



Electrodynamic Dust Shield Testing on the Materials on International Space Station Experiment 11

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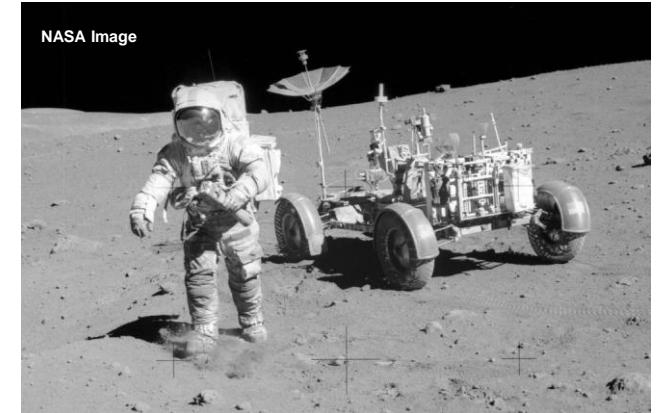


Overview

- **Dust has a large impact on Lunar systems (Pervasive, abrasive, and adhesive properties)**
- **Kennedy Space Center's Electrostatics and Surface Physics Lab (ESPL) has created the Electrodynamic Dust Shield (EDS) to mitigate these impacts**

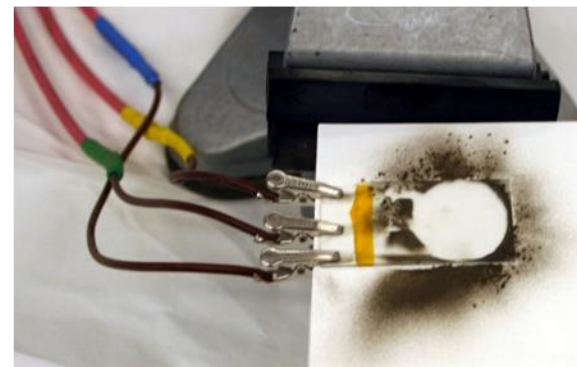
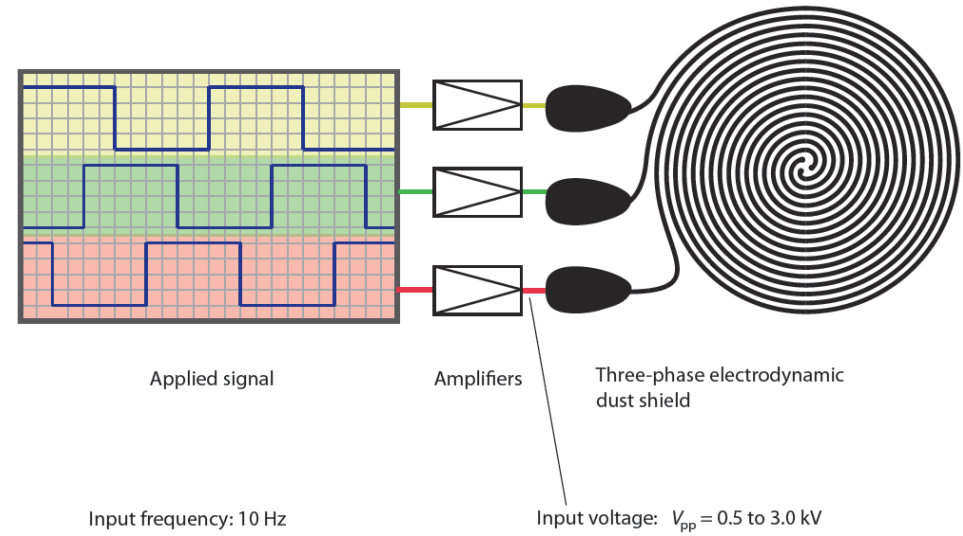
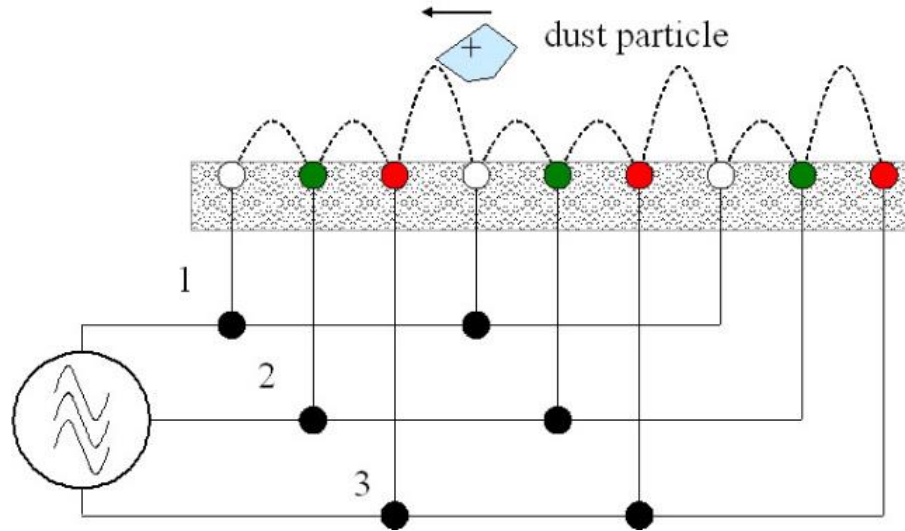
“I think dust is probably one of our greatest inhibitors to a nominal operation on the Moon. I think we can overcome other physiological or physical or mechanical problems except dust.”

