Westinghouse Electric Corporation
Astronuclear Laboratory

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WANL-TNR-106

MAY 8, 1963

SUBMITTED BY:

**Westinghouse Electric Corporation
Astronuclear Laboratory
Pittsburgh 36, Pennsylvania**

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**A CONDITIONAL
MONTE CARLO
MASTER PROGRAM
FOR SOLVING THE
TRANSPORT EQUATION**

SNPO-C
2/26/63

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July 10, 1963

*
Mr. H. Tushar
Space Nuclear Propulsion Office
NASA Lewis Research Center
21000 Brookpark Road
Cleveland 35, Ohio

Subject: WANL-TNR-106 dated May 3, 1963, "A Conditional Monte Carlo Program for Solving the Transport Equation"

Dear Mr. Tushar:

Transmitted herewith is one (1) copy of the subject report.

This report is transmitted for your information.

Respectfully,

H. F. Faught
Program Manager
NERVA Nuclear Subsystem

jm

Enclosure

cc: Mr. V. R. Miller - AGC

12

June 25, 1963

ERRATA SHEET

The following corrections are to be made in WANL-TNR-106:

Page 5, the last line should be:

source planes (height of layers) is constant as shown in figure 4. If the configuration

Page 16, Equation (24) should be:

$$\begin{aligned} \sqrt{X_i^2 + Y_i^2} &\leq \text{radius of core} & \Delta Z &= \text{height of one layer} \\ -(B - \Delta Z) &\leq Z_i \leq B, \quad i = 1, 2, \dots, n & B &= \text{height of reactor} \end{aligned} \quad (24)$$

Page 26, line four, part IV. WEIGHT FUNCTION PROGRAM, should be
be worthwhile to take our choices several different ways at once.¹ In fact, we can

Page 28, Equation (39) should be

$$(3) \sum_{i=1}^F \sum_g \frac{1}{I} \sum_{j=1}^I \left[\left(\sum_{j=1}^J E_{ij} T_{w,j} \right) - (\phi_{w,g}) \right]^2 \quad (39)$$

Page 28, Equation (40) should be

$$(4) \frac{1}{I} \sum_{i=1}^I \left[\left(\sum_g \sum_{j=1}^J E_{ij} T_{w,j} \right) - \left(\sum_g \phi_{w,g} \right) \right]^2 \quad (40)$$

Page 31, 7th and 6th lines from bottom of page should be

A four by four matrix $P_{k\ell}$ must be given as input for each material region:

$$P_{k\ell} = \sigma_{k\ell}(\text{scattering}) + \nu_k \sigma_k(\text{fission}) \chi_\ell$$

Page 38, Equation (42) should be

$$\text{NOHIS } 1 = (100) \quad (\text{NOPTS } 1) \quad (42)$$

NOTE

This report has been prepared primarily for internal use. The computer program it describes is presently being revised as outlined in Section V of Part I. The lessons learned from experience on proper source mesh spacing, choice of conditional weight function, etc. are not discussed in this report. Use of the program to compute eigenvalues is only outlined. The latter will be discussed in a subsequent report.

Some minor changes in the program made after this report was written are described under "Additional Notes" added at the end of the report (page 214). References in the text to "Additional Notes" have been made by asterisks (*).

	Page
PART I Description of Program Without Control Vanes	i
PART II Description of Control Vane Part of Program	201

TABLE OF CONTENTS PART I

I.	INTRODUCTION	Page 1
II.	REACTOR GEOMETRY AND MATERIAL REGIONS	5
	A. Annuli	7
	B. Layers	8
	C. Source Mesh	8
	D. Source Point Coordinates	9
	E. Field Points	9
	F. Source Weights	9
III.	DESCRIPTION OF THE PROGRAM	10
	Chain I	12
	A. Generation of Raw Histories and Rotation Into the Z Axis	12
	Chain II	14
	A. Spheres of Influence	14
	B. Rotating and Stretching a History and Calculation of Vertex Coordinates	15
	C. Calculation of the Parts of a History Which Pass Through Different Material Regions	17
	D. Reaction Type and Energy Group Calculation	19
	E. Axial Routine	21
	F. Calculation of Non-Weighted Estimator Values	23
	G. Results	24
IV.	WEIGHT FUNCTION PROGRAM	26
V.	REVISED PROGRAM	30
	APPENDIX I (choice of reaction type and determination of the energy group)	33

APPENDIX II (approximate running time)	Page 37
APPENDIX III (Input Symbols and Definitions Exclusive of Control Rods)	39
REFERENCES	44
INSTRUCTIONS FOR KEY PUNCHING DATA CARDS, AND INPUT DATA FORMS	45
FLOW DIAGRAMS	60
SAMPLE PROBLEM	72
PROGRAM LISTINGS	127

I. INTRODUCTION

Monte Carlo Methods of solving neutron transport problems are usually considered to have three advantages compared with finite difference methods. These are (a) more accurate representation of the physical reactions, (b) more accurate representation of boundaries between regions of different composition, (c) greater efficiency compared with finite difference methods as the dimensionality of the problem increases. At the same time Monte Carlo methods have a number of disadvantages viz. (a) the nature of the solution being a statistical estimate rather than a deterministic solution, (b) the inability to make full use of an approximate solution as input, (c) the inability to obtain results at chosen points or, if this defect is removed by some technique, uncertainty over the possible introduction of an effective bias, (d) the large amount of computer time usually required, (e) sometimes inflexibility of a program limiting it to a small class of specialized problems.

The Monte Carlo program to be described here has been designed to eliminate some of the above disadvantages. It is based on a relatively new technique, Conditional Monte Carlo, discovered by Trotter and Tukey^{(1),(2)}. The method does not take the place of finite difference methods. Instead it complements those methods and is designed to work in conjunction with a finite difference method. A primary objective of the method is to get more accurate values for the neutron flux near boundaries by performing a few (~ 10) iterations: using as zero iterate a solution obtained from a finite difference method. The solution obtained by the finite difference method may be poor in the neighborhood of a boundary because of the order of approximation (e.g. diffusion theory in the neighborhood of a control rod), or because of inaccuracy in the representation of the actual boundary shape on a finite difference mesh. A localized error such as this should be removable in a few iterations.⁽³⁾

A secondary objective of the program is to provide a method for computing a Green's function which can then be used to perform as many iterations as may be required to obtain convergence.

The conditional Monte Carlo method provides an unbiased estimate of the probability that a particle starting at a given point will end at a given point after exactly n steps. The technique can be used to estimate the solution of both non-homogeneous and homogeneous integral equations.

The application of Conditional Monte Carlo to the solution of source type transport problems has been given in reference 2. The application to homogeneous integral equations is straightforward.

The eigenvalue problem for a reactor may be written

$$O\psi = \lambda^{-1}\psi \quad (1)$$

where O is an integral operator; if ψ_0 is an approximate eigenfunction corresponding to the smallest eigenvalue λ_0 , a better approximation can be found under very general conditions by iteration. By expanding the zero iterate approximation, ψ_0 , in eigenfunctions it can be shown that⁽⁴⁾

$$\lambda_0 \approx \frac{\psi_n}{\psi_{n+1}} \quad (2)$$

for n sufficiently large. In the last expression ψ_n and ψ_{n+1} are defined by

$$\psi_n = O^{(n)}\psi_0 \quad (3)$$

The zero iterate flux ψ_0 may be represented on a set of mesh points. The operator $O^{(n)}$ corresponds to a random walk with n steps from a source point to the field point, finally summed over the properly weighted source points. Thus the expression on the right hand side of the last equation is a multiple integral which can be estimated by conditional Monte Carlo.

Four Energy Group Problem

To simplify the programming and to reduce the computer time this first program has been written as a four energy group program with isotropic scattering in the laboratory system. The latter restriction means that anisotropic scattering is to be accounted

for by the "transport approximation". With these restrictions the estimator, Equation 69* reference 2, becomes

$$U_g = \frac{2}{4\pi} \left[\prod_{i=1}^n \frac{\tau_{n,i}}{\rho_{n,i}} \right] e^{-\sum_{j=1}^J \tau_j} e^{+\sum_{i=1}^n \Delta_i} R^{n-3} T_n(R') \\ \tau_j = \sigma_j^{\text{transport}}(E_j) \delta_j \quad (4)$$

for a unit source. For a source S_g the estimator is $U_g S_g$. If $S_g(x,y,z)$ is the source weight associated with the point (x,y,z) for group g :

$$S_g = \phi_g^{(0)}(x,y,z) \Delta V \quad (5)$$

where $\phi_g^{(0)}(x,y,z)$ is the zero iterate flux at (x,y,z) and ΔV is the volume element associated with the point (x,y,z) .

Also $(R')^{n-1} T_n(R')$ is the conditional weight function (denoted $h(R')$ in reference 2).^{**} The other notation used in Equation 4 is explained below.

Summary of Sampling Procedure

The sampling procedure using the estimator (Equation 4) is as follows:

(1) Production of "raw histories"

To do n simultaneous iterations the first process is to generate a set of random walks in an infinite homogeneous medium with unit cross sections. This means produce a set of n random direction cosines (u_i', v_i', w_i') , $i = 1, \dots, n$; and a set of n random flight lengths Δ_i , $i = 1, \dots, n$. The problem of finding the random triple (u_i', v_i', w_i') is the problem of finding a sample from a uniform distribution on the unit sphere. We follow Cashwell and Everett (LA-2120, page 36). To get a set of random flight lengths we sample from

$$e^{-\Delta}$$

*In reference 2 Equation 69 there should be an equal sign between I_n and H .

**See additional notes, page 214.

In practice the n step histories are produced in sets of 100 histories and (after rotation of the end point into the z axis as described in 2 below) stored on magnetic tape. Besides the direction cosines and flight lengths the quantities

$$R'_n = \left[\left(\sum_{i=1}^n \vec{\Delta}_i \right) \cdot \left(\sum_{i=1}^n \vec{\Delta}_i \right) \right]^{1/2}$$

$$= \sum_{i=1}^n \Delta_i$$

$$\vec{\Delta}_i = (\Delta_i \mu_i', \Delta_i \nu_i', \Delta_i \omega_i')$$
(6)

are stored for each history.

(2) First rotation

Each random walk is rotated so that the final point of the walk lies on the +z axis. This process is described later in this report.

(3) To estimate the flux at a given field point (x_f, y_f, z_f) we start with the first source point (x_s, y_s, z_s) and calculate

$$R = \left[(x_f - x_s)^2 + (y_f - y_s)^2 + (z_f - z_s)^2 \right]^{1/2}$$
(7)

By comparing R with the input quantities D_1 and D_2 the number of raw histories (FNOH) out of the first set of 100 histories to be used at this source and field point is determined. Each flight length Δ_i in the first raw history is now multiplied by (R/R'_n) . The stretched or compressed history is now translated and rotated a second time so that the initial point lies on (x_s, y_s, z_s) and the final point lies on (x_f, y_f, z_f) .

(4) To obtain a sample of U_g for given source and field points and a given raw history, it is now necessary to sample the reaction at each collision point.

For each raw history four estimates of U_g are produced corresponding to starting with source energy E_g , $g = 1, \dots, 4$.

- Starting with a given energy at the source point a reaction at the first collision point (the source point) is chosen using the input probabilities p_r , then at the next collision point and so on. The result of this procedure is four estimates U_g , $g = 1, \dots, 4$. Each of these estimates corresponds to a sample ending with a random energy $E_{g'}$, $g' = 1, \dots, 4$ at the field point.
- (5) If the reactor is homogeneous in the z direction U_g can be used to estimate the flux for any value of z by a process of translating the history in the z direction. This process is described below under "Axial Routine".
- (6) After all the raw histories to be used at the first source point have been used the calculation proceeds to the next source point and so on until the source mesh has been completely swept. All the contributions from the various source points which end with energy $E_{g'}$, $g' = 1, \dots, 4$ at the field point are added together as the calculation proceeds. Finally the calculation proceeds to the next "radial field point" (pair of x_f, y_f).

II. REACTOR GEOMETRY AND MATERIAL REGIONS

The program is designed to solve for the flux in a finite cylinder. However, the program described in this report is restricted to cylinders which are homogeneous in the axial (z) direction and symmetric about the axis. These regions of different material must be described as annular regions of finite height (see figures 1 and 2). The program described in Part II of this report removes the restriction of azimuthal symmetry. The program is also planned so that the restriction of homogeneity in the axial direction can be removed without complete reprogramming. The removal of the latter restriction has been accomplished for a one-group version of the program (not reported on here) but has not yet been done for the four group program.

Although the program is written for a finite cylinder, the source is entered on a rectangular lattice on planes perpendicular to the axis. The distance between the source planes (height of layers) is constant as shown in figure 3. If the configuration

Figure 1
Reactor Geometry

of the reactor is invariant under a 180 degree rotation about the axis, sweeping the source in the semi-circle gives the complete solution. If the reactor is such that it is not invariant under a 180 degree rotation about the axis, the full solution of a problem requires two runs of the program: once to sweep the source mesh in the semi-circle in which the field point lies and once to sweep the remaining semi-circle. The contributions to the fluxes at a field point from each run are then added. The running times for the two runs will in general be different, since the sampling will be more thorough while sweeping the semi-circle in which the field point lies than while sweeping the complementary semi-circle (see definitions of D1 and D2 in input symbols).

A. Annuli

The number of annuli, representing regions of different material, must be less than 15. The annuli are specified by supplying the radii of the annuli. Figure 2 shows the top view of a core with 4 annuli. A(1) is fixed in the program. The radius of the smallest circle is entered as A(2).

Figure 2

Top view of a reactor with 4 annuli.

B. Layers

For the purpose of computing, the reactor is divided into an even number of equal layers in the axial direction. The maximum number of layers is currently set at 20. It should be emphasized that the layers are only for computing purposes and are not, at present, different material regions. See figure 3.

C. Source Mesh

The reactor is divided into source volumes by superposing a three dimensional mesh on the reactor. The three dimensional mesh consists of a variable mesh on the x-y plane and layers of equal thickness in the z direction. The source mesh is constructed by considering a square with inscribed circle.

The number of divisions of the square in both the x and y directions is specified as input data; the upper limit on each value is currently set at 26; and the number of divisions in each direction must be an even number.

As was stated previously, the source mesh for only a semicircle need be considered.

Figure 3

Pictorial view of one half of a layer showing the source mesh

The source mesh, as shown in figure 3, is variable in both the x and y direction; the mesh in the x direction must be symmetrical about the point $x = 0$, since the source weights are entered for only half the rectangle shown in figure 3.

D. Source Point Coordinates

The source points are located at the center of the volumes shown in figure 3. It should be emphasized that the construction of the source mesh is necessary in order to locate the source points, but it is the source point coordinates that are input to the computer and not the source mesh. The source points are marked by an x in figure 3, and it is the coordinates of these points which are required as input data. The order in which the x coordinates are required is from left to right and the y coordinates are required from bottom to top as shown in figure 3.

Since the center of the reactor is taken as the origin (0,0) for the x-y coordinates, all of the y coordinates will be positive values while half of the x coordinates will be negative. The program, knowing the height of the core and the number of layers in the reactor, calculates the z coordinate as it is needed.

E. Field Points

Field points at which the flux is to be calculated are inputted by giving pairs of (x,y) values. The program always calculates the flux for the pair (0,0) and the latter pair is not inputted. The program will compute the flux on all the interfaces between layers in the z direction, also on the top and bottom of the cylinder for each "radial field point" (pair of x,y) inputted.

F. Source Weights

Corresponding to each source point there are four source weights inputted. Let the source weights be symmetrical around the axis of the core, then only the source weights for one fourth of the reactor need be supplied as input. Since the source weights are also symmetrical around the midplane of the core, source weights for only one-eighth of the reactor need be supplied as input (see figures 4 and 5). The source weights for the other points are obtained by translation. These simplifications of source weight specification are to conserve core storage in the computer and may later be removed as required.

The number of source weights required per group is given by the following formula:

$$\frac{\text{number of source weights}}{\text{group}} = \frac{\text{number of divisions of source mesh in x-direction}}{2} \times \frac{\text{number of divisions of source mesh in y-direction}}{2} \times \frac{\text{number of layers}}{2} \quad (8)$$

The source weights for all of group one are read into core storage followed by the source weights for groups 2, 3, and 4 in that order.

Figure (4) shows the half of the reactor for which calculations are performed; figure (5) shows that part of the reactor for which source weights must be supplied as input data. Figure (6) shows that part of the bottom layer for which source weights are required and the order in which they are required. The source weights for energy group 1 are read into core storage for the bottom layer, (see figure 6) followed by the source weights for subsequent layers up to the midplane of the reactor; this process is then repeated for energy groups 2, 3, and 4.

III. DESCRIPTION OF THE PROGRAM

The program is written for the IBM 7094 computer with two data channels (A and B) 12 tape drives, and a 32K random access core storage. The logical tape drives which this program uses are listed below:

Logical tape drive	Use
5	Input tape (binary decks and data)
6	Output tape.
4	The links of the chain are stacked on this tape.
3	The generated histories are stored on this tape.
12	The flux estimates without the weight function are written on this tape.

The program consists of two chains (two core loadings), and is written primarily in "Fortran II", although some of the more time consuming parts are written in FAP (Fortran Assembly Language).

Figure 4
One-half of the reactor circumscribed by a rectangle

Figure 5
The part of the reactor for which source weights are required as input data.

Figure 6 (layer 1 of figure 5)
Source weights are read in for one layer in the order shown, and then repeated for subsequent layers up to the midplane (for each group).

The general flow of the program and some of the more important details are described in this section. For finer details the flow diagrams and program listings should be consulted.

Chain I

Chain I of the program is loaded into core storage and execution is initiated. The input data are read into core storage and subsequently written on the output tape.

A. Generation of Raw Histories and Rotation into the z Axis.

The raw histories are generated using random numbers uniformly distributed between zero and one. Both the number of histories to be generated and the number of steps in each history are input data. The histories are generated in multiples of one hundred.

A raw history consists of the direction cosines, the flight lengths, the straight line distance from (0,0,0) to the final point of the history, and the quantity $e^{+\sum_{i=1}^n \Delta u_i}$ which will be called "the raw history weight". The straight line distance from start to finish of a history must also be between certain limits, which are input values, or the history is not acceptable.

If we represent the flight lengths by Δ'_i and the direction cosines by u'_i , v'_i and w'_i , where i goes from 1 to the number of steps n in the history, then the coordinates of the end point of a history are:

$$\begin{aligned} X'_n &= \sum_{i=1}^n \Delta'_i u'_i \\ Y'_n &= \sum_{i=1}^n \Delta'_i v'_i \\ Z'_n &= \sum_{i=1}^n \Delta'_i w'_i \end{aligned} \quad (9)$$

The straight line distance from the starting point (0,0,0) to the end point (X'_n, Y'_n, Z'_n) is:

$$s' = \left[(X'_n)^2 + (Y'_n)^2 + (Z'_n)^2 \right]^{1/2} \quad (10)$$

In order to rotate the point (X', Y', Z') into the point $(0,0,1)$ the history must first be stretched (compressed) so that the total flight length of the stretched (compressed) raw history will be equal to 1. Hence, if Δ''_i is the i^{th} flight length of the stretched (compressed) history,

$$\Delta''_i = \frac{\Delta'_i}{s'} \quad (11)$$

The rotation of (X', Y', Z') into the point $(0,0,1)$ is accomplished by means of an orthogonal transformation. Such a transformation preserves all distances and angles, i.e., an orthogonal transformation causes a rigid rotation of the normalized raw history. Hence, if (u', v', w') denotes the end point of the stretched raw history

$$\begin{aligned} u' &= X'_n / s' \\ v' &= Y'_n / s' \\ w' &= Z'_n / s' \end{aligned} \quad (12)$$

We note that $(w'')^2 + (u'')^2 + (v'')^2 = 1$ and let

$$\rho'' = \sqrt{1 - (w'')^2} = \sqrt{(u'')^2 + (v'')^2} \quad (13)$$

The orthogonal matrix⁽⁴⁾

$$R_1 = \begin{pmatrix} \frac{u''w''}{\rho''} & \frac{v''w''}{\rho''} & -\rho'' \\ -\frac{v''}{\rho''} & \frac{u''}{\rho''} & 0 \\ u'' & v'' & w'' \end{pmatrix} \quad (14)$$

transforms the point (u'', v'', w'') into $(0,0,1)$ since

$$R_1 \cdot \begin{pmatrix} u'' \\ v'' \\ w'' \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \quad (15)$$

The matrix R_1 can be used to calculate the three direction cosines of the rotated flight lengths. Thus, if u''_i, v''_i, w''_i are the direction cosines of the i^{th} flight length

$$\begin{pmatrix} u''_i \\ v''_i \\ w''_i \end{pmatrix} = R_1 \cdot \begin{pmatrix} u'_i \\ v'_i \\ w'_i \end{pmatrix} \quad (16)$$

Following the calculation of the direction cosines and flight lengths of the stretched and rotated history, the $\Delta''_i, u''_i, v''_i, w''_i$ for $1 \leq i \leq n$ are written on tape along with the s' and weight factor for that history.

Chain II

Chain two of the program (second core loading) is now loaded into core storage and execution initiated. The first one-hundred histories are read into core storage from the scratch tape, and are used in sequence from 1 to 100 and back to 1 again, until the flux values at all field points have been calculated. If there are more than 100 histories, the next 100 histories are read into core from the scratch tape and the process repeated. Following the reading of the histories from tape, the first field and source points are selected. Since the source mesh is considered to be square instead of circular, it is possible that the chosen source point is not in the physical core. This is checked immediately and if the current source point is not within the reactor, the next source point is selected.

A. Spheres of Influence

The distance from the source to field point determines how many histories should be used for this source and field point. If the distance from source to field point is less than an input value $D1$ (first sphere of influence) all 100 histories are used; if the distance is less than an input value $D2$ (second sphere of influence) but greater than $D1$ then $100 * \text{FRACF}$ (input value) histories are used; if the distance is greater than $D2$ then $100 * \text{FRACG}$ (input value) histories are used.

B. Rotating and Stretching a History and Calculation of Vertex Coordinates

Following the selection of the source and field point, a raw history is chosen and rotated, stretched, and translated so that (0,0,0) for the raw history is located at the field point. We first calculate

$$\text{DIST} = [(x_f - x_s)^2 + (y_f - y_s)^2 + (z_f - z_s)^2]^{1/2} \quad (17)$$

and

$$\begin{aligned} u &= \frac{(x_f - x_s)}{\text{DIST}} \\ v &= \frac{(y_f - y_s)}{\text{DIST}} \\ w &= \frac{(z_f - z_s)}{\text{DIST}} \end{aligned} \quad (18)$$

where (x_f, y_f, z_f) and (x_s, y_s, z_s) are the field and source points respectively.

Next form the matrix

$$R = \begin{pmatrix} \frac{uw}{\rho} & -\frac{v}{\rho} & u \\ \frac{vw}{\rho} & \frac{u}{\rho} & v \\ -\rho & 0 & w \end{pmatrix} \quad (19)$$

where $\rho = \sqrt{1 - w^2} = \sqrt{u^2 + v^2}$ since $u^2 + v^2 + w^2 = 1$; R is an orthogonal transformation which rotates the point (0,0,1) into the point (u,v,w) on the unit sphere. It can also be shown that if (u_i, v_i, w_i) represent the direction cosines of the i^{th} flight length of the rotated history

$$\begin{pmatrix} u_i \\ v_i \\ w_i \end{pmatrix} = R \begin{pmatrix} u_i'' \\ v_i'' \\ w_i'' \end{pmatrix} \quad (20)$$

The matrix R depends only on the source and field points, and not on each individual history, so that when more than one history is used for the current source and field point, the matrix R need not be recalculated.

The stretching of the history is effected by calculating the i^{th} flight length, Δ_i , by the formula:

$$\Delta_i = (\text{DIST}) \cdot \Delta_i'' \quad (21)$$

The translation of the history accomplished by setting

$$\begin{aligned} x_0 &= x_s \\ y_0 &= y_s \\ z_0 &= z_s \end{aligned} \quad (22)$$

and calculating the coordinates of the i^{th} vertex of the history according to

$$\begin{aligned} X_i &= X_{i-1} + \Delta_i u_i \\ Y_i &= Y_{i-1} + \Delta_i v_i \\ Z_i &= Z_{i-1} + \Delta_i w_i \end{aligned} \quad i = 1, 2, \dots, n \quad (23)$$

A check is available in that (X_n, Y_n, Z_n) must be (X_f, Y_f, Z_f) .

As the above coordinates are calculated, two checks are made to determine if the history will be entirely inside the reactor in all of the calculations which follow.

These tests are

$$\begin{aligned} \sqrt{X^2 + Y^2} &\leq \text{radius of core} & \Delta Z &= \text{height of one layer} \\ -(B - \Delta Z) &\leq Z \leq B, \quad i = 1, 2, \dots, n & B &= \text{height of reactor} \end{aligned} \quad (24)$$

If the coordinates fail either of these tests, then the history makes zero contribution to the flux values.

The second check could possibly pass a history whose Z coordinates span almost twice the height of the core, and this history could not possibly contribute to the flux. But at the same time a history can be in the imaginary or the real core and still contribute to the flux at a field point which is not on the bottom layer. This occurs in the axial routine when the field flux on all layers is calculated by shifting each history to successively higher layers in the core. Figure 9 gives more of the details.

Figure 9

It can be seen that history "a" (---) will contribute to the field point as marked; but when the history is shifted up to history "a'" the history goes out of the top of the core and hence escapes.

The history marked "b" (—) will contribute only when shifted upwards by 9 layers.

The history marked "c" (—) will contribute only when shifted upwards by 5 layers and thereafter until the history goes out the top of the reactor.

C. Calculation of the Parts of a History Which Pass Through Different Material Regions

For each history which passes the above tests (equation 24), the next objective is to calculate the lengths of the various parts of the steps which pass through the different material regions. Figure 10 shows a two dimensional view of this for a core with four annuli and a three step history.

Figure 10

The various parts of the steps which pass through the various annuli are marked by ().

Consider the step going from the source point to the point marked vertex # 1 in figure 10. The program calculates which of the two end points of the step is further from the center of the core. The parametric equations of the infinite line starting at the point further from the center of the core and passing through the other end point are constructed as follows:

$$X = X_{i-1} + \bar{d} \cdot u_i$$

$$Y = Y_{i-1} + \bar{d} \cdot v_i$$

$$Z = Z_{i-1} + \bar{d} \cdot w_i$$

Parametric equations of the line passing through $(X_{i-1}, Y_{i-1}, Z_{i-1})$, the source point, with direction cosines u_i, v_i, w_i . $\bar{d}$ is the signed distance from X_{i-1} to X . (25)

The equation of the j^{th} circle is

$$X^2 + Y^2 = R_j^2 \quad (26)$$

where R_j is the radius of the particular circle whose intersections with the line, equation 25, we wish to find. The first value of R_j considered, is the radius of the nearest circle toward the center of the core, i.e., the nearest circle whose radius is equal to or less than the distance of $(X_{i-1}, Y_{i-1}, Z_{i-1})$ from the center of the core.

Equations 25 and 26 may be solved simultaneously for the values of $\bar{d}$.

$$\bar{\mathcal{J}} = \frac{-(X_{st}u_i + Y_{st}v_i) \pm \left[(X_{st}u_i + Y_{st}v_i)^2 - (u_i^2 + v_i^2)(X_{st}^2 + Y_{st}^2 - R_j^2) \right]^{\frac{1}{2}}}{(u_i^2 + v_i^2)} \quad (27)$$

The subscript st is equal to either i or i-1 depending on which end point of the step is further from the center.

The value of $\bar{\mathcal{J}}$ represents the distance from the starting point of the step to the intersections of the step with the circle of radius R_j . The value of R_j is changed to represent the next smaller circle until the value of the discriminant in the equation for $\bar{\mathcal{J}}$ is negative. When the value of the discriminant is negative, the flight length and that particular circle do not intersect in the real plane. Only values of $\bar{\mathcal{J}}$ which are smaller than the flight length of the step are retained.

The parts of the step which pass through the various annuli of different material are found as follows:

$$\begin{aligned} \mathcal{J}_1 &= \bar{\mathcal{J}}_1 \\ \mathcal{J}_i &= \bar{\mathcal{J}}_i - \bar{\mathcal{J}}_{i-1}; \quad i = 2, 3, \dots, \text{number of } \bar{\mathcal{J}} \text{'s} \\ &\quad \text{found for step.} \end{aligned} \quad (28)$$

The above process can now be repeated for the remaining steps of the history until the values of $\mathcal{J}_i$ and the annulus through which each passes are known.

D. Reaction Type and Energy Group Calculation

The energy group in which each step of a history lies must now be taken into account. When a collision occurs, both the number of neutrons out of the collision and the energy group of these neutrons are a function of the reaction type which occurred.

The program allows four reaction types, namely:

elastic scattering (out of the current energy group)

in-group elastic scattering

fission

non-elastic scattering

For elastic and in-group elastic scattering the value of FNEW (number of neutrons out of a collision per neutron into the collision) is equal to one. The values of FNEW for fission and non-elastic scattering reactions are input data.

When an in-group elastic scattering reaction occurs, the energy group of the outgoing neutron is the same as the energy group of the incoming neutron. For elastic scattering, the energy group of the product neutron drops to the next lower energy group. This implies that a neutron with energy of group four should never be allowed to undergo elastic scattering, since the product neutron would be in a non-existent group five. This is avoided by entering zeroes for the elastic scattering cross-sections for group four.

For both fission and non-elastic scattering reactions, the energy group of the product neutrons may be from one to four and is determined by comparing a random number with an input number.

The reaction type is determined by comparing a random number with other numbers which represent the probability of the various reactions occurring. These probabilities are calculated from the cross-sections. See appendix I for a more detailed explanation.

The history is first started into the source point with an energy of group one, and the energy groups and values of FNEW of the subsequent steps are then calculated. The unit estimator for the history starting from the source point with an energy of group one may now be calculated as follows:

$$\text{unit estimator} = \frac{2}{4\pi} * (\text{PRODT} * [e^{-\text{RETAU}}] * \text{WEFUN} * (\frac{1}{\text{FNOH}}) * \text{TN} * \text{DIST}^{(n-3)}) \quad (29)$$

$$\text{PRODT} = \prod_{i=1}^n \text{FNEW}_i * \text{TIGREA}_i \quad \text{where } n \text{ is the number of steps in the history and TIGREA is the total scattering cross-section and is a function of annulus and energy.} \quad (30)$$

$$\text{RETAU} = \sum_{i=1}^m \text{SIGTR}_i * \mathcal{J}_i \quad \text{where } m \text{ is the number of } \mathcal{J}_i \text{'s found for the entire history. } \text{SIGTR}_i \text{ is the transport cross-section of the material in which a particular } \mathcal{J}_i \text{ lies, and is a function of the energy group of the } \mathcal{J}_i. \quad (31)$$

WEFUN = weight for the history being used

$(\frac{1}{\text{FNOH}})$ = factor to account for the fact that more than one history may be used for the set of source and field points.

TN = weight function

DIST = distance from source to field-point.

The history is also started into the source point with energies of group two, group three, and group four. The corresponding unit estimators for each are calculated, giving a unit estimator for each group.

The flux contribution to the field point for each of the four groups may now be calculated by multiplying each of the four unit estimators by the four appropriate source weights associated with the source point. It must be remembered, however, that this gives only the flux values on the bottom of the core. In order to obtain flux values for points directly above the selected field point the axial routine is used; the axial routine will now be explained.

E. Axial Routine

Figure 11 shows a reactor with a history of 2 steps between the source and field points. The flux contribution of the source to field point for each group, may be calculated by multiplying each of the four unit estimators by the source weights associated with the source point. It is also necessary to determine the flux contributions at the points indicated by the arrows ($\swarrow$) on figure 11, that is, on the interfaces between the layers.

Figure 11 shows the actual core and an imaginary core directly below; the imaginary core should be viewed as a mirror image of the actual core. For every

Figure 11
Illustration of Axial Calculation

history in the actual core there is a mirror image of this history in the imaginary core. From here on, the flux contribution from the actual history (positive contributor) will be referred to as the positive contribution and the flux contribution from the mirror image (negative contributor) as the negative contribution.

The total contribution at a point is composed of the sum of the positive and negative contributions. If either the actual history or its mirror image is out of the actual core, the corresponding component of the total flux contribution is zero.

In order to find the flux contribution at the point labeled $\swarrow^2$ we need only shift both the positive and negative unit estimator up one layer and multiply by the appropriate source weights, remembering that if either of the shifted histories goes out of the actual core, the corresponding contributor is set to zero. The appropriate source weights are now those associated with the starting point of the shifted history. This process is continued until the flux contributions to all points through $\swarrow^9$ have been calculated.

F. Calculation of Non-Weighted Estimator Values

The final result of this program is the flux estimates which contain as a factor a weight function (TN(I)).

The conditional Monte Carlo program writes out on a scratch tape, values of the flux estimates without the weight function. These values (ESTIM(I)) are then used as input data to another program, (Weight Function Program) which will use these values in conjunction with a large range of weight functions. The values of ESTIM(I) are stored as follows:

For each field point on the bottom of the reactor and each point on the interface between layers directly above the field point, the following number of storage locations are reserved for accumulating values of ESTIM(I):

$$NUT4 = \frac{\text{number of locations}}{\text{POINT}} = 4 * FNUTN \quad (32)$$

where the 4 is the number of energy groups and FNUTN is the number of values in the TN

array. For each point there are FNUTN storage locations reserved for each energy group. The energy group of the neutron, at the field point, determines in which of the four sets of FNUTN locations the value is to be added. The straight line distance of the history R', as generated, indicates the particular location in which the value of ESTIM(I) is to be added.

Since a neutron starts from a source point with each of the four energy groups, each may be in any of the four groups at the field point depending on the type of reactions which take place between the source and field points. For each history then, four contributions are made to the values of ESTIM(I).

As the history is shifted upward one layer at a time in the axial routine, the subscripts of the four locations to which the values of ESTIM(I) are to be added are incremented by NUT4.

Values of ESTIM(I), for each of the four groups and each of the points, are accumulated as histories are used from all the source points to this field point.

When we begin calculations for the next field point on the bottom of the reactor, the subscripts of the ESTIM(I), to which values are to be added, are incremented by:

$$ISLOP = (NUTN4) (NUMBER\ OF\ LAYER + 1) \quad (33)$$

The process is repeated for all field points and the values of ESTIM(I) recorded on tape. The values of ESTIM(I) are then set to zero and the process repeated for the next block of 100 histories. When the computer run has been completed there are as many blocks of ESTIM(I) values on the scratch tape as there are blocks of 100 histories.

The values of ESTIM(I) are, as stated above, written on a scratch tape; they are also punched on cards and written on the output tape.

G. Results

When the flux at all field points has been calculated for a block of one-hundred histories, the results are printed out.

Assume the reactor to be as shown in figure 12.

Figure 12

The figure shows a reactor with 10 layers, and field points marked by x. The points where the flux values are calculated are marked by 0.

Eleven flux values are printed for each of the four groups at each of the field points. The first eleven numbers are for group one followed by the values for the remaining three groups. The flux values for the field point at the origin (0,0) will be printed out first followed by the flux values for the remaining field points in the order in which they were entered as input data. This will be repeated as many times as there are blocks of 100 histories.

Assume the field points to be as in figure 12 (two field points), and the number of histories to be 200 (2 blocks of 100 histories). The output would be as follows:

XX	XX	XX	XX	XX	XX	XX	XX	}	(FNUTN)(IENER)(NUMBER OF (NUMBER OF FIELD POINTS) LAYER + 1 VALUES OF ESTIM(I) (8 NUMBERS PER LINE)
XX	XX	XX	XX	XX	XX	XX	XX		
"	"	"	"	"	"	"	"		
"	"	"	"	"	"	"	"		
"	"	"	"	"	"	"	"		
XX	XX	XX	XX	XX	XX	XX	XX		

EDIT FOR STEP I (I is a value which indicates which block of 100 histories the output represents)

This would be repeated as many times as there are blocks of 100 histories.

IV. WEIGHT FUNCTION PROGRAM

How to make the optimum choice of the weight function in conditional Monte Carlo has been a gap in the theory^{1,2}. The solution of the problem given here is based on the remark "so long as we deal with linear problems and have choices, it is likely to be worthwhile to take our choices several different ways at once." In fact, we can delay choosing the weight function until the Monte Carlo is done. Thus, in this sense, we do the Monte Carlo with all possible choices for the weight function.

The central result of the conditional Monte Carlo theory is a statistical estimator which contains as a factor a weight function that must be positive and normalized but is otherwise arbitrary. By a suitable change of variables this weight function appears as a function of the model process displacement (R') only. This

weight function should be chosen to give a minimum variance estimate. However, the problem of finding "a priori" the weight function to satisfy this condition is as difficult as the problem to be solved by the Monte Carlo.

It is clear that one can, by a simple edit in the computer code, obtain Monte Carlo results corresponding to several different weight functions simultaneously. A simple extension of this idea provides a complete solution to the problem of choosing the optimum weight function.

In practice the weight function $T(R')$ can be entered as a table $\left\{T_j\right\}_{j=1}^J$ into the computer code. The estimator then has the form $\frac{1}{B} \sum_{b=1}^B \sum_j E_{bj} T_j$. With just one term in a random position in the sum over j . One now observes that instead of having the Monte Carlo program compute the above quantity with a given weight function the program can instead be made to accumulate estimates of the quantities.

It is now a matter of using the Monte Carlo results themselves to choose a weight function giving a minimum variance estimate. For the problem reduces to that of minimizing some measure of variance such as:

$$\sum_{i=1}^I \left(\sum_{j=1}^J E_{ij} T_{w,j} - \frac{1}{I} \sum_{i=1}^I \sum_{j=1}^J E_{ij} T_{w,j} \right)^2 \quad (34)$$

by varying T_w . In the above E_{ij} represents the estimate of E_j given by the i^{th} block of B histories.

This program, given the required values of parameters, calculates the values of $T_{w,j}$ from the following formula:

$$T_{w,j} = \frac{(R'_j)^\alpha e^{-\beta(R'_j)^\gamma}}{\sum_{j=1}^J \left\{ [(R'_j)^\alpha e^{-\beta(R'_j)^\gamma}] \left[\frac{(R'_j + \bar{\Delta}_j)^m - (R'_j - \bar{\Delta}_j/2)^m}{m} \right] \right\}} \quad (35)$$

where w indicates the T_j for a particular set of α , β and γ values. R'_j is the straight line distance a history will travel (model process displacement) and $\bar{\Delta}_j$ is

the increment of R'_j ; j is the same as the number of entries in $TN(I)$ of Monte Carlo (FNUTN), while n is the number of steps comprising a history.

Using all blocks of E_j values, each block generated by a block of one-hundred histories in the Monte Carlo program, the flux estimates are calculated by using the following formula:

$$\phi_{w,j} = \frac{1}{I} \sum_{i=1}^I \sum_{j=1}^J E_{ij} T_{w,j} \quad (36)$$

for each T_w and each group and each field point, and printed out.

Four measures of variance are calculated, viz:

$$(1) \frac{1}{I} \sum_{i=1}^I \left[\left(\sum_{j=1}^J E_{ij} T_{w,j} \right) - (\phi_{w,g}) \right]^2 \quad (37)$$

$$(2) \sum_g \frac{1}{I} \sum_{i=1}^I \left[\left(\sum_{j=1}^J E_{ij} T_{w,j} \right) - (\phi_{w,g}) \right]^2 \quad (38)$$

$$(3) \sum_{f=1}^F \frac{1}{I} \sum_{i=1}^I \left[\left(\sum_{j=1}^J E_{ij} T_{w,j} \right) - (\phi_{w,g}) \right]^2 \quad (39)$$

$$(4) \frac{1}{I} \sum_{i=1}^I \left[\left(\sum_g \sum_{j=1}^J E_{ij} T_{w,j} \right) - \left(\sum_g \phi_{w,g} \right) \right]^2 \quad (40)$$

In formula 3 the $\sum_f$ represents a sum over radial field points. The symbol $\sum_g$ means sum over groups; the symbol $(\phi_{w,g})$ is defined below:

$$\phi_{w,g} = \frac{1}{I} \sum_{i=1}^I \sum_{j=1}^J E_{ij} T_{w,j} \quad (41)$$

The variances using the above formulas are calculated using the values of E_{ij} on the midplane only.

This program executes very rapidly on the computer.

WEIGHT FUNCTION
INPUT SYMBOLS

The input quantities required by this program are:

U1 = Number of layers used in conditional Monte Carlo program which generated the values of $E_{g,j}$ being used by this program.

FIENER = Number of energy groups.

FNUTN = Number of intervals in TN array.

BLOC = Number of blocks of 100 histories; also the number of block of $E_{g,j}$ on tape.

FFFCL = Total number of field points, including the origin (0,0).

FNOALP = The number of values of ALP (I) and also the number of values of BET (I).

FN = The number of steps in each history.

GAMA = An exponent used in calculating the weight function.

X2(I) = X coordinates of the field points, starting with zero and continuing in the same order as in the conditional Monte Carlo program.

ALP(I) = An exponent used in calculating the weight function.

BET(I) = An exponent used in calculating the weight function.

RPRIM(I) = The straight line distance which a history will travel.
 (model process displacement)

DELS(I) = Increment of TN array.

V. REVISED PROGRAM

Results obtained using the computer program described in this report show that most of the fluctuation is caused by the analog Monte Carlo part of the program for sampling the scattering from one group to another. This has been found by doing a problem twice, each time with the same "raw histories", i.e. same random walks in configuration space, but with different sampling of the scattering at collision points. The resulting fluxes summed over groups show much closer agreement with results using the TDC code than do the individual group fluxes.

To remove this difficulty the program is being revised to eliminate entirely the analog sampling of scattering at collision points. Instead all possible reaction permutations will be followed. This means that once a sample of raw histories is obtained the rest of the calculation is done deterministically. The theory for the revised program is outlined below.

First Collision Source Weights

From the source vector

$$S_i, (i=1, \dots, 4) = [S_1(x,y,z), S_2(x,y,z), S_3(x,y,z), S_4(x,y,z)]$$

a "first collision source", D_g can immediately be computed at each source point:

$$D_g, (g=1, \dots, 4) = [D_1(x,y,z), D_2(x,y,z), D_3(x,y,z), D_4(x,y,z)]$$

$$D_g = \sum_{i=1}^4 S_i P_{ig}^{(s)}$$

where the superscript s denotes the collision matrix for the region in which the source point lies.

We can now forget about the original source weights S_i ; and, where in the axial routine the source weights S were swept, we will now sweep the first collision source weights $D_g(x,y,z)$.

The Combined Collision - Transport Matrix

The unit estimator at present is a single number $U_{g,g'}$, which gives the contribution to the group g' flux at the field point due to the group g source at the source point.

We now want to compute a matrix unit estimator $U_{gg'}$, which will be used with the first collision source vector D_g . The four by four matrix $U_{gg'}$ will be the contribution to the group g' flux at the field point due to a unit collision source coming out of the source point in group g , $g=1, \dots, 4$; $g' = 1, \dots, 4$. Note that g in what follows denotes the energy out of the source point.

Notation:

Let n denote the n^{th} step in a walk

$$n = 1, \dots, N$$

Let δ_j denote the j^{th} piece of a single step which lies completely in a single material region.

Let $k, l, m, \dots$ denote dummy (summed over) group indices.

Define

$$E_k^{(n)} = \exp - \left[\sum_{j=1}^J \sigma_j^{\text{transport}}(E_k) \delta_j \right]$$

Note that the sum in the argument of the exponential is over just the n^{th} step of a walk and not over all the steps (as in the old program).

A four by four matrix P_k must be given as input for each material region:

$$P_{k\ell} = \sigma_{k\ell} \text{ (scattering)} + \mu_k \sigma_k \text{ (fission)} \chi_\ell$$

The element $P_{k\ell}$ is the weight of a neutron in group ℓ coming out of the n^{th} collision per neutron in energy group k going into the n^{th} collision, where now the collisions are labelled starting with the first vertex following the source point. This means $n = 1$ corresponds not to the source point but to the first vertex following the source point when n is a superscript on P . When n is a superscript on $\mathcal{E}$ it means

the step just before the n^{th} collision, so $\mathcal{E}^{(1)}$ corresponds to the first flight from the source point.

We can now define a matrix $M_{gg'}$, for a random walk with N steps as follows:

$$M_{gg'} = \sum_k \sum_l \cdots \sum_m \mathcal{E}_g^{(1)} P_{gk}^{(1)} \mathcal{E}_k^{(2)} P_{k}^{(2)} \mathcal{E}_l^{(3)} \cdots P_{mg'}^{(N-1)} \mathcal{E}_{g'}^{(N)}$$

$$g = 1, \dots, 4; g' = 1, \dots, 4.$$

Then the unit estimator is $U_{gg'}$

$$U_{gg'} = \frac{2}{4\pi} M_{gg'} \left[e^{+\sum_{n=1}^N \Delta_n} R^{N-3} T_N(R') \right] \frac{1}{\text{nr. of histories}}$$

(number of histories is FNOH in program)

New Axial Routine

In the old axial routine, for a given source group, there was a contribution into just a single energy group at the field point.

Using the matrix unit estimator, as we go through the axial routine, the source weighting at a source point will be given by multiplying the row vector $D_g(x,y,z)$ into the matrix $U_{gg'}$,

$$F_{g'} = \sum_{g=1}^4 D_g U_{gg'}$$

So the source weighting produces a vector $F_{g'}$, $g' = 1, \dots, 4$ at the field point.

APPENDIX I

Choice of reaction type and determination of energy out of a collision.

Four reaction types are allowed; they are as follows:

- (1) in-group elastic scattering
- (2) elastic scattering
- (3) fission
- (4) non-elastic scattering which is independent of the material annulus.

The macroscopic cross-sections for each of these reactions for each material and each energy group are given as input data to the program as follows:

(1) SIGIGE(I,J)	The subscript I designates
(2) SIGEL(I,J)	the material annulus; the
(3) SIGFIS(I,J)	subscript J designates
(4) SIGNEL(I,J)	the energy group.

The probabilities for the reactions occurring are calculated as follows:

$$\text{TIGREA}(I,J) = \text{SIGIGE}(I,J) + \text{SIGEL}(I,J) + \text{SIGFIS}(I,J) + \text{SIGNEL}(I,J)$$

- (1) $\text{PROIGE}(I,J) = \text{SIGIGE}(I,J) / \text{TIGREA}(I,J)$
- (2) $\text{PROEL}(I,J) = \text{SIGEL}(I,J) / \text{TIGREA}(I,J) + \text{PROIGE}(I,J)$
- (3) $\text{PROFIS}(I,J) = \text{SIGFIS}(I,J) / \text{TIGREA}(I,J) + \text{PROEL}(I,J)$
- (4) $\text{PRONEL}(I,J) = \text{SIGNEL}(I,J) / \text{TIGREA}(I,J) + \text{PROFIS}(I,J)$

where the I and J subscripts mean the same as before.

The way in which the reaction type is calculated is shown by the following flow chart, where R is a random number between zero and one. The energy group of the neutron (J subscript) and the material annulus in which the reaction takes place (I subscript) are known.

After the reaction type has been determined the energy group to which the neutron belongs after the collision can be calculated. In the case of in-group elastic scattering the energy group of the emitted neutron is the same as the incident neutron. When a neutron of energy group (g) undergoes elastic scattering, the emitted neutron will be in the energy group $(g + 1)$. Elastic scattering in group 4 is not allowed.

For a fission reaction, the calculation of the energy group of the emitted neutrons is explained by the following flow chart where R is a random number between zero and one.

The values of $CHI(I)$ are input values to the program and are defined to be the probabilities that the average energy of the emitted neutrons of fission have energy of group (I).

For a non-elastic scattering reaction the calculation of the energy group of the emitted neutrons is explained by the following flow chart. The energy group of the emitted neutrons are independent of the material annulus, and therefore, only the energy group of the incident neutron need be known.

The values of PPONEL(IEIN,I) are input data to the program and are required in the following order:

PPONEL (1,1)
(2,1)
(3,1)
(4,1)
(1,2)
(2,2)
(3,2)
(4,2)
(1,3)
(2,3)
(3,3)
(4,3)
(1,4)
(2,4)
(3,4)
(4,4)

where the first subscript denotes the energy group of the incident neutron, and the second subscript denotes the energy group of the emitted neutrons. It is clear that up-scattering as well as down-scattering may be obtained by entering the appropriate values for PPONEL(I,J)

APPENDIX II

APPROXIMATION OF RUNNING TIME

The computer time required for a specific problem varies as the number of material regions and the number of steps in a history varies. For a given number of material regions and a given number of steps in the histories, there is a constant k which facilitates the calculation of the required computer time. It should be emphasized that the value of the constant k will change as the number of regions and the number of steps change. To approximate the running time, it is necessary to calculate, approximately, the total number of histories that will be used from all source points to one field point, for one block of 100 histories. This number may then be multiplied by the number of field points and the number of blocks of 100 histories to give the total number of histories that will be used for the entire run. It has been found that approximately .018 seconds are required for each history; this value is for histories of 5 steps and 3 material regions.

To calculate, approximately, the total number of histories that will be used from all source points to one field point, for one block of 100 histories, the following procedure may be used:

- (1) Calculate the volume of the sphere of radius $D1$ divided by 4:

$$VOL1 = \frac{(D1)^3}{3} \quad (42)$$

- (2) Knowing the source mesh dimensions on the x-y plane, the height of the core, and the number of layers in the core, the average volume of the source volumes in the quarter sphere of radius $D1$ may be calculated. Call this average volume $AVOL1$.

- (3) The approximate number of source points in the quarter sphere of radius $D1$ is equal to

$$NOPTS1 = \frac{VOL1}{AVOL1} \quad (43)$$

(4) The number of histories that will be used from the source points in the quarter sphere of radius D1 is equal to

$$\text{NOHIS 1} = (100)(\text{NOPTS 1}) \quad (42)$$

The approximate number of source points in the quarter sphere of radius D2 may be found in a similar manner. Call this value NOPTS 2. The approximate number of histories that will be used from the source points in the quarter sphere of radius D2 minus the quarter sphere of radius D1 is equal to

$$\text{NOHIS 2} = (\text{NOPTS2} - \text{NOPTS 1}) (100) (\text{FRACTF}) \quad (43)$$

The approximate number of source points in half the reactor minus the quarter sphere of radius D2 is

$$\text{NOPTS 3} = (S) \left(\frac{T}{2} \right) (U1) - \text{NOPTS 2} \quad (44)$$

The approximate number of histories that will be used from these source points to the field point is

$$\text{NOHIS 3} = (\text{NOPTS 3}) (100) (\text{FRACTG}) \quad (45)$$

The total number of histories used from all source points to one field point, for one block of 100 histories, is equal to

$$\text{NOHIST} = \text{NOHIS 1} + \text{NOHIS 2} + \text{NOHIS 3} \quad (46)$$

The approximate running time is now found by using the formula below:

$$\text{running time(sec.)} = (\text{NOHIST}) (.018) \begin{array}{l} \text{NUMBER OF} \\ \text{FIELD POINTS} \\ \text{INCLUDING (0,0)} \end{array} \begin{array}{l} \text{NUMBER OF} \\ \text{BLOCKS OF} \\ \text{100 HISTORIES} \end{array} \quad (47)$$

It should be emphasized that the running time given by the above formula is only approximate and a safety factor should be allowed.

APPENDIX III
INPUT SYMBOLS AND DEFINITIONS EXCLUSIVE OF CONTROL ROD SPECIFICATIONS

A(J) = Inside radius of annulus number J, J = 2, ---, FV
A(1) = 0. is built into the program.

B = Height of the reactor

BSOB(I) = Probability that the straight line length of a history will fall within
the interval (XX - YY/2) to (XX + YY/2)
I = 2, 3, ---, FN + 1. Only the FN and (FN + 1) values are used and
therefore any values may be entered for BSOB(I), I = 2, ---, FN - 1.

CHECKD = 1.; No control elements present.

CHECKD = 0.; Control elements are present.

CHI (I) = The probability that the average energy of the emitted neutrons of
fission have energy of group I.

D 1 = Radius of the first sphere of influence. When the distance from
source point to field point is less than D 1, one hundred histories
will be sampled from this source to field point.

D 2 = Radius of the second sphere of influence. When the distance from
source to field points is greater than D 1 but less than D 2, then the
fraction FRACTF of one hundred histories will be used from the source
to field point. When the distance is greater than D 2, then the
fraction FRACTG of one hundred histories will be used from source to
field point.

DELS = Increment of the TN array.

DELS1 = Increment of the TN1 array. When the value of FKEY equals 1.,
anything may be entered for the value of DELS.

ENER (I) = The energy of the groups. These values are not used by the program
and therefore any values may be entered as input.

FFF = The number of field points on the bottom of the reactor, exclusive of
the origin.

FIENER = The number of energy groups.

FIROD = 2.; Control elements are present.

FIROD = 1.; There are no control elements present.

FKEY = 1.; Execute the program for the number of steps in the histories equal
to FN.

FKEY = 2.; Execute the program for the number of steps in the histories equal
to FN and then repeat for the number of steps equal to FN + 1.

FM = The total number of histories to be generated.

FN = The number of steps in a history.

FNEW (I,3) = The ratio of the number of neutrons emitted to the number of neutrons incident for the I^{th} group during a fission reaction.

FNEW (I,4) = The ratio of the number of neutrons emitted to the number of neutrons incident for the I^{th} group during a non-elastic scattering reaction.

FNUTN = The number of entries in the TN array.

FNUTN1 = The number of entries in the TN1 array.

FRACTF = A fraction described in the definition of D 2.

FRACTG = A fraction described in the definition of D 2.

FV = The number of annuli in the reactor

PPONEL (I,J) = A 4 x 4 matrix used to choose the energy group to which a neutron belongs after a non-elastic scattering occurs. I denotes the energy group of the incident neutron and J denotes the energy group of the emitted neutron.

S = The number of source mesh divisions in the x-direction.

SIGEL (I,J) = The elastic scattering cross-sections for the I^{th} annuli and the J^{th} energy group.

SIGFIS (I,J) = The fission cross-sections for the I^{th} annuli and the J^{th} energy group.

SIGIGE (I,J) = The in-group elastic scattering cross-sections for the I^{th} annuli and the J^{th} energy group.

SIGNEL (I,J) = The non-elastic scattering cross-sections for the I^{th} annuli and the J^{th} energy group.

SIGTR (I,J) = The transport cross-sections for the I^{th} annuli and the J^{th} energy group.

SINSPE = + 1.; one energy group only. (Single speed)

SINSPE = - 1.; More than one energy group.

SOWT (I) = The source weights. These values are indicative of the energy of a neutron at the source points. The number of input source weights are found as follows: $I = (S/2)(T/2)(U1/2)(FIENER)$. All the source weights for group 1 are read into the computer followed by groups 2, 3, and 4. See page for more details.

T = The number of source mesh divisions in the y-direction.

TESCON = 1048576.; This is a constant entered in columns 1 to 12 of the last card of the data and is used to insure that the correct number of data cards are present. The decimal point is to be punched as shown.

TITL1 (I) = Twelve title words of six characters each, including blanks.

TN (J) = The tabular table representing the weight function, for the number of steps in the histories equal to FN.

TN1 (J) = The tabular table representing the weight function, for the number of steps in the histories equal to (FN + 1.). When the value of FKEY = 1., anything may be entered for this array.

U1 = The number of layers in the reactor (for computing purposes only).

X (I) = The x coordinates of the source points on the bottom layer. I = 1, 2, ---, S. See page 8.

X 2 (I) = The x coordinates of the field points exclusive of the origin. X2(1) = 0.; is built into the program. I = 2, 3, ---, FFF.

XX = A number used, in conjunction with YY, to determine which histories are acceptable during the generation of the histories.

XMULTI (I) = The ratio of impinging neutrons to the emitted neutrons for each region. This array is entered only when doing the single speed case (SINSPE = + 1.) I = 1, 2, 3, ---, FV + 1.

Y 2 (I) = The y coordinates of the field points exclusive of the origin. Y2(1) = 0. is built into the program. I = 2, 3, ---, FFF.

YE (I) = The y coordinates of the source points on the bottom layer. I = 1, 2, ---, S/2.

YY = A number used, in conjunction with XX, to determine which histories are acceptable during the generation of the histories.

SYMBOLS AND DEFINITIONS OF OTHER VARIABLES FREQUENTLY USED BY THE PROGRAM

BROBIL (I) =	The unit estimator for each group. I = 1, 2, 3, 4.
DELTA (I) =	The distance from the starting point of the current step to the intersection points of the step with the annuli.
DELZ =	The thickness of the layers.
DIST =	The distance from current source to field points.
ESTIM (I) =	The values of the flux estimates without the weight function; these values are written on a scratch tape and used as input data to the weight function program.
FFLUXB (I) =	Unnormalized estimates of flux values.
FNEW (I,1) =) FNEW (I,2) =)	The ratio of the number of incident neutrons to the number of emitted neutrons for elastic and in-group elastic scattering is equal to one and is built into the program.
FLLE 14 (I) =	The length of each step of the current history after it has been constrained to fit from current source to field point.
FLUX B (I) =	Normalized estimates of flux values.
IBOREG (I) =	The annulus in which each of the parts of the history (REDEL(I)) lie.
IHIS =	A counter used to indicate which history is currently being used.
IHISUS =	A count of the number of histories that have currently been used for the current source and field points.
INOLY =	The number of source mesh points in one half of a layer.
ISA =	A counter used to indicate the current source point position in the current row.
ISOL1 =	A value used to calculate the subscript of ESTIM.
ISLOP =	A constant, calculated by the program, used to increment the value of ISOL1 each time the current field point changes.
ITA =	A counter used to indicate the layer which contains the current source point.
IUA =	A counter used to indicate which row contains the current source point; a row is parallel to the x-axis.
KHALF =	S/2.

NOH =	The number of histories which are to be used from current source to field points.
PROEL (I,J) =	The probability of elastic scattering for the I th annulus and the J th energy group.
PROFIS (I,J) =	The probability of fission for the I th annulus and the J th energy group.
PROIGE (I,J) =	The probability of in-group elastic scattering for the I th annulus and the J th energy group.
PRONEL (I,J) =	The probability of non-elastic scattering for the I th annulus and the J th energy group.
REDEL (I) =	The lengths of the parts of the history which pass through the annuli.
TIGREA (I,J) =	The total cross-section for each annulus and each energy group.
UCOL (I) =)	The direction cosines of each step of the history after it has been constrained to fit from current source to field points.
VCOL (I) =)	
WCOL (I) =)	
XF (I) =)	The x,y,z coordinates of the vertices of the current history after it has been constrained to fit from current source to field points.
YF (I) =)	
ZF (I) =)	

REFERENCES

1. H. F. Trotter and J. W. Tukey, in "Symposium on Monte Carlo Methods" (H. A. Meyer, ed.), Wiley, New York, 1954.
2. D. W. Drawbaugh, On the Solution of Transport Problems by Conditional Monte Carlo, Nuc. Sci. and Engr. 9, 185, (1960).
3. B. Davison, "Neutron Transport Theory", p. 219, Oxford, (1957).
4. W. Goad and R. Johnston, A Monte Carlo Method for Criticality Problems, Nuc. Sci. and Engr. 5, 371, (1958).

