

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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CURRENT WORK AND PROBLEMS

At the U. S. Army Nuclear Defense Laboratory work in shielding is carried on in two divisions. In the Nuclear Engineering Division (M. J. Schumchyk, M. A. Schmoke) work is in progress in the following area: (1) Effectiveness of structures against fallout radiation including, specifically, (a) "in and down" scattering in below ground concrete structures, (b) skyshine and ceiling shine, (c) usefulness of scale models, (d) effect of shape variations in shielding structures, (2) shielding effectiveness of vehicles, (3) effectiveness of detector collimators, especially for use in aerial surveys, and (4) determination of relative dose contribution from uniformly contaminated annular areas as a function of height using (a) radioactively tagged particle spread (b) stationary point source system, and (d) circulating point source system. The Nuclear Physics Division (A. T. Futterer) is working on (1) an edit routine to apply to output from the Los Alamos NGM Monte Carlo particle transport program (2) schemes for applying such output to shielding problems, (3) evaluation of existing shielding codes, (4) evaluation of existing calculated radiation transport data for tabulation and publication, and (5) evaluation and compilation (under subcontract) of neutron cross sections for Mg, Na, Cl, Ca, and K.

From the J. Stefan Nuclear Institut in Yugoslavia (M. Copic, F. Zerdin) we hear the following. A neutron attenuation program, ATENN, based on RASH B (removal, age-diffusion) has been developed for the ZUSE Z-23 computer. When checked against measurements made in the thermal column of the heavy water experimental reactor in Vinca, discrepancies of more than a factor of 4 were found in the estimate of the epithermal flux densities. These discrepancies were attributed to the inappropriateness of the geometric model in the calculations. An improved program based on RASH E is being developed. In this model removal groups are fitted by Chebyshev polynomials and the age-diffusion equations are treated by an approximation due to Wachspress.

Computer programs have been developed gamma ray attenuation and heat generation in shields.

Areas where it is felt increased effort is needed include optimization studies using adjoint functions, improved calculational models to handle thin layers of iron imbedded in water, study of effect of ducts and voids in concrete on the temperature distribution in the concrete.

Lockheed California (E. L. Joiner) is at work on radiation and shielding problems encountered by high flying aircraft. The atmospheric radiation profile,

environmental and secondaries due to interaction with aircraft structure, is being studied from ground level to the top of the atmosphere. Geiger counter telescopic data, taken in high flying aircraft are being analyzed. Work is proceeding on a computer program designed to evaluate penetrating environmental radiation deposited in specific radiation detectors, arbitrary absorbers, or manned vehicles.

G. E. Cincinnati (W. E. Edwards) reports the following. The computer code QAD has been modified to use a 14-1 type exponential neutron attenuation function for hydrogen material thicknesses less than a specified amount. It has also been modified to contain gamma ray buildup factors for light and heavy materials. Work has started on automated combination of point kernel and multigroup diffusion programs. QAD and 14-1 are being considered for the point kernel program. If QAD is used it will be modified to contain desirable 14-1 features. GEORGE III has been selected for the diffusion part ... Molybdenum and rhenium neutron cross sections are being compiled ... SURF has been written in FORTRAN IV for analysis of unscattered flux densities from arrays of neutron and gamma ray sources and for analysis of single scattering from conical or plane surfaces. It is being improved and documented for release.

RECENT VISITORS TO RSIC

The following people visited RSIC during the month of September: Herbert Goldstein, Columbia University, New York; E. H. Cooke-Yarbrough, AERE, Harwell, England; Henri Smets, OECD, Paris, France; Frederick P. Cowan, Brookhaven National Lab., Upton, New York; Arthur Reetz, NASA Headquarters, Washington; Arnold Futterer, Nuclear Defense Laboratory, Aberdeen, Maryland; Jim Haffner, North American Aviation, Los Angeles, California; Marshall Grotenhuis, Argonne National Laboratory, Argonne, Illinois; C. W. Hill, Lockheed-Georgia, Marietta, Georgia; M. O. Burrell NASA-George C. Marshall Space Flight Center, Huntsville, Alabama; Robert Stooksbury and Lambrose Lois, Westinghouse Electric Corp, Pittsburgh, Pa.; Wade Selph and Norman Schaeffer, Radiation Research Associates, Fort Worth, Texas; Ed Kidd, General Dynamics, Fort Worth, Texas; Jerry Lahti, NASA-Lewis Research Center, Cleveland, Ohio; Col. Wm. Alfonte, DASA, Washington, D. C; Harvey Israel, Los Alamos Scientific Laboratory, Los Alamos, N. M.; Maurice Wilkinson, Boeing-Aerospace, Seattle, Washington; Lt. Roger Case, AFWL-WLRB, Kirtland Air Force Base, N.M.; Robert Roussin, University of Illinois, Urbana, Illinois; Lewis V. Spencer, National Bureau of Standards, Washington, D. C.; Jack E. Terry, AERE, Harwell, England.

