RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION FOR THE DEPARTMENT OF ENERGY

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The great use of life is to use it for something that outlasts it—William James

CALL FOR PAPERS

Japan to Host 6th ICRS

The Japan Atomic Energy Research Institute (JAERI) will host the Sixth International Conference on Radiation Shielding (6th ICRS) to be held in Tokyo, Japan, May 16–20, 1983. The sponsor (JAERI) is joined in cosponsorship by the Power Reactor and Nuclear Fuel Development Corporation (PNC) of Japan, the Japan Nuclear Ship Research & Development Agency (JNSRDA), the Atomic Energy Society of Japan (AESJ), the International Atomic Energy Agency (IAEA), the OECD Nuclear Energy Agency (NEA), and the American Nuclear Society (ANS). RSIC and the European Shielding Information Service (ESIS) will give reasonable assistance as needed. Information concerning the development of the conference plans and program will be published in the *RSIC Newsletter* as it becomes available.

The 6th ICRS is intended to be an international meeting presenting advances in shielding and radiation protection for fission and fusion reactor plants and related facilities. Emphasis will be on practical aspects of shield design, on requirements for nuclear data, and on operating power reactor occupational exposure problems.

The technical program will consist of both invited and contributed papers.

Papers are solicited on the following topics.

1. Sensitivity analysis and data requirements for shielding (including target accuracies).
2. Development and testing of multigroup cross-section libraries for shielding.
3. New developments and improvements in multidimensional radiation transport methods (discrete ordinates, finite elements, Monte Carlo, and others).
4. Integral shielding experiments for data and methods testing, and their analyses.
5. Shielding design for fission and fusion power plants (including design criteria).
6. Neutron and gamma-ray streaming in fission and fusion facilities.
7. Radiation protection experience with newly designed or operating facilities.
8. Neutron and gamma-ray skyshine in fission, fusion, accelerator and other facilities.
9. Radiation damage and radiation heating in shield materials.
10. Radiation exposure with operating reactors (including experience and design to reduce exposures) from corrosion and fission product sources for in-plant radiation protection.
11. In-plant radiation protection instrumentation (area radiation monitors, continuous air monitors, experience, design criteria, rationale for location of instruments).

12. Radiation shielding for post-accident and decommissioning.
13. Standards and information resources (e.g., efforts in material standards, penetration designs, and radiation zoning and monitoring).
14. Impact of new radiation protection standards such as ICRP-26 and 30.

The deadline for summaries (10 copies in English, less than 500 words, no figures) is September 6, 1982. Mail summaries to:

Takumi Asaoka
Reactor Engineering Division
Japan Atomic Energy Research Institute
Tokai, Ibaraki-ken 319-11
JAPAN

Full camera-ready papers, not to exceed 10 pages, will be required by May 16, 1983 for publication in the proceedings. Authors are requested to bring 200 preprints for distribution at the conference. For further information, contact T. Asaoka at the above address.

RSIC INTERACTION WITH USERS

User statistics compiled on March 31, 1982 indicate that for the past six months (October 1, 1981–March 31, 1982) RSIC's request/response coordination group was busy as usual and that the shielding and related communities remain active. A total of 1591 separate letters/telephone calls (about 12.8 each working day) requesting a variety of products and services (3804 total) were processed during the six-month period.

A breakdown of activities averaged on a daily basis follows.

Activities/Working Day

3.6 code/data packages were shipped to requesters.
5.6 shielding documents (RSIC reports, handbooks, code and data documentation in addition to those included in the above packages) were mailed.
21.4 responses were made to inquiries for information, including: suggesting possible solutions to problems; recommending calculational methods, computer codes, nuclear data sets, or literature specimens for study; troubleshooting problems when requester has difficulties using RSIC materials; and giving miscellaneous consultation and advisory services.
0.1 special retrospective literature searches were made.
30.7 total separate activities were required daily to satisfy the 1591 requests.

In addition to the above daily activities, the following special products or services were given.

The *RSIC Newsletter* was mailed each month to a peak of 1450 people. Maintenance of the RSIC-user directory resulted in 330 changes during the period.
A total of 29 people (10 from outside the USA) came for an orientation visit and/or to use the Center's facilities during the six months.

Quick access to the above information is made possible by a computerized system developed in house. The ADES system is an interactive, menu-driven management information system implemented on RSIC's minicomputer. The system employs a data base access method with a multiway B-tree organization. ADES is used to record all requests for services. Data bases are also maintained on customer profiles, installations, and code or data packages. To facilitate the handling of user queries about the status of their requests cross-referencing is done by installation as well as by code package.

Specific Gamma-Ray Dose Constants Revised

The specific dose constants published in ORNL/RSIC-45, *Specific Gamma-Ray Dose Constants for Nuclides Important to Dosimetry and Radiological Assessment* (September 1981), were recalculated when an error in the computer program was discovered. The gamma-ray dose constant is the dose equivalent at 1 m from an unshielded point source of unit strength (1 Bq). The error, omission of the third term in the polynomial representation of the flux-to-dose equivalent factor between 0.5 and 5, MeV resulted in the dose factor being too high by 2% at 0.5 MeV, falling to 0% at 1 MeV, and increasing to nearly 9% at 5 MeV. The correct polynomial gives results within 3% of the standard values. The effect on the specific dose constant was much smaller, generally much less than 2%. The greatest error noted was for ^{49}Ca which was too high by 4.5%.

A 5-page list of the new results is available from RSIC upon request, and the next printing of ORNL/RSIC-45 will contain the revised values.

NCRP Report on Dosimetry for Radiation Therapy

The National Council on Radiation Protection and Measurements (NCRP) announced the publication of NCRP Report No. 69 *Dosimetry of X-Ray and Gamma-Ray Beams for Radiation Therapy in the Energy Range 10 keV to 50 MeV.* The report describes a dosimetric process that will allow the delivery of a prescribed absorbed dose from x-ray and gamma-ray sources to a uniform phantom within the accuracy needed for radiation therapy. The radiations considered in the report are x rays with peak energies in the range from 10 keV to 50 MeV and gamma rays from radionuclide therapy units. The report describes and discusses the many recommended procedural details for the continuing proper delivery of absorbed dose by radiation therapy machines. It also considers the salient features of exposure and absorbed dose measurement that relate them to the national radiation standards, and includes a discussion of the uncertainty in the delivery of the absorbed dose.

