

RSIC Newsletter



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No. 303

February 1990

Man tends to treat all his opinions as principles.—Herbert Agar

CHANGES TO THE COMPUTER CODE COLLECTION

Two changes were made to the computer code collection during the month. A new code system was packaged and added to the collection and an existing code package was extended with an additional hardware version.

CCC-200/MCNP 3

A new hardware version of this general purpose Monte Carlo neutron and gamma-ray transport code system was provided by ProCom GmbH, Aachen, Fed. Rep. of Germany. The new version corresponds to MCNP Version 3 and runs on the IBM PC/AT equipped with a 32-bit co-processor board, DSI-32/4, available from DEFINICON Systems, Inc. Memory must be at least 512Kb with 4 Mbyte RAM memory. At least a 20 Mbyte hard disk is also needed. The Green Hills FORTRAN software and runtime library provided by DEFINICON is required. The system runs under DOS 3.3 or a later version. Note that MCNP 3B has been released by the Los Alamos developers and distributed by RSIC for mainframe users since February 1989. The PC version is distributed on 9 DS/HD (1.2 MB) 5.25-in. diskettes. References: LA-7396-M, Rev. (April 1981) and informal documentation. FORTRAN 77; CDC 7600, CRAY 1, IBM 3033, VAX 11 (A) and IBM PC/AT (B).

CCC-544/CEPXS/ONELD

Los Alamos National Laboratory, New Mexico, and Sandia National Laboratory, Albuquerque, New Mexico, have contributed this one-dimensional coupled electron-photon multigroup discrete ordinates code system. CEPXS generates cross sections to be input to ONELD, a one-dimensional advanced discrete ordinates code that uses linear-discontinuous spatial differencing and diffusion-consistent weighted diamond angular differencing. The equations are solved via source iteration with S-2 synthetic acceleration of the inner iterations. Two hardware versions are available. The VAX version runs under VMS and includes a few lines of C. The Cray version runs under the Los Alamos CTSS operating system with the CFTLIB library. References: SAND89-1685 (October 1989), SAND89-1661 (September 1989) and LA-9184-M, Rev. (December 1989). FORTRAN 77; VAX (A) and Cray (B).

CCC-545/SCALE-4

A new version of this modular code system for performing standardized computer analyses for licensing evaluation was contributed by the Computing and Telecommunications Division of Oak Ridge National Laboratory (ORNL). The SCALE system was developed for the NRC to satisfy a need for a standardized method of analysis for the

evaluation of nuclear fuel facility and package designs. SCALE-4 differs significantly from SCALE-3, released in February 1985, in that (1) the entire system has been converted to FORTRAN 77 and made operational in both IBM and CRAY environments, (2) CSAS1, CSAS2, KENO IV, JUNEBUG-II, and the CESAR data base have been removed, (3) the enhanced HEATING6.1 module allows multidimensional radiative heat transfer and multidimensional spherical geometries to be modeled, (4) the OCULAR module has been developed to generate radiation exchange factors compatible with the axi-symmetric r-z geometry of HEATING6.1, (5) the PLORIGEN module is available to provide plots of ORIGEN-S output, (6) the SAS1 and SAS4 shielding analysis modules have been added, (7) the SAS2 depletion module has had major improvements, (8) the NITAWL module has been replaced with

NITAWL-II and the SCALE libraries restructured to match NITAWL-II requirements, and (9) plotting modules were upgraded to use DISSPLA 10.5 routines.

COMMENT, a program to convert the source files between IBM and CRAY, is included to facilitate code conversion. The IBM version was compiled under OS/VS2 using the IBM VS compiler (Level 2.2.0) and Assembler level H on an IBM 3033 computer. With minor modifications, the system was installed and tested on a CRAY X-MP running CTSS using the CFT77 compiler, with the exception of the thermal codes which require the CFT compiler. The CRAY version is full FORTRAN. A brief paper highlighting the new system is available from RSIC for users who want to review changes. References: NUREG/CR-200, Revision 4; ORNL/NUREG/CSD-2/R4 Volumes 1, 2, and 3 (Draft January 1990). FORTRAN 77 and Assembler; IBM and CRAY.

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.

