

DATES TO REMEMBER

Hands-On Training & Education Course Dates:

Two-week Practitioner Course Dates:

Jan 22 - Feb 2, 2024

Aug 5 - 16, 2024

One-week Manager's Course Dates:

NCERC – Dec 11 – 15, 2023, Mar 18 - 22, 2024,

Dec 9 - 13, 2024

SNL – Apr 29 - May 3, 2024, Sep 9 – 13, 2024

T&E Page: <https://ncsp.llnl.gov/training-education>

LINKS TO REMEMBER

[NCSP Website](#)

[NCSP Program Management](#)

[NCSP Mission and Vision](#)

[NCSP Five-Year Execution Plan](#)

[NCSP Planning Calendar](#)

[Previous NCSP Newsletters](#)

[CSSG Taskings](#)

[Nondestructive Assay Program](#)



FALL 2023

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A Message from the NCSP Manager

Happy Fall,

As I write this, many of you are at the International Conference on Nuclear Criticality in Sendai, Japan. I am hoping that it is a safe and successful trip for you all and that you will have much to share at the upcoming Integral Experiments Meeting later this month and the ANS Meeting in DC in November.

As predicted, FY24 will be a lean year for the NCSP. The SEMO budget (which includes the NCSP) took a significant budget cut due to excess carryover and the need to support ongoing NNSA mission needs. However, the NCSP, due to excellent recent performance and cutting down carryover, was able to keep a sustained budget for FY24, but without any margin for increased spending or costs.

A special thanks to everyone that supports the NCSP. We've completed some great tasks this past FY. Here is our FY24 Make It Happen List.

No.	Milestone	Technical Program Element	Lead Site
1	CAAS testing with GODIVA IV	IE	AWE/LLNL/LANL
2	Fabricate and test cooling design for the TEX/MOX experiment (IER 296)	IE	IRSN/LANL/LLNL
3	Complete control room upgrades at NCERC	IE	LANL
4	Submit benchmark evaluation of experiments for the Flattop benchmark series (IER 423)	IE	LANL
5	Complete measurement campaign (IER 153)	IE	LANL
6	Submit benchmark to independent reviewer(s) (IER 537)	IE	LANL
7	Complete measurements for TEX/CI (IER 499)	IE	LANL/LLNL
8	Complete measurements for GODIVA IV Shielding Benchmark (IER 498)	IE	LANL/LLNL/ORNL
9	Additional Manager/CSO hands-on courses due to heightened demand	IE	LANL/ORNL/LLNL/SNL
10	Complete GODIVA characterization report (IER 574)	IE	LANL/SNL
11	Submit benchmark evaluation for publication (IER 532)	IE	LLNL
12	Perform AFFRI dosimetry intercomparison international exercise (IER 484)	IE	LLNL/IRSN/AWE
13	Submit benchmark evaluation of epithermal experiments (IER 441)	IE	SNL
14	Publish revision of the CEDT manual	IE	SNL
15	Final release of ENDF/B-VIII.1 Nuclear data library	ND	BNL
16	Complete DICER transmission measurements of Pu-239 at LANSCE	ND	LANL
17	Complete fabrication of the U-233 PPAC	ND	LLNL
18	Complete Zr-92 nuclear data measurements at GELINA	ND	ORNL
19	Validation of accelerator structure design with completion of site acceptance testing accelerator section #1 at RPI. (RPI ND3)	ND	RPI/NNL

Please contact Marsha Henley for information or contributions:

henleym@ornl.gov

In Memoriam – Gary Harms



Gary Harms, our NCSP Sandia National Laboratory Site Program Manager, passed away on Sunday, August 20, 2023, at his home in Albuquerque, NM. In addition to serving as the NCSP Program Manager for Sandia, Gary was awarded the NCSD Technical Excellence Award in 2018. Gary joined ANS-1, Conduct of Critical Experiments, in 2011. He became vice chair in 2015 and chair of the working group in 2017 after the passing of Ted Schmidt. Gary was part of the ORNL-SNL-LANL team to develop the current 2-week Hands-on Courses. Gary was also a member of ANS-19.5, Requirements for Reference Reactor Physics Measurements from 2012 to 2015. Gary had recently celebrated his 40th anniversary with Sandia National Laboratories serving the nation and was a well-known and well-respected member of the International Criticality Safety Benchmark Evaluation Project community. David Ames has agreed to take on the Sandia Site Program Manager to continue the outstanding work led by Gary over the years. Please continue to keep Gary's family and friends in your thoughts and prayers.



