

# Joint CQSE and CASTS Seminar

Weekly Seminar  
Mar. 27, 2015 (Friday)

TIME Mar. 27, 2015, 14:30 ~ 15:30  
TITLE Einstein-Podolsky-Rosen Steering and Quantum Information Processing  
SPEAKER Prof. Che-Ming Li  
Department of Engineering Science, National Cheng-Kung University  
PLACE Rm716, CCMS & New Physics Building, NTU

## Abstract

Einstein-Podolsky-Rosen (EPR) steering describes how different ensembles of quantum states can be remotely prepared by measuring one particle of an entangled pair. Here, we investigate quantum steering for single quantum  $d$ -dimensional systems (qudits) and devise quantum witnesses to efficiently verify the steerability therein, which are applicable both to single-system steering and EPR steering. In the single-system case our steering witnesses enable the unambiguous ruling-out of generic classical means of mimicking steering. Ruling out ‘false-steering’ scenarios has implications for securing channels against both cloning-based individual attack and coherent attacks when implementing quantum key distribution using qudits. We also show that these steering witnesses also have applications in quantum computation, in that they can serve as an efficient criterion for the evaluation of quantum logic gates of arbitrary size. Finally, we describe how the non-local EPR variant of these witnesses also function as tools for identifying faithful one-way quantum computation, secure entanglement-based quantum communication, and genuine multipartite EPR steering.

