TECHNICAL REPORT
ECOM-00240-F, VOL. II

MONTE CARLO CODES FOR STUDY OF LIGHT TRANSPORT IN THE ATMOSPHERE

Volume II: Utilization Instructions

FINAL REPORT

By

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AUGUST 1965

ECOM

UNITED STATES ARMY ELECTRONICS COMMAND • FORT MONMOUTH, N.J.

CONTRACT DA28-043 AMC-00240(E)

RADIATION RESEARCH ASSOCIATES, INC.
Fort Worth, Texas

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1 JULY 1964 TO 31 JULY 1965

CONTRACT NO. DA 28-043 AMC-00240(E)

DA Project No. 1VO 14501-B-53A-13-03

DASA Subtask No. DASA 1304-01/12.017

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ABSTRACT

Monte Carlo procedures designated as LITE-I and LITE-II were developed to study the transport of light through the earth's atmosphere under various environmental conditions. LITE-I treats monochromatic light emitted from a point source, and LITE-II treats monochromatic plane sources of light. The codes have been written in both ALGOL for the Burrough's B-5000 and FORTRAN II for other computers. The codes are sufficiently flexible to treat multiple scattering in an atmosphere in which air density and aerosol size distribution vary independently and arbitrarily with altitude. Provision for treating ground and cloud reflection with an albedo method is also available in the codes.

The codes have been verified through comparisons with other calculations of light transport in the atmosphere. Utilization instructions, input data formats, sample problems, and the ALGOL listings of the codes are given to aid those who wish to utilize the codes.

FOREWORD

The authors wish to express their appreciation to Henrietta Hendrickson and Hemma Francis of Oak Ridge National Laboratory who aided in the checkout and running of test problems on the FORTRAN versions of the LITE codes. They also wish to acknowledge the assistance of Leon Leskowitz, of the U. S. Army Electronics Laboratory, Fort Monmouth, New Jersey, for his assistance in translating the FORTRAN codes to the ALGOL language and his many helpful suggestions during the checkout of the ALGOL versions of the LITE codes. The work described in this report was carried out under the technical monitorship of Dr. R. W. Fenn of the Atmospheric Sciences Laboratory, USAEC, Fort Monmouth, New Jersey.

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I. INTRODUCTION

The LITE-I and LITE-II codes were developed to study the transport of light in a plane atmosphere under various environmental conditions. LITE-I treats multiple scattering from a point source of light, and LITE-II treats multiple scattering from a plane source of light. The Monte Carlo methods utilized in the codes are described in detail in Volume I of this report. The description includes the methods used to describe an air-ground geometry, to treat Rayleigh and Mie scattering, and to treat ground and cloud reflection.

The LITE codes were written in both ALGOL for the B-5000 and FORTRAN II for other computers. This volume of the report includes the input data formats for the ALGOL versions of the codes. The input data formats for the FORTRAN versions are different from those in ALGOL versions, only in that the format for floating point numbers have an E preceding the exponent, rather than an @ symbol. That is, the number 217.8 would be written in floating form as 2.178@+02 for the ALGOL versions of the code, and 2.178E+02 for the FORTRAN versions. The order of the input data and field width specifications are the same for both the FORTRAN and ALGOL versions.

This volume of the report should be considered as a utilization document for the LITE-I and LITE-II codes. Operator instructions for running the LITE codes on the B-5000 computer and on the IBM 7090 are contained in Section II. The input data formats for the ALGOL versions of the two codes are given in Section III. The input and output of a sample problem run with each code, LITE-I and LITE-II, are discussed in Section IV. In Section V, listings of the ALGOL language instructions for the two LITE codes are presented.

II. OPERATOR INSTRUCTIONS

The ALGOL versions of the LITE codes were designed to run on the Burroughs B-5000 computer. The multi-processing feature of the B-5000 allows on-line read in and printout of data from one program while computation is being performed with another program. Thus the LITE codes may be read-in and printed-out on-line The Fort Monmouth computing center plans to store the object program on tape and read the program from tape to reduce the number of cards that have to be loaded each time a program is run with one of the codes. The ALGOL versions use no tape units other than those that a facility normally uses for input and output

The FORTRAN versions of the LITE codes are designed for off-line read-in and printout. The FORTRAN II binary decks and the problem decks are loaded on input tape 5 and the output is produced on output tape 6. No scratch tapes are required for the program operation.

The running time for the LITE codes is highly dependent upon the input data. In particular, the running time is dependent on the fraction of the total collisions that are taken to be Rayleigh scattering events, on the average number of collisions followed per history, and on the total number of histories followed. The multi-processing feature of the B-5000 makes it difficult to predict the machine time required to run a given problem unless the problem is the only one being processed in the B-5000. The time required to run a LITE-I problem on the B-5000 was checked for three separate runs of the problem. The times required for each of the three runs were found to be different, varying by a factor of three over the range of the slowest to the fastest time. The average time per collision is estimated to be about .002 minutes for problems having five detector positions.

III INPUT DATA FORMATS

The input data formats for LITE-I and LITE-II are identical even though some of the input data used in LITE-I are not used in LITE-II. The provisions for reading in these items are the same for both codes, therefore, those input data not actually used in the LITE-II calculations are indicated by an asterick, and comments are made in the following sections prescribing how these items should be treated when preparing input data for LITE-II. The unit used to define distances (centimeters, meters, feet, etc.) should be the same for all distances described by the input data to the LITE codes. If the unit is meters, then the intensities are in units of photons m^{-2}/source photon for LITE-I and photons m^{-2}/source photon m^{-2} for LITE-II.

The input for the LITE codes is divided into ten groups. The number in column 10 of the first card of each group designates the group of input data that follows on that and succeeding cards.

3.1 Control Numbers

Table I contains control numbers in Group I that specify the amount of input data required. Some of the control numbers appear again in the other input groups. When this occurs, the two values input for the same item must agree or the program will detect an error and terminate the problem. The number of histories to be processed, NHMAX, may be divided into sample sizes of NHMAX/NGROUP. The sample size must be less than 500. The number of groups, NGROUP, into which the histories are divided, should be large enough to provide for an accurate calculation of a standard deviation. Six bases are input for the random number generator. This allows consecutive random numbers to be generated

TABLE I

GROUP 1 Input Data (Control Numbers)

Card	Format	Input Item	Definition	Limit
1	I10	LIBRAY	Input group number	=1
2	6I10	NHMAX	Number of histories	
		NGROUP	Number of deviation groups (The number of histories should be equally divisible by NGROUP.)	$\frac{NHMAX}{NGROUP} \le 500$
		NRMAX	Number of regions	≤100
		NBMAX	Number of boundaries	≤100
		NCMAX	Maximum collisions allowed per history	
		NDMAX	Number of receivers	≤10
3	6I10	NPA	Number of print cosines	≤25
		NPCOL	Number of print collisions	≤24
		NAOP	Option for sampling source angles = -1, isotropic distribution, no biasing = 0, biased sampling from isotropic distribution = 1, anisotropic distribution	
		NAG	Number of cosines for defining source angular distribution	≤37
		NRFLB	Number of reflection boundaries	≤5
		NMAT	Number of regions having different Mie phase functions	≤10
4	6I10	NSOREG	Number of source region	
		MAXR	Maximum number of reflections allowed	
		IBASE	Base for random number generator	
		IBAS1	Base for random number generator	
		IBAS2	Base for random number generator	

TABLE I (con't)

Card	Format	Input Item	Definition	Limit
4	6I10	IBAS3	Base for random number generator	
5	2I10	IBAS4	Base for random number generator	
		IBAS5	Base for random number generator	

TABLE II

Group 2 Input Data

Card	Format	Input Item	Definition	Limit
1	I10	LIBRAY	Input group number	=2
2	6R10.4	HS	Source height	
		DLONG	Large distance for boundary distance calculation	
		DELTA	Small distance for stepping off boundary	
		SMVAL	Small value for testing cosine angle with zero	
		WCO	Weight cut-off parameter	
		ELIM	Maximum number of errors to be allowed	
3	R10.4	DMIN	Minimum distance from collision to receiver point	

using a different base. Generating random numbers in this manner insures the independence between consecutive random numbers and decreases the possibility of producing identical histories when a random number generator recycles.

3.2 Constants

Table II contains constants in Input Group 2 that are used by the code. Since the values to be assigned these constants depend on the individual problem, they are included as input rather than being fixed within the code. For economy, the distance, DLONG, should be greater than the maximum possible distance within an inside region. The distance, DELTA, should be a small value, but large enough to change the maximum possible distance within an inside region in the fifth or sixth significant digit when added to that distance. ELIM is an input item that will prevent those errors that occur with a very small probability from terminating the problem. When fewer than ELIM errors occur, those errors will be listed with the output, but only those histories containing the errors will be terminated. The results for all other histories will be saved and printed as output.

3.3 Source Angular Distribution

Input Group 3 data which are used to describe the source angular distributions are given in Table III. All angular distributions are considered to symmetrical about the vertical, H, axis. The source angular distribution is assumed to be defined with a cumulative distribution expressed in terms of the cosine of the angle measured from the positive H axis. Provisions for sampling from a biased distribution

TABLE III. GROUP 3 Input Data (Source Angular Distribution)

Card	Format	Input Item	Definition	Limit
1	3I10	LIBRAY	Input group number	=3
		NAOP	Option for sampling source angles (See Table I)	
		NAG	Number of cosines for defining source angular distribution	≤37
2 continues on following cards	6R10.4	CANG(J)	Cosine values at which the cumulative source angular probabilities are given (cosines in descending order)	J=1, NAG
Follows last card containing CANG(J)	6R10.4	PAG(J)	Cumulative probabilities defining source angular distribution (first value must be zero, probabilities in ascending order)	J=1, NAG
Follows last card containing PAG(J)	6R10.4	WAG(J)*	Weight parameter for biased sampling from anisotropic distribution (omit unless NAOP=1)	J=1, NAG

* WAG(J) is the weight that will be assigned to particles emitted from the source at angles with cosines between CANG(J-1) and CANG(J). Thus WAG(1) is arbitrary, since it will never be used by the code.

are also included to improve the sampling in the directions toward the receiver positions. If the original angular distribution is isotropic, then the program adjusts the light particle weight automatically, but if the original distribution is anisotropic, then the weight adjustment parameters, WAG, must be input.

3.4 Reflection Distribution

Table IV lists Input Group 4 data which are used in describing the reflection of light from a ground or cloud surface. If the problem contains no reflection surfaces, this group of data may be omitted. A listing of Input Group 4 data is required for each reflection surface. The reflection surfaces are limited to 5 for any one problem and the boundary number assigned to any reflection surface must be less than or equal to 5. Reflection is limited to plane surfaces. The angular distribution of the reflected light must be expressed in terms of the cosine of the angle measured from the normal to the reflection surface and is assumed azimuthally symmetric. If the reflection distribution is isotropic in the upper or lower hemispheres, then the reflection angle distribution tables should be omitted. If the reflection distribution is anisotropic, then both the reflection distribution and the cumulative distribution must be input.

TABLE IV. GROUP 4 Input Data (Reflection Distributions)

Card	Format	Input Item	Definition	Limit
1	5I10	LIBRAY	Input group number	=4
		NRB	Number of reflection boundary	≤5
		JREFLT(NRB)	Reflection Option = 1, reflection isotropic in upper hemisphere = 2, anisotropic in upper hemisphere = 3, isotropic in lower hemisphere = 4, anisotropic in lower hemisphere	
		NRFANG(NRB)	Number of points used to define reflection distribution at boundary NRB	≤37
		NRFCOS(NRB)	Number of cosines defining cumulative reflection distribution at boundary NRB	≤50
2	R10.4	ALBEDO(NRB)	Reflection Albedo	
3 continues on following cards	6R10.4	*RFANG(NRB,J)	Cosines of angles used to define reflection distribution (omit if JREFLT(NRB)=1 or 3, descending order)	J=1, NRFANG(NRB)
Follows last card of RFANG's	6R10.4	*POR(NRB,J)	Probability of reflecting per unit solid angle into an angle whose cosine is RFANG (NRB,J) (Omit if JREFLT(NRB) = 1 or 3)	J=1, NRFANG(NRB)
Follows last card of POR's		RFLCOS(NRB,J)	Cosine values of reflection angle corresponding to the cumulative reflection distribution for values of J/NRFCOS (NRB). Input the values of RFLCOS in descending order. First cosine is input for probability = 1/NRFCOS(NRB). (Omit if JREFLT = 1 or 3).	J=1, NRFCOS(NRB)

* These values are not used in LITE-II; however, if JRFLT(NRB) equals 2 or 4, some arbitrary values must be input for these values, since the instructions for reading in these items have not been removed from LITE-II.

3.5 Printout Control

Input Group 5 data, which describes the upper bounds of the print angle groups and the print collision numbers, are shown in Table V. The upper bounds of the print angles are given in terms of the cosine of the angles between the source-receiver axis and the direction of the scattered light at the receiver position for LITE-I and in terms of the cosine of the angle between the particle's direction and the normal to the receiver plane for LITE-II. The print collision numbers are the orders of scattering for which scattered light intensities are to be listed. The light intensity from all orders of scattering greater than the previous collision number up to and including the given collision number is listed opposite each print collision number.

TABLE V. Group 5 Input Data (Printout Control)

Card	Format	Input Item	Definition	Limit
1	3I10	LIBRAY	Input group number	=5
		NPCOL	Number of print collisions	≤24
		NPA	Number of print cosines	≤25
2 continues on following cards	6I10	INCOL(J)	Print collision numbers (in ascending order)	J=1, NPCOL
Follows last card of INCOL's	6R10.4	CIPA(J)	Print cosines (descending order)	J=1, NPA

3.6 Detector Locations

Input Group 6 data, which describe the detector locations, are listed in Table VI. In tracing histories with LITE-I, only the height and radius of each collision point are preserved to identify the location of the collisions. The azimuthal angle between a plane containing the source and collision points and a plane containing the source and detector points is selected at random from a uniform distribution between 0 and 2π. To improve the statistics, several azimuthal angles may be selected for a given detector radius and an estimate made of the light intensity scattered to the detector for each azimuthal angle so determined. The intensities at detector points defined by each of these azimuthal angles are averaged to obtain the intensities at a single detector point. The input item NPHID(J) specifies the number of azimuthal positions that will be selected for the jth detector point. In LITE-II only the heights of the collision points are recorded, thus the values input for RD(I) and NPHID(I) are not used in the scattering calculation and may be left blank.

In LITE-I, DBSS(J) is the light intensity per unit source strength emitted per unit solid angle in a direction toward a point located on the jth detector ring. LITE-I calculates the direct beam intensity for the jth detector ring with the expression,

$$DBI = DBSS(J)e^{-RHOT}/T^2$$

where RHOT is the number of optical path lengths between the source and the jth detector point, and

T is the distance from the source point to the jth detector point.

TABLE VI. Group 6 Input Data (Detector Locations)

Card	Format	Input Item	Definition	Limit
1	2I10	LIBRAY	Input [illegible] p number	[illegible]6
		NDMAX	Numbe[illegible] detector rings	≤10
2	2R10.4, I10,R10.4	HD(1)	Height of 1st detector ring	
		*RD(1)	Radius of 1st detector ring	
		*NPHID(1)	Number of detector points on 1st ring	
		*DBSS(1)	Direct beam source strength for 1st detector	
3	2R10.4, I10,R10.4	HD(2)	Height of 2nd detector ring	
		*RD(2)	Radius of 2nd detector ring	
		*NPHID(2)	Number of detector points for 2nd ring	
		DBSS(2)	Direct beam source strength for 2nd detector	
A card similar to 2 and 3 is required for each detector ring				
Last card of group 6	2R10.4, I10,R10.4	HD(NDMAX)	Height of last detector ring	
		*RD(NDMAX)	Radius of last detector ring	
		*NPHID (NDMAX)	Number of detector points on last ring	
		*DBSS (NDMAX)	Direct beam source strength for last detector ring	

* The NPHID(J) values are not used by LITE-II, and the RD(J) and DBSS(J) values should be input for LITE-II as discussed in Section 3.6

The equation used for direct-beam calculations in both LITE-I and LITE-II are identical, therefore, the direct-beam calculation is only applicable to plane parallel sources in LITE-II. For a plane parallel source, the values input for RD(J) should be given by the expression

$$RD(J) = (HD(J)-HS)/\cos\theta_o$$

where HD(J) is the height of the Jth receiver plane,

HS is the height of the source, and

$\cos\theta_o$ is the cosine of the angle at which the source is incident upon the slab.

In addition, DBSS(J) should be input as the product of the number of particles emitted per unit area from the source plane times the secant of the source angle times the slant thickness squared, T^2, between the source and receiver plane.

3.7 Geometry Description

Input Group 7 data listed in Table VII provides for the geometry description. An air-ground geometry is defined with region boundaries composed of horizontal planes and right circular vertical cylinders in LITE-I and by horizontal planes in LITE-II. The planes are identified as boundary type 1 and the cylinders as boundary type 2. For boundary type 1, COEE is the H intercept of the plane, and for boundary type 2, COEE is the radius of the cylindrical surface. All reflection surfaces must be assigned boundary numbers less than or equal to 5. A negative sign preceding the boundary number, NBOUND, denotes a reflection boundary. Regions are defined by the signed boundary numbers encompassing the region. In reference to

TABLE VII Group 7 Input Data (Geometry Description)

Card	Format	Input Item	Definition	Limit
1	3I10	LIBRAY	Input group number	=7
		NBMAX	Number of boundaries	≤100
		NRMAX	Number of regions	≤100
2	2I10 R10.4	*NBOUND(1)	Position of boundary 1 in boundary table	
		ITYPE(1)	Type of boundary 1. ITYPE(1) = 1, H plane ITYPE(1) = 2, cylinder	
		COEE(1)	Coefficient of boundary 1	
A card similar to card 2 is required for each boundary.				
Follows last boundary card	3I5, R5.2, 8I5	*NREG(1)	Position of region 1 in region table	
		NB(1)	Number of boundaries encompassing region 1	
		MAT(1)	Phase function number for region 1	
		EMP(1)	Importance number for region 1	
		IB(1,1)	First boundary, bounding region 1 (sign on IB designates inner or outer boundary with respect to region 1)	
		MPR(1,1)	Most probable region of entry across first boundary of region 1	
		IB(1,2)	Second boundary bounding region 1 with appropriate sign	
		MPR(1,2)	Most probable region of entry across second boundary of region 1	
		IB(1,3)	Third boundary bounding region 1 with appropriate sign	
		MPR(1,3)	Most probable region of entry across third boundary of region 1	
		IB(1,4)	Fourth boundary bounding region 1 with appropriate sign	
		MPR(1,4)	Most probable region of entry across fourth boundary of region 1	

A card similar to the preceding card is required for each region including outside regions.

* Boundaries and regions are assigned numbers sequentially in the order they are listed in the input. The values NBOUND(J) and NREG(J) therefore should both begin with 1 for the first boundary or region listed and increase sequentially for the remaining boundaries or regions

planes, the minus sign denotes a "lower" plane, and the plus sign denotes an "upper" plane. In reference to a cylindrical surface, the minus sign denotes an "inner" surface, and the plus sign denotes an "outer" surface. All space must be identified including outside regions which are not completely encompassed by boundaries. The most probable regions of entry, MPR, are given to speed up the region search process. When there are two or more possible regions of entry across a given boundary, the region with the smallest region number should be given as the most probable region of entry.

The region importance number, EMP, is given to reduce the sampling in regions of minor importance. A particle when crossing from one region to a region of more importance will not be affected by the region importance numbers. However, when a particle crosses from a region to a region of less importance, a random number will be generated and the history terminated if the ratio of the importance numbers (EMP for region entered/EMP for region exited) is less than the random number. If the ratio of the importance numbers is greater than the random number, then the particle weight is multiplied by the reciprocal of the ratio and tracing of the history is continued.

3.8 Mie Scattering Data

The Input Group 8 data listed in Table VIII defines the Mie scattering phase functions to be used in the air-ground geometry. The data shown in Table VIII for Input Group 8 must be repeated for each phase function to be defined. Up to 10 phase functions may be defined in any one problem. MAT is the number assigned to the phase function defined by the data in Input Group 8. This number is used

TABLE VIII Group 8 Input Data (Mie Scattering Data)

Card	Format	Input Item	Definition	Limit
1	2I10	LIBRAY	Input group number	=8
		MAT	Mie scattering phase function number for the following data	≤10
2	2I10 10X,R10.4	NDFCOS (MAT)	Number of cosines for which the Mie scattering phase function are given	≤50
		NPHANG (MAT)	Number of cosines used to describe the cumulative angular distributions for Mie scattering	≤50
		RAYLEE(MAT)	= 1, Rayleigh scattering only = 0, Both Rayleigh and Mie Scattering	
3	6R10.4	*DIFCOS (MAT,J)	Cosine values at which Mie scattering phase functions are listed (descending order) Omit if RAYLEE = 1	J=1, NDFCOS (MAT)
Follows last DIFCOS card	6R10.4	*PDCOS (MAT,J)	Values of the phase function at the designated cosines Omit if RAYLEE = 1 NDFCOS values.	J=1, NDFCOS (MAT)
Follows last PDCOS card	6R10.4	PHANG (MAT,J)	Cosines at equal probability intervals describing cumulative phase function Omit if RAYLEE = 1 (descending order) PHANG(MAT,1) = 1,NPHANG(MAT)	J=1, NPHANG (MAT)

* The values input for DIFCOS(MAT,J) and PDCOS(MAT,J) are not used by LITE-II. However, at least one value must be input for each of these items if RAYLEE(MAT) is less than 1 (The provisions for reading in these values were not removed from LITE-II.)

to designate the phase function for each of the regions defined by the Input Group 7 data.

Special routines have been incorporated into the code for treating Rayleigh scattering, therefore, it is only necessary to input the Mie scattering phase functions. If only Rayleigh scattering is to be considered (RAYLEE = 1.0), then Input Group 8 data defining DIFCOS(MAT,J), PDCOS(MAT,J), and PHANG(MAT,J) may be omitted. When Mie scattering is treated, both the phase function and the cumulative Mie scattering angular distribution must be input.

3.9 Cross Section Input Data

Input Group 9 data give the number of mean-free-path lengths to ground level, the ratio of the scattering-to-total cross section, and the ratio of Rayleigh to scattering cross section as of function of altitude. The scattering cross section is taken to be the sum of the Mie and Rayleigh scattering cross sections. The difference between the extinction coefficient (total cross section) and the scattering cross section is defined as the absorption cross section.

The number of mean-free-path lengths, TAU, from the ground level to height HV is defined by the equation

$$TAU \int_0^{HV} \Sigma_T(h)\,dh$$

where $\Sigma_T(h)$ is the extinction coefficient as a function of the altitude h.

TABLE IX. Input Group 9 (Cross Section Input Data)

Card	Format	Input Item	Definition	Limit
1	2I10	LIBRAY	Input group number	=9
		NOH	Number of altitudes at which the path lengths from zero to HV are listed	≤100
2* through NOH+1	4R10.4	HV(J)*	Altitude for which cross section data is to be listed	J=1,NOH
		TAU(J)	Number of path lengths from zero to HV(J)	J=1,NOH
		SCATR(J)	Ratio of scattering-to-total cross section for altitude HV(J)	J=1,NOH
		RAYR(J)	Ratio of Rayleigh-to-scattering cross section for altitude HV(J)	J=1,NOH

* Card 2 contains the four items HV(J), TAU(J), SCATR(J), and RAYR(J) for J=1, the same four items for J=2 are on the next cards, and etc.

3.10 Data Print and Check Options

Data for Input Group 10 as given in Table X are contained on a single card. This card gives the problem number and data print and check options. The problem number is printed on output to identify the output data. IDUMP is a print option that allows the printout of intermediate values calculated during the generation of each history. This option is included to aid in checkout The quantity of printout produced when IDUMP is non-zero makes it inadvisable to print the intermediate data if more than ten histories are being processed.

ICHECK is an option that provides for several checks on the input data. The input cumulative probability tables are checked for ascending order, and several of the cosine tables are checked for descending order. In addition, various input values are checked to insure that storage locations reserved for dimensioned variables are not exceeded. Cards within the input data groups 1 through 9 must be arranged in the order specified in Tables I through IX, but it is not necessary to order the groups. The cards for Input Group 10 must be loaded after the cards for all other input groups have been loaded.

3.11 Loading Instructions

The LITE codes are designed to process several problems during any one computer run. The input data for a second problem may be loaded directly behind the input data for Input Group 10 for the previous problem. Furthermore, if any of the input data groups 1 through 9 are identical for two consecutive problems, that input data group may be omitted in the second problem. Each individual problem must contain a card for input Group 10.

TABLE X. Group 10 Input Data (Data Print and Check Options)

Card	Format	Input Item	Definition	Limit
1	4I10	LIBRAY	Input group number	=10
		NPROB	Problem number	
		IDUMP	Option for intermediate printout = 0, no intermediate printout = 1, gives intermediate printout	
		ICHECK	Option for checking input data = 0, no check on input data = 1, check input data	

IV. SAMPLE PROBLEMS

The sample problems given in this section for both LITE-I and LITE-II were designed to calculate the angular distribution of the scattered radiation emerging from a Rayleigh atmosphere.

4.1 LITE-I Sample Problem

In order to compute the transmitted intensity through a 0.5 mean-free-path thick Rayleigh atmosphere with a ground albedo of 0.8, the point receivers in the LITE-I problem were placed just slightly above the ground surface at distances 0 50, 150, 300 and 500 units from the vertical axis through the source point. The units selected are arbitrary units, since the atmospheric thickness is measured in terms of optical thicknesses (mean-free-path). The Rayleigh atmosphere was described as being 301 units thick with a cross section varying exponentially according to the expression,

$$\Sigma(h) = 0.00625e^{-0.0125h}$$

where h is the altitude in the arbitrary units. Thus the point receivers were located at 0, 0 3125, 0 9375, 1.875 and 3 125 mean-free-paths from the vertical axis through the source point

Table XI lists the input data for the LITE-I sample problem. One thousand (1000) histories were processed in ten groups of 100 histories each A maximum of 20 collisions and 10 reflections were allowed for each history. The source angular distribution was confined to a single angle normal to the upper surface of the atmosphere. The angular distribution of the reflected photon current was input as a cosine distribution to conform to Lambert's law of reflection The atmosphere was described with three regions separated by two parallel

TABLE XI. LITE-1 CODE SAMPLE PROBLEM INPUT DATA

```
         1                                                        160001    LITE
      1000        10         3         2        20         5      160002    LITE
        20        20        -1         2         1         1      160003    LITE
         2        10     39451     26193     34521     36714      160004    LITE
     36743     87321                                              160005    LITE
         2                                                        160006    LITE
 3.000ə&02 5.000ə&03 1.000ə-03 1.000ə-02 1.000ə-05 1.000ə&01      160007    LITE
 1.000ə&00                                                        160008    LITE
         3        -1         2                                    160009    LITE
-1.000ə&00-1.000ə&00                                              160010    LITE
 0.000ə&00 1.000ə&00                                              160011    LITE
         4         1         2         2        20                160012    LITE
 8.000ə-01                                                        160013    LITE
 1.000ə&00 0.000ə&00                                              160014    LITE
 3.182ə&00 0.000ə&00                                              160015    LITE
 9.746ə-01 9.487ə-01 9.220ə-01 8.944ə-01 8.660ə-01 8.366ə-01      160016    LITE
 8.063ə-01 7.746ə-01 7.416ə-01 7.071ə-01 6.709ə-01 6.325ə-01      160017    LITE
 5.915ə-01 5.478ə-01 5.000ə-01 4.472ə-01 3.873ə-01 3.162ə-01      160018    LITE
 2.235ə-01 0.000ə&00                                              160019    LITE
         5        20        20                                    160020    LITE
         1         2         3         4         5         6      160021    LITE
         7         8         9        10        11        12      160022    LITE
        13        14        15        16        17        18      160023    LITE
        19        20                                              160024    LITE
 9.000ə-01 8.000ə-01 7.000ə-01 6.000ə-01 5.000ə-01 4.000ə-01      160025    LITE
 3.000ə-01 2.000ə-01 1.000ə-01 0.000ə&00-1.000ə-01-2.000ə-01      160026    LITE
-3.000ə-01-4.000ə-01-5.000ə-01-6.000ə-01-7.000ə-01-8.000ə-01      160027    LITE
-9.000ə-01-1.000ə&00                                              160028    LITE
         6         5                                              160029    LITE
 1.000ə-01 0.000ə&00         2 9.000ə&04                          160030    LITE
 1.000ə-01 5.000ə&01         2 9.250ə&04                          160031    LITE
 1.000ə-01 1.500ə&02         2 1.125ə&05                          160032    LITE
 1.000ə-01 3.000ə&02         2 1.800ə&05                          160033    LITE
 1.000ə-01 5.000ə&02         2 3.400ə&05                          160034    LITE
         7         2         3                                    160035    LITE
        -1         1 0.000ə&00                                    160036    LITE
         2         1 3.010ə&02                                    160037    LITE
    1    1    1 0.00    1    2                                    160038    LITE
    2    2    1 1.00   -1    1    2    3                          160039    LITE
    3    1    1 0.00   -2    2                                    160040    LITE
         8         1                                              160041    LITE
```

TABLE XI. (CON'T)

0	0		1.000a&00	160042	LITE
9	23			160043	LITE
0.00a&00	0.000a&00	1.000a&00	1.000a&00	160044	LITE
5.00a&00	3.000a-02	1.000a&00	1.000a&00	160045	LITE
10.00a&00	5.840a-02	1.000a&00	1.000a&00	160046	LITE
15.00a&00	8.000a-02	1.000a&00	1.000a&00	160047	LITE
20.00a&00	1.090a-01	1.000a&00	1.000a&00	160048	LITE
30.00a&00	1.550a-01	1.000a&00	1.000a&00	160049	LITE
35.00a&00	1.753a-01	1.000a&00	1.000a&00	160050	LITE
40.00a&00	1.960a-01	1.000a&00	1.000a&00	160051	LITE
50.00a&00	2.300a-01	1.000a&00	1.000a&00	160052	LITE
60.00a&00	2.650a-01	1.000a&00	1.000a&00	160053	LITE
70.00a&00	2.950a-01	1.000a&00	1.000a&00	160054	LITE
80.00a&00	3.200a-01	1.000a&00	1.000a&00	160055	LITE
90.00a&00	3.350a-01	1.000a&00	1.000a&00	160056	LITE
10.00a&01	3.550a-01	1.000a&00	1.000a&00	160057	LITE
12.50a&01	3.925a-01	1.000a&00	1.000a&00	160058	LITE
15.00a&01	4.190a-01	1.000a&00	1.000a&00	160059	LITE
17.50a&01	4.410a-01	1.000a&00	1.000a&00	160060	LITE
20.00a&01	4.580a-01	1.000a&00	1.000a&00	160061	LITE
22.50a&01	4.700a-01	1.000a&00	1.000a&00	160062	LITE
25.00a&01	4.740a-01	1.000a&00	1.000a&00	160063	LITE
27.50a&01	4.800a-01	1.000a&00	1.000a&00	160064	LITE
30.00a&01	4.850a-01	1.000a&00	1.000a&00	160065	LITE
50.00a&01	5.000a-01	1.000a&00	1.000a&00	160066	LITE
10	1600	0	0	160067	LITE

planes 301 units apart. The upper and lower regions were given an importance number of zero, so that particles entering these regions would be terminated. The source was located at a height of 300 units above the ground

The output for the LITE-I problem is listed in Table XII The first ten pages of Table XII list the scattered intensity as a function of collision number for each of the receiver points and each of the ten history groups. The eleventh page of Table XII contains averages of the scattered intensities over the ten history groups The twelfth page of Table XII gives the deviations of the group intensities about the average intensities over all the groups.

On the thirteenth page of Table XII, the history termination counters give the number of histories terminated after exceeding the maximum number of collisions allowed, by escaping the atmosphere, and by the particle weight dropping below the input weight cutoff value. The thousand histories produced 11,901 collisions which is an average of 11.901 collisions per history In pages 14 through 23 of Table XII, the angular distribution of the scattered intensities are given as a function of the order of reflection for each receiver point The cosine values listed on these pages are the cosines of the angle measured from the source-receiver axis for each of the receiver positions Page 24 of Table XII shows the scattered intensities as a function of the region of scatter Page 25 of Table XII gives the reflected intensity at each of the receivers, and the last page of Table XII gives the direct intensity at each of the receivers The units of the intensities computed for the LITE-I sample problem are

(Text continues on page 52.)

TABLE XII. PRINTOUT FOR LITE-I SAMPLE PROBLEM (26 PAGES)

FLUXES FOR DEVIATION GROUP 1.

COLLISIONS	DETECTOR 01	02	03	04	05
1	1.5915P-04	2.9079P-06	3.1649P-07	5.2347P-08	1.0050P-08
2	2.7223P-04	5.6773P-06	9.0754P-07	1.4919P-07	2.2987P-08
3	9.0753P-06	2.5210P-06	3.3429P-07	6.0016P-08	1.0528P-08
4	2.1749P-06	3.7205P-06	2.1591P-07	5.5540P-08	1.3477P-08
5	6.0854P-07	9.3268P-07	3.1260P-07	2.2308P-08	9.1502P-09
6	2.1295P-07	1.7499P-07	6.1270P-08	2.6179P-08	5.7906P-09
7	1.1953P-07	1.6004P-07	4.6148P-08	1.7067P-08	4.6909P-09
8	1.1687P-07	5.6076P-08	3.0406P-08	1.2936P-08	1.4107P-09
9	3.1608P-08	3.5035P-08	1.0065P-08	4.2389P-09	1.0679P-09
10	1.3181P-08	7.7206P-09	8.1783P-09	2.2291P-09	1.4944P-09
11	1.1519P-08	8.9931P-08	4.4293P-09	2.5111P-09	5.0244P-10
12	4.7233P-09	5.7698P-09	1.7119P-09	1.2395P-09	2.4915P-10
13	1.5906P-09	1.5224P-09	1.3727P-08	1.6633P-09	2.1755P-10
14	4.5081P-10	5.0917P-10	3.4691P-10	1.0798P-10	8.0257P-11
15	1.7872P-10	2.2183P-10	1.9136P-10	1.4470P-10	8.2913P-11
16	3.3837P-11	2.6671P-11	5.4349P-11	4.8660P-11	4.0202P-10
17	6.0479P-11	7.0804P-11	2.4398P-10	2.1147P-10	1.2421P-11
18	3.2746P-11	9.5842P-11	1.1983P-11	4.2358P-11	8.1339P-11
19	1.3356P-11	8.1652P-12	1.3318P-11	1.2883P-11	2.3357P-11
20	3.6175P-11	4.4462P-11	2.7192P-12	5.8435P-13	2.9595P-13
TOTAL	4.4376P-04	1.6291P-05	2.2636P-06	4.0804P-07	8.2298P-08

BASE FOR RANDOM NUMBER GENERATOR IS 12286841897

FLUXES FOR DEVIATION GROUP 2.

COLLISIONS

DETECTOR

	01	02	03	04	05
1	2.1951E-04	3.7308E-06	4.1957E-07	6.3246E-08	1.0932E-08
2	6.5634E-04	4.3613E-06	1.0750E-06	1.1402E-07	2.2170E-08
3	1.4046E-04	1.9796E-06	4.7924E-07	7.2467E-08	1.3415E-08
4	1.0513E-06	5.5223E-07	1.5147E-07	6.0964E-08	9.6638E-09
5	2.0546E-07	2.3975E-07	4.1916E-07	5.1055E-08	5.1227E-09
6	7.4387E-08	1.4469E-07	9.3102E-08	1.2566E-08	2.8281E-09
7	4.4211E-08	6.1007E-08	3.2217E-08	2.0327E-08	3.2780E-09
8	3.3336E-08	3.0121E-08	1.5775E-08	7.7831E-09	3.8704E-09
9	1.6190E-08	4.4500E-08	7.0199E-09	6.6398E-09	2.9056E-09
10	3.4025E-08	1.8036E-07	3.4369E-09	1.4792E-09	1.5056E-09
11	1.1273E-08	5.4509E-09	2.1434E-09	7.4027E-10	1.6067E-10
12	2.5674E-09	1.5240E-09	4.5529E-10	3.7546E-10	1.6022E-10
13	1.7173E-09	1.8062E-09	5.7421E-10	3.2076E-10	8.0924E-11
14	2.2236E-10	3.0380E-10	3.2262E-10	4.1732E-11	6.1782E-11
15	1.0872E-09	1.6451E-09	4.2776E-10	1.5164E-10	2.3349E-11
16	3.2701E-10	2.2468E-10	4.1310E-10	2.5429E-11	5.1921E-11
17	3.6631E-10	1.8429E-09	3.6937E-11	1.3679E-11	1.3183E-11
18	1.3421E-10	1.9882E-10	1.8782E-11	1.1900E-11	2.0414E-11
19	1.2502E-10	1.2135E-10	4.2396E-11	8.4250E-12	3.2234E-12
20	9.8828E-12	1.7320E-11	4.7150E-12	7.7383E-12	5.9743E-12
TOTAL	1.0178E-03	1.1338E-05	2.7004E-06	4.1224E-07	7.6273E-08

BASE FOR RANDOM NUMBER GENERATOR IS 40064689449

FLUXES FOR DEVIATION GROUP 3.

