RSIC Newsletter

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When you hire people who are smarter than you are, you prove you are smarter than they are.—R. H. Grant

CHANGES TO THE COMPUTER CODE COLLECTION

Three changes were made to the Computer Code Collection. Two new code systems were packaged and one existing code package was extended with an additional hardware version. All three were contributions from a foreign country.

CCC-370/DCHAIN2

The Japan Atomic Energy Research Institute (JAERI), Tokai-mura, Japan, through the OECD Nuclear Energy Agency Data Bank, Gif-sur-Yvette Cedex, France, contributed a new hardware version of this code system for calculating transmutation of nuclides. DCHAIN2 analyzes radioactive growth and decay of nuclides by one-point approximation. The new release runs on PC 386 or 486 computers with a math coprocessor. The Microsoft Fortran compiler, version 5.0 was used to create the executables included in the package. The PC version (B) is available on one DS/HD 5.25-in. diskette (1.2 MB). Reference: JAERI-M-8727 (March 1980). Fortran 77 and Assembler, FACOM and IBM (A); Fortran 77, PC (B).

PSR-316/CASTHY

This statistical model code system for calculating neutron cross sections and gamma-ray spectrum was contributed by JAERI. CASTHY calculates neutron cross sections of total, shape elastic scattering and compound nucleus formation with the optical model, and compound elastic scattering, inelastic scattering and capture cross sections by the statistical model applying Hauser-Feshbach and/or Moldauer formula. Capture gamma-ray spectra are also calculated. CASTHY was developed on Facom computers and tested on an IBM RISC 6000 running AIX. The package is distributed on 1 DS/HD (1.2 MB) diskette. References: JAERI 1321. Fortran 77; Facom and IBM RISC.

PSR-322/FDMXPC-MICRO

This code system for processing evaluated neutron data in ENDF format on personal computers was contributed by the Central Research Institute for Physics of the Hungarian Academy of Sciences, Institute of Atomic Energy Research, Budapest, Hungary. FDMXPC processes evaluated neutron cross-section data in ENDF format to group-averaged functionals mainly for the modelling of neutron transmission experiments. It is also possible to treat mixtures of isotopes. This version of the code has been extended to use ENDF-6 format. The Briet-Wigner, Reich-Moore or Adler-Adler neutron cross-section formulae are integrated numerically over specified energy intervals by means of Romberg's integration method. FDMXPC runs on PC AT computers with 286/386 processors under

DOS. A math coprocessor is recommended. The package is distributed on 1 DS/HD (1.2 MB) diskette. References: KFKI-1991-10/G and informal documentation. Fortran 77; PC AT.

CHANGES TO THE DATA LIBRARY COLLECTION

Three new data libraries were added to the collection during the month. One change resulted from a foreign contribution.

DLC-162/TDF

Lawrence Livermore National Laboratory contributed this thermonuclear plasma data file and access routine library. The library was created to provide a consistent, well-documented set of evaluated cross sections from which processed information can be generated for use in fusion applications and also to provide the user with a realistic assessment of the uncertainties remaining in the reaction cross sections. TDF contains information on five exothermic nuclear reactions among the three hydrogen isotopes. Four of the reactions result in two-body final states while the fifth results in a three-body final state. The data file contains, as functions of plasma temperature, tabulated Maxwellian averages of the specific reactivity and kinetic energies of every involved particle, Maxwellian spectra of each emitted particle, and cumulative emission probability functions. The range of plasma temperatures is from 0.1 keV to 1 MeV. The access routine library, TDFLIB, consists of subroutines to be called by programs written by the user. These routines are written in ANSI Fortran 77 language using double precision arithmetic and should run on any machine that supports a Fortran compiler. The data library is transmitted on one DS/HD 5.25-inch diskette (1.2 MB). Reference: UCRL-JC-109082 (Nov. 1991) and UCRL-JC-107158 (May 1991). Fortran 77, All computers.

DLC-163/XG-IAEA

The International Atomic Energy Agency (IAEA), Vienna, Austria, contributed this library of x-ray and gamma-ray standards for detector efficiency calibration. The data are the result of the work of an IAEA Coordinated Research Program from 1986 to 1990. Included for selected radionuclides are three tables for the recommended standard values and uncertainties of their half-lives, energies and emission probabilities of x-rays, and energies and emission probabilities of gamma-rays. X-rays range from 5 to 90 keV and gamma-rays from 30 to 3000 keV. The data are shown in either nuclide sort or energy sort. An executable DBASE program and binary DBASE data files are transmitted on one DS/HD 5.25-inch diskette (1.2 MB). Reference: IAEA-NDS-112 (Dec. 1991) and IAEA-TECDOC-619 (Sept. 1991). PC.

