

Towards Verified Calibrated Radiance Spectra with TELIS

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Abstract

The balloon borne cryogenic heterodyne spectrometer TELIS allows limb sounding of the Earth's atmosphere within the sub-millimetre and far-infrared spectral range. The instrument was developed by a consortium of major European institutes that includes the Space Research Organisation of the Netherlands (SRON), the Rutherford Appleton Laboratory (RAL) in the United Kingdom and the German Aerospace Center (DLR, lead institute).

The instrument offers three channels sensitive within the frequency ranges of 450-650 GHz, 499-503 GHz and 1.790 – 1.870 THz. All receivers utilise state-of-the-art superconducting heterodyne technology [1].

Like all remote sensing instruments, TELIS requires a full characterisation of the instrumental errors. A known error budget in the calibrated radiance spectra is necessary to obtain verified gas concentration profiles.

A major characterisation campaign was carried out, utilizing gas cell measurements of OCS and Methanol in order to identify and correct the main error sources. The cell measurements enabled the characterisation of the full instrument under controlled and well known conditions which were kept close to in-flight conditions. Opaque lines with known intensity were recorded at different IF-frequencies. The information obtained from these measurements allowed us to investigate the dominant radiometric error sources of the TELIS instrument caused by non-linearities in the signal chain. The results are merged with results obtained from a former characterisation campaign of the isolated TELIS IF-chain including a reference spectrometer [2] as well as with results obtained from in-flight spectra.

REFERENCES

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- [2] 'Characterisation of the TELIS autocorrelator spectrometer', P. Vogt, M. Birk, G. Wagner, F. Geiger, G. De Lange, H. Golstein, O. Kiselev, A. Emrich, 21st International Symposium on Space Terahertz Technology, 23rd-25th of March, 2010, Oxford, England