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One-dimensional electron behavior in semiconducting carbon nanotubes studied using random telegraph signal[1] DAVID TOBIAS, Center for Superconductivity Research, Department of Physics, University of Maryland, College Park, MD 20742-4111, A. TSELEV, P. BARBARA, Department of Physics, Georgetown University, Washington DC 20057, C.J. LOBB, M.S. FUHRER, Center for Superconductivity Research, Department of Physics, University of Maryland, College Park, MD 20742-4111 — We have analyzed the random telegraph signal (RTS) from a semiconducting carbon nanotube in a field effect transistor geometry. We interpret the RTS as due to a single electronic charge tunneling between the nanotube and a nearby defect. We study the tunneling rate of electrons between the nanotube and defect as a function of defect energy, controlled by gate bias, and temperature. An analysis of the tunneling rates allows us to determine an effective temperature for the electron system inside the nanotube as a function of drain bias. The change in the tunneling rates versus the energy of the defect is inconsistent with Fermi liquid theory, providing evidence for the non-Fermi liquid ground state of the one-dimensional semiconducting carbon nanotube.

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