

# RSIC Newsletter



RADIATION SHIELDING INFORMATION CENTER

**OAK RIDGE NATIONAL LABORATORY**

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

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*One part of knowledge consists in being ignorant of such things as are not worthy to be known---Crates*

## SURVEY OF SOVIET SHIELDING WORK ISSUED

The report "A Survey of Recent Soviet Radiation Shielding Work", ORNL-RSIC-23 by J. Lewin, J. Gurney, and D. K. Trubey has recently been distributed to those on the RSIC reactor-weapons radiation shielding distribution list. The report may be obtained from RSIC upon request.

## ANS MEETING IN WASHINGTON, NOVEMBER 10-15

The American Nuclear Society winter meeting in Washington, D. C., November 10-15, will be an international conference on the constructive uses of atomic energy. Some of the highlights for shielders will be: a session of invited speakers from several countries titled "Key Problems in Reactor Shielding (November 14)", and an evening paper by Gene Hungerford, Purdue University, "Problems in the Design and Construction of Fast Reactor Shields" (November 11), a general shielding session (November 11), and a session on "Radiation Dosimetry Standards" (November 12).

## GAMMA-RAY CROSS SECTIONS AVAILABLE

Gamma-Ray cross sections for elements of atomic numbers 1-83, 86, 90, 92 and 94 have recently been furnished RSIC by R. J. Howerton of Lawrence Radiation Laboratory. The values were taken from W. H. McMaster, et al., "Compilation of X-Ray Cross Sections," Section II, UCRL-50174 (January 1967) and J. H. Hubbell and M. J. Berger, "Photon Attenuation and Energy Transfer Coefficients", NBS 8681, Second Edition, (Sept. 1966).

GAMMA-RAY CROSS SECTIONS AVAILABLE (Cont.)

The photoelectric and pair-production cross sections are available on tape in an OGRE, BCD format which can be read by a revised cross section handling routine to produce the usual OGRE binary master tape. Those requesting this data and routine should forward a tape and ask for OGRE Library No. 2.

CORRECTION TO CODE PACKAGE

A correction to CCC-75/G-33 code package has been called to the attention of RSIC by George M. Kowal, Gilbert Associates, Inc., Reading, Pennsylvania, and has been confirmed by G. P. Lahti of NASA Lewis Research Center, Columbus, Ohio. Negative dose rates are obtained if one has a thick region of more than ten (10) mean-free-paths (mfp). This is caused by the higher order buildup coefficients of which some are negative and which exceed the positive coefficients, thus resulting in a negative buildup and hence dose rate. To correct this point one has to introduce an IF statement in subroutine ATTEN just before calculating the value "B" and limit the value of RELX to ten (10), i.e.

```
IF (RELX - 10.0) i1, i1, i2
```

```
    i2 RELX = 10.0
```

```
    i1 CONTINUE
```

PERSONAL ITEMS

Fritz Schmidt will work with RSIC for several months analyzing neutron attenuation data for concrete. We would appreciate it if anyone who has new data, which should be considered in the review, would forward it to RSIC. Fritz came to the ORNL Neutron Physics Division a year ago from the Institut für Kernenergetik, Universität Stuttgart, Germany, to work in the SNAP shielding area.

Miroslav Havránek, from the Technical University at Prague is now at the Institut für Kernenergetik, Stuttgart for a period of 10 months working in SNAP shielding projects using Moments Methods and Monte Carlo.

PERSONAL ITEMS (Cont.)

George G. Biro has been appointed full time consultant of Gibbs and Hill, Inc., subsidiary of Dravo Corporation, in New York City. Dr. Biro will assist the company in the planning and execution of projects concerning nuclear facilities.

VISITORS TO RSIC

Visitors to RSIC during the month of September were: W. H. Wilkie, Georgia Institute Technology, Atlanta, Georgia; John Goodenough and Russell Stone, both of U. S. Dept. of Agriculture, Knoxville, Tennessee; Jack Harvey, ORNL, Oak Ridge, Tennessee; James Hurley, Engineer, Bechtel Corporation, San Francisco, California.

OCTOBER 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 codes literature.

REACTOR AND WEAPONS SHIELDING

*Correction: Nuclear Engineering and Design, 4(4), 423-28, 1966. "Radiation Shielding at the NRL LINAC Facility", G. W. Zimmer\*, K. M. Murray.*

REACTOR AND WEAPONS SHIELDING (Cont.)

