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THE BRL NONEQUILIBRIUM NUCLEAR FIREBALL CODE: THUNDERBALL,(U)
JUN 77 J LACETERA, G R DAUM, G J KLEM

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REPORT NO. 1992

THE BRL NONEQUILIBRIUM NUCLEAR FIREBALL CODE: THUNDERBALL

Joseph Lacetera
Gaelen R. Daum
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Nonequilibrium	Time Dependent	Blackout
Radiation-Hydrodynamics	Photon Energy Deposition	Atomic Ions
X-Ray Transport	Photoionization	Atomic & Ionic Cross Sections

20. ABSTRACT (Continue on reverse side if necessary and identify by block number) (hmn)

The BRL nuclear-fireball code THUNDERBALL is described. It is a nonequilibrium, time-dependent, radiation-hydrodynamics, photon transport, and atmospheric response code, which computes nonequilibrium atomic-ionic, molecular ionic, and free-electron densities relevant to radar absorption and blackout.

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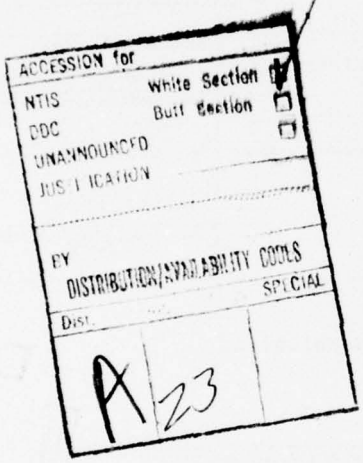


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I. INTRODUCTION

1.1 BACKGROUND.

In the past several years, highly accurate models of atmospheric transport of x-rays and material response of homogeneous and composite materials to x-ray energy deposition have been developed at the Ballistic Research Laboratory. Calculations have been performed involving x-ray transport in both the atmosphere and in targets, energy deposition in target materials including ablators, substructure and components, and the hydrodynamic material response of structures to energy deposition. The effects of various parameters on material response prediction of vulnerability and lethality of US ABM's and foreign RV's have been determined by relating these effects to critical radii. Most recently, models of the nonequilibrium atmospheric response to nuclear bursts have been used in parameter studies involving the prediction of radar obscuration volumes.

1.2 X-RAY TRANSPORT AND MATERIAL RESPONSE.

The uncertainties present in the production of the atmospheric transport data involve the methods of solving the transport equation (e.g. Monte Carlo or finite difference), the cross sections used in the calculations, and the question of whether atmospheric response can be ignored in the calculation of absorption coefficients. These uncertainties produce uncertainties in the radii for which various material response phenomena begin to occur.

Calculations have been performed to determine x-ray fluences delivered to a target predicted by both a responding medium model and a cold air cross section model[1,2]. Indications are that while the x-ray free-field data obtained using the cold air approximation may not suffice for all x-ray/target interactions of interest, particularly at high altitudes, the cold air approximation certainly suffices for altitudes below 30 kilometers and for the co-altitude ranges of interest.

During FY72 an x-ray data base[3] was generated using the Monte Carlo code OGRE, and a code FOX[4] was written to fold arbitrary weapon spectra

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1. Joseph Lacetera, "Effects of Nonequilibrium Phenomena Upon X-Ray Transport in the Atmosphere (U)", US Army Ballistic Research Laboratories Report No. 1636, SRD, February 1973. AD #524945L
2. Joseph Lacetera, "Effects of Cold Air Cross Sections on X-Ray Transport in the Atmosphere (U)", US Army Ballistic Research Laboratories (draft).
3. Norman E. Banks and Wayne A. Coleman, "Transport of Photons Through Air Using Source Energy Band Structure from 300 keV to 2 keV (U)", US Army Ballistic Research Laboratories Report No. 1577, U, April 1972.
4. Christopher M. Clayton, "A Users Manual for the BRL Folding Code, FOX (U)", BRL Report No. 1655, US Army Ballistic Research Laboratories, U, June 1973. AD #912571L

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into the data base in order to generate real transported x-ray environments. The results of FOX folding calculations compared favorably with previous calculations using both Monte Carlo and discrete-ordinates techniques, and a handbook of x-ray transport data for candidate ABM warheads was generated[5].

During FY73 the need for angular dependence in the x-ray free-field data used in energy deposition calculations was established[6,7]. Subsequently, during FY74 an energy-, angular-, and time-dependent x-ray data base was generated with the newly developed, BRL-sponsored DART[8] code, and the x-ray deposition code FSCATT was modified[9] to accept angular dependent data. During FY75 this data base was folded with weapon spectra newly generated under BRL sponsorship, using FLAIR[10] to produce angular-dependent input for x-ray deposition calculations with the new FSCATT.

During FY74 and FY75 studies were performed to relate uncertainties uncovered in previous calculations to their effects on critical radii

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5. Joseph Lacetera and Christopher M. Clayton, "X-Ray Transport Data for Candidate ABM Warheads (U)", US Army Ballistic Research Laboratories Report No. 1697, SRD-N, January 1974. AD #529019L
6. Janet Lacetera and Joseph Lacetera, "Sensitivity of X-Ray Deposition in ABM Materials to Free-Field Angular Dependence (U)", US Army Ballistic Research Laboratories Report No. 1674, SRD-N, September 1973. AD #527474L
7. Janet Lacetera and Richard V. Haire, "Sensitivity of X-Ray Energy Deposition Profile in ABM Materials to Differences in X-Ray Free-Field as Generated by the FOX and ATR Codes (U)", BRL Memorandum Report No. 2451, S, March 1975. AD #C001819L
8. W.A. Woolson, D.L Huffman, W.H. Scott, Jr., W.A. Coleman, "DART-A Monte Carlo Code for Atmospheric Transport of X-Rays and Gamma-Rays (U)", BRL Contract Report No. 198, U, December 1974 (AD B001107L.
9. R.H. Fisher, "FSCATT: Angular Dependence and Filter Options (U)", BRL Contract Report No. 290, March 1976. AD #A023188
10. W.H. Scott, Jr., and B.L. Colborn, "FLAIR - A Scaling and Folding Code for the Generation of Photon Transport Results in Air", Science Applications, Inc., La Jolla, CA, BRL Contract Report (to be published).

(sure-kill and sure-safe distances)[11,12]. These uncertainties involved x-ray transport in the atmosphere and in targets, energy deposition in target materials, and hydrodynamic material response of targets to energy deposition. Among the parameters evaluated and related to critical radii were: (1) differences in x-ray transport models (cold air, responding atmosphere), numerical techniques (Monte Carlo, finite difference) and inclusion of angular dependence in the x-ray free-field; (2) inclusion of the fluorescence process in energy deposition in target material[13]; and (3) inclusion of angular dependence in energy deposition calculations.

A comparison was made of the atmospheric transport of x-rays from a unit energy source through air calculated by the folding codes FOX and FLAIR, and the radiation transport code THUNDERBALL. (See Appendix A.) Observed differences in integral quantities predicted by the codes were on the order of 5% or less. These results indicated that the methods on solving the transport equation, or choosing the cross section sets, involve uncertainties which were small compared to uncertainties involved in the material response calculations. It was concluded that, at target distances for which the time dependent atmospheric response can be ignored, the folding codes produce x-ray free field data which are equivalent to that which the best explicit transport codes can produce. (The folding calculations take less than a minute on a CDC 7600). However, for smaller miss distances the cold air approximation[2] used in generating the data bases may not suffice for predicting x-ray fluences on BMD targets.

1.3 NUCLEAR FIREBALL-RADAR.

The ability to accurately calculate the atmospheric ionization due to deposition of x-ray energy from SPRINT interceptors and foreign reentry vehicles is critical to the accurate prediction of the nuclear environment by radar software systems. Radar systems can be defeated by absorption, clutter, multipath, reflection, etc. The ability to minimize these effects depends on (1) accurate calculations of the atmospheric ionization to create a parameterized data base, (2) obtaining, by actual measurements, sufficient data from a particular nuclear burst

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11. Joseph Lacetera and Janet Lacetera, "Critical Parameters in X-Ray Interactions With ABM/RV Materials (U)", US Army Ballistic Research Laboratories, BRL MR 2586, February 1976. AD #C005358L
12. Joseph Lacetera, "Uncertainties in the Atmospheric Transport of X-Rays Related to Uncertainties in Material Response (U)", Fifth Symposium on Nuclear Survivability of Propulsion and Ordnance Systems, Menlo Park, CA, October 1975.
13. Joseph Lacetera and Janet Lacetera, "Sensitivity of X-Ray Deposition in ABM Materials to the Inclusion of Fluorescence (U)", US Army Ballistic Research Laboratories, BRL R 1861, SRD-N, February 1976. AD #C005331L

(or bursts) in order to (3) correlate the measured data with the data base such that the history of the burst can be characterized by computer simulation as a function of time. Using this prediction technique obscuration volumes for the radar systems can be mapped. The effectiveness of the radar system can be enhanced by avoiding searches within the obscuration volumes. However, for such a technique to work, it is necessary to have an accurate data base which describes the perturbed data base.

It has been shown[14] that the atmospheric properties most important to such predictions are the free-electron densities and free-electron-density gradients in the radar path. (Absorption is an important effect for electron densities on the order of 10^6 particles/cc. The range of 10^7-10^{10} particles/cc represents the range for which clutter is the dominant effect.) These variables are sensitive functions of the ionizational structure of the atmospheric gas, both at the point of interest and in regions closer to the center of burst from which radiation, capable of photodetachment of electrons from negative ions, is being emitted.

Previous calculations[1] with a nonequilibrium, atomic-ion model have shown that nonequilibrium species populations have a strong effect on fireball emission. Subsequent calculations[15] with THUNDERBALL have indicated that population densities of important absorber/emitters, such as NO, can be far from equilibrium at times of interest in the radar-blackout problem. Thus the assumption of a fireball in local thermodynamic equilibrium (LTE) will not always suffice in late-time chemistry calculations. In such cases, the detailed ionizational structure of the fireball must be calculated by a nuclear fireball code which explicitly calculates the nonequilibrium interaction between the radiation and the atomic ions and the nonequilibrium chemical kinetics of the important molecular absorbers. Such a capability is provided in THUNDERBALL.

II. THE THUNDERBALL CODE

2.1 GENERAL DESCRIPTION.

THUNDERBALL (Thermonuclear Unrestricted Nonequilibrium Detonation Evaluator for the Radar Bomblight Problem With All Relevant Processes) is a nonequilibrium, radiation-hydrodynamics, photon transport and atmospheric response code. Photon and mass transport are calculated in spherical geometry and ion population densities are calculated directly from the interaction between the radiation field and the responding

14. Bruce Carney, E.L. Lortie, M.D. Kregel, and F.F. Niles, "Atmospheric Deionization Following a 5 MT Burst at 30 km Altitude (U)", BRL Report No. 1671, C, September 1973 (AD5278834).
15. Joseph Lacetera, and Gaelen R. Daum, "Effects of Nonequilibrium Phenomena on Radar Transmission-Nonequilibrium Ionization", BRL Report (in draft).

atmosphere. The code also has an option for choosing atomic-ion specie densities via the Saha equation, if the user wishes to assume LTE. However, molecular specie densities are always calculated explicitly.

The basic sequence of calculations is as follows. An initial zone structure is given as input, along with a description of the weapon source and the ambient atmosphere (See Appendix B). The code then determines the absorptive and emissive properties of each volume of gas from the species populations. A time step is chosen such that stability is maintained in the solution of radiation transport, hydrodynamics, species densities, and energy partitioning. After the interaction of the radiation and material field is calculated, the radiation transport and atmospheric response are calculated. The macroscopic effects of the microscopic processes are used as input to the hydrodynamic calculations, which in turn feed back new local conditions. Calculational volumes are so chosen that variables, differential in r, vary almost continuously from one spatial region to the next, thus ensuring that the calculational averages will be truly representative of the condition of the radiation and material fields in each volume element. The output of the code describes the condition of the atmosphere and the radiation field at user-specified instants of time for each spatial cell.

The code is written in FORTRAN IV, and is maintained in a program library using the SCOPE, UPDATE system on a CDC-7600. Memory requirement is 160K octal using the 60-bit word size. A restart capability is provided by storing all of blank common on a permanent file at specified time intervals.

2.2 X-RAY TRANSPORT AND ATMOSPHERIC RESPONSE.

The problem of determining the detailed effect of nonequilibrium phenomena on the atmospheric transport of x rays is extremely complex. It involves the interaction of a very intense radiation pulse with a rapidly ionizing gas which remains in a nonequilibrium configuration for times which are long compared to the time of passage of the pulse. This means that ionic species population densities must be calculated explicitly without resort to LTE assumptions, and the time steps chosen for these calculations must be such that changes in physical quantities will be small compared to the value of these physical quantities.

The important physical processes are:

1. Photoelectric effect
2. Auger effect/fluorescence effect
3. Ionization by electron impact
4. Bremsstrahlung
5. Scattering.

The photon transport equation is written

$$\frac{\partial E(\underline{r},\underline{v})}{\partial t} + \nabla \cdot (\underline{v}\, E) = c\, S_o(\underline{r},\underline{v}) - \alpha\,(\underline{r})\, cE,$$

where $E(\underline{r},\underline{v})$ is the energy flux, $S_o(\underline{r},\underline{v})$ is the energy emission flux, $\alpha(\underline{r})$ is the local absorption coefficient, and c is the speed of light. THUNDERBALL calculates photon transport using the finite difference method in an Eulerian geometry. A rezoning process is used to provide a fine spatial mesh in those regions where physical quantities are in the greatest state of flux.

Spatially, the region of interest is initially divided into 50 spherical shells of equal differential radius. When the front edge of the radiation pulse reaches the outermost shell, the 32 innermost shells are rezoned to 16 shells of twice the original differential radius. The sixteen additional shells thus obtained are added on to the outermost shells and computations continue. This rezoning process is repeated whenever necessary until the problem is completed.

Given a distribution of local species populations and local temperature, the radiation sources per unit volume for a given photon band are computed. While these calculations are being made, the various contributions to the derivatives dn_i/dt from radiative recombinations (radiative source terms) are being tabulated. The absorption coefficient for each photon energy band is then evaluated using an average photon energy. For this reason photon bands are always chosen so that the various cut-off energies fall at the division points between photon bands.

When the sources and absorption coefficients have been evaluated for the given band, the radiative transport of energy is computed to determine where the emitted energy is absorbed and how much is radiated away. The species changes dn_i due to absorption of photons are next evaluated from the computed fluxes and the various partial absorption coefficients. Finally the effects of the suprathermal electrons are evaluated. This cycle of computations is then repeated for the photon band with the next lower photon energies, and so on until all photon bands have been covered. The scan proceeds from high to low photon energies to ensure that the fluorescence radiation from K-shell absorption in lithium-like ions is properly included. Finally, when all radiative processes at all photon energies have been evaluated and their effects accumulated, the collisional contributions and their inverses are added at each position in space.

2.3 ATOMIC ION MODEL.

The atomic ion model in the code is based on a photoionization cross section set, calculated by Daum[16] using the XSECT code[17]. XSECT contains a model of photoionization processes for virtually all atomic and ionic species of interest.

The atomic models currently in use in many codes are so crude that their only justification is that they were the best available at the time of their development. Positive ions are incorporated into these models by extrapolating information about the neutral atom[18], or by assuming a simple (photon energy)$^{-3}$ dependence[19]. These models provide qualitative solutions, but confidence in the quantitative results must be extremely low. As an example the RADCHEM code[19] assumed a (photon energy)$^{-3}$ dependence for K-shell ionization of an average atom. Ionization from the L-shell was ignored as no estimate of its cross section was known. Daum calculated cross sections for all the ions of oxygen and nitrogen. These cross sections were then folded to yield K- and L-shell cross sections for each stage of ionization of an average atom, assumed to be 0.8 nitrogen and 0.2 oxygen. These cross sections were found to yield significantly different absorption coefficients (by a factor of five) for low energy radiation when compared to the results from Richard's model (See Appendix C). At higher energies, the two models agreed surprisingly well (within 25%). Being firmly grounded in basic physics, the results with Daum's cross sections may be taken as strong evidence that previous calculations using Richard's "guesstimates" of the cross sections are satisfactory for energies away from the photoionization threshold. The confidence one may place on the Richard's-model results is much greater now that confirmation has been obtained. On the other hand, where energies close to the photoionization threshold are likely to be important, the XSECT model enables one to perform more accurate calculations.

The XSECT cross sections are weighted appropriately, in THUNDERBALL, to an average atom approximation of the atmosphere. In this model the atmosphere is assumed to consist of molecules A_2, atoms A, and their ions A^{M+} (M=1-7), along with free electrons e^-.

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16. Gaelen R. Daum, "Photoionization Cross Sections for O, N, Aℓ, and Their Ions", BRL Report No. 1894, U, June 1976. AD #B012453L
17. Gaelen R. Daum, "The BRL Photoionization Code XSECT", BRL Report No. 1869, U, March 1976. AD #B010267L
18. W.D. Barfield, G.D. Koontz, and W.F. Huebner, J. Quant. Spectrosc. and Radiat. Transfer 12, 1409 (1972).
19. P.I. Richards, Summary Report on Investigation of Radiation and Chemical Calculations, Tech. Op. Res. Report No. TO-B 62-64 (1962).

The photoionization cross sections are then used, employing the principle of detailed balance, to compute inverse emissive reaction rates. Stimulated emission is included in the detailed balance equations for exactness.

The principles of detailed balance and mass action are used extensively to ensure that all necessary interrelations between the various processes are treated properly. The principle of detailed balance requires that in thermodynamic equilibrium the rate of a reaction and its inverse are equal. The law of mass action says that the products of the concentrations of the species which are present and their rate constants are a function of temperature alone. One therefore knows the ratio of the concentrations and hence the ratio of the rate constants. THUNDERBALL uses these principles to determine inverse cross sections which are not otherwise known, and also to establish consistent inverse cross section pairs. The rate equations will thus allow thermodynamic equilibrium to occur under the proper conditions.

The code allows local kinetic equilibrium velocity distribution among the free electrons. However, excess energy from the photoelectrons is accounted for in terms of further ionization and conversion to kinetic energy of the average particle. Collisional processes which occur as the atomic species seek equilibrium are also accounted for in detail.

Excited states are ignored on the premise that their effects will be small compared to gross changes in species population.

Collisional Ionization

$$A^{(i)+} + e^- \rightleftharpoons A^{(i+1)+} + 2\ e^- \ .$$

The ions are assumed to be at rest and in the ground state. Cross sections are assumed to be independent of the state of ionization. The number of ionizations of $A^{(i)+}$ per unit volume per unit time by electrons of energy E is then,

$$M_e\ M_i\ v(E)\ f(E)\ \phi\ (E,E')\ dE\ dE'$$

where v(E) is the velocity distribution of the incident electrons of energy E, f(E) is their energy distribution, and $\phi(E,E')$ the cross section for the collision. The energy distribution is assumed Maxwellian, and is given by,

$$M_e\ f(E)dE = \frac{2}{\sqrt{\pi}}\ \frac{e^{-E/kT}}{(kT)^{3/2}}\ E^{\frac{1}{2}} \ .$$

The inverse (three body) reaction is proportional to

$$M_e^2 M_{i+1} f(E') \; f(E'') \; dE' \; dE'' \; ,$$

and since the reactions are inversely related we can write

$$K_3 = K_2 / S_i(kT) ,$$

where $S_i(kT) = \dfrac{M_e M_{i+1}}{M_i}$ is derivable from the Saha equation. The net rate of ionization is then

$$K_2 M_e M_i - K_3 M_e^2 M_{i+1} \; .$$

Collisional Dissociation

Molecular dissociation processes in the atomic-ion model include:

$$e^- + A_2 \rightleftharpoons e^- + 2A \qquad \text{(oxygen only)}$$

$$A + A_2 \rightleftharpoons 3A$$

$$A_2 + A_2 \rightleftharpoons A_2 + 2A \; .$$

Free-Free Emission (Bremsstrahlung)

Bremsstrahlung can occur in the Coulomb field of an ion

$$e^- + A^{(i)+} \rightarrow e^- + A^{(i)+} + h\nu$$

or in the field of a neutral atom

$$e^- + A \rightarrow e^- + A + h\nu \; .$$

The heavy particle is assumed to stay at rest, so the photon energy comes from the loss in kinetic energy of the electron.

Free-Free Absorption (Inverse bremsstrahlung)

$$h\nu + e^- + A^i \rightarrow e^- + A^i \; .$$

Here, there is no restriction on the photon energy, so photons from fireball emission are readily absorbed.

Stimulated Emission

$$h\nu + e^- + A^i \rightarrow e^- + A^i + 2\,h\nu \quad .$$

This reaction, while not contributing significantly to the radiative field, must be accounted for in the detailed balance equations. Since this emission is coherent with, and in the same direction as, the incident radiation, it is treated as negative absorption.

Photoelectric Absorption and Auger Effect

$$h\nu + A^{(i)+} \rightarrow A^{(i+1)+} + e^- \qquad h\nu > I, \text{ the ionization energy.}$$

For K-shell absorption in one- and two-electron ions and L-shell absorption in other species, these processes are directly reversible. For ions of three or more electrons, the process is not considered reversible. The calculations are not corrected for recombinations, and there is no corresponding emission term. Besides the highly energetic photoelectron, an Auger electron is emitted as the ion decays to fill the K-shell hole. The excess energy of these electrons and the L-shell photoelectrons is converted to further ionization and kinetic energy of the average particle. K-shell absorption in lithium-like ions does not produce Auger electrons so fluorescence radiation is calculated, in this case, as part of the emission term.

Scattering

Scattering of photons with energies above 10-keV by electrons is accounted for by using Compton cross sections for free electrons. The Klein-Nishina cross section is used to compute the absorption coefficient, and scattered photons are treated as emissions.

2.4 CHEMICAL KINETICS MODEL.

This model is based on a minimum reaction set for NO production given by Sutherland and Zinn[20], and is complete in the sense that for every reaction included we also include the inverse process. Population densities are computed for N_2, O_2, N, O, NO, N_2O, O_2^-, O_2^+, and O_3. The model also includes photodetachment of electrons from O_2^- and electron attachment to O_2. It is coupled to the atomic-ion model via the reactions:

$$e^- + N^+ \rightleftharpoons N$$

$$e^- + O^+ \rightleftharpoons O \quad .$$

20. C. Dexter Sutherland and John Zinn "Chemistry Computations for Irradiated Hot Air", Los Alamos Scientific Laboratory,

2.5 ATMOSPHERIC EQUATION OF STATE.

The basic atmospheric equation of state (EOS) is an ideal gas law which uses the average atom approximation to describe the state of ionization of the gas.

The molecule A_2, atom A, and its ions $A^{(i)+}$ are represented as follows:

$$A_2(K=1),\ A(K=2),\ A^{+1}(K=3),\ \ldots A^{+7}(K=9),\ e^{-}(K=10).$$

The gas pressure is calculated as

$$P = (E_T - \frac{\rho v^2}{2} - \sum N_K E_{cK}) \frac{\sum N_K}{\sum N_K f_K}$$

where $\rho = \sum N_K m_K$ (m_K = mass of specie K), the f_K are 1/2 the degrees of freedom of particles of specie K, and the E_{cK} are the corresponding heats of formation.

2.6 HYDRODYNAMICS.

Given the particle number densities, N_K, of the average atom model particles with their atomic masses m_K, the conservation laws are written as follows:

Conservation of Momentum

$$\frac{\partial(\rho \underline{v})}{\partial t} + \underline{v} \cdot \nabla (\rho \underline{v}) + \frac{\partial P}{\partial r} = f_R$$

where $\rho = \sum N_K m_K$, f_R is the net force per unit volume due to the absorption and emission of radiation, P is the pressure, and $\underline{v}$ the flow velocity.

