Radiation Safety Information Computational Center

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Despite whatever agreement there may be between some of us, let us never forget that we are all working whole-heartedly and humbly for the same goal – a country of peace, abundance and prosperity – for all of our people of all races, of all groups – whoever they may be, wherever they may live. – Chester Bowles

CHANGES TO THE RSICC CODE AND DATA COLLECTION

CCC-783/RASCAL 4.3

RASCAL Version 4.3 is the latest in the series of the **R**adiological **A**ssessment **S**ystem for **C**onsequence **A**na**L**ysis codes. It evaluates releases from nuclear power plants, spent fuel storage pools and casks, fuel cycle facilities, and radioactive material handling facilities. Developed for the U.S. Nuclear Regulatory Commission, RASCAL is designed to be used in the independent assessment of dose projections during response to radiological emergencies. The system supplements assessments based on plant conditions. RASCAL will be used by response personnel to conduct an independent evaluation of dose and consequence projections and for training and drills. The model was developed to allow consideration of

the dominant aspects of source term, transport, dose, and consequences. Source term calculations in RASCAL estimate the amount of radioactive (or hazardous) material released based on a wide variety of potential radiological accident scenarios. The source term calculations performed that pertain to fuel-cycle facility and materials accidents can generally be categorized as (1) fuel-cycle facility/UF accidents, (2) uranium fires and explosions, (3) criticality accidents, and (4) isotopic releases (e.g., transportation, materials).

Major changes and improvements in RASCAL 4.3 are listed below.

- **Create Inventory Base File** option which allows users to enter information about how a reactor has been operated to develop a more realistic and accurate reactor core inventory for use in the STDose model calculations.

- **Source Term Merge/Export** option which allows users to combine source terms for two or more reactors on a single site into a common source term to allow the user to assess the consequences from a **multi-reactor event**.

- **Configure Met Download** option allows users to setup an automated meteorological data acquisition module to gather and retrieve of meteorological data from the National Weather Service.

- Changes to the **Source Term to Dose (STDose)** to include:

    - **Long Term Station Blackout (SOARCA)** option for accident progression as described in NUREG-1935, State-of-the-Art Reactor Consequence Analyses (SOARCA)"

    - The **(LOCA) (NUREG-1465)** option (*previously named Time Core Is Uncovered in RASCAL 4.2*) which incorporates a change in the containment pressure/hole-size method of estimating release rates

    - **Coolant Release Accidents** option (*previously named Specified Core Damage Endpoint in RASCAL 4.2*) which is now associated with a specific accident that result in core damage (LTSBO and LOCA) and updated coolant source terms consistent with the Gale codes (NUREG-0016 and NUREG-0017)

    - **Use of Custom Reactor Inventory** option which allows the user to model realistic source terms based upon fuel management practices of the site using the **Create Inventory Base File** option

- Spent Fuel Source Term calculations have not changed significantly in RASCAL 4.3; however, the calculation details require a more complete description of the fuel pools contents and the determination of the nuclide inventory at risk.

- The changes to the transport, dispersion and dose calculation adds a fourth Cartesian computational grid which increases the RASCAL 4.3 domain from a 50 mile radius to a **100 mile radius** with the associated surface roughness data files for all grids. The calculation of the **child thyroid dose** has been added to allow for administration of potassium iodide (KI) and ingestion DCFs from Federal Guidance Reports 11 and 13 are included in the radionuclide database.

· Creation of activity balance file which allows the user to track the activity for selected nuclides and nuclide groups from the reactor core and coolant systems through various pathways to the environment.

· Addition of an **importance model utility**, which allows the user to process the total nuclide activity released to the environment in the course of an event by evaluating the relative importance of the nuclides to four dose measures and ranking the nuclides in order of importance.

· The ability to **export and import** a time dependent source term file describing the release of radionuclides to the atmosphere and surface concentration in the STDose model in either a XML or CSV format.

The package is transmitted on a CD which includes executables, data, help files, documentation and an install procedure. Visual Basic and Visual Fortran; Windows OS (XP, 7, 8) (C00783PCX8602).

