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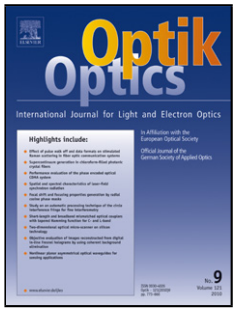

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Aspect ratio based nonlinear effects in spot size dependent propagation characteristics of trapezoidal index single mode fiber

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Abstract. We investigate the nonlinear propagation characteristics of single mode trapezoidal index fibers involving the exact numerical linear and nonlinear spot sizes and their relative change with respect to aspect ratio. From comparison of normalized spot sizes in absence and presence of Kerr nonlinearity, it is seen that nonlinear effect is more pronounced in lower values of normalized frequency for each aspect ratio. Further, for near cut-off propagation, the triangular index fiber excels in performance in respect of percentage change of spot sizes and fractional core power.

Keywords: Kerr Nonlinearity, Single Mode Fiber, Trapezoidal Index Profile, Spot Size, Fractional Core Power.

1. Introduction

Optical nonlinearities generate tremendous interest for its abilities of signal switching, de-multiplexing, wavelength conversion, light amplification, and supercontinuum generation [1-3]. In fact, nonlinear optical phenomena like Raman amplification and lasing [4], optical modulation, self-phase and cross-phase modulations [5,6], four-wave mixing [7] etc. have, already, been proliferated in literature [8]. On the other hand, a considerable amount of work has been reported on field distributions of a single mode fiber (SMF) and hybrid plasmonic waveguides with the optical Kerr effect [9]. Recently, impact of chromatic dispersion on nonlinear interaction between two sinusoidally modulated optical signals has been studied [7] in the context of four wave mixing. The usual waveguide material like silica has very low Kerr nonlinearities. So, it is essential to dope some rare earth materials having very high

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