



## DUSTY PLASMA FOR PROCESSES VISUALIZATION IN STRONGLY CORRELATED SYSTEMS

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### KEYWORDS:

**Main subjects:** flow visualization, strongly correlated systems

**Fluid:** laminar flow of a strongly coupled dusty liquid, nozzle flow, boundary layers

**ABSTRACT:** Dusty or complex plasma is an object capable of self-organization, which has been subjected to intensive investigation during the last fifteen years. Dusty plasma can be a unique laboratory tool for the investigation of the physics of systems with extremely strong Coulomb interaction. As a result of strong interaction of micron-sized dust particles with electrical charges up to  $10^2$ - $10^5 e^{-1}$  may form the ordered structures of liquid and crystal types accessible to observe them visually at the kinetic level. Dusty plasma is affected by gravity. Depending on the size of the solid particles gravity can be the dominating force. Under microgravity conditions in space much weaker forces become important and other new phenomena not achievable on Earth can be observed. In this report results are presented from the experimental studies of dusty plasmas under ground bounded and microgravity conditions. Structural and transport characteristics of the system of macro particles in dusty plasma were measured in a set of experiments in rf gas-discharge plasmas in microgravity conditions on the board of International Space Station. A number of different phenomena were studied including self-excitation of dusty waves, formation of plasma crystal and plasma liquid regions, different vortices of charged dust grains. The experimental studies of the viscosity of a dust-plasma liquid were carried out. The results of analysis of the obtained data made it possible to estimate the coefficient of dynamic viscosity of a dust-plasma liquid. Dusty plasmas were also studied in a combined dc/rf discharge under microgravity conditions in parabolic flights. The chamber provided a particular advantage for investigation of different dynamical phenomena in dusty plasmas such as sheared laminar flow of a strongly coupled dusty liquid, nozzle flow, boundary layers and instabilities, shock waves formation and propagation, dust particle lane formation and space dust grain separation by their size. A formation of the externally driven dust-acoustic shock wave has been observed in three-dimensional elongated uniform dust cloud in a low-pressure gas-discharge plasma under microgravity conditions after the action of an electrical pulse on this cloud.