

Rotation of individual dust particles in plasma around their own axis

**D'yachkov L.G.^{1,®}, Dзлиeva E.S.², Novikov L.A.²,
Gasilov M.A.², Pavlov S.I.² and Karasev V.Yu.²**

¹ Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow, 125412, Russia

² Saint-Petersburg State University, Universitetskaya Naberezhnaya 7/9, Saint-Petersburg, 199034, Russia

® dyachk@mail.ru

After dusty plasma studies began at the end of the last century, it was soon discovered that dust particles rotate around their own axis, which passes through their center. Here we consider the mechanism of such rotation. It's obviously related to the dust particle's surface deviation from a perfect spherical shape. It is the imperfections of its surface that determine its rotation speed. Since perfectly spherical solid dust particles are virtually nonexistent, they all have surface defects and must rotate around their own axis. The angular velocity vector of the different particles has a random direction, which is obviously related to the random shape and nature of the surface defects. The rotation speed does not depend on whether the particle is isolated or part of a dust structure, and should not change when the particle moves, for example, from the discharge axis to its wall. We consider the dust particle rotation mechanism as a result of the particle collision with ions and the transfer of rotational momentum to the particle surface elements. Under various assumptions about the sizes of dust particle surface defects, confirmed by microscopic images of dust particles, it has been shown that their rotation speeds can reach values on the order of 10³ rad/s, which corresponds to observations of micron-sized particles.