RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

OAK RIDGE NATIONAL LABORATORY
OPERATED BY UNION CARBIDE CORPORATION FOR THE DEPARTMENT OF ENERGY

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People should blow their own horn. After all, they're really the only ones who know the tune. — Bob Talbert in the Detroit Free Press

RSIC PRODUCTS REVIEW CONTINUES

After a long interruption due to pressures of other work, we have resumed the internal audit of RSIC products with consequent removal from the information collections materials considered to be obsolete in terms of current usage and the state of the art. Any surplus documents will be offered in the *RSIC Grab Bag* for those who may wish a reference copy. We call your attention to the results of prior audits listed in RSIC Newsletters No. 172–April 1979 and No. 173–May 1979.

The Shielding Code Collection (CCC's)

Retained for RSIC archives and for dissemination upon demand are the following code packages:

CCC-100/K-019	Space shielding.
CCC-101/NAP	Multigroup time-dependent neutron activation.
CCC-102/SURF	Single scattering code.
CCC-103/OPEX	Shield optimization.
CCC-104/EDNA	Electron dose; kernel integration.
CCC-106/PF-COMP	Building fallout radiation protection factor analysis.
CCC-107/ETRAN	Monte Carlo electron and photon transport.
CCC-108/SPECTRA	Neutron spectra calculation.
CCC-109/SOSUM	Multigroup beta and gamma-ray source calculations.
CCC-110/AIRTRANS	Monte Carlo 3-D transport.
CCC-112/SAND	Neutron flux spectra determination.
CCC-115/GADJET	Monte Carlo gamma-ray adjoint transport.
CCC-116/TRECO	Space technology.
CCC-117/BETA II	Monte Carlo bremsstrahlung and electron transport.
CCC-118/SIGMA	Space technology.
CCC-119/ELBA	Space technology.
CCC-120/SPACETRAN	Dose calculation – integration of ANISN leakage data.
CCC-121/SABINE	Removal-diffusion shielding.
CCC-122/RAD 2	Fission product radioactivities.
CCC-123/XSDRN	Multigroup 1-D discrete ordinates transport.
CCC-124/KDLIBE	Kernel-diffusion.
CCC-125/RSAC	Radiological safety analysis.
CCC-126/ASOP	Discrete ordinates-shield optimization.
CCC-127/MORSE	Monte Carlo radiation transport.
CCC-128/06R	Monte Carlo neutron transport.

In several instances above, the code packages were reduced in size with the removal of different computer versions, or other material no longer considered useful. In some cases, the retained material is still requested but is archived for other reasons.

The following code packages will no longer be offered for dissemination:

CCC-105/RDMM	Newer technology available.
CCC-111/FLORA	Not requested in 10 years.
CCC-113/ATHENA	Not requested in 10 years.
CCC-114/SAM C	Obsoleted by SAM-CE (CCC-187).

Peripheral-to-Shielding Routines (PSR's)

A critical review of the PSR collection (1—50) resulted in the removal of the following code packages:

PSR-2/CHAD	Obsolete technology.
PSR-5/AGN-SIGMA	Not requested in 10 years.
PSR-6/EDISN	Not requested in 8 years.
PSR-7/MUG	Obsoleted by newer versions.
PSR-9/CSP	Not requested in 8 years.
PSR-16/RANGE	Not requested in 12 years.
PSR-19/AGN-GAM	Not requested in 15 years.
PSR-21/PHOX	Newer technology available.
PSR-25/DUCAL	Not requested in 8 years.
PSR-27/GIRD	Not requested in 10 years.
PSR-34/EVP XIX	Not requested in 7 years.
PSR-37/SASSI	Not requested in 7 years.
PSR-38/PHROG	Not requested in 7 years.
PSR-46/XLACS	Obsoleted by XLACS II in AMPX.
PSR-48/ALC1	Newer technology available.
PSR-50/GAMBIT	Not requested in 8 years.

