Planning JVLA Observations

Capabilities & practicalities

Michael P. Rupen

Project Scientist for the WIDAR Correlator

Atacama Large Millimeter/submillimeter Array

Expanded Very Large Array

Robert C. Byrd Green Bank Telescope

Very Long Baseline Array

What is the JVLA?

A very quick introduction

The JVLA

- VLA came on-line in the 1980s
- Huge upgrade (x10 in major parameters) over the past decade
- Super-powerful
- Super-flexible
- Available *now*

28x25m antennas, 8 feeds, 0.035-36.4 km

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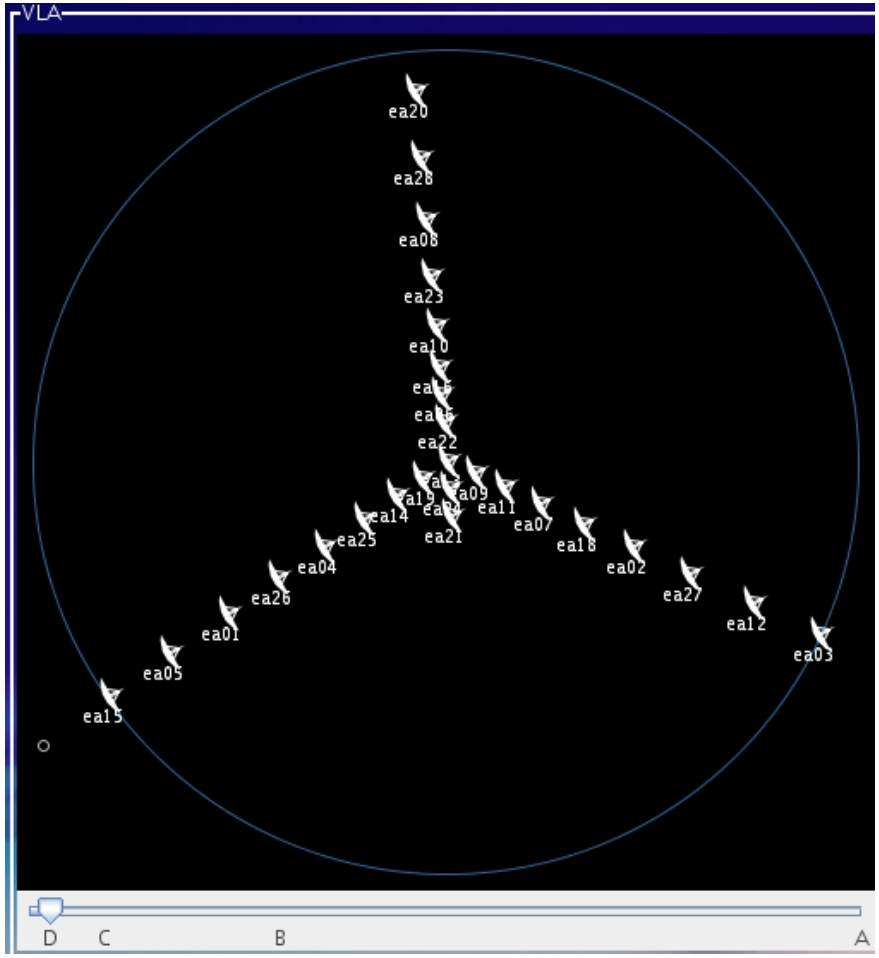
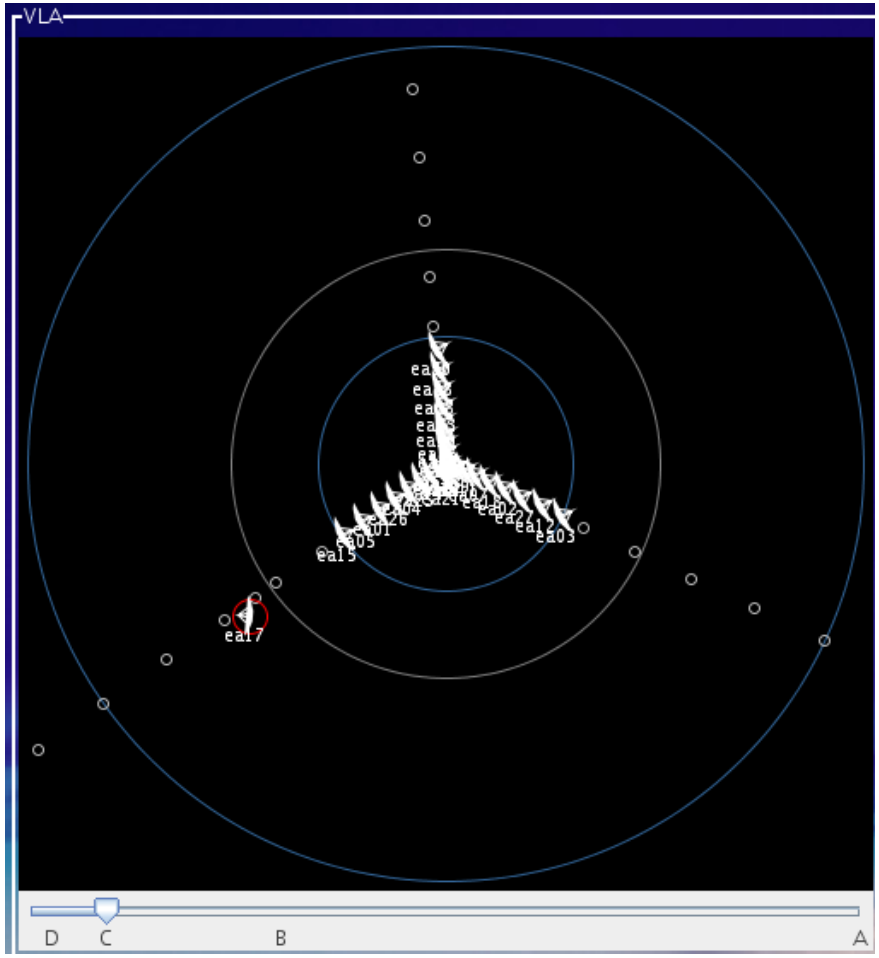


- Reconfigured every 4 months
- Spatial dynamic range in 1 cfg: ~20-100
- Currently D→C→B→A (x3.3 in baseline length)
- "Hybrids" for southern sources
- Short baselines retained in C cfg

28x25m antennas, 8 feeds, 0.035-36.4 km



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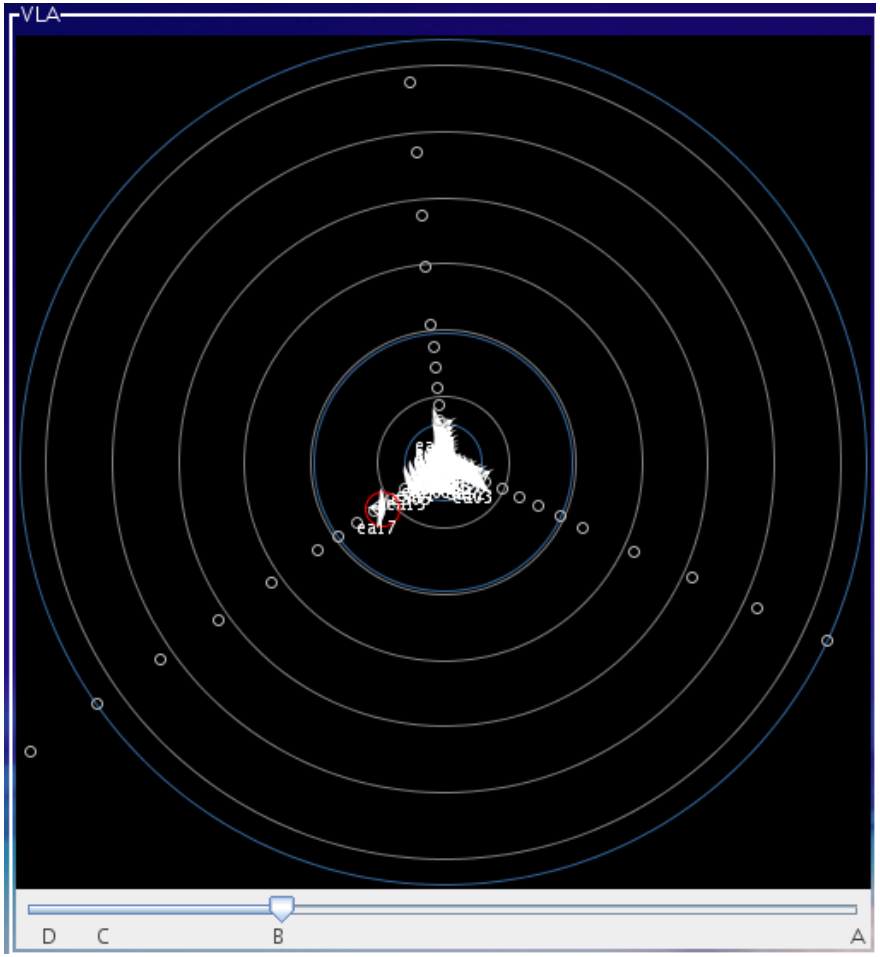

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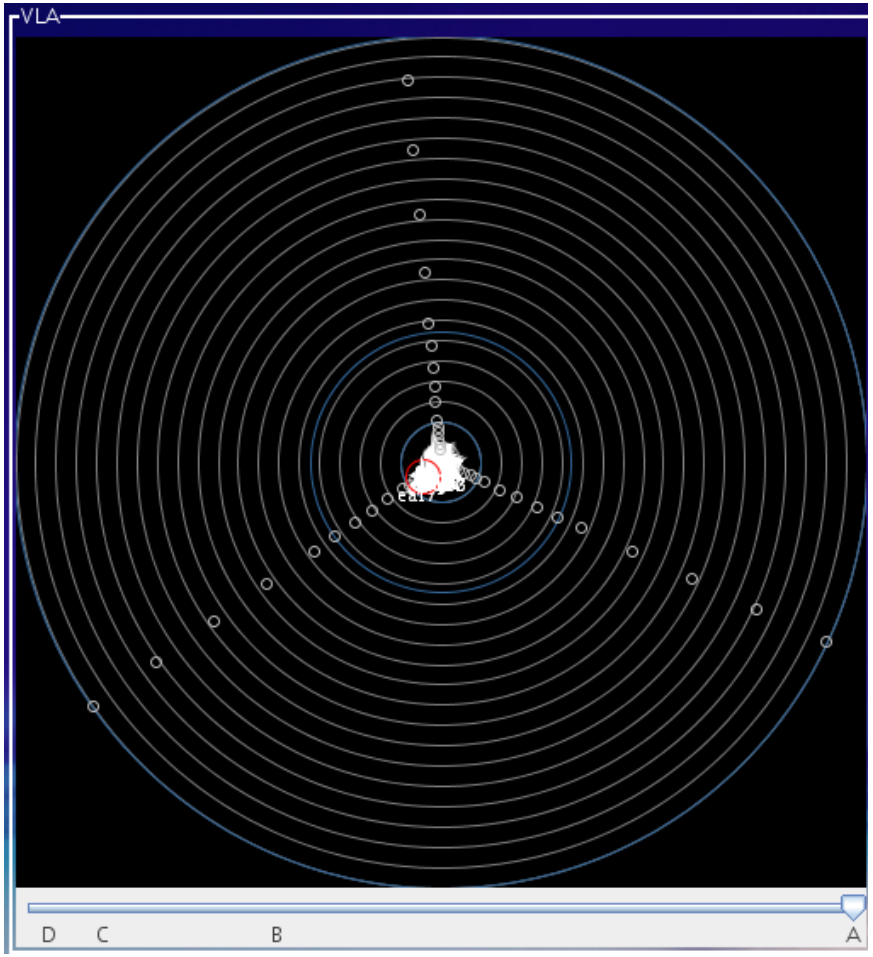

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1-50 GHz in 8 bands

EVLA

Can switch bands in ~20 sec

Band	Range
	(GHz)
20 cm (L)	1.0–2.0
13 cm (S)	2.0–4.0
6 cm (C)	4.0–8.0
3 cm (X)	8.0–12.0
2 cm (Ku)	12.0–18.0
1.3 cm (K)	18.0–26.5
1 cm (Ka)	26.5–40.0
0.7 cm (Q)	40.0–50.0

