



SDS Overview



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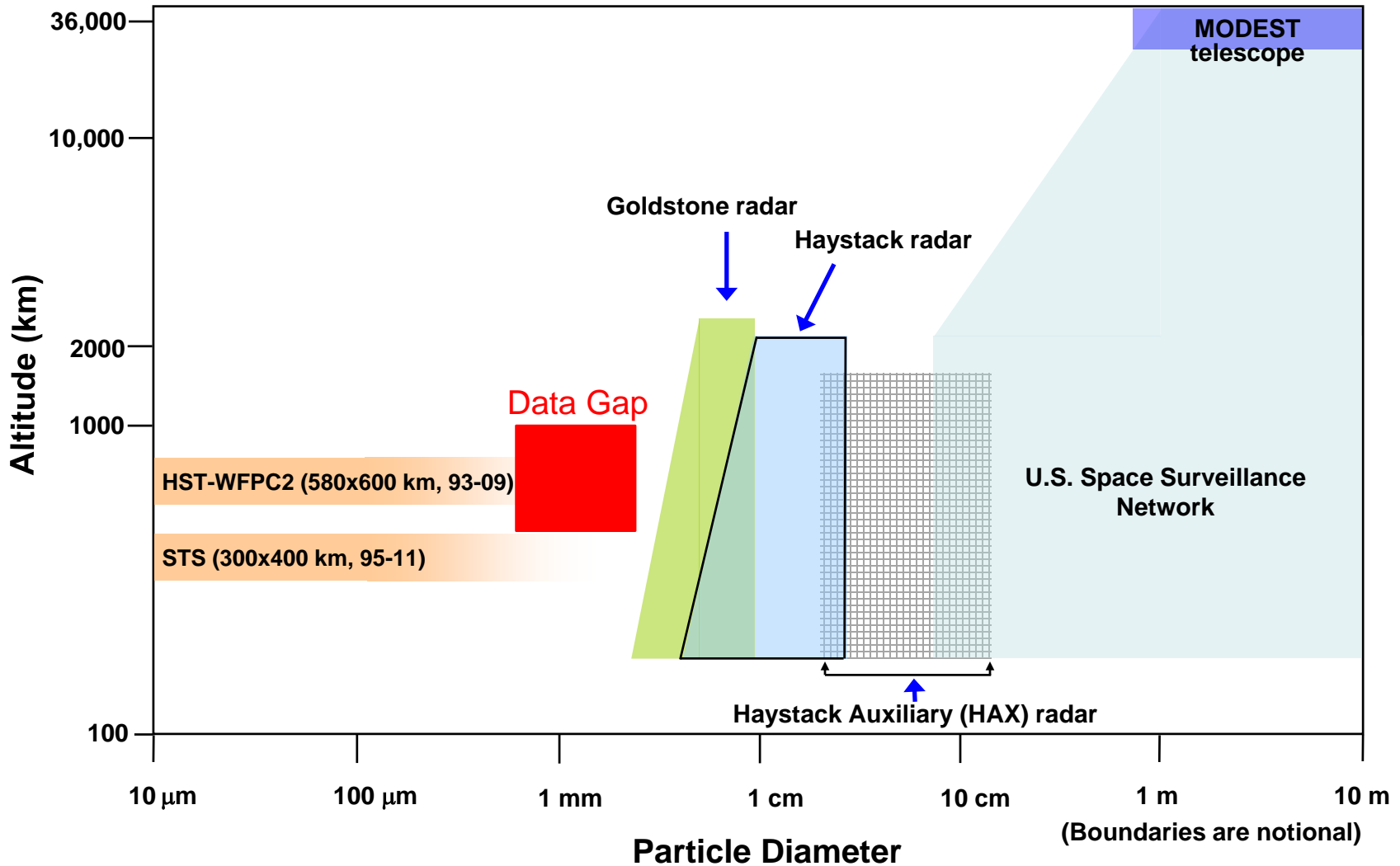
SDS Background



- The Space Debris Sensor (SDS) is a NASA experimental payload scheduled to fly aboard the International Space Station (ISS) starting in 2017
 - First flight demonstration of the Debris Resistive/Acoustic Grid Orbital NASA-Navy Sensor (DRAGONS) developed and matured by the NASA Orbital Debris Program Office (ODPO)
 - SDS will provide statistical in-situ data on the orbital debris population that is too small for ground-based remote sensing
 - Information on debris ranging from 50 μm to 500 μm in size
 - Estimates of this small debris population are currently based on inspection of exposed surfaces returned on Shuttle (retired 2011)
 - Results will be used to update the ODPO Orbital Debris Engineering Model (ORDEM)
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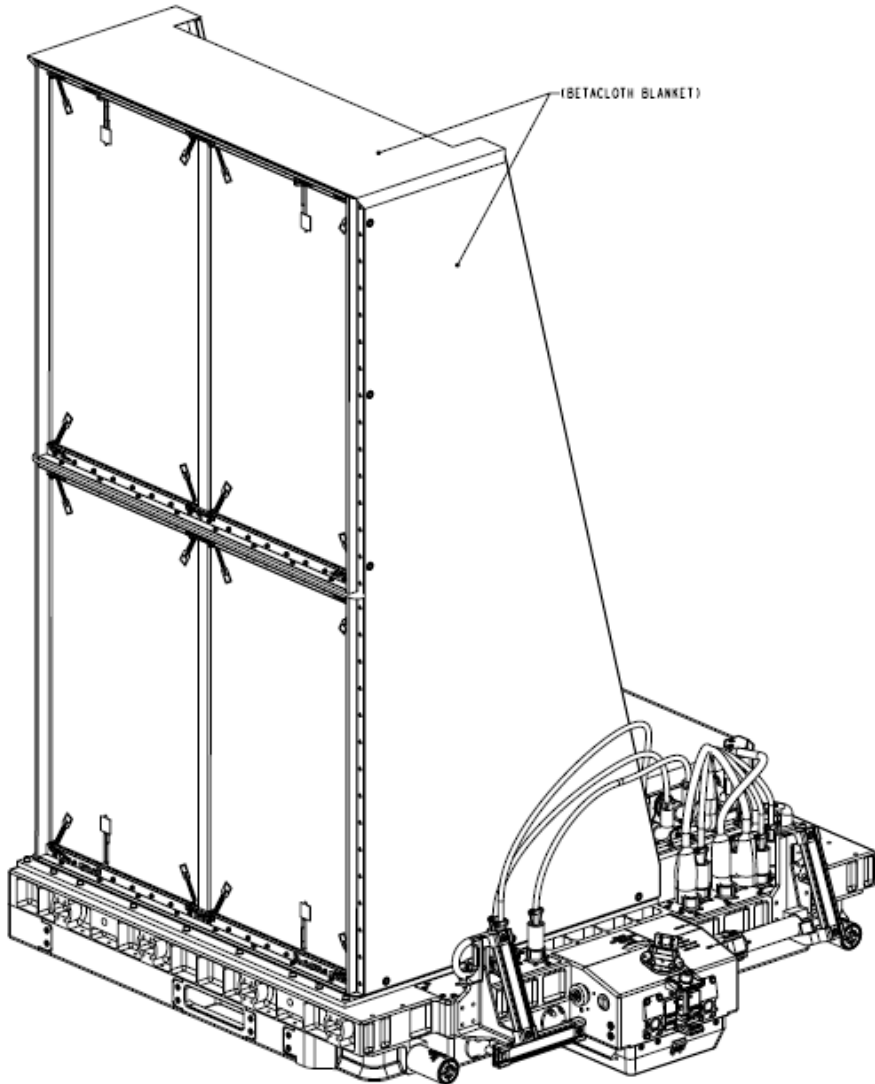


