Quarterly Status Update (QSU) #3 FY 2012
April - June 2012

NSF Briefing – September 14, 2012

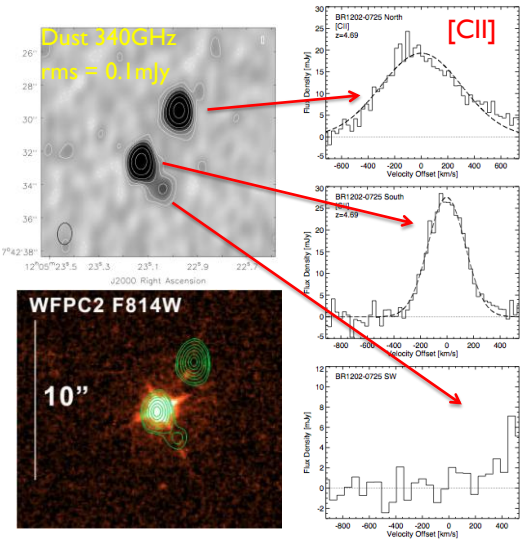
Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array
Robert C. Byrd Green Bank Telescope
Very Long Baseline Array

Agenda

- Science Results
- Observatory Science Operations (OSO)
- Observatory Telescope Operations (OTO)
- Observatory Development & Programs (ODP)
- Broader Impact
- Observatory Administrative Services (OAS)
- Director's Office

ALMA: Imaging cool gas during massive galaxy formation

- [CII]158um= best tracer of cool atomic gas in high z galaxies
- ALMA with 16 antennas in 20min at 340GHz => already deepest observations by factor 10 at these frequencies!
- Dust continuum and [CII] 158um emission from canonical starburst group galaxies, B1202-0725 at z=4.7
- Three galaxies detected, including an FIR-luminous quasar, a hyper-starburst galaxy, and a normal star-forming galaxy => Early massive galaxy formation in merging, starburst group



JVLA and PdBI CO and [CII] spectra and images of HDF850.1 at z=5.183 emitting galaxies (Wagg et al. 2012)

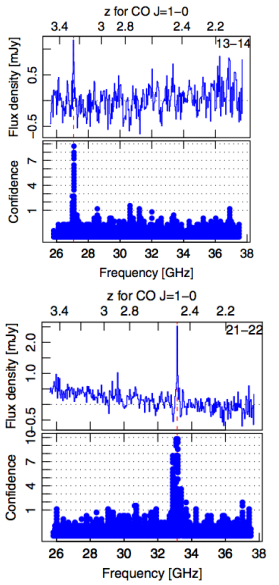
Title: [C II] Line Emission in Massive Star-forming Galaxies at z = 4.7

Web link: http://adsabs.harvard.edu/abs/2012ApJ...752L..30W

Publication: Wagg, J. et al. 2012ApJ...752...91W

GBT: Blind search for molecular gas in high z galaxies

- Herschel has identified large samples of gravitationally lensed, very dusty, FIR luminous star forming galaxies, but optical redshifts are difficult to obtain due to obscuration
- Wide bandwidth of Zspec on the GBT has become a powerful tool to obtain redshifts, and molecular gas properties, in this important samples of early galaxies, with 9 new CO redshifts discovered



GBT spectra of high z CO emitting galaxies (Harris et al. 2012)

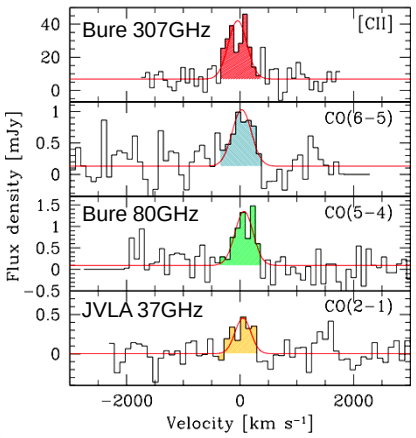
Title: Blind Detections of CO J = 1–0 in 11 H-ATLAS Galaxies at z = 2.1–3.5 with the GBT/Zpectrometer

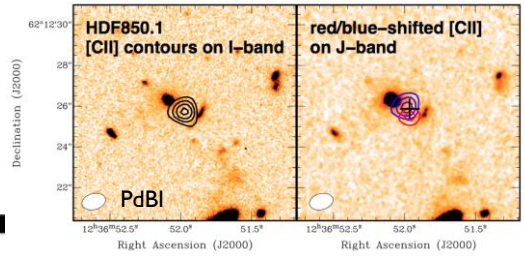
Web link: http://adsabs.harvard.edu/abs/2012ApJ...752..152H

Publication: Harris et al. 2012ApJ...752..152H

PdBI+VLA: blind CO redshift determination in first SMG

- HDF850.1 was the first optically obscured, distant extreme starburst 'submm galaxy' discovered
- Difficulty: optically obscured => no redshift for 15 years!
- Bure+VLA search: z(CO,[CII]) = 5.183
- M(H_2)~ 4e10 M_o = fuel for star formation
- Still no optical/nearIR ID





VLA and PdBI CO and [CII] spectra and images of HDF850.1 at z=5.183 emitting galaxies (Walter et al. 2012)

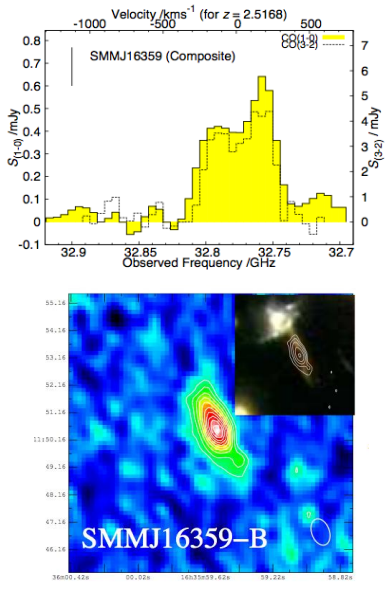
Title: The intense starburst HDF 850.1 in a galaxy overdensity at z ≈ 5.2 in the Hubble Deep Field

Web link: http://adsabs.harvard.edu/abs/2012Natur.486..233W

Publication: Walter et al. 2012Natur.486..233W

VLA: Imaging molecular gas in early main sequence galaxies

- Using gravitational lensing to magnify distant galaxies, the JVLA has imaged the molecular gas in a set of lower luminosity star forming galaxies at z~2.5
- Large,rotating disks are seen, containing warm molecular gas
- They also detect thermal Free Free emission for the first time in distant galaxies, providing the best measure to date of star formation rates



VLA spectra and images of a star forming galaxy at z=2.5 (Thompson et al. 2012)

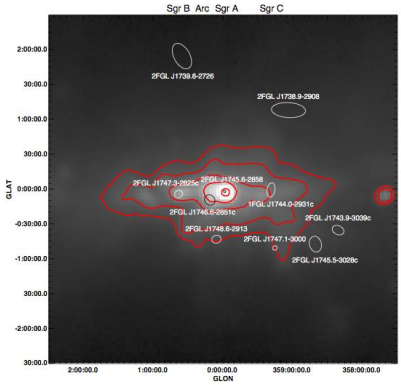
Title: JVLA imaging of 12CO J=1-0 and free-free emission in lensed submillimetre galaxies

Web link: http://lanl.arxiv.org/abs/1207.0492

Publication: Thompson et al. 2012, MNRAS, in press

GBT+Fermi untangle diffuse gamma rays from the Galactic center

- Diffuse gamma ray emission (1-300Gev) from the Galactic center has been difficult to explain
- A GBT 1.4GHz synchrotron image compared with the Fermi gamma ray image show a clear correlation.
- This correlation indicates that the gamma rays are produced by thermal bremstrahlung due to interaction of the synchrotron emitting relativistic electrons with the thermal gas.



GBT1.4GHz contour image of the Galactic center, plus greyscale of Fermi GeV emission (Yusef-Zadeh et al. 2012)

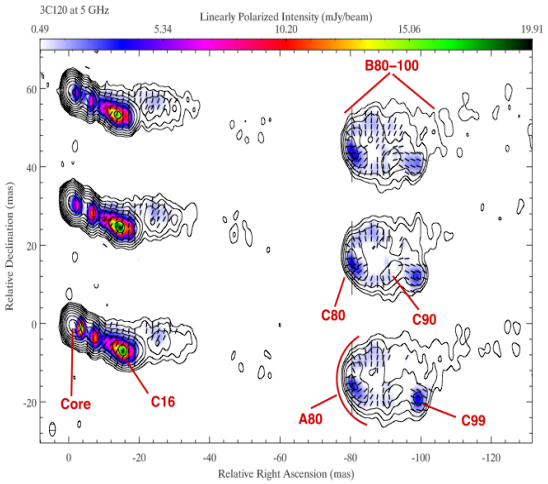
Title: Interacting Cosmic Rays with Molecular Clouds: A Bremsstrahlung Origin of Diffuse High Energy Emission from the Inner 2deg by 1deg of the Galactic Center

Web link: http://arxiv.org/abs/1206.6882

Publication: Yusef-Zadeh et al. 2012, ApJ, in press

VLBA: A standing wave of cosmic proportions

- 3C120: canonical powerful radio jet from supermassive black hole, and unique Fermi GeV source
- VLBA shows relativistic motion for most components in pc-scale jet
- One component of the jet appears stationary, C80
- Interpreted as a recollimation shock, effectively a standing-wave, collimating the large scale jet into a narrow channel that propagates out to100kpc!



VLBA images of 3C120 at 5GHz (Agudo et al. 2012)

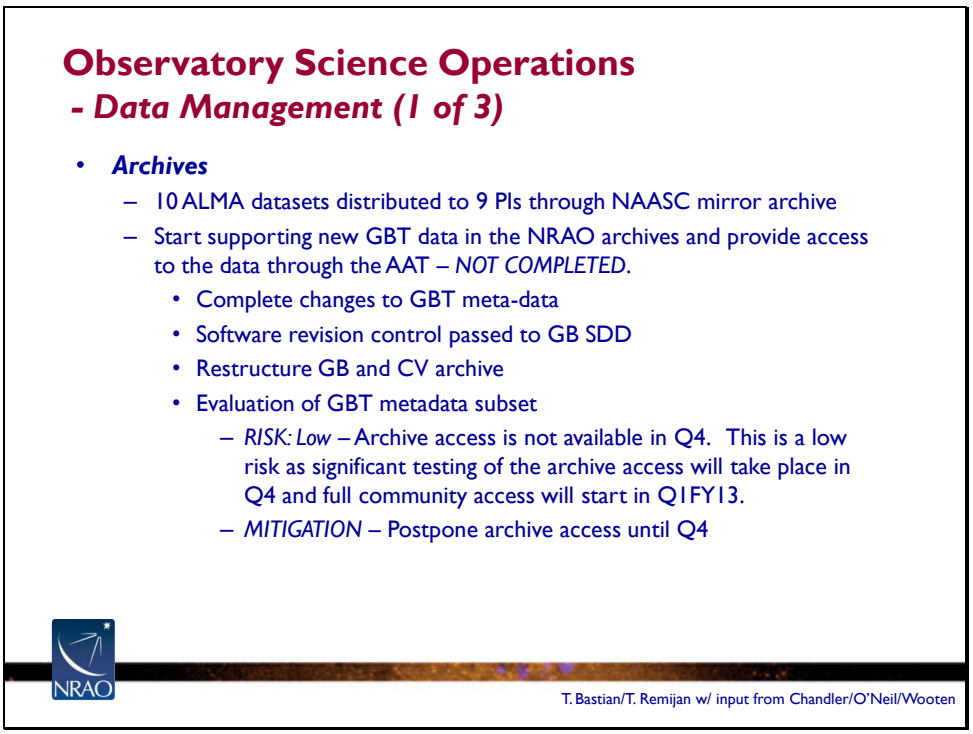
Title: A Recollimation Shock 80 mas from the Core in the Jet of the Radio Galaxy 3C 120: Observational Evidence and Modeling

Web link: http://adsabs.harvard.edu/abs/2012ApJ...752...92A

Publication: Agudo et al. 2012ApJ...752...92A

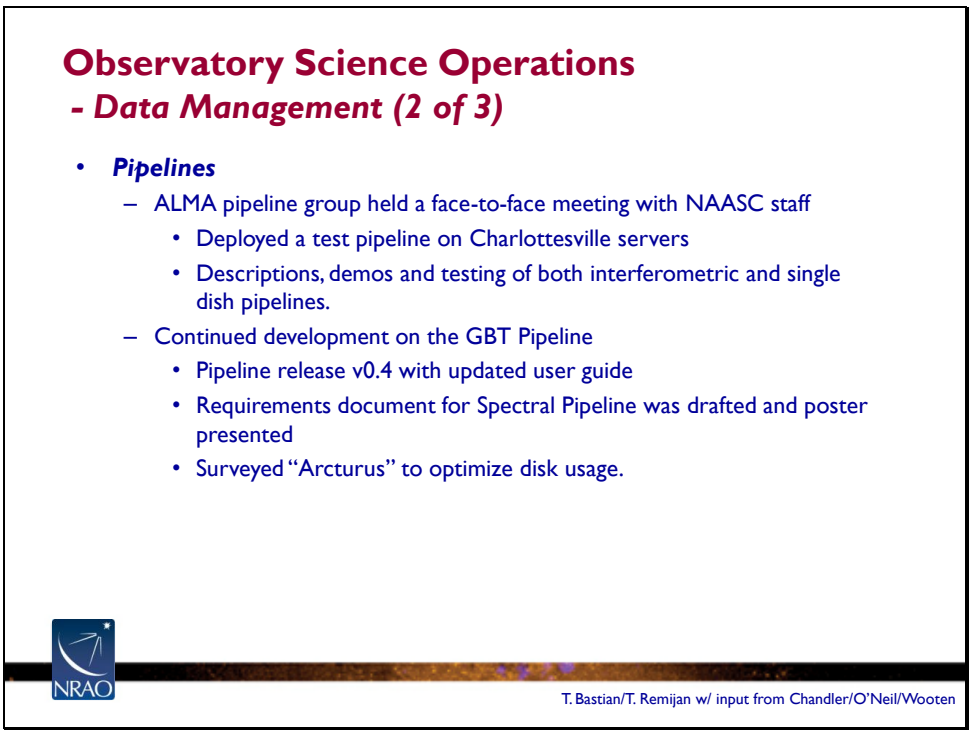
Agenda

- Science Results
- Observatory Science Operations
  - Data Management
  - Facility-based Activities
  - Shared Services
  - Training the Next Generation
  - Metrics
- Observatory Telescope Operations
- Observatory Development & Programs
- Broader Impact
- Observatory Administrative Services
- Director's Office



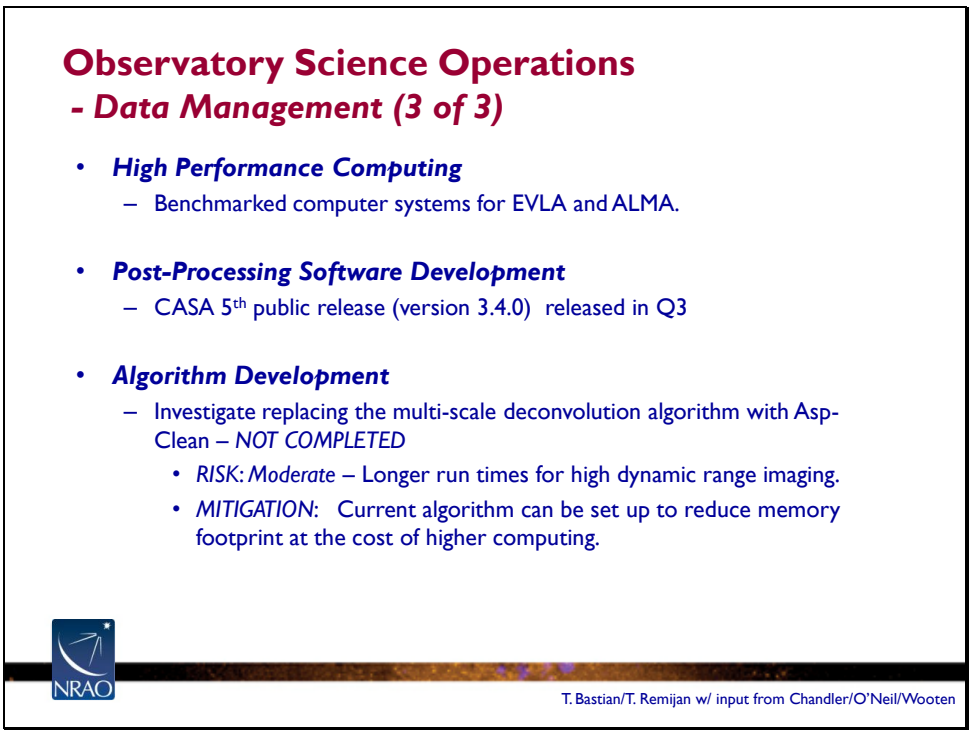
ALMA Cycle 0 observations continued through Q3 FY12. In this time, **10 datasets were delivered to 9 North American or Chilean PIs**. The data transfer took place through the NAASC mirror of the ALMA archive. Correspondence with the PIs during the data delivery continued to take place through the ALMA helpdesk.

The GBT Archive access group continued to have bi-weekly meetings to discuss the overall progress on delivering GBT data to PIs through the AAT. It was found in the course of these meeting that changes to the **GBT archive metadata were needed and more evaluation and testing** than anticipated was necessary and as such has delayed the release of GBT PI data through the AAT until Q4. The **risk involved in this action is low** given significant testing will take place with the **mitigation that archive access will take place at the end of Q4**. In Q3, there was also significant **restructuring of the GB archive** and corresponding Charlottesville mirror and the **scripts for generating the GB metadata have been assigned to the GB SDD** under revision control. John Benson is currently testing his database loader for the AAT. Melinda Mellow has generated a test version of about half the metadata so far and has been iterating with John for small changes to the AAT files.



Members of the ALMA Pipeline group, including Lindsey Davis and Jeff Kern, held a **face-to-face meeting with NAASC staff** to discuss the development of the ALMA pipeline and to **deploy a test pipeline on the servers** in Charlottesville from April 30th to May 2nd. On April 30th, high level meetings took place with members of the NAASC scientific staff and the CASA subsystem scientist how the pipeline worked. May 1st was devoted to both **descriptions and demonstration interferometric runs with the pipeline; May 2nd was devoted to single dish runs**. The outcome from the meeting was that the ALMA pipeline worked as intended with test ASDMs, so from a technical standpoint it was a success. Testers were given clear instructions on operating the pipeline and to report on their progress monthly to discuss results and to share information with testers in Europe and Chile.

Work continued to progress on the GBT pipeline. During Q3FY12, **pipeline release v0.4 was made available to users with updated documentation and user guide**. A **requirements document** was drafted on the spectral line pipeline and a **poster presented** at the at Tulley-Fisher workshop on the spectral pipeline. Other work included **surveying "Arcturus" disk usage** which freed a large amount of space, identified usage patterns, and designed solutions such as removing intermediate files by default.



Acquired demo computer systems from vendors and began final benchmarking for EVLA post processing and ALMA-CL pipeline clusters. The benchmarking and specification is slated to be done in Q4 and both clusters ordered in Q1FY13.

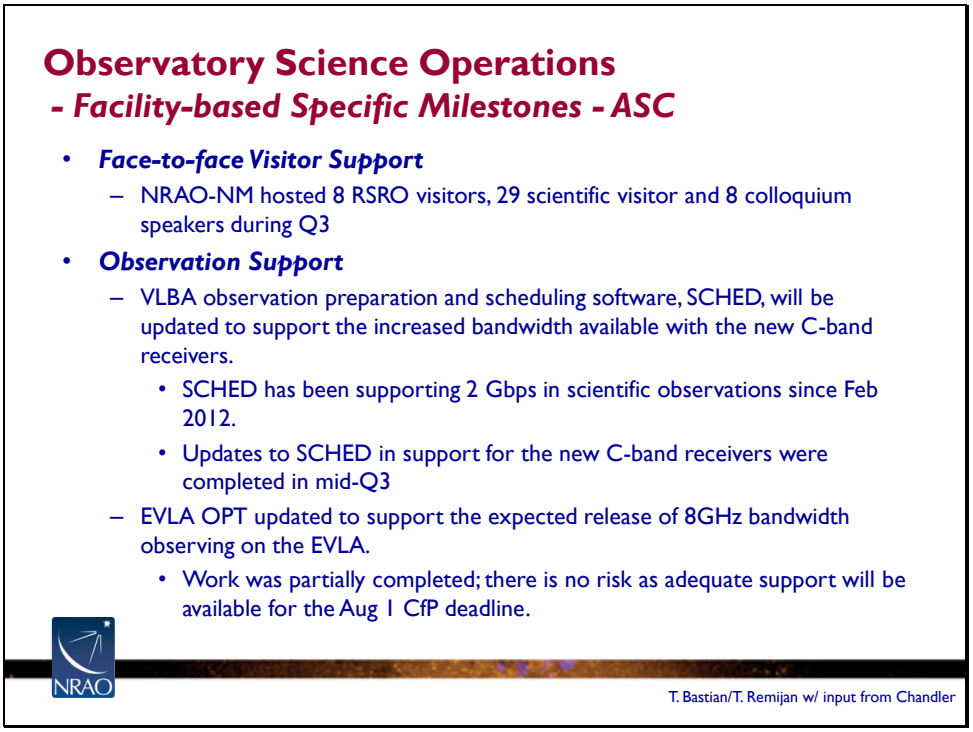
CASA 3.4.0 was released in Q3 on June 18. A prerelease version was used for the NRAO 13th synthesis imaging workshop with approximately 150 students and new users being introduced to CASA through two days of interactive tutorials. Between June 18 and June 30 the new release has been downloaded over 350 times.

Investigate replacing the multi-scale deconvolution algorithm with Asp-Clean. Only preliminary investigations were done. More time was required for work on wide-band wide-field imaging problem. The risk assignment for not completing this task is listed as a **moderate risk because high dynamic range imaging at high resolution of complex fields may take longer run-time** than anticipated. Only a small percent of total science requests fall in this range. The **mitigation to this risk is to modify the current algorithm** to reduce memory footprint at the cost of higher computing. Explorations in CASA underway for better memory footprint management via software framework solutions.

TABLE 1: Performance to Program Operating Plan Major Milestones & Functional Tasks
-Data Management-

Gantt Chart

	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
2	**− Observatory Science Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
3	**+ User Portal**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
6	**+ Proposal Process**	**Sat 10/1/11**	**Sat 3/31/12**	**Thu 6/28/12**	
8	**+ Observing Prep Tools**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
10	**+ Helpdesk/User Forums**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
14	**+ Science Community Communications**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
18	**+ VAO**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
20	**+ Metrics and Statistics**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
22	**+ Observation Support**	**Sat 10/1/11**	**Sat 6/30/12**	**NA**	
26	**+ User Education and Training**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
31	**+ Science User Outreach**	**Sat 10/1/11**	**Sat 3/31/12**	**Sat 3/31/12**	
34	**+ Library and Historical Archives**	**Sat 10/1/11**	**Sat 12/31/11**	**Sat 12/31/11**	
36	**− Data Management**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
37	**− Archive/Data Access**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
38	Support GBT data in NRAO archives through AAT	Sat 10/1/11	Sat 6/30/12	NA	Est completion: Q4 More Eval and testing required.
39	Full mirroring of VLA archive to CV	Sat 10/1/11	Sat 6/30/12	Tue 3/20/12	
40	Pipeline products for VLA available through AAT	Sat 10/1/11	Sat 6/30/12	Sat 3/31/12	
41	VLA batch re-processing through prototype web interface in AAT	Sat 10/1/11	Sun 9/30/12	NA	
42	**− HPC**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
43	Additional archive storage installed	Sat 10/1/11	Sun 9/30/12	NA	
44	First early science data products mirrored to NAASC	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	
45	**− Pipeline Development**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
46	All Standard VLA observations processed through pipeline as observed	Sat 10/1/11	Sun 9/30/12	NA	
47	Integration of new 4mm receiver and spectrometer into data reduction pipeline	Sat 10/1/11	Sun 9/30/12	NA	
48	**− Post-Processing Software Development**	**Sat 10/1/11**	**Sat 6/30/12**	**Sat 6/30/12**	
49	CASA 4th and 5th public release	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
50	**− Algorithm Development**	**Sat 10/1/11**	**Sat 12/31/11**	**Sat 12/31/11**	
51	Completion of SW framework for wide-band, wide-field, full polarization imaging	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	

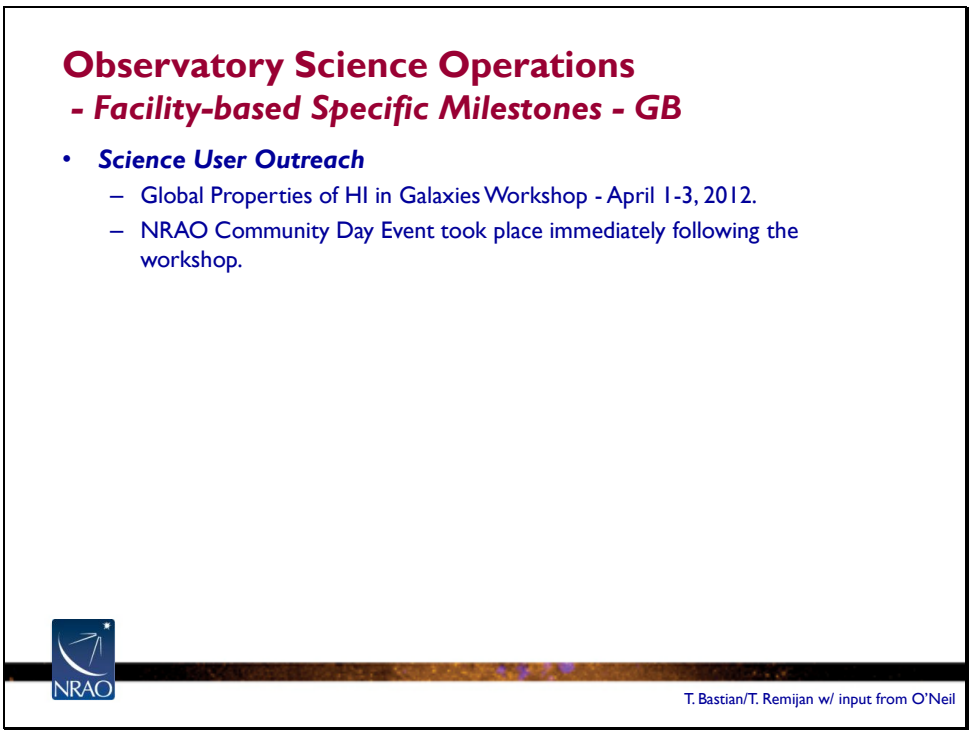


In Q3 FY12 **NRAO-NM hosted a total of 45 visitors including 8 RSRO scientists and 29 scientific visitors and 8 colloquium speakers.**

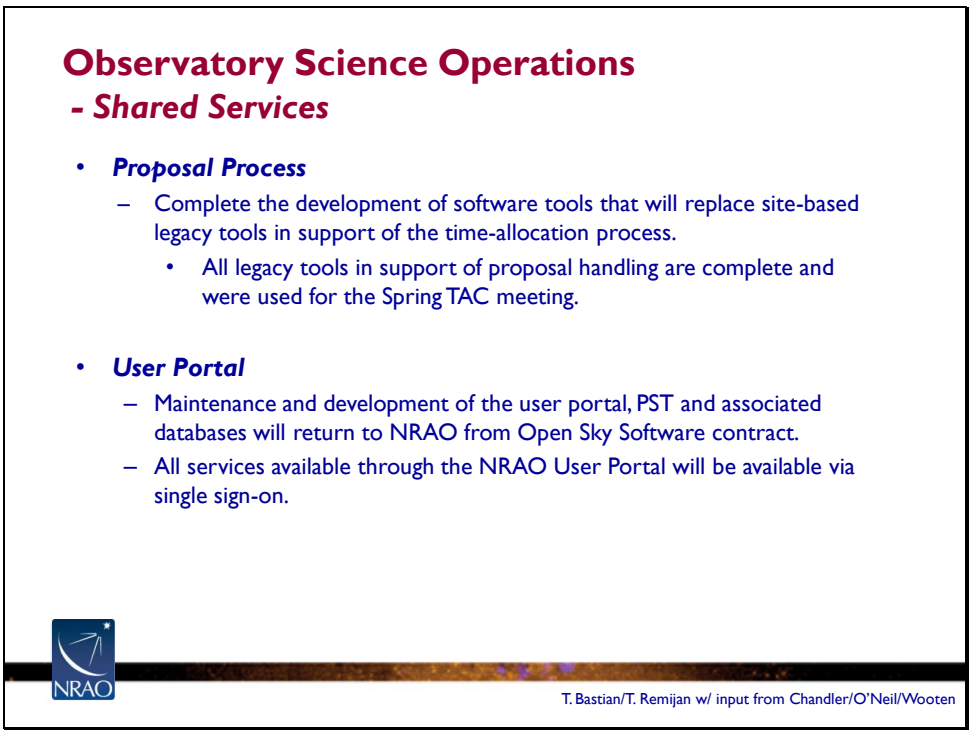
SCHED has been supporting 2 Gbps in the PFB mode of the VLBA's new instrumentation in tests since June 2011, and in scientific observations since February 2012. SCHED's functionality for the newer DDC mode closely parallels what it has to do for the legacy system, requiring only an extension of the allowable values for some parameters. This support has also been proven in numerous tests since August 2011.

Support for the new C-band receivers, with tuning ranges far beyond the norm for the older VLBA receivers, has been more challenging. The **updates to SCHED itself were completed by mid-Q3**, but in the process it was realized that corresponding changes to the VLBA's original station control system were required. These were also completed and successfully tested near the end of the third quarter.

Support of the 8GHz of bandwidth observing for the EVLA was partially completed. Stand-alone tool for setup of 8 GHz bandwidth observations, needed for the August 1, 2012 proposal deadline, is done. That will be moved into the main OPT in Q1 2013, in preparation for support of real 8 GHz bandwidth observing at the EVLA in January 2013.



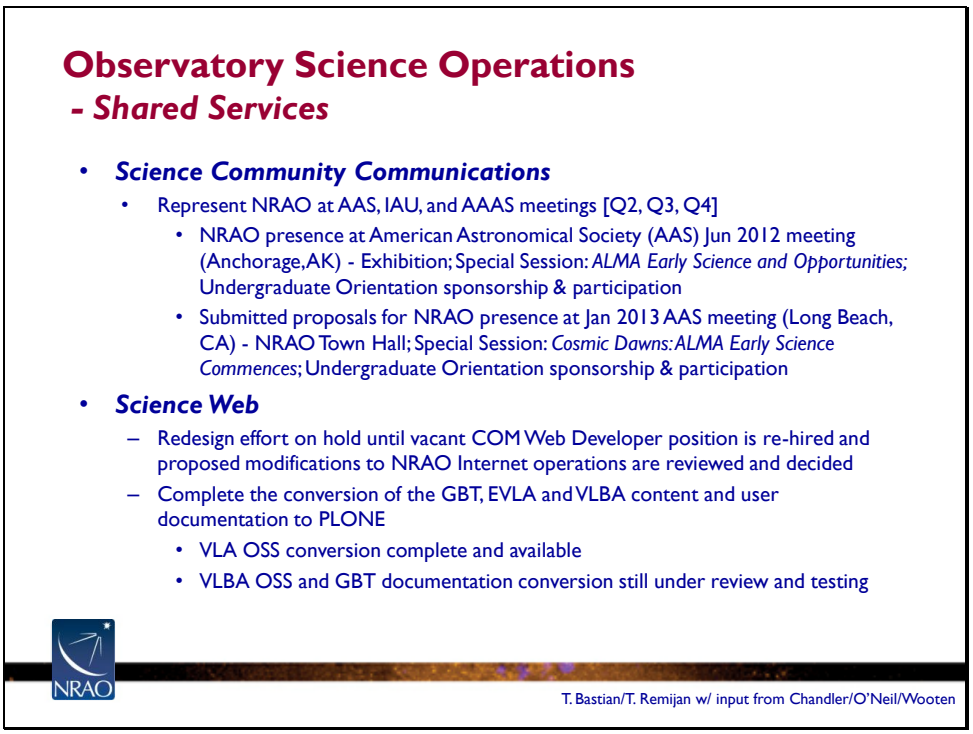
In Q3, from **Apr 1-3, 2012, A Green Bank Workshop titled "Global Properties of HI in Galaxies"** was held at the NRAO in Green Bank, WV in honor of the 35th anniversary of the discovery of the Tully-Fisher relationship. This workshop brought together researchers and students to discuss recent results on HI in galaxies. Immediately following the workshop, information and **training sessions were provided on use of the GBT and EVLA, and an ALMA Training and Community Day.**



In Q3 FY12, all **the legacy tools in support of proposal handling have been complete**. These new tools were used at the TAC meeting in Q3 FY12. Specifically, the tools provide session editing, an overview calendar, pressure plots, carry over and report generation features. After the TAC, the tools provided source conflict features and additional reports. Additional work for replacing some of the TAC reports and for cleaning up the software will be ongoing through Q4 FY12.

