Production of coherence of a nonallowed transition in the stationary regime of a Raman scattering process

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Abstract: We study the generation of coherence of a nonallowed transition by a Raman scattering process in a three-level system. We present analytical and numerical solutions of the density-matrix equations in steady state. We study the conditions for maximizing the coherence. We find that, when the system is far off resonance and the fields and the coupling are not too strong, the problem of coherence in the three-level system reduces to that in an effective two-level model, and the maximal coherence generated in steady state is limited by the steady-state two-level-model value ?1/(2??2). We show that when the amplitudes of the fields are sufficiently high that the system is far beyond the strong-coupling regime, the coherence of the nonallowed transition can reach its stationary maximum value -1/2. We study the difference between the wave-vector shifts of the two fields, and examine the possibility of stationary induced transparency and matched pulses. ?? 1999 The American Physical Society.

Index Keywords: Lasers; Magnetic susceptibility; Problem solving; Quantum theory; Resonance; Wave interference; Electric dipole; Laser fields; Maximal coherence; Quantum coherence; Raman scattering

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