Electrically driven single-electron spin resonance in a slanting Zeeman field

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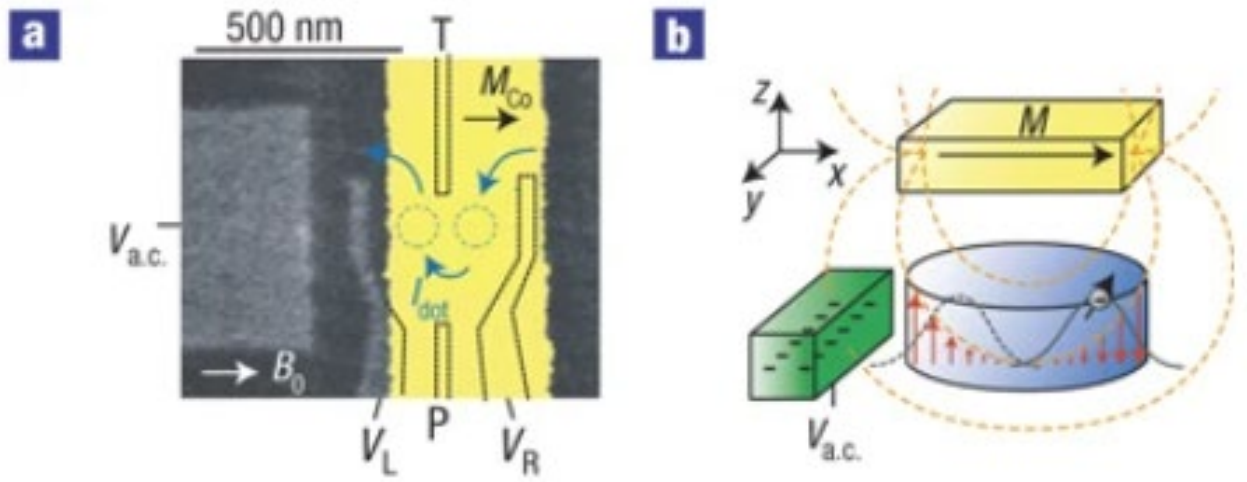
Motivation

- Individual control of multiple electron spins
- Exploring the possibilities for large QD arrays

