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Microgravity Sciences Onboard the International Space Station and Beyond - Part 1 (6)

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OHB MICROGRAVITY PAYLOADS: AN INSIGHT INTO PLASMA KRISTALL-4

Abstract

Human Spaceflight and Microgravity is an important, and long standing area of business for OHB System. The space experts at OHB have worked, in addition to the ISS, on 6 Shuttle/Spacelab missions, 2 MIR missions and the EURECA mission, performing development and operating tasks.

This paper will offer an introduction to the microgravity payloads that OHB has developed for the ISS, and projects involved in non-ISS platforms, like sounding rockets or re-entry capsules. Then, the paper will focus and present in detail one of those payloads, the Plasma Kristall-4 (PK-4) facility in EPM, the operational challenges of handling 3TB of science data that PK-4 is generating during every science mission, and an overview of first published scientific results. Plasma Kristall-4 (PK-4) is the third complex plasma research facility OHB built together with the scientific community.

Complex plasmas are low-temperature plasmas in which small particles of micrometer size are suspended. These particles interact strongly with each other due to electrical fields generated inside a plasma chamber and the electrons collected on their surface. These interactions have led to observation of structures very similar to atoms in solids, liquids or gases. The relatively large size of the particles, in comparison to atoms, implies lower timescales and makes the processes observable with microscopes. Experiments under microgravity conditions are important to remove the influence of gravity, which exerts a significant stress on the complex plasma system.

The PK-4 facility was installed in Columbus' EPM Rack by cosmonauts Elena Serova and Aleksandr Samokutyaev in November 2014. As of February 2017, so far 4 of 15 anticipated science campaigns were executed.