

Molecular Control for Time- and Symmetry-Resolving Auger Electron Spectroscopy

Initiative: Forschung mit Freie-Elektronen-Lasern: Peter Paul Ewald-Fellowships am LCLS in Stanford

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Laufzeit: 3 Jahre

Active control of chemical reactions requires a delicate interplay of changing electronic symmetries. The fellowship is focused on the development of a new style of X-ray spectroscopy, one that provides not only time-resolved identification of transient electronic states but also reveals the symmetry evolution of those states. It will leverage innovative technical developments from free-electron laser science, quantum optical control, and advanced data mining in order to create a new scheme of ultrafast molecular investigations. More specifically, a femtosecond (fs) optical laser will be used to induce rotational motion in a target molecular ensemble. As the ensemble varies its orientation in a complicated but concerted tumbling pattern, unprecedentedly fast pump-probe experiments will be performed with sub-10 fs optical pulses as 'pump' pulses followed by few fs 'probe' pulses from the Linac Coherent Light Source. The resulting electron emission, photo and Auger, will be recorded with a novel detector array that can measure the electronic symmetry from 16 different 'points of view'. This new scheme will uniquely enable us to investigate and control hitherto unseen processes in increasingly complex molecular systems with the final aim to achieve free-electron laser based insight in chiral molecules. Hosts are the LCLS Laser Science and Technology group at SLAC National Accelerator Laboratory and the PULSE Institute in Stanford.

Projektbeteiligte

Dr. Markus Ilchen

European XFEL

Small Quantum Systems (SQS)

Schenefeld