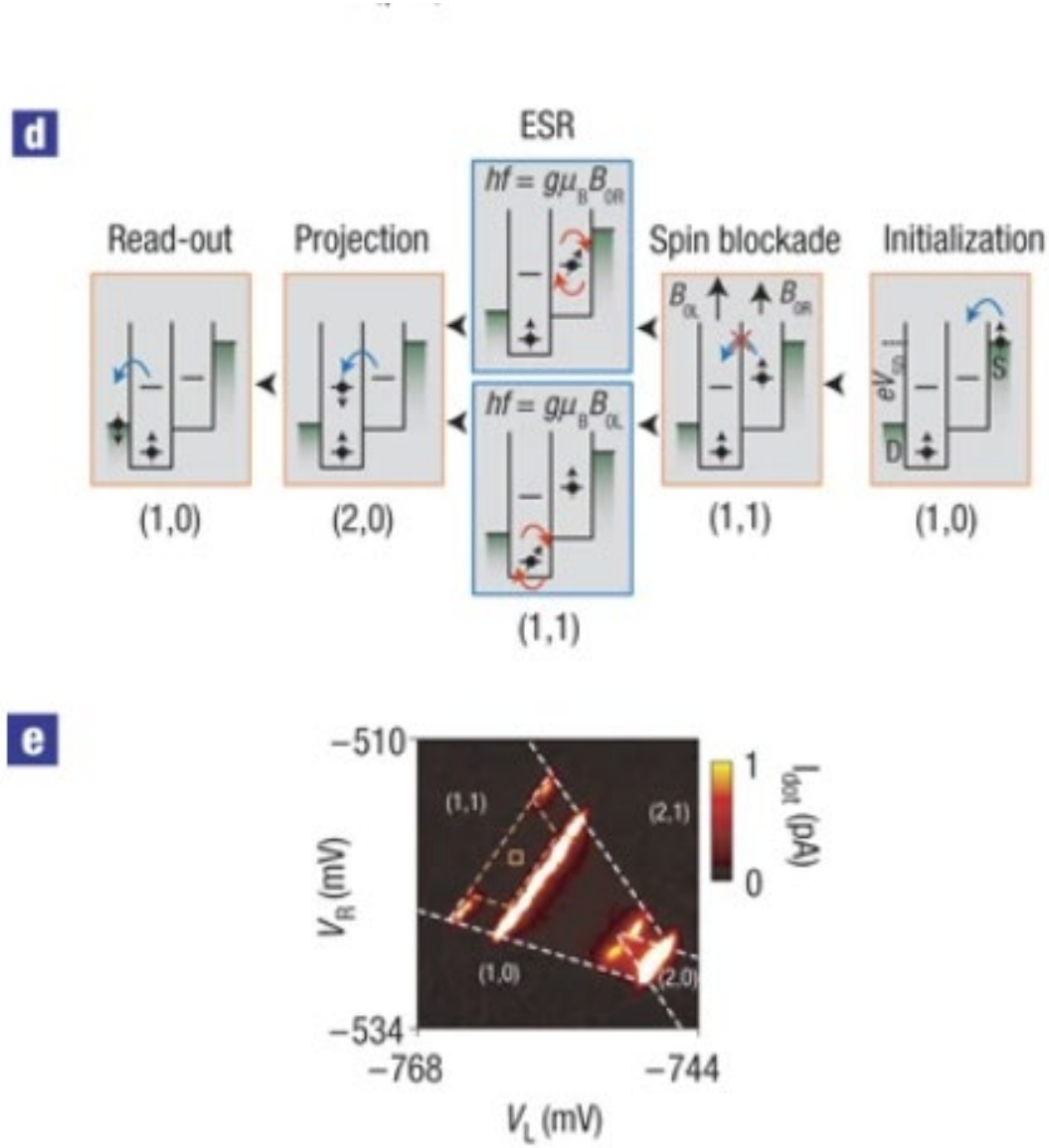
Device lay-out

- Well known GaAs QD device
- Micromagnet over the top
- AC gate on the side



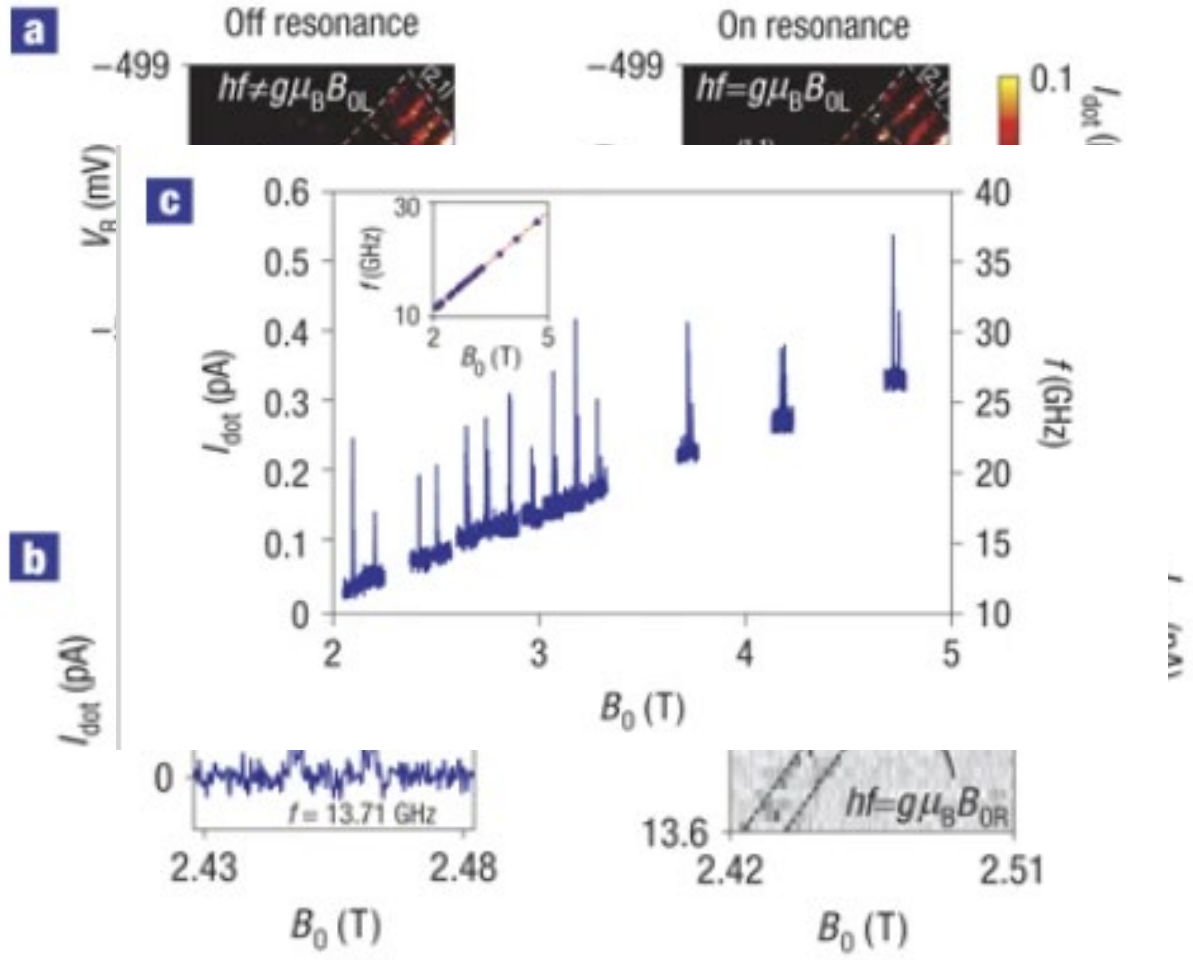
Working principle

- Tuning AC frequency to flip either left or right spin lifting PSB
