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. 103 June 1973

I begin to suspect that a man's bewilderment
is the measure of his wisdom.
....Hawthorne

NEW TEXTBOOK ON REACTOR SHIELDING PUBLISHED

The textbook, *REACTOR SHIELDING FOR NUCLEAR ENGINEERS*, Norman M. Schaeffer, Editor, has been published by the USAEC Technical Information Center. It is available from the National Technical Information Service, Springfield, Virginia, as TID-25951 for $13.60 in soft cover.

Dr. Schaeffer, President of Radiation Research Associates, Inc., Fort Worth, Texas, has pursued radiation transport and shielding research for many years. He was a leading physicist in the Convair, Fort Worth shielding program of the middle 1950's, which was part of the national aircraft nuclear propulsion program.

The various chapters were prepared by specialists such as W. F. Selph, C. W. Garrett, P. N. Stevens, D. K. Trubey, L. G. Mooney, S. T. Friedman, H. C. Claiborne, and J. D. Marshall.

The chapter titles include: Historical Background; Radiation Sources and Distribution; Interaction of Radiation with Matter; Radiation Transport; Monte Carlo Methods for Radiation Transport; Shield Attenuation Calculations; Albedos, Ducts, and Voids; Shield Heating, Air Transport, Shield Materials and Optimization; Experimental Shielding; and Shield Design. The various chapters include exercises and solutions.

The AEC booth at the Chicago ANS meeting will have display copies.

NEW CALIFORNIUM DEMONSTRATION CENTER AT LSU

John C. Courtney of the Louisiana State University (LSU) has announced that the AEC has established a Californium Demonstration Center at the LSU Nuclear Science Center as an aid in stimulating the development of industrial, medical and educational uses of Cf-252 neutron sources. A variety of Cf source sizes is available for use on the LSU campus or for off-campus loan. Those interested in borrowing a source should contact him at the Center, Baton Rouge, La. 87809.

NUCLEAR SYMPOSIUM CALLS FOR PAPERS

A call for papers and advance program have been released for the 1973 Nuclear Science Symposium to be held November 14-16 in San Francisco, Calif. The symposium is being sponsored jointly by the Nuclear and Plasma Sciences Society of the Institute of Electrical and Electronics Engineers (IEEE), the U.S. Atomic Energy Commission, and the National Aeronautics and Space Administration.

The symposium will feature sessions on Nuclear Techniques in Environmental Research, Low-Level Environmental Radionuclide Analysis Systems, Nuclear Techniques in Elemental Analysis, Nuclear Techniques in Biomedicine, Data Acquisition and Processing, CAMAC Systems, Radiation Detectors and Circuits, Reactor Instrumentation and Control, Plasma and Fusion Power, and Nuclear Instrumentation. There will also be a concurrent symposium on power systems, and a plenary session emphasizing environmental problems.

Interested authors should submit 10 copies of a 50-word abstract and a 500-word summary to be used as a basis for paper selection. Full information may be obtained from Paul L. Phelps, Program Chairman, Lawrence Livermore Laboratory, L-523, Box 808, Livermore, Calif. 94550. Papers must be sent by June 15, 1973.

INTERNATIONAL SYMPOSIUM
RADIATION PROTECTION - PHILOSOPHY AND IMPLEMENTATION

The Second International Symposium organized by the Society for Radiological Protection, the major British Society concerned solely with this subject, will be held at the Aviemore Conference Center, Invernesshire, Scotland, from 2 to 6 June 1974.

The theme of the Symposium is the philosophy of radiological protection, together with the means of implementing that philosophy. Scientific sessions will include discussion of the choice of parameters to measure and the measurement thereof (but not details of actual instruments); the interpretation of results in relation to dose limits and an assessment of significant genetic and somatic doses to the worker and the population; and an assessment of the consequences of exposure, together with subsequent decision-making from the points of view of highly exposed individuals, waste management, reactor safety and siting and sources to which the public may be exposed.

The working languages of the Symposium will be English and French. Papers will be accepted in either language and simultaneous translation facilities will be provided at full sessions. Depending on the amount of material offered, papers may be presented in extenso, by rapporteur session or in title.

Further details and registration forms may be obtained from the Administrative Secretary, Miss Sylvia Cross, Secretary's Department, CEGB, Room 1324,

Sudbury House, 15 Newgate Street, London ECIA 7AU. Notification of interest should be made as soon as possible.

