10. DISTRIBUTION OF ELECTRON CONCENTRATION WITH HEIGHT AND ITS INFLUENCE ON THE PROPAGATION OF RADIO WAVES

L. A. ZHEKULIN

ABSTRACT

In this paper there is investigated the propagation of radio waves in a non-homogeneous ionized atmosphere with a dispersion of ionization obtained as a result of recent investigations into the structure of the ionosphere.

On the basis of the wave treatment of the problem, relations were found for the electric field intensity, expressed as Airy functions; and the results were compared with the approximate solution by geometric optics.

According to the latest experimental data, there occurs a change in the ionization gradient in the E-region of the ionosphere. Here we find an approximately steady increase of ionization density with height.

According to previous assumptions, the ionization density has a maximum in the E-layer. Hence, with higher frequency and in crossing the critical value (for the E-layer), the region of signal reflexion from the E-layer has a discontinuity in the higher regions of the ionosphere (F_1 or F_2). In accordance with the new ideas concerning the dispersion of ionization, the level of signal reflexion changes gradually from the E-region to the higher regions of the ionosphere. In this paper we investigate the electric field of the reflected wave for both of these essentially different pictures of the structure of the ionosphere in the E-region, where we take into account the influence of absorption in the atmosphere. We study the reflexion of the electromagnetic wave in the F-region of the ionosphere. The field of the reflected wave is determined for frequencies close to the critical frequency of the F-region of the ionosphere, for different values of the gradient of the ionization density above maximum.

We investigate the form of the impulse reflected from a non-homogeneous ionized atmosphere with ionization dispersion, which corresponds to the new experimental data.

11. ABSORPTION OF RADIO WAVES IN THE IONOSPHERE AND DISTRIBUTION OF ELECTRON CONCENTRATION IN THE F_2-LAYER

A. N. KAZANTSEV

ABSTRACT

One of the methods used in the treatment of the results obtained during radio observations of Earth satellites consists of determining the radio-wave absorption coefficients by measurements of the electric-field strength at comparable positions.

Over the territory of the Soviet Union the Earth satellites sometimes passed below the maximum of the F_2-layer, sometimes above it, and sometimes near it.

By analysing the measurements of the field strength of the satellite radio signals in the area of direct visibility, and comparing integral coefficients of absorption at different heights of the satellite in relation to the maximum of electron concentration of the F_2-layer, it is possible to determine the radio-wave absorption both in the whole thickness of the F_2-layer and in its two halves as well as in lower regions.

Preliminary investigations show that the value of the integral absorption in the F_2-layer, found experimentally, agrees well with that calculated for the so-called 'biparabolic' layer with exponential extension. Using a model in which the variation of a distribution model of electron concentration with height most closely corresponds to the