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. 84 November 1971

The dissemination of information
is one of the cornerstones
of modern civilization.
...John F. Budd

FOURTH INTERNATIONAL CONFERENCE ON REACTOR SHIELDING FORMALLY ANNOUNCED

The Fourth International Conference on Reactor Shielding will be held in Paris, France, at the Headquarters of the Union Internationale des Chemins de Fer on October 9-13, 1972. The Conference is being organized jointly by the OECD European Nuclear Energy Agency (ENEA) and the French Atomic Energy Commission in collaboration with the International Atomic Energy Agency (IAEA). Scientific patronage is being extended by the European-American Committee on Reactor Physics (EACRP) and the American Nuclear Society (ANS) through the Shielding and Dosimetry Division and the French Section of the Society. The purpose of the Conference is to present and discuss recent developments in reactor shielding in all parts of the world from the physics aspect (theory and experiment) and from the engineering aspect.

Scientific Secretaries for the Conference have been designated as follows: Christian Devillers, CEA/CEN/Fontenay-aux-Roses, France; Boris Kolbasov, IAEA, Vienna, Austria; and Jacques Royen, ENEA-OECD, Paris, France. Administrative Secretary is Jacques de La Ferte, ENEA-OECD. Correspondence on scientific or administrative matters may be directed to:

Secretariat of the Fourth International
Conference on Reactor Shielding
OECD European Nuclear Energy Agency
38 Blvd. Suchet
F-75 Paris 16e, France

The Conference is open to all reactor shielding scientists, as well as to those having a special interest in this field, who are working in OECD or IAEA

member countries. The working languages will be English, French, and Russian. Simultaneous interpretation will be provided. A summary of a proposed paper must be submitted before March 15, 1972.

A Program Committee has been appointed as follows: Armen A. Abagyan, PPEI, Obninsk, USSR; John Butler, AERE, Harwell, England; Giorgio Fogagnolo, SNAM Progetti, Milano, Italy; Pierre Lafore, CEN, Saclay, France; Fred C. Maienschein, ORNL, Oak Ridge, Tennessee; and Heinz Vossebrecker, INTERATOM, Köln, Germany. The Committee will screen the papers, organize the sessions and appoint the session chairmen.

A *CALL FOR PAPERS* appears in this issue of the Newsletter on pages 21 - 23. A package of general information is available from the Secretariat or from RSIC on request. It includes the CALL FOR PAPERS, details on submission of papers and summaries, instructions for authors, participation form, paper submission form, and examples of paper needed for typing summaries and papers. Information about registration, hotels, transportation, and visas will be furnished participants well in advance of the meeting.

The Radiation Shielding Information Center staff has agreed to act as a clearinghouse for information about the Conference for the benefit of the USA shielding community. The Secretariat is concerned that the Conference be well-attended and that the world shielding community be represented on the program. For planning purposes they would like to know of intent to attend well in advance of the Conference. RSIC will be pleased to collect such information within the United States and to forward it to the organizing committees. Please address comments and inquiries to:

International Shielding Conference
Radiation Shielding Information Center
Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, Tennessee 37830

or telephone CONFERENCE COORDINATOR: 615-483-8611, ext. 3-6944 or
FTS 615-483-6944

RSIC SEMINAR-WORKSHOP REMINDER

For those planning to participate, this is the last reminder to register for the *RADIATION TRANSPORT IN AIR* Seminar-Workshop to be held in Oak Ridge on November 15-17, 1971. All sessions will be held at the Oak Ridge National Laboratory, where the first session will begin in the East Auditorium at 9:00 A.M., Monday, November 15. Since badges are required, it is important that you notify RSIC *IN ADVANCE* of your plan to attend.

RSIC TO COLLECT INFORMATION ON TESTING OF COMPUTATIONAL METHODS AND NUCLEAR DATA

In connection with the International Shielding Conference in Paris, October 9-13, 1972, RSIC will attempt to collect information on tests of computational methods and nuclear data which are now in progress. Such tests are usually integral over energy and may provide (1) a means of validating the applicability of data sets (data libraries) and spotlighting inadequate portions of the data sets which may require additional differential experiments or evaluation; or (2) a means of validating the development of both rigorous and approximate analytical methods and the codes which implement them.

It is sometimes difficult to differentiate between nuclear data testing and methods testing. In data testing, one attempts to use established and reliable analysis and measurement techniques so that the major uncertainty is associated with the data. With transport methods testing, one hopes to use reliable or reference data in the analysis of an experimental configuration which is relevant to a shield design problem. Computational method tests may be purely calculational, comparing the results of two or more methods to develop confidence in the results.

Completed work not yet published elsewhere should be submitted to the Conference in papers offered for the methods and data-testing session. For work in progress which will not be ready for reporting, please notify RSIC using the form "Tests of Nuclear Data or Radiation Transport Methods," page 24 of this issue. If sufficient data are collected, they will be presented to the symposium and in the interim will be distributed to all the contributors.

ICRU DEFINES NEW NAMES FOR RADIATION PROTECTION QUANTITIES

The new report *Radiation Quantities and Units,* ICRU Report 19 (July 1, 1971), supercedes ICRU Report 11. The major changes are (a) introduction of additional quantities in the area of microdosimetry and radiation protection, and (b) more rigorous definitions of the quantities resulting in a somewhat different formalism without altering their meaning or range of applicability.

