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. 49 December, 1968

With the gain of knowledge, connect the habit of imparting it. This increases mental wealth by putting it in circulation; and it enhances the value of our knowledge to ourselves, not only in its depth, confirmation, and readiness for use, but in that acquaintance with human nature, that self-command, and that reaction of moral training upon ourselves, which are above all price.---Mrs. Sigourney

SEMINAR-WORKSHOP ON ELECTRON TRANSPORT TO BE HELD IN JANUARY

The Radiation Shielding Information Center and the Center for Radiation Research of the National Bureau of Standards (NBS) will co-sponsor a seminar-workshop on electron transport theory January 27-28, 1969 at the Oak Ridge National Laboratory.

Dr. Martin Berger and Mr. Steven Seltzer of NBS will present the theory and operation of their electron and photon transport program, RSIC code package CCC-107/ETRAN. Plans for other speakers are not yet final. It is expected that the first day will be mainly concerned with theory and the second day with code operation.

ETRAN 15 is a Monte Carlo computer program which performs the following calculations: (1) the reflection and transmission of electrons and photons by a target, (2) the production of secondary bremsstrahlung and characteristic X-ray photons in the target and their emergences from it, (3) the deposition of energy and charge by electrons as a function of depth in the target, and (4) the flux of electrons as a function of depth in the target. Further information can be found in the reports *Electron and Photon Transport Programs*, NBS Reports 9836 and 9837, (1968) by M. J. Berger and S. M. Seltzer.

All prospective attendees should contact RSIC as soon as possible by mail or telephone (615-483-8611, ext. 3-6944 or FTS system 615-483-6944). Attendees will be responsible for their own travel and housing reservations. Limousine service to the Oak Ridge motels (Holiday Inn, Diplomat, and Alexander Motor Inn) is available for each flight at the Knoxville airport.

Further details will be sent to those who have expressed interest in attending.

REVISED INFORMATION ON GROUP NEUTRON CROSS-SECTION LIBRARY

The 99-group neutron cross-section library (see November RSIC Newsletter) nuclide list has been revised and corrected as follows. "Shielding" library: H, D, 6-Li, 7-Li, Be, 10-B, 12-C, 14-N, 16-O, 23-Na, Mg, 27-Al, Ti, V, Cr, Mn, Fe, Ni, 182-W, 183-W, 184-W, 186-W, 235-U, 238-U, 238-Pu, 239-Pu, 241-Pu, 242-Pu.

The remaining nuclides ("Reactor" library), available on special request, are: Nb, Mo, 135-Xe, 149-Sm, 151-Eu, 153-Eu, Gd, 164-Dy, 175-Lu, 176-Lu, 181-Ta, 197-Au, 232-Th, 234-U, 236-U, 237-Np, 241-Am, 243-Am, 244-Cm.

The cross sections are packaged as Data Library Collection, Set 2 (DLC-2) and should be requested as DLC-2/99-Group Neutron Cross Section Library. Each request should be accompanied by the required number of full 2400-ft. reels of magnetic tape, specified as follows:

(a) 7 track, 556 BPI
- 1 tape for H and Pu
- 1 tape for the "shielding" library
- 1 tape for the "reactor" library

or (b) 9 track, 800 BPI
- 1 tape for the "shielding" library (including H and Pu)
- 1 tape for the "reactor" library

A data retrieval program accompanies the data which can edit the tape selecting the desired nuclides and P_n expansion and producing cards, card images on tape, or an ANISN binary tape.

Please state computer type, compiler language, density and track requirements for all tapes sent to RSIC for either code or data transmission.

IAEA ORGANIZING INFORMAL INFORMATION EXCHANGE

A "correspondence club" of scientists in many countries is being organized by the International Atomic Energy Agency to make available information about the measurement of reactor radiations. It will be guided by a working group of world experts appointed with the collaboration of Governments.

One of the Agency's continuing interests is to try to ensure that fullest use is made of research reactors, particularly in developing countries. The work carried out with these reactors can aid many branches of science, but for many of the studies it is necessary to know what happens to different materials when exposed to radiation inside the

different types of reactors. Varying types of radiation produce differing effects, and it is extremely important to obtain accurate information of the amount of radiation received by a sample. Methods of measurement also vary according to the information required; it is therefore necessary that the methods used should be well understood, so that the experimental results from different laboratories can be properly compared.

