

Short-pulse high-intensity laser-plasma science using an X-ray free electron laser



M. Nakatsutsumi¹, T. Toncian², K. Appel¹, C. Baehtz², S. Göde¹,
Z. Konopkova¹, M. Makita¹, G. Priebe¹, A. Schmidt¹,
K. Sukharnikov¹, I. Thorpe¹, A. Pelka², M. Lederer¹,
T. E. Cowan², and U. Zastrau¹

¹European XFEL, Schenefeld, Germany

²Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

The High Energy Density Science instrument at the European X-ray Free-Electron Laser Facility is dedicated to the investigation of a wide range of materials at extreme conditions of pressure, temperature, ionization or electro-magnetic field. Several separate optical laser systems (~5J/25fs, ~100J/ns, ~2mJ/15fs and ~45mJ/1ps) will be available for warm- to hot-dense-matter creation, dynamic compression, relativistic laser-plasma interaction and more.

The instrument is designed to enable applications of various x-ray probing techniques including spectroscopic, scattering, diffraction and imaging methods with 3 to 25 keV tunable photon energies. Being one of the 6 baseline instruments of the European XFEL, first user experiments are planned for the beginning of 2019. The installation of several high-power lasers, a dedicated diamond anvil cell setup and of the ~60T pulsed magnets will be available through contributions by the Helmholtz International Beamline for Extreme Fields (HIBEF) User Consortium.

Overview of the experimental capabilities and selected science cases particularly using short-pulse high-intensity lasers will be presented.

The presentation will be in Japanese while slides are in English for non-Japanese audiences.

References:

- [1] www.xfel.eu/research/instruments/hed
- [2] M. Nakatsutsumi et al., Plasma Phys. Control. Fusion 59, 014028 (2017).
- [3] www.hibef.de

http://xfel-old.desy.de/organization/staff/nakatsutsumi_motoaki/