Conservation of Energy

$$\frac{\partial E_T}{\partial t} + \nabla (E_T \underline{v}) + \nabla \cdot (P \underline{v}) = -\underline{v} f_R - \nabla \cdot Q_R$$

where Q_R is the net radiative emission energy flux, so $\nabla \cdot Q_R$ is the net power emission per unit volume.

Conservation of Mass

$$\frac{\partial N_K}{\partial t} + \nabla \cdot (N_K \underline{v}) = C_K$$

where C_K represents the creation and destruction of particles of specie K due to ionization and recombination.

Heating due to the collision processes causes hydrodynamic expansion and consequent shock wave propagation.

2.7 CODE INPUT.

To provide a restart capability all of blank common is automatically stored by the code on a permanent I/O file at specified output times. These "runs" are stored consecutively so that a restart can be made from any of these points in time. Handling of this I/O file is as described in the following card input description.

The first two input cards are read in alphanumeric format; all other cards are input through the use of NAMELIST statements.

TITLE: FORMAT (12A6), problem identifier

REELID: FORMAT (A10), permanent I/O file identifier written by the code at the beginning of a new I/O file, and checked on restarts.

NAMELIST START (I/O Information)

IOB: Number of the I/O file on which blank common variables are stored at specified output times to provide a restart capability. On initial runs IOB=1 or 2. On restarts, IOB must equal 2.

IOB1: Number of new IO file, if desired, on restarts. On initial runs IOB1=IOB. On restarts: IOB=1 to write on a new file; IOB=2 to write on the same file as was read.

NRUN: The number of runs on the restart IO file. On initial starts NRUN=0. On restarts NRUN is specified according to the desired restart time, as indicated on previous printed output.

TIMMAX: The maximum time, in CPU seconds (decimal), that the code will use in the calculation.

NAMELIST PROBLM (Problem parameters)

IHOB: Altitude in kilometers.

ID: Weapon source parameter. ID=0 if source is radiating; ID=-1 if source is off.

IE: The number of Eulerian zones used at the current time. Initially IE may be any number from 1 to 50.

IPAR: The number of weapon source spectra used to describe the time dependent weapon output.

RMAX: The distance (cm) that 50 zones will initially cover. The code divides RMAX by 50 to get initial zone size.

TIME: The current problem time.

YIEL: Weapon source yield (calories)

NAMELIST WEAPON (Source spectrum)

WOFLUX (t,E): Weapon output flux (cal/keV) as a function of time and photon energy.

NAMELIST RUN (Control parameters)

CKTIME: Time for next print edit (sec).

END: Real time (sec) at which calculation will terminate.

FREQ: Print edit frequency (sec)

LMAXT: Number of photon energy bands used in radiation calculations.

NSS1: = 0 for x ray weapon source;
= 1 for parameterized initial conditions.

NSS2: = 0 for calculations with chemical kinetics;
= 1 for calculations without chemical kinetics.

NSS3: = -1 on initial start; = 1 for expanding grid; = 0 if geometry is static.

NSS4: = 0 for nonequilibrium atomic ion model; = 1 for using Saha equation; = -1 for cold air calculations.

NSS5: = 0 for automatic rezone; = 1 for manual rezone.

2.8 CODE OUTPUT.

When the code initially receives control from the system it prints the computer clock time (T7600) and all of the NAMELIST variables. A

page is then printed which is headed by the name of the problem (TITLE), the maximum CPU time before cutoff (TIMMAX), and a list of control parameters and physical variables that are all defined at the end of this section. This is followed by the weapon source and radiation field frequency group edit. The remaining printed output is periodic, as specified by the FREQ parameter.

The first page of the periodic output gives information on the problem time, current and previous time steps, time step control parameters, and the number of zones in the grid. The second page lists, as a function of r, mass density, particle density, particle velocity, pressure, temperature, internal energy, electron charge per cc, and zone dimensions. The fourth page is an edit of the atomic ion model, and the fifth page is an edit of the chemical kinetics model. Subsequent output lists information on the radiation field, including absorption and emission by the gas, as a function of photon energy. At the end of each output print (each run) the number of the run and the number of the I/O file are printed.

The following is a partial, alphabetical list of the output variables. Others are self-explanatory.

ABSORPTION: Energy (joules) absorbed from the total radiation field.

A^{M+}/VOL: Number density (μμmole/cc) of species in atomic ion model.

ATMF: Time step control parameter based on reaction rates in atomic ion model.

AVE VEL: Average particle velocity (cm/sec) in zone I.

CHMF: Time step control parameter based on reaction rates in chemical kinetics model.

DT: Current time step (sec).

E: Total excess (above ambient) energy (joules) in problem.

ECHG: Time step control parameter based on rate of deposition of radiative energy into gas.

EKIN: Total kinetic energy (joules) in gas.

EMISSION: Energy (joules) radiated from zone I.

ERAD: Total radiation field energy (joules).

FLCH: Time step control parameter based on radiative flux rates of change.

HYVDR: Time step control parameter based on hydrodynamic calculations.

MASS DENS: Density (gm/cm^3) in zone I.

NCYC: Number of calculational cycle.

NUCL DENS: Total particle density ($\mu\mu$mole/cc) in zone I in atomic ion model.

PART/VOL: Total particle density (1/cc) in zone I, in chemical kinetics model; particle densities for individual species are fractions of this number (e.g. NITROGEN has the value .800 for ambient air).

PRESSURE: Kinetic pressure ($dynes/cm^2$)

TEMP: Kinetic temperature (K).

III. SAMPLE CALCULATION

The configuration of a sample input deck for a THUNDERBALL calculation is shown in Figure 1.

The first card (TITLE) is a 72-character alphanumeric identifier describing the problem. The second card specifies the alphanumeric identifier (REELID) of the I/O tape (or disk file) on which all of COMMON is stored periodically to provide a restart capability. The remainder of the input is via the NAMELIST option. All other required information is stored in the code.

The START NAMELIST provides I/O information to the code. NRUN = 0 means that this is an initial run (not a restart). IOB = IOBL = 2 means that there will be one I/O file called TAPE 2. TIMMAX = 60 means that the code will stop calculations, with a normal termination after 60 decimal seconds of CPO time.

The PROBLM NAMELIST indicates the type of problem being run. IHOB = 30 means that the burst altitude is 30 kilometers. ID = 0 normally implies a radiating photon source however this control is overridden in this particular problem by the RUN variable NSS1. IE = 50 means that the problem will initially have 50 spherical shells spanning the distance RMAX = 5E+05 cm in equal increments. The total yield in the calculations will be initiated at TO = 1.0 sec. IPAR is also overridden in this problem, by the RUN variable NSS1.

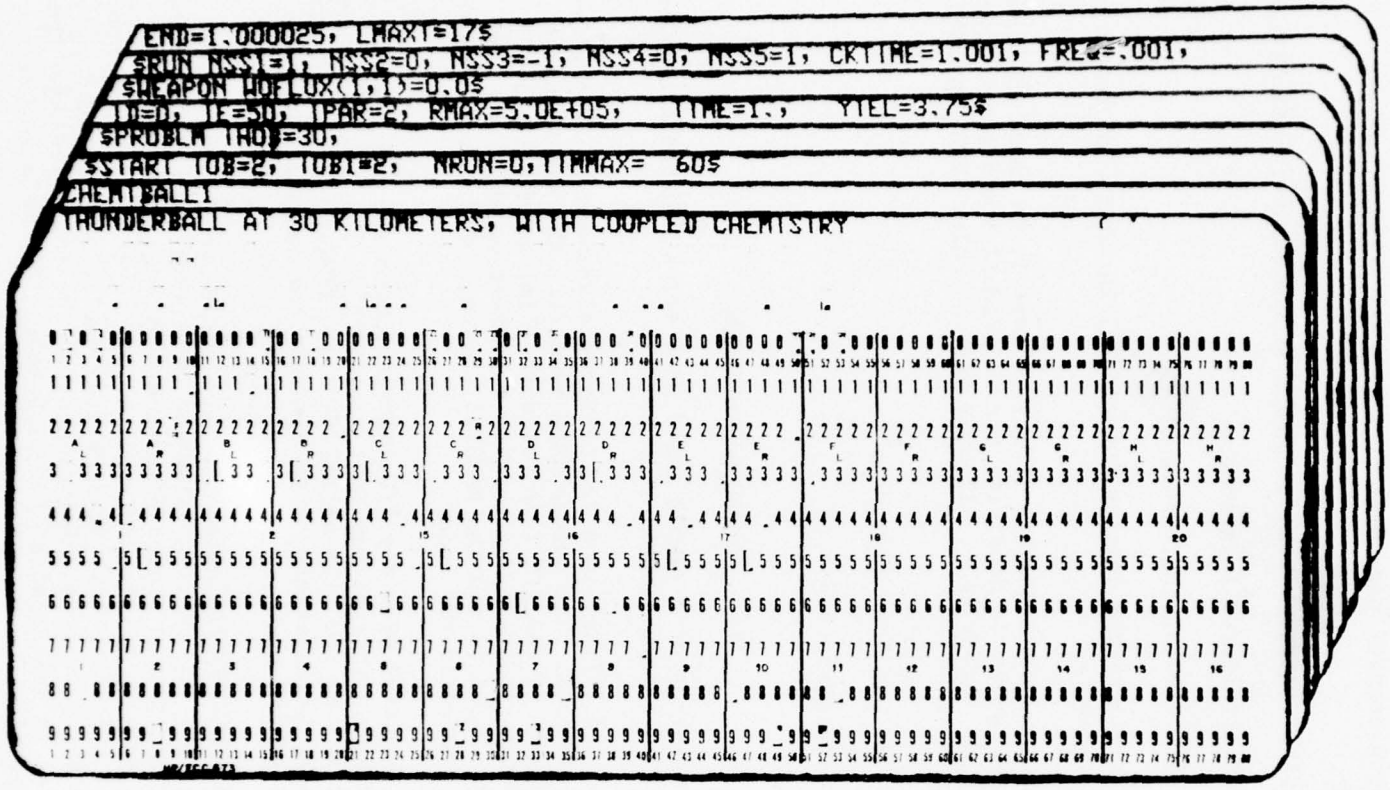


Figure 1. Sample Input Deck for THUNDERBALL Calculation.

With the current coding THUNDERBALL expects a description of a photon source in all problems. In this problem no late-time radiation was included so the value of 0.0 was read into a single element of the weapon-output-flux array.

The RUN variables are the control parameters which specify the way in which the problem will be run. NSS1=1 means that parameterized initial conditions will be used; NSS2=0 means that chemical kinetics will be included; NSS3=-1 must be set this way on initial starts; NSS4=0 means that atomic ion populations will be calculated in non-equilibrium; NSS5=1 means no automatic rezoning. CKTIME (sec) is the time selected for the first printout (and COMMON dump to TAPE2); and FREQ(sec) is the frequency of printing and dumping. END is the time at which the calculation will normally terminate if the TIMMAX variable has not already terminated the calculation. Normal terminations are always accompanied by a printout and tape dump. LMAXT is the number of photon energy bands that will be used in transporting photons; these being bands 1 through 17. The output corresponding to this input stream is listed in Appendix D, along with a glossary of the output variables.

IV. CONCLUSIONS AND RECOMMENDATIONS

The current atomic model could be further improved by incorporating the results of Missavage, Manson and Daum[21]. It is shown there that it is not necessary to calculate cross sections for each stage of ionization, as Daum has done, but that it is sufficient to calculate cross sections for the isonuclear sequence. This simplification in the model represents a great saving of labor and computer time. (Rather than doing thirty-four cross section calculations, only twenty-four are required.) With these modifications, it is estimated that the atomic model portion of the code would run 30% faster. The Manson research has proven its applicability and worth to studies of radar obscuration volumes, giving greater reliability to the results, allowing further simplification of the model, and increasing the range of problems that may be treated. The work should prove equally applicable to other research of military interest (such as laser propagation), as well as outstanding problems in other areas such as plasma physics and astrophysics.

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21. D.W. Missavage, S.T. Manson, and G.R. Daum, Phys. Rev. (to be published).

REFERENCES

1. Joseph Lacetera, "Effects of Nonequilibrium Phenomena Upon X-Ray Transport in the Atmosphere (U)", US Army Ballistic Research Laboratories Report No. 1636, SRD, February 1973. AD #524945L

2. Joseph Lacetera, "Effects of Cold Air Cross Sections on X-Ray Transport in the Atmosphere (U)", US Army Ballistic Research Laboratories (draft).

3. Norman E. Banks and Wayne A. Coleman, "Transport of Photons Through Air Using Source Energy Band Structure from 300 keV to 2 keV (U)", US Army Ballistic Research Laboratories Report No. 1577, U, April 1972. AD #894773L

4. Christopher M. Clayton, "A Users Manual for the BRL Folding Code, FOX (U)", BRL Report No. 1655, US Army Ballistic Research Laboratories, U, June 1973. AD #912571

5. Joseph Lacetera and Christopher M. Clayton, "X-Ray Transport Data for Candidate ABM Warheads (U)", US Army Ballistic Research Laboratories Report No. 1697, SRD-N, January 1974. AD #529019L

6. Janet Lacetera and Joseph Lacetera, "Sensitivity of X-Ray Deposition in ABM Materials to Free-Field Angular Dependence (U)", US Army Ballistic Research Laboratories Report No. 1674, SRD-N, September 1973. AD #527474L

7. Janet Lacetera and Richard V. Haire, "Sensitivity of X-Ray Energy Deposition Profile in ABM Materials to Differences in X-Ray Free-Field as Generated by the FOX and ATR Codes (U)", BRL Memorandum Report No. 2451, S, March 1975. AD #C001819L

8. W.A. Woolson, D.L. Huffman, W.H. Scott, Jr., W.A. Coleman, "DART-A Monte Carlo Code for Atmospheric Transport of X-Rays and Gamma-Rays (U)", BRL Contract Report No. 198, U, December 1974 (AD B001107L).

9. R.H. Fisher, "FSCATT: Angular Dependence and Filter Options (U)", BRL Contract Report No. 290, March 1976. AD #A023188

10. W.H. Scott, Jr., and B.L. Colborn, "FLAIR - A Scaling and Folding Code for the Generation of Photon Transport Results in Air", Science Applications, Inc., La Jolla, CA, BRL Contract Report (to be published).

11. Joseph Lacetera and Janet Lacetera, "Critical Parameters in X-Ray Interactions With ABM/RV Materials (U)", US Army Ballistic Research Laboratories, BRL MR 2586, February 1976. AD #C005358L

12. Joseph Lacetera, "Uncertainties in the Atmospheric Transport of X-Rays Related to Uncertainties in Material Response (U)", Fifth Symposium on Nuclear Survivability of Propulsion and Ordnance Systems, Menlo Par, CA, October 1975.

13. Joseph Lacetera and Janet Lacetera, "Sensitivity of X-Ray Deposition in ABM Materials to the Inclusion of Fluorescence (U), US Army Ballistic Research Laboratories, BRL R 1861, SRD-N, February 1976. AD #C005331L

14. Bruce Carney, E.L. Lortie, M.D. Kregel, and F.F. Niles, "Atmospheric Deionization Following a 5 MT Burst at 30 km Altitude (U)", BRL Report No. 1671, C, September 1973 (AD 5278834).

15. Joseph Lacetera, and Gaelen R. Daum, "Effects of Nonequilibrium Phenomena on Radar Transmission-Nonequilibrium Ionization", (draft report).

16. Gaelen R. Daum, "Photoionization Cross SEctions for O, N, Aℓ, and Their Ions", BRL Report No. 1894, U, June 1976. AD #B012453L

17. Gaelen R. Daum, "The BRL Photoionization Code XSECT", BRL Report No. 1869, U, March 1976. AD #B010267L

18. W.D. Barfield, G.D. Koontz, and W.F. Juebner, J. Quant. Spectrosc. and Radiat. Transfer 12, 1409 (1972).

19. P.I. Richards, Summary Report on Investigation of Radiation and Chemical Calculations, Tech. Op. Res. Report No. TO-B 62-64 (1962).

20. C. Dexter Sutherland and John Zinn, "Chemistry Computations for Irradiated Hot Air", Los Alamos Scientific Laboratory.

21. D.W. Missavage, S.T. Manson, and G.R. Daum, Phys. Rev. (to be published).

APPENDIX A: X-RAY TRANSPORT DATA

A comparison of time-integrated flux (fluence) as a function of mass depth has been made between the folding codes FOX and FLAIR and the THUNDERBALL code for the same x-ray source. The results are shown in Table A as a function of mass depth in arbitrary units. The numbers in parenthesis are the ratio of the calculated fluence to that obtained using the FOX code.

TABLE A. $4\pi r^2$ FLUENCE AS A FUNCTION OF MASS DEPTH

Mass Depth (arbitrary units)	FOX	FLAIR	THUNDERBALL
.05	.848 (1.00)	.922 (1.09)	.825 (.970)
.10	.766 (1.00)	.797 (1.03)	.728 (.940)
.30	.605 (1.00)	.616 (1.02)	.560 (.930)
.50	.476 (1.00)	.491 (1.03)	.430 (.900)
1.00	.268 (1.00)	.273 (1.02)	----

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APPENDIX B: ATMOSPHERIC DATA

Atmospheric data used for ambient air were taken from the U.S. Standard Atmosphere, 1962. Specifically these data were particle density and gas temperature as a function of altitude. Energy density in units of erg/μμmole was computed from the temperature and installed in the code along with particle density in units of μμmole/cc. This data is shown in Table B.

TABLE B. ATMOSPHERIC DATA

Altitude (km)	Energy Density (erg/μμmole)	Particle Density (μμmole/cc)	Temperature (°K)
0	2.533 + 06	4.229 + 07	288
10	6.624 + 05	1.428 + 07	223
20	1.382 + 05	3.069 + 06	217
30	2.992 + 04	6.356 + 05	227
40	7.179 + 03	1.379 + 05	250
50	1.995 + 03	3.545 + 04	271
60	5.614 + 02	1.056 + 04	256
70	1.380 + 02	3.022 + 03	220
80	2.594 + 01	6.907 + 02	181
90	4.110 + 00	1.094 + 02	181
100	7.537 - 01	1.727 + 01	210
110	1.836 - 01	3.437 + 00	257
120	6.308 - 02	8.683 - 01	350
130	3.058 - 02	2.756 - 01	534
140	1.853 - 02	1.249 - 01	714
150	1.266 - 02	6.824 - 02	893

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TABLE C.2 COLD AIR ABSORPTION COEFFICIENTS (E_ν = 1.0 - 300 keV)

Photon Energy (keV)	Absorption Coefficients (cm^{-1})		
	Ref 18	Richards	FLAIR
1.0 - 2.0	2.05 + 03	1.43 + 03	0.0 + 00
2.0 - 4.0	2.87 + 02	1.79 + 02	0.0
4.0 - 6.0	4.24 + 01	2.57 + 01	0.0
6.0 - 8.0	1.34	8.36 + 00	1.04 + 01
8.0 - 10	5.70 + 00	3.74	6.91 + 00
10 - 15	2.44	1.65	2.38
15 - 20	7.30 - 01	5.35 - 01	8.23 - 01
20 - 25	3.06	2.40	3.68
25 - 30	1.55	1.28	1.93
30 - 40	7.65 - 02	6.68 - 02	8.86 - 02
40 - 50	3.17	3.00	3.91
50 - 60	1.60	1.60	2.03
60 - 70	9.06 - 03	9.58 - 03	1.17
70 - 80	5.60	6.18	7.36 - 03
80 - 90	3.69	4.22	4.88
90 - 105	2.39	2.84	3.07
105 - 120	1.48	1.83	1.93
120 - 140	9.36 - 04	1.20	1.22
140 - 160	5.82	7.73 - 04	7.66 - 04
160 - 190	3.60	4.95	4.59
190 - 220	2.13	3.04	2.78
220 - 260	1.30	1.91	1.73
260 - 300	7.84 - 05	1.19	1.07

APPENDIX D: SAMPLE OUTPUT

```
$START
IOA     = 0,
IOB     = 2,
IOB1    = 2,
IOC     = 0,
VRJW    = 0,
TIMMAX  = .6E+02,
$END
```

```
$PROBLM
ID      = 0,
IE      = 50,
IMOB    = 50,
IPAR    = 2,
RMAX    = .5E+06,
TIME    = .1E+01,
YIEL    = .375E+01,
$END
```

```
$RUN
CKTIME  = .1001E+01,
END     = .1000025E+01,
FREQ    = .1E-02,
_MAXT   = 17,
VSS1    = 1,
VSS2    = 0,
VSS3    = -1,
VSS4    = 0,
VSS5    = 1,
$END
```

THUNDERBALL AT 30 KILOMETERS, WITH COUPLED CHEMISTRY

MAX CP TIME BEFORE CUTOFF IS 60.000 SECONDS

NRUN = 0 IOB = 2 IREZON = 0
REELID =CHEMTBALL1 IPAR = 2 KRSTRT = 0

GLOSSARY

31=	.20	BNDFAC =	1.00E+00	DELDMP=	1.00E-08	END =	1.00E+00
32=1000.00		BNLPTM =	0.	DMPFAC=	1.00E+00	EPSLN =	1.00E-03
33=	1.00	COLL =	1.00E-14	DMPTIM=	0.	LMAXT =	17
34=	0.00	DEBRIS =	0.	DTFAC =	2.00E-01	NSTOP =	999999
35=	.25	DELBND =	1.00E-08	ELNEG =	1.00E+00	OUTAPE=	0
						RMAX =	5.00E+05

NSS1= 1 IOA= 0
NSS2= 0 IOB= 2
NSS3= -1 IOC= 0
NSS4= 0 IOD= 0
NSS5= 1 IMAX= 51

ID= 0 DRMIN= 1.0000E+04 DMAX(IMAX)= 0.
IE=50 TIME = 1.0000E+00 RMAX(IMAX) = 2.9926E+04

K	XGT(K)	EXST(K)	ER(K)	ON*(K,IMAX)
1	2.8964E0E-11	0.	2.5000E0E+00	6.3560E0E+05
2	1.4482E0E-11	4.7100E0E+00	1.5000E0E+00	0.
3	1.4482E0E-11	1.8705E0E+01	1.5000E0E+00	0.
4	1.4482E0E-11	4.7560E0E+01	1.5000E0E+00	0.
5	1.4482E0E-11	9.5920E0E+01	1.5000E0E+00	0.
6	1.4482E0E-11	1.7024E0E+02	1.5000E0E+00	0.
7	1.4482E0E-11	2.8676E0E+02	1.5000E0E+00	0.
8	1.4482E0E-11	7.9355E0E+02	1.5000E0E+00	0.
9	1.4482E0E-11	1.4433E0E+03	1.5000E0E+00	0.
10	0.	0.	1.5000E0E+00	0.