The members of the "Working Group on Reactor Radiation Measurements" are: A. W. Boyd (Canada), I. Draganic' (Yugoslavia), Y. Droulers (France), S. Hayakawa (Japan), V. Kadlec (Czechoslovakia), J. K. Linacre (UK, Chairman), V. G. Madeev (USSR), J. Moteff (USA), M. P. Navalkar (India), S. B. Wright (UK), F. Szabo (Hungary) and W. Köhler (IAEA), with S. Sanatani of the Agency as Scientific Secretary.

These scientists will define the special topics to be studied and will act as chairmen of sub-groups, in which any specialists having particular interest and applied experience will be eligible to participate. Problems will be discussed mainly by correspondence, and annual reports will be prepared by the Working Group. Any experts in Member States who would like to take part are invited to write to the Scientific Secretary at the IAEA indicating their particular interest and giving a brief account of their past experience in the field, as well as their current activity. Those suitable will be accepted without formality as members of sub-groups. The only condition they would be expected to fulfil is that they write at least once a year to their respective sub-group chairmen indicating progress in their own work or work in their laboratories.

In order to promote consistency in measurement of reactor radiation, two practical manuals are being prepared for the Agency's Technical Reports Series. They are "Neutron Fluence Measurements", edited by John Moteff, and "Determination of Absorbed Dose in Reactors", edited by J. K. Linacre.

The first five-groups with their chairmen, are:

Theoretical aspects of reactor radiation measurement - J. Moteff

Neutron spectra and fluence measurement - Y. Droulers

Determination of gamma spectra - V. Kadlec

Absorbed dose or dose rate determination by physical and chemical methods - I. Draganic'

Calorimetric method - A. W. Boyd

Up to the present time, the shielding community has not been involved to a great degree. However, we believe it would benefit all groups, which measure or calculate reactor radiation levels, to participate. It is likely that monthly newsletters will be issued to

all participants giving information of work in progress so that people having similiar problems will know with whom to communicate. Probably special interest groups, such as those interested in spectra unfolding, will develop.

For further information, those in the U. S. can write or call John Moteff, Nuclear Systems Programs, General Electric Co., Cincinnati, Ohio 45215, phone: 513-243-5549. Others should write S. Sanatani at the Agency.

ENGINEERING COMPENDIUM NOW PUBLISHED

The first volume of the IAEA sponsored *Engineering Compendium on Radiation Shielding*, Vol. I, "Shielding Fundamentals and Methods" is now available from Springer-Verlag for DM 240 or US $60.00. This vast work of 537 pages, with 467 figures, has been 5 years in preparation. Everitt Blizard was a member of the original board of editors; the present board is R. G. Jaeger (Editor-in-Chief), A. B. Chilton, M. Grotenhuis, A. Hönig, Th. A. Jaeger, and H. H. Eisenlohr.

LEAD SHIELDING CONFERENCE IN LONDON

Lead Development Association, in co-operation with the United Kingdom Atomic Energy Authority, is organising a conference on Lead Shielding and Nuclear Safety from 25 to 27 March 1969, at the Hyde Park Hotel, Kensington, London.

The program will include two full days of technical discussions at which leading authorities will present papers reviewing all aspects of lead shielding, with special sessions devoted to Transport of Radioactive Materials. On the third day there will be technical visits directly concerned with the subjects discussed.

The Conference should be of special interest not only to those involved in the manufacture and use of lead shields, but also to all those engaged in transport, public safety and insurance.

The Conference Fee of £ 15 includes the cost of preprints of the papers, lunches and refreshments during technical sessions, transport for visits, an opening reception on the evening of 24 March, the conference dinner, and a published report of the discussions.

Special arrangements have been made by LDA to reserve hotel accommodation at the Hyde Park and adjoining hotels for the convenience of delegates. Programs, with Registration and Hotel booking forms, may be obtained on request from the Lead Development Association, 34 Berkeley Square, London W 1.

