

## **TELIS – development of a new balloon borne THz/submm heterodyne limb sounder**

U. Mair, M. Krocka, G. Wagner and M. Birk

*Institute for Remote Sensing Technology, DLR, Germany*

H.-W. Hübers, H. Richter and A. Semenov

*Institute for Space Sensor Technology and Planetary Exploration, DLR, Germany*

P. Yagoubov, R. Hoogeveen, T. de Graauw, A. Maurellis, and A. Selig

*SRON, The Netherlands*

V. Koshelets and S. Shitov

*IREE, Russia*

B. Ellison, B. Kerridge, D. Matheson, R. Siddans and J. Reburn

*RAL, United Kingdom*

TELIS (Terahertz and submm Limb Sounder) is a compact, lightweight heterodyne spectrometer developed by DLR in cooperation with SRON and RAL. TELIS will be operated on a balloon platform simultaneously with the existing FT spectrometer MIPAS-B. Its purpose is to measure a variety of important atmospheric constituents within the lower stratosphere, including OH, HO<sub>2</sub>, O<sub>3</sub>, O<sub>2</sub>, H<sub>2</sub>O, NO, NO<sub>2</sub>, CO, HCl, HOCl, ClO, and BrO. The combined MIPAS-B/TELIS instrument is a standalone chemistry mission, but will also be providing measurements complementary to existing and planned spaceborne instruments, e.g., ODIN, Envisat, ACE.

In order to cover the most important atmospheric species three frequency channels have been selected: 500 GHz, 650 GHz and 1.8 THz. The 500 GHz channel is being developed by RAL based on a similar instrument previously used for airborne measurements of the lower stratosphere. It includes a fixed tuned highly sensitive waveguide SIS mixer, solid state local oscillator (LO) chain and a low noise IF chain. The 650 GHz channel is developed in cooperation between IREE and SRON and is based on a new single-chip superconducting integrated receiver that comprises on one substrate a low-noise SIS mixer with quasioptical antenna and a superconducting Flux Flow Oscillator (FFO) acting as LO. Tunability of the FFO shall allow for a wideband operation of this channel, with a goal to obtain 100 GHz instantaneous rf bandwidth or even more. The 1.8 THz channel is based on a phonon-cooled NbN HEB mixer technology, similar to that under development for SOFIA by MSPU and DLR. All channels will operate in a single sideband mode with the image sideband suppression done by quasioptical filtering.

In a current baseline TELIS instrument has a common optical front-end, quasioptical channel separation and one common 4 GHz back-end which analyzes optionally one, two or all three channels simultaneously. In general, the instrument will serve as tool to measure, together with the MIPAS-B, a very complete set of atmospheric trace gases, act as a development platform for new mixer technologies and validation tool for future satellite missions.

Presentation preference: **poster**

Corresponding author address and e-mail:

Space Research Organization of the Netherlands

Landleven 12, 9747 AD Groningen, the Netherlands

[p.a.yagoubov@sron.rug.nl](mailto:p.a.yagoubov@sron.rug.nl)