# Radiation Safety Information Computational Center


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***"Effort only fully releases its reward after a person refuses to quit."***

***Napoleon Hill***

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# MCNP6.1.1 Beta Release

RSICC is pleased to announce the release of MCNP6.1.1 Beta from Los Alamos National Laboratory. It is recommended that MCNP6.1.1Beta not be used for production level calculations, because it does not have the same level of verification, validation and testing as MCNP 6.1, both in the evaluation of new features and existing feature interoperability, and testing on a wide variety of hardware and operating systems. However, if users wish to perform their own V&V, it is ultimately up to their careful consideration how these executables should be used. This release does have the same high level of confidence for the existing capabilities released in MCNP 6.1.

This release was created for users interested in testing the new capabilities that are mostly for homeland security and non-proliferation applications. The beta version does not include new capabilities for the criticality safety community, but does run significantly faster than the production version. The MCNP package available from RSICC contains the final production version of MCNP 5 and MCNP X, and the latest production version of MCNP 6, in addition to this beta release and the associated nuclear and atomic data.

Customers that have already obtained either the source or executable version of MCNP6.1 will only be sent a single DVD that contains the beta code. All other individuals will receive the full complement of codes as stated previously. Furthermore, the cost recovery fee will be waived for all requests received prior to 4:00pm on September 12, 2014 for those customers that normally would be required to pay the fee.

# CHANGES TO THE RSICC CODE AND DATA COLLECTION

There were two updates or additions to the RSICC catalog for those individuals that may be interested.

## BCC-009/MCNP6.1.1BETA/MCNP6.1/MCNP5/MCNPX

Los Alamos National Laboratory, Los Alamos, New Mexico, USA has contributed a new BETA version of MCNP6.1.1. MCNP6™ is a general-purpose, continuous-energy, generalized-geometry, time-dependent, Monte Carlo radiation-transport code designed to track many particle types over broad ranges of energies. This MCNP6.1.1Beta is a follow-on to the MCNP6.1 production version which itself was the culmination of a multi-year effort to merge the MCNP5™ [X-503] and MCNPX™ [PEL11] codes into a single product. This MCNP6.1.1 beta has been released in order to provide the radiation transport community with the latest feature developments and bug fixes in the code. MCNP6.1.1 has taken input from a group of people, residing in the Los Alamos National Laboratory's (LANL) X Computational Physics Division, Radiation Transport Group (XCP-3), and Nuclear Engineering and Nonproliferation Division, Systems Design and Analysis Group (NEN-5). They have combined their code development efforts to produce this next evolution of MCNP. For those familiar with previous versions of MCNP, you will discover the code has been expanded to handle a multitude of particles and to include model physics options for energies above the cross-section table range, a material burnup feature, and delayed particle

production. Expanded and/or new tally, source, and variance-reduction options are available to the user as well as an improved plotting capability. The capability to calculate $k_{eff}$ eigenvalues for fissile systems remains a standard feature. Although MCNP6 is simply and accurately described as the merger of MCNP5 and MCNPX capabilities, the result is much more than the sum of these two computer codes. MCNP6 is the result of five years of effort by the MCNP5 and MCNPX code development teams.

Major MCNP6 features that have been implemented since the release of version 6.1.

Physics:

- The use of data libraries in light ion transport.
- Charged particle transport in unstructured mesh geometries.
- Cerenkov photon production and reflection/refraction physics for visible light photons
- Correlated decay particle production.
- Correlated prompt particle production (CGM)
- Delayed alpha particle production physics.

Sources:

- Improvements for better user control of spontaneous decay sources.
- Addition of heavy ions to standard cosmic source.
- Release 3 of Cosmic and Terrestrial background data file.

Tallies:

- New tally option to model Compton Image Detectors.

Other

- Speed improvements

**It is recommended that MCNP6.1.1Beta not to be used for production level calculations, because it does not have the same level of verification, validation and testing as MCNP 6.1, both in the evaluation of new features and existing feature interoperability, and testing on a wide variety of hardware and operating systems. However, if users wish to perform their own V&V, it is ultimately up to their careful consideration how these executables should be used. This release does have the same high level of confidence for the existing capabilities released in MCNP 6.1.**

The MCNP6.1.1Beta/MCNP6.1/MCNP5/MCNPX package is distributed on 4 DVDs that can be read on Windows, Linux or MacOS systems.

