# INELASTIC COTUNNELLING MEDIATED SINGLET-TRIPLET TRANSITION IN CARBON NANOTUBES

**G. Ilnicki[a], S. Moriyama[b], J. Martinek[a,c], T. Fuse[b], K. Ishibashi[b]**
[a]Institute of Molecular Physics, Polish Academy of Sciences, 60-179 Poznań. Poland
[b]Advanced Device Laboratory, RIKEN, 2-1, Hirosawa, Wako, Saitama 351-0198, Japan
[c]Institute for Materials Research, Tohoku University, Sendai 980-77, Japan

9.7 cm

Cotunnelling transport through a quantum dot (QD) is one of the simplest quantum many-body effects. In the Coulomb-blockade regime, when sequential tunnelling of single electrons in a dot is suppressed, only two (or more) electrons may tunnel in the correlated manner: into and simultaneously out of the dot leaving dot's charge unchanged. We study experimentally as well as theoretically the cotunneling transport in a carbon nanotube quantum dot for even and odd occupancy regimes. In both regimes characteristic cotunneling resonances were observed in the transport current $I$ as a function of magnetic field $B$ centered at $B = 0$ ($B > 0$) for odd (even) dot's occupancy. While for odd occupancy the signal is associated with the Kramers doublet, for the odd occupancy it is related to the singlet-triplet transition (STT). This experimental setup ($I$ vs. $B$) provides clear separation between elastic and inelastic cotunneling components. Different coupling strengths of the QD's levels allow mapping of the STT model into the model of a QD attached to ferromagnetic leads, where the non-equilibrium spin accumulation and spin-dependent transport are expected. The theoretical study of the second order perturbation theory agrees well with the experiment, which allows precise fit of the cotunneling line shape and extraction of the information about effective spin asymmetry, spin accumulation, and spin-flip relaxation in the dot.

13.4 cm

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**Corresponding author :**
G. Ilnicki

**Address for correspondence :**
Institute of Molecular Physics, Polish Academy of Sciences, 60-179 Poznań. Poland

**Email address :**
forest@ifmpan.poznan.pl