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Electron Spin Resonance of Electrons in a Large-Area Silicon MOSFET SHYAM SHANKAR, A. M. TYRYSHKIN, SUSHOBHAN AVASTHI, S. A. LYON, Dept. of Electrical Engineering, Princeton University — Spins of electrons in two-dimensional (2D) semiconductor heterostructures are considered as qubit candidates for quantum information processing. Electron spin resonance (ESR) of silicon MOSFETs can be useful in characterizing electrons in 2D structures, but previous attempts have been inconclusive. To have sufficient signal for ESR measurements, a large area n- channel silicon FET with a 100nm thick oxide was made using standard processing techniques. Two ESR signals were seen at temperatures below 20K with a gate bias above the threshold voltage of 0.9V. A weak signal with a linewidth of 1G, at g=1.9988(1) may be similar to one seen by Wallace and Silsbee (PRB 1991). A stronger signal is found at g=2.0000(1) with a linewidth of 400mG. This signal shows a noticeable increase in g- factor from 1.9999 at 1V to 2.0000 at 1.7V gate bias and a corresponding decrease in linewidth from 500mG to 400mG. A small g-factor and linewidth change is also seen when the FET is rotated with respect to the applied magnetic field. The signal intensity shows non-Curie temperature behavior below 10K. Such a signal, possibly from conduction electrons or electrons in shallow traps, has not been reported before and is being further investigated.

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