The Microwave Radiometer Technology Acceleration (MiRaTA) CubeSat

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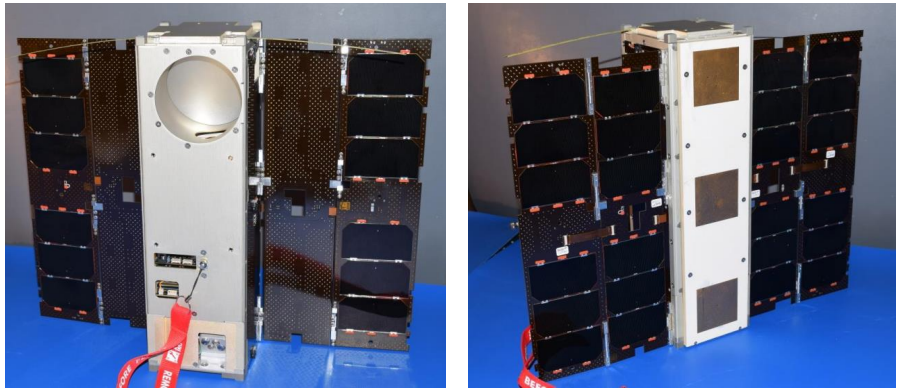
Objective

In-space validation of new microwave radiometer and GPS Radio Occultation (GPSRO) technology:

- Develop a CubeSat all-weather sounder at 3 bands: ~55 GHz (temperature), ~183 GHz (humidity), and ~207 GHz (cloud ice).
- Validate radiometric accuracy and precision to state-of-the-art levels.
- Demonstrate atmospheric GPSRO from a CubeSat platform to improve data product retrieval and calibration.
- Compare radiometer and GPSRO fields-of-view for cross-validation and link radiometer calibration to NIST standards



MiRaTA flight model spacecraft delivered and launched for joint atmospheric GPSRO and microwave radiometer observations

Accomplishments

- Although the mission radiometer and GPSRO technology was never validated in space, the project delivered G/V-band radiometers calibrated with accuracy within TRL advancement requirements (note that some G-Band EMI impacts the V-band radiometer, but that can be calibrated-out from thermal vacuum testing data)
- Delivered the GPSRO Compact Total Electron Content and Atmospheric GPS Sensor (CTAGS) antenna and verified performance (in the lab)
- Built, delivered, and launched flight model spacecraft, performed spacecraft checkout, and acquired on-orbit data in science-mode prior to power system and radio failures
- Items learned to improve mission success include adding extra link budget margin, multiple options to power key systems, radios that operate independently of the spacecraft computer, EPS having watchdog/latch-up protection, frequent monitoring of spacecraft health
- Produced 9 SM and 2 PH.D students with an additional 3 PH.D students working toward completion of their degrees at MIT

Co-Is/Partners: William J. Blackwell, MIT Lincoln Laboratory; Neil Erickson, UMass-Amherst; Rebecca Bishop, The Aerospace Corporation; Tim Neilsen, USU/SDL

TRL_{in}= 5 **TRL_{out}= 6**