Single shot read-out of an individual electron spin in a quantum dot

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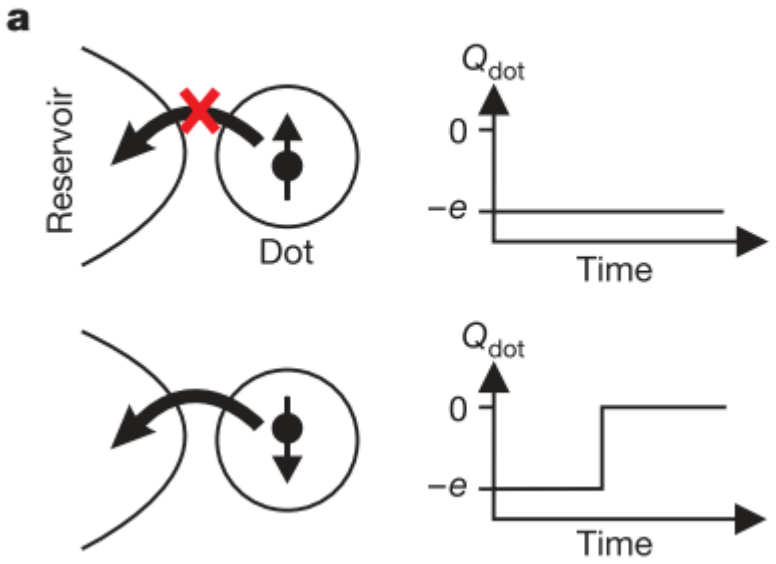
Motivation

- Obtaining in-situ measurement technique for single spin state
- Measure T_1 of electrons

Basic principle

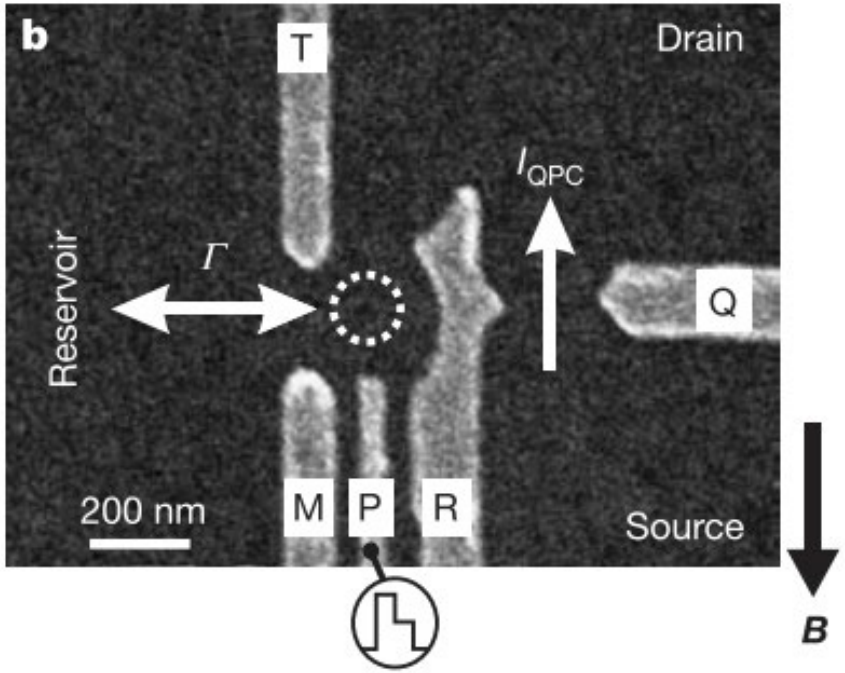
- Zeeman splitting
- Fine tuning of the potential of the dot
- Convert charge to spin state



Device properties

- Gates M, R and T create dot
- Gates R and Q used to put QPC in tunneling regime
- Measurement time scale 8 μs << 1/Γ

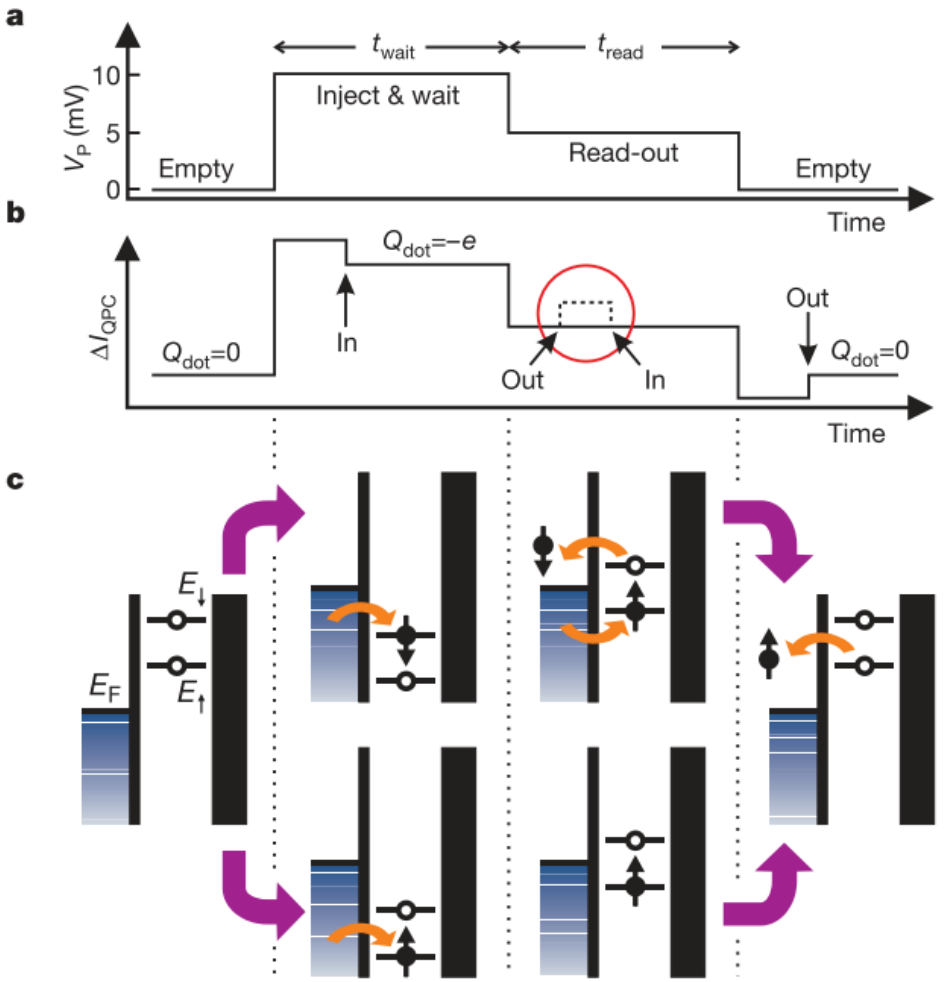
- $E_{therm} < E_{zeeman} < E_{orbital\ splitting}, E_{charge}$