NUCLEAR AND SPACE RADIATION EFFECTS CONFERENCE

The 1973 IEEE Annual Conference on NUCLEAR AND SPACE RADIATION EFFECTS will be held July 23-26 at the Utah State University, Logan, Utah. The preliminary program includes the following technical sessions:

- Defects in Materials - Radiation Damage and Ion Implantation,
- Radiation Effects in Semiconductor Devices,
- Charge Buildup and Surface Effects,
- Ionization Effects in Materials and Devices,
- Radiation Effects in Circuits and Systems,
- Radiation Dosimetry and Energy Deposition, and
- Quality Assurance and Measurement Standards.

Invited speakers will cover the following topics:

- "Bubble Domain Materials and Devices, and Radiation Hardness" (John L. Archer, Rockwell International Electronics Research Division),
- "Some Biological Consequences of Ionizing Radiation" (Dr. Robert K. Jones, Lovelace Foundation),
- "High Density Technologies As They Relate to Semiconductor Memories" (William D. Baker, Fairchild Semiconductor), and
- "Comparison of Computer Analysis Codes" (Dr. James J. Bowers, University of South Florida).

Information on the Conference may be obtained from Conference Chairman Julian S. Nichols AFWL/ELT, Kirtland AFB, New Mexico 87117.

SDI POLICY CLARIFICATION

In the past several months some of you have returned your green SDI cards to RSIC without comment. Although there is no indication on the card, we assume that you are asking for copies of the cited documents. In the event that our assumption is correct, we make the following clarification of RSIC policy.

RSIC's SDI service is designed to provide references and abstracts of documents which match the interest profiles furnished by those of you who use the service. If a document is needed, you should contact your own library first. The green SDI cards also indicate where the document may be obtained if the local library does not have it. Please keep your green

cards for your personal library.

Microfiche of documents in the RSIC system, except for copyrighted material such as journal articles, books, etc.,which are not otherwise obtainable will be furnished on request. When ordering microfiche, please keep your green cards; just write us a letter citing the assigned accession number and the document citation.

CODE-DATA-OR-GENERAL DISCUSSION CORNER

We have for many years encouraged our readers to contribute to the *RSIC Newsletter any items which were felt to be of interest to any segment* of the shielding community. Dr. Hugo W. Bertini, Neutron Physics Division, Oak Ridge National Laboratory, offers the following contribution.

AN APPLICATION FOR MECC-7, CCC-156

A possible application of the MECC-7 intranuclear cascade code[1] that probably has been overlooked is its use for the calculation of low energy nuclear reactions. Nonelastic reactions of protons, with energies from 15 to 60 MeV on various nuclei, have been investigated by the comparison of theoretical predictions from MECC-7 with experimental results. The degree of agreement has ranged from excellent to fair.[2,3,4] Similar agreement is expected for incident neutrons.

The only other model that is applicable in this energy region is the precompound decay model,[5] but this has the disadvantage of requiring arbitrary parameters to fit the data, and it is unable to produce differential energy spectra at any desired angle. MECC-7 is free of these disadvantages.

This note is intended to point out an area of application of the intranuclear cascade code (which with slight modification should apply reasonably well for thermonuclear 14-MeV neutrons[3]) in an area where no other model can supply estimates of detailed cross sections needed for applied purposes.

References:

1. Hugo W. Bertini, Phys. Rev. C6, 631 (1972).

2. Hugo W. Bertini, Phys. Rev. C5 , 2118 (1972).

3. R. G. Alsmiller, Jr. and O. W. Hermann, Nuc. Sci. Eng. 40, 254 (1969).

4. R. W. Peelle and F. E. Bertrand, Neutron Physics Division Annual Progress Report for Period Ending May 31, 1970," ORNL-4592, p.98 (Sept.1970).

5. M. Blann, Phys. Rev. Letters 28 757 (1972); see this paper for many other references. C. K. Cline, Nucl. Phys. A174, 73 (1971).

ORNL-RSIC-31 ISSUED

ORNL-RSIC-31, ABSTRACTS OF PERIPHERAL SHIELDING CODE PACKAGES ASSEMBLED BY THE RADIATION SHIELDING INFORMATION CENTER has just been issued in loose-leaf form. Copies have been mailed to those who made a request in advance of publication. Additional copies are available in RSIC.