CCC-780/BIGGI-4T

BIGGI-4T was contributed by the Commission des Communautes Europeenes 21020 - Ispra (Varese) Italy through the OECD Nuclear Energy Agency Data Bank, Issy-les-Moulineaux, France. BIGGI-4T solves the Boltzmann's transport equation (in integral form) numerically for gamma rays in plane or spherical geometry. Each of the three dimensions (space, energy, angle) is described by a mesh point set, and the integrals in the transport equation are approximated by sums. The exponential transformation allows the choice of large spatial steps in thick source-free shield regions, up to about 2 mfp. At most there can be 51 energy groups, 9 angular mesh points, 9 materials, 9 regions, 30 elements in the library, 9 source energies, 6 wavelength steps, 4 arbitrary response functions.

The package is transmitted on CD and includes the source code, data and documentation. Fortran IV, IBM 360 Series (C00780I036000).

PSR-583/SQUIRT VER2

The Nuclear Regulatory Commission, Washington, DC contributed this code system to predict leakage rate and area of crack opening for cracked pipes in nuclear power plants. The SQUIRT (Seepage Quantification of Upsets In Reactor Tubes) software is predicts leakage rate and area of crack opening for cracked pipes in nuclear power plants. In all cases, the fluid in the piping system is assumed to be water at a given temperature and pressure. The development of the SQUIRT computer model enables licensing authorities and industry users to conduct leak-rate evaluations for leak-before-break applications in a more efficient manner.

The package is transmitted on a CD with a self-installing Windows file that contains the executables, documentation, data files and test cases. Source files are not included. Microsoft Quick Basic and Visual Basic 6.0; Pentium (P00583PCX8600).

PSR-586/EXCURS-3-RR

EXCURS-3-RR, a kinetic computer code, is contributed by the Centre de Radioprotection et de Surete (CRS), Alger 16000, Algeria through the OECD Nuclear Energy Agency Data Bank, Issy-les-Moulineaux, France. EXCURS-3-RR simulates reactivity and loss of flow accidents in MTR research reactors and in sodium cooled fast reactors. EXCURS-3-RR is a new version of the EXCURS-3 code. It is

based on a coupling of neutron point kinetics and thermal hydraulics equations, with adjusted reactivity feedbacks. The thermohydraulics reactor behavior is determined by solving the one-dimensional heat conduction equation, with forced heat convection boundary condition. The calculations are restricted to a single equivalent unit cell which consists of fuel, clad and coolant.

The EXCURS-3_RR package is transmitted on CD and includes the source code, input/output files and a user's manual. Fortran 77, Dec VAX (P00586D0VAX00).

PSR-587/THACT-RR

THACT-RR, a computer program for analyzing thermal-hydraulics transients in research reactors code, is contributed by the Centre de Radioprotection et de Surete (CRS), Alger 16000, Algeria through the OECD Nuclear Energy Agency Data Bank, Issy-les-Moulineaux, France. THACT-RR is a channel code and it analyses the transient response of a research reactor core after power excursions or coolant flow and/or coolant temperature changes. The THACT-RR code provides a homogeneous one-dimensional compressible fluid flow capability with an optional voiding model that estimates the void produced by sub-cooled boiling. It allows flow reversal and sub-cooled nucleate boiling. It also includes a selection of flow instability, departure from nucleate boiling, single and two-phase heat transfer correlations, and a physical properties library adapted to pressures, temperatures, and flow rates encountered in research reactors.

The THACT-RR package is transmitted on CD and includes the source code, input/output files and a user's manual. Fortran 77, Dec VAX (P00587D0VAX00).

PSR-588/AIREKMOD-RR

AIREKMOD-RR, a point kinetics code, is contributed by the Centre de Radioprotection et de Surete (CRS), Alger 16000, Algeria through the OECD Nuclear Energy Agency Data Bank, Issy-les-Moulineaux, France. AIREKMOD-RR simulates fast transients in nuclear research reactor cores. It can also be used for theoretical reactor dynamics studies. It is used for research reactor kinetic analysis and provides a point neutron kinetic capability. The thermal hydraulic behavior is governed by a one-dimensional heat balance equation. The calculations are restricted to a single equivalent unit cell which consists of fuel, clad and coolant.

