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Title:Analytical description of the Stokes coherent cooperative Raman scattering by a subwavelength sample

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Abstract:The present article is aimed at an analytical description of Stokes coherent cooperative Raman scattering by three-level quantum systems confined in a ball with a diameter much smaller than the Stokes wavelength. It is shown that if the pump electric field is strong enough to neglect the influence of the ball self-radiation on the dynamic of the ground to the second excited state transition, then the inverse pump Rabi frequency is much smaller than the duration of the radiated Stokes pulse. It is found that in this case and under the assumption of a resonant pump the problem has an analytical solution. The latter demonstrates that the emitted Stokes pulse has a time-profile two times lower and longer than that of a superadiant pulse from a subwavelength sample of initially fully inverted two-level systems. The obtained analytical solution may be used, e.g. for testing the fidelity of numerical models of coherent cooperative Raman scattering in the limiting domain of parameters where it is valid. © 2012 Copyright Taylor and Francis Group, LLC.

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