The new report addresses the rationale, the care and use of instruments, and the measurements required for radiation therapy machines. Discussion is limited to a single treatment field and a water or tissue phantom. Major sections of the report cover basic parameters of the photon beams and principles of dosimetry, national radiation standards, secondary standards, field instruments, commission, calibration and other measurements on radiation therapy machines, and uncertainty in delivery of absorbed dose. It also includes an appendix setting out definitions of terms relevant to dosimetry for radiation therapy.

A copy of NCRP Report 69 can be purchased for $12.00 from NCRP Publications, 7910 Woodmont Avenue, Suite 1016, Bethesda, Maryland 28014

Prominent Shielding Specialists Die

RSIC has learned with regret of the recent deaths of four prominent members of the international shielding community, *Joseph Barish* of Oak Ridge National Laboratory, March 6, 1982, *Jacob Kastner* of the U.S. Nuclear Regulatory Commission (NRC) on February 10, 1982, *Lech Szymendera* of the Institute of Nuclear Research of Poland on December 21, 1981, and *R. Vaidyanathan* of the Reactor Research Center of Kalpakkam, India on February 19, 1982.

Joseph Barish , a mathematician in the Computer Sciences Division, worked with members of R. G. Alsmiller's Applied Physics and Fusion Reactor Analysis Group within the Engineering Physics Division. His work was primarily in the areas of applied mathematics, high energy particle transport, shielding of manned space vehicles, and fusion reactor neutronics. Many projects resulted in contributions to RSIC's collection, including CCC-359/MAGIK and DLC-87/HILO.

Jacob Kastner had retired from a position as technical analyst for Material Certification and Procedures Branch, NRC Office of Nuclear Materials Safety and Safeguards. He was well known in the radiological assessment and dosimetry field, having published many papers on those subjects while he was at Argonne National Laboratory and at NRC. Many of his papers were on thermoluminescence, solid state, or dielectric track detectors. He held a number of patents.

Lech Szymendera, 52 years old at the time of his death, was head of the Radiation Shielding Group of the Institute of Nuclear Research, Otwock-Swierk, Poland. He will be remembered by the international shielding community as a participant in the 5th International Conference on Reactor Shielding and for his contributions of computing technology (CCC-315/SAMSY) and of shielding literature to the RSIC collections. He was an engineer and mathematician, having received the D.Sc. in Engineering and M.Sc in Mathematics in his country, and an M.Sc. in Mechanical Engineering in England. He is survived by his wife, a dentist in Warsaw, a son and a daughter, and by his brother Janusz, an internationally recognized specialist in nuclear medicine. Lech Szymendera was host for the RSIC orientation visit to the shielding community of Poland in June 1978 and took a personal interest in seeing that research results published in Poland were placed in RSIC.

Dr. Vaidyanathan was a staff member of the Reactor Physics Section, headed by R. Shankar Singh, at the Reactor Research Centre, Kalpakkam, India. Although only 28 years old at the time of his death, he had published a number of papers on transport theory, radiation transport, and shielding. His best-known contribution was probably the APARNA code series (CCC-296) which was placed in RSIC several years ago. Currently, he was co-author with V. Sundararaman of a technical note, "Analysis of the Finite Difference Ap-

proximation in the Discrete Ordinate Transport Equation in One-Dimensional Geometry," to be published in *Nuclear Science and Engineering.*

IAEA/NDS Publishes Newsletter

The Nuclear Data Section (NDS) of the International Atomic Energy Agency (IAEA) recently distributed Issue No. 4 of the *Nuclear Data Newsletter,* a relatively new publication in its present form. The issue carries news of the World Request List for Nuclear Data Measurements (WRENDA 81/82), data indexes and bibliographies, data libraries received, data handling and processing codes, and selected new publications of interest. Inquiries about the newsletter and its distribution may be made to NDS, IAEA, P.O. Box 100, A-1400, Vienna, Austria.

CHANGES IN THE COMPUTER CODES COLLECTION

An error was corrected and several new contributions were packaged during the month of March as follows.

CCC-411/EFDOS

The EFDOS code package for calculating effective committed dose equivalents by inhalation of radioactive materials occurring in routine atmospheric releases from nuclear fuel cycle facilities was updated to correct errors in subroutines STATIS and DIFFUS. The necessity for the update and information for making corrections were supplied by the original contributors in the Power Reactor and Nuclear Fuel Development Corporation (PNC), Tokai-mura, Ibaraki-ken, Japan. Details of the corrections are available from RSIC for persons now using the code system. FORTRAN; IBM 370/3033.

CCC-416/CONDOS-II

A code package for estimating radiation doses from radionuclide-containing consumer products was contributed by the Oak Ridge National Laboratory. Designed for use in calculating radiation dose equivalents to man during the life span of a radioactive consumer product, CONDOS-II can also be used as a general tool for radiation dose calculations. Doses to selected body organs and tissues are calculated for both external exposure pathways (direct irradiation and immersion in contaminated air) and internal exposure pathways (ingestion and inhalation of radionuclides). Doses from external exposures are annual dose equivalents (sieverts or millirem from exposures during a designated number of hours per year). Reference: NUREG/CR-2068 (ORNL/NUREG/TM-454). FORTRAN IV; IBM 360/370.

CCC-417/AT123D

An analytical transient one-, two-, and three-dimensional simulation of waste transport in the aquifer system was contributed by Oak Ridge National Laboratory. The code system has the capability for addressing three types of wastes, eight types of source configurations, three kinds of source releases, and four variations of aquifer dimensions. Mechanisms of transport included in the analysis are advection, hydrodynamic dispersion, adsorption, decay/degeneration, and waste losses to the atmosphere. Reference: ORNL-5602. FORTRAN IV; IBM 360/370.