TRAVELING WITH RSIC

Staff members Betty F. Maskewitz and David K. Trubey visited NASA-Lewis Research Center, Cleveland, Ohio, and United Nuclear Corporation, Elmsford, New York (during the week of October 3-7) to discuss computer codes ATHENA and UNC-SAM, which are being placed in the RSIC collection.

ATHENA, a system of Fortran programs for radiation transport and heating calculations in complex reactor geometries, was programmed by David Spielberg of UNC and further developed by Walter Paulson of LRC. Deriving its basic structure from UNC-SAM, ATHENA embodies many generalizations and additional features. A new Fortran 63 version of SANE II was also contributed to RSIC by UNC.

Discussions were held at LRC with Millard Wohl, Gerald Lahti and Paulson of the research group and with Leonard Soffer of the development group of the Space Power Systems Division; at UNC with Robert Schamberger, Martin Cohen, and Simon Kellman of the Mathematics and Physics Division.

A visit was also made to Union Carbide Research Institute at Elmsford where discussions were held with Clay Zerby and Fred Keller on PHOTRAN, a general purpose time dependent photon transport program in complex geometry, developed by UCRI for the Air Force Weapons Laboratory.

SEPTEMBER 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. The accession list is divided into three fields of (1) reactor and weapons shielding, (2) space and accelerator shielding, and (3) shielding computer codes.

RSIC is not a documentation center. Hard copies of the literature cited below must generally be obtained elsewhere. In most cases, however, we will be able to supply microfiche copies upon request. There may be a delay if a microfiche original is not available and we must produce one. This will be the case with ordered and newly obtained literature only. Naturally, we cannot supply copies of literature which is copyrighted or whose distribution is restricted.

Reactor and Weapons Shielding

NAA-SR-MEMO-11872

Application of the P_3 Method to the Calculation of Particle Fluxes in Shields
W. B. Green

AECL-2563

Decay of the Gamma Ray Dose Rate Following a Shutdown in the NRX Reactor
A. W. Boyd, H. W. J. Connor - March 1966

UCRL-14921-T

Evaluation of Some of the Approximate Theories of Particle Transport
J. R. Terrall - March 1966

AERE-M-1670

ETA and Neutron Cross Sections of U-235 from 0.03 to 200 eV
F. D. Brooks, J. E. Jolly, M. G. Schomberg, and M. G. Sowerby
February 1966

ORNL-TM-1077 (Rev.)

Slowing-Down Spectra of Neutrons in Lithium Hydride
V. V. Verbinski - May 20, 1966

ORNL-TM-1078 (Rev.)

Angular Distributions of Low-Energy Neutrons Leaking from Various
Scattering Materials
V. V. Verbinski - May 20, 1966

ORNL-TM-1548

Variance of the Surface-Crossing Flux Estimator Used in Monte Carlo
Calculations
F. H. Clark - June 8, 1966

ORNL-TM-1421

Measurements and Single-Velocity Calculations of Differential Angular
Thermal-Neutron Albedos for Concrete
R. E. Maerker and F. J. Muckenthaler - April 5, 1966

ORNL-TM-1541

Measurements and Calculations of the Spectral and Spatial Details
of the Fast-Neutron Flux in Water Shields
V. V. Verbinski, M. S. Bokhari, J. C. Courtney, and G. E. Whitesides
May 26, 1966

ORNL-TM-1484

Importance Sampling Devices for Selecting Track Lengths and Directions
After Scatter in O5R
F. H. Clark and N. A. Betz - August 5, 1966

Papers of Ship Research Institute No. 6

A Code and Some Results of a Numerical Integration Method of the
Photon Transport Equation in Slab Geometry
I. Kataoka and K. Takeuchi - March 1965

ORNL-TM-1547

Calculations of the Transport of Neutrons from Fission and 14-MeV
Points Sources in an Infinite Medium of Air
E. A. Straker - August 9, 1966

USNRDL-TR-1043

Gamma Rays Resulting from Interactions of 14.7 MeV Neutrons with
Sodium, Sulfur, Chlorine, Potassium and Lead
W. E. Thompson and F. C. Engesser - July 14, 1966

