Radiation Safety Information Computational Center

Oak Ridge National Laboratory
Post Office Box 2008
Oak Ridge, Tennessee 37831-6003
Managed by
UT-Battelle, LLC
for the U.S. Department of Energy
under contract DE-AC05-00OR22725

phone 865-574-6176 fax 865-241-4046
email PDC@ORNL.GOV
www http://rsicc.ornl.gov/

Timothy E. Valentine, Ph.D. - RSICC Director

No. 636 May 2018

"*"In three words I can sum up everything*
I've learned about life: it goes on." –Robert Frost

TABLE of CONTENTS

CHANGES TO THE RSICC CODE AND DATA COLLECTION

There are two updates to the RSICC catalog for those individuals that may be interested.

PSR-617/F-Score

F-Score Nuclide ID Scoring Applications (Version 1.0) has been contributed by Sandia National Laboratories, Albuquerque, New Mexico. The goal of the Domestic Nuclear Detection Office (DNDO) Algorithm Improvement Program (AIP) is to facilitate gamma-radiation detector nuclide identification algorithm development, improvement, and validation. Accordingly, scoring criteria have been developed to objectively assess the performance of nuclide identification algorithms. In addition, a Microsoft Excel spreadsheet application for automated nuclide identification scoring has been developed. The fundamental equation used to evaluate nuclide identification algorithm performance is based on F-scores. F-scores are a statistical method for determining accuracy by utilizing precision (p) and recall (r).

F-Score is transmitted on one CD which includes executable, documentation and reference material; C++; Windows operating systems. (P617PCX8600).

PSR-610/GADRAS-DRF-18.7.6

The Gamma Detector Response and Analysis Software–Detector Response Function (GADRAS-DRF-18.7.6) update was contributed by Sandia National Laboratories, Albuquerque, New Mexico and Livermore, California. GADRAS-DRF-18.7.6 contains a suite of capabilities related to radiation detection. Its primary function is the simulation of gamma-ray and neutron detector signals to radiation sources. It also contains limited analysis functionality. GADRAS-DRF-18.7.6 is the public version of the full version of GADRAS with capabilities such as radiation transport and advanced analyses removed. Features in a gamma-ray detector spectrum; such as photo-peaks and the Compton continuum are derived from first-principles calculations based on interaction cross sections. Neutron detector response is computed by interpolating on a pre-computed database of thermal (3He) detector responses. For both gamma-ray and neutron detectors, the response to radiation that scatters into the

detector from the surrounding environment is determined by a combination of first-principle calculations and empirical modeling. For new detectors, known detector parameters such as size and resolution are all that is necessary to compute an initial response function. This response function may be refined by measuring calibration sources and fitting the detector's parameters to match the data.

Improvements include:

- Training Aids (documents and example files) have been added for the Batch Inject and F-Score Tool under their respective Help menus.
- In Spectrum File Tools, the user can now use ":" instead of "-" when specifying a range of records. In addition, the "Sum" keyword allows users to provide ranges of records or individual records to add.
- When characterizing a detector, spectra with differing number of channels can be used simultaneously.
- Detection of coincident gamma rays is now computed for calibration sources that are displaced relative to the center of a detector.
- Neutron absorption in CsI detectors is now computed by assuming that the spectra are the same as NaI.
- Neutron capture by hydrogen in materials that surround a detector can introduce a peak at 2223 keV that is not associated with radiation source models
- The detector response function was modified to more accurately replicate effects associated with photoelectrons that enter the detector after being produced by gamma-ray interactions with materials that surround the detector.
- The method used to interpolate scatter coefficients was changed from linear interpolation to a cubic as a function of scatter angle.
- The accuracy of isotope identification obtained by analyzing spectra recorded by PVT detectors has been improved.

The package contains setup executable, user manual, runtime libraries, and data files and is transmitted on one CD. Windows (P00610PCX8603).

END USE STATEMENT

Customers are strongly encouraged to provide full and complete information regarding the intended end use of the software being requested. End use statements that specify that the code is for research, training or educational activities are not sufficient. RSICC's regulators need to know explicitly for what purpose you intend to use the codes and detail needs to be provided. Requests that lack sufficient detail will be rejected.