To meet the need for the characterization of ambient radiation levels at any location for purposes of radiation protection, the quantities *absorbed dose index,* D_I, and *dose equivalent index,* H_I, are defined below. In this approach, the maximum absorbed dose in the human body is approximated by the maximum absorbed dose in a sphere of tissue-equivalent material.

The newly defined quantities are:

1. The absorbed dose index, D_I, at a point is the maximum absorbed dose within a 30 cm diameter sphere centered at this point and consisting of material equivalent to soft tissue with a density of 1 g cm^{-3}.

This definition applies to all ionizing radiations and one may distinguish the various components of a complex radiation field by indicating, for example, the gamma ray D_I, neutron D_I, proton D_I, etc.

It should be noted that the maximum absorbed dose due to components of the radiation may occur at different locations in the sphere. Hence, the D_I for the radiation field as a whole is generally less than the sum of the values for its components.

2. The *dose equivalent index*, H_I, at a point is the maximum dose equivalent within a 30 cm diameter sphere centered at this point and consisting of material equivalent to soft tissue with a density of 1 g cm^{-3}.

It should be noted that a similar concept has been employed for a long time in the use, for example, of the well-known Snyder-Neufeld flux-to-dose rate factors derived from calculation of energy deposition in a slab phantom. This was discussed by Claiborne and Trubey* who provided similar data for gamma rays.

ICRU reports are available from

ICRU Publications
P. O. Box 30165
Washington, D. C. 20014

The price of ICRU Report 19 is $2.50.

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* H. C. Claiborne and D. K. Trubey, Nucl. App. and Tech. 8(5), 450-455 (1970).

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ADDITIONS TO THE COMPUTER CODE COLLECTION

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

CCC-89F/DOT II W — The latest frozen model of the DOT II W, Two Dimensional Discrete Ordinates Transport Code, has been contributed by Westinghouse Astronuclear Laboratory, Pittsburgh, Pa., Reference: WANL-TME-1982 (Revision A). FORTRAN IV; IBM 360.

CCC-150B/MAP — The latest frozen model of MAP, Kernel Integration Code in Complex Geometry with Special Application to Surface Sources Determined by Discrete Ordinates Calculations, has been received from Westinghouse Astronuclear Laboratory, Pittsburgh, Pa. This version of MAP is packaged as CCC-150B. Reference: WANL-TME-2706. FORTRAN IV, IBM 360.

CCC-169/CAVEAT — General Purpose Monte Carlo Radiation Transport Code, contributed by Teledyne Brown Engineering and NASA George C. Marshall Space Flight Center, Huntsville, Alabama. Reference: Technical Note SE-290, Volumes I and II. FORTRAN IV; CCC-169A, IBM 7090/94; CCC-169B, IBM 360.

CCC-123/XSDRN — Multigroup One-Dimensional Discrete Ordinates Spectral Averaging Neutron Transport Code Package has been extended by the addition of the BX code which produces an XSDRN data library from GAM-II THERMOS data libraries. BX was contributed by the Oak Ridge National Laboratory.

PSR-20B/LAPHANO — The latest version in the LAPH series has been contributed by the Los Alamos Scientific Laboratory and is packaged as PSR-20B/LAPHANO: Multigroup Photon Production Matrix and Source Vector Code for ENDF/B. References: LA-4337 (ENDF-132) and a new report to be published. FORTRAN IV, CDC 6600 and IBM 360.

NOTE TO USERS OF CCC-161/NMTC CODE PACKAGE

RSIC has received correspondence from T. W. Armstrong, Oak Ridge National Laboratory,and from W. J. Wiesehahn of the Simon Fraser University, British Columbia, calling attention to compilation restrictions, to a nonstandard library subroutine, and to errata in the documentation, ORNL-4606. A direct mailing has been made by RSIC to known NMTC users. Any users not receiving the direct mailing may request it from RSIC.

MODIFICATION TO CCC-82C/ANISN CODE PACKAGE

The following modification should be made to the TAPEMAKER routine in CCC-82C/ANISN Code Package.

Just after the 3rd statement after statement numbered 999 add:

```
   DØ 200  I = LCRX, LIM1
200 D(I) = 0.0
```

CHANGES TO CCC-127/MORSE CODE PACKAGE

Attention is called to the revised MORSE Cross-Section Module, MORSEC and XCHEKR received by RSIC in September. A new set of subroutines replaces all identically named subroutines included in file 1 of the RSIC Code Package CCC-127B. In addition, new subroutines have been added, and changes have been made to existing subroutines. For those using MORSE who have not

received the changes in a direct mailing - they are available on request from RSIC.

NEW CODE ADDED TO DLC-2/99 GROUP CROSS SECTION DATA PACKAGE

A contribution from the Nuclear Effects Laboratory of the Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland, has been added to the DLC-2/Data Library Package. The neutron cross section collapsing code, APRFX-I reads data from DLC-2, collapses and combines cross section sets for multigroup transport calculations. It is designed to perform group collapsing for as many isotopes, mixtures and Legendre expansion sets as desired from the DLC-2B library.

APRFX-I collapses the fine group cross sections to a broad group structure according to a flux spectrum either input by the user or calculated by the code. The code will average the fine group cross sections to form either macroscopic or microscopic isotope cross sections and any combination of macroscopic mixtures of these cross sections on the same problem. It also determines the broad group input source and generates averaged neutron velocities for use with transport calculations.

