



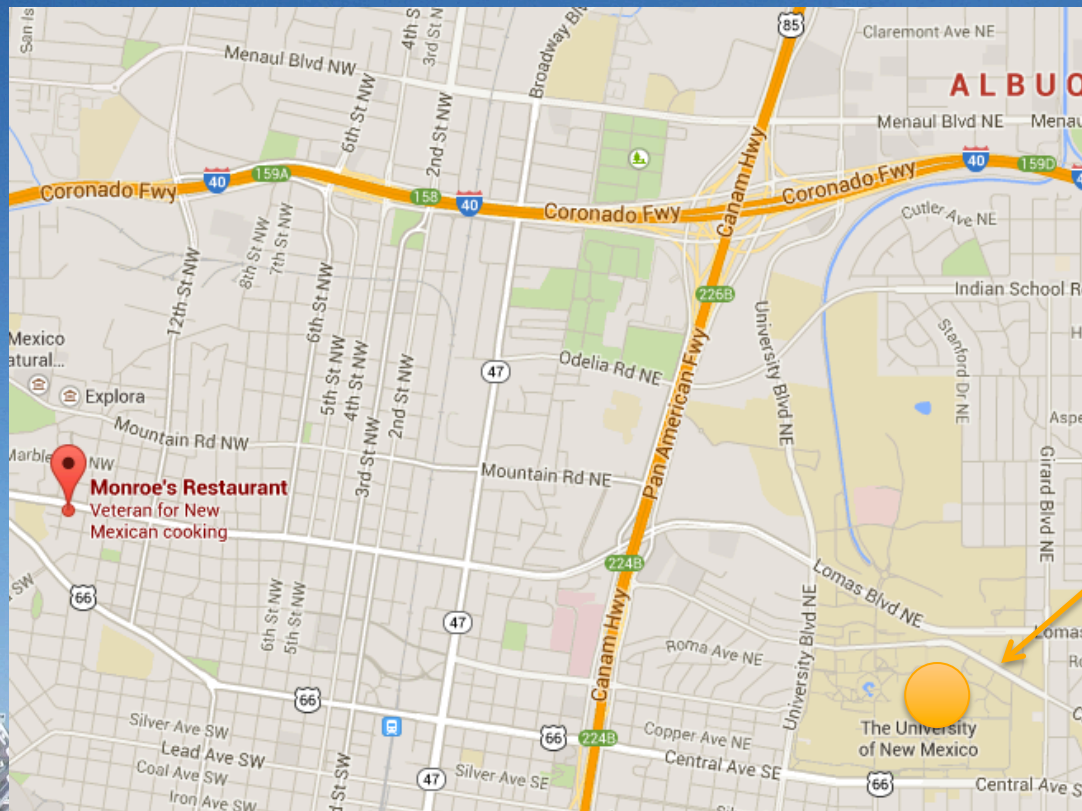
# Observatory Update

Greg Taylor (UNM)

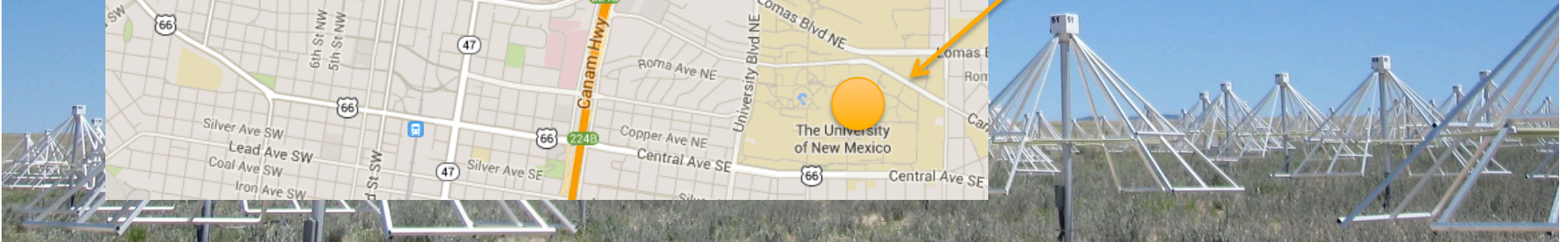


# Meeting Logistics

- Internet access: see instructions on board
- Lunch – at Student Union Building. Return by 1:00pm.
- Dinner – at Monroe's on Lomas. 6:30pm
- NRL/Others by video – speak up when asking questions



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 252 (98%) good stands
- All 4 beams operable, 5 outriggers 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>

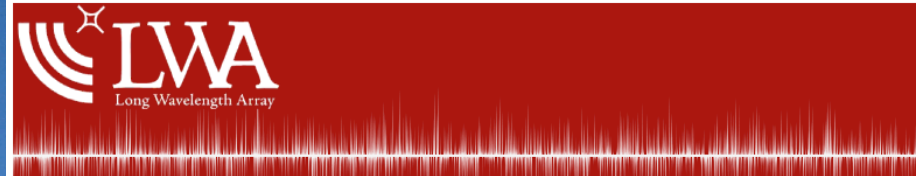
- User forum:

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



# Recording Capability

- 45 DRSUs (34 UNM + 5 LIU and 5 VT) 1 failure (in shipping)
- mostly 10 or 15 TB capacity each
- total DRSU storage 495 TB
- At site typically 10 DRSUs = 376 beam hrs + 50 hrs TBW/TBN



## Frontend for DRSU Database

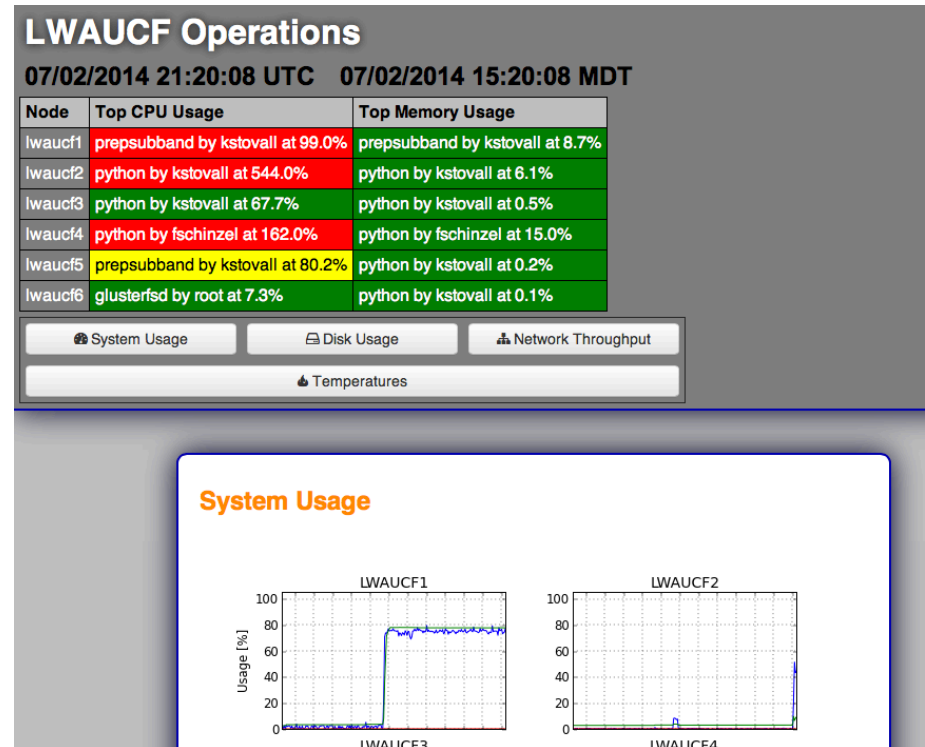
### Overview [DRSUS/External Disks](#)

