RSIC Newsletter

OAK RIDGE NATIONAL LABORATORY
POST OFFICE BOX X • OAK RIDGE, TENNESSEE 37831-6362
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC.
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Phone No. 615-574-6176 or FTS 624-6176
EasyLink Mailbox: 62813374
Telex(Answer Back): 854467(ORNL EPIC UD)
(For RSIC TELEX Communication Only)

No. 269 *April 1987*

Problems are only opportunities in work clothes.—Henry J. Kaiser

NEW DOE SPONSORSHIP/ACTIVITIES FOR RSIC

Feedback and other input to RSIC from the contributor/user community has led to new and/or expanded coverage by RSIC of subject areas related to nuclear reactor and space systems and to nuclear waste management programs. We are pleased to announce new sponsorship for these activities within the Department of Energy (DOE).

A new feature is added to the newsletter to call attention to EPIC support of activities directed towards qualifying (QA/QC) specific computing technology for use in DOE's Civilian Radioactive Waste Management programs. Beginning as an experimental clearinghouse function, we have accepted the first entry on behalf of the Technical Code Coordination Group (TCCG). See page 4, Civilian Radioactive Waste (CRW) Computing Technology.

Kiev to Host International Neutron Physics Conference

The *International Conference on Neutron Physics,* will be convened in Kiev, the Ukraine, USSR, September 21–25, 1987. The conference is sponsored by the USSR State Committee on Utilization of Atomic Energy with support from the Academy of Sciences of the USSR and the Academy of Sciences of the Ukrainian SSR.

The focus of the conference is on modern neutron physics problems with emphasis on the fundamental problems of neutron physics and nuclear data for nuclear technology and other branches. The principal topics include: Neutron and fundamental problems of physics; Theory of neutron reactions; Experimental research; Neutron processes in reactors; Neutron sources; and Open problems in neutron physics.

All correspondence concerning participation in the conference should be sent to the scientific secretary of the Organization Committee: M. F. Vlasov, USSR, 252028, Kiev-28, Prospekt Nauki 119, Institute for Nuclear Research of the Ukr. SSR Academy of Sciences (phone 653619).

CHANGES TO THE COMPUTER CODE COLLECTION

During the month seven changes were made to the computer code collection. Four new code systems were packaged and added to the collection, two existing code packages were replaced with newly frozen versions, and one code package was updated. Two changes resulted from foreign contributions.

CCC-370/DCHAIN2

A newly frozen version of this one-point depletion code for solving the coupled equation of radioactive growth and decay by the Bateman method was contributed by the Japan Atomic Energy Research Institute (JAERI), Tokai-mura, Naka-gun, Ibaraki-ken, Japan, via the OECD Nuclear Energy Agency (NEA) Data Bank, Gif-sur-Yvette, France. A library of nuclear data for 1172 fission products, including the data for half lives, decay schemes, neutron absorption cross sections, fission yields, and disintegration energies is included in the package. DCHAIN2 is used to compute compositions, radioactivity and decay heat of fission products. The gamma-ray spectrum of fission products can be computed with CCC-386/FPGAM using compositions from DCHAIN2. Reference: JAERI-M 8727. FORTRAN 77 and Assembler; IBM 3033.

CCC-393/MONK 6.3

This general purpose Monte Carlo neutronics code system has been replaced by a newly frozen version contributed by the Reactor Physics Division, UK Atomic Energy Authority (UKAEA), Winfrith, Dorchester, England, and the Chemical Plants, Laboratories and Criticality Group, UKAEA Safety and Reliability Directorate, Warrington, England, via the OECD Nuclear Energy Agency Data Bank, Gif-sur-Yvette, France. Written principally for criticality calculations relevant to the transport, storage, and processing of fissile material, MONK calculates the reactivity of an assembly of materials whose geometry can be described to almost any degree of complexity. It can now be run using various multigroup data sets including data from WIMS, MURAL, KENO and CCC-466/SCALE3. The package includes SCAN, a geometry checking routine which produces pictures on the line printer of a cross section through previous CCC-393/MONK 6.2. References: SRD-R-86 and SRD-R-88 and informal notes. FORTRAN H Extended, Assembler Language; IBM 3090.

CCC-493/QAD-CGGP

The additional coding recommended in the February 1987 *RSIC Newsletter* was incorporated into the IBM PC (B) and CRAY XMP (C) versions of this point kernel code for neutron and gamma-ray shielding calculations. In addition, all versions were corrected to avoid taking the logarithm of a negative number sometimes encountered for situations involving large mean free paths. We thank Ralph M. Parsons, Inc., Pasadena, California, for alerting us about the problem. The change required in FUNCTION BUILD is to redefine FDIFF = (FK40-1.)/(FK35-1.) following statement 200. Reference: Bechtel Report NE007 and informal notes. FORTRAN 77; IBM 3033 and Data General MV/4000 (A), IBM PC MICRO (B) (2 diskettes required) and CRAY XMP (C).

CCC-499 MICRO/PART61

This low-level, radioactive-waste impacts analysis system was contributed by Envirosphere Company, New York, and the U.S. Nuclear Regulatory Commission, Washington. The system of codes and data files implements an expansion of the impacts analysis methodology used during the development of the 10 CFR Part 61 rule to allow improved consideration of the cost and impact of treatment and disposal of low-level radioactive waste close to or exceeding Class C concentrations. The principal modifications to the methodology of Part 61 include: (1) an update of the low-level radioactive waste source term, (2) consideration of additional alternative disposal technologies, (3) expansion of the methodology used to calculate disposal costs, (4) consideration of an additional exposure pathway involving direct human contact with disposed waste due to a hypothetical drilling scenario, and (5) use of updated health physics analysis procedures (ICRP-30).

