

**Colloquium Max Born Institute  
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**Prof. Dr. Thomas Pfeifer**

Max-Planck-Institut für Kernphysik  
Heidelberg, Germany

**Changing the shape of atoms and small molecules in intense laser fields  
observed by XUV spectroscopy and x-ray imaging**

Atoms and small molecules are often considered "well understood" systems. However, their interaction with even moderate electric field strengths in an optical laser pulse quickly challenge our understanding. At the same time, these interactions hold the key for controlling molecular structure and dynamics with lasers beyond the reaches of traditional chemistry. Here, we will discuss how fundamental properties of atoms and small molecules change in short-pulsed strong laser fields. Characteristic spectroscopic line shapes of atoms in the gas phase and molecules in the solution phase get modified in strong laser fields, and can be understood as phase-control operations on the excited quantum states. Furthermore, we will look at the first motion-picture diffraction images of C<sub>60</sub> molecules, taken with an x-ray camera at LCLS, that show various regimes of structural changes of C<sub>60</sub> as it interacts with an intense optical laser pulse of various intensities.