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Interaction of Coherent VUV Radiation with Xenon Clusters

ZACHARY WALTERS, CHRIS H. GREENE, Department of Physics and JILA, University of Colorado, Boulder, ROBIN SANTRA, ITAMP, Harvard-Smithsonian Center for Astrophysics — The interaction of atomic clusters with short, intense pulses of laser light to form extremely hot, dense plasmas has attracted extensive experimental and theoretical interest. The high density of atoms within the cluster greatly enhances the atom-laser interaction, while the finite size of the cluster prevents energy from escaping the interaction region. A model of the laser-cluster interaction is presented which uses non-perturbative R-matrix techniques to calculate inverse bremsstrahlung and photoionization cross sections for Herman-Skillman atomic potentials. We describe the evolution of the cluster under the influence of the processes of inverse bremsstrahlung heating, photoionization, collisional ionization and recombination, and expansion of the cluster. Results are compared with the Hamburg experiment of Wabnitz et al [Nature **420**, 482 (2002)]. This work was supported by the Department of Energy, Office of Science.

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