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Breakdown of the Wigner-Mattis theorem in semiconductor carbon-nanotube quantum dots MASSIMO RONTANI, INFM-CNR Research Center S3, Modena, Italy, ANDREA SECCHI, University of Modena, Italy, FRANCA MANGHI, INFM-CNR S3 and University of Modena, Italy — The Wigner-Mattis theorem states the ground state of two bound electrons, in the absence of the magnetic field, is always a spin-singlet. We predict the opposite result –a triplet- for two electrons in a quantum dot defined in a semiconductor carbon nanotube. The claim is supported by extensive many-body calculations based on the accurate configuration interaction code DONRODRIGO (www.s3.infm.t/donrodrigo). The crux of the matter is the peculiar two-valley structure of low-energy states, which encodes a pseudo-spin degree of freedom. The spin polarization of the ground state corresponds to a pseudo-spin singlet, which is selected by the inter-valley short-range Coulomb interaction. Single-electron excitation spectra and STM wave function images may validate this scenario, as shown by our numerical simulations.

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