DLC-164/UNGER

This package of effective dose equivalent factors for specific radionuclides was contributed by Los Alamos National Laboratory, New Mexico, under sponsorship of the DOE/DP-MA. UNGER is a data set of gamma-ray fluence-to-effective dose factors and specific dose constants for nuclides important to dosimetry and radiological assessments. It is an update to ORNL/RSIC-45/R1 (1982) based on DLC-80/DRALIST radioactive decay spectra and ANSI/ANS-6.1.1–1991 (see the D. K. Trubey review which follows) fluence-to-dose factors. ORNL/RSIC-45/R1 was based on the fluence-to-dose factors of ANSI-ANS-6.1.1–1977. The data are used to assess the radiological hazard of the various radionuclides from the unshielded dose rate at 1 meter (the specific dose constant). The program for calculating the dose factors and specific dose constants, implemented on a PC using the Microsoft 5.0 compiler, is included. The package is transmitted on one DS/HD 5.25-inch diskette (1.2 MB). Reference: Informal notes (July 1992). PC; Fortran.

PERSONAL ITEMS

In serving a specialized area of scientific endeavor, it seems important that we note significant changes in the activities of people concerned with radiation protection, transport, and shielding in the nuclear industry. We, therefore, continue to carry personal items as they are brought to our attention.

Dr. Joseph Vigassy has been appointed vice-resident of the Hungarian Atomic Energy Commission, effective in June 1992.

Dr. Kiyoshi Takeuchi Director of the Tokai Branch, Ship Research Institute, died on August 12, 1992.

NEW STANDARDS AVAILABLE

The following standards have recently been published and are available from the American Nuclear Society for the prices shown.

ANSI/ANS-6.1.1-1991, *Neutron and Gamma-Ray Fluence-to-Dose Factors* (revision of ANSI/ANS-6.1.1-1977), $48.

This standard presents data recommended for computing the biologically relevant dosimetric quantity in neutron and gamma-ray fields. Specifically, this standard is intended for use by shield designers to calculate effective dose equivalent. Values are given for effective dose equivalent per unit fluence for neutron energies from 1 eV to 14 MeV and for gamma-ray energies for 0.01 to 12 MeV. Establishing maximum permissible exposure limits is outside the scope of this standard.

Data, taken from ICRP 51,[1] are presented for four modes of exposure: anterior-posterior (frontal), posterior-anterior (rear), lateral (side), and rotational (rotationally symmetric). The gamma-ray factors are also provided for isotropic incidence. According to the standard, if the orientation of the receptor with respect to the radiation field is unknown, anterior-posterior geometry values should be used. For use in calculations, the data have been fit to fourth order polynomials whose coefficients are given for each mode of exposure.

In an appendix, not a part of the standard, a comparison is made with the 1977 standard (deep dose equivalent) and ambient dose equivalent. It is seen that there is little difference among the three gamma-ray conversion factors above approximately 100 keV gamma-ray energy. However, below 100 keV the values vary widely. In particular, the values from the 1977 standard are much higher in the lowest energy region. For neutron radiation it was found for one example (PWR containment) that the effective dose equivalent was less than half of the dose equivalent given by the 1977 standard or the ambient dose equivalent.

Also, in the appendix, the rationale is given for selection for the standard of the effective dose equivalent as compared to the ambient dose equivalent. It states that effective dose equivalent "is directly analogous to human exposure and dose accumulation in critical organs, which it seeks to accurately depict as a risk-weighted average" whereas "the ambient dose equivalent is a derived quantity, the definition of which has no physical relationship to the actual exposure conditions or the subject of the dose deposition."

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[1] *Data for Use in Protection Against External Radiation*, ICRP Publication 51, Pergamon Press, Oxford, U.K. (1987).

ANSI/ANS-6.4.3-1991, *Gamma-Ray Attenuation Coefficients and Buildup Factors for Engineering Materials*. $75.

This standard presents evaluated gamma-ray elemental attenuation coefficients and single-material buildup factors for selected engineering materials for use in shielding calculations of structures in power plants and other nuclear facilities. The data cover the energy range 0.015–15 MeV and up to 40 mean free paths (mfp). These data are intended to be standard reference data for use in radiation analyses employing point-kernel methods.

