Commission B: FIELDS AND WAVES
(b) Scattering and diffraction

ON THE FEATURES OF THE ANGULAR SPECTRUM OF SCATTERED RADIATION PASSING THROUGH THE TURBULENT MAGNETOPLASMA

G.V. Jandieri [1)] , T.N. Bzhalava, I.N.Jabnidze [1)] , N.Kh.Gomidze [1)] , V.G. Jandieri [2)]

1. Physics Department, Georgian Technical University,
   380075 Tbilisi, Georgia.
   Fax: (+99532) 253898; E-mail: jandieri@access.sanet.ge
2. Computer Science and Communication Engineering Department, Kyushu University,
   Fukuoka 812–8581, Japan
   E–mail: vjandieri@yahoo.com

It is well known that the strong absorption in randomly inhomogeneous media makes a substantial effect on the statistical characteristics of multiple scattered radiation. Asymmetric statement of a problem could lead to significant distortions of the angular (spatial) power spectrum (APS) of multiple scattered electromagnetic radiations. Study of the angular power spectrum of scattered field is of a great practical importance. Statistical characteristics of the APS in a randomly inhomogeneous absorptive anisotropic medium, such as collisional turbulent magnetoplasma, are investigated in this paper using geometrical optics approximation. The behaviour of the statistical characteristics substantially depends on the asymmetrical statement of the problem: oblique incidence and medium anisotropy. Each of them leads to the distortion of the APS, but mutual action of these two factors may amplify or weaken the influence of absorption on the deformation of the APS. It has been shown that at small angle of incidence of plane electromagnetic wave on the boundary of turbulent magnetoplasma, the APS is broadening with increasing the immersion depth and its maximum is displaced towards the normal direction to the boundary. These effects occur due to an asymmetrical statement of the problem. Asymmetry appears not only at oblique illumination of the boundary. It can be an intrinsic property of medium, for example anisotropy. Influence of both absorption and anisotropy on the evolution of the APS at small amplitude of electromagnetic wave incident on a thick plane layer of a turbulent collisional magnetoplasma is considered in this paper. For strong phase fluctiations APS has the Gaussian form. The statistical characteristics are expressed through the correlation function of the phase. From the numerical simulations it follows that the anomalous broadening of the APS and displacement of its center of gravity take place when so called “parameter of compensation” is not equal to zero. Numerical calculations have been carried out for nonisotropic spactral correlation function of electron concentration fluctuation. Investigations have shown that along the particular direction neither displacement of the center of gravity nor anomalous broadening of the APS not observed. In this direction two asymmetric factors of the problem (oblique incidence and medium anisotropy) compensate each other. This direction we call as “direction of compensation”. The existence of the certain direction along which these factors mutually compensate each other is the new effect. The radiation propagates along this direction as in case of normal incidence on the boundary of an isotropic medium. “Angle of compensation” has been also found. When the refracted wave propagates along the direction of compensation the center of gravity is not displaced. At other angles of refraction, the center of gravity of the APS asymptotically tends to the direction of compensation with increasing the immersion depth of the layer. Beyond the compensation direction the some asymmetrical factors predominate and the effect of anomalous broadening of the APS is observed. Angular power spectrum is symmetric along the direction of compensation and coefficient of asymmetry is equal to zero.