I	DRA	NA
1	1.0000E+04	51
2	0.	0
3	0.	0
4	0.	0
5	0.	0
6	0.	0

TOTAL ELECTRON DENSITY FOR SCATTERING= 0.8954E+0E

INITIAL TIME STEP IS 5.5711E-05 SECONDS

HNUB

1.0000E-01	1.5000E-01	4.5000E-01	1.0000E+00	1.8200E+00	3.2600E+00
4.1300E+00	5.6000E+00	8.0000E+00	1.0000E+01	1.4000E+01	1.8000E+01
2.3420E+01	2.8900E+01	4.8200E+01	7.4320E+01	9.6520E+01	3.7900E+02
5.3280E+02	8.4300E+02	1.0000E+03	2.0000E+03	4.0000E+03	6.0000E+03
8.0000E+03	1.0000E+04	1.5000E+04	2.0000E+04	2.5000E+04	3.0000E+04
4.0000E+04	5.0000E+04	6.0000E+04	7.0000E+04	8.0000E+04	9.0000E+04
1.0500E+05	1.2000E+05	1.4000E+05	1.6000E+05	1.9000E+05	2.2000E+05
2.6000E+05	3.0000E+05				

NUFLUX(ERGS/C**2/SEC)

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.					

DURATION OF SOURCE= 0. SECONDS

RADIUS OF SOURCE = 0. CM

YIELD= 3.7500E+00 MEGATONS

K	VK	CR	CI	SAMC	IONZ.POTL	HT.FORMTN
1	3.7900E+02	1.7320E+00	7.1800E+01	5.4900E+13	2.3415E+01	0.
2	3.7900E+02	2.6500E-01	3.5900E+01	2.3800E+10	1.3995E+01	4.7100E+00
3	3.7900E+02	9.5000E-01	3.6000E+01	7.0400E+09	2.8955E+01	1.8705E+01
4	3.7900E+02	1.0200E+00	3.5100E+01	1.7620E+09	4.8260E+01	4.7660E+01
5	3.7900E+02	2.9000E-01	3.4200E+01	2.1140E+10	7.4320E+01	9.5920E+01
6	3.7900E+02	5.9000E-01	3.4500E+01	5.2800E+09	9.6520E+01	1.7024E+02
7	5.3279E+02	3.6400E+01	0.	2.1140E+10	5.3279E+02	2.6676E+02
8	6.4375E+02	2.1500E+01	0.	5.2800E+09	6.4375E+02	7.9955E+02

SAHA INITIALIZATION DATA

I	INT.ENERGY (ERGS/CC)	KIN.TEMP (ERGS/MMM)	ELEC.DENSITY (MMM/CC)
1	0.	5.3300E-02	1.
2	3.6000E+04	2.4400E-01	2.6400E+01
3	1.9600E+06	4.3700E-01	5.1100E+02
4	2.0000E+06	4.6300E-01	6.0000E+03
5	2.8900E+06	6.4000E-01	7.6500E+04
6	3.0000E+06	6.7300E-01	8.0000E+04
7	3.3800E+06	7.2400E-01	9.0100E+04
8	3.6400E+06	7.2900E-01	9.5400E+04
9	3.7000E+06	7.3200E-01	9.6000E+04
10	3.8000E+06	7.4000E-01	9.7000E+04
11	9.4600E+06	8.3300E-01	2.0700E+05
12	9.5000E+06	8.3800E-01	2.2100E+05
13	9.5500E+06	8.5600E-01	2.3200E+05
14	9.6000E+06	8.4700E-01	2.3900E+05
15	9.6500E+06	9.1500E-01	2.4500E+05
16	9.7000E+06	9.3700E-01	2.5000E+05
17	9.7500E+06	1.0200E+00	2.5500E+05
18	9.8000E+06	1.2100E+00	2.6000E+05
19	9.8500E+06	1.3000E+00	2.6500E+05
20	1.6100E+07	1.4400E+00	4.5000E+05
21	2.0000E+07	1.5400E-01	6.5000E+05
22	2.5700E+07	1.2600E+00	9.1000E+05
23	3.0000E+07	1.3100E+00	1.0000E+06
24	3.3400E+07	1.3000E+00	1.3000E+06
25	3.8400E+07	2.2500E+00	1.3800E+06
26	3.9000E+07	2.5100E-01	1.4400E+06
27	4.4000E+07	2.6300E+00	1.5800E+06
28	6.4600E+07	3.7100E+00	2.0100E+06
29	1.0300E+08	5.5400E+00	2.8000E+06
30	1.8100E+08	5.7200E+00	3.9500E+06
31	2.5400E+08	7.3500E+00	4.4600E+06
32	2.9200E+08	7.3700E+00	5.0500E+06
33	3.0400E+08	8.1200E+00	5.1500E+06
34	3.0900E+08	8.2200E+00	5.1900E+06
35	3.0900E+08	8.2300E+00	5.2000E+06
36	3.1000E+08	8.2500E+00	5.2100E+06
37	3.1100E+08	8.2700E+00	5.2200E+06

T7500= 58.024 SECONDS

TIME	= 1.00E0E+00	B1	= 2.0000E-01	ELNEG=	1.0000E+00	IE	= 50
DTBL	= 1.6738E-07	CULL	= 1.0000E-14	HYVOR=	7.1763E-05	NCYC	= 159
DT_	= 1.6738E-07	DTFAC=	2.0000E-01	ATMF	= 2.0470E-01	ID	= -1
DT	= 1.6739E-07	B2	= 1.0000E+03	ECHG	= 9.8381E-05	NSS1	= 1
DEBRS=	0.	DRVIT=	1.0000E+04	CHMF	= 1.0000E+00	NBNRN=	1
EXM	=-3.4976E+11	EPRAD=	6.7215E+22	E	= 6.7215E+22	EKIN	= 2.0955E+22
ZMASS=	1.6372E-01	ZETX	= 2.7849E+08	TGEM	= 2.7060E+00	EKAD	= 1.7693E+17

IME= 1.000066226E+00
CYC= 159

I	MASS DENS	ELEC DENS	AVE VEL	PRESSURE	KIN TEMP	INT ENERGY	EL CHG/VOL	RADIUS
1	4.491E-07	3.101E+04	0.	4.390E+04	1.338E+04	3.302E+05	5.259E-11	1.000E+04
2	4.491E-07	3.101E+04	0.	4.390E+04	1.338E+04	3.302E+05	5.736E-11	2.000E+04
3	4.492E-07	3.102E+04	0.	4.391E+04	1.338E+04	3.302E+05	7.111E-11	3.000E+04
4	4.493E-07	3.102E+04	0.	4.391E+04	1.338E+04	3.302E+05	6.601E-11	4.000E+04
5	4.494E-07	3.103E+04	0.	4.392E+04	1.338E+04	3.302E+05	8.716E-11	5.000E+04
6	4.496E-07	3.105E+04	0.	4.393E+04	1.338E+04	3.302E+05	6.514E-11	6.000E+04
7	4.499E-07	3.107E+04	5.509E+03	4.394E+04	1.338E+04	3.302E+05	7.772E-11	7.000E+04
8	4.504E-07	3.110E+04	9.782E+03	4.396E+04	1.338E+04	3.302E+05	6.299E-11	8.000E+04
9	4.511E-07	3.115E+04	1.340E+04	4.399E+04	1.338E+04	3.302E+05	4.778E-11	9.000E+04
10	4.521E-07	3.122E+04	1.688E+04	4.404E+04	1.338E+04	3.302E+05	3.328E-11	1.000E+05
11	4.536E-07	3.132E+04	2.051E+04	4.411E+04	1.339E+04	3.301E+05	1.139E-10	1.100E+05
12	4.559E-07	3.148E+04	2.381E+04	4.422E+04	1.339E+04	3.301E+05	5.162E-11	1.200E+05
13	4.594E-07	3.172E+04	2.737E+04	4.439E+04	1.339E+04	3.301E+05	4.396E-11	1.300E+05
14	4.645E-07	3.207E+04	3.103E+04	4.464E+04	1.340E+04	3.300E+05	4.518E-11	1.400E+05
15	4.721E-07	3.260E+04	3.479E+04	4.502E+04	1.341E+04	3.300E+05	1.100E-11	1.500E+05
16	4.835E-07	3.339E+04	3.867E+04	4.561E+04	1.343E+04	3.299E+05	2.338E-11	1.600E+05
17	5.006E-07	3.457E+04	4.265E+04	4.653E+04	1.348E+04	3.298E+05	3.721E-11	1.700E+05
18	5.261E-07	3.633E+04	4.675E+04	4.804E+04	1.359E+04	3.297E+05	2.710E-11	1.800E+05
19	5.643E-07	3.896E+04	5.095E+04	5.068E+04	1.386E+04	3.296E+05	7.967E-12	1.900E+05
20	6.212E-07	4.290E+04	5.522E+04	5.674E+04	1.486E+04	3.295E+05	7.893E-12	2.000E+05
21	7.064E-07	4.878E+04	5.949E+04	6.589E+04	1.623E+04	3.293E+05	1.352E-13	2.100E+05
22	8.337E-07	5.757E+04	6.383E+04	3.939E+04	8.247E+03	3.291E+05	3.343E-18	2.200E+05
23	1.024E-06	7.070E+04	6.823E+04	3.370E+04	6.280E+03	3.288E+05	1.955E-13	2.300E+05
24	1.308E-06	9.033E+04	7.274E+04	3.569E+04	5.843E+03	3.283E+05	1.307E-13	2.400E+05
25	1.733E-06	1.197E+05	7.734E+04	3.987E+04	5.534E+03	3.276E+05	6.216E-14	2.500E+05
26	2.368E-06	1.635E+05	8.203E+04	4.648E+04	5.257E+03	3.264E+05	2.240E-14	2.600E+05
27	3.317E-06	2.290E+05	8.681E+04	5.627E+04	4.979E+03	3.246E+05	5.494E-15	2.700E+05
28	4.735E-06	3.270E+05	9.164E+04	7.011E+04	4.674E+03	3.216E+05	7.054E-16	2.800E+05
29	6.854E-06	4.733E+05	9.664E+04	8.857E+04	4.302E+03	3.167E+05	2.956E-17	2.900E+05
30	1.002E-05	6.920E+05	1.017E+05	1.093E+05	3.755E+03	3.089E+05	1.400E-19	3.000E+05
31	1.476E-05	1.019E+06	1.068E+05	1.177E+05	2.778E+03	2.961E+05	4.755E-23	3.100E+05
32	2.183E-05	1.507E+06	1.120E+05	1.102E+05	1.759E+03	2.756E+05	1.569E-25	3.200E+05
33	3.240E-05	2.237E+06	1.175E+05	9.708E+04	1.044E+03	2.427E+05	8.938E-28	3.300E+05
34	4.820E-05	3.328E+06	1.227E+05	7.609E+04	5.499E+02	1.902E+05	5.052E-31	3.400E+05
35	7.182E-05	4.959E+06	1.281E+05	4.282E+04	2.077E+02	1.071E+05	9.946E-36	3.500E+05
36	1.841E-05	1.271E+06	1.989E+01	1.251E+04	2.367E+02	3.134E+04	1.760E-07	3.600E+05
37	1.841E-05	1.271E+06	9.559E-05	1.250E+04	2.365E+02	3.132E+04	1.758E-07	3.700E+05
38	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	3.800E+05
39	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	3.900E+05
40	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.000E+05
41	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.100E+05
42	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.200E+05
43	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.300E+05
44	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.400E+05
45	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.500E+05
46	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.600E+05
47	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.700E+05
48	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.800E+05
49	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	4.900E+05
50	1.841E-05	1.271E+06	0.	1.250E+04	2.365E+02	3.132E+04	1.758E-07	5.000E+05
51	1.841E-05	1.271E+06	0.	1.197E+04	2.265E+02	2.992E+04	0.	5.100E+05

I	MOLEC/VOL	ATOM/VOL	A+/VOL	A++/VOL	A(4E)/VOL	A(3E)/VOL	A(2E)/VOL	A(1E)/VOL	BARNUC/VOL	ELNS/VOL
1	1.254E-01	2.257E+04	2.440E+03	4.474E+00	8.917E-06	1.519E-14	7.050E-26	1.408E-87	3.900-160	8.449E+03
2	1.255E-01	2.257E+04	2.439E+03	4.469E+00	8.892E-06	1.511E-14	6.994E-26	1.364E-87	3.678-160	8.448E+03
3	1.255E-01	2.256E+04	2.437E+03	4.462E+00	8.854E-06	1.498E-14	6.885E-26	1.300E-87	3.365-160	8.446E+03
4	1.256E-01	2.259E+04	2.434E+03	4.451E+00	8.798E-06	1.479E-14	6.739E-26	1.210E-87	2.942-160	8.443E+03
5	1.257E-01	2.260E+04	2.430E+03	4.435E+00	8.714E-06	1.450E-14	6.525E-26	1.085E-87	2.404-160	8.439E+03
6	1.259E-01	2.262E+04	2.424E+03	4.411E+00	8.589E-06	1.409E-14	6.218E-26	9.230E-88	1.778-160	8.433E+03
7	1.262E-01	2.265E+04	2.415E+03	4.375E+00	8.407E-06	1.349E-14	5.787E-26	7.247E-88	1.134-160	8.423E+03
8	1.268E-01	2.270E+04	2.401E+03	4.322E+00	8.144E-06	1.265E-14	5.199E-26	5.056E-88	5.800-161	8.410E+03
9	1.272E-01	2.279E+04	2.381E+03	4.245E+00	7.766E-06	1.149E-14	4.473E-26	2.958E-88	2.139-161	8.389E+03
10	1.282E-01	2.296E+04	2.350E+03	4.133E+00	7.235E-06	9.956E-15	3.490E-26	1.315E-88	4.753-162	8.359E+03
11	1.295E-01	2.321E+04	2.305E+03	3.972E+00	6.512E-06	8.043E-15	2.448E-26	3.996E-89	5.165-163	8.313E+03
12	1.316E-01	2.359E+04	2.239E+03	3.742E+00	5.562E-06	5.846E-15	1.440E-26	6.751E-90	1.880-164	8.246E+03
13	1.346E-01	2.413E+04	2.145E+03	3.422E+00	4.391E-06	3.618E-15	6.481E-27	4.640E-91	1.284-166	8.147E+03
14	1.390E-01	2.493E+04	1.992E+03	2.992E+00	3.073E-06	1.752E-15	1.936E-27	8.063E-93	6.987-170	7.998E+03
15	1.455E-01	2.613E+04	1.772E+03	2.441E+00	1.788E-06	5.812E-16	3.065E-28	1.666E-95	2.041-174	7.777E+03
16	1.548E-01	2.795E+04	1.441E+03	1.780E+00	7.793E-07	1.065E-16	1.785E-29	1.500E-99	2.969-179	7.444E+03
17	1.674E-01	2.782E+04	8.942E+02	1.102E+00	2.122E-07	7.505E-18	2.080E-31	3.195-104	2.954-184	6.944E+03
18	1.819E-01	3.014E+04	5.184E+02	5.115E-01	2.632E-08	1.023E-19	1.570E-34	4.001-109	2.296-189	6.185E+03
19	1.983E-01	3.293E+04	3.006E+02	1.486E-01	8.156E-10	7.946E-23	5.121E-39	3.675-114	1.496-194	5.008E+03
20	1.433E-01	3.937E+04	2.026E+02	1.434E-02	1.420E-12	2.432E-27	8.803E-44	2.734-119	8.531-200	3.026E+03
21	1.901E-01	4.872E+04	5.402E+01	7.301E-07	3.540E-17	3.929E-32	1.053E-48	1.738-124	4.355-205	5.402E+01
22	1.265E+02	5.731E+04	5.318E-03	7.307E-12	4.841E-22	4.431E-37	9.851E-54	9.777-130	2.026-210	3.316E-03
23	8.155E+13	5.859E+04	5.214E-08	8.260E-17	4.612E-27	3.918E-42	7.684E-59	4.983-135	8.732-216	5.519E-06
24	1.887E+04	5.888E+04	4.987E-07	4.262E-22	3.475E-32	2.894E-47	5.200E-64	2.341-140	3.528-221	8.976E-07
25	3.302E+04	5.803E+04	2.457E-07	2.547E-27	2.202E-37	1.857E-52	3.136E-69	1.026-145	1.348-226	2.457E-07
26	5.716E+04	4.920E+04	8.736E-08	1.354E-32	1.219E-42	1.064E-57	1.718E-74	4.238-151	4.905-232	8.030E-08
27	9.311E+04	4.231E+04	2.822E-08	1.923E-37	8.038E-48	5.547E-63	8.675E-80	1.661-156	1.709-237	2.626E-08
28	1.485E+05	3.368E+04	8.805E-09	8.849E-43	2.728E-53	2.662E-68	4.078E-85	6.217-162	5.728-243	6.805E-09
29	2.257E+05	2.193E+04	3.935E-10	3.247E-43	1.139E-58	1.192E-73	1.801E-90	2.231-167	1.853-248	8.935E-10
30	3.420E+05	8.104E+03	1.480E-11	8.471E-48	4.439E-64	5.022E-79	7.516E-96	7.711-173	5.800-254	1.485E-11
31	5.092E+05	4.125E+02	2.163E-13	9.201E-53	1.628E-69	2.002E-84	2.961-101	2.573-178	1.761-259	2.108E-15
32	7.537E+05	1.793E+01	7.627E-20	1.232E-57	5.655E-75	7.592E-90	1.129-106	8.311-184	5.200-265	7.627E-20
33	1.119E+06	2.552E-03	1.432E-24	1.335E-62	1.870E-80	2.752E-95	4.096-112	2.604-189	1.494-270	1.821E-24
34	1.664E+06	2.489E-05	5.407E-29	1.280E-67	5.910E-86	9.564-101	1.428-117	7.931-195	4.187-276	3.357E-29
35	2.480E+06	4.493E-09	5.207E-34	1.167E-72	1.792E-91	3.197-106	4.793-123	2.351-200	1.145-281	5.188E-34
36	3.357E+05	1.491E+01	1.271E-04	8.882E-73	2.560E-97	5.043-112	7.603-129	3.323-206	1.497-287	1.269E-04
37	3.356E+05	1.491E+01	1.271E-04	1.106E-77	4.945-107	1.074-121	1.629-138	6.423-216	0.	1.269E-04
38	3.356E+05	1.491E+01	1.271E-04	1.383E-82	3.824-122	9.112-137	1.391-153	5.011-231	0.	1.269E-04
39	3.356E+05	1.491E+01	1.271E-04	1.552E-87	7.096-143	1.845-157	2.836-174	9.438-252	0.	1.269E-04
40	3.356E+05	1.491E+01	1.271E-04	2.074E-92	5.835-167	1.087-181	1.683-198	5.206-276	0.	1.269E-04
+1	3.356E+05	1.491E+01	1.271E-04	2.574E-97	1.961-192	6.037-207	9.408-224	0.	0.	1.269E-04
+2	3.356E+05	1.491E+01	1.271E-04	3.189-102	2.335-209	2.292-233	3.594-250	0.	0.	1.269E-04
+3	3.356E+05	1.491E+01	1.271E-04	3.957-107	3.967-218	2.948-260	4.646-277	0.	0.	1.269E-04
+4	3.356E+05	1.491E+01	1.271E-04	4.914-112	6.754-227	3.881-288	0.	0.	0.	1.269E-04
+5	3.356E+05	1.491E+01	1.271E-04	6.110-117	1.153-235	0.	0.	0.	0.	1.269E-04
+6	3.356E+05	1.491E+01	1.271E-04	7.607-122	1.983-244	0.	0.	0.	0.	1.269E-04
+7	3.356E+05	1.491E+01	1.271E-04	9.507-127	3.620-253	0.	0.	0.	0.	1.269E-04
+8	3.356E+05	1.491E+01	1.271E-04	1.227-131	1.043-261	0.	0.	0.	0.	1.269E-04
+9	3.356E+05	1.491E+01	1.271E-04	2.095-136	9.789-270	0.	0.	0.	0.	1.269E-04
50	3.356E+05	1.491E+01	1.271E-04	1.043-140	1.687-277	0.	0.	0.	0.	1.269E-04
51	3.356E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.

I	ATOM/VOL	NITROGEN	N2	NO	OXYGEN	NO2	O2	O2+	O2-	O3
1	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	1.112E+16	.249	.542	.019	.084	.000	.106	0.000	.000	.000
24	3.046E+16	.221	.568	.022	.113	.000	.076	0.000	.000	.000
25	5.963E+16	.192	.600	.017	.142	.000	.050	0.000	.000	.000
26	1.032E+17	.168	.626	.011	.165	.000	.030	0.000	.000	.000
27	1.682E+17	.152	.645	.006	.182	.000	.015	0.000	.000	.000
28	2.647E+17	.141	.657	.003	.192	.000	.007	0.000	.000	.000
29	4.076E+17	.136	.663	.001	.197	.000	.002	0.000	.000	.000
30	6.176E+17	.134	.666	.000	.199	.000	.001	0.000	.000	0.000
31	9.197E+17	.133	.667	.000	.199	.000	.001	0.000	.000	0.000
32	1.361E+18	.134	.665	.000	.196	.000	.004	0.000	.000	.000
33	2.020E+18	.160	.639	.001	.164	.000	.036	0.000	.000	.000
34	3.006E+18	.229	.571	.000	.076	.000	.124	0.000	.000	.000
35	4.478E+18	.143	.657	.000	.057	.000	.141	0.000	.000	.002
36	1.148E+18	.256	.544	.000	.066	.000	.134	0.000	.000	.000
37	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
38	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
39	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
40	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
41	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
42	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
43	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
44	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
45	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
46	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
47	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
48	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
49	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
50	1.148E+18	.255	.544	.000	.066	.000	.134	0.000	.000	.000
51	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

