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Permittivity Probe on the Rosetta Lander Philae: Preparation for On-Comet-Phase

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Mid of November 2014 the ESA Rosetta spacecraft will send its Lander Philae to the surface of the comet 67P/Churyumov-Gerasimenko. The three landing gear feet carry sensors of the Surface Electrical, Seismic and Acoustic Monitoring Experiments (SESAME), among them the Permittivity Probe (PP) [1]. Together with sensors attached to the MUPUS PEN and the APXS detector lid, PP features three transmitter electrodes and 2 receiver electrodes. Using any combination of two transmitters the quadrupole arrangement can measure the electrical properties of the comet surface material at different depths between 50 cm and about 2 m. The instrument is optimized for the detection of water ice inside the observed volume, its purity and temperature.

For PP a critical mission phase is the descent towards the comet surface as after separation from the spacecraft and unfolding of the landing gear the instrument is for the first time in the real measurement configuration while the vacuum condition of space provides a known reference. This phase will be used for calibration of all signal disturbances like stray capacitances caused by cable connections, structure elements and other instruments. During the past year a special test scenario was developed and tested combining the operational requirements from several instruments into an integrated time line. Together with laboratory measurements using flight-equivalent material the electrical properties of the PP instrument network will be modeled. The results set the framework for the analysis of the on-comet observations under different electrode-combinations and geometry conditions. An observation sequence for the first days after landing was defined taking the different observational requirements into account.

Reference:

[1] Seidensticker, K.J., Thiel, K. and Schmidt, W., 2004: The Rosetta Lander Experiment SESAME and the new Target Comet 67P/Churyumov-Gerasimenko. Astrophys. Space Sci., 311,297-307.