Research on Transmission Characteristics of Photonic-crystal Fiber with a Subwaveleng th Air Core

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***Abstract*— This paper presents a comprehensive investigation of a subwavelength air-core photonic crystal fiber (PCF) and i ts application in a high-performance fiber polarizer. Through numerical simulations based on the finite-difference beam prop agation method, we demonstrate that the proposed PCF structure enables exceptional light confinement within its subwavelen gth air core, overcoming the classical diffraction limit. An optimized polarizer design integrating a metal film with the side-p olished PCF exhibits outstanding performance with an extinction ratio of 43.393 dB and an insertion loss of 1.553 dB for T E-polarized light. Comparative analysis confirms the superior efficacy of this approach over alternative configurations, establi shing its potential for advanced photonic applications.**

Keywords*— *Photonic Crystal Fiber, Subwavelength Optics, Fiber Polarizer, Extinction Ratio, Optical Confinement

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