Single-mode ytterbium-doped large-mode-area photonic bandgap rod fiber amplifier

Enabling Single-Mode (SM) operation in Large-Mode-Area (LMA) fiber amplifiers and lasers is critical, since a SM output ensures high beam quality and excellent pointing stability. In this paper, we demonstrate and test a new design approach for achieving SM LMA rod fibers by using a photonic bandgap structure. The structure allows resonant coupling of higher-order modes from the core and acts as a spatially Distributed Mode Filter (DMF). With this approach, we demonstrate passive SM performance in an only ~50cm long and straight ytterbium-doped rod fiber. The amplifier has a mode field diameter of ~59µm at 1064nm and exhibits a pump absorption of 27dB/m at 976nm. © 2011 Optical Society of America.