

TELIS SIR channel performance analysis

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Abstract

The TELIS (Terahertz and sub-millimeter limb sounder) instrument is a three-channel heterodyne receiver developed for atmospheric research. TELIS is mounted together with the MIPAS-B2 instrument on a balloon platform of the Institute for Meteorology and Climate Research of the Karlsruhe Institute of Technology. TELIS can observe both in the sub-millimeter range (480-650 GHz) and at 1.8 THz, while MIPAS-B2 observes trace-gases in the thermal infrared window. Results are used to refine and constrain numerical chemical transport models.

The SRON contribution to TELIS is the 480-650 GHz Superconducting Integrated Receiver (SIR) channel. This is a unique superconducting on-chip heterodyne receiver, consisting of a double dipole antenna, a SIS mixer, a flux-flow Local Oscillator, and a superconducting harmonic mixer used for phase locking of the LO-signal. The lowest noise temperature of the receiver is 120 K DSB, measured over the full IF bandwidth (2 GHz).

The first successful flight campaign with TELIS/MIPAS was in March 2009 from Kiruna (Sweden). The SIR channel was operating well during the 11 hour flight. Many hundreds of limb scan data have been taken at different frequency settings. This has shown the stable remote operation of the SIR receiver in harsh environmental conditions. The data is currently further analyzed and in order to get reliable level 2 data processing we have further characterized the channel properties after return of the instrument to the laboratory. Especially the Side Band Ratio of the channel is of importance and we have performed detailed analysis of this with a high resolution Bruker Fourier Transform Spectrometer. A new flight with TELIS is scheduled for winter 2010, again from Kiruna.

We will present data of the first flight, details of the channel characterization and possibly new results on the second flight of the instrument.