NCSP
NUCLEAR CRITICALITY SAFETY PROGRAM

NEWSLETTER

WINTER 2023

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Please contact Marsha Henley for information or contributions:

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One-week Manager's Course Dates:
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T&E Page: https://ncsp.llnl.gov/training-education

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A Message from the NCSP Manager

Hello. I want to wish everybody and safe and happy holidays. We have a very busy time period coming up. Our federal budget is still in continuing resolution. My Christmas wish is for an approved federal budget.

There are several meetings coming up in February, including the NCS Community Workshop at ORNL, the NCSP Technical Program Review at Brookhaven which will include an NDAG and CSSG meeting, and the WANDA meeting, also in February in DC. Some of you will also be participating in the JOWOG meeting at Y-12 the same month. If you plan to attend either the NCS Workshop or NCSP TPR, please register ASAP for those on the NCSP website.

The TPR helps the Management Team prepare for the upcoming PPBE budget year and the NA-ESH budget summit for the FYNSP which occurs in March. As I mentioned to the NCSP Site Program Managers, each NCSP over target request this year must be accompanied by a justification whitepaper that ties it back to one or more milestones on the NNSA Strategic Integrated Roadmap.

Hope to see you all in February.

Angela L. Chambers

NNSA National Nuclear Security Administration

U.S. DEPARTMENT OF ENERGY

Luiz Leal, Recipient of the 2023 Seaborg Medal from the American Nuclear Society (ANS)

The ANS has named Oak Ridge National Laboratory's (ORNL) Luiz Leal the recipient of the 2023 Seaborg Medal. The Seaborg Medal recognizes an individual for outstanding scientific or engineering research achievements associated with the development of peaceful uses of nuclear science. This award honors "excellence worthy of international recognition sustained over a period of time."

Leal is a distinguished researcher in ORNL's Nuclear Data group in the Fusion and Fission Energy and Science Directorate. Leal led nuclear data and measurement efforts with ORNL's Linear Accelerator early in his career and is recognized as a leading international expert in evaluating nuclear data and developing global data libraries. His work is foundational in supporting nuclear criticality safety and reactor system analyses completed around the world.

Leal is a Fellow of ANS and Reactor Physics Division recipient of the Eugene P. Wigner Reactor Physicist Award in 2016. Luiz has supported the NCSP program for many years at ORNL and IRSN. (source: https://www.ornl.gov/news/leal-awarded-ans-seaborg-medal)

John Miller, NCSD Technical Excellence Award

The 2023 American Nuclear Society Nuclear Criticality Safety Division's Technical Excellence Award was awarded to John Miller for outstanding contributions in developing and applying nuclear criticality safety technology. This was based on his years of technical leadership with the Nuclear Criticality Safety Program at Sandia National Laboratories and for continued support of various NCS training course (e.g., DOE NCSP Hands-on Training, University of New Mexico NCS Workshop) that has impacted a new generation of NCS engineers helping to further their skills and knowledge. Additionally, John's service as the DOE NCS Program IE Manager and ANS-8.19 working group chair has impacted NCS Programs for generations.

CSSG Happenings

The CSSG has undergone a few changes to membership in the last quarter.

- Mikey Brady has transitioned to Emeritus,
- Kevin Reynolds is the new Deputy Chair, and
- Catherine Percher is a New Member.

Many thanks to Mikey for her contributions as the Deputy Chair! We look forward to her support as an Emeritus Member.

The next in-person meeting of the CSSG will be in conjunction with the Techical Program Review meeting in February 2024.

NCSP FY24 – FY28 Five-Year Execution Plans

The NCSP FY24 – FY28 five-year execution plan has been published. It is posted on the NCSP website. The five-year execution plan for integral experiments has also been published. It is available by contacting the NCSP Management Team at ncsp-mgmt@llnl.gov.

NCSP Technical Program Review (TPR) and Joint Meetings

Please save the date for the 2024 Technical Program Review (TPR) and joint meetings to be held February 20 – 23, 2024, in Riverhead, New York. Brookhaven National Laboratory will host the meeting. The TPR meeting will run from Tuesday to Thursday, February 20 to 22. The registration website is now open. If you need the passcode, please contact ncspteam@ornl.gov. Other NCSP meetings, including the Nuclear Data Advisory Group (NDAG), Analytical Methods Working Group (AMWG), and the Criticality Safety Support Group (CSSG) will also be held Feb. 23, 2024. The purpose of the TPR is to provide the NCSP Manager, Dr. Angela Chambers, with an update on NCSP work completed in FY2023. Dr. Chambers may invite other presentations as necessary. Those interested in presenting NCSP-funded work from FY2023 should work with their site Program Manager and presentations must be aligned with an FY2023 task. Look forward to seeing you there!

DOE Community of Practices Workshop

A DOE Community of Practices workshop will be held February 13 – 15, 2024. Oak Ridge National Laboratory will host the workshop in person and through virtual meetings. The registration form is now available. There is no registration fee. A detailed agenda is coming soon.