CCC-418/SCAP-82

A single scatter, albedo scatter, or point kernel analysis code system in complex geometry was contributed by Westinghouse Electric Corporation, Madison, Pennsylvania. SCAP is designed to calculate the neutron or gamma radiation level at detector points located within or outside a complex radiation scatter source geometry or a user specified discrete scattering volume. Free field input format is used. This new package replaces an older version of SCAP which was used as an auxiliary to the CCC-94/KAP-VI kernel integration code system. Reference: SCAP User's Manual, April 1980. FORTRAN IV; CDC-7600.

PSR-175/GABAS

A code package for generating composite time-dependent, fission product spectra was contributed by IRT Corporation, San Diego, California and Sandia National Laboratories, Albuquerque, New Mexico. Multigroup beta and gamma ray spectra for individual nuclides are folded with their corresponding time-dependent activities (usually generated by a fission product inventory code) to produce a composite time-dependent fission product spectrum. Both the spectra and the activities are

input to GABAS which combines them appropriately and adds the results to give a fission product number spectrum and a fission product energy spectrum as a function of time. Reference: IRT-6406-004. FORTRAN IV; UNIVAC 1100/81.

PSR-176/MULTIASM

A computer routine for assembling several assembler language source decks at one time was contributed by Oak Ridge National Laboratory. Written in IBM/360 assembler language, the code calls the IBM assembler repeatedly, once for each assembler routine being processed. Reference: Informal User Manual. Assembler language; IBM 360/370.

SCALE-O Action Alert

Notification of errors in a module in the system has been made to all persons to whom RSIC had mailed the initial SCALE release (SCA-O/SCALE or CCC-288/SCALE). In the event someone did not receive the mailing, we call your attention to the following.

For certain cases, the resonance processing for the SCALE system standard composition zircalloy (ID 40302) can lead to negative groupwise constants and serious errors in calculated multiplication factors. The problem stems from the isolated resonance approximation in the NITAWL-S model. It appears to be significant only under select combinations of conditions. Details of these conditions and of modifications which should be made in the code system in order to arrive at a solution to the problem may be requested from RSIC.

CHANGES TO THE DATA LIBRARY COLLECTION

A new data package was added .

DLC-91/COVFILS

A 30-Group Covariance Library based on ENDF/B-V was contributed by Los Alamos National Laboratory, Los Alamos, New Mexico. Generated using NJOY II (PSR-171), COVFILS includes data on the total cross sections, scattering cross sections, and the most important absorption cross sections for ^{1}H, ^{10}B, C, ^{16}O, Cr, Fe, Ni, Cu, and Pb. Reactions in COVFILS include total cross sections, elastic and inelastic scattering cross sections, nonelastic (total minus elastic) cross sections, and all cross sections making a significant contribution to the total absorption cross section for each nuclide. Both multigroup cross sections and associated multigroup relative covariance matrices are included. The covariances describe both the uncertainty in the multigroup cross sections and the correlations between them. Reference: LA-8733-MS(ENDF-306). FORTRAN IV; IBM 360.

ASTM STANDARDS ACTIONS

The following actions have been taken by the American Society for Testing and Materials:

ASTM E 482-76 (1981) Neutron Dosimetry for Reactor Pressure Vessel Surveillance (reapproval).

ASTM E 525-74 (1981) Reporting Neutron Dosimetry Results on Nuclear Graphite (reapproval).

These standards are available from ASTM at $4.00 per copy.

PERSONAL ITEMS

Krzysztof A. Wincel is the new head of the Radiation Shielding Group, Reactor Engineering Department, of the Institute of Nuclear Research of Otwock-Swierk, Poland. Wincel returned to Poland in December following a year of graduate research and study under *Nick Tsoulfanidis* in the Nuclear Engineering Program of the University of Missouri-Rolla. He is a nuclear engineering graduate (MS) of the University of Mining and Metallurgy, Krakow, Poland.

Gail de Planque has been promoted to Deputy Director of DOE's Environmental Measurements Laboratory (EML) in New York City. As Deputy, de Planque will participate in the development and guidance of EML's operation and technical and administrative planning. Her principal area of research at the laboratory is in radiation dosimetry, transport, and instrumentation, with the general goal of assessing the effects of radiation on humans and the environment.

In 15 years of distinguished government service, Gail de Planque has published over 50 articles, papers, and reports. As a member of the American Nuclear Society, Gail has received the ANS 25th Anniversary Exceptional Service Award, the ANS Board of Director Certification of Governance; and

was an invited member of the ANS Technical Delegation to the People's Republic of China. She is a member of the Editorial Board of *Radiation Protection Dosimetry,* the Association for Women in Science, Health Physics Society, American Physical Society, American Association for the Advancement of Science, and the New York Academy of Sciences.

Dr. Thomas E. Albert is Division Manager of an office that Science Applications, Inc. has established in Clearwater, Florida.

VISITORS TO EPIC

The following persons came for an orientation visit and/or to use EPIC facilities during the month of March: *Mel Austin,* Rolls-Royce & Assoc., LTD, Derby, U.K.; *Maria Petilli,*CNEN, Rome, Italy; *Wolf Mannhart,* PTB, Braunschweig, F.R. of Germany; *J. J. Wagschal,* Hebrew University, Jerusalem, Israel; *Dr. Hans F. Wingender,* Safety Engineering Department of Nukem Corporation, Hanau, F. R. of Germany; *David B. Simpson* and *Pat Fox,* Tennessee Valley Authority, Knoxville, Tennessee; *Richard E. Malenfant,* Los Alamos National Laboratory, Los Alamos, New Mexico; and *C. V. Chester* (Energy Division) and *F. E. Latham* (Computer Sciences Division), Oak Ridge National Laboratory.

UPCOMING CONFERENCES, COURSES, AND MEETINGS

We call your attention to the following conferences, courses, and meetings.

