

# RSIC Newsletter



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*The ink of the scholar is more sacred than the blood of a martyr.  
... Mohammed*

## MISSION ACCOMPLISHED

The success of last year's MORSE-CGA Workshop and interest expressed in a workshop for SCALE prompted EPIC to plan the SCALE workshop just recently completed.

April in East Tennessee is a lovely time of year, even with unpredictable weather (within days we had record-breaking frosts and record-breaking highs). I apologize if my own faulty forecasting led to any sniffles. Perhaps the sunshine and blossoms of East Tennessee compensated.

As for the business at hand, an overwhelming majority of the participants went away with more SCALE savvy than they arrived with. The 49 registrants represented 28 installations in the U.S. and 9 in other countries. Their SCALE experience ranged from "novice" to "expert." Of the lecturers and discussion leaders from the Computing and Telecommunications Division, Martin Marietta Energy Systems, Inc., all have worked or are presently working on the SCALE development effort. The opportunity to meet the developers ranked high on the list of benefits obtained from the workshop as indicated on the exit questionnaire. Many of those responding also appreciated the opportunity to meet and talk with other SCALE users; one respondent suggested, "Perhaps 'user's groups' would be a good idea." We also learned from the results of this questionnaire that this was the first EPIC workshop for 75% of those responding, but that 75% also got what they expected from it.

We at EPIC would like to express our appreciation to those who took the time to fill out the questionnaire, many with detailed comments. It will be a valuable tool in planning for future workshops. Many interesting suggestions were made for improving the workshop format from "have an evening session and give us an afternoon off to see the museum/area/national park/etc.," to providing hands-on terminal time. Several suggested that the registration fee was disproportionately low compared to the expense of getting here. The attendees expressed appreciation for the willingness of the speakers and the EPIC staff to discuss individual questions and problems.

## CHANGES TO THE COMPUTER CODE COLLECTION

Eight changes were made to the computer code collection during the month of April. Three new code systems were packaged, two existing code packages were extended with additional hardware versions, one code package was replaced with a new version, and two code packages were enhanced or updated with software changes. Three changes resulted from foreign contributions.

### CCC-121/SABINE-3

This Spinney (removal diffusion) shielding code system in one-dimensional geometry was extended to include a UNIVAC version. The new version was contributed by the EURATOM Ispra Establishment, Italy, via the OECD Nuclear Energy Agency (NEA) Data Bank, Gif-sur-Yvette, France. Reference: EUR 5159e. FORTRAN IV; IBM 370 (A), CDC 7600 (B), and UNIVAC 1106 (C).

### CCC-178/HETC

This Monte Carlo high-energy nucleon-meson neutron and gamma-ray transport code system was extended to include a VAX version, contributed by the Swiss Institute for Nuclear Research, Villigen, Switzerland. Two 9-track, 1600-bpi tapes are required to write the interchange format BACKUP SAVE SET created under VAX/VMS version 4.3. Reference: ORNL-4744. FORTRAN IV; IBM (A) and VAX-11 (C).

### CCC-372/ACT-ARA

A code system for calculating changes in radiological source terms with time was contributed by Applied Research Associates, Inc., Albuquerque, New Mexico. ACT-ARA calculates the source term activity from a set of initial activities as a function of discrete time steps. The code system is intended to support analysis of releases from radioactive waste disposal sites such as those required by 40 CFR 191. The calculation considers inbreeding of daughter products and also calculates "probable release," which is activity at a given time multiplied by both the fraction released and the probability of the release. Reference: WIPP/DOE-85-201. FORTRAN 77; CRAY.

### CCC-420/DARTAB

This code system to combine airborne radionuclide environmental exposure data with dosimetric and health effects data to generate tabulations of predicted health impacts was updated by the Oak Ridge National Laboratory (ORNL), original con-

tributors of the code. The code now allows the option of reading either the old or new format of the RADRISK (CCC-422) data file. The modification was implemented through changes in the DARTAB main routine, subroutine RDSTOR and COMMON/COMNU/. Users may request the new source from RSIC. Reference: ORNL-5692. FORTRAN IV; IBM 360/370.