The code is written in FORTRAN IV. The packaged version was compiled and executed on the IBM 360/75/91 system by RSIC.

CURRENT WORK AND PROBLEMS

The following reports-in-brief of work in progress continues the *CURRENT WORK AND PROBLEMS* feature. The names in parentheses identify reporters for each installation. We welcome contributions to this feature from those who have not yet responded, from those whose work has significantly changed, and from those who wish to call attention to new problem areas.

At the Department of Nuclear Engineering, Kyoto University, Kyoto Japan (Tomonori Hyodo, Takashi Nakamura): Monte Carlo calculations of neutron transmission are being done. The response of NaI(Tℓ) scintillators to gamma rays is also being calculated by the Monte Carlo method. The penetration of bremsstrahlung is being calculated using the point kernel method. Measurements of neutron penetration through matter are being done using liquid scintillators and 3-He counters. Other work is in the area of bremsstrahlung dosimetry.

They feel that a work area needing immediate effort is *utilizing photoreaction cross sections of metals in the measurement of bremsstrahlung.*

At Lockheed-California Company, Burbank, California (Frank L. Bouquet): work is being done in the areas of weapons, high altitude atmospheric, and space radiations.

ANNUAL REPORT OF THE ORNL NEUTRON PHYSICS DIVISION NOW AVAILABLE

The "Neutron Physics Division Annual Progress Report for Period Ending May 31, 1971," ORNL-4705, has now been issued. The report is composed of a wide variety of abstracts and summaries on neutron cross sections, reactor and weapons radiation shielding, theoretical studies for medium- and high-energy radiation shielding, and medium-energy nucleon spectroscopic studies. In addition, RSIC current statement of functions, summary of operations and services, abstracts of reports published, and tables of additions to codes and data collections are included.

Copies of the report are available from ORNL and from NTIS.

PERSONAL ITEMS

Dr. Karl Hornyik is currently a member of the faculty at Radiation Center, Oregon State University at Corvallis, working on development of the new Nuclear Engineering Technology program sponsored in part by the National Science Foundation. He was formerly on the staff of VPISU, Blacksburg, Virginia for two years and prior to that with G.f.K. in Karlsruhe, West Germany, for three years where he worked on shielding problems for the fast breeder reactor development program.

Major Jerry L. McKenzie now heads the Reactor Division of the Armed Forces Radiobiology Research Institute, National Naval Medical Center, Bethesda, Maryland. He was formerly located at Wright-Patterson Air Force Base and prior to that at the Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico.

Dr. W. H. Kohler, a member of faculty at Texas A & M University, has accepted an appointment to INTERATOM, Koeln, Germany.

W. R. Cobb, formerly with the ORNL Reactor Division, is now associated with Nuclear Fuel Services, Rockville, Maryland.

Dr. W. G. Simon has accepted an appointment to the faculty of the Department of Physics and Astronomy at the University of Wyoming. Dr. Glen Stinson is replacing him at the University of Alberta, Canada.

Olive Y. Liu has transferred from the Schlumberger-Doll Research Center, Ridgefield, Connecticut, to Schlumberger Well Services, Houston, Texas.

Henry T. Smith, formerly with Teledyne Brown Engineering Company, has accepted a position in the Huntsville, Alabama office of Science Applications, Inc.

The former United Nuclear Corporation of Elmsford, New York, has changed its name to Gulf United Nuclear Fuels Corporation.

Dr. G. R. Stevenson has accepted an appointment to the Radiation Group of the new 300 GeV Accelerator Project at CERN in Geneva. Dr. D. R. Perry replaces him on the RSIC distribution at the Radiation Protection Group in the Rutherford High Energy Laboratory, Chilton, Didcot, Berkshire, England.

VISITORS TO RSIC

Visitors to RSIC during the month of October were: C. Devillers, CEA/CEN Fontenay-aux-Roses, France;D. J. Dudziak, Los Alamos Scientific Laboratory. Los Alamos, New Mexico; A. Gobbi, Yale University, New Haven, Conn.; D. H. Holze, Boeing, Kent, Wash.; R. LaBauve, Los Alamos Scientific Laboratory, Los Alamos, N.M.; John H. McNeilly, Ballistic Research Lab., Aberdeen Proving Ground, Maryland; M. Rosenstein and R. H. Schneider, Bureau of Radiological Health, Rockville, Md.; William Stein, Los Alamos Scientific Laboratory, Los Alamos, N.M.; B. Stevens, Information Division, ORNL; J. F. Strahl, NUS Corporation, Rockville, Md.; M. Wilkinson, The Boeing Company, Kent, Wash.

OCTOBER 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 abstracts of the literature in the RSIC system may be requested through the Selective Dissemination of Information (SDI) Service, which is available to all.

