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M3Or2C-02 [Invited]: Towards a Fluxonium Quantum Processor

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Fluxonium is a multi-level superconducting artificial atom. Its rich spectrum and selection rules provide promising solutions to standing problems in quantum computing such as low coherence and spectral crowding. In this talk, we describe our progress towards constructing a quantum processor based on fluxonium qubits. More specifically, our current focus is to experimentally realize a microwave-activated two-qubit gate with capacitively coupled fluxoniums. When biased at the flux sweet-spot, the individual qubits have frequencies around 500 MHz and reproducibly reach long coherence times in excess of 100 us (the best device had T2 > 300 us) [1]. A c-Phase gate can be achieved by sending a short 2π-pulse at the frequency near the $1 \longrightarrow 2$ transition of the target qubit [2]. Our work includes characterization of coherence and parameter fluctuations in multi-qubit chips, modeling and experimentally validating the two-qubit interactions, optimizing the joint readout, and benchmarking of the gate operations.

[1] Nguyen et al., arXiv preprint arXiv:1810.11006v1 (2018)
[2] Nesterov et al., Phys. Rev. A 98, 030301 (2018)

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