POSSIBLE MECHANISM OF CORRELATION OF SPECTRAL CHARACTERISTICS OF REFLECTOMETRIC AND PROBE MEASUREMENTS OF PLASMA DENSITY FLUCTUATIONS IN TOKAMAKS [[1]](#footnote-1)\*)

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To explain the observed correlations between the spectral characteristics of reflectometric and probe measurements of plasma density fluctuations in tokamaks (see, for example, [1, 2]), the previously developed kinetic theory [3, 4] for the spectrum of density fluctuations of a medium with a nonlocal (nondiffusion) character of the motion of individual fluctuations is applied to the calculation of the spectrum of plasma density fluctuations measured by probes.

The calculations performed are based on an approach that uses the idea [5] of the possibility of applying the general concept of Levy walks to the description of nonlocal properties of fluctuations in the density of a turbulent medium. This approach made it possible to formulate in [3, 4] the problem of determining these properties from the scattering spectra of electromagnetic (EM) waves and cross-correlation reflectometry. The effectiveness of the proposed method was demonstrated by interpreting the data of radial and poloidal correlation reflectometry of EM waves in the radio frequency range for diagnosing turbulent plasma in axisymmetric toroidal facilities for the magnetic confinement of thermonuclear plasma. In particular, in [3, 4] a universal description was obtained of the relationship between the observed quasi-coherent mode component [6, 7] in the spectrum of scattered EM waves in the plasma of the T-10 tokamak and the Mandelstam-Brillouin scattering process. It was also shown that the nonlocality of spatial correlations in a turbulent medium, which corresponds to the deviation of the pair correlation function of plasma density fluctuations from the Gaussian one, is due to long-range carriers of medium density fluctuations, for which the free path distribution function is described by the Levy distribution.

In the present work, common features are found between the spectra of reflectometric and probe measurements related to their dependence on the velocity distribution of density fluctuations. Possible reasons for the similarity of the main parameters of quasi-coherent plasma density fluctuations recorded using correlation reflectometry and similar maxima in the spectrum of signals from probe measurements in tokamaks are analyzed.

References

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