The AIREKMOD-RR package is transmitted on CD and includes the source code, input/output files and a user's manual. Fortran 77, Dec VAX (P00588D0VAX00).

PSR-591/BEST-5

BEST-5 was contributed by the ENEL - CPN, Rome, Italy through the OECD Nuclear Energy Agency Data Bank, Issy-les-Moulineaux, France. BEST-5 analyzes fuel cycle optimization in nuclear power plants. BEST-5 optimizes the specific fuel cost calculated over all the life on in some cases over periods even shorter. The optimal solution has to observe the constraints of the maximum burn-up at discharge and of minimum cycle duration, as well as the adequate criterion in core composition. The use of the "state variable" concept is well suited to the stagewise nature of the problem. The problem is subdivided into a series of simpler optimizations, each limited to one stage, while the technique of the dynamic programming permits to obtain the global optimum and to easily allow for the imposed constraints. The "system" under examination is the reactor itself which turns the fresh fuel into states of minor value. Best initial core composition and subsequent reload strategies up to the equilibrium. The Bellman method of

dynamic programming is utilized in the BEST-5 program for fuel cycle design problems in connection with money interest and replacement energy cost.

The package is transmitted on CD and includes the source code, JCL, documentation, and test cases. Fortran IV, IBM 360/IBM 370 Series (P591I037000).

SCIENCE EDUCATION PROGRAMS AT OAK RIDGE NATIONAL LABORATORY

Looking for an internship or post graduate opportunity at Oak Ridge National Laboratory? The Science Education Programs at Oak Ridge National Laboratory provide paid opportunities for undergraduates, grad students, recent graduates, and faculty to participate in high-quality research alongside world-class scientists to solve real-world problems. Opportunities are available for internships and co-ops, research appointments, and sabbaticals.

You can access all available opportunities through the website at http://www.orau.org/ornl. The Talent and Opportunity System allows you to create a profile, and then answer only 5 or 6 questions for each program or job posting for which you apply.

All levels of participants from undergraduates to faculty are encouraged to publish research papers with their mentors. Please browse through the Research Profiles on the different participants and their research experiences at the right hand side of the bottom of the web site listed above. Also, there is a video of research participants at ORNL sharing their thoughts on how access to world-class research facilities and staff has catapulted their careers in science and technology. You can find it on YouTube at http://ow.ly/2EQLz.

CONFERENCES, TRAINING COURSES, SYMPOSIA

RSICC attempts to keep its users and 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 via email to arwoodjw@ornl.gov with "conferences" in the subject line by the 20th of each month. Please include the announcement in its native format as an attachment to the message. Please provide a website address for the event if one is available.

Every attempt is made to ensure that the links provided in the Conference and Calendar sections of this newsletter are correct; however, if the links become unavailable, please call the point of contact for the event.

CONFERENCES

Joint International Conference on Supercomputing in Nuclear Applications & Monte Carlo

The Joint International Conference on Supercomputing in Nuclear Applications & Monte Carlo will be held on October 27-31, 2013, at the Cité des Sciences et de L'Industrie de la Villette in Paris, France.

The conference aims to highlight renewed strategy and simulation paradigms, and to identify future conceptual and technological breakthroughs. The objective is to increase the predictive capacity of the calculation tools designed and developed by teams of engineers and researchers all over the globe. The idea is to improve the performances accordingly in terms of calculation time, usability and maintainability. All these factors are indeed crucial for the central question of the role of a global nuclear application economy, including safety, optimizations, and costs.

For up-to-date information about this conference, visit their website at https://www.sfen.fr/SNA-and-MC-2013.

