Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Modeling Double Hole Dynamics in Intense Laser Produced Xenon Cluster Plasmas[1] TZVETELINA PETROVA, Naval Research Laboratory, KENNETH WHITNEY, Berkeley Research Associates, JACK DAVIS, GEORGE PETROV, Naval Research Laboratory — When femtosecond laser pulses with intensities greater than $\sim 10^{19}$W/cm^2 interact with a cluster of xenon atoms, the atoms are stripped of their N-shell electrons in less than a femtosecond and a Coulomb explosion ensues with ions initially in the ground state of Ni-like xenon. X-ray lasing at $\sim$2.86 Å has been observed in such cluster explosions [1] and gain coefficients were measured. Gains comparable to those measured have been obtained in the single hole states of Co-like xenon in an initial non-equilibrium theoretical analysis of these experiments [2]. Alternatively, x-ray amplification has also been attributed to the generation of population inversions between double and single hole states in the M-shell ions of xenon [3]. In order to investigate the viability of this possibility, we have added double hole states to the Fe-like ionization stage of our detailed ionization dynamic model of Ni-, Co-, and Fe-like xenon [2]. Results from our model calculations will be presented in this talk.
[1] A. B. Borisov, *et. al.*, J. Phys. B: At. Mol. Opt. Phys. **40** (2007) F307. [2] Tz. B. Petrova, *et. al.*, J. Phys. B: At. Mol. Opt. Phys. **43** (2010) 025601. [3] W. Andreas Schroeder, *et. al.*, J. Phys. B: At. Mol. Opt. Phys. **34** (2001) 297.

[1]Work supported by DoE/NNSA and NRL.

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Date submitted: 07 Jul 2010 Electronic form version 1.4