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Investigating Two-Mode Mode Diversity with Laguerre-Gaussian and Hermite-Gaussian Modes

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One of the main effects of turbulence on higher order modes used within Free Space Optical systems is crosstalk between neighbouring modes, which in turn causes Mode Dependent Loss (MDL) and generally reduces the capacity of communication systems using multiplexing. Nevertheless, crosstalk could also be used for "energy conservation" within a system. This so-called mode diversity could help reduce MDL and improve the resilience of a system in turbulence. Rudimentary mode diversity using Orbital Angular Momentum modes has indeed been shown to minimise MDL. Could the use of other higher order mode sets also lead to improved mode diversity systems? In this presentation the use of Laguerre-Gaussian (LG) and Hermite-Gaussian (HG) modes are investigated in two-mode mode diversity systems. Modes with both unnormalized and normalised second moment radii are investigated and the combinations of modes which provide the highest received power are found by examining the modal decompositions of modes within both mode diversity systems and systems involving single modes. It is shown that for both LG and HG modes with unnormalized radii the maximum power is received for a given mode when a Gaussian beam is sent with the mode, however, for modes with normalised radii the maximum power is received when adjacent modes are sent.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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