DIMENSIONS MUST BE INCREASED FOR OGRE LIBRARY NO. 2

The new OGRE gamma-ray cross section Library No. 2, available from RSIC (see October Newsletter), has more data points than the original library which necessitates an increase in storage space. The cross-section handling subroutine GENSIG should have the dimension increased to 100 for the variables E, SIGPE, and SIGPP. Storage was also increased in the new master cross-section handling code normally distributed with Library No. 2.

NEW CODE PACKAGES AVAILABLE

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

CCC-103/CSP	Neutron Cross Section averaging code, contributed by Neutron Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee
CCC-104/EDNA	Electron Dose and Number Analysis Code, contributed by Space Sciences Laboratory NASA Marshall Space Flight Center, Huntsville, Alabama
CCC-105/RDMM	Relative Deviation Minimization Method - Activation Analysis Code, contributed by European Atomic Energy Community - EURATOM Joint Nuclear Research Center, Ispra Establishment, Italy
CCC-106/PF-COMP	Building Protection Factor Analysis Code, contributed by Research Triangle Institute, Raleigh, North Carolina and the U. S. Army Office of Civil Defense
CCC-107/ETRAN	Monte Carlo Code System for Electron and Photon Transport Through Extended Media, contributed by Center for Radiation Research, National Bureau of Standards, Washington, D. C.
CCC-108/SPECTRA	Neutron Activation Code, contributed by Sandia Laboratory, Albuquerque, New Mexico

PERSONAL ITEM

Ulf Tveten, formerly with Stone and Webster, Boston, and Aerojet General has a new bride and is now with the Institute for Atomenergi, Kjeller, Norway.

Dr. Ira F. Zartman retired in November as Chief of Reactor Physics in the AEC Division of Reactor Development and Technology. Dr. William H. Hannum is Dr. Zartman's replacement.

Congratulations to Major William Anders, on his selection as crew member for the Apollo-8 flight. Bill has had an interest in shielding for many years and has been the astronaut shielding specialist.

R. R. "Bob" Coveyou left Oak Ridge in November for an appointment with the IAEA in Vienna.

VISITORS TO RSIC

Visitors to RSIC during the month of November were: O. J. Hahn, University of Kentucky, Lexington, Kentucky; Carol Lowery Grove, Public Relations Assistant, Oak Ridge National Laboratory; Tom Albert, University of Florida, Gainesville, Florida; Thomas A. Jaeger, Bundesanstalt fur Materialprufung, 1 Berlin 45, Germany; R. Nicks, CCR EURATOM, Ispra, Italy; Millard L. Wohl, NASA Lewis Research Center, Cleveland, Ohio; Frank L. Bouquet, Lockheed-Calif. Co., Burbank, California; L. Massimo, EURATOM (Brown-Boveri-Krupp), Mannheim, Germany; James Price, Radiation Research Associates, Fort Worth, Texas.

DECEMBER 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 distributuion is restricted. Neither service is yet available for the codes literature.

AD-668220

Analysis of Roof Washdown Versus Applied Shielding as a Fallout Countermeasure
H. Lee
December 1966

AD-672225 (N68-345555)

Comparison of Discrete Ordinates Calculations with Measured Neutron Spectra in Standard Shield Geometries
A. E. Profio
August 8, 1967

AEC-TR-6315 (BOOK)

The Transportation of Radioactive Materials
N. I. Leshchinskii
(Translated from the Book TRANSPORTIROVANIE RADIOAKTIVNYKH VESHCHESV, Moscow, Gosatomizdat, 1962)

AERE-M-2053

X-Ray Calibration Spectra for use in Dosimetry
A. K. Burt, L. H. J. Peaple
July 1968

AERE-R-5653

Iterative Unfolding of Compton Spectra
M. G. Silk
June 1968

AERE-R-5808

The Design of a Ventilated Thermal and Mechanical Shield for a Heavy Lead Shielded Flask Which Contains a Heat Emitting Source
F. E. Dixon
July 1968

ANL-7387

Compilation of ENDF/B Data for Magnesium, Titanium, Vanadium, Molybdenum, and Gadolinium
E. M. Pennington, J. C. Gajiniak
March 1968