Radiation Protection

Radiation Protection, part of the Continuing Education Courses at the Georgia Institute of Technology, is a ten-day short course which emphasizes radiation protection, interaction of radiation with matter, measurement techniques for specific radionuclides, biological effects of radiation, personnel monitoring, operation of field and laboratory instruments, public health and environmental considerations, appropriate standards, and rules and regulations.

The Department of Continuing Education will conduct this course under the sponsorship of Georgia Tech's School of Nuclear Engineering and Health Physics, May 3–14, 1982.

The course fee is $850 and includes all necessary classroom materials. Participants must either pay their own fees or have their organization supply the Department of Continuing Education with proper billing authorization before attending class. Your fees may be refunded if notice of withdrawal is made before the registration deadline, April 23, 1982. Participants who successfully complete the course will earn 7 continuing education units (CEUs). Application may be made to: Department of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332.

Energy Seminars

Technology for Energy Corporation (TEC) of Knoxville, Tennessee has announced a series of energy seminars to be held in Knoxville coincident with the 1982 World's Fair. The titles and dates of each seminar are given on the following page.

Enrollment is being accepted on a first-come, first-served basis. Fees ($395 for 1½ days and $495 for 2 days) include all materials for the seminar and a catered lunch each day. Detailed information is available from Marilyn Mattley, TEC, One Energy Center, Pellissippi Parkway, Knoxville, TN 37922; telephone: 615-966-5856.

ORAU Courses

The Medical and Health Sciences Division of the Oak Ridge Associated Universities offers the following REAC/TS courses in fiscal year 1982: Handling of Radiation Accidents by Emergency Personnel, May 5–7 and again on September 8–10; Medical Planning and Care in Radiation Accidents, August 23–27; and Health Physics in Radiation Accidents, September 20–24. Detailed information on each course is available from ORAU Medical and Health Sciences Division, P.O. Box 117, Oak Ridge, TN 37830.

Calendar

May 1982

International Congress on Technology and Technology Exchange, David L. Lawrence Convention Center, Pittsburgh, Pennsylvania, May 3–6. Contact: Patricia Osborne, Program Coordinator, International Congress on Technology and Technology Exchange, c/o Engineers' Society of Western PA, William Penn Hotel, 530 William Penn Place, Pittsburgh, PA 15235 USA.

TEC SEMINAR SERIES

Title	Date	Seminar Leader
Control Room Design Review	May 10–11 (1½ days)	R. H. Pope
Basic Vibration Analysis	May 24–25 Aug. 16–17 (2 days)	K. R. Piety
Radiation Monitoring, Post-Accident Monitoring, and Meteorological System Design	May 31–June 1 Oct. 18–19 (2 days)	J. R. Lockridge
Resource Allocation and Dynamic Management Planning Using the Management in Depth Concept	June 14–15 (1½ days)	T. G. Tyler
Applications of Acoustic Monitoring to Power Plants	June 28–29 Oct. 14–15 (1½ days)	W. A. Pfeifer
Surveillance and Diagnostics by Noise Techniques	July 7–8 (2 days)	J. C. Robinson
Gamma Thermometers as Replacement In-Core Power Detectors for Light Water Reactors	July 26–27 (2 days)	D. L. Bell
Establishing Reasonable Risk: Applications of PRA and Human Factors	Aug. 2–3 (2 days)	S. V. Asselin
Special Topics in Monte Carlo Particle Transport Analysis	Aug. 9–10 (2 days)	P. N. Stevens
Fossil Fuel Elemental Analysis Workshop	Aug. 23–24 (2 days)	R. K. Mobley
Portable X-Ray Residual Stress Analyzer Workshop	Oct. 11–12 (1½ days)	R. W. Hendricks

AAES Engineering Leadership Conference — 1982, Sandpiper Bay, Port St. Lucie, Florida, May 5–7. Contact: American Association of Engineering Societies, Inc., 345 East 47th Street, New York, NY 10017.

September 1982

International Conference on Nuclear Data for Science and Technology, Antwerp, Belgium, September 6–10. Contact: K. H. Bökhoff, Commission of the European Communities Joint Research Centre, Central Bureau for Nuclear Measurement, Geel Establishment, Steenweg op Retie, B-2440 Geel, Belgium.

Conference on the Neutron and Its Applications and Exhibition, Cambridge, United Kingdom, September 13–17. Contact: The Institute of Physics, 47 Belgrave Square, London SWIX 8QX, UK.

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 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

AAEC/E-490 Measurement of Time-Dependent Fast Neutron Energy Spectra in a Depleted Uranium Assembly., . . Whittlestone, S., . . October 1980, . . NTIS (U.S. Sales Only), PC A03/MF A01

AEEW-M-1825 Scalar Flux-Oriented Method for the Transport Equation in Slab Geometry., . . Budd, C., . . January 1981, . . NTIS (U.S. Sales Only), PC A03/MF A01

AERE-R-9780 An Organic Scintillator Neutron Spectrometer Suitable for In-Phantom Studies., . . Harrison, K.G., . . July 1981, . . UKAEA Atomic Energy Research Establishment, Harwell, UK, Environmental and Medical Sciences

ANL-8l-70 Use of Additional Fission Sources or Scattering Sources to Model Inward Axial Leakages in Fast-Reactor Analysis., . . Grimm, K.N.; Meneghetti, D., . . October 1981, . . NTIS, PC A03/MF A01

ANL/NDM-62 Covariance Matrices and Applications to the Field of Nuclear Data., . . Smith, D.L., . . November 1981, . . NTIS, PC A05/MF A01

BMFT-FB-SS-298 (In German) Radiation Protection and Dosimetry in Clinical Nuclear Medicine., . . Bader, R.; Hartmann, G.; Krauss, O.; Mund, H.J.; Petrausch, G., . . June 1979, . . NTIS (U.S. Sales Only), PC A03/MF A01

