RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION • FOR THE U.S. ATOMIC ENERGY COMMISSION

POST OFFICE BOX X •
OAK RIDGE, TENNESSEE 37831

No. 111   February 1974

Either I will find a way,

or I will make one.

-- Sir P. Sidney

INFORMATION MUST FLOW FREELY

The Atomic Industrial Forum, Inc., 475 Park Ave., S., N. Y. 10016, in its publication AIF INFO No. 66, reports on a survey of reactor safety experts conducted by the Christian Science Monitor. The reporter, David Salisbury, was interviewed by INFO. We would like to quote a paragraph of the INFO report:

> *The survey revealed a problem of credibility, Salisbury told INFO, between industry and the laboratories and vice versa. He suggested that eventually one key to this problem may be standardization. Currently, however, he sees part of the problem due to the fact that each vendor has different computer codes and "they are really the only people with the knowledge and the know-how to use them." This situation is compounded by the proprietary nature of the business which vendors maintain is necessary for competition. "Because certain information is considered proprietary, people like Dr. Henry Kendall and Ralph Nader can say that the things they are not telling us are bad," Salisbury said. "This type of situation throws a pall on everyone. Information is a primary resource we must use as effectively as we can, and the only way to use information effectively is free flow."*

RSIC has always maintained that the *open code concept* contributes to a living, growing technology. We define *open codes* as those which, at an operational stage of their development, become reasonably well-documented, closely scrutinized in their internals by members of the industry at large, widely implemented, and frequently modified by the users. These are characteristics which we commonly expect to find in any piece of valid science or technology. We define a code as *closed* if it does not meet these conditions. Proprietary and commercial policies tend to have the effect of producing closed codes.

We are pleased to note that in shielding the *open code concept* is flourishing and that the industry cooperates fully with RSIC in efforts to advance the technology in calculational methods and computer codes.

ESIS SHIELDING DATA BANK

Through the establishment of a shielding data bank (S.D.B.), the European Shielding Information Service (ESIS) intends to speed up access to and retrieval of shielding information.

In a first phase, the data bank handles only bibliographic items delivered by the weekly scanning of periodicals, reports, and books. The yearly growth is estimated to lie between 450-500 new titles. Authors, titles, abstracts, references,and publication dates are stored within the bank. The bibliography contains at present 350 objects and represents a test of the retrieval system which in the near future will be extended to the other classes, such as experiments, codes, cross sections, shielding materials, etc. When filled with sufficient information, the SDB will be made available to the European Shielding Community.

CHANGES TO THE DNA WORKING CROSS SECTION LIBRARY

Modifications were recently made to the aluminum and tantalum data sets. These changes are summarized below.

Tantalum-181 - MAT 4179 LLL

MOD 3 November 1973

The gamma-ray production files were revised to incorporate recent measurements by J. K. Dickens at ORNL.

The tabulated elastic scattering angular distribution at 14 MeV was thinned to reduce the number of points below the 100 allowed by ENDF format.

Aluminum-27 - MAT 4135 LASL

MOD 3 November 1973

The file 1 BCD description was revised to reflect the changes that are given below.

The thermal neutron radiative capture gamma-ray spectrum was revised to better agree with recent data. File 13 and 15 (n,n'γ) and (n,n'pγ) were revised to include the measurements by Dickens et al.(ORNL-TM-4232,1973).

Improved (n,p) and (n,α) cross sections were incorporated. These are the same as were provided to the CSEWG Standards Subcommittee. The total cross section was extensively revised, especially below 1 MeV, to include the measurement of Perey et al. (ORNL-4823, 1972).

The (n,n') cross sections to high-lying pseudo levels were revised for neutron energies near 14 MeV to give better agreement to measurements by Kammerdiener (U. Cal. Davis Thesis, 1972). In addition (n,n') data to lower levels were revised to be consistent with the changes made to file 13 and 15 mentioned above. Anisotropic (n,n') angular distributions based on experimental data were incorporated.

CHANGES TO THE CODE COLLECTION

The following changes were made to the code collection during January. In several instances, changes to existing code packages are described; others are new additions. Unless otherwise noted, requests should be accompanied by a full reel of magnetic tape.

