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. 3 February 12, 1965

HIGH-ENERGY RADIATION SHIELDING NOW COVERED BY RSIC

Information concerning shielding from radiation occurring in space and in the vicinity of accelerators is now being collected by RSIC, although to date it consists entirely of data from particle-transport calculations, cross-section values, and review articles. The methods which will be used for disseminating this information will be announced later.

RSIC COMPUTER CODE COLLECTION INCLUDES 39 PACKAGES

The RSIC collection of digital computer codes now includes 39 code packages, 26 of which are operable at the Center and are available on request. Most of the codes in the collection were either written for the IBM-7090 or have been modified to run on this computer; at least five were written specifically for the IBM-1604 and two for the IBM-1620. Several of the codes are in FORTRAN language and may be easily modified for use on other computers.

The methods utilized by the codes include Monte Carlo, point-to-point kernel integration, numerical integration, and the Spinney (removal-diffusion) method. The codes have been used for calculations of radiation penetration, reflection, and heating; radiation scattering in ducts; and radiation scattering from structural components such as those encountered in SNAP (Space Nuclear Auxiliary Power) geometries. Transport of charged particles has also been treated.

The shielding community has given good response to the efforts of the RSIC staff members collecting the codes, as is evident from the following list of installations who have contributed to the collection:

Atomics International, North American Aviation
Aeronautical Research Laboratories, Wright Air Development Center
George C. Marshall Space Flight Center
Hanford Atomic Products Operation
Kaman Nuclear
Los Alamos Scientific Laboratory
Lincoln Laboratory, MIT
NASA, Lewis Research Center
NDA, United Nuclear Corporation
Northrop Space Laboratories
Nuclear Materials Propulsion Operation, General Electric Company

Oak Ridge National Laboratory
Rand Corporation
Research Institute of National Defense, Sweden
Technical Operations Research
TRG, Incorporated
USA, Tank-Automotive Center
USAF Materials Laboratory, Wright-Patterson
USAF Nuclear Aerospace and Research Facility
Westinghouse Astronuclear

A listing of the codes available from the collection will appear in a future newsletter.

A LISTING OF CODE LITERATURE: AN ENCLOSURE

This issue of the newsletter is accompanied by an enclosure which consists of a bibliography of reports on computer programs for shielding calculations. The bibliography, entitled "Report Collection -- Codes," was compiled by RSIC staff members who routinely scan the literature on radiation shielding and on mathematics and computer codes in search of useful tools for shielding calculations. The literature on codes which appear to fall in this category is placed in the RSIC files. The reports included in the enclosed bibliography were selected from those in the files.

THE SHIELDING COMMUNITY NEEDS YOUR INFORMATION

It is obviously impossible for RSIC to be aware of every piece of shielding literature or of available computer codes for shielding calculations. Therefore, to ensure that your information is made known to the shielding community through RSIC, we request that you assume the responsibility of informing us about it, either by mailing us a copy of your report or by advising us by letter.

MISCELLANEOUS POLICIES AND SERVICES OF RSIC

RSIC is not a documentation center. The literature selected by RSIC may be obtained in general elsewhere.

RSIC maintains files of preliminary or informal publications which generally are not selected to be placed in RSIC bibliographies. These publications include proceedings of symposia, transactions of societies, letters to the editor, progress reports, strictly internal reports, etc. Also, RSIC maintains an archival microfiche file of all the shielding literature (except classified literature) and files of full-size copies of the literature, although no attempt is made to ensure complete coverage since the microfiche file does ensure complete coverage.

JANUARY ACCESSION LIST OF LITERATURE

The following accession list consists of literature which the RSIC obtained through its usual scanning procedures. This literature will be examined for assignment to various files or for possible rejection.

