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LUNAR PROVING GROUND: INFRASTRUCTURE ON THE EARTH OR ON THE MOON?

Abstract

This essay presents an assessment of positions that participants took at the the Lunar Proving Ground (LPG) Workshop hosted by the Lunar Surface Innovation Consortium at the Johns Hopkins University Advanced Physics Lab (JHU-APL) in August, 2023. It reviews the various needs and desires that the participants presented for their conception of a LPG. It finds that the majority of these researchers want real lunar dust and regolith to pursue their experiments. Therefore, the LPG needs to provide a "dirty" thermo-vacuum chamber in which to conduct tests with real lunar dust and regolith. However, this assessment also finds that it is possible to pursue experiments in many topics with Earth-made regolith simulant. The main discriminator appears to be that experiments in electrostatics focusing on nanophase iron need to be conducted in a cold vacuum. The real lunar regolith and dust must be maintained in a cold vacuum from the time it leaves the Moon. This mode of protecting lunar material during space travel to the Earth and while being used for experiments on Earth would probably be prohibitively expensive. The paper concludes that more the more ordinary experiments in traction, abrasion, sintering, etc, simulant and a "dirty" thermos-vac should suffice, but experiments in electrostatics are best conducted on the Moon.