Demonstration of a Hyperspectral Microwave Receiver Subsystem

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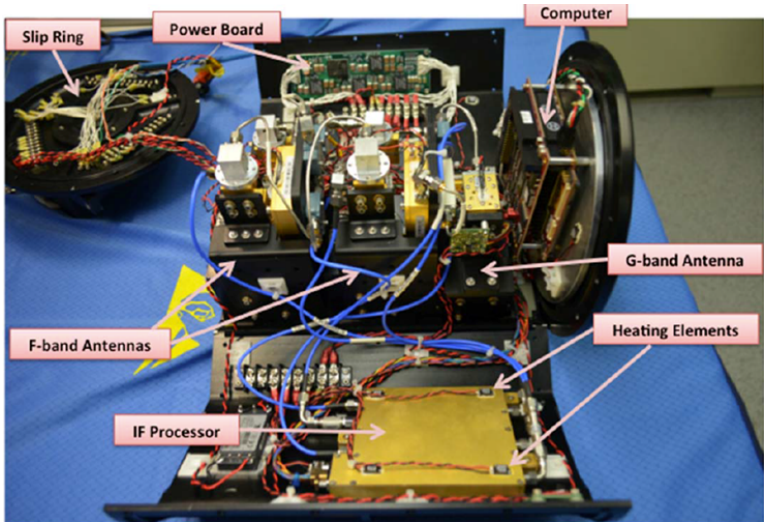
Objective

- Develop and demonstrate a new hyperspectral microwave receiver subsystem to support future atmospheric sounding missions such as PATH.
- Achieve an all-weather sounding capability through broadband 118 and 183 GHz receiver subsystems.
  - Core technology effort is an ultra-compact (<100cm3, 500g) Intermediate Frequency processor (IFP) module enabling hyperspectral sensing within the mass/volume envelope of current systems.
- Enable smaller sensors with greater reliability, launch opportunities, and performance with the proposed IFP technology, together with recent RF advancements.



Fully assembled hyperspectral microwave receive subsystem

Accomplishments

- Developed, integrated, and tested a 52-channel receiver subsystem compatible with NASA CoSMIR airborne scanner
- Proved a new IFP module with ultra-compact size and low-power (~5 W) operation, suitable for smallsat operation
- Proved a new wideband receiver architecture with state-of-the-art performance in low-SWaP package
- Developed data system to interface receivers, collect and aggregate data, and communicate with CoSMIR host
- Demonstrated receiver at room temperature and in thermal chamber (-20C to +20C) to simulate airborne environment
- Achieved or exceeded all performance metrics: linearity (0.3%), NEDT (0.35K in each channel), and volume (10x10x1 cm^3)
- Identified optimizations (RF and video gain settings) for further performance improvement
- Infusions of IFP (9 channel prototype version): MiRaTA ('17 launch), MicroMAS ('17 launch), TROPICS (12 satellites for '19 launch readiness)

Co-Is/Partners:

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$TRL_{in} = 3$ $TRL_{out} = 5$