量子信息科技学术研讨会 (2018.9.17-21)

# 报告

## 量子精密测量中的最优调控

## Optimal quantum control for quantum metrology

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### 讲者介绍 Biography

Haidong Yuan received his Bachelor's degree from Tsinghua University and PhD from Harvard University. He then did his postdoctoral work at Massachusetts Institute of Technology. From 2012 to 2014 he was an assistant professor at the department of Applied Mathematics, the Hong Kong Polytechnic University, since Sep 2014 he is with the department of Mechanical and Automation Engineering, the Chinese University of Hong Kong as an assistant professor.

### 报告摘要 Abstract

Measurement and estimation of parameters are essential for science and engineering, where the main quest is to find out the highest achievable precision with given resources and design schemes to attain it. With recent development of technology, it is now possible to design measurement protocols utilizing quantum mechanical effects, such as entanglement, to attain far better precision than classical schemes. This has found wide applications in quantum phase estimation, quantum imaging, atomic clock synchronization, etc, and created a high demand for better understanding of measurement protocols based on quantum mechanical effects. In this talk I will present a general framework for quantum metrology which relates the ultimate precision limit to the underlying quantum dynamics. This framework provides efficient methods for computing the ultimate precision limit and optimal schemes to attain it. I will show that with noiseless dynamics a universal time scaling emerges as a fundamental property under the optimal controlled schemes for quantum metrology, and the optimally controlled scheme outperforms the entanglement scheme for multi-parameter quantum metrology. If time permits, I will also talk about how the cooperation between quantum control and noises can further improve the precision limit.