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A Modeling of Photonic Crystal Fiber with a Boundary Integral Equations MIN HYUNG CHO, Quantum Photonic Science Research Center, Hanyang University, WEI CAI, Depratment of Mathematics and Statistics, The University of North Carolina at Charlotte, TSING-HUA HER, Depratment of Physics and Optical Science, The University of North Carolina at Charlotte, YOUNGPAK LEE, Quantum Photonic Science Research Center, Hanyang University — A boundary integral equation (BIE) for the photonic crystal fiber is formulated using the free space Green's function and Huygen's principle. The BIE reduces the number of unknowns significantly and is flexible to handle the geometry of the fiber owing to its nature of the formulation. The real and imaginary parts of the propagating constant, which is related to the dispersion and the confinement loss of the fiber, are calculated as a function of wavelength for both the air-silica fiber and the photonic bandgap fiber by the root searching method. The numerical simulations show that the air-silica fiber guides the light according to the total internal reflection and that the photonic bandgap fiber guides the light based on the scattering from the Fabry-Perot-like high-index inclusion. As a consequence, the spectrum of photonic bandgap fiber shows the discontinuities, and the locations of discontinuities obtained with BIE are compared with the simple analytical model based on the AntiResonant Reflecting Optical Waveguide (ARROW) model suggested by Natalie et al.

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