Site Program Manager Changes

David Ames serves as the Deputy Lead for the Sandia Nuclear Criticality Safety Program. He has been with Sandia for twelve years and seven years with the DOE NCSP. Prior to Sandia, David received a BS in Mechanical Engineering from the University of Utah and an MS and PhD in Nuclear Engineering from Texas A&M.



Welcome William Hall as the new NCSP Site Program Manager for the Nevada National Security Site (NNSS). William graduated from Idaho State University with a Bachelor of Business Science in Finance. He spent twelve years with a major concrete producer as the Quality Control and Quality Assurance Manager. His career at the NNSS began in 2017 as a Project Control Specialist. Over the next five and a half years, William supported the DAF, NNSS's Storage Program, and NNSS's Capabilities Based Investment Program. In August of 2023, William was promoted to DAF and NCSP Program Manager.

Mission and Vision

On May 3, 2023, a group of NCSP-funded sites met at LLNL after the TEX2.0 meetings to discuss the revision of the NCSP Mission and Vision (M&V) document (https://ncsp.llnl.gov/sites/ncsp/files/2021-04/ncsp_mission_vision.pdf). Five teams have been assigned a technical program element to complete these activities.

1. Review the status of current goals and attributes based on the five-year plan Chapter 1 information.
2. Decide which goals are complete and which should continue.
3. Discuss new attributes and goals for the NCS community to add to the revised M&V.

Team leads have been established to facilitate discussions and to summarize information.

- Analytical Methods – B.J. Marshall
- Information Preservation & Dissemination – Angela Chambers
- Integral Experiments – John Miller
- Nuclear Data – Mike Zerkle
- Training and Education – Doug Bowen

The new M&V document is slated to be completed in early 2024 and will define the budget and technical priorities of the NCSP program for the next 5- and 10-year periods.

Annual NCSP Budget Execution Meeting and FY24-28 Five-Year Plan

This year, we held the annual NCSP Budget Execution meeting in person at the Las Vegas National Atomic Testing Museum on Wednesday, July 19, and Thursday, July 20. The NCSP Management Team visited some Nevada National Security Sites (the National Criticality Experiments Research Center (NCERC) on Tuesday, July 18, 2023. Tours included NCERC control room equipment at the Mercury Bluebox, Mercury modernization, and NCERC control rooms and vaults at DAF. The FY2024 NCSP budget was finalized during the meeting, and FY24 NCSP priorities, e.g., Integral experiments and nuclear data measurements/evaluations, were discussed for the NCSP. The NCSP Program Manager approved the FY24 – FY28 five-year plan on August 21. The plan is posted on the website at https://ncsp.llnl.gov/sites/ncsp/files/2023-08/ncsp_five_year_execution_plan_fy2024-2028-final.pdf.

