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Method for investigation of mode coupling in multimode step-index silica photonic crystal fibers

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ABSTRACT

We propose a new method for investigation the state of mode coupling in a multimode step-index silica photonic crystal fiber (SI SPCF) with a solid-core by solving the time-independent power flow equation. For various arrangements of air-holes (different numerical apertures (NAs)), as well as a different widths of launch beam distribution, the length L_c for achieving equilibrium mode distribution (EMD) and length z_s at which a steady state distribution (SSD) is established are determined for such fiber. We obtained that the larger the air holes in the cladding (higher NA), the longer length of the fiber it takes for the modal distribution-transients to reach their equilibrium and steady state. In the case of a wide launch that excites more guiding modes, these lengths shorten. Such information is of interest for application of multimode SI SPCFs in telecommunication and fiber optic sensors.

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