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Superconducting Nanotube Dots

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In this talk, I will focus on charge transport in carbon nanotube devices with superconducting source and drain contacts in the finite-bias non-equilibrium transport regime. As contact material, bi-layers of Au and Al were used and transport has been studied at temperatures in the 0.1 K range. Because carbon nanotubes are quantum dots (qdots), we in fact explore the physics of qdots with superconducting contacts, something which only recently became possible thanks to carbon nanotubes and most recently to semiconducting nanowires. In my talk, I will first summarize our pioneering work on multiwalled carbon nanotubes in which we could demonstrate proximity induced effects both in the weak and the strong coupling regime. In the latter an intriguing interplay between superconductivity and Kondo physics appears. Then, I will discuss the physics of multiple Andreev reflection in a situation when only one resonant state is present and compare this with experimental results. Finally, I will compare our early results with our recent measurements on single-wall carbon nanotubes. This work has been supported by the Swiss Institute on Nanoscience, the Swiss National Science Foundation, EU projects DIENOW and HYSWITCH. I gratefully acknowledge contribution of the following persons to this work (in alphabetic order): B. Babic, W. Belzig, C. Bruder, M. R. Buitelaar, J.-C. Cuevas, A. Eichler, L. Forro, J. Gobrecht, M. Gräber, M. Iqbal, T. Kontos, A. Levy Yeyati, A. Martin-Rodero, T. Nussbaumer, S. Oberholzer, C. Strunk, H. Scharf, J. Trbovic, E. Vecino, M. Weiss