

# RSIC Newsletter



RADIATION SHIELDING INFORMATION CENTER

## OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION FOR THE US DEPARTMENT OF ENERGY

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OAK RIDGE, TENNESSEE 37830

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*It's so much easier to suggest solutions when you don't know too much about the problem.* . . . *Malcolm Forbes*

### RSIC PRODUCTS REVIEW CONTINUES

The RSIC product review continues with emphasis currently on shielding code packages. The April issue of the *RSIC Newsletter* featured the results of a review of CCC-1 through CCC-80. The following actions resulted from the review of CCC-81 through CCC-98. Retained for RSIC archives and for dissemination upon demand are the following code packages:

CCC-82/ANISN-CEA	French version of 1-D discrete ordinates.
CCC-83/RAID	Monte Carlo multibend duct calculation.
CCC-84/SHADRAC	Heating & dose calculation—kernel integration.
CCC-85/MOMGEN-MOMDIS	Moments Method; gamma-rays.
CCC-87/LG-H	Japanese ray analysis duct code.
CCC-88/RADOS	Atmospheric transport; gamma-ray dose code.
CCC-89/DOT II and IIW	2-D discrete ordinates (C) IBM (II), (F) IBM (IIW) and (G) CDC (IIW).
CCC-90/AMC	Monte Carlo albedo method code; ducts.
CCC-92/SAP-N,-G	Albedo model scatter analysis.
CCC-93/McFLARE	Space shielding technology.
CCC-94/KAP-VI	Kernel integration.

The following code packages have been removed from the collection: CCC-81/UNC-SAM-2, CCC-86/HANGER, CCC-89/DOT (A,B,D,E), CCC-91/NEFIRS, CCC-95/TAPAT, CCC-96/TIC-TOC-TOE, CCC-97/ODD-K, and CCC-98/FASTER.

### RADIATION COUNCIL REPORTS ELECTION RESULTS

The election of six new members and the reelection of eleven members to the National Council on Radiation Protection and Measurements (NCRP) was announced by Warren K. Sinclair, President. The Council, successor to the *National Committee on Radiation Protection and Measurement*, was chartered by Congress in 1964 as a non-profit corporation to collect, analyze, and disseminate scientific information and recommendations about radiation measurements and protection against radiation.

Those newly elected at the Council's Annual Meeting were: Edward L. Alpen, Director, Donner Laboratory, University of California, Berkeley; John D. Boice, Jr., Environmental Epidemiology Branch, National Cancer Institute, Bethesda, MD; Antone Brooks, Inhalation Toxicology Institute, Lovelace Foundation, Albuquerque, NM; Gerald Dodd, Radiologist and Head Diagnostician, University of Texas System Cancer Center, Houston; A. Everett James, Chairman, Department of Radiology, Vanderbilt University, Nashville, TN; and Bernd Kahn, Environmental Resources Center, Georgia Institute of Technology, Atlanta.

Those reelected to Council membership are: Seymour Abrahamson, Chairman, Department of Zoology, University of Wisconsin, Madison; Victor P. Bond, Associate Director, Brookhaven National Laboratory, Upton, Long Island, NY; Robert L. Brent, Professor of Radiation Biology, Jefferson Medical College, Stein Research Center, Philadelphia, PA; Reynold F. Brown, Clinical Professor of Radiology and Preventive Medicine, University of

California, San Francisco; Randall S. Caswell, Deputy Director, Center for Radiation Research, National Bureau of Standards, Washington, D.C.; Arthur B. Chilton, Associate Professor of Nuclear and Civil Engineering, University of Illinois, Urbana; Dade W. Moeller, School of Public Health, Harvard University, Boston, MA; James V. Neel, Professor, Department of Human Genetics, University of Michigan, Ann Arbor; Warren K. Sinclair, Associate Director for Biomedical and Environmental Research, Argonne National Laboratory, Illinois; George L. Voelz, Health Research Division Leader, Los Alamos Scientific Laboratory, NM; and George M. Wilkening, Head, Environmental Health and Safety Laboratory, Bell Telephone Laboratory, Murray Hill, NJ.

Elected to serve on the Board of Directors were two new members. They are: Richard F. Foster, Senior Staff Advisor, Battelle Northwest Laboratory, Richland, WA and G. B. Hutchison, Department of Epidemiology, School of Public Health, Harvard University, Boston, MA.