Disc 1 of B00009MNYCP00 contains MCNP6.1, MCNP5, MCNPX source code, pre-compiled executables and approximately 650 reference documents.

Disc 4 of B00009MNYCP00 contains MCNP6.1.1 Beta source code, pre-compiled executables, data files documentation and approximately 680 reference documents.

Disc 1 of B00009MNYCP01 contains MCNP6.1, MCNP5, MCNPX pre-compiled executables and approximately 650 reference documents.

Disc 4 of B00009MNYCP01 contains MCNP6.1.1 Beta pre-compiled executables, data files, documentation and approximately 680 reference documents.

Discs 2 and 3 of both packages contain the same ENDF/B-VII.1 data.

Export control regulations restrict the distribution of FORTRAN source code. If restrictions apply, RSICC will send the executable-only version. Please order the package you prefer, and your preference will be honored if possible. FORTRAN 90 and C; Windows PCs, Linux PC, MacOS [Package ID: B000009MNYCP00 (full source distribution) and B00009MNYCP01 (executable-only distribution)].

## CCC-826/SCEPTRE 1.4

Sandia National Laboratories, Albuquerque, New Mexico has contributed SCEPTRE 1.4: Sandia Computational Engine for Particle Transport for Radiation Effects. The SCEPTRE code solves the linear Boltzmann transport equation for one-, two- and three-dimensional geometries. SCEPTRE is capable of handling any particle type for which multigroup-Legendre cross sections are available. However, the code is designed primarily to model the transport of photons, electrons, and positrons through matter. For efficiency and flexibility, SCEPTRE contains capability for both the first- and second-order forms of the Boltzmann transport equation. The SCEPTRE code uses an unstructured-mesh finite-elements spatial approximation, and a multigroup-Legendre, discrete-ordinates energy/angular approximation. Parallel solution is available for a spatially-decomposed mesh using MPI. For second-order transport methods, a spherical harmonics angular treatment is also available. For the first-order form of the transport equation, the within-group solves are performed with parallel sweeps and source iteration. For the second-order forms, an SPD linear system is formed and the space/angle dependence is solved simultaneously with a Trilinos parallel preconditioned CG solver. A different solution method can be specified for each energy group. C++ compilers and MPI implementation are required to compile the source code. The build system uses autotools and has been tested with gcc and Intel compilers, with Open MPI and MVAPICH. No executables are included in the package. Required open source third party libraries are Boost, NetCDF and Trilinos. Included in the package are the referenced document and source transmitted on CD ROM in tar format. C++, Linux (C008826PCX8600).

# 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 customers 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 walkersy@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


### 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/#.

## The Pennsylvania State University 2014 Radiation Safety Roundtable

The 13th annual Penn State University Radiation Safety Roundtable will be held **October 6-8, 2014** at the PSU State College campus. This two and a half day event annually brings together about 50 - 70 radiation safety professionals from the academic, medical, corporate, and (occasionally) regulatory sectors for an informal but in-depth discussion on current issues and creative solutions to shared problems. The program will begin in the morning of Monday, October 6 and concludes after lunch on Wednesday, October 8.

The conference is held at the Penn State Conference Center Hotel and registration information is at: http://register.outreach.psu.edu/search/publicCourseSectionDetails.do?method=load&sectionId=600193. For conference information please contact Jeff Leavey at JAL62@psu.edu.

## 3rd International Workshop on Accelerator-Driven Sub-Critical Systems & Thorium Utilization

This will be held at the Virginia Commonwealth University in Richmond, Virginia, from **October 14-17, 2014.** Experts from around the world will exchange information on topics relevant to accelerator-driven sub-critical systems. The three-day workshop will include working sessions on:

- Fast spectrum and thorium-based systems
- Thermal spectrum systems
- Comparison to other systems and future directions
- Superconducting radio frequency ingot niobium technology
- Accelerator systems and enabling technologies

The workshop will seek to identify areas of common interest to explore the possibilities of future collaboration.

