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**Experiments with a Reaction Microscope at the Free-Electron Laser FLASH**

Reaction Microscopes have proven to be versatile tools to study the interaction of photons, electrons and ions with atoms, molecules and clusters. No other instrument is capable of providing three-dimensional momenta of several electrons and ions in coincidence. Employing parallel electric and magnetic fields, all electrons and ions are projected onto opposing time- and position-sensitive detectors. The impact position and time allow to calculate the fragments' initial momenta and thus to reconstruct the reaction of projectile and target.

This talk will focus on the operation and the scientific opportunities of a Reaction Microscope at a Free Electron Laser, illustrated by our experiments at FLASH in Hamburg. Specifically, time-resolved XUV pump-probe experiments on the relaxation dynamics of small molecules will be discussed: Electron transfer across highly charged and fragmenting iodine molecules and Interatomic Coulombic Decay, a fast relaxation process in weakly bound systems, in neon dimers.