Reactor Shielding

AERE-R-4111

The Use of Cobalt as an Accurate Thermal Neutron Flux Monitor
N. K. Taylor and J. K. Linacre -- July 1964

AERE-R-4723

Some Yields in the Thermal and EPI-Cadmium Neutron Fission of Pu-239
I. F. Croall and H. H. Willis -- September 1964

AERE-R-4524

Calibration of a Neutron REM Counter
J. W. Leake and J. W. Smith -- July 1964

AEEW-R-390

The IBM-7090 Programmes Perseus, Ariadne, and Cerberus
C. Green -- August 1964

AERE-R-4663

The Use of ^{10}B for Neutron Flux Density Measurements, by the Determination of the ^{7}Li Formed
N. K. Taylor and J. K. Linacre

NASA-TN-D-2515

Approximate Predictions of the Transport of Thermal Radiation through an Absorbing Plane Layer
Max A. Heaslet and Franklyn B. Fuller -- November 1964

NDL-TM-15

A Point-Source Circulation System for Simulating Fallout Gamma Radiation
Ralph E. Rexroad, Murray A. Schmoke and Michael J. Schmuchyk

TRG Report 845 (D)

Gamma Dose Rate in the D. F. R. Rotating Shield Calculation and Measurement
J. Adamson, N. I. McNair and A. M. Judd -- 1964

USNRDL-TR-795

The Calculations in La-2390 and Questions on the Prediction of Weapon Neutron Fields and Resulting Induced Activity
R. L. Mather -- November 12, 1964

USNRDL-TR-789

Design Criteria for Roof Washdown Phase II. Fallout Removal Studies on Typical Roofing Surfaces for Three Size Ranges of Particles (44 to 88μ, 88 to 177μ, and 590 to 1190μ).
R. H. Heiskell, W. S. Kehrer, and N. J. Vella -- August 11, 1964

WL-TDR-64-95

Advanced Shielding Technology for NAP Applications
E. E. Jones and F. O. Leopard -- December 1964

FZK-9-187 (NARF-63-8T)

Measurement of Radiation Heating in Aerospace Structural Materials
B. E. Morris, N. D. King, and H. G. Carter -- September 16, 1963

AFSWC-TN-59-6

Scattered Gamma Radiation Measurements from a Co^{60} Contaminated Field
C. L. Schlemn, Alexander E. Anthony, Jr., and Zolin G. Burson -- January 1959

AERE-R-4553

Specific -- A Monte Carlo Programme for High-Energy Neutron Spectrum Estimation
M. P. Ruffle -- August 1964

Trans. Architect. Inst. Japan, No. 89,350 (September 1963) Translation requested.

Design of a Maze for Radiation Protection
Masaaki Sakuta

ORNL-P-655

Distribution of Dose and Dose Equivalent in a Cylindrical Tissue Phantom from Fission Sources of Neutrons
Troyce D. Jones -- 1964

MLM-1200

Gamma Shielding Requirements for Plutonium-238 and Polonium-210
K. W. Foster -- May 15, 1964

BOOK

Alpha-, Beta- and Gamma-Ray Spectroscopy, Vol. 1
Editor: Kai Siegbahn -- Publisher: North-Holland Publishing Company

NDL-TR-2

Scattered Radiation and Free Field Dose Rates from Distributed Cobalt-60 and Cesium-137 Sources
R. L. Rexroad and M. A. Schmoke

JPRS-27535 (TT-64-51784)

Protection Against Radiation and Dosimetry
Aleksey Alekseevich Moiseev and Viktor Ivanovich Ivanov

French Patent 1,264,556

Incorporation of Lead Ore in Shields for Protection Against Nuclear and Radioactive Radiations
A. Petitjean -- May15, 1961

Annals of Physics, 9, 1-23 (1960)

Elementary Solutions of the Transport Equation and Their Applications
K. M. Case

International J. Appl. Radiation and Isotopes, 15(9), 529-539 (September 1964)

An Experimental Study of γ-Ray Attenuation in Polyethylene-Lead Shields
C. A. Bisselle, R. A. Karam, and J. Wethington, Jr.

