Beam Schedule (tentative)

Next Start: July 2011

Obtaining Beam Time

Scientists may apply for beam time at LANSCE by completing a proposal. The proposal process description and the proposal form are available at: www.lansce.lanl.gov

Proposal Process

For more information on the proposal process and be notified of the Call for Proposals, please contact the User Office Administrator.

Proprietary work is permitted.

Proposal Process Contacts

WNR User Office Administrator
Tanya Herrera
505.667.6797
tanyah@lanl.gov

LANSCE User Office
Los Alamos Neutron Science Center
505.665.1010
lansce-user-office@lanl.gov

For information on user facility agreements and payment terms for industrial users, contact:

Technology Transfer Division
505.665.9090

Cost for Beam Time

The cost to users not affiliated with the Department of Energy is $11,000 for the first day and $2750 per 8-hour additional shift (cost is subject to change). Experiments are conducted 24 hours/day, 7 days/week during scheduled beam time.

Technical Information

Visit wnr.lanl.gov for technical information or contact Steve Wender.

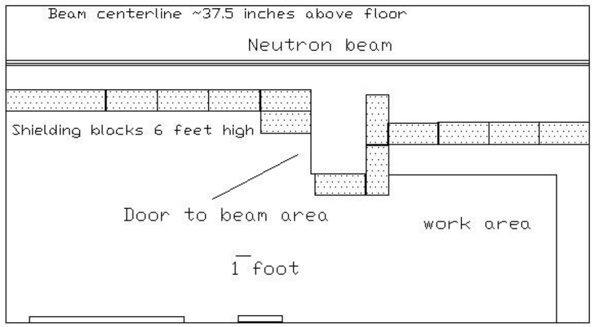

Figure 3. Floor plan of ICE House electronics irradiation facility.

WNR Group Leader

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NNSA

Los Alamos NATIONAL LABORATORY

LANSCE
Los Alamos Neutron Science Center

Accelerated Neutron Testing of Semiconductors

Los Alamos Neutron Science Center

Accelerated Neutron Testing of Semiconductor Devices

Los Alamos Neutron Science Center

The high-energy neutron source at the Los Alamos Neutron Science Center (LANSCE) provides beams of neutrons for accelerated neutron testing of semiconductor devices.

Neutrons produced by cosmic-ray bombardment in the atmosphere are known to be a significant threat to integrated circuits at aircraft altitudes as well as at lower latitudes. In fact, researchers have shown that neutrons can cause single-event and multiple-event upsets effects in solid-state memories and other semiconductor devices. In addition, researchers have observed that neutrons can induce latchup and burnout in semiconductor devices.

At LANSCE, the high-energy proton beam produces neutrons with the same energy distribution as those in the atmosphere. These neutrons can be used to induce and measure hard and soft errors in solid-state memories and other semiconductor devices. The intense neutron flux at LANSCE allows testing at greatly accelerated rates where irradiation times of less than an hour are equivalent to many years of neutron exposure due to cosmic rays.

Neutron Production at LANSCE

At LANSCE, high-energy neutrons are produced through spallation. A linear accelerator produces an 800-MeV pulsed proton beam, with currents of approximately 5 µA, that strikes a tungsten target. The impact produces a spectrum of neutrons whose energy distribution and intensity can be precisely measured by time-of-flight techniques.

The neutron energy spectrum produced at LANSCE has energies up to approximately 600 MeV and is very similar in shape to the atmospheric neutron spectrum at 40,000 ft. (A. Taber and E. Normand, "Single Event Upset in Avionics," IEEE Trans. Nucl. Sci. 40, 120{1993]).

Figure 1 shows the neutron spectrum produced at LANSCE compared with the neutron spectrum induced by a cosmic-ray at 40,000 ft. In this figure, the cosmic-ray flux is multiplied by 10^6. The integrated neutron flux above 1 MeV in the LANSCE beam is presently 3 x 10^5 n/cm^2/s with spot sizes of 8, 5 and 2.5 cm. Contact us if other spot sizes are required.

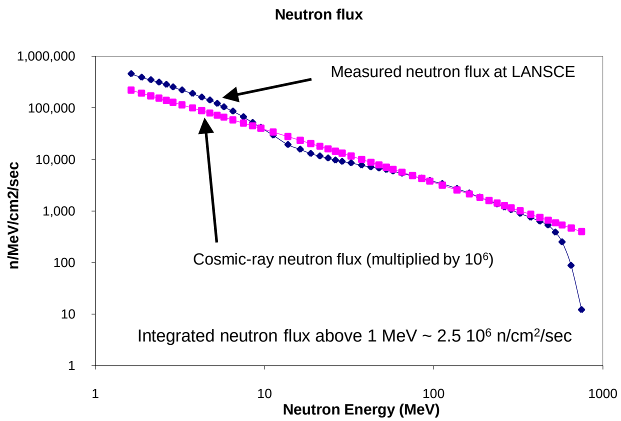

Figure. 1 The energy dependence of the cosmic-ray neutron flux and the measured neutron flux at LANSCE. The cosmic-ray neutron flux is multiplied by 1 x 10^6.

The shape of the neutron spectrum at LANSCE may be altered by placing absorbing material in the beam to reduce the low-energy intensity relative to the high-energy components.
Figure 2 shows the effect on the shape of the neutron spectrum obtained by adding various amounts of polyethylene absorbers in the neutron beam.

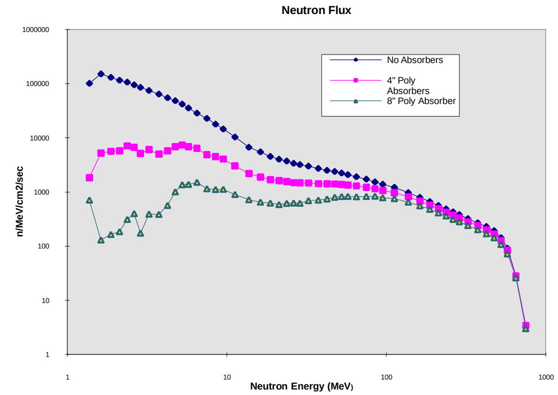

Figure 2. The measured energy dependence of the neutron flux at LANSCE for three absorber situations: no absorber, 4 in. of polyethylene, and 8 in. of polyethylene.

The Irradiation of Chips & Electronics (ICE) Facility

One of the six neutron flight paths operating simultaneously at the high-energy neutron source has been constructed to perform accelerated neutron testing of semiconductor devices. This facility (ICE House) permits users to set up and conduct experiments efficiently. Figure 3 shows a floor plan of the experimental area. Devices may be placed in the beam in air and operated in a fielded configuration.
Experimenters monitor and control the test from a shielded data acquisition area approximately 10 ft. away. The neutron beam is turned on and off with a shutter controlled from the data area. Los Alamos National Laboratory will provide the training required to work independently. The number of neutrons/cm^2 on the sample is continuously monitored and available to the experimenters.

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