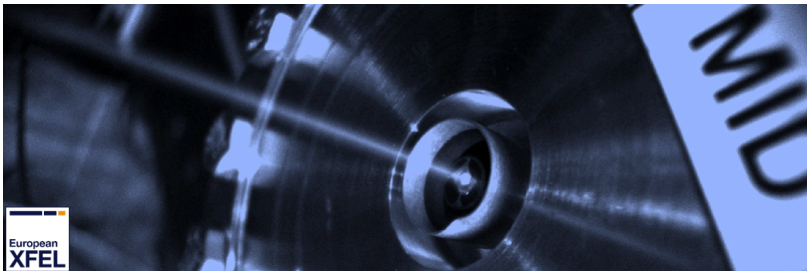

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Hard XFEL radiation for Warm Dense Matter, High Energy Density Studies

Friday 20 January 2023 10:45 (20 minutes)

Optical lasers are incredible tools able to deliver a lot of energy on a small volume, easily achieving the Warm Dense Matter and more in general High Energy Density regimes.
The use of this hot plasma to compress matter has been proved fundamental to reach conditions not only relevant to basic physics but also for material science, geophysics, astrophysics as well as inertial confinement fusion.

Probing such states is difficult for several reasons: small confinement times due to unstable hydrodynamical conditions and highly compressed matter. That's why X-FELs are unique machines that can probe solids on small timescales are able to provide important data to constrain theories and simulations.

In this talk I will review possible WDM/HEDP experiments using optical lasers coupled to X-rays above 40keV

Diffraction:
Very important for liquid melting of silicates and other materials relevant to geophysics because it allows to get data over a larger k and thus better resolve the pair distribution function.

Radiography:
Having stronger x-ray would allow to increase the size of probed targets, giving micron scale resolution to study hydrodynamic instabilities, fragmentation and void creation. Coupling this with external magnetic field will help understanding its interaction of shocked material (change in propagation, conductivity etc.) that will be beneficial both for laboratory astrophysics and ICF.

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Track Classification: High pressure, planetary, and geology science, electron dynamics, warm dense matter, relativistic laser plasmas, strong field science