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Noise and Directionality in a SLUG Microwave Amplifier for Superconducting Qubit Readout TED THORBECK, SHAOJIANG ZHU, EDWARD LEONARD, ROBERT MCDERMOTT, University of Wisconsin — Josephson parametric amplifiers have been widely used for low-noise dispersive readout of superconducting qubits. However, multiple stages of cryogenic isolation are required to protect the qubit from the strong microwave pump tone and from the high temperature noise of downstream gain stages. We want to remove circulators and isolators from the measurement chain because they are bulky, expensive, and magnetic. The SLUG (superconducting low-inductance undulatory galvanometer) is a microwave amplifier that achieves broad bandwidth, low added noise, and high gain. In this talk we discuss measurements of the SLUG added noise (less than photon system added noise). We describe theoretical and experimental investigations of the SLUG reverse isolation. Finally, we discuss backaction of the SLUG on the measured qubit, and we present strategies for the suppression of SLUG backaction.

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