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Charge dynamics and spin blockade in a hybrid double quantum dot in silicon[1] ANASUA CHATTERJEE, MATIAS URDAMPILLETA, CHEUK CHI LO, JOHN MANSIR, London Centre for Nanotechnology, University College London, SYLVAIN BARRAUD, CEA-LETI, ANDREAS BETZ, M. FERNANDO GONZALEZ-ZALBA, Hitachi Cambridge Laboratory, JOHN J. L. MORTON, London Centre for Nanotechnology, University College London — Hybrid architectures combining donor atoms and quantum dots in silicon can take advantage of fast gate voltage based spin manipulations to form a hybrid singlet-triplet qubit, with access to the quantum memory offered by the nuclear spin of the donor via the hyperfine interaction. Additionally, spin buses using quantum dot chains could mediate the transfer of quantum information between long-lived donor spins. We present an approach to a novel hybrid double quantum dot by coupling a donor to an artificial atom in a CMOS-compatible nanotransistor. Using gate-based RF-reflectometry, we probe the charge stability of the system and its quantum capacitance. Through microwave spectroscopy, we find a tunnel coupling of 2.7GHz and characterize the charge dynamics, revealing a charge T_1 of 100ns. We also show spin blockade at the inderdot transition and investigate the spin dynamics, opening up the possibility to operate this coupled system as a singlet-triplet qubit and to coherently transfer spin information between the quantum dot and the donor electron and nucleus.

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