Abstract Submitted
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A Two-Atom Relaxation-Theory Approach to Understanding Non-Markovian Dynamics in Dense Atomic Gases[1] JOSH W. DUNN, CHRIS H. GREENE, Department of Physics and JILA, University of Colorado, Boulder, CO 80309-0440 — Relaxation theory, based on detailed treatment of atomic scattering, has in the past provided an elegant formalism [1] and yielded accurate predictions of experimental collisional-broadening data [2]. Recent experiments have utilized sophisticated transient four-wave-mixing techniques to probe interactions in dense atomic gases, and the use of fast lasers to create probe pulses allows for atomic collisions to be explored on a timescale shorter than the dephasing time of the gas [3]. We present a theoretical description of such phenomena that extends the relaxation-theory treatments beyond the regime of static collision broadening to the incorporate dynamical effects of transient photon-echo pulses. Beginning with a realistic description of two-atom scattering, we are able to calculate the nonlinear response function for the system, a quantity which can be compared with experimental photon-echo data. [1] U. Fano, Phys. Rev. **131**, 259 (1963). [2] A. Ben-Reuven, Phys. Rev. **145**, 7 (1966). [3] V. O. Lorenz and S. T. Cundiff, Phys. Rev. Lett **95**, 163001 (2005).

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