INSTRUCTIONS FOR KEY PUNCHING DATA CARDS

The first card is always a title card, and may contain any punches in columns 1 to 72. All other cards are to have their number in the following fields:

first number in columns 1 through 12
second number in columns 13 through 24
third number in columns 25 through 36
fourth number in columns 37 through 48
fifth number in columns 49 through 60
sixth number in columns 61 through 72

All numbers should have decimal points. If an exponent is used with a number, the exponent must be punched in the extreme right hand part of the field. If any value is left blank on the input sheet, the corresponding field on the card may be skipped. If all the values representing a card on the input sheet are blank, that card does not need to be punched or included in the data deck. For this reason, if a variable is to be zero it should be written as a zero on the input sheets.

When the value of FIROD = 1., the input sheets on which the control elements are specified are not needed and may be removed.

CONDITIONAL MONTE CARLO FLUX PROGRAM

Column
1

Column
72

TITLE
CARD

--

CARD # 2

CARD # 3

CARD # 4

CARD # 5

CARD # 6

VARIABLE	VALUE	REMARKS
FN		THE NUMBER OF STEPS IN HISTORY
FM		THE NUMBER OF HISTORIES TO BE USED
FKEY		=1., DO N CASE ONLY =2., DO N AND N + 1 CASES
S		THE NUMBER OF SOURCE MESH DIVISIONS IN THE X DIRECTION
T		THE NUMBER OF SOURCE MESH DIVISIONS IN THE Y DIRECTION
UL		THE NUMBER OF LAYERS
FV		THE NUMBER OF ANNULI
FFF		THE NUMBER OF FIELD POINTS OTHER THAN THE AXIS
D1		SPHERE OF INFLUENCE WITHIN WHICH 100 HISTORIES ARE USED FROM EACH FIELD POINT
D2		SPHERE OF INFLUENCE WITHIN WHICH (FRACTF * 100) HISTORIES ARE USED FROM EACH FIELD POINT
FRACTF		FRACTION OF 100 HISTORIES TO BE USED WHEN DISTANCE FROM SOURCE TO FIELD POINT > D1 BUT < D2
FRACTG		FRACTION OF 100 HISTORIES TO BE USED WHEN DISTANCE FROM SOURCE TO FIELD POINT > D2
XX		XX - YY/2. = LOWER WEIGHT FUNCTION CUT OFF
YY		XX + YY/2. = UPPER WEIGHT FUNCTION CUT OFF
B		HEIGHT OF CORE
FNUTN		THE NUMBER OF VALUES IN THE TN ARRAY FOR N STEPS IN THE HISTORY
DELS		INCREMENT OF TN ARRAY FOR N STEPS
FNUTN1		THE NUMBER OF VALUES IN THE TN1 ARRAY FOR (N + 1.) STEPS IN THE HISTORY
DELS1		INCREMENT OF TN1 ARRAY FOR N + 1 STEPS
FIENER		THE NUMBER OF ENERGY GROUPS
PRINT		NOT USED
SINSPE		+ 1., DO SINGLE SPEED CASE - 1., DO MULTI-GROUP CASE
FIROD		2., DO ROD CASE 1., NO RODS

CARD # 7

VARIABLE	VALUE	REMARKS
CHECKD		= 0.; CONTROL RODS PRESENT = 1.; CONTROL RODS NOT PRESENT

VARIABLE	VALUE	REMARKS
----------	-------	---------

FNUROD		SEE PART TWO OR REPORT FOR DEFINITION
RORADO		OF THESE SYMBOLS. THE VALUES ON THIS
RORADI		PAGE ARE NOT INPUT UNLESS FIRD = 2.
ROINRA		
XBIG (1)		SEE PART TWO OF REPORT
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
(14)		
(15)		
(16)		
YBIG (1)		SEE PART TWO OF REPORT
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		

This data is not input unless FIROD = 2.

VARIABLE	VALUE	REMARKS
YBIG (13)		
(14)		
(15)		
(16)		
XSMAL (1)		SEE PART TWO OF REPORT
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
(14)		
(15)		
(16)		
YSMAL (1)		SEE PART TWO OF REPORT
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		

VARIABLE	VALUE	REMARKS
YSMAL (13)		
(14)		
(15)		
(16)		
XZERO (1)		SEE PART TWO OF REPORT
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
(14)		
(15)		
(16)		
YZERO (1)		SEE PART TWO OF REPORT
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		

VARIABLE	VALUE	
YZERO (13)		
(14)		
(15)		
(16)		

VARIABLE		VALUE	REMARKS
TN	(1)		THE WEIGHT FUNCTION IN TABULAR FORM FOR HISTORY OF N STEPS
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		
	(9)		
	(10)		
	(11)		
	(12)		
	(13)		
	(14)		
	(15)		
	(16)		
	(17)		
	(18)		
	(19)		
	(20)		
	(21)		
	(22)		
	(23)		
	(24)		
	(25)		
	(26)		
	(27)		
	(28)		
	(29)		
	(30)		
	(31)		
	(32)		
	(33)		
	(34)		
	(35)		
	(36)		

VARIABLE	VALUE	REMARKS
TN1 (1)		THE WEIGHT FUNCTION IN TABULAR FORM
(2)		FOR HISTORY OF N + 1 STEPS. ANY
(3)		VALUES MAY BE ENTERED WHEN FKEY = 1.
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
(14)		
(15)		
(16)		
(17)		
(18)		
(19)		
(20)		
(21)		
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		
(28)		
(29)		
(30)		
(31)		
(32)		
(33)		
(34)		
(35)		
(36)		

VARIABLE	VALUE	REMARKS
BSOB (1)		PROBABILITY THAT THE STRAIGHT LINE
(2)		LENGTH OF A HISTORY WILL FALL
(3)		WITHIN THE INTERVAL $(XX - YY/2)$
(4)		AND $(XX + YY/2)$
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
A (2)		RADIUS OF ANNULI EXCLUSIVE OF THE
(3)		CENTER
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
X (1)		X COORDINATES OF THE SOURCE MESH
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		

[illegible]

VARIABLE	VALUE	REMARKS
CHI (1)		THE PROBABILITY THAT THE AVERAGE
(2)		ENERGY OF THE EMITTED NEUTRONS
(3)		OF FISSION HAVE ENERGY OF GROUP I
(4)		
FNEW (1,3)		THE NUMBER OF NEUTRONS EMITTED TO
(2,3)		THE NUMBER OF NEUTRONS INCIDENT
(3,3)		FOR A FISSION REACTION
(4,3)		
FNEW (1,4)		THE NUMBER OF NEUTRONS EMITTED
(2,4)		TO THE NUMBER OF NEUTRONS INCIDENT
(3,4)		FOR A NON-ELASTIC SCATTERING
(4,4)		REACTION
ENER (1)		ENERGY VALUES OF THE FOUR GROUPS.
(2)		THESE VALUES ARE NOT USED BY THE
(3)		PROGRAM IN ANY WAY.
(4)		
PPONEL (1,1)		
(2,1)		
(3,1)		
(4,1)		
(1,2)		
(2,2)		
(3,2)		
(4,2)		
(1,3)		
(2,3)		
(3,3)		
(4,3)		

[illegible]

PPONEL	(1,4)
	(2,4)
	(3,4)
	(4,4)

Y2

VARIABLE	VALUE	REMARKS
XMULTI (1)		RATIO OF INPINGING NEUTRONS TO
(2)		EMITTED NEUTRONS FOR EACH
(3)		REGION (USED ONLY FOR SINGLE
(4)		SPEED CASE)
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
TESCON	1048576.	TEST CONSTANT
		THIS CARD GOES BEHIND THE SOURCE
		WEIGHTS (LAST CARD OF DATA) AND
		IS USED TO CHECK IF THE CORRECT
		NUMBER OF DATA CARDS ARE PRESENT.

MAIN PROGRAM CHAIN 1

SUBROUTINE INPUT

SUBROUTINE PROCES

MAIN PROGRAM CHAIN II

SUBROUTINE CAL

SUBROUTINE CAL (CONT'D)

SUBROUTINE SEARCH

SUBROUTINE ENERGY

SUBROUTINE SUMP

SUBROUTINE SUBCPT

SUBROUTINE OUTPUT

B=44,NO RODS OR RING,200 HIS, TDCSD WTS 1334009,4-18-63,PROBIN 1.

N 5.000000E 00 M 2.000000E 02 S 2.600000E 01 T 2.600000E 01
U 1.000000E 01 V 3.000000E 00 F 4.000000E 00
D1 2.692500E 01 D2 4.038700E 01 SF10.000000E-02 SG10.000000E-03
X 2.700000E 00 Y 4.800000E 00 B 4.400000E 01
FNUTN 2.500000E 01 DELS 1.920000E-01 FNUTN1 2.500000E 01 DELS1 0.192000

NO. OF ENERGY GROUPS = 4.000

CHECKD = 0.10000E 01

THE X VALUES FOR THE MESH ARE

-61.06030	-57.92900	-54.79770	-51.66640	-48.53510	-45.40380
-40.70690	-34.44430	-28.18170	-21.91910	-15.65650	-9.39390
-3.13130	3.13130	9.39390	15.65650	21.91910	28.18170
34.44430	40.70690	45.40380	48.53510	51.66640	54.79770
57.92900	61.06030				

THE Y VALUES FOR THE MESH ARE

1.56560	4.69700	7.82820	10.95960	14.09080	17.22220
21.91910	28.18170	34.44430	40.70690	46.96950	53.23210
59.49470					

FIELD GEOMETRY RADII

X VALUES

3.000000E 01	4.750000E 01	5.250000E 01	5.750000E 01
--------------	--------------	--------------	--------------

Y VALUES

0.	0.	0.	0.
----	----	----	----

THE BSOB ARRAY IS

1.000000E 00	1.000000E 00	1.000000E 00	1.000000E 00	1.000000E 00
--------------	--------------	--------------	--------------	--------------

THE TN ARRAY IS

4.739000E-01	2.682000E-01	1.860000E-01	1.168000E-01	7.840000E-02	5.400000E-02
3.670000E-02	2.580000E-02	1.850000E-02	1.360000E-02	1.020000E-02	7.700000E-03
5.820000E-03	4.410000E-03	3.290000E-03	2.460000E-03	1.840000E-03	1.380000E-03
1.040000E-03	7.900000E-04	5.010000E-04	4.640000E-04	3.560000E-04	2.790000E-04
2.190000E-04					

THE TN1 ARRAY IS

-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.

BOUNDARY GEOMETRY

RADII

4.516370E 01

5.119620E 01

6.262623E 01

THE TRANSPORT CROSS-SECTIONS ARE (REGION,ENERGY)

1.166500E-01	1.609500E-01	1.758200E-01	1.758200E-01	2.511400E-01	3.505300E-01
4.515800E-01	4.515800E-01	2.914600E-01	3.936600E-01	5.766600E-01	5.766600E-01
3.097800E-01	3.695000E-01	7.097200E-01	7.097200E-01		

7/

THE ELASTIC SCATTERING CROSS-SECTIONS ARE

1.962900E-02	2.691300E-02	4.778800E-02	4.778800E-02	8.068000E-03	1.235500E-02
2.807000E-02	2.807000E-02	1.215000E-03	8.236000E-03	2.369500E-02	2.369500E-02
0.	0.	0.	0.		

THE IN-GROUP ELASTIC SCATTERING CROSS-SECTIONS ARE

9.521000E-02	1.331000E-01	1.239200E-01	1.239200E-01	2.414200E-01	3.377500E-01
4.229300E-01	4.229300E-01	2.796000E-01	3.850400E-01	5.442600E-01	5.442600E-01
2.789200E-01	3.687300E-01	6.987100E-01	6.987100E-01		

THE FISSION SCATTERING CROSS-SECTIONS ARE

4.444594E-04	0.	2.191044E-03	0.	7.194001E-04	0.
0.	0.	6.093848E-03	0.	0.	0.
2.596004E-02	0.	0.	0.		

THE NON-ELASTIC SCATTERING CROSS-SECTIONS ARE

-0.	-0.	-0.	-0.	-0.	-0.
-0.	-0.	-0.	-0.	-0.	-0.
-0.	-0.	-0.	-0.		

THE CHI ARRAY IS

7.517800E-01	2.482200E-01	0.	0.
--------------	--------------	----	----

THE FNEW(I,3) ARRAY IS

6.298817E 00	5.715056E 00	5.627826E 00	5.655305E 00
--------------	--------------	--------------	--------------

THE FNEW(I,4) ARRAY IS

-0.	-0.	-0.	-0.
-----	-----	-----	-----

THE ENERGY ARRAY IS

-0.	-0.	-0.	-0.
-----	-----	-----	-----

THE PPONEL(I,J) ARRAY IS

-0.	-0.	-0.	-0.	-0.	-0.
-0.	-0.	-0.	-0.	-0.	-0.
-0.	-0.	-0.	-0.	-0.	-0.

PROBABILITIES OF IN-GROUP ELASTIC SCATTERING

0.750000E 00	0.750000E 00	0.750000E 00	0.	0.750000E 00	0.750000E 00
0.750000E 00	0.	0.750000E 00	0.750000E 00	0.750000E 00	0.
0.750000E 00	0.100000E 01	0.100000E 01	0.		

PROBABILITIES OF ELASTIC SCATTERING

0.125000E-00	0.250000E-00	0.125000E-00	0.	0.125000E-00	0.250000E-00
0.250000E-00	0.	0.125000E-00	0.250000E-00	0.250000E-00	0.
0.	0.	0.	0.		

PROBABILITIES OF FISSION

0.125000E-00	0.	0.125000E-00	0.	0.125000E-00	0.
0.	0.	0.125000E-00	0.	0.	0.

0.250000E-00 0. 0.
PROBABILITIES OF NON-ELASTIC SCATTERING 0.
0. 0. 0.
0. 0. 0.
0. 0. 0.

0.
0.
0.
0.

0.
0.

0.
0.

SOURCE WT

2.604860E-06	4.818160E-06	8.238120E-06	1.413540E-05	2.364220E-05	3.921030E-05
1.147390E-04	1.416120E-04	1.601020E-04	1.750280E-04	1.866710E-04	1.947240E-04
1.989220E-04	2.508620E-06	4.676410E-06	7.994620E-06	1.367080E-05	2.288470E-05
3.798960E-05	1.133580E-04	1.406480E-04	1.591850E-04	1.740760E-04	1.856820E-04
1.936990E-04	1.978530E-04	2.318420E-06	4.403360E-06	7.528550E-06	1.279290E-05
2.145350E-05	3.539750E-05	1.105130E-04	1.386910E-04	1.573540E-04	1.721820E-04
1.837180E-04	1.916680E-04	1.957560E-04	2.033810E-06	4.016380E-06	6.881410E-06
1.159950E-05	1.950740E-05	3.187140E-05	1.060450E-04	1.356850E-04	1.546100E-04
1.693590E-04	1.807960E-04	1.886580E-04	1.926800E-04	0.	3.541270E-06
6.112310E-06	1.022160E-05	1.719490E-05	2.784730E-05	9.977260E-05	1.315480E-04
1.509530E-04	1.656310E-04	1.769400E-04	1.846990E-04	1.886580E-04	0.
3.004750E-06	5.269500E-06	8.753150E-06	1.461320E-05	2.364220E-05	9.080730E-05
1.259940E-04	1.463220E-04	1.610180E-04	1.721820E-04	1.798270E-04	1.837180E-04
0.	4.185570E-06	7.939790E-06	1.321060E-05	2.151160E-05	3.508200E-05
1.378980E-04	2.284480E-04	2.746430E-04	3.048780E-04	3.268660E-04	3.417690E-04
3.493410E-04	0.	0.	4.565410E-06	8.189140E-06	1.321060E-05
2.084770E-05	8.115470E-05	1.759950E-04	2.389970E-04	2.746430E-04	2.975240E-04
3.121910E-04	3.195160E-04	0.	0.	0.	3.997410E-06
7.224810E-06	1.139540E-05	4.252140E-05	9.228790E-05	1.759950E-04	2.284480E-04
2.579450E-04	2.746430E-04	2.825020E-04	0.	0.	0.
0.	0.	5.331400E-06	2.061240E-05	4.252140E-05	8.115470E-05
1.378980E-04	1.915280E-04	2.169880E-04	2.284480E-04	0.	0.
0.	0.	0.	0.	7.853850E-06	1.828910E-05
3.319950E-05	5.514200E-05	8.115470E-05	1.051830E-04	1.200720E-04	0.
0.	0.	0.	0.	0.	0.
0.	1.253830E-05	2.061240E-05	2.944390E-05	3.752420E-05	4.252140E-05
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	9.369780E-06	1.253830E-05
1.427830E-05	4.040030E-06	7.649520E-06	1.322700E-05	2.282760E-05	3.838670E-05
6.536290E-05	1.940330E-04	2.358140E-04	2.651540E-04	2.891570E-04	3.080160E-04
3.211080E-04	3.279410E-04	3.882500E-06	7.418670E-06	1.282960E-05	2.207260E-05
3.713620E-05	6.312830E-05	1.918560E-04	2.342960E-04	2.636880E-04	2.876200E-04
3.064110E-04	3.194420E-04	3.261970E-04	3.573860E-06	6.975010E-06	1.206900E-05
2.064540E-05	3.478350E-05	5.850070E-05	1.873050E-04	2.312220E-04	2.607640E-04
2.845650E-04	3.032220E-04	3.161380E-04	3.227870E-04	3.121240E-06	6.346230E-06
1.101330E-05	1.870370E-05	3.160640E-05	5.229710E-05	1.799990E-04	2.265170E-04
2.563900E-04	2.800180E-04	2.984830E-04	3.112430E-04	3.177850E-04	0.
5.574100E-06	9.759060E-06	1.646000E-05	2.781970E-05	4.538620E-05	1.693780E-04
2.200680E-04	2.505760E-04	2.740200E-04	2.922460E-04	3.048140E-04	3.112430E-04
0.	4.695250E-06	8.384860E-06	1.406710E-05	2.360500E-05	3.838670E-05
1.532720E-04	2.114280E-04	2.432460E-04	2.666190E-04	2.845650E-04	2.969150E-04
3.032220E-04	0.	6.428720E-06	1.254140E-05	2.112580E-05	3.465950E-05
5.677170E-05	2.274650E-04	3.864480E-04	4.581510E-04	5.058710E-04	5.409830E-04
5.649500E-04	5.771600E-04	0.	0.	7.033230E-06	1.294660E-05

2.112580E-05	3.357850E-05	1.315200E-04	2.963610E-04	4.026910E-04	4.581510E-04
4.942100E-04	5.175150E-04	5.292080E-04	0.	0.	0.
6.131940E-06	1.137940E-05	1.816570E-05	6.850200E-05	1.497800E-04	2.963610E-04
3.864480E-04	4.321160E-04	4.581510E-04	4.704890E-04	0.	0.
0.	0.	0.	8.279300E-06	3.278070E-05	6.850200E-05
1.315200E-04	2.274650E-04	3.244180E-04	3.680530E-04	3.864480E-04	0.
0.	0.	0.	0.	0.	1.204250E-05
2.899780E-05	5.331080E-05	8.903580E-05	1.315200E-04	1.711620E-04	1.963480E-04
0.	0.	0.	0.	0.	0.
0.	0.	1.963280E-05	3.278070E-05	4.718240E-05	6.036250E-05
6.850200E-05	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.444970E-05
1.963280E-05	2.248050E-05	5.285220E-06	1.005930E-05	1.739080E-05	2.997530E-05
5.047860E-05	8.693600E-05	2.593150E-04	3.125710E-04	3.510330E-04	3.826340E-04
4.073400E-04	4.244910E-04	4.334550E-04	5.078080E-06	9.754720E-06	1.686910E-05
2.898500E-05	4.881110E-05	8.388530E-05	2.564850E-04	3.106150E-04	3.490960E-04
3.806180E-04	4.052380E-04	4.223060E-04	4.311630E-04	4.672340E-06	9.167390E-06
1.587010E-05	2.711310E-05	4.568410E-05	7.759760E-05	2.505190E-04	3.066580E-04
3.452340E-04	3.766100E-04	4.010630E-04	4.179790E-04	4.266930E-04	4.077250E-06
8.334410E-06	1.448320E-05	2.456690E-05	4.148810E-05	6.919020E-05	2.408270E-04
3.006080E-04	3.394640E-04	3.706360E-04	3.948580E-04	4.115670E-04	4.201360E-04
0.	7.310600E-06	1.283510E-05	2.162690E-05	3.651550E-05	5.986360E-05
2.265370E-04	2.923540E-04	3.317950E-04	3.627440E-04	3.866830E-04	4.031460E-04
4.115670E-04	0.	6.148460E-06	1.102830E-05	1.849220E-05	3.099340E-05
5.047860E-05	2.046230E-04	2.814030E-04	3.221960E-04	3.529710E-04	3.766100E-04
3.928030E-04	4.010630E-04	0.	8.399300E-06	1.646860E-05	2.778280E-05
4.553120E-05	7.451680E-05	3.015210E-04	5.165300E-04	6.077930E-04	6.698180E-04
7.161780E-04	7.477290E-04	7.637550E-04	0.	0.	9.194110E-06
1.700560E-05	2.778280E-05	4.411610E-05	1.726620E-04	3.953680E-04	5.373550E-04
6.077930E-04	6.544720E-04	6.851730E-04	7.006130E-04	0.	0.
0.	8.009210E-06	1.492800E-05	2.389320E-05	8.999300E-05	1.968910E-04
3.953680E-04	5.165300E-04	5.745320E-04	6.077930E-04	6.236750E-04	0.
0.	0.	0.	0.	1.083260E-05	4.311400E-05
8.999300E-05	1.726620E-04	3.015210E-04	4.335810E-04	4.923710E-04	5.165300E-04
0.	0.	0.	0.	0.	0.
1.572750E-05	3.812320E-05	7.009150E-05	1.169180E-04	1.726620E-04	2.255000E-04
2.594060E-04	0.	0.	0.	0.	0.
0.	0.	0.	2.571830E-05	4.311400E-05	6.204380E-05
7.933380E-05	8.999300E-05	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
1.889230E-05	2.571830E-05	2.948670E-05	6.184860E-06	1.177510E-05	2.035340E-05
3.503690E-05	5.915080E-05	1.023920E-04	3.061300E-04	3.673790E-04	4.120770E-04
4.490580E-04	4.780560E-04	4.981310E-04	5.086100E-04	5.942310E-06	1.141840E-05
1.974400E-05	3.388270E-05	5.718090E-05	9.876130E-05	3.028090E-04	3.651200E-04
4.098120E-04	4.466920E-04	4.755900E-04	4.955770E-04	5.059290E-04	5.467260E-06
1.073080E-05	1.857740E-05	3.170140E-05	5.348930E-05	9.128950E-05	2.957910E-04

3.605680E-04	4.053030E-04	4.419880E-04	4.706900E-04	4.905150E-04	5.007040E-04
4.770640E-06	9.755500E-06	1.695660E-05	2.873470E-05	4.854300E-05	8.130790E-05
2.843520E-04	3.536510E-04	3.985760E-04	4.349860E-04	4.634100E-04	4.830060E-04
4.930390E-04	0.	8.556360E-06	1.502800E-05	2.530560E-05	4.269400E-05
7.025240E-05	2.674190E-04	3.442810E-04	3.896720E-04	4.257510E-04	4.538150E-04
4.731360E-04	4.830060E-04	0.	7.195600E-06	1.291020E-05	2.164150E-05
3.622490E-05	5.915080E-05	2.413710E-04	3.317750E-04	3.785430E-04	4.143440E-04
4.419880E-04	4.610000E-04	4.706900E-04	0.	9.827830E-06	1.927650E-05
3.252900E-05	5.327190E-05	8.713310E-05	3.546240E-04	6.097970E-04	7.148100E-04
7.865580E-04	8.406290E-04	8.775390E-04	8.963400E-04	0.	0.
1.075820E-05	1.990540E-05	3.252900E-05	5.161860E-05	2.020780E-04	4.662360E-04
6.341370E-04	7.148100E-04	7.687780E-04	8.044290E-04	8.224540E-04	0.
0.	0.	9.371230E-06	1.747210E-05	2.797280E-05	1.052940E-04
2.306680E-04	4.662360E-04	6.097970E-04	6.769810E-04	7.148100E-04	7.330610E-04
0.	0.	0.	0.	0.	1.267670E-05
5.047030E-05	1.052940E-04	2.020780E-04	3.546240E-04	5.116750E-04	5.813620E-04
6.097970E-04	0.	0.	0.	0.	0.
0.	1.840190E-05	4.462510E-05	8.203160E-05	1.366700E-04	2.020780E-04
2.644930E-04	3.046480E-04	0.	0.	0.	0.
0.	0.	0.	0.	3.009890E-05	5.047030E-05
7.263140E-05	9.283830E-05	1.052940E-04	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	2.210660E-05	3.009890E-05	3.451160E-05	6.653320E-06	1.266730E-05
2.189340E-05	3.766690E-05	6.368170E-05	1.104580E-04	3.305500E-04	3.960070E-04
4.439030E-04	4.836460E-04	5.148140E-04	5.364510E-04	5.477460E-04	6.392250E-06
1.228350E-05	2.123930E-05	3.642430E-05	6.155370E-05	1.065250E-04	3.269690E-04
3.936100E-04	4.414750E-04	4.811000E-04	5.121640E-04	5.336950E-04	5.448590E-04
5.880890E-06	1.154330E-05	1.998640E-05	3.407710E-05	5.756720E-05	9.843640E-05
3.193970E-04	3.887810E-04	4.366370E-04	4.760420E-04	5.068970E-04	5.282370E-04
5.392250E-04	5.131090E-06	1.049360E-05	1.824400E-05	3.088740E-05	5.222810E-05
8.763490E-05	3.070440E-04	3.814410E-04	4.294100E-04	4.685150E-04	4.990660E-04
5.201480E-04	5.309570E-04	0.	9.203720E-06	1.616800E-05	2.720630E-05
4.591850E-05	7.567880E-05	2.887360E-04	3.714880E-04	4.198240E-04	4.585870E-04
4.887550E-04	5.095260E-04	5.201480E-04	0.	7.740720E-06	1.388880E-05
2.327530E-05	3.894620E-05	6.368170E-05	2.605370E-04	3.581250E-04	4.078910E-04
4.463320E-04	4.760420E-04	4.964750E-04	5.068970E-04	0.	1.057060E-05
2.073500E-05	3.499880E-05	5.726720E-05	9.371890E-05	3.823440E-04	6.584440E-04
7.708470E-04	8.474180E-04	9.054880E-04	9.451640E-04	9.653800E-04	0.
0.	1.157200E-05	2.141160E-05	3.499880E-05	5.549340E-05	2.174440E-04
5.032010E-04	6.846590E-04	7.708470E-04	8.282980E-04	8.666410E-04	8.859840E-04
0.	0.	0.	1.007910E-05	1.879390E-05	3.009400E-05
1.131940E-04	2.483150E-04	5.032010E-04	6.584440E-04	7.306210E-04	7.708470E-04
7.902140E-04	0.	0.	0.	0.	0.
1.363700E-05	5.429550E-05	1.131940E-04	2.174440E-04	3.823440E-04	5.523990E-04
6.277610E-04	6.584440E-04	0.	0.	0.	0.
0.	0.	1.979160E-05	4.800530E-05	8.823670E-05	1.469240E-04

2.174440E-04	2.848630E-04	3.282740E-04	0.	0.	0.
0.	0.	0.	0.	0.	3.237860E-05
5.429550E-05	7.814210E-05	9.983030E-05	1.131940E-04	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	2.377920E-05	3.237850E-05	3.712260E-05	4.702210E-06
1.052840E-05	1.869440E-05	3.147040E-05	4.673860E-05	6.678490E-05	1.790490E-04
2.216660E-04	2.541820E-04	2.797190E-04	2.990600E-04	3.121980E-04	3.189580E-04
4.430210E-06	1.017320E-05	1.813410E-05	3.052770E-05	4.563450E-05	6.543490E-05
1.770990E-04	2.199920E-04	2.525810E-04	2.781180E-04	2.974330E-04	3.105380E-04
3.172370E-04	3.882860E-06	9.483900E-06	1.705400E-05	2.871890E-05	4.351010E-05
6.239240E-05	1.731250E-04	2.166250E-04	2.493760E-04	2.749240E-04	2.941920E-04
3.072360E-04	3.138650E-04	3.038240E-06	8.494330E-06	1.553720E-05	2.618850E-05
4.053400E-05	5.804440E-05	1.669880E-04	2.115250E-04	2.445560E-04	2.701370E-04
2.893510E-04	3.023190E-04	3.088840E-04	0.	7.254970E-06	1.370150E-05
2.315480E-05	3.689400E-05	5.268570E-05	1.586070E-04	2.046230E-04	2.380980E-04
2.637560E-04	2.829250E-04	2.958120E-04	3.023190E-04	0.	5.812170E-06
1.164800E-05	1.986710E-05	3.239340E-05	4.673860E-05	1.476890E-04	1.957420E-04
2.299340E-04	2.557800E-04	2.749240E-04	2.877430E-04	2.941920E-04	0.
6.430850E-06	1.674870E-05	2.976560E-05	4.867030E-05	7.491900E-05	2.451170E-04
3.566400E-04	4.285820E-04	4.814530E-04	5.199320E-04	5.454550E-04	5.582370E-04
0.	0.	7.556460E-06	1.739140E-05	2.976560E-05	4.720490E-05
1.669460E-04	2.888240E-04	3.718060E-04	4.285820E-04	4.684630E-04	4.943380E-04
5.071650E-04	0.	0.	0.	5.863930E-06	1.488510E-05
2.539300E-05	9.623430E-05	1.836360E-04	2.888240E-04	3.566400E-04	4.008790E-04
4.285820E-04	4.420760E-04	0.	0.	0.	0.
0.	9.746370E-06	4.544310E-05	9.623430E-05	1.669460E-04	2.451170E-04
3.072410E-04	3.406750E-04	3.566400E-04	0.	0.	0.
0.	0.	0.	1.130060E-05	3.964490E-05	7.534290E-05
1.230450E-04	1.669460E-04	2.020510E-04	2.225620E-04	0.	0.
0.	0.	0.	0.	0.	0.
2.466450E-05	4.544310E-05	6.665290E-05	8.512660E-05	9.623430E-05	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	1.581110E-05	2.466450E-05	2.931890E-05
9.239800E-06	2.077750E-05	3.679950E-05	6.120070E-05	9.018510E-05	1.265220E-04
3.350850E-04	4.128090E-04	4.725820E-04	5.197410E-04	5.555200E-04	5.798410E-04
5.923410E-04	8.696960E-06	2.007470E-05	3.570430E-05	5.939250E-05	8.814400E-05
1.239950E-04	3.315710E-04	4.097450E-04	4.696310E-04	5.167820E-04	5.525110E-04
5.767690E-04	5.891620E-04	7.610010E-06	1.871360E-05	3.359500E-05	5.593820E-05
8.419780E-05	1.184730E-04	3.244640E-04	4.035830E-04	4.637250E-04	5.108760E-04
5.465130E-04	5.706580E-04	5.829280E-04	5.952810E-06	1.675900E-05	3.062830E-05
5.114360E-05	7.862030E-05	1.106320E-04	3.136140E-04	3.942470E-04	4.548500E-04
5.020290E-04	5.375530E-04	5.615540E-04	5.737080E-04	0.	1.430940E-05
2.702850E-05	4.541800E-05	7.169660E-05	1.010440E-04	2.989410E-04	3.816550E-04
4.429580E-04	4.902540E-04	5.256680E-04	5.495110E-04	5.615540E-04	0.
1.144960E-05	2.298810E-05	3.909010E-05	6.299020E-05	9.018510E-05	2.791890E-04
3.655280E-04	4.279560E-04	4.755280E-04	5.108760E-04	5.345770E-04	5.465130E-04

0.	1.259840E-05	3.304390E-05	5.869250E-05	9.532640E-05	1.455580E-04
4.658440E-04	6.675380E-04	7.986210E-04	8.956020E-04	9.665160E-04	1.013640E-03
1.037260E-03	0.	0.	1.480780E-05	3.431370E-05	5.869250E-05
9.254180E-05	3.235270E-04	5.463420E-04	6.951650E-04	7.986210E-04	8.716950E-04
9.193190E-04	9.429520E-04	0.	0.	0.	1.149070E-05
2.936050E-05	5.010640E-05	1.885530E-04	3.546090E-04	5.463420E-04	6.675380E-04
7.481350E-04	7.986210E-04	8.233180E-04	0.	0.	0.
0.	0.	1.916150E-05	8.968630E-05	1.885530E-04	3.235270E-04
4.658440E-04	5.799710E-04	6.390370E-04	6.675380E-04	0.	0.
0.	0.	0.	0.	2.214820E-05	7.822930E-05
1.483060E-04	2.393600E-04	3.235270E-04	3.884640E-04	4.252800E-04	0.
0.	0.	0.	0.	0.	0.
0.	4.860990E-05	8.968630E-05	1.313250E-04	1.673110E-04	1.885530E-04
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	3.099160E-05	4.860990E-05
5.782880E-05	1.272040E-05	2.864360E-05	5.069730E-05	8.427490E-05	1.241130E-04
1.737390E-04	4.592700E-04	5.640270E-04	6.451110E-04	7.092230E-04	7.579120E-04
7.910200E-04	8.080360E-04	1.197330E-05	2.767580E-05	4.919580E-05	8.177890E-05
1.213310E-04	1.702680E-04	4.545580E-04	5.598880E-04	6.410970E-04	7.051990E-04
7.538180E-04	7.868360E-04	8.037060E-04	1.047770E-05	2.579630E-05	4.630190E-05
7.701370E-05	1.159450E-04	1.626970E-04	4.450040E-04	5.515640E-04	6.330710E-04
6.971680E-04	7.456550E-04	7.785180E-04	7.952190E-04	8.197050E-06	2.309670E-05
4.222380E-05	7.040780E-05	1.083120E-04	1.519680E-04	4.303560E-04	5.389530E-04
6.210230E-04	6.851330E-04	7.334590E-04	7.661250E-04	7.826680E-04	0.
1.971340E-05	3.726100E-05	6.253270E-05	9.877930E-05	1.388850E-04	4.104180E-04
5.219050E-04	6.049120E-04	6.691170E-04	7.172880E-04	7.497350E-04	7.661250E-04
0.	1.576510E-05	3.168940E-05	5.384030E-05	8.674950E-05	1.241130E-04
3.833620E-04	5.000740E-04	5.845590E-04	6.491200E-04	6.971680E-04	7.294110E-04
7.456550E-04	0.	1.734740E-05	4.553840E-05	8.091660E-05	1.312390E-04
2.005440E-04	6.397660E-04	9.150130E-04	1.091580E-03	1.222940E-03	1.319230E-03
1.383290E-03	1.415430E-03	0.	0.	2.038800E-05	4.729220E-05
8.091660E-05	1.274100E-04	4.456440E-04	7.502140E-04	9.019050E-04	1.091580E-03
1.190540E-03	1.255100E-03	1.287210E-03	0.	0.	0.
1.582320E-05	4.045120E-05	6.907270E-05	2.595910E-04	4.880950E-04	7.502140E-04
9.150130E-04	1.023230E-03	1.091580E-03	1.124950E-03	0.	0.
0.	0.	0.	2.637950E-05	1.236340E-04	2.595910E-04
4.456440E-04	6.397660E-04	7.963160E-04	8.766730E-04	9.150130E-04	0.
0.	0.	0.	0.	0.	3.049990E-05
1.078460E-04	2.043100E-04	3.295860E-04	4.456440E-04	5.341800E-04	5.843140E-04
0.	0.	0.	0.	0.	0.
0.	0.	6.693920E-05	1.236340E-04	1.810120E-04	2.303970E-04
2.595910E-04	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	4.266980E-05
6.693920E-05	7.967010E-05	1.512900E-05	3.407710E-05	6.031580E-05	1.003320E-04
1.477980E-04	2.069820E-04	5.471040E-04	6.708360E-04	7.667490E-04	8.427310E-04
9.004870E-04	9.397730E-04	9.599650E-04	1.424030E-05	3.292490E-05	5.853010E-05

9.735660E-05	1.444820E-04	2.028390E-04	5.415190E-04	6.659360E-04	7.620020E-04
8.379560E-04	8.956310E-04	9.348090E-04	9.548250E-04	1.246140E-05	3.068600E-05
5.508710E-05	9.167600E-05	1.380640E-04	1.938080E-04	5.301820E-04	6.560860E-04
7.525040E-04	8.284290E-04	8.859470E-04	9.249380E-04	9.447550E-04	9.749120E-06
2.747190E-05	5.023480E-05	8.379780E-05	1.289730E-04	1.810130E-04	5.127710E-04
6.411760E-04	7.382340E-04	8.141680E-04	8.714750E-04	9.102340E-04	9.298630E-04
0.	2.344690E-05	4.432940E-05	7.440440E-05	1.176180E-04	1.654120E-04
4.890270E-04	6.210480E-04	7.191540E-04	7.951790E-04	8.522940E-04	8.907870E-04
9.102340E-04	0.	1.875070E-05	3.770200E-05	6.405290E-05	1.032810E-04
1.477980E-04	4.567760E-04	5.953020E-04	6.951050E-04	7.714870E-04	8.284290E-04
8.666720E-04	8.859470E-04	0.	2.063190E-05	5.416420E-05	9.626780E-05
1.561700E-04	2.387930E-04	7.620870E-04	1.090030E-03	1.298520E-03	1.453820E-03
1.567830E-03	1.643770E-03	1.681880E-03	0.	0.	2.424790E-05
5.625170E-05	9.626780E-05	1.516040E-04	5.306560E-04	8.938620E-04	1.133680E-03
1.298520E-03	1.415520E-03	1.491930E-03	1.529940E-03	0.	0.
0.	1.881930E-05	4.811190E-05	8.217810E-05	3.088970E-04	5.812320E-04
8.938620E-04	1.090030E-03	1.217830E-03	1.298520E-03	1.337990E-03	0.
0.	0.	0.	0.	3.137460E-05	1.470920E-04
3.088970E-04	5.306560E-04	7.620870E-04	9.488350E-04	1.044520E-03	1.090030E-03
0.	0.	0.	0.	0.	0.
3.627540E-05	1.282960E-04	2.430700E-04	3.923710E-04	5.306560E-04	6.361740E-04
6.959560E-04	0.	0.	0.	0.	0.
0.	0.	0.	7.961680E-05	1.470920E-04	2.153570E-04
2.741070E-04	3.088970E-04	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
5.074830E-05	7.961680E-05	9.475840E-05	1.636290E-05	3.686180E-05	6.526060E-05
1.085940E-04	1.600260E-04	2.241870E-04	5.926110E-04	7.261990E-04	8.297520E-04
9.118590E-04	9.742900E-04	1.016770E-03	1.038610E-03	1.540120E-05	3.561400E-05
6.332560E-05	1.053710E-04	1.564320E-04	2.196940E-04	5.865700E-04	7.209110E-04
8.246280E-04	9.066980E-04	9.690360E-04	1.011410E-03	1.033050E-03	1.347670E-05
3.319180E-05	5.959460E-05	9.921740E-05	1.494760E-04	2.099000E-04	5.743020E-04
7.102800E-04	8.143760E-04	8.964010E-04	9.585660E-04	1.000730E-03	1.022160E-03
1.054510E-05	2.971510E-05	5.434150E-05	9.068010E-05	1.396220E-04	1.960250E-04
5.554550E-04	6.941930E-04	7.989680E-04	8.809840E-04	9.429270E-04	9.848320E-04
1.006060E-03	0.	2.536180E-05	4.795750E-05	8.050530E-05	1.273150E-04
1.791140E-04	5.297380E-04	6.724900E-04	7.783520E-04	8.604800E-04	9.221860E-04
9.637980E-04	9.848320E-04	0.	2.028180E-05	4.078640E-05	6.930470E-05
1.117880E-04	1.600260E-04	4.947840E-04	6.447130E-04	7.523860E-04	8.348650E-04
8.964010E-04	9.377290E-04	9.585660E-04	0.	2.231530E-05	5.858700E-05
1.041390E-04	1.689750E-04	2.584840E-04	8.253450E-04	1.180700E-03	1.405830E-03
1.573470E-03	1.696620E-03	1.778650E-03	1.819850E-03	0.	0.
2.622380E-05	6.084490E-05	1.041390E-04	1.640350E-04	5.744900E-04	9.682250E-04
1.227910E-03	1.405830E-03	1.532090E-03	1.614640E-03	1.655660E-03	0.
0.	0.	2.035680E-05	5.204110E-05	8.890380E-05	3.342240E-04
6.293070E-04	9.682250E-04	1.180700E-03	1.318810E-03	1.405830E-03	1.448430E-03
0.	0.	0.	0.	0.	3.393410E-05

1.591230E-04	3.342240E-04	5.744900E-04	8.253450E-04	1.027810E-03	1.131460E-03
1.180700E-03	0.	0.	0.	0.	0.
0.	3.924070E-05	1.387740E-04	2.629980E-04	4.246750E-04	5.744890E-04
6.888510E-04	7.536430E-04	0.	0.	0.	0.
0.	0.	0.	0.	8.611890E-05	1.591230E-04
2.329720E-04	2.965830E-04	3.342240E-04	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	5.488300E-05	8.611890E-05	1.024970E-04	3.960390E-06	9.172930E-06
1.568300E-05	2.430970E-05	3.143190E-05	3.684620E-05	8.358890E-05	9.741110E-05
1.101030E-04	1.208180E-04	1.291520E-04	1.348610E-04	1.378000E-04	3.709370E-06
8.867240E-06	1.526390E-05	2.372650E-05	3.101520E-05	3.663160E-05	8.305470E-05
9.679930E-05	1.094480E-04	1.201340E-04	1.284470E-04	1.341390E-04	1.370520E-04
3.204280E-06	8.269120E-06	1.444630E-05	2.258650E-05	3.017480E-05	3.603410E-05
8.199010E-05	9.558610E-05	1.081460E-04	1.187740E-04	1.270440E-04	1.327030E-04
1.355870E-04	2.426760E-06	7.400380E-06	1.327520E-05	2.093750E-05	2.890690E-05
3.502020E-05	8.040270E-05	9.378860E-05	1.062090E-04	1.167470E-04	1.249530E-04
1.305660E-04	1.334200E-04	0.	6.293180E-06	1.181340E-05	1.887130E-05
2.724670E-05	3.347710E-05	7.835620E-05	9.142240E-05	1.036510E-04	1.140660E-04
1.221910E-04	1.277450E-04	1.305660E-04	0.	4.979830E-06	1.012160E-05
1.654430E-05	2.485730E-05	3.143190E-05	7.614030E-05	8.853080E-05	1.005040E-04
1.107600E-04	1.187740E-04	1.242600E-04	1.270440E-04	0.	5.179680E-06
1.458830E-05	2.552070E-05	3.936360E-05	5.504110E-05	1.431720E-04	1.667760E-04
1.895150E-04	2.093710E-04	2.249790E-04	2.356860E-04	2.411220E-04	0.
0.	6.215860E-06	1.515640E-05	2.552070E-05	3.836020E-05	1.177150E-04
1.510760E-04	1.710690E-04	1.895150E-04	2.042970E-04	2.145110E-04	2.197150E-04
0.	0.	0.	4.657860E-06	1.292450E-05	2.198480E-05
7.797210E-05	1.244820E-04	1.510760E-04	1.667760E-04	1.800720E-04	1.895150E-04
1.943610E-04	0.	0.	0.	0.	0.
8.235880E-06	3.952090E-05	7.797210E-05	1.177150E-04	1.431720E-04	1.545980E-04
1.625220E-04	1.667760E-04	0.	0.	0.	0.
0.	0.	8.922510E-06	3.456220E-05	6.315090E-05	9.548650E-05
1.177150E-04	1.310470E-04	1.374880E-04	0.	0.	0.
0.	0.	0.	0.	0.	2.121330E-05
3.952090E-05	5.658940E-05	7.023800E-05	7.797210E-05	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	1.307460E-05	2.121330E-05	2.544250E-05	8.400310E-06
1.942900E-05	3.298420E-05	4.999960E-05	6.362250E-05	7.283810E-05	1.618030E-04
1.877200E-04	2.119820E-04	2.325660E-04	2.485880E-04	2.595630E-04	2.652050E-04
7.864390E-06	1.878410E-05	3.211970E-05	4.886690E-05	6.286220E-05	7.248690E-05
1.608380E-04	1.865610E-04	2.107250E-04	2.312530E-04	2.472330E-04	2.581760E-04
2.637720E-04	6.788310E-06	1.752320E-05	3.043430E-05	4.665770E-05	6.132200E-05
7.154600E-05	1.589670E-04	1.842610E-04	2.082280E-04	2.286390E-04	2.445360E-04
2.554160E-04	2.609570E-04	5.141440E-06	1.569030E-05	2.801050E-05	4.347430E-05
5.897780E-05	6.989610E-05	1.562990E-04	1.808570E-04	2.045160E-04	2.247420E-04
2.405150E-04	2.513080E-04	2.567930E-04	0.	1.335160E-05	2.496660E-05
3.945360E-05	5.579970E-05	6.729480E-05	1.530690E-04	1.764070E-04	1.996150E-04

2.195950E-04	2.352050E-04	2.458830E-04	2.513080E-04	0.	1.057030E-05
2.142490E-05	3.476020E-05	5.108090E-05	6.362250E-05	1.496120E-04	1.710380E-04
1.936010E-04	2.132430E-04	2.286390E-04	2.391830E-04	2.445360E-04	0.
1.097270E-05	3.093220E-05	5.388150E-05	8.211500E-05	1.126620E-04	2.846380E-04
3.228770E-04	3.653830E-04	4.031980E-04	4.331340E-04	4.536980E-04	4.641470E-04
0.	0.	1.316780E-05	3.213120E-05	5.388150E-05	8.013260E-05
2.397890E-04	2.973100E-04	3.309170E-04	3.653830E-04	3.934800E-04	4.130440E-04
4.230210E-04	0.	0.	0.	9.869300E-06	2.741780E-05
4.650100E-05	1.627410E-04	2.522180E-04	2.973100E-04	3.228770E-04	3.476700E-04
3.653830E-04	3.745660E-04	0.	0.	0.	0.
0.	1.747270E-05	8.367140E-05	1.627410E-04	2.397890E-04	2.846380E-04
3.028640E-04	3.154470E-04	3.228770E-04	0.	0.	0.
0.	0.	0.	1.890790E-05	7.322490E-05	1.328060E-04
1.965950E-04	2.397890E-04	2.641250E-04	2.752580E-04	0.	0.
0.	0.	0.	0.	0.	0.
4.502700E-05	8.367140E-05	1.192670E-04	1.473000E-04	1.627410E-04	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	2.769970E-05	4.502700E-05	5.397650E-05
1.184290E-05	2.737700E-05	4.638520E-05	7.018000E-05	8.916460E-05	1.015960E-04
2.246910E-04	2.599540E-04	2.933170E-04	3.217030E-04	3.438300E-04	3.589940E-04
3.667890E-04	1.108840E-05	2.647080E-05	4.517900E-05	6.859070E-05	8.812470E-05
1.011260E-04	2.234100E-04	2.583680E-04	2.915830E-04	3.198890E-04	3.419590E-04
3.570760E-04	3.648070E-04	9.572880E-06	2.469600E-05	4.282460E-05	6.549310E-05
8.600850E-05	9.986330E-05	2.209250E-04	2.552230E-04	2.881420E-04	3.162820E-04
3.382330E-04	3.532630E-04	3.609190E-04	7.251940E-06	2.211520E-05	3.943150E-05
6.103460E-05	8.276270E-05	9.764420E-05	2.173840E-04	2.505690E-04	2.830330E-04
3.109050E-04	3.326780E-04	3.475870E-04	3.551650E-04	0.	1.881990E-05
3.515750E-05	5.541450E-05	7.832000E-05	9.413870E-05	2.130890E-04	2.444690E-04
2.763060E-04	3.038020E-04	3.253460E-04	3.400940E-04	3.475870E-04	0.
1.489950E-05	3.018160E-05	4.886310E-05	7.169870E-05	8.916460E-05	2.084610E-04
2.371070E-04	2.680400E-04	2.950550E-04	3.162820E-04	3.308390E-04	3.382330E-04
0.	1.547620E-05	4.359870E-05	7.586210E-05	1.153090E-04	1.581270E-04
3.973750E-04	4.484140E-04	5.061530E-04	5.580500E-04	5.992580E-04	6.276230E-04
6.420440E-04	0.	0.	1.856970E-05	4.528740E-05	7.586210E-05
1.125400E-04	3.364350E-04	4.143610E-04	4.590930E-04	5.061530E-04	5.447180E-04
5.715860E-04	5.853320E-04	0.	0.	0.	1.392090E-05
3.864720E-05	6.549310E-05	2.285380E-04	3.535520E-04	4.143610E-04	4.484140E-04
4.818620E-04	5.061530E-04	5.187130E-04	0.	0.	0.
0.	0.	2.463220E-05	1.178760E-04	2.285380E-04	3.364350E-04
3.973750E-04	4.217960E-04	4.385490E-04	4.484140E-04	0.	0.
0.	0.	0.	0.	2.667070E-05	1.031930E-04
1.867530E-04	2.759440E-04	3.364350E-04	3.697420E-04	3.847500E-04	0.
0.	0.	0.	0.	0.	0.
0.	6.346770E-05	1.178760E-04	1.678440E-04	2.069790E-04	2.285380E-04
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	3.906150E-05	6.346770E-05

7.608350E-05	1.421230E-05	3.284940E-05	5.564320E-05	8.422340E-05	1.070090E-04
1.218580E-04	2.692540E-04	3.110730E-04	3.507980E-04	3.846660E-04	4.110870E-04
4.292020E-04	4.385150E-04	1.330690E-05	3.176210E-05	5.419730E-05	8.231300E-05
1.057640E-04	1.212990E-04	2.677370E-04	3.091830E-04	3.487350E-04	3.824990E-04
4.088520E-04	4.269110E-04	4.361470E-04	1.148840E-05	2.963200E-05	5.137440E-05
7.858960E-05	1.032280E-04	1.197970E-04	2.647920E-04	3.054380E-04	3.446370E-04
3.781920E-04	4.044030E-04	4.223550E-04	4.315020E-04	8.703430E-06	2.653510E-05
4.730550E-05	7.323020E-05	9.933900E-05	1.171520E-04	2.605860E-04	2.998990E-04
3.385440E-04	3.717780E-04	3.977690E-04	4.155750E-04	4.246280E-04	0.
2.258220E-05	4.217990E-05	6.647560E-05	9.400910E-05	1.129650E-04	2.554760E-04
2.926470E-04	3.305200E-04	3.633020E-04	3.890130E-04	4.066250E-04	4.155750E-04
0.	1.787950E-05	3.621360E-05	5.861300E-05	8.604990E-05	1.070090E-04
2.499780E-04	2.839230E-04	3.206880E-04	3.528670E-04	3.781920E-04	3.955710E-04
4.044030E-04	0.	1.857360E-05	5.231230E-05	9.101230E-05	1.383340E-04
1.898040E-04	4.767140E-04	5.373610E-04	6.057650E-04	6.675210E-04	7.166450E-04
7.504890E-04	7.677050E-04	0.	0.	2.228560E-05	5.433850E-05
9.101220E-05	1.350070E-04	4.038080E-04	4.969100E-04	5.499840E-04	6.057650E-04
6.516450E-04	6.836730E-04	7.000480E-04	0.	0.	0.
1.670730E-05	4.637260E-05	7.857880E-05	2.741690E-04	4.243160E-04	4.969100E-04
5.373610E-04	5.769040E-04	5.057650E-04	6.207210E-04	0.	0.
0.	0.	0.	2.956000E-05	1.414360E-04	2.741690E-04
4.038080E-04	4.767140E-04	5.057460E-04	5.256660E-04	5.373610E-04	0.
0.	0.	0.	0.	0.	3.200930E-05
1.238200E-04	2.240250E-04	3.311520E-04	4.038080E-04	4.437070E-04	4.616530E-04
0.	0.	0.	0.	0.	0.
0.	0.	7.616030E-05	1.414360E-04	2.013550E-04	2.482780E-04
2.741690E-04	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	4.687760E-05
7.616030E-05	9.129290E-05	1.542200E-05	3.564760E-05	6.039090E-05	9.144110E-05
1.162060E-04	1.323310E-04	2.923360E-04	3.375670E-04	3.805750E-04	4.172750E-04
4.459130E-04	4.655540E-04	4.756530E-04	1.443940E-05	3.446680E-05	5.881980E-05
8.936450E-05	1.148530E-04	1.317250E-04	2.906950E-04	3.355190E-04	3.783430E-04
4.149280E-04	4.434890E-04	4.630720E-04	4.730850E-04	1.246630E-05	3.215480E-05
5.575260E-05	8.531680E-05	1.120980E-04	1.300940E-04	2.875080E-04	3.314650E-04
3.739060E-04	4.102600E-04	4.386660E-04	4.581310E-04	4.680490E-04	9.445290E-06
2.879410E-05	5.133470E-05	7.949030E-05	1.078700E-04	1.272200E-04	2.829530E-04
3.254710E-04	3.673100E-04	4.033060E-04	4.314770E-04	4.507820E-04	4.605970E-04
0.	2.450570E-05	4.577480E-05	7.215130E-05	1.020750E-04	1.226730E-04
2.774140E-04	3.176350E-04	3.586150E-04	3.941290E-04	4.219840E-04	4.410750E-04
4.507820E-04	0.	1.940210E-05	3.930020E-05	6.361540E-05	9.342600E-05
1.162060E-04	2.714510E-04	3.082090E-04	3.479690E-04	3.828140E-04	4.102600E-04
4.290920E-04	4.386660E-04	0.	2.015600E-05	5.676590E-05	9.876450E-05
1.501460E-04	2.060920E-04	5.176860E-04	5.834320E-04	6.573980E-04	7.242580E-04
7.774660E-04	8.141290E-04	8.327880E-04	0.	0.	2.418270E-05
5.896440E-05	9.876450E-05	1.465340E-04	4.384960E-04	5.396000E-04	5.970850E-04
6.573980E-04	7.070500E-04	7.417500E-04	7.594750E-04	0.	0.

0.	1.813180E-05	5.032190E-05	8.527710E-05	2.975780E-04	4.607820E-04
5.396000E-04	5.834320E-04	6.262070E-04	6.573980E-04	6.735910E-04	0.
0.	0.	0.	0.	3.207640E-05	1.534900E-04
2.975780E-04	4.384960E-04	5.176860E-04	5.491810E-04	5.707740E-04	5.834320E-04
0.	0.	0.	0.	0.	0.
3.473960E-05	1.343630E-04	2.431410E-04	3.595240E-04	4.384960E-04	4.818410E-04
5.013270E-04	0.	0.	0.	0.	0.
0.	0.	0.	8.264680E-05	1.534900E-04	2.185110E-04
2.694720E-04	2.975780E-04	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
5.086750E-05	8.264680E-05	9.906840E-05	4.604020E-06	1.020240E-05	1.478530E-05
1.678690E-05	1.532020E-05	1.121120E-05	1.163720E-05	6.494500E-06	4.850020E-06
4.434310E-06	4.422890E-06	4.504860E-06	4.566170E-06	4.301010E-06	9.916890E-06
1.457070E-05	1.679930E-05	1.547030E-05	1.160420E-05	1.197640E-05	6.624880E-06
4.896780E-06	4.444480E-06	4.416410E-06	4.491240E-06	4.549510E-06	3.685450E-06
9.341720E-06	1.412370E-05	1.676200E-05	1.573350E-05	1.236190E-05	1.269610E-05
6.905120E-06	5.001110E-06	4.471230E-06	4.407850E-06	4.467270E-06	4.518820E-06
2.726140E-06	8.470660E-06	1.341390E-05	1.655130E-05	1.603990E-05	1.334360E-05
1.387540E-05	7.371840E-06	5.182700E-06	4.525540E-06	4.404360E-06	4.437270E-06
4.478720E-06	0.	7.293440E-06	1.239580E-05	1.603140E-05	1.639560E-05
1.437600E-05	1.564440E-05	8.072910E-06	5.469890E-06	4.625440E-06	4.418760E-06
4.411420E-06	4.437270E-06	0.	5.807080E-06	1.104370E-05	1.518590E-05
1.674180E-05	1.532020E-05	1.846480E-05	9.134290E-06	5.928200E-06	4.806980E-06
4.471230E-06	4.405600E-06	4.407850E-06	0.	5.857420E-06	1.672220E-05
2.614640E-05	3.251220E-05	3.268870E-05	5.049860E-05	2.352550E-05	1.422440E-05
1.069170E-05	9.408690E-06	8.988230E-06	8.875720E-06	0.	0.
7.134950E-06	1.730500E-05	2.614640E-05	3.224210E-05	6.369100E-05	3.871600E-05
2.105310E-05	1.422440E-05	1.134730E-05	1.016150E-05	9.734250E-06	0.
0.	0.	5.208490E-06	1.495680E-05	2.352320E-05	6.482810E-05
6.173720E-05	3.871600E-05	2.352550E-05	1.709500E-05	1.422440E-05	1.308510E-05
0.	0.	0.	0.	0.	9.585640E-06
4.334350E-05	6.482810E-05	6.369100E-05	5.049860E-05	3.379760E-05	2.644410E-05
2.352550E-05	0.	0.	0.	0.	0.
0.	9.926140E-06	3.880420E-05	5.934640E-05	6.719280E-05	6.369100E-05
5.896650E-05	5.533460E-05	0.	0.	0.	0.
0.	0.	0.	0.	2.471920E-05	4.334350E-05
5.580240E-05	6.237470E-05	6.482810E-05	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	1.505640E-05	2.471920E-05	2.946980E-05	1.032010E-05	2.280870E-05
3.275260E-05	3.592940E-05	3.181590E-05	2.278980E-05	2.288520E-05	1.260390E-05
9.409870E-06	8.628850E-06	8.620260E-06	8.786700E-06	8.908190E-06	9.638400E-06
2.217520E-05	3.230210E-05	3.606210E-05	3.219120E-05	2.361650E-05	2.357120E-05
1.286160E-05	9.499200E-06	8.647790E-06	8.607940E-06	8.759910E-06	8.875430E-06
8.255130E-06	2.089800E-05	3.136020E-05	3.618890E-05	3.288480E-05	2.523740E-05
2.504390E-05	1.341610E-05	9.698970E-06	8.697220E-06	8.590170E-06	8.711610E-06
8.814690E-06	6.106780E-06	1.896130E-05	2.984400E-05	3.603520E-05	3.377600E-05

2.735950E-05	2.749690E-05	1.434080E-05	1.004760E-05	8.796980E-06	8.578310E-06
8.651640E-06	8.734960E-06	0.	1.633930E-05	2.763430E-05	3.523400E-05
3.474970E-05	2.963380E-05	3.124370E-05	1.574180E-05	1.060010E-05	8.985150E-06
8.602290E-06	8.598040E-06	8.651640E-06	0.	1.301970E-05	2.466840E-05
3.358970E-05	3.575530E-05	3.181590E-05	3.723150E-05	1.788640E-05	1.149100E-05
9.327820E-06	8.697220E-06	8.580350E-06	8.590170E-06	0.	1.312020E-05
3.743490E-05	5.821700E-05	7.124990E-05	6.921390E-05	1.032110E-04	4.627670E-05
2.765230E-05	2.072270E-05	1.826840E-05	1.747860E-05	1.727100E-05	0.
0.	1.598140E-05	3.873150E-05	5.821700E-05	7.078680E-05	1.337100E-04
7.823940E-05	4.137380E-05	2.765230E-05	2.198990E-05	1.970350E-05	1.888510E-05
0.	0.	0.	1.166820E-05	3.350320E-05	5.249390E-05
1.421690E-04	1.284000E-04	7.823940E-05	4.627670E-05	3.340440E-05	2.765230E-05
2.539780E-05	0.	0.	0.	0.	0.
2.148900E-05	9.683980E-05	1.421690E-04	1.337100E-04	1.032110E-04	6.782540E-05
5.226520E-05	4.627670E-05	0.	0.	0.	0.
0.	0.	2.223860E-05	8.678420E-05	1.314450E-04	1.441330E-04
1.337100E-04	1.218160E-04	1.137260E-04	0.	0.	0.
0.	0.	0.	0.	0.	5.541500E-05
9.683980E-05	1.239710E-04	1.376340E-04	1.421690E-04	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	3.372570E-05	5.541500E-05	6.601730E-05	1.487030E-05
3.281570E-05	4.696390E-05	5.129340E-05	4.533080E-05	3.227510E-05	3.216270E-05
1.761720E-05	1.310630E-05	1.200420E-05	1.199060E-05	1.222210E-05	1.239120E-05
1.388930E-05	3.190830E-05	4.633150E-05	5.149270E-05	4.587820E-05	3.345060E-05
3.314190E-05	1.798240E-05	1.323240E-05	1.203000E-05	1.197300E-05	1.218460E-05
1.234530E-05	1.189810E-05	3.007740E-05	4.500440E-05	5.169460E-05	4.688600E-05
3.576630E-05	3.524640E-05	1.876750E-05	1.351420E-05	1.209890E-05	1.194810E-05
1.211740E-05	1.226070E-05	8.803150E-06	2.729810E-05	4.285730E-05	5.150900E-05
4.817040E-05	3.881790E-05	3.875580E-05	2.007560E-05	1.400580E-05	1.224070E-05
1.193230E-05	1.203370E-05	1.214970E-05	0.	2.353010E-05	3.971080E-05
5.041730E-05	4.956790E-05	4.212830E-05	4.412060E-05	2.205050E-05	1.479110E-05
1.250410E-05	1.196570E-05	1.195900E-05	1.203370E-05	0.	1.875470E-05
3.547650E-05	4.813500E-05	5.103560E-05	4.533080E-05	5.266600E-05	2.506970E-05
1.605000E-05	1.299030E-05	1.209890E-05	1.193460E-05	1.194810E-05	0.
1.891270E-05	5.389580E-05	8.362390E-05	1.019050E-04	9.872370E-05	1.463070E-04
6.504790E-05	3.869560E-05	2.889910E-05	2.542950E-05	2.431700E-05	2.402630E-05
0.	0.	2.303450E-05	5.575760E-05	8.362390E-05	1.012720E-04
1.906810E-04	1.107120E-04	5.806030E-05	3.869560E-05	3.070260E-05	2.745940E-05
2.630480E-05	0.	0.	0.	1.682040E-05	4.824590E-05
7.546350E-05	2.033590E-04	1.829810E-04	1.107120E-04	6.504790E-05	4.680090E-05
3.869560E-05	3.550360E-05	0.	0.	0.	0.
0.	3.096200E-05	1.392840E-04	2.033590E-04	1.906810E-04	1.463070E-04
9.586560E-05	7.360670E-05	6.504790E-05	0.	0.	0.
0.	0.	0.	3.205860E-05	1.248860E-04	1.884640E-04
2.057970E-04	1.906810E-04	1.733410E-04	1.614860E-04	0.	0.
0.	0.	0.	0.	0.	0.