The routines provided are CLASIFY (classifies waste streams in four classes), IMPACTS (various impact measures), INVERSE (activity or concen-

tration limits), ECONOMY (costs of disposal), INTRUDE (impacts of an intruder), and VOLUMES (waste stream annual volumes). Ten data libraries provide information on radioactive waste streams and their physical, chemical, and radiological properties. References: NUREG/CR-4370, Vol. 1 and 2 (Jan. 1986). Microsoft Fortran 77 Version 3.30 (tested at RSIC with version 3.31) under PC DOS; IBM PC (or compatible). ***Eight*** *5.25-in. DSDD diskettes are required to obtain the entire package.*

CCC-509 MICRO/KUXKVPS

This solution for the shielding of medical X rays by the methods in NCRP Report No. 49 was contributed by Douglas J. Simpkin of the Department of Radiology, St. Lukes's Hospital, Milwaukee, Wisconsin. KUXKVPS calculates the thickness of shielding material required to bring the weekly exposure near an x-ray room down to the maximum permitted. Tube potentials allowed are 50, 70, 100, 125, and 150 kV. Shielding data from the literature are included in DATA statements for lead, concrete, gypsum, steel, and plate glass. The code was written in BASIC A and tested under PC-DOS (IBM PC). An executable file produced by a BASIC compiler is included and will run 8-10 times faster than the interpreted BASIC. An ASCII file is included for possible conversion to other systems. Reference: *Health Physics* **52**(4), (1987) and informal notes. BASIC; IBM PC.

PSR-242/SABRINA

This interactive three-dimensional geometry-modeling program for use with the CCC-200/MCNP Monte Carlo neutron and photon transport code system was contributed by Los Alamos National Laboratory (LANL), Los Alamos, New Mexico. In SABRINA, the user constructs geometry shapes and debugs spatial descriptions for complicated geometry models. This enhanced capability significantly reduces the effort of constructing and debugging complicated three-dimensional geometry models for Monte Carlo analysis. The graphics capabilities available in the PSR-243/CGS plotting package (see the following announcement) are compatible with the requirements of SABRINA. A TEKTRONIX-type monitor is required for plotting on a terminal. References: Los Alamos Report GR801 (December 1985), LA-10688-M (October 1986), and RSIC Informal Notes (April 1987). FORTRAN 77; VAX 11 and 8600. The code was run at ORNL on the VAX 8600 under VAX/VMS. The distribution will be in VAX Backup format.

PSR-243/CGS

This general purpose graphics system, contributed by LANL, is a library of Fortran subroutines that provides general purpose graphics. The CGS subroutines are divided into three functional groups. The viewing subroutines define the plotting limits and placement of the graphics output on the graphics view surfaces. The output subroutines generate graphics images as well as prepare a surface for plotting. The attribute subroutines control the appearance of the graphics output. Also included are the CGSHIGH and NCAR graphics packages which provide high level plotting. The PSCAN postprocessor can be used to display and edit selected pages of a CGS metafile at a TEKTRONIX terminal. The PXXLIB library of subroutines can be used to write a CGS metafile postprocessor for new graphics devices and devices supported by non-CGS graphics libraries. A TEKTRONIX-type monitor is required for plotting on a terminal. References: Los Alamos Reports LA-5525-M (May 1982), GR801 (December 1985), GR800 (December 1985), GR864 (November 1985), GR806 (February 1986), GR805 (October 1985), GR803 (August 1984) and RSIC Informal Notes (April 1987). FORTRAN 77; VAX 8600 under VAX/VMS. Distribution will be in VAX Backup format.

CHANGE TO THE DATA LIBRARY COLLECTION

An existing data library was enhanced with an additional version.

DLC-105B/MCNPDAT

This compilation of cross-section data for use in MCNP, Version 3A, was contributed by LANL. This version, denoted DLC-105B/MCNPDAT, is a supplement to the CCC-200/MCNP3A package announced in the March 1987 *RSIC Newsletter*, containing extensive sets of data based on ENDF/B-V. The various libraries are as follows:

RMCCS1: 64 cross-section tables from ENDF/B-V, LANL and ENDL85.

RMCCSA1: 27 cross-section tables from ENDF/B-V, LANL and ENDL85.

ENDF5U1: 31 cross-section tables from ENDF/B-V.

DRMCCS1: 91 cross-section tables from ENDF/B-V, LANL and ENDL85. These discrete data correspond to RMCCS1 and RMCCSA1.

ENDF5P1: 23 cross-section tables from ENDF/B-V.

ENDF5T1: 43 cross-section tables from ENDF/B-V.

DRE51: 54 cross-section tables from ENDF/B-V. These discrete data correspond to ENDF5P1 and ENDF5U1.

A program, MAKXSF, is provided to translate the data libraries into binary format, which will cut down on the running time of MCNP. References: Informal notes and LA-7396-M, Rev. 2 (September 1986). There are 2,142,077 records; two 6250-bpi, 9-track tapes are required to obtain the complete library.

CIVILIAN RADIOACTIVE WASTE (CRW) COMPUTING TECHNOLOGY

The following code package collection is maintained as part of a specialized activity under the umbrella of the Engineering Physics Information Centers (EPIC) under the guidance of the DOE/OCRWM/TCCG. One code system has been contributed to the CRW collection.

CRW-001/COBRA-SFS

This code system for performing thermal-hydraulic analysis of spent fuel storage systems was contributed by Pacific Northwest Laboratory, Richland, Washington. It may be used to model a wide range of flow problems, including natural circulation within an enclosed system. Other features include three-dimensional solid conduction and detailed radiation heat transfer in rod bundles. COBRA-SFS solves a set of incompressible subchannel equations for mass and momentum conservation in the coolant and energy conservation in the fuel rods, solid structures, and coolant. Radiation heat transfer is modeled using detailed exchange factors. An auxiliary program, RADX-1, generates radiation exchange factors for fuel pins in square arrays to be used as input to COBRA-SFS. COBRA-SFS has been used on LTSS and CTSS operating systems. Version 1.11 of the CFT compiler and CFTLIB were used to execute the sample case on the CRAY X-MP/1 computer running CTSS at ORNL. References: PNL-6049, Vol. I and II (November 1986). FORTRAN 77; CDC 7600 and CRAY.

