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Quantum Non-demolition measurements of single spins in semiconductors[1] MOHAN SAROVAR, KEVIN YOUNG, University of California, Berkeley, THOMAS SCHENKEL, Lawrence Berkeley National Laboratory, K. BIRGITTA WHALEY, University of California, Berkeley — For the development of large-scale quantum computers, electron spin-encoded qubits in solid-state are appealing because of their favorable decoherence time scales, high potential for scalability, and many handles for precision control. However, an additional requirement that is traditionally challenging in the solid-state is a capacity for high-fidelity qubit readout. We propose a scheme for measuring the state of a single donor electron spin using a field-effect transistor induced two-dimensional electron gas and electrically detected magnetic resonance techniques. The scheme is facilitated by hyperfine coupling to the donor nucleus. We analyze the potential sensitivity and outline experimental requirements. Our measurement provides a single-shot, projective, and effectively quantum non-demolition measurement of an electron spin-encoded qubit state.

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