Optical Phenomena in Photonic-Magnonic Crystals

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The photonic-magnonic crystals (PMCs) are complex multifunctional one-dimensional systems which combine properties of magnonic and photonic crystals (PCs) and possess the band gaps (PBGs) in GHz and PHz regimes for spin waves and light, respectively [1- 3]. In this presentation we report about the optical phenomena in PMCs which are bi-periodic structures $[C(A/B)^N]^M C$ with the equidistant magnetic layers C spaced by dielectric PCs $(A/B)^N$. We focus on investigation on the transmittivity spectra, Faraday rotation and Goos-Hänchen effect of the light passing through the finite size PMCs.

The transmittivity spectra of the PMCs contain the inside-PBG bands of complex structure [1 - 3]. We sowed the increase of Goos-Hänchen shift and Faraday rotation at the frequencies of inside-PBG modes and enhancement of the shift peaks due to the linear magneto-electric effect in the magnetic layers of the system for the case of s- (p-) polarized transmitted beam produced by p- (s-) polarized incident beam. The magneto-electric coupling in the magnetic layers results in significant increase of the positive maxima of the polarization plane rotation angles of *s*-polarized incident light and decreases the negative ones, whereas the Faraday rotation of *p*-polarized light almost doesn't change in presence of the magneto-electric interaction.

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