

LUVMI – Volatile Extraction and Measurements in Lunar Polar Regions

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The low inclination of the lunar orbit allows areas in high latitudes to remain in eternal darkness. These Permanently Shadowed Regions (PSR) are never illuminated by heating sunlight and are some of the coldest places in the Solar System which are thought to contain vast deposits of water and other volatiles. In-situ measurements are required as a definite proof of the existence of water and other volatiles in and around a PSR.

The Lunar Volatiles Mobile Instrumentation (LUVMI) is an autonomous, low mass, modular rover consisting of surface and subsurface sensing instruments with an in-situ sampling and analysis technology capable of depth resolved volatile extraction and characterisation. With a total mass of less than 20 kg LUVMI is intended as an additional mobile payload for a lunar polar lander mission that will add the capability of allowing access to a PSR. Volatile extraction from the lunar regolith will be carried out by the Volatiles Sampler (VS), which will sample the subsurface up to a depth of 10 cm, extract water and other loosely bound volatiles through heating. The design of the VS provides efficient volatile sample transfer and minimizes sample handling requirements. Evolved volatile characterisation will be performed by the Volatiles Analyser (VA) which is a miniature mass spectrometer based on the Ptolemy mass spectrometer instrument on-board Philae, the ESA Rosetta Lander.

We will discuss the LUVMI rover concept, the current concept of operations and the design of the mass spectrometer extraction systems.