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Quantum state and quantum entanglement protection using quantum measurements SHUCHAO WANG, Tsinghua University, YING LI, National University of Singapore, XIANGBIN WANG, Tsinghua University, LEONG CHUAN KWEK, National University of Singapore, ZONGWEN YU, Data Communication Science and Technology Research Institute, WENJIE ZOU, Tsinghua University — The time evolution of some quantum states can be slowed down or even stopped under frequent measurements. This is the usual quantum Zeno effect. Here we report an operator quantum Zeno effect(Shu-Chao Wang, Ying Li, Xiang-Bin Wang,and Leong Chuan Kwek, PRL 110, 100505 (2013)), in which the evolution of some physical observables is slowed down through measurements even though thequantum state changes randomly with time. Based on the operator quantum Zeno effect, we show how we can protect quantum information from decoherence with two-qubit measurements, realizable with noisy two-qubit interactions. Besides, we report the quantum entanglement protection using weak measurement and measurement reversal scheme(Shu-Chao Wang, Zong-Wen Yu, Wen-Jie Zou, and Xiang-Bin Wang, PRA 89, 022318 (2014)). Exposed in the nonzero temperature environment, a quantum system can both lose and gain excitations by interacting with the environment. In this work, we show how to optimally protect quantum states and quantum entanglement in such a situation based on measurement reversal from weak measurement. In particular, we present explicit formulas of protection. We find that this scheme can circumvent the entanglement sudden death in certain conditions.

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