Orbital Debris Measurement Coverage



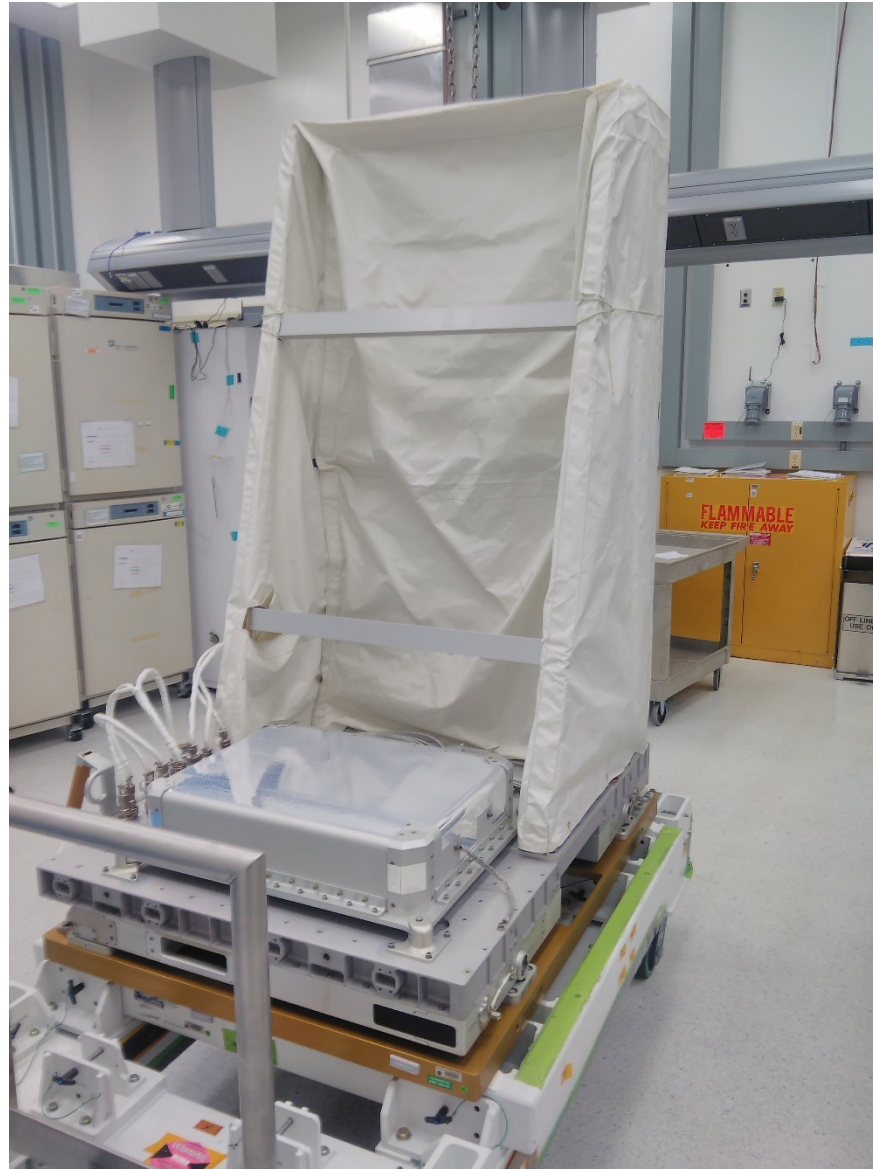


SDS Front View





SDS Rear View



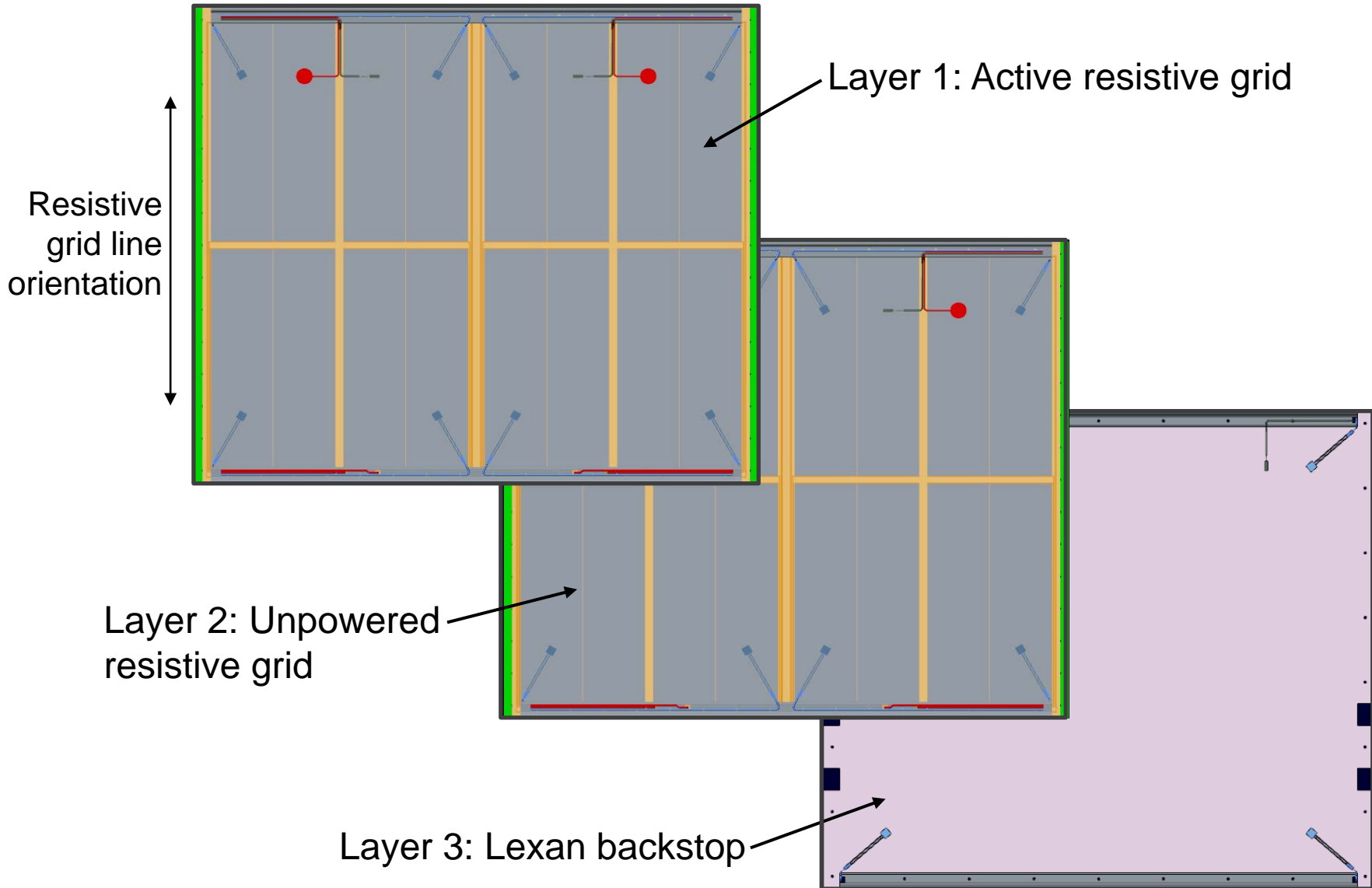


Vital Statistics

- **Weight:**
 - Total: 267.69 kg / 590 lbs
 - Columbus External Payload Adapter (CEPA): 117.94 kg / 260 lbs
 - SDS: 149.75 kg / 330 lbs
- **Size:**
 - External Height: 67.56 inches (Height Exception to the GPV approved, MAGIK analysis shows no issues)
 - External Width: 47.92 inches (CEPA with handrails)
 - External Depth: 53.00 inches (CEPA with handrails)
- **Power**
 - 40W: SDS operating without heaters
 - 155W: SDS operating with ISS heaters
 - 100W: SDS non-operating with launch heaters