7.981830E-05	1.392840E-04	1.779400E-04	1.971020E-04	2.033590E-04	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	4.860790E-05	7.981830E-05	9.506960E-05
1.802470E-05	3.975610E-05	5.685010E-05	6.207070E-05	5.486140E-05	3.903560E-05
3.883920E-05	2.119980E-05	1.573500E-05	1.439920E-05	1.437780E-05	1.465380E-05
1.485640E-05	1.683590E-05	3.865820E-05	5.608790E-05	6.231130E-05	5.552450E-05
4.046020E-05	4.002840E-05	2.164130E-05	1.588890E-05	1.442960E-05	1.435610E-05
1.460900E-05	1.480120E-05	1.442260E-05	3.644180E-05	5.448700E-05	6.255510E-05
5.674510E-05	4.326680E-05	4.258130E-05	2.259090E-05	1.623140E-05	1.451260E-05
1.432640E-05	1.452870E-05	1.470010E-05	1.067140E-05	3.307710E-05	5.189510E-05
6.233150E-05	5.830110E-05	4.696650E-05	4.683240E-05	2.417380E-05	1.682570E-05
1.468620E-05	1.430950E-05	1.442840E-05	1.456730E-05	0.	2.851470E-05
4.809330E-05	6.101370E-05	5.999320E-05	5.098180E-05	5.332310E-05	2.656280E-05
1.777300E-05	1.500600E-05	1.435040E-05	1.433910E-05	1.442840E-05	0.
2.273100E-05	4.297490E-05	5.826110E-05	6.176070E-05	5.486140E-05	6.367170E-05
3.021860E-05	1.929940E-05	1.559300E-05	1.451260E-05	1.431140E-05	1.432640E-05
0.	2.292630E-05	6.530630E-05	1.012650E-04	1.233210E-04	1.194880E-04
1.769970E-04	7.855600E-05	4.658600E-05	3.472090E-05	3.052070E-05	2.917050E-05
2.881940E-05	0.	0.	2.792210E-05	6.756030E-05	1.012650E-04
1.225560E-04	2.307800E-04	1.338610E-04	7.005570E-05	4.658600E-05	3.690280E-05
3.298450E-05	3.158260E-05	0.	0.	0.	2.039010E-05
5.846510E-05	9.140320E-05	2.460970E-04	2.214540E-04	1.338610E-04	7.855600E-05
5.639150E-05	4.658600E-05	4.272510E-05	0.	0.	0.
0.	0.	3.752950E-05	1.687280E-04	2.460970E-04	2.307800E-04
1.769970E-04	1.158780E-04	8.893620E-05	7.855600E-05	0.	0.
0.	0.	0.	0.	3.886230E-05	1.513080E-04
2.281330E-04	2.490350E-04	2.307800E-04	2.097790E-04	1.954020E-04	0.
0.	0.	0.	0.	0.	0.
0.	9.673790E-05	1.687280E-04	2.154410E-04	2.385440E-04	2.460970E-04
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	5.892120E-05	9.673790E-05
1.152080E-04	1.963780E-05	4.331120E-05	6.192660E-05	6.762380E-05	5.978590E-05
4.254250E-05	4.231670E-05	2.306670E-05	1.710030E-05	1.564140E-05	1.561470E-05
1.591340E-05	1.613370E-05	1.834290E-05	4.211480E-05	6.109590E-05	6.788370E-05
6.050820E-05	4.409580E-05	4.361500E-05	2.354720E-05	1.726810E-05	1.567550E-05
1.559160E-05	1.586660E-05	1.607480E-05	1.571400E-05	3.970010E-05	5.935170E-05
6.814560E-05	6.183760E-05	4.715350E-05	4.640070E-05	2.458160E-05	1.764230E-05
1.576690E-05	1.556030E-05	1.577910E-05	1.596580E-05	1.162760E-05	3.603500E-05
5.652880E-05	6.789790E-05	6.353080E-05	5.118380E-05	5.103630E-05	2.630800E-05
1.829360E-05	1.595520E-05	1.554230E-05	1.567170E-05	1.582240E-05	0.
3.106680E-05	5.239050E-05	6.646140E-05	6.536910E-05	5.555790E-05	5.810900E-05
2.891810E-05	1.932470E-05	1.630690E-05	1.558740E-05	1.557370E-05	1.567170E-05
0.	2.476510E-05	4.681770E-05	6.346390E-05	6.728790E-05	5.978590E-05
6.938720E-05	3.291090E-05	2.098940E-05	1.694600E-05	1.576690E-05	1.554460E-05
1.556030E-05	0.	2.498020E-05	7.114660E-05	1.103080E-04	1.343300E-04
1.301970E-04	1.928940E-04	8.559170E-05	5.069420E-05	3.775740E-05	3.316950E-05

3.169190E-05	3.130650E-05	0.	0.	3.042250E-05	7.360160E-05
1.103080E-04	1.334980E-04	2.514860E-04	1.458790E-04	7.630470E-05	5.069420E-05
4.012460E-05	3.585580E-05	3.432340E-05	0.	0.	0.
2.221730E-05	6.369680E-05	9.957390E-05	2.680670E-04	2.413310E-04	1.458790E-04
8.559170E-05	6.140590E-05	5.069420E-05	4.648750E-05	0.	0.
0.	0.	0.	4.088800E-05	1.838160E-04	2.680670E-04
2.514860E-04	1.928940E-04	1.262780E-04	9.691720E-05	8.559170E-05	0.
0.	0.	0.	0.	0.	4.234530E-05
1.648370E-04	2.485050E-04	2.713080E-04	2.514860E-04	2.286090E-04	2.129440E-04
0.	0.	0.	0.	0.	0.
0.	0.	1.053960E-04	1.838160E-04	2.346760E-04	2.598450E-04
2.680670E-04	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	6.419700E-05
1.053960E-04	1.255180E-04				

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 04123 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 04021 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .
ACC 0 000000000000 MQ 0 000000000000 PQ 0

*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .

ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	05236	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
8	***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04021	. BLOCK REFERENCE CODE	NOT SET
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04021	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04123	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04123	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	05236	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	05236	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	05236	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	05236	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04021	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04021	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04015	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04021	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04117	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	
***	UNDERFLOW ON +,-,OR * OPERATION	AT CORE LOCATION	04123	. BLOCK REFERENCE CODE	NOT SET	
ACC	0	000000000000 MQ	0	000000000000 PQ	0	

[illegible]

ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
*** UNDERFLOW ON +,-,OR * OPERATION AT CORE LOCATION 05236 . BLOCK REFERENCE CODE NOT SET .									
ACC	0	000000000000	MQ	0	000000000000	PQ	0		
0.656193E-09	0.435431E-09	0.127652E-06	0.135362E-06	0.404856E-06	0.494459E-05	0.249132E-05	0.217636E-0		
0.530137E-05	0.458624E-05	0.696476E-05	0.136676E-06	0.264119E-04	0.150133E-04	0.478478E-04	0.440943E-0		
0.505506E-04	0.309655E-04	0.	0.184581E-03	0.412094E-04	0.322812E-04	0.831206E-04	0.301378E-0		
0.104296E-03	0.805612E-09	0.115649E-09	0.561768E-07	0.737726E-07	0.672532E-06	0.249762E-05	0.115714E-0		
0.270768E-05	0.579587E-05	0.462714E-05	0.135022E-04	0.233206E-09	0.258109E-04	0.191039E-04	0.699590E-0		
0.136779E-04	0.591670E-04	0.841585E-04	0.	0.285681E-03	0.760264E-04	0.724884E-04	0.149912E-0		
0.536170E-03	0.167393E-03	0.217989E-09	0.173936E-10	0.168022E-07	0.657567E-07	0.220188E-06	0.103174E-0		
0.651964E-06	0.111485E-05	0.235468E-05	0.148234E-05	0.510741E-05	0.375196E-09	0.105655E-04	0.834456E-0		
0.271677E-04	0.417919E-05	0.260017E-04	0.312756E-04	0.	0.134105E-03	0.306936E-04	0.237341E-0		
0.474202E-04	0.200802E-03	0.826903E-04	0.225268E-10	0.212849E-12	0.109145E-08	0.144836E-08	0.489999E-0		
0.327785E-07	0.219545E-07	0.355261E-07	0.780386E-07	0.520058E-07	0.155020E-06	0.485219E-11	0.403148E-0		
0.253579E-06	0.779551E-06	0.182646E-06	0.878638E-06	0.659945E-06	0.	0.515422E-05	0.735149E-0		
0.893333E-06	0.184862E-05	0.778037E-05	0.257716E-05	0.103307E-08	0.448642E-08	0.167000E-06	0.264515E-0		
0.124112E-05	0.796435E-05	0.513379E-05	0.471500E-05	0.979355E-05	0.104748E-04	0.123316E-04	0.276664E-0		
0.381988E-04	0.354464E-04	0.843223E-04	0.278972E-04	0.124774E-03	0.609045E-04	0.237027E-04	0.316688E-0		
0.127771E-03	0.571028E-04	0.181568E-03	0.392336E-03	0.129277E-03	0.132133E-08	0.241770E-07	0.122349E-0		
0.263855E-06	0.294876E-05	0.745584E-05	0.621705E-05	0.153928E-04	0.147233E-04	0.141723E-04	0.273349E-0		
0.129883E-04	0.465249E-04	0.507090E-04	0.147323E-03	0.608064E-04	0.166928E-03	0.223144E-03	0.624808E-0		

0.687390E-03	0.344221E-03	0.139054E-03	0.336609E-03	0.802135E-03	0.231038E-03	0.400001E-09	0.214557E-07
0.327769E-07	0.200251E-06	0.102295E-05	0.284759E-05	0.247001E-05	0.660340E-05	0.700789E-05	0.430357E-05
0.108016E-04	0.152886E-04	0.206712E-04	0.270985E-04	0.638524E-04	0.240704E-04	0.992876E-04	0.903873E-04
0.267409E-04	0.368174E-03	0.149488E-03	0.551446E-04	0.138336E-03	0.345378E-03	0.134877E-03	0.424479E-10
0.481043E-09	0.215445E-08	0.486517E-08	0.341591E-07	0.111969E-06	0.112973E-06	0.146979E-06	0.203443E-06
0.164692E-06	0.404686E-06	0.202679E-06	0.795953E-06	0.889706E-06	0.190273E-05	0.124784E-05	0.237740E-05
0.184073E-05	0.709363E-06	0.134162E-04	0.401652E-05	0.215780E-05	0.512102E-05	0.143772E-04	0.469181E-05
0.191505E-08	0.601702E-08	0.224135E-06	0.484789E-06	0.179947E-05	0.110647E-04	0.733082E-05	0.799507E-05
0.136274E-04	0.155152E-04	0.160301E-04	0.447497E-04	0.498958E-04	0.471239E-04	0.107466E-03	0.409719E-04
0.180576E-03	0.896367E-04	0.312654E-04	0.402135E-03	0.169596E-03	0.711153E-04	0.260374E-03	0.498474E-03
0.167636E-03	0.256713E-08	0.361327E-07	0.190217E-06	0.491941E-06	0.440087E-05	0.113364E-04	0.963441E-05
0.243440E-04	0.220357E-04	0.208791E-04	0.404669E-04	0.186007E-04	0.685302E-04	0.747305E-04	0.198126E-03
0.841604E-04	0.273182E-03	0.330990E-03	0.873586E-04	0.102895E-02	0.485575E-03	0.203939E-03	0.487051E-03
0.108209E-02	0.312376E-03	0.876096E-09	0.333382E-07	0.551350E-07	0.364940E-06	0.154749E-05	0.428335E-05
0.378912E-05	0.106161E-04	0.108012E-04	0.642305E-05	0.160238E-04	0.238092E-04	0.311586E-04	0.405587E-04
0.893922E-04	0.354745E-04	0.152928E-03	0.138044E-03	0.401593E-04	0.552562E-03	0.218649E-03	0.852075E-04
0.213308E-03	0.494228E-03	0.195207E-03	0.983207E-10	0.757290E-09	0.399014E-08	0.856364E-08	0.525404E-07
0.175210E-06	0.176481E-06	0.233120E-06	0.325321E-06	0.245814E-06	0.625015E-06	0.293765E-06	0.121454E-05
0.136542E-05	0.270085E-05	0.191079E-05	0.387518E-05	0.277796E-05	0.107158E-05	0.213529E-04	0.579195E-05
0.338148E-05	0.771144E-05	0.211985E-04	0.716608E-05	0.241097E-08	0.754226E-08	0.297833E-06	0.640482E-06
0.226895E-05	0.133281E-04	0.890337E-05	0.101290E-04	0.163892E-04	0.188038E-04	0.193052E-04	0.577009E-04
0.598182E-04	0.574624E-04	0.125567E-03	0.498390E-04	0.227079E-03	0.111277E-03	0.385731E-04	0.481503E-03
0.197156E-03	0.863094E-04	0.303994E-03	0.583309E-03	0.198339E-03	0.319103E-08	0.452153E-07	0.252772E-06
0.633302E-06	0.556356E-05	0.142243E-04	0.120959E-04	0.307576E-04	0.277000E-04	0.257715E-04	0.508336E-04
0.222958E-04	0.861603E-04	0.945015E-04	0.239608E-03	0.104025E-03	0.345429E-03	0.413631E-03	0.107379E-03
0.132929E-02	0.594111E-03	0.259242E-03	0.594667E-03	0.132691E-02	0.383686E-03	0.112881E-08	0.423237E-07
0.732791E-07	0.478760E-06	0.196409E-05	0.548527E-05	0.481440E-05	0.135525E-04	0.138453E-04	0.805238E-05
0.201920E-04	0.300318E-04	0.394384E-04	0.516361E-04	0.111469E-03	0.448636E-04	0.193958E-03	0.174842E-03
0.505184E-04	0.716628E-03	0.273544E-03	0.108388E-03	0.268611E-03	0.618158E-03	0.245411E-03	0.125008E-09
0.967423E-09	0.516299E-08	0.109432E-07	0.670403E-07	0.223812E-06	0.225157E-06	0.298423E-06	0.413646E-06
0.309853E-06	0.795301E-06	0.370591E-06	0.155312E-05	0.174642E-05	0.337130E-05	0.243549E-05	0.492545E-05
0.351748E-05	0.135513E-05	0.276599E-04	0.726755E-05	0.431363E-05	0.975834E-05	0.268908E-04	0.903641E-05
0.290117E-08	0.853534E-08	0.338167E-06	0.732699E-06	0.253911E-05	0.149519E-04	0.987098E-05	0.114227E-04
0.183520E-04	0.208425E-04	0.213794E-04	0.651204E-04	0.660510E-04	0.643131E-04	0.138397E-03	0.555968E-04
0.252585E-03	0.124639E-03	0.425430E-04	0.543438E-03	0.212162E-03	0.960348E-04	0.325480E-03	0.646666E-03
0.221073E-03	0.395491E-08	0.509368E-07	0.286821E-06	0.722573E-06	0.628485E-05	0.160614E-04	0.136744E-04
0.347349E-04	0.312580E-04	0.288808E-04	0.573513E-04	0.246508E-04	0.975006E-04	0.106938E-03	0.267408E-03
0.116735E-03	0.389958E-03	0.466457E-03	0.120785E-03	0.151399E-02	0.664757E-03	0.293862E-03	0.663450E-03
0.149247E-02	0.432419E-03	0.132078E-08	0.479636E-07	0.833476E-07	0.543955E-06	0.222642E-05	0.623423E-05
0.546146E-05	0.153797E-04	0.157161E-04	0.908722E-05	0.229347E-04	0.339330E-04	0.447409E-04	0.587761E-04
0.125663E-03	0.508068E-04	0.219802E-03	0.198281E-03	0.572253E-04	0.816357E-03	0.308945E-03	0.123392E-03
0.304152E-03	0.699423E-03	0.278044E-03	0.143795E-09	0.109944E-08	0.587421E-08	0.125566E-07	0.761931E-07
0.254187E-06	0.255889E-06	0.339143E-06	0.470860E-06	0.351139E-06	0.904383E-06	0.420568E-06	0.176490E-05
0.198940E-05	0.381335E-05	0.276766E-05	0.559022E-05	0.399376E-05	0.153602E-05	0.315126E-04	0.823806E-05
0.490727E-05	0.110776E-04	0.305317E-04	0.102613E-04	0.300229E-08	0.886265E-08	0.350621E-06	0.759816E-06
0.263882E-05	0.155272E-04	0.101124E-04	0.118556E-04	0.189954E-04	0.215629E-04	0.220559E-04	0.676341E-04

0.681139E-04	0.665032E-04	0.142971E-03	0.578184E-04	0.260476E-03	0.129261E-03	0.442065E-04	0.570238E-03
0.216732E-03	0.996773E-04	0.334463E-03	0.670160E-03	0.226838E-03	0.411077E-08	0.528943E-07	0.298370E-06
0.753222E-06	0.654270E-05	0.167288E-04	0.142041E-04	0.361405E-04	0.324677E-04	0.299715E-04	0.596387E-04
0.255879E-04	0.101401E-03	0.111339E-03	0.277107E-03	0.120810E-03	0.405221E-03	0.484613E-03	0.125235E-03
0.157860E-02	0.689645E-03	0.305921E-03	0.688918E-03	0.154882E-02	0.449598E-03	0.137425E-08	0.498874E-07
0.867487E-07	0.566968E-06	0.231999E-05	0.648653E-05	0.568044E-05	0.160054E-04	0.163509E-04	0.944338E-05
0.238619E-04	0.352752E-04	0.465531E-04	0.612134E-04	0.130600E-03	0.528408E-04	0.228685E-03	0.206287E-03
0.595528E-04	0.849753E-03	0.321243E-03	0.128529E-03	0.316193E-03	0.727492E-03	0.289275E-03	0.149660E-09
0.114448E-08	0.611631E-08	0.130856E-07	0.794128E-07	0.264754E-06	0.266310E-06	0.353181E-06	0.490087E-06
0.365449E-06	0.941509E-06	0.437883E-06	0.183748E-05	0.207191E-05	0.396716E-05	0.288130E-05	0.581664E-05
0.415727E-05	0.159895E-05	0.328170E-04	0.857429E-05	0.511347E-05	0.115314E-04	0.317792E-04	0.106834E-04
0.290117E-08	0.853534E-08	0.338167E-06	0.732699E-06	0.253911E-05	0.149519E-04	0.987098E-05	0.114227E-04
0.183520E-04	0.208425E-04	0.213794E-04	0.651204E-04	0.660510E-04	0.643131E-04	0.138397E-03	0.555968E-04
0.252585E-03	0.124639E-03	0.425430E-04	0.543438E-03	0.212162E-03	0.960348E-04	0.325480E-03	0.646666E-03
0.221073E-03	0.395491E-08	0.509368E-07	0.286821E-06	0.722573E-06	0.628485E-05	0.160614E-04	0.136744E-04
0.347349E-04	0.312580E-04	0.288808E-04	0.573513E-04	0.246508E-04	0.975006E-04	0.106938E-03	0.267408E-03
0.116735E-03	0.389958E-03	0.466457E-03	0.120785E-03	0.151399E-02	0.664757E-03	0.293862E-03	0.663450E-03
0.149247E-02	0.432419E-03	0.132078E-08	0.479636E-07	0.833476E-07	0.543955E-06	0.222642E-05	0.623423E-05
0.546146E-05	0.153797E-04	0.157161E-04	0.908722E-05	0.229347E-04	0.339330E-04	0.447409E-04	0.587761E-04
0.125663E-03	0.508068E-04	0.219802E-03	0.198281E-03	0.572253E-04	0.816357E-03	0.308945E-03	0.123392E-03
0.304152E-03	0.699423E-03	0.278044E-03	0.143795E-09	0.109944E-08	0.587421E-08	0.125566E-07	0.761931E-07
0.254187E-06	0.255889E-06	0.339143E-06	0.470860E-06	0.351139E-06	0.904383E-06	0.420568E-06	0.176490E-05
0.198940E-05	0.381335E-05	0.276766E-05	0.559022E-05	0.399376E-05	0.153602E-05	0.315126E-04	0.823806E-05
0.490727E-05	0.110776E-04	0.305317E-04	0.102614E-04	0.241097E-08	0.754226E-08	0.297833E-06	0.640482E-06
0.226895E-05	0.133281E-04	0.890337E-05	0.101290E-04	0.163892E-04	0.188038E-04	0.193052E-04	0.577009E-04
0.598182E-04	0.574624E-04	0.125567E-03	0.498390E-04	0.227079E-03	0.111277E-03	0.385731E-04	0.481503E-03
0.197156E-03	0.863094E-04	0.303994E-03	0.583309E-03	0.198339E-03	0.319103E-08	0.452153E-07	0.252772E-06
0.633302E-06	0.556356E-05	0.142243E-04	0.120959E-04	0.307576E-04	0.277000E-04	0.257715E-04	0.508336E-04
0.222958E-04	0.861603E-04	0.945015E-04	0.239608E-03	0.104025E-03	0.345429E-03	0.413631E-03	0.107379E-03
0.132929E-02	0.594111E-03	0.259242E-03	0.594667E-03	0.132691E-02	0.383686E-03	0.112881E-08	0.423237E-07
0.732791E-07	0.478760E-06	0.196409E-05	0.548527E-05	0.481440E-05	0.135525E-04	0.138453E-04	0.805238E-05
0.201920E-04	0.300318E-04	0.394384E-04	0.516361E-04	0.111469E-03	0.448636E-04	0.193958E-03	0.174842E-07
0.505184E-04	0.716628E-03	0.273544E-03	0.108388E-03	0.268611E-03	0.618158E-03	0.245411E-03	0.125008E-05
0.967423E-09	0.516299E-08	0.109432E-07	0.670403E-07	0.223812E-06	0.225157E-06	0.298423E-06	0.413646E-06
0.309853E-06	0.795301E-06	0.370591E-06	0.155312E-05	0.174642E-05	0.337130E-05	0.243549E-05	0.492545E-05
0.351748E-05	0.135513E-05	0.276599E-04	0.726755E-05	0.431363E-05	0.975834E-05	0.268908E-04	0.903641E-05
0.191505E-08	0.601702E-08	0.224135E-06	0.484789E-06	0.179947E-05	0.110647E-04	0.733082E-05	0.799507E-05
0.136274E-04	0.155152E-04	0.160301E-04	0.447497E-04	0.498958E-04	0.471239E-04	0.107466E-03	0.409719E-04
0.180576E-03	0.896367E-04	0.312654E-04	0.402135E-03	0.169596E-03	0.711153E-04	0.260374E-03	0.498474E-03
0.167636E-03	0.256713E-08	0.361327E-07	0.190217E-06	0.491941E-06	0.440087E-05	0.113364E-04	0.963441E-05
0.243440E-04	0.220357E-04	0.208791E-04	0.404669E-04	0.186007E-04	0.685302E-04	0.747305E-04	0.198126E-03
0.841604E-04	0.273182E-03	0.330990E-03	0.873586E-04	0.102895E-02	0.485575E-03	0.203939E-03	0.487051E-03
0.108209E-02	0.312376E-03	0.876096E-09	0.333382E-07	0.551350E-07	0.364940E-06	0.154749E-05	0.428335E-05
0.378912E-05	0.106161E-04	0.108012E-04	0.642305E-05	0.160238E-04	0.238092E-04	0.311586E-04	0.405587E-04
0.893922E-04	0.354745E-04	0.152928E-03	0.138044E-03	0.401593E-04	0.552562E-03	0.218649E-03	0.852075E-04
0.213308E-03	0.494228E-03	0.195207E-03	0.983207E-10	0.757290E-09	0.399014E-08	0.856364E-08	0.525404E-03

0.175210E-06	0.176481E-06	0.233120E-06	0.325321E-06	0.245814E-06	0.625015E-06	0.293765E-06	0.121454E-05
0.136542E-05	0.270085E-05	0.191079E-05	0.387518E-05	0.277796E-05	0.107158E-05	0.213529E-04	0.579195E-05
0.338148E-05	0.771144E-05	0.211985E-04	0.716608E-05	0.103307E-08	0.448642E-08	0.167000E-06	0.264515E-06
0.124112E-05	0.796435E-05	0.513379E-05	0.471500E-05	0.979355E-05	0.104748E-04	0.123316E-04	0.276664E-04
0.381988E-04	0.354464E-04	0.843223E-04	0.278972E-04	0.124774E-03	0.609045E-04	0.237027E-04	0.316688E-03
0.127771E-03	0.571028E-04	0.181568E-03	0.392336E-03	0.129277E-03	0.132133E-08	0.241770E-07	0.122349E-06
0.263855E-06	0.294876E-05	0.745584E-05	0.621705E-05	0.153928E-04	0.147233E-04	0.141723E-04	0.273349E-04
0.129883E-04	0.465249E-04	0.507090E-04	0.147323E-03	0.608064E-04	0.166928E-03	0.223144E-03	0.624808E-04
0.687390E-03	0.344221E-03	0.139054E-03	0.336609E-03	0.802135E-03	0.231038E-03	0.400001E-09	0.214557E-07
0.327769E-07	0.200231E-06	0.102295E-05	0.284759E-05	0.247001E-05	0.660340E-05	0.700789E-05	0.430357E-05
0.108016E-04	0.152886E-04	0.206712E-04	0.270985E-04	0.638524E-04	0.240704E-04	0.992876E-04	0.903873E-04
0.267409E-04	0.368174E-03	0.149488E-03	0.551446E-04	0.138336E-03	0.345378E-03	0.134877E-03	0.424479E-10
0.481043E-09	0.215445E-08	0.486517E-08	0.341591E-07	0.111969E-06	0.112973E-06	0.146979E-06	0.203443E-06
0.164692E-06	0.404686E-06	0.202679E-06	0.795953E-06	0.889706E-06	0.190273E-05	0.124784E-05	0.237740E-05
0.184073E-05	0.709363E-06	0.134162E-04	0.401652E-05	0.215780E-05	0.512102E-05	0.143772E-04	0.469181E-05
0.656193E-09	0.435431E-09	0.127652E-06	0.135362E-06	0.404856E-06	0.494459E-05	0.249132E-05	0.217636E-05
0.530137E-05	0.458624E-05	0.696476E-05	0.136676E-06	0.264119E-04	0.150133E-04	0.478478E-04	0.440943E-05
0.505506E-04	0.309655E-04	0.	0.184581E-03	0.412094E-04	0.322812E-04	0.831206E-04	0.301328E-03
0.104296E-03	0.805612E-09	0.115649E-09	0.561768E-07	0.737726E-07	0.672532E-06	0.249762E-05	0.115714E-05
0.270768E-05	0.579587E-05	0.462714E-05	0.135022E-04	0.233206E-09	0.258109E-04	0.191039E-04	0.699590E-04
0.136779E-04	0.591670E-04	0.841585E-04	0.	0.285681E-03	0.760264E-04	0.724884E-04	0.149912E-03
0.536170E-03	0.167393E-03	0.217989E-09	0.173936E-10	0.168022E-07	0.657567E-07	0.220188E-06	0.103174E-05
0.651964E-06	0.111485E-05	0.235468E-05	0.148234E-05	0.510741E-05	0.375196E-09	0.105655E-04	0.834456E-05
0.271677E-04	0.417919E-05	0.260017E-04	0.312756E-04	0.	0.134105E-03	0.306936E-04	0.237341E-04
0.474202E-04	0.200802E-03	0.826903E-04	0.225268E-10	0.212849E-12	0.109145E-08	0.144836E-08	0.489999E-08
0.327785E-07	0.219545E-07	0.355261E-07	0.780386E-07	0.520058E-07	0.155020E-06	0.485219E-11	0.403148E-06
0.253579E-06	0.779551E-06	0.182646E-06	0.878638E-06	0.659945E-06	0.	0.515422E-05	0.735149E-06
0.893333E-06	0.184862E-05	0.778037E-05	0.257716E-05	0.613941E-09	0.646054E-09	0.110632E-06	0.760039E-07
0.317123E-06	0.324691E-05	0.159522E-05	0.201864E-05	0.387731E-05	0.352313E-05	0.530505E-05	0.374354E-06
0.206755E-04	0.134861E-04	0.376302E-04	0.400978E-05	0.366775E-04	0.249221E-04	0.	0.183854E-03
0.333168E-04	0.359254E-04	0.620124E-04	0.246477E-03	0.955595E-04	0.288461E-08	0.209707E-10	0.187394E-07
0.870577E-07	0.494670E-06	0.188480E-05	0.108571E-05	0.246403E-05	0.513496E-05	0.386706E-05	0.803094E-05
0.232286E-07	0.195648E-04	0.120542E-04	0.495529E-04	0.126837E-04	0.519030E-04	0.443227E-04	0.
0.171274E-03	0.558519E-04	0.251836E-04	0.107761E-03	0.414179E-03	0.165517E-03	0.188682E-09	0.294281E-10
0.285485E-07	0.387718E-07	0.170358E-06	0.809290E-06	0.541546E-06	0.980372E-06	0.188911E-05	0.141723E-05
0.444627E-05	0.736876E-12	0.771400E-05	0.536098E-05	0.235902E-04	0.357845E-05	0.192512E-04	0.226530E-04
0.	0.882092E-04	0.196344E-04	0.223829E-04	0.364976E-04	0.189611E-03	0.681985E-04	0.116841E-12
0.302944E-12	0.548705E-09	0.109888E-08	0.934552E-08	0.395622E-07	0.193648E-07	0.297771E-07	0.102065E-06
0.729227E-07	0.176775E-06	0.725112E-09	0.343775E-06	0.289674E-06	0.120598E-05	0.174463E-06	0.779027E-06
0.104492E-05	0.	0.272508E-05	0.139078E-05	0.609397E-06	0.188914E-05	0.834091E-05	0.266637E-05
0.915030E-09	0.729659E-08	0.178037E-06	0.157758E-06	0.892407E-06	0.550050E-05	0.388666E-05	0.500521E-05
0.749683E-05	0.789256E-05	0.111722E-04	0.118743E-04	0.286842E-04	0.316501E-04	0.643725E-04	0.193606E-04
0.952388E-04	0.494926E-04	0.164828E-04	0.351375E-03	0.949502E-04	0.684573E-04	0.124587E-03	0.342597E-03
0.123764E-03	0.526661E-08	0.375105E-07	0.320335E-07	0.285727E-06	0.249277E-05	0.470990E-05	0.457427E-05
0.776939E-05	0.107644E-04	0.127022E-04	0.187230E-04	0.132038E-04	0.372929E-04	0.354916E-04	0.109838E-03
0.533728E-04	0.126396E-03	0.140591E-03	0.410075E-04	0.420701E-03	0.262594E-03	0.584746E-04	0.257766E-03

0.633003E-03	0.237666E-03	0.352362E-09	0.187775E-07	0.686246E-07	0.134929E-06	0.876890E-06	0.258262E-05
0.238959E-05	0.368014E-05	0.561718E-05	0.462096E-05	0.953955E-05	0.142766E-04	0.155780E-04	0.202002E-04
0.547153E-04	0.208079E-04	0.585060E-04	0.544296E-04	0.264203E-04	0.214597E-03	0.992248E-04	0.600623E-04
0.102505E-03	0.345034E-03	0.111818E-03	0.166281E-12	0.107573E-09	0.944514E-09	0.468891E-08	0.396929E-07
0.112254E-06	0.999757E-07	0.138722E-06	0.251287E-06	0.305695E-06	0.475422E-06	0.480072E-06	0.634948E-06
0.935601E-06	0.260454E-05	0.137333E-05	0.355077E-05	0.344203E-05	0.839929E-06	0.878654E-05	0.601588E-05
0.148019E-05	0.514954E-05	0.138067E-04	0.403330E-05	0.138712E-08	0.109431E-07	0.255712E-06	0.257752E-06
0.121643E-05	0.743775E-05	0.549220E-05	0.799441E-05	0.105053E-04	0.112882E-04	0.158087E-04	0.217096E-04
0.372455E-04	0.427198E-04	0.792308E-04	0.275591E-04	0.139542E-03	0.718869E-04	0.218287E-04	0.511078E-03
0.134979E-03	0.888158E-04	0.185296E-03	0.451912E-03	0.157139E-03	0.119201E-07	0.573589E-07	0.501535E-07
0.511048E-06	0.376562E-05	0.698146E-05	0.701167E-05	0.125314E-04	0.157362E-04	0.190613E-04	0.270194E-04
0.204243E-04	0.554068E-04	0.509899E-04	0.146288E-03	0.772603E-04	0.197479E-03	0.205369E-03	0.576741E-04
0.603906E-03	0.353613E-03	0.796917E-04	0.370479E-03	0.872033E-03	0.336271E-03	0.822995E-09	0.294428E-07
0.108458E-06	0.228077E-06	0.139524E-05	0.387079E-05	0.374465E-05	0.582885E-05	0.850532E-05	0.686274E-05
0.144963E-04	0.219543E-04	0.232887E-04	0.303997E-04	0.780206E-04	0.310995E-04	0.101669E-03	0.809788E-04
0.393388E-04	0.318635E-03	0.141924E-03	0.923658E-04	0.150704E-03	0.496248E-03	0.160742E-03	0.202140E-12
0.169482E-09	0.172094E-08	0.852686E-08	0.628993E-07	0.176836E-06	0.156630E-06	0.220885E-06	0.390600E-06
0.478493E-06	0.729668E-06	0.729412E-06	0.971614E-06	0.141530E-05	0.361962E-05	0.208969E-05	0.575768E-05
0.526525E-05	0.127115E-05	0.147969E-04	0.867481E-05	0.216565E-05	0.793882E-05	0.201975E-04	0.598856E-05
0.185280E-08	0.137916E-07	0.321528E-06	0.342670E-06	0.152181E-05	0.898146E-05	0.664610E-05	0.101989E-04
0.128931E-04	0.139432E-04	0.196536E-04	0.281628E-04	0.451759E-04	0.527857E-04	0.904907E-04	0.329390E-04
0.173735E-03	0.870443E-04	0.263552E-04	0.640934E-03	0.161664E-03	0.110439E-03	0.234770E-03	0.537028E-03
0.188881E-03	0.152663E-07	0.723774E-07	0.663991E-07	0.657600E-06	0.476813E-05	0.879799E-05	0.881850E-05
0.158938E-04	0.197082E-04	0.236551E-04	0.336985E-04	0.253355E-04	0.695103E-04	0.642962E-04	0.177143E-03
0.962040E-04	0.247822E-03	0.257106E-03	0.715082E-04	0.770437E-03	0.428485E-03	0.101556E-03	0.457891E-03
0.106877E-02	0.419693E-03	0.105573E-08	0.375352E-07	0.139822E-06	0.295963E-06	0.178380E-05	0.491591E-05
0.476435E-05	0.743471E-05	0.108483E-04	0.858039E-05	0.184058E-04	0.277280E-04	0.296230E-04	0.384280E-04
0.971687E-04	0.393579E-04	0.128943E-03	0.102445E-03	0.496836E-04	0.420158E-03	0.176709E-03	0.118227E-03
0.189687E-03	0.623401E-03	0.201138E-03	0.221663E-12	0.217189E-09	0.226365E-08	0.111498E-07	0.807622E-07
0.226667E-06	0.200138E-06	0.283264E-06	0.501646E-06	0.607156E-06	0.931391E-06	0.925075E-06	0.123580E-05
0.182262E-05	0.451514E-05	0.266395E-05	0.735608E-05	0.673239E-05	0.160598E-05	0.192878E-04	0.108670E-04
0.285320E-05	0.100177E-04	0.255067E-04	0.759141E-05	0.229979E-08	0.155819E-07	0.364121E-06	0.396746E-06
0.170949E-05	0.984681E-05	0.739191E-05	0.115123E-04	0.143519E-04	0.154595E-04	0.220664E-04	0.316261E-04
0.502213E-04	0.592694E-04	0.979353E-04	0.365033E-04	0.193382E-03	0.966587E-04	0.290691E-04	0.730317E-03
0.178695E-03	0.121168E-03	0.259308E-03	0.592475E-03	0.206452E-03	0.174813E-07	0.818165E-07	0.765969E-07
0.750041E-06	0.539541E-05	0.995727E-05	0.997033E-05	0.179622E-04	0.222549E-04	0.265910E-04	0.380240E-04
0.284447E-04	0.786322E-04	0.729807E-04	0.197882E-03	0.108227E-03	0.279120E-03	0.289857E-03	0.805086E-04
0.874079E-03	0.476797E-03	0.115956E-03	0.516791E-03	0.119900E-02	0.471416E-03	0.119939E-08	0.426230E-07
0.158774E-06	0.338550E-06	0.202329E-05	0.558395E-05	0.540716E-05	0.843606E-05	0.123221E-04	0.971610E-05
0.208798E-04	0.313667E-04	0.336360E-04	0.437449E-04	0.109566E-03	0.446561E-04	0.146298E-03	0.116200E-03
0.562977E-04	0.477819E-03	0.199347E-03	0.135006E-03	0.214870E-03	0.706050E-03	0.227899E-03	0.389583E-12
0.247242E-09	0.258255E-08	0.129675E-07	0.920021E-07	0.258148E-06	0.227770E-06	0.322380E-06	0.571164E-06
0.690351E-06	0.106067E-05	0.104997E-05	0.140793E-05	0.207721E-05	0.511690E-05	0.302977E-05	0.837231E-05
0.766357E-05	0.182597E-05	0.220442E-04	0.123226E-04	0.326299E-05	0.113841E-04	0.289887E-04	0.862268E-05
0.238291E-08	0.161884E-07	0.380265E-06	0.416124E-06	0.178231E-05	0.102113E-04	0.751383E-05	0.119858E-04
0.148358E-04	0.160553E-04	0.229536E-04	0.326730E-04	0.519882E-04	0.617367E-04	0.991435E-04	0.378186E-04

0.200550E-03	0.100682E-03	0.298763E-04	0.767908E-03	0.185570E-03	0.125071E-03	0.267388E-03	0.607173E-03
0.211545E-03	0.181809E-07	0.850381E-07	0.798405E-07	0.780348E-06	0.560712E-05	0.103650E-04	0.103603E-04
0.186852E-04	0.231315E-04	0.276498E-04	0.395041E-04	0.294891E-04	0.817742E-04	0.759910E-04	0.205165E-03
0.112504E-03	0.290126E-03	0.300845E-03	0.836273E-04	0.909364E-03	0.495738E-03	0.120898E-03	0.537318E-03
0.124372E-02	0.489700E-03	0.124728E-08	0.443593E-07	0.165246E-06	0.352330E-06	0.210766E-05	0.581539E-05
0.562401E-05	0.878061E-05	0.128205E-04	0.101040E-04	0.217320E-04	0.326163E-04	0.350078E-04	0.455238E-04
0.113864E-03	0.464698E-04	0.152259E-03	0.120883E-03	0.585519E-04	0.497400E-03	0.207356E-03	0.140460E-03
0.223400E-03	0.733645E-03	0.236873E-03	0.410086E-12	0.257509E-09	0.269043E-08	0.135351E-07	0.958822E-07
0.269097E-06	0.237171E-06	0.335812E-06	0.594914E-06	0.718857E-06	0.110480E-05	0.109294E-05	0.146707E-05
0.216526E-05	0.532557E-05	0.315535E-05	0.872057E-05	0.798231E-05	0.190188E-05	0.229671E-04	0.128295E-04
0.339674E-05	0.118683E-04	0.301826E-04	0.897265E-05	0.229979E-08	0.155819E-07	0.364121E-06	0.396746E-06
0.170949E-05	0.984681E-05	0.739191E-05	0.115123E-04	0.143519E-04	0.154595E-04	0.220664E-04	0.316261E-04
0.502213E-04	0.592694E-04	0.979353E-04	0.365033E-04	0.193382E-03	0.966587E-04	0.290691E-04	0.730317E-03
0.178695E-03	0.121168E-03	0.259308E-03	0.592475E-03	0.206452E-03	0.174813E-07	0.818165E-07	0.765969E-07
0.750041E-06	0.539541E-05	0.995727E-05	0.997033E-05	0.179622E-04	0.222549E-04	0.265910E-04	0.380240E-04
0.284447E-04	0.786322E-04	0.729807E-04	0.197882E-03	0.108227E-03	0.279120E-03	0.289857E-03	0.805086E-04
0.874079E-03	0.476797E-03	0.115956E-03	0.516791E-03	0.119900E-02	0.471416E-03	0.119939E-08	0.426230E-07
0.158774E-06	0.338550E-06	0.202329E-05	0.558395E-05	0.540716E-05	0.843606E-05	0.123221E-04	0.971610E-05
0.208798E-04	0.313667E-04	0.336360E-04	0.437449E-04	0.109566E-03	0.446561E-04	0.146298E-03	0.116200E-03
0.562977E-04	0.477819E-03	0.199347E-03	0.135006E-03	0.214870E-03	0.706050E-03	0.227899E-03	0.389583E-12
0.247242E-09	0.258255E-08	0.129675E-07	0.920021E-07	0.258148E-06	0.227770E-06	0.322380E-06	0.571164E-06
0.690351E-06	0.106067E-05	0.104997E-05	0.140793E-05	0.207721E-05	0.511690E-05	0.302977E-05	0.837231E-05
0.766357E-05	0.182597E-05	0.220442E-04	0.123226E-04	0.326299E-05	0.113841E-04	0.289887E-04	0.862268E-05
0.185280E-08	0.137916E-07	0.321528E-06	0.342670E-06	0.152181E-05	0.898146E-05	0.664610E-05	0.101989E-04
0.128931E-04	0.139432E-04	0.196536E-04	0.281628E-04	0.451759E-04	0.527857E-04	0.904907E-04	0.329390E-04
0.173735E-03	0.870443E-04	0.263552E-04	0.640934E-03	0.161664E-03	0.110439E-03	0.234770E-03	0.537028E-03
0.188881E-03	0.152663E-07	0.723774E-07	0.663991E-07	0.657600E-06	0.476813E-05	0.879799E-05	0.881850E-05
0.158938E-04	0.197082E-04	0.236551E-04	0.336985E-04	0.253355E-04	0.695103E-04	0.642962E-04	0.177143E-03
0.962040E-04	0.247822E-03	0.257106E-03	0.715082E-04	0.770437E-03	0.428485E-03	0.101556E-03	0.457891E-03
0.106877E-02	0.419693E-03	0.105573E-08	0.375352E-07	0.139822E-06	0.295963E-06	0.178380E-05	0.491591E-05
0.476435E-05	0.743471E-05	0.108483E-04	0.858039E-05	0.184058E-04	0.277280E-04	0.296230E-04	0.384280E-04
0.971687E-04	0.393579E-04	0.128943E-03	0.102445E-03	0.496836E-04	0.420158E-03	0.176709E-03	0.118227E-03
0.189637E-03	0.623401E-03	0.201138E-03	0.221663E-12	0.217189E-09	0.226365E-08	0.111498E-07	0.807622E-07
0.226667E-06	0.200138E-06	0.283264E-06	0.501646E-06	0.607156E-06	0.931391E-06	0.925075E-06	0.123580E-05
0.182262E-05	0.451514E-05	0.266395E-05	0.735608E-05	0.673239E-05	0.160598E-05	0.192878E-04	0.108670E-04
0.285320E-05	0.100177E-04	0.255067E-04	0.759141E-05	0.138712E-08	0.109431E-07	0.255712E-06	0.257752E-06
0.121643E-05	0.743775E-05	0.549220E-05	0.799441E-05	0.105053E-04	0.112882E-04	0.158087E-04	0.217096E-04
0.372455E-04	0.427198E-04	0.792308E-04	0.275591E-04	0.139542E-03	0.718869E-04	0.218287E-04	0.511078E-03
0.134979E-03	0.888158E-04	0.185296E-03	0.451912E-03	0.157139E-03	0.119201E-07	0.573589E-07	0.501535E-07
0.511048E-06	0.376562E-05	0.698146E-05	0.701167E-05	0.125314E-04	0.157362E-04	0.190613E-04	0.270194E-04
0.204243E-04	0.554068E-04	0.509899E-04	0.146288E-03	0.772603E-04	0.197479E-03	0.205369E-03	0.576741E-04
0.603906E-03	0.353613E-03	0.796917E-04	0.370479E-03	0.872033E-03	0.336271E-03	0.822995E-09	0.294428E-07
0.108458E-06	0.228077E-06	0.139524E-05	0.387079E-05	0.374465E-05	0.582885E-05	0.850532E-05	0.686274E-05
0.144963E-04	0.219543E-04	0.232887E-04	0.303997E-04	0.780206E-04	0.310995E-04	0.101669E-03	0.809788E-04
0.393388E-04	0.318635E-03	0.141924E-03	0.923658E-04	0.150704E-03	0.496248E-03	0.160742E-03	0.202140E-12
0.169482E-09	0.172094E-08	0.852686E-08	0.628993E-07	0.176836E-06	0.156630E-06	0.220885E-06	0.390600E-06

0.478493E-06	0.729668E-06	0.729412E-06	0.971614E-06	0.141530E-05	0.361962E-05	0.208969E-05	0.575768E-05
0.526525E-05	0.127115E-05	0.147969E-04	0.867481E-05	0.216565E-05	0.793882E-05	0.201975E-04	0.598856E-05
0.915030E-09	0.729659E-08	0.178037E-06	0.157758E-06	0.892407E-06	0.550050E-05	0.388666E-05	0.500521E-05
0.749683E-05	0.789256E-05	0.111722E-04	0.118743E-04	0.286842E-04	0.316501E-04	0.643725E-04	0.193606E-04
0.952388E-04	0.494926E-04	0.164828E-04	0.351375E-03	0.949502E-04	0.684573E-04	0.124587E-03	0.342597E-03
0.123764E-03	0.526661E-08	0.375105E-07	0.320335E-07	0.285727E-06	0.249277E-05	0.470990E-05	0.457427E-05
0.776939E-05	0.107644E-04	0.127022E-04	0.187230E-04	0.132038E-04	0.372929E-04	0.354916E-04	0.109838E-03
0.533728E-04	0.126396E-03	0.140591E-03	0.410075E-04	0.420701E-03	0.262594E-03	0.584746E-04	0.257766E-03
0.633003E-03	0.237666E-03	0.352362E-09	0.187775E-07	0.686246E-07	0.134929E-06	0.876890E-06	0.258262E-05
0.238959E-05	0.368014E-05	0.561718E-05	0.462096E-05	0.953955E-05	0.142766E-04	0.155780E-04	0.202002E-04
0.547153E-04	0.208079E-04	0.585060E-04	0.544296E-04	0.264203E-04	0.214597E-03	0.992248E-04	0.600623E-04
0.102505E-03	0.345034E-03	0.111818E-03	0.166281E-12	0.107573E-09	0.944514E-09	0.468891E-08	0.396929E-07
0.112254E-06	0.999757E-07	0.138722E-06	0.251287E-06	0.305695E-06	0.475422E-06	0.480072E-06	0.634948E-06
0.935601E-06	0.260454E-05	0.137333E-05	0.355077E-05	0.344203E-05	0.839929E-06	0.878654E-05	0.601588E-05
0.148019E-05	0.514954E-05	0.138067E-04	0.403330E-05	0.613941E-09	0.646054E-09	0.110632E-06	0.760039E-07
0.317123E-06	0.324691E-05	0.159522E-05	0.201864E-05	0.387731E-05	0.352313E-05	0.530505E-05	0.374354E-06
0.206755E-04	0.134861E-04	0.376302E-04	0.400978E-05	0.366775E-04	0.249221E-04	0.	0.183854E-03
0.333168E-04	0.359254E-04	0.620124E-04	0.246477E-03	0.955595E-04	0.288461E-08	0.209707E-10	0.187394E-07
0.870577E-07	0.494670E-06	0.188480E-05	0.108571E-05	0.246403E-05	0.513496E-05	0.386706E-05	0.803094E-05
0.232286E-07	0.195648E-04	0.120542E-04	0.495529E-04	0.126837E-04	0.519030E-04	0.443227E-04	0.
0.171274E-03	0.558519E-04	0.251836E-04	0.107761E-03	0.414179E-03	0.165517E-03	0.188682E-09	0.294281E-10
0.285485E-07	0.387718E-07	0.170358E-06	0.809290E-06	0.541546E-06	0.980372E-06	0.188911E-05	0.141723E-05
0.444627E-05	0.736876E-12	0.771400E-05	0.536098E-05	0.235902E-04	0.357845E-05	0.192512E-04	0.226530E-04
0.	0.882092E-04	0.196344E-04	0.223829E-04	0.364976E-04	0.189611E-03	0.681985E-04	0.116841E-12
0.302944E-12	0.548705E-09	0.109888E-08	0.934552E-08	0.395622E-07	0.193648E-07	0.297771E-07	0.102065E-06
0.729227E-07	0.176775E-06	0.725112E-09	0.343775E-06	0.289674E-06	0.120598E-05	0.174463E-06	0.779027E-06
0.104492E-05	0.	0.272508E-05	0.139078E-05	0.609397E-06	0.188914E-05	0.834091E-05	0.266637E-05
0.210310E-09	0.702067E-10	0.485252E-07	0.226074E-07	0.998167E-07	0.153054E-05	0.530927E-06	0.517814E-06
0.102198E-05	0.134049E-05	0.194650E-05	0.442403E-08	0.640688E-05	0.436580E-05	0.128406E-04	0.131587E-05
0.162384E-04	0.906740E-05	0.	0.337117E-04	0.108801E-04	0.621038E-05	0.260006E-04	0.970371E-04
0.429405E-04	0.680430E-09	0.511886E-09	0.289851E-07	0.332285E-07	0.139120E-06	0.601369E-06	0.439620E-06
0.106100E-05	0.195499E-05	0.169311E-05	0.311849E-05	0.136181E-07	0.735456E-05	0.691112E-05	0.212892E-04
0.509646E-05	0.193592E-04	0.249883E-04	0.	0.724944E-04	0.319348E-04	0.157525E-04	0.462061E-04
0.183440E-03	0.501937E-04	0.273658E-09	0.262395E-10	0.130900E-07	0.203264E-07	0.122959E-06	0.334672E-06
0.269037E-06	0.431014E-06	0.114408E-05	0.113372E-05	0.184259E-05	0.464089E-09	0.595029E-05	0.317108E-05
0.131350E-04	0.194851E-05	0.131722E-04	0.115037E-04	0.	0.560547E-04	0.193097E-04	0.772488E-05
0.296014E-04	0.107112E-03	0.319718E-04	0.107295E-09	0.530561E-10	0.976916E-08	0.959129E-08	0.389560E-07
0.243646E-06	0.134875E-06	0.188351E-06	0.484905E-06	0.382226E-06	0.838574E-06	0.818862E-09	0.197084E-05
0.145376E-05	0.509318E-05	0.740903E-06	0.396711E-05	0.491477E-05	0.	0.213924E-04	0.591704E-05
0.408925E-05	0.962943E-05	0.387142E-04	0.116695E-04	0.324477E-09	0.182338E-08	0.786307E-07	0.512479E-07
0.282633E-06	0.239319E-05	0.120477E-05	0.131689E-05	0.219947E-05	0.297198E-05	0.328130E-05	0.480031E-05
0.921405E-05	0.115634E-04	0.229663E-04	0.592239E-05	0.426809E-04	0.164540E-04	0.614562E-05	0.680157E-04
0.403865E-04	0.190160E-04	0.487928E-04	0.127843E-03	0.572092E-04	0.130639E-08	0.541400E-08	0.676137E-07
0.102219E-06	0.744096E-06	0.221149E-05	0.258219E-05	0.480635E-05	0.577695E-05	0.577110E-05	0.787281E-05
0.117055E-04	0.154609E-04	0.220658E-04	0.490470E-04	0.196031E-04	0.750085E-04	0.701418E-04	0.176162E-04
0.213288E-03	0.122507E-03	0.364033E-04	0.102986E-03	0.312716E-03	0.793160E-04	0.539742E-09	0.825772E-05

0.300989E-07	0.967463E-07	0.800846E-06	0.130908E-05	0.141929E-05	0.212246E-05	0.340012E-05	0.389042E-05
0.526394E-05	0.109690E-04	0.147260E-04	0.102924E-04	0.339908E-04	0.144305E-04	0.492982E-04	0.373381E-04
0.122260E-04	0.180806E-03	0.839807E-04	0.198586E-04	0.877025E-04	0.176221E-03	0.566898E-04	0.219355E-09
0.183008E-08	0.248987E-07	0.417047E-07	0.239163E-06	0.822296E-06	0.701917E-06	0.953268E-06	0.158444E-05
0.154034E-05	0.241198E-05	0.250173E-05	0.463461E-05	0.587973E-05	0.128215E-04	0.523235E-05	0.175857E-04
0.164032E-04	0.500857E-05	0.676162E-04	0.311600E-04	0.121773E-04	0.321822E-04	0.797237E-04	0.225744E-04
0.610091E-09	0.265854E-08	0.129836E-06	0.884853E-07	0.409535E-06	0.315799E-05	0.177413E-05	0.217206E-05
0.310892E-05	0.423684E-05	0.436219E-05	0.631056E-05	0.122744E-04	0.161706E-04	0.287279E-04	0.839204E-05
0.680225E-04	0.238418E-04	0.817855E-05	0.909466E-04	0.503802E-04	0.244293E-04	0.672814E-04	0.161763E-03
0.750104E-04	0.304254E-08	0.828055E-08	0.108477E-06	0.180755E-06	0.113441E-05	0.333538E-05	0.398037E-05
0.776718E-05	0.889507E-05	0.867207E-05	0.118576E-04	0.178732E-04	0.233573E-04	0.338413E-04	0.698667E-04
0.293276E-04	0.120724E-03	0.106885E-03	0.260566E-04	0.318212E-03	0.171297E-03	0.537029E-04	0.153770E-03
0.440197E-03	0.118206E-03	0.129027E-08	0.127232E-08	0.494812E-07	0.165184E-06	0.125697E-05	0.203466E-05
0.223392E-05	0.337934E-05	0.536005E-05	0.602063E-05	0.819089E-05	0.176101E-04	0.230596E-04	0.167480E-04
0.501183E-04	0.223368E-04	0.773058E-04	0.583361E-04	0.182671E-04	0.302271E-03	0.127247E-03	0.302826E-04
0.135368E-03	0.256612E-03	0.876118E-04	0.528023E-09	0.296917E-08	0.413047E-07	0.749581E-07	0.386617E-06
0.131442E-05	0.113155E-05	0.156218E-05	0.252979E-05	0.243697E-05	0.385147E-05	0.395916E-05	0.732995E-05
0.943009E-05	0.195271E-04	0.829610E-05	0.284727E-04	0.259014E-04	0.779653E-05	0.117122E-03	0.476519E-04
0.193875E-04	0.503442E-04	0.123299E-03	0.345471E-04	0.787871E-09	0.332576E-08	0.169876E-06	0.121663E-06
0.503318E-06	0.377003E-05	0.216964E-05	0.277372E-05	0.386777E-05	0.483423E-05	0.527645E-05	0.725646E-05
0.150106E-04	0.196833E-04	0.338182E-04	0.101542E-04	0.842893E-04	0.285860E-04	0.100439E-04	0.112521E-03
0.579061E-04	0.296707E-04	0.933221E-04	0.193958E-03	0.905349E-04	0.391868E-08	0.104556E-07	0.141376E-06
0.234883E-06	0.143359E-05	0.426128E-05	0.503535E-05	0.985649E-05	0.113645E-04	0.109143E-04	0.149434E-04
0.225759E-04	0.295971E-04	0.427616E-04	0.864643E-04	0.368868E-04	0.152634E-03	0.134866E-03	0.326056E-04
0.405820E-03	0.211623E-03	0.688499E-04	0.192733E-03	0.547203E-03	0.148177E-03	0.165315E-08	0.161665E-08
0.641782E-07	0.211704E-06	0.161386E-05	0.260433E-05	0.286176E-05	0.432872E-05	0.687881E-05	0.768167E-05
0.104627E-04	0.224921E-04	0.295618E-04	0.214567E-04	0.634812E-04	0.285238E-04	0.989544E-04	0.746154E-04
0.233698E-04	0.387540E-03	0.161786E-03	0.385661E-04	0.172946E-03	0.325861E-03	0.111690E-03	0.684141E-09
0.384275E-08	0.538081E-07	0.975292E-07	0.501707E-06	0.170424E-05	0.146605E-05	0.202476E-05	0.327827E-05
0.315075E-05	0.497984E-05	0.511657E-05	0.948144E-05	0.122148E-04	0.250798E-04	0.107259E-04	0.367800E-04
0.334775E-04	0.100544E-04	0.152066E-03	0.612781E-04	0.251549E-04	0.649562E-04	0.158779E-03	0.443788E-04
0.940581E-09	0.374976E-08	0.194212E-06	0.141787E-06	0.558189E-06	0.413355E-05	0.244397E-05	0.313867E-05
0.433199E-05	0.527319E-05	0.590995E-05	0.754182E-05	0.168372E-04	0.221400E-04	0.366244E-04	0.113140E-04
0.952949E-04	0.318070E-04	0.108600E-04	0.125133E-03	0.627090E-04	0.361241E-04	0.104027E-03	0.214674E-03
0.100770E-03	0.444722E-08	0.118186E-07	0.160522E-06	0.266520E-06	0.162229E-05	0.483143E-05	0.570237E-05
0.111596E-04	0.129014E-04	0.123311E-04	0.169182E-04	0.255403E-04	0.335271E-04	0.484419E-04	0.971115E-04
0.415969E-04	0.172800E-03	0.152511E-03	0.368379E-04	0.460613E-03	0.237716E-03	0.789945E-04	0.218362E-03
0.614212E-03	0.166499E-03	0.188065E-08	0.183250E-08	0.730317E-07	0.241730E-06	0.183593E-05	0.296414E-05
0.325497E-05	0.492052E-05	0.782830E-05	0.873022E-05	0.118997E-04	0.255620E-04	0.336573E-04	0.244416E-04
0.720421E-04	0.323961E-04	0.112595E-03	0.848668E-04	0.266037E-04	0.441247E-03	0.183777E-03	0.441897E-04
0.196651E-03	0.370338E-03	0.126913E-03	0.782105E-09	0.439008E-08	0.615260E-07	0.111784E-06	0.573694E-06
0.194957E-05	0.167620E-05	0.231453E-05	0.374888E-05	0.360246E-05	0.569359E-05	0.585010E-05	0.108439E-04
0.139797E-04	0.286481E-04	0.122598E-04	0.420617E-04	0.382749E-04	0.114956E-04	0.173910E-03	0.700223E-04
0.287874E-04	0.742553E-04	0.181408E-03	0.507288E-04	0.971909E-09	0.389272E-08	0.203016E-06	0.148650E-06
0.582811E-06	0.429500E-05	0.252307E-05	0.326902E-05	0.449882E-05	0.548766E-05	0.610361E-05	0.785276E-05
0.175764E-04	0.228715E-04	0.375161E-04	0.116986E-04	0.100437E-03	0.330341E-04	0.109031E-04	0.131792E-03