The deadline for paper acceptance is September 1, 2014. For questions, contact adsthu@adsthu.org. For up-to-date information about this conference, visit their website at http://www.adsthu.org/index.html.

## 4th International Conference on Nuclear & Renewable Energy Resources (NURER2014)

This event will consist of a knowledge-based and comprehensive scientific program, featuring oral and poster presentations with possible commercial exhibitions from energy and publishing sectors. Thus, it will provide a good opportunity to become familiar with the most recent R&D tools in innovative nuclear and renewable energy systems, as well as looking at cutting-edge ideas on a sound scientific-technical basis. The aim is to combine the intellectual debates on the leading practical applications on nuclear and non-nuclear technologies, such as hydrogen energy, wind energy, solar concentrating systems, PVs, power systems, alternative energy tools, deep space exploration, etc. This conference will take place **October 26-29, 2014** in Antalya, Turkey.

For up-to-date information about this conference, visit their website at www.nurer2014.org.


## 1st Workshop on Methodologies for Spent Nuclear Fuel Pool Simulations

This workshop will introduce participants to the use, accuracy, and limitations of methodologies/tools employed for the evaluation of safety and safeguards for spent nuclear fuel pools. It will be held **October 28-30, 2014** at the Virginia Tech Research Center in Arlington, Virginia.

For up-to-date information about this conference, visit their website at www.cpe.vt.edu/nuclear.


## MCNP for the Health Physicist

The next "Practical MCNP for the Health Physicist, Rad. Engineer and Medical Physicist" class presented by the Radiation Measurements Group at Los Alamos National Laboratory has been scheduled for **November 3-7 2014**. The course, to be held in Los Alamos, has recently been updated to reflect the recent release of MCNP6. Further details can be found on RSICC's homepage (https://rsicc.ornl.gov/Default.aspx) under the "Workshops" link.

## 3rd International Technical Meeting on Small Reactors "Applications of Research Reactors and Small Modular Reactors" (ITMSR-3)

The 3rd International Technical Meeting on Small Reactors (ITMSR-3) will be held in Ottawa, Ontario, Canada, **November 5-7, 2014** at the Ottawa Marriott Hotel. This technical meeting will focus on the applications of research reactors and small modular reactors. Detailed information is available at www.cns-snc.ca/events/3tm/. A Call for Papers for the ITMSR-3 is attached for your information and distribution. The technical meeting will provide a great opportunity for you to interact and exchange ideas with researchers and designers of other domestics and international organizations, publish advancements and expertise in the subject areas.

For up-to-date information about this conference, visit their website at www.cns-snc.ca/events/3tm/.


## M&C + SNA + MC 2015

The Oak Ridge/Knoxville Section of the American Nuclear Society (ANS) will host and sponsor the FIRST combined Mathematics and Computations (M&C) ANS topical, Supercomputing in Nuclear Applications (SNA), and Monte Carlo (MC) 2015. The joint international conference will be held at the Sheraton Music City in Nashville, Tennessee during the week of A**pril 19-23, 2015**. M&C is the latest in the series organized by the Mathematics and Computation Division of the American Nuclear Society. Prior to 2010, SNA and MC existed as separate conferences. In 2010, SNA and MC combined and held SNA+MC 2010 in Tokyo, Japan. This was followed by SNA+MC 2013 held in Paris, France.

For up-to-date information about this conference, visit their website at http://mc2015.org.

# The 17th International Conference on Emerging Nuclear Energy Systems (ICENES2015)

This conference will consist of an informative and comprehensive scientific program, featuring oral and poster presentations and a commercial exhibition. This will provide a unique opportunity to become familiar with the most recent advancements in innovative nuclear energy systems, as well as looking at "bold" and "unthinkable" ideas on a sound scientific-technical basis. The forum will also be open to intellectual debate leading to practical applications around innovative non-nuclear technologies, such as hydrogen energy, solar energy, deep space exploration and others. This conference will take place **May 10-14, 2015** inclusive, in Antalya, Turkey.