REACTOR AND WEAPONS SHIELDING

A/CONF.49/P-523 (CONF-710901-489) June 1971

Health, Safety, and Legal Aspects of Nuclear Energy in the Field of Radiation Protection in Portugal
J. Pistacchini Galvao; A. Vaz Carreiro, A. Ortins de Bettencourt, A. Nazare Vaz; et al.
Avail.: Dep.; NTIS (U.S. Sales only)
(Prepared for 4th International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland (6 Sep 1971)

AECL-3802 January 1971

Thermal Test Calculations for Packages of Steel Construction
W. R. Taylor
Avail.: NTIS

AECL-3803 January 1971

Design and Development of Packagings for Low Enriched Fuel Bundles
W. R. Taylor
Avail.: NTIS

AED-C-13-7 August 1970

Bibliographies in Nuclear Science and Technology. Section 13. Decontamination.
H. Philipp, E. Wichman (comps.)
Avail.: NTIS

BMBW-FBK-71-2 (In German) March 1971

New Monte Carlo Technique for Radiation Transport Problems: Calculation of the Combined Spatial, Angular, and Energy Distribution of Multiple Scattered Gamma-Rays
H. Stehfest

BNL-400 3rd Ed. Vol. II June 1970

Angular Distributions in Neutron-Induced Reactions Volume II. Z = 21 to 94
D. I. Garber, L. G. Stromberg et al.

BNL-15746 (Vol. 2) June 1971

Compilation of Fast Reactor Experiments
Philip F. Palmedo
Avail.: Dep.; NTIS

CEA-N-1423 (In French) March 1971

Library of Nuclear Data for Fission Products (Second Version)
B. Barre, R. de Tourreil
Avail.: Dep.; NTIS (U.S. Sales only)

CEA-R-4156 (In French) March 1971

Emotivity Parameter in Industrial Medicine and the Special Conditions Imposed by Radioprotection in the Nuclear Industry
J. Bessuges
Avail.: NTIS

CEA-R-4188 (In French) 1971

Shielding Problems Set by the Use of a Natural Uranium Target with a Linear Electron Accelerator. Shielding and Safety Systems Necessary.
Henry Vialettes, Jean Rocchesani, Pierre Lemure
Avail: Dep.; NTIS (U.S. Sales only)

CONF-701002 August 1971

Neutron Standards and Flux Normalization. Proceedings of a Symposium held at Argonne National Laboratory, Argonne, Ill., October 21-23, 1970.
Avail.: Dep.; NTIS

CONF-710301 (Vol. 1), pp. 1-24 August 1971

Critical Experiments and Spectrum Measurements on the Validity of Microscopic Data
E. D. Pendlebury
Avail.: NTIS ($12.00, 2 vol.set),(mf $1.90 - 2 vol. set)

CONF-710301 (Vol. 1), pp. 91-97 August 1971

Integral Tests and Evaluation of Cross-Section Data from Studies of Fast Neutron Transport in Bulk Media
B. K. Malaviya, N. N. Kaushal, M. Becker, E. T. Burns, A. Ginsberg, E. R. Gaerttner
Avail.: NTIS ($12.00, 2 vol. set), (mf $1.90 per set)

CONF-710301 (Vol. 1), pp. 106-112 August 1971

The Role of Cross Section Minima in the Deep Penetration of Fast Neutrons
H. Goldstein, L. J. Lidofsky, E. Oblow, W. E. Preeg, P. Soran, C. R. Weisbin
Avail.: NTIS ($12.00, 2 vol. set), (mf $1.90 per set)

CONF-710301 (Vol. 1), pp. 120-127 August 1971

Neutron Energy Dependent Cross Section Evaluation by a Multiple Foil Activation Method
W. N. McElroy, R. L. Simons, J. A. Ulseth, L. S. Kellogg
Avail.: NTIS ($12.00, 2 vol. set), (mf $1.90 per set)

CONF-710301 (Vol. 1), pp. 367-372 August 1971

Photon Production Data Review and Retrieval in the ENDF
D. J. Dudziak
Avail.: NTIS ($12.00 per set) (mf $1.90 per set)

CONF-710301 (Vol. 2), pp. 514-520 August 1971

Neutron Cross-Section Requirements for Fusion Reactor Design
D. Steiner
Avail.: NTIS ($12.00 per set) (mf, $1.90 per set)

CONF-710301 (Vol. 2), pp. 598-604 August 1971

Neutron Filtered Beams as Standard Sources
O. D. Simpson, J. R. Smith, J. W. Rogers
Avail.: NTIS ($12.00 per set) (mf, $1.90 per set)

CONF-710302, Vol. 2, pp. 1016-1023 March 1971

Generating Moments of the Photon Production Matrices and Sources from ENDF Data: The LAPHAN Code
D. J. Dudziak, R. E. Seamon
Avail.: NTIS ($12.00 per set) ($0.95 per set)

CONF-710315-23 1970

Standards Required for LMFBR Design and Construction
R. G. Hobson
(Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.)

CONF-7103015-12 March 9, 1971

Development and Use of Standards for the LMFBR
J. O. Henrie, R. E. Durand

COO-2049-5 July 30, 1971

Evaluation of Minima in Total Neutron Cross Section by Transmission of Fission Spectra Through Thick Samples
W. H. Miller, W. Meyer

COO-2060-14

Applications of the Transmission Matrix to Radiation Shielding. Progress Report, March 15,1971-June 15, 1971
Alfred F. Rohach
Avail:Dep.; NTIS

DEMO-70/11 July 1970

Measurement of the Coefficient of Gamma Absorption of Materials Used for Nuclear Constructions
E. Mavroyannakis, J. Antoniades
Avail.: NTIS

DESY-70-59 November 1970

Fluorescense Excitation of Ultra-Soft X-Ray Emission Spectra Using Synchrotron Radiation
K. Feser, J. Muller, G. Wiech, A. Faessler
Avail.: NTIS

