Interferometric Probing of Photoionization Dynamics and Resonance-Controlled Photoemission Delays

D Bharti[1], J del Valle Rosales[2], K Bartschat[3], R Moshammer[1], A Harth[4], and T Pfeifer[1]

[1] *Quantum Dynamics&Control, Max Planck Institute for Nuclear Physics (MPIK), Heidelberg, Germany*
Contact Email: bharti@mpi-hd.mpg.de

Photoelectron interferometric techniques offer a powerful means to investigate the dynamics of photoemission by measuring phase shifts acquired during the ionization process. In two-color experiments based on the RABBITT scheme, sideband oscillations encode information about the energy- and angle-dependent phase of the emitted electron wave packet. These phase variations reflect the influence of both the atomic potential and the nature of the ionization pathways.

In systems where direct ionization competes with resonant multi-photon channels, the phase of the sideband signal becomes strongly dependent on laser parameters such as intensity and wavelength. In particular, Stark-shifted coupled resonances can induce abrupt phase variations and channel-selective interference. Measurements in noble gases reveal strong angular dependence and intensity-induced phase flips, which are compared with simulations based on single-active-electron and time-dependent R-matrix models.