# NIST Program in Microwave Remote-sensing radiometry

Current efforts:

- Evaluation of the physical properties and performance of microwave black-body
- An SI-based microwave brightness-temperature (TB) standard including both a standard black-body target and a standard (i.e., well-characterized) reference radiometer
- Improved techniques for evaluating and documenting the uncertainty of microwave remote-sensing radiometers to achieve SI traceability
  - Advanced calibration methods & instrument architecture (collaboration with NASA GSFC)

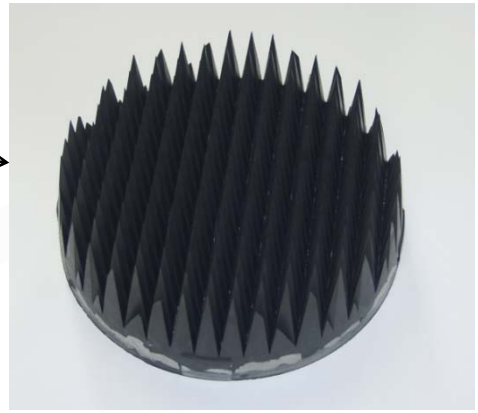
# Goal: Traceability for space-based climate monitoring

Expected outcome - new NIST calibration and measurement services:

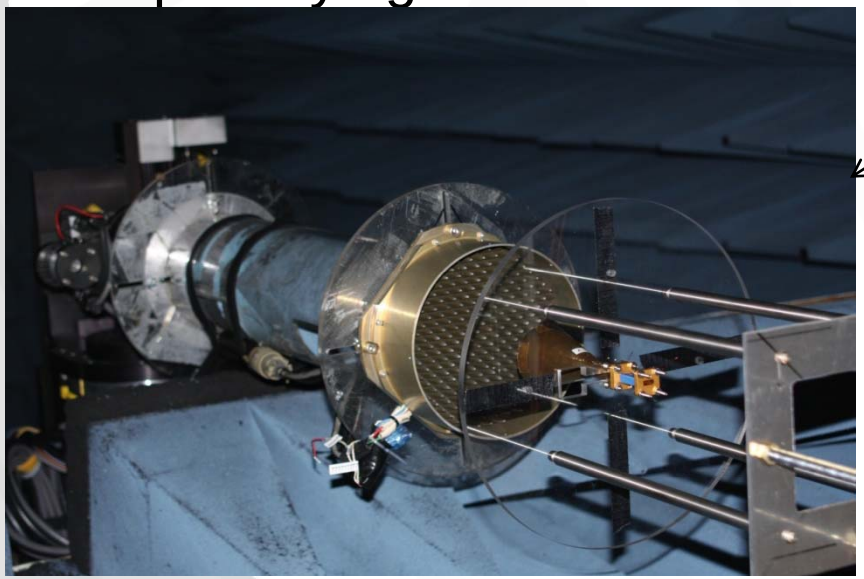
- SI-traceable microwave brightness-temperature calibrations for passive microwave remote-sensing radiometers, including:
  - pre-flight calibration capability for space-based instruments
  - rigorous, systematic uncertainty analysis of flight instruments
- Highly accurate measurements of land and air temperature, wind speed, sea surface temperature and salinity, soil moisture, sea ice, precipitation, and water vapor, as critical input to global climate change science and public policy decisions.

# SI-based Microwave Measurements

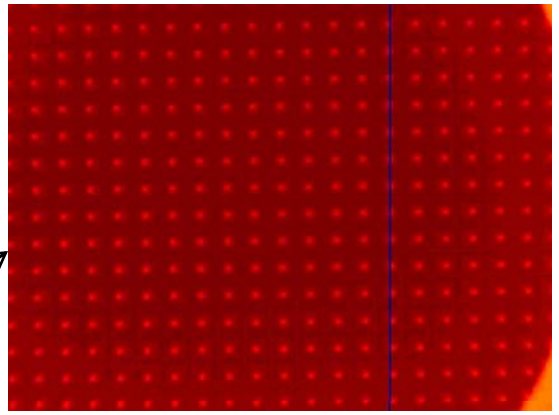
- Most radiometers use a two-point calibration (observe hot and cold black-body target) to get the antenna temp.



- *No SI-traceable radiance standards exist*
- NIST is developing such a standard, including identifying and quantifying error sources



