Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

The High Energy Density science instrument at the European XFEL, Hamburg, Germany: a new platform for shock compression research KAREN APPEL, MOTOAKI NAKATSUTSUMI, GERD PRIEBE, European XFEL, ALEXANDER PELKA, Helmholtz-Zentrum Dresden Rossendorf, IAN THORPE, THOMAS TSCHENTSCHER, European XFEL — The High Energy Density science instrument (HED) at the European XFEL, Hamburg, Germany will provide unique experimental possibilities for the investigation of near solid material driven to extreme states and will also establish a new platform to study materials response to shock compression. HED is located at the SASE2 undulator, which provides up to 27000 pulses per second with about 10^{12} photons per pulse, photon energies between 3 and 24 keV and pulse lengths of 2 – 100 fs. Self-seeding is foreseen, as well as natural bandwidth (BW) SASE radiation. In addition, energy BW of 10^{-4} and 10^{-6} will be available through monochromators. Focussing is based on CRL optics, which will allow to provide beam sizes of 2 μm, 10-20 μm and 150 – 260 μm at the sample position. Samples will be driven to extreme states by different types of optical lasers (either 200 kHz/3 mJ/15 fs, 10 Hz/100 TW/30 fs or 10 Hz/100J/ns), the pump-probe FEL beam (delays of up to 2 -23 ps for 5 -20 keV using a split-and-delay unit) and pulsed magnetic fields (up to 50 T). Pump probe experiments can be performed at adapted repetition rates (4.5 MHz, 1 – 10 Hz, single shot). X-ray techniques comprise diffraction, imaging and spectroscopic methods. User operation is planned for fall 2017. We will present the science case of HED, the current layout and present ideas on first shock compression experiments.

Karen Appel
European XFEL

Date submitted: 28 Jan 2015 Electronic form version 1.4