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Single-electron regime and Pauli Spin Blockade in a silicon MOS DQD

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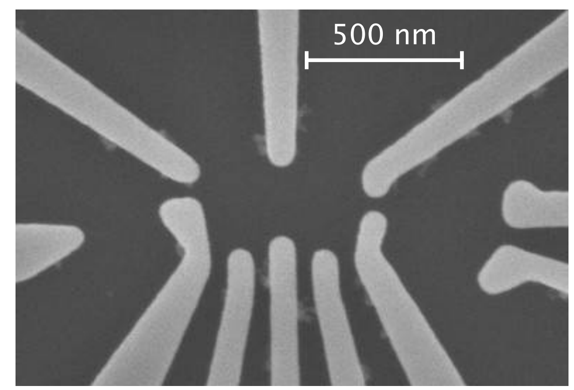
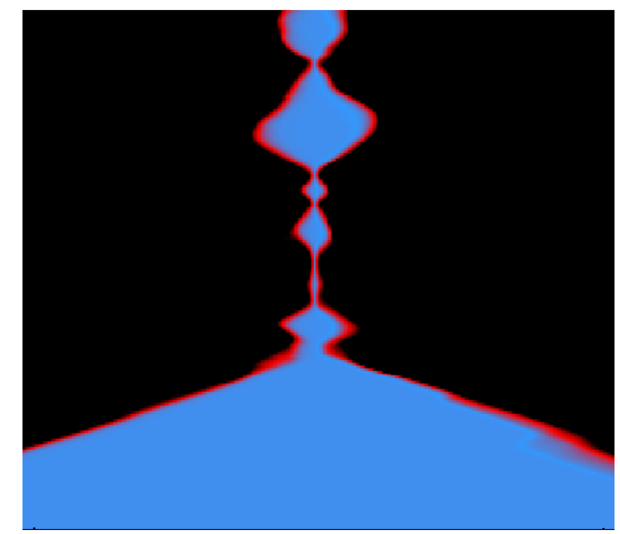
Outline

