



# State of the Observatory

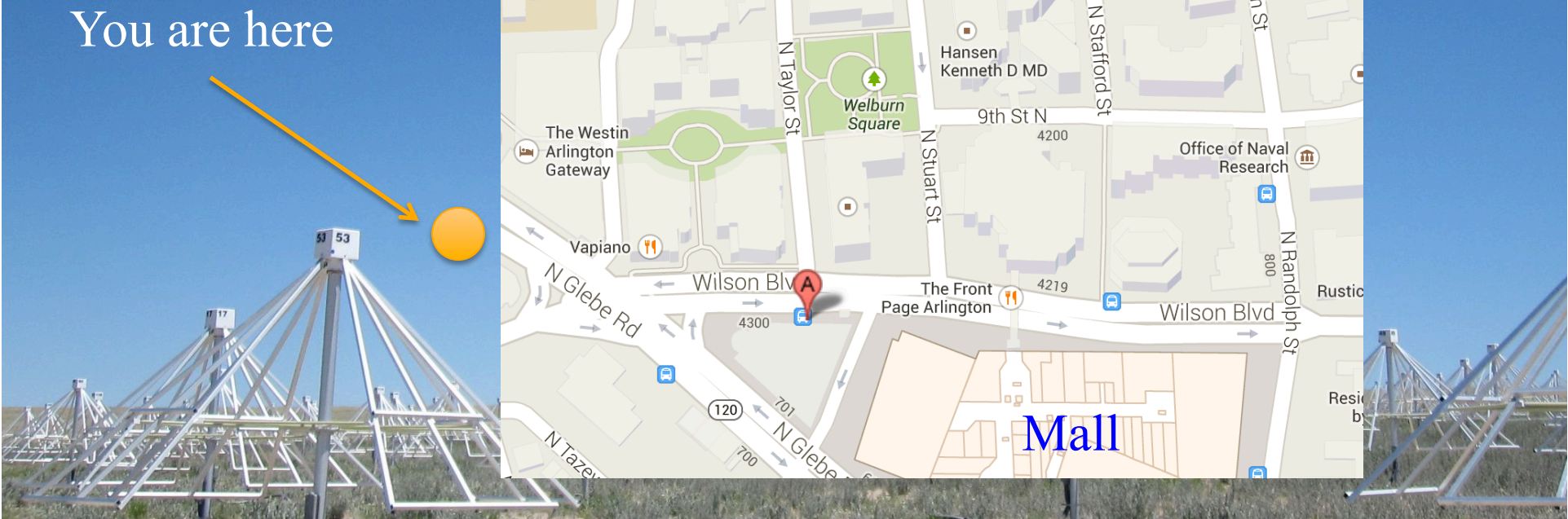
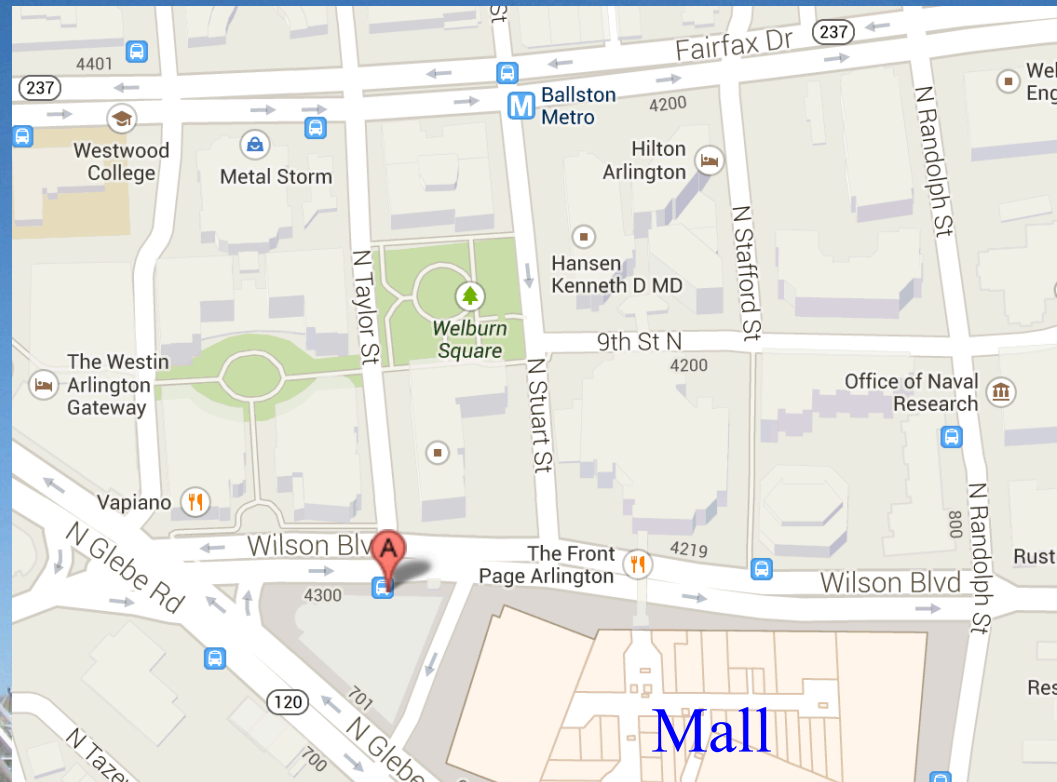
Greg Taylor (UNM)



# Meeting Logistics

- **Internet access: see instructions on board**
- **Lunch – at local restaurants. Please return by 1:00pm.**
- **Dinner – at Ted’s Montana Grill, 4300 Wilson Blvd, 6:30pm**
- **UNM/HU/Others by video – please use microphones**

You are here



# LWA1 Status

- LWA1 funded as a University Radio Observatory (from 3/1/12)
- Initial Operating Capability reached on April 24, 2012
- Currently beam forming with 248 (95%) good stands
- All 4 beams operable
- TBN degrades during beamforming, so TBN or beams but not both
- See known issues page:

<http://www.phys.unm.edu/~lwa/astro/currentissues.html>

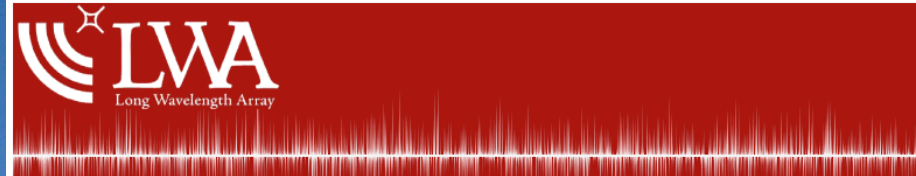
- User forum:

<http://lwa1.freeforums.org/index.php>



# Recording Capability

- 39 DRSUs (28 UNM + 5 LIU and 5 VT) 1 failure (in shipping)
- mostly 10 or 15 TB capacity each
- total DRSU storage 405 TB
- At site typically 10 DRSUs = 376 beam hrs + 50 hrs TBW/TBN



