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报告

以复合脉冲对自旋量子比特进行抗噪控制的进展

Recent Developments in Composite Pulses for Robust Control of Spin Qubits

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讲者介绍 Biography

Dr. Xin (Sunny) Wang received B.S. from School of Physics, Peking University in 2005, and received his Ph.D. degree from Columbia University in 2010. His Ph.D. study was focused on the theory of strongly correlated materials, in particular the high-Tc superconductors. From 2010-2015, Dr. Wang was a Research Associate in Condensed Matter Theory Center at University of Maryland, College Park. Starting from 2015 he joined City University of Hong Kong as an Assistant Professor. His current research interests include the theory of quantum computation using electron spins and strongly correlated electrons. He has published about 40 journal papers, including those in Nature Communications, npj Quantum Information, and Physical Review Letters.

报告摘要 Abstract

Spin qubits in semiconductor quantum dots are promising candidates for quantum information processing due to their demonstrated long coherence time, reasonably high control fidelity, and prospects for scalability. Despite these successes, there remain great challenges to overcome, with the major one being decoherence, the process through which the qubit loses the information it carries while interacting with its environment. Various techniques are proposed to combat decoherence, including the dynamically corrected gates using composite pulse sequences that can cancel both nuclear and charge noises simultaneously while performing a quantum gate operation. In this talk, I will present recent developments on these noise-compensating composite pulses for spin qubits, including gate sequences which are simultaneously resilient to nuclear and charge noises at both single and two-qubit level. In particular, corresponding to the recent experimental development of symmetric barrier control scheme, we introduce an optimized set of pulse sequences that are much more efficient than traditional ones both in terms of gate times and fidelities. These new pulses may extend the coherence times of the spin qubits by about two orders of magnitude.