



## Studying the Mars atmosphere using a SOIR Instrument

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SOIR (Solar Occultation InfraRed spectrometer) is an echelle infrared spectrometer on board the Venus Express orbiter (VEX). SOIR probes the Venus atmosphere by solar occultation, operating between 2.2 and 4.3  $\mu\text{m}$  with a resolution of  $0.15 \text{ cm}^{-1}$ . This spectral range is suitable for the detection of several key components of planetary atmospheres, including  $\text{H}_2\text{O}$  and its isotopologue HDO,  $\text{CH}_4$  and other trace species. The Acousto-Optics Tunable Filter (AOTF) allows a narrow range of wavelengths to pass, according to the radio frequency applied to the  $\text{TeO}_2$  crystal; this selects the order. The advantage of the AOTF is that different orders can be observed quickly and easily during one occultation. The SOIR instrument was designed to have a minimum of moving parts, to be light and compact. To obtain a compact optical scheme, a Littrow configuration was implemented in which the usual collimating and imaging lenses are merged into a single off-axis parabolic mirror. The light is diffracted on the echelle grating, where orders overlap and addition occurs, and finally is recorded by the detector. The detector is  $320 \times 256$  pixels and is cooled to 88 K during an occultation measurement, to maximise the signal to noise ratio.

SOIR on VEX has been in orbit around Venus since April 2006, allowing us to characterise the instrument and study its performance. These data have allowed the engineering team to devise several instrumental improvements. These will be outlined briefly, with regard to the improvement they will offer for the observations. We will focus on the capacity of an improved instrument to perform nadir observations as well as solar occultation measurements. We will show Mars data as could be observed by a SOIR instrument to demonstrate what SOIR would be capable of in Mars orbit.