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P2.3011 Ion-acoustic waves in collisional dusty plasma: effects of grain charge fluctuations

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See the full abstract here
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Dust grains acquire electric charges (eg) due to absorption of electrons (e) and ions (i) from the surrounding plasma, i.e. each grain is charged by the plasma currents Ich (= e, i) to its surface. The electric field fluctuations influence the charging currents and, thus, give rise to the grain charge fluctuations. Such self-consistent influence gives the additional contribution to the dielectric permittivity of dusty plasma (k,), which determines the dispersion and damping of waves. The obtained expression for dielectric permittivity has the form [1] .———————

where ch = ceh + cih is the charging frequency (ch = - Ich/ eg), Ig = ngIch/e n is the frequency of plasma particles collisions with grains, n is the number density. We used the dielectric susceptibility of collisional plasma (k,) obtained from the Bhatnagar-Gross-Krook kinetic equation. For the ion charging current Icih, we used the interpolation formula proposed in [2]. The influence of dust charging and charge fluctuations on dispersion and damping of ion-acoustic waves is illustrated in Fig. 1.

Figure 1: Eigenfrequencies k (a) and damping rates |k| (b) of ion-acoustic waves in nonisothermal (Te/Ti = 100) argon plasma as results of numerical solution of the dispersion equation (k, k + ik) = 0 for in = 0.02pi, a = 0.15D and P = egng/eeni = 0, 0.2, 0.5, 0.8. The insert shows the ratio k/|k|.

References
[1] A.I. Momot, A.G. Zagorodny, and O.V. Momot Phys. Plamas 25, 073706 (2018)
[2] S.A. Khrapak and G.E. Morfill, Phys. Plasmas 15, 114503 (2008)

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