

Development and Test of Lunar Dust Removal using a Gecko Roller

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Development Objectives:

- Mature gecko roller technology through quantification of dust removal efficacy at lunar relevant (UHV) pressures and temps on hard surfaces and spacesuit fabric swatches. TRL 4→5
- Mature roller reusability through demonstration of cleaning appliance and comparison of efficiency. TRL 2→4



1-100 μm scale cinnamon adhered to gecko roller in ambient pressure proof of concept

SOA improvement:

- Minimal power required during dust removal
- Reduces hazard of dust redeposition
- Eliminates need to embed electrodes or modify surface

Approach:

- Testing completed with lunar highland dust simulant
- Roller testing completed in $<10^{-9}$ T vac chamber & 220 K thermovac chamber
- Three cleaning appliance technologies tested in 10 μT vac chamber
- Cleaning sensor built/tested and optimal roller operational parameters quantified

Impact and Infusion:

- Dust removal technology is required for long duration crewed or robotic operations on the lunar surface.
- Proposed investigation will provide key demonstration and technology characteristics needed for infusion of gecko roller technology into future mission designs.
- Technology applicable to both crewed and robotic missions.