For up-to-date information about this conference, visit their website at http://www.icenes2015.org.

# TRAINING COURSES


## LANL MCNP6 Class Schedule

| Date | Course Name and Description | Location | Cost |
|---|---|---|---|
| October 20-24, 2014 | Introduction to MCNP6<br>Non-US citizens must register 2014-08-18<br>Min 8 students – Max 15<br>Mon 12:30 – Fri 12:00 | Los Alamos, NM | $1,900 or $1,600* |
| October 27-29, 2014 | Unstructured Mesh with AttilaMCNP<br>Non-US citizens must register 2014-08-25<br>Min 8 students – Max 15<br>Mon 12:30 – Wed 4:30 | Los Alamos, NM | $1,000 or $800* |

***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.

**Intermediate class** Unstructured Mesh with Attila4MCNP is an introduction to the new unstructured mesh capability in MCNP6 and the Attila4MCNP problem-setup Graphical User Interface (GUI) from Transpire, Inc (www.transpireinc.com). Attendees should have prior experience with MCNP; no experience with the other codes is required. In this class, the participant will learn how to develop 3-D geometries in SpaceClaim (www.spaceclaim.com), import these CAD geometries into Attila4MCNP, mesh the geometry, setup the entire MCNP6 input file with the GUI, and run the calculation using the MCNP6 unstructured mesh capability. Part of the CAD instruction will involve CAD cleanup and defeaturing of existing CAD files. The participant will also learn how to run the Attila solver to generate weight windows with the CADIS methodology. The MCNP6 pre- and post-processor programs will be taught. The material is organized with group exercises.

**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.

## MCNP6, Penelope, and Visual Editor Training

Classes are taught using the most recent (beta) version of the Visual Editor Code. All class attendees must have a valid MCNP/MCNPX RSICC license. Bring proof of receipt (letter or email) to the class.

| **Visual Editor Classes 2014 & 2015** | | |
|---|---|---|
| October 20-24, 2014 | Beginning Visual MCNP | Barcelona, Spain |
| October 27-31, 2014 | Intermediate Visual MCNP | Barcelona, Spain |
| December 1-5, 2014 | Beginning Visual MCNP | London, UK |
| December 8-12, 2014 | Intermediate Visual MCNP | London, UK |
| January 5-9, 2015 | Beginning Visual MCNP | Las Vegas, NV |
| January 19-23, 2015 | Intermediate Visual MCNP | Las Vegas, NV |
| February 2-6, 2015 | Beginning Visual MCNP | Seoul, Korea |
| February 9-13, 2015 | Intermediate Visual MCNP | Seoul, Korea |
| February 16-20, 2015 | Beginning Visual MCNP | Sydney, Australia |
| February 23-27, 2015 | Beginning Visual MCNP | Honolulu, Hawaii |
| March 16-20, 2015 | Beginning Visual MCNP | Paris, France |
| March 30-April 3, 2015 | Intermediate Visual MCNP | Barcelona, Spain |
| April 13-17, 2015 | Beginning Visual MCNP | Las Vegas, NV |
| April 20-24, 2015 | Intermediate Visual MCNP | Las Vegas, NV |
| May 11-15, 2015 | Visual MCNP6 for Shielding Calculations (Class size limited to six students.) | Barcelona, Spain |
| May 18-22, 2015 | Visual MCNP6 for Criticality Calculations (Class size limited to six students.) | Barcelona, Spain |
| May 25-29, 2015 | Visual MCNP6 for Medical Physics | Barcelona, Spain |

| | | |
|---|---|---|
| | (Class size limited to six students.) | |
| June 15-19, 2015 | Beginning Visual MCNP | Prague, Czech Republic |
| October 5-9, 2015 | Beginning Visual MCNP | Paris, France |

The introductory workshops combine teaching on MCNP basics and how to create MCNP input files using the Visual Editor. The intermediate Visual Editor workshops focus on more advanced topics such as tallies and variance reduction using the Visual Editor.

