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Electro-optic switches based on Goos Hanchen shift in a pseudo-isotropic structurally chiral slab doped with metal nanoparticles

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Abstract

In this paper, the electrical control of the lateral shift of the reflected beams from a pseudo-isotropic nanocomposite structurally chiral slab is investigated, theoretically. The medium is made of a pseudo-isotropic chiral material where the silver nanoparticles are dispersed randomly inside it. The results show that the structure does not have any photonic bandgap in the absence of a low-frequency electric field and the lateral shift of the reflected beam from the structure is negligible. By the application of a low-frequency electric field, a photonic bandgap appears in the transmission spectra of the structure which only prevents the propagation of the right-handed circularly polarized waves. The giant positive and negative lateral shifts are observed at the edges of this bandgap. The mentioned properties of the structure have been used in the design of the electro-optical switches. Also, it has been shown that the lateral shifts can be controlled by varying the light incidence angle, the filling fraction of metallic nanoparticles, and the thickness of the slab.

Keywords: Goos Hanchen shift, pseudo-isotropic, structurally chiral, filling factor, and nanocomposite.

For full article, refer to the Persian section