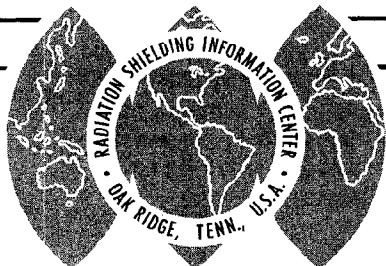


# RSIC Newsletter



RADIATION SHIELDING INFORMATION CENTER

## OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION • FOR THE U.S. ATOMIC ENERGY COMMISSION

POST OFFICE BOX X •  
OAK RIDGE, TENNESSEE 37831

No. 40

March, 1968

*In science, read by preference, the newest works;  
in literature, the oldest... E. B. Lytton*

### MEETING OF SHIELDING SUBCOMMITTEE OF CSEWG HELD AT LOS ALAMOS

The Shielding Subcommittee of the Cross Section Evaluation Working Group met at Los Alamos, New Mexico, February 20-21. The committee broke into three working groups as follows: (1) Codes and Formats, (2) Data Testing, and (3) Photon Data.

The format now provides for nine photon interaction cross sections. A library of six photon interaction cross sections for 87 elements is now being prepared and six subprograms for producing differential cross sections will be available in a few months.

The Data Testing Group is in the process of collecting and evaluating "benchmark" problems for the purpose of testing the adequacy of certain cross section data for shielding calculations.

Some evaluations of neutron cross-section data for Ca, Si, and Mg will be available in ENDF/B format in a few months. These data will include gamma-ray production cross-sections.

### NEW CODE PACKAGES AVAILABLE

Operable, tested with a sample problem, and available for distribution are the following code packages:

CCC-88/RADOS

Gamma Dose Estimation from Cloud of Radio-Active Gases, contributed by Savannah River Laboratory, E. I. du Pont de Nemours and Co., Aiken, South Carolina (DP-1098).

CCC-89/DOT	Two Dimensional Discrete Ordinates Code with Anisotropic Scattering, contributed by Union Carbide Corporation, Nuclear Division, Oak Ridge, Tennessee (K-1694)
CCC-90/AMC	Monte Carlo Code Utilizing the Albedo Approach for Calculating Neutron and Capture Gamma-Ray Distributions in ducts, contributed by Oak Ridge National Laboratory, Oak Ridge, Tennessee (ORNL-3964)
CCC-91/NEFIRS	Neutron Flux Distributions in Reactor Shields, contributed by Gulf General Atomic, San Diego, California, (GA-8069)
CCC-92/SAP	Neutron and Gamma Ray Albedo Model Scatter Shield Analysis Programs, contributed by Westinghouse Astromuclear Laboratory, Pittsburg, Pa. (WANL-TME-1273, WANL-TME-1273, Revision A)
CCC-93/MCFLARE	Monte Carlo Code to Simulate Solar Flare Events, contributed by NASA-Lewis Research Center, Cleveland, Ohio. (NASA TN D-4311)

The CCC-48/QAD code package has been updated to include QAD-5K, a version which utilizes multiple source region data. Contributed by Brown Engineering Company, Huntsville, Alabama, QAD-5K is described in report, BE-TN RL-251.

#### PERSONAL ITEMS

Charles Garrett is now with Radiation Research Association at Fort Worth, Texas.

H. Yamakoshi has finished his work with RSIC and is now returning to the Ship Research Institute, Tokyo, Japan.

#### CORRECTIONS TO QAD DOCUMENT, LA-3573

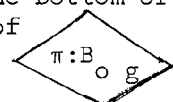
Richard E. Malenfant has submitted to RSIC an errata sheet for

the report LA-3573, "QAD: A Series of Point - Kernel General - Purpose Shielding Programs." The RSIC document package for QAD now reflects the corrections. For the early document distribution the corrections are as follows:

Page 44. The value for  $\alpha_1$  will be  $3.9151 \times 10^{-9}$  rads (tissue)/sec-fission for QAD P-5. In QAD IV, it should be  $2.9857 \times 10^2$  rads (tissue)/sec-watt. These values were chosen to equate the result for zero penetration from an Albert-Welton kernel to one derived from water moments data.