2013 IEEE Nuclear Science Symposium and Medical Imaging Conference

"Beyond Imagination of Future Science" will be held in Seoul, South Korea from October 27 - November 2, 2013 at the COEX Convention Center. In addition to the presentation of original work, the conference will provide extensive educational opportunities via short courses and special emphasis seminars before and during the conference. This meeting has always been a great place to exchange ideas and share knowledge and experience in the nuclear science, medical imaging, and room-temperature semiconductor X-Ray and Gamma-Ray detector fields.

For up-to-date information about this conference, visit their website at http://www.nss-mic.org/2013/NSSMain.asp .

10th International Conference of Computational Methods in Sciences and Engineering

The 10th International Conference of Computational Methods in Sciences and Engineering will be held April 4-7, 2014 at the Metropolitan Hotel, Athens, Greece. The conference will feature a mini-symposium on energy, with emphasis on nuclear energy entitled: "Accelerate Discovery and Design of New Materials Applications in Nuclear Power by High Performance Supercomputing."

For up-to-date information about this conference, visit their website at http://www.iccmse.org/ .

19th Pacific Basin Nuclear Conference

The 19th Pacific Basin Nuclear Conference will be held August 24-28, 2014 at the Hyatt Regency Hotel, Vancouver, British Columbia, Canada. The conference will showcase the advancement of nuclear technology in power generation, health science, and environmental stewardship. Challenges facing nuclear technology will be discussed as well as future development. The conference features ten Technical Tracks, covering all aspects of nuclear technology.

For up-to-date information about this conference, visit their website at www.pbnc2014.org.

PHYSOR 2014 International Conference

The ANS Reactor Physics Topical Meeting will be held at The Westin Miyako, Kyoto, Japan September 28 – October 3, 2014. The technical program will include timely and relevant special topics. Students will be actively involved in all technical events and activities. Exciting workshops and technical tours will be also offered.

For up-to-date information about this conference, visit their website at http://physor2014.org/# .

TRAINING COURSES

2013-2014 MCNP6 CLASS SCHEDULE

Date	Course Name and Description	Location	Cost
October 7-11, 2013	**Introduction to MCNP6** Registration is open to all. Non-U.S. citizens must register by 8/5/13. Minimum of 8 students-Maximum of 15, Monday 12:30 p.m. - Friday 12:00 p.m.	Los Alamos, NM	$1,900 or $1,600*
2014	Class schedule for 2014 is being planned now.		

*Early payment discount: A discount of $300 per student is given when the registration payment is received in full at least 4 weeks prior to the start of class.

Introductory classes are for those who have little or no experience with MCNP. This class surveys the features of MCNP so the beginning user will be introduced to the capabilities of the program, and will have hands-on experience at running the code to solve simple problems. Course topics include Basic Geometry, Source Definitions, Output (Tallies), Advanced Geometry (repeated structures specifications), Variance Reduction Techniques, Statistical Analysis, Criticality, Plotting of Geometry and Tallies, and Neutron / Photon / Electron Physics.

Intermediate workshops cover the entire spectrum of MCNP/MCNPX, but proceed at a much faster pace and are more in-depth than the introductory classes. These workshops are open to new users; the first day of class is a review of basics. However, the intermediate workshops are targeted toward more

experienced users and are more problem solving than lecture classes. Intermediate workshops feature flexible course content, skip topics of least interest to the participants, and provide significantly more depth than introductory classes.

Advanced classes- Variance Reduction and Criticality are for people with MCNP experience who want to extend their knowledge and gain depth of understanding. Most areas of MCNP operation will be discussed in detail, with emphasis on Advanced Geometry, Advanced Variance Reduction Techniques, and other advanced features of the program. Time will be available to discuss approaches to specific problems of interest to participants. Classes on specific topics are offered when there is sufficient interest.

Note: While MCNP supports a number of platforms, LANL class computers are Windows based. More information about the MCNP courses at LANL is available on their website at https://laws.lanl.gov/vhosts/mcnp.lanl.gov/classes/classinformation.shtml.

