

Multiplexing of spatial modes in the mid-IR region

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ABSTRACT:

Traditional optical communication systems optimize multiplexing in polarization and wavelength both transmitted in fiber and free-space to attain high bandwidth data communication. Yet despite these technologies, we are expected to reach a bandwidth ceiling in the near future. Communications using orbital angular momentum (OAM) carrying modes offers infinite dimensional states, providing means to increase link capacity by multiplexing spatially overlapping modes in both the azimuthal and radial degrees of freedom. OAM modes are multiplexed and de-multiplexed by the use of spatial light modulators (SLM). Implementation of complex amplitude modulation is employed on laser beams phase and amplitude to generate Laguerre-Gaussian (LG) modes. Modal decomposition is employed to detect these modes due to their orthogonality as they propagate in space. We demonstrate data transfer by sending images as a proof-of concept in a lab-based scheme. We demonstrate the creation and detection of OAM modes in the mid-IR region as a precursor to a mid-IR free-space communication link.