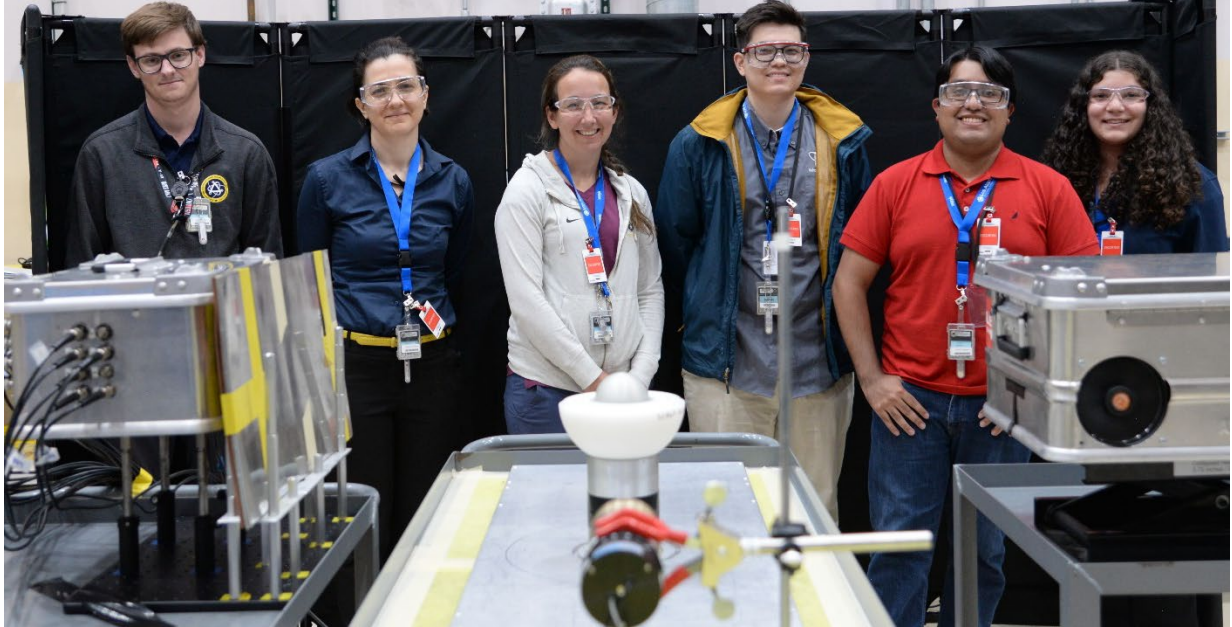
NCERC Provides Unique Opportunities for University Student Researchers

LA-UR-23-29948

Student researchers recently had the opportunity to measure radiation signatures from Category I Special Nuclear Material (SNM) at the National Criticality Experiments Research Center (NCERC) through two National Nuclear Security Administration (NNSA) programs, the Defense Nuclear Nonproliferation (DNN, NA-22) University Consortia Program and the Dr. G. Robert Keepin Nonproliferation Science Summer Program, also sponsored by DNN.

University Consortia Measurements:

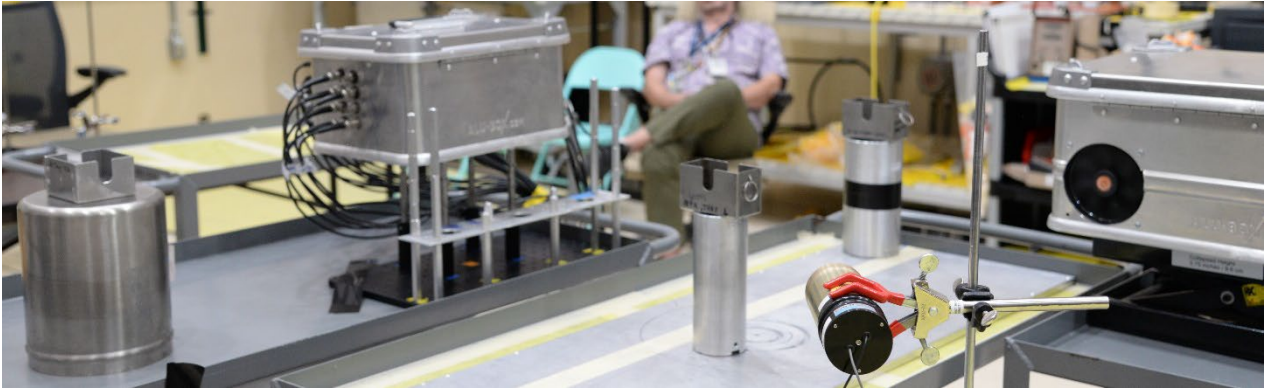
Five students and one faculty member visited NCERC in July of 2023 to measure radiation signatures from SNM in a week-long measurement campaign organized by staff at Los Alamos National Laboratory (LANL). Participants included students from the University of Florida, the University of Michigan, and the University of Illinois at Urbana-Champaign. The measurement campaign was organized on behalf of the Consortium for Monitoring, Testing, and Verification (MTV), the Nuclear Science and Security Consortium (NSSC), and the Consortium for Enabling Technologies and Innovation (ETI).



University Consortia participants next to their experimental setups and a replica of the BeRP ball (4.5 kg alpha-phase plutonium) surrounded by polyethylene.

