Proton Radiography Call for Proposals

The Los Alamos Neutron Science Center (LANSCE) is issuing a Call for Proposals for experiments to be carried out at the Proton Radiography Facility during fiscal year 2009 (FY2009). Assuming adequate funding for accelerator operations, this call will cover the run cycle beginning on October 1, 2008 and extending through the end of September 2009—there is a maintenance period planned to begin January 2 and extending through early June 2009. Proposals that have been previously reviewed must be resubmitted for consideration in the FY2009 run cycle, even if they received very high scores in the past.

All experiments whether they are dynamic, static, classified or unclassified must have a corresponding proposal submitted to the Program Advisory Committee (PAC). The PAC is an advisory committee to the LANSCE User Facility Director and not a funding committee. However, the PAC ranking may be folded into programmatic sponsors' decision-making processes and used as a means for Laboratory management to identify potential funding.

All proposals that cover work that is continuing or are an extension of work being done this year (FY2008) must attach either a progress report, a final shot report, or a published paper on the results of that work. An overview of proton radiography capabilities can be accessed at the url:

http://www.lanl.gov/quarterly/q_w03/pro_rad.shtml.

To submit a proposal, please use the accompanying form. The proposals should include the objectives for the experiments, importance of achieving these objectives, why pRad experiments are the best means of achieving the objectives, and show an operationally feasible approach. Technical, operational, and safety risks should all be identified. Proposals should provide a detailed description of the experimental devices, the experimental configurations and beam time requested. Good integration with modeling and validation programs where appropriate will improve proposal ratings.

The following are suggestions for topics that could attract programmatic support.

<u>Campaign 1</u>

1. Activities planned/funded in FY08.
    a. MOLLI 3P—contingent on UK support
    b. HE Cylinder—contingent on resolving a new HE fabrication problem
    c. HS-HSR—Strength effects at high rates of strain
    d. Richtmeyer-Meshkov Instability experiments
    e. Selected HE performance experiments
    f. DSH – development, likely not involving pRad beam time, but potentially offering opportunities for engagement of pRad Core Team members in development activities

2. Activities planned (expected to be funded) in FY09
    a. MOLLI 3P—current best guess at UK schedule
    b. HS-HSR Strength effects at high rates of strain—possible continuation
    c. DSH—potentially first pRad experiments in ejecta transport, instability behavior
    d. Selected HE performance experiments
    e. Richtmyer-Meshkov Instability experiments—expected to conclude in FY09
    f. Possible consideration of dynamic friction

Campaign 2

C2 activities are focused on obtaining the necessary thermodynamic (equation-of-state, phase diagram, melt, etc.) and constitutive properties (spall, ejecta, yield strength, etc.) data for plutonium, uranium, beryllium and other metals. Proposed pRad experiments involving direct measurements of phase transformations and their associated kinetics, quantification of strength, quantification of ejecta (single and double shock) and the elucidation of damage mechanisms in Pu, U, and Be are encouraged.

C2 also focuses on the performance and safety properties of high explosives (HE), with the goal of this effort is to provide accurate experimental data to feed models that will ultimately be used for weapon certification. We encourage proposals that would provide a new direction in the quantification of High Explosive Product EOS, that examine the mechanistic details of EBW and DOI detonators, that characterize the hydrodynamics of reactive flow in neat energetics, that characterize reactive flow in damaged energetics, and that use pRad for quantification of detonator/booster/main charge initiation studies at STS extremes.

In both areas (metals and energetics), we encourage close coupling of theory and experiments and we would favor those proposals that have a “predictive” flavor that would be verified with the pRad diagnostic

Campaign 3

C3 has interests in

1. Improving quantitative use and interpretation of image data; particularly multi-time data.
2. Work that supports complex transformation
    a. Understanding the relation between manufacturing processes and performance
    b. Technical work that might allow cost reductions (either in R&D or production)
    c. Technical work that might allow entirely new and better approaches (in R&D or production)
3. Work that demonstrates, develops or supports understanding the potential role of penetrating radiography for MaRIE

Campaign 4

C4 is interested in two specific areas of investigation related to material dynamics and turbulence. The Material Dynamics program is directed towards understanding the interactions of sweeping detonation waves with metal shells and the effects of tamping on expansive behavior. Quantifying the impact of these effects is of high priority over the next few years. Our second area of ongoing investigation relates to validating turbulence models. Proton radiography provides a unique capability for investigating turbulence effects in High Mach number flows. Experiments that document the evolution of turbulence as well as Rayleigh-Taylor and Richtmyer-Meshkov instabilities will be considered.

Dynamic Plutonium Experiments

Proposals are solicited for future Dynamic Plutonium Experiments (DPE) to be fielded at pRad. The DPE program is looking for experimental concepts on three scales:

1. Fundamental—where one physical mechanism is being investigated.
2. Mid-scale integral—where a limited number of physical mechanisms are integrated together and investigated.
3. Integral—where Experimental results are based on the complex interaction of several physical mechanisms.

All of these scales of complexity are important to our efforts to develop new, validated physics models of the dynamic response of plutonium. Ideas should connect to the requirements identified in the Ten Year DPE Plan and the Pu strategy. Copies of these documents are available upon request from Frank Cverna.

There are specific constraints on conducting Pu containing experiments at pRad; details may be discussed with Frank Merrill.

Unclassified proposals must be submitted to the LANSCE User Office (lansce_users@lanl.gov) no later than January 23, 2008 using the form available on the LANSCE Web site (next to the pRad call announcement under "News & Announcements").

If submitting hardcopies of classified proposals, they may be sent to

Los Alamos National Laboratory
Mail Station 5000
LANSCE User Office c/o MS H803
Los Alamos, NM 87545

or hand carried to

TA-53, Bldg. 1, Room D108

Electronic versions of classified proposals may be emailed to fulton_robert_d@lanl.gov on the secure network.

The proposals will be peer reviewed by the Program Advisory Committee (PAC) in late April.

For technical questions, contact Frank Merrill (fmerrill@lanl.gov). Any other questions should be directed to the User Office at lansce_users@lanl.gov or 505-665-1010.

Proposals are due January 23, 2008.