Health Physics, 8, 233-243 (1962)

Radiation Measurements Over Simulated Plane Sources
F. J. Davis and P. W. Reinhardt

Arkiv for Fysik, 16, 293-313 (1960)

Heat Hazards from Fission Products and Fallout II. Gamma Radiation from Nuclear Weapons Fallout
R. Bjornerstedt

AEEW-R-377

The Calculation of Fast Neutron Spectra for Pressure Vessel Damage Studies
A. F. Avery and J. Butler -- May 1964

KAPL-M-6193

Calculation of the Time Dependent Gamma Ray Dose Produced by the Decay of the U-232 Chain
David T. Goldman and Dario Bollacasa -- August 26, 1964

NUC-E-15 (AD-432876)

Evaluation of the Shielding Characteristics of Structures for Simulated Residual Radiation - Final Report
L. Degelman, A. Foderaro, and G. Kowal -- November 1963

Can. J. Phys. 39, 604-608 (1961)

Gamma Dose in a Hole in a Uniformly Contaminated Plane: Contribution by Ground Penetration
C. E. Clifford

Unpublished Paper

Monte Carlo Calculations and Experimental Data for Radiation Streaming through Bent Ducts
J. D. Marshall - November 30-December 3, 1964
Presented at the 1964 Winter Meeting of ANS, San Francisco, California

Miscellaneous

Cerama-Shield
Osborne Industries, Inc., 2636 S. Grand Avenue, Los Angeles, California

REIC Report No. 36

The Effect of Nuclear Radiation on Electronic Components, Including Semiconductors
R. K. Thatcher, D. J. Hamman, W. E. Chapin, C. L. Hanks, and E. N. Wyler -- October 1, 1964

Soviet J. Atomic Energy, 15(5), 1132-1139 (November 1963)

Measurement of Neutron Tissue Dose Behind Reactor Shielding
I. B. Keyrim-Markus, V. T. Jorneyev, V. V. Markelov, and L. N. Uspenskiy

WAPD-BT-31

Penetration of Point Monodirectional Gamma Rays Through Slab Shields
K. Shure -- 1964

IS-993

A Computer Method for Determining by Least Squares Gamma Ray Relative Intensities Using a Bent-Crystal Monochromator
Joseph Emerson Brown and E. N. Hatch -- August 1964

ORNL-P-785

Am - Be - Cm Neutron Sources: Fabrication and Characteristics
E. H. Acree

AERE-R-4776

A Compilation of Experimental and Theoretical Neutron Spectra
R. H. Jones, Editor -- November 1964

German Patent 1,167,459

Neutron Shield
Goodyear Tire and Rubber Company

Kerntechnik, 6:393-9 (September 1963) Translation requested

Dose Build-up Factors for Concrete
A. Hoenig

AWRE 0-52/64

On the Solution of Certain Neutronics Problems by Way of a Suitable Adjoint Problem
E. D. Pendlebury -- October 1964

AERE-R-4765

Some Problems of Gamma Dosimetry at Energies above 2 MeV
P. D. Holt -- October 1964

AE-164

The Solution of a Velocity-Dependent Slowing-Down Problem Using Case's Eigenfunction Expansion
Arne Claesson -- November 1964

FZK-186-2

Nuclear Radiation Heating in Liquid Hydrogen. Volume II. Experimental Data
W. A. Hehs, B. O. McCauley, G. E. Miller, and D. M. Wheeler -- June 30, 1964

CRRP-1201

On the Solution of the Integral Boltzmann Equation in Cylindrical Geometry
D. C. Sahni -- September 1964

HW-84451

Shielding Requirements for Moxtyl Fuels
L. G. Faust -- May 22, 1964

HW-84329

Neutron Detector Shielding in a Reactor Background Environment
O. K. Harling -- October 1964

HNS-1229-54

A Procedure for the Calculation of Neutron Activation of an Infinite Homogeneous Medium
C. L. Carnahan -- September 15, 1964