0.646632E-04	0.378237E-04	0.108788E-03	0.220871E-03	0.104190E-03	0.462440E-08	0.122838E-07	0.167015E-06
0.277168E-06	0.168756E-05	0.502182E-05	0.592877E-05	0.116056E-04	0.134298E-04	0.128136E-04	0.175922E-04
0.265676E-04	0.348913E-04	0.503255E-04	0.100735E-03	0.432354E-04	0.179752E-03	0.158520E-03	0.382667E-04
0.478657E-03	0.246981E-03	0.821357E-04	0.227616E-03	0.636484E-03	0.172575E-03	0.195806E-08	0.190614E-08
0.760331E-07	0.251756E-06	0.191145E-05	0.308713E-05	0.338858E-05	0.512240E-05	0.815074E-05	0.908992E-05
0.123877E-04	0.266023E-04	0.350423E-04	0.254524E-04	0.749716E-04	0.337213E-04	0.117250E-03	0.883549E-04
0.277065E-04	0.459346E-03	0.191298E-03	0.460044E-04	0.204738E-03	0.385535E-03	0.132053E-03	0.815411E-09
0.457651E-08	0.641530E-07	0.116566E-06	0.598281E-06	0.203322E-05	0.174773E-05	0.241332E-05	0.390906E-05
0.375657E-05	0.593716E-05	0.610039E-05	0.113086E-04	0.145793E-04	0.298717E-04	0.127829E-04	0.438666E-04
0.399128E-04	0.119882E-04	0.181361E-03	0.730195E-04	0.300235E-04	0.774363E-04	0.189160E-03	0.529048E-04
0.940581E-09	0.374976E-08	0.194212E-06	0.141787E-06	0.558189E-06	0.413355E-05	0.244397E-05	0.313867E-05
0.433199E-05	0.527319E-05	0.590995E-05	0.754182E-05	0.168372E-04	0.221400E-04	0.366244E-04	0.113140E-04
0.952949E-04	0.318070E-04	0.108600E-04	0.125133E-03	0.627090E-04	0.361241E-04	0.104027E-03	0.214674E-03
0.100770E-03	0.444722E-08	0.118186E-07	0.160522E-06	0.266520E-06	0.162229E-05	0.483143E-05	0.570237E-05
0.111596E-04	0.129014E-04	0.123311E-04	0.169182E-04	0.255403E-04	0.335271E-04	0.484419E-04	0.971115E-04
0.415969E-04	0.172800E-03	0.152511E-03	0.368379E-04	0.460613E-03	0.237716E-03	0.789945E-04	0.218362E-03
0.614212E-03	0.166499E-03	0.188065E-08	0.183250E-08	0.730317E-07	0.241730E-06	0.183593E-05	0.296414E-05
0.325497E-05	0.492052E-05	0.782830E-05	0.873022E-05	0.118997E-04	0.255620E-04	0.336573E-04	0.244416E-04
0.720421E-04	0.323961E-04	0.112595E-03	0.848668E-04	0.266037E-04	0.441247E-03	0.183777E-03	0.441897E-04
0.196651E-03	0.370338E-03	0.126913E-03	0.782105E-09	0.439008E-08	0.615260E-07	0.111784E-06	0.573694E-06
0.194957E-05	0.167620E-05	0.231453E-05	0.374888E-05	0.360246E-05	0.569359E-05	0.585010E-05	0.108439E-04
0.139797E-04	0.286481E-04	0.122598E-04	0.420617E-04	0.382749E-04	0.114956E-04	0.173910E-03	0.700223E-04
0.287874E-04	0.742553E-04	0.181408E-03	0.507288E-04	0.787871E-09	0.332576E-08	0.169876E-06	0.121663E-06
0.503318E-06	0.377003E-05	0.216964E-05	0.277372E-05	0.386777E-05	0.483423E-05	0.527645E-05	0.725646E-05
0.150106E-04	0.196833E-04	0.338182E-04	0.101542E-04	0.842893E-04	0.285860E-04	0.100439E-04	0.112521E-03
0.579061E-04	0.296707E-04	0.933221E-04	0.193958E-03	0.905349E-04	0.391868E-08	0.104556E-07	0.141376E-06
0.234883E-06	0.143359E-05	0.426128E-05	0.503535E-05	0.985649E-05	0.113645E-04	0.109143E-04	0.149434E-04
0.225759E-04	0.295971E-04	0.427616E-04	0.864643E-04	0.368868E-04	0.152634E-03	0.134866E-03	0.326056E-04
0.405820E-03	0.211623E-03	0.688499E-04	0.192733E-03	0.547203E-03	0.148177E-03	0.165315E-08	0.161665E-08
0.641782E-07	0.211704E-06	0.161386E-05	0.260433E-05	0.286176E-05	0.432872E-05	0.687881E-05	0.768167E-05
0.104627E-04	0.224921E-04	0.295618E-04	0.214567E-04	0.634812E-04	0.285238E-04	0.989544E-04	0.746154E-04
0.233698E-04	0.387540E-03	0.161786E-03	0.385661E-04	0.172946E-03	0.325861E-03	0.111690E-03	0.684141E-09
0.384275E-08	0.538081E-07	0.975292E-07	0.501707E-06	0.170424E-05	0.146605E-05	0.202476E-05	0.327827E-05
0.315075E-05	0.497984E-05	0.511657E-05	0.948144E-05	0.122148E-04	0.250798E-04	0.107259E-04	0.367800E-04
0.334775E-04	0.100544E-04	0.152066E-03	0.612781E-04	0.251549E-04	0.649562E-04	0.158779E-03	0.443788E-04
0.610091E-09	0.265854E-08	0.129836E-06	0.884853E-07	0.409535E-06	0.315799E-05	0.177413E-05	0.217206E-05
0.310892E-05	0.423685E-05	0.436219E-05	0.631056E-05	0.122744E-04	0.161706E-04	0.287279E-04	0.839204E-05
0.680225E-04	0.238418E-04	0.817855E-05	0.909466E-04	0.503802E-04	0.244293E-04	0.672814E-04	0.161763E-03
0.750104E-04	0.304254E-08	0.828055E-08	0.108477E-06	0.180755E-06	0.113441E-05	0.333538E-05	0.398037E-05
0.776718E-05	0.889507E-05	0.867207E-05	0.118576E-04	0.178732E-04	0.233573E-04	0.338413E-04	0.698667E-04
0.293276E-04	0.120724E-03	0.106885E-03	0.260566E-04	0.318212E-03	0.171297E-03	0.537029E-04	0.153770E-03
0.440197E-03	0.118206E-03	0.129027E-08	0.127232E-08	0.494812E-07	0.165184E-06	0.125697E-05	0.203466E-05
0.223392E-05	0.337934E-05	0.536005E-05	0.602063E-05	0.819089E-05	0.176101E-04	0.230596E-04	0.167480E-04
0.501183E-04	0.223368E-04	0.773058E-04	0.583361E-04	0.182671E-04	0.302271E-03	0.127247E-03	0.302826E-04
0.135368E-03	0.256612E-03	0.876118E-04	0.528023E-09	0.296917E-08	0.413047E-07	0.749581E-07	0.386617E-06
0.131442E-05	0.113155E-05	0.156218E-05	0.252979E-05	0.243697E-05	0.385147E-05	0.395916E-05	0.732995E-05

0.943009E-05	0.195271E-04	0.829610E-05	0.284727E-04	0.259014E-04	0.779653E-05	0.117122E-03	0.476519E-04
0.193875E-04	0.503442E-04	0.123299E-03	0.345471E-04	0.324477E-09	0.182338E-08	0.786307E-07	0.512479E-07
0.282633E-06	0.239319E-05	0.120477E-05	0.131689E-05	0.219947E-05	0.297198E-05	0.328130E-05	0.480031E-05
0.921405E-05	0.115634E-04	0.229663E-04	0.592239E-05	0.426809E-04	0.164540E-04	0.614562E-05	0.680157E-04
0.403865E-04	0.190160E-04	0.487928E-04	0.127843E-03	0.572092E-04	0.130639E-08	0.541400E-08	0.676137E-07
0.102219E-06	0.744096E-06	0.221149E-05	0.258219E-05	0.480635E-05	0.577695E-05	0.577110E-05	0.787281E-05
0.117055E-04	0.154609E-04	0.220658E-04	0.490470E-04	0.196031E-04	0.750085E-04	0.701418E-04	0.176162E-04
0.213288E-03	0.122507E-03	0.364033E-04	0.102986E-03	0.312716E-03	0.793160E-04	0.539742E-09	0.825772E-09
0.300989E-07	0.967463E-07	0.800846E-06	0.130908E-05	0.141929E-05	0.212246E-05	0.340012E-05	0.389042E-05
0.526394E-05	0.109690E-04	0.147260E-04	0.102924E-04	0.339908E-04	0.144305E-04	0.492982E-04	0.373381E-04
0.122260E-04	0.180806E-03	0.839807E-04	0.198586E-04	0.877025E-04	0.176221E-03	0.566898E-04	0.219355E-09
0.183008E-08	0.248987E-07	0.417047E-07	0.239163E-06	0.822296E-06	0.701917E-06	0.953268E-06	0.158444E-05
0.154034E-05	0.241198E-05	0.250173E-05	0.463461E-05	0.587973E-05	0.128215E-04	0.523235E-05	0.175857E-04
0.164032E-04	0.500857E-05	0.676162E-04	0.311600E-04	0.121773E-04	0.321822E-04	0.797237E-04	0.225744E-04
0.210310E-09	0.702067E-10	0.485252E-07	0.226074E-07	0.998167E-07	0.153054E-05	0.530927E-06	0.517814E-06
0.102198E-05	0.134049E-05	0.194650E-05	0.442403E-08	0.640688E-05	0.436580E-05	0.128406E-04	0.131587E-05
0.162384E-04	0.906740E-05	0.	0.337117E-04	0.108801E-04	0.621038E-05	0.260006E-04	0.970371E-04
0.429405E-04	0.680430E-09	0.511886E-09	0.289851E-07	0.332285E-07	0.139120E-06	0.601369E-06	0.439620E-06
0.106100E-05	0.195499E-05	0.169311E-05	0.311849E-05	0.136181E-07	0.735456E-05	0.691112E-05	0.212892E-04
0.509646E-05	0.193592E-04	0.249883E-04	0.	0.724944E-04	0.319348E-04	0.157525E-04	0.462061E-04
0.183440E-03	0.501937E-04	0.273658E-09	0.262395E-10	0.130900E-07	0.203264E-07	0.122959E-06	0.334672E-06
0.269037E-06	0.431014E-06	0.114408E-05	0.113372E-05	0.184259E-05	0.464089E-09	0.595029E-05	0.317108E-05
0.131350E-04	0.194851E-05	0.131722E-04	0.115037E-04	0.	0.560547E-04	0.193097E-04	0.772488E-05
0.296014E-04	0.107112E-03	0.319718E-04	0.107295E-09	0.530561E-10	0.976916E-08	0.959129E-08	0.389560E-07
0.243646E-06	0.134875E-06	0.188351E-06	0.484905E-06	0.382226E-06	0.838574E-06	0.818862E-09	0.197084E-05
0.145376E-05	0.509318E-05	0.740903E-06	0.396711E-05	0.491477E-05	0.	0.213924E-04	0.591704E-05
0.408925E-05	0.962943E-05	0.387142E-04	0.116695E-04	0.373211E-10	0.719383E-10	0.116837E-07	0.782821E-08
0.444451E-07	0.952677E-06	0.290865E-06	0.209990E-06	0.527937E-06	0.623368E-06	0.943018E-06	0.550751E-08
0.382358E-05	0.166518E-05	0.818350E-05	0.828563E-06	0.611192E-05	0.569453E-05	0.	0.156857E-04
0.507960E-05	0.265550E-05	0.187427E-04	0.497005E-04	0.186605E-04	0.322667E-10	0.275082E-10	0.509937E-08
0.630487E-08	0.848358E-07	0.336952E-06	0.125625E-06	0.726853E-06	0.757500E-06	0.553323E-06	0.175596E-05
0.145720E-08	0.362042E-05	0.227553E-05	0.109899E-04	0.210557E-05	0.102384E-04	0.125850E-04	0.
0.384517E-04	0.166642E-04	0.716947E-05	0.180684E-04	0.118485E-03	0.306709E-04	0.151510E-10	0.132215E-11
0.127774E-07	0.143479E-07	0.827620E-07	0.232592E-06	0.217281E-06	0.169178E-06	0.550638E-06	0.340188E-06
0.139606E-05	0.166411E-09	0.292836E-05	0.324621E-05	0.591721E-05	0.967454E-06	0.765771E-05	0.129749E-04
0.	0.143348E-04	0.833843E-05	0.373819E-05	0.192491E-04	0.845525E-04	0.137639E-04	0.289873E-10
0.636865E-13	0.745626E-08	0.502314E-08	0.336257E-07	0.167158E-06	0.874843E-07	0.224137E-06	0.421303E-06
0.429735E-06	0.924774E-06	0.207915E-09	0.178454E-05	0.103212E-05	0.485599E-05	0.831959E-06	0.370684E-05
0.605528E-05	0.	0.201747E-04	0.681296E-05	0.368587E-05	0.103351E-04	0.417209E-04	0.936658E-05
0.560860E-10	0.655280E-09	0.174796E-07	0.180235E-07	0.111884E-06	0.131206E-05	0.584687E-06	0.504898E-06
0.997404E-06	0.148869E-05	0.184741E-05	0.135299E-05	0.540455E-05	0.373518E-05	0.134236E-04	0.328888E-05
0.155670E-04	0.997019E-05	0.343631E-05	0.326159E-04	0.202399E-04	0.519638E-05	0.310491E-04	0.664705E-04
0.240087E-04	0.516530E-10	0.294130E-08	0.121105E-07	0.397950E-07	0.357961E-06	0.132792E-05	0.702803E-06
0.315910E-05	0.258316E-05	0.219088E-05	0.477066E-05	0.242342E-05	0.742139E-05	0.965921E-05	0.272493E-04
0.124332E-04	0.303155E-04	0.400335E-04	0.137351E-04	0.118139E-03	0.867058E-04	0.200146E-04	0.580949E-04
0.213647E-03	0.552439E-04	0.263351E-10	0.315307E-09	0.328392E-07	0.696125E-07	0.602634E-06	0.105290E-05

0.136611E-05	0.725344E-06	0.197642E-05	0.166011E-05	0.494765E-05	0.766102E-05	0.773576E-05	0.114794E-04
0.180046E-04	0.157795E-04	0.328564E-04	0.386059E-04	0.130709E-04	0.726265E-04	0.471375E-04	0.892852E-05
0.584952E-04	0.212044E-03	0.311842E-04	0.610155E-10	0.236661E-08	0.209909E-07	0.390756E-07	0.278127E-06
0.782266E-06	0.573870E-06	0.967397E-06	0.187668E-05	0.183412E-05	0.322151E-05	0.208796E-05	0.508581E-05
0.582708E-05	0.165715E-04	0.594754E-05	0.192617E-04	0.253309E-04	0.737652E-05	0.895733E-04	0.400658E-04
0.148378E-04	0.425328E-04	0.106898E-03	0.236377E-04	0.852312E-10	0.991971E-09	0.255694E-07	0.342400E-07
0.171302E-06	0.158232E-05	0.841764E-06	0.814717E-06	0.143116E-05	0.235588E-05	0.250763E-05	0.236751E-05
0.727102E-05	0.503300E-05	0.159253E-04	0.448751E-05	0.272219E-04	0.141393E-04	0.434812E-05	0.440849E-05
0.303722E-04	0.615672E-05	0.390809E-04	0.852378E-04	0.321518E-04	0.115245E-09	0.452529E-08	0.197964E-07
0.724758E-07	0.560309E-06	0.203864E-05	0.109864E-05	0.500774E-05	0.406368E-05	0.338923E-05	0.733592E-05
0.347586E-05	0.112314E-04	0.148447E-04	0.392116E-04	0.190654E-04	0.475642E-04	0.622585E-04	0.209621E-04
0.211218E-03	0.123694E-03	0.306359E-04	0.839207E-04	0.308168E-03	0.835873E-04	0.599313E-10	0.495672E-05
0.531617E-07	0.134495E-06	0.964266E-06	0.166780E-05	0.219509E-05	0.117435E-05	0.318154E-05	0.255937E-05
0.788022E-05	0.122189E-04	0.123572E-04	0.183816E-04	0.273478E-04	0.252684E-04	0.529598E-04	0.616589E-04
0.206433E-04	0.115090E-03	0.720342E-04	0.140851E-04	0.908721E-04	0.335011E-03	0.497862E-04	0.147365E-05
0.387928E-08	0.348364E-07	0.695109E-07	0.459276E-06	0.128750E-05	0.942499E-06	0.159604E-05	0.308704E-05
0.296302E-05	0.528584E-05	0.338371E-05	0.833879E-05	0.957614E-05	0.266806E-04	0.972178E-05	0.315494E-04
0.414783E-04	0.120644E-04	0.149947E-03	0.645211E-04	0.245422E-04	0.689864E-04	0.172896E-03	0.383772E-04
0.128993E-09	0.123815E-08	0.336103E-07	0.471869E-07	0.214625E-06	0.182095E-05	0.103112E-05	0.104757E-05
0.174744E-05	0.303890E-05	0.315732E-05	0.304688E-05	0.899507E-05	0.610730E-05	0.182362E-04	0.528403E-05
0.341063E-04	0.183500E-04	0.560932E-05	0.546381E-04	0.345865E-04	0.754165E-05	0.486732E-04	0.103052E-05
0.379243E-04	0.141870E-09	0.571337E-08	0.255156E-07	0.930099E-07	0.708767E-06	0.258679E-05	0.138960E-05
0.635910E-05	0.517557E-05	0.432244E-05	0.928137E-05	0.434433E-05	0.142489E-04	0.190100E-04	0.489650E-04
0.239917E-04	0.603748E-04	0.788146E-04	0.266078E-04	0.267404E-03	0.153762E-03	0.397136E-04	0.105799E-04
0.387023E-03	0.105075E-03	0.768904E-10	0.629345E-09	0.684056E-07	0.173072E-06	0.123708E-05	0.214278E-05
0.281616E-05	0.150578E-05	0.408327E-05	0.327005E-05	0.100998E-04	0.156776E-04	0.158813E-04	0.236241E-04
0.348354E-04	0.323869E-04	0.679426E-04	0.791466E-04	0.264257E-04	0.147904E-03	0.917594E-04	0.183731E-04
0.116129E-03	0.428770E-03	0.637826E-04	0.190818E-09	0.501981E-08	0.452872E-07	0.902445E-07	0.596322E-04
0.167220E-05	0.122408E-05	0.207080E-05	0.400622E-05	0.384251E-05	0.686022E-05	0.438697E-05	0.108308E-04
0.124352E-04	0.345718E-04	0.126139E-04	0.409656E-04	0.538019E-04	0.156609E-04	0.194490E-03	0.836142E-04
0.318826E-04	0.894751E-04	0.224242E-03	0.498151E-04	0.158148E-09	0.139379E-08	0.389163E-07	0.547763E-07
0.243576E-06	0.200329E-05	0.114768E-05	0.118605E-05	0.196540E-05	0.343938E-05	0.349293E-05	0.344295E-05
0.101462E-04	0.688157E-05	0.198029E-04	0.579721E-05	0.387473E-04	0.204521E-04	0.634571E-05	0.610461E-04
0.371050E-04	0.807089E-05	0.518587E-04	0.113849E-03	0.459043E-04	0.161386E-09	0.645568E-08	0.288553E-04
0.105598E-06	0.801377E-06	0.293296E-05	0.157145E-05	0.719446E-05	0.585574E-05	0.487968E-05	0.104874E-05
0.491852E-05	0.161399E-04	0.215292E-04	0.552028E-04	0.270683E-04	0.684793E-04	0.891505E-04	0.299518E-04
0.302534E-03	0.172362E-03	0.449860E-04	0.119783E-03	0.436447E-03	0.118785E-03	0.865348E-10	0.712173E-04
0.778409E-07	0.196827E-06	0.140661E-05	0.243810E-05	0.320196E-05	0.171126E-05	0.464061E-05	0.371574E-05
0.114812E-04	0.178314E-04	0.180599E-04	0.268723E-04	0.395783E-04	0.368129E-04	0.772825E-04	0.900067E-04
0.300408E-04	0.168000E-03	0.104126E-03	0.209322E-04	0.132042E-03	0.487453E-03	0.725060E-04	0.217814E-04
0.573096E-08	0.517929E-07	0.103144E-06	0.681730E-06	0.191223E-05	0.139980E-05	0.236692E-05	0.457946E-05
0.439343E-05	0.784292E-05	0.501550E-05	0.123858E-04	0.142194E-04	0.395221E-04	0.144212E-04	0.468563E-04
0.614930E-04	0.179043E-04	0.222276E-03	0.955879E-04	0.364531E-04	0.102301E-03	0.256395E-03	0.569706E-04
0.164182E-09	0.144696E-08	0.406640E-07	0.575671E-07	0.253799E-06	0.208660E-05	0.117839E-05	0.123750E-05
0.201574E-05	0.353843E-05	0.358791E-05	0.357339E-05	0.105543E-04	0.712142E-05	0.202691E-04	0.600980E-04
0.399560E-04	0.211290E-04	0.654812E-05	0.632761E-04	0.377722E-04	0.890187E-05	0.545312E-04	0.117474E-04

0.482502E-04	0.167464E-09	0.670870E-08	0.300001E-07	0.109784E-06	0.834511E-06	0.304925E-05	0.163297E-05
0.747878E-05	0.608948E-05	0.506806E-05	0.108997E-04	0.511269E-05	0.167863E-04	0.224110E-04	0.573165E-04
0.281412E-04	0.712326E-04	0.926661E-04	0.311612E-04	0.315062E-03	0.178787E-03	0.468600E-04	0.124277E-03
0.453687E-03	0.123477E-03	0.898118E-10	0.740298E-09	0.810411E-07	0.204895E-06	0.146420E-05	0.253811E-05
0.333286E-05	0.178104E-05	0.483018E-05	0.386665E-05	0.119504E-04	0.185623E-04	0.187993E-04	0.279744E-04
0.411987E-04	0.383162E-04	0.804633E-04	0.936930E-04	0.312694E-04	0.174884E-03	0.108318E-03	0.217928E-04
0.137464E-03	0.507471E-03	0.754671E-04	0.226988E-09	0.597266E-08	0.540035E-07	0.107527E-06	0.710759E-06
0.199377E-05	0.145952E-05	0.246756E-05	0.477425E-05	0.458078E-05	0.817692E-05	0.522932E-05	0.129144E-04
0.148254E-04	0.412072E-04	0.150358E-04	0.488585E-04	0.641075E-04	0.186667E-04	0.231715E-03	0.996621E-04
0.380050E-04	0.106662E-03	0.267331E-03	0.594037E-04	0.158148E-09	0.139379E-08	0.389163E-07	0.547763E-07
0.243576E-06	0.200329E-05	0.114768E-05	0.118605E-05	0.196540E-05	0.343938E-05	0.349293E-05	0.344295E-05
0.101462E-04	0.688157E-05	0.198029E-04	0.579721E-05	0.387473E-04	0.204521E-04	0.634571E-05	0.610461E-04
0.371050E-04	0.807089E-05	0.518587E-04	0.113849E-03	0.459043E-04	0.161386E-09	0.645568E-08	0.288553E-07
0.105598E-06	0.801377E-06	0.293296E-05	0.157145E-05	0.719446E-05	0.585574E-05	0.487968E-05	0.104874E-04
0.491852E-05	0.161399E-04	0.215292E-04	0.552028E-04	0.270683E-04	0.684793E-04	0.891505E-04	0.299518E-04
0.302534E-03	0.172362E-03	0.449860E-04	0.119783E-03	0.436447E-03	0.118785E-03	0.865348E-10	0.712173E-09
0.778409E-07	0.196827E-06	0.140661E-05	0.243810E-05	0.320196E-05	0.171126E-05	0.464061E-05	0.371574E-05
0.114812E-04	0.178314E-04	0.180599E-04	0.268723E-04	0.395783E-04	0.368129E-04	0.772825E-04	0.900067E-04
0.300408E-04	0.168000E-03	0.104126E-03	0.209322E-04	0.132042E-03	0.487453E-03	0.725060E-04	0.217814E-09
0.573096E-08	0.517929E-07	0.103144E-06	0.681730E-06	0.191223E-05	0.139980E-05	0.236692E-05	0.457946E-05
0.439343E-05	0.784292E-05	0.501550E-05	0.123858E-04	0.142194E-04	0.395221E-04	0.144212E-04	0.468563E-04
0.614930E-04	0.179043E-04	0.222276E-03	0.955879E-04	0.364531E-04	0.102301E-03	0.256395E-03	0.569706E-04
0.128993E-09	0.123815E-08	0.336103E-07	0.471869E-07	0.214625E-06	0.182095E-05	0.103112E-05	0.104757E-05
0.174744E-05	0.303890E-05	0.315732E-05	0.304688E-05	0.899507E-05	0.610730E-05	0.182362E-04	0.528403E-05
0.341063E-04	0.183500E-04	0.560932E-05	0.546381E-04	0.345865E-04	0.754165E-05	0.486732E-04	0.103052E-03
0.379243E-04	0.141870E-09	0.571337E-08	0.255156E-07	0.930099E-07	0.708767E-06	0.258679E-05	0.138960E-05
0.635910E-05	0.517557E-05	0.432244E-05	0.928137E-05	0.434433E-05	0.142489E-04	0.190100E-04	0.489650E-04
0.239917E-04	0.603748E-04	0.788146E-04	0.266078E-04	0.267404E-03	0.153762E-03	0.397136E-04	0.105799E-03
0.387023E-03	0.105075E-03	0.768904E-10	0.629345E-09	0.684056E-07	0.173072E-06	0.123708E-05	0.214278E-05
0.281616E-05	0.150578E-05	0.408327E-05	0.327005E-05	0.100998E-04	0.156776E-04	0.158813E-04	0.236241E-04
0.348354E-04	0.323869E-04	0.679426E-04	0.791466E-04	0.264257E-04	0.147904E-03	0.917594E-04	0.183731E-04
0.116129E-03	0.428770E-03	0.637826E-04	0.190818E-09	0.501981E-08	0.452872E-07	0.902445E-07	0.596322E-06
0.167220E-05	0.122408E-05	0.207080E-05	0.400622E-05	0.384251E-05	0.686022E-05	0.438697E-05	0.108308E-04
0.124352E-04	0.345718E-04	0.126139E-04	0.409656E-04	0.538019E-04	0.156609E-04	0.194490E-03	0.836142E-04
0.318826E-04	0.894751E-04	0.224242E-03	0.498151E-04	0.852312E-10	0.991971E-09	0.255694E-07	0.342400E-07
0.171302E-06	0.158232E-05	0.841764E-06	0.814717E-06	0.143116E-05	0.235588E-05	0.250763E-05	0.236751E-05
0.727102E-05	0.503300E-05	0.159253E-04	0.448751E-05	0.272219E-04	0.141393E-04	0.434812E-05	0.440849E-04
0.303722E-04	0.615672E-05	0.390809E-04	0.852378E-04	0.321518E-04	0.115245E-09	0.452529E-08	0.197964E-07
0.724758E-07	0.560309E-06	0.203864E-05	0.109864E-05	0.500774E-05	0.406368E-05	0.338923E-05	0.733592E-05
0.347586E-05	0.112314E-04	0.148447E-04	0.392116E-04	0.190654E-04	0.475642E-04	0.622585E-04	0.209621E-04
0.211218E-03	0.123694E-03	0.306359E-04	0.839207E-04	0.308168E-03	0.835873E-04	0.599313E-10	0.495672E-09
0.531617E-07	0.134495E-06	0.964266E-06	0.166780E-05	0.219509E-05	0.117435E-05	0.318154E-05	0.255937E-05
0.788022E-05	0.122189E-04	0.123572E-04	0.183816E-04	0.273478E-04	0.252684E-04	0.529598E-04	0.616589E-04
0.206433E-04	0.115090E-03	0.720342E-04	0.140851E-04	0.908721E-04	0.335011E-03	0.497862E-04	0.147365E-09
0.387928E-08	0.348364E-07	0.695109E-07	0.459276E-06	0.128750E-05	0.942499E-06	0.159604E-05	0.308704E-05
0.296302E-05	0.528584E-05	0.338371E-05	0.833879E-05	0.957614E-05	0.266806E-04	0.972178E-05	0.315494E-04

0.414783E-04	0.120644E-04	0.149947E-03	0.645211E-04	0.245422E-04	0.689864E-04	0.172896E-03	0.383772E-04
0.560860E-10	0.655280E-09	0.174796E-07	0.180235E-07	0.111884E-06	0.131206E-05	0.584687E-06	0.504898E-06
0.997404E-06	0.148869E-05	0.184741E-05	0.135299E-05	0.540455E-05	0.373518E-05	0.134236E-04	0.328888E-05
0.155670E-04	0.997019E-05	0.343631E-05	0.326159E-04	0.202399E-04	0.519638E-05	0.310491E-04	0.664705E-04
0.240087E-04	0.516530E-10	0.294130E-08	0.121105E-07	0.397950E-07	0.357961E-06	0.132792E-05	0.702803E-06
0.315910E-05	0.258316E-05	0.219088E-05	0.477066E-05	0.242342E-05	0.742139E-05	0.965921E-05	0.272493E-04
0.124332E-04	0.303155E-04	0.400335E-04	0.137351E-04	0.118139E-03	0.867058E-04	0.200146E-04	0.580949E-04
0.213647E-03	0.552439E-04	0.263351E-10	0.315307E-09	0.328392E-07	0.696125E-07	0.602634E-06	0.105290E-05
0.136611E-05	0.725344E-06	0.197642E-05	0.166011E-05	0.494765E-05	0.766102E-05	0.773576E-05	0.114794E-04
0.180046E-04	0.157795E-04	0.328564E-04	0.386059E-04	0.130709E-04	0.726265E-04	0.471375E-04	0.892852E-05
0.584952E-04	0.212044E-03	0.311842E-04	0.610155E-10	0.236661E-08	0.209909E-07	0.390756E-07	0.278127E-06
0.782266E-06	0.573870E-06	0.967397E-06	0.187668E-05	0.183412E-05	0.322151E-05	0.208796E-05	0.508581E-05
0.582708E-05	0.165715E-04	0.594754E-05	0.192617E-04	0.253309E-04	0.737652E-05	0.895733E-04	0.400658E-04
0.148378E-04	0.425328E-04	0.106898E-03	0.236377E-04	0.373211E-10	0.719383E-10	0.116837E-07	0.782821E-08
0.444451E-07	0.952677E-06	0.290865E-06	0.209990E-06	0.527937E-06	0.623368E-06	0.943018E-06	0.550751E-08
0.382358E-05	0.166518E-05	0.818350E-05	0.828563E-06	0.611192E-05	0.569453E-05	0.	0.156857E-04
0.507960E-05	0.265550E-05	0.187427E-04	0.497005E-04	0.186605E-04	0.322667E-10	0.275082E-10	0.509937E-08
0.630487E-08	0.848358E-07	0.336952E-06	0.125625E-06	0.726853E-06	0.757500E-06	0.553323E-06	0.175596E-05
0.145720E-08	0.362042E-05	0.227553E-05	0.109899E-04	0.210557E-05	0.102384E-04	0.125850E-04	0.
0.384517E-04	0.166642E-04	0.716947E-05	0.180684E-04	0.118485E-03	0.306709E-04	0.151510E-10	0.132215E-11
0.127774E-07	0.143479E-07	0.827620E-07	0.232592E-06	0.217281E-06	0.169178E-06	0.550638E-06	0.340188E-06
0.139606E-05	0.166411E-09	0.292836E-05	0.324621E-05	0.591721E-05	0.967454E-06	0.765771E-05	0.129749E-04
0.	0.143348E-04	0.833843E-05	0.373819E-05	0.192491E-04	0.845525E-04	0.137639E-04	0.289873E-10
0.636865E-13	0.745626E-08	0.502314E-08	0.336257E-07	0.167158E-06	0.874843E-07	0.224137E-06	0.421303E-06
0.429735E-06	0.924774E-06	0.207915E-09	0.178454E-05	0.103212E-05	0.485599E-05	0.831959E-06	0.370684E-05
0.605528E-05	0.	0.201747E-04	0.681296E-05	0.368587E-05	0.103351E-04	0.417209E-04	0.936658E-05
0.107719E-10	0.137037E-10	0.119547E-08	0.167745E-08	0.202645E-07	0.501875E-06	0.145767E-06	0.706026E-07
0.142125E-06	0.239548E-06	0.412054E-06	0.356485E-09	0.131745E-05	0.879814E-06	0.355631E-05	0.445071E-06
0.345034E-05	0.224597E-05	0.	0.465200E-05	0.249616E-05	0.179845E-05	0.678808E-05	0.245358E-04
0.622742E-05	0.154481E-10	0.143029E-10	0.707008E-08	0.328122E-08	0.233770E-07	0.124380E-06	0.398440E-07
0.199026E-06	0.317519E-06	0.268166E-06	0.578064E-06	0.901911E-10	0.127840E-05	0.887582E-06	0.458432E-05
0.976320E-06	0.435774E-05	0.515735E-05	0.	0.135023E-04	0.371301E-05	0.299466E-05	0.119597E-04
0.421796E-04	0.140001E-04	0.292484E-10	0.522701E-12	0.227884E-08	0.375016E-08	0.464642E-07	0.763955E-07
0.524999E-07	0.113439E-06	0.230047E-06	0.312720E-06	0.398950E-06	0.459493E-10	0.127695E-05	0.627771E-06
0.307203E-05	0.337241E-06	0.231612E-05	0.339713E-05	0.	0.196165E-04	0.611164E-05	0.330375E-05
0.299522E-05	0.282413E-04	0.120485E-04	0.180727E-10	0.401569E-13	0.210469E-08	0.376408E-08	0.204958E-07
0.104493E-06	0.536626E-07	0.147694E-06	0.265072E-06	0.227008E-06	0.570381E-06	0.296895E-11	0.119097E-05
0.750107E-06	0.303539E-05	0.472119E-06	0.247960E-05	0.303649E-05	0.	0.115332E-04	0.345488E-05
0.266407E-05	0.608212E-05	0.243401E-04	0.690867E-05	0.168351E-10	0.302720E-09	0.174772E-08	0.411706E-08
0.578814E-07	0.690364E-06	0.287084E-06	0.173359E-06	0.295445E-06	0.602161E-06	0.757391E-06	0.479051E-06
0.183340E-05	0.198771E-05	0.652758E-05	0.153915E-05	0.648310E-05	0.403056E-05	0.980039E-06	0.122016E-04
0.784959E-05	0.506397E-05	0.135052E-04	0.330220E-04	0.783970E-05	0.255829E-10	0.139292E-08	0.200821E-07
0.108311E-07	0.146920E-06	0.540967E-06	0.265315E-06	0.765123E-06	0.103984E-05	0.128242E-05	0.155894E-05
0.232109E-05	0.301630E-05	0.322055E-05	0.130400E-04	0.731299E-05	0.146531E-04	0.180055E-04	0.600686E-05
0.452302E-04	0.272508E-04	0.125554E-04	0.433080E-04	0.779844E-04	0.271389E-04	0.593960E-10	0.667524E-10
0.680104E-08	0.334288E-07	0.284323E-06	0.367701E-06	0.426603E-06	0.538299E-06	0.102027E-05	0.156654E-05

0.183085E-05	0.141776E-05	0.335935E-05	0.422316E-05	0.103670E-04	0.820926E-05	0.954265E-05	0.108216E-04
0.216488E-05	0.686630E-04	0.291729E-04	0.120754E-04	0.117950E-04	0.657576E-04	0.334028E-04	0.398191E-10
0.708998E-09	0.671018E-08	0.255938E-07	0.162631E-06	0.499609E-06	0.452948E-06	0.595810E-06	0.117863E-05
0.108772E-05	0.207576E-05	0.136786E-05	0.364546E-05	0.401889E-05	0.107097E-04	0.431127E-05	0.147329E-04
0.137939E-04	0.451070E-05	0.520982E-04	0.247908E-04	0.101083E-04	0.277476E-04	0.687552E-04	0.186170E-04
0.332273E-10	0.439673E-09	0.250634E-08	0.740066E-08	0.886684E-07	0.855639E-06	0.427094E-06	0.279597E-06
0.418049E-06	0.115877E-05	0.103501E-05	0.651857E-06	0.244823E-05	0.265641E-05	0.787092E-05	0.216725E-05
0.103075E-04	0.604441E-05	0.142588E-05	0.178933E-04	0.136746E-04	0.645453E-05	0.192803E-04	0.439564E-04
0.104345E-04	0.594755E-10	0.218031E-08	0.318612E-07	0.199385E-07	0.229050E-06	0.841670E-06	0.411757E-06
0.120086E-05	0.173483E-05	0.198566E-05	0.240450E-05	0.345536E-05	0.465156E-05	0.501327E-05	0.191582E-04
0.111309E-04	0.230077E-04	0.279583E-04	0.919297E-05	0.760117E-04	0.389900E-04	0.195358E-04	0.661282E-04
0.114659E-03	0.411745E-04	0.142026E-09	0.105456E-09	0.113938E-07	0.548425E-07	0.457728E-06	0.592688E-06
0.688491E-06	0.876719E-06	0.164339E-05	0.251489E-05	0.294047E-05	0.225122E-05	0.537898E-05	0.676386E-05
0.162858E-04	0.132697E-04	0.154498E-04	0.174074E-04	0.338334E-05	0.110962E-03	0.459079E-04	0.197472E-04
0.182121E-04	0.102946E-03	0.539473E-04	0.967958E-10	0.118296E-08	0.112836E-07	0.461033E-07	0.271655E-06
0.832748E-06	0.755651E-06	0.997085E-06	0.196601E-05	0.180056E-05	0.345241E-05	0.226925E-05	0.606563E-05
0.669716E-05	0.175486E-04	0.717216E-05	0.244623E-04	0.229457E-04	0.745961E-05	0.875422E-04	0.406670E-04
0.168099E-04	0.457696E-04	0.113583E-03	0.306965E-04	0.440446E-10	0.543659E-09	0.323841E-08	0.107824E-07
0.111125E-06	0.102280E-05	0.533073E-06	0.371696E-06	0.522819E-06	0.145618E-05	0.127321E-05	0.789673E-06
0.296747E-05	0.325844E-05	0.908187E-05	0.255119E-05	0.138127E-04	0.731476E-05	0.185259E-05	0.229024E-04
0.177324E-04	0.758104E-05	0.213059E-04	0.518068E-04	0.123430E-04	0.736800E-10	0.276184E-08	0.404020E-07
0.255688E-07	0.289602E-06	0.107024E-05	0.522180E-06	0.152279E-05	0.226459E-05	0.249833E-05	0.306976E-05
0.434676E-05	0.589302E-05	0.636103E-05	0.241397E-04	0.140537E-04	0.291829E-04	0.354395E-04	0.116281E-04
0.975935E-04	0.482241E-04	0.247346E-04	0.830227E-04	0.143756E-03	0.519105E-04	0.181325E-09	0.134058E-09
0.146498E-07	0.703512E-07	0.587853E-06	0.762266E-06	0.883035E-06	0.112481E-05	0.211338E-05	0.322935E-05
0.377222E-05	0.287924E-05	0.690910E-05	0.868954E-05	0.208373E-04	0.170336E-04	0.198200E-04	0.223325E-04
0.432065E-05	0.142375E-03	0.588758E-04	0.254273E-04	0.233139E-04	0.131827E-03	0.693341E-04	0.125834E-09
0.153671E-08	0.146939E-07	0.600131E-07	0.353819E-06	0.108416E-05	0.983562E-06	0.129805E-05	0.255987E-05
0.234517E-05	0.449313E-05	0.295493E-05	0.789805E-05	0.871991E-05	0.228472E-04	0.934028E-05	0.318333E-04
0.298476E-04	0.970950E-05	0.114000E-03	0.529119E-04	0.219034E-04	0.595701E-04	0.147822E-03	0.400055E-04
0.504709E-10	0.609289E-09	0.375556E-08	0.128770E-07	0.127202E-06	0.121629E-05	0.599011E-06	0.422893E-06
0.586625E-06	0.162517E-05	0.143062E-05	0.848265E-06	0.328865E-05	0.368225E-05	0.979384E-05	0.279128E-05
0.155997E-04	0.813234E-05	0.208073E-05	0.250666E-04	0.195558E-04	0.803680E-05	0.229578E-04	0.565763E-04
0.136852E-04	0.826231E-10	0.312243E-08	0.456719E-07	0.289972E-07	0.327386E-06	0.121153E-05	0.590925E-06
0.172196E-05	0.256818E-05	0.282122E-05	0.347029E-05	0.490068E-05	0.666454E-05	0.721250E-05	0.272839E-04
0.158567E-04	0.330859E-04	0.400800E-04	0.131355E-04	0.110196E-03	0.539362E-04	0.281610E-04	0.936353E-04
0.162536E-03	0.585571E-04	0.205618E-09	0.151753E-09	0.166561E-07	0.799213E-07	0.668237E-06	0.866822E-06
0.100327E-05	0.127811E-05	0.240107E-05	0.367151E-05	0.428677E-05	0.326978E-05	0.785354E-05	0.987890E-05
0.236801E-04	0.193609E-04	0.225263E-04	0.253758E-04	0.490259E-05	0.161735E-03	0.669388E-04	0.289093E-04
0.265083E-04	0.149780E-03	0.788601E-04	0.143799E-09	0.175563E-08	0.168058E-07	0.686252E-07	0.404722E-06
0.123998E-05	0.112481E-05	0.148450E-05	0.292800E-05	0.268340E-05	0.513840E-05	0.338027E-05	0.903416E-05
0.997379E-05	0.261446E-04	0.106850E-04	0.364047E-04	0.341257E-04	0.111049E-04	0.130394E-03	0.605284E-04
0.250615E-04	0.681366E-04	0.169076E-03	0.457894E-04	0.536711E-10	0.631698E-09	0.395944E-08	0.134870E-07
0.131459E-06	0.122934E-05	0.622074E-06	0.437416E-06	0.615339E-06	0.169658E-05	0.148009E-05	0.868940E-06
0.340889E-05	0.376444E-05	0.100662E-04	0.288327E-05	0.161922E-04	0.837065E-05	0.216421E-05	0.259883E-04
0.202871E-04	0.923711E-05	0.236334E-04	0.591602E-04	0.141217E-04	0.856772E-10	0.324492E-08	0.474614E-07

0.301286E-07	0.340186E-06	0.125885E-05	0.614226E-06	0.178953E-05	0.267061E-05	0.293226E-05	0.360677E-05
0.509424E-05	0.691511E-05	0.749629E-05	0.283582E-04	0.164687E-04	0.343966E-04	0.416551E-04	0.136316E-04
0.114581E-03	0.562091E-04	0.293521E-04	0.967661E-04	0.168920E-03	0.606411E-04	0.213852E-09	0.157752E-05
0.173351E-07	0.831601E-07	0.695459E-06	0.902193E-06	0.104399E-05	0.133006E-05	0.249857E-05	0.382137E-05
0.446116E-05	0.340221E-05	0.817317E-05	0.102811E-04	0.246457E-04	0.201496E-04	0.234646E-04	0.264060E-04
0.509976E-05	0.168289E-03	0.696713E-04	0.300878E-04	0.275908E-04	0.155853E-03	0.820872E-04	0.149882E-05
0.182977E-08	0.175214E-07	0.715428E-07	0.421972E-06	0.129279E-05	0.117268E-05	0.154768E-05	0.305276E-05
0.279805E-05	0.535710E-05	0.352441E-05	0.941920E-05	0.103987E-04	0.272628E-04	0.111407E-04	0.379541E-04
0.355756E-04	0.115778E-04	0.135950E-03	0.631109E-04	0.261319E-04	0.710402E-04	0.176281E-03	0.477502E-04
0.504710E-10	0.609289E-09	0.375556E-08	0.128770E-07	0.127202E-06	0.121629E-05	0.599011E-06	0.422893E-06
0.586625E-06	0.162517E-05	0.143062E-05	0.848265E-06	0.328865E-05	0.368225E-05	0.979384E-05	0.279128E-05
0.155997E-04	0.813234E-05	0.208073E-05	0.250666E-04	0.195558E-04	0.803680E-05	0.229578E-04	0.565763E-04
0.136852E-04	0.826231E-10	0.312243E-08	0.456719E-07	0.289972E-07	0.327386E-06	0.121153E-05	0.590925E-06
0.172196E-05	0.256818E-05	0.282122E-05	0.347029E-05	0.490068E-05	0.666454E-05	0.721250E-05	0.272839E-04
0.158567E-04	0.330859E-04	0.400800E-04	0.131355E-04	0.110196E-03	0.539362E-04	0.281610E-04	0.936353E-04
0.162536E-03	0.585571E-04	0.205618E-09	0.151753E-09	0.166561E-07	0.799213E-07	0.668237E-06	0.866822E-06
0.100327E-05	0.127811E-05	0.240107E-05	0.367151E-05	0.428677E-05	0.326978E-05	0.785354E-05	0.987890E-05
0.236801E-04	0.193609E-04	0.225263E-04	0.253758E-04	0.490259E-05	0.161735E-03	0.669388E-04	0.289093E-04
0.265083E-04	0.149780E-03	0.788601E-04	0.143799E-09	0.175563E-08	0.168058E-07	0.686252E-07	0.404722E-06
0.123998E-05	0.112481E-05	0.148450E-05	0.292800E-05	0.268340E-05	0.513840E-05	0.338027E-05	0.903416E-05
0.997379E-05	0.261446E-04	0.106850E-04	0.364047E-04	0.341257E-04	0.111049E-04	0.130394E-03	0.605284E-04
0.250615E-04	0.681366E-04	0.169076E-03	0.457894E-04	0.440446E-10	0.543659E-09	0.323841E-08	0.107824E-05
0.111125E-06	0.102280E-05	0.533073E-06	0.371696E-06	0.522819E-06	0.145618E-05	0.127321E-05	0.789673E-06
0.296747E-05	0.325844E-05	0.908187E-05	0.255119E-05	0.138127E-04	0.731476E-05	0.185259E-05	0.229024E-05
0.177324E-04	0.758104E-05	0.213059E-04	0.518068E-04	0.123430E-04	0.736800E-10	0.276184E-08	0.404020E-05
0.255688E-07	0.289602E-06	0.107024E-05	0.522180E-06	0.152279E-05	0.226459E-05	0.249833E-05	0.306976E-05
0.434676E-05	0.589302E-05	0.636103E-05	0.241397E-04	0.140537E-04	0.291829E-04	0.354395E-04	0.116281E-04
0.975935E-04	0.482241E-04	0.247346E-04	0.830227E-04	0.143756E-03	0.519105E-04	0.181325E-09	0.134058E-05
0.146498E-07	0.703512E-07	0.587853E-06	0.762266E-06	0.883035E-06	0.112481E-05	0.211338E-05	0.322935E-05
0.377222E-05	0.287924E-05	0.690910E-05	0.868954E-05	0.208373E-04	0.170336E-04	0.198200E-04	0.223325E-04
0.432065E-05	0.142375E-03	0.588758E-04	0.254273E-04	0.233139E-04	0.131827E-03	0.693341E-04	0.125834E-04
0.153671E-08	0.146939E-07	0.600131E-07	0.353819E-06	0.108416E-05	0.983562E-06	0.129805E-05	0.255987E-05
0.234517E-05	0.449313E-05	0.295493E-05	0.789805E-05	0.871991E-05	0.228472E-04	0.934028E-05	0.318333E-05
0.298476E-04	0.970950E-05	0.114000E-03	0.529119E-04	0.219034E-04	0.595701E-04	0.147822E-03	0.400055E-05
0.332273E-10	0.439673E-09	0.250634E-08	0.740066E-08	0.886684E-07	0.855639E-06	0.427094E-06	0.279597E-05
0.418049E-06	0.115877E-05	0.103501E-05	0.651857E-06	0.244823E-05	0.265641E-05	0.787092E-05	0.216725E-05
0.103075E-04	0.604441E-05	0.142588E-05	0.178933E-04	0.136746E-04	0.645453E-05	0.192803E-04	0.439564E-04
0.104345E-04	0.594755E-10	0.218031E-08	0.318612E-07	0.199385E-07	0.229050E-06	0.841670E-06	0.411757E-05
0.120086E-05	0.173483E-05	0.198566E-05	0.240450E-05	0.345536E-05	0.465156E-05	0.501327E-05	0.191582E-05
0.111309E-04	0.230077E-04	0.279583E-04	0.919297E-05	0.760117E-04	0.389900E-04	0.195358E-04	0.661282E-04
0.114659E-03	0.411745E-04	0.142026E-09	0.105456E-09	0.113938E-07	0.548425E-07	0.457728E-06	0.592688E-05
0.688491E-06	0.876719E-06	0.164339E-05	0.251489E-05	0.294047E-05	0.225122E-05	0.537898E-05	0.676386E-05
0.162858E-04	0.132697E-04	0.154498E-04	0.174074E-04	0.338334E-05	0.110962E-03	0.459079E-04	0.197472E-04
0.182121E-04	0.102946E-03	0.539473E-04	0.967958E-10	0.118296E-08	0.112836E-07	0.461033E-07	0.271655E-04
0.832748E-06	0.755651E-06	0.997085E-06	0.196601E-05	0.180056E-05	0.345241E-05	0.226925E-05	0.606563E-05
0.669716E-05	0.175486E-04	0.717216E-05	0.244623E-04	0.229457E-04	0.745961E-05	0.875422E-04	0.406670E-04

0.168099E-04	0.457696E-04	0.113583E-03	0.306965E-04	0.168351E-10	0.302720E-09	0.174772E-08	0.411706E-08
0.578814E-07	0.690364E-06	0.287084E-06	0.173359E-06	0.295445E-06	0.602161E-06	0.757391E-06	0.479051E-06
0.183340E-05	0.198771E-05	0.652758E-05	0.153915E-05	0.648310E-05	0.403056E-05	0.980039E-06	0.122016E-04
0.784959E-05	0.506397E-05	0.135052E-04	0.330220E-04	0.783970E-05	0.255829E-10	0.139292E-08	0.200821E-07
0.108311E-07	0.146920E-06	0.540967E-06	0.265315E-06	0.765123E-06	0.103984E-05	0.128242E-05	0.155894E-05
0.232109E-05	0.301630E-05	0.322055E-05	0.130400E-04	0.731299E-05	0.146531E-04	0.180055E-04	0.600686E-05
0.452302E-04	0.272508E-04	0.125554E-04	0.433080E-04	0.779844E-04	0.271389E-04	0.593960E-10	0.667524E-10
0.680104E-08	0.334288E-07	0.284323E-06	0.367701E-06	0.426603E-06	0.538299E-06	0.102027E-05	0.156654E-05
0.183085E-05	0.141776E-05	0.335935E-05	0.422316E-05	0.103670E-04	0.820926E-05	0.954265E-05	0.108216E-04
0.216488E-05	0.686630E-04	0.291729E-04	0.120754E-04	0.117950E-04	0.657576E-04	0.334028E-04	0.398191E-10
0.708998E-09	0.671018E-08	0.255938E-07	0.162631E-06	0.499609E-06	0.452948E-06	0.595810E-06	0.117863E-05
0.108772E-05	0.207576E-05	0.136786E-05	0.364546E-05	0.401889E-05	0.107097E-04	0.431127E-05	0.147329E-04
0.137939E-04	0.451070E-05	0.520982E-04	0.247908E-04	0.101083E-04	0.277476E-04	0.687552E-04	0.186170E-04
0.107719E-10	0.137037E-10	0.119547E-08	0.167745E-08	0.202645E-07	0.501875E-06	0.145767E-06	0.706026E-07
0.142125E-06	0.239548E-06	0.412054E-06	0.356485E-09	0.131745E-05	0.879814E-06	0.355631E-05	0.445071E-06
0.345034E-05	0.224597E-05	0.	0.465200E-05	0.249616E-05	0.179845E-05	0.678808E-05	0.245358E-04
0.622742E-05	0.154481E-10	0.143029E-10	0.707008E-08	0.328122E-08	0.233770E-07	0.124380E-06	0.398440E-07
0.199026E-06	0.317519E-06	0.268166E-06	0.578064E-06	0.901911E-10	0.127840E-05	0.887582E-06	0.458432E-05
0.976320E-06	0.435774E-05	0.515735E-05	0.	0.135023E-04	0.371301E-05	0.299466E-05	0.119597E-04
0.421796E-04	0.140001E-04	0.292484E-10	0.522701E-12	0.227884E-08	0.375016E-08	0.464642E-07	0.763955E-07
0.524999E-07	0.113439E-06	0.230047E-06	0.312720E-06	0.398950E-06	0.459493E-10	0.127695E-05	0.627771E-06
0.307203E-05	0.337241E-06	0.231612E-05	0.339713E-05	0.	0.196165E-04	0.611164E-05	0.330375E-05
0.299522E-05	0.282413E-04	0.120485E-04	0.180727E-10	0.401569E-13	0.210469E-08	0.376408E-08	0.204958E-07
0.104493E-06	0.536626E-07	0.147694E-06	0.265072E-06	0.227008E-06	0.570381E-06	0.296895E-11	0.119097E-05
0.750107E-06	0.303539E-05	0.472119E-06	0.247960E-05	0.303649E-05	0.	0.115332E-04	0.345488E-05
0.266407E-05	0.608212E-05	0.243401E-04	0.690867E-05				

THE FLUXB ARRAY IS

1.564758E-06	3.182037E-06	4.447520E-06	5.420644E-06	6.044602E-06	6.258572E-06
6.044602E-06	5.420644E-06	4.447520E-06	3.182037E-06	1.564758E-06	
1.895106E-06	5.180618E-06	7.670138E-06	9.602402E-06	1.082821E-05	1.125626E-05
1.082821E-05	9.602402E-06	7.670138E-06	5.180618E-06	1.895106E-06	
7.677492E-07	2.372108E-06	3.580874E-06	4.548242E-06	5.157971E-06	5.366447E-06
5.157971E-06	4.548242E-06	3.580874E-06	2.372108E-06	7.677492E-07	
2.531848E-08	7.588295E-08	1.169612E-07	1.490126E-07	1.693311E-07	1.762934E-07
1.693311E-07	1.490126E-07	1.169612E-07	7.588295E-08	2.531848E-08	
1.226353E-06	2.503877E-06	3.526807E-06	4.331872E-06	4.825649E-06	4.999087E-06
4.825649E-06	4.331872E-06	3.526807E-06	2.503877E-06	1.226353E-06	
1.377251E-06	3.707386E-06	5.426388E-06	6.782026E-06	7.648396E-06	7.949050E-06
7.648396E-06	6.782026E-06	5.426388E-06	3.707386E-06	1.377251E-06	
6.060495E-07	1.833957E-06	2.778440E-06	3.528740E-06	4.002104E-06	4.163885E-06
4.002104E-06	3.528740E-06	2.778440E-06	1.833957E-06	6.060495E-07	
2.667182E-08	8.425895E-08	1.298820E-07	1.657296E-07	1.886255E-07	1.964760E-07
1.886255E-07	1.657296E-07	1.298820E-07	8.425895E-08	2.667182E-08	
4.183177E-07	8.571044E-07	1.190870E-06	1.448225E-06	1.608691E-06	1.672484E-06
1.608691E-06	1.448225E-06	1.190870E-06	8.571044E-07	4.183177E-07	
5.760558E-07	1.829099E-06	2.767929E-06	3.495066E-06	3.953109E-06	4.108982E-06
3.953109E-06	3.495066E-06	2.767929E-06	1.829099E-06	5.760558E-07	
3.526491E-07	1.240265E-06	1.945019E-06	2.486467E-06	2.828187E-06	2.944352E-06
2.828187E-06	2.486467E-06	1.945019E-06	1.240265E-06	3.526491E-07	
1.414204E-07	5.022615E-07	8.054281E-07	1.041765E-06	1.191179E-06	1.242176E-06
1.191179E-06	1.041765E-06	8.054281E-07	5.022615E-07	1.414204E-07	
2.210119E-07	4.089646E-07	5.648889E-07	6.895023E-07	7.688025E-07	7.953619E-07
7.688025E-07	6.895023E-07	5.648889E-07	4.089646E-07	2.210119E-07	
2.879392E-07	9.380934E-07	1.451275E-06	1.835236E-06	2.074561E-06	2.156876E-06
2.074561E-06	1.835236E-06	1.451275E-06	9.380934E-07	2.879392E-07	
2.012241E-07	8.535262E-07	1.356912E-06	1.739770E-06	1.977895E-06	2.058867E-06
1.977895E-06	1.739770E-06	1.356912E-06	8.535262E-07	2.012241E-07	
1.329559E-07	5.821186E-07	9.544226E-07	1.238374E-06	1.415802E-06	1.476122E-06
1.415802E-06	1.238374E-06	9.544226E-07	5.821186E-07	1.329559E-07	
9.680581E-08	1.784380E-07	2.493123E-07	3.059005E-07	3.438014E-07	3.548163E-07
3.438014E-07	3.059005E-07	2.493123E-07	1.784380E-07	9.680581E-08	
1.096252E-07	3.977892E-07	6.157364E-07	7.804774E-07	8.822005E-07	9.167325E-07
8.822005E-07	7.804774E-07	6.157364E-07	3.977892E-07	1.096252E-07	
8.844708E-08	3.811224E-07	6.110592E-07	7.840650E-07	8.910720E-07	9.273594E-07
8.910720E-07	7.840650E-07	6.110592E-07	3.811224E-07	8.844708E-08	
8.070615E-08	3.739458E-07	6.218181E-07	8.095279E-07	9.259676E-07	9.654098E-07
9.259676E-07	8.095279E-07	6.218181E-07	3.739458E-07	8.070615E-08	
0.102614E-09	0.171157E-08	0.549024E-07	0.378650E-06	0.103921E-05	0.448453E-06
0.715685E-05	0.297535E-05	0.916860E-05	0.100455E-04	0.121878E-04	0.420920E-04
0.469279E-04	0.100987E-04	0.171177E-03	0.113594E-03	0.475936E-03	0.139838E-05
0.228438E-03	0.619018E-10	0.431481E-10	0.108838E-06	0.429493E-06	0.161631E-05
					0.176912E-04
					0.846763E-05
					0.
					0.
					0.
					0.508562E-06
					0.247700E-05