REGISTRATION REQUIREMENTS

RSICC does not permit individuals to “pre-register” or “pre-order” software for use at a temporary or alternate location. The single user license and export control agreements are specific to the individual’s end use and the location at which the software will be used. During the registration process, individuals are required to provide the name of the institution at which they will use the software, an institutional mailing address and an institutional e-mail address. As an example, students that work at a location other than their university are required to update their registration with RSICC and submit a new request for any software that they intend to use after they have begun work at the new location.

SINGLE-USER LICENSE AGREEMENT REVISED

The single-user license agreement has been revised to address concerns regarding changes in end-use and/or employment of individuals that have received packages from RSICC. In some instances, individuals obtain approvals from our Federal regulators for use of software packages for very specific purposes or while employed or associated with specific organizations. To address this concern, the single-user license agreement has been modified to indicate that the license is only valid for the end-use as stated in the Licensee's request and only while associated with the organization under which the request is being made. After February 1, 2015, the individual's single-user license would no longer be valid if they change their end-use or are no longer associated with the organization for which they obtained the original license. In these cases, the individual would need to submit a new request to RSICC for the package for the new end-use or the new affiliation.

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.

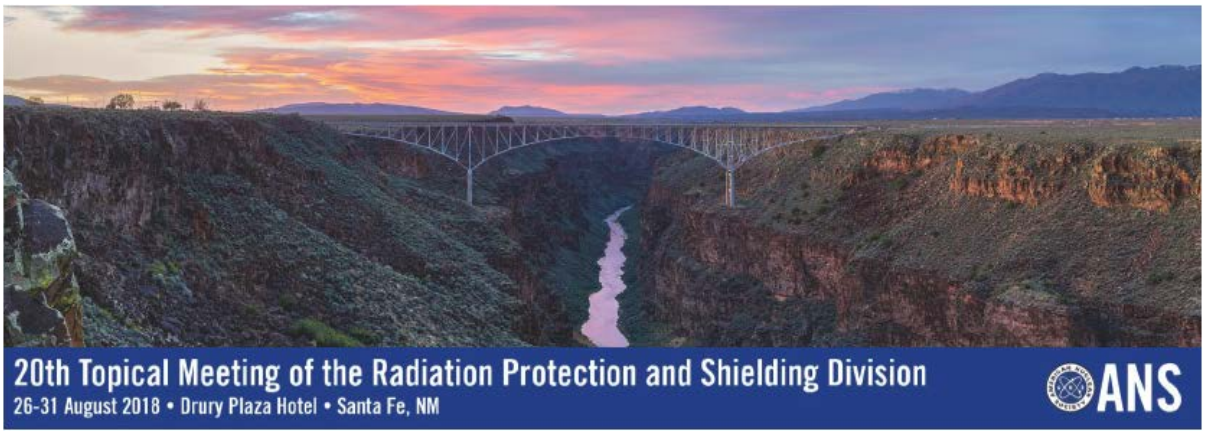
CONFERENCES, TRAINING COURSES, SYMPOSIA

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 for RSICC Newsletter**" in the subject line by the 15th 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

Workshop on MRT Particle Transport Methodology and RAPID

This workshop will be held **June 6-8, 2018** at the Virginia Tech Research Center, in Arlington, Virginia. The goal of this workshop is to introduce participants to the Multi-stage, Response-function Transport (MRT) methodology and the RAPID formulation and code system. Please see the website for more details: http://www.cpe.vt.edu/rapid/.

