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P4.3020 Phase mixing of Langmuir wave in a warm multi-component plasma

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See full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.3020.pdf

An analytical study on the space-time evolution of normal electrostatic modes in warm multicomponent plasma is presented. Multi-component plasma can be comprised of electrons, ions, dusts etc. Immobile dust grains can be either positively or negatively charged. [1] In this work, they are considered to be distributed uniformly over space with constant density. In a fluid description, a nonlinear analysis of the basic fluid-Maxwell's equations of ions and electrons confirms that the excited Langmuir wave can break even at arbitrarily low amplitude due to phase-mixing.[2] When multi-component plasma is perturbed from the equilibrium, both electrons and ions respond to the perturbation. But due to the positive charge, heavier mass and lower mobility, ions respond differently than electrons. They (electrons and ions) redistribute themselves in such a way, that the plasma becomes spatially inhomogeneous. This spatial inhomogeneity drives the excited Langmuir wave to phase-mixing. The nature of the dust-charge as well as the amount of dust grains present in the system can significantly influence the phase-mixing process. The approximate time when the phase-mixing occurs, is also evaluated analytically. The phase-mixing time is also found to increase with the temperature.

References :
[1] Introduction to Dusty Plasma Physics, Institute of Physics, Bristol, 2002.
[2] Phys. Rev. Lett. 82, (1999) 1867.

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