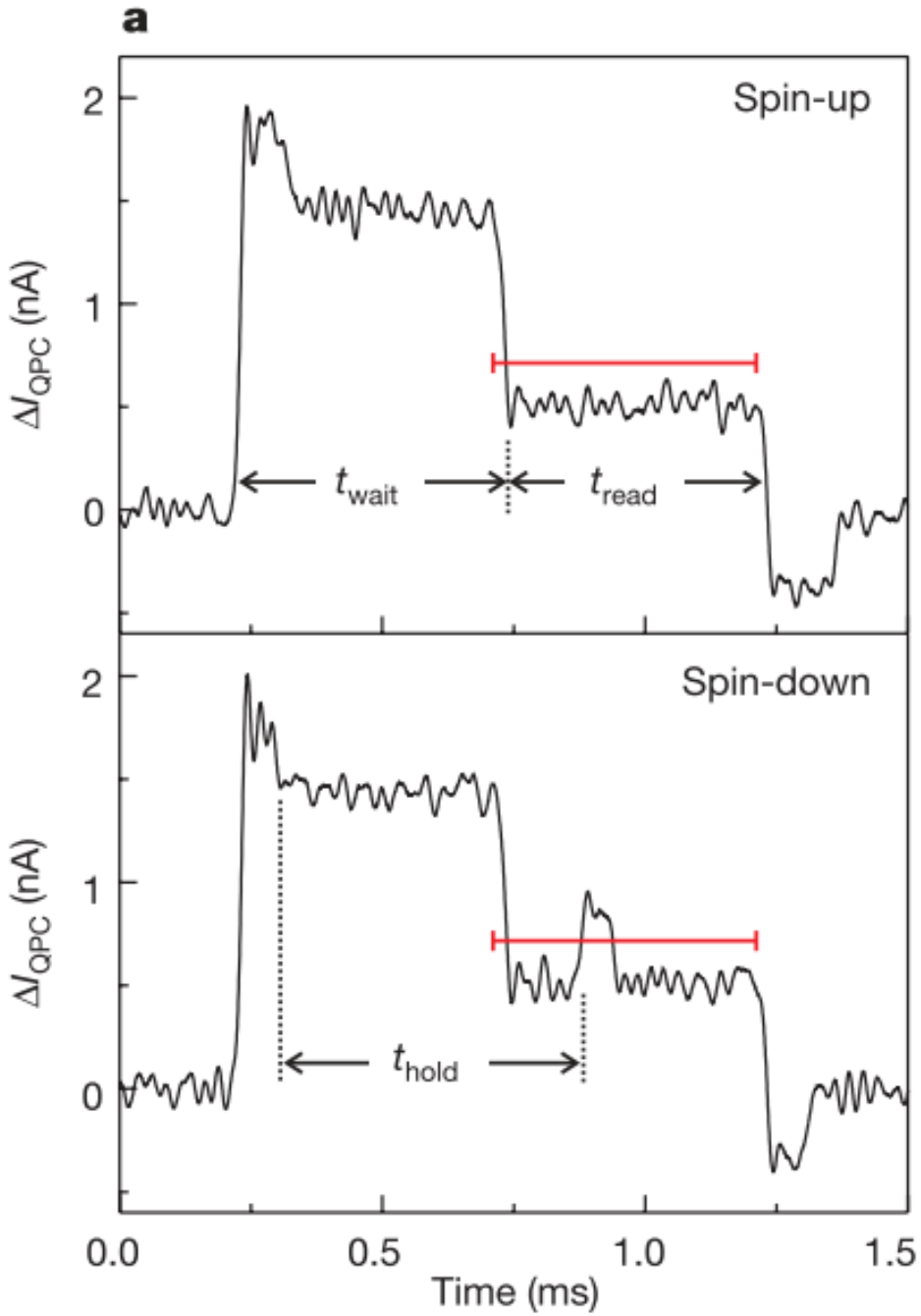
Measurement procedure

- Two stage pulse regime

- Does an electron always tunnel in after the spin down tunneled out?



Typical Measurement



T_1 and fidelity extraction

- Vary wait time to extract T_1

- False positive and false negative
- Total fidelity 65%??

- Improvements to be made with electron temperature and faster measurement