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. 57 August, 1969

You cannot teach a man anything;
you can only help him to find it for himself.
- Galileo

NAME PROPOSED FOR CALCULATED MAXIMUM DOSE

The usual response function, or flux-to-dose conversion factors, for converting neutron flux to a dose rate is the maximum dose rate in the dose-rate distribution calculated by Snyder and Neufeld[1] for a unit flux density of monoenergetic neutrons that are incident normally on a phantom represented by a slab of tissue. This is the conversion factor that is stipulated for use by the Federal Register and generally has the force of law for reactor design.

The concept of using the maximum dose rate for each energy is an arbitrary procedure but a reasonable one since the maximum is not very sensitive to angular distribution and is generally conservative. Since it is an arbitrary, but well-defined, procedure it ought to have a name and one has been proposed.[2] It is the "maximum exposure dose" (MED) and is the product of the incident flux density, the maximum absorbed dose in a phantom, and the quality factor. We believe it is in the best interest of clearer communication that a name be adopted for this quantity which is so often used in shield design.

MORE BENCHMARK PROBLEM DATA NEEDED

The shielding benchmark problem project has entered a new phase. The committee has selected and published* data for four problems which were described in the June RSIC Newsletter and now awaits feedback from the shielding community.

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[1]W. S. Snyder and J. Neufeld, "On the Passage of Heavy Particles Through Tissue," Radiation Res. 6, 67 (1957). Also in NBS Handbook 63.
[2]H. C. Claiborne and D. K. Trubey, "Gamma-Ray Dose Rates in a Slab Phantom," Trans. Am. Nucl. Soc. 12(1), 383 (1969). Also ORNL-TM-2574.

*A. E. Profio, Editor, "Shielding Benchmark Problems," ORNL-RSIC-25 (ANS-SD-9) (June 1969).

We were gratified that benchmark data were cited in several papers at the June American Nuclear Society meeting only a few days after the problems were issued. The success of the effort now depends on the response in the shielding community. New data, whether showing verification or disagreement, is now desired by the committee. It also wants more problems suggested. Procedures are given in the Problems book.

The committee does not regard the present or future data to represent absolute TRUTH; the important thing is that certain problems have been selected and data for them were acquired which represent the state-of-the-art. Let us support this very important project by participation.

If you do not have a copy of the report, please contact RSIC.

TWO RSIC-SPONSORED SEMINARS AT OAK RIDGE

A seminar-workshop on "*Multigroup Cross Section Preparation - Theory, Techniques, and Computer Codes*" will be held October 1-3 and a seminar on two-dimensional discrete ordinates calculations will be held September 30 in Oak Ridge. Details are given in the July RSIC Newsletter. Please let us know as soon as possible if you plan to attend.

The codes *SUPERTOG* and *XSDRN* will be available from RSIC at the time of the seminar and requests for them will be held until then. The *XSDRN* document, ORNL-TM-2500, has recently been issued and is available from RSIC.

ARTICLE ON RSIC in Nuclear Engineering and Design

The April issue of *Nuclear Engineering and Design* has articles on the information center concept by F. Kertesz, on the Nuclear Safety Information Center by J. R. Buchanan and W. B. Cottrell, and on the Radiation Shielding Information Center by D. K. Trubey

DLC-2 NEUTRON CROSS SECTION LIBRARY REVISED

The 99-group neutron cross-section library based on ENDF/B has been revised and is now designated DLC-2B. The nuclides in the library are listed below and the changed ones are underlined. The revision reflects recent changes in the resolved and unresolved resonance treatments in the SUPERTOG code. For some nuclides, the new resonance treatment resulted in a significant change in the cross sections for some of the groups in the resonance region. For this reason, all nuclides were re-run for which resonance data was given on the ENDF/B file.

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, 240-Pu, 241-Pu, 242-Pu.

Reactor Library: Nb, Mo, 135-Xe, 149-Sm, 151-Eu, 153-Eu, Gd, 164-Dy, 175-Lu, 176-Lu, 181-Ta, 197-Au, 234-U, 236-U, 237-Np, 241-Am, 243-Am, 244-Cm.

We are grateful to R. Q. Wright, Computing Technology Center, for providing these cross sections.