COLLISIONS DETECTOR

	01	02	03	04	05
1	2.2528E-04	3.5454E-06	4.2040E-07	6.8512E-08	1.2604E-08
2	3.8773E-04	4.9302E-06	4.9555E-07	1.1378E-07	2.0689E-08
3	1.2482E-05	2.6076E-06	1.9461E-07	5.3117E-08	1.2918E-08
4	2.3808E-06	1.1555E-06	1.8032E-06	4.7234E-08	6.4659E-09
5	7.1116E-07	8.4355E-07	1.4348E-07	3.1132E-08	2.4535E-08
6	2.2288E-07	1.4181E-07	4.1543E-08	1.1450E-08	4.7309E-08
7	1.0127E-07	7.4930E-08	3.1064E-08	2.1744E-08	4.7281E-09
8	1.4282E-07	9.4795E-08	5.1057E-08	6.5587E-09	4.5360E-09
9	1.0870E-08	4.3073E-08	2.2291E-08	4.7528E-09	1.7608E-09
10	8.2601E-09	1.4056E-08	1.2948E-08	1.0014E-09	1.1107E-09
11	6.1998E-09	1.1694E-08	3.7860E-09	1.0008E-09	1.5359E-09
12	5.6554E-09	6.0470E-09	4.2038E-08	1.1841E-09	5.1203E-09
13	1.1142E-09	2.7385E-09	1.2098E-09	1.8086E-10	8.1661E-10
14	1.2935E-09	2.0037E-09	8.6700E-10	4.6151E-10	3.0420E-09
15	3.68[illegible]9E-10	6.3912E-10	2.2745E-10	1.0919E-10	5.1525E-11
16	6.7513E-10	1.3046E-09	5.5673E-10	1.1129E-10	2.2901E-10
17	3.0425E-10	2.2973E-10	1.0053E-10	1.2052E-10	1.2516E-11
18	2.2804E-10	3.1852E-10	9.0187E-11	2.9020E-11	1.7591E-10
19	4.9238E-11	8.8564E-11	2.5051E-10	3.1350E-11	[illegible].9341E-10
20	6.1787E-11	5.5845E-11	2.1426E-10	9.3268E-12	3.7979E-12
TOTAL	6.2909E-04	1.3476E-05	3.2655E-06	3.6252E-07	1.4784E-07

BASE FUR RANDOM NUMBER GENERATOR IS 27609630425

FLUXES FOR DEVIATION GROUP 4.

COLLISIONS	DETECTOR 01	02	03	04	05
1	1.3705E-03	4.5090E-06	4.4663E-07	6.8059E-08	1.2157E-08
2	4.7655E-04	4.4809E-06	5.9544E-07	8.7997E-08	1.6469E-08
3	2.4111E-05	1.5444E-06	3.4689E-07	1.8413E-07	1.5516E-08
4	1.6212E-06	6.5290E-07	2.0276E-07	5.4760E-08	2.9907E-08
5	3.2659E-07	2.0907E-07	7.8374E-08	2.0189E-08	4.5149E-09
6	1.2551E-06	5.2103E-07	3.6174E-08	1.1253E-08	4.2881E-09
7	8.6883E-08	6.4357E-08	2.9141E-08	1.1990E-08	7.5175E-09
8	1.2254E-07	1.3199E-07	2.0650E-08	3.5591E-09	7.7460E-10
9	1.5729E-08	2.1516E-08	1.6549E-08	1.9407E-09	3.7526E-09
10	7.1103E-09	6.2154E-09	2.9016E-09	8.5509E-10	9.5854E-10
11	1.7841E-08	1.0166E-08	1.1622E-08	1.1637E-09	5.7854E-10
12	3.7220E-09	2.0362E-09	1.9661E-09	2.6480E-09	4.7521E-10
13	3.7204E-09	6.0067E-09	2.0347E-09	3.0610E-10	1.7210E-10
14	2.7856E-10	2.7418E-10	1.9697E-10	4.3438E-10	1.6488E-10
15	2.7304E-10	3.3364E-10	4.3078E-10	5.4786E-10	4.1012E-11
16	4.8388E-11	5.5111E-11	6.8913E-11	6.3288E-11	1.1993E-10
17	1.1259E-10	2.4112E-10	8.5181E-11	2.6430E-11	3.1688E-11
18	1.2468E-11	1.7954E-11	2.3945E-11	5.3728E-12	9.3919E-11
19	2.7345E-11	3.2638E-11	8.3316E-12	9.2184E-10	1.4890E-11
20	6.2847E-12	6.5842E-12	4.8744E-11	6.9045E-12	2.8863E-12
TOTAL	1.8746E-03	1.2161E-05	1.7920E-06	4.5086E-07	9.7551E-08

BASE FOR RANDOM NUMBER GENERATOR IS 36120537193

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-2.884E-03

FLUXES FOR DEVIATION GROUP 5.

COLLISIONS	DETECTOR 01	02	03	04	05
1	1.1668E-04	3.9334E-06	3.8272E-07	5.4515E-08	8.9547E-09
2	3.7696E-04	5.0138E-06	8.1894E-07	1.0003E-07	3.1901E-08
3	1.0472E-05	2.1562E-06	2.2348E-07	6.4451E-08	1.5129E-08
4	2.5110E-06	7.4494E-07	2.1908E-07	6.6706E-08	2.1035E-08
5	5.9072E-07	3.0042E-07	8.8181E-08	3.2993E-08	1.1743E-08
6	4.1643E-07	2.8058E-07	9.3944E-08	2.5322E-08	2.5021E-09
7	1.8459E-07	1.2557E-07	4.2401E-08	6.7604E-09	2.5307E-09
8	3.7808E-08	2.1321E-08	3.0374E-08	5.3571E-09	2.1826E-09
9	1.3999E-08	2.6765E-08	7.8229E-09	2.1005E-08	1.0189E-09
10	7.6889E-09	6.6672E-08	5.0991E-09	6.5416E-09	6.9197E-10
11	2.5150E-09	2.5749E-09	3.1531E-08	9.4150E-10	7.4563E-10
12	7.1748E-10	1.0402E-09	5.4074E-10	2.8668E-10	1.7152E-10
13	7.2099E-10	4.6977E-10	4.7866E-10	1.6288E-09	1.0065E-10
14	4.7446E-10	5.5572E-10	2.1388E-10	4.4636E-10	2.7901E-11
15	8.7476E-10	1.0430E-10	1.6134E-10	6.8207E-11	1.4971E-11
16	2.7195E-09	2.8310E-10	5.3944E-11	2.8375E-11	3.3234E-11
17	7.6055E-11	1.3687E-11	3.6874E-11	3.2618E-11	1.7311E-10
18	2.8473E-12	2.2817E-12	2.6104E-12	1.1918E-11	9.2343E-12
19	6.5394E-12	7.2647E-12	1.7489E-11	3.3936E-10	6.3543E-11
20	3.0104E-12	2.1654E-12	3.8906E-12	6.1123E-12	1.3692E-11
TOTAL	5.0788E-04	1.2675E-05	1.9451E-06	3.8748E-07	9.9043E-08

BASE FOR RANDOM NUMBER GENERATOR IS 4944023603

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-1.038E-02

FLUXES FOR DEVIATION GROUP 6.

COLLISIONS DETECTOR

	01	02	03	04	05
1	1.3263E-04	3.7668E-06	3.7394E-07	5.2970E-08	8.6380E-09
2	7.2642E-04	5.5603E-06	6.1546E-07	1.3070E-07	1.4934E-08
3	9.1895E-05	8.8675E-06	3.8516E-07	7.1736E-08	1.1465E-08
4	3.5452E-06	1.5517E-06	2.9473E-07	4.1438E-08	7.6318E-09
5	1.2269E-06	5.7877E-07	8.9906E-08	2.1883E-08	6.5839E-09
6	3.5706E-07	1.3333E-07	3.9195E-08	2.5783E-08	7.8879E-09
7	5.1862E-08	2.9445E-07	1.7281E-08	9.6285E-09	2.2110E-09
8	1.5693E-08	1.4320E-08	1.3219E-08	6.0299E-09	3.6918E-09
9	2.5015E-08	1.2480E-08	6.4525E-09	2.1195E-09	8.7338E-09
10	6.7458E-09	1.0374E-08	3.5205E-09	2.9210E-09	2.5248E-10
11	5.0284E-09	5.1399E-09	2.6681E-08	6.7769E-10	1.0372E-08
12	1.9542E-09	4.8035E-09	1.0432E-09	4.0464E-09	4.1732E-10
13	2.6712E-09	2.3177E-09	2.3712E-09	1.8836E-09	6.2968E-10
14	4.9333E-10	6.3873E-10	4.1320E-10	1.1914E-09	2.7629E-10
15	5.8577E-10	6.2136E-10	1.3720E-09	5.6082E-10	1.1731E-10
16	1.6521E-10	2.0919E-10	2.5613E-10	6.7394E-10	6.2287E-11
17	4.9206E-10	5.5952E-10	3.7541E-10	1.6767E-09	6.5443E-11
18	4.0565E-10	6.2151E-10	1.3892E-10	1.1131E-10	4.4061E-11
19	1.7246E-10	2.6352E-10	8.7682E-11	2.5356E-10	1.4578E-11
20	1.1259E-10	1.0376E-10	7.4923E-10	8.3857E-12	6.0985E-12
TOTAL	9.5619E-04	2.0805E-05	1.8724E-06	3.7630E-07	8.4034E-08

BASE FOR RANDOM NUMBER GENERATOR IS 33978281611

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-1.219E-02

FLUXES FOR DEVIATION GROUP 7.

COLLISIONS	DETECTOR 01	02	03	04	05
1	2.3069E-04	4.0424E-06	4.5723E-07	7.1975E-08	1.3039E-08
2	1.3779E-04	5.9893E-06	7.0027E-07	1.1317E-07	1.6597E-08
3	3.3771E-06	1.9053E-06	5.1033E-07	6.8042E-08	1.2521E-08
4	1.4402E-06	6.5837E-07	2.0963E-07	6.9376E-08	1.0829E-08
5	4.5443E-07	2.6264E-07	8.1901E-08	1.3341E-08	1.8624E-08
6	1.3942E-07	1.9965E-07	3.4194E-08	5.4112E-08	4.2518E-09
7	3.2334E-08	3.3412E-08	9.2997E-08	8.0372E-09	5.1501E-09
8	8.4674E-09	1.0813E-08	6.3437E-09	3.9409E-09	5.9484E-09
9	5.1820E-09	6.5765E-09	1.5014E-08	4.5797E-09	1.2713E-09
10	5.7616E-09	4.7340E-09	2.1102E-09	9.1407E-10	5.0299E-10
11	1.4203E-09	1.6770E-09	1.9488E-09	1.2776E-09	2.6069E-10
12	1.0186E-09	1.4285E-09	4.7596E-09	5.4764E-10	2.4548E-10
13	1.7490E-10	1.4882E-10	3.9141E-10	3.1544E-10	3.4597E-10
14	1.3198E-10	1.2983E-10	1.4947E-10	3.1843E-10	1.1953E-09
15	9.1721E-11	6.9482E-11	2.1375E-10	2.2277E-10	1.2665E-10
16	2.5993E-10	2.0860E-10	5.0359E-11	6.6837E-11	1.1817E-10
17	7.5538E-11	5.1690E-11	3.6812E-11	9.5600E-11	1.8373E-10
18	1.1107E-11	9.3646E-12	8.9752E-12	5.4155E-11	9.8080E-12
19	9.4199E-12	6.4312E-12	3.2100E-12	2.4407E-12	1.0437E-11
20	2.4665E-12	2.1118E-12	1.8379E-12	8.4414E-12	5.2456E-12
TOTAL	3.7395E-04	1.3117E-05	2.1176E-06	4.1040E-07	9.1237E-08

BASE FOR RANDOM NUMBER GENERATOR IS 19965574521

FLUXES FOR DEVIATION GROUP A.

COLLISIONS DETECTOR

	01	02	03	04	05
1	1.8611E-04	4.0205E-06	4.1241E-07	6.1721E-08	1.0636E-08
2	4.7695E-04	4.7821E-06	5.2701E-07	7.1378E-08	2.8992E-08
3	4.3183E-05	4.6511E-06	3.9477E-07	7.0411E-08	2.0063E-08
4	1.3106E-04	1.2390E-06	2.5126E-07	3.7075E-08	1.3812E-08
5	5.7477E-07	2.7193E-07	1.6014E-06	7.7626E-08	3.1164E-09
6	1.1836E-07	9.6979E-08	4.5754E-08	2.6993E-08	5.6149E-09
7	8.5679E-08	1.1898E-07	1.5644E-08	8.6229E-09	2.9048E-09
8	2.2839E-08	1.8888E-08	1.15[illegible]-08	1.6006E-08	2.9225E-09
9	6.4901E-09	7.5716E-09	5.8401E-09	2.6236E-09	2.6313E-09
10	9.5548E-09	6.9853E-09	1.0790E-08	2.2087E-09	6.7512E-10
11	1.4015E-09	1.6598E-09	8.0617E-09	7.8788E-10	1.6731E-10
12	2.8800E-09	3.6024E-09	1.9348E-09	1.3328E-09	2.0119E-10
13	3.7631E-10	2.6316E-10	3.1628E-10	4.3344E-10	6.0789E-10
14	6.2227E-10	6.0147E-10	3.5057E-10	1.0028E-09	1.7033E-10
15	1.4206E-10	1.4656E-10	1.0101E-10	3.5424E-10	8.7873E-10
16	1.1873E-10	8.7905E-11	1.8195E-10	6.4465E-10	2.5478E-11
17	5.5878E-11	6.0866E-11	8.9848E-11	7.1108E-10	4.8889E-11
18	1.0769E-11	1.3268E-11	8.8398E-12	6.4428E-12	3.4007E-11
19	1.1193E-11	9.9016E-12	2.2727E-11	5.5294E-11	5.6406E-12
20	1.8073E-11	2.5401E-11	2.5657E-11	6.7579E-11	3.3265E-11
TOTAL	8.3813E-04	1.5220E-05	3.2875E-06	3.8006E-07	9.3541E-08

BASE FOR RANDOM NUMBER GENERATOR IS 25535587099

FLUXES FOR DEVIATION GROUP 9.

COLLISIONS	DETECTOR 01	02	03	04	05
1	1.0132E-03	3.3071E-06	3.6367E-07	5.6773E-08	1.0186E-08
2	6.0482E-04	4.3804E-06	7.7094E-07	9.2274E-08	1.7872E-08
3	9.5366E-05	2.2392E-06	2.6058E-07	3.1753E-07	1.2179E-08
4	2.3177E-06	5.5828E-07	2.3771E-07	7.1796E-08	1.1104E-08
5	3.9714E-07	3.0046E-07	1.6859E-07	3.1968E-08	7.4295E-09
6	3.6374E-07	3.7584E-07	1.3071E-07	2.8440E-08	3.0129E-09
7	7.0809E-08	5.2705E-08	4.1320E-08	3.6615E-08	6.4321E-09
8	4.6096E-08	3.1863E-08	4.3959E-08	1.5019E-08	6.7956E-10
9	1.0973E-08	8.0899E-09	6.9087E-09	5.1493E-09	2.3175E-09
10	8.8731E-09	1.3236E-08	4.1069E-09	2.2339E-09	2.7567E-09
11	3.2647E-09	3.4262E-09	6.8579E-08	4.6768E-09	1.4083E-09
12	8.3425E-10	9.4195E-10	1.2965E-09	3.9407E-10	4.3230E-10
13	1.4811E-09	2.5039E-09	4.8425E-10	4.7174E-10	3.0368E-10
14	2.8807E-10	3.0179E-10	6.0728E-10	5.2686E-10	4.4633E-10
15	6.9104E-11	6.3036E-11	1.4092E-10	3.4029E-10	1.6874E-09
16	4.2637E-10	6.8659E-10	8.9488E-10	6.4669E-10	2.7524E-11
17	3.9722E-11	5.4104E-11	2.3009E-10	8.9880E-11	2.0062E-11
18	2.7279E-10	3.4369E-10	2.3807E-09	7.1626E-11	1.1071E-10
19	1.7137E-09	4.8732E-10	1.5272E-10	3.2899E-11	9.8362E-12
20	1.7812E-11	1.3131E-11	1.5217E-09	4.7579E-12	5.8354E-12
TOTAL	1.7166E-03	1.1276E-05	2.1048E-06	6.6506E-07	7.8421E-08

BASE FOR RANDOM NUMBER GENERATOR IS 12020560659

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-2.553E-02

FLUXES FOR DEVIATION GROUP 10.

COLLISIONS DETECTOR

COLLISIONS	01	02	03	04	05
1	1.0101E-03	3.7660E-06	4.2707E-07	6.8542E-08	1.2713E-08
2	2.3448E-04	5.2953E-06	7.7619E-07	9.6327E-08	3.1553E-08
3	5.0653E-06	1.8005E-06	4.1365E-07	9.8397E-08	1.2125E-08
4	1.7676E-06	6.6038E-07	7.0889E-07	5.9295E-08	5.0856E-08
5	5.4119E-07	1.4686E-06	5.1399E-07	4.8020E-08	1.3410E-08
6	1.5065E-07	2.9855E-07	7.5151E-08	6.5793E-08	6.2732E-09
7	3.4972E-08	4.7442E-08	2.9116E-08	7.4752E-09	6.9986E-09
8	3.6703E-08	3.9093E-08	1.5409E-08	7.7765E-09	2.6006E-09
9	9.5163E-09	7.8744E-09	1.5759E-08	3.1575E-09	1.1445E-09
10	1.9592E-09	1.6952E-09	1.9911E-09	2.3410E-09	8.9612E-10
11	2.1001E-09	2.6558E-09	9.9639E-10	1.1069E-09	5.1224E-10
12	1.7280E-09	1.4017E-09	1.1175E-09	1.1422E-09	1.8393E-10
13	1.7473E-10	8.4573E-10	2.0569E-10	1.9317E-09	1.4100E-10
14	4.4229E-10	2.6085E-10	3.3695E-10	6.4900E-11	2.0206E-10
15	9.2372E-11	7.3000E-11	7.0345E-11	1.7266E-10	4.4598E-09
16	8.5566E-11	1.0922E-10	2.1119E-11	1.9453E-11	2.2701E-11
17	1.1922E-11	1.2787E-11	2.6908E-11	7.3819E-11	1.3301E-11
18	6.3604E-11	3.6305E-11	2.9340E-11	7.8562E-12	3.0158E-11
19	2.8785E-11	2.6055E-11	8.5181E-11	1.0057E-11	1.1120E-11
20	2.0035E-12	1.6419E-12	6.1476E-12	3.4533E-11	4.4293E-12
TOTAL	1.2522E-03	1.3391E-05	2.9801E-06	4.6169E-07	1.4415E-07

BASE FOR RANDOM NUMBER GENERATOR IS 66622907867

SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR 01	02	03	04	05
1	4.6638E-04	3.7529E-06	4.0201E-07	6.1866E-08	1.0991E-08
2	4.3503E-04	5.0471E-06	7.2824E-07	1.0689E-07	2.2416E-08
3	4.3551E-05	3.0273E-06	3.5430E-07	1.0603E-07	1.3586E-08
4	1.4987E-05	1.1494E-06	4.2946E-07	5.6418E-08	1.7478E-08
5	5.6369E-07	5.4078E-07	3.4975E-07	3.5051E-08	1.0423E-08
6	3.3110E-07	2.3675E-07	6.5104E-08	2.8789E-08	8.9758E-09
7	8.1214E-08	1.0329E-07	3.7735E-08	1.4827E-08	4.6442E-09
8	5.8318E-08	4.4928E-08	2.3874E-08	8.4967E-09	2.8617E-09
9	1.4557E-08	2.1348E-08	1.1372E-08	5.6206E-09	2.6604E-09
10	1.0316E-08	3.1205E-08	5.5082E-09	2.2725E-09	1.0845E-09
11	6.2562E-09	1.3438E-08	1.5978E-08	1.4884E-09	1.6243E-09
12	2.5801E-09	2.8595E-09	5.6864E-09	1.3197E-09	7.6566E-10
13	1.3742E-09	1.8623E-09	2.1794E-09	9.1357E-10	3.4161E-10
14	4.6976E-10	5.5792E-10	3.8048E-10	4.5964E-10	5.6672E-10
15	3.7630E-10	3.9174E-10	3.3367E-10	2.6724E-10	7.4837E-10
16	4.8597E-10	3.1956E-10	2.5515E-10	2.3286E-10	1.0923E-10
17	1.5948E-10	3.1372E-10	1.2626E-10	3.0518E-10	5.7435E-11
18	1.1742E-10	1.6576E-10	2.7143E-10	3.5196E-11	6.0957E-11
19	2.1571E-10	1.0512E-10	6.8357E-11	1.6681E-10	3.5003E-11
20	2.7008E-11	2.7243E-11	2.5789E-10	1.5436E-11	8.1520E-12
TOTAL	9.6102E-04	1.3975E-05	2.4329E-06	4.3146E-07	9.9438E-08

BASE FOR RANDOM NUMBER GENERATOR IS 66622907867

INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR 01	02	03	04	05
1	1.4118D-04	1.3101D-07	1.2793D-08	2.1930D-09	4.7399D-10
2	5.7173D-05	1.7118D-07	5.3899D-08	5.6968D-09	1.9130D-09
3	1.4539D-05	6.6797D-07	3.1292D-08	2.5010D-08	8.2238D-10
4	1.2237D-05	2.8943D-07	1.5227D-07	3.5009D-09	4.0924D-09
5	8.3014D-08	1.2543D-07	1.3987D-07	5.7393D-09	2.0464D-09
6	1.0339D-07	3.9851D-08	9.7103D-09	5.3973D-09	4.0730D-09
7	1.3956D-08	2.3489D-08	6.5482D-09	2.8224D-09	5.7046D-10
8	1.4804D-08	1.1811D-08	4.4132D-09	1.3583D-09	5.0788D-10
9	2.4684D-09	4.5482D-09	1.6927D-09	1.6809D-09	6.9660D-10
10	2.6414D-09	1.6700D-08	1.1466D-09	4.9757D-10	2.1321D-10
11	1.6605D-09	8.1297D-09	6.4028D-09	3.7083D-10	9.3303D-10
12	5.0516D-10	6.0483D-10	3.8491D-09	3.5591D-10	4.6037D-10
13	3.4249D-10	5.2103D-10	1.2380D-09	2.2565D-10	7.6900D-11
14	9.7381D-11	1.6072D-10	6.4131D-11	1.1445D-10	2.8026D-10
15	1.0762D-10	1.4742D-10	1.1544D-10	5.3079D-11	4.2368D-10
16	2.4286D-10	1.1804D-10	8.6181D-11	8.7795D-11	3.6429D-11
17	4.9719D-11	1.6884D-10	3.5246D-11	1.5714D-10	1.9869D-11
18	4.2026D-11	6.1784D-11	2.2273D-10	1.0544D-11	1.6152D-11
19	1.5879D-10	4.7010D-11	2.3911D-11	8.6975D-11	1.7477D-11
20	1.0634D-11	9.8050D-12	1.5036D-10	6.1426D-12	2.8397D-12
TOTAL	1.5609D-04	8.6093D-07	1.7301D-07	2.6380D-08	7.7180D-09

BASE FOR RANDOM NUMBER GENERATOR IS 66622907867

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RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM      1600

HISTORY TERMINATION COUNTERS.

      190 HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED     20.
      549 HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS.
      257 HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF.
        0 HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS.

    11901 COLLISIONS OCCURRED.

PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAMETERS.

REGION HISTORIES   REGION HISTORIES   REGION HISTORIES   REGION HISTORIES
       TERMINATED         TERMINATED         TERMINATED         TERMINATED
   1        0         2        0         3      549
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RADIATION RESEARCH ASSOCIATES 'LITE' PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1

SOURCE HEIGHT H= 3.000E+02, DETECTOR COORDINATES HD= 1.000E-01 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	4.7331E-04	4.2383E-05	2.8715E-07	8.5013E-09	8.3196E-11	6.0287E-11	0.0000E+00
0.8000	4.4727E-07	8.8841E-05	1.7592E-07	1.1289E-08	6.7965E-10	5.7428E-12	0.0000E+00
0.7000	4.4381E-07	4.5084E-05	1.2425E-07	7.2154E-09	5.5778E-10	9.4199E-12	7.5083E-12
0.6000	7.2922E-08	6.8838E-05	9.8120E-08	4.9125E-09	1.1602E-09	1.6434E-10	7.2993E-12
0.5000	1.1771E-07	4.0420E-05	1.2330E-07	6.2971E-09	3.8858E-10	9.0703E-11	1.2387E-11
0.4000	8.0966E-08	4.0969E-05	1.3079E-05	8.6074E-09	4.8141E-10	6.6328E-11	2.6700E-11
0.3000	2.0721E-07	5.0474E-05	3.2097E-07	5.4970E-09	1.0656E-09	5.0530E-11	1.2837E-11
0.2000	2.8450E-07	1.0294E-05	1.8214E-07	1.2700E-08	1.2638E-09	4.2169E-10	2.8424E-11
0.1000	2.0266E-07	5.2209E-06	2.5360E-07	2.8383E-08	6.9969E-10	1.5478E-10	7.6809E-12
0.0000	2.3371E-07	2.8481E-05	2.0597E-07	1.2409E-08	9.2007E-10	5.6580E-10	3.2731E-11
-0.1000	0.0000E+00	1.4964E-05	3.4664E-05	2.0606E-08	2.4810E-10	8.6667E-11	2.5802E-11
-0.2000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	4.7540E-04	4.3597E-04	4.9515E-05	1.2642E-07	7.5480E-09	1.6763E-09	1.6137E-10

RADIATION RESEARCH ASSOCIATES ELITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.0000E+02. DETECTOR COORDINATES HD= 1.0000E-01 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	0.0000E+00	0.0000E+00	0.0000E+00	5.1599E-04
0.8000	0.0000E+00	0.0000E+00	0.0000E+00	8.9476E-05
0.7000	2.0764E-14	1.3197E-13	0.0000E+00	4.5660E-05
0.6000	0.0000E+00	0.0000E+00	0.0000E+00	6.9016E-05
0.5000	4.8921E-13	0.0000E+00	0.0000E+00	4.0668E-05
0.4000	8.9747E-15	1.6300E-12	0.0000E+00	5.4139E-05
0.3000	1.2583E-12	0.0000E+00	0.0000E+00	5.1009E-05
0.2000	4.0429E-12	0.0000E+00	0.0000E+00	1.0775E-05
0.1000	7.9343E-12	2.8779E-14	0.0000E+00	5.7065E-06
0.0000	3.2531E-12	2.3206E-14	0.0000E+00	2.8934E-05
-0.1000	1.4654E-13	2.3275E-14	1.2010E-13	4.9649E-05
-0.2000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	1.7154E-11	1.8372E-12	1.2010E-13	9.6102E-04

RADIATION RESEARCH ASSOCIATES 'LITE' PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD=, 5.0E+01

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	6.8916E-07	4.9694E-07	4.2884E-08	3.9368E-08	8.33[illegible]E-11	4.4953E-11	3.[illegible]00E-12
0.8000	8.6675E-07	4.8584E-07	6.3180E-08	5.6664E-09	8.58[illegible]E-10	2.5236E-11	0.0000E+00
0.7000	6.2216E-07	5.2145E-07	5.1192E-08	4.3395E-09	1.0861E-09	1.1274E-11	4.6721E-12
0.6000	6.0420E-07	6.0177E-07	3.7370E-08	6.6751E-09	6.0578E-10	9.0353E-11	5.2093E-12
0.5000	5.7532E-07	6.0737E-07	2.2000E-07	8.7967E-09	3.2958E-10	8.0210E-11	3.1953E-11
0.4000	4.7979E-07	9.4178E-07	2.2293E-07	6.9262E-09	1.8382E-09	5.5500E-10	1.2991E-11
0.3000	2.5111E-07	1.0972E-06	9.0576E-08	5.6175E-09	1.7011E-09	1.2546E-10	1.6301E-11
0.2000	5.6993E-07	1.0192E-06	8.2714E-08	1.7785E-08	7.2783E-10	1.3885E-10	2.0631E-11
0.1000	2.7951E-07	7.2083E-07	3.3043E-07	3.4376E-08	6.7535E-10	7.2944E-11	1.7791E-11
0.0000	4.0018E-06	1.9415E-07	5.8802E-08	1.8716E-08	8.3212E-10	6.2968E-09	6.6577E-12
-0.1000	2.4217E-08	8.1940E-08	3.4049E-08	2.7398E-09	2.8801E-10	3.0986E-10	3.4646E-11
-0.2000	2.7809E-09	6.6781E-07	7.6295E-08	4.8045E-09	3.9106E-10	2.3259E-10	8.9992E-12
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	5.0050E-06	7.4362E-06	1.3604E-06	1.5581E-07	9.4170E-09	7.9836E-09	1.8381E-10

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 5.0@+01

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	0.0000@+00	0.0000@+00	0.0000@+00	1.2685@-06
0.8000	0.0000@+00	0.0000@+00	0.0000@+00	1.4223@-06
0.7000	1.5879@-14	1.1382@-13	0.0000@+00	1.2002@-06
0.6000	0.0000@+00	0.0000@+00	0.0000@+00	1.3007@-06
0.5000	8.4770@-13	0.0000@+00	0.0000@+00	1.4120@-06
0.4000	3.7694@-13	7.7488@-13	0.0000@+00	1.6538@-06
0.3000	8.8376@-13	0.0000@+00	0.0000@+00	1.4463@-06
0.2000	9.5694@-12	7.9973@-15	0.0000@+00	1.6905@-06
0.1000	1.2872@-12	1.1365@-14	1.6391@-14	1.3659@-06
0.0000	8.4431@-13	2.7612@-14	0.0000@+00	3.1882@-07
-0.1000	1.5252@-12	5.5144@-14	0.0000@+00	1.4358@-07
-0.2000	4.2933@-13	6.6000@-15	0.0000@+00	7.5232@-07
-0.3000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.4000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.5000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.6000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.7000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.8000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	1.5780@-11	9.9741@-13	1.6391@-14	1.3975@-05

RADIATION RESEARCH ASSOCIATES PLITEP PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1

SOURCE HEIGHT H= 3.000P+02. DETECTOR COORDINATES HD= 1.000P-01 RD=, 1.5P+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	1.1640P-07	5.4551P-08	6.0630P-09	2.4889P-09	8.1840P-10	3.1831P-11	4.4790P-11
0.8000	1.0012P-07	1.2805P-07	1.5995P-08	3.0947P-09	1.7752P-09	3.9832P-11	2.4913P-11
0.7000	1.2464P-07	1.0668P-07	3.0437P-08	2.8497P-09	4.3494P-10	2.1634P-11	3.4983P-12
0.6000	2.0111P-07	1.6061P-07	2.4654P-08	2.7743P-09	2.9634P-10	7.4676P-11	1.0067P-11
0.5000	1.0563P-07	2.4214P-07	2.6327P-08	1.4034P-08	3.3158P-10	7.8086P-11	2.0600P-11
0.4000	7.6635P-08	1.5984P-07	6.2063P-08	6.1864P-09	6.9875P-10	1.1747P-10	5.2661P-12
0.3000	1.5755P-08	3.2656P-08	1.4188P-08	2.5248P-09	2.9702P-09	2.8841P-10	1.2041P-11
0.2000	4.9922P-09	1.7183P-08	1.1954P-08	2.1906P-09	3.3261P-10	3.0805P-11	3.7232P-12
0.1000	6.5235P-09	1.8913P-07	5.9316P-08	7.3626P-10	6.4424P-11	2.8297P-11	8.2378P-12
0.0000	1.8489P-08	3.7384P-08	2.4116P-09	1.5769P-09	9.2986P-11	1.0580P-11	9.6344P-12
-0.1000	3.8500P-09	1.6263P-07	2.6154P-09	4.9490P-09	4.7255P-10	2.1631P-11	6.0455P-12
-0.2000	1.2987P-09	9.2290P-09	9.0230P-09	5.1364P-10	2.2969P-09	1.8959P-11	8.0618P-12
-0.3000	3.2763P-10	8.7825P-09	4.2495P-09	1.0930P-09	2.0881P-10	6.0446P-11	3.8945P-11
-0.4000	5.5642P-11	8.1534P-09	8.3243P-10	4.5844P-10	1.3254P-10	6.7395P-11	1.7873P-12
-0.5000	2.2174P-12	1.1419P-08	4.3238P-10	5.4923P-10	6.6490P-12	1.5106P-12	4.3440P-12
-0.6000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
-0.7000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
-0.8000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
-0.9000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
-1.0000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
TOTAL	7.7583P-07	1.3284P-06	2.7056P-07	4.6019P-08	1.0933P-08	8.9156P-10	2.0195P-10

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 1.5@+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	0.0000@+00	0.0000@+00	0.0000@+00	1.8040@-07
0.8000	6.8028@-15	8.2873@-14	0.0000@+00	2.4910@-07
0.7000	6.2810@-14	7.6948@-13	0.0000@+00	2.6506@-07
0.6000	1.8770@-13	6.1050@-14	0.0000@+00	3.8953@-07
0.5000	6.4361@-13	3.6285@-15	0.0000@+00	3.8856@-07
0.4000	2.9153@-12	1.9606@-15	4.1708@-16	3.0555@-07
0.3000	9.7605@-12	9.7088@-15	0.0000@+00	6.8405@-08
0.2000	1.3056@-12	1.8529@-13	0.0000@+00	3.6689@-08
0.1000	5.5600@-13	4.5406@-15	0.0000@+00	2.5581@-07
0.0000	1.3606@-11	4.7060@-17	0.0000@+00	5.9989@-08
-0.1000	5.8478@-13	3.4638@-14	0.0000@+00	1.7454@-07
-0.2000	1.5973@-13	2.3134@-14	0.0000@+00	2.2388@-08
-0.3000	1.9102@-13	4.9130@-14	0.0000@+00	1.4761@-08
-0.4000	3.5938@-14	0.0000@+00	0.0000@+00	9.7017@-09
-0.5000	9.4989@-14	3.6076@-13	0.0000@+00	1.2416@-08
-0.6000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.7000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.8000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	3.0111@-11	1.5862@-12	4.1708@-16	2.4329@-06

RADIATION RESEARCH ASSOCIATES ELITEE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.0000E+02. DETECTOR COORDINATES HD= 1.0000E-01 RD=, 3.0E+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	5.8022E-08	2.5529E-08	7.6062E-09	7.9495E-10	1.7614E-10	5.6893E-11	9.2453E-11
0.8000	4.3791E-08	3.7307E-08	9.8578E-09	1.4321E-09	3.2453E-10	3.0783E-10	2.2367E-11
0.7000	3.5743E-08	6.7239E-08	1.1280E-08	2.4132E-09	6.1183E-10	6.2115E-11	2.0216E-11
0.6000	7.0538E-09	1.4643E-08	5.3538E-09	1.2254E-09	3.7771E-10	2.3790E-10	2.4425E-11
0.5000	1.9435E-09	9.9879E-09	2.0109E-09	4.1057E-10	3.3374E-10	2.7454E-11	4.7606E-12
0.4000	2.3398E-09	8.4595E-09	9.9295E-10	1.0289E-09	1.1126E-10	2.6731E-11	8.6714E-12
0.3000	1.0046E-09	6.8090E-09	1.6086E-09	3.6719E-10	3.6153E-11	1.5299E-11	1.9956E-12
0.2000	4.1802E-09	2.9357E-09	6.3399E-10	5.8159E-10	2.8895E-11	6.3261E-12	5.4007E-12
0.1000	1.2454E-08	2.3915E-09	2.0991E-09	3.5331E-10	2.8366E-11	6.1435E-12	1.3277E-12
0.0000	7.8688E-10	1.8740E-09	2.5975E-09	4.6299E-11	1.1590E-10	2.2322E-11	7.4558E-12
-0.1000	1.6901E-09	2.4666E-09	5.0809E-10	1.3144E-10	1.0686E-10	9.2200E-11	3.8952E-12
-0.2000	5.0190E-10	9.4179E-10	7.6175E-09	6.4725E-11	1.0315E-10	1.4761E-11	5.1711E-13
-0.3000	7.8770E-10	1.9145E-09	3.7243E-09	2.0468E-10	3.0922E-11	5.7301E-12	1.4371E-12
-0.4000	3.2802E-10	8.2648E-10	8.1085E-10	1.6049E-10	6.7840E-11	7.3898E-12	8.2425E-13
-0.5000	4.6641E-11	2.5665E-10	1.1935E-09	9.9421E-11	7.9499E-11	2.3344E-12	2.4228E-12
-0.6000	1.0071E-09	2.5715E-09	1.9096E-10	7.3672E-11	9.6920E-12	4.1391E-12	1.6351E-12
-0.7000	1.3803E-11	1.9605E-09	4.3004E-10	3.7796E-11	3.6953E-11	2.9349E-12	3.3528E-13
-0.8000	0.0000E+00	7.0864E-15	1.8700E-11	1.9891E-12	1.2350E-13	1.8542E-14	1.1824E-14
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	1.7169E-07	1.6811E-07	5.8535E-08	9.4277E-09	2.5796E-09	8.9852E-10	2.0015E-10

