HEARTBEAT INSTABILITY UNDER MICROGRAVITY CONDITIONS OBSERVED IN THE PK-3 PLUS LABORATORY

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In many experiments that were performed with the PK-3 Plus setup on board of the International Space Station the so called heartbeat instability could be observed. Under microgravity conditions the microparticles in a complex plasma arrange themselves in a vast cloud that spreads nearly all over the available inter-electrode space. In the middle of the plasma chamber a void is often formed\textsuperscript{1,2}. The void is completely free of particles. Under certain conditions the complex plasma becomes unstable and rhythmically pulsates in the radial direction\textsuperscript{3,4}. In given experiments the instability has been observed in a wide parameter range. Measurements where performed with MF particles of different diameters from 6.81µm to 15µm in Argon as well as in Neon plasma at different discharge powers. The gas pressure varies between 8Pa and 100Pa. The frequency of the observed oscillation ranges from 0.8Hz to 7Hz. At the lower frequencies oscillations are strongly nonlinear. The oscillation frequency increases linearly with plasma power and with the neutral gas pressure. The correlation of the particle motion and the recorded plasma parameters is discussed.

Figure 1. Visualization of microparticle oscillations affected by the heartbeat instability