Workshop Objectives are:

- Discuss the current health of nuclear criticality safety (NCS) programs at defense nuclear facilities from various perspectives (e.g., DNFSB, DOE headquarters, DOE field offices)
- Meet face-to-face to discuss priorities, approaches, and concerns for criticality safety oversight, including current plans and activities.

If you have any questions, please contact Kermit Bunde, bundeka@id.doe.gov, or Angela Chambers, angela.chambers@nnsa.doe.gov.

Cross Section Evaluation Working Group November Meeting

Between November 13 and 17, the 2023 annual meeting of the Cross Section Evaluation Working Group (CSEWG) was held at Brookhaven National Laboratory. The meeting was in a hybrid format to accommodate the participation of those that could not travel. It had more than 140 registrants from the US and abroad, with approximately two thirds attending in-person and the rest remotely. The attendants were from a wide variety of institutions, mostly from DOE national laboratories, such as BNL (14 participants), LANL (28), ORNL (15), LLNL (16), NNL (12), universities, and the private sector.

The main focus of the meeting was on the final preparations for the next important nuclear reaction data release ENDF/B-VIII.1. CSEWG is currently aiming for a May 2024 release. The meeting was divided into Validation, Evaluations, Covariances, Measurements, and Formats & Processing sessions. The Evaluations session was itself divided into neutrons, photo-nuclear, thermal neutrons scattering law, fission product yields, and charged particles sub-sessions. ENDF/B-VIII.1 will include updates to the major actinides 239Pu, 238U, and 235U, in addition to other important materials such as iron, chromium, silicon, oxygen, fluorine, tantalum isotopes, and others. ENDF/B-VIII.1 Beta releases had been distributed throughout FY23, the latest one being "Beta 2". Therefore, much of this meeting was dedicated to the reporting of

validation performance, focusing on criticality benchmarks. The work presented indicated overall good performance, and that major issues have been addressed. It also pointed to avenues for further improvements to be made before final library release.

Because a large part of the nuclear data community had converged on BNL this week, two satellite meetings were also held: the Nuclear Data Advisory Group (NDAG) meeting, focusing projects and deliverables related to the Nuclear Criticality Safety Program; and the WANDA planning meeting, where focus areas for the 2024 Workshop for Applied Nuclear Data Activities (WANDA) were presented.

It is noteworthy that the 2023 CSEWG meeting had strong participation from junior staff as well as graduate students who not only presented their nuclear data related work but some of them also organized themselves as meeting rapporteurs. That is a bright and encouraging development for the future of the nuclear data community.

NCERC Machine and Capability Succession Planning

LA-UR-23-33496

Effective and safe operation of the National Criticality Experiments Research Center (NCERC) requires maintaining a vast array of equipment and documentation. The most effective way of completing this is by specifically assigning individuals to oversee these tasks as a Principal Investigator (PI). The PI role looks slightly different depending on whether it is for a critical assembly machine, a building, or a capability. For a machine, the PI is responsible for serving as the subject matter expert for the machine, maintaining documentation, working with the Cognizant System Engineers for maintenance and upgrades, and coordinating with the Critical Experiments Team Leader for scheduling operations and down-time for the machine. For a building or capability, the PI is responsible for maintaining the equipment/building in a state of

operational readiness, identifying and supporting preventive and scheduled maintenance and upgrades, maintaining documentation, and coordinating with the Critical Experiments Team Leader for scheduling operations.

Recently, some responsibilities were passed on to new PI's due to staffing changes. Theresa Cutler became the PI for the Flattop critical assembly and Travis Grove became the PI for the Comet critical assembly. Rob Weldon was named the PI for the Count Room, reflecting the increased importance of radiation metrology in NCERC operations. Jessie Walker was named PI for the High Bays to act a single point of contact for maintaining knowledge of their status. These are the first major shifts in PI assignments since the move from the Los Alamos Critical Experiments Facility to NCERC.

Additionally, the position of Co-PI was created during this restructuring period. The Co-PI position is specifically for the purpose of succession planning fostering long-term sustainability of NCERC experimental operations as there are many nuances to each machine that take time to learn. This also allows for knowledge transfer to occur over time and for there to not be a disruption when a changeover happens. This position will also allow for the shifting of newer staff through the Co-PI positions to allow for a wider breadth of knowledge of each machine and capability creating more well-rounded crew members and chiefs.

Instrumental in the reorganization of PI's and the creation of the Co-PI position was Johnna Marlow, group leader of the Advanced Nuclear Technology group in the Nuclear Engineering and Nonproliferation division. She commented, "NCERC is a unique capability and a national resource across many mission areas; thoughtful stewardship and deliberate knowledge transfer-embodied by the renewal of the instrument/capability PI appointments and the new position of the Co-PI is fundamental to sustaining NCERC into the future." The full list of PI's and Co-PI's is provided in Table 1 for both the machines and the capabilities at NCERC.

Table 1. List of PI's and Co-PI's for NCERC Machines and Capabilities.