- \* Mr. G. W. Zimmer's name was mis-spelled in our Newsletter No. 45, dated August, 1968. Mr. Zimmer, we apologize for this error, and thank you for calling it to our attention.

AE-325

Some Comparisons of Measured and Predicted Primary Radiation Levels  
in the Agesta Power Plant  
E. Aalto, R. Sandlin, A. Krell  
May 1968

AEEW-M-790

Winfrith Nuclear Data Group Notes on Topics in Nuclear Data Evaluation,  
1964-1968  
M. F. James, J. S. Story  
1968

AERE-R-5224

The Average Neutron Total Cross-Section of B-10 from 100 eV to 10 MeV  
and Absorption Cross-Section up to 500 keV  
K. M. Diment  
February 1967

AFCRL-68-0006 (AD-668551, N68-27190)

Cosmic Ray Neutron Studies, Final Report, April 1, 1962 - June 30, 1967  
S. A. Korff, R. B. Mendell, W. G. Sandie  
December 1, 1967

APDA-221

Operational Shield Tests for the Enrico Fermi Atomic Power Plant  
R. J. Beaudry  
July 1968

APED-5398

Summary of Fission Product Yields for U-235, U-238, Pu-239, and  
Pu-241 at Thermal, Fission Spectrum and 14-MeV Neutron Energies  
M. E. Meek, B. F. Rider  
March 1, 1968

BRL-1409

Stilbene Spectrometer for Neutrons and Gamma Rays: System Improve-  
ments  
Frank Konrad  
July 1968

CEA-R-3170 (In French)

The C<sub>n</sub> Method for Approximation of the Boltzmann Equation  
P. Benoist, A. Kavenoky  
January 1968

EIR-BERIGHT-105

S<sub>∞</sub> Transport Theory in Plane Geometry  
J. Mennig, J. T. Marti  
April 1968

EUR-3950.e

Evaluation of the B-10 (n,α) Cross Section and Branching Ratio  
K. Gubernator, H. Moret  
1968

JINR-P16-3936 (In Russian)

Efficiency of Introducing Additional Boron into the Shielding  
from the Accelerator Stray Radiation  
L. N. Zaitsev, L. R. Kimel, M. M. Komochkov, V. P. Sidorin,  
B. S. Sychev, O. A. Ulitin

KFK 120 (Pt. 1)

Neutron Cross Sections for Fast Reactor Materials. Part 1  
Evaluation  
J. J. Schmidt  
February 1966

LA-DC-9802

Fast-Neutron Biological Dose Attenuation by Lead and Polyethylene  
Shields  
D. J. Dudziak  
1968

N68-28163 (MLM-1457)

Curie Levels and Roentgen Rates for Neutron Irradiated Elements  
B. D. Craft, H. L. Rook, L. L. Bentz  
March 1968

NSJ-tr-105

Study on the Integration of a Marine Reactor Plant: The Problem of  
Shielding Design.  
Yoshihisa Tanaka

ORNL-TM-2225

Fast-Neutron Spectroscopy with Thick Organic Scintillators  
W. R. Burrus, V. V. Verbinski  
June 25, 1968

ORNL-TM-2284

Revised Neutron Kerma Values at the Boundary of a Semi-Infinite  
Concrete Medium  
F. A. R. Schmidt  
July 10, 1968

ORNL-tr-1963 (*Translated from Jad. Energie, Czech., 13:241*)

Depth Doses of Fission Neutrons in Tissue-Equivalent Material  
Lubomir David  
July 1967

RRA-M71

Simplified Method for Calculating Neutron-Capture and Fission-  
Product Gamma-Ray Doses Inside Underground Concrete Structures  
J. D. Marshall, M. B. Wells  
June 11, 1967

RRA-M85

Calculations of Fission-Product Gamma-Ray Doses in Single-Compartment  
Above Ground Concrete Structures  
L. G. Mooney, M. B. Wells  
June 9, 1968

UCRL-50442

Calculation of Forward Bremsstrahlung Spectra From Thick Targets  
W. C. Dickinson, E. M. Lent  
June 6, 1968