MCNPX Classes 2013		
October 7-11, 2013	**MCNP6 Intermediate Workshop**	Taejon, South Korea
November 11-15,2013	**MCNP6 Intermediate Workshop**	Barcelona, Spain

The MCNPX team at Los Alamos National Laboratory offers interactive workshops for training users in the capabilities of MCNPX at the intermediate level.

The list of workshops is tentative, as workshops may be added, removed, or modified throughout the year, depending on user interests. Workshops with fewer than 12 registrants on the early registration date are subject to cancellation or rescheduling.

In order to process non-U.S. citizens by the class date, non-U.S. citizens must register at least 6 weeks prior to the start of the training class. All non-U.S. citizens who reside in countries listed in the U.S. Code of Federal Regulations, Title 10, Part 810.8, are required to register at least 8 weeks prior to the start of the training class. These participants must be processed by the DOE and should not make travel arrangements until approval from DOE has been obtained.

Additional information about the courses can be found at the website, http://mcnpx.lanl.gov/. To register send an email to Randy Schwarz at randyschwarz@mcnpvised.com, indicating the workshop of interest to you.

Practical MCNP for the Health Physicist, Medical Physicist, and Rad Engineer

DATES: October 21-25, 2013
FEE: $1,800 per person
PLACE: Los Alamos National Lab, TA00-0767-149**,** Los Alamos, NM, 87545

Monte Carlo type calculations are ideally suited to solving a variety of problems in radiation protection and dosimetry. The Los Alamos MCNP™ code is a general and powerful Monte Carlo transport code for photons, neutrons, and electrons, and can be safely described as the "industry standard." This course is aimed at the HP, medical physicist, and rad engineer with no prior experience with Monte Carlo techniques. The focus is almost entirely on the application of MCNP™ to solve a variety of practical problems in radiation shielding and dosimetry. The intent is to "jump start" the student toward using MCNP™ productively. With a little practice and study of the examples, many will find they are able to solve problems that have, in the past, been out of reach.

For more information, including course description and registration information, please visit their website at: http://www.lanl.gov/orgs/rp/mcnp.shtml. Non-US citizens need to register 60 days in advance to allow for necessary visitor approvals.

Note that this course is separate from and independent of the courses being offered by the MCNP and MCNPX Teams at LANL.

OECD Nuclear Energy Agency-Data Bank Training Courses

October 16-18, 2013	**EASY, the European Activation System**	NEA, Paris, France
November 4-8, 2013	**TRIPOLI 4**	NEA, Paris, France

These workshops combine teaching by the authors on program physics, along with instructions on how to use the software. The courses include a large number of practical exercises. Note that the number of participants to the courses is limited. Priority is given to nationals from NEA Data Bank member countries. Class sizes are limited and courses may be cancelled if minimum enrollment is not obtained one month prior to course. Course fees are refundable up to one month before each class. After one

month, course fees will not be refunded. Note that all attendees must be registered users. Registration information is available at: http://www.oecd-nea.org/dbprog/trainingcourses.htm.

Fall 2013 Training Courses

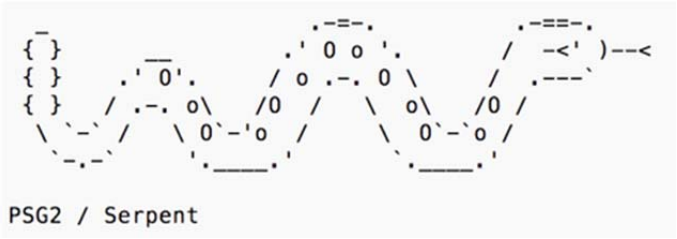
Date	Title	Location	Cost
October 7-11, 2013	**Criticality Safety Calculations Course** *Introductory through advanced criticality calculations using KENO V.a and KENO-VI; resonance self-shielding techniques*	ORNL Oak Ridge, TN, USA	$2000*
October 14-18, 2013	**SCALE Lattice Physics and Depletion Course** *2D lattice physics calculations; 1D, 2D, and 3D depletion calculations; resonance self-shielding techniques including Monte Carlo Dancoff factors for non-uniform lattices; generation of libraries for ORIGEN-ARP*	ORNL Oak Ridge, TN, USA	$2000*
October 21-23, 2013	**SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis Course** *Isotopic depletion, activation analysis, and source term characterization using ORIGEN/ORIGEN-ARP*	ORNL Oak Ridge, TN, USA	$1500*
October 28-November 1, 2013	**SCALE Criticality and Shielding Course** *Basic criticality calculations with KENO-VI; shielding analysis with automated variance reduction using MAVRIC; criticality accident alarm system analysis*	ORNL Oak Ridge, TN, USA	$2000*