Machine/Capability	PI	Co-PI
Planet	Rene Sanchez	Kelsey Amundson
Comet	Travis Grove	Nicholas Thompson
Flattop	Theresa Cutler	Kristin Stolte
Godiva IV	Joetta Goda	Geordie McKenzie
Count Room	Robert Weldon	Nick Whitman
High Bays	Jessie Walker	Garrett McMath
Nuclear Instrumentation	Geordie McKenzie	Cole Kostelac

Brief biographies of the Co-PI's, many of whom are newer staff members, are included here.

Kelsey Amundson received her M.Eng in Nuclear Engineering from UC-Berkeley in 2019 and her B.S. in Nuclear Engineering in 2016 from UW-Madison. She joined the Defense Nuclear Facilities Safety Board in 2016 prior to becoming a full-time staff member in NEN-2 in 2020. Kelsey is a certified crew member on all 4 critical assemblies at NCERC and is the LANL point-of-contact for NCSP criticality safety courses. While not at NCERC, Kelsey focuses on experiment design and benchmarking.

Nicholas Thompson obtained his Ph.D. in Nuclear Engineering and Science from Rensselaer Polytechnic Institute (RPI) in 2017 with a focus on measuring neutron capture cross sections, during which he became a Senior Reactor Operator at the Walthousen Reactor Critical Facility, a 100 W research and training reactor at RPI. As part of his postdoc at LANL, Nicholas spent a year working at the Institut de Radioprotection et de Sûreté Nucléaire in France, analyzing neutron clustering measurements before transitioning to a full-time staff member on the NCERC team. As a team member, he is working on various projects related to the design and analysis of integral experiments as well operating the critical assemblies.

Kristin Stolte received her Ph.D. in Nuclear Engineering from Texas A&M University in 2022, and her B.S. in Nuclear Engineering in 2018 from the University of Florida. She joined the NCERC team in 2017 as an undergraduate student. Upon completion of her Ph.D., she converted to a full-time staff member where she has focused on critical experiment operation and design along with benchmarking.

Robert Weldon received his Ph.D. in Nuclear Engineering in 2019 from North Carolina State University and a B.S. in Physics from Pennsylvania State University in 2013. He is an expert in radiation detection and data acquisition systems. He joined the NCERC team in 2020 where his work has focused on detector diagnostics for critical and subcritical systems including reactor noise, neutron spectroscopy, improving the Godiva IV fast burst diagnostic system, and restarting NCERC's count room capability.

Nick Whitman received his M.Eng and Ph.D. in Nuclear Engineering from Oregon State University in 2019 and 2021 where his focus was on neutral particle transport. He also received his B.S. in Nuclear Engineering from Texas A&M University in 2016. Nick first started at Los Alamos in 2015 and joined the critical experiments team in 2022 after obtaining his Ph.D. Since joining the critical experiments team, Nick has supported a variety of research such as activation foil measurements, subcritical and critical experiments, and add-on experiments for the existing critical assemblies.

Cole Kostelac obtained a B.S. and M.S. in Nuclear Engineering at the Missouri University of Science and Technology in Rolla, Missouri and is also currently pursuing a Ph.D. while working. Additionally, he was a Senior Reactor Operator at his university's 200 kW research reactor (MSTR) and is member of the Reactor Safety Committee at the 10 MW University of Missouri Research Reactor (MURR) in Columbia, Missouri. Cole was hired as a student in 2020 and transitioned to a staff role in 2022. Cole is pursuing research in the areas of neutron noise and pile oscillator experiments to measure kinetics parameters of critical assemblies.

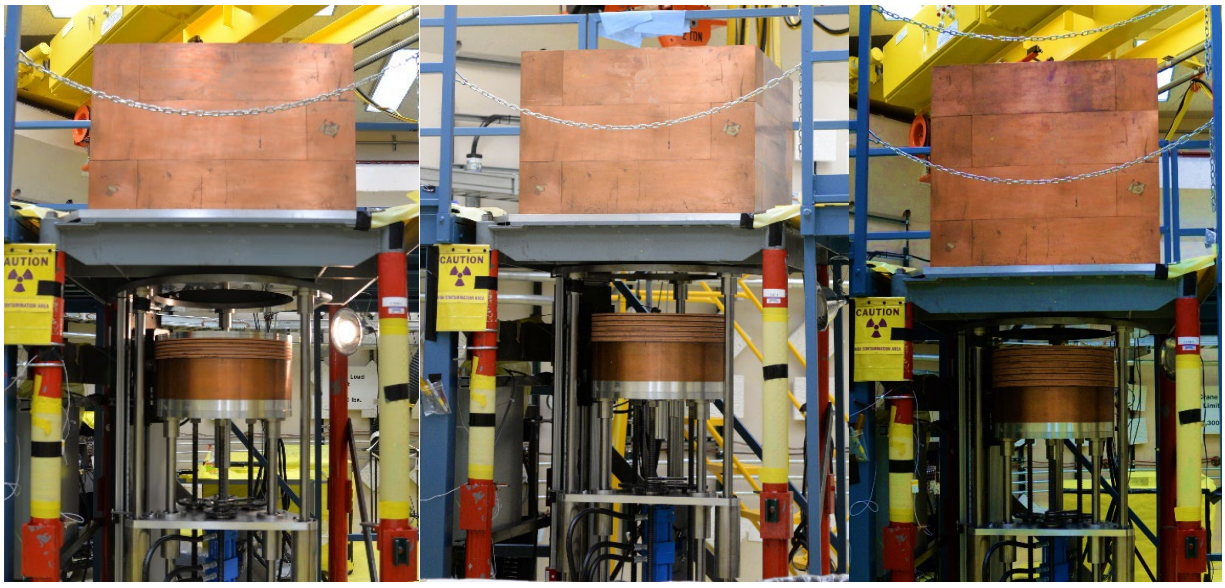
Garrett McMath has been working at LANL since 2013, in the Nuclear Engineering and Nonproliferation (NEN) division, in three different groups: NEN-5, NEN-1, and currently with Critical Experiments team in NEN-2. Garrett is a subject matter expert in gamma and neutron measurements, criticality safety, and an emergency responder for the Joint Technical Operations Team. He develops many training courses across the complex primarily related to safeguards, neutron and gamma NDA, and criticality safety