-	ENERGY BAND (ERGS/GM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
1	1.000E-01	1.500E-01								
			1	5.6687EE-04	1.24391E-09	9.44016E-03	2.01473E+01	2.01473E+01	1.46315E-05	1.83771E-08
			2	5.6676EE-04	1.27305E-09	9.43746E-03	2.06251E+01	2.06251E+01	1.50479E-05	7.56007E-08
			3	5.6665E-04	1.3409E-09	9.43332E-03	2.17338E+01	2.17338E+01	1.60216E-05	1.81108E-07
			4	5.6635EE-04	1.3882EE-09	9.42701E-03	2.25170E+01	2.25170E+01	1.67313E-05	3.36232E-07
			5	5.6798E-04	1.42017E-09	9.41751E-03	2.30580E+01	2.30580E+01	1.72326E-05	5.41104E-07
			6	5.6742IE-04	1.4418IE-09	9.40333E-03	2.34450E+01	2.34450E+01	1.75957E-05	7.95609E-07
			7	5.6658EE-04	1.4561EE-09	9.38226E-03	2.37322E+01	2.37322E+01	1.78665E-05	1.09957E-06
			8	5.6535EE-04	1.4647EE-09	9.35107E-03	2.39522E+01	2.39522E+01	1.80729E-05	1.45277E-06
			9	5.6354IE-04	1.4679EE-09	9.3049EE-03	2.41249E+01	2.41249E+01	1.82320E-05	1.85485E-06
			10	5.6085IE-04	1.4654EE-09	9.23693E-03	2.42628E+01	2.42628E+01	1.83542E-05	2.30529E-06
			11	5.5684EE-04	1.4555EE-09	9.13653E-03	2.43739E+01	2.43739E+01	1.84449E-05	2.80318E-06
			12	5.5104EE-04	1.4374IE-09	8.98850E-03	2.44636E+01	2.44636E+01	1.85059E-05	3.34706E-06
			13	5.4243EE-04	1.4062EE-09	8.77058E-03	2.45352E+01	2.45352E+01	1.85355E-05	3.93442E-06
			14	5.2975EE-04	1.3573IE-09	8.45070E-03	2.45909E+01	2.45909E+01	1.85274E-05	4.56101E-06
			15	5.1123EE-04	1.2831EE-09	7.98359E-03	2.46320E+01	2.46320E+01	1.84689E-05	5.21930E-06
			16	4.8435EE-04	1.1736EE-09	7.30811E-03	2.46598E+01	2.46598E+01	1.83354E-05	5.89548E-06
			17	4.4596EE-04	1.0158EE-09	6.34617E-03	2.46754E+01	2.46754E+01	1.80793E-05	6.56251E-06
			18	3.9265EE-04	7.9576EE-10	5.01342E-03	2.46768E+01	2.46768E+01	1.76011E-05	7.16265E-06
			19	3.2241EE-04	5.0466EE-10	3.25470E-03	2.46278E+01	2.46278E+01	1.66762E-05	7.56127E-06
			20	2.3389IE-04	1.6092IE-10	1.14297E-03	2.41026E+01	2.41026E+01	1.48379E-05	7.45457E-06
			21	1.4558EE-04	3.4787EE-14	3.30731E-07	2.19244E+01	2.19244E+01	1.25437E-05	6.94793E-06
			22	1.0847EE-16	5.5715EE-22	1.6511EE-15	2.00413E+01	2.00413E+01	1.06029E-05	6.44552E-06
			23	9.4011EE-22	1.3553IE-27	4.9154EE-21	1.8398EE+01	1.8398EE+01	8.94758E-06	5.94499E-06
			24	1.2876EE-23	3.6515EE-29	1.3249EE-22	1.6944EE+01	1.6944EE+01	7.52659E-06	5.44516E-06
			25	1.0464EE-24	2.7222EE-30	1.0054EE-23	1.5631EE+01	1.5631EE+01	6.30051E-06	4.94590E-06
			26	1.1423EE-25	2.8758EE-31	1.0863EE-24	1.4410EE+01	1.4410EE+01	5.23906E-06	4.44825E-06
			27	1.3734EE-26	3.4024EE-32	1.1748EE-25	1.3234EE+01	1.3234EE+01	4.31917E-06	3.95474E-06
			28	1.9053EE-27	4.8304EE-33	7.9856EE-27	1.2066EE+01	1.2066EE+01	3.52348E-06	3.46959E-06
			29	1.9391IE-29	5.5318EE-35	1.5954EE-28	1.0882EE+01	1.0882EE+01	2.83886E-06	2.99868E-06
			30	8.4265EE-33	1.0403EE-38	3.9243EE-32	9.6717EE+00	9.6717EE+00	2.25505E-06	2.54911E-06
			31	1.6953EE-40	2.6762EE-46	7.8990EE-40	8.4456EE+00	8.4456EE+00	1.76333E-06	2.12837E-06
			32	9.1444IE-49	5.0183EE-55	9.1454IE-49	7.2274EE+00	7.2274EE+00	1.35555E-06	1.74343E-06
			33	3.9493EE-56	3.4598E9E-64	3.6293EE-58	6.0497EE+00	6.0497EE+00	1.02343E-06	1.39984E-06
			34	6.2522EE-67	1.8485EE-73	4.6639EE-68	4.9466EE+00	4.9466EE+00	7.5829EE-07	1.10100E-06
			35	9.0063EE-77	5.9473EE-83	2.5311EE-79	3.9479EE+00	3.9479EE+00	5.51102E-07	8.47926E-07
			36	6.5899EE-10	3.2771EE-24	4.0488IE-20	3.0741EE+00	3.0741EE+00	3.92750E-07	6.39310E-07
			37	8.5714EE-18	2.4506EE-24	4.0326EE-20	2.3355IE+00	2.3355IE+00	2.74441E-07	4.71891E-07
			38	8.5714EE-18	1.8466EE-24	4.0326EE-20	1.7314EE+00	1.7314EE+00	1.88040E-07	3.41042E-07
			39	8.5714EE-18	1.3363EE-24	4.0326EE-20	1.2531EE+00	1.2531EE+00	1.26358E-07	2.41390E-07
			40	8.5714EE-18	9.4483EE-25	4.0326EE-20	8.8579EE-01	8.8579EE-01	8.32945E-08	1.67389E-07
			41	8.5714EE-18	6.5259EE-25	4.0326EE-20	6.1194EE-01	6.1194EE-01	5.38823E-08	1.13764E-07
			42	8.5714EE-18	4.4685EE-25	4.0326EE-20	4.1343EE-01	4.1343EE-01	3.42186E-08	7.58141E-08
			43	8.5714EE-18	2.9150EE-25	4.0326EE-20	2.7335EE-01	2.7335EE-01	2.13429E-08	4.95655E-08
			44	8.5714EE-18	1.8876EE-25	4.0326EE-20	1.7699EE-01	1.7699EE-01	1.30803E-08	3.18062E-08
			45	8.5714EE-18	1.1977EE-25	4.0326EE-20	1.1231EE-01	1.1231EE-01	7.88064E-09	2.00436E-08
			46	8.5714EE-18	7.4533EE-26	4.0326EE-20	6.9891EE-02	6.9891EE-02	4.66976E-09	1.24108E-08
			47	8.5714EE-18	4.5519EE-26	4.0326EE-20	4.2682EE-02	4.2682EE-02	2.72285E-09	7.55456E-09
			48	8.5714EE-18	2.7298EE-26	4.0326EE-20	2.5597EE-02	2.5597EE-02	1.56300E-09	4.52305E-09
			49	8.5714EE-18	1.6047EE-26	4.0326EE-20	1.5085EE-02	1.5085EE-02	8.83699E-10	2.66493E-09
			50	8.5714EE-18	9.5215EE-27	4.0326EE-20	8.7412EE-03	8.7412EE-03	4.92335E-10	1.54593E-09

L	ENERGY BAND (ERGS/GRAM)	I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
2	1.500E-01 4.500E-01								
		1	1.3[illegible]947E-04	4.59947E-09	4.85604E-02	2.05022E+02	2.05022E+02	1.54343E-04	1.93855E-07
		2	1.3[illegible]908E-04	4.91876E-09	4.85466E-02	2.14651E+02	2.14651E+02	1.61918E-04	8.13478E-07
		3	1.3[illegible]847E-04	5.44496E-09	4.85253E-02	2.37721E+02	2.37721E+02	1.80146E-04	2.03637E-06
		4	1.3[illegible]754E-04	5.86798E-09	4.84929E-02	2.56361E+02	2.56361E+02	1.95111E-04	3.92096E-06
		5	1.3[illegible]615E-04	6.18929E-09	4.84441E-02	2.70675E+02	2.70675E+02	2.06765E-04	6.49242E-06
		6	1.3[illegible]407E-04	6.43212E-09	4.83712E-02	2.81723E+02	2.81723E+02	2.15856E-04	9.76014E-06
		7	1.3[illegible]099E-04	6.61483E-09	4.82630E-02	2.90382E+02	2.90382E+02	2.23025E-04	1.37259E-05
		8	1.3[illegible]642E-04	6.74919E-09	4.81028E-02	2.97278E+02	2.97278E+02	2.28739E-04	1.83870E-05
		9	1.3[illegible]967E-04	6.84135E-09	4.78650E-02	3.02843E+02	3.02843E+02	2.33319E-04	2.37369E-05
		10	1.3[illegible]971E-04	6.89250E-09	4.75165E-02	3.07377E+02	3.07377E+02	2.36976E-04	2.97642E-05
		11	1.3[illegible]500E-04	6.89899E-09	4.70007E-02	3.11081E+02	3.11081E+02	2.39840E-04	3.64499E-05
		12	1.3[illegible]331E-04	6.85160E-09	4.62404E-02	3.14087E+02	3.14087E+02	2.41962E-04	4.37622E-05
		13	1.27134E-04	6.73424E-09	4.51213E-02	3.16471E+02	3.16471E+02	2.43323E-04	5.16486E-05
		14	1.22433E-04	6.52188E-09	4.34739E-02	3.18257E+02	3.18257E+02	2.43810E-04	6.00201E-05
		15	1.15557E-04	6.17793E-09	4.10819E-02	3.19416E+02	3.19416E+02	2.43184E-04	6.87238E-05
		16	1.05583E-04	5.65228E-09	3.76157E-02	3.19842E+02	3.19842E+02	2.40996E-04	7.74890E-05
		17	9.13388E-05	4.88134E-09	3.26825E-02	3.19292E+02	3.19292E+02	2.36418E-04	8.58161E-05
		18	7.15593E-05	3.79916E-09	2.58501E-02	3.17197E+02	3.17197E+02	2.27874E-04	9.27318E-05
		19	4.54975E-05	2.37565E-09	1.68319E-02	3.11961E+02	3.11961E+02	2.12317E-04	9.62679E-05
		20	1.45549E-05	7.40021E-10	5.97029E-03	2.97631E+02	2.97631E+02	1.85511E-04	9.32008E-05
		21	3.94496E-09	1.78670E-13	1.74659E-06	2.70592E+02	2.70592E+02	1.56138E-04	8.64844E-05
		22	5.67917E-17	1.60477E-21	7.54922E-15	2.47161E+02	2.47161E+02	1.31285E-04	7.98087E-05
		23	1.57986E-22	5.99128E-27	2.13786E-20	2.26577E+02	2.26577E+02	1.10102E-04	7.31543E-05
		24	4.80093E-24	1.60270E-28	5.63111E-22	2.08119E+02	2.08119E+02	9.19424E-05	6.65163E-05
		25	3.70411E-25	1.18476E-29	4.19725E-23	1.91097E+02	1.91097E+02	7.63135E-05	5.99061E-05
		26	4.22944E-26	1.23801E-30	4.45158E-24	1.74883E+02	1.74883E+02	6.28396E-05	5.33543E-05
		27	4.85253E-27	1.29110E-31	4.71788E-25	1.58963E+02	1.58963E+02	5.12366E-05	4.69134E-05
		28	5.53442E-28	8.45944E-33	3.12850E-26	1.42998E+02	1.42998E+02	4.12886E-05	4.06571E-05
		29	6.77092E-30	1.43776E-34	5.28222E-28	1.26866E+02	1.26866E+02	3.28267E-05	3.46747E-05
		30	2.21652E-33	4.10566E-38	1.39511E-31	1.10667E+02	1.10667E+02	2.57096E-05	2.90621E-05
		31	6.52057E-41	1.00163E-45	2.37651E-39	9.46792E+01	9.46792E+01	1.98090E-05	2.39098E-05
		32	1.29811E-49	1.72210E-54	1.95555E-48	7.92917E+01	7.92917E+01	1.49993E-05	1.92913E-05
		33	1.12412E-58	1.22139E-63	4.51069E-58	6.49154E+01	6.49154E+01	1.11525E-05	1.52542E-05
		34	5.85468E-68	4.91300E-73	2.34651E-68	5.19092E+01	5.19092E+01	8.13798E-06	1.18158E-05
		35	2.13663E-77	1.44886E-82	1.48132E-80	4.05251E+01	4.05251E+01	5.82583E-06	8.96363E-06
		36	1.51353E-18	7.82549E-24	3.46321E-21	3.08844E+01	3.08844E+01	4.09095E-06	6.65916E-06
		37	1.51440E-18	5.52480E-24	3.44230E-21	2.29797E+01	2.29797E+01	2.81783E-06	4.84515E-06
		38	1.51440E-18	4.25271E-24	3.44230E-21	1.66987E+01	1.66987E+01	1.90405E-06	3.45331E-06
		39	1.51440E-18	3.00528E-24	3.44230E-21	1.18563E+01	1.18563E+01	1.26245E-06	2.41175E-06
		40	1.51440E-18	2.09601E-24	3.44230E-21	8.22963E+00	8.22963E+00	8.21576E-07	1.65104E-06
		41	1.51440E-18	1.41637E-24	3.44230E-21	5.58780E+00	5.58780E+00	5.24971E-07	1.10839E-06
		42	1.51440E-18	9.41339E-25	3.44230E-21	3.71373E+00	3.71373E+00	3.29495E-07	7.30025E-07
		43	1.51440E-18	6.12791E-25	3.44230E-21	2.41756E+00	2.41756E+00	2.03223E-07	4.71955E-07
		44	1.51440E-18	3.96991E-25	3.44230E-21	1.54252E+00	1.54252E+00	1.23226E-07	2.99638E-07
		45	1.51440E-18	2.44677E-25	3.44230E-21	9.65298E-01	9.65298E-01	7.34908E-08	1.86916E-07
		46	1.51440E-18	1.50276E-25	3.44230E-21	5.92864E-01	5.92864E-01	4.31286E-08	1.14623E-07
		47	1.51440E-18	9.06411E-26	3.44230E-21	3.57593E-01	3.57593E-01	2.49173E-08	6.91330E-08
		48	1.51440E-18	5.57245E-26	3.44230E-21	2.11952E-01	2.11952E-01	1.41786E-08	4.10305E-08
		49	1.51440E-18	3.13109E-26	3.44230E-21	1.23526E-01	1.23526E-01	7.94996E-09	2.39743E-08
		50	1.51440E-18	1.79534E-26	3.44230E-21	7.08291E-02	7.08291E-02	4.39422E-09	1.37978E-08

L	ENERGY BAND (ERGS/MMV)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
5	4.500E-01	1.000E+00								
			1	1.349218-05	1.214866-09	6.12593E-02	5.37964E+02	5.37964E+02	4.73981E-04	5.95320E-07
			2	1.348826-05	1.332856-09	6.12419E-02	5.90382E+02	5.90382E+02	5.12401E-04	2.57430E-06
			3	1.348226-05	1.634936-09	6.12152E-02	7.24512E+02	7.24512E+02	6.09228E-04	6.88672E-06
			4	1.347516-05	1.944866-09	6.11745E-02	8.62445E+02	8.62445E+02	7.03779E-04	1.41431E-05
			5	1.345946-05	2.243546-09	6.11132E-02	9.95895E+02	9.95895E+02	7.91009E-04	2.48377E-05
			6	1.343906-05	2.525946-09	6.10216E-02	1.12296E+03	1.12296E+03	8.70574E-04	3.93639E-05
			7	1.340866-05	2.769936-09	6.08855E-02	1.24313E+03	1.24313E+03	9.42886E-04	5.80290E-05
			8	1.336376-05	3.033676-09	6.06840E-02	1.35628E+03	1.35628E+03	1.00841E-03	8.10598E-05
			9	1.329736-05	3.254546-09	6.03853E-02	1.46233E+03	1.46233E+03	1.06746E-03	1.08599E-04
			10	1.319926-05	3.448906-09	5.99468E-02	1.56113E+03	1.56113E+03	1.12018E-03	1.40694E-04
			11	1.305466-05	3.610256-09	5.92945E-02	1.65227E+03	1.65227E+03	1.16640E-03	1.77265E-04
			12	1.284116-05	3.729146-09	5.83429E-02	1.73505E+03	1.73505E+03	1.20562E-03	2.18054E-04
			13	1.252666-05	3.791316-09	5.69368E-02	1.80826E+03	1.80826E+03	1.23682E-03	2.62533E-04
			14	1.206446-05	3.776096-09	5.48745E-02	1.87000E+03	1.87000E+03	1.25829E-03	3.09760E-04
			15	1.136636-05	3.654696-09	5.18668E-02	1.91733E+03	1.91733E+03	1.26725E-03	3.58126E-04
			16	1.040616-05	3.389746-09	4.75219E-02	1.94581E+03	1.94581E+03	1.25949E-03	4.04972E-04
			17	9.008716-06	2.958686-09	4.13449E-02	1.94887E+03	1.94887E+03	1.22865E-03	4.45982E-04
			18	7.566666-06	2.267106-09	3.27974E-02	1.91690E+03	1.91690E+03	1.16558E-03	4.74325E-04
			19	4.515556-06	1.384896-09	2.15108E-02	1.83642E+03	1.83642E+03	1.05824E-03	4.79825E-04
			20	1.465346-06	4.281626-10	7.81730E-03	1.69003E+03	1.69003E+03	9.00035E-04	4.52177E-04
			21	3.986796-10	1.067116-13	2.34853E-06	1.50925E+03	1.50925E+03	7.42897E-04	4.11488E-04
			22	5.301136-16	7.496196-22	7.58714E-15	1.34746E+03	1.34746E+03	6.11333E-04	3.71632E-04
			23	1.333456-23	2.681286-27	1.79334E-20	1.20035E+03	1.20035E+03	5.00775E-04	3.32727E-04
			24	5.010286-25	8.768976-29	4.46653E-22	1.06467E+03	1.06467E+03	4.07711E-04	2.94961E-04
			25	5.062006-26	4.741996-30	3.18362E-23	9.38113E+02	9.38113E+02	3.29408E-04	2.58586E-04
			26	5.596026-27	4.656846-31	3.23013E-24	8.19270E+02	8.19270E+02	2.63705E-04	2.23900E-04
			27	5.453176-28	4.537766-32	3.25945E-25	7.07538E+02	7.07538E+02	2.08858E-04	1.91236E-04
			28	2.735226-29	2.760516-33	2.03511E-26	6.02979E+02	6.02979E+02	1.63425E-04	1.60925E-04
			29	5.056696-31	4.317716-35	3.15764E-28	5.06120E+02	5.06120E+02	1.26170E-04	1.33272E-04
			30	1.390146-34	1.111786-38	7.15892E-32	4.17724E+02	4.17724E+02	9.59971E-05	1.08515E-04
			31	4.253256-42	2.262436-46	8.09305E-40	3.38547E+02	3.38547E+02	7.19125E-05	8.67996E-05
			32	2.455766-51	1.967506-55	2.81908E-49	2.69143E+02	2.69143E+02	5.29965E-05	6.81611E-05
			33	4.944456-60	1.737046-64	1.46540E-59	2.09723E+02	2.09723E+02	3.83987E-05	5.25211E-05
			34	2.241316-69	1.005826-74	3.32305E-71	1.60095E+02	1.60095E+02	2.73414E-05	3.96979E-05
			35	2.524056-79	1.667546-83	4.23066E-88	1.19687E+02	1.19687E+02	1.91264E-05	2.94278E-05
			36	5.899676-20	5.652406-25	8.28935E-28	8.76223E+01	8.76223E+01	1.31428E-05	2.13936E-05
			37	5.901686-20	5.205556-25	8.14619E-28	6.28197E+01	6.28197E+01	8.87110E-06	1.52535E-05
			38	5.901886-20	4.357666-25	8.14619E-28	4.41132E+01	4.41132E+01	5.88207E-06	1.06681E-05
			39	5.901886-20	2.958046-25	8.14619E-28	3.03495E+01	3.03495E+01	3.83191E-06	7.32039E-06
			40	5.901886-20	2.021556-25	8.14619E-28	2.04644E+01	2.04644E+01	2.45319E-06	4.92992E-06
			41	5.901886-20	1.336516-25	8.14619E-28	1.35297E+01	1.35297E+01	1.54382E-06	3.25952E-06
			42	5.901886-20	8.867536-26	8.14619E-28	8.77426E+00	8.77426E+00	9.55325E-07	2.11660E-06
			43	5.901886-20	5.516496-26	8.14619E-28	5.58442E+00	5.58442E+00	5.81495E-07	1.35043E-06
			44	5.901886-20	3.447396-26	8.14619E-28	3.48984E+00	3.48984E+00	3.48291E-07	8.46911E-07
			45	5.901886-20	2.116396-26	8.14619E-28	2.14246E+00	2.14246E+00	2.05356E-07	5.22302E-07
			46	5.901886-20	1.277046-26	8.14619E-28	1.29276E+00	1.29276E+00	1.19237E-07	3.16896E-07
			47	5.901886-20	7.577636-27	8.14619E-28	7.67094E-01	7.67094E-01	6.82070E-08	1.89241E-07
			48	5.901886-20	4.423596-27	8.14619E-28	4.47835E-01	4.47835E-01	3.84532E-08	1.11277E-07
			49	5.901886-20	2.582316-27	8.14619E-28	2.57362E-01	2.57362E-01	2.13744E-08	6.44578
			50	5.901886-20	1.453076-27	8.14619E-28	1.45659E-01	1.45659E-01	1.17188E-08	3.67972

L	ENERGY BAND (ERGS/MMM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
4	1.000E+00	1.820E+00								
			1	2.21883E-06	1.81529E-10	5.00411E-02	4.88794E+02	4.88794E+02	6.47670E-04	8.13474E-07
			2	2.21519E-06	2.01122E-10	5.00270E-02	5.41709E+02	5.41709E+02	7.10825E-04	3.57118E-06
			3	2.21721E-06	2.51962E-10	5.00053E-02	6.78944E+02	6.78944E+02	8.72426E-04	9.86190E-06
			4	2.21572E-06	3.06515E-10	4.99723E-02	8.26501E+02	8.26501E+02	1.03844E-03	2.08685E-05
			5	2.21347E-06	3.61607E-10	4.99225E-02	9.76043E+02	9.76043E+02	1.19872E-03	3.76399E-05
			6	2.21011E-06	4.16222E-10	4.98431E-02	1.12516E+03	1.12516E+03	1.35080E-03	6.10778E-05
			7	2.20513E-06	4.69760E-10	4.97375E-02	1.27276E+03	1.27276E+03	1.49387E-03	9.19386E-05
			8	2.19776E-06	5.21635E-10	4.95738E-02	1.41805E+03	1.41805E+03	1.62753E-03	1.30828E-04
			9	2.18686E-06	5.71101E-10	4.93319E-02	1.56026E+03	1.56026E+03	1.75141E-03	1.78181E-04
			10	2.17077E-06	6.17093E-10	4.89748E-02	1.69841E+03	1.69841E+03	1.86488E-03	2.34229E-04
			11	2.14702E-06	6.58048E-10	4.84482E-02	1.83116E+03	1.83116E+03	1.96691E-03	2.98924E-04
			12	2.11199E-06	6.91659E-10	4.76722E-02	1.95661E+03	1.95661E+03	2.05582E-03	3.71824E-04
			13	2.06039E-06	7.14564E-10	4.65311E-02	2.07203E+03	2.07203E+03	2.12893E-03	4.51894E-04
			14	1.98458E-06	7.21973E-10	4.48590E-02	2.17349E+03	2.17349E+03	2.18215E-03	5.37193E-04
			15	1.87374E-06	7.07340E-10	4.24234E-02	2.25540E+03	2.25540E+03	2.20938E-03	6.24369E-04
			16	1.71312E-06	6.62341E-10	3.89106E-02	2.30993E+03	2.30993E+03	2.20171E-03	7.07930E-04
			17	1.48397E-06	5.77820E-10	3.39259E-02	2.32634E+03	2.32634E+03	2.14668E-03	7.79210E-04
			18	1.16596E-06	4.47049E-10	2.70392E-02	2.29072E+03	2.29072E+03	2.02789E-03	8.25239E-04
			19	7.46662E-07	2.73275E-10	1.79419E-02	2.18666E+03	2.18666E+03	1.82716E-03	8.28466E-04
			20	2.49761E-07	8.35586E-11	6.77956E-03	1.99833E+03	1.99833E+03	1.54089E-03	7.74145E-04
			21	5.81370E-11	2.01928E-14	2.12574E-06	1.77060E+03	1.77060E+03	1.26229E-03	6.99180E-04
			22	5.09714E-19	1.33679E-22	4.30188E-15	1.56690E+03	1.56690E+03	1.03023E-03	6.26279E-04
			23	1.79249E-24	4.14777E-28	7.60702E-21	1.38249E+03	1.38249E+03	8.36439E-04	5.55750E-04
			24	5.00539E-26	1.01693E-29	1.73174E-22	1.21383E+03	1.21383E+03	6.74552E-04	4.88008E-04
			25	3.40102E-27	6.91106E-31	1.14880E-23	1.05845E+03	1.05845E+03	5.39550E-04	4.23547E-04
			26	4.31750E-28	8.61081E-32	1.08554E-24	9.14803E+02	9.14803E+02	4.27423E-04	3.62906E-04
			27	4.79043E-29	9.27088E-33	1.01226E-25	7.82096E+02	7.82096E+02	3.34882E-04	3.06626E-04
			28	5.35397E-30	1.03593E-34	9.73716E-27	6.60151E+02	6.60151E+02	2.59166E-04	2.55201E-04
			29	6.09522E-32	1.16027E-36	7.76974E-29	5.49184E+02	5.49184E+02	1.97882E-04	2.09022E-04
			30	1.52808E-35	1.37564E-39	1.37724E-32	4.49588E+02	4.49588E+02	1.48915E-04	1.68333E-04
			31	4.30143E-43	2.60420E-47	8.00642E-41	3.61715E+02	3.61715E+02	1.10356E-04	1.33201E-04
			32	6.42973E-52	3.76597E-56	6.69499E-51	2.85703E+02	2.85703E+02	8.04775E-05	1.03506E-04
			33	4.82666E-61	2.78835E-65	2.59651E-62	2.21366E+02	2.21366E+02	5.77220E-05	7.89513E-05
			34	2.19233E-70	5.14216E-75	1.98363E-76	1.68154E+02	1.68154E+02	4.07031E-05	5.90983E-05
			35	5.10493E-80	1.69820E-84	6.24167-102	1.25183E+02	1.25183E+02	2.82113E-05	4.34059E-05
			36	5.74430E-21	8.77992E-26	6.02634E-40	9.13172E+01	9.13172E+01	1.92165E-05	3.12801E-05
			37	5.74653E-21	8.27796E-26	5.80070E-40	6.52707E+01	6.52707E+01	1.28639E-05	2.21189E-05
			38	5.74653E-21	4.39734E-26	5.80070E-40	4.57183E+01	4.57183E+01	8.46343E-06	1.53498E-05
			39	5.74653E-21	3.01898E-26	5.80070E-40	3.13877E+01	3.13877E+01	5.47347E-06	1.04564E-05
			40	5.74653E-21	2.03216E-26	5.80070E-40	2.11279E+01	2.11279E+01	3.48025E-06	6.99392E-06
			41	5.74653E-21	1.34164E-26	5.80070E-40	1.39488E+01	1.39488E+01	2.17622E-06	4.59473E-06
			42	5.74653E-21	8.69108E-27	5.80070E-40	9.03594E+00	9.03594E+00	1.33865E-06	2.96588E-06
			43	5.74653E-21	5.52662E-27	5.80070E-40	5.74592E+00	5.74592E+00	8.10293E-07	1.88178E-06
			44	5.74653E-21	3.45140E-27	5.80070E-40	3.58835E+00	3.58835E+00	4.82816E-07	1.17402E-06
			45	5.74653E-21	2.11781E-27	5.80070E-40	2.20185E+00	2.20185E+00	2.83296E-07	7.20536E-07
			46	5.74653E-21	1.27746E-27	5.80070E-40	1.32815E+00	1.32815E+00	1.63750E-07	4.35198E-07
			47	5.74653E-21	7.57949E-28	5.80070E-40	7.87921E-01	7.87921E-01	9.32750E-08	2.58792E-07
			48	5.74653E-21	4.42393E-28	5.80070E-40	4.59947E-01	4.59947E-01	5.23790E-08	1.51576E-07
			49	5.74653E-21	2.54232E-28	5.80070E-40	2.64320E-01	2.64320E-01	2.90082E-08	8.74788E-08
			50	5.74653E-21	1.43898E-28	5.80070E-40	1.49608E-01	1.49608E-01	1.58496E-08	4.97678E-08