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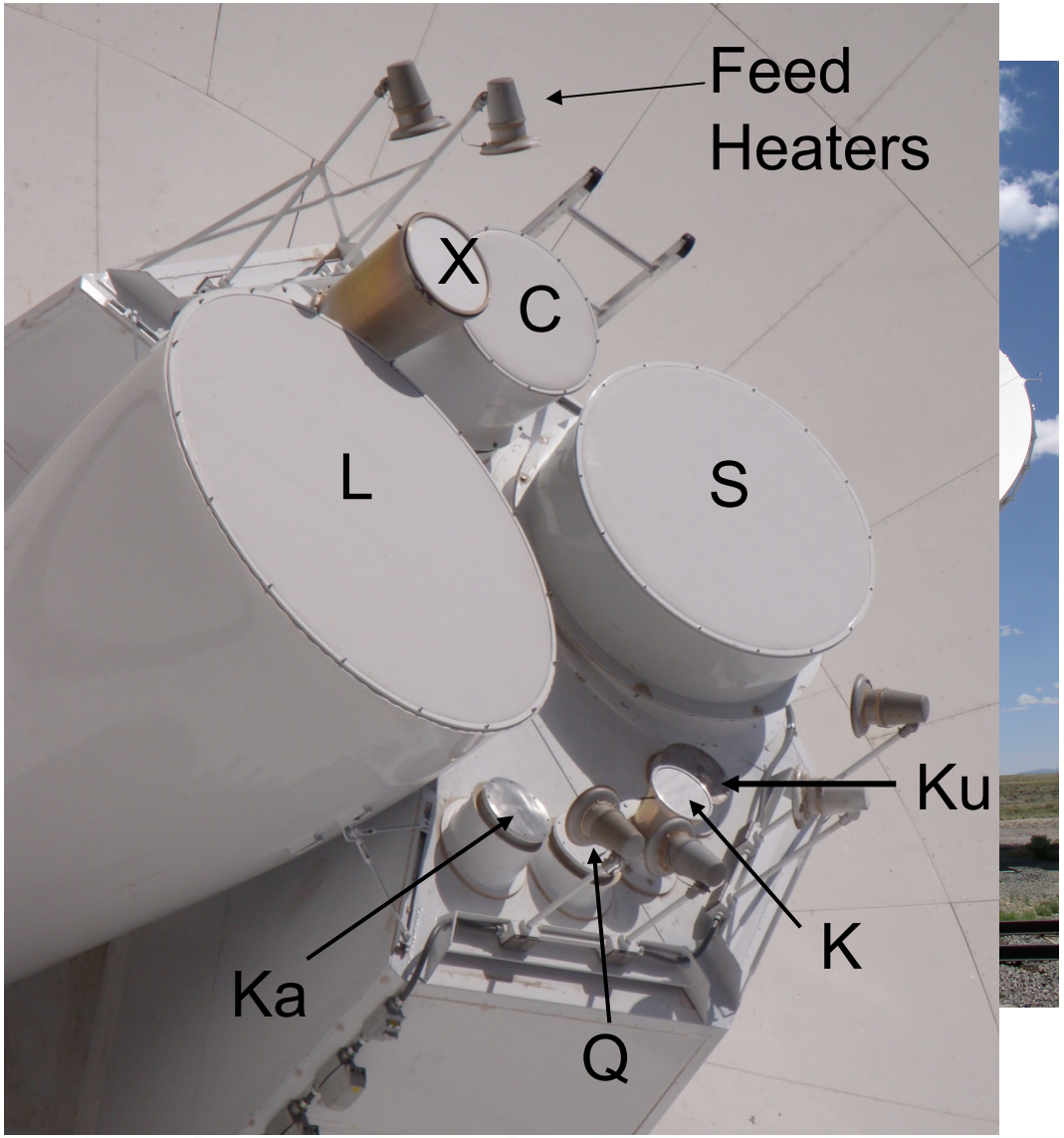
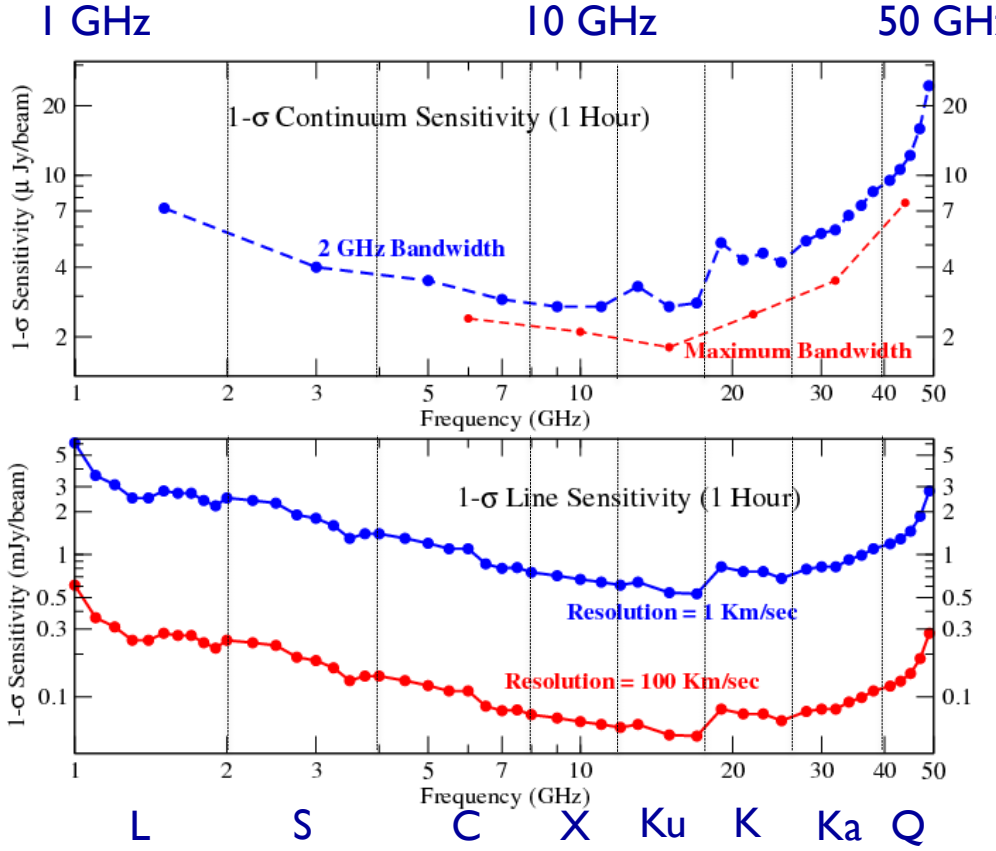


Basic scientific capabilities

Sensitivity & frequency coverage EVLA



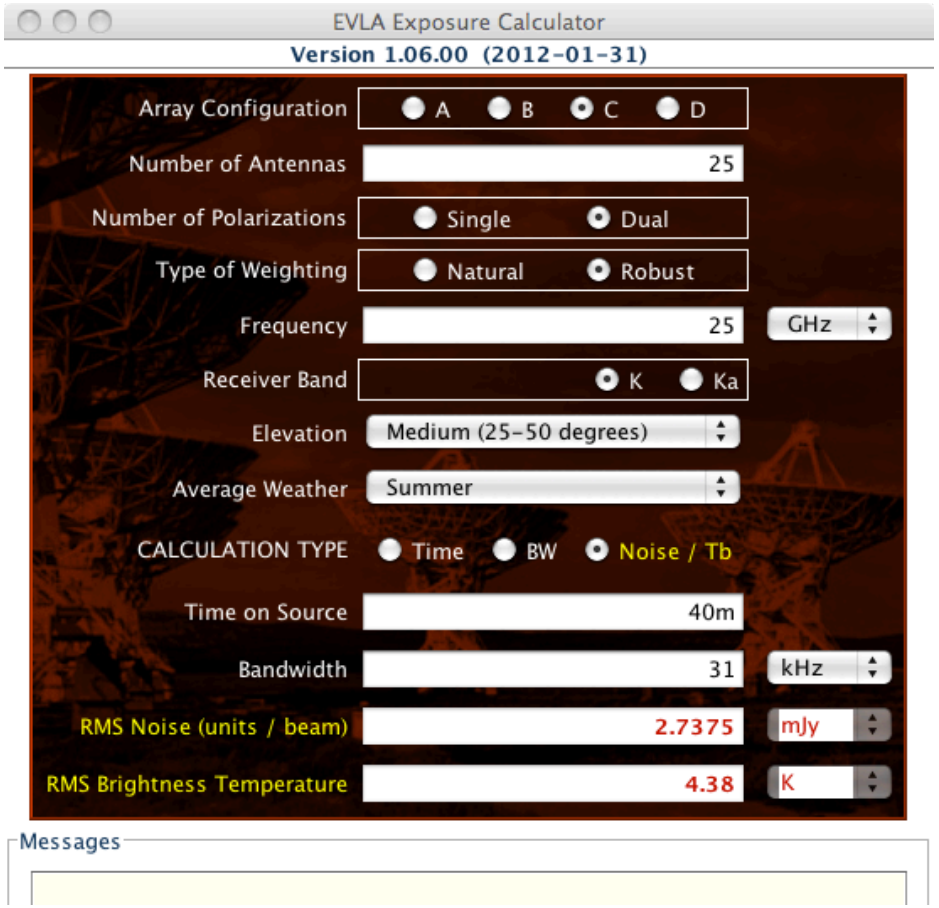
Continuum: ~few microJy/sqrt(hr)

Line 1km/s: ~few mJy/sqrt(hr)

8-bit: 2 x 1 GHz basebands within a given band

3-bit: 4 x 2 GHz basebands within a given band (only offered for wideband)

Sensitivity & frequency coverage EVLA



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- Up to 2:1 bandwidth ratios
- *Worst* spectral resolution: 2 MHz/ channel (full pol'n products)

➔Bandwidth synthesis for better uv-coverage

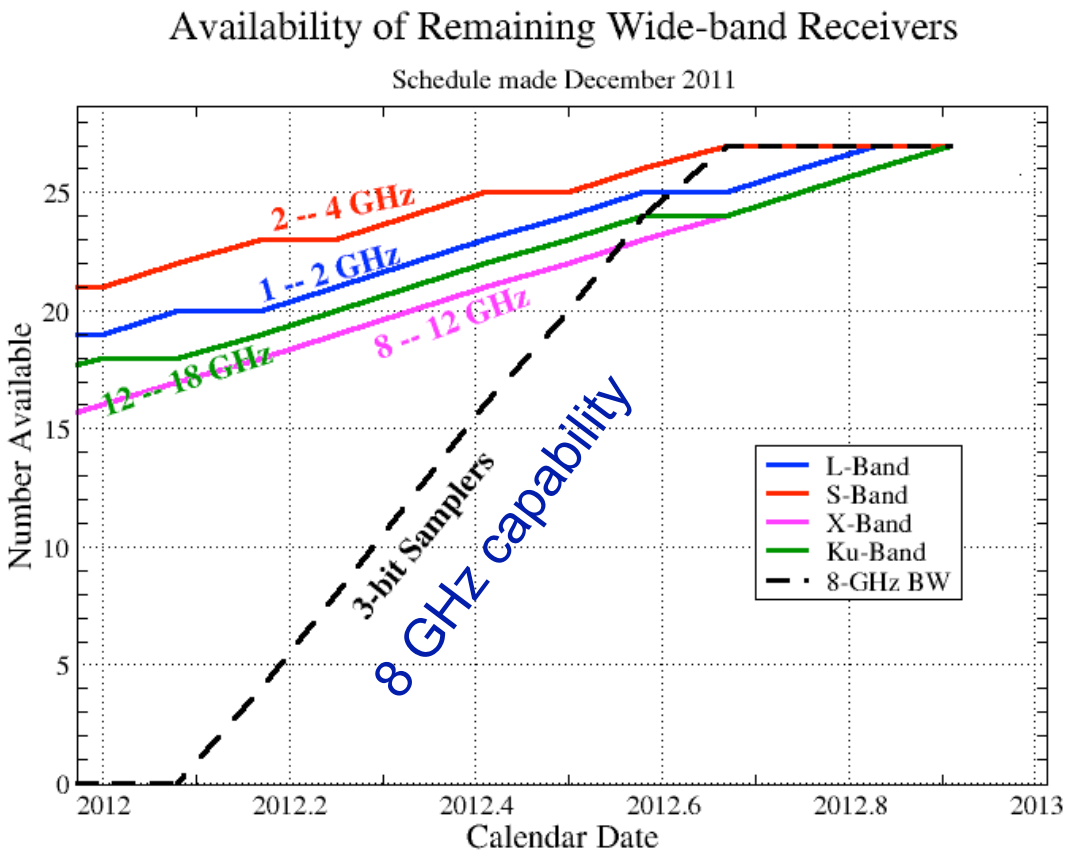
➔Instantaneous spectral indices

Receiver Availability

EVLA

Most receivers are installed

21 antennas have wideband (3-bit) samplers (8 GHz/pol'n)



Complete:

C: 4-8 GHz

K: 18-26.5 GHz

Ka: 26.5–40GHz

Q: 40-50GHz

Angular resolution

EVLA

Configuration	A	B	C	D
B_{max} (km[1])	36.4	11.1	3.4	1.03
B_{min} (km[1])	0.68	0.21	0.035[5]	0.035
	Synthesized Beamwidth θ_{HPBW}(arcsec)[1,2,3]			
74 MHz (4 band)	24	80	260	850
1.5 GHz (L)	1.3	4.3	14	46
3.0 GHz (S)[6]	0.65	2.1	7.0	23
6.0 GHz (C)	0.33	1.0	3.5	12
8.5 GHz (X)[7]	0.23	0.73	2.5	8.1
15 GHz (Ku)[6]	0.13	0.42	1.4	4.6
22 GHz (K)	0.089	0.28	0.95	3.1
33 GHz (Ka)	0.059	0.19	0.63	2.1
45 GHz (Q)	0.043	0.14	0.47	1.5