RADIATION RESEARCH ASSOCIATES "LITE" PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.0000E+02. DETECTOR COORDINATES HD= 1.0000E-01 RD=, 3.0E+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	2.4703E-15	0.0000E+00	0.0000E+00	9.2278E-08
0.8000	1.6417E-13	6.4659E-14	0.0000E+00	9.3043E-08
0.7000	6.5422E-12	2.7610E-14	4.9363E-17	1.1738E-07
0.6000	3.5025E-13	2.6646E-15	0.0000E+00	2.8916E-08
0.5000	1.4718E-12	1.3529E-15	0.0000E+00	1.4720E-08
0.4000	8.1184E-14	1.0924E-19	0.0000E+00	1.2968E-08
0.3000	6.9385E-14	2.7383E-14	0.0000E+00	9.8430E-09
0.2000	1.4174E-13	5.4346E-21	0.0000E+00	8.3722E-09
0.1000	5.9009E-13	9.8856E-17	0.0000E+00	1.7334E-08
0.0000	1.5968E-12	1.1289E-18	0.0000E+00	5.4520E-09
-0.1000	6.5272E-13	0.0000E+00	0.0000E+00	4.9998E-09
-0.2000	2.2995E-12	3.8494E-16	0.0000E+00	9.2467E-09
-0.3000	5.9174E-13	6.1251E-15	0.0000E+00	6.6699E-09
-0.4000	1.2810E-13	2.1555E-13	0.0000E+00	2.2022E-09
-0.5000	4.0561E-14	5.1904E-16	0.0000E+00	1.6805E-09
-0.6000	1.4037E-16	3.1107E-13	0.0000E+00	3.8591E-09
-0.7000	2.3285E-13	5.2845E-23	0.0000E+00	2.4826E-09
-0.8000	0.0000E+00	1.0290E-16	0.0000E+00	2.0850E-11
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	1.4956E-11	6.5752E-13	4.9363E-17	4.3146E-07

RADIATION RESEARCH ASSOCIATES 'LITE' PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02, DETECTOR COORDINATES HD= 1.000E-01 RD=, 5.0E+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	1.4329E-08	1.3614E-08	3.6221E-09	8.3011E-10	1.7981E-10	2.8826E-11	1.1257E-11
0.8000	8.1347E-09	1.4524E-08	3.5004E-09	8.8569E-10	1.2207E-10	6.1928E-11	9.0972E-12
0.7000	1.1333E-09	3.6178E-09	1.3607E-09	2.2578E-10	5.8905E-11	3.6296E-11	1.9345E-12
0.6000	5.2080E-10	1.0216E-09	7.9627E-10	2.9995E-10	4.6506E-10	1.0720E-11	5.0194E-12
0.5000	7.9934E-10	4.1664E-09	5.7254E-10	8.6835E-11	1.4626E-11	2.0849E-12	1.0433E-13
0.4000	1.5429E-10	1.1474E-09	1.7143E-09	7.3774E-11	1.1903E-10	3.0665E-12	1.3346E-12
0.3000	2.3284E-10	6.5096E-10	2.7085E-10	1.3818E-10	1.7152E-11	1.5533E-11	2.2603E-13
0.2000	1.5578E-09	3.1797E-10	2.7220E-10	4.2143E-11	1.7717E-10	3.2072E-12	2.6437E-13
0.1000	2.0084E-10	4.7683E-10	1.5752E-10	1.0826E-09	1.5701E-11	7.6559E-13	2.5283E-13
0.0000	1.1664E-10	9.3503E-10	3.7291E-11	1.4847E-11	1.3125E-10	2.9087E-10	1.8039E-12
-0.1000	1.9891E-09	7.3667E-10	2.1479E-10	7.6770E-11	2.6898E-11	5.6463E-12	1.0280E-12
-0.2000	1.2741E-10	2.4297E-10	2.0711E-10	4.8745E-12	2.1442E-11	1.5308E-11	8.1935E-13
-0.3000	1.0081E-11	4.2643E-09	3.8782E-10	2.0191E-11	1.6431E-11	5.7214E-12	1.6492E-11
-0.4000	1.9121E-10	1.6238E-10	4.9815E-10	3.4992E-11	5.0229E-11	4.4355E-12	7.0736E-15
-0.5000	2.6592E-12	2.2987E-09	1.1188E-10	2.8092E-11	1.8858E-12	2.1775E-12	9.6840E-15
-0.6000	1.0881E-12	2.4682E-10	5.5362E-11	6.1474E-12	4.0886E-11	8.6465E-12	1.2750E-13
-0.7000	1.5506E-10	1.1222E-09	5.3460E-11	5.6136E-11	7.4226E-12	1.4575E-12	1.1575E-13
-0.8000	6.1524E-11	1.2333E-10	1.2870E-10	9.6434E-12	5.6155E-12	4.1693E-13	1.7359E-14
-0.9000	0.0000E+00	4.5412E-13	4.6970E-11	1.5847E-11	8.5488E-11	3.4727E-13	2.2726E-12
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	2.9718E-08	4.9669E-08	1.4008E-08	3.9326E-09	1.5571E-09	4.9745E-10	5.2184E-[illegible]

RADIATION RESEARCH ASSOCIATES ELITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.0000E+02. DETECTOR COORDINATES HD= 1.0000E-01 RD=, 5.0E+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	7.1545E-14	1.9161E-13	0.0000E+00	3.2615E-08
0.8000	4.8016E-13	6.2178E-15	3.7761E-18	2.7238E-08
0.7000	2.9476E-13	1.4927E-15	0.0000E+00	6.4350E-09
0.6000	1.8750E-13	7.2852E-15	0.0000E+00	3.1196E-09
0.5000	3.2693E-13	4.4871E-14	0.0000E+00	5.6423E-09
0.4000	2.7463E-13	1.0332E-17	0.0000E+00	3.2134E-09
0.3000	1.0108E-13	1.8028E-18	0.0000E+00	1.3258E-09
0.2000	6.6920E-14	0.0000E+00	0.0000E+00	2.3708E-09
0.1000	2.1820E-13	1.1080E-16	0.0000E+00	1.9347E-09
0.0000	1.2199E-16	0.0000E+00	0.0000E+00	1.5277E-09
-0.1000	8.3513E-13	1.0020E-16	0.0000E+00	3.0518E-09
-0.2000	1.0655E-15	9.2856E-18	0.0000E+00	6.1994E-10
-0.3000	1.9660E-16	0.0000E+00	0.0000E+00	4.7210E-09
-0.4000	9.6500E-14	0.0000E+00	0.0000E+00	9.4150E-10
-0.5000	1.7568E-17	0.0000E+00	0.0000E+00	2.4454E-09
-0.6000	2.3282E-13	0.0000E+00	0.0000E+00	3.5931E-10
-0.7000	4.7379E-16	2.0108E-19	0.0000E+00	1.3959E-09
-0.8000	1.1834E-14	0.0000E+00	0.0000E+00	3.2926E-10
-0.9000	5.1657E-23	0.0000E+00	0.0000E+00	1.5138E-10
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	3.1999E-12	2.5171E-13	3.7761E-18	9.9438E-08

RADIATION RESEARCH ASSOCIATES PLITEP PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS REGION OF SCATTER

REGION	DETECTOR				
	01	02	03	04	05
1	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
2	9.6102P-04	1.3975P-05	2.4329P-06	4.3146P-07	9.9438P-08
3	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
TOTAL	9.6102P-04	1.3975P-05	2.4329P-06	4.3146P-07	9.9438P-08

```
LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR.

DETECTOR  1, REFLECTED FLUX = 4.965@-05

DETECTOR  2, REFLECTED FLUX = 1.082@-06

DETECTOR  3, REFLECTED FLUX = 1.593@-08

DETECTOR  4, REFLECTED FLUX = 5.794@-09

DETECTOR  5, REFLECTED FLUX = 9.052@-11
```

RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM 1600

DIRECT BEAM LIGHT INTENSITIES

DETECTOR	DIRECT INTENSITY
1	6.16480-01
2	6.12360-01
3	5.82120-01
4	5.04180-01
5	3.90020-01

photons/unit area per source photon where the unit area is in the arbitrary units used to define the thickness of the atmosphere. If one assumes that the thickness of the atmosphere is 30 KM, then multiplication of the intensities given in Table XII by 10^{-8} would result in intensities that have units of photons cm^{-2} per source photon.

In order to compare the results of this sample problem with transmission data for a normal incident broad beam source, the reflected intensity at each receiver should be subtracted from the total scattered intensity, since the total scattered intensity includes the intensity reflected from the ground surface. The differences should then be plotted as a function of the radial position of the receivers and this radial distribution integrated over the plane containing the detector points to give the transmitted intensity for radiation incident normal to the atmosphere.

4.2 LITE-II Sample Problem

The LITE-II sample problem was designed to calculate the angular distributions of the scattered intensities at several depths in a Rayleigh atmosphere of 0.5 mean-free-path in thickness and with a ground albedo of 0.8, due to a plane source incident at $\theta_o = \cos^{-1} 0.6$. Table XIII shows the input data for the LITE-II problem. A total of 2000 histories were divided into ten groups of 200 histories each. A maximum of 20 collisions were allowed for each history. The atmosphere and ground reflection distribution is defined in the same manner as in the sample problem for LITE-I.

Four receiver planes were placed within the atmosphere at altitudes of 0.1, 100, 200 and 299 units above ground level The lower receiver plane is sufficiently close to the lower surface of the atmosphere to record the scattered intensity transmitted through the atmosphere. The upper plane is sufficiently close to the upper surface to record radiation emerging from the top of the atmosphere The output for the LITE-II sample problem shown in Table XIV is in the same format as that previously shown for the LITE-I sample problem.

To obtain the transmitted intensity from the data printed for the first receiver, only those intensities listed for those cosine intervals with lower bounds ranging from -0.1 to -1.0 should be considered. The intensities given for those cosine intervals with lower bounds ranging from 0.9 to 0 0 are mainly comprised of the intensity reflected from the ground surface and would not be transmitted through the lower surface of the atmosphere. The intensities given in Table XIII for the last receiver position that fall in cosine intervals with lower bounds between 0.9 to 0.0 are the intensities emerging from the top surface of the atmosphere. The units of the LITE-II computed intensities are photons/unit area per source photon/unit area, where the unit area is parallel to the top of the atmosphere.

TABLE XIII. LITE-II CODE SAMPLE PROBLEM INPUT DATA

```
         1                                                            160001    LITE
      2000        10         3         2        20         4          160002    LITE
        20        20        -1         2         1         1          160003    LITE
         2        10     39451     26193     34521     36714          160004    LITE
     36743     87321                                                  160005    LITE
         2                                                            160006    LITE
 3.000E+02 5.000E+03 1.000E-03 1.000E-02 1.000E-05 1.000E+01          160007    LITE
 1.000E+00                                                            160008    LITE
         3        -1         2                                        160009    LITE
-6.000E-01-6.000E-01                                                  160010    LITE
 0.000E+00 1.000E+00                                                  160011    LITE
         4         1         2         2        20                    160012    LITE
 8.000E-01                                                            160013    LITE
 1.000E+00 0.000E+00                                                  160014    LITE
 3.182E-01 0.000E+00                                                  160015    LITE
 9.746E-01 9.487E-01 9.220E-01 8.944E-01 8.660E-01 8.366E-01          160016    LITE
 8.063E-01 7.746E-01 7.416E-01 7.071E-01 6.709E-01 6.325E-01          160017    LITE
 5.915E-01 5.478E-01 5.000E-01 4.472E-01 3.873E-01 3.162E-01          160018    LITE
 2.235E-01 0.000E+00                                                  160019    LITE
         5        20        20                                        160020    LITE
         1         2         3         4         5         6          160021    LITE
         7         8         9        10        11        12          160022    LITE
        13        14        15        16        17        18          160023    LITE
        19        20                                                  160024    LITE
 9.000E-01 8.000E-01 7.000E-01 6.000E-01 5.000E-01 4.000E-01          160025    LITE
 3.000E-01 2.000E-01 1.000E-01 0.000E+00-1.000E-01-2.000E-01          160026    LITE
-3.000E-01-4.000E-01-5.000E-01-6.000E-01-7.000E-01-8.000E-01          160027    LITE
-9.000E-01-1.000E+00                                                  160028    LITE
         6         4                                                  160029    LITE
 1.000E-01 0.000E+00         2 9.000E+04                              160030    LITE
 1.000E+02 0.000E+00         2 9.000E+04                              160031    LITE
 2.000E+02 0.000E+00         2 9.000E+04                              160032    LITE
 2.990E+02 0.000E+00         2 9.000E+04                              160033    LITE
         7         2         3                                        160034    LITE
        -1         1 0.000E+00                                        160035    LITE
         2         1 3.010E+02                                        160036    LITE
         1    1 0.00    1    2                                        160037    LITE
         2    1 1.00   -1    1    2    3                              160038    LITE
         1    1 0.00   -2    2                                        160039    LITE
         8         1                                                  160040    LITE
         0         0           1.000E+00                              160041    LITE
         9        23                                                  160042    LITE
```

TABLE XIII. (CON'T)

0.00a£0ᵐ	0.000a£00	1.000a£00	1.000a£00	160043	LITE
5.00a£0ⁿ	3.000a-02	1.000a£00	1.000a£00	160044	LITE
10.00a£0ⁿ	5.840a-02	1.000a£00	1.000a£00	160045	LITE
15.00a£0ⁿ	8.000a-02	1.000a£00	1.000a£00	160046	LITE
20.00a£0ⁿ	1.090a-01	1.000a£00	1.000a£00	160047	LITE
30.00a£0ᵐ	1.550a-01	1.000a£00	1.000a£00	160048	LITE
35.00a£0ⁿ	1.753a-01	1.000a£00	1.000a£00	160049	LITE
40.00a£0ⁿ	1.960a-01	1.000a£00	1.000a£00	160050	LITE
50.00a£0ᵐ	2.300a-01	1.000a£00	1.000a£00	160051	LITE
60.00a£0ᵐ	2.650a-01	1.000a£00	1.000a£00	160052	LITE
70.00a£0ⁿ	2.950a-01	1.000a£00	1.000a£00	160053	LITE
80.00a£00	3.200a-01	1.000a£00	1.000a£00	160054	LITE
90.00a£00	3.350a-01	1.000a£00	1.000a£00	160055	LITE
10.00a£01	3.550a-01	1.000a£00	1.000a£00	160056	LITE
12.50a£01	3.925a-01	1.000a£00	1.000a£00	160057	LITE
15.00a£01	4.190a-01	1.000a£00	1.000a£00	160058	LITE
17.50a£01	4.410a-01	1.000a£00	1.000a£00	160059	LITE
20.00a£01	4.580a-01	1.000a£00	1.000a£00	160060	LITE
22.50a£01	4.700a-01	1.000a£00	1.000a£00	160061	LITE
25.00a£01	4.740a-01	1.000a£00	1.000a£00	160062	LITE
27.50a£01	4.800a-01	1.000a£00	1.000a£00	160063	LITE
30.00a£01	4.850a-01	1.000a£00	1.000a£00	160064	LITE
50.00a£01	5.000a-01	1.000a£00	1.000a£00	160065	LITE
1ⁿ	1600	0	0	160066	LITE

TABLE XIV. PRINTOUT FOR LITE-II SAMPLE PROBLEM (24 PAGES)

FLUXES FOR DEVIATION GROUP 1.

COLLISIONS	DETECTOR 01	02	03	04
1	1.0854E+00	1.0865E+00	8.5695E-01	6.8107E-01
2	8.0560E-01	4.4508E-01	4.0986E-01	3.0106E-01
3	5.1241E-01	3.6971E-01	3.0526E-01	2.6496E-01
4	1.8504E-01	2.3491E-01	1.5774E-01	1.4206E-01
5	1.0975E-01	1.5855E-01	1.3020E-01	1.2497E-01
6	1.0991E-01	9.4155E-02	8.9366E-02	7.3525E-02
7	6.3003E-02	5.7118E-02	3.7767E-02	3.6405E-02
8	3.2604E-02	3.5563E-02	2.3651E-02	2.1011E-02
9	5.3156E-02	1.7361E-02	1.4247E-02	1.2739E-02
10	1.3836E-02	1.1399E-02	8.5186E-03	8.7369E-03
11	1.1817E-02	1.1697E-02	5.9368E-03	5.3795E-03
12	7.4066E-03	3.6823E-03	3.4573E-03	3.1081E-03
13	5.9364E-03	3.2048E-03	2.6831E-03	2.3968E-03
14	4.1722E-03	2.5229E-03	2.0037E-03	1.7990E-03
15	1.4308E-03	1.5317E-03	1.2305E-03	1.0283E-03
16	1.2929E-03	1.0361E-03	8.2141E-04	7.3054E-04
17	4.7562E-04	3.6446E-04	4.0835E-04	4.0114E-04
18	3.9502E-04	2.8876E-04	2.3386E-04	2.1989E-04
19	3.2853E-04	2.4585E-04	1.6585E-04	1.4970E-04
20	7.6570E-05	1.4003E-04	1.1960E-04	1.1175E-04
TOTAL	3.0041E+00	2.5551E+00	2.0506E+00	1.6819E+00

BASE FOR RANDOM NUMBER GENERATOR IS 39177805137

FLUXES FOR DEVIATION GROUP 2.

COLLISIONS	DETECTOR 01	02	03	04
1	1.2345E+00	9.0468E-01	8.6186E-01	5.8398E-01
2	6.4686E-01	4.7448E-01	3.2269E-01	3.0806E-01
3	5.0423E-01	2.5822E-01	2.4620E-01	2.3565E-01
4	2.8637E-01	2.0351E-01	1.4207E-01	1.2786E-01
5	1.6458E-01	1.9543E-01	1.2144E-01	8.4200E-02
6	1.2033E-01	8.6072E-02	5.8836E-02	5.5052E-02
7	8.3676E-02	5.9265E-02	4.2201E-02	4.0500E-02
8	1.0783E-01	4.9787E-02	2.9263E-02	2.8147E-02
9	4.4192E-02	3.5349E-02	2.5945E-02	2.2868E-02
10	2.2106E-02	1.9831E-02	1.0930E-02	9.6496E-03
11	1.8444E-02	8.9556E-03	7.7554E-03	1.6695E-02
12	9.2170E-03	6.6142E-03	6.3368E-03	5.6503E-03
13	5.1866E-03	5.4525E-03	3.5125E-03	3.2112E-03
14	3.5754E-03	3.5671E-03	2.8830E-03	2.6252E-03
15	4.6394E-03	1.7276E-03	1.6003E-03	6.1049E-04
16	1.3841E-03	2.5262E-03	8.2459E-04	7.2399E-04
17	1.1335E-03	1.9734E-03	4.9359E-04	6.3648E-04
18	7.9847E-04	5.6904E-04	4.5373E-04	3.9107E-04
19	4.6070E-04	7.4384E-04	2.4061E-04	2.3777E-04
20	1.3147E-04	4.6693E-04	4.9920E-04	4.1062E-04
TOTAL	3.2597E+00	2.3192E+00	1.8860E+00	1.5276E+00

BASE FOR RANDOM NUMBER GENERATOR IS 64332465745

FLUXES FOR DEVIATION GROUP 3.

COLLISIONS DETECTOR

	01	02	03	04
1	1.1799E+00	8.7141E-01	6.6035E-01	6.0880E-01
2	5.3972E-01	4.4410E-01	4.5677E-01	4.1410E-01
3	3.4782E-01	3.0732E-01	3.0213E-01	2.7983E-01
4	2.5732E-01	2.3397E-01	1.3253E-01	1.2876E-01
5	1.2045E-01	1.4427E-01	1.0744E-01	9.5420E-02
6	7.9209E-02	6.0208E-02	5.7985E-02	5.0109E-02
7	7.1533E-02	4.3917E-02	3.1243E-02	2.7370E-02
8	3.7633E-02	2.9056E-02	2.5021E-02	2.3729E-02
9	2.3879E-02	1.2653E-02	1.1363E-02	1.1966E-02
10	1.9507E-02	1.0239E-02	7.9530E-03	8.1298E-03
11	9.0595E-03	8.7947E-03	6.7124E-03	5.9463E-03
12	6.4842E-03	3.9412E-03	3.8062E-03	3.0840E-03
13	3.2987E-03	2.4272E-03	2.4340E-03	4.2365E-03
14	2.6656E-03	1.2034E-03	2.1849E-03	1.4627E-03
15	1.9091E-03	1.1675E-03	8.1676E-04	7.6469E-04
16	1.9183E-03	6.1288E-04	6.3001E-04	5.7671E-04
17	1.0549E-03	6.1471E-04	4.4037E-04	3.5813E-04
18	3.4119E-04	6.2211E-04	4.6821E-04	4.1649E-04
19	2.5225E-04	2.5545E-04	1.4077E-04	1.2677E-04
20	3.4363E-04	1.2878E-04	1.0135E-04	1.0708E-04
TOTAL	2.7043E+00	2.1769E+00	1.8105E+00	1.8653E+00

BASE FOR RANDOM NUMBER GENERATOR IS 58724308995

FLUXES FOR DEVIATION GROUP 4.

COLLISIONS DETECTOR

	01	02	03	04
1	1.1030E+00	1.0121E+00	8.5907E-01	6.8307E-01
2	5.4642E-01	4.2677E-01	5.6250E-01	3.5792E-01
3	5.0716E-01	3.0806E-01	2.3261E-01	2.4359E-01
4	2.1906E-01	2.1540E-01	1.5780E-01	1.5247E-01
5	1.3296E-01	1.2589E-01	9.8436E-02	9.7558E-02
6	8.8271E-02	1.0037E-01	6.6010E-02	6.3189E-02
7	5.5914E-02	5.9972E-02	3.9425E-02	3.6414E-02
8	4.0857E-02	3.3155E-02	2.4172E-02	2.2358E-02
9	2.6426E-02	1.3100E-02	1.0553E-02	9.0087E-03
10	2.0241E-02	1.1089E-02	7.5054E-03	7.0162E-03
11	7.6152E-03	9.3026E-03	7.9717E-03	7.0270E-03
12	9.6053E-03	3.5367E-03	2.2628E-03	1.9434E-03
13	5.5058E-03	3.7177E-03	4.5772E-03	3.4957E-03
14	4.3535E-03	2.6994E-03	2.5720E-03	2.7931E-03
15	2.9285E-03	1.3905E-03	1.4219E-03	1.3629E-03
16	1.0169E-03	7.4565E-04	9.7013E-04	8.9266E-04
17	6.2802E-04	6.5961E-04	1.2268E-03	8.5865E-04
18	7.1478E-04	1.8443E-04	1.6407E-04	1.7605E-04
19	3.6653E-04	2.7279E-04	2.4619E-04	2.3481E-04
20	2.0780E-04	9.4429E-05	7.0749E-05	6.6461E-05
TOTAL	2.7733E+00	2.3285E+00	2.0797E+00	1.4923E+00

BASE FOR RANDOM NUMBER GENERATOR IS 67684980393

FLUXES FOR DEVIATION GROUP 5.

COLLISIONS	DETECTOR 01	02	03	04
1	1.0981E+00	7.8208E-01	6.5630E-01	6.1162E-01
2	6.8319E-01	3.9888E-01	4.8347E-01	3.9157E-01
3	3.8906E-01	3.2332E-01	3.1560E-01	2.9477E-01
4	2.0789E-01	1.8700E-01	1.3832E-01	1.3859E-01
5	1.4616E-01	1.3311E-01	1.0077E-01	8.7472E-02
6	7.6811E-02	8.3185E-02	7.4029E-02	5.9534E-02
7	6.7456E-02	4.3619E-02	3.4834E-02	3.2401E-02
8	4.6671E-02	3.0999E-02	3.0860E-02	2.7006E-02
9	2.5459E-02	1.4510E-02	1.2689E-02	1.0687E-02
10	2.2081E-02	1.2156E-02	9.9607E-03	9.5695E-03
11	1.1960E-02	9.2265E-03	7.0373E-03	6.7747E-03
12	5.2233E-03	1.0374E-02	6.8388E-03	6.7896E-03
13	4.7973E-03	4.4135E-03	3.0435E-03	2.7512E-03
14	1.6800E-02	3.3833E-03	1.8502E-03	1.0432E-03
15	1.2556E-03	1.6498E-03	2.2574E-03	1.2782E-03
16	1.8065E-03	6.5279E-04	6.9972E-04	5.8885E-04
17	1.0036E-03	9.2481E-04	6.9123E-04	7.9605E-04
18	1.0173E-03	1.2957E-04	2.6861E-04	2.4533E-04
19	1.1060E-03	5.1008E-04	5.4437E-04	5.1327E-04
20	4.0202E-04	1.5036E-04	1.0657E-04	9.0498E-05
TOTAL	2.8083E+00	2.0410E+00	1.8802E+00	1.6150E+00

BASE FOR RANDOM NUMBER GENERATOR IS 50915447297

FLUXES FOR DEVIATION GROUP 6.

COLLISIONS	DETECTOR 01	02	03	04
1	1.1027E+00	7.7152E-01	6.8969E-01	6.3673E-01
2	6.0242E-01	5.4007E-01	3.8690E-01	3.3245E-01
3	3.5863E-01	2.6616E-01	2.4077E-01	2.3490E-01
4	2.6474E-01	1.8743E-01	1.7488E-01	1.3181E-01
5	1.5041E-01	1.1075E-01	1.1242E-01	1.0158E-01
6	1.4943E-01	8.3675E-02	7.7476E-02	7.3415E-02
7	5.3175E-02	5.3230E-02	5.1842E-02	4.4634E-02
8	3.4153E-02	2.7517E-02	2.6604E-02	2.2219E-02
9	2.2221E-02	2.0793E-02	1.5960E-02	1.4580E-02
10	1.2676E-02	1.3679E-02	1.2021E-02	1.1348E-02
11	9.8610E-03	8.5385E-03	6.4912E-03	5.7683E-03
12	5.1325E-03	5.3740E-03	5.7633E-03	5.3201E-03
13	6.7736E-03	2.6791E-03	1.7399E-03	1.2438E-03
14	2.3592E-03	1.6095E-03	9.9677E-04	9.3746E-04
15	2.3668E-03	1.0276E-03	8.5368E-04	8.2862E-04
16	1.4553E-03	5.9963E-04	6.9840E-04	6.9038E-04
17	6.4220E-04	6.4643E-04	4.2748E-04	4.1500E-04
18	3.3166E-04	2.4715E-04	1.6303E-04	1.5525E-04
19	2.6293E-04	1.9066E-04	1.5642E-04	1.5864E-04
20	7.4361E-05	1.4061E-04	1.6458E-04	8.4232E-05
TOTAL	2.7796E+00	2.1179E+00	1.8062E+00	1.6193E+00

BASE FOR RANDOM NUMBER GENERATOR IS 55868853539

FLUXES FOR DEVIATION GROUP 7.

COLLISIONS	DETECTOR 01	02	03	04
1	1.1852@+00	7.6180@-01	7.8848@-01	6.8875@-01
2	6.7020@-01	4.1025@-01	4.2490@-01	3.5884@-01
3	3.3186@-01	2.8997@-01	2.7619@-01	2.1293@-01
4	2.9957@-01	2.1304@-01	1.6840@-01	1.3798@-01
5	1.5746@-01	1.2193@-01	1.0883@-01	9.2992@-02
6	1.0419@-01	9.5116@-02	7.4992@-02	6.3855@-02
7	4.1654@-02	5.8618@-02	4.9428@-02	5.0177@-02
8	3.8483@-02	3.3665@-02	2.3953@-02	2.3978@-02
9	3.1594@-02	1.6260@-02	1.2773@-02	1.1521@-02
10	1.5972@-02	1.4275@-02	9.8596@-03	8.4662@-03
11	7.6240@-03	1.0807@-02	6.1546@-03	6.3387@-03
12	5.2274@-03	6.0898@-03	4.7998@-03	4.2372@-03
13	4.4444@-03	2.2627@-03	2.7952@-03	2.6953@-03
14	2.0090@-03	2.9886@-03	2.1380@-03	2.2079@-03
15	2.2734@-03	1.1124@-03	7.5509@-04	7.0694@-04
16	9.8149@-04	4.9617@-04	4.8890@-04	4.7634@-04
17	1.1703@-03	5.1565@-04	3.9606@-04	3.7647@-04
18	3.5547@-04	3.3537@-04	2.7791@-04	2.6203@-04
19	2.7104@-04	1.9796@-04	2.0933@-04	2.2063@-04
20	1.3706@-04	9.7050@-05	1.4536@-04	1.4279@-04
TOTAL	2.9007@+00	2.0598@+00	1.9560@+00	1.6671@+00

BASE FOR RANDOM NUMBER GENERATOR IS 22882805977

FLUXES FOR DEVIATION GROUP 8.

COLLISIONS	DETECTOR 01	02	03	04
1	1.2796E+00	6.6579E-01	5.4792E-01	5.4762E-01
2	6.1675E-01	4.2408E-01	3.1652E-01	3.1015E-01
3	4.5067E-01	2.9239E-01	2.4242E-01	2.4067E-01
4	2.4821E-01	2.1223E-01	1.6828E-01	2.0537E-01
5	1.6307E-01	1.3123E-01	1.1999E-01	9.4179E-02
6	9.5231E-02	9.6095E-02	6.6002E-02	6.1281E-02
7	4.9887E-02	5.5016E-02	4.9902E-02	4.0383E-02
8	3.3839E-02	3.5008E-02	2.3078E-02	1.9920E-02
9	2.2990E-02	1.7001E-02	1.2616E-02	1.1176E-02
10	1.5619E-02	1.5170E-02	1.1376E-02	1.1230E-02
11	6.6540E-03	8.2615E-03	6.9810E-03	5.9605E-03
12	7.9766E-03	1.0219E-02	5.6892E-03	6.4531E-03
13	3.5950E-03	8.5378E-03	7.1107E-03	4.7791E-03
14	2.9077E-03	2.1000E-03	1.3682E-03	1.9408E-03
15	1.1006E-03	1.0192E-03	9.9299E-04	1.7402E-03
16	4.7139E-04	8.3851E-04	6.4902E-04	5.1290E-04
17	2.2210E-04	6.0292E-04	4.4331E-04	4.0546E-04
18	2.1767E-04	2.5798E-04	2.0397E-04	1.9902E-04
19	2.1449E-04	1.2040E-04	1.1142E-04	1.0656E-04
20	9.0662E-05	1.2769E-04	7.3307E-05	6.1225E-05
TOTAL	2.9994E+00	1.9961E+00	1.5837E+00	1.5642E+00

BASE FOR RANDOM NUMBER GENERATOR IS 67301579371

FLUXES FOR DEVIATION GROUP 9.

COLLISIONS	DETECTOR 01	02	03	04
1	9.4016E-01	8.1060E-01	6.6885E-01	6.9998E-01
2	6.5930E-01	7.0939E-01	4.0878E-01	3.6486E-01
3	3.1145E-01	2.9076E-01	2.5212E-01	1.9225E-01
4	2.4115E-01	1.6904E-01	1.6204E-01	1.4309E-01
5	2.8315E-01	1.4859E-01	8.2515E-02	7.6065E-02
6	8.8991E-02	7.5026E-02	5.6120E-02	4.5772E-02
7	8.9503E-02	5.9113E-02	3.8576E-02	3.5560E-02
8	6.9164E-02	3.0702E-02	2.7009E-02	2.3349E-02
9	3.5150E-02	1.6996E-02	1.7487E-02	1.3307E-02
10	1.7793E-02	1.3846E-02	8.0407E-03	7.0483E-03
11	1.4564E-02	8.7793E-03	7.2034E-03	6.0797E-03
12	5.4651E-03	8.6302E-03	1.8304E-02	4.5042E-03
13	8.4426E-03	2.7804E-03	3.6438E-03	3.4887E-03
14	2.3746E-03	3.0484E-03	2.0735E-03	2.1344E-03
15	4.2023E-03	1.4716E-03	8.7281E-04	8.3291E-04
16	3.9507E-03	1.9587E-03	1.3115E-03	1.2604E-03
17	1.1175E-03	1.3205E-03	4.5205E-04	4.2260E-04
18	1.0060E-03	4.1168E-04	4.378[illegible]E-04	4.1293E-04
19	6.8422E-04	5.4857E-04	4.9630E-04	4.7638E-04
20	9.9600E-05	4.9626E-04	2.9866E-04	2.7004E-04
TOTAL	2.7778E+00	2.3765E+00	1.7766E+00	1.6221E+00

BASE FOR RANDOM NUMBER GENERATOR IS 20960844731

FLUXES FOR DEVIATION GROUP 10.

COLLISIONS	DETECTOR 01	02	03	04
1	1.0077E+00	7.5566E-01	6.1336E-01	5.5816E-01
2	5.9094E-01	6.0792E-01	3.5142E-01	3.0757E-01
3	5.6225E-01	3.0677E-01	2.3511E-01	2.0411E-01
4	2.5055E-01	2.0457E-01	1.5941E-01	1.5390E-01
5	1.4843E-01	1.2040E-01	1.0463E-01	9.0539E-02
6	9.9415E-02	6.6206E-02	7.2154E-02	5.5849E-02
7	6.7173E-02	5.3990E-02	3.2594E-02	3.2345E-02
8	7.0063E-02	3.0823E-02	3.2611E-02	2.8644E-02
9	3.6609E-02	2.3760E-02	2.1650E-02	1.9126E-02
10	2.7800E-02	1.5245E-02	1.1969E-02	9.6000E-03
11	1.0546E-02	1.2827E-02	1.0207E-02	9.4853E-03
12	9.3749E-03	8.3145E-03	4.3603E-03	4.0288E-03
13	8.0213E-03	4.4101E-03	3.6348E-03	3.4925E-03
14	2.9576E-03	3.7043E-03	1.9144E-03	2.0120E-03
15	2.3294E-03	1.7097E-03	1.4187E-03	1.3940E-03
16	1.2603E-03	1.0806E-03	9.7078E-04	9.0139E-04
17	6.7369E-04	7.6762E-04	6.9912E-04	4.4650E-04
18	6.1348E-04	4.6234E-04	8.0977E-04	6.6236E-04
19	3.1644E-04	1.5973E-04	1.5615E-04	6.1207E-04
20	4.9201E-04	1.9449E-04	1.3966E-04	1.3238E-04
TOTAL	2.8976E+00	2.2499E+00	1.6595E+00	1.4830E+00

BASE FOR RANDOM NUMBER GENERATOR IS 4258861A169

SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR 01	02	03	04
1	1.1216E+00	8.4623E-01	7.2228E-01	6.4998E-01
2	6.3615E-01	4.6810E-01	4.1259E-01	3.4466E-01
3	4.2756E-01	3.0547E-01	2.6484E-01	2.3337E-01
4	2.4599E-01	2.0811E-01	1.5615E-01	1.4620E-01
5	1.5765E-01	1.3902E-01	1.0867E-01	9.4498E-02
6	1.0118E-01	8.6511E-02	6.9297E-02	6.0158E-02
7	6.4298E-02	5.4386E-02	4.0781E-02	3.7619E-02
8	5.1132E-02	3.4427E-02	2.6642E-02	2.4036E-02
9	3.2167E-02	1.6810E-02	1.5548E-02	1.3788E-02
10	1.8763E-02	1.3763E-02	9.8134E-03	9.0795E-03
11	1.0814E-02	9.7591E-03	7.2451E-03	7.6355E-03
12	7.1117E-03	6.6776E-03	6.1638E-03	4.5419E-03
13	5.6002E-03	3.9886E-03	3.5175E-03	3.1791E-03
14	4.4174E-03	2.6827E-03	2.0005E-03	1.9856E-03
15	2.4436E-03	1.3808E-03	1.2220E-03	1.0747E-03
16	1.5558E-03	1.0547E-03	8.0644E-04	7.3541E-04
17	8.1215E-04	6.4103E-04	5.6784E-04	5.1565E-04
18	5.7913E-04	3.5086E-04	3.5610E-04	3.1404E-04
19	4.2671E-04	3.2453E-04	2.4714E-04	2.2366E-04
20	2.0552E-04	2.0566E-04	1.7190E-04	1.4771E-04
TOTAL	2.8905E+00	2.2221E+00	1.8489E+00	1.6338E+00

BASE FOR RANDOM NUMBER GENERATOR IS 4258861?169

INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR 01	02	03	04
1	3.0598E-02	3.7190E-02	3.3667E-02	2.3707E-02
2	2.3162E-02	3.0311E-02	2.2580E-02	1.1732E-02
3	2.7077E-02	1.0289E-02	9.6142E-03	7.9753E-03
4	1.0451E-02	5.2459E-03	4.2104E-03	6.7907E-03
5	1.4277E-02	7.3409E-03	4.0472E-03	3.4756E-03
6	6.4889E-03	3.4674E-03	3.1070E-03	2.7047E-03
7	4.4694E-03	1.8170E-03	2.2169E-03	1.0751E-03
8	7.2763E-03	1.9003E-03	9.9024E-04	8.0293E-04
9	3.0722E-03	2.0096E-03	1.4845E-03	1.2363E-03
10	1.3657E-03	8.4405E-04	5.1809E-04	4.5151E-04
11	1.0767E-03	4.5559E-04	3.6645E-04	1.0146E-03
12	5.5466E-04	7.8147E-04	1.3466E-03	4.7523E-04
13	5.1874E-04	5.6985E-04	4.4542E-04	2.6577E-04
14	1.3258E-03	2.4999E-04	1.6050E-04	1.5950E-04
15	3.5671E-04	8.3968E-05	1.4093E-04	1.0448E-04
16	2.8125E-04	2.0903E-04	6.9943E-05	7.0238E-05
17	9.8172E-05	1.4260E-04	7.6945E-05	5.4768E-05
18	8.7994E-05	4.4732E-05	6.6301E-05	4.7043E-05
19	8.2476E-05	6.1369E-05	4.5209E-05	5.4382E-05
20	4.5626E-05	4.5983E-05	3.9613E-05	3.2966E-05
TOTAL	4.9123E-02	5.2855E-02	4.7164E-02	3.1619E-02

BASE FOR RANDOM NUMBER GENERATOR IS 42588619169

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RADIATION RESEARCH ASSOCIATES *LITE* PROBLEM       1600

HISTORY TERMINATION COUNTERS.