CCC-79/ISOSHLD   General Purpose Isotope Shielding Analysis Code has been updated to reflect changes suggested by Steven J. Nathan of the Ralph M. Parsons Company and Lee Simmons, SAI, Huntsville, Alabama (one of the code originators). The corrections (made in Function BFUNC and in Subroutine CYL) are available from RSIC on request.

CCC-82D/ANISN   The packaged CDC 6600 version of ANISN has been extended to include the FFREAD routine modified and contributed by Babcock and Wilcox, Lynchburg, Virginia.

CCC-94/KAP VI   This kernel integration code in complex geometry has been modified at the suggestion of B. L. Peele, Duke Power Company, to make it possible to use the spherical source option under certain conditions. The change:

In subroutine SOURCE, line 138 reads

FS (M, 2, 1) = AS1-AS2

It should be changed to read

FS (M, 2, 1) = ABS (AS1-AS2)

The original line allows FS to go negative if the source polar angle exceeds $\pi/2$, which it must if symmetry about the x-y plane is not satisfied. The corrected line eliminates the "negative volumes" which can occur.

Requests filled after 1-18-74 reflect the change.

CCC-126B/ASOP   ANISN Shield Optimization Program was converted to run on UNIVAC 1108 at the Jet Propulsion Laboratory, Pasadena, California. FORTRAN V; UNIVAC 1108. Reference: CTC-INF-941.

CCC-142B/MERCURE 4   Three Dimensional Code for Integrating Multigroup Line of Sight Attenuation Kernels by Monte Carlo Techniques, contributed by CEA/CEN, Saclay, France, through the Nuclear Energy Agency's Computer Programme Library, Ispra, Italy. FORTRAN IV and machine language; IBM 360.

CCC-146C/UNAMIT   One Dimensional Spherical Multilayer Reactor-Shield Weight Optimization Code; UNIVAC 1108 version contributed by Cal Tech's Jet Propulsion Laboratory, Pasadena, California. IBM 7090/94 and 360 versions were contributed earlier by NASA/Lewis Research Center and United Nuclear Corporation. Reference: NASA TM X-2048.

CCC-177B/DOPEX   Laminated Shield Weight Optimization Code - Steepest Descent Calculation Method. Early development by AI (OPEX); further developed by NASA/Lewis Research Center (OPEX II and DOPEX). This UNIVAC 1108 version was contributed by Cal Tech's Jet Propulsion Laboratory, Pasadena, California. Reference: NASA TM X-2554.

CCC-226A/GAMMOM-I   Gamma-Ray Moments Method Code contributed by Center for Radiation Research, National Bureau of Standards, Washington, D.C. The code calculates the moments of the energy fluence from a plane source of gamma rays in an infinite medium. FORTRAN IV; IBM 360 and UNIVAC 1108. Reference: NBS-TN-766.

CCC-228/SPAR   Calculation of Stopping Powers and Ranges for Muons, Charged Pions, Protons, and Heavy Ions, contributed by ORNL Mathematics and Neutron Physics Divisions. FORTRAN IV; IBM 360. Reference: ORNL-TM-4869.

PSR-68/MANYFILE   The programming language for this routine for use in the manipulation of data sets between various input/ output devices was incorrectly stated in the recent announcement. We should have cited PL/1 Language for the IBM 360/91. Reference: ORNL-TM-4377.

PSR-69/POWER   Source Distribution Input Data Generator for ANISN contributed by Babcock and Wilcox. The program reads an angular flux tape from a prior ANISN run and generates a shell source array as input to a new run. FORTRAN IV; CDC 7600. Reference: B&W Informal Notes.

PSR-70/COAG-II   Calculation of the Westcott Epithermal Index and the Westcott 2200 m/s Neutron Flux, contributed by Operations Division, Oak Ridge National Laboratory. FORTRAN IV; IBM 360.

PSR-71/SPECTRANS-2 Neutron Spectrum Library Generation Standardizes Spectra and Computes Kerma, Dose-Equivalent, Spectra, Dose Fractions and Average Energies, contributed by Health Physics Department, Central Research Institute for Physics, Budapest, Hungary. ICL FORTRAN. References: KFK1-73-57, KFK1-72-65, and KFK1-72-67.

PSR-72/MODSOV Linear Matrix Equation $(\dot{x} = Ax + k)$ Interactive Program contributed by ORNL Instrumentation and Controls Division. ASCII FORTRAN, PDP-10. Reference: ORNL-TM-4404. Designed for remote terminal operations in a conversational structure to meet day-to-day calculational requirements of ecological systems. Requesters may furnish either a DECtape or a magnetic tape reel for transmittal.