-Apollo 17 Astronaut Gene Cernan





Electrodynamic Dust Shield



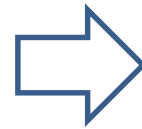
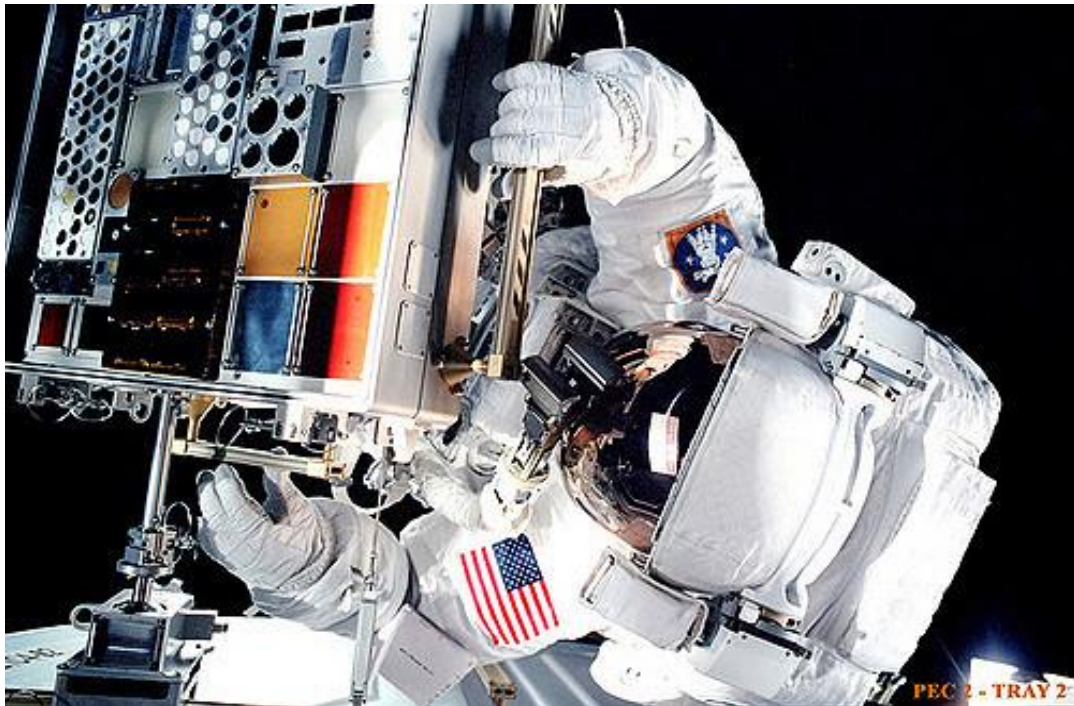