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
  - Located in the old correlator room of the VLA control building
  - Connected to the LWA1 site via a 10GbE link
  - 37 users as of today
  - 54 TB on /data/network
  - Automatic notifications > 90 days



<http://lwalab.phys.unm.edu/CompScreen/cs.php>

# 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



# LWA1 Database

The screenshot shows a web browser window titled "LWAdb Utility" with the URL "https://lwalab.phys.unm.edu/lwadb/sessions/". The browser's address bar and tabs are visible. The page content includes a navigation menu with items like "LWAdb", "Sessions", "Observations", "Projects", "Reports", "LWAdb Administration", and a user profile "gtaylor". Below the menu is a large heading "Sessions Management" and a link "Create New Session". There is a "Show" dropdown menu set to "10" and a "Search:" input field. The main content is a table of session entries, with the first 10 rows displayed. The table has columns for Session ID, Sub ID, Project, UTC Date, Operator, Observations, DRSU Tag, and Actions. The table is followed by "Showing 1 to 10 of 7,072 entries" and "Previous Next" navigation links.

## LWAdb Utility

LWAdb Sessions Observations Projects Reports LWAdb Administration gtaylor

## Sessions Management

[Create New Session](#)

Show  Search:

entries

Showing 1 to 10 of 7,072 entries

Session ID	Sub ID	Project	UTC Date	Operator	Observations	DRSU Tag	Actions
85	0	LH011	14-07-06 11:00 UTC	MM	1	056844_000002756	<a href="#">view</a> or <a href="#">edit</a>
1578	0	LS003001	14-07-06 09:55 UTC	MM	1	056844_000002365	<a href="#">view</a> or <a href="#">edit</a>
1579	0	LS003001	14-07-06 09:55 UTC	MM	1	056844_000002366	<a href="#">view</a> or <a href="#">edit</a>
1580	0	LS003001	14-07-06 09:55 UTC	MM	1	056844_000002367	<a href="#">view</a> or <a href="#">edit</a>
1581	0	LS003001	14-07-06 09:55 UTC	MM	1	056844_000002368	<a href="#">view</a> or <a href="#">edit</a>
1021	0	LO001	14-07-06 08:05 UTC	MM	1	056844_000001730	<a href="#">view</a> or <a href="#">edit</a>
1022	0	LO001	14-07-06 08:05 UTC	MM	1	056844_000001731	<a href="#">view</a> or <a href="#">edit</a>
1023	0	LO001	14-07-06 08:05 UTC	MM	1	056844_000001732	<a href="#">view</a> or <a href="#">edit</a>
44	0	LS006	14-07-06 06:29 UTC	MM	1	056844_000000794	<a href="#">view</a> or <a href="#">edit</a>
45	0	LS006	14-07-06 06:29 UTC	MM	1	056844_000000795	<a href="#">view</a> or <a href="#">edit</a>

