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Transport in Carbon Nanotubes: 2LSU(2) regime reveals subtle competition between Kondo and Intermediate Valence states G. MARTINS, C. BUSSER, E. VERNEK, P. ORELLANA, G. LARA, E. KIM, A. FEIGUIN, E. ANDA — Three different numerical techniques are used to study the two-level SU(2) regime, obtained from an SU(4) Hamiltonian by orbital mixing via coupling to the leads. SU(4) Kondo physics has been experimentally observed, and studied in detail, in Carbon Nanotube Quantum Dots. Adopting a two molecular orbital basis, the Hamiltonian is rewritten, such that one of the molecular orbitals decouples from the charge reservoir, although still interacting capacitively with the other molecular orbital. This basis transformation explains in a clear way how the charge transport in this system turns from double- to single-channel when it transitions from the SU(4) to the 2LSU2 regime. The charge occupancy of these molecular orbitals displays gate-potential-dependent occupancy oscillations that arise from a competition between the Kondo and Intermediate Valence (IV) states. The determination of whether the Kondo or the IV state is more favorable, for a specific value of gate potential, is assessed by the definition of an energy scale T_0, which is calculated through DMRG. We speculate that the calculation of T_0 may provide experimentalists with a useful tool to analyze correlated charge transport in many other systems. For that, a current work is underway to improve the numerical accuracy of its DRMG calculation and explore different definitions.

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