LUNAR DUST TOLERANCE TESTING OF REPRESENTATIVE SEALS FOR LUNAR SURFACE HATCH SEALS. N. Jimenez[1], S. Gerdts[1], P. H. Dunlap[1] and J. Mather[2], [1]NASA Glenn Research Center, 21000 Brookpark road. Cleveland OH, 44135, nathan.jimenez@nasa.gov, stephen.gerdts@nasa.gov, patrick.h.dunlap@nasa.gov [2T] The University of Akron, 302 E Buchtel Ave, Akron, OH 44325, janice.mather@nasa.gov

Introduction: The Moon's surface creates a uniquely challenging environment for mechanisms and materials. Electrostatic adhesion combined with a jagged particulate morphology makes lunar dust particularly destructive to the components and sub-systems of lunar surface assets. One component that will be acutely impacted by lunar dust is seals, particularly those on the hatches which will be opened and closed to allow extravehicular activities (EVA) and on docking systems that will connect surface assets and spacecraft together. Lunar dust on these seals can create leak paths for the pressurized atmosphere of a surface asset to escape. Quantifying the level of lunar dust contamination that is allowable for seals is of paramount importance for mission planners and asset designers. This paper covers dust tolerance testing that was conducted on representative hatch seals with the Uniform Dust Deposition System (UDDS) at NASA Glenn Research Center [1]. Sub scale (≈30 cm diameter) versions of seals for the Orion docking hatch and NASA Docking System (NDS were coated evenly with varying amounts of lunar dust simulant to evaluate its effect on seals leak rates. The resulting leak rate results from these flight proven seal design can help planners and designers construct robust missions and products.

Digital Formats:

Figure 1: NDS seal with 28 cm centerline diameter

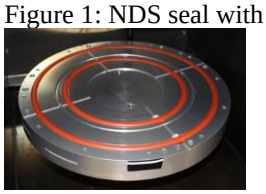

Figure 2: Orion docking hatch seals with 20 cm and 30 cm centerline diameters

Test Apparatus: This section describes the UDDS and the test procedures. It gives a brief description of the system and references appropriate sources for the test procedures utilized for this testing. This paragraph is a placeholder.

Results: This section is a place holder for the finalized representation of data.

References:

[1] Gerdts, S., Jimenez, N., and Dunlap, P.H., "Lunar Simulant Deposition Technique for Dust Tolerance Studies," NASA/TM-2021-0024128, 2022.