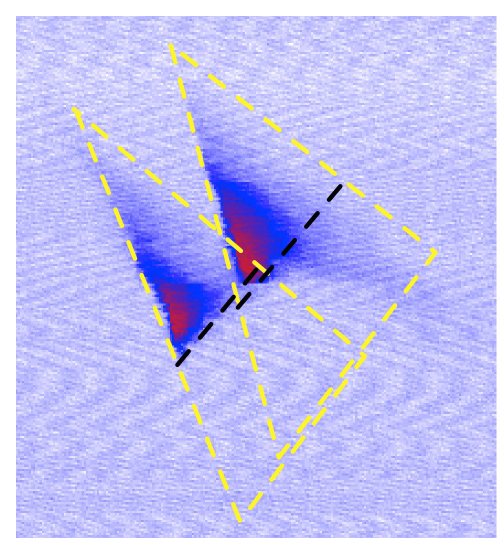
Si MOS DQD



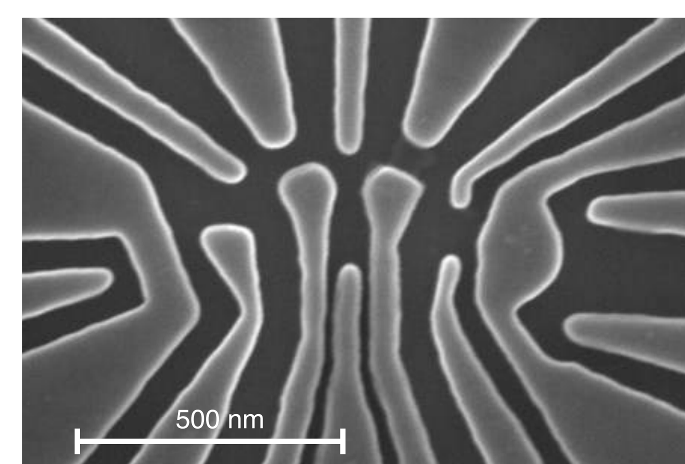
Single electron regime



Spin Blockade

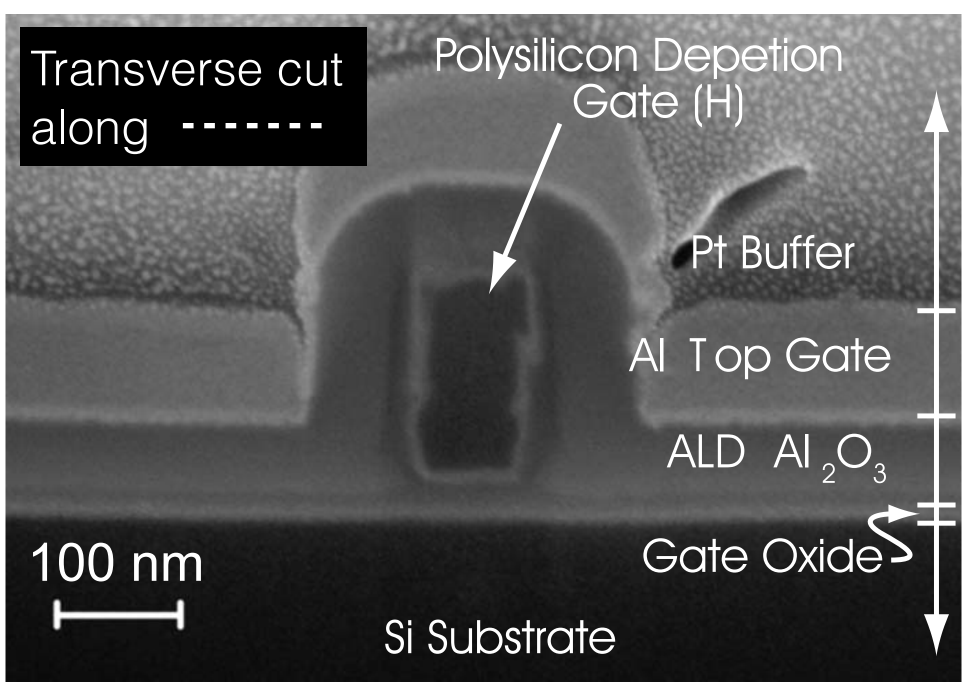


