Weekly Seminar

Circuit QED with graphene double quantum dots and superconductor resonator

School of Physics,
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Time: 4:00pm, Jan. 7, 2015 (Wednesday)
时间: 2015年1月7日 （周三） 下午4:00
Venue: Room 607, Science Building 5
地点: 理科五号楼607会议室

Abstract

Graphene has attracted considerable attention in recent years due to its unique physical properties and potential applications. Graphene quantum dots have been proposed as quantum bits due to its unique properties. Here we report a circuit quantum electrodynamics (cQED) experiment using graphene double quantum dot (DQD) charge qubit and a superconducting reflection-line resonator (RLR). The demonstration of this capacitive coupling between graphene qubit and the resonator provides a possible approach for mediating interactions between spatially-separated graphene qubits. Taking advantage of sensitive microwave readout measurements using the resonator, we measure for the first time the charge-state dephasing rates for charge states in graphene DQDs. It is found that the dephasing rate has a four-fold period dependence on the QD charge number, which may give us some hits to the long-sought four-fold degeneracy energy levels in graphene with bot spin and valley degrees. To demonstrating the scaling probability of the hybrid system, we report an experimental demonstration of two graphene double quantum dots (DQDs) coupled over a distance of up to 60 **μm**, through a microwave resonator. We further characterize this nonlocal coupling by measuring the correlation between the DC currents in the two DQDs. This correlation is observed to be strongly dependent on the average photon number in the resonator. Our results explore T-C physics in electronic transport, and also contribute to the study of non-local transport and future implementations of remote electronic entanglement.

About the Speaker

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Nature Comm., Nanoletter Physics Review Letter Apply Physics Letters Optics Letters, Physics Review A/B SCI 70 Science Nature 1000

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Journal of Nanoscience Letters (Associate Editor).