Abstract Submitted
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**Cryogenic RF filters with zero DC resistance** HENDRIK BLUHM, KATHRYN A. MOLER, Stanford University — We present a design for cryogenic RF filters with zero DC resistance, based on wires with a superconducting core and a resistive sheath. The superconducting core allows low frequency currents to pass with negligible dissipation. Signals above the cutoff frequency are dissipated in the resistive part due to their small skin depth. The filters consist of twisted pairs shielded with copper tape [1]. Above approximately 1 GHz, the attenuation is exponential in $\sqrt{\omega}$, as typical for skin depth based RF filters. This mimics the exponential quantum cutoff above $f = k_B T/h \approx 200 MHz$ in a 10 mK black body spectrum. By using additional capacitors of 10 nF per line, an attenuation of at least 45 dB above 15 MHz, (the timescale relevant for dephasing in metals) can be obtained. Thus one single stage at mixing chamber temperature in a dilution refrigerator is sufficient to attenuate room temperature black body radiation to levels corresponding to 10 mK above about 15 MHz.

1. Lafe Spietz, John Teufel, and R. J. Schoelkopf. Submitted to RSI Sep 20, 2004

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