

Abstract Submitted  
for the DAMOP05 Meeting of  
The American Physical Society

**Spectral Modulation by Rotational Wave Packets** MARK BAERTSCHY, University of Colorado at Denver, KLAUS HARTINGER, OMID MASSIHZADEH, RANDY BARTELS, Colorado State University — Periodic rephasing of molecular rotational wave packets can create rapid fluctuations in the optical properties of a molecular gas which can be used to manipulate the temporal phase and spectral content of ultrashort light pulses. We have demonstrated spectral control of a time-delayed ultrafast probe pulse propagating through the rotational wave packet prepared by a pump laser pulse. The spectrum of the probe pulse can be either broadened or compressed, depending on the relative sign of the temporal phase modulation and the initial chirp of the probe pulse. Adjustment of the spectral phase at the output of the interaction region allows controlled temporal pulse stretching<sup>1</sup> and compression<sup>2</sup>. The degree to which the spectrum of an ultrafast pulse can be modified depends on the strength and shape of the rotational wavepacket. We are studying the optimization of the rotational wave packet excitation with complex, shaped pump laser pulses for the purpose of optimizing probe pulse spectra modulation. <sup>1</sup> Klaus Hartinger and Randy A. Bartels, *Opt. Lett.*, submitted (2005). <sup>2</sup> R.A. Bartels, T.C. Weinacht, N. Wagner, M. Baertschy, Chris H. Greene, M.M. Murnane, and H.C. Kapteyn, *Phys. Rev. Lett.*, **88**, 013903 (2002). **This work was supported by the NSF.**

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Date submitted: 28 Jan 2005

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