Visitors to RSIC

During the month the following persons came for an orientation visit and/or to use RSIC facilities: *Cpt. Anthony B. Strines, Jr.; Cpt. Claude H. Fore, III; Cpt. William D. Metzler;* and *Cpt. Denis E. Beller,* U.S. Air Force, Wright-Patterson AFB, Ohio; *Cpt. Norman Davis,* U.S. Marine Corps, Fairborn, Ohio; *1Lt. John C. Lucas,* U.S. Air Force, Dayton, Ohio; *John C. Botha,* ESCOM, South Africa; *Jon A. Broadway,* U.S. Environmental Protection Agency, Montgomery, Alabama; *David Auslander,* Univ. of Tennessee, Knoxville; *Shigetoshi Iwanaga,* Nuclear Safety Technology Cen-

ter, Tokyo; and *Tetsuo Kobori,* Power Reactor and Nuclear Fuel Development Corp., Tokyo.

Calendar

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

May 1987

4th International Hazardous Waste Symposium on Environmental Aspects of Stabilization-Solidification of Hazardous and Radioactive Wastes, May 3–6, 1987, Atlanta, Georgia, sponsored by ASTM Committee-34 on Waste Disposal, Environment Canada, and ORNL. Contact: T. Michael Gilliam, Bldg. 3017, ORNL, Oak Ridge, TN 37831 USA (phone 615-574-6820); or Pierre Cote, Environmental Canada, Wastewater Technology Centre, P.O. Box 5050, Burlington, Ontario L7R4A6 (phone 416-336-4605).

Control of Occupational Exposures in Nuclear Power Plants, May 11–15, 1987, Boston, Massachusetts, a course sponsored by the Harvard School of Public Health. Contact: Dade W. Moeller, Office of Continuing Education, 677 Huntington Ave., Boston, MA 02115 (phone 617-732-1171).

Advanced Course on Optimization of Radiation Protection, May 17–22, 1987, Brookhaven National Laboratory, Upton, New York, sponsored by Brookhaven National Laboratory ALARA Center, the U.S. Nuclear Regulatory Commission, and the Commission of European Communities. Contact: John W. Baum, Brookhaven National Laboratory, Bldg. 535A, Upton, NY 11973 (phone 516-282-4214); or Marie Cooney (phone 516-282-7716).

6th Symposium on Reactor Dosimetry, May 31–June 5, 1987, Jackson Hole, Wyoming, sponsored by the American Society for Testing and Materials, and the Commission of the European Communities in cooperation with the International Atomic Energy Agency. Contact: G. R. Lamaze, National Bureau of Standards, Bldg. 235, Gaithersburg, MD 20899 (phone 301-921-2767) or H. Röttger, Joint Research Centre, Petten Establishment, HFR Div., Postbus 2, 1755 ZG Petten, The Netherlands.

June 1987

Techniques in Nuclear Radiation Shield Analysis, June 1–5, 1987, Dallas, Texas, a course sponsored by the University of Texas at Austin. Contact: Mike Jackson, Continuing Engineering Studies, Office of the Dean, ECJ 10.234, College of Engineering, The University of Texas at Austin, Austin, TX 78712.

American Nuclear Society Annual Meeting, June 7–12, 1987, Dallas, Texas. Contact: ANS, Meeting Dept., 555 N. Kensington Ave., La Grange Park, IL 60525 (phone 312-352-6611).

27th Annual International Conference of the Canadian Nuclear Association and 8th Annual Conference of the Canadian Nuclear Society, Saint John, New Brunswick, Canada. Contact: CNA, 111 Elizabeth St., 11th Floor, Toronto, Ont., Canada M5G 1P7 (phone 416-977-6152).

Application of Computer Technology to Radiation Protection, June 22–26, 1987, Bled, Yugoslavia, sponsored by the IAEA. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna.

July 1987

32nd Annual Meeting of the Health Physics Society, July 5–9, 1987, Salt Lake City, Utah. Contact: John W. Poston, Sr., Dept. of Nuclear Engr., Texas A&M Univ., College Station, TX 77843-3133 (phone 409-845-4161).

Advanced Workshop on Occupational & Environmental Radiation Protection, July 13–17, 1987, Boston, Massachusetts,a course sponsored by the Harvard School of Public Health. Contact: Dade W. Moeller, Office of Continuing Education, 677 Huntington Ave., Boston, MA 02115 (phone 617-732-1171).

8th International Congress of Radiation Research, July 19–24, 1987, Edinburgh, United Kingdom, sponsored by the International Association for Radiation Research. Attendance is by application and invitation. Contact: E. Martin Fielden, IARR, Div. Radioprotezione CSN Casaccia, Rome, Italy.

August 1987

23rd Nuclear Accident Dosimetry Intercomparison, Aug. 10–14, 1987, Oak Ridge, Tennessee, sponsored by ORNL. Contact: R. E. Swaja or C. S. Sims, ORNL, Bldg. 7710, P.O. Box X, Oak Ridge, TN 37831-6379 (phone 615-574-5851).

Occupational and Environmental Radiation Protection, Aug. 10–14, 1987, Boston, Massachusetts, a course sponsored by the Harvard School of Public Health. Contact: Dade W. Moeller, Office of Continuing Education, 677 Huntington Ave., Boston, MA 02115 (phone 617-732-1171).