Reelected as President and Vice President, respectively, were Warren K. Sinclair and Hymer L. Friedell.

Honorary membership was conferred upon: William L. Russell, Principal Geneticist, Oak Ridge National Laboratory, Oak Ridge, TN and James Newell Stannard, Clinical Professor of Community Health and Radiology, University of California at San Diego Medical School.

### NEW USSR DATA CENTER FOR EXPERIMENTAL PHOTONUCLEAR DATA ANNOUNCED

Following a recommendation by the Co-ordinating Group for Non-Neutron Nuclear Data, which supervises the acquisition and evaluation of nuclear data in the USSR, and a proposal by the Center for Data on the Structure of the Atomic Nucleus and on Nuclear Reactions (CaJAD) of the USSR State Committee on the Utilization of Atomic Energy, a Data Center for Experimental Photonuclear Data (DCEPD) is to be set up at Moscow State University with the same rights as the base organization, CaJAD, within the framework of the laboratory for electromagnetic processes and interaction of atomic nuclei at the Moscow State University Institute for Nuclear Physics Research. The Center will undertake the acquisition, classification, evaluation and interpretation of data obtained in experiments with gamma-quanta.

Scientific leadership of the new center includes V. V. Varlamov, Professor B. S. Ishkhanov, I. M. Kapitonov, Professor I. B. Teplov, and Professor V. G. Shevchenko.

Work has been going on in the USSR for more than ten years on the acquisition, evaluation and interpretation of nuclear physics data. Over this period a large volume of data on the structure of the atomic nucleus and on the characteristics of nuclear reactions induced by various particles has been collected, classified, and analyzed. However, prior to the establishment of this new center, work has not included data on the physics of nuclear reactions induced by gamma-quanta.

Studies of reactions induced by gamma-quanta constitute an important part of the work done on the structure of the atomic nucleus and on the mechanisms of intranuclear processes. Interactions of this type are of special interest because the properties of the electromagnetic field have been studied in detail. Consequently, photonuclear reactions can yield more reliable information about the properties of the atomic nucleus than reactions occurring as a result of strong interaction, where it is difficult to separate effects associated with manifestation of the nuclear structure from effects associated with the reaction mechanism. Studies on photodisintegration of atomic nuclei are now being performed at over 50 laboratories in the Soviet Union and other countries. On average, some 100 publications are issued every year, and their number is increasing constantly. Because of this, the systemization of photonuclear data is becoming a matter of great importance in the context of the state of development now reached by this branch of nuclear physics.

An experimental data bank and an automated system for preparing and utilizing the information will be established in the new center, DCEPD. The system is to be based on the ES computer, a part of Moscow State University's computer collective utilization network. The network has facilities for using the central processors of the large computers at the University's Scientific Research Calculation Center in order to solve individual problems. The intention is also to set up various types of automated data libraries, including the following: references to publications and a summary of their contents in a form permitting automated search, preliminary acquaintance, and use; and experimental data on photoabsorption cross-sections, partial photonuclear reactions, angular distributions and energy spectra of various photonuclear reaction products and properties of specific nuclei. Classification of the theoretical results obtained for photodisintegration of atomic nuclei is also planned for the future.

The Center will distribute material on this branch of nuclear physics to interested organizations in the form of computer print-outs, reels of magnetic tape, various types of manuals, tables, and compilations. It is intended that the Center's data libraries will be continuously expanded by the acquisition of numerical data from published sources.

The Center will exchange information on photodisintegration of atomic nuclei with foreign organizations through CaJAD.

#### PERSONAL ITEMS

**William E. Kreger** has been appointed Assistant Director for Site Analysis, Division of Site Safety and Environmental Analysis, Office of Nuclear Reactor Regulation. In this position, he is responsible for coordinating and supervising the programs of the Accident Analysis Branch, the Effluent Treatment Systems Branch and the Radiological Assessment Branch. Kreger is a member of Scientific Committee 22 of the National Council on Radiation Protection and Measurement, and Vice Chairman and Chairman Elect of the Radiation Protection and Shielding Division of the American Nuclear Society.

**Keith Eckerman** has recently left the Radiological Assessment Branch, Office of Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission, Washington, D.C. to become group leader for Metabolism and Dosimetry in the Health and Safety Research Division of the Oak Ridge National Laboratory.

