

HHG : from concept to application

Sophie Kazamias

Université Paris-Saclay, IJC lab, bat 200, Campus d'Orsay, 91405 Orsay Cedex

In the lecture I will first present the basic characteristics of high order harmonic generation in terms of spectral, spatial and temporal aspects and explain why this phenomenon can be used to produce an exceptional source of light.

I will then detail the theory of atomic high harmonic generation in a semi-classical approach: how an atom behaves in presence of a strong laser field, first by intuitive physicist approaches and then in the frame of the strong field approximation that allows the calculation of the nonlinear harmonic dipole in amplitude and phase.

The macroscopic approach will be necessary to understand the link between the single atom response and the harmonic source efficiency in terms of number of photons produced: I will detail the problem of phase-matching in HHG.

I will then explain why the HHG can be used to produce attosecond sources and present some famous experiments of attophysics.

As a conclusion, I will give some recent applications of HHG and modern instrumental developments of the source to show that HHG is still a very active field of research more than 30 years after its discovery.