

Small, Focused, Science Experiments at the Green Bank Observatory



Rich Bradley: NRAO CDL

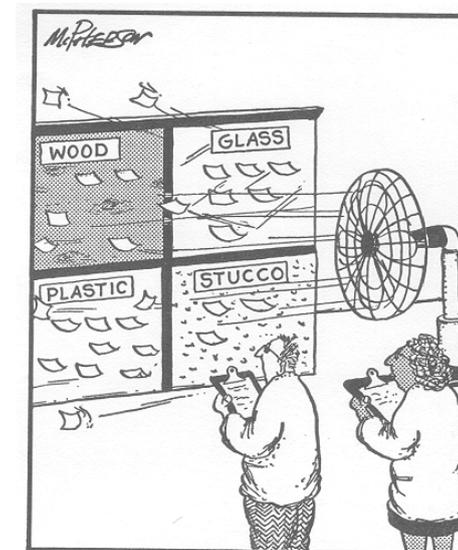
The “small” experiment

- *Research-grade experiment that does NOT involve the GBT*
- *PI driven – generally NOT a general use instrument*
- *Usually a focused application – science / science enabling*
- *Instrument scale will depend on the science application*
- *Scale does NOT imply scientific implications!*
- *Lots of student participation!*



Basic types of experiments

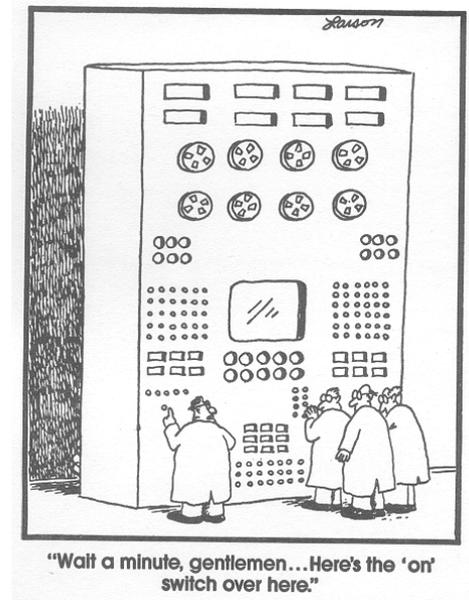
- *Direct scientific measurements*
- *Engineering prototype / evaluation*
- *A new instrument package for a vintage telescope*
- *Long term observations to serve the scientific community*



At the Post-it Note research laboratory.

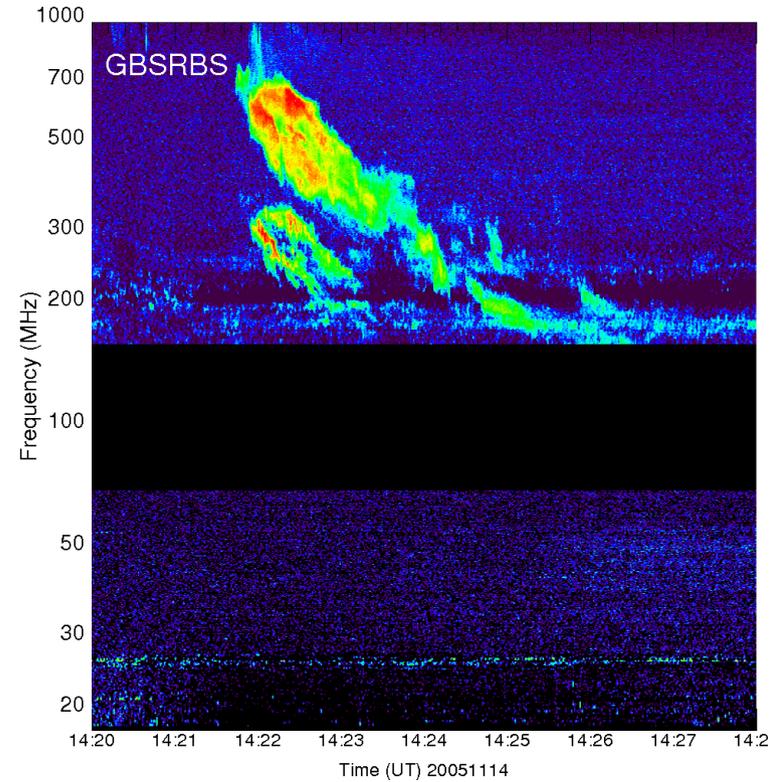
Importance of the Green Bank site

- *Infrastructure – power, access, Internet, protocols*
- *Human resources – expert advice on many topics*
- *Works Area and Electronics Laboratory*
- *Field laboratory / operations center / open areas*
- *Equipment and RFI measurements*
- *Suitable weather / climate most of the year*
- *Existence of vintage antennas*



