**Novel nonlinear physics driven by ultrafast structured laser pulses**

The degree of control we have achieved over the manipulation of light is truly amazing. In particular, nowadays we can create ultrashort attosecond pulses (with durations of trillionths of a second), of very high frequencies (up to the soft X-rays), and with increasingly complex spatial structures thanks to our ability to harness their angular momentum. It’s already a decade since the first and pioneering experiments of high harmonic generation (HHG) driven by laser pulses with different angular momentum properties, which have allowed us to, for example, achieve circularly polarized attosecond pulses [1], extreme-ultraviolet (EUV) harmonic vortices with high topological charges [2], time-varying OAM pulses [3], or EUV vector-vortex beams [4].

In this talk we will review some of the works that have triggered the field of ultrafast structured EUV pulses during the last decade. We will focus not only in the ability to tailor the angular momentum properties of high harmonics and attosecond pulses, but also on how through the angular momentum of the driving beam we can harness the frequency and divergence properties of the harmonic radiation [5].

On the other hand, by harnessing ultrafast structured laser pulses, it has been recently proposed the possibility to generate intense, ultrafast magnetic pulses isolated from the electric field (yet obeying Maxwell equations!) [6]. This idea has opened the possibility to explore ultrafast magnetism induced solely by an ultrafast magnetic field. We will show that when circularly polarized magnetic pulses are irradiated into magnetic materials, the magnetization response is chiral and, most importantly, nonlinear [7]. This introduces a novel way to perform all-optical switching at femtosecond or even sub-femtosecond timescales by using moderately intense (hundreds of Tesla) magnetic field pulses. Thus, structured laser pulses offer an appealing alternative to study magnetization dynamics at the attosecond timescale, where a complete understanding of the electronic and spin interactions remains unexplored.

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