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Coherent X-rays from Lasers: Applied Attosecond Science

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Intense, femtosecond-duration light pulses can be coherently upconverted into the extreme ultraviolet and soft x-ray region of the spectrum using the process of high-harmonic generation.[1] This process is interesting both as a table-top x-ray laser light source with very short (0.1-10 femtosecond) time duration and high coherence, and for the physics of the generation process, which is intimately linked to attosecond time-scale atomic dynamics. In this talk, I will discuss how this process works, how it can be manipulated using coherent control techniques, and will survey a number of experiments that have made use of the unique characteristics of this light source. [1] H. C. Kapteyn, M. M. Murnane, and I. P. Christov, "Extreme Nonlinear Optics: Coherent X Rays from Lasers," Physics Today, March 2005.