Critical Experiment Reflected By copper to bEtter Understand Scattering (CERBERUS) Successfully Performed at the National Criticality Experiments Research Center (NCERC)

LA-UR-23-32397
Authors: Theresa Cutler, Kelsey Amundson, Cole Kostelac, Zach Lemke, Kristin Stolte, Robert Weldon

The Critical Experiment Reflected By copper to bEtter Understand Scattering (CERBERUS) was completed in August and September 2023 at the National Criticality Experiments Research Center (NCERC) at the Nevada National Security Site (NNSS). The goal of this experiment was to provide an integral benchmark of a copper moderated HEU metal system to validate differential nuclear data for copper. Despite the number of experiments evaluated in the International Criticality Safety Benchmark Evaluation Project (ICSBEP) Handbook, there is still a gap of integral experiments sensitive to neutrons in the intermediate energy region. Of the ICSBEP benchmarks sensitive to neutrons in the intermediate energy region, very few are also sensitive to Cu in that region.

The recent CERBERUS measurement campaign provides three unique configurations to validate the scattering cross sections of copper in a highly enriched uranium (HEU) system. Copper is a moderate Z-material with complex scattering properties and is an excellent material to create intermediate energy systems. Copper reflected systems, such as the Zeus series, performed at NCERC's predecessor, Los Alamos Critical Experiments Facility, provide the best-known benchmarks for intermediate energy nuclear data validation. Examination of copper as the interstitial material will improve understanding of the results of the Zeus series as well as future experiments. Improving Cu nuclear data is also important outside of the Zeus series, because it is present in many bronze and aluminum alloys, which are used in various nuclear operations.



These figures show the full experiment loaded on Comet. Left: 3/16" Cu configuration; Middle: 5/16" Cu configuration; Right: 7/16" Cu configuration

The CERBERUS experiments were led by LANL and included nuclear data experts from Oak Ridge National Laboratory (ORNL), University of Tennessee- Knoxville, and Naval Nuclear Laboratory as members of the design team. The experiments were funded by the DOE Nuclear Criticality Safety Program (NCSP).

The CERBERUS experiments were conducted on the Comet vertical lift assembly machine at NCERC, which allows the critical mass to be loaded in two portions and brought together remotely. Layers of bare HEU Jemima plates were alternated with copper interstitial plates then surrounded by copper reflectors. The amount of interstitial copper was varied to change the ratio of scattering to capture reactions occurring in the copper. The diameter of the core region was 21" and the core was reflected using the same blocks used in the earlier Zeus experiments. The neutron spectra of the configurations were predominantly fast.

Left: Kristin Stolte measuring one of the Jemima plates with the CMM. Middle: Nicholas Rench measuring the thickness of a Jemima plate with calipers. Right: Zach Lemke measuring the thickness of a copper plate with a micrometer.

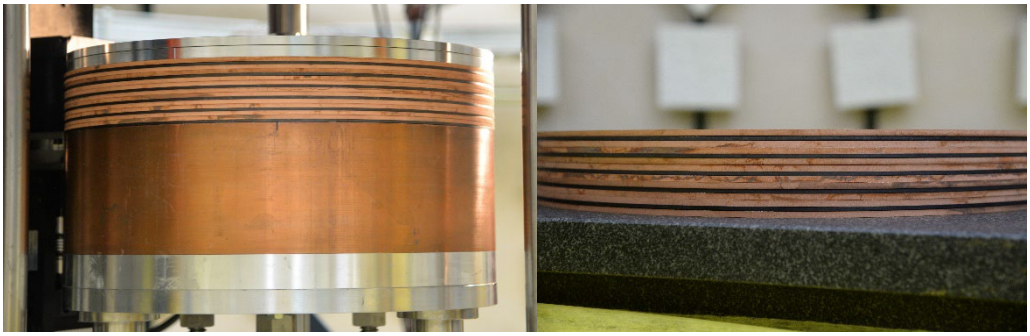
In preparation for the experiment, the HEU plates were measured using a Coordinate Measurement Machine (CMM) on a granite surface plate, and weighed, all using calibrated equipment. The new copper interstitial plates were measured using calipers. Upon completion of each configuration, each portion of the stack, i.e., the top and bottom, were measured on the

granite surface plate with a CMM. This allows the experimenters and benchmark evaluators to infer the size of tiny gaps between plates.

