Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Probing the characteristics of carbon nanotube based devices through the Aharonov-Bohm phase GEORGY FEDOROV, DMITRY SMIRNOV, NHMFL, ALEXANDER TSELEV, Duke University, DAVID JIMÉNEZ, Universitat Autònoma de Barcelona, SYLVAIN LATIL, University of Namur, NIKOLAY G. KALUGIN, New Mexico Tech, PAOLA BARBARA, Georgetown University, STEPHAN ROCHE, CEA — The exceptional low-dimensionality and symmetry of carbon nanotubes (CNT) are at the origin of their spectacular physical properties governed by quantum effects. Ajiki and Ando [1] predicted that an axial magnetic field would tune the bandstructure of a CNT between a metal and a semiconductor, owing to the modulation of the Aharonov-Bohm (AB) phase of the electronic wave function. This remarkable effect of magnetic field leads to a class of new physical phenomena observed in CNT. Here we report on quasimetallic CNT forming a conduction channel of three-terminal devices, which can further operate as CNT field effect transistors, under the modulation of the AB- phase. The off-state conductance varies exponentially with the magnetic flux intensity. We show that the helical symmetries of metallic CNT, as well as the characteristics of Schottky barriers formed at the metal-nanotube contacts, can be obtained by using temperature-dependent magnetoresistance measurements. [1] Ajiki, H. & Ando, T. J. Phys. Soc. Jpn. 62, 1255-1266 (1993)

Georgy Fedorov
NHMFL

Date submitted: 04 Dec 2006 Electronic form version 1.4