Numerical study of Frozen modes and the effect of losses in a Finite Size Magnetic Photonic Crystal

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We introduced a periodic structure with broken space inversion and time reversal symmetry[1]. We study the problem of a microwave incident on the surface of a periodic structure with unit cell including two anisotropic dielectric layers and a magnetic layer. This magnetic photonic crystal has a dispersion relation[2] which supports a stationary inflection point at which the group velocity vanishes, giving rise to a peculiar resonance, called the "frozen mode"[3]. Using finite element method, we analyze numerically the frozen mode in a finite periodic structure with finite transverse dimensions. We show that reflection of an incident wave is minimized while its amplitude becomes huge[4] within the crystal. The frozen mode is less sensitive to structural imperfection, boundary conditions. We have also studied about the effect of magnetic and electric losses on the sensitivity of frozen mode.

References:

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