

THE MATTER IN EXTREME CONDITIONS INSTRUMENT AT LCLS: A NEW PLATFORM FOR HIGH ENERGY DENSITY SCIENCE

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The last five years have seen the commissioning of and first user experiments on both the Free Electron Laser in Hamburg (FLASH) and the Linac Coherent Light Source (LCLS)¹ in Stanford, and more are slated to come online in the next couple of years. The high photon frequency (i.e. larger than the plasma frequency of solid density), short pulse length (i.e. 10s to 100s of femtoseconds) and large photon number per pulse (i.e. 10^{12} photons per pulse) make it an ideal source to create and study states of matter at high energy density.

The Matter in Extreme Conditions instrument at LCLS is specifically designed to accommodate research in High Energy Density Science. It combines the superior LCLS X-ray beam with two relatively high energy and high power laser systems and a number of diagnostics tailored to this field of science. In this presentation, we will present the capabilities LCLS in general and MEC in particular. We will cover the current state of the end station, future upgrades, and show some selected scientific highlights of its first three years of operation.

[1] Nagler, B., Arnold, B., Bouchard, G., Boyce, R.F., Boyce, R.M., Callen, A., Campell, M., Curiel, R., Galtier, E., Garofoli, J. et al. (2015). *J. Synchrotron Rad.* 22, doi:10.1107/S1600577515004865.

¹LCLS is an Office of Science User Facility operated for the U.S. Department of Energy Office of Science by Stanford University. The MEC instrument has additional support from the DOE Office of Science, Office of Fusion Energy Sciences under contract No.SF00515. If no footnotes, last line of text.