## Projected User Operation

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*Tentative operation plan for LCLS [hours per fiscal year]*
## APS vs. LCLS

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<th>APS</th>
<th>LCLS</th>
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<tr>
<td>Operating Hours</td>
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<td>Beamlines</td>
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Experience from High Power Laser Facilities

- Many facilities hold an experimental readiness review ~1 month before beamtime (T. Ditmire)

- Hasn’t been determined if this will occur at LCLS but it is certainly a possibility
Preparation

- Clearly define the responsibilities of participants
- Simulate the experiment
- Understand experimental details
  - X-ray parameters (photons/pulse, wavelength, bandwidth, timing requirements, …)
  - Optical laser parameters (wavelength, intensity, …)
  - Sample motion control (diftactometer configuration, additional motions?, …)
  - Sample environment (low T, liquid, vacuum, …)
  - Alignment procedure
  - Data collection procedure (collection time, software for on-site analysis, veto protocol, …)
- Prepare and characterize samples
  - Metrology (surface finish, film thickness, …)
  - All-optical experiments
  - X-ray measurements (orientation, diffraction efficiency, …)
- Identify “missing equipment”
  - Define who is responsible for defining and testing missing equipment
  - Must be completed far ahead of time so components can be properly integrated into the instrument controls and data systems
- Experimental execution plan
  - Order of operations and logic flow chart
  - Experiment staffing plan
Nonthermal Melting Diffractometer Configuration

Figure 1: Diffractometer configuration optimized for nonthermal melting studies. Green stages are required, yellow are optional, and white are not required. The copper structure represents the cryostat. The sample will be mounted flush to the end of the cold finger.

Alignment and Operation

1. Align sample normal to the phi rotation axis. This is accomplished by bounced a HeNe off of the sample surface onto a location a few meters from the sample. Phi is then rotated. The tip and tilt stages are adjusted until the laser spot does not precess with the rotation of Phi.

2. Adjust sample surface to vertical plane. This is achieved by back reflecting a leveled laser from the sample. Chi and Mu is then rotated to put the laser back on itself.

3. Move sample to the center of the diffractometer. This is accomplished by imaging the sample profile along the Z axis while Mu is rotated from 0° and 180°. The Sample X stage is then adjusted until the location of the sample surface does not translate. The same procedure is performed while imaging the sample profile from the X axis while Mu is rotated from 90° and 270°. In this case the Sample Z stage is adjusted. Next

4. Move diffractometer into the beam. This is achieved by moving Diffractometer Y and Diffractometer X.

5. Set grazing angle of the sample with respect to the X-ray beam by rotating Mu.

6. Exploring reciprocal space. This is accomplished by rotating Phi.

7. Translating the sample after damage is achieved with Diffractometer Y.
Maximizing the Probability of Success

- Regular communication and collaboration with instrument staff during preparation phase
- Thorough planning
- I envision:
  - A single instrument point of contact being assigned for each experiment
  - At least one instrument staff around at all times during an experiment
- Everyone must know what to expect from instrument staff and vice versa
XPP Contacts

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