      617 HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED     20.
     1175 HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS.
      208 HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF.
        0 HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS.

    25661 COLLISIONS OCCURRED.

PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAMETERS.

REGION HISTORIES   REGION HISTORIES   REGION HISTORIES   REGION HISTORIES
        TERMINATED         TERMINATED         TERMINATED         TERMINATED
   1         1        2         0        3      1174
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RADIATION RESEARCH ASSOCIATES ELITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	0.0000E+00	1.1811E-01	2.7495E-02	6.5642E-03	1.5955E-03	2.3837E-04	3.4866E-05
0.8000	0.0000E+00	1.1655E-01	2.8665E-02	7.5017E-03	1.3716E-03	3.2374E-04	7.8351E-05
0.7000	0.0000E+00	9.8671E-02	2.7526E-02	5.0349E-03	1.6364E-03	2.3987E-04	9.1976E-05
0.6000	0.0000E+00	1.2365E-01	2.5756E-02	6.3411E-03	1.3578E-03	4.0802E-04	1.0326E-04
0.5000	0.0000E+00	1.2489E-01	2.7135E-02	6.2789E-03	1.6205E-03	4.5720E-04	1.5592E-04
0.4000	1.0371E-03	1.0294E-01	2.9734E-02	7.7555E-03	1.2499E-03	3.9810E-04	8.4970E-05
0.3000	1.3605E-03	1.0104E-01	2.4831E-02	6.7836E-03	1.0781E-03	3.5742E-04	1.0937E-04
0.2000	0.0000E+00	1.2207E-01	2.1799E-02	3.1676E-03	9.7747E-04	3.5225E-04	3.7146E-05
0.1000	0.0000E+00	6.0197E-02	2.0694E-02	4.5632E-03	9.7094E-04	5.1394E-04	1.8766E-05
0.0000	0.0000E+00	3.2727E-01	5.5124E-02	9.0736E-03	5.0460E-03	1.2204E-03	1.5163E-04
-0.1000	5.7163E-02	9.5776E-02	1.5023E-02	2.6965E-03	9.0450E-04	3.4990E-04	1.2976E-05
-0.2000	7.5565E-02	7.0838E-02	1.3948E-02	3.0020E-03	8.9122E-04	1.9577E-04	8.9245E-05
-0.3000	8.3357E-02	5.6280E-02	1.1005E-02	3.1217E-03	7.5126E-04	4.6772E-04	4.2606E-05
-0.4000	7.2539E-02	4.2817E-02	1.2110E-02	2.2287E-03	5.7836E-04	7.1271E-05	2.3552E-05
-0.5000	7.5920E-02	4.3666E-02	1.0090E-02	1.6725E-03	6.2702E-04	1.2108E-04	1.9652E-05
-0.6000	6.0509E-02	3.7506E-02	8.3661E-03	2.3191E-03	5.3517E-04	1.6013E-04	2.0357E-05
-0.7000	4.7625E-02	3.2167E-02	9.4785E-03	1.8718E-03	3.4996E-04	7.1634E-05	1.5188E-05
-0.8000	5.9622E-02	2.8429E-02	6.7285E-03	1.6689E-03	3.4013E-04	1.0427E-04	2.0428E-05
-0.9000	4.7800E-02	2.5422E-02	7.5475E-03	1.3502E-03	4.4734E-04	6.6428E-05	1.4088E-05
-1.0000	3.8209E-02	2.6176E-02	4.8920E-03	1.4160E-03	2.8894E-04	5.5640E-05	2.3549E-05
TOTAL	6.3071E-01	1.7545E+00	3.8695E-01	8.4212E-02	2.2618E-02	6.1732E-03	1.1479E-03

RADIATION RESEARCH ASSOCIATES "LITE" PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1

SOURCE HEIGHT H= 5.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.4663E-05	2.9073E-06	0.0000E+00	1.5405E-01
0.8000	1.2315E-05	1.6795E-06	0.0000E+00	1.5450E-01
0.7000	2.1961E-05	7.5790E-07	0.0000E+00	1.3412E-01
0.6000	1.6101E-05	4.4925E-07	0.0000E+00	1.5864E-01
0.5000	2.6386E-06	3.8401E-06	0.0000E+00	1.6055E-01
0.4000	1.3453E-05	9.8192E-08	0.0000E+00	1.4321E-01
0.3000	3.9143E-05	1.0923E-06	0.0000E+00	1.3564E-01
0.2000	4.4131E-06	0.0000E+00	0.0000E+00	1.4841E-01
0.1000	3.1260E-06	1.4872E-07	0.0000E+00	8.6961E-02
0.0000	5.3184E-06	0.0000E+00	0.0000E+00	3.9789E-01
-0.1000	2.9082E-09	1.0242E-07	0.0000E+00	1.8193E-01
-0.2000	6.7405E-06	5.4507E-08	0.0000E+00	1.6544E-01
-0.3000	9.1378E-06	0.0000E+00	0.0000E+00	1.5503E-01
-0.4000	5.4751E-06	3.6905E-09	0.0000E+00	1.3037E-01
-0.5000	8.1913E-06	0.0000E+00	0.0000E+00	1.3213E-01
-0.6000	6.2343E-07	5.6471E-07	0.0000E+00	1.0942E-01
-0.7000	4.6074E-06	0.0000E+00	0.0000E+00	9.1583E-02
-0.8000	8.0304E-07	2.1965E-07	0.0000E+00	9.6914E-02
-0.9000	2.1120E-06	3.4822E-08	0.0000E+00	8.2650E-02
-1.0000	1.0276E-06	0.0000E+00	0.0000E+00	7.1062E-02
TOTAL	1.7387E-04	1.1953E-05	0.0000E+00	2.8905E+00

RADIATION RESEARCH ASSOCIATES #LITE# PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02, DETECTOR COORDINATES HD= 1.000E+02 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	2.5489E-02	9.9308E-02	2.3679E-02	5.7730E-03	1.3259E-03	2.3701E-04	3.8490E-05
0.8000	3.4009E-02	9.9569E-02	2.3760E-02	6.0972E-03	1.1393E-03	2.7464E-04	6.5521E-05
0.7000	4.4796E-02	8.1264E-02	2.2703E-02	4.7031E-03	1.3619E-03	2.4490E-04	7.3484E-05
0.6000	3.7885E-02	9.9357E-02	2.0642E-02	5.1326E-03	1.1178E-03	3.5650E-04	6.7027E-05
0.5000	4.3321E-02	9.5231E-02	2.1548E-02	4.9843E-03	1.1296E-03	3.1724E-04	1.1658E-04
0.4000	5.3966E-02	7.7577E-02	2.0789E-02	5.6582E-03	1.0816E-03	2.7665E-04	7.2328E-05
0.3000	6.6336E-02	7.4174E-02	1.7099E-02	4.4201E-03	8.0338E-04	2.6885E-04	5.7432E-05
0.2000	7.6006E-02	7.3862E-02	1.5913E-02	2.6598E-03	7.6513E-04	1.6767E-04	4.3444E-05
0.1000	7.5037E-02	5.7401E-02	1.3375E-02	3.5779E-03	6.2564E-04	1.3775E-04	1.0986E-05
0.0000	1.2367E-01	3.6580E-02	8.5464E-03	2.0378E-03	1.7789E-04	1.1930E-04	2.4801E-05
-0.1000	1.1665E-01	4.2790E-02	1.3228E-02	1.7572E-03	8.3798E-04	1.3357E-04	9.1686E-06
-0.2000	7.1991E-02	3.0661E-02	6.1386E-03	2.2345E-03	6.1516E-04	1.2659E-05	3.1677E-05
-0.3000	4.2976E-02	1.3555E-02	5.4225E-03	7.0688E-04	2.4813E-04	2.9098E-05	2.0546E-06
-0.4000	3.7664E-02	6.7466E-03	4.7767E-03	5.7339E-04	1.9435E-04	1.5415E-05	1.3440E-06
-0.5000	3.5006E-02	1.0239E-02	2.0361E-03	5.4551E-04	1.4410E-04	3.1991E-05	6.3722E-06
-0.6000	2.5100E-02	9.3811E-03	2.4249E-03	5.1669E-04	9.7081E-05	2.4327E-05	2.5972E-06
-0.7000	2.0137E-02	7.6380E-03	1.9703E-03	4.3369E-04	8.9264E-05	1.0700E-05	3.4826E-07
-0.8000	2.0526E-02	8.6879E-03	1.9067E-03	5.0153E-04	4.7054E-05	1.2784E-05	4.7260E-06
-0.9000	2.0247E-02	6.0145E-03	1.8456E-03	3.0318E-04	7.1856E-05	1.9610E-05	4.0817E-06
-1.0000	1.4172E-02	7.1915E-03	1.8995E-03	1.7174E-04	6.3234E-05	3.2902E-06	1.6811E-06
TOTAL	9.6499E-01	9.3943E-01	2.2970E-01	5.2588E-02	1.1936E-02	2.6940E-03	6.3415E-04

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@+02 RD=, 0.0@+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.1916@-05	3.1572@-06	0.0000@+00	1.5566@-01
0.8000	1.0008@-05	1.1063@-06	0.0000@+00	1.4493@-01
0.7000	1.5744@-05	4.6448@-07	0.0000@+00	1.5516@-01
0.6000	1.2864@-05	2.5548@-07	0.0000@+00	1.4457@-01
0.5000	2.8939@-06	2.6087@-06	0.0000@+00	1.6665@-01
0.4000	1.7601@-05	5.6522@-07	0.0000@+00	1.5944@-01
0.3000	1.6834@-05	3.4857@-07	0.0000@+00	1.6318@-01
0.2000	5.4681@-06	8.5398@-07	0.0000@+00	1.6922@-01
0.1000	6.5032@-06	3.5057@-07	0.0000@+00	1.5017@-01
0.0000	6.0120@-06	0.0000@+00	0.0000@+00	1.7116@-01
-0.1000	5.6375@-07	0.0000@+00	0.0000@+00	1.7541@-01
-0.2000	2.9844@-06	2.9461@-07	0.0000@+00	1.1169@-01
-0.3000	9.1186@-07	0.0000@+00	0.0000@+00	6.2943@-02
-0.4000	1.8524@-07	1.0730@-08	0.0000@+00	5.1972@-02
-0.5000	0.0000@+00	0.0000@+00	0.0000@+00	4.8010@-02
-0.6000	3.4378@-08	0.0000@+00	0.0000@+00	3.7547@-02
-0.7000	1.7691@-06	0.0000@+00	0.0000@+00	3.0481@-02
-0.8000	2.4513@-07	0.0000@+00	0.0000@+00	3.1687@-02
-0.9000	5.0606@-07	0.0000@+00	0.0000@+00	2.8506@-02
-1.0000	9.6094@-07	0.0000@+00	0.0000@+00	2.3504@-02
TOTAL	1.1401@-04	1.0036@-05	0.0000@+00	2.2221@+00

RADIATION RESEARCH ASSOCIATES ‹LITE› PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1

SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 2.000E+02 RD=, 0.0E+00

ANGLE	NUMBER OF REFLECTIONS						
(COSINE)	0	1	2	3	4	5	6
0.9000	3.0156E-02	9.3991E-02	2.2211E-02	5.4265E-03	1.2138E-03	2.1635E-04	3.9976E-05
0.8000	4.3519E-02	9.4442E-02	2.2207E-02	5.4600E-03	1.0624E-03	2.4725E-04	6.5987E-05
0.7000	5.6188E-02	7.7287E-02	2.1084E-02	4.5009E-03	1.2572E-03	2.2723E-04	6.6647E-05
0.6000	4.9471E-02	9.1246E-02	1.6979E-02	4.7886E-03	1.0069E-03	3.3365E-04	5.8562E-05
0.5000	5.6084E-02	8.5310E-02	1.9245E-02	4.6665E-03	9.9845E-04	2.7245E-04	1.0311E-04
0.4000	6.4018E-02	6.7602E-02	1.8412E-02	5.0492E-03	9.4111E-04	2.3269E-04	6.1129E-05
0.3000	7.7269E-02	6.4987E-02	1.4581E-02	4.1106E-03	7.4081E-04	2.4924E-04	4.6771E-05
0.2000	9.9226E-02	5.6684E-02	1.3893E-02	2.6944E-03	8.2040E-04	1.1690E-04	5.0441E-05
0.1000	1.0752E-01	4.6467E-02	1.0922E-02	3.1565E-03	3.8404E-04	1.8033E-04	1.3440E-05
0.0000	1.1529E-01	4.6092E-02	8.3306E-03	1.2394E-03	3.5840E-04	1.4199E-04	4.5907E-06
-0.1000	4.9396E-02	3.3309E-02	5.1437E-03	3.9355E-04	4.7463E-05	1.55[illegible]5E-05	2.5871E-06
-0.2000	2.5266E-02	1.4288E-02	1.8522E-03	1.2143E-04	1.7073E-04	2.9493E-06	0.0000E+00
-0.3000	1.1692E-02	4.2511E-03	6.8961E-04	1.9132E-04	2.8195E-05	9.1915E-08	1.2091E-07
-0.4000	1.1161E-02	3.1468E-03	1.1300E-03	1.2551E-04	3.4219E-06	1.0280E-06	0.0000E+00
-0.5000	5.9926E-03	7.1007E-04	2.1758E-04	1.8480E-05	5.3954E-05	1.5151E-06	6.9766E-06
-0.6000	2.8784E-03	2.0515E-03	5.3456E-04	5.2066E-05	8.3845E-06	1.2004E-05	6.0927E-07
-0.7000	5.9965E-03	1.6548E-03	3.1249E-04	1.1629E-04	5.2154E-06	1.7139E-07	1.0621E-07
-0.8000	3.8844E-03	1.7964E-03	4.3389E-04	6.3535E-05	6.7539E-06	4.0848E-06	1.9688E-07
-0.9000	3.7302E-03	9.4376E-04	2.6867E-04	2.3181E-05	2.6831E-05	9.9307E-06	2.0223E-07
-1.0000	2.7787E-03	1.7624E-03	4.3732E-04	6.6204E-05	2.0797E-06	2.3803E-07	8.7870E-07
TOTAL	8.2152E-01	7.9202E-01	1.8088E-01	4.2462E-02	9.1314E-03	2.2656E-03	5.2233E-04

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.0000@+02. DETECTOR COORDINATES HD= 2.0000@+02 RD=, 0.0@+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.2144@-05	2.8343@-06	0.0000@+00	1.5327@-01
0.8000	9.2784@-06	9.8050@-07	0.0000@+00	1.6721@-01
0.7000	1.3831@-05	4.0290@-07	0.0000@+00	1.6062@-01
0.6000	1.0991@-05	6.5891@-07	0.0000@+00	1.6590@-01
0.5000	3.8477@-06	2.1697@-06	0.0000@+00	1.6669@-01
0.4000	1.8018@-05	4.5240@-07	0.0000@+00	1.5633@-01
0.3000	1.2846@-05	2.5010@-07	0.0000@+00	1.6200@-01
0.2000	4.9141@-06	6.0009@-07	0.0000@+00	1.7549@-01
0.1000	3.4156@-06	1.7588@-07	0.0000@+00	1.7064@-01
0.0000	1.2618@-06	0.0000@+00	0.0000@+00	1.7146@-01
-0.1000	1.3237@-08	0.0000@+00	0.0000@+00	8.8308@-02
-0.2000	0.0000@+00	5.3027@-07	0.0000@+00	4.1704@-02
-0.3000	0.0000@+00	0.0000@+00	0.0000@+00	1.6852@-02
-0.4000	2.5600@-07	0.0000@+00	0.0000@+00	1.5568@-02
-0.5000	0.0000@+00	0.0000@+00	0.0000@+00	7.0012@-03
-0.6000	4.1423@-08	0.0000@+00	0.0000@+00	5.5376@-03
-0.7000	7.6100@-07	0.0000@+00	0.0000@+00	8.0883@-03
-0.8000	1.1854@-07	0.0000@+00	0.0000@+00	5.1894@-03
-0.9000	3.6550@-09	0.0000@+00	0.0000@+00	5.0028@-03
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	5.0459@-03
TOTAL	9.1741@-05	9.0550@-06	0.0000@+00	1.8489@+00

RADIATION RESEARCH ASSOCIATES "PLITE" PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1

SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HO= 2.990E+02 RO=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	3.0779E-02	9.2519E-02	2.1692E-02	5.3560E-03	1.1923E-03	2.1044E-04	3.9726E-05
0.8000	4.6212E-02	9.1895E-02	2.1639E-02	5.5529E-03	1.0302E-03	2.4114E-04	6.3940E-05
0.7000	6.2230E-02	7.6424E-02	2.0572E-02	4.3954E-03	1.2173E-03	2.2289E-04	6.4459E-05
0.6000	5.2976E-02	8.8387E-02	1.8509E-02	4.6486E-03	9.7464E-04	3.2125E-04	5.6344E-05
0.5000	6.0647E-02	8.3291E-02	1.8814E-02	4.4604E-03	9.5987E-04	2.6409E-04	9.8254E-05
0.4000	6.8516E-02	6.6400E-02	1.7781E-02	5.0264E-03	8.9379E-04	2.2104E-04	6.0908E-05
0.3000	8.4183E-02	6.2643E-02	1.4351E-02	4.0453E-03	7.0772E-04	2.3376E-04	5.0814E-05
0.2000	9.3668E-02	5.5438E-02	1.3182E-02	2.6405E-03	7.3483E-04	1.5601E-04	4.6231E-05
0.1000	1.0913E-01	4.4234E-02	1.1611E-02	3.0360E-03	6.7733E-04	1.8095E-04	1.1400E-05
0.0000	1.0593E-01	3.3454E-02	1.2428E-02	1.9852E-03	2.5106E-04	9.6766E-05	5.5874E-06
-0.1000	0.0000E+00	3.4579E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.2000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.3000	1.1651E-04	3.9256E-04	6.6737E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.4000	1.8355E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	5.8662E-07	0.0000E+00
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	4.7132E-08	0.0000E+00	0.0000E+00	0.0000E+00
-0.9000	5.9922E-04	3.1691E-07	0.0000E+00	0.0000E+00	0.0000E+00	3.4884E-08	0.0000E+00
-1.0000	0.0000E+00	7.4686E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	7.1518E-01	6.9550E-01	1.7059E-01	4.1147E-02	8.6390E-03	2.1490E-03	4.9766E-04

RADIATION RESEARCH ASSOCIATES ALITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1

SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 2.990E+02 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.1807E-05	2.7559E-06	0.0000E+00	1.5180E-01
0.8000	8.9922E-06	9.5006E-07	0.0000E+00	1.6664E-01
0.7000	1.4761E-05	3.8827E-07	0.0000E+00	1.6514E-01
0.6000	1.0550E-05	6.6293E-07	0.0000E+00	1.6588E-01
0.5000	4.2182E-06	2.0681E-06	0.0000E+00	1.6854E-01
0.4000	1.7012E-05	4.2309E-07	0.0000E+00	1.5892E-01
0.3000	1.1935E-05	2.2941E-07	0.0000E+00	1.6623E-01
0.2000	4.4627E-06	5.4746E-07	0.0000E+00	1.6587E-01
0.1000	2.8025E-06	1.4700E-07	0.0000E+00	1.6889E-01
0.0000	8.5047E-07	0.0000E+00	0.0000E+00	1.5415E-01
-0.1000	0.0000E+00	0.0000E+00	0.0000E+00	3.4579E-04
-0.2000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	5.1775E-04
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	1.8414E-04
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	4.7132E-08
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	5.9958E-04
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	7.4688E-05
TOTAL	8.7391E-05	8.1722E-06	0.0000E+00	1.6338E+00

RADIATION RESEARCH ASSOCIATES 'LITE' PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS REGION OF SCATTER

REGION	DETECTOR 01	02	03	04
1	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	2.8905E+00	2.2221E+00	1.8489E+00	1.6338E+00
3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	2.8905E+00	2.2221E+00	1.8489E+00	1.6338E+00

```
LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR.

DETECTOR  1, REFLECTED FLUX = 1.661@+00

DETECTOR  2, REFLECTED FLUX = 6.262@-01

DETECTOR  3, REFLECTED FLUX = 5.228@-01

DETECTOR  4, REFLECTED FLUX = 4.995@-01
```

RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM 1600

DIRECT BEAM LIGHT INTENSITIES

DETECTOR	DIRECT INTENSITY
1	6.1648@-01
2	1.9757@+00
3	8.7603@+00
4	8.9982@+04

V. PROGRAM DESCRIPTION

Each of the LITE codes are divided into several subroutines which are designated as procedures in the ALGOL language. The ALGOL programs are compiled each time they are loaded on the computer and no object decks are produced. The ALGOL language requires that any procedure called by another procedure must be loaded before the calling procedure. For this reason the procedures used in the LITE-I and LITE-II codes are listed in the following sections in reverse order with respect to the order they are actually used on the machine. The following is a listing of the procedures used in the LITE codes and a one sentence description of each procedure.

Procedures Used in the LITE-I and LITE-II Codes

Procedure	Purpose
MAIN	Reads in the input data
SRMAIN+	Controls the flow of the problem on the machine
SRCHECK	Checks input data
SRDBEAM	Calculates direct intensities
SRSCTANG	Calculates scattering and direction after collision
SRREFLCT	Calculates new direction after a reflection
SRINITIAL	Initializes parameters used in accumulating the scattered intensities
SRPATHL	Generates random path lengths between collisions
SRANGLE	Selects source angles from input distribution
SRAVRAGE	Calculates and prints average scattered intensities as a function of collision number and receiver position over each deviation group

Procedure	Purpose
SRANSWER	Calculates and prints the average scattered intensities as a function of receiver position, receiver angle, and order of reflection over all histories
SRDETECT+	Calculates scattered intensities at receiver points from each collision point
SRDIFSCA*	Calculates the probability of a photon scattering into a direction so as to be headed toward the receiver from each collision point and reflection surface
SRDSTBD	Calculates the distance along particles direction to boundary of region containing collision
SRSEARCH	Locates region containing the particles position coordinates for each collision
SRRANDA	Generates random numbers used in the sampling processes

* This procedure is used only in LITE-I

\+ These procedures are different for each code. All other procedures are the same in both codes

The ALGOL listing of LITE-I is given in Section 5.1 and the ALGOL listing of LITE-II is given in Section 5.2. Card numbers 1000 - 18000 of the ALGOL language version of both codes contain control cards for operation of the codes on the Burroughs B-5000 computer. Cards 19000 - 116000 of both codes contain lists of the subscripted real and integral variables that are common to all of the procedures included in the LITE codes. Cards 117000 through 129000 contain function subprograms furnished by the B-5000 monitor system

