.102E+06	9.852E+05	1.044E+06
6.00	6.326E+06	6.353E+06	2.301E+06	1.883E+06	1.643E+06	1.377E+06	1.376E+06	1.200E+06	1.246E+06
7.00	8.302E+06	8.329E+06	2.960E+06	2.383E+06	2.062E+06	1.700E+06	1.677E+06	1.432E+06	1.458E+06
8.00	1.054E+07	1.057E+07	3.706E+06	2.945E+06	2.528E+06	2.057E+06	2.006E+06	1.681E+06	1.683E+06
10.00	1.555E+07	1.558E+07	5.378E+06	4.201E+06	3.554E+06	2.837E+06	2.720E+06	2.214E+06	2.157E+06
12.00	2.138E+07	2.140E+07	7.318E+06	5.657E+06	4.725E+06	3.720E+06	3.522E+06	2.804E+06	2.672E+06
15.00	3.166E+07	3.169E+07	1.075E+07	8.228E+06	6.785E+06	5.247E+06	4.897E+06	3.800E+06	3.527E+06
20.00	5.278E+07	5.280E+07	1.779E+07	1.351E+07	1.101E+07	8.317E+06	7.640E+06	5.758E+06	5.174E+06
25.00	7.866E+07	7.869E+07	2.641E+07	1.998E+07	1.619E+07	1.203E+07	1.093E+07	8.078E+06	7.098E+06
30.00	1.091E+08	1.091E+08	3.656E+07	2.759E+07	2.228E+07	1.638E+07	1.475E+07	1.075E+07	9.291E+06
35.00	1.439E+08	1.439E+08	4.817E+07	3.629E+07	2.924E+07	2.136E+07	1.909E+07	1.376E+07	1.175E+07
40.00	1.830E+08	1.830E+08	6.118E+07	4.606E+07	3.705E+07	2.694E+07	2.392E+07	1.711E+07	1.446E+07
50.00	2.732E+08	2.732E+08	9.125E+07	6.861E+07	5.509E+07	3.982E+07	3.507E+07	2.475E+07	2.062E+07
60.00	3.788E+08	3.788E+08	1.264E+08	9.500E+07	7.621E+07	5.491E+07	4.811E+07	3.362E+07	2.773E+07
70.00	4.988E+08	4.989E+08	1.665E+08	1.250E+08	1.002E+08	7.206E+07	6.293E+07	4.365E+07	3.574E+07
80.00	6.327E+08	6.327E+08	2.111E+08	1.585E+08	1.270E+08	9.118E+07	7.946E+07	5.477E+07	4.461E+07
100.00	9.390E+08	9.390E+08	3.132E+08	2.351E+08	1.883E+08	1.349E+08	1.173E+08	8.018E+07	6.477E+07
120.00	1.293E+09	1.293E+09	4.313E+08	3.236E+08	2.591E+08	1.855E+08	1.610E+08	1.095E+08	8.794E+07
150.00	1.906E+09	1.906E+09	6.355E+08	4.768E+08	3.816E+08	2.731E+08	2.366E+08	1.603E+08	1.275E+08
200.00	3.119E+09	3.119E+09	1.040E+09	7.800E+08	6.242E+08	4.463E+08	3.864E+08	2.608E+08	2.066E+08
250.00	4.539E+09	4.539E+09	1.513E+09	1.135E+09	9.082E+08	6.492E+08	5.617E+08	3.784E+08	2.987E+08
300.00	6.136E+09	6.136E+09	2.046E+09	1.534E+09	1.228E+09	8.774E+08	7.589E+08	5.107E+08	4.022E+08
400.00	9.773E+09	9.773E+09	3.258E+09	2.444E+09	1.939E+09	1.397E+09	1.208E+09	8.120E+08	6.379E+08
500.00	1.389E+10	1.389E+10	4.629E+09	3.472E+09	2.778E+09	1.985E+09	1.716E+09	1.153E+09	9.046E+08
600.00	1.838E+10	1.838E+10	6.126E+09	4.595E+09	3.676E+09	2.626E+09	2.270E+09	1.525E+09	1.195E+09
700.00	2.317E+10	2.317E+10	7.724E+09	5.793E+09	4.635E+09	3.311E+09	2.862E+09	1.922E+09	1.505E+09
800.00	2.821E+10	2.821E+10	9.402E+09	7.052E+09	5.642E+09	4.030E+09	3.484E+09	2.339E+09	1.893E+09
1000.00	3.884E+10	3.884E+10	1.295E+10	9.709E+09	7.768E+09	5.549E+09	4.796E+09	3.220E+09	2.522E+09
1200.00	4.999E+10	4.999E+10	1.666E+10	1.250E+10	9.999E+09	7.143E+09	6.173E+09	4.144E+09	3.245E+09

DE/DX IN MUSCOVITE

(MEV CM2/GM)

I = 128.3 A/Z = 2.011

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	5.335E+02	1.435E+03	5.280E+03	6.869E+03	8.241E+03	1.082E+04	1.332E+04	1.740E+04	2.136E+04
0.12	5.091E+02	1.428E+03	5.446E+03	7.162E+03	8.658E+03	1.126E+04	1.398E+04	1.846E+04	2.284E+04
0.15	4.759E+02	1.413E+03	5.627E+03	7.499E+03	9.155E+03	1.178E+04	1.478E+04	1.977E+04	2.471E+04
0.20	4.296E+02	1.383E+03	5.814E+03	7.885E+03	9.757E+03	1.296E+04	1.576E+04	2.148E+04	2.722E+04
0.25	3.947E+02	1.350E+03	5.913E+03	8.134E+03	1.018E+04	1.373E+04	1.646E+04	2.278E+04	2.921E+04
0.30	3.666E+02	1.316E+03	5.959E+03	8.295E+03	1.047E+04	1.432E+04	1.699E+04	2.382E+04	3.085E+04
0.40	3.233E+02	1.262E+03	5.956E+03	8.475E+03	1.084E+04	1.516E+04	1.889E+04	2.535E+04	3.341E+04
0.50	2.908E+02	1.193E+03	5.882E+03	8.451E+03	1.101E+04	1.569E+04	1.982E+04	2.642E+04	3.533E+04
0.60	2.651E+02	1.058E+03	5.770E+03	8.421E+03	1.105E+04	1.602E+04	2.047E+04	2.719E+04	3.680E+04
0.70	2.440E+02	9.757E+02	5.637E+03	8.319E+03	1.102E+04	1.621E+04	2.094E+04	2.801E+04	3.797E+04
0.80	2.263E+02	9.042E+02	5.493E+03	8.186E+03	1.093E+04	1.629E+04	2.125E+04	2.984E+04	3.899E+04
1.00	1.978E+02	7.912E+02	5.193E+03	7.869E+03	1.066E+04	1.625E+04	2.157E+04	3.102E+04	4.023E+04
1.20	1.758E+02	7.032E+02	4.895E+03	7.522E+03	1.031E+04	1.603E+04	2.159E+04	3.172E+04	4.104E+04
1.50	1.509E+02	6.035E+02	4.485E+03	7.006E+03	9.745E+03	1.551E+04	2.131E+04	3.220E+04	4.403E+04
2.00	1.249E+02	4.996E+02	3.978E+03	6.331E+03	8.954E+03	1.467E+04	2.063E+04	3.233E+04	4.560E+04
2.50	1.070E+02	4.279E+02	3.564E+03	5.749E+03	8.232E+03	1.378E+04	1.975E+04	3.186E+04	4.612E+04
3.00	9.372E+01	3.749E+02	3.222E+03	5.252E+03	7.592E+03	1.293E+04	1.880E+04	3.107E+04	4.601E+04
3.50	8.349E+01	3.339E+02	2.936E+03	4.825E+03	7.029E+03	1.214E+04	1.786E+04	3.013E+04	4.549E+04
4.00	7.531E+01	3.012E+02	2.689E+03	4.458E+03	6.534E+03	1.141E+04	1.697E+04	2.912E+04	4.472E+04
5.00	6.308E+01	2.523E+02	2.266E+03	3.862E+03	5.715E+03	1.016E+04	1.534E+04	2.706E+04	4.280E+04
6.00	5.503E+01	2.201E+02	1.980E+03	3.444E+03	5.130E+03	9.227E+03	1.409E+04	2.538E+04	4.098E+04
7.00	4.893E+01	1.957E+02	1.761E+03	3.110E+03	4.655E+03	8.452E+03	1.302E+04	2.382E+04	3.914E+04
8.00	4.413E+01	1.785E+02	1.587E+03	2.814E+03	4.264E+03	7.798E+03	1.210E+04	2.242E+04	3.736E+04
10.00	3.704E+01	1.482E+02	1.334E+03	2.369E+03	3.656E+03	6.760E+03	1.060E+04	2.002E+04	3.412E+04
12.00	3.205E+01	1.282E+02	1.154E+03	2.051E+03	3.193E+03	5.975E+03	9.436E+03	1.808E+04	3.131E+04
15.00	2.680E+01	1.072E+02	9.647E+02	1.715E+03	2.678E+03	5.102E+03	8.120E+03	1.579E+04	2.785E+04
20.00	2.124E+01	8.497E+01	7.647E+02	1.360E+03	2.124E+03	4.127E+03	6.621E+03	1.308E+04	2.351E+04
25.00	1.774E+01	7.094E+01	6.383E+02	1.135E+03	1.774E+03	3.469E+03	5.619E+03	1.121E+04	2.046E+04
30.00	1.531E+01	6.124E+01	5.512E+02	9.799E+02	1.531E+03	2.999E+03	4.901E+03	9.846E+03	1.806E+04
35.00	1.353E+01	5.411E+01	4.870E+02	8.658E+02	1.353E+03	2.651E+03	4.367E+03	8.804E+03	1.625E+04
40.00	1.216E+01	4.865E+01	4.378E+02	7.784E+02	1.216E+03	2.384E+03	3.933E+03	7.984E+03	1.480E+04
50.00	1.020E+01	4.080E+01	3.672E+02	6.528E+02	1.020E+03	1.999E+03	3.303E+03	6.773E+03	1.264E+04
60.00	8.853E+00	3.541E+01	3.187E+02	5.666E+02	8.853E+02	1.735E+03	2.868E+03	5.922E+03	1.110E+04
70.00	7.870E+00	3.148E+01	2.833E+02	5.037E+02	7.870E+02	1.542E+03	2.550E+03	5.289E+03	9.948E+03
80.00	7.118E+00	2.847E+01	2.563E+02	4.566E+02	7.118E+02	1.395E+03	2.306E+03	4.802E+03	9.048E+03
100.00	6.043E+00	2.417E+01	2.175E+02	3.868E+02	6.043E+02	1.184E+03	1.958E+03	4.082E+03	7.739E+03
120.00	5.308E+00	2.123E+01	1.911E+02	3.397E+02	5.308E+02	1.040E+03	1.720E+03	3.588E+03	6.829E+03
150.00	4.456E+00	1.822E+01	1.640E+02	2.916E+02	4.456E+02	8.930E+02	1.476E+03	3.080E+03	5.895E+03
200.00	3.782E+00	1.513E+01	1.362E+02	2.421E+02	3.782E+02	7.413E+02	1.225E+03	2.556E+03	4.898E+03
250.00	3.305E+00	1.322E+01	1.150E+02	2.115E+02	3.305E+02	6.471E+02	1.071E+03	2.234E+03	4.282E+03
300.00	2.980E+00	1.192E+01	1.073E+02	1.907E+02	2.980E+02	5.841E+02	9.656E+02	2.015E+03	3.862E+03
400.00	2.567E+00	1.027E+01	9.243E+01	1.643E+02	2.567E+02	5.032E+02	8.318E+02	1.736E+03	3.327E+03
500.00	2.317E+00	9.256E+00	8.339E+01	1.483E+02	2.317E+02	4.540E+02	7.506E+02	1.566E+03	3.002E+03
600.00	2.149E+00	8.598E+00	7.735E+01	1.375E+02	2.149E+02	4.213E+02	6.964E+02	1.453E+03	2.786E+03
700.00	2.031E+00	8.126E+00	7.313E+01	1.300E+02	2.031E+02	3.982E+02	6.582E+02	1.373E+03	2.633E+03
800.00	1.945E+00	7.779E+00	7.001E+01	1.245E+02	1.945E+02	3.812E+02	6.301E+02	1.315E+03	2.520E+03
1000.00	1.830E+00	7.319E+00	6.587E+01	1.171E+02	1.830E+02	3.586E+02	5.928E+02	1.237E+03	2.371E+03
1200.00	1.761E+00	7.045E+00	6.340E+01	1.127E+02	1.761E+02	3.452E+02	5.706E+02	1.191E+03	2.293E+03

