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THE SCIENTIFIC EXPLOITATION OF THE MOON IN ITALY: THE EARTH MOON MARS NRRP PROJECT

Abstract

EMM is a project funded by the Ministry of Research under the Italian National Recovery and Resilience Plan (NRRP). Its main objective is to advance the scientific exploitation of the Moon in Italy and utilize it as a platform for observing the Earth and the Universe, while also supporting activities to prepare for human exploration of Mars.

The key objectives of EMM are as follows:

1. Establish a new infrastructure for the deep space network (SRT/DSN), to establish a powerful link between Earth, Moon and Mars.
2. Explore the potential of the Moon as a versatile research laboratory dedicated to Earth and Universe Science.
3. Conduct research and development activities to create innovative instruments for unprecedented observations of the Earth and the Universe. These instruments will be integrated into the Lunar Infrastructure.
4. Advance our understanding of Earth and Planetary atmospheres by creating a network of experts in data analysis and theoretical models. This interdisciplinary approach will involve combining datasets from different instruments to gain complementary insights.

To achieve these objectives, EMM will implement several new infrastructures:

SRT Infrastructure: The SRT is a fully steerable 64-meter diameter parabolic radio telescope located in Sardinia. It operates within the 0.3-116 GHz frequency range. A study will be conducted to enhance its capabilities for deep space and near-Earth telecommunication links. This study will lead to the design and implementation of Deep Space communication services.

Lunar Infrastructure: The project aims to design a lunar-based multi-purpose research laboratory. This infrastructure will accommodate various instruments and will be adaptable as a modular set-up.

Instrumentation for Lunar Infrastructure: The Moon provides a unique vantage point for observing the Earth and the Universe, studying the origin and evolution of our Solar System. The lunar environment offers advantages such as low temperatures, thermal stability, absence of atmosphere, and a stable platform for large observatories. However, challenges such as dust contamination and solar wind plasma bombardment need to be addressed. Ten instruments will be developed to expand scientific knowledge and establish an Italian multidisciplinary observatory on the Moon.

Additionally, EMM aims to build an **Earth-Mars atmosphere infrastructure** to enhance Italy's capability in modeling and studying Earth and planetary atmospheres using indirect measurements.