Dudziak Appointed Department Head at NC State

North Carolina State University Interim Chancellor, Larry K. Monteith, has announced the appointment of *Donald J. Dudziak* as head of the Department of Nuclear Engineering, effective May 16. Dudziak is a Fellow of the Los Alamos National Laboratory, where he has been employed since 1965. He managed a group that developed nuclear analysis methods for fission and fusion reactors. Dudziak earned his master's degree in radiological physics and radiation biology at the Univ. of Rochester, N. Y., and his doctoral degree in applied mathematics at the Univ. of Pittsburgh. Since then he has taught at the graduate and undergraduate levels in radiation shielding and a course for technicians in criticality control. He has taught as visiting professor at the Univ. of Virginia

and as a part-time professor at the Univ. of New Mexico. Before joining Los Alamos, Dudziak worked at the Bettis Atomic Power Laboratory and taught at the Bettis Reactor Engineering School. He is a member of the American Nuclear Society and the Naval Reserve Association.

Herbert Eugene Hungerford writes that he retired in 1982 (Prof. Emeritus, Purdue Univ., Nuclear Engineering), but still occasionally does shielding consulting. He was at Oak Ridge National Laboratory from 1950-55, working with E. P. Blizard and his shielding group. He is listed in "Who's Who in America," latest edition, for his many technical accomplishments. He writes that he values the *RSIC Newsletter* because it keeps him up on "what's going on in shielding, and what some of my old friends and colleagues are doing now." Prof. Hungerford can be reached at 2104 Fourth Court S.E., Vero Beach, FL 32962.

Radiation Detection and Measurement, A Review

Radiation Detection and Measurement, by

Glenn F. Knoll, John Wiley & Sons, Inc., New York, 1989, \$63.95, 754 pp.

From time to time we publish book reviews of publications useful to the shielding specialist. Even though many, or even most, specialists are involved only in making calculations of radiation transport or shield design, it is important to understand radiation measurement to some degree. *Radiation Detection and Measurement*, can admirably serve this purpose. The second edition is updated to reflect significant developments in the field of radiation measurement that have occurred since the first edition was published in 1979. It broadly covers the devices and techniques used in the measurement of ionizing radiation, while retaining the same organization, style, and clear writing that made the first edition a "classic" in its field.

The book serves two purposes. First, as a textbook, it is appropriate for use in a first year course in nuclear instrumentation or radiation measurements. For use in such a course, it has twice the number of illustrative problems at the end of each chapter as in the previous edition. Secondly, it can serve as a general review of radiation detection techniques for scientists and engineers actively involved in radiation measurements or who otherwise have need of understanding such measurements.

The first four chapters are introductory, taking up radiation sources and interactions, general properties of detectors, counting statistics, and error prediction. The next three chapters discuss gas-filled detectors: ionization chambers, propor-

tional counters, and Geiger-Mueller counters. The following three chapters on scintillation counters discuss photomultiplier tubes, photodiodes, and spectroscopy. Semiconductor detectors come next: semiconductor diode detectors, germanium gamma-ray detectors, and other solid-state detectors. There are two chapters on neutron detectors and neutron spectroscopy which are followed by three chapters on detector electronics and pulse processing. Finally, there is a chapter on miscellaneous detector types, such as Cerenkov detectors, photographic emulsions, thermoluminescent dosimeters, track-etch detectors, and activation foils, and a chapter which discusses background and detector shielding.

A major change has been made in the appendices compared to the first edition. The appendix sections discuss NIM and CAMAC instrumentation standards and cable connectors, whereas the first edition has several sections on radiation effects and exposure limits. We suspect the author felt that discussions of dose and exposure limits could easily become obsolete at the present time.

The author, Glenn Knoll, is currently Professor and Chairman of the Department of Nuclear Engineering at the University of Michigan. He is a Fellow of the American Nuclear Society and the Institute of Electrical and Electronics Engineers and a member of the Editorial Board for *Nuclear Instruments and Methods in Physics Research*.

The book is well-indexed, attractively printed, and sturdily bound. We recommend it to anyone needing basic information on nuclear radiation instrumentation.

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.