Showing 1 to 10 of 7,072 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

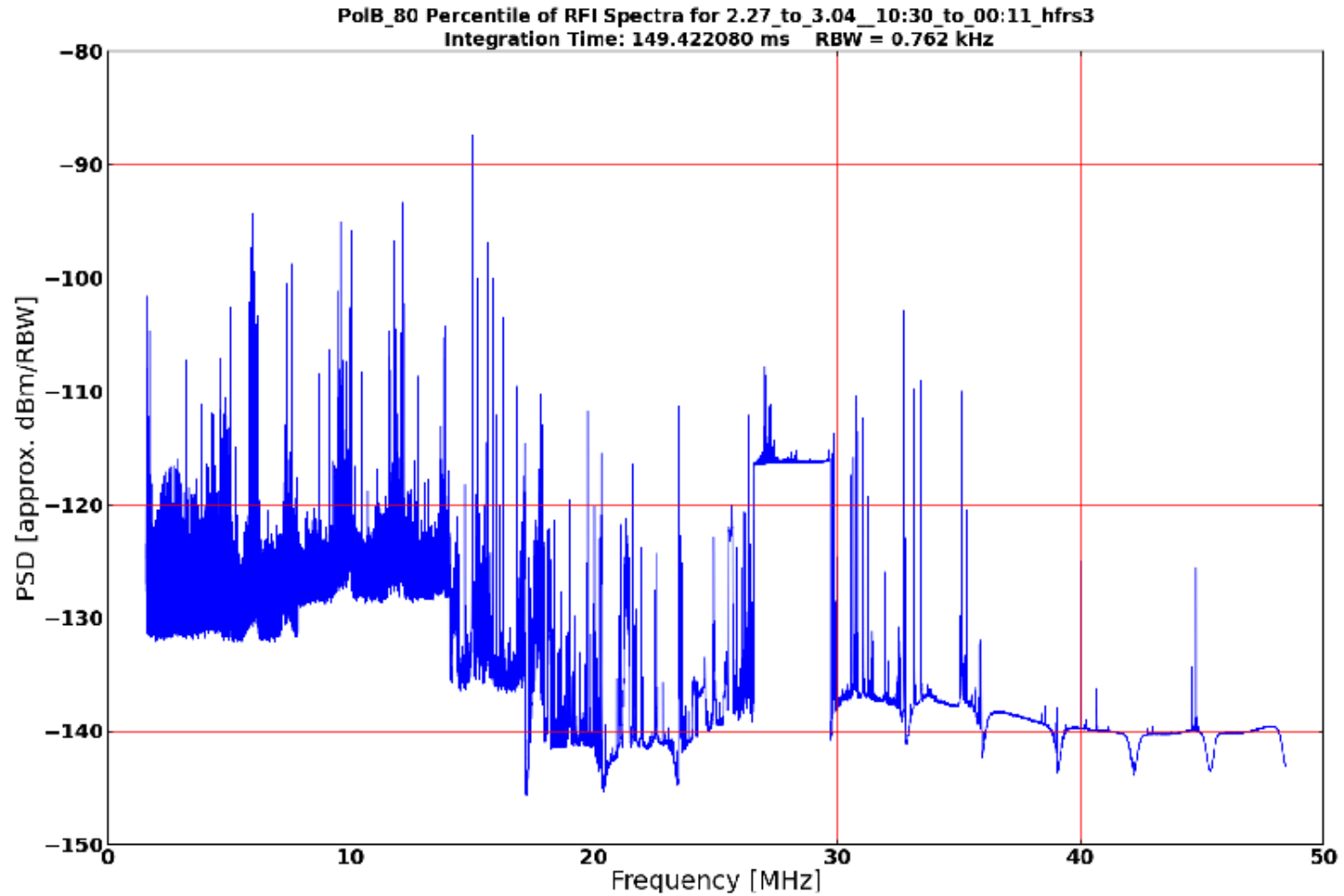




# LWA SV site work



# LWA SV site testing Feb. 2014

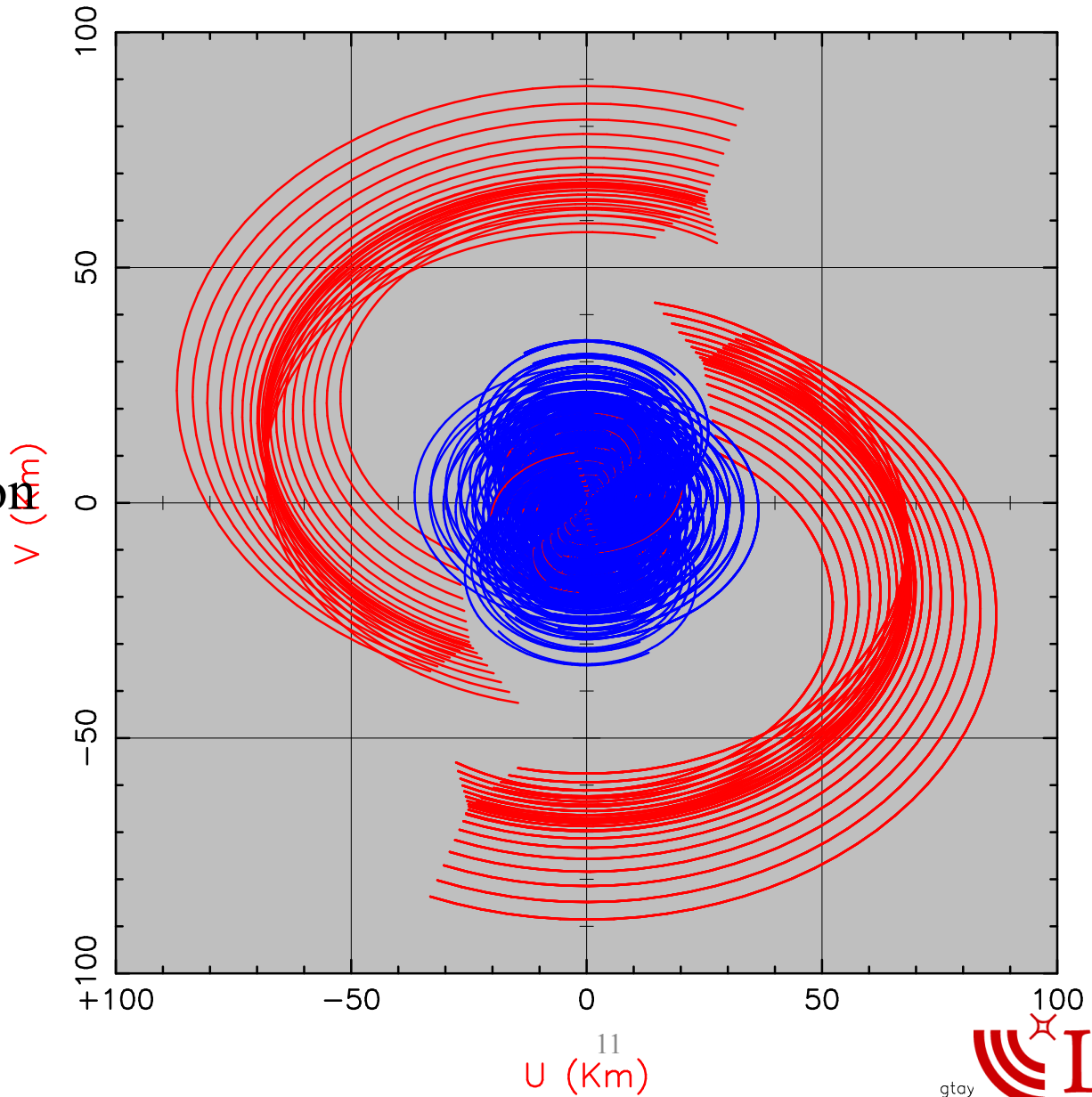


# VLA + SV

UV Coverage for svout

- LWA\_SV
- LWA\_VL
- VLA1
- VLA2
- VLA3
- VLA4
- VLA5
- VLA6
- VLA7
- VLA8
- VLA9
- VLA10
- VLA11
- VLA12
- VLA13
- VLA14
- VLA15
- VLA16
- VLA17
- VLA18
- VLA19
- VLA20
- VLA21
- VLA22
- VLA23
- VLA24
- VLA25
- VLA26
- VLA28