The **full maintenance and development of the user portal and PST was completed** in Q3 FY12. All relevant software and databases have been transferred to Socorro.

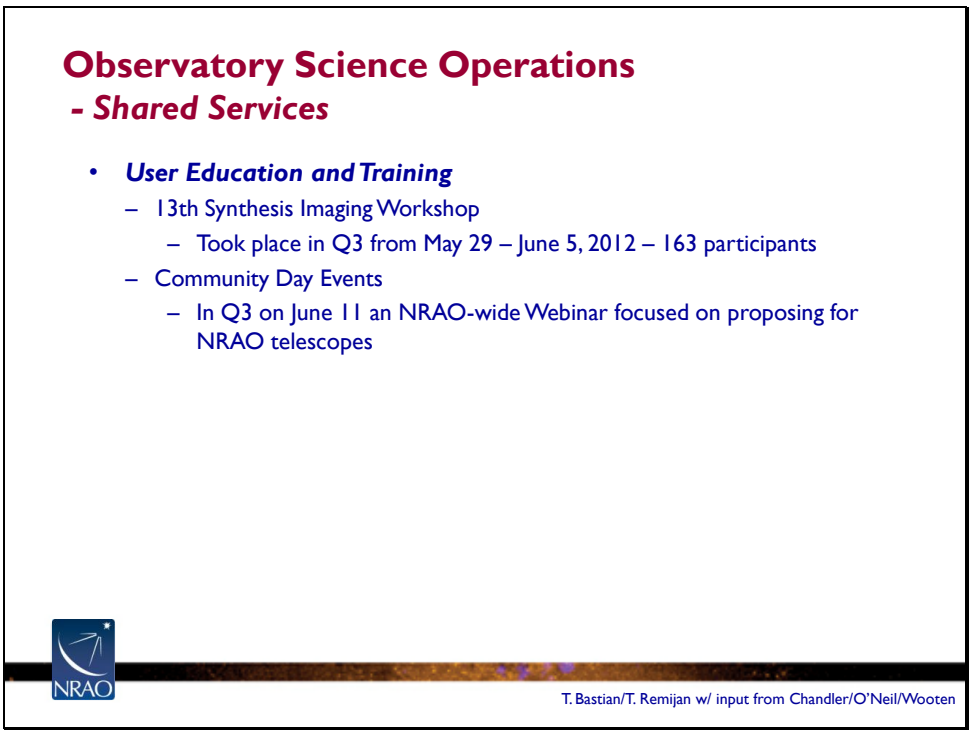
The infrastructure to **support single sign-on for the ALMA and NRAO helpdesks is in place**, and last minute details about how to handle the sign-off of sessions are being finalized with ALMA. Single sign-on will provide users with access to their helpdesk tickets in both helpdesk databases simultaneously. It will be implemented early in Q4 FY12 (Q3 deliverable). Risk: The software migration from LDAP to Oracle for ALMA introduced unnecessary risk. Mitigation: Waited for after ALMA and NRAO proposal calls to be completed before completing migration. No negative impact expected.



220th AAS Meeting:10-14 June 2012 in Anchorage, Alaska with ~1200 attendees. NRAO special events included our re-designed exhibit, an ALMA Special Session: ALMA Early Science and Opportunities an NRAO Splinter Session (Proposing to Use the NRAO Telescopes) and undergraduate orientation sponsorship and participation. **Jan 2013 (Long Beach, CA) AAS meeting:** ALMA Special Session will feature 6 speakers, at least half from the community, and an associated poster session.

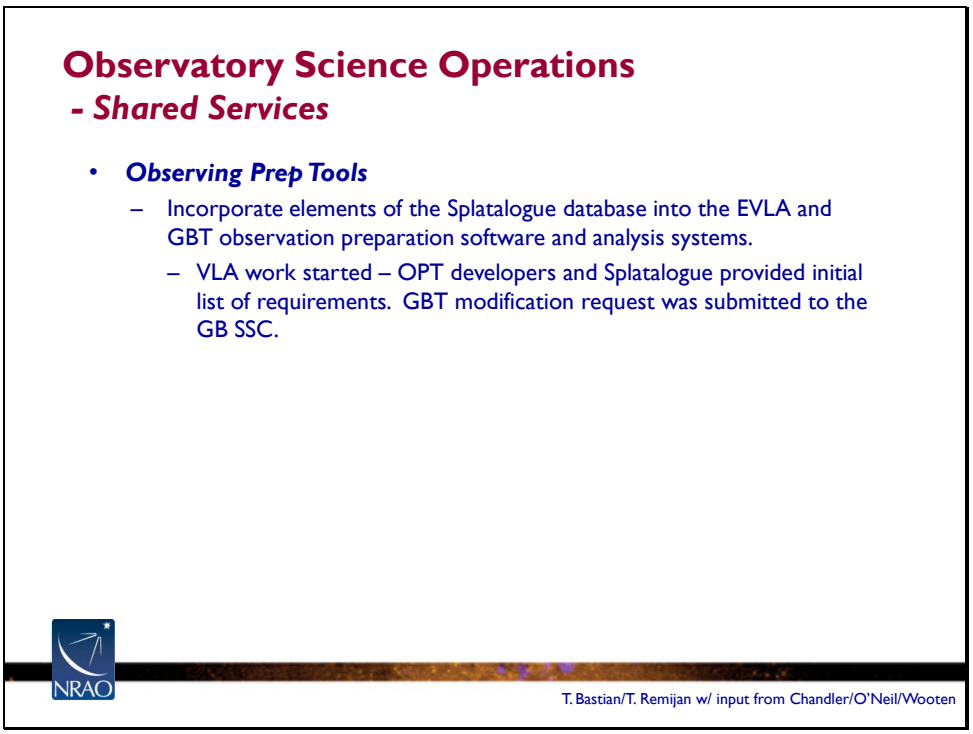
NRAO Internet Operations Plan: This Plan identifies and unifies the roles and resources required to design, develop, and maintain a more effective NRAO Internet presence for our audiences: the science community; the public; our staff; and external stakeholders such as the NSF and Congress.

The **VLA Observational Status Summary (OSS), the main document describing its instrumental capabilities in detail, was moved to PLONE** and is now available off the VLA web pages. The move was facilitated by using the addition to PLONE of the 'helpcenter' framework, allowing much more flexibility in accessing and navigating long documents such as the OSS. A similar **conversion to PLONE was concluded for the VLBA OSS, but it has not been released yet pending final checks and conversion of the GBT documentation is pending** given the requirement to easily export the online documentation into a .pdf file.

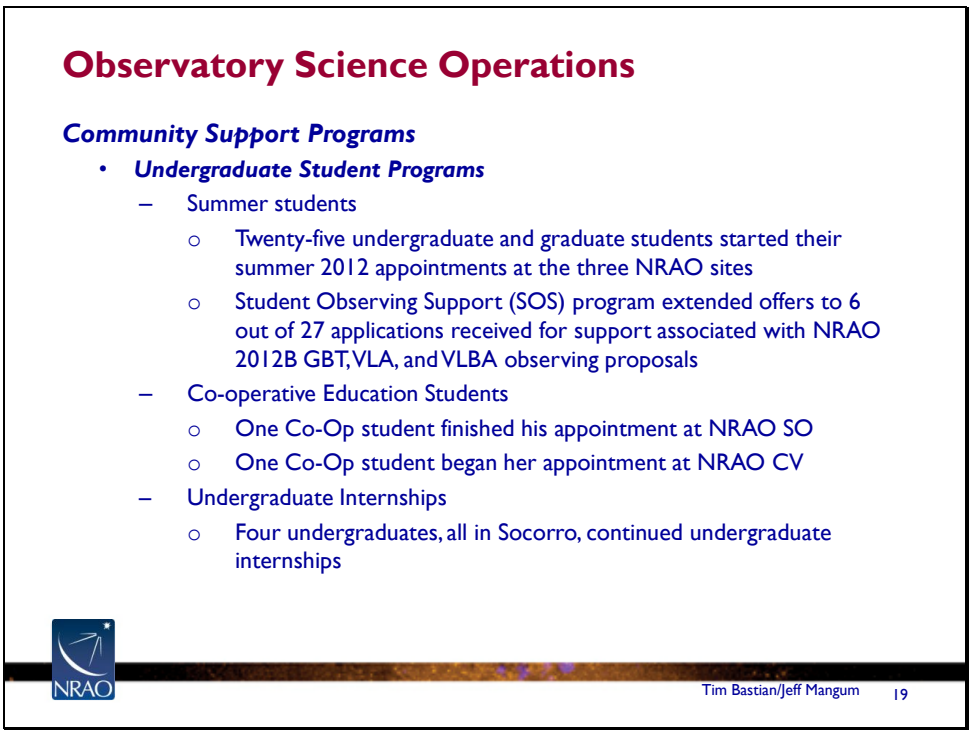


The **13th Synthesis Imaging Workshop took place in Socorro from May 29 - June 5, 2012, and was attended by 163 participants** from around the world, with the vast majority of attendees being aspiring radio astronomers in an early phase of their career. Feedback after the workshop was overwhelmingly positive and gave us valuable suggestions for the next edition in 2014.

In Q3, NRAO scientific staff invited astronomers interested in planning for the upcoming ALMA, VLA, GBT, and VLBA proposal deadlines to participate in a web-based seminar on "Planning a Proposal for NRAO Telescopes." **Broadcast 11 June 2012, this webinar provided an overview of the key capabilities available for each NRAO telescope**, and the key decisions and steps needed to assemble an observing time proposal for the upcoming proposal deadlines. This proposal planning webinar was broadcast via the Internet from the NRAO sites in Charlottesville, VA and Socorro, NM. Participation by the community was encouraging and valuable lessons about running such an event (a first for NRAO) were learned.



At the **VLA, Initial discussions between OPT developers and Splatalogue maintainer provided a list of requirements**, which will be implemented after work on the RCT 8 GHz bandwidth observing is complete, as that was deemed as more important. Discussions also started on the implementation of the RFI table into the Splatalogue database. In **Green Bank, a modification request was submitted** to the developers of GBTIDL for consideration by the Green Bank scientific steering committee.

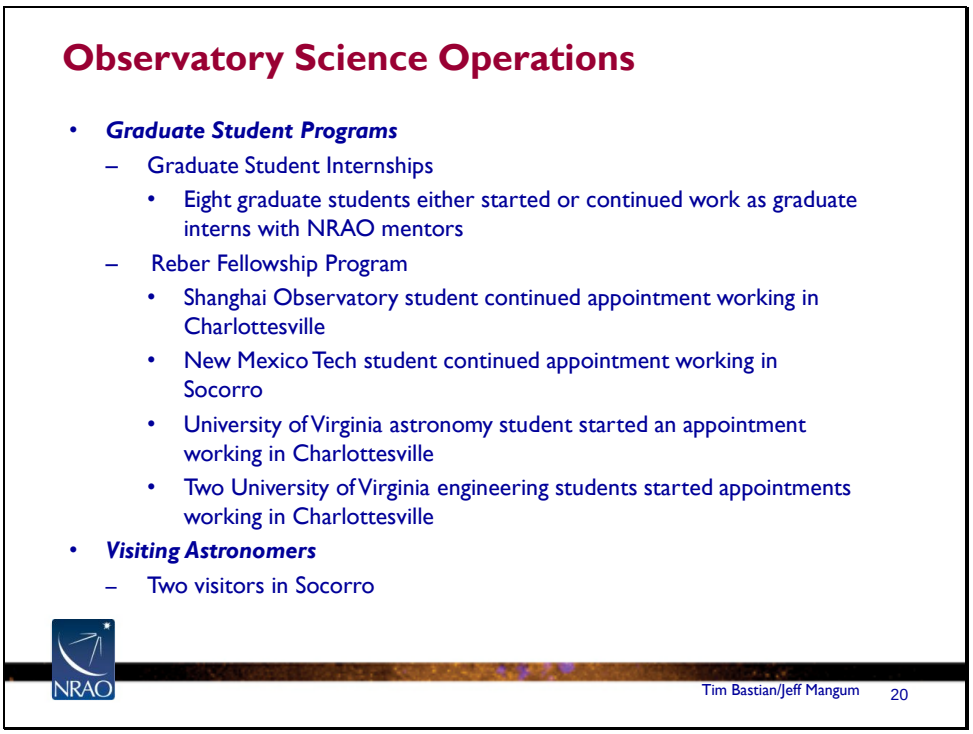


Summer Student Program: 25 summer student internship appointments started (SOC/GB/CV = 6/8/11)

Co-Op: One **Co-Op student** finished his appointment (Utkarsh Sinha (SO)) while one Co-Op student started her appointment (Robyn Smith (CV)).

SOS Program: Allocated full budget target of $125,274.

Undergraduate Interns: Five undergraduates (SO: 4) continued undergraduate internships working in the Electronics Division in Socorro: Natalie Kane, Deepak Rai, Orlando Lopez, and Loren Good (all SO).



Graduate Interns: Eight graduate students began or continued work as **graduate interns** with NRAO mentors:

Paul Ries (UVA) is working with Todd Hunter on studying the long-wavelength characteristics of TNOs

Dana Ficut-Vicas (University of Hertfordshire) continued her project working with Michael Rupen on the Little Things project.

Joanna Corby (University of Virginia) started her project working with Tony Remijan on chemistry.

James Chibueze (NAOJ) worked with Crystal Brogan on star formation.

Laura Perez (Caltech) worked with Claire Chandler on star formation

Ahahi Caidu-Primo (MPIA) worked with Adam Leroy and Juergen Ott on extragalactic star formation.

Tina Hsu (University of Michigan) worked with Amy Mioduszewski on stars.

Jaehan Bae (University of Michigan) worked with Amy Mioduszewski on stars.

Sierra Smith (JMU) worked with Ellen Bouton on radio astronomy history.

Reber: Four graduate students participated in the Reber Doctoral Fellowship (formerly the Pre-Doctoral) program:

Feng Gao (Shanghai Observatory) continued his PhD research working w/ Jim Braatz in Charlottesville on reducing and analyzing VLBI observations of water maser emission from galactic nuclei as part of the Megamaser Cosmology Project.

Josh Marvil continued his appointment working with Fraser Owen.

Charles Romero (Uva) started his appointment working with Brian Mason.

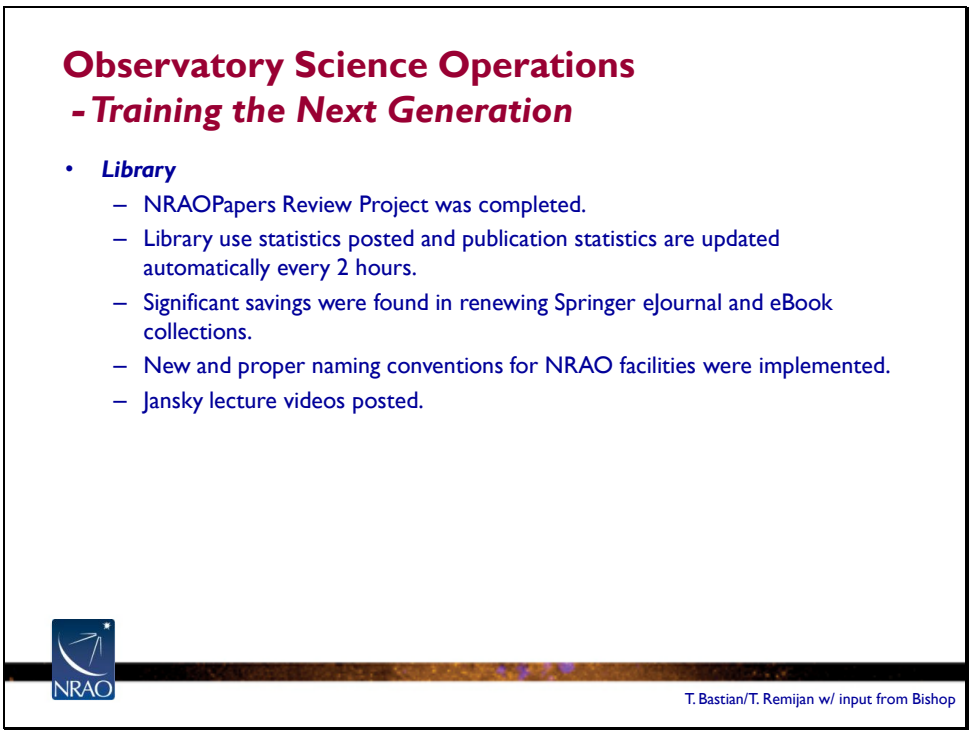
Michael Cyberey (Uva engineering) started his appointment working with Tony Kerr and Art Lichtenberger

Greg Stonko (Uva engineering) started his appointment working with Tony Kerr and Art Lichtenberger

Visiting Astronomers:

Andreas Brunthaler from MPIfR finished a one-year visit to NRAO SOC which began in June 2011. Christopher Stockdale from Marquette University started a two-month visit to NRAO SOC which began in June 2012.

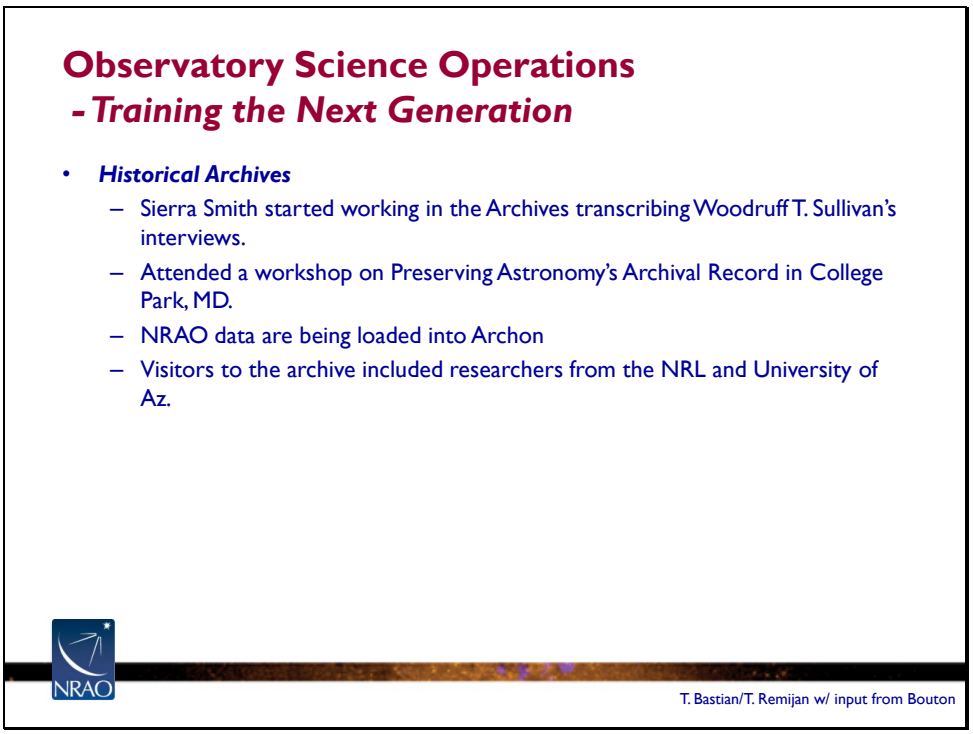
D.J. Pisano (WVU) began a two-month visit to NRAO GB in June 2012. He was here with Spencer Wolfe, who is also visiting for two months (WVU grad student) to work on GBT data reduction and to aid the site EPO efforts.



The **NRAOPapers Review Project (requiring review of almost 8800 historical papers mentioning the VLA) was finally completed**. Of the total number reviewed, about 39% (over 4,000 papers) of the papers needed to be added to NRAOPapers. Almost half of the 4,000 were refereed papers. NRAOPapers now contains 8459 records of papers using VLA data with 5860 refereed. In addition, NRAOPapers methodology was reviewed by the Library staff and the AstroBib group, approved and posted on the NRAO Library web page at http://www.nrao.edu/library/pagecharges.shtml). **Library use statistics were posted** to NRAO Library web at http://www.nrao.edu/library/libstats.shtml. **NRAO publications statistics on the web (http://www.nrao.edu/library/pubstats.shtml) are now updated dynamically** and reflect additions within 2 hours of records being added.

Significant savings were found with the renewal of the Springer eJournal & eBook collections into 2013. The final agreed upon price was 3% over last year's invoice price while maintaining the same level of access for NRAO staff.

The **NRAO Library was instructed to enforce proper instrument/location naming conventions**. Library pages were updated to reflect the way names must be used in papers submitted for page charge reimbursement (available at http://www.nrao.edu/library/pagecharges.shtml). Links to the **Jansky videos to add to the Jansky Lecturers page** to ensure complete and linked information were also provided.



Sierra Smith is working in the Archives as a Graduate Intern, transcribing Woodruff T. Sullivan's digitized audio interviews of 20th century radio astronomers. With the assistance of Ken Kellermann and of several senior scientists at other institutions, we continued to seek addresses for interviewees or next of kin so as to obtain permissions for researchers to access the oral interviews conducted by Sullivan.

Ellen Bouton was an **invited participant at the Workshop on Preserving Astronomy's Archival Record**, held in College Park MD in April, where she reported on the status of NRAO's historical and data archives.

NRAO archival data are being loaded into Archon, open-source software developed at University of Illinois to manage descriptive information about archival materials, create finding aids, and publish them on the Web. The software will be tested and evaluated. Pat Murphy has assisted with installation of the Archon software, and a request has been submitted for help with batch loading of item records, modifications to customize the Archon scripts, and help in customizing the public front end to better match the look and feel NRAO Web pages.

Visitors to the Archives in this period included **researchers from the Naval Research Laboratory and from University of Arizona**. Finding aids for the Archives collection and the Archives online catalog are linked from the NRAO Archives home page, http://www.nrao.edu/archives/.

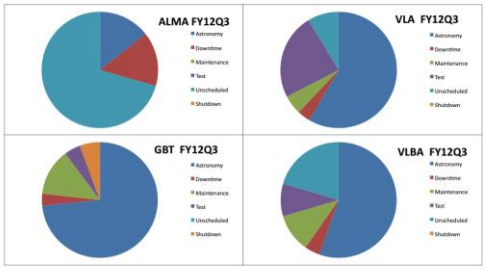
Telescope Usage (Astronomy, Downtime, Maintenance, Test/Calibration, Unscheduled)

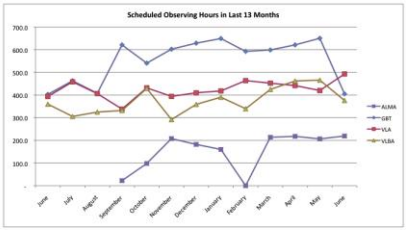
	ALMA FY12Q3	April	May	June
ALMA	**Scheduled**	643.5	217.7	206.5	219.3
	Astronomy	***314.9***	*105.7*	*115.3*	*93.9*
	Downtime	***328.6***	*112.0*	*91.2*	*125.4*
	Maintenance	-	-	-	-
	Test	-	-	-	-
	Unscheduled	1,540.5	502.3	537.5	500.7
	Shutdown	-	-	-	-
	Total Hours	**2,184.0**	720.0	744.0	720.0

	GBT FY12Q3	April	May	June
GBT	**Scheduled**	1,676.5	621.2	650.3	405.0
	Astronomy	***1,602.9***	*607.2*	*634.5*	*361.2*
	Downtime	***73.6***	*14.0*	*15.8*	*43.8*
	Maintenance	285.8	54.8	54.2	176.8
	Test	99.5	44.0	39.5	16.0
	Unscheduled	-	-	-	-
	Shutdown	122.2	-	-	122.2
	Total Hours	**2,184.0**	720.0	744.0	720.0

	VLA FY12Q3	April	May	June
VLA	**Scheduled**	1,354.5	441.7	420.0	492.8
	Astronomy	***1,275.7***	*417.7*	*399.4*	*458.6*
	Downtime	***78.8***	*24.0*	*20.6*	*34.2*
	Maintenance	117.8	34.6	38.7	44.5
	Test	522.4	168.7	199.3	154.4
	Unscheduled	189.3	75.0	86.0	28.3
	Shutdown	-	-	-	-
	Total Hours	**2,184.0**	720.0	744.0	720.0

	VLBA FY12Q3	April	May	June
VLBA	**Scheduled**	1,303.6	462.0	465.8	375.8
	Astronomy	***1,210.6***	*435.2*	*418.8*	*356.6*
	Downtime	***93.0***	*26.8*	*47.0*	*19.2*
	Maintenance	235.0	72.8	59.2	103.0
	Test	199.7	38.7	84.2	76.8
	Unscheduled	445.7	146.5	134.8	164.4
	Shutdown	-	-	-	-
	Total Hours	**2,184.0**	720.0	744.0	720.0





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Note that, beginning this quarter, the observation data slides now contain ALMA metrics. Since this is the first report containing such metrics, they are still incomplete. They will be enhanced and modified in subsequent reports.

Presented are the figures for the quarter. The figures are summarized in the pie charts. To give some perspective, the important metric of Scheduled Observing is presented for the last 13 months.

For ALMA , this shows the ramp-up observing of all Cycle 0 proposals.

For the other telescopes, there are no significant trends; monthly differences are within the usual monthly variations. (The summer dip in the GBT is the annual outage for painting the structure). There was also a net reduction of ~5hrs for GBT astronomy observing in June. This was because of the derecho weather event.

There is still a large allocation for test time due to EVLA commissioning. There is also a large allocation of test time to commission the wideband capabilities of the VLBA.

Scheduled: planned observing time

Astronomy: amount of hours observed by a proposal ("Observing Hours" in subsequent slides)

Downtime: amount of hours lost during observing

Maintenance: scheduled period for service for infrastructure, hardware and software

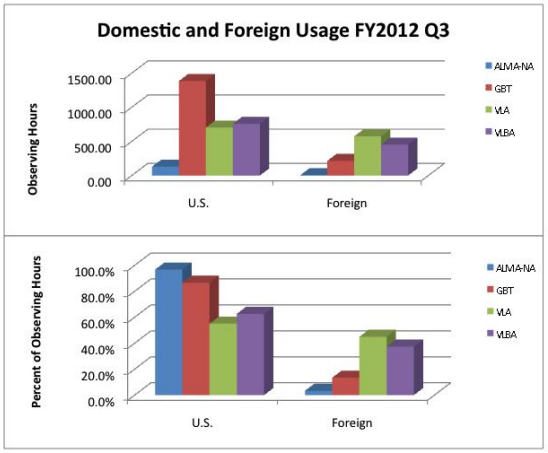
Test: test observations, not peer reviewed proposals.

Unscheduled: idle time due to unschedulable gaps between observing programs and predicted extended inclement weather.

Shutdown: usually a holiday. Other major shutdowns are for major equipment work, such as GBT structural painting or the VLA WIDAR correlator installation in 2010.

Telescope Usage by Observing Hours Expended in terms of - US/Foreign Observers

	U.S.	Foreign	Unspecified
ALMA-NA	128.80	4.40	0.00
GBT	1384.25	214.00	0.00
VLA	702.19	573.51	0.00
VLBA	758.23	452.27	0.00



	U.S.	Foreign	Unspecified
ALMA-NA	96.7%	3.3%	0.0%
GBT	86.6%	13.4%	0.0%
VLA	55.0%	45.0%	0.0%
VLBA	62.6%	37.4%	0.0%

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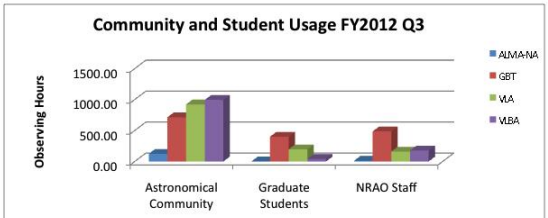
Telescope usage distributed by national institutional affiliation of the *Principal Investigator*.

Note that this includes ALMA observations of North American proposals.

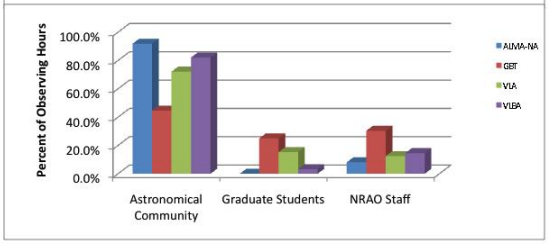
There is no significant trend.

Telescope Usage by Observing Hours Expended in terms of - Astronomical Community/Graduate Students/NRAO Staff

	Astronomical Community	Graduate Students	NRAO Staff
ALMA-NA	122.40	0.00	10.80
GBT	713.50	399.25	485.50
VLA	921.01	195.54	159.15
VLBA	994.00	39.57	176.92



	Astronomical Community	Graduate Students	NRAO Staff
ALMA-NA	91.9%	0.0%	8.1%
GBT	44.6%	25.0%	30.4%
VLA	72.2%	15.3%	12.5%
VLBA	82.1%	3.3%	14.6%



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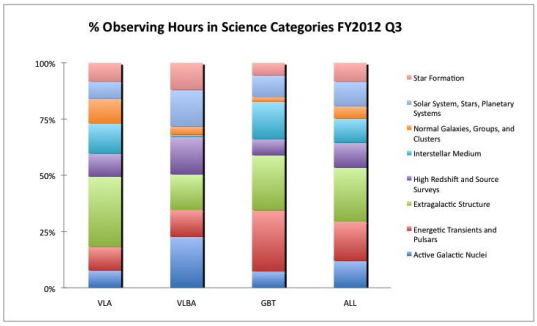
Telescope usage distributed by the scientific status of the *Principal Investigator.*

Note that this includes ALMA observations of North American proposals. (The ALMA proposals do not include student identification.)

There is no significant trend.

Observatory Science Operations
- *Telescope Usage by Science Category*

	GBT	VLA	VLBA
Active Galactic Nuclei	7.2%	7.7%	22.6%
Energetic Transients and Pulsars	27.2%	10.6%	12.0%
Extragalactic Structure	24.5%	31.1%	15.8%
High Redshift and Source Surveys	7.2%	10.3%	16.7%
Interstellar Medium	16.5%	13.4%	0.8%
Normal Galaxies, Groups, and Clusters	2.2%	10.8%	3.8%
Solar System, Stars, Planetary Systems	9.6%	7.7%	16.2%
Star Formation	5.6%	8.3%	12.0%
Unspecified	0.0%	0.0%	0.0%



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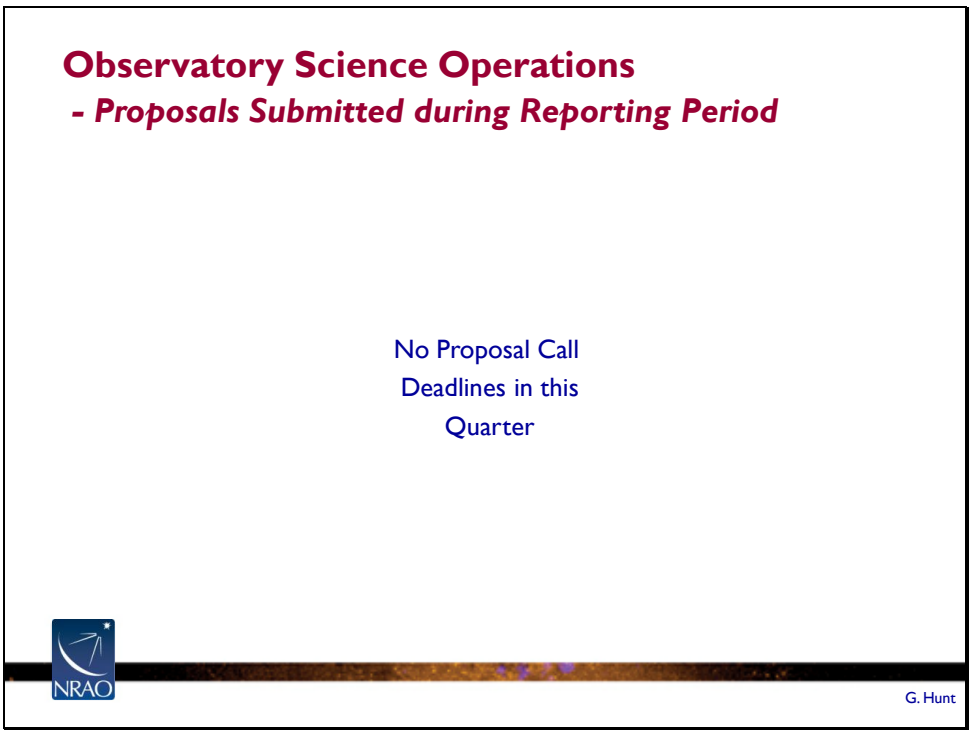
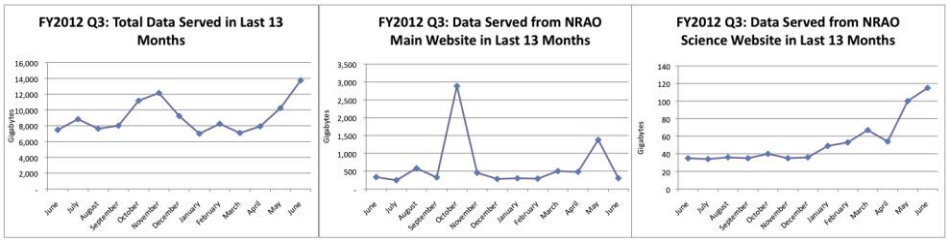
Proposals are considered in 8 distinct scientific categories. Although the total number of proposals is roughly uniform across all categories, it is clear that certain types of observing take different amounts of observing time on different telescopes.