5.1 ALGOL LISTING FOR THE LITE-I CODE

```
BEGIN FILE OUT PRINT 1          (2,15]JINTEGER XRAZQ,VVUWU,FZOVC,LKNJA,OK
VQK,QRANI,LJLOU,GCPCVJINTEGER ARRAY ZIKLA,QNCCL[0:12]JFORMAT HHFRK("TIME
 ON  ",I4,X96,I2,X1,A3," 1965"),CHQUB("TIME OFF ",I4,X30,"PRCC. TIME =",
I10," SECS",X20,"I/O TIME =",I10," SECS")JDEFINE BLZAT=LJLOU+FZOVC DIV 2
16000JGCPOV+FZOVC MOD 216000/3600#JFILL ZIKLA[*]WITH 0,31,59,90,120,151,
181,212,243,273,304,334,366JFILL QNCCL[*]WITH 0,"JAN","FEB","MAR","APR",
"MAY","JUN","JUL","AUG","SEP","OCT","NOV","DEC"JFZOVC+TIME(1]JLKNJA+TIME
(2)JOKVQK+TIME[3))VVUWU+TIME(0]JQRANI+100×VVUWU.[30:6]+10×VVUWU.[36:6]+V
VUWU.[42:6)JXRAZQ+1JWHILE QRANI≥ZIKLA[XRAZQ]DO XRAZQ+XRAZQ+1JQRANI+QRANI
-ZIKLA[XRAZQ-1))BLZATJWRITE[PRINT[PAGE],HHFRK,100×LJLOU+GCPOV,QRANI,QNCC
L[XRAZQ]]J
BEGIN
FILE    CARO  (2,10]J          FILE IN DAT (2,10)J
FILE OUT PUNCH 0[2,10)J
FILE XXXXXX 2(2,15]J
SWITCH FILE FILESW+XXXXXXJ
LABEL  FINISJ
BOOLEAN ARRAY  SENSL[0:4], SENSW[0:6]]
REAL ARRAY
     ABC[0:20],
     SVTFLUX[0:25,      0:10],
      SVFLUX[0:25,0:25,0:10],
      SVDIFCOS[0:50,0:10 ],
      SVPDCOS [0:50,0:10 ),
      SVPHANG [0:50,0:10 ],
      SVAFLUX [0:25,0:10 ],
      SVPDR   [0:37,0:5  ],
      SVRFANG [0:37,0:5  ),
      SVSAFLUX[0:25,0: 10],
      SVSQFLUX[0:25,0:10 ],
      SVFLUD  [0:50,0:10 ],
      SVRFLCOS[0:50,0:10 ),
```

```
        SVA      [0:10 ],
        SVCANG   [0:37 ],
        SVEMP    [0:50 ],
        SVFLUR   [0:10 ],
        SVCIPA   [0:25 ],
        SVFFLUX  [0:10 ],
        SVALBEDO[0:5  ],
        SVCOEE   [0:50 ],
        SVDVFLUX[0:10 ],
        SVHD     [0:10 ],
        SVPAG    [0:37 ],
        SVRAYLEE[0:10 ],
        SVSANG   [0:500],
        SVSTFLUX[0:10 ],
        SVWEIGHT[0:500],
        SVDBFLUX[0:10 ],
        SVPFANG [0:50 ],
        SVWAG    [0:37 ],
        SVPRFLT [0:50 ],
        SVRD     [0:10 ],
        SVRFLUX [0:10 ],
        SVSIGNDT[0:10 ],
        SVSUMRHO[0:50 ],
        SVCRATIO [0:10] ,
        SVHV[0:100],
        SVTAU[0:100],
    SVSCATR[0:100],
        SVRAYR[0:100],
        SVTAUHD[0:10],
        SVOBSS  [0:10 ];
    INTEGER ARRAY
        SVIB    [0:4 ,0:50 ],
```

```
      SVNPR    [0:4 ,0:50 ],
      SVJREFLT[0:5   ],
      SVNDFCOS[0:10 ],
      SVNREG   [0:50 ],
      SVINCOL [0:25 ],
      SVNAT    [0:50 ],
      SVNB     [0:50 ],
      SVNPHANG[0:10 ],
      SVNRFANG[0:5   ],
      SVNRICO [0:50 ],
      SVITYPE [0:50 ],
      SVNATERL[0:10 ],
      SVNBOUND[0:50 ],
      SVNPHID [0:10 ],
    NRFR[0:5],
      SVNRFCOS[0:5   ];
REAL
    JALPHA ,    JBETA   ,    JBRAC   ,    JCDEPHI,    JCOTH   ,
    JCOTH1 ,    JCOTH2 ,     JCPA    ,    JCPHI   ,   JCPHI1 ,
    JCPHI2 ,    JCPHID ,     JCPRRD ,     JCPT    ,   JCSA    ,
    JCSANG ,    JCTEP   ,    JDELTA ,     JDEOM   ,   JDIFH   ,
    JDIST   ,   JDLONG ,     JDOM    ,    JDT     ,   JEAH    ,
    JELIM   ,   JFI     ,    JFNPA   ,    JFNRA   ,   JH      ,
    JH1     ,   JH2     ,    JHS     ,    JHT     ,
                                          JPAG    ,   JPJM1   ,
    JPL     ,   JPSCAT ,     JR      ,    JR1     ,   JR2     ,
    JREFL   ,   JRESULT,     JRHO    ,    JRHOT   ,   JRN     ,
    JRRD2   ,   JRRDSQ ,     JRT     ,    JSDEPHI,    JSITH   ,
    JSITH1 ,    JSITH2 ,     JSMVAL ,     JSOD    ,   JSPHI   ,
    JSPHI1 ,    JSPHI2 ,     JSPHID ,     JSPT    ,   JSSANG ,
    JSTEP   ,   JSUMDST,     JSUMSQ ,     JT      ,   JTEMP   ,
    JTS     ,   JUPLMIT,     JWAIT   ,    JWCO    ,   JWHOA   ,
```

```
  JRATLEE, JTAUH, JTAUH1, JTAUH2,
    JX     ,     JXR    ,     JERRORS,     JDMIN  ;
INTEGER
      JJHB, JJHT, JNREFL, JMAXR, JNMAXR, JIBAS1, JIBAS2,
      JIBAS3, JIBAS4, JIBAS5, JNOH,
                                                     JIBASE ,
    JICB    ,    JIDUMP ,    JJ1     ,    JKA1    ,    JKA2    ,
    JKA3    ,    JKA4   ,    JLA     ,    JLB     ,    JLIBRAY,
    JLOC    ,    JLP    ,    JLSR    ,    JLST    ,    JMAT1   ,
    JMAT2   ,    JMAXCOL,    JMPREG  ,    JNAG    ,    JNAGP   ,
    JNAOP   ,    JNAOPP ,    JNBMAX  ,    JNBMAXP,     JNCB    ,
    JNCM    ,    JNCMAX ,    JNCOL   ,    JNCR    ,    JNCR1   ,
    JNCR2   ,    JNCYC  ,    JNOEVG  ,    JNDMAX  ,    JNDMAXP,
    JNFORM  ,    JNGROUP,    JNHIST  ,    JNHMAX  ,    JNLB    ,
    JNLM    ,    JNMAT  ,    JNMATP  ,    JNOGO   ,    JNPA    ,
    JNPAP   ,    JNPART ,    JNPHASE,     JNPCOL  ,    JNPCOLP,
    JNPROB  ,    JNRA   ,    JNRFLB  ,    JNRFLBP,     JNRING  ,
    JNRMAX  ,    JNRMAXP,    JNRSTOP,     JNSOREG,     JNSY    ,
    JNSP    ,    JNUB   ,    JNWAIT  ,    K,  JNRB ;
REAL  Q,XPR;
FORMAT F(//////"STOP / PAUSE  NO. ",I5);
REAL PROCEDURE INT(ARG1);          VALUE ARG1;        REAL ARG1;
   INT←SIGN(ARG1)×ENTIER(ABS(ARG1));
REAL PROCEDURE TANH(ARG1);         VALUE ARG1;        REAL ARG1;
   TANH←((Q←EXP(ARG1×2))-1)/(Q+1);
REAL PROCEDURE MAX(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;
   MAX←IF ARG1≥ARG2 THEN ARG1 ELSE ARG2;
REAL PROCEDURE MIN(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;
   MIN←IF ARG1≤ARG2 THEN ARG1 ELSE ARG2;
REAL PROCEDURE DIM(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;
   DIM←MAX(ARG1-ARG2,0);
PROCEDURE ERROR(ARG1);             VALUE ARG1;        REAL ARG1;
```

```
BEGIN WRITE(PRINT,F,ARG1); GO TO FINIS END;
PROCEDURE SRRANDA(JIBASE,JRN);
INTEGER JIBASE;
REAL JRN;
BEGIN INTEGER A, B;
      A.[12:18] ← JIBASE.[30:18];
      B.[12:35] ← JIBASE.[13:35];
      JIBASE.[12:36] ← A+B+JIBASE;
      A ← +0;
      A.[21:27] ← JIBASE.[12:27];
      JRN ← A;
      JRN ← JRN/134217728.0;
END SRRANDA;
PROCEDURE SRSEARCH;
BEGIN
INTEGER   JI,JJ,JK;
FORMAT FL23(/" BOUNDARY",I3," HAS BEEN INCORRECTLY IDENTIFIED."),
FL37(/" POINT LIES ON BOUNDARY",I3),
FL85(/" SEARCH CYCLE THROUGH REGIONS IS NOT HANDELED PROPERLY."),
FL95(/" CANNOT FIND REGION FOR POINT WITH COORDINATES R = ",E10.3,
   ", H = ",E10.3));
LIST LIST1(JNCB);
LIST LIST2(JH,JR);
LABEL L5,L10,L20,L25,L30,L35,L38,L40,L50,L60,L80,L90,L97,L100,L36,L37;
L5: JNSY←0;
JNLB←JMPREG;
JNUB←JNRMAX;
L10: JK←JNLB;
DO BEGIN
  JJ←SVNB[JK];
  JI←1;
  DO BEGIN
```

```
    JNCB←ABS(SVIB[JI,JK]);
    IF (XPR←(SVITYPE[JNCB]-1))>0 THEN GO TO L30;
    IF XPR=0 THEN GO TO L25;
    L20: WRITE(PRINT,FL23,LIST1);
    JWHOA←JWHOA+1;
    GO TO L50;
    L25: JXR←SVCOEE[JNCB]-JH;
    GO TO L35;
    L30: JXR←SVCOEE[JNCB]-JR;
    L35: IF (XPR←(JXR))>0 THEN GO TO L40;
    IF XPR<0 THEN GO TO L38;
    WRITE(PRINT,FL37,LIST1);
    IF JCOTH > 0 THEN GO TO L36 ;
JH ← JH - JDELTA ;
GO TO L37 ;
L36:
JH ← JH + JDELTA ;
L37:
    JR←JR+JDELTA×JSITH×JCPHI;
    GO TO L5;
    L38: IF (XPR←(SVIB[JI,JK]))>0 THEN GO TO L60;
    IF XPR=0 THEN GO TO L20 ELSE GO TO L50;
    L40: IF (XPR←(SVIB[JI,JK]))=0 THEN GO TO L20;
    IF XPR<0 THEN GO TO L60;
    L50: END UNTIL (JI←(JI+1))>JJ;
  JNCR←JK;
  GO TO L100;
  L60: END UNTIL (JK←(JK+1))>JNUB;
IF (XPR←(JNSY))>0 THEN GO TO L90;
IF XPR<0 THEN GO TO L80;
JNSY←1;
JNLB←1;
```

```
JNUB←JMPREG;
GO TO L10;
L80: WRITE(PRINT,FL85);
JWHOA←JWHOA+1;
GO TO L97;
L90: WRITE(PRINT,FL95,LIST2);
JWHOA←JWHOA+1;
L97: JNCR←0;
L100:  END;
PROCEDURE SRDSTBD;
BEGIN
INTEGER      JJ,JK;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRSEARCH;
FORMAT FL15(" BOUNDARY",I3," HAS BEEN IDENTIFIED INCORRECTLY."),
FL55(/" LOC =",I4,"  ICB =",I4,"  X =",E10.3,"  BRAC =",E10.3,
   "  DIST =",E10.3/" H =",E10.3,"  R =",E10.3,"  COEE(ICB) =",E10.3,
   "  ITYPE(ICB) =",I4),
FL75(/" COLLISION POINT IS WITHIN A DISTANCE OF 1.1 DELTA FROM BOUNDAR",
"Y",I4,".  IT WAS MOVED OFF THE BOUNDARY.");
LIST LIST1(JICB);
LIST LIST2(JLOC,JICB,JX,JBRAC,JDIST,JH,JR,SVCOEE[JICB],SVITYPE[
 JICB]);
LIST LIST3(JNCB);
LABEL L5,L20,L30,L36,L38,L39,L56,L60,L80;
JNCB←0;
JJ1←1;
JLOC←105;
L5: JDIST←JDLONG;
JK←SVNB[JNCR];
JJ←1;
DO BEGIN
```

```
    JICB←ABS(SVIB[JJ,JNCR]);
    IF (XPR←(SVITYPE[JICB]-1))>0 THEN GO TO L30;
    IF XPR=0 THEN GO TO L20;
    WRITE(PRINT,FL15,LIST1);
    JWHOA←JWHOA+1;
    GO TO L80;
    L20: IF (ABS(JCOTH)≤JSMVAL) THEN GO TO L60;
    JX←(SVCOEE[JICB]-JH)/JCOTH;
    GO TO L39;
    L30: IF (ABS(JSITH)≤JSMVAL) THEN GO TO L60;
    JBRAC←(SVCOEE[JICB]*2-(JR×JSPHI)*2);
    IF JBRAC≤0 THEN GO TO L60;
    IF (XPR←(SVCOEE[JICB]-JR))>0 THEN GO TO L38;
    IF XPR<0 THEN GO TO L36;
    JMPREG←JNCR;
    SRSEARCH;
    IF (JERRORS≥JWHOA) THEN GO TO L5 ELSE GO TO L80;
    L36: JX←(-JR×JCPHI-SQRT(JBRAC))/JSITH;
    GO TO L39;
    L38: JX←(-JR×JCPHI+SQRT(JBRAC))/JSITH;
    L39: IF JIDUMP≤0 THEN GO TO L56;
    WRITE(PRINT,FL55,LIST2);
    L56: IF JX≤0 THEN GO TO L60;
    IF (JDIST≤JX) THEN GO TO L60;
    JDIST←JX+JDELTA;
    JNCB←JICB;
    JJ1←JJ;
    L60: END UNTIL (JJ←(JJ+1))>JK;
IF (JDIST≥1.1×JDELTA) THEN GO TO L80;
WRITE(PRINT,FL75,LIST3);
JH←JH+JDELTA×JCOTH;
JR←JR+JDELTA×JSITH×JCPHI;
```

```
JMPREG←SVMPR[JJ1,JNCR];
SRSEARCH;
IF JNCR>0 THEN GO TO L5;
L80:  END;
PROCEDURE SRDIFSCA;
BEGIN
INTEGER        JI,JJAIL;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRRANDA;
FORMAT FL55(/
   " THE COSINE VALUES FOR WHICH THE MIE SCATTERING PHASE FUNCTION ",
   "ARE INPUT ARE INCORRECT FOR MATERIAL",I3,".");
LIST LIST1(JNCM);
LABEL L110,L150,L170,L5,L20,L52,L60,L80;
SWITCH SWGO1←L110,L150,L110,L150;
IF JREFL≤0 THEN GO TO L5;
JJAIL←SVJREFLT[JNRB];
GO TO SWGO1[JJAIL];
L110: JPSCAT←1/6.28318;
GO TO L80;
L150: JNCYC←SVNRFANG[JNRB];
JI←1;
DO BEGIN
  IF (JCSA≥SVRFANG[JI,JNRB]) THEN GO TO L170;
  END UNTIL (JI←(JI+1))>JNCYC;
L170: JPSCAT←SVPOR[JI-1,JNRB]+(SVPOR[JI,JNRB]-SVPOR[JI-1,JNRB])×(JCSA-
 SVRFANG[JI-1,JNRB])/(SVRFANG[JI,JNRB]-SVRFANG[JI-1,JNRB]);
GO TO L80;
L5: SRRANDA(JIBASE,JRN);
IF (JRN>JRATLEE) THEN GO TO L20;
JPSCAT←(1+JCSA×JCSA)×.059683;
GO TO L80;
```

```
L20: JNCYC←SVNDFCOS[JNCM];
JI←1;
DO BEGIN
  IF (JCSA≥SVDIFCOS[JI,JNCM]) THEN GO TO L60;
  END UNTIL (JI←(JI+1))>JNCYC;
L52: WRITE(PRINT,FL55,LIST1);
JWHOA←JWHOA+1;
GO TO L80;
L60: IF (JI≤1) THEN GO TO L52;
JPSCAT←SVPDCOS[JI-1,JNCM]+(SVPDCOS[JI,JNCM]-SVPDCOS[JI-1,JNCM])×(JCSA-
 SVDIFCOS[JI-1,JNCM])/(SVDIFCOS[JI,JNCM]-SVDIFCOS[JI-1,JNCM]);
L80:  END;
PROCEDURE SRDETECT;
BEGIN
REAL    JCOD,  JSID;  INTEGER  JJ,JK,JL,JM, JLC;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
     SRRANDA, SRDSTBD, SRSEARCH, SRDIFSCA;
FORMAT FL22(/" LOC =",I4," ALPHA =",E10.3," BETA =",E10.3," DIFH =",
   E10.3/" RRD2 =",E10.3," RRDSQ =",E10.3," SUMSQ =",E10.3," SOD =",
   E10.3/" NRING =",I4," J =",I4," K =",I4," CPT =",E10.3," SPT =",
   E10.3/" DOM =",E10.3," CPHID =",E10.3," SPHID =",E10.3," CPRRD =",
E10.3/" T =",E10.3," COTH =",E10.3," TEMP =",E10.3," SITH =",E10.3/
   " CPHI =",E10.3," SPHI =",E10.3," H =",E10.3," R =",E10.3/
   " RHOT =",E10.3," SUMDST =",E10.3," HT =",E10.3," DT =",F10.3/
   " RN =",E10.3),
FL27(/" LOC =",I4," LSR =",I4," NCR =",I4," MAT1 =",I4," MAT2 =",I4,
"  H =",E10.3/" TS =",E10.3," RT =",E10.3," CPHI =",E10.3," R =",
   E10.3/" HT =",E10.3," DT =",E10.3," RHOT =",E10.3),
FL257(/" LOC =",I4," J =",I4," LA =",I4," LP =",I4," CSA =",E10.3,
   "  PSCAT =",E10.3/" WAIT =",E10.3," RHOT =",E10.3," NRING =",I4,
   "  CPA =",E10.3/" RESULT =",F10.3," FLUX(J,LP,LA) =",E10.3,
   "  FLUD(J,NCR1) =",E10.3/" NCR1 =",I4," RFLUX(J) =",E10.3,
```

```
   "  REFL =",E10.3));
LIST LIST1(JLOC,JALPHA,JBETA,JDIFH,JRRD2,JRRDSQ,JSUMSQ,JSOD,JNRING,JJ,
 JK,JCPT,JSPT,JDOM,JCPHID,JSPHID,JCPRRD,JT,JCOTH,JTEMP,JSITH,JCPHI,
 JSPHI,JH,JR,JRHOT,JSUMDST,JHT,JDT,JRN);
LIST LIST2(JLOC,JLSR,JNCR,JMAT1,JMAT2,JH,JTS,JRT,JCPHI,JR,JHT,JDT,JRHOT)
 ;
LIST LIST3(JLOC,JJ,JLA,JLP,JCSA,JPSCAT,JWAIT,JRHOT,JNRING,JCPA,JRESULT,
 SVFLUX[JLA,JLP,JJ],SVFLUD[JNCR1,JJ],JNCR1,SVRFLUX[JJ],JREFL);
BEGIN
  LABEL L10, L25, L100, L210, L230,
 L250,L255,L260,L280,L300;
JALPHA←JSITH2×JCPHI2;
JBETA←JSITH2×JSPHI2;
JJ←1;
DO BEGIN
  JDIFH←SVHD[JJ]-JH2;
  JRRD2←JR2×SVRD[JJ]×2;
  JRRDSQ←SVRD[JJ]×SVRD[JJ]+JR2×JR2;
  JSUMSQ←JRRDSQ+JDIFH*2;
  JSOD←SQRT(SVRD[JJ]*2+(SVHD[JJ]-JHS)*2);
  JCOD←(SVHD[JJ]-JHS)/JSOD;
  JSID←SVRD[JJ]/JSOD;
  JNRING←SVNPHID[JJ];
  JK←1;
  DO BEGIN
    L10: SRRANDA(JIBAS1,JRN);
    JCPT←2×JRN-1;
    SRRANDA(JIBAS2,JRN);
    JSPT←2×JRN-1;
    JDOM←JCPT*2+JSPT*2;
    IF (JDOM>1) THEN GO TO L10;
    JDOM←SQRT(JDOM);
```

```
JCPHID←JCPT/JDOM;
JSPHID←JSPT/JDOM;
JCPRRD←JCPHID×JRRD2;
JT←SQRT(JSUMSQ-JCPRRD);
IF (JT<JDMIN) THEN GO TO L260;
JCOTH←JDIFH/JT;
JTEMP←SQRT(JRRDSQ-JCPRRD);
JSITH←JTEMP/JT;
JLOC←90;
IF JIDUMP≤0 THEN GO TO L25;
WRITE(PRINT,FL22,LIST1);
  L25: IF(ABS(JCOTH)>JSMVAL) THEN GO TO L100;
  JRHOT←JT×(SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);
  GO TO L210;
  L100: JRHOT ← (SVTAUHD[JJ]-JTAUH2)/JCOTH;
L210: JCSA←(JALPHA×(SVRD[JJ]×JCPHID-JR2)+JBETA×(SVRD[JJ]×JSPHID)+
 JCOTH2×JDIFH)/JT;
SRDIFSCA;
IF (JERRORS<JWHOA) THEN GO TO L300;
JRESULT←(JWAIT×JPSCAT×EXP(-JRHOT))/((JNRING)×JT*2);
JCPA← (JSID×(SVRD[JJ] -JR2×JCPHID)/JT)+(JCOTH×JCOD);
JL←1;
DO BEGIN
  IF (SVCIPA[JL]≤JCPA) THEN GO TO L230;
  END UNTIL (JL←(JL+1))>JNPA;
L230: JLA←JL;
  JLP ← JNREFL;
SVFLUX[JLA,JLP,JJ]←SVFLUX[JLA,JLP,JJ]+JRESULT;
SVFLUD[JNCR2,JJ]←SVFLUD[JNCR2,JJ]+JRESULT;
IF JREFL≤0 THEN GO TO L255;
SVRFLUX[JJ]←SVRFLUX[JJ]+JRESULT;
L255: JLOC←110;
```

```
    JM←1;
    DO BEGIN
      IF (SVINCOL[JM]≥JNCOL) THEN GO TO L250;
      END UNTIL (JM←(JM+1))>JNPCOL;
    L250: JLC←JM;
      SVAFLUX[JLC,JJ] ← SVAFLUX[JLC,JJ]+JRESULT;
    IF JIDUMP≤0 THEN GO TO L260;
    WRITE(PRINT,FL257,LIST3);
    L260: END UNTIL (JK←(JK+1))>JNRING;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
GO TO L300;
L280: JWHOA←JWHOA+1;
L300:  END END;
PROCEDURE SRANSWER;
BEGIN
   REAL ARRAY SVIIREF[0:25];
REAL  JFGROUP,JFNHMAX;     INTEGER  JI,JJ,JK,JN,JM ;
INTEGER  OX1;
FORMAT FL110(" RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM",I10),
FL120(/" HISTORY TERMINATION COUNTERS."),
FL130(/" ",I9,
   " HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED",I6,
   "."/I10,
   " HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS."/
   I10," HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF." /I10,
 " HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS. "),
    FL135 (/" ",I9,
       " COLLISIONS OCCURRED."),
FL150(/
   " PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAM",
   "ETERS."),
FL160(/
```

```
  " REGION HISTORIES   REGION HISTORIES   REGION HISTORIES   REGIO",
  "N HISTORIES"/
  "        TERMINATED        TERMINATED        TERMINATED       ",
  "  TERMINATED"),
FL170(" ",I4,I9,I10,I9,I10,I9,I10,I9),
FL190(/
  "   SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF ",
  "REFLECTIONS FROM SURFACE 1"),
FL200("        SOURCE HEIGHT H=",E10.3,".   DETECTOR COORDINATES  HD=",
  E10.3,"  RD=,",E10.1,01),
FL210("  ANGLE",X27,"NUMBER OF REFLECTIONS"),
FL250(" (COSINE)",I8,6(X9,I2)),
FL262(" (COSINE)    TOTAL"),
FL264(" ",X23,"TOTAL"),
FL266(" ",X34,"TOTAL"),
FL268(" ",X45,"TOTAL"),
FL270(" ",X56,"TOTAL"),
FL272(" ",X67,"TOTAL"),
FL274(" ",X78,"TOTAL"),
FL280(" ",R7.4,X1,7E11.4),
FL300(/"  TOTAL  ",7E11.4),
FL450(/
  "                 SCATTERED LIGHT INTENSITY VERSUS REGION OF ",
  "SCATTER"),
FL460(/"  REGION   ",X30,"DETECTOR"),
FL485(/"              01"),
FL495(/"              01          02"),
FL505(/"              01          02          03"),
FL515(/"              01          02          03          04"),
FL525(/"              01          02          03          04          05"),
FL535(/
  "           01          02          03          04          05  ",
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  "       06"),
FL545(/
  "              01            02           03           04           05  ",
  "       06          07"),
FL560("    ",I2,X3,7E11.4),
FL580(/"  TOTAL  ",7E11.4),
FL605(/"                 08"),
FL615(/"                 08           09"),
FL625(/"                 08           09           10"),
FL680(" LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR."),
FL690(/" DETECTOR",I3,", REFLECTED FLUX =",E10.3);
LIST LIST1(JNPROB);
    LIST LIST1A (JNOGO);
LIST LIST2(JMAXCOL,JNCMAX,JNRSTOP,JNWAIT,JNMAXR);
LIST LIST3(FOR DX1+1 STEP 1 UNTIL JNRMAX DO [DX1,SVNRICO[DX1]]);
LIST LIST4(JHS,SVHD[JJ],SVRD[JJ]);
LIST LIST5(FOR DX1+JKA1 STEP 1 UNTIL JKA2 DO SVIIREF[DX1]);
LIST LIST6(SVCIPA[JN],FOR DX1+JKA1 STEP 1 UNTIL JKA2 DO  SVFLUX[
 JN,DX1,JJ]);
LIST LIST7(FOR DX1+JKA1 STEP 1 UNTIL JKA2 DO  SVTFLUX[DX1,JJ]);
LIST LIST9(SVNREG[JI],FOR DX1+1 STEP 1 UNTIL JNFORM DO SVFLUD[JI,
 DX1]);
LIST LIST10(FOR DX1+1 STEP 1 UNTIL JNFORM DO SVFLUR[DX1]);
LIST LIST11(SVNREG[JI],FOR DX1+8 STEP 1 UNTIL JNFORM DO SVFLUD[
 JI,DX1]);
LIST LIST12(FOR DX1+8 STEP 1 UNTIL JNFORM DO SVFLUR[DX1]);
LIST LIST13(JI,SVRFLUX[JI]);
BEGIN
LABEL L180,L185,L240,L261,L263,L265,L267,L269,L271,L273,L275,L430,
 L460,L480,L490,L500,L510,L520,L530,L540,L550,L600,L610,L620,L650,
 L670;
SWITCH SWG01+L261,L263,L265,L267,L269,L271,L273,L275;
```

```
SWITCH SWGO2←L480,L490,L500,L510,L520,L530,L540,L600,L610,L620;
JFNHMAX←JNHMAX;
JFGROUP←JNGROUP;
JJ←1;
DO BEGIN
  JLST←JMAXR+1;
  JI←1;
  DO BEGIN
    JK←1;
    DO BEGIN
       SVFLUX[JK,JI,JJ]← SVFLUX[JK,JI,JJ]/JFNHMAX;
       SVFLUX[JK,JLST,JJ]← SVFLUX[JK,JLST,JJ]+ SVFLUX[JK,JI,JJ];
   SVTFLUX[JI,JJ]←SVTFLUX[JI,JJ]+SVFLUX[JK,JI,JJ];
      END UNTIL (JK←(JK+1))>JNPA;
   SVTFLUX[JLST,JJ]←SVTFLUX[JLST,JJ]+SVTFLUX[JI,JJ];
  SVIIREF[JI]←JI-1;
    END UNTIL (JI←(JI+1))>JMAXR;
  JM←1;
  DO BEGIN
    SVFLUD[JM,JJ]←SVFLUD[JM,JJ]/JFNHMAX;
    SVFLUR[JJ]←SVFLUR[JJ]+SVFLUD[JM,JJ];
    END UNTIL (JM←(JM+1))>JNRMAX;
  SVRFLUX[JJ]←SVRFLUX[JJ]/JFNHMAX;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
COMMENT  SUBROUTINE RESULT;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL120);
WRITE(PRINT,FL130,LIST2);
    WRITE (PRINT,FL135,LIST14);
IF JNRSTOP≤0 THEN GO TO L180;
WRITE(PRINT,FL150);
```

```
WRITE(PRINT,FL160);
WRITE(PRINT,FL170,LIST3);
L180: JJ←1;
DO BEGIN
  JKA2←0;
  JKA3←0;
  L185: WRITE(PRINT[PAGE]);
        WRITE(PRINT,FL110,LIST1);
  WRITE(PRINT,FL190);
  WRITE(PRINT,FL200,LIST4);
  WRITE(PRINT,FL210);
  JKA1←JKA2+1;
  JKA2←JKA1+6;
  IF (JKA2≤JMAXR) THEN GO TO L240;
  JKA3←1;
  JKA2←JMAXR;
  IF (JKA1>JMAXR) THEN GO TO L261;
  L240: WRITE(PRINT,FL250,LIST5);
  IF JKA3≤0 THEN GO TO L275;
  JKA2←JKA2+1;
  JKA4←JKA2-JKA1+1;
  GO TO SWGO1[JKA4];
  L261: WRITE(PRINT,FL262);
  GO TO L275;
  L263: WRITE(PRINT,FL264);
  GO TO L275;
  L265: WRITE(PRINT,FL266);
  GO TO L275;
  L267: WRITE(PRINT,FL268);
  GO TO L275;
  L269: WRITE(PRINT,FL270);
  GO TO L275;
```

```
  L271: WRITE(PRINT,FL272);
  GO TO L275;
  L273: WRITE(PRINT,FL274);
  L275: JN←1;
  DO BEGIN
    WRITE(PRINT,FL280,LIST6);
    END UNTIL (JN←(JN+1))>JNPA;
  WRITE(PRINT,FL300,LIST7);
  IF JKA3≤0 THEN GO TO L185;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
IF (JNDMAX>7) THEN GO TO L430;
JNFORM←JNDMAX;
GO TO L440;
L430: JNFORM←7;
L440: WRITE(PRINT[PAGE]);
      WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL450);
WRITE(PRINT,FL460);
GO TO SWGO2[JNFORM];
L480: WRITE(PRINT,FL485);
GO TO L550;
L490: WRITE(PRINT,FL495);
GO TO L550;
L500: WRITE(PRINT,FL505);
GO TO L550;
L510: WRITE(PRINT,FL515);
GO TO L550;
L520: WRITE(PRINT,FL525);
GO TO L550;
L530: WRITE(PRINT,FL535);
GO TO L550;
L540: WRITE(PRINT,FL545);
```

```
L550: JI←1;
DO BEGIN
  WRITE(PRINT,FL560,LIST9);
  END UNTIL (JI←(JI+1))>JNRMAX;
WRITE(PRINT,FL580,LIST10);
IF (JNDMAX≤JNFORM) THEN GO TO L670;
JNFORM←JNDMAX;
GO TO L440;
L600: WRITE(PRINT,FL605);
GO TO L650;
L610: WRITE(PRINT,FL615);
GO TO L650;
L620: WRITE(PRINT,FL625);
L650: JI←1;
DO BEGIN
  WRITE(PRINT,FL560,LIST11);
  END UNTIL (JI←(JI+1))>JNRMAX;
WRITE(PRINT,FL580,LIST12);
L670: WRITE(PRINT[PAGE]);
      WRITE(PRINT,FL680);
JI←1;
DO BEGIN
  WRITE(PRINT,FL690,LIST13);
  END UNTIL (JI←(JI+1))>JNDMAX;
 END END;
PROCEDURE SRAVRAGE;
BEGIN
INTEGER  DX1,JI,JJ,JK ,JINDX ;
REAL JFPART,JFGROUP;
FORMAT FL110(" ",X29,"FLUXES FOR DEVIATION GROUP",I3,"."),
FL120(/" COLLISIONS",X30,"DETECTOR"),
FL145(/"              01"),
```

```
FL155(/"              01          02"),
FL165(/"              01          02          03"),
FL175(/"              01          02          03          04"),
FL185(/"              01          02          03          04          05"),
FL195(/
   "              01          02          03          04          05  ",
   "      06"),
FL205(/
   "              01          02          03          04          05  ",
   "      06          07"),
FL220("    ",I2,X3,7E11.4),
FL230(/"  TOTAL  ",7E11.4),
FL265(/"              08"),
FL275(/"              08          09"),
FL285(/"              08          09          10"),
FL320(/" BASE FOR RANDOM NUMBER GENERATOR IS",I13),
FL400 (/" ",X11,
   " SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER."),
 FL450 (" ",X11,
    " INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.");
LIST LIST1(JNDEVG);
LIST LIST2(SVINCOL[JI],FOR DX1←1 STEP 1 UNTIL JNFORM DO SVAFLUX[
 JI,DX1]);
LIST LIST3(FOR DX1←1 STEP 1 UNTIL JNFORM DO SVSTFLUX[DX1]);
LIST LIST4(SVINCOL[JI],FOR DX1←8 STEP 1 UNTIL JNDMAX DO SVAFLUX[
 JI,DX1]);
LIST LIST5(FOR DX1←8 STEP 1 UNTIL JNDMAX DO SVSTFLUX[DX1]);
LIST LIST6(JIBASE);
LABEL L125,L130,L140,L150,L160,L170,L180,L190,L200,L210,L260,L270,
 L280,L290,L310, L115, L410, L450;
SWITCH SWGD1←L140,L150,L160,L170,L180,L190,L200;
SWITCH SWGD2←L260,L270,L280;
```

```
JNDEVG←JNDEVG+1;
      JINDX ← 0 ;
JFPART←JNPART;
      JFGROUP ← JNGROUP ;
JJ←1;
DO BEGIN
  SVSTFLUX[JJ]←0;
  JI←1;
  DO BEGIN
    SVAFLUX[JI,JJ]←SVAFLUX[JI,JJ]/JFPART;
    SVSAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]+SVAFLUX[JI,JJ];
    SVSQFLUX[JI,JJ]←SVSQFLUX[JI,JJ]+SVAFLUX[JI,JJ]*2;
  SVSTFLUX[JJ]←SVSTFLUX[JJ]+SVAFLUX[JI,JJ];
    END UNTIL (JI←(JI+1))>JNPCOL;
  SVFFLUX[JJ]←SVFFLUX[JJ]+SVSTFLUX[JJ];
  SVDVFLUX[JJ]←SVDVFLUX[JJ]+SVSTFLUX[JJ]*2;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL110,LIST1);
L115: WRITE(PRINT,FL120);
IF (JNDMAX>7) THEN GO TO L125;
JNFORM←JNDMAX;
GO TO L130;
L125: JNFORM←7;
L130: GO TO SWGO1[JNFORM];
L140: WRITE(PRINT,FL145);
GO TO L210;
L150: WRITE(PRINT,FL155);
GO TO L210;
L160: WRITE(PRINT,FL165);
GO TO L210;
L170: WRITE(PRINT,FL175);
```

```
GO TO L210;
L180: WRITE(PRINT,FL185);
GO TO L210;
L190: WRITE(PRINT,FL195);
GO TO L210;
L200: WRITE(PRINT,FL205);
L210: JI←1;
DO BEGIN
  WRITE(PRINT,FL220,LIST2);
  END UNTIL (JI←(JI+1))>JNPCOL;
WRITE(PRINT,FL230,LIST3);
IF (JNDMAX≤JNFORM) THEN GO TO L310;
JNFORM←JNDMAX-JNFORM;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL120);
GO TO SWGO2[JNFORM];
L260: WRITE(PRINT,FL265);
GO TO L290;
L270: WRITE(PRINT,FL275);
GO TO L290;
L280: WRITE(PRINT,FL285);
L290: JI←1;
DO BEGIN
  WRITE(PRINT,FL220,LIST4);
  END UNTIL (JI←(JI+1))>JNPCOL;
WRITE(PRINT,FL230,LIST5);
L310: WRITE(PRINT,FL320,LIST6);
JJ←1;
DO BEGIN
  JI←1;
  DO BEGIN
```

```
  SVAFLUX[JI,JJ]←0;
    END UNTIL (JI←(JI+1))>JNPCOL END  UNTIL (JJ←(JJ+1))>JNDMAX;
IF (JNHIST<JNHMAX) THEN GO TO L450;
IF (XPR←(JINDX))>0 THEN GO TO L450;
IF XPR<0 THEN GO TO L410;
JINDX←-1;
JJ←1;
DO BEGIN
  JI←1;
  DO BEGIN
  SVAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]/JFGROUP;
    END UNTIL (JI←(JI+1))>JNPCOL;
  SVSTFLUX[JJ]←SVFFLUX[JJ]/JFGROUP;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL400);
GO TO L115;
L410: JINDX←1;
JJ←1;
DO BEGIN
  JI←1;
  DO BEGIN
    SVAFLUX [JI,JJ]←SQRT((SVSQFLUX[JI,JJ]/JFGROUP*2)-(SVSAFLUX[
     JI,JJ])*2/(JFGROUP*3)));
    END UNTIL (JI←(JI+1))>JNPCOL;
       SVSTFLUX[JJ]←SQRT((SVDVFLUX[JJ]/JFGROUP*2)-(SVFFLUX[JJ]*2/
   JFGROUP*3)));
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL450);
GO TO L115;
L450:  END;
```

```
PROCEDURE SRANGLE;
BEGIN
INTEGER  JJ,JI ;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRRANDA;
FORMAT FL15(/" NO ANGLE PROBABILITY COULD BE FOUND GREATER THAN",E10.3),
FL34(/" INCORRECT SUBSCRIPT FOR ANGLE PROBABILITY.");
LIST LIST1(JRN);
LABEL L20,L35,L40,L45,L50;
JI←1;
DO BEGIN
  SRRANDA(JIBAS4,JRN);
  JJ←1;
  DO BEGIN
    IF (SVPAG[JJ]≥JRN) THEN GO TO L20;
    END UNTIL (JJ←(JJ+1))>JNAG;
  WRITE(PRINT,FL15,LIST1);
  JWHOA←JWHOA+1;
  GO TO L50;
  L20: IF (JJ>1) THEN GO TO L35;
  WRITE(PRINT,FL34);
  JWHOA←JWHOA+1;
  GO TO L50;
  L35: SRRANDA(JIBAS5,JRN);
  SVSANG[JI]←SVCANG[JJ-1]-JRN×(SVCANG[JJ-1]-SVCANG[JJ]);
  IF (XPR←(JNAOP))>0 THEN GO TO L40;
  IF XPR<0 THEN GO TO L45;
  JPJM1←SVPAG[JJ-1];
  SVWEIGHT[JI]←(1/(SVPAG[JJ]-JPJM1))×(SVCANG[JJ-1]-SVCANG[JJ])/(SVCANG[1
]-SVCANG[JNAG]);
  GO TO L50;
  L40: SVWEIGHT[JI]←SVWAG[JJ];
```

```
  GO TO L50;
  L45: SVWEIGHT[JI]←1;
  L50: END UNTIL (JI←(JI+1))>JNPART;
 END;
PROCEDURE SRPATHL;
BEGIN
  INTEGER JJ;     REAL ADJUST ;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRRANDA;
FORMAT FL130(/" LOC =",I4,"  J =",I4,"  JHB =",I4,"  JHT =",I4,"  RN =",
S1,E10.3/"  RHO =",S1,E10.3,"  COTH =",S1,E10.3,"  TAUH1 =",S1,E10.3,
   "  TAUH2 =",S1,E10.3/"  PL =",S1,E10.3,"  H2 =",S1,E10.3));
LIST LIST1(JLOC,JJ,JJHB,JJHT,JRN,JRHO,JCOTH,JTAUH1,JTAUH2,JPL,JH2);
LABEL L30,L50,L70,L100,L105,L140,L60,L110,L25;
SRRANDA(JIBAS2,JRN);
JLOC←25;
JPL←0;
IF (ABS(JCOTH) ≤ JSMVAL) THEN GO TO L25 ;
IF JCOTH>0 THEN GO TO L30;
L25:  JRHO ← -LN(JRN) ;
GO TO L50;
L30:  JUPLMIT ← (SVTAU[JNOH] - JTAUH1) / JCOTH ;
ADJUST ← 1 - EXP(-JUPLMIT) ;
JRHO ← -LN(1 - JRN × ADJUST) ;
JWAIT ← JWAIT × ADJUST ;
L50: JTAUH2←JTAUH1+JRHO×JCOTH;
IF (JTAUH2>0) THEN GO TO L60;
JTAUH2←SVTAU[1];
  JH2←-JDLONG;
  JJHB←1;
JJHT←2;
GO TO L105;
```

```
L60: JJ←1;
DO BEGIN
  IF (JTAUH2<SVTAU[JJ]) THEN GO TO L70;
  END UNTIL (JJ←(JJ+1))>JNOH;
JH2←JDLONG;
JJHB←JNOH-1;
JJHT←JNOH;
GO TO L105;
L70: JJHB←JJ-1;
JJHT←JJ;
IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;
JH2←JH;
JPL←JRHO/((SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]));
GO TO L110;
L100: JH2←SVHV[JJHB]+(SVHV[JJHT]-SVHV[JJHB])×(JTAUH2-SVTAU[JJHB])/(
 SVTAU[JJHT]-SVTAU[JJHB]);
L105: JPL←(JH2-JH1)/JCOTH;
L110: IF JIDUMP≤0 THEN GO TO L140;
WRITE(PRINT,FL130,LIST1);
L140:  END;
PROCEDURE SRINITAL;
BEGIN
INTEGER JJ,JI,JK,JN ;
JJ←1;
DO BEGIN
  JLB←JNPCOL+1;
  JI←1;
  DO BEGIN
    SVSAFLUX[JI,JJ]←0;
    SVSQFLUX[JI,JJ]←0;
      SVTFLUX[   JI,JJ]←0;
    JK←1;
```

```
      DO BEGIN
        SVFLUX[JK,JI,JJ]←0;
        END UNTIL (JK←(JK+1))>JNPA;
      END UNTIL (JI←(JI+1))>JLB;
    JN←1;
    DO BEGIN
      SVFLUD[JN,JJ]←0;
      END UNTIL (JN←(JN+1))>JNRMAX;
    SVRFLUX[JJ]←0;
    SVFFLUX[JJ]←0;
    SVDVFLUX[JJ]←0;
    SVFLUR[JJ]←0;
    END UNTIL (JJ←(JJ+1))>JNDMAX;
      JMAXCOL ← 0;
      JNWAIT ← 0;
      JNOGO ← 0;
      JI ← 1;
      DO BEGIN
         SVNRICO[JI] ← 0 ;
         END UNTIL(JI←(JI+1))>JNRMAX;
  END;
PROCEDURE SRREFLCT;
BEGIN
REAL  JDENOM;        INTEGER   JI,JJAIL;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRRANDA;
FORMAT FL35(/" REFLECTION ANGLE DISTRIBUTION FOR BOUNDARY",I3,
   " IS IN ERROR.");
LIST LIST1(JNRB);
LABEL L10,L15,L20,L33,L40,L60,L70,L80,L100;
SWITCH SWGO1←L10,L20,L15,L20;
SRRANDA(JIBASE,JRN);
```

```
JNRB←JNCB;
JJAIL←SVJREFLT[JNRB];
GO TO SWGO1[JJAIL];
L10: JCOTH1←JRN;
GO TO L70;
L15: JCOTH1←-JRN;
GO TO L70;
L20: JNRA←SVNRFCOS[JNRB];
JFNRA←JNRA;
JI←1;
DO BEGIN
  JFI←JI;
  SVPRFLT[JI]←JFI/JFNRA;
  IF (JRN≤SVPRFLT[JI]) THEN GO TO L40;
  END UNTIL (JI←(JI+1))>JNRA;
L33: WRITE(PRINT,FL35,LIST1);
JWHOA←JWHOA+1;
GO TO L100;
L40: IF (XPR←(JI-1))>0 THEN GO TO L60;
IF XPR<0 THEN GO TO L33;
JCOTH1←1+(JRN/SVPRFLT[JI])×(SVRFLCOS[JI,JNRB]-1);
GO TO L70;
L60: JCOTH1←SVRFLCOS[JI-1,JNRB]+((JRN-SVPRFLT[JI-1])/(SVPRFLT[JI]-
 SVPRFLT[JI-1]))×(SVRFLCOS[JI,JNRB]-SVRFLCOS[JI-1,JNRB]);
L70: JSITH1←SQRT(1-JCOTH1*2);
L80: SRRANDA(JIBAS1,JRN);
JSPT←2×JRN-1;
SRRANDA(JIBAS3,JRN);
JCPT←2×JRN-1;
JDENOM←JCPT*2+JSPT*2;
IF (JDENOM>1) THEN GO TO L80;
JDENOM←SQRT(JDENOM);
```

```
JCPHI1←JCPT/JDENOM;
JSPHI1←JSPT/JDENOM;
L100: END;
PROCEDURE SRSCTANG;
BEGIN
REAL  JCOPHI, JSOPHI;   INTEGER  JI,JNPASE ;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRREFLCT, SRRANDA;
FORMAT FL80(/" THE PHASE ANGLE PROBABILITIES FOR MATERIAL",I3,
   " ARE INCORRECT."),
FL139(/" LOC =",I4," NPHASE =",I4," NCM =",I4," REFL =",E10.3,
   " CSANG =",E10.3/" SSANG =",E10.3," CTEP =",E10.3," STEP =",E10.3,
"  DEOM =",E10.3," CDPHI =",E10.3/" SOPHI =",E10.3," COTH2 =",E10.3,
   " SITH2 =",E10.3," SOEPHI =",E10.3/" COEPHI =",E10.3," CPHI2 =",
   E10.3," SPHI2 =",E10.3," COTH1 =",E10.3/" SITH1 =",E10.3,
   " CPHI1 =",E10.3," SPHI1 =",E10.3," RN =",E10.3));
LIST LIST1(JNCM);
LIST LIST2(JLOC,JNPHASE,JNCM,JREFL,JCSANG,JSSANG,JCTEP,JSTEP,JDEOM,
 JCOPHI,JSOPHI,JCOTH2,JSITH2,JSDEPHI,JCOEPHI,JCPHI2,JSPHI2,JCOTH1,
 JSITH1,JCPHI1,JSPHI1,JRN);
LABEL L5,L10,L50,L90,L110,L120,L130,L137,L140;
IF JREFL≤0 THEN GO TO L5;
SRREFLCT;
GO TO L137;
L5: SRRANDA(JIBAS4,JRN);
IF (JRN> JRATLEE)        THEN GO TO L50;
L10: SRRANDA(JIBAS5,JRN);
JCSANG←1-2×JRN;
SRRANDA(JIBASE,JRN);
IF (JRN≤.5) THEN GO TO L120;
SRRANDA(JIBAS1,JRN);
IF (JRN>JCSANG×JCSANG) THEN GO TO L10 ELSE GO TO L120;
```

```
L50: SRRANDA(JIBAS2,JRN);
JNPASE←SVNPHANG[JNCM];
JFNPA←JNPASE;
JI←1;
DO BEGIN
  JFI←JI;
  SVPFANG[JI]←JFI/JFNPA;
  IF (JRN≤SVPFANG[JI]) THEN GO TO L90;
  END UNTIL (JI←(JI+1))>JNPASE;
WRITE(PRINT,FL80,LIST1);
JWHOA←JWHOA+1;
GO TO L140;
L90: IF (JFI>1) THEN GO TO L110;
JCSANG←1+(JRN/SVPFANG[JI])×(SVPHANG[JI,JNCM]-1);
GO TO L120;
L110: JCSANG←SVPHANG[JI-1,JNCM]+((JRN-SVPFANG[JI-1])/(SVPFANG[JI]-
 SVPFANG[JI-1]))×(SVPHANG[JI,JNCM]-SVPHANG[JI-1,JNCM]);
L120: JSSANG←SQRT(1-JCSANG×JCSANG);
L130: SRRANDA(JIBAS3,JRN);
JCTEP←1-2×JRN;
SRRANDA(JIBAS4,JRN);
JSTEP←1-2×JRN;
JDEOM←JCTEP*2+JSTEP*2;
IF (JDEOM>1) THEN GO TO L130;
JDEOM←SQRT(JDEOM);
JCDPHI←JCTEP/JDEOM;
JSDPHI←JSTEP/JDEOM;
 IF JSITH2 < JSMVAL THEN BEGIN JCOTH1 ← JCSANG×JCOTH2
 JSITH1 ← JSSANG;
JCPHI1 ← JCDPHI;
 JSPHI1 ← JSDPHI;
 END ELSE BEGIN
```

```
JCOTH1←JCOTH2×JCSANG+JSITH2×JSSANG×JCDPHI;
JSITH1←SQRT(1-JCOTH1×JCOTH1);
JSDEPHI←(JSSANG×JSDPHI)/JSITH1;
JCDEPHI←(JCSANG-JCOTH1×JCOTH2)/(JSITH1×JSITH2);
JCPHI1←JCPHI2×JCDEPHI-JSPHI2×JSDEPHI;
JSPHI1←JSPHI2×JCDEPHI+JCPHI2×JSDEPHI;
 END;
L137: JCOTH2←JCOTH1;
JSITH2←JSITH1;
JCPHI2←JCPHI1;
JSPHI2←JSPHI1;
JLOC←80;
IF JIDUMP≤0 THEN GO TO L140;
WRITE(PRINT,FL139,LIST2);
L140:  END;
PROCEDURE SRDBEAM;
BEGIN
INTEGER JJ, JJ2;  REAL   JVD;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRDSTRD, SRSEARCH;
FORMAT FL11(" HS IS GREATER THAN HV(NOH).                    "),
       FL230(" RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM",I10),
FL240(/" DIRECT BEAM LIGHT INTENSITIES"//
   "  DETECTOR   DIRECT INTENSITY"),
FL250(/" ",I6,X8,E11.4);
LIST LIST1(JNPROB);
LIST LIST2(JJ,SVDBFLUX[JJ]);
LABEL L3,L100,L210,L300,L280;
JJ2←2;
DO BEGIN
  IF (JHS≤SVHV[JJ2]) THEN GO TO L3;
  END UNTIL (JJ2←(JJ2+1))>JNOH;
```

```
WRITE(PRINT,FL11);
GO TO L300;
L3: JJHB←JJ2-1;
JJHT←JJ2;
JJ←1;
DO BEGIN
  JVO←SVHD[JJ]-JHS;
  JT←SQRT(JVO*2+SVRO[JJ]*2);
  JCOTH←JVO/JT;
  IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;
      JRHOT←JT×(SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);
      GO TO L210;
      L100: JRHOT ← (SVTAUHD[JJ]-JTAUH )/JCOTH;
  L210: SVDBFLUX[JJ]←SVDBSS[JJ]×EXP(-JRHOT)/JT*2;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL230,LIST1);
WRITE(PRINT,FL240);
JJ←1;
DO BEGIN
  WRITE(PRINT,FL250,LIST2);
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
L280: JWHOA←JWHOA+1;
L300:  END;
PROCEDURE SRCHECK;
BEGIN
INTEGER   JI1,JINAG,JINPA,JINPCOL,JINRF1,JINRF2,JINRF,JJCHECH,JJCHECK,
       JJ,JNRF1,JNRF2,JNRF3,JNRF,JNAG1,JNPA1,JNPCOL1 ;
FORMAT FL25("  THE NUMBER OF REFLECTION BOUNDRIES",I3,
   " EXCEEDS THE LIMIT OF 5 ALLOWED",".DATA CHECK CONTINUES..."),
FL45("  THE NUMBER OF DETECTORS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED",
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```
   ".DATA CHECK CONTINUES...");
FL65("  THE NUMBER OF MATERIALS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED",
   ".DATA CHECK CONTINUES...");
FL85("  THE NUMBER OF PRINT COLLISIONS",I3,
   " EXCEEDS THE LIMIT OF 24 ALLOWED",".DATA CHECK CONTINUES...");
FL105("  THE NUMBER OF PRINT ANGLES",I3,
   " EXCEEDS THE LIMIT OF 25 ALLOWED",".DATA CHECK CONTINUES...");
FL125("  THE NUMBER OF SOURCE ANGLES",I3,
   " EXCEEDS THE LIMIT OF 37 ALLOWED",".DATA CHECK CONTINUES...");
FL145("  THE NUMBER OF REGIONS",I4," EXCEEDS THE LIMIT OF  50 ALLOWED",
   ".DATA CHECK CONTINUES...");
FL165("  THE NUMBER OF BOUNDRIES",I4,
   " EXCEEDS THE LIMIT OF  50 ALLOWED",".DATA CHECK CONTINUES...");
FL180("  COSINE SOURCE ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL215("  COSINE PRINT ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL235(" REFLECTION ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL270("  REFLECTION COSINES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL315("  DIFFERENTIAL COSINES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL355("  PHASE ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL385("  ANGLE PROBABILITIES MUST BE INPUT IN ASCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL415("  INPUT NUMBER OF COLLISSION MUST BE IN ASCENDING ORDER",
   ".DATA CHECK CONTINUES...");
FL435(" ","  THERE ARE A TOTAL OF",I5," INPUT DATA ERRORS"///
   "TAKE PROBLEM OFF COMPUTER AND CORRECT ERRORS. BETTER LUCK NEXT ",
   "TIME"),
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FL455(" INPUT DATA SEEMS TO BE ALLRIGHT. EXECUTION CONTINUES.");
LIST LIST1(JNRFLB);
LIST LIST2(JNDMAX);
LIST LIST3(JNMAT);
LIST LIST4(JNPCOL);
LIST LIST5(JNPA);
LIST LIST6(JNAG);
LIST LIST7(JNRMAX);
LIST LIST8(JNBMAX);
LIST LIST9(JJCHECK);
LABEL L30,L50,L70,L90,L110,L130,L150,L170,L200,L220,L240,L280,L300,
 L320,L360,L370,L390,L420,L450;
JJCHECK←0;
IF (JNRFLB≤5) THEN GO TO L30;
WRITE(PRINT,FL25,LIST1);
JJCHECK←JJCHECK+1;
L30: IF (JNDMAX≤10) THEN GO TO L50;
WRITE(PRINT,FL45,LIST2);
JJCHECK←JJCHECK+1;
L50: IF (JNMAT≤10) THEN GO TO L70;
WRITE(PRINT,FL65,LIST3);
JJCHECK←JJCHECK+1;
L70: IF (JNPCOL≤24) THEN GO TO L90;
WRITE(PRINT,FL85,LIST4);
JJCHECK←JJCHECK+1;
L90: IF (JNPA≤25) THEN GO TO L110;
WRITE(PRINT,FL105,LIST5);
JJCHECK←JJCHECK+1;
L110: IF (JNAG≤37) THEN GO TO L130;
WRITE(PRINT,FL125,LIST6);
JJCHECK←JJCHECK+1;
L130: IF (JNRMAX≤50) THEN GO TO L150;
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```
WRITE(PRINT,FL145,LIST7);
JJCHECK+JJCHECK+1;
L150: IF (JNBMAX≤50) THEN GO TO L170;
WRITE(PRINT,FL165,LIST8);
JJCHECK+JJCHECK+1;
JNAG1+JNAG-1;
L170: JJ+1;
DO BEGIN
  IF (SVCANG[JJ]≥SVCANG[JJ+1]) THEN GO TO L200;
  WRITE(PRINT,FL180);
  JJCHECK+JJCHECK+1;
  L200: END UNTIL (JJ+(JJ+1))>JNAG1;
JNPA1+JNPA-1;
JJ+1;
DO BEGIN
  IF (SVCIPA[JJ]≥SVCIPA[JJ+1]) THEN GO TO L220;
  WRITE(PRINT,FL215);
  JJCHECK+JJCHECK+1;
  L220: END UNTIL (JJ+(JJ+1))>JNPA1;
IF JNRFLB≤0 THEN GO TO L300;
JI1+1;
DO BEGIN
  JNRF+SVNRFANG[JI1]-1;
  JJ+1;
  DO BEGIN
    IF (SVRFANG[JJ,JI1]≥SVRFANG[JJ+1,JI1]) THEN GO TO L240;
    WRITE(PRINT,FL235);
    JJCHECK+JJCHECK+1;
    L240: END UNTIL (JJ+(JJ+1))>JNRF;
  END UNTIL (JI1+(JI1+1))>JNRFLB;
JI1+1;
DO BEGIN
```

```
  JNRF1←SVNRFCOS[JI1]-1;
  JJ←1;
  DO BEGIN
    IF (SVRFLCOS[JJ,JI1]≥SVRFLCOS[JJ+1,JI1]) THEN GO TO L280;
    WRITE(PRINT,FL270);
    JJCHECK←JJCHECK+1;
    L280: END UNTIL (JJ←(JJ+1))>JNRF1;
  END UNTIL (JI1←(JI1+1))>JNRFLB;
L300: JI1←1;
DO BEGIN
  IF (SVRAYLEE[JI1]=1) THEN GO TO L370;
  JNRF2←SVNDFCOS[JI1]-1;
  JJ←1;
  DO BEGIN
    IF (SVDIFCOS[JJ,JI1]≥SVDIFCOS[JJ+1,JI1]) THEN GO TO L320;
    WRITE(PRINT,FL315);
    JJCHECK←JJCHECK+1;
    L320: END UNTIL (JJ←(JJ+1))>JNRF2;
  JNRF3←SVNPHANG[JI1]-1;
  JJ←1;
  DO BEGIN
    IF (SVPHANG[JJ,JI1]≥SVPHANG[JJ+1,JI1]) THEN GO TO L360;
    WRITE(PRINT,FL355);
    JJCHECK←JJCHECK+1;
    L360: END UNTIL (JJ←(JJ+1))>JNRF3;
  L370: END UNTIL (JI1←(JI1+1))>JNMAT;
JNAG1←JNAG-1;
JJ←1;
DO BEGIN
  IF (SVPAG[JJ]≤SVPAG[JJ+1]) THEN GO TO L390;
  WRITE(PRINT,FL385),
  JJCHECK←JJCHECH+1;
```

```
  L390: END UNTIL (JJ←(JJ+1))>JNAG1;
JNPCOL1←JNPCOL-1;
JJ←1;
DO BEGIN
  IF (SVINCOL[JJ]≤SVINCOL[JJ+1]) THEN GO TO L420;
  WRITE(PRINT,FL415);
  JJCHECK←JJCHECK+1;
  L420: END UNTIL (JJ←(JJ+1))>JNPCOL1;
IF JJCHECK≤0 THEN GO TO L450;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL435,LIST9);
ERROR(0);
L450: WRITE(PRINT,FL455);
 END;
PROCEDURE SRMAIN;
BEGIN
INTEGER   JJAIL, JJ2;
REAL JFRACT;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRINITAL, SRSEARCH, SRAVRAGE, SRANSWER, SRANGLE, SRPATHL, SRDSTBD,
   SRRANDA, SRDETECT, SRSCTANG;
FORMAT FL11(" HS IS GREATER THAN HV(NOH).                    "),
       FL6(/" CANNOT LOCATE REGION CONTAINING SOURCE PARTICLE."),
FL76(/" LOC =",I4," NPART =",I4," NSP =",I4," NHIST =",I6," NCR =",
   I4," NCOL =",I4/" H1 =",E10.3," R1 =",E10.3," COTH1 =",E10.3,
   " SITH1 =",E10.3/" CPHI1 =",E10.3," SPHI1 =",E10.3," WAIT =",
   E10.3),
FL96(/" LOC =",I4," NCR =",I4," NCM =",I3," R =",E10.3," H =",E10.3/
" COTH =",E10.3," SITH =",E10.3," CIPH =",E10.3," SPHI =",E10.3),
FL106(/" A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=",E10.3),
FL136(/" PROGRAM FAILED TO CALCULATE DISTANCE TO A BOUNDARY."),
FL142(/" LOC =",I4," NCR =",I4," NCB =",I4," T =",E10.3," SUMDST =",
```

```
E10.3/" DIST =",E10.3," RHOT =",E10.3," DT =",E10.3," HT =",E10.3/
  " RHO =",E10.3," NCM =",I4," NLM =",I4),
FL147(/" LOC =",I4," NCM =",I4," NLM =",I4," H =",E10.3," TS =",
  E10.3/" RT =",E10.3," CPHI =",E10.3," R =",E10.3),
FL177(/" CANNOT FIND REGION CONTAINING PARTICLE COORDINATES, H=",E10.3,
" R=",E10.3),
FL264(/" LOC =",I4," NCR1 =",I4," NCR2 =",I4," DIST =",E10.3,
  " DT =",E10.3/" T =",E10.3," SUMDST =",E10.3," H2 =",E10.3,
  " TS =",E10.3/" RT =",E10.3," CPHI2 =",E10.3," R2 =",E10.3,
  " SPHI2 =",E10.3/" COTH2 =",E10.3," SITH2 =",E10.3," NCOL =",I4);
LIST LIST1(JLOC,JNPART,JNSP,JNHIST,JNCR,JNCOL,JH1,JR1,JCOTH1,JSITH1,
 JCPHI1,JSPHI1,JWAIT);
LIST LIST2(JLOC,JNCR,JNCM,JR,JH,JCOTH,JSITH,JCPHI,JSPHI);
LIST LIST3(JPL);
LIST LIST4(JLOC,JNCR,JNCB,JT,JSUMDST,JDIST,JRHOT,JDT,JHT,JRHO,JNCM,JNLM)
 ;
LIST LIST5(JLOC,JNCM,JNLM,JH,JTS,JRT,JCPHI,JR);
LIST LIST6(JH,JR);
LIST LIST7(JNLM);
LIST LIST8(JLOC,JNCR1,JNCR2,JDIST,JDT,JT,JSUMDST,JH2,JTS,JRT,JCPHI2,JR2,
 JSPHI2,JCOTH2,JSITH2,JNCOL);
BEGIN
LABEL L7,L10,L60,L70,L80,L100,L110,L120,L130,L140,L144,L150,L161,
L3, L8, L1600,
 L165,L166,L170,L180,L310,L188,L2,            L250,L260,L268,
 L320,L340,L350;
SWITCH SWGO1+L165,L165,L161,L161;
JNPART+JNHMAX DIV JNGROUP;
JNSP+JNPART+1;
JNHIST+0;
JNDEVG+0;
SRINITAL;
```

```
JMPREG←JNSOREG;
JWHOA←0;
JH←JHS;
JR←0;
JJ2←2;
DO BEGIN
  IF (XPR←(JHS-SVHV[JJ2]))=0 THEN GO TO L2;
  IF XPR<0 THEN GO TO L3;
  END UNTIL (JJ2←(JJ2+1))>JNOH;
WRITE(PRINT,FL11);
GO TO L350;
L3: JTAUH←SVTAU[JJ2-1]+(SVTAU[JJ2]-SVTAU[JJ2-1])×(JHS-SVHV[JJ2-1])/(
 SVHV[JJ2]-SVHV[JJ2-1]);
GO TO L8;
L2: JTAUH←SVTAU[JJ2];
L8: JERRORS←JWHOA;
SRSEARCH;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF (JNCR=JNSOREG) THEN GO TO L7;
WRITE(PRINT,FL6);
GO TO L350;
L7: JREFL←0;
L10: IF (XPR←(JNPART-JNSP))>0 THEN GO TO L70;
IF XPR<0 THEN GO TO L60;
SRAVRAGE;
IF (JNHIST<JNHMAX) THEN GO TO L60;
SRANSWER;
GO TO L350;
L60: SRANGLE;
IF (JERRORS<JWHOA) THEN GO TO L340;
JNSP←0;
L70: JNHIST←JNHIST+1;
```

```
JNREFL←1;
JLOC←10;
JTAUH2←JTAUH;
JNSP←JNSP+1;
JH1←JHS;
JR1←0;
JNCR←JNSOREG;
JCOTH1←SVSANG[JNSP];
JSITH1←SQRT(1-JCOTH1×JCOTH1);
JCPHI1←1;
JSPHI1←0;
JWAIT←SVWEIGHT[JNSP];
JNCOL←1;
IF JIDUMP≤0 THEN GO TO L80;
WRITE(PRINT,FL76,LIST1);
L80: JR←JR1;
JLOC←20;
JTAUH1←JTAUH2;
JH←JH1;
JREFL←0;
JCOTH←JCOTH1;
JSITH←JSITH1;
JCPHI←JCPHI1;
JSPHI←JSPHI1;
JNCR1←JNCR;
JNCM←SVMAT[JNCR];
IF JIDUMP≤0 THEN GO TO L100;
WRITE(PRINT,FL96,LIST2);
L100: SRPATHL;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JPL>0 THEN GO TO L110;
WRITE(PRINT,FL106,LIST3);
```

```
 JWHOA+JWHOA+1;
GO TO L340;
L110: JT+JPL;
JRHOT+0;
L120: JDT+0;
JSUMDST+0;
JHT+JH;
L130: SRDSTBD;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JNCB≥0 THEN GO TO L140;
WRITE(PRINT,FL136);
GO TO L350;
L140: JSUMDST+JSUMDST+JDIST;
JLOC+50;
IF JIDUMP≤0 THEN GO TO L144;
WRITE(PRINT,FL142,LIST4);
L144: IF (JSUMDST≥JT) THEN GO TO L250;
JNCM+SVMAT[JNCR];
JH+JH+JCOTH×JDIST;
JTS+JDIST×JSITH;
JRT+SQRT(JR×JR+JTS×JTS+2×JR×JTS×JCPHI);
 IF JRT < JSMVAL THEN BEGIN JCPHI + 1 ;JSPHI + 0 ; END  ELSE BEGIN
JCPHI+(JTS+JR×JCPHI)/JRT;
JSPHI+JR×JSPHI/JRT;
 END;
JR+JRT;
JNLM+JNCM;
JLOC+60;
IF JIDUMP≤0 THEN GO TO L150;
WRITE(PRINT,FL147,LIST5);
L150: IF (SVNBOUND[JNCB])≥0 THEN GO TO L170;
JH2+JH-2×JDELTA×JCOTH;
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```
JR2←JR-2×JDELTA×JSITH×JCPHI;
IF (JNCB≠1) THEN GO TO L1600;
JNREFL ← JNREFL + 1 ;
IF (JNREFL-JMAXR≤1) THEN GO TO L1600;
JNMAXR←JNMAXR+1;
GO TO L10;
L1600: JREFL←1;
JNRB←JNCB;
JJAIL←SVJREFLT[JNRB];
GO TO SWGO1[JJAIL];
L161: JCOTH2←-1;
GO TO L166;
L165: JCOTH2←1;
L166: JSITH2←0;
JCPHI2←1;
JSPHI2←0;
JWAIT←JWAIT×SVALBEDO[JNCB];
GO TO L260;
L170: JMPREC←SVMPR[JJ1,JNCR];
SRSEARCH;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JNCR>0 THEN GO TO L180;
WRITE(PRINT,FL177,LIST6);
GO TO L350;
L180: JNCR2←JNCR;
      IF (SVEMP[JNCR2]≥SVEMP[JNCR1]) THEN GO TO L188;
SRRANDA(JIBAS5,JRN);
IF (JRN>(SVEMP[JNCR2]/SVEMP[JNCR1])) THEN GO TO L310;
JWAIT←JWAIT×(SVEMP[JNCR1]/SVEMP[JNCR2]);
GO TO L188;
L310: SVNRICO[JNCR2]←SVNRICO[JNCR2]+1;
JNRSTOP←JNRSTOP+1;
```

```
GO TO L10;
L188: JOT←JOT←JOIST;
JNCM←SVMAT[JNCR];
GO TO L130;
L250: JOIST←JT-JOT;
JH2←JH←JCOTH×JOIST;
JTS←JOIST×JSITH;
JRT←SQRT(JR×JR+JTS×JTS+2×JR×JTS×JCPHI);
 IF JRT < JSMVAL THEN BEGIN JCPHI2← 1 ;JSPHI2← 0 ; END  ELSE BEGIN
JCPHI2←(JTS+JR×JCPHI)/JRT;
JSPHI2←JR×JSPHI/JRT;
 END;
JR2←JRT;
JCOTH2←JCOTH;
JSITH2←JSITH;
JFRACT←(JH2-SVHV[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);
JRATLEE←SVRAYR[JJHB]+(SVRAYR[JJHT]-SVRAYR[JJHB])×JFRACT;
SVCRATIO[JNCM]←SVSCATR[JJHB]+(SVSCATR[JJHT]-SVSCATR[JJHB])×JFRACT;
JWAIT←JWAIT×SVCRATIO[JNCM];
L260: JNCR2←JNCR;
JLOC←70;
IF JIOUMP≤0 THEN GO TO L268;
WRITE(PRINT,FL264,LIST8);
L268: SROETECT;
IF (JERRORS<JWHOA) THEN GO TO L340;
JNCOL←JNCOL+1;
IF (JNCOL≤JNCMAX) THEN GO TO L320;
JMAXCOL←JMAXCOL+1;
JNOGO←JNOGO+1;
GO TO L10;
    L320: JNOGO ←JNOGO + 1;
    SRSCTANG;
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IF (JERRORS<JWHOA) THEN GO TO L340;
JR1←JR2;
JH1←JH2;
JNCR←JNCR2;
IF (JWAIT>JWCO) THEN GO TO L80;
JNWAIT←JNWAIT+1;
GO TO L10;
L340: IF (JWHOA>JELIM) THEN GO TO L350;
JERRORS←JWHOA;
GO TO L10;
L350:  END END;
PROCEDURE MAINPRO;
BEGIN
INTEGER JI1,JI2,JI3,JI4,JICHECK,JJATL,JLIS1,JLIS2,I,J;
INTEGER  DX1,DX2;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRCHECK, SRMAIN, SRDBEAM;
FORMAT FL10(5I10),
FL110(2I10,4R10.4),
FL130(6R10.4),
FL170(4R10.4),
FL210(2I10,R10.4),
FL230(3I5,R5.2,8I5),
FL310(2R10.4,I10,R10.4),
FL330(/" SVHD[J] IS GREATER THAN SVHV[JNOH] FOR J =",I4,
 ".."),
FL350 (/"I=",I4,"J=",I4,"TAUHD[I]=",S1,E10.3),
FL410(6I10),
FL510(R10.4),
FL810(6I10),
FL905(/
   " THE NUMBER OF HISTORIES WAS NOT EQUALLY DIVISIBLE BY  THE NUMB",
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   "ER OF DEVIATION GROUPS."/"  THE NUMBER OF HISTORIES WAS  RESET TO",
   I6),
FL920(/" INPUT NUMBER OF MATERIALS DOES NOT AGREE WITH NMAT. "),
FL950(/" INPUT NUMBER OF BOUNDARIES DOES NOT AGREE WITH NBMAX."),
FL980(/" INPUT NUMBER OF REGIONS DOES NOT AGREE WITH NRMAX."),
FL1010(/" INPUT NUMBER OF DETECTORS DOES NOT AGREE WITH NDMAX."),
FL1040(/" INPUT NUMBER OF PRINT COLLISIONS DOES NOT AGREE WITH NPCOL."),
FL1070(/" INPUT NUMBER OF PRINT COSINES DOES NOT AGREE WITH NPA."),
FL2000(/
   " INPUT NUMBER OF REFLECTION BOUNDARIES DOES NOT AGREE WITH NRFL",
   "B."),
FL2030(/" INPUT SOURCE ANGLE OPTION DOES NOT AGREE WITH NAOP."),
FL2060(/" INPUT NUMBER OF SOURCE ANGLES DOES NOT AGREE WITH NAG.");
LIST LIST1(JLIBRAY,JI1,JI2,JI3,JI4);
LIST LIST21 (FOR DX1←1 STEP 1 UNTIL JNDH DO [SVHV[DX1],SVTAU[DX1],
 SVSCATR[DX1],  SVRAYR[DX1]]);
LIST LIST2(SVNDFCOS[JI1],SVNPHANG[JI1],SVSIGNOT[JI1],SVRAYLEE[JI1],SVA[
 JI1],SVCRATIO[JI1]);
LIST LIST3(FOR DX1←1 STEP 1 UNTIL JLIS1 DO SVDIFCOS[DX1,JI1]);
LIST LIST4(FOR DX1←1 STEP 1 UNTIL JLIS1 DO SVPOCOS[DX1,JI1]);
LIST LIST5(FOR DX1←1 STEP 1 UNTIL JLIS2 DO SVPHANG[DX1,JI1]);
LIST LIST6(FOR DX1←1 STEP 1 UNTIL JI1 DO [SVNBOUND[DX1],SVITYPE[
 DX1],SVCDEE[DX1]]);
LIST LIST7(FOR DX1←1 STEP 1 UNTIL JI2 DO [SVNREG[DX1],SVNB[DX1],SVMAT[
 DX1],SVEMP[DX1],FOR DX2←1 STEP 1 UNTIL 4 DO [SVIB[DX2,DX1],SVMPR[
 DX2,DX1]]]);
LIST LIST8(FOR DX1←1 STEP 1 UNTIL JI1 DO [SVHD[DX1],SVRD[DX1],SVNPHID[
 DX1],SVDBSS[DX1]]);
LIST LIST9(FOR DX1←1 STEP 1 UNTIL JI1 DO SVINCOL[DX1]);
LIST LIST10(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCIPA[DX1]);
LIST LIST11(SVALBEDO[JI1]);
LIST LIST12(FOR DX1←1 STEP 1 UNTIL JI3 DO SVRFANG[DX1,JI1]);
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LIST LIST13(FOR DX1←1 STEP 1 UNTIL JI3 DO SVPOR[DX1,JI1]);
LIST LIST14(FOR DX1←1 STEP 1 UNTIL JI4 DO SVRFLCOS[DX1,JI1]);
LIST LIST15(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCANG[DX1]);
LIST LIST16(FOR DX1←1 STEP 1 UNTIL JI2 DO SVPAG[DX1]);
LIST LIST17(FOR DX1←1 STEP 1 UNTIL JI2 DO SVWAG[DX1]);
LIST LIST18(JHS,JDLONG,JDELTA,JSMVAL,JWCO,JELIM,JDMIN);
LIST LIST19(JNHMAX,JNGROUP,JNRMAX,JNBMAX,JNCMAX,JNDMAX,JNPA,JNPCOL,
 JNAOP,JNAG,JNRFLB,JNMAT,JNSOREG,JMAXR,JIBASE,JIBAS1,JIBAS2,JIBAS3,
 JIBAS4, JIBAS5);
LIST LIST20(JNHMAX);
LIST LIST23 (I, J, SVTAUHD[I]) ;
LIST LIST22(I);
LABEL L5,L100,L200,L300,L400,L500,L520,L600,L700,L800,L900,L908,L930,
    L5A,L5AA,L150,L170,L190,L506,L507,L508,L320,L390,L850,
 L960,L990,L1020,L1050,L1080,L2010,L2040,L2070,L2087,L3000;
SWITCH SWGO1←L800,L700,L600,L500,L400,L300,L200,L100,L850,L900,L3000;
SWITCH SWGO2←L5,L520,L5,L520;
JNMATP←0;
JNBMAXP←0;
JNRMAXP←0;
JNRFLBP←0;
JNDMAXP←0;
JNPCOLP←0;
JNPAP←0;
JNAGP←0;
L5A:READ(DAT,10,ABC[*])[L5AA];  WRITE (CARD,10,ABC[*]);  GO TO L5A;
L5AA:REWIND(CARD);   CLOSE(DAT,RELEASE);
L5: READ(CARD,FL10,LIST1)[FINIS];
JNOGO←0;
GO TO SWGO1[JLIBRAY];
L100: JNMATP←JNMATP+1;
SVMATERL[JNMATP]←JI1;
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            I←1;
        DO BEGIN
            IF SVMATERL[I]≠SVMATERL[JNMATP] THEN
            GO TO L150;
            IF I≠JNMATP THEN GO TO L170;
L150:       END UNTIL (I←(I+1))> JNMATP;
            GO  TO  L190;
L170:       JNMATP← JNMATP-1;
L190:       READ (CARD, FL110, LIST2));
JLIS1←SVNDFCOS[JI1];
JLIS2←SVNPHANG[JI1];
IF (SVRAYLEE[JI1]≥1) THEN GO TO L5;
READ(CARD,FL130,LIST3));
READ(CARD,FL130,LIST4));
READ(CARD,FL130,LIST5));
GO TO L5;
L200: JNRMAXP←JI1;
JNRMAXP←JI2;
READ(CARD,FL210,LIST6));
READ(CARD,FL230,LIST7));
GO TO L5;
L300: JNDMAXP←JI1;
READ(CARD,FL310,LIST8));
GO TO L5;
L400: JNPCOLP←JI1;
JNPAP←JI2;
READ(CARD,FL410,LIST9));
READ(CARD,FL130,LIST10));
GO TO L5;
L500: JNRFLBP←JNRFLBP+1;
SVJREFLT[JI1]←JI2;
          NRFB[JNRFLBP]←JI1;
```

```
   I←1;
      DO BEGIN
   IF NRFB[I]≠NRFB[JNRFLBP] THEN
         GO  TO  L507;
         IF I≠JNRFLBP THEN GO TO L506;
L507:    END UNTIL (I←(I+1)) > JNRFLBP;
   GO TO L508;
L506:   JNRFLBP←JNRFLBP-1;
   L508: READ (CARD,FL510,LIST11);
JJAIL←SVJREFLT[JI1];
GO TO SWGO2[JJAIL];
L520: SVNRFANG[JI1]←JI3;
READ(CARD,FL130,LIST12);
READ(CARD,FL130,LIST13);
SVNRFCOS[JI1]←JI4;
READ(CARD,FL130,LIST14);
GO TO L5;
L600: JNADPP←JI1;
JNAGP←JI2;
READ(CARD,FL130,LIST15);
READ(CARD,FL130,LIST16);
IF JNADPP≤0 THEN GO TO L5;
READ(CARD,FL130,LIST17);
GO TO L5;
L700: READ(CARD,FL130,LIST18);
GO TO L5;
L800: READ(CARD,FL810,LIST19);
GO TO L5;
L850: JNOH←JI1;
READ (CARD,FL170,LIST21);
GO TO L5;
L900: JNPROB←JI1;
```

```
JIDUMP←JI2;
JICHECK←JI3;
JNPART←JNHMAX DIV JNGROUP;
IF (JNHMAX=JNPART×JNGROUP) THEN GO TO L908;
JNHMAX←JNPART×JNGROUP;
WRITE(PRINT,FL905,LIST20);
L908: IF (JNMATP=JNMAT) THEN GO TO L930;
WRITE(PRINT,FL920);
JNOGO←JNOGO+1;
L930: IF (JNBMAXP=JNBMAX) THEN GO TO L960;
WRITE(PRINT,FL950);
JNOGO←JNOGO+1;
L960: IF (JNRMAXP=JNRMAX) THEN GO TO L990;
WRITE(PRINT,FL980);
JNOGO←JNOGO+1;
L990: IF (JNOMAXP=JNOMAX) THEN GO TO L1020;
WRITE(PRINT,FL1010);
JNOGO←JNOGO+1;
L1020: IF (JNPCOLP=JNPCOL) THEN GO TO L1050;
WRITE(PRINT,FL1040);
JNOGO←JNOGO+1;
L1050: IF (JNPAP=JNPA) THEN GO TO L1080;
WRITE(PRINT,FL1070);
JNOGO←JNOGO+1;
L1080: IF (JNRFLBP=JNRFLB) THEN GO TO L2010;
WRITE(PRINT,FL2000);
JNOGO←JNOGO+1;
L2010: IF (JNAOPP=JNAOP) THEN GO TO L2040;
WRITE(PRINT,FL2030);
JNOGO←JNOGO+1;
L2040: IF (JNAGP=JNAG) THEN GO TO L2070;
WRITE(PRINT,FL2060);
```

```
JNOGO←JNOGO+1;
L2070: IF JNOGO>0 THEN GO TO L5;
IF JICHECK≤0 THEN GO TO L2087;
SRCHECK;
L2087: I← 1;
DO BEGIN
J← 2;
DO BEGIN
IF (SVHD[I]>SVHV[J])THEN GO TO L320;
SVTAUHD[I]←SVTAU[J-1]+(SVTAU[J] -SVTAU[J-1])×(SVHD[I]-SVHV[J-1])/
 (SVHV[J]-SVHV[J-1]);
IF (JIDUMP ≤ 0) THEN GO TO L390 ;
WRITE (PRINT, FL350, LIST23) ;
 GO TO L390;
L320: END UNTIL (J←(J+1) )>JNOH;
WRITE (PRINT,FL330,LIST22);
L390: END UNTIL(I←(I+1))>JNOMAX;
       SRMAIN;
SRDBEAM;
GO TO L5;
L3000: ERROR(0);
 END;
COMMENT  INITIALIZING BLOCK;
  XPR←Q←K←0;
 SENSW[1]←FALSE;
 SENSW[2]←FALSE;
 SENSW[3]←FALSE;
 SENSW[4]←FALSE;
 SENSW[5]←FALSE;
 SENSW[6]←FALSE;
 SENSL[1]←FALSE;
 SENSL[2]←FALSE;
```

```
 SENSL[3]+FALSE;
 SENSL[4]+FALSE;
MAINPRO; FINIS: END;
LKNJA+(TIMF(2)-LKNJA)/60;DKVQK+(TIMF(3)-DKVQK)/60;FZOVC+TIME(1);BLZAT;WR
ITE(PRINT[PAGE]);WRITE(PRINT,CHGUB,100×LJLDU+GCPOV,LKNJA,DKVQK);
END.
```

