AOST: AN INFRARED SPECTROMETER FOR THE PHOBOS-SOIL MISSION. E. Palomba[1], O. Korablev[2], A. Grigoriev [2] and the AOST international team, [1]IFSI-INAF, Via Fosso del Cavaliere 100, 00133 Roma, Italy, palomba@ifsi-roma.inaf.it [2]Space Research Institute, Russia Academy of Sciences, 84/32 Profsoyuznaya str., Moscow, 117810, Russia.

Introduction: AOST is a Fourier Transform spectrometer for the characterisation of the Phobos surface and for the study of the Martian atmosphere and surface. The instrument, developed in a collaborative effort between Russia, Italy and other European countries (France, Germany), is included in the scientific payload of the next Phobos-Soil space mission [1].

Technical features: AOST is a double pendulum interferometer able to operate in the 2.5-25 µm spectral interval. The spectral resolution is variable down to 0.55 cm^{-1}. The Field Of View is about 2.3 degrees, that is a 2 km footprint on the Phobos surface during the quasi-synchronous orbit phase. The instrument has a solid and compact structure (4 kg mass) and its power requirement in operation is about only 10 W. AOST is fixed to the solar panel edge through a special mechanical structure and is completely thermal independent. The main technical features of the instrument are listed in Table 1.

Parameter	Value
Telescope Diameter Focal length	Cassegrain type 23 mm 75 mm
FOV	2.2 deg (full angle)
Pointing	full-sphere
Spectral Resolution HR MR LR	 0.55 cm^{-1} 1.2 cm^{-1} 6 cm^{-1}
Mass	4 kg
Power	10 W (in operation) 3 W (heating mode)
NESR ($mW/m^2cm^{-1}sr$) HR MR @15 µm LR @15 µm	 6.6 0.1 0.016
Interferometer alignment	in flight

Table1. The main technical parameters of AOST.

Sun occultation observation mode. One of the most important observation features of AOST is the possibility to observe when the Sun is in occultation, as made in the past by other spectrometers [2,3]. The sequence starts when the Sun approaches the limb of Martian atmosphere and ends when the Sun is eclipsed by Mars. A complete observation will sample different heights of the atmosphere, allowing up to 20 measurements in one cycle. Self-calibration is provided, as the sequence begins when the Sun is well above the atmosphere.

Scientific objectives: The AOST scientific goals are the study of Phobos and Mars.

Phobos. AOST will make use of a low spectral resolution observation mode to enhance the S/N ratio for the analysis of the Martian moon. The large global coverage and spatial resolution in the quasi-synchronous orbit phase will allow to investigate variations in the mineralogical composition in the different units of Phobos. The differences in the measured radiation between the illuminated and shadowed portion of the satellite will allow to study its thermal properties. After landing AOST will continue to acquire spectra and will map, at very small spatial resolution, the vicinity of the landing site characterising the Phobos regolith with a minimum resolution of about 40 of centimetres.

Mars. Following the phase of landing/collecting samples, the probe will lift off from the Phobos surface and will continue to orbit around Mars for about 1 year. In that period will be possible to observe Mars continuously. The high spectral resolution observation mode will be used to detect and characterise minor gaseous species of high astrobiological and volcanic relevance, such as methane, formaldehyde, SO_2, OCS. All these observations could be arranged by using a Solar occultation geometry to maximise the S/N, that is fundamental to discern minor species spectral features. This mode of observation will allow to study non–LTE active processes effects in the atmosphere of Mars. Other relevant topics concern the monitoring of diurnal and seasonal variations of:

- vertical profiles of atmospheric temperature;
- water vapour and other minor constituents;
- aerosols (dust and condensation clouds);

A minor, but not less important, goal is the study of the Martian surface.

References:

[1] Zakharov A. V. et al. (2006) *LPS XXXVII*, Abstract #1276. [2] Korablev O. et al. (2006) *JGR*, 111, E09S03 [3] Krasnopolskii V. A. et al. (1991) *Icarus*, 94, 32-44