

Los Alamos Neutron Science Center Neutron Science for Civilian Uses

Applying neutron research to astronomy and semiconductor science



LANSCE, shown in the artist's rendering above, provides both low-energy and high-energy neutron beams for research.

The neutron science conducted at LANSCE has applications in the civilian world ranging from basic research to essential semiconductor device testing. LANSCE operates a nuclear science user program as a national resource.

The same neutron-capture research on radioactive samples that is crucial in interpreting radiochemical diagnostics of past nuclear tests is also crucial to developing an understanding of stellar nucleosynthesis, the formation of elements inside stars. The process inside stars that produces heavy elements involves a sequence of neutron capture reactions. By analyzing meteorites and using other techniques, astrophysicists can determine what elements have been produced during nucleosynthesis. Coupling that information with reaction rate data obtained at LANSCE, astrophysicists can create and test stellar models, which give insight into the processes that take place inside stars.



The DANCE detector array at the Lujan Center (shown below) consists of 160 barium-fluoride crystals. DANCE measures low-energy neutron capture on radioactive samples.



Neutrons produced by natural cosmic rays bombarding the earth can cause failures in semiconductor devices. It has been estimated that the rate of such failures is higher than the combined rates of all other failures. Because the neutron spectrum at the Weapons Neutron Research (WNR) facility is similar to the cosmic-ray-induced atmospheric neutron spectrum but many orders of magnitude more

intense, engineers from industry can use the LANSCE beam to test and evaluate semiconductor devices quickly. One hour of measurements at the WNR is equivalent to more than 100 years of neutron exposure at aircraft altitudes. To date, more than 90 user facility agreements have been concluded with more than 40 different companies.



Neutrons produced by cosmic rays in the upper atmosphere can penetrate to low altitudes. They interact with silicon in semiconductors, causing serious failures in computers and other semiconductor devices. Researchers use the LANSCE beam to test and evaluate semiconductor devices at greatly accelerated rates.

Steve Wender, LANSCE-3
wender@lanl.gov
505-667-1344



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