J. Nucl. Sci. Technol. 3(5), 209-212 (May 1966)

A Method for the Numerical Integration of the Neutron Transport Equa-
tion in Slab Geometry
J. Takeuch and I. Kataoka

HN-186

Shielding Effectiveness of Soils Against Initial Radiation
J. H. Wilson and R. H. Karcher - August 1966

LA-DC-7702

Response of Selected Neutron Monitoring Instruments to Several Types of
Neutron Sources
S. E. Hankins - 1965

NYO-3270-2 (Vol. I and II)

San Onofre Nuclear Generating Station, Unit I. Final Engineering
Report and Safety Analysis. Vol. I

Thesis - North Carolina State of the University of North Carolina - 1964

The Effect of Pipes on Gamma-Ray Dose Rate in a Nuclear Reactor Shield
Wilson Durward Leggett III

NYO-9726

PM-3A Secondary Shield
J. and M., Inc.

CEX-65.03

Operations Plan - Operation Henre
F. F. Haywood, T. G. Provenzano, J. A. Auxier - June 1965

Thesis - Dresden Tech. Univ. (1964)

Studies of the Backscattering of Gamma Radiation
S. Koch

British Patent 1,025,100

Shielding Material for Protection Against Neutron Radiation
F. Schnittler, and T. Chvatal

AD-624370

Magnitude and Distribution of Weapon Effects for the Design of Shelters
for Protection Against Fallout (Research Paper P-194)
H. A. Knapp - July 1965

AD-624041

Time-Dependent Neutron Transport from a Point Isotropic Source at an
Altitude of 100,000 Feet
G. A. Ausman, Jr., and Francis Wimenitz - Sept. 10, 1965

HASL-167

An Experimental Determination of Differential Energy and Angle
Spectra for ¹³⁷-Cs Gamma Rays in Sand
M. Alberg, K. O'Brien, J. McLaughlin, A. Lazanoff - February 1966

AD-626770

An Investigation of School Designs to Resist Integrated Nuclear Weapons Effects

R. N. Bruce, Jr., J. E. Branch, M. P. Gronbeck, J. T. Hanley, D. F. McCahill - 1965

TID-22499

Development of a ^{137}Cs Facility for Ecological Research
B. Frank Golley and J. Frank McCormick - January 1966

LA-3446

Gamma Dose Rate Measurements - Kiwi Transient Nuclear Test
F. W. Sanders - March 29, 1966

LA-3393

Integral Gamma and Neutron Measurements on the Phoebus LA-321 Reactor
F. C. V. Worman and A. J. Ahlquist - June 22, 1966

SC-RR-66-229

Tabulation of Cross Sections, Q-Values, and Sensitivities for Nuclear Reactions of Nuclides with ^{14}MeV Neutrons
B. T. Kenna and F. J. Conrad - June 1966

MLM-1326

An Elementary Guide to the Measurement of Fast Neutron Fluxes
M. E. Anderson - July 17, 1966

CF-66-5-11

Design of Shielding for the Primary and By-Pass Cold Traps of the Fluidized-Bed Volatility Pilot Plant
F. W. Miles - May 2, 1966

WAPD-T-1908

Numerical Comparison of Methods of Describing Heavy Element Neutron Slowing Down
L. B. Freeman and E. M. Gelbard - February 1966

JINR-P-2636

Cross Sections for Electron-Positron Pair Production by Gamma Quanta ($E/\text{sub gamma} = 10-10,000\text{ MeV}$) in Hydrogen, Carbon, Fluorine, Chlorine, Bromine and Xenon
Ya. Bem and V. G. Grishin - 1966

AD 620149

Reactor Shielding Calculations by the Monte Carlo Methods
T. M. Jordon - 1965

AGN-TM-412

Army Gas-Cooled Reactor Systems Program. M1-1A Shield Optimization Study
December 1965

AECL-2563

Decay of the Gamma Ray Dose Rate Following a Shutdown in the NRX Reactor
A. W. Boys and H. W. J. Connor - March 1966

AD-633216

Secondary Gamma Ray Transmission Through Plane Slabs of Concrete
Alfred J. Budka, and T. J. Dolce - Sept. 1965

AECD-HP-4

Radiation Levels Around the 3-MeV Dacca Van de Graaf Generator
S. A. Abdullah, A. Hossain, M. Hussain and A. A. Siddiqui
February 1966

NASA-CR-54386

Gamma Spectrum Measurements Snap 8 Radiation Effects Test Program.
Vol. I
Georgia Nucl. Laboratories of Lockheed-Ga. Co. - 1966

