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Investigation of entanglement of atomic systems near coherent perfect absorber materials

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Abstract

Recently, coherent perfect absorbers have received much attention from researchers in the field of classical optics. Such absorbers, known as a time-reversal of lasers, provide perfect absorption of the incident light. Considering the very attractive features of these materials, in this paper, we investigate the quantum optics of these materials. To do this, we consider two coherent perfect absorber structures and assume two identical two-level atoms; one of which is prepared in its ground state and the other in the excited state, are placed on both sides of the coherent perfect absorber slabs. We compute the spontaneous emission rate, Lamb shift, and collective decay of atoms near two slabs, and then investigate the entanglement dynamics of the atomic system using the concurrence. We find that these parameters exhibit a damped oscillatory behavior with increasing the distance between the atoms and the slabs. In contrast to the classical regime, we also observe that these structures are not the perfect absorbers in the quantum regime.

Keywords: coherent perfect absorber, Green tensor, collective decay rate, entanglement

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