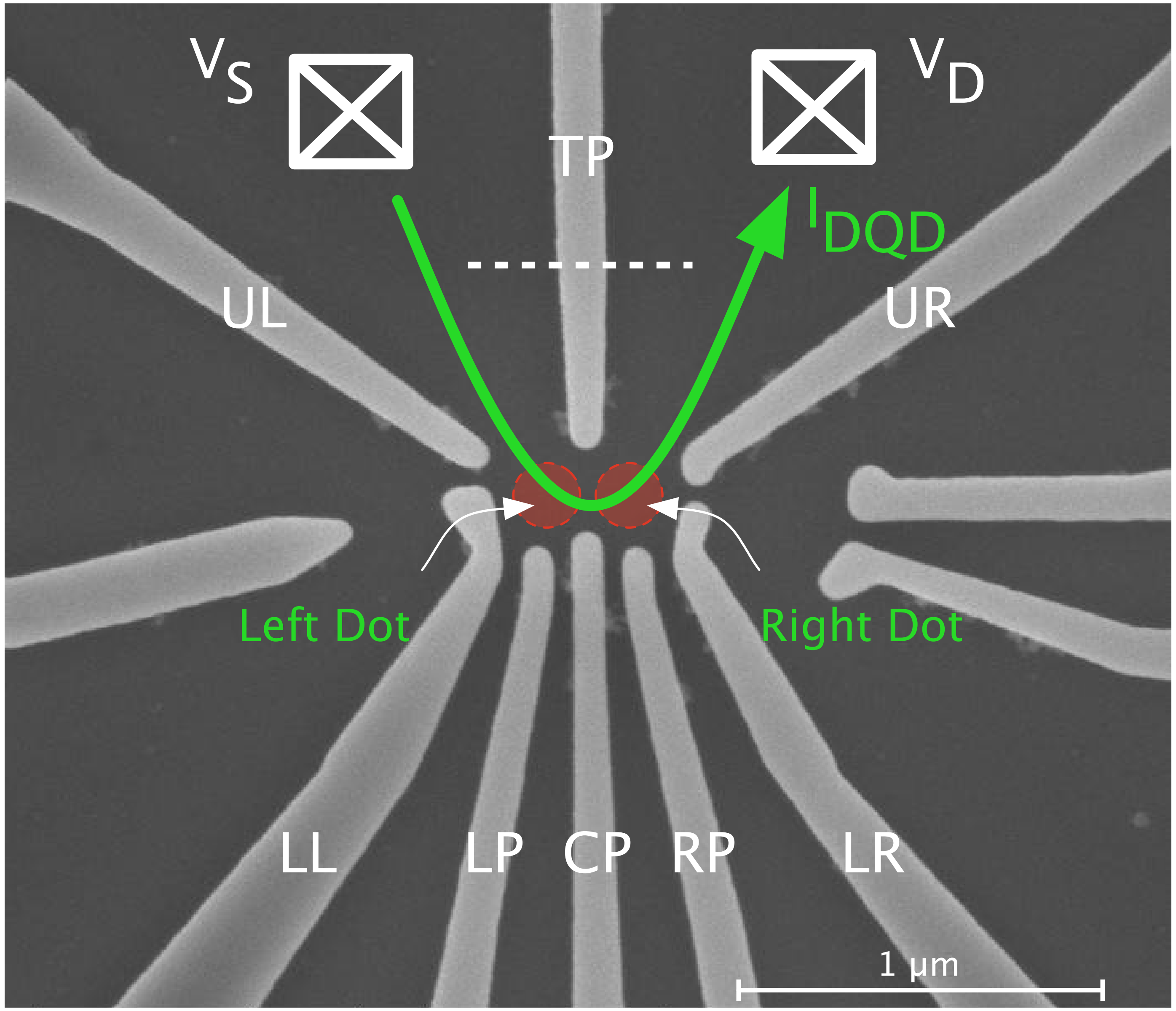
New design: All Si



Device

- Si MOS DQD
- Poly-Si depletion gates
- Aluminium Accumulation Gate
- Transport measurements





