ral to use as the stated function the Airy function v(t) (more accurately, the Airy function and its derivative in combination with an oscillating exponential function).[6-8] It turns out that the amplitude factors in front of the Airy function and its derivative, which are to be determined, as well as the arguments of the Airy function and the exponentials, are expressed algebraically in terms of the geometrical-optics solutions (i.e., in terms of the pair of solutions of the eikonal equation $(\nabla\psi)^2 = \epsilon$ and the transport equation div $(A^2 \nabla\psi) = 0$). At a distance away from the caustic, in the light region, such a standard solution goes over into a sum of incident and reflected waves of the ray approximation, while in the shadow region it goes over to the damped wave of the "complex" geometrical optics. However, unlike these geometrical expressions, the standard solution is finite on the caustic.

For caustics of more complicated form, the standard formulas can be suitably complicated, but the main "geometrical" statement remains in force: all the stated solution parameters to be determined are expressed in terms of solutions (both real and complex) of the geometrical-optics equations.[7,8]

Similar results are obtained also from the asymptotic integral representations proposed by Maslov.[9] These representations are obtained from an analysis of the wave problems in a mixed coordinate-momentum space, but the obtained diffraction solutions also turn out to be "tied in" with the rays.

In addition, the paper describes briefly two other more known generalizations of the method of geometrical optics: the method of parabolic equation (the diffusion approximation)[10,11] and the geometrical theory of diffraction developed by Keller and his followers.[1,12] In these generalizations, the geometrical "skeleton" also plays an exceptionally important role.

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L. L. Goryshnik and Yu. A. Kravtsov. Correlation Theory of Radio Wave Scattering in the Polar Ionosphere.

The paper is an exposition of the correlation theory of scattering of radio waves in the polar ionosphere. A derivation is presented of a general expression for the space-time correlation function of the signals of auroral radio reflections, taking into account the main features of the polar ionosphere as a scattering medium and the main features of the emission and reception of pulsed sounding signals.

With the aid of the obtained expressions for the signals of radio reflections and their correlation functions, three questions are considered: 1) the study of the correlation properties of signals of radio reflections following the emission of either a single short pulse or a sequence of short pulses, 2) analysis of the operation of a spectrum analyzer measuring the frequency spectrum of the fluctuations of the electron concentration in the ionosphere, and 3) an estimate of the change of the polarization of the signal as it propagates and is scattered in the polar ionosphere.

Comparison of the results of the theoretical estimates of the change of the polarization with the experimental data shows good agreement.

Thus, the developed theory makes it possible to study, even without specifying concretely a model for the scattering medium, both some properties of radio reflections, and some principal possibilities of different methods of measuring the statistical properties of fluctuations of the parameters of the polar ionosphere. In addition, the general expression for the space-time correlation functions will undoubtedly be useful for the solution of the fundamental problem of the study of the auroral radio reflections, namely the clarification, on the basis of the properties and the statistics of the signal of the radio reflections, of the true structure and the time behavior of the inhomogeneities of the polar ionosphere.

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Z. I. Feĭzulin. Propagation of Bounded Wave Beams in Media with Random Inhomogeneities.

The paper considers two groups of problems: 1) the calculation of the fluctuations of the amplitude and of the phase in a spatially-bounded waveguide beam propagating in a medium with random inhomogeneities, and 2) investigation of the influence of the fluctuating medium on the shape of the bounded beam.

The mean value and the correlation characteristics of the complex phase in a bounded beam of electromagnetic radiation with a Gaussian amplitude distribution over the cross section, propagating in a medium with a fluctuating dielectric constant, are obtained in the approximation of the method of smooth perturbations. Values are obtained for the scales of the transverse correlation of the level of the amplitude for a model of a medium with a Gaussian correlation function of the fluctuations, and for a locally-isotropic turbulent model, the fluctuations of the dielectric constant of which are described by the Kolmogorov "two-thirds" law.

Besides the case when the medium is statistically and regularly homogeneous and isotropic, fluctuations of the level and of the phase are considered for a beam propagating in a medium whose average dielectric constant is a slow function of the coordinates (in terms of the wavelength and the dimension of the inhomogeneities).

For a quantitative description of the deformation of the wave beams propagating in the turbulent medium, a mean-squared measure of the width of the illuminated region is introduced. It is shown that this measure is very convenient in calculations, since its use makes it possible to derive manageable formulas under rather general assumptions concerning the shape of the beam and the statistical and regular properties of the medium. It is important that the terms corresponding to the geometrical, diffraction, and fluctuation divergences of the beam enter additively in the final expressions. This makes it possible to estimate readily the contribution of each of the indicated effects.

The obtained measure of the width of the illuminated region behind the turbulent layer makes it possible to solve a number of concrete problems. These include the problems considered in the paper, corresponding to the three possible cases of mutual arrangement of the radiation source and the inhomogeneities causing the fluctuations: 1) the problem of the broadening of a laser beam in a turbulent atmosphere (the inhomogeneities are in the near zone relative to the source); 2) the problem of the resolving power of antennas in a turbulent medium (the inhomogeneities are located in the far zone), and finally 3) the problem of the influence exerted on the resolving power by random errors of the field distribution in the antenna aperture (the inhomogeneities lie on the source itself).

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