UK Hosts Radiation Transport Meeting

Imperial College in London will host the 3rd Interna-

tional Seminar on Finite Element and Allied Methods in Radiation Transport; Shielding, Reactor Physics and Geophysics Applications, to be held April 19-20, 1990. The seminar is sponsored by the U.K. Institution of Nuclear Engineers. Progress made since the first two International Seminars on Finite Element Methods in Radiation Physics has led to the discovery and applications of transport theory codes with a wide application of to reactor core and shielding design problems. Time dependent methods have been developed which show promise for geophysics applications. Simultaneously there have been advances in the use of the finite element method to accelerate the convergence of Monte Carlo

codes, and the adaption of nodal methods to provide fast diffusion theory solutions in support of thermal reactor operations. The ideas used in finite element and nodal methods codes and in finite element accelerators for Monte Carlo have much in common, and the conference aims to draw specialists in these fields together to the advantage of workers primarily concerned with calculations in support of design and operation. It is also intended to review benefits likely to result from the use of advanced computing methods using vector and highly parallel architectures.

The seminar will include invited and contributed papers. The five sessions are: Industry Needs and Technical Overview; Applications to Shielding and Criticality; Applications to Geotechnology; Use of Advanced Computer Architectures; and New Developments. Invited speakers include J. Butler, AEA Technology, Winfrith; M. Salvatores, Commissariat a l'Energie Atomique, France; A. Badruzzaman, Sandia National Laboratories; W. R. Martin, University of Michigan, USA; and R. T. Ackroyd, University of London. Authors may select to have their papers published in a special issue of *Progress in Nuclear Energy*.

Requests for additional information should be addressed to Prof. A.J.H. Goddard, Nuclear Power Sect., Mech. Engg. Dept., Imperial College of Science, Technology, and Medicine, Exhibition Road, London SW7 2BX, U.K. (phone 01-589-5111 ext 6248/9; Fax 01-823-8845).

Nuclear Radiation Unfolding Conference

The Nuclear Radiation Unfolding Conference is planned for May 1-3, 1990, at Kirtland Air Force Base, New Mexico, by the Defense Nuclear Agency, Test Science and Technology Office. The conference is divided into Unclassified and Classified (Secret-Restricted Data, CNWDI) sessions. The conference will provide a forum for the discussion of the capabilities and limitations of the unfold techniques (time integrated and time dependent) being used to determine the radiation spectra from a nuclear source. Contributors are invited to submit an abstract on the following topics: The Mathematics of Codes; The Dependence of the Codes on the

Number and Type of Response Functions Utilized; The Energy Resolution of the Codes; The Goodness of Fit for the Unfolded Spectrum and the Dependence on the Number of Channels/Data Points; and The Amplification of Uncertainty (based on the uncertainty in the response functions and the nonunique nature of the unfold) in the Final Fold. Abstracts are due **March 5, 1990**, and should be submitted to Cpt. Russell B. Daniel, Technical Director, Radiation Environments, Defense Nuclear Agency, Test Directorate, Kirtland Air Force Base, NM 87115-5000 (phone 505-844-5596).

Radiation Shielding Short Courses Offered

The University of Texas at Austin is offering two short courses as described below. Registration information may be obtained from Continuing Engg. Studies, College of Engg., E.C.J. 10.324, The Univ. of Texas, Austin, TX 78712 (phone 512-471-3056).

Techniques in Nuclear Radiation Shield Analysis

is offered April 30-May 4, 1990, in Ft. Worth, Texas. The course is designed to help participants perform shield analysis and design calculations with greater confidence and obtain a better understanding of the underlying assumptions and simplifications used in many radiation protection computations. Emphasis will be placed on point-kernel techniques. Several PC code systems will be demonstrated and participants will execute sample problems with these codes.

Below Regulatory Concern (BRC) Radwaste Disposal

is offered Oct. 15-19, 1990, in Austin. The course will help students determine the radiological health impact of disposing short-lived radionuclide wastes in sanitary landfills. Procedures for determining what level of activity is below regulatory concern will be emphasized using the Nuclear Regulatory Commission code system IMPACTS-BRC on the PC and PATHRAE developed for the Environmental Protection Agency. Modifications of these codes for a BRC rule in Texas will be covered.

Calendar

Your attention is directed to the following events of interest.

March 1990

7th Pacific Basin Conference, Mar. 4-8, 1990, San Diego, California, sponsored by the ANS. Contact: ANS Meetings Department, 555 N. Kensington

Ave., La Grange Park, IL 60525 (phone 312-352-6611).

