

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Cryogenic CMOS circuits for single charge digital readout¹ KEVIN ENG, T. M. GURRIERI, J. HAMLET, M. S. CARROLL, Sandia National Laboratory — The readout of a solid state qubit often relies on single charge sensitive electrometry. However the combination of fast and accurate measurements is non trivial due to large RC time constants due to the electrometers resistance and shunt capacitance from wires between the cold stage and room temperature. Currently fast sensitive measurements are accomplished through rf reflectometry. I will present an alternative single charge readout technique based on cryogenic CMOS circuits in hopes to improve speed, signal-to-noise, power consumption and simplicity in implementation. The readout circuit is based on a current comparator where changes in current from an electrometer will trigger a digital output. These circuits were fabricated using Sandia's $0.35\mu\text{m}$ CMOS foundry process. Initial measurements of comparators with an addition a current amplifier have displayed current sensitivities of $< 1\text{nA}$ at 4.2K , switching speeds up to $\sim 120\text{ns}$, while consuming $\sim 10\mu\text{W}$. I will also discuss an investigation of noise characterization of our CMOS process in hopes to obtain a better understanding of the ultimate limit in signal to noise performance.

¹Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed-Martin Company, for the U. S. DOE under Contract No. DE-AC04-94AL85000.

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Date submitted: 20 Nov 2009

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