Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Engineering gate-controlled potential barrier and nano-constriction in bilayer graphene CHING-TZU CHEN, IBM TJ Watson Research Center, HSIN-YING CHIU, DAVID DIVINCENZO, SIYURANGA KOSWATTA — Graphene, as a material with zero net nuclear spin and a small spin-orbit coupling, is a natural candidate for building quantum-dot-based spin qubits, since electron spin coherence time can potentially be much longer compared to the prevailing GaAs-based systems. To date, graphene quantum dots have largely been realized using etch-defined nanoribbons or nano-islands. Due to fabrication-related edge defects or channel doping inhomogeneity, these etch-defined nanostructures generally suffer from randomly distributed incidental dots, causing undesirable resonance peaks in transport. To eliminate the disorder-induced localized states, we explore the possibility of electron confinement by using electric-field-controlled band gap opening in bilayer graphene. In this talk, we discuss various nanostructure designs towards this aim. We will present the transport characteristics of the dual-gated and side-gated devices, compare their performance, and analyze the gate tunability in various configurations. We will also comment on their use in quantum dots and other device applications.

Ching-Tzu Chen
IBM TJ Watson Research Center

Date submitted: 18 Nov 2010 Electronic form version 1.4