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Amplification of higher-order Poincaré sphere beams

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Abstract

The Higher order Poincar´e sphere (HOPS) is generally used to describe scalar and vector orbital angular momentum modes. These modes have found many applications to date; however, they are limited to low power levels. It has thus become topical to consider amplification of such structured light modes. Here, we study the purity of the HOPS beams in a master oscillator power amplifier configuration using recently developed characterization tools through birefringent and non-birefringent amplifiers. We outline a general theory for this problem where we consider both gain and vector perspectives, and confirm our theory by experiment.