# Ultrafast processes and imaging of clusters

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The understanding of the interaction of high intensity, short-wavelength, short-pulse radiation with matter is essential for virtually all experiments with new superintense X-ray sources, in particular for flash imaging of nm sized particles. Clusters as a form of matter intermediate between atoms and bulk solids are ideal samples to study fundamental light
– matter interaction processes. They are finite systems with the density of bulk solids allowing the investigation of inner- and interatomic phenomena.1,2,3 Very recently, initial experiments have shown that in nm-sized gas phase particles can be imaged by single shot scattering.4 Upcoming X-ray lasers will allow improving the resolution and going to smaller particles. This will open new fields in cluster and nanometer-scale science. Ultrafast electron and ion dynamics can be studied with nm spatial resolution by means of time-resolved scattering using pump-probe techniques as well as time of flight spectroscopy. The talk will give an overview of recent results obtained at the FLASH facility in Hamburg and the LCLS in Stanford.

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