IA-980

Nuclear Cross Sections for Fast Reactors
S. Yiftah and M. Sieger -- July 1964

IDO-17025

Comparison of the Prompt Fission Gamma Spectrum of U-233 Induced by Thermal Neutrons and by 1.8 eV Resonance Neutrons
M. S. Moore and R. S. Spencer -- October 1964

JAERI-1058

The Factorization Method for the Multigroup Integral Transport Theory in Heterogeneous Systems
Hiroshi Takahashi -- July 1964

JAERI-4029

Status Report of Shielding Investigation in Japan
April 1964

LA-3139

The Fabrication of Lead-Boron Carbide Components for KIWI Neutron-Gamma Collimator
Haskell Sheinberg -- July 20, 1964

NP-14383

The Calculation of Fast Neutron Spectra for Pressure Vessel Damage Studies
A. F. Avery and J. Butler -- December 1963

NP-14469

Gamma Ray Spectra of Neutron Activated Elements
Oswald U. Anders -- April 1964

ORNL-3116 (SECRET)

Some Monte Carlo Results on the Penetration of Neutrons from Weapons in an Air-Over-Ground Geometry
R. H. Ritchie and V. E. Anderson -- July 12, 1962

UCRL-7838

Numerical Methods for Nonlinear Radiation Transport Calculations
Philip M. Campbell and Robert G. Nelson -- September 1964

UCRL-11674

Low-Background Concrete
Harold A. Wollenberg and Alan R. Smith -- September 18, 1964

Nukleonik, 6(6), 285-287, October 1964

Geometrical Attenuation of Particle Streaming in Annular and Ordinary Ducts
Jan Nilsson

RRA-M45

Simplified Methods for Calculating the Penetration of Neutron and Gamma Radiation into Underground Concrete Structures
D. G. Collins, R. L. French, L. G. Mooney, K. W. Tompkins and M. B. Wells -- November 25, 1964

Space Shielding

Army Ballistics Missile Agency, Redstone Arsenal

A Brief Survey of Cosmic Ray Data with Regard to Space Vehicle Protection
Seymore T. Nelson -- 1959

American Astronautical Society

Regarding the Predictability of Flares
Gerald F. Anderson -- 1961

NASA Research Advisory Committee on Nuclear Energy Systems

Recommendations on Shielding Research for Manned Space Vehicles
1961

Apollo Project, The Martin Company

Effects of Different Re-entry Vehicle Designs on the Biological Dose from Space Radiation
Sidney Russak

The Boeing Company

Computer Calculations of Doses from Protons in Space
David L. Dye and Gunning Butler -- 1961

U. S. Naval School of Aviation Medicine

Time Profile Tissue Ionization Dosages for Bailey's Synthetic Spectrum of a Typical Solar Flare Event
Hermann J. Schaefer - April 4, 1962

U. S. Naval School of Aviation Medicine

LET Analysis of Tissue Ionization Dosages for Proton Radiation in Space
Hermann J. Schaefer -- February 1962

Am. Soc. Testing Mater., Spec. Tech. Publ., 363 (1963), 1-13 (1964)

Specific Solar Flare Events and Associated Radiation Doses
T. Foelsche

N64-30510

The Calculation of Proton Penetration and Dose Rates
Martin O. Burrell -- August 17, 1964

NASA SP-50

AAS-NASA Symposium on the Physics of Solar Flares
Wilmot N. Hess, Editor -- 1964

UCRL-10061

The Effect of Shielding on Radiation Produced by the 730 MeV Synchroclotron and the 6.2 GeV Synchrotron at the Lawrence Radiation Laboratory
H. Wade Patterson -- January 25, 1962

Convair (Astronautics) Division

Estimated Radiation Shield for the High Energy Solar Flare of February 23, 1956
Donald H. Robey -- March 25, 1960

Convair (Astronautics) Division

On the Influence of Particle Radiation on Manned Space Flight
Donald H. Robey -- August 4, 1960