Tables of the mass attenuation coefficient, with and without coherent scattering, are given for 35 elements and 3 mixtures (air, water, and concrete). Mass energy absorption coefficients are also given for 23 elements and 6 mixtures (air, water, concrete, ICRP tissue, ICRU tissue, and standard man tissue).

The buildup factors for elements below molybdenum and for the mixtures, are mostly from moments method calculations of Eisenhauer, et al. The higher atomic number elements are from PALLAS calculations of Tanaka and Sakamoto. These calculations included bremsstrahlung and fluorescence, both of which affect the results significantly. Much detail is given near the absorption edges where the buildup factor becomes very large.

In addition to the tables of exposure and energy absorption buildup factors, coefficients are given for fitting functions. The geometric progression (G-P) fitting function is recommended because of its accuracy in reproducing the buildup factors. For elements and energies not given, interpolation can be done in the G-P coefficients. Coefficients for the Taylor function are also given for use in methods which require it.

Other tables are provided. Correction factors are given to account for the change in spectra and absorption in a tissue medium following the shield. Correction factors are also given to account for the neglect of coherent scattering in the calculations.

D. K. Trubey

CONFERENCES, COURSES, SYMPOSIA

RSIC attempts to keep its users/contributors advised of conferences, courses, and symposia in the field of radiation protection, transport, and shielding through this section of the newsletter. Should you be involved in the planning/organization of such events, feel free to send your announcements and calls for papers to RSIC.

Call for Papers—8th Reactor Dosimetry Symposium

A call for papers has been issued for the *8th ASTM-EURATOM Symposium on Reactor Dosimetry*, to be held August 29–September 3, 1993, in Vail, Colorado. This is the eighth in the series of symposiums held approximately every three years to provide a forum for the interchange of state-of-the-art techniques, data bases, and standardization of radiation metrology. Those involved in reactor dosimetry will find value in attending this symposium. It is sponsored by the American Society for Testing and Materials (ASTM) and by the Commission of the European Communities. Co-sponsors include the U.S. National Institute of Standards and Technology, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, and

the Electric Power Research Institute; additional co-sponsorships are expected. The symposium is held in cooperation with the International Atomic Energy Agency (IAEA).

Papers are solicited for presentation in the traditional areas covered by this series of symposia under the broad theme of dosimetry for the correlation of radiation effects. Under this theme, papers are expected in the following categories (which are not intended to be all-inclusive):

- Characterization of neutron environments;
- Dosimetry techniques and innovations;
- Computational methods of dosimetry evaluation;
- Advanced neutron sources (reactors and accelerators);
- Damage correlation and exposure units;
- Nuclear data, benchmarking, calibrations, and standards;
- Irradiation of electronic devices for hardness testing;
- Irradiations for materials surveillance;
- Gamma-ray field characterization;
- Neutron and gamma-ray transport calculations; and
- Temperature measurements and calorimetry.

Papers in these and other areas are expected to cover applications such as fission and fusion energy research, test and research reactor experiments, power reactor materials surveillance, plant life extension, and active (on-line) monitoring. The symposium will be organized into oral presentations, poster sessions, and informal round-table workshops. All papers will be presented in English.

Those authors who wish to submit a paper are requested to send a 300–500 word abstract with the ASTM Paper Submittal Form to the appropriate program secretary by **November 15, 1992**. The abstract should be "camera ready" (single spaced) for inclusion in a booklet of accepted abstracts. The ASTM Program Secretary for the Americas and the Pacific Rim is Dr. David Vehar, Division 3152, Sandia National Laboratories, P.O. Box 5800, Albuquerque, NM 87185 (phone 505-845-8859; fax 505-845-3115). The EURATOM Program Secretary for Europe, Africa, and Asia is Dr. G. Tsotridis, P.O. Box 2, 1755 ZG Petten, The Netherlands (phone 31-2246-5211; fax 31-2246-1449). Authors will be notified of acceptance by February 20, 1993.

Further details may be obtained from either of the above listed secretaries or from the General Chairman, Dr. Harry Farrar IV (phone 818-340-1227; fax 818-340-2132).

Immediately preceding the symposium on August 29, ASTM will hold a Standards Technology Training Course on Condition Assessment and Surveillance of Reactor Pressure Vessels. Course information may be obtained from Kathy Dickinson, ASTM (phone 215-299-5480; fax 215-299-5470).

