Influence of local Coulomb potential on transport through carbon nanotubes

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In this paper, we present the results of helium temperature transport measurements through carbon nanotubes using an AFM conductive tip as a mobile gate for creation of a local distributive Coulomb potential.

Shifting of the conductance peaks positions for the first hole states is observed and explained qualitatively in framework of particle in 1-D box model for semiconducting nanotubes.

Stability of the fourfold degeneracy of the energy states in a metallic nanotube to external Coulomb potential and coupling to the contacts is demonstrated (see Fig. 1). These observations are in agreement with previous theoretical calculations where no influence of local Coulomb potential and the opacity of potential barriers on degenerate states has been found [1]. Thus, we can conclude that destruction of the fourfold degeneration only comes from defects and imperfections of the metallic nanotube itself.

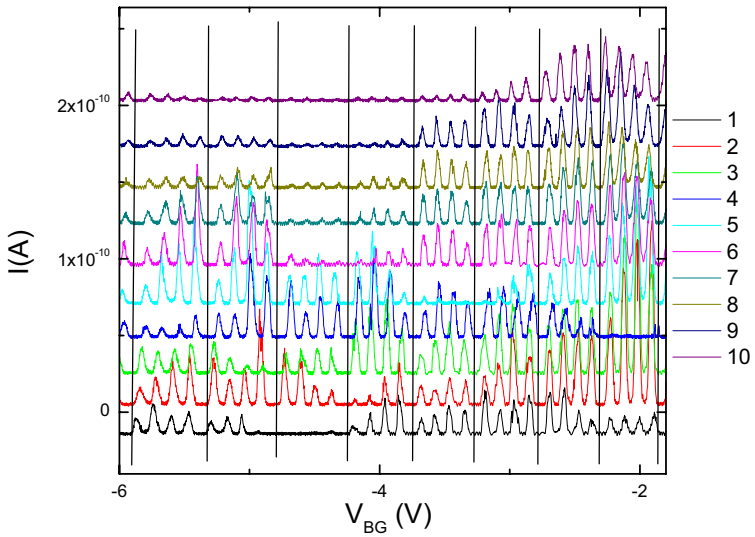

Figure. Conductivity of the CNT of high quality vs back gate voltage for different AFM tip positions. The value of tip voltage is of ~ 8 V.

[1] San-Huang Ke, H.U. Baranger, W. Yang, *Phys. Rev. Lett.* **91**, 116803 (2003).