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A Dressed Spin Qubit in Silicon[1] ARNE LAUCHT, RACHPON KALRA, JUAN DEHOLLAIN, STEPHANIE SIMMONS, JUHA MUHONEN, FAHD MOHIYADDIN, SOLOMON FREER, FAY HUDSON, UNSW Australia, KOHEI ITOH, Keio University, DAVID JAMIESON, JEFF MCCALLUM, University of Melbourne, ANDREW DZURAK, ANDREA MORELLO, UNSW Australia
— Coherent dressing of a quantum two-level system has been demonstrated on a variety of systems, including atoms, self-assembled quantum dots, and superconducting quantum bits, and can be demonstrated by measuring Rabi oscillations, or a Mollow triplet in the spectrum. It can be used to gain access to a new quantum system with improved properties - a different and tunable level splitting, faster and easier control, and longer coherence times. In our work we investigate the properties of the dressed, donor-bound electron spin in silicon, and probe its potential for the use as quantum bit in scalable architectures. Here, the two dressed spin-polariton levels constitute the quantum bit. The dressed qubit can be coherently driven with an oscillating magnetic field, an oscillating electric field, by frequency modulating the driving field, or by a simple detuning pulse. We measure coherence times of T2* = 2.4 ms and T2 = 9 ms (Hahn echo), one order of magnitude longer than those of the undressed qubit.

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