Speaker: **Franziska Gervers, University of Freiburg**

Title: **Anisotropic Three-Photon Transitions in Photoelectron Interferometry**

Date: **Friday, August 14, 11:00 am (s.t.).**

Place: **Seminar room 915**

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Photoelectron interferometry techniques such as RABBIT (Reconstruction of Attosecond Beating By Interference of Two-photon Transitions) provide access to photoemission time delays, where the measured atomic phase combines the Wigner delay of interest with a continuum–continuum (cc) phase induced by the IR field. Previous models of the cc phase have generally assumed isotropy and therefore depend only on photoelectron energy, not on emission direction. However, Berkane et al. (2024) demonstrated for the two-photon case that a WKB correction to the continuum wavefunction reproduces the experimentally observed angular dependence (Heuser et al., 2016). This work extends this anisotropic WKB approach to the three-photon case, motivated by the same qualitative breakdown of the isotropic approximation, recently reported for a three-photon scheme (Rajendran et al., 2026). Starting from a partial-wave decomposition of the three-photon transition amplitude, an analytical, orientation-dependent expression for the radial matrix element is derived recursively. Applied to the central sideband of a 3SB scheme, the approach yields a pronounced delay dip of several hundred attoseconds near 90°, in good agreement with numerically exact TDSE simulations. In the 2SB scheme, the approach also provides an angle-resolved description of the observed breakdown of the isotropic cancellation between absorption and emission cc phases. These results demonstrate that the anisotropy of cc transitions persists beyond the two-photon order, and even becomes more pronounced at three-photon order.