Objective

• Develop a wideband 1 m² deployable P-band (250 to 500 MHz) and I-band (up to 200 MHz) antenna enabling future U-class Signal-of-Opportunity (SoOp) instruments.
• Enable P/I-band microwave remote sensing of Earth’s surface from U-class platforms for soil moisture, biomass, and snow measurements.
• Perform electromagnetic and mechanical design for a wideband antenna tuned to all three bands of interest that is also deployable so that it can be integrated onto a U-class satellite bus.
• Perform antenna range tests to verify performance
• Develop simulation software tools for science mission design using multi-frequency SoOp

Accomplishments

• Developed simulator incorporating 8 constellations (186 transmitters) providing sources from I-band (137 MHz) to L-band (1575 MHz).
• Demonstrated use of simulator in designing constellation for root-zone soil moisture (RZSM) retrieval at 137, 255 & 370 MHz
• Electromagnetic and mechanical design of membrane antenna, with consistent gain from 3-6 dB over 137-380 MHz
• Built rigid breadboard and membrane antenna models with equivalent EM properties
• Tested rigid antennas in laboratory and field (TRL4) measured and simulated gain patterns agree within 2 dB test uncertainty.
• Developed SoOp end-to-end simulator to evaluate system performance, including attitude control and spot-beams
• Designed deployable membrane structure using motor-driven boom and tape deployer (TRL3) with

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TRL_{in} = 2  \quad TRL_{out} = 4 \text{ (Electromagnetics)}
\quad 3 \text{ (Mechanical)}