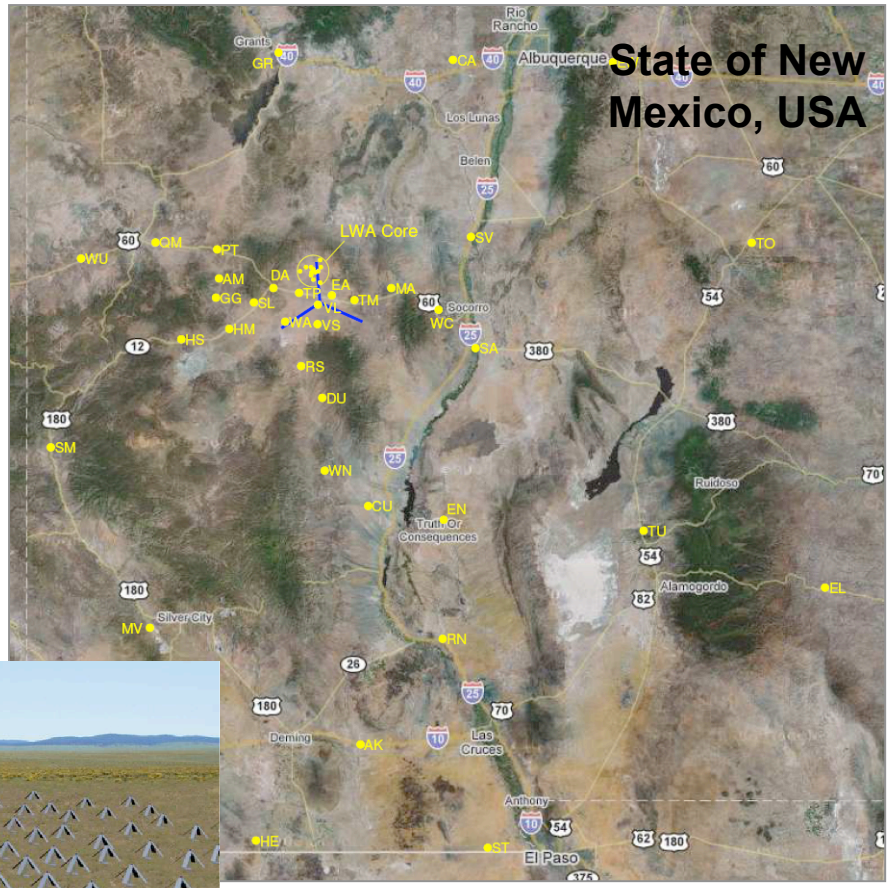
Project Update:
Long Wavelength Array

Ylva Pihlström (UNM)

The full scale LWA

- 10-88 MHz optimal tuning range
- Baselines up to 400 km
  - Resolution [8,2]″ at [20,80] MHz
- >50 stations giving mJy-level sensitivity
  - Each station is an array of dipoles in a 100m diameter aperture (FoV [8,2]°)



