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Attosecond Spectroscopy

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Attosecond spectroscopy is enabled by the advent of intense ultrashort light pulses comprising merely a few wave cycles. Manipulating the hyperfast-varying electric field evolution of these pulses permits the manipulation and tracking of the atomic-scale motion of electrons. A striking implication of this ability is the generation and characterization of isolated attosecond pulses of extreme ultraviolet (XUV) light and their characterization. Spectroscopic techniques making use of the unprecedented temporal resolution that attosecond XUV pulses offer can track and control electron dynamics in the interior of atoms, molecules as well as in solids and provide insight in the evolution of ultrafast electronic population dynamics and related coherent processes. Attosecond technology in combination with conventional electron spectroscopy, dubbed "attosecond streaking" investigates the timing of photoemission and electronic transport processes on solid surfaces. The extension of transient absorption measurement schemes makes coherent electronic dynamics accessible and the effects that ultrastrong and –short laser electric fields exert on the electronic structure of matter and the band structure population dynamics.