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Modelling Crosstalk and Propagation of LG Beams in Turbulence

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The use of higher order modes in optical communications is topical due to their versatility and in particular their ability to conveniently increase the number of degrees of freedom in a communications system. This enables multiplexing for higher bandwidth communications as well as diversity for improving the robustness of a link. One of the main reasons why we do not see commercial systems making use of Mode Division Multiplexing is because the channel has not been accurately modelled and so it is impossible to engineer a reliable system. Accurate models exist for flat and spherical wave-fronts, but are not suitable for higher order modes and do not take into account crosstalk effects which is critical for multiplexing. Experimental measurements of the intensity fluctuations and crosstalk of Laguerre-Gauss modes in various conditions was performed on a 150 m free space link at the CSIR in Pretoria. Statistical modes based on the data as well as some example mechanisms for how the models may be used in future will be presented.

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Andrew Forbes, Wits, andrew.forbes@wits.ac.za

Primary authors: Prof. FORBES, Andrew (U. Witwatersrand); Mr COX, Mitchell (University of the Witwatersrand)

Presenter: Mr COX, Mitchell (University of the Witwatersrand)

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