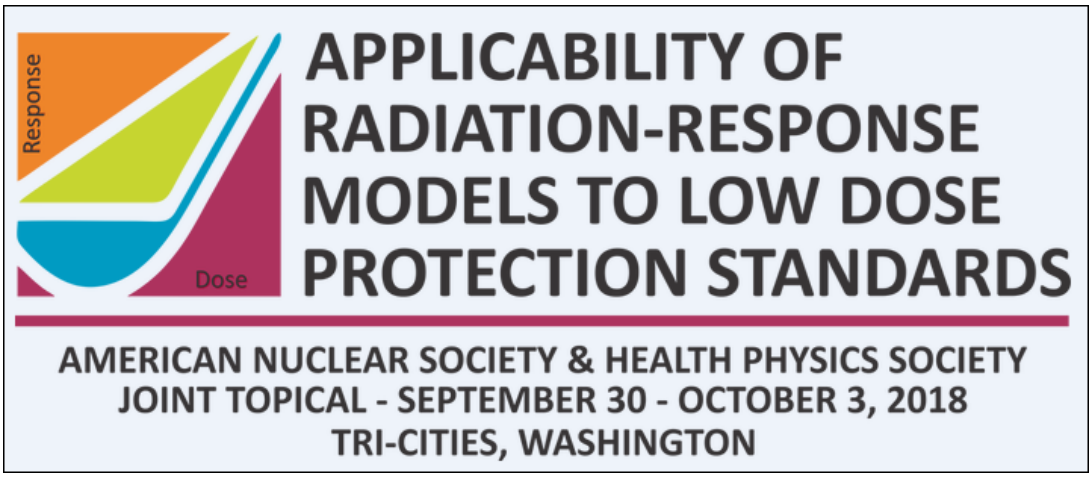


20th Topical Meeting of the Radiation Protection and Shielding Division

This meeting will be held **August 26-31, 2018** in Santa Fe, New Mexico. Please visit the website http://rpsd2018.ans.org/ for more information. If questions, please contact Michael Rising, LANL at mrising@lanl.gov.

PHYTRA4

The Fourth International Conference on Physics and Technology of Reactors and Applications will be held **September 17-19, 2018,** in Marrakech, Morocco. This conference will be organized by the Moroccan Association for Nuclear Engineering and Reactor Technology (GMTR) with the collaboration of the National Centre for Energy, Sciences and Nuclear Techniques (CNESTEN) and the Moroccan Agency for Nuclear and Radiological Safety and Security (AMSSNuR) after the resounding success which the previous editions had met. Please see their website for more information at http://phytra4.gmtr.ma/.



American Nuclear Society & Health Physics Society Joint Topical

The American Nuclear Society and Health Physics Society are co-sponsoring a scientific conference on "Radiation Response Models to Low Dose Protection Standards," in Pasco, Washington, **September 30 - October 3, 2018**. For additional information contact Alan Waltar, conference chair, alan.waltar@gmail.com, or Darrell Fisher, technical program co-chair, at darrell.fisher@versantphysics.com.

NURER 2018

The 6th International Conference on Nuclear and Renewable Energy Resources (NURER2018) will be held **September 30 - October 3, 2018,** in Juju, Korea. This is recognized as one of the major international conferences for the exchange of information on scientific, engineering, and other technical aspects of innovative nuclear and renewable energy science and technology. For more details on this conference, please visit their website at http://nurer2018.org.

TRAINING COURSES

LANL MCNP6 Class Schedule

Website: https://laws.lanl.gov/vhosts/mcnp.lanl.gov/classes/classinformation.shtml

June 4-8, 2018 Los Alamos, NM	Introduction to MCNP6 –FULL— Non-US citizens must register by 2018-03-12 | Mon 10:00 - Fri 12:00	--FULL--
Aug 6-10, 2018 Los Alamos, NM	Criticality Calculations with MCNP6 Non-US citizens must register by 2018-05-14 | Mon 10:00 - Fri 12:00	$1800 or $1500*
Aug 13-17, 2018 Los Alamos, NM	Introduction to MCNP6 –FULL-- Non-US citizens must register by 2018-05-21 | Mon 10:00 - Fri 12:00	--FULL--
Aug 20-24, 2018 Los Alamos, NM	Variance Reduction with MCNP6 Non-US citizens must register by 2018-05-28 | Mon 10:00 - Fri 12:00	$1800 or $1500*
Nov 27-29, 2018 Los Alamos, NM	Using NJOY to Create MCNP® ACE Files & Visualize Nuclear Data Non-US citizens must register by 2018-09-03 | Tues 10:00 - Fri 5:00	$1200 or $900*
Dec 3-7, 2018 Los Alamos, NM	Introduction to MCNP6 Non-US citizens must register by 2018-09-10 | Mon 10:00 - Fri 12:00	$1800 or $1500*