### CCC-442/ACDOS3

This code system for calculation of activities and dose rates produced by neutron activation was replaced with version 2 of the code, contributed by Lawrence Berkeley Laboratory, Berkeley, California. Formerly, the decay processes considered for purposes of the dose rate calculation were beta-minus (including the effect of annihilation radiation) and gamma de-excitation. In Version 2, the foregoing are considered as well as electron-capture decays. Reference: LBL-12711, LBL-14547. FORTRAN IV; CDC 7600.

### CCC-474/MORSE-CGA

The IBM and CRAY versions of this general purpose Monte Carlo multigroup neutron and gamma-ray transport code system with array geometry capability were updated by the original contributors at ORNL. (1) Checks were added to Subroutine AZIP to assure that the loop indices read in for array data under the IOP=1 option (mixed cell orientation) are within limits. This corrects the possibility of an infinite loop when input data is incorrect. (2) Subroutine MESH was updated to correct a round-off problem which sometimes caused the last column of a picture to be in error leading users to think the geometry specifications were incorrect. (3) Subroutine ENRGYS was updated to correct a problem in the adjoint case when less than NMTG groups were being analyzed. Users may request the updated code from RSIC. Reference: ORNL-6174, ORNL-4972, ORNL-4972/R2. FORTRAN IV; IBM 3033 (C) and CRAY (E).

### PSR-224/PREM

This code system for calculating the energy spectra and distribution of excitons at each stage of a multi-nucleon emission process was contributed by Tohoku University, Sendai, Japan, through the OECD NEA Data Bank, Gif-sur-Yvette, France. PREM computes energy spectra and cross sections of processes when an initial distribution function is given. Master equations for exciton number are solved for each generation in succession. Quantities obtained include pre-equilibrium as well as equilibrium contributions. It is possible to obtain the equilibrium contributions only and the time development function for the first generation. Angular momentum conservation is not taken into account. Reference: Reprint from The Science Reports of the Tohoku University, Series 8,

Vol 3, No. 1 (June 1982). FORTRAN IV; IBM 360/370.

### PSR-229-MICRO/GIP

This group-organized cross-section input program contributed by Idaho National Engineering Laboratory, Idaho Falls, Idaho, reads nuclide-organized cross-section libraries prepared for ANISN or DOT and prepares a group-organized library. The source was extracted from CCC-320/DOT 4.2, a contribution of Oak Ridge National Laboratory, and modified to run on the IBM Personal Computer using the IBM Personal Computer Professional FORTRAN compiler, Version 1.00. It requires about 512K memory and the 8087 math coprocessor. Reference: GIP input instructions taken from selected pages of CCC-320/DOT 4.2. FORTRAN 77; IBM PC.

## RP&S Calls for Papers

A call for papers has been issued for an international topical meeting on the *Theory and Practices for Radiation Protection and Shielding*, April 22-24, 1987, in Knoxville, Tennessee. The meeting is being sponsored by the American Nuclear Society (ANS) Radiation Protection and Shielding (RP&S) Division and the Oak Ridge/Knoxville Section of ANS. It is the first topical planned by the ANS RP&S Division in a new program that focuses on only one national ANS Meeting while sponsoring special topical meetings approximately every two years. The General Chairman is D. G. Cacuci; Technical Program Chairman is R. T. Santoro; and the Publications Chairman is D. T. Ingersoll; all are from ORNL. The program will include a diverse selection of topics ranging from practical solutions of radiation protection problems to theoretical developments

in radiation transport methods. Papers are solicited in the specific areas of personnel dosimetry, radiation measurement instrumentation and analysis, radiation protection aspects of nuclear waste management, operational health physics, radiation management experience in nuclear power plants, fission and fusion reactor shielding applications, analytic and numerical methods for radiation transport, and nuclear cross section data. **August 15, 1986** is the deadline for submission of 450-900-word summaries. Notification of acceptance will be made by *September 12, 1986*, and the deadline for full papers is *December 12, 1986*. Summaries and inquiries should be directed to Robert T. Santoro, Technical Program Chairman, Topical Conference on Theory and Practices for Radiation Protection and Shielding, ORNL, P.O. Box X, Oak Ridge, TN 37831 USA (phone 615-574-6084).

### 1985 NCRP Progress

The National Council on Radiation Protection and Measurements (NCRP) noted in its 1985 Annual Report released at the 22nd Annual Meeting in Washington the publication of nine NCRP reports as follows:

NCRP Report No. 79, *Neutron Contamination from Medical Electron Accelerators*, \$15.

