Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Theory of Coherent Anti-Stokes Raman Scattering Taking into Account Propagation Effects ALEXANDER QUINN, SVETLANA MALINOVSKAYA, Stevens Institute of Technology, ULTRAFAST DYNAMICS AND CONTROL THEORY GROUP TEAM[1] — Inelastic scattering of light in a material causes electrons to jump from one state to another. When three different frequencies of laser light are guided into a material, light emitted from the material is coherent. This "anti-Stokes" emission frequency is equal to the frequencies of the "pump" and "probe" beams minus that of the "Stokes" beam. The population of electrons in a given state changes in a relationship proportional to the lasers' applied electric fields. Our research focuses on finding general solutions of semiclassical differential equations for the fields coupled to the Liouville-von Neumann equation that describes dynamics in a molecular system in coherent anti-Stokes Raman scattering. Different approximations are used to determine the rate of change of population in vibrational states. For the case of a large one-photon detuning, the adiabatic elimination, which sets the time derivative of the excited state(s) equal to 0, is applied. We also invoke the rotating-wave approximation, which neglects rapidly-oscillating terms of order exp(-2i*omega*t).

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Date submitted: 27 Jan 2011 Electronic form version 1.4