MCNP6 Training

For more information, see the website: http://mcnpvised.com/train_mcnp.html

Current Classes			
Date (Click Date for Info)	**Class**	**Course Content**	**Location**
September 10-14, 2018	**Intermediate MCNP6 Workshop**		**Seattle, WA**
October 22-26, 2018	**MCNP6 Intermediate Workshop**	**To see an outline for the course, Click Here.**	**Paris, France**

Beginning/Advanced Visual Editor Training

For more information, see the website: http://mcnpvised.com/train.html

Click Date for Info)	**Workshop** (40 Cont. Ed. credits through American Academy of Health Physics. Click here for AAHP Site. Class number is 2008-00-026 for Vised classes and 2011-00-022 for MCNPX Team Workshops)	**Level of Difficulty**	**Workshop Content**	**Location**
July 9-13, 2018	**Intermediate MCNP6 Using Nucwiz**		**Detailed Description**	**Prague, Czech Republic**
July 16-20, 2018	**Advanced Visual Editor with Applications in Mesh Tallies and Variance Reduction**		Detailed Description	**Prague, Czech Republic**
July 30 - August 3, 2018	**Advanced MCNP® Training with Applications for Nuclear Reactor Decommissioning**		**Custom for Ulsan National Institute of Science and Tech.**	**Ulsan, South Korea**
September 17-21, 2018	**Intermediate MCNP6 Using Nucwiz**		**Detailed Description**	**Richland, WA**
September 24-28, 2018	**Beginning Visual Editor**		Detailed Description	**Las Vegas, NV**
October 1-5, 2018	**Advanced Visual Editor with Applications in Mesh Tallies and Variance Reduction**		Detailed Description	**Las Vegas, NV**
October 15-19, 2018	**Beginning Visual Editor** **The NEA handles registration for this workshop.**		Detailed Description	**Paris, France**

SCALE Training Courses – Fall 2018

Training is provided by developers and expert users from the SCALE team. Courses provide a review of theory, description of capabilities and limitations of the software, and hands-on experience running problems of varying levels of complexity.

All attendees MUST be licensed SCALE 6.2.1 users. SCALE 6.2.1 is available from ORNL/RSICC in the USA, the OECD/NEA Data Bank in France, and the RIST/NUCIS in Japan.

All currently scheduled SCALE Courses are described below.

Date	Course Name and Description	Location	Cost
October 15 – 19, 2018	**Sensitivity and Uncertainty Analysis for Criticality Safety Assessment and Validation Course** Sensitivity and uncertainty analysis methods provide advanced techniques for code and data validation including the identification of appropriate experiments, detailed quantification of bias and bias uncertainty, identification of gaps in available experiments, and the design of new experiments. The Sampler sequence within SCALE provides a flexible tool for quantifying uncertainties due to manufacturing tolerances as well as composition and dimensional uncertainties in criticality safety assessments. This 5-day training class provides a foundation on sensitivity and uncertainty analysis and applies these methods to criticality safety validation applications, as well as instruction on the use of Sampler for uncertainty quantification. Topics covered include: • The TSUNAMI sensitivity and uncertainty analysis techniques for determining the sensitivity of the k-eff eigenvalue to cross section uncertainties using both multigroup and continuous-energy physics. • SCALE's comprehensive cross section covariance data library, which is applied to these sensitivity coefficients to estimate the data-induced uncertainty in k-eff. • The TSUNAMI-IP code, which determines the correlation between benchmark and application systems in terms of their shared sources of data-induced uncertainty.	ORNL Oak Ridge, TN USA	$2000*