Radioactive Material Transportation Basic Workshop, Mar. 12-15, 1990, Oak Ridge, Tenn., sponsored by the U.S. Dept. of Energy. Contact: Teresa Yearwood, Science Applications International Corp., P.O. Box 2501, Oak Ridge, TN 37831 (phone 615-482-9031).

International Conference on Supercomputing in Nuclear Applications, Mar. 12-16, 1990, Mito City, Japan, sponsored by JAERI. Contact: Kiyoshi Asai, Computing Center, JAERI, Tokai-mura, Naka-gun, Ibaraki 319-11, Japan (phone 0292(82)5611; Fax 0292(82)6070).

Fuel Cycle 90 Conference, Mar. 25-28, 1990, Nashville, Tennessee, sponsored by the U.S. Council for Energy Awareness (USCEA). Contact: USCEA, Suite 400, 1776 I Street, NW, Washington, DC 20006-2495 (phone 202-293-0770).

April 1990

Workshop on Statistics of Human Exposure to Ionizing Radiation, Apr. 2-4, 1990, Oxford, U.K., sponsored by the CEC, the U.S. Dept. of Energy, and the Atomic Energy Control Board. Contact: Dr. J. Sinnaeve, CEC, DG XII/D/3, Rue de la Loi 200, B-1049 Brussels, Belgium, or M. C. O'Riordan, Chilton, Didcot, Oxon OX11 0RQ, UK.

26th Annual Meeting of the National Council on Radiation Protection and Measurement, Health and Ecological Implications of Radioactively Contaminated Sites, Apr. 4-5, 1990, Washington, D.C. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814.

International Conference for High-Level Radioactive Waste Management, April 8-12, 1990, Las Vegas, Nevada. Contact: Dean William Wells, Howard Hughes College of Engineering, UNLV, Las Vegas, NV 89154 (phone 702-739-3699).

3rd International Seminar on Finite Element and Allied Methods in Radiation Transport, Shielding, Reactor Physics and Geophysics Applications, Apr. 19-20, 1990, at the Imperial College of Science, Technology, and Medicine, in London. Contact: Prof. A.J.H. Goddard, Nuclear Power Section, Mechanical Engineering Department, Imperial College, London, SW7 2BX, U.K. (phone 01-589 5111 Ext. 6248/9, Fax 1 823 8845).

Radioactive Material Transportation Basic Workshop, Apr. 23-26, 1990, Albuquerque, N. M., sponsored by the U.S. Dept. of Energy. Contact: Teresa Yearwood, Science Applications International Corp., P.O. Box 2501, Oak Ridge, TN 37831 (phone 615-482-9031).

Physor '90, Apr. 23-26, 1990, Marseille, France. Contact: Yuri Orechwa, Engineering Physics Division, Bldg. 208, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, IL 60439 USA.

Respiratory Protection at Nuclear Facilities, a course offered Apr. 23-27, 1990, in Atlanta. Contact:

Radiation Safety Assoc., Inc., P.O. Box 107, Hebron, CT 06248 (phone 203-228-0487).

May 1990

Radioactive Material Transportation Basic Workshop, May 7-10, 1990, Chicago, Ill., sponsored by the U.S. Dept. of Energy. Contact: Teresa Yearwood, Science Applications International Corp., P.O. Box 2501, Oak Ridge, TN 37831 (phone 615-482-9031).

International Symposium on Radiation Protection Infrastructure, May 7-11, 1990, Munich, Fed. Rep. of Germany, sponsored by the IAEA. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400, Vienna, Austria.

7th Symposium on Radiation Measurements and Applications, May 21-24, 1990, the University of Michigan, Ann Arbor. Contact: Helen Lum, Symposium Secretary, 3034 Phoenix Memorial Laboratory, The University of Michigan, Ann Arbor, MI 48109-2100 (phone 313-764-6214; Fax 313-763-4540).

June 1990

American Nuclear Society Annual Meeting, June 10-15, 1990, Nashville, Tennessee. Contact: Mary Keenan, Meetings Manager, ANS, 555 N. Kensington Ave., La Grange Park, IL 60525 (phone 312-352-6611).

15th Symposium on Effects of Radiation on Materials, June 17-21, 1990, Nashville, Tennessee, sponsored by the American Society for Testing and Materials. Contact: Conferences, ASTM, 1916 Race St., Philadelphia, PA 19103 (phone 215-299-5400).

