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Fluxonium qubit readout with the Josephson parametric converter¹ M. HATRIDGE, B. ABDO, A. KAMAL, N. MASLUK, F. SCHACKERT, M.H. DEVORET, Applied Physics Dept., Yale University — Rapid, single shot quantum-non demolition readout is a prerequisite for proposed active quantum feedback and error correction experiments in superconducting qubit systems. The fluxonium qubit, an artificial atom comprised of a Josephson junction array inductively shunting a Cooper-pair box, is a non-Purcell limited system with excellent coherence times, making it a natural candidate for such experiments. The largest obstacle towards achieving single shot fluxonium readout is the severe signal-to-noise ratio degradation of the qubit readout by the microwave frequency amplification chain. This degradation can be minimized through the addition of a quantum-limited pre-amplifier to the chain. We have designed and constructed such an amplifier, the Josephson Parametric Converter (JPC), which achieves nearly quantum limited amplification with a bandwidth and dynamic range suitable for readout of our current fluxonium design, and are currently integrating the JPC and fluxonium. We will discuss experimental requirements of the combined JPC and fluxonium system and anticipated improvements in measurement fidelity and speed.

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