北京大学物理学院凝聚态物理与材料物理所

http://www.phy.pku.edu.cn/~icmp/forun/2016/2016qinu.xml

2016年第18期（No.381since 2001）

Superconducting circuits for Quantum Information Processing

Superconducting quantum circuits, particularly circuit Quantum Electrodynamics (circuit QED), have become a promising platform for quantum information processing (QIP) because of their long coherence times, fast quantum manipulation, and ease of scale up. In this talk, I will first review the recent progress based on this system towards QIP, in particular quantum error correction. Then I will focus on our two recent experiments with this system at Tsinghua University, although not particular for the purpose of QIP. In the first experiment, we demonstratea unique two-fold quantum delayed-choice experiment, enabled by a which-path detector with further unprecedented controllability to test of wave-particle complementarity.In the second experiment, we demonstrate a new method to generate arbitrary Fock-state superpositions. As examples, we generate high-fidelity phase eigenstates under various Hilbert-space dimensions and squeezed states, which are useful for quantumwalk and high-precision measurements, respectively.

Dr. Luyan Sun got his bachelor degree at the Department of Physics, Zhejiang University, in 2001. He thendid his PhD study at University of Maryland, College Park, mainlyon silicon-based quantum computation. After getting his PhD in physics in 2008, he moved to Yale University and started to work on quantum computation based on superconducting systemas a post-doctor. Since the end of 2013, Dr. Sun has been working at Tsinghua University with a new lab onsuperconducting qubits and circuit QED systems.His publications, including several in Nature and PRL, have been cited for more than 1,000 times. Dr. Sun wasselected to the 1000 Youth Talent Plan of and 221 Basic Research Plan for Young Faculties at Tsinghua in 2014.

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