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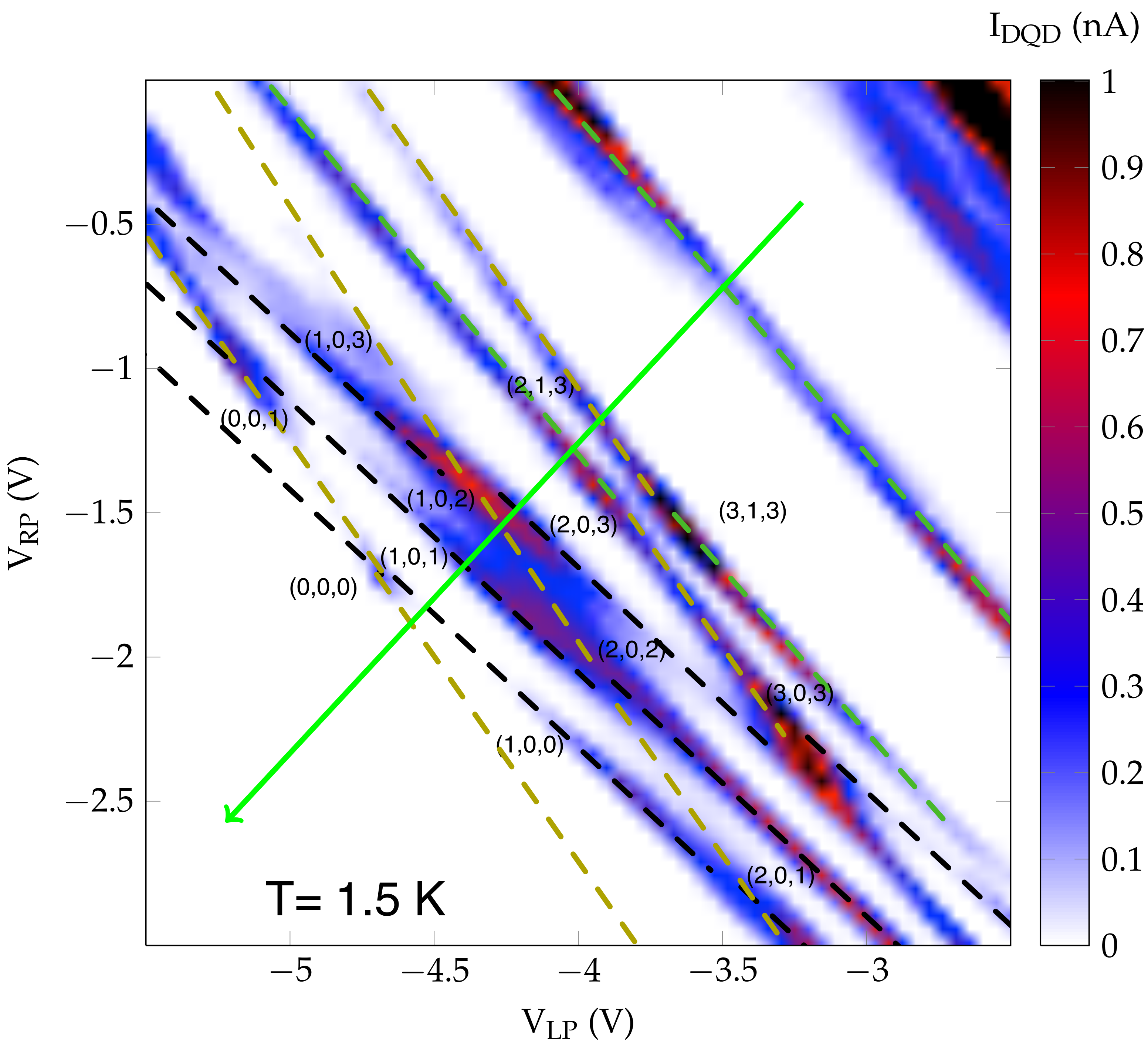
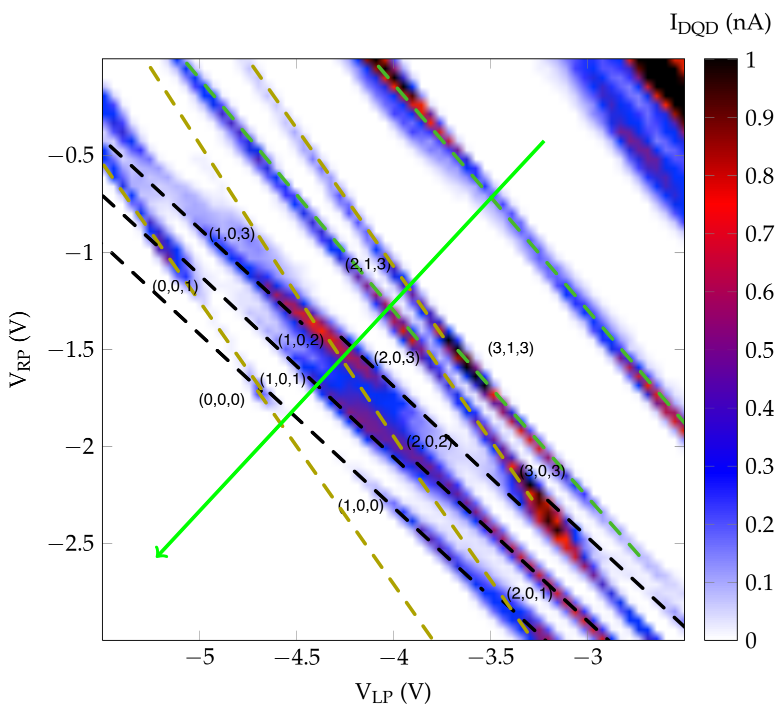
Stability Diagram

