Progress towards a metastable superconducting qubit\textsuperscript{1} ANDREW KERMAN, WILLIAM OLIVER, VLADIMIR BOLKHOVSKY, MARK GOUKER, MIT Lincoln Laboratory — We will report on progress towards the demonstration of a metastable RF SQUID (MRFS) qubit, which has the potential to exhibit excited-state lifetimes many orders of magnitude longer than present-day superconducting qubits, while retaining long enough coherence times to allow gate error rates as low as $\sim 10^{-5}$. These properties result from the two main characteristics of the MRFS qubit: (i) its two lowest levels are essentially macroscopically distinct persistent-current states, which can be strongly decoupled from high-frequency electromagnetic fluctuations (in contrast to most superconducting qubits whose levels are approximately those of a nonlinear LC oscillator and are thus strongly coupled); and (ii) its extremely large inductance makes it only weakly sensitive to low-frequency magnetic flux noise.

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