

Thursday, 8th of June 2017, 17:00

Campus Schenefeld, main building (XHQ) room E1.172

## Sang-Kil Son

CFEL-DESY Theory Division

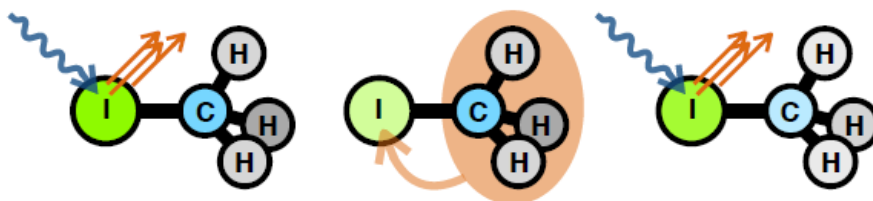
### What happens to atoms and molecules during x-ray free-electron laser pulses?

In this talk, I will present a theoretical framework to treat x-ray-induced processes and to simulate detailed ionization and fragmentation dynamics of atoms and molecules during intense XFEL pulses, introducing two dedicated x-ray physics toolkits, XATOM and XMOLECULE. They can provide a fundamental insight to understand how matter interact with intense XFEL pulses. I will mainly present two recent studies: x-ray multiphoton ionization dynamics of xenon atoms including resonant and relativistic effects [1,2] and ultrafast explosion dynamics of iodomethane molecules [3]. In both studies, atoms and molecules are interacting with ultra-intense hard x-rays. Using our toolkits, charge state distributions and kinetic energy releases of fragments are calculated to probe ionization and fragmentation dynamics, and compared with recent experimental results conducted at LCLS. I will discuss very simple but striking phenomena that uniquely happen at high x-ray intensity, namely resonance-enabled x-ray multiple ionization (REXMI) and charge-rearrangement-enhanced x-ray ionization of molecules (CREXIM). With these examples, I will demonstrate how important understanding of the fundamental XFEL-matter interaction is and how theory and experiment work together to advance XFEL science

[1] K. Toyota, S.-K. Son, and R. Santra, Phys. Rev. A 95, 043412 (2017).

[2] B. Rudek et al., in preparation.

[3] A. Rudenko, L. Inhester, et al., Nature (in press, 2017), doi: 10.1038/nature22373



■ Host: Evgeny Gorelov