RSIC Newsletter

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*When a nation gives birth to a man who is able to produce a great thought, another is
born who is able to understand and admire it.—Joubert*

Pentium Floating Point Division Bug

(The following is taken from an email message received from Cleve Moler.)

There has been a flurry of activity the last few days on the Internet news group, comp.sys.intel, that should interest MATLAB users. A serious design flaw has been discovered in the floating point unit on Intel's Pentium chip. Double precision divisions involving operands with certain bit patterns can produce incorrect results.

The most dramatic example seen so far can be extracted from a posting by Tim Coe of Vitesse Semiconductor. In MATLAB, his example becomes

    x = 4195835
    y = 3145727
    z = x - (x/y)*y

With exact computation, z would be zero. In fact, we get zero on most machines, including those using Intel 286, 386, and 486 chips. Even with roundoff error, z should not be much larger than eps*x, which is about 9.3e-10. But, on the Pentium,

    z = 256

The relative error, z/x, is about 2^{-14} or 6.1e-5. The computed quotient, x/y, is accurate to only 14 bits.

An article in last week's edition of *Electronic Engineering Times* credits Prof. Thomas Nicely, a mathematics professor at Lynchburg College in Virginia, with the first public announcement of the Pentium division bug. One of Nicely's examples involves

    p = 824633702441

With exact computation

    q = 1 - (1/p)*p

would be zero. With floating point computation, q should be on the order of eps. On most machines, we find that

$q = eps/2 = 2^{\wedge}(-53) \sim= 1.11e-16$

But on the Pentium

$q = 2^{\wedge}(-28) \sim= 3.72e-09$

This is roughly single precision accuracy and is typical of most of the examples that had been posted before Coe's analysis.

The bit patterns of the operands involved in these examples are very special. The denominator in Coe's example is

$y = 3*2^{\wedge}20 - 1$

Nicely's research involves a theorem about sums of reciprocals of prime numbers. His example involves a prime of the form

$p = 3*2^{\wedge}38 - 18391$

We're not sure yet how many operands cause the Pentium's floating point division to fail, or even what operands produce the largest relative error. It is certainly true that failures are very rare. But, as far as we are concerned, the real difficulty is having to worry about this at all. There are so many other things than can go wrong with computer hardware, and software, that, at least, we ought to be able to rely on the basic arithmetic.

The bug is definitely in the Pentium chip. It occurs at all clock rates. The bug does not affect other arithmetic operations, or the built-in transcendental functions. Intel has recently made changes to the on-chip Program Logic Array that fixes the bug and is now believed to be producing error free CPUs. It remains to be seen how long it will take for these to reach users.

An unnamed Intel spokesman is quoted in the EE Times article as saying "If customers are concerned, they can call and we'll replace any of the parts that contain the bug." But, at the MathWorks, we have our own friends and contacts at Intel and we're unable to confirm this policy. We'll let you know when we hear anything more definite. In the meantime, the phone number for Customer Service at Intel is 800-628-8686.

-- Cleve Moler
Chairman and Chief Scientist
The MathWorks, Inc.
moler@mathworks.com

CHANGES TO THE COMPUTER CODE COLLECTION

Three changes were made to the computer code collection during the month. One existing code package was updated, an existing package was replaced with a newly frozen version, and a new code system was packaged and added to the collection.

CCC-200/MCNP4A

OP SYS: UNIX, DOS, VMS

Language: Fortran 77

Computers: Many

This general purpose Monte Carlo code system for calculating the time-dependent continuous-energy transport of neutrons, photons, and/or electrons in three-dimensional geometries has been updated with modifications to the install.fix file to facilitate installation on DEC ALPHA OSF/1, DEC Ultrix, and Cray UNICOS systems. Users who have MCNP 4A need only ask for diskette #1, which includes all changes. MCNP4A is available in UNIX tar format on cartridge tape or on 29, 3.5-in. DS/HD (1.44 MB) diskettes in self-extracting compressed DOS files. In addition to the source files, MCNP4A executables are included for personal computer users. These were created on a PC/486 under DOS 6.0 using the Lahey Fortran F77L3-EM/32 Version

Format: DOS, tar

5.10 compiler. Reference: LA-12625 (1993). Fortran 77 and C; UNIX workstations, PC 386, Cray, Vax, mainframe and all computers in general; (C00200/ALLCP/03).

