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Robust quantum gates for stochastic time-varying noise CHIA-HSIEN HUANG, HSI-SHENG GOAN, Department of Physics, National Taiwan University, Taipei 10617, Taiwan — How to effectively construct robust quantum gates for time-varying noise is a very important but still outstanding problem. Here we develop a systematic method to find pulses for quantum gate operations robust against both low- and high-frequency (comparable to the qubit transition frequency) stochastic time-varying noise. Our approach, taking into account the noise properties of quantum computing systems, can output single smooth pulses in the presence of multi-sources of noise. Furthermore, our method is quite general and not sensitive to system models and noise models, and will make essential steps toward constructing high-fidelity and robust quantum gates for fault-tolerant quantum computation. Finally, we discuss and compare the gate operation performance by our method with that by the filter-transfer-function method.

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