Institut de Minéralogie et de Physique des Milieux Condensés
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SÉMINAIRE
Mardi 1er Octobre, 10h30

Salle de conférence, 4ème étage, Tour 22-23
IMPMC, Université P. et M. Curie, 4, Place Jussieu, 75005 Paris

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Warm dense matter studies on Free Electron Lasers

An accurate knowledge of the properties of matter under extreme conditions is crucial for geophysics and planetary science. For example, detailed information on equation of states, melting curves and solid phases of geophysically relevant materials (Fe, SiO_2, …) are required to model planet interiors. Recently, the development of the 4th generation x-ray sources, the Free Electron Lasers (FEL), has succeeded in coupling exciting aspects of synchrotron radiation with intense laser properties, giving ultrafast, high intensity laser beams in the X-ray and XUV energetic range. These instruments are characterized by an extremely short pulse length in the order of ~10fs, a tunable photon energy, a high brilliance and an ultra high intensity up to 10^{17} W/cm^2. In that context, X-ray FEL sources coupled with high-energy lasers are affording unique opportunities to measure microscopic structural properties at extreme conditions.

After introducing FEL principle and properties, I will present actual X-ray diagnostics developments on such facilities as X-ray scattering and X-ray absorption spectroscopy. FEL facilities offer unique opportunities to study planetology physic by coupling high energy lasers and such bright X-ray sources to investigate microscopic properties of matter under extreme conditions. In particular, I will detail a recent study performed at the MEC end-station of the LCLS facility (SLAC, Stanford) and devoted to investigate the solid-liquid transition in laser-shocked iron using XANES.

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