Exercises will focus on creating input files and visualizing output data with the Visual Editor. Attendees are encouraged to bring their own input files for viewing and modifying in the Visual Editor; this is particularly important for the intermediate workshop.

The course description and registration information can be found at http://www.mcnpvised.com/index.html.

| **MCNP6 Workshops 2014 & 2015** | | |
|---|---|---|
| November 24-28, 2014 | MCNP6 Intermediate Workshop | Paris, France |
| January 12-16, 2015 | MCNP6 Intermediate Workshop | Las Vegas, NV |
| March 23-27, 2015 | MCNP Intermediate Workshop | Paris, France |
| April 27-May 1, 2015 | MCNP Intermediate Workshop | Livermore, CA |

Intermediate Workshops cover the entire spectrum of MCNP6 but proceed at a much faster pace and are more in-depth than Introductory Classes. These workshops are open to new users; the first day 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.

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://www.mcnpvised.com/train.html.

To register send an email to Randy Schwarz at randyschwarz@mcnpvised.com, indicating the workshop of interest to you.

## NEA Nuclear Energy Agency

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

Please note that all attendees must be registered users.

| Date | Class | Course Content | Price | Location |
|---|---|---|---|---|
| 24-28 November 2014 | MCNP6 intermediate | Course description<br>To register, click here | 2000 Euros | Paris, France |

* The fee includes the training course, luncheons and coffee breaks.

**Contact: programs@oecd-nea.org**

# SYMPOSIA

## 2014 CALENDAR

***September***

**Topical Meeting of the ANS Radiation Protection and Shielding Division (RPSD 2014)**, September 14-18, 2014, Knoxville, TN. For up-to-date information about this conference and the Call for Papers, visit their website at www.rpsd2014.org.

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

***November***

**2014 ANS Winter Meeting and Nuclear Technology Expo, Nuclear – The Foundation of Clean Energy**, November 9-13, 2014, Anaheim, CA. For up-to-date information about this conference, visit their website at http://www.ans.org/meetings/c_1.

***December***

**WINS 2014 Workshop on Elastic and Inelastic Neutron Scattering**, December 3-5, 2014, Dresden, Germany. For up-to-date information about this conference, visit their website at http://www.hzdr.de/db/Cms?pNid=3221.

## 2015 CALENDAR

***February***

**9th International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human Machine Interface Technologies (NPIC&HMIT 2015),** February 22-26, 2015, Charlotte, NC. For up-to-date information about this conference, visit their website at http://www.npic-hmit2015.org/.

**Health Physics Society 48th Midyear Topical Meeting,** February 1-4, 2015, Norfolk, VA. Website not yet available.

***April***

**ANS Mathematics & Computation (M&C) 2015 & Supercomputing in Nuclear Applications (SNA) and Monte Carlo (MC),** April 19-23, 2015, Nashville, TN. For up-to-date information about this conference, visit their website at http://mc2015.org/.

***May***

**2015 International Congress on Advances in Nuclear Power Plants (ICAPP '15),** May 3-6, 2015, Nice, France. For up-to-date information about this conference, visit their website at https://www.sfen.fr/ICAPP.

**Used Fuel Management Conference,** May 5-7, 2015, Orlando, FL. Website not yet available.

***June***

**ANS Annual Meeting: Nuclear Technology: An Essential Part of the Solution**, June 7-11, 2015, San Antonio, TX. Website not yet available.

***July***

**U.S. Women in Nuclear Conference,** July 12-15, 2015, Austin, TX. Website not yet available.

**INMM 56th Annual Meeting,** July 12-16, 2015, Indian Wells, CA. Website not yet available.

**Health Physics Society 60th Annual Meeting**, July 12-16, 2015, Indianapolis, IN. Website not yet available.

***September***

**Global 2015 International Nuclear Fuel Cycle Conference,** September 20-24, 2015, Paris, France. For up-to-date information about this conference, visit their website at. https://www.sfen.fr/GLOBAL.

***November***

**ANS Winter Meeting and Nuclear Technology Expo,** November 8-12, 2015, Washington, **DC.** Website not yet available.