Requests for the data should be accompanied by the required number of full 2400-ft. reels of magnetic tape as specified below:

If 7-track 556 BPI:

(a) 1 tape for revised nuclides only
(b) 1 tape for H, Pu, and W
(c) 1 tape for "shielding" library (not including H, Pu, and W)
(d) 1 tape for "reactor" library

If 9-track, 800 BPI:

(a) 1 tape for revised nuclides only
(b) 1 tape for entire library

A data retrieval program accompanies the data which can edit the tape, selecting the desired nuclides and P_n ($n \leq 8$) expansion and producing cards, card images on tape, or an ANISN binary tape. The card image format may be either ANISN-DOT or DTF-IV format.

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

UPDATE TO CCC-82/ANISN CODE PACKAGE

W. W. Engle, Computing Technology Center, Union Carbide Nuclear Division, has updated ANISN to reflect a correction needed to collapse Group Structure for Coupled Neutron-Gamma-Ray Cross Sections.

The previous versions of ANISN improperly calculate the self-scatter cross sections when collapsing group structure. This difficulty is relevant only when using coupled sets of cross sections such as the DLC-9 library (104 neutron groups coupled with 18 gamma-ray groups) announced in the previous RSIC newsletter.

The update information is available for those who request it.

CHANGE IN CODE PACKAGE CCC-46C/OGRE-G (IBM-360 version)

Changes suggested by D.C. Irving, ORNL, have been made in the 05R geometry routines of OGRE-G which prevent certain difficulties associated with quadric surfaces. These changes can be obtained by OGRE users upon request.

CORRECTION TO CORRECTION!

The printing in RSIC Newsletter No. 56, July 1969 of a correction to CCC-81B/UNC-SAM 2 has resulted in the following correction to the correction! The new statements in subroutine CARLO, suggested by Capt. W. Coleman of U. S. Army Nuclear Effects Laboratory, Edgewood Arsenal, should read

```
805  TT=T  $  T=TP  $  EE=E  $  E=EPRIM

CALL FAP(FWATE,XC)  $T=TT  $E=EE  $CALL DR(1,NREG)  $  GO TO 270
```

The July Newsletter should be referred to for details.

NEW PSR PACKAGE AVAILABLE

The following Peripheral Shielding Routine has been added to the list of PSR packages:

PSR-10/EVAP — Code Modifications to Calculate Particle Evaporation from Excited Compound Nuclei, by M. P. Guthrie, Oak Ridge National Laboratory, Oak Ridge, Tennessee, ORNL-4379 (1969). Available for IBM 360.

NEW CODE PACKAGES AVAILABLE

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

CCC-116/TRECO — Orbital Integration Computer Program for Trapped Radiation, contributed by National Space Science Data Center, NASA Goddard Space Flight Center, Greenbelt, Maryland. (NASA SP-3024, Vol. I-IV, NSSDC68-02). Available for CDC 6600.

CCC-117/BETA — Monte Carlo Bremsstrahlung and Electron Transport Analysis Code in Complex Geometry, contributed by ART Research Corporation, Los Angeles, California, and Air Force Weapons Laboratory, Air Force Systems Command, Kirtland Air Force Base, New Mexico. (AFWL-TR-68-111). Available for IBM 7090.

CCC-118/SIGMA Space Radiation Dose Analysis Within Complex Configurations, contributed by McDonnell Douglas Missile & Space Systems Division, Santa Monica, California. (DAC-60878). Available for IBM 7090.

CCC-119/ELBA Electron and Bremsstrahlung Dose Code, contributed by Space Sciences Laboratory, George C. Marshall Space Flight Center, Huntsville, Alabama. (NASA-SP-169 and informal notes). Available for IBM 7090.

PERSONAL ITEMS

Dr. Lewis V. Spencer, Ottawa University, Kansas, was recently awarded the "Gray Medal" by the International Commission on Radiological Units and Measurements (ICRU) for outstanding contributions to fields of interest to the ICRU. Congratulations, Lew.

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Dr. Glen A. Graves, now on leave from the Los Alamos Scientific Laboratory, arrived in Vienna in early May for an 18-month appointment with the International Atomic Energy Agency. He is Head of the Physics Section, Division of Research and Laboratories.

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Dr. A. E. Profio, formerly with Gulf General Atomic , is now with the Department of Chemical and Nuclear Engineering of the University of California, Santa Barbara.

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Stanton T. Friedman is now with McDonnell-Douglas Astronautics in a group working on the development of advanced concepts for propulsion.

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Lambros Lois, formerly with Bettis Atomic Power Laboratory, is now at the National Technical University of Athens, Greece.