(GM/CM2)

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.825E-04	3.006E-04	3.091E-04	3.304E-04	3.511E-04	3.879E-04	4.720E-04	5.357E-04	6.797E-04
0.12	2.211E-04	3.567E-04	3.540E-04	3.761E-04	3.985E-04	4.387E-04	5.308E-04	5.983E-04	7.559E-04
0.15	2.824E-04	4.416E-04	4.192E-04	4.417E-04	4.660E-04	5.118E-04	6.144E-04	6.864E-04	8.622E-04
0.20	3.936E-04	5.822E-04	5.243E-04	5.459E-04	5.720E-04	6.244E-04	7.456E-04	8.224E-04	1.024E-03
0.25	5.158E-04	7.351E-04	6.269E-04	6.460E-04	6.725E-04	7.296E-04	8.701E-04	9.492E-04	1.173E-03
0.30	6.479E-04	8.827E-04	7.283E-04	7.437E-04	7.696E-04	8.296E-04	9.899E-04	1.070E-03	1.314E-03
0.40	9.402E-04	1.196E-03	9.300E-04	9.351E-04	9.520E-04	1.020E-03	1.207E-03	1.298E-03	1.575E-03
0.50	1.268E-03	1.528E-03	1.133E-03	1.124E-03	1.141E-03	1.202E-03	1.414E-03	1.514E-03	1.820E-03
0.60	1.629E-03	1.892E-03	1.340E-03	1.314E-03	1.323E-03	1.379E-03	1.613E-03	1.724E-03	2.054E-03
0.70	2.024E-03	2.524E-03	1.551E-03	1.504E-03	1.504E-03	1.553E-03	1.806E-03	1.917E-03	2.279E-03
0.80	2.451E-03	2.714E-03	1.767E-03	1.700E-03	1.687E-03	1.726E-03	1.996E-03	2.108E-03	2.498E-03
1.00	3.400E-03	3.664E-03	2.217E-03	2.100E-03	2.058E-03	2.070E-03	2.371E-03	2.477E-03	2.923E-03
1.20	4.477E-03	4.741E-03	2.694E-03	2.516E-03	2.440E-03	2.418E-03	2.742E-03	2.834E-03	3.338E-03
1.50	6.330E-03	6.593E-03	3.465E-03	3.180E-03	3.040E-03	2.952E-03	3.302E-03	3.361E-03	3.912E-03
2.00	1.006E-02	1.032E-02	4.911E-03	4.400E-03	4.126E-03	3.890E-03	4.265E-03	4.234E-03	4.852E-03
2.50	1.458E-02	1.484E-02	6.566E-03	5.722E-03	5.327E-03	4.901E-03	5.278E-03	5.122E-03	5.781E-03
3.00	1.959E-02	1.985E-02	8.342E-03	7.232E-03	6.596E-03	5.952E-03	6.318E-03	6.013E-03	6.694E-03
3.50	2.526E-02	2.552E-02	1.030E-02	8.825E-03	7.968E-03	7.072E-03	7.412E-03	6.930E-03	7.614E-03
4.00	3.158E-02	3.185E-02	1.243E-02	1.055E-02	9.447E-03	8.264E-03	8.564E-03	7.878E-03	8.547E-03
5.00	4.618E-02	4.644E-02	1.732E-02	1.443E-02	1.273E-02	1.087E-02	1.105E-02	9.877E-03	1.047E-02
6.00	6.327E-02	6.363E-02	2.305E-02	1.887E-02	1.647E-02	1.380E-02	1.379E-02	1.203E-02	1.249E-02
7.00	9.315E-02	8.341E-02	2.965E-02	2.387E-02	2.066E-02	1.704E-02	1.681E-02	1.433E-02	1.462E-02
8.00	1.055E-01	1.058E-01	3.712E-02	2.950E-02	2.453E-02	2.061E-02	2.010E-02	1.685E-02	1.687E-02
10.00	1.557E-01	1.560E-01	5.385E-02	4.206E-02	3.559E-02	2.842E-02	2.735E-02	2.219E-02	2.162E-02
12.00	2.140E-01	2.143E-01	7.327E-02	5.663E-02	4.731E-02	3.726E-02	3.527E-02	2.809E-02	2.677E-02
15.00	3.169E-01	3.172E-01	1.076E-01	8.237E-02	6.793E-02	5.254E-02	4.994E-02	3.804E-02	3.533E-02
20.00	5.282E-01	5.285E-01	1.780E-01	1.352E-01	1.102E-01	8.326E-02	7.649E-02	5.766E-02	5.183E-02
25.00	7.872E-01	7.875E-01	2.643E-01	1.999E-01	1.620E-01	1.204E-01	1.094E-01	8.087E-02	7.108E-02
30.00	1.092E+00	1.092E+00	3.659E-01	2.761E-01	2.229E-01	1.639E-01	1.477E-01	1.076E-01	9.302E-02
35.00	1.440E+00	1.440E+00	4.820E-01	3.632E-01	2.926E-01	2.137E-01	1.910E-01	1.378E-01	1.176E-01
40.00	1.831E+00	1.831E+00	6.122E-01	4.608E-01	3.707E-01	2.695E-01	2.394E-01	1.712E-01	1.447E-01
50.00	2.733E+00	2.734E+00	9.130E-01	6.865E-01	5.512E-01	3.985E-01	3.509E-01	2.477E-01	2.064E-01
60.00	3.789E+00	3.790E+00	1.265E+00	9.450E-01	7.624E-01	5.493E-01	4.813E-01	3.364E-01	2.775E-01
70.00	4.990E+00	4.991E+00	1.665E+00	1.251E+00	1.003E+00	7.209E-01	6.236E-01	4.367E-01	3.577E-01
80.00	6.329E+00	6.329E+00	2.112E+00	1.585E+00	1.270E+00	9.122E-01	7.949E-01	5.489E-01	4.464E-01
100.00	9.393E+00	9.394E+00	3.133E+00	2.351E+00	1.883E+00	1.350E+00	1.173E+00	8.022E-01	6.480E-01
120.00	1.294E+01	1.294E+01	4.314E+00	3.237E+00	2.592E+00	1.856E+00	1.611E+00	1.096E+00	8.798E-01
150.00	1.906E+01	1.906E+01	6.357E+00	4.769E+00	3.817E+00	2.731E+00	2.367E+00	1.603E+00	1.279E+00
200.00	3.120E+01	3.120E+01	1.040E+01	7.802E+00	6.244E+00	4.465E+00	3.865E+00	2.608E+00	2.066E+00
250.00	4.540E+01	4.540E+01	1.513E+01	1.135E+01	9.084E+00	6.493E+00	5.618E+00	3.785E+00	2.987E+00
300.00	6.137E+01	6.137E+01	2.046E+01	1.535E+01	1.222E+01	8.775E+00	7.590E+00	5.108E+00	4.023E+00
400.00	9.774E+01	9.774E+01	3.258E+01	2.444E+01	1.955E+01	1.3397E+01	1.208E+01	8.121E+00	6.380E+00
500.00	1.389E+02	1.389E+02	4.630E+01	3.473E+01	2.778E+01	1.985E+01	1.816E+01	1.153E+01	9.047E+00
600.00	1.838E+02	1.838E+02	6.127E+01	4.595E+01	3.676E+01	2.626E+01	2.270E+01	1.525E+01	1.196E+01
700.00	2.317E+02	2.317E+02	7.724E+01	5.793E+01	4.635E+01	3.311E+01	2.862E+01	1.922E+01	1.506E+01
800.00	2.821E+02	2.821E+02	9.403E+01	7.052E+01	5.642E+01	4.031E+01	3.484E+01	2.339E+01	1.833E+01
1000.00	3.884E+02	3.884E+02	1.295E+02	9.710E+01	7.768E+01	5.454E+01	4.796E+01	3.220E+01	2.522E+01
1200.00	5.000E+02	5.000E+02	1.667E+02	1.250E+02	1.0000E+02	7.143E+01	6.174E+01	4.044E+01	3.245E+01

DE/DX IN PHLOGOPITE MICA

I = 129.44 A/Z = 2.009

(MEV CM2/GM)

