

LCLS Call for Proposals

Experiments with Soft and Hard X-rays at the AMO, SXR, XPP, CXI, XCS, and MEC Experimental Stations

Closing Date: July 29, 2014

The Linac Coherent Light Source (LCLS) (<http://lcls.slac.stanford.edu>) encourages scientists from diverse fields to propose experiments utilizing the LCLS's unique capabilities to be carried out **March - August 2015**.

Interested scientists are encouraged to learn more about the instruments and latest developments by contacting LCLS scientists and by reviewing detailed instrument descriptions available on the LCLS User web site. <http://lcls.slac.stanford.edu/Instruments.aspx>

Experimental stations available to users:

- **Atomic, molecular and optical science (AMO)** – contact srd-sxd@slac.stanford.edu
- **Investigation of materials with soft X-rays (SXR)** – contact srd-sxd@slac.stanford.edu
- **X-ray Pump Probe (XPP)** – contact srd-hxd@slac.stanford.edu
- **Coherent X-ray Imaging (CXI)** – contact srd-cxi@slac.stanford.edu
- **X-ray Correlation Spectroscopy (XCS)** – contact srd-hxd@slac.stanford.edu
- **Matter in Extreme Conditions (MEC)** -- contact srd-mec@slac.stanford.edu

We have demonstrated FEL operations over the **energy range 280 eV to 11.2 keV using the fundamental** with pulse energies of at least 1-3 mJ depending on the pulse duration and photon energy (please note that operation above 10 keV requires special accelerator conditions that may not be available at all times). Third harmonic radiation is available up to 25 keV at about 1% of the fundamental pulse energy. The pulse length can be varied from 40 fs to 300 fs for hard X-rays, while for soft X-rays the range is extended to 500 fs. Shorter pulses, <10 fs, with a reduced number of photons per pulse can also be provided. The maximum repetition rate of the LCLS is 120 Hz (please note that this may be reduced to 115 Hz at certain time periods).

For users who require a monochromator, seeded beams can provide 2 to 4 times more photons per pulse than SASE beams, and with similar pulse durations and shot-to-shot intensity fluctuations. The narrow seeded line, 0.4 to 1.1 eV fwhm, for 50 fs pulse duration typically contains an average pulse energy of 0.3 mJ, with occasional shots up to 1 mJ. It is accompanied by a relatively broadband SASE background of comparable total energy. Seeded beams are available from 5.5 keV to 9.5 keV and can be tuned up from a SASE beam in about 30 minutes.

Soft X-ray self seeding has been demonstrated across the range 500-1000 eV. This mode may help users who benefit from more photons through a monochromator or would like a narrow bandwidth but cannot use a monochromator. Soft X-ray seeding development will continue over the next year,

and may be available during the October 2014-March 2015 run. Check with srd-sxd@slac.stanford.edu for latest developments and estimated parameters.

LCLS is currently developing “two color” operating modes, where pairs of FEL pulses are produced with about 1% photon energy separation, in both the hard and soft X-ray regimes. We will accept proposals utilizing two color operation. A polarization control undulator is planned to be installed in the LCLS this fall and will provide arbitrarily polarized radiation with limited intensity in the soft x-ray regime. Please contact the respective instrument e-mail address listed above for updated performance parameters as you prepare your proposal.

Proposals must provide sufficient information to evaluate the impact, originality, need for LCLS, scientific risk, prior results, as well as technical feasibility. Proposal evaluation criteria include:

- **Scientific Impact:** Does proposal address a question that, if successfully answered by the proposed experiment, will have a strong impact either on the scientific field or technological area addressed by the research?
- **Originality/New Scientific Field:** If successful, does the proposal open a new field?
- **Need for LCLS/Experimental Plans:** To what extent is the LCLS critical for the success of this proposal? Can other techniques or facilities provide similar information about the scientific question?
- **Scientific Risk:** Evaluate the probability that the proposed research will yield significant new results.
- **Prior Results:** Evaluate success or progress of prior experiments.
- **Feasibility:** LCLS scientists conduct a preliminary technical feasibility review of submitted proposals.
- **Compatibility:** Can the experiment be performed simultaneously with another experiment (i.e. can it be performed with monochromatic, hard x-ray beam)? Does the experiment require significant modifications to a LCLS instrument setup? We specifically encourage proposals that use monochromatic, hard x-ray beam and proposals that minimize instrument modifications.

Register as a user and submit LCLS proposals through the user portal: <https://www-ssrl.slac.stanford.edu/URAWI/>.