## Frontend for DRSU Database

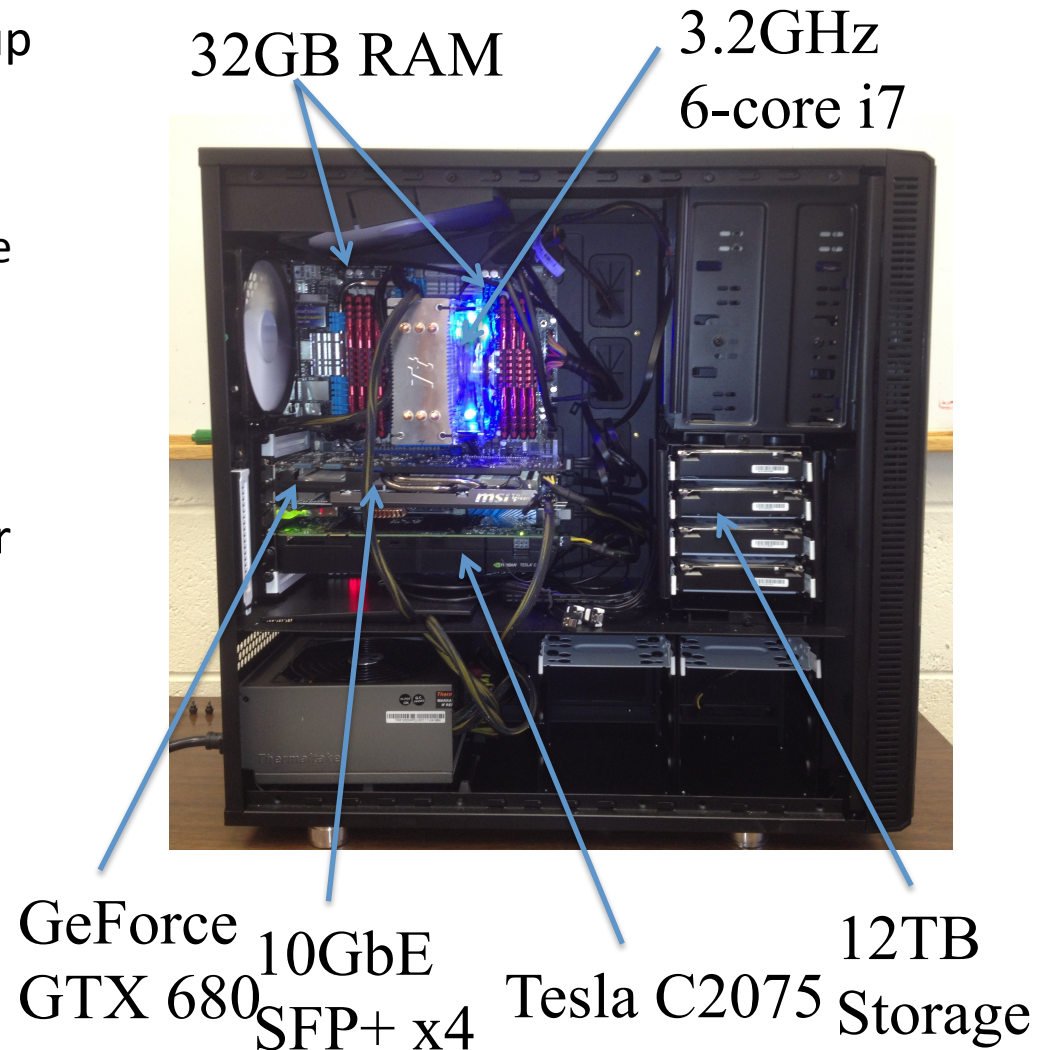
### Overview [DRSUS/External Disks](#)

Barcode	Owner	Location	Status	Condition	Size/Disks
<a href="#">S10TCC13S0023</a>	LWA	UNM	data	ok	10.0 TB/5
<a href="#">S10TCC13S0015</a>	LWA	UNM	data	ok	10.0 TB/5
<a href="#">S10TCC13S0019</a>	LWA	UNM	data	untested	10.0 TB/5
<a href="#">S10TCC13S0014</a>	LWA	UNM	data	ok	10.0 TB/5
<a href="#">S10TCC13S0021</a>	LWA	UNM	data	ok	10.0 TB/5
<a href="#">S10TCC13S0008</a>	LWA	UNM	data	ok	10.0 TB/5
<a href="#">S10TCC13S0025</a>	LWA	LWA1	DR5	ok	10.0 TB/5
<a href="#">S15TCV12S0004</a>	LWA	LWA1	DR4	ok	15.0 TB/5
<a href="#">S15TCV12S0003</a>	LWA	LWA1	DR3	ok	15.0 TB/5
<a href="#">S15TCV12S0002</a>	LWA	LWA1	DR2	ok	15.0 TB/5
<a href="#">S15TCV12S0001</a>	LWA	LWA1	DR1	ok	15.0 TB/5
<a href="#">S10TCC13S0026</a>	LWA	UNM	data	ok	10.0 TB/5
<a href="#">S10TCC13S0006</a>	Long Island University DRSU-1	UNM	cleared	ok	10.0 TB/5
<a href="#">S10TCC13S0017</a>	LWA	UNM	cleared	untested	10.0 TB/5
<a href="#">S10TCC13S0005</a>	LWA	UNM	cleared	ok	10.0 TB/5



# The LWA User's Computing Facility

- LWA1 has large data volumes (up to ~1 TB/hour) and a relatively remote site
  - Quick turn around on data requires computing close to the data
- LWA1 User's Computing Facility Cluster
  - Six nodes (shown right)
  - Located in the old correlator room of the VLA control building
  - Connected to the LWA1 site via a 10GbE link
  - 26 users as of today



# UNM Computing Capabilities

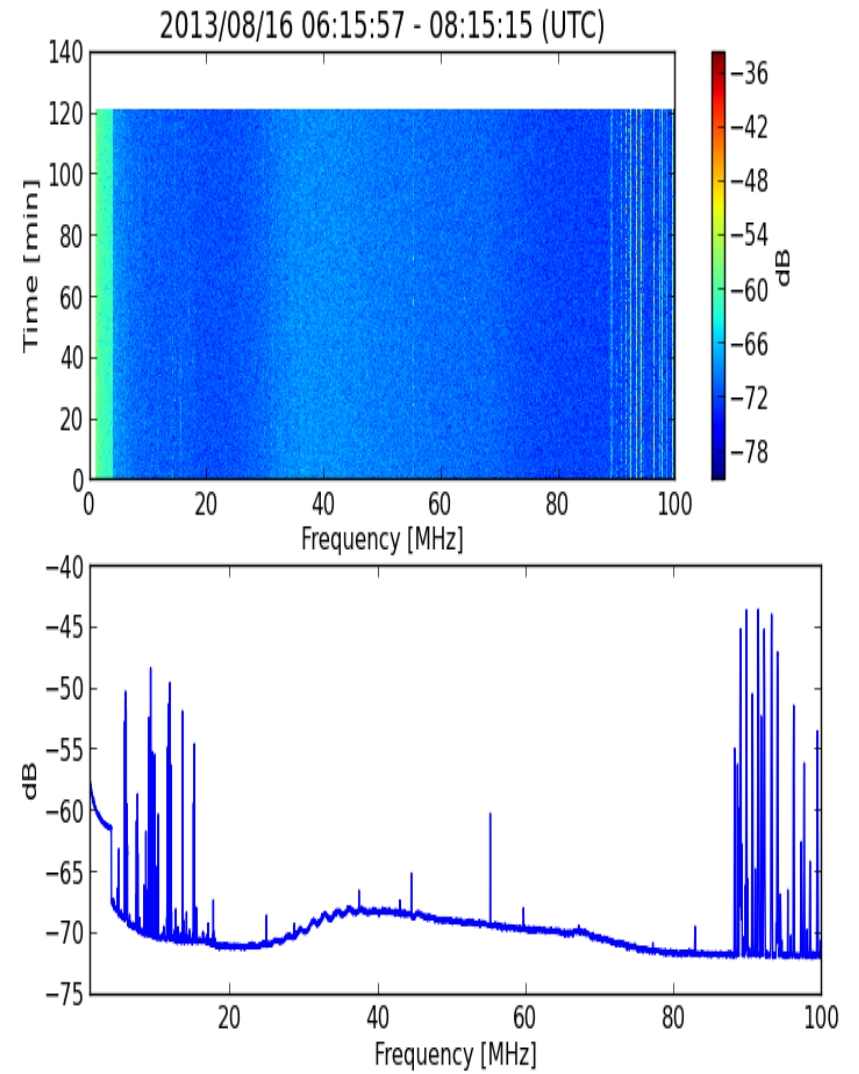
- Hercules – dual hexacore Mac Pro with 6 TB storage
- Leo – quad core with 48 TB storage
- LDA – quad core with 48 TB storage at CARC
- Virgo – dual quad core with 128 GB RAM

