Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Molecular Ionization at High Intensities: Characterizing OPA Laser Pulses[1] COLLIN MCACY, University of Nebraska-Lincoln, RYAN KARNEMAAT, Rose-Hulman Institute of Technology, SKYLER MARSH, Southeast Missouri State University, DAVID FOOTE, CORNELIS UITERWAAL, University of Nebraska-Lincoln — Ultrashort laser pulses have long been the primary instruments of probing and analyzing intense-field molecular dynamics on femtosecond timescales. In particular, processes involving resonance-enhanced multiphoton ionization (REMPI) have provided insight into ionization and dissociation dynamics. Typically the scope of REMPI is limited by the laser properties; namely, REMPI is limited by the transition energies accessible by an integer number of photons. However, the ability to tune the energies of these photons adds flexibility to the available resonances and, for longer wavelengths, makes tunneling the dominant ionization process. Optical parametric amplification (OPA) provides these changes, but the nonlinear processes required for OPA could have complicating effects on pulse duration and focusability, distorting beam quality and compromising experiments. We present the parametric amplification of 800-nm, 50-fs laser pulses in a TOPAS-C system: we use autocorrelation, power measurements, and knife-edging techniques to determine output pulse duration, intensity, and focal characteristics as a function of wavelength. We also report on the effects such changes will have on the practicality of various techniques requiring high-intensity processes.

[1]This material is based upon work supported by the National Science Foundation under Grant No. PHY-0355235.

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Date submitted: 27 Jan 2012 Electronic form version 1.4