ADDITION TO DLC COLLECTION

The Westinghouse Astronuclear Laboratory and the NASA Marshall Space Flight Center have made available through RSIC their technology (including data and computer codes) in analyzing nuclear reactor systems. The cross section generation, data processing techniques, and several libraries of nuclear data have been packaged together as follows:

DLC-26/W-M-NRSM — WANL-MSFC Nuclear Rocket Shielding Data Generators (GAMLEG-W, APPROPOS, NAGS, SATURN) and Neutron and Photon Cross Section Libraries 1 - 6. The set of computer codes are written in FORTRAN IV. They were designed to be nearly hardware-independent, and have been run on the CDC 6600 and the UNIVAC 1108. Reference: WANL-PR-(LL)-034, Vols. 2 and 3. DLC-26 package contains 60,222 records of information. Judging by how the tapes must be written, the requester may deduce the number of reels he must send for the package.

CHANGES TO CODE COLLECTION

Several changes have been made to the code collection: New code packages, hardware versions made available, and additions, modifications, and corrections made to existing code packages.

PSR-13/SUPERTOG — R. Q. Wright of ORNL and John Kinch of BRL called our attention to an error in Subroutine CWAX and corrections have been made in RSIC masters. Users may correct their version by making this change: replace statement reading: EPS=ESP1, by a new statement to read: EPS=EPS1

PSR-20B/LAPHANO — A sample problem input and output has been added to the CDC 6600 version. LAPHANO is currently packaged in two versions and may be requested as follows: PSR-20B/LAPHANO-CDC(3/73) for CDC 6600; and PSR-20C/LAPHANO-IBM(3/73) for IBM 360 users. Contributor: Los Alamos Scientific Laboratory. Ref.: LA-4750-MS (ENDF 156).

PSR-54/INTRIGUE II — The IBM 360 Subroutine Package for Making Linear, Logarithmic and Semilogarithmic Graphs has been extended to include new options: INTRIGUE-II-L (Ref. ORNL-4664) is designed for using the Calcomp Plotter; INTRIGUE-II-C

(Ref. ORNL-TM-3947) is designed to use the Calcomp pen-and-ink or the Cathode Ray Tube (CRT) Plotter. Contributor: Oak Ridge National Laboratory.

PSR-57/SATURN — P_ℓ or Transport Corrected Multigroup Neutron Cross Section Data Processor, contributed by Westinghouse Astronuclear Laboratory and NASA Marshall Space Flight Center. FORTRAN IV, IBM 360 (PSR-57A) and UNIVAC 1108 (PSR-57B). Reference: WANL-PR(LL) - 034, Vols. 2, 3. SATURN handles cross section data in ANISN-DOT format, and combines into one code the options formerly performed using ALC1 (PSR-48), JRMACRO (in DLC-11/RITTS), and TAPEMAKER (in CCC-82).

PSR-58/ADLER III — A Program to Calculate Cross Sections from Adler-Adler Resonance Parameters, contributed by Oak Ridge National Laboratory. ADLER III is a revision of the ADLER code, originally developed at Brookhaven National Laboratory.

PSR-59/MATEXP — Matrix Exponential Method Applied to Systems of Ordinary Differential Equations, contributed by Oak Ridge National Laboratory. FORTRAN IV, IBM 360. Reference: ORNL-TM-1933.

CCC-94/KAP VI-SCAP — The original code package (KAP V) is now replaced with a later generation, KAP VI, and an additional code, SCAP, has been added. The new package is entitled: Kernel Integration Code System in Complex Geometry. Contributors: Westinghouse Astronuclear Laboratory and NASA Marshall Space Flight Center. Reference: WANL-PR(LL)-034, Vol. 6 and WANL-PR(LL)-040, Vol. 2. FORTRAN IV. Data libraries and data generation codes are available in DLC-26.

CCC-117/BETA II — The Time-Dependent, Generalized Geometry Monte Carlo Code System for Bremsstrahlung and Electron Transport Analysis has been updated to reflect current state-of-the-art. The code package extension was a contribution from A.R.T. Research Corporation, Los Angeles, and the Air Force Weapons Laboratory, New Mexico. Versions may be requested as follows: CCC-117B: IBM 360 (Double Precision), CCC-117C: CDC 6600 (Single Precision), CCC-117D: UNIVAC 1108 (Single Precision). All versions are programmed in FORTRAN IV. Reference: ART-60, Vol. II.

CCC-152/ALGAM — A major update, which obsoletes older models of this Monte Carlo Estimation of Internal Dose from Gamma-Ray Sources in a Phantom Man, has been contributed by Oak Ridge National Laboratory. The new package may be requested as CCC-152/ALGAM-97(5/73). FORTRAN IV, IBM 360. Ref.: ORNL-TM-2250.