It is to be noted that newer technology exists in almost all cases above. RSIC staff members will be pleased to make recommendations upon request.

NUCLEAR STANDARDS NEWS

New members of the American Nuclear Society Standards Steering Committee are **W. L. Godfrey** and **R. S. Carter**. Godfrey, Project Manager, Operations Division, at Allied General Nuclear Fuel Services, replaces **P. F. Gustafson** as chairman of N48, "Radioactive Waste Management." Gustafson, formerly at Argonne National Laboratory, has accepted the position of Director, Illinois Department of Nuclear Safety. Carter replaces **W. L. Whittemore** (General Atomic Company) as chairman of N17, "Research Reactors, Reactor Physics, and Radiation Shielding." Carter, former N17 secretary, is Chief, Reactor Radiation Division, National Bureau of Standards. Whittemore remains a member of ANS-15, "Operation of Research Reactors." (For more PEOPLE/NUPPSCO NEWS, see page 2 of the February 15, 1981, issue of the *Nuclear Standards News.*)

Attention is called to the ANSI N42.12-1980, "Calibration and Usage of Sodium Iodide Detector Systems." Order from IEEE, $5.00.

CORRECTION

In the article, "X-Ray and Ionizing Radiation Data Center," in the February issue of the RSIC Newsletter, the NBS Center's telephone number was incorrectly listed. The correct number is: (301) 921-2685.

FEEDBACK FROM SCALE USAGE

J. A. Bucholz, UCND/CSD—ORNL, has called RSIC attention to a number of useful changes which should be made by those maintaining an operating version of SCALE-0/CSAS1—CSAS2 modular code system. In general, these changes, which facilitate usage of the system, are minor modifications (addition or

deletion of cards) and easy to make. Too numerous to be listed here, these changes and an explanation related to them are being mailed to those known to be using SCALE and are available to others upon request.

The changes will be made in the open code package in RSIC, and subsequent requesters will receive current state-of-the-art technology. Availability of the updated package will be announced in the RSIC Newsletter.

CHANGES IN THE COMPUTER CODE COLLECTION

The following changes were made in February.

CCC-270/SUBDOSA II

The code package for calculation of external gamma-ray and beta doses from accidental atmospheric release of radionuclides has been replaced by a newly frozen version supplied by Battelle Pacific Northwest Laboratory. The new version, SUBDOSA II, reflects improvements which have been made to the code since its original package date, October 23, 1975. It will accept the data library RMDLIB as a master library. The beta energy library and gamma energy library were also modified to use the same radionuclide identifications as the master library. FORTRAN IV; CYBER 74.

CCC-289/SKYSHINE II

SKYSHINE, the code package for Monte Carlo integration of 6-MeV gamma-ray transmission, reflection, and air-scattered data to compute dose rates outside concrete-steel buildings, has been replaced by a newly frozen version, SKYSHINE II. This new version, supplied by Radiation Research Associates, Inc., Fort Worth, Texas, possesses the ability to address three types of point-isotropic radiation sources: 1) primary gamma rays, 2) neutrons, and 3) secondary gamma rays. The emitted radiation may now be characterized by an energy emission spectrum defined by the user. Reference: NUREG/CR-0781 (RRA-T7901). FORTRAN IV; IBM 360.

CCC-371/ORIGEN 2

The isotope generation and depletion code package has been extended to include a CDC version, (B), contributed by the Oak Ridge National Laboratory. ORNL also contributed the original version of ORIGEN 2, the IBM (A). FORTRAN IV.

CCC-399/ORIGEN-JR

ORIGEN-JR, a code system for calculating radiation sources and analyzing nuclide transmutations, was contributed by Japan Atomic Energy Research Institute, Tokai-mura, Japan. An outgrowth of ORIGEN 1 (CCC-217), the code is valuable for shielding calculations of spent-fuel casks and fuel-reprocessing plants.