BNL-30297; CONF-811040-136 HYFIRE: A Tokamak/High-Temperature Electrolysis System., . . Fillo, J.A.; Powell, J.P.; Benenati, R.; Varljen, T.C.; Chi, J.W.H.; Karvowski, J.S., . . 1981, . . NTIS, PC A02/MF A01

BNL-30616; CONF-811012-56 Radiation Damage in Semiconductor Detectors., . . Kraner, H.W., . . December 1981, . . NTIS, PC A02/MF A01

CEA-N-2232; NEANDC(E)224; INDC(FR)51/L Some Aspects of Nuclear Fission., . . Michaudon, A., . . December 1981, . . le Service de Documentation, Centre d'Etudes Nucleaires de Saclay, 91191 GIF-sur-YVETTE Cedex (France)

CONF-780921, pp. 604-609 Energy Spectra of Delayed Neutrons from Uranium Fission., . . Owen, J.G.; Walker, J.; Weaver, D.R., . . In: International Conference on Neutron Physics and Nuclear Data for Reactors and Other Applied Purposes. Harwell, UK, 25-29 September 1978., . . September 1978, . . OECD, 2, rue Andre-Pascal, 75775 PARIS CEDEX 16, France

CONF-780921, pp. 870-874 Monte Carlo Calculations for Intermediate-Energy Standard Neutron Field., . . Joneja, O.P.; Subbukutty, K.; Iyengar, S.B.D.; Navalkar, M.P., . . September 1978, . . OECD, 2, rue Andre-Pascal, 75775 PARIS CEDEX 16, France

CONF-800304, pp. 731-735 Nuclear Shielding Analyses for an Intense Neutron Source Facility., . . Celnik, J., . . In: 5. International Congress of the International Radiation Protection Association; Jerusalem, Israel (8 March 1980)., . . 1980, . . Pergamon Press, Oxford, England

CONF-810831-24 Spectral Tailoring for Fusion Radiation-Damage Studies: Where Do We Stand., . . Gabriel, T.A.; Lillie, R.A.; Thoms, K.; Childs, R.L., . . 1981, . . NTIS, PC A02/MF A01

CONF-811040-110 (Draft) Fusion Engineering Device (FED) First Wall/Shield Design., . . Sager, P.H.; Fuller, G.; Cramer, B.; Davisson, J.; Haines, J.; Kirchner, J., . . 1981, . . NTIS, PC A02/MF A01

CONF-811103-81 Potential Impact of ICRP-30 on the Calculated Risk from Waste Repositories., . . Croff, A.G., . . 1981, . . NTIS, PC A02/MF A01

DOE/ET-51013-17; MIT-PFC/RR-81-19 Towards a Strategy of Reliable Fusion First Wall Design., . . Schultz, J.H., . . May 1981, . . NTIS

EGG-M-06781; CONF-811103-79 High-Temperature Neutron Shield., . . White, E.R.; Bower, J.M., . . 1981, . . NTIS, PC A02/MF A01

EMD-81-132 Coal and Nuclear Wastes: Both Potential Contributors to Environmental and Health Problems., . . Energy and Minerals Div., General Accounting Office, Washington, D. C., . . September 31, 1981, . . General Accounting Office, P.O. Box 6015, Gaithersburg, MD 20760

EPRI-NP-2188 Development and Demonstration of an Advanced Methodology for LWR Dosimetry Applications., . . Maerker, R.E.; Wagschal, J.J.; Broadhead, B.L., . . December 1981, . . NTIS, PC A07/MF A01

GA-A-16513; CONF-811046-13 Low-Activation Fusion-Reactor Design., . . Hopkins, G. R.; Cheng, E.T.; Wong, C.P.C.; Maya, I.; Schultz, K.R., . . September 1981, . . NTIS, PC A02/MF A01

GJBX-414-81; SAI-272-81-177-LJ ARES: Automated Response Function Code. Users Manual., . . Maung, T.; Reynolds, G.M., . . June 1981, . . NTIS, PC A05/MF A01

HEDL-SA-2408-FP; CONF-811215-4 Recent Developments and Capabilities in Neutron Radiography at HEDL., . . Tobin, J.E.; Karnesky, R.A., . . 1981, . . NTIS, PC A03/MF A01

HEDL-SA-2425-FP; CONF-811103-94 Nuclear-Heat Deposition for a Fusion-Like Neutron Environment., . . Carter, L.L.; Hegberg, D.E.; Wilcox, A.D., . . October 1981, . . NTIS, PC A02/MF A01

HEDL-SA-2431; CONF-811103-89 Gamma-Ray Measurements in the Fast Test Reactor., . . Moore, F.S.; Bunch, W.L., . . May 1981, . . NTIS, PC A02/MF A01

HEDL-SA-2468; CONF-811103-92 Reaction Rates and Neutron Flux Spectra in the FFTF., . . Rawlins, J.A.; McBeath, R.S.; Wootan, D.W.; Lippincott, E.P.; Davis, A.I., . . June 1981, . . NTIS, PC A02/MF A01

HEDL-SA-2490-FP; CONF-811103-51 Beta Decay Properties from a Statistical Model., . . Mann, F.M.; Dunn, C.; Schenter, R.E., . . November 1981, . . NTIS, PC A02/MF A01

IAE-3173 (In Russian) Computer Code for Calculation of Gamma-Quanta and Neutron Propagation in Complex Media (NEUGAM)., . . Dobrynin, Yu.L., . . 1979, . . NTIS (U.S. Sales Only), PC A03/MF A01

IAEA-RL-83 100 by 100 Group Relative Covariance Matrices of 46Ti(n,p), *58*Ni(n,p), *58*Ni(n,2n), *56*Fe(n,p), *47*Ti(n,np), *47*Ti(n,p), *48*Ti(n,np), *48*Ti(n,p) Using Greenwood's Energy Structure for the REAL-80 Project., . . Muir, D.; Ertek, C.; Cross, B., . . December 1980, . . NTIS (U. S. Sales Only), PC A02/MF A01

