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Implementation of longitudinal qubit-ancilla coupling: a 3D V-shaped transmon R. DASSONNEVILLE, J. PUERTAS, L. PLANAT, F. FOROUGHI, Y. KRUPKO, C. NAUD, W. GUICHARD, N. ROCH, O. BUISSON, University Grenoble Alpes, CNRS — Despite important progresses in recent years, implementing a fast and high fidelity readout remains a major challenge in cQED. Indeed, inferring a qubit state is limited by the trade-off between speed and accuracy due to Purcell effect. To overcome this, we introduce a superconducting V-shaped artificial atom coupled to a 3D-cavity. This atom is made of two transmons coupled via a large inductance [1]. The resulting circuit presents two modes – called qubit and ancilla – showing a strong longitudinal coupling. Using symmetry rules [2], the ancilla can be strongly coupled to the cavity while the qubit remains unspoiled by the Purcell effect. However due to their strong longitudinal coupling, the qubit can still be inferred through the ancilla state. We will present spectroscopic evidences of the V-shape nature of our 3D circuit and its qubit-ancilla longitudinal coupling. Time domain measurements reveal relaxation and coherence times on par with other 3D architectures. Moreover our approach promises a QND readout with fidelity as high as 99.9% for a measurement time down to 60 ns [3].
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