



**HAL**  
open science

## Performance of the ACS NIR channel in nadir

Alexander Lomakin, Anna Fedorova, Alexander Trokhimovskiy, Andrey Patrakeev, Nikita Kokonkov, Karim Gizatullin, Gaetan Lacombe, Franck Montmessin, Oleg Korablev

► **To cite this version:**

Alexander Lomakin, Anna Fedorova, Alexander Trokhimovskiy, Andrey Patrakeev, Nikita Kokonkov, et al.. Performance of the ACS NIR channel in nadir. EPSC-DPS Joint Meeting 2019, Sep 2019, Geneva, Switzerland. pp.EPSC-DPS2019-1798-2. insu-04481986

**HAL Id: insu-04481986**

**<https://insu.hal.science/insu-04481986v1>**

Submitted on 28 Feb 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Performance of the ACS NIR channel in nadir

**Alexander Lomakin** (1,2), Anna Fedorova (1), Alexander Trokhimovskiy (1), Andrey Patrakeev (1), Nikita Kokonkov (1), Karim Gizatullin (1,2), Gaetan Lacombe (3), Franck Montmessin (3), Oleg Korablev (1)  
(1) Institute of Space Research, Moscow, Russia, (2) Moscow Institute of Physics and Technology, Dolgoprudnyi, (3) LATMOS/IPSL, UPMC Univ. Paris 06 Sorbonne Universités, UVSQ, CNRS, Paris, France  
(aleksander.lomakin96@gmail.com)

### Abstract

The Atmospheric Chemistry Suite (ACS) is a set of three spectrometers (-NIR, -MIR, and -TIRVIM) intended to observe Mars atmosphere onboard the ESA-Roscosmos ExoMars 2016 Trace Gas Orbiter (TGO) mission [1]. The near-infrared channel (NIR) is a compact spectrometer operating in the range of 0.7–1.7  $\mu\text{m}$  with a resolving power of  $\lambda/\Delta\lambda$  around 25,000. It is designed to operate in nadir and in solar occultation modes. The spectrometer employs an acousto-optic tunable filter (AOTF) to select diffraction orders in an echelle spectrometer. During one measurement cycle, it is possible to register up to ten different diffraction orders, each corresponding to an instantaneous spectral range of 10–20 nm.

The main task of NIR in nadir is measurements of water vapor in 1.38  $\mu\text{m}$  and the  $\text{O}_2$  ( $\text{a}^1\Delta_g$ ) emission as a tracer of ozone at 1.27  $\mu\text{m}$ . But, first results showed that the signal-to-noise ratio (SNR) of NIR does not exceed 30, while the planned value was more than 100.

ACS/NIR in terms of nadir capabilities can be compared to SPICAM IR: both spectrometers work in almost similar spectral range but they have different resolving power:  $\sim 2000$  for SPICAM and  $\sim 25000$  for NIR. Here we will present a comparison of the water retrieval for close observations of two instruments, NIR calibration status, signal-to-noise estimations and first results from ACS/NIR nadir mode.

### Acknowledgements

ExoMars is the space mission of ESA and Roscosmos. The ACS experiment is led by IKI Space Research Institute in Moscow. The project acknowledges funding by Roscosmos and CNES. Science operations of ACS are funded by Roscosmos and ESA.

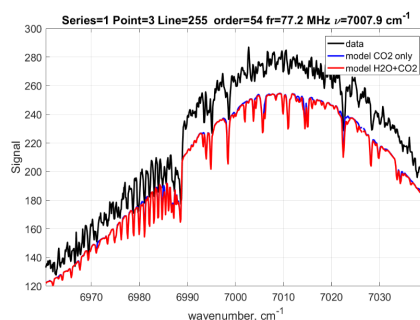


Figure 1: Example of the ACS-NIR spectrum in nadir in order 54 corresponding to  $\text{CO}_2$  1.43  $\mu\text{m}$  band

### References

- [1] Korablev, O., Montmessin, F., and ACS Team: The Atmospheric Chemistry Suite (ACS) of three spectrometers for the ExoMars 2016 Trace Gas Orbiter, *Space Sci. Rev.*, 214:7, 2018.