Slow light produced by far-off-resonance Raman scattering

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Abstract: The authors survey the theoretical and experimental aspects of generation of slow light in a far-off-resonance Raman medium driven by a strong coupling field. When material dispersion is negligible, the propagation of two coupled sidebands can be described in terms of two normal modes that propagate independently at different group velocities, one at the vacuum speed of light and one at a reduced velocity. They use solid hydrogen as a Raman medium to demonstrate the generation of slow light. The numerical calculations and experimental observations show that, due to high density, narrow Raman width, and small two-photon detuning, far-off-resonance Raman scattering in solid hydrogen can slow down the pulse-peak velocity of the Stokes and anti-Stokes fields to the order of c/10 000. This velocity reduction affects the amplitudes of the Stokes and anti-Stokes fields via the beating between the normal modes. The double-peak structure observed in the intensity temporal profiles of the sideband fields is a signature of the splitting of the copropagating normal modes.

Author Keywords: Off resonance; Slow light; Solid hydrogen; Stimulated Raman scattering

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