7th Asia-Pacific Conference on Plasma Physics, 12-17 Nov, 2023 at Port Messe Nagoya

Trapping of wave in a flowing dusty plasma

Krishan Kumar, P. Bandyopadhyay, Swarnima Singh and A. Sen
Institute for Plasma Research, A CI of Homi Bhabha National Institute
e-mail (speaker): krishan.kumar@ipr.res.in

We report on experimental observations of trapping of waves in a flowing dusty plasma. The experiments are performed in an inverted Π -shaped dusty plasma experimental device in which the dusty plasma is created in a DC glow discharge argon plasma using micrometer sized kaolin particles [1]. Two copper wires are installed radially on the cathode, which serve to generate the flow in the dust fluid as well as to confine the waves. The dust fluid is initially made to flow over both the wires by altering the sheath potential of one of these wires, and as a result, the wave gets excited and propagates in the downstream direction. The wave gets trapped in between the wires when their separation is below a critical value of ~2 cm. For a long time (of the order of a few seconds), the trapped-wave structure retains its identity. The amplitude of the wave crests and the distance between them remain constant with the dust fluid flow velocities. A numerical solution of the forced Korteweg-de Vries equation with two source terms as well as molecular dynamic simulations reproduce our experimental findings in a qualitative manner.

Reference:
[1] S. Jaiswal, P. Bandyopadhyay, and A. Sen, Rev. Sci. Enstrom. 86, 113503 (2015).
[2] Krishan Kumar, P. Bandyopadhyay, Swarnima Singh and A. Sen, Phys. Plasmas 29, 123703 (2022).