ENRG./NUC. (MEV/AMU)	1	H	4	HE	12	C	16	O	20	NE	28	SI	40	AR	56	FE	84	KR
5.308E+02	5.308E+02	1.428E+03	5.261E+03	6.845E+03	8.213E+03	1.078E+04	8.213E+03	8.213E+03	8.213E+03	1.078E+04	1.078E+04	1.078E+04	1.327E+04	1.327E+04	1.735E+04	1.735E+04	2.130E+04	2.130E+04
5.066E+02	5.066E+02	1.421E+03	5.426E+03	7.137E+03	8.629E+03	1.123E+04	7.137E+03	8.629E+03	8.629E+03	1.123E+04	1.123E+04	1.123E+04	1.394E+04	1.394E+04	1.840E+04	1.840E+04	2.277E+04	2.277E+04
4.737E+02	4.737E+02	1.407E+03	5.607E+03	7.473E+03	9.125E+03	1.175E+04	7.473E+03	9.125E+03	9.125E+03	1.175E+04	1.175E+04	1.175E+04	1.473E+04	1.473E+04	1.971E+04	1.971E+04	2.464E+04	2.464E+04
4.277E+02	4.277E+02	1.378E+03	5.793E+03	7.853E+03	9.725E+03	1.292E+04	7.853E+03	9.725E+03	9.725E+03	1.292E+04	1.292E+04	1.292E+04	1.571E+04	1.571E+04	2.141E+04	2.141E+04	2.714E+04	2.714E+04
3.932E+02	3.932E+02	1.345E+03	5.893E+03	8.107E+03	1.014E+04	1.368E+04	8.107E+03	1.014E+04	1.014E+04	1.368E+04	1.368E+04	1.368E+04	1.641E+04	1.641E+04	2.271E+04	2.271E+04	2.912E+04	2.912E+04
3.652E+02	3.652E+02	1.311E+03	5.933E+03	8.263E+03	1.044E+04	1.428E+04	8.263E+03	1.044E+04	1.044E+04	1.428E+04	1.428E+04	1.428E+04	1.694E+04	1.694E+04	2.374E+04	2.374E+04	3.076E+04	3.076E+04
3.223E+02	3.223E+02	1.258E+03	5.933E+03	8.423E+03	1.080E+04	1.511E+04	8.423E+03	1.080E+04	1.080E+04	1.511E+04	1.511E+04	1.511E+04	1.884E+04	1.884E+04	2.528E+04	2.528E+04	3.331E+04	3.331E+04
2.900E+02	2.900E+02	1.150E+03	5.865E+03	8.450E+03	1.097E+04	1.564E+04	8.450E+03	1.097E+04	1.097E+04	1.564E+04	1.564E+04	1.564E+04	1.976E+04	1.976E+04	2.634E+04	2.634E+04	3.532E+04	3.532E+04
2.645E+02	2.645E+02	1.055E+03	5.754E+03	8.393E+03	1.102E+04	1.597E+04	8.393E+03	1.102E+04	1.102E+04	1.597E+04	1.597E+04	1.597E+04	2.041E+04	2.041E+04	2.711E+04	2.711E+04	3.670E+04	3.670E+04
2.258E+02	2.258E+02	9.023E+02	5.473E+03	8.163E+03	1.091E+04	1.625E+04	8.163E+03	1.091E+04	1.091E+04	1.625E+04	1.625E+04	1.625E+04	2.119E+04	2.119E+04	2.976E+04	2.976E+04	3.878E+04	3.878E+04
1.974E+02	1.974E+02	7.896E+02	5.181E+03	7.850E+03	1.064E+04	1.621E+04	7.850E+03	1.064E+04	1.064E+04	1.621E+04	1.621E+04	1.621E+04	2.151E+04	2.151E+04	3.093E+04	3.093E+04	4.011E+04	4.011E+04
1.755E+02	1.755E+02	7.019E+02	4.885E+03	7.503E+03	1.029E+04	1.599E+04	7.503E+03	1.029E+04	1.029E+04	1.599E+04	1.599E+04	1.599E+04	2.154E+04	2.154E+04	3.164E+04	3.164E+04	4.094E+04	4.094E+04
1.506E+02	1.506E+02	6.033E+02	4.473E+03	6.983E+03	9.722E+03	1.548E+04	6.983E+03	9.722E+03	9.722E+03	1.548E+04	1.548E+04	1.548E+04	2.125E+04	2.125E+04	3.221E+04	3.221E+04	4.391E+04	4.391E+04
1.247E+02	1.247E+02	4.987E+02	3.970E+03	6.313E+03	8.935E+03	1.464E+04	6.313E+03	8.935E+03	8.935E+03	1.464E+04	1.464E+04	1.464E+04	2.058E+04	2.058E+04	3.225E+04	3.225E+04	4.548E+04	4.548E+04
1.068E+02	1.068E+02	4.271E+02	3.553E+03	5.733E+03	8.215E+03	1.375E+04	5.733E+03	8.215E+03	8.215E+03	1.375E+04	1.375E+04	1.375E+04	1.970E+04	1.970E+04	3.178E+04	3.178E+04	4.600E+04	4.600E+04
9.317E+01	9.317E+01	3.743E+02	3.215E+03	5.243E+03	7.578E+03	1.290E+04	5.243E+03	7.578E+03	7.578E+03	1.290E+04	1.290E+04	1.290E+04	1.876E+04	1.876E+04	3.100E+04	3.100E+04	4.583E+04	4.583E+04
8.326E+01	8.326E+01	3.343E+02	2.931E+03	4.817E+03	7.017E+03	1.211E+04	4.817E+03	7.017E+03	7.017E+03	1.211E+04	1.211E+04	1.211E+04	1.783E+04	1.783E+04	3.006E+04	3.006E+04	4.533E+04	4.533E+04
7.320E+01	7.320E+01	3.003E+02	2.683E+03	4.451E+03	6.523E+03	1.139E+04	4.451E+03	6.523E+03	6.523E+03	1.139E+04	1.139E+04	1.139E+04	1.693E+04	1.693E+04	2.905E+04	2.905E+04	4.462E+04	4.462E+04
6.300E+01	6.300E+01	2.523E+02	2.263E+03	3.857E+03	5.707E+03	1.014E+04	3.857E+03	5.707E+03	5.707E+03	1.014E+04	1.014E+04	1.014E+04	1.532E+04	1.532E+04	2.703E+04	2.703E+04	4.271E+04	4.271E+04
5.497E+01	5.497E+01	2.199E+02	1.973E+03	3.440E+03	5.123E+03	9.214E+03	3.440E+03	5.123E+03	5.123E+03	9.214E+03	9.214E+03	9.214E+03	1.407E+04	1.407E+04	2.534E+04	2.534E+04	4.092E+04	4.092E+04
4.888E+01	4.888E+01	1.935E+02	1.753E+03	3.106E+03	4.650E+03	8.441E+03	3.106E+03	4.650E+03	4.650E+03	8.441E+03	8.441E+03	8.441E+03	1.300E+04	1.300E+04	2.378E+04	2.378E+04	3.907E+04	3.907E+04
4.409E+01	4.409E+01	1.763E+02	1.583E+03	2.812E+03	4.259E+03	7.789E+03	2.812E+03	4.259E+03	4.259E+03	7.789E+03	7.789E+03	7.789E+03	1.208E+04	1.208E+04	2.238E+04	2.238E+04	3.730E+04	3.730E+04
3.791E+01	3.791E+01	1.480E+02	1.333E+03	2.367E+03	3.653E+03	6.753E+03	2.367E+03	3.653E+03	3.653E+03	6.753E+03	6.753E+03	6.753E+03	1.059E+04	1.059E+04	2.000E+04	2.000E+04	3.407E+04	3.407E+04
3.202E+01	3.202E+01	1.281E+02	1.153E+03	2.049E+03	3.191E+03	5.970E+03	2.049E+03	3.191E+03	3.191E+03	5.970E+03	5.970E+03	5.970E+03	9.426E+03	9.426E+03	1.806E+04	1.806E+04	3.127E+04	3.127E+04
2.678E+01	2.678E+01	1.071E+02	9.640E+02	1.714E+03	2.676E+03	5.098E+03	1.714E+03	2.676E+03	2.676E+03	5.098E+03	5.098E+03	5.098E+03	8.113E+03	8.113E+03	1.578E+04	1.578E+04	2.781E+04	2.781E+04
2.123E+01	2.123E+01	9.452E+01	7.643E+02	1.359E+03	2.123E+03	4.124E+03	1.359E+03	2.123E+03	2.123E+03	4.124E+03	4.124E+03	4.124E+03	6.617E+03	6.617E+03	1.307E+04	1.307E+04	2.349E+04	2.349E+04
1.773E+01	1.773E+01	7.030E+01	5.331E+02	1.134E+03	1.773E+03	3.467E+03	1.134E+03	1.773E+03	1.773E+03	3.467E+03	3.467E+03	3.467E+03	5.616E+03	5.616E+03	1.120E+04	1.120E+04	2.039E+04	2.039E+04
1.530E+01	1.530E+01	6.121E+01	5.503E+02	9.794E+02	1.530E+03	2.998E+03	9.794E+02	1.530E+03	1.530E+03	2.998E+03	2.998E+03	2.998E+03	4.898E+03	4.898E+03	9.840E+03	9.840E+03	1.803E+04	1.803E+04
1.332E+01	1.332E+01	5.409E+01	4.853E+02	8.653E+02	1.332E+03	2.650E+03	8.653E+02	1.332E+03	1.332E+03	2.650E+03	2.650E+03	2.650E+03	4.365E+03	4.365E+03	8.800E+03	8.800E+03	1.624E+04	1.624E+04
1.216E+01	1.216E+01	4.863E+01	4.373E+02	7.781E+02	1.216E+03	2.383E+03	7.781E+02	1.216E+03	1.216E+03	2.383E+03	2.383E+03	2.383E+03	3.931E+03	3.931E+03	7.980E+03	7.980E+03	1.473E+04	1.473E+04
1.020E+01	1.020E+01	4.078E+01	3.670E+02	6.523E+02	1.020E+03	1.998E+03	6.523E+02	1.020E+03	1.020E+03	1.998E+03	1.998E+03	1.998E+03	3.302E+03	3.302E+03	6.771E+03	6.771E+03	1.262E+04	1.262E+04
8.350E+00	8.350E+00	3.540E+01	3.183E+02	5.664E+02	8.350E+02	1.735E+03	5.664E+02	8.350E+02	8.350E+02	1.735E+03	1.735E+03	1.735E+03	2.867E+03	2.867E+03	5.920E+03	5.920E+03	1.110E+04	1.110E+04
7.837E+00	7.837E+00	3.147E+01	2.832E+02	5.035E+02	7.837E+02	1.542E+03	5.035E+02	7.837E+02	7.837E+02	1.542E+03	1.542E+03	1.542E+03	2.549E+03	2.549E+03	5.287E+03	5.287E+03	9.942E+03	9.942E+03
7.116E+00	7.116E+00	2.846E+01	2.563E+02	4.554E+02	7.116E+02	1.395E+03	4.554E+02	7.116E+02	7.116E+02	1.395E+03	1.395E+03	1.395E+03	2.305E+03	2.305E+03	4.601E+03	4.601E+03	9.045E+03	9.045E+03
6.042E+00	6.042E+00	2.417E+01	2.173E+02	3.867E+02	6.042E+02	1.184E+03	3.867E+02	6.042E+02	6.042E+02	1.184E+03	1.184E+03	1.184E+03	1.957E+03	1.957E+03	4.081E+03	4.081E+03	7.737E+03	7.737E+03
5.307E+00	5.307E+00	2.123E+01	1.913E+02	3.397E+02	5.307E+02	1.040E+03	3.397E+02	5.307E+02	5.307E+02	1.040E+03	1.040E+03	1.040E+03	1.720E+03	1.720E+03	3.587E+03	3.587E+03	6.827E+03	6.827E+03
4.555E+00	4.555E+00	1.822E+01	1.643E+02	2.913E+02	4.555E+02	9.228E+02	2.913E+02	4.555E+02	4.555E+02	9.228E+02	9.228E+02	9.228E+02	1.476E+03	1.476E+03	3.079E+03	3.079E+03	5.888E+03	5.888E+03
3.791E+00	3.791E+00	1.513E+01	1.361E+02	2.423E+02	3.791E+02	7.412E+02	2.423E+02	3.791E+02	3.791E+02	7.412E+02	7.412E+02	7.412E+02	1.225E+03	1.225E+03	2.556E+03	2.556E+03	4.898E+03	4.898E+03
3.004E+00	3.004E+00	1.332E+01	1.193E+02	2.115E+02	3.004E+02	6.477E+02	2.115E+02	3.004E+02	3.004E+02	6.477E+02	6.477E+02	6.477E+02	1.071E+03	1.071E+03	2.234E+03	2.234E+03	4.282E+03	4.282E+03
2.980E+00	2.980E+00	1.192E+01	1.073E+02	1.907E+02	2.980E+02	5.841E+02	1.907E+02	2.980E+02	2.980E+02	5.841E+02	5.841E+02	5.841E+02	9.655E+02	9.655E+02	2.014E+03	2.014E+03	3.862E+03	3.862E+03
4.000E+00	4.000E+00	1.027E+01	9.243E+01	1.643E+02	2.567E+02	5.032E+02	1.643E+02	2.567E+02	2.567E+02	5.032E+02	5.032E+02	5.032E+02	8.318E+02	8.318E+02	1.735E+03	1.735E+03	3.327E+03	3.327E+03
3.000E+00	3.000E+00	2.316E+00	8.333E+01															