- Standard DQD stability diagram in PSB



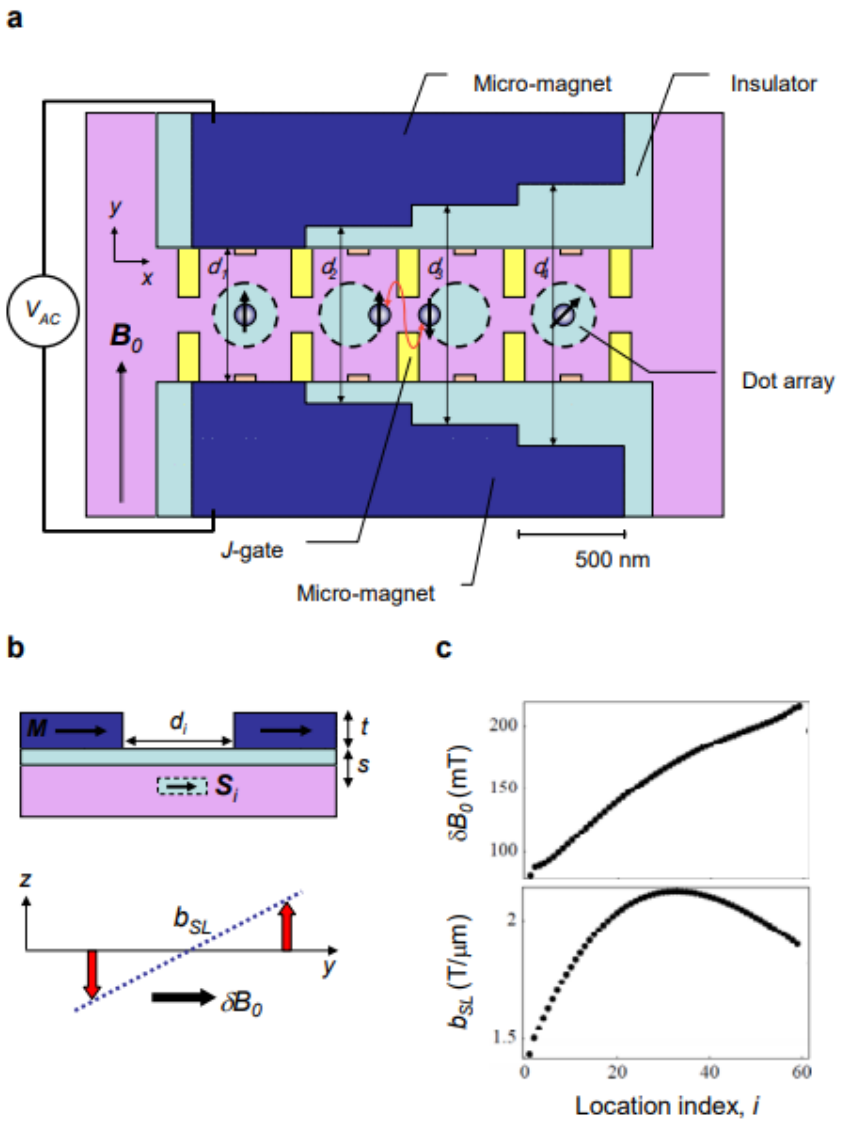
Single spin resonance

- CW mode, to check for PAT, on resonance finite leakage
- Addressing both dots individually



