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Long-lived 3D c-shunt flux qubit and its possible applications.

In this talk, I will describe an experimental realization of a capacitively shunted flux qubit embedded in a 3D microwave cavity. The 3D c-shunt flux qubit (3D CSFQ) demonstrates excellent energy-relaxation times T1 in the range 60-90 μs [1] and spin-echo dephasing times T2 up to 100 μs at the optimal flux bias [1,2]. Such long-lived flux-tunable qubits have potential applications in various quantum technologies. For example, a 3D CSFQ can be coupled to a two-level-system (TLS) defect via a spin-locking pulse sequence [2]. Potentially, a similar technique can be used to couple a qubit to an NV center in diamond which can be employed for coherent microwave-to-optical conversion. Other possible applications of 3D CSFQs include bosonic quantum computing.

[1] L.V. Abdurakhimov et al., Appl. Phys. Lett. 115, 262601 (2019).

[2] L.V. Abdurakhimov et al., Phys. Rev. B 102, 100502(R) (2020).