

Inhomogeneity of oscillation properties in a dusty plasma monolayer

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In the first approach, experimental dusty plasma structures are described as systems of particles, interacting by the screened Coulomb potential. Their confinement is provided by an electrostatic trap. According to the paper [1] the structural and dynamic properties (e.g. interparticle separation, coupling and Lindemann parameters) of such systems are inherently inhomogeneous. The question of inhomogeneity of oscillation parameters is not studied in detail, so it is of a great interest for researchers. In this work the special case of these systems, called the dusty plasma monolayer, is under consideration. To describe the behavior of particles, their motion equations are solved numerically.

It is demonstrated that oscillation properties of finite systems are fundamentally nonuniform due to their structural inhomogeneity. It is shown that the characteristic frequency of particle oscillations decreases with the increase of its radial distance. We compare the bulk matter and respective homogeneous subsystems of the finite structure in detail to find relations between their oscillation properties. The agreement of results with the theoretical approach [1] and the experiment [2] is reached. Results of the study give relationship between finite structures and bulk matter by oscillation properties. Obtained results are important for the phase transitions research [3].

[1] Nikolaev V S and Timofeev A V 2019 *Phys. Plasmas* **26** 073701

[2] Wong C S, Goree J and Haralson Z 2017 *IEEE Trans. Plasma Sci.* **46** 763–767

[3] Vaulina O S, Vladimirov S V, Petrov O F and Fortov V E 2002 *Phys. Rev. Lett.* **88** 245002