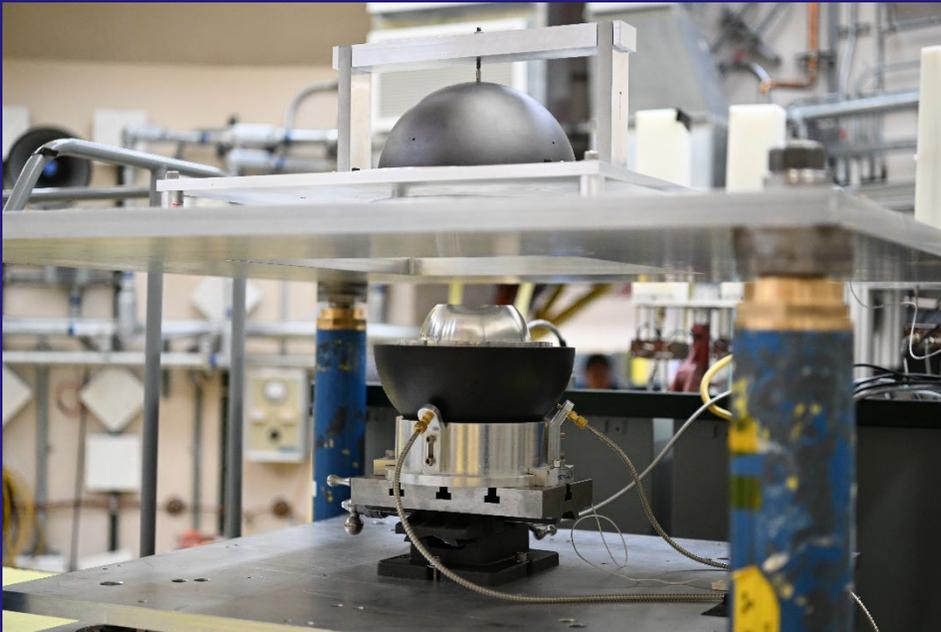


#NEUTRON PULSE



1ST QUARTER 2024 EDITION

LA-UR-24-23264

NEUTRON PULSE

1ST QUARTER 2024 EDITION

OPERATIONS SUMMARY

The Prompt Fission Uranium Neutron Spectrum (PFUNS) experiment was successfully conducted through five weeks of operation. Two criticality safety classes were conducted this quarter, one for Criticality Safety Engineers and one targeted for nuclear facility managers.

PFUNS ON PLANET

A longtime effort for the Nuclear Criticality Safety Program was completed in February with the successful execution of the PFUNS experiment. The objective was to determine the prompt fission neutron spectrum (PFNS) of the uranium isotope ^{235}U . Activation foils were placed in a central void region of a critical configuration consisting of concentric highly enriched uranium (HEU) metal hemishells. Foils with threshold reactions were carefully selected to cover a wide range of the fission spectrum.

Two irradiations were conceived based on predictive calculations of reaction probabilities. The first irradiation included fission foils that enabled calculating reaction rate ratios for nuclear data validation. The second irradiation (twice the power level of the first) contained activation foils to achieve the main objective for PFUNS: reduction of uncertainties in the high energy region of the ^{235}U PFNS through neutron spectral adjustment and validation of chi-nu measurements at LANSCE.

The second irradiation was performed over a continuous 12 hour operation and required shift-work of NCERC staff and MSTs facility personnel.



▲ *Kenny Valdez (NEN-2) builds the lower half of the HEU configuration on the Planet moveable platen table. The upper half was later built on the stationary platform.*

▼ *Jesson Hutchinson (NEN-2) places the sample plate in the central cavity.*



NEUTRON PULSE

1ST QUARTER 2024 EDITION

NCERC personnel preemptively relocated several components and assembled temporary shielding to reduce the possibility of equipment failure due to high radiation dose during the irradiations. Dosimetry was deployed to document dose rates at various locations throughout the building.

The experiment will also be evaluated as a benchmark for the International Criticality Safety Benchmark Evaluation Project (ICSBEP) and the reactivity of four configurations was measured. A Coordinate Measurement Machine recorded physical measurements of the configurations and detectors measured leakage neutron spectrum prior to the irradiations to minimize model uncertainty.

The activation foils were successfully counted in the NCERC Count Room utilizing seven HPGe detectors and an automatic sample changer. The fission foils are continuing the counting process at NCERC.

CRITICALITY SAFETY CLASSES

NCERC hosted two criticality Safety Classes sponsored by the Nuclear Criticality Safety Program. These classes provided a hands-on experience of 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.



▲ Foil configuration on the PFUNS sample plate.

▼ HPGe detector mounted on the Möbius cooler in the NCERC Count Room.



NEUTRON PULSE

1ST QUARTER 2024 EDITION

CONTROL ROOM 2 UPGRADE

NCERC Control Rooms are being upgraded to use commercially available components, to replace obsolete equipment, and provide a streamlined user interface. Key upgrades include control consoles with larger monitors, improved critical assembly control systems, and updated human-machine interface software incorporating 12+ years of lessons-learned. The new control console has improved displays and communications to better support criticality safety classes.

Control Room 2 was selected to be upgraded first and significant progress has been made this quarter. The orientation of the console has been changed to better accommodate students, trainees, and experimentalists. An under-floor cable management system has been installed replacing overhead cable trays. The control console has been installed and the majority of components have been mounted.

Configuration Management, Conduct of Engineering, and Quality Assurance documentation associated with the new safety systems has been completed. A startup and testing plan will be performed along with crew familiarization training prior to resuming operations later this year.



▲ Upgraded control console with larger monitors installed in Control Room 2.