RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

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

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*Only those who have the patience to do simple things perfectly will acquire the skill
to do difficult things easily.*   *. . . Schiller*

REACTOR DOSIMETRY CONFERENCE HELD IN PALO ALTO

The Second ASTM-EURATOM Symposium on Reactor Dosimetry was attended by about 100 specialists from a number of countries. The meeting on dosimetry methods for fuels, cladding, and structural materials was held in Palo Alto, California, October 3–7, 1977, with the Electric Power Research Institute (EPRI) as hosts. The conference was sponsored by the ASTM (Subcommittee E10.05 on dosimetry), EURATOM (Working Group on Reactor Dosimetry), EPRI, and the U.S. Nuclear Regulatory Commission (NRC) with the cooperation of the IAEA. The Chairman, W. C. Morgan (Battelle-Northwest),was assisted by Co-chairmen U. Farinelli (CNEN) and W. N. McElroy (HEDL).

The program was very wide ranging: overviews, reports of working groups, dosimetry of LWR pressure vessels, analysis of fuels, benchmark neutron fields, magnetic fusion materials and dosimetry, unfolding neutron spectra, and other topics (even prehistorical reactors!). Much of the program was in the form of workshops to develop conclusions on the state of the art. The proceedings will be published by NRC.

One of the more interesting papers (to this reviewer) was on the subject of photofission effects on ^{238}U fission detectors and was given by Charles Bowman of the National Bureau of Standards. In some situations the high-energy gamma-ray flux seems to be sufficiently great to contribute significantly to the response of the detector. This underlines the importance of transport calculations for both neutrons and gamma rays in the analysis of reactor dosimetry measurements, especially in regions near the pressure vessel. In Farinelli's opening paper, "Dosimetry and Shielding," he suggested wider application of methods now common in shielding: elaborate transport calculations and sensitivity analysis.

A paper of great interest to the neutron spectrum unfolding specialists was given by Francis Perey of ORNL. He brought his experience of developing uncertainty treatment of cross sections into the unfolding problem. Perey applies the least squares method in a code which treats the uncertainties in all the input data (cross sections, activations, input spectrum) with covariance matrices describing the joint density function of all three types. The resulting unbiased solution is a volume in hyperspace consistent with the input data. This approach assumes that the goal is to improve our knowledge of the spectrum as represented by the input spectrum. The code (STAY'SL), reported to be very fast and easy to use, is available from RSIC.

IAEA SPECIALIST MEETING ON NEUTRON SPECTRUM UNFOLDING HELD IN OAK RIDGE

An IAEA specialist meeting on the Current Status of Neutron Spectrum Unfolding was held in Oak Ridge October 10–12, 1977, following the Palo Alto ASTM-EURATOM symposium. The meeting was held within the frame of the IAEA program on standardization of reactor radiation measurements. The IAEA promotes a systematic study of the most promising unfolding codes for use in determining spectra from activation measurements. The purpose of the meeting was to assess the state of the art and develop recommendations for further IAEA activities.

The Oak Ridge meeting, attended by about 25 participants and observers, was to some extent an extension of the Palo Alto meeting for those especially interested in unfolding. A number of prepared papers were given, but much of the discussion was influenced by the light cast on the treatment of uncertainties (not errors, i.e., mistakes!) by the Perey least squares approach (see Palo Alto report above).

The participants agreed on a number of recommendations to be reported in a forthcoming IAEA document centering on an improved and more elaborate treatment of uncertainties. Other recommendations increased benchmark problem efforts, and a processed dosimetry file, (Doppler broadened and self-shielded data) which should be made available with associated software.

PERSONAL ITEMS

The reorganization of ERDA into the new Department of Energy (DOE) has brought about other changes among groups represented in the RSIC user-contributor community. We have received notice that the former US ERDA Health and Safety Laboratory is now known as the US DOE Environmental Measurements Laboratory. The address remains 376 Hudson Street, New York, NY 10014.