Table 1 gives preliminary results for the three measured configurations, including the HEU mass of the critical configuration, measured reactor period and associated excess reactivity. Further analysis of the data will continue and calculations will be performed to analyze experimental and measurement uncertainties.

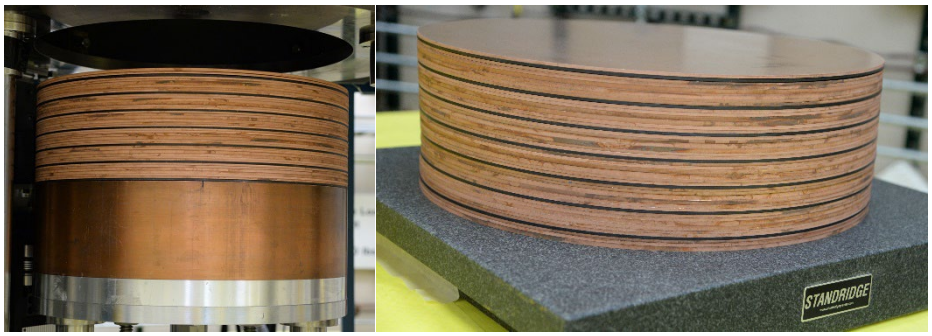
Table 1. CERBERUS Preliminary Data

Configuration	HEU Mass (kg)	Measured Reactor Period (seconds)	Associated Excess Reactivity (cents)
3/16" Cu	137.2	92.20	10.15
5/16" Cu	149.7	17.85	29.31
7/16" Cu	173.8	45.28	16.90



The figure on the left shows the bottom stack on Comet for the 3/16" interstitial Cu configuration. The figure on the right shows the top stack for the 3/16" interstitial Cu configuration on the granite surface plate where CMM measurements were performed.

The figure on the left shows the bottom stack on Comet for the 5/16" interstitial Cu configuration. The figure on the right shows the top stack for the 5/16" interstitial Cu configuration on the granite surface plate where CMM measurements were performed.



The figure on the left shows the bottom stack on Comet for the 7/16" interstitial Cu configuration. The figure on the right shows the top stack for the 7/16" interstitial Cu configuration on the granite surface plate where CMM measurements were performed.

This experiment also included a week of supplemental measurements which are of high interest to the nuclear data community for validation. Four systems were used: He-3 tubes in the center of the assembly; four organic scintillators, the Rossi Alpha Measurements - Rapid Organic (n,γ) Discrimination Detector (RAM-RODD) , external to the assembly; a large single organic scintillator for leakage spectra measurements; and a series of fission and activation foils. Both RAM-RODD positioned outside the copper reflector and He-3 tubes located inside the assembly were used to estimate Rossi- α during a delayed critical measurement. Preliminary analysis suggests the ex-core scintillators recorded an inverse alpha value of -20,235.21 ± 176.20 ns while the in-core He-3 detectors recorded a value of -17,652.47 ± 211.8 ns. The difference between these values may be due to the thick copper reflector and could yield information on copper scattering cross sections and angular distributions.

The CERBERUS experiments are being evaluated by LANL researchers and submitted to the ICSBEP in 2025.

Some members of the CERBERUS Team at NCERC [left to right: front row: Kenny Valdez (LANL), Jocelyn Avilla (MSTS), Danielle Sands (MSTS), Theresa Cutler (LANL), Kristin Stolte (LANL), Kelsey Amundson (LANL), Lee Hofeldt (MSTS), Amy Ramirez (MSTS), Ken Crow (MSTS); back row: Rene Sanchez (LANL), Edmund Quarshie (LANL), Dave Watts (LANL), Dominic Cotroneo IV (MSTS), Dominic Cotroneo III (MSTS)]

Acknowledgements
NCERC is supported by the DOE Nuclear Criticality Safety Program, funded and managed by the National Nuclear Security Administration for the Department of Energy.

Thom Mason Visits NCERC

The National Criticality Experiments Research Center (NCERC) provides a unique capability to conduct experiments using fissionable material at subcritical, critical, and supercritical states. One of the many missions supported by NCERC is hands-on criticality safety training for criticality safety engineers, criticality safety officers (CSOs), managers, fissile material handlers (FMHs), regulators, and many more. In addition to the flagship courses provided by the DOE

Nuclear Criticality Safety Program (NCSP), NCERC organizes a dedicated hands-on class for FMH supervisors, CSOs, and FMHs who work at the LANL Plutonium Facility.

