



## IMPRS UFAST Call for PhD applications 2025/2026

### FC1 – Spin-resolved dynamics induced by ultrafast rotating current in chiral molecules



<b>Title of PhD Project</b>	<b>Spin-resolved dynamics induced by ultrafast rotating current in chiral molecules</b>
<b>Type</b>	Experimental Theory
<b>Supervisor(s)</b>	Prof. Dr. Francesca Calegari (DESY, UHH) Dr. Vincent Wanie (DESY)
<b>Affiliation(s):</b>	DESY, UHH
<b>Number of positions:</b>	1
<b>Abstract:</b>	<p>Photoelectron circular dichroism (PECD) is a powerful method of chiral discrimination, providing asymmetry signals up to two orders of magnitude stronger than in conventional optical techniques. Our team has exploited this approach to experimentally resolve ultrafast electron dynamics in chiral molecules, producing chiral currents [1]. It has recently been predicated that combining such photoinduced currents with a circularly polarized probe pulse enables an enantioselective filter of molecular orientations following photoionization. Furthermore, recent work has demonstrated that molecular orientation can be directly linked to photoelectron spin [2]. In this project, the candidate will design and commission a spin polarimeter to enable spin- and time-resolved PECD measurements shortly after coherent excitation of electronic dynamics in chiral molecules. These experiments will exploit covariance techniques using our two-sided spectrometer, employing velocity-map imaging (2D) and mass-spectral acquisition (1D), to provide new insights into the interplay between chirality and spin polarization.</p> <p>[1] V. Wanie et al., “Capturing electron-driven chiral dynamics in UV-excited molecules” <i>Nature</i> 630, 109–115 (2024). <a href="https://doi.org/10.1038/s41586-024-07415-y">https://doi.org/10.1038/s41586-024-07415-y</a></p> <p>[2] P. Caesar et al., “Enantiosensitive locking of photoelectron spin and cation orientation” <a href="https://arxiv.org/abs/2505.22433v4">arXiv:2505.22433v4</a> (2025).</p>
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