In addition to spectrum indices adopted in the ORIGEN code, one-group cross sections for each reaction can be used to treat the burnup conditions in a reactor core. Neutron and gamma-ray source data are generated in the same format as in shielding codes QAD-P5 (CCC-48), ANISN (CCC-254) and DOT-III (CCC-209). Reference: JAERI-M-8229. FORTRAN IV; FACOM 230-75.

CCC-402/PABLM

PABLM, a code to calculate accumulated radiation doses to man from radionuclides in the environment, was contributed by Battelle Pacific Northwest Laboratory, Richland, Washington. A total of 19 ingestion pathways (or food products) may be selected with corresponding consumption rates, growing periods, and air or water concentrations and deposition rates. A total of 4 external exposure pathways may also be selected with corresponding exposure times and soil or water concentrations. Dose factors for persons swimming in contaminated water are calculated using the water concentration of radionuclides, and the assumption that the water is an infinite medium with respect to the range of the emitted radiations. The program can be used to calculate accumulated doses to 23 possible body organs or tissues for any one or combination of radionuclides. Reference: PNL-3209. ASCII FORTRAN; UNIVAC 1100/44.

CCC-403/FOOD

FOOD, a code system for calculating radiation dose to man from radionuclides in the environment, was contributed by Battelle Pacific Northwest Laboratories, Richland, Washington. Radiation doses to man may be calculated from deposition on farm or garden soil and crops during either an atmospheric or water release of radionuclides. Deposition may be either directly from the air or from irrigation water. Fifteen crop or animal product pathways may be chosen. Reference: PNL-3180. FORTRAN IV; UNIVAC 1108.

CCC-404/ARRRG

ARRRG, a code system for calculating radiation dose to man from radionuclides in the environment, was contributed by Battelle Pacific Northwest Laboratory, Richland, Washington. Radiation doses to man may be calculated from radionuclides released to bodies of water from which people might obtain fish, other aquatic foods, or drinking water, and in which they might fish, swim or boat. The radiation doses from external exposure to contaminated water are calculated using the basic assumption that the contaminated medium is large enough to be considered an "infinite" volume relative to the range of the emitted radiations. Doses may be calculated for either a maximum-exposed individual or for a population group. Reference: PNL-3180. FORTRAN; UNIVAC 1100/44.

CCC-405/SENSIT

SENSIT, one-dimensional, generalized perturbation theory multigroup cross section and design sensitivity and uncertainty analysis code system, was contributed by Los Alamos National Laboratory, Los Alamos, New Mexico. SENSIT calculates the sensitivity and uncertainty of a calculated integral response due to input cross sections and their uncertainties. Sensitivity profiles are computed for reaction cross sections and secondary energy distributions. In the design mode, SENSIT computes changes in an integral response due to design changes. Uncertainty analyses are performed for cross section covariances, secondary energy distribution shape uncertainties, and energy dependent response covariances. SENSIT uses angular flux files from ONETRAN (CCC-266), ANISN (CCC-254), and DTF (CCC-130) and reads cross sections in three commonly used formats. Reference: LA-8498-MS. FORTRAN IV and assembler language; CDC 7600.

PSR-158/SAMMY

SAMMY, a computer model for multilevel R-matrix fits to neutron data using Bayes' equations, was contributed by Oak Ridge National Laboratory. This method has several advantages over the least-squares method. One advantage is that the assumptions under which the parameter values have been determined are more clearly evident than in many results based upon least squares. Reference: ORNL/TM-7485 (ENDF-297). FORTRAN IV; PDP-10.

CHANGES IN THE DATA LIBRARY COLLECTION

The following changes were made in February. Please note that the date (year) of the change is appended to the data library name when an existing package is updated or replaced. This device helps to distinguish betwen the current and earlier versions when their use is reported in published results of research.