F. R. Mynatt has left the ORNL Neutron Physics Division where he was a section manager to serve as Program Manager for NRC Reactor-Safety Research at the Laboratory. His several NPD activities have been divided among three groups as follows: BRP Analysis, G. F. Flanagan, Leader; Reactor Physics and Shielding, D. E. Bartine, Leader; and Reactor Methods and Data Development, C. R. Weisbin, Leader.

Jun Kuwabara, Mitsubishi Atomic Power Industries, Inc. (MAPI), has recently been reassigned within the company to manage the Hybrid Computer Section of the Advanced Reactors Engineering Department. Masaki Ohkubo will replace him as RSIC's volunteer coordinator within MAPI. Mr. Ohkubo, a reactor physics graduate of Tokyo Institute of Technology, entered MAPI employment and became involved in the radiation analysis of PWR plants; his most recent assignment being the shield design and hazard analysis of a 3 loop PWR plant. He is currently Assistant to the Manager, Safety Analysis Section, MAPI Water Reactor Department.

WANTED—FEEDBACK FROM USE OF AIREM CODE

In 1974, we announced the availability of a code package for the calculation of doses, population doses, and ground depositions due to atmospheric emissions of radionuclides, a contribution of the U. S. Environmental Protection Agency. To date, RSIC has recorded 34 separate transactions regarding AIREM and has transmitted the complete code package (CCC-242/AIREM) to 14 separate installations. We would like to know if the code is being used and would like information concerning its use.

If you have used, or are now using AIREM, please let us know. If you have reported work in which you used AIREM, please give us references. A note from you relating your experiences with this code package will be appreciated.

UT OFFERS ADJOINT MONTE CARLO COURSE

A course describing adjoint Monte Carlo calculations is being offered at the University of Tennessee as a part of Tennessee Industries Week, December 12-16, 1977. This important technique may sometimes be the only practical mode of analysis for many problems in radiation shield design. However, an understanding of the underlying theory of adjoint analysis is essential to the effective utilization of this powerful method.

The course is intended for the practicing shield designer and does not presume prior knowledge of adjoint Monte Carlo. However, some understanding of forward Monte Carlo, radiation transport physics, and computer programming is desirable. The basics of Monte Carlo will be reviewed in addition to an in-depth treatment of the adjoint Monte Carlo calculation.

For registration information, contact Fred N. Peebles, Dean of Engineering, University of Tennessee, Knoxville, Tennessee 37916; telephone 615-974-5321. Class size will be limited to the first 25 paid registrations.

CHANGES IN THE COMPUTER CODE COLLECTION

The following changes were made in the computer code collection during the month of October.

CCC-187/SAM-CE

The SAM-CE code package (Monte Carlo time-dependent three-dimensional complex geometry code system) was updated to include Revision 5 of SAM-F, designed for primary neutrons and gamma rays, as well as for secondary gamma rays and electrons. This new version includes the latest version of MAGI's Combinatorial Geometry (see June 1977 newsletter) and the ability to score at volume, special small volume and point detectors. The code package contains the new versions of BCDEAN data generator and SAM-F, new photon cross sections, and the SAM-X data generator. A correction (details available from RSIC) was made to SAM-X (Subroutine ADX). MAGI, Elmsford, New York, contributed the original package and this current update. FORTRAN IV, IBM 360. Instructions are included for implementation on a CDC computer.

CCC-255/ANISN-W

This multigroup one-dimensional discrete ordinates transport code with anisotropic scattering was updated to correct errors called to RSIC attention by Richard Johnson of Purdue University and Ward Engle, Oak Ridge National Laboratory. The errors were occurring in the P_0 self-scattering cross section. Details of the update are available from RSIC. CDC 6600.

CCC-288/KENO

The code package (multigroup Monte Carlo criticality code system) was expanded to include a CDC 7600 version, contributed by the UCND Computer Science Division. The new hardware version is designated CCC-288C.

