Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Anisotropic third-harmonic plasmonic resonances in expanding nanoclusters XIAOMING WANG, XIAOHUI GAO, BONGGU SHIM, ALEXEY AREFIEV, BORIS BREIZMAN, MIKE DOWNER, University of Texas at Austin
— We present experiments showing that optical third-harmonic generation (THG) from expanding argon nanoclusters by time-delayed 80 fs probe pulses exhibits strong transient polarization anisotropy for several hundred femtoseconds after cluster ionization and heating by a linearly polarized pump, even though linear optical properties remain isotropic. We then theoretically model THG anisotropy by extending our previous model of cluster nonlinear response as a collective probe-driven oscillation of a cold electron core in the potential of a positive ion background of nonuniform density [1] to the case of arbitrary relative polarizations of the pump and probe. The anisotropy of THG is determined only by the angular dependence of the ion density nonuniformity and not by the entire ion density profile. Consequently, even a weak anisotropy of the ion density nonuniformity, that would not alter the isotropic linear optical properties of the cluster, can produce the observed two-fold stronger THG with perpendicular, compared to parallel, pump-probe polarizations. [1] M. V. Fomyts'kyi et al., Phys. Plasmas 11, 3349 (2004).

Michael Downer
University of Texas at Austin

Date submitted: 15 Jul 2008 Electronic form version 1.4