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Effective Index Model and Guided Modes in a Photonic Crystal Fiber[1] JESUS ARRIAGA, Universidad Autonoma de Puebla — In the last few years, there has been intense work in photonic crystal fibers (PCF's). These systems can be obtained by surrounding the core of a normal fiber with a two-dimensional photonic crystal made of silica, with air holes running along the length of the fiber. To study the waveguiding properties of these fibers, the cladding surrounding the solid core is replaced by an effective homogeneous medium described by an effective refractive index. This effective index model has been used to explain some of the peculiar properties of these systems. However, using the effective index medium to calculate the number of guided modes in PCF's, it is necessary to know the radius of the core precisely. Because in PCF's there is no clear boundary between the cladding and the core, different values of the fiber's core have been used in the literature. In this work we calculate the waveguiding properties of PCF's solving the Maxwell equations by using the plane wave expansion and the supercell method. We calculate the propagation constant both, for the propagating modes in the PCF's and for the fundamental space-filling mode (FSM). The FSM is the fundamental mode of the infinite photonic crystal cladding when the core is absent. Our results predict single-mode behavior at higher values of the air holes radius when compared with those reported previously.

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