0.381432E-05	0.778451E-05	0.625139E-05	0.150439E-04	0.776099E-05	0.113536E-04	0.562937E-04	0.261668E-04
0.118885E-04	0.623060E-04	0.204845E-04	0.183720E-03	0.153895E-03	0.420759E-03	0.	0.
0.	0.112846E-03	0.816583E-11	0.189246E-11	0.364424E-07	0.154315E-06	0.469817E-06	0.198403E-06
0.761780E-06	0.111581E-05	0.275564E-05	0.165590E-05	0.504667E-05	0.741270E-05	0.438431E-05	0.235220E-04
0.114401E-04	0.532131E-05	0.268296E-04	0.842483E-05	0.734930E-04	0.466953E-04	0.176603E-03	0.
0.	0.	0.523160E-04	0.235857E-12	0.654470E-13	0.122018E-08	0.408706E-08	0.107462E-05
0.429624E-08	0.370182E-07	0.516608E-07	0.839557E-07	0.635055E-07	0.148271E-06	0.817310E-07	0.182875E-06
0.659022E-06	0.331769E-06	0.170021E-06	0.107758E-05	0.333102E-06	0.224667E-05	0.193350E-05	0.640392E-05
0.	0.	0.	0.235217E-05	0.162369E-09	0.119766E-07	0.199498E-06	0.710923E-06
0.147128E-05	0.134351E-05	0.622865E-05	0.357038E-05	0.122617E-04	0.664764E-05	0.157218E-04	0.203281E-04
0.183985E-04	0.814290E-04	0.388555E-04	0.337360E-04	0.978496E-04	0.649952E-04	0.261467E-03	0.199287E-03
0.699176E-03	0.	0.158445E-03	0.	0.414845E-03	0.101958E-09	0.340719E-08	0.540305E-06
0.126095E-05	0.189916E-05	0.167062E-05	0.103528E-04	0.829943E-05	0.185454E-04	0.146987E-04	0.326661E-04
0.275695E-04	0.241302E-04	0.134926E-03	0.747056E-04	0.503408E-04	0.153038E-03	0.129768E-03	0.441768E-03
0.394740E-03	0.768026E-03	0.	0.348697E-03	0.	0.375490E-03	0.151724E-10	0.461916E-06
0.176568E-06	0.549270E-06	0.102598E-05	0.975135E-06	0.355934E-05	0.341994E-05	0.835513E-05	0.427528E-05
0.142309E-04	0.279791E-04	0.134363E-04	0.627614E-04	0.386439E-04	0.454633E-04	0.871496E-04	0.733338E-04
0.254110E-03	0.121267E-03	0.344094E-03	0.	0.149671E-03	0.	0.122050E-03	0.453900E-10
0.475752E-10	0.592881E-08	0.157892E-07	0.200071E-07	0.281100E-07	0.159454E-06	0.125268E-06	0.187666E-06
0.189721E-06	0.320000E-06	0.266030E-06	0.428665E-06	0.194233E-05	0.114607E-05	0.103933E-05	0.325493E-05
0.191674E-05	0.500890E-05	0.554918E-05	0.125964E-04	0.	0.429452E-05	0.	0.509710E-05
0.209876E-09	0.207197E-07	0.301178E-06	0.100897E-05	0.197712E-05	0.203301E-05	0.778061E-05	0.514031E-05
0.165054E-04	0.857752E-05	0.209552E-04	0.294576E-04	0.244629E-04	0.111125E-03	0.532004E-04	0.573405E-04
0.136033E-03	0.975888E-04	0.341487E-03	0.297136E-03	0.934263E-03	0.	0.256022E-03	0.
0.642244E-03	0.134640E-09	0.553166E-08	0.812005E-06	0.214662E-05	0.272214E-05	0.257572E-05	0.147494E-04
0.126255E-04	0.280552E-04	0.212440E-04	0.468157E-04	0.412894E-04	0.333939E-04	0.198745E-03	0.110379E-03
0.912351E-04	0.227737E-03	0.189847E-03	0.655733E-03	0.589442E-03	0.111962E-02	0.	0.476819E-03
0.	0.570104E-03	0.207013E-10	0.744439E-08	0.274951E-06	0.967970E-06	0.156992E-05	0.150474E-05
0.527601E-05	0.526005E-05	0.131695E-04	0.654524E-05	0.213279E-04	0.433091E-04	0.206417E-04	0.948551E-04
0.580874E-04	0.746707E-04	0.134469E-03	0.110878E-03	0.387534E-03	0.186338E-03	0.516738E-03	0.
0.213672E-03	0.	0.181729E-03	0.627754E-12	0.753341E-10	0.932835E-08	0.272964E-07	0.308471E-07
0.452848E-07	0.236057E-06	0.193348E-06	0.288088E-06	0.299065E-06	0.474592E-06	0.403301E-06	0.694014E-06
0.295199E-05	0.171348E-05	0.175976E-05	0.510018E-05	0.281420E-05	0.755433E-05	0.856591E-05	0.191913E-04
0.	0.614461E-05	0.	0.764956E-05	0.242104E-09	0.282784E-07	0.375508E-06	0.124902E-05
0.238927E-05	0.261886E-05	0.889798E-05	0.641312E-05	0.202270E-04	0.104803E-04	0.251703E-04	0.365229E-04
0.289132E-04	0.134415E-03	0.640033E-04	0.756917E-04	0.172977E-03	0.118593E-03	0.406955E-03	0.366586E-03
0.112677E-02	0.	0.281924E-03	0.	0.793330E-03	0.157851E-09	0.708504E-08	0.103358E-05
0.274015E-05	0.339674E-05	0.331186E-05	0.182565E-04	0.158759E-04	0.357289E-04	0.268002E-04	0.581270E-04
0.531000E-04	0.428422E-04	0.248781E-03	0.136438E-03	0.116489E-03	0.291243E-03	0.236104E-03	0.821872E-03
0.739273E-03	0.140112E-02	0.	0.572457E-03	0.	0.713601E-03	0.245958E-10	0.947603E-06
0.351855E-06	0.129648E-05	0.199602E-05	0.193365E-05	0.661835E-05	0.666994E-05	0.168529E-04	0.835684E-05
0.268191E-04	0.556552E-04	0.264914E-04	0.119985E-03	0.731836E-04	0.951109E-04	0.171403E-03	0.140117E-03
0.491552E-03	0.235230E-03	0.653471E-03	0.	0.267953E-03	0.	0.229538E-03	0.750505E-10
0.965641E-10	0.119618E-07	0.355201E-07	0.390086E-07	0.579497E-07	0.298046E-06	0.246498E-06	0.379456E-06
0.386652E-06	0.600157E-06	0.528127E-06	0.910089E-06	0.375988E-05	0.216736E-05	0.225511E-05	0.655383E-05
0.355975E-05	0.964658E-05	0.109039E-04	0.245329E-04	0.	0.775749E-05	0.	0.971425E-05

0.248451E-09	0.323039E-07	0.422139E-06	0.140276E-05	0.263817E-05	0.294162E-05	0.976221E-05	0.721847E-05
0.227782E-04	0.116929E-04	0.278670E-04	0.416366E-04	0.324908E-04	0.149769E-03	0.705737E-04	0.854401E-04
0.198632E-03	0.131794E-03	0.455755E-03	0.407573E-03	0.126049E-02	0.	0.298553E-03	0.
0.883188E-03	0.325424E-09	0.802952E-08	0.117163E-05	0.312185E-05	0.383056E-05	0.375485E-05	0.205511E-04
0.179288E-04	0.406262E-04	0.304020E-04	0.654810E-04	0.602124E-04	0.490960E-04	0.282248E-03	0.152984E-03
0.131794E-03	0.332734E-03	0.265727E-03	0.926681E-03	0.833793E-03	0.158742E-02	0.	0.638647E-03
0.	0.805056E-03	0.504938E-10	0.107466E-07	0.399792E-06	0.148125E-05	0.226523E-05	0.219608E-05
0.748281E-05	0.757623E-05	0.192345E-04	0.950102E-05	0.303958E-04	0.631669E-04	0.302786E-04	0.136123E-03
0.828146E-04	0.107933E-03	0.194701E-03	0.158597E-03	0.558906E-03	0.266486E-03	0.741640E-03	0.
0.302471E-03	0.	0.259888E-03	0.155607E-11	0.109828E-09	0.136137E-07	0.404917E-07	0.443916E-07
0.659266E-07	0.338100E-06	0.280281E-06	0.432612E-06	0.439761E-06	0.681427E-06	0.601404E-06	0.104493E-05
0.427985E-05	0.246038E-05	0.256961E-05	0.746250E-05	0.404367E-05	0.109644E-04	0.123885E-04	0.279091E-04
0.	0.880033E-05	0.	0.110423E-04	0.401928E-09	0.336916E-07	0.439493E-06	0.147770E-05
0.275936E-05	0.305381E-05	0.100383E-04	0.750738E-05	0.240087E-04	0.121416E-04	0.288272E-04	0.429497E-04
0.336471E-04	0.154932E-03	0.728354E-04	0.886132E-04	0.206435E-03	0.136582E-03	0.466474E-03	0.422232E-03
0.130789E-02	0.	0.303489E-03	0.	0.914975E-03	0.335303E-09	0.835231E-08	0.121799E-05
0.325977E-05	0.397880E-05	0.390407E-05	0.213416E-04	0.186322E-04	0.423026E-04	0.316927E-04	0.680577E-04
0.625661E-04	0.511687E-04	0.293524E-03	0.158651E-03	0.137180E-03	0.346146E-03	0.275730E-03	0.962811E-03
0.866164E-03	0.164865E-02	0.	0.660276E-03	0.	0.836551E-03	0.532227E-10	0.111798E-07
0.416064E-06	0.154467E-05	0.235887E-05	0.228602E-05	0.778360E-05	0.788281E-05	0.200279E-04	0.989384E-05
0.316158E-04	0.657253E-04	0.315615E-04	0.141630E-03	0.861432E-04	0.112410E-03	0.202715E-03	0.164950E-03
0.581728E-03	0.277232E-03	0.771600E-03	0.	0.314577E-03	0.	0.270400E-03	0.162775E-11
0.114352E-09	0.141742E-07	0.422143E-07	0.462018E-07	0.686362E-07	0.351907E-06	0.291819E-06	0.450797E-06
0.457958E-06	0.709129E-06	0.626973E-06	0.108975E-05	0.445640E-05	0.256055E-05	0.267644E-05	0.776998E-05
0.420849E-05	0.114139E-04	0.128970E-04	0.290584E-04	0.	0.916076E-05	0.	0.114957E-04
0.248451E-09	0.323039E-07	0.422139E-06	0.140276E-05	0.263817E-05	0.294162E-05	0.976221E-05	0.721847E-05
0.227782E-04	0.116929E-04	0.278670E-04	0.416366E-04	0.324908E-04	0.149769E-03	0.705737E-04	0.854401E-04
0.198632E-03	0.131794E-03	0.455755E-03	0.407573E-03	0.126049E-02	0.	0.298553E-03	0.
0.883188E-03	0.325424E-09	0.802952E-08	0.117163E-05	0.312185E-05	0.383056E-05	0.375485E-05	0.205511E-04
0.179288E-04	0.406262E-04	0.304020E-04	0.654810E-04	0.602124E-04	0.490960E-04	0.282248E-03	0.152984E-03
0.131794E-03	0.332734E-03	0.265727E-03	0.926681E-03	0.833793E-03	0.158742E-02	0.	0.638647E-03
0.	0.805056E-03	0.504938E-10	0.107466E-07	0.399792E-06	0.148125E-05	0.226523E-05	0.219608E-05
0.748281E-05	0.757623E-05	0.192345E-04	0.950102E-05	0.303958E-04	0.631669E-04	0.302786E-04	0.136123E-03
0.828146E-04	0.107933E-03	0.194701E-03	0.158597E-03	0.558906E-03	0.266486E-03	0.741640E-03	0.
0.302471E-03	0.	0.259888E-03	0.155607E-11	0.109828E-09	0.136137E-07	0.404917E-07	0.443916E-07
0.659266E-07	0.338100E-06	0.280281E-06	0.432612E-06	0.439761E-06	0.681427E-06	0.601404E-06	0.104493E-05
0.427985E-05	0.246038E-05	0.256961E-05	0.746250E-05	0.404367E-05	0.109644E-04	0.123885E-04	0.279091E-04
0.	0.880033E-05	0.	0.110423E-04	0.242104E-09	0.282784E-07	0.375508E-06	0.124902E-05
0.238927E-05	0.261886E-05	0.889798E-05	0.641312E-05	0.202270E-04	0.104803E-04	0.251703E-04	0.365229E-04
0.289132E-04	0.134415E-03	0.640033E-04	0.756917E-04	0.172977E-03	0.118593E-03	0.406955E-03	0.366586E-03
0.112677E-02	0.	0.281924E-03	0.	0.793330E-03	0.157851E-09	0.708504E-08	0.103358E-05
0.274015E-05	0.339674E-05	0.331186E-05	0.182565E-04	0.158759E-04	0.357289E-04	0.268002E-04	0.581270E-04
0.531000E-04	0.428422E-04	0.248781E-03	0.136438E-03	0.116489E-03	0.291243E-03	0.236104E-03	0.821872E-03
0.739273E-03	0.140112E-02	0.	0.572457E-03	0.	0.713601E-03	0.245958E-10	0.947603E-08
0.351855E-06	0.129648E-05	0.199602E-05	0.193365E-05	0.661835E-05	0.666994E-05	0.168529E-04	0.835684E-05
0.268191E-04	0.556552E-04	0.264914E-04	0.119985E-03	0.731836E-04	0.951109E-04	0.171403E-03	0.140117E-03

0.491552E-03	0.235230E-03	0.653471E-03	0.	0.267953E-03	0.	0.229538E-03	0.750505E-12
0.965641E-10	0.119618E-07	0.355201E-07	0.390086E-07	0.579497E-07	0.298046E-06	0.246498E-06	0.379456E-06
0.386652E-06	0.600157E-06	0.528127E-06	0.910089E-06	0.375988E-05	0.216736E-05	0.225511E-05	0.655383E-05
0.355975E-05	0.964658E-05	0.109039E-04	0.245329E-04	0.	0.775750E-05	0.	0.971425E-05
0.209876E-09	0.207197E-07	0.301178E-06	0.100897E-05	0.197712E-05	0.203301E-05	0.778061E-05	0.514031E-05
0.165054E-04	0.857752E-05	0.209552E-04	0.294576E-04	0.244629E-04	0.111125E-03	0.532004E-04	0.573405E-04
0.136033E-03	0.975888E-04	0.341487E-03	0.297136E-03	0.934263E-03	0.	0.256022E-03	0.
0.642244E-03	0.134640E-09	0.553166E-08	0.812005E-06	0.214662E-05	0.272214E-05	0.257572E-05	0.147494E-04
0.126255E-04	0.280552E-04	0.212440E-04	0.468157E-04	0.412894E-04	0.333939E-04	0.198745E-03	0.110379E-03
0.912351E-04	0.227737E-03	0.189847E-03	0.655733E-03	0.589442E-03	0.111962E-02	0.	0.476819E-03
0.	0.570104E-03	0.207013E-10	0.744439E-08	0.274951E-06	0.967970E-06	0.156992E-05	0.150474E-05
0.527601E-05	0.526005E-05	0.131695E-04	0.654524E-05	0.213279E-04	0.433091E-04	0.206417E-04	0.948551E-04
0.580874E-04	0.746707E-04	0.134469E-03	0.110878E-03	0.387534E-03	0.186338E-03	0.516738E-03	0.
0.213672E-03	0.	0.181729E-03	0.627754E-12	0.753341E-10	0.932835E-08	0.272964E-07	0.308471E-07
0.452848E-07	0.236057E-06	0.193348E-06	0.288088E-06	0.299065E-06	0.474592E-06	0.403301E-06	0.694014E-06
0.295199E-05	0.171348E-05	0.175976E-05	0.510018E-05	0.281420E-05	0.755433E-05	0.856591E-05	0.191913E-04
0.	0.614461E-05	0.	0.764956E-05	0.162369E-09	0.119766E-07	0.199498E-06	0.710923E-06
0.147128E-05	0.134351E-05	0.622865E-05	0.357038E-05	0.122617E-04	0.664764E-05	0.157218E-04	0.203281E-04
0.183985E-04	0.814290E-04	0.388555E-04	0.337360E-04	0.978496E-04	0.649952E-04	0.261467E-03	0.199287E-03
0.699176E-03	0.	0.158445E-03	0.	0.414845E-03	0.101958E-09	0.340719E-08	0.540305E-06
0.126095E-05	0.189916E-05	0.167062E-05	0.103528E-04	0.829943E-05	0.185454E-04	0.146987E-04	0.326661E-04
0.275695E-04	0.241302E-04	0.134926E-03	0.747056E-04	0.503408E-04	0.153038E-03	0.129768E-03	0.441768E-03
0.394740E-03	0.768026E-03	0.	0.348697E-03	0.	0.375490E-03	0.151724E-10	0.461916E-08
0.176568E-06	0.549270E-06	0.102598E-05	0.975135E-06	0.355934E-05	0.341994E-05	0.835513E-05	0.427528E-05
0.142309E-04	0.279791E-04	0.134363E-04	0.627614E-04	0.386439E-04	0.454633E-04	0.871496E-04	0.733338E-04
0.254110E-03	0.121267E-03	0.344094E-03	0.	0.149671E-03	0.	0.122050E-03	0.453900E-12
0.475752E-10	0.592881E-08	0.157892E-07	0.200071E-07	0.281100E-07	0.159454E-06	0.125268E-06	0.187666E-06
0.189721E-06	0.320000E-06	0.266030E-06	0.428665E-06	0.194233E-05	0.114607E-05	0.103933E-05	0.325493E-05
0.191674E-05	0.500890E-05	0.554918E-05	0.125964E-04	0.	0.429452E-05	0.	0.509710E-05
0.102614E-09	0.171157E-08	0.549024E-07	0.378650E-06	0.103921E-05	0.448453E-06	0.139838E-05	0.161631E-05
0.715685E-05	0.297535E-05	0.916860E-05	0.100455E-04	0.121878E-04	0.420920E-04	0.176912E-04	0.846763E-05
0.469279E-04	0.100987E-04	0.171177E-03	0.113594E-03	0.475936E-03	0.	0.	0.
0.228438E-03	0.619018E-10	0.431481E-10	0.108838E-06	0.429493E-06	0.100873E-05	0.508562E-06	0.247700E-05
0.381432E-05	0.778451E-05	0.625139E-05	0.150439E-04	0.776099E-05	0.113536E-04	0.562937E-04	0.261666E-04
0.118885E-04	0.623060E-04	0.204845E-04	0.183720E-03	0.153895E-03	0.420759E-03	0.	0.
0.	0.112846E-03	0.816583E-11	0.189246E-11	0.364424E-07	0.154315E-06	0.469817E-06	0.198403E-06
0.761780E-06	0.111581E-05	0.275564E-05	0.165590E-05	0.504667E-05	0.741270E-05	0.438431E-05	0.235220E-04
0.114401E-04	0.532131E-05	0.268296E-04	0.842483E-05	0.734930E-04	0.466953E-04	0.176603E-03	0.
0.	0.	0.523160E-04	0.235857E-12	0.654470E-13	0.122018E-08	0.408706E-08	0.107462E-07
0.429624E-08	0.370182E-07	0.516608E-07	0.839557E-07	0.635055E-07	0.148271E-06	0.817310E-07	0.182875E-06
0.659022E-06	0.331769E-06	0.170021E-06	0.107758E-05	0.333102E-06	0.224667E-05	0.193350E-05	0.640392E-05
0.	0.	0.	0.235217E-05	0.225267E-09	0.352429E-09	0.403502E-07	0.266987E-06
0.690086E-06	0.395842E-06	0.101162E-05	0.150109E-05	0.552525E-05	0.233539E-05	0.722456E-05	0.750511E-05
0.987991E-05	0.327316E-04	0.162195E-04	0.828617E-05	0.390300E-04	0.818914E-05	0.131565E-03	0.903868E-04
0.411984E-03	0.	0.	0.	0.143562E-03	0.109734E-10	0.497126E-10	0.871502E-07
0.351868E-06	0.874571E-06	0.304715E-06	0.168825E-05	0.251449E-05	0.589941E-05	0.415572E-05	0.100173E-04

0.598365E-05	0.845814E-05	0.400269E-04	0.159033E-04	0.122789E-04	0.547333E-04	0.121967E-04	0.143261E-03
0.118576E-03	0.353533E-03	0.	0.	0.	0.169691E-03	0.991262E-10	0.322511E-09
0.292151E-07	0.117242E-06	0.412894E-06	0.170609E-06	0.654629E-06	0.104700E-05	0.182582E-05	0.141448E-05
0.394028E-05	0.680444E-05	0.299155E-05	0.192433E-04	0.673233E-05	0.453717E-05	0.297963E-04	0.104758E-04
0.567626E-04	0.537923E-04	0.147469E-03	0.	0.	0.	0.337302E-04	0.303145E-11
0.591146E-13	0.102767E-08	0.562620E-08	0.157657E-07	0.664780E-08	0.280267E-07	0.467286E-07	0.923592E-07
0.778541E-07	0.203144E-06	0.206050E-06	0.182184E-06	0.790419E-06	0.366370E-06	0.157914E-06	0.122885E-05
0.344975E-06	0.312105E-05	0.243832E-05	0.803747E-05	0.	0.	0.	0.280820E-05
0.372424E-09	0.200075E-08	0.154039E-06	0.568092E-06	0.113281E-05	0.113287E-05	0.523565E-05	0.283269E-05
0.951040E-05	0.460199E-05	0.123234E-04	0.181654E-04	0.150775E-04	0.646454E-04	0.349491E-04	0.276913E-04
0.733825E-04	0.587632E-04	0.224715E-03	0.155423E-03	0.643695E-03	0.	0.123457E-03	0.
0.276429E-03	0.194248E-10	0.205054E-08	0.310483E-06	0.119788E-05	0.152925E-05	0.135131E-05	0.734608E-05
0.499046E-05	0.150728E-04	0.106168E-04	0.226129E-04	0.274094E-04	0.239033E-04	0.100248E-03	0.527612E-04
0.689977E-04	0.140123E-03	0.130923E-03	0.371611E-03	0.278179E-03	0.616296E-03	0.	0.326320E-03
0.	0.314659E-03	0.190818E-09	0.503234E-08	0.821898E-07	0.405722E-06	0.821712E-06	0.687994E-06
0.320943E-05	0.301520E-05	0.503546E-05	0.407647E-05	0.862402E-05	0.228292E-04	0.920342E-05	0.509304E-04
0.238407E-04	0.221789E-04	0.701266E-04	0.491030E-04	0.139754E-03	0.127984E-03	0.273204E-03	0.
0.113934E-03	0.	0.972681E-04	0.582877E-11	0.494780E-10	0.739916E-08	0.188676E-07	0.353016E-07
0.330376E-07	0.151344E-06	0.139884E-06	0.232912E-06	0.212267E-06	0.460837E-06	0.708843E-06	0.544917E-06
0.236245E-05	0.115273E-05	0.119360E-05	0.304279E-05	0.199154E-05	0.687388E-05	0.652643E-05	0.150726E-04
0.	0.666166E-05	0.	0.566526E-05	0.491511E-09	0.408809E-08	0.240436E-06	0.868113E-06
0.155340E-05	0.175880E-05	0.690769E-05	0.412739E-05	0.128850E-04	0.615933E-05	0.161706E-04	0.275245E-04
0.198286E-04	0.874353E-04	0.469778E-04	0.503818E-04	0.100418E-03	0.864988E-04	0.303243E-03	0.225751E-03
0.881572E-03	0.	0.181253E-03	0.	0.381893E-03	0.261361E-10	0.304352E-08	0.460050E-06
0.199016E-05	0.229578E-05	0.207723E-05	0.100757E-04	0.755174E-05	0.229031E-04	0.163279E-04	0.319934E-04
0.410869E-04	0.359717E-04	0.146667E-03	0.770948E-04	0.113394E-03	0.215005E-03	0.194558E-03	0.550197E-03
0.417469E-03	0.909442E-03	0.	0.451057E-03	0.	0.466567E-03	0.264017E-09	0.863037E-08
0.129135E-06	0.656563E-06	0.124029E-05	0.108017E-05	0.469249E-05	0.458734E-05	0.816831E-05	0.624757E-05
0.126662E-04	0.356398E-04	0.145217E-04	0.773060E-04	0.352879E-04	0.366826E-04	0.108705E-03	0.714407E-04
0.214868E-03	0.198280E-03	0.407900E-03	0.	0.166625E-03	0.	0.140598E-03	0.808501E-11
0.978087E-10	0.116379E-07	0.321676E-07	0.537503E-07	0.533994E-07	0.224705E-06	0.218369E-06	0.360805E-06
0.322755E-06	0.689736E-06	0.111243E-05	0.885436E-06	0.364919E-05	0.173319E-05	0.197452E-05	0.471894E-05
0.295633E-05	0.106386E-04	0.102481E-04	0.228010E-04	0.	0.988949E-05	0.	0.889242E-05
0.102167E-08	0.582969E-08	0.300083E-06	0.111416E-05	0.190120E-05	0.218971E-05	0.819632E-05	0.516003E-05
0.159420E-04	0.742925E-05	0.192443E-04	0.348110E-04	0.246966E-04	0.105074E-03	0.566540E-04	0.657225E-04
0.125653E-03	0.106421E-03	0.369132E-03	0.275307E-03	0.108047E-02	0.	0.205405E-03	0.
0.457441E-03	0.308435E-10	0.384895E-08	0.583841E-06	0.256181E-05	0.288353E-05	0.264484E-05	0.123591E-04
0.948423E-05	0.294247E-04	0.205979E-04	0.397169E-04	0.528936E-04	0.457829E-04	0.182029E-03	0.944260E-04
0.143784E-03	0.272533E-03	0.242867E-03	0.689020E-03	0.522394E-03	0.114312E-02	0.	0.555223E-03
0.	0.585746E-03	0.578796E-09	0.109942E-07	0.168696E-06	0.882804E-06	0.156693E-05	0.138079E-05
0.589256E-05	0.581421E-05	0.105305E-04	0.797319E-05	0.159106E-04	0.459503E-04	0.185195E-04	0.981574E-04
0.442883E-04	0.465611E-04	0.141102E-03	0.902696E-04	0.272461E-03	0.251764E-03	0.516565E-03	0.
0.208419E-03	0.	0.177023E-03	0.177044E-10	0.124618E-09	0.149947E-07	0.423625E-07	0.686189E-07
0.684952E-07	0.284604E-06	0.278949E-06	0.466341E-06	0.418468E-06	0.872479E-06	0.142641E-05	0.115134E-05
0.466091E-05	0.219093E-05	0.253726E-05	0.619370E-05	0.373869E-05	0.136108E-04	0.130797E-04	0.291889E-04
0.	0.124839E-04	0.	0.112899E-04	0.115048E-08	0.673888E-08	0.340532E-06	0.126921E-05

0.211119E-05	0.246371E-05	0.911099E-05	0.579869E-05	0.180619E-04	0.820792E-05	0.209115E-04	0.392196E-04
0.277900E-04	0.116831E-03	0.628523E-04	0.739689E-04	0.141653E-03	0.119034E-03	0.414916E-03	0.306214E-03
0.120378E-02	0.	0.223374E-03	0.	0.508237E-03	0.622810E-10	0.432668E-08	0.661422E-06
0.292035E-05	0.326378E-05	0.300869E-05	0.138694E-04	0.107208E-04	0.334962E-04	0.234125E-04	0.448559E-04
0.601817E-04	0.522515E-04	0.205968E-03	0.106134E-03	0.162680E-03	0.307708E-03	0.273934E-03	0.778879E-03
0.589829E-03	0.129477E-02	0.	0.626246E-03	0.	0.661735E-03	0.658273E-09	0.124742E-07
0.191706E-06	0.100719E-05	0.177428E-05	0.156972E-05	0.667273E-05	0.660067E-05	0.119881E-04	0.905476E-05
0.179936E-04	0.522106E-04	0.211638E-04	0.111522E-03	0.501770E-04	0.530954E-04	0.160428E-03	0.102360E-03
0.309386E-03	0.285528E-03	0.586435E-03	0.	0.235012E-03	0.	0.200913E-03	0.202049E-10
0.141402E-09	0.170790E-07	0.483821E-07	0.781835E-07	0.780646E-07	0.323371E-06	0.317469E-06	0.533995E-06
0.476124E-06	0.992021E-06	0.162989E-05	0.132216E-05	0.530884E-05	0.248999E-05	0.289047E-05	0.706612E-05
0.424870E-05	0.154937E-04	0.148896E-04	0.332659E-04	0.	0.141813E-04	0.	0.128337E-04
0.115811E-08	0.706255E-08	0.353902E-06	0.132303E-05	0.219387E-05	0.255752E-05	0.943392E-05	0.603089E-05
0.189891E-04	0.843031E-05	0.217183E-04	0.403292E-04	0.289743E-04	0.121101E-03	0.651103E-04	0.768215E-04
0.147124E-03	0.123652E-03	0.430886E-03	0.316562E-03	0.124770E-02	0.	0.230900E-03	0.
0.523858E-03	0.632539E-10	0.449040E-08	0.687947E-06	0.304397E-05	0.339200E-05	0.313224E-05	0.144194E-04
0.111439E-04	0.348861E-04	0.243510E-04	0.466399E-04	0.625837E-04	0.543562E-04	0.214151E-03	0.110269E-03
0.169068E-03	0.320383E-03	0.284774E-03	0.809816E-03	0.613196E-03	0.134721E-02	0.	0.649994E-03
0.	0.688157E-03	0.685052E-09	0.129792E-07	0.199543E-06	0.104941E-05	0.184873E-05	0.163401E-05
0.694058E-05	0.686904E-05	0.124835E-04	0.943887E-05	0.187215E-04	0.543414E-04	0.220641E-04	0.116055E-03
0.522225E-04	0.553354E-04	0.167014E-03	0.106487E-03	0.321852E-03	0.297103E-03	0.610428E-03	0.
0.244390E-03	0.	0.209061E-03	0.210363E-10	0.147132E-09	0.177890E-07	0.505069E-07	0.814926E-07
0.813438E-07	0.336717E-06	0.330641E-06	0.556842E-06	0.496628E-06	0.103409E-05	0.169824E-05	0.137943E-05
0.552979E-05	0.259372E-05	0.301132E-05	0.736194E-05	0.442354E-05	0.161449E-04	0.155099E-04	0.346580E-04
0.	0.147684E-04	0.	0.133697E-04	0.115048E-08	0.673888E-08	0.340532E-06	0.126921E-05
0.211119E-05	0.246371E-05	0.911099E-05	0.579869E-05	0.180619E-04	0.820792E-05	0.209115E-04	0.392196E-04
0.277900E-04	0.116831E-03	0.628523E-04	0.739689E-04	0.141653E-03	0.119034E-03	0.414916E-03	0.306214E-03
0.120378E-02	0.	0.223374E-03	0.	0.508237E-03	0.622810E-10	0.432668E-08	0.661422E-06
0.292035E-05	0.326378E-05	0.300869E-05	0.138694E-04	0.107208E-04	0.334962E-04	0.234125E-04	0.448559E-04
0.601817E-04	0.522515E-04	0.205968E-03	0.106134E-03	0.162680E-03	0.307708E-03	0.273934E-03	0.778879E-03
0.589829E-03	0.129477E-02	0.	0.626246E-03	0.	0.661735E-03	0.658273E-09	0.124742E-07
0.191706E-06	0.100719E-05	0.177428E-05	0.156972E-05	0.667273E-05	0.660067E-05	0.119881E-04	0.905476E-05
0.179936E-04	0.522106E-04	0.211638E-04	0.111522E-03	0.501770E-04	0.530954E-04	0.160428E-03	0.102360E-03
0.309386E-03	0.285528E-03	0.586435E-03	0.	0.235012E-03	0.	0.200913E-03	0.202049E-10
0.141402E-09	0.170790E-07	0.483821E-07	0.781835E-07	0.780646E-07	0.323371E-06	0.317469E-06	0.533995E-06
0.476124E-06	0.992021E-06	0.162989E-05	0.132216E-05	0.530884E-05	0.248999E-05	0.289047E-05	0.706612E-05
0.424870E-05	0.154937E-04	0.148896E-04	0.332659E-04	0.	0.141813E-04	0.	0.128337E-04
0.102167E-08	0.582969E-08	0.300083E-06	0.111416E-05	0.190120E-05	0.218971E-05	0.819632E-05	0.516003E-05
0.159420E-04	0.742925E-05	0.192443E-04	0.348110E-04	0.246966E-04	0.105074E-03	0.566540E-04	0.657225E-04
0.125653E-03	0.106421E-03	0.369132E-03	0.275307E-03	0.108047E-02	0.	0.205405E-03	0.
0.457441E-03	0.308435E-10	0.384895E-08	0.583841E-06	0.256181E-05	0.288353E-05	0.264484E-05	0.123591E-04
0.948423E-05	0.294247E-04	0.205979E-04	0.397169E-04	0.528936E-04	0.457829E-04	0.182029E-03	0.944260E-04
0.143784E-03	0.272533E-03	0.242867E-03	0.689020E-03	0.522394E-03	0.114312E-02	0.	0.555223E-03
0.	0.585746E-03	0.578796E-09	0.109942E-07	0.168696E-06	0.882804E-06	0.156693E-05	0.138079E-05
0.589256E-05	0.581421E-05	0.105305E-04	0.797319E-05	0.159106E-04	0.459503E-04	0.185195E-04	0.981574E-04
0.442883E-04	0.465611E-04	0.141102E-03	0.902696E-04	0.272461E-03	0.251764E-03	0.516565E-03	0.

0.208419E-03	0.	0.177023E-03	0.177044E-10	0.124618E-09	0.149947E-07	0.423625E-07	0.686189E-07
0.684952E-07	0.284604E-06	0.278949E-06	0.466341E-06	0.418468E-06	0.872479E-06	0.142641E-05	0.115134E-05
0.466091E-05	0.219093E-05	0.253726E-05	0.619370E-05	0.373869E-05	0.136108E-04	0.130797E-04	0.291889E-04
0.	0.124839E-04	0.	0.112899E-04	0.491511E-09	0.408809E-08	0.240436E-06	0.868113E-06
0.155340E-05	0.175880E-05	0.690769E-05	0.412739E-05	0.128850E-04	0.615933E-05	0.161706E-04	0.275245E-04
0.198286E-04	0.874353E-04	0.469778E-04	0.503818E-04	0.100418E-03	0.864988E-04	0.303243E-03	0.225751E-03
0.881572E-03	0.	0.181253E-03	0.	0.381893E-03	0.261361E-10	0.304352E-08	0.460050E-06
0.199016E-05	0.229578E-05	0.207723E-05	0.100757E-04	0.755174E-05	0.229031E-04	0.163279E-04	0.319934E-04
0.410869E-04	0.359717E-04	0.146667E-03	0.770948E-04	0.113394E-03	0.215005E-03	0.194558E-03	0.550197E-03
0.417469E-03	0.909442E-03	0.	0.451057E-03	0.	0.466567E-03	0.264017E-09	0.863037E-08
0.129135E-06	0.656563E-06	0.124029E-05	0.108017E-05	0.469249E-05	0.458734E-05	0.816831E-05	0.624757E-05
0.126662E-04	0.356398E-04	0.145217E-04	0.773060E-04	0.352879E-04	0.366826E-04	0.108705E-03	0.714407E-04
0.214868E-03	0.198280E-03	0.407900E-03	0.	0.166625E-03	0.	0.140598E-03	0.808501E-11
0.978087E-10	0.116379E-07	0.321676E-07	0.537503E-07	0.533994E-07	0.224705E-06	0.218369E-06	0.360805E-06
0.322755E-06	0.689736E-06	0.111243E-05	0.885436E-06	0.364919E-05	0.173319E-05	0.197452E-05	0.471894E-05
0.295633E-05	0.106386E-04	0.102481E-04	0.228010E-04	0.	0.988949E-05	0.	0.889242E-05
0.372424E-09	0.200075E-08	0.154039E-06	0.568092E-06	0.113281E-05	0.113287E-05	0.523565E-05	0.283269E-05
0.951040E-05	0.460199E-05	0.123234E-04	0.181654E-04	0.150775E-04	0.646454E-04	0.349491E-04	0.276913E-04
0.733825E-04	0.587632E-04	0.224715E-03	0.155423E-03	0.643695E-03	0.	0.123457E-03	0.
0.276429E-03	0.194248E-10	0.205054E-08	0.310483E-06	0.119788E-05	0.152925E-05	0.135131E-05	0.734608E-05
0.499046E-05	0.150728E-04	0.106168E-04	0.226129E-04	0.274094E-04	0.239033E-04	0.100248E-03	0.527512E-04
0.689977E-04	0.140123E-03	0.130923E-03	0.371611E-03	0.278179E-03	0.616296E-03	0.	0.326320E-03
0.	0.314659E-03	0.190818E-09	0.503234E-08	0.821898E-07	0.405722E-06	0.821712E-06	0.687994E-06
0.320943E-05	0.301520E-05	0.503546E-05	0.407647E-05	0.862402E-05	0.228292E-04	0.920342E-05	0.509304E-04
0.238407E-04	0.221789E-04	0.701266E-04	0.491030E-04	0.139754E-03	0.127984E-03	0.273204E-03	0.
0.113934E-03	0.	0.972681E-04	0.582877E-11	0.494780E-10	0.739916E-08	0.188676E-07	0.353016E-07
0.330376E-07	0.151344E-06	0.139884E-06	0.232912E-06	0.212267E-06	0.460837E-06	0.708843E-06	0.544917E-06
0.236245E-05	0.115273E-05	0.119360E-05	0.304279E-05	0.199154E-05	0.687388E-05	0.652643E-05	0.150726E-04
0.	0.666166E-05	0.	0.566526E-05	0.225267E-09	0.352429E-09	0.403502E-07	0.266987E-06
0.690086E-06	0.395842E-06	0.101162E-05	0.150109E-05	0.552525E-05	0.233539E-05	0.722456E-05	0.750511E-05
0.987991E-05	0.327316E-04	0.162195E-04	0.828617E-05	0.390300E-04	0.818914E-05	0.131565E-03	0.903868E-04
0.411984E-03	0.	0.	0.	0.143562E-03	0.109734E-10	0.497126E-10	0.871502E-07
0.351868E-06	0.874571E-06	0.304715E-06	0.168825E-05	0.251449E-05	0.589941E-05	0.415572E-05	0.100173E-04
0.598365E-05	0.845814E-05	0.400269E-04	0.159033E-04	0.122789E-04	0.547333E-04	0.121967E-04	0.143261E-03
0.118576E-03	0.353533E-03	0.	0.	0.	0.169691E-03	0.991262E-10	0.322511E-09
0.292151E-07	0.117242E-06	0.412894E-06	0.170609E-06	0.654629E-06	0.104700E-05	0.182582E-05	0.141448E-05
0.394028E-05	0.680444E-05	0.299155E-05	0.192433E-04	0.673233E-05	0.453717E-05	0.297963E-04	0.104758E-04
0.567626E-04	0.537923E-04	0.147469E-03	0.	0.	0.	0.337302E-04	0.303145E-11
0.591146E-13	0.102767E-08	0.562620E-08	0.157657E-07	0.664780E-08	0.280267E-07	0.467286E-07	0.923592E-07
0.778541E-07	0.203144E-06	0.206050E-06	0.182184E-06	0.790419E-06	0.366370E-06	0.157914E-06	0.122885E-05
0.344975E-06	0.312105E-05	0.243832E-05	0.803747E-05	0.	0.	0.	0.280820E-05
0.804472E-11	0.361515E-10	0.169119E-07	0.691617E-07	0.279289E-06	0.140062E-06	0.373303E-06	0.453019E-06
0.159039E-05	0.623107E-06	0.293657E-05	0.297010E-05	0.270564E-05	0.130100E-04	0.409348E-05	0.202847E-05
0.146104E-04	0.349648E-05	0.366361E-04	0.216685E-04	0.143972E-03	0.	0.	0.
0.927267E-04	0.300997E-13	0.974089E-10	0.241523E-07	0.104790E-06	0.344722E-06	0.191914E-06	0.498392E-06
0.102447E-05	0.204669E-05	0.217815E-05	0.341475E-05	0.178270E-05	0.344891E-05	0.151650E-04	0.817389E-05

0.267087E-05	0.314819E-04	0.388830E-05	0.692048E-04	0.424251E-04	0.165966E-03	0.	0.
0.	0.312216E-04	0.975533E-12	0.284909E-09	0.191025E-07	0.883607E-07	0.145163E-06	0.937805E-07
0.351999E-06	0.629731E-06	0.984279E-06	0.902118E-06	0.225022E-05	0.953604E-06	0.250678E-05	0.940462E-05
0.384258E-05	0.292965E-05	0.176492E-04	0.547187E-05	0.525462E-04	0.252105E-04	0.646688E-04	0.
0.	0.	0.289655E-04	0.148708E-11	0.353748E-10	0.711017E-08	0.309978E-07	0.846833E-07
0.291728E-07	0.165727E-06	0.203825E-06	0.534944E-06	0.342003E-06	0.101472E-05	0.140034E-05	0.108570E-05
0.455296E-05	0.173375E-05	0.103450E-05	0.584979E-05	0.118698E-05	0.174648E-04	0.114103E-04	0.348189E-04
0.	0.	0.	0.789501E-05	0.137680E-10	0.124019E-08	0.544321E-07	0.173458E-06
0.380453E-06	0.303170E-06	0.217003E-05	0.784825E-06	0.298668E-05	0.157543E-05	0.514227E-05	0.682341E-05
0.427444E-05	0.253290E-04	0.981216E-05	0.788425E-05	0.301587E-04	0.183820E-04	0.558616E-04	0.389307E-04
0.195428E-03	0.	0.576166E-04	0.	0.158141E-03	0.560874E-13	0.364457E-09	0.168880E-06
0.430380E-06	0.736221E-06	0.613057E-06	0.282365E-05	0.234642E-05	0.616975E-05	0.472279E-05	0.895610E-05
0.121949E-04	0.114882E-04	0.502985E-04	0.327901E-04	0.152209E-04	0.890625E-04	0.538634E-04	0.174269E-03
0.101753E-03	0.359712E-03	0.	0.141416E-03	0.	0.764922E-04	0.184618E-11	0.252570E-08
0.574340E-07	0.301711E-06	0.430435E-06	0.419393E-06	0.195185E-05	0.147940E-05	0.361576E-05	0.232858E-05
0.760705E-05	0.700327E-05	0.835701E-05	0.293160E-04	0.139152E-04	0.187121E-04	0.611297E-04	0.505081E-04
0.131092E-03	0.667340E-04	0.141283E-03	0.	0.130862E-03	0.	0.109166E-03	0.303051E-11
0.439151E-09	0.410325E-07	0.135176E-06	0.216507E-06	0.198190E-06	0.100139E-05	0.663932E-06	0.170592E-05
0.118198E-05	0.262867E-05	0.533473E-05	0.314294E-05	0.146363E-04	0.728557E-05	0.646199E-05	0.181787E-04
0.138875E-04	0.517152E-04	0.362848E-04	0.825568E-04	0.	0.345083E-04	0.	0.378205E-04
0.184261E-10	0.236812E-08	0.844103E-07	0.267730E-06	0.486793E-06	0.427158E-06	0.285035E-05	0.107462E-05
0.428476E-05	0.217346E-05	0.689382E-05	0.109506E-04	0.613340E-05	0.342713E-04	0.138738E-04	0.143531E-04
0.473449E-04	0.262908E-04	0.750858E-04	0.597676E-04	0.243139E-03	0.	0.910674E-04	0.
0.216196E-03	0.772114E-13	0.582286E-09	0.267020E-06	0.712998E-06	0.111075E-05	0.967031E-06	0.414701E-05
0.362849E-05	0.971534E-05	0.677887E-05	0.133501E-04	0.185581E-04	0.181626E-04	0.756773E-04	0.493369E-04
0.261012E-04	0.145691E-03	0.807940E-04	0.264514E-03	0.154883E-03	0.543805E-03	0.	0.198478E-03
0.	0.110741E-03	0.253456E-11	0.403702E-08	0.928420E-07	0.510914E-06	0.669890E-06	0.677707E-06
0.298748E-05	0.229779E-05	0.589941E-05	0.364945E-05	0.117298E-04	0.110196E-04	0.132633E-04	0.458216E-04
0.214120E-04	0.312762E-04	0.971431E-04	0.790457E-04	0.205169E-03	0.104349E-03	0.219058E-03	0.
0.195864E-03	0.	0.170996E-03	0.428897E-11	0.714884E-09	0.673673E-07	0.234267E-06	0.341090E-06
0.327808E-06	0.156513E-05	0.106282E-05	0.278878E-05	0.192219E-05	0.412694E-05	0.860177E-05	0.515199E-05
0.232506E-04	0.113589E-04	0.105650E-04	0.300731E-04	0.220218E-04	0.829488E-04	0.574101E-04	0.131458E-03
0.	0.529979E-04	0.	0.602969E-04	0.217474E-10	0.309807E-08	0.106391E-06	0.339132E-06
0.581357E-06	0.538534E-06	0.340298E-05	0.130769E-05	0.537669E-05	0.263272E-05	0.843344E-05	0.140044E-04
0.749562E-05	0.417285E-04	0.169582E-04	0.189342E-04	0.601492E-04	0.319349E-04	0.911689E-04	0.726089E-04
0.293792E-03	0.	0.110379E-03	0.	0.256897E-03	0.921873E-13	0.751419E-09	0.339967E-06
0.926426E-06	0.140286E-05	0.123076E-05	0.520533E-05	0.459354E-05	0.123826E-04	0.844717E-05	0.167762E-04
0.236511E-04	0.235845E-04	0.953236E-04	0.619890E-04	0.333806E-04	0.186343E-03	0.101500E-03	0.332316E-03
0.195724E-03	0.689751E-03	0.	0.244137E-03	0.	0.137754E-03	0.553180E-11	0.516873E-06
0.119013E-06	0.667759E-06	0.851597E-06	0.870641E-06	0.381541E-05	0.293958E-05	0.761843E-05	0.474768E-05
0.149738E-04	0.141967E-04	0.172420E-04	0.586004E-04	0.273211E-04	0.400517E-04	0.124973E-03	0.100986E-03
0.262478E-03	0.133184E-03	0.280971E-03	0.	0.248761E-03	0.	0.218257E-03	0.946693E-11
0.926242E-09	0.873046E-07	0.306770E-06	0.440667E-06	0.425133E-06	0.202092E-05	0.137405E-05	0.362635E-05
0.250408E-05	0.533066E-05	0.111495E-04	0.674050E-05	0.300848E-04	0.146590E-04	0.136772E-04	0.391737E-04
0.284670E-04	0.107301E-03	0.742548E-04	0.170179E-03	0.	0.681726E-04	0.	0.781807E-04
0.291215E-10	0.356842E-08	0.120049E-06	0.387403E-06	0.643660E-06	0.610599E-06	0.375100E-05	0.147878E-05

0.616352E-05	0.286693E-05	0.943769E-05	0.158322E-04	0.846835E-05	0.471374E-04	0.190710E-04	0.212332E-04
0.684644E-04	0.351166E-04	0.102431E-03	0.807017E-04	0.329218E-03	0.	0.124890E-03	0.
0.283739E-03	0.105450E-12	0.845705E-09	0.384917E-06	0.105151E-05	0.159337E-05	0.139850E-05	0.588083E-05
0.519799E-05	0.141013E-04	0.950844E-05	0.189568E-04	0.267922E-04	0.269260E-04	0.108187E-03	0.700245E-04
0.377632E-04	0.211539E-03	0.114551E-03	0.375905E-03	0.221670E-03	0.781805E-03	0.	0.275040E-03
0.	0.155039E-03	0.626380E-11	0.587644E-08	0.135514E-06	0.761665E-06	0.968511E-06	0.990324E-06
0.433836E-05	0.334256E-05	0.867164E-05	0.540268E-05	0.170372E-04	0.161772E-04	0.196653E-04	0.666894E-04
0.310620E-04	0.455538E-04	0.142233E-03	0.114810E-03	0.298558E-03	0.151384E-03	0.319691E-03	0.
0.282576E-03	0.	0.248135E-03	0.108178E-10	0.105876E-08	0.998124E-07	0.351106E-06	0.503934E-06
0.486051E-06	0.231070E-05	0.157076E-05	0.415058E-05	0.286432E-05	0.609521E-05	0.127561E-04	0.772769E-05
0.344085E-04	0.167605E-04	0.156532E-04	0.448345E-04	0.325405E-04	0.122690E-03	0.849099E-04	0.194619E-03
0.	0.779160E-04	0.	0.894530E-04	0.306024E-10	0.372797E-08	0.124589E-06	0.404107E-06
0.652255E-06	0.639293E-06	0.389156E-05	0.153866E-05	0.643125E-05	0.300077E-05	0.953783E-05	0.160266E-04
0.859455E-05	0.488239E-04	0.197282E-04	0.220512E-04	0.718859E-04	0.360831E-04	0.106181E-03	0.833145E-04
0.340214E-03	0.	0.129252E-03	0.	0.289222E-03	0.240084E-13	0.878095E-09	0.400317E-06
0.109540E-05	0.165921E-05	0.145488E-05	0.611135E-05	0.540584E-05	0.146678E-04	0.994718E-05	0.196855E-04
0.278710E-04	0.280360E-04	0.112525E-03	0.727855E-04	0.393432E-04	0.219875E-03	0.119022E-03	0.390694E-03
0.230585E-03	0.813373E-03	0.	0.285967E-03	0.	0.160915E-03	0.648493E-11	0.611742E-08
0.141108E-06	0.792984E-06	0.100676E-05	0.103107E-05	0.451741E-05	0.348006E-05	0.902954E-05	0.562796E-05
0.177370E-04	0.168450E-04	0.204901E-04	0.694396E-04	0.323394E-04	0.474408E-04	0.148103E-03	0.119520E-03
0.310827E-03	0.157589E-03	0.332832E-03	0.	0.294227E-03	0.	0.258290E-03	0.112802E-10
0.110392E-08	0.104074E-06	0.366152E-06	0.525487E-06	0.506798E-06	0.240965E-05	0.163785E-05	0.432863E-05
0.298693E-05	0.635646E-05	0.133016E-04	0.806152E-05	0.358823E-04	0.174786E-04	0.163245E-04	0.467580E-04
0.339303E-04	0.127939E-03	0.885433E-04	0.202958E-03	0.	0.812567E-04	0.	0.932925E-04
0.291215E-10	0.356842E-08	0.120049E-06	0.387403E-06	0.643660E-06	0.610599E-06	0.375100E-05	0.147878E-05
0.616352E-05	0.286693E-05	0.943769E-05	0.158322E-04	0.846835E-05	0.471374E-04	0.190710E-04	0.212332E-04
0.684644E-04	0.351166E-04	0.102431E-03	0.807017E-04	0.329218E-03	0.	0.124890E-03	0.
0.283739E-03	0.105450E-12	0.845705E-09	0.384917E-06	0.105151E-05	0.159337E-05	0.139850E-05	0.588083E-05
0.519799E-05	0.141013E-04	0.950844E-05	0.189568E-04	0.267922E-04	0.269260E-04	0.108187E-03	0.700245E-04
0.377632E-04	0.211539E-03	0.114551E-03	0.375905E-03	0.221670E-03	0.781805E-03	0.	0.275040E-03
0.	0.155039E-03	0.626380E-11	0.587644E-08	0.135514E-06	0.761665E-06	0.968511E-06	0.990324E-06
0.433836E-05	0.334256E-05	0.867164E-05	0.540268E-05	0.170372E-04	0.161772E-04	0.196653E-04	0.666894E-04
0.310620E-04	0.455538E-04	0.142233E-03	0.114810E-03	0.298558E-03	0.151384E-03	0.319691E-03	0.
0.282576E-03	0.	0.248135E-03	0.108178E-10	0.105876E-08	0.998124E-07	0.351106E-06	0.503934E-06
0.486051E-06	0.231070E-05	0.157076E-05	0.415058E-05	0.286432E-05	0.609521E-05	0.127561E-04	0.772769E-05
0.344085E-04	0.167605E-04	0.156532E-04	0.448345E-04	0.325405E-04	0.122690E-03	0.849099E-04	0.194619E-03
0.	0.779160E-04	0.	0.894530E-04	0.217474E-10	0.309807E-08	0.106391E-06	0.339132E-06
0.581357E-06	0.538534E-06	0.340298E-05	0.130769E-05	0.537669E-05	0.263272E-05	0.843344E-05	0.140044E-04
0.749562E-05	0.417285E-04	0.169582E-04	0.189342E-04	0.601492E-04	0.319349E-04	0.911689E-04	0.726089E-04
0.293792E-03	0.	0.110379E-03	0.	0.256897E-03	0.921873E-13	0.751419E-09	0.339967E-06
0.926426E-06	0.140286E-05	0.123076E-05	0.520533E-05	0.459354E-05	0.123826E-04	0.844717E-05	0.167762E-04
0.236511E-04	0.235845E-04	0.953236E-04	0.619890E-04	0.333806E-04	0.186343E-03	0.101500E-03	0.332316E-03
0.195724E-03	0.689751E-03	0.	0.244137E-03	0.	0.137754E-03	0.553180E-11	0.516873E-08
0.119013E-06	0.667759E-06	0.851597E-06	0.870641E-06	0.381541E-05	0.293958E-05	0.761843E-05	0.474768E-05
0.149738E-04	0.141967E-04	0.172420E-04	0.586004E-04	0.273211E-04	0.400517E-04	0.124973E-03	0.100986E-03
0.262478E-03	0.133184E-03	0.280971E-03	0.	0.248761E-03	0.	0.218257E-03	0.946693E-11

0.926242E-09	0.873046E-07	0.306770E-05	0.440667E-06	0.425133E-06	0.202092E-05	0.137405E-05	0.362635E-05
0.250408E-05	0.533066E-05	0.111495E-04	0.674050E-05	0.300848E-04	0.146590E-04	0.136772E-04	0.391737E-04
0.284670E-04	0.107301E-03	0.742548E-04	0.170177E-03	0.	0.681726E-04	0.	0.781807E-04
0.184261E-10	0.236812E-08	0.844103E-07	0.267730E-06	0.486793E-06	0.427158E-06	0.285035E-05	0.107462E-05
0.428476E-05	0.217346E-05	0.689382E-05	0.109506E-04	0.613340E-05	0.342713E-04	0.138738E-04	0.143531E-04
0.473449E-04	0.262908E-04	0.750858E-04	0.597676E-04	0.243139E-03	0.	0.910674E-04	0.
0.216196E-03	0.772114E-13	0.582286E-09	0.267020E-06	0.712998E-06	0.111075E-05	0.967031E-06	0.414701E-05
0.362849E-05	0.971534E-05	0.677887E-05	0.133501E-04	0.185581E-04	0.181626E-04	0.756773E-04	0.493369E-04
0.261012E-04	0.145691E-03	0.807940E-04	0.264514E-03	0.154883E-03	0.543805E-03	0.	0.198478E-03
0.	0.110741E-03	0.253456E-11	0.403702E-08	0.928420E-07	0.510914E-06	0.669890E-06	0.677707E-06
0.298748E-05	0.229779E-05	0.589941E-05	0.364945E-05	0.117298E-04	0.110196E-04	0.132633E-04	0.458216E-04
0.214120E-04	0.312762E-04	0.971431E-04	0.790457E-04	0.205169E-03	0.104349E-03	0.219058E-03	0.
0.195864E-03	0.	0.170996E-03	0.428897E-11	0.714884E-09	0.673673E-07	0.234267E-06	0.341090E-06
0.327808E-06	0.156513E-05	0.106282E-05	0.278878E-05	0.192219E-05	0.412694E-05	0.860177E-05	0.515199E-05
0.232506E-04	0.113589E-04	0.105650E-04	0.300731E-04	0.220218E-04	0.829488E-04	0.574101E-04	0.131458E-04
0.	0.529979E-04	0.	0.602969E-04	0.137680E-10	0.124019E-08	0.544321E-07	0.173458E-06
0.380453E-06	0.303170E-06	0.217003E-05	0.784825E-06	0.298668E-05	0.157543E-05	0.514227E-05	0.682341E-05
0.427444E-05	0.253290E-04	0.981216E-05	0.788425E-05	0.301587E-04	0.183820E-04	0.558616E-04	0.389307E-04
0.195428E-03	0.	0.576166E-04	0.	0.158141E-03	0.560874E-13	0.364457E-09	0.168880E-06
0.430380E-06	0.736221E-06	0.613057E-06	0.282365E-05	0.234642E-05	0.616975E-05	0.472279E-05	0.895610E-05
0.121949E-04	0.114882E-04	0.502985E-04	0.327901E-04	0.152209E-04	0.890625E-04	0.538634E-04	0.174269E-04
0.101753E-03	0.359712E-03	0.	0.141416E-03	0.	0.764922E-04	0.184618E-11	0.252570E-06
0.574340E-07	0.301711E-06	0.430435E-06	0.419393E-06	0.195185E-05	0.147940E-05	0.361576E-05	0.232858E-05
0.760705E-05	0.700327E-05	0.835701E-05	0.293160E-04	0.139152E-04	0.187121E-04	0.611297E-04	0.505081E-04
0.131092E-03	0.667340E-04	0.141283E-03	0.	0.130862E-03	0.	0.109166E-03	0.303051E-11
0.439151E-09	0.410325E-07	0.135176E-06	0.216507E-06	0.198190E-06	0.100139E-05	0.663932E-06	0.170592E-05
0.118198E-05	0.262867E-05	0.533473E-05	0.314294E-05	0.146363E-04	0.728557E-05	0.646199E-05	0.181787E-04
0.138875E-04	0.517152E-04	0.362848E-04	0.825568E-04	0.	0.345083E-04	0.	0.378205E-04
0.804472E-11	0.361515E-10	0.169119E-07	0.691617E-07	0.279289E-06	0.140062E-06	0.373303E-06	0.453019E-06
0.159039E-05	0.623107E-06	0.293657E-05	0.297010E-05	0.270564E-05	0.130100E-04	0.409348E-05	0.202847E-05
0.146104E-04	0.349648E-05	0.366361E-04	0.216685E-04	0.143972E-03	0.	0.	0.
0.927267E-04	0.300997E-13	0.974089E-10	0.241523E-07	0.104790E-06	0.344722E-06	0.191914E-06	0.498392E-06
0.102447E-05	0.204669E-05	0.217815E-05	0.341475E-05	0.178270E-05	0.344891E-05	0.151650E-04	0.817389E-05
0.267087E-05	0.314819E-04	0.388830E-05	0.692048E-04	0.424251E-04	0.165966E-03	0.	0.
0.	0.312216E-04	0.975533E-12	0.284909E-09	0.191025E-07	0.883607E-07	0.145163E-06	0.937805E-05
0.351999E-06	0.629731E-06	0.984279E-06	0.902118E-06	0.225022E-05	0.953604E-06	0.250678E-05	0.940462E-05
0.384258E-05	0.292965E-05	0.176492E-04	0.547187E-05	0.525462E-04	0.252105E-04	0.646688E-04	0.
0.	0.	0.289655E-04	0.148708E-11	0.353748E-10	0.711017E-08	0.309978E-07	0.846833E-07
0.291728E-07	0.165727E-06	0.203825E-06	0.534944E-06	0.342003E-06	0.101472E-05	0.140034E-05	0.108570E-05
0.455296E-05	0.173375E-05	0.103450E-05	0.584979E-05	0.118698E-05	0.174648E-04	0.114103E-04	0.348189E-04
0.	0.	0.	0.789501E-05	0.217994E-10	0.186871E-10	0.555096E-08	0.299985E-07
0.155344E-06	0.338148E-07	0.154750E-06	0.210254E-06	0.616283E-06	0.349943E-06	0.118178E-05	0.834123E-06
0.927158E-06	0.697067E-05	0.214934E-05	0.102578E-05	0.681138E-05	0.133504E-05	0.197294E-04	0.104075E-04
0.604043E-04	0.	0.	0.	0.381516E-04	0.227071E-12	0.431830E-09	0.544063E-06
0.439677E-07	0.132469E-06	0.471532E-07	0.283633E-06	0.483682E-06	0.590717E-06	0.787610E-06	0.171576E-05
0.540984E-06	0.168625E-05	0.957751E-05	0.241288E-05	0.298970E-05	0.129333E-04	0.443112E-05	0.312444E-04

