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**Development of a high-Q superconducting microwave resonator for coupling to trapped laser-cooled atoms**[1] JARED HERTZBERG, KRISTEN VOIGT, ZAEILL KIM, JONATHAN HOFFMAN, JEFF GROVER, JONGMIN LEE, PABLO SOLANO, Joint Quantum Institute, University of Maryland, RANGGA BUDOYO, CODY BALLARD, JAMES ANDERSON, Physics Department, University of Maryland, CHRIS LOBB, LUIS OROZCO, STEVEN ROLSTON, FREDERICK WELLSTOOD, Joint Quantum Institute, University of Maryland — We present progress towards a hybrid quantum system in which microwave quanta may be exchanged between a superconducting qubit and laser-trapped atoms via a magnetic dipole interaction. In initial experiments, we seek to couple a thin-film superconducting LC resonator cooled to 20 mK to the 6.835 GHz hyperfine splitting in an ensemble of optically trapped 87Rb atoms.[1] The atoms will be trapped in the evanescent optical field on the waist of a tapered 500-nm-diameter optical fiber which is moved to within a few microns of the inductor in the LC resonator. Rayleigh scattered light from defects in the optical fiber will impinge on the superconducting device. We describe the resulting effects of absorbed photons and how to minimize optical effects as well as results on positioning the resonator relative to the optical fiber within a dilution refrigerator. [1] Z. Kim et al., AIP ADVANCES 1, 042107 (2011).

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