**Full-time university students can register at a reduced rate. Both professional and student registration fees are discounted $200 for each course over one.*

Class size is limited and course may be cancelled if minimum enrollment is not obtained one month prior to the course. Course fees are refundable up to one month before each class.

FOREIGN NATIONAL VISITORS TO ORNL – Payment MUST be received at least one week prior to attending the training course. All foreign national visitors must register 40 days before the start date of the training course they plan to attend.

For more information, including course descriptions, discounts, registration deadlines, and online registration, please visit http://scale.ornl.gov/training.shtml.



Serpent User's Group Meeting 2013

In collaboration with the UC Berkeley Department of Nuclear Engineering, the Serpent User's Group Meeting 2013 will be held at Berkeley Skydeck, Berkeley, CA November 6-8, 2013. The Serpent Monte Carlo code has been developed for reactor physics, group constant generation, and burn-up calculations since 2004. The introductory tutorial on November 5th will address the fundamental concepts and basic use of the Serpent code. The User's Group Meeting that follows on the 6th through the 8th will cover a general overview of the methods and capabilities of the Serpent code as well as with plans for future development. It will also cover applications, coupling to other codes, and verification and benchmarking of the various features of the code.

For more information regarding this meeting, visit their website at http://serpentugm2013.eventbrite.com/.

SYMPOSIA

The 15th International Symposium on Reactor Dosimetry (ISRD-15)

The 15th International Symposium on Reactor Dosimetry (ISRD-15) will take place from May 18-23, 2014 at the Hotel Aquabella in Aix-en-Provence, France. The aim of the symposium is to bring together the communities involved in research, development and applications related to reactor dosimetry. The symposium is jointly organized by the European Working Group on Reactor Dosimetry (EWGRD) and the Committee E10 on Nuclear Technology and Applications of the American Society for Testing and Materials (ASTM).

The Announcement and Call for Papers can be viewed at http://reactordosimetry.org/Announcements/ISRD15_1st-announcement-A4.pdf. For up-to-date information about this conference, visit their website at http://reactordosimetry.org/index.html.

2013 CALENDAR

October

Joint International Conference on Supercomputing in Nuclear Applications & Monte Carlo, October 27-31, 2013, Paris, France. For up-to-date information about this conference, visit their website at https://www.sfen.fr/SNA-and-MC-2013.

November

Serpent User's Group Meeting 2013, November 6-8,Berkeley, CA. For up-to-date information about this conference, visit their website at http://serpentugm2013.eventbrite.com/.

ANS Winter Meeting, November 10-14, 2013, Washington, D.C. For up-to-date information about this conference, visit their website at http://www.ans.org/meetings/m_81.

2014 CALENDAR

April

International Conference of Computational Methods in Sciences and Engineering, April 4-7, 2014, Athens, Greece. For up-to-date information about this conference, visit their website at http://www.iccmse.org/ .

May

International Symposium on Reactor Dosimetry (ISRD-15), May 18-23, 2014, Aix-en-Provence, France. For up-to-date information about this conference, visit their website at http://reactordosimetry.org/index.html.

August

19th Pacific Basin Nuclear Conference, August 24-28, 2014, Vancouver, British Columbia, Canada. For up-to-date information about this conference, visit their website at www.pbnc2014.org.

October

PHYSOR 2014, September 28 – October 3, 2014, Kyoto, Japan**.** For up-to-date information about this conference, visit their website at http://physor2014.org/#.