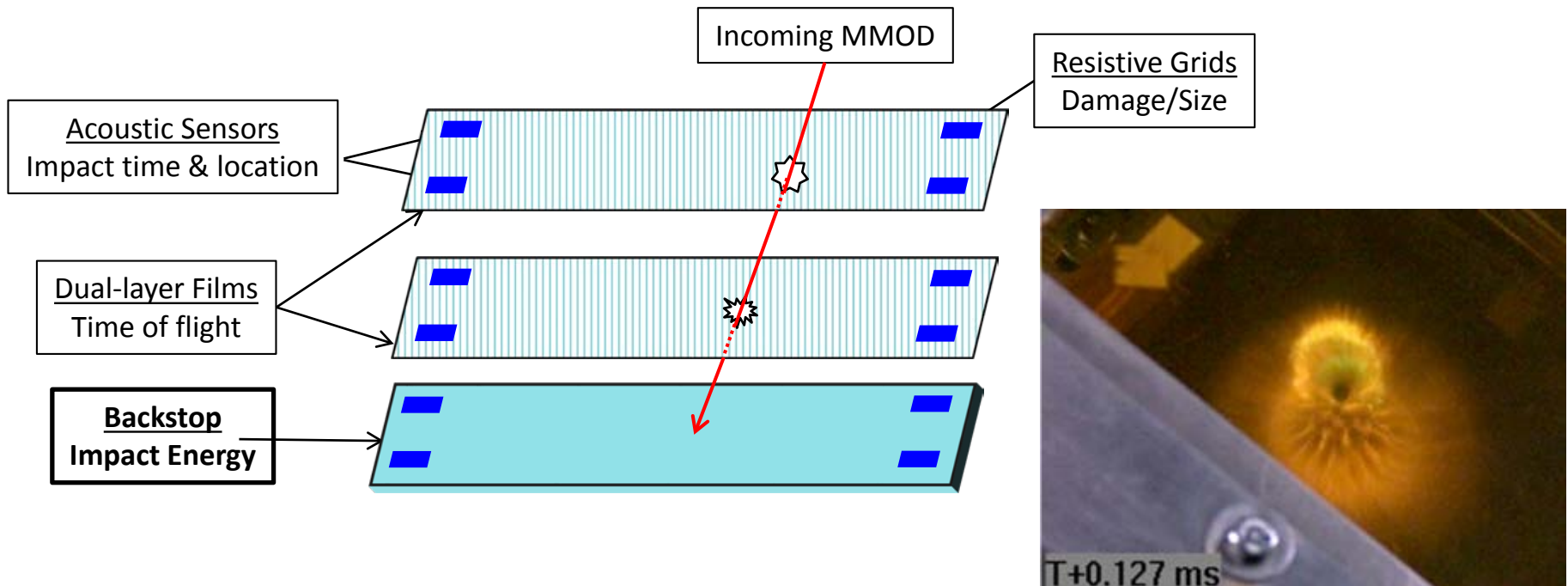
3-Layer Assembly





Detection Principles

- SDS combines dual-layer thin films, an acoustic sensor system, a resistive grid sensor system, and sensed backstop to provide excellent semi-real-time impact detection and recording capability
 - Impact data includes: **Impact time, impact flux, particle size, impact speed, impact direction, and impact energy/particle density**

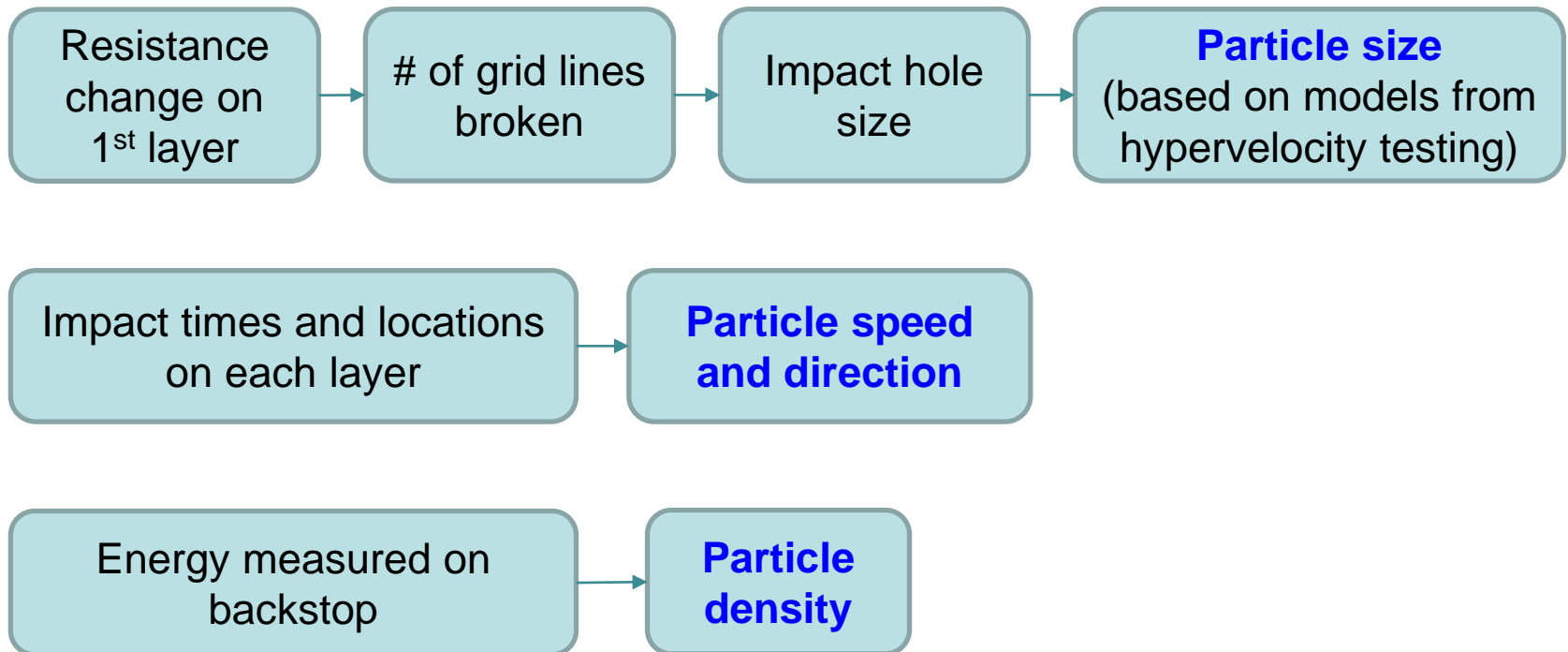




SDS Detection Coverage



- Impacts on SDS will provide information to categorize orbital debris
 - **Speed** and **Direction** to categorize object origin (Inclination, Eccentricity)
 - **Size** and **Density**



