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Kerr Nonlinear Modes in Photonic Crystal Waveguide with Off-channel Features[1] BUDDHI RAI, Western Michigan University, GULAY BIRKOK, Gebze Institute of Technology, ARTHUR MCGURN, Western Michigan University — A theoretical method using nonlinear difference equation approach has been developed for investigating guided modes of photonic crystal waveguide for cases in which the guided modes interact with multiple bound electromagnetic modes localized on off-channel impurity features of Kerr nonlinear media. The interest is on the properties of resonant scattering of the modes exhibited by the system formed of both linear and nonlinear media sites in the photonic crystal lattice. The scattering is treated and compared with results of the scattering of the modes in the linear limit of the Kerr media, i.e. in the absence of intensity $|E|^2$ term in the Kerr dielectrics derived in recursive difference equation formulation. The equations of the system are simple and can be quickly solved to demonstrate the wide and interesting varieties of behavior present in the system, including among others, optical bistability and induced transparency. Additionally, the method is applied for a case in which the field dependence of Kerr dielectric properties allows two different frequency waveguide modes to interact with one another by a modulation of the off-channel site dielectric properties. In this interaction, the one mode is used to model numerically the transmission characteristics of the other.

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