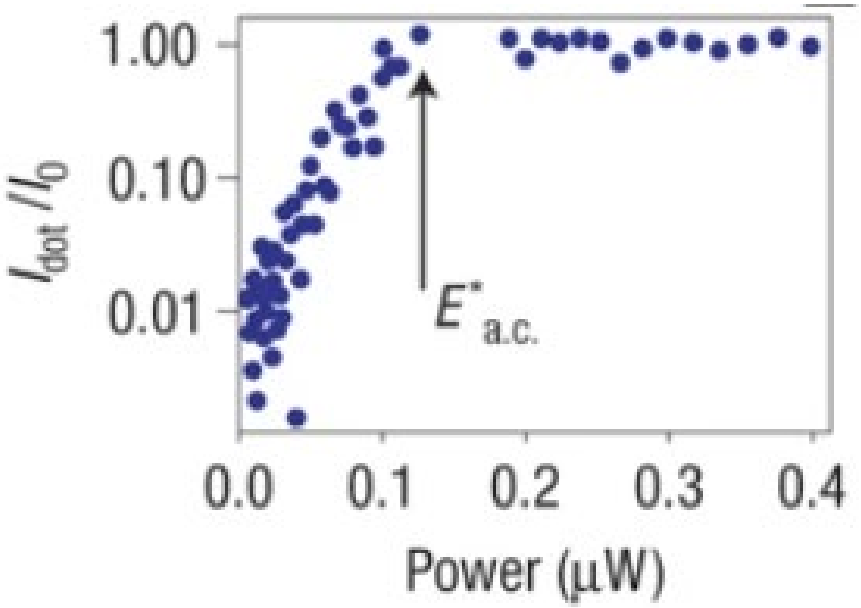
Intermezzo: micromagnet design ideas

- Tapered magnet design for individual addressability
- Both change in B_y and B_z due to design -> individual resonance conditions



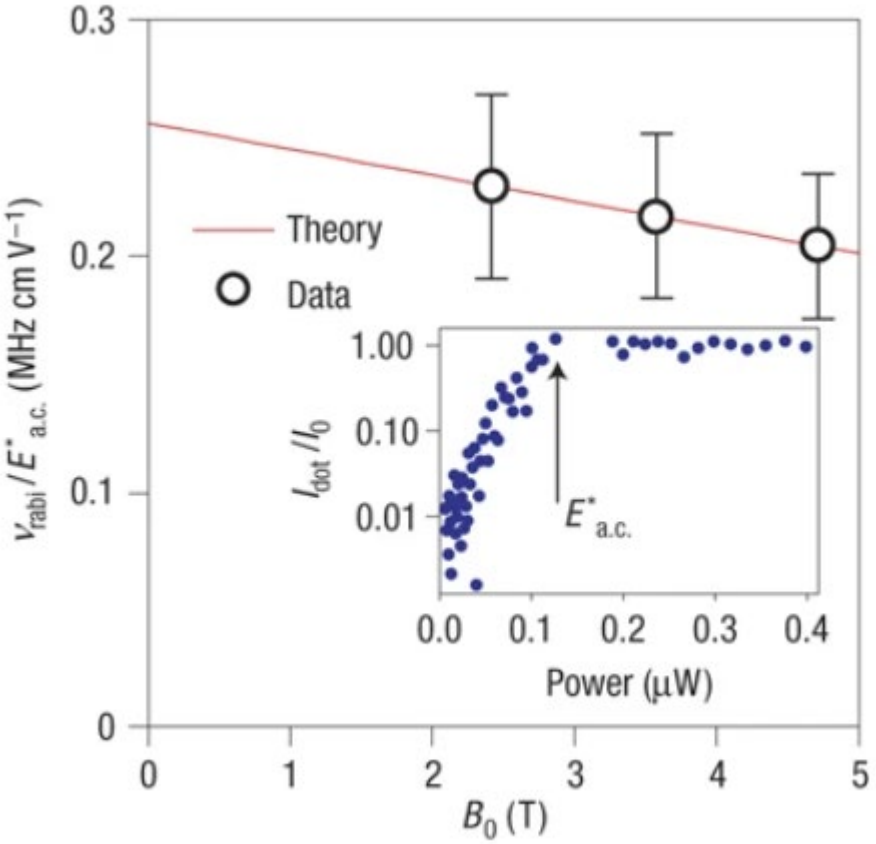
Overhauser effect

- Determining B_{ac} by finding saturation E-field
- $B_{ac} > B_N$, spin flip everytime
- $B_{ac} < B_N$ resonance only met occasionally
- Saturation at $B_{ac} = B_N/2$



Rabi Oscillations

- No significant variations in F_{rabi} vs B_0
- S-O coupling responsible for slight decrease in F_{rabi}



Conclusions

- Individual addressability of QD’s shown
- Accessible with a single ESR gate
- Modelled potential improved design for longer sequences of QD’s