

## **Attoscience: Novel ultrafast sources and metrology for the study and control of electron dynamics**

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Attoscience, a result of relatively recent revolutions in laser technology and metrology, is the dynamical study of fundamental processes on unprecedented timescales that are critical in many areas of physics, chemistry and biology. Its emergence is predicated on the ability to generate and control few-cycle optical waveforms, intense femtosecond pulses and attosecond duration sources, as well as the means to fully characterize these sources and the electromagnetic field or photoionized electrons scattered from the systems under study. Over the past few years, we have developed methods to fully characterize the temporal [1, 2] and spatial [3] extreme ultraviolet (XUV) fields emitted from high harmonic generation (HHG) — the most common method of generating attosecond pulses — as well as techniques to study attosecond phenomenon during HHG [4, 5]. The next logical step is to implement these methods to the study of dynamical processes that occur on an attosecond time scale. Key to the realization of such experiments are developments in intense few-cycle optical and UV sources to initiate and drive the dynamics, as well as improving the efficiency HHG to produce bright XUV attosecond pulses to probe the subsequent dynamics. In this seminar, I will outline the metrological methods that we have developed and how we propose to implement these into studying and optimizing these novel sources.

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