NCRP Report No. 80, *Induction of Thyroid Cancer by Ionizing Radiation*, \$13.

NCRP Report No. 81, *Carbon-14 in the Environment*, \$13.

NCRP Report No. 82, *SI Units in Radiation Protection and Measurements*, \$11.

NCRP Report No. 83, *The Experimental Basis for Absorbed-Dose Calculations in Medical Uses of Radionuclides*, \$14.

NCRP Report No. 84, *General Concepts for the Dosimetry of Internally Deposited Radionuclides*, \$13.

NCRP Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, (2nd edition) \$25.

NCRP Proceedings No. 6, *Some Issues Important in Developing Basic Radiation Protection Recommendations*, \$19.

Taylor Lecture No. 9, *Truth (and Beauty) in Radiation Measurements*, by John H. Harley, \$11.

NCRP Report No. 86, *Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields*, scheduled for release in April 1986, presents a comprehensive evaluation of the available literature on the biological effects from the molecular and cellular level, through systemic effects to behavioral effects, and responses in human beings. New activities reported include formulation of a comprehensive evaluation of the exposure of the U.S. population to projects concerned with uranium, visual display terminals, and exposure control in a nuclear emergency.

NCRP reports are available from NCRP, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814.

### 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.

### Hyodo Retires

Professor Tomonori Hyodo retired from Kyoto University in Japan on March 31, 1986, after a long and distinguished academic research career. Research in shielding and radiation transport at Kyoto University will continue under Dr. Kazuo Shin.

Professor Hyodo continues an active professional career. On April 1, 1986, he assumed the duties of President of Okayama Vocational Training College in Kurashiki. He also continues as a member of the governmental Reactor Safety Examination and will continue to maintain a personal interest in shielding. Hyodo, a long-term RSIC participant, was made a Fellow of the American Nuclear Society in 1980 "for his established record of distinction as author, educator, and research scientist; he has been a leader in many professional societies, especially the Atomic Energy Society of Japan; his textbook, *Introduction to Radiation Shielding*, has been a standard text in Japanese universities; he is a leading authority on neutron and gamma-ray measurements and is especially well known internationally for his measurements and reviews of gamma-ray backscattering."

### New Members Elected to NCRP

President of the National Council on Radiation Protection and Measurements (NCRP), Warren K. Sinclair, announced the election of four members and the reelection of seven members to serve six-year terms as Council members. Newly elected members are Frederick T. Cross, Battelle Pacific Northwest Laboratories, Richland, Washington; Fred. A. Mettler, Univ. of New Mexico Hospital, Albuquerque, New Mexico; Lawrence N. Rothenberg, Memorial Sloan-Kettering Cancer Center, New York; and Jacob W. Thiessen, U.S. Dept. of Energy, Washington. Reelected members are William J. Bair, Battelle Pacific Northwest Laboratories, Richland, Washington; Arthur W. Guy, Univ. of Washington, Seattle; Ray D. Lloyd, Univ. of Utah, Salt Lake City; A. Alan Moghissi, Institute of Regulatory Science, Alexandria, Virginia; Norman C. Rasmussen, Massachusetts Institute of Technology, Cambridge; Leonard A. Sagan, Electric Power Research Institute, Palo Alto, California; and Arthur C. Upton, New York Univ., Medical Center, New York.

### Visitors to RSIC

During the month the following persons came for an orientation visit and/or to use RSIC facilities: Norman P. Baumann, Savannah River Laboratory, Aiken, South Carolina; Frederick W. Lipps, Univ. of Houston, Texas; J. Roth Hyland, Southwest Research Inst., San Antonio, Texas; K. Dieter Ziegenbein, Akademie der Wissen-

schaften, German Democratic Republic; *D. V. Gopinath*, Indira Ghandi Centre for Atomic Research, Kalpakkam, India; *Gareth Williams*, Gesellschaft f. Strahlen-und Umweltforschung mbH, München, F. R. Germany; *Kryszysztof Morstin*, Brookhaven National Laboratory, Upton, New York; *Jeffrey M. Corbin*,

Martin Marietta Michoud Aerospace, New Orleans, Louisiana; *Guy Ledanois*, CEA Limeil-Valenton Laboratory, Paris, France; *Vahe Keshishian*, Rockwell International/Rocketdyne, Canoga Park, California; *J. Hipp*, Air Force Weapons Laboratory, Albuquerque, New Mexico; and *L. D. Gerrald*, Exxon Nuclear Co., Inc., Richland, Washington.