DLC-31G/FEWG1-81

The 37 neutron, 21 gamma-ray group library was updated to fix an error in the response function table, group 1, position 1. A large ($\sim 10^{38}$) value was inadvertently entered on RSIC's most recent version (see ORNL/TM-4840, page B2 for correct value). In addition, the hydrogen thermal group, P_1, cross section value was changed to 36 b from its previous value of 12 b (the $2l + 1$ factor). Finally, the data sets for phosphorous and sulfur were replaced by newly generated ones to correct an error in the representation of the scattering matrix (all elements were zero). We are grateful to J. Courtney, Department of Nuclear Engineering, Louisiana State University, for pointing out the first error mentioned above and to J. Pace, ORNL, for providing the fix, for changing the hydrogen P_1 term, and for providing new data sets for P and

S. The correction to hydrogen is likely to have an impact only on results for very hydrogenous systems. The error for P and S would result in their acting as pure absorbers (no scattering).

DLC-79/DOSDAT II-81

DOSDAT II-81, a library of dose-rate conversion factors for external exposure to photons and electrons, was contributed by the Oak Ridge National Laboratory. These data represent a significant update of the DLC-63/DOSDAT library. The data, given for approximately 500 radioactive nuclides, are used to estimate the gamma-ray and electron dose rates for whole body and for 24 body organs for air and water immersion and from ground-surface sources. A retrieval program is included in the package. References: *Trans. Am. Nuc. Soc.* 34, 84-85 (1980) and ORNL/NUREG-79. FORTRAN IV; IBM 360.

DLC-80/DRALIST

DRALIST, a data set of radioactive decay energies, spectra, half lives, and other information for 561 radionuclides in MEDLIST (DLC-46) output format and also in an abbreviated form, was contributed by Oak Ridge National Laboratory. The data are derived from the Evaluated Nuclear Structure Data File (ENSDF) using the MEDLIST program. A modified version of the MEDPRINT program with improved editing capability is also provided. A file of decay branching information is also provided. Reference: Informal notes and draft of handbook, "Radioactive Decay Data Tables: A Handbook of Decay Data for Application to Radiation Dosimetry and Radiological Assessments." FORTRAN IV; IBM 360.

PERSONAL ITEMS

Dennis Mennerdahl, formerly with the Swedish Nuclear Power Inspectorate, is now associated with AB Erling Mennerdahl, a family-owned consulting firm. He is presently participating in an NEA/CSNI Working Group on criticality codes used for analysis of spent fuel shipping casks and their use in analysis of benchmark problems.

VISITORS TO EPIC

The following persons came for an orientation visit and/or to use EPIC facilities during the month of February: **Arthur Bass** and **Douglas G. Smith**, ERT (Environmental Research & Technology, Inc.), Lexington, Massachusetts; **Bernard E. Epstein**, Franklin Research Center, Philadelphia, Pennsylvania; Tjark Holst, Control Data GMBH, Frankfurt, W. Germany; **Charles W. Miller**, Oak Ridge National Laboratory, Oak Ridge, Tennessee; **Yasushi Nomura**, Nuclear Power Engineering Test Center (NPETC), Japan; Ernest **Plechaty**, Lawrence Livermore National Laboratory, Livermore, California; and **Yo Taik Song**, Office of Military Application, DOE, Germantown, Maryland.

CONFERENCES AND COURSES

International Seminar on the Role of Finite Element Methods in Radiation Physics

Program and meeting arrangements information has been received for the "International Seminar on the Role of Finite Element Methods in Radiation Physics" to be held at the United Kingdom Imperial College, April 23—24, 1981, sponsored by the Computational Physics Group of the Institute of Physics and the Institution of Nuclear Engineers. The Seminar will cover the formulation of finite element methods for radiation physics problems, their relationship to Monte Carlo and other methods, a survey of finite element solutions to benchmark problems and practical problems in reactor physics and shielding. Papers will be grouped into applications to diffusion theory, 1st order and 2nd order solutions of the transport equation. The aim of the meeting is to bring together applied mathematicians, users of related methods and those concerned with developing the method to solve the Boltzmann equation for radiation transport in complex geometry.

