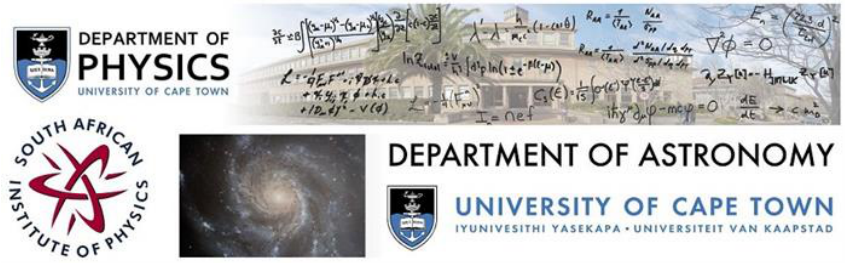

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Characterization of a Q-Plate in terms of Hyper-Geometric Gaussian modes

Wednesday, 6 July 2016 16:10 (1h 50m)

Abstract content
   (Max 300 words)
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The q-plate (QP) is a recently (2006) developed geometric-phase optical element, proving to be invaluable due to its ability to couple the spin and orbital angular momentum (OAM) of light. Currently gaining importance in the advancement of scientific research, the q-plate is utilized in quantum information transfer, quantum cloning, encoding information in photons and precise, non-contact measurement of mechanical rotations as well as recent research into the physical implementation of the quantum walk. Imperfect transformation has been indicated to occur within the QP, whereby the input beam incurs additional radial modes which can be mathematically described in terms of Hyper-Geometric Gaussian modes. It is therefore important to characterize its operation.

In this work, characterization of a QP and quarter wave plate (QWP) for the implementation of a quantum walk was executed. Theoretical and experimental studies on polarization and modal transformation were employed on these two optical elements. The effect of the QWP orientation and fast axis angle on linearly polarized light is demonstrated. Further confirmation of polarization and OAM transformations exacted by a q = 0.5 QP are quantified. The outcomes were found to correlate well with theoretical expectations. Furthermore, the incurrence of additional radial modes on an incident beam is demonstrated by experimental decomposition of the generated beam into a Laguerre-Gaussian basis set. Finally, the mathematical description of a QP output mode as a Hyper-Geometric Gaussian mode is experimentally verified.

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