Note that ALMA observations are not included in this presentation. The inclusion of the ALMA North American observations would not change this significantly, since they represent only 3% of the total hours observed by all telescopes in this period.



There was no Call for Proposals during this quarter. The next call for proposals for the GBT, VLA, and VLBA (NRAO Semester 2013A) is August 1, 2012 for observations to be scheduled between January 2013 and July 2013. The next call for proposals for ALMA Early Science Cycle 1 is July 12, 2012 for observations to be scheduled starting on January 1, 2013.

Observatory Science Operations
- Data Serviced during Reporting Period



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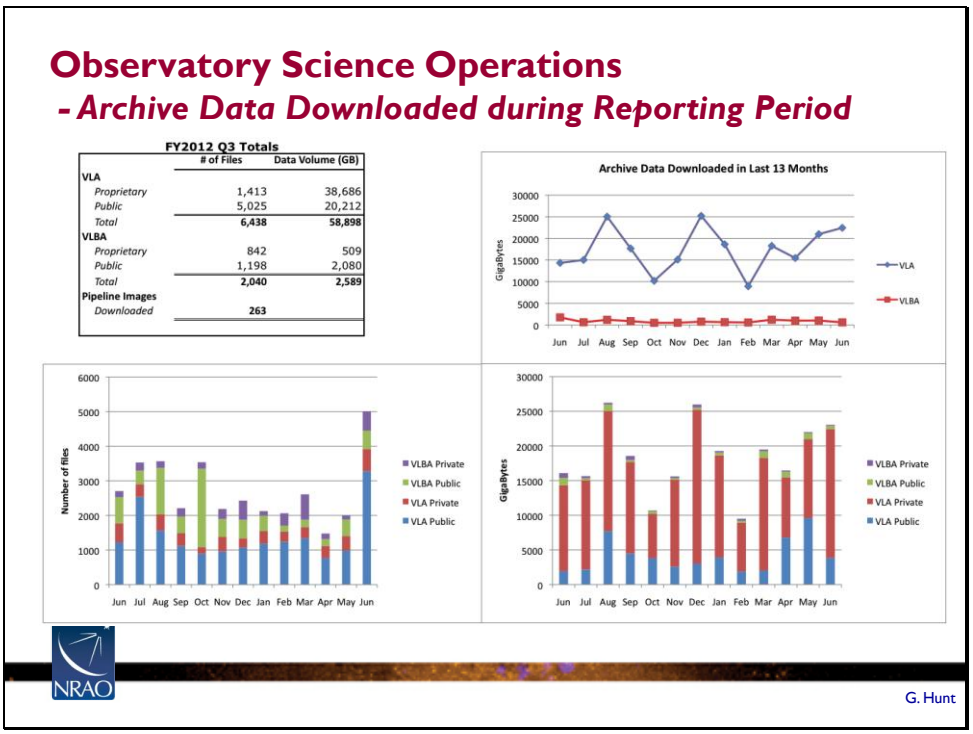
Total data served per month from all NRAO web servers. Specific data for the main web site and for the science web site.

The main web site provides NRAO's presence on the web. The science website is primarily in support of the observers.

To give some perspective, these are presented for the last 13 months. You can clearly see the response to the ALMA Opens Its Eyes announcement in October. Although the total traffic is modest, the recent increase in traffic from the science website reflects increased use of the NRAO e-news service.



This shows the data provided to the community by month by the NRAO Archive in Socorro.

To give some perspective, these are presented for the last 13 months.

TABLE 2: Performance to Program Operating Plan Major Milestones & Functional Tasks
-Observatory Science Operations-

Gantt Chart

	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
1	**- NRAO All Funding**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
2	**- Observatory Science Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
3	**- User Portal**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
4	Reinsource Open Sky SW Contract	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
5	Single Sign-On Capability	Sat 10/1/11	Sun 9/30/12	NA	
6	**- Proposal Process**	**Sat 10/1/11**	**Sat 3/31/12**	**Thu 6/28/12**	
7	Complete SW Development Time Allocation Process	Sat 10/1/11	Sat 3/31/12	Thu 6/28/12	Complete now, but finished late of Q2.
8	**- Observing Prep Tools**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
9	Incorp Splatalogue DB into VLA/GBT OPT	Sat 10/1/11	Sun 9/30/12	NA	
10	**- Helpdesk/User Forums**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
11	Single sign on from portal to both helpdesks	Sat 10/1/11	Sat 6/30/12	NA	Decision to delay to mitigate risk.
12	Integrate GB Ops into Helpdesks	Sat 10/1/11	Sun 9/30/12	NA	
13	User-to-User discussion forum re: CASA	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	
14	**- Science Community Communications**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
15	Represent at AAS, IAU, and AAAS meetings	Sat 10/1/11	Sun 9/30/12	NA	
16	Represent at NSBP/NSHP	Sat 10/1/11	Sun 9/30/12	NA	
17	Represent at ICHPC	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	
18	**- VAO**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
19	Prototype VAO access to ALMA, VLA, VLBA, GBT	Sat 10/1/11	Sun 9/30/12	NA	
20	**- Metrics and Statistics**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
21	Complete enhancements and integration with legacy DBs	Sat 10/1/11	Sun 9/30/12	NA	
22	**- Observation Support**	**Sat 10/1/11**	**Sat 6/30/12**	**NA**	
23	SCHED updated to support C-band VLBA	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
24	OPT updated to support 8 GHz on VLA	Sat 10/1/11	Sat 6/30/12	NA	Decision to slip schedule after key observing complete.
25	OPT incorp correlator set-ups	Sat 10/1/11	Sun 9/30/12	NA	
26	**- User Education and Training**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
27	CASA Tutorial ALMA Cycle 0 and VLA	Sat 10/1/11	Sat 12/31/11	Sat 3/31/12	
28	13th Synthesis Imagin Workshop	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
29	Community Days Events	Sat 10/1/11	Sun 9/30/12	NA	
30	H1 Conference GB	Sat 10/1/11	Sat 3/31/12	Tue 4/3/12	
31	**- Science User Outreach**	**Sat 10/1/11**	**Sat 3/31/12**	**Sat 3/31/12**	
32	NAASC 6th Scientifiic Conference	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
33	Prototype VLA CASA pipeline for D-Config Data	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	
34	**- Library and Historical Archives**	**Sat 10/1/11**	**Sat 12/31/11**	**Sat 12/31/11**	
35	Implement page charge support	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	

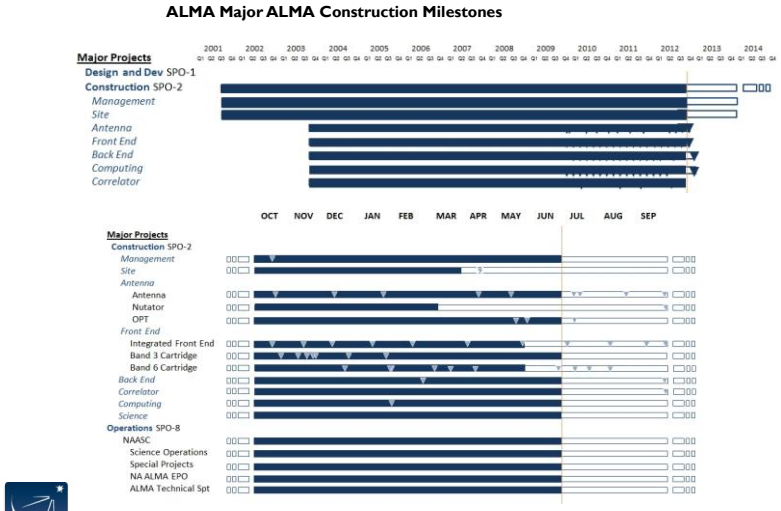
TABLE 3: Performance to Program Operating Plan Financial Projections
-Observatory Science Operations-

	Total NSF New Funds (PRL) and Carryover	FY12 Thru Q3 Actuals	% Spent	Notes (75% fiscal year elapsed)
Observatory Science Operations (OSO)	**13,314,050**	**7,627,747**	**57.29%**	**OSO Spending increases in 3rd and 4th quarters overall due to summer programs and student research projects.**
Observer Support, Services, and Tools	4,298,986	3,758,551	87.43%	Ahead due to computer hardware purchase for GB Archive support and Open Sky expenses.
Community Support Programs	1,604,540	1,088,005	67.81%	Most spending for Community Support occurs in the 3rd and 4th quarters as students come to NRAO for summer projects
North American ALMA Science Center	6,919,647	2,654,513	38.36%	Spending ramps up in summer as students come to NRAO to work with NAASC Scientists. Also, ALMA Telescopes just began receiving data for analysis and research in the 1st Quarter.
Research Experience Teachers & Undergraduates	490,877	126,679	25.81%	Most REU/RET Spending occurs in 3rd and 4th quarters as students come to NRAO for summer projects. $490.8K is for FY12 and FY13 funding.

Agenda

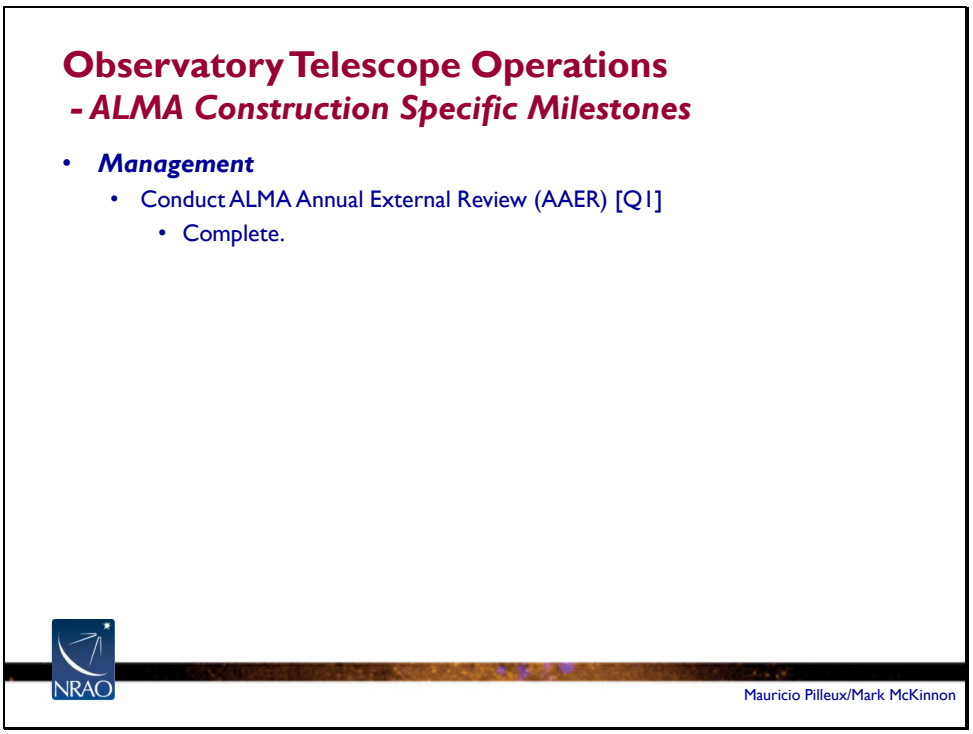
- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
  - ALMA Construction
  - EVLA Construction
  - EVLA/VLBA Operations
  - Green Bank Operations
- Observatory Development & Programs
- Broader Impact
- Observatory Administrative Services
- Director's Office

Observatory Telescope Operations
- *ALMA Construction Project Schedule View*

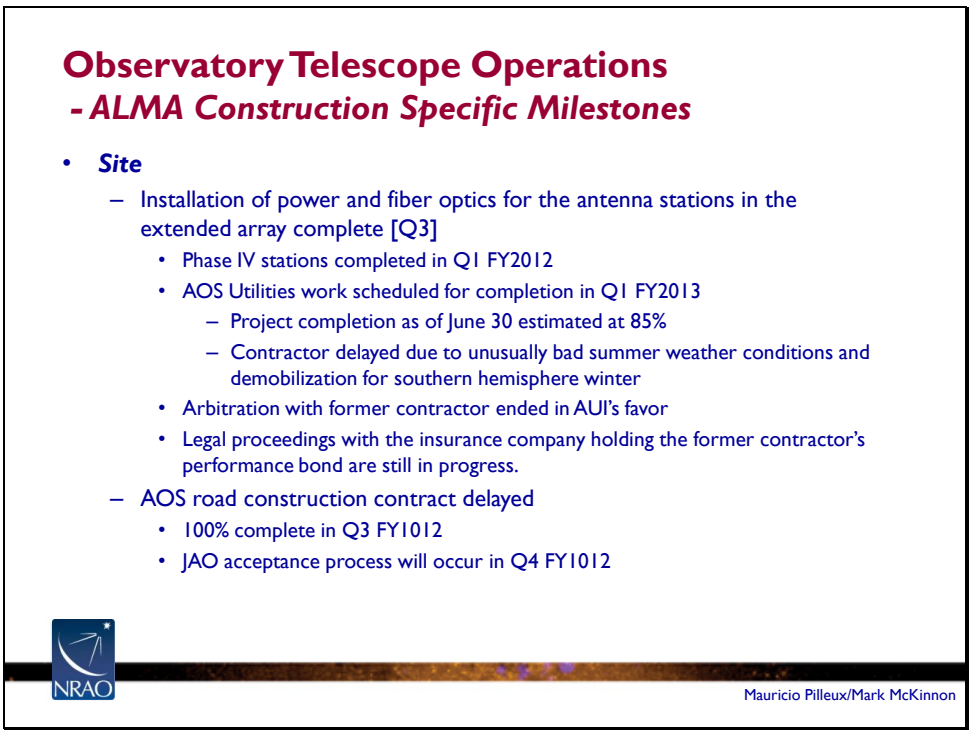


Mauricio Pilleux/Mark McKinnon

The first graph illustrates the full lifecycle. The second graph is this fiscal year view. The vertical line represents where we are today.

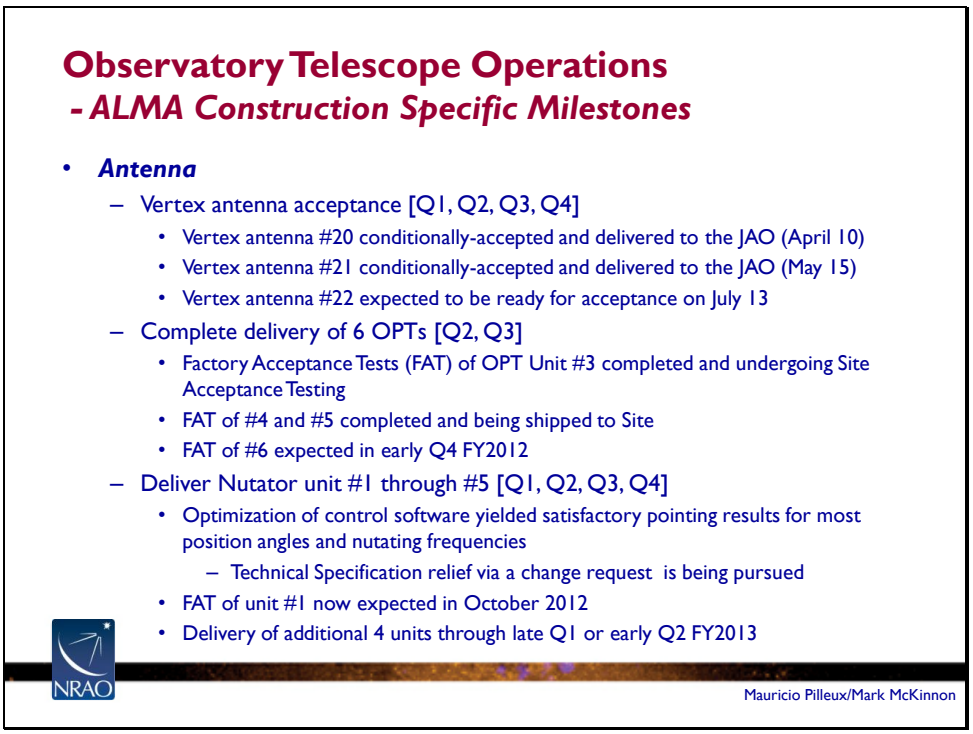


MANAGEMENT: The **ALMA Annual External Review (AAER)** was conducted in Santiago 17-20 October 2011 and reported in Q1.



Site: The **AOS Utilities Contract** is 85% complete. The next milestone is the 5 km Array and this is now scheduled to be completed in Q4 FY2012. The schedule has slipped due to the bad weather experienced at the AOS. However, the delay should not affect the overall completion of the ALMA Project. Legal proceedings with the former contractor and the insurance company holding the performance bond are in progress. On the arbitration process with the former contractor, the verdict was favorable to AUI/NRAO. The insurance company arbitration process is being refined in light of the favorable verdict.

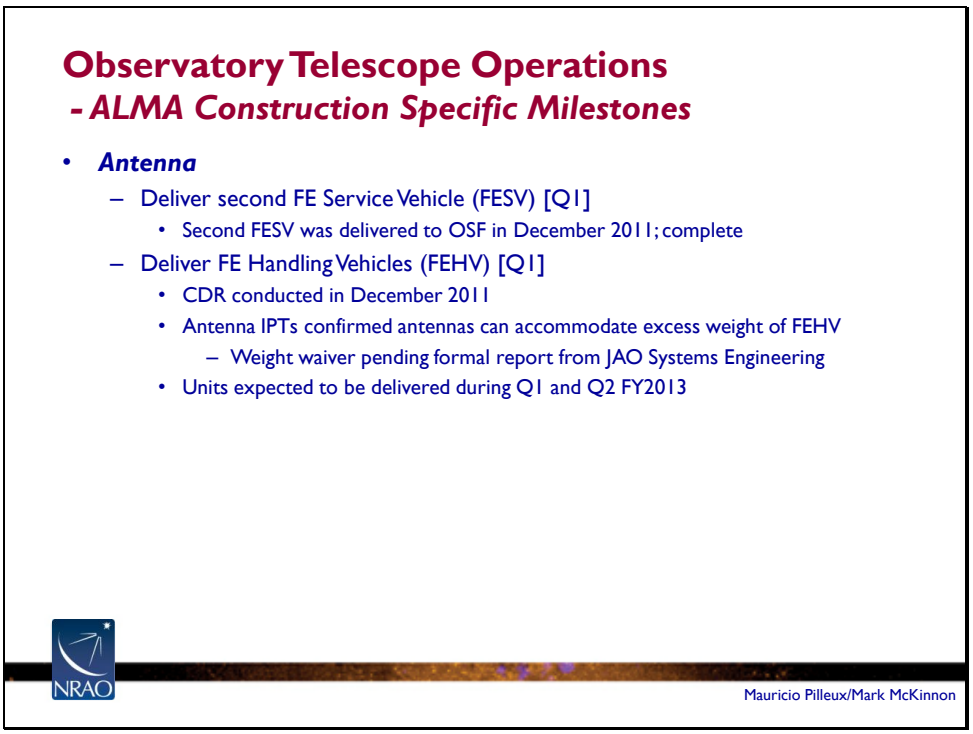
AOS Road Construction Contract work is 100% complete. The ALMA acceptance process for the roads will be performed during Q4 FY2012.



Antenna: During Q3 FY2012 the **20th and 21st Vertex antennas were conditionally-accepted** by the JAO. Pointing acceptance testing began in late-May on the **22nd Vertex antenna**; unfortunately, a combination of bad weather, ongoing problems with the OPT mini-rack control hardware and problems with OPT installation forced a delay of the **Antenna 22** Pointing Acceptance. As a result, acceptance of Antenna 22 is now scheduled for mid-July. The **23rd Vertex antenna** is nearing completion with acceptance of the antenna by the JAO expected in early Q4 FY2012. Vertex and NAAIPT continue to work with AIV to provide a high level of antenna availability. Efforts continue to concentrate on resolving one remaining open issue related to encoder faults. The root cause of encoder faults was believed to be related to EMC-type noise on connector cables; this proved to not be the case after on-site testing. Investigations are now concentration on timing error problems generated by frequent re-setting of the Local Oscillator Reference Receiver.

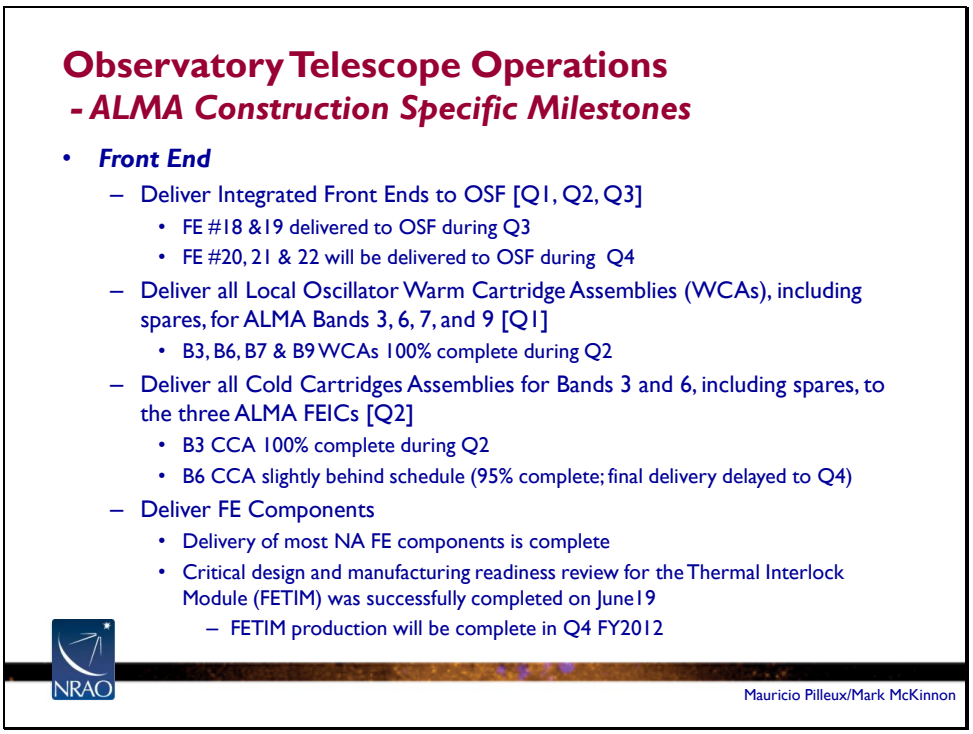
Production OPT (POPT): Factory Acceptance Testing (FAT) for **POPT Unit #3** was conducted on 1 May, with delivery of **POPT Unit #3** to the site made in late May to allow on-site commissioning/acceptance which is now underway. FAT of **POPT Units #4 and #5** was conducted 20-21 June; delivery to site expected in early Q4 with on-site commissioning/acceptance to follow. FAT of **POPT Unit #6** scheduled for July with site delivery and on-site commissioning/acceptance to be completed by mid-late August. **POPT Unit #2** continues to be used successfully on-site for acceptance of Vertex antennas following the installation of a new QSI CCD Camera. Upgrade of **POPT Unit #1** is pending receipt of a new QSI CCD camera on-site.

Nutator: NRAO control engineer in **Green Bank** working in tandem with Taiwan vendor engineers has resolved control system issues with satisfactory pointing performance for all but a few large position angles and high nutating frequencies. Current performance results have been submitted to ALMA Science for possible relief from Nutator Technical Specification requirements of the few problematic pointing areas. FAT has now been delayed until late October 2012. With a successful FAT, **delivery of Nutator Unit #2** to Chile would be in early Q1 FY2013 for on-site engineering and interface tests (PAS).

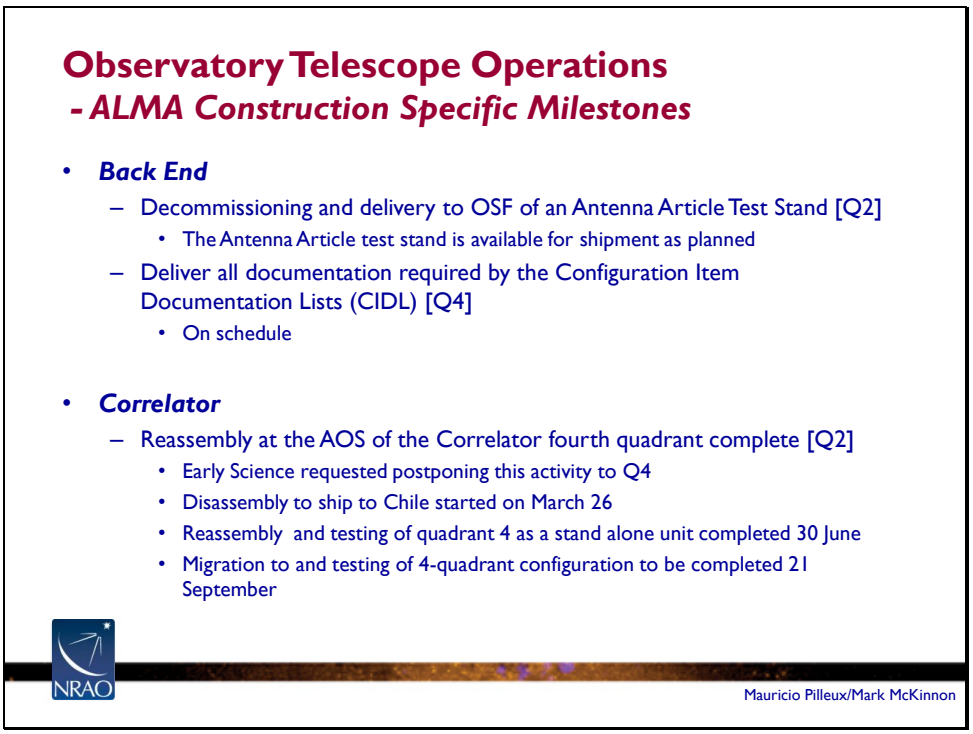


ANTENNA: PAS of the second (of two) **Front End Service Vehicles (FESV)** was passed at the OSF in December 2011.

CDR of the **Front End Handling Vehicle (FEHV)** was performed in December 2011. The design exceeds the specified maximum weight for the antenna platform (450 kg was specified, design requires 680 kg). JAO has requested further information from Antenna IPTs regarding maximum weight allowed on the antenna platform to confirm that FEHV can proceed as designed. Acceptance was provided informally and System Engineering has not responded formally. Delivery of FEHV units (4) is now expected to occur during Q1 and Q2 FY2013. Currently, the delay poses no risks as other methods exist to install/remove FEs.

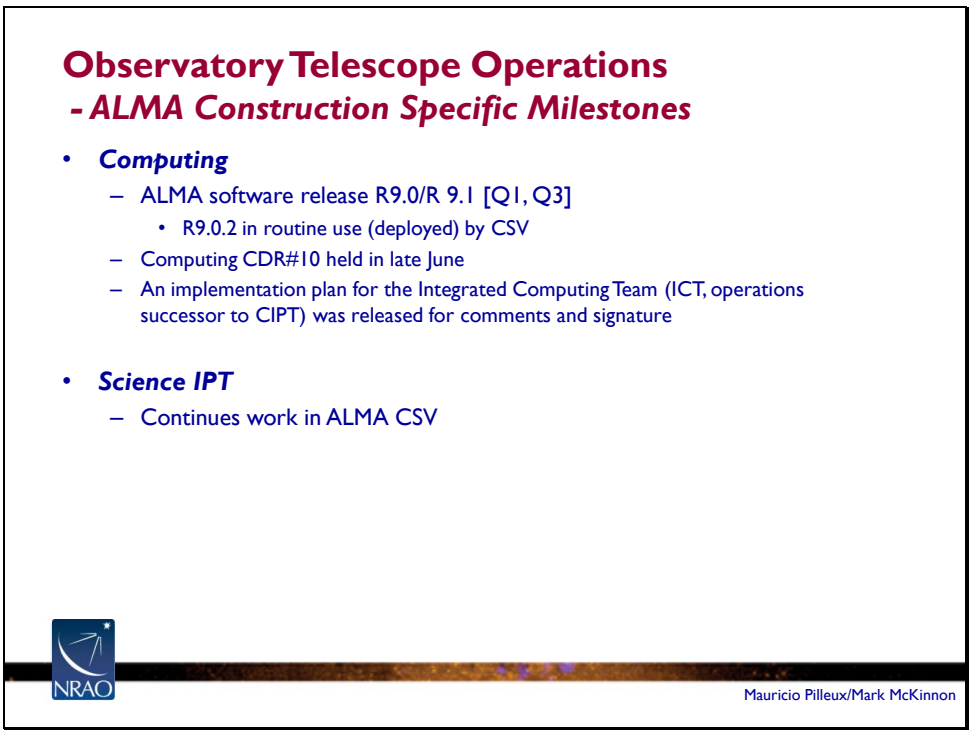


FRONT END: **Front End Assemblies:** last delivery (#22) delayed until September 2012 primarily due to accidental contamination of FE#61 by debris from plastic protection cap that was inadvertantly left on a Band 7 feed horn plus some delay caused by ITAR embargo. No cost impact to NA Project. **Local Oscillator Warm Cartridge Assemblies:** Final delivery of NAOJ Warm Cartridge Assemblies (Bands 4, 8, & 10) are on track to finish in Q2 FY2013 which corresponds to the end of the Japanese FY as required in the NAOJ Goods and Services Contract. **Cold Cartridge Assemblies: Band 6** mixer/preamp yield rate improved and the Band 6 team should finish production at the end of August. Final delivery of Band 6 CCA scheduled for August. Four deliveries remain to be delivered to the EU FEIC, three of which are held up in the acceptance process as we decide who has to bear the risk cost of JAO's conditional acceptance of these cartridges. **FE Components:** All B3, B6, B7 & B9 components are 100% complete. Additional B4, B8 & B10 components requested by NAOJ to accelerate their deliveries were delivered during Q2. All additional costs paid by NAOJ; no schedule impact. **FE Thermal Interlock Module** (FETIM) was a late emerging project requirement. CDMR passed in June 2012; production will run through Q4. Costs already incorporated in the FE IPT cost-to-complete estimate.



Back End: Production is essentially complete with the focus directed towards delivering the last spare items and subassemblies while also managing the transition into Off-site Operations support. The Antenna Article Test Stand, one of two in Socorro, is already available for shipment to the Operations Support Facility in Chile. Shipment will occur when JAO is ready to receive it. Closeout of documentation handoff requirements are also being managed and on schedule for FY12 Q4 milestone.

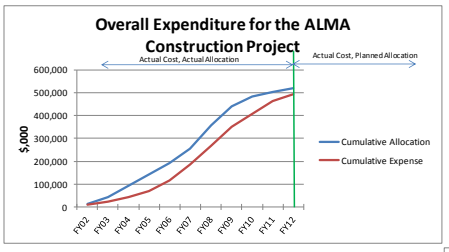
Correlator: The testing of the **fourth quadrant** required for PAI took place in Q1 and permission to ship was received. CSV requested that the re-assembly be postponed by a few months to better accommodate the needs of Early Science. This resulted in a revised schedule, and disassembly of the quadrant for shipment to Chile commenced on March 26. Reassembly and testing at the AOS as a stand-alone quadrant was completed on schedule by 30 June. It will be integrated with the other 3 quadrants to form a single correlator consisting of four quadrants by late September.



