

Concepts of phase, amplitude, and polarization shaping

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Femtosecond pulse shaping is a very powerful technique and was successfully applied to a variety of different systems - especially in the field of coherent control. Extending the common parameters phase and amplitude by including the parameter polarization became an emerging topic in the past few years. Since physical systems are mostly three dimensional, adding the polarization increases significantly their controllability.

We present new setups for pulse shaping which enable us to simultaneously and independently modulate the parameter phase, amplitude, and polarization [1,2,3]. We demonstrate the capabilities of these setups using systematic scans of the relevant pulse parameters and parametric example pulses [4].

Furthermore, we present the implementation in a feedback loop optimization of multi photon ionization of NaK in a molecular beam. The resulting pulse increases the ionization yield compared to a pulse without polarization modulation. The pulse form reveals the ionization dynamics including the orientation of the transition dipole moment of the participating electronic states [5].

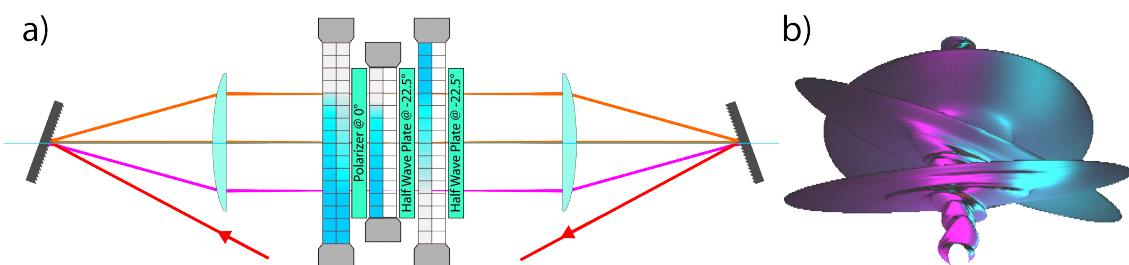


Figure (a) depicts a schematic of our latest setup [3]. It utilizes a sequence of four liquid crystal arrays for control of phase, amplitude and polarization. It is the first non-interferometric setup which is capable of unrestricted manipulation of the polarization ellipse of the electric field. In figure (b) a parametrically shaped triple pulse sequence is shown. Two linear pulses at 0° and 30° separated by 300 fs are followed by a circular one. The three dimensional picture is retrieved from measured crosscorrelation data.

References

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