RSIC Newsletter

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We should not only master questions, but also act upon them, and act definitely.—Woodrow Wilson

NEW BUILDUP FACTOR DATA AVAILABLE

The American Nuclear Society Working Group ANS-6.4.3 has released its 1988 compilation of gamma-ray buildup factors and attenuation coefficients in a report and in 3 code and data package updates. The report by D. K. Trubey, *New Gamma-Ray Buildup Factor Data for Point Kernel Calculations: ANS-6.4.3 Standard Reference Data,* ORNL/RSIC-49 (Sept. 1988), is now available from RSIC. The 1988 data are also available in the following updated code/data packages: CCC-493/QAD-CGGP, CCC-494/G33-GP, and DLC-129/ANS643.

Both QAD and G33, point kernel gamma-ray shielding codes, have been in use for many years throughout the nuclear industry. They were revised in Japan to make use of the G-P buildup factor fitting function to take advantage of the extensive compilation of buildup factors being developed by ANS-6.4.3. The revision of QAD-CG was originally performed by Yoshihiro Matsumoto of Mitsui Engineering Shipbuilding Co. Ltd., and the revision of G33 was performed by Tohru Fujita and Masayoshi Kawai of Nippon Atomic Industry Group Co., Ltd. (NAIG). The benchmarking results were presented at the 1985 Fall Meeting of the Atomic Energy Society of Japan, and application of G33 to gamma-ray skyshine analysis is documented by Fujita and Kawai in NAIG Annual Review, 11-12 (1985). The work was performed as an activity of the Nuclear Code Committee of Japan Atomic Energy Research Institute (JAERI).

The codes were later modified by Yukio Matsumoto of JAERI and forwarded to RSIC and implemented on the IBM PC by Vic Cain of Science Applications International and on Data General MV/family, IBM 3033, and Cray computers by RSIC staff members. The work performed by RSIC was supported by the U.S. Nuclear Regulatory Commission as a task of the Technical Data Management Center.

The data library package, DLC-129/ANS-643, includes the data libraries and a retrieval program containing the GP routines of QAD-CGGP. These routines are designed to interpolate in energy and extrapolate beyond the 40 mean free paths which is the shield thickness limit in the original transport calculations.

The 1988 buildup factor database of 26 materials is an extensive revision of the 1985 compilation previously available. Several elements have been added, and the data have been revised for most elements. The most extensive revisions have been in the elements from molybdenum upwards. The codes have been revised to accommodate the additional materials.

The attenuation coefficient library of 100 elements has also been updated. The data are now from the National Bureau Standards library, PHOTX, and are based on a total cross section with free-electron Compton scattering and without coherent scattering.

CHANGES TO THE COMPUTER CODE COLLECTION

During the month five changes or additions were made to the computer code collection (CCC). Two code systems were packaged and added to the collection, two existing code packages were replaced with new versions, and an existing code package was extended with an additional hardware version. Two changes resulted from foreign contributions.

CCC-493/QAD-CGGP

This package, contributed by Japan Atomic Energy Research Institute (JAERI), Tokyo, and Oak Ridge National Laboratory (ORNL), is a combinatorial geometry version of QAD-P5A, a point kernel code for neutron and gamma-ray shielding calculations. QAD-CGGP includes the use of the GP fitting function for the buildup factors. The original QAD-CGGP code was developed by Mitsui Engineering and Shipbuilding Co., Ltd. This replacement includes buildup factor coefficients determined from the 1988 buildup factor data compilation of ANS-6.4.3 as described in ORNL/RSIC-49. Data tables are provided which supply attenuation and GP coefficients. The PC version was tested at RSIC using the Ryan-McFarland Fortran compiler, Version 2.42, and requires a math coprocessor (e.g., 8087). Executable files are included on the diskettes. The package is available on tape or 2 DS/DD (360K) diskettes. References: Informal notes (Oct. 1988) and Bechtel Power Corp. NE007 (1977). FORTRAN 77; Data General MV/family, IBM 3033 (A) and IBM PC (B).

CCC-494/G33-GP

G33-GP, a replacement of G-cubed also called G33, was contributed by JAERI and ORNL. It performs scattering calculations with a buildup factor applied to the first scatter and was extended to include the use of the GP fitting function for the buildup factors by Nippon Atomic Industry Group Co., Ltd. The package includes buildup factor coefficients determined from the 1988 buildup factor data compilation of ANS-6.4.3 as described in ORNL/RSIC-49. Data tables are provided which supply attenuation and GP coefficients. The PC version was tested at RSIC using Ryan-McFarland Fortran, Version 2.42 and requires a math coprocessor (e.g., 8087). Executable files are included on the diskette. The package is available on tape or 1 DS/DD (360K) diskette. References: Informal notes (Oct. 1988) and LA-5176 (1973). FORTRAN 77; Data General MV/family, IBM 3033 (A) and IBM PC (B).

