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 Hanford (Jess Greenborg) a number of shielding activities are being carried on. In computer code development a bremsstrahlung capability is being added to ISOSHLD; also, MAC is being programmed in spherical geometry. The experimental shielding program includes determination of the shielding requirements for a 147-Pm isotope power source; determination of the shielding properties of various boron impregnated concretes; development of neutron spectrometers to operate in the range 10 kev - 1 Mev. Analytical studies are being conducted with relation to the shield design for the FFTF; shield designs for space nuclear power systems; and shielding for 90-Sr during processing. Jess now works at Donald W. Douglas Laboratories.

The South African Council for Scientific and Industrial Research (Mrs. M. A. Forman) is using Monte Carlo and semi-empirical studies of the effect of soil composition on density and moisture measurements by the backscattering of gamma rays and neutrons from sources within a few inches of the ground.

CONESCO (J. Batter) is working on shielding against nuclear weapons and on ground air interface measurements and shelter effectiveness in a field of fallout radiation. They feel additional work is desirable in determining the initial spectrum of neutrons from a weapon.

Imatran Voima Oy-Finland (E. Aalto) is interested mainly in shielding of electric power generation plants. In particular, they feel the need for further work in shielding the exterior portions (turbines, etc.) of a direct (boiling) cycle heat transfer system.

UPDATE OF CCC-30/MARTY-N

A 21-card FORTRAN source deck for the neutron cross section function, SUM, has been added to the CCC-30/MARTY-N code package by Gerald P. Lahti of NASA Lewis Research Center, Cleveland, Ohio. The code, as received and run by RSIC, had in it only the binary version of this function. The RSIC staff "defapped" the binary routine and included the resulting 153-card FAP deck in the code package for distribution. The RSIC master is being updated and the function SUM is available on request to those needing the FORTRAN deck.

CORRECTION TO THE QAD/CCC-48 COMPUTER CODE PACKAGE

An error in the water kernel data table, XNMMC, has been reported by R. Protsik, General Electric Company, San Jose, California, and R. E. Malenfant, Los Alamos Scientific Laboratory. The corrected data is available from RSIC upon request.

NEW CODE PACKAGES AVAILABLE

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

CCC-54/NRN	Spinney Method (removal-diffusion) contributed by AB Atomenergie, Stockholm, Sweden, through the ENEA Computer Programme Library, Ispra, Italy.
CCC-68/TYCHE III	Monte Carlo slowing down code, contributed by Atomics International, Canoga Park, California.
CCC-69/CURIE-DOSE-THUNDERHEAD	External and internal radiation dose calculations, contributed by Atomics International, Canoga Park, California.
CCC-70/CHARGE	Space radiation shielding code, contributed by Missile and Space Systems Division, Douglas Aircraft Company, Inc., Santa Monica, California.
CCC-71/MIST	Carlson Sn slab code, contributed by AED, Phillips Petroleum Company, Idaho Falls, Idaho.
CCC-72/COMPRASH	Spinney Method (removal-diffusion) contributed by UKAEA Shielding Group, Water Reactor Physics Division, AERE, Harwell, England, through the ENEA Computer Programme Library, Ispra, Italy.

ADDITIONS TO 05R CODE PACKAGE

A computer code, ACTIFK, written to facilitate the analysis of the collision tapes generated by the 05R neutron transport code, is in the process of being packaged for distribution. Designed for specific use in solving shielding problems, the routine is described in the report, ORNL-3856, written by F. B. K. Kam and K. D. Franz.

The 05R Reactor Analysis package, CIMMAR (Coveyou, Irving, Mihalczo, Morrison Analysis Routine), is in the process of being packaged and will take a few weeks more. REACT, CONVRG, and ACTIVATE are subroutines called by CIMMAR and will be included in the package.

