PARTICLE SIZE EFFECT ON PARTICLE DYNAMIC IN A LINEAR ELECTRODYNAMIC TRAP AT A CONSTANT CHARGE-TO-MASS RATIO

Dobroklonskaya M.S.,* Vasilyak L.M., Pecherkin V.Ya.

JIHT RAS, Moscow, Russia

**m.dobro42@gmail.com*

To effectively trap charged dust particles, it is important to correctly determine the boundaries of particle dynamic instability. As follows from the system of Mathieu's equations, the dependence of a particle's motion only on the ratio of its charge to its mass is relevant only for the vacuum. The role of drug force is increased at atmospheric pressure in air or buffer gas. This force is proportional to the size of the flowed particle and is a component of the Langevin equation that describes the motion of the particle in the medium.

The paper involves computer simulation of the two-dimensional trajectory of a charged particle in a horizontal linear electrodynamic trap in air at atmospheric pressure for several cases where the ratio of the particle's charge to its mass remained constant and corresponded to a stable motion inside the trap, but the values of mass and charge were changed by N times.by N times. Since a spherical particle's mass is related to its size by the cubic degree - the size and drug force changed proportionally.

The multiplier N varied in the range from 0.5 to 5 with a step of 0.25. The calculation proved that the form of the trajectory changes with the growth of the particle mass. When N from 0.5 to 2.25 the electrodynamic forces of the trap exceed the gravitational ones and after a certain number of periods the oscillatory motion of the particle is established. At further increase in N the particle does not reach the equilibrium state and instability develops. As a result, the trajectory amplitude increases , the velocity exceeds 2 m/s and the particle after reaching the electrodes either sticks to them or flies out of the trap (N=3.25).

Thus, we can conclude that the stability boundaries for charged particles in electrodynamic traps must be searched not only by the q/m ratio, but also by the particle sizes that are planned to be used in the experiment.