Examples of past experiments

Solar Radio Burst Spectrometer



Bastian, Bradley,
White, Parashare

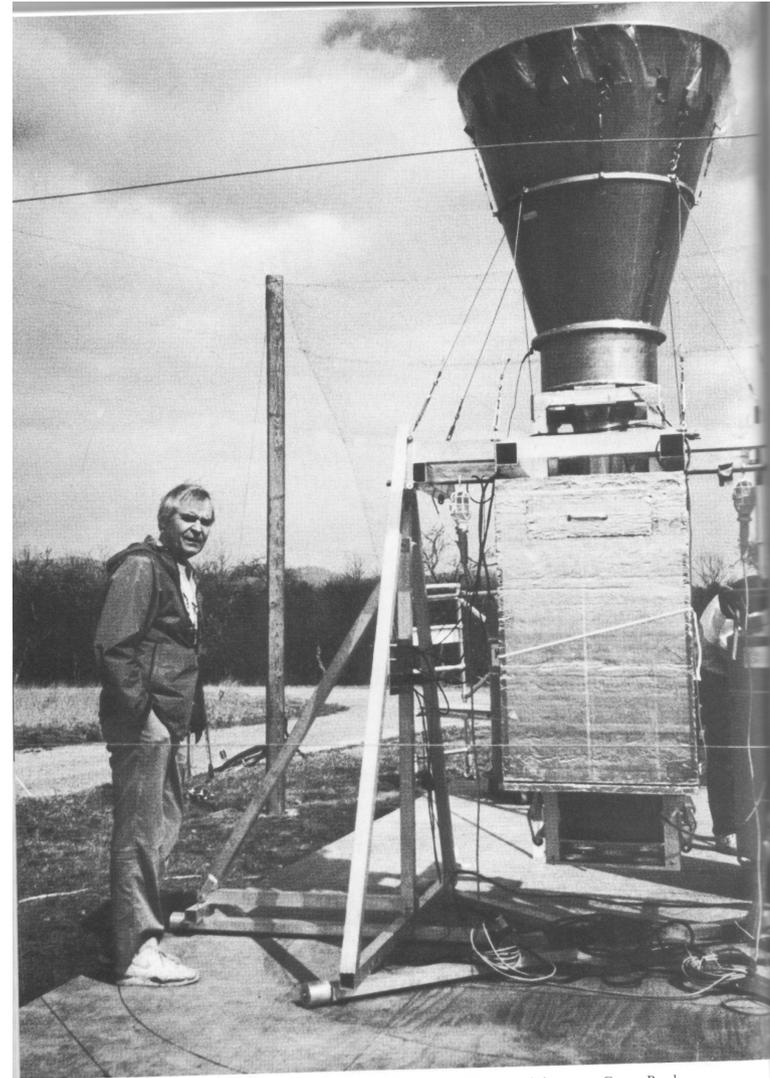


Examples of past experiments

Early CMB Experiment

This experiment led
to the WMAP spacecraft

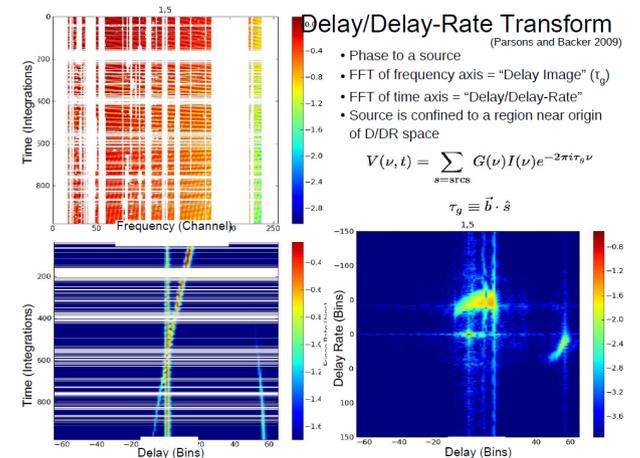
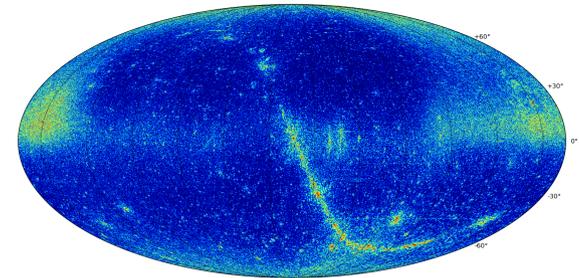
Wilkinson, Staggs, et al.



