Abstract Submitted
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Purcell protection with strong measurability in a longitudinally coupled three-qubit system[1] SUMERU HAZRA, SUMAN KUNDU, TANAY ROY, MADHAVI CHAND, MEGHAN P. PATANKAR, R. VIJAY, Tata Institute of Fundamental Research, Mumbai 400005 — The standard dispersive readout technique in circuit-QED introduces a channel of relaxation via the measurement cavity due to the Purcell effect. Detuning the qubit from the cavity to suppress Purcell decay reduces the dispersive shift while Purcell filters require additional microwave circuitry. We propose a novel multi-qubit circuit, the "trimon", where three coupled anharmonic oscillator modes behave as three longitudinally coupled qubits in the 3D circuit-QED architecture. One dipolar mode is coupled to the cavity directly whereas the other orthogonal dipolar mode and the quadrupolar mode are ideally uncoupled from the resonator and hence Purcell protected. The directly coupled qubit leads to the standard dispersive shift on the cavity while the uncoupled qubits show dispersive shifts via the inter-qubit longitudinal coupling. We will demonstrate the Purcell protection of the uncoupled qubits when the coupled qubit is tuned very close to the resonator frequency for strong dispersive shift. Finally, we will discuss the potential of this device as an "ideal qubit" to replace the standard transmon qubits in many applications. Reference: arXiv:1610.07915.

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