**Lester K. Price** is now Chief of the newly created Fusion Branch of U.S. DOE Oak Ridge Operations. He was previously with the Technical Projects Office in the Office of Fusion Energy (DOE) in Washington, D.C.

We regret to learn that **Mr. H. Weber**, Head of the Shielding and Radioactivity Dept., Kraftwerk Union, Aktiengesellschaft, Reaktortechnik, FR Germany, died shortly after an accident last August.

#### CHANGES OF ADDRESS

The following notices of changes of address were received in April: **Darrol H. Timmons**, from University of Missouri at Columbia, to EXXON Nuclear Company, Richland, Washington; **M. R. Haroon**, from Arya-Mehr Technical University, Tehran, Iran, to Centre for Nuclear Studies, Rawalpindi, Pakistan; **Yo Taik Song**, from U.S. Naval Surface Weapons Center, Silver Spring, Maryland, to Office of Military Applications, U.S. Department of Energy, Washington, D.C.; and **L. L. Dickerson**, from U.S. Army Missile Materiel Readiness Command, Redstone Arsenal, Alabama, to Arradcom, Dover, New Jersey.

#### VISITORS TO RSIC

The following persons came for an orientation visit and/or to use RSIC facilities during the month of April: William B. Gardner, IBM Corporation, Knoxville, TN; Dietrich Habs, University of Heidelberg, Federal Republic of Germany; Jack Isbel, Data General Corporation, Knoxville, TN; Sara R. Jordan, UCND Computer Sciences Division at ORNL; Gert Prillinger, IKE, University of Stuttgart, Germany; Richard M. Rubin, Radiation Research Associates, Ft. Worth, TX; and Andy Thomas, Rolls Royce & Associates, Derby, United Kingdom.

#### UPCOMING MEETINGS

##### May 1979

*Workshop on Reactor Licensing and Safety*, May 13-16, 1979, Waldorf-Astoria, New York, New York. Contact: Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Washington, D.C. 20014; Telephone (301) 654-9260.

*Programs in Radiological Sciences and Protection/Health Physics*, May 14-25, 1979, University of Lowell, MA. Contact: Dr. Kenneth W. Skrable, Professor of Radiological Sciences, University of Lowell, 1 University Avenue, Lowell, MA 01854.

**June 1979**

*19th Canadian Nuclear Association International Conference and Exhibition*, June 13, 1979, Royal York Hotel, Toronto, Canada. Contact: Dr. Michael Hare, Program Chairman, CNA Conference, Atomic Energy of Canada Limited, Sheridan Park Research Community, Mississauga, Ontario, Canada, L5K 1B2.

*IAEA Symposium on Occupational Radiation Exposure in Nuclear Fuel Cycle Facilities*, June 18–22, 1979, Los Angeles, CA. Contact: Mr. O. Ilari, Division of Nuclear Safety, OECD Nuclear Energy Agency, IAEA/NEA, P. O. Box 590, Kartner Ring 11, A-1011 Vienna, Austria.

*Workshop on Insurance*, June 24–27, 1979, Sheraton Islander Inn, Newport, RI. Contact: Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Washington, D.C. 20014.

**July 1979**

*IAEA Symposium on Underground Disposal of Radioactive Wastes*, July 2–6, 1979, Otaniemi, Finland. Contact: Mr. John H. Kane, Special Assistant for Conferences, Department of Energy, Washington, D. C. 20545.

*1979 IEEE Annual Conference on Nuclear and Space Radiation Effects*, July 17–20, 1979, University of California, Santa Cruz, California. Contact: J. P. Raymond, Mission Research Corporation, P. O. Box 1209, La Jolla, California 92031.

**August 1979**

*Fourth International Summer School*, August 22–September 2, 1979, Dubrovnik, Yugoslavia. Contact: Dr. Z. Vukovic or Dr. P. Markovic, Boris Kidric Institute of Nuclear Sciences—Vinca, P. O. Box 522, 1101 Belgrade, Yugoslavia.

**November 1979**

*International Radiation Protection Association—The Second Asian Regional Congress on Radiation Protection*, November 19–23, 1979, Manila, Philippines. Contact: Dr. Celia T. Anatalio, Congress President, Director, Radiation Health Office, Ministry of Health, San Lazaro Compound, Rizal Avenue, Sta. Cruz, Manila, Philippines.