David Wilkinson and the Princeton microwave-background detector, Green Bank, West Virginia, 1991 PHOTO: MICHAEL D. LEMONICK

Examples of past experiments

PAPER-GB

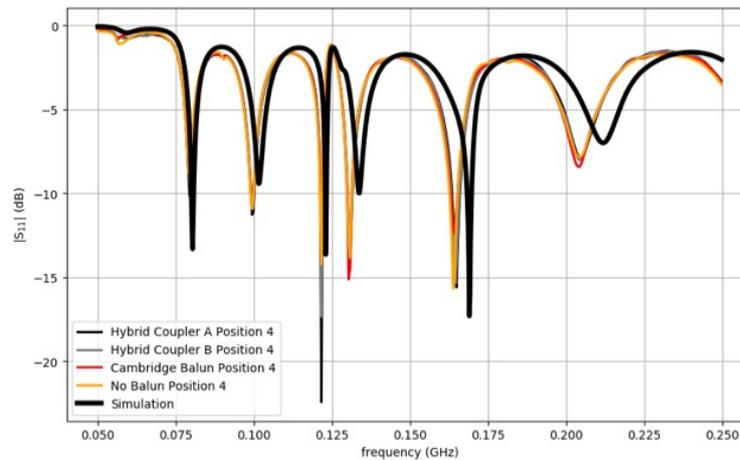


Backer, Bradley, Parsons, et al.



Examples of past experiments

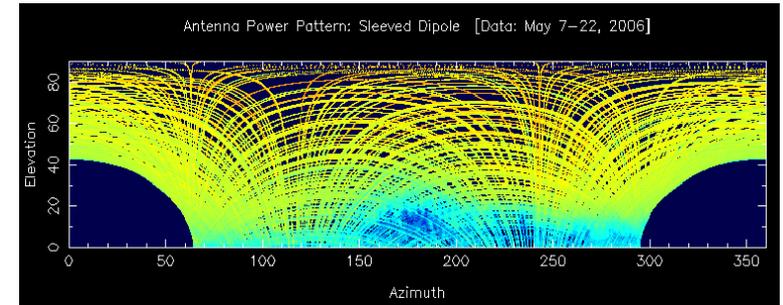
HERA Antenna



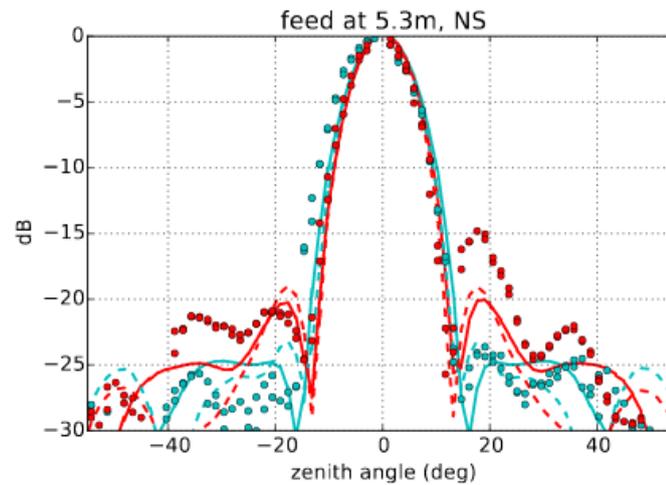
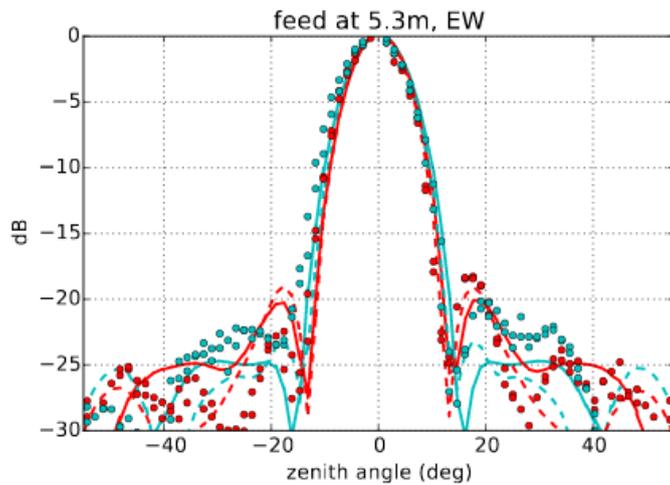
Parsons, DeBoer,
Hewitt, et al.