Thom Mason, Director of Los Alamos National Laboratory (LANL), visited NCERC during one of these classes earlier this year. Also participating in the visit was Associate Laboratory Director for Global Security, Nancy Jo Nicholas. During this visit they had the opportunity to observe and participate in a hands-on Pu demonstration (see Figure 1), which shows the effect hands can have on nuclear material. The demonstration begins with allowing people to hold a 4.5 kg sphere of α-phase Pu (BeRP ball) while detectors display the effect of their hands on the Pu with respect to criticality (see Figure 2). The demonstration continues with a quantitative approach to simulate the effect of hands by incrementally adding layers of polyethylene reflector.

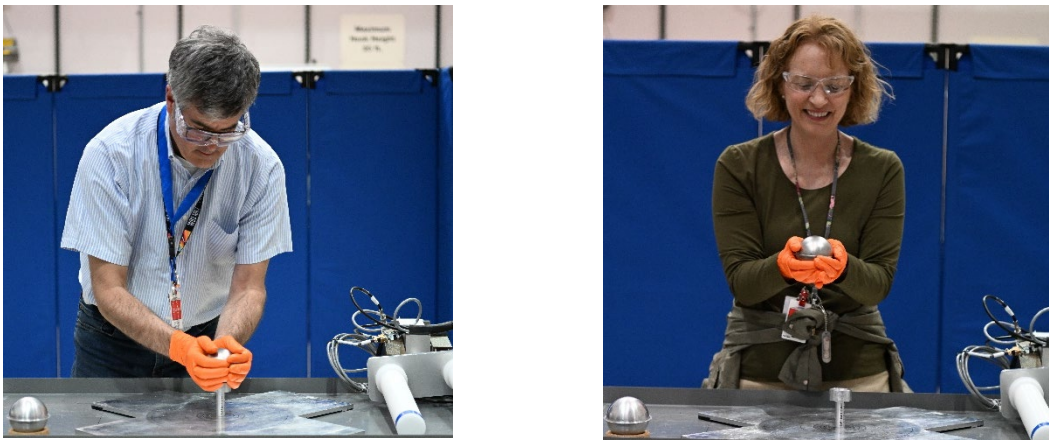


Figure 1. Photograph of Thom Mason, Laboratory Director of Los Alamos National Laboratory, (left) and NJ Nicholas, Associate Laboratory Director – Global Security, (right) holding the BeRP ball at NCERC.

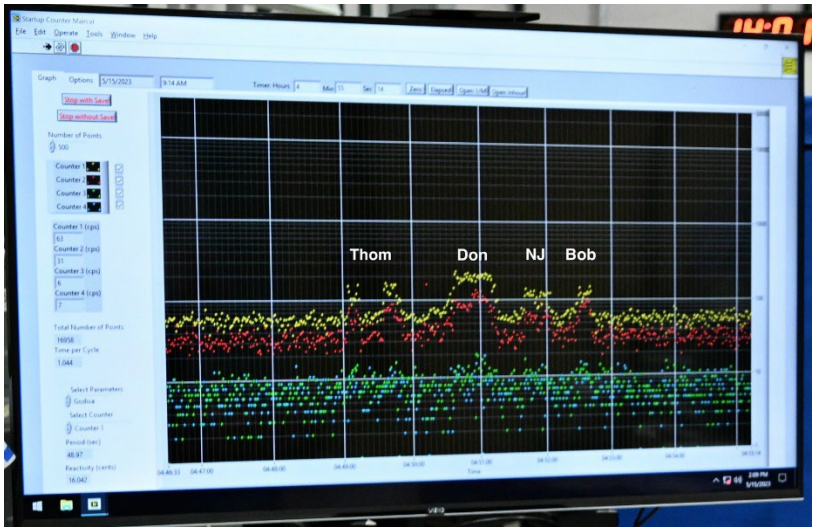


Figure 2. Detector read-out for each person holding the BeRP ball. The count rate increase displayed by the detector can depend on the size of a person's hand, how tightly they hold the Pu and how close they are to the cart.

Hands-on criticality safety demonstrations provide people who work with nuclear material the opportunity to see the impact of changes to criticality safety parameters, such as reflection and moderation, in a controlled setting. This allows the participants to have a better understanding of criticality safety hazards, which is paramount to safe operations in any nuclear facility.

Training and Education

Two-week Practitioner Course Dates:

- January 22 – February 2, 2024
- August 5 – 16, 2024

Registration is open (courses to be held in person)

The first week (lectures and workshops) will be held at the National Atomic Testing Museum (NATM), while the second week (hands-on portion) will be held at the National Criticality Experiments Research Center (NCERC) and Sandia National Laboratories. The courses are designed to meet the ANSI/ANS-8.26, "Criticality Safety Engineer Training and Qualification Program," requirement for hands-on experimental training. The NATM portion of the course involves virtual classroom lectures and workshops for NCS Evaluation development. The NCERC and SNL portions involve hands-on experiments with the critical assemblies. MSTS, LANL, ORNL, LLNL, SNL, Y12, and NFO staff participate in the course execution.