CCC-518/CRRIS

This code system, contributed by ORNL, consists of eight fully integrated computer codes which calculate environmental transport of atmospheric releases of radionuclides and resulting doses and health risks to individuals or populations. Because of its modular structure, CRRIS allows assessments to be tailored to the user's needs. Radionuclides are handled either in terms of the released radionuclides or the exposure radionuclides which consist of both the released nuclides and decay products that build up during environmental transport. Atmospheric dispersion calculations are performed by the ANEMOS computer code for distances less than 100 km and by the RETADD-II computer code for regional-scale distances. Both codes estimate annual-average air concentrations and ground deposition rates by location. SUMIT will translate and scale multiple ANEMOS runs onto a master grid. TERRA reads radionuclide air concentrations and deposition rates to estimate concentrations of radionuclides in food and surface soil. Radiologic decay and ingrowth, soil leaching, and transport through the food chain are included in the calculations. MLSOIL computes an effective radionuclide ground-surface concentration to be used in computing external health effects. The five-layer model of radionuclide transport through soil in MLSOIL provides an alternative to the single-layer model used in TERRA. DFSOIL computes dose factors used in MLSOIL to compute doses from the five soil layers and from the ground surface. ANDROS reads environmental concentra-

tions of radionuclides computed by the other CRRIS codes and produces tables of doses and risks to individuals or populations from atmospheric releases of radionuclides. References: ORNL-5912, ORNL-5913, ORNL-5194, ORNL-5785, ORNL/CSD-994, ORNL-5974 and ORNL-5889. FORTRAN 66 and Assembler; IBM 3033.

CCC-524 MICRO/IRDAM

Version 3 of this microcomputer-based program for rapidly assessing the radiological impact of an accident at a nuclear power plant was contributed by Battelle Pacific Northwest Laboratory, Richland, Washington. IRDAM was developed to provide respondents to radiological emergencies with a user friendly, easily portable program to be used at any location (HQ, Base Team, or Site Team) while the staff is not fully augmented to assess the extent of the problem. It can handle a variety of accidental release scenarios. Information on meteorological conditions, source term mixtures, and time periods for decay and plume passage are all incorporated in the calculations. Both elevated and ground-level releases can be accommodated. Dose equivalents are calculated for the whole body and thyroid at 6 fixed downwind distances between 500 and 20,000 meters. Although it was written for the Osborne computer using GW-BASIC, the code will run on any PC which supports a reasonably standard version of the BASIC language. REFERENCES: NUREG/CR-0312, PNL 4510, Vol 1-3 (1983). BASIC; IBM PC/XT/AT.

PSR-267/SCINFUL

This Monte Carlo based computer code package to determine a scintillator full-energy response to neutron detection was extended with a CRAY version contributed by Los Alamos National Laboratory, Los Alamos, New Mexico. SCINFUL uses a few programming techniques of its parent program, PSR-014/O5S, and includes several new features. It provides a calculated full response anticipated for either a cylindrical NE-213 (liquid) scintillator or an NE-110 (solid) scintillator. The incident design neutron energy range is 0.1 to 80 MeV. The program may also be used to compute angle-integrated spectra of charged particles following neutron interaction with ^{12}C. Reference: ORNL-6462 (March 1988) and ORNL-6463 (April 1988). FORTRAN 77; VAX (A) and CRAY (B).

CHANGE TO THE DATA LIBRARY COLLECTION

An existing data library was updated with new data.

DLC-129/ANS643

This replacement of ANS643 was contributed by ORNL, Tokyo Institute of Technology, and JAERI. This package of geometric progression (GP) gamma-ray buildup factor and attenuation coefficients based on compilation of American Nuclear Society Standards Working Group ANS-6.4.3 was updated with the 1988 database documented in ORNL/RSIC-49. Buildup factor data are provided for 26 elements and 3 mixtures (water, air, and concrete) for the energy range 15 keV to 15 MeV. A retrieval code, **Daniel**, will provide tables of buildup factors from the data file. The code uses subroutines developed in Japan for QAD-CGGP. They provide a capability to interpolate in energy and extrapolate in thickness. Attenuation coefficients are provided for 100 elements. This package is available on tape or 1 DS/DD (360K) diskette. The **Daniel** retrieval program was compiled with the Microsoft Fortran compiler, Version 4.01. Reference: Informal notes (Oct. 1988) and ORNL/RSIC-49 (Sept. 1988). FORTRAN 77; Data General MV/family, IBM 3033 (A) and IBM PC (B).

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.

Richard H. Odegaarden has informed us of his impending retirement from the Nuclear Regulatory Commission at the end of the month.

Gary L. Bennett has transferred from the Department of Energy to the National Aeronautics and Space Administration (NASA) to manage the advanced space power systems.