**December 1979**

*2nd Miami International Conference on Alternative Energy Sources*, December 10–12, 1979, Miami Beach, Florida. Contact: Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami, P. O. Box 248294, Coral Gables, Florida 33124.

**EPIC PACKAGES DESALINATION CODES**

At the request of the Nuclear Desalination Program at the Oak Ridge National Laboratory, the Engineering Physics Information Centers (EPIC) staff has made an archival collection of the computer codes generated in the local desalting programs. The code packages have been assigned numbers preceded by OSW/NDP-x where OSW is Office of Saline Water, NDP is Nuclear Desalting Program, and x indicates a package number in a series. The packages are as follows:

**OSW/NDP-1/VTE/MSF-21**—Rapid Calculation or Optimization of Multistage Flash (MSF) and Vertical Tube Evaporators (VTE).

**OSW/NDP-2/RO-75**—Calculation and Design Optimization of Reverse Osmosis Seawater Desalination Plants.

**OSW/NDP-3/ORIC**—Computation of Optimum Plant Designs for the Desalination of Seawater and the Production of Electricity.

**OSW/NDP-4/ORMEF**—Computation of Detailed Multi-Effect Multi-Stage Flash Evaporation Desalination Plant Designs.

**OSW/NDP-5/ORSEF**—Calculation of Multi-Stage Flash Evaporating Desalination Plant Designs.

**OSW/NDP-5/ORSEF-2/-3**—Calculations of Desalination Plant Designs Using Multi-Stage Flash Evaporation.

**OSW/NDP-5/OROSEF**—Overall Design of Multi-Stage Flash Desalination Plant.

**OSW/NDP-6/ORVAC-BP**—Calculation of a Desalination Plant Incorporating A Vapor Compressor System Driven by a Backpressure Turbine.

**OSW/NDP-6/ORVAC-CT**—Calculation of a Desalination Plant Incorporating a Vapor Compressor System Driven by a Condensing Turbine.

**OSW/NDP-6/ORVAC-TF**—Calculation of a Desalination Plant Incorporating a Vapor Compressor System Topping an MSF Plant.

**OSW/NDP-7/ORVE/ORVEC**—Calculations of a Desalination Plant Combining Vertical Evaporators with MSF Feed Heating.

**OSW/NDP-7/ORVEM**—Calculation of a Desalination Plant Employing Mixed Feed in Vertical Effect Evaporators.

**OSW/NDP-8/ORFIG-MSF**—Operational Studies of Fixed Geometry Multi-Stage Flash (MSF) and Vertical Tube Evaporator (VTE) Desalination Plant Designs.

**OSW/NDP-8/ORFIG-VTE**—Operational Studies of Fixed Geometry Multi-Stage Flash (MSF) and Vertical Tube Evaporator (VTE) Desalination Plant Designs.

**OSW/NDP-9/ORCON-1**—Calculation of a Stream Condenser of Circular Cross Section.

These code packages are available for general distribution. Requests may be sent to EPIC and should be accompanied by a reel of magnetic tape.

## CHANGES IN THE COMPUTER CODE COLLECTION

The following changes were made in April.

### CCC-164/NAC

The NAC neutron activation analysis and product-isotope inventory code package was updated to correct two errors in thermal group activation cross sections of Na and Fe. The values as corrected are:  $1.22 \times 10^{-2}$  for Na,  $3.33 \times 10^{-5}$  for Fe. Charles Shih, Kaiser Engineers, Oakland, California called the error to RSIC's attention, and Suzanne Weinstein Gooder, NASA Lewis, Cleveland, Ohio verified the need for correction. All versions of the code package, (A), (B), and (C), were updated. FORTRAN IV; IBM 360/75/91, IBM 7090, and CDC 7600.

### CCC-258/MORSE-E

The European Shielding Information Service (ESIS) version of MORSE-CG, general purpose Monte Carlo multigroup neutron and gamma-ray transport code system, was updated to add systems routines IAND, IOR, and ICOMP. FORTRAN IV and Assembler Language; IBM 360.

