

UEC Meeting Minutes  
October 27<sup>th</sup>, 2023

**Present:**

N. Hartley, M. Mitrano, U. Bergmann, N. Powers-Riggs, C. Rajendran, E. Biasin, B. Ofori-Okai, S. Pandolfi, M. Centurion, M. Dunne, L. Conradson, B. Tan, Jim Evans, Mariano Trigo, Cathy Knotts, Samuel Teitelbaum, Rebecca Boll

**Opening remarks-** Nick Hartley, UEC Chair

Congratulations to Chitra Rajendran elected as UEC Vice Chair

**Updates from Mike Dunne**

- Congratulations to Chitra elected as Vice Chair
- Two main topics discussed at SAC (meeting joined by N. Hartley and M. Mitrano)
  1. How are we approaching turn on new instruments and end stations at LCLS II (from now to shutdown)
  2. Design status of the instruments for LCLS-II-HE

**LCLS-II Project celebration**

- Visited by Secretary of Energy Jennifer Granholm, Undersecretary Geri Richmond, Director of the Office of Science Asmeret Berhe, Principal Deputy for the Office of Science Harriet Kung, and Associate Director for Basic Energy Sciences Linda Horton (5 levels of DOE management, all female)
- There was a tour and a celebration for staff and visitors. Was showcased on TV and in multiple media outlets.

The upcoming BESAC meeting (the principal advisory committee for BES – the agency that funds LCLS and its upgrades) is on Dec 12<sup>th</sup> with a special panel session focused on LCLS Science using the new LCLS-II capabilities. Mike will chair the panel.

The LCLS-II instrument suite comprises 4 new instruments with 6 interaction points and 11 new endstations:

- TMO instrument
  - MBES, MRCO endstations at the first interaction point,
  - DREAM endstation at the second interaction point
- qRIXS instrument
  - High resolution time- and q- resolved spectrometer
  - Includes an option for a coherent fluctuation spectroscopy endstation (XPFS)
- ChemRIXS instrument
  - Condensed phase chemistry endstation
  - Option for two user supplied end stations
    - SurfSpec (interfacial chemistry and catalysis)
    - momentum microscope k-Microscope (SLAC, DESY and MPI, Mainz)
- TXI, Tender X-ray instrument
  - Tender Spectroscopy endstation

- Forward scatter, imaging endstation
- Dual beam nonlinear science endstation
- Important points - Capabilities that enable experiments to be done:
  - Ramp up of x-ray beam – start of scientific experiments at 33 kHz for a few months and can reasonably quickly go to 100 kHz. Power levels will be phased in steps.
  - New pump laser systems and the associated synchronization timing systems will be rate-limiting factors for some experiments.
  - One key question is how to develop the pump laser capability from its fundamental & harmonics to tunable optical THz, UV, optical and so forth... how to phase that development?
  - At the same time developing detector systems and data acquisition systems for high-rate operations. The latter requires substantial input from the user communities if full advantage is to be taken of the high rate beam.
  - We have decisions to be made as a community, which was a principal focus at the LCLS SAC for the past 2-3 yrs.
- Commissioning and early science experiments
  - Early Science means the initial set of experiments prior to open access via the PRP. There is an agreed consortium approach for each of the new instruments (with TMO and ChemRIXS plans at a very mature stage of development).
  - First PRP experiments in TMO and ChemRIXS will be scheduled in the first half of CY2024.
  - This will be followed by DREAM and MRCO, qRIXS
- Timeline for initial LCLS-II operation is relatively tight.
  - Copper linac is available as normal, but two shutdowns of the SCRF accelerator are needed in order to enable the LCLS-II-HE upgrade:
    - Summer 2024: brief shutdown (~ 3 months)
    - Summer 2025 - fall 2026: long shutdown (~15 months)
  - This means there is now limited time to make use of the superconducting beam prior to the Summer 2025 shutdown for HE (~ 15 operating months)
  - This is insufficient to commission and utilize all 11 endstations. Thus, there needs to be a prioritization and phasing.
  - Beamtime in the period leading up to the LCLS-II-HE shutdown will be allocated as follows for the new LCLS-II instruments:
    - Safe and sustainable delivery of operations
    - Serve the current LCLS user community
    - Delivery of high-impact science that demonstrates the capabilities of LCLS-II
    - Showcase the capabilities of LCLS-II flagship instruments (DREAM, chemRIXS, qRIXS)
    - Honor commitments (e.g. to user supplied endstations and existing programs)

- Balance scientific impact versus technical risk of successful implementation

Information on the DOE-SC early career awards (ECAs): In the upcoming ECA call there will likely be a dedicated program for scientists who develop new capabilities (e.g., add to the facility's capabilities). This provides a career avenue that was previously lacking.

#### **Q&A session:**

Q1: Which stations are available for the run 22 -24 and what capabilities?

- Run 22 will feature TMO-MBES and ChemRIXS
- Next phase will be TMO-DREAM, TMO-MRCO and qRIXS
- Subsequent phase will be k-Microscope and TXI-Spectroscopy

Q2: Comments on serving the current LCLS user and bringing in new users / expanding the user community?

- This comment is purely regarding the soft x ray exploitation to make sure that the community that spent a lot of time in developing the scientific case and instrument design can make full use of this system. Hundreds of users fall into this category. That does not mean that new users are not welcome or not involved, they should and could.
- On the hard x ray system, we are working to establish new communities in areas of priority such as sustainability, microelectronics, etc.
- Happy to get feedback on this

Q3: Prioritising the user basis to protect this investment like scientific campaigns and so on. Is any decision made about whether to deliver hard x rays with copper linac during the shut down ?

- Yes, the Cu linac will provide beam to both undulators at 120Hz during the LCLS-II-HE shutdown.
- Outline schedule is at: <https://lcls.slac.stanford.edu/sites/default/files/long-range-operating-schedule.pdf>

Q4: When is the call deadline for Run 23?

- Call will likely be issued in early December, for early February submission,
- Run 23 will start in August 2024 (Cu linac) or Oct 2024 (SCRF).
- Will include TMO and ChemRIXS, and some access to qRIXS, DREAM (details to be determined)

Q5: Will there be a separate prioritization of the proposals for different undulators?

- No. This was discussed with the PRP previously. Scientific excellence is important no matter what instrument or which beam. PRP focuses on the scientific ranking, not the scheduling logistics

Q6: Are early science campaigns open to the broader community? How broad this community is? In EuXFEL after commissioning was more like community proposals where old expert users and new users were able to work together

- It is the same for LCLS. An open call was made for early science phase for each instrument. This was peer reviewed and selected, and then an open invitation was made for people to participate in the selected experiments.

Q7: How is the expansion of the user base with respect to hard x rays going to work?

Will you dedicate time and how do you define a new user?

- We would appreciate input on this. It's in our best interest to bring in new users. The nature of XFEL science is often a consortium-based approach anyway, where no single PI can typically do an experiment.

Q8 : About HE instrumentation in the SAC meeting , new beam for HE comes on 2027 and more realistically in 2028. Where will photochemistry science be located?

- Lot of discussions on this going on. Will likely be a roll-in/out dedicated endstation in CXI, with the potential to be also fielded in MFX.