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High Intensity Femtosecond XUV and X-ray Pulse Interactions with Atomic Clusters

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While the dynamics of clusters exploding under the irradiation of intense near IR pulses has been well studied over the past ten years, dynamics of clusters subject to intense, femtosecond short wavelength pulses have only recently come under study. Initial results show some similarities with cluster dynamics observed in IR pulses, such as high charge state production and fast ion ejection from the exploding clusters. However, the mechanisms for these phenomena appear to be somewhat different in the short wavelength pulses. In this talk, I will present results on explosions of argon, xenon and methane clusters irradiated by XUV pulses produced by high harmonic generation at wavelengths near 30 nm and by femtosecond x-ray pulses produced by the Linac Coherent Light Source (LCLS). I will discuss the mechanisms for high charge state production and examine the effects of plasma continuum lowering on photo-ionization of the cluster atoms. I will also consider the nature of the cluster explosions comparing our results in the XUV and X-ray region with our previous results on clusters exploding in intense 800 nm pulses.