Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Tuning the electronic states of carbon nanotube based devices under magnetic field SEBASTIEN NANOT, LNCMP - Laboratoire National Des Champs Magnetiques Pulses, BERTRAND RAQUET, WALTER ESCOFFIER, JEAN-MARC BROTO, LNCMP, REMI AVRILLER, STEPHAN ROCHE, CEA - INAC/SPSMS/GT — Carbon nanotubes have already demonstrated their wide potential in nanoelectronics and optoelectronics. In our study, we demonstrate that an applied magnetic field, along with a control of the electrostatic doping, drastically modifies the electronic band structure of a carbon nanotube based transistor. Several examples will be addressed in this presentation. In a parallel configuration (B parallel to the tube axis), a quantum flux threading the tube induces a giant Aharonov-Bohm conductance modulation mediated by Schottky barriers which profile is magnetic field dependent. In the perpendicular configuration, the applied magnetic field breaks the revolution symmetry along the circumference and non conventional Landau states are expected in the high field regime. By playing with a carbon nanotube based electronic Fabry-Perot resonator, we bring evidence that the electronic transmission of the device can be modified by a transverse magnetic field. The field dependence of the resonant states of the cavity reveals the onset of the first landau state at zero energy. These experiments also enlighten the outstanding efficiency of magneto-conductance experiments to probe the electronic properties of carbon based nano-materials.

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Date submitted: 19 Nov 2008 Electronic form version 1.4