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Charles M. Huddleston is moving his Civil Defense work to the Naval Ordnance Laboratory, Silver Springs, Maryland, in September.

VISITORS TO RSIC

Visitors to RSIC during the month of July were: Anthony Buhl, Instrumentation and Controls Division, ORNL; Major Richard W. Enz and Christopher Schonwalder, DASA, Washington, D.C.; George E. Evans, Tarrytown Technical Center, Union Carbide Corporation, Tarrytown, N.Y.; Richard Green, Jack Jones, and Leon Yount, Computing Technology Center, Union Carbide Corporation, Oak Ridge, Tenn.; John Herbst, Nuclear Technology Corporation, White Plains, N. Y.; Lev L. Issaev, Member, USSR State Committee for the Application of Atomic Energy, and Representative of the IAEA Director General to the UN; Carl J. Kovitz, NASA-MSC, Houston, Tex.; Victor Ley and Ignacio Maldonado Rico, Comision Nacional de Energia Nuclear, Mexico; Gary Mar, University of Tennessee, Knoxville, Tenn.; N. A. Tubbs, CCDN, Gif-sur-Yvette, France; Millard Wohl, NASA Lewis Research Center, Cleveland, O.

AUGUST 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 (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 the 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

AAEC/E-198 *May 1969*

Resonance Parameters for Measured keV Neutron Capture Cross Sections
A. R. deL. Musgrove
Available: AEC Depository Libraries

AD-679-376 April 1968

Energy Distribution and Dose Rate of Gamma-Quanta Scattered at the Earth-Atmosphere Boundary
Yu. I. Kolevatov, V. I. Kukhtevich, G. A. Trykov

AD-684493 February 1969

Evaluation of Compton Backscatter Technique for Measurement of Ocean Sediment Density
R. W. Deutsch, J. Swift, J. P. Roberts
Available: CFSTI

AE-339 (N69-18728) November 1968

Silicon Diode Dosimeter for Fast Neutrons
L. Svansson, P. Swedberg, C. O. Widell, M. Wik

BNWL-992 March 1969

A Numerical Comparison of Diffusion and Transport (S_n) Codes for Selected Fast Reactor Configurations
L. D. O'Dell, R. W. Hardie, W. W. Little, Jr.
Available: CFSTI

CONF-680507, pp. 541-55

Status of Fallout Shielding Calculations in the USA
C. Eisenhauer

DP-1177-1 October 1968

Savannah River Laboratory Isotopic Power and Heat Sources - Part I. Cobalt-60
H. S. Hilborn
Available: CFSTI

GA-8006 (DASA-2267) January 31, 1969

Measurement of Gamma-Ray Production Cross Sections for Nitrogen and Oxygen
V. J. Orphan, C. G. Hoot

GA-9149, Vol. I (DASA-2289, Vol. I) March 27, 1969

Measurement of Neutron Penetration Standards, Vol. I - Angular Neutron and Gamma-Ray Spectrum Measurements in a Bulk Iron Assembly
C. J. Cerbone

GA-9149, Vol. II (DASA-2289, Vol. II) March 27, 1969

Measurement of Neutron Penetration Standards. Vol. II - High Resolution Measurements of the Total Neutron Cross Sections of Nitrogen and Iron
A. D. Carlson, R. J. Cerbone

IFA-FT-74 March 1969

Compton Scattering of Photons by Bound K-Shell Electrons
M. Gavrila
Available: AEC Depository Libraries

IN-1182 (ENDF-116) May 1969

An Evaluation and Compilation of Neptunium-237 Cross Section Data for the ENDF-B File.
J. R. Smith, R. A. Grimesey
Available: CFSTI

K-Trans-52 (Transl. from Beton Zhelezobeton, No. 4, 20-1) 1968

Heavy Resin Concrete: A Material for Radiation Shielding
V. S. Loginov, E. A. Kashkovskaya, N. A. Astaf'ev
Available: AEC Depository Libraries; CFSTI

MIT-3903-1 (MITNE-99) May 1969

Numerical Solution of the Two-Dimensional Time-Dependent Multigroup Equations
W. T. McCormick, Jr., K. F. Hansen
Available: AEC Depository Libraries; CFSTI

N69-10812 (Transl. from J. At. Energy Soc. Japan (Tokyo), 9(8), 440-446 (Aug. 1967) and 9(9), 518-523 (Sept. 1967)