ANL-7424

Postfabrication Evaluation of Integrity and Serviceability of Canned Graphite for the EBR-II Neutron Shield
A. H. Heineman
March 1968

APEX-918 Declassified

Reactor and Shield Physics
W. E. Edwards, J. D. Simpson
May 31, 1962

BNWL-648

Decay Heat Deposition from Irradiated FTR Fuel Bundle
W. L. Bunch
December 5, 1967

CEA-R-3428 (In French)

Study of the Reactions Li-6 (p,α) He-3, Li-6 (d,α), He-4, Li-6 (d,p_o) Li-7 and Li-6(d,p_1), Li-7 from 300 keV to 1000 keV.
F. Bertrand, G. Grenier, J. Pornet
April 1968

CONF-681001

Proceedings of the Second International Symposium on Packaging and Transportation of Radioactive Materials, Gatlinburg, Tennessee, October 14-18,1968.
L. B. Shappert

DUN-4250

Evaluation of Existing Shipping Containers for Off-Site Shipments of Radioactive Isotopes
R. J. Ehlers
June 3, 1968

KY-D-2553

Demonstration Fuel Element Shipping Cask From Laminated Uranium Metal: Testing Program
C. B. Clifford
1968

LA-3527

Neutron Cross Sections for U-235 and U-238 in the Energy Range 1 keV to 14 MeV.
J. H. Berlijn, R. E. Hunter, C. C. Cremer
August 1968

NASA-TN-D-4755

Tables of Energy and Angular Distributions of Thick Target Bremsstrahlung in Metals
C. A. Powell, Jr.
October 1968

ORNL-TR-1869 (Translated from ABS-THH-1019) (In German)

A Method for the Measurement of Increment Factors for Gamma Radiation in the Energy Region of 0.5 to 15 MeV
W. Futtermenger

PINSTECH/HP-5

Estimation of Gamma Flux at the Thermal Column of Pakistan Research Reactor
A. Ali, S. M. Ahmed, M. A. Mubarak
1968

TID-24601

Neutron Radiative Capture in Na, Al, Fe, and Ni from 1 to 200 keV
R. W. Hockenbury, Z. M. Bartolome, J. R. Tatarczuk, W. R. Moyer, R. C. Block
1968

WAPD-TM-801

Collided Flux Diffusion Theory
D. R. Harris
August 1968

Atomkernenergie, 13,357-9 (1968) (In German)

Radiation Field Investigations within the FDR Shield
R. Fiebig, F. Frisius

Atompraxis, 14 (9/10), 426 (1968)

Increase in Dose Output by Use of a Radiation Shield
E. Sauter

Hoken Butsuri, 2, 155-9 (December 1967) (In Japanese)

A Calculation for the Shielding Experiment of a Vehicle on the Infinite Surface Contaminated with Radioactive Materials
T. Urai

Indian J. Phys., 42(2), 85- (1968)

Calculated Efficiencies of Cylindrical Ge(Li) Detectors
K. V. K. Iyengar, B. Lal

Izv. Vyssh. Ucheb. Zaved., Fiz., No. 3, 129-31 (1968) (In Russian)

Perturbation of the Radiation Field by Local Inhomogeneity
A. M. Kolchuzhkin, V. V. Uchaibin

J. Nucl. Sci. Technol. (Tokyo), 5, 315-17, (June 1968)

Stochastic Formulation of Neutron Multiple Collision Processes by the First-Collision Probability Method
K. Saito, Y. Taji

J. Nucl. Sci. Technol. (Tokyo), 5(8), 385- (1968)

Transmission of Gamma-Rays From 60-Co Monodirectional Source Through Slabs of Polyethylene and Iron
I. Umeda, T. Hyodo

Mem. Fac. Eng., Koyto University, Vol. XXX (2), 187-196 (April 1968)

Simple Low Energy Gamma Ray Spectral Analysis Using Large NaI (Tl) Scintillation Spectrometers
Tomonori Hyodo

Nucl. Sci. Eng., 34(2), 114-121 (Nov. 1968) (ORNL-TM-2242)

