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Steady-state Behaviors of a Quantum Oscillator Coupled with a Three-level Emitter

A. Mirzac and M. A. Macovei

Institute of Applied Physics, Chişinău, Republic of Moldova

A laser-pumped three-level Λ -type system the upper state of which is being coupled with a quantum oscillator characterized by a single quantized leaking mode has been investigated. Two distinct situations leading to lasing effects of the quantum oscillator's degrees of freedom have been identified and the mechanisms behind them have been described. Particularly, the interplay between single- or two-quanta processes accompanied by quantum interference effects among the induced emitter's dressed-states responsible for flexible lasing effects has been proved, respectively.