Calendar

Your attention is directed to the following events of interest.

October 1992

International Symposium on Nuclear Data Evaluation Methodology, Oct. 12–16, 1992, Upton, New York, sponsored by Brookhaven National Laboratory. Contact: C. L. Dunford, Brookhaven National Laboratory, NNDC/197D, Upton, New York 11973.

Radioactive Waste Management, Oct. 19–23, 1992, Kansas City, Missouri, a technical short course. Contact: Woodson Assoc., Inc., P.O. Box 2665,

Gaithersburg, MD 20886 (phone 301-990-0751; Fax 301-990-6153).

MicroShield, MicroSkyshine, RadDecay Workshop, Oct. 21–23, 1992, Rockville, Maryland, sponsored by Grove Engineering. Contact: Diane Snee, Grove Engineering, Inc., 15215 Shady Grove Road, Rockville, MD 20850 (phone 301-258-2727; Fax 301-330-5462).

Selection and Preparation of Witnesses for Environmental Litigation, Oct. 22–23, 1992, a course sponsored by the University of Texas at Austin. Contact: Continuing Engineering Studies, The University of Texas at Austin, College of Engineering, ECJ 10.324, Austin, TX 78712 (phone 512-471-3506, Fax 512-471-0831).

Analysis of Radioactive Environment Samples, Oct. 27–30, 1992, Atlanta, a short course sponsored by Georgia Tech Continuing Education. Contact: Dept. of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332-0385 (phone 404-894-2547).

November 1992

Radiation Physics Conference, Nov. 14–18, 1992, Kena, Egypt. Contact: Prof. A. H. El-Kamel, Vice President-Assit University, Kena Branch, Kena, Egypt (Fax 096-327-706).

1992 ANS/ENS International Meeting, Nov. 15–20, 1992, Chicago. Contact: General Chair James D. Shiffer, Pacific Gas & Electric Co., 77 Beale St., San Francisco, CA 94106 (phone 415-973-4684).

14th Low-Level Radioactive Waste Management Conference, Nov. 18–20, 1992, Phoenix, Arizona. Contact: Kathleen Asbell, EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415-3960 (phone 208-526-8330; Fax 208-526-9165).

Basic Radiation Safety & Management, Nov. 19–20, 1992, Chicago, Illinois, a seminar presented by Stan A. Huber Consultants, Inc. Contact: Stan A. Huber Consultants, Inc., 200 N. Cedar Road, New Lenox, IL 60451 (phone 815-485-6161; Fax 815-485-4433).

December 1992

Radioactive Waste Management, Dec. 7–11, 1992, Charlotte, North Carolina. Contact: Linda S. Woodson, Woodson Associates, Inc., P.O. Box 2665, Gaithersburg, MD 20886 (phone 301-990-0751; fax 301-990-6153).

January 1993

Managing Nuclear Emergencies, Jan. 11–15, 1993, Phoenix, Arizona. Contact: Linda S. Woodson, Woodson Associates, Inc., P.O. Box 2665, Gaithersburg, MD 20886 (phone 301-990-0751; fax 301-990-6153).

February 1993

HEART, Feb. 1–5, 1993, Naval Training Center, Orlando, Florida, sponsored by the Department of Defense and the Department of Energy. Contact: Arne Kalma, S-Cubed, 3020 Callen Road, San Diego, CA 92121 (phone 619-450-2439).

Practical Radiation Shielding, Feb. 1–5, 1993, Atlanta, Georgia, a course sponsored by Shonka Research Associates, Inc. Contact: Shonka Research Assoc., 4939 Lower Roswell Road, Suite 106, Marietta, GA 30068 (phone 404-509-7606).

Maintenance/Repair of Oil Filled Lead Glass Shielding Windows, Feb. 9–11, 1993, Kent, Washington, sponsored by Hot Cell Services. Contact: Ronald A. Campbell, Hot Cell Services Corp., 22626 85th Place South, Kent, WA 98031 (phone 206-854-4945; fax 206-854-4947).

Internal Dosimetry, Feb. 9–12, 1993, Las Vegas, Nevada. Contact: Linda S. Woodson, Woodson Associates, Inc., P.O. Box 2665, Gaithersburg, MD 20886 (phone 301-990-0751; fax 301-990-6153).

