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Scientific opportunities at the HED beamline, European XFEL

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In May 2018, all three undulators are in operation at the European XFEL, and will start opening to users from the end of 2018. The High-Energy Density (HED) science instrument is one of the two endstations at SASE 2 and is dedicated to the studies of matter at extreme conditions. Major scientific applications include dynamic and static compression studies, time-resolved femtosecond HED dynamics, x-ray isochoric heating, relativistic laser-plasma interaction and more.

Here we present the technical capability of the HED beamline. The upcoming possibilities for the studies of material at extreme conditions will be discussed. In particular, the following unique beamline capabilities are highlighted: two vacuum chambers, three optical pump lasers (2mJ – 45mJ @ 15fs - 1ps, ~5J @ 25fs, and ~100J @ ns), in-vacuum sample exchange system, high resolution x-ray spectrometers, and several x-ray sensitive high resolution 2D detectors. Each chamber is optimised to certain experimental interests and techniques, such as X-ray diffraction/spectroscopy/imaging capabilities for chamber 1, and shock-compression experiment capability (e.g. Diamond Anvil Cells) for chamber 2.

Primary authors: Dr MAKITA, Mikako (European XFEL GmbH); Dr APPEL, Karen (European XFEL GmbH); Dr GÖDE, Sebastian (European XFEL GmbH); Dr KONOPKOVA, Zuzana (European XFEL GmbH); Dr NAKATSUTSUMI, Motoaki (European XFEL GmbH); Dr PRESTON, Thomas (European XFEL GmbH); Dr THORPE, Ian (European XFEL GmbH); Dr BÄHTZ, Carsten (HZDR); Dr HÖPPNER, Hauke (HZDR); Dr PELKA, Alexander (HZDR); Dr TONCIAN, Toma (HZDR); Dr TSCHENTSCHER, Thomas (European XFEL GmbH); Dr ZASTRAU, Ulf (European XFEL GmbH)

Presenter: Dr MAKITA, Mikako (European XFEL GmbH)

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