5.2 ALGOL LISTINGS FOR THE LITE-II CODE

```
BEGIN FILE OUT PRINT 1          (2,15);INTEGER XRAZQ,VVUWU,FZOVC,LKNJA,DK
VQK,QRANI,LJLDU,GCPOV;INTEGER ARRAY ZIKLA,QNCCL[0:12];FORMAT HHFRK("TIME
 ON  ",I4,X96,I2,X1,A3," 1965"),CHGUR("TIME OFF ",I4,X30,"PROC. TIME =",
I10," SECS",X20,"I/O TIME =",I10," SECS");DEFINE BLZAT=LJLDU+FZOVC DIV 2
16000;GCPOV+FZOVC MOD 216000/3600#;FILL ZIKLA[*]WITH 0,31,59,90,120,151,
181,212,24[illegible],273,304,334,366;FILL QNCCL[*]WITH 0,"JAN","FEB","MAR","APR",
"MAY","JUN","JUL","AUG","SEP","OCT","NOV","DEC";FZOVC+TIME(1);LKNJA+TIME
(2);DKVQK+TIME(3);VVUWU+TIME(0);QRANI+100×VVUWU.[30:6]+10×VVUWU.[36:6]+V
VUWU.[42:6];XRAZQ+1;WHILE QRANI≥ZIKLA[XRAZQ]DO XRAZQ+XRAZQ+1;QRANI+QRANI
-ZIKLA[XRAZQ-1];BLZAT;WRITE(PRINT[PAGE],HHFRK,100×LJLDU+GCPOV,QRANI,QNCC
L[XRAZQ]);
BEGIN
FILE    CARD  (2,10);          FILE IN DAT (2,10);
FILE OUT PUNCH 0(2,10);
FILE XXXXXX 2(2,15);
SWITCH FILE FILESW+XXXXXX;
LABEL  FINIS;
BOOLEAN ARRAY  SENSL[0:4], SENSW[0:6];
REAL ARRAY
     ABC[0:20],
     SVTFLUX[0:25,     0:10],
      SVFLUX[0:25,0:25,0:10],
      SVDIFCDS[0:50,0:10 ],
      SVPDCOS [0:50,0:10 ],
      SVPHANG [0:50,0:10 ],
      SVAFLUX [0:25,0:10 ],
      SVPOR   [0:37,0:5  ],
      SVRFANG [0:37,0:5  ],
      SVSAFLUX[0:25,0: 10],
      SVSQFLUX[0:25,0:10 ],
      SVFLUD  [0:50,0:10 ],
      SVRFLCDS[0:50,0:10 ],
```

```
        SVA      [0:10 ],
        SVCANG   [0:37 ],
        SVEMP    [0:50 ],
        SVFLUR   [0:10 ],
        SVCIPA   [0:25 ],
        SVFFLUX [0:10 ],
        SVALBEDO[0:5   ],
        SVCDEE   [0:50 ],
        SVDVFLUX[0:10 ],
        SVHO     [0:10 ],
        SVPAG    [0:37 ],
        SVRAYLEE[0:10 ],
        SVSANG   [0:500],
        SVSTFLUX[0:10 ],
        SVWEIGHT[0:500],
        SVOBFLUX[0:10 ],
        SVPFANG [0:50 ],
        SVWAG    [0:37 ],
        SVPRFLT [0:50 ],
        SVRD     [0:10 ],
        SVRFLUX [0:10 ],
        SVSIGNOT[0:10 ],
        SVSUMRHO[0:50 ],
        SVCRATIO [0:10] ,
        SVHV[0:100],
        SVTAU[0:100],
    SVSCATR[0:100],
        SVRAYR[0:100],
        SVTAUHO[0:10],
        SVOBSS  [0:10 ];
    INTEGER ARRAY
        SVIB     [0:4 ,0:50 ],
```

```
    SVMPR   [0:4 ,0:50 ],
    SVJREFLT[0:5   ],
    SVNDFCOS[0:10 ],
    SVNREG  [0:50 ],
    SVINCOL [0:25 ],
    SVMAT   [0:50 ],
    SVNB    [0:50 ],
    SVNPHANG[0:10 ],
    SVNRFANG[0:5   ],
    SVNRICO [0:50 ],
    SVITYPE [0:50 ],
    SVMATERL[0:10 ],
    SVNBOUND[0:50 ],
    SVNPHID [0:10 ],
   NRFB[0:5],
    SVNRFCOS[0:5   ];
REAL
   JALPHA ,    JBETA   ,    JBRAC   ,    JCDEPHI,    JCOTH   ,
   JCOTH1 ,    JCOTH2 ,     JCPA    ,    JCPHI   ,   JCPHI1 ,
   JCPHI2 ,    JCPHID ,     JCPRRD ,     JCPT    ,   JCSA    ,
   JCSANG ,    JCTEP   ,    JDELTA ,     JDEOM   ,   JDIFH   ,
   JDIST  ,    JDLONG ,     JDOM    ,    JDT     ,   JEAH    ,
   JELIM  ,    JFI     ,    JFNPA   ,    JFNRA   ,   JH      ,
   JH1    ,    JH2     ,    JHS     ,    JHT     ,
                                         JPAG    ,   JPJM1   ,
   JPL    ,    JPSCAT ,     JR      ,    JR1     ,   JR2     ,
   JREFL  ,    JRESULT,     JRHO    ,    JRHOT   ,   JRN     ,
   JRRD2  ,    JRRDSQ ,     JRT     ,    JSDEPHI,    JSITH   ,
   JSITH1 ,    JSITH2 ,     JSMVAL ,     JSOD    ,   JSPHI   ,
   JSPHI1 ,    JSPHI2 ,     JSPHID ,     JSPT    ,   JSSANG ,
   JSTEP  ,    JSUMDST,     JSUMSQ ,     JT      ,   JTEMP   ,
   JTS    ,    JUPLMIT,     JWAIT   ,    JWCO    ,   JWHOA   ,
```

```
  JRATLEE, JTAUH, JTAUH1, JTAUH2,
    JX      ,    JXR     ,    JERRORS,    JDMIN  ;
 INTEGER
      JJHB, JJHT, JNREFL, JMAXR, JNMAXR, JIBAS1, JIBAS2,
      JIBAS3, JIBAS4, JIBAS5, JNOH,
                                                    JIBASE ,
    JICB    ,    JIDUMP ,    JJ1     ,    JKA1    ,    JKA2    ,
    JKA3    ,    JKA4   ,    JLA     ,    JLB     ,    JLIBRAY,
    JLOC    ,    JLP    ,    JLSR    ,    JLST    ,    JMAT1   ,
    JMAT2   ,    JMAXCOL,    JMPREG  ,    JNAG    ,    JNAGP   ,
    JNAOP   ,    JNAOPP ,    JNBMAX  ,    JNBMAXP,    JNCB    ,
    JNCM    ,    JNCMAX ,    JNCOL   ,    JNCR    ,    JNCR1   ,
    JNCR2   ,    JNCYC  ,    JNDEVG  ,    JNDMAX  ,    JNDMAXP,
    JNFORM  ,    JNGROUP,    JNHIST  ,    JNHMAX  ,    JNLB    ,
    JNLM    ,    JNMAT  ,    JNMATP  ,    JNOGO   ,    JNPA    ,
    JNPAP   ,    JNPART ,    JNPHASE,    JNPCOL  ,    JNPCOLP,
    JNPROB  ,    JNRA   ,    JNRFLB  ,    JNRFLBP,    JNRING  ,
    JNRMAX  ,    JNRMAXP,    JNRSTOP,    JNSOREG,    JNSY    ,
    JNSP    ,    JNUB   ,    JNWAIT  ,    K,  JNRB ;
REAL  Q,XPR;
FORMAT F(//////"STOP / PAUSE  NO. ",I5);
REAL PROCEDURE INT(ARG1);          VALUE ARG1;        REAL ARG1;
   INT←SIGN(ARG1)×ENTIER(ABS(ARG1));
REAL PROCEDURE TANH(ARG1);         VALUE ARG1;        REAL ARG1;
   TANH←((Q←EXP(ARG1×2))-1)/(Q+1);
REAL PROCEDURE MAX(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;
   MAX←IF ARG1≥ARG2 THEN ARG1 ELSE ARG2;
REAL PROCEDURE MIN(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;
   MIN←IF ARG1≤ARG2 THEN ARG1 ELSE ARG2;
REAL PROCEDURE DIM(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;
   DIM←MAX(ARG1-ARG2,0);
PROCEDURE ERROR(ARG1);             VALUE ARG1;        REAL ARG1;
```

```
BEGIN WRITE(PRINT,F,ARG1); GO TO FINIS END;
PROCEDURE SRRANDA(JIBASE,JRN);
INTEGER JIBASE;
REAL JRN;
BEGIN INTEGER A, B;
      A.[12:18] ← JIBASE.[30:18];
      B.[12:35] ← JIBASE.[13:35];
      JIBASE.[12:36] ← A+B+JIBASE;
      A ← +0;
      A.[21:27] ← JIBASE.[12:27];
      JRN ← A;
      JRN ← JRN/134217728.0;
END SRRANDA;
PROCEDURE SRSEARCH;
BEGIN
INTEGER   JI,JJ,JK;
FORMAT FL23(/" BOUNDARY",I3," HAS BEEN INCORRECTLY IDENTIFIED."),
FL37(/" POINT LIES ON BOUNDARY",I3),
FL85(/" SEARCH CYCLE THROUGH REGIONS IS NOT HANDELED PROPERLY."),
FL95(/" CANNOT FIND REGION FOR POINT WITH COORDINATES R = ",E10.3,
  ", H = ",E10.3);
LIST LIST1(JNCB);
LIST LIST2(JH,JR);
LABEL L5,L10,L20,L25,L30,L35,L38,L40,L50,L60,L80,L90,L97,L100;
L5: JNSY←0;
JNLB←JMPREG;
JNUB←JNRMAX;
L10: JK←JNLB;
DO BEGIN
  JJ←SVNB[JK];
  JI←1;
  DO BEGIN
```

```
        JNCB←ABS(SVIB[JI,JK]);
        IF (XPR←(SVITYPE[JNCB]-1))>0 THEN GO TO L30;
        IF XPR=0 THEN GO TO L25;
        L20: WRITE(PRINT,FL23,LIST1);
        JWHOA←JWHOA+1;
        GO TO L50;
        L25: JYR←SVCOEE[JNCB]-JH;
        GO TO L35;
        L30: JXR←SVCOEE[JNCB]-JR;
        L35: IF (XPR←(JXR))>0 THEN GO TO L40;
        IF XPR<0 THEN GO TO L38;
        WRITE(PRINT,FL37,LIST1);
        JH←JH+JDELTA×JCOTH;
        JR←JR+JDELTA×JSITH×JCPHI;
        GO TO L5;
        L38: IF (XPR←(SVIB[JI,JK]))>0 THEN GO TO L60;
        IF XPR=0 THEN GO TO L20 ELSE GO TO L50;
        L40: IF (XPR←(SVIB[JI,JK]))=0 THEN GO TO L20;
        IF XPR<0 THEN GO TO L60;
        L50: END UNTIL (JI←(JI+1))>JJ;
      JNCR←JK;
      GO TO L100;
      L60: END UNTIL (JK←(JK+1))>JNUB;
    IF (XPR←(JNSY))>0 THEN GO TO L90;
    IF XPR<0 THEN GO TO L80;
    JNSY←1;
    JNLB←1;
    JNUB←JMPREG;
    GO TO L10;
    L80: WRITE(PRINT,FL85);
    JWHOA←JWHOA+1;
    GO TO L97;
```

```
L90: WRITE(PRINT,FL95,LIST2);
JWHOA←JWHOA+1;
L97: JNCR←0;
L100:  END;
PROCEDURE SRDSTBD;
BEGIN
INTEGER      JJ,JK;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRSEARCH;
FORMAT FL15(" BOUNDARY",I3," HAS BEEN IDENTIFIED INCORRECTLY."),
FL55(/" LOC =",I4,"  ICB =",I4,"  X =",E10.3,"  BRAC =",E10.3,
   "  DIST =",E10.3/" H =",E10.3,"  R =",E10.3,"  CDEE(ICB) =",E10.3,
   "  ITYPE(ICB) =",I4),
FL75(/" COLLISION POINT IS WITHIN A DISTANCE OF 1.1 DELTA FROM BOUNDAR",
"Y",I4,".  IT WAS MOVED OFF THE BOUNDARY.");
LIST LIST1(JICB);
LIST LIST2(JLOC,JICB,JX,JBRAC,JDIST,JH,JR,SVCDEE[JICB],SVITYPE[
 JICB]);
LIST LIST3(JNCB);
LABEL L5,L20,L30,L36,L38,L39,L56,L60,L80;
JNCB←0;
JJ1←1;
JLOC←105;
L5: JDIST←JDLONG;
JK←SVNB[JNCR];
JJ←1;
DO BEGIN
  JICB←ABS(SVIB[JJ,JNCR]);
  IF (XPR←(SVITYPE[JICB]-1))>0 THEN GO TO L30;
  IF XPR=0 THEN GO TO L20;
  WRITE(PRINT,FL15,LIST1);
  JWHOA←JWHOA+1;
```

```
   GO TO L80;
   L20: IF (ABS(JCOTH)≤JSMVAL) THEN GO TO L60;
   JX←(SVCOEE[JICB]-JH)/JCOTH;
   GO TO L39;
   L30: IF (ABS(JSITH)≤JSMVAL) THEN GO TO L60;
   JBRAC←(SVCOEE[JICB]*2-(JR×JSPHI)*2);
   IF JBRAC≤0 THEN GO TO L60;
   IF (XPR←(SVCOEE[JICB]-JR))>0 THEN GO TO L38;
   IF XPR<0 THEN GO TO L36;
   JMPREG←JNCR;
   SRSEARCH;
   IF (JERRORS≥JWHOA) THEN GO TO L5 ELSE GO TO L80;
   L36: JX←(-JR×JCPHI-SQRT(JBRAC))/JSITH;
   GO TO L39;
   L38: JX←(-JR×JCPHI+SQRT(JBRAC))/JSITH;
   L39: IF JIDUMP≤0 THEN GO TO L56;
   WRITE(PRINT,FL55,LIST2);
   L56: IF JX≤0 THEN GO TO L60;
   IF (JDIST≤JX) THEN GO TO L60;
   JDIST←JX+JDELTA;
   JNCB←JICB;
   JJ1←JJ;
   L60: END UNTIL (JJ←(JJ+1))>JK;
IF (JDIST≥1.1×JDELTA) THEN GO TO L80;
WRITE(PRINT,FL75,LIST3);
JH←JH+JDELTA×JCOTH;
JR←JR+JDELTA×JSITH×JCPHI;
JMPREG←SVMPR[JJ1,JNCR];
SRSEARCH;
IF JNCR>0 THEN GO TO L5;
L80:  END;
PROCEDURE SRDETECT;
```

```
BEGIN
   INTEGER JL, JM, JLC, JI, JJ3, JJ2;
FORMAT FL190(" LOC =",I4," LA =",I4," LC =",I4," LP =",I4,
   " NCR1 =",I4/" COTH =",S1,E13.3," I =",I4," H2 =",S1,E13.3,
   " HD[I] =",S1,E13.3),
       FL240(" LOC= ",I4," J2 =",I4/" RESULT=",S1,E10.3," FLUX =",
         S1, E13.3,
   " FLUD =",S1,E13.3," RFLUX =",S1,E13.3," REFL =",S1,E10.3," AFLUX =",
S1,E13.3);
LIST LIST1(JLOC, JLA, JLC, JLP, JNCR1, JCOTH, JI, JH2, SVHD[JI]);
LIST LIST2(JLOC,JJ2, JRESULT,SVFLUX[JLA,JLP,JJ2],SVFLUD[JNCR2,JJ2],
    SVRFLUX[JJ2],JREFL, SVAFLUX[JLC,JJ2]);
LABEL L20,L40,L60,L70,L90,L100,L120,L130,L150,L160,L170,L200,L220,
 L250,L300;
COMMENT  CALCULATION OF FLUX CROSSING ALTITUDE PLANE;
COMMENT  DETECTORS;
COMMENT  DETERMINE INDEX, LA FOR FOR PRINTOUT ANGLES.;
JL←1;
DO BEGIN
  IF (JCOTH2≥SVCIPA[JL]) THEN GO TO L20;
  END UNTIL (JL←(JL+1))>JNPA;
L20: JLA←JL;
COMMENT  DETERMINE NUMBER OF COLLOSION PRINTOUT GROUP INDEX, LC.;
JM←1;
DO BEGIN
  IF (SVINCOL[JM]≥JNCOL) THEN GO TO L40;
  END UNTIL (JM←(JM+1))>JNPCOL;
L40: JLC←JM;
COMMENT  DETERMINE NUMBER OF REFLECTION PRINTOUT GROUP INDEX, LP.;
JM←1;
DO BEGIN
  IF (JM≥JNREFL) THEN GO TO L60;
```

```
  END UNTIL (JM←(JM+1))>JMAXR;
L60: JLP←JM;
L70: JI←1;
DO BEGIN
  IF (XPR←(JH2-SVHD[JI]))=0 THEN GO TO L90;
  IF XPR<0 THEN GO TO L100;
  END UNTIL (JI←(JI+1))>JNDMAX;
IF (JCOTH2+JSMVAL)≥0 THEN GO TO L300 ELSE GO TO L120;
L90: JH2←JH2+JDELTA×JCOTH2;
GO TO L70;
COMMENT  H2 IS BELOW DETECTOR PLANE HD(I);
L100: IF (ABS(JCOTH2)≤JSMVAL) THEN GO TO L300;
IF (XPR←(JCOTH2))>0 THEN GO TO L160;
COMMENT  FLUX IS CALCULATED FOR DETECTORS BELOW H2;
IF XPR=0 THEN GO TO L300 ELSE GO TO L130;
L120: JJ3←JNDMAX;
GO TO L150;
L130: IF (JI≤1) THEN GO TO L300;
JJ3←JI-1;
L150: JJ1←1;
GO TO L170;
COMMENT  FLUX IS CALCULATED FOR DETECTOR PLANES ABOVE H2;
L160: JJ3←JNDMAX;
JJ1←JI;
L170: IF JIDUMP≤0 THEN GO TO L200;
JLOC←90;
  WRITE(PRINT,FL190,LIST1);
COMMENT  CALCULATE FLUXES;
L200: JJ2←JJ1;
DO BEGIN
  JRESULT←JWAIT×EXP((JTAUH2-SVTAUHD[JJ2])/JCOTH2)/ABS(JCOTH2);
  SVFLUX[JLA,JLP,JJ2]←SVFLUX[JLA,JLP,JJ2] +JRESULT;
```

```
  SVFLUD[JNCR2,JJ2]←SVFLUD[JNCR2,JJ2]+JRESULT;
  SVAFLUX[JLC,JJ2]←SVAFLUX[JLC,JJ2]+JRESULT;
  IF JREFL≤0 THEN GO TO L220;
  SVRFLUX[JJ2]←SVRFLUX[JJ2]+JRESULT;
  L220: JLOC←110;
  IF JIDUMP≤0 THEN GO TO L250;
WRITE(PRINT,FL240,LIST2);
  L250: END UNTIL (JJ2←(JJ2+1))>JJ3;
L300:  END;
PROCEDURE SRANSWER;
BEGIN
   REAL ARRAY SVIIREF[0:25];
REAL  JFGROUP,JFNHMAX;     INTEGER  JI,JJ,JK,JN,JM ;
INTEGER  DX1;
FORMAT FL110(" RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM",I10),
FL120(/" HISTORY TERMINATION COUNTERS."),
FL130(/" ",I9,
   " HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED",I6,
   "."/I10,
   " HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS."/
   I10," HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF." /I10,
  " HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS. "),
    FL135 (/" ",I9,
       " COLLISIONS OCCURRED."),
FL150(/
   " PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAM",
   "ETERS."),
FL160(/
   " REGION HISTORIES   REGION HISTORIES   REGION HISTORIES   REGIO",
   "N HISTORIES"/
   "         TERMINATED          TERMINATED          TERMINATED       ",
   "  TERMINATED"),
```

```
FL170(" ",I4,I9,I10,I9,I10,I9,I10,I9),
FL190(/
   "   SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF ",
   "REFLECTIONS FROM SURFACE 1"),
FL200("        SOURCE HEIGHT H=",E10.3,".   DETECTOR COORDINATES  HD=",
   E10.3," RD=",",E10.1,01),
FL210("  ANGLE",X27,"NUMBER OF REFLECTIONS"),
FL250(" (COSINE)",I8,6(X9,I2)),
FL262(" (COSINE)    TOTAL"),
FL264(" ",X23,"TOTAL"),
FL266(" ",X34,"TOTAL"),
FL268(" ",X45,"TOTAL"),
FL270(" ",X56,"TOTAL").
FL272(" ",X67,"TOTAL"),
FL274(" ",X78,"TOTAL"),
FL280(" ",R7.4,X1,7E11.4),
FL300(/"  TOTAL   ",7E11.4),
FL450(/
   "                   SCATTERED LIGHT INTENSITY VERSUS REGION OF ",
   "SCATTER"),
FL460(/"  REGION   ",X30,"DETECTOR"),
FL485(/"              01"),
FL495(/"              01          02"),
FL505(/"              01          02          03"),
FL515(/"              01          02          03          04"),
FL525(/"              01          02          03          04          05"),
FL535(/
   "          01          02          03          04          05 ",
   "     06"),
FL545(/
   "          01          02          03          04          05 ",
   "     06          07"),
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FL560("    ",I2,X3,7E11.4),
FL580(/"  TOTAL  ",7E11.4),
FL605(/"               08"),
FL615(/"               08         09"),
FL625(/"               08         09          10"),
FL680(" LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR."),
FL690(/" DETECTOR",I3,", REFLECTED FLUX =",E10.3);
LIST LIST1(JNPROB);
    LIST LIST14 (JNOGO);
LIST LIST2(JMAXCOL,JNCMAX,JNRSTOP,JNWAIT,JNMAXR) ;
LIST LIST3(FOR DX1←1 STEP 1 UNTIL JNRMAX DO [DX1,SVNRICD[DX1]]);
LIST LIST4(JHS,SVHD[JJ],SVRD[JJ]);
LIST LIST5(FOR DX1←JKA1 STEP 1 UNTIL JKA2 DO SVIIREF[DX1]);
LIST LIST6(SVCIPA[JN],FOR DX1←JKA1 STEP 1 UNTIL JKA2 DO  SVFLUX[
 JN,DX1,JJ]);
LIST LIST7(FOR DX1←JKA1 STEP 1 UNTIL JKA2 DO  SVTFLUX[DX1,JJ]);
LIST LIST9(SVNREG[JI],FOR DX1←1 STEP 1 UNTIL JNFORM DO SVFLUD[JI,
 DX1]);
LIST LIST10(FOR DX1←1 STEP 1 UNTIL JNFORM DO SVFLUR[DX1]);
LIST LIST11(SVNREG[JI],FOR DX1←8 STEP 1 UNTIL JNFORM DO SVFLUD[
 JI,DX1]);
LIST LIST12(FOR DX1←8 STEP 1 UNTIL JNFORM DO SVFLUR[DX1]);
LIST LIST13(JI,SVRFLUX[JI]);
BEGIN
LABEL L180,L185,L240,L261,L263,L265,L267,L269,L271,L273,L275,L430,
 L440,L480,L490,L500,L510,L520,L530,L540,L550,L600,L610,L620,L650,
 L670;
SWITCH SWGO1←L261,L263,L265,L267,L269,L271,L273,L275;
SWITCH SWGO2←L480,L490,L500,L510,L520,L530,L540,L600,L610,L620;
JFNHMAX←JNHMAX;
JFGROUP←JNGROUP;
JJ←1;
```

```
DO BEGIN
  JLST←JMAXR+1;
  JI←1;
  DO BEGIN
    JK←1;
    DO BEGIN
       SVFLUX[JK,JI,JJ]← SVFLUX[JK,JI,JJ]/JFNHHMAX;
       SVFLUX[JK,JLST,JJ]← SVFLUX[JK,JLST,JJ]+ SVFLUX[JK,JI,JJ];
   SVTFLUX[JI,JJ]←SVTFLUX[JI,JJ]+SVFLUX[JK,JI,JJ];
      END UNTIL (JK←(JK+1))>JNPA;
   SVTFLUX[JLST,JJ]←SVTFLUX[JLST,JJ]+SVTFLUX[JI,JJ];
  SVIIREF[JI]←JI-1;
    END UNTIL (JI←(JI+1))>JMAXR;
  JM←1;
  DO BEGIN
    SVFLUD[JM,JJ]←SVFLUD[JM,JJ]/JFNHHMAX;
    SVFLUR[JJ]←SVFLUR[JJ]+SVFLUD[JM,JJ];
    END UNTIL (JM←(JM+1))>JNRMAX;
  SVRFLUX[JJ]←SVRFLUX[JJ]/JFNHHMAX;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
COMMENT  SUBROUTINE RESULT;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL120);
WRITE(PRINT,FL130,LIST2);
    WRITE (PRINT,FL135,LIST14);
IF JNRSTOP≤0 THEN GO TO L180;
WRITE(PRINT,FL150);
WRITE(PRINT,FL160);
WRITE(PRINT,FL170,LIST3);
L180: JJ←1;
DO BEGIN
```

```
JKA2←0;
JKA3←0;
L185: WRITE(PRINT[PAGE]);
      WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL190);
WRITE(PRINT,FL200,LIST4);
WRITE(PRINT,FL210);
JKA1←JKA2+1;
JKA2←JKA1+6;
IF (JKA2≤JMAXR) THEN GO TO L240;
JKA3←1;
JKA2←JMAXR;
IF (JKA1>JMAXR) THEN GO TO L261;
L240: WRITE(PRINT,FL250,LIST5);
IF JKA3≤0 THEN GO TO L275;
JKA2←JKA2+1;
JKA4←JKA2-JKA1+1;
GO TO SWGO1[JKA4];
L261: WRITE(PRINT,FL262);
GO TO L275;
L263: WRITE(PRINT,FL264);
GO TO L275;
L265: WRITE(PRINT,FL266);
GO TO L275;
L267: WRITE(PRINT,FL268);
GO TO L275;
L269: WRITE(PRINT,FL270);
GO TO L275;
L271: WRITE(PRINT,FL272);
GO TO L275;
L273: WRITE(PRINT,FL274);
L275: JN←1;
```

```
  DO BEGIN
    WRITE(PRINT,FL280,LIST6);
    END UNTIL (JN←(JN+1))>JNPA;
  WRITE(PRINT,FL300,LIST7);
  IF JKA3≤0 THEN GO TO L185;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
IF (JNDMAX>7) THEN GO TO L430;
JNFORM←JNDMAX;
GO TO L440;
L430: JNFORM←7;
L440: WRITE(PRINT[PAGE]);
      WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL450);
WRITE(PRINT,FL460);
GO TO SWGO2[JNFORM];
L480: WRITE(PRINT,FL485);
GO TO L550;
L490: WRITE(PRINT,FL495);
GO TO L550;
L500: WRITE(PRINT,FL505);
GO TO L550;
L510: WRITE(PRINT,FL515);
GO TO L550;
L520: WRITE(PRINT,FL525);
GO TO L550;
L530: WRITE(PRINT,FL535);
GO TO L550;
L540: WRITE(PRINT,FL545);
L550: JI←1;
DO BEGIN
  WRITE(PRINT,FL560,LIST9);
  END UNTIL (JI←(JI+1))>JNRMAX;
```

```
WRITE(PRINT,FL580,LIST10);
IF (JNDMAX≤JNFORM) THEN GO TO L670;
JNFORM←JNDMAX;
GO TO L440;
L600: WRITE(PRINT,FL605);
GO TO L650;
L610: WRITE(PRINT,FL615);
GO TO L650;
L620: WRITE(PRINT,FL625);
L650: JI←1;
DO BEGIN
  WRITE(PRINT,FL560,LIST11);
  END UNTIL (JI←(JI+1))>JNRMAX;
WRITE(PRINT,FL580,LIST12);
L670: WRITE(PRINT[PAGE]);
      WRITE(PRINT,FL680);
JI←1;
DO BEGIN
  WRITE(PRINT,FL690,LIST13);
  END UNTIL (JI←(JI+1))>JNDMAX;
 END END;
PROCEDURE SRAVPAGE;
BEGIN
INTEGER  DX1,JI,JJ,JK ,JINDX ;
REAL JFPART,JFGROUP;
FORMAT FL110(" ",X29,"FLUXES FOR DEVIATION GROUP",I3,"."),
FL120(/" COLLISIONS",X30,"DETECTOR"),
FL145(/"           01"),
FL155(/"           01         02"),
FL165(/"           01         02         03"),
FL175(/"           01         02         03         04"),
FL185(/"           01         02         03         04         05"),
```

```
FL195(/
   "              01          02          03          04          05  ",
   "       06"),
FL205(/
   "              01          02          03          04          05  ",
   "       06          07"),
FL220("    ",I2,X3,7E11.4),
FL230(/"  TOTAL  ",7E11.4),
FL265(/"               08"),
FL275(/"               08          09"),
FL285(/"               08          09          10"),
FL320(/" BASE FOR RANDOM NUMBER GENFRATOR IS",I13),
FL400 (/" ",X11,
   " SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER."),
 FL450 (" ",X11,
    " INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.");
LIST LIST1(JNOEVG);
LIST LIST2(SVINCOL[JI],FOR OX1←1 STEP 1 UNTIL JNFORM DO SVAFLUX[
 JI,OX1]);
LIST LIST3(FOR OX1←1 STEP 1 UNTIL JNFORM DO SVSTFLUX[OX1]);
LIST LIST4(SVINCOL[JI],FOR OX1←8 STEP 1 UNTIL JNOMAX DO SVAFLUX[
 JI,OX1]);
LIST LIST5(FOR OX1←8 STEP 1 UNTIL JNOMAX DO SVSTFLUX[OX1]);
LIST LIST6(JIBASE);
LABEL L125,L130,L140,L150,L160,L170,L180,L190,L200,L210,L260,L270,
 L280,L290,L310, L115, L410, L450;
SWITCH SWG01←L140,L150,L160,L170,L180,L190,L200;
SWITCH SWG02←L260,L270,L280;
JNOEVG←JNOEVG+1;
     JINDX ← 0 ;
JFPART←JNPART;
     JFGROUP ← JNGROUP ;
```

```
JJ+1;
DO BEGIN
  SVSTFLUX[JJ]+0;
  JI+1;
  DO BEGIN
    SVAFLUX[JI,JJ]+SVAFLUX[JI,JJ]/JFPART;
    SVSAFLUX[JI,JJ]+SVSAFLUX[JI,JJ]+SVAFLUX[JI,JJ];
    SVSQFLUX[JI,JJ]+SVSQFLUX[JI,JJ]+SVAFLUX[JI,JJ]*2;
  SVSTFLUX[JJ]+SVSTFLUX[JJ]+SVAFLUX[JI,JJ];
    END UNTIL (JI+(JI+1))>JNPCOL;
  SVFFLUX[JJ]+SVFFLUX[JJ]+SVSTFLUX[JJ];
  SVDVFLUX[JJ]+SVDVFLUX[JJ]+SVSTFLUX[JJ]*2;
  END UNTIL (JJ+(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL110,LIST1);
L115: WRITE(PRINT,FL120);
IF (JNDMAX>7) THEN GO TO L125;
JNFORM+JNDMAX;
GO TO L130;
L125: JNFORM+7;
L130: GO TO SWGO1[JNFORM];
L140: WRITE(PRINT,FL145);
GO TO L210;
L150: WRITE(PRINT,FL155);
GO TO L210;
L160: WRITE(PRINT,FL165);
GO TO L210;
L170: WRITE(PRINT,FL175);
GO TO L210;
L180: WRITE(PRINT,FL185);
GO TO L210;
L190: WRITE(PRINT,FL195);
```

```
GO TO L210;
L200: WRITE(PRINT,FL205);
L210: JI←1;
DO BEGIN
  WRITE(PRINT,FL220,LIST2);
  END UNTIL (JI←(JI+1))>JNPCOL;
WRITE(PRINT,FL230,LIST3);
IF (JNDMAX≤JNFORM) THEN GO TO L310;
JNFORM←JNDMAX-JNFORM;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL110,LIST1);
WRITE(PRINT,FL120);
GO TO SWGO2[JNFORM];
L260: WRITE(PRINT,FL265);
GO TO L290;
L270: WRITE(PRINT,FL275);
GO TO L290;
L280: WRITE(PRINT,FL285);
L290: JI←1;
DO BEGIN
  WRITE(PRINT,FL220,LIST4);
  END UNTIL (JI←(JI+1))>JNPCOL;
WRITE(PRINT,FL230,LIST5);
L310: WRITE(PRINT,FL320,LIST6);
JJ←1;
DO BEGIN
  JI←1;
  DO BEGIN
  SVAFLUX[JI,JJ]←0;
    END UNTIL (JI←(JI+1))>JNPCOL END  UNTIL (JJ←(JJ+1))>JNDMAX;
IF (JNHIST<JNHMAX) THEN GO TO L450;
IF (XPR←(JINDX))>0 THEN GO TO L450;
```

```
IF XPR<0 THEN GO TO L410;
JINDX←-1;
JJ←1;
DO BEGIN
  JI←1;
  DO BEGIN
  SVAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]/JFGROUP;
    END UNTIL (JI←(JI+1))>JNPCOL;
  SVSTFLUX[JJ]←SVFFLUX[JJ]/JFGROUP;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL400);
GO TO L115;
L410: JINDX←1;
JJ←1;
DO BEGIN
  JI←1;
  DO BEGIN
    SVAFLUX [JI,JJ]←SQRT((SVSQFLUX[JI,JJ]/JFGROUP*2)-(SVSAFLUX[
     JI,JJ])*2/(JFGROUP*3)));
    END UNTIL (JI←(JI+1))>JNPCOL;
       SVSTFLUX[JJ]←SQRT((SVDVFLUX[JJ]/JFGROUP*2)-(SVFFLUX[JJ]*2/
   JFGROUP*3)));
  END UNTIL (JJ←(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL450);
GO TO L115;
L450:  END;
PROCEDURE SRANGLE;
BEGIN
INTEGER  JJ,JI ;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
```

```
    SRRANDA;
FORMAT FL15(/" NO ANGLE PROBABILITY COULD BE FOUND GREATER THAN",E10.3),
FL34(/" INCORRECT SUBSCRIPT FOR ANGLE PROBABILITY.");
LIST LIST1(JRN);
LABEL L20,L35,L40,L45,L50;
JI←1;
DO BEGIN
  SRRANDA(JIBASE,JRN);
  JJ←1;
  DO BEGIN
    IF (SVPAG[JJ]≥JRN) THEN GO TO L20;
    END UNTIL (JJ←(JJ+1))>JNAG;
  WRITE(PRINT,FL15,LIST1);
  JWHOA←JWHOA+1;
  GO TO L50;
  L20: IF (JJ>1) THEN GO TO L35;
  WRITE(PRINT,FL34);
  JWHOA←JWHOA+1;
  GO TO L50;
  L35: SRRANDA(JIBAS1,JRN);
  SVSANG[JI]←SVCANG[JJ-1]-JRN×(SVCANG[JJ-1]-SVCANG[JJ]);
  IF (XPR←(JNAOP))>0 THEN GO TO L40;
  IF XPR<0 THEN GO TO L45;
  JPJM1←SVPAG[JJ-1];
  SVWEIGHT[JI]←(1/(SVPAG[JJ]-JPJM1))×(SVCANG[JJ-1]-SVCANG[JJ])/(SVCANG[1
]-SVCANG[JNAG]);
  GO TO L50;
  L40: SVWEIGHT[JI]←SVWAG[JJ];
  GO TO L50;
  L45: SVWEIGHT[JI]←1;
  L50: END UNTIL (JI←(JI+1))>JNPART;
 END;
```

```
PROCEDURE SRPATHL;
BEGIN
  INTEGER JJ;      REAL ADJUST  ;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRRANDA;
FORMAT FL130(/" LOC =",I4," J =",I4," JHB =",I4," JHT =",I4," RN =",
S1,E10.3/" RHO =",S1,E10.3," COTH =",S1,E10.3," TAUH1 =",S1,E10.3,
   " TAUH2 =",S1,E10.3/" PL =",S1,E10.3," H2 =",S1,E10.3));
LIST LIST1(JLOC,JJ,JJHB,JJHT,JRN,JRHO,JCOTH,JTAUH1,JTAUH2,JPL,JH2);
LABEL L30,L50,L70,L100,L105,L140,L60,L110,L25;
SRRANDA(JIBAS2,JRN);
JLOC←25;
JPL←0;
IF (ABS(JCOTH) ≤ JSMVAL) THEN GO TO L25 ;
IF JCOTH>0 THEN GO TO L30;
L25 :  JRHO ← -LN(JRN) ;
GO TO L50;
L30:  JUPLMIT ← (SVTAU[JNOH] - JTAUH1) / JCOTH ;
ADJUST ← 1 - EXP(-JUPLMIT) ;
JRHO ← -LN(1 - JRN × ADJUST) ;
JWAIT ← JWAIT × ADJUST ;
L50: JTAUH2←JTAUH1+JRHO×JCOTH;
IF (JTAUH2>0) THEN GO TO L60;
JTAUH2←SVTAU[1];
  JH2←-JDLONG;
  JJHB←1;
JJHT←2;
GO TO L105;
L60: JJ←1;
DO BEGIN
  IF (JTAUH2<SVTAU[JJ]) THEN GO TO L70;
  END UNTIL (JJ←(JJ+1))>JNOH;
```

```
JH2←JDLONG;
JJHB←JNDH-1;
JJHT←JNDH;
GO TO L105;
L70: JJHB←JJ-1;
JJHT←JJ;
IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;
JH2←JH;
JPL←JRHO/((SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]));
GO TO L110;
L100: JH2←SVHV[JJHB]+(SVHV[JJHT]-SVHV[JJHB])×(JTAUH2-SVTAU[JJHB])/(
 SVTAU[JJHT]-SVTAU[JJHB]);
L105: JPL←(JH2-JH1)/JCOTH;
L110: IF JIDUMP≤0 THEN GO TO L140;
WRITE(PRINT,FL130,LIST1);
L140:  END;
PROCEDURE SRINITAL;
BEGIN
INTEGER JJ,JI,JK,JN ;
JJ←1;
DO BEGIN
  JLB←JNPCOL+1;
  JI←1;
  DO BEGIN
    SVSAFLUX[JI,JJ]←0;
    SVSQFLUX[JI,JJ]←0;
      SVTFLUX[   JI,JJ]←0;
    JK←1;
    DO BEGIN
      SVFLUX[JK,JI,JJ]←0;
      END UNTIL (JK←(JK+1))>JNPA;
    END UNTIL (JI←(JI+1))>JLB;
```

```
  JN←1;
  DO BEGIN
    SVFLUD[JN,JJ]←0;
    END UNTIL (JN←(JN+1))>JNRMAX;
  SVRFLUX[JJ]←0;
  SVFFLUX[JJ]←0;
  SVDVFLUX[JJ]←0;
  SVFLUR[JJ]←0;
  END UNTIL (JJ←(JJ+1))>JNDMAX;
    JMAXCOL ← 0;
    JNWAIT ← 0;
    JNOGO ← 0;
    JI ← 1;
    DO BEGIN
       SVNRICO[JI] ← 0 ;
       END UNTIL(JI←(JI+1))>JNRMAX;
 END;
PROCEDURE SRREFLCT;
BEGIN
REAL  JDENOM;        INTEGER   JI,JJAIL;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRRANDA;
FORMAT FL35(/" REFLECTION ANGLE DISTRIBUTION FOR BOUNDARY",I3,
   " IS IN ERROR.");
LIST LIST1(JNRB);
LABEL L10,L15,L20,L33,L40,L60,L70,L80,L100;
SWITCH SWGO1←L10,L20,L15,L20;
SRRANDA(JIBAS3,JRN);
JNRB←JNCB;
JJAIL←SVJREFLT[JNRB];
GO TO SWGO1[JJAIL];
L10: JCOTH1←JRN;
```

```
GO TO L70;
L15: JCOTH1←-JRN;
GO TO L70;
L20: JNRA←SVNRFCOS[JNRB];
JFNRA←JNRA;
JI←1;
DO BEGIN
  JFI←JI;
  SVPRFLT[JI]←JFI/JFNRA;
  IF (JRN≤SVPRFLT[JI]) THEN GO TO L40;
  END UNTIL (JI←(JI+1))>JNRA;
L33: WRITE(PRINT,FL35,LIST1);
JWHOA←JWHOA+1;
GO TO L100;
L40: IF (XPR←(JI-1))>0 THEN GO TO L60;
IF XPR<0 THEN GO TO L33;
JCOTH1←1+(JRN/SVPRFLT[JI])×(SVRFLCOS[JI,JNRB]-1);
GO TO L70;
L60: JCOTH1←SVRFLCOS[JI-1,JNRB]+((JRN-SVPRFLT[JI-1])/(SVPRFLT[JI]-
 SVPRFLT[JI-1]))×(SVRFLCOS[JI,JNRB]-SVRFLCOS[JI-1,JNRB]);
L70: JSITH1←SQRT(1-JCOTH1*2);
L80: SRRANDA(JIBAS4,JRN);
JSPT←2×JRN-1;
SRRANDA(JIBAS5,JRN);
JCPT←2×JRN-1;
JDENOM←JCPT*2+JSPT*2;
IF (JDENOM>1) THEN GO TO L80;
JDENOM←SQRT(JDENOM);
JCPHI1←JCPT/JDENOM;
JSPHI1←JSPT/JDENOM;
L100:  END;
PROCEDURE SRSCTANG;
```

```
BEGIN
REAL  JCOPHI, JSDPHI;   INTEGER  JI,JNPASE ;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRREFLCT, SRRANDA;
FORMAT FL80(/" THE PHASE ANGLE PROBABILITIES FOR MATERIAL",I3,
   " ARE INCORRECT."),
FL139(/" LOC =",I4," NPHASE =",I4," NCM =",I4," REFL =",E10.3,
   "  CSANG =",E10.3/" SSANG =",E10.3,"  CTEP =",E10.3,"  STEP =",E10.3,
"  DEDM =",E10.3,"  CDPHI =",E10.3/" SDPHI =",E10.3,"  COTH2 =",E10.3,
   "  SITH2 =",E10.3,"  SDEPHI =",E10.3/" CDEPHI =",E10.3,"  CPHI2 =",
   E10.3,"  SPHI2 =",E10.3,"  COTH1 =",E10.3/" SITH1 =",E10.3,
   "  CPHI1 =",E10.3,"  SPHI1 =",E10.3,"  RN =",E10.3);
LIST LIST1(JNCM);
LIST LIST2(JLOC,JNPHASE,JNCM,JREFL,JCSANG,JSSANG,JCTEP,JSTEP,JDEDM,
 JCDPHI,JSDPHI,JCOTH2,JSITH2,JSDEPHI,JCDEPHI,JCPHI2,JSPHI2,JCOTH1,
 JSITH1,JCPHI1,JSPHI1,JRN);
LABEL L5,L10,L50,L90,L110,L120,L130,L137,L140;
IF JREFL≤0 THEN GO TO L5;
SRREFLCT;
GO TO L137;
L5: SRRANDA(JIBASE,JRN);
IF (JRN> JRATLEE)       THEN GO TO L50;
L10: SRRANDA(JIBAS1,JRN);
JCSANG←1-2×JRN;
SRRANDA(JIBAS2,JRN);
IF (JRN≤.5) THEN GO TO L120;
SRRANDA(JIBAS3,JRN);
IF (JRN>JCSANG×JCSANG) THEN GO TO L10 ELSE GO TO L120;
L50: SRRANDA(JIBAS4,JRN);
JNPASE←SVNPHANG[JNCM];
JFNPA←JNPASE;
JI←1;
```

```
DO BEGIN
  JFI←JI;
  SVPFANG[JI]←JFI/JFNPA;
  IF (JRN≤SVPFANG[JI]) THEN GO TO L90;
  END UNTIL (JI←(JI+1))>JNPASE;
WRITE(PRINT,FL80,LIST1);
JWHOA←JWHOA+1;
GO TO L140;
L90: IF (JFI>1) THEN GO TO L110;
JCSANG←1+(JRN/SVPFANG[JI])×(SVPHANG[JI,JNCM]-1);
GO TO L120;
L110: JCSANG←SVPHANG[JI-1,JNCM]+((JRN-SVPFANG[JI-1])/(SVPFANG[JI]-
 SVPFANG[JI-1]))×(SVPHANG[JI,JNCM]-SVPHANG[JI-1,JNCM]);
L120: JSSANG←SQRT(1-JCSANG×JCSANG);
L130: SRRANDA(JIBASE,JRN);
JCTEP←1-2×JRN;
SRRANDA(JIBASE,JRN);
JSTEP←1-2×JRN;
JDEOM←JCTEP*2+JSTEP*2;
IF (JDEOM>1) THEN GO TO L130;
JDEOM←SQRT(JDEOM);
JCOPHI←JCTEP/JDEOM;
JSOPHI←JSTEP/JDEOM;
 IF JSITH2 < JSMVAL THEN BEGIN JCOTH1 ← JCSANG×JCOTH2
 JSITH1 ← JSSANG;
JCPHI1 ← JCOPHI;
 JSPHI1 ← JSOPHI;
 END ELSE BEGIN
JCOTH1←JCOTH2×JCSANG+JSITH2×JSSANG×JCOPHI;
JSITH1←SQRT(1-JCOTH1×JCOTH1);
JSOEPHI←(JSSANG×JSOPHI)/JSITH1;
JCOEPHI←(JCSANG-JCOTH1×JCOTH2)/(JSITH1×JSITH2);
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```
JCPHI1←JCPHI2×JCDEPHI-JSPHI2×JSDEPHI;
JSPHI1←JSPHI2×JCDEPHI+JCPHI2×JSDEPHI;
 END;
L137: JCOTH2←JCOTH1;
JSITH2←JSITH1;
JCPHI2←JCPHI1;
JSPHI2←JSPHI1;
JLOC←80;
IF JIDUMP≤0 THEN GO TO L140;
WRITE(PRINT,FL139,LIST2);
L140:  END;
PROCEDURE SRDBEAM;
BEGIN
INTEGER JJ, JJ2;  REAL   JVD;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRDSTBD, SRSEARCH;
FORMAT FL11(" HS IS GREATER THAN HV(NOH).                              "),
       FL230(" RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM",I10),
FL240(/" DIRECT BEAM LIGHT INTENSITIES"//
   "  DETECTOR   DIRECT INTENSITY"),
FL250(/" ",I6,X8,E11.4);
LIST LIST1(JNPROB);
LIST LIST2(JJ,SVDBFLUX[JJ]);
LABEL L3,L100,L210,L300,L280;
JJ2←2;
DO BEGIN
  IF (JHS≤SVHV[JJ2]) THEN GO TO L3;
  END UNTIL (JJ2←(JJ2+1))>JNOH;
WRITE(PRINT,FL11);
GO TO L300;
L3: JJHB←JJ2-1;
JJHT←JJ2;
```

```
JJ+1;
DO BEGIN
  JVD+SVHD[JJ]-JHS;
  JT+SQRT(JVD*2+SVRD[JJ]*2));
  JCOTH+JVD/JT;
  IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;
      JRHOT+JT×(SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]));
      GO TO L210;
      L100: JRHOT + (SVTAUHD[JJ]-JTAUH )/JCOTH;
  L210: SVDBFLUX[JJ]+SVDBSS[JJ]×EXP(-JRHOT)/JT*2;
  END UNTIL (JJ+(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL230,LIST1);
WRITE(PRINT,FL240);
JJ+1;
DO BEGIN
  WRITE(PRINT,FL250,LIST2);
  END UNTIL (JJ+(JJ+1))>JNDMAX;
WRITE(PRINT[PAGE]);
L280: JWHOA+JWHOA+1;
L300:  END;
PROCEDURE SRCHECK;
BEGIN
INTEGER   JI1,JINAG,JINPA,JINPCOL,JINRF1,JINRF2,JINRF,JJCHECH,JJCHECK,
        JJ,JNRF1,JNRF2,JNRF3,JNRF,JNAG1,JNPA1,JNPCOL1 ;
FORMAT FL25("  THE NUMBER OF REFLECTION BOUNDRIES",I3,
   " EXCEEDS THE LIMIT OF 5 ALLOWED",".DATA CHECK CONTINUES..."),
FL45("  THE NUMBER OF DETECTORS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED",
   ".DATA CHECK CONTINUES..."),
FL65("  THE NUMBER OF MATERIALS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED",
   ".DATA CHECK CONTINUES..."),
FL85("  THE NUMBER OF PRINT COLLISIONS",I3,
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   " EXCEEDS THE LIMIT OF 24 ALLOWED",".DATA CHECK CONTINUES..."),
FL105("  THE NUMBER OF PRINT ANGLES",I3,
   " EXCEEDS THE LIMIT OF 25 ALLOWED",".DATA CHECK CONTINUES..."),
FL125("  THE NUMBER OF SOURCE ANGLES",I3,
   " EXCEEDS THE LIMIT OF 37 ALLOWED",".DATA CHECK CONTINUES..."),
FL145("  THE NUMBER OF REGIONS",I4," EXCEEDS THE LIMIT OF  50 ALLOWED",
   ".DATA CHECK CONTINUES..."),
FL165("  THE NUMBER OF BOUNDRIES",I4,
   " EXCEEDS THE LIMIT OF  50 ALLOWED",".DATA CHECK CONTINUES..."),
FL180("  COSINE SOURCE ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL215("  COSINE PRINT ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL235(" REFLECTION ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL270("  REFLECTION COSINES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL315("  DIFFERENTIAL COSINES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL355("  PHASE ANGLES MUST BE INPUT IN DESCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL385("  ANGLE PROBABILITIES MUST BE INPUT IN ASCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL415("  INPUT NUMBER OF COLLISSION MUST BE IN ASCENDING ORDER",
   ".DATA CHECK CONTINUES..."),
FL435(" ","  THERE ARE A TOTAL OF",I5," INPUT DATA ERRORS"///
   "TAKE PROBLEM OFF COMPUTER AND CORRECT ERRORS. BETTER LUCK NEXT ",
   "TIME"),
FL455(" INPUT DATA SEEMS TO BE ALLRIGHT. EXECUTION CONTINUES.");
LIST LIST1(JNRFLB);
LIST LIST2(JNDMAX);
LIST LIST3(JNMAT);
```

