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Dipole to quadrupole interactions in a transmon qubit: Purcell protection and tunable coupling JAY GAMBETTA, Institute for Quantum Computing, ALEXANDRE BLAIS, Université de Sherbrooke, LEV BISHOP, DAVID SCHUSTER, Yale University — In a recent experiment Houck et al [Phys. Rev. Lett. 101, 080502 (2008)] showed that the major source of decoherence in the transmon qubit was relaxation through the resonator. This relaxation is known as the Purcell effect and arises from the dipole interaction between the transmon qubit and the resonator's electromagnetic field. In this talk I will present a modification of the transmon qubit that allows us to tune the transmon-resonator interaction from dipole to quadrupole, and hence turn the Purcell effect off with surprisingly little effect on the control and measurement.

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