Black-body target undergoing testing in NIST anechoic chamber

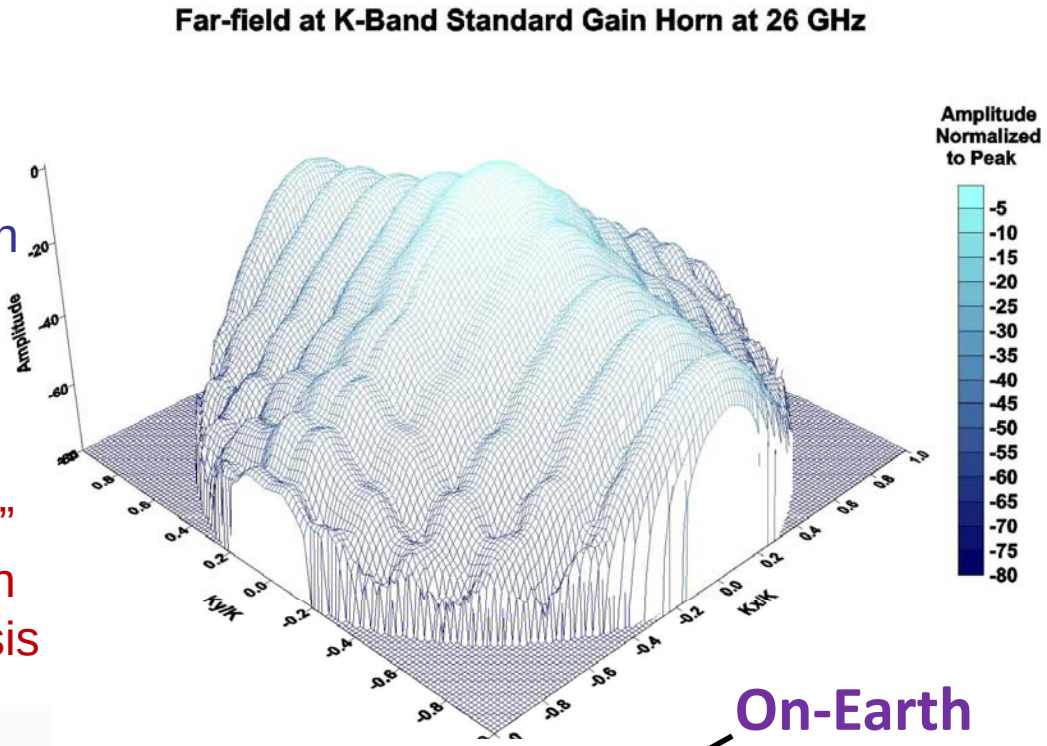


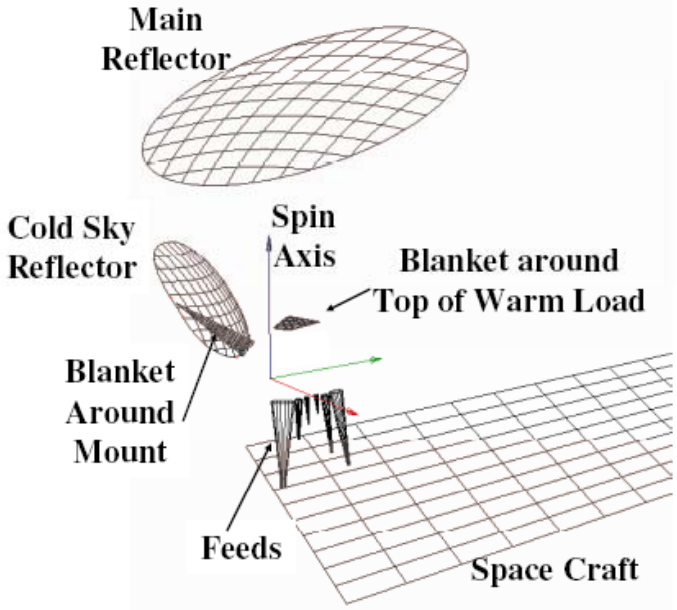
IR thermal imaging to evaluate T nonuniformity

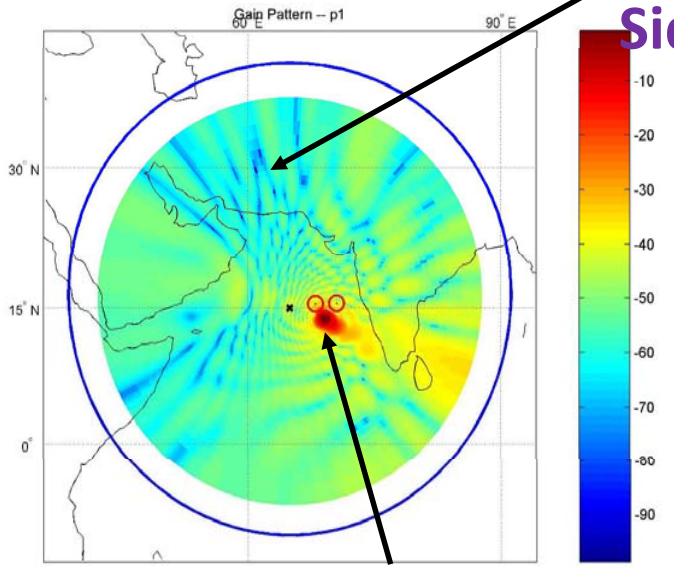
# “Best Practice” Principle

Accurate antenna pattern measurements and pattern correction algorithms are essential to environmental data record (EDR) retrievals.

NIST is developing a “Best Practices” document to aid designers/builders in standardizing procedures and analysis




On-Earth Sidelobes

Main Beam

Graphic courtesy of Shannon Brown, JPL

# (Proposed) Workshop on microwave radiometry SI traceability and best practices

- Targeted for summer 2011 in Boulder, CO
- Review report  from WMO-BIPM Workshop, April 2010
- Co-sponsored by NASA GSFC (others?)
- Gov't, academic, & industry participants
- Publish "Best Practices" document in 2012
  - Companion to NIST IR
- True SI traceability is a long-term goal, but useful steps towards that are achievable now