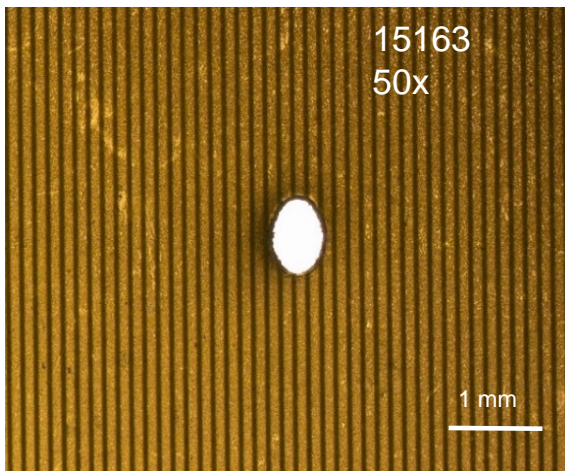


500 μ m 440C Stainless Steel

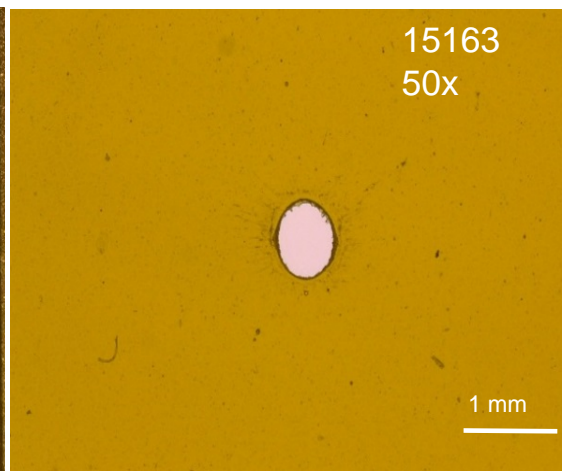


- Steel maintains shape throughout, impacts all 3 layers
- No visible break up of particles during impacts

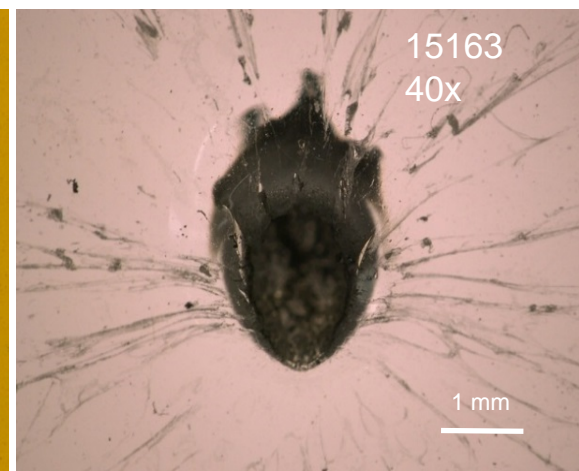
Layer 1



Layer 2



Backstop



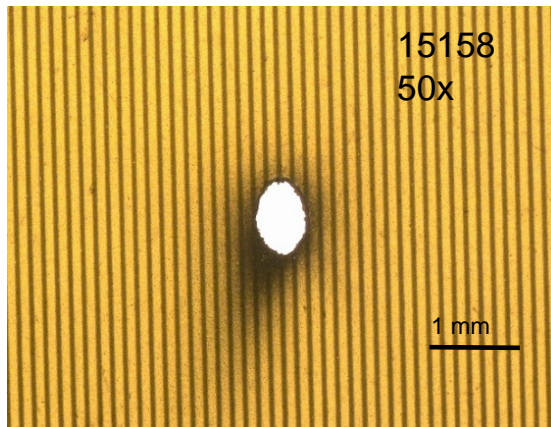


500 μ m Aluminum Al 2017-T4

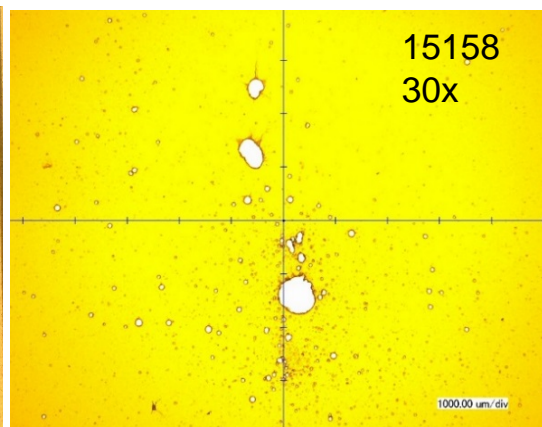


- Aluminum particles show break-up after 1st layer
- Multiple impact holes on 2nd layer

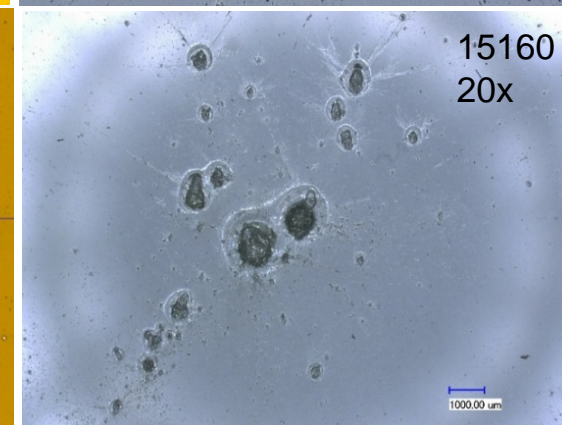
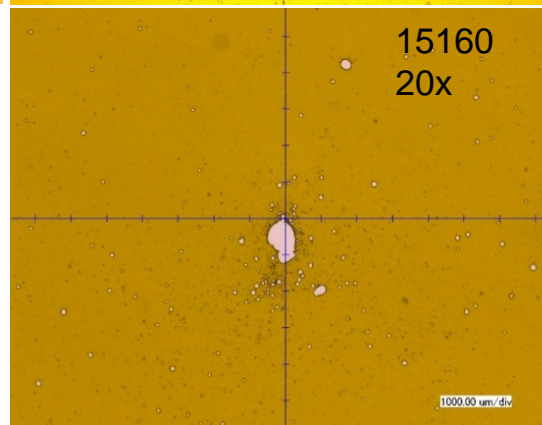
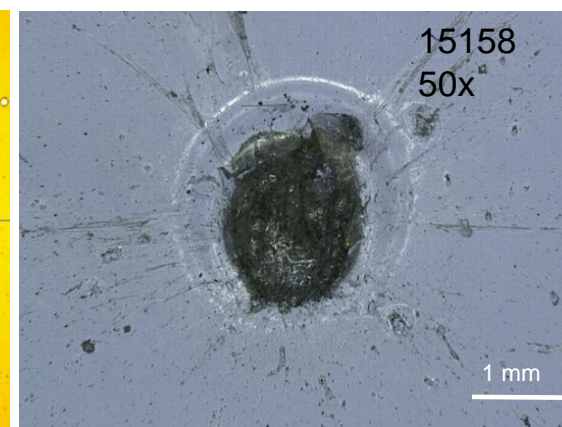
Layer 1