The program includes papers and speakers as follows:

On the status of finite difference and Monte Carlo methods for solving practical problems in radiation physics – A. F. Avery (invited), Atomic Energy Establishment Winfrith, UKAEA, United Kingdom.

The why and how of finite elements – R. T. Ackroyd (invited), Risley Nuclear Power Development Establishment, UKAEA, United Kingdom.

Experiences using the finite element method in reactor calculations – F. Schmidt (invited), Institut fu"r Kernenergetik und Energiesysteme, Stuttgart, Federal Republic of Germany.

The application of the finite element method to the solution of radiation shielding problems – D. T. Grenfell, British Nuclear Fuels Ltd., United Kingdom.

FENDER, A finite element code for the solution of the diffusion equation in shield design applications – E. Shuttleworth, Atomic Energy Establishment Winfrith, UKAEA, United Kingdom.

Comparison of finite differences and finite elements in the case of large fast power reactors – J-C. Estiot, Centre d'Etudes Nucle'aires de Cadarache, C.E.A., France.

Solution of finite element problems without assembly using group theory – S. Pelloni, Eidg. Institut fu"r Reactorforschung, Switzerland.

Phase space finite element methods applied to the first order form of the transport equation – J. J. Duderstadt (invited), The University of Michigan, United States of America.

Solution of the Boltzmann neutron transport equation using a weighted residual technique – J. K. Fletcher, Risley Nuclear Power Development Establishment, UKAEA, United Kingdom.

Some efficient Lagrangian mesh finite elements in two-dimensional transport reactor calculations encoded in ZEPHYR – M. Mordant (invited), Centre d'Etudes de Limeil, C.E.A., France.

A unified formalism for spatial discretization schemes of transport equations in slab geometry – J. P. Hennart, Universidad Nacional Autonama de Mexico, Mexico.

Some observations on finite element solutions of few group eigenvalue transport and diffusion theory benchmark problems – R. T. Ackroyd, Risley Nuclear Power Development Establishment, UKAEA, United Kingdom.

The constrained finite element approach to coarse mesh transport computations – E. E. Lewis (invited), Nothwestern University, United States of America.

A finite element method for multigroup source problems in two-dimensions – A. K. Ziver, Imperial College of Science and Technology, United Kingdom.

The development of a Monte Carlo code for the solution of generalized-geometry problems by tracking in finite element mesh – P. C. Miller, Atomic Energy Establishment Winfrith, UKAEA, United Kingdom.

A comparison of finite element and discrete ordinate methods for one-dimensional multigroup shielding problems – C. S. Quah, Imperial College of Science and Technology, United Kingdom.

Miscellaneous remarks on choice of moments, moment reduction, local and global error bounds – A. Splawski, Queen Mary College, United Kingdom.

Summing up of the meeting – M. M. R. Williams, Queen Mary College, United Kingdom.

Registration fee and accommodation information may be secured from: Dr. A. J. H. Goddard, Mechanical Engineering Department, Imperial College, London SW7 2BX.

CALENDAR OF MEETINGS

We call attention to the following meetings.

March 1981

The Radiation Safety Specialist Training Program, March 9—13, 1981, Oklahoma City, Oklahoma. Contact: Oklahoma State University, Technology Extension, 313 Crutchfield, Stillwater, OK 74078, (405) 624-5714.

9th Annual National INTERFACE '81, March 30—April 2, 1981, Las Vegas Convention Center, Las Vegas, Nevada. Contact: Conference Registration Department, INTERFACE '81, 160 Speen Street, Framingham, MA 01701, (617) 879-4502 or (800) 225-4620.