*At. Energ. (USSR) (In Russian) 24, 194-5, (February 1968)*

Measuring the Dose Field of Mixed Radiation Behind a Steel Shield  
M. O. Zelchinskii, Komochkov, B. S. Sychev, A. P. Cherevatenko

*At. Energ. (USSR) (In Russian) 24, 391-392 (April 1968)*

Influence of Splitting of Shield on Buildup Factor  
Yu. A. Kazanskii, V. I. Kukhtevich, B. P. Shementenko

*Batelle Tech. Rev.*, 17(8), 9, (1968)

Shipping Containers for Irradiated Reactor Fuels  
J. D. Rollins, E. C. Lusk

*Dokl. Akad. Nauk SSSR*, 180 (4), 836-8 (1968)

Experimental Determination of the Quantity of Fast Neutrons in the  
Fission Spectrum  
F. Nasyrov, et al.

*Hitachi Hyoron*, 49 (7), 1-8 (1967) (In Japanese)

Buildup Factors of Gamma-Ray Penetration for Multiple Layers in  
Reactor Shielding  
M. Kitazume, A. Ogushi

*J. Nucl. Sci. Technol.*, 5 (6) 279, (1968)

Gamma-Rays and Fast Neutrons Streaming About an Angular Duct  
M. Kitazume

*Kernenergie*, 11, 61-72 (March 1968) (In Russian)

Passage of Radiation Through Inhomogeneities in Shields  
D. L. Broder, V. N. Mironov, K. K. Popkov

*Kernenergie*, 11, 77-81 (March 1968), (In Russian)

Application of Multigroup Methods for the Calculation of Neutron  
Flux Distributions in Inhomogeneous Shields  
D. L. Broder, Z. S. Kondrashova, A. V. Kudryavtseva, V. V. Levin,  
I. P. Markelov, V. P. Polivanski

*Nucl. Data A4(4)*, 321-357 (July 1968)

Neutron Cross Sections of Deuterium in the Energy Range 0.0001 eV  
to 20 MeV  
A. Horsley

*Nucl. Data A4(4)*, 359-395 (July 1968)

Isomeric States ( $T_{1/2} \geq 10^{-10}$  S) Listed According to Increasing  
Half-Life  
J. Kantele, O. Tannila

*Nucl. Sci. Eng.*, 33 (3) 284-290 (September 1968)

Monte Carlo Integration of the Adjoint Gamma-Ray Transport Equation  
M. H. Kalos

Nucl. Sci. Eng., 33(3) 340-354 (September 1968)

Some Consideration of Dose Buildup Factor for a  $^{60}\text{Co}$  Cylindrical Source with Shell-Shaped Shield.  
Y. Furuta, Y. Kanemori

Nucl. Sci. Eng., 34 (1) 76-82, (October 1968)

A New Derivation of Discrete Ordinate Approximations  
Stanley Kaplan

Zh. Vyssh. Mat. Mat. Fiz., 8, 211-6 (January-February) (In Russian)

One Scheme of Modeling Particle Trajectories in Systems Complex Geometry  
E. S. Kuropatenko, V. N. Ogibin

BOOK (NSA #22-16-35632)

Fast Reactor Physics, Vol. 1, pp. 453-65  
Time-Dependent  $S_N$  Calculations Describing Pulsed Experiments at the FRO Reactor  
J. Kockum, S. Soederberg  
Vienna, International Atomic Energy Agency, 1968

THESIS

Deep Penetration of Neutrons in Attenuating Media  
Odelli Ozer  
Columbia University, 1968

#### SPACE AND ACCELERATOR SHIELDING

CR-112 (N68-24324, AD-667490)

The Singly and Doubly Charged Particles in the Primary Cosmic Radiation  
P. S. Freier, C. J. Waddington  
January 1968

MPS/Int. MU/EP 67-5

Monte Carlo Calculation of Particle Loss Distributions Along the Vacuum Chamber of the CPS Near Internal Targets and of the Transverse Attenuation of Strongly Interacting Particle Fluxes in the P. S. Magnet Units and Earth Shield  
J. Ranft  
June 20, 1967

NASA-TM-X-60492 (N68-25285)

Transmission of 2.43 MeV Electrons Through Thick Silicon Targets  
Jag J. Singh  
September 2, 1967

NP-17500

Data Compilation of Baryon-Baryon Interactions. I. Proton-Proton  
Collisions Between 1 and 32 GeV/c  
G. Alexander, O. Benary, U. Maor  
1967