Provide a descriptive title of your proposed experiment that you would be willing to be made public if awarded beam time. Provide an abstract that concisely (less than 1,900 characters including spaces) summarizes the proposed experiment, quantities to be measured, samples to be studied, expected scientific results and impact. Identify Principal Investigators (PIs) and all proposal collaborators (ask new team members to register through the user portal). In the safety management portion of the LCLS proposal submission process, list and describe any safety concerns that may arise with samples you will examine, equipment you will use, or techniques you will perform (including any physical, chemical or biological hazards) and how these issues will be addressed in the experiment design.

Upload proposal text including the following information (insert the spokesperson’s name in the upper right hand corner of each page; limit proposal PDF to 6 pages with at least 1 inch margins and 10 point font). Indicate if the proposal has been submitted previously and highlight different aspects to the new proposal.

1. **Experimental Team**: In a table, list the names, institution, email address, and roles of PIs and collaborators who would participate in the proposed experiment (e.g., sample prep, theory, data collection, data analysis). This section could also briefly mention directly-relevant previous work done by the team members.
2. **Scientific Case**: Briefly explain the background and significance of your experiment. In particular, why is LCLS required for this experiment? Itemize the specific aims and particular questions you want to answer. Focus on the specific experiment and avoid broad discussions in general terms.
3. **Experimental Procedure**: Provide specific information so that the feasibility of this experiment at the requested LCLS instrument can be evaluated. Tell us if you plan or have carried out supporting experiments at other facilities. Have simulations of the experiment been performed? What are the anticipated data rates? Provide a beam time plan, indicating what could be accomplished in less than 1 week (approximately 60 hours of beam time). Describe any additional equipment you plan to bring to LCLS for the experiment.
4. **Technical Feasibility**: Proposals must contain sufficient information for the LCLS to review the proposal for technical feasibility. This information should include:
 - Equipment
 - Which elements of the proposed instrument do you require for the proposal?
 - What additional equipment is needed, including laser, detector, sample delivery/environment, temperature, pressure, etc?
 - How do you plan to provide/organize the additional equipment?
 - Parameters
 - Describe X-ray wavelength, pulse energy, bandwidth, beam size, repetition rate, pulse duration.
 - If laser is required, describe laser wavelength, pulse energy, bandwidth, beam size, repetition rate, pulse duration, timing, geometry.
 - Experimental protocol
 - Describe the experimental geometry.
 - Calculate the expected signal rate/background
 - Describe samples and concentrations, sample preparation and storage.
 - Describe local facilities that may be required.
 - **In addition, a separate questionnaire may be required for some instruments.**
5. **Progress Report**: **When submitting a proposal, also upload a brief progress report summarizing previous LCLS beam time allocated to your research team; include proposal number(s), date(s) of experiment, instrument(s) used, a brief summary of how experiment time was used and how results were disseminated (list major invited talks, papers published or in press, awards or special recognition). NOTE:** User publications are extremely important in demonstrating the scientific impact of LCLS. Proposal teams must inform and acknowledge LCLS and the DOE Office of Science in presentations and publications using this template: "*The Linac Coherent Lightsource (LCLS), SLAC National Accelerator Laboratory, is supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Contract No. DE-AC02-76SF00515.*"
6. **Addenda**: **New** information that becomes available after the proposal was submitted may be submitted up to **two weeks** before the scheduled Proposal Review Panel (PRP). Addenda is limited to 'late breaking news' on one page and must be consistent with the original scope of the proposal. LCLS management will determine if the supplemental information meets the criteria to forward

such material to the PRP. Forward addenda to the LCLS Proposal Administrator (nbrown@slac.stanford.edu). **NOTE:** PRP dates are posted on the LCLS Events webpage: <http://www-ssrl.slac.stanford.edu/lcls/users/events.html>

The [proposal process](http://lcls.slac.stanford.edu/user/) and proposal guidelines are described at the LCLS web site <http://lcls.slac.stanford.edu/user/> and user portal <https://www-ssrl.slac.stanford.edu/URAWI> . We strongly recommend that scientists intending to submit proposals contact LCLS instrument scientists and familiarize themselves with instruments, capabilities, proposal requirements and mechanics of the submission process well in advance of the proposal deadline.

Please note that LCLS reserves the right to schedule accepted experiments any time within the specified run period. Users should be prepared to perform their experiments if allocated time at the beginning of the run period.

Proposals must be submitted before 4 PM (Pacific) on Tuesday, July 29, 2014.