0.202602E-04	0.535083E-04	0.	0.	0.	0.228676E-04	0.197832E-12	0.589386E-11
0.862734E-08	0.190795E-07	0.128866E-06	0.731537E-07	0.197313E-06	0.307159E-06	0.630987E-06	0.570462E-06
0.120067E-05	0.642747E-06	0.165616E-05	0.530844E-05	0.159391E-05	0.140793E-05	0.591312E-05	0.133376E-05
0.148813E-04	0.111736E-04	0.614614E-04	0.	0.	0.	0.572228E-05	0.971631E-14
0.483958E-10	0.686178E-08	0.303267E-07	0.698201E-07	0.208132E-07	0.161300E-06	0.192509E-06	0.473536E-06
0.330611E-06	0.881840E-06	0.717923E-06	0.713241E-06	0.431561E-05	0.168693E-05	0.983821E-06	0.641506E-05
0.133403E-05	0.194257E-04	0.101493E-04	0.299655E-04	0.	0.	0.	0.812769E-05
0.353422E-10	0.375496E-09	0.202103E-07	0.672767E-07	0.209488E-06	0.113008E-06	0.742790E-06	0.340291E-06
0.112278E-05	0.868272E-06	0.189611E-05	0.233273E-05	0.155756E-05	0.125270E-04	0.464400E-05	0.314834E-05
0.122218E-04	0.662669E-05	0.336564E-04	0.178062E-04	0.849948E-04	0.	0.254581E-04	0.
0.692475E-04	0.364582E-12	0.128993E-08	0.403152E-07	0.137022E-06	0.316357E-06	0.361906E-06	0.164026E-05
0.110807E-05	0.244894E-05	0.177706E-05	0.435739E-05	0.259945E-05	0.628493E-05	0.264136E-04	0.148906E-04
0.156090E-04	0.516169E-04	0.316084E-04	0.613079E-04	0.532914E-04	0.114261E-03	0.	0.981282E-04
0.	0.510872E-04	0.385816E-12	0.365779E-10	0.424267E-07	0.107119E-06	0.408671E-06	0.293713E-06
0.125800E-05	0.116372E-05	0.206917E-05	0.267214E-05	0.324548E-05	0.308794E-05	0.592819E-05	0.189914E-04
0.122175E-04	0.904088E-05	0.211802E-04	0.157161E-04	0.415562E-04	0.533498E-04	0.165203E-03	0.
0.771269E-04	0.	0.206725E-04	0.205541E-13	0.230682E-09	0.407408E-07	0.134800E-06	0.231198E-06
0.227430E-06	0.103947E-05	0.723533E-06	0.184926E-05	0.143471E-05	0.311739E-05	0.354491E-05	0.341649E-05
0.180622E-04	0.986723E-05	0.870667E-05	0.287546E-04	0.171972E-04	0.559535E-04	0.420255E-04	0.861923E-04
0.	0.521341E-04	0.	0.275939E-04	0.715637E-10	0.812092E-09	0.291504E-07	0.117839E-06
0.262725E-06	0.196304E-06	0.104183E-05	0.470881E-06	0.153650E-05	0.112461E-05	0.256148E-05	0.375953E-05
0.246074E-05	0.168767E-04	0.672078E-05	0.589798E-05	0.168403E-04	0.993472E-05	0.458795E-04	0.295512E-04
0.110397E-03	0.	0.331798E-04	0.	0.954229E-04	0.479347E-12	0.204415E-08	0.669109E-07
0.251167E-06	0.481934E-06	0.585826E-06	0.248431E-05	0.171515E-05	0.396203E-05	0.285862E-05	0.661786E-05
0.394428E-05	0.102957E-04	0.405653E-04	0.226336E-04	0.249764E-04	0.811286E-04	0.477390E-04	0.939308E-04
0.845482E-04	0.176296E-03	0.	0.144728E-03	0.	0.762266E-04	0.890645E-12	0.616521E-10
0.675714E-07	0.179028E-06	0.647249E-06	0.473605E-06	0.196854E-05	0.184978E-05	0.340402E-05	0.433753E-05
0.509273E-05	0.494060E-05	0.956345E-05	0.299305E-04	0.193307E-04	0.150722E-04	0.338711E-04	0.243565E-04
0.657175E-04	0.846141E-04	0.264299E-03	0.	0.119140E-03	0.	0.325852E-04	0.450531E-13
0.383583E-09	0.671371E-07	0.228911E-06	0.377895E-06	0.376026E-06	0.169636E-05	0.118617E-05	0.306279E-05
0.238775E-05	0.508842E-05	0.580339E-05	0.565518E-05	0.294669E-04	0.160881E-04	0.143297E-04	0.474410E-04
0.280054E-04	0.911980E-04	0.689493E-04	0.141562E-03	0.	0.815248E-04	0.	0.448448E-04
0.872741E-10	0.110529E-08	0.360997E-07	0.157597E-06	0.326344E-06	0.245485E-06	0.127115E-05	0.579752E-06
0.190272E-05	0.145364E-05	0.308255E-05	0.464762E-05	0.297678E-05	0.204468E-04	0.781322E-05	0.781012E-05
0.212259E-04	0.120874E-04	0.567329E-04	0.363198E-04	0.133862E-03	0.	0.378623E-04	0.
0.117507E-03	0.104035E-11	0.259739E-08	0.844445E-07	0.329383E-06	0.612864E-06	0.748292E-06	0.314428E-05
0.217009E-05	0.505445E-05	0.367327E-05	0.836395E-05	0.508946E-05	0.132924E-04	0.511902E-04	0.285998E-04
0.317745E-04	0.103767E-03	0.601514E-04	0.118624E-03	0.107143E-03	0.224531E-03	0.	0.177547E-03
0.	0.957948E-04	0.114951E-11	0.777878E-10	0.867402E-07	0.230650E-06	0.830203E-06	0.607065E-06
0.252088E-05	0.237002E-05	0.437183E-05	0.556822E-05	0.651799E-05	0.633711E-05	0.123626E-04	0.383435E-04
0.247515E-04	0.193462E-04	0.433487E-04	0.311253E-04	0.839704E-04	0.108399E-03	0.339071E-03	0.
0.152023E-03	0.	0.415638E-04	0.580343E-13	0.497198E-09	0.870844E-07	0.297725E-06	0.490431E-06
0.488470E-06	0.220230E-05	0.153896E-05	0.397981E-05	0.310336E-05	0.660186E-05	0.753093E-05	0.736330E-05
0.382250E-04	0.208737E-04	0.185982E-04	0.615920E-04	0.363265E-04	0.118197E-03	0.895058E-04	0.183838E-03
0.	0.105351E-03	0.	0.582070E-04	0.111122E-09	0.132424E-08	0.404484E-07	0.177360E-06
0.343041E-06	0.277483E-06	0.142277E-05	0.652175E-06	0.216819E-05	0.160902E-05	0.346754E-05	0.538776E-05

0.320116E-05	0.228045E-04	0.831582E-05	0.898887E-05	0.244805E-04	0.131011E-04	0.645442E-04	0.399754E-04
0.149069E-03	0.	0.421716E-04	0.	0.128836E-03	0.116446E-11	0.293938E-08	0.954367E-07
0.374144E-06	0.693466E-06	0.847572E-06	0.355358E-05	0.245810E-05	0.574656E-05	0.416098E-05	0.947670E-05
0.577940E-05	0.150778E-04	0.578523E-04	0.323406E-04	0.359428E-04	0.117729E-03	0.680589E-04	0.134093E-05
0.121207E-03	0.254266E-03	0.	0.199802E-03	0.	0.108539E-03	0.131871E-11	0.876998E-10
0.986213E-07	0.262027E-06	0.944476E-06	0.689779E-06	0.286628E-05	0.269389E-05	0.497150E-05	0.633114E-05
0.741142E-05	0.721112E-05	0.140656E-04	0.436162E-04	0.281359E-04	0.220063E-04	0.492681E-04	0.353608E-04
0.953798E-04	0.123232E-03	0.385585E-03	0.	0.172734E-03	0.	0.471936E-04	0.738984E-15
0.568039E-09	0.995355E-07	0.340273E-06	0.560829E-06	0.558578E-06	0.251812E-05	0.175920E-05	0.454985E-05
0.354893E-05	0.754667E-05	0.860997E-05	0.842399E-05	0.437047E-04	0.238631E-04	0.212710E-04	0.704119E-04
0.415257E-04	0.135075E-03	0.102329E-03	0.210218E-03	0.	0.120490E-03	0.	0.665666E-04
0.115497E-09	0.138123E-08	0.420877E-07	0.183494E-06	0.365758E-06	0.289649E-06	0.147801E-05	0.677776E-06
0.219682E-05	0.170677E-05	0.364399E-05	0.563530E-05	0.323237E-05	0.235898E-04	0.850473E-05	0.937166E-05
0.255506E-04	0.135433E-04	0.664867E-04	0.413094E-04	0.153622E-03	0.	0.433392E-04	0.
0.132690E-03	0.120691E-11	0.305555E-08	0.991987E-07	0.389958E-06	0.720866E-06	0.881255E-06	0.369516E-05
0.255550E-05	0.598166E-05	0.433152E-05	0.985213E-05	0.600700E-05	0.156916E-04	0.602385E-04	0.336178E-04
0.373899E-04	0.122513E-03	0.707392E-04	0.139373E-03	0.125982E-03	0.264497E-03	0.	0.207421E-05
0.	0.112886E-03	0.137095E-11	0.910740E-10	0.102654E-06	0.272818E-06	0.983488E-06	0.717832E-06
0.298364E-05	0.280383E-05	0.517493E-05	0.659021E-05	0.771442E-05	0.750661E-05	0.146423E-04	0.453988E-04
0.292864E-04	0.229088E-04	0.512951E-04	0.368032E-04	0.992534E-04	0.128269E-03	0.401394E-03	0.
0.179762E-03	0.	0.491165E-04	0.770225E-13	0.592120E-09	0.103767E-06	0.354737E-06	0.584786E-06
0.582401E-06	0.262544E-05	0.183406E-05	0.474338E-05	0.370034E-05	0.786785E-05	0.897628E-05	0.878413E-05
0.455669E-04	0.248793E-04	0.221778E-04	0.734100E-04	0.432938E-04	0.140814E-03	0.106687E-03	0.219184E-03
0.	0.125651E-03	0.	0.694095E-04	0.111122E-09	0.132424E-08	0.404484E-07	0.177360E-06
0.343041E-06	0.277483E-06	0.142277E-05	0.652175E-06	0.216819E-05	0.160902E-05	0.346754E-05	0.538776E-05
0.320116E-05	0.228045E-04	0.831582E-05	0.898887E-05	0.244805E-04	0.131011E-04	0.645442E-04	0.399754E-04
0.149069E-03	0.	0.421716E-04	0.	0.128836E-03	0.116446E-11	0.293938E-08	0.954367E-07
0.374144E-06	0.693466E-06	0.847572E-06	0.355358E-05	0.245810E-05	0.574656E-05	0.416098E-05	0.947670E-05
0.577940E-05	0.150778E-04	0.578523E-04	0.323406E-04	0.359428E-04	0.117729E-03	0.680589E-04	0.134093E-05
0.121207E-03	0.254266E-03	0.	0.199802E-03	0.	0.108539E-03	0.131871E-11	0.876998E-10
0.986213E-07	0.262027E-06	0.944476E-06	0.689779E-06	0.286628E-05	0.269389E-05	0.497150E-05	0.633114E-05
0.741142E-05	0.721112E-05	0.140656E-04	0.436162E-04	0.281359E-04	0.220063E-04	0.492681E-04	0.353608E-04
0.953798E-04	0.123232E-03	0.385585E-03	0.	0.172734E-03	0.	0.471936E-04	0.738984E-15
0.568039E-09	0.995355E-07	0.340273E-06	0.560829E-06	0.558578E-06	0.251812E-05	0.175920E-05	0.454985E-05
0.354893E-05	0.754667E-05	0.860997E-05	0.842399E-05	0.437047E-04	0.238631E-04	0.212710E-04	0.704119E-04
0.415257E-04	0.135075E-03	0.102329E-03	0.210218E-03	0.	0.120490E-03	0.	0.665666E-04
0.872741E-10	0.110529E-08	0.360997E-07	0.157597E-06	0.326344E-06	0.245485E-06	0.127115E-05	0.579752E-06
0.190272E-05	0.145364E-05	0.308255E-05	0.464762E-05	0.297678E-05	0.204468E-04	0.781322E-05	0.781012E-05
0.212259E-04	0.120874E-04	0.567329E-04	0.363198E-04	0.133862E-03	0.	0.378623E-04	0.
0.117507E-03	0.104035E-11	0.259739E-08	0.844445E-07	0.329383E-06	0.612864E-06	0.748292E-06	0.314428E-05
0.217009E-05	0.505445E-05	0.367327E-05	0.836395E-05	0.508946E-05	0.132924E-04	0.511902E-04	0.285998E-04
0.317745E-04	0.103767E-03	0.601514E-04	0.118624E-03	0.107143E-03	0.224531E-03	0.	0.177547E-05
0.	0.957948E-04	0.114951E-11	0.777878E-10	0.867402E-07	0.230650E-06	0.830203E-06	0.607065E-06
0.252088E-05	0.237002E-05	0.437183E-05	0.556822E-05	0.651799E-05	0.633711E-05	0.123626E-04	0.383435E-04
0.247515E-04	0.193462E-04	0.433487E-04	0.311253E-04	0.839704E-04	0.108399E-03	0.339071E-03	0.
0.152023E-03	0.	0.415638E-04	0.580343E-13	0.497198E-09	0.870844E-07	0.297725E-06	0.490431E-06

0.488470E-06	0.220230E-05	0.153896E-05	0.397981E-05	0.310336E-05	0.660186E-05	0.753093E-05	0.736330E-05
0.382250E-04	0.208737E-04	0.185982E-04	0.615920E-04	0.363265E-04	0.118197E-03	0.895058E-04	0.183838E-03
0.	0.105351E-03	0.	0.582070E-04	0.715637E-10	0.812092E-09	0.291504E-07	0.117839E-06
0.262725E-06	0.196304E-06	0.104183E-05	0.470881E-06	0.153650E-05	0.112461E-05	0.256148E-05	0.375953E-05
0.246074E-05	0.168767E-04	0.672078E-05	0.589798E-05	0.168403E-04	0.993472E-05	0.458795E-04	0.295512E-04
0.110397E-03	0.	0.331798E-04	0.	0.954229E-04	0.479347E-12	0.204415E-08	0.669109E-07
0.251167E-06	0.481934E-06	0.585826E-06	0.248431E-05	0.171515E-05	0.396203E-05	0.285862E-05	0.661786E-05
0.394428E-05	0.102957E-04	0.405653E-04	0.226336E-04	0.249764E-04	0.811286E-04	0.477390E-04	0.939308E-04
0.845482E-04	0.176296E-03	0.	0.144728E-03	0.	0.762266E-04	0.890645E-12	0.616521E-10
0.675714E-07	0.179028E-06	0.647249E-06	0.473605E-06	0.196854E-05	0.184978E-05	0.340402E-05	0.433753E-05
0.509273E-05	0.494060E-05	0.956345E-05	0.299305E-04	0.193307E-04	0.150722E-04	0.338711E-04	0.243665E-04
0.657175E-04	0.846141E-04	0.264299E-03	0.	0.119140E-03	0.	0.325852E-04	0.450531E-13
0.383583E-09	0.671371E-07	0.228911E-06	0.377895E-06	0.376026E-06	0.169636E-05	0.118617E-05	0.306279E-05
0.238775E-05	0.508842E-05	0.580339E-05	0.565518E-05	0.294669E-04	0.160881E-04	0.143297E-04	0.474410E-04
0.280054E-04	0.911980E-04	0.689494E-04	0.141562E-03	0.	0.815248E-04	0.	0.448448E-04
0.353422E-10	0.375496E-09	0.202103E-07	0.672767E-07	0.209488E-06	0.113008E-06	0.742790E-06	0.340291E-06
0.112278E-05	0.868272E-06	0.189611E-05	0.233273E-05	0.155756E-05	0.125270E-04	0.464400E-05	0.314834E-05
0.122218E-04	0.662669E-05	0.336564E-04	0.178062E-04	0.849948E-04	0.	0.254581E-04	0.
0.692475E-04	0.364582E-12	0.128993E-08	0.403152E-07	0.137022E-06	0.316357E-06	0.361906E-06	0.164026E-05
0.110807E-05	0.244894E-05	0.177706E-05	0.435739E-05	0.259945E-05	0.628493E-05	0.264136E-04	0.148906E-04
0.156090E-04	0.516169E-04	0.316084E-04	0.613079E-04	0.532914E-04	0.114261E-03	0.	0.981282E-04
0.	0.510872E-04	0.385816E-12	0.365779E-10	0.424267E-07	0.107119E-06	0.408671E-06	0.293713E-06
0.125800E-05	0.116372E-05	0.206917E-05	0.267214E-05	0.324548E-05	0.308794E-05	0.592819E-05	0.189914E-04
0.122175E-04	0.904088E-05	0.211802E-04	0.157161E-04	0.415562E-04	0.533498E-04	0.165203E-03	0.
0.771269E-04	0.	0.206725E-04	0.205541E-13	0.230682E-09	0.407408E-07	0.134800E-06	0.231198E-06
0.227430E-06	0.103947E-05	0.723533E-06	0.184926E-05	0.143471E-05	0.311739E-05	0.354491E-05	0.341649E-05
0.180622E-04	0.986723E-05	0.870667E-05	0.287546E-04	0.171972E-04	0.559535E-04	0.420255E-04	0.861923E-04
0.	0.521341E-04	0.	0.275939E-04	0.217994E-10	0.186871E-10	0.555096E-08	0.299985E-07
0.155344E-06	0.338148E-07	0.154750E-06	0.210254E-06	0.616283E-06	0.349943E-06	0.118178E-05	0.834123E-06
0.927158E-06	0.697067E-05	0.214934E-05	0.102578E-05	0.681138E-05	0.133504E-05	0.197294E-04	0.104075E-04
0.604043E-04	0.	0.	0.	0.381516E-04	0.227071E-12	0.431830E-09	0.544063E-08
0.439677E-07	0.132469E-06	0.471532E-07	0.283633E-06	0.483682E-06	0.590717E-06	0.787610E-06	0.171576E-05
0.540984E-06	0.168625E-05	0.957751E-05	0.241288E-05	0.298970E-05	0.129333E-04	0.443112E-05	0.312444E-04
0.202602E-04	0.535083E-04	0.	0.	0.	0.228676E-04	0.197832E-12	0.589386E-11
0.862734E-08	0.190795E-07	0.128866E-06	0.731537E-07	0.197313E-06	0.307159E-06	0.630987E-06	0.570462E-06
0.120067E-05	0.642747E-06	0.165616E-05	0.530844E-05	0.159391E-05	0.140793E-05	0.591312E-05	0.133376E-05
0.148813E-04	0.111736E-04	0.614614E-04	0.	0.	0.	0.572228E-05	0.971631E-14
0.483958E-10	0.686178E-08	0.303267E-07	0.698201E-07	0.208132E-07	0.161300E-06	0.192509E-06	0.473536E-06
0.330611E-06	0.881840E-06	0.717923E-06	0.713241E-06	0.431561E-05	0.168693E-05	0.983821E-06	0.641506E-05
0.133403E-05	0.194257E-04	0.101493E-04	0.299655E-04	0.	0.	0.	0.812769E-05
0.590734E-11	0.110677E-10	0.132583E-08	0.973811E-08	0.700205E-07	0.109855E-07	0.698441E-07	0.845661E-07
0.260437E-06	0.145572E-06	0.474067E-06	0.380787E-06	0.586663E-06	0.240944E-05	0.761196E-06	0.677977E-06
0.333181E-05	0.622882E-06	0.116167E-04	0.401897E-05	0.326933E-04	0.	0.	0.
0.214866E-04	0.176217E-12	0.476147E-13	0.255806E-08	0.125625E-07	0.740396E-07	0.703369E-08	0.122689E-06
0.162572E-06	0.338425E-06	0.393898E-06	0.750208E-06	0.145320E-05	0.680693E-06	0.353738E-05	0.156387E-05
0.805316E-06	0.397244E-05	0.137593E-05	0.995957E-05	0.110132E-04	0.242830E-04	0.	0.

0.	0.854548E-05	0.838993E-15	0.423723E-10	0.202651E-08	0.192622E-07	0.485677E-07	0.361980E-07
0.105353E-06	0.129512E-06	0.245782E-06	0.156782E-06	0.425660E-06	0.730395E-06	0.290582E-06	0.241919E-06
0.160940E-05	0.745660E-06	0.396490E-05	0.746863E-06	0.825334E-05	0.513702E-05	0.251139E-04	0.
0.	0.	0.278791E-05	0.133131E-13	0.488559E-11	0.507984E-08	0.167687E-07	0.445372E-07
0.197026E-07	0.916159E-07	0.116448E-06	0.319684E-06	0.209478E-06	0.547129E-06	0.442066E-06	0.493003E-06
0.232345E-05	0.981284E-06	0.646256E-06	0.389894E-05	0.785462E-06	0.113150E-04	0.614479E-05	0.196322E-04
0.	0.	0.	0.763159E-05	0.938058E-11	0.779174E-10	0.704225E-08	0.258449E-07
0.895897E-07	0.384663E-07	0.373029E-06	0.136305E-06	0.474891E-06	0.372850E-06	0.739512E-06	0.905269E-06
0.910253E-06	0.445658E-05	0.175066E-05	0.196158E-05	0.554043E-05	0.284047E-05	0.183945E-04	0.782972E-05
0.445661E-04	0.	0.142420E-04	0.	0.322975E-04	0.282940E-12	0.124569E-09	0.261036E-07
0.702619E-07	0.149658E-06	0.129414E-06	0.746525E-06	0.409075E-06	0.101968E-05	0.104979E-05	0.218491E-05
0.521350E-05	0.190103E-05	0.108542E-04	0.617620E-05	0.700552E-05	0.148094E-04	0.139974E-04	0.299580E-04
0.333587E-04	0.488821E-04	0.	0.402240E-04	0.	0.225079E-04	0.165153E-14	0.134106E-04
0.957489E-08	0.914870E-07	0.127099E-06	0.167208E-06	0.740075E-06	0.487574E-06	0.953381E-06	0.737482E-06
0.154099E-05	0.290713E-05	0.124449E-05	0.926028E-05	0.653414E-05	0.343965E-05	0.153783E-04	0.145938E-04
0.273776E-04	0.153187E-04	0.725491E-04	0.	0.291466E-04	0.	0.979044E-05	0.284856E-14
0.190510E-10	0.297570E-07	0.796972E-07	0.147586E-06	0.151366E-06	0.665182E-06	0.451028E-06	0.125045E-05
0.965146E-06	0.199018E-05	0.229274E-05	0.217796E-05	0.108289E-04	0.567911E-05	0.635157E-05	0.166150E-04
0.112523E-04	0.352249E-04	0.265253E-04	0.596596E-04	0.	0.258445E-04	0.	0.285511E-04
0.215951E-10	0.127275E-09	0.131131E-07	0.405206E-07	0.114879E-06	0.688201E-07	0.495342E-06	0.195991E-06
0.615644E-06	0.516012E-06	0.105388E-05	0.180477E-05	0.126262E-05	0.603139E-05	0.273721E-05	0.354602E-05
0.747799E-05	0.483124E-05	0.248004E-04	0.131915E-04	0.591746E-04	0.	0.215936E-04	0.
0.401925E-04	0.372010E-12	0.197097E-09	0.410491E-07	0.118983E-06	0.230870E-06	0.203166E-06	0.112744E-05
0.645034E-06	0.162675E-05	0.164274E-05	0.338030E-05	0.818846E-05	0.320930E-05	0.168449E-04	0.970477E-05
0.113442E-04	0.231797E-04	0.213595E-04	0.452457E-04	0.520125E-04	0.742927E-04	0.	0.537891E-04
0.	0.344329E-04	0.227517E-14	0.219371E-09	0.156743E-07	0.154010E-06	0.202717E-06	0.274575E-06
0.118274E-05	0.782179E-06	0.155586E-05	0.117898E-05	0.246095E-05	0.472193E-05	0.200586E-05	0.148829E-04
0.104916E-04	0.556507E-05	0.251218E-04	0.234073E-04	0.437747E-04	0.243256E-04	0.117325E-03	0.
0.440297E-04	0.	0.152451E-04	0.688418E-13	0.321241E-10	0.497608E-07	0.139775E-06	0.244585E-06
0.253887E-06	0.109997E-05	0.751551E-06	0.209736E-05	0.161249E-05	0.329618E-05	0.382988E-05	0.367343E-05
0.180245E-04	0.940103E-05	0.105964E-04	0.278060E-04	0.186617E-04	0.586983E-04	0.440950E-04	0.992624E-04
0.	0.423595E-04	0.	0.474143E-04	0.266168E-10	0.186976E-09	0.160466E-07	0.564754E-07
0.130820E-06	0.986246E-07	0.592397E-06	0.248497E-06	0.826729E-06	0.643051E-06	0.135606E-05	0.234275E-05
0.159755E-05	0.749921E-05	0.338052E-05	0.503181E-05	0.964118E-05	0.605304E-05	0.312211E-04	0.164095E-04
0.702274E-04	0.	0.266273E-04	0.	0.458261E-04	0.807129E-12	0.250090E-09	0.520987E-07
0.153695E-06	0.294035E-06	0.257502E-06	0.141568E-05	0.820530E-06	0.208862E-05	0.209832E-05	0.427569E-05
0.104128E-04	0.415062E-05	0.213325E-04	0.120768E-04	0.144731E-04	0.295603E-04	0.269830E-04	0.568956E-04
0.657693E-04	0.951940E-04	0.	0.642471E-04	0.	0.433762E-04	0.498197E-14	0.282219E-04
0.201044E-07	0.199711E-06	0.260597E-06	0.352490E-06	0.151971E-05	0.100289E-05	0.200318E-05	0.151708E-05
0.315874E-05	0.606852E-05	0.260915E-05	0.191206E-04	0.134749E-04	0.714618E-05	0.322887E-04	0.300299E-04
0.559784E-04	0.312066E-04	0.150562E-03	0.	0.554742E-04	0.	0.194561E-04	0.889801E-14
0.418626E-10	0.647170E-07	0.182232E-06	0.318448E-06	0.330567E-06	0.143249E-05	0.978287E-06	0.273126E-05
0.210075E-05	0.429128E-05	0.498760E-05	0.479054E-05	0.234592E-04	0.122383E-04	0.137897E-04	0.361823E-04
0.243000E-04	0.764064E-04	0.574103E-04	0.129294E-03	0.	0.550867E-04	0.	0.617414E-04
0.297886E-10	0.217786E-09	0.178858E-07	0.675311E-07	0.145045E-06	0.112869E-06	0.656313E-06	0.283791E-06
0.909913E-06	0.707670E-06	0.153601E-05	0.258559E-05	0.181629E-05	0.836273E-05	0.373024E-05	0.567078E-05

0.111752E-04	0.676587E-05	0.356429E-04	0.181487E-04	0.779104E-04	0.	0.287154E-04	0.
0.490240E-04	0.903119E-12	0.282878E-09	0.588952E-07	0.174481E-06	0.333439E-06	0.291259E-06	0.160141E-05
0.928082E-06	0.236599E-05	0.238150E-05	0.483695E-05	0.117803E-04	0.469461E-05	0.241407E-04	0.135152E-04
0.163807E-04	0.335928E-04	0.305019E-04	0.642164E-04	0.742955E-04	0.107783E-03	0.	0.710216E-04
0.	0.490572E-04	0.563553E-14	0.320950E-09	0.228347E-07	0.227007E-06	0.296499E-06	0.400506E-06
0.172829E-05	0.113939E-05	0.227632E-05	0.172466E-05	0.359220E-05	0.690019E-05	0.296641E-05	0.217397E-04
0.153207E-04	0.812495E-05	0.366907E-04	0.341339E-04	0.635380E-04	0.354685E-04	0.171113E-03	0.
0.623689E-04	0.	0.220738E-04	0.101420E-12	0.478939E-10	0.739824E-07	0.208411E-06	0.364274E-06
0.378081E-06	0.163892E-05	0.111882E-05	0.312361E-05	0.240304E-05	0.490881E-05	0.570482E-05	0.547935E-05
0.268287E-04	0.139985E-04	0.157700E-04	0.413747E-04	0.277990E-04	0.873859E-04	0.656658E-04	0.147924E-03
0.	0.630066E-04	0.	0.706273E-04	0.309290E-10	0.227401E-09	0.186267E-07	0.712618E-07
0.141969E-06	0.117272E-06	0.675698E-06	0.294474E-06	0.933926E-06	0.738365E-06	0.157949E-05	0.269402E-05
0.171734E-05	0.868950E-05	0.385781E-05	0.586839E-05	0.117322E-04	0.703829E-05	0.369357E-04	0.188864E-04
0.792925E-04	0.	0.292295E-04	0.	0.486310E-04	0.936095E-12	0.294011E-09	0.612127E-07
0.181504E-06	0.346484E-06	0.302686E-06	0.166507E-05	0.964533E-06	0.245820E-05	0.247620E-05	0.502850E-05
0.122436E-04	0.488414E-05	0.251019E-04	0.140299E-04	0.170292E-04	0.349278E-04	0.316932E-04	0.667145E-04
0.772286E-04	0.112020E-03	0.	0.724335E-04	0.	0.509915E-04	0.585747E-14	0.334055E-09
0.237595E-07	0.236259E-06	0.308646E-06	0.416761E-06	0.179892E-05	0.118564E-05	0.236871E-05	0.179494E-05
0.373902E-05	0.718159E-05	0.308735E-05	0.226261E-04	0.159461E-04	0.845588E-05	0.381819E-04	0.355250E-04
0.661026E-04	0.369114E-04	0.178074E-03	0.	0.648226E-04	0.	0.229624E-04	0.105633E-12
0.499374E-10	0.771222E-07	0.217283E-06	0.379806E-06	0.394183E-06	0.170889E-05	0.116645E-05	0.325656E-05
0.250549E-05	0.511811E-05	0.594783E-05	0.571271E-05	0.279707E-04	0.145951E-04	0.164412E-04	0.431345E-04
0.289850E-04	0.911068E-04	0.684638E-04	0.154239E-03	0.	0.656925E-04	0.	0.736390E-04
0.297886E-10	0.217786E-09	0.178858E-07	0.675311E-07	0.145045E-06	0.112869E-06	0.656313E-06	0.283791E-06
0.909913E-06	0.707670E-06	0.153601E-05	0.258559E-05	0.181629E-05	0.836273E-05	0.373024E-05	0.567078E-05
0.111752E-04	0.676587E-05	0.356429E-04	0.181487E-04	0.779104E-04	0.	0.287154E-04	0.
0.490240E-04	0.903119E-12	0.282878E-09	0.588952E-07	0.174481E-06	0.333439E-06	0.291259E-06	0.160141E-05
0.928082E-06	0.236599E-05	0.238150E-05	0.483695E-05	0.117803E-04	0.469461E-05	0.241407E-04	0.135152E-04
0.163807E-04	0.335928E-04	0.305019E-04	0.642164E-04	0.742955E-04	0.107783E-03	0.	0.710216E-04
0.	0.490572E-04	0.563553E-14	0.320950E-09	0.228347E-07	0.227007E-06	0.296499E-06	0.400506E-06
0.172829E-05	0.113939E-05	0.227632E-05	0.172466E-05	0.359220E-05	0.690019E-05	0.296641E-05	0.217397E-04
0.153207E-04	0.812495E-05	0.366907E-04	0.341339E-04	0.635380E-04	0.354685E-04	0.171113E-03	0.
0.623689E-04	0.	0.220738E-04	0.101420E-12	0.478939E-10	0.739824E-07	0.208411E-06	0.364274E-06
0.378081E-06	0.163892E-05	0.111882E-05	0.312361E-05	0.240304E-05	0.490881E-05	0.570482E-05	0.547935E-05
0.268287E-04	0.139985E-04	0.157700E-04	0.413747E-04	0.277990E-04	0.873859E-04	0.656658E-04	0.147924E-03
0.	0.630066E-04	0.	0.706273E-04	0.266168E-10	0.186976E-09	0.160466E-07	0.564754E-07
0.130820E-06	0.986246E-07	0.592397E-06	0.248497E-06	0.826729E-06	0.643051E-06	0.135606E-05	0.234275E-05
0.159755E-05	0.749921E-05	0.338052E-05	0.503181E-05	0.964118E-05	0.605304E-05	0.312211E-04	0.164095E-04
0.702274E-04	0.	0.266273E-04	0.	0.458261E-04	0.807129E-12	0.250090E-09	0.520987E-07
0.153695E-06	0.294035E-06	0.257502E-06	0.141568E-05	0.820530E-06	0.208862E-05	0.209832E-05	0.427569E-05
0.104128E-04	0.415062E-05	0.213325E-04	0.120768E-04	0.144731E-04	0.295603E-04	0.269830E-04	0.568956E-04
0.657693E-04	0.951940E-04	0.	0.642471E-04	0.	0.433762E-04	0.498197E-14	0.282219E-09
0.201044E-07	0.199711E-06	0.260597E-06	0.352490E-06	0.151971E-05	0.100289E-05	0.200318E-05	0.151708E-05
0.315874E-05	0.606852E-05	0.260915E-05	0.191206E-04	0.134749E-04	0.714618E-05	0.322887E-04	0.300299E-04
0.559784E-04	0.312066E-04	0.150562E-03	0.	0.554742E-04	0.	0.194561E-04	0.889801E-13
0.418626E-10	0.647170E-07	0.182232E-06	0.318448E-06	0.330567E-06	0.143249E-05	0.978287E-06	0.273126E-05

0.210075E-05	0.429128E-05	0.498760E-05	0.479054E-05	0.234592E-04	0.122383E-04	0.137897E-04	0.361823E-04
0.243000E-04	0.764064E-04	0.574103E-04	0.129294E-03	0.	0.550867E-04	0.	0.617414E-04
0.215951E-10	0.127275E-09	0.131131E-07	0.405206E-07	0.114879E-06	0.688201E-07	0.495342E-06	0.195991E-06
0.615644E-06	0.516012E-06	0.105388E-05	0.180477E-05	0.126262E-05	0.603139E-05	0.273721E-05	0.354602E-05
0.747799E-05	0.483124E-05	0.248004E-04	0.131915E-04	0.591746E-04	0.	0.215936E-04	0.
0.401925E-04	0.372010E-12	0.197097E-09	0.410491E-07	0.118983E-06	0.230870E-06	0.203166E-06	0.112744E-05
0.645034E-06	0.162675E-05	0.164274E-05	0.338030E-05	0.818846E-05	0.320930E-05	0.168449E-04	0.970477E-05
0.113442E-04	0.231797E-04	0.213595E-04	0.452457E-04	0.520125E-04	0.742927E-04	0.	0.537891E-04
0.	0.344329E-04	0.227517E-14	0.219371E-09	0.156743E-07	0.154010E-06	0.202717E-06	0.274575E-06
0.118274E-05	0.782179E-06	0.155586E-05	0.117898E-05	0.246095E-05	0.472193E-05	0.200586E-05	0.148829E-04
0.104916E-04	0.556507E-05	0.251218E-04	0.234073E-04	0.437747E-04	0.243256E-04	0.117325E-03	0.
0.440297E-04	0.	0.152451E-04	0.688418E-13	0.321241E-10	0.497608E-07	0.139775E-06	0.244585E-06
0.253887E-06	0.109997E-05	0.751551E-06	0.209736E-05	0.161249E-05	0.329618E-05	0.382988E-05	0.367343E-05
0.180245E-04	0.940103E-05	0.105964E-04	0.278060E-04	0.186617E-04	0.586983E-04	0.440950E-04	0.992624E-04
0.	0.423595E-04	0.	0.474143E-04	0.938058E-11	0.779174E-10	0.704225E-08	0.258449E-07
0.895897E-07	0.384663E-07	0.373029E-06	0.136305E-06	0.474891E-06	0.372850E-06	0.739512E-06	0.905269E-06
0.910253E-06	0.445658E-05	0.175066E-05	0.196158E-05	0.554043E-05	0.284047E-05	0.183945E-04	0.782972E-05
0.445661E-04	0.	0.142420E-04	0.	0.322975E-04	0.282940E-12	0.124569E-09	0.261036E-07
0.702619E-07	0.149658E-06	0.129414E-06	0.746525E-06	0.409075E-06	0.101968E-05	0.104979E-05	0.218491E-05
0.521350E-05	0.190103E-05	0.108542E-04	0.617620E-05	0.700552E-05	0.148094E-04	0.139974E-04	0.299580E-04
0.333587E-04	0.488821E-04	0.	0.402240E-04	0.	0.225079E-04	0.165153E-14	0.134106E-04
0.957489E-08	0.914870E-07	0.127099E-06	0.167208E-06	0.740075E-06	0.487574E-06	0.953381E-06	0.737482E-06
0.154099E-05	0.290713E-05	0.124449E-05	0.926028E-05	0.653414E-05	0.343965E-05	0.153783E-04	0.145938E-04
0.273776E-04	0.153187E-04	0.725491E-04	0.	0.291466E-04	0.	0.979044E-05	0.284856E-13
0.190510E-10	0.297570E-07	0.796972E-07	0.147586E-06	0.151366E-06	0.665182E-06	0.451028E-06	0.125045E-05
0.965146E-06	0.199018E-05	0.229274E-05	0.217796E-05	0.108289E-04	0.567911E-05	0.635157E-05	0.166150E-04
0.112523E-04	0.352249E-04	0.265253E-04	0.596596E-04	0.	0.258445E-04	0.	0.285511E-04
0.590734E-11	0.110677E-10	0.132583E-08	0.973811E-08	0.700205E-07	0.109855E-07	0.698441E-07	0.845661E-07
0.260437E-06	0.145572E-06	0.474067E-06	0.380787E-06	0.586663E-06	0.240944E-05	0.761196E-06	0.677977E-06
0.333181E-05	0.622882E-06	0.116167E-04	0.401897E-05	0.326933E-04	0.	0.	0.
0.214866E-04	0.176217E-12	0.476147E-13	0.255806E-08	0.125625E-07	0.740396E-07	0.703369E-08	0.122689E-06
0.162572E-06	0.338425E-06	0.393898E-06	0.750208E-06	0.145320E-05	0.680693E-06	0.353738E-05	0.156387E-05
0.805316E-06	0.397244E-05	0.137593E-05	0.995957E-05	0.110132E-04	0.242830E-04	0.	0.
0.	0.854548E-05	0.838993E-15	0.423723E-10	0.202651E-08	0.192622E-07	0.485677E-07	0.361986E-07
0.105353E-06	0.129512E-06	0.245782E-06	0.156782E-06	0.425660E-06	0.730395E-06	0.290582E-06	0.241919E-05
0.160940E-05	0.745660E-06	0.396490E-05	0.746863E-06	0.825334E-05	0.513702E-05	0.251139E-04	0.
0.	0.	0.278791E-05	0.133131E-13	0.488559E-11	0.507984E-08	0.167687E-07	0.445372E-07
0.197026E-07	0.916159E-07	0.116448E-06	0.319684E-06	0.209478E-06	0.547129E-06	0.442066E-06	0.493003E-06
0.232345E-05	0.981284E-06	0.646256E-06	0.389894E-05	0.785462E-06	0.113150E-04	0.614479E-05	0.196322E-04
0.	0.	0.	0.763159E-05				

EDIT FOR STEP 2

THE FLUXB ARRAY IS

1.600784E-06	3.195427E-06	4.443866E-06	5.410796E-06	6.040957E-06	6.257993E-06
6.040957E-06	5.410796E-06	4.443866E-06	3.195427E-06	1.600784E-06	
1.933110E-06	5.177369E-06	7.674639E-06	9.625288E-06	1.087201E-05	1.130180E-05
1.087201E-05	9.625288E-06	7.674639E-06	5.177369E-06	1.933110E-06	
7.753661E-07	2.448844E-06	3.727194E-06	4.736324E-06	5.374520E-06	5.592734E-06
5.374520E-06	4.736324E-06	3.727194E-06	2.448844E-06	7.753661E-07	
2.524831E-08	7.410009E-08	1.140328E-07	1.455772E-07	1.655241E-07	1.723431E-07
1.655241E-07	1.455772E-07	1.140328E-07	7.410009E-08	2.524831E-08	
1.263887E-06	2.569003E-06	3.602153E-06	4.418601E-06	4.929953E-06	5.111266E-06
4.929953E-06	4.418601E-06	3.602153E-06	2.569003E-06	1.263887E-06	
1.439123E-06	3.942799E-06	5.826588E-06	7.302921E-06	8.251298E-06	8.578982E-06
8.251298E-06	7.302921E-06	5.826588E-06	3.942799E-06	1.439123E-06	
6.329425E-07	1.843916E-06	2.806370E-06	3.569920E-06	4.051264E-06	4.216043E-06
4.051264E-06	3.569920E-06	2.806370E-06	1.843916E-06	6.329425E-07	
2.863476E-08	8.627654E-08	1.331777E-07	1.703066E-07	1.939521E-07	2.020619E-07
1.939521E-07	1.703066E-07	1.331777E-07	8.627654E-08	2.863476E-08	
4.302110E-07	8.730112E-07	1.218835E-06	1.489850E-06	1.664370E-06	1.724459E-06
1.664370E-06	1.489850E-06	1.218835E-06	8.730112E-07	4.302110E-07	
5.933340E-07	1.873164E-06	2.850654E-06	3.603912E-06	4.079655E-06	4.242037E-06
4.079655E-06	3.603912E-06	2.850654E-06	1.873164E-06	5.933340E-07	
3.543289E-07	1.239647E-06	1.946566E-06	2.492330E-06	2.835365E-06	2.951986E-06
2.835365E-06	2.492330E-06	1.946566E-06	1.239647E-06	3.543289E-07	
1.492307E-07	5.253366E-07	8.424990E-07	1.090665E-06	1.247331E-06	1.300757E-06
1.247331E-06	1.090665E-06	8.424990E-07	5.253366E-07	1.492307E-07	
2.094001E-07	3.962241E-07	5.524072E-07	6.765163E-07	7.552254E-07	7.818015E-07
7.552254E-07	6.765163E-07	5.524072E-07	3.962241E-07	2.094001E-07	
2.781109E-07	9.143003E-07	1.418408E-06	1.797076E-06	2.032840E-06	2.113966E-06
2.032840E-06	1.797076E-06	1.418408E-06	9.143003E-07	2.781109E-07	
1.939310E-07	7.937110E-07	1.263159E-06	1.619421E-06	1.841167E-06	1.916507E-06
1.841167E-06	1.619421E-06	1.263159E-06	7.937110E-07	1.939310E-07	
1.379166E-07	6.016247E-07	9.861149E-07	1.279694E-06	1.463083E-06	1.525420E-06
1.463083E-06	1.279694E-06	9.861149E-07	6.016247E-07	1.379166E-07	
9.419838E-08	1.756741E-07	2.479447E-07	3.071389E-07	3.443640E-07	3.547364E-07
3.443640E-07	3.071389E-07	2.479447E-07	1.756741E-07	9.419838E-08	
1.141616E-07	4.061396E-07	6.293561E-07	7.975348E-07	9.015281E-07	9.366987E-07
9.015281E-07	7.975348E-07	6.293561E-07	4.061396E-07	1.141616E-07	
8.842756E-08	3.706319E-07	5.954209E-07	7.642616E-07	8.685019E-07	9.038504E-07
8.685019E-07	7.642616E-07	5.954209E-07	3.706319E-07	8.842756E-08	
8.427747E-08	3.842399E-07	6.397822E-07	8.329697E-07	9.527635E-07	9.933199E-07
9.527635E-07	8.329697E-07	6.397822E-07	3.842399E-07	8.427747E-08	

* LIST

C

MAIN PROGRAM CHAIN 1

DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),

1 XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)

DIMENSION XMULTI(15),MYER(12)

DIMENSION YE(25)

DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),

1 PPONEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),

2 A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),

3 FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(

4 10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),

5 SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),

6 VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(

7 150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(

8 4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),

9 V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)

DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)

COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU

COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,

1 XMULTI,SINSPE,IKAP,RODDEL,IALLL,I8,DELTA,IREG,BODEL,IBOREG,

2 ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,

3 IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,

4 ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,

5 ICHROD,ILESS,IB,MI11

COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO

1 ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,

2 I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF

COMMON FNOH,MYER,

1 TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,

2 D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1

3 ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,

4 IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,

5 SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,

6 SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ, ZZ1,ZZ2,IN,N1,NS,

7 NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24

8 ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,

9 XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH

COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRR00,

1 T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,

2 JACK, IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,

3 KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,

4 FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,

5 SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1

6 ,IHIGHB,ILOWB,FTOPB,FBOBB,FBTOPB,FBBBAV,BLAMDA,LAYERB,IRADB,

7 COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,

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      8      DELTAX,YDEL,KKISS,XN1,YN1,ZN1  
COMMON CHECKD  
COMMON YE  
COMMON ISUBE, ISUEST,ESTMI,NUT4,NUT5,ESTIM,ISLOP,ISOL1  
REWIND 12  
DO 10 IGD=1,705  
10  FFLUXB(IGD)=0.  
    IF(COP)2,2,1  
1   IF(KEY-1)2,2,3  
2   CALL INPUT  
3   REWIND NTAPA  
4   CALL PROCES  
    PRINT 40  
40  FORMAT (90H WHEN JOB IS COMPLETED SAVE TAPE B-6 AND REGISTER TO A.  
1KILLINGER  
    CALL CHAIN (2,4)  
    END
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LIST
SUBROUTINE INPUT
DIMENSION RODDEL(20),RODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1   XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1   PPONEL(4,4),FNEW(4,4),JSAVE(15),JFIN(10),IUT(4),TIGREA(15,4),
2   A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3   FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4   10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5   SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6   VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7   150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8   4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9   V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUX8(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTM1(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,BETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,ICIN,PRODI,
1   XMULTI,SINSPE,IKAP,RODDDEL,IALLL,IB,DELTA,IREG,BODEL,IBOREG,
2   ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3   IRDD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAGS,RORAIS,
4   ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5   ICHROD,ILESS,IB,M111
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFCCC
1   ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2   I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1   TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2   D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3   ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4   IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5   SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6   SOWT,I,KBD,IC,ID,IHST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7   NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8   ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9   XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRROD,
1   T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,
2   JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3   KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,
4   FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,KSUFLU,
5   SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6   ,IHIGHB,ILOWB,FTCPB,FBOBB,FBCPB,FBBBAV,BLAMD,AYERB,IRADB,
7   COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8   DELTAX,YDEL,KKISS,XN1,YN1,ZN1

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COMMON CHECKD
COMMON YE
COMMON ISUBE,ISUEST,ESTMI,NUT4,NUT5,ESTIM,ISOLP,ISOLI
C A ARRAY = RADIUS OF ANNULI
C B= HEIGHT OF CORE
C BSOB ARRAY = PROBABILITY THAT A HISTORY WILL FALL WITHIN AN
C INTERVAL DESCRIBED BY( $XX + OR - YY/2$ )
C CHECKD = 1 , NO CONTROL RODS PRESENT
C CHECKD = 0 , CONTROL RODS ARE PRESENT ,USE SUBROUTINE CHECKA
C CORRAD = CORE RADIUS
C DELS = INCREMENT OF TN ARRAY FOR N CASE
C D1= SPHERE OF INFLUENCE WITHIN WHICH 100 HIS. ARE USED FROM EACH
C FIELD PT.
C D2= SPHERE OF INFLUENCE WITHIN WHICH A FRACTION OF 100 HIS. ARE
C USED FROM EACH FIELD PT.
C DELS1 = INCREMENT OF TN ARRAY FOR N+1 CASE
C FFF=NUMBER OF FIELD PTS. OTHER THAN THE AXIS
C FIENER = NUMBER OF ENERGY GROUPS
C FIROD=2. , DO ROD CASE
C FIROD=1. , DO NOT DO ROD CASE
C FKEY=1 , DO N CASE ONLY
C FKEY=2 , DO N AND N+1 CASES
C FM=NUMBER OF HISTORIES
C FN=NUMBER OF STEPS IN HISTORY
C FNUROD= NUMBER OF RODS (4 TO 16)
C FNUTN = NUMBER OF VALUES IN TN ARRAY ( FOR N CASE)
C FNUTN1= NUMBER OF VALUES IN TN ARRAY (FOR N+1 CASE)
C FRACTF= FRACTION TO BE USED WHEN DISTANCE FROM FIELD TO SOURCE
C POINTS IS LESS THAN D2
C FRACTG= FRACTION TO BE USED WHEN DISTANCE FROM FIELD TO SOURCE
C POINTS IS GREATER THAN D2
C FV= NUMBER OF ANNULI
C INOLY= THE NUMBER OF MESH PTS. IN ONE HALF LAYER
C ISOIRD=1 , STARTING PT. OF STEP IN ROD ANNULUS
C ISOIRD=0 , STARTING PT. OF STEP NOT IN ROD ANNULUS
C SINSPE =+1 , DO SINGLE SPEED CASE
C SINSPE =-1 , DO MULTI-GROUP CASE
C SOWT(J) = SOURCE WEIGHTS FOR ALL ENERGY GROUPS, REQUIRED IN THE
C FOLLOWING ORDER. SOURCE WEIGHTS FOR LAYER ONE FOLLOWED
C BY ALL LAYERS UP TO THE MIDPLANE FOR GROUP ONE FOLLOWED
C SOURCE WEIGHTS FOR REMAINING GROUPS
C S = NUMBER OF SOURCE MESH DIVISIONS IN THE X DIRECTION
C T = NUMBER OF SOURCE MESH DIVISIONS IN THE X DIRECTION CONSIDERING
C THE TOTAL REACTOR AND NOT MERELY HALF OF IT (T MUST BE EVEN)
C TESCON= A TEST CONSTANT USED TO CHECK INPUT DATA (1.E38)
C TITL1(J)= 72 COLUMNS OF TITLE INFORMATION

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200

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C      TN ARRAY = AN ARRAY DESCRIBING THE PROBABILITY OF A HISTORY OF
C      GIVEN STRAIGHT LINE LENGTH OCCURING (FOR N CASE)
C      TN1 ARRAY = SAME AS TN ARRAY ( FOR N+1 CASE)
C      U1= THE NUMBER OF LAYERS IN THE REACTOR (THESE ARE NOT PHYSICAL
C      LAYERS , BUT FOR COMPUTING PURPOSES ONLY)
C      XMULTI ARRAY= RATIO OF IMPINGING NEUTRONS TO EMITTED NEUTRONS
C      FOR EACH REGION (USED ONLY FOR SINGLE SPEED CASE)
C      XX= A NUMBER USED TO DETERMINE WHICH HISTORIES ARE TO BE DISCARDED
C      X(I) = X COORDINATE OF SOURCE POINTS
C      YE(I)= Y COORDINATE OF SOURCE POINTS
C      X2(J)= X COORDINATE OF FIELD POINTS EXCLUSIVE OF THE ORIGIN
C      Y2(J)= Y COORDINATE OF FIELD POINTS EXCLUSIVE OF THE ORIGIN
C      YY= A NUMBER USED TO DETERMINE WHICH HISTORIES ARE TO BE DISCARDED
C      THE VALUE OF T MUST BE EVEN
C      THE NUMBER OF LAYERS (U1) MUST BE EVEN
C      WHEN RUNNING ROD CASE AND USING SUBROUTINE CHECKA THE INPUT VALUE
C      OF THE TRANSPORT CROSS-SECTION FOR THE ROD ABSORBER IS DEFINED TO
C      BE EQUAL TO THE TRUE TRANSPORT CROSS-SECTION OF THE ROD ABSORBER
C      MINUS THE TRANSPORT CROSS-SECTION OF THE ROD ANNULI MATERIAL
C      INTPE= 5
C      READ INPUT TAPE INTPE,101,(TITL1(J),J=1,12)
C      READ INPUT TAPE INTPE,102,FN,FM,FKEY,S,T,U1
C      READ INPUT TAPE INTPE,102,FV,FFF,D1,D2,FRACTF,FRACTG
C      READ INPUT TAPE INTPE,102,XX,YY,B,FNUTN,DELS
C      READ INPUT TAPE INTPE,102,FNUTN1,DELS1,FIENER,PRINT ,SINSPE
C      READ INPUT TAPE INTPE,102,FIROD
C      READ INPUT TAPE INTPE,102,CHECKD
C      IROD = FIROD
C      GO TO (1008,1002),IROD
1002 READ INPUT TAPE INTPE,102,FNUROD,RORADO,RORADI,ROINRA
C      ROINR1=ROINRA*ROINRA
C      NUROD = FNUROD
C      READ INPUT TAPE INTPE,102,(XBIG(I),I=1,NUROD)
C      READ INPUT TAPE INTPE,102,(YBIG(I),I=1,NUROD)
C      READ INPUT TAPE INTPE,102,(XSMAL(I),I=1,NUROD)
C      READ INPUT TAPE INTPE,102,(YSMAL(I),I=1,NUROD)
C      READ INPUT TAPE INTPE,102,(XZERO(I),I=1,NUROD)
C      READ INPUT TAPE INTPE,102,(YZERO(I),I=1,NUROD)
C      GAM1 = ARTNF (YZERO(2) / XZERO(2))
C      GAM3 = ASINF (RORADO / XZERO(1))
C      GAM2 = GAM1 - GAM3 - .02
C      TAN1=ABSF(TANF(GAM2))
C      IF(NUROD-8)1005,1009,1006
1009 BETA1=1.57079633
C      GO TO 1010
1005 ILESS = 0