PERSONAL ITEMS

Tom Jaworowski says that he has been named RSIC Coordinator for the Pacific International Computing Company (PIC). He takes the place of Robin Mickle, who is in Spain where he is managing computing for a new PIC international company. PIC is a contractor for Bechtel Corporation, San Francisco.

The following changes of address are noted:

Leonard Soffer from NASA/Lewis Research Center to USAEC Directorate of Licensing, Millard Wohl from NASA/Lewis Research Center to Gulf Energy and Environmental Systems, San Diego, California, and R. J. Thomson from Atomics International to Bechtel Power Corporation, Norwalk, California.

VISITORS TO RSIC

Visitors to RSIC during January were: R. K. Disney, Westinghouse ARD, Madison, Pa.; R. J. Neuhold, USAEC, Washington, D.C.; H. Rief, CCR-EURATOM, Ispra, Italy; J. Ball and W. B. Ewbank, Nuclear Data Project, W. B. Cottrell, Nuclear Safety Information Center, C. W. Craven, Jr., Environmental Sciences, and J. J. Shonka, Health Physics Division, ORNL; M. Leimer, Kaman Nuclear Corp., Colorado Springs, Colo.; J. Mack, Martin Marietta Corp., Orlando, Fla.

RSIC DOCUMENTS AVAILABLE

A list of reports issued by RSIC is included in this issue. Copies are available from RSIC free of charge while the supply lasts. A few of the reports are available in microfiche only. These are indicated.

LIST OF REPORTS ISSUED BY RSIC

ORNL-RSIC-1 - (Superseded by ORNL-RSIC-5)

ORNL-RSIC-2 - (Superseded by ORNL-RSIC-5)

ORNL-RSIC-3 - A Comparison of First- and Last-Flight Expectation Values
Used in an 05R Monte Carlo Calculation of Neutron Distributions in
Water - D. K. Trubey and M. B. Emmett (May 1965).

ORNL-RSIC-4 - Some Calculations of the Fast-Neutron Distribution in Ordi-
nary Concrete from Point and Plane Isotropic Fission Sources - D. K.
Trubey and M. B. Emmett (June 1965).

*ORNL-RSIC-5, Vol. I, II, and III - Bibliography, Subject Index, and
Author Index of the Literature Examined by the Radiation Shielding
Information Center (Reactor and Weapons Shielding).

ORNL-RSIC-6, Vol. I and II - Abstracts of the Literature Examined by the
Radiation Shielding Information Center (Reactor and Weapons Shielding).

+ORNL-RSIC-7 - Tabulated Values of Scattered Gamma-Ray Fluxes in Iron Inter-
polated from Moments-Method Calculation - D. K. Trubey (May 1965).

ORNL-RSIC-8 - Survey of Methods for Calculating Gamma-Ray Heating - H. C.
Claiborne (June 1965) .

ORNL-RSIC-9 - A Comparison of Three Methods Used to Calculate Gamma-Ray
Transport in Iron - D. K. Trubey, S. K. Penny, and K. D. Lathrop.
(October 1965).

ORNL-RSIC-10 - A Survey of Empirical Functions Used to Fit Gamma-Ray
Buildup Factors - D. K. Trubey (February 1966).

ORNL-RSIC-11 - Bibliography, Subject Index, and Author Index of the
Literature Examined by the Radiation Shielding Information Center
(Space and Accelerator Shielding) (Rev. II, May 1970).

ORNL-RSIC-12 - Abstracts of the Literature Examined by the Radiation
Shielding Information Center (Space and Accelerator Shielding).

ORNL-RSIC-13, Vol. I, II, and III - Abstracts of Digital Computer Codes
Assembled by the Radiation Shielding Information Center - Betty F.
Maskewitz. (At present only Vol. III is available.)

ORNL-RSIC-14 - The Exponential Transform as an Importance-Sampling Device -
A Review - Francis H. Clark (Jan. 1966).

ORNL-RSIC-15 - Bibliography of the Computer Codes Literature Examined by
the Radiation Shielding Information Center - Betty F. Maskewitz,
Vivian A. Jacobs, Jane Gurney (July 1967).

