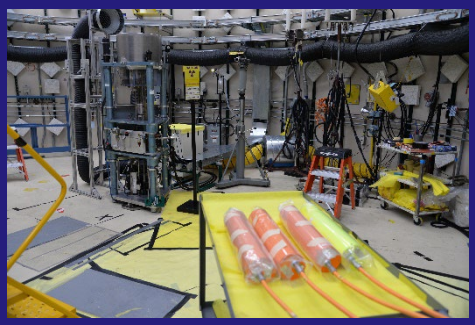
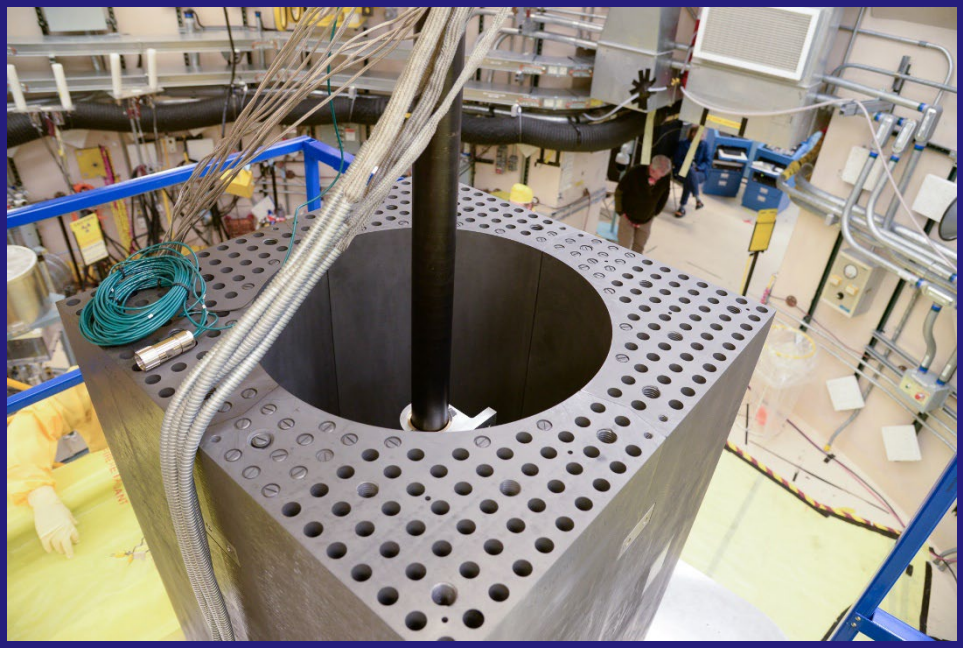
THE NEUTRON PULSE





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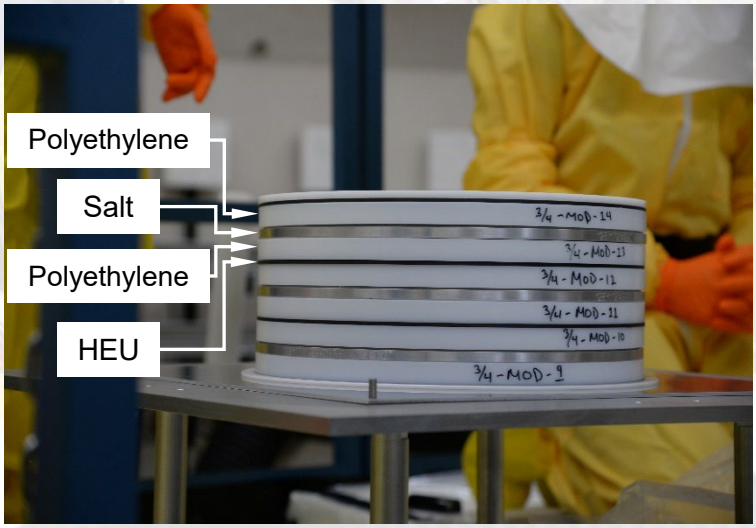
Operations Summary

NCERC successfully conducted seven weeks of critical assembly operations including two campaigns on Comet, TEX-Cl and Deimos, and CAAS testing using Godiva IV. Four criticality safety classes were hosted including one sponsored by NCSP and three for first responders. NCERC supported NDSE operations conducted at the NNSS's ZEBRA facility. Additionally, NCERC hosted the Keepin Workshop and University Consortia Measurements.

TEX-Cl on Comet

Thermal-epithermal eXperiments – Chlorine (TEX-Cl) was conducted to analyze the neutron absorption effects of chlorine, used in various processing operations throughout the DOE complex. Data provided by this critical experiment, a joint project with LLNL through NCSP, will give nuclear criticality safety engineers a validation basis for crediting chlorine with neutron absorption in their evaluations. The experiment was assembled using bare HEU Jemima plates, polyethylene moderator plates and reflectors, and compacted purified sodium-chloride salt in aluminum containers. Three critical configurations were measured – configurations varied in the thickness of the polyethylene, the quantity of salt, and the stacking sequence: "standard" with a single polyethylene plate below each salt plate and "sandwich" with the salt plate being between two moderator plates. Each critical configuration was highly characterized with coordinate measuring machine (CMM) measurements. This experiment will be evaluated for the International Criticality Safety Benchmark Evaluation Project (ICSBEP).



