



Solar occultation infrared spectrometer (SOIR)

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SOIR is a compact, low-power, low-mass, high-resolution spectrometer. It operates in the infrared (IR) wavelength range, from 2.2 μm to 4.3 μm , using solar occultations to measure absorption spectra of minor species in the atmosphere. SOIR uses a novel echelle grating with a groove density of 4 lines/mm in a Littrow configuration in combination with an IR acousto-optic tunable filter (AOTF) for order selection. The detector is an actively cooled HgCdTe focal plane array of 256 by 320 pixels. It is designed to obtain an average instrument line profile of 0.2 cm^{-1} . This paper focuses on the optical, electrical and mechanical design of SOIR, as well as improvements currently being made to the design to address issues identified on the VEX mission.

SOIR would be a powerful addition to any atmospheric science mission. The SOIR instrument has already proven its capability to monitor routinely key components of the Venus atmosphere. SOIR discovered a new absorption band of a CO_2 isotopologue, previously undetected on Earth. In the atmosphere of Mars, the next generation SOIR spectrometer could accurately measure CH_4 abundance down to sub-ppb level, detect hydrocarbon species and measure the $\text{HDO}/\text{H}_2\text{O}$ isotopic ratio from orbit.