IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Dr. Piotr Szyszka
Wroclaw University of Science and Technology, Poland

LUNAR REGOLITH ANALYZER

Abstract

One of the most important projects aimed at expanding human presence in the Solar System is the establishment of a permanent base on our natural satellite - the Moon. One of the main problems that complicate this process (beside the microgravity and cosmic radiation) are electrostatically charged regolith dust particles floating above the moon's surface. They can adhere to all surfaces, including spacesuits, equipment and solar panels. This causes damaging to the equipment and posing a threat to human life. Understanding the regolith particles properties and governing physics are critical for future missions and a sustained extraterrestrial life development. Here, we propose the Lunar Regolith Analyzer (LRA). Its core is an electrodynamic trap which can be utilized for introduction of regolith particles, their arrangement in an easily manipulated chain of separated particles in a form of so-called Coulomb Crystal. By utilization of additional analytical equipment, it opens the possibility of analysis including: a structure (size and geometry), a chemical composition and electrostatic properties, resulting in instrument capable to: 1) select, sort and store the charged particles, 2) perform the analysis of the electrostatic properties, 3) perform the analysis of structure and morphology using optical, electron, or x-ray microscopy, 4) perform the analysis of chemical composition, using e.g. Laser Ablation Mass Spectrometer, Optical Emission Spectrometer or X-Ray Spectrometer. The device seems to be a perfect tool for understanding the properties and behavior of the lunar regolith and resource assessment.