

Plenary Talk PV VI We 8:30 E 415 und E 214
Attosecond electron dynamics in high harmonic generation and laser induced tunneling ionization — •URSULA KELLER —
ETH Zurich, Physics Department, 8093 Zürich, Switzerland

Tunneling theories are the standard approach to intense-field ionization and have successfully described high harmonic generation (HHG), quantum path interference (QPI) in HHG, laser-induced electron tunneling and diffraction. We have observed for the first time the interference between the two shortest quantum paths contributing to the harmonic emission. By varying the laser intensity, we change their

interference and thus demonstrate a control of the paths on an attosecond time scale. Furthermore, it is typically assumed that electrons can escape from atoms through tunneling when exposed to strong laser fields, but the timing of the process has been controversial, and far too rapid to probe in detail. We have used attosecond angular streaking to place an intensity-averaged upper limit of 12 attoseconds on the tunneling delay time in strong field ionization of a helium atom in the non-adiabatic tunneling regime. This is the fastest process that has been measured directly in the time domain and the different theoretical interpretations of this result is still controversial.