DPSU-71-124-1 *February 1971*

Safety Summary Report: LLD-1 Package (Packaging of Radioactive and Fissile Materials). Final Report.
R. F. Rogers (comp.)
Avail.: NTIS

FEI-216 *(In Russian)* *1970*

Interaction Between 14-MeV Neutrons and the Nuclei of Iron, Copper, and Niobium
O. A. Sal'nikov, G. N. Lovchikova, G. V. Kotel'nikova, V. S. Nesterenko, N. I. Fetisov, A. M. Trufanov
Avail.: Dep.; NTIS (U.S. Sales only)

HASL-244 *July 1971*

User's Guide to SWIFT, A Monte Carlo Technique for Unfolding Neutron Spectra
Robert S. Sanna
Avail.: Dep.; NTIS

HW-76299 *January 21, 1963*

Rail Accident Statistics Pertinent to the Shipment of Radioactive Materials
K. B. Stewart
Avail.: NTIS

ICRU Report 19 *July 1, 1971*

Radiation Quantities and Units
International Commission on Radiation Units and Measurements
ICRU Publications, P. O. Box 30165, Washington, D. C. 20014 $2.50

KFK-1263 *(In German)* *September 1970*

Transport of High Level Vitrified Fission Products
W. Bechthold
Avail.: NTIS

KFK-1391 *April 1971*

Comparison of 3 Methods to Control the Leakage of Particles in a Monte Carlo Game
H. Borgwaldt
(Kernforschungszentrum, Karlsruhe)

LA-4757 *September 1971*

Simplification of Ray Effect Corrections in Transport Calculations
B. G. Carlson
Avail.: NTIS

LA-4774 September 1971

Two-Dimensional Air Transport Calculations
K. D. Lathrop
Avail.: Dep.; NTIS

LA-DC-12314 (CONF-710606-12) 1971

Instituting a Neutron Spectrum Unfolding Capability
A. A. Robba, R. R. Fullwood, L. R. Veeser
Avail.: Dep.; NTIS

LB/G-3075 1970

Construction of Response Matrices in Gamma-Scintillation Spectrometry
R. Brust, D. Richter
(Translated by N. J. Davren
Avail.: Dep.; NTIS (U.S. Sales only)

NASA-CR-1873 October 1971

Radiation Effects Design Handbook. Section 7. Structural Alloys
M. Kangilaski
Avail.: NTIS

NASA TM X-67937 October 1971

Effect of Angular Quadrature on Results of Two-Dimensional Space Power Reactor Shield Calculations
D. J. Connolley, G. P. Lahti
(Tech. Paper proposed for presentation at ANS Winter Meeting Miami Beach, Florida)

NP-18728 July 1970

Levels of Cs-137 in Man in U.A.R. During Year 1970
F. M. El-Assaly, A. A. Alloush
Avail.: NTIS

NP-18732 July 2, 1970

Technical Report on Annual Occupational Radiation Exposure Dose Levels for U.A.R. Atomic Energy Workers During the Period 1962-1969.
A. M. Sayed
Avail.: NTIS

NP-18790 1970

Annual Report to the Director-General of Health for the Year Ended 30 June 1970
Commonwealth X-Ray and Radium Lab., Melbourne, Australia
Avail.: NTIS

ORNL-4705 October 1971

Neutron Physics Division Annual Progress Report for Period Ending May 31, 1971
F. C. Maienschein (Director), et al.
Avail.: NTIS

ORNL-TM-3366 (CONF-710304-13) August 1971

MORSE Monte Carlo Shielding Calculations for the Zirconium Hydride Reference Reactor
C. E. Burgart
From Symposium on Natural and Manmade Radiation in Space; Las Vegas, Nev. (1 Mar. 1971)
Avail.: NTIS

ORNL-TM-3463 (CONF-710606-13) August 1971

Techniques Used at Oak Ridge National Laboratory for Unfolding Neutron and Gamma-Ray Pulse-Height Spectra
R. W. Peelle
Avail.: Dep.; NTIS

ORNL-TM-3506 August 1971

Safety Analysis of ORNL Bulk Radioisotope Shipping Cask
R. D. Seagren
Avail.: Dep.; NTIS

ORNL-TM-3514 October 5, 1971

Experimental Investigation of Neutron Streaming Through the Grid-Plate-Shield of the Fast Flux Test Facility
C. E. Clifford, F. R. Mynatt, P. N. Stevens

ORNL-TR-2465 1968

Program of Dose Calculation
J. Brettes, J. P. Philippon
(pp. 139-64 of Calcul des Doses de Radiation dan---(1968) in French)

ORNL-TR-2493 (Atomkernenergie, 16, 146-52 (1970))

Investigation of the Energy Distribution of Singly- and Multiply-Scattered Gamma-Radiation. II. Doubly- and Triply- Back-Scattered Radiation
E. Wechselberger

ORNL-TR-2494 (Kernenergie, 13(8), 237-242 (1970))

Shielding of Fast Breeders
L. Albrecht, M. Gegusch, W. Schimmel

ORNL-TR-2534 (THESIS) 1971

A Method for Determining the Differential Albedo for 1 to 17 MeV-Photons
H. G. Vogt
Technical University of Hannover