CCC-631/LWRARC 1.0

OP SYS: DOS

Language: BASIC, Assembler

Computers: PC

Format: DOS

Oak Ridge National Laboratory contributed this code system for calculating automated afterheat rate for standard light water reactor fuel assembly designs. LWRARC calculates spent fuel decay heat generation rates for standard pressurized water reactor (PWR) and boiling water reactor (BWR) fuel assembly designs for cooling times between 1 and 110 years. It provides an interactive menu-driven user interface to perform automated interpolations and adjustments of a data base of decay heat generation rates produced by the SAS2H analysis sequence of the CCC-545/SCALE-4.2 system. Using generic PWR and BWR assembly models, SAS2H calculations were performed for each model for six different burnups at each of three separate specific powers to produce heat rates at 20 cooling times in the range of 1 to 110 years. LWRARC uses a procedure that includes proper interpolation formulae for the tabulated heat generation rates. Adjustment formulae for the interpolated values are provided to account for differences in initial ^{235}U enrichment and changes in the specific power of a cycle from the average value. Finally, safety reactor formulae derived as a function of burnup, cooling time, and type of reactor are added. LWRARC runs on IBM and compatible personal computers. The Microsoft BASIC PDS 7.1 compiler/linker was used to compile the BASIC source files and link them with proprietary BASIC and Assembler routines from Crescent Software's QuickPak Professional and QuickScreen libraries to create the executable included in the package. The BASIC source files are included in the package. The files are available on one diskette. Reference: NUREG/CR-5625, ORNL-6698 (July 1994). BASIC and Assembler; IBM PC; (C00631/IBMPC/00).

PSR-171/NJOY 91.118

OP SYS: CTSS, UNICOS, UNIX

Language: Fortran 77

Computers: many

Format: tar, DOS

Los Alamos National Laboratory, Los Alamos, New Mexico, contributed a newly frozen version of this code system for producing pointwise and multigroup cross sections from ENDF/B evaluated nuclear data, including ENDF/B-VI. NJOY91 works with neutrons, photons, and charged particles and produces libraries for a wide variety of particle transport and reactor analysis codes. This is the last in the NJOY-91 series. It uses the same module structure as the earlier versions and its graphics options depend on DISSPLA. This new release, designated NJOY91.118, includes bug fixes, improvements in several modules, and some new capabilities. Information on the changes is included in the README file. A new test problem was added to test some ENDF-6 features, including Reich-Moore resonance reconstruction, energy-angle matrices in GROUPR, and energy-angle distributions in ACER. The 91.118 release is basically configured for UNIX. The test problem input files are UNIX shell scripts, and the test problem results are from runs on a Cray Y-MP8/4-64 running UNICOS.

Note that NJOY 94.0 will be released in the near future (watch the *RSIC Newsletter* for announcement of availability). It was derived from 91.118 by adding the LEAPR module, making extensive updates to PURR, inserting the new direct-to-Postscript graphics capability, and resequencing. Users who are running the 91.91 version may wish to request the updates only for 91.118. The code runs on Cray/UNICOS, Cray/CTSS, IBM, VAX/VMS, and Sun workstations. The package is transmitted on either 1 DC 6150 (150 MB) cartridge or 8-mm tape in tar format. References: Informal document (November

1994), LA-12057-MS (April 1991), LANL Memo T-2-L-10991 (June 1987), LA-9303-M (ENDF-324), Vol. I (May 1982), Vol. II (May 1982), Vol. III (October 1987), Vol. IV (December 1985), and LA-UR 89-2057 (June 1989). Fortran 77; Cray (CTSS & UNICOS), VAX/VMS, SUN/UNIX; (P00171/MFMWS/03).

CHANGE TO THE DATA LIBRARY COLLECTION

One addition was made to the data library collection during the month.

