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## An intense attosecond light source for XUV-XUV pump-probe experiments

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Short and intense extreme ultraviolet (XUV) pulses are a valuable tool to study ultrafast dynamics and non-linear processes in atomic and molecular systems. These XUV pulses can be generated by two complementary techniques, Free Electron Lasers (FELs) and High-order Harmonic Generation (HHG). The advantage of HHG is a pulse duration on the attosecond time scale, whereas, due to low conversion efficiency, the pulses are generally less intense compared to FEL sources, which makes it difficult to achieve non-linear ionization.

In order to investigate electron dynamics in molecules at the Lund Laser Centre, an intense XUV-XUV pump-probe setup has been developed. For this purpose, high-flux high-order harmonics are generated with photon energies up to 60 eV, pulse energies in the  $\mu\text{J}$  regime and pulse durations on the attosecond time scale.

The beam is focused tightly by two toroidal mirrors in a Wolter configuration [1] up to intensities sufficient to induce multiphoton processes in atoms [2] and molecules. The resulting charged fragments are detected by a double-sided Velocity Map Imaging Spectrometer (VMIS) with the ability to record the kinetic energy distribution of electrons and ions as well as the mass-to-charge spectrum for ions in a synchronized fashion [3]. Recently, a split-and-delay unit has been implemented [4], opening up the possibility to do pump-probe experiments for studying electron dynamics in molecules. Future developments include the integration of an Infrared (IR)-XUV interferometer for further pump-probe studies or molecular alignment experiments.

I will present an overview of the Intense XUV Beamline at the Lund Laser Centre including the specifications and experimental possibilities, as well as a general outlook about ongoing developments.

### References

- [1] H. Coudert-Alteirac et al., *Micro-focusing of broadband high-order harmonic radiation by a double toroidal mirror*. Appl. Sci. 7(11), 1159 (2017).
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- [4] F. Campi et al., *Design and test of a broadband split-and-delay unit for attosecond XUV-XUV pump-probe experiments*. Rev. Sci. Instrum. 87, 023106 (2016).

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