N-65-14857

Gamma Fluxes from Circular and Spherical Sources
Johnnie R. Keith and F. H. Shelton - May 16, 1964

Space and Accelerator Shielding

AD 620162

Computational Methods for Space Radiation Shielding Analysis
M. P. Billings, et al. - May 1965

SLAC-Trans-30

Emission of Photons During the Electromagnetic Annihilation of Heavy Particles
V. N. Baier and V. A. Khoze - 1965

NP-15697 (Vol. 1)

Data Compilation and Evaluation of Space Shielding Problems. Vol. 1. Range and Stopping Power Data
C. W. Hill, W. B. Ritchie, K. M. Simpson

Thesis - Case Inst. of Tech., Cleveland, Ohio

Cosmic Ray Primary Electron Flux Measurement with Rigidity Above 5 BV
Lawrence H. Smith - 1965

N-15697 (Vol. 2)

Data Compilation and Evaluation of Space Shielding Problems. Vol. II.
Dose Calculations in Space Vehicles
C. W. Hill, W. B. Ritchie, K. M. Simpson - Aug. 1965

AFCRL-66-140

Catalog of High Energy Solar Particle Events 1957-1961, Scientific
Report No. 7
P. Cummings - Dec. 1965

NASA-CR-70802

Plasma Radiation Shielding (Final Report)
AVCO-Everett Research Lab., Everett, Mass. - January 1966

BNL-tr-74

Calculation of Neutron Production by μ -Mesons for Different Ground
Depths
G. T. Zatsepin, O. G. Ryazhskaya - 1965

N-66-14060 (NASA-TT-F-9794)

Investigation of Primary Cosmic Rays on the "Proton-1" Spacecraft
M. L. Grigorov, V. E. Nesterov, I. D. Rapoport, I. A. Savenko,
and G. A. Skuridin

N-66-12961

High-Energy Photons and Neutrinos from Cosmic Sources
R. J. Gould, G. R. Burbridge - April 1, 1965

CERN-Trans-66-1

An Estimation of Ionizing Radiation Levels Near the 10-GeV Synchrotron
of the Joint Institute for Nuclear Research
M. M. Komochkov, V. N. Bebedev

NP-tr-1395

Distribution of the Penetrating Radiation Field Over the Protection
Zone of the 10-GeV Synchrotron
V. N. Lebedev, L. S. Zolin, M. I. Salatskaya

UCRL-16042 (Rev.)

Cosmic-Ray-Produced Neutrons on the Ground: Neutron Production Rate
and Flux Distribution
M. Yamashita, L. D. Stephens, H. W. Patterson

N66-15587 (NASA-CR-69435)

Data Compilation and Evaluation of Space Shielding Problems. Vol. II.
Dose Calculations in Space Vehicles
C. W. Hill, et al. - August 1965

Shielding Computer Codes

AD 621021 (microfiche)	May 1965	SAQUISN
Group Discrete Sn Transport Calculation for Cylindrical Geometry by R. Saqui Fortran IV for IBM 7094		
AWRE-O-27/66	May 1966	DICE Mk V
The Preparation of Nuclear Data into a Form Suitable for Monte Carlo Calculations Using an Electronic Computer Edited by J. B. Parker Fortran S2 for IBM 7030		
UMNE-2 (TID-17014)	June 1962	SFDOS
Interim Report on Scattering of Gammas Through Ducts by C. Park, C. Agnihotri, and J. Silverman Fortran for IBM 1620		
WANL-TME-941	August 1964	SSDM
Progress on an Automated Radiation Analysis Program by H. C. Woodsum Fortran for IBM 7090/7094		
AWRE-O-4/64	May 1964	NDF PRINT
A Data Listing Programme for the UKAEA Nuclear Data Library by D. M. Jarman, K. Parker, and E. D. Pendlebury Fortran for the IBM 7030		
ABEW-M-553	May 1965	EDITOR
A Programme for Editing BCD Data on Magnetic Tape in the Format of the UKAEA Nuclear Data Library by A. L. Pope Fortran S2 for IBM 7030		
UCRL-10980 (Rev.)	July 1964	ASTROS
Primary and Secondary Proton Dose Rates in Spheres and Slabs of Tissue by R. Wallace, P. G. Steward, and C. Sondhaus Fortran IV for IBM 7090		

UCRL-16154

May 1965

ASTROS

Results of Computations of Depth Dose in Tissue Irradiated by Protons
by P. G. Steward
IBM 7090/94

ACF-434-1

March 1963

N-201

Gamma Heating and Dose Calculations
by B. F. Williams and W. M. Burley
Fortran for IBM 1620