Above-threshold ionization induced by combined laser and THz pulses

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When atoms are exposed to the combined laser and THz pulses, the high-energy photoelectrons with a significant yield can easily be produced [1]. The THz pulse with strength of a few-MV/cm can not induce the ionization, but it can affect the motion of the electron after liberation [2]. The influence of the THz pulse on the electron dynamics is significant when its vector potential, which governs the electron dynamics after the ionization, is comparable with the vector potential of the laser field. We use the theory based on the strong-field approximation to examine how the time delay between the THz and laser pulses affects the photoelectron yield. Also, we investigate the differences of the THz-pulse-assisted ionization for different atomic targets as well as the nondipole effects, which are significant for the THz pulse [3]. Figure 1 displays the comparison of the direct (left panel) and rescattered (right panel) photoelectron spectra obtained with and without (black solid lines) the THz pulse for an Ar atom exposed to the laser field with intensity $I = 10^{14}$ W/cm^2 and wavelength of 1030 nm. The amplitude of the THz pulse (with frequency 0.5 THz) is 0.45 MV/cm, while the time delay, in units of the laser-field period, is indicated in the legend.

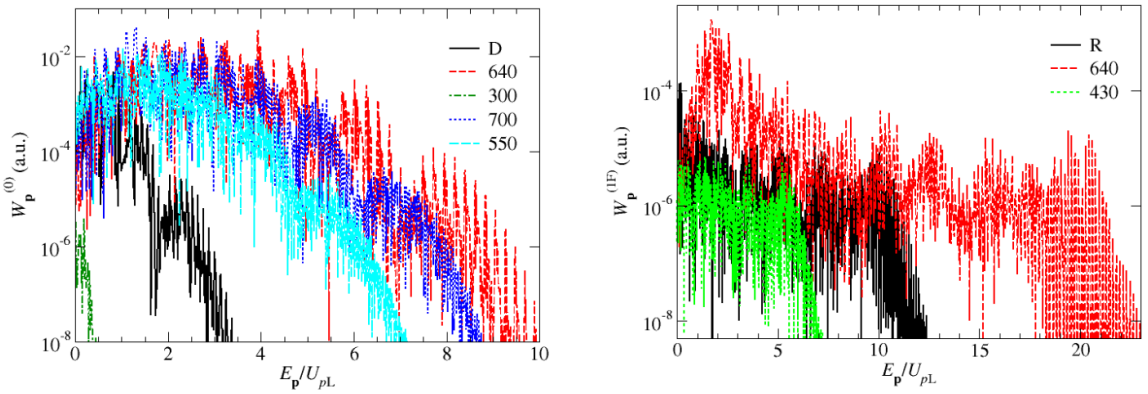

Figure 1: Comparison of the direct (left panel) and rescattered (right panel) photoelectron spectra obtained with and without (black solide lines) the THz pulse for an Ar atom exposed to a linearly polarized field.

References

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