9th International Conference on Structural Mechanics in Reactor Technology (SMiRT-9), Aug. 17–21, 1987, Lausanne, Switzerland, sponsored by the International Association for Structural Mechanics in Reactor Technology, the Commission of the European Communities, and the École Polytechnique Fédérale de Lausanne. Contact: Folker H. Wittmann, École Polytechnique Fédérale de Lausanne, SMiRT-9, Chemin de Bellerive 32, CH-1007 Lausanne, Switzerland.

International Conference on Nuclear Fuel Reprocessing and Waste Management, Aug. 24–28, 1987, Paris, sponsored by the American Nuclear Society and the European Nuclear Society. Contact: Lloyd McClure, Westinghouse Idaho Nuclear Co., Idaho Chemical Processing Plant, P.O. Box 4000, Idaho Falls, ID 83401.

Seminar on the Adoption, Application and Implementation of the Agency's Regulations for the Safe Transport of Radioactive Materials, Aug. 31–Sept. 4, 1987, Vienna, sponsored by the International Atomic Energy Agency. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400, Vienna, Austria.

September 1987

Pacific Basin Nuclear Conference, Sept. 6–11, 1987, Beijing, People's Republic of China, sponsored by the Chinese Nuclear Society and the American Nuclear Society. Contact: Xu Honggui, Chinese Nuclear Society, P.O. Box 2125, Beijing, People's Republic of China, or ANS, 555 North Kensington Ave., La Grange Park, IL 60525 (phone 312-352-6611).

ANS/ENS International Conference on Fast Breeder Reactor Systems: Experience Gained and Path to Economical Power Generation, Sept. 13–17, 1987, Richland, Washington. Contact: M. C. Carelli, Westinghouse-AESD, P.O. Box 158, Madison, PA 15663 (phone 412-722-5284), or W. Marth, Kernforschungszentrum Karlsruhe, Postfach 3640, D-7500 Karlsruhe 1, F. R. Germany.

Introduction to Internal Dosimetry, Sept. 21–25, 1987, a course sponsored by the Quantum Technology Training Center, Atlanta, Georgia.

Monte Carlo Transport of Electrons and Photons Below 50 MeV, Sept. 24–Oct. 3, 1987, Trapani, Italy. The closing date for application has been extended to May 15, 1987 (see July 1986 *RSIC Newsletter* for details). Contact: David W. O. Rogers, Ionizing Radiation Standards, National Research Council of Canada, Ottawa, Ontario K1A OR6 Canada (phone 613-993-2715).

October 1987

Annual Congress of the Association for Radiation Protection, Oct. 6–9, 1987, Basel, Switzerland. Contact: Fachverband f. Strahlenschutz e.V., c/o H. Brunner, Abt. SU/81, Eidg. Institut f. Reaktorforschung (EIR), CH-5303 Würenlingen, Switzerland (phone 0041 56-99 2350).

6th Symposium on Neutron Dosimetry, Oct. 12–16, 1987, Neuherberg, F. R. Germany, sponsored by the Commission of the European Communities, Society for Radiation and Environmental Research, and the U.S. Department of Energy. Contact: Gesellschaft f. Strahlen- und Umweltforschung mbH, München, Dr. H. Schraube, Ingolsta—dter Landstr. 1, D-8042 Neuherberg, F. R. Germany.

12th Symposium on Fusion Engineering, Oct. 27–30, 1987, Princeton, New Jersey. Contact: IEEE, Technical Activities Dept., 345 E. 47th Street, New York, NY 10017 (phone 212-705-7895).

November 1987

Joint Meeting of the ANS and the Atomic Industrial Forum, Nov. 15–19, 1987, Los Angeles, California. Contact: Meetings Dept., ANS, 555 N. Kensington Ave., La Grange Park, IL 60525 (phone 312-352-6611).

February 1988

Waste Management '88: Symposium on Radioactive Waste Management, Feb. 26–Mar. 3, 1988, Tucson, Arizona, sponsored by the University of Arizona. Contact: M. Wacks, Dept. of Nuclear and Energy Engineering, University of Arizona, Tucson, AZ 85721 (phone 602-621-2475).

April 1988

Workshop on Non-ionising Radiation Biological Effects, Protection and Standards, Apr. 5–8, 1988, Melbourne, Australia. Contact: J. C. Button, Scientific Secretary, IRPA 7, Health and Safety Div., Australian Atomic Energy Commission, Private Mail Bag, Sutherland, NSW 2232 Australia.

Seventh International Congress of the International Radiation Protection Association (IRPA 7), Apr. 10–17, 1988, Sydney, Australia. Contact: J.C.E. Button, Scientific Secretary, IRPA 7, Health & Safety Div., Australian Atomic Energy Commission, Private Mail Bag, Sutherland, N.S.W. 2232, Australia (phone 61-2-543-3295) (Telex: AA.24562).

International Conference on Radiation Protection Principles in Nuclear Energy, Apr. 18–22, 1988, Sidney, Australia, sponsored by the IAEA. Contact: W. Porter, IE-13, U.S. Dept. of Energy, Forrestal, Washington, DC 20585 (phone 202-252-4573).

September 1988

Industrial Radiation and Radioisotope Measurement Applications, Sept. 6–8, 1988, Pinehurst, North Carolina, a topical meeting sponsored by the Isotopes and Radiation Division of the ANS. Contact: Robin P. Gardner, General Chairman, or Kuruvilla Verghese, Tech. Program Chairman, North Carolina State Univ., School of Engineering, Box 7909, Raleigh, NC 27695-7909.