### CCC-269/RSYST

The integrated modular code system package for shielding and reactor physics calculations has been updated to replace the original with a newly revised version of the system. RSYST is a contribution of the Nuclear Research Institute (IKE), Stuttgart Technical University, Federal Republic of Germany. In use since 1969, and packaged by RSIC in 1975, RSYST is a sequence of modules formulated by user command

language. A data base managed by a central program, data blocks containing structure descriptions, and hierarchical linking of data blocks enable flexible management of all data. Reference: OLS-79-28. FORTRAN IV and Assembler Language; IBM 360.

#### **CCC-335/GALE**

A computerized mathematical model for calculating the release of radioactive material in gaseous and liquid effluents from boiling water and pressurized water reactors was contributed by the U. S. Nuclear Regulatory Commission (NRC). The calculations are based on data generated from operating reactors, field tests, laboratory tests, and plant-specific design considerations incorporated to reduce the quantity of radioactive materials that may be released to the environment. The data are included in the package. References: NUREG-0016 and -0017. FORTRAN IV; IBM 360.

#### **CCC-336/ASFIT-DS2**

A gamma-ray transport code for one-dimensional finite systems was contributed by Reactor Research Centre, Kalpakkam, India, and Oak Ridge National Laboratory. Based on ASFIT-D (CCC-153), ASFIT-DS2 treats gamma-ray transport in slab geometry. The source is monoenergetic and is assumed to be normally incident or a flux isotropically incident (cosine-distributed current) or isotropic in a region. Reference: Informal Notes; *Nucl. Sci. Eng.* 43, 186-196 (1971); *Nucl. Sci. Eng.* 43, 197-211 (1971); *Nucl. Sci. Eng.* 52, 494-498 (1973). FORTRAN IV; IBM 360.

#### **CCC-339/AKTIV**

A calculation of radioactivity, nuclear afterheat, and biological hazard potential for fusion reactor stainless steel blankets as dependent on irradiation and shut-down time was contributed by Max-Planck-Institut fuer Plasmaphysik, Garching, and INTERATOM, Bergisch-Gladbach, Federal Republic of Germany. The matrix exponential method is used to solve the set of linear differential equations describing the time variation of the nuclide densities. The package includes auxiliary routines AKTIN and AKTOUT which handle input and output for large problems and promote efficient use of computer time for these operations. Reference: IPP 4/154. FORTRAN IV; IBM 360 and AMDAHL 470.

#### **PSR-117/MARS**

The MARS code package for manipulating multigroup cross-section libraries in the AMPX and CCCC formats was updated to replace AMPX routines (files 1-20) with AMPX II, a contribution of UCND Computer Sciences Division at ORNL. FORTRAN IV and Assembler Language; IBM 360.

#### **PSR-129/SPHINX**

The one-dimensional diffusion and transport nuclear cross-section processing code package was extended to include an IBM version (B), a conversion made by UCND Computer Sciences Division at Oak Ridge National Laboratory. Westinghouse Advanced Reactors Division, Madison, Pennsylvania developed the code (Version A) for CDC computers.

#### **PSR-134/SICALC**

SICALC computes values of multigroup thermal neutron scattering law data for hydrogen in light water and deuterium in heavy water at seven temperatures in the range 293 K to 620 K for hydrogen in light water based on Nelkin's model and for deuterium in heavy water based on Honeck's model. United Kingdom Atomic Energy Authority, Winfrith, Dorchester, Dorset, England contributed the code through the OECD-NEA Data Bank, Gif-sur-Yvette, France. Reference: AEEW-R950. FORTRAN IV and Assembler Language; IBM 360.

#### **PSR-136/WINDOWS**

The code package, contributed by Oak Ridge National Laboratory, is a simplified and slightly faster version of CRYSTAL BALL (CCC-233). WINDOWS contains capability for the following procedures: unfolding neutron differential spectrum; estimating windows and detector contributions; laying upper and

lower bounds for integral response; and obtaining group fluxes from neutron transport calculations. The name "windows" refers to the program's ability to model integral responses to a neutron flux. One may think of these responses as views of the neutron spectrum through a "window" open between the bounds of integration and colored by the underlying response function. INTRIGUE-II (PSR-54) provides capability of generating plots of the spectra and windows and is included in the package. Reference: ORNL/TM-6656. FORTRAN IV and Assembler Language; IBM 360.

#### **PSR-137/MARLOWE**

The computer simulation of atomic-displacement cascades in solids in the binary-collision approximation was contributed by Centre d'Etudes Nucleaires de Saclay, France and the Oak Ridge National Laboratory. The code includes radiation damage functions and displacement cross sections. Reference: Phys. Rev. B, 9(12), 5008-5024, 15 June 1974. FORTRAN IV; IBM 360 and CDC 7600.