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LIST LIST4(JNPCOL);
LIST LIST5(JNPA);
LIST LIST6(JNAG);
LIST LIST7(JNRMAX);
LIST LIST8(JNBMAX);
LIST LIST9(JJCHECK);
LADEL L30,L50,L70,L90,L110,L130,L150,L170,L200,L220,L240,L280,L300,
 L320,L360,L370,L390,L420,L450;
JJCHECK←0;
IF (JNRFLB≤5) THEN GO TO L30;
WRITE(PRINT,FL25,LIST1);
JJCHECK←JJCHECK+1;
L30: IF (JNDMAX≤10) THEH GO TO L50;
WRITE(PRINT,FL45,LIST2);
JJCHECK←JJCHECK+1;
L50: IF (JNMAT≤10) THEN GO TO L70;
WRITE(PRINT,FL65,LIST3);
JJCHECK←JJCHECK+1;
L70: IF (JNPCOL≤24) THEN GO TO L90;
WRITE(PRINT,FL85,LIST4);
JJCHECK←JJCHECK+1;
L90: IF (JNPA≤25) THEN GO TO L110;
WRITE(PRINT,FL105,LIST5);
JJCHECK←JJCHECK+1;
L110: IF (JNAG≤37) THEN GO TO L130;
WRITE(PRINT,FL125,LIST6);
JJCHECK←JJCHECK+1;
L130: IF (JNRMAX≤50) THEN GO TO L150;
WRITE(PRINT,FL145,LIST7);
JJCHECK←JJCHECK+1;
L150: IF (JNBMAX≤50) THEN GO TO L170;
WRITE(PRINT,FL165,LIST8);
```

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JJCHECK←JJCHECK+1;
JNAG1←JNAG-1;
L170: JJ←1;
DO BEGIN
  IF (SVCANG[JJ]≥SVCANG[JJ+1]) THEN GO TO L200;
  WRITE(PRINT,FL180);
  JJCHECK←JJCHECK+1;
  L200: END UNTIL (JJ←(JJ+1))>JNAG1;
JNPA1←JNPA-1;
JJ←1;
DO BEGIN
  IF (SVCIPA[JJ]≥SVCIPA[JJ+1]) THEN GO TO L220;
  WRITE(PRINT,FL215);
  JJCHECK←JJCHECK+1;
  L220: END UNTIL (JJ←(JJ+1))>JNPA1;
IF JNRFLB≤0 THEN GO TO L300;
JI1←1;
DO BEGIN
  JNRF←SVNRFANG[JI1]-1;
  JJ←1;
  DO BEGIN
    IF (SVRFANG[JJ,JI1]≥SVRFANG[JJ+1,JI1]) THEN GO TO L240;
    WRITE(PRINT,FL235);
    JJCHECK←JJCHECK+1;
    L240: END UNTIL (JJ←(JJ+1))>JNRF;
  END UNTIL (JI1←(JI1+1))>JNRFLB;
JI1←1;
DO BEGIN
  JNRF1←SVNRFCOS[JI1]-1;
  JJ←1;
  DO BEGIN
    IF (SVRFLCOS[JJ,JI1]≥SVRFLCOS[JJ+1,JI1]) THEN GO TO L280;
```