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210

220

230

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340

	GO TO 1007	380
132	1006 ILESS = 1	
	BETA1 = ARTNF (YZERO(3) / XZERO(3))	400
	1010 BETA2 = BETA1 -GAM3 -.02	
	TAN2=ABSF(TANF(BETA2))	
	1007 RORAOS = RORADO * RORADO	430
	RORAIS = RORADI * RORADI	440
	1008 CONTINUE	460
	IPRINT=PRINT	
	ISORT=1	
	IENER=FIENER	
	NUTN=FNUTN	
	NUT4=4*NUTN	
	N= FN	
	M= FM	
	READ INPUT TAPE INTPE,102,(TN(I),I=1,NUTN)	
	NUTN1=FNUTN1	
	READ INPUT TAPE INTPE,102,(TN1(I),I=1,NUTN1)	
	NAT=N+1	
	READ INPUT TAPE INTPE,102,(BSOB(I),I=2,NAT)	
	KISS=S	
	KHALF=KISS/2	
	KDO=KISS*KHALF	
	IS= S+1.0	
	IT1= T	
	T1= T/2.0	
	IT2= T1	
	INOLY=KHALF*IT2	
	IT3=IT2-1	
	IU1= U1	
	IU2=IU1	
	IU6=IU2/2	
	IU1=IU1+1	
	IV= FV	
	IVP1= IV+1	
	I8=IVP1	
	READ INPUT TAPE INTPE,102,(A(J),J=2,I8)	
C	READ IN SOURCE POINT COORDINATES	
	READ INPUT TAPE INTPE,102,(X(I),I=1,KISS)	
	READ INPUT TAPE INTPE,102,(YE(I),I=1,KHALF)	
	CORRAD = A(I8)	
C		
C	SIGTR = THE TRANSPORT CROSS-SECTIONS	
C		
	READ INPUT TAPE INTPE,102,((SIGTR(IEG,I),IEG=1,I8),I=1,IENER)	
C		

```

C      SIGEL = THE ELASTIC SCATTERING CROSS-SECTIONS
C
C      READ INPUT TAPE INTPE,102,((SIGEL(IEG,I),IEG=1,I8),I=1,IENER)
C
C      SIGIGE =THE IN-GROUP ELASTIC SCATTERING CROSS-SECTIONS
C
C      READ INPUT TAPE INTPE,102,((SIGIGE(IEG,I),IEG=1,I8),I=1,IENER)
C
C      SIGFIS =THE FISSION CROSS-SECTIONS
C
C      READ INPUT TAPE INTPE,102,((SIGFIS(IEG,I),IEG=1,I8),I=1,IENER)
C
C      SIGNAL= THE NON-ELASTIC SCATTERING CROSS-SECTIONS
C
C      READ INPUT TAPE INTPE,102,((SIGNAL(IEG,I),IEG=1,I8),I=1,IENER)
C
C      CHI=PROBABILITY THAT THE AVERAGE ENERGY OF THE EMITTED NEUTRONS
C      OF FISSION HAVE ENERGY OF GROUP I
C      READ INPUT TAPE INTPE,102,(CHI(I),I=1,IENER)
C
C      FNEW= THE NUMBER OF NEUTRONS EMITTED TO THE NUMBER OF NEUTRONS
C      INCIDENT
C      READ INPUT TAPE INTPE,102,(FNEW(I,3),I=1,IENER)
C      READ INPUT TAPE INTPE,102,(FNEW(I,4),I=1,IENER)
C
C      ENER= ENERGIES OF THE GROUPS
C      READ INPUT TAPE INTPE,102,(ENER(I),I=1,IENER)
C
C      PPONEL= A MATRIX FOR NON ELASTIC SCATTERING
C
C      READ INPUT TAPE INTPE,102,((PPONEL(I,J),I=1,IENER),J=1,IENER)
C
C      PROBABILITY FOR REACTION K IN REGION J FOR ENERGY I
401 DO 402 J=1,I8
      DO 402 I=1,IENER
        TIGREA(J,I)=SIGIGE(J,I)+SIGEL(J,I)+SIGFIS(J,I)+SIGNAL(J,I)
        PROIGE(J,I)=SIGIGE(J,I)/TIGREA(J,I)
        PROEL(J,I)=SIGEL(J,I)/TIGREA(J,I)+PROIGE(J,I)
        PROFIS(J,I)=PROEL(J,I)+ SIGFIS(J,I)/TIGREA(J,I)
402 PRONEL(J,I)=SIGNAL(J,I)/TIGREA(J,I)+PROFIS(J,I)
        IFFF= FFF
        IFP1= IFFF+1
        NUT5=IFP1*IENER*NUTN*IU1
        X2(1)= 0.
        IF(FFF) 6,7,6
6      READ INPUT TAPE INTPE,102,(X2(J),J=2,IFP1)

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      READ INPUT TAPE INTPE,102,(Y2(J),J=2,IFP1)
      Y2(1)=0.
      IF(SINSPE) 7,384,384
384    READ INPUT TAPE INTPE ,102,(XMULTI(I),I=1,I8)
7      LJ1=(KHALF*IT2)*IU6 *IENER
      U88=IU1
      LJ2=(FFF+1.0)*U88
      READ INPUT TAPE INTPE,102,(SOWT(J),J=1,LJ1)
      N2=N-1
      CHIP(1)=CHI(1)+CHI(2)
      CHIP(2)=CHIP(1)+CHI(3)
      ZZ1= XX-YY/2.0
      ZZ2= XX+YY/2.0
      KEY= FKEY
3      IN= N+1
4      N1= N+1
      NS= S
      NOUT= 6
      KISS2=KISS*IT2
      DO 5 I=1,120
5      FFLUXB(I)=0.
      FLAG= 0.
      WRITE OUTPUT TAPE NOUT,100,(TITL1(J),J=1,12)
      WRITE OUTPUT TAPE NOUT,113
      WRITE OUTPUT TAPE NOUT,103,FN,FM,S,T
      WRITE OUTPUT TAPE NOUT,104,U1,FV,FFF
      WRITE OUTPUT TAPE NOUT,105,D1,D2,FRACTF,FRACTG
      WRITE OUTPUT TAPE NOUT,106,XX,YY,B,FNUTN,DELS,FNUTN1,DELS1
106    FORMAT(3H X 1PE13.6,5X,2HY 1PE13.6,5X,2HB 1PE13.6/7H FNUTN 1PE
113.6,5X,5HDELS 1PE13.6,5X,7HFNUTN1 1PE13.6,5X,6HDELS1 1G13.6 )
      IF(IROD-1)2236,2236,2237
2237 WRITE OUTPUT TAPE NOUT,2225,FIROD,FNUROD,RORADO,RORADI,ROINRA
2225 FORMAT ( 8H0 FIROD= E12.5,5X,13HNO. OF RODS = E12.5,5X,20HROD OUTS
1IDE RADIUS = E12.6/ 20HOROD INSIDE RADIUS = E12.5,5X,30HINSIDE RAD
2IUS OF ROD ANNULUS = E12.5 )
2236 WRITE OUTPUT TAPE NOUT,114
      WRITE OUTPUT TAPE NOUT,613,FIENER,PRINT,SINSPE
613    FORMAT(24H0 NO. OF ENERGY GROUPS= F6.3,5X,6HPRINT=F6.3,5X,7HSINSPE
1=F6.3 )
      WRITE OUTPUT TAPE NOUT,2895,CHECKD
2895    FORMAT ( 11H0 CHECKD = E14.5 )
      WRITE OUTPUT TAPE NOUT,2243
2243    FORMAT ( 34H THE X VALUES FOR THE MESH ARE )
      WRITE OUTPUT TAPE NOUT,102 ,(X(I),I=1,KISS)
      WRITE OUTPUT TAPE NOUT,2242
2242    FORMAT ( 34H THE Y VALUES FOR THE MESH ARE )

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WRITE OUTPUT PE NOUT,102,(YE(I),I=1,KHALF )
WRITE OUTPUT TAPE NOUT,114
WRITE OUTPUT TAPE NOUT,108
WRITE OUTPUT TAPE NOUT,2226
2226 FORMAT (9H X VALUES )
WRITE OUTPUT TAPE NOUT,115,(X2(J),J=2,IFP1)
WRITE OUTPUT TAPE NOUT,2227
2227 FORMAT (9H0Y VALUES )
WRITE OUTPUT TAPE NOUT,115,(Y2(J),J=2,IFP1)
IF(IROD-1)2234,2234,2235
2235 WRITE OUTPUT TAPE NOUT,2228
2228 FORMAT (20H0 VALUES OF XBIG ARE )
WRITE OUTPUT TAPE NOUT,102,(XBIG(I),I=1,NUROD)
WRITE OUTPUT TAPE NOUT,2229
2229 FORMAT (20H0 VALUES OF YBIG ARE )
WRITE OUTPUT TAPE NOUT,102,(YBIG(I),I=1,NUROD)
WRITE OUTPUT TAPE NOUT,2230
2230 FORMAT (22H0 VALUES OF XSMAL ARE )
WRITE OUTPUT TAPE NOUT,102,(XSMAL(I),I= 1,NUROD)
WRITE OUTPUT TAPE NOUT,2231
2231 FORMAT (22H0 VALUES OF YSMAL ARE )
WRITE OUTPUT TAPE NOUT,102,(YSMAL(I),I= 1,NUROD)
WRITE OUTPUT TAPE NOUT,2232
2232 FORMAT (22H0 VALUES OF XZERO ARE )
WRITE OUTPUT TAPE NOUT,102,(XZERO(I),I= 1,NUROD)
WRITE OUTPUT TAPE NOUT,2233
2233 FORMAT (22H0 VALUES OF YZERO ARE )
WRITE OUTPUT TAPE NOUT,102,(YZERO(I),I= 1,NUROD)
2234 WRITE OUTPUT TAPE NOUT,113
WRITE OUTPUT TAPE NOUT,393
WRITE OUTPUT TAPE NOUT,118,(BSOB(I),I=2,NAT)
WRITE OUTPUT TAPE NOUT,208
WRITE OUTPUT TAPE NOUT,118,(TN(I),I=1,NUTN)
WRITE OUTPUT TAPE NOUT,209
WRITE OUTPUT TAPE NOUT,118,(TN1(I),I=1,NUTN1)
WRITE OUTPUT TAPE NOUT,113
WRITE OUTPUT TAPE NOUT,109
WRITE OUTPUT TAPE NOUT,110
WRITE OUTPUT TAPE NOUT,114
WRITE OUTPUT TAPE NOUT,115,(A(J),J=2,I8)
WRITE OUTPUT TAPE NOUT,113
WRITE OUTPUT TAPE NOUT,113
IF(SINSPE)385,386,386
386 WRITE OUTPUT TAPE NOUT,387
387 FORMAT(23H0 THE XMULTI ARRAY IS )
WRITE OUTPUT TAPE NOUT,102,(XMULTI(I),I=1,I8)

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385 WRITE OUTPUT TAPE NOUT,300
300 FORMAT (53H1 THE TRANSPORT CROSS-SECTIONS ARE (REGION,ENERGY) )
    WRITE OUTPUT TAPE NOUT,118,((SIGTR(IEG,I),IEG=1,I8),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,301
301 FORMAT(51H0 THE ELASTIC SCATTERING CROSS-SECTIONS ARE )
    WRITE OUTPUT TAPE NOUT,118,((SIGEL(IEG,I),IEG=1,I8),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,302
302 FORMAT(52H0 THE IN-GROUP ELASTIC SCATTERING CROSS-SECTIONS ARE )
    WRITE OUTPUT TAPE NOUT,118,((SIGIGE(IEG,I),IEG=1,I8),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,303
303 FORMAT(52H0 THE FISSION SCATTERING CROSS-SECTIONS ARE )
    WRITE OUTPUT TAPE NOUT,118,((SIGFIS(IEG,I),IEG=1,I8),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,304
304 FORMAT(52H0 THE NON-ELASTIC SCATTERING CROSS-SECTIONS ARE )
    WRITE OUTPUT TAPE NOUT,118,((SIGNEL(IEG,I),IEG=1,I8),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,306
306 FORMAT(22H0 THE CHI ARRAY IS )
    WRITE OUTPUT TAPE NOUT,118,(CHI(I),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT, 41
41  FORMAT (27H0  THE FNEW(I,3) ARRAY IS )
    WRITE OUTPUT TAPE NOUT,118,(FNEW(I,3),I=1,IENER )
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT, 42
42  FORMAT (27H0  THE FNEW(I,4) ARRAY IS )
    WRITE OUTPUT TAPE NOUT,118,(FNEW(I,4),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,44
44  FORMAT (25H0  THE ENERGY ARRAY IS )
    WRITE OUTPUT TAPE NOUT,118,(ENER(I),I=1,IENER)
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,113
    WRITE OUTPUT TAPE NOUT,43

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45  FORMAT (29H0 THE PPONEL,,J) ARRAY IS      )
    WRITE OUTPUT TAPE NCUT,118,((PPONEL(I,J),I=1,IENER),J=1,IENER)
    WRITE OUTPUT TAPE NCUT,113
    WRITE OUTPUT TAPE NCUT,113
    WRITE OUTPUT TAPE NCUT,116
    WRITE OUTPUT TAPE NCUT,114
    LJ6=KISS*KHALF*IU2
    WRITE OUTPUT TAPE NCUT,118, (SOWT( I ),I=1,LJ1)
    WRITE OUTPUT TAPE NCUT,114
    WRITE OUTPUT TAPE NCUT,113
    DO 1 J=1,IVP1
1    A(J)= A(J)*A(J)
    NTAPA= 3
    FIFP2=IFP1
    IFIFP3=FIFP2*U88
    IFP1U=IFIFP3*IENER
    IFOD=KHALF*IT2*IU6
    DELZ= B/U1
    READ INPUT TAPE INTPE,102,TESCON
    IF(TESCON-1048576.)2222,2223,2222
2222 WRITE OUTPUT TAPE NCUT,2224
2224 FORMAT( 22H0 DATA OUT OF ORDER          )
    CALL EXIT
2223 IENERS=IENER*IENER
100  FORMAT(1H112A6)
101  FORMAT(12A6)
393  FORMAT(20H THE BSOB ARRAY IS              )
102  FORMAT(6F12.5)
103  FORMAT(3H N 1PE13.6,5X,2HM 1PE13.6,5X,2HS 1PE13.6,5X,2HT 1PE13.6)
104  FORMAT(3H U 1PE13.6,5X,2HV 1PE13.6,5X,2HF 1PE13.6)
105  FORMAT(3H D11PE13.6,5X,2HD21PE13.6,5X,2HSF1PE13.6,5X,2HSG1PE13.6)
108  FORMAT(21H FIELD GEOMETRY RADII)
109  FORMAT(18H BOUNDARY GEOMETRY)
110  FORMAT(8H0 RADII)
111  FORMAT(17H0 MULTIPLICATION)
112  FORMAT(22H0 TOTAL CROSS SECTION)
113  FORMAT(1H0)
114  FORMAT(1H )
115  FORMAT(4X,1PE13.6,8X,1PE13.6,8X,1PE13.6,8X,1PE13.6)
116  FORMAT(14H1 SOURCE WT                      )
117  FORMAT(26H ZERO ITERATE FIELD FLUXES)
118  FORMAT(6(1PE16.6))
208  FORMAT(18H0 THE TN ARRAY IS      )
209  FORMAT(20H0 THE TN1 ARRAY IS      )
207  FORMAT(20H0THE ASOB ARRAY IS      )
    RETURN

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* LIST
SUBROUTINE PROCES
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1 XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1 PPONEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),
2 A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3 FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4 10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5 SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6 VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7 150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8 4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9 V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,
1 XMULTI,SINSPE,IKAP,RODDDEL,IALLL,I8,DELTA,IREG,BODEL,IBOREG,
2 ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3 IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,
4 ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5 ICHROD,ILESS,I8,M111
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1 ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2 I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1 TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2 D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3 ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4 IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5 SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6 SOWT,I,KBD,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7 NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8 ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9 XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRR00,
1 T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,
2 JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3 KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,
4 FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5 SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6 ,IHIGHB,ILOWB,FTOPB,FBOBB,F8TOPB,FBBBAV,BLAMDA,LAYERB,IRADB,
7 COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8 DELTAX,YDEL,KKISS,XN1,YN1,ZN1

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COMMON CHECKD
COMMON YE
COMMON ISUBE, ISUEST, ESTMI, NUT4, NUT5, ESTIM, ISLOP, ISOLI
DO 251 K=1, IT2
KKISS=(K-1)*KISS
DO 251 L=1, KISS
IWHO =KKISS+L
X(IWHO)=X(L)
251 Y(IWHO)=YE(K)
37 DO 51 IC2=1, M
25 ZN1=0.
YN1=0.
XN1=0.
FLLE0=0.
FLLE1=0.
DO 3 IBA=1, N
U=URN(DUMMY)
FLLE(IBA)=-NLOGF(U)
FLLE1=FLLE1+ABSF(FLLE(IBA))
U=URN(DUMMY)
W(IBA)=2.*U-1.
RHO=SQRTF(1.-W(IBA)**2)
U=URN(DUMMY)
PHI=3.141593*(2.*U-1.)
UC(IBA)=RHO*COSF(PHI)
V1(IBA)=RHO*SINF(PHI)
XN1=XN1+FLLE(IBA)*UC(IBA)
YN1=YN1+FLLE(IBA)*V1(IBA)
3 ZN1=ZN1+FLLE(IBA)*W(IBA)
SN=SQRTF(XN1**2+YN1**2 +ZN1**2)
IF(SN-ZZ1)25,25,20
20 IF(SN-ZZ2)2401,25,25
2401 UCDOT1=XN1/SN
VIDOT1=YN1/SN
WDOT1=ZN1/SN
26 SNPRO1=SQRTF(1.-WDOT1**2)
DO 9 IBA=1, N
UC1(IBA)=(UCDOT1*WDOT1*UC(IBA)+VIDOT1*WDOT1*V1(IBA))/SNPRO1
1-W(IBA)*SNPRO1
V11(IBA)=(-VIDOT1*UC(IBA)+UCDOT1*V1(IBA))/SNPRO1
9 W1(IBA)=UCDOT1*UC(IBA)+VIDOT1*V1(IBA)+WDOT1*W(IBA)
31 WEFUN1=EXP(FLLE1)
DO 34 IBA=1, N
34 FLLE(IBA)=FLLE(IBA)/SN
50 WRITE TAPE NTAPA, WEFUN1(1), SN(1), (UC1(IBA), V11(IBA), W1(IBA),
1 FLLE(IBA), IBA=1, N)

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51 C INUE
REWIND NTAPA
RETURN
END

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LIST
MAIN PROGRAM CHAIN 2
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1 XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1 PPNEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),
2 A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3 FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4 10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5 SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6 VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7 150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8 4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9 V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPNEL,FNEW,JSAVE,IEIN,PRODT,
1 XMULTI,SINSPE,IKAP,RODDDEL,IALLL,I8,DELTA,IREG,BODEL,IBOREG,
2 ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3 IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,
4 ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5 ICHROD,ILESS,IB,MI11
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1 ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2 I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1 TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2 D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3 ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4 IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5 SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6 SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7 NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8 ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9 XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRROD,
1 T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,
2 JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3 KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,
4 FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5 SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6 ,IHIGH8,ILOWB,FTOPB,FBOBB,FBTOPB,FBBBAV,BLAMDA,LAYERB,IRADB,
7 COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8 DELTAX,YDEL,KKISS,XN1,YN1,ZN1

```

```

COMMON CHECKD
COMMON YE
COMMON ISUBE, ISUEST, ESTMI, NUT4, NUT5, ESTIM, ISLOP, ISOL1
KBLOCK= 1
ISLOP = IENER * IU1 * NUTN
1 KHIS1= 1
KHIS2= N
DO 350 IBD=1,100
352 READ TAPE NTAPA, WEFUN(IBD), SN(IBD), (UC(IBA), V1(IBA), W(IBA),
1 FLLE(IBA), IBA=KHIS1, KHIS2)
353 KHIS1= KHIS1+N
350 KHIS2= KHIS2+N
3555 IHIS=1
IFFFCL= 0
ISOL1 = 0
ISA= 1
IUA= 1
ITA= 1
355 CALL CAL
300 IF(IUA-IU2) 301, 302, 302
301 IUA=IUA+1
GO TO 355
302 IUA=1
303 IF(ISA-KISS) 305, 304, 304
305 ISA=ISA+1
GO TO 355
500 CALL CAL
GO TO 300
304 IF(ITA-IT2) 315, 321, 321
315 ITA=ITA+1
ISA=1
IUA=1
GO TO 500
321 ISA=1
ITA=1
IF(IFFFCL-IFFF) 325, 326, 326
325 IFFFCL=IFFFCL+1
ISOL1 = ISOL1 + ISLOP
GO TO 500
326 CALL OUTPUT
IF(IDO) 583, 583, 1
583 COP=1.
CALL CHAIN(1,4)
END

```

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*
LIST
SUBROUTINE CAL
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1      XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1      PPONEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),
2      A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3      FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4      10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5      SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6      VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7      150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8      4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9      V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IEENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,
1      XMULTI,SINSPE,IKAP,RODDDEL,IALLL,I8,DELTA,IREG,BODEL,IBOREG,
2      ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3      IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,
4      ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5      ICHROD,ILESS,IB,M111
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1      ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2      I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1      TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2      D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3      ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4      IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5      SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6      SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7      NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8      ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9      XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRR00,
1      T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,
2      JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3      KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,
4      FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5      SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6      ,IHIGHB,ILOWB,FTOPB,FBOBB,FBTOPB,FBBBAV,BLAMDA,LAYERB,IRADB,
7      COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8      DELTAX,YDEL,KKISS,XN1,YN1,ZN1

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COMMON CHECKD
COMMON YE
COMMON ISUBE, ISUEST, ESTMI, NUT4, NUT5, ESTIM, ISLOP, ISOL1
IVP1=IV+1
I=(ITA-1)*KISS+ISA
DISP=(X(I)**2+Y(I)**2)
IF(DISP-A(IVP1))887,887,888
888 RETURN
887 A(1)=0.
ICHGA=IU6-IUA+1
ICHGE =IU6+IUA
IF(ISA-KHALF)2485,2485,2486
2485 IIO2=KHALF*(ITA-1)+ISA
2486 IAU1=1
IPQ=(ITA-1)*KISS+ISA
ZIAU1=0.
UA=IUA
ZIAU=(B/U1)*(UA-.5)
Q24=X2(IFFFCL+1)-X(IPQ)
DIST=SQRTF(Q24**2 +(Y2(IFFFCL+1)-Y(IPQ))**2 +ZIAU**2)
IF(DIST-D1)71,71,72
71 NOH=100
GO TO 7501
72 IF(DIST-D2)73,73,74
73 NOH=FRACF*100.+.5
GO TO 7501
74 NOH=FRACG*100.+.5
7501 UCO=Q24/DIST
FNOH=NOH
VCO=-Y(IPQ)/DIST
WCO=-ZIAU/DIST
SPROJ= SQRTF(1.-WCO**2)
A2= -VCO/SPROJ
B1= -A2*WCO
B2= UCO/SPROJ
A1= B2*WCO
C1= -SPROJ
IHISUS= 1
XF(1)= X(IPQ)
YF(1)= Y(IPQ)
7500 ZF(1)= ZIUA
XLENG2(1)= XF(1)**2+YF(1)**2
202 NNN2= (IHIS-1)*N+1
IIT4=1
RODDEL=0.
NNN= IHIS*N

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```

    IAU1=1
    ZIAU1=0.
    IZA= 2
    DO 70 IBA=NNN2,NNN
    FLLE14(IZA)=DIST*FLLE(IBA)
    UCO1(IZA)= A1*UC(IBA)+A2*V1(IBA)+UCO*W(IBA)
    VCO1(IZA)= B1*UC(IBA)+B2*V1(IBA)+VCO*W(IBA)
    WCO1(IZA)= C1*UC(IBA)+WCO*W(IBA)
100  XF(IZA)=XF(IZA-1)+UCO1(IZA)*FLLE14(IZA)
    YF(IZA)=YF(IZA-1)+VCO1 (IZA)*FLLE14(IZA)
    ZF(IZA)=ZF(IZA-1)+WCO1(IZA)*FLLE14(IZA)
    IF(ZF(IZA)+B)76,77,77
77   IF(ZF(IZA)-B)78,78,76
78   XLENG2(IZA)=XF(IZA)**2+YF(IZA)**2
    IF(XLENG2(IZA) -A(IVP1))70,76,76
76   IF(IHIS-100)90,201,201
90   IHIS=IHIS+1
99   IHISUS=IHISUS+1
    IF(IHISUS-NOH)202,202,200
200  RETURN
201  IHIS=1
    GO TO 99
70  IZA = IZA + 1
    GO TO (9001,9002),IROD
C
C   IS SOURCE PT. IN ROD ANNULI
9002 IF(XLENG2(1)-ROINR1)9003,9003,9004
C   YES
9004 ISOIRD=1
    GO TO 9005
C   NO
9003 ISOIRD=0
C
C   IS SOURCE PT. IN LEFT HALF OF CORE
9005 IF(XF(1))9007,9007,9006
C   NO
9006 ICUT=1
    GO TO 9001
C   YES
9007 ICUT=0
9001 JACK = 1
    KILP=0
    CALL SEARCH(A,XLENG2,JSAVE,N)
    IZA1= IZA-1
    IF(CHECKD)21112,21113,21112
21113 DO 21114 NN34=1,N1

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10
20

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110

21114	RODDEL(NN34)=0.	
21112	DO133 IB=2, IZA1	
	XLENG3 = XLENG2(IB) - XLENG2(IB-1)	120
	IF (XLENG3) 9008,9009,9009	130
9008	JHIGH = JSAVE(IB-1)	140
	IBC=IB-1	
	GO TO 9010	160
9009	JHIGH = JSAVE(IB)	170
	IBC = IB	180
9010	QRA1 = UCO1(IB)**2 + VCO1(IB)**2	190
	QRA12= 2.*QRA1	
93	JLOW=JHIGH	
	JFIN= JHIGH	
	IAL=2	
	IAO=2	
	QRBB1=2.*(XF(IBC)*UCO1(IB)+YF(IBC)* VCO1(IB))	
	QRB1=QRBB1*QRBB1	
	QRC2 = XF(IBC)**2 + YF(IBC)**2	210
	QRA92 =4.*QRA1	
700	GO TO (110,9012), IROD	230
9012	IB = IB	240
	CALL ROD	250
110	QRC1= QRC2-A(JFIN)	
	QRTOT = QRB1-QRA92*QRC1	
1101	IF(QRTOT)152,111,111	
112	JFIN=JFIN-1	
	JLOW=JFIN	
	GO TO 110	
111	QRROOT =SQRTF(QRTOT)	
	DEL=ABSF((-QRBB1+QRROOT)/QRA12)	
	DEL1=ABSF((-QRBB1-QRROOT)/QRA12)	
1111	IF(DEL-DEL1)114,114,113	
113	DELT= DEL	
	DEL= DEL1	
	DEL1= DELT	
114	IF(DEL-FLLE14(IB)) 116,152,152	
116	DELTA(IAL)= DEL	
1161	IAL=IAL+1	
	IF(DEL1-FLLE14(IB))117,7,7	
117	FALSE(IAO)=DEL1	
1171	IAO=IAO+1	
7	IF(A(JFIN))152,152,112	
152	IF(IAL-2) 161,161,155	
155	IF(IAO-2)154,154,150	
150	IAO =IAO-1	
1501	DELTA(IAL)=FALSE(IAO)	

```

      IAL=IAL+1
      IAO=IAO-1
      IF(IAO-2)154,1501,1501
87T 154 DELTA(IAL)=FLLE14(IB)
      KILP=KILP+1
136 MYER(KILP)=IAL-1
      SYMBOL=0.
      DO 1642 IC=2,IAL
      IBOREG(JACK)=JHIGH
      REDEL(JACK)=DELTA(IC)-DELTA(IC-1)
      IF(SYMBOL)163,163,1641
163 IF(JHIGH-JLOW)164,164,165
165 JHIGH=JHIGH-1
      GO TO 1642
164 SYMBOL=1.
1641 JHIGH=JHIGH+1
1642 JACK=JACK+1
      GO TO 133
161 REDEL(JACK)=FLLE14(IB)
      IBOREG(JACK)=JHIGH
      JACK=JACK+1
      KILP=KILP+1
      MYER(KILP)=1
      GO TO 133
133 CONTINUE
      JACK=JACK-1
      I=1
      CALL ENERGY
      IF(IHIS-100)7503,7504,7504
7504 IHIS=1
      GO TO 7505
7503 IHIS=IHIS+1
7505 ISTAL=IFFFCL*IU1*IENER+1
      CALL SUBCPT
      IF(ISA-KHALF)2480,2480,2481
2481 IIO2=XMODF(ISUBPT,INOLY)
      IF(IIO2)2480,8123,2480
8123 IIO2=INOLY
2480 DO 301 I=1,IENER
301 IAU2(I)=(IUT(I)-1)*IU1+ISTAL
      DO 2363 I=1,IENER
      ISUEST(I) = ISOL1 + ISUBE(I)
      IIIII1=(I-1)*IFOCO
      IMAG1(I)=ISUBPT +IIIII1
2363 IMAG2(I)=IIO2 +IIIII1
      IF(ITI2)2361,2880,2362

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```

2361 IIT3=-1
      IBY=-1
      GO TO 205
2880 IIT3=0
      IBY=1
      GO TO 205
2362 IIT3=1
      IBY=1
205  DO 303 JOC=1,IENER
303  ESTB(JOC)=0.
      BMZU= B-ZIAU1
      IF(ZIUA-BMZU) 206,209,209
206  DO 207 I=2,N
      IF(ZF(I)+ZIAU1) 209,209,208
208  IF(ZF(I)-BMZU) 207,209,209
207  CONTINUE
      DO 320 JOC=1,IENER
      JBC=IMAG1(JOC)
      IJINK = ISUEST(JOC)
      ESTIM(IJINK) = ESTMI(JOC) * SOWT(JBC) + ESTIM(IJINK)
320  ESTB(JOC)=BROBIL(JOC)*SOWT(JBC)
209  DO 302 JOC=1,IENER
302  IMAG1(JOC)=IMAG1(JOC) + IIT3*INOLY
      IF(ZIUA -ZIAU1)210,2980,2980
210  DO 215 I=2,N
      IF(ZF(I)+BMZU) 216,216,212
212  IF(ZF(I)-ZIAU1) 215,216,216
215  CONTINUE
      DO 309 JOC=1,IENER
      JBC=IMAG2(JOC)
      IJINK = ISUEST(JOC)
      ESTIM(IJINK) = ESTIM(IJINK) + ESTMI(JOC) * SOWT(JBC)
309  ESTB(JOC)=ESTB(JOC)+BROBIL(JOC)*SOWT(JBC)
216  DO 304 JOC=1,IENER
304  IMAG2(JOC)=IMAG2(JOC) +IIT4*INOLY
2980 DO 305 JOC=1,IENER
      JBC=IAU2(JOC)
305  FFLUXB(JBC)=FFLUXB(JBC)+ESTB(JOC)
      1 IF(IU1-IAU1)99,99,220
220  ZIAU1= ZIAU1+DELZ
      DO 306 JOC=1,IENER
      ISUEST(JOC) = ISUEST(JOC) + NUT4
306  IAU2(JOC)=IAU2(JOC)+1
6409 IAU1=IAU1+1
      IF(IBY) 2406,205,2390
2390 IF(IAU1-ICHGA)205,2392,2394

```

4

2

5

6

```
2392 IIT3=0  
    GO TO 205  
2394 IIT3=-1  
    IBY=-1  
2406 IF(IAU1-ICHGE)205,2408,2409  
2408 IIT4=0  
    GO TO 205  
2409 IIT4=-1  
    IBY=0  
    GO TO 205  
    END
```

```

*      FAP
*  SUBROUTINE SEARCH
*  THIS PROGRAM CALCULATES WHICH REGION EACH OF THE VERTICES LIE IN
      ENTRY SEARCH
L(1) DEC 1
L(2) DEC 2
L1D PZE 0,0,1
SAVE1 BSS 1
SAVE2 BSS 1
SEARCH SXD SAVE1,1
        SXD SAVE2,2
        CLA 1,4
        ADD L(1)
        STA SRCH1
        CLA 2,4
        ADD L(1)
        STA SRCH2
        CLA 3,4
        ADD L(1)
        STA SRCH3
        LXA L(1),1
        CLA* 4,4
        ADD L1D
        STD SRCH4
SRCH5 LXA L(2),2
SRCH2 CLA 0,1          XLENG2+1
SRCH1 CAS 0,2          A+1
        TXI *-1,2,1
        NOP
        TXI *+1,2,-1
        PXD 0,2
SRCH3 STO 0,1          JSAVE+1
        TXI *+1,1,1
SRCH4 TXL SRCH5,1
        LXD SAVE1,1
        LXD SAVE2,2
        TRA 5,4
        END

```

```

*      FAP
*      SUBROUTINE ENERGY
*
*      THIS PROGRAM CALCULATES THE TYPE OF REACTION WHICH OCCURS AT EACH
*      COLLISION AND THE ENERGY GROUP TO WHICH THE NEUTRON BELONGS AFTER
*      EACH COLLISION

```

```

      ENTRY ENERGY
L1D   PZE    0,0,1
L2D   PZE    0,0,2
L4D   PZE    0,0,4
L(1)  DEC    1.
L(2)  DEC    2
L(4)  DEC    4
LOD   PZE    0,0,0
IVAL  PZE    0,0,15
L3D   PZE    0,0,3
DUMMY BSS    1
SAV1  BSS    1
SAV2  BSS    1
SAV4  BSS    1
SAV5  BSS    1
SAV6  BSS    1
SAV7  BSS    1
SAV8  BSS    1
SAV9  BSS    1
ISTRT BSS    1

```

```

*
*      SAVE INDEX REGISTERS
ENERGY SXD    SAV1,1
      SXD    SAV2,2
      SXD    SAV4,4
      CLA    N2
      STD    HAIR
      CLA    IENER
      STD    HARE
      LXD    L1D,1
      LXD    LOD,2

```

```

*
*      START OUTER LOOP , THE OUTER LOOP IS PREFORMED ONCE FOR EACH
*      ENERGY GROUP

```

```

THER  PXD    ,1
      SXA    SAV10,1
      STD    IEIN
      SUB    L1D
      XCA
      MPY    IVAL

```

LLS 17
ADD JSAVE,2
PDX ,1
CLA L(1)
STO PRODT

*
* START INNER LOOP , THE INNER LOOP IS PREFORMED ONCE FOR EACH
* STEP OF THE HISTORY

HERE PDX ,1
STD SAV8

*
* CALCULATE RANDOM NUMBER

TSX \$URN,4
TSX DUMMY

*
* DID IN-GROUP ELASTIC SCATTERING OCCUR
CAS PROIGE+1,1

*
* IN-GROUP ELASTIC SCATTERING DID NOT OCCUR
TRA 1202A
TRA 1202A

*
* IN-GROUP ELASTIC SCATTERING DID OCCUR , ENERGY GROUP REMAINS THE SAME
* FNEW=1.

1201A CLA IEIN,2
STD IEIN-1,2
PDX ,1
SUB JSAVE,2
ADD JSAVE-1,2
PDX ,1
1201B LDQ L(1)
TRA 1221A

*
* DID ELASTIC SCATTERING OCCUR
1202A CAS PROEL+1,1

*
* ELASTIC SCATTERING DID NOT OCCUR
TRA 1204A
TRA 1204A

*
* ELASTIC SCATTERING DID OCCUR ,ENERGY GROUP DROPS DOWN ONE GROUP
* FNEW=1.

1203A CLA IEIN,2
ADD L1D
STD IEIN-1,2
TXI *+1,1,15


```
PXD      ,1
SUB      JSAVE,2
ADD      JSAVE-1,2
PDX      ,1
TRA      1201B

*
* DID FISSION OCCUR
1204A CAS   PROFIS+1,1
*
* FISSION DID NOT OCCUR
TRA      1207A
TRA      1207A
*
* FISSION DID OCCUR
* CALCULATE RANDOM NUMBER
1206A TSX   URN,4
        TSX   DUMMY
        XCA
        CLA   JSAVE-1,2
        PDX   ,1
        XCA
        CAS   CHI
        TXI   1209A,1,15
        TXI   1209A,1,15
*
* NEUTRON HAS ENERGY OF GROUP ONE ,DETERMINE THE VALUE OF FNEW
1208A CLA   L1D
        STD   IEIN-1,2
        LDQ   FNEW-8
        TRA   1221A
1209A CAS   CHIP
        TXI   1211A,1,15
        TXI   1211A,1,15
*
* NEUTRON HAS ENERGY OF GROUP TWO ,DETERMINE THE VALUE OF FNEW
1210A CLA   L2D
        STD   IEIN-1,2
        LDQ   FNEW-9
        TRA   1221A
1211A CAS   CHIP-1
        TXI   1213A,1,15
        TXI   1213A,1,15
*
* NEUTRON HAS ENERGY OF GROUP THREE,DETERMINE THE VALUE OF FNEW
1212A CLA   L3D
        STD   IEIN-1,2
```

LDQ FNEW-10
TRA 1221A

*
* NEUTRON HAS ENERGY OF GROUP FOUR ,DETERMINE THE VALUE OF FNEW

1213A CLA L4D
STD IEIN-1,2
LDQ FNEW-11
TRA 1221A

*
* NON-ELASTIC SCATTERING

1207A CLA JSAVE-1,2
PDX ,1

*
* CALCULATE RANDOM NUMBER

TSX URN,4
TSX DUMMY
XCA
CLA IEIN,2
PDX ,4
XCA
CAS PPONEL+1,4
TXI IRA,1,15
TXI IRA,1,15

*
* NEUTRON HAS ENERGY OF GROUP ONE ,DETERMINE THE VALUE OF FNEW

1215A CLA L1D
STD IEIN-1,2
LDQ FNEW-12
TRA 1221A
1216A CAS PPONEL,4
TXI IRB,1,15
TXI IRB,1,15

*
* NEUTRON HAS ENERGY OF GROUP TWO ,DETERMINE THE VALUE OF FNEW

1217A CLA L2D
STD IEIN-1,2
LDQ FNEW-13
TRA 1221A
1218A CAS PPONEL,4
TXI IRC,1,15
TXI IRC,1,15

*
* NEUTRON HAS ENERGY OF GROUP THREE,DETERMINE THE VALUE OF FNEW

1219A CLA L3D
STD IEIN-1,2
LDQ FNEW-14

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      TRA      1221A
*
* NEUTRON HAS ENERGY OF GROUP FOUR ,DETERMINE THE VALUE OF FNEW
1220A CLA      L4D
      STD      IEIN-1,2
      LDQ      FNEW-15
      TRA      1221A
IRA   TXI      1216A,4,4
IRB   TXI      1218A,4,4
IRC   TXI      1220A,4,4
*
* SINGLE SPEED CASE
PLUS  LDQ      XMULTI+1,4
      TRA      TIG
1221A LXD      SAV8,4
      CLA      SINSPE
      TPL      PLUS
*
* MULTI GROUP CASE
TIG   FMP      TIGREA+1,4
      XCA
      FMP      PRODT
      STO      PRODT
      TXI      *+1,2,1
*
* END OF INNER LOOP
HAIR  TXL      HERE,2,**
*
* CALL SUBROUTINE SUMP  TO CALCULATE UNIT ESTIMATOR FOR CURRENT GROUP
      TSX      $SUMP,4
SAV10 AXT      ,1
      LXD      LOD,2
      TXI      *+1,1,1
*
* END OF OUTER LOOP
HARE  TXL      THER,1,**
*
* RESTORE INDEX RESISTERS
      LXD      SAV1,1
      LXD      SAV2,2
      LXD      SAV4,4
      TRA      1,4
IUT   COMMON  4
TIGREA COMMON 60
N     COMMON  1
N2    COMMON  1

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IERER COMMON 1
REDEL COMMON 150
RETAU COMMON 1
PROIGE COMMON 60
PROEL COMMON 60
PROFIS COMMON 60
CHI COMMON 4
CHIP COMMON 3
PPONEL COMMON 16
FNEW COMMON 16
JSAVE COMMON 15
IEIN COMMON 10
PRODT COMMON 1
XMULTI COMMON 15
SINSPE COMMON 1
END

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LIST
SUBROUTINE SUMP
CALCULATION OF RETAU AND THE ESTIMATOR
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1      XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1      PPONEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),
2      A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3      FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4      10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5      SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6      VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7      150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8      4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9      V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,
1      XMULTI,SINSPE,IKAP,RODDEL,IALLL,I8,DELTA,IREG,BODEL,IBOREG,
2      ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3      IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,
4      ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5      ICHROD,ILESS,IB,M111
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1      ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2      I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1      TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2      D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3      ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4      IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5      SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6      SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7      NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8      ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9      XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRROO,
1      T,QRA12,DEL,DEL1,DEL2,FALSE,SYMBOL,JHIGH8,JLOW1,
2      JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3      KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DEL2,ESTB,BMZU,K1,
4      FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5      SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6      ,IHIGHB,ILOWB,FTOPB,FBOBB,FBTOPB,FBBBAV,BLAMDA,LAYERB,IRADB,
7      COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,

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8      D...X, ...L, ...SS, ..., Y..._N1
COMMON CHECKD
COMMON YE
COMMON ISUBE, ISUEST, ESTMI, NUT4, NUT5, ESTIM, ISLOP, ISOL1
RETAU=0.
INN=1
IBALY=0
DO 1231 IQ=1,N
  IBALY=MYER(IQ)+IBALY
DO 1230 IMM=INN,IBALY
  IR=IBOREG(IMM)
  IT=IEIN(IQ+1)
1230 RETAU=RETAU+SIGTR(IR,IT)*REDEL(IMM)
1231 INN=IBALY+1
  IF(CHECKD)990,991,990
991  RUMP1=0.
  DO777 IQ=2,N1
  IT=IEIN(IQ)
777  RUMP1=RUMP1+SIGTR(IR,IT)*RODDEL(IQ)
  RETAU=RETAU+RUMP1
990  SUBSIT=.159154925*PRODT*(EXP(-RETAU))*WEFUN(IHIS)*(1./FNOH)
992  IBQC =(SN(IHIS)-ZZ1)/DELS +1.
  SUBA=DIST**(N-3)* TN(IBQC)
597  BROBIL(I)=SUBSIT*SUBA*BSOB(N)
  IUT(I)=IEIN(N+1)
  ISUBE(I) =(IUT(I) - 1) * NUTN + IBQC
  ESTMI(I) = BROBIL(I) / TN(IBQC)
  I=I+1
RETURN
END

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1
2

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* LIST
SUBROUTINE ROD
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1 XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1 PPONEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),
2 A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3 FL3E14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4 10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5 SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6 VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7 150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8 4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9 V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,
1 XMULTI,SINSPE,IKAP,RODDDEL,IALLL,I8,DELTA,IREG,BODEL,IBOREG,
2 ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3 IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORADS,RORAIS,
4 ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5 ICHROD,ILESS,IB,M111
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1 ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2 I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1 TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2 D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3 ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4 IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5 SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6 SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7 NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8 ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9 XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRRDO,
1 T,QRA12,DEL,DEL1,DEL2,FALSE,SYMBOL,JHIGH8,JLOW1,
2 JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3 KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,8MZU,K1,
4 FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5 SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6 ,IHIGHB,ILOWB,FTOPB,FBOBB,F8TOPB,FBBBAV,BLAMDA,LAYERB,IRADB,
7 COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8 DELTAX,YDEL,KKISS,XN1,YN1,ZN1

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COMMON CHECKD
COMMON YE
COMMON ISUBE, ISUFST,FSTMI,NUT4,NUT5,ESTIM,ISLOP,ISOL1
ISORT=1

IS VERTEX IN ROD ANNULUS
IF(XLENG2(IB)-ROINR1)5,5,15

NO, VERTEX IS NOT IN ROD ANNULUS
IF(ISOIRD)90,90,10
ISOIRD=0
GO TO 20

50

YES, VERTEX IS IN ROD ANNULUS
ISOIRD=1

IS VERTEX IN RIGHT HALF OF CORE
IF(XF(IB))25,25,30

NO, VERTEX NOT IN RIGHT HALF OF CORE
ICUT=0
GO TO 70

90

YES, VERTEX IS IN RIGHT HALF OF CORE
IF(ICUT)35,35,40
ICUT=1
GO TO 70

120

CALCULATE TANGENT OF ANGLES OF LINES FROM CENTER TO VERTICES
40 TANPT2 = ABSF (YF(IB) / XF(IB))
TANPT1 = ABSF (YF(IB-1) / XF(IB-1))

130

140

BOTH VERTICES IN FIRST SECTOR
IF(TANPT2 - TAN1) 45,45,80
45 IF(TANPT1 - TAN1) 50,50,80

150

160

YES, CHECK FIRST ROD ONLY
50 IBIL=0
ICHROD = 1
GO TO 77

180

ARE BOTH VERTICES WITHIN SECOND SECTOR
55 IF (TANPT2 - TAN2) 60,60,70
60 IF (TANPT1 - TAN2) 65,65,70

200

210

YES, CHECK FIRST, SECOND, AND LAST ROD

65	IBIL=1	
	ICHROD = 2	230
	GO TO 77	
80	IF(ILESS) 70,70,55	
160 C C	CHECK ALL RODS	
70	IBIL=0	
	ICHROD = NUROD	260
77	CALL CHECKA	
90	RETURN	310
	END	320

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* LIST
SUBROUTINE CHECKA
THIS ROUTINE CALCULATES THE SUM OF THE LENGTHS OF THOSE PARTS OF
A WALK WHICH PASS THRU A ROD ABSORBER
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1 XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(15,4),PROEL(15,4),PROFIS(15,4),CHI(4),CHIP(3),
1 PPONEL(4,4),FNEW(4,4),JSAVE(15),IEIN(10),IUT(4),TIGREA(15,4),
2 A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3 FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4 10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5 SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6 VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7 150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8 4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9 V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,
1 XMULTI,SINSPE,IKAP,RODDEL,IALL,I8,DELTA,IREG,BODEL,IBOREG,
2 ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3 IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,
4 ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5 ICHROD,ILESS,IB,M11
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1 ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2 I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1 TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2 D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3 ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4 IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5 SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6 SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7 NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8 ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9 XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRROO,
1 T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,
2 JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3 KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,
4 FIFP2,IFIFP3,IFP10,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5 SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6 ,IHIGHB,ILOWB,FTOPB,FBOBB,FBTOPB,FBBBAV,BLAMDA,LAYERB,IRADB,

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791

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7      COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8      DELTAX,YDEL,KKISS,XN1,YN1,ZN1
      COMMON CHECKD
      COMMON YE
      COMMON ISUBE, ISUEST,ESTM1,NUT4,NUT5,EST1M,ISLOP,ISOL1
      RODDEL(1)=0.
      ICHR = 1
C
C      CHECK INTERSECTION WITH OUTSIDE CYLINDER OF ROD(1)
C
101  X101 = XF(IBC) - XZERO(ICHR)
      Y101 = YF(IBC) - YZERO(ICHR)
      A103 = (UCO1(IB) * Y101 - VCO1(IB) * X101)**2
      DISC = -(A103) + RORAOS * QRA1
      IF(DISC) 13,100,100
C
C      NO INTERSECTION
C      ALL RODS CHECKED
C
13   IF (ICHR - ICHROD) 105,110,110
C
C      ALL RODS ARE NOT CHECKED , GO TO NEXT ROD
C
105  ICHR = ICHR + 1
      GO TO 101
C
C      DOES LAST ROD NEED TO BE CHECKED
C
110  IF (IBIL) 1001,1001,115
C
C      CHECK LAST ROD
C
115  IBIL = -1
      ICHR = FNURD
      GO TO 101
C
C      ALL RODS CHECKED
C
1001 RODDEL(1B)=RODDEL(1)
      RETURN
C
C      THERE WAS AN INTERSECTION CALCULATE RDEL AND FDEL
C
100  TERM1 = UCO1(1B) * X101 + VCO1(1B) * Y101
      DISC = SQRTF (DISC)
      FDEL = (-TERM1 + DISC) / QRA1

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RDEL = (-TERM1 - DISC) / QRA1	400
140 IF (RDEL) 150,145,145	530
150 IF (FDEL) 13,155,155	540
C	550
C ISIN = -1 IS FOR RDEL CROSSING IN BACKWARD DIRECTION	560
C	570
155 ISIN = -1	580
GO TO 4	590
145 IF (FDEL) 160,165,165	600
C	610
C ISIN = 0 IS FOR FDEL CROSSING IN BACKWARD DIRECTION	620
C	630
160 ISIN = 0	640
GO TO 4	650
C	660
C ISIN = 1 RDEL AND FDEL ARE BOTH TRUE CROSSINGS (FORWARD DIRECTION)	670
C	680
165 ISIN = 1	690
C	700
C FLIGHT LENGTH OR FORWARD PROJECTION MAKES TWO CROSSINGS WITH	710
C OUTSIDE CYLINDER	720
C	730
4 IF (ISIN) 7,8,170	740
C	750
C IS RDEL LESS THAN FLIGHT LENGTH	760
C	770
170 IF (RDEL - FLLE14(IB)) 175,13,13	780
C	790
C YES RDEL IS LESS THAN FLIGHT LENGTH	800
C CALCULATE (X1,Y1)	810
C	820
175 XONE = XF(IBC) + RDEL * UCO1(IB)	830
YONE = YF(IBC) + RDEL * VCO1(IB)	840
C	850
C DOES (X1,Y1) PASS TEST	860
C	870
CALL CKPT1	880
C	1010
C CALCULATE (X2,Y2)	1020
C	1030
5 XTWO = XF(IBC) + FDEL * UCO1(IB)	1040
YTWO = YF(IBC) + FDEL * VCO1(IB)	1050
C	1060
C DOES (X2,Y2) PASS TEST	1070
C	1080
CALL CKPT2	1090

	IF(IG00)6,13,6	1360
C		1361
C		1362
C		1363
C		1364
96 C	CHECK INTERSECTION WITH INSIDE CYLINDER OF ROD(I)	1370
	6 DISC = -(A103) + RORAIS * QRA1	1380
	IF (DISC) 30,245,245	1400
C		1410
C	THERE WAS AN INTERSECTION	1420
C		1430
	245 DISC = SQRTF(DISC)	1440
	IF (ISIN) 15,16,250	1450
C		1460
C	ISIN = 1 RDEL AND FDEL ARE BOTH TRUE CROSSINGS	1470
C		1480
	250 IF (I11) 10,255,255	1490
C		1500
C	(X1,Y1) PASSED TEST,RDEL LESS THAN FLIGHT LENGTH	1510
C		1520
	255 IF (I12) 260,265,50	1530
C		1540
C	(X2,Y2) PASSED TEST FDEL IS LESS THAN FLIGHT LENGTH	1550
C	CALCULATE RDEL2	1560
C		1570
	265 RDEL2 = (-TERM1 - DISC) / QRA1	1580
	RODDEL = RODDEL + 2.0 * ABSF(RDEL2 - RDEL)	1590
	GO TO 13	1600
C		1610
C	(X2,Y2) PASSED TEST , FDEL IS GREATER THAN FLIGHT LENGTH	1620
C	CALCULATE RDEL2 AND FDEL2	1630
C		1640
	260 FDEL2= (-TERM1 + DISC) / QRA1	1650
	RDEL2= (-TERM1 - DISC) / QRA1	1660
	275 IF (FDEL2 - FLLE14(IB)) 280,285,285	1750
C		1760
C	FDEL2 IS LESS THAN FLIGHT LENGTH	1770
C		1780
	280 RODDEL = RODDEL + ABSF(RDEL2 - RDEL) + ABSF(FLLE14(IB) - FDEL2)	1790
	GO TO 13	1800
C		1810
C	FDEL2 IS GREATER THAN FLIGHT LENGTH	1820
C		1830
	285 RODDEL = RODDEL + ABSF(RDEL2 - RDEL)	1840
	GO TO 13	1850
C		1860

C	ISIN = -1 IS FOR RDEL CROSSING IN BACKWARD DIRECTION	1870
C	CALCULATE (X2,Y2)	1880
C		1890
C	7 XTWO = XF(IBC) + FDEL * UCD1(1B)	1900
C	YTWO = YF(IBC) + FDEL * VCD1(1B)	1910
C		1920
C	TEST (X2,Y2)	1930
C		1940
C	CALL CKPT22	1950
C	GO TO 6	2170
C		2180
C	ISIN = 0 IS FOR FDEL CROSSING IN BACKWARD DIRECTION	2190
C	CALCULATE (X1,Y1)	2200
C		2210
C	8 XONE = XF(IBC) + RDEL * UCD1(1B)	2220
C	YONE = YF(IBC) + RDEL * VCD1(1B)	2230
C		2240
C	TEST (X1,Y1)	2250
C		2260
C	CALL CKPT11	2270
C	IF(IGOO)6,13,6	2440
C		2450
C	ISIN = 1 RDEL AND FDEL ARE BOTH TRUE CROSSING (FORWARD DIRECTION)	2460
C	I11 = -1 (X1,Y1) DID NOT PASS TEST	2470
C	CALCULATE FDEL2	2480
C		2490
C	10 FDEL2 = (-TERM1 + DISC) / QRA1	2500
C	IF (I12) 355,360,360	2510
C		2520
C	I12 = -1 FDEL IS GREATER THAN FLIGHT LENGTH (X2,Y2) PASSED TEST	2530
C		2540
C	355 IF (FDEL2 - FLLE14(1B)) 365,13,13	2550
C		2560
C	FDEL2 IS LESS THAN FLIGHT LENGTH	2570
C		2580
C	365 RODDEL = RODDEL + ABSF(FLLE14(1B) - FDEL2)	2590
C	GO TO 13	2600
C		2610
C	I12 = 0 FDEL IS LESS THAN FLIGHT LENGTH (X2,Y2) PASSED TEST	2620
C		2630
C	360 RODDEL = RODDEL + ABSF(FDEL - FDEL2)	2640
C	GO TO 13	2650
C		2660
C	ISIN = -1 IS FOR RDEL CROSSING IN BACKWARD DIRECTION	2670
C	CALCULATE RDEL2 AND FDEL2	2680
C		2690

15	FDEL2= (-TERM1 + DISC) / QRA1	2700
	RDEL2= (-TERM1 - DISC) / QRA1	2710
380	IF (RDEL2) 435,435,385	2780
435	IF (I12) 440,445,13	3040
440	IF (FDEL2- FLLE14(IB)) 445,13,13	3080
C		2790
C	SOURCE POINT IS BETWEEN INSIDE CYLINDER AND OUTSIDE CYLINDER	2800
C	CALCULATE (X1P,Y1P)	2810
C		2820
385	XONEP = XF(IBC) + RDEL2 * UCO1(IB)	2830
	YONEP = YF(IBC) + RDEL2 * VCO1(IB)	2840
C		2850
C	TEST (X1P,Y1P) AND SOURCE POINT	2860
C		2870
	CALL CKPT1P	2880
	IF(IGOO)445,13,445	3120
445	XTWOP = XF(IBC) + FDEL2 * UCO1(IB)	3130
	YTWOP = YF(IBC) + FDEL2 * VCO1(IB)	3140
C		3150
C	TEST (X2P,Y2P)	3160
C		3170
	CALL CKPT2P	3180
	GO TO 13	3350
C		3360
C	ISIN = 0 IS FOR FDEL CROSSING IN BACKWARD DIRECTION	3370
C	CALCULATE RDEL2	3380
C		3390
16	RDEL2 = (-TERM1 - DISC) / QRA1	3400
	IF (RDEL2) 485,485,480	3410
C		3420
C	SOURCE POINT IS IN THE INSIDE CYLINDER	3430
C		3440
480	IF (I12) 495,490,13	3450
C		3460
C	I12 = 0 (X1,Y1) PASSED TEST RDEL IS LESS THAN FLIGHT LENGTH	3470
C		3480
490	RODDEL = RODDEL + ABSF(RDEL - RDEL2)	3490
	GO TO 13	3500
C		3510
C	I12 = -1 (X1,Y1) PASSED TEST,RDEL IS GREATER THAN FLIGHT LENGTH	3520
C		3530
495	IF (RDEL2 - FLLE14(IB)) 500,13,13	3540
C		3550
C	RDEL2 IS LESS THAN FLIGHT LENGTH	3560
C		3570
500	RODDEL = RODDEL + ABSF(FLLE14(IB) - RDEL2)	3580

GO TO 13	3590
C	3600
C SOURCE POINT IS IN BETWEEN CYLINDERS	3610
C	3620
485 IF (I12) 505,510,13	3630
C	3640
C I12 = 0 (X1,Y1) PASSED TEST,RDEL IS LESS THAN FLIGHT LENGTH	3650
C	3660
510 RODDEL = RODDEL + ABSF (RDEL)	3670
GO TO 13	3680
C	3690
C I12 = -1 (X1,Y1) PASSED TEST,RDEL IS GREATER THAN FLIGHT LENGTH	3700
C	3710
505 RODDEL = RODDEL + ABSF(FLLE14(IB))	3720
GO TO 13	3730
C	3740
C ISIN = 1 RDEL AND FDEL ARE BOTH TRUE CROSSINGS (FORWARD DIRECTION)	3750
C I11 = 0 (X1,Y1) PASSED TEST,RDEL IS LESS THAN FLIGHT LENGTH	3760
C I12 = 1 (X2,Y2) DID NOT PASS TEST	3770
C CALCULATE RDEL2 AND (X1P,Y1P)	3780
C	3790
50 RDEL2 = (-TERM1 - DISC) / QRA1	3800
XONEP = XF(IBC) + RDEL2 * UCO1(IB)	3810
YONEP = YF(IBC) + RDEL2 * VCO1(IB)	3820
C	3830
C TEST (X1P,Y1P)	3840
C	3850
CALL CKP1P	3860
GO TO 13	3940
C	3950
C NO INTERSECTION WITH INSIDE CYLINDER	3960
C	3970
30 IF (ISIN) 40,35,535	3980
C	3990
C ISIN = 1 RDEL AND FDEL ARE BOTH TRUE CROSSINGS (FORWARD DIRECTION)	4000
C	4010
535 IF (I11) 13,540,13	4020
C	4030
C (X1,Y1) PASSED TEST I11 = 0	4040
C	4050
540 IF (I12) 32,31,13	4060
C	4070
C (X2,Y2) PASSED TEST I12 = 0	4080
C	4090
31 RODDEL = RODDEL + ABSF(FDEL - RDEL)	4100
GO TO 13	4110

C		4120
C	(X2,Y2) FAILED TEST I12 = -1	4130
C		4140
170	32 RODDEL = RODDEL + ABSF(FLLE14(IB) - RDEL)	4150
	GO TO 13	4160
C		4170
C	ISIN = -1 RDEL CROSSING IN BACKWARD DIRECTION	4180
C		4190
C	40 IF (I12) 42,41,13	4200
C		4210
C	(X2,Y2) PASSED TEST,FDEL IS LESS THAN FLIGHT LENGTH I12 = 0	4220
C		4230
C	41 RODDEL = RODDEL + ABSF(FDEL)	4240
	GO TO 13	4250
C		4260
C	I12 = -1 (X2,Y2) PASSED TEST FDEL IS GREATER THAN FLIGHT LENGTH	4270
C		4280
C	42 RODDEL = RODDEL + ABSF(FLLE14(IB))	4290
	GO TO 13	4300
C		4310
C	ISIN = 0 FDEL CROSSING IN BACKWARD DIRECTION	4320
C		4330
C	35 IF (I12) 43,44,13	4340
C		4350
C	I12 = -1 (X1,Y1) PASSED TEST RDEL IS GREATER THAN FLIGHT LENGTH	4360
C		4370
C	43 RODDEL = RODDEL + ABSF(FLLE14(IB))	4380
	GO TO 13	4390
C		4400
C	I12 = 0 (X1,Y1) PASSED TEST,RDEL IS LESS THAN FLIGHT LENGTH	4410
C		4420
C	44 RODDEL = RODDEL + ABSF(RDEL)	4430
	GO TO 13	4440
	END	4450

```

*      FAP
*      SUBROUTINE SUBCPT
*
*      THIS SUBROUTINE CALCULATES THE SUBSCRIPT OF SOURCE WEIGHT ASSOCIATED
*      WITH THE SOURCE POINT
*      SUBROUTINE SUBCPT
          ENTRY SUBCPT
L1D   PZE   0,0,1
LOD   PZE   0,0,0
  SAVE BSS   1
  ISB1 BSS   1
  ITI1 BSS   1
  IUB1 BSS   1
SUBCPT CLA   ISA
      CAS   KHALF
      TRA   ACBIG1
      TRA   *+1
      CLA   ISA
      STO   ISB1
SEC4  CLA   IUA
      CAS   IU6
      TRA   ACBIG2
      TRA   SECK
      CLA   L1D
SEC5  STO   ITI2
  STRT CLA   IUA
      SUB   L1D
      XCA
FIR11 MPY   INOLY
      ALS   17
      ADD   ISB1
      STO   SAVE
      CLA   ITA
      SUB   L1D
      XCA
      MPY   KHALF
      ALS   17
      ADD   SAVE
      STO   ISUBPT
      TRA   1,4
ACBIG1 CLA   L1D
      ADD   KISS
      SUB   ISA
      STO   ISB1
      TRA   SEC4
ACBIG2 CLS   L1D

```

	STO	ITI2
	CLA	IU2
	SUB	IUA
	XCA	
	TRA	FIR11
SECK	CLA	LOD
	STO	ITI2
	TRA	STRT
	COMMON	975
ISUBPT	COMMON	1
INOLY	COMMON	1
IU6	COMMON	1
ITI2	COMMON	1
	COMMON	79
KISS	COMMON	1
	COMMON	131
KHALF	COMMON	1
	COMMON	7
IU2	COMMON	1
ISA	COMMON	1
ITA	COMMON	1
IUA	COMMON	1
	END	

```

*      FAP
*  SUBROUTINE CKPT2P
*  THIS SUBROUTINE CHECKS IF (XTWOP,YTWOP) IS IN THE ABSORBING MATERIAL,
*  IF IT IS, AND I12=-1, THE ABSOLUTE VALUE OF (FLIGHT LENGTH - FDEL2)
*  IS ADDED TO RODDEL(1), IF I12=0,THE ABSOLUTE VALUE OF (FDEL-FDEL2)
*  IS ADDED TO RODDEL(1). IF (XTWOP,YTWOP)IS NOT IN THE ABSORBING
*  MATERIAL OR IF I12= +1  CONTROL IS RETURNED TO THE CALLING PROGRAM.

