Resonant two-photon ionization of Krypton resolved in spin-orbit components

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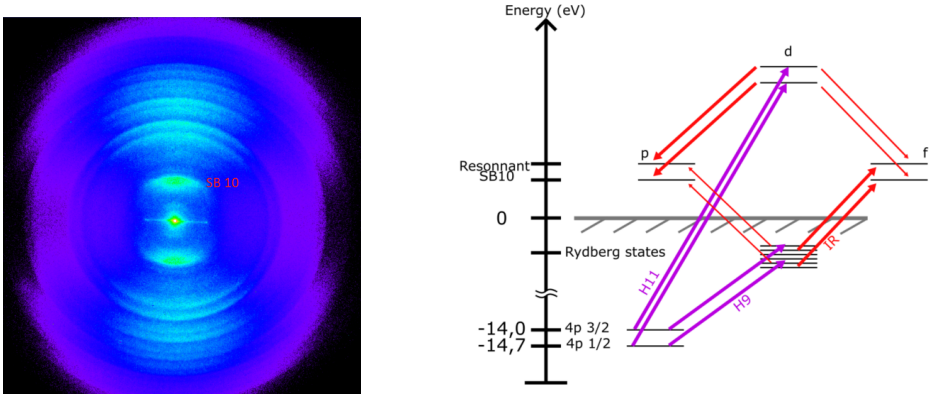
XUV coherent sources based on high-order harmonic generation (HHG) are a powerful tool to access temporal information on resonant ionization processes through two-photon interferometric schemes [1].



(a) (b)

Figure 1: a) VMI image of the momentum distribution of photoemitted electrons from Kr atoms induced by XUV+IR pulses. b) Photoelectron energy diagram of the experiment.

Here, we present experimental results of angularly-resolved photoemission dynamics in krypton. The 0.7-eV spin-orbit splitting of the krypton ion leads to a characteristic "double band" structure when this element is ionized by an attosecond XUV pulse train. As previously performed in helium [2], we combine Rainbow RABBIT electron interferometry with momentum imaging in order to retrieve angularly- and spin-orbit- resolved photoemission dynamics. The near-threshold excitation of Krypton using harmonic 9 of the Ti:S laser leads to resonant two-photon H9+IR transitions involving bound (Rydberg) states in the 1/2 spin-orbit component but also potentially autoionizing states in the 3/2 spin-orbit component (Fig.1b). The resonant spectral amplitude and phase information is encoded in sideband 10 measured in a Velocity-Map Imaging (VMI) spectrometer (Fig.1a) as a function of the XUV-IR delay.

References

[1] M. Swoboda *et al.*, Phase Measurement of Resonant Two-Photon Ionization in Helium, *Physical Review Letters* 104, (2010), 103003

[2] A. Autuori *et al.*, Anisotropic dynamics of two-photon ionization: An attosecond movie of photoemission, *Science advances* 8, (2022), eabl7594