From the generation to the temporal characterization of ultra-short XUV sources.

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For years, the development of intense ultra-short XUV sources has stimulated significant efforts towards the characterization of their temporal profile at the femtosecond to attosecond timescale, using different techniques. Among them, the laser-dressed photoionization technique has been successfully implemented with XUV/soft X-ray free-electron lasers (XFEL) [1] and with high-order harmonics (HHG) generated from gas [2]. In our thesis work, we have investigated the possibility to apply this technique to high-order harmonics generated from a plasma mirror (LIDYL-CEA Saclay) and to a plasma-based seeded XUV laser (IJC-Lab). A velocity map imaging (VMI) spectrometer is used to obtain the angular resolution of the photoelectron momenta relative to the radiation polarization axis.

For both XUV sources it was found that the contribution from longer-lived, incoherent (thermal or ASE) plasma emission is a major issue that could hinder the observation of the sought laser-dressing effect [3, 4]. We will show that the sensitivity of the angular distribution of photoelectrons to the polarization state of the ionizing pulse could be used as a method to monitor the level of unpolarized radiation (ASE or thermal emission) in seeded XUV laser pulses.

References:

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