

On the spectrum of waveguides in planar photonic bandgap structures

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We study a Helmholtz-type spectral problem related to the propagation of electromagnetic waves in photonic crystal waveguides. The waveguide is created by introducing a linear defect into a two-dimensional periodic medium. The defect is infinitely extended and aligned with one of the coordinate axes. The perturbation is expected to introduce guided mode spectrum inside the band gaps of the fully periodic, unperturbed spectral problem. We prove that guided mode spectrum can be created by arbitrarily small perturbations and that, after performing a Floquet decomposition in the axial direction of the waveguide, for any fixed value of the quasi-momentum the perturbation generates at most finitely many new eigenvalues inside the gap.