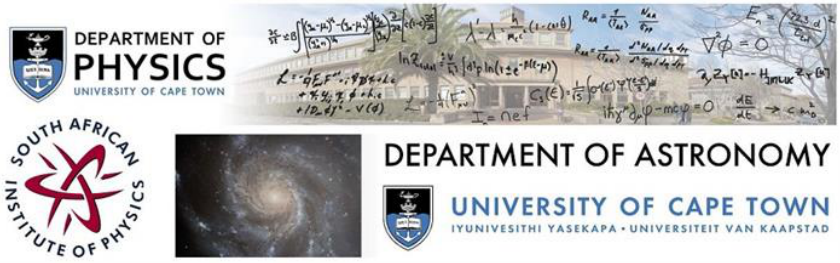

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Free-space data transfer using the spatial modes of light

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

Abstract content
   (Max 300 words)
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Orbital angular momentum (OAM) of light has become, over the years, the focus of intensive research worldwide. Traditional optical communication systems optimize multiplexing in polarization and the colour of the light that is transmitted to attain a high bandwidth data communication link. Yet despite these technologies, we are expected to reach a bandwidth ceiling in the near future due to nonlinear effects in fibres. We are particularly interested in the additional spatial degree of freedom that light provides for optical communication. The OAM basis has become the most common choice for free-space communication. These modes carry integer values of OAM. The idea is to assign information to each integer value of OAM where theoretically there is no limit. We have experimentally demonstrated that we can generate and detect these modes by making use of a Spatial Light Modulator (SLM) to digitally vary the phase of the light beam.

OAM carrying modes were generated using a technique known as complex amplitude modulation as a way of modulating a laser beam in phase and amplitude. We also detected these modes using a technique known as modal decomposition as a way of detecting OAM carrying light beams. A 100X100 grey scale picture was sent and received with high fidelity to demonstrate these techniques. This work was done in a lab-based scheme, free from the challenges associated with atmospheric turbulence. We wish to extend this work to the mid-IR region as an attempt to mitigate the problem of atmospheric turbulence over a long distance communication link and show high bit data transfer.

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Main supervisor (name and email)
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