Weekly Seminar

Circuit QED with graphene double quantum dots and superconductor resonator

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Time: 4:00pm, Jan. 7, 2015 (Wednesday)
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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

郭国平，男，1977年12月出生．教授．博士生导师 国家重大研究计划“固态量子芯片”项目首席科学家，国家首届优秀青年基金获得者．2000年和2005年在中国科学技术大学获得本科和博士学位。一直从事半导体纳米结构的量子输运及其在量子信息中的应用实验研究，在量子信息特别是半导体量子计算和量子芯片领域取得了若干原创性的研究成果如第一次在半导体量子点上实现了超快的单比特普适量子逻辑门，首次实现了石墨烯并联双量子点，发现并实现了SiGe纳米线中自旋轨道的栅极可控性等，以第一作者和责任通信作者在Nature Comm., Nanoletter，Physics Review Letter，Apply Physics Letters，Optics Letters, Physics Review A/B等主要国际学术期刊发表SCI论文70多篇，被Science、Nature等重要杂志引用近1000次．先后主持了多个国家自然科学基金重点，面上项目,国家优秀青年基金项目，科技部重大研究计划973课题和教育部新世纪优秀人才基金项目，兼任Journal of Nanoscience Letters 副编辑(Associate Editor).

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