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Exploring Matter at Ultrashort Time Scales

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High-order harmonic generation (HHG) in gases and its applications is today an active field of research worldwide. High-order harmonics are created when intense laser radiation interacts with a gas of atoms or molecules. In the time domain, the emission is a train of pulses in the extreme ultraviolet range, separated by half a laser cycle and with attosecond duration. The interference between attosecond pulses results in a frequency comb of high-order (odd) harmonics. This presentation will introduce the physics and describe the present status of high-order harmonic generation and attosecond pulses.
There is today an increased diversity of HHG sources driven by a variety of lasers ranging from high energy lasers at low repetition rate to high average power lasers, based upon optical parametric amplification or simply high-power oscillators. HHG sources can be vastly different, with parameters such as peak power or repetition rate varying by several orders of magnitude. There is also a growing diversity of HHG applications spanning many areas from atomic and molecular physics to condensed matter. We will focus on the use of attosecond pulses to probe photoionization dynamics in atoms.

Primary author: Prof. L'HUILLIER, Anne (Lund University, Department of Physics)

Presenter: Prof. L'HUILLIER, Anne (Lund University, Department of Physics)

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