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Room temperature high-fidelity non-adiabatic holonomic quantum computation on solid-state spins in Nitrogen-Vacancy centers[1] GUO-AN YAN, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, HUA LU, Hubei University of Technology; University of Science and Technology of China, AI-XI CHEN, Zhejiang Sci-Tech University; University of Waterloo —
The high-speed implementation and robustness against of non-adiabatic holonomic quantum computation provide a new idea for overcoming the difficulty of quantum system interacting with the environment easily decoherence, which realizes large-scale quantum computer construction. Here, we show that a high-fidelity quantum gates to implement non-adiabatic holonomic quantum computation under solid-state spin in Nitrogen-Vacancy(NV) centers, providing an extensible experimental platform that has the potential for room-temperature quantum computing, which has increased attention recent years. Compared with the previous method, we can implement both the one and two-qubit gates by varying the amplitude and phase of the microwave pulse applied to control the non-Abelian geometric phase acquired by NV centers. We also find that our proposed scheme may be implemented in the current experiment to discuss the gate fidelity with the experimental parameters. Therefore, the scheme adopts a new method to achieve high-fidelity non-adiabatic holonomic quantum computation.

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