RANGE IN SODA LIME GLASS (GM/CM2) I = 131.6 A/Z = 2.014

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	1.846E-04	3.038E-04	3.123E-04	3.337E-04	3.546E-04	3.918E-04	4.768E-04	5.411E-04	6.866E-04
0.12	2.237E-04	3.607E-04	3.577E-04	3.799E-04	4.026E-04	4.432E-04	5.361E-04	6.043E-04	7.635E-04
0.15	2.858E-04	4.466E-04	4.233E-04	4.463E-04	4.708E-04	5.170E-04	6.207E-04	6.933E-04	8.708E-04
0.20	3.985E-04	5.919E-04	5.299E-04	5.516E-04	5.779E-04	6.308E-04	7.532E-04	8.307E-04	1.035E-03
0.25	5.221E-04	7.406E-04	6.336E-04	6.528E-04	6.795E-04	7.371E-04	8.789E-04	9.588E-04	1.185E-03
0.30	6.558E-04	8.929E-04	7.360E-04	7.515E-04	7.776E-04	8.382E-04	1.000E-03	1.080E-03	1.321E-03
0.40	9.512E-04	1.209E-03	1.145E-03	1.136E-03	1.153E-03	1.214E-03	1.428E-03	1.530E-03	1.839E-03
0.50	1.282E-03	1.545E-03	1.354E-03	1.328E-03	1.336E-03	1.393E-03	1.629E-03	1.741E-03	2.074E-03
0.60	1.647E-03	1.912E-03	1.567E-03	1.521E-03	1.520E-03	1.569E-03	1.824E-03	1.937E-03	2.302E-03
0.70	2.045E-03	2.311E-03	1.785E-03	1.717E-03	1.704E-03	1.743E-03	2.016E-03	2.129E-03	2.523E-03
0.80	2.476E-03	2.741E-03	2.120E-03	2.012E-03	2.078E-03	2.091E-03	2.394E-03	2.501E-03	2.953E-03
1.00	3.433E-03	3.699E-03	2.239E-03	2.120E-03	2.164E-03	2.142E-03	2.501E-03	2.622E-03	3.171E-03
1.20	4.518E-03	4.784E-03	2.720E-03	2.541E-03	2.464E-03	2.442E-03	2.769E-03	2.862E-03	3.371E-03
1.50	6.385E-03	6.652E-03	3.497E-03	3.210E-03	3.069E-03	2.980E-03	3.335E-03	3.394E-03	3.951E-03
2.00	1.015E-02	1.041E-02	4.956E-03	4.441E-03	4.164E-03	3.927E-03	4.306E-03	4.275E-03	4.901E-03
2.50	1.470E-02	1.497E-02	6.625E-03	5.825E-03	5.377E-03	4.947E-03	5.329E-03	5.171E-03	5.838E-03
3.00	1.975E-02	2.002E-02	8.414E-03	7.296E-03	6.655E-03	6.07E-03	6.378E-03	6.071E-03	6.759E-03
3.50	2.454E-02	2.473E-02	1.038E-02	8.901E-03	8.038E-03	7.136E-03	7.480E-03	6.996E-03	7.687E-03
4.00	3.183E-02	3.210E-02	1.253E-02	1.064E-02	9.528E-03	8.338E-03	8.641E-03	7.951E-03	8.629E-03
5.00	4.653E-02	4.680E-02	1.746E-02	1.454E-02	1.284E-02	1.097E-02	1.115E-02	9.966E-03	1.057E-02
6.00	6.384E-02	6.410E-02	2.323E-02	1.901E-02	1.660E-02	1.391E-02	1.391E-02	1.214E-02	1.260E-02
7.00	8.375E-02	8.402E-02	2.987E-02	2.405E-02	2.082E-02	1.718E-02	1.695E-02	1.447E-02	1.475E-02
8.00	1.063E-01	1.066E-01	3.739E-02	2.972E-02	2.522E-02	2.077E-02	2.027E-02	1.699E-02	1.702E-02
10.00	1.568E-01	1.570E-01	5.421E-02	4.235E-02	3.584E-02	2.863E-02	2.746E-02	2.236E-02	2.180E-02
12.00	2.154E-01	2.156E-01	7.374E-02	5.701E-02	4.763E-02	3.732E-02	3.593E-02	2.839E-02	2.699E-02
15.00	3.189E-01	3.191E-01	1.082E-01	8.289E-02	6.839E-02	5.289E-02	4.938E-02	3.895E-02	3.561E-02
20.00	5.314E-01	5.316E-01	1.791E-01	1.360E-01	1.109E-01	8.378E-02	7.699E-02	5.806E-02	5.221E-02
25.00	7.917E-01	7.920E-01	2.659E-01	2.011E-01	1.630E-01	1.211E-01	1.101E-01	8.141E-02	7.157E-02
30.00	1.098E+00	1.098E+00	3.679E-01	2.776E-01	2.242E-01	1.649E-01	1.486E-01	1.083E-01	9.364E-02
35.00	1.448E+00	1.448E+00	4.846E-01	3.652E-01	2.942E-01	2.149E-01	1.921E-01	1.383E-01	1.184E-01
40.00	1.844E+00	1.844E+00	6.155E-01	4.633E-01	3.728E-01	2.710E-01	2.407E-01	1.722E-01	1.456E-01
50.00	2.748E+00	2.748E+00	9.179E-01	6.501E-01	5.542E-01	4.006E-01	3.528E-01	2.491E-01	2.076E-01
60.00	3.809E+00	3.809E+00	1.272E+00	9.554E-01	7.664E-01	5.522E-01	4.839E-01	3.383E-01	2.791E-01
70.00	5.016E+00	5.016E+00	1.674E+00	1.257E+00	1.008E+00	7.247E-01	6.339E-01	4.391E-01	3.597E-01
80.00	6.361E+00	6.362E+00	2.122E+00	1.593E+00	1.277E+00	9.168E-01	7.990E-01	5.509E-01	4.488E-01
100.00	9.440E+00	9.440E+00	3.149E+00	2.363E+00	1.893E+00	1.337E+00	1.179E+00	8.063E-01	6.515E-01
120.00	1.300E+01	1.300E+01	4.335E+00	3.253E+00	2.605E+00	1.845E+00	1.619E+00	1.101E+00	8.844E-01
150.00	1.916E+01	1.916E+01	6.387E+00	4.792E+00	3.836E+00	2.745E+00	2.379E+00	1.611E+00	1.285E+00
200.00	3.134E+01	3.134E+01	1.045E+01	7.839E+00	6.273E+00	4.446E+00	3.883E+00	2.621E+00	2.077E+00
250.00	4.561E+01	4.561E+01	1.521E+01	1.141E+01	9.127E+00	6.545E+00	5.645E+00	3.803E+00	3.002E+00
300.00	6.166E+01	6.166E+01	2.055E+01	1.542E+01	1.234E+01	8.816E+00	7.626E+00	5.132E+00	4.042E+00
400.00	9.819E+01	9.819E+01	3.273E+01	2.455E+01	1.964E+01	1.404E+01	1.214E+01	8.159E+00	6.410E+00
500.00	1.395E+02	1.395E+02	4.651E+01	3.686E+01	2.791E+01	1.994E+01	1.724E+01	1.158E+01	9.088E+00
600.00	1.846E+02	1.846E+02	6.154E+01	4.615E+01	3.693E+01	2.681E+01	2.281E+01	1.532E+01	1.201E+01
700.00	2.328E+02	2.328E+02	7.759E+01	5.819E+01	4.656E+01	3.336E+01	2.875E+01	1.931E+01	1.513E+01
800.00	2.833E+02	2.833E+02	9.445E+01	7.084E+01	5.666E+01	4.048E+01	3.495E+01	2.350E+01	1.841E+01
1000.00	3.901E+02	3.901E+02	1.300E+02	9.752E+01	7.667E+01	5.533E+01	4.817E+01	3.234E+01	2.533E+01
1200.00	5.021E+02	5.021E+02	1.674E+02	1.255E+02	1.004E+02	7.174E+01	6.201E+01	4.161E+01	3.259E+01