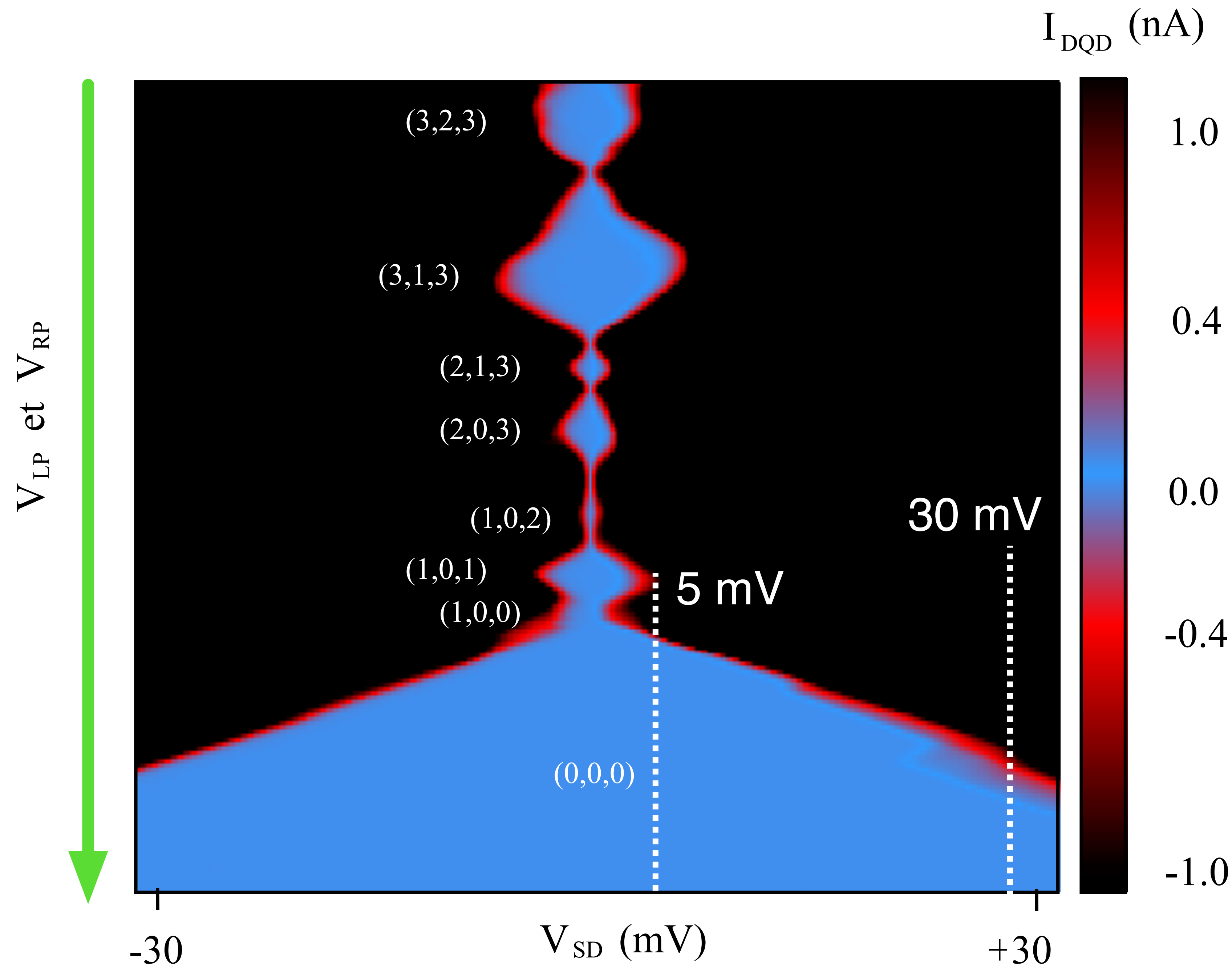


- T= 1.5 K
- Rough tuning
- Tendancy to triple dot formation
- No current region: emptied dots?