8/13/08

LWA project status

2006	Initial funding	
2007	Funding distributed	
	Kickoff meeting	
	System Requirements Review	
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2008-2012	LWA-1	Preliminary Design Review
		Critical Design Review
		Initial construction
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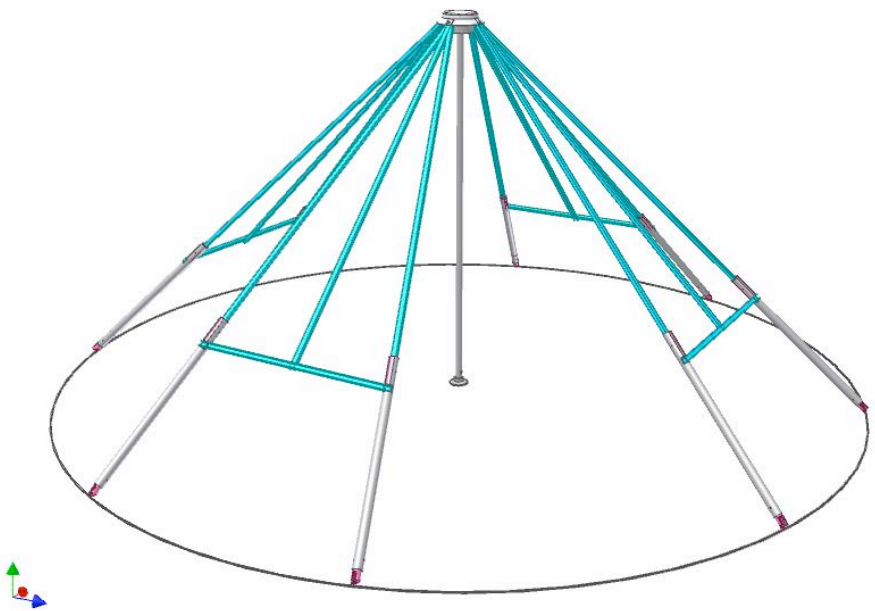
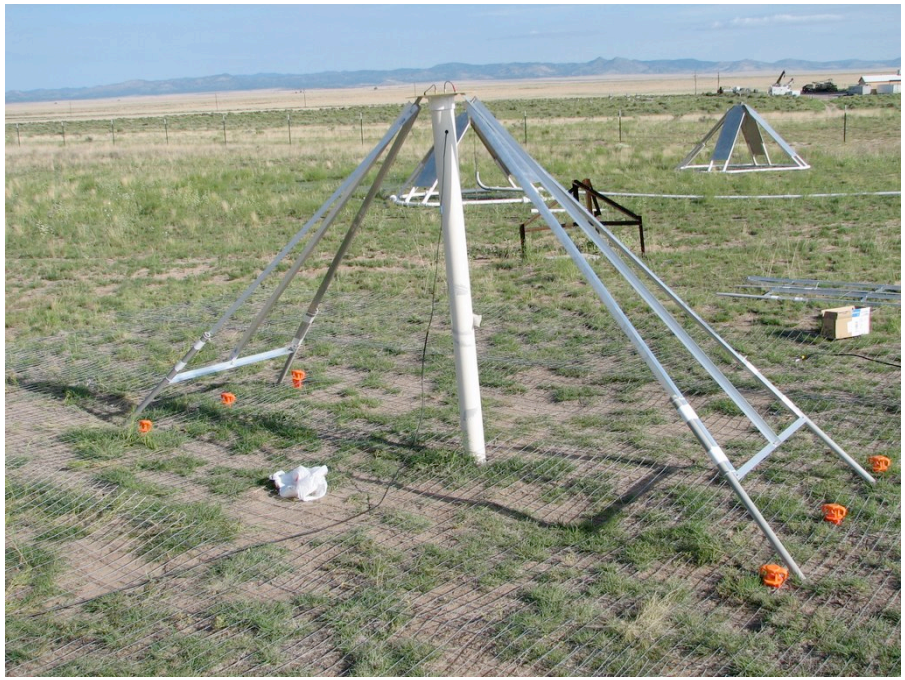
2012-2016	LWIA (16 stations over 200 km)	
	LWA core	
	Full LWA (w/long baselines)	

Antennas

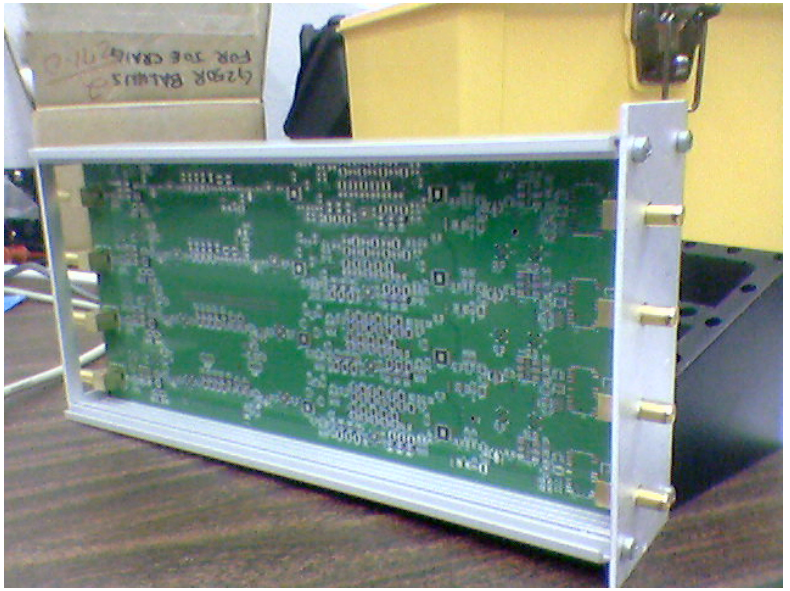




- Antenna designed by NRL
- Burns Industries to generate three prototypes, while exploring such issues as:
  - Mechanical stability, particularly under wind loading,
  - Mechanical and electrical linkage to ground plane,
  - Incorporation of environmental container for front end electronics.
- At least one prototype will be fielded during September.

