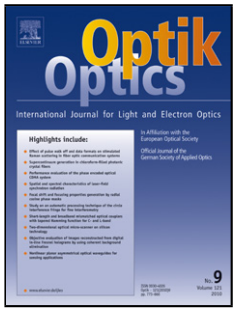

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Mapping the polarization distribution of arbitrary vector polarization beam

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Abstract. Vector polarization beams have been the topic of numerous theoretical and experimental investigations due to their special optical properties. Knowing the polarization states over the beam cross section of a vector beam is crucial to related researches. In this paper, we report a scheme to map the polarization distribution of an arbitrary vector beam with high precision. By using Jones matrix theory, the method has been analyzed in theory. The corresponding measurement setup has been built and the verification experiments have shown the feasibility of our scheme. Furthermore, the measurement precision has been systematically studied by Monte Carlo simulations.

Keywords: polarization distribution, vector beam, radial polarization, physical optics.

1. Introduction

Recently, there is an increasing interest in vector beams due to the novel properties shown in light field evolution and the interaction with matters, such as producing a smaller focused spot[1-2], increasing the information capacity of free space optical communication via mode division multiplexing[3], self-healing when obstructed[4] and so on. Unique optical properties make vector beams widely used in many fields, including optical microscopy [5-6], micro-nano photonics [7], and high-resolution optical metrology [8-9], optical tweezers[10-12], lithography[12], frequency shifting[13], electron acceleration[14],material processing [15]. Moreover, aiming to these specific applications, a large number of theoretical and experimental researches