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*ORNL-RSIC-5, Vol. I, is no longer available from RSIC. Requesters are
referred to the National Technical Information Service, Department of
Commerce, Springfield, Va. 22151.

+Available from RSIC in microfiche only.

ORNL-RSIC-16 - Use of ICRU-Defined Units in Shielding - D. K. Trubey (October 1968).

ORNL-RSIC-17 - Comparisons of Results Obtained with Several Proton Penetration Codes - W. Wayne Scott and R. G. Alsmiller, Jr. (July 1967).

ORNL-RSIC-18 - Estimates of Primary and Secondary Particle Doses Behind Aluminum and Polyethylene Slabs Due to Incident Solar-Flare and Van Allen Belt Protons - W. Wayne Scott (July 1967).

ORNL-RSIC-19 - A Review of the Discrete Ordinates S_n Method of Radiation Transport Calculations - D. K. Trubey and Betty F. Maskewitz (March 1968).

ORNL-RSIC-20 - Weapons Radiation Shielding Handbook - Chapter 5: Methods for Calculating Effects of Ducts, Access Ways, and Holes in Shields - Wade E. Selph and H. Clyde Claiborne (Jan. 1968).

ORNL-RSIC-21 - Weapons Radiation Shielding Handbook - Chapter 4: Neutron and Gamma-Ray Albedos - Wade E. Selph (Feb. 1968).

ORNL-RSIC-22 - Comparisons of Results Obtained with Several Proton Penetration Codes - Part II - W. Wayne Scott and R. G. Alsmiller, Jr. (June 1968).

ORNL-RSIC-23 - A Survey of Recent Soviet Radiation Shielding Work - J. Lewin, J. Gurney, D. K. Trubey (Sept. 1968).

ORNL-RSIC-24 - Compilation of Data on Experimental Shielding Facilities and Tests of Shields of Operating Reactors - Compiled by: European American Committee on Reactor Physics, European Nuclear Energy Agency (Nov. 1968).

ORNL-RSIC-25 - Shielding Benchmark Problems - A. E. Profio, Editor.

+ORNL-RSIC-26 - The Attenuation Properties of Concrete for Shielding of Neutrons of Energy Less than 15 MeV - F. A. R. Schmidt (Aug. 1970).

+ORNL-RSIC-27 - A Review of Multigroup Nuclear Cross Section Preparation - Theory, Techniques, and Computer Codes - compiled by D. K. Trubey and J. Gurney (Jan. 1970).

ORNL-RSIC-28 - Comparisons of the Results Obtained with Several Electron-Penetration Codes - W. Wayne Scott (March 1970).

+ORNL-RSIC-29 - A Review of the Monte Carlo Method for Radiation Transport Calculations - compiled by Betty F. Maskewitz and Vivian Z. Jacobs (February 1971).

ORNL-RSIC-30 - Abstracts of the Data Library Packages Assembled by the Radiation Shielding Information Center - R. W. Roussin (Mar. 1972).

ORNL-RSIC-31 - Abstracts of Peripheral Shielding Code Packages Assembled by the Radiation Shielding Information Center - Betty F. Maskewitz

ORNL-RSIC-32 - Recent Developments in the Shielding of Neutron Sources - H. Clyde Claiborne (June 1971).

+Available from RSIC in microfiche only.

ORNL-RSIC-33 - A Review of Calculations of Radiation Transport in Air - Theory, Techniques, and Computer Codes - compiled by D. K. Trubey and H. E. Comolander (May 1972).

ORNL-RSIC-34, Vol. I - Defense Nuclear Agency Working Cross Section Library - Description and Contents - R. W. Roussin (October 1972).

ORNL-RSIC-35 - Shielding of Manned Space Vehicles Against Protons and Alpha Particles - R. G. Alsmiller, Jr., R. T. Santoro, J. Barish, H. C. Claiborne (Nov. 1972).

ORNL-RSIC-36 - Shielding Against Initial Radiations from Nuclear Weapons - Lorraine S. Abbott (July 1973).