Examples of past experiments

ORBCOMM Beam-Mapping



Bradley, Ries, Neben

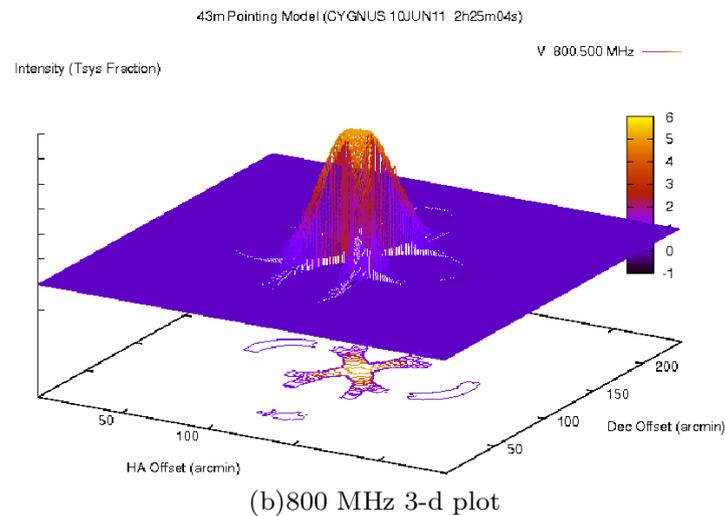


Examples of past experiments

Wide Bandwidth Sinuous Feed



Beam Map on 140 ft



Bradley, Gawande, Langston

Other examples of past experiments

PAF Experiments

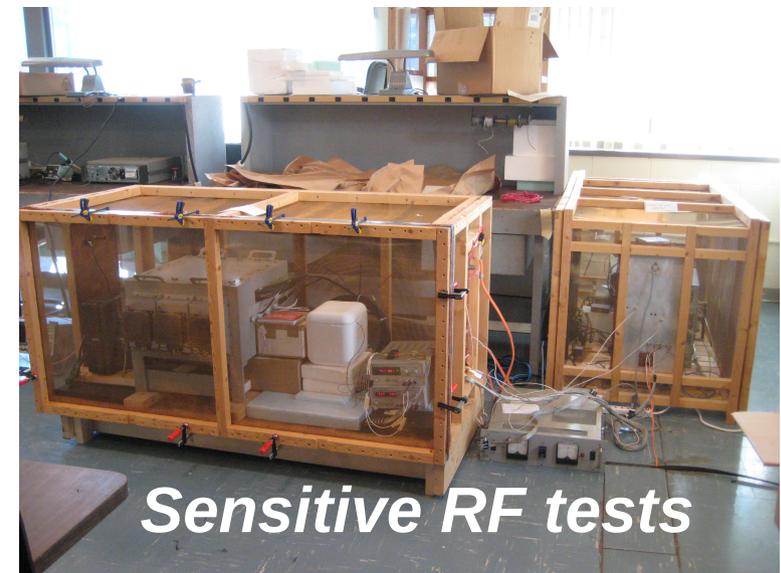
MITEoR Prototype

DARE Antenna Tests

Holographic Surface Measurements

RFI Mitigation Experiments

LoFASM



Examples of possible future experiments

Advanced Solar Monitor

20-2000 MHz operating bandwidth
50 kHz spectral resolution
0.1 sec cadence (variable)
High dynamic range
Dynamic response



