Stochastic Model of Electromagnetic Signal Propagation in the Turbulent Flow with Resonance Absorption

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The purpose of this work is a numerical investigation of the process of electromagnetic signal multiple interactions with moving turbulent inhomogeneous in the flow of slightly ionized plasma with resonance absorption. To the analysis of this problem a method of stochastic modeling is applied (V.G. Spitsyn, IEEE AP-S International Symposium, 1, 288-291, 2002). Here is considered the propagation of waves with arbitrary frequency spectrum in the plane-parallel turbulent flow with inhomogeneous profiles of velocity and concentration of turbulences. The indicatrix of turbulence over-radiation is supposed by isotropic type. In the Figures 1, 2 are presented the computation results of angular and frequency spectrums of scattering signal for case of propagation wave across the axis of flow.

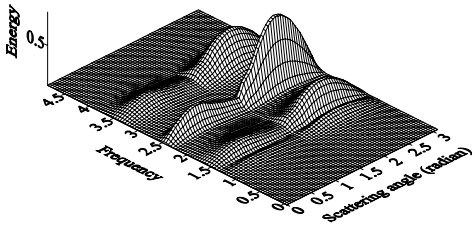

Figure 1

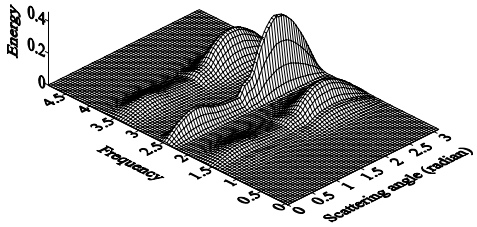

Figure 2

In the horizontal plane in the Figure 1 and Figure 2 are presented the scattering angle, calculated from the direction of incident wave propagation, and the value of dimensionless Doppler shift of frequency. By the vertical axis in this figures are calculated the energy of scattering signal, which is normalized on the maximum of energy in the first frame (Figure 1). There are presented the results of transformation frequency spectrum of incident wave with three Gaussian components in the flow with inhomogeneous profiles of velocity and concentration of turbulences. In the Figure 1 is presented the angular and frequency spectrum scattering signal, which received for case of multiply signal interaction with turbulences. In the Figure 2 is presented the results of signal propagation in the flow for case of only one act of signal scattering on the turbulences. In Figure 1 we can see more strong effect of resonance absorption on the frequency equal 1,4 in comparison with Figure 2. This fact is explained by the large significant of effect of multiply signal interaction with moving turbulences.