LSIC Dust Mitigation Focus Group 9/21/2023

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Dust Mitigation Research
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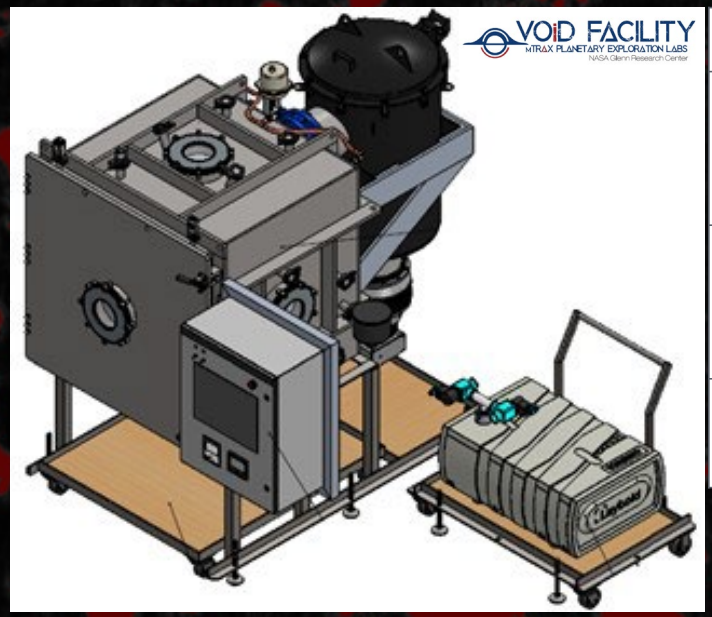
Dust Test Rigs

Uniform Dust Deposition System (UDDS)

- System to deposit dust uniformly and repeatably in a dry (ambient pressure and temperature) environment.
- Developed technique to analyze dust coverage with machine learning software.

Vacuum Operations in Dust (VOiD) Rig

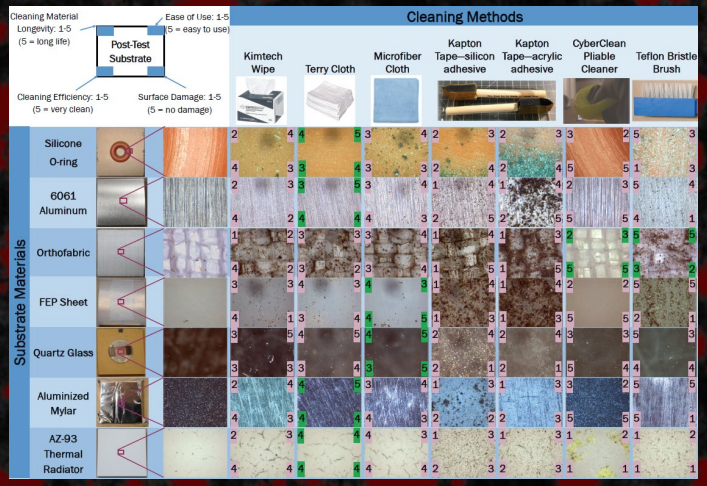


Name	Value	Unit
Internal Working Dimensions	35 W X 35 D X 32.5 H (89 X 89 X 82.5)	in (cm)
Working Temperature	-180 to +150 (-290 to +300)	°C (°F)
Vacuum Level	10^{-6}	Torr

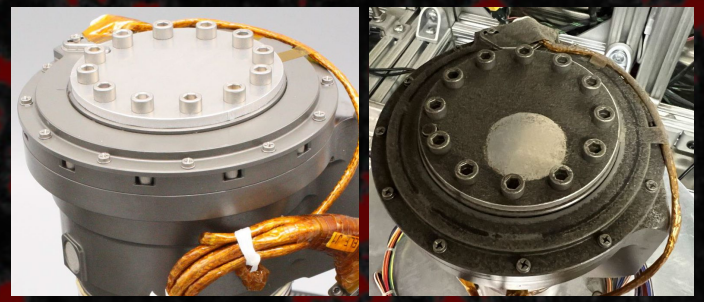
- Dirty Thermal Vacuum Chamber (DTVAC) providing accessible testing for large component or subsystem testing.
- Currently being installed / commissioned, targeting operation in early summer 2024

Dust Projects

- Several studies in the UDDS have been completed, including:
  - Environmental seal characterization and cleaning study (HLS Dusty Seals)
  - Surface cleaning method study (DM Slide)
  - Cryogenic fluid connection dust tolerance testing (Cryomag ECI)
  - Actuator lifecycle testing (COLDArm)
  - Magnetic gear dust intrusion testing (MDECE)



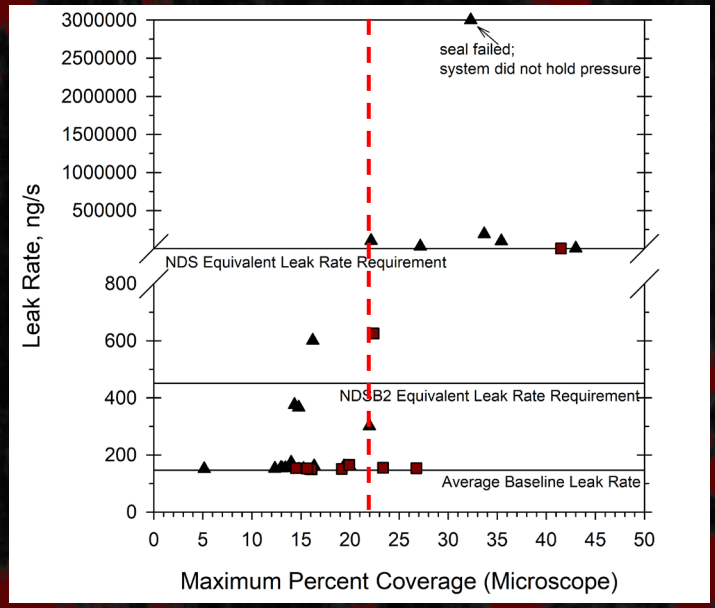
DM Slide Cleaning Method Study



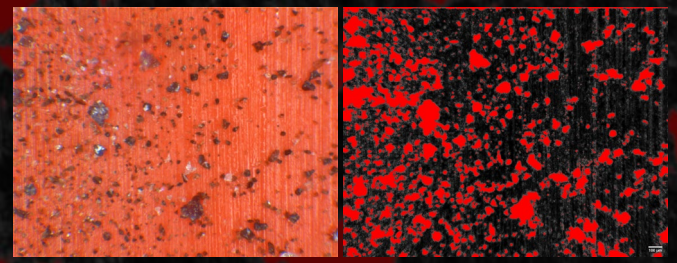
COLDArm Actuator Lifecycle Dust Testing for Endurance A

Cryomag ECI Dust I

HLS Dusty Seals



HLS Dusty Seals Leak Rates for Subscale NDS Seals with JSC-1A Lunar Simulant



Dusted Contaminated NDS Seal, Left: Micrograph, Right: Segmented Image