

## Magnetic transport in a graphene double quantum dot

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Owing to its extremely high mobility ( $>100 \text{ m}^2/\text{Vs}$ ) and long expected spin relaxation time, graphene is a promising material for making field-effect transistors and quantum computing devices such as spin qubits. Double quantum dots have proved to be model systems for investigating the dynamics of single electrons, and were recently used to measure the spin coherence time in a GaAs based double dot device.<sup>1</sup> In an effort to have equally exquisite access to the dynamics of Dirac quasiparticles in graphene, we have fabricated a graphene double dot device and measured its transport properties at low temperature. Our device consists of two plunger gates for tuning the energy levels in the quantum dots, and three side gates to vary the inter-dot and the dot-lead tunnel barriers (Fig. 1.) At 100mK the conductance of the device as a function of the energy levels in the dots exhibits the honeycomb structure which is typical of a double dot device (Fig. 2.) From the dimensions of the honeycomb we extract the capacitive coupling strength between dots and the gates<sup>2</sup>, and examine how this evolves as a function of magnetic field. We will discuss magnetic field dependent changes in the capacitance coupling from the dot to the gate.

### References

[1] K. D. Petersson et al, Nano Lett., 2010, 10 (8), pp 2789–2793

[2] Xing Lan Liu et al, Nano Lett., 2010, 10 (8), pp 1623–1627

### Figures

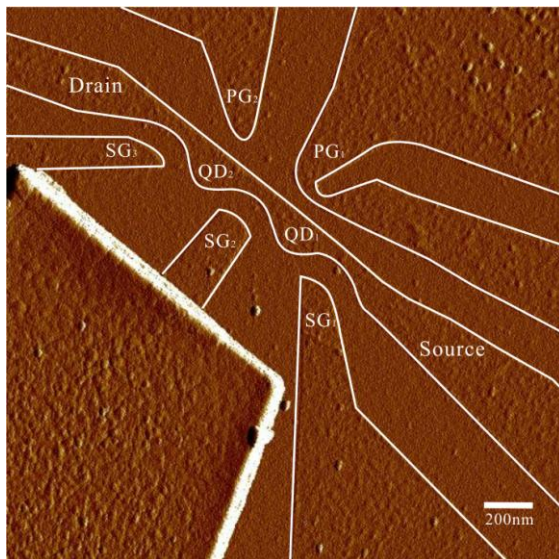


Fig. 1: The AFM image of graphene double quantum dot device that is measured in this work.

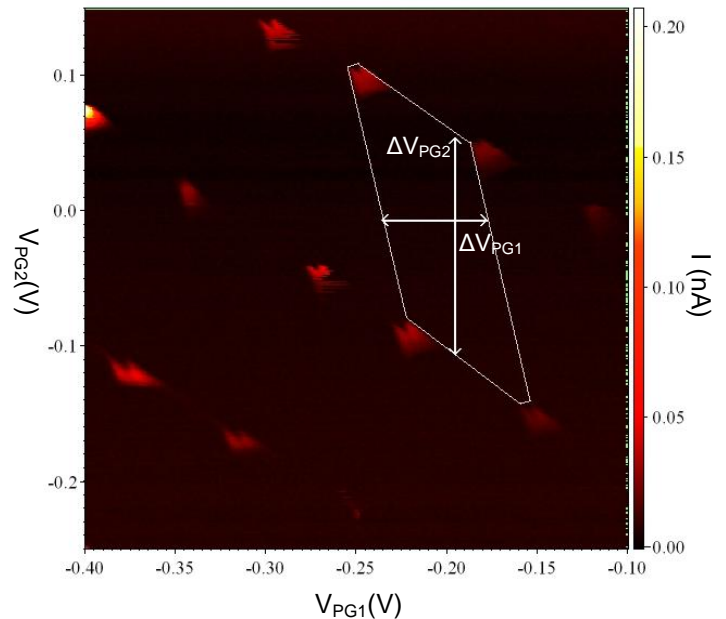


Fig. 2: Current as a function of plunger gate voltages  $V_{PG1}$  and  $V_{PG2}$  at  $V_{bias}=-1\text{mV}$ .  $\Delta V_{PG1}$  and  $\Delta V_{PG2}$  are used to determine the dimension of the honeycomb.