WEAPONS RADIATION SHIELDING HANDBOOK chapters available (prepared for the Defense Nuclear Agency):

DASA-1892-5, Chapter 2 - Basic Concepts of Radiation Shielding Analysis, Paul N. Stevens and H. Clyde Claiborne

DNA-1892-3 (Rev. 1) (formerly DASA 1892-3), Chapter 3 - Methods for Calculating Neutron and Gamma-Ray Attenuation, Paul N. Stevens and David K. Trubey

DASA-1892-2, Chapter 4 - Neutron and Gamma-Ray Albedos, Wade E. Selph (RSIC-21)

DASA-1892-1, Chapter 5 - Methods for Calculating Effects of Ducts, Access Ways, and Holes in Radiation Shields, Wade E. Selph and H. Clyde Claiborne (RSIC-20)

Reprints of Journal Articles available:

Nuclear Applications

> Vol. 3 (July 1967) "Fission Neutron Attenuation and Gamma-Ray Buildup Factors for Lithium Hydride," Francis B. K. Kam and Francis H. S. Clark
>
> Vol. 4 (Jan. 1968) "Energy and Dose Buildup Factors for Various Concretes," F. H. Clark and D. K. Trubey
>
> Vol. 6 (June 1969) "Gamma-Ray Buildup Factors for Sand, Air, and Wood (Cellulose)," Francis H. Clark

Nuclear Applications & Technology

> Vol. 8 (May 1970, "Dose Rates in a Slab Phantom from Monoenergetic Gamma Rays," H. C. Claiborne and D. K. Trubey
>
> Vol. 9 (Sept. 1970), "Gamma-Ray Buildup Factor Coefficients for Concrete and Other Materials," D. K. Trubey (Errata - Nuc. Tech., Vol. 10 (Feb. 1971))

Nuclear Engineering and Design

9 (1969), "The Radiation Shielding Information Center - A Technical Information Service for Nuclear Engineers," D. K. Trubey

10 (1969), "Analytical Radiation Shielding Calculations for Concrete - Formulas and Parameters," F. A. R. Schmidt

10 (1969), "Computer Codes for Shielding Calculations - 1969," D. K. Trubey and Betty F. Maskewitz

13 (1970), "Computer Codes for Shielding Calculations - 1970," Betty F. Maskewitz and D. K. Trubey

13 (1970), "Kernel Methods for Radiation Shielding Calculations," D. K. Trubey

15 (1971), "Heat Generation by Neutrons in Some Moderating and Shielding Materials," H. C. Claiborne, M. Solomito, J. J. Ritts

15 (1971), "Shielding for Advanced Reactors in the United States," F. C. Maienschein, C. E. Clifford, F. R. Mynatt, and L. S. Abbott

15 (1971), "Adjoint S_n Calculations of Coupled Neutron and Gamma-Ray Transport Through Concrete Slabs," R. W. Roussin and F. A. R. Schmidt

22 (1972), "Computer Codes for Shielding and Related Calculations - 1972," Betty F. Maskewitz, Francis H. Clark, and D. K. Trubey

Nuclear Science and Engineering

27 (1967), "Variance of Certain Flux Estimators Used in Monte Carlo Calculations," Francis H. Clark

Nuclear Technology

Vol. 13 (February 1972), "Bracketing the Peak Primary Gamma-Ray Dose Rate from Nuclear Devices by Steady-State Transport Calculations," H. C. Claiborne and W. W. Engle, Jr.

Reactor Technology

Vol. 15 No. 2 (Summer 1972), "Discrete-Ordinates Methods for the Numerical Solution of the Transport Equation," K. D. Lathrop

Health Physics

Vol. 13 (1967), "Importance of Epithermal Neutrons Relative to Thermal Neutrons in Absorbed Doses," F. H. Clark

Atomkernenergie

Bd. 22 (1973)Lfg. 1, "Comparison of Transport and Diffusion Theory for Fast Reactor Shielding Calculations," Sumer Sahin

ORNL-TM-2719, "The 1969 Computer-Based Information Retrieval System in Brief," J. G. Jones, D. K. Trubey, and J. Gurney

JANUARY ACCESSION OF LITERATURE

REACTOR AND WEAPONS SHIELDING

AERE-R-7548
    Review of Fission Product Yield Data for Fast Neutron
Fission.
    Cuninghame, J.G.
    September,1973
    Dep., NTIS (U.S. Sales Only) $6.50

AGC-2277(Vol.1)(Bk.1)
    Radiation Effects Data Book. Vol.1. Radiation Effects.
    Aerojet-General Corp., Azusa, Calif.
    September 30,1964
    Declassified August 28,1973
    Dep., NTIS $20.00