Layer 2



Backstop



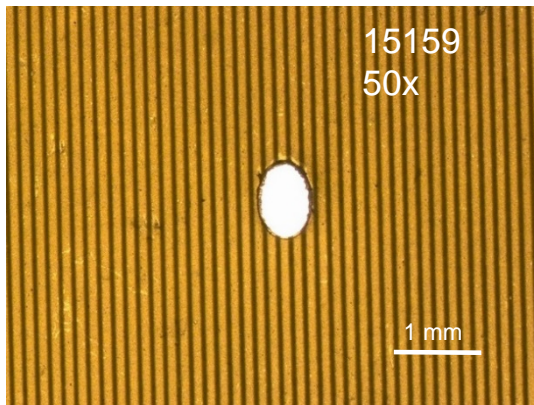


500 μ m PMMA Plexiglass

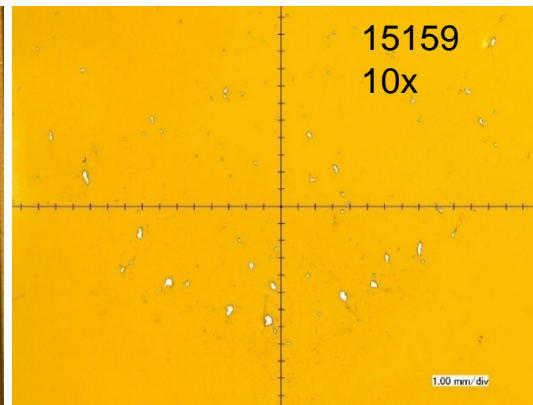


- Plastic particles break up significantly after 1st layer
- Multiple small impact holes on 2nd layer
- Residue only on Lexan backstop, if shot shows up at all

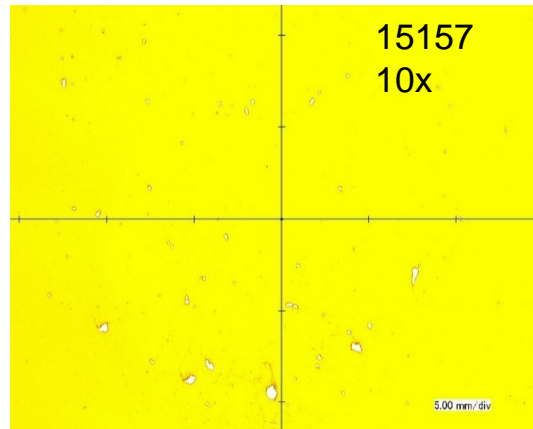
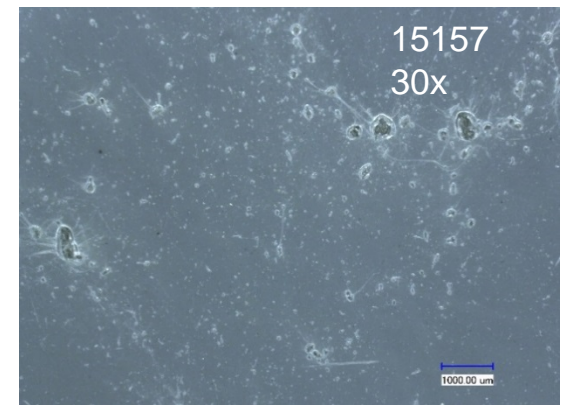
Layer 1



