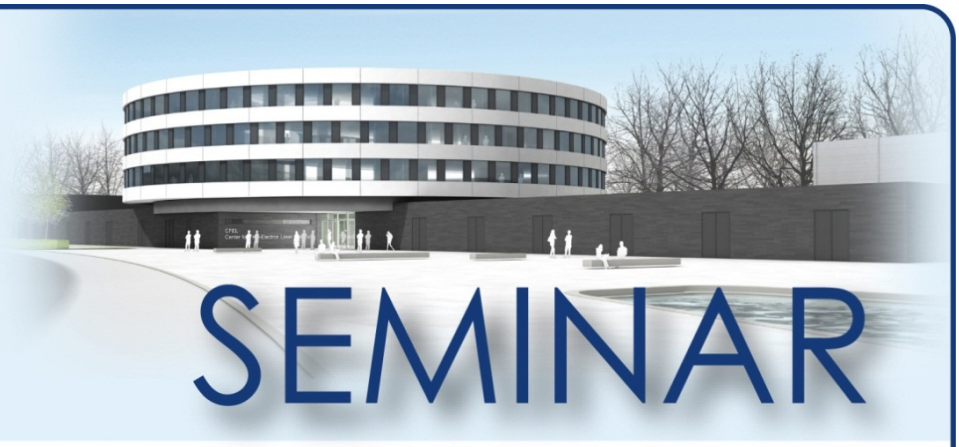
CFEL SCIENCE



# SEMINAR

***21st October 2020 - 2:00 p.m.***

Virtual meeting room in ZOOM (ID: 995 2271 0924 / PW: 859382)

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## Transient ionization potential depression in nonthermal dense plasmas at high x-ray intensity


High energy density matter exists extensively in the universe, from hot dense plasmas such as supernova and stellar interiors to warm dense matter such as planetary interiors. The advent of x-ray free-electron lasers (XFELs), which provide intense ultrashort x-ray pulses, has brought a new way of creating and analyzing nonequilibrium hot and warm dense plasmas in the laboratory. In the dense plasma, the ionization potential depression (IPD) induced by the plasma environment plays a crucial role for understanding and modeling microscopic dynamical processes. In this work, we propose a non-LTE (NLTE) approach to calculate the IPD effect by combining a quantum-mechanical electronic-structure calculation and a classical molecular dynamics simulation. This hybrid approach enables us to investigate the time evolution of ionization potentials and IPDs without the limitation of the LTE assumption. The time-integrated ionization potential values are in good agreement with benchmark experimental data on solid-density aluminum plasma and other theoretical predictions based on LTE.


Host: Robin Santra – CFEL-DESY Theory Division