PSR-112/AIM, NITAWL, XSDRNPM

This package of AMPX modules for performing transport calculations and manipulating cross sections in AMPX interface format was converted to run on the CDC 7600 and contributed to RSIC by the UCND Computer Science Division and Control Data Corporation, Rockville, Maryland. Reference: ORNL-TM-3706. FORTRAN IV; CDC 7600.

PSR-113/STAY'SL

This least squares dosimetry unfolding code was contributed by Oak Ridge National Laboratory. In STAY'SL, the output spectrum and its covariance matrix are calculated by minimizing chi-square based on the input data: the activation data, the input spectrum, the dosimetry cross sections and their uncertainties given by covariance matrices. The solution reflects the uncertainties in all of the input data and their correlations. The correlations in the uncertainties of the various dosimetry cross sections are taken into account; however, the uncertainties in the activation data, input spectrum and cross sections are assumed to be uncorrelated with each other. Reference: ORNL/TM-6062. FORTRAN IV; PDP-10.

CHANGES IN THE DATA LIBRARY COLLECTION

The data library collection was changed during the month as follows.

DLC-35/EURLIB III

The EURLIB data package has been completely updated with a new and revised data library generated from ENDF/B-IV, a contribution of CCR EURATOM, Ispra (Varese), Italy. This new library replaces the original which is now obsolete. It is a coupled library (the original was for neutrons only) with 100 neutron and 20 gamma-ray groups. Data are provided for H, C, O, Na, Ca, Cr, Mn, Fe, Ni, Zr, ^{235}U, and ^{238}U.

VISITORS TO RSIC

The following persons came for an orientation visit and/or to use RSIC facilities during the month of October:

V. Chernyshev, International Atomic Energy Agency, Vienna, Austria; D. R. Finch, E.I. du Pont, Savannah River Laboratory, Aiken, South Carolina; George Guthrie, HEDL, Westinghouse Hanford, Richland, Washington; Preben Hvelplund, University of Aarhus, Aarhus, Denmark; Hanne Hvelplund, Occupational Therapist, Aarhus, Denmark; John H. Hubbell, National Bureau of Standards, Washington, D.C.; Yale D. Harker, EG&G, Idaho Falls, Idaho; M. Rafiq Haroon, Centre for Nuclear Studies, Pinstech, Rawalpindi, Pakistan; Ki In Han, Korean Atomic Energy Research Institute, Seoul, Korea; Michihisa Ikeda, Century Research Center Corporation, Tokyo, Japan; Kenneth Kin, Control Data Corporation, Rockville, Maryland; Mitsuyuki Kitazume, Hitachi Engineering Company, Hitachi, Japan; R. J. LaBauve, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; E. P. Lippincott, Westinghouse Hanford, Richland, Washington; Matzke Manfred, Physikalisch Technische Bunderaustalt, Braunschweig, F.R. Germany; Kazumori Matsuo, Nuclear Safety Research Association, Tokyo, Japan; Kazuyoshi Minami, Fujitsu Limited, Tokyo, Japan; Shun-ichi Miyasaka and Hiroshi Ryufuku, Japan Atomic Energy Research Institute, Tokyo, Japan; H. Nolthenius and W. L. Zijp, ECN Netherlands Energy Research Foundation, Petten, The Netherlands; V. Okada, Kansai Electric Power Company, Osaka, Japan; Eiji Ochiai, Mitsubishi Atomic Power Company, Tokyo, Japan; Pedro J. Otaduy, University of Florida, Gainesville, Florida; Ernest Plechaty, Lawrence Livermore Laboratory, Livermore, California; Philip F. Rose, Brookhaven National Laboratory, Upton, New York; and Bernard W. Wehring, University of Illinois, Urbana, Illinois.

OCTOBER 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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>> Centre d'Etude de l'Energie Nucleaire, E. Plaskylaan 144, Brussel 4 (Belgie)

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> ENDF/B Dosimetry File for Version V.
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