Page 113. The out transfer vectors  $\delta_1$  and  $\alpha_2$  on the right-hand side of the page should be interchanged.

Page 114. The out transfer vector  $\zeta_1$  closest to the bottom of the page, i.e., the one resulting from the  $\leq$  branch of should be replaced with  $\delta_1$ .



Page 124. The "W cards" should precede the "H cards" as indicated in the sample problem rather than the converse as shown on page 124.

#### CORRECTIONS TO FASTER CODE

During checkout of the Monte Carlo code, FASTER, it was discovered that two cards were missing in the version received by RSIC. Since the code was distributed to a number of installations at the same time it was given to RSIC, the cards may be missing in other versions. They are as follows:

- (1). In Subroutine DETECT, the sixth continuation card to COMMON/INDEXS: 6ISPW, ISPE, IAID, IRSP, ISGT, IIDE, IIDI,
- (2). In Subroutine SOBER, the missing card is: COMMON/INDEXG/JZERO.

#### VISITORS TO RSIC

Visitors to RSIC during the month of March are: B. G. Bennett, U.S.A.E.C. Health & Safety Laboratory, New York, New York; E. A. Belvin, TVA, Muscle Shoals, Alabama; H. E. Lindley, TVA, Muscle Shoals, Ala.; S. B. Carpenter, TVA, Muscle Shoals, Ala.; D. J. Dudziak, University of California, Los Alamos, New Mexico; D. Martin, Institution of Electrical Engineers, London WC2, England; M. J. Kolar, Lewis Research Center, Cleveland, Ohio; K. Takeuchi, Ship Research Institute, Tokyo, Japan.

### MARCH ACCESSION LIST OF LITERATURE

The RSIC is now aware of the literature cited in the following list. This literature has either been obtained by RSIC or has been placed on order. When received, this material will be examined and assigned to various files if suitable for our information system. The accession list is divided into three fields of (1) reactor and weapons shielding, (2) space and accelerator shielding, and (3) shielding computer codes. These titles are announced before processing and indexing so that there will be no delay and can serve as a prompt announcement of current literature.

RSIC is not a documentation center. Copies of the literature cited must generally be obtained from the author or from a documentation center such as the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

RSIC maintains a microfiche file of literature entered into its information system. Computer searches of this system (which produces a special bibliography) and duplicate microfiche copies of literature in our file are available upon request. Naturally we cannot supply copies of literature which is copyrighted (such as books or journal articles) or whose distribution is restricted. Neither service is yet available for the code literature.

#### Reactor and Weapons Shielding

ABS-THH 1039 (NP-17030)

Investigations on the Shielding in the Reprocessing Installation for Irradiated Nuclear Fuels at Karlsruhe (WAK). In German.  
W. Futtermenger; H. Schultz  
December 1966

ABS-THH-1040

Tables of Total Gamma Attenuation Coefficients of the Elements at 0.01 MeV to 100 MeV. In German  
S. Sasse  
July, 1967

AEEW-M-774

The Format of Binary Tapes of the U.K.A.E.A. Nuclear Data Library  
G. Doherty, D. S. Norton  
September, 1967

AWRE O-63/67

Neutron Cross Section of Copper in the Energy Range 0.0001 MeV  
to 15 MeV-Sources of Data for Files 249 to 251 in the UKAEA  
Nuclear Data Library  
Susan M. Offord, K. Parker  
December, 1967

BNL-50060

Evaluation of the Neutron Cross Section of Manganese for the  
ENDF/B Library  
T. Stephenson, A. Prince  
June, 1967

BNL-50073

Dose-Effect Modifying Factors in Radiation Protection  
Report of Subcommittee M-1 of the National Commission on Rad-  
iation Protection  
August, 1967

BNWL-520

Corrosion and Boron Deposition in Boric Acid Solutions  
G. R. Bloom, T. F. Demmitt  
December, 1967

BNWL-625

Gamma Heating Calculations in Graphite Moderated Systems  
G. E. Hanson, G. J. Busselman  
November 1, 1967

CEA-R-3298

The Neutronic Method for Measuring Soil Moisture In French  
Philippe Couchat  
July, 1967