Visitors to RSIC

During the month the following persons came for an orientation visit and/or to use RSIC facilities: *Hsiao-Fang Pang,* INER, Taiwan; and *Luiz Bertelli,* Brazilian Nuclear Energy Commission, Rio de Janeiro.

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.

WATTec 89

Global Competiveness: Maximizing Our Resources is the theme of *WATTec '89,* a national conference and exhibition to be held February 14–17, 1989, in Knoxville, Tennessee. This year over forty East Tennessee chapters of national societies lend their support to this effort to provide a forum on the broadening role of science and technology in a globally competitive economy. Complete information may be obtained from WATTec, P.O. Box 629, Oak Ridge, TN 37831-0629.

Calls for Papers

Nuclear & Space Radiation Effects Conference

The *26th Annual Conference on Nuclear and Space Radiation Effects* will be held July 24–28, 1989, in Marco Island, Florida. The conference is sponsored by the Institute of Electrical and Electronic Engineers, Inc. (IEEE), with co-sponsorship provided by the Defense Nuclear Agency, Sandia National Laboratories, and the Jet Propulsion Laboratory of NASA. The focus of the conference is on nuclear and space radiation effects and electromagnetic pulse effects on electronic devices, materials, circuits, and systems, as well as semiconductor processing technology and techniques for producing radiation-tolerant (hardened) devices, integrated circuits, and memories. Prospective authors are invited to submit ten copies of an abstract and a summary to Peter S. Winokur, Div. 2147, Sandia National Laboratories, 1515 Eubank SE, Albuquerque, NM 87123 (phone 505-846-2998) by **February 3, 1989**, on the following topics: Basic Radiation Effects Mechanisms for Materials and Devices; Radiation Effects and Spacecraft Charging in Satellites; Radiation Transport, Energy Deposition, Dosimetry, and Radiation Facilities; Methods of Design and Manufacturing for Radiation-Hardened Electronic Devices, Integrated Circuits, and the Effects of Radiation on These Devices; Electromagnetic Pulse Phenomena, Assessment of Coupling, and Measurement Technology (IEMP, SGEMP, SREMP); Radiation Effects Phenomena in SOS and SOI Technology; Single-Event Upset and Latch-up Phenomena; Hardness Assurance Technology and Testing Techniques; Radiation Effects on the Materials and Electronics of Nuclear Reactors (Power and Space); New Developments and Technologies of Interest to the Nuclear and Space Radiation Effects Community; and Modeling of Radiation-Induced Latch-up.

A short course on radiation effects and hardening will be offered on July 24 followed by the program on July 25–28. Information may be obtained from the General Chairman, Dante M. Tasca, General Electric Co., Room M1211, Bldg. 100, P.O. Box 8555, Philadelphia, PA 19101 (phone 215-354-4132).

FOCUS '89

FOCUS '89 is the first of a series of meetings to concentrate on issues unique to the disposal of nuclear waste. It will be held September 18–21, 1989, in Las Vegas, Nevada. Sessions will include work related to high-level and low-level nuclear waste. International participation is encouraged to ensure the exchange of ideas helpful in characterizing or storing nuclear waste in unsaturated zones. Authors are encouraged to submit summaries describing work in the following areas: Geochemistry (pore water composition, minerals, alteration); Neotectonic effects on the unsaturated zone;

Facility and package design; Transport—fracture flow, matrix flux, retardation; Performance assessment modeling; Climatology (past, present, future); Technology development for characterizing the unsaturated zone; and Current and potential regulatory interactions.

Summaries must be submitted by **February 15,** 1989, to Dr. D. Burton Slemmons, Technical Program Chair, University of Nevada-Reno, School of Mines, Center for Neotectonic Studies, LME 400, Reno, NV 89557-0047 (phone 702-784-6067). The authors of summaries for presentation will be notified by March 31, 1989.

Dose Control Workshop, 2nd Notice

Brookhaven National Laboratory is the site for the *International Workshop on New Developments in Occupational Dose Control and ALARA Implementation at Nuclear Power Plants and Similar Facilities* planned for September 18–21, 1989. The workshop is sponsored jointly by the U.S. Nuclear Regulatory Commission (NRC) and the Department of Energy (DOE) in cooperation with the Organization for Economic Cooperation and Development (OECD) Nuclear Energy Agency.

Invited and contributed papers and workshop discussions will be held on the following topics.

