Single-Photon Detector and Qubit based on 2D materials

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Many unique materials properties make two-dimensional materials an attractive platform for quantum devices. In this talk, we shall exploit (A) the giant thermal response of graphene to make a bolometer with sensitivity set by its intrinsic thermal fluctuation [1], (B) the plasmonic coupling based on 2D materials to observe single-photons [2], and (C) the pristine interfaces of heterostructures to make superconducting qubit that demonstrate a surprisingly long quantum coherence in a compact structure [3]. Our experimental demonstrations the feasibility of detecting single-photon from microwave to infrared frequencies by the 2D materials and the miniaturization of superconducting qubit by more than 1000 times, benefiting the building of quantum network and quantum processor.

References

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Figures

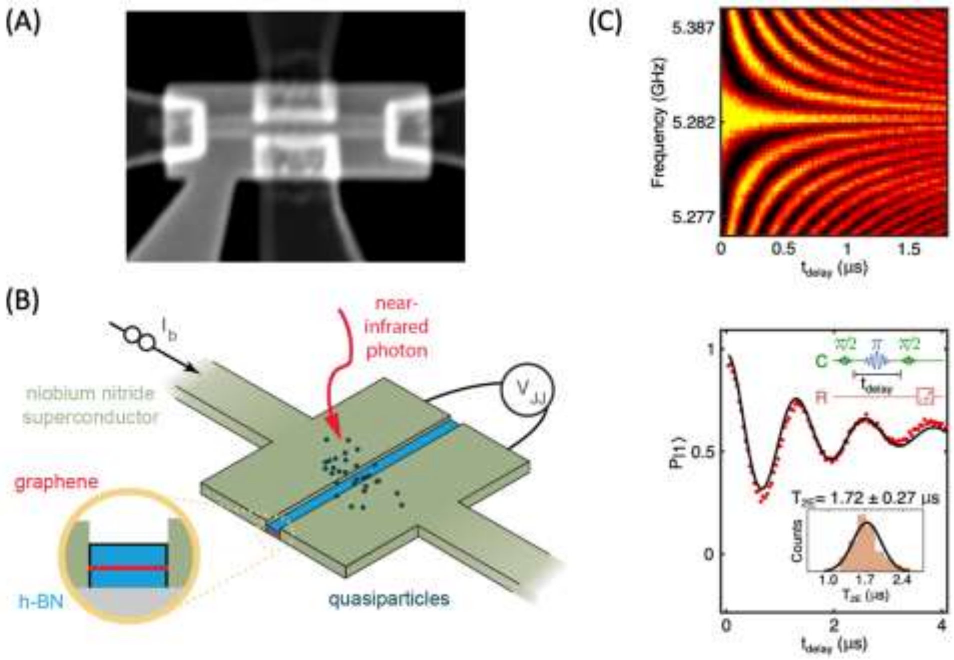

Figure 1: (A) Graphene bolometer showing Josephson junction and microwave antenna coupling under scanning electron microscope. (B) Schematic of single-photon detection experiment. (C) Ramsey fringes and Hahn echo showing the quantum coherence from a 2D qubit.