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SLUG Microwave Amplifier as a Nonreciprocal Gain Element for Scalable Qubit Readout TED THORBECK, EDWARD LEONARD, SHAO-JIANG ZHU, ROBERT MCDERMOTT, University of Wisconsin - Madison — Josephson parametric amplifiers for superconducting qubits require several stages of cryogenic isolation to protect the qubit from strong microwave pump tones and downstream noise. But isolators and circulators are large, expensive and magnetic, so they are an obstacle to scaling up a superconducting quantum computer. In contrast, the SLUG (Superconducting Low-inductance Undulatory Galvanometer) is a high gain, broadband, low noise microwave amplifier that provides built-in reverse isolation. Here, we describe the dependence of the SLUG reverse isolation on signal frequency and device operating point. We show that the reverse isolation of the SLUG can be as large as or larger than that of a bulk commercial isolator. Finally, we discuss the use of the SLUG to read out a transmon qubit without isolators or circulators.

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