```

```

      ENTRY  CKPT2P

```

```

KEEP1  BSS      1
KEEP2  BSS      1
ABSO    BSS      1
ZERC    PZE      0,0,0
CKPT2P  SXD      KEEP1,1
        SXD      KEEP2,2
        LXD      ICHR,1
        LXD      IB,2
        CLA      XTWOP
        CAS      XSMAL+1,1
        TRA      **1
        CAS      XBIG+1,1
        TRA      OUT
        TRA      **1
        CLA      YTWOP
        CAS      YSMAL+1,1
        TRA      **1
        CAS      YBIG+1,1
        TRA      OUT
        TRA      **1
        CLA      I12
        CAS      ZERO
        TRA      OUT
        TRA      NEXT
        CLA      FLLE14+1,2
        FSB      FDEL2
        STO      ABSO
        CLA      RODDEL
        FAM      ABSO
        STO      RODDEL
        LXD      KEEP1,1
        LXD      KEEP2,2
        TRA      1,4
NEXT    CLA      FDEL
        FSB      FDEL2
        STO      ABSO
        CLA      RODDEL
        FAM      ABSO

```

	STO	RODDEL
OUT	LXD	KEEP1,1
	LXD	KEEP2,2
	TRA	1,4
	COMMON	480
174 RODDEL	COMMON	20
	COMMON	283
XBIG	COMMON	17
YBIG	COMMON	17
XSMAL	COMMON	17
YSMAL	COMMON	17
	COMMON	72
IB	COMMON	1
	COMMON	56
XONE	COMMON	1
YONE	COMMON	1
XTWO	COMMON	1
Y TWO	COMMON	1
XONEP	COMMON	1
YONEP	COMMON	1
XTWOP	COMMON	1
YTWOP	COMMON	1
IGOO	COMMON	1
ICHR	COMMON	1
I11	COMMON	1
I12	COMMON	1
FDEL	COMMON	1
RDEL	COMMON	1
RDEL2	COMMON	1
FDEL2	COMMON	1
IBC	COMMON	1
FLLE14	COMMON	10
XF	COMMON	10
YF	COMMON	10
	END	

```

*      FAP
*  SUBROUTINE CKPT1
*  THIS SUBROUTINE CHECKS IF (XONE,YONE) IS IN THE ABSORBING MATERIAL
*  AND SETS THE INDICATOR I11 ACCORDINGLY.
      ENTRY CKPT1
KEEP1  BSS      1
ZERO   PZE      0,0,0
ONE     PZE      0,0,1
CKPT1  SXD      KEEP1,1
        LXD      ICHR,1
        CLA      XONE
        CAS      XSMAL+1,1
        TRA      **1
        CAS      XBIG+1,1
        TRA      ABC
        TRA      **1
        CLA      YONE
        CAS      YSMAL+1,1
        TRA      **1
        CAS      YBIG+1,1
        TRA      ABC
        TRA      **1
        CLA      ZERO
        STO      I11
        LXD      KEEP1,1
        TRA      1,4
ABC     CLS      ONE
        STO      I11
        LXD      KEEP1,1
        TRA      1,4
        COMMON  783
XBIG    COMMON  17
YBIG    COMMON  17
XSMAL   COMMON  17
YSMAL   COMMON  17
        COMMON  72
IB       COMMON  1
        COMMON  56
XONE    COMMON  1
YONE    COMMON  1
XTWO    COMMON  1
YTWO    COMMON  1
XONEP   COMMON  1
YONEP   COMMON  1
XTWOP   COMMON  1
YTWOP   COMMON  1

```

IG00	COMMON	1
ICHR	COMMON	1
I11	COMMON	1
I12	COMMON	1
FDEL	COMMON	1
RDEL	COMMON	1
RDEL2	COMMON	1
FDEL2	COMMON	1
IBC	COMMON	1
FLLE14	COMMON	10
XF	COMMON	10
YF	COMMON	10
	END	

```

*      FAP
*      SUBROUTINE CKPT2
*      THIS SUBROUTINE CHECKS IF (XTWO,YTWO) IS IN THE AB ORBING MATERIAL
*      AND SETS THE INDICATOR IG00 ACCORDINGLY.

```

```

      ENTRY CKPT2

```

```

KEEP1  BSS      1
KEEP2  BSS      1
ZERO   PZE      0,0,0
ONE    PZE      0,0,1
CKPT2  SXD      KEEP2,2
      SXD      KEEP1,1
      LXD      ICHR,1
      CLA      XTWO
      CAS      XSMAL+1,1
      TRA      *+1
      CAS      XBIG+1,1
      TRA      BCA
      TRA      *+1
      CLA      YTWO
      CAS      YSMAL+1,1
      TRA      *+1
      CAS      YBIG+1,1
      TRA      BCA
      TRA      *+1
      LXD      IB,2
      CLA      FDEL
      FSB      FLLE14+1,2
      TMI      SETZR
      CLS      ONE
      STO      I12
      CLA      ONE
      STO      IG00
      LXD      KEEP1,1
      LXD      KEEP2,2
      TRA      1,4
SETZR  CLA      ZERO
      STO      I12
      CLA      ONE
      STO      IG00
      LXD      KEEP1,1
      LXD      KEEP2,2
      TRA      1,4
1777 SETZ  CLA      ZERO
      STO      IG00
      LXD      KEEP1,1
      LXD      KEEP2,2

```



```
BCA      TRA      1,4
          CLA      I11
          TMI      SETZ
          CLA      ONE
          STO      I12
          STO      IG00
          LXD      KEEP1,1
          LXD      KEEP2,2
          TRA      1,4
          COMMON  783
XBIG     COMMON  17
YBIG     COMMON  17
XSMAL    COMMON  17
YSMAL    COMMON  17
          COMMON  72
IB        COMMON  1
          COMMON  56
XONE     COMMON  1
YONE     COMMON  1
XTWO     COMMON  1
YTWO     COMMON  1
XONEP    COMMON  1
YONEP    COMMON  1
XTWOP    COMMON  1
YTWOP    COMMON  1
IG00     COMMON  1
ICHR     COMMON  1
I11      COMMON  1
I12      COMMON  1
FDEL     COMMON  1
RDEL     COMMON  1
RDEL2    COMMON  1
FDEL2    COMMON  1
IBC      COMMON  1
FLLE14   COMMON 10
XF        COMMON 10
YF        COMMON 10
          END
```

```

*      F40
*      SUBROUTINE CKPT11
*      THIS SUBROUTINE CHECKS IF (XONE,YONE) IS IN THE ABSORBING MATERIAL
*      AND IF (RDEL) IS LESS THAN THE FLIGHT LENGTH AND SET INDICATORS
*      ACCORDINGLY.

```

```

      ENTRY CKPT11
KEEP1  BSS      1
KEEP2  BSS      1
ZERO   PZE      0,0,0
ONE     PZE      0,0,1
CKPT11 SXD      KEEP1,1
        SXD      KEEP2,2
        LXD      ICHR,1
        LXD      IB,2
        CLA      XONE
        CAS      XSMAL+1,1
        TRA      *+1
        CAS      XBIC+1,1
        TRA      CBA
        TRA      *+1
        CLA      YONE
        CAS      YSMAL+1,1
        TRA      *+1
        CAS      YBIG+1,1
        TRA      CBA
        TRA      *+1
        CLA      RDEL
        CAS      FLLE14+1,2
        TRA      SETM1
        TRA      SETM1
        CLA      ZERO
        STO      I12
        CLA      ONE
        STO      IGOL
        LXD      KEEP1,1
        LXD      KEEP2,2
        TRA      1,4
SETM1  CLS      ONE
        STO      I12
        CLA      ONE
        STO      IGCC
        LXD      KEEP1,1
        LXD      KEEP2,2
        TRA      1,4
CBA    CLA      ZERC
        STO      IGOC

```

```
180 LXD      KEEP1,1
    LXD      KEEP2,2
    TRA      1,4
    COMMON 783
XBIG  COMMON 17
YBIG  COMMON 17
XSMAL COMMON 17
YSMAL COMMON 17
      COMMON 72
    IB      COMMON 1
      COMMON 56
    XONE    COMMON 1
    YONE    COMMON 1
    XTWO    COMMON 1
    YTWOP   COMMON 1
    XONEP   COMMON 1
    YONEP   COMMON 1
    XTWOP   COMMON 1
    YTWOP   COMMON 1
    IGDO    COMMON 1
    ICHR    COMMON 1
    I11     COMMON 1
    I12     COMMON 1
    FDEL    COMMON 1
    RDEL    COMMON 1
    RDEL2   COMMON 1
    FDEL2   COMMON 1
    IBC     COMMON 1
    FLLE14  COMMON 10
    XF      COMMON 10
    YF      COMMON 10
    END
```

```

*      FAP
*      SUBROUTINE CKPT1P
*      THIS SUBROUTINE CHECKS IF (XONEP,YONEP) IS IN THE ABSORBING MATERIAL,
*      IF IT IS NOT, INDICATOR IGOO IS SET .  IF IT IS,THE (X,Y) COORDINATE
*      OF THE VERTEX,FURTHER FROM THE CENTER OF THE REACTOR,IS CHECKED TO
*      DETERMINE IF IT IS IN THE ABSORBING MATERIAL. IF IT IS, THE ABSOLUTE
*      VALUE OF (RDEL2) IS ADDED TO RODDEL(1) AND THE INDICATOR IGOO SET
*      ACCORDINGLY .

```

```

      ENTRY CKPT1P
KEEP1  BSS      1
KEEP2  BSS      1
ZERO   PZE      0,0,0
ONE    PZE      0,0,1
CKPT1P SXD      KEEP1,1
      SXD      KEEP2,2
      LXD      ICHR,1
      LXD      IBC,2
      CLA      XONEP
      CAS      XSMAL+1,1
      TRA      ++1
      CAS      XBIG+1,1
      TRA      CNT
      TRA      ++1
      CLA      YONEP
      CAS      YSMAL+1,1
      TRA      ++1
      CAS      YBIG+1,1
      TRA      CNT
      TRA      ++1
      CLA      XF+1,2
      CAS      XSMAL+1,1
      TRA      ++1
      CAS      XBIG+1,1
      TRA      CNT
      TRA      ++1
      CLA      YF+1,2
      CAS      YSMAL+1,1
      TRA      ++1
      CAS      YBIG+1,1
      TRA      CNT
      TRA      ++1
      CLA      RODDEL
      FAM      RDEL2
      STO      RODDEL
CNT     CLA      I12
      LXD      IB,2

```

	TMI	CHK
	TZE	SETP1
	TPL	SETZ
CHK	CLA	FDEL2
	FSB	FLLE14+1,2
	TMI	SETP1
SETZ	CLA	ZERO
	STO	IGOO
	LXD	KEEP1,1
	LXD	KEEP2,2
	TRA	1,4
SETP1	CLA	ONE
	STO	IGOO
	LXD	KEEP1,1
	LXD	KEEP2,2
	TRA	1,4
	COMMON	480
RODDEL	COMMON	20
	COMMON	283
XBIG	COMMON	17
YBIG	COMMON	17
XSMAL	COMMON	17
YSMAL	COMMON	17
	COMMON	72
IB	COMMON	1
	COMMON	56
XONE	COMMON	1
YONE	COMMON	1
XTWO	COMMON	1
YTW	COMMON	1
XONEP	COMMON	1
YONEP	COMMON	1
XTWOP	COMMON	1
YTWOP	COMMON	1
IGOO	COMMON	1
ICHR	COMMON	1
I11	COMMON	1
I12	COMMON	1
FDEL	COMMON	1
RDEL	COMMON	1
RDEL2	COMMON	1
FDEL2	COMMON	1
IBC	COMMON	1
FLLE14	COMMON	10
XF	COMMON	10
YF	COMMON	10

END

```

*      FAP
*      SUBROUTINE CKPT22
*      THIS SUBROUTINE CHECKS IF (XTWO,YTWO) IS IN THE ABSORBING MATERIAL,
*      IF IT IS NOT, I12=1 . IF IT IS AND FDEL IS LESS THAN THE FLIGHT
*      LENGTH I12 =0 , OTHERWISE I12=-1 .

```

```

      ENTRY CKPT22
KEEP1  BSS      1
KEEP2  BSS      1
ZERO   PZE      0,0,0
ONE    PZE      0,0,1
CKPT22 SXD      KEEP1,1
      SXD      KEEP2,2
      LXD      ICHR,1
      CLA      X TWO
      CAS      XSMAL+1,1
      TRA      *+1
      CAS      XBIG+1,1
      TRA      CAB
      TRA      *+1
      CLA      YTWO
      CAS      YSMAL+1,1
      TRA      *+1
      CAS      YBIG+1,1
      TRA      CAB
      TRA      *+1
      LXD      IB,2
      CLA      FDEL
      FSB      FLLE14+1,2
      TPL      SETM1
      CLA      ZERO
      STO      I12
      LXD      KEEP1,1
      LXD      KEEP2,2
      TRA      1,4
SETM1  CLS      ONE
      STO      I12
      LXD      KEEP1,1
      LXD      KEEP2,2
      TRA      1,4
CAB    CLA      ONE
      STO      I12
      LXD      KEEP1,1
      LXD      KEEP2,2
      TRA      1,4
      COMMON  783
XBIG   COMMON  17

```

YBIG	COMMON	17
XSMAL	COMMON	17
YSMAL	COMMON	17
	COMMON	72
IB	COMMON	1
	COMMON	56
XONE	COMMON	1
YONE	COMMON	1
XTWO	COMMON	1
YTWO	COMMON	1
XONEP	COMMON	1
YONEP	COMMON	1
XTWOP	COMMON	1
YTWOP	COMMON	1
IGOO	COMMON	1
ICHR	COMMON	1
I11	COMMON	1
I12	COMMON	1
FDEL	COMMON	1
RDEL	COMMON	1
RDEL2	COMMON	1
FDEL2	COMMON	1
IBC	COMMON	1
FLLE14	COMMON	10
XF	COMMON	10
YF	COMMON	10
	END	


```

*      FAP
*      SUBROUTINE CKP1P
*      THIS SUBROUTINE CHECKS IF (XONEP,YONEP) IS IN THE ABSORBING MATERIAL,
*      IF IT IS, THE ABSOLUTE VALUE OF (RDEL2-RDEL) IS ADDED TO  RODDEL(1)
*      AND CONTROL RETURNED TO THE CALLING PROGRAM

```

```

      ENTRY  CKP1P
KEEP1  BSS      1
ABSL   BSS      1
CKP1P  SXD      KEEP1,1
      LXD      ICHR,1
      CLA      XONEP
      CAS      XSMAL+1,1
      TRA      ++1
      CAS      XBIG+1,1
      TRA      OUT
      TRA      ++1
      CLA      YONEP
      CAS      YSMAL+1,1
      TRA      ++1
      CAS      YBIG+1,1
      TRA      OUT
      TRA      ++1
      CLA      RDEL2
      FSB      RDEL
      STO      ABSL
      CLA      RODDEL
      FAM      ABSL
      STO      RODDEL
OUT     LXD      KEEP1,1
      TRA      1,4
      COMMON   480
RODDEL  COMMON   20
      COMMON   283
XBIG    COMMON   17
YBIG    COMMON   17
XSMAL   COMMON   17
YSMAL   COMMON   17
      COMMON   72
IB       COMMON   1
      COMMON   56
XONE    COMMON   1
YONE    COMMON   1
XTWO    COMMON   1
YTWO    COMMON   1
XONEP   COMMON   1
YONEP   COMMON   1

```

XIWUP COMMON 1
YTWCP COMMON 1
IGOO COMMON 1
ICHR COMMON 1
I11 COMMON 1
I12 COMMON 1
FDEL COMMON 1
RDEL COMMON 1
RDEL2 COMMON 1
FDEL2 COMMON 1
IBC COMMON 1
FLLE14 COMMON 10
XF COMMON 10
YF COMMON 10
END

```

*
LIST
SUBROUTINE OUTPUT
DIMENSION RODDEL(20),BODEL(50),IBOREG(150),XBIG(17),YBIG(17),
1 XSMAL(17),YSMAL(17),XZERO(17),YZERO(17),Y2(16)
DIMENSION XMULTI(15),MYER(12)
DIMENSION YE(25)
DIMENSION PROIGE(60),PROEL(60),PROFIS(60),CHI(4),CHIP(3),PPONEL(16
1 ),FNEW(16),JSAVE(15),IEIN(10),IUT(4),TIGREA(60),
2 A(15),X2(16),XF(10),YF(10),ZF(10),X(455),Y(455),XLENG2(11),
3 FLLE14(10),FLLE(1000),TITL1(12),TN(50),TN1(50),BSOB(
4 10),SIGTR(15,4),SIGEL(15,4),SIGIGE(15,4),SIGFIS(15,4),
5 SIGNAL(15,4),ENER(4),SOWT(1691,4),FFLUXB(1261),UCO1(10),
6 VCO1(10),WCO1(10),DELTA(30),FALSE(10),IREG(50),REDEL(
7 150),WEFUN(101),SN(101),IAU2(4),IMAG1(4),IMAG2(4),ESTB(
8 4),BROBIL(4),W(1000),V1(1000),UC(1000),UC1(10),PRONEL(15,4),
9 V11(10),W1(10),FLUXB(1261),BFLUX(316),ZFLUXB(316),IBREG(50)
DIMENSION ISUBE(4),ISUEST(4),ESTMI(4),ESTIM(5510)
COMMON IUT,TIGREA,N,N2,IENER,REDEL,RETAU
COMMON PROIGE,PROEL,PROFIS,CHI,CHIP,PPONEL,FNEW,JSAVE,IEIN,PRODT,
1 XMULTI,SINSPE,IKAP,RODDER,IALLL,I8,DELTA,IREG,BODEL,IBOREG,
2 ISAIND,XBIG,YBIG,XSMAL,YSMAL,XZERO,YZERO,Y2,CORRAD,FIROD,
3 IROD,FNUROD,NUROD,ISOIRD,ISORT,RORADO,RORADI,RORAOS,RORAIS,
4 ROINRA,ROINR1,THICAB,TAN1,TAN2,TANPT1,TANPT2,IBIL,ICUT,
5 ICHROD,ILESS,IB,M11
COMMON IBREG,ISUBPT,INOLY,IU6,ITI2,IFOCO
1 ,XONE,YONE,XTWO,YTWO,XONEP,YONEP,XTWOP,YTWOP,IGOO,ICHR,
2 I11,I12,FDEL,RDEL,RDEL2,FDEL2,IBC,FLLE14,XF,YF
COMMON FNOH,MYER,
1 TITL1,FN,FM,M,FKEY,KEY,S,KISS,T,U1,FV,FFF,D1,
2 D2,FRACTF,FRACTG,XX,YY,B,FNUTN,DELS,NUTN,NUTN1,FNUTN1,DELS1
3 ,FIENER,PRINT,IPRINT,TN,TN1,NAT,BSOB,KHALF,KDO,IS,IT1,T1,IT2,
4 IT3,IU1,IU2,ISA,ITA,IUA,IV,IVP1,A,SIGTR,SIGEL,SIGIGE,SIGFIS,
5 SIGNAL,ENER,PRONEL,X2,IFFF,IFP1,LJ1,U88,LJ2,UC,KCO,LJ3,LJ4,
6 SOWT,I,KBO,IC,ID,IBST,KKO,IXQ,IZQ,IRQ,ZZ1,ZZ2,IN,N1,NS,
7 NOUT,KIS2,FFLUXB,FLAG,NTAPA,DISP,IAU1,IPQ,ZIAU1,UA,ZIUA,Q24
8 ,X,Y,DIST,NOH,UCO,VCO,WCO,SPROJ,A2,B1,B2,C1,IHISUS,ZF,
9 XLENG2,NNN2,NNN,IZA,UCO1,VCO1,WCO1,IHIS,IZA1,JHIGH
COMMON JLOW,JFIN,IAL,IAO,QRA1,QRB1,QRC1,QRC2,QRTOT,QRR00,
1 T,QRA12,DEL,DEL1,DELT,FALSE,SYMBOL,JHIGH8,JLOW1,
2 JACK,IT,IR,SUBSIT,IBQC,SUBA,BROBIL,ISTAL,KIS1,
3 KIS6,KIS7,IHEL,IBIL,IAU2,IMAG1,IMAG2,DELZ,ESTB,BMZU,K1,
4 FIFP2,IFIFP3,IFP1U,FKBLCK,CY3,KBLOCK,FLUXB,IDO,AREA1,BSUFLU,
5 SUFLB,VVFLUX,VOL,AB86,VFLUXB,VFLUXA,ZFLUXB,BFLAMH,BFLAML,QLAM1
6 ,IHIGHB,ILOWB,FTOPB,FBOBB,FBOBPB,FBBBAV,BLAMDA,LAYERB,IRADB,
7 COP,IMORE,KACC,SN,WEFUN,UC,V1,W,FLLE,KHIS1,KHIS2,IFFFCL,
8 DELTAX,YDEL,KKISS,XN1,YN1,ZN1

```

```

COMMON CHECKD
COMMON YE
COMMON ISUBE, ISUEST, ESTMI, NUT4, NUT5, ESTIM, ISLOP, ISOL1
IU=IU1
K1=FM/100.
FKBLCK= KBLOCK
CY3=1./FKBLCK
WRITE OUTPUT TAPE NOUT,501,(ESTIM(I),I = 1,NUT5 )
501 FORMAT (1H 8E13.6 )
WRITE TAPE 12,NUT5
WRITE TAPE 12,(ESTIM(I),I = 1,NUT5 )
AUT5 = NUT5
NUT31 = AUT5 / 6.0
IST = 1
IND = 6
DO 999 JD =1,NUT31
PUNCH 503,JD,(ESTIM(I),I = IST,IND )
503 FORMAT ( 15,6E11.6 )
IST = IST + 6
999 IND = IND + 6
NUT32 = MODF (AUT5,6.)
IF (NUT32) 1001,1001,1002
1002 IST = IST - 6
IND = IND - 6 + NUT32
JD = NUT31 + 1
PUNCH 503,JD,(ESTIM(I),I = IST,IND )
1001 DO 504 I = 1,NUT5
504 ESTIM(I) = 0.0
301 WRITE OUTPUT TAPE NOUT,21,KBLOCK
302 DO 597 I=1,IFP1U
597 FLUXB(I)=FFLUXB(I)*CY3
WRITE OUTPUT TAPE NOUT,20
WRITE OUTPUT TAPE NOUT,991
991 FORMAT (23H THE FLUXB ARRAY IS )
I1=1
I2=IU1
IFP1=FIFP2 *FIENER
DO 591 I=1,IFP1
WRITE OUTPUT TAPE NCUT,23,(FLUXB(I),I=I1,I2)
I1=I1+IU1
591 I2=I2+IU1
581 IF(KBLOCK-K1)2,3,2
2 KBLOCK= KBLOCK+1
IDO= 1
6 RETURN
3 IFFF2=IFFF+1

```

1

```

DO 600 JA=1, IFFF2
I6=(JA-1)*(IENER*IU1)
I7=I6+IU1
I8=I7+IU1
I9=I8+IU1
DO 600 I=1, IU1
I6=I6+I
I7=I7+I
I8=I8+I
I9=I9+I
600 BFLUX(I)=FFLUXB(I)+FFLUXB(I7)+FFLUXB(I8)+FFLUXB(I9)
IF(FFF)383,383,394
394 IF(ABSF(X2(IFFF+1)**2-A(IV+1))/SQRTF(A(IV+1))-.0001)395,395,383
395 AREA1=6.283185*B*SQRTF(A(IV+1))/U1
BSUFLU=0.
ICARL=IFFF*IU1+1
DO 396 I =1, IU2
381 SUFLB=(BFLUX(ICARL)+BFLUX(ICARL+1))*AREA1/2.
382 BSUFLU=BSUFLU+SUFLB
396 ICARL=ICARL+1
WRITE OUTPUT TAPE NOUT,387,BSUFLU
387 FORMAT (36H0 THE SURFACE INTEGRAL USING EST B =1PG14.6 )
383 GO TO(584,300),KEY
300 IF(FLAG)10,10,400
400 VFLUXA=0.
DO 570 I=1, IFFF
IS3=(I-1)*IU1+1
VOL=B* 3.1415927*(X2(I+1)**2 - X2(I)**2)/U1
IUX20=IS3+IU1
DO 570 K=1, IU2
573 AB86=(ZFLUXB(IS3)+ZFLUXB(IS3+1)+ZFLUXB(IUX20) +ZFLUXB (IUX20+1))
VFLUXB =AB86*VOL/4.
VFLUXA=VFLUXA +VFLUXB
569 IUX20=IUX20+1
570 IS3=IS3+1
WRITE OUTPUT TAPE NOUT,391,VFLUXA
391 FORMAT(43H0THE VOL. FLUX INTERGAL USING B EST. IS= 1PG14.6 )
8 IF(FLAG)401,10,401
10 FLAG= 1.0
DO 11 I=1, IFIFP3
11 ZFLUXB(I)=BFLUX(I)
DO 101 I=1, IFP1U
101 FFLUXB(I)=0.
N= N1
IDO=0
INUTN9=FNUTN1+.3

```

```

DO 610 I=1,INUTN9
610  TN(I)=TN1(I)
    DELS=DELS1
    N1= N+1
    FN= N
    KBLOCK= 1
    GO TO 6
401  BFLAMH=0.
    BFLAML=100.
    DO 420 I=1,IFIFP3
        QLAM1=ZFLUXB(I)/BFLUX(I)
        IF(QLAM1-BFLAMH)410,410,415
415  BFLAMH=QLAM1
        IHIGHB=I
410  IF(QLAM1-BFLAML)421,420,420
421  BFLAML=QLAM1
        ILOWB=I
420  CONTINUE
        FTOPB=0.
        FBOBB=0.
        DO 390 I=1,IFFF
            IS3=(I-1)*IU1+1
            VOL=8* 3.1415927*(X2(I+1)**2 - X2(I)**2)/U1
            IUX20=IS3+IU1
            DO 390 K=1,IU2
371  AB86=(ZFLUXB(IS3)+ZFLUXB(IS3+1)+ZFLUXB(IUX20) +ZFLUXB (IUX20+1))
            FBTOPV=(AB86**2)*VOL/16.
            FBBBAV=AB86*VOL/16.*(BFLUX(IS3)+BFLUX(IS3+1)+BFLUX(IUX20)
1          +BFLUX(IUX20 +1))
372  FBOBB=FBOBB+FBBBAV
            FBTOP=FTOP+FBTGPV
389  IUX20=IUX20+1
390  IS3=IS3+1
373  BLAMDA=FTOP/FBOBB
43  WRITE OUTPUT TAPE NOUT,24,(TITL1(I),I=1,12)
701  IHIGHB=IHIGHB-1
        LAYERB=XMODF(IHIGHB,IU)+1
        IRADB=IHIGHB/IU+1
        WRITE OUTPUT TAPE NOUT,702,BFLAMH,LAYERB,X2(IRADB)
702  FORMAT(7HOLMAXB=1PG14.6,10H      LAYERBI3,9H      RADIUS1PG14.6)
        ILOWB=ILOWB-1
        LAYERB=XMODF(ILOWB,IU)+1
        IRADB=ILOWB/IU+1
        WRITE OUTPUT TAPE NOUT,704,BFLAML,LAYERB,X2(IRADB)
704  FORMAT(7HOLMINB=1PG14.6,10H      LAYERBI3,9H      RADIUS1PG14.6)
        WRITE OUTPUT TAPE NOUT,596,BLAMDA

```

```
596  FORMAT (10H  BLAMDA=1PE14.6 )
584  KEY=KEY-1
      IDO=0
      GO TO 6
20   FORMAT(1H1)
21   FORMAT(14H1EDIT FOR STEP13)
22   FORMAT(1H )
23   FORMAT(6(1PE16.6))
24   FORMAT (1H112A6)
25   FORMAT(11H FINAL EDIT)
26   FORMAT(13H0FIELD FLUXES)
27   FORMAT(5HORHO=F6.3)
28   FORMAT(6HOLMAX=1PE14.6,8H  LAYER13,9H  RADIUS1PE14.6)
29   FORMAT(6H LMIN=1PE14.6,8H  LAYER13,9H  RADIUS1PE14.6)
30   FORMAT(8H LAMBDA=1PE14.6)
      END
```

*COND. MONTE CARLO 621AST059000 02 33012FORTSYST

```
C WEIGHT FUNCTION PROGRAM
C THIS PROGRAM REQUIRES BLANK TAPES ON B-2 AND A-4. THE TAPE WITH
C THE VALUES OF THE STATISTICAL ESTIMATOR WITHOUT THE WEIGHT
C FUNCTUON MUST BE MOUNTED ON B-6. SET DENSITY ON TAPE DRIVES B-2,
C A-4, AND B-6 TO 800 B.P.I. .
* LIST
  DIMENSION TW(2000),ESTIM(7700),SUMET1(9900),EGTWMP(4500),EGTWSG
1      (1980),FLUX(900),FLUXSG(999), VA(5625),VAR(5625),
2      VARBY3(250),A(1000),B(2000),C(1000),D(500),E(500),
3      TWEQ(2000),ALP(45),BET(45),DELS(35),X2(10),RPRIM(35),
4      RGAM(35),DELTA(35),DENOM(35),IMIT(60)
  EQUIVALENCE (ESTIM (5700),A),(SUMET1(5700),B),(SUMET1(7700),C),
1      (VA,ESTIM),(VAR,SUMET1),(SUMET1(8700),D),(SUMET1(9200)
2      ,E),(TW,TWEQ),(A,EGTWSG),(C,FLUX),(D,FLUXSG),(E,VARBY3)
  COMMON TW,EGTWMP,ESTIM
C ALP=EXPONET USED IN CALCULATING WEIGHT FUNCTION
C BET=EXPONET USED IN CALCULATING WEIGHT FUNCTION
C GAMMA=EXPONET USED IN CALCULATING WEIGHT FUNCTION
C U1=NUMBER OF LAYERS
C FIENER=NUMBER OF ENERGY GROUPS
C FNUTN=NUMBER OF INTERVALS IN TN TABLE
C FFFCL=NUMBER OF RADIAL FIELD POINTS
C DELS = INCREMENT OF TN TABLE
C BLOC = NUMBER OF BLOCKS OF 100 HISTORIES EACH
  NIN=5
  NOUT=6
1010 WRITE OUTPUT TAPE NOUT,1011
1011 FORMAT ( 35H1 ANALYSIS OF WEIGHT FUNCTION )
  JIND=0
  REWIND 2
  REWIND 4
  READ INPUT TAPE NIN,1,U1,FIENER,FNUTN,BLOC,FFFCL,FNOALP
  READ INPUT TAPE NIN,1,FN,GAMA
1  FORMAT (6E12.0)
  WRITE OUTPUT TAPE NOUT,800,FIENER,FNUTN,BLOC,FFFCL,FNOALP,FN,GAMA
800  FORMAT ( 16H NO. OF GROUPS= 1PE12.6,30HNO. OF INTERVALS OF TN ARRA
1Y= 1PE12.6 / 28H NO. OF BLOCKS OF 100 HIS.= 1PE12.6,20H NO. OF FIE
2LD PTS.= 1PE12.6 / 32H NO OF SETS OF ALPHA AND BETA = 1PE12.6,
3 23H NO. OF STEPS IN HIS.= 1PE12.6, 8H GAMA = 1PE12.6)
  IU1=U1
  IENER=FIENER
  NUTN=FNUTN
  IFFFCL=FFFCL
  NOALP=FNOALP
  IBLOC=BLOC
```



```

N=FN
NUM=IU1*IENER*NUTN
READ INPUT TAPE NIN,1,(X2(I),I=1,IFFFCL)
READ INPUT TAPE NIN,1,(ALP(I),I=1,NOALP)
READ INPUT TAPE NIN,1,(BET(I),I=1,NOALP)
READ INPUT TAPE NIN,1,(RPRIM(I),I=1,NUTN)
READ INPUT TAPE NIN,1,(DELS(I),I=1,NUTN)
DO 4 I=1,NUTN
4  RGAM(I)=(RPRIM(I))*GAMA
  WRITE OUTPUT TAPE NOUT,802
802  FORMAT ( 38H VALUES OF ALPHA (READ ACROSS ROWS) )
  WRITE OUTPUT TAPE NOUT,809,(ALP(I),I=1,NOALP)
  WRITE OUTPUT TAPE NOUT,803
803  FORMAT ( 38H VALUES OF BETA (READ ACROSS ROWS) )
  WRITE OUTPUT TAPE NOUT,809,(BET(I),I=1,NOALP)
  WRITE OUTPUT TAPE NOUT,804
804  FORMAT ( 38H VALUES OF RPRIM (READ ACROSS ROWS) )
  WRITE OUTPUT TAPE NOUT,809,(RPRIM(I),I=1,NUTN)
  WRITE OUTPUT TAPE NOUT,806
806  FORMAT ( 38H VALUES OF R**GAMA(READ ACROSS ROWS) )
  WRITE OUTPUT TAPE NOUT,809,(RGAM(I),I=1,NUTN)
  WRITE OUTPUT TAPE NOUT,805
805  FORMAT ( 38H VALUES OF DELS (READ ACROSS ROWS) )
  WRITE OUTPUT TAPE NOUT,809,(DELS(I),I=1,NUTN)
  WRITE OUTPUT TAPE NOUT,807
807  FORMAT ( 38H VALUES OF FIELD PT RADII )
  WRITE OUTPUT TAPE NOUT,809,(X2(I),I=1,IFFFCL)
809  FORMAT ( 6E17.5)
  DO 6 JA=1,NUTN
    DELB=DELS(JA)/2.
6    DELTA(JA)=((RPRIM(JA)+DELB)**N-(RPRIM(JA)-DELB)**N) /FN
    DO 3 I=1,NOALP
      FHEX=-BET(I)
      AEX =ALP(I)
      DEM1=0.
    DO 2 JA=1,NUTN
2    DEM1=DEM1+(RPRIM(JA)**(AEX)*EXPF(FHEX*RGAM(JA)))*DELTA(JA)
3    DENOM(I)=DEM1
    IL=0
    DO 5 I=1,NOALP
      FHEX=ALP(I)
      FHAX=BET(I)
      DEM1=DENOM(I)
    DO 5 JA=1,NUTN
      IL=IL+1
5    TW(IL)=((RPRIM(JA)**FHEX)*(EXPF(-FHAX*RGAM(JA))))/DEM1

```

```

988  ISTRT1=I01/2*IENER
      ICLIP=IENER*(I01+1)
      IMIP=NOALP*ICLIP
      ICHIP=ICLIP*NUTN
      DO 50 IN=1,IBLOC
      ICC=1
      ISE=0
      READ TAPE 12,NUT5
      READ TAPE 12,(ESTIM(I),I=1,NUT5 )
      IFI=-NUTN+1
13    IAB=1
      IFIR=IFI
      ISEC=ISE
      DO 15 ICO=1,IFFECL
      ISTRT=(ICC-1)*IMIP+ISTRT1
      DO 12 IJ=1,NOALP
      IT2=(IJ-1)*NUTN+1
      DO 10 I=1,ICLIP
      IE1=IT2
      IFIR=IFIR+NUTN
      ISEC=ISEC+NUTN
      SUMET=0.
      DO 11 J=IFIR,ISEC
      SUMET=SUMET+ESTIM(J)*TW(IE1)
11    IE1=IE1+1
      SUMET1(IAB)=SUMET
10    IAB=IAB+1
      IFIR=IFI
12    ISEC=ISE
      IFI=IFI+ICHIP
      IFIR=IFI
      DO 16 M=1,NOALP
      IMLSST=(M-1)*ICLIP+ISTRT
      DO 16 N=1,IENER
      IMLSST=IMLSST+1
      EGTWMP(ICC)=SUMET1(IMLSST)
16    ICC=ICC+1
      ISE=ISE+ICHIP
15    ISEC=ISE
      IC3=ICC-1
      WRITE TAPE 4,(EGTWMP(L),L=1,IC3)
      IBB=IAB-1
      WRITE TAPE 2,(SUMET1(ICO),ICO=1,IBB)
99    CONTINUE
      REWIND 2
      REWIND 4

```

```

      READ TAPE 2,(SUMET1(IDD),IDD=1,IBB)
      IBLAC=IBLOC-1
      IF (IBLAC)890,890,889
889   DO 701 I=1,IBLAC
      READ TAPE 2,(TWEQ(IDD),IDD=1,IBB)
      DO 701 J=1,IBB
701   SUMET1(J)=SUMET1(J)+TWEQ(J)
      DO 702 J=1,IBB
702   SUMET1(J)=SUMET1(J)/BLOC
890   WRITE OUTPUT TAPE NOUT,144
144   FORMAT ( 75H1VALUES OF 1/BLOCK(SUM OVER BLOCK(SUM OVER INTERVALS
1 OF TN (EG*TW))) )
      WRITE OUTPUT TAPE NOUT,53
      REWIND 2
      ICU=ICLIP*NOALP
      DO 725 I=1,IFFFCL
      IPU=(I-1)*ICU
      RRAD=X2(I)
      WRITE OUTPUT TAPE NOUT,73,RRAD
73   FORMAT( 22HOFIELD POINT RADIUS = E14.5 )
      DO 725 IQA =1,NOALP
      WRITE OUTPUT TAPE NOUT,71,ALP(IQA),BET(IQA)
71   FORMAT ( 8HOALPHA= 1PE14.6,10X, 7H BETA= 1PE14.6 )
      IGEN=(IQA-1)*ICLIP
      IAST=IPU +IGEN+1
      IAED=IAST-1+ICLIP
725  WRITE OUTPUT TAPE NOUT,72,(SUMET1(L),L=IAST,IAED)
72   FORMAT ( 4E17.8)
      NAA=0
      IOO=NOALP*IFFFCL
      IQO=IENER*IOO
      DO 80 MN=1,IBLOC
      MNI=(MN-1)*IQO+1
      MNI1=MN*IQO
      MNI2=MNI-1
      READ TAPE 4,(EGTWMP(L),L=MNI,MNI1)
      DO 80 I=1,IOO
      IBST=(I-1)*IENER+MNI
      IBED=I*IENER+MNI2
      EGTW12=0.
      DO 81 IB=IBST,IBED
81   EGTW12=EGTW12+EGTWMP(IB)
      NAA=NAA+1
80   EGTWSG(NAA)=EGTW12
      REWIND 4
      DO 90 I=1,IBLOC

```

```

90  IMIT(I)=(I-1)*IQO+1
    DO 82 II=1,IQO
      ETAVG=0.
      DO 83 JJ=1,IBLOC
        MM = IMIT(JJ)
        IMIT(JJ)=IMIT(JJ)+1
83  ETAVG=ETAVG+ EGTWMP(MM)
82  FLUX(II)=ETAVG/BLOC
    IST=1
    IFIN=IENER
    IQO=IQO/IENER
    DO 84 IZY=1,IBLOC
      I=(IZY-1)*IQO
      DO 84 IQ=1,IQO
        ETAVG=0.
        DO 85 IM=IST,IFIN
95  ETAVG=ETAVG+FLUX(IM)
          IR=I+IQ
          FLUXSG(IR)=ETAVG
          IST=IST+IENER
84  IFIN=IFIN+IENER
        WRITE OUTPUT TAPE NOUT,101
101  FORMAT ( 30H1 VARIANCE BY FORMULA NO. 4      )
        WRITE OUTPUT TAPE NOUT,140
140  FORMAT ( 88H0FORMULA NO. 4= 1/BLOCK(SUM OVER BLOCK((SUM OVER GROU
      1PS(SUM OVER INTERVALS OF TN(EG*TW - / 50H (SUM OVER GROUPS(FLUX))
      2SQUARED)))) SQUARED)      )
        ISET=NOALP*IFFFCL
        DO 96 I=1,ISET
96  VAR(I)=0.
        ISAT =NOALP-1
        DO 97 N=1,IFFFCL
          IFST=(N-1)*NOALP +1
          IST =IFST-ISET
          DO 94 M=1,IBLOC
            IST=IST+ISET
            IEND=IST+ISAT
            IFST1=IFST
            DO 94 I=IST,IEND
              VA(IFST1)=(EGTWSG(I)-FLUXSG(IFST1)  )**2
              VAR(IFST1)=VAR(IFST1)+VA(IFST1)
94  IFST1=IFST1+1
          IFST1=IFST1-1
          DO 95 K=IFST,IFST1
            VAR(K)=VAR(K)/BLOC
95  X1=X2(N)

```

```

      WRITE OUTPUT TAPE NOUT,98,X1
98  FORMAT ( 21HOFIELD POINT RADIUS= 1PE14.6)
97  WRITE OUTPUT TAPE NOUT,72,(VAR(J),J=IFST,IFST1)
      WRITE OUTPUT TAPE NOUT,115
115  FORMAT ( 29H1 VARIANCE BY FORMULA NO. 1      )
      WRITE OUTPUT TAPE NOUT,141
141  FORMAT ( 86HOFORMULA NO. 1= 1/BLOCK(SUM OVER BLOCK(SUM OVER INTERV
1ALS OF TN(EG*TW)-FLUX) SQUARED)
      WRITE OUTPUT TAPE NOUT,120
120  FORMAT ( 85H0THE FOLLOWING ROWS ARE FOR SETS OF ALPHA AND BETA GO
1ING FROM ONE TO END OF TABLE
      WRITE OUTPUT TAPE NOUT,53
53  FORMAT( 8H0GROUP 1,10X, 8H GROUP 2,10X,8H GROUP 3,10X,8H GROUP 4)
      ISET=NOALP*IENER*IFFFCL
      DO 110 I=1,ISET
110  VAR(I)=0.
      ISBT=NOALP*IENER
      ISAT=ISBT-1
      DO 113 N=1,IFFFCL
      IDON=(N-1)*NOALP
      IFST=(N-1)*ISBT+1
      IST=IFST-ISET
      DO 112 M=1,IBLOC
      IST=IST+ISET
      IEND=IST+ISAT
      IFST1=IFST
      DO 112 I=IST,IEND
      VA(IFST1)=(EGTWMP(I)-FLUX(IFST1))*2
      VAR(IFST1)=VAR(IFST1)+VA(IFST1)
112  IFST1=IFST1+1
      IFST1=IFST1-1
      DO 111 K=IFST,IFST1
111  VAR(K)=VAR(K)/BLOC
      DO 125 IKIM =1,NOALP
      VB1 =0.
      IDIM=IDON+IKIM
      I2=(IKIM-1)*IENER+IFST
      I4=(IKIM+IDON)*IENER
      DO 126 IPIM =I2,I4
126  VB1=VB1+VAR(IPIM)
125  VARBY3(IDIM)=VB1
      X1=X2(N)
      WRITE OUTPUT TAPE NOUT,116,X1
116  FORMAT( 22HOFIELD POINT RADIUS = 1PE14.6      )
113  WRITE OUTPUT TAPE NOUT,72,(VAR(J),J=IFST,IFST1)
      WRITE OUTPUT TAPE NOUT,600

```

```

600  FORMAT ( 29H1 VARIANCE BY FORMULA NO. 2          )
      WRITE OUTPUT TAPE NOUT,142
142  FORMAT( 104H0FORMULA NO 2=(SUM OVER GROUPS(1/I (SUM OVER BLOCK(SU
      1M OVER INTERVALS OF TN(EG*TW)-FLUX) SQUARED)))          )
      WRITE OUTPUT TAPE NOUT,128
128  FORMAT( 84H0 EACH VALUE OF THIS TABLE CORRESPONDS TO A VALUE OF
      1 TW, (READ ACROSS ROWS)                                )
      DO 127 MM=1,IFFFCL
      IST=(MM-1)*NOALP+1
      IND=MM*NOALP
      DO 132 I=1,NOALP
      ETAVG=0.
      K=I
      DO 130 J=1,IFFFCL
      ETAVG=ETAVG + VARBY3(K)
130  K=K+NOALP
132  VAR(I)=ETAVG
      X1=X2(MM)
      WRITE OUTPUT TAPE NOUT,98,X1
127  WRITE OUTPUT TAPE NOUT,91,(VARBY3(L),L=IST,IND)
91   FORMAT ( 6E15.6)
      WRITE OUTPUT TAPE NOUT,131
131  FORMAT( 30H1VARIANCE BY FORMULA NO. 3          )
      WRITE OUTPUT TAPE NOUT,143
143  FORMAT ( 100H0FORMULA NO. 3=(SUM OVER FIELD PTS.(SUM OVER GROUPS(
      11/BLOCK(SUM OVER BLOCK(SUM OVER INTERVALS OF / 30H TN(EG*TW)-FLU
      2X) SQUARED))))          )
      WRITE OUTPUT TAPE NOUT,128
      WRITE OUTPUT TAPE NOUT,133,(VAR(I),I=1,NOALP)
133  FORMAT ( 6E 15.6)
      GO TO 1010
      END

```

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PART TWO

TABLE OF CONTENTS PART II

	Page
I. INTRODUCTION	203
II. CONTROL ROD GEOMETRY	203
III. CONTROL VANE CALCULATIONS	205
IV. INPUT SYMBOLS AND DEFINITIONS FOR CONTROL ROD SPECIFICATIONS	209
V. SYMBOLS AND DEFINITIONS OF OTHER VARIABLES FREQUENTLY USED WHEN CONSIDERING CONTROL RODS	211
VI. FLOW DIAGRAMS OF PROGRAMS CONCERNED WITH CONTROL ROD CALCULATIONS	214

PART II

I. INTRODUCTION

This part describes the part of the computer program required when control vanes in the form of arcs of circles are present in the reactor. A control vane is part of a control rod and is described below.

When the rods are present, those parts of the history which pass through the vanes must be calculated. The method used to accomplish this is similar to the method used to find the intersections of a step and an annulus, except that a rod is viewed as two concentric cylinders and the center of the rod is not at the origin. The vane material occupies part of the space between the two concentric cylinders as shown in figures 13 and 14.

II. CONTROL ROD GEOMETRY

The number of control rods must be equal to or greater than four but not more than sixteen. The location of the rods is specified by supplying the x-y coordinates of the center of each rod. The rods must be contained within a given annulus and the inside radius of this annulus must be given as input data when rods are present. Figure 13 shows one possible configuration of a reactor with four rods and figure 14 shows an enlarged view of a rod and the symbols for which values are required as input for each rod. The material of the control rods, exclusive of the vane portions, is considered to be the same as the material of the annular region containing the rods. A control rod, identified as rod number one, is always centered on the positive x axis. The orientation of each vane, vane radius, and angle subtended by a vane can be different for each rod.

Figure 13 A reactor with 4 control rods.

ROINRA = INSIDE RADIUS OF ROD ANNULUS

Figure 14 A control rod.

RORADO = ROD OUTSIDE RADIUS
RORADI = ROD INSIDE RADIUS

$\left. \begin{matrix} \text{XBIG} \\ \text{XSMAL} \end{matrix} \right\} = \text{LARGEST AND SMALLEST VALUES OF} \\ \text{X COORDINATES ASSOCIATED WITH} \\ \text{VANE OF THIS PARTICULAR ROD.}$

$\left. \begin{matrix} \text{XZERO} \\ \text{YZERO} \end{matrix} \right\} = \text{X-Y COORDINATES OF} \\ \text{CENTER OF ROD}$

$\left. \begin{matrix} \text{YBIG} \\ \text{YSMAL} \end{matrix} \right\} = \text{LARGEST AND SMALLEST VALUES OF} \\ \text{Y COORDINATES ASSOCIATED WITH} \\ \text{VANE OF THIS PARTICULAR ROD.}$

III. CONTROL VANE CALCULATIONS

The program always checks to ascertain if the source point is in the annulus which contains the rods and an indicator set accordingly; it is also determined whether or not the source point is in the right half of the reactor and an indicator set accordingly. The vertex of the current step will be the source point for the next step; the indicators are then set accordingly so that the information concerning the source point for the next step will be available when needed.

At a subsequent point in the program it is determined whether the vertex is in the rod annulus and also if the vertex is in the right half of the reactor. If either the source point or the vertex is in the annular region containing the rods it is possible to have an intersection of the history with one or more vanes. The question arises then, which rods do we check? If either the source point or the vertex or both are in the left hand half of the reactor, all rods are checked for intersections. If both the source point and the vertex are in the right half of the reactor the program then finds which rods need to be checked for possible intersections with the step. This is done by comparing the angles formed by the lines going from the origin to both the starting point and the end point of the step with an angle (α_1) which contains only the rod on the x axis. If both vertices of the step are not contained within this angle then a larger angle (α_2) is used. Figure 15 shows the reactor and the angles (α_1) and (α_2). The angles (α_1) and (α_2) are input data.

Figure 15

As is seen from the figure, angle α_1 contains only rod number one while α_2 contains rods number one, two and eight.

Since the field points are usually on or near the positive x-axis, and since the spheres of influence are used to obtain more sampling from source points near the field point, it is seen that most of the histories will have their starting and ending points in the right half of the reactor. Since most of the histories start and end in the right half, it is reasonable to find the minimum number of control rods that need to be checked for intersections when a step of a history is in the right half of the reactor.

If neither the source point or the vertex are within the rod annulus, then no intersection can occur and no checking is needed. The parts of a step which pass through rod absorbers are found by solving the parametric equations of the infinite line through the two end points of the step with the equation of the outside cylinder of the rod to obtain the two values of $\mathcal{S}$. The direction cosines of the steps in a history are (u_i, v_i, w_i) ; $i = 1, \dots, n$. The values a_j and b_j are the x-y coordinates of the center point of the control rod j , and R_j is either the radius of the inside cylinder or outside cylinder of the control rod j depending on which cylinder is of current interest.

The equations of the infinite line through the starting point (X_{st}, Y_{st}) with signed distance $\bar{S}$ from the starting point (X_{st}, Y_{st}) to the intersection point (X, Y) are as follows:

$$\begin{aligned} X &= X_{st} + \bar{S} u_i \\ Y &= Y_{st} + \bar{S} v_i \\ Z &= Z_{st} + \bar{S} w_i \end{aligned} \quad (48)$$

The equation of the cylinder of interest is:

$$(X - a_j)^2 + (Y - b_j)^2 = R_j^2 \quad (49)$$

where j denotes a particular control rod.

Equations 48 and 49 may be solved simultaneously for the values of

$$\begin{aligned} (X_{st} + \bar{S} u_i - a_j)^2 + (Y_{st} + \bar{S} v_i - b_j)^2 &= R_j^2 \\ ((X_{st} - a_j) + \bar{S} u_i)^2 + ((Y_{st} - b_j) + \bar{S} v_i)^2 &= R_j^2 \\ (u_i^2 + v_i^2) + 2\bar{S}(u_i(X_{st} - a_j) + v_i(Y_{st} - b_j)) + (X_{st} - a_j)^2 + (Y_{st} - b_j)^2 \\ &\quad - R_j^2 = 0 \\ \bar{S} &= \frac{-[u_i(X_{st} - a_j) + v_i(Y_{st} - b_j)]}{(u_i^2 + v_i^2)} \\ &\quad \pm \frac{\{[u_i(X_{st} - a_j) + v_i(Y_{st} - b_j)]^2 - (u_i^2 + v_i^2)[(X_{st} - a_j)^2 + (Y_{st} - b_j)^2 - R_j^2]\}^{\frac{1}{2}}}{(u_i^2 + v_i^2)} \end{aligned} \quad (50)$$

Equation 50 may be simplified to:

$$\bar{S} = \frac{-[u_i(X_{st} - a_j) + v_i(Y_{st} - b_j)] \pm \sqrt{[u_i(Y_{st} - b_j) - v_i(X_{st} - a_j)]^2 + R_j^2(u_i^2 + v_i^2)}}{(u_i^2 + v_i^2)} \quad (51)$$

The values of the subscript st, on X_{st} and Y_{st} , may be either i-1 or i depending on which of the two end points of the step is further away from the center of the reactor. R_j is the radius of either of the two cylinders which constitute a control rod, depending on which of the two cylinders are being checked for an intersection.

To determine if an intersection occurred between the step and control rod j, it is only necessary to evaluate the discriminant of the above equation using the appropriate constants, and check the sign. If the sign of the discriminant is negative, no intersection occurred; if the sign is positive an intersection did occur.

When an intersection does occur, the two values of $\bar{S}$ (RDEL and FDEL, where FDEL is always larger than RDEL) are used to calculate the x-y coordinates of the two points of intersection. The x-y coordinates, found by using RDEL, are called XONE and YONE; the coordinates, found by using FDEL, are called XTWO and YTWO. These two sets of coordinates are now checked to determine if the step passed through the vane; if not, the process is repeated for the next rod for which an intersection is possible.

When the step does pass through the vane, the x-y coordinates of the intersection with the inside cylinder of the rod are calculated using the same formula but changing R_j . These coordinates are checked to determine if they are truly on the vane portion of the inside cylinder; that is, the history could have passed through the end of the absorber and in this case it is neglected. Knowing the values of $\bar{S}$ (RDEL2 and FDEL2), for which intersection occurs with the inside cylinder of the rod, and the values of RDEL and FDEL; the portion of the step which passes through the vane can be found. The parts of the step which pass through vanes are accumulated and this value is saved for each step of the history until the energy of each step is known. Consult the flow chart for subroutine CHECKA for further details.

The value of RETAU, given by equation 31 in "Part One" of this report, is now modified to the following:

$$\text{RETAU} = \sum_{i=1}^m \text{SIGTR}_i * \mathcal{S} i + \sum_{i=1}^n \text{SIGTR (VANE MATERIAL)} * \text{RODDEL}_i$$

where m is the number of $\mathcal{S} i$'s found for the entire history, and n is the number of steps in a history. The value of SIGTR (vane material) is defined to be equal to the true transport cross-section of the rod absorber minus the transport cross-section of the rod annuli material; it should be remembered that SIGTR (vane material) is group dependent. RODDEL_i is the part of step i which passes through vane material.

IV. INPUT SYMBOLS AND DEFINITIONS FOR CONTROL ROD SPECIFICATIONS

FNURD =	The number of control elements. This value should not be entered into the computer unless FIROD = 2.
ROINRA =	The inside radius of the annulus containing the rods.
RORADI =	The radius of the inside cylinder of the control rod.
RORADO =	The radius of the outside cylinder of the control rod.
XBIG (I) =	The largest value of the x-coordinate associated with the rod absorber material (vane) for each control rod.
XSMAL (I) =	The smallest value of the x-coordinate associated with the rod absorber material (vane) for each control rod.
XZERO (I) =	The x-coordinates of the center of the control rods.
YBIG(I) =	The largest value of the y-coordinate associated with the rod absorber material (vane) for each control rod.
YSMAL (I) =	The smallest value of the y-coordinate associated with the rod absorber material (vane) for each control rod.
YZERO (I) =	The y-coordinates of the center of the rods.

One control rod must be centered on the positive x-axis, and this rod is considered to be the number one rod. The other rods are numbered in sequence going in a counter-clockwise direction. See figure (16).

It is seen from figure (16) that if any of the values of YBIG (I), YSMAL (I), XBIG (I), or XSMAL (I) are associated with the end of the vane, then the value of that variable is given as the midpoint of the end of the vane.

Figure 16
211

V. SYMBOLS AND DEFINITIONS OF OTHER VARIABLES
FREQUENTLY USED WHEN CONSIDERING CONTROL RODS

FDEL =	The value of that part of a step which causes the step to intersect the outside cylinder of the control rod vane at the point (XTWO, YTWOP). See figure (17).
FDEL 2 =	The value of that part of a step which causes the step to intersect the inside cylinder of the control rod vane at the point (XTWOP, YTWOP). See figure (17).
ICUT =	0; Indicates that the vertex of the current step of the current history, which is further from the origin (0,0), is in the left half of the reactor.
ICUT =	1; Indicates that the vertex of the current step of the current history, which is further from the origin (0,0), is in the right half of the reactor.
ISOIRD =	1; The starting point of a step is in the annulus containing the control rods.
ISOIRD =	0; The starting point of a step is not in the annulus containing the control rods.
RDEL =	The value of that part of a step which causes the step to intersect the outside cylinder of the control rod vane at the point (XONE, YONE). See figure (17).
RDEL 2 =	The value of that part of a step which causes the step to intersect the inside cylinder of the control rod vane at the point (XONEP, YONEP). See figure (17).
RODDEL (I) =	The summation of the parts of a step which passed through the rod absorbers.
ROINRI =	Inside radius of control rod annulus squared.
RORAIS =	The square of the radius of the inside cylinder of the control rods.
RORAOS =	The square of the radius of the outside cylinder of the control rods.
TAN 1 =	The tangent of the largest angle, taken from the x-axis, which contains only the control rod positioned on the x-axis.
TAN 2 =	The tangent of the largest angle, taken from the x-axis, which contains only the control rod positioned on the x-axis and the adjacent control rod.

TANPT 1 = The absolute value of the tangent of ϕ_1 ; ϕ_1 is the angle between the x-axis and the line from the origin to the starting point of a step.

TANPT 2 = The absolute value of the tangent of ϕ_2 ; ϕ_2 is the angle between the x-axis and the line from the origin to the end point of a step.

XONE =) The x and y coordinates given by the intersection of a step and the outside cylinder of a rod. (See definition of RDEL and figure 17.)

YONE =)

XONEP =) The x and y coordinates given by the intersection of a step and the inside cylinder of a rod. (See definition of RDEL2 and figure 17.)

YONEP =)

XTWO =) The x and y coordinates given by the intersection of a step and the outside cylinder of a rod. (See definition of FDEL and figure 17.)

YTWO =)

XTWOP =) The x and y coordinates given by the intersection of a step and the inside cylinder of a rod. (See definition of FDEL 2 and figure 17.)

YTWOP =)

Figure 17 showing a control rod and a step of a history passing through the rod.

ADDITIONAL NOTES

* The p's in Equation 4 have the same meaning as in Equation 69 reference 2.

The quantity $p_{r,i}$ is an input number giving the probability of sampling reaction r at a scattering point for a neutron going into the point i in energy group g . A 4×4 matrix p_{rg} is inputted for each material region. The physical reaction probability at the point is accounted for by weighting, thus the factor $\frac{\sigma_{r,i}}{p_{r,i}}$ appears in the estimator Equation 4.

In an earlier version of the program the scattering at a point was sampled by straight analog Monte Carlo, so that the $p_{r,i}$ were computed internally to be $\frac{\sigma_{r,i}}{\sum_r \sigma_{r,i}}$.

The quantity $\sum_r \sigma_{r,i}$ is the quantity TIGREA in the program listing.

** In the sampling of unstretched histories a sample is used only if the displacement R' lies in the interval $x - y/2 < R' < x + y/2$, where x and y are input quantities. A block of 100 unstretched histories means 100 histories which pass the test and are used. This sampling process requires that the conditional weight function have an additional normalization factor (called B_n in the program).

B_n is just the probability that an unstretched sample will fall in the given interval. The B_n have been computed for $n = 2, \dots, 10$ by running the raw history part of the program for 10,000 history runs.

ROD SUBROUTINE

SUBROUTINE CHECKA

SUBROUTINE CHECKA (cont'd.)

ISIN = 1, FDEL AND RDEL ARE BOTH FOR CROSSINGS IN THE FORWARD DIRECTION
EXAMPLE:

SUBROUTINE CHECKA (cont'd.)

$ISIN = -1$, RDEL CROSSING IN BACKWARD DIRECTION
EXAMPLE:

SUBROUTINE CHECKA (cont'd)

SUBROUTINE CHECK A (cont'd.)

SUBROUTINE CHECK A (cont'd)

SUBROUTINE CHECK A (Cont'd.)

SUBROUTINE CKPIP

SUBROUTINE CKPTI

SUBROUTINE CKPTII

SUBROUTINE CKPTIP

SUBROUTINE CKPT2

SUBROUTINE CKPT22

SUBROUTINE CKPT2P