

The oblique incidence of electromagnetic waves on gyrotropic stratified periodic structures

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One of the possibilities of creation of controlled converters of electromagnetic waves polarization is the use of stratified periodic structures, combining the properties of their components.

We consider stratified periodic structure, consisting of any quantity of elementary cells, placed in an external magnetic field. It is supposed, that the first layer of such a cell is isotropic, and does not possess the gyrotropic properties. The second layer is also isotropic, however it possesses the gyrotropic properties, that leads to circular birefringence of waves inside the layer.

From the continuity equations and the exact solution of the Maxwell equations the elements of a matrix are obtained. This matrix connects complex amplitudes of electric and magnetic fields of an incident wave with the same characteristics of transmitted and reflected waves. Multiplying boundary matrixes and matrixes of propagation in a medium, we obtain resulting matrix for the elementary cell connecting an incident wave with reflected and transmitted waves. Obtained amplitudes of reflected and transmitted waves satisfy to the law of conservation of the electromagnetic field energy.

When changing either an external magnetic field or an angle of incidence or the frequency of electromagnetic waves the polarization properties change both of transmitted and reflected waves. As a result there is the possibility to use such a structure, which has selective reflection of light, as the polarization converter controlled by a magnetic field.