Electrodynamic Dust Shield





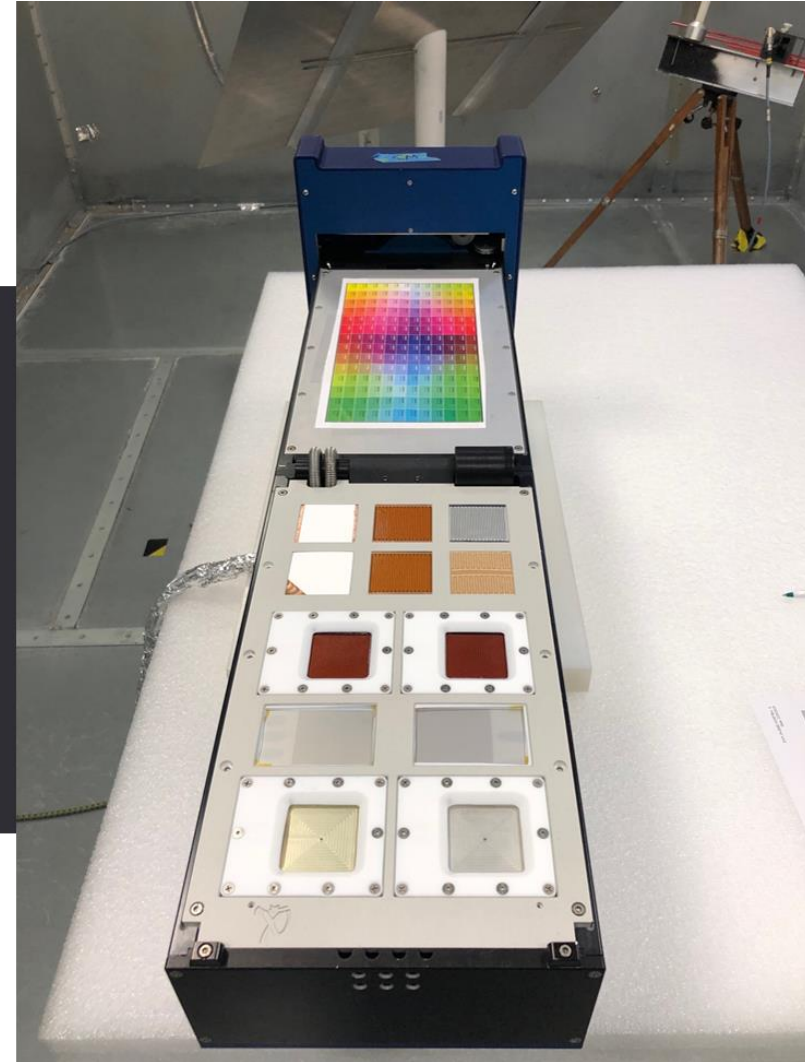
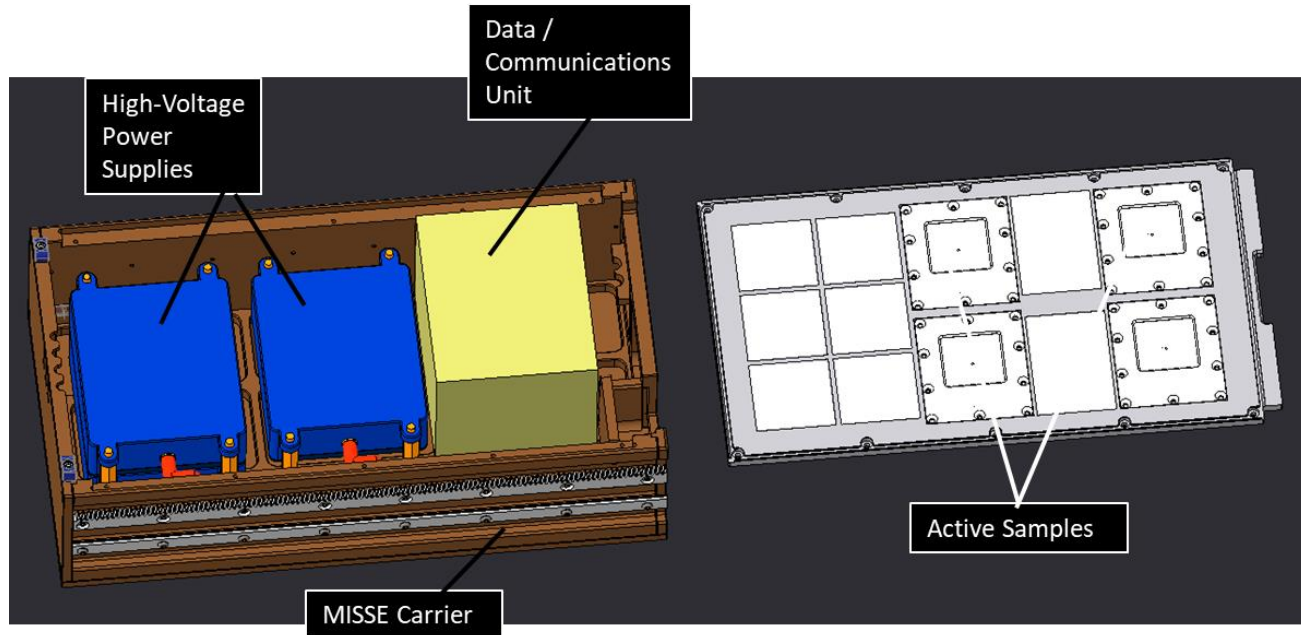
Materials on ISS Experiment



