

The High Energy Density Matter (HED) at European XFEL

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The High Energy Density science instrument (HED) [1, 2] is one of the first six instruments to be realized at the European XFEL, Hamburg, Germany. The science scope of the HED instrument focuses on matter at extreme conditions of temperature, pressure electric and/or magnetic field strength. Major applications are high-pressure planetary physics, warm- and hot- dense matter, laser-induced relativistic plasmas and complex solids in pulsed magnetic fields. The extreme states can be reached 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, shot on demand). Available X-ray techniques comprise diffraction, imaging and spectroscopic methods. The technical design report of HED was published July 2014 and user operation is planned for 2017. In this contribution, we present the main characteristics of the instrument with a focus on specific instrumentation challenges.

[1] “Conceptual Design Report: Scientific Instrument High Energy Density Physics (HED)”,
M. Nakatsutsumi and Th. Tschentscher

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http://www.xfel.eu/documents/technical_documents/

[2] “Technical Design Report: Scientific Instrument High Energy Density Physics (HED)”,
M. Nakatsutsumi, K. Appel, G. Priebe, I. Thorpe, A. Pelka, B. Muller, and Th. Tschentscher

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