CCC-156/MECC-7 — A replacement for older models of this Medium-Energy Intranuclear Cascade Code System has been contributed by Oak Ridge National Laboratory. MECC-7 represents expanded

capability, increased cross sections, and has added a combined analysis package. FORTRAN IV, IBM 360. Reference: ORNL-4564. Requests filled after mid-April reflect these changes. (See Code Discussion Corner for H. W. Bertini contribution to this issue of the Newsletter).

CCC-173B/ZEBRA1 — A UNIVAC 1108 version of the ZEBRA1 Monte Carlo Electron Transport Code was contributed by Systems, Science and Software, La Jolla, California. FORTRAN IV. Reference: HDL-TR-1536. An IBM 360 version is available as CCC-173A.

CCC-187C/SAM-CE — An ANSI-Standard FORTRAN version of SAM-F, the forward calculation of MAGI's Monte Carlo Time Dependent Three-Dimensional Complex Geometry (Combinatorial) Shielding Code System Using ENDF Cross Sections, has been contributed by NASA Lewis Research Center, Cleveland, Ohio. SAM-F has been packaged using the IBM 360 system.

CCC-206/EGAD — Calculation of Dose Integrals from External Gamma Emitters, contributed by Savannah River Laboratories, Aiken, S.C. Reference: DP-1304. FORTRAN IV, IBM 360.

CCC-207/FLUKA-TRANKA — Three-Dimensional High-Energy (50 MeV-1000 GeV) Extranuclear Hadron Cascade Monte Carlo Code System for Cylindrical Backstop Geometries, contributed by Radiation Group, European Organization for Nuclear Research (CERN) Geneva, Switzerland. FORTRAN IV, CDC 6600.

CCC-208/JN-METD — Neutron Transport Code with Isotropic Scattering - Bare Spheres and Homogeneous Slabs (j_N Method 1) - Multilayer Slabs (J_N Method 2), contributed by Nuclear Studies Division, CCR EURATOM, Ispra (Varese), Italy through the OECD Nuclear Agency Computer Programme Library. References: EUR 4601e and EUR 4839e. FORTRAN IV, IBM 360 and 370.

CCC-209/DOT III — Two-Dimensional Discrete Ordinates Radiation Transport Code, contributed by Neutron Physics Division, Oak Ridge National Laboratory. FORTRAN IV, IBM 360.

PERSONAL ITEMS

Walter Zobel, ORNL physicist for 18 years, has recently joined the Tennessee Valley Authority (TVA), Knoxville, to be associated with the Nuclear Shielding and Analytical Design Group, Nuclear Design Staff, Mechanical Design Branch of TVA's Division of Engineering Design.

The following address changes have been sent to RSIC: George H. Anno from ART Research, Los Angeles, to Pacific-Sierra Research Corporation in Santa Monica, Calif; and John Kriese from ORNL to Westinghouse Bettis Atomic Power Laboratory.

C. M. Kim, formerly with Bechtel in Los Angeles, is currently supervising the work of the Nuclear Analysis Group, LMFBR Project, Burns and Roe, Inc., Oradell, N.J.

Dr. Mostafa Sohrabpour has returned to his responsibilities in Shiraz, Iran, where he is associated with the School of Engineering, Pahlaxi University, having concluded his work at the University in Columbia, Missouri.

VISITORS TO RSIC

Visitors to RSIC during the month of May were: B. Gore, Battelle Northwest, Richland, Wash.; F. D. McDaniel and F. D. Snyder, University of Kentucky, Lexington; D. W. Muir, Los Alamos Scientific Laboratory, New Mex.; J. W. Poston, Health Physics Div., ORNL; L. Stewart, Los Alamos Scientific Laboratory;W. B. Wilson, Texas A&M University, College Station.

MAY ACCESSION OF LITERATURE

The following literature cited has been ordered for review, and that selected as suitable will be placed in the RSIC Information Storage and Retrieval Information System (SARIS). This early announcement is made as a service to the shielding community. Copies of the literature are not distributed by RSIC. They may generally be obtained from the author or from a documentation center such as the National Technical Information Service (NTIS), Department of Commerce, Springfield, Virginia 22151.

RSIC maintains a microfiche file of the literature entered into SARIS, and duplicate copies are available on request. Naturally, we cannot fill requests for literature which is copyrighted (such as books or journal articles) or whose distribution is restricted.

Special bibliographies and selected computer-printed abstracts of the literature in the RSIC system are available upon request. The Selective Dissemination of Information (SDI) Service is available by submitting a list of subject categories defining the recipient's interests.

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