Contribution ID: **57** Type: **Invited talk**

Imaging gas-phase molecules with high temporal resolution by coherent electron diffraction

Wednesday, June 21, 2023 11:30 AM (25 minutes)

Imaging time-resolved molecular dynamics demands atto- to few-femtosecond temporal and picometer spatial resolution. Laser-induced electron diffraction (LIED) is a strong-field method based on coherent laser-driven scattering with one of the target's own electrons after photoionization. In this way, LIED differs from conventional ultrafast electron diffraction (UED) with external electron beams, in which the electron pulse is scattered by many target molecules, causing incoherent scattering of hundreds (to tens of thousands) of electrons. LIED has demonstrated its ability to image the three-dimensional structure of a single gas-phase molecule in full kinematic coincidence with combined sub-atomic picometre and femtosecond spatiotemporal resolution. However, retrieving complex molecular systems becomes progressively difficult with increasing molecular structure and is a challenge for any diffraction-based imaging technique.
In my talk, I will present our state-of-the-art technical achievements on the LIED and their consequent experimental results to overcome the limitations of imaging complex molecules for highly time-resolved investigation.

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Session Classification: Ultrafast electron probes