One-week CSO/Manager's Course Dates:

- NCERC CSO/Manager Course – March 18 – 22, 2024
- Sandia CSO/Manager Course – April 29 – May 3, 2024
- Sandia CSO/Manager Course – September 9 - 13, 2024
- NCERC CSO/Manager Course – December 9 - 13, 2024

Registration is open (courses to be held in person)

The courses are designed for fissile material handlers, process supervisors, line managers, and regulators with criticality safety responsibilities. MSTS, LANL, ORNL, LLNL, SNL, Y12, and Nuclear Facility Operator (NFO) staff participate in the course execution.

MCNP User Symposium

The 2023 MCNP User Symposium was held from September 18-21, 2023. The symposium was a hybrid event. Over 50 people participated in person at Los Alamos and another 250 participated virtually. We are proud that the total participation at the MCNP User Symposia over the past three years has been more than 1,100 people.

The international reach of MCNP was indicated by participation from citizens of 32 countries: Belgium, Brazil, Bulgaria, Canada, the Czech Republic, Egypt, France, Germany, Ghana, Haiti, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, Morrocco, Nepal, the Netherlands, Nigeria, Peru, the Philippines, Poland, Romania, Slovenia, Spain, Switzerland, Taiwan, Turkey, Ukraine, the United Kingdom, and the United States.

Opening remarks were provided by Dr. Jess Gehin, associate Lab director for Nuclear Science and Technology at Idaho National Laboratory. Jess provided examples of how INL has used MCNP for their MARVEL Microreactor project.

Nearly 40 presentations were made during the Symposium. These included users from Los Alamos, throughout the United States, and around the world. There were also several presentations from the MCNP development team and the Los Alamos Nuclear Data team. The distribution of presentations was as follows:

- Ten presentations from the MCNP Team
- Four presentations from the Los Alamos Nuclear Data Team
- Six presentations from Los Alamos users
- Twelve presentations from users within the United States (many of these were student presentations)
- Six presentations from users outside the United States.

Presentation sessions included: MCNP History, Fusion Applications, Plotting, Unstructured Mesh and CAD, Transport Methods and Statistics, Tools, Data and Physics, Performance, Criticality, and Applications and Experimental Design.

Among the presentations there were many that described interesting and diverse applications of MCNP as well as talks on code capabilities and performance. We include below the titles of user presentations simply to provide a quick overview of the breadth of use cases:

- Challenges of Increasingly Large and Complex Fusion Neutronics Models
- Forward Modeling of Gas Cherenkov Detectors for Inertial Confinement Fusion Using MCNP
- ViMMCNP
- Preliminary Investigation of Utilizing Hierarchical Void Cells in MCNP Simulations
- Creating and Using HDF5 Unstructured Mesh Inputs in MCNP
- Octavian Modeling with MCNP6.3
- Correlated Sampling for Fixed-Source Problems Using MCNP's Tally Fluctuation Chart
- Computational Scheme for Propagating the Stochastic Uncertainty in Coupled MC Radiation Transport Simulations.
- DRiFT: An MCNP Post-Processing Tool for High-Fidelity Modeling
- Preliminary Implementation of HPGe Response into DRiFT
- Cyclone: Tools and Features for Monte Carlo Analysis
- Generating Multigroup Cross Section Libraries for MCNP

- Validation of the Single-Event Method and EPRDATA14 Library for Low-Energy Electron Transport Via Stopping Power Calculations
- Underground Nuclear Explosions and Activation Analysis
- Athena-1 Modeling with MCNP6.3
- CottonwoodTM: The New Attila4MC® Deterministic Solver for CADIS and FW-CADIS Variance Reduction supporting the MCNP® Unstructured Mesh (MCNP-UM)
- Observing MCNP Calculation and Runtime Performance on Edge Supercomputing
- Verifying LNK3DNT Feature in MCNP6
- Code Patches and Workflow for Cold and Thermal Neutron Beam Simulations
- Activation Calculations with the UM Model of ORNL's Second Target Station and the RNUCS Patch to MCNP6.2
- Bridging a Gap in MCNP for Contraband and WMD Detection
- Design and Performance of the Shielded and Compact Beam-Dump for the European Spallation Source (ESS) DTL4 Commissioning
- Potential Medical Applications of Monte Carlo Code MCNP6.2 Using the Adult Mesh-Type Reference Computational Phantoms from ICRP Publication 145
- Simulation of Runaway Electron Scattering and Attenuation by Solid Particulates for Disruption Mitigation in Fusion Reactors.

There was also an open Q&A session with the MCNP team and the Nuclear Data team.

In addition to the technical presentations and discussions, there were various social activities and tours arranged for the in-person attendees. This included a reception at Bathtub Row Brewing Co-op, dinner at Gabriel's, and a tour of the Los Alamos Neutron Science Center (LANSCE).

The full agenda is available at **www.lanl.gov/mcnp2023**. Those who registered received an email following the event with instructions on how to access complete presentation material. Los Alamos presentations are available to all on the MCNP website at: **https://mcnp.lanl.gov/symposia.html**.