Leo

Virgo



# LWA SV site testing 8/16/2013

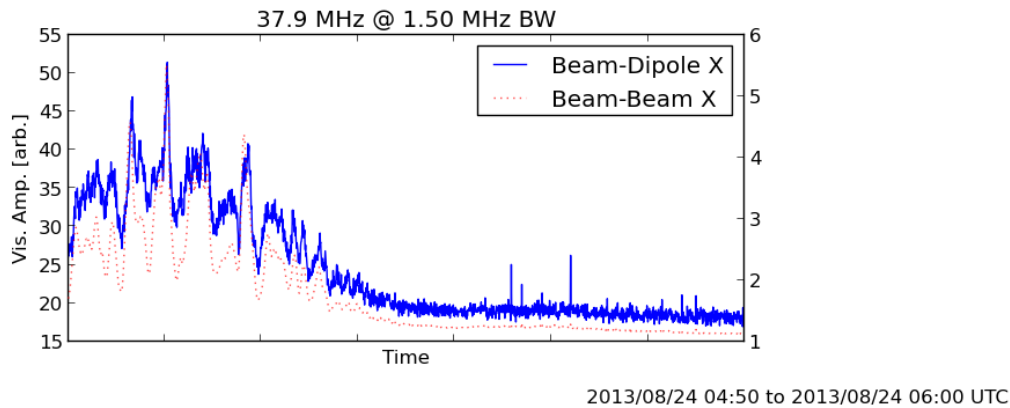


# LWA1 – LWA NA Fringes

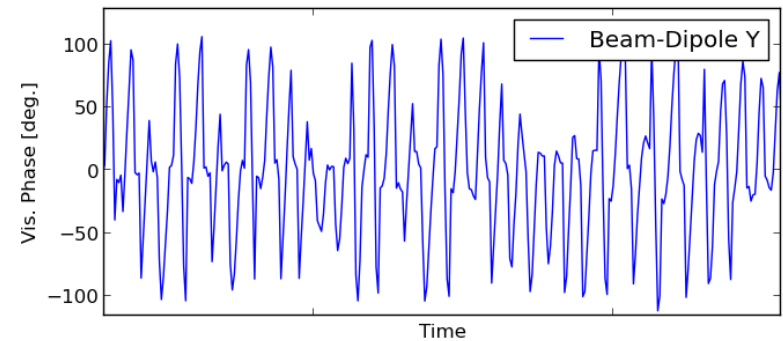
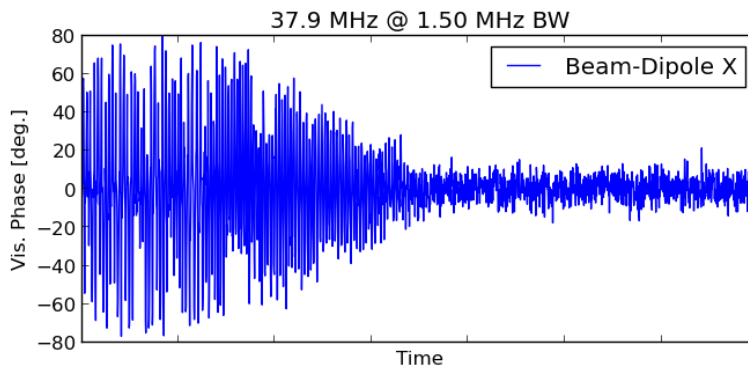
~20 km baseline, primarily N-S

Observing Cygnus A transit

Ampl.



Phase



Time



# LWA1 Database

LWAdb Utility

https://lwalab.phys.unm.edu/lwadb/sessions/

Assemblies Ops TBN hist beams LWA TV LEDA MyUNM LWA Apple News astro-ph ADS Apple

## LWAdb Utility

LWAdb Sessions Observations Projects Reports LWAdb Administration gtaylor

## Sessions Management

[Create New Session](#)

Show  Search:

entries

Showing 1 to 10 of 3,524 entries

Session ID	Sub ID	Project	UTC Date	Operator	Observations	DRSU Tag	Actions
49	0	LS003001	13-08-08 23:50 UTC	JR	1	056512_000014339	<a href="#">view</a> or <a href="#">edit</a>
50	0	LS003001	13-08-08 23:50 UTC	JR	1	056512_000014340	<a href="#">view</a> or <a href="#">edit</a>
5	0	LB003	13-08-08 20:40 UTC	JR	1	056512_000013454	<a href="#">view</a> or <a href="#">edit</a>
6	0	LB003	13-08-08 20:40 UTC	JR	1	056512_000013455	<a href="#">view</a> or <a href="#">edit</a>
365	0	COMFS001	13-08-08 16:15 UTC	JR	1	056512_000012536	<a href="#">view</a> or <a href="#">edit</a>
366	0	COMFS001	13-08-08 16:15 UTC	JR	1	056512_000012537	<a href="#">view</a> or <a href="#">edit</a>
1067	0	COMJD	13-08-08 05:02 UTC	JR	1	056512_000010232	<a href="#">view</a> or <a href="#">edit</a>
1068	0	COMJD678	13-08-08 05:02 UTC	JR	1	056512_000010233	<a href="#">view</a> or <a href="#">edit</a>
1066	0	COMJD678	13-08-07 05:06 UTC	JR	1	056511_000005290	<a href="#">view</a> or <a href="#">edit</a>
21	0	LH008	13-08-06 21:10 UTC	JR	0	056510_000003619	<a href="#">view</a> or <a href="#">edit</a>

Showing 1 to 10 of 3,524 entries [Previous](#) [Next](#)

# LWA1 Archive

- Metadata
- All spectrometer mode observations
- Calibration data

Index of /metadata/observation/130808\_done

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
<a href="#">Parent Directory</a>		-	
<a href="#">COMFS001_0365.tgz</a>	08-Aug-2013 11:15	468K	
<a href="#">COMFS001_0366.tgz</a>	08-Aug-2013 11:15	468K	
<a href="#">COMFS_130808_1615_b3.sdf</a>	08-Aug-2013 09:55	46K	
<a href="#">COMFS_130808_1615_b4.sdf</a>	08-Aug-2013 09:55	46K	
<a href="#">COMJD678_1068.tgz</a>	08-Aug-2013 01:03	466K	
<a href="#">COMJD_1067.tgz</a>	08-Aug-2013 01:03	459K	
<a href="#">COMJD_130808_0502_1067_B2.sdf</a>	07-Aug-2013 12:48	1.2K	
<a href="#">COMJD_130808_0502_1068_B3.sdf</a>	07-Aug-2013 12:48	44K	
<a href="#">LB003_0005.tgz</a>	08-Aug-2013 15:40	461K	
<a href="#">LB003_0006.tgz</a>	08-Aug-2013 15:40	460K	
<a href="#">LB003_130808_2040_05_B2.sdf</a>	08-Aug-2013 10:09	931	
<a href="#">LB003_130808_2040_06_B3.sdf</a>	08-Aug-2013 10:09	939	
<a href="#">LS003_130808_2350_b3.sdf</a>	08-Aug-2013 13:33	46K	
<a href="#">LS003_130808_2350_b4.sdf</a>	08-Aug-2013 13:33	46K	
<a href="#">LS003001_0049.tgz</a>	08-Aug-2013 18:50	468K	
<a href="#">LS003001_0050.tgz</a>	08-Aug-2013 18:50	468K	

