

Two-mode laser with atoms injected in a superposition of their states

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Abstract: The master equation for the field in the two-mode laser with atoms injected in a superposition of their states is presented, and lasing without population inversion is studied from this vantage. An explicit expression for the steady-state photon distribution is derived under the conditions of detailed balance and no injected coherence. We study the photon statistics, as well as the decay of off-diagonal density-matrix elements and the linewidths of the two laser modes. The effect of an injected atomic coherence on the amplification of light is examined. It is shown that the interference terms in the master equation cancel the absorption terms if the field in each mode is in a coherent state and the conditions for atomic trapping are fulfilled. Numerical calculations demonstrate the buildup of lasing without inversion from the vacuum state of the field. © 1995 The American Physical Society.

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