ORO-2791-27 15 August 1968

Annual Progress Report on Neutron-Interaction Gamma Rays
W. E. Tucker, J. B. Ashe, P. S. Buchanan, K. D. Clausen, I. L. Morgan, D. O. Nellis, G. H. Williams
Avail.: Dep.; NTIS

PEL-188 October 1970

Radiation Protection and Control at the National Institute for Metallurgy During the Period 1960-1969
D. K. Craig, J. Kruger, G. Stewart
Atomic Energy Board, Pelindaba, Pretoria, South Africa

PEL-204 August 1970

Investigation into the Different Computer Techniques Available for the Analysis of Gamma-Ray Spectra Obtained with a Lithium-Drifted Germanium Detector
J. Turkstra, M. C. J. van Rensburg, W. J. de Wet
Avail.: Dep.; NTIS (U.S. Sales only)

PHS-Publ. 2016 January 1970

Radiological Health Handbook
Public Health Service, Rockville, Md.
GPO $4.00

RRA-T-7012 August 1, 1970

Monte Carlo Codes to Study the Transport of X-Rays and Fluorescent Light in the Atmosphere
F. O. Leopard, D. G. Collins et al.

RPI-328-230 1971

Experimental and Analytical Studies of Fast Neutron Transport in Iron
B. K. Malaviya, N. N. Kaushal, M. Becker, E. T. Burns, A. Ginsberg, E. R. Gaerttner
Avail.: Dep., NTIS

RT/FI-(70)47 November 19, 1970

Method of Analysis of Neutron Capture Gamma-Ray Spectra
A. Fubini, A. Napoli, D. Prosperi, F. Terrasi
Avail.: Dep.; NTIS (U.S. Sales only)

RT/PROT-71-11 *April 1971*

Health Protection Analysis of Transportation of Radioactive Substances Through Tunnels: The Mont Blanc Tunnel
C. Faloci, F. Lucci, A. Susanna
Avail: Dep.; NTIS (U.S. Sales only)

SC-DR-710320 *September 1971*

Processing Codes for Group-Averaged Discrete Ordinates Cross-Section Tables
K. G. Adams, J. H. Renken, J. H. Flinchum
Avail.: Dep.; NTIS

SC-M-68-378 (Rev.2) *July 1968; Rev. June 1971*

Recommended Safety Guides, Sandia Laboratories
W. W. Allison

TRG-Report-2133 *1971*

Calculations for a Large Fast Reactor: A Comparison of Results Organised by the International Atomic Energy Agency
A. R. Baker, A. D. Hammond
Avail.: Dep.; NTIS (U.S. Sales only). UK 70p

UCRL-50400 (Vol. 4) *April 15, 1971*

Evaluated Nuclear Cross Section Library
R. J. Howerton, R. J. Doyas, T. C. Michels, S. T. Perkins
Avail.: Dep.; NTIS

UCRL-73270 (CONF-710809-3) *June 30, 1971*

Production of Tritium by Nuclear Weapons
J. A. Miskel
Avail.: Dep.; NTIS

Brit. J. Radiol., 44(525), 708- *(1971)*

Design of a Practical Fast-Neutron Therapy Equipment for Routine Clinical Use
D. A. Lundberg

Health Phys., 21(4), 585- *(1971)*

Exposure Rates from Products of Thermal-Neutron Fission of U-235 at Selected Times After Fission
D. Sam, L. R. Bunney

Nucl. Instrum. Methods, 95(3), 571- *(1971)*

Total Absorption Ionization-Chamber for 1.5-10 KeV Gamma Rays
P. B. Lyons, J. A. Baran, J. H. McCrary

Nucl. Sci. Eng., 46(1), 1-11(Oct. 1971)

A Three-Dimensional Stochastic Gamma-Ray Transport Method for Shielding Calculations
A. Razani, H. E. Hungerford

Nucl. Sci. Eng., 46(1), 12-21 (Oct. 1971)

Monte Carlo Calculation of the Effect of Subterranean Perturbations on Reflected X Rays
W. A. Coleman

Nucl. Sci. Eng., 46(1), 53-60 (Oct. 1971)

Spectra of Fast Neutrons from Water Pulsed with 14-MeV Neutrons
M. L. Stelts, J. D. Anderson, L. F. Hansen, E. F. Plechaty, C. Wong

Nucl. Sci. Eng., 46(1), 150-159 (Oct. 1971)

Synthesis of Fast Reactor Neutron Energy Spectra (Tech. Notes)
P. A. Ombrellaro, M. A. Snider

Nucl. Sci. Eng., 46(1), 159-165 (Oct. 1971)

Synthesis Solutions of the Multigroup Boltzmann Equation for Slabs (Tech. Note)
W. Schwetje

BOOK *1971*

Mathematical Methods in Particle Transport Theory
M. M. R. Williams
London, Butterworths (429 p.)

