中国科学院数学与系统科学研究院

量子论与信息论

学术报告

报告题目： Quantum State and Gate Verification with Minimum Settings

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地　　点： 数学与系统科学研究院 南楼 **N620**

摘　　要： Efficient verification of quantum states and gates is crucial to the development of quantum technologies. Although the sample complexities of quantum state verification and quantum gate verification have been studied by many researchers, the number of experimental settings has received little attention and is poorly understood. In this work we study systematically quantum state verification and quantum gate verification with a focus on the number of experimental settings. We show that any bipartite pure state can be verified by only two measurement settings based on local projective measurements. Any bipartite unitary in dimension d can be verified by 2d experimental settings based on local operations. In addition, we introduce the concept of entanglement-free verification and clarify its connection with minimal-setting verification. Furthermore, any two-qubit unitary can be verified with at most five experimental settings; moreover, a generic two-qubit unitary (except for a set of measure zero) can be verified by an entanglement-free protocol based on four settings. For a graph state, the minimum number of settings is tied to the chromatic number of the underlying graph. Finally, we summary the open problems and pose several conjectures.