Coulomb Diamonds



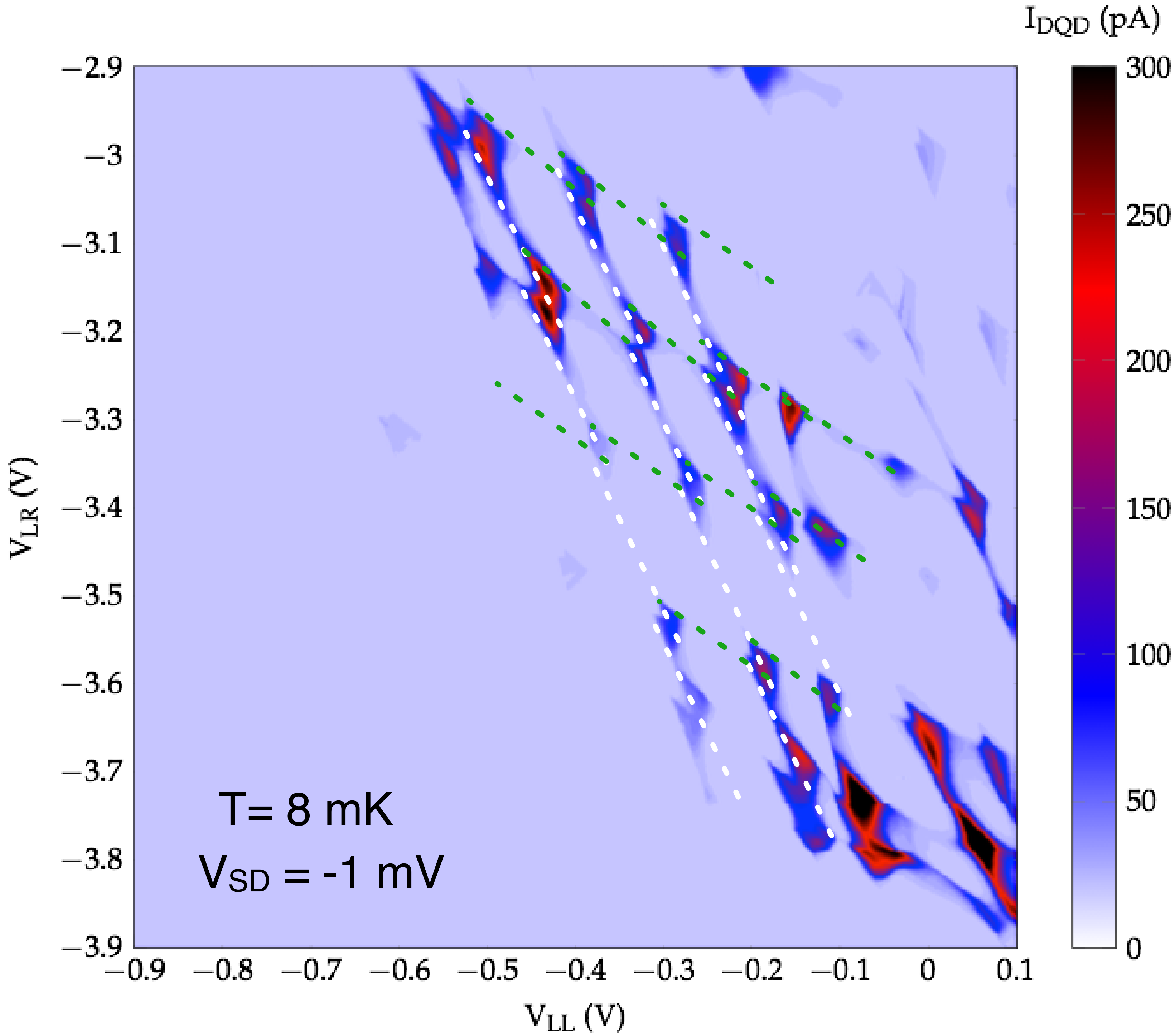
- Scanning the stability diagram along the green arrow, sweeping the SD bias
- Last diamond not closing for SD bias larger than 30 mV
- **Single electron regime**