L	ENERGY EAGE (ERGS/MMC)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
5	1.420E+00	5.260E+00								
			1	4.529746-07	2.699306-11	3.34213E-02	3.33913E+02	3.33913E+02	5.46654E-04	6.86597E-07
			2	4.428356-07	2.997406-11	3.34120E-02	3.70895E+02	3.70895E+02	6.02716E-04	3.02805E-06
			3	4.426226-07	3.773206-11	3.33977E-02	4.67107E+02	4.67107E+02	7.47054E-04	8.44470E-06
			4	4.422966-07	4.614476-11	3.33758E-02	5.71625E+02	5.71625E+02	8.98409E-04	1.80544E-05
			5	4.418106-07	5.473446-11	3.33429E-02	6.78719E+02	6.78719E+02	1.04763E-03	3.28956E-05
			6	4.411816-07	6.334856-11	3.32937E-02	7.86726E+02	7.86726E+02	1.19214E-03	5.39039E-05
			7	4.799996-07	7.189426-11	3.32204E-02	8.94868E+02	8.94868E+02	1.33079E-03	8.19020E-05
			8	4.786976-07	8.027896-11	3.31120E-02	1.00258E+03	1.00258E+03	1.46278E-03	1.17584E-04
			9	4.760306-07	8.838286-11	3.29519E-02	1.10927E+03	1.10927E+03	1.58734E-03	1.61489E-04
			10	4.725356-07	9.603326-11	3.27153E-02	1.21421E+03	1.21421E+03	1.70343E-03	2.13951E-04
			11	4.673776-07	1.029756-10	3.23667E-02	1.31634E+03	1.31634E+03	1.80966E-03	2.75024E-04
			12	4.597706-07	1.088296-10	3.18533E-02	1.41419E+03	1.41419E+03	1.90392E-03	3.44350E-04
			13	4.495676-07	1.130416-10	3.10990E-02	1.50562E+03	1.50562E+03	1.98316E-03	4.20954E-04
			14	4.321136-07	1.148226-10	2.99954E-02	1.58756E+03	1.58756E+03	2.04291E-03	5.02916E-04
			15	4.086686-07	1.130876-10	2.83910E-02	1.65571E+03	1.65571E+03	2.07671E-03	5.86877E-04
			16	3.752456-07	1.064566-10	2.60832E-02	1.70405E+03	1.70405E+03	2.07544E-03	6.67329E-04
			17	3.235956-07	9.340346-11	2.28186E-02	1.72451E+03	1.72451E+03	2.02681E-03	7.35699E-04
			18	2.547336-07	7.277156-11	1.83211E-02	1.70680E+03	1.70680E+03	1.91546E-03	7.79485E-04
			19	1.658936-07	4.496296-11	1.23806E-02	1.63906E+03	1.63906E+03	1.72560E-03	7.82416E-04
			20	5.571966-08	1.407656-11	4.97372E-03	1.50936E+03	1.50936E+03	1.45527E-03	7.31129E-04
			21	1.548676-11	3.489646-15	1.66814E-06	1.34625E+03	1.34625E+03	1.19132E-03	6.59866E-04
			22	9.860456-20	1.983776-23	1.63671E-15	1.19955E+03	1.19955E+03	9.71603E-04	5.90641E-04
			23	5.275616-25	5.849016-29	1.87053E-21	1.06586E+03	1.06586E+03	7.88297E-04	5.23763E-04
			24	9.034016-27	1.425316-30	3.72569E-23	9.42614E+02	9.42614E+02	6.35327E-04	4.59631E-04
			25	5.475286-28	9.667506-32	2.22229E-24	8.28053E+02	8.28053E+02	5.07910E-04	3.98710E-04
			26	7.655686-29	9.240956-33	1.89073E-25	7.21077E+02	7.21077E+02	4.02204E-04	3.41494E-04
			27	5.427196-30	8.761666-34	1.56997E-26	6.21182E+02	6.21182E+02	3.15057E-04	2.88474E-04
			28	7.650226-31	5.173536-35	7.72171E-28	5.28348E+02	5.28348E+02	2.43818E-04	2.40088E-04
			29	1.052836-32	7.404666-37	8.57508E-30	4.42896E+02	4.42896E+02	1.86197E-04	1.96679E-04
			30	5.114826-36	1.906536-40	1.06324E-33	3.65317E+02	3.65317E+02	1.40175E-04	1.58454E-04
			31	7.224786-44	3.566586-48	2.36281E-42	2.96097E+02	2.96097E+02	1.03939E-04	1.25456E-04
			32	1.141116-52	4.499266-57	2.46996E-53	2.35569E+02	2.35569E+02	7.58552E-05	9.75608E-05
			33	1.362146-62	2.486306-66	2.04576E-66	1.83806E+02	1.83806E+02	5.44569E-05	7.44853E-05
			34	5.645216-71	8.576606-76	3.22725E-84	1.40572E+02	1.40572E+02	3.84416E-05	5.58147E-05
			35	1.353796-80	2.586606-85	1.49409-122	1.05334E+02	1.05334E+02	2.66756E-05	4.10430E-05
			36	5.595036-22	1.241756-26	4.81738E-58	7.73205E+01	7.73205E+01	1.81939E-05	2.96156E-05
			37	5.594626-22	8.432886-27	4.49471E-58	5.55985E+01	5.55985E+01	1.21961E-05	2.09708E-05
			38	5.594626-22	6.292546-27	4.49471E-58	3.91672E+01	3.91672E+01	8.03569E-06	1.45741E-05
			39	5.594626-22	4.343026-27	4.49471E-58	2.70376E+01	2.70376E+01	5.20461E-06	9.94276E-06
			40	5.594626-22	2.439246-27	4.49471E-58	1.82950E+01	1.82950E+01	3.31437E-06	6.66055E-06
			41	5.594626-22	1.950196-27	4.49471E-58	1.21387E+01	1.21387E+01	2.07571E-06	4.38252E-06
			42	5.594626-22	1.284336-27	4.49471E-58	7.90079E+00	7.90079E+00	1.27882E-06	2.83334E-06
			43	5.594626-22	3.108196-28	4.49471E-58	5.04685E+00	5.04685E+00	7.75298E-07	1.80051E-06
			44	5.594626-22	5.085446-28	4.49471E-58	3.16540E+00	3.16540E+00	4.62689E-07	1.12508E-06
			45	5.594626-22	3.133376-28	4.49471E-58	1.95033E+00	1.95033E+00	2.71910E-07	6.91575E-07
			46	5.594626-22	1.849476-28	4.49471E-58	1.18106E+00	1.18106E+00	1.57411E-07	4.18351E-07
			47	5.594626-22	1.126996-28	4.49471E-58	7.03292E-01	7.03292E-01	8.98011E-08	2.49153E-07
			48	5.594626-22	6.619416-29	4.49471E-58	4.12018E-01	4.12018E-01	5.05041E-08	1.46150E-07
			49	5.594626-22	3.817056-29	4.49471E-58	2.37588E-01	2.37588E-01	2.80112E-08	8.44723E-08
			50	5.594626-22	2.167576-29	4.49471E-58	1.34918E-01	1.34918E-01	1.53271E-08	4.81272E-08

L	ENERGY BAND (ERGS/GM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
5	3.260E+09	4.130E+09								
			1	1.19573E-07	1.38790E-12	6.86759E-03	6.93470E+01	6.93470E+01	2.87724E-04	3.61382E-07
			2	1.19539E-07	1.54289E-12	6.86569E-03	7.71136E+01	7.71136E+01	3.17585E-04	1.59555E-06
			3	1.19486E-07	1.94696E-12	6.86279E-03	9.73517E+01	9.73517E+01	3.94585E-04	4.46039E-06
			4	1.19406E-07	2.38739E-12	6.85837E-03	1.19454E+02	1.19454E+02	4.75754E-04	9.56076E-06
			5	1.19286E-07	2.83982E-12	6.85168E-03	1.42235E+02	1.42235E+02	5.56229E-04	1.74656E-05
			6	1.19106E-07	3.29645E-12	6.84166E-03	1.65356E+02	1.65356E+02	6.34603E-04	2.86942E-05
			7	1.18839E-07	3.75260E-12	6.82678E-03	1.88661E+02	1.88661E+02	7.10225E-04	4.37101E-05
			8	1.18442E-07	4.20358E-12	6.80473E-03	2.12040E+02	2.12040E+02	7.82629E-04	6.29109E-05
			9	1.17857E-07	4.64321E-12	6.77214E-03	2.35379E+02	2.35379E+02	8.51340E-04	8.66120E-05
			10	1.16993E-07	5.06244E-12	6.72405E-03	2.58526E+02	2.58526E+02	9.15763E-04	1.15020E-04
			11	1.15719E-07	5.44777E-12	6.65318E-03	2.81268E+02	2.81268E+02	9.75071E-04	1.48187E-04
			12	1.13839E-07	5.77896E-12	6.54889E-03	3.03294E+02	3.03294E+02	1.02808E-03	1.85943E-04
			13	1.11071E-07	6.02618E-12	6.39587E-03	3.24150E+02	3.24150E+02	1.07307E-03	2.27773E-04
			14	1.07067E-07	6.14622E-12	6.17236E-03	3.43186E+02	3.43186E+02	1.10754E-03	2.72650E-04
			15	1.01071E-07	6.08127E-12	5.84827E-03	3.59481E+02	3.59481E+02	1.12794E-03	3.18757E-04
			16	9.24771E-08	5.75432E-12	5.38366E-03	3.71762E+02	3.71762E+02	1.12930E-03	3.63111E-04
			17	8.02317E-08	5.08058E-12	4.72915E-03	3.78332E+02	3.78332E+02	1.10497E-03	4.01086E-04
			18	6.32556E-08	3.99189E-12	3.83111E-03	3.77038E+02	3.77038E+02	1.04674E-03	4.25963E-04
			19	4.08571E-08	2.49876E-12	2.64669E-03	3.65394E+02	3.65394E+02	9.46203E-04	4.29024E-04
			20	1.49849E-08	8.92997E-13	1.14440E-03	3.40623E+02	3.40623E+02	8.01621E-04	4.02734E-04
			21	3.98094E-12	2.04726E-16	4.15781E-07	3.07251E+02	3.07251E+02	6.58848E-04	3.64933E-04
			22	2.65438E-20	1.05163E-24	1.64155E-16	2.76983E+02	2.76983E+02	5.39568E-04	3.28006E-04
			23	7.35635E-26	3.06697E-30	1.02740E-22	2.49088E+02	2.49088E+02	4.39651E-04	2.92115E-04
			24	2.01930E-27	7.53747E-32	1.68903E-24	2.23014E+02	2.23014E+02	3.55903E-04	2.57480E-04
			25	1.55545E-28	5.16461E-33	8.62746E-26	1.98371E+02	1.98371E+02	2.85814E-04	2.24364E-04
			26	1.70430E-29	4.98998E-34	6.28568E-27	1.74927E+02	1.74927E+02	2.27375E-04	1.93054E-04
			27	1.87283E-30	4.78328E-35	4.38699E-28	1.52592E+02	1.52592E+02	1.78941E-04	1.63843E-04
			28	1.29825E-31	2.45533E-36	1.73959E-29	1.31402E+02	1.31402E+02	1.39132E-04	1.37004E-04
			29	2.33316E-33	4.35392E-38	1.42157E-31	1.11491E+02	1.11491E+02	1.06751E-04	1.12761E-04
			30	8.98069E-37	1.07473E-41	1.00055E-35	9.30494E+01	9.30494E+01	8.07416E-05	9.12703E-05
			31	1.09760E-44	2.03967E-49	4.53465E-45	7.62780E+01	7.62780E+01	6.01461E-05	7.25973E-05
			32	2.52310E-53	2.55076E-58	1.30653E-57	6.13481E+01	6.13481E+01	4.40945E-05	5.67119E-05
			33	1.78261E-62	1.44309E-67	1.27216E-73	4.83661E+01	4.83661E+01	3.17963E-05	4.34905E-05
			34	4.03989E-72	5.03939E-77	6.78020E-98	3.73555E+01	3.73555E+01	2.25424E-05	3.27301E-05
			35	2.44336E-81	1.41557E-86	9.16268-159	2.82538E+01	2.82538E+01	1.57084E-05	2.41689E-05
			36	2.12155E-22	7.42986E-28	7.98384E-90	2.09234E+01	2.09234E+01	1.07573E-05	1.75105E-05
			37	2.12234E-22	5.38927E-28	7.05352E-90	1.51712E+01	1.51712E+01	7.23933E-06	1.24478E-05
			38	2.12234E-22	3.82652E-28	7.05352E-90	1.07719E+01	1.07719E+01	4.78780E-06	8.68347E-06
			39	2.12234E-22	2.66116E-28	7.05352E-90	7.49137E+00	7.49137E+00	3.11225E-06	5.94557E-06
			40	2.12234E-22	1.81332E-28	7.05352E-90	5.10462E+00	5.10462E+00	1.98883E-06	3.99676E-06
			41	2.12234E-22	1.21111E-28	7.05352E-90	3.40936E+00	3.40936E+00	1.24973E-06	2.63860E-06
			42	2.12234E-22	7.93213E-29	7.05352E-90	2.23295E+00	2.23295E+00	7.72416E-07	1.71135E-06
			43	2.12234E-22	5.09685E-29	7.05352E-90	1.43480E+00	1.43480E+00	4.69726E-07	1.09086E-06
			44	2.12234E-22	3.21462E-29	7.05352E-90	9.04940E-01	9.04940E-01	2.81154E-07	6.83659E-07
			45	2.12234E-22	1.99114E-29	7.05352E-90	5.60520E-01	5.60520E-01	1.65694E-07	4.21427E-07
			46	2.12234E-22	1.21162E-29	7.05352E-90	3.41136E-01	3.41136E-01	9.61822E-08	2.55623E-07
			47	2.12234E-22	7.25041E-30	7.05352E-90	2.04104E-01	2.04104E-01	5.50136E-08	1.52635E-07
			48	2.12234E-22	4.26677E-30	7.05352E-90	1.20113E-01	1.20113E-01	3.10168E-08	8.97573E-08
			49	2.12234E-22	2.47097E-30	7.05352E-90	6.95596E-02	6.95596E-02	1.72442E-08	5.20025E-08
			50	2.12234E-22	1.40890E-30	7.05352E-90	3.96616E-02	3.96616E-02	9.45734E-09	2.96960E-08

L	ENERGY BAND (ERGS/MMS)	I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
7	4.130E+00 5.000E+00								
		1	5.3667ME-08	4.31945E-13	4.72711E-03	4.80861E+01	4.80861E+01	9.74159E-05	1.22354E-07
		2	5.365248-08	4.30568E-13	4.72582E-03	5.35145E+01	5.35145E+01	1.07619E-04	5.40680E-07
		3	5.362888-08	6.07478E-13	4.72385E-03	6.76765E+01	6.76765E+01	1.33965E-04	1.51434E-06
		4	5.359298-08	7.46360E-13	4.72084E-03	8.32045E+01	8.32045E+01	1.61859E-04	3.25271E-06
		5	5.353888-08	8.89667E-13	4.71629E-03	9.92806E+01	9.92806E+01	1.89648E-04	5.95495E-06
		6	5.345808-08	1.03503E-12	4.70947E-03	1.15676E+02	1.15676E+02	2.16851E-04	9.80512E-06
		7	5.333818-08	1.18105E-12	4.69932E-03	1.32291E+02	1.32291E+02	2.43237E-04	1.49698E-05
		8	5.316058-08	1.32629E-12	4.68429E-03	1.49058E+02	1.49058E+02	2.68640E-04	2.15943E-05
		9	5.289808-08	1.46691E-12	4.66208E-03	1.65906E+02	1.65906E+02	2.92886E-04	2.97971E-05
		10	5.251068-08	1.60610E-12	4.62930E-03	1.82739E+02	1.82739E+02	3.15760E-04	3.96595E-05
		11	5.193898-08	1.73362E-12	4.58102E-03	1.99419E+02	1.99419E+02	3.36965E-04	5.12106E-05
		12	5.109588-08	1.84502E-12	4.51002E-03	2.15735E+02	2.15735E+02	3.56080E-04	6.44020E-05
		13	4.988548-08	1.93074E-12	4.40597E-03	2.31379E+02	2.31379E+02	3.72499E-04	7.90681E-05
		14	4.820328-08	1.97690E-12	4.25425E-03	2.45900E+02	2.45900E+02	3.85354E-04	9.48649E-05
		15	4.587648-08	1.96825E-12	4.03440E-03	2.58661E+02	2.58661E+02	3.93416E-04	1.11179E-04
		16	4.251828-08	1.86781E-12	3.72129E-03	2.68781E+02	2.68781E+02	3.94985E-04	1.27002E-04
		17	3.861302E-08	1.65896E-12	3.28150E-03	2.75090E+02	2.75090E+02	3.87811E-04	1.40769E-04
		18	3.442358-08	1.31359E-12	2.68087E-03	2.76114E+02	2.76114E+02	3.69137E-04	1.50218E-04
		19	1.938678-08	8.31360E-13	1.89113E-03	2.70141E+02	2.70141E+02	3.36111E-04	1.52398E-04
		20	8.857378-09	2.72164E-13	8.77234E-04	2.55093E+02	2.55093E+02	2.87608E-04	1.44494E-04
		21	1.811918-12	7.07512E-17	3.44427E-07	2.32908E+02	2.32908E+02	2.38577E-04	1.32147E-04
		22	4.954998-21	3.54466E-25	6.00975E-17	2.12629E+02	2.12629E+02	1.97265E-04	1.19918E-04
		23	5.219058-26	1.04377E-30	2.32708E-23	1.93721E+02	1.93721E+02	1.62329E-04	1.07855E-04
		24	4.933148-28	2.59469E-32	3.30974E-25	1.75770E+02	1.75770E+02	1.32741E-04	9.60323E-05
		25	4.662998-29	1.80450E-33	1.50724E-26	1.58475E+02	1.58475E+02	1.07702E-04	8.45460E-05
		26	7.452968-30	1.76708E-34	9.80823E-28	1.41656E+02	1.41656E+02	8.65765E-05	7.35083E-05
		27	5.178928-31	1.71675E-35	6.04390E-29	1.25246E+02	1.25246E+02	6.8850EE-05	6.30413E-05
		28	5.876398-32	1.05840E-36	2.05914E-30	1.09294E+02	1.09294E+02	5.40945E-05	5.32671E-05
		29	1.662008-33	1.80392E-38	1.36162E-32	9.39402E+01	9.39402E+01	4.19364E-05	4.42973E-05
		30	3.016948-37	4.00883E-42	6.55496E-37	7.93874E+01	7.93874E+01	3.20434E-05	3.62219E-05
		31	2.494818-45	7.69918E-50	1.07337E-46	6.58637E+01	6.58637E+01	2.41091E-05	2.91001E-05
		32	1.103048-53	9.49285E-59	3.42108E-60	5.35817E+01	5.35817E+01	1.78475E-05	2.29545E-05
		33	7.773548-65	5.57058E-68	5.63324E-78	4.27046E+01	4.27046E+01	1.29916E-05	1.77697E-05
		34	5.523748-72	1.96539E-77	3.69572-106	3.33235E+01	3.33235E+01	9.29476E-06	1.34954E-05
		35	1.504868-81	5.57459E-87	1.21262-180	2.54498E+01	2.54498E+01	6.53393E-06	1.00531E-05
		36	3.275308-83	2.35277E-88	5.02844-109	1.90198E+01	1.90198E+01	4.51233E-06	7.34506E-06
		37	3.278778-83	2.16029E-88	4.29844-109	1.39100E+01	1.39100E+01	3.06124E-06	5.26369E-06
		38	3.278778-83	1.54631E-88	4.29844-109	9.95660E+00	9.95660E+00	2.04026E-06	3.70035E-06
		39	3.278778-83	1.08359E-88	4.29844-109	6.97719E+00	6.97719E+00	1.33606E-06	2.55238E-06
		40	3.278778-83	7.45661E-89	4.29844-109	4.78840E+00	4.78840E+00	8.59824E-07	1.72790E-06
		41	3.278778-83	5.00045E-89	4.29844-109	3.21976E+00	3.21976E+00	5.43935E-07	1.14843E-06
		42	3.278778-83	3.29588E-89	4.29844-109	2.12220E+00	2.12220E+00	3.38353E-07	7.49650E-07
		43	3.278778-83	2.13050E-89	4.29844-109	1.37182E+00	1.37182E+00	2.07026E-07	4.80785E-07
		44	3.278778-83	1.35134E-89	4.29844-109	8.70123E-01	8.70123E-01	1.24642E-07	3.03081E-07
		45	3.278778-83	8.41504E-90	4.29844-109	5.41840E-01	5.41840E-01	7.38674E-08	1.87874E-07
		46	3.278778-83	5.14739E-90	4.29844-109	3.31437E-01	3.31437E-01	4.31079E-08	1.14568E-07
		47	3.278778-83	3.09450E-90	4.29844-109	1.99253E-01	1.99253E-01	2.47826E-08	6.87594E-08
		48	3.278778-83	1.82936E-90	4.29844-109	1.17791E-01	1.17791E-01	1.40408E-08	4.06316E-08
		49	3.278778-83	1.06399E-90	4.29844-109	6.85098E-02	6.85098E-02	7.84265E-09	2.36507E-08
		50	3.278778-83	6.09159E-91	4.29844-109	3.92234E-02	3.92234E-02	4.32045E-09	1.35662E-08

