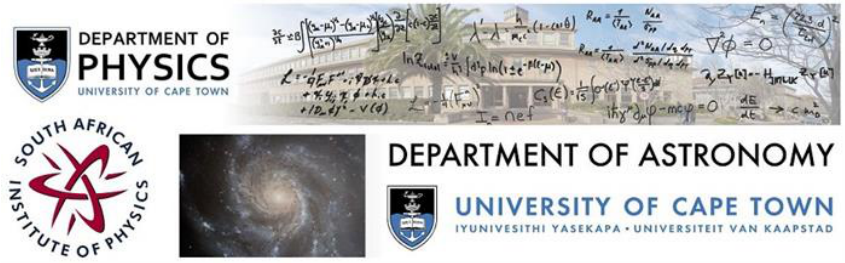

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Quantum channel tomography with classical light

Tuesday, 5 July 2016 14:40 (20 minutes)

Abstract content
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Entanglement is a salient feature of quantum mechanics, summarizing the correlations between systems which cannot be described independently; the state of the composite system cannot be expressed as a product state of its constituents. This non-separable property is however not unique to quantum systems; in fact, classes of classical electromagnetic fields have long been known to exhibit entanglement properties: here, the entanglement is between degrees of freedom rather than individual photons. We thus pose the question: given a classically entangled field, can one make predictions about the dynamics of quantum entangled photons, subject to perturbations in a given channel? Our findings are two folds: on one hand we show that classically entangled fields can accurately model the dynamics of quantum entangled systems, particularly the decay of entanglement resulting perturbations of the quantum state leading to decoherence. On the other hand, again using classical fields, we prove the Choi-Jamiolkowski isomorphism which, for quantum systems, states that the complete channel information can be obtained from a state tomography of the maximally entangled states, acted upon by the channel operator.

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