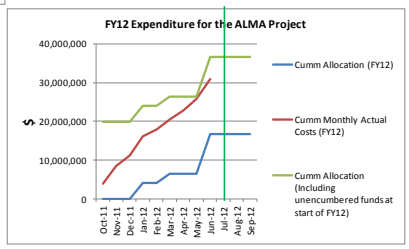
Computing: **Release 9.0.7** with additional DSO support tools in use in Santiago (final test reports being assembled). Release 9.1 on track for use in Q4 correlator operations. No major issues raised in CDR#10, minor deltas discussed and agreed. ICT implementation plan received very complimentary reviews from the project.

SCIENCE: Science IPT members worked with the NA antenna contractor to test newly assembled antennas before delivery to JAO and provides help to resolve antenna problems uncovered by JAO.

Observatory Telescope Operations
ALMA Construction Financial Performance Graphs
Overall & Q3 FY2012



Overall Spending for the ALMA Construction Project

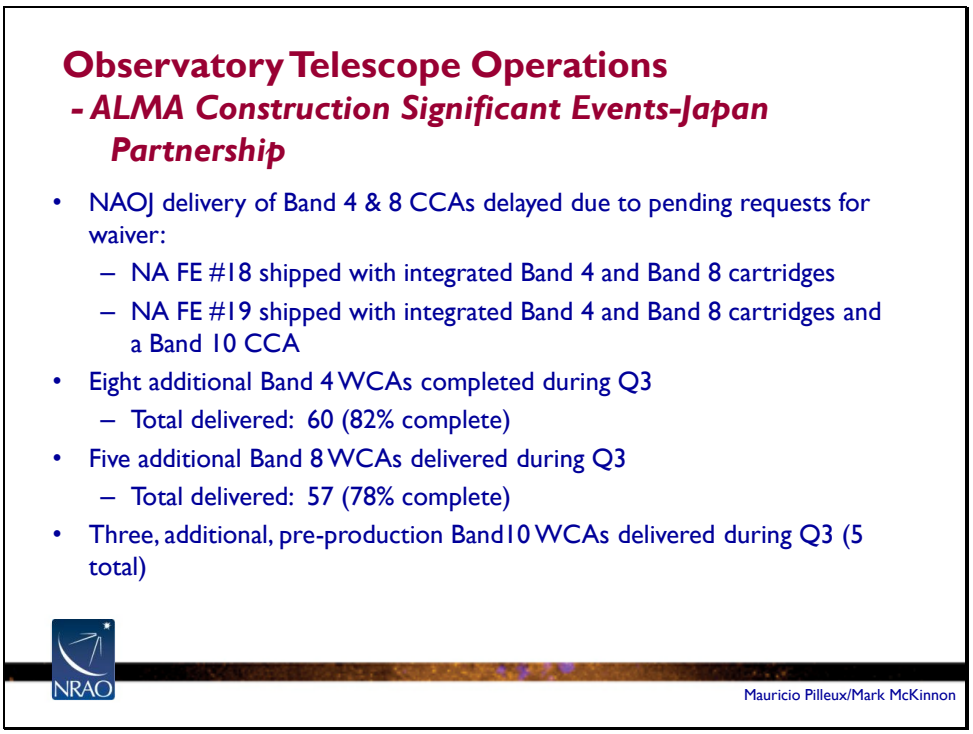


FY12 Spending for the ALMA Construction Project

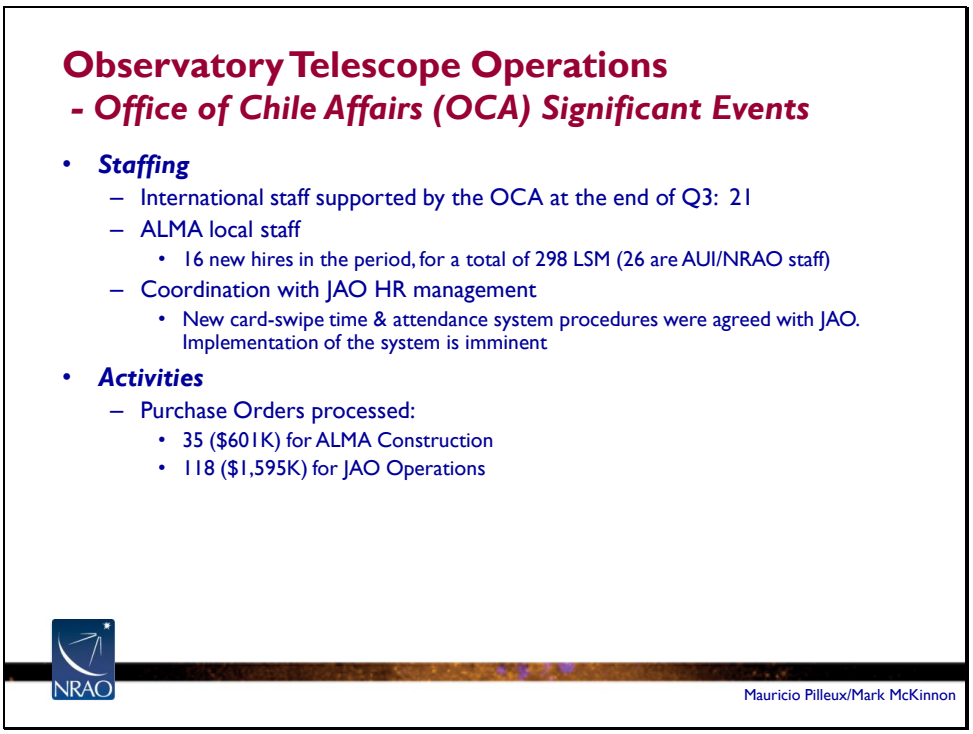
NRAO

Mauricio Pilleux/Mark McKinnon 9

Both graphs show the **NSF budget allocation**. In the case of the overall plan, the cumulative allocation is the allocation actually provided by NSF up to the end of FY2011, plus the planned allocations in FY2012.

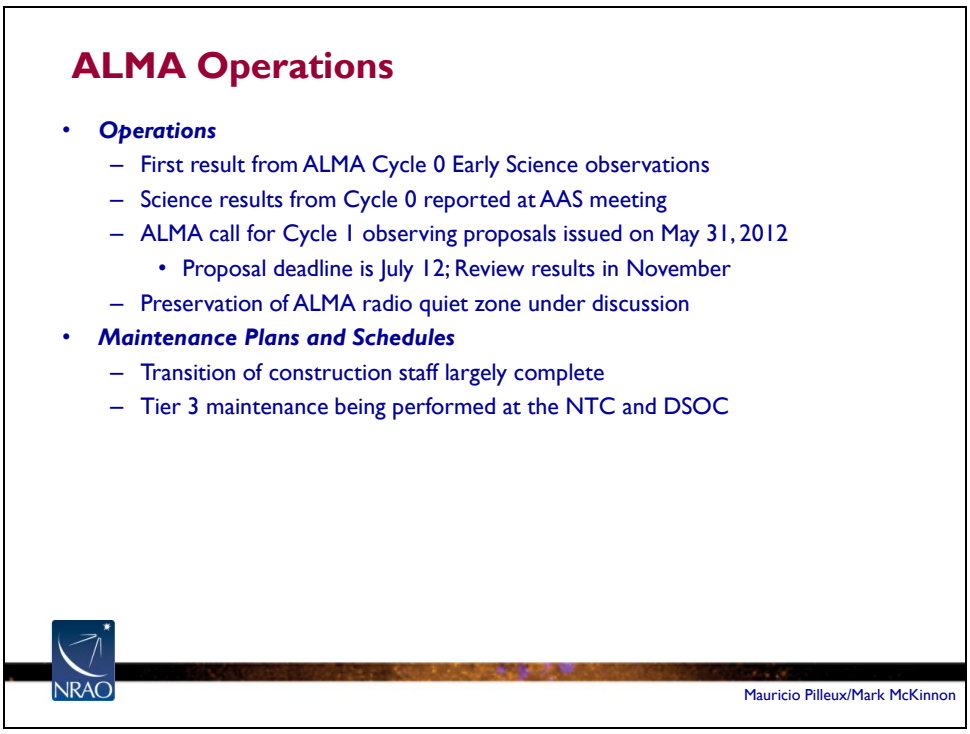


Front End Assemblies: Overall, NAOJ's delivery of Bands 4, 8, and 10 is coming later in the project than the delivery of the baseline Bands 3, 6, 7, and 9 due to NAOJ's late entry into the project. Integration planning for Band 4, 8, and 10 CCAs is complete. Some work will occur at the NA FEIC and EA FEIC; the balance of this work will occur at the OSF. NA FEs # 18 & 19 were shipped with integrated cartridges (cold + warm cartridge subassemblies). **Warm Cartridge Assemblies:** Production of Band 4 and Band 8 WCAs will be complete during Q1 FY2013. Production of Band 10 WCAs will complete in Q2 FY2013.



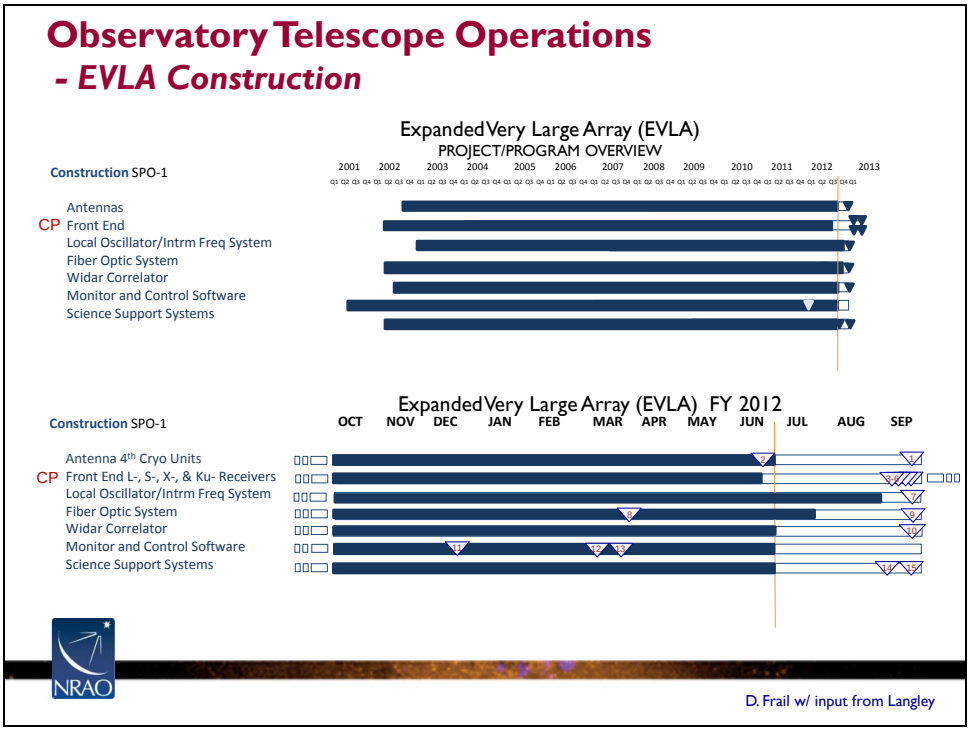
OFFICE OF CHILE AFFAIRS (OCA): The number of **international staff** at the end of Q2 is 21 FTE, two left and two were added. OCA has increased the total number of **Local Staff Members** employed in the quarter, bringing the total number of employees for which OCA provides ALMA with legal, payroll and travel support to 298 local staff on 30 June 2012 (26 are under AUI/NRAO direct supervision).

OCA has provided the legal and institutional support for contracts and procurements for ALMA as follows: a total of 35 purchase orders were issued for ALMA Construction ($601K) and 118 for ALMA Operations ($1,595K). The arbitration process due to the early termination of the AOS Utilities – Electrical and Fiber Optic cable installation contract with Echeverría & Kelly Ltda. gave a favorable ruling for AUI; the approach for the arbitration process for the payment of the associated performance insurance policy was modified to use the positive result of the other arbitration. Reports were issued to CONAMA (environmental authority) related to flora/fauna and archaeological follow-ups.

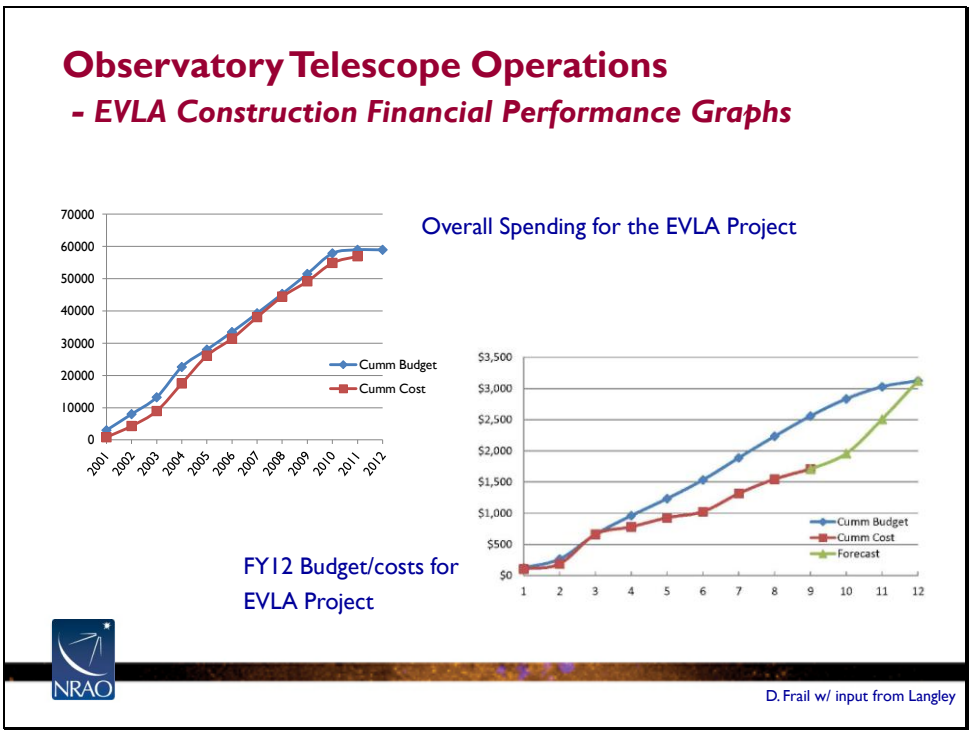


Operations:
An ALMA Special Session was held at the Anchorage **AAS** meeting on June 14. The ALMA call for **Cycle 1 observing proposals** was issued on May 31, 2012. The proposal deadline is July 12 with results available in November. Observations to begin on January 1, 2013; end on October 31, 2013. The preservation of the **ALMA radio quiet zone** is under discussion by NA Executive and JAO.

Maintenance Plans and Schedules
Transition of construction staff to operations positions is largely complete. Tier 3 **maintenance** of FE components, BE components, and photonics is performed at the NTC and DSOC as needed.



The top graph illustrates the full lifecycle of the EVLA construction project. The bottom graph reports status on POP goals for the current fiscal year. The vertical line represents where we are today. The CP represents the critical path. FE receiver production remains on the critical path, as the final receiver deliveries are not scheduled until the end of the current calendar year. Details are provided in additional slides.

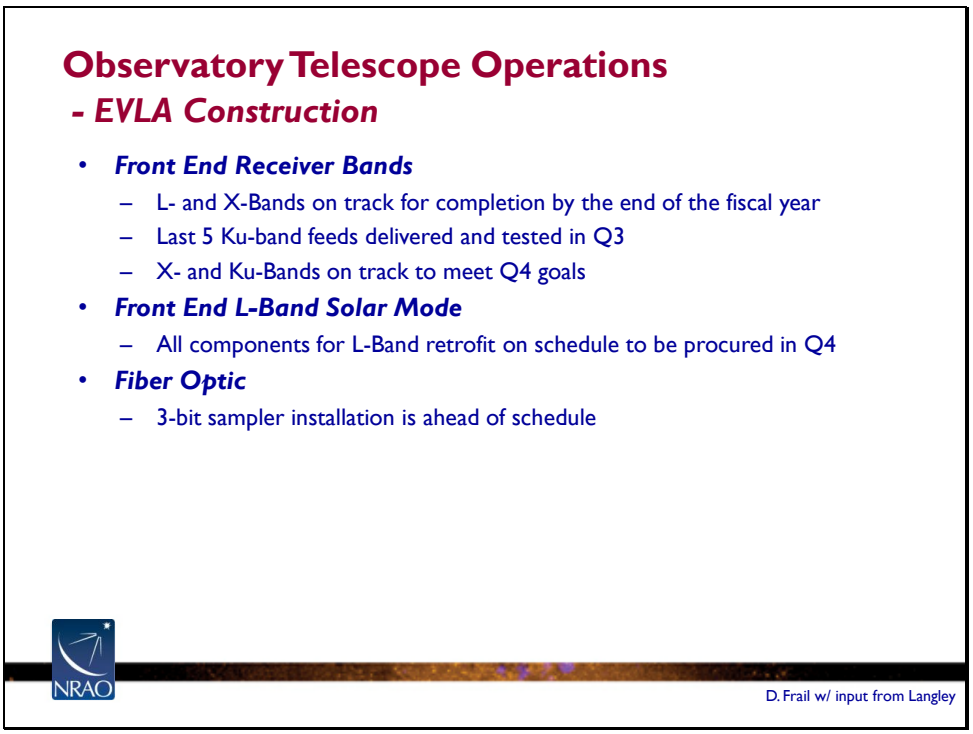


The budget line (blue) is based on a linear progression of the total budget for the fiscal year, the cost line (red) represents the actual expenditures to date, and the forecast line (green) represents the anticipated expenditures based on spending plans.

There are planned major budgeted expenditures which will take place towards the end of the fiscal year and perhaps even in the following quarter. Among these include the archive hardware and computing cluster (~$550k). Computing would like to delay spending these funds for as long as possible so as to receive the highest level of hardware for the dollar. Other major upcoming expenditures include the overall effort to develop an Antenna Control Unit prototype (~$70k of $270k remaining to be spent), the purchase of all components necessary for FE solar enhancements (~$250k, in process), and hardware for the Correlator Back End ($120k).

Project contingency levels change as often as project needs arise and conversely, as WBS budgets are reviewed. As of the end of Q3, the contingency balance stood at $564K, 25.4% of the cost to complete of Draws during Q3 on contingency included the following: $52k to the Local Oscillator account for the purpose of replacing 40 problematic T304 module RF assemblies, $28k added to the budget for hardware to improve Correlator Back End throughput, and $25k to complete civil construction tasks.

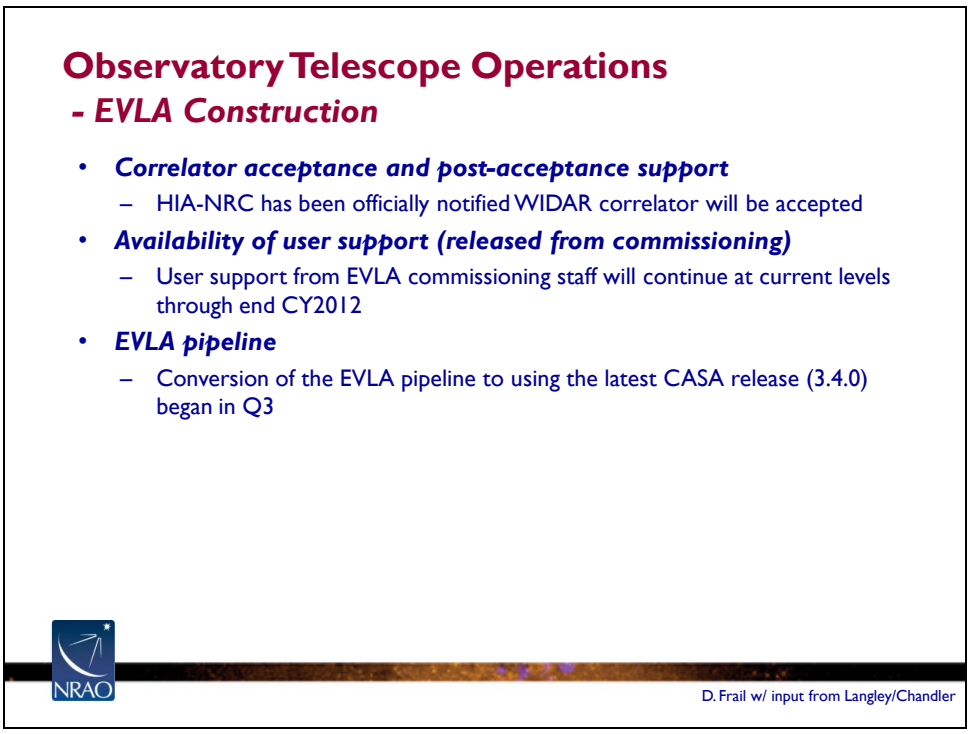
Two items from the risk register were triggered in Q3. The aforementioned $28k for the Correlator Back End triggered the associated risk.



At the end of Q3 22 L-band and 24 S-band EVLA compliant receivers have been implemented on the array. 20 X-band and 21 Ku-band receivers have been installed.

X- and Ku- receiver installations have fallen behind schedule due to a higher than anticipated staff absence rate (illness) and other pressing tasks. The Q4 goal of having 26 each installed is in jeopardy and likely will not be met. We anticipate 24 each will be installed by the end of September. The problem is understood. These bands, along with L- and S-, will be fully outfitted on the array at the end of the 2012 calendar year. (The end of CY12 goal of all EVLA hardware implemented is not in danger.)

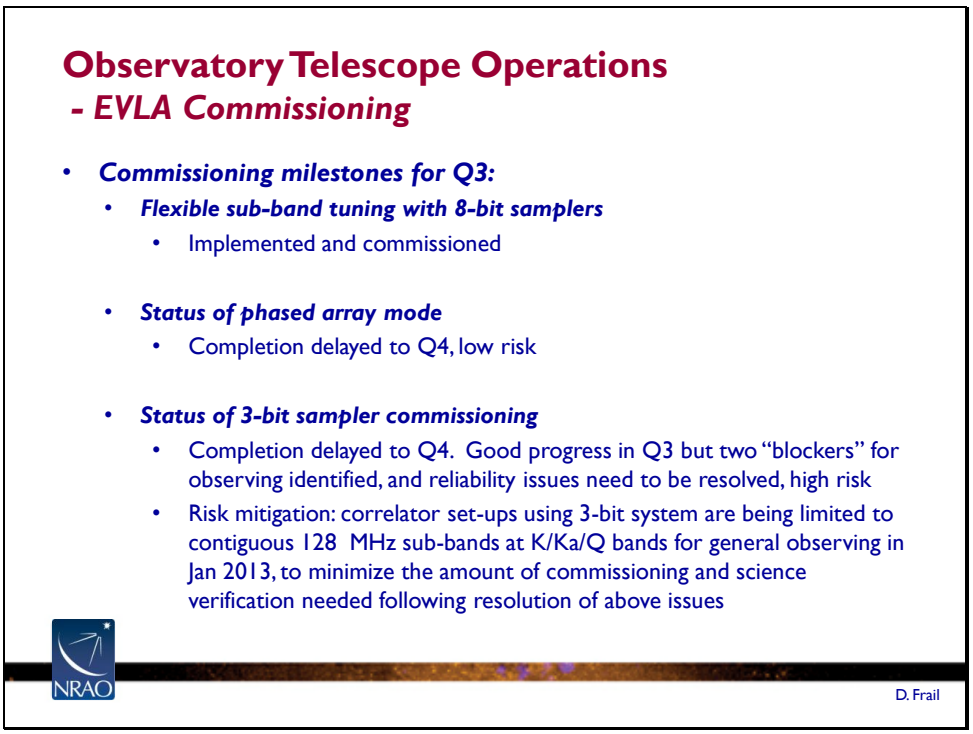
22 antennas have been outfitted with 3-bit samplers, along with portions of other antennas.



Correlator acceptance and post-acceptance support: HIA-NRC has been officially notified that the WIDAR correlator will be accepted by NRAO at the close of the current fiscal year. HIA-NRC will continue to provide WIDAR support to NRAO staff at present levels through December 2012.

Availability of user support (released from commissioning): User support from EVLA commissioning staff will continue at current levels through end CY2012; many EVLA commissioning staff were involved in the Synthesis Imaging Workshop in Q3.

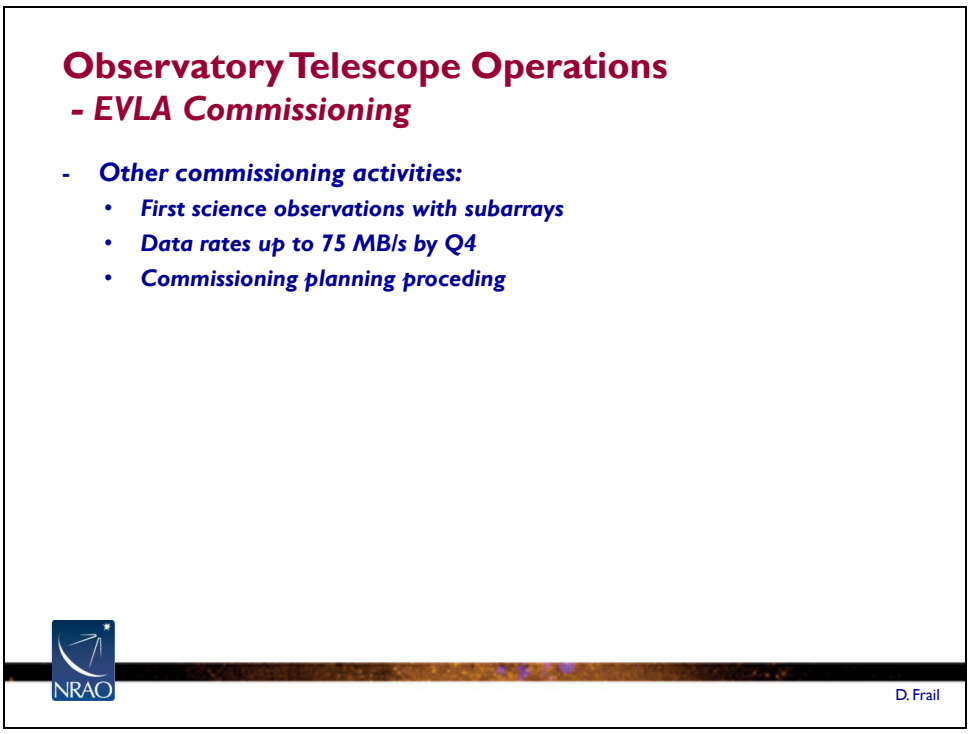
EVLA pipeline: Conversion of the EVLA pipeline to using the latest CASA release (3.4.0) began in Q3; heuristics for automated reference antenna selection, gain solution intervals, and flagging were worked on. Infrastructure of automated reduction of data on completion of scheduling blocks will be tested in Q4.



Flexible sub-band tuning: implemented and commissioned in Q3. This is working well for OSRO observations and it will be offered as a general observing mode in January 2013.

Phased array mode: The EVLA can phase 256 MHz bandwidth in 2 polarizations reliably, which is what is needed to be compatible with 2 Gbps VLBI. Data are being written to the Mark 5C recorder at the VLA, which will be used in the future for VLBI. 27 antennas of the VLA have been phased successfully and fringes have been obtained between a single VLA antenna and VLBA antennas. Fringes with the VLA and VLBA were not obtained during Q3, but further test data have already been obtained in early Q4. We are offering phased VLA for VLBI as a capability for general observing in January 2013.

3-bit sampler commissioning: In Q3, 10 additional antennas were completely populated with 3-bit samplers bringing the total to 19. One antenna remains half populated. Good progress has been made and it is now known how to set the attenuators and gain slope equalizers to ensure the data can be reliably calibrated. Reference pointing with the 3-bit samplers has also been demonstrated. The first RSRO test observations with the 3-bit samplers have also begun although the system is not ready for RSRO science. The first 3-bit demonstration spectral line data was submitted to a conference proceedings in the High Energy Density Physics Journal. During testing, two blocker issues were identified and these are being troubleshooted at the highest priority: 1) a problem with the firmware in the samplers was uncovered that causes the samplers to not be set up correctly about 5% of the time; 2) When changing correlator configurations (e.g., between 3 and 8-bit samplers) the WIDAR correlator drops data packets, causing a loss of data. These issues must be resolved before the 3-bit system can be released for commissioning for RSRO science observations. Risk: Cannot commission for all receiver bands. Mitigation: Only offered high frequency in last proposal call. All others offered as shared risk.



First science observations with subarrays: Demonstrated first science observations on 12 April 2012 (VLA/12A-249) with 3 sub-arrays: DQ Tau simultaneous monitoring in Ka-band with X-band reference pointing (8 ants), Ku-band (8 ants), C-band (11 ants).

Data rates up to 75 MB/s by Q4: Already achieved data rate ~100 MB/s (ahead of schedule) using 10 ms dumps with 3 sub-band pairs and 27 antennas for a RSRO science program (to observe Rotating Radio Transients).

Commissioning planning: Defined general capabilities to be offered to the community for the August 1 2012 proposal deadline, and developed a commissioning plan-to-completion to ensure capabilities will be delivered by Jan 2013. Documentation updated during Q3, ahead of July 9 Call for Proposals.

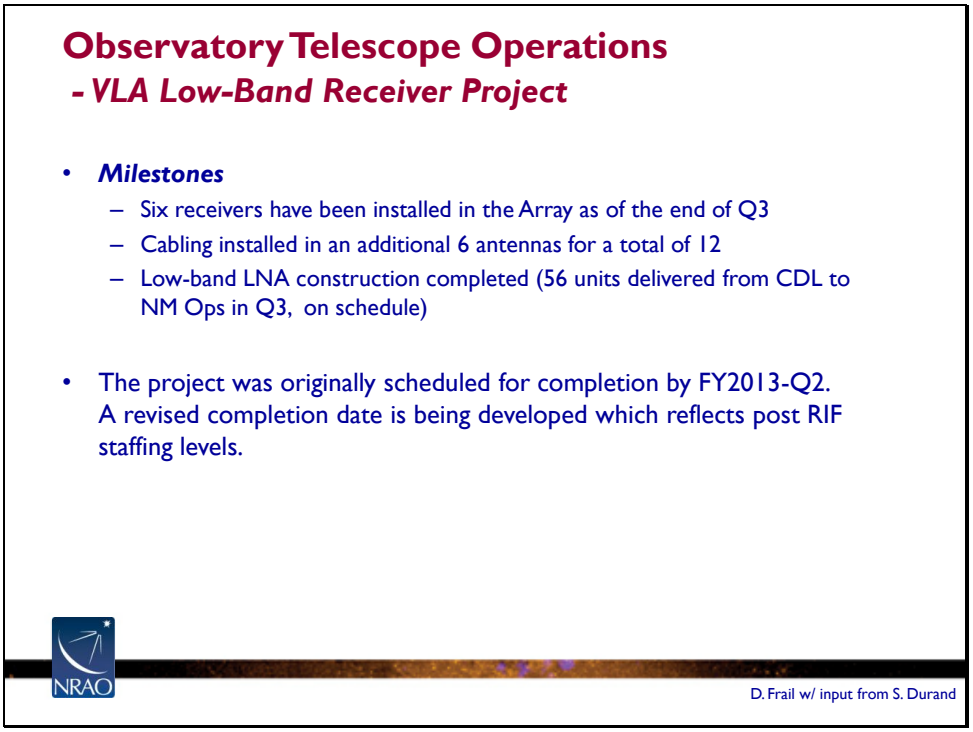
TABLE 4: Performance to Program Operating Plan Major Milestones & Functional Tasks
-Observatory Telescope Operations/Construction-

Gantt Chart

	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
52	**– Observatory Telescope Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
53	**– ALMA Construction**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
54	Annual ALMA External Review	Sat 10/1/11	Sat 12/31/11	NA	
55	Installation of power and fiber optics	Sat 10/1/11	Sat 6/30/12	NA	Bad weather delay; should not affect overall ALMA Project.
56	17th Vertex antenna accepted	Sat 10/1/11	Sat 12/31/11	NA	
57	Nutators devivered to the OSF	Sat 10/1/11	Sat 6/30/12	NA	Control systems issues resolved. Delayed until late 10/12.
58	Redesigned units (OPT) delivered to OSF	Sat 10/1/11	Sat 3/31/12	NA	
59	Delivery of last (22nd) FE	Sat 10/1/11	Sat 6/30/12	NA	Deplayed until 09/12 due to contamination of FE#61.
60	All WCA, including spares for ALMA Bands 3, 6, 7, and 9 delivered.	Sat 10/1/11	Sat 12/31/11	NA	
61	WCAs for Bands 4 and 8 delivered	Sat 10/1/11	Sat 3/31/12	NA	On track to finish Q2 FY13; corresponding with Japan deliverble.
62	CCA for Bands 3 and 6, including spares, delivered	Sat 10/1/11	Sat 3/31/12	NA	First production of Band 6 expected end August.
63	Delivery of second FE service vehicles (FESV)	Sat 10/1/11	Sat 12/31/11	NA	
64	Delivery of FESV handling vehicles	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
65	Decommissioning and delivery to OSF of Antenna Article Test Stand	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
66	CIDL delivered	Sat 10/1/11	Sun 9/30/12	NA	
67	Reassembly at AOS of 4th quadrant complete	Sat 10/1/11	Sat 3/31/12	Sat 6/30/12	
68	Release R9.0 and R9.1 of ALMA SW	Sat 10/1/11	Sat 6/30/12	NA	9.1 slip to Q4; corresponds to use in Q4 correlator ops.
69	**– EVLA Construction**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
70	Complete integration of antennas	Sat 10/1/11	Sun 9/30/12	NA	
71	Complete installation of L and S-band front end systems.	Sat 10/1/11	Sun 9/30/12	NA	
72	3-bit mode compliant downconverter modules fully deployed	Sat 10/1/11	Sun 9/30/12	NA	
73	3-bit compliant DTS modules fully deployed	Sat 10/1/11	Sun 9/30/12	NA	
74	WIDAR formally accepted	Sat 10/1/11	Sun 9/30/12	NA	
75	Monitor & Control Commissioning Supported	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
76	Test version of the OPT available with capabilities to be advertised for full operations	Sat 10/1/11	Sun 9/30/12	NA	
77	Pipeline-processed EVLA/OSRO data delivered to users	Sat 10/1/11	Sun 9/30/12	NA	
78	Subarray and phased array observing modes commissioned.	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
79	Increased flexibility in correlator set-ups will be commissioned and deployed for RSRO use.	Sat 10/1/11	Sun 9/30/12	NA	
80	3-bit samplers will be deployed and commissioned for RSRO use.	Sat 10/1/11	Sat 3/31/12	NA	Limited bands for general observing; all others shared risk.

