Non-Hermitian Anharmonicity Induces Single-Photon Emission

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Single-photon sources are in high demand for quantum information applications [1]. In this work, we theoretically propose a novel mechanism for generating single-photon emission, incorporating cavity modes with different losses. In contrast to the well-known photon blockade mechanism [2], which operates in the strong coupling regime of cavity QED systems and relies on anharmonicity in the energy levels, our proposed mechanism [3] does not require strong coupling. Instead, it relies on nonlinearity in loss, linked to the anharmonicity of non-Hermitian energies, that can be engineered within the weak coupling regime. We theoretically demonstrate this mechanism in the feasible setup of hybrid metallodielectric cavity weakly coupled to a two-level emitter, showcasing its potential for achieving high-purity single-photon emission at high repetition rates [3].

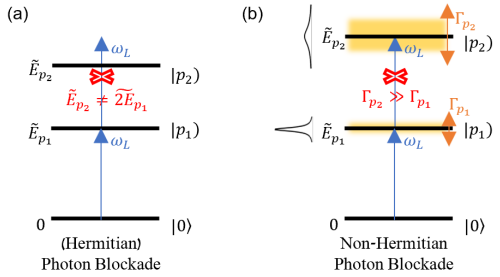

Fig. 1: The two mechanisms for photon blockade: (a) the well-known (Hermitian) mechanism and (b) the novel non-Hermitian mechanism.

References

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