Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Carbon-nanotube-based single electron memories processed by double self-assembly** VINCENT BOUCHIAT, CNRS/CRTBT, LAETITIA MARTY, CNRS/LEPES, CECILE NAUD, CNRS/LEPES, AURORE BONHOMME, CNRS/CRTBT, EMMANUEL ANDRE, CNRS/CRTBT, ANTONIO IAIA, CNRS/LEPES, EMMANUELLE RICHARD, CNRS/LEPES, ANNE-MARIE BONNOT, NANOTUBE TEAM — We demonstrate wafer-scale integration and operation of single electron memories based on carbon nanotube field effect transistors (CNFETs). Our method involves a two step double self assembly process. The first step consists of a Hot-Filament CVD growth and in situ electrical connection of single walled carbon nanotubes on a predefined submicron catalytic template acting as contact electrodes. We obtain a overall integration yield of semiconducting carbon nanotubes exhibiting field effect that can exceed 50% for 9000 devices on a 2 inches wafer. The second step is a wet step which consists of local functionalization and controlled attachment of a colloidal gold bead of radius 15nm on the nanotube. The sample is then coated with parylene dielectric followed by deposition of a top gate electrode aligned with respect to the nanotubes. The bead acts as a storage node for the memory while the CNFETs operated in the subthreshold regime behave as electrometers with exponential amplification. Operation of devices with retention of single charge quantum is successfully demonstrated at liquid helium temperature. Depending on the nanotube-dot coupling, the transfer of a single electron into the gold dot can lead up to one order of magnitude increase of the CNFET channel current.

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Date submitted: 08 Dec 2004 