Attosecond Transient Absorption in a Strong Field

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Transient absorption is a typical time-resolved pump-probe experimental scheme that was first used to probe millisecond timescale dynamics [1]. As the laser pulses got shorter and more intense, this technic became able to probe faster phenomena. In particular, the use of High Harmonic Generation (HHG) [2] gives access to the attosecond timescale, which is the natural scale of electrons dynamics in matter. Typical attosecond transient absorption experiments use an extreme UV (XUV) pulse as a pump and either another XUV or an IR pulse as a probe [3]. In the case of an IR probe pulse, its intensity is usually of the order of 10^{12} W.cm^{-2}.

In this work, we study transient absorption of various atomic species in the gas phase using an unusually intense (10^{14} W.cm^{-2}) IR pulse (pump) and an attosecond train pulse (probe), motivated by experiments done at Laboratoire d'Optique Appliquée. We present and analyze results of numerical simulations obtained in the single-active electron approximation in 2D [4,5] to interpret this scheme as a new way to measure IR pulse durations.

References

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