4 configurations: A → big; D → small

~4 months in each configuration, cycling D C B A

(plus hybrids for southern sources)

Largest angular scale & field-of-view

EVLA

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Field of view (depends on diameter of a single antenna)

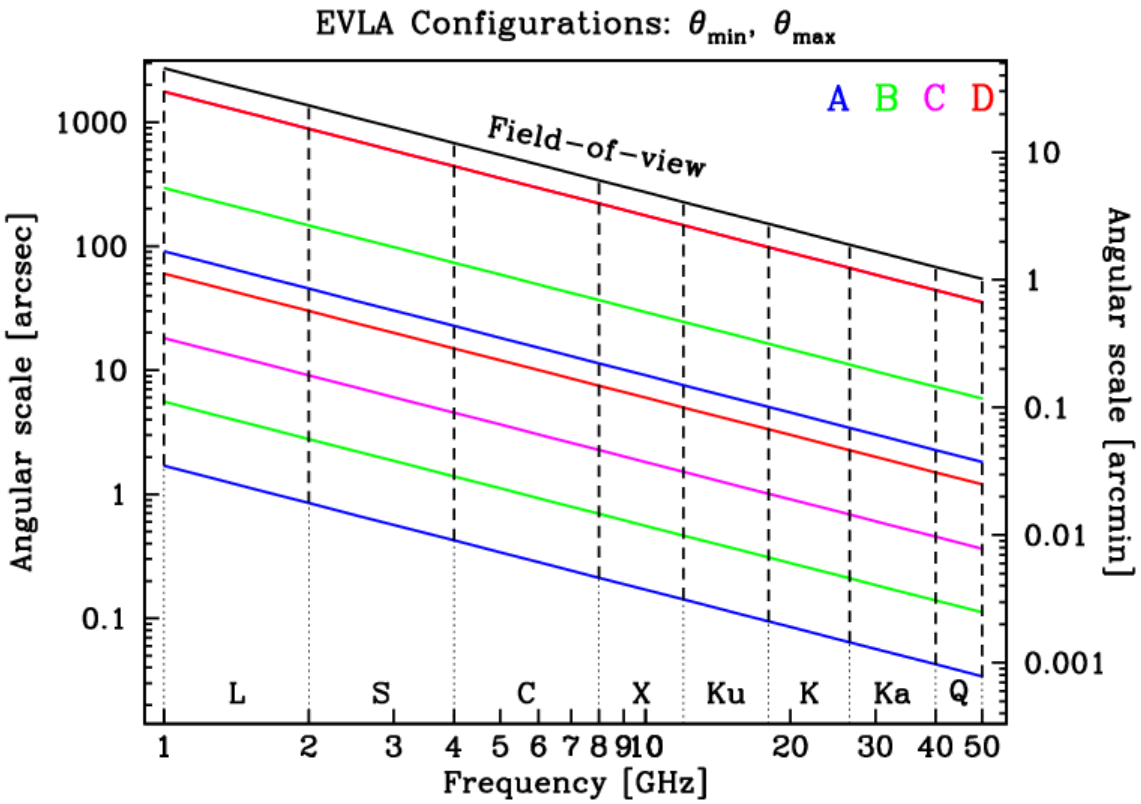
608’
30’
15’
7.5’
5.3’
3’
2’
1.4’
1’

Smaller configurations give better surface brightness sensitivity and don’t filter out larger structures

Imaging beyond primary beam requires *mosaicking*

Angular resolution, largest angular scale, & field-of-view

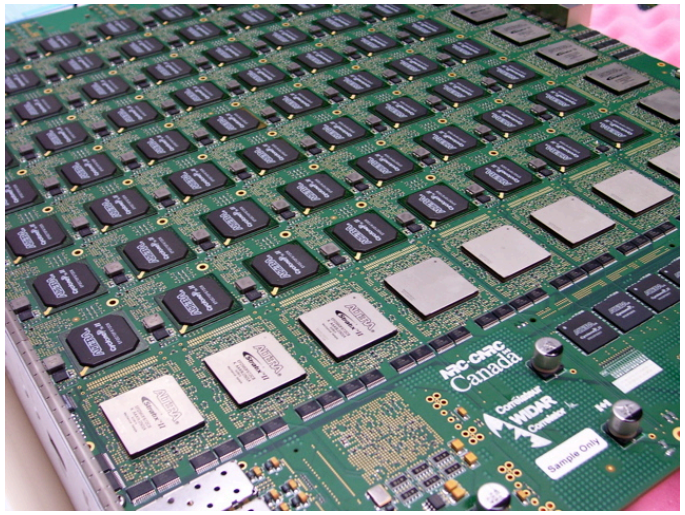
EVLA



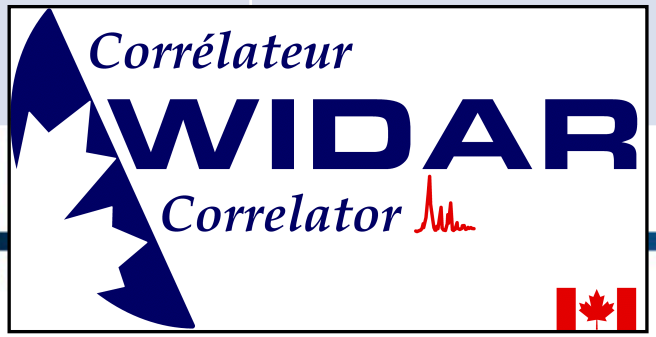
WIDAR Correlator

EVLA

- WIDAR: Wideband Interferometric Digital Architecture
- 10^{16} calculations/s (10 P-ops)
- Fiber bandwidth: 3 Tbits/s
- 16 GHz per antenna = 2600 TV channels
- 175 kW
- 128 Gbits/s output ~ 3 DVD
- 128 baseline boards
- 128 station boards

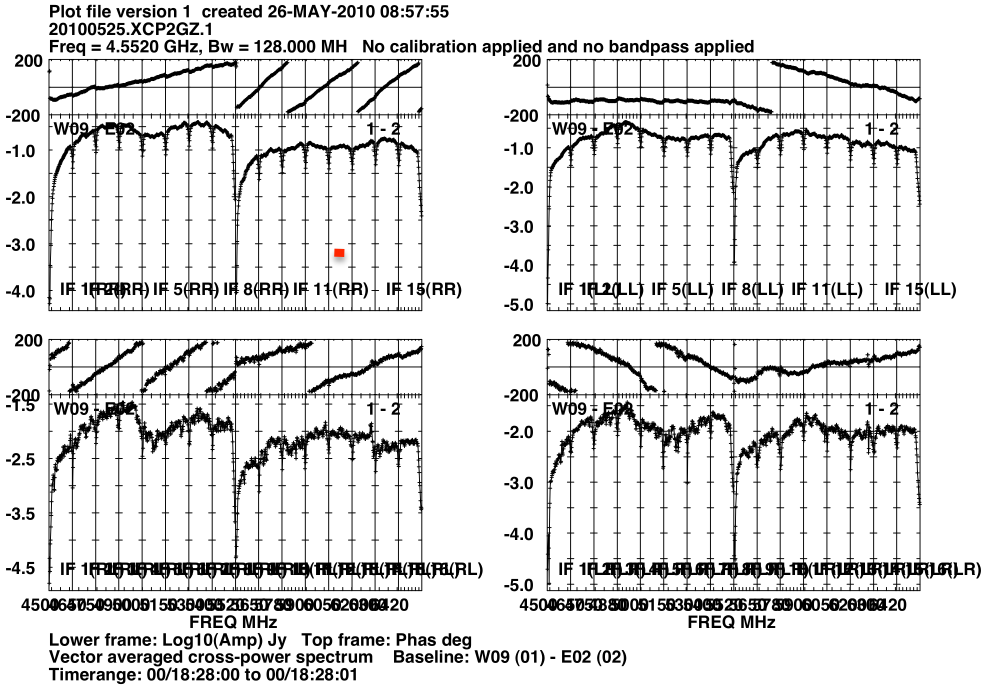


	VLA	WIDAR-now	WIDAR-2013
Quantization	3-level	16/256-level	16/256-level
# antennas	27	28	(32)
Max. bandwidth	0.2 GHz	16 GHz	16 GHz
# subband pairs	1 - 2	1 – 64	1 – 64
# channels (total)	2-512	256 – 32,768	256 – (4,194,304)
Max./min. δv	50 MHz / 381 Hz	2 MHz / 122 Hz	2 MHz / (0.12 Hz)
dt_{min}	1.7 sec	0.01 sec	0.01 sec
Max. data rate	3.3 x 10^3 vis/sec	~10 x 10^6 vis/sec	(1600-16000 x 10^6 vis/sec)
Extras	Phasing VLBI Subarrays	Phasing Subarrays Auto-correlation	Phasing VLBI Subarrays (Pulsar phase bins) (Burst mode) Auto-correlation



One baseline, one dump

- 2 x 1 GHz baseband pairs
- = 16 x 128 MHz subband pairs
- 64 ch/pp/sb → 4096 x 2 MHz channels
- *One baseline, one dump!*



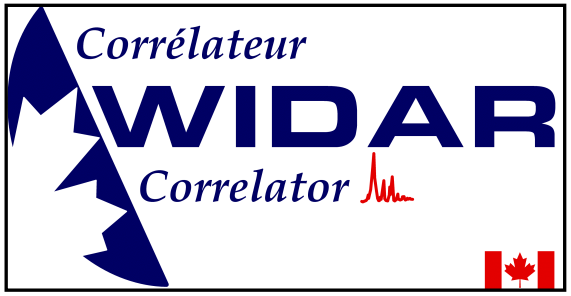
Flexibility: truly independent subbands

64 independent Spectral Windows

Ability to make simultaneous continuum & multiple line measurements

Example: L band, all at once:

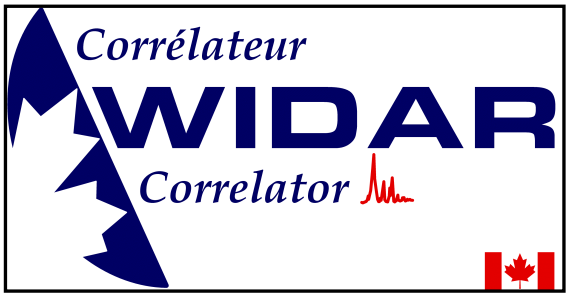
- continuum
- galactic + extragalactic HI imaging & absorption
- OH lines
- >10 radio recombination lines



Flexibility: truly independent subbands

64 independent Spectral Windows

- Tuning
- Bandwidth (31.25 kHz – 128 MHz)
- Number of polarization products (single, dual, full)
- Number of channels
- Trade subbands for channels (hardware stacking)
- Trade time resolution for channels (recirculation)
- Dump rates

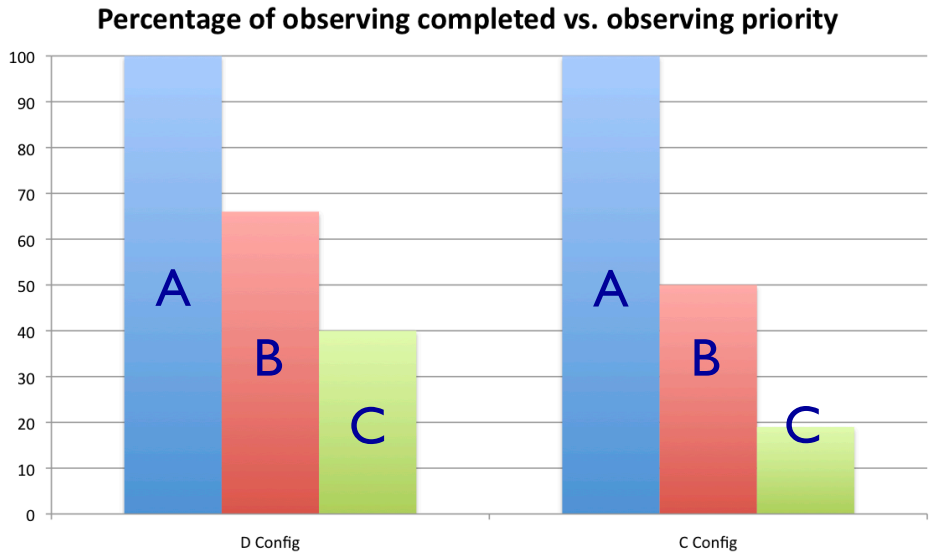


Dynamic scheduling

- Everything is dynamically scheduled
- Can't tell exactly when your schedule will run, or what will have been observed just before that
  - Initial slew is uncertain
- Scheduling is based on:
  - TAC priority (A B C, science, etc.) – i.e., competition
  - *Current* weather (rms phase, wind – by-band defaults, which you can override) – note we do not yet look at the ionosphere, weather predictions, solar activity, opacity, RFI
  - Efficiency