10 arcsec resolution  
at 74 MHz



J0136+4751

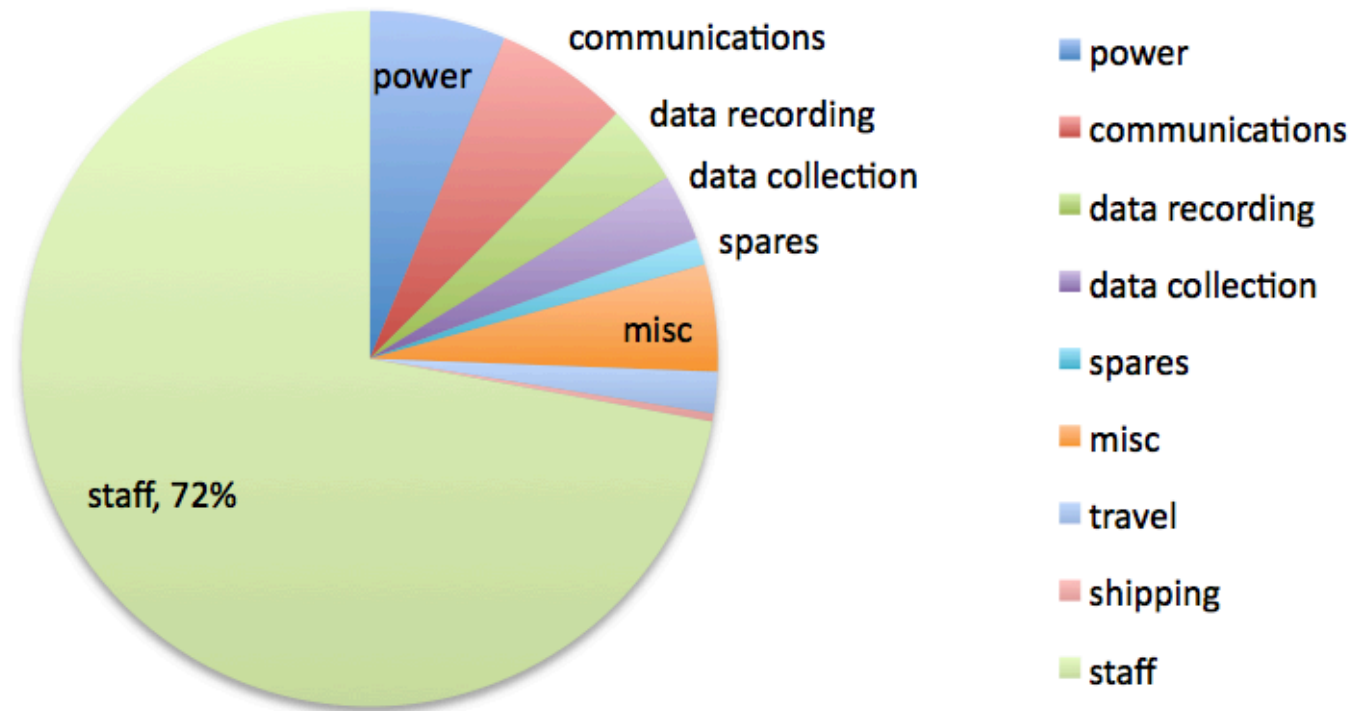
# Current Support

- Cosmic Dawn program (NSF) – ends 7/31/2014
- HJUDE (NSF) – ends 8/30/2015
- LEDA (NSF) – ends 1/31/2015
- LoFASM (UTB) – ends 1/31/2015
- URO (NSF) – ends 2/28/2016
- Ionospheric Research (AFRL) – ends 10/31/2014
- Campus Networking Infrastructure (NSF)
- LWA Center at UNM (unrestricted)

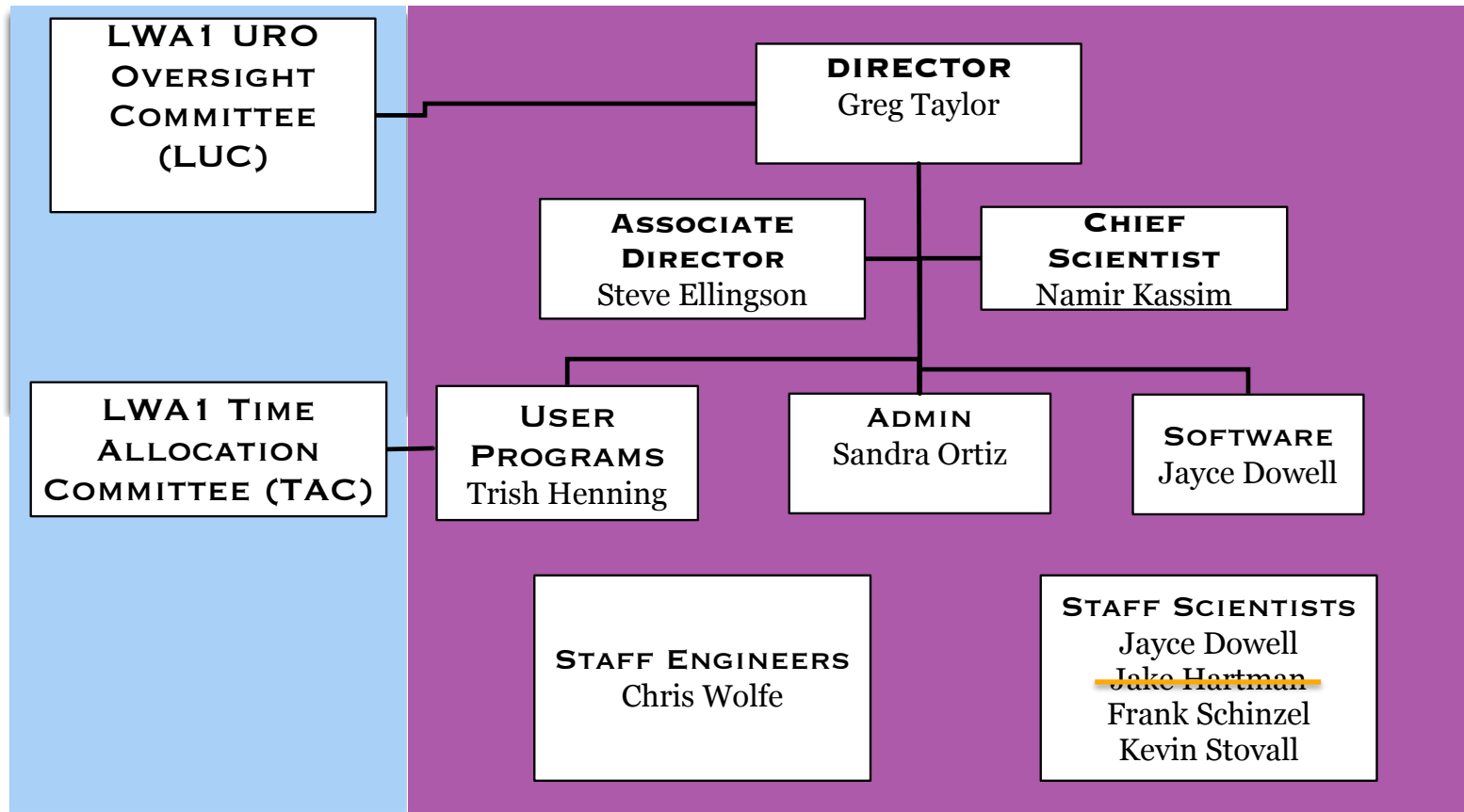


# LWA Ops Budget - \$320K/year

## LWA1 Operations Cost - URO



# Current Staffing



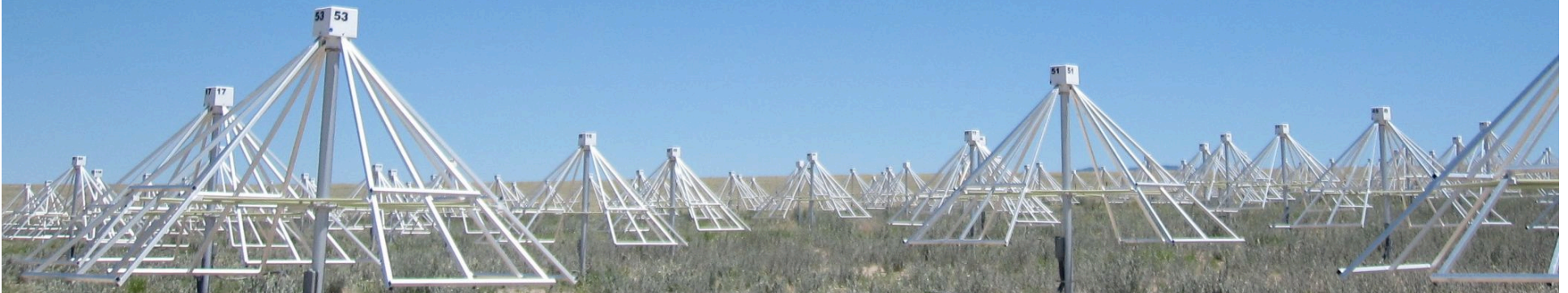
postdocs: Frank Schinzel and Kevin Stovall (UNM)  
grad students: Ken Obenberger, Caleb Grimes, Mark Gorski, Bob Mesler (UNM)  
Chris Wolfe, Hank Tillman, Augustine Yellu (VT)  
undergrads: Colby Gutierrez-Kraybill, Tarraneh Eftekhari, and Jeff Richards (UNM)