17th European Conference on Controlled Fusion and Plasma Heating, June 25-29, 1990, Amsterdam, The Netherlands. Contact: F. C. Schuller, FOM-Instituut voor Plasmafysica "Rijhuizen," Postbus 1207, NL-3430 BE Nieuwegein.

July 1990

3rd International Workshop on Respiratory Tract Dosimetry, July 1-3, 1990, Albuquerque, N. M., sponsored by the U.S. Dept. of Energy, CEC, and the Inhalation Toxicology Research Institute. Contact: Raymond A. Guilmette, Workshop Co-chairman, Inhalation Toxicology Research Inst., P.O. Box 5890, Albuquerque, NM 87185 (phone 505-844-5835).

5ièmes Journées d'Etudes sur la Chimie sous Rayonnement, July 1-6, 1990, Sherbrooke, Québec. Contact: Jean-Paul Jay-Gerin, JECR-90, Département de médecine nucléaire et de

radiobiologie, Faculté de médecine, Univ. de Sherbrooke, Sherbrooke, Québec, Canada J1H 5N4 (phone 819-563-5555, ext. 4682, Fax 819-564-5445; Bitnet S015@UDESVM). The conference language is French.

27th Annual International Nuclear and Space Radiation Effects Conference and Short Course, July 16-20, 1990, Reno, Nevada, sponsored by the Institute of Electrical and Electronics Engineers, Inc. Contact: Joseph R. Srour, Northrop Corp., M.S. X400/N5, 2301 West 120th St., P.O. Box 5032, Hawthorne, CA 90251-5032 (phone 213-600-4151).

August 1990

International Topical Meeting on Fast Reactor Safety, Aug. 12-16, 1990, Snowbird, Utah, sponsored by the ANS. Contact: Wayne K. Letho, Argonne National Laboratory, P.O. Box 2528, Idaho Falls, ID 83403-2528 (phone 208-526-7369).

Operational Radiation Protection, Aug. 20-22, 1990, Idaho Falls, Idaho, sponsored by the ANS. Contact: Jack Liebenthal, EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415-3515 (phone 208-526-1252).

7th ASTM-EURATOM Symposium on Reactor Dosimetry, Aug. 27-31, 1990, Strasbourg, France. Contact: G. Tsotridis, Joint Research Centre, Petten Establishment, HFR Div., Postbus 2, NL-1755 ZG, Petten, The Netherlands (phone 02246 5122, Telex REACP NL 57211, Fax 02246 1449) or G. P. Lamaze, National Inst. of Standards and Technology, Bldg. 235, Gaithersburg, MD 20899 USA (phone 301-975-6202, Telex 197 674 NBS UT, Fax 301-921-9847).

September 1990

16th Symposium on Fusion Technology, Sept. 3-7, 1990, London. Contact: JET Joint Undertaking, Conference Office, Abingdon, Oxon, OX14 3EA, United Kingdom.

Radioactive Materials Transportation Basic Workshop, Kennewick, Washington. Contact: Teresa Yearwood, SAIC, P.O. Box 2501, Oak Ridge, TN 37831 (phone 615-482-9031).

ENC'90, The World Conference and Exhibition, Looking Into Nuclear's Future in the 21st Century, Sept. 23-28, 1990, Geneva, Switzerland, organized by the European Nuclear Society in collaboration with the American Nuclear Society and the European Atomic Forum, Foratom. Contact: ENC '90 Secretariat, c/o ENS, P.O. Box 5032, CH-3001 Berne, Switzerland.

Symposium on Recent Advances in Multidisciplinary Analysis and Optimization, Sept. 24-26, 1990, San Francisco, sponsored by the U.S. Air Force and NASA. Contact: V. B. Venkayya, WRDC/FIBRA, WPAFB, OH 45433-6553 (phone 513-255-7191 or 513-255-6992).

Radiation Transport Calculations Using EGS4: A Four-Day Hands-on Course, Sept. 24-27, 1990, Ottawa, Canada. Contact: Dr. A. F. Bielajew, Div. of Physics, National Research Council of Canada, Ottawa, Canada, K1A 0R6 (phone 613-993-2715, Bitnet BLFNRCVM01).