Photos courtesy of Alpha Space and NASA



EDS Integration onto MISSE-11 Payload



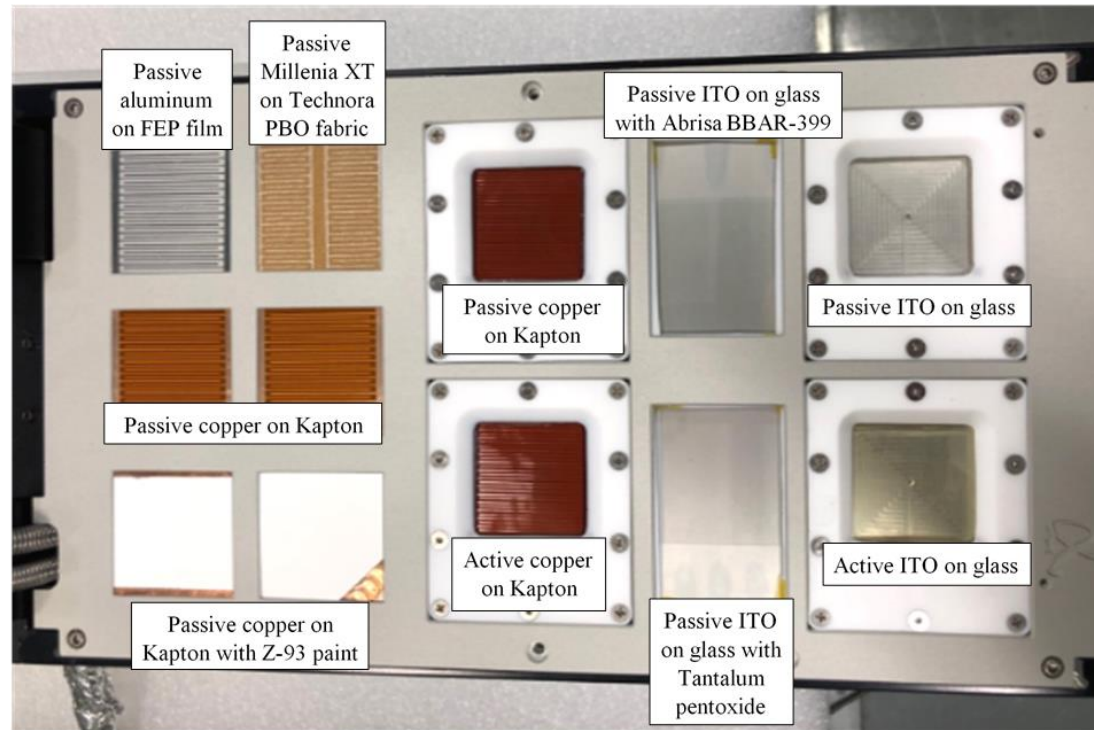
Photos courtesy of Alpha Space



Experiment Design: Materials

On the EDS MISSE-11 Experiment:

