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

**A LISTING OF CODE LITERATURE: AN ENCLOSEMENT**

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. P. 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-590
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-IN-D-2915
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. Schmouchyk

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. Kehrler, 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 Co²⁶° Contaminated Field
C. L. Schlemer, 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. Raffle -- August 1964


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

MIM-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

NDI-TR-2

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

JFRS-27555 (TT-64-51/84)

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

French Patent 1,254,526

Incorporation of Lead Ore in Shields for Protection Against Nuclear and Radioactive Radiations
A. Petitjean -- May 15, 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 F. W. Reinhardt

Arkiv for Fysik, 16, 297-313 (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-432076)
Evaluation of the Shielding Characteristics of Structures for Simulated Residual Radiation - Final Report
L. Degelman, A. Foderaro, and G. Kowal -- November 1963

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., 2536 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


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. Chure -- 1964

TS-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-1-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

AERE 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

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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

CRRP-1201

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

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

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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 1.6 eV Resonance Neutrons
M. S. Moore and R. S. Spencer -- October 1964

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

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Status Report of Shielding Investigation in Japan
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The Fabrication of Lead-Boron Carbide Components for KIWI Neutron-Gamma Collimator
Haskell Sheinberg -- July 20, 1964

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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

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Philip M. Campbell and Robert G. Nelson -- September 1964

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

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

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Simplified Methods for Calculating the Penetration of Neutron and Gamma Radiation into Underground Concrete Structures

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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
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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

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LET Analysis of Tissue Ionization Dosages for Proton Radiation in Space
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Specific Solar Flare Events and Associated Radiation Doses
T. Poelsche

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

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Wilmot N. Hess, Editor -- 1964

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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
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Nature of the Moon's Surface and Suggested Measurements with Instrumented Landing Capsules
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A New Analytical Method for Determining Dose Rates in Absorber Systems Exposed to Space Radiation
James E. Corry and Daniel E. Stogryn -- May 1952
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 0, 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

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Radiation Hazards in Space
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Space Technology Laboratory, Inc.

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

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Shielding and Activation Considerations for a Meson Factory
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Part III, Solar Flares - Seminar for the Electronuclear Research Division,
ORNL -- February 14, 1961

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Energetic Particles in the Environment of the Earth with Emphasis on Their Implications to Space Flight
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On the Influence of Particle Radiation on Manned Space Flight
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Further Evaluation of Tissue Depth Doses in Proton Radiation Fields in Space
Hermann J. Schaefer -- May 24, 1960

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Initiated by Incoming Proton Beams with Energies Between 10 and 1000 GeV
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Protection in Space
T. Foelsche -- July 1950

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

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

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

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S. P. Shen

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