Scheduling considerations

EVLA



- Priority A: observe during requested observing conditions, long SBs are fine
- Priority B: number of projects approved designed to fit into available hours per configuration, but shorter SBs help with scheduling around priority A projects
- Priority C: filler, short SBs (0.5 to 1.0 hr) will improve chances of observation

Dynamic scheduling

- Getting on the telescope:
  - Get your observing schedules in early
  - Short blocks are easier…but require more overhead
  - Can request `filler' time (short bad weather blocks) – note we are accepting much more Priority C than in the past
  - Daytime is harder (competes with commissioning, maintenance)
  - The weather changes during the year

Computing challenges

EVLA

- The EVLA produces a **LOT** of data: ~50 MB/s now, ~75 MB/s for this proposal cycle
  - 1 hour= 180 GB @ 50 MB/s
  - Simply transferring the data is painful → internet or disks
- Complete frequency coverage and wide bandwidths
  - Radio frequency interference (RFI) *everywhere*
  - Instruments vary (e.g., field-of-view goes as wavelength)
  - Sources vary (e.g., freq^2 → factor 4 different in flux over 2:1 bandwidth ratio)
  - Extremely sensitive → sidelobes and dynamic range issues
  - LOTS more science: lines, spectral shapes, polarization, mosaics, on-the-fly mapping

Proposing for the EVLA

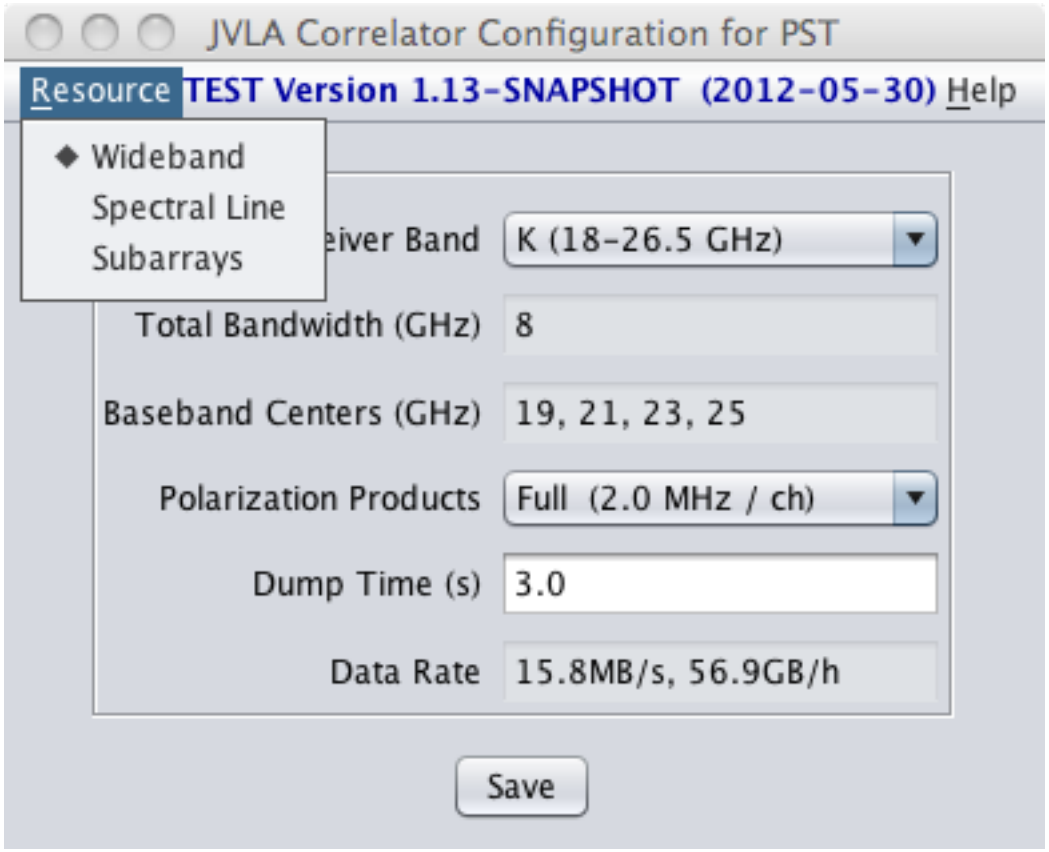
A preview of the July 7, 2012 call for proposals

Initial capabilities for full operations, 2013A

- The move to D configuration in Jan 2013 will mark the start of full operations for the JVLA; at that time we will offer:
- 8-bit sampler system with:
  - Independent and flexible sub-bands, up to **32 total sub-bands, max. 16,384 spectral channels distributed over 2 GHz bandwidth per polarization**
- 3-bit sampler system with:
  - **Low spectral resolution with full 8 GHz bandwidth per polarization** for "continuum" observations and high frequency extragalactic line work
- Multiple sub-arrays:
  - Up **to 3 independent sub-arrays, any band, using low spectral resolution ("continuum" mode) with 2 GHz bandwidth/polarization**
- **Phased array for VLBI**:
  - Up to 128 MHz BW for 2 sub-bands to match VLBA 2 Gbps system
- **Data dump times >=50 ms, data rates <=20 MB/s standard**

Wideband with low res'n: 8 GHz/pol'n

- Full pol'n products: 2 MHz/channel
- Dual pol'n products: 1 MHz/channel
- Single pol'n product: 0.5 MHz/channel



Flexible subbands over 2 x 1 GHz basebands

EVLA

- Two independently-tunable 1 GHz basebands
- Up to 16 subbands in each baseband
  - –Each independently tunable, but can't cross 128 MHz boundaries
  - –128, 64, 32, …, 0.03125 MHz bandwidths
  - –Can choose different bandwidths, polarization products, and channelization for each subband
  - –All must share the same dump time
- Total of 16384 channels spread flexibly over subbands and polarization products: "Baseline Board stacking"

Flexible subbands over 2 x 1 GHz basebands

EVLA

JVLA Correlator Configuration for PST

Resource | TEST Version 1.13-SNAPSHOT (2012-05-30) | Help

Receiver Band: K (18-26.5 GHz)

Baseband Centers (GHz): 25, 26

Dump Time (s): 3.0

Baseband 1

Frequency Range: 24.488GHz - 25.512GHz

DataRate: 6.9MB/s, 24.7GB/h

Subbands

SB	BW	Prod	BlBPs	# Chan	Ch Width (f)	Ch Width (v)	MB/s
1	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
2	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
3	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
4	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
5	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
6	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
7	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
8	128.0MHz	Full	1	64	2MHz	23.1km/s	0.25
9	16.0MHz	Dual	4	512	31.3kHz	360.3m/s	0.98
10	16.0MHz	Dual	4	512	31.3kHz	360.3m/s	0.98
11	16.0MHz	Dual	4	512	31.3kHz	360.3m/s	0.98
12	16.0MHz	Dual	4	512	31.3kHz	360.3m/s	0.98
13	16.0MHz	Dual	4	512	31.3kHz	360.3m/s	0.98
14							
15							
16							

Baseband 2

Frequency Range: 25.488GHz - 26.512GHz

DataRate: 8.8MB/s, 31.6GB/h

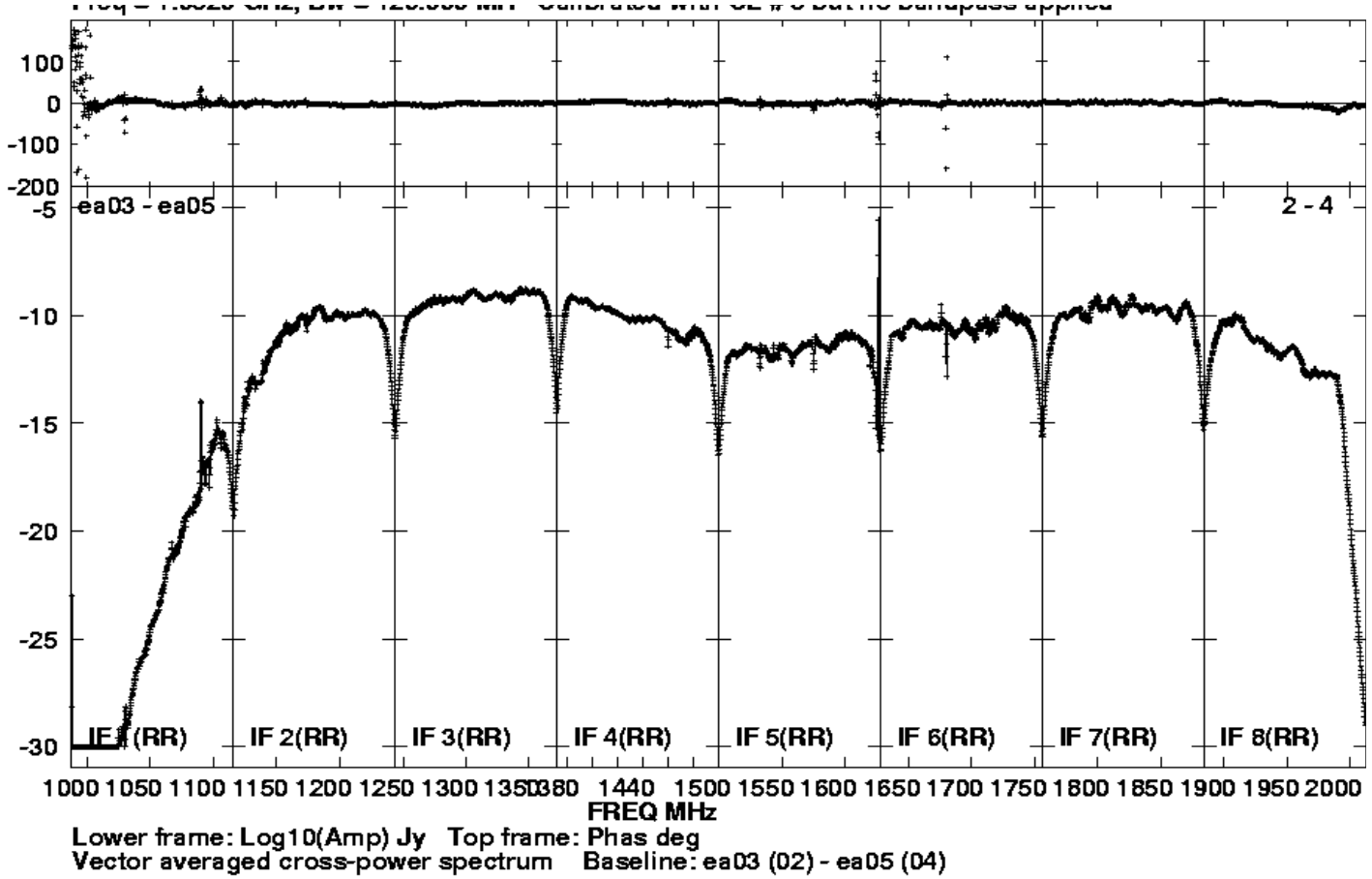
Subbands

SB	BW	Prod	BlBPs	# Chan	Ch Width (f)	Ch Width (v)	MB/s
1	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
2	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
3	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
4	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
5	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
6	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
7	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
8	128.0MHz	Full	1	64	2MHz	24.0km/s	0.25
9	16.0MHz	Dual	4	512	31.3kHz	374.7m/s	0.98
10	16.0MHz	Dual	4	512	31.3kHz	374.7m/s	0.98
11	4.0MHz	Dual	7	896	4.5kHz	53.5m/s	1.71
12	1.0MHz	RR	3	768	1.3kHz	15.6m/s	0.73
13	31.25kHz	RR	10	2,560	12.2Hz	0.1m/s	2.42
14							
15							
16							