Energy Absorption Spectrum-Radiation Dose Operator - Principle and the Automation of Operation
I. Miyanaga
Available: CFSTI

NP-tr-1770 (Transl. from Mat. Sb., 51, 227-38 (1960) 1960

Numerical Method of Solving Two-Dimensional and Three-Dimensional Diffusion Equations
N. I. Buleev

NRC-TT-1361 (Transl. from Strahlentherapie, 131: 143-9 (1966)

Definition of the Dose Equivalent, the REM and the Valuation Factor
H. Berger, D. Harder, W. Hubner, R. Jaeger
Available: AEC Depository Libraries

ORNL-RSIC-25 (ANS-SD-9) June 1969

Shielding Benchmark Problems
A. E. Profio, editor
Available: AEC Depository Libraries; CFSTI; RSIC

ORNL-TM-2525 June 1969

X-Ray Attenuation Scanning of Nuclear Fuel Plates
B. E. Foster, S. D. Snyder, R. W. Knight
Available: AEC Depository Libraries; CFSTI

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Parametric Study of the NIOBE Program on Harmonie.
B. Barre
Available: AEC Depository Libraries; CFSTI

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Study of the Data Central System for Information Retrieval Applied to NSA Data
E. M. Kidd, C. E. Price, S. L. Yount
Available: CFSTI

REIC Report No. 46 June 16, 1969

The Effect of Radiation on Electrical Insulating Materials
C. L. Hanks, D. J. Hamman
Available: CFSTI

RPI-328-157 (CONF-690609-16)

A Numerical Solution of the Time Dependent DP/sub L/ Approximation
H. N. Knickle, P. B. Daitch
Available: AEC Depository Libraries; CFSTI

RRA-M71A April 21, 1969

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

RRA-M91 June 13, 1969

Analysis of Initial Radiation Protection Aboard Ship
R. L. French, J. M. Newell

SC-DC-69-1671 (CONF-690609-4) 1969

Use of the Method of Discrete Ordinates for Photon Transport Calculations
J. H. Renken
Available: AEC Depository Libraries; CFSTI

TR/FI (68)49 November 5, 1968

Evaluation of Neutron Spectra by Activation Measurements of Spectral Indexes
F. Pistella
Available: CFSTI as N69-21049

UJV-2126-R (*in Czech*) February 1969

S/sub/N Calculation of the Transport of Particles in the Cylindrical Shielding
J. Rataj
Available: AEC Depository Libraries

UR-49-1099 May 2, 1969

A Nomogram for Calculating the Energy Relations in Compton Scattering
H. L. Andrews

USNCEL-TN-864 December 1966

The Attenuation of Au-198 Gamma Rays in an 11-inch Steel Duct
J. M. Chapman
Available: CFSTI as AD-684456

WAPD-TM-830 March 1969

Transmission Measurement of the Cf-252 Fission Neutron Spectrum (LWBR Development Program)
L. Green
Available: AEC Depository Libraries; CFSTI

WAPD-TM-856 April 1969

An Application of Lommel's Functions to Neutron Transport in Time-Dependent P_1 Theory
J. R. Burger
Available: AEC Depository Libraries; CFSTI

Brit. J. Radiol., 42(497), 378-383(1969)

Effective Atomic Number and Calculation of Composition of Phantom Materials
J. Wever, D. J. Vandenbe

Energ. Nucl. (Milan) 16(4), 42-5 (Apr. 1969)

Neutron Density Versus Flux with Region-Averaged Spectra
R. Bonalumi

Health Phys., 16(4), 475- (1969)

Health Physics Considerations in Processing Transplutonium Elements
D. H. Denham

IEEE Trans. Nucl. Sci., NS16(1), 35- (1969)

Characteristics of an Ultra-High Resolution Ge(Li) Spectrometer for Singles and Coincidence X-Ray and Gamma-Ray Studies
J. M. Palms, P. V. Rao, R. E. Wood

J. Atomic Energy Society Japan, 10, 5, 249-58 May 1968

Neutron Penetration
H. Yamaki, T. Fuse, Y. Toyoda

J. Math. Phys. (N.Y.), 10, 266-76 (Feb. 1969)

Theory of the Propagation of the Plane-Wave Disturbances in a Distribution of Thermal Neutrons
J. J. Duderstadt

J. Nucl. Energy, 23, 67-72 (March 1969)

Error Estimation for Time-Dependent Monte Carlo Leakage Spectra
H. Kschwendt

J. Nucl. Sci. Technol., 5,5,58-9 *May 1968*

On Curtailment of Neutron Slowing Down Interval in Multi-Group Calculation
N. Mizoo