Stability Diagram

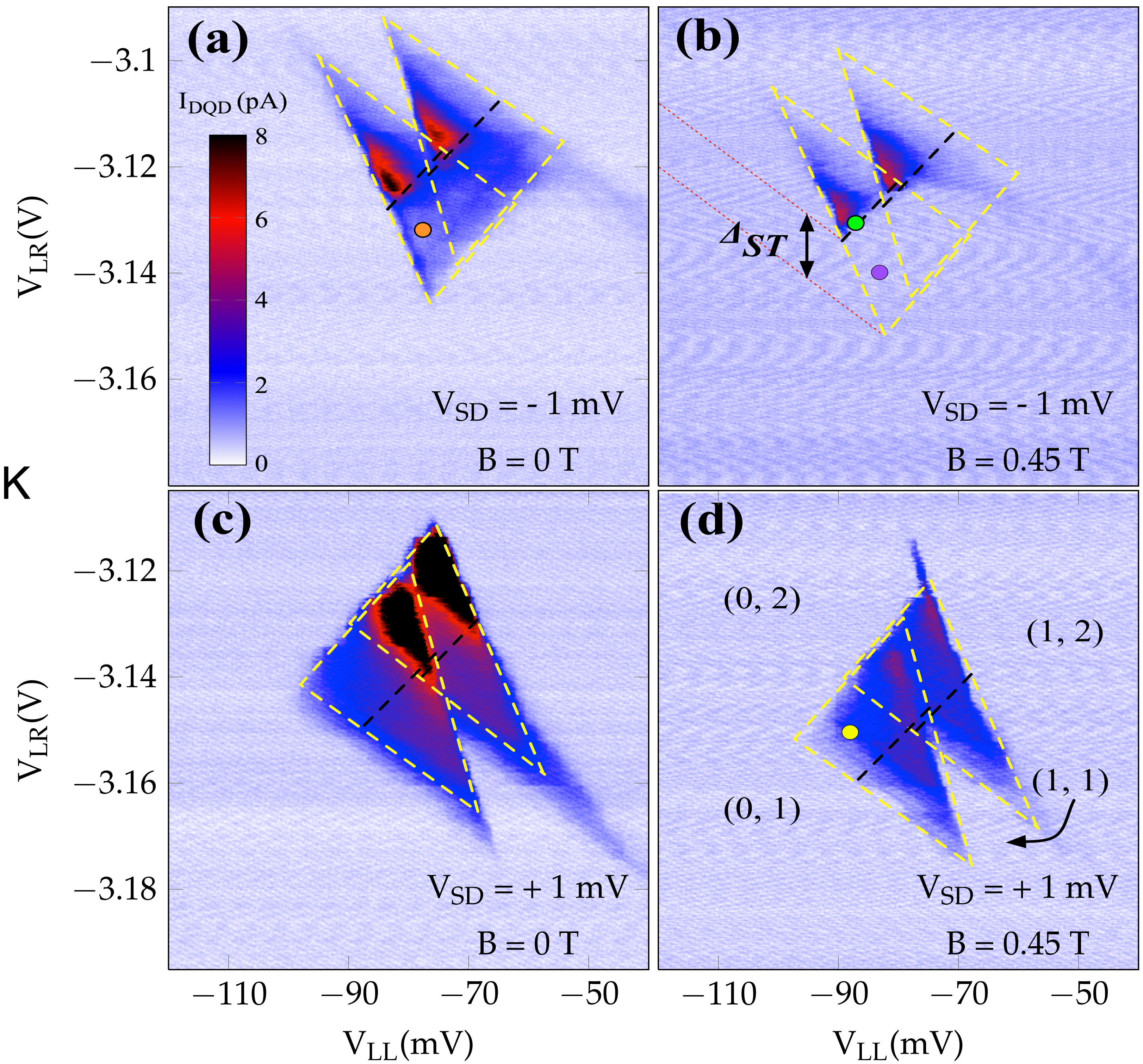
Characteristic energies	
E	2.3 ± 0.6 meV
E	2.3 ± 0.3 meV
△E left	0.3 ± 0.2 meV
△E right	0.3 ± 0.2 meV
E	0.3 ± 0.4 meV