#### **PSR-138/LEAP-ADDELT**

The multigroup thermal neutron scattering data generator for hydrogen in light water and deuterium in heavy water was contributed by United Kingdom Atomic Energy Authority, Winfrith, Dorchester, Dorset, England through the OECD NEA Data Bank, Gif-sur-Yvette, France. ADDELT receives as input the scattering law calculated by LEAP and adds to it the effect of delta functions in phonon frequency spectrum. References: AEEW 95, AEEW-M. FORTRAN IV and Assembler Language; IBM 360.

#### **SCALE-01/HEATING 5**

The generalized heat conduction code package was updated to replace the original HEATING5 source (File 1 of the SCALE-01 package) to reflect current development by the contributor, UCND Computer Sciences Division at Oak Ridge National Laboratory. A description of differences between the original and the replacement may be requested from RSIC. FORTRAN IV and Assembler Language; IBM 360.

#### **SCALE-02/KENO IV**

The IBM version (A) of the multigroup Monte Carlo criticality code system was updated to replace GEOMCHK with a more generalized version. The new GEOMCHK routine was supplied by the original contributors, UCND Computer Sciences Division at Oak Ridge National Laboratory.

### **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 22151.

*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.**

#### **REACTOR AND WEAPONS RADIATION SHIELDING LITERATURE**

AD-A-052681; Thesis  
Radiation Dose Analysis of a PWR 1 Accident  
for the Projected Reactor Site at Cementon, New  
York.  
Huncharek, J.D.  
March 1976  
NTIS

- AECL-5715  
Low-Level Radiation: A Review of Current Estimates of Hazards to Human Populations.  
Myers, D.K.  
December 1977  
Dep., NTIS (U.S. Sales Only)
- AEEW-R-1183  
The Zero-Power Basis of Fast Reactor Dosimetry.  
Sanders, J.E.  
June 1978  
UKAEA, Atomic Energy Establishment, Winfrith, Dorchester, Dorset, Great Britain
- ANL-79-9  
Evaluating Computer Program Performance on the CRAY-1.  
Rudsinski, L.  
January 1979  
Applied Mathematics Div., Argonne National Lab., Illinois
- ARBRL-TR-02053; AD-A-054761  
Calculation of Combat Vehicle Protection Against a Residual Radiation Threat. Final Report.  
Rainis, A.E.; Schwenk, R.M.; Rexroad, R.E.; Kinch, J.W.  
April 1978  
NTIS
- BNL-NCS-25295  
Evaluated Files of Nuclear Cross-Sections for Fusion Reactor Calculations.  
Bhat, M.R.  
1978  
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- BNL-NCS-50,702, 2nd Ed.  
A Source List of Nuclear Data Bibliographies, Compilations, and Evaluations. Second Edition.  
Burrows, T.W.  
October 1978  
NTIS
- BNWL-SA-6114; CONF-770720-16  
Improved Method for Calculation of Population Doses from Nuclear Complexes over Large Geographical Areas.  
Corley, J.P.; Baker, D.A.; Hill, E.R.; Wendell, L.L.  
September 1977  
Dep., NTIS
- CEA-CONF-3951; CONF-770304-17  
Finite Element Depletion Diffusion Calculation Method with Space-Dependent Cross-Sections.  
Kavenoky, A.; Lautard, J.J.  
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- CEA-CONF-3965; CONF-770401  
Analysis of Dose Rates Near the Circuit of a PWR After Shutdown.  
Beslu, P.; Devillers, C.; Lalet, A.; Frejaville, G.  
1977  
Dep., NTIS (U.S. Sales Only)
- CEA-CONF-3966  
Shielding Against Neutron Streaming in Pressurized-Water Reactors.  
Devillers, C.; Payen, J.P.  
1977  
Dep., NTIS (U.S. Sales Only)
- CEA-R-4825 (In French)  
Linear Formulation About Neutron Spectrometry - Model Spectra Method.  
Bricka, M.  
March 1977  
CEA Centre d'Etudes Nucleaires de Saclay, 91-Gif-sur-Yvette (France), Dept. de Surete Nucleaire
- CONF-771009-P.III/IV  
Energy Use Management. Proceedings of the International Conference. Vol.III/IV.  
Fazzolare, R.A.; Smith, C.B. (Eds.)  
1978  
Pergamon Press
- CONF-780957-2  
Fast Neutron Dose Equivalent Rates in Heavy Ion Target Areas.  
Fulmer, C.B.; Butler, H.M.; Ohnesorge, W.F.; Mosko, S.W.  
1978  
Dep., NTIS
- CONF-781022-42  
Fission Product Source Terms for the LWR Loss-of-Coolant Accident.  
Lorenz, R.A.; Collins, J.L.; Malinauskas, A.P.  
1978  
Dep., NTIS
- CONF-781105-28  
CFRMF Neutron Radiography Facility.  
Stepan, I.E.; Anderson, D.M.; Harker, Y.D.  
1978  
Dep., NTIS
- CONF-781117-2  
U.S. Integral and Benchmark Experiments.  
Maienschein, F.C.  
1978  
Dep., NTIS