- Two active EDS (for optical and thermal systems)
- Ten passive EDS (for laboratory study upon return)

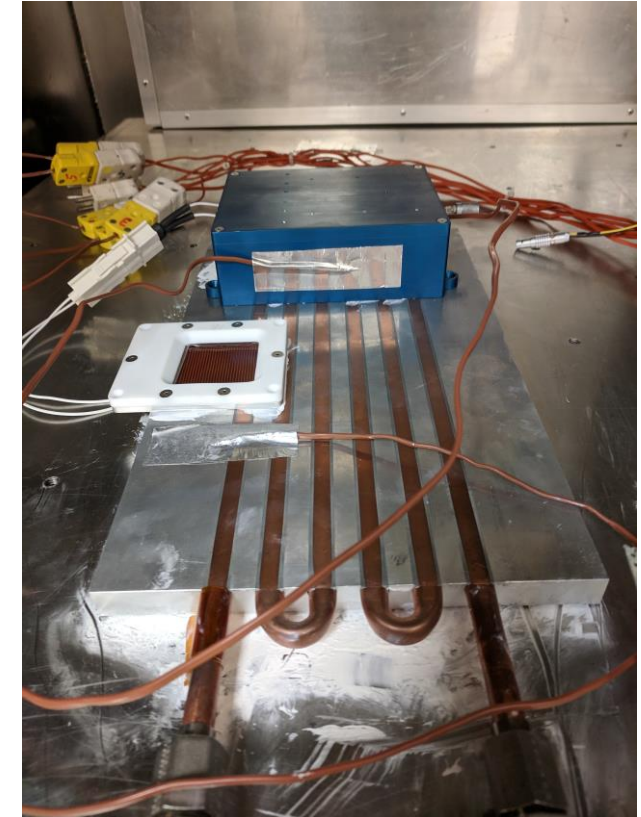
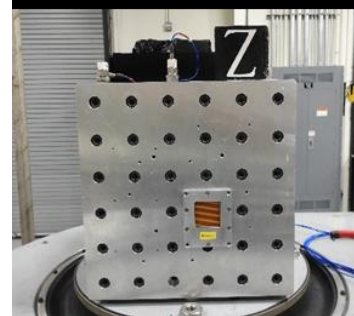
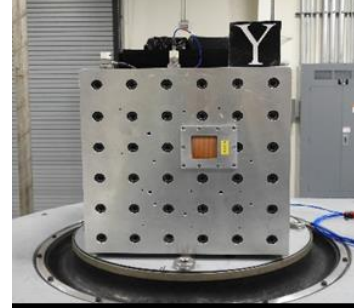
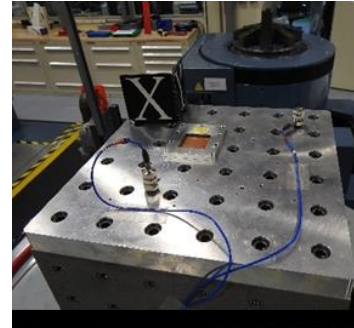




Experimental Testing

Pre-launch structural/thermal testing:

Environment	Test	Parameter	Value
Vibration		Frequency Sweep	20 - 2000 Hz
		Acceleration (RMS)	8.8 g
		Duration	1 min
Thermal Vacuum	Cold Storage	Temperature	-40 °C
		Duration	90 min
		Pressure	3×10^{-5} Torr
	Hot Storage	Temperature	60 °C
		Duration	90 min
		Pressure	3×10^{-5} Torr
Powered		Temperature	0, 5, ..., 40, 45 °C (10 trials)
		Duration	1 min at each temperature
		Pressure	3×10^{-5} Torr

