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SMOS Payload In-Orbit Performance

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SMOS is ESA's second Earth Explorer mission with the objective of producing global maps of Soil Moisture and Ocean Salinity over the Earth. It carries a single payload on-board, MIRAS, the first-ever spaceborne L-band Microwave Imaging Radiometer with Aperture Synthesis in two dimensions. The performance requirements of MIRAS are demanding in terms of spatial resolution, accuracy, stability and precision, all critical to fulfil its scientific objectives.
SMOS was launched 2 November 2009. Following its launch, a six month commissioning phase started consisting of four phases. The first 2.5 weeks were devoted to the Launch and Early Operation Phase (LEOP) where the commissioning of PROTEUS, the service module, was carried out. After this phase came 4.5 weeks of Switch-On and Data Acquisition Phase (SODAP), where the satellite-ground links and the ground segment in charge of the mission control, commanding and data processing, were brought up into full operation. This subsequent period, which is the current phase in January 2010 and the subject of this presentation, consists of 6 weeks of Payload Commissioning, which will be followed by 13.5 weeks of a Pseudo-operational phase which will precede the operational one.
Within the five Payload Commissioning weeks, several activities are dedicated to verify that the payload is in good working conditions and to characterise its performance. The first week is dedicated to test the thermal and electrical stability of the instrument and to acquire the Flat Target Response of the instrument. All physical temperatures of the instrument were expected and later verified to be within a range of 6°C peak to peak around a set point temperature of 22°C. During the electrical stability, internal calibration signals are injected and several instrument parameters are derived such as the gain, offset and equivalent noise temperature of all receivers of MIRAS. The calibration signals are first referenced to two standards, one being a matched load at a known physical temperature, the other being the cosmic microwave background radiation near the poles of our galaxy. The measurement of the latter target, the Flat Target Response, is the aim of the external calibration.
The second week is dedicated to study the calibration of the phase of the local oscillator (LO). This is necessary because the 12 different LO circuits (one per arm segment plus three in the hub) follow slightly different thermally-driven phase histories. The third week is dedicated to an early test of the full-pol mode of the instrument, which up to this point has been operating largely in dual-pol. The last two weeks are devoted to consolidate the LO calibration and to perform several external calibrations to test different issues, such as possible electromagnetic contamination from the S and X-band transmitters, the star tracker or the solar array driving mechanism.
This presentation will include some of the most relevant results from the 5 weeks of Payload Commissioning.