DE/DX IN SODA LIME GLASS (MEV CM2/GM) I = 131.6 A/Z = 2.014

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	5.234E+02	1.410E+03	5.203E+03	6.772E+03	8.127E+03	1.067E+04	1.314E+04	1.717E+04	2.108E+04
0.12	4.996E+02	1.404E+03	5.367E+03	7.060E+03	8.538E+03	1.111E+04	1.379E+04	1.821E+04	2.254E+04
0.15	4.674E+02	1.390E+03	5.545E+03	7.393E+03	9.028E+03	1.143E+04	1.458E+04	1.951E+04	2.439E+04
0.20	4.224E+02	1.361E+03	5.730E+03	7.775E+03	9.623E+03	1.219E+04	1.553E+04	2.120E+04	2.686E+04
0.25	3.885E+02	1.329E+03	5.830E+03	8.022E+03	1.004E+04	1.254E+04	1.624E+04	2.248E+04	2.883E+04
0.30	3.611E+02	1.296E+03	5.877E+03	8.182E+03	1.033E+04	1.413E+04	1.677E+04	2.351E+04	3.045E+04
0.40	3.190E+02	1.245E+03	5.878E+03	8.341E+03	1.070E+04	1.496E+04	1.865E+04	2.502E+04	3.298E+04
0.50	2.873E+02	1.139E+03	5.808E+03	8.368E+03	1.087E+04	1.549E+04	1.957E+04	2.608E+04	3.487E+04
0.60	2.621E+02	1.046E+03	5.700E+03	8.318E+03	1.092E+04	1.582E+04	2.022E+04	2.684E+04	3.634E+04
0.70	2.413E+02	9.650E+02	5.571E+03	8.220E+03	1.089E+04	1.601E+04	2.068E+04	2.865E+04	3.749E+04
0.80	2.235E+02	8.947E+02	5.431E+03	8.091E+03	1.081E+04	1.609E+04	2.099E+04	2.947E+04	3.841E+04
1.00	1.958E+02	7.833E+02	5.137E+03	7.782E+03	1.054E+04	1.606E+04	2.131E+04	3.064E+04	3.973E+04
1.20	1.741E+02	6.963E+02	4.845E+03	7.441E+03	1.020E+04	1.584E+04	2.134E+04	3.134E+04	4.055E+04
1.50	1.493E+02	5.973E+02	4.437E+03	6.929E+03	9.636E+03	1.534E+04	2.106E+04	3.181E+04	4.309E+04
2.00	1.231E+02	4.948E+02	3.939E+03	6.265E+03	8.860E+03	1.451E+04	2.040E+04	3.195E+04	4.506E+04
2.50	1.060E+02	4.239E+02	3.530E+03	5.692E+03	8.149E+03	1.364E+04	1.953E+04	3.150E+04	4.558E+04
3.00	9.28E+01	3.715E+02	3.192E+03	5.202E+03	7.519E+03	1.280E+04	1.860E+04	3.073E+04	4.549E+04
3.50	8.27E+01	3.310E+02	2.910E+03	4.781E+03	6.964E+03	1.202E+04	1.768E+04	2.981E+04	4.498E+04
4.00	7.46E+01	2.987E+02	2.666E+03	4.418E+03	6.475E+03	1.130E+04	1.680E+04	2.881E+04	4.424E+04
5.00	6.25E+01	2.504E+02	2.248E+03	3.831E+03	5.668E+03	1.007E+04	1.521E+04	2.682E+04	4.236E+04
6.00	5.46E+01	2.185E+02	1.966E+03	3.418E+03	5.089E+03	9.151E+03	1.397E+04	2.514E+04	4.058E+04
7.00	4.85E+01	1.943E+02	1.748E+03	3.087E+03	4.620E+03	8.385E+03	1.291E+04	2.361E+04	3.877E+04
8.00	4.38E+01	1.753E+02	1.576E+03	2.794E+03	4.233E+03	7.738E+03	1.200E+04	2.223E+04	3.702E+04
10.00	3.67E+01	1.472E+02	1.325E+03	2.357E+03	3.631E+03	6.711E+03	1.092E+04	1.986E+04	3.383E+04
12.00	3.18E+01	1.274E+02	1.146E+03	2.033E+03	3.172E+03	5.934E+03	9.368E+03	1.794E+04	3.106E+04
15.00	2.66E+01	1.065E+02	9.586E+02	1.704E+03	2.661E+03	5.069E+03	8.065E+03	1.568E+04	2.763E+04
20.00	2.11E+01	8.446E+01	7.601E+02	1.351E+03	2.111E+03	4.101E+03	6.580E+03	1.299E+04	2.334E+04
25.00	1.76E+01	7.053E+01	6.347E+02	1.128E+03	1.763E+03	3.449E+03	5.585E+03	1.114E+04	2.026E+04
30.00	1.52E+01	6.089E+01	5.480E+02	9.743E+02	1.522E+03	2.982E+03	4.872E+03	9.786E+03	1.795E+04
35.00	1.34E+01	5.381E+01	4.843E+02	8.610E+02	1.345E+03	2.637E+03	4.342E+03	8.753E+03	1.615E+04
40.00	1.21E+01	4.838E+01	4.355E+02	7.741E+02	1.210E+03	2.371E+03	3.911E+03	7.939E+03	1.472E+04
50.00	1.01E+01	4.058E+01	3.652E+02	6.493E+02	1.015E+03	1.988E+03	3.285E+03	6.736E+03	1.257E+04
60.00	8.80E+00	3.523E+01	3.170E+02	5.636E+02	8.807E+02	1.736E+03	2.855E+03	5.890E+03	1.104E+04
70.00	7.82E+00	3.132E+01	2.818E+02	5.011E+02	7.829E+02	1.535E+03	2.535E+03	5.262E+03	9.893E+03
80.00	7.09E+00	2.833E+01	2.550E+02	4.533E+02	7.082E+02	1.398E+03	2.294E+03	4.778E+03	9.001E+03
100.00	6.01E+00	2.405E+01	2.165E+02	3.848E+02	6.013E+02	1.179E+03	1.948E+03	4.062E+03	7.700E+03
120.00	5.28E+00	2.113E+01	1.902E+02	3.401E+02	5.289E+02	1.093E+03	1.711E+03	3.570E+03	6.795E+03
150.00	4.53E+00	1.814E+01	1.632E+02	2.902E+02	4.534E+02	8.897E+02	1.469E+03	3.065E+03	5.856E+03
200.00	3.76E+00	1.506E+01	1.355E+02	2.409E+02	3.764E+02	7.378E+02	1.220E+03	2.544E+03	4.875E+03
250.00	3.28E+00	1.316E+01	1.184E+02	2.105E+02	3.289E+02	6.447E+02	1.066E+03	2.224E+03	4.262E+03
300.00	2.96E+00	1.187E+01	1.068E+02	1.899E+02	2.967E+02	5.815E+02	9.612E+02	2.005E+03	3.845E+03
400.00	2.56E+00	1.022E+01	9.201E+01	1.636E+02	2.566E+02	5.009E+02	8.281E+02	1.728E+03	3.312E+03
500.00	2.30E+00	9.225E+00	8.302E+01	1.476E+02	2.306E+02	4.520E+02	7.47E+02	1.559E+03	2.989E+03
600.00	2.14E+00	8.560E+00	7.704E+01	1.370E+02	2.140E+02	4.194E+02	6.933E+02	1.447E+03	2.773E+03
700.00	2.02E+00	8.090E+00	7.281E+01	1.294E+02	2.023E+02	3.964E+02	6.553E+02	1.367E+03	2.621E+03
800.00	1.93E+00	7.746E+00	6.971E+01	1.239E+02	1.936E+02	3.796E+02	6.274E+02	1.309E+03	2.510E+03
1000.00	1.82E+00	7.288E+00	6.559E+01	1.166E+02	1.822E+02	3.571E+02	5.904E+02	1.233E+03	2.361E+03
1200.00	1.75E+00	7.016E+00	6.314E+01	1.123E+02	1.754E+02	3.438E+02	5.663E+02	1.186E+03	2.273E+03

RANGE IN PHOSPHATE GLASS (GM/CM2) I = 196.8 A/Z = 2.138

ENRG./NUC. (MEV/ANU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	2.439E-04	3.965E-04	4.023E-04	4.290E-04	4.554E-04	5.026E-04	6.112E-04	6.931E-04	8.792E-04
0.12	2.985E-04	4.738E-04	4.619E-04	4.893E-04	5.177E-04	5.690E-04	6.877E-04	7.744E-04	9.780E-04
0.15	3.847E-04	5.904E-04	5.484E-04	5.759E-04	6.046E-04	6.644E-04	7.967E-04	8.889E-04	1.116E-03
0.20	5.389E-04	7.864E-04	6.878E-04	7.132E-04	7.454E-04	8.119E-04	9.676E-04	1.066E-03	1.326E-03
0.25	7.052E-04	9.848E-04	8.232E-04	8.477E-04	8.770E-04	9.485E-04	1.129E-03	1.230E-03	1.519E-03
0.30	8.824E-04	1.186E-03	9.564E-04	9.756E-04	1.004E-03	1.079E-03	1.285E-03	1.386E-03	1.701E-03
0.40	1.267E-03	1.598E-03	1.220E-03	1.222E-03	1.248E-03	1.325E-03	1.566E-03	1.682E-03	2.040E-03
0.50	1.691E-03	2.028E-03	1.482E-03	1.467E-03	1.482E-03	1.561E-03	1.834E-03	1.962E-03	2.356E-03
0.60	2.151E-03	2.491E-03	1.747E-03	1.710E-03	1.719E-03	1.789E-03	2.090E-03	2.232E-03	2.658E-03
0.70	2.649E-03	2.989E-03	2.015E-03	1.955E-03	1.951E-03	2.012E-03	2.339E-03	2.481E-03	2.948E-03
0.80	3.183E-03	3.523E-03	2.289E-03	2.202E-03	2.184E-03	2.235E-03	2.583E-03	2.726E-03	3.230E-03
1.00	4.363E-03	4.704E-03	2.855E-03	2.706E-03	2.654E-03	2.672E-03	3.060E-03	3.199E-03	3.777E-03
1.20	5.691E-03	6.032E-03	3.451E-03	3.229E-03	3.135E-03	3.112E-03	3.533E-03	3.656E-03	4.308E-03
1.50	7.971E-03	8.312E-03	4.409E-03	4.057E-03	3.885E-03	3.786E-03	4.243E-03	4.327E-03	5.043E-03
2.00	1.257E-02	1.291E-02	6.203E-03	5.579E-03	5.247E-03	4.967E-03	5.459E-03	5.437E-03	6.246E-03
2.50	1.823E-02	1.857E-02	8.283E-03	7.308E-03	6.764E-03	6.247E-03	6.747E-03	6.570E-03	7.433E-03
3.00	2.431E-02	2.466E-02	1.045E-02	9.097E-03	8.324E-03	7.550E-03	8.043E-03	7.690E-03	8.588E-03
3.50	3.117E-02	3.152E-02	1.282E-02	1.104E-02	1.000E-02	8.931E-03	9.399E-03	8.836E-03	9.747E-03
4.00	3.880E-02	3.914E-02	1.539E-02	1.313E-02	1.180E-02	1.039E-02	1.082E-02	1.001E-02	1.092E-02
5.00	5.630E-02	5.664E-02	2.126E-02	1.780E-02	1.578E-02	1.357E-02	1.387E-02	1.249E-02	1.331E-02
6.00	7.682E-02	7.716E-02	2.810E-02	2.311E-02	2.027E-02	1.711E-02	1.720E-02	1.513E-02	1.581E-02
7.00	1.004E-01	1.007E-01	3.595E-02	2.908E-02	2.528E-02	2.101E-02	2.085E-02	1.796E-02	1.864E-02
8.00	1.267E-01	1.270E-01	4.472E-02	3.568E-02	3.078E-02	2.525E-02	2.478E-02	2.097E-02	2.118E-02
10.00	1.848E-01	1.852E-01	6.412E-02	5.025E-02	4.271E-02	3.438E-02	3.319E-02	2.731E-02	2.638E-02
12.00	2.527E-01	2.531E-01	8.675E-02	6.724E-02	5.631E-02	4.475E-02	4.265E-02	3.433E-02	3.306E-02
15.00	3.722E-01	3.725E-01	1.266E-01	9.711E-02	8.031E-02	6.256E-02	5.876E-02	4.610E-02	4.324E-02
20.00	6.163E-01	6.166E-01	2.079E-01	1.581E-01	1.291E-01	9.812E-02	9.066E-02	6.902E-02	6.288E-02
25.00	9.141E-01	9.145E-01	3.072E-01	2.326E-01	1.887E-01	1.408E-01	1.287E-01	9.597E-02	8.517E-02
30.00	1.263E+00	1.264E+00	4.236E-01	3.193E-01	2.586E-01	1.908E-01	1.726E-01	1.268E-01	1.107E-01
35.00	1.662E+00	1.662E+00	5.565E-01	4.193E-01	3.383E-01	2.477E-01	2.223E-01	1.615E-01	1.391E-01
40.00	2.108E+00	2.108E+00	7.052E-01	5.311E-01	4.275E-01	3.115E-01	2.775E-01	1.999E-01	1.703E-01
50.00	3.136E+00	3.137E+00	1.048E+00	7.883E-01	6.332E-01	4.584E-01	4.046E-01	2.873E-01	2.411E-01
60.00	4.337E+00	4.337E+00	1.448E+00	1.088E+00	8.733E-01	6.299E-01	5.529E-01	3.884E-01	3.224E-01
70.00	5.700E+00	5.700E+00	1.902E+00	1.429E+00	1.146E+00	8.246E-01	7.211E-01	5.023E-01	4.137E-01
80.00	7.217E+00	7.217E+00	2.408E+00	1.808E+00	1.449E+00	1.041E+00	9.085E-01	6.285E-01	5.145E-01
100.00	1.068E+01	1.068E+01	3.564E+00	2.675E+00	2.143E+00	1.537E+00	1.336E+00	9.161E-01	7.431E-01
120.00	1.469E+01	1.469E+01	4.898E+00	3.679E+00	2.943E+00	2.108E+00	1.830E+00	1.248E+00	1.005E+00
150.00	2.160E+01	2.160E+01	7.201E+00	5.403E+00	4.325E+00	3.095E+00	2.684E+00	1.820E+00	1.456E+00
200.00	3.525E+01	3.525E+01	1.175E+01	8.817E+00	7.056E+00	5.046E+00	4.370E+00	2.952E+00	2.342E+00
250.00	5.121E+01	5.121E+01	1.707E+01	1.281E+01	1.025E+01	7.326E+00	6.340E+00	4.274E+00	3.377E+00
300.00	6.914E+01	6.914E+01	2.305E+01	1.729E+01	1.383E+01	9.888E+00	8.554E+00	5.759E+00	4.540E+00
400.00	1.099E+02	1.099E+02	3.664E+01	2.748E+01	2.199E+01	1.571E+01	1.359E+01	9.137E+00	7.182E+00
500.00	1.560E+02	1.560E+02	5.199E+01	3.909E+01	3.120E+01	2.229E+01	1.927E+01	1.295E+01	1.017E+01
600.00	2.062E+02	2.062E+02	6.873E+01	5.155E+01	4.124E+01	2.947E+01	2.547E+01	1.711E+01	1.342E+01
700.00	2.597E+02	2.597E+02	8.658E+01	6.494E+01	5.195E+01	3.711E+01	3.208E+01	2.155E+01	1.689E+01
800.00	3.159E+02	3.159E+02	1.053E+02	7.895E+01	6.319E+01	4.514E+01	3.902E+01	2.620E+01	2.054E+01
1000.00	4.345E+02	4.345E+02	1.448E+02	1.086E+02	8.690E+01	6.207E+01	5.365E+01	3.602E+01	2.822E+01
1200.00	5.587E+02	5.587E+02	1.862E+02	1.397E+02	1.117E+02	7.982E+01	6.899E+01	4.631E+01	3.627E+01

