ALGORITHM FOR RECONSTRUCTING NONLOCAL CHARACTERISTICS OF TOKAMAK PLASMA TURBULENCE from REFLECTOMETRY [[1]](#footnote-1)\*)

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Interpretation of plasma reflectometry signals in the EC frequency range of EM waves allows one to reconstruct the spectral composition of plasma density fluctuations (see, for example, [1]). In addition to interest in the general physical problem of establishing a relationship between turbulence parameters and heat transfer processes, which, as is known, exhibit strong nonlocality (nondiffusion) properties, of practical interest [2] is the influence of nonlocal turbulence properties on the measurement of the spatial profile of plasma density, including such measurements in the ITER using reflectometry from the side of a high magnetic field.

For tokamak plasma, analytical methods have been developed that make it possible to relate the spectral distribution of reflectometry signals with the correlation function of plasma density fluctuations (see, for example, [3, 4]). In this case, model correlation functions of plasma density fluctuations are used to interpret the properties of plasma turbulence. Direct numerical simulations of three-dimensional turbulence of a magnetized inhomogeneous plasma under conditions of intense plasma heating, which are necessary for this interpretation, has not yet provided the creation of a database that can be practically used to solve inverse problems of reconstructing the properties of turbulence from reflectometry signals.

This paper presents preliminary results of the development of a universal algorithm for reconstructing the nonlocal characteristics of tokamak plasma turbulence from reflectometry. The algorithm is based on the use of the formalism of an integro-differential equation for superdiffusion (nonlocal) transfer of excitation of a medium and methods developed in [5-7] for exact numerical and approximate analytical self-similar solution of such equations. In them, the kernel of the operator, integral with respect to spatial variables, determined by the distribution function of excitation carriers along the free path, slowly decreases with increasing distance and belongs to the class of Levy distributions. Application of the approach [6, 7] to the description of nonlocal properties of turbulence within the approach based on Levy flights and proposed in [8] made it possible to propose the problem [9] of recovering these properties using an equation of the Biberman-Holstein type, taking into account the finite velocity of the carriers and a given stochastic distribution of their velocities. Proposed algorithm includes the numerical solution of the equation for the distribution function of excitation carriers in an inhomogeneous plasma with a structure similar to a weakly turbulent MHD [10].

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