Space and Accelerator Shielding

N65-18274 (NASA-TM-X-55160)

Measurement of Low-Energy Primary Cosmic-Ray Protons on IMP-1 Satellite
F. B. MacDonald, G. H. Ludwig - November 1964

N66-13563 (NASA-CR-68657)

An Annotated Bibliography on Motion of Charged Particles in Magnetic Fields and Magnetic Shielding Against Space Radiation
Perry F. McDonald - November 1965

N66-13126 (NASA-TM-X-53351)

An Environmental Model for Van Allen Belt Protons
William T. Roberts - Oct. 1, 1965

NP-15425 (Douglas Paper No. 3525; N65-32789; AD-620152)

Computational Methods for Space Radiation Shielding Analysis
M. P. Billings, R. W. Langley - May 1965

N66-23050 (AD-627686)

Solar Flares and Prediction
John Firor and Carl Lilliequist - December 1965

BNL-tr-74

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

J. Geophys. Res., 71(5), 1445-1451 (March 1, 1966)

Monte Carlo Calculations of Radionuclide Production in Iron Targets Bombarded with 400-MeV Protons
D. B. Ebeoglu, K. M. Wainio, K. More, and O. L. Tiffany

Space/Aeronautics, 45, 106, 109, 110, 112, 115, 117, 118, 120 (Feb. 1966)

Plasma Radiation Shielding for Deep Space Vehicles
R. H. Levy and G. S. Janes

NASA-CR-70802 (N66-20058)

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

AIAA J., 3(5), 988-9 (May 1965)

Comment on "Mass and Magnetic Dipole Shielding Against Electrons of the Artificial Radiation Belt"
R. H. Levy - May 1965

N65-21724

Radiation Exposure in Solar Particle Beams Behind Very Low Shielding
Hermann J. Schaefer - February 19, 1963

N65-33865 (NASA-CR-64997)

Tissue Dosages from Alpha Particles and Heavy Nuclei in Solar Particle Beams in Space
H. J. Schaefer - June 17, 1965

N65-33858 (NASA-CR-64915)

Magnetic Radiation Shielding Systems Analysis and Superconducting Coil Technology
R. E. Bernert, Z. J. J. Stekly, and E. D. Hoag - July 1964

ER-5997 (N66-13635; NP-15098)

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

SM-46257 (NP-15125)

Radiation Protection for Manned Orbiting Space Stations
T. M. Jordan and E. F. Koprowski - September 1964

ORNL-TR-631 (Translated from Vestn.Mosk.Univ., Ser. III., Fiz. Astron., No. 3, 28-37) (May-June 1964)

Equations for One-Dimensional Cascade Theory of Electron-Photon Showers at Arbitrary Boundary Conditions and Appearance of Source Functions
A. K. Bakhtadze

Health Phys., 12(5) 653-61 (May 1966)

Depth-dose Data for Protons and Pions from 1.0 to 10.0 BeV/c
R. V. Wheeler - May 1966

IVA Medd., No. 138, 21-8 (1963)

Dose Measurements at the Electron Accelerator Facility at Riso
Gunnar Thaarup

J. Spacecraft and Rockets, 2(6), 931-937 (Nov.-Dec. 1965)

Radiation Shielding Requirements for Manned Satellites
F. W. French and K. F. Hansen

Health Phys., 12(2), 227-37 (Feb. 1966)

Calculation of Radiation Dose from Protons and Neutrons to 400 MeV
J. Neufeld, W. S. Snyder, J. E. Turner, and H. Wright

AIAA J., 4(1), 9-13 (January 1966)

Some Techniques Applicable to the Shielding of Nuclear Particles from Space
M. J. Barrett

ORNL-TM-1423

Calculated Fluxes of Less than 50-MeV Neutrons Diffusing Beneath the Shield of a Meson Production Facility
W. E. Kinney - Feb. 23, 1966

ORNL-tr-1118 (Thesis - Kiel Universitat 1963)

The Extension of Some Experimental Results of Cosmic Ray Physics to Nuclear Physics
K. Pinkau

ORNL-tr-1191 (Translated from NP-15385)

Yield and Angular Distribution of Secondary Nucleons from Flat Shielding under the Action of 660-Mev Protons No. 8
V. A. Kon'shin, E. S. Matusevich, V. I. Regushevskii

Nucleonics, 24(4), 64, 66-69 (April 1966)

Radiation Hazards of the New Generation of Accelerators
R. H. Thomas

NASA-CR-334 (N66-12159)

Investigations of Electron Interactions with Matter
Part 1. Bremsstrahlung Production in Aluminum and Iron
Wm. E. Dance and L. L. Baggerly
Part 2. Electron Scattering in Aluminum
D. H. Rester and W. J. Rainwater, Jr.