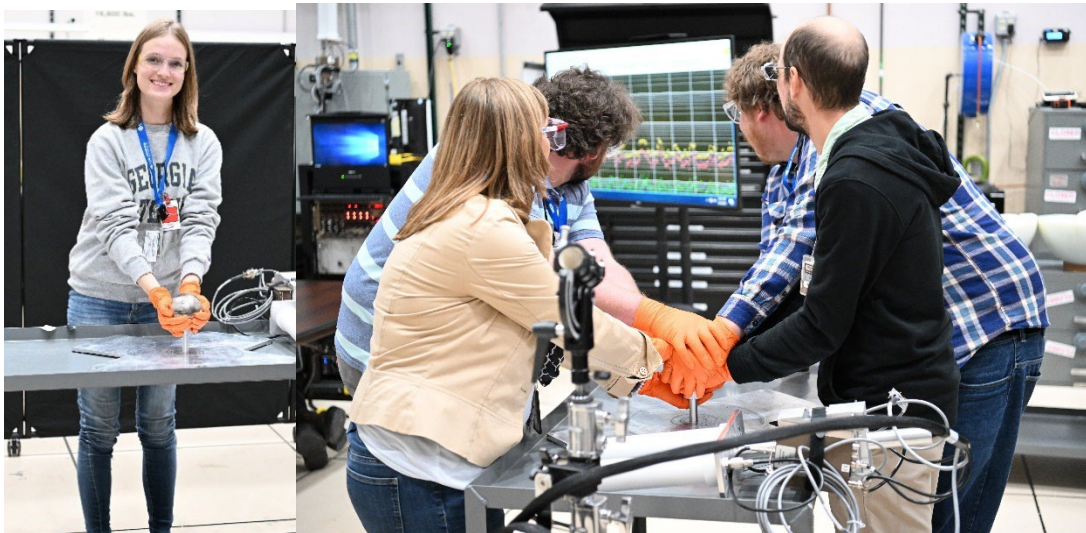
NCERC is sited at the Device Assembly Facility (DAF) on the Nevada National Security Site (NNSS) and offers a world-class facility and staffing for critical experiments and other measurements on a myriad of SNM forms with a multitude of reflectors and moderators.

The university participants were able to measure kilogram quantities of HEU, plutonium, and neptunium with their radiation detection equipment including correlated neutron instruments, gamma spectroscopy, and gamma scatter imaging. The participants were also able to make measurements to test discrimination between physically separated similar and dissimilar SNM forms. One cornerstone of the University Consortia Program is to provide students with unique opportunities within the NNSA related to nonproliferation. The NCERC campaigns provide a unique and memorable experience to make measurements and gain training on SNM detection and analysis for these students.



University consortia experiments measuring physically separated, differing quantities of Zero Power Physics Reactor (ZPPR) weapons-grade plutonium metal plates.

This year was the eighth measurement campaign at NCERC. During the eight years of NCERC campaigns, more than ten universities with a combined total of more than fifty students have participated. Over the years students have performed measurements on more than 150 configurations of SNM.



Left: Student Natalie Cannon handling the Neptunium sphere. Right: BeRP ball demonstration showing the effect of hand reflection.

The NSSC Keepin Nonproliferation Science Summer Program Demonstrations:

The Dr. G. Robert Keepin Nonproliferation Science Summer Program, sponsored by DNN, offers an opportunity to learn about how game-changing science, engineering, and technology are applied to reduce the dynamic threats of nuclear proliferation. The Keepin Program is performed each summer at LANL through the Nuclear Science and Security Consortium (NSSC), led by the University of California, Berkeley. This program is a summer-long program that includes guest lectures, tours, workshops, and training sessions. One workshop included in the Keepin Program is performed at NCERC and involved over 25 students. The students participate in hands-on demonstrations with the BeRP ball (a 4.5 kg sphere of plutonium) and the neptunium sphere (a 6 kg sphere of neptunium) in addition to a criticality demonstration on Flattop. The day included a stop at Sedan crater for the students. This was the third year that the Keepin Program participants visited NCERC.



Keepin workshop participants at Sedan Crater at NNSS.

