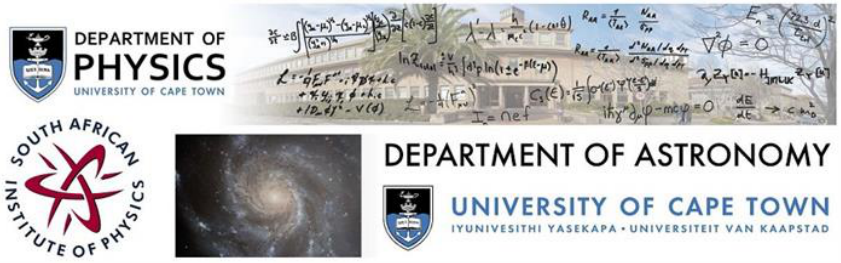

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Hyper-entanglement for secure communication

Thursday, 7 July 2016 09:40 (20 minutes)

Abstract content
   (Max 300 words)
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Entangled photons can be generated using spontaneous parametric down conversion to create two photons that are correlated in space. These photons can be tailored to exhibit entanglement either in their polarisation or spatial modes which are their independent degrees of freedom (DOF). However, hyper-entangled states can be generated by coupling the DOFs and exploiting their non-separable property that is observable under the classical and quantal regime. We demonstrate the first transport of hyper entangled photons through optical fibers in a classical and quantum setup by manipulating the dynamic and geometric phase of light. A method of engineering hyper-entangled photon states is mathematically proposed to exploit the classical properties of the DOFs of light to induce the hyper-entangled states. We then implement this in a setup that measures and quantifies the entanglement as a result of using optical fibers as the carrier of the hyper-entangled photons. This finds application in quantum information systems such as quantum key distribution protocols that can ensure secure communication between two parties. They are provided with an extended DOF that allows them to establish a securely encrypted communication system using two different measuring bases in addition to higher bandwidth that is supplemented by the use of optical fibers.

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Main supervisor (name and email)
and his / her institution

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