DASA-11.058

Fast Neutron Streaming Through Concrete Ducts  
Yo Taik Song  
February, 1968

EGG-1183-2163

Energy and Angular Dependence of Air Scattered Gamma Ray Distribu-  
tion Functions  
J. A. Michael, H. A. Lamonds  
November 9, 1967

GEMP 579

U-235 Fission Product Decay Energy Release Rates  
J. M. Brunner, W. E. Edwards  
December, 1967

JUL-444-MA

The Numerical Treatment of the Energy-Dependent One-Dimensional  
Transport Equation with Source Terms  
Hans Werner Meuer, Lutz Richter  
December, 1966

LA-3251 (Rev.)

Transport Theory; The Method of Discrete Ordinates  
Bengt G. Carlson, Kaye D. Lathrop  
Revised August 20, 1965

LA-DC-8616

Design and Performance of an Open-Well Shield for High Power  
Propulsion Reactor Testing  
Glen A. Graves  
1967

LA-DC-9092

Development of the  $S_n$  Discrete Ordinates Method  
Bengt G. Carlson  
September 14, 1967

MLM-1422

Neutron Energy Spectra of  $^{239}\text{Pu-Be}$ ,  $^{238}\text{Pu-F}$ , and  $^{238}\text{Pu-}^{18}\text{O}(\alpha, n)$   
Sources  
M. E. Anderson  
February 4, 1967

N67-30522

Calculations of Neutron Flux Distributions by Means of Integral  
Transport Methods  
I. Carivak  
May, 1967

NAA-SR-Memo-12440

Lithium Hydride-Heavy Metal Shielding Experiments  
A. W. Thiele

NAA-SR-Memo-12467

Neutron and Gamma Ray Attenuation in Sodium Shields  
A. W. Thiele  
June 30, 1967

NAA-SR-12493

Discrete Ordinates Representations of the Scattering Kernel  
B. D. O'Reilly, Sr., R. C. Lewis  
November 30, 1967

NASA-CR-89958

Prediction of Neutron Induced Activation. Vol. II: NAP, Physical  
Models and Experimental Validation  
David A. Klopp  
January, 1966

NASA-TM-X1461

Shielding Requirements for the NASA Plumbrook HB-6 Beamhole Rad-  
iation Effects Facility  
Harvey S. Bloomfield  
November, 1967

NASA-TN-D-4223

Comparison of Absolute Calculated and Measured Gamma and Neutron  
Dose in Tungsten-Water-Moderated Critical Assembly  
Paul G. Klann, Walter A. Paulson  
November, 1967

NP-17063

Various Methods for Fast Neutron Detection In French  
Y. Herbaut  
November 30, 1965

ORNL-RSIC-20 (DASA-1892-1)

Methods for Calculating Effects of Ducts, Access Ways, and Holes  
in Radiation Shields  
Wade E. Selph, H. Clyde Claiborne  
January 1968

ORNL-RSIC-21 (DASA-1892-2)

Neutron and Gamma-Ray Albedos  
Wade E. Selph  
January, 1968

ORNL-TM-2079

Calculations of Neutron Fluence-To-Kerma Factors for the Human Body

J. J. Ritts, E. Solomito, P. N. Stevens  
January, 1968

ORNL-tr-1813

On the Analytical Solution of the Energy-Dependent Neutron Transport Equation in  $S_n$  Formulation

H. Beuchat

SC-RR-67-419

Application of the Method of Discrete Ordinates to Photon Transport Calculations

James H. Renken, Kenneth G. Adams

(NRSS-5) (AD-663570)

Nuclear Radiation Shielding Studies Report No. 5, Modeling Relationships in Neutron Transport Through Ducts and Cavities

University of Illinois

Justo Diaz

September, 1967

UCRL-TRANS-10128

Measurement of Flux Density and Dose Rate Removal Cross Sections of Various Shielding Materials for Neutrons

D. Nachtigall, M. Heinzelmann

December, 1966

USNRDL-TR-67-120

The Moments Method used to Determine the Energy Albedo of Gamma Rays from Cesium-137 Impinging on Aluminum and Iron Barriers