J. Res. Nat. Bur. Stand., 72b,1,79-88 *January 1968*

Simple Analytic Expressions for the Total Born Approximation Cross Section for Pair Production in a Coulomb Field
L. C. Maximon

KFKI (Kozp. Fiz. Kut. Intez.) Kozlem, 16, 381-97 (1968) (In Hungarian)

Dose-Equivalent Rates of Neutrons and Gamma Rays in the Environment of the WWR-SM Reactor
S. Makra, M. Toth

Nippon Genshiryoku Gakkaishi, 9, 700-4 (Dec. 1967) (In Japanese)

Reflection of Neutrons by Human Body
H. Tatsuta, H. Ryufuku

Nippon Genshiryoku Gakkaishi, 11, 144-9 (1969) (In Japanese)

Gamma-Ray Leakage Through a Junction Between Lead and Concrete Walls
S. Miyasaka, Y. Kanemori, Y. Fukushima, T. Yamada

Nucl. Appl., 6(4), 274-278 (April 1969)
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Measured and Calculated Absolute Power and Fission Distribution in the TSF-SNAP Reactor
E. A. Straker, F. J. Muckenthaler

Nucl. Appl. Tech., 7(1), 62-66 (July 1969)

Neutron Emission Rates and Energy Spectra of Two Pu-238 Power Sources
M. E. Anderson, R. A. Neff

Nucl. Appl. Tech., 7(1), 89-99(July 1969)
(ORNL-TM-2079, Rev.)

Calculation of Neutron Fluence-to-Kerma Factors for the Human Body
J. J. Ritts, M. Solomito, P. N. Stevens

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Circular Polarization of Gamma-Radiation After Capture of Polarized Thermal Neutrons
K. Abrahams, W. Ratynski

Phys. Rev., 177, 1, 330-6 *January 1969*

Quantum Corrections to the Neutron Transport Equation
E. Diana, A. Scotti

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

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A Numerical Integration Method in the P_n Approximation
L. Saveanu

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V. B. Uvarov

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Use of the Monte Carlo Method for Calculation of Differentials of Functionals of Solutions of the Transport Equation with Respect to System Parameters
G. A. Mikhailov

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Semiconductor Nuclear-Particle Detectors and Circuits
Editors: W. L. Brown, W. A. Higinbotham, G. C. Miller, R. L. Chase
National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., Washington, D.C. 20418

BOOK *(168 pp.)* *1969*

Index to the Literature of Semiconductor Detectors
Editor: J. M. McKenzie
National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., Washington, D. C. 20418

BOOK (MSF-1421) (In Russian) (423 pp.) *1968*

Albedo Gamma Radiation (Al'bedo Gamma-Izlucheniya)
B. P. Bulatov
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Basic Nuclear Engineering
A. R. Foster, R. L. Wright, Jr.
Allyn and Bacon, Inc., Longwood Dept., Rockleigh, N. J. 07647

BOOK (Pamphlet - 44 pp.) 1966

Code of Practice Against Radiation Hazards
Imperial College of Science and Technology, London

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Low-Energy Neutron Physics
I. I. Gurevich, L. V. Tarasov
North-Holland, Amsterdam

BOOK (AEC-*tr*-6879) (359 pp.) 1966

Physics of Reactor Shielding
Yu. A. Kazanskii, V. I. Kukhtevich, E. S. Matusevich, B. I. Sinitsyn, S. G. Tsypin
Available: AEC Depository Libraries; CFSTI

BOOK (*In Russian*) (138 pp.) 1968

Predvaritel'No Napryazhennyi Zhelezobeton V Stroitel'Stve Yadernykh Ustanovok. *(Prestressed Ferro-Concrete for Construction of Nuclear Reactors)*
A. N. Komarovskii
Atomizdat, Moscow

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Table of Isotopes - Sixth Edition
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Wiley-Interscience, a division of John Wiley & Sons

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Nuclear Reaction Analysis: Graphs and Tables
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Wiley-Interscience, a division of John Wiley & Sons

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Interactions of Photons and Leptons with Matter
R. R. Roy, R. D. Reed
Academic Press, New York

