Enhancing photon generation in cavity through antiresonant terms of the vacuum Rabi coupling

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Abstract
The Rabi model describes the simplest interaction between a two-level system and a bosonic mode beyond the rotating wave approximation. The antiresonant terms that result from this coherent interaction play an important role. In this paper, we go beyond the rotating wave approximation even for the interaction with vacuum. This leads to the 'incoherent' antiresonant terms. Using the master equation which includes both coherent and incoherent antiresonant terms, we numerically compute the mean photon number and show that these incoherent antiresonant terms enhance the generation of mean photon number. Moreover we study numerically the effect of the detuning and show that it also enhances the generation of photons. Finally, we generalize our result to two two-level and two-mode systems.

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