## 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.

### Space Power Systems Short Course

The Institute for Space Nuclear Power Studies, Chemical/Nuclear Engineering Dept. of the Univ. of New Mexico, Albuquerque, is sponsoring a short course entitled, *Introduction to Space Nuclear Power Systems*. The course is to be conducted at the Rosslyn West Park Hotel, Rosslyn, Virginia, June 16-18, 1986.

The course is intended for engineers, managers, graduate students, and university professors involved in the development and application of nuclear systems to space missions. The three-day course will cover the following topics: the history of space nuclear power, reactor/shield design concepts, space environment, radioisotope generators, systems safety, power conversion systems, thermal energy transport, heat rejection concepts, nuclear/electric propulsion, and SP-100 technology. The instructors are *William Barattino*, *Mohamed S. El-Genk*, *James Lee*, and *Patrick McDaniel*. Further information is available from *Carlota Klimas*, Asst. Dir., Inst. for Space Nuclear Power Studies, Chemical & Nuclear Engr. Dept., Albuquerque, NM 87131 (phone 505-277-4950).

### HL Waste Disposal Short Course

Disposal Safety Inc. has organized a short course entitled *The Safety of High-Level Radioactive Waste Disposal*, to be held October 27-29, 1986, in Washington. The course is designed for engineers, scientists, and technical managers involved in the development and re-

view of repositories or their component systems. The course will cover sources and toxicity of high-level waste, description of geologic disposal systems, introduction to basic analysis and scenarios, Waste Policy Act and siting process, repository licensing, role of performance assessment in the DOE program, methods of scenario selection, probabilities, waste package performance, groundwater transport, geochemistry, and surface water transport and dose to man. Further information may be obtained from Disposal Safety, Inc., 1211 Connecticut Ave., NW, Suite 610, Washington, DC 20036 (phone 202-293-3993).

### Calendar

Your attention is directed to the following additional events of interest to the radiation shielding and protection community.

#### June 1986

*4th European Nuclear Conference (ENC-86)*, June 1-6, 1986, sponsored by the European Nuclear Society. Contact: Dr. Peter Bucher, ENC-4 Conference Secretary, ENS, P.O. Box 2613, CH-3001 Berne, Switzerland.

*26th Annual International Conference of the Canadian Nuclear Association and the 7th Annual Conference of the Canadian Nuclear Society*, June 8-11, 1986. Contact: J. A. Weller, Canadian Nuclear Association, 111 Elizabeth St., Toronto, Ontario, Canada M5G 1P7.

*Air Sampling*, June 9-13, 1986, a course sponsored by ORAU. Contact: Jo T. Tipton, Registrar, ORAU, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3434).

*Topical Meeting on the Technology of Fusion Energy*, June 15-19, 1986, Reno, Nevada, sponsored by ANS. Contact: C. D. Henning, Lawrence Livermore National Laboratory, P.O. Box 5511, L-644, Livermore, CA 94550 (phone 415-422-0235).

*ANS Annual Meeting*, June 15–20, 1986, Reno, Nevada. Contact: D. G. Pettengill, ANS, 555 N. Kensington Ave., La Grange Park, IL 60535 (phone 312-352-6611 ext. 257).

*Safe Use of Radionuclides*, June 16–20, 1986, a course sponsored by ORAU. Contact: Jo T. Tipton, Registrar, ORAU, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3434).

*13th International Symposium on the Effects of Radiation on Materials*, June 23–25, 1986, Seattle, Washington, sponsored by ASTM Committee E-10 on Nuclear Technology and Applications. Contact: F. A. Garner, Westinghouse Hanford Co., P.O. Box 1970, W/A-58, Richland, WA 99352 (phone 509-376-4136).

*4th International Conference on Emerging Nuclear Energy Systems*, June 30–July 4, 1986, Madrid, Spain, sponsored by the Spanish Nuclear Society and the Madrid Polytech Univ. Contact: G. Velarde, Madrid Univ. Polytechnica, Escuela Tecnica Superior de Ingenieros Industriales, P.O. Castellana, 80, Madrid, Spain, or Nils Diaz, School of Engineering, California State Univ., Long Beach, CA 90840 (phone 213-498-5121).