SPACE AND ACCELERATOR SHIELDING

CERN-HERA-69-3 *December 2, 1969*

Compilation of Total and Total Elastic Cross-Sections
Giacomelli
Avail.: Dep.; NTIS (U.S. Sales only)

CERN-HERA-70-5 *September 1970*

Compilation of Cross Sections. IV. π^+ Induced Reactions
E. Flaminio, J. D. Hansen, D. R. O. Morrison, N. Tovey
Avail.: Dep.; NTIS (U.S. Sales only)

JINR-P2-5924 (In Russian) *1971*

Cross Sections of the Pion-Nucleon Interactions
V. S. Barashenkov, V. A. Okhlopkova
Avail.: Dep.; NTIS (U.S. Sales only)

JINR-P7-5808 (In Russian) (CONF-710209-3) 1971

Physics of High-Energy Multiply Charged Ions
A. M. Baldin
Avail.: Dep.; NTIS (U.S. Sales only)

MDAC PAPER WD1528 March 1971

Solar Cosmic Ray Hazard to Interplanetary and Earth-Orbital Space Travel
W. R. Yucker

MDAC WD1630 October 1971

A Technique for Evaluation of Space Radiation Dose to Distributed Body Organs
M. P. Billings, R. W. Langley

MDAC PAPER WD1631 May 1971

Bremsstrahlung Shielding for an Orbiting Electron Spectrometer
W. R. Yucker

MDAC WD 1736 October 1971

A Simplified Model for Estimating Space Proton Dose to Distributed Body Organs
R. W. Langley, M. P. Billings
(Presented to ANS Winter Meeting, Miami Beach, Fla. 17-21 Oct. 1971)

NASA-CR-1871 September 1971

Radiation Effects Design Handbook. Section 5. The Radiations in Space and Their Interactions with Matter
M. L. Green, D. J. Hamman
Avail.: NTIS

NASA-SP-8049 (N71-30849) March 1971

The Earth's Ionosphere: Space Design Criteria (Environment)
R. G. Lyle, P. D. Stabekis
Avail.: NTIS

ORNL-4673 October 1971

Calculation of the Nucleon- and Pion-Induced Star and Flux Distributions from 400-GeV Proton Interactions in Iron
R. T. Santoro, T. A. Gabriel
Avail.: NTIS

ORNL-TM-3437 August 27, 1971

Nucleon and Charged-Pion Albedo Spectra in an Accelerator Cave From 200-GeV Proton Interactions in Iron
T. A. Gabriel, R. T. Santoro

ORNL-TR-2490 (Astron. Raumfahrt, 2, 58-61 (1969) in German)

Exposure to Radiation in Orbital Flights
H. Swart

ORNL-TR-2520 (Transl. from JINR-P2-5549)

Classification of Inelastic Interactions of High-Energy Protons and Nuclei. II. Characteristics of Low-Energy Nuclei
V. S. Barashenkov, A. S. Il'inov, N. M. Sobolevskii, V. D. Toneev
Avail.: Dep.; NTIS

Annual Report of the Rad. Center of Osaka Prefecture, 4, 50-54 (1963)

Backscattering of Electrons in the Energy Range 4-14 MeV
S. Okabe, T. Tabata, R. Ito

Annual Report of the Rad. Center of Osaka Prefecture, 6, 56-59 (1965)

Energy Distribution of Backscattered Electrons II
T. Tabata, S. Okabe, R. Ito

Annual Report of the Rad. Center of Osaka Prefecture, 10, 42-44 (1970)

On the Analytical Integration of the Moliere's Distribution Function for the Multiple Scattering of Charged Particles
R. Ito

Annual Report of the Rad. Center of Osaka Prefecture, 11, 67-70 (1970)

Empirical Equations for the Projected-Range Straggling of 4- to 24-MeV Electrons
T. Tabata, R. Ito, S. Okabe, Y. Fujita

Annual Report of the Rad. Center of Osaka Prefecture, 11, 71-7 (1970)

A Semiempirical Equation for the Mean Projected Range of Electrons
T. Tabata, R. Ito, S. Okabe

Nucl. Instrum. Methods, 94(1)39-43 (1971)

Energy Straggling of Alpha Particles in Thick Absorbers
D. A. Sykes, S. J. Harris

Nucl. Instrum. Methods, 94(3), 509-513 (1971)

An Empirical Equation for the Backscattering Coefficient of Electrons
T. Tabata, R. Ito, S. Okabe

Nucl. Sci. Eng., 45(2), 107-116 (August 1971)

A Method for Solving Time-Dependent Electron Transport Problems
M. C. Cordaro, M. S. Zucker

Phys. Rev., 162(2), 336-347 (Oct. 1967)

Backscattering of Electrons from 3.2 to 14 MeV
T. Tabata

Soviet J. Nucl. Phys., 13(4) (April 1971)

Further Development of the Intranuclear Cascade Model
V. S. Barenshenkov, A. S. Il'inov, V. D. Toneev

COMPUTER CODES LITERATURE

AERE-R-6642-Pt-1 — *December 1970* — *LIBRARY*

A Library of Neutron Induced Fission Product Yields Maintained and Interrogated by Computer Methods. Part 1: The Establishment of the Library
by E. A. C. Crouch, United Kingdom Atomic Energy Authority, Harwell
Avail.: Dep.

CEA-CONF-1669 — *October 1970* — *NIOBE, ANISN, POKER*

Comparative Performances of Monte Carlo and Discrete Ordinate One-Dimensional Transport Codes in an Iron Bulk Shield Calculation
by Christian Devillers, CEA/CEN/FAR, France
Avail.: Dep.

CEA-N-1354 (In French) — *October 1970* — *SABINE*

Study of the Validity of the SABINE Code in Calculations on the Shielding of Heavy and Light Water Reactors
CEA/CEN/FAR, France; J. Guezenec, M. Hot, P. Pepin
Avail.: Dep.