DLC-181/MCNPDAT6

OP SYS: all

Language: NA

Computers: all

Format: compressed tar

The Radiation Transport Group at Los Alamos National Laboratory (LANL) has contributed new data libraries for use with the Monte Carlo code package CCC-200/MCNP4A. This release includes the neutron data library ENDF60, the photon library MCPLIB02, the electron library EL1, an updated XSDIR file, and a README information file. A more detailed description of the ENDF-VI library, *ENDF/B-VI Data for MCNP* (LA-12891), is to be published; its availability will be announced in the *RSIC Newsletter*. The neutron data library ENDF60 is based on the ENDF/B-VI evaluations through revision 2. Some of these evaluations have been modified by the Nuclear Theory and Applications Group at LANL. The README file provides information regarding each data file of the ENDF60 library. The new photon library MCPLIB02 extends the photon interaction data from 100 MeV to 100 GeV. The electron library EL1 was released with the CCC-200/MCNP4A code package and is included here for completeness. The updated XSDIR file includes the new data libraries, as well as making the default libraries equivalent to the recommended data libraries as listed in Appendix G of the MCNP4A manual. Additionally, the libraries MCPLIB02 and EL1 are the default libraries for photon and electron data. MCNPDAT6 and D00105/ALLCP/02 (MCNPDAT) provide a comprehensive set of cross sections for a wide range of radiation transport applications. The users need determines which data library is appropriate. The data libraries are available on either DC 6150 (150 MB), 4-mm DAT (8 GB), or 8-mm (2.3 GB) cartridge tapes in compressed tar files. It is alternately available on either QIC-80 tape or 90- or 150-MB Bernoulli disk in DOS format. References: Informal notes (December 1994). All computers; D00181/ALLCP/00.

CONFERENCES, COURSES, SYMPOSIA

RSIC attempts to keep its users/contributors advised of conferences, courses, and symposia in the field of radiation protection, transport, and shielding through this section of the newsletter. Should you be involved in the planning/organization of such events, feel free to send your announcements and calls for papers to RSIC.

MCNP® and DANTSYS® Class Schedule

X-6 is committed to offering training classes that promote the efficient and knowledgeable use of LARAMIE® (Los Alamos Radiation Modeling Interactive Environment) codes. All classes include "hands-on" computer experience, allowing students to learn interactively. Classes are taught by the members of the code teams. Students have access to the vast experience and knowledge of our staff in the areas of transport methods research, production code and data library development, and various practical applications. Classes may not necessarily be five days long.

February 6 **Introduction to MCNP**
Level: Class for new or novice users of MCNP.
Topics: basic geometry, source definition, tallies, data, variance reduction, criticality, and plotting of geometry and tally results.

March 20 **OECD/NEA MCNP class**, *Stuttgart, Germany*

April 10 **Criticality Calculations with MCNP**

Emphasis on setting up accurate problem representations with advanced MCNP geometries. Criticality output features of MCNP4A will be presented. The new MCNP criticality primer is featured, using progressively more advanced example problems.

May 8 **Advanced MCNP Topics**
Level: At least Introductory class experience is required.
Topics: geometry, sources, tallies, physics, variance reduction, and other topics of specialized interest.

June 12 **Introduction to DANTSYS**
Level: new or novice users who have little experience in solving deterministic transport problems.
Goal is to use codes efficiently and to obtain reliable solutions to criticality, shielding, and source-driven problems.

June 19 **Introduction to MCNP**

July 17 **Electron--Photon Calculations with MCNP**
Level: Novice users welcome.
Photon and electron calculations will be discussed, with a particular focus on physics, typical sources, tallies, biasing, and variance reduction used for these particles.

August 14 **Variance Reduction**
Level: At least Introductory class experience.
Techniques will be described and empirically demonstrated. Subsequently, students will have hands-on experience applying to calculations. Successes and failures will be analyzed.

September 11 **Criticality Calculations with MCNP**

October 16 **Introduction to MCNP**

LARAMIE, MCNP, and DANTSYS are trademarks of the Regents of the University of California, Los Alamos National Laboratory.

Classes are limited to 20 participants. Classes subject to cancellation if minimum enrollment not obtained. Course fees range from $1500 - $1800. Course fees are refundable up to three weeks before class. For further information or reservations, contact Judi Briesmeister, jfb@lanl.gov or 505-667-727.

Judi Briesmeister

Calendar

Your attention is directed to the following events of interest.

