

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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Slogans are apt to petrify man's thinking.

....Nehru

DATA FOR PROTECTION AGAINST IONIZING RADIATION FROM EXTERNAL SOURCES

(ICRP Publication 21 BOOK DISCUSSION taken from ESIS Newsletter No. 7, European Shielding Information Service, CCR, Ispra, Italy (October 1973)).

The International Commission on Radiological Protection calls its report Nr. 21 a "Supplement to ICRP Publication 15" which is entitled "Protection Against Ionizing Radiation from External Sources." But the "Supplement" (101 pages) is much longer than the original (34 pages). This relation shows that the new publication 21 is certainly much more than a slight correction of the old one. Report 15 lists only the principles of radiological protection (2 tables, no figures), but report 21 gives a lot of detailed information: 59 large figures, 21 tables, plus 5 pages of references and bibliography. So a radiologist using report 21 can in many cases avoid a time consuming research into the literature.

The book consists mainly of 12 appendices (not chapters, since the whole is regarded as a supplement of publication 15). The first three appendices describe collision stopping powers and quality factors (once called relative biological efficiency = RBE). The rather long appendix 4 gives dose distributions in the body; the figures 10-12 are very important, showing - for low photon energies - a considerable difference between the doses received by some critical organs and those doses measured in the same radiation field by a personal dosimeter on the front of the trunk. The next four appendices give conversion factors and quality factors for electrons, neutrons, protons, and photons. One of the last four appendices gives range-energy curves, the three others describe neutron, gamma-X-ray, and beta ray sources and shielding (bremsstrahlung included).

The reviewer accepts that this publication 21 was limited in allowable size but nevertheless he would have appreciated some quantitative error estimates (i.e.: let the error of the total neutron or gamma cross sections be only 5%; then the shielding transmission factor calculated as 10^{-6} will be wrong by a factor of nearly two).

This report is published by Pergamon Press and costs £2.50. (\$ 7.75).

-- H. Penkuhn

CHANGES TO THE DNA WORKING CROSS SECTION LIBRARY

New modifications have been made to the evaluated data for O, Ta, H, T, and Pb. The changes are summarized below.

Oxygen - MAT 4134 LASL
MOD 2 August 1973

The results of an R-Matrix analysis of the O-16(n,n), O-16(n, α)C-13, and C-13(α , α) reactions below 6 MeV were incorporated in MF=3, MT=1,2,107, and 780.

Adjustments were made in MF=3, MT=4,51-55,103,107,780-782 so that MT=2 better agrees with elastic measurements from 7 to 11 MeV. Adjustments were made particularly to MT=51 to improve agreement with (n,n') measurements, and MT=51-89 were modified to improve (somewhat) agreement with sphere transmission integral measurements. The nonelastic cross section was removed from file 3.

Legendre coefficients in MF=4,MT=2 were modified to include R-Matrix analysis results below 6 MeV and new experimental data above 6 MeV. The data were also thinned. Anisotropic inelastic neutron angular distributions were added for MT=51-55.

Anisotropic secondary gamma-ray angular distributions were added for the 5.131 and 6.917 MeV gamma rays. Gamma-ray production cross sections in MF=13 were adjusted to reflect this change and the revisions in file 3 inelastic data mentioned above.

Cross sections for MT=4,51-89,103,104,107,780-783 in MF=3 and 13 were thinned.

TA-181 - MAT 4179 LLL
MOD 2 August 1973

Electron production cross sections, multiplicities, and spectra have been included for special DNA applications. These are in files 72-75 and are analogous to files 12-15 photon production formats.

The total cross section above 10 MeV was increased by a few per cent to agree with best available data. Elastic scattering cross section was adjusted.

For energies above 750 keV, forward angle elastic scattering was adjusted to agree with Wick's limit. Also, the number of energies at which distributions are given was increased.

The excitation of the 6 keV level is now described because of emphasis on electron production (it deexcites primarily by internal conversion).

Discrete photons of 0.165, 0.153, and 0.136 MeV are now included rather than being lumped in a single 0.15 MeV line.

A modification in the formalism to calculate photon spectra resulted in an increased amount of high energy photons.

Hydrogen - MAT 4148 LASL
MOD 2 October 1973

The LP flag was implemented in MF=12, MT=102.

Tritium - MAT 4169 LASL
MOD 1 October 1973

The capture cross section is less than 6.7 microbarns at thermal energy and therefore was removed from file 3.

Lead - MAT 4136 ORNL
MOD 5 October 1973

MT=16,17, and 91 in files 3 and 5 were modified according to recent data (1,2) near 14 MeV and statistical-empirical model calculations. This modification was motivated by integral tests such as the pulsed sphere measurements (3) and analysis (4) and others (5).

1. J. L. Kammerdiener, UCRL-51232 (1972).
2. G. Clayeux et al., CEA-R-4279 (1972).
3. C. Wong et al., UCRL-51144 (1972).
4. E. D. Cashwell, private communication to CSEWG (1973).
5. D. Bogart et al., Preprint of NSE article (1973).

CHANGES TO CODE COLLECTION

Several changes have been made to the codes collection: new code packages, a new software version made available, and additions and corrections made to existing code packages.