L	ENERGY BAND (ERGS/****)	I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
8	5.000E+00 8.000E+00	1	1.[illegible]E-08	2.96620E-14	9.06879E-04	9.33043E+00	9.33043E+00	5.35516E-05	6.72609E-08
		2	1.[illegible]E-08	3.30428E-14	9.06635E-04	1.03968E+01	1.03968E+01	5.91866E-05	2.97354E-07
		3	1.[illegible]E-08	4.16825E-14	9.06267E-04	1.31840E+01	1.31840E+01	7.37463E-05	8.33628E-07
		4	1.[illegible]E-08	5.16170E-14	9.05700E-04	1.62593E+01	1.62593E+01	8.91978E-05	1.79252E-06
		5	1.[illegible]E-08	6.17342E-14	9.04842E-04	1.94658E+01	1.94658E+01	1.04632E-04	3.28544E-06
		6	1.[illegible]E-08	7.20792E-14	9.03556E-04	2.27620E+01	2.27620E+01	1.19783E-04	5.41609E-06
		7	1.[illegible]E-08	8.25653E-14	9.01641E-04	2.61321E+01	2.61321E+01	1.34523E-04	8.27907E-06
		8	1.[illegible]E-08	9.31064E-14	8.98803E-04	2.95668E+01	2.95668E+01	1.48758E-04	1.19578E-05
		9	1.[illegible]E-08	1.03584E-13	8.94609E-04	3.30571E+01	3.30571E+01	1.62391E-04	1.65210E-05
		10	1.[illegible]E-08	1.13813E-13	8.88422E-04	3.65894E+01	3.65894E+01	1.75300E-04	2.20176E-05
		11	1.[illegible]E-08	1.23504E-13	8.79314E-04	4.01417E+01	4.01417E+01	1.87315E-04	2.84674E-05
		12	1.[illegible]E-08	1.32203E-13	8.65938E-04	4.36779E+01	4.36779E+01	1.98201E-04	3.58474E-05
		13	1.[illegible]E-08	1.39223E-13	8.46372E-04	4.71419E+01	4.71419E+01	2.07617E-04	4.40696E-05
		14	1.[illegible]E-08	1.43548E-13	8.17926E-04	5.04492E+01	5.04492E+01	2.15079E-04	5.29473E-05
		15	1.[illegible]E-08	1.43741E-13	7.76958E-04	5.34782E+01	5.34782E+01	2.19905E-04	6.21452E-05
		16	1.[illegible]E-08	1.37899E-13	7.19776E-04	5.60603E+01	5.60603E+01	2.21159E-04	7.11107E-05
		17	1.[illegible]E-08	1.23774E-13	6.37788E-04	5.79720E+01	5.79720E+01	2.17610E-04	7.89889E-05
		18	1.[illegible]E-08	9.93020E-14	5.28184E-04	5.89341E+01	5.89341E+01	2.07759E-04	8.45464E-05
		19	6.[illegible]E-09	6.39642E-14	3.85332E-04	5.86238E+01	5.86238E+01	1.90060E-04	8.61763E-05
		20	2.[illegible]E-09	2.15004E-14	2.00032E-04	5.66112E+01	5.66112E+01	1.63741E-04	8.22637E-05
		21	6.[illegible]E-13	5.74314E-18	8.88267E-08	5.28111E+01	5.28111E+01	1.36724E-04	7.57306E-05
		22	5.[illegible]E-21	2.87650E-26	3.97147E-18	4.92983E+01	4.92983E+01	1.13824E-04	6.91940E-05
		23	1.[illegible]E-28	8.65871E-32	6.51873E-25	4.59523E+01	4.59523E+01	9.43288E-05	6.26743E-05
		24	3.[illegible]E-28	2.20627E-33	7.08400E-27	4.26730E+01	4.26730E+01	7.76959E-05	5.62096E-05
		25	2.[illegible]E-29	1.56813E-34	2.59939E-28	3.93826E+01	3.93826E+01	6.35065E-05	4.98526E-05
		26	2.[illegible]E-30	1.37166E-35	1.36455E-29	3.60294E+01	3.60294E+01	5.14323E-05	4.36689E-05
		27	6.[illegible]E-31	1.56215E-36	6.81902E-31	3.25919E+01	3.25919E+01	4.12097E-05	3.77325E-05
		28	1.[illegible]E-32	9.66155E-38	1.67910E-32	2.90808E+01	2.90808E+01	3.26206E-05	3.21216E-05
		29	3.[illegible]E-34	1.52471E-39	7.31688E-35	2.55380E+01	2.55380E+01	2.54769E-05	2.69112E-05
		30	1.[illegible]E-37	5.88959E-43	1.64321E-39	2.20298E+01	2.20298E+01	1.96092E-05	2.21663E-05
		31	2.[illegible]E-45	7.61897E-51	3.27130E-50	1.86376E+01	1.86376E+01	1.48593E-05	1.79354E-05
		32	1.[illegible]E-54	9.97133E-60	9.59411E-66	1.54447E+01	1.54447E+01	1.10766E-05	1.42461E-05
		33	2.[illegible]E-63	5.71323E-69	2.46936E-87	1.25252E+01	1.25252E+01	8.11720E-06	1.11026E-05
		34	1.[illegible]E-72	2.04887E-78	6.39482-124	9.93447E+00	9.93447E+00	5.84511E-06	8.48673E-06
		35	4.[illegible]E-82	5.90062E-88	1.14277-227	7.70395E+00	7.70395E+00	4.13459E-06	6.36148E-06
		36	5.[illegible]E-93	5.17057E-29	2.69646-150	5.84042E+00	5.84042E+00	2.87243E-06	4.67567E-06
		37	5.[illegible]E-23	2.35084E-29	2.14734-150	4.32881E+00	4.32881E+00	1.95986E-06	3.36991E-06
		38	5.[illegible]E-23	1.70388E-29	2.14734-150	3.13749E+00	3.13749E+00	1.31336E-06	2.38199E-06
		39	5.[illegible]E-23	1.20980E-29	2.14734-150	2.22450E+00	2.22450E+00	8.64539E-07	1.65159E-06
		40	5.[illegible]E-23	8.38214E-30	2.14734-150	1.54347E+00	1.54347E+00	5.59145E-07	1.12366E-06
		41	5.[illegible]E-23	5.69441E-30	2.14734-150	1.04856E+00	1.04856E+00	3.55401E-07	7.50370E-07
		42	5.[illegible]E-23	3.78964E-30	2.14734-150	6.97819E-01	6.97819E-01	2.22076E-07	4.92029E-07
		43	5.[illegible]E-23	2.47196E-30	2.14734-150	4.55183E-01	4.55183E-01	1.36466E-07	3.16922E-07
		44	5.[illegible]E-23	1.56135E-30	2.14734-150	2.91187E-01	2.91187E-01	8.24990E-08	2.00606E-07
		45	5.[illegible]E-23	9.92675E-31	2.14734-150	1.82790E-01	1.82790E-01	4.90838E-08	1.24840E-07
		46	5.[illegible]E-23	6.11428E-31	2.14734-150	1.12661E-01	1.12661E-01	2.87519E-08	7.64138E-08
		47	5.[illegible]E-23	3.70462E-31	2.14734-150	6.82164E-02	6.82164E-02	1.65885E-08	4.60248E-08
		48	5.[illegible]E-23	2.20493E-31	2.14734-150	4.06013E-02	4.06013E-02	9.43048E-09	2.72902E-08
		49	5.[illegible]E-23	1.29069E-31	2.14734-150	2.37666E-02	2.37666E-02	5.28472E-09	1.59369E-08
		50	5.[illegible]E-23	7.43466E-32	2.14734-150	1.36901E-02	1.36901E-02	2.92040E-09	9.17007E-09

L	ENERGY BAND (ERGS/NMAX)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
9	8.000E+00	1.000E+01								
			1	2.53815E-09	2.24710E-15	1.51023E-04	1.57240E+00	1.57240E+00	1.30615E-05	1.64053E-08
			2	2.53570E-09	2.50656E-15	1.50983E-04	1.75447E+00	1.75447E+00	1.44461E-05	7.25772E-08
			3	2.53194E-09	3.10642E-15	1.50923E-04	2.23131E+00	2.23131E+00	1.80276E-05	2.03784E-07
			4	2.52623E-09	3.94016E-15	1.50831E-04	2.76098E+00	2.76098E+00	2.18431E-05	4.38959E-07
			5	2.51763E-09	4.72973E-15	1.50690E-04	3.31759E+00	3.31759E+00	2.56709E-05	8.06065E-07
			6	2.50479E-09	5.54438E-15	1.50480E-04	3.89489E+00	3.89489E+00	2.94463E-05	1.33144E-06
			7	2.48571E-09	6.37877E-15	1.50167E-04	4.49112E+00	4.49112E+00	3.31382E-05	2.03946E-06
			8	2.45747E-09	7.22788E-15	1.49702E-04	5.10594E+00	5.10594E+00	3.67229E-05	2.95193E-06
			9	2.41574E-09	8.08431E-15	1.49016E-04	5.73926E+00	5.73926E+00	4.01755E-05	4.08729E-06
			10	2.35414E-09	8.93568E-15	1.48003E-04	6.39045E+00	6.39045E+00	4.34646E-05	5.45915E-06
			11	2.26323E-09	9.76109E-15	1.46513E-04	7.05755E+00	7.05755E+00	4.65471E-05	7.07404E-06
			12	2.12919E-09	1.05262E-14	1.44329E-04	7.73625E+00	7.73625E+00	4.93622E-05	8.92785E-06
			13	1.95184E-09	1.11767E-14	1.41140E-04	8.41871E+00	8.41871E+00	5.18237E-05	1.10003E-05
			14	1.64212E-09	1.16298E-14	1.36519E-04	9.09206E+00	9.09206E+00	5.38094E-05	1.32466E-05
			15	1.21902E-09	1.17650E-14	1.29896E-04	9.73683E+00	9.73683E+00	5.51492E-05	1.55852E-05
			16	6.66679E-09	1.14161E-14	1.20555E-04	1.03254E+01	1.03254E+01	5.56126E-05	1.78814E-05
			17	3.75475E-09	1.03867E-14	1.07675E-04	1.08210E+01	1.08210E+01	5.49012E-05	1.99283E-05
			18	2.52625E-09	8.46825E-15	9.04557E-05	1.11779E+01	1.11779E+01	5.26599E-05	2.14296E-05
			19	2.03173E-09	5.56677E-15	6.83670E-05	1.13443E+01	1.13443E+01	4.85334E-05	2.20058E-05
			20	1.82165E-09	1.92353E-15	3.99465E-05	1.12489E+01	1.12489E+01	4.22983E-05	2.12507E-05
			21	2.93054E-13	5.26425E-19	2.01862E-08	1.07731E+01	1.07731E+01	3.57367E-05	1.97944E-05
			22	1.58400E-21	2.70439E-27	2.14896E-19	1.03309E+01	1.03309E+01	3.01170E-05	1.83082E-05
			23	3.85041E-27	6.56537E-33	1.41467E-26	9.89609E+00	9.89609E+00	2.52750E-05	1.67933E-05
			24	1.55575E-28	2.19059E-34	1.15434E-28	9.44457E+00	9.44457E+00	2.10882E-05	1.52564E-05
			25	1.05763E-29	1.59974E-35	3.36437E-30	8.95564E+00	8.95564E+00	1.74639E-05	1.37092E-05
			26	1.19191E-30	1.64645E-36	1.40489E-31	8.41343E+00	8.41343E+00	1.43314E-05	1.21682E-05
			27	1.22467E-31	1.67911E-37	5.27956E-33	7.80896E+00	7.80896E+00	1.16356E-05	1.06538E-05
			28	1.06470E-32	1.06444E-38	9.77657E-35	7.14177E+00	7.14177E+00	9.33209E-06	9.18935E-06
			29	1.06023E-34	1.71970E-40	2.72925E-37	6.42062E+00	6.42062E+00	7.38338E-06	7.79904E-06
			30	4.73278E-38	4.48573E-44	2.71409E-42	5.66268E+00	5.66268E+00	5.75540E-06	6.50590E-06
			31	1.09569E-45	4.97035E-52	5.67807E-54	4.89135E+00	4.89135E+00	4.41545E-06	5.32952E-06
			32	1.73043E-54	1.19702E-60	1.10629E-71	4.13287E+00	4.13287E+00	3.33100E-06	4.28415E-06
			33	1.22258E-63	5.95364E-70	2.42014E-97	3.41282E+00	3.41282E+00	2.46933E-06	3.37751E-06
			34	5.52775E-75	2.54694E-79	6.44430-143	2.75280E+00	2.75280E+00	1.79792E-06	2.61047E-06
			35	2.65295E-82	7.45072E-89	5.79459-278	2.16833E+00	2.16833E+00	1.28531E-06	1.97758E-06
			36	1.45503E-23	4.06160E-30	1.95466-194	1.66783E+00	1.66783E+00	9.02021E-07	1.46829E-06
			37	1.45558E-23	3.05248E-30	1.44300-194	1.25292E+00	1.25292E+00	6.21408E-07	1.06849E-06
			38	1.45558E-23	2.24029E-30	1.44300-194	9.19549E-01	9.19549E-01	4.20260E-07	7.62211E-07
			39	1.45558E-23	1.60700E-30	1.44300-194	6.59608E-01	6.59608E-01	2.79068E-07	5.33124E-07
			40	1.45558E-23	1.12720E-30	1.44300-194	4.62669E-01	4.62669E-01	1.81991E-07	3.65730E-07
			41	1.45558E-23	7.73568E-31	1.44300-194	3.17518E-01	3.17518E-01	1.16592E-07	2.46165E-07
			42	1.45558E-23	5.19716E-31	1.44300-194	2.13323E-01	2.13323E-01	7.34018E-08	1.62628E-07
			43	1.45558E-23	3.42034E-31	1.44300-194	1.40391E-01	1.40391E-01	4.54281E-08	1.05500E-07
			44	1.45558E-23	2.20636E-31	1.44300-194	9.05620E-02	9.05620E-02	2.76497E-08	6.72335E-08
			45	1.45558E-23	1.39591E-31	1.44300-194	5.72966E-02	5.72966E-02	1.65570E-08	4.21111E-08
			46	1.45558E-23	8.66738E-32	1.44300-194	3.55759E-02	3.55759E-02	9.75837E-09	2.59348E-08
			47	1.45558E-23	5.28472E-32	1.44300-194	2.16916E-02	2.16916E-02	5.66317E-09	1.57125E-08
			48	1.45558E-23	3.16612E-32	1.44300-194	1.29957E-02	1.29957E-02	3.23751E-09	9.36878E-09
			49	1.45558E-23	1.86490E-32	1.44300-194	7.65466E-03	7.65466E-03	1.82395E-09	5.50039E-09
			50	1.45558E-23	1.05057E-32	1.44300-194	4.43529E-03	4.43529E-03	1.01308E-09	3.18106E-09

L	ENERGY BAND (ERGS/GRAM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
10	1.000E+01	1.400E+01								
			1	2.53388E-08	1.07873E-14	2.49737E-04	2.54351E+00	2.54351E+00	5.62816E-06	7.06897E-09
			2	2.53439E-08	1.20157E-14	2.49809E-04	2.83258E+00	2.83258E+00	6.22816E-06	3.12903E-08
			3	2.53514E-08	1.52161E-14	2.49919E-04	3.58596E+00	3.58596E+00	7.77961E-06	8.79408E-08
			4	2.53628E-08	1.87422E-14	2.50083E-04	4.41498E+00	4.41498E+00	9.43644E-06	1.89635E-07
			5	2.53797E-08	2.24209E-14	2.50328E-04	5.27802E+00	5.27802E+00	1.11047E-05	3.48689E-07
			6	2.54052E-08	2.62168E-14	2.50694E-04	6.16542E+00	6.16542E+00	1.27591E-05	5.76914E-07
			7	2.54433E-08	3.01322E-14	2.51240E-04	7.07559E+00	7.07559E+00	1.43892E-05	8.85570E-07
			8	2.55004E-08	3.41898E-14	2.52057E-04	8.01041E+00	8.01041E+00	1.59897E-05	1.28532E-06
			9	2.55857E-08	3.84318E-14	2.53279E-04	8.97426E+00	8.97426E+00	1.75565E-05	1.78613E-06
			10	2.57133E-08	4.29258E-14	2.55111E-04	9.97392E+00	9.97392E+00	1.90859E-05	2.39719E-06
			11	2.59036E-08	4.77758E-14	2.57866E-04	1.10192E+01	1.10192E+01	2.05739E-05	3.12675E-06
			12	2.61875E-08	5.31419E-14	2.62026E-04	1.21241E+01	1.21241E+01	2.20165E-05	3.98199E-06
			13	2.66086E-08	5.92723E-14	2.68330E-04	1.33086E+01	1.33086E+01	2.34095E-05	4.96899E-06
			14	2.72308E-08	6.65563E-14	2.78053E-04	1.46028E+01	1.46028E+01	2.47511E-05	6.09313E-06
			15	2.81379E-08	7.56065E-14	2.93140E-04	1.60536E+01	1.60536E+01	2.60463E-05	7.36068E-06
			16	2.94274E-08	8.73676E-14	3.17059E-04	1.77380E+01	1.77380E+01	2.73188E-05	8.78397E-06
			17	3.11486E-08	1.03171E-13	3.56079E-04	1.97895E+01	1.97895E+01	2.86399E-05	1.03958E-05
			18	3.38376E-08	1.24187E-13	4.22655E-04	2.24581E+01	2.24581E+01	3.02018E-05	1.22904E-05
			19	3.84025E-08	1.48927E-13	5.46286E-04	2.62802E+01	2.62802E+01	3.25277E-05	1.47486E-05
			20	4.48019E-08	1.35698E-13	8.33952E-04	3.29542E+01	3.29542E+01	3.70795E-05	1.86287E-05
			21	5.31041E-08	2.49221E-13	1.42662E-03	4.49788E+01	4.49788E+01	4.18901E-05	2.32027E-05
			22	7.20439E-08	1.42573E-10	5.46131E-04	3.85539E+01	3.85539E+01	3.39410E-05	2.06329E-05
			23	1.07492E-03	5.87015E-10	3.07504E-04	3.26271E+00	3.26271E+00	7.45505E-06	4.95332E-06
			24	2.33945E-03	6.77981E-11	2.43100E-04	1.78090E-01	1.78090E-01	4.43194E-06	3.20631E-06
			25	5.76663E-03	5.41139E-11	1.90962E-04	3.53439E-02	3.53439E-02	3.62709E-06	2.84727E-06
			26	9.98204E-03	2.59534E-11	1.41282E-04	1.43368E-02	1.43368E-02	2.99748E-06	2.54503E-06
			27	1.62516E-02	1.57016E-11	9.30595E-05	5.76883E-03	5.76883E-03	2.45532E-06	2.24815E-06
			28	2.55944E-02	8.30685E-12	4.92880E-05	1.93909E-03	1.93909E-03	1.98812E-06	1.95771E-06
			29	3.44175E-02	2.77766E-12	1.64532E-05	4.20922E-04	4.20922E-04	1.58851E-06	1.67794E-06
			30	5.47207E-02	2.61260E-13	1.52424E-06	2.61368E-05	2.61368E-05	1.25061E-06	1.41368E-06
			31	8.69347E-02	5.56171E-16	1.49159E-09	4.42153E-08	4.42153E-08	9.68866E-07	1.16944E-06
			32	1.51627E-01	5.94016E-19	4.32945E-15	3.15015E-11	3.15015E-11	7.37833E-07	9.48959E-07
			33	1.95376E-01	4.95060E-22	3.96061E-22	1.51389E-14	1.51389E-14	5.51935E-07	7.54928E-07
			34	2.30845E-01	2.38405E-25	6.39043E-31	4.90065E-18	4.90065E-18	4.05351E-07	5.88543E-07
			35	4.33048E-01	7.73214E-29	1.04737E-45	1.06677E-21	1.06677E-21	2.92174E-07	4.49540E-07
			36	1.11021E-01	1.47829E-31	7.83258E-25	7.95538E-24	7.95538E-24	2.06656E-07	3.36389E-07
			37	1.11004E-01	1.28212E-31	7.65947E-25	6.90071E-24	6.90071E-24	1.43427E-07	2.46618E-07
			38	1.11004E-01	1.28196E-31	7.65947E-25	6.89982E-24	6.89982E-24	9.76853E-08	1.77168E-07
			39	1.11004E-01	1.28196E-31	7.65947E-25	6.89983E-24	6.89983E-24	6.53005E-08	1.24748E-07
			40	1.11004E-01	1.28196E-31	7.65947E-25	6.89984E-24	6.89984E-24	4.28550E-08	8.61214E-08
			41	1.11004E-01	1.28196E-31	7.65947E-25	6.89984E-24	6.89984E-24	2.76196E-08	5.83143E-08
			42	1.11004E-01	1.28196E-31	7.65947E-25	6.89985E-24	6.89985E-24	1.74871E-08	3.87442E-08
			43	1.11004E-01	1.28196E-31	7.65947E-25	6.89986E-24	6.89986E-24	1.08810E-08	2.52695E-08
			44	1.11004E-01	1.28196E-31	7.65947E-25	6.89986E-24	6.89986E-24	6.65659E-09	1.61863E-08
			45	1.11004E-01	1.28196E-31	7.65947E-25	6.89987E-24	6.89987E-24	4.00540E-09	1.01873E-08
			46	1.11004E-01	1.28197E-31	7.65947E-25	6.89988E-24	6.89988E-24	2.37158E-09	6.30295E-09
			47	1.11004E-01	1.28197E-31	7.65947E-25	6.89988E-24	6.89988E-24	1.38236E-09	3.83535E-09
			48	1.11004E-01	1.28197E-31	7.65947E-25	6.89989E-24	6.89989E-24	7.93558E-10	2.29642E-09
			49	1.11004E-01	1.28197E-31	7.65947E-25	6.89989E-24	6.89989E-24	4.48850E-10	1.35358E-09
			50	1.11004E-01	1.28197E-31	7.65947E-25	6.89990E-24	6.89990E-24	2.50249E-10	7.85782E-10