Layer 2



Backstop

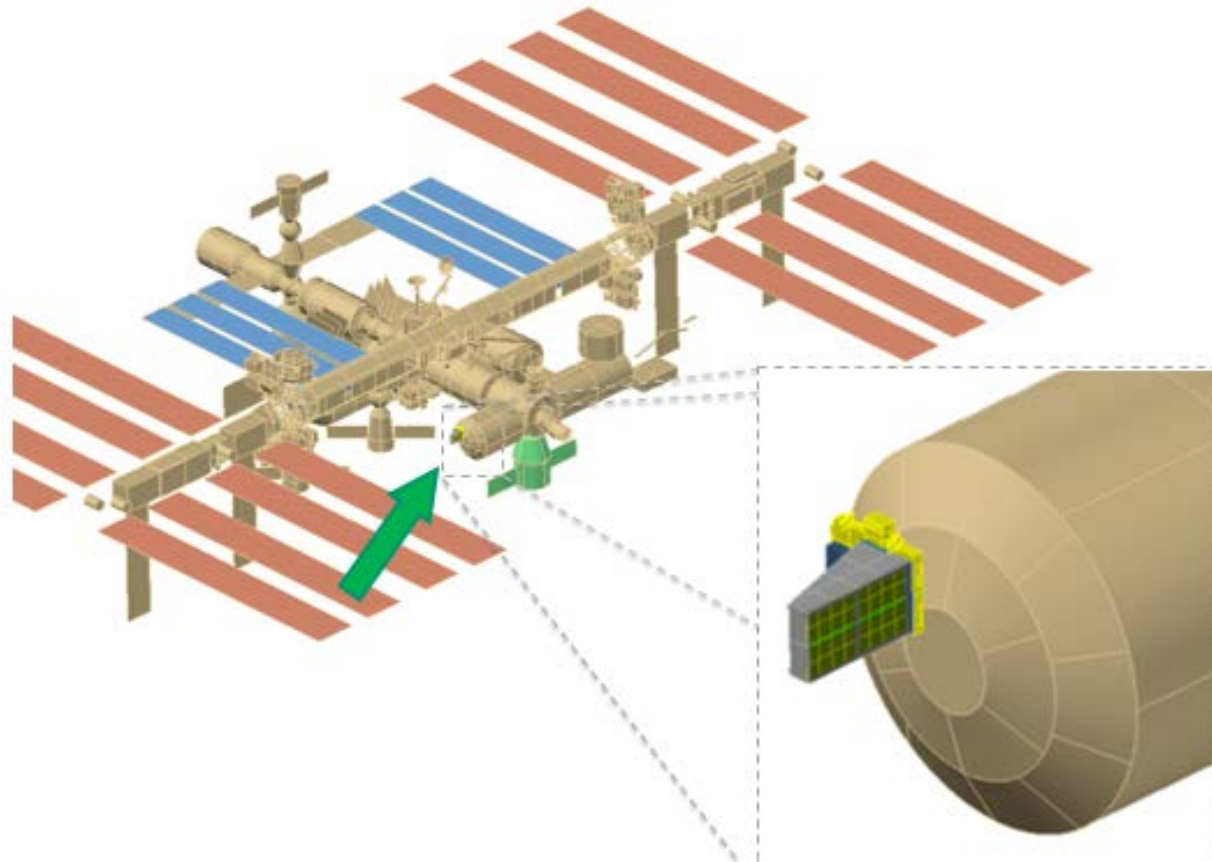




SDS Installation on ISS

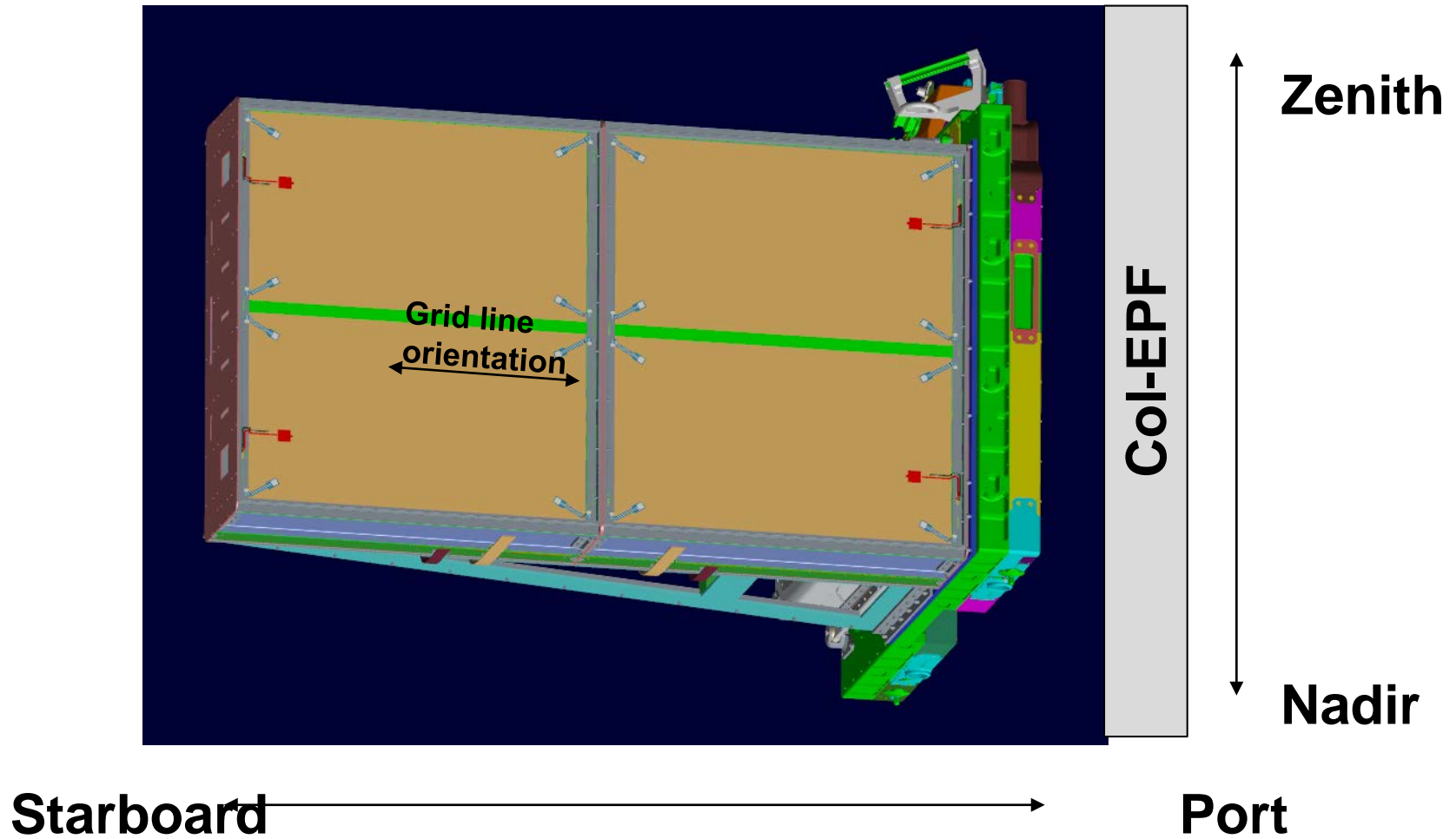


- SDS scheduled to launch on SpaceX 13 (Nov. 2017)
- Installation on the Columbus External Payload Facility (Col-EPF) in the ISS forward-facing (ram) direction



