

ENERGY EXCHANGE BETWEEN DEGREES OF FREEDOM OF A DUSTY PLASMA SYSTEM

V.P. Semyonov¹, A.V. Timofeev²

¹*MIEM HSE, Moscow, Russia, e-mail: VPSemenov@gmail.com*

²*JIHT, Moscow, Russia*

Phenomenon and mechanisms of an energy transfer between degrees of freedom of a dusty plasma system are of great interest in the field of dusty plasma [1-3]. One of such mechanisms is based on parametric resonance [2-5]. Both energy transfer between vertical and horizontal and between two horizontal degrees of freedom are studied.

Model of dusty plasma system is taking into account stochastic charge fluctuations, caused by fluctuations and discreteness of ions and electrons flow on the surface of dust particles, dependence of electric field intensity on vertical coordinate and dependence of particles charge on vertical coordinate, caused by changes in the concentrations of electrons and ions in the near-electrode layer. Simplified model including only most significant terms for small amplitudes is used to describe initial stages of energy transfer. MD modeling is used to describe later stages of energy transfer e. g. saturation stage.

Conditions of onset of energy transfer between degrees of freedom and its properties are obtained for a wide range of parameter. Results of MD modeling and simplified model studying are compared with each other.

Obtained results allow to describe energy transfer and energy redistribution over degrees of freedom in dusty plasma more accurate.

References

- [1] Ivlev A.V., Knopka U., Morfill G.E., Phys. Rev. E, 2000, **62**, 2739
- [2] Norman G.E., Timofeev A.V., Phys. Rev. E, 2011, **84**, 056401
- [3] Norman G.E., Timofeev A.V., J. Phys.: Conf. Ser., 2016, **774**, 012170
- [4] Semyonov V.P., Timofeev A.V., J. Phys.: Conf. Ser., 2016, **681**, 012025
- [5] Semyonov V.P., Timofeev A.V., J. Phys.: Conf. Ser., 2016, **774**, 012171