Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Isolating Electrons on the Surface of Superfluid Helium MAIKA TAKITA, C. SPENCER NICHOLS, STEPHEN LYON, Department of Electrical Engineering, Princeton University, Princeton, NJ 08544 — Electrons on helium have been suggested as promising mobile spin qubits. Electrons floating on the surface of superfluid helium can be transferred extremely efficiently in narrow channels with underlying gates. The channels are filled with superfluid helium by capillary action and electrons on the surface can be clocked over a billion pixels in a 3-phase charge coupled device (CCD) without any detectable transfer errors. To use electrons as qubits, we need to reliably obtain a single electron per pixel. We demonstrate an electron turnstile operating across 78 parallel channels for isolating electrons. First, electrons are accumulated over wide 2.3um channels and clocked using the CCD gates into the narrow 0.8um wide turnstile regions. When large packets of electrons are clocked from the wide channels through the narrow regions, the number of electrons per pixel decreases. Using the narrow underlying gates in the turnstile region, the electron packets are repeatedly split. We find a plateau in the electron signal as a function of the applied gate voltages indicating a quantized number of electrons per pixel in each of the 78 parallel channels.

Maika Takita
Department of Electrical Engineering,
Princeton University, Princeton, NJ 08544

Date submitted: 14 Nov 2014 Electronic form version 1.4