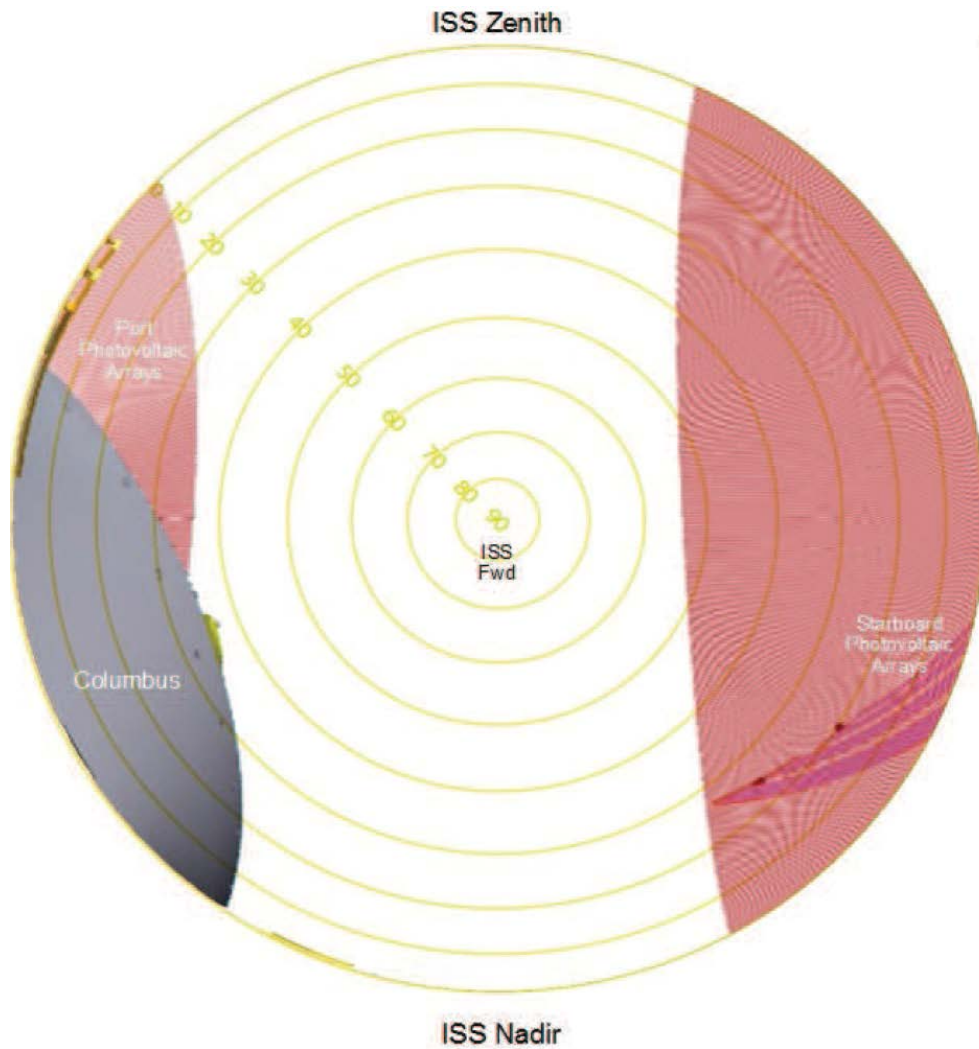


SDS ISS Orientation

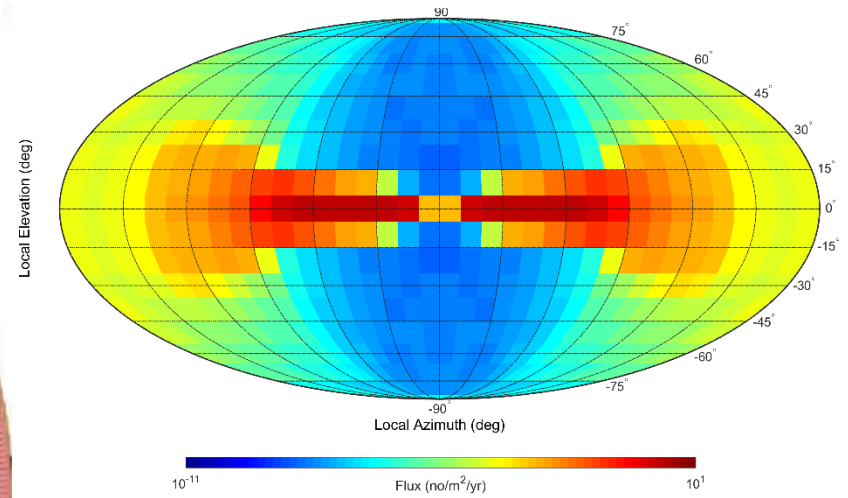




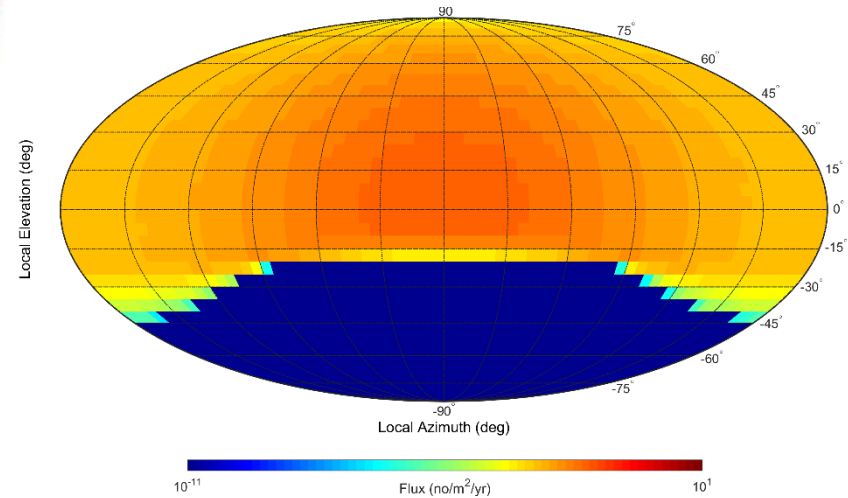
SDS Field of View



2D directional flux, orbital debris



2D directional flux, micrometeoroids





Questions?

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