DE/DX IN PHOSPHATE GLASS

I = 196.8

(MEV CM2/GM)

A/Z = 2.138

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	3.741E+02	1.037E+03	3.896E+03	5.194E+03	6.259E+03	8.256E+03	1.019E+04	1.335E+04	1.643E+04
0.12	3.586E+02	1.032E+03	4.085E+03	5.410E+03	6.571E+03	8.595E+03	1.070E+04	1.416E+04	1.756E+04
0.15	3.386E+02	1.026E+03	4.224E+03	5.666E+03	6.949E+03	8.995E+03	1.131E+04	1.517E+04	1.899E+04
0.20	3.114E+02	1.015E+03	4.379E+03	5.972E+03	7.418E+03	9.895E+03	1.207E+04	1.649E+04	2.093E+04
0.25	2.910E+02	1.002E+03	4.474E+03	6.181E+03	7.756E+03	1.058E+04	1.262E+04	1.750E+04	2.247E+04
0.30	2.715E+02	9.869E+02	4.532E+03	6.327E+03	8.002E+03	1.095E+04	1.304E+04	1.831E+04	2.375E+04
0.40	2.473E+02	9.652E+02	4.574E+03	6.496E+03	8.335E+03	1.161E+04	1.345E+04	1.954E+04	2.575E+04
0.50	2.267E+02	9.466E+02	4.557E+03	6.561E+03	8.514E+03	1.213E+04	1.531E+04	2.070E+04	2.727E+04
0.60	2.087E+02	9.328E+02	4.505E+03	6.560E+03	8.56E+03	1.243E+04	1.587E+04	2.103E+04	2.845E+04
0.70	1.938E+02	7.749E+02	4.429E+03	6.516E+03	8.612E+03	1.262E+04	1.627E+04	2.249E+04	2.939E+04
0.80	1.809E+02	7.230E+02	4.340E+03	6.443E+03	8.50E+03	1.275E+04	1.656E+04	2.318E+04	3.014E+04
1.00	1.596E+02	6.382E+02	4.138E+03	6.239E+03	8.239E+03	1.275E+04	1.656E+04	2.318E+04	3.014E+04
1.20	1.424E+02	5.697E+02	3.922E+03	5.994E+03	8.184E+03	1.264E+04	1.688E+04	2.478E+04	3.194E+04
1.50	1.222E+02	4.887E+02	3.601E+03	5.597E+03	7.754E+03	1.227E+04	1.678E+04	2.521E+04	3.433E+04
2.00	1.016E+02	4.063E+02	3.215E+03	5.091E+03	7.172E+03	1.168E+04	1.635E+04	2.544E+04	3.569E+04
2.50	8.762E+01	3.505E+02	2.906E+03	4.662E+03	6.648E+03	1.105E+04	1.575E+04	2.522E+04	3.628E+04
3.00	7.718E+01	3.087E+02	2.645E+03	4.289E+03	6.173E+03	1.044E+04	1.509E+04	2.473E+04	3.636E+04
3.50	6.905E+01	2.762E+02	2.424E+03	3.963E+03	5.748E+03	9.854E+03	1.442E+04	2.340E+04	3.455E+04
4.00	6.251E+01	2.500E+02	2.230E+03	3.679E+03	5.370E+03	9.311E+03	1.376E+04	2.305E+04	3.455E+04
5.00	5.307E+01	2.123E+02	1.906E+03	3.236E+03	4.768E+03	8.419E+03	1.262E+04	2.205E+04	3.452E+04
6.00	4.652E+01	1.861E+02	1.674E+03	2.905E+03	4.398E+03	7.694E+03	1.168E+04	2.082E+04	3.328E+04
7.00	4.152E+01	1.661E+02	1.494E+03	2.637E+03	3.932E+03	7.08E+03	1.086E+04	1.966E+04	3.199E+04
8.00	3.757E+01	1.503E+02	1.351E+03	2.439E+03	3.617E+03	6.572E+03	1.014E+04	1.861E+04	3.070E+04
10.00	3.170E+01	1.268E+02	1.141E+03	2.202E+03	3.124E+03	5.741E+03	8.953E+03	1.676E+04	2.830E+04
15.00	2.753E+01	1.101E+02	9.911E+02	1.762E+03	2.742E+03	5.104E+03	8.022E+03	1.524E+04	2.617E+04
20.00	2.312E+01	9.248E+01	8.323E+02	1.480E+03	2.310E+03	4.387E+03	6.952E+03	1.342E+04	2.347E+04
25.00	1.842E+01	7.369E+01	6.632E+02	1.179E+03	1.842E+03	3.575E+03	5.715E+03	1.222E+04	2.002E+04
30.00	1.544E+01	5.174E+01	5.455E+02	9.879E+02	1.544E+03	3.019E+03	4.876E+03	9.677E+03	1.750E+04
35.00	1.336E+01	5.344E+01	4.810E+02	8.951E+02	1.336E+03	2.617E+03	4.270E+03	8.538E+03	1.558E+04
40.00	1.183E+01	4.733E+01	4.259E+02	7.572E+02	1.183E+03	2.319E+03	3.817E+03	7.662E+03	1.407E+04
50.00	1.066E+01	4.262E+01	3.893E+02	6.819E+02	1.066E+03	2.088E+03	3.444E+03	6.967E+03	1.286E+04
60.00	9.360E+00	3.584E+01	3.225E+02	5.734E+02	8.860E+02	1.736E+03	2.901E+03	5.935E+03	1.104E+04
70.00	7.792E+00	3.117E+01	2.805E+02	4.987E+02	7.793E+02	1.577E+03	2.525E+03	5.205E+03	9.726E+03
80.00	6.938E+00	2.775E+01	2.498E+02	4.440E+02	6.938E+02	1.360E+03	2.248E+03	4.659E+03	8.737E+03
100.00	5.345E+00	2.513E+01	2.262E+02	4.021E+02	6.283E+02	1.232E+03	2.033E+03	4.238E+03	7.965E+03
120.00	5.345E+00	2.138E+01	1.924E+02	3.421E+02	5.345E+02	1.048E+03	1.733E+03	3.610E+03	6.833E+03
150.00	4.702E+00	1.881E+01	1.693E+02	3.009E+02	4.702E+02	9.216E+02	1.523E+03	3.178E+03	6.042E+03
200.00	4.042E+00	1.617E+01	1.455E+02	2.458E+02	4.042E+02	7.933E+02	1.319E+03	2.733E+03	5.219E+03
250.00	3.362E+00	1.345E+01	1.210E+02	2.152E+02	3.362E+02	6.59E+02	1.089E+03	2.273E+03	4.354E+03
300.00	2.942E+00	1.177E+01	1.059E+02	1.883E+02	2.942E+02	5.533E+02	9.533E+02	1.989E+03	3.812E+03
400.00	2.656E+00	1.062E+01	9.562E+01	1.700E+02	2.656E+02	5.206E+02	8.605E+02	1.795E+03	3.442E+03
500.00	2.292E+00	9.167E+00	8.251E+01	1.467E+02	2.292E+02	4.492E+02	7.425E+02	1.549E+03	2.970E+03
600.00	2.070E+00	8.282E+00	7.454E+01	1.325E+02	2.070E+02	4.038E+02	6.703E+02	1.400E+03	2.683E+03
700.00	1.923E+00	7.692E+00	6.923E+01	1.231E+02	1.823E+02	3.749E+02	6.231E+02	1.300E+03	2.492E+03
800.00	1.819E+00	7.277E+00	6.549E+01	1.164E+02	1.819E+02	3.566E+02	5.894E+02	1.230E+03	2.358E+03
1000.00	1.642E+00	6.972E+00	6.275E+01	1.116E+02	1.743E+02	3.416E+02	5.647E+02	1.178E+03	2.259E+03
1200.00	1.533E+00	6.569E+00	5.912E+01	1.051E+02	1.642E+02	3.219E+02	5.321E+02	1.110E+03	2.128E+03
		6.331E+00	5.698E+01	1.013E+02	1.583E+02	3.102E+02	5.123E+02	1.070E+03	2.051E+03