Total Data Rate: 15.6MB/s, 56.3GB/h

Save

Edge effects

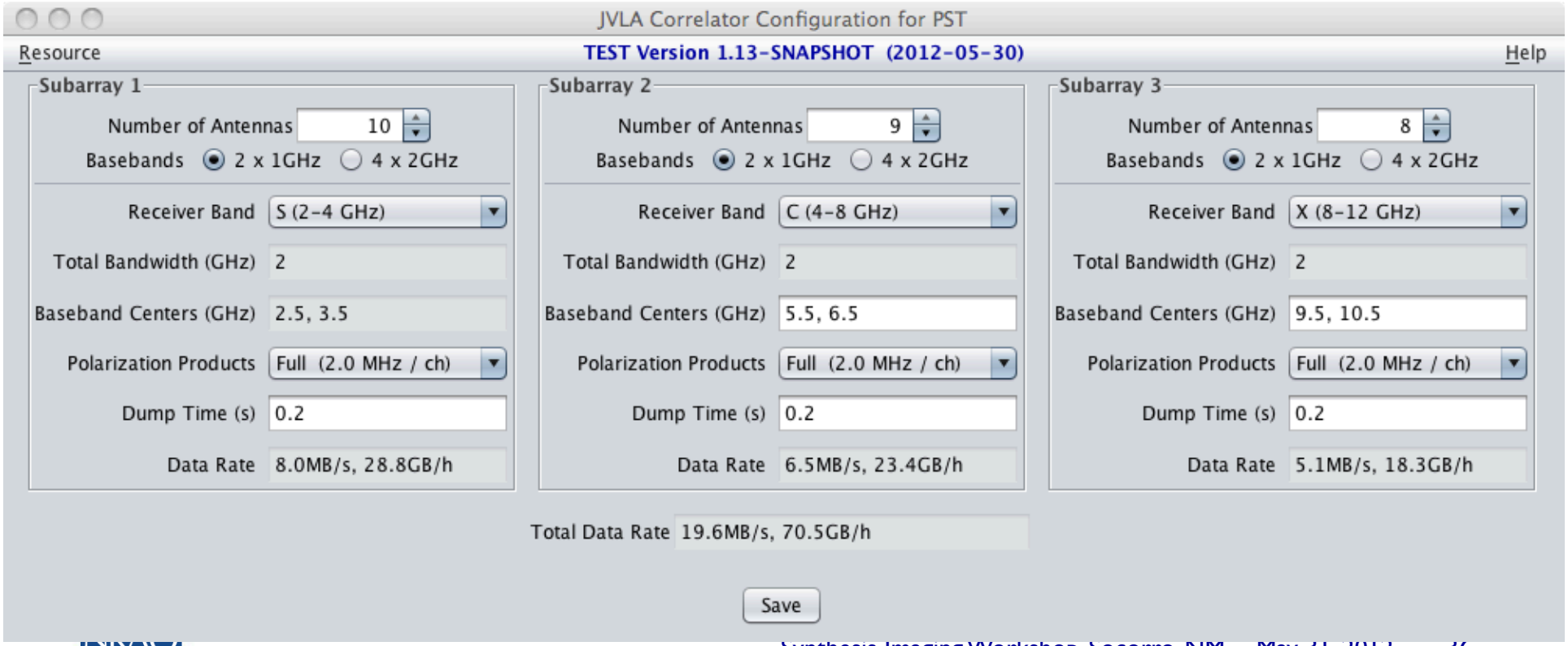


- Subband edges (few channels) are noisier
- Can lose 10s of channels for narrowest subbands

Up to 3 "continuum" subarrays

EVLA

- 2 x 1 GHz bandwidth
  - –Independently tunable
- Spectral resolution:
  - –2 MHz with full pol'n products
  - –1 MHz with dual pol'n products
  - –0.5 MHz with single pol'n product



Dump times and data rates

EVLA

- Standard allows: >= 50msec, <= 20 MB/s
  - –20 MB/s = 70 GB/hr
- Special justification needed for dump times faster than the defaults (1sec A & B-high, 3sec B-low/C, 5sec D)
- Data rate limit is set by disk space (!), which translates directly to $$$

Phased VLA for VLBI

EVLA

- Two independently-tunable subband pairs
  - –Cannot change bandwidth during the observation – think hard about phasing!
- 2 bit sampling → max 2 Gbps

Shared Risk observing, semester 2013A

- In order to push boundaries of standard capabilities we will continue to offer a Shared Risk observing program
  - Correlator set-ups that are not well tested but can be scheduled through dynamic scheduler
  - Programs will receive test time to verify feasibility
  - Residence not required (unless the tests fail)
  - Examples:
    - Sub-arrays with 3-bit samplers
    - Fast dump modes up to 60 MB/s (8-bit)
    - 3-bit with sub-band BWs narrower than 128 MHz

RSRO program, semester 2013A

EVLA

- RSRO program will continue for technically challenging capabilities driven by the community
  - Residency requirements will be relaxed over current (no 3-month minimum)
  - Examples:
    - On-the-fly (OTF) mosaics
    - Phased array for non-VLBI
    - General recirculation set-ups (more channels)
    - Real-time transient detection
    - Pulsar observing modes

Proposals

August1, 2012 deadline

EVLA

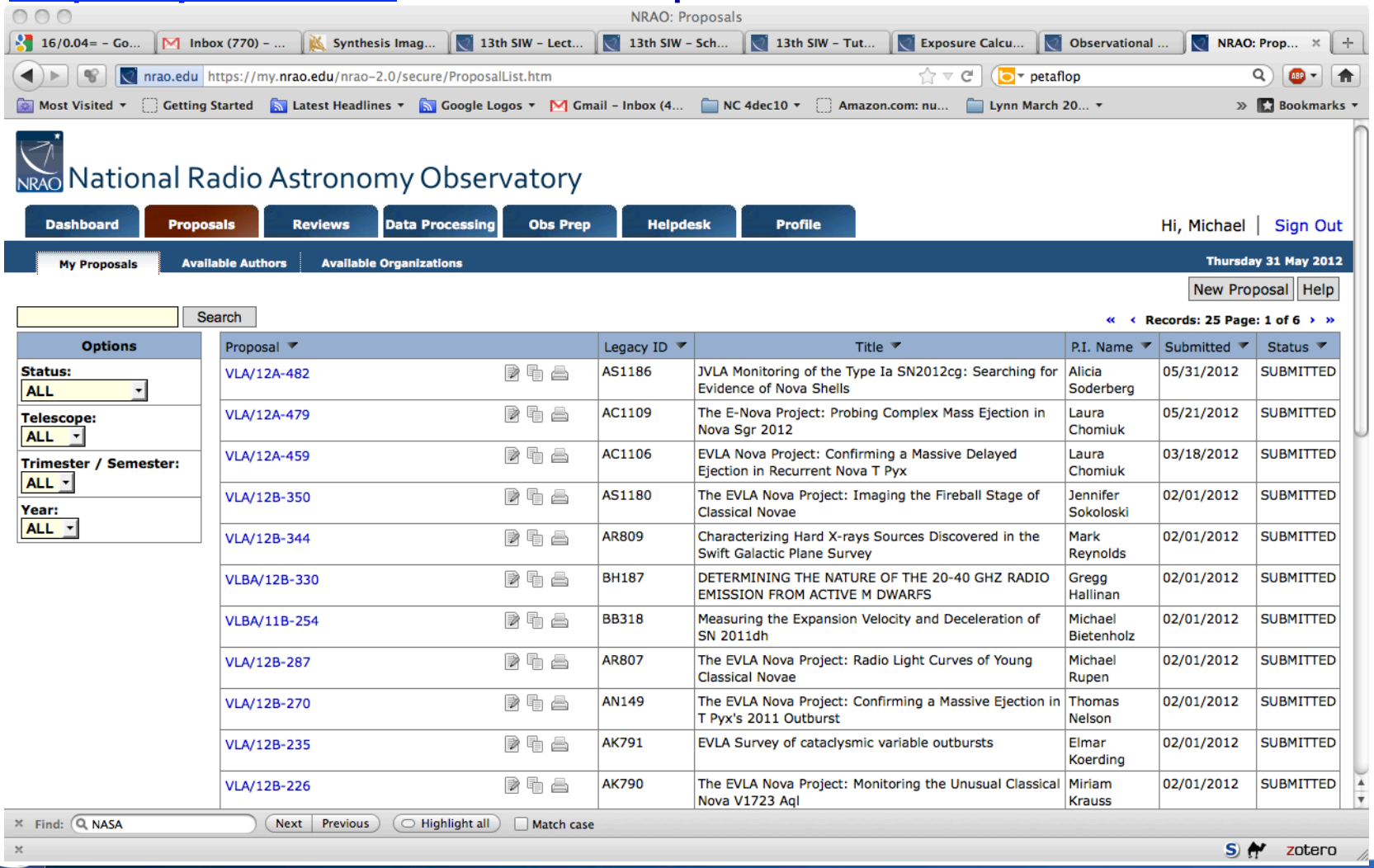
- Any configuration
- D config currently scheduled Jan 25- Apr 27, 2013
- Regular, Rapid response, Large proposals (>200 hrs)
  - Key science
  - Proprietary period normally 12months since last observations
- **Observing time *includes* overheads** (flux, phase, bandpass calibration; slew time; dummy scans)
- Joint proposals with Chandra, Fermi, Spitzer
- Future calls: Feb 1, Aug 1

– DDT (ToO/Exploratory/EPO) proposals anytime (<=6 mos. proprietary period)

Proposal Submission Tool (PST)

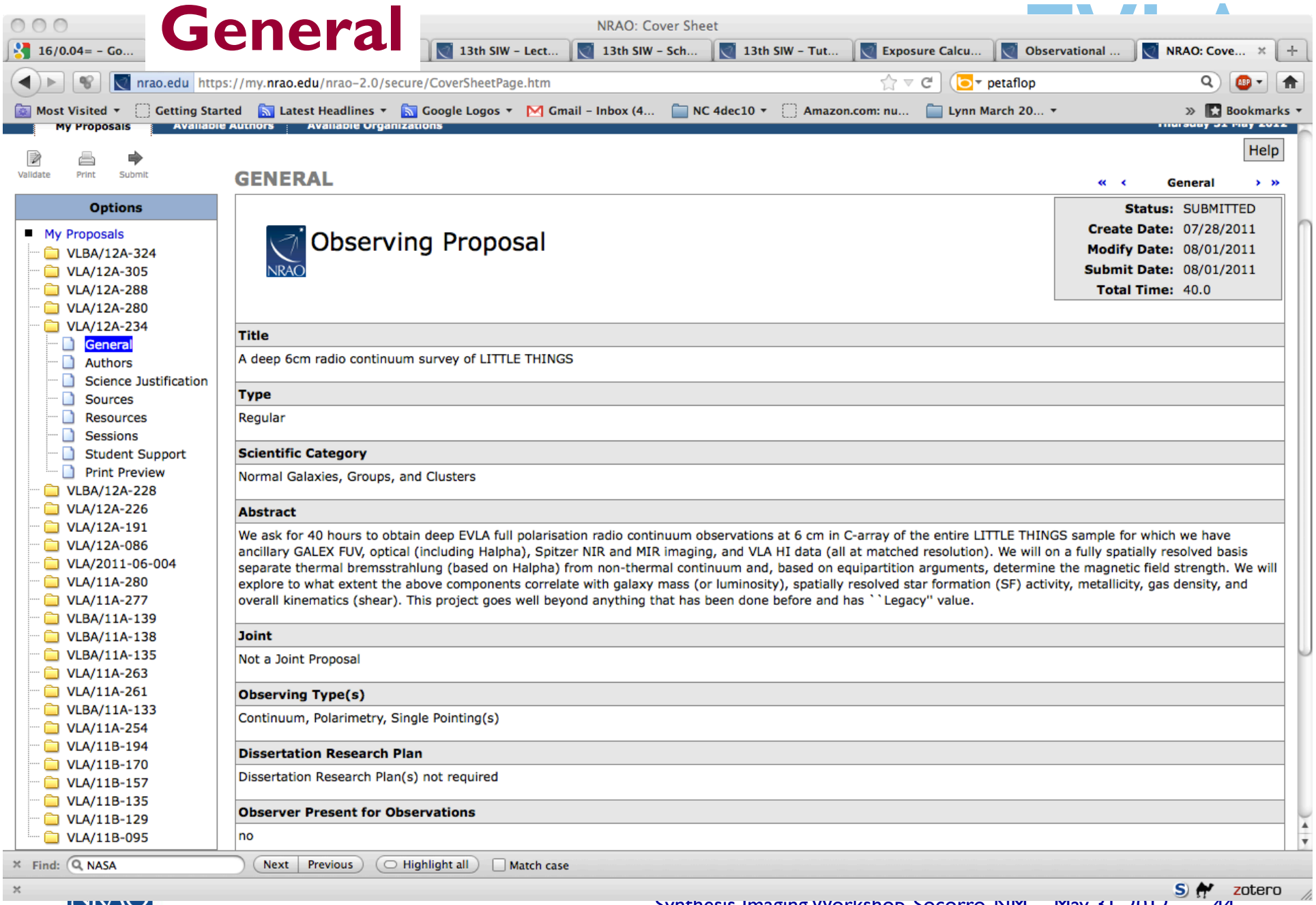
EVLA

- http://my.nrao.edu, click on Proposals



Proposal	Legacy ID	Title	P.I. Name	Submitted	Status
VLA/12A-482	AS1186	JVLA Monitoring of the Type Ia SN2012cg: Searching for Evidence of Nova Shells	Alicia Soderberg	05/31/2012	SUBMITTED
VLA/12A-479	AC1109	The E-Nova Project: Probing Complex Mass Ejection in Nova Sgr 2012	Laura Chomiuk	05/21/2012	SUBMITTED
VLA/12A-459	AC1106	EVLA Nova Project: Confirming a Massive Delayed Ejection in Recurrent Nova T Pyx	Laura Chomiuk	03/18/2012	SUBMITTED
VLA/12B-350	AS1180	The EVLA Nova Project: Imaging the Fireball Stage of Classical Novae	Jennifer Sokoloski	02/01/2012	SUBMITTED
VLA/12B-344	AR809	Characterizing Hard X-rays Sources Discovered in the Swift Galactic Plane Survey	Mark Reynolds	02/01/2012	SUBMITTED
VLBA/12B-330	BH187	DETERMINING THE NATURE OF THE 20-40 GHZ RADIO EMISSION FROM ACTIVE M DWARFS	Gregg Hallinan	02/01/2012	SUBMITTED
VLBA/11B-254	BB318	Measuring the Expansion Velocity and Deceleration of SN 2011dh	Michael Bietenholz	02/01/2012	SUBMITTED
VLA/12B-287	AR807	The EVLA Nova Project: Radio Light Curves of Young Classical Novae	Michael Rupen	02/01/2012	SUBMITTED
VLA/12B-270	AN149	The EVLA Nova Project: Confirming a Massive Ejection in T Pyx's 2011 Outburst	Thomas Nelson	02/01/2012	SUBMITTED
VLA/12B-235	AK791	EVLA Survey of cataclysmic variable outbursts	Elmar Koerding	02/01/2012	SUBMITTED
VLA/12B-226	AK790	The EVLA Nova Project: Monitoring the Unusual Classical Nova V1723 Aql	Miriam Krauss	02/01/2012	SUBMITTED