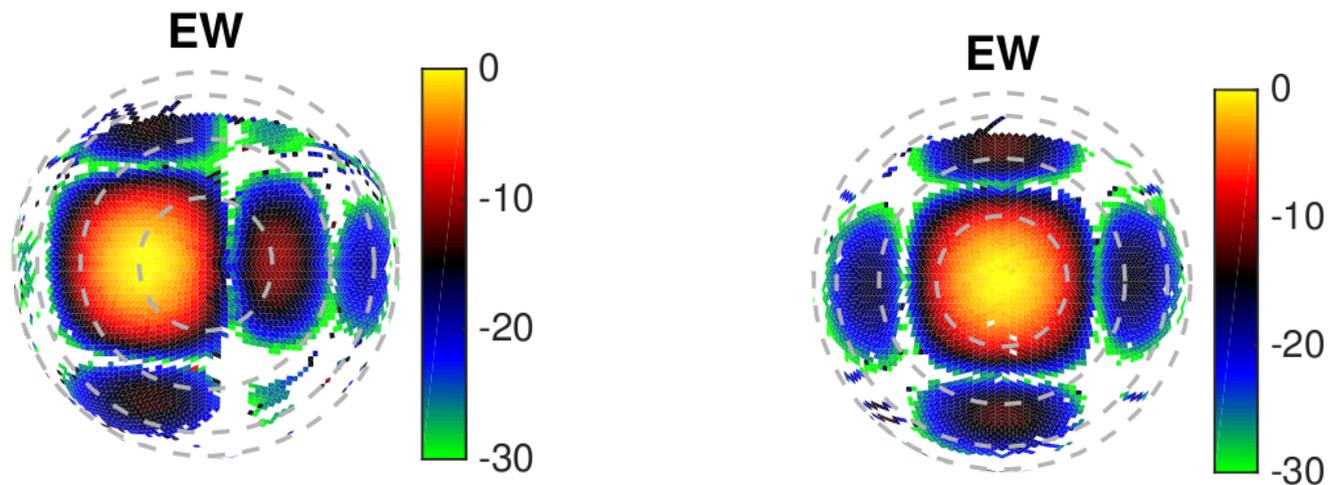
10.7 cm Solar Flux Measurements – a second source

The Solar Radio Monitoring Program is a service operated by the National Research Council and Natural Resources Canada with support from the Canadian Space Agency. Its function is to provide current and previous values of the 10.7cm Solar Flux solar activity index to any user to whom it might be of use.



Examples of possible future experiments

Next Generation ORBCOMM Beam Mapping



Examples of possible future experiments

Cosmic Twilight Polarimeter (CTP)

New “spin” on the global hydrogen spectral signature experiments



Examples of possible future experiments

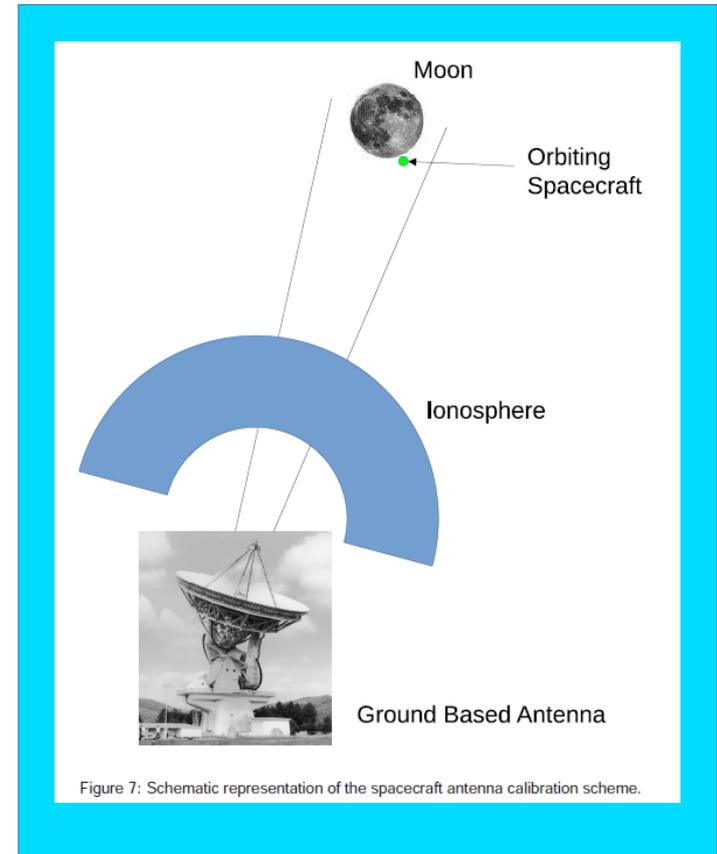
Remote antenna measurements using the 140 FT

NASA Astronomy and Physics Research and Analysis (APRA)
Program

Earth Based Calibration of Lunar Orbiting Antennas for Ultra-Precision Radiometry

R. F. Bradley
J. O. Burns

14 March 2017



Examples of possible future experiments

Next Generation RFI Mitigation Development

EARS: Can Science Sensing and Cognitive Radio Coexist?

Maité Brandt-Pearce, Department of ECE, University of Virginia

Richard Bradley, National Radio Astronomy Observatory

Bradley Lindseth, Department of Electrical Engineering, University of North Dakota

