

DPP13-2013-001510

Abstract for an Invited Paper  
for the DPP13 Meeting of  
the American Physical Society

### **Exploring the matter of extremes at the Linac Coherent Light source<sup>1</sup>**

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A new technique using the Linac Coherent Light Source (LCLS), an x-ray free electron laser source, was developed at Matter in Extreme Conditions (MEC) endstation to study wide range of extreme conditions in phase space. The LCLS has  $\geq 3$  mJ per 60 fs pulse enabling an intensity x-ray beam between 4 keV -9.5 keV to be focused onto a small spot  $\sim 2$  micron at MEC. Short pulse optical laser system with 40fs, 150mJ, 10Hz at 800nm and long pulse optical laser system with variable pulse duration of 2-200ns,  $< 50$  J, 1 shot/7 min at 527nm serve to create high energy density state or shock compression state. MEC instrument is equipped with a suite of target diagnostics like as emission spectrometers, scattering spectrometers, area detectors for x-ray diffraction, VISAR, and FDI. We present capabilities of the MEC instrument and give an overview of several experiments which are performed at MEC.

<sup>1</sup>MEC instrument is funded and operated by the US Department of Energy, Office of Science, Fusion Energy Science. LCLS is an Office of Science User Facility operated for the U.S. Department of Energy Office of Science by Stanford University.