N68-29221 (ORNL-RSIC-19, p. 109-137, N68-29213)

The Discrete Ordinates Method Coupled with the Straightahead  
Approximation for Use in High-Energy Accelerator Shielding Studies  
R. G. Alsmiller, Jr., R. T. Boughner, W. W. Engle  
March 1968

ORNL-TM-1839 (NASA-CR-85623)

High-Energy Nucleon Transport  
R. G. Alsmiller, Jr.  
June 6, 1967

ORNL-TM-2287

Monte Carlo Calculations of Residual Nuclei Production in Thick Iron  
Targets Bombarded by 1- and 3-GeV Protons and Comparison with  
Experiment  
T. W. Armstrong  
July 1, 1968

ORNL-TM-2319

The Effects of Multiple Coulomb Scattering and Range Straggling in  
Shielding Against Solar-Flare Protons  
R. G. Alsmiller, Jr., J. Barish, W. W. Scott  
August 12, 1968

ORNL-tr-1814 (Translated from German, *Astronomie und Raumfahrt*, 5, (1),  
23-32 (1967)) (A67-31197)

On Some Problems of Radiation Protection in Cosmic Flights II  
H. Swart

ORNL-TR-1989 [Translation of CEA-R-3491 (In French)]

Neutron Transmission in the Access Tunnels to a High-Energy Proton  
Accelerator  
M. M. d'Hombres, C. Devillers, F. Gervaise, B. de Sereville, P. Tardy-  
Joubert  
May 1968

SID-64-2037

Study of Space Radiation Shielding  
J. W. Haffner  
December 1, 1964

*Bull. Acad. Sci. USSR, Phys. Ser.*, 29 (10), 1679-85, (1966)

Composition and Energy Spectrum of Primary Cosmic Rays in the Low-Energy Region  
L. V. Kurnosova, L. A. Razorenov, and M. I. Fradkin

*Health Phys.*, 12, 209-226 (1966)

Radiobiological Aspects of the Supersonic Transport  
A report of the International Commission on Radiological Protection  
Task Group, A. C. Upton, Chairman

*Jap. J. Appl. Phys.*, 7 (4) 335-41 (April 1968)

Energy Loss of Electrons of 0.6 to 1.2 MeV in Relatively Thick Al Foils  
Eichi Hara

#### COMPUTER CODES LITERATURE

ORNL-4287

August 1968

FABCOST 9

FABCOST 9, A Computer Code for Estimating Fabrication Costs for Rod-Bundle Fuel Elements  
A. L. Lotts, T. N. Washburn and F. J. Homan  
FORTRAN IV for IBM 7094

LR-18905 (NASA-CR-65584) (mf) June 1965

CONFAC

Computer Program for the Calculation of Three Dimensional Configuration Factors  
E. R. Linneman, H. R. Holmes, K. J. Kahn, and B. A. Nevelli  
FORTRAN IV for IBM 7094

D5-13310

August 1967

QAD-P5A

QAD - P5A Computer Program for Shielding Evaluation and Radiation Environmental Prediction of Nuclear Space Vehicles  
R. J. Burnside, H. G. Jones, R. G. Cockrell

TID-24033 (Vol. 1) (mf)

August 1967

BERAD

A Program to Compute Beta Radiation Dosage. Volume I - Program Description  
Gale B. Curtis and Joan S. Petty  
IBM 7094 and CDC 3600

TID-24033 (Vol. 2) (mf) August 1967 BERAD

A Program to Compute Beta Radiation Dosage. Volume II - User's  
Manual and Program Listings  
Joan S. Petty and Gale B. Curtis  
IBM 7094 and CDC

RL-SSL-200 July 1968 EDISN

A Computer Code for Calculating the Energy Distribution of In-  
elastically Scattered Neutrons  
R. Snow and M. C. George  
FORTRAN for IBM 1130 or IBM 360

ROU 205 (mf) January 1966 PF-COMP

Protection Analysis and Construction Evaluation System  
F. A. Bryan, Jr. , E. L. Hill, B. W. Howard, T. Johnson,  
R. O. Lyday, P. S. McMullan, and M. D. Wright  
CDC 3600

BNWL-855 August 1968 SAND II

Modification of SAND II  
S. Berg  
UNIVAC 1108