MARCH 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-208, . . *Design Analyses of Self-Cooled Liquid Metal Blankets.,* . . Gohar, Y., . . December 1986, . . NTIS, PC A04/MF A01

BNL-NCS-52028, . . *Compilation of Requests for Nuclear Data.,* . . Rose, P.F.; Daly, A., . . January 1987, . . NTIS

CLM-P-787, . . *Radiological Implications of Low Activation Steels as Structural Materials in Fusion Reactors.,* . . Hancox, R.; Mitchell, B.; Butterworth, G.J., . . September 1986, . . UKAEA Culham Lab., Abingdon

CLM-R-266, . . *Computer Codes for the Engineering Design of Fusion Experiments.,* . . Jukes, J.D., . . June 1986, . . UKAEA Culham Lab., Abingdon

EGG-M-21783; CONF-8310104-9, . . *Measuring Delayed Neutron Spectra---A Comparison of Techniques.,* . . Greenwood, R.C.; Caffrey, A.J., . . October 1983, . . NTIS, PC A03/MF A01; MF available from INIS

EPRI-NP-3513, . . *Postaccident Liquid Sampling Systems.,* . . Davidson, G.R.; Lahti, G.P.; Binney, S.E.; Ingle, J.D.,Jr.; Westall, J.C., . . May 1984, . . Research Reports Center, Box 50490, Palo Alto, CA 94303

EPRI-NP-4437, . . *Structured Sensitivity Analyses Using the MAAP 2.0 Computer Code.,* . . Mendoz, Z.T.; Hall, J.M., . . October 1986, . . Research Reports Center, Box 50490, Palo Alto, CA 94303

EPRI-NP-4735, . . *Radiation Effects on Lubricants. Final Report.,* . . Bolt, R.O., . . August 1986, . . Research Reports Center, Box 50490, Palo Alto, CA 94303

EPRI-NP-4805, . . *Prediction of In-Core Gamma Effects. Final Report.,* . . Harris, D.R.; Suk, S., . . October 1986, . . Research Reports Center, Box 50490, Palo Alto, CA 94303

ERPI-NP-4887, . . *The CASTOR-V/21 PWR Spent-Fuel Storage Cask: Testing and Analyses.,* . . Dziadosz, D.; Creer, J.M.; Schoonen, D.H., . . November 1986, . . Research Reports Center, Box 50490, Palo Alto, CA 94303

EPRI-NP-5058, . . *Testing of the ENDF/B-V Nuclear Data Library in Thermal Benchmark Experiments.,* . . Schmidt, E.; Rose, P.F., . . February 1987, . . Research Reports Center, Box 50490, Palo Alto, CA 94303

EUR-6813,V.2, pp.683-692; CONF-791051,V.2, pp.683-692, . . *Covariances of Fission-Integral Measurements at the NBS ^{252}Cf and ISNF Facilities and at the ORNL-PCA Facility.,* . . Wagschal, J.J.; Maerker, R.E., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

EUR-6813,V.2, pp.721-731; CONF-791051,V.2, pp.721-731, . . *Unfolding by Least-Squares Methods: SAND-II, STAY'SL.,* . . Matzke, M., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

EUR-6813,V.2, pp.779-786; CONF-791051,V.2, pp.779-786, . . *Multialgorithm Unfolding Studies of Neutron Spectra from Activation Detectors.,* . . Routti, J.T.; Sandberg, J.V., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

EUR-6813,V.2, pp.787-806; CONF-791051,V.2, pp.787-806, . . *Comparison of Four Neutron Spectrum Unfolding Codes.,* . . Zijp, W.L.; Nolthenius, H.J., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

EUR-6813,V.2, pp.919-927; CONF-791051,V.2, pp.919-927, . . *Benchmark Referencing of Neutron Dosimetry Measurements.,* . . Eisenhauer, C.M.; Grundl, J.A.; Gilliam, D.M.; McGarry, E.D.; Spiegel, V., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

EUR-6813,V.2, pp.928-936 CONF-791051,V.2, pp.928-936, . . *Review of ANS Special Session on Radiation Streaming in Power Reactors.,* . . Lee, R.R., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

EUR-6813,V.2, pp.1220-1228; CONF-791051,V.2, pp.1220-1228, . . *Measured and Calculated Radiation Environments of 170, 600 and 1000-Meters from an Air Equilibrated Fission Source.,* . . Meason, J.L.; Harris, D.C.; Flanders, T.M.; Stevens, S.W.; Luera, T.F.; O'Kuma, J.H., . . 1980, . . NTIS (U.S. Sales Only), PC A99/MF A01

FEI-1314 (In Russian), . . *Investigation of Leakage Spectra of Neutrons and Gamma-Quanta from the Surface of Molybdenum Prisms.,* . . Bezhunov, G.M.; Volkov, V.S.; Kremenetskij, A.K., . . 1982, . . MF available from INIS

INDC(CCP)-265/L, . . *Evaluation of Neutron-^{6}Li and -^{7}Li Interaction Cross-Sections for Calculating Kerma Factors.,* . . Bondarenko, I.M.; Petrov, Eh.E., . . December 1986, . . IAEA Nuclear Data Section, Wagramerstrasse 5, A-1400 Vienna

INIS-mf-9065, pp.19-21, . . *The Use of Computers in Neutron Activation Analysis.,* . . Fardy, J.J.; Bowles, C.J.; Porritt, R.E.J., . . November 1983, . . MF available for INIS

INIS-SU-236, pp.151-155 (In Russian), . . *Monte-Carlo Calculation Results of Gamma Radiation Transmission Through Matter.,* . . Sheda, J.; Musilek, L.; Chekhak, T., . . 1983, . . MF available from INIS

LA-10725-M, . . *Tokai Densitometer Manual: Program for Technical Assistance to IAEA Safeguards (USA/IAEA), Department of Energy, Safeguards and Security.,* . . Sprinkle, J.K.,Jr.; Hsue, S.-T.; Junck, K., . . January 1987, . . NTIS