Apache Server at lda10g.alliance.unm.edu Port 80

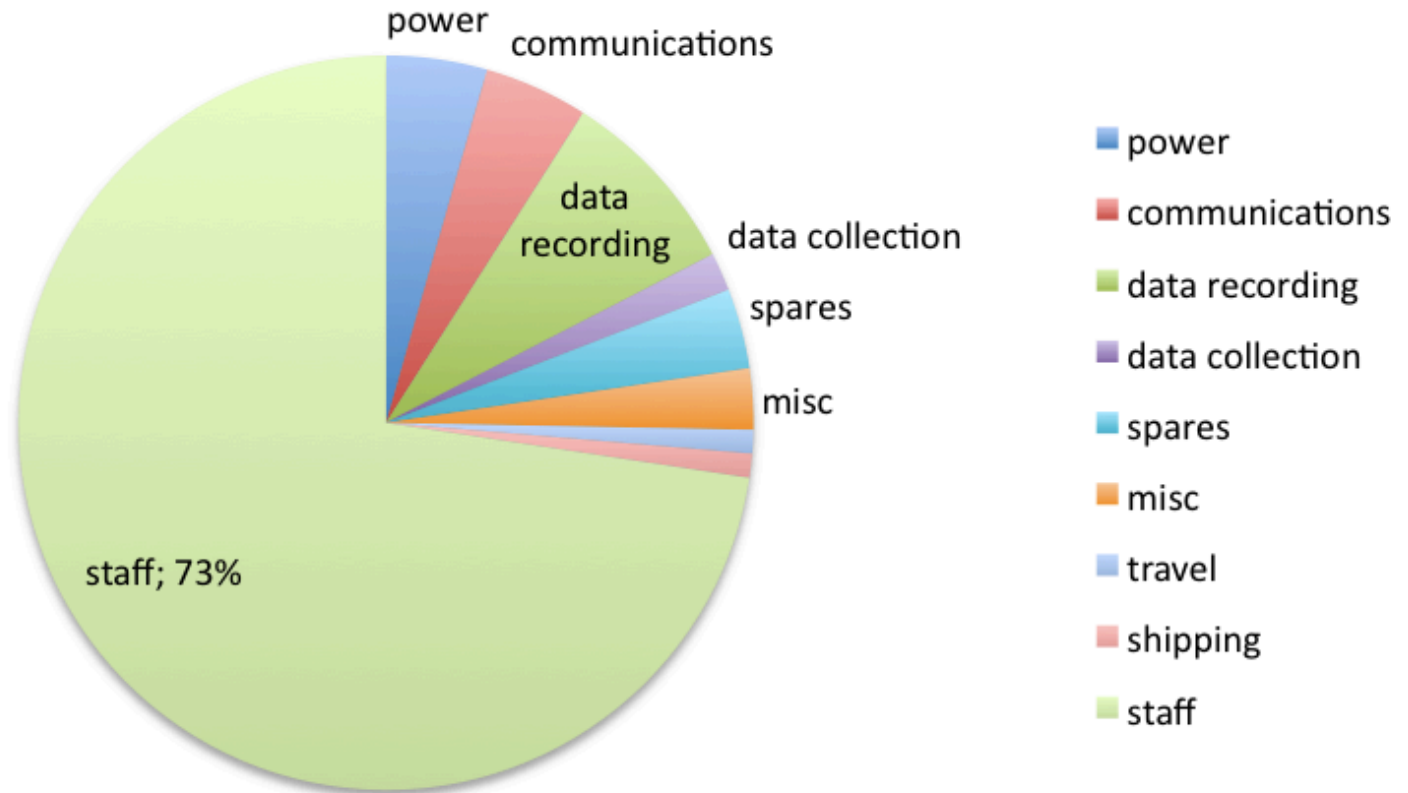
# Current Support

- LUNAR program – ends 4/21/2014
- Cosmic Dawn program (NSF) – ends 7/31/2014
- HJUDE (NSF) – ends 8/30/2014
- LEDA (NSF) – ends 8/30/2014
- LoFASM (UTB) – ends 1/31/2015
- URO (NSF) – ends 2/28/2015
- Ionospheric Research (AFRL) – ends 10/31/2014
- LWA Center at UNM (unrestricted)

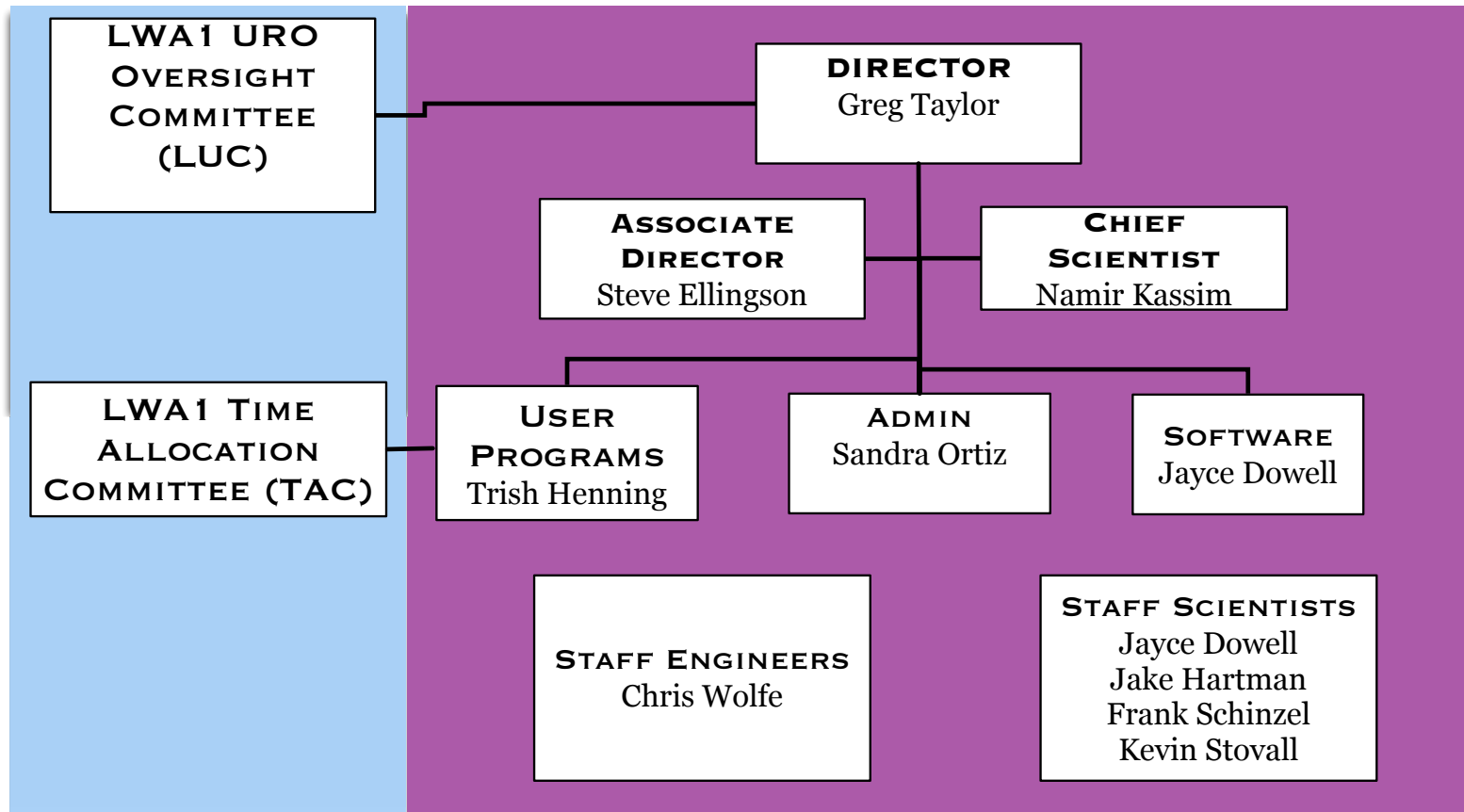


# LWA Ops Budget - \$600K/year

## LWA1 Operations Cost - URO



# Current Staffing



postdocs: Frank Schinzel and Kevin Stovall (UNM)  
grad students: Ken Obenberger, Caleb Grimes, Mark Gorski, Bob Mesler (UNM)  
Chris Wolfe, Hank Tillman, Augustine Yellu (VT)  
undergrads: Colby Gutierrez-Kraybill, Tarraneh Eftekhari, and Jeff Richards (UNM)

# LWA1 Operators (days)

- Joe Craig (32)
- Jayce Dowell (17)
- Tarraneh Eftekhari (14)
- Steve Ellingson (13)
- Alex Garcia (7)
- Caleb Grimes (25)
- Mark Gorski (7)
- Colby Gutierrez (8)
- Jake Hartman (7)
- Justin Linford (14)
- Bob Mesler (40)
- Ken Obenberger (7)
- Jeff Richards (14)
- Frank Schinzel (40)
- Greg Taylor (59)
- Hank Tillman (7)
- Chris Wolfe (14)
- UTB/ARCC (51)

If you want a turn let me know!



# Projects

46 observing projects ongoing

CFP1 completion: 64%

CFP2 completion: 103%

CFP3 completion: 9%

15 unique PIs, 46 users

5 new PIs (15 new users)

**Cumulative: 83 users from 33 institutions**

CFP4 deadline November 1, 2013

CFP4 observing begins March 1, 2014



# Projects as of Aug. 9, 2013

Science Area	Projects	Hours
Hot Jupiters:	2	1372
Transients	6	1096
Pulsars:	7	569
Solar and Space Weather	3	505
Ionosphere/Atmos	10	332
Planets	4	248
Cosmology	2	16
Others	8	282
Commissioning	-	2038