C. V. Smith, N. E. Scofield

September, 1967

WAPD-T-1927

Spherical Harmonics Methods:  $P_L$  and Double  $P_L$  Approximations

E. M. Gelbard

May, 1966



BOOK

Importance- The Adjoint Function  
Jeffery Lewins  
Pergamon Press  
1965

BOOK

Monte Carlo Method in Radiation Transport Problems In Russian  
G. I. Marchuk  
1967

BOOK

Fast Reactor Technology: Plant Design  
J. G. Yevick  
MIT Press  
1966

Atomkernenergie, 12: 425-7, 1967

Calculations of Penetration Factors of Split Shaped Collimators  
and Cylindrical Gamma-Sources with Self-Absorption In German  
J. Knoth, F. Sandrock, H. Schwenke

Brit J. Radiol, 41:33-39

Measurements of 6 MV X-rays, I. Primary Radiation Absorption in  
Lead, Steel, and Concrete  
C. J. Karzmark, Tatiana Capone  
1968

Intern. J. Appl. Radiation Isoto., 19:74, 1968

Shielding Properties of Concrete for D-T Neutrons

J. Atomic Energy Society of Japan, 9:661-672, 1967

Progress in Nuclear Science and Technology, (11) Development of  
Reactor Shielding Techniques In Japanese  
Y. Furuta, I. Kataoka, T. Hyodo, Y. Tanaka

J. Appl. Phys., 38:4925-6, 1967

Legendre Polynomial Expansion for the Klein-Nishina Formula  
J. H. Renken

J. of the Association for Computing Machinery, 14:100-119, January, 1967

Fourier Analysis of Uniform Random Number Generators  
R. R. Coveyou, R. D. MacPherson

Kerntechnik, 9:446-451, 1967

Penetration Parameters for 15-MeV Neutron Beams  
J. J. Broerse

Nucl. Eng. Design, 6: 325-341, 1967

Determination of Exposure Buildup Factors for Gamma Irradiation  
in Energy Range of 0.5-15 MeV in Stratified Slabs-Iron and  
Water  
H. G. Vogt

Nucl. Inst. Methods, 58:117, 1968

Influence of Geometric Factors on Problems of Measurement in  
Radiation Fields.  
W. Prochazk, F. Bensch

Nucl. Sci. Eng., 31:183-190, February, 1968

Geometry and Barrier Attenuation of Cobalt-60 Gamma Rays by a  
Vertical Steel Slab  
G. E. Plummer

Nucl. Sci. Eng., 31:191-206, February, 1968

A Study of Fission-Neutron Spectra with High-Energy Activation  
Detectors Part II: Fission Spectra  
James A. Grundl

Nukleonik, 10:227, 1967

Analytic Treatment of Arbitrary Anisotropic Scattering in Energy  
Dependent Transport Theory  
S.A.W. Gerstl

Nukleonik, 10:157-8, September, 1967

Some Rational Approximations for the Exponential Integral  
Functions  $E_n$  ( $n=1,2,3,4$ )  
Kakuji Makiho

Nuovo Cimento, 43 B(1), 6-35, May, 1966

Solution of the Linear Transport Equation by Finite Fourier  
Transforms  
A. Bhattacharjie

Soviet J. of Atomic Energy, 22:273-274, March, 1967

The Gamma-Ray Buildup Factor for Finite Media  
V. A. Klimanov, V. P. Mashkovich, Yu. Podsevalov

