Complex Plasma Research on the International Space Station

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Complex (dusty) plasma research under microgravity conditions complements the research in the laboratory. Due to reduction of the main force on microparticles in the lab, gravity, it is possible to form large, homogeneous 3D complex plasma systems in the bulk region of plasmas and to investigate phenomena other than those accessible on earth in detail. Therefore, our team designed and built different setups for microgravity research.
PK-3 Plus, which ended in 2013, already gained a long series of interesting scientific results with about 40 publications. The chambers of this setup has a pair of parallel electrode plates and is therefore able to produce a cylindrical symmetric rf-plasma. Particles of different size and material can be injected into the discharge. The cloud is illuminated by a laser sheet and observed in 2D with cameras with different resolutions and fields of view. Moving this observation system in the direction of sight, tomographic reconstruction of the 3D particle configuration is possible later on.
This configuration is ideal to investigate stable liquid and crystalline systems and give interesting insights into a wide range of phenomena like crystallization, phase separation of binary mixtures, instabilities like heart-beat instability or projectile interaction with a strongly coupled complex plasma cloud.
This contribution will give an overview over a selection of recent results of the very successful project PK-3 Plus.
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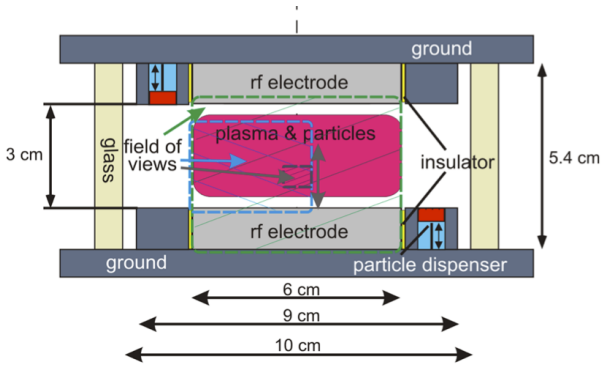

Figure 1: PK-3 Plus is a cylindrical symmetric plasma chamber ideal for stable complex plasma clouds in rf-discharges.