AGC-2277(Vol.1)(Rev.)
    Radiation Effects Data Book. Vol.I. Radiation Effects.
    Aerojet-General Corp., Azusa, Calif.
    April 30,1965
    Declassified August 28,1973
    Dep., NTIS $14.75

AGC-2277(Vol.1)(Bk.2)
    Radiation Effects Data Book. Vol.I. Radiation Effects.
    Aerojet-General Corp., Azusa, Calif.
    September 30,1964
    Declassified August 28,1973
    Dep., NTIS $14.50

AGC-2277(Vol.2)(Rev.)
    Radiation Effects Data Book. Volume 2. Appendices.
    Aerojet-General Corp., Azusa, Calif.
    September 30,1963
    Declassified August 28,1973
    Dep., NTIS $21.25

AWRE-O-35/73
    Calculation of Neutron Angular Flux Emerging from Shells
    of Natural Uranium Surrounding a Central Source.
    West, P.H.
    September,1973
    Dep., NTIS (U.S. Sales Only) $4.00

BARC-686
    Analysis of Complex NaI(Tl) Gamma Spectra from Mixtures
    of Nuclides.
    Rangarajan, C.; Mishra, U.C.; Gopalakrishnan, S.S.;
    Sadasivan, S.
    1973
    Dep., NTIS (U.S. Sales Only) $5.50

BIPM-68-5 (In French)
    Ratio of Two Random Variables and the Simulation of This
    Quantity Using a Monte Carlo Method.
    Mueller, J.W.
    1968
    Dep., NTIS (U.S. Sales Only) $3.00

BMFT-FBK-73-17 (In German)
    Radiation Through Complex Geometrical Shielding Ducts.
    Koban, J.
    July,1973
    Dep., NTIS (U.S. Sales Only) $8.00

BNL-325, Third Edition, Vol.1
    Neutron Cross Sections. Vol.1. Resonance Parameters.
    Mughabghab, S.P.; Garber, D.I.
    June,1973
    NTIS $13.60   MF $1.45

BNL-18252
    Development and Status of the Evaluated Nuclear Data
    File ENDF/B.
    Pearlstein, S.
    1973
    NTIS

BNWL-1772
    Transmutation of High-Level Radioactive Waste with a
    Controlled Thermonuclear Reactor.
    Wolkenhauer, W.C.; Leonard, B.R.,Jr.; Gore, B.F.
    September,1973
    Dep., NTIS $7.60

BRL-R-1675
    Evaluation of Operational Characteristics of Selected
    Unfolding Codes.
    Kilminster, D.T.
    September,1973
    NTIS

BRL-R-1681
    Experimental Studies of the Neutron and Gamma Shielding
    Provided by Field Fortifications from a 14-MeV Neutron
    Source.
    Rexroad, R.E.; Jacobson, J.H.
    October,1973
    NTIS

CEA-N-1658 (In French)
    Cn Method for Solving the Neutron Transport Equation in
    Spherical Geometry. Comparison with the Results of the
    Critical Godiva and Jezebel Experiments.
    Mordant, M.
    1973
    NTIS

CEA-R-4434 (In French)
    Ionometric Determination of a Standard Absorbed Dose
    in Air Using a Cavity Chamber.
    Sklavenitis, L.; Simoen, J.P.; Troesch, G.; Pages, L.;
    Tabot, L.
    March,1973
    Dep., NTIS (U.S. Sales Only) $4.00

COM-73-11267/4
    Radiation Measurement.
    Latimer, J.R.
    1972
    NTIS $3.50

CONF-721018-22
    Development of Calculation Methods and Codes and Their
    Application to Space Reactor Shielding.
    Amin, E.; Hehn, G.; Klumpp, W.; Ruehle, R.
    1972
    NTIS $3.00

CONF-721018-26
    Streaming of Neutrons and Gamma-Rays Along Reactor
    Coolant Pipes.
    Amin, E.; Hehn, G.; Zumach, W.
    1972
    Dep., NTIS (U.S. Sales Only) $3.00

CONF-721018-27
    Intercomparison of Different Methods to Calculate
    Neutron Transport Along Sodium Ducts.
    Amin, E.; Hehn, G.; Schmidt, F.; Diettrich, O.;
    Futtermenger, W.; Vogt, H.; Groenefeld, G.; Vossebrecker,
    H.; Herrnberger, V.
    1972
    Dep., NTIS (U.S. Sales Only) $3.00