COMPUTER CODES LITERATURE

- |   |                |                      |
|---|----------------|----------------------|
| SC-RR-67-419  | June 1967      | DTF<br>GAMLEG<br>MIX |
| Applications of the Method of Discrete Ordinates to Photon Transport Calculations<br>James H. Renken, Kenneth G. Adams<br>FORTRAN IV for CDC 3600   |                |                      |
| ORNL-TM-1610  | December 1966  | TACS                 |
| TACS- A Code to Calculate Fast Reactor Group Cross Sections from Point Data for Primary Use in $S_n$ Transfer Codes<br>O. L. Smith<br>FORTRAN II for IBM 7090   |                |                      |
| TRG-1466 (R)  | September 1967 | ATTOW                |
| ATTOW - A Two-Dimensional Shielding Program<br>W. D. Collier, G. C. Curtis<br>FORTRAN IV for IBM 7090   |                |                      |
| RL-NRD-610  | November 1965  | RIBD                 |
| Use of Computer Code RIBD for Fission Product Analysis<br>J. L. Rash<br>FORTRAN IV for IBM 7090 and UNIVAC 1107   |                |                      |
| ORNL-4160   | February 1968  | O5S                  |
| O5S - A Monte Carlo Code for Calculating Pulse Height Distributions Due to Monoenergetic Neutrons Incident on Organic Scintillators<br>R. E. Textor, V. V. Verbinski<br>FORTRAN 63 for CDC 1604   |                |                      |
| AFWL-TR-67-41, Vol. I   | September 1967 | SAND II              |
| A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation. Volume I - A Study of the Iterative Method<br>W. N. McElroy, S. Berg, T. Crockett, R. G. Hawkins<br>FORTRAN IV for CDC 6600                |                |                      |
| AFWL-TR-67-41, Vol. II  | September 1967 | SAND II              |
| A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation. Volume II - SAND II (Spectrum Analysis by Neutron Detectors. II) and Associated Codes<br>S. Berg, W. N. McElroy<br>FORTRAN IV for CDC 6600 |                |                      |

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A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation. Volume III - Reference Cross Section Library for SAND II W. N. McElroy, S. Berg, R. G. Hawkins FORTRAN IV for CDC 6600		
AFWL-TR-67-41, Vol. IV	September 1967	SAND II
A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation. Volume IV - Reference Spectrum Library for SAND II W. N. McElroy, S. Berg FORTRAN IV for CDC 6600		
NASA TN D-4311	February 1968	MCFLARE
MCFLARE - A Monte Carlo Code to Simulate Solar Flare Events and Estimate Probable Doses Encountered on Interplanetary Missions Gerald P. Lahti, Irving M. Karp, Burt M. Rosenbaum FORTRAN IV for IBM 7094-II/7044		
EUR 3555e	September 1967	BIGGI 3P BIGGI 4T
User's Manual for the Gamma Transport Codes BIGGI 3P and BIGGI 4T H. Penkuhn Fortran IV for IBM 7090 and 360/65		
EUR 2488 e	August 1965	BIGGI 3
A Numerical Solution of the Gamma Transport Equation Applied to Concrete Slabs H. Penkuhn		
EUR 1643.e	March 1964	BIGGI
Research on Radiation Shielding U. Canali, B. Chinaglia, C. Manduchi, W. Matthes, R. Nicks, N. Papmehl, H. Penkuhn, G. Perlini		

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ADDENDUM

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RESTRICTED DOCUMENTS

The following documents are available only in the United States.

AFWL-TR-66-111

Summary of Neutron and Gamma Dosimetry Techniques  
H. M. Murphy  
September, 1967

AFWL-TR-66-153

Comparison of Discrete-Ordinates and Monte Carlo Calculations  
with Measurements of Fast Neutron Spectra in Paraffin Shields  
A. E. Profio  
March, 1967

AFWL-TR-67-72

Experimental Verification of Neutron Transport Calculations in  
Lithium Hydride  
A. E. Profio, R. J. Carbonne, D. L. Huffman  
November, 1967

FZK-312

Measured and Calculated Data for 14.7 MeV Neutron Transmitted  
Through Ducts and Voids in Shields  
F. O. Leopard, J. R. William, C. S. Stevens  
December, 1966

FZK-315

Studies of Neutron Thermalization, Secondary Gamma-Ray Production,  
and the Exponential Transformation  
J. M. Norwood, E. E. Jones, D. A. Goodwin, J. W. McWhirter,  
H. G. Carter  
December, 1966

FZK-323

Development of Free-Field Radiation Data for Nuclear Weapons--  
Final Report  
T. W. DeVries  
April, 1967

NDL-TR-52 (AD-486361)

Evaluation of Internal Detector Positions for the M48A2 Tank and  
the M59 and M113 Armored Personnel Carriers  
M. A. Schmoke, R. E. Rexroad, M. J. Schumchuk  
June, 1966