

# High harmonic spectroscopy of attosecond electron dynamics in molecules

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High harmonic emission occurs when an electron, liberated from a molecule by an incident intense laser field, gains energy from the field and recombines with the parent molecular ion. The emission provides a snapshot of the structure and dynamics of the recombining system, encoded in the amplitudes, phases and polarization of the harmonic light, giving rise to a new spectroscopic tool, the high harmonic spectroscopy. I will review our recent results on using this new tool to unravel attosecond multi-electron dynamics induced by ionization.

Ultrafast removal of an electron with intense or ultrashort laser pulse induces nonequilibrium response of the electrons. This response can be viewed as a motion of a hole created in the molecule. I will show how we can use high harmonic spectroscopy to follow this motion with attosecond temporal and angstrom scale spatial resolution. One of the most striking and unexpected outcomes of our technique emerges when it is applied to chiral molecules. We find that high harmonic generation can enhance usually weak chiral signals by orders of magnitude and can allow us to monitor chiroptical interactions with sub femtosecond temporal resolution.