Tomographic Extraction of the Internuclear Separation Based on Two-Center Interference with Aligned Diatomic Molecules

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Investigations of the interaction of intense femtosecond laser with atoms and molecules have offered a new opportunity in ultrafast imaging of molecular structure and dynamics. Several imaging approaches based on intense laser-molecule interaction, \textit{e.g.}, laser-induced electron diffraction (LIED), photoelectron holograph (PH), and high-harmonic generation (HHG) spectroscopy, etc. have been proposed and achieved great successes in past decades \cite{1}. Among those approaches, LIED is of particular interesting as it provides a promising method to extract the molecular internuclear separation and to trace its evolution on sub-femtosecond timescale \cite{2}. Still, the LIED approach requires a priori knowledge of the atomic differential cross sections (DCSs) and a relatively complicated derivation in the extraction procedure. In this work, we will demonstrate a simple tomographic method to retrieve the molecular internuclear separation \cite{3}, which is based on the two-centre interference from the laser-induced rescattered electron in aligned diatomic molecules. Some advantages of our approach, compared to the well-explored LIED scheme, will be discussed.

References

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