- CONF-781117-3  
Methods for U.S. Shielding Calculations:  
Applications to FFTF and CRBR Designs.  
Engle, W.W., Jr.; Mynatt, F.R.; Disney, R.K.  
1978  
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- CONF-781146-13  
Fission Product Source Terms for the LWR  
Loss-of-Coolant Accident.  
Malinauskas, A.P.; Lorenz, R.A.; Collins, J.L.;  
Osborne, M.F.; Towns, R.L.  
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- COO-2509-4; Thesis  
Mechanisms of Fast Neutron Penetration in  
Thick Layers of Sodium.  
Huang, L.Y.  
1975  
Dep., NTIS
- COO-3077-154  
Survey of  $1\ 1/2$  Transport Codes.  
Grad, H.  
October 1978  
Courant Institute of Mathematical Sciences, New  
York University, New York
- ECN-40  
Evaluated Neutron Cross Sections of Natural  
Molybdenum.  
Gruppelaar, H.  
May 1978  
Dep., NTIS (U.S. Sales Only)
- EPRI-NP-985  
Sensitivity of Nuclear Fuel Cycle Cost to  
Uncertainties in Nuclear Data.  
Becker, M.; Harris, D.R.  
February 1979  
Rensselaer Polytechnic Institute, Dept. of  
Nuclear Engineering, Troy, New York 12181
- EPRI-NP-996  
238-U Resonance Self-Indication Capture  
Measurements and Analysis.  
Block, R.C.; Harris, D.R.; Kim, S.H.;  
Kobayashi, K.  
February 1979  
Rensselaer Polytechnic Institute, Dept. of  
Nuclear Engineering, Troy, New York 12181
- HEDL-SA-1557; CONF-780722-20  
Radiation Damage Function Analysis.  
Gold, R.; Lippincott, E.P.; McElroy, W.N.;  
Simons, R.L.  
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- HEDL-SA-1568-FP; CONF-781105-75  
Shielding Calculations for the Fusion Materials  
Irradiation Test Facility.  
Carter, L.L.; Morford, R.J.  
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- HEDL-SA-1616-FP; CONF-780858-9  
Varied Applications of a New  
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Covariance Capability.  
Schmittroth, F.  
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Dep., NTIS
- HEDL-SA-1633  
Tissue Equivalent Proportional Counter Real  
Time Neutron Monitor.  
Smith, R.C.; Strode, J.N.; Brackenbush, L.W.;  
Faust, L.G.  
1978  
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- HEDL-TME-78-100  
HEDL Evaluation of Thorium Cycle Cross  
Sections for ENDF/B-V.  
Mann, F.M.  
January 1979  
Dep., NTIS
- HEDL-TME-78-107 (AT)  
Calculation of Neutron Source Strength in FFTF  
Fuel as a Function of Irradiation.  
Ombrellaro, P.A.  
February 1979  
DOE, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830
- HMI-B-202  
Evaluation of the Activity Levels in Fusion  
Reactor Blankets.  
Gruber, J.  
May 1977  
Dep., NTIS (U.S. Sales Only)
- ICP-1050-IV  
Fast Reactor Fission Yields  $^{240}\text{Pu}$  and  $^{242}\text{Pu}$ .  
Maeck, W.J.; Eggleston, R.L.; Erickson, A.L.;  
Tromp, R.L.  
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