CEA-N-1359 (In French) — *October 1970* — *TRIPOLI*

Three Dimensional Monte Carlo Calculation (TRIPOLI Code) of the Neutron Spectra in the Lower Shield of Phenix
by Jean-Claude Nimal and Therese Vergnaud, CEA/CEN/FAR, France
FORTRAN IV, IBM 360
Avail.: Dep.

ORNL-4564 — *May 1971* — *MECC-3*

Instructions for the Operation of Codes Associated with MECC-3, A Preliminary Version of an Intranuclear-Cascade Calculation for Nuclear Reactions
by H. W. Bertini, M. P. Guthrie, O. W. Hermann, Oak Ridge National Laboratory
FORTRAN IV, IBM 360
Avail.: Dep.; NTIS

INTERNATIONAL SHIELDING CONFERENCE - CALL FOR PAPERS

The OECD European Nuclear Energy Agency and the French Atomic Energy Commission in collaboration with the International Atomic Energy Agency issue *A CALL FOR PAPERS* for the Fourth International Conference on Reactor Shielding to be held in Paris on October 9-13, 1972. A Summary of a proposed paper should be submitted before March 15, 1972, should be between 400-800 words, and should be prepared according to specific requirements, copies of which are available from the Secretariat or from the Radiation Shielding Information Center.

PROVISIONAL PROGRAM OF THE CONFERENCE

The Program Committee would like this Conference to be centered on the practical problems encountered in reactor shielding, and the basic issues - theoretical methods, nuclear data - to be presented in the context of effective needs. In particular, the Committee would appreciate the emphasis being laid on the following points: influence of shielding on reactor costs; criteria of choice of methods (desired accuracy, cost, available computers, etc.); comparison of measurements with prediction on operational reactor plant; and analysis of the sources of error.

Each paper prepared for the Conference is expected to be designed to fit into one of the following categories:

A. General Approach to Reactor Shield Design

1. Practical problems encountered on a specific reactor type (fast, water type, gas-cooled, research, marine, and space reactors).

2. Design criteria and philosophy with emphasis on economic repercussions.

3. Means for diffusion of information: Information Analysis Center, Data and Computer Code Distribution Centers.

B. Development of Theoretical Methods and Shielding Computer Codes

1. Recent improvements in Monte Carlo, discrete ordinates, and other methods of solving Boltzmann Equation.

2. Computer codes for bulk penetration, shield irregularities, shield optimization, laying stress

   - on the one hand on the design criteria: performance, computer capacity, connection with other codes (modular programming), computer-aided design, etc.;

   - on the other hand on the physical approximations and the mode of nuclear data processing.

C. Engineering Solutions to Shielding Problems

1. Shield Design

Description of the methods and contribution of both theory and experiment to the actual solutions used in reactor shield design (biological shield, heating, radiation damage, after heat, instrumentation, fuel handling), for each item, required accuracy and criteria for the choice of method.

2. Operational Reactor Plants:

Particular problems of an operational reactor plant, for example:

- access requirements during normal operation to the various parts of the plant for inspection and maintenance (activation, contamination due to fission and corrosion products);

- accessibility in case of incident;

- program for monitoring damage to materials (analysis of test samples, extrapolation to in-pile structures);

- fuel processing (fuel element transfer equipment, fuel reprocessing plants, active handling cells).

3. Test of Design Methods

Validation of design methods by comparison with (I) exact computations and (II) mock-up experiments.

Possibility of adjustment of parameters to achieve fits with measurements and calculation.

Comparison of prediction with measurements on operational reactor plants, types of measurements, measuring techniques.

D. Nuclear Data

1. Identification of main cross sections needed for shield design (especially required accuracy).

2. Main libraries of evaluated cross-sections (neutron data sets, photon data sets, coupled neutron-photon data sets) for shield design (especially required accuracy).

3. Codes for processing cross-sections; control of processing-introduced errors, in particular, when using multigroup cross-section sets.

4. Use of data adjustment procedures.

5. Nuclear data other than neutron and photon cross-sections, especially fission products, yields, half-lives, emission spectra, radiation sources, etc.

E. Test of Exact Computational Methods and Data

1. Experiments designed to test nuclear data.

2. Experimental tests of computational methods.

3. Intercomparison of computational methods.

Additional Information

General information on the Conference, as well as forms and other specific information for submitting summaries and papers may be secured from:

Secretariat of the Fourth International
Conference on Reactor Shielding
c/o OECD European Nuclear Energy Agency
38 Blvd. Suchet
F-75 Paris 16e, France

or from

Radiation Shielding Information Center
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37830

TESTS OF NUCLEAR DATA OR RADIATION TRANSPORT METHODS

1. Type of Test (indicate which):
   (a) Experiment and Analysis to test: Nuclear Data_____
   Computation Method_____
   (b) Comparison of Calculations: _____
2. Material(s) of interest:
3. Data or computational method tested:
4. Energy range covered:
5. Description of test:
6. Accuracy goal:
7. Estimated date by which data will become available:
8. Test carried out at:
9. References to published description of computation method, related experiment, or other related work:
10. Contact for further information about test:

    Name:_____

    Organization:_____

    Address:_____

    _____

NOTE: Please use copies of this form for additional tests.

Please return form by March 1, 1972 to : International Shielding Conf.
Radiation Shielding
Information Center
Oak Ridge National Laboratory
P.O.Box X
Oak Ridge, Tennessee 37830