

Abstract Submitted
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Charge-noise-insensitive gate operations for always-on, exchange-only qubits YUN-PIL SHIM, CHARLES TAHAN, Laboratory for Physical Sciences — Exchange-only qubit in a triple quantum dot allows for exchange-only implementation of all gate operations. In addition to the long gate pulses to implement qubit gate operations, exchange operation makes qubit gates susceptible to charge noise since the charge and spin degrees of freedom are coupled during exchange operations. There have been efforts to find sweet spots for qubit operations that are insensitive to charge noise, such as resonant exchange (RX) qubit which operates on a partial sweet spot and symmetric operation point (SOP) that offers a dynamical sweet-spot for pair-wise exchange interactions. We present an always-on, exchange-only (AEON) qubit that offers a true sweet spot to charge noise on the quantum dot energy levels [1]. Further, our qubit system allows for all single- and two-qubit gate operations to be done at sweet spots using only DC-pulses to tune the couplings between the dots, while only taking one pulse for an encoded two-qubit entangling operation. We show that AEON qubit can be considered as a generalization of SOP to three spin system, and present numerical simulations for SOP operations. [1] Yun-Pil Shim and Charles Tahan, Phys. Rev. B 93, 121410(R) (2016).

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