Total

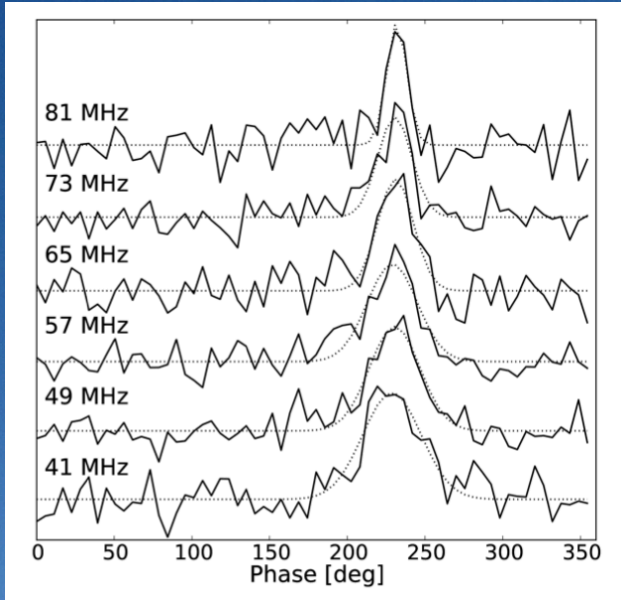
42

6459

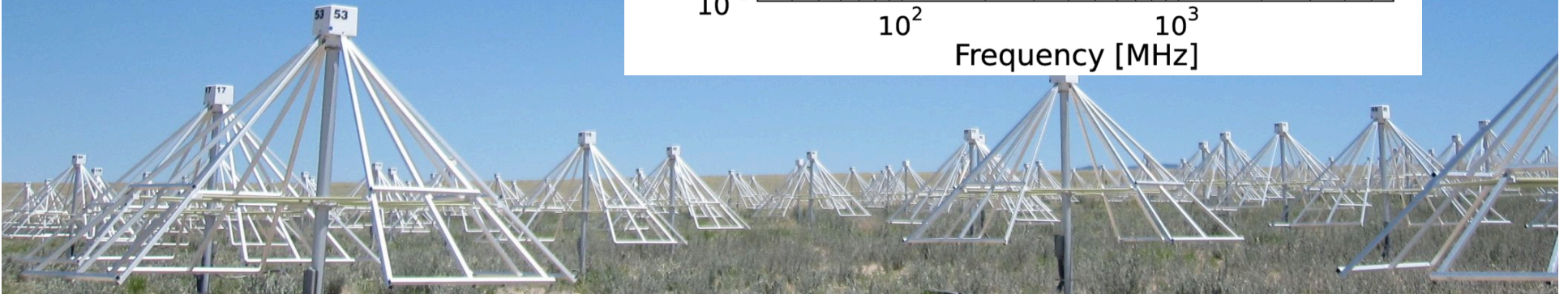
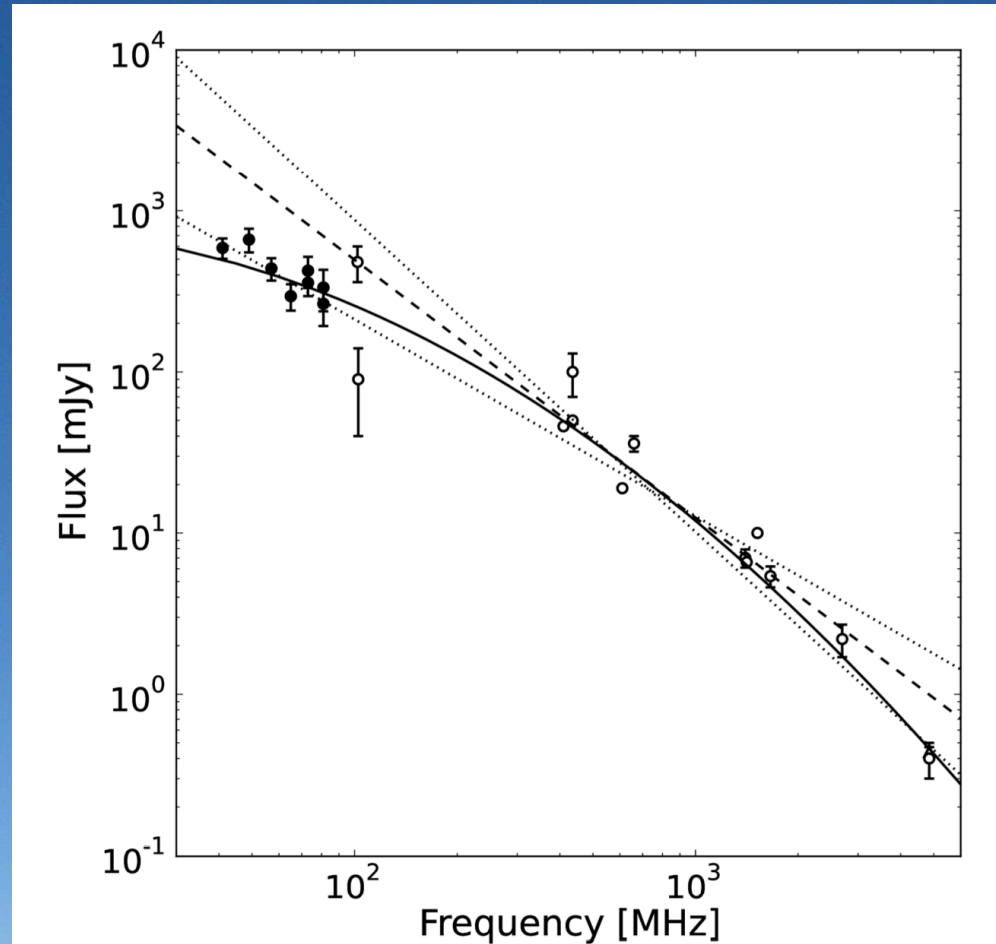




# LWA Publication Highlights - 1

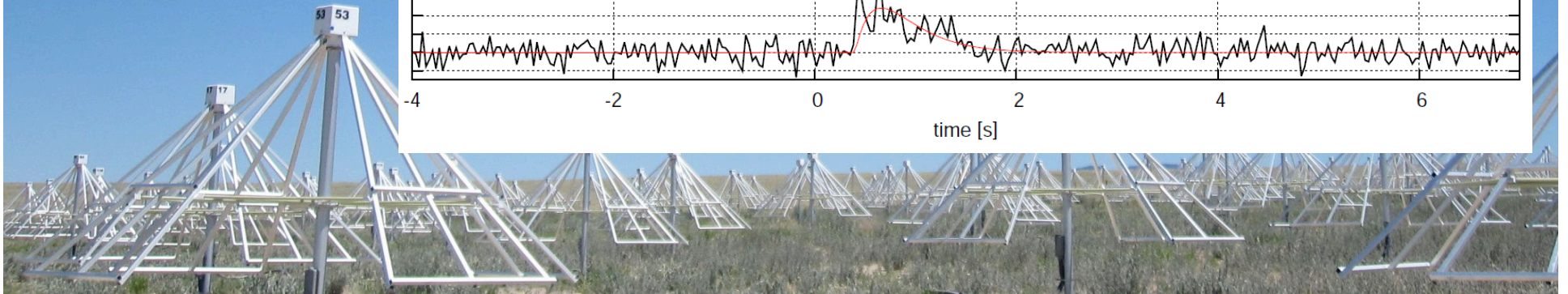
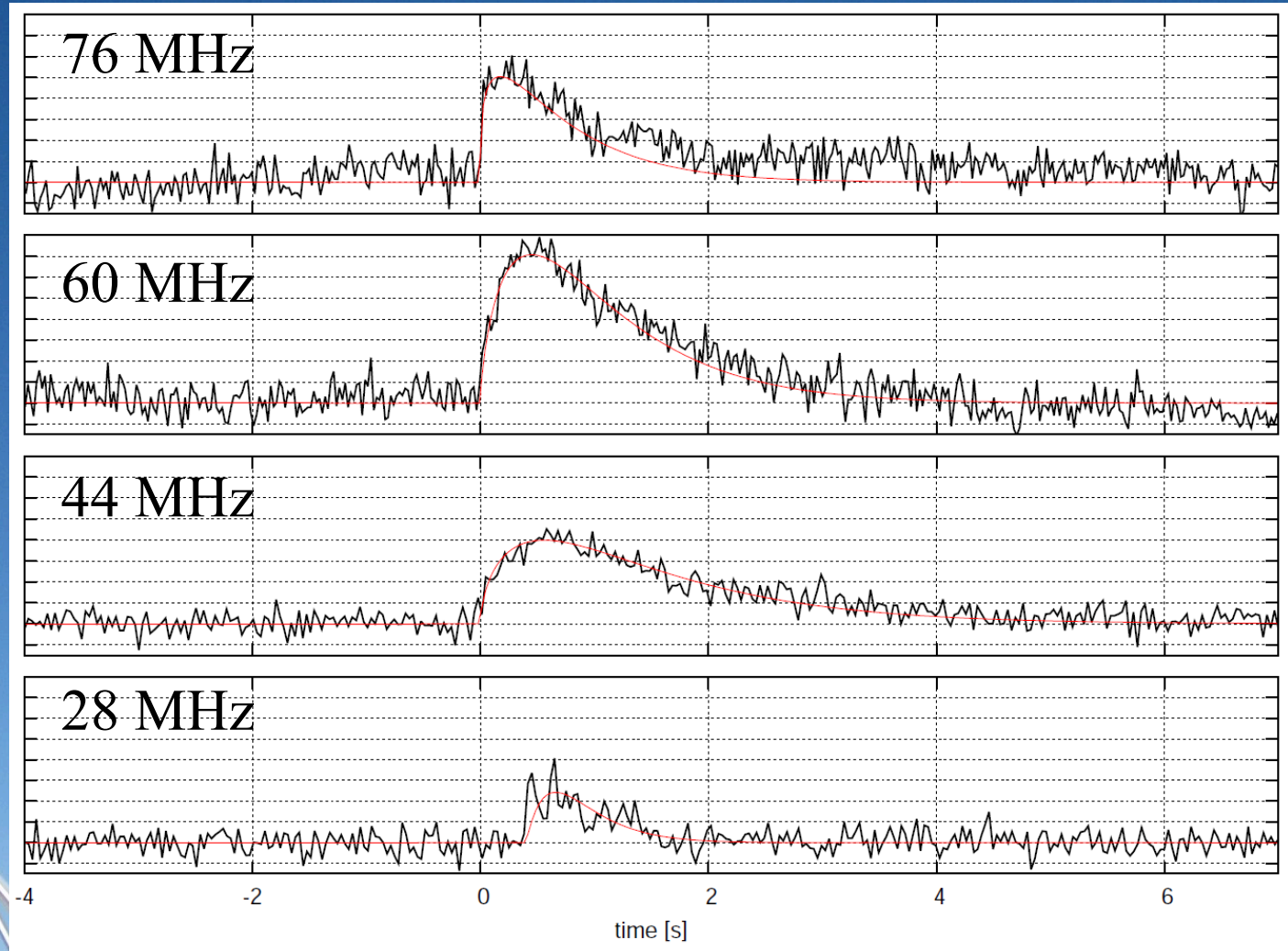