L	ENERGY BAND (ERGS/MM**)	I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
11	1.400E+01 1.800E+01								
		1	4.76565E-01	3.54210E-10	2.11669E-03	4.44062E-03	4.44062E-03	3.17618E-06	3.98928E-09
		2	4.76650E-01	3.54118E-10	2.11609E-03	4.43867E-03	4.43867E-03	3.51458E-06	1.76572E-08
		3	4.76779E-01	3.53982E-10	2.11518E-03	4.43578E-03	4.43578E-03	4.38872E-06	4.96101E-08
		4	4.76971E-01	3.53759E-10	2.11378E-03	4.43120E-03	4.43120E-03	5.32195E-06	1.06950E-07
		5	4.77260E-01	3.53414E-10	2.11167E-03	4.42419E-03	4.42419E-03	6.26189E-06	1.96623E-07
		6	4.77692E-01	3.52893E-10	2.10853E-03	4.41367E-03	4.41367E-03	7.19513E-06	3.25335E-07
		7	4.78337E-01	3.52114E-10	2.10385E-03	4.39800E-03	4.39800E-03	8.11736E-06	4.99575E-07
		8	4.79298E-01	3.50960E-10	2.09694E-03	4.37478E-03	4.37478E-03	9.02755E-06	7.25671E-07
		9	4.80731E-01	3.49251E-10	2.08672E-03	4.34052E-03	4.34052E-03	9.92652E-06	1.00988E-06
		10	4.82866E-01	3.46728E-10	2.07163E-03	4.29010E-03	4.29010E-03	1.08167E-05	1.35858E-06
		11	4.86049E-01	3.43002E-10	2.04936E-03	4.21621E-03	4.21621E-03	1.17027E-05	1.77853E-06
		12	4.90797E-01	3.37506E-10	2.01651E-03	4.10852E-03	4.10852E-03	1.25923E-05	2.27749E-06
		13	4.97883E-01	3.29410E-10	1.96813E-03	3.95289E-03	3.95289E-03	1.34984E-05	2.86522E-06
		14	5.08465E-01	3.17516E-10	1.89706E-03	3.73087E-03	3.73087E-03	1.44430E-05	3.55551E-06
		15	5.24279E-01	3.00132E-10	1.79318E-03	3.42023E-03	3.42023E-03	1.54639E-05	4.37008E-06
		16	5.47936E-01	2.74953E-10	1.64272E-03	2.99801E-03	2.99801E-03	1.66288E-05	5.34675E-06
		17	5.83376E-01	2.39061E-10	1.42826E-03	2.44830E-03	2.44830E-03	1.80650E-05	6.55730E-06
		18	6.36602E-01	1.89330E-10	1.13112E-03	1.77687E-03	1.77687E-03	2.00292E-05	8.15076E-06
		19	7.17052E-01	1.23949E-10	7.40446E-04	1.03276E-03	1.03276E-03	2.31052E-05	1.04762E-05
		20	8.42152E-01	4.74679E-11	2.83541E-04	3.36756E-04	3.36756E-04	2.87947E-05	1.44665E-05
		21	1.02851E+00	1.23476E-11	7.37480E-05	7.17266E-05	7.17266E-05	3.48222E-05	1.92879E-05
		22	1.26479E+00	2.68651E-13	1.59868E-06	1.32673E-06	1.32673E-06	2.79243E-05	1.69753E-05
		23	1.23296E+00	2.42581E-14	1.44822E-07	1.17547E-07	1.17547E-07	2.35310E-06	1.56346E-06
		24	1.19529E+00	1.88051E-14	6.45500E-08	5.39810E-08	5.39810E-08	1.29967E-07	9.40257E-08
		25	1.13423E+00	5.35664E-15	3.20114E-08	2.82146E-08	2.82146E-08	2.62292E-08	2.05900E-08
		26	1.04242E+00	2.50681E-15	1.49759E-08	1.43676E-08	1.43676E-08	1.06597E-08	9.05072E-09
		27	9.16050E-01	9.91089E-16	5.92063E-09	6.50673E-09	6.50673E-09	4.29046E-09	3.92845E-09
		28	7.24692E-01	2.79740E-16	1.67095E-09	2.30625E-09	2.30625E-09	1.44236E-09	1.42030E-09
		29	4.77767E-01	5.83439E-17	2.28921E-10	4.79477E-10	4.79477E-10	3.13119E-10	3.30746E-10
		30	1.94523E-01	7.03084E-19	4.15802E-12	2.15944E-11	2.15944E-11	1.94426E-11	2.19779E-11
		31	4.58583E-02	3.44859E-22	4.49378E-17	4.72150E-14	4.72150E-14	3.28765E-14	3.96824E-14
		32	1.17560E-02	7.39459E-25	5.75649E-27	8.53938E-17	8.53938E-17	2.34213E-17	3.01232E-17
		33	7.67365E-03	1.54094E-27	3.80431E-42	1.04403E-19	1.04403E-19	1.12552E-20	1.53947E-20
		34	1.14156E-01	1.64325E-30	1.33210E-67	8.60027E-23	8.60027E-23	3.64338E-24	5.28996E-24
		35	1.76062E-01	1.35645E-33	3.93032E-77	4.76475E-26	4.76475E-26	7.93099E-28	1.22026E-27
		36	4.39197E-02	4.81967E-25	2.88609E-18	6.55637E-17	6.55637E-17	4.88151E-23	7.94600E-23
		37	4.39133E-02	4.83092E-25	2.88663E-18	6.57263E-17	6.57263E-17	4.89281E-23	8.41302E-23
		38	4.39133E-02	4.83096E-25	2.88663E-18	6.57269E-17	6.57269E-17	4.89285E-23	8.87399E-23
		39	4.39133E-02	4.83097E-25	2.88663E-18	6.57271E-17	6.57271E-17	4.89287E-23	9.34722E-23
		40	4.39133E-02	4.83099E-25	2.88663E-18	6.57273E-17	6.57273E-17	4.89288E-23	9.83274E-23
		41	4.39133E-02	4.83100E-25	2.88663E-18	6.57274E-17	6.57274E-17	4.89290E-23	1.03305E-22
		42	4.39133E-02	4.83101E-25	2.88663E-18	6.57276E-17	6.57276E-17	4.89291E-23	1.08407E-22
		43	4.39133E-02	4.83102E-25	2.88663E-18	6.57278E-17	6.57278E-17	4.89292E-23	1.13630E-22
		44	4.39133E-02	4.83104E-25	2.88663E-18	6.57279E-17	6.57279E-17	4.89293E-23	1.18977E-22
		45	4.39133E-02	4.83105E-25	2.88663E-18	6.57281E-17	6.57281E-17	4.89294E-23	1.24447E-22
		46	4.39133E-02	4.83106E-25	2.88663E-18	6.57282E-17	6.57282E-17	4.89296E-23	1.30040E-22
		47	4.39133E-02	4.83107E-25	2.88663E-18	6.57284E-17	6.57284E-17	4.89297E-23	1.35756E-22
		48	4.39133E-02	4.83108E-25	2.88663E-18	6.57285E-17	6.57285E-17	4.89298E-23	1.41594E-22
		49	4.39133E-02	4.83109E-25	2.88663E-18	6.57286E-17	6.57286E-17	4.89298E-23	1.47556E-22
		50	4.39133E-02	4.83110E-25	2.88663E-18	6.57288E-17	6.57288E-17	4.89299E-23	1.53640E-22

L	ENERGY BAND (ERGS/GRAM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
12	1.800E+01	2.342E+01								
			1	4.38116E-01	9.21847E-12	5.50887E-05	1.25712E-04	1.25712E-04	2.79224E-09	3.50705E-12
			2	4.38194E-01	9.21620E-12	5.50737E-05	1.25658E-04	1.25658E-04	2.79095E-09	1.40217E-11
			3	4.38312E-01	9.21291E-12	5.50509E-05	1.25580E-04	1.25580E-04	2.78904E-09	3.15273E-11
			4	4.38469E-01	9.20738E-12	5.50160E-05	1.25453E-04	1.25453E-04	2.78601E-09	5.59877E-11
			5	4.38755E-01	9.19876E-12	5.49633E-05	1.25260E-04	1.25260E-04	2.78139E-09	8.73357E-11
			6	4.39152E-01	9.18566E-12	5.48843E-05	1.24969E-04	1.24969E-04	2.77446E-09	1.25450E-10
			7	4.39745E-01	9.16613E-12	5.47669E-05	1.24535E-04	1.24535E-04	2.76414E-09	1.70116E-10
			8	4.40628E-01	9.13710E-12	5.45930E-05	1.23891E-04	1.23891E-04	2.74886E-09	2.20964E-10
			9	4.41945E-01	9.09414E-12	5.43359E-05	1.22941E-04	1.22941E-04	2.72630E-09	2.77363E-10
			10	4.43908E-01	9.03070E-12	5.39566E-05	1.21544E-04	1.21544E-04	2.69311E-09	3.38255E-10
			11	4.46835E-01	8.93717E-12	5.33975E-05	1.19497E-04	1.19497E-04	2.64449E-09	4.01899E-10
			12	4.51200E-01	8.79953E-12	5.25748E-05	1.16519E-04	1.16519E-04	2.57365E-09	4.65481E-10
			13	4.57714E-01	8.59755E-12	5.13678E-05	1.12224E-04	1.12224E-04	2.47135E-09	5.24579E-10
			14	4.67442E-01	8.30253E-12	4.96048E-05	1.06118E-04	1.06118E-04	2.32556E-09	5.72497E-10
			15	4.81980E-01	7.87483E-12	4.70491E-05	9.76153E-05	9.76153E-05	2.12193E-09	5.99657E-10
			16	5.03728E-01	7.26203E-12	4.33874E-05	8.61326E-05	8.61326E-05	1.84598E-09	5.93549E-10
			17	5.36309E-01	6.39978E-12	3.82353E-05	7.12944E-05	7.12944E-05	1.48868E-09	5.40368E-10
			18	5.85241E-01	5.22010E-12	3.11867E-05	5.32905E-05	5.32905E-05	1.05723E-09	4.30232E-10
			19	6.59200E-01	3.67689E-12	2.19663E-05	3.33249E-05	3.33249E-05	5.92579E-10	2.68685E-10
			20	7.74207E-01	1.80800E-12	1.08004E-05	1.39523E-05	1.39523E-05	2.05367E-10	1.03176E-10
			21	9.45527E-01	6.60164E-13	3.94334E-06	4.17142E-06	4.17142E-06	5.77516E-11	3.19884E-11
			22	1.11218E+00	8.46697E-16	4.69180E-09	4.55914E-09	4.55914E-09	9.90486E-13	6.02121E-13
			23	1.13329E+00	1.14856E-17	6.82351E-11	6.05715E-11	6.05715E-11	8.74966E-14	5.81348E-14
			24	1.09884E+00	2.57020E-18	1.71442E-11	1.56051E-11	1.56051E-11	4.01733E-14	2.90636E-14
			25	1.04175E+00	8.97901E-19	5.36364E-12	5.14958E-12	5.14958E-12	2.09953E-14	1.64813E-14
			26	9.56535E-01	2.65781E-19	1.58761E-12	1.66008E-12	1.66008E-12	1.06906E-14	9.07691E-15
			27	8.35706E-01	6.30699E-20	3.76706E-13	4.51974E-13	4.51974E-13	4.84125E-15	4.43277E-15
			28	6.81656E-01	9.48747E-21	5.66500E-14	8.56686E-14	8.56686E-14	1.71589E-15	1.68964E-15
			29	4.82209E-01	5.34326E-22	3.18512E-15	7.38615E-15	7.38615E-15	3.56729E-16	3.76811E-16
			30	1.68177E-01	2.01271E-24	1.13428E-17	7.15023E-17	7.15023E-17	1.60651E-17	1.81600E-17
			31	2.42559E-02	1.11522E-27	1.35386E-24	2.74693E-19	2.74693E-19	3.51234E-20	4.23945E-20
			32	2.45861E-02	4.29262E-30	7.65339E-39	1.06478E-21	1.06478E-21	6.35169E-23	8.16919E-23
			33	2.56499E-02	1.66953E-32	3.65419E-62	2.79404E-24	2.79404E-24	7.76498E-26	1.06208E-25
			34	2.51083E-02	4.39327E-35	1.24897-105	4.94232E-27	4.94232E-27	6.39620E-29	9.28687E-29
			35	2.91263E-02	7.78984E-38	9.29013-178	5.88170E-30	5.88170E-30	3.54377E-32	5.45244E-32
			36	2.85755E-02	9.25280E-41	1.34423-106	2.68676E-32	2.68676E-32	4.88151E-23	7.94600E-23
			37	2.05725E-02	4.23339E-43	1.19838-106	1.22944E-34	1.22944E-34	4.89281E-23	8.41302E-23
			38	2.05725E-02	1.44007E-45	1.19837-106	5.63425E-37	5.63425E-37	4.89285E-23	8.87399E-23
			39	2.05725E-02	6.90381E-48	1.19837-106	2.58574E-39	2.58574E-39	4.89287E-23	9.34722E-23
			40	2.05725E-02	4.09167E-50	1.19837-106	1.18828E-41	1.18828E-41	4.89288E-23	9.83274E-23
			41	2.05725E-02	1.48274E-52	1.19837-106	5.46776E-44	5.46776E-44	4.89290E-23	1.03305E-22
			42	2.05725E-02	6.67385E-55	1.19837-106	2.51901E-46	2.51901E-46	4.89291E-23	1.08406E-22
			43	2.05725E-02	4.00071E-57	1.19837-106	1.16186E-48	1.16186E-48	4.89292E-23	1.13630E-22
			44	2.05725E-02	1.84733E-59	1.19837-106	5.36490E-51	5.36490E-51	4.89293E-23	1.18977E-22
			45	2.05725E-02	8.53904E-62	1.19837-106	2.47986E-53	2.47986E-53	4.89294E-23	1.24447E-22
			46	2.05725E-02	3.95106E-64	1.19837-106	1.14744E-55	1.14744E-55	4.89295E-23	1.30040E-22
			47	2.05725E-02	1.82994E-66	1.19837-106	5.31441E-58	5.31441E-58	4.89296E-23	1.35756E-22
			48	2.05725E-02	8.48326E-69	1.19837-106	2.46366E-60	2.46366E-60	4.89297E-23	1.41594E-22
			49	2.05725E-02	5.93616E-71	1.19837-106	1.14312E-62	1.14312E-62	4.89298E-23	1.47556E-22
			50	2.05725E-02	1.82750E-73	1.19837-106	5.30850E-65	5.30850E-65	4.89299E-23	1.53640E-22

L	ENERGY BAND (ERGS/GRAM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
13	2.342E+01	2.496E+01								
			1	3.90276E-01	6.58575E-14	3.81614E-07	9.77564E-07	9.77564E-07	1.20305E-10	1.51104E-13
			2	3.90346E-01	6.58429E-14	3.81516E-07	9.77166E-07	9.77166E-07	1.20253E-10	6.04153E-13
			3	3.90451E-01	6.58223E-14	3.81368E-07	9.76588E-07	9.76588E-07	1.20177E-10	1.35848E-12
			4	3.90609E-01	6.57866E-14	3.81140E-07	9.75647E-07	9.75647E-07	1.20054E-10	2.41261E-12
			5	3.90846E-01	6.57302E-14	3.80794E-07	9.74195E-07	9.74195E-07	1.19867E-10	3.76382E-12
			6	3.91199E-01	6.56443E-14	3.80274E-07	9.72001E-07	9.72001E-07	1.19586E-10	5.40718E-12
			7	3.91727E-01	6.55154E-14	3.79499E-07	9.68725E-07	9.68725E-07	1.19166E-10	7.33398E-12
			8	3.92514E-01	6.53237E-14	3.78350E-07	9.63864E-07	9.63864E-07	1.18545E-10	9.52916E-12
			9	3.93688E-01	6.50400E-14	3.76652E-07	9.56686E-07	9.56686E-07	1.17629E-10	1.19671E-11
			10	3.95436E-01	6.26213E-14	3.74149E-07	9.46131E-07	9.46131E-07	1.16281E-10	1.46049E-11
			11	3.98043E-01	6.20052E-14	3.70466E-07	9.30687E-07	9.30687E-07	1.14308E-10	1.73720E-11
			12	4.01932E-01	6.11018E-14	3.65066E-07	9.08255E-07	9.08255E-07	1.11437E-10	2.01549E-11
			13	4.07734E-01	5.97838E-14	3.57189E-07	8.76015E-07	8.76015E-07	1.07300E-10	2.27759E-11
			14	4.16400E-01	5.78757E-14	3.45786E-07	8.30407E-07	8.30407E-07	1.01424E-10	2.49681E-11
			15	4.29351E-01	5.51452E-14	3.29470E-07	7.67364E-07	7.67364E-07	9.32555E-11	2.63540E-11
			16	4.48724E-01	5.13043E-14	3.06519E-07	6.83093E-07	6.83093E-07	8.22559E-11	2.64482E-11
			17	4.77748E-01	4.60333E-14	2.75023E-07	5.75677E-07	5.75677E-07	6.81175E-11	2.47256E-11
			18	5.21536E-01	3.90531E-14	2.33317E-07	4.47552E-07	4.47552E-07	5.11414E-11	2.08117E-11
			19	5.87220E-01	3.03261E-14	1.81175E-07	3.08547E-07	3.08547E-07	3.27626E-11	1.48551E-11
			20	6.89687E-01	2.08071E-14	1.24302E-07	1.80251E-07	1.80251E-07	1.60784E-11	8.07781E-12
			21	8.42280E-01	1.19231E-14	7.12273E-08	8.45743E-08	8.45743E-08	3.28524E-12	1.81968E-12
			22	9.92918E-01	1.57661E-18	1.73151E-12	9.48675E-12	9.48675E-12	3.40821E-15	2.07186E-15
			23	1.11585E+00	4.99425E-22	2.11789E-15	2.67405E-15	2.67405E-15	4.50635E-17	2.99413E-17
			24	1.27019E+00	4.16096E-23	2.44788E-16	1.92895E-16	1.92895E-16	1.16100E-17	8.39931E-18
			25	1.49151E+00	6.87279E-24	4.10469E-17	2.74054E-17	2.74054E-17	3.83114E-18	3.00745E-18
			26	1.83932E+00	1.09364E-24	6.53186E-18	3.55242E-18	3.55242E-18	1.23503E-18	1.04861E-18
			27	2.35096E+00	1.29942E-25	7.76051E-19	3.30226E-19	3.30226E-19	3.36249E-19	3.07878E-19
			28	3.12072E+00	8.32912E-27	4.97337E-20	1.59459E-20	1.59459E-20	6.37340E-20	6.27591E-20
			29	4.28345E+00	1.40260E-28	8.36526E-22	1.95635E-22	1.95635E-22	5.49502E-21	5.80437E-21
			30	6.05526E+00	5.78792E-32	3.27549E-25	5.70984E-26	5.70984E-26	5.31923E-23	6.01286E-23
			31	8.41735E+00	8.94056E-37	5.72039E-35	6.05804E-31	6.05804E-31	2.04335E-25	2.46636E-25
			32	1.18995E+01	9.50609E-42	6.18770E-55	4.35559E-36	4.35559E-36	7.91848E-28	1.01843E-27
			33	1.63547E+01	6.84848E-47	2.74852E-89	2.11404E-41	2.11404E-41	2.07746E-30	2.84152E-30
			34	2.07927E+01	3.33030E-52	3.70001-157	6.91046E-47	6.91046E-47	3.67429E-33	5.33484E-33
			35	4.28994E+01	1.09057E-57	0.	1.51882E-52	1.51882E-52	4.37233E-36	6.72727E-36
			36	1.09964E+01	2.40092E-63	2.98861-226	1.30423E-57	1.30423E-57	1.99683E-38	3.25040E-38
			37	1.09968E+01	2.36498E-68	2.09130-226	1.12190E-62	1.12190E-62	9.13466E-41	1.57067E-40
			38	1.09968E+01	1.77897E-73	2.09130-226	9.66513E-68	9.66513E-68	4.18501E-43	7.59020E-43
			39	1.09968E+01	1.53476E-78	2.09130-226	8.33833E-73	8.33833E-73	1.92008E-45	3.66807E-45
			40	1.09968E+01	1.32588E-83	2.09130-226	7.20338E-78	7.20338E-78	8.82123E-48	1.77271E-47
			41	1.09968E+01	1.14688E-88	2.09130-226	6.23089E-83	6.23089E-83	4.05786E-50	8.56750E-50
			42	1.09968E+01	9.93241E-94	2.09130-226	5.39627E-88	5.39627E-88	1.86894E-52	4.14079E-52
			43	1.09968E+01	8.61198E-99	2.09130-226	4.67889E-93	4.67889E-93	8.61783E-55	2.00136E-54
			44	1.09968E+01	7.47536-104	2.09130-226	4.06136E-98	4.06136E-98	3.97817E-57	9.67338E-57
			45	1.09968E+01	6.49562-109	2.09130-226	3.52907-103	3.52907-103	1.83835E-59	4.67566E-59
			46	1.09968E+01	5.64959-114	2.09130-226	3.06964-108	3.06964-108	8.50379E-62	2.26005E-61
			47	1.09968E+01	4.91420-119	2.09130-226	2.67260-113	2.67260-113	3.93747E-64	1.09245E-63
			48	1.09968E+01	4.28690-124	2.09130-226	2.32907-118	2.32907-118	1.82484E-66	5.28076E-66
			49	1.09968E+01	3.73919-129	2.09130-226	2.03150-123	2.03150-123	8.46480E-69	2.55269E-68
			50	1.09968E+01	3.26423-134	2.09130-226	1.77345-128	1.77345-128	3.92988E-71	1.23398E-70