# LWA1 Operators (days)

- Joe Craig (32)
- Jayce Dowell (17)
- Tarraneh Eftekhari (107)
- Steve Ellingson (13)
- Justin Linford (14)
- Bob Mesler (40)
- Michael McCracken (37)
- Ken Obenberger (7)
- Jeff Richards (79)

**HAL is taking control ...**

- Mark Gorski (7)
- Colby Gutierrez (8)
- Jake Hartman (7)
- Greg Taylor (88)
- Hank Tillman (7)
- Chris Wolfe (14)
- UTB/ARCC (75)



# Projects

60 observing projects ongoing

CFP1 completion: 64% (closed)

CFP2 completion: 206%

CFP3 completion: 333%

CFP4 completion: 33%

**Cumulative: 98 users from 36 institutions and 4 countries**

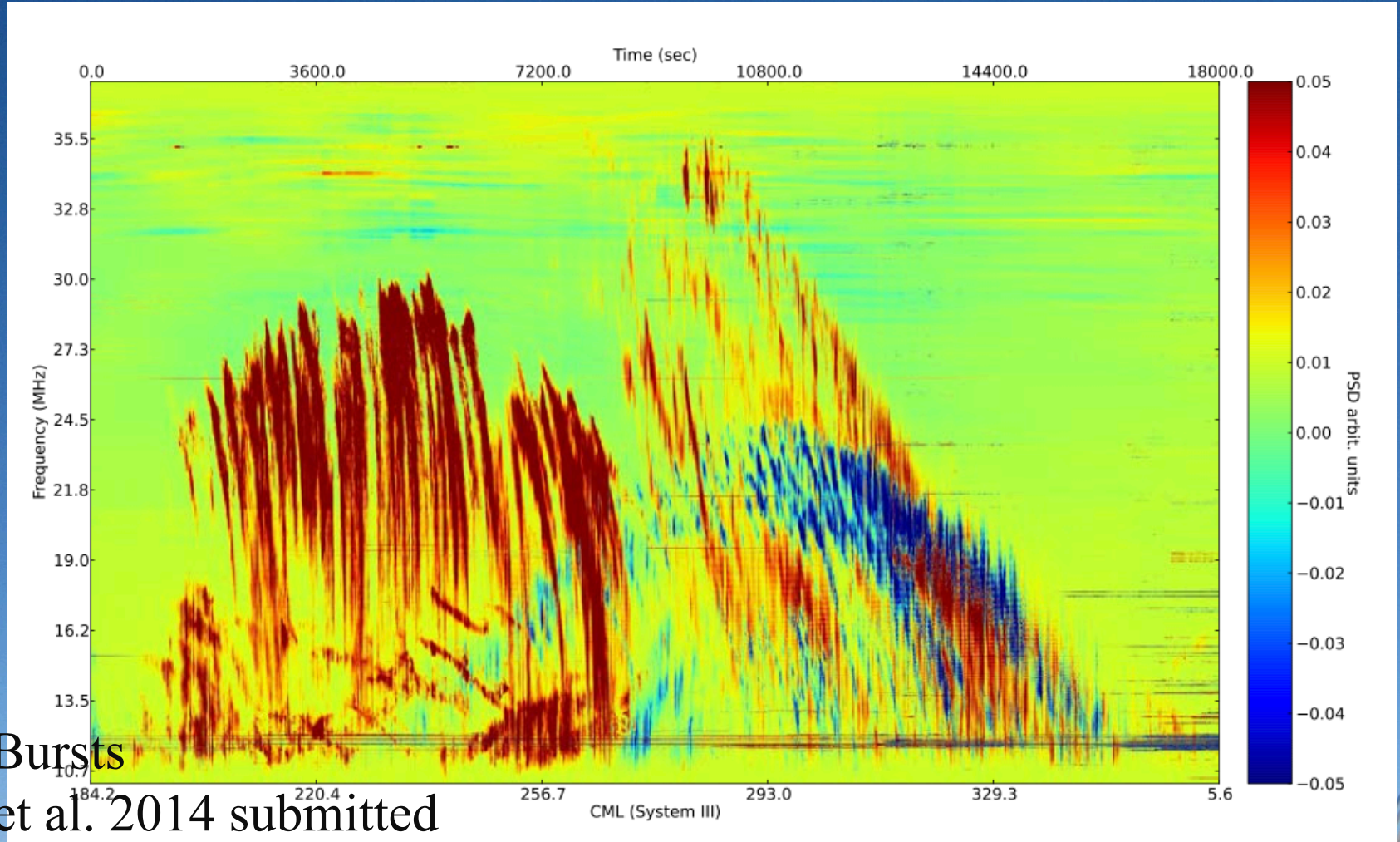
CFP5 deadline August 15, 2014

CFP5 observing begins January 1, 2015





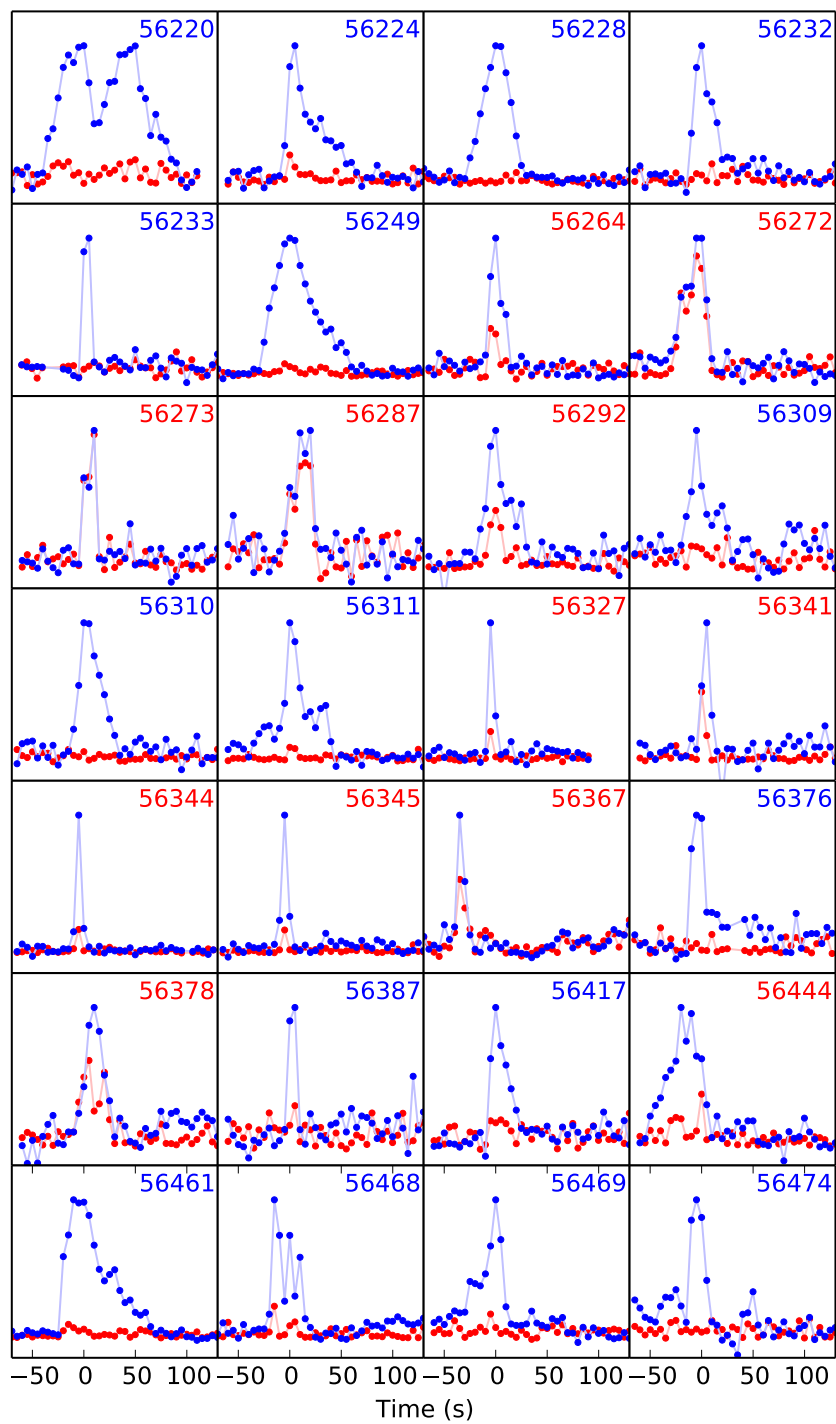
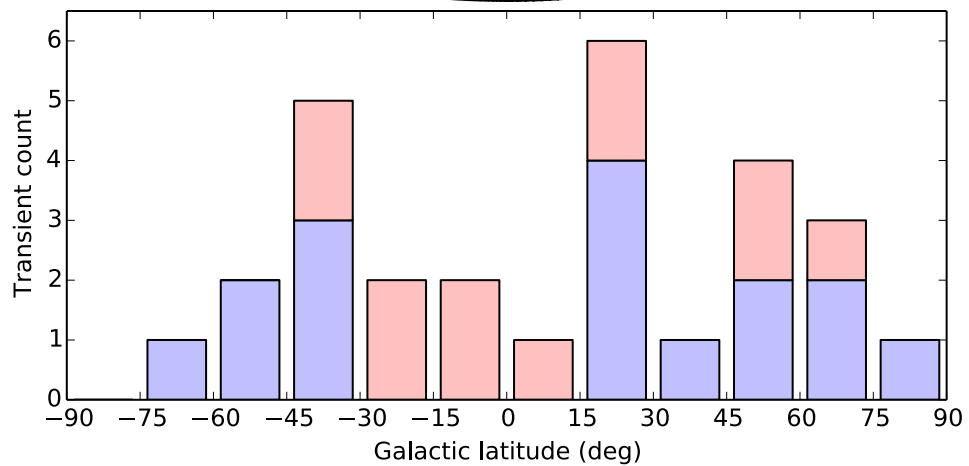
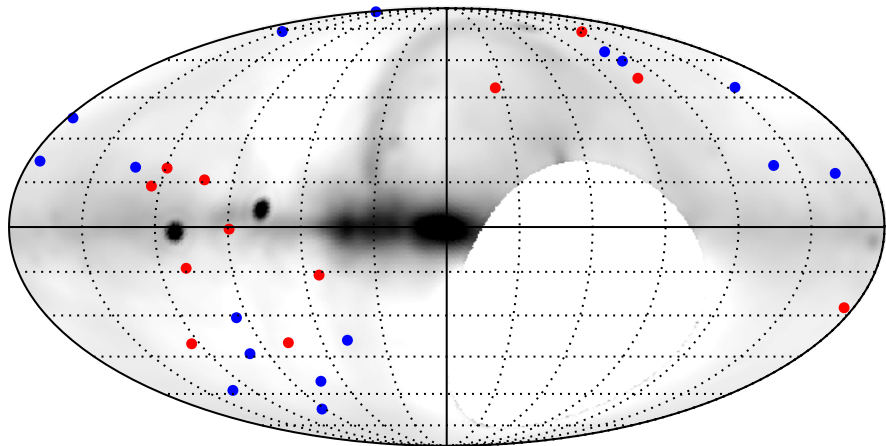
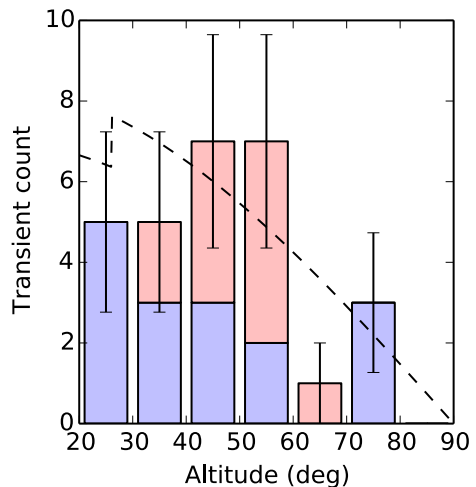
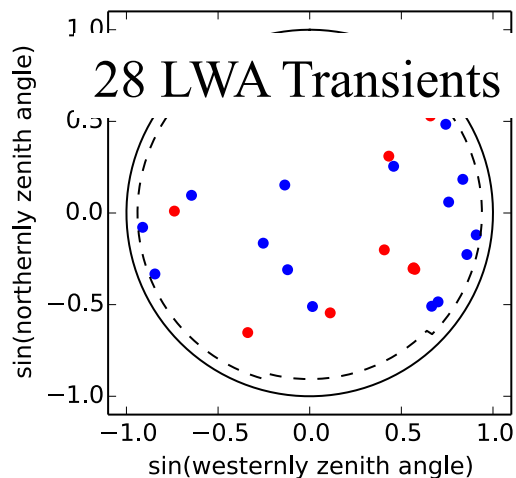
# LWA Publication Highlights - 1



