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Optimized Shielding and Fabrication Techniques for TiN and Al Microwave Resonators[1] JOHN MARK KREIKEBAUM, EUNSEONG KIM, WILLIAM LIVINGSTON, ALLISON DOVE, Univ of California - Berkeley, GREGORY CALUSINE, DAVID HOVER, DANNA ROSENBERG, WILLIAM OLIVER, MIT Lincoln Laboratory, IRFAN SIDDIQI, Univ of California - Berkeley — We present a systematic study of the effects of shielding and packaging on the internal quality factor (Q_i) of Al and TiN microwave resonators designed for use in qubit readout. Surprisingly, Q_i =1.3x10^6 TiN samples investigated at 100 mK exhibited no significant changes in linewidth when operated without magnetic shielding and in an open cryo-package. In contrast, Al resonators showed systematic improvement in Q_i with each successive shield. Measurements were performed in an adiabatic demagnetization refrigerator, where typical ambient fields of 0.2 mT are present at the sample stage. We discuss the effect of 100 mK and 500 mK Cu radiation shields and cryoperm magnetic shielding on resonator Q as a function of temperature and input power in samples prepared with a variety of surface treatments, fabrication recipes, and embedding circuits.

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