Measurements for Godiva IV Benchmark Reevaluation

Kristin Stolte, Joetta Goda, Charlie Kiehne, Jeffery Favorite, Nicholas Whitman

LA-UR-23-29950

In March and June 2023, high-fidelity measurements of the Godiva IV critical assembly were taken at the National Criticality Experiments Research Center (NCERC) at the Nevada National Security Site by a team from Los Alamos National Laboratory. Godiva, Figure 1, is a cylindrical critical assembly composed of highly enriched uranium (HEU) that can operate in the delayed and super prompt critical ranges. Operating in the super prompt range is referred to as a "burst."

These measurements were taken as part of the reevaluation of the Godiva IV benchmark evaluation for the International Criticality Safety Benchmark Evaluation Program (ICSBEP) Handbook. This reevaluation is being completed to update the current revision of the benchmark to be more representative of the current state of Godiva, NCERC room return, and analysis level expected in modern benchmarking efforts. The measurement campaign consisted of physical, delayed critical, and reactivity worth measurements.

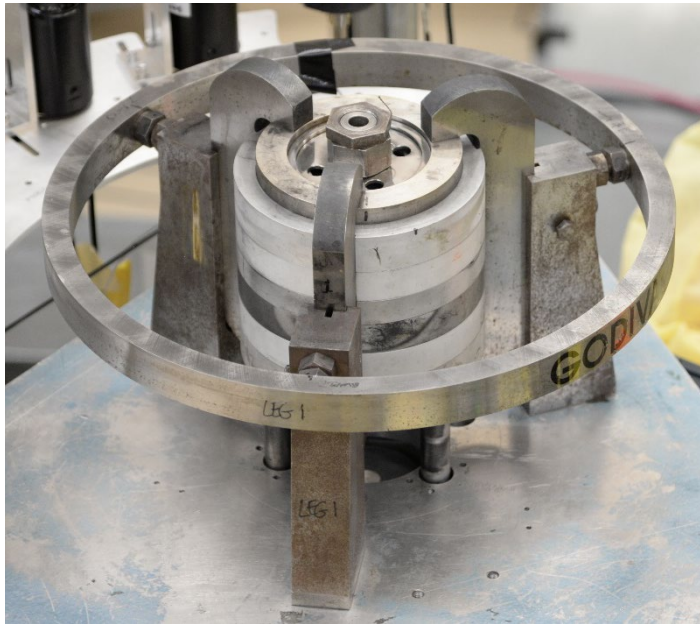


Figure 1. Godiva IV Top View with Top Hat Removed.

In 2005, Godiva was disassembled and moved from TA-18 to NCERC. This disassembly and reassembly led to additional information about Godiva, which is noted in an erratum to the current benchmark. The reevaluation will include this information as well as what was gained through the measurement campaign completed in 2023. This measurement campaign specifically targeted the Safety Block gap, control rod positions, new Top Hat, and environmental differences. To obtain many of these measurements, a coordinate measuring machine (CMM) was used along with a set of high-precision calipers and measured shims. The CMM measured the diameters of the fuel rings and other cylindrical features, the elevations of the various components, and the conical angle at the top of the Safety Block. This is the same CMM that was originally procured for the Flattop reevaluation, and it has become a go-to tool for many measurements taken at NCERC. For the Safety Block Gap, a set of shims were used to determine the thickness of shim could be placed before the electromagnet that holds the Safety Block in place would no longer hold.

The CMM was used in two separate modes by a qualified machinist. In the first mode, the CMM takes point measurements made with a "ruby tip" probe at the end of the arm which inferred the elevations and diameters of the components from the locations of the touches. This mode was used especially on the top of the Safety Block, Figure 2 right, to determine the angle of the conical section. The second mode is a scanning mode, which creates a 3D information-rich rendering of the scanned components. Figure 3 shows one of these scans being completed, and Figure 4 shows the digital results of the scan.