INIS-mf-5627, pp. vp (In Russian) Using of the T-20 Demonstration Thermonuclear Reactor for Testing Modules of the High-Temperature Gas-Cooled Blanket of a Power Thermonuclear Reactors., . . Vasil'ev, N.N.; Kurbatov, D.K.; Nedospasov, A.V.; Shatalov, G.W., . . 1978, . . Dep., NTIS (U.S. Sales Only)

INIS-mf-5670, pp. 31-35 (In Russian) On the Standard Form of 252-Cf Spontaneous Fission Prompt Neutron Spectrum., . . Akhmedov, G. M.; Stavinskij, V.S., . . 1978, . . Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow

INIS-mf-5670, pp. 83-94 (In Russian) Kerma-Factors in Neutron Interactions with Lithium Hydride., . . Bondarenko, I.M., . . 1978, . . Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow

IPPJ-455 Surface Study of Fusion Research in Universities Linkage Organization., . . Miyahara, A., . . April 1980, . . NTIS (U.S. Sales Only), PC A03/MF A01

Juel-Spez-34 Radionuclide Gamma Ray Data File GAMDAT-78., . . Erdtmann, G.; Soyka, W., . . April 1979, . . NTIS (U.S. Sales Only), PC A02/MF A01

KAERI-430/RR-163/80 (In Korean) Compilation of the Computing Methods in Radiation Shielding., . . Moon, P.S.; Ha, C.W.; Kwon, S. G.; Lee, J.K.; Suh, K.W., . . 1980, . . Korea Atomic Energy Research Inst., Seoul (Republic of Korea)

LA-9037-MS; ENDF-318 Los Alamos Benchmarks: Calculations Based on ENDF/B-V Data., . . Kidman, R.B., . . November 1981, . . NTIS, PC A03/MF A01

LA-9051 Photoneutron Generation with Electron Undulators., . . Baldwin, G.C., . . December 1981, . . NTIS, PC A02/MF A01

LA-9090-MS; ENDF-320 Integral Data Testing of ENDF/B Fission-Product Data and Comparisons of ENDF/B with Other Fission Product Data Files., . . LaBauve, R.J.; England, T.R.; George, D.C., . . November 1981, . . NTIS, PC A06/MF A01

LA-9125-MS Calculated Neutron Source Spectra from Selected Irradiated PWR Fuel Assemblies., . . Rinard, P.M.; Bosler, G.E.; Phillips, J.R., . . December 1981, . . NTIS, PC A02/MF A01

MLM-2898 Gamma-Ray Measurements for Simultaneous Calorimetric Assay., . . Rakel, D.A., . . March 2, 1982, . . NTIS, PC A02/MF A01

NCRP-69 Dosimetry of X-Ray and Gamma-Ray Beams for Radiation Therapy in the Energy Range 10 keV to 50 MeV., . . NCRP, . . December 15, 1981, . . National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Washington, D.C. 20014

ORNL-5147/R1 Safety Analysis Report for Packaging (SARP) of the Oak Ridge National Laboratory. TRU Curium Shipping Container., . . Box, W.D.; Klima, B.B.; Seagren, R.D.; Shappert, L.B.; Aramayo, G.A., . . June 1980, . . Oak Ridge National Laboratory, Oak Ridge, TN

ORNL/TM-7948/V1 Fusion Engineering Device Design Description. Volume 1., . . Flanagan, C.A.; Steiner, D.; Smith, G.E., . . December 1981, . . NTIS, PC A24/MF A01

ORNL/TM-7948/V2 Fusion Engineering Device Design Description. Volume 2., . . Flanagan, C.A.; Steiner, D.; Smith, G.E., . . December 1981, . . NTIS, PC A99/MF A01

ORNL/TM-8056; ENDF-319 An Evaluation of the Resolved-Resonance-Region Cross Sections of *232*Th., . . Olsen, D.K., . . March 1982, . . NTIS, PC A04/MF A01

PPPL-1843 A Monte Carlo Model of Neutral Particle Transport in Diverted Plasmas., . . Heifetz, D.; Post, D.; Petravic, M., . . November 1981, . . Princeton University, N.J., Plasma Physics Lab.

PNL-3570 Understanding Radioactive Waste., . . Murray, R.L., . . December 1981, . . NTIS, PC A07/MF A01

SAND-80-1968 Electron Energy and Charge Albedos - Calorimetric Measurement vs Monte Carlo Theory., . . Lockwood, G.J.; Ruggles, L.E.; Miller, G.H.; Halbleib, J.A., . . November 1981, . . NTIS, PC A05/MF A01

SAND-81-1265 Fusion Hybrid Reactor., . . Bethe, H.A., . . August 1981, . . NTIS, PC A03/MF A01

UCRL-50400, Vol. 17, Pt. A, Rev. 2 Program LINEAR (Version 79-1): Linearize Data in the Evaluated Nuclear Data File/Version B (ENDF/B) Format., . . Cullen, D.E., . . October 31, 1979, . . NTIS

UCRL-53152, Pt. 2 Results of Calculations of External Gamma Radiation Exposure Rates from Fallout and Related Radionuclide Compositions. Operation Buster-Jangle, 1951., . . Hicks, H. G., . . July 1981, . . NTIS

UCRL-53152, Pt. 3 Results of Calculations of External Gamma Radiation Exposure Rates from Fallout and Related Radionuclide Compositions. Operation Tumbler-Snapper, 1952., . . Hicks, H.G., . . July 1981, . . NTIS

UCRL-53152, Pt. 4 Results of Calculations of External Gamma Radiation Exposure Rates from Fallout and Related Radionuclide Compositions. Operation Upshot-Knothole, 1953., . . Hicks, H.G., . . July 1981, . . NTIS

UCRL-53152, Pt. 6 Results of Calculations of Expernal Gamma Radiation Exposure Rates from Fallout and the Related Radionuclide Compositions. Operation Plumbob, 1957., . . Hicks, H. G., . . July 1981, . . NTIS

UCRL-53152, Pt. 7 Results of Calculations of External Gamma Radiation Exposure Rates from Fallout and the Related Radionuclide Compositions. Operation Hardtack II, 1958., . . Hicks, H.G., . . July 1981, . . NTIS

UCRL-86177 Calculation of the Concentration of Any Radionuclide Deposited on the Ground by Fallout from a Nuclear Detonation., . . Hicks, H.G., . . 1981, . . Lawrence Livermore National Laboratory, Livermore, CA, . . Accepted by Health Physics for publication.