MCNP® Courses

Class Information: https://mcnp.lanl.gov/classes.html

Fees and Registration Information: https://mcnp.lanl.gov/class_registration.html

Apr 8 – 12, 2024	Intermediate MCNP6 (Online)
April 29 – May 3, 2024	MCNP6 for Nuclear Safeguards Practitioners
May 20 – 24, 2024	Practical MCNP for the Health Physicist, Radiological Engineer, and Medical Physicist
June 3 – 7, 2024	Criticality Calculations with MCNP6
June 17 – 21, 2024	Introduction to MCNP6 (online)

Aug 26 – 30, 2024	Using NJOY to Create MCNP ACE Files and Visualize Nuclear Data
September 30 – October 4, 2024	Intermediate MCNP6
Oct 21 – 25, 2024	Introduction to MCNP6 (online)
Dec 2 – 6, 2024	Variance Reduction with MCNP6

SCALE Courses

The next training block will be held in person at Oak Ridge National Laboratory February 25 – March 22, 2024. There will be no virtual or hybrid option for the courses. Registration fee information is available here. The Registration will be open by the end of January. More information about the courses is found at https://www.ornl.gov/scale/training.

February 26 – March 1, 2024	Polaris/PARCS for LWR Core Analysis
March 4 – 8, 2024	SCALE Criticality Safety and Radiation Shielding
March 11 – 15, 2024	SCALE Sensitivity and Uncertainty Analysis for Criticality Safety Assessment and Validation
March 18 – 22, 2024	SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis

Nuclear Energy Agency (NEA) Courses and Workshops

Information about Nuclear Energy Agency (NEA) courses is found at https://www.oecd-nea.org/dbcps/training-courses/.

4-8 March 2024	Introduction to MCNP6
11-15 March 2024	Intermediate MCNP6
16-17 April 2024	FRENDY

13-17 May 2024	PHITS
21-24 May 2024	FUDGE/(MC)GIDI/GNDS
18-20 June 2024	FISPACT-II

Radioactive Material Packaging (RAMPAC)

Radiation and Nuclear Criticality Analysis of RAM Packages, ($2,500 tuition and course materials), March 4-8, 2024, at the Oak Ridge National Laboratory, Oak Ridge, TN: The course will provide detailed instruction 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 class exercises associated with the package shielding and NCS analyses. With regard to the class exercises, analysis teams will be faced with "staged" SARP examples in which a number of important decision processes in the generation of a SARP will be demonstrated and discussed.

If you are interested in attending this course or have any questions, please contact Bradley Loftin at (865) 241-4112 or loftinbm@ornl.gov.

DOE/NRC Collaboration on Criticality Safety Support for Commercial-Scale HALEU Fuel Cycles (DNCSH) Workshop #1

Save the Date
DOE/NRC Collaboration on Criticality Safety Support for
Commercial-Scale HALEU Fuel Cycles (DNCSH) Workshop #1

A Collaboration between the U.S. Department of Energy
and the U.S. Nuclear Regulatory Commission

When: Thursday, February 29, 2024

Where: Webinar (Details on registration available soon)

Abstract: Demand for a fuel enrichment range known as high-assay, low-enriched uranium (HALEU) is rapidly increasing driven by potential new, advanced power reactors and performance enhancements to existing commercial power reactors. The HALEU Availability Program is addressing existing challenges to the U.S. infrastructure necessary for a commercial-scale enrichment operation that supplies this demand. However, there is an additional important parallel consideration for a timely transition to HALEU-based fuel cycles, in that the U.S. Nuclear Regulatory Commission (NRC) must have the data necessary to perform safety evaluations to confirm the performance of industry designs. A significant component of that data is criticality benchmarks that are relevant for the specific proposed fuel

forms, geometries, neutron absorbers, moderators for facility operations, and transportation at commercial scale. The commercial scale component is important, as it is currently possible to produce and transport fissile material at any enrichment in any fuel form in small quantities. The economic viability of HALEU-based fuel cycles is sensitive on being able to safely scale-up the quantity for these specific types of fuel.

Congress has recognized this need, and as part of the Inflation Reduction Act, has allocated $100M to the U.S. Department of Energy (DOE) to develop criticality safety data and support the industry with transportation challenges, where the latter is a separate activity. This project, through the development of publicly available data, will support the NRC in initiating, executing, and completing activities which will reduce the uncertainty associated with approving commercial-scale facility and transportation operations for the HALEU fuel cycle.

This webinar - the first of a series that will cover several anticipated fuel cycle needs - will briefly summarize the goals of the DNCSH project and then present status on evaluating nuclear data and validation gaps for criticality safety analyses for application in 10CFR70 and 10CFR71. The main goal of this first DNCSH webinar is to discuss front-end transportation of TRISO-based fuel forms with graphite moderation, presenting recently developed application models and initial thoughts on nuclear data and validation gaps. The webinar will then proceed to breakout sessions intended to help inform the DNCSH team on additional relevant considerations for application models and future measurement needs. The information collected will be summarized in the first DNCSH FOA for new measurements which will address the gaps identified by the DNCSH team, estimated to distribute a total of $10M.

For additional information, please reach out to the National Technical Director for this effort, Dr. William Wieselquist, at wieselquiswa@ornl.gov.