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Large Core Silica Few-Mode Optical Fibers with Reduced Differential Mode Delay and Enhanced Mode Effective Area over 'C'-Band

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Abstract : This work presents a fast and simple method for the design of large core silica optical fibers with differential mode delay (DMD) management. Some results are reported concerned with refractive index profile optimization for 42 μm core 16-LP-mode optical fiber for next-generation optical networks. Here special refractive index profile form provides total DMD reducing over all mode staff under desired enhanced mode effective area. Method for the simulation of 'real manufactured' few-mode optical fiber (FMF) core geometry differing from the desired optimized structure by core non-symmetrical ellipticity and refractive index profile deviation including local fluctuations is proposed. Results of the following analysis of optimized FMF with inserted geometry distortions performed by earlier on developed modification of rigorous mixed finite-element method showed strong DMD degradation that requires additional higher-order mode management. In addition, this work also presents a method for design mode division multiplexer channel precision spatial positioning scheme at FMF core end that provides one of the potentiality solutions of described DMD degradation problem concerned with 'distorted' core geometry due to features of optical fiber manufacturing techniques.

Keywords : differential mode delay, few-mode optical fibers, nonlinear Shannon limit, optical fiber non-circularity, ‘real manufactured’ optical fiber core geometry simulation, refractive index profile optimization
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