



28th March 2018 - 2:00 p.m.
CFEL-bldg. 99, seminar room IV

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Start-to-end simulations of photon experiments at advanced laser lightsources: The SIMEX workpackage in EUCALL

Simulations of experiments at modern light sources, such as optical laser laboratories, synchrotrons, and free electron lasers, become increasingly important for the successful preparation, execution, and analysis of these experiments investigating ever more complex physical systems, e.g. biomolecules, complex materials, and ultra-short-lived states of matter at extreme conditions. We have implemented SimEx, a python based simulation library to enable integrated start-to-end simulations of various types of photon science experiments including diffractive imaging, inelastic scattering, and absorption spectroscopy. Our simulations track the radiation from the source through the beam transport optics to the sample or target under investigation, its interaction with and scattering from the sample, and registration in a photon detector. Our interfaces to advanced simulation codes and well defined hierarchical data formats and metadata standards allow simulation setups for arbitrarily complex experiments including multiple optical and x-ray sources e.g. for pump-probe applications. This tool allows researchers and facility operators to simulate their experiments and instruments under real life conditions, identify promising and unattainable regions of the parameter space and ultimately make better use of valuable beamtime. In the presentation, I will outline the status and future development of the simulation platform and discuss selected applications including single-particle imaging of biomolecules and metallic nano-particles, x-ray scattering diagnostics of hot dense plasmas in high power laser–matter interaction, and x-ray absorption spectroscopy in warm dense matter created by high energy laser–matter interaction.

Host: Robin Santra – CFEL-DESY Theory Division