Jovian Bursts

Clarke et al. 2014 submitted

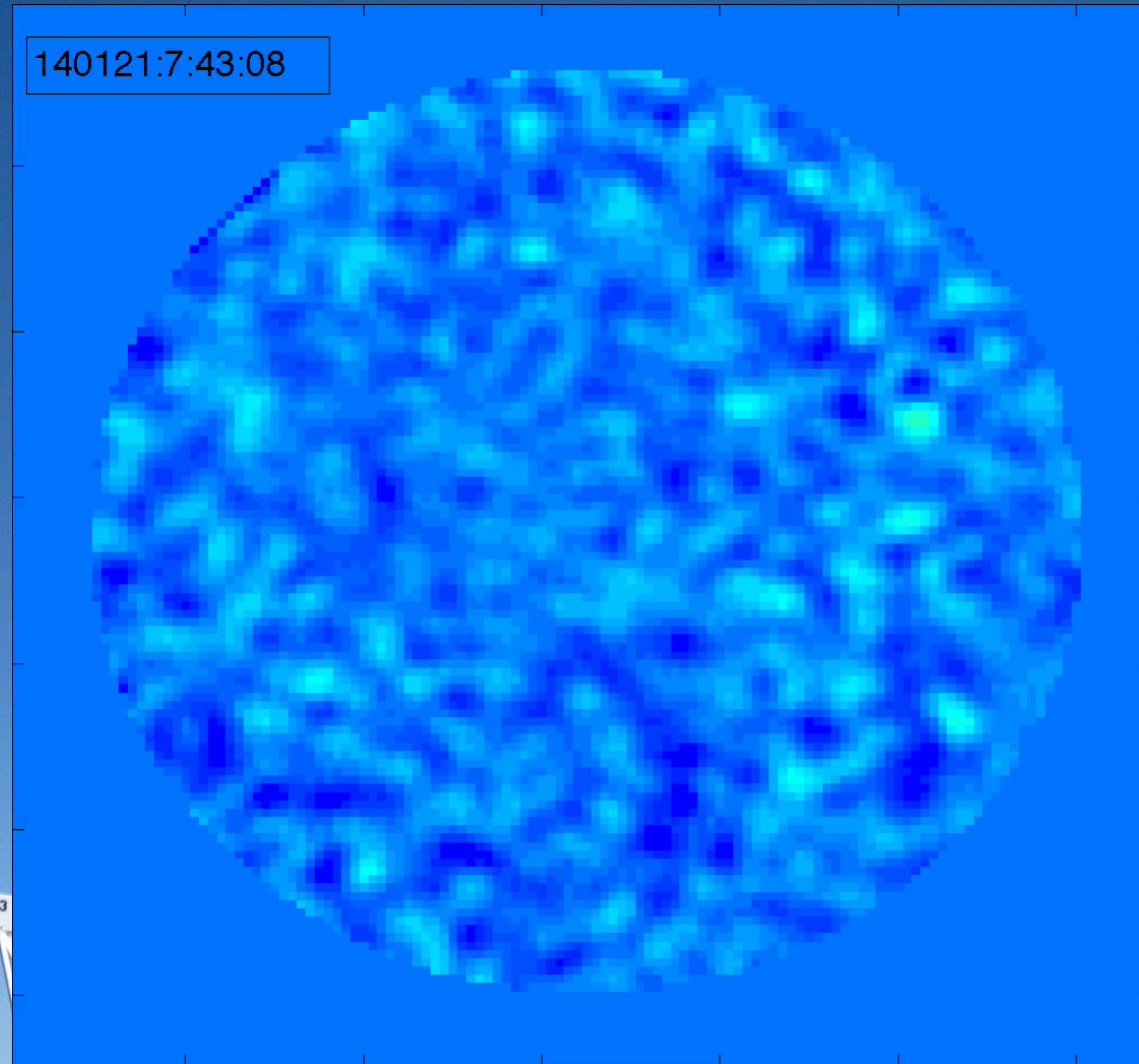




# LWA Publication Highlights - 2

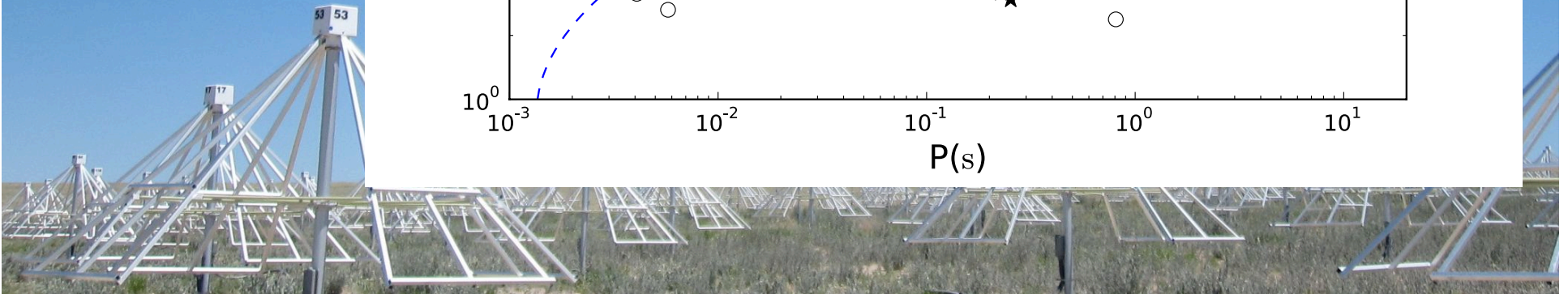
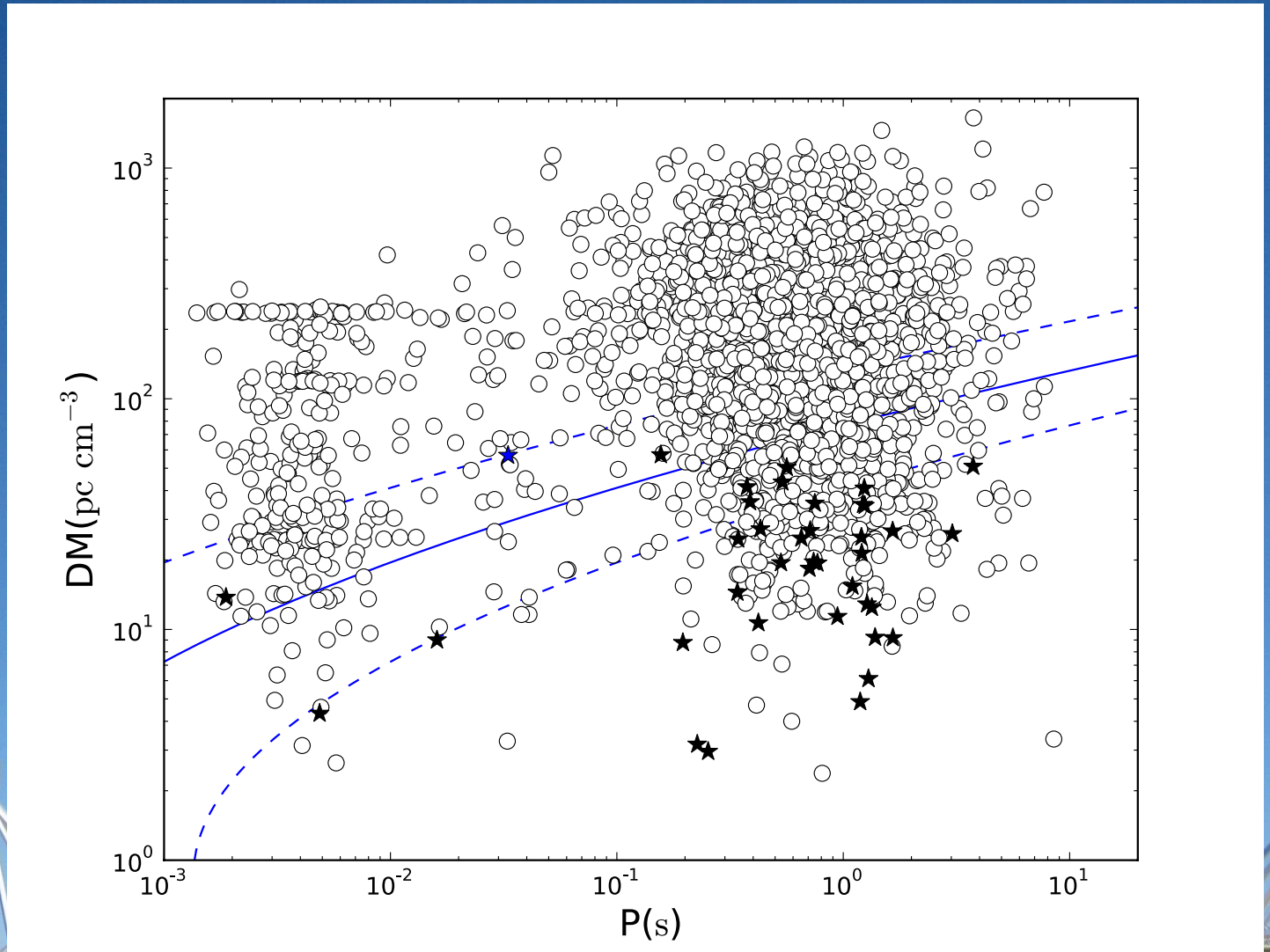
Great Balls  
Of Fire!

Obenberger et al.  
2014



# LWA Publication Highlights - 3

Pulsars  
Stovall et al.  
38 pulsars  
(and counting)



# 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."



# LWA Publications in 2014

13. Clarke, T.E., Higgins, C., Skarda, J., Imai, K., Imai, M., Reyes, F., Thieman, J., Jaeger, T., Schmitt, H., Dalal, N.P., Dowell, J., Ellingson, S.W., Hicks, B., Schinzel, F.K, & Taylor, G.B.  
2014, JGR, submitted  
[Probing Jovian Decametric Emission with the Long Wavelength Array Station 1](#)
12. Obenberger, K.S., Taylor, G.B., Hartman, J.M., Dowell, J., Ellingson, S.W., Helmboldt, J.F., Henning, P.A., Kavic, M., Schinzel, F.K, Simonetti, J.H., Stovall, K. & Wilson, T.L.  
2014, ApJL, 788, L26  
[Detection of Radio Emission from Fireballs](#)
11. Tsai, J., Simonetti, J., Akukwe, B., Bear, B., Cutchin, S., Dowell, J., Gough, J., Kanner, J., Kassim, N., Schinzel, F., Shawhan, P., Taylor, G.B., Yancey, C., Quezada, L., & Kavic, M.  
2014, submitted  
[Observations of Giant Pulses from Pulsar B0950+08 using LWA1](#)
10. Obenberger, K.S., Hartman, J.M., Taylor, G.B., Craig, J., Dowell, J., Helmboldt, J.F., Henning, P.A., Schinzel, F.K, & Wilson, T.L.  
2014, ApJ, 785, 27  
[Limits on GRB Prompt Radio Emission Using the LWA1](#)
9. Kocz, J., Greenhill, L.J., Bernardi, G., Jameson, A., Barsdell, B.R., Craig, J., Taylor, G.B., Schinzel, F., & Wertheimer, D.  
2014, JAI, 3, 50002  
[A Scalable Hybrid FPGA/GPU FX Correlator](#)
8. Dowell, J., Ray, P.S., Taylor, G.B., Blythe, J.N., Clarke, T., Craig, J., Ellingson, S.W., Helmboldt, J.F., Henning, P.A., Lazio, J., Schinzel, F., Stovall, K., & Wolfe, C.N.  