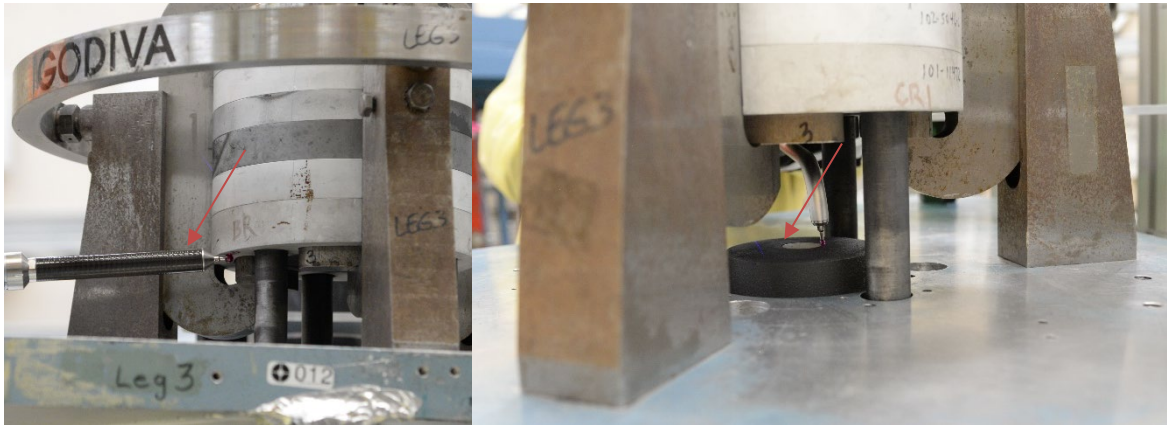


Figure 2. Ruby Tip Probe Measurements of Godiva. (Left) Obtaining elevation of the bottom of the fuel, and (Right) measuring the angle of the top of the Safety Block.



Figure 3. Charlie Kiehne Taking a CMM Scan of Godiva.

