Contribution ID: **76** Type: **On-site planned, but remote also possible**

3D Modelling of Self-Amplified X-ray Emission

The ultrashort high-intensity pulses from x-ray free-electron lasers can drive the matter in novel states. In our group, we investigate the self-amplified x-ray emission caused by massive inner-shell photoionization. In these conditions, spontaneously emitted x-ray fluorescence develops into collective emission resulting in short and intense x-ray bursts. This phenomenon can give rise to new spectroscopic tools or x-ray sources with unique properties.

Due to the short wavelengths, the numerical description of the propagation of x-ray pulses is a challenging task. So far, we rely heavily on the paraxial approximation, which only accounts for the light traveling within a narrow solid angle. Choosing an appropriate geometry of the medium can justify the use of this approximation. However, in the general case, one must consider all the modes of the field.

Within the summer student program, we would like to take a step forward in the rigorous treatment of the x-rays. A potential solution is to decompose the x-ray field into several paraxial beams. Then, the interaction between introduced beams can model real propagation and diffraction. The project will help understand the role and properties of the emission going sideways and its effect on the overall properties of the x-ray pulse. The presented problem requires knowledge of electrodynamics, quantum mechanics (quantum optics), and basic skills in numerical modeling.

Field

A6: Theory and computing

DESY Place

Hamburg

DESY Division

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Special Qualifications:

Quantum Mechanics (Quantum Optics)

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