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A LANGMUIR PROBE SYSTEM ON-BOARD THE EMIRATES LUNAR MISSION'S RASHID ROVER

Abstract

The lunar electron sheath is considered the main driver for the transportation of dust across the lunar surface. Lunar surface missions have collected a lot of indirect evidence of this sheath. However, no direct measurement of the density of the low energy electrons, below approximately 10 eV, which would be representative of the photo-electron population close to the lunar surface, has been conducted yet. Measuring the photo-electron density in-situ will allow to determine the yield factor of the lunar surface. If done at several locations on the lunar surface this would provide the ability to spatially map the yield factor and thereby identify areas of greater surface charging and thus potentially enhanced dust movement. A mobile system which would allow to collect such horizontally and vertically resolved photo-electron profiles, would be a major improvement in understanding lunar surface charging, dust transport, and the formation and evolution of the lunar surface plasma sheath. In this paper the Langmuir probe system on-board the Emirates Lunar Mission's Rashid rover is presented. This system consists of four Langmuir probes, distributed across the rover and at heights above ground that they sample the peak densities of the vertical photo-electron distribution. The system design and its operational concepts are presented. Furthermore, the physical challenges, technical feasibility, and the promises such a system holds in view of providing new knowledge about the local lunar plasma environment are discussed.