LA-UR-86-3705, . . *Requirements for Charged-Particle Reaction Cross Sections in the D-T, D-D, T-T and D-^{3}He Fuel Cycles.,* . . Jarmie, N., . . December 1986, . . Los Alamos National Laboratory, Los Alamos, New Mexico 87545

NUREG/CR-3585, Vol.2, . . *De Minimis Waste Impacts Analysis Methodology: IMPACTS-BRC User's Guide and Methodology for Radioactive Wastes Below Regulatory Concern. (Draft report for comment),* . . Forstom, J.M.; Goode, D.J., . . July 1986, . . NRC

NUREG/CR-4289, . . *Residual Radionuclide Contamination Within and Around Commercial Nuclear Power Plants: Assessment of Origin, Distribution, Inventory and Decommissioning.,* . . Abel, K.H.; Robertson, D.E.; Thomas, C.W., . . February 1986, . . NRC

NUREG/CR-4374, Vol.3, . . *A Review of the OCO-NEE-E Probabilistic Risk Assessment: Containment Performance, Radiological Source Terms and Risk Estimates.,* . . Park, C.K.; Agrawal, A.K.; Khatib-Rahbar, M., . . June 1986, . . NRC

NUREG/CR-4499, . . *CONTAIN Code Calculations of the Effects on the Source Term of CsI to I_2* Conversion Due to Severe Hydrogen Burns., . . Valdez, G.D., . . October 1986, . . NRC

ORNL/CSD/TM-239, . . *HEATING6 Analysis of International Thermal Benchmark Problem Sets 1 and 2.,* . . Childs, K.W.; Bryan, C.B., . . October 1986, . . NTIS

PNL-5802, . . *COBRA-SFS Thermal-Hydraulic Analysis Computer Code. Volume II---User's Manual.,* . . Rector, D.R.; Cuta, J.M.; Lombardo, N.J., . . December 1986, . . Pacific Northwest Lab., Richland, WA

STI/PUB/708; BOOK - Safety Series No.72, . . *Principles for Establishing Intervention Levels for the Protection of the Public in the Event of a Nuclear Accident or Radiological Emergency.,* . . IAEA, . . 1985, . . IAEA, Vienna ISBN 92-0-623085-9

Ann. Nucl. Energy, 11(3), 97-109, . . *Computation Accuracy and Efficiency of a Polynomial Nodal Method for Diffusion and Spatial Burnup Problems.,* . . Brega, E.; Pasquantonio, D.Di.; Salina, E., . . 1984

Arab J. Nucl. Sci. Appl., 15(1), 61-75, . . *A Method for Unfolding Proton Recoil Spectra.,* . . Megahid, R.M.; Gaafar, M.A.; El-Shereef, A.I., . . January 1982

ATOMKI (At. Kut. Intez.) Koezl., 25(3), 77-83 (In Hungarian), . . *Estimation of the Removal Cross Section by Monte Carlo Method.,* . . Divos, F., . . September 1983

Chungnam J. Sci., Chungnam Natl. Univ., 10(2), 81-89 (In Korean), . . *Study on the Measurement and Analysis of Neutron Spectra in the Nuclear Reactor Core.,* . . Yang, J.C., . . 1983

Health Phys., 52(3), 267-280, . . *Fallout Sheltering: Is It Feasible?,* . . Ehrlich, R.; Ring, J., . . March 1987

Health Phys., 52(3), 367-370, . . *Occupational Radiation Exposures During Maintenance Activities at Nuclear Power Plants in Japan.,* . . Imahori, A., . . March 1987

Health Phys., 52(3), 385-387, . . *Marble Attenuation Characteristics for Diagnostic X Rays.,* . . Abdul-Majid, S., . . March 1987

Jad. Energ., 29(8-9), 319-323, . . *Study of Shielding Characteristics of Certain Materials. II.,* . . Prouza, Z.; Hermanska, J.; Neruda, O.; Cerny, J.; Ustav, J.E.; Spurny, F., . . August-September 1983

Kernenergie, 23(11), 372-379, . . *On the Relation Between Adjoint and Importance Function in Monte Carlo Solutions of Linear Particle Transport Problems. 2.,* . . Noack, K., . . November 1980

Kernenergie, 27(7), 299-304 (In German), . . *Minimax Approximations to a Function of Two Variables for Shielding Calculations (Secant Integral).,* . . Boettcher, A., . . July 1984

Med. Phys., 13(5), 687-694, . . *Differences in Electron Depth-Dose with EGS and ETRAN and Improved Energy-Range Relationships.,* . . Rogers, D. W.O.; Bielajew, A.F., . . September-October 1986

N.E.A. Data Bank Newsl. No.30, 7-15, . . *Finite Element Computational Methods for Neutron Diffusion and Neutron Transport.,* . . Kavenoky, A.; Lautard, J.J., . . December 1983

N.E.A. Data Bank Newsl. No.30, 52-108, . . *The Solution of the Two-Dimensional Steady State Transport Equation by a Reduction to a Set of Coupled Diffusion Order Equations.,* . . Grenfell, D.T., . . December 1983

N.E.A. Data Bank Newsl. No.30, 287-304, . . *Applicability of Finite Elements to Transport Theory (The Code TRIDENT).,* . . Dudziak, D.J.; Stepanek, J., . . December 1983

Nucl. Instrum. Methods, 220(2,3), 517-524, . . *Comparison of the Results of Neutron Flux and Energy Measurements with the Predictions of Theoretical Calculations for a Coaxial 14 MeV Neutron Tube.,* . . Bahal, B.M.; Fanger, H.U., . . March 1, 1984

Nucl. Instrum. Methods, 220(2/3), 531-536, .. *The Application of Thermal Neutron Capture Gamma Rays to Matrix Identification in a Transuranic Waste Assay System Based on an Electron Accelerator.,* . . Close, D.A.; Franks, L.A.; Kocimski, S.M., . . March 1, 1984