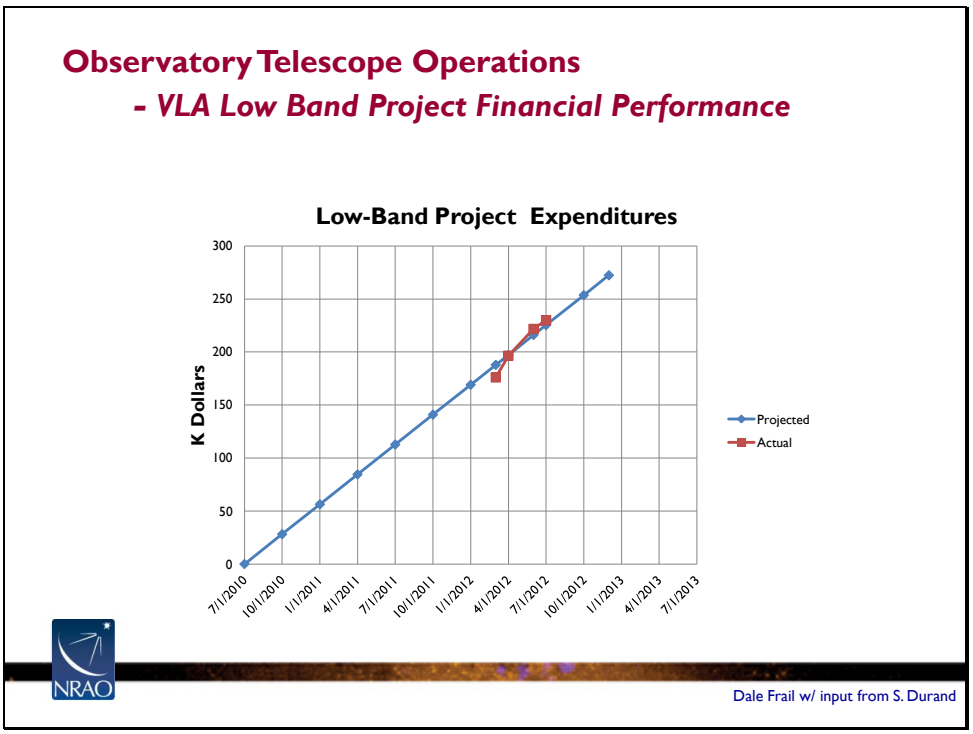
TABLE 5: Performance to Program Operating Plan Financial Projections
-Observatory Telescope Operations/Construction-

	Total NSF New Funds (PRL) and Carryover	FY12 Thru Q3 Actuals	% Spent	Notes (75% fiscal year elapsed)
Observatory Construction Projects	**73,598,817**	**35,427,816**	**48.14%**	
ALMA NA Construction	60,867,193	28,959,969	47.58%	While ALMA-Construction is reported on the POP on a per year basis, ALMA-C is tracked as inception to date by the project. ALMA is forward funded by NSF and the variance is the remaining forward funding and contingency for completion of the project.
ALMA Japan Construction	9,228,624	4,919,230	53.30%	While ALMA Japan is reported on the POP on a per year basis, ALMA-J, as part of the overall ALMA Construction project, is tracked as inception to date by the project. ALMA-J is forward funded by NSF and the variance is the remaining forward funding and contingency carried forward for completion of the project.
EVLA Construction	3,503,000	1,548,617	44.21%	Project completion is expected in FY12.

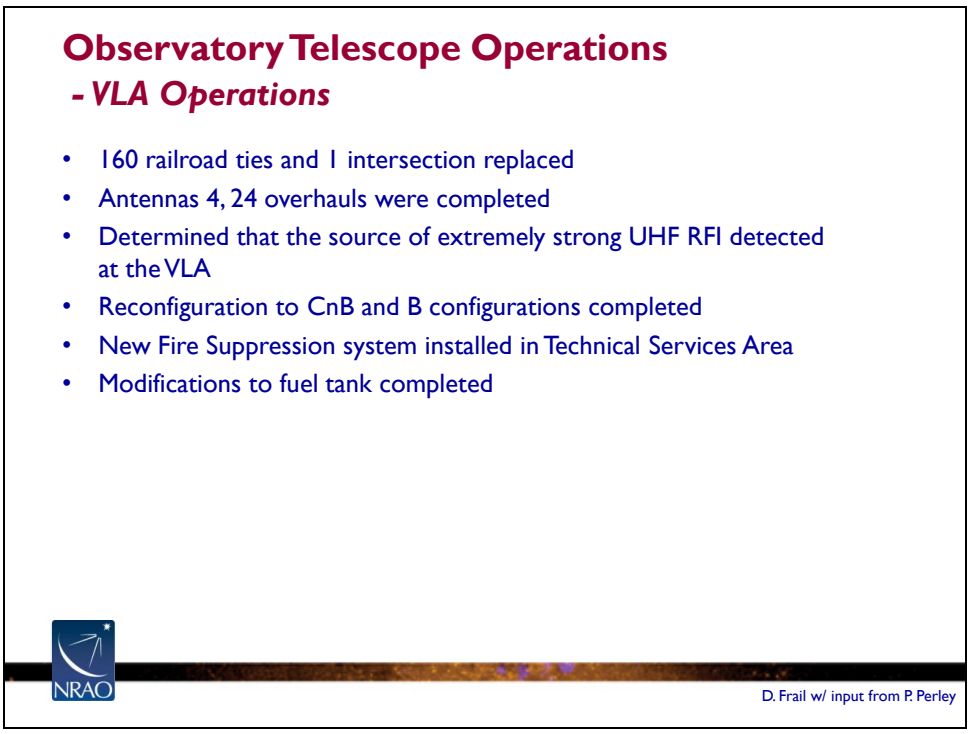


VLA low-band receivers: Six receivers were install in the array. It is anticipated that 6 additional receivers will be installed by the end of FYQ4 for a total of 12 receivers. Performance of the system 4-band (50-80 MHz) Trx = ~401 degrees K, P-band (230 – 470 MHz) Trx = ~66 degrees K.

A revised completion date is being developed which reflects post RIF staffing levels.



The Low Band project was funded by NRL ($270k). Expenditures up to FY2012-Q3 is $229.956k. This project will have spent all project funds by December 2012.



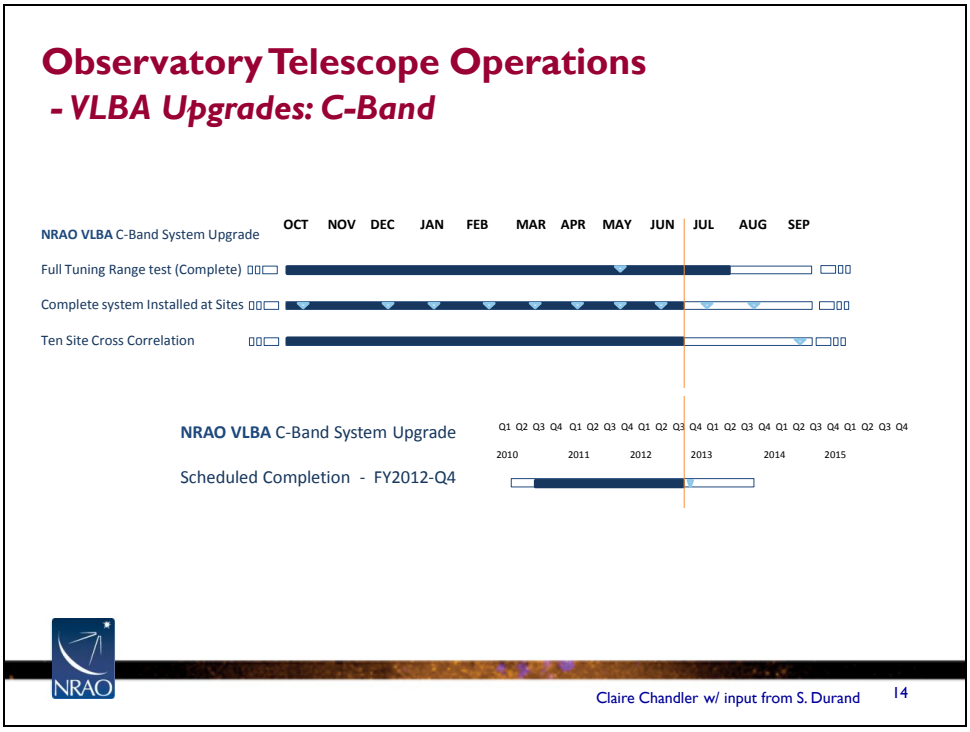
Railroad Infrastructure Maintenance and Repair: 160 railroad ties were replaced. 1 intersection was replaced.

Antennas: Overhauls on Antennas 4, 24 were completed.

Radio Frequency Interference Mitigation: Fixed some software bugs in the RF Direction Finding System control software. The system is now a fully functioning tool for use in investigating RFI reports. Determined that the source of extremely strong UHF RFI detected at the VLA to be temporary military "war games" activity on the west side of the San Mateo mountains. (No impact.)

Array Configuration change: Reconfiguration to CnB and B configurations completed in Q3

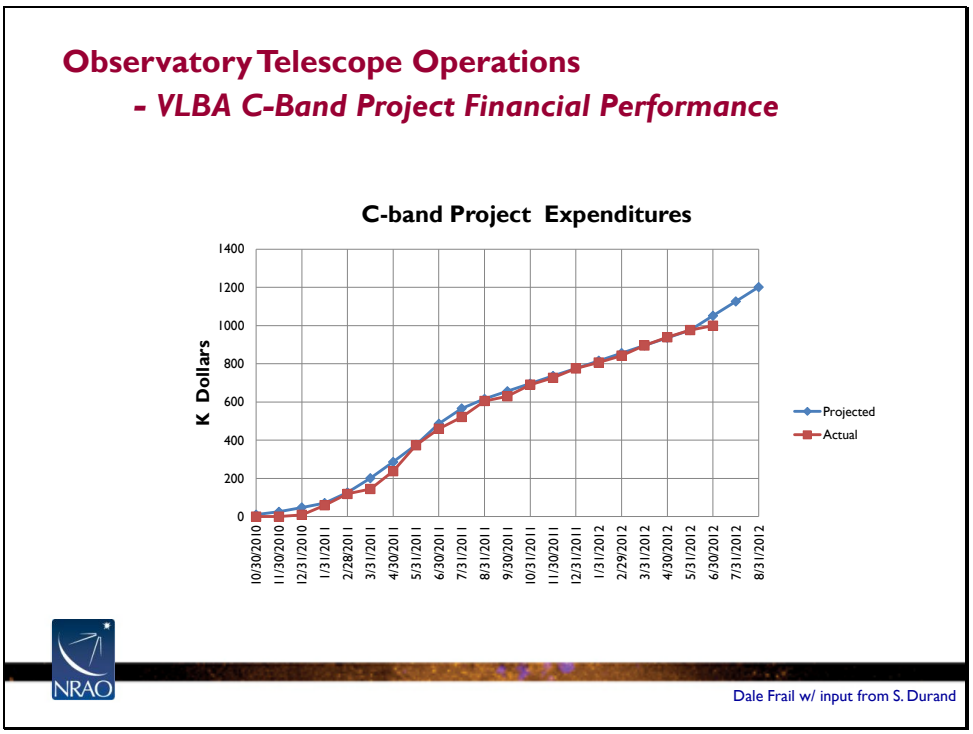
Other Operations Activities in Q3: New Fire Suppression system in the Technical Services Area was installed. Various concrete work was completed– foundations for API; sidewalk repair; water tank drain. Modifications to fuel tank completed to bring that system up to code.



NL, BR, and MK were outfitted with complete C-band systems during Q3, to provide 8 complete systems, ahead of schedule.

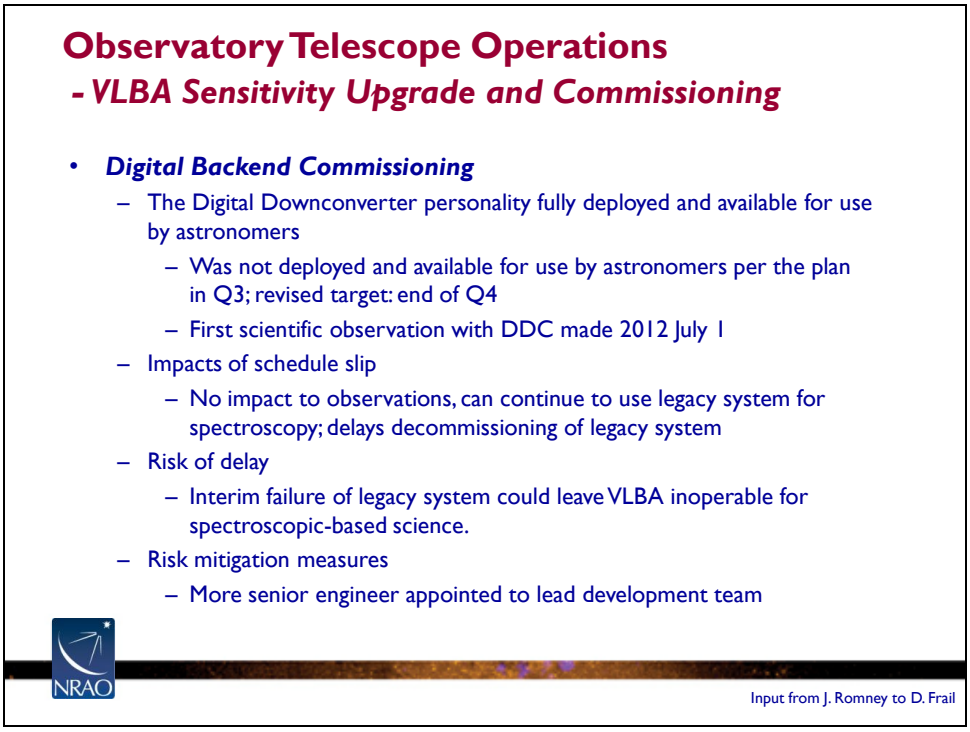
VLBA C-Band Project Support: GB Machine Shop has completed the fabrication of all 10 C-Band Feeds on Schedule. VLA Machine shop has completed fabricating the projects worth of Dewars, OMTs, and module chassis [Q2]. CDL is providing the LNAs [FY2011-Q3 to FY2012-Q3]

The project is on schedule for completion in FY2012-Q4.



The C-band Project is on track to complete the installation of the receivers, downconverters and new monitor and control equipment at all 10 VLBA sites by September 2012. The synthesizer development effort that was started in FY2012-Q1 is ongoing and will complete a functional prototype by December 2012.

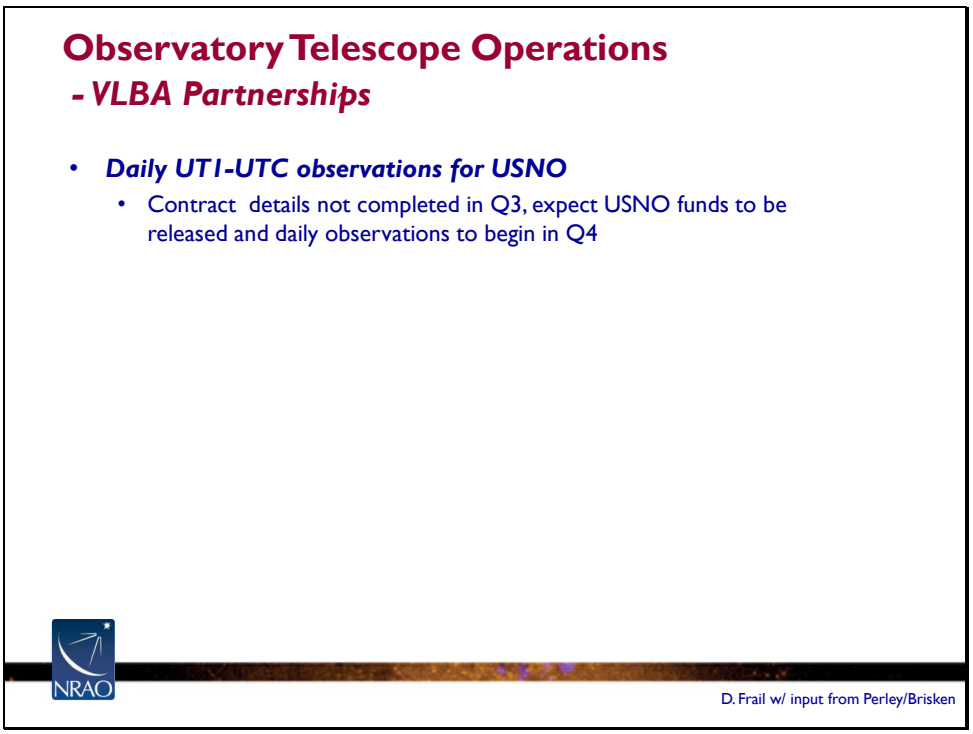
As of FY2013-Q3 the project has spent $999k. Procurement of some of the major parts to build the 20 Synthesizers will be made at the end of this fiscal year. A purchase order for an integrated assembly (~$79k) is in process. The project is on track to spend the all allocated funds this fiscal year.



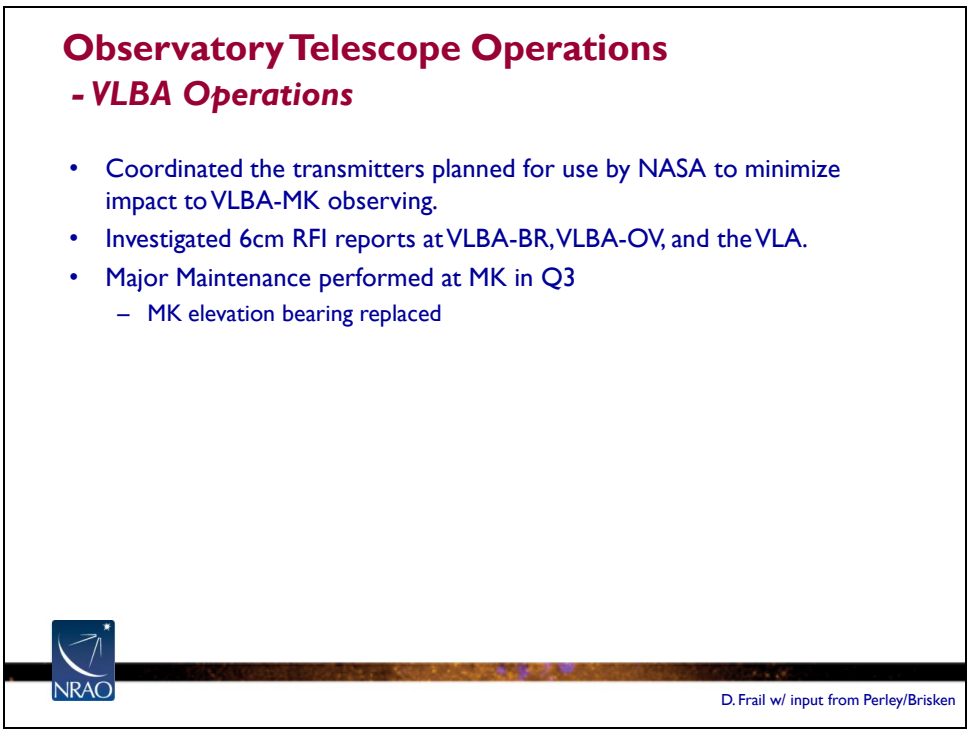
The goal of the DDC FPGA personality is to provide flexible spectroscopic observing modes using the VLBA's digital backends. The complexity of the design has made it difficult to implement, and in FY12 Q2 it was found that aliased out-of-band signals (and noise) were affecting the bottom ~6 MHz of each sub-band, preventing the DDC from being useful for narrowband spectroscopy. While this problem is being addressed the legacy backends are continuing to be used for spectroscopic observations.

The senior engineer who developed the original design became available to lead the firmware group in May 2012, after completion of 3-bit sampler development for the EVLA. He pointed out some rearrangement of firmware blocks that should prevent or minimize aliasing, and new tests were performed in Q3. The first science verification test data were obtained on July 1, and are waiting to be correlated and analyzed.

Note that the Polyphase Filterbank (PFB) personality for the digital backends already supports wideband continuum observations, at fixed 2-Gbps data rate. The DDC can already support the same throughput at the widest bandwidths, more conveniently and flexibly than the PFB.

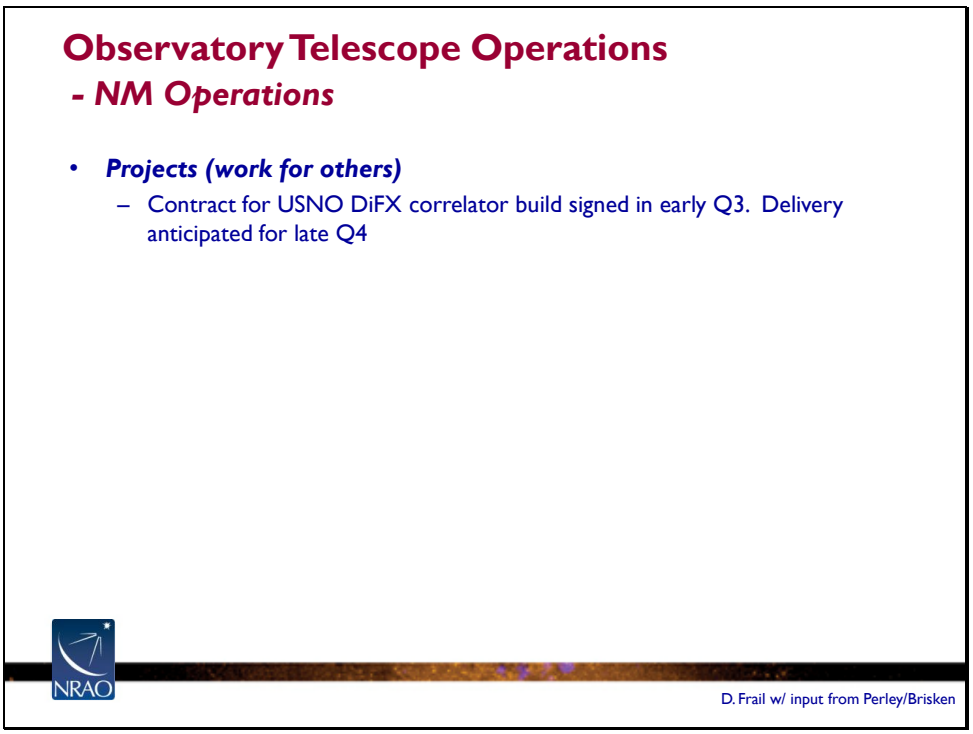


USNO UT1-UTC Observations – No funds transferred to NRAO in Q3, but progress in late Q3 was made to complete the required statement of work. July 20, 2012 is the current date to finalize the contract.



Operations: Radio Frequency Interference Mitigation: Coordinated the transmitters planned for use by NASA during their planned, July 2012 lunar rover tests at "Apollo Valley" on Mauna Kea so as to **minimize impact to VLBA-MK observing**. **Investigated 6cm RFI** reports at VLBA-BR, VLBA-OV, and the VLA. Identified interfering sources and indicated "open" spectrum for future observational planning purposes.

Maintenance Plans and Schedules: Major Maintenance performed at MK in Q3. MK elevation bearing replaced. Metal flakes had been showing up in grease samples from the Mauna Kea VLBA antenna elevation bearing since September 2009. Metal flakes in the grease indicate that the bearing race or rollers have spalled or shattered. If this bearing had not been replaced, it would have continued to deteriorate until the antenna was rendered unusable, incurring significant (weeks) downtime.

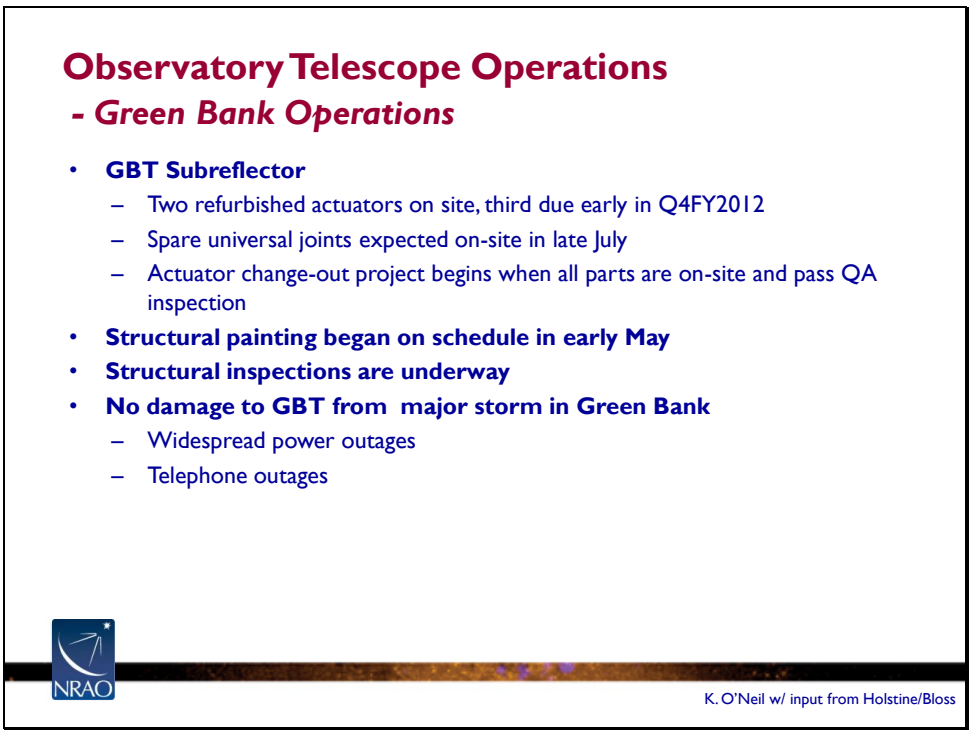


USNO DiFX – The contract to build, support and deliver a DifX software correlator to the US Naval Observatory (USNO) was signed in late April. A test correlator was designed and built in May and reviewed by USNO in the first week of June. Construction of the production correlator began at the end of June and is scheduled for delivery in September.

TABLE 6: Performance to Program Operating Plan Major Milestones & Functional Tasks -Observatory Telescope Operations/NM Projects-

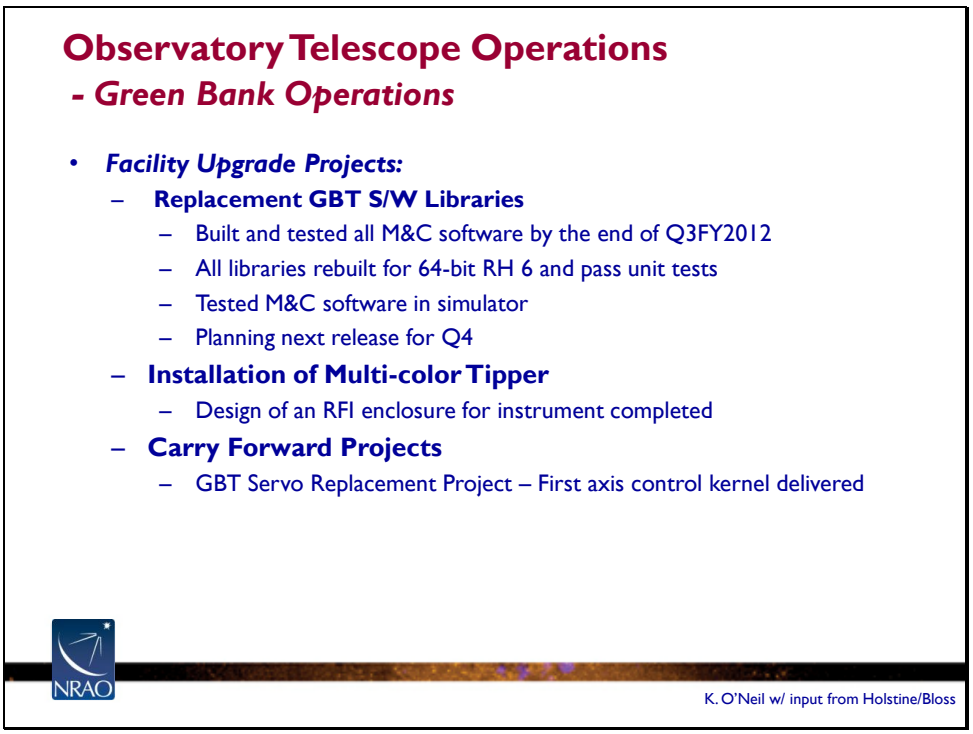
Gantt Chart

	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
92	**– Observatory Development Programs**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
93	**+ GB**	**NA**	**NA**	**NA**	
110	**– NM**	**NA**	**NA**	**NA**	
111	**– NM - EVLA-Low-Band**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
112	First functional receivers in the array (4 units)	Sat 10/1/11	Sat 12/31/11	Sat 3/31/12	
113	Deliver low-band receiver performance documentation to NRL (CDR)	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
114	Complete LNA construction (56 units delivered from CDL to NM Ops)	Sat 10/1/11	Sat 6/30/12	NA	
115	First observations using the low-band system under the Resident Shared Risk Observing program	Sat 10/1/11	Sun 9/30/12	NA	At risk due to RIF impact.
116	**– NM - VLBA Sensitivity Upgrade**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
117	Second digital backend installed at all sites.	Sat 10/1/11	Sun 9/30/12	NA	
118	First scientific observations with the DDC personality	Sat 10/1/11	Sat 6/30/12	NA	
119	**– NM - VLBA C-band Upgrade Project**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
120	Full tuning range available for new C-band receivers at 5 sites	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
121	C-Band system deployment and engineering verification – including cross-correlation complete at 10 sites	Sat 10/1/11	Sun 9/30/12	NA	
122	**– NM - USNO DiFX correlator Development**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
123	Sing contract with USNO	Sat 10/1/11	Mon 4/30/12	Mon 4/30/12	
124	Design and build test correlator	Sat 10/1/11	Thu 5/31/12	Thu 5/31/12	
125	Build, support and deliver DifX SW correlator	Thu 6/30/11	Sun 9/30/12	NA	
126	**– NM - USNO Observations**	**Sat 10/1/11**	**Sun 9/30/12**	**Sat 3/31/12**	
127	Begin daily UT1-UTC observations for USNO.	Sat 10/1/11	Sat 12/31/11	Sat 3/31/12	
128	**– NM DVA-1**	**Sat 10/1/11**	**Sat 6/30/12**	**Sat 6/30/12**	
129	CDR complete	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	



Work continues on refurbishment of the **subreflector actuators** following mechanical failure of the X2 actuator last fall and the Y2 actuator in March. X2 and the spare Z unit have been refurbished and are back on site; Y2 is nearly finished at the manufacturer. Spare universal joints are in fabrication and delivery is expected by the end of July. Changeouts of the other units will begin using these units after that.

