Nondipole Time Delay and Double-Slit Interference in Tunneling Ionization

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Recently two-center interference in single-photon molecular ionization was employed to observe a zeptosecond time delay due to the photon propagation of the internuclear distance in a molecule [1]. We investigate the possibility of a comparable nondipole time delay in tunneling ionization and decode the emerged time delay signal. With the here newly developed Coulomb-corrected nondipole molecular strong-field approximation, we derive and analyze the photoelectron momentum distribution, the signature of nondipole effects, and the role of the degeneracy of the molecular orbitals. We show that the ejected electron momentum shifts and interference fringes efficiently imprint both the molecule structure and laser parameters. The corresponding nondipole time delay value significantly deviates from that in single-photon ionization. In particular, when the two-center interference in the molecule is destructive, the time delay is independent of the bond length. We also identify the double-slit interference in tunneling ionization of atoms with nonzero angular momentum *via* a nondipole momentum shift.

References

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