DAMOP14-2014-020089

Abstract for an Invited Paper
for the DAMOP14 Meeting of
the American Physical Society

Ultrafast Rotation of Light Fields Applied to Highly Non-Linear Optics

FABIEN QUÉRÉ, CEA Saclay

Femtosecond laser beams can exhibit spatio-temporal couplings (STC), i.e. a temporal dependence of their spatial properties, or vice versa. Although these couplings have long been considered as detrimental for high-intensity and ultrafast experiments, moderate and controlled STC provide a powerful means of controlling high-intensity laser-matter interactions [1]. This talk will first explain the basics of a particular STC, where the propagation direction of laser light rotates in time on the femtosecond time scale. Laser pulses with such ultrafast wavefront rotation can be used to generate attosecond pulses of light through non-linear optical processes. We show that these pulses, periodically generated in each laser cycle, can then be emitted in spatially separated beamlets [1]. This effects provides a new type of light sources called attosecond lighthouses [1,2], and can be exploited for ultrafast measurements with femtosecond resolution, in a scheme called photonic streaking [3].

[1] Phys. Rev. Lett. 108, 113904 (2012).
[2] Nature Phot. 6, 829-833 (2012).
[3] Nature Phot. 7, 651-656 (2013).