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Noble gas cluster size effect on high harmonic generation[1] ZHOU WANG, HYUNWOOK PARK, PIERRE AGOSTINI, LOUIS DIMAURO, The Ohio State University — This work focuses on understanding the physics of high harmonic generation from inert gas clusters (Neon, Argon, Krypton, Xenon). In the experiment, noble gas clusters are produced by a supersonic pulsed jet, and high harmonics from cluster-laser interaction are generated. Atom density, n_{atom}, and cluster density, $n_{cluster}$, can be controlled independently by changing the valve temperature and backing pressure, enabling us to study the cluster size effect. We observe 1) for a given cluster size, a quadratic increase of the harmonic yield versus the cluster density: $Y_{HH} \propto n_{cluster}^2$; 2) an increase of the yield with the size of the clusters, rapid up to a critical size N_t, then slower. The value of N_t is observed to shift for different noble gas clusters. We find that calculations' assuming a partially delocalized electron wave function is consistent with the observed enhanced single cluster response. The delocalization is caused by the potential from neighbor ions and electrons. In our model, the saddle point method in a 1D Lewenstein's model is used to calculate harmonic yield as a function of cluster size. The calculation result reproduces the features of single cluster response qualitatively including the shift of N_t.

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