L	ENERGY BAND (ERGS/MMM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
14	2.496E+01	4.526E+01								
			1	3.34927E-01	2.27734E-13	1.36102E-06	4.06241E-06	4.06241E-06	7.39394E-12	9.28678E-15
			2	3.34967E-01	2.27469E-13	1.35939E-06	4.05719E-06	4.05719E-06	7.38846E-12	3.71196E-14
			3	3.35027E-01	2.27071E-13	1.35691E-06	4.04937E-06	4.04937E-06	7.38029E-12	8.34268E-14
			4	3.35117E-01	2.26455E-13	1.35317E-06	4.03730E-06	4.03730E-06	7.36755E-12	1.48058E-13
			5	3.35251E-01	2.25524E-13	1.34756E-06	4.01908E-06	4.01908E-06	7.34822E-12	2.30734E-13
			6	3.35453E-01	2.24133E-13	1.33923E-06	3.99191E-06	3.99191E-06	7.31931E-12	3.30950E-13
			7	3.35753E-01	2.22074E-13	1.32691E-06	3.95170E-06	3.95170E-06	7.27643E-12	4.47821E-13
			8	3.36202E-01	2.19045E-13	1.30879E-06	3.89258E-06	3.89258E-06	7.21321E-12	5.79827E-13
			9	3.36872E-01	2.14615E-13	1.28231E-06	3.80628E-06	3.80628E-06	7.12053E-12	7.24414E-13
			10	3.37871E-01	2.08184E-13	1.24387E-06	3.68130E-06	3.68130E-06	6.98555E-12	8.77385E-13
			11	3.39364E-01	1.98961E-13	1.18875E-06	3.50274E-06	3.50274E-06	6.79097E-12	1.03206E-12
			12	3.41592E-01	1.85939E-13	1.11094E-06	3.25214E-06	3.25214E-06	6.51422E-12	1.17819E-12
			13	3.44919E-01	1.67998E-13	1.00373E-06	2.90999E-06	2.90999E-06	6.12858E-12	1.30088E-12
			14	3.49869E-01	1.44190E-13	8.61467E-07	2.46212E-06	2.46212E-06	5.60729E-12	1.38038E-12
			15	3.57317E-01	1.14361E-13	6.83235E-07	1.91219E-06	1.91219E-06	4.93310E-12	1.39410E-12
			16	3.68421E-01	8.01594E-14	4.78880E-07	1.29992E-06	1.29992E-06	4.11423E-12	1.32287E-12
			17	3.85033E-01	4.60762E-14	2.75242E-07	7.14964E-07	7.14964E-07	3.20107E-12	1.16194E-12
			18	4.09915E-01	1.90854E-14	1.13991E-07	2.78172E-07	2.78172E-07	2.28404E-12	9.29478E-13
			19	4.47299E-01	4.42488E-15	2.64178E-08	5.91030E-08	5.91030E-08	1.44999E-12	6.57449E-13
			20	5.04255E-01	4.26279E-16	2.54200E-09	5.05067E-09	5.05067E-09	7.18193E-13	3.60820E-13
			21	5.93237E-01	2.00030E-16	1.19483E-09	2.02820E-09	2.02820E-09	6.82061E-14	3.77791E-14
			22	6.94169E-01	3.09482E-20	5.36555E-16	2.66364E-13	2.66364E-13	7.60631E-18	4.62390E-18
			23	7.86048E-01	4.07905E-24	5.22390E-20	3.12407E-17	3.12407E-17	2.04170E-21	1.35655E-21
			24	8.77447E-01	9.36203E-28	2.73017E-21	6.29925E-21	6.29925E-21	1.43510E-22	1.03823E-22
			25	1.04736E+00	4.05995E-29	2.42008E-22	2.31595E-22	2.31595E-22	2.03879E-23	1.60045E-23
			26	1.23566E+00	5.42140E-30	2.04216E-23	1.58995E-23	1.58995E-23	2.64272E-24	2.24382E-24
			27	1.64521E+00	2.00488E-31	1.19643E-24	7.28958E-25	7.28958E-25	2.45660E-25	2.24932E-25
			28	2.18114E+00	5.57774E-33	3.20634E-26	1.47306E-26	1.47306E-26	1.18625E-26	1.16810E-26
			29	2.99369E+00	2.65211E-35	1.57086E-28	5.29286E-29	5.29286E-29	1.45537E-28	1.53731E-28
			30	4.23261E+00	1.90477E-39	6.44029E-33	2.68868E-33	2.68868E-33	4.24741E-32	4.80127E-32
			31	6.16223E+00	4.20969E-44	3.34139E-45	4.08167E-38	4.08167E-38	4.50637E-37	5.43926E-37
			32	9.11297E+00	6.40482E-49	2.20236E-71	4.19906E-43	4.19906E-43	3.23993E-42	4.16702E-42
			33	1.35265E+01	5.66234E-54	2.34170E-96	2.91620E-48	2.91620E-48	1.57252E-47	2.15087E-47
			34	2.01225E+01	4.59396E-59	5.14230-106	1.36399E-53	1.36399E-53	5.14023E-53	7.46329E-53
			35	2.99514E+01	2.15256E-64	8.86727-116	4.28953E-59	4.28953E-59	1.12975E-58	1.73824E-58
			36	7.66652E+00	6.78078E-70	2.34184E-86	5.27055E-64	5.27055E-64	9.70203E-64	1.57927E-63
			37	7.66539E+00	8.34479E-75	2.88337E-91	6.48717E-69	6.48717E-69	8.34572E-69	1.43502E-68
			38	7.66539E+00	1.02865E-79	3.55375E-96	7.99662E-74	7.99662E-74	7.18980E-74	1.30399E-73
			39	7.66539E+00	1.26980E-84	4.38688-101	9.87134E-79	9.87134E-79	6.20280E-79	1.18497E-78
			40	7.66539E+00	1.56961E-89	5.42265-106	1.22020E-83	1.22020E-83	5.35853E-84	1.07685E-83
			41	7.66539E+00	1.94270E-94	6.71157-111	1.51024E-88	1.51024E-88	4.63511E-89	9.78627E-89
			42	7.66539E+00	2.40739E-99	8.31699-116	1.87149E-93	1.87149E-93	4.01425E-94	8.89390E-94
			43	7.66539E+00	2.98672-104	1.03184-120	2.32185E-98	2.32185E-98	3.48059E-99	8.08313E-99
			44	7.66539E+00	3.70956-109	1.28157-125	2.88378-103	2.88378-103	3.02123-104	7.34646-104
			45	7.66539E+00	4.61221-114	1.59346-130	3.58549-108	3.58549-108	2.62526-109	6.67709-109
			46	7.66539E+00	5.74030-119	1.98378-135	4.46246-113	4.46246-113	2.28350-114	6.06886-114
			47	7.66539E+00	7.15122-124	2.47940-140	5.55929-118	5.55929-118	1.98816-119	5.51616-119
			48	7.66539E+00	8.91717-129	3.20199-145	6.93213-123	6.93213-123	1.73262-124	5.01390-124
			49	7.66539E+00	1.11291-133	5.51533-150	8.65165-128	8.65165-128	1.51127-129	4.55748-129
			50	7.66539E+00	1.39015-138	2.78249-154	1.08069-132	1.08069-132	1.31933-134	4.14270-134

L	ENERGY BAND (ERGS/GM)		I	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
15	4.426E+01	7.452E+01								
			1	1.6[illegible]E-01	5.35017E-19	3.1983AE-12	1.89309E-11	1.89309E-11	3.48902E-12	4.38221E-15
			2	1.[illegible]E-01	5.33493E-19	3.18906E-12	1.88749E-11	1.88749E-11	3.48507E-12	1.75090E-14
			3	1.[illegible]E-01	5.31211E-19	3.17495E-12	1.87910E-11	1.87910E-11	3.47916E-12	3.93284E-14
			4	1.[illegible]E-01	5.27710E-19	3.15374E-12	1.86624E-11	1.86624E-11	3.47002E-12	6.97335E-14
			5	1.[illegible]E-01	5.22452E-19	3.12214E-12	1.84695E-11	1.84695E-11	3.45621E-12	1.08525E-13
			6	1.[illegible]E-01	5.14666E-19	3.07548E-12	1.81841E-11	1.81841E-11	3.43559E-12	1.55344E-13
			7	1.[illegible]E-01	5.03260E-19	3.00723E-12	1.77662E-11	1.77662E-11	3.40507E-12	2.09561E-13
			8	1.[illegible]E-01	4.86743E-19	2.90846E-12	1.71616E-11	1.71616E-11	3.36016E-12	2.70103E-13
			9	1.[illegible]E-01	4.63160E-19	2.76747E-12	1.62997E-11	1.62997E-11	3.29452E-12	3.35171E-13
			10	1.[illegible]E-01	4.30079E-19	2.56974E-12	1.50935E-11	1.50935E-11	3.19933E-12	4.01836E-13
			11	1.[illegible]E-01	3.85170E-19	2.30133E-12	1.34616E-11	1.34616E-11	3.06301E-12	4.65504E-13
			12	1.[illegible]E-01	3.26643E-19	1.95156E-12	1.13463E-11	1.13463E-11	2.87102E-12	5.19263E-13
			13	1.73572E-01	2.55101E-19	1.52404E-12	8.78087E-12	8.78087E-12	2.60748E-12	5.53474E-13
			14	1.[illegible]E-01	1.75793E-19	1.05013E-12	5.97015E-12	5.97015E-12	2.25953E-12	5.56241E-13
			15	1.794345E-01	1.00024E-19	5.97417E-13	3.33047E-12	3.33047E-12	1.82621E-12	5.16087E-13
			16	1.[illegible]E-01	4.23224E-20	2.52703E-13	1.36913E-12	1.36913E-12	1.33185E-12	4.28236E-13
			17	1.[illegible]E-01	1.12719E-20	6.72588E-14	3.49775E-13	3.49775E-13	8.37328E-13	3.03937E-13
			18	2.[illegible]E-01	1.57599E-21	9.38925E-15	4.60897E-14	4.60897E-14	4.30075E-13	1.75016E-13
			19	2.[illegible]E-01	1.70150E-22	1.01286E-15	4.58042E-15	4.58042E-15	1.71496E-13	7.77590E-14
			20	2.[illegible]E-01	4.34669E-23	2.59366E-16	1.04417E-15	1.04417E-15	4.72541E-14	2.37405E-14
			21	2.[illegible]E-01	1.23346E-22	7.37093E-16	2.55291E-15	2.55291E-15	1.63481E-15	9.05515E-16
			22	3.[illegible]E-01	3.[illegible]E-26	3.20116E-28	6.82365E-19	6.82365E-19	2.14650E-19	1.30487E-19
			23	3.[illegible]E-01	1.04259E-29	4.62529E-36	1.63014E-22	1.63014E-22	2.51710E-23	1.67242E-23
			24	4.[illegible]E-01	2.50064E-33	1.52240E-38	3.43508E-26	3.43508E-26	4.88538E-27	3.53436E-27
			25	5.[illegible]E-01	5.28874E-37	1.46453E-40	6.15953E-30	6.15953E-30	1.72300E-28	1.35256E-28
			26	6.[illegible]E-01	7.51539E-41	1.35580E-42	9.02841E-34	9.02841E-34	1.18273E-29	1.00420E-29
			27	7.[illegible]E-01	1.[illegible]E-44	6.76538E-45	1.03867E-37	1.03867E-37	5.42251E-31	4.96498E-31
			28	1.[illegible]E+00	1.[illegible]E-48	8.[illegible]E-48	9.02866E-42	9.02866E-42	1.09578E-32	1.07902E-32
			29	1.[illegible]E+00	1.[illegible]E-52	5.79705E-52	5.73345E-46	5.73345E-46	3.93732E-35	4.15898E-35
			30	2.[illegible]E+00	8.95644E-57	9.15803E-60	2.58163E-50	2.58163E-50	2.00000E-39	2.26080E-39
			31	3.[illegible]E+00	4.[illegible]E-61	1.71757E-81	8.00293E-55	8.00293E-55	3.03616E-44	3.66469E-44
			32	4.[illegible]E+00	1.25578E-65	3.11101-104	1.68121E-59	1.68121E-59	3.12343E-49	4.01718E-49
			33	5.[illegible]E+00	2.[illegible]E-70	3.00840-114	2.38423E-64	2.38423E-64	2.16916E-54	2.96694E-54
			34	6.[illegible]E+00	3.75591E-75	2.27598-124	2.27720E-69	2.27720E-69	1.01456E-59	1.47308E-59
			35	1.[illegible]E+01	3.54373E-80	1.63565-134	1.46239E-74	1.46239E-74	3.19064E-65	4.90913E-65
			36	2.[illegible]E+00	2.[illegible]E-85	5.86615-111	3.66916E-79	3.66916E-79	3.92063E-70	6.38191E-70
			37	3.[illegible]E+00	5.[illegible]E-90	1.06542-120	9.22197E-84	9.22197E-84	4.82564E-75	8.29752E-75
			38	3.[illegible]E+00	1.[illegible]E-94	7.53593-136	2.32131E-88	2.32131E-88	5.94849E-80	1.07886E-79
			39	3.[illegible]E+00	5.[illegible]E-99	1.24537-156	5.85141E-93	5.85141E-93	7.34304E-85	1.40280E-84
			40	3.[illegible]E+00	9.[illegible]-104	6.28343-181	1.47698E-97	1.47698E-97	9.07678E-90	1.82407E-89
			41	3.[illegible]E+00	2.35148-108	2.86936-206	3.73288-102	3.73288-102	1.12343E-94	2.37193E-94
			42	3.[illegible]E+00	5.[illegible]-113	9.39721-223	9.44593-107	9.44593-107	1.39215E-99	3.08443E-99
			43	3.[illegible]E+00	1.[illegible]-117	1.59657-231	2.39304-111	2.39304-111	1.72716-104	4.01106-104
			44	3.[illegible]E+00	3.[illegible]-122	2.71844-240	6.06925-116	6.06925-116	2.14516-109	5.21622-109
			45	3.[illegible]E+00	9.[illegible]-127	4.64071-249	1.54092-120	1.54092-120	2.66715-114	6.78363-114
			46	3.[illegible]E+00	2.46695-131	7.98145-258	3.91618-125	3.91618-125	3.31950-119	8.82223-119
			47	3.[illegible]E+00	6.27572-136	1.45646-266	9.96245-130	9.96245-130	4.13540-124	1.14737-123
			48	3.[illegible]E+00	1.59797-140	4.13749-275	2.53671-134	2.53671-134	5.15662-129	1.49223-128
			49	3.[illegible]E+00	4.07247-145	3.93997-283	6.46489-139	6.46489-139	6.43572-134	1.94079-133
			50	3.[illegible]E+00	1.[illegible]-149	6.79131-291	1.64900-143	1.64900-143	8.03893-139	2.52422-138

L	ENERGY BAND (ERGS/MMV)		E	ABS COEF (1/CM)	ABSORPTION (JOULES)	EMISSION (JOULES)	TOTAL FLUX (WATTS/CM2)	RIGHT FLUX (WATTS/CM2)	FLUENCE (CAL/CM2)	YIELD (KILOTONS)
16	7.432E+01	9.652E+01								
			1	5.595358E-02	6.61736E-29	3.95803E-22	4.71024E-21	4.71024E-21	1.00439E-14	1.26151E-17
			2	5.595449E-02	6.58812E-29	3.94002E-22	4.68892E-21	4.68892E-21	1.00300E-14	5.03907E-17
			3	5.595586E-02	6.54467E-29	3.91286E-22	4.65724E-21	4.65724E-21	1.00094E-14	1.13146E-16
			4	5.595790E-02	6.47760E-29	3.87217E-22	4.60853E-21	4.60853E-21	9.97714E-15	2.00501E-16
			5	5.460966E-02	6.37770E-29	3.81189E-22	4.53566E-21	4.53566E-21	9.92816E-15	3.11744E-16
			6	5.461553E-02	6.23056E-29	3.72363E-22	4.42861E-21	4.42861E-21	9.85497E-15	4.45602E-16
			7	5.461235E-02	6.01771E-29	3.59618E-22	4.27385E-21	4.27385E-21	9.74660E-15	5.99845E-16
			8	5.462255E-02	5.71530E-29	3.41525E-22	4.05416E-21	4.05416E-21	9.58733E-15	7.70668E-16
			9	5.463778E-02	5.29583E-29	3.16427E-22	3.74969E-21	3.74969E-21	9.35501E-15	9.51741E-16
			10	5.466152E-02	4.73040E-29	2.82633E-22	3.34046E-21	3.34046E-21	9.01939E-15	1.13283E-15
			11	5.469428E-02	4.00997E-29	2.39568E-22	2.82039E-21	2.82039E-21	8.54109E-15	1.29804E-15
			12	5.545208E-02	3.15050E-29	1.88197E-22	2.20274E-21	2.20274E-21	7.87311E-15	1.42396E-15
			13	5.620968E-02	2.22220E-29	1.32721E-22	1.54004E-21	1.54004E-21	6.96829E-15	1.47912E-15
			14	5.749118E-02	1.35145E-29	8.06947E-23	9.24452E-22	9.24452E-22	5.79825E-15	1.42739E-15
			15	5.960332E-02	6.75362E-30	4.03112E-23	4.53213E-22	4.53213E-22	4.38881E-15	1.24028E-15
			16	6.156208E-02	2.80823E-30	1.55581E-23	1.70191E-22	1.70191E-22	2.86664E-15	9.21727E-16
			17	6.553441E-02	6.94570E-31	4.13844E-24	4.35239E-23	4.35239E-23	1.48030E-15	5.37325E-16
			18	1.010059E-01	1.08471E-31	6.44726E-25	6.41616E-24	6.41616E-24	5.17590E-16	2.10630E-16
			19	1.034995E-01	1.55171E-32	9.21965E-26	8.46684E-25	8.46684E-25	9.05186E-17	4.10426E-17
			20	1.223506E-01	1.92780E-32	1.15152E-25	9.41374E-25	9.41374E-25	3.89944E-18	1.95908E-18
			21	1.415416E-01	5.08416E-31	3.03955E-24	2.14606E-23	2.14606E-23	3.41812E-21	1.89328E-21
			22	1.567221E-01	3.26375E-34	9.98451E-45	1.16958E-26	1.16958E-26	9.13608E-25	5.55386E-25
			23	1.773506E-01	1.78655E-37	1.02584E-57	5.69726E-30	5.69726E-30	2.18254E-28	1.45013E-28
			24	2.136438E-01	8.73761E-41	7.69053E-62	2.44807E-33	2.44807E-33	4.59907E-32	3.32722E-32
			25	2.451513E-01	3.76838E-44	3.63554E-65	8.95156E-37	8.95156E-37	8.24672E-36	6.47367E-36
			26	3.067720E-01	1.58264E-47	1.72613E-68	2.67577E-40	2.67577E-40	1.20881E-39	1.02635E-39
			27	3.845544E-01	4.14597E-51	3.09595E-72	6.27805E-44	6.27805E-44	1.39079E-43	1.27344E-43
			28	5.238938E-01	9.75587E-55	6.58754E-77	1.11300E-47	1.11300E-47	1.20918E-47	1.19068E-47
			29	7.187618E-01	1.73423E-58	1.32642E-83	1.44154E-51	1.44154E-51	7.68179E-52	8.11424E-52
			30	1.016191E+00	2.25179E-62	5.14351E-96	1.32390E-55	1.32390E-55	3.46192E-56	3.91335E-56
			31	1.479455E+00	2.07285E-66	1.12746-110	8.37088E-60	8.37088E-60	1.07510E-60	1.29766E-60
			32	2.157885E+00	1.51349E-70	1.84704-120	3.58680E-64	3.58680E-64	2.26677E-65	2.91539E-65
			33	3.247508E+00	5.63954E-75	1.96433-130	1.03753E-68	1.03753E-68	3.23861E-70	4.42972E-70
			34	4.751094E+00	1.65442E-79	1.63920-140	2.02127E-73	2.02127E-73	3.14000E-75	4.55909E-75
			35	7.198605E+00	3.18980E-84	1.30238-150	2.64761E-78	2.64761E-78	2.07782E-80	3.19693E-80
			36	1.045541E+01	4.18512E-89	5.17282-127	1.35494E-82	1.35494E-82	5.52775E-85	8.99794E-85
			37	1.545148E+01	2.14518E-93	1.03804-136	6.94607E-87	6.94607E-87	1.55028E-89	2.66565E-89
			38	1.545148E+01	1.10137E-97	8.07483-152	3.56624E-91	3.56624E-91	4.72861E-94	8.57612E-94
			39	1.545148E+01	5.66270-102	1.45953-172	1.83358E-95	1.83358E-95	1.61681E-98	3.08872E-98
			40	1.545148E+01	2.91540-106	8.04354-197	9.44006-100	9.44006-100	6.26840-103	1.25970-102
			41	1.545148E+01	1.50290-110	3.99408-222	4.86639-104	4.86639-104	2.71184-107	5.72560-107
			42	1.545148E+01	7.75698-115	1.10839-248	2.51171-108	2.51171-108	1.26820-111	2.80979-111
			43	1.545148E+01	4.00929-119	7.74104-276	1.29788-112	1.29788-112	6.22010-116	1.44452-115
			44	1.545148E+01	2.07351-123	0.	6.71402-117	6.71402-117	3.13321-120	7.61875-120
			45	1.545148E+01	1.07377-127	0.	3.47688-121	3.47688-121	1.60109-124	4.07220-124
			46	1.545148E+01	5.56620-132	0.	1.80233-125	1.80233-125	8.24510-129	2.19130-128
			47	1.545148E+01	2.88817-136	0.	9.35190-130	9.35190-130	4.26431-133	1.18313-132
			48	1.545148E+01	1.50000-140	0.	4.85698-134	4.85698-134	2.21116-137	6.39871-137
			49	1.545148E+01	7.79726-145	0.	2.52475-138	2.52475-138	1.14850-141	3.46347-141
			50	1.545148E+01	4.05661-149	0.	1.31353-142	1.31353-142	5.97284-146	1.87547-145

TIME= 1.00E+00

	FLUX (CAL/CM2)	YIELD (KILOTONS)	FLUX (WATTS)
1	2.23794E-03	0.	1.61592E-20
2	2.31149E-03	7.09748E-06	6.43547E-20
3	3.05787E-03	2.40004E-05	1.43881E-19
4	3.81549E-03	5.56340E-05	2.53160E-19
5	4.15491E-03	1.05676E-04	3.89314E-19
6	4.66761E-03	1.77341E-04	5.47301E-19
7	5.13287E-03	2.73400E-04	7.18669E-19
8	5.64731E-03	3.96156E-04	8.89913E-19
9	6.05204E-03	5.47383E-04	1.04077E-18
10	6.42402E-03	7.28188E-04	1.14311E-18
11	6.77345E-03	9.38775E-04	1.16553E-18
12	7.08216E-03	1.17805E-03	1.08040E-18
13	7.35269E-03	1.44297E-03	8.83591E-19
14	7.54867E-03	1.72748E-03	6.13451E-19
15	7.65291E-03	2.02094E-03	3.45998E-19
16	7.68499E-03	2.30570E-03	1.50746E-19
17	7.68524E-03	2.55387E-03	4.63350E-20
18	7.68193E-03	2.72368E-03	8.91694E-21
19	6.41655E-03	2.75826E-03	1.89973E-21
20	5.45765E-03	2.60656E-03	1.15289E-20
21	4.51174E-03	2.38148E-03	2.26541E-18
22	3.69769E-03	2.14683E-03	3.58637E-21
23	2.97593E-03	1.89226E-03	5.05428E-24
24	2.44956E-03	1.67098E-03	6.26019E-27
25	1.99752E-03	1.46080E-03	6.57621E-30
26	1.63441E-03	1.26112E-03	5.62987E-33
27	1.32174E-03	1.07382E-03	3.77234E-36
28	9.48389E-04	9.00828E-04	1.90488E-39
29	7.29952E-04	7.43768E-04	7.00996E-43
30	5.52452E-04	6.03848E-04	1.82497E-46
31	4.12278E-04	4.81704E-04	3.26389E-50
32	3.12772E-04	3.77334E-04	3.94774E-54
33	2.10880E-04	2.90112E-04	3.21720E-58
34	1.33266E-04	2.18857E-04	1.76258E-62
35	1.03345E-04	1.61970E-04	6.48155E-67
36	7.42477E-05	1.17588E-04	9.29625E-71
37	5.08408E-05	8.37466E-05	1.33358E-74
38	3.81427E-05	5.85205E-05	1.91315E-78
39	2.15580E-05	4.01310E-05	2.74469E-82
40	1.57453E-05	2.70147E-05	3.93780E-86
41	9.69726E-06	1.78572E-05	5.64973E-90
42	5.80124E-06	1.15950E-05	8.10614E-94
43	3.28116E-06	7.39848E-06	1.16309E-97
44	1.33271E-06	4.64092E-06	1.66887-101
45	1.13114E-06	2.88311E-06	2.39466-105
46	8.88561E-07	1.73791E-06	3.43616-109
47	5.46355E-07	1.03839E-06	4.93074-113
48	2.15527E-07	6.10970E-07	7.07554-117
49	1.19172E-07	3.54153E-07	1.01535-120
50	6.57437E-08	2.12327E-07	1.45706-124

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