Nucl. Instrum. Methods, A253(1), 113-118, . . *Measurements and Calculations on the Shielding Effect of Small Slabs for 14 MeV Neutrons.,* . . Bashter, I.I.A.; Cooper, P.N., . . December 15, 1986

Nucl. Technology, 77(1), 60-67, . . *Exposure Buildup Factors of High-Energy Gamma Rays for Water, Concrete, Iron, and Lead.,* . . Hirayama, H., . . April 1987

Nucl. Technology, 77(1), 68-81, . . *Coal Analysis with Gamma Rays from Capture of ^{252}Cf Neutrons--- Experimental Equipment Designs and Results.,* . . Duffey, D.; Wiggins, P.F., . . April 1987

Nucl. Technology, 77(1), 97-109, . . *A Monte Carlo Model for On-Line Neutron Capture Prompt Gamma-Ray Analysis of Coal in Transmission Geometry.,* . . Yuan, Y.L.; Gardner, R.P.; Verghese, K., . . April 1987

Radiation Res., 101, 213-224, . . *Calculations for Distributions in Water for 10-MeV Electrons.,* . . Ozdemir, A.; Teng, S-P.; Lindstrom, D.G.; Anderson, D.W., . . 1985

Soviet J. At. Energy(English Transl.), 48(3), 219-220, . . *Energy Distribution of Fast Neutrons in the F-1 Uranium-Graphite Reactor.,* . . Kanareikin, V.A.; Tyryshkin, V.M.; Yuzgiv, V.S., . . March 1980

Soviet J. At. Energy(English Transl.), 50(2), 126-128, . . *Transformation of the Multiple Scattered Gamma Radiation Spectra in Different Media.,* . . Artsybashev, V.A., . . February 1981

Soviet J. At. Energy(English Transl.), 50(2), 137-138, . . *Exact Solutions of Transport Equation in the -Forward-Backward- Approximation.,* . . Zhemchugov, V.P., . . February 1981

Soviet J. At. Energy(English Transl.), 52(3), 209-212, . . *Procedure for Determining the Optimal Dose Ratio of a Deterministic and a Probabilistic Source.,* . . Barsov, P.A.; Kolomenskii, A.V.; Sakovich, V.A., . . March 1982

Soviet J. At. Energy(English Transl.), 53(2), 572-574, . . *Multigroup System of Constants for Calculating High-Energy Neutron Transport.,* . . Vyrskii, M.Yu.; Bubinin, A.A.; Ilyushkin, A.I.; Kolesov, V.E.; Krivtsov, A.S.; Longe, I.I.; Mashkovich, V.P.; Sakharov, V.K., . . August 1982

Soviet J. At. Energy(English Transl.), 54(3), 222-224, . . *Approximate Solution of the Gamma-Quanta Transfer Equation in Straight-Ahead Scattering.,* . . Zhemchugov, V.P., . . March 1983

Soviet J. At. Energy(English Transl.), 54(5), 382-384, . . *A Technique of Measuring Neutron Spectra of Powerful Sources.,* . . Anikin, G.V.; Kotukhov, I.I., . . May 1983

Soviet J. At. Energy(English Transl.), 55(1), 495-498, . . *Optimizing Heterogeneous Shielding Compositions by a Sequential Simplex Method.,* . . Nikitin, N.V.; Sazykin, B.V., . . July 1983

Soviet J. At. Energy(English Transl.), 55(3), 608-609, . . *Effect of Collimation of a Monoenergetic Source on the Accumulation Factor.,* . . Zav'yalkin, F.M.; Osipov, S.P., . . September 1983

Soviet J. At. Energy(English Transl.), 55(3), 615-618, . . *Dose Factors of the Build-Up of Collimated Gamma Radiation in a Shielding Geometry for Cylindrical Media Consisting of Water, Aluminum, and Iron.,* . . Vasil'ev, M.B.; Chuvashev, N.F., . . September 1983

Soviet J. At. Energy(English Transl.), 55(4), 686-687, . . *Dose Buildup Factors of Collimated Gamma Radiation Behind Steel and Aluminum Plates.,* . . Vasil'ev, M.B.; Chuvashev, N.F., . . October 1983

Trans. Theory and Stat. Phys., 16(1), 1-59, . . *Slowing Down of Fast Particles in Fluids.,* . . Ligou, J., . . 1987

BOOK, . . *NUCLEAR POWER: A RATIONAL APPROACH. Fourth Edition.,* . . Deutsch, R.W., . . 1987, . . GP Courseware, Inc., Columbia, MD 21044 $4.95

BOOK, . . *HANDBOOK ON THE PHYSICS AND CHEMISTRY OF THE ACTINIDES.,* . . Freeman, A.J., . . 1986, . . North-Holland, Amsterdam

BOOK, . . *RADIATION DOSIMETRY: PHYSICAL AND BIOLOGICAL ASPECTS.,* . . Orton, C.G., . . 1986, . . Plenum Press, New York, NY

COMPUTER CODES LITERATURE

AAEC/E-620 ..... ICPP
ICPP - A Collision Probability Module for the AUS Neutronics Code System., . . Robinson, G.S., . . Australian Atomic Energy Commission Research Establishment, Lucas Heights, . . October 1985, . . AVAIL: INIS (Microfiche only)

AAEC/E-621 ..... EDITAR
EDITAR: A Module for Reaction Rate Editing and Cross-Section Averaging Within the AUS Neutronics Code System., . . Robinson, G.S., . . Australian Atomic Energy Commission Research Establishment, Lucas Heights, . . March 1986, . . AVAIL: INIS (Microfiche only)