March 1993

Occupational and Environmental Radiation Protection, Mar. 22–26, 1993, Boston, Massachusetts, a short course offered by Harvard School of Public Health. Contact: Mary F. McPeak, Assoc. Dean for Continuing Education, 677 Huntington Ave., Boston, MA 02115 (phone 617-432-1171; Fax 617-432-1969).

April 1993

29th Annual Meeting of the National Council on Radiation Protection and Measurements, Apr. 7–8, 1993, Arlington, Virginia. Contact: NCRP, 7910 Woodmont Avenue, Suite 800, Bethesda, MD 20814.

Joint International Conference on Mathematical Methods and Supercomputing in Nuclear Appli-

cations, Apr. 19–23, 1993, Karlsruhe, Germany. Contact: H. Kuesters, KFK/INR, Postfach 3640 D-W-7500 Karlsruhe 1, Germany, or W. Werner, GRS, D-W-8046 Garching, Germany.

International High-Level Radioactive Waste Management Conference, Apr. 25–29, 1993, Las Vegas, Nevada, sponsored by the ANS, the U.S. Dept. of Energy, and the American Society of Civil Engineers. Contact: Billy Cole, E. R. Johnson Assoc., 10461 White Granite Drive, Suite 204, Oakton, VA 22124 (phone 703-359-8355; Fax 703-359-0842).

4th Topical Symposium on Emergency Preparedness and Response, to be held April 26–29, 1993, in Long Island, New York. Contact: Brant Aidikoff, Technical Program Chairman, LIANS, Box 436, Upton, New York 11973 (phone 516-436-4256).

May 1993

Advanced Workshop on Occupational and Environmental Radiation Protection, May 10–14, 1993, Boston, Massachusetts, a short course offered by Harvard School of Public Health. Contact: Mary F. McPeak, Assoc. Dean for Continuing Education, 677 Huntington Ave., Boston, MA 02115 (phone 617-432-1171; Fax 617-432-1969).

Management and Disposal of Radioactive Waste, May 24–28, 1993, Boston, Massachusetts, a short course offered by Harvard School of Public Health. Contact: Mary F. McPeak, Assoc. Dean for Continuing Education, 677 Huntington Ave., Boston, MA 02115 (phone 617-432-1171; Fax 617-432-1969).

June 1993

Safewaste '93: The Final Disposal of Nuclear Waste, June 14–18, 1993, Avignon, France, sponsored by the ANS and the European Nuclear Society. Contact: Pierre Tanguy, EDF, Direction Generale 32, Rue de Monceau, 75384 Paris Cedex 08, France.

July 1993

Nuclear and Space Radiation Effects Conference, July 19–23, 1993, Snowbird, Utah. Contact: P. V. Dressendorfer, Sandia National Laboratories, Division 2535, P.O. Box 5800, Albuquerque, NM 87185.

August 1993

SMiRT 12, Structural Mechanics in Reactor Technology, Aug. 15–20, 1993, Stuttgart, Germany. Contact: Prof. Karl Kussmaul, SMiRT 12, Stätliche Materialprüfungsanstalt (MPA), University of Stuttgart, Pfaffenwaldring 32, 7000 Stuttgart 80 Germany (phone 49-711-685-3582; Fax 49-711-685-3144 or 2635).

Topical Meeting on Environmental Transport and Dosimetry, Aug. 31–Sept. 3, 1993, Charleston, South Carolina, sponsored by the ANS. Contact: Robert Addis, Savannah River Laboratory, Environmental Transport Group, Bldg. 773-A, Box 616, Aiken, SC 29808 (phone 803-725-3325).

May 1994

9th Pacific Basin Nuclear Conference, May 1–5, 1994, Sydney, Australia. Contact: Australian Nuclear Association, P.O. Box 445, Sutherland, NSW 2232, Australia.

AUGUST ACCESSION OF LITERATURE

The following literature cited has been ordered for review, and that selected as suitable will be placed in the RSIC Information Storage and Retrieval Information System (SARIS). This early announcement is made as a service to the shielding community. Copies of the literature are not distributed by RSIC. They may generally be obtained from the author or from a documentation center such as the National Technical Information Service (NTIS), Department of Commerce, Springfield, Virginia 22161.

RSIC maintains a microfiche file of the literature entered into SARIS, and duplicate copies of out-of-print reports may be available on request. Naturally, we cannot fill requests for literature which is copyrighted (such as books or journal articles) or whose distribution is restricted.

This literature is on order. It is not in our system. Please order from NTIS or other available source as indicated.

RADIATION SHIELDING LITERATURE

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