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Comparing SiGe HBT Amplifier Circuits for Fast Single-shot Spin Readout TROY ENGLAND, Sandia National Labs, MATTHEW CURRY, University of New Mexico/Sandia National Labs, STEPHEN CARR, ANDREW MOUNCE, RYAN JOCK, PETER SHARMA, Sandia National Labs, CHLOE BUREAU-OXTON, University of Sherbrooke/Sandia National Labs, MARTIN RUDOLPH, TERRY HARDIN, MALCOLM CARROLL, Sandia National Labs — Fast, low-power quantum state readout is one of many challenges facing quantum information processing. Single electron transistors (SETs) are potentially fast, sensitive detectors for performing spin readout. From a circuit perspective, however, their output impedance and nonlinear conductance are ill suited to drive the parasitic capacitance of coaxial conductors used in cryogenic environments, necessitating a cryogenic amplification stage. We will compare two amplifiers based on single-transistor circuits implemented with silicon germanium heterojunction bipolar transistors. Both amplifiers provide gain at low power levels, but the dynamics of each circuit vary significantly. We will explore the gain mechanisms, linearity, and noise of each circuit and explain the situations in which each amplifier is best used. This work was performed, in part, at the Center for Integrated Nanotechnologies, a U.S. DOE Office of Basic Energy Sciences user facility. Sandia National Laboratories is a multi-program laboratory operated by Sandia Corporation, a Lockheed-Martin Company, for the U. S. Department of Energy under Contract No. DE-AC04-94AL85000.

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