

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Ultralow Noise Microwave Amplifier Based on the Superconducting Low-inductance Undulatory Galvanometer SHAOJIANG ZHU, DAVID HOVER, GUILHEM RIBEILL, ROBERT MCDERMOTT, University of Wisconsin, Madison — We have developed an ultralow noise microwave linear amplifier based on the Superconducting Low-inductance Undulatory Galvanometer (SLUG). The compact SLUG element is straightforward to model at microwave frequencies, allowing separate optimization of the SLUG element and the resonant input matching network. SLUG amplifiers incorporating high-Jc junctions have shown gains of order 15 dB in the frequency range from 3-10 GHz with instantaneous bandwidth up to several hundred MHz. Large-volume normal metal cooling fins have been integrated into the SLUG element to promote thermalization of hot electrons in the resistive shunts at millikelvin temperatures, and the amplifiers have achieved added system noise of one photon in the GHz frequency range. We discuss application of the SLUG amplifier to single shot dispersive readout of the transmon qubit.

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Date submitted: 09 Nov 2012

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