MSP J2145-0750  
Dowell et al. 2013 in press



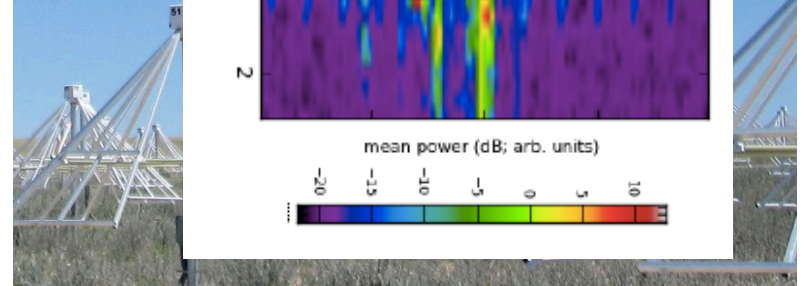
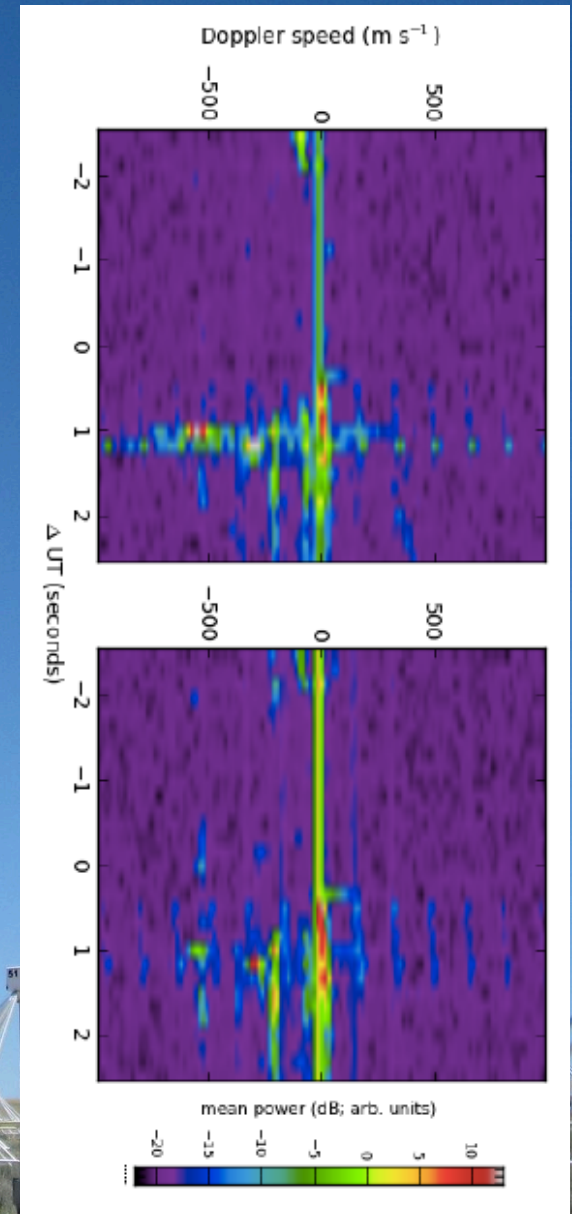
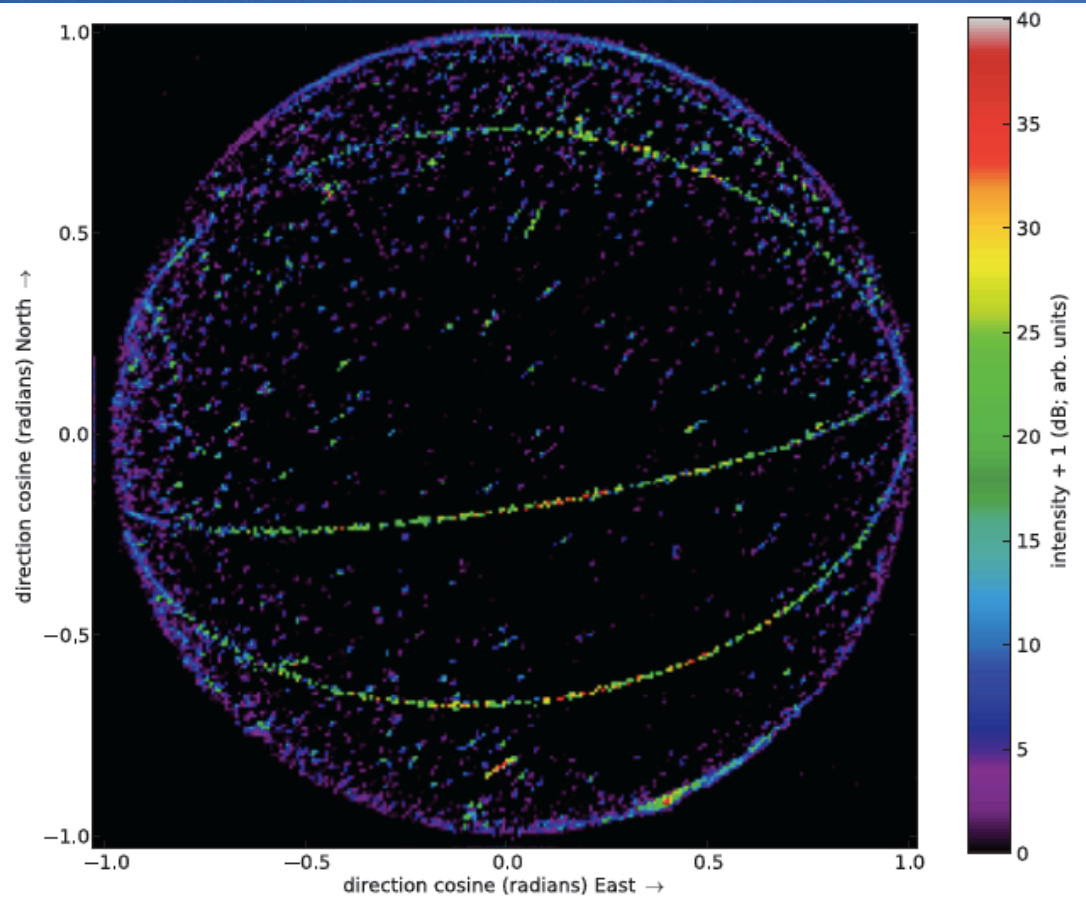
# LWA Publication Highlights - 2

