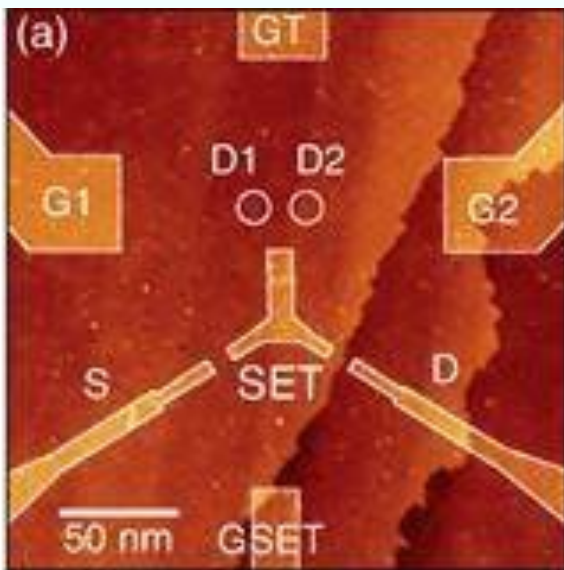




High-Fidelity Rapid Initialization and Read-Out of an Electron Spin via the Single Donor D⁻ Charge State

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We demonstrate high-fidelity electron spin read-out of a precision placed single donor in silicon via spin selective tunnelling to either the D. or D⁻ charge state of the donor. By performing read-out at the stable two electron D⁰ ↔ D⁻ charge transition we can increase the tunnel rates to a nearby single electron transistor charge sensor by nearly 2 orders of magnitude, allowing faster qubit read-out (1 ms) with minimum loss in read-out fidelity (98.4%) compared to read-out at the D. ↔ D⁰ transition (99.6%). Furthermore, we show that read-out via the D⁻ charge state can be used to rapidly initialize the electron spin qubit in its ground state with a fidelity of F_I = 99.8%.

Overview STM image of the device architecture after lithography.

LINK TO FULL PAPER (SUBSCRIBERS ONLY):
<http://journals.aps.org/prl/pdf/10.1103/PhysRevLett.115.166806>