

EFFECT OF STRUCTURAL NON-UNIFORMITY ON PARTICLE OSCILLATIONS IN A COMPLEX PLASMA MONOLAYER

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Experimental studies show that complex plasma monolayer can be either uniform or non-uniform in structure [1]. In one of the possible structural configurations of the monolayer, the central region denser than the peripheral one. In such system, one can distinguish several concentric ring-shaped fragments, in each of which the particle number density is close to uniform.

We analyze the dynamical properties—amplitudes, spectrum and frequencies of dust particle oscillations—in concentric regions of experimental monolayer [2]. We show that dynamical properties of such system are inhomogeneous like the structural ones. The dust particle oscillations at the highest available frequency are localized in the central region of the structure. This phenomenon can be explained on the basis of the model of harmonically confined screened Coulomb charges, which is suitable for describing the inhomogeneity of structural and spectral properties in our experimental system. The balance of attractive central confinement and repulsive screened Coulomb interaction creates the gradient of particle number density in the structure. Further, the density gradient creates difference in the effective stiffness coefficients that correspond to each particle.

When the structure with a strong screening of particle interactions is under consideration, one can analyze it as a set of weakly interacting fragments. Such an approach might be useful for the theory of phase transitions and structure formation in complex plasmas.

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1. Alekseevskaya A. A., Vasilieva E. V., Filippov A. V., Vasiliev M. M., Petrov O. F. // *Molecules*. 2023. V. 28. No. 7. P. 3259.
 2. Voronov I. V., Nikolaev V. S., Timofeev A. V., Syrovatka R. A., Lipaev A. M., Zamorin D. A., Klumov B. A. // *J. Phys. D: Appl. Phys.* 2023. V. 56. No. 48. P. 485203.