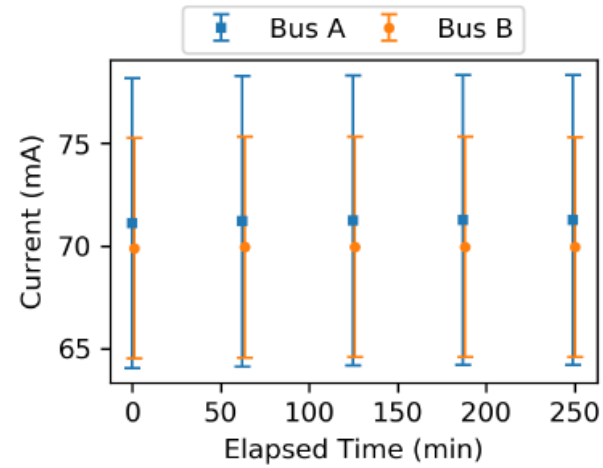
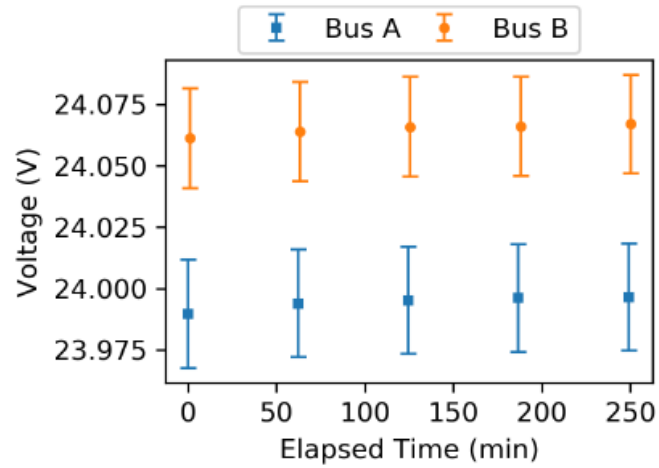




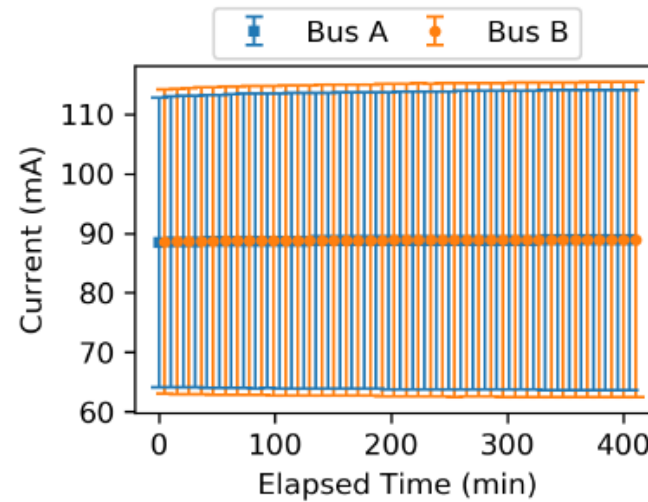
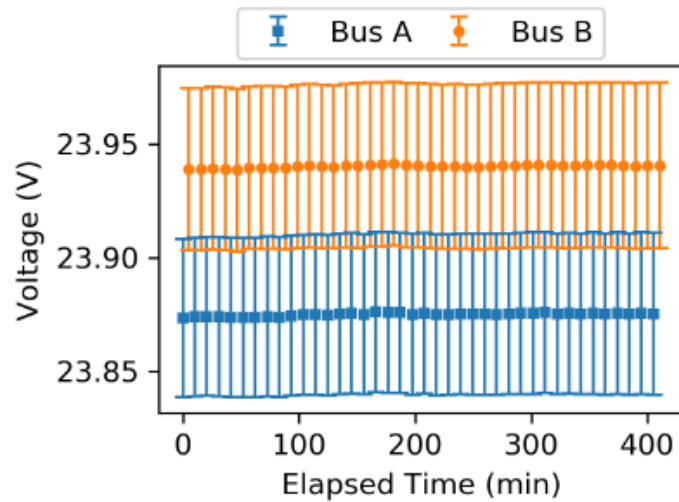
Pre-flight Electrical Testing