#### July 1986

*23rd International Conference on High-Energy Physics*, July 16–23, 1986, Berkeley, California. Contact: S. C. Loken, 50-137 Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720.

*23rd Annual Conference on Nuclear and Space Radiation Effects*, July 21–23, 1986, Providence, Rhode Island, sponsored by the Nuclear and Plasma Sciences Society and the Inst. of Electrical and Electronics Engineers. Contact: Sandra Grawet, Science Applications International Corp., 2615 Pacific Coast Highway, Hermosa Beach, CA 90254 (phone 213-318-2611).

#### August 1986

*Occupational and Environmental Radiation Protection*, Aug. 11–15, 1986, a course sponsored by Harvard School of Public Health, Boston, Massachusetts. Contact: Office of Continuing Education, Dept. A, Harvard School of Public Health, 677 Huntington Ave., Boston, MA 02115 (phone 617-732-1171).

*Criticality Accident Dosimetry Training Course*, Aug. 11–15, 1986, Oak Ridge, Tenn., sponsored by ORNL. Contact: C. S. Sims, ORNL, Bldg. 7710, P.O. Box X, Oak Ridge, TN 37831 (phone 615-574-5851).

*19th DOE/NRC Nuclear Air Cleaning Conference*, Aug. 13–15, 1986, Seattle, Washington. Contact: Melvin W. First, Conference Chairman, Harvard Air Cleaning Laboratory, 665 Huntington Ave., Boston, MA 02115-9957 (phone 617-732-1164).

*International Nuclear Physics Conference*, Aug. 25–30, 1986, Harrogate, United Kingdom. Contact: Inst. of Physics, 47 Belgrave Square, London SW1X 8QX (phone 01-235-6111).

*8th International Conference on Solid State Dosimetry*, Aug. 26–29, 1986, St. Catherine's College, Oxford, organized by the National Radiological Protection Board, U.K. Contact: Miss L. Ashby, National Radiological Protection Board, Chilton, Didcot, Oxfordshire, U.K.

#### September 1986

*International Conference on Nuclear and Radiochemistry*, Sept. 1–5, 1986, Beijing, sponsored by the Chinese Nuclear Society and Chinese Chemical Society. Contact: Prof. Liu Yuanfang, Dept. of Technical Physics, Beijing Univ., Beijing, People's Republic of China.

*International Conference on Reliable Fuels for Liquid-Metal Reactors*, Sept. 7–11, 1986, Tucson, Arizona, sponsored by ANS, AIME, and the U.S. Dept. of Energy. Contact: E. A. Aitken, Tech. Prog. Chairman, General Electric Co., Nuclear System Technology Div., 310 DeGuigne Dr., Sunnyvale, CA 94088 (phone 408-738-7237).

*Annual Information Meeting of the Canadian Nuclear Fuel Waste Management Program*, Sept. 7–12, 1986, Winnipeg, Canada. Contact: R. S. Dixon, Publicity Chairman, Nuclear Fuel Waste Management, Pinawa, Manitoba, Canada ROE 1LO.

*International Conference on Radioactive Waste Management*, Sept. 7–12, 1986, Winnipeg, Manitoba, Canada, sponsored by the Canadian Nuclear Society and ANS. Contact: Dr. T. S. Drolet, CFFTP, 2700 Lakeshore Rd. West, Mississauga, Ontario, Canada L5J 1K3 (phone 416-823-6654).

*Conference on the Treatment and Containment of Radioactive Wastes and Disposal in Arid Environments (Radwaste '86)*, Sept. 7–13, 1986, sponsored by Atomic Energy Corp. of South Africa, Electricity Supply Commission of South Africa, and Nuclear Development Corp. of South Africa. Contact: Radwaste Conf. Secretariat, NUCOR, Private Bag X256, Pretoria 0001, South Africa (phone 27-12-21-3311 ext. 677).

*14th SOFT—Symposium on Fusion Technology*, Sept. 8–12, 1986, Avignon, France. Contact: A. Torossian, Dept. de Recherches sur la Fusion Contrôlée, Centre d'Études Nucleaires de Cadarache, B.P. No. 1, F-13108 Ste-Paul-lez Durance, France.

