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## Pumping up the frequency conversion of structured light

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Frequency conversion of light with orbital angular momentum (OAM) such as Laguerre-Gaussian (LG) beams is important for various applications such as free-space optical communications, sensitive infrared light detection, and obtaining OAM lasers. Traditional methods of frequency conversion involve a nonlinear medium and two input beams i.e., a signal LG beam and a pump beam with either flat-top or plane wave or gaussian profiles which suffer from significant loss of pump photons. To overcome this issue, we introduce the concept of pump shaping. By utilizing pump beams with specific shapes, such as amplitude-ring and annular-ring, we experimentally demonstrate a significant improvement in the frequency conversion efficiency and purity of the output mode. Our approach employs Difference Frequency Generation (DFG), a second-order nonlinear process, but can be extended to other processes, such as Sum Frequency Generation (SFG) and Second Harmonic Generation (SHG), offering a highly efficient solution for frequency conversion of structured light.

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

yes

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

PhD

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