2013, ApJL, 775, L28  
[Detection and Flux Density Measurements of the Millisecond Pulsar J2145-0750 below 100 MHz](#)
7. Helmboldt, J.F., Ellingson, S.W., Taylor, G.B., Wilson, T.L., & Wolfe, C.N.  
2014, Radio Science, 49, 3  
[All-sky imaging of meteor trails at 55.25 MHz with the first station of the Long Wavelength Array](#)

15 talks/posters at AAS in January!

# Publication comparisons 6/13 – 7/14

LWA: 5 publications

LOFAR: 8 publications

MWA: 3 publications



# 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
- Discuss future capabilities
- 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:	$\theta \leq [8,2]''$	$\theta \leq [7,1.4]''$
• LAS at [20,80] MHz	$\geq [8,2]^\circ$	$\geq [16,4]^\circ$
• Baseline range:	100 m to 400 km	50 m to 600 km
• Sensitivity [20,80 MHz]:	$\sigma \leq [1.0,0.5]$	$\sigma \leq [0.5,0.1]$
• Collecting Area (m <sup>2</sup> )	$A_c = 1 \times 10^6$	$A_c = 4 \times 10^6$
• Dynamic range:	$DR \geq [1 \times 10^3, 2 \times 10^3]$	$DR \geq [2 \times 10^3, 8 \times 10^3]$
• $\Delta\nu_{\max}$ (per beam)	$\Delta\nu \geq 4$ MHz	$\Delta\nu = 20$ MHz
• $\Delta\nu_{\min}$	$\Delta\nu \leq 100$ Hz	$\Delta\nu \leq 10$ Hz
• Temporal Res	$\Delta\tau = 10$ msec	$\Delta\tau \leq 0.1$ 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.
• Configuration:	2D array, N = 53 stations	2D array, N $\geq$ 53



## 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

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- 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

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- 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



# 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