*4th European congress and 13th Regional Congress of the International Radiation Protection Association and Technical Exhibition*, Sept. 15–19, 1986, Salzburg, Austria, sponsored by the Austrian Association for Radiation Protection; Austrian Ministry of Health and Environmental Protection, Austrian Ministry of Science; and Austrian Research Centre. Contact: A. Hefner, Österreichischer Verband f. Strahlenschutz, A-2444 Seibersdorf, Austria (phone 02254 80-2509 or 2560).

*Advances in Reactor Physics and Safety Meeting*, Sept. 17–19, 1986, Saratoga Springs, N. Y., sponsored by ANS. Contact: Norman C. Francis, Knolls Atomic

Power Lab., River Road, Schenectady, NY 12301, or Donald R. Harris, Rensselaer Polytechnic Inst., Troy, NY (phone 518-270-6407).

#### October 1986

*American Physical Society Nuclear Physics Division Meeting*, October 9-11, 1986, Vancouver, Canada. Contact: APS, 335 E. 45th St., New York, NY 10017 (phone 212-682-7341).

*Nuclear Transportation Issues*, Oct. 19-22, 1986, Charleston, South Carolina, sponsored by the Atomic Industrial Forum. Contact: Conference Office, AIF, 7101 Wisconsin Ave., Bethesda, MD 20814-4891 (phone 301-654-9260).

*Hanford Life Sciences Symposium: Radiation Protection—A Look to the Future—Celebrating Four Decades of Research at Hanford*, Oct. 21-23, 1986, Richland, Washington, sponsored by the Dept. of Energy. Contact: William J. Bair, Environment, Health and Safety Research Program, Battelle, Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352 (phone 509-375-2421).

#### November 1986

*International Symposium on Nuclear Material Safeguards*, Nov. 10-14, 1986, sponsored by IAEA. Contact: IAEA, Conf. Service Section, P.O. Box 100, A-1400 Vienna, Austria.

*United Nations Conference for the Promotion of International Co-operation in the Peaceful Uses of Nuclear Energy*, Nov. 10-28, 1986. Contact: Executive Secretary, UN Conf. for the Promotion of Internatl. Co-operation in the Peaceful Uses of Nuclear Energy, Vienna International Centre, P.O. Box 500, A-1400 Vienna, Austria.

*International Symposium on Nuclear Material Safeguards*, Nov. 10-14, 1986, Vienna, sponsored by the International Atomic Energy Agency. Contact: IAEA, Conference Service Section, P.O. Box 100, A-1400 Vienna, Austria.

*ANS and Atomic Industrial Forum Joint Meeting*, Nov. 16-21, 1986, Washington, D. C. Contact: D. G. Pettengill, ANS, 555 N. Kensington Ave., La Grange Park, IL 60535 (phone 312-352-6611 ext. 257).

## APRIL 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

**ANL/FPP/TM-203**, . . *Nuclear Data Needs for Fusion Reactors*, . . Gohar, Y., . . January 1986, . . NTIS

**BME-TR-RES-10/86**, . . *The Covariance Matrix of Neutron Spectra*, . . Szondi, E.J., . . January 1986, . . Nuclear Reactor of the Technical University, H-1521 Budapest, Muegyetem rkp. 9, Hungary

**BME-TR-RES-11/86**, . . *An Approximate Method for Developing the Covariance Matrix of a Set of Measured Activities*, . . Szondi, E.J., . . January 1986, . . Nuclear Reactor of the Technical University, H-1521 Budapest, Muegyetem rkp. 9, Hungary

**BNL-33692**, . . *Radiation Damage in Silicon Detectors*, . . Kraner, H.W., . . August 1983, . . NTIS

**BNL-NCS-37669**, . . *Reference Data for Nuclear Research*, . . Pearlstein, S., . . December 1985, . . NTIS

**CFFTP-G-85037**, . . *Radiological Safety Assessment of a Reference INTOR Facility*, . . Khan, T.A.; Stasko, R.R.; Watts, R.T., . . February 1985, . . Ontario

Hydro Research Div., Toronto, Canada

**CONF-820609-43**, . . *Sensitivity Study of Neutron Transport Through Standard and Rebar Concrete*, . . Bhuiyan, S.I.; Roussin, R.W.; Lucius, J.L., . . 1982, . . NTIS, PC A02/MF A01; MF available from INIS