Structural painting and the **3-year structural inspection** are receiving major focus this summer. A loss of commercial power after a derecho resulted in a site outage for about 27 hours starting on June 30. The GBT and supporting computer servers returned to service fairly smoothly. Wide spread outages in the Green Bank area lasted longer than a week. Offsite telephone and Internet service was also interrupted several times during the week. The GB staff response to this extraordinary event was exemplary: the plant maintenance crews worked hard to keep the telescope, site electricity, and water running; the cafe/cafeteria staff served food to those in need; and many members of other GB divisions – science, electronics, computing, mechanical, software, and telescope operations –worked long hours to resume GBT science operations while also making the facilities safe and available to assist community recovery efforts.

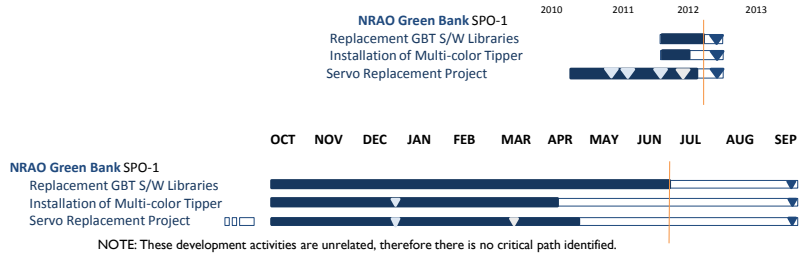


Replacement GBT S/W Libraries – The Software Division built and tested all M&C software in Q3. All libraries were rebuilt for 64-bit Red Hat v6 and passed unit tests. M&C software tested in simulator. Planning next release for Q4.

Installation of Multi-color Tipper - A design for an enclosure that shields RFI created by the Tipper from affecting observations provided to the GB shop for fabrication in Q4FY2012. This places this project behind schedule. Risk: Less data may be available for characterizing the Green Bank atmosphere. Mitigation: Establish initial parameters with less data or extend data collection time into FY2013.

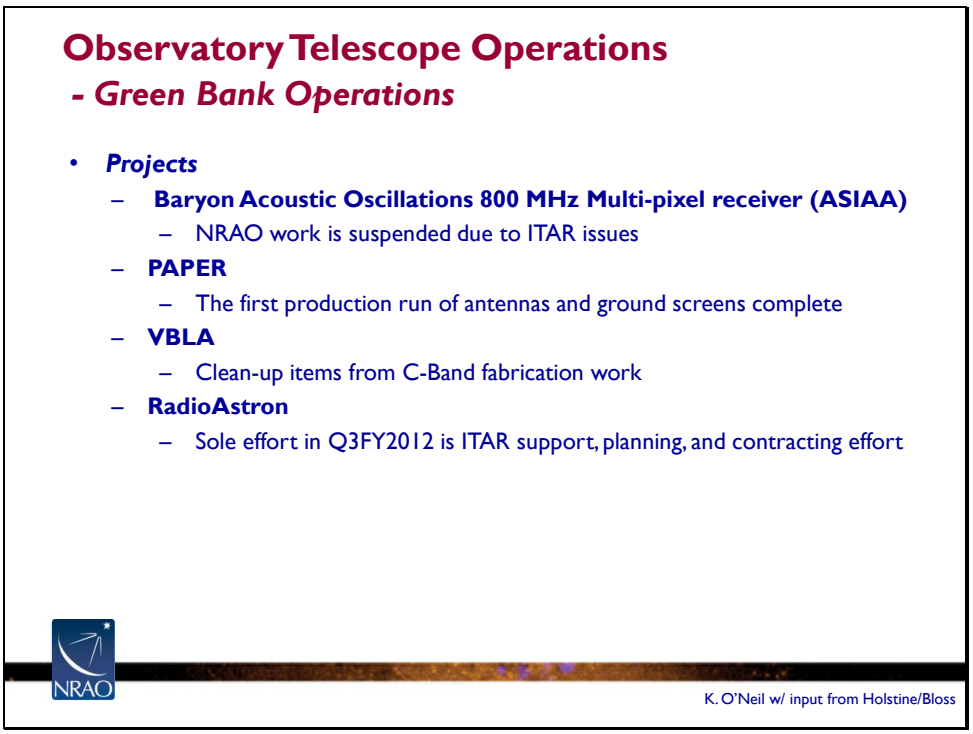
GBT Servo Replacement Project – Version 1 of the GBT elevation axis control kernel for the digital servo system was delivered into the simulation environment along with the necessary simulations for testing. Work in Q4FY2012 will deliver the azimuth control kernel. The project is behind schedule. Risk: Delays in incorporating pointing improvements into the GBT servo for high-frequency spectral observations. Mitigation: Provide additional time for high-frequency observers and retain tighter high frequency weather parameters to schedule projects.

Observatory Telescope Operations
- *Green Bank Telescope Upgrades*



NOTE: These development activities are unrelated, therefore there is no critical path identified.

K. O'Neil w/ input from Bloss



Baryon Acoustic Oscillations 800 MHz Multi-pixel receiver (ASIAA) - NRAO work is suspended due to ITAR issues and negotiations with Taiwanese partner.

PAPER – The first production run of antenna and ground screen fabrication is complete and handed over to the PAPER team. Run two of three is in progress and will finish in Q4FY2012.

VLBA - Clean-up items from C-Band fabrication work.

RadioAstron – Refurbish work and equipment expenditures were suspended for Q3FY2012 due to export issues. Support continues for the ITAR negotiating team.

TABLE 7: Performance to Program Operating Plan Major Milestones & Functional Tasks -Observatory Telescope Operations/Operations-

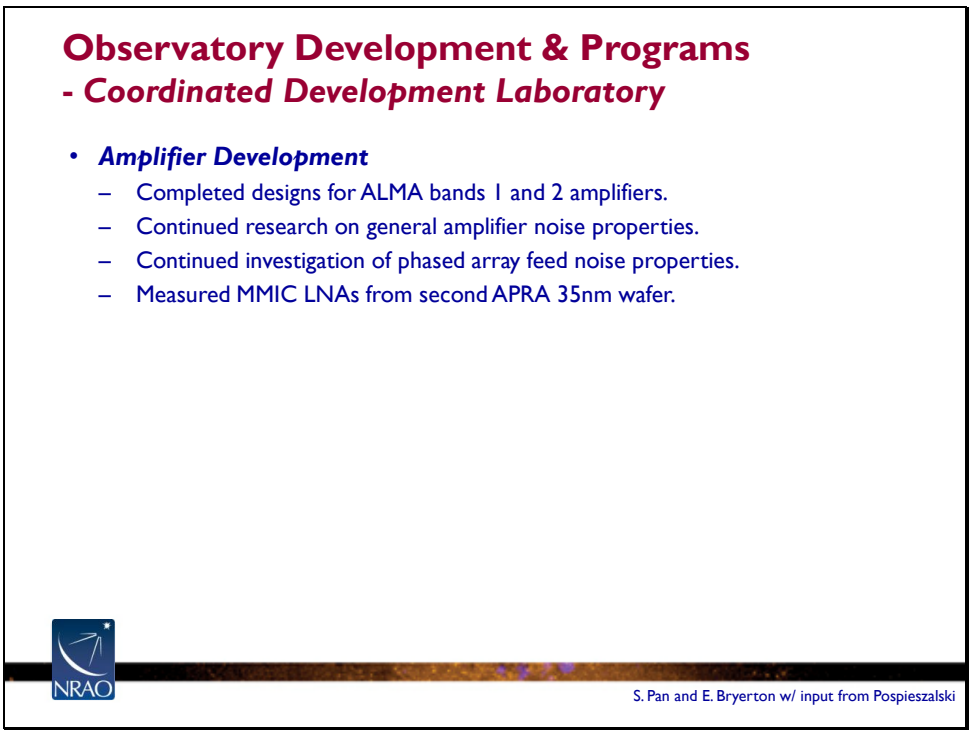
	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
1	**− NRAO All Funding**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
2	**+ Observatory Science Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
52	**− Observatory Telescope Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
53	**+ ALMA Construction**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
69	**+ EVLA Construction**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
81	**− EVLA Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
82	Replacing antenna 10 azimuth bearing.	Sat 10/1/11	Sun 9/30/12	NA	
83	Approximately 5000 ties will be replaced along the ~44 miles of array tracks.	Sat 10/1/11	Sun 9/30/12	NA	
84	Array reconfiguration.	Sat 10/1/11	Sun 9/30/12	NA	
85	**− VLBA Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
86	VLBA Tiger Team Visits	Sat 10/1/11	Sun 9/30/12	NA	
87	**− GBT Operations**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
88	**− GB Projects**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
89	Replacement of software libraries for GBT complete.	Sat 10/1/11	Sun 9/30/12	NA	
90	Installation of multi-color tipper complete.	Sat 10/1/11	Sun 9/30/12	NA	Addl RFI shielding required. Design will be fabricated Q4 FY12.
91	GBT Servo Replacement Project	Sat 10/1/11	Sun 9/30/12	NA	Behind schedule due to weather.

TABLE 8: Performance to Program Operating Plan Financial Projections -Observatory Telescope Operations/Operations-

	Total NSF New Funds (PRL) and Carryover	FY12 Thru Q3 Actuals	% Spent	Notes (75% fiscal year elapsed)
Observatory Telescope Operations (OTO)	**52,912,657**	**30,930,973**	**58.46%**	
Green Bank Operations	9,669,702	6,378,152	65.96%	Green Bank's general expenditure trends are weighted toward Q3 and Q4 with summer programs, dorm maintenance/increased usage, café operations, and telescope painting.
New Mexico Operations - EVLA	12,752,802	9,585,949	75.17%	
New Mexico Operations - VLBA	5,215,183	3,907,112	74.92%	
ALMA Technical Support and JAO Chile Operations	25,208,559	11,032,122	43.76%	NRAO received $3.0M in revenue from NRAO's Japanese partners for invoices billed in FY11. NRAO also received $750K in recovery from ESO and $983K in LSM Recovery. The remaining funds are for prior year commitments for expenses for future years.
Green Bank Solar Radio Burst Spectrometer	66,412	27,638	41.62%	Solar Radio Burst spending does not follow linear trends.

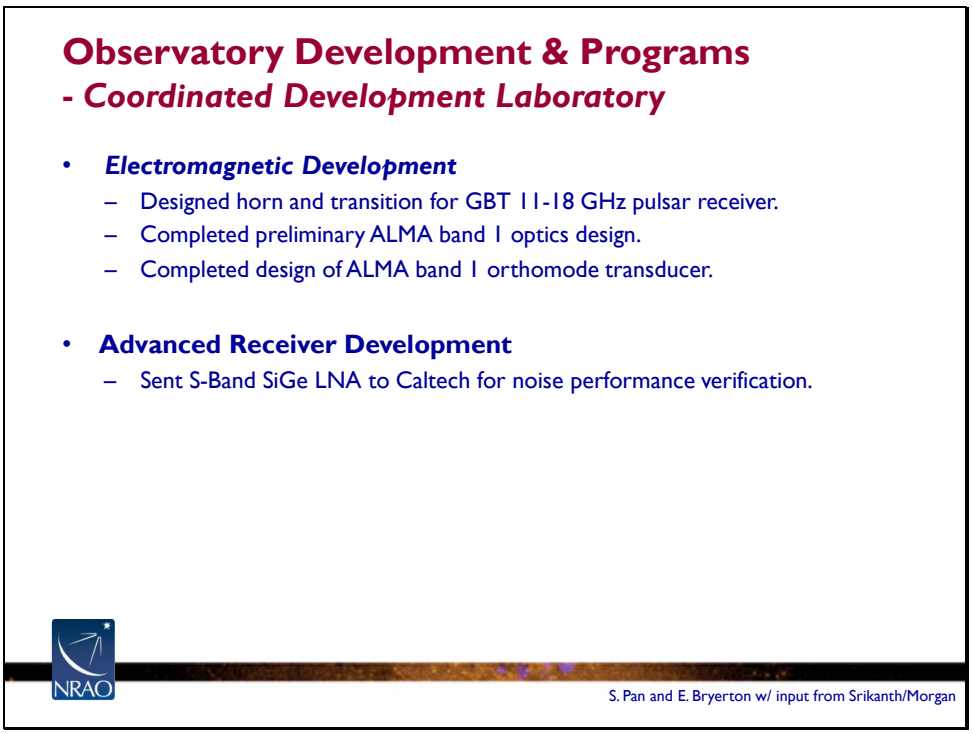
Agenda

- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs (ODP)
  - Coordinated Development Laboratory
  - CDL Production, Maintenance and Repair
  - New Initiatives Office
- Broader Impact
- Observatory Administrative Services
- Director's Office



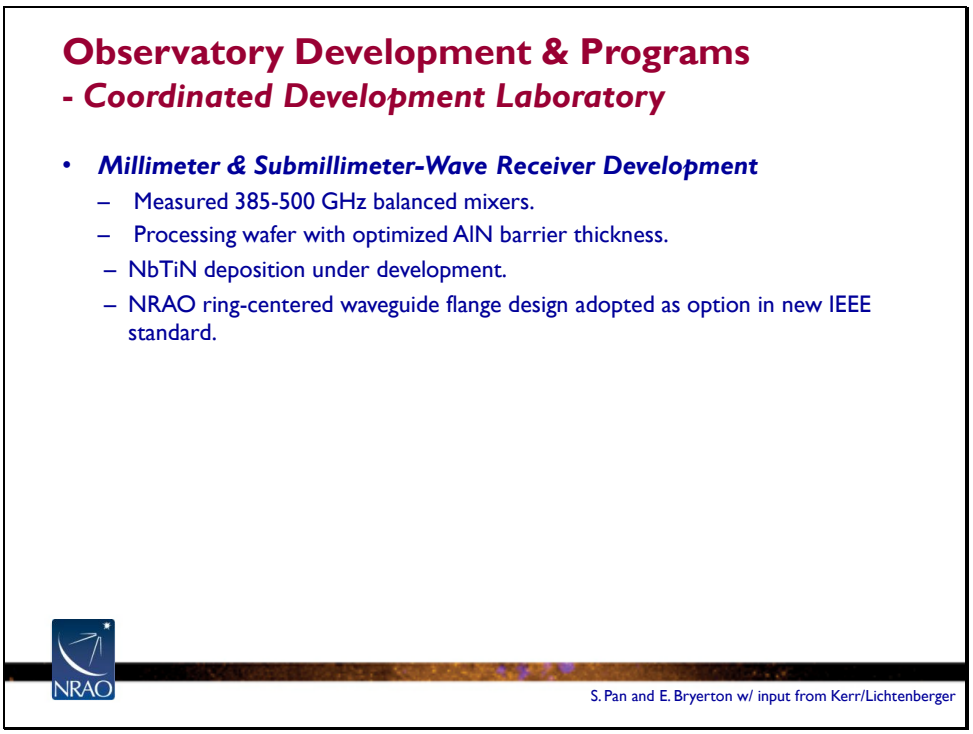
Amplifier Development:
Development of **ALMA bands 1 and 2 amplifiers** using NGST cryo3 devices continues. The electrical designs are complete. Research into **general amplifier noise properties;** in particular on noise properties of heterojunction bipolar transistors (HBTs) and CMOS MOSFET continues. A paper covering the design and performance of JVLA amplifiers was presented at the MIKON 2012 Conference, Warsaw, Poland, May 2012 and is now listed in IEEE Explore (M. W. Pospieszalski, "Cryogenic Amplifiers for Jansky Very Large Array Receivers," in Proceedings of MIKON 2012 Conference, pp.748-751, Warsaw, Poland, May 2012).

Measured room-temperature noise of sample MMICs from **second APRA 35nm wafer** run using probe station. Measured room temperature and cryogenic noise of two sample modules each of four different MMIC designs — three of which were new designs. Highlights of packaged data include <30K noise temperature from 75-85 GHz and <40K from 68-90 GHz in packaged ALMA band 2 prototype using successfully retuned MMIC. Also measured <30K from 86-98 GHz and <40K from 81-102 GHz for new W-band design.

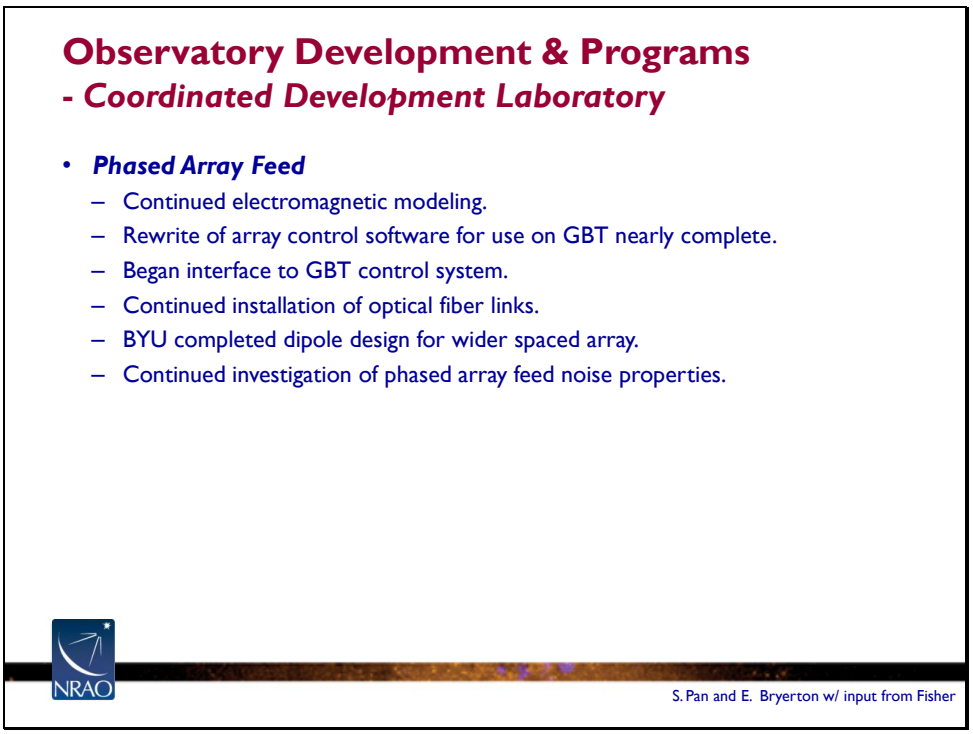


Electromagnetic Development:
Designed a broadband corrugated horn for the **GBT 11-18 GHz pulsar receiver**. Also designed circular-to-square transition that connects this horn to the OMT. The illumination taper at the edge of the subreflector is -13.4 dB and crosspolarization is lower than -29 dB, except at 18 GHz where it is -24 dB. The beam is circularly symmetric over the whole band. In **preliminary ALMA band 1 optics design**, reflective optics is too big to fit in the available space and hence a lens in front of the feed aperture will be used. The **ALMA band 1 orthomode transducer** (OMT) is based on a turnstile junction and was designed to cover the extended 33-52 GHz band.

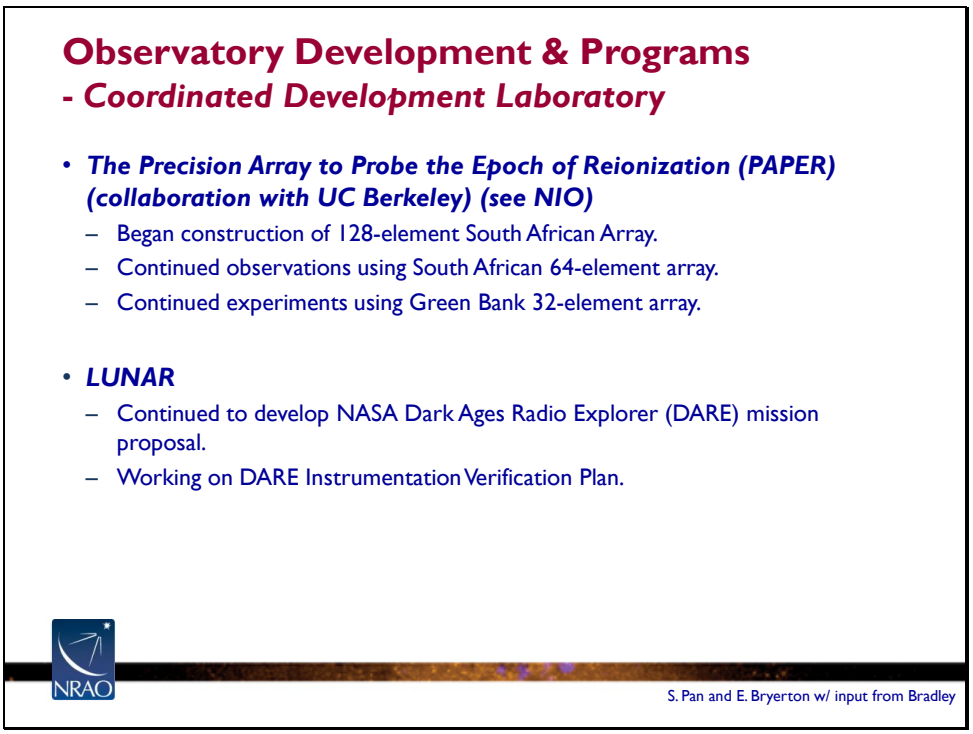
Advanced Receiver Development:
One of the **S-Band SiGe LNAs** used in the cryogenic digital OMT development was sent to Caltech (from whom we purchased the SiGe transistors) for cryogenic noise measurement on their test set to cross-check our own. They will then install a new SiGe device from a second wafer with higher current gain and slightly improved noise performance. They will also provide recommendations for how to improve the LNA design, based on their greater experience with these transistors. With the exception of this offer for assistance from our colleagues at Caltech, very little progress is being made on any aspect of this research program as technical support remains well below critical levels (due to ALMA Band 6 issues). This situation is expected to improve beginning in October 2012.



Millimeter & Submillimeter-Wave Receiver Development:
385-500 GHz balanced mixers using Nb/Al-AlN/Nb trilayer have been measured. They show 2-3 dB higher noise than single-ended mixers built using same component mixer chips. Single-ended mixers give 60-70K DSB noise temperature over 385-500 GHz band. Excess noise of balanced mixers may be due to membrane hybrids, which are being tested in this design for possible scaling to supra-THz frequencies where conventional waveguide hybrids are difficult or impossible to machine. **Wafer with optimized AlN barrier thickness**, which is in process, is expected to yield single-ended mixers with 40-50K DSB noise temperature over 385-500 GHz. These optimized mixer chips will also clarify where excess noise in balanced mixers is originating. The 385-500 GHz mixer designs serve as proof-of-concepts for band 10 (787-950 GHz) and band 11 (>1 THz) SIS mixers. The **NbTiN deposition** needed to produce Nb/Al-AlN/NbTiN trilayer for band 10 and 11 mixers is under development. For sub-millimeter waveguide interfaces, the **NRAO ring-centered waveguide flange** design has been adopted as an option in the new IEEE standard.

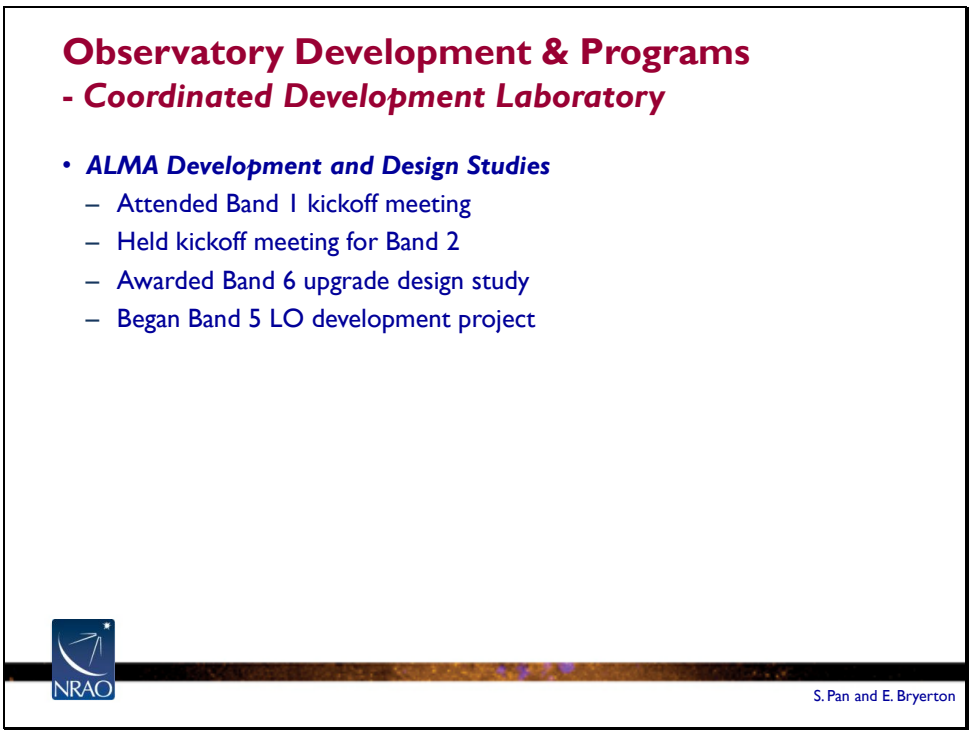


Phased Array Feed:
This quarter was primarily devoted to **electromagnetic modeling** of the array and to the rewrite of the **array control software** and data acquisition software for compatibility with the GBT system. Near the end of the quarter, the **interface to the GBT control system** was defined in collaboration with the Green Bank staff. The extensive task of establishing **optical fiber links** between the lab equipment room and three array test locations (outdoor test building, 20-meter, and GBT) has made good progress. The new **dipole design for wide spaced array**, completed by BYU, is optimized for use on the GBT. The task of a staged development of a phased array beamformer based on CASPER technology has been assumed by NRAO with the pending expiration of the BYU grant for work on this project.

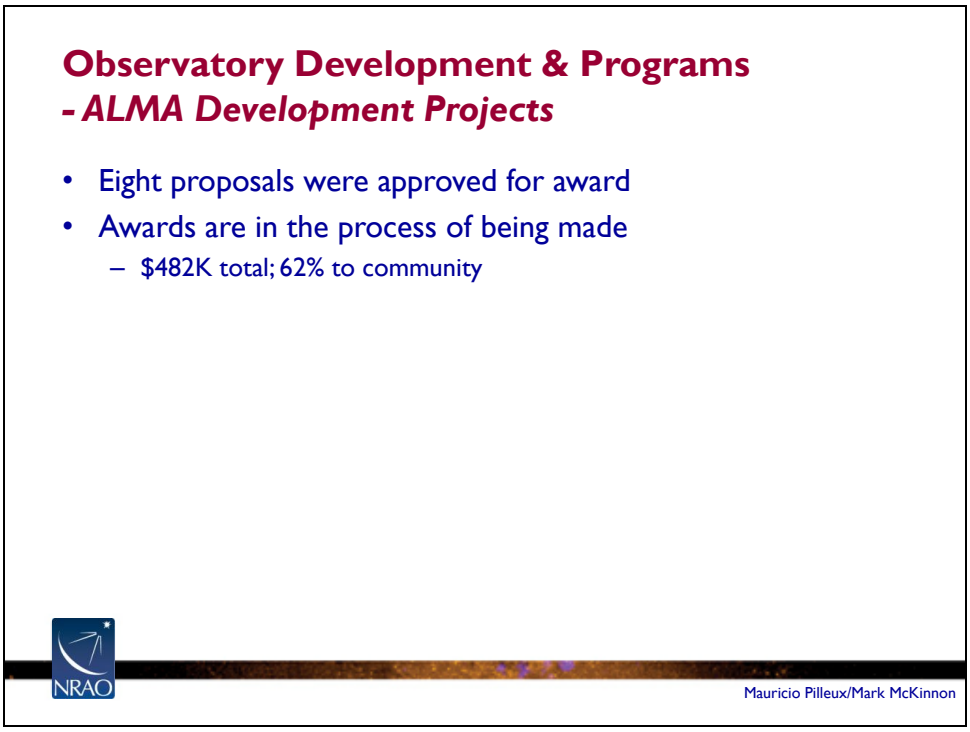


The Precision Array to Probe the Epoch of Reionization (PAPER): Construction and testing of components for the expanded **128-element South African Array** started this quarter. Data analysis and observations continue using the existing **South African 64-element** and **Green Bank 32-element** arrays, including a study of ionospheric effects on PAPER data.

LUNAR: The Lunar University Node for Astrophysics Research (LUNAR) is a grant from the NASA Lunar Science Institute to develop instrumentation for lunar-based research. Our current activity is centered around the Explorer-class **DARE mission proposal** with specific attention given to the antenna and front-end design concepts. Continued to work on the **DARE Instrument Verification Plan**, including the start of long-term observations with the engineering prototype in Australia this quarter.



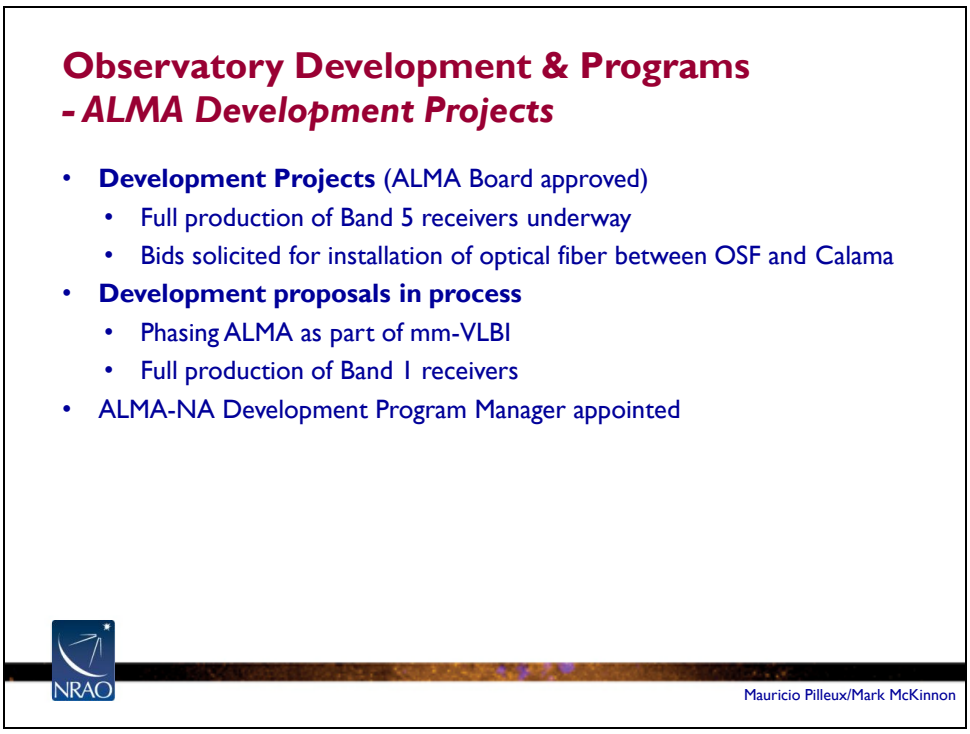
ALMA Development and Design Studies:
The CDL is involved in three of the approved ALMA design studies: Band 1, Band 2, and Band 6 upgrade. In addition, the joint construction proposal for ALMA Band 5 was approved by the ALMA Board. The NRAO will build the band 5 local oscillators and our European colleagues will be responsible for the band 5 cold cartridges. Band 5 work has already begun, with a set of preliminary interface documentation complete. The band 1 design study is a collaboration with HIA, ASIAA, and the University of Chile. A kickoff meeting was held this quarter in Taiwan with four members of the CDL technical staff attending. A kickoff band 2 meeting was held and work has begun on the amplifier and optics development.



