Features of Reflection from the Layer of Hyperbolic Metamaterial

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In this paper, we investigate the features of reflection of a plane elliptically polarized electromagnetic wave fallen from isotropic transparent dielectric on a layer of hyperbolic metamaterial with optical axis in an interface and main effective dielectric permittivities less than the permittivity of dielectric. The cases are analyzed when one (ordinary or extraordinary) wave or two waves, exited inside the layer, are inhomogeneous. It is shown that for certain sub-wavelength thickness of the layer one can choose the angles of incidence for which two inhomogeneous (evanescent) waves existing in this layer totally tunnel through it. It is established that, in contrary to ordinary uniaxial crystal, maximal value of reflection coefficient from the metamaterial layer approaches the unity when the thickness increases.

Keywords: hyperbolic metamaterial, effective medium theory, electromagnetic wave, reflection, polarization.

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