

165-229 GHz Front End Receivers for the Microwave Sounder and Microwave Imager Instruments onboard MetOp-SG satellites – Preliminary Design and Results

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Abstract—The European contribution to operational meteorological observations from polar orbit has been provided by the first generation of MetOp satellites since 2006. The MetOp Second Generation (MetOp-SG) series of satellites will provide continuity and enhancement of these observations in the 2020-2040 timeframe. The MetOp-SG space segment will consist of two satellites, Sat-A and Sat-B, comprising a suite of active and passive Earth observing instrumentation covering a broad spectral range from microwave to visible wavelengths. RAL Space is contracted to provide space-qualified front-end heterodyne receivers operating between 165-325 GHz for three instruments on the mission, namely the Microwave Sounder (MWS), Microwave Imager (MWI) and Ice Cloud Imager (ICI); and is supporting Radiometer Physics GmbH (RPG) on the development of front-end receivers at 448 and 664 GHz for ICI. This paper will focus on the preliminary design and results of front-end receivers operating between 165-229 GHz for the MWS and MWI instruments. A companion paper (B. Thomas *et al.*) will focus on the ICI front-end receivers.

The preliminary design of front-end receivers at 165 GHz, 183 GHz and 229 GHz for the MWS, and at 165 GHz and 183 GHz for the MWI, is complete. Although there is an overlap in the spectral range of the instruments the accommodation constraints of the receivers are significantly different. The receiver front-ends use core technology developed within Europe: mm-wave low-noise amplifier MMICs from IAF-Freiburg, and Schottky diodes from Teratech Components Ltd and ACST GmbH. The packaging and qualification of these devices into LNA, mixer, multiplier and integrated receiver modules is the responsibility of RAL and RPG. In addition, the front-end receivers are supported by US technology: power amplifier MMICs from ADI/Hittite, and IF low-noise amplifiers and dielectric resonator oscillators from L3/Narda/Miteq.

The preliminary design and breadboard test results of the front-end receivers for the MWS and MWI will be presented at the conference. Critical aspects related to the design and performance tuning of the front-end receivers will be addressed.