January 1995

12th Symposium on Space Nuclear Power and Propulsion, Jan. 8–12, 1995, Albuquerque, New Mexico. Contact: Mohamed S. El-Genk, Inst. for Space Nuclear Power Studies, University of New Mexico, Albuquerque, NM 87131-1341 (phone 505-277-5442).

International Conference on Fluxes and Technological Enhancement of Radionuclides In and Around Large-Scale Non-Nuclear Industries, Jan. 9–13, 1995, Khon Kae, Thailand, sponsored by Lund University. Contact: Lund University, Dept. of Rad. Phys., E. Holm, S-22185, Lund, Sweden (fax 46-46-127249).

Radiation Safety Program Management, Jan. 23–27,

1995, Albuquerque, New Mexico. Contact: Technical Management Services, Inc., P.O. Box 226, New Hartford, CT 06057 (phone 203-738-2440, fax 203-738-9322).

Health Physics Training & Education—28th Midyear Topical Meeting of the Health Physics Society, Jan. 29–Feb. 1, 1995, Charleston, South Carolina. Contact: HPS, Suite 130, 8000 Westpark Drive, McLean, VA 22102 (phone Glenn Sturchio at 908-594-6267).

February 1995
Radiation Safety Officer, a technical short course, Feb. 6–10, 1995, Las Vegas, Nevada. Contact: Nevada Technical Assoc., Inc., P.O. Box 90748, Henderson, NV 89009 (phone 702-564-2798).

Environmental Monitoring, Feb. 6–10, 1995, Washington, DC. Contact: Technical Management Services, Inc., P.O. Box 226, New Hartford, CT 06057 (phone 203-738-2440, fax 203-738-9322).

Radiation Detection & Measurement, Feb. 20–24, 1995, Orlando, Florida. Contact: Technical Management Services, Inc., P.O. Box 226, New Hartford, CT 06057 (phone 203-738-2440, fax 203-738-9322).

International Conference on Internal Radiation Protection Dosimetry: Occupational Workers and the Public, Feb. 21–24, 1995, Bombay, India, sponsored by the Indian Association of Radiation Protection. Contact: Dr. R. C. Sharma, IARP, Low-Level Counting Laboratory, BARC Hospital, Anushaktinagar, Bombay 400 094, India (phone 91-022-5512936; fax 91-022-556-0750).

Waste Management '95, Feb. 26–Mar. 2, 1995, Tucson, Arizona. Contact: WM Symposia, Inc., Suite 19, 245 S. Plumer, Tucson, AZ 85719 (phone 602-624-8573; fax 602-792-3993).

Higher European Research Course for Users of Large Experimental Systems: Neutron and Synchrotron Radiation for Condensed Matter Studies, Feb. 26–Apr. 7, 1995, Grenoble, France. Contact: CNRS, Sec. Hercules, P.O. Box 166X, Maison des Magisteres, F-38042, Grenoble Cedex 6, France.

March 1995
34th International Nuclear and Particle Physics University Meeting: Low-Dimensional Models in Statistical Physics and Quantum Field Theory, Mar. 4–11, 1995, Schladming, Austria. Contact: Univ. Graz, Inst. f. Theoretische Physik, Universitätplatz 5, A-8010, Graz, Austria (fax 43-316-384091, email utp@edvz.kfunigraz.ac.at).

Radiation Transport Calculations Using the EGS4 Monte Carlo System, Mar. 6–9, 1995, Seattle, Washington. Contact: Ms. Suzan Walker, Computer Services Director, The Lawrence H. Lanzl Inst. of Medical Physics, 3876 Bridge Way N., Suite 300, Seattle, WA 98103-7951 (phone 206-545-1141; fax 206-545-1347; email suzan_walker@lanzl.com).

Transportation & Packaging of Radioactive Materials, Mar. 6–10, 1995, Washington, DC. Contact: Technical Management Services, Inc., P.O. Box 226, New Hartford, CT 06057 (phone 203-738-2440, fax 203-738-9322).

1995 HEART Conference, Mar. 13–17, 1995, Sandia National Laboratories, Albuquerque, New Mexico. Contact: Delores Walters, JAYCOR, P.O. Box 85154, San Diego, CA 92138 (phone 619-535-9-763).

