

The vibrational properties of the dust trap created in standing striation

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Complex (dusty) plasmas have recently attracted the attention of researchers as systems available for observation at the kinetic level and have been studied in many aspects, such as phase transitions, waves, response to different external influences, and instabilities [1]. The investigation of free and forced oscillations of dust particles is important for understanding the dynamics of dusty plasma. For example, the investigation of the oscillatory motion of the dust particles can be used to study the phenomena of energy transfer between degrees of freedom in a plasma-dust system. In addition, the experimental investigations of the dust particle oscillations make it possible to determine the charge of a dust particle [3] and to measure the spatial distribution of the electric field [4].

In this paper, the method of the discharge current modulation [5], was used to investigate the vibrational properties of the dust trap in a stratum. Amplitude-frequency characteristics depending on pressure are measured. The resonance frequency, the logarithmic decrement and the amplitude of resonance peak are determined. In order to obtain the value of eigenfrequency the measurement of the phase shift of the forced dust particle oscillations and the investigation of the velocity resonance are carried out. The calculation of the dust particle charge with the help of eigenfrequency is made.

The quantitative description of the resonance behaviour of the dust particle based on the theory of the forced harmonic oscillator was made. The Q-factor of dusty plasma system is measured for the first time and the obtained value is compared with Q-factors of dusty plasma oscillatory systems previously investigated in rf plasma.

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