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“Vortex Photoelectron Holography in Strong-Field Tunneling Ionization: Probing the Helical Phase of Chiral Molecules”

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日 時: 2025年8月6日(水) 16:00~17:00

場 所: 工学部8号館502講義室 Eng. Bldg. 8, Room 502

【Abstract】

Strong-field photoelectron holography (SFPH) is a powerful tool for characterizing the phase structure of photoelectron wavepackets in tunneling ionization, offering insights into molecular structures and ultrafast electron dynamics. Previous studies on SFPH have primarily focused on atoms and simple molecules, where the electron wavepacket from tunneling ionization has a plane phase front. Recently, we generalize the SFPH theory, conventionally applied to plane-phase electron wavepackets, to vortex electrons. We show how the helical phase of vortex electrons is imprinted in the holographic fringes. In chiral molecules, the electron orbitals have a helical density distribution, and tunneling ionization can generate vortex photoelectrons with a helical phase front. By applying this approach to chiral molecules, we demonstrate that the helical phase of tunnelled electron wavepacket can be probed by SFPH, providing direct insight into the chirality of the molecular orbitals. Our work provides a way for probing phase information in chiral light-molecule interaction, which is otherwise inaccessible in existing chirality recognition methods. The intrinsic attosecond temporal resolution of SFPH further enables the measurement of ultrafast electron dynamics in chiral molecules.

使用言語 : 英語 (English)

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