TMO will be installed in the current AMO experimental hutch.

**TMO - A new soft X-ray beamline at LCLS II**

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**Acknowledgments:**
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LCLS is building a set of 4 new soft X-ray beamlines to take the advantage of LCLS-II upgrade with high repetition rate and new undulators. The TMO (Time resolved Molecular Optical science) beamline also known as NEH 1.1 will support many experimental techniques not currently available at LCLS. First light on TMO is expected in February 2020.

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**TMO beamline layout and End Stations**

The main components of the beamline (KB optics, DREAM end stations and diagnostics components) are built on granite stands to meet the stability and focus overlap requirements of the X-ray and pump laser.

Both the existing LAMP as well as the newly built DREAM end-station will be configured to take full advantage of both the high pulse energy from the copper accelerator (120 Hz) as well as high average intensity and high repetition rate (up to 100 kHz) from the superconducting accelerator.

**TMO optic systems**

Each end station will have its own focusing optic systems (KB Mirrors) which can focus the beam down to 300 nm, and have laser pump probe experiments capability.

- 2 set of KB mirrors in series provide for 2 end stations interaction points of 1 and 0.3µm focus spot
- 1st set of KB mirrors has bending capability to adjust focus on either IP

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**Building thermal stability**

The thermal stability of the building itself has a direct impact on beam stability. External shifts of temperature have directly been measured as floor deviation in the sub-basement of the building where the beamline is installed. Variations of up to 30µ have been measured on the floor flatness and horizontality. In order to meet our very demanding requirements the part of the building that is directly exposed to climate and solar radiation is being thermally insulated to reduce thermal expansion.

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**Vacuum profile**

The large range of vacuum pressure used in the 2 main end stations requires sophisticated pumping options and numerous differential pumping systems between the essential elements of the beam-line. The LAMP end station will work at levels of up to 10-5 torr, while the DREAM end station will continuously work in the low 10-11 torr range.

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**LCLS beamline hutches**

- AMO: Atomic, Molecular and Optical Science
- SX: Soft X-ray Research
- XRF: X-ray Pump Probe
- XCS: X-ray Correlation Spectroscopy
- MXM: Macromolecular Cryocrystallography
- CX: Coherent X-ray Imaging
- MEC: Matter in Extreme Conditions