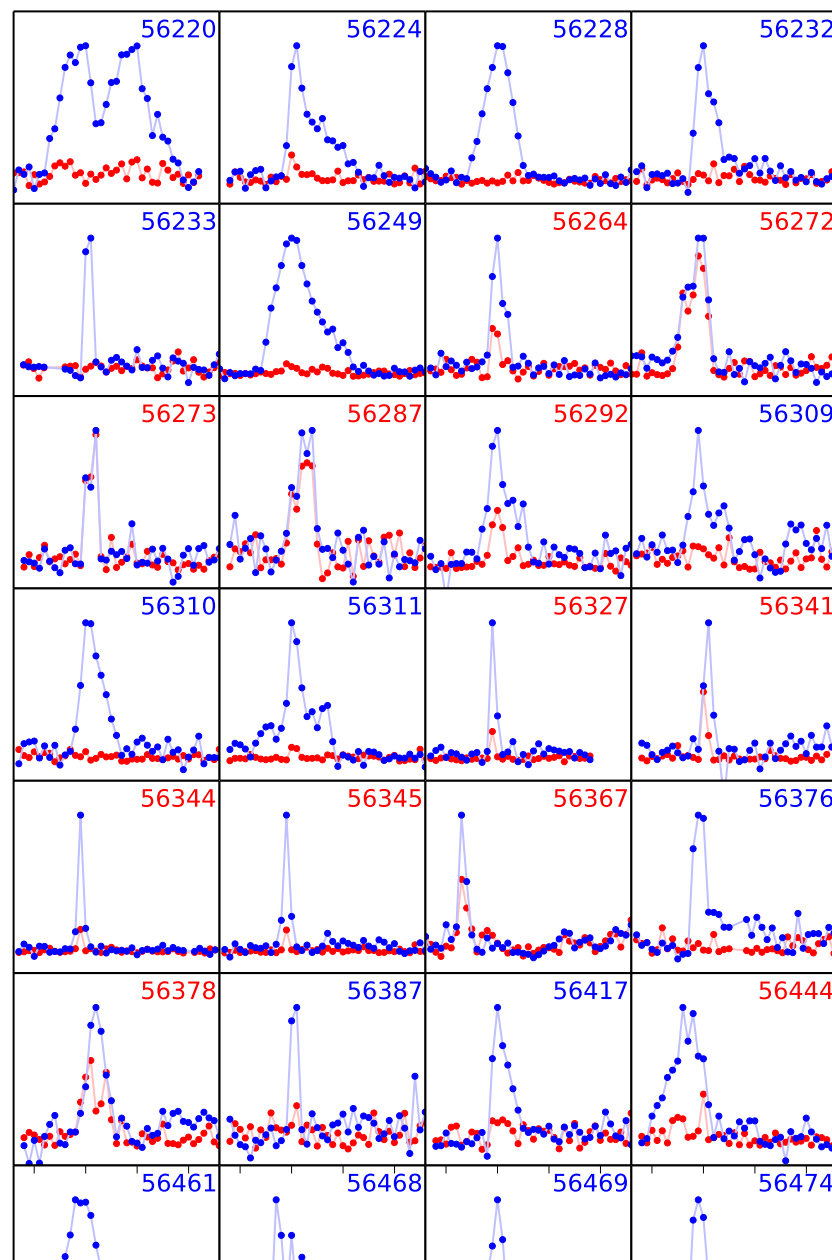
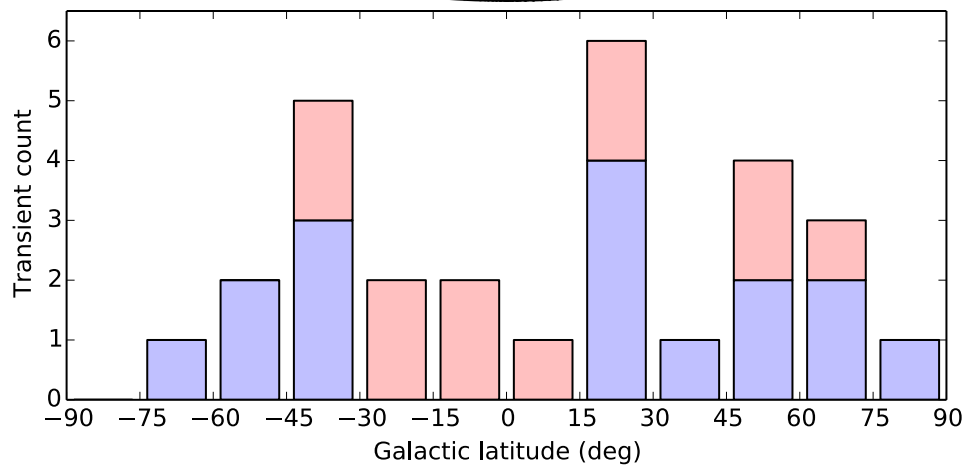
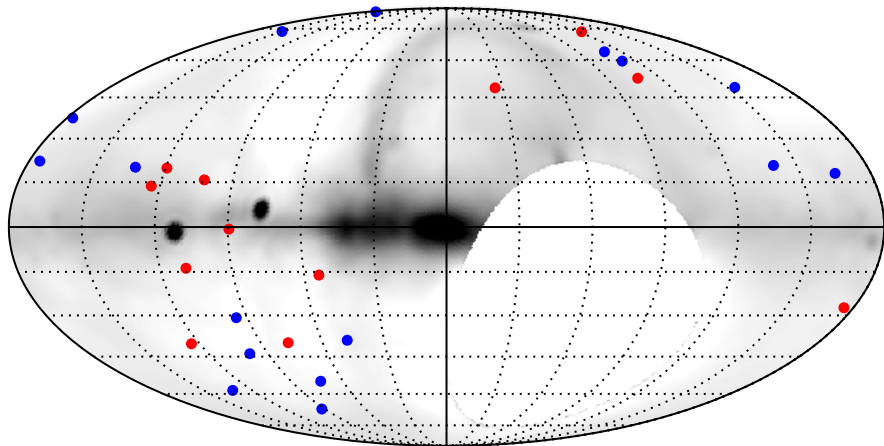
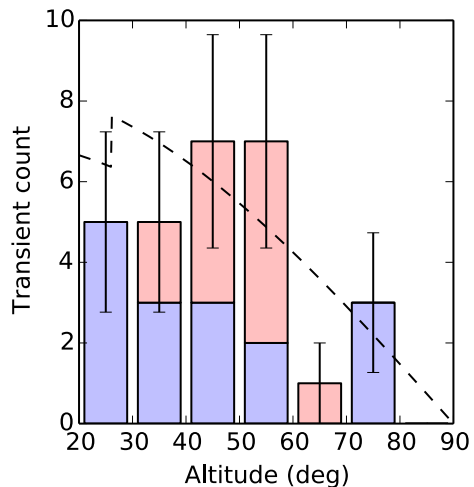
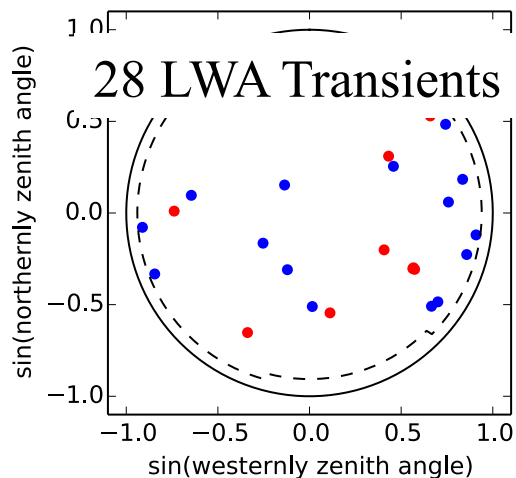
Crab Giant  
Pulses  
Ellingson et al.  
2013