RANGE IN OLIVINE

I = 158.9 A/Z = 2.050

(GM/CM2)

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	2.076E-04	3.399E-04	3.475E-04	3.710E-04	3.941E-04	4.352E-04	5.294E-04	6.007E-04	7.621E-04
0.12	2.528E-04	4.048E-04	3.985E-04	4.228E-04	4.477E-04	4.925E-04	5.955E-04	6.710E-04	8.476E-04
0.15	3.245E-04	5.029E-04	4.725E-04	4.971E-04	5.239E-04	5.748E-04	6.897E-04	7.700E-04	9.669E-04
0.20	4.536E-04	6.683E-04	5.918E-04	6.150E-04	6.436E-04	7.017E-04	8.373E-04	9.228E-04	1.149E-03
0.25	5.942E-04	8.366E-04	7.285E-04	7.281E-04	7.570E-04	8.200E-04	9.772E-04	1.065E-03	1.316E-03
0.30	7.450E-04	1.008E-03	8.220E-04	8.383E-04	8.664E-04	9.326E-04	1.112E-03	1.205E-03	1.474E-03
0.40	1.075E-03	1.362E-03	1.050E-03	1.053E-03	1.078E-03	1.146E-03	1.355E-03	1.456E-03	1.767E-03
0.50	1.442E-03	1.735E-03	1.277E-03	1.266E-03	1.283E-03	1.350E-03	1.587E-03	1.695E-03	2.042E-03
0.60	1.845E-03	2.139E-03	1.508E-03	1.478E-03	1.486E-03	1.548E-03	1.810E-03	1.934E-03	2.303E-03
0.70	2.281E-03	2.576E-03	1.742E-03	1.691E-03	1.688E-03	1.742E-03	2.026E-03	2.150E-03	2.555E-03
0.80	2.751E-03	3.046E-03	1.982E-03	1.907E-03	1.892E-03	1.935E-03	2.238E-03	2.363E-03	2.800E-03
1.00	3.794E-03	4.089E-03	2.479E-03	2.349E-03	2.303E-03	2.318E-03	2.635E-03	2.774E-03	3.276E-03
1.20	4.972E-03	5.267E-03	3.004E-03	2.809E-03	2.726E-03	2.704E-03	3.068E-03	3.173E-03	3.738E-03
1.50	6.997E-03	7.292E-03	3.851E-03	3.539E-03	3.388E-03	3.294E-03	3.659E-03	3.759E-03	4.378E-03
2.00	1.108E-02	1.137E-02	5.439E-03	4.883E-03	4.585E-03	4.322E-03	4.736E-03	4.729E-03	5.427E-03
2.50	1.609E-02	1.638E-02	7.276E-03	6.407E-03	5.921E-03	5.457E-03	5.885E-03	5.720E-03	6.464E-03
3.00	2.151E-02	2.181E-02	9.202E-03	7.995E-03	7.304E-03	6.608E-03	7.027E-03	6.703E-03	7.475E-03
3.50	2.766E-02	2.796E-02	1.133E-02	9.729E-03	8.801E-03	7.834E-03	8.228E-03	7.714E-03	8.492E-03
4.00	3.451E-02	3.481E-02	1.364E-02	1.161E-02	1.041E-02	9.136E-03	9.488E-03	8.756E-03	9.522E-03
5.00	5.028E-02	5.058E-02	1.892E-02	1.580E-02	1.397E-02	1.198E-02	1.220E-02	1.095E-02	1.164E-02
6.00	6.881E-02	6.911E-02	2.510E-02	2.059E-02	1.801E-02	1.515E-02	1.519E-02	1.330E-02	1.386E-02
7.00	9.011E-02	9.041E-02	3.220E-02	2.598E-02	2.254E-02	1.866E-02	1.846E-02	1.583E-02	1.619E-02
8.00	1.142E-01	1.145E-01	4.023E-02	3.203E-02	2.756E-02	2.251E-02	2.203E-02	1.854E-02	1.865E-02
10.00	1.674E-01	1.677E-01	5.797E-02	4.536E-02	3.846E-02	3.033E-02	2.966E-02	2.427E-02	2.377E-02
12.00	2.295E-01	2.298E-01	7.866E-02	6.088E-02	5.095E-02	4.028E-02	3.826E-02	3.062E-02	2.993E-02
15.00	3.389E-01	3.392E-01	1.151E-01	8.825E-02	7.288E-02	5.656E-02	5.295E-02	4.131E-02	3.854E-02
20.00	5.631E-01	5.634E-01	1.899E-01	1.443E-01	1.177E-01	8.919E-02	8.216E-02	6.223E-02	5.621E-02
25.00	8.373E-01	8.376E-01	2.813E-01	2.129E-01	1.726E-01	1.285E-01	1.171E-01	8.692E-02	7.675E-02
30.00	1.159E+00	1.160E+00	3.886E-01	2.934E-01	2.370E-01	1.746E-01	1.576E-01	1.153E-01	1.001E-01
35.00	1.527E+00	1.528E+00	5.113E-01	3.854E-01	3.106E-01	2.271E-01	2.034E-01	1.472E-01	1.262E-01
40.00	1.940E+00	1.940E+00	6.487E-01	4.884E-01	3.930E-01	2.80E-01	2.544E-01	1.826E-01	1.549E-01
50.00	2.891E+00	2.891E+00	9.659E-01	7.263E-01	5.833E-01	4.250E-01	3.722E-01	2.634E-01	2.202E-01
60.00	4.003E+00	4.004E+00	1.337E+00	1.004E+00	8.058E-01	5.809E-01	5.094E-01	3.569E-01	2.953E-01
70.00	5.267E+00	5.268E+00	1.758E+00	1.320E+00	1.059E+00	7.614E-01	6.654E-01	4.625E-01	3.797E-01
80.00	6.675E+00	6.675E+00	2.227E+00	1.672E+00	1.340E+00	9.626E-01	8.393E-01	5.795E-01	4.732E-01
100.00	9.895E+00	9.896E+00	3.301E+00	2.477E+00	1.984E+00	1.423E+00	1.233E+00	8.466E-01	6.853E-01
120.00	1.362E+01	1.362E+01	4.541E+00	3.407E+00	2.78E+00	1.954E+00	1.696E+00	1.155E+00	9.289E-01
150.00	2.005E+01	2.005E+01	6.684E+00	5.015E+00	4.014E+00	2.873E+00	2.490E+00	1.688E+00	1.348E+00
200.00	3.277E+01	3.277E+01	1.092E+01	8.195E+00	6.558E+00	4.650E+00	4.060E+00	2.742E+00	2.174E+00
250.00	4.765E+01	4.765E+01	1.588E+01	1.191E+01	9.534E+00	6.816E+00	5.897E+00	3.974E+00	3.138E+00
300.00	6.437E+01	6.437E+01	2.146E+01	1.610E+01	1.288E+01	9.205E+00	7.963E+00	5.360E+00	4.223E+00
400.00	1.024E+02	1.024E+02	3.445E+01	2.4561E+01	1.828E+01	1.464E+01	1.266E+01	8.513E+00	6.690E+00
500.00	1.455E+02	1.455E+02	4.849E+01	3.637E+01	2.910E+01	2.079E+01	1.797E+01	1.208E+01	9.479E+00
600.00	1.924E+02	1.924E+02	6.414E+01	4.811E+01	3.849E+01	2.750E+01	2.377E+01	1.597E+01	1.252E+01
700.00	2.425E+02	2.425E+02	8.083E+01	6.063E+01	4.850E+01	3.465E+01	2.995E+01	2.012E+01	1.577E+01
800.00	2.951E+02	2.951E+02	9.837E+01	7.378E+01	5.902E+01	4.217E+01	3.645E+01	2.447E+01	1.918E+01
1000.00	4.406E+02	4.406E+02	1.354E+02	1.015E+02	8.122E+01	5.802E+01	5.014E+01	3.366E+01	2.637E+01
1200.00	5.225E+02	5.225E+02	1.742E+02	1.306E+02	1.045E+02	7.644E+01	6.455E+01	4.331E+01	3.391E+01

DE/DX IN OLIVINE

(MEV CM2/GM)