NASA-SP-3024 (N66-16054)

Models of the Trapped Radiation Environment
Vol. I: Inner Zone Protons and Electrons
James I. Vette - 1966

NASA-SP-3024

Models of the Trapped Radiation Environment
Vol. II: Inner and Outer Zone Electrons
J. I. Vette, A. B. Lucero, and J. A. Wright -1966

N64-30510 (NASA-TM-X-53063)

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

AERL-AMP-179 (N66-19708)

Plasma Radiation Shielding
R. H. Levy and S. Janes - December 1965

NASA CR- GA-6497

A Method of Solution for Particle Transport Problems
G. C. Pomraning - July 23, 1965

Shielding Computer Codes

BNWL-236 June 1966 ISOSHLD

ISOSHLD--A Computer Code for General Purpose Isotope Shielding Analysis
by R. L. Engel, J. Greenborg, and M. M. Hendrickson
Fortran IV

CEA N 591 (ORNL-tr-1374) March 1966 DOMINO 2

Calculation of the Thermal Neutron Flux and Currents, Energy and Gamma Dose on the Axis of a Channel of a Graphite-CO_2 Reactor
by Jacques Duco
Fortran II for IBM 7094

CEA N 564 (ORNL-tr-1376) October 1965 CENTAURE 3

Calculation of Reflection and Transmission Coefficients of a Slab of a Given Material for Thermal Neutrons: Evaluation of the Radiative Capture Gammas
by Jacques Brisbois and Jacques Duco
IBM 7090

CEA N 593 (ORNL-tr-1377) April 1966 MALAGA

Propagation of Neutrons Treated by the Age Theory
by Jacques Brisbois, Christian Devillers and Therese Dosa
Fortran for IBM 7090-7094

CEA R 2872 (ORNL-tr-1367) October 1965

Monte Carlo Method: Codes for the Study of Criticality Problems
by J. Moreau, H. Rabot, and C. Robin
IBM 7094

CEN/FAR 17 (ORNL-tr-1379) April 1966 05R-GEOM

Geometric Treatment of Trajectories in the 05R Program
by Mrs. Yvette Caseau
Fortran for IBM 7090 and CDC 1604

DEP/SEPP No. 488/66 (ORNL-tr-1371) May 1966 ZEUS 2

One Velocity Three-Dimensional Monte Carlo
by C. Devillers, P. LaFore, and J. C. Nimal
IBM 7094

IEA-111 (microfiche) December 1965 FPC

Digital Program for Calculation of Activities of Fission Products of Long Half Life
by Maria Jose C. Nastasi and C. Caceres

NAA-SR-11831 May 1966 DTF-II

The DTF-II Shielding Data Library
by W. B. Green
Fortran II for IBM 7090

NAA-SR-11980 (Vol. VI) June 1966 UNICORN

UNICORN - A Program to Calculate Point Cross Sections from Resonance Parameters
by J. M. Otter
Fortran IV for IBM 7094

NASA TN D-3573 August 1966 TDSN

A Fortran IV Two-Dimensional Discrete Angular Segmentation Transport Program
by Clayton E. Barber
Fortran IV

ORNL-3844 March 1966 LEP

Instructions for the Operation of Codes Associated with the Low-Energy Intranuclear Cascade Calculation
by H. W. Bertini, H. E. Francis, and M. P. Guthrie
Fortran II for IBM 7090

ORNL-3856 September 1956 ACTIFK

ACTIFK, A General Analysis Code for 05R
by F. B. K. Kam and K. D. Franz
Fortran 63 for CDC-1604-A

ORNL-TM-1484 August 1966 05R

Importance Sampling Devices for Selecting Track Lengths and Directions after Scatter in 05R
by F. H. Clark and N. A. Betz
Fortran for IBM 7090 and CDC-1604

ORNL-TM-1552 August 1966 CEASE

A Note on Subroutine CEASE (05R: EVAP), A Modification of EVAP in 05R
by E. A. Straker and V. R. Cain
Fortran for IBM 7090 and CDC 1604

ORNL-tr-1380 05R

Study of the Interactions of Neutrons with Matter by the Monte Carlo Method
by R. Paillere
Fortran for IBM 7090 and CDC 1604

UNC-5148 March 1966 ATHENA

ATHENA - A System of Fortran Programs for Radiation Transport and Heating Calculations in Complex Reactor Geometries
by D. Spielberg
Fortran IV for IBM 7094 and Fortran 63 for CDC 1604-A

UNC-5151 June 1966 AIRTRANS

AIRTRANS - A Time-Dependent Monte Carlo System for Radiation Transport in a Variable Density Atmosphere
by M. O. Cohen
Fortran