

PlasmaLab/EKOPlasma – The next laboratory for complex plasma research on the International Space Station

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The PlasmaLab project was started in 2007 as a Russian-German cooperation, with the aim to develop new plasma chambers for future laboratories for the investigation of complex plasmas under microgravity conditions on the International Space Station (ISS). One of the developed chambers – the “Zyflex”-chamber (Fig. 1) – is now being prepared for the EKOPlasma mission, to be launched in 2019/2020, as follow-up lab to continue the ongoing research started with PKE-Nefedov, PK-3 Plus and PK-4.

The “Zyflex”-chamber is a large, cylindrical plasma chamber with parallel, rf-driven electrodes and a flexible inner geometry. It is designed to extend the accessible experimental parameter range, i.e. neutral gas pressure, plasma density and electron temperature, and also to allow an independent control of the plasma parameters, therefore increasing the experimental possibilities and expected knowledge gain significantly. With this system it will be possible to work at very low neutral gas pressures, thus reducing the damping of the particle motion to virtually undamped. A control of the electron temperature can be realized by using electrodes with an additional, dc-biased grid, and the particle motion will be recorded with real-time 3D optical diagnostics. Large, homogeneous 3D particle systems can be created for studies of fundamental phenomena such as phase transitions, dynamics of liquids or phase separation.

Here, we will present the current status of the project, the technological advancements, and the scientific outlook as projected from experiments on ground and in microgravity conditions during parabolic flight campaigns.

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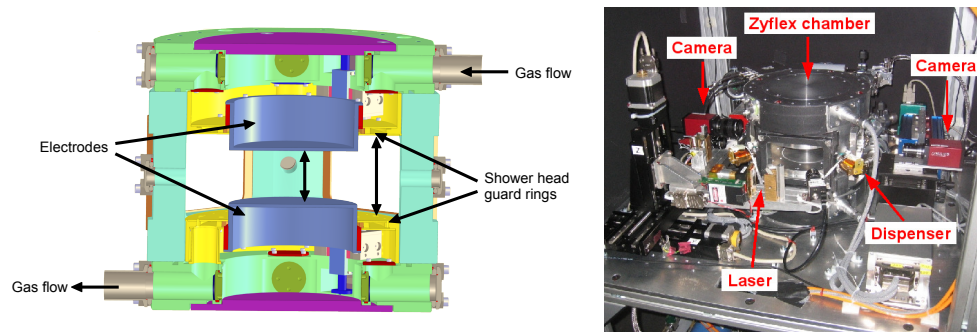


Figure 1: Left: Schematic of the Zyflex plasma chamber. Electrodes (blue) and guard rings (yellow) can be moved independently. Right: Parabolic flight setup of the Zyflex chamber.