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Effect of diffusivity on the propagation and the Landau damping of the space-charge wave in a turbulent plasma column MYOUNG-JAE LEE, YOUNG-DAE JUNG, KYU-SUN CHUNG, Hanyang University — When collisions of electrons with ions are involved, the random fluctuating electric field would affect the projectile electrons in a turbulent plasma since the response of the random field fluctuations is important in the binary encounters as well as in the interaction potentials. The dispersion relation for the space-charge wave propagating in a cylindrically-bounded turbulent plasma is derived in terms of the cylinder radius and the roots of the Bessel function of the first kind which appears as the boundary condition by employing the longitudinal dielectric permittivity that contains the diffusivity based on the Dupree theory of turbulent plasma. We find that the wave frequency for a lower-order root of the Bessel function is higher than that of a higher-order root. We also find that the Landau damping of the wave is greatest for the lowest order root, but it is suppressed significantly as the order of the root increases. The wave frequency and the Landau damping are enhanced as the cylinder size increases. We find that the diffusivity of turbulent plasma would enhance the damping of space-charge waves for a small wave number. As the wave number increases, the diffusivity is less effective to the damping of the wave.

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