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Strong single-qubit lasing and cooling at the symmetry point?
CARSTEN HUTTER, Stockholm University — Recent theoretical and experimental work discussed the possibility to achieve single-qubit lasing and cooling in systems of driven superconducting qubits coupled to an oscillator. The considered system and Hamiltonian in Refs. [1,2] were such that a first-order coupling term vanishes at the symmetry point. While Ref. [2] operated close to the symmetry point for using both first and second order coupling terms, another interesting regime would be the one with the opposing conditions of lowest dephasing (at the symmetry point) and strongest coupling (far away from the symmetry point).
Here, I address the question whether it is possible by different design to achieve single-qubit lasing or cooling with both strongest coupling and lowest dephasing, without compromising between the two. Starting from a more general model Hamiltonian than Refs. [1,2], I find the optimal conditions for a strong first order coupling at the symmetry point, realized by a different Hamiltonian than the one used in Refs. [1,2]. I also suggest first designs, which could realize this alternative model Hamiltonian, and discuss their practical limitations.
[1] J. Hauss, A. Fedorov, C. Hutter, A. Shnirman, G. Schön, Phys. Rev. Lett. 100, 037003 (2008)
[2] M. Grajcar et al, Nature Physics 4, 612 (2008)

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