Single attosecond pulse generation by two chirped laser pulses interaction with plasmas

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Extreme ultra-violent (XUV) and X-rays with duration of a few tens of attoseconds can be used as ideal tools to explore nonlinear ultrafast dynamical processes in atoms and molecules, such as the doubly-ionization, atomic core excitation and atto-ionization of Fano resonances processes. Such attosecond light can be produced with phase-locked high harmonics generation (HHG) by laser-matter (gas or plasma targets) interaction. For many applications, usually the generation of high-energy isolated attosecond light pulses is much more advantageous, becasue intense isloated attosecond pulses will open the door to nonlinear processes in XUV or X-ray spectra region with attosecond resolution in the perturbative domin, especially for pump-probe technologies.

Several technologies such as polarization gating, spatiotemporal gating and temporal gating, have been proposed to isolate pulses. Besides, a single attosecond pulse can be also obtained by controlling the carrier envelope phase (CEP) of a short laser pulse with a duration shorter than 5fs. However, applications of gating technologies can cause decays of attosecond light intensities and conditions of controlling CEP are too strict to be realized in experiments. Here, we propose to generate an intense attoseocnd pulse by using two laser pulses, a normal one and a chirped one, interacting with overdense plasmas. By tuning the initial phase and the linear chirp parameters, the numbers of attoseocond pulses and intensities can be controlled .

References

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