- CCC-121/SABINE Spinney (Removal-Diffusion) Shielding Code in Complex Geometry. CDC 6600 versions were contributed by Atomic Energy of Canada Limited, Power Projects, Sheridan Park, Ontario, and EIR, Würenlingen, Switzerland, through the OECD-Nuclear Energy Agency Computer Programme Library. Reference: EUR 3636e.
- CCC-127/MORSE-G An ANSI-Standard FORTRAN (IBM-360) version has been added to the General Purpose (05R-GEOM) Monte Carlo Multigroup Neutron and Gamma-Ray Transport Code Package, MORSE, by NASA Lewis Research Center. Versions currently available: CCC-127A (CDC 1604), CCC-127B (IBM 360, ORNL-05R GEOM, 8-20-73), CCC-127C (CDC 6600) and CCC-127D (ANSI-Std FORTRAN). The versions of MORSE which use MACI's Combinatorial Geometry are packaged as CCC-203/MORSE-CG.

- CCC-152/ALGAM Monte Carlo Estimation of Internal Dose from Gamma-Ray Sources in a Phantom Man has been updated by the contributors (ORNL) to correct organ weights. These values are in DATA BOXV 3rd and 5th values of card D and 3rd value in card F, respectively. The new weights are: 80 Log Skin 1170.6779; 82 Total Skin 2791.1676; and 92 Total Tissue 48478.966. All requests filled after 9-4-73 reflect these changes.
- CCC-224/ARC Aircraft Radiation Transport Code - Crew Dose Calculation contributed by Radiation Research Associates, Fort Worth, Texas. The code is written in FORTRAN IV, designed to operate on CDC 6600 and IBM 360 computers. This transport program calculates crew dose from nuclear weapons, accounting for aircraft attenuation, attitude, flight path, range, yield, fission-fusion ratio, altitude, neutron, air secondary gamma rays, and fission-product gamma rays with hydrodynamic enhancement. A modified version of MEVDP (CCC-157) and air-transport data from ATR (CCC-179) are built into the code system. Reference: DNA 3110F (RRA-T7302) (April 1973).
- PSR-13/SUPERTO- III A new package incorporating recent code development replaces older versions. This Data Generator -(Fine Group Constants and P_n Scattering Matrices from ENDF/B-III) was contributed by Oak Ridge National Laboratory. Principal changes include: new weighting option for the thermal group; changes in resolved and unresolved resonance treatment; revision in several subroutines, including the use of double precision in at least one case. Reference: ORNL-TM-2679.
- PSR-67/MAINTAIN Utility Routine for Maintaining and Revising Card Image Files on Tape, contributed by the Neutron Physics Division, Oak Ridge National Laboratory. FORTRAN IV, IBM 360. Reference: ORNL-TM-4291.

DATA COLLECTION CHANGE

- DLC-23/CASK 40-Group Coupled Neutron and Gamma-Ray Cross Section Data Library has been modified to correct errors in the gamma-ray production data for some materials. The changes were recommended by Ed Straker, SAI, and are based primarily on energy conservation considerations for the thermal group. This version is designated DLC-23C. Thermal group gamma-ray production data for Na, Ti and Mn were reduced in magnitude, and data for Al, K, Ca, Cr, Mo, and W were increased. The entire data set for Ni was removed because of errors present in the neutron data. The secondary gamma-ray data for Fe

and Tawere replaced by sets resulting from new POPOP4 runs.

PERSONAL ITEMS

Robert Vichnevetsky has changed his address from Electronic Associates, Inc., Princeton, N. J., to Department of Computer Science, Livingston College, Rutgers University, New Brunswick, N. J.

Hideo Hirayama has accepted a post of research associate of the National Laboratory for High Energy Physics, Oho-machi, Tsukuba-gun, Ibaraki, Japan.

F. A. Garner has changed from Westinghouse Advanced Reactors Division, Penn, Pa., to Richland, Washington, to work at HEDL, Westinghouse-Hanford.

Babcock & Wilcox has announced two new appointments: William R. Gray, associate project manager with the fuel department of the Nuclear Power Generation Division in Lynchburg, Va.; and Joseph J. Sapyta, a lead engineer with products and services in the same division.

George M. Kowal, Gilbert Associates, Inc., has been recently promoted to manage the Nuclear and Safety Analysis Department.

Charlie Kelber will, in November, take a leave from Argonne National Laboratory to join the AEC's new Division of Reactor Safety Research, as Assistant Director for Reactor Safety.

C. Papastergiou, who has made an extended visit to ORNL, has returned to his work in N.R.C. "DEMOCRITOS", Aghia Paraskeri - Attikis, Athens, Greece.

VISITORS TO RSIC

Visitors to RSIC during the month of October were: J. O. Buchanan, Department of Defense, Washington, D.C.; M. P. Debraine and M. J. Iung, Centre d'Etudes Nucleaires de Saclay, France; P. B. Hemmig, USAEC, Washington, D.C.; R. C. Haight, Lawrence Livermore Laboratory, California; Capt. D. C. Kaul, Defense Nuclear Agency, Washington, D.C.; M. K. Leimer and P. B. Snow, Kaman Sciences Corp., Colorado Springs, Colo.; H. Murchison, Memphis Data Preparation, Memphis, Tenn.; J. C. Scarborough, NUS Corp., Rockville, Md.; F. P. Szabo, Defence Research Establishment, Ottawa, Ont., Canada; I. L. Thomas, Director's Division, ORNL; M. L. Winton, Nuclear Safety Information Center, ORNL.

Dr. Werner Schuler, OECD Nuclear Energy Agency's Computer Programme Library, Ispra (Varese) Italy, spent three weeks in RSIC in fulfillment of the personnel exchange feature of the USAEC-NEA Exchange Agreement.

OCTOBER ACCESSION OF LITERATURE

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Urquhart, D.F.
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Australian AEC Research Establishment, Lucas Heights
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RBE of High-Energy Bremsstrahlung.
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Fast Neutron Damage In Stainless Steels.
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