コーナーキューブおよびアキシコンリトロリフレクターの偏光特性

Polarization properties of corner-cube and axicon retroreflectors

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Introduction

Corner-cube retroreflectors (CCRs) and axicons with 90 degrees apex angle are optical devices with interesting reflective and polarization characteristics. One of their properties is that the collimated radiation incident on both elements (arbitrarily direction for CCRs and normal incident for the axicon with 90 degrees apex angle) is reflected back in the direction that is counter-parallel to the incident beam. Another common property of both elements is that the reflected beam has coherent properties, which could be used for passive intra-resonator coherent beam combining (CBC). Finally, by rotation of the CCR one could compensate the beam astigmatism induced by thermal load in the laser active medium. For these reasons CCRs are already used as total-reflecting mirrors in laser resonators [1]. Recently we have suggested that axicons with 90 degrees apex angle can be also used for such purpose.

Knowledge of intensity distributions of *p*- and *s*-polarization components in retroreflected beam is essential for designing and building resonators with retroreflective components. So, in this contribution we present and discuss basic polarization properties of corner-cube and axicon retroreflectors. Namely, experimental results of near- and far-field intensity distributions for depolarized, *p*- and *s*- polarized outputs of these elements are presented and analyzed.

Experimental Setup, Results and Discussion

The experimental setup used in this study is schematically illustrated in Fig. 1. *p*- polarized, TEM_{00} mode, 5 mm in diameter laser beam passes a BS (beam splitter) with 10% transmission, then a PBS (polarization beam splitter) unit and reflects from a retroreflector element (CCR or axicon). The *s*- polarized component of the reflected beam is diverted by the PBS and monitored by the CCD2, while the *p*- polarized component passes the PBS without losses and 90% of it is diverted by the BS to the CCD1. For depolarized monitoring, the PBS unit is removed from the beam path and the retroreflected beam intensity distribution is monitored by the CCD1. By inserting or removing the L1 and L2 lenses, near-field (NF) and far-field (FF) intensity distributions can be monitored.

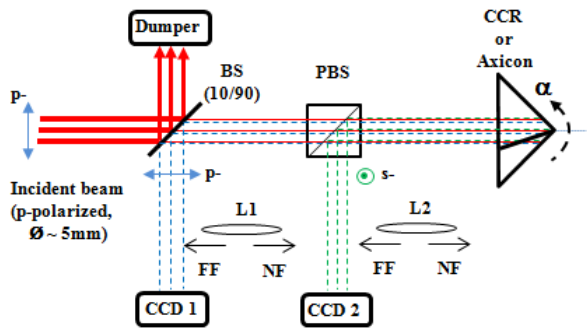

Fig. 1. Experimental setup for investigating depolarization properties of retroreflective elements.

In Fig. 2 two examples of NF and FF intensity distributions for depolarized, *p*- and *s*- polarized components from CCR retroreflected output beam for α = 0° and 30° orientations are presented.

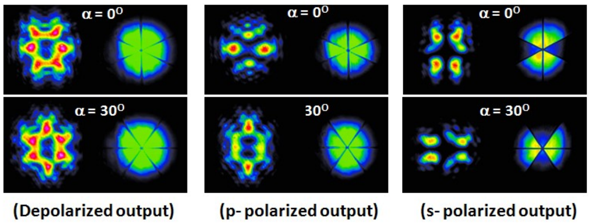

Fig. 2. NF (left) and FF (right) intensity distributions for depolarized (A), *p*- polarized (B) and *s*- polarized (C) components of retroreflected output beam from a CCR. The images are provided for two orientations of CCR at α = 0° and 30°, respectively.

Summarized, in retroreflected beam the intensity distributions are inhomogeneous and differ for different polarization components. Taking into consideration depolarization properties is essential in resonator designs with retroreflective elements.

[1] G. Zhou, et al., Appl. Opt. 21/9 (1982)

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