General


NRAO: Cover Sheet
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Most Visited
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Print
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Options
My Proposals
VLBA/12A-324
VLA/12A-305
VLA/12A-288
VLA/12A-280
VLA/12A-234
General
Authors
Science Justification
Sources
Resources
Sessions
Student Support
Print Preview
VLBA/12A-228
VLA/12A-226
VLA/12A-191
VLA/12A-086
VLA/2011-06-004
VLA/11A-280
VLA/11A-277
VLBA/11A-139
VLBA/11A-138
VLBA/11A-135
VLA/11A-263
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VLA/11B-194
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VLA/11B-157
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VLA/11B-129
VLA/11B-095
Observing Proposal
Status: SUBMITTED
Create Date: 07/28/2011
Modify Date: 08/01/2011
Submit Date: 08/01/2011
Total Time: 40.0
Title
A deep 6cm radio continuum survey of LITTLE THINGS
Type
Regular
Scientific Category
Normal Galaxies, Groups, and Clusters
Abstract
We ask for 40 hours to obtain deep EVLA full polarisation radio continuum observations at 6 cm in C-array of the entire LITTLE THINGS sample for which we have ancillary GALEX FUV, optical (including Halpha), Spitzer NIR and MIR imaging, and VLA HI data (all at matched resolution). We will on a fully spatially resolved basis separate thermal bremsstrahlung (based on Halpha) from non-thermal continuum and, based on equipartition arguments, determine the magnetic field strength. We will explore to what extent the above components correlate with galaxy mass (or luminosity), spatially resolved star formation (SF) activity, metallicity, gas density, and overall kinematics (shear). This project goes well beyond anything that has been done before and has ``Legacy'' value.
Joint
Not a Joint Proposal
Observing Type(s)
Continuum, Polarimetry, Single Pointing(s)
Dissertation Research Plan
Dissertation Research Plan(s) not required
Observer Present for Observations
no
Find: NASA
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Match case
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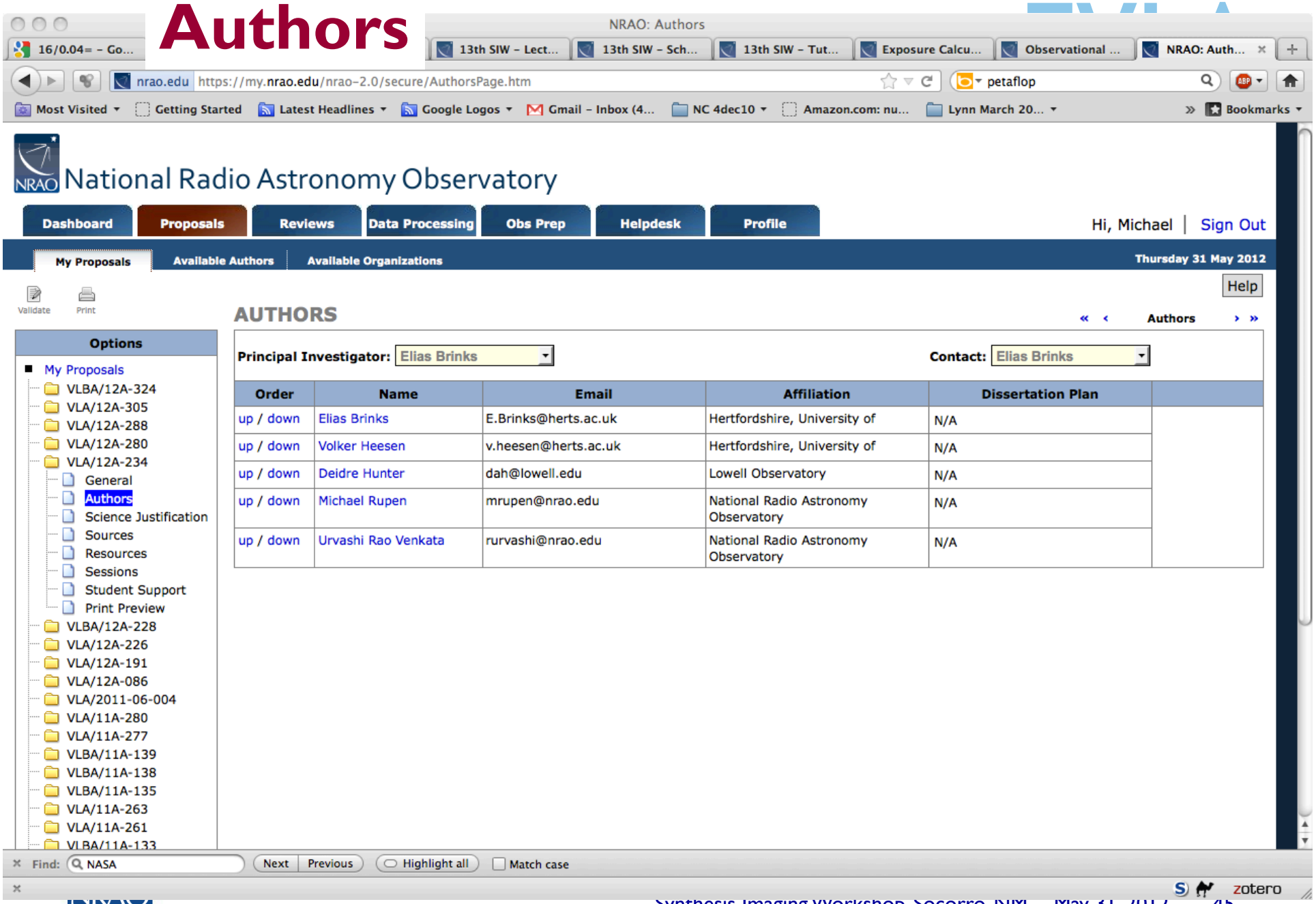
Authors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Thursday 31 May 2012
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Print
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AUTHORS
Authors
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My Proposals
VLBA/12A-324
VLA/12A-305
VLA/12A-288
VLA/12A-280
VLA/12A-234
General
Authors
Science Justification
Sources
Resources
Sessions
Student Support
Print Preview
VLBA/12A-228
VLA/12A-226
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VLA/11A-261
VLBA/11A-133
Principal Investigator: Elias Brinks
Contact: Elias Brinks
Order | Name | Email | Affiliation | Dissertation Plan
up / down | Elias Brinks | E.Brinks@herts.ac.uk | Hertfordshire, University of | N/A
up / down | Volker Heesen | v.heesen@herts.ac.uk | Hertfordshire, University of | N/A
up / down | Deidre Hunter | dah@lowell.edu | Lowell Observatory | N/A
up / down | Michael Rupen | mrupen@nrao.edu | National Radio Astronomy Observatory | N/A
up / down | Urvashi Rao Venkata | rurvashi@nrao.edu | National Radio Astronomy Observatory | N/A
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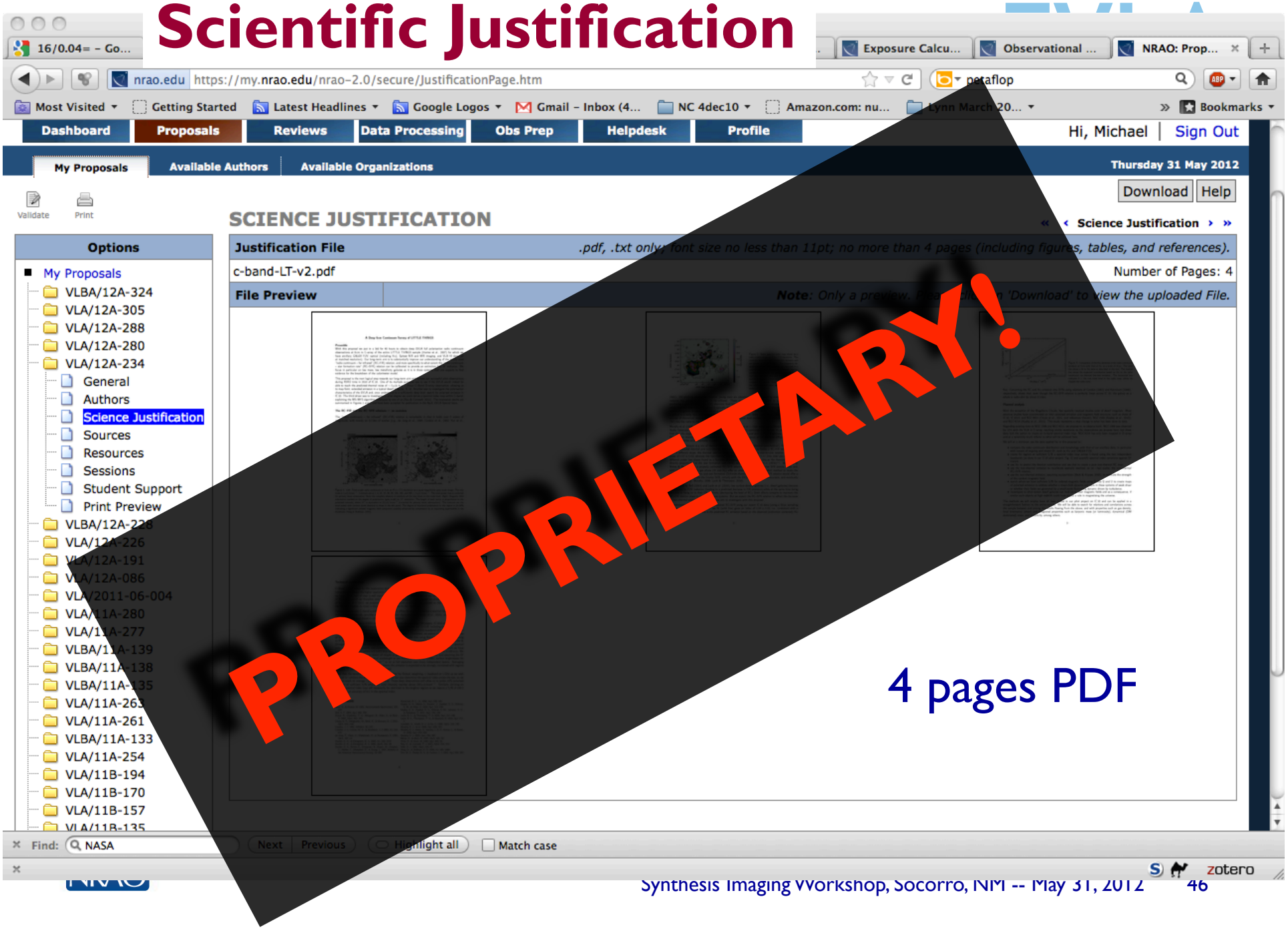
Scientific Justification