I = 158.9 A/Z = 2.050

ENRG./NUC. (MEV/AMU)	1 H	4 HE	12 C	16 O	20 NE	28 SI	40 AR	56 FE	84 KR
0.10	4.517E+02	1.234E+03	4.632E+03	6.049E+03	7.273E+03	9.570E+03	1.190E+04	1.544E+04	1.897E+04
0.12	4.321E+02	1.229E+03	4.776E+03	6.304E+03	7.639E+03	9.964E+03	1.238E+04	1.638E+04	2.028E+04
0.15	4.061E+02	1.219E+03	4.937E+03	6.601E+03	8.078E+03	1.043E+04	1.309E+04	1.754E+04	2.194E+04
0.20	3.701E+02	1.199E+03	5.109E+03	6.949E+03	8.616E+03	1.147E+04	1.397E+04	1.906E+04	2.417E+04
0.25	3.431E+02	1.177E+03	5.299E+03	7.181E+03	8.997E+03	1.216E+04	1.460E+04	2.022E+04	2.595E+04
0.30	3.210E+02	1.154E+03	5.263E+03	7.337E+03	9.275E+03	1.270E+04	1.508E+04	2.115E+04	2.741E+04
0.40	2.865E+02	1.118E+03	5.283E+03	7.506E+03	9.627E+03	1.347E+04	1.679E+04	2.254E+04	2.971E+04
0.50	2.595E+02	1.031E+03	5.246E+03	7.555E+03	9.807E+03	1.397E+04	1.755E+04	2.352E+04	3.144E+04
0.60	2.385E+02	9.517E+02	5.167E+03	7.532E+03	9.877E+03	1.430E+04	1.826E+04	2.422E+04	3.278E+04
0.70	2.205E+02	8.817E+02	5.065E+03	7.462E+03	9.873E+03	1.449E+04	1.870E+04	2.588E+04	3.384E+04
0.80	2.052E+02	8.200E+02	4.950E+03	7.361E+03	9.817E+03	1.459E+04	1.901E+04	2.664E+04	3.469E+04
1.00	1.802E+02	7.207E+02	4.700E+03	7.103E+03	9.605E+03	1.460E+04	1.934E+04	2.774E+04	3.591E+04
1.20	1.609E+02	6.419E+02	4.443E+03	6.807E+03	9.313E+03	1.443E+04	1.939E+04	2.841E+04	3.669E+04
1.50	1.372E+02	5.489E+02	4.063E+03	6.333E+03	8.793E+03	1.396E+04	1.914E+04	2.884E+04	3.936E+04
2.00	1.142E+02	4.566E+02	3.625E+03	5.753E+03	8.121E+03	1.326E+04	1.851E+04	2.906E+04	4.087E+04
2.50	9.811E+01	3.924E+02	3.261E+03	5.246E+03	7.496E+03	1.251E+04	1.787E+04	2.872E+04	4.144E+04
3.00	8.618E+01	3.447E+02	2.958E+03	4.809E+03	6.937E+03	1.177E+04	1.707E+04	2.809E+04	4.144E+04
3.50	7.693E+01	3.077E+02	2.703E+03	4.431E+03	6.441E+03	1.108E+04	1.626E+04	2.730E+04	4.106E+04
4.00	6.951E+01	2.780E+02	2.481E+03	4.103E+03	6.001E+03	1.044E+04	1.568E+04	2.645E+04	4.045E+04
5.00	5.861E+01	2.344E+02	2.105E+03	3.581E+03	5.288E+03	9.363E+03	1.410E+04	2.476E+04	3.894E+04
6.00	5.125E+01	1.844E+02	1.844E+03	3.204E+03	4.762E+03	8.535E+03	1.300E+04	2.329E+04	3.741E+04
7.00	4.565E+01	1.826E+02	1.643E+03	2.900E+03	4.334E+03	7.841E+03	1.205E+04	2.193E+04	3.585E+04
8.00	4.124E+01	1.650E+02	1.483E+03	2.630E+03	3.978E+03	7.251E+03	1.122E+04	2.069E+04	3.431E+04
10.00	3.471E+01	1.388E+02	1.249E+03	2.220E+03	3.423E+03	6.310E+03	9.867E+03	1.856E+04	3.148E+04
12.00	3.008E+01	1.203E+02	1.083E+03	1.925E+03	2.997E+03	5.593E+03	8.612E+03	1.681E+04	2.900E+04
15.00	2.521E+01	1.008E+02	9.074E+02	1.613E+03	2.519E+03	4.791E+03	7.610E+03	1.477E+04	2.589E+04
20.00	2.003E+01	8.012E+01	7.211E+02	1.282E+03	2.003E+03	3.889E+03	6.259E+03	1.227E+04	2.198E+04
25.00	1.675E+01	6.701E+01	6.031E+02	1.072E+03	1.675E+03	3.276E+03	5.300E+03	1.055E+04	1.913E+04
30.00	1.448E+01	5.792E+01	5.213E+02	9.267E+02	1.448E+03	2.836E+03	4.632E+03	9.283E+03	1.698E+04
35.00	1.281E+01	5.123E+01	4.611E+02	8.197E+02	1.281E+03	2.510E+03	4.133E+03	8.315E+03	1.531E+04
40.00	1.152E+01	4.610E+01	4.149E+02	7.375E+02	1.152E+03	2.259E+03	3.726E+03	7.551E+03	1.397E+04
50.00	9.676E+00	3.871E+01	3.484E+02	6.193E+02	9.676E+02	1.897E+03	3.134E+03	6.418E+03	1.196E+04
60.00	8.407E+00	3.363E+01	3.027E+02	5.380E+02	8.407E+02	1.648E+03	2.724E+03	5.619E+03	1.052E+04
70.00	7.479E+00	2.991E+01	2.692E+02	4.786E+02	7.479E+02	1.466E+03	2.423E+03	5.024E+03	9.436E+03
80.00	6.768E+00	2.707E+01	2.437E+02	4.332E+02	6.768E+02	1.327E+03	2.192E+03	4.566E+03	8.592E+03
100.00	5.751E+00	2.301E+01	2.070E+02	3.681E+02	5.751E+02	1.127E+03	1.853E+03	3.885E+03	7.359E+03
120.00	5.056E+00	2.022E+01	1.820E+02	3.279E+02	5.056E+02	9.909E+02	1.638E+03	3.417E+03	6.500E+03
150.00	4.342E+00	1.737E+01	1.563E+02	2.779E+02	4.342E+02	8.511E+02	1.407E+03	2.935E+03	5.608E+03
200.00	3.606E+00	1.445E+01	1.299E+02	2.309E+02	3.608E+02	7.072E+02	1.169E+03	2.439E+03	4.673E+03
250.00	3.195E+00	1.262E+01	1.136E+02	2.019E+02	3.195E+02	6.183E+02	1.022E+03	2.133E+03	4.086E+03
300.00	2.846E+00	1.139E+01	1.025E+02	1.822E+02	2.846E+02	5.579E+02	9.222E+02	1.925E+03	3.689E+03
400.00	2.454E+00	9.815E+00	8.834E+01	1.570E+02	2.454E+02	4.809E+02	7.950E+02	1.659E+03	3.180E+03
500.00	2.215E+00	8.862E+00	7.975E+01	1.418E+02	2.215E+02	4.342E+02	7.178E+02	1.498E+03	2.871E+03
600.00	2.057E+00	8.226E+00	7.404E+01	1.316E+02	2.057E+02	4.031E+02	6.663E+02	1.390E+03	2.665E+03
700.00	1.945E+00	7.778E+00	7.000E+01	1.244E+02	1.945E+02	3.811E+02	6.300E+02	1.314E+03	2.525E+03
800.00	1.862E+00	7.450E+00	6.705E+01	1.192E+02	1.862E+02	3.650E+02	6.034E+02	1.259E+03	2.415E+03
1000.00	1.773E+00	7.015E+00	6.312E+01	1.122E+02	1.773E+02	3.443E+02	5.681E+02	1.185E+03	2.275E+03
1200.00	1.689E+00	6.755E+00	6.080E+01	1.081E+02	1.689E+02	3.310E+02	5.472E+02	1.142E+03	2.185E+03

INITIAL DISTRIBUTION

Copies

NAVY

2 Commander, Naval Ship Systems Command (SHIPS 2021)
1 Commander, Naval Ship Systems Command (SHIPS 03541)
1 Chief of Naval Operations (Op-75)
1 Director, Naval Research Laboratory
1 Chief of Naval Research
3 CO, Office of Naval Research, Branch Office, London
1 Supt., Naval Postgraduate School, Monterey

ARMY

1 Chief of Research and Development (Atomic Office)
1 Commander, Nuclear Defense Laboratory
1 CO, Army Electronic Research and Development Laboratory

AIR FORCE

1 Assistant Chief of Staff, Intelligence (AFNIE)
1 Director, USAF Project RAND
1 Director, Air University Library, Maxwell AFB

OTHER DOD ACTIVITIES

1 Director, Defense Atomic Support Agency (Library)
1 Commander, TC/DASA, Sandia Base (TCTG5, Library)
20 Defense Documentation Center

AEC ACTIVITIES AND OTHERS

1 Atomic Energy Commission, Washington
1 California Institute of Technology (Fowler)
1 NASA, Lewis Research Center
1 National Bureau of Standards (Library)
15 Division of Technical Information Extension, Oak Ridge

USNRDL

30 Technical Information Division

DISTRIBUTION DATE: 4 February 1967

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) U.S. Naval Radiological Defense Laboratory San Francisco, California 94135		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
		2b. GROUP	
3. REPORT TITLE CHARGED PARTICLE TRACKS IN POLYMERS: NO. 3 - RANGE AND ENERGY LOSS TABLES			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)			
5. AUTHOR(S) (Last name, first name, initial) Henke, Richard P. 9 Benton, Eugene V.			
6. REPORT DATE 4 February 1967		7a. TOTAL NO. OF PAGES 39	7b. NO. OF REFS 12
8a. CONTRACT OR GRANT NO.		9a. ORIGINATOR'S REPORT NUMBER(S) USNRDL-TR-1102	
b. PROJECT NO.			
c. NASA Reg. A-65315#1		9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d.			
10. AVAILABILITY/LIMITATION NOTICES Distribution of this document is unlimited.			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY National Aeronautics and Space Admin. Washington, D.C. 20546	
13. ABSTRACT The range and energy loss rate for the ions ^1H , ^4He , ^{12}C , ^{16}O , ^{20}Ne , ^{28}Si , ^{40}Ar , ^{56}Fe , and ^{84}K are given in the energy/nucleon interval 0.1 - 1200 MeV/amu. These quantities are tabulated for the stopping materials cellulose nitrate, cellulose acetate butyrate, HBpaIT polyester, Lexan, Mylar, muscovite and phlogopite mica, soda lime and phosphate glass and olivine. The values for a given stopping material can be extended to other materials with similar values of the mean excitation potential by simple scaling. The computation involved a published mathematical method which was modified and extended to lower energies.			

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Charged particle tracks Polymers Range Energy loss						

INSTRUCTIONS

1. **ORIGINATING ACTIVITY:** Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization (*corporate author*) issuing the report.

2. **REPORT SECURITY CLASSIFICATION:** Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

3. **GROUP:** Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

4. **REPORT TITLE:** Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a classified title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

5. **DESCRIPTIVE NOTES:** If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

6. **AUTHOR(S):** Enter the name(s) of author(s) as shown on the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

7. **REPORT DATE:** Enter the date of the report as day, month, year; or month, year. If more than one date appears on the report, use date of publication.

7a. **TOTAL NUMBER OF PAGES:** The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. **NUMBER OF REFERENCES:** Enter the total number of references cited in the report.

8. **CONTRACT OR GRANT NUMBER:** If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. **PROJECT NUMBER:** Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. **ORIGINATOR'S REPORT NUMBER(S):** Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. **OFFER REPORT NUMBER(S):** If the report has been assigned any other report numbers (*either by the originator or by the sponsor*), also enter this number(s).

10. **AVAILABILITY/LIMITATION NOTICES:** Enter any limitations on further dissemination of the report, other than those

imposed by security classification, using standard statements such as:

- (1) "Qualified requesters may obtain copies of this report from DDC."
- (2) "Foreign announcement and dissemination of this report by DDC is not authorized."
- (3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through _____."
- (4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through _____."
- (5) "All distribution of this report is controlled. Qualified DDC users shall request through _____."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. **SUPPLEMENTARY NOTES:** Use for additional explanatory notes.

12. **SPONSORING MILITARY ACTIVITY:** Enter the name of the departmental project office or laboratory sponsoring (*paying for*) the research and development. Include address.

13. **ABSTRACT:** Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as (TS), (S), (C), or (U).

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. **KEY WORDS:** Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, roles, and weights is optional.