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      WRITE(PRINT,FL270);
      JJCHECK←JJCHECK+1;
      L280: END UNTIL (JJ←(JJ+1))>JNRF1;
    END UNTIL (JI1←(JI1+1))>JNRFLB;
L300: JI1←1;
DO BEGIN
    IF (SVRAYLEE[JI1]=1) THEN GO TO L370;
    JNRF2←SVNDFCOS[JI1]-1;
    JJ←1;
    DO BEGIN
      IF (SVDIFCOS[JJ,JI1]≥SVDIFCOS[JJ+1,JI1]) THEN GO TO L320;
      WRITE(PRINT,FL315);
      JJCHECK←JJCHECK+1;
      L320: END UNTIL (JJ←(JJ+1))>JNRF2;
    JNRF3←SVNPHANG[JI1]-1;
    JJ←1;
    DO BEGIN
      IF (SVPHANG[JJ,JI1]≥SVPHANG[JJ+1,JI1]) THEN GO TO L360;
      WRITE(PRINT,FL355);
      JJCHECK←JJCHECK+1;
      L360: END UNTIL (JJ←(JJ+1))>JNRF3;
    L370: END UNTIL (JI1←(JI1+1))>JNMAT;
JNAG1←JNAG-1;
JJ←1;
DO BEGIN
    IF (SVPAG[JJ]≤SVPAG[JJ+1]) THEN GO TO L390;
    WRITE(PRINT,FL385);
    JJCHECK←JJCHECH+1;
    L390: END UNTIL (JJ←(JJ+1))>JNAG1;
JNPCOL1←JNPCOL-1;
JJ←1;
DO BEGIN
```

```
  IF (SVINCOL[JJ]≤SVINCOL[JJ+1]) THEN GO TO L420;
  WRITE(PRINT,FL415));
  JJCHECK←JJCHECK+1;
  L420: END UNTIL (JJ←(JJ+1))>JNPCOL1;
 IF JJCHECK≤0 THEN GO TO L450;
WRITE(PRINT[PAGE]);
WRITE(PRINT,FL435,LIST9);
ERROR(0);
L450: WRITE(PRINT,FL455));
 END;
PROCEDURE SRMAIN;
BEGIN
INTEGER JJ2, JJAIL;
REAL JCRATIO, JFRACT;
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:
    SRINITAL, SRSEARCH, SRAVRAGE, SRANSWER, SRANGLE, SRPATHL, SRDSTBD,
   SRRANDA, SRSCTANG, SRDETECT;
FORMAT FL11(" HS IS GREATER THAN HV(NOW).                          "),
FL6(/" CANNOT LOCATE REGION CONTAINING SOURCE PARTICLE."),
FL76(/" LOC =",I4," NPART =",I4," NSP =",I4," NHIST =",I6," NCR =",
   I4," NCOL =",I4/" H1 =",S1,E10.3," R1 =",S1,E10.3," COTH1 =",S1,
   E10.3," SITH1 =",S1,E10.3/" CPHI1 =",S1,E10.3," SPHI1 =",S1,E10.3,
   " WAIT =",S1,E10.3).
FL96(/" LOC =",I4," NCR =",I4," NCM =",I3," R =",S1,E10.3," H =",S1,
E10.3/" COTH =",S1,E10.3," SITH =",S1,E10.3," CIPH =",S1,E10.3,
   " SPHI =",S1,E10.3),
FL106(/" A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=",S1,E10.3),
FL136(/" PROGRAM FAILED TO CALCULATE DISTANCE TO A BOUNDARY."),
FL142(/" LOC =",I4," NCR =",I4," NCB =",I4," T =",S1,E10.3,
   " SUMDST =",S1,E10.3/" DIST =",S1,E10.3," RHOT =",S1,E10.3,
   " DT =",S1,F10.3," HT =",S1,F10.3/" RHO =",S1,F10.3," NCM =",I4,
   " NLM =",I4),
```

```
FL147(/" LOC =",I4," NCM =",I4," NLM =",I4," H =",S1,E10.3," TS =",
   S1,E10.3/" RT =",S1,E10.3," CPHI =",S1,E10.3," R =",S1,E10.3)),
FL177(/" CANNOT FIND REGION CONTAINING PARTICLE COORDINATES, H=",S1,
   E10.3," R=",S1,E10.3)),
FL264(/" LOC =",I4," NCR1 =",I4," NCR2 =",I4," DIST =",S1,E10.3,
   " DT =",S1,E10.3/" T =",S1,E10.3," SUMOST =",S1,E10.3," H2 =",S1,
   E10.3," TS =",S1,E10.3/" RT =",S1,E10.3," CPHI2 =",S1,E10.2,
   " R2 =",S1,E10.3," SPHI2 =",S1,E10.3/" COTH2 =",S1,E10.3,
   " SITH2 =",S1,E10.3," NCOL =",I4));
LIST LIST1(JLOC,JNPART,JNSP,JNHIST,JNCR,JNCOL,JH1,JR1,JCOTH1,JSITH1,
 JCPHI1,JSPHI1,JWAIT);
LIST LIST2(JLOC,JNCR,JNCM,JR,JH,JCOTH,JSITH,JCPHI,JSPHI);
LIST LIST3(JPL);
LIST LIST4(JLOC,JNCR,JNCB,JT,JSUMOST,JDIST,JRHOT,JDT,JHT,JRHO,JNCM,JNLM)
 ;
LIST LIST5(JLOC,JNCM,JNLM,JH,JTS,JRT,JCPHI,JR);
LIST LIST6(JH,JR);
LIST LIST7(JLOC,JNCR1,JNCR2,JDIST,JDT,JT,JSUMOST,JH2,JTS,JRT,JCPHI2,JR2,
 JSPHI2,JCOTH2,JSITH2,JNCOL);
BEGIN
LABEL L3,L2,L8,L7,L10,L60,L70,L80,L100,L110,L130,L140,L144,L150,L1600,
 L161,L165,L166,L170,L180,L310,L188,L250,L260,L269,L320,L340,L350;
SWITCH SWG01←L165,L165,L161,L161;
JNPART←JNHMAX DIV JNGROUP;
JNSP←JNPART+1;
JNHIST←0;
JNDEVG←0;
SRINITAL;
JMPREG←JNSOREG;
JWHOA←0;
JH←JHS;
JJ2←2;
```

```
DO BEGIN
  IF (XPR←(JHS-SVHV[JJ2]))=0 THEN GO TO L2;
  IF XPR<0 THEN GO TO L3;
  END UNTIL (JJ2←(JJ2+1))>JNOH;
WRITE(PRINT,FL11);
GO TO L350;
L3: JTAUH←SVTAU[JJ2-1]+(SVTAU[JJ2]-SVTAU[JJ2-1])×(JHS-SVHV[JJ2-1])/(
 SVHV[JJ2]-SVHV[JJ2-1]);
GO TO L8;
L2: JTAUH←SVTAU[JJ2];
L8: JERRORS←JWHOA;
SRSEARCH;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF (JNCR=JNSOREG) THEN GO TO L7;
WRITE(PRINT,FL6);
GO TO L350;
L7: JREFL←0;
L10: IF (XPR←(JNPART-JNSP))>0 THEN GO TO L70;
IF XPR<0 THEN GO TO L60;
SRAVRAGE;
IF (JNHIST<JNHMAX) THEN GO TO L60;
SRANSWER;
GO TO L350;
L60: SRANGLE;
IF (JERRORS<JWHOA) THEN GO TO L340;
JNSP←0;
L70: JNHIST←JNHIST+1;
JNREFL←1;
JLOC←10;
JNSP←JNSP+1;
JTAUH2←JTAUH;
JH1←JHS;
```

```
JNCR←JNSOREG;
JCOTH1←SVSANG[JNSP];
JSITH1←SQRT(1-JCOTH1×JCOTH1);
JWAIT←SVWEIGHT[JNSP];
JNCOL←1;
IF JIDUMP≤0 THEN GO TO L80;
WRITE(PRINT,FL76,LIST1);
L80: JLOC←20;
JH←JH1;
JREFL←0;
JTAUH1←JTAUH2;
JCOTH←JCOTH1;
JSITH←JSITH1;
JNCR1←JNCR;
JNCM←SVMAT[JNCR];
IF JIDUMP≤0 THEN GO TO L100;
WRITE(PRINT,FL96,LIST2);
L100: SRPATH;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JPL>0 THEN GO TO L110;
WRITE(PRINT,FL106,LIST3);
JWHOA←JWHOA+1;
GO TO L340;
L110: JT←JPL;
JRHOT←0;
JDT←0;
JSUMDST←0;
JHT←JH;
L130: SRDSTBD;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JNCB≥0 THEN GO TO L140;
WRITE(PRINT,FL136);
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```
GO TO L350;
L140: JSUMDST←JSUMDST+JDIST;
JLOC←50;
IF JIDUMP≤0 THEN GO TO L144;
WRITE(PRINT,FL142,LIST4);
L144: IF (JSUMDST≥JT) THEN GO TO L250;
JNCM←SVMAT[JNCR];
JH←JH+JCOTH×JDIST;
JTS←JDIST×JSITH;
JNLM←JNCM;
JLOC←60;
IF JIDUMP≤0 THEN GO TO L150;
WRITE(PRINT,FL147,LIST5);
L150: IF (SVNBOUND[JNCB])≥0 THEN GO TO L170;
JH2←JH−2×JDELTA×JCOTH;
IF (JNCB≠1) THEN GO TO L1600;
JNREFL←JNREFL+1;
IF (JNREFL − JMAXR ≤ 1) THEN GO TO L1600 ;
JNMAXR ← JNMAXR + 1 ;
GO TO L10 ;
L1600: JREFL←1;
JNRB←JNCB;
JJAIL←SVJREFLT[JNRB];
GO TO SWGO1[JJAIL];
L161: JCOTH2←−1;
GO TO L166;
L165: JCOTH2←1;
L166: JSITH2←0;
JWAIT←JWAIT×SVALBEDO[JNCB];
GO TO L260;
L170: JMPREG←SVMPR[JJ1,JNCR];
SRSEARCH;
```

```
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JNCR>0 THEN GO TO L180;
WRITE(PRINT,FL177,LIST6);
GO TO L350;
L180: JNCR2←JNCR;
IF (SVEMP[JNCR2]≥SVEMP[JNCR1]) THEN GO TO L188;
SRRANDA(JIBASE,JRN);
IF (JRN>(SVEMP[JNCR2]/SVEMP[JNCR1])) THEN GO TO L310;
JWAIT←JWAIT×(SVEMP[JNCR1]/SVEMP[JNCR2]);
GO TO L188;
L310: SVNRICO[JNCR2]←SVNRICO[JNCR2]+1;
JNRSTOP←JNRSTOP+1;
GO TO L10;
L188: JDT←JDT+JDIST;
JNCM←SVMAT[JNCR];
GO TO L130;
L250: JDIST←JT-JDT;
JH2←JH+JCOTH×JDIST;
JTS←JDIST×JSITH;
JCOTH2←JCOTH;
JSITH2←JSITH;
JFRACT←(JH2-SVHV[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);
JCRATIO←SVSCATR[JJHB]+(SVSCATR[JJHT]-SVSCATR[JJHB])×JFRACT;
JRATLEE←SVRAYR[JJHB]+(SVRAYR[JJHT]-SVRAYR[JJHB])×JFRACT;
JWAIT←JWAIT×JCRATIO;
L260: JNCR2←JNCR;
JLOC←70;
SRSCTANG;
IF (JERRORS<JWHOA) THEN GO TO L340;
SRDETECT;
IF (JERRORS<JWHOA) THEN GO TO L340;
IF JIDUMP≤0 THEN GO TO L269;
```

```
WRITE(PRINT,FL264,LIST7);
L269: JNCOL←JNCOL+1;
IF (JNCOL≤JNCMAX) THEN GO TO L320;
JMAXCOL←JMAXCOL+1;
JNOGO←JNOGO+1;
GO TO L10;
L320: JNOGO←JNOGO+1;
JH1←JH2;
JNCR←JNCR2;
IF (JWAIT>JWCO) THEN GO TO L80;
JNWAIT←JNWAIT+1;
GO TO L10;
L340: IF (JWHOA>JELIM) THEN GO TO L350;
JERRORS←JWHOA;
GO TO L10;
L350:  END END;
PROCEDURE MAINPRO;
BEGIN
INTEGER JI1,JI2,JI3,JI4,JICHECK,JJAIL,JLIS1,JLIS2,I,J;
INTEGER  DX1,DX2;
COMMENT  THE FOLLOWING SUBPOUTINES ARE REQUIRED:
    SRCHECK, SRMAIN, SRDBEAM;
FORMAT FL10(5I10),
FL110(2I10,4R10.4),
FL130(6R10.4),
FL170(4R10.4),
FL210(2I10,R10.4),
FL230(3I5,R5.2,8I5),
FL310(2R10.4,I10,R10.4),
FL330(/" SVHD[J] IS GREATER THAN SVHV[JNOH] FOR J =",I4,
 ".")),
FL350 (/"I=",I4,"J=",I4,"TAUHD[I]=",S1,E10.3),
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FL410(6I10),
FL510(R10.4),
FL810(6I10),
FL905(/
   " THE NUMBER OF HISTORIES WAS NOT EQUALLY DIVISIBLE BY  THE NUMB",
   "ER OF DEVIATION GROUPS."/"  THE NUMBER OF HISTORIES WAS  RESET TO",
   I6),
FL920(/" INPUT NUMBER OF MATERIALS DOES NOT AGREE WITH NMAT. "),
FL950(/" INPUT NUMBER OF BOUNDARIES DOES NOT AGREE WITH NBMAX."),
FL980(/" INPUT NUMBER OF REGIONS DOES NOT AGREE WITH NRMAX."),
FL1010(/" INPUT NUMBER OF DETECTORS DOES NOT AGREE WITH NDMAX."),
FL1040(/" INPUT NUMBER OF PRINT COLLISIONS DOES NOT AGREE WITH NPCOL."),
FL1070(/" INPUT NUMBER OF PRINT COSINES DOES NOT AGREE WITH NPA."),
FL2000(/
   " INPUT NUMBER OF REFLECTION BOUNDARIES DOES NOT AGREE WITH NRFL",
   "B."),
FL2030(/" INPUT SOURCE ANGLE OPTION DOES NOT AGREE WITH NADP."),
FL2060(/" INPUT NUMBER OF SOURCE ANGLES DOES NOT AGREE WITH NAG.");
LIST LIST1(JLIBRAY,JI1,JI2,JI3,JI4);
LIST LIST21 (FOR DX1←1 STEP 1 UNTIL JNDH DO [SVHV[DX1],SVTAU[DX1],
 SVSCATR[DX1],  SVRAYR[DX1]]);
LIST LIST2(SVNDFCOS[JI1],SVNPHANG[JI1],SVSIGNOT[JI1],SVRAYLEE[JI1],SVA[
 JI1],SVCRATIO[JI1]);
LIST LIST3(FOR DX1←1 STEP 1 UNTIL JLIS1 DO SVDIFCOS[DX1,JI1]);
LIST LIST4(FOR DX1←1 STEP 1 UNTIL JLIS1 DO SVPDCOS[DX1,JI1]);
LIST LIST5(FOR DX1←1 STEP 1 UNTIL JLIS2 DO SVPHANG[DX1,JI1]);
LIST LIST6(FOR DX1←1 STEP 1 UNTIL JI1 DO [SVNBOUND[DX1],SVITYPE[
 DX1],SVCOEE[DX1]]);
LIST LIST7(FOR DX1←1 STEP 1 UNTIL JI2 DO [SVNREG[DX1],SVNB[DX1],SVMAT[
 DX1],SVEMP[DX1],FOR DX2←1 STEP 1 UNTIL 4 DO [SVIB[DX2,DX1],SVMPR[
 DX2,DX1]]]);
LIST LIST8(FOR DX1←1 STEP 1 UNTIL JI1 DO [SVHD[DX1],SVRD[DX1],SVNPHID[
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 DX1],SVDBSS[DX1]]);
LIST LIST9(FOR DX1←1 STEP 1 UNTIL JI1 DO SVINCDL[DX1]);
LIST LIST10(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCIPA[DX1]);
LIST LIST11(SVALBEDO[JI1]);
LIST LIST12(FOR DX1←1 STEP 1 UNTIL JI3 DO SVRFANG[DX1,JI1]);
LIST LIST13(FOR DX1←1 STEP 1 UNTIL JI3 DO SVPDR[DX1,JI1]);
LIST LIST14(FOR DX1←1 STEP 1 UNTIL JI4 DO SVRFLCOS[DX1,JI1]);
LIST LIST15(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCANG[DX1]);
LIST LIST16(FOR DX1←1 STEP 1 UNTIL JI2 DO SVPAG[DX1]);
LIST LIST17(FOR DX1←1 STEP 1 UNTIL JI2 DO SVWAG[DX1]);
LIST LIST18(JHS,JDLONG,JDELTA,JSMVAL,JWCO,JELIM,JDMIN);
LIST LIST19(JNHMAX,JNGROUP,JNRMAX,JNBMAX,JNCMAX,JNDMAX,JNPA,JNPCDL,
 JNADP,JNAG,JNRFLB,JNMAT,JNSDREG,JMAXR,JIBASE,JIBAS1,JIBAS2,JIBAS3,
 JIBAS4, JIBAS5);
LIST LIST20(JNHMAX);
LIST LIST23(I,J,SVTAUHD[I]) ;
LIST LIST22(I);
LABEL L5,L100,L200,L300,L400,L500,L520,L600,L700,L800,L900,L908,L930,
    L5A,L5AA,L150,L170,L190,L506,L507,L508,L320,L390,L850,
 L960,L990,L1020,L1050,L1080,L2010,L2040,L2070,L2087,L3000;
SWITCH SWGO1←L800,L700,L600,L500,L400,L300,L200,L100,L850,L900,L3000;
SWITCH SWGO2←L5,L520,L5,L520;
JNMATP←0;
JNBMAXP←0;
JNRMAXP←0;
JNRFLBP←0;
JNDMAXP←0;
JNPCDLP←0;
JNPAP←0;
JNAGP←0;
L5A:READ(DAT,10,ABC[*])[L5AA];  WRITE (CARD,10,ABC[*]);  GO TO L5A;
L5AA:REWIND(CARD);   CLOSE(DAT,RELEASE);
```

```
L5: READ(CARD,FL10,LIST1)[FINIS];
JNOGO←0;
GO TO SWGO1[JLIBRAY];
L100: JNMATP←JNMATP+1;
SVMATERL[JNMATP]←JI1;
            I←1;
        DO BEGIN
            IF SVMATERL[I]≠SVMATERL[JNMATP] THEN
            GO TO L150;
            IF I≠JNMATP THEN GO TO L170;
L150:       END UNTIL (I←(I+1))> JNMATP;
            GO  TO  L190;
L170:       JNMATP← JNMATP-1;
L190:       READ (CARD, FL110, LIST2);
JLIS1←SVNDFCOS[JI1];
JLIS2←SVNPHANG[JI1];
IF (SVRAYLEE[JI1]≥1) THEN GO TO L5;
READ(CARD,FL130,LIST3);
READ(CARD,FL130,LIST4);
READ(CARD,FL130,LIST5);
GO TO L5;
L200: JNBMAXP←JI1;
JNRMAXP←JI2;
READ(CARD,FL210,LIST6);
READ(CARD,FL230,LIST7);
GO TO L5;
L300: JNDMAXP←JI1;
READ(CARD,FL310,LIST8);
GO TO L5;
L400: JNPCOLP←JI1;
JNPAP←JI2;
READ(CARD,FL410,LIST9);
```

```
READ(CARD,FL130,LIST10);
GO TO L5;
L500: JNRFLBP←JNRFLBP+1;
SVJREFLT[JI1]←JI2;
          NRFB[JNRFLBP]←JI1;
    I←1;
        DO BEGIN
    IF NRFB[I]≠NRFB[JNRFLBP] THEN
           GO  TO  L507;
           IF I≠JNRFLBP THEN GO TO L506;
L507:      END UNTIL (I←(I+1)) > JNRFLBP;
    GO TO L508;
L506:    JNRFLBP←JNRFLBP-1;
    L508: READ (CARD,FL510,LIST11);
JJAIL←SVJREFLT[JI1];
GO TO SWGO2[JJAIL];
L520: SVNRFANG[JI1]←JI3;
READ(CARD,FL130,LIST12);
READ(CARD,FL130,LIST13);
SVNRFCOS[JI1]←JI4;
READ(CARD,FL130,LIST14);
GO TO L5;
L600: JNADPP←JI1;
JNAGP←JI2;
READ(CARD,FL130,LIST15);
READ(CARD,FL130,LIST16);
IF JNADPP≤0 THEN GO TO L5;
READ(CARD,FL130,LIST17);
GO TO L5;
L700: READ(CARD,FL130,LIST18);
GO TO L5;
L800: READ(CARD,FL810,LIST19);
```

```
GO TO L5;
L850: JNOH←JI1;
READ (CARD,FL170,LIST21);
GO TO L5;
L900: JNPROB←JI1;
JIDUMP←JI2;
JICHECK←JI3;
JNPART←JNHMAX DIV JNGROUP;
IF (JNHMAX=JNPART×JNGROUP) THEN GO TO L908;
JNHMAX←JNPART×JNGROUP;
WRITE(PRINT,FL905,LIST20);
L908: IF (JNMATP=JNMAT) THEN GO TO L930;
WRITE(PRINT,FL920);
JNOGO←JNOGO+1;
L930: IF (JNBMAXP=JNBMAX) THEN GO TO L960;
WRITE(PRINT,FL950);
JNOGO←JNOGO+1;
L960: IF (JNRMAXP=JNRMAX) THEN GO TO L990;
WRITE(PRINT,FL980);
JNOGO←JNOGO+1;
L990: IF (JNDMAXP=JNDMAX) THEN GO TO L1020;
WRITE(PRINT,FL1010);
JNOGO←JNOGO+1;
L1020: IF (JNPCOLP=JNPCOL) THEN GO TO L1050;
WRITE(PRINT,FL1040);
JNOGO←JNOGO+1;
L1050: IF (JNPAP=JNPA) THEN GO TO L1080;
WRITE(PRINT,FL1070);
JNOGO←JNOGO+1;
L1080: IF (JNRFLBP=JNRFLB) THEN GO TO L2010;
WRITE(PRINT,FL2000);
JNOGO←JNOGO+1;
```

```
L2010: IF (JNAOPP=JNAOP) THEN GO TO L2040;
WRITE(PRINT,FL2030);
JNOGO←JNOGO+1;
L2040: IF (JNAGP=JNAG) THEN GO TO L2070;
WRITE(PRINT,FL2060);
JNOGO←JNOGO+1;
L2070: IF JNOGO>0 THEN GO TO L5;
IF JICHECK≤0 THEN GO TO L2087;
SRCHECK;
L2087: I← 1;
DO BEGIN
J← 2;
DO BEGIN
IF (SVHD[I]>SVHV[J])THEN GO TO L320;
SVTAUHO[I]←SVTAU[J-1]+(SVTAU[J] -SVTAU[J-1])×(SVHD[I]-SVHV[J-1])/
 (SVHV[J]-SVHV[J-1]);
IF (JIDUMP ≤ 0) THEN GO TO L390 ;
WRITE (PRINT, FL350, LIST23) ;
 GO TO L390;
L320: END UNTIL (J←(J+1) )>JNOH;
WRITE (PRINT,FL330,LIST22);
L390: END UNTIL(I←(I+1))>JNOMAX;
       SRMAIN;
SRDBEAM;
GO TO L5;
L3000: ERROR(0);
 END;
COMMENT  INITIALIZING BLOCK;
  XPR←Q←K←0;
 SENSW[1]←FALSE;
 SENSW[2]←FALSE;
 SENSW[3]←FALSE;
```

```
 SENSW[4]←FALSE;
 SENSW[5]←FALSE;
 SENSW[6]←FALSE;
 SENSL[1]←FALSE;
 SENSL[2]←FALSE;
 SENSL[3]←FALSE;
 SENSL[4]←FALSE;
MAINPRO; FINIS: END;
LKNJA←(TIME(2)-LKNJA)/60;DKVQK←(TIME(3)-DKVQK)/60;FZOVC←TIME(1);BLZAT;WR
ITE(PRINT[PAGE]);WRITE(PRINT,CHGUB,100×LJLDU+GCPOV,LKNJA,DKVQK);
END.
```

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Security Classification

DOCUMENT CONTROL DATA - R&D

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

1 ORIGINATING ACTIVITY (Corporate author) Radiation Research Associates, Inc. 1506 W. Terrell Avenue, Fort Worth, Texas	2a REPORT SECURITY CLASSIFICATION NA 2b GROUP NA

3 REPORT TITLE

Monte Carlo Codes for Study of Light Transport in the Atmosphere

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report, Vol I & Vol II, 1 July 1964 to 31 July 1965

5 AUTHOR(S) (Last name, first name, initial)

Collins, D. G.
Wells, M. B.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
August 1965	183	None

8a. CONTRACT OR GRANT NO. DA 28-043 AMC-00240(E)	9a. ORIGINATOR'S REPORT NUMBER(S) RRA-T54-II
b. PROJECT NO. 1VO-14501-B-53A-13	
c.	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) ECOM-00240-F, Vol. II
d.	

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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Atmospheric Sciences Laboratory U. S. Army Electronics Command Fort Monmouth, New Jersey

13 ABSTRACT

Monte Carlo procedures designated as the LITE-I and LITE-II codes were developed to study the transport of light through the earth's atmosphere under various environmental conditions. The LITE-I code treats monochromatic light emitted from a point source, and the LITE-II code treats monochromatic plane sources of light. The codes have been written in both ALGOL for the Burroughs B-5000 and FORTRAN-II for other computers. The codes are sufficiently flexible to treat multiple scattering in an atmosphere in which air density and aerosol size distribution vary independently and arbitrarily with altitude. Provision for treating ground and cloud reflection with an albedo method is also available in the codes.

The codes have been varified through comparisons with other calculations of light transport in the atmosphere. Utilization instructions, input data formats, sample problems, and the ALGOL listings of the codes are given to aid those who wish to utilize the codes.

DD FORM 1 JAN 64 1473

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Monte Carlo Methods						
Light transmission						
Radiation transport						
Variable density atmosphere						
Albedo						
Point Source						
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