SPACE AND ACCELERATOR SHIELDING

AD-679376 April 1968

Energy Distribution and Dose Rate of Gamma-Quanta Scattered at the Earth-Atmosphere Boundary
Yu. I. Kolevatov, V. I. Kukhtevich, G. A. Trykov

BMwF-FB-W-69-03 (N69-21220) (In German) January 1969

Calculation of the Radiation Dose Inside a Satellite with a Defined Structure Taking into Consideration the Pitch Angle Distribution of the Radiation
K. Wohlleben, R. Baeuerlein, H. Riekert
Available: CFSTI

BMwF-FB-W-69-04 (N69-21277) (In German) January 1969

Ionization Inside a Satellite Due to the Bremsstrahlung Produced by the Electron Component of the Van Allen Radiation
R. Baeuerlein
Available: CFSTI

DNPL/P-8 (CONF-690320-2) April 1969

Radioactivity Induced by High-Energy Electrons
G. Saxon
Available: AEC Depository Libraries

HEPL-588 November 1968

Electron-Induced Cascade Showers in Water and Aluminum,(U)
R. R. Whitney, H. D. Zeman, C. J. Crannell
Available: CFSTI as AD-683 704

JINR-P1-4442 (In Russian) 1969

Empirical Dependence-Range-Energy-For 100-100000 MeV Protons
I. K. Vzorov
Available: AEC Depository Libraries

NASA-SP-3024, Vol. V 1969

Models of the Trapped Radiation Environment. Volume V: Inner Belt Protons
J. P. Lavine, J. I. Vette
Available: CFSTI

NASA-CR-96317 (TR-844) June 1968

A Program to Calculate Particle Spectra Produced in High-Energy Proton-Proton Collisions by the Two-Temperature Statistical Model
J. R. Wayland
Available: CFSTI as N68-33548

ORNL-TM-2583 May 2, 1969

Calculation of the Residual Photon Dose Rate Induced in Iron by 200-MeV Protons
T. W. Armstrong, J. Barish

ORNL-TR-1944 (Minerva Radiol., 13, 324-34 (June 1968) in Italian)

Dangers from Ionising Radiations Associated with Space Flights Carried Out with Human Crews. Note I. Notes on Ionising Radiations in Extra-Terrestial Space.
G. Agati, A. Judica-Cordiglia
Available: CFSTI

ORNL-TR-2144 (Radioprotection, 3(2), 115-29 (1968) in French)

Dangers of Irradiation in a Space Flight Environment. Application to an Earth-Moon Project
M. Genet

ORNL-TR-2163 (JINR-P2-4333 in Russian) *1969*

Interaction Cross Sections of Nucleons with Helium
V. S. Barashenkov, S. M. Eliseev

ORNL-TR-2164 (JINR-P2-4346 in Russian) *1969*

Inelastic Interactions of High-Energy Deuterons with Atmoic Nuclei
V. S. Barashenkov, K. K. Guidma, V. D. Toneev

ORNL-TR-2165 (JINR-P16-4304 in Russian) *1969*

Buildup of Low-Energy Radiation in Accelerator Shields
B. S. Sychev
Available: CFSTI

PPAD-654-E (CONF-690103-12) *January 20, 1969*

Operational Monitoring at the Princeton-Pennsylvania Accelerator
W. Schimmerling, M. Awschalom
Available: AEC Depository Libraries; CFSTI

PPAD-661 E *May 1969*

Activations of Air Near a Target Bombarded by 3 GeV Protons
M. Awschalom, F. L. Larsen, W. Schimmerling

Academy of Sciences, USSR, Bulletin, Vol. 32 (Mar. 1968) (A69-28367)

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Cascade and Evaporation Processes in Relativistic Nucleus-Nucleus and Proton-Nucleus Interactions
I. Otterlund

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(A 69-27756)

Measurement of Medium Energy Protons (Experiment S.71C)
F. Sorass, K. Aarsnes, H. R. Lindalen

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135 to 1650 keV Solar Protons After the Flare of July 7, 1966, Observed in the Magnetotail and Magnetosheath
A. Konradi

J. Geophys. Research, 74, 1230-7 (Mar. 1, 1969)

Solar Cosmic Rays of July 13, 1961
H. S. Ahluwalia

J. Geophys. Research, 74, 1361-73 (Mar. 15, 1969)
(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

J. Nucl. Sci. Technol. (Tokyo), 6, 588-91 (April 1969)

Proton Shield Weight Optimization
J. S. Rosen

Nucl. Appl., 6(4), 336-343 (April 1969)

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