Abstract Submitted
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Double Quantum Dot Qubits in Microwave Cavities MATTHEW MCGREAL, Ohio University — Fabrication of coherent qubits and scalability schemes are essential for the realization of quantum computers. Electron spins in semiconductors make promising qubits because of their long coherence times (ms) compared to gate operation timescales (ns). Additionally, a photon cavity can mediate long-range interactions between spins and allow for non-destructive measurements of the qubit state using the transmission through the cavity. Combining these effects makes an electron spin in a double quantum dot (DQD) coupled to a microwave cavity a good candidate for a qubit with the potential for scalability. As shown [0], a single electron in a DQD creates a dipole moment that can be coupled to the spin degree of freedom in the presence of magnetic fields, leading to strong spin-photon coupling. This project explores qubits systems containing 1, 2, and 3 double quantum dots inside a microwave cavity. Having reproduced theoretical results for systems containing 1 [1] and 2[2] qubits, I analyze the transmission amplitude, including a third DQD qubit, and discuss the resulting limitations of this scalability method. [0] M. Benito et al. In: Phys. Rev. B 96 (23 Dec. 2017), p. 235434. [1] Guido Burkard et al. In: Nature Reviews Physics 2.3 (Jan. 2020), pp. 129– 140. issn: 2522-5820. [2] F. Borjans et al. In: Nature 577 (7789 2020), pp. 195–198.

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