**FEI-1233 (In Russian)**, . . *Experimental Investigations of Neutron Transport Through a Cylindrical Mock-Up of an Iron-Sodium Shield*, . . Kolevatov, Yu.I.; Nikolaev, A.N.; Trykov, L.A.; Burian, I.; Otopal, P.; Marek, M.; Yanskij, B.; Tikhij, M., . . 1982, . . NTIS

**FEI-1445 (In Russian)**, . . *Approximation of Angular Distributions for Elastically Scattered Neutrons*, . . Korobejnikov, V.V.; Korobejnikova, L.V.; Nikolaev, M.N.; Tsiubulya, A.M., . . 1983, . . NTIS (U.S. Sales Only), PC A02/MF A01

**FEI-1474 (In Russian)**, . . *Investigations of an Ionizing Radiation Transport in a Nitrogen-Containing Medium*, . . Volkov, V.S.; Kremenetskij, A.K.; Pavlov, G.M.; Pizaeva, L.N., . . 1983, . . NTIS (U.S. Sales Only), PC A02/MF A01

**GA-A18152**, . . *Magnetic Fusion Energy Program Nuclear Data Needs. Annual Report for the Period November 1, 1984 through October 31, 1985*, . . Cheng, E.T.; Mathews, D.R.; Schultz, K.R., . . October 1985, . . NTIS, PC A05/MF A01

**ICRP-45**, . . *Quantitative Bases for Developing a Unified Index of Harm: A Report*, . . International Commission on Radiological Protection, . . 1985, . . Pergamon Press

**ICRP-46**, . . *Radiation Protection Principles for the Disposal of Solid Radioactive Waste: A Report*, . . International Commission on Radiological Protection, . . 1985, . . Pergamon Press

**INDC(BUL)-011/L**, . . *Legendre-Series Development of the Anisotropy Density of Neutron Elastic Scattering by Means of Cubic Splines*, . . Voykov, G.; Gadjokov, V.; Ilieva, K., . . February 1986, . . IAEA Nuclear Data Section, Wagramerstrasse 5, A-1400 Vienna

**INDC(CCP)-251/L**, . . *Measurement and Evaluation of Nuclear Data for Fissile and Fertile Isotopes: An Important Task of Present-Day Physics*, . . Van'kov, A.A., . . January 1986, . . IAEA Nuclear Data Section, Wagramerstrasse 5, A-1400 Vienna

**INDC(CCP)-253/L**, . . *Evaluation of Resonance Self-Shielding Factors for  $^{238}\text{U}$  in the Unresolved Resonance Region*, . . Komarov, A.V.; Lukyanov, A.A., . . January 1986, . . IAEA Nuclear Data Section, Wagramerstrasse 5, A-1400 Vienna

**INDC(CCP)-254/L**, . . *Group Cross-Sections and Resonance Self-Shielding Factors for  $^{239}\text{Pu}$  in the Unresolved Resonance Region*, . . Van'kov, A.A.; Toshkov, S.; Ukraintsev, V.F.; Yaneva, N., . . January 1986, . . IAEA Nuclear Data Section, Wagramerstrasse 5, A-1400 Vienna

**INDC(NDS)-175/LAMO**, . . *Nuclear and Atomic Data for Radiotherapy and Related Radiobiology. (Summary and Recommendations)*, . . IAEA Advisory Group Meeting in Co-Operation with the Radiobiological Institute of the Division for Health Research TNO, 16-20 September 1985, Rijswijk, the Netherlands, . . Okamoto, K. (Ed.), . . November 1985, . . IAEA Nuclear Data Section, Wagramerstrasse 5, A-1400 Vienna

**INIS-mf-9532, pp.263-265**, . . *Effect of Neutron Source Spectrum on Optimal Shield Composition and Performance*, . . Levin, P.; Greenspan, E.; Gilai, D., . . Published in summary form only, . . 1983, . . NTIS (U.S. Sales Only), PC A14/MF A01

**JAERI-M-85-201; PPG-900; UCLA-ENG-85-37**, . . *U.S./JAERI Fusion Neutronics Calculational Benchmarks for Nuclear Data and Code Intercomparison*, . . Youssef, M.Z. (Ed.), . . December 1985, . . Fusion Engineering, University of California, Los Angeles, California

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