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报告

门控半导体量子点中的快速量子操控

Fast Quantum Control in Gate-Defined Semiconductor Quantum Dots

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国家重点基础研究发展计划项目 A 类首席科学家，负责主持多个国家自然科学基金项目，中科院先导项目 B 课题以及中科院创新性项目。先后入选教育部新世纪优秀人才、国家优秀青年基金、国家万人计划之青年拔尖人才、长江特聘教授青年学者、国家杰出青年基金等国家人才计划，荣获第十四届中国青年科技奖。以第一作者，责任通信作者在主要国际学术期刊发表论文 80 多篇，正面他引 1000 多次，部分工作受到国际著名科学网站高度重视和报道。

报告摘要 Abstract

The gate-defined semiconductor quantum dot system, which can be manipulated electrically and fabricated using modern microelectronic technology, is considered as an ideal platform for quantum computation. The efficiency of quantum computation depends on the speed of gate operation. And charge qubit has quick operational speed and strong inter-qubit strength but with technical challenges. In this talk, I will introduce our experiments on ultrafast quantum control in semiconductor charge qubits including ultrafast universal quantum control of single charge qubit using LZS interference[1], conditional rotation of two strongly coupled qubits[2] and static Toffoli gate of three qubits[3]. Furthermore, to find a balance between coherence and operation speed, we experimentally demonstrated tunable hybrid qubit in GaAs quantum dots system[4, 5]. Finally, I will show our recent progress on Ge hut wire hole quantum dot which may have the potential of fast spin rotations using EDSR with the strong spin-orbit coupling[6].

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[2] Hai-Ou Li, et al., Conditional rotation of two strongly coupled semiconductor charge qubits, Nat. Commun. 6, 7681 (2015).

[3] Hai-Ou Li, et al., Controlled Quantum Operations of a Semiconductor Three-Qubit System, Phys. Rev. Appl. 9, 024015 (2018).

[4] Gang Cao, et al., Tunable Hybrid Qubit in a GaAs Double Quantum Dot, Phys. Rev. Lett. 116, 086801 (2016).

[5] Bao-Chuan Wang, et al., Tunable Hybrid Qubit in a Triple Quantum Dot, Phys. Rev. Appl. 8, 064035 (2017).

[6] Yan Li, et al., Coupling a Germanium Hut Wire Hole Quantum Dot to a Superconducting Microwave Resonator, Nano Lett. 18, 2091 (2018).