Convair (Astronautics) Division

Nature of the Moon's Surface and Suggested Measurements with Instrumented Landing Capsules
March 1959

Lockheed-California Company

A New Analytical Method for Determining Dose Rates in Absorber Systems Exposed to Space Radiation
James E. Corry and Daniel E. Stogryn -- May 1962

Lockheed-California Company

Ionization Energy Loss and Dose Rates in Absorbers of Simple Geometrical Shape Exposed to Space Radiations
James E. Corry and Daniel Stogryn -- June 1961

FZK-144

A Study of Space Radiation Problems for Manned Vehicles
R. K. Wilson, R. A. Miller and R. L. Kloster -- June 8, 1962

Missile and Space Systems Division, Douglas Aircraft

Complete Dose Analysis of the November 12, 1960, Solar Cosmic Ray Event
A. G. Masley and A. D. Goedeke -- April-May 1962

NASA Langley Research Center

Radiation Hazards in Space
T. Foelsche -- August 1961

Space Technology Laboratory, Inc.

The Radiation Environment in the Interior of a Space Vehicle
Allen Rose -- November 1960

UCRL-10086

Shielding and Activation Considerations for a Meson Factory
April 11, 1962

7th Annual Meeting of the American Astronautical Society, January 16-18, 1961

Protection Against Solar Flare Protons
Part III, Solar Flares - Seminar for the Electronuclear Research Division, ORNL -- February 14, 1961

Research Division Meeting, NASA Langley Research Center

Fundamentals of Shielding Against Ionization Radiation in Space Flight
T. Foelsche -- March 1960

Langley Research Center

Energetic Particles in the Environment of the Earth with Emphasis on Their Implications to Space Flight
T. Foelsche -- February 1961

Society of Automotive Engineers Astronautical Symposium, Los Angeles, October 12-14, 1960

On the Influence of Particle Radiation on Manned Space Flight
Donald H. Robey

Astronautics

Radiation Danger in Space
Hermann J. Schaefer -- July 1960

U. S. Naval School of Aviation Medicine Research Report No. 17

Further Evaluation of Tissue Depth Doses in Proton Radiation Fields in Space
Hermann J. Schaefer -- May 24, 1960

CERN-64-47

Monte Carlo Calculation of the Nucleon-Meson Cascade in Shielding Materials Initiated by Incoming Proton Beams with Energies Between 10 and 1000 GeV
J. Ranft -- November 18, 1964

Aerospace Medicine, Vol. 30, p. 631-639, September 1959

Radiation Dosage in Flight Through the Van Allen Belt
Hermann J. Schaefer

NASA Langley Research Center

Major Solar Proton Beams and Preliminary Estimate of Shielding Weights for Protection in Space
T. Foelsche -- July 1960

U.S. Naval School of Aviation Medicine Research Report No. 16

Tissue Depth Doses in the High Intensity Proton Radiation Field of the Inner Van Allen Belt
Hermann J. Schaefer -- November 10, 1959

Technical Memo 131/1-60-61 (Martin Company, Denver)

The Radiation of Solar Flares and Van Allen Belt to Low Orbiting Vehicles
Jane Blizard - January 1961

J. Astronautical Sciences, p. 64

Biological Shielding for Radiation Belt Particles
D. L. Dye and J. C. Noyes

NASA-TN-D-588

Proceedings of Conference on Radiation Problems in Manned Space Flight, June 1960, Washington, D. C.
G. T. Jacobs, Editor - December 1960

ORNL-TM-552

Material Requirements for Shielding Against Space Radiations
C. D. Zerby - May 21, 1963

Astronautica Acta 9:FASC.4

Nuclear Problems in Radiation Shielding in Space
S. P. Shen

ER-6643

Computer Programs for Shielding Problems in Manned Space Vehicles
C. W. Hill, C. C. Douglass, Jr. -- January 1964

ER-5997

Shielding Problems in Manned Space Vehicles
W. M. Schofield, E. C. Smith and C. W. Hill -- December 1, 1962