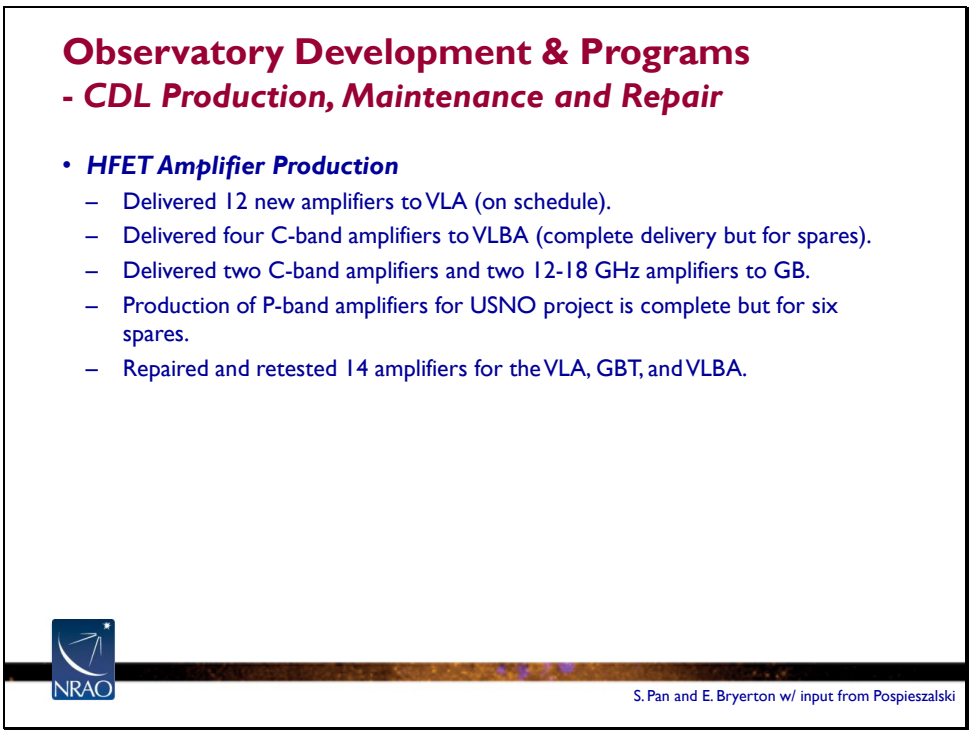
Development Studies from November 2011 call for proposals approved for award (8):

- Second Generation Receiver for ALMA Band 6 (Kerr, NRAO)
- Design Study for Production of Band 2 Cartridges (Bryerton ,NRAO)
- Millimeter/Sub-millimeter VLBI with ALMA (Kern, NRAO)
- Increase the ALMA Data Rate (Glendenning, NRAO)
- Ultra-wideband Quantum-limited Amplifiers for Receiver Front Ends (Woody, Caltech)
- A Visualization Portal for ALMA Data (Rosolowski, UBC)
- Unleashing Large Dataset Science (Mundy, Maryland)
- ALMA Band 1 Receiver Development Study (Ho, ASIAA)

Awards are in the process of being made. $482K total; 62% to community.



The ALMA Board has approved the full **production of Band 5** and it is underway. ESO will be providing RF part of the receiver while NRAO provides the LO part. Bids have been solicited for installation of optical fiber between OSF and Calama to improve data transmission rate and minimize operating costs. Two development proposals are in process: the **Phasing ALMA** as part of mm-VLBI and **Full Production of Band 1** receivers in collaboration with HIA, ASIAA, NAOJ, and U. Chile. Bill Randolph was appointed **ALMA-NA Development** Program Manager effective June 11.

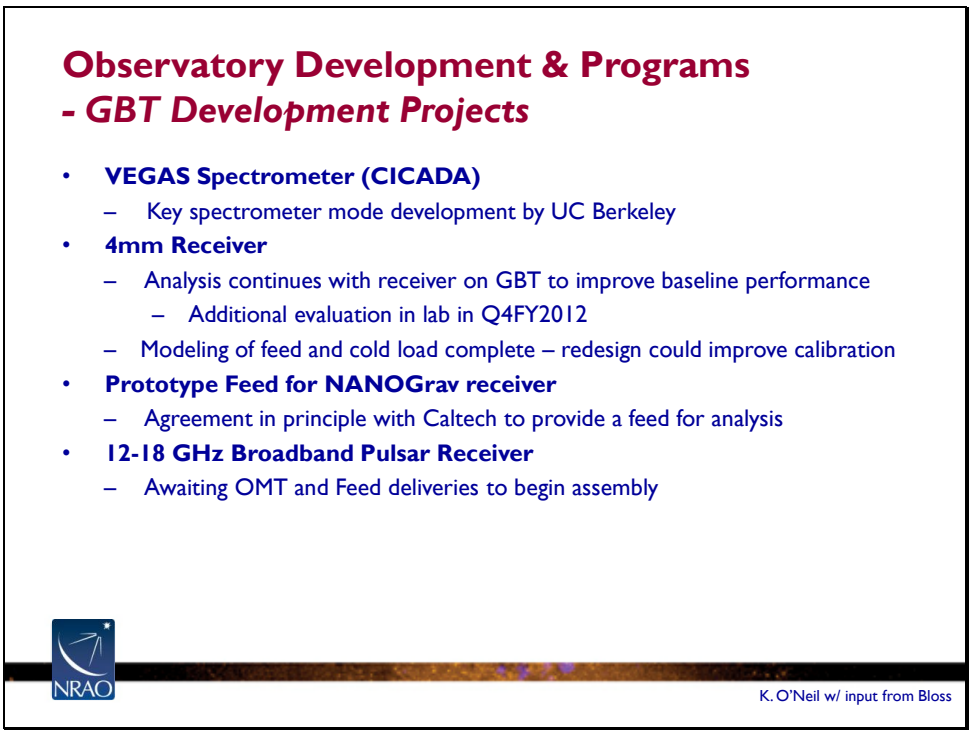


HFET Amplifier Production:
New amplifier production included four 2-4 GHz, six 4-8 GHz, four 8-12 GHz, and six 12-18 GHz amplifiers. Repair, upgrade, and retesting of amplifiers included twelve 1-2 GHz, one 4-12 GHz, and one 8-18 GHz. In total, 34 amplifiers were shipped. The VLA and VLBA amplifier production is on schedule.

TABLE 9: Performance to Program Operating Plan Major Milestones & Functional Tasks -Observatory Development Programs/CDL-

Gantt Chart

	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
92	**- Observatory Development Programs**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
93	**+ GB**	**NA**	**NA**	**NA**	
110	**+ NM**	**NA**	**NA**	**NA**	
130	**- NTC**	**NA**	**NA**	**NA**	
131	**- CDL- Phased Array Feed Project**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
132	20m test run with CASPER data collection.	Sat 10/1/11	Sat 12/31/11	NA	Readjusting - BYU funding loss.
133	Install fiber-optic analog transmission system on receiver and 20 meter telescope.	Sat 10/1/11	Sun 9/30/12	NA	
134	Design and prototype 20MHz bandwidth beamformer.	Sat 10/1/11	Sun 9/30/12	NA	
135	Continue test runs on 20m and GBT	Sat 10/1/11	Sun 9/30/12	NA	
136	**- CDL-Advanced Receiver Technology**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
137	Test advanced 1.7 – 2.6 GHz receiver	Sat 10/1/11	Sun 9/30/12	NA	
138	**- CDL-Low-noise Cryogenic Amplifier Dev.**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
139	Production of Amplifiers for EVLA	Sat 10/1/11	Sun 9/30/12	NA	
140	Production of Amplifiers for P-Band project (USNO).	Sat 10/1/11	Sun 9/30/12	NA	
141	Production of Amplifiers for VLBA C-band upgrade.	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
142	C-band amplifiers for GBT	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
143	C-band amplifiers for Arecibo	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
144	Upgrade of 8 Ka-band amplifiers for CARMA S-Z Array.	Sat 10/1/11	Sat 6/30/12	Sat 3/31/12	
145	Study of cryogenic properties of SiGe HBTs.	Sat 10/1/11	Sun 9/30/12	NA	At risk-staffing.
146	Development of ALMA Bands #1, #2 amplifiers.	Sat 10/1/11	Sun 9/30/12	NA	
147	Research on general noise properties of three terminal active devices.	Sat 10/1/11	Sun 9/30/12	NA	
148	Research on noise properties of phase array feeds.	Sat 10/1/11	Sun 9/30/12	NA	
149	**- CDL-HFET Amplifier Production**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
150	VLA, VLBA, GB	Sat 10/1/11	Sun 9/30/12	NA	
151	**- CDL - Electromagnetic Development**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
152	General Research and Development	Sat 10/1/11	Sun 9/30/12	NA	
153	**- CDL-MMIC Development**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
154	Test new MMIC 35nm InP HEMT designs	Sat 10/1/11	Sun 9/30/12	NA	At risk-staffing.
155	**- CDL-mm and submm devices**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
156	Develop NbTiN SIS junctions with AlN barriers	Sat 10/1/11	Sun 9/30/12	NA	
157	Develop balanced and sideband separating SIS beam-lead mixers on Si membranes for 800 GHz to 1.4 THz.	Sat 10/1/11	Sun 9/30/12	NA	
158	**- CDL-Digital Signal Processing**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
159	Support PAF work (see above)	Sat 10/1/11	Sun 9/30/12	NA	At risk-staffing.
160	Complete 20m Radio SkyNet Spectrometer	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
161	GBT Spectrometer ATI Project	Sat 10/1/11	Sun 9/30/12	NA	
162	**- CDL & GB PAPER**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
163	Construction and testing of components for expanded 128-ele	Sun 4/1/12	Sun 9/30/12	NA	
164	**- CDL- LUNAR**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
165	Develop DARE Instrumen Verification Plan	Sat 10/1/11	Sun 9/30/12	NA	
166	Start long-term observations with engineering prototype in Au	Sun 4/1/12	Sun 9/30/12	NA	
167	**- CDL-ALMA Development and Design Studies**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
168	Band 1	Sat 10/1/11	Sun 9/30/12	NA	
169	Band 2	Sat 10/1/11	Sun 9/30/12	NA	
170	Band 6	Sat 10/1/11	Sun 9/30/12	NA	



VEGAS Spectrometer (CICADA) – the Univ. of Calif. at Berkeley team continues work on the spectrometer modes required for some early science observations with the GBT in Sept/Oct 2012. Hardware issues in the Green Bank instrument identified in Spring observations have been addressed and last hardware purchases of ROACH FPGA boards and ADCs to replace barrowed units for the spring will occur in Q4FY2012 or early Q1FY2013.

4mm Receiver – Some absorber was installed in key locations as an experiment to determine the cause of baseline structure but the results were inconclusive; therefore, the receiver will be removed for laboratory testing in Q4FY2012. Finite element and geometric modeling of the feed and cold combination examined the interaction of the components yielding helpful insights into a possible redesign of the cold load.

Prototype Feed **for NANOGrav receiver** – Revived discussions with Sandy Weinreb at Caltech confirmed that Caltech will manufacture A feed and LNA's for evaluation in Green Bank antenna ranges. The milestone of 'R&D phase completed and budget established' in Q4FY2012 will not be achieved; PI had conflicting NRAO priorities. Risk: A final design and proposal for fabrication will be delayed. Mitigation: None.

12-18GHz **Broadband Pulsar Receiver** – The last remaining key components are currently in fabrication (OMT at NTC; feed at GB). Once these items are received and tested assembly inside the dewar will commence. The milestone of 'First light with Ku receiver' in Q3FY2012 was not achieved due to fabrication was not completed on time. Design fabrication delayed due to competing NRAO priorities at CDL. Risk: Commissioning and beginning of the wideband pulsar search will be delayed by about one quarter. Mitigation: Elevate the priority of receiver assembly once final components are delivered to minimize the delay.

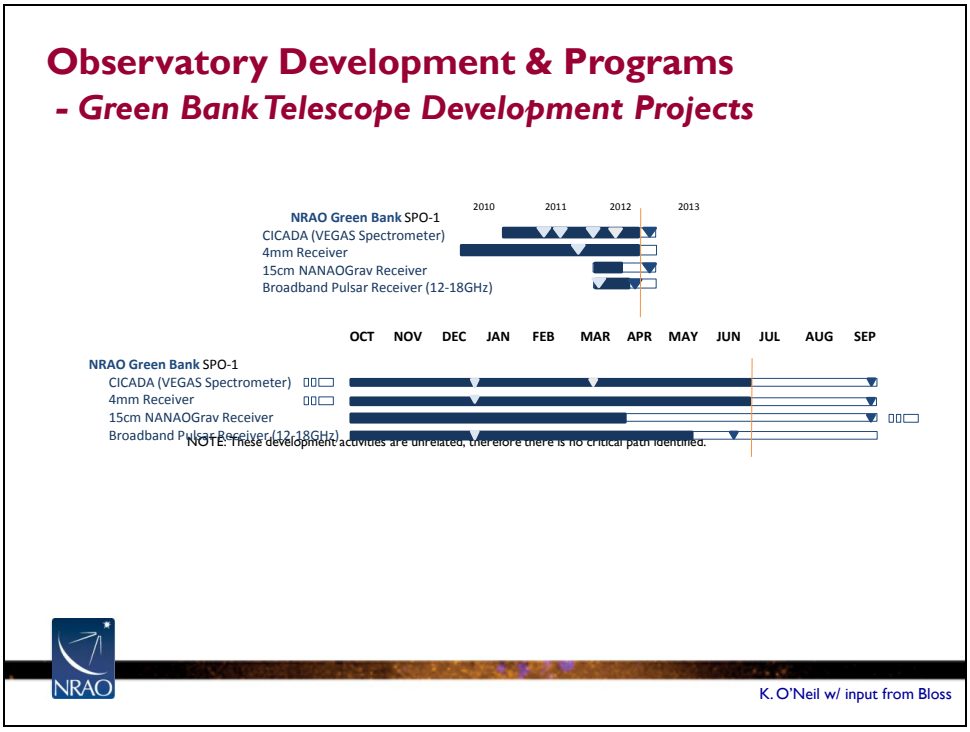
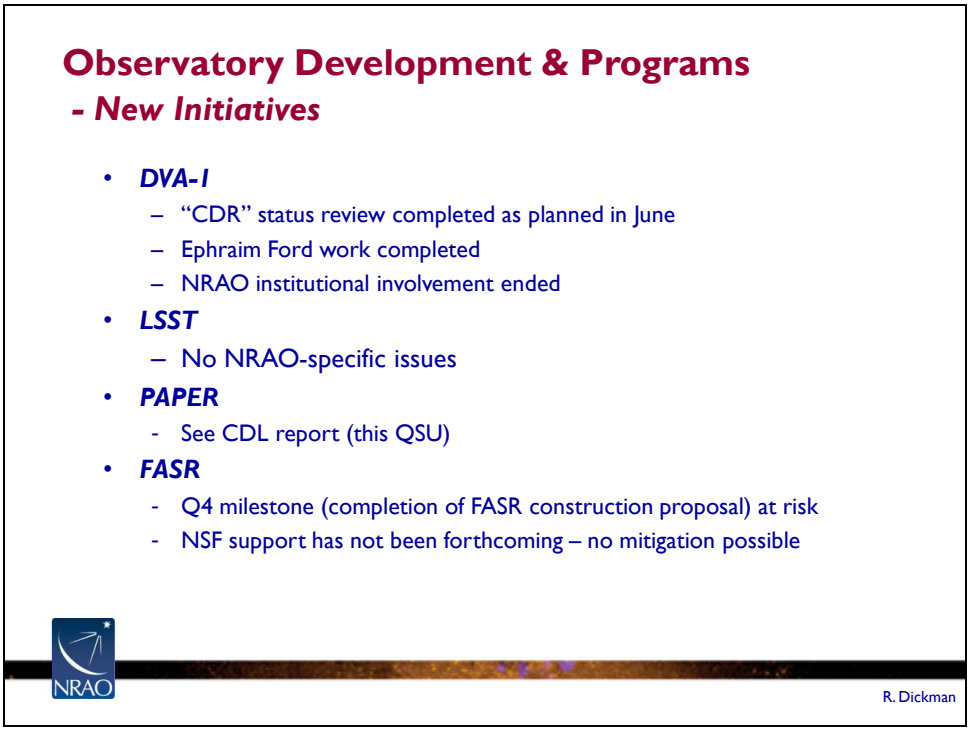


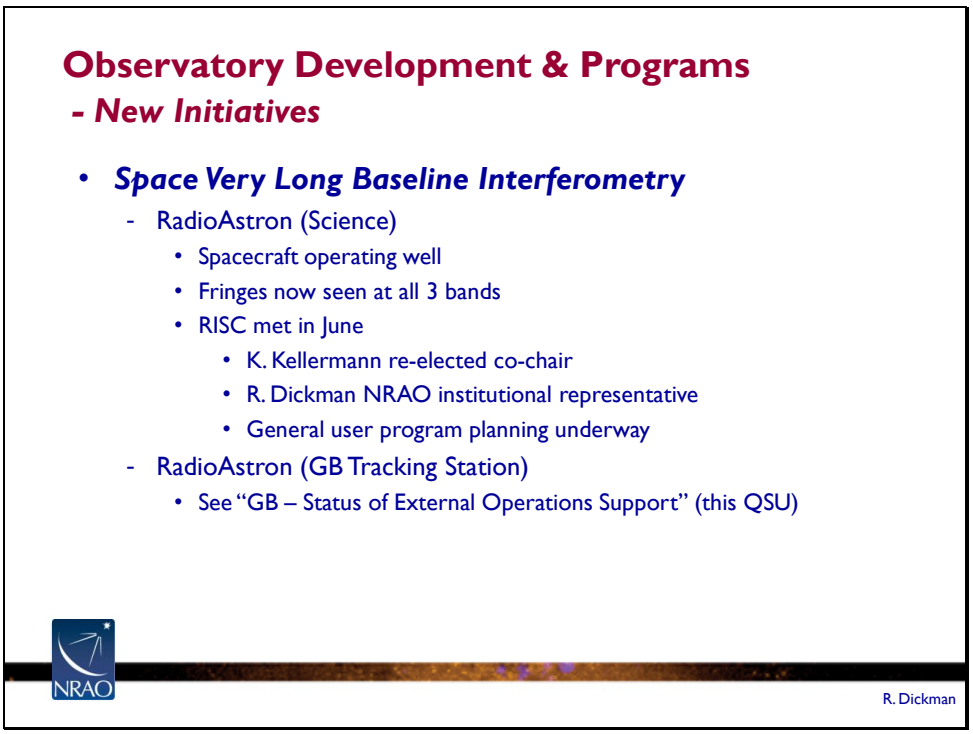
TABLE 10: Performance to Program Operating Plan Major Milestones & Functional Tasks -Observatory Development Programs/GB-

Gantt Chart

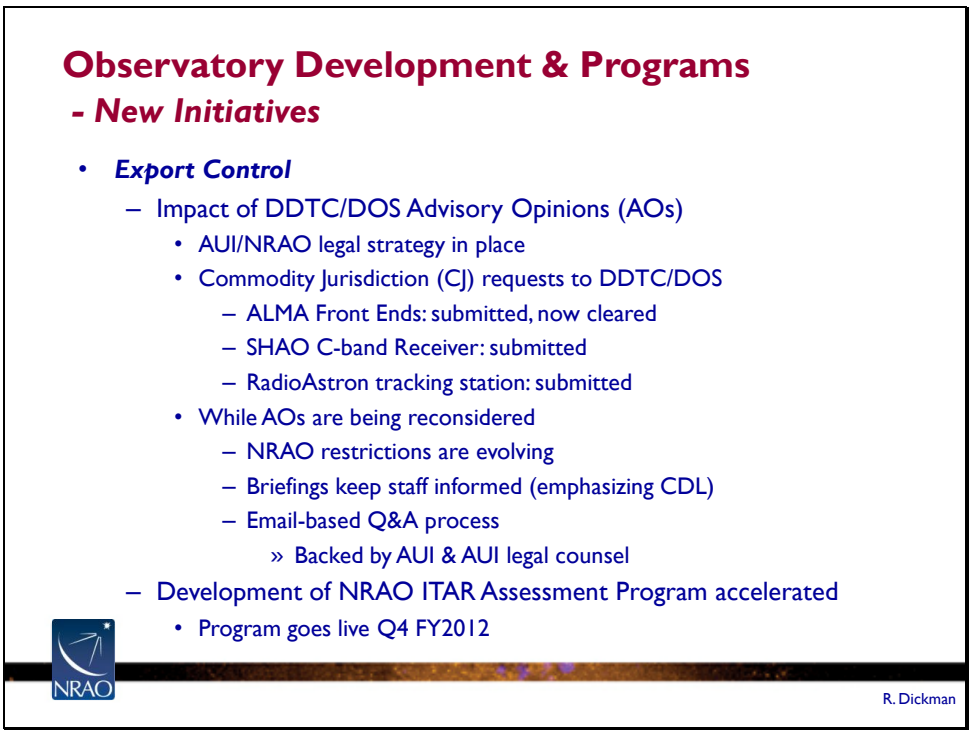
	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
92	**- Observatory Development Programs**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
93	**- GBT Development**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
94	**- VEGAS Spectrometer (CICADA, aka Digital Signal Processing)**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
95	Single spectrometer, single mode tests with GBT complete	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	
96	Shared risk science operations begin	Sun 1/1/12	Sat 3/31/12	Sat 3/31/12	
97	Eight spectrometers completed in expert mode	Sat 3/31/12	Sun 9/30/12	NA	
98	**- 4mm two-pixel receiver for molecular line and VLBA studies complete.**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
99	4mm integration into GBT systems complete	Sat 10/1/11	Sun 9/30/12	NA	
100	**- Prototype feed for wideband NANOGrav receiver complete (CDL).**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
101	R&D phase completed and budget established	Sat 10/1/11	Sun 9/30/12	NA	
102	**- Broadband Pulsar Receiver**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
103	Feed design completed	Sat 10/1/11	Sat 12/31/11	Sat 3/31/12	
104	Receiver with new feed 1st light	Sat 3/31/12	Sat 6/30/12	NA	Design fabrication delayed due to competing NRAO priorities at CDL.
105	**- GB Work for Others**	**NA**	**NA**	**NA**	
106	Baryon Acoustic Oscillations 800 MHz Multi-Pixel (ASIAA) Broadband receiver covering 12-18 GHz for the detection and	Sat 10/1/11	Sun 9/30/12	NA	Project suspended by GB due to ITAR issues.
107	VLBA C-Band Fabrication	Sat 10/1/11	Sun 9/30/12	NA	
108	RadioAstron	Sat 10/1/11	Sun 9/30/12	NA	



DVA-I: Ephraim Ford's work was **fully supported by external TDP funds.**



RISC: RadioAstron International Science Council.

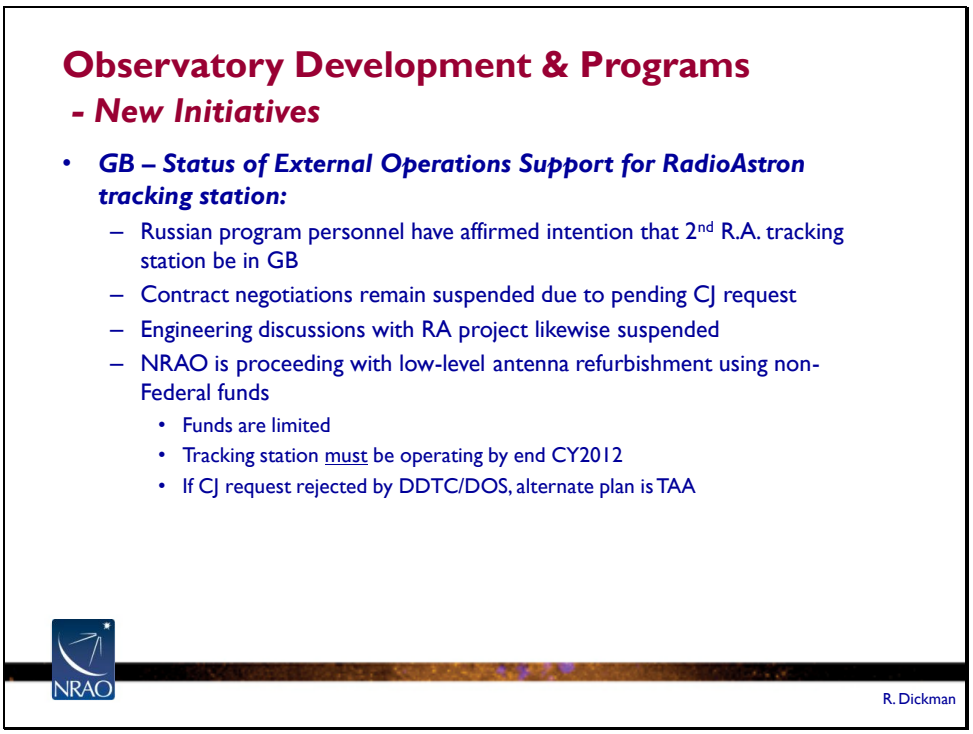


DDTC/DOS: Directorate of Defense Trade Controls/Department of State. **Commodity Jurisdiction Request Dates and Status:** ALMA Front Ends: CJ request submitted 5/18/12; clearance given 6/15. SHAO C-band receiver: CJ request submitted 6/21/12; decision pending. [Note, as of 08/05 this has been "cleared", i.e., DOS agrees that the receiver is NOT controlled under ITAR.] RadioAstron tracking station: CJ submitted 7/19/12; decision pending.

Observatory Development & Programs
- *New Initiatives*

- ***VLBA – Status of External Operations Support: CASS/CSIRO***
  - ICRAR not participating
  - Contract for $200k/2years signed 6/26/12
  - All funds received by AUI
- ***VLBA – Status of External Operations Support:* SHAO**
  - C-band receiver construction remains suspended due to ITAR
  - No additional VLBA funds received
  - May be awaiting outcome of DOS CJ
- ***VLBA – Status of External Operations Support: ASIAA***
  - Activities have been suspended indefinitely

R. Dickman



GB: RadioAstron (RA) tracking station: At recent RISC meeting Russian program personnel affirmed intention that 2nd tracking station will be in GB. Other data downlink is at Pushchino, Russia.

TAA: Technical Assistance Agreement. Permits well-defined ITAR-related activities with certain countries (including Russia) to be carried out.

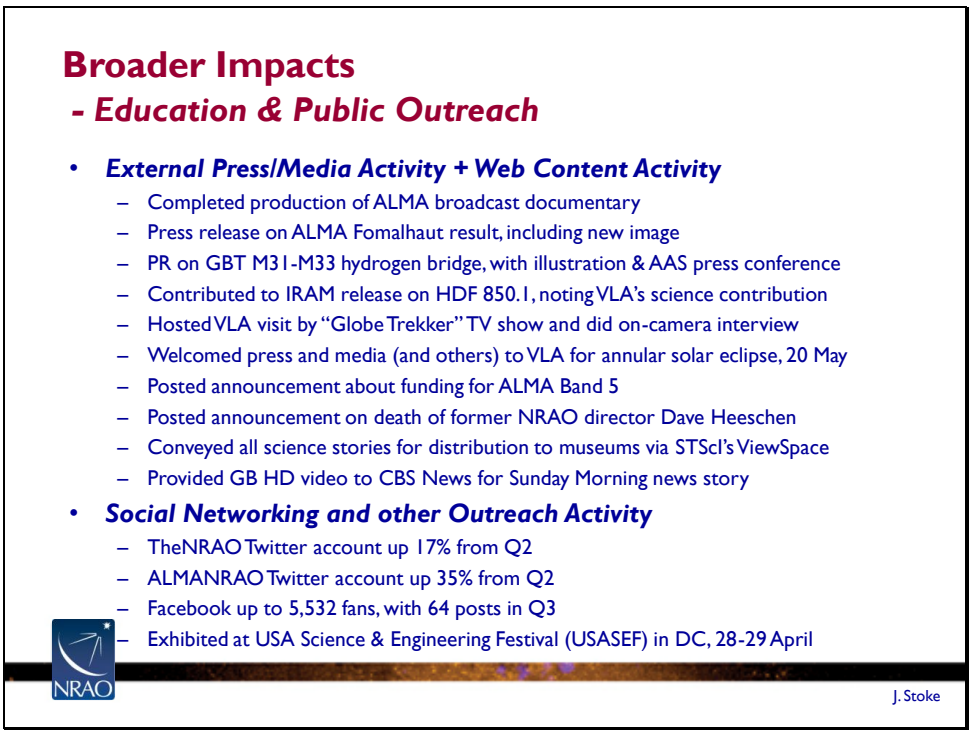
NAA Workshop: New Theme: Workshop will focus on the twin themes of (1) transient radio science in the LSST era coupled with (2) signal processing and other new enabling technologies. **Why the New Date**: We found a low level of enthusiasm in US community for a repeat of 2011 AUI Santa Fe workshop. This necessitated developing a significantly more nuanced workshop topic than the "NAA," which is apparently not all that well-known or particularly well-liked in the community.

TABLE 11: Performance to Program Operating Plan Major Milestones & Functional Tasks -Observatory Development Programs/NIO-

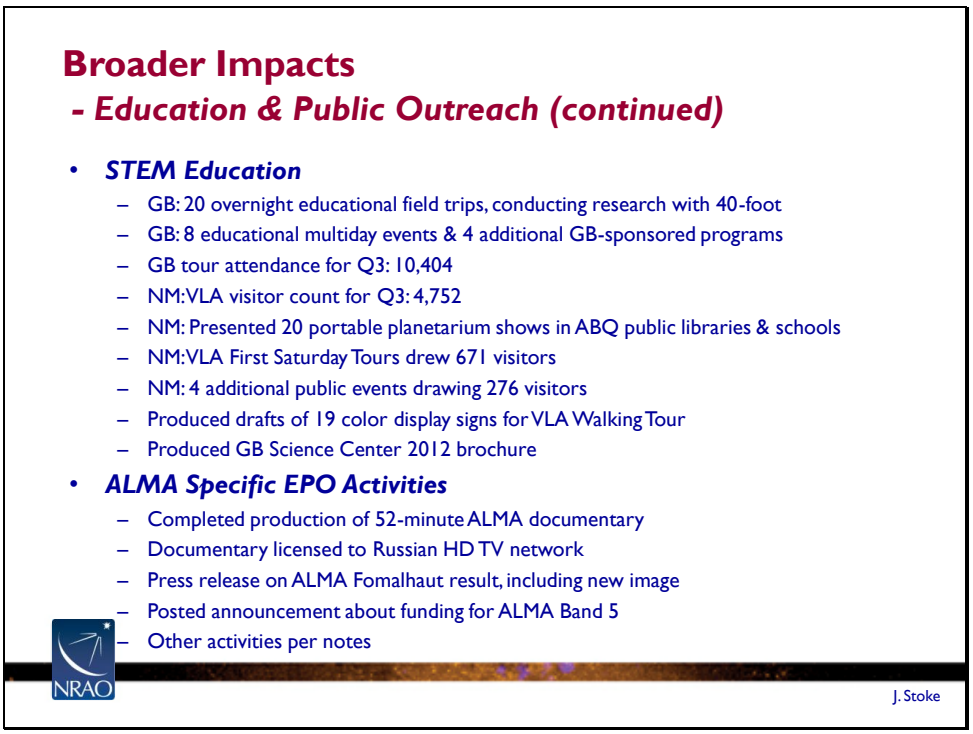
	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
92	− **Observatory Development Programs**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
93	+ **GB**	**NA**	**NA**	**NA**	
110	+ **NM**	**NA**	**NA**	**NA**	
130	+ **NTC**	**NA**	**NA**	**NA**	
171	CV - LSST	Sat 10/1/11	Sun 9/30/12	NA	
172	CV - FASR	Sat 10/1/11	Sun 9/30/12	NA	At risk-project stalled.
173	− **NIO**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
174	MOU Development.	Sat 10/1/11	Sun 9/30/12	NA	
175	Convene and lead a community workshop – 2020.	Sat 10/1/11	Sun 9/30/12	NA	
176	Development of a full FASR construction proposal complete.	Sat 10/1/11	Sun 9/30/12	NA	
177	Organize workshops on the NAA.	Sat 10/1/11	Sun 9/30/12	NA	

Agenda

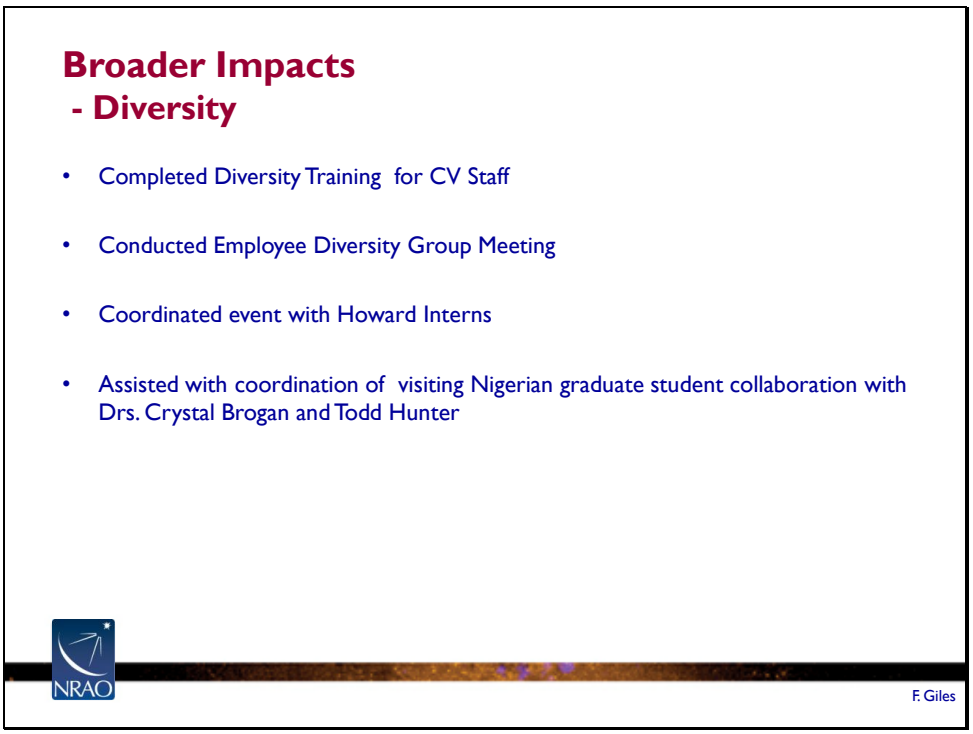
- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs (ODP)
  - Coordinated Development Laboratory
  - New Initiatives Office
- Boarder Impacts
  - Education and Public Outreach
  - Diversity
- Observatory Administrative Services
- Director's Office



- ALMA Broadcast documentary: Completed post production (editing, sound, color correction, titles) of 52-minute version.
- ALMA/Fomalhaut PR: http://www.nrao.edu/pr/2012/fomalhaut/.
- M31-M33 PR: http://www.nrao.edu/pr/2012/m31m33/.
- IRAM PR (featuring VLA): http://www.mpia.de/Public/menu_q2.php?Aktuelles/PR/2012/PR120613/PR_120613_en.html
- Globe Trekker: http://www.pilotguides.com/tv_shows/globe_trekker/index.php.
- Annular Eclipse time-lapse sunset clip: http://www.youtube.com/watch?v=mxHlSQrPnuw&list=UUbc9umokfZFiGskSvDTBo6g&index=1&feature=plcp
- ALMA Band 5: http://www.nrao.edu/pr/2012/almaband5/.
- Heeschen: http://www.nrao.edu/heeschen.html.
- ViewSpace: http://hubblesource.stsci.edu/exhibits/self-update/viewspace/programs/.
- CBS Sunday Morning: http://www.cbsnews.com/8301-3445_162-57437846/a-rare-island-of-serenity-thanks-to-the-fcc/.
- USASEF at DC convention center was massive; probably 100,000 people+ per day.



