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Theory of the Quantum Dot Hybrid Qubit

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The quantum dot hybrid qubit, formed from three electrons in two quantum dots, combines the desirable features of charge qubits (fast manipulation) and spin qubits (long coherence times). The hybridized spin and charge states yield a unique energy spectrum with several useful properties, including two different operating regimes that are relatively immune to charge noise due to the presence of optimal working points or "sweet spots." In this talk, I will describe dc and ac-driven gate operations of the quantum dot hybrid qubit. I will analyze improvements in the dephasing that are enabled by the sweet spots, and I will discuss the outlook for quantum hybrid qubits in terms of scalability.

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