Experimental Evaluation of Minima in the Total Neutron Cross Sections of Several Shielding Materials
E. A. Straker

Nucl. Sci. Eng., 34(2), 122-133 (Nov. 1968)

Space-Angle Energy-Time-Dependent Neutron Transport in a Homogeneous Slab by the j_N Method
T. Asaoka

Nucl. Sci. Eng., 34(2), 169-180 (Nov. 1968)

Spectrum of Gamma Rays Emitted by a Stainless Steel Clad, Pool-Type Reactor (BSR-II)
G. T. Chapman, W. R. Burrus

Phys. Med. Biol., 13, 335-46 (July 1968)

Relationships Between Exposure, Kerma and Absorbed Dose in a Medium Exposed to Mega-Voltage Photons from an External Source
H. F. Batho

State Dent. J., 33, 221-4 (April 1967)

Reflection, Scatter, and Attenuation by Some Building Materials in Dental Radiography
A. D. Goren, L. Pentel

Strahlentherapie, 135, 25-31 (1967) (In German)

Determination of Depth Dose Curves for Soft X Rays
B. Markus

SPACE AND ACCELERATOR SHIELDING

ANS-SD-4 (CONF-661125 - Suppl. 1)

Proceedings of the Special Sessions on Radiation Transport and Biological Effects Presented at the 1966 Winter Meeting, Pittsburgh Pennsylvania, November 1, 1966
D. K. Trubey (editor)
November 1, 1966

NASA-CR-1037 (N68-22849)

Study of Radiation Hazards to Man on Extended Missions
S. B. Curtis, M. C. Wilkinson
May 1968

ORNL-TR-1862 (Phys. Lett. 24B, 519-21) (May 15, 1967) (In German)

Transmission and Range of Fast Electrons in the Energy Range 4 to 30 MeV
D. Harder, G. Poschet
May 15, 1967

ORNL-TR-2031 (Moskovskii Universite, Vestnik, Seria III - Fizika Astronomiia, Vol. 23 (2), 11-16, Mar. - Apr. 1968; A68-32450)

The Measurement of Absorbed Radiation on Space Flights
B. M. Makhmudov

Bull. Acad. Sci. USSR, Phys. Ser. (English Transl.), 30 (10), 1645-8, (October 1966)

Nuclear Cascade Processes in an Ionization Calorimeter
E. V. Denisov, L. G. Dedenko, S. A. Dubrovina, K. A. Kotel'nikov, A. E. Morozov, O. R. Ogurtsov, V. V. Sokolovskii, V. V. Slavatinskii, I. N. Fetisov

Bull. Acad. Sci. USSR, Phys. Ser. (English Transl.) 30 (10), 1674-7 (October 1966)

Investigation of Electron-Photon Cascades in Iron and Lead in the Energy Region Above 100 BeV
M.K. Babaev, A. S. Baigubekov, R. Z. Denikaev, Yu. A. Emel'yanov, Yu. T. Lukin, Zh. S. Takibaev, G. S. Khomenko

IEEE Trans. Nucl. Sci., Vol. NS-14 (3) 965-76 (June 1967)

Radiation Problems with High-Energy Proton Accelerators
W. S. Gilbert

Phys. Rev., 171, 310-15 (July 10, 1968)

Charged Component of 1-GeV Electron Showers in Lead
D. J. Drickey, J. R. Kilner, D. Benaksas

Symposium (IAEA, 329-34, 1967)

Contribution of the Intermediate Energy Neutrons to the Neutron Dose Equivalent Outside the Shielding of Reactors and High Energy Accelerators
D. Nachtigall

BOOK

The Radiation Belt and Magnetosphere
W. N. Hess
1968, Publisher: Blaisdell Publishing Co., Waltham, Mass.

BOOK

Symposium on High Energy Nuclear Reactions in Astro-Physics, Philadelphia, 1967
Editor B. P. Shen
Article 1: High Energy Nuclear Reactions , J. M. Miller (19-36)
Article 2: Neutron Production by Cosmic Rays in the Atmosphere
S. A. Korff and R. B. Mendell, (159-68)
Publisher: W. A. Benjamin, Inc.