- Lithographic double quantum dot



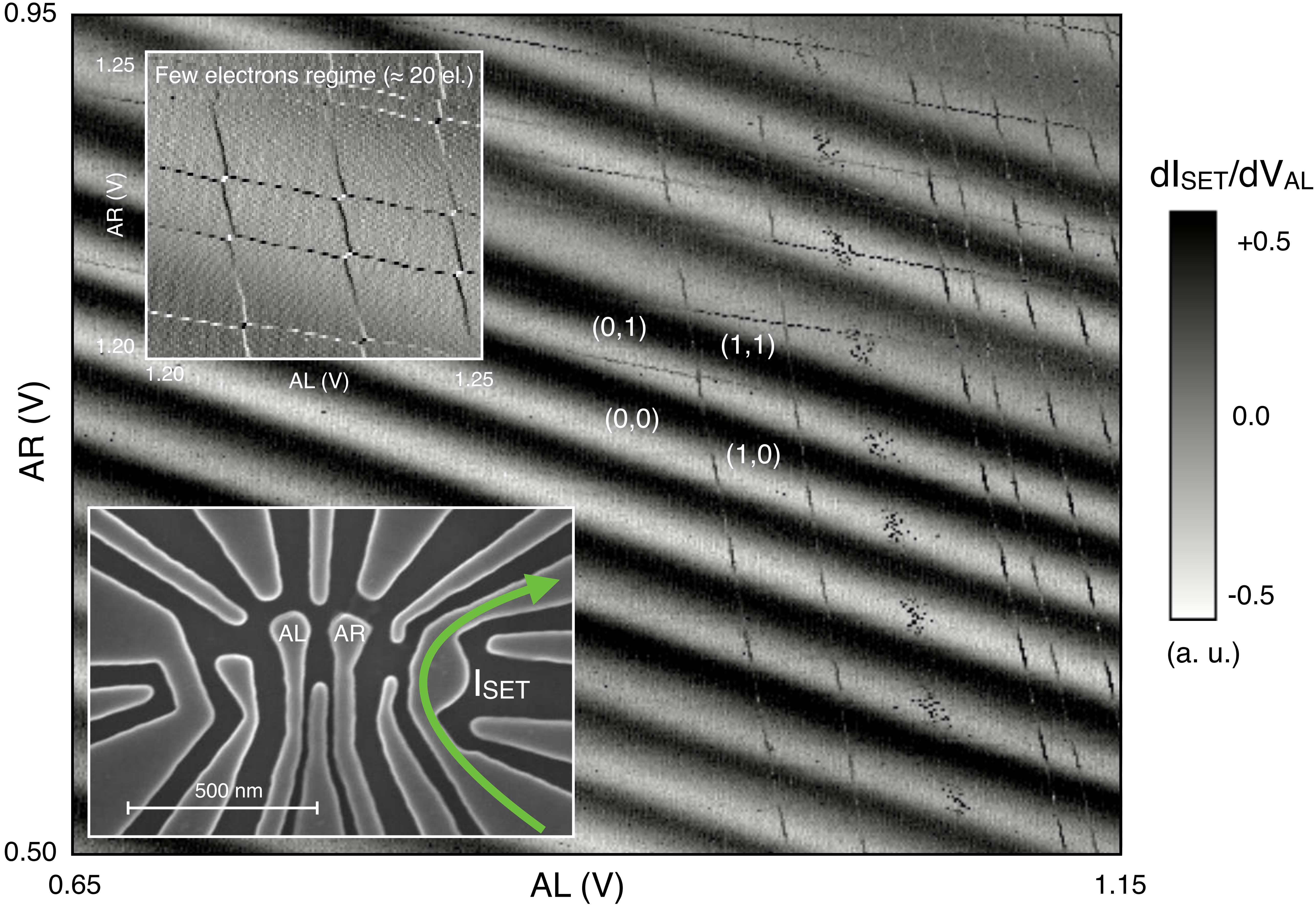
Pauli Spin Blockade

T= 8 mK



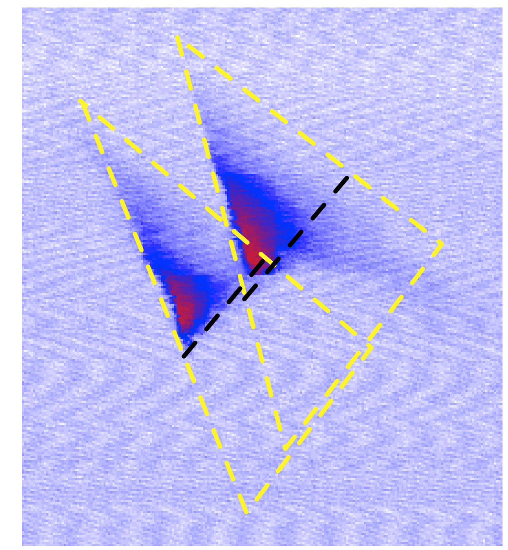
- In plane magnetic field
- Singlet-triplet separation: 0.4 meV
- Effective electron number only

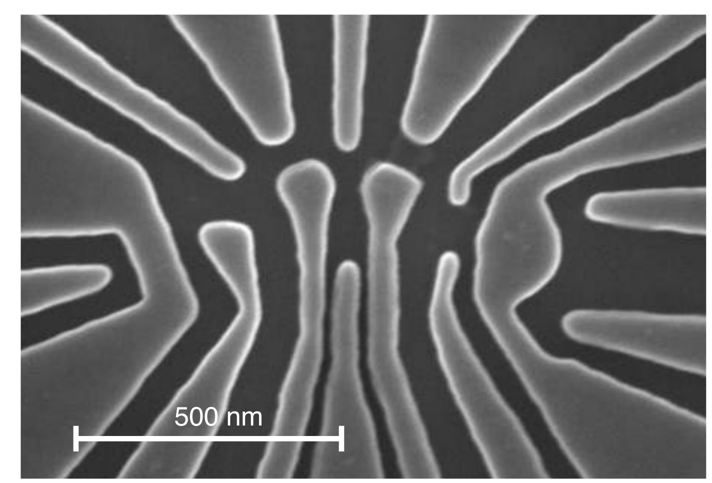
New design: zero electrons



Conclusion

- Single-electron regime in a Si MOS DQD
- Lithographic double quantum dot:
  E_{add} = 2.3 meV, ΔE = 0.3 meV
- Pauli Spin Blockade: Δ_{ST} =0.4 meV
- Improved device: zero electron regime.





Thank you!