AAEC/E-624 ..... CHAR; BURNMAC
CHAR and BURNMAC - Burnup Modules of the AUS Neutronics Code System., . . Robinson, G.S., . . Australian Atomic Energy Commission Research Establishment, Lucas Heights, . . March 1986, . . AVAIL: INIS (Microfiche only)

DOE/RL-01030-T3 ..... DIFFUSION
Analytic Solution for One-Dimensional Diffusion of Radionuclides from a Waste Package., . . Oliver, D.L., . . Rockwell International Corporation, Richland, WA, . . March 1985, . . AVAIL: NTIS; INIS (Microfiche only)

EGG-PBS-6768 ..... GAUSS VIII
GAUSS VIII: A Computer Program for the Nuclide Activity Analysis of Gamma-Ray Spectra from GE Semiconductor Spectrometers., . . Putnam, M.H.; Helmer, R.G.; McCullagh, C.M., . . EG and G Idaho, Idaho Falls, ID, . . December 1985, . . AVAIL: NTIS; INIS (Microfiche only)

Fusion Technol., 8(1), 581-585 ..... ATHENA
Analysis of a Liquid Metal Cooled Blanket Transient Using ATHENA., . . Roth, P.A.; Chow, H., . . EG and G Idaho, Idaho Falls, ID, . . July 1985

Fusion Technol., 8(1), 608-613 ... NEWLIT; MCNP
NEWLIT - A General Code for Neutron Wall Loading Distribution in Toroidal Reactors., . . Attaya, H.M.; Sawan, M.E., . . Fusion Technology Institute, University of Wisconsin, Madison, . . July 1985

Fusion Technol., 8(2), 2582-2586 ..... HTO
Development of a Tritium Dispersion Code., . . Bell, R.P.; Davis, M.W.; Joseph, S.; Wong, K.Y., . . Monserco Limited, Mississauga, Ontario, . . September 1985

IAEA-NDS-79 (Rev.0) PLOTC4
Program PLOTC4 (Version 86-1). Plot Evaluated Data from the ENDF/B Format and/or Experimental Data Which is in a Computation Format., . . Cullen, D.E., . . International Atomic Energy Agency, Vienna, Austria, . . September 1986, . . AVAIL: INIS (Microfiche only)

IAEA-NDS-80 (Rev.0) X4TOC4
Program X4TOC4 (Version 86-1). Translation of Experimental Data from the EXFOR Format to a Computation Format., . . Cullen, D.E., . . International Atomic Energy Agency, Vienna, Austria, . . September 1986, . . AVAIL: INIS (Microfiche only)

INIS-mf-10467, 17-20 ..... NEUTRON TRANSPORT THEORY
On the Adjoint and Forward Space for the Solution of Transport Problems., . . Shayer, Z.; Greenspan, E., . . Israel Atomic Energy Commission, Tel Aviv; Israel Atomic Energy Commission, Beersheba, . . 1986

INIS-mf-10467, 21-25 ..... NEUTRON TRANSPORT THEORY
On Variation of the Principle of Linear-Superposition by Discrete-Ordinate Codes., . . Shayer, Z.; Greenspan, E., . . Israel Atomic Energy Commission, Tel Aviv; Israel Atomic Energy Commission, Beersheba, . . 1986

INIS-mf-10467, 26-30 ..... ITM
The Leakage Transfer Matrix (LTM) Method for the Solution of Radiation Deep Penetration Problems., . . Shayer, Z.; Greenspan, E., . . Israel Atomic Energy Commission, Tel Aviv; Israel Atomic Energy Commission, Beersheba, . . 1986

J. Comput. Phys., 66(1), 239-249 . . MONTE CARLO
Time-Implicit Monte Carlo Collision Algorithm for Particle-in-Cell Electron Transport Models., . . Cranfill, C.W.; Brackbill, J.U.; Goldman, S.R., . . Los Alamos National Laboratory, Los Alamos, NM, . . September 1986

Med. Phys., 13(3), 374-384 ..... DOT 3.5; ANISN
Measurement and Calculation of Neutron Leakage from a Medical Electron Accelerator., . . Uwamino, Y.; Nakamura, T.; Ohkubo, T.; Hara, A., . . Institute for Nuclear Study, University of Tokyo, . . May 1986

Nippon Genshiryoku Gakkai-Shi, 26(11), 917-926 ... . PALLAS;
DOT 3.5; SKYSHINE-2 $$ Neutron Skyshine from Nuclear Facilities., . . Nakamura, T., . . Tokyo University, Tanashi, Japan, . . November 1984

Nucl. Instrum. Methods Phys. Res., Sect. A, 250(3), 557-564 ..... MCNP; DOT 4.3
Monte Carlo and Discrete Ordinates Calculations for 14 MeV Neutrons Streaming Through a Stainless Steel Duct: Comparisons With Experiment., . . Santoro, R.T.; Barnes, J.M.; Alsmiller, R.G., Jr.; Drischler, J.D., . . Oak Ridge National Laboratory, TN, . . September 1986

Nucl. Power Eng., 64(4), 15-17 (In Chinese) ..... AIRDOS-EPA
A Review of the AIRDOS-EPA Code., . . Li, J,; Gao, Y.; Pu, G., . . August 1985, . . FORTRAN

RSI-0283; SAND-85-7262 ..... SPECTROM-32
Computer Calculations to Develop Quality Assurance (QA) Methodology for Nuclear Waste Repository Design Calculations: Isothermal Parallel Calculation. Topical Report RSI-0283., . . Fossum, A.F., . . RE/SPEC, Inc., Rapid City, SD, . . April 1986, . . AVAIL: NTIS; INIS (Microfiche only)

Thesis, Microfilms Order No. 84-22,716 ..... DISCRETE CONES METHOD
Discrete Cones Method in Two-Dimensional Neutron Transport Computation., . . Watanabe, Y., . . Wisconsin Univ., Madison, . . 1984