Internal Dose Assessment, Mar. 13–17, 1995, Knoxville, Tennessee, a course offered by Consultec Scientific, Inc. Contact: Consultec Scientific, Inc., Suite 110, 725 Pellissippi Pkw., Knoxville, TN 37932-3300 (phone 615-675-4333 or 800-269-4333; fax 615-675-4334; email info@consultec.com).

Radiation Health and Risks, Mar. 13–17, 1995, Knoxville, Tennessee, a course offered by Consultec Scientific, Inc. Contact: Consultec Scientific, Inc., Suite 110, 725 Pellissippi Pkw., Knoxville, TN 37932-3300 (phone 615-675-4333 or 800-269-4333; fax 615-675-4334; email info@consultec.com).

Gamma Spectroscopy, March 20–24, 1995, in Oak Ridge, Tennessee, a short course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3576 or 615-241-4888; fax 615-576-9383).

5th Topical Meeting on Tritium Technology in Fission, Fusion, and Isotopic Applications, Mar. 26–31, 1995, Augusta, Georgia, sponsored by the ANS. Contact: C. E. Murphy, Westinghouse SRC, Savannah River Lab., Aiken, SC 29808.

Health Physics for the Industrial Hygienist, March 27–31, 1995 in Oak Ridge, Tennessee, a short course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 61 5-576-3576 or

615-241-4888; fax 615-576-9383).

April 1995

High Performance Computing '95, Apr. 9–13, 1995, Tucson, Arizona, sponsored by the Society for Computer Simulation. Contact: High Performance Computing '95, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, IL 60439 (email tentner@pepper.ra.angl.gov).

Applied Health Physics, Apr. 10–May 12, 1995, in Oak Ridge, Tennessee, a five-week course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3576 or 615-241-4888; fax 615-576-9383).

31st Annual Meeting of the National Council on Radiation Protection and Measurements, Apr. 12–13, 1995, Arlington, Virginia. Contact: NCRPM, Suite 800, 7910 Woodmont Ave., Bethesda, MD 20814-3095 (phone 800-229-2652; fax 301-907-8768).

5th Topical Meeting on Emergency Preparedness and Response, Apr. 18–21, 1995, Savannah, Georgia, sponsored by the American Nuclear Society Savannah River Section. Contact: Charles H. Hunter, Jr., Technical Program Chairman, Westinghouse Savannah River Co., Bldg. 773-A, Aiken, SC 29808 (phone 803-725-2953; fax 803-725-4233).

ICONE-3, The Third International Conference on Nuclear Engineering—Nuclear Power and the Energy Future, Apr. 23–27, 1995, Kyoto, Japan. Contact: Mr. M. Takahashi, Japan Society of Mechanical Engineers, Shinjuku-Sanshin Bldg. 5F, 2-4-9 Yoyogi, Shibuya-ku, Tokyo 151 Japan (phone 81-3-3379-6781; fax 81-3-3379-0934); or W. C. Cleff, Sargent & Lundy, 55 E. Monroe St., Chicago, IL 60603.

SCALE Training Course, Apr. 24–28, 1995, in Oak Ridge, Tennessee, sponsored by the DOE Transportation and Packaging Safety Division and hosted by the Radiation Shielding Information Center (RSIC) at ORNL. Contact: Lindy Norris, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831-6370 (phone 615-574-6471).

International Conference on Mathematics and Computations, Reactor Physics, and Environmental Analyses, Apr. 30–May 4, 1995, Portland, Oregon. Contact: Ms. L. Briggs, Argonne National Laboratory, 9700 S. Cass Ave., Argonne,

IL 60439 (phone +91708-252-4677, fax 708-252-4620, email llbriggs@anl.gov).

May 1995

1995 International High-Level Radioactive Waste Management Conference, May 1–5, 1995, Las Vegas, Nevada. Contact: Allen G. Croff, American Nuclear Society, 555 N. Kensington Ave., La Grange Park, IL 60525.

Conference and International Symposium on Radionuclide Metrology and Its Applications, May 15–19, 1995, Paris, France. Contact: Laboratoire Primaire des Rayonnements Ionisants, P.O. Box 52, F-91193, Gif-sur-Yvette Cedex, France (fax 33-1-69-08-29-19, email ICRM@BABAORUM. CEA.FR).

