

Center for Quantum Science and Engineering (CQSE)

Seminar
Jul. 9, 2012 (Monday)

TIME Jul. 9, 11:00am
TITLE Contextuality, the Kochen-Specker Theorem and its 13 Rays Proof
SPEAKER Prof. Oh Choo Hiap
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PLACE Rm716, CCMS & New Physics Building, NTU

Abstract

The quantum contextuality has become experimentally testable due to the discovery of the so called the Kochen-Specker(KS) inequalities, which include Bell-inequalities as special cases since locality can be understood as a space-like-separation-enforced non-contextuality. In the past ten years this fascinating nonclassical feature has been verified in several experiments on photons, trapped ions, and neutrons. The quantum contextuality as revealed by Kochen-Specker theorem should manifest itself in any state of a system with more than 2 distinguishable states. However for the simplest system capable of exhibiting quantum contextuality namely a qutrit, only a state-dependent test has been done most recently. The main obstacle to a state-independent verification of quantum contextuality for qutrits is that too many observables, e.g., at least 31, are involved in all the known state-independent tests. In this talk, we provide a state-independent proof of KS theorem using only 13 rays determined by 26 points on the surface of a magic cube. Based on this proof we have derived a novel Kochen-Specker inequality, called the magic-cube inequality, that must be satisfied by all non-contextual hidden variable models while being violated by all qutrit states. The talk is based on the paper "State-Independent Proof of Kochen-Specker Theorem with 13 Rays", Sixia Yu et al, Physical Review Letters 108, 030402 (2012) different scientific disciplines.