▲ *Labeled top stack of TEX-Cl 8-layer sandwich configuration on Comet*

▲ *Experimenters take CMM measurements from the Comet work platform*

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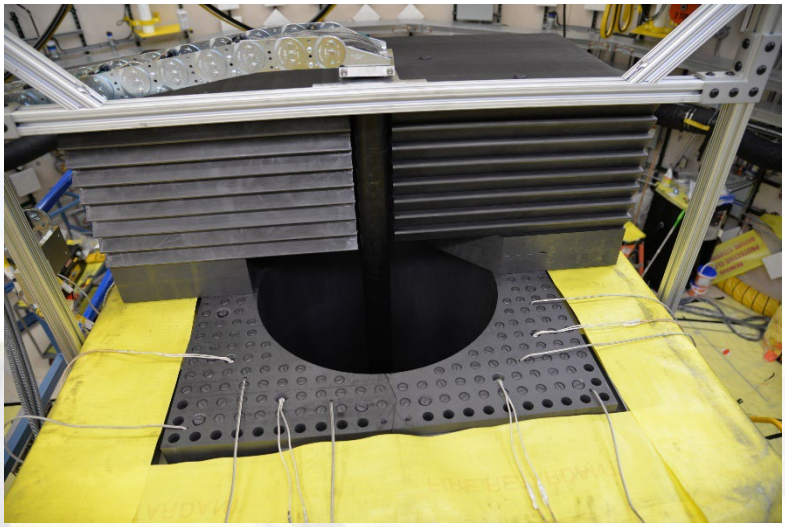
DEIMOS ON COMET

Deimos, funded by the LANL Laboratory Directed Research & Development (LDRD) program, is a critical experiment that features High-Assay Low-Enriched Uranium (HALEU) fuel reflected by graphite and beryllium on the Comet critical assembly. Designed as a testbed, this critical experiment is the first in a set to investigate the thermal neutron energy spectrum by housing advanced reactor materials in a graphite matrix.

The experiment configuration consists of a graphite cylindrical central core that is raised by the movable platen into a graphite square outer core on a custom top plate. HALEU fuel compacts from the 1980s Compact Nuclear Power Source (CNPS) experiment are vertically stacked in graphite fuel cups to create “rods” that are then inserted into the central and outer cores. Graphite reflector plates and beryllium reflector blocks are stacked on top of and around the outer core to obtain criticality within the limited footprint available.

Heaters are used to raise the assembly temperature to determine temperature-based reactivity feedback effects for the validation of multi-physics modeling techniques. Rossi-α measurements were also computed to yield nuclear kinetics parameters for a system with a unique neutron spectrum.



▲ *Half of the top reflectors removed for fuel cup loading*

▲ *Charlie Kiehne checks the beryllium reflector alignment*

▲ *Experiment configuration for heated tests*

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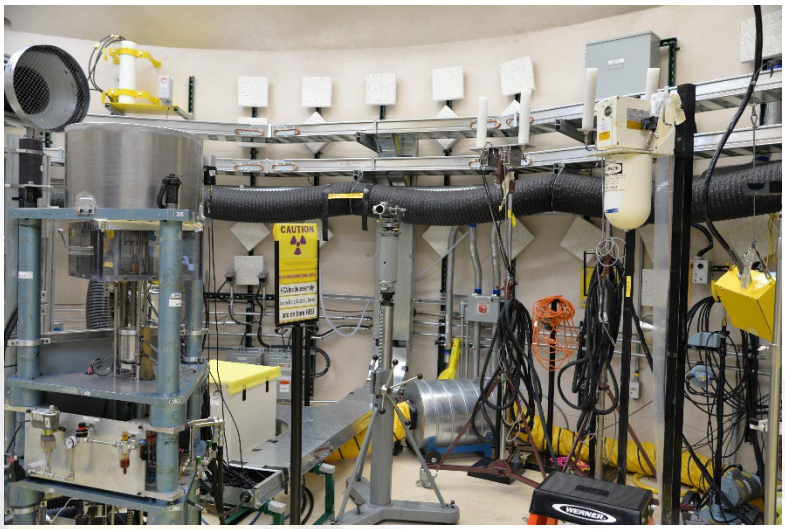
GODIVA IV CAAS TESTING

The first Godiva IV operations following the Control Room 2 upgrade were to support Criticality Accident Alarm System testing. The primary objective was to test the UK Atomic Weapons Establishment (AWE) mini-CIDS system. Mirion Technologies, which provides CAAS systems for the new Y-12 Uranium Processing Facility (UPF), was also able to test CAAS components.



▲ *AWE CAAS detector setup next to Godiva-IV*

CRITICALITY SAFETY CLASSES

NCERC hosted four Criticality Safety Classes sponsored by NCSP and other programs. These classes provided a hands-on experience showing the effects of changing parameters important to nuclear criticality safety. Participants used the approach-to-critical experiment methodology to guide the construction of a critical configuration and operated Planet and Flat-Top.

▲ *Alex McSpaden presenting during the BeRP/Np demo*

ADDITIONAL ACTIVITIES

NCERC supported Neutron Diagnosed Subcritical Experiments (NDSE) operations by providing radioactive material and personnel necessary to meet mission goals. Additionally, NCERC completed Control Room 2 upgrades and began Control Room 1 upgrades.

▲ *Crane operations during NDSE*

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