

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

Author: Dr. Maria Cristina De Sanctis
INAF - Istituto Nazionale di AstroFisica, Italy

Dr. Francesca Altieri
INAF, Italy

Dr. Simone De Angelis
INAF-IAPS, Italy

Dr. Marco Ferrari
INAF-IAPS, Italy

Dr. Alessandro Frigeri
INAF-IAPS, Italy

Dr. Sergio Fonte
INAF-IAPS, Italy

Dr. Jeremy Brossier
INAF-IAPS, Italy

Dr. Marco Giardino

ASI - Italian Space Agency, Italy

Dr. Eleonora Ammannito

ASI - Italian Space Agency, Italy

Dr. Andrea Apuzzo

Roma Tre University, Italy

Dr. Michelangelo Formisano

INAF-IAPS, Italy

Dr. Lorenzo Rossi

INAF-IAPS, Italy

Dr. Francesco Antonacci

Leonardo S.p.A, Italy

Dr. Francesco Villa

Leonardo S.p.A, Italy

MA_MISS SPECTROMETR ON ROSALIND FRANKLIN ROVER FOR THE EXPLORATION OF THE
MARTIAN SUBSURFACE

Abstract

Mars is a primary destination to search for signs of life in our Solar System and probing the subsurface is a key element in this quest. ExoMars mission was designed to search life into the Martian subsurface, accessing to sequences of buried layers that may host biomarkers. Accessing the unaltered subsurface by using a Drill, collecting samples down to 2 m, has been the innovative approach of the ExoMars mission. The rover includes has a complex payload to conduct detailed investigations of composition, search for or-ganics, and recognize indicators of past or extant life[1]. An essential part of the payload is Ma_MISS (Mars Multispectral Imager for Subsurface Studies) experiment hosted by the drill system[2,3]. Ma_MISS is a miniaturized spectrometer (VNIR) with an optical head inside the drill tip, capable of observing the

borehole walls from where the Martian samples are collected. Ma_MISS is a modular instrument and it consists of two main parts: i) the spectrometer and the proximity electronics located outside of the drilling tool and ii) the Optical Head and fibers located inside the drill itself [2]. The Drill consists of a main rod, which hosts the drill tip, plus three additional rods (each 50 cm long), which allow it to reach a maximum depth of 2 m. The drill tip has the Ma_MISS Optical Head to observe the borehole wall. Ma_MISS is equipped with a light source of 5W to illuminate the borehole. All the rods are equipped with optical fibers, able to transmit light and signal. The illumination spot on the target is about 1 mm in diameter at a focal distance of about 0.6 mm. The reflected light is collected through a 120 m spot. The spectrometer observes a single point target on the borehole wall and using the drill movements, can build up spectral images of the target. By combining column and ring observations, Ma_MISS reconstructs of a fairly complete image of the borehole wall. Here we will present the scientific goals and characteristics of the instrument to support the Martian exploration, in the context of the rover mission.

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References: [1] Vago et al. (2017) *Astrobiology* 17, 471–510. [2] De Sanctis et al. (2017) *Astrobiology* 17(6–7), 612–620. [3] De Sanctis et al. (2022) *PSJ* 3, 142.