Resonance magneto-electric effects near the surface in a dielectric.

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Recently, some interesting facts during the studies of behavior of a dielectric in electromagnetic (EM) field have been discovered [1-3]. The interface of a dielectric with arbitrary spontaneous polarization and metal (or superconductor) was placed into a strong constant EM field. It has been obtained that at a certain orientation of the surface to the field the spectrum of elementary excitations of the system is displaced to the long-wave region and a propagating in the system weak EM wave excites surface polaritons, which influence the character of its propagation.

In present research, the peculiarities of EM wave propagation in a wide range of mutual orientation of the interface, crystal axis and constant EM field were studied in framework of multi-channel scattering theory [4,5]. The analysis of complex dielectric constant predicts a series of phenomena. The displacement of the elementary excitations spectrum can lead to the situation when the interaction between different branches of the dispersion relation at certain energy will be resonant. According to the theory, this interaction determines the transparency of the interface, i.e. the transmission and reflection of the electromagnetic wave and waves of polarization form the interface. The possibility of the homogeneous static modulated polarization of the dielectric, which is one of the results of the resonant interaction, would be helpful in studies of incommensurate (modulated) phases in ferroelectrics. Obtained birefringence of the propagating EM wave strongly depends on the orientation of crystal axis and EMF. However it appears, that the uniaxiality of the dielectric crystal has no principal meaning for some results obtained in this work.

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