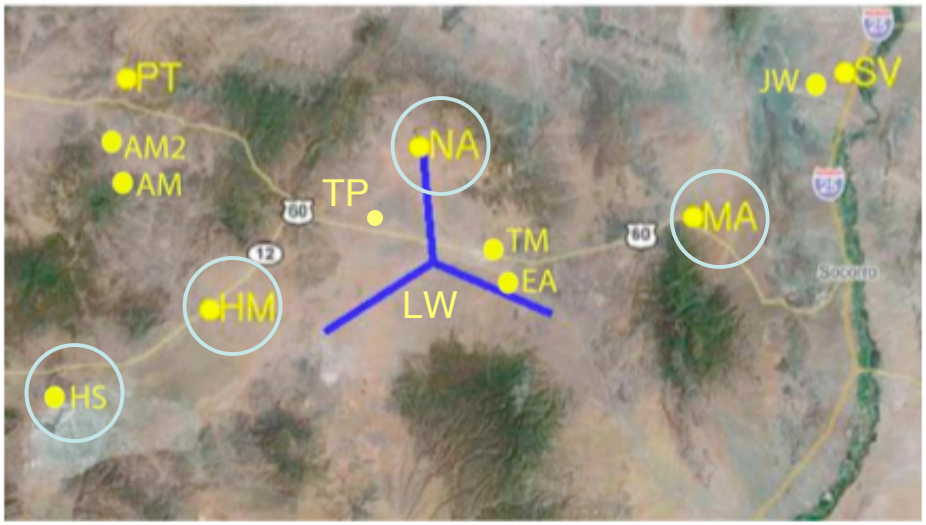
Analog receiver

- ARX designed by UNM, has reconfigurable filter options due to variable RFI conditions.
- Includes a 98 MHz FM notch filter.
- Brass board for RX testing is ready:
  - Reconfigurable filter
  - Bias-T for FEE
  - Gain control



Site selection

- Considerations
  - RFI levels
  - Fiber and power access
  - Accessibility, configuration
  - State land, biological and archeological review



First 4 sites selected:

- Biological and archeological survey show that LW, NA, HS, HM, TP and MA sites are 'clean'
- Agreements with ranchers reached, lease application submitted.

Data communications

- MC station 0.5 Mbps two way traffic (4 beams of 8 MHz each)
- Station beams must be transmitted to correlator: 5.6 Gbps for full RF, 576 Mbps for 8 MHz (one way traffic)
- Options:
  - Fiber preferred but commercial fiber expensive $25k/station/yr
  - Sneakernet and phone line MCS possible option

