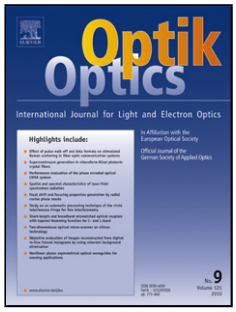

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Diffraction beam characteristics of the tapered-platform fiber

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Abstract: The diffraction beam characteristics of tapered-platform fiber are demonstrated by theoretical analysis and experimental measurement. The tapered-platform fiber is designed and fabricated. Based on light ray theory, the Gauss beam lens conversion model is established and the outgoing beam of the tapered-platform fiber end-face is analyzes. The transmission characteristics at the near field and far field spatial distribution of the tapered-platform fiber are measured with visible light, which are showing the evolution of tapered-platform fiber in optical transmission and mode spot. A CCD based video zoom microscope system is built to record cone optical fiber diffraction, and the diffraction pattern of tapered-platform fiber diffraction field in different locations is tested. The results show the diffraction field of tapered-platform fiber is Gauss beam, this research will provide important reference to the application of tapered-platform fiber.

Keyword: Fiber optics, tapered-platform fiber, Gauss beam, diffraction theory

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1. Introduction

Compared with the ordinary fiber, tapered fiber has special optical properties and conical structures, many researchers pay more attention to the theoretical and experimental research in tapered fiber. Tapered fiber are widely used in various fields, such as optical fiber sensor [1-2], Measurement [3], optical communication [4-5]. Those fields mostly used advantage of the tapered fiber, small volume, the output beam concentrated energy, and easy coupling characteristics. Such as: a high sensitivity ammonia sensor based on a tapered small core single mode fiber structure for measurement of ammonia concentration, and expended to fabricate Oxazine-based optic fiber sensor for detection of ammonia in water were reported [6-7], efficient coupling to the Whispering Gallery modes of a droplet resonator embedded in liquid medium was researched by Wang Y. [8], and used the easy coupling characteristics, aluminum nitride-on-sapphire platform was integrated high-Q microresonators [9-10], et al.

Those above are the main characteristics of application for the tapered fiber,. However, in the actual production of tapered fiber, the part of taper is difficult to achieve standardization and the tip portion of the core and the cladding is easily disproportionate stretch, which will lead to the stray light in the part of taper. Those factors are effect to the coupling efficiency of the tapered