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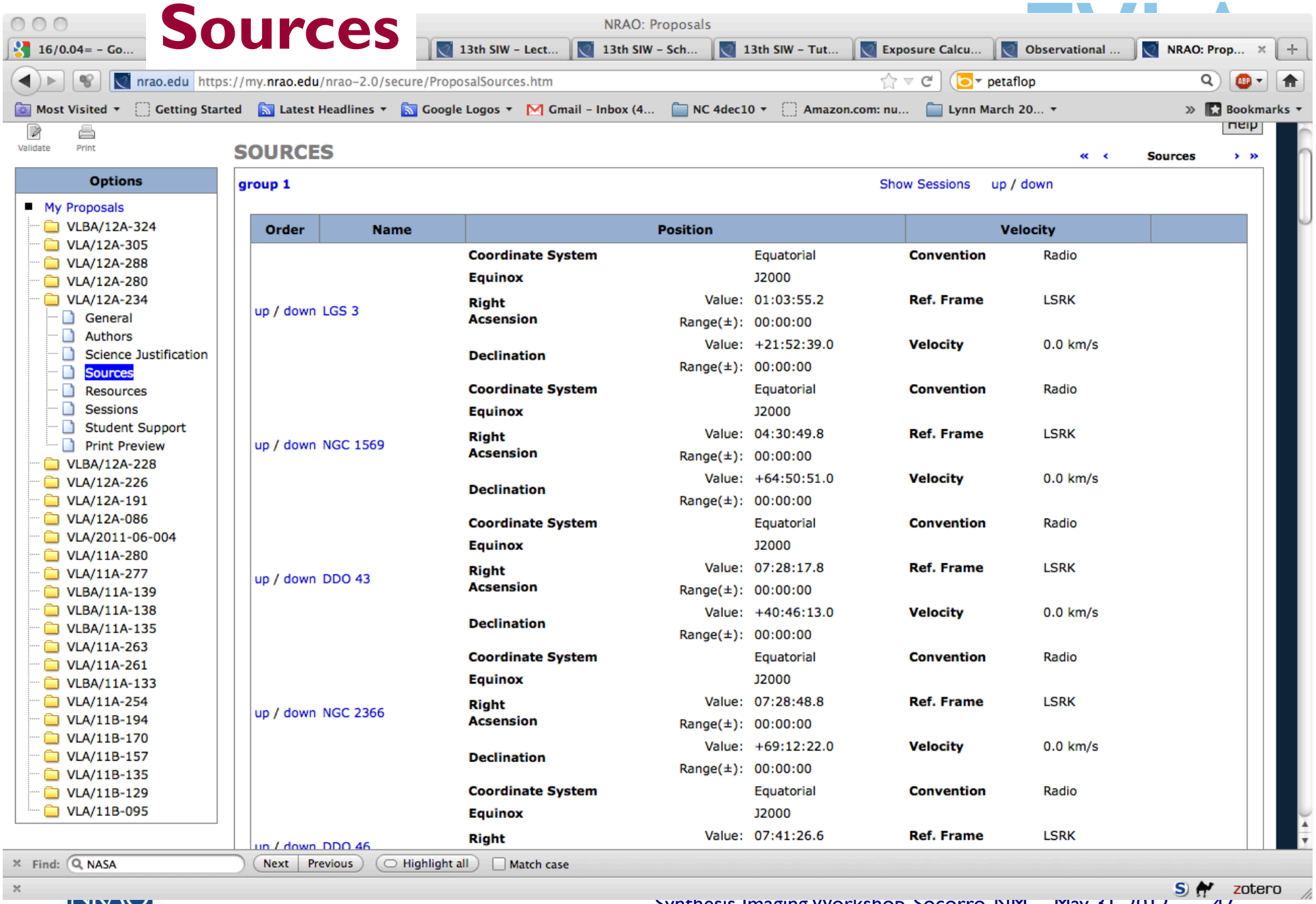
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SOURCES
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VLA/12A-280
VLA/12A-234
General
Authors
Science Justification
Sources
Resources
Sessions
Student Support
Print Preview
VLBA/12A-228
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VLA/2011-06-004
VLA/11A-280
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group 1
Show Sessions
up / down
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Name
Position
Velocity
Coordinate System
Equatorial
Convention
Radio
Equinox
J2000
Right Ascension
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Ref. Frame
LSRK
up / down LGS 3
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Range(±): 00:00:00
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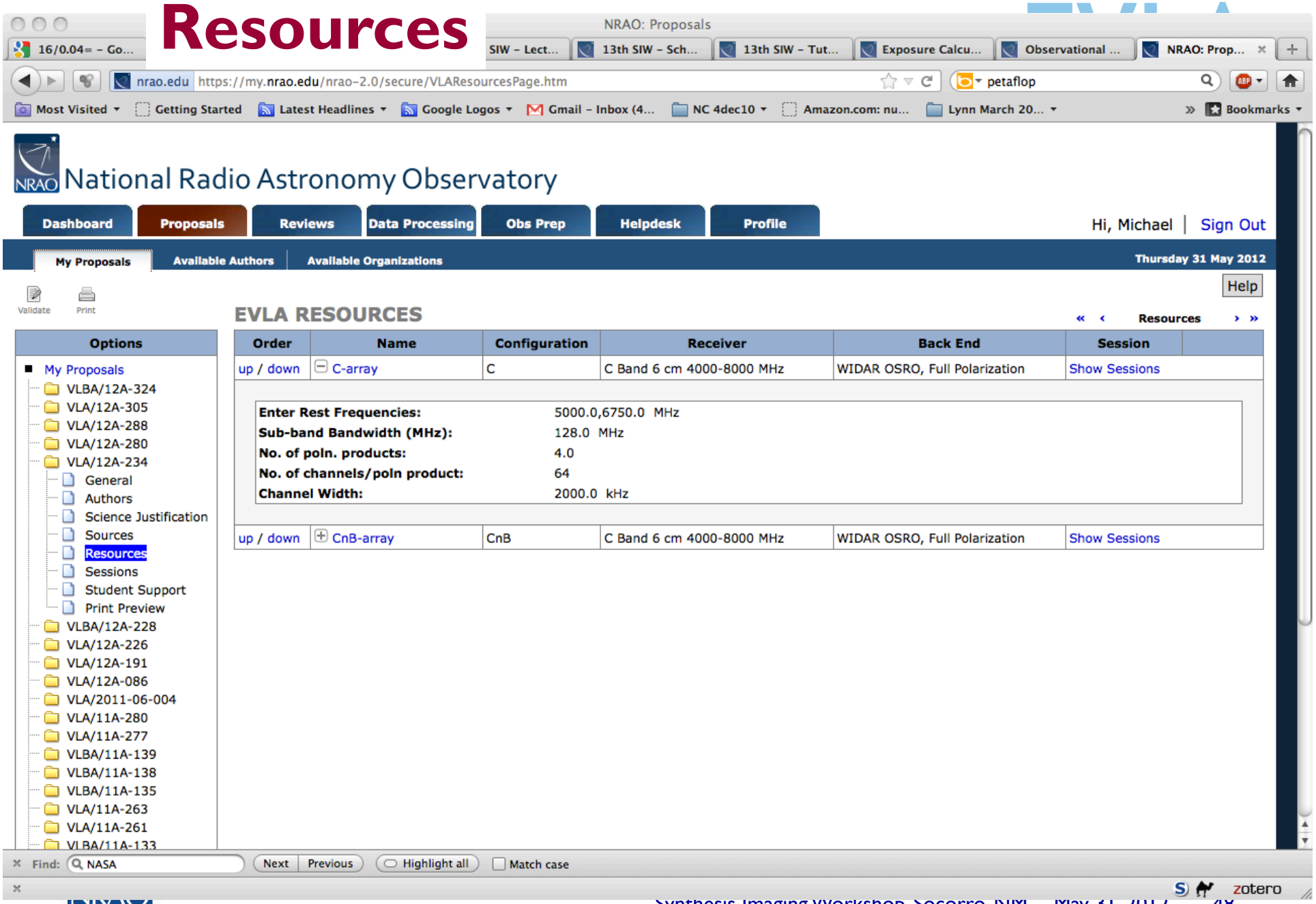
Resources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Print
Help
EVLA RESOURCES
Resources
Options
My Proposals
VLBA/12A-324
VLA/12A-305
VLA/12A-288
VLA/12A-280
VLA/12A-234
General
Authors
Science Justification
Sources
Resources
Sessions
Student Support
Print Preview
VLBA/12A-228
VLA/12A-226
VLA/12A-191
VLA/12A-086
VLA/2011-06-004
VLA/11A-280
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VLBA/11A-133
Order
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Configuration
Receiver
Back End
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up / down
C-array
C
C Band 6 cm 4000-8000 MHz
WIDAR OSRO, Full Polarization
Show Sessions
Enter Rest Frequencies:
5000.0,6750.0 MHz
Sub-band Bandwidth (MHz):
128.0 MHz
No. of poln. products:
4.0
No. of channels/poln product:
64
Channel Width:
2000.0 kHz
up / down
CnB-array
CnB
C Band 6 cm 4000-8000 MHz
WIDAR OSRO, Full Polarization
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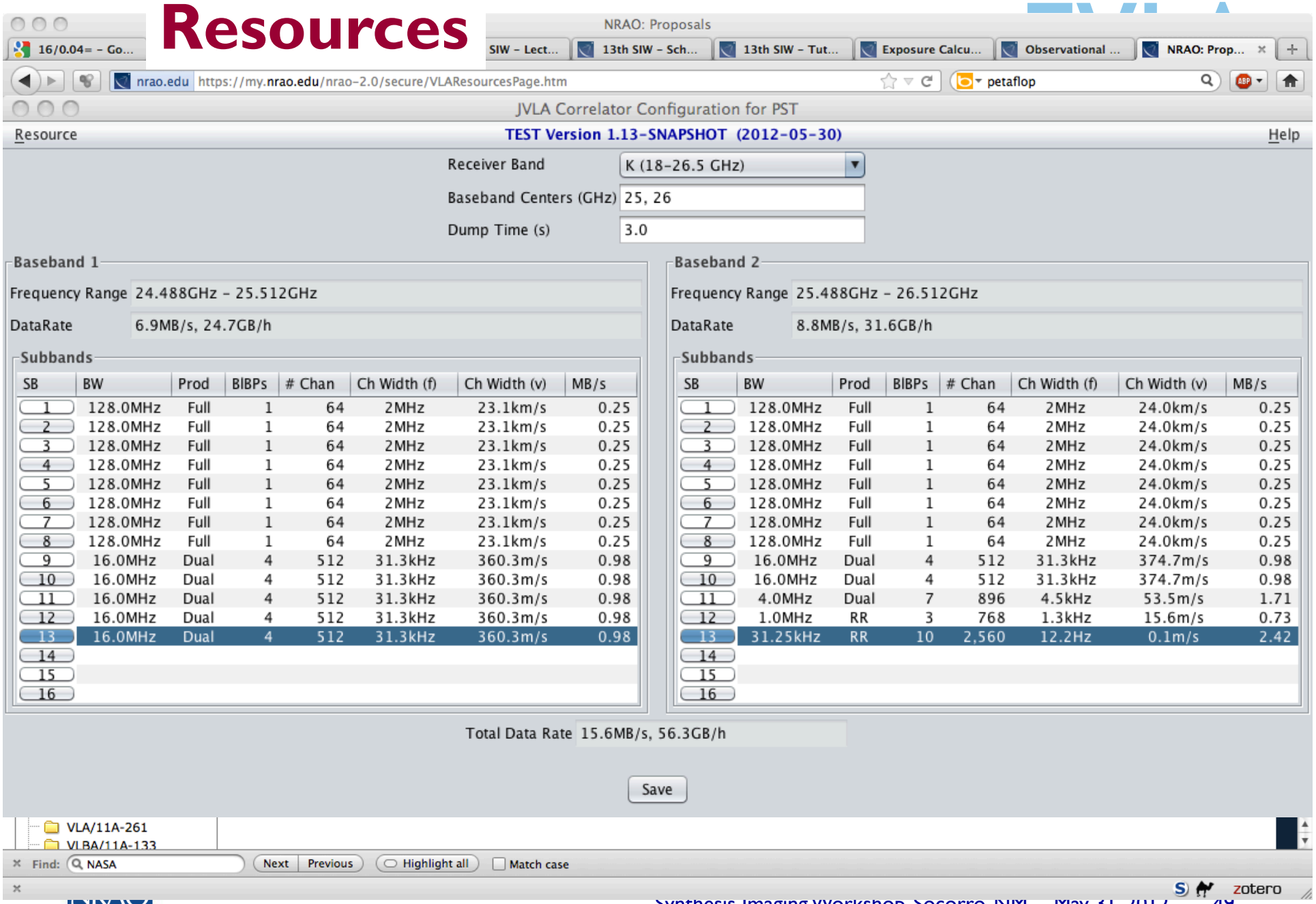
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petaflop
JVLA Correlator Configuration for PST
Resource
TEST Version 1.13-SNAPSHOT (2012-05-30)
Help
Receiver Band
K (18-26.5 GHz)
Baseband Centers (GHz)
25, 26
Dump Time (s)
3.0
Baseband 1
Frequency Range
24.488GHz - 25.512GHz
DataRate
6.9MB/s, 24.7GB/h
Subbands
SB BW Prod BlBPs # Chan Ch Width (f) Ch Width (v) MB/s
1 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
2 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
3 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
4 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
5 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
6 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
7 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
8 128.0MHz Full 1 64 2MHz 23.1km/s 0.25
9 16.0MHz Dual 4 512 31.3kHz 360.3m/s 0.98
10 16.0MHz Dual 4 512 31.3kHz 360.3m/s 0.98
11 16.0MHz Dual 4 512 31.3kHz 360.3m/s 0.98
12 16.0MHz Dual 4 512 31.3kHz 360.3m/s 0.98
13 16.0MHz Dual 4 512 31.3kHz 360.3m/s 0.98
14
15
16
Baseband 2
Frequency Range
25.488GHz - 26.512GHz
DataRate
8.8MB/s, 31.6GB/h
Subbands
SB BW Prod BlBPs # Chan Ch Width (f) Ch Width (v) MB/s
1 128.0MHz Full 1 64 2MHz 24.0km/s 0.25
2 128.0MHz Full 1 64 2MHz 24.0km/s 0.25
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4 128.0MHz Full 1 64 2MHz 24.0km/s 0.25
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6 128.0MHz Full 1 64 2MHz 24.0km/s 0.25
7 128.0MHz Full 1 64 2MHz 24.0km/s 0.25
8 128.0MHz Full 1 64 2MHz 24.0km/s 0.25
9 16.0MHz Dual 4 512 31.3kHz 374.7m/s 0.98
10 16.0MHz Dual 4 512 31.3kHz 374.7m/s 0.98
11 4.0MHz Dual 7 896 4.5kHz 53.5m/s 1.71
12 1.0MHz RR 3 768 1.3kHz 15.6m/s 0.73
13 31.25kHz RR 10 2,560 12.2Hz 0.1m/s 2.42
14
15
16
Total Data Rate 15.6MB/s, 56.3GB/h
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VLBA/11A-133
Find: NASA
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Previous
Highlight all
Match case
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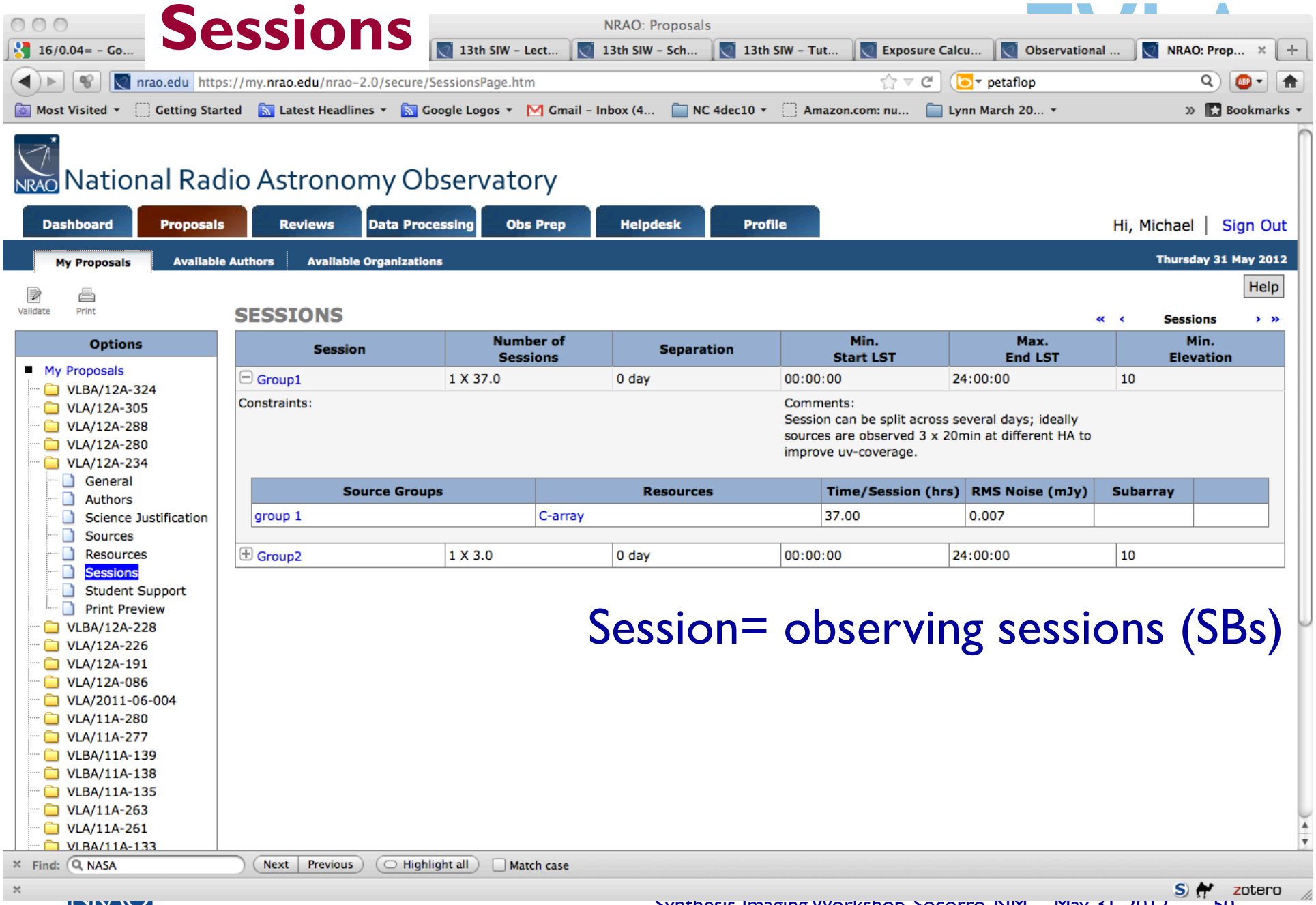
Sessions