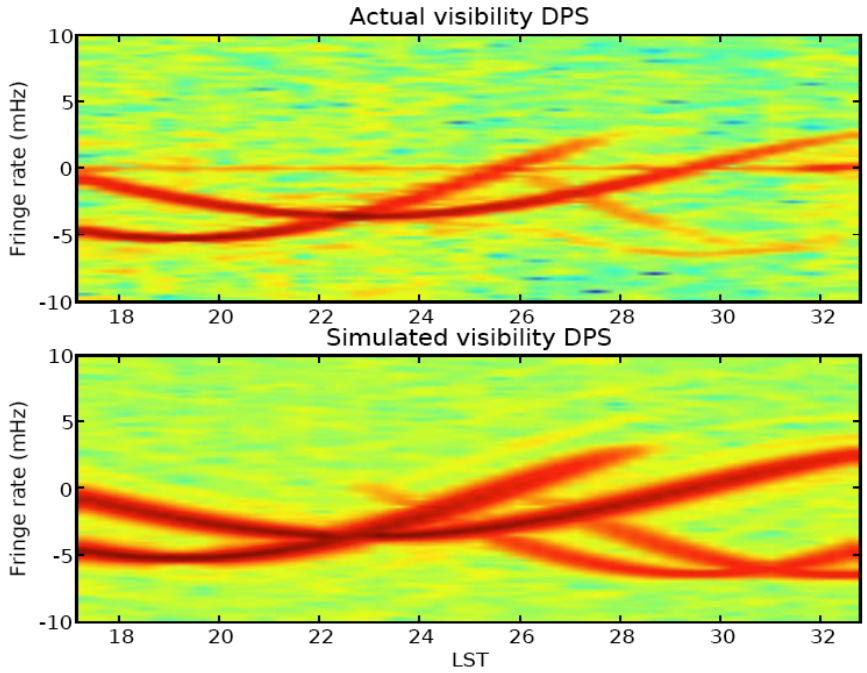
Correlation

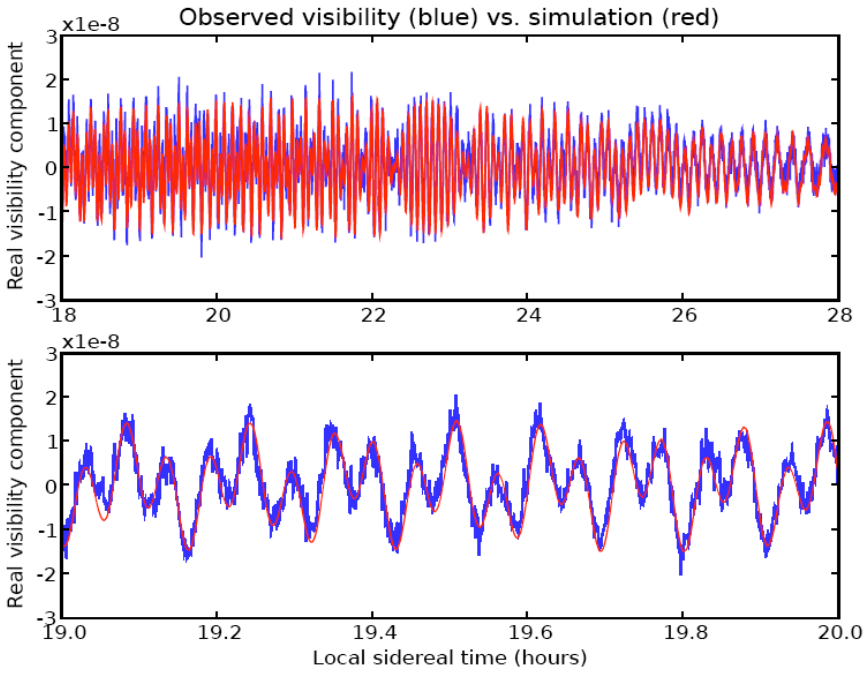
Stations	1	3	16	53
Record rate (Mb/s/ant)*	0	576	576	576
Raw Data Rate (TB/day)	0	19	100	330
Correlator (TFLOPS)	0.0	0.05	2	23
Archive Rate (GB/day)	0	4	150	1700

*Assuming 8 MHz beams

Interferometer test

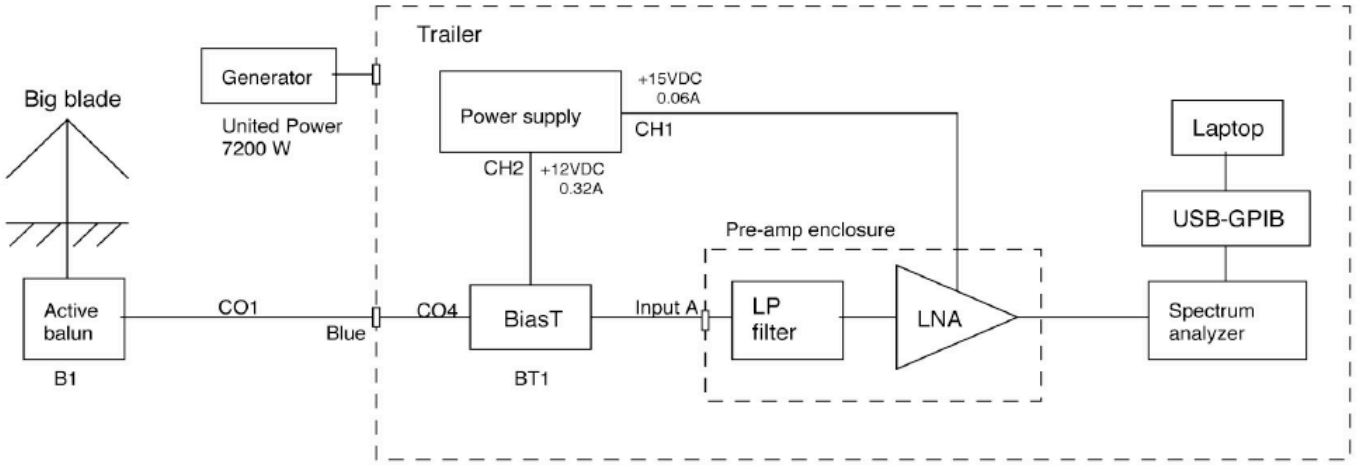
- At our demonstrator array site, tests to characterize antenna pattern
- 20 kHz channel





