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Cross-Process Interference in Strong-Field Ionization: Insights from CEP-Dependent Photoelectron Spectra

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Photoelectron spectra from strong-field ionization show features like energy cutoffs and interference patterns, influenced by direct and backscattered electrons [1]. The typical cut-offs at 2⊠⊠ and 10⊠⊠ can be explained within the famous three-step model, while quantum inter- and intracycle interferences are typically associated with selfinterference of direct or backscattered, respectively [2,3]. However, also cross-process interference (CPI) between direct and backscattered electrons could reveal further insights. To isolate CPI, competing effects from self-interference must be suppressed, achievable with singlecycle laser pulses [4] that confine electron emission to a single optical period. Metallic nanotips further enhance this by restricting electron motion to one half-space, ensuring strong backscattering [5]. Quantum simulations predict CEP-dependent photoelectron spectra with distinct interference patterns. An extended trajectory model confirms these features originate from CPI, offering insights into the underlying physical mechanisms.
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