April 1981

Risk Assessment for Energy Systems, April 20—24, 1981, University of California, Los Angeles, California. Contact: Continuing Education in Engineering and Mathematics, P. O. Box 24901, UCLA Extension, Los Angeles, CA 90024, (213) 825-1295 or -3344.

May 1981

Conference on Industry's Role in the Development of Fusion Power, May 3—6, 1981, New York Hilton Hotel, New York City, New York. Contact: Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Washington, D.C. 20014, (301) 654-9260.

June 1981

Workshop on the Electric Imperative, June 14—17, 1981, Hyatt Del Monte, Monterey, California. Contact: Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Washington, D.C. 20014, Attention: Conference Registrar, (301) 654-9260.

INDIAN SYMPOSIUM ON RADIATION PHYSICS

The Fourth National Symposium on Radiation Physics will be held at the Department of Physics, Punjabi University, Patiala, India, in the first week of October 1981.

Topics expected to be covered in the symposium include: 1) Basic Radiation Physics Data (measured and theoretical); 2) Radiation Sources, their characteristics and applications; 3) Radiation Transport; 4) Radiation Dosimetry; and 5) Radiation Instrumentation. Additional information may be secured from Professor B. S. Sood, Punjabi University, Patiala, India.

FEBRUARY 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.

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REACTOR AND WEAPONS RADIATION
SHIELDING LITERATURE

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Nuclear Data Requirements for Fusion Reactor
Nucleonics., Bhat, M.R.; Abdou, M.A., 1980,
NTIS, PC A02/MF A01

BNL-28627; CONF-801011-74
Review of Fusion Synfuels., Fillo, J.A., 1980,
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CEA-R-4844(Rev.1) (In French)
External Irradiation During and After the Passage of a
Radioactive Cloud., Despres, A.; Bouville, A.;
Guezengar, J.-M.; Le Grand, J.; Lorenzi, P.; Grandin,
M.; Lalande, R., January 1980, NTIS (U.S. Sales
Only), PC A11/MF A01

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Computer Code for Calculating Neutron Cross-Sections
from Resonance Parameter Data., Mill, A.J.,
August 1979, NTIS (U.S. Sales Only), PC A03/MF
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CONF-7810231, pp.9-15
Lecture 1: Computer Methods in Radiation Protection as
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Techniques in Radiation Transport and Dosimetry.
(Proceedings of a School, Erice, Sicily, Oct. 1978),
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Lecture 2: The Physics of Radiation Transport.,
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Lecture 4: The Methods and Applications of Monte
Carlo in Low Energy (less than or equal to 20 MeV)
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Transport and Dosimetry. (Proceedings of a School,
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Lecture 5: The Methods and Applications of Discrete
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Lecture 8: Cross Section Processing Codes and Data
Bases (AMPX). (Summary Only), Engle, W.W.,Jr.,
In: Computer Techniques in Radiation Transport and
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Lecture 10: Approximate Methods in Reactor Shielding
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in Radiation Transport and Dosimetry. (Proceedings of a
School, Erice, Sicily, October 1978), 1980, Plenum
Press, New York

CONF-7810231, pp.389-407
Lecture 24: Unfolding Techniques for Activation
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Lecture 25: Bremsstrahlung Spectrum Analysis by
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Lecture 26: Application of Activation-Spectrum Analysis
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Dosimetry. (Proceedings of a School, Erice, Sicily,
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Radiation Level Trends in Westinghouse Pressurized Water Reactors., Frank, F.J.; Sejivar, J., In: Conference on Radiation Protection in Nuclear Power Plants and the Fuel Cycle, Bristol, UK, 27 November - 1 December 1978., 1978, British Nuclear Energy Society, London

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Radiological Protection in the Prototype Fast Reactor, Dounreay, Scotland., Adam, E.R.; Howard, R.S.; McDonald, W., In: Conference on Radiation Protection in Nuclear Power Plants and the Fuel Cycle, Bristol, UK, 27 November - 1 December 1978., 1978, British Nuclear Energy Society, London

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