Coherent control of a carbon nanotube-based gatemon qubit

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The standard transmon qubit may be modified by using a Josephson junction with few well-transmitted channels. Via a gate the junction's transmission and thus qubit properties become tuneable. Previous works have shown coherent measurements in such gatemon qubits with nanowire or graphene-based junctions. We present a qubit design using ultraclean single carbon nanotubes as junction material. Measurements of the resonance frequency show signatures of charge parity change in the quantum dot formed by the carbon nanotube. We measured Rabi oscillations demonstrating coherent control. We currently work on a microwave design to reduce energy relaxation.

Figures

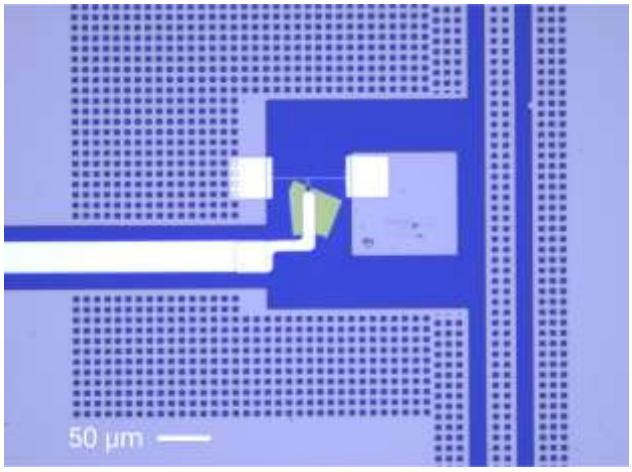

Figure 1: Optical microscope picture of transmon qubit coupled to a coplanar waveguide (on the right). The carbon nanotube (not visible) is covered by hexagonal boron nitride (green) and a top gate (towards the left).

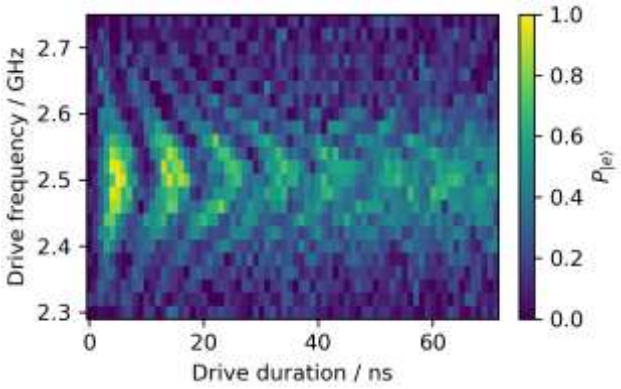

Figure 2: Rabi oscillations measured at various drive frequencies. The qubit frequency is at 2.5 GHz.