WFPS-TME-81-031 Neutron Attenuation in the Laser Ducts of an Inertial-Confinement Fusion Reactor., . . Augustine, F.,Jr., . . November 1981, . . NTIS, PC A06/MF A01

Atomkernenergie, 34(4), 303-304 Stochastic Green Functions for Scattering Transport Theory., . . Lewins, J., . . 1979, . . Short communication only

Atomkernenergie, 37(1), 25-31 (In German) State of the Japanese Nuclear Research Ship MUTSU., . . Lettnin, H., . . 1981

Atomkernenergie, 37(2), 118-122 Biological Radiation Shielding for a Fast Undercritical Hybrid Assembly., . . Sahin, S.; Ligou, J.; Caro, M., . . 1981

Int. J. Radiat. Oncol., Biol. Phys., 7(1), 125-128 Comparison of Photon Dosages Behind High and Low Z Shielding Blocks in Electron Fields., . . Shabason, L.; Hendee, W.R.; Ibbott, G. S., . . January 1981

J. Nucl. Sci. Technol., 16(5), 329-342 Proton-Recoil Counter Technique for Measurement of Fast Neutron Spectrum., . . Obu, M.; Shirakata, K., . . May 1979

Kernenergie, 24(2), 63-68 14.7 MeV Neutron Spectra Modified by Various Shielding. Com-

parison of Theoretical Calculations and Experimental Results., . . Doerschel, B.; Spurny, F., . . February 1981

Med. Phys., 8(4), 507-509 Perturbation of Electron Beam Doses as a Function of SSD Due to the Use of Shielding Blocks on the Clinac-18., . . Thomadsen, B.R.; Asp, L.W.; Geijn, J.v.d.; Paliwal, B.R.; PoCheng, C., . . July 1981

Nucl. Eng. Design, 55(3), 419-426 Spectral Measurements of Gamma Radiation Streaming Through Ducts., . . Meenakshisundaram, P.K.; Bhatnagar, V.M.; Raghunath, V.M.; Gopinath, D. V., . . December 1979

Nucl. Instrum. Methods, 171(3), 561-565 Effect of Bremsstrahlung on Scattered Gamma Ray Spectra., . . Sundararaman, V., . . May 1980

Nucl. Instrum. Methods, 173(3), 449-452 Experimental Study of the Pb and Bi Breeding Zones Effect on the Neutron Parameters of a Molten-Salt Blanket in a Fusion Reactor., . . Novikov, V.M.; Sheehov, S.B.; Romodanov, V.L.; Zagryadsky, V.A.; Chuvilin, D.Y., . . July 1980

Nucl. Sci. Eng., 80(3), 360-369 Penetration Through Shielding Materials of Secondary Neutrons and Photons Generated by 52-MeV Protons., . . Uwamino, Y.; Nakamura, T.; Shin, K., . . March 1982

Nucl. Sci. Eng., 80(3), 379-387 Delayed Neutron Yields from Fission of Uranium-233, Neptunium-237, Plutonium-238, -240, -241, and Americium-241., . . Benedetti, G.; Cesana, A.; Sangiust, V.; Terrani, M.; Sandrelli, G., . . March 1982

Nucl. Sci. Eng., 80(3), 407-411 The Perturbation Produced in the Neutron Spectrum of an Assembly by a Spectrometer., . . Sekimoto, H.; Ohtsuka, M.; Yamamuro, N., . . March 1982

Nucl. Sci. Eng., 80(3), 412-415 Time-Dependent Surface Angular Flux for a Semi-Infinite Medium with Specular Reflection., . . Ganapol, B.D., . . March 1982

Nucl. Sci. Eng., 80(3), 424-447 Predicting the Cost of Splitting in Monte Carlo Particle Transport., . . Juzaitis, R.J., . . March 1982

Nucl. Sci. Eng., 80(3), 448-452 Neutron-Photon Multigroup Cross Sections for Neutron Energies Less than or Equal to 400 MeV. (Tech. Note), . . Alsmiller, R.G.,Jr.; Barish, J., . . March 1982, . . Announced previously as ORNL/TM-7818

Nucl. Sci. Eng., 80(3), 455-461 Yields of Short-Lived Fission Products of Thermal-Neutron Fission of Thorium-229. (Tech. Note), . . Dickens, J.K.; McConnell, J.W.; Northcutt, K.J., . . March 1982

Nucl. Sci. Eng., 80(3), 469-473 The Calculation of the Chord Distribution Function. (Tech. Note), . . Kwiat, D., . . March 1982

Nucl. Technology, 57(1), 20-35; EGG-PHYS-5243 Sensitivity and Uncertainty Analysis of the Coupled Fast Reactivity Measurements Facility Central Flux Spectrum., . . Ryskamp, J. M.; Anderl, R.A.; Broadhead, B.L.; Ford, W.E.,III; Lucius, J.L.; Marable, J.H.; Wagschal, J.J., . . April 1982

Nucl. Technology, 57(1), 50-57 Environmental Gamma-Ray Measurement Methods for French Nuclear Installation Impact Studies., . . Gauthier, D.; Caput, C.; Bourdeau, F., . . April 1982

Radiat. Prot., 2(1), 17-23 Fast Neutron Dosimetry in Nuclear Criticality Accidents., . . Yook, C.C., . . July 1977

BOOK, Vol. 1, Pt. A FUSION. Vol. 1, Pt. A., . . Teller, E., . . 1981, . . Academic Press, New York

