We design microwave radiometers that are small, lightweight, and low power for a variety of platforms.
Space-Based Observations

WindSat Radiometer

- Main reflector diameter: 1.83 m
- Mass: 341 kg
- Power consumption: 350 W
- Earth Incident Angle: ~53°
- IFOV @ 35 GHz: 8 x 13 km

AMSR2 Radiometer

- Main reflector diameter: 2.00 m
- Mass: 405 kg
- Power consumption: 400 W
- Earth Incident Angle: 55°
- IFOV @ 35 GHz: 7 x 12 km
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SMAP Radiometer

- Main reflector diameter: 6.00 m
- Mass: 944 kg
- Power consumption: 1,450 W
- Earth Incident Angle: 40°
- IFOV @ 1.41 GHz: 38 x 49 km
Space-Based Observations

Larger satellites have higher associated costs and risks!

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2m Deployable Reflector:
- Stowed Diameter – 102mm
- Stowed Height – 323 mm
- Approx. Mass – 436 g

Main reflector diameter 1.83 m

AMS R2 Radiometer

Main reflector diameter 2.00 m
Deployable Reflector Antenna

1.5U

Stowed

117mm
55mm
66 mm

Deployed

660mm
117mm

550mm Aperture
Mass of Reflector: ~91g

3U Concept
(Front Solar Panels Removed)

3U Concept w/ cross-track scanning
Support Net Generation

W-Band operation requires a highly accurate surface!
Features of Reflector

Dual scissor truss increases stowing efficiency and synchronized deployment.

Cross-struts assisted with torsion springs to reduce deployment power (spring not pictured).

Passive locking mechanism locks deployed reflector in place, eliminating need for sustained power.
Stress Testing of Structural Rim

Forces and BCs

Deformation

Stresses

Maximum deflection $\sim 0.01 \times$ Diameter

Minimum factor of safety $= 14$
Reflective Mesh

**Requirements**
- Gold plated molybdenum wire
  - 10 to 30μm diameter
- Tricot warp weave for elasticity
- Maximum pore size \( \frac{a}{\lambda} < 0.1 \)
- Approximately 34 openings per cm (OPC) @ 100 GHz

**Supplier**
- Three knit patterns currently being manufactured
- Manufacturer confident of achieving an OPC of greater than 24

Example of Tricot Weave Pattern
Mesh Characterization – pore size
Mesh Char. – surface roughness

- Flat Reflector
- Standard Gain Horn

125 X 100 mm reflectors

Reflection Loss

- Green: Mesh 1
- Red: Mesh 2
Scaled Reflector Assembly

Adhesive Testing and First Assembly
Scaled Reflector Assembly

Tension Ties and Deployment Motor
Scaled Reflector Assembly

Rigid Rim Test and Mesh Transfer
Larger satellites are costly and can pose a high degree of risk!

Deployable reflector antennas are a potential solution to EO needs!

- Operation up to 100 GHz
- Custom Software for optimization and design
- 0.55m prototype under development
- Scalable design
- Deployment based on proven technology
- Manufacturing improved mesh
- Testing procedures developed with promising initial results
Potential Deployment Sequence

3U cross-track scanning CubeSat concept with 0.55m aperture

Questions?