Electronic Quantum State Dynamics in Helium Droplets traced by Coherent Diffractive Imaging

Thomas Fennel[1]

[1]*Institute of Physics, University of Rostock, Rostock, Germany*

Single-Shot Coherent Diffractive Imaging (CDI) has become a mature tool to capture the structure and dynamics of nanoscale systems such as viruses, nanoparticles and helium droplets in free flight. The conventional application of the underlying single-shot imaging implies that the imaging pulse interacts instantly and perturbatively with the target such that the diffraction image reflects the target shape and (unperturbed) optical properties via the linear-response field propagation through (and around) the target. Especially the advancing capabilities of intense XUV light sources render the question important, at which point non-linear quantum state dynamics driven by the imaging pulse become significant. In this talk I will discuss an attempt to tackle this question theoretically by means of scattering simulations that include field propagation and local quantum state dynamics for the example of Helium droplets [1]. It will be shown for the example of resonantly driven Helium droplets that the departure from the strictly linear regime may open up a wide range of opportunities to track and drive quantum state population dynamics [2]. Options for associated new metrologies in the field of CDI will be discussed.

[1] B. Kruse et al., “Quantum coherent diffractive imaging”, J. Phys. Photonics 2, 024007 (2020)
[2] B. Kruse et al., in preparation

Contact Information: *Thomas Fennel, Strong-Field Nanophysics Group, Institute of Physics, University of Rostock, 18051 Rostock, Germany, Email: thomas.fennel@uni-rostock.de*