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Gate-defined graphene double quantum dot and excited state spectroscopy[1] XING LAN LIU, DOROTHEE HUG, LIEVEN VANDERSYPEN, Kavli Institute of NanoScience, Delft University of Technology — A graphene double quantum dot is a highly attractive system for quantum information processing. In particular, spin relaxation and coherence times in graphene are expected to be very long due to the absence of nuclear spin and spin-orbit interaction. We experimentally demonstrate a double quantum dot based on a graphene nano-ribbon device. Three top gates are fabricated on a graphene nano-ribbon to form a double quantum dot, where two gates on the left and right control independently the number of carriers on the left and right dot, and a middle gate is used to tune the inter-dot coupling. The inter-dot coupling changes non-monotonously when the middle gate voltage is varied, indicating that disorder influences the tunability. Transport through excited states is observed when the inter-dot coupling is switched off by the middle gate. We extract from the measurements the quantized level spacing in the double dot, and the results are comparable with expectations. The same device design principle can be applied to defining multiple quantum dots along a graphene nano-ribbon with independent gate control over barriers and charges.

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