International Conference on Monte Carlo Methods for Neutron and Photon Transport Calculations, Sept. 25-28, 1990, Budapest, Hungary. Contact: Dr. Lázló Koblinger, Central Research Inst. for Physics, P.O. Box 49, H-1525 Budapest, Hungary (Fax 36-1-15552530).

The Safety, Status and Future of Non-Commercial Reactors and Irradiation Facilities, Sept. 30-Oct. 4, 1990, Boise, Idaho, ANS Topical Meeting, sponsored by the Idaho Section and co-sponsored by The Commission of the European Communities (CEC), Atomic Energy Society of Japan, and the Nuclear Reactor Safety Division of the ANS. Contact: Dr. Romney B. Duffey, General Chairman, The Safety, Status and Future of Non-Commercial Reactors and Irradiation Facilities, P.O. Box 51218, Idaho Falls, ID 83405-1218 (phone 208-526-9804).

October 1990

Spectrum '90: Radioactive Waste Technologies, Decontamination, Decommissioning and Hazardous Wastes, Oct. 3-5, 1990, Knoxville, Tennessee, sponsored by ANS. Contact: Thomas H. Row, ORNL, P.O. Box 2008, 4500N MS6198, Oak Ridge, TN 37831-6198 (phone 615-574-5974 or FTS 624-5974).

9th Topical Meeting on Technology of Fusion Energy, Oct. 8-12, 1990, Chicago, sponsored by the American Nuclear Society. Contact: Dr. Charles Baker, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, IL 60439 (phone 312-972-4836, FTS 972-4836).

November 1990

Nuclear Energy Forum, Nov. 11-14, 1990, Washington, D. C., sponsored by the U.S. Council for Energy Awareness. Contact: Conference Office, U.S. Council for Energy Awareness, 1776 I Street, NW, Suite 400, Washington, DC 20006-2495 (phone 202-293-0770).

American Nuclear Society Winter Meeting, Nov. 11-16, 1990, Washington, D.C. Contact: Mary Keenan, Meetings Manager, ANS, 555 N. Kensington Ave., La Grange Park, IL 60525.

International Symposium on High-Dose Dosimetry for Radiation Processing, Nov. 12-16, 1990, Vienna, sponsored by IAEA. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna,

Austria.

September 1991

ICNC '91, International Conference on Nuclear Criticality Safety, September 1991, Oxford, United Kingdom. Contact: ICNC '91 Secretariat, Publicity Office, AEA Technology, Winfrith, Dorchester, Dorset DT2 8DH, United Kingdom (phone 0305 251888 ext 2739, Fax 0305 202122, Telex 41231).

JANUARY 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

J. Nucl. Sci. Technol., 26(8), 777-786, . . Validation of ORIGEN Computer Code by Measurements on Nuclear Fuels of JPDR-1, . . Ezure, H., . . Aug. 1989

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Book, . . Radiation Protection in Nuclear Energy, Vol. I & II, . . Howard Kito, P. - English Editor; Kaufmann, B. - English Editor, . . Apr 1988, . . In: Conference Proceedings, Sydney, 18-22 April 1988

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Using an Electron-Linac, . . Hayashi, S.A.; Kimura, I.; Kobayashi, K.; Yamamoto, S.; Mori, T.; Nakagawa, M., . . 1988, . . JAERI, . . In: International Conference, Mito, Ibaraki Japan 30 May - 3 Jun 1988

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CONF 880546, pp. 187-192, . . Review of the Nuclear Data Status and Requirements for Fusion Reactors, . . Cheng, E.T., . . May 1988, . . JAERI, . . International Conference, Mito, Ibaraki Japan 30 May - 3 Jun 1988

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CONF-900124, . . 19th International Symposium on Radioactive Isotopes in Clinical Medicine and Research, Bagastein, Austria, . . Jan 9-12, 1990 POC: Hofer, R., Abt. f. Nuklearmedizin, 2. Medizinische Univ. Klinik, Garnisogasse 13, A-1090 Vienna, Austria 0222

CONF-901019, . . *International Conference on Monte Carlo Methods in Neutron and Photon Transport*, Budapest, Hungary, . . Oct 9-12, 1990 POC: Dr. I. Lux, Hungarian Academy of Sciences, Central Research Institute, P.O. Box 49, H-1525 Budapest, Hungary

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