CONF-730958-3
    Computer Studies of Replacement Sequences in Solids
    Associated with Atomic Displacement Cascades.
    Holmes, D.K.; Robinson, M.T.
    1973
    Dep., NTIS $3.25

CONF-731101-34
    Preparation and Characterization of Neutron Dosimeter
    Materials.
    Kobisk, E.H.; Adair, H.L.
    1973
    Dep., NTIS $4.00

COO-1671-50; CONF-730952-2
    Two-Component Model in the Theory of RBE.
    Katz, R.; Sharma, S.C.
    1972
    Dep., NTIS $3.00

COO-1671-51; CONF-730952-3
    Radiobiological Modeling for High LET Therapy.
    Katz, R.; Sharma, S.C.
    1973
    Dep., NTIS $3.25

COO-3522-2
    Biological and Clinical Dosimetry. Annual Progress
    Report, July 1, 1972-June 30, 1973.
    Laughlin, J.S.
    1973
    Dep., NTIS $5.25

DP-MS-73-39; CONF-731101-40
    Production of Delayed Photoneutrons from 235-U in
Heavy Water Moderator.
    Baumann, N.P.; Currie, R.L.; Pellarin, D.J.
    No Date
    Dep., NTIS $3.00

DP-MS-73-46; CONF-731101-21
    Response Matrix Method and the Cosine-Currents
Approximation.
    Pryor, R.J.
    1973
    Dep., NTIS $3.00

ESL-16
    Neutronic and Photonic Analyses of Simulated Fusion
Reactor Blankets Containing Thorium and Natural Uranium.
    Parish, T.A.; Draper, E.L.,Jr.
    October,1973

HEDL-SA-407; CONF-720842-1; N73-26707
    Effect of Prior Microstructure on Neutron Damage in
Stainless Steel.
    Laidler, J.J.; Mastel, B.
    April,1972
    NTIS

ICRU-19(Suppl.)
    Dose Equivalent.
    ICRU
    September 1,1973
    ICRU Publications, Washington, D.C. $1.00

LA-5375-PR
    Defense Nuclear Agency Sponsored Cross-Section
Evaluation Group. Annual Progress Report, July 1,1972
-June 30,1973.
    Young, P.G.; Harris, D.R.
    August,1973
    NTIS

LBL-2195
    Environmental Measurements and Monitoring Programs
Around Reactors: Pre-Operational, Operational, and
for Accidents.
    Budnitz, R.J.
    September,1973
    Dep., NTIS $3.25

LCA-NT-217-F-T (In French)
    Monte Carlo Method for Studying the Radioprotection
of a Radioactive Product Container (Example of
Radioprotection Calculations).
    Demonsant, J.
    October 5,1972
    Dep., NTIS (U.S. Sales Only)$3.75

NASA-TN-D-7485
    Transport Analysis of Measured Neutron Leakage
  Spectra from Spheres as Tests of Evaluated High-Energy
  Cross Sections.
    Bogart, D.; Shook, D.F.; Pieno, D.
    November,1973
    NTIS

NASA-TM-X-2835; E-7347; N73-27580
    Shield Materials Recommended for Space Power Nuclear
  Reactors.
    Kaszubinski, L.J.
    July,1973
    NTIS $3.00

ORNL-TM-4266
    Effects of Air-Density Perturbations on the Transport
  of Gamma Rays Produced by Point Gamma-Ray Sources.
    McGregor, B.J.; Mynatt, F.R.
    December,1973
    NTIS

ORNL-TM-4369
    Calculations Related to the Use of Photons, Neutrons,
  Negatively Charged Pions, Protons, and Alpha Particles
  in Cancer Radiotherapy.
    Alsmiller, R.G.,Jr.; Santoro, R.T.; Armstrong, T.W.;
  Barish, J.; Chandler, K.C.; Chapman, G.T.
    January,1974

ORNL-TM-4379
    Gamma-Ray Production from Neutron Interactions with
  Nickel for Incident Neutron Energies Between 1.0 and
  10 MeV: Tabulated Differential Cross Sections.
    Dickens, J.K.; Love, T.A.; Morgan, G.L.
    November,1973
    Dep., NTIS $5.45

ORNL-TM-4387
    1972 Intercomparison of Nuclear Accident Dosimetry
  Systems at the Oak Ridge National Laboratory.
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