

THE INFLUENCE OF IONOSPHERE PLASMA HOLES ON HF RADIO WAVE PROPAGATION.

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The results of HF radio wave propagation modeling on routes crossing ionosphere holes (large-scale inhomogeneity formation with lowered electron density) in approximation of geometrical optics are presented. The geometrical sizes holes in ionosphere of considered in this article are much more than HF wave length. This ionospheric holes are long-living formations. Their life-time is ranged from of several hours to several days in dependence on geographical region where they are observed or can be observed. The experimental and modeling ionosphere sections with length ≤ 3000 km in full ionosphere heights range 150-1000 km are used: 1. experimental – radio tomography sections of middle-latitude and subauroral ionosphere, 2. modeling – numerical-analytical section of equatorial ionosphere with used data of vertical ionosphere sounding. It was received, that the asymmetry of electron density distribution (in coordinate: altitude-latitude) results to qualitative and quantitative distinctions of wave trajectories in dependences on geometrical hole sizes and sounding parameters: direction, point position, angle and frequency. The characteristics of propagation modes are defined. The most important are: one-hop and come back trajectories, ray captured by E-F2 layers channel, capture and keep waves in hole, trapeziform and passing through hole rays in the frequency range $f \geq f_p$, (f - sounding frequency, f_p - plasma frequency); rebounding trajectories in the frequency range $f \gg f_p$. The interest presents the family of captured and kept by hole trajectories. For different conditions the anomaly time-delay reach ~ 23 ms by hole of subauroral ionosphere and ~ 155 ms by hole of equatorial ionosphere for $f \approx 5$ MHz. When waves propagate along rebounding trajectories, the operating frequency can be higher than the plasma frequency in the ionospheric channels by about on order of magnitude. The operating frequency have been obtained ≥ 30 MHz. The conditions of capture and keep in hole waves are discussed.