



Wideband Instrument for Snow Measurements (WISM)

Félix A. Miranda¹, Kevin M. Lambert², Robert R. Romanofsky¹; Tim Durham³, Kerry Speed³, Robert Lange³, Art Olsen³, Brett Smith³, Robert Taylor³, Mark Schmidt³, Paul Racette⁴, Quenton Bonds⁴, Ludovic Brucker⁵, Lora Koenig⁶, Hans-Peter Marshall⁷, Ken Vanhille⁸, Anatoly Borissenko⁸, Leung Tsang⁹, and Shurun Tan⁹

¹NASA Glenn Research Center; ²Vantage Partners LLC; ³Harris Corp.; ⁴NASA Goddard Space Flight Center; ⁵Universities Space Research Association; ⁶University of Colorado; ⁷Boise State University; ⁸Nuvotronics; ⁹ University of Michigan

May 24, 2016

This effort is being performed under the following NASA funded work

**“Enhancement, Demonstration, and Validation of the
Wideband Instrument for Snow Measurements (WISM)”**

**NASA Research Opportunities in Space and Earth Sciences
(ROSES) 2013 Instrument Incubator Program (IIP)
Cooperative Agreement # NNX14AI04A
Dr. Tim Durham, PI**

Importance of Snow

- 50% to 80% of the yearly water supply in the western United States is supplied by the seasonal snowpack.
- To effectively manage water resources, accurate measurement of the amount of water in the snowpack, the snow water equivalent (SWE), is needed on the very small spatial scales over which the snowpack varies.



Highly variable snowpack

Background

- NASA GRC participates in a Earth Sciences Technology Office, Instrument Incubator Program - “Wideband Instrument for Snow Measurement¹”
- Program objective is to improve the science and technology of remote sensing for determining SWE.
- Includes hardware development and data processing
 - Multi-frequency radars and radiometers operating through a single aperture antenna
 - SWE extraction from remote sensing data
 - Airborne and space based platforms

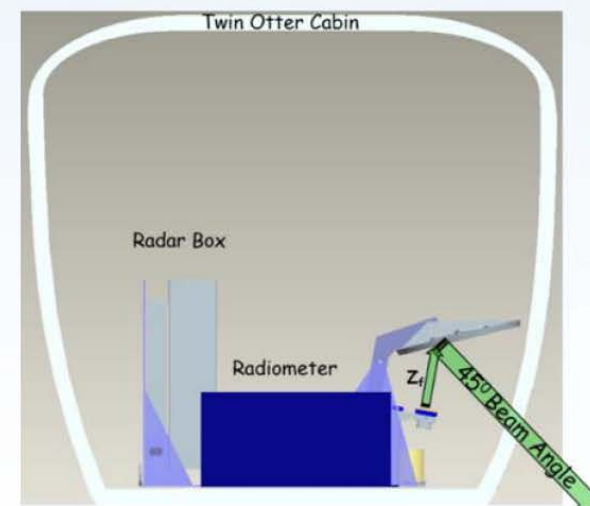


Twin Otter Aircraft



¹NASA Research Opportunities in Space and Earth Sciences,
2013 Instrument Incubator Program
Cooperative Agreement # NNX14AI04A
Dr. Tim Durham, Harris Corp. PI

