

## **Matter at extreme states studied by European XFEL**

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The High Energy Density science (HED) instrument at the European XFEL will provide unique possibilities for the investigation of near solid density matter at states of extreme excitation. European XFEL is a large research infrastructure currently under construction in the Hamburg metropol region, North Germany. This infrastructure will provide researchers with free-electron laser radiation in the x-ray range from 0.25 to 25 keV and six initial science instruments dedicated to a variety of x-ray techniques and applications. First experiments are scheduled for 2016. At the HED instrument intense, coherent, and ultrashort x-ray pulses can be applied to obtain structural and electronic properties of highly excited condensed matter in extreme conditions. Excitations will be driven using a variety of optical laser systems, but also pulsed magnetic and electric fields are considered. In addition, the intense FEL pulses can be used for excitation, too. The major science areas addressed by the HED instrument are condensed matter at extreme excitation, solid density plasmas and quantum states of matter.

The talk will provide an overview of the science to be carried out at the HED instrument. Examples of current experiments will be shown.