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**Clocked electron transport across surface of superfluid helium: Towards single electron control**

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Date/Time: Tue 26 Aug 2014, 14:00 – 15:00

Venue: Meeting Room C016, Level C, Lab 1

Title: Clocked electron transport across surface of superfluid helium:

Towards single electron control

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Electrons floating on the surface of superfluid helium have been suggested as promising mobile spin qubits.  We have demonstrated transferring electrons extremely efficiently in a narrow channel structure with underlying gates, showing no transfer error while clocking 10^9 pixels in a 3-phase charge coupled device (CCD)[1]. On average, one electron per channel was clocked, but to reliably obtain a single electron per channel we have designed an electron turnstile operating across 77 parallel channels. The turnstile will ideally permit a single electron to pass through while clocking electrons. In our device electrons are first accumulated over wide 2.3μm channels, and can subsequently be clocked using the CCD gates into narrow 0.8μm wide channels. The large number of electrons per pixel in the wide channels reduces to a smaller number per pixel after clocking through the narrow channels. Initially, we find that more than one electron can be held on the small pixels. Underlying gates in the turnstile region allow us to repeatedly split these electron packets. We find a plateau in the electron signal as a function of the applied gate voltages indicating quantized number of electrons per pixel occupation across the 77 parallel channels.

[1] F.R. Bradbury *et al.*, Phys. Rev. Lett. **107**, 266803 (2011)

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