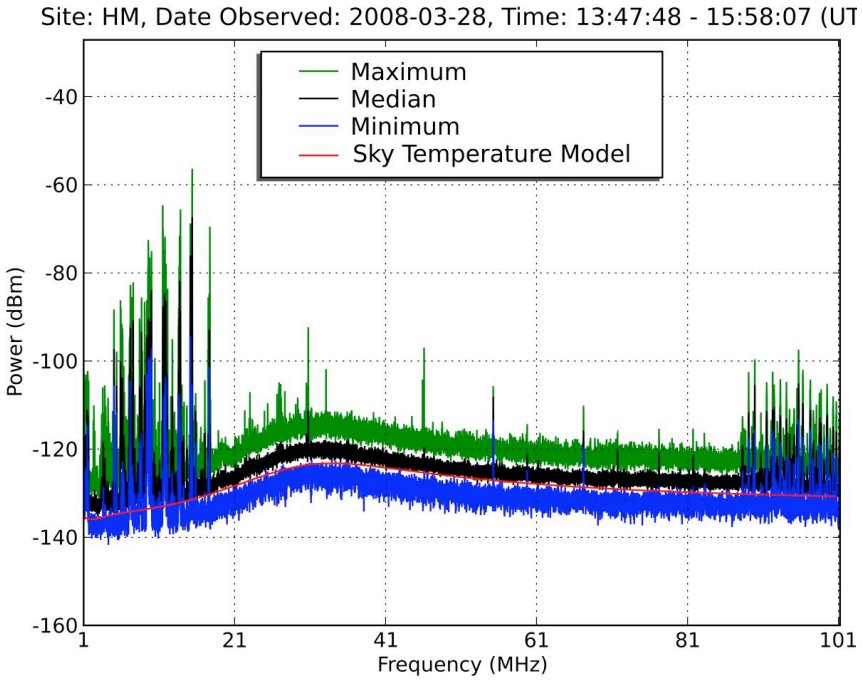
RFI environment

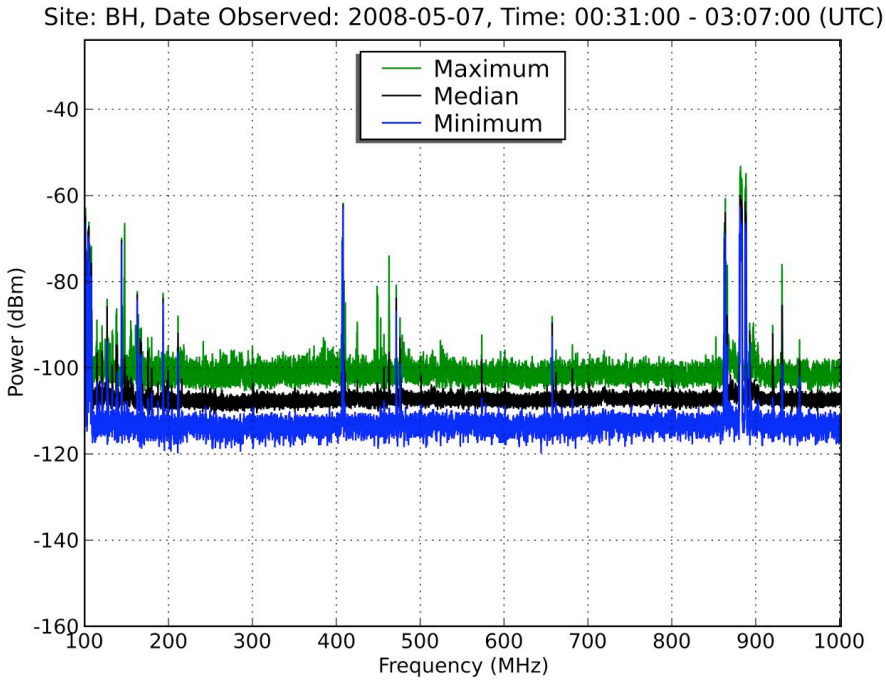
- Ongoing RFI testing, have surveyed 8 sites for strong RFI peaks (rx linearity requirements) between 1-1000 MHz.



- FFT spectrometer system currently being defined, to perform deeper integrations at selected candidate sites for weak in-band RFI (to get within a factor of two of ITU defined levels).

RFI candidate sites





Science with the full LWA

- Ionospheric physics, and space weather
- Plasma astrophysics
- Acceleration of relativistic particles
- Cosmic evolution and the high-z Universe
- Exploration and discovery (including transients)