	• The USLSTATS trending analysis tool, which uses similarity coefficients from TSUNAMI-IP (among other parameters) to estimate the computational bias and bias uncertainty for design and licensing applications. • The TSURFER data adjustment tool, which uses generalized linear least squares to adjust nuclear data parameters to minimize discrepancies between computed predictions and the results of integral experiments; these adjustments can then be used to estimate bias and bias uncertainty in design and licensing applications. • The SAMPLER code for uncertainty assessment, which randomly samples nuclear data and/or system compositions and dimensions to quantify the uncertainty in system k-eff. This course will cover the theoretical basis for these analysis techniques and will also conduct exercises for attendees to familiarize themselves with these tools. It is recommended that attendees are familiar with the KENO Monte Carlo code or are experienced SCALE users, although these are not necessary prerequisites.		
October 22 – 26, 2018	**SCALE/TRITON Lattice Physics and Depletion** SCALE supports a wide range of reactor physics analysis capabilities. SCALE reactor physics calculations couple neutron transport calculations with ORIGEN to simulate the time-dependent transmutation of various materials of interest. TRITON is SCALE's modular reactor physics sequence for a wide variety of system types. Attendees of this course will learn how to use TRITON for depletion analysis. The TRITON training material is centered around using the NEWT 2-D transport module for 2-D depletion analysis and briefly touches on 3-D depletion analysis. The course will instruct users on the use of KENO in place of NEWT for 3-D Monte Carlo-based depletion; however, KENO is not covered in depth within this course. Additional applications of TRITON are incorporated into the training, including the creation of ORIGEN libraries for rapid spent fuel characterization calculations, defining appropriate unit cell calculations of various reactor types for cross section processing, performing restart calculations, and performing uncertainty analysis of reactor physics calculations using Sampler. No prior knowledge of SCALE is required.	ORNL Oak Ridge, TN USA	$2000*
October 29 – November 2, 2018	**SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis** This is a hands-on class that covers the use of ORIGEN for isotopic depletion, decay, decay heat, and radiation source-terms calculations. The course features the use of the Fulcrum consolidated SCALE	ORNL Oak Ridge, TN USA	$2000*

	graphical interface and Fulcrum plotting capabilities for displaying nuclear data and results. The class includes solving activation, spent fuel, and nuclear safeguards and security analyses. This class provides an introduction to the ORIGAMI tool for convenient characterization of spent nuclear fuel with radially and axially varying burnup. Advanced applications including simulation of chemical processing, continuous feed and removal are also covered. No prior knowledge of SCALE is required.		
November 5 – 9, 2018	**SCALE Criticality Safety and Radiation Shielding** This course provides instruction on the use of the KENO-VI Monte Carlo code for criticality safety calculations and the MAVRIC (Monaco with Automated Variance Reduction using Importance Calculations) shielding sequence with 3-D automated variance reduction for deep-penetration problems. KENO-VI is a 3D eigenvalue Monte Carlo code for criticality safety and Monaco is a 3D fixed-source Monte Carlo code for shielding analysis. Both codes use the SCALE Standard Composition Library and the SCALE Generalized Geometry Package (SGGP), which allows for versatile modeling of complex geometries and provides convenient, efficient methods for modeling repeated and nested geometry configurations such as lattices. The MAVRIC sequence is based on the CADIS (Consistent Adjoint Driven Importance Sampling) methodology. For a given tally in a Monte Carlo calculation that the user wants to optimize, the CADIS method uses the result of an adjoint calculation from the Denovo 3D deterministic code to create both an importance map for weight windows and a biased source distribution. MAVRIC is completely automated in that from a single user input, it creates the cross sections (forward and adjoint), computes the adjoint fluxes, creates the importance map and biased source, and then executes Monaco. An extension to the CADIS method using both forward and adjoint discrete ordinates calculations (FW-CADIS) is included in MAVRIC so that multiple point tallies or mesh tallies over large areas can be optimized (calculated with roughly the same relative uncertainty). Both KENO and Monaco use ENDF/B-VII.0 or ENDF/B-VII.1 cross-section data distributed with SCALE to perform continuous energy (CE) or multigroup (MG) calculations. Both codes can also be used with the Fulcrum consolidated SCALE user interface and KENO3D for interactive model setup, computation, output review, and 3-D visualization. Instruction is also provided on the SCALE material input and resonance self-shielding capabilities and the data visualization capabilities within Fulcrum for visualizing fluxes, reaction rates, and cross-section data as well as mesh tallies. KENO-VI and MAVRIC can be applied together to perform an integrated criticality accident alarm system (CAAS) analysis. No prior knowledge of SCALE is required.	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.*

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 regarding these courses, visit the SCALE training website at https://www.ornl.gov/scale/scale-training.