1st International Conference on Neural, Parallel, and Scientific Computations, May 28–31, 1995, Atlanta, Georgia. Contact: Morehouse College, Dept. of Mathematics, M. Sambandham, 830 Westview Drive, SW, Atlanta, GA 30314 (fax 404-458-7932, email icnpsc@voyager. cau.auc.edu).

June 1995

Air Sampling for Radioactive Materials, June 12–16, 1995, in Oak Ridge, Tennessee, a short course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3576 or 615-241-4888; fax 615-576-9383).

Environmental Monitoring, June 26–30, 1995 in Oak Ridge, Tennessee, a short course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3576 or 615-241-4888; fax 615-576-9383).

July 1995

32nd Annual IEEE International Nuclear and Space Radiation Effects Conference, July 21–27, 1995, Madison, Wisconsin. Contact: United Technologies, Microelectronics Center, 1575 Garden of the Gods Road, Colorado Springs, CO 80907 (fax 719-594-8187).

Joint Annual Meeting of the Health Physics Society and the American Association of Physicists in Medicine to Celebrate the X-Ray Centennial, July 23–27, 1995, Boston, Massachusetts. Contact: Health Physics Society, ATTN: Richard J. Burke, Jr., Suite 130, 8000 Westpark Drive, McLean, VA 22102 (phone 703-790-1745; fax 703-790-9063)

or American Association of Physicists in Medicine, ATTN: Salvatore Trofi, Jr., One Physics Ellipse, College Park, MD 20740-3846 (phone 301-209-3350; fax 301-209-0862).

August 1995

10th Brazilian Meeting on Reactor Physics and Thermal Hydraulics (X ENFIR) and the *3rd Brazilian Meeting on Nuclear Applications (III ENAN)*, Aug. 7–11, 1995, Rio de Janeiro, Brazil. Contact: Wilma S. Bastos, IEN, C.P. 68550, CEP-21945.970, RJ, Brazil (fax 55-21-5902692: email IENRCB@BRLNCC.BITNET).

Safe Use of Radionuclides, August 21–25, 1995, in Oak Ridge, Tennessee, a short course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117(phone +91 615-576-3576 or 615-241-4888; fax 615-576-9383).

September 1995

5th International Conference on Radioactive Waste Management and Environmental Remediation, Sept. 3–9, 1995 Berlin, Germany. Contact: ASME Headquarters, Ms. L. Friedman, 345 East 47th St., New York, NY 10017-2392 (fax 212-705-7856) or Battelle Pacific Northwest Laboratory, MSIN K1-19, SC Slate, P.O. Box 999, Richland, WA 99352 (fax 509-375-5963).

VOLGA-95, Sept. 4–8, 1995, in Volga, Russia. Contact: Prof. V. Khromov, Department Head, Chairman of Organizing Committee, Prof. V. Naumov, Program Chairman, or Dr. L. Goncharov, Scientific Secretary at the Moscow Engineering Physics Institute, Kashirskoe Shosse 31, Moscow, 115409, Russia (phone +7-095-323-9242; fax +7-095-324-7026; email volga@rephyd.mepi.msk.ru).

Environmental Monitoring, September 11–15, 1995, in Oak Ridge, Tennessee, a short course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 (phone 615-576-3576 or 615-241-4888; fax 615-576-9383).

Applied Health Physics, September 18–October 20, 1995, in Oak Ridge, Tennessee, a five-week course sponsored by Oak Ridge Associated Universities. Contact: Registrar Professional Training Programs, Oak Ridge Associated Universities, P.O. Box 117,

Oak Ridge TN 37831-0117 (phone 615-576-3576 or 615-241-4888; fax 615-576-9383).

16th Symposium on Fusion Engineering, Sept. 30–Oct. 4, 1995, Urbana, Illinois. Contact: Cella Elliott, Conference Secretary, Fusion Studies Lab., University of Illinois, Urbana, IL 61801 (phone 217-333-2772; fax 217-333-2906; email miley@uiucvmd.bitnet).