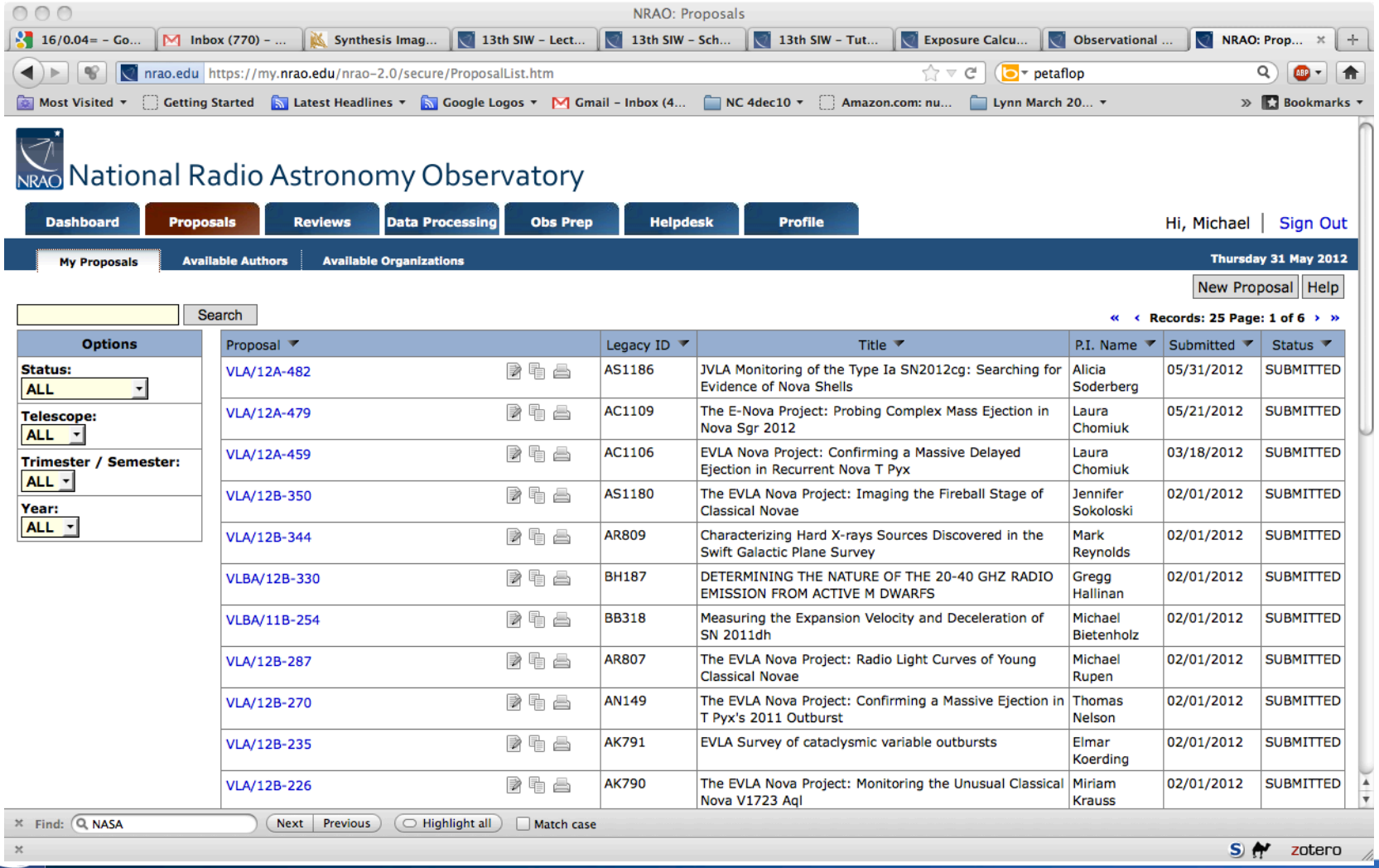


Session= observing sessions (SBs)

Proposal Submission Tool (PST)

EVLA

Preview, verify, & submit!



Proposal	Legacy ID	Title	P.I. Name	Submitted	Status
VLA/12A-482	AS1186	JVLA Monitoring of the Type Ia SN2012cg: Searching for Evidence of Nova Shells	Alicia Soderberg	05/31/2012	SUBMITTED
VLA/12A-479	AC1109	The E-Nova Project: Probing Complex Mass Ejection in Nova Sgr 2012	Laura Chomiuk	05/21/2012	SUBMITTED
VLA/12A-459	AC1106	EVLA Nova Project: Confirming a Massive Delayed Ejection in Recurrent Nova T Pyx	Laura Chomiuk	03/18/2012	SUBMITTED
VLA/12B-350	AS1180	The EVLA Nova Project: Imaging the Fireball Stage of Classical Novae	Jennifer Sokoloski	02/01/2012	SUBMITTED
VLA/12B-344	AR809	Characterizing Hard X-rays Sources Discovered in the Swift Galactic Plane Survey	Mark Reynolds	02/01/2012	SUBMITTED
VLBA/12B-330	BH187	DETERMINING THE NATURE OF THE 20-40 GHZ RADIO EMISSION FROM ACTIVE M DWARFS	Gregg Hallinan	02/01/2012	SUBMITTED
VLBA/11B-254	BB318	Measuring the Expansion Velocity and Deceleration of SN 2011dh	Michael Bietenholz	02/01/2012	SUBMITTED
VLA/12B-287	AR807	The EVLA Nova Project: Radio Light Curves of Young Classical Novae	Michael Rupen	02/01/2012	SUBMITTED
VLA/12B-270	AN149	The EVLA Nova Project: Confirming a Massive Ejection in T Pyx's 2011 Outburst	Thomas Nelson	02/01/2012	SUBMITTED
VLA/12B-235	AK791	EVLA Survey of cataclysmic variable outbursts	Elmar Koerding	02/01/2012	SUBMITTED
VLA/12B-226	AK790	The EVLA Nova Project: Monitoring the Unusual Classical Nova V1723 Aql	Miriam Krauss	02/01/2012	SUBMITTED

Things to think about

- **Overhead:** >50% at high frequencies in big configurations
  - Moving the antennas, calibration, …
  - Huge overhead for short Scheduling Blocks
- **Available time:** more time is available at night, and some parts of the sky are highly over-subscribed (e.g., Galactic Center)
- **Weather:** high-frequency daytime observations in the summer will be painful. Low-frequency during solar max won't be fun either.
- **Sensitivity:** see JVLA Exposure Calculator
- **Spatial scales:** resolution, largest angular scales, field-of-view
- **Uv-coverage:** 10sec may get you the sensitivity, but you can't image a complex source
- **RFI**

What NRAO can do for you

Documentation on the Web

Go to www.nrao.edu, click on astronomer, then EVLA:

- **Observational Status Summary**: basic introductory guide with (almost) everything in this talk, and more!
- **EVLA Exposure Calculator**: how long does it take to get to 1microJy/beam?
- **FAQs**: how much overhead do I need?
- **eNews:** late-breaking news for our observing community
- **Data archive**: all VLA, VLBA, EVLA data are accessible through the NRAO archive
- Plus information on proposal submission, observing scripts, memo series, RFI plots and lists, data reduction…

Support

- **Travel support**
- **Observing/data reduction visits**
- **Preprint and page charges**
- **Large proposal/key science support**
- **Students (undergraduate and graduate)**
  - Summer students
  - Student observing support (also class observations in some cases)
  - Co-op program (undergraduates)
  - Graduate student internships
  - Graduate fellowships
- **Postdoctoral fellowships (Jansky and others)**
- **Short- or long-term visits**
  - PhD astronomers or radio engineers, preferably junior

NRAO staff

- **Helpdesk:** pundits on demand!
- **E-mail, telephone**
- **Wide variety of radio expertise**
  - Data analysts
  - Software engineers
  - Hardware gurus
  - Scientific staff
- **Friendly, helpful** (well, at least we try our best…)
  - **We really do like working in a *national* observatory**
  - **You can't possibly have crazier ideas than we do**