Multiplexed OAM Hybrid Near-Mid Infrared Link

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Abstract:

We are developing a hybrid fiber-to-free-space optical link based on Orbital Angular Momentum (OAM) for advanced multiplexing. The link operates across two distinct wavelength ranges connected through a coherent conversion process. We focused on the design of a stable nonlinear cavity to coherently transfer OAM beams from the near-infrared (NIR) to the mid-infrared (MIR) spectral region, ensuring the preservation of mode quality throughout the conversion. Future work will focus on coupling NIR OAM beams into graded-index fibers to implement the final NIR-MIR link. Additionally, we investigated self-induced spin-to-orbital angular momentum conversion (SISTOC) triggered by laser-induced thermal gradients in optical media. The absorption of a TEM_{00} laser beam produces a radially symmetric temperature distribution, leading to stress-induced birefringence and a spatially varying phase retardation. This mechanism enables the transfer of spin angular momentum into orbital angular momentum, resulting in the depolarization of the transmitted beam and the formation of structured intensity profiles. Our results indicate that SISTOC is a pervasive effect occurring in common optical components, even at low optical power levels.

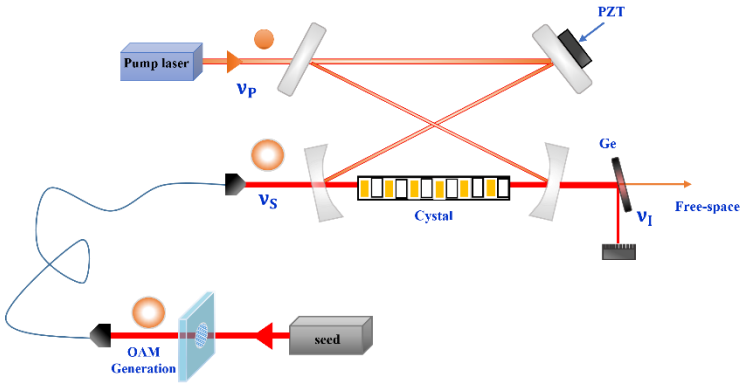

Figure 1Interface between fiber and free-space,for optical communication

References

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