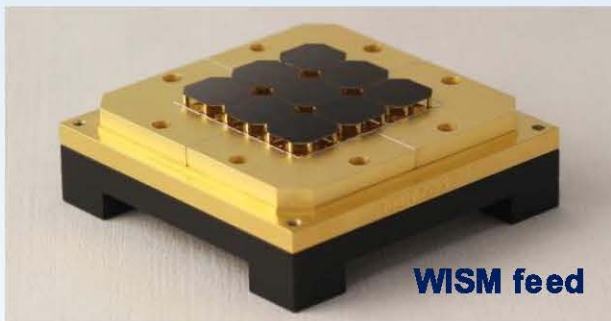
Instrument Layout in Cabin



NASA GRC Role

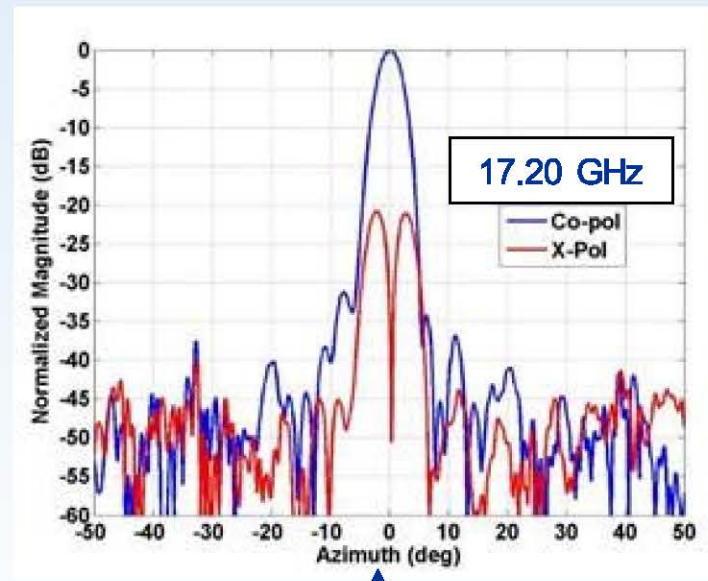
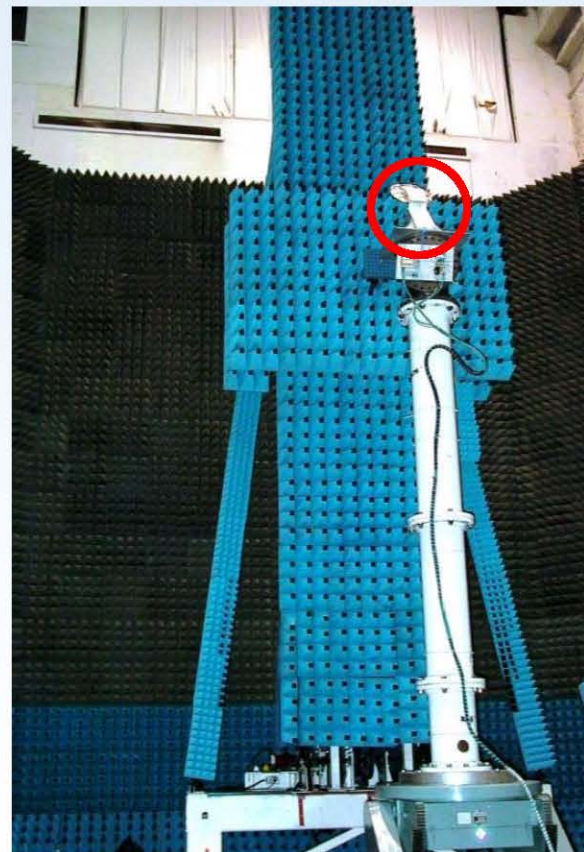
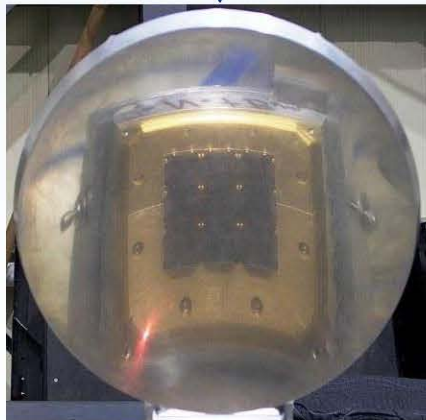
➤ WISM antenna characterization

- Test antennas to provide performance verification
- Experimentally obtain attributes needed for SWE extraction
- Reflector Performance Analysis



WISM feed

Laser radar used for integration, alignment and surface mapping.



WISM antenna radiation pattern.

← WISM reflector antenna being tested in the NASA GRC Planar Near-field Antenna Range.

How is NASA GRC data used?

- Ensures antenna is built and integrated as designed.
- Known antenna beam size and shape enables system planners to establish altitude and power requirements.
- Additional information (gain, sidelobe structure) allow enhancement of extraction algorithms.

