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Application of multiple phase-screen calculation for radio sounding of artificial ionospheric in homogeneities

The work submits experimental data and numerical computation of radio wave propagation through ionosphere irregularities, formed at injection chemical reagents, are studied in this case. The Multiple Phase Screen (MPS) calculation consists of collapse ionospheric structure into multiple thin phase-changing screens with free-space. When the wave propagates to the ground wave, front distortion leads to the formation of interference pattern, characterized by amplitude fluctuations. The MPS method solves the parabolic wave equation and allows for direct computation of realizations of the received signal. In order to reproduce the conditions of the experiment, we fix a point of reception and consider the variation of the amplitude at this point. According to the estimates, at the intersection of the front edge of the shadow should be a sharp increase in the amplitude of the signal (the effect of the edge focusing) and then - a decline of 5-15 dB. Changing the size of the artificial plasma cloud (APC) and the decrease in the density of the electron density in it resulted in a gradual increase in the amplitude of the signal. Before the amplitude of the signal returns to its original level, there will be the second, less pronounced peak corresponding to the intersection of the second edge of the shadow. Through the development of the APC in time the picture will be asymmetric. A number of active experiments in the ionosphere with different conditions of injection, which took place on the scientific-research vessels (RV) was chosen for modeling. The results of these experiments, as well as a number of previous researches allow us to represent the APC as a large-scale formation with a higher electron density relative to the background plasma immersed in a randomly inhomogeneous medium. Dimensions of APC and density of the electron concentration were determined from ionosonde data and optical measurements. To assess the impact of large-scale component of the APC simulation was carried out for deterministic strong Gaussian lens.

Biography

Igor Nasyrov is a PhD holder in Physics. His main fields of interest include: Ionosphere, artificial ionospheric disturbances, and Sura ionospheric heating facility. Currently, he is an Associate Professor of the Institute of Physics, the Kazan Federal University (Kazan, Russia). He has published more than 20 papers in reputed journals. He is a Member of the Scientific Council of Russian Academy of Sciences on the complex problem radio waves propagation.

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