

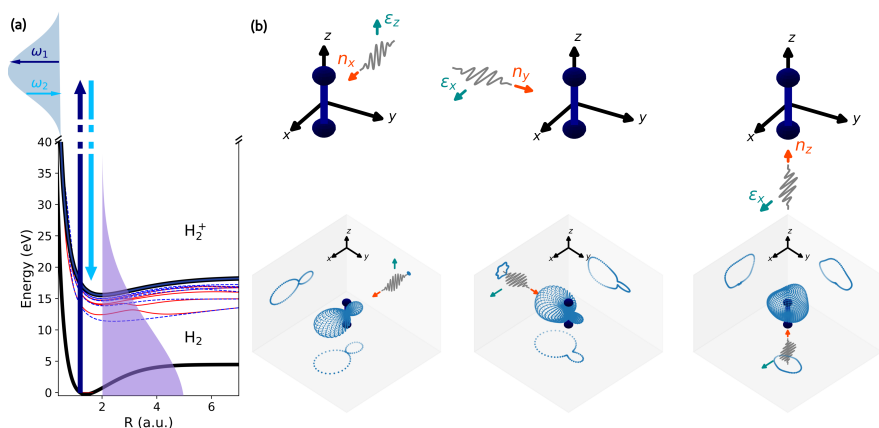
15th February 2023 - 2:00 p.m.
CFEL-bldg. 99, seminar room IV

Arturo Sopena Moros

Centre for Free-Electron Laser Science, DESY, Germany

Asymmetric electron emission in the H_2 molecule in stimulated Compton scattering with soft-X rays

The last two decades have seen the rise of X-ray free electron lasers (XFELs) throughout the world, providing ultra-short pulses with unprecedented intensities, over a large range of photon energies going from VUV to the hard X-ray domain. New avenues are also opened to explore non-linear response in X-ray regime, like non-linear Raman and Compton scattering processes.



I will present a new approach to stimulated Compton scattering (SCS) on hydrogen molecules using intense, ultrashort soft-X-ray pulses. The time-dependent Schrödinger equation is solved to analyze this process, taking into account both dipole and non-dipole terms. The short X-ray wavelength challenges the common dipole

approximation, leading to symmetry breaking in photoelectron emission that is highly dependent on X-ray wavelength and molecular orientation. This is a unique non-linear effect observed in the low-energy electrons emitted after photon absorption and stimulated emission within the pulse energy bandwidth.

Additionally, I will also present results for SCS simulations using two ultrashort pulses with different photon energies and propagation directions. As seen in atoms, non-dipole effects depend on the relative propagation angle of the pulses presenting a maximum in the SCS ionization probability for counter-propagating pulses. In this case, the direction of the photoelectron emission asymmetry can be related to the momentum transferred to the molecule by the absorption of a photon and the subsequent emission stimulated by the second field.