ALARA organization in design and operation, including design reviews and operational planning, overall plant optimization studies, results from the Nordic study, mock-up training, and training workers for self-monitoring;

ALARA engineering in design and modifications, including cobalt reduction in nuclear plants, special shielding, cost-benefit analyses and other decision-aiding techniques, remote tooling and robotics, and control-rod drive rebuild facilities;

System chemistry and water purification, including zinc injection, pH control, hydrogen water chemistry, ultra-fine filtration, and passivation of pipes and components;

ALARA in operation, including maintenance work, system (and component) decontamination, remote inspections and surveillance, and start-up and shutdown procedures; and

Recommendations and regulations of groups such as ICRP/NCRP, IAEA, INPO, CEC, DOE, and NRC. Proposed abstracts should be received by **March 1, 1989**, by John W. Baum, BNL ALARA Center, Bldg. 703M, Brookhaven National Laboratory, Upton, NY 11973 (phone 516-282-4425 or fax 516-282-5810).

Calendar

Your attention is directed to the following events of interest.

November 1988

Gamma-Ray Assay of Nuclear Materials, Nov. 28–Dec. 2, 1988, Los Alamos, New Mexico, sponsored by the U.S. Dept. of Energy. Contact: Linda Robinson, LANL, Los Alamos, NM 87545 (phone 505-667-5258 or FTS 843-5258).

December 1988

Radon in Buildings: Sources, Biological Effects, Monitoring, & Control, Dec. 19–20, 1988, a short course offered by the Harvard School of Public Health, Boston, Massachusetts. Contact: Office of Continuing Education, Harvard School of Public Health, 677 Huntington Ave., Boston, MA 02115 (phone 617-732-1171).

January 1989

6th Symposium on Space Nuclear Power Systems, Jan. 9–12, 1989, Albuquerque, New Mexico, sponsored by the Univ. of New Mexico. Contact: Mohamed El-Genk, The Inst. for Space Nuclear Power Studies, Univ. of New Mexico, 237 Farris Engineering Center, Albuquerque, NM 78131 (phone 505-277-2813).

February 1989

WATTec '89, Feb. 14–17, 1989, Knoxville, Tennessee. Contact: WATTec, P.O. Box 629, Oak Ridge, TN 37831-0629.

April 1989

25th Annual Meeting of the National Council on Radiation Protection and Measurements, Apr. 5–6, 1989, in Washington, D. C. Contact: W. Roger Ney, Executive Director, NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814.

Advances in Nuclear Engineering Computation and Radiation Shielding, Apr. 9–13, 1989, Santa Fe, New Mexico, a topical meeting sponsored by the ANS M&C and RP&S Divisions. Contact: E. W. Larsen, Technical Program Chairman, Group X-6, MS B226, Los Alamos National Laboratory, Los Alamos, NM 87545 USA (phone 313-936-0124)

7th International Meeting on Radiation Processing, April 23–28, 1989, Leeuwenhorst Congres Center, Noordwijkerhout, The Netherlands, a biennial conference dedicated to the dissemination and advancement of the technology of industrial

radiation processing. Contact: E. Franken, 7th Internatl. Meeting on Radiation Processing, P.O. Box 4240, 6710 EE Ede, The Netherlands (phone AA 31 8380 37476; Telex 37030; FAX AA 31 8380 39643).

Fifty Years With Nuclear Fission, Apr. 26—28, 1989, Gaithersburg, Maryland, sponsored by the U.S. National Bureau of Standards. Contact: Jan Hauber, Room B109, Bldg. 245, National Bureau of Standards, Gaithersburg, MD 20899.

10th Annual Meeting of the Canadian Radiation Protection Association, Apr. 30–May 3, 1989, in Victoria, British Columbia. Contact: Lutz E. Moritz, TRIUMF, 4004 Wesbrook Mall, Vancouver, B. C., Canada V6T 2A3 (phone 604-222-1047; Telex (0)-4508503; FAX 604-222-1047).

June 1989

Annual Meeting of the American Nuclear Society, June 4–8, 1989, Atlanta, Georgia. Contact: ANS Meetings Dept., 555 N. Kensington Ave., La Grange Park, IL 60525 (phone 312-352-6611).

Packaging and Transportation of Radioactive Materials: PATRAM '89, June 11–16, 1989, Arlington, Virginia, sponsored by US-DOE. Contact: Larry Blalock, Chairman, US Organizing Comm., US Dept. of Energy, P.O. Box 2001, Oak Ridge, TN 37831-8765 (phone 615-576-0945 or FTS 626-0945).

July 1989

26th IEEE Annual Conference on Nuclear and Space Radiation Effects, July 24–28, 1989, Marco Island, Florida. Contact: Dante M. Tasca, General Electric Co., Room M1211, Bldg. 100, P.O. Box 8555, Philadelphia, PA 19101 (phone 215-354-4132).

September 1989

International Workshop on New Developments in Occupational Dose Control and ALARA Implementation at Nuclear Power Plants and Similar Facitlities, Sept. 18–21, 1989, Brookhaven National Laboratory, Upton, New York. Contact: Dr. John W. Baum, BNL ALARA Center, Bldg. 703M, Upton, NY 11973 (phone 516-282-4214).

OCTOBER 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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