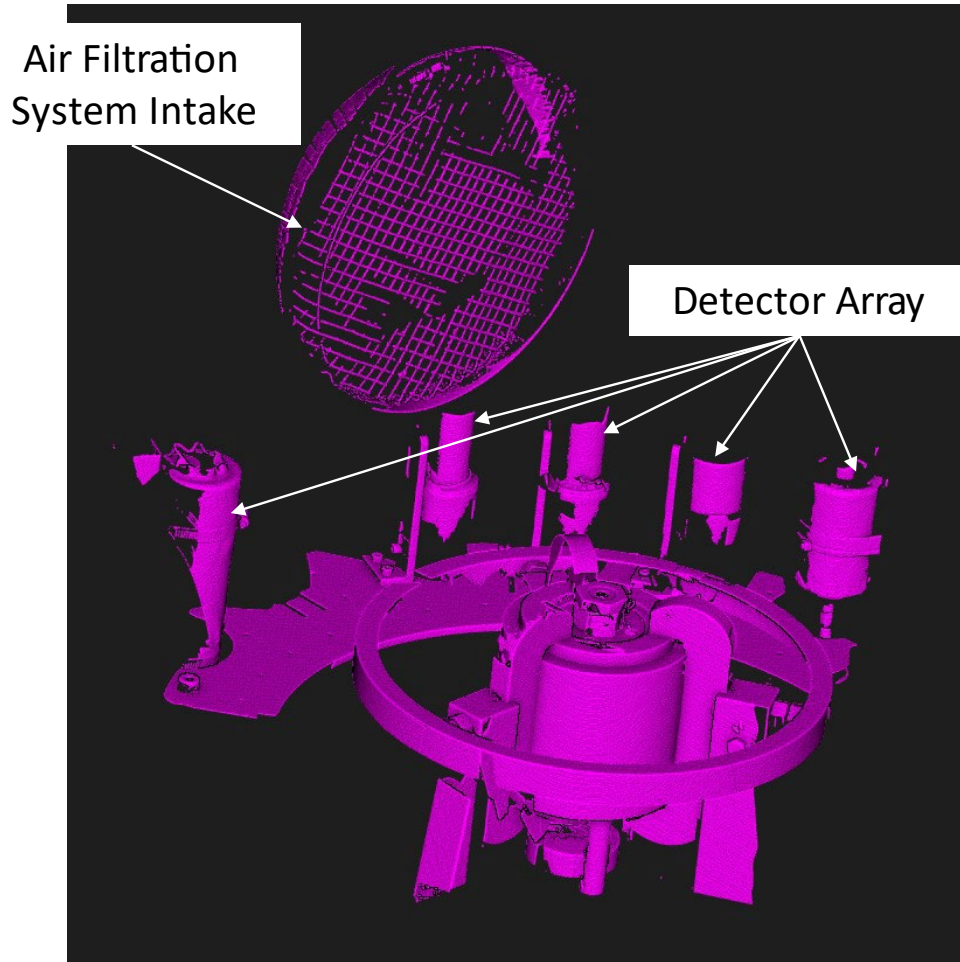


Figure 4. Digital Rendering of CMM Scan of Godiva Showing Additional Equipment.

In addition to the physical measurements, delayed critical measurements were taken at two different temperatures to assess any temperature effects on reactivity. Lastly, there are many external components that exist in the area around Godiva for monitoring and measuring burst activity. The reactivity worth of these components was measured individually during the campaign and will be applied as a bias in the benchmark reevaluation. The full measurement campaign has been documented as a CED-3B, and the information has been transmitted to the benchmark evaluator. Future Godiva campaigns and experiment designers will greatly benefit from these measurements and the reevaluation of the benchmark.

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 Upton, New York**. Brookhaven National Laboratory will host the meetings. The TPR meeting will run from Tuesday, February 20, to Thursday, February 22. A registration website will be available on the NCSP this fall, and a venue/agenda is in progress. Other NCSP meetings may be held during TPR week, including the Nuclear Data Advisory Group (NDAG) and the Criticality Safety Support Group (CSSG). 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.

Training and Education

August 7 – 18, 2023, Two-week Practitioner Course

A two-week Hands-on course was successfully executed at the National Atomic Testing Museum, the National Criticality Experiments Research Center (NCERC), and Sandia National Laboratory. The course had 29 students – this is the largest two-week hands-on course held by the NCSP. The course was coordinated by ORNL and supported by instructors and experimenters from Sandia National Laboratory, NCERC, LLNL, and ORNL. MSTS provided support for NCERC operations. This is the final two-week course in FY2023. Those interested in taking the course in FY2024 can register on the NCSP website, <https://ncsp.llnl.gov/training-education>. Please contact Doug Bowen (bowendg@ornl.gov) or Marsha Henley (henleym@ornl.gov) for more information.

Nondestructive Assay Holdup Measurements Course for Nuclear Criticality Safety

ORNL provided a hands-on Nondestructive Assay Holdup Measurements Course from Sept 11-14, 2023. The class was attended by 13 participant representing criticality safety, material control and accountability, and nondestructive assay staff from Y-12, ORNL, TRISO-X, and USNC. The course was designed to describe the parameters with associated uncertainties needed to determine the mass of holdup deposits based on the GGH methodology. Empirical methods such as the In Situ Object Counting Software and other gamma imaging techniques were also demonstrated. During the course, participants were given opportunities to characterize and measure simulated deposits in 5 process equipment mockups. Discussions on the importance of assumptions and their impact on measurement results were also had. Evaluations for the course were positive with many declarations that the hands-on exercises helped drive home the point that holdup measurements are complex and that there is now a better understanding of why uncertainties are high for many holdup measurements. This course was funded by Non-Destructive Assay (NDA) funding from the NCSP.



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 – December 11 – 15, 2023
- 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® Courses

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

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

Oct 2 – 6, 2023	Intermediate MCNP6
Oct 23 – 27, 2023	Introduction to MCNP6 (online)
Dec 4 – 8, 2023	Variance Reduction with MCNP6
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
Sept 30 – Oct 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 October 2 – October 27, 2023. There will be no virtual or hybrid option for the courses. Registration fee information is available [here](#). The Registration link is [here](#). More information about the courses is found at <https://www.ornl.gov/scale/training>.

Oct 2 - 6, 2023	Source Terms for Advanced Reactor Spent Fuel Applications
Oct 9 – 13, 2023	SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis
Oct 23 – 27, 2023	SCALE Criticality Safety Calculations



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/>.

9-13 October 2023	PHITS Advanced
6-10 November 2023	FLUKA.CERN
14-17 November 2023	SERPENT-2
4-8 December 2023	NJOY