October 1995

International Symposium on Nuclear Energy, Oct. 20–21, 1995, Bucharest, Romania. Contact: C. Briatianu, Univ. Politechnicadin Bucuresti, Facultateade Inginerie Mecanica, Splaiul Independentei Nr. 313, Sector 6, 77206, Bucharest, Romania (phone 40-1-6314010/224).

Annual Meeting of the Society for Industrial and Applied Mathematics, Oct. 23–26, 1995, Charlotte, North Carolina. Contact: Soc. for Indus. and App. Math., 3600 University City Sciences Center, Philadelphia, PA 19104-2688 (fax 215-386-7999, email meetings@siam.org).

November 1995

ANS International Topical Meeting on Managing Plant Life, Nov. 28–30, 1995, Nice, France. Contact: Dr. S. Charbonneau, Tour Fiat, Cedex 16, F-92024, Paris, France.

December 1995

11th International Conference on Packaging and Transportation of Radioactive Materials, Dec. 3–8, 1995, Las Vegas, Nevada. Contact: Laura Dechter, Social & Scientific Systems, Inc., 7101 Wisconsin Ave., Bethesda, MD 20814-4805 (phone 301-986-4870; fax 301-913-0351).

April 1996

Annual Meeting of the National Council on Radiation Protection and Measurements, Apr. 3–4, 1996, Arlington, Virginia. Contact: Natl. Council on Radiation, Protection and Measurements, Suite 800, 7910 Woodmont Ave., Bethesda, MD 20814 (fax 301-907-8768).

Annual Meeting of the Radiation Research Society, Apr. 13–18, 1996, Chicago, Illinois. Contact: Radiation Research Society, M. G. Watson, Suite 600, 2021 Spring Rd., Oak Brook, IL 60521.

NOVEMBER 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 22161. For literature listed as available from INIS contact INIS Clearinghouse, International Atomic Energy Agency, P.O. Box 100, A-1400 Vienna.

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.

Radiation Shielding Literature

ORNL/TM-12755 . . . . . . Drischler, J.D.; Johnson, J.O.; Kerris, K.G. . . . August 1994 . . . Oak Ridge National Laboratory, Oak Ridge, TN . . . Army Research Laboratory, Adelphi, MD.

KEK Preprint 94-18 . . . *A New Approximating Model for Gamma-Ray Buildup Factors of Stratified Shields* . . . SHIN, K.; HIRAYAMA, H. . . . May 1994 . . . National Laboratory for High Energy Physics, Ibaraki-ken, Japan . . . . . . Submitted of Nucl. Sci. Eng.

KEK Preprint 94-22 . . . *Submitted to OECD/NEA Specialists' Meeting on Shielding Aspects of Accelerators, Targets and Irradiation Facilities, Arlington, TX, USA, April 28-29, 1994.* . . . May 1994 . . . . . . Gas-Bremsstrahlung in 2.5-GeV Electron Storage Ring . . . National Laboratory for High Energy Physics, Ibaraki-ken, Japan.

KEK Preprint 94-25 . . . *Implementation of the Doppler Broadening of a Compton-Scattered Photon into the EGS4 Code* . . . HIRAYAMA, H. . . . May 1994 . . . National Laboratory for High Energy Physics, Ibaraki-ken, Japan . . . . . . Submitted to Nucl. Instrum. Meth.

KEK Preprint 94-29 . . . *Review of Shielding Problems Concerning Electron Accelerators* . . . HIRAYAMA, H.; BAN, S. . . . May 1994 . . . National Laboratory for High Energy Physics, Ibaraki-ken, Japan . . . . . . Presented at the Specialists' Meeting on Shielding Aspects of Accelerators, Targets and Irradiation Facilities, Arlington, TX, USA, April 28-29, 1994.

KEK Preprint 94-65 . . . *Structure Dependence of Gamma-Ray Irradiation Effects on Polyethylenes Studied by Positron Annihilation* . . . SUZUKI, T.; OKI, Y.; NUMAJIRI, M.; MIURA, T.; KONDO, K.; ITO, Y. . . . July 1994 . . . National Laboratory for High Energy Physics, Ibaraki-ken, Japan . . . . . . To be published in Radiation Physics and Chemistry.

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