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Electron Tunneling in a High Impedance Environment. M.A. CASTELLANOS-BELTRAN, K.W. LEHNERT, JILA, National Institute of Standards and Technology and the University of Colorado. Boulder, CO. 80309-0440, USA. — Discreteness of charge is a characteristic not usually perceived in regular electric circuits because electrons form a delocalized quantum fluid; any perceived charge is a continuous quantity related to the collective displacement of electrons relative to an ionic background. We attempt to detect the tunneling of individual electrons in a circuit by forcing them to flow continuously through a high-impedance resistor and then hop discretely across a tunnel junction. By measuring the potential of the island, the node of the circuit between the resistor and the tunnel junction, with a fast, sensitive electrometer (a radio-frequency single electron transistor) we will detect individual single electron tunneling events. We describe the preliminary measurements of this circuit, where we are able to resolve the time average potential of the island. We expect to be able to resolve tunneling events at higher frequencies more accurately than has previously been demonstrated [1].

[1] W. Lu, Z. Ji, L. Pfeiffer, K.W. West, and A.J. Rimberg, *Nature* **423**, 422 (2003).

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