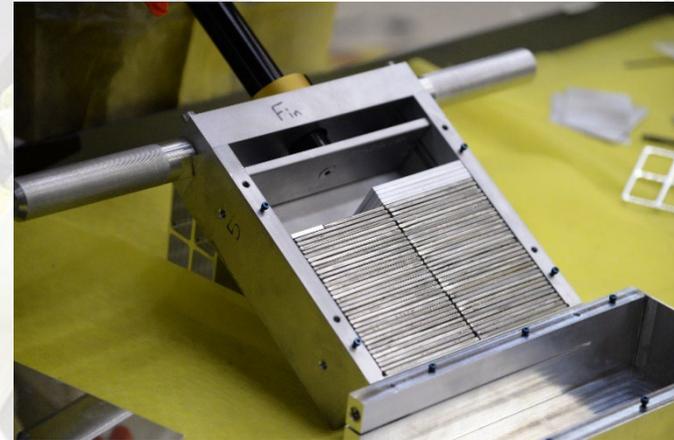


CRITICAL ASSEMBLY OPERATIONS

NCERC experimenters performed eight weeks of critical assembly operations including Experiments Underpinned by Computational Learning for Improvements in nuclear Data (EUCLID) and Thermal/Epithermal eXperiments for Hafnium (TEX-Hf).

EUCLID ON PLANET

The EUCLID experiment is the culmination of a three-year Laboratory Directed Research and Development (LDRD) project which utilized machine learning techniques to design an experiment to isolate potential compensating errors in nuclear data for ^{239}Pu systems with fast neutron spectra. A parametric study was performed using the various constraints of Planet to determine the optimal experiment configurations. The results of the D-Optimality analysis led to two configurations: 8x1 (High Mass/Slab reactor) and 3x2 (Low Mass/Cube reactor) of plutonium Zero Power Physics Reactor (ZPPR) plates. Nearly 1,000 non-fuel components were test fit at LANL to minimize assembly issues and familiarize workers with the configurations. Jesson Hutchinson (NEN-2) led the team that assembled the experiment components and hand-stacking of both configurations. In addition to determining the reactivity of a benchmark configuration, the team performed neutron leakage measurements with multiple detector systems on sub-critical configurations, including Rossi-alpha measurements, measured reactivity coefficients (void reactivity worth), and irradiated fission and activation foils to determine spectral indices. Over 100 kilograms of plutonium was assembled in the 8x1 configuration, the largest mass of plutonium used in a critical experiment at NCERC.



◀ ZPPR plates loaded into a 3x2 bucket.



◀ Jesson Hutchinson (NEN-2) positions a loaded ZPPR plate bucket into the 8x1 configuration.

TEX-HF ON COMET

The TEX-Hf experiment was a joint campaign between LANL, LLNL and Naval Nuclear Laboratory (NNL) to validate neutron absorption and scattering cross sections for hafnium in an HEU system. Naval Reactors specifically requested this experiment to improve hafnium nuclear data using well characterized and unclassified benchmarks. Seven experiment configurations were measured consisting of alternating layers of bare HEU fuel, polyethylene moderator, and hafnium absorber. The reactor period was measured for each configuration in addition to physical measurements. The data will be used in the preparation of a benchmark evaluation for submittal to the International Criticality Safety Benchmark Evaluation Project (ICSBEP).

ADDITIONAL SUPPORT OPERATIONS

Vendor delays of safety significant components jeopardized the execution timeline of the EUCLID experiment. NEN-2, NCERC QA, and NCERC CSEs coordinated the components pickup, receipt inspection, revision of engineering documentation, and nonconformance reporting. The two components with out-of-tolerance dimensions were dispositioned “Use As-Is” due to their continued ability to perform their safety function. The efforts of NEN-2 and NCERC-FO personnel prevented further delay of the EUCLID experiment. These components were also the first to be procured and receipt inspected under the new LANL P841-1 pilot program.



◀ TEX-Hf configuration on Comet.



▲ Visitors and crew for TEX-Hf experiment in the NCERC Comet Control Room [left to right: Michael Zerkle (NNL), John Miller (SNL), Kelsey Amundson (LANL), Ruby Araj (LLNL), Jesse Norris (LLNL)]. Not shown: Rene Sanchez (LANL), Travis Grove (LANL), Theresa Cutler (LANL), Geordie McKenzie (LANL), Nick Thompson (LANL), Justin Martin (LANL), Kristin Stolte (LANL)