Bus A: Kapton

Bus B: Glass



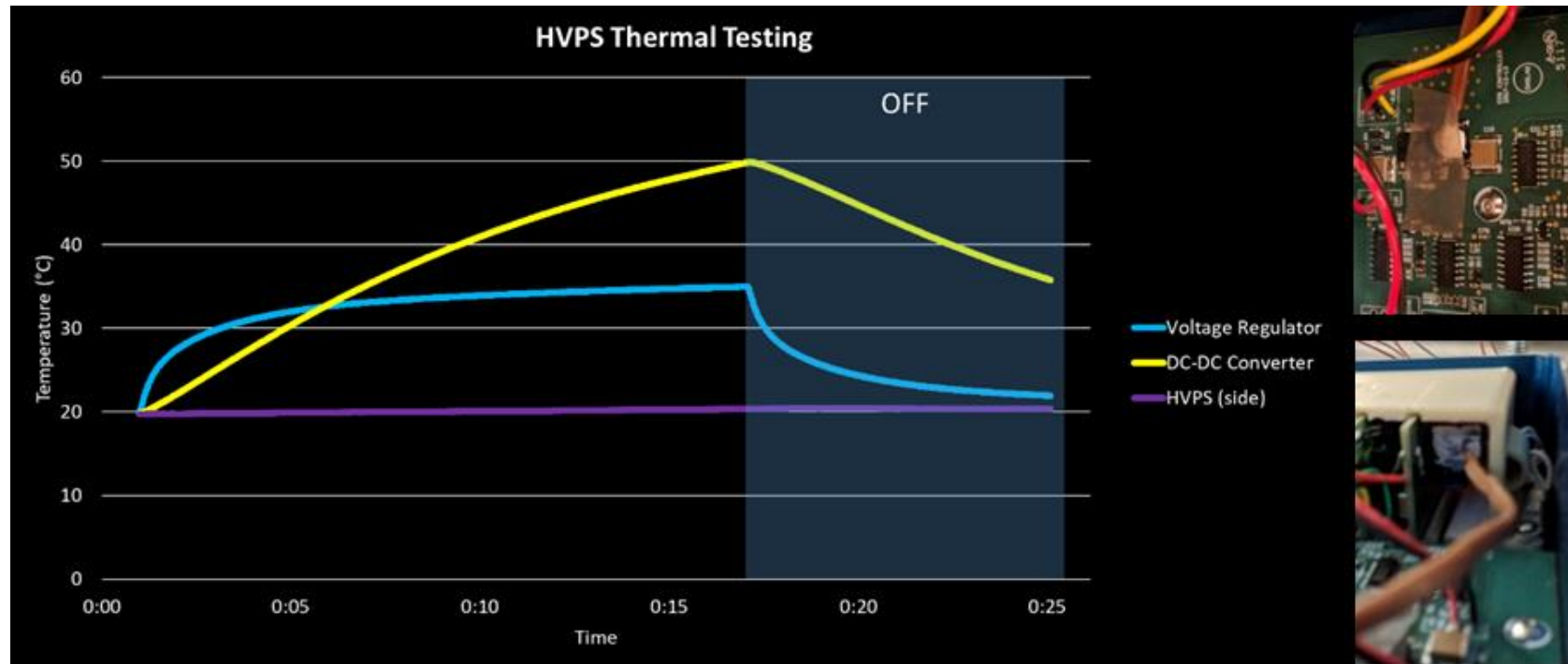
Mean voltages and currents for flight DCU testing at hourly intervals



Mean voltages and currents from DCU stress testing at ten minute intervals with capacitive loads



Thermal Vacuum Experimental Testing



HVPS testing results with thermocouples mounted to low voltage regulator (upper right) and high voltage converter (bottom right)



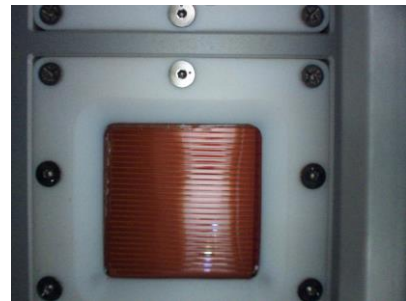
EDS MISSE-11 Launch



Photo Courtesy of Michael Johansen, NASA KSC



EDS MISSE-11 aboard ISS





Next Steps

- Initial data indicates that EDS hardware is performing nominally
- Looking for follow-on flight opportunities for active EDS
- Further studies for active and passive dust mitigation integrated systems
- Preparing EDS for integration with lunar payloads and landers