2012 LANSCE Topical User Meeting
January 9-10, 2012

The Office of Defense Programs is developing a long-term strategy for the construction of new experimental science facilities supporting NNSA missions. The new facilities will provide the critical science and technology capabilities necessary to execute the 21st century responsibilities of NNSA in executing its mission and in supporting the broader national security agenda. The call focuses on large facilities with costs exceeding $100M.

The NNSA facility call, coupled with LANL plans to invest in critical Laboratory capabilities and infrastructure, provides a real opportunity to enhance the research capabilities of LANSCE. The intent of the one and a half day focused user meeting is to allow the user community a means to affect this unique opportunity for significant improvements to the LANSCE scientific infrastructure.

LANSCE is seeking the user community input in three main topics:

- ***Neutron Sciences (Contact: Jim Rhyne - rhyne@lanl.gov)***
  - **New Directions in Local Structure Research *(Contacts: Kate Page - kpage@lanl.gov, Anna Llobet - allobet@lanl.gov)***

    Local structure (or total scattering) is a technique that is currently enjoying intense research interest as a result of its success in explaining structural effects in oxide materials, nano and amorphous systems, and other systems exhibiting disorder on a local scale. The Lujan Center capabilities in this field are unique among neutron scattering facilities and include the NPDF and HIPD instruments and local expertise in state of the art analysis and modeling for pair distribution function studies (PDF). As a result the NPDF instrument has recently been oversubscribed by a factor of three. In order to continue our leadership position in local structure research, we are proposing to convert the Pharos inelastic instrument to a scattering machine with full capabilities for PDF experiments. In this workshop the Lujan Center is soliciting input for enhancing the local structure program including specific suggestions on instrumentation (NPDF, HIPD, and Pharos), new sample environments, and added analysis software capabilities.

  - **Neutron Radiography Capability *(Contacts: Michal Mocko - mmocko@lanl.gov, Ron Nelson – rnelson@lanl.gov)***

    Neutron radiography has not been widely deployed at short-pulse spallation neutron sources. Generally, the continuous neutron sources (reactors) offer higher time-averaged neutron fluxes with larger beam profiles than the pulsed spallation sources. On the other hand, the pulsed sources offer one distinct advantage: timing structure of the neutron pulses resulting in easy determination of the neutron energy via time-of-flight technique. Hence, successful implementation of neutron

radiography at a pulsed source calls for very different experimental approaches. Namely, it requires a two-dimensional neutron sensitive detector with high spatial (~10-50 μm) and temporal (~1 μs) resolution. Recent progress in neutron detection technology enables us to propose deployment of a neutron imaging user facility at the Lujan Center. Exploiting the time-of-flight technique in neutron radiography (or tomography) will result in, naturally, energy-resolved images and better utilization of the neutron beam. It is the purpose of this workshop to explore user interest and desired characteristics of a radiographic beam line at Lujan.

- ***Nuclear sciences (Contact: Steve Wender - wender@lanl.gov)***

  We are proposing to enhance our capability to study a wide range of nuclear science experiments in the neutron energy range from approximately 1 keV to several MeV. We have recognized that the combination of Lujan Center for low-energy neutrons and Target-4 for high-energy leaves a gap in this middle-range neutron energy. This energy range is important for Defense Program experiments as well as Nuclear Energy, Nuclear Physics and Nuclear Astrophysics. This enhancement involves stacking narrow pulses in the Proton Storage Ring and transporting the beam to an optimized target in Target-4. We estimate that we can have increases in beam currents of two orders of magnitude with greatly improved energy resolution. This capability enhancement would make LANSCE the most intense epithermal facility in the world for high-resolution neutron energy measurements.

  The goal of this of this workshop will be to discuss this proposal with particular attention to the benefits that this new capability will bring to the various measurements that are needed by our sponsors and the nuclear science community.

- ***Materials dynamics (Contact: Frank Merrill – fmerrill@lanl.gov)***

  We are proposing to improve the proton radiography capability at LANSCE through an energy and current upgrade. A super conducting linac energy enhancement could allow acceleration up to 3 GeV, while an upgrade to the front end of the linac could increase H+ beam current by up to a factor of five. This dual upgrade will allow improved radiographic resolution as well as improved penetrating capability. This combination will allow the study dynamic material science at smaller length scales for thin systems (~10 microns) as well as maintain the present spatial and temporal resolution capability through thicker systems (~100 microns). The improved resolution and penetration will allow proton radiography to verify that newly developed constitutive models accurately predict the microscopic (10 micron) to macroscopic (10 cm) materials performance.

  The workshop will facilitate user participation in helping LANSCE management prioritize future facility investments.