Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Sorting Category: 05.14 (E)

Observation of phase transition from Tomonaga-Luttinger liquid states to superconductive phase in carbon nanotubes JUNJI HARUYAMA, MASAHARU MATSUDAIRA, NAOYOSHI MURATA, Aoyama Gakuin University, YUKO YAGI, Japan Science and Technology Agency, ERICK EINARSON, SHIGEO MARUYAMA, Tokyo University, TOSHIKI SUGAI, HISANORI SHINOHARA, Nagoya University — A carbon nanotube (CNT) is a one-dimensional (1D) ballistic conductor, which has Tomonaga-Luttinger liquid (TLL) state that arises from the repulsive Coulomb interaction between electrons. In contrast, the phonon-mediated attractive Coulomb interaction leads to BCS-type superconductivity (SC) in 2D and 3D conductors. Thus, interplay of SC with the TLL states in CNTs has attracted considerable attention [1]. The experimental report, however, was only in our multi-walled CNTs (MWNTs) [2]. Here, we report the detailed observation of change in 1D Coulomb interaction in the MWNTs. The results indicate occurrence of the phase transition from the TLL states to the SC phase, as energy decreases. The small number of shells with current flow in the partially end-bonded MWNTs makes the observation possible.
[1] e.g., D.Loss et al., Phys.Rev.B 50, 12160 (1994-II), E.Perfetto et al., Phys.Rev.B 74, 201403(R) (2006)
[2] I.Takesue, J.Haruyama., et al., Phys.Rev.Lett.96, 057001 (2006)

Junji Haruyama
J-haru@ee.aoyama.ac.jp
Aoyama Gakuin University

[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 29 Nov 2007 Electronic form version 1.4