BOOK, Vol. 1, Pt. B FUSION. Vol. 1, Pt. B., . . Teller, E., . . 1981, . . Academic Press, New York

BOOK FAST BREEDER REACTORS., . . Waltar, A.E., . . 1981, . . Pergamon Press, New York

COMPUTER CODES LITERATURE

AECL-6975 ..... TRANSOPTR
TRANSOPTR - A Second Order Beam Transport Design Code with Automatic Internal Optimization and General Constraints., . . Heighway, E.A., . . Atomic Energy of Canada, Ltd., Chalk River, Ontario, Chalk River Nuclear Labs., . . July 1980

AEEW-R 1249; WPC/P31 ..... MONK5W
Modifications to the Monte Carlo Neutronics Code MONK., . . Hutton, J.L., . . Energy Systems Analysis Division, Atomic Energy Establishment, Winfrith, Dorchester, Dorset, UK, . . September 1979, . . AVAIL: NTIS

Ann. Nucl. Energy, 7(2), 107-117 ... RADAK; PIPE
Energy and Angular Flux Density Spectra of 6 MeV Gamma-Rays Penetrating Shielding Materials., . . Abookazemi, M.E.; Bishop, G.B., . . Liverpool University, Dept. of Mechanical Engineering, UK, . . 1980

CEA-CONF-5280 ..... TRIMARAN
TRIMARAN: A Three Dimensional Multigroup P1

Monte Carlo Code for Criticality Studies., . . Ermuncu, G.; Gonnord, J.; Nimal, J.C., . . CEA Centre d'Etudes Nucleaires de Saclay, 91-Gif-sur-Yvette, France, . . April 1980

CONF-810462-2 ..... AIRDOS-EPA
Validation of Annual Average Air Concentration Predictions from the AIRDOS-EPA Computer Code., . . Miller,C.W.; Fields, D.E.; Cotter, S.J., . . Oak Ridge National Laboratory, TN, . . 1981

DOE/EML-391 ..... TWOGO
An Iterative Nonlinear Unfolding Code: TWOGO., . . Hajnal, F., . . Environmental Measurements Laboratory, New York, NY, . . March 1981, . . AVAIL: NTIS

DP-MS-79-54; CONF-791103-74 ..... SHIELD
SHIELD System., . . Finch, D.R.; Chandler, J.R.; Church, J.P., . . Savannah River Lab., Aiken, SC, . . November 1979

E11-81-88 ..... GEOMC
GEOMC - A Monte-Carlo Program for Calculating Geometrical Aberrations in Curved-Crystal Spectrometers., . . Zschornack, G.; Muller, G.; Musiol, G., . . Joint Institute for Nuclear Research, Dubna, USSR, . . 1981

FSL-64 ..... RDCS
RDCS: A Code to Pick Multigroup Cross Sections from a Binary Nuclides-Organized Library and Generate Input Files for Transport Codes., . . Holloway, J.P.; Ragheb, M.M.H., . . University of Illinois, Urbana, IL, . . August 1981, . . CDC CYBER

J. Nucl. Sci. Technol., 16(8), 563-573 ..... ANISN-JR; PALLAS; SAND-II
Fast Neutron Transport Through Laminated Iron-Water Shield., . . Miura, T.; Takeuchi, K.; Yamano, N., . . Ship Research Inst., Tokai, Ibaraki, Japan, . . August 1979

JAERI-M 7988 ..... MCRTOF
MCRTOF - A Monte-Carlo Program for Multiple Scattering of Neutrons in Resonance Energy Region., . . Ohkubo, M., . . Japan Atomic Energy Research Institute, Tokai, Japan, . . November 1978, . . FACOM-230/75

Nucl. Instrum. Methods, 187, 587-594 .... SAND-II
Spectral Measurements of Neutrons Produced by 52 MeV Protons with Activation Detectors., . . Shin, K.; Saito, T.; Fujii, M.; Nakamura, T., . . Japan Atomic Energy Research Institute, Tokai, Japan, . . October 1980

NUREG/CR-1690; PNL-3382 ..... WRAITH
WRAITH - A Computer Code for Calculating Internal and External Doses Resulting from an Atmospheric Release of Radioactive Material., . . Scherpelz, R.I.; Borst, F.J.; Hoenes, G.R., . . Pacific Northwest Laboratory, Richland, WA, . . December 1980, . . FORTRAN, . . AVAIL: NTIS

NUREG/CR-1917; ORNL/NUREG/CSD/TM-19 .... SCALE
Validation of Three Cross-Section Libraries Used with the SCALE System for Criticality Safety Analysis., . . Hathout, A.M.; Westfall, R.M.; Dodds, H.L., . . Oak Ridge National Laboratory, TN, . . June 1981

ORNL/TM-7295 ..... LILITA
Description and Use of the Monte Carlo Code LILITA., . . Gomez del Campo, J.; Stokstad, R.G., . . Oak Ridge National Laboratory, TN, . . September 1981

ORNL/TM-7818 ..... HILO
Neutron-Photon Multigroup Cross Sections for Neutron Energies Less Than or Equal to 400 MeV., . . Alsmiller, Jr., R.G.; Barish, J., . . Oak Ridge National Laboratory, TN, . . June 1981

Pap. Ship Res. Inst., 57, 1-47 .. PALLAS-2DCY-FC
PALLAS-2DCY-FC, A Calculation Method and Radiation Transport Code in Two-Dimensional (r, z) Geometry., . . Takeuchi, K., . . Ship Research Inst., Tokai, Ibaraki, Japan, . . July 1979, . . FORTRAN IV ,FACOM 230/75; CDC 6600

WAPD-TM-1275 ..... AIRWAY
AIRWAY - A FORTRAN Computer Program to Estimate Radiation Dose Commitments to Man From the Atmospheric Release of Radionuclides., . . Rider, J.L., . . Bettis Atomic Power Laboratory, West Mifflin, PA, . . June 1979, . . FORTRAN, . . AVAIL: NTIS