MAR06-2005-005144

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Controlling Carbon Nanotube Quantum Devices.

NADYA MASON, University of Illinois at Urbana-Champaign

The unique properties of nanotubes make them attractive candidates for a variety of quantum devices. We present transport data on nanotube-based quantum devices that demonstrate both one-dimensional physics and quantum-dot behavior. We show how voltages applied to narrow metallic gates can be used to produce localized depletion regions in the underlying tubes. A single depletion region in a nanotube with ohmic contact electrodes creates a quantum point contact, while a pair of depletion regions defines the quantum dot. Local gate voltages tune the conduction through point contacts, the transparencies of tunnel barriers, and electrostatic energies within single and multiple dots. We will show how this full gate control allows us to measure and control quantum phenomena such as quantized conductance steps and "Honeycomb" charge stability patterns in nanotube devices.