

Sub-Barrier Recollisions and the Tunnel Exit Time Delay in Strong-Field Ionization

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Tunneling ionization is characterized by a time delay, observed asymptotically as a specific shift of the photoelectron momentum distribution. This shift corresponds to a negative time delay which is caused by the interference of the sub-barrier recolliding and direct ionization paths, as laid out in [1]. While a Gedankenexperiment following the peak of the wavefunction considering only the direct ionization path shows a positive tunnelling time delay at the tunnel exit, in this paper, we investigate the effects of sub-barrier recollisions on the time delay pattern at the tunnel exit. We conclude that the interference of the direct and recolliding trajectories slightly decreases the tunneling time delay at the exit, the latter nevertheless maintaining its sizeable positive value. The relation of the variation of the exit time delay due to the sub-barrier recollisions to the asymptotic momentum shift and its dependence on the laser field are discussed.

References

- [1] M Klaiber, K Z Hatsagortsyan and C H Keitel, Phys. Rev. Lett. **120**, 013201 (2018)