# LWA Publication Highlights - 3

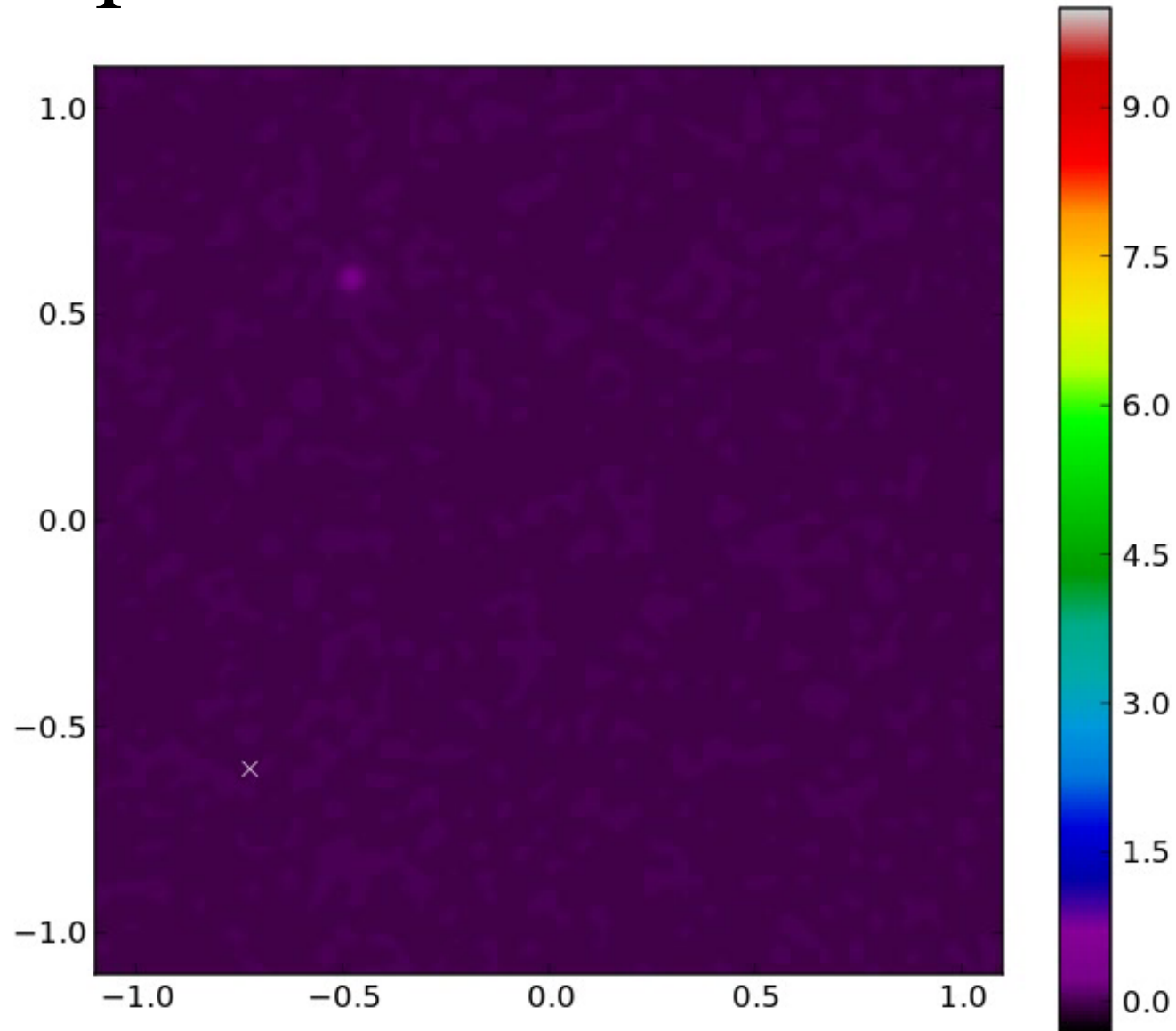
## Meteor Trails – Helmboldt et al. 2013





Hartman, Obenberger et al. 2013

# Space Situational Awareness

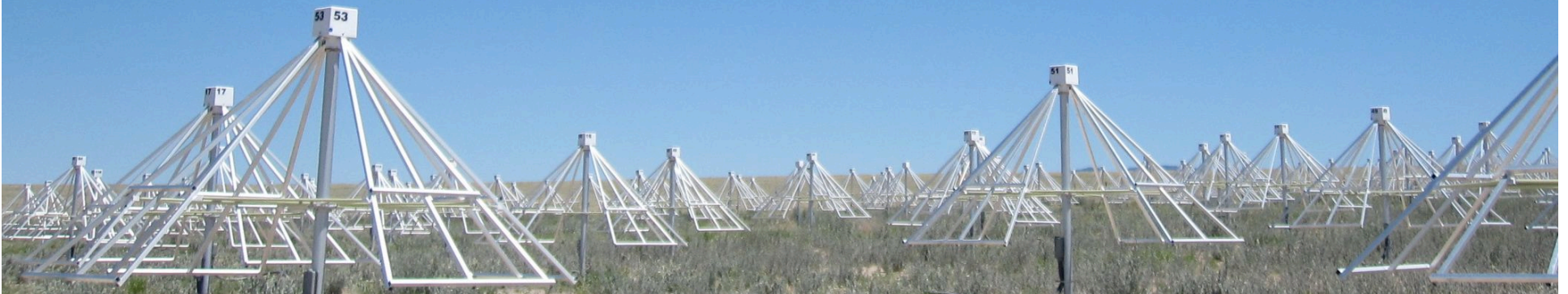


Tracking the ISS with LWA1 at 55.25 MHz

# Publication Policy

**For data collected after June 1, 2013 (CFP $\geq$ 3):**

- **First author sends courtesy draft to Director prior to submission**
- acknowledgements: "Construction of the LWA has been supported by the Office of Naval Research under Contract N00014-07-C-0147. Support for operations and continuing development of the LWA1 is provided by the National Science Foundation under grants AST-1139963 and AST-1139974 of the University Radio Observatory program."



# Goals

- Review LWA1 Hardware and current capabilities
- Learn How to Use LWA1
- Results with LWA1
- New Instrumentation
- Inform you about many related projects & proposals
- Exchange ideas
- Gather fodder for URO reporting



# Backup Slides





# Technical Specifications:

	<u>Required</u>	<u>Achieved</u>
• Frequency Range:	20 MHz to 80 MHz	10 MHz to 88 MHz
• Angular resolution:	$\Delta \theta \leq [8,2]''$	$\Delta \theta \leq [7,1.4]''$
• LAS at [20,80] MHz	$\geq [8,2]^\circ$	$\geq [16,4]^\circ$
• <b>Baseline range:</b>	<b>100 m to 400 km</b>	<b>50 m to 600 km</b>
• Sensitivity [20,80 MHz]:	$\Delta \theta \leq [1.0,0.5]$	$\Delta \theta \leq [0.5,0.1]$
• <b>Collecting Area (m<sup>2</sup>)</b>	$A_c = 1 \times 10^6$	$A_c = 4 \times 10^6$
• <b>Dynamic range:</b>	$DR \geq [1 \times 10^3, 2 \times 10^3]$	$DR \geq [2 \times 10^3, 8 \times 10^3]$
• $\Delta \nu \Delta \theta_{\max}$ (per beam)	$\Delta \nu \Delta \theta \geq 4$ MHz	$\Delta \nu \Delta \theta = 20$ MHz
• $\Delta \nu \Delta \theta_{\min}$	$\Delta \nu \Delta \theta \leq 100$ Hz	$\Delta \nu \Delta \theta \leq 10$ Hz
• Temporal Res	$\Delta \nu \tau = 10$ msec	$\Delta \nu \tau \leq 0.1$ msec
• Polarization:	1 circular	Full
• Sky Coverage:	$z \geq 40^\circ$	$z \geq 15^\circ$
• FoV [20,80] MHz	$[8,2]^\circ$	$\leq [16,4]^\circ$
• # of beams:	4 single pol.	4 single pol.
• <b>Configuration:</b>	<b>2D array, N = 53 stations</b>	<b>2D array, N <math>\geq</math> 53</b>



# LWA Publications in 2012-2013

- The LWA1 Radio Telescope, S.W. Ellingson et al., *IEEE*, 2013, in press
- First Light for the First Station of the the Long Wavelength Array, G.B. Taylor *et al.*, JAI, 2012, 1, 50006
- The Long Wavelength Array Software Library, J. Dowell et al. 2012, JAI, 1, 50004
- Probing the Climatological Impact of a Cosmic Ray-Cloud Connection through Low-Frequency Radio Observations, Magee & Kavic, 2012



## continued

- Detection and Flux Density Measurements of the Millisecond Pulsar J2145-0750 below 100 MHz, Dowell et al. 2013, ApJL submitted
- All-sky Imaging of Meteor Trails at 55.25 MHz with the first station of the LWA, Helmboldt et al. 2013, Radio Science, submitted
- Observations of Crab Giant Pulses in 20-84 MHz using the LWA1, Ellingson et al. 2013, ApJ, in press
- Passive over-the horizon radar with WWV and the first station of the Long Wavelength Array, Helmboldt, J.F. et al. 2013, Radio Science, submitted



# LWA Proceedings in 2012-2013

- 1  [2013AAS...22134518D](#) 1.000 01/2013 [A](#) [U](#)  
Dartez, Louis P.; Jenet, F.; Cohen, S.; A ROACH Based Data Acquisition System for the Low Frequency All Sky Monitor (LoFASM)  
Creighton, T. D.; Ford, A.; Garcia, A.;  
Hicks, B.; Hinojosa, J.; Kassim, N. E.;  
Longoria, C.; and 10 coauthors

---

- 2  [2013AAS...22134517F](#) 1.000 01/2013 [A](#) [U](#)  
Ford, Anthony; Jenet, F.; Craig, J.; Progress on the Low Frequency All Sky Monitor  
Creighton, T. D.; Dartez, L. P.;  
Hicks, B.; Hinojosa, J.; Jaramillo, R.;  
Kassim, N. E.; Lunsford, G.; and 5  
coauthors

---

- 3  [2013AAS...22134110M](#) 1.000 01/2013 [A](#) [U](#)  
Monkiewicz, Jacqueline A.; Observing Cosmic Dawn with the Long Wavelength Array: Custom Beamforming Techniques  
Bowman, J. D.; Hartman, J.;  
Taylor, G. B.; Monkiewicz, J. A.

Total of 16 published abstracts

