

Seminar über Microwavephysics and Atmospheric Physics

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Titel: Development of Microwave Calibration Targets for Meteorological Operational Satellites - Second Generation (MetOp-SG)

This talk summarizes the development of microwave calibration units for the second generation of meteorological operational satellites (MetOp-SG), developed by ESA and EUMETSAT. In particular, we focus on the design and manufacturing of on-board calibration targets (OBCT) for the microwave sounder (MWS) and the ice cloud imager (ICI), respectively. MWS operates in seven bands between 23GHz and 230GHz, while ICI covers five bands between 180GHz and 670GHz. As the OBCTs act as temperature reference for microwave radiometers, they are required to exhibit a low electromagnetic reflectivity and a uniform temperature distribution. Finding the best trade between these contrary properties is one of the main design challenges. While the electromagnetic analysis and design of OBCTs are well established, methods for simulating the target's brightness temperature, i.e. the temperature observed by the radiometer, are not available. In this talk, we will introduce a numerical technique which allows to compute the brightness temperature of arbitrary shaped targets. Fundamental theoretical investigations regarding various target parameters have been carried out and will be discussed in this contribution. Based on these studies, we have developed a pyramid target layout which reduces temperature gradients without impairing the electromagnetic performance. The designed targets were manufactured and coherent reflectivity measurements were conducted on a quasi-optical bench for the entire frequency spectrum and various incident angles. The experimental studies validate the numerically predicted performance and show that the manufactured OBCT prototypes fulfil the specific RF requirements in all frequency bands.

Zeit: Freitag, 31.03.2017, 10:15 Uhr

Ort: **Hörsaal A97**, Gebäude exakte Wissenschaften, Sidlerstrasse 5, Bern, Schweiz