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Towards Coupling Neutral Atoms to a Superconducting Resonator at 20 mK[1] J.A. GROVER, J.E. HOFFMAN, Z. KIM, K.D. VOIGT, A.K. WOOD, J.R. ANDERSON, A.J. DRAGT, M. HAFEZI, C.J. LOBB, L.A. OROZCO, S.L. ROLSTON, J.M. TAYLOR, C.P. VLAHACOS, F.C. WELLSTOOD, Joint Quantum Institute, Dept. of Physics, UMD and NIST, College Park, MD 20742, USA, P. SOLANO, Center for Optics and Photonics, Universidad de Concepción, Casilla 160-C, Concepción, Chile — Recent proposals in quantum computing center on the creation of hybrid quantum processors. Here we report progress on an experiment to couple an ensemble of ^{87}Rb atoms to a superconducting, thin-film LC resonator at 20 mK through a magnetic dipole transition. We have demonstrated tuning of the LC resonator to within 2 kHz of the 6.8GHz hyperfine splitting of ^{87}Rb. The next step is to trap the atoms around a sub-wavelength optical fiber using a two-color, evanescent wave dipole trap. This will allow us to bring the atoms less than 10 μm above the surface of the superconductor without producing excessive heating. We seek to provide proof of principle for interfacing a stable quantum memory, the ^{87}Rb atoms, to superconducting qubits.

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