Safety Analysis Report for Packaging (SARP)

Shielding/Criticality Safety Generalist and Analyst Courses

Developed and Conducted by Oak Ridge National Laboratory

Radioactive Material Package Shielding Evaluation and Nuclear Criticality Safety Evaluation Training

The U.S. Department of Energy (DOE) Packaging Certification Program (PCP), Office of Packaging and Transportation, is offering Safety Analysis Report for Packaging (SARP) shielding and nuclear criticality safety (NCS) courses for SARP generalists and analysts.

The **SARP Generalist Course** will be held at the National Transportation Research Center, Oak Ridge National Laboratory, Oak Ridge, TN, **June 4 -8**, **2018.** This course is designed for project managers, supervisors, NCS/shielding subject matter experts (SME), or SMEs in non-NCS/shielding technical areas (e.g., structural, thermal, package design, etc.) who need to better understand how the NCS/shielding analyses fit in the broader SARP documentation. Specifically, the Generalist Course provides an overview of the regulations and guidelines for the criticality and shielding analysis for a SARP, and the course shows how the NCS/shielding chapters integrate with the other parts of the SARP. Students in the Generalist Course will review an actual SARP document after the course material is presented to emphasize the key elements of the shielding and criticality analyses. The registration cost for all students is $2000. Those interested can register for the course at the following website, https://utconferences.eventsair.com/safety-analysis-report-for-packaging-sarp-shielding-criticality-safety-generalist-course/sarp/Site/Register.

The **SARP Analyst Course** is scheduled for **September 17 - 21, 2018** at the National Transportation Research Center, Oak Ridge National Laboratory, Oak Ridge, TN. This course will provide detailed training on the radioactive material package shielding analyses and NCS evaluation fundamentals needed by analysts/practitioners (i.e., safety analysts and/or technical reviewers) to prepare and/or review technical analyses for the SARP documentation. The Analyst Course also provides an overview of regulations and guidelines in addition to detailed in-class exercises associated with the package shielding and NCS analyses. Regarding the in-class exercises, analysis teams will be faced with "staged" SARP examples in which important decision processes in the generation of a SARP will be demonstrated and discussed. The registration cost for all students is $2000. Information regarding the course is available at the following website, https://public.ornl.gov/conferences/sarp/index.shtml.

Please contact the ORNL SARP Course Point-of-Contact if you have questions about the courses. Douglas G. Bowen, Oak Ridge National Laboratory, bowendg@ornl.gov,(865) 576-0315.

SYMPOSIA

2018 CALENDAR

June

2018 American Nuclear Society (ANS) Annual Meeting, June 17-21, 2018, Philadelphia, Pennsylvania. Website: http://www.ans.org/meetings/c_1.

July

HPS 63rd Annual Meeting, July 15-19, 2018, Cleveland. Ohio. Website: http://hps.org/meetings/meeting46.html.

26th International Conference on Nuclear Engineering - ICONE, July 22-26, 2018, London, England. Website: http://www.asme.org/events/icone.

August

20th Topical Meeting of the Radiation Protection & Shielding Division of ANS (RPSD-2018), August 26-31, 2018, Santa Fe, New Mexico. Website: http://rpsd2018.ans.org.

September

Pacific Basin Nuclear Conference, September 30-October 5, 2018, San Francisco, California. Website: http://pbnc.ans.org.

November

IEEE Nuclear Science Symposium, November 11-17, 2018, Sydney, Australia. Website: http://www.nssmic.org/2018/.

2018 American Nuclear Society (ANS) Winter Meeting, November 11-15, 2018, Orlando, Florida. Website: http://www.ans.org/meetings/c_1.

2019 CALENDAR

June

2019 American Nuclear Society (ANS) Annual Meeting, June 9-13, 2019, Minneapolis, Minnesota. Website: http://www.ans.org/meetings/c_1.