GB Overnight Educational Field Trips: Howard Community College (DC), Grosse Pointe High School (MI), Morehead University (KY), Annadale High School (VA), Robert Bland Middle School (WV), Eden Christian Academy (PA), Rutgers University (NJ), Manassas Middle School (VA), Highland Adventist School (WV), Washington and Lee (VA), Spring Ridge Middle School (MD), Roberto Clemente Middle School (MD), Waynesburg University (PA), Boy Scout troop 366 (PA), Boy Scout Troop 75 (WV), Roanoke College (VA), Southern Virginia University (VA), Carolina Friends School (NC), UVA LSAMP students (VA), Valley Ridge Gov. School (VA). GB multi-day events: Chautauqua Short Course, Green Bank Star Quest, Society of Amateur Radio Astronomers Conference, Space Race Rumpus Cycling festival. Additional GB programs: National Youth Science Camp Tour, Outreach to Charleston WV~400 visitors to our booth, 3-day Capstone seminar at WVU for PSC students and teachers, 2 RET teachers (from CA & VA). GB tour note: Only a fraction of visitors pay to take the guided tour. NM additional public events: 3 telescope demos at libraries, transit of Venus event at NM Tech Etscorn Observatory. Russian HDTV network: http://www.1tvch.ru/. Other ALMA Activities: Interacted with photographer for National Geographic to help write an internal proposal for a photographic expedition to ALMA next year (approved by NatGeo!). Developed ITAR press statements when it seemed the Front End shipment/support suspension might draw press attention. Processed media request to visit ALMA from MIT Technology Review magazine. Interacted with AUI media consultant regarding modification of ALMA short video. Produced NRAO director's message on the death of NAOJ ALMA Astronomer Koh-Ichiro Morita. Communicated with CBS News 60 Minutes about possible ALMA piece. Interacted with NBC News on multiple occasions to spur bringing the Rock Center ALMA segment to broadcast (successful in July!). Processed request from Yale University student international relations magazine to visit ALMA GD/Vertex Site Erection Facility. Presented fun "sneak preview" of ALMA documentary to NRAO CV staff. Posted ALMA "halfway to completion" announcement on NRAO website: http://www.nrao.edu/pr/2012/almahalf/. Began work with NSF OLPA producer on planning for ALMA segment for their Science Nation video series. Began work on public crisis communication plan (typ. to be invoked in the event of a disaster at ALMA or other sites). Provided ALMA aerial video clips to NRAO Photonics lead engineer for use in an engineering society banquet address. Discussed "SAVI for Chile" grant program with NSF OLPA. Lobbied ALMA management to release ALMA Venus Pre-transit image for the public. Facebooked NAOJ announcement of Cycle 0 distant galaxies result. Provided packet of information, including ALMA, for Teddy Hickenlooper, middle school-aged son of the Colorado governor. Interacted with several scientists having Cycle 0 results about possible PR.



Diversity Training was conducted in CV and covered cultural competence, EEO/AA, generational differences, laws that affect diversity, identity abrasion and the NRAO diversity plan along with other topics. The Diversity Advocate and the **Employee Diversity Group** Model has been formalized. The Employee Diversity Groups serve as the voice and ears for the staff and communicate to the Advocates as to the learning topics and events that are relevant for each site. Group meetings consist of speakers on a dedicated diversity topic, informal discussions on topics of interest within the group and employees, as well as quarterly sessions for the staff.

A networking event was provided to the **5** Summer 2012 **Howard University Interns.**

Two scientific staff members **(Crystal Brogan** and **Todd Hunter)** sponsored Nigerian student, James Chibueze to work on an SMA 1.3 mm study of NGC6334 star formation region.

Broader Impacts
- Diversity New Hires

- ***Socorro***
  - 2 White Females
  - 1 Asian Female
  - 1 Asian Male

F. Giles

Agenda

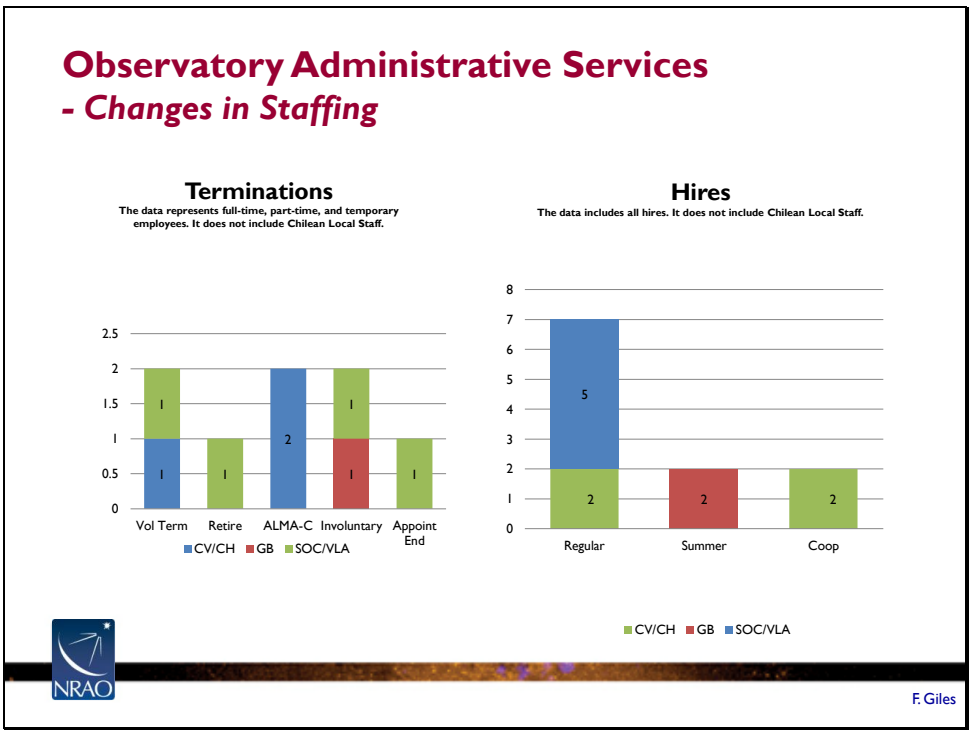
- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs
- Broader Impact
- Observatory Administrative Services
  - Human Resources
  - Computing and Information Systems
  - Observatory Business Services
    - Environmental Safety and Security
    - Fiscal
    - Management Information Systems
    - Contracts and Procurement
    - Financial Performance
  - Office of Chile Affairs
- Director's Office

Visiting Committee – HR staff participated in the 2012 Visiting Committee review process. Key HR staff members Jim Firmani (HR Manager), Faye Giles (Employment and Diversity Manager), Shirley Franks (Sr. Compensation Analyst) and Denise Merricks (Sr. Benefits Analyst) were interviewed in a closed session meeting, responding to interrogatories on employee moral, diversity, post doctorate benefits and the 2010 NRAO Employee Survey. Jim Firmani and Faye Giles also briefed the Committee on NRAO's **diversity initiatives and statistics** along with highlights of key enhancements to its **paid family leave coverage**, which NRAO HR was preparing to recommend to AUI for review and approval. NRAO's response to the final VC report is being developed for **4th Quarter** completion.

NRAO Total Rewards Strategy – Completed **benchmarking of NRAO benefits and compensation programs** to peer organizations, thereby **establishing a measurable Total Rewards index** for use in managing NRAO's Total Rewards Strategy (TRS). Jim Firmani (HR Manager), Shirley Franks (Sr. Compensation Analyst) and Denise Merricks (Sr. Benefits Analyst) briefed the results of the project to the **AUI Operations and Administration Committee** on May 14, 2012. The final implementation stages of the TRS program will be completed in 1st Quarter FY13. Note, Q3 milestone "Successful electronic benefit open enrollment process' was completed in Q2.

Reduction in Force – Developed and implemented the **Reduction in Force process** for use by NRAO ADs to assist them in determining which positions/staff members could be eliminated as a result of **NRAO's reduced FY13 budget**. Jim Firmani (HR Manager) and Shirley Franks (Sr. Compensation Analyst) performed the necessary due diligence on each recommendation that included review and guidance from an outside employment attorney. Final preparations were completed in June for the July 10th implementation.

Organization Charts – Instituted publication process for **NRAO-wide organization charts** that graphically display **functional reporting relationships** across the Observatory. Charts are posted to the NRAO AD Wiki page and updated each quarter, or sooner should a measurable organizational change occur. A formal process for managing all changes to functional reporting relationships will be instituted by HR in 4th Quarter FY12.

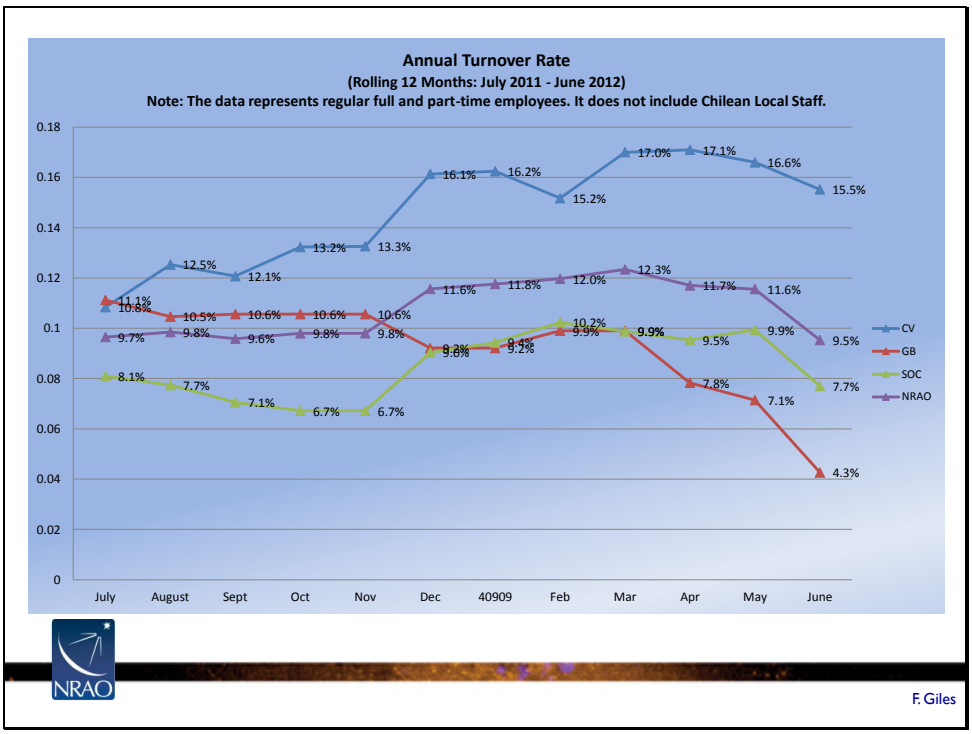


Terminations

Voluntary Terminations:	1 white female SOC
	1 Hispanic male – CV
Retirements:	1 white female – SOC
ALMA – C Roll Offs:	2 white males – CV
Involuntary Terms:	1 white male – GB
	1 white male – SOC
Appointment Ended:	1 white male – SOC

Hires: Of the 11 hires:

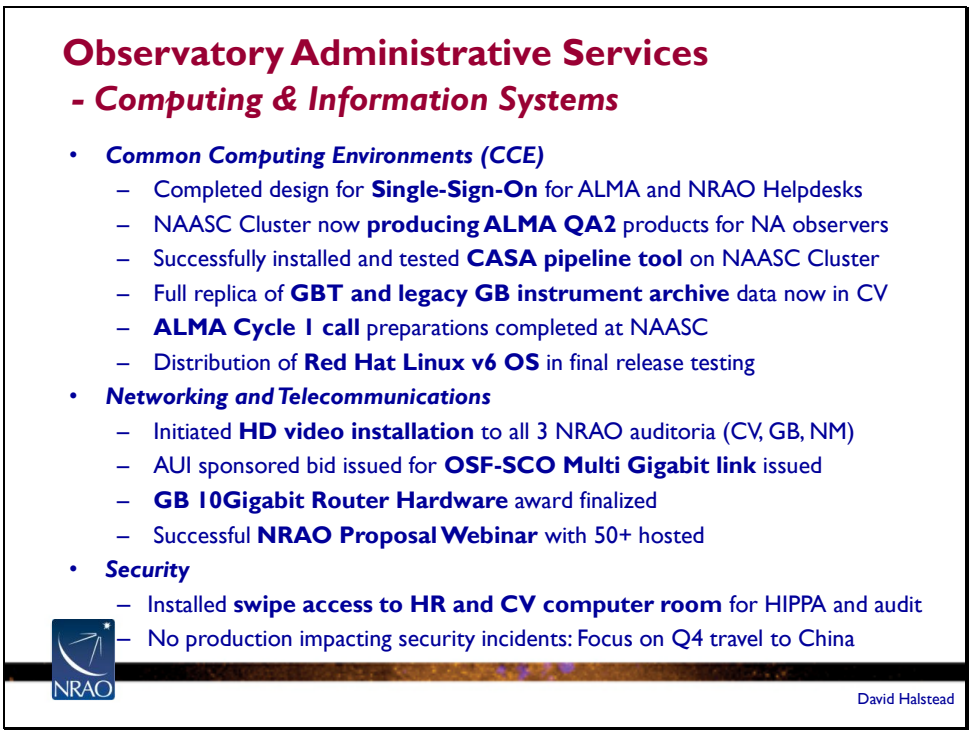
2 Software Engineers – SOC 1 white male; 1 white female
1 Post Doc – SOC Asian female
1 Visiting Scientist – SOC Asian male
1 Sales Clerk – SOC - white female
2 Co- Op Students – CV 2 white females
2 Housekeepers – GB Summer hires 1 male; 1 female
1 Test Scientist – JAO – Hispanic male
1 Director – CV – white male



The annual termination levels from Qtr 3, 2011 through Qtr 3, 2012 reflect a **small mixture of voluntary resignations, ALMA Construction roll offs and retirements**.

During this quarter, **two employees** were terminated as part of the **ALMA-C staff reduction** while **two** other employees were **terminated for cause**.

NRAO's turnover rate will **rise in the 4th Quarter** due to **additional ALMA-C layoffs** and (**11**) terminations from **the FY13 NRAO operations budget Reduction in Force**.



Common Computing Environments (CCE)

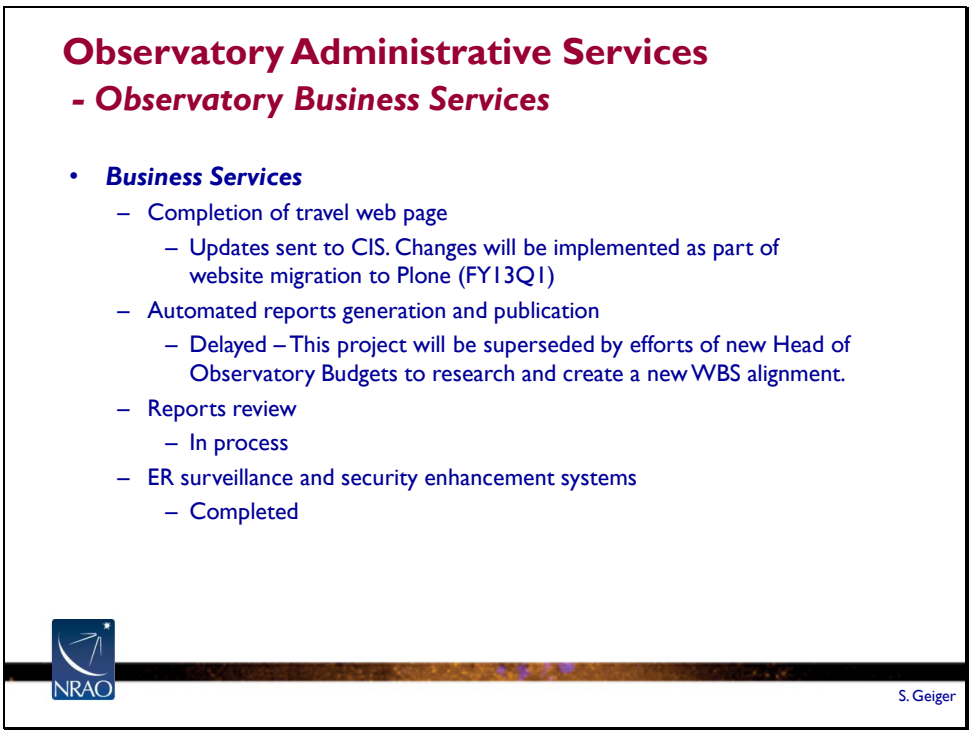
• **Unification of Helpdesks** on track: **Account Association** (NRAO and ALMA) due in Q4
• Cluster CPU capacity sufficient to allow **ALMA QA Level2 moved from JAO to NAASC**
• **CASA Pipeline** installed on NAASC compute cluster and test runs successfully executed
• Replica of **all GBT data now present in CV** (awaiting Archive Access integration)
• Science Portal and Helpdesk **ready for ALMA Cycle 1 call**
• **64bit Linux v6 ready** for Q4 deployment

Networking and Telecommunications

• Replacement of 3 end of life video conference units with High Def systems (reduce travel, improve communication)
• AUI RFP to install **fiber optic cable to the ALMA OSF** was issued: selection in Q4
• Hardware and **fiber build-out for Green Bank** high speed Internet link finalized for Q4 start
• **Online training for NRAO proposals** hosted with 50+ Observers participating in presentations, video + Q&A

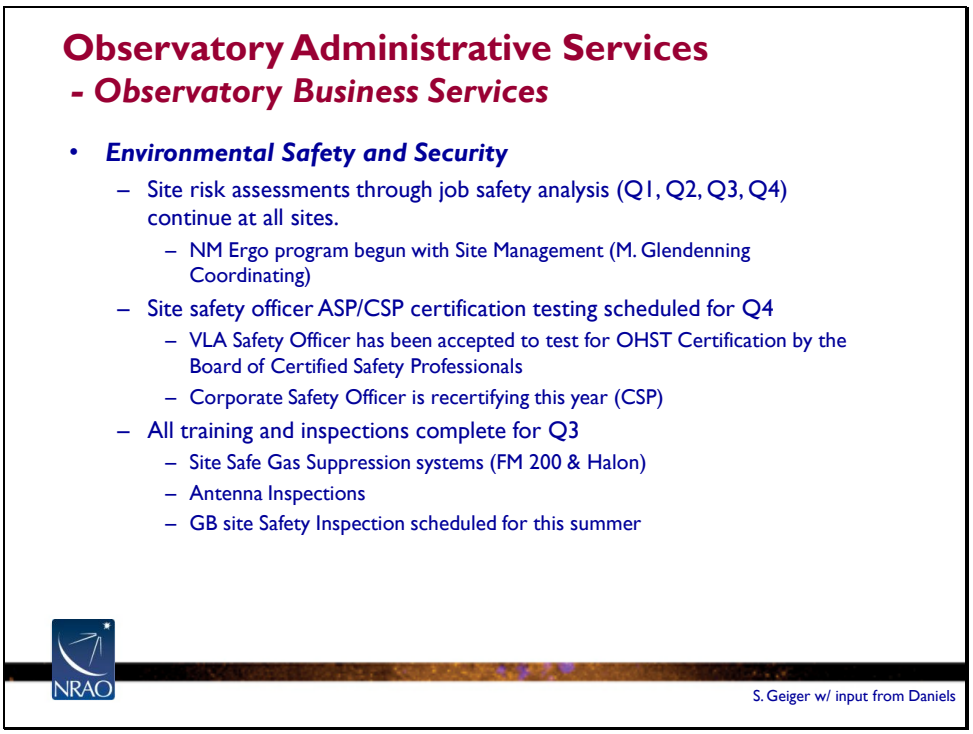
Security

• Security audit recommendation addressed with installation of **swipe access to HR and IT**
• No production impacting security events**: China safety/security planning** underway for IAU**.**



Current reports may be changed due to new WBS alignment. This project will be considered for 2013 POP. Risk: Low. Mitigation: Current reports still work.

Surveillance cameras at Edgemont Road have been upgraded. Security door for after hours to Human Resources/Administration hallway has been installed to improve protection of confidential information.



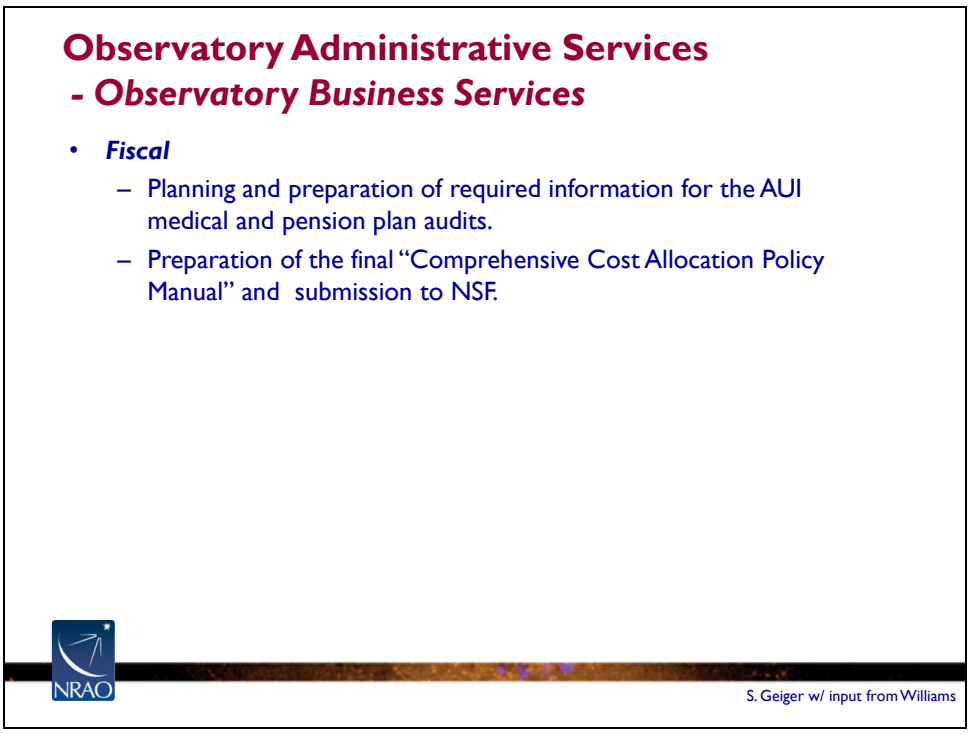
Site training: Green Bank-28 New Hire Safety Orientations conducted; Socorro-Back Safety & Power Lifting- 31 employees, Antenna lockout refresher-2 employees, Fire Alarm Panel Training-5 employees, Slip, Trip and falls- 33 employees, Pro-Active Safety & the Self Inspection-29 employees, New Hire Safety orientation-5 employees; VLA-fire brigade training- 13 employees. NFPA 70E Electrical Safety training provided to VLA Maintenance & Electronics Workers. Total number of training sessions in excess of 200.

Recycling: 878 Pounds of Batteries (wet & dry), 100% of our packaging cardboard plus 300 pounds of additional cardboard product and 3000 pounds of scrap steel.

Inspections: standard Monthly safety inspections completed at all sites (fire extinguishers, first aid kits, etc); Socorro: 1st (of 2) semi-annual Halon Inspection/testing conducted. VLA FM 200 system inspected. All Fire Extinguishers checked at all sites.

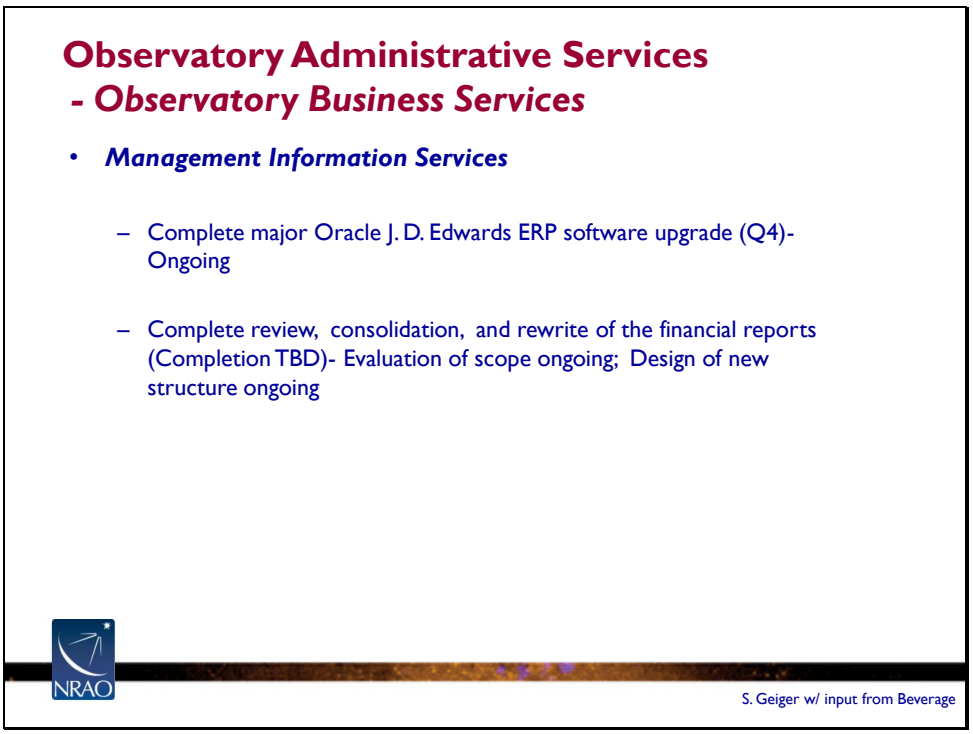
Emergency Services: A new 2012 F350 Ambulance was acquired for the NRAO-VLA-EMS group. Outside funding was acquired for the purchase of a new Philips Heart Start MRx unit for the NRAO-VLA-EMS group.

Ergonomics: NRAO-NM started working on an Ergonomic policy and a material funding program to help mitigate some of the ergonomic concerns facing NRAO-NM. Joint mission between Ops, Business office and ES&S.

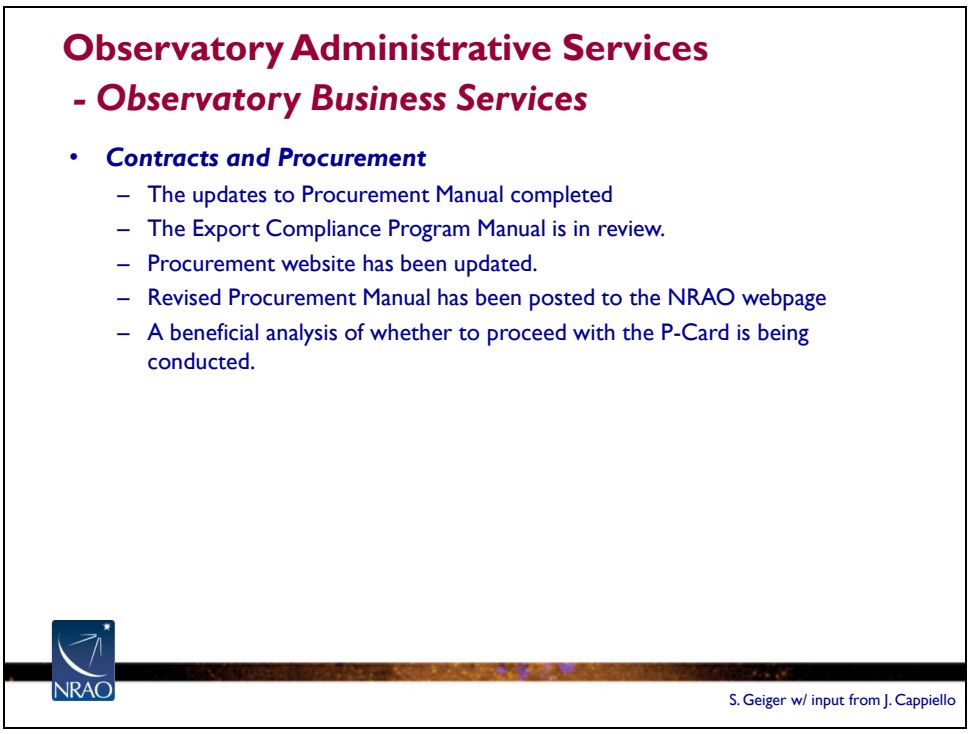


Preparation for the annual AUI Medical and Pension plan audits began in May 2012 with audit fieldwork to complete in August.

In response to the NSF/OIG report 6171-2010-1790008, finding 11-01 AUI prepared and submitted the "Comprehensive Cost Allocation Policy" to provide detailed procedures pertaining to all allocation methodologies.



Testing continued into FY12 Q4. Go-live set for month of August.



Finalize Procurement Manual Update: The updates have been completed February 2012. (FY12Q2)

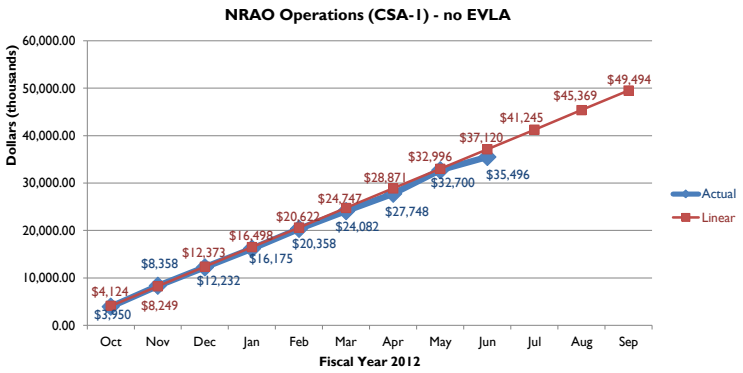
Implement an export compliance program: The Export Compliance Program Manual is in review. Project implementation combined with efforts of Office of New Initiatives to create a comprehensive process. Program will be in place FY12Q4.

Revise the Procurement website internal and external pages: Website has been updated. All updates/revisions were completed February 2012 (FY12Q2). Revised Procurement Manual has been posted to the NRAO webpage. (FY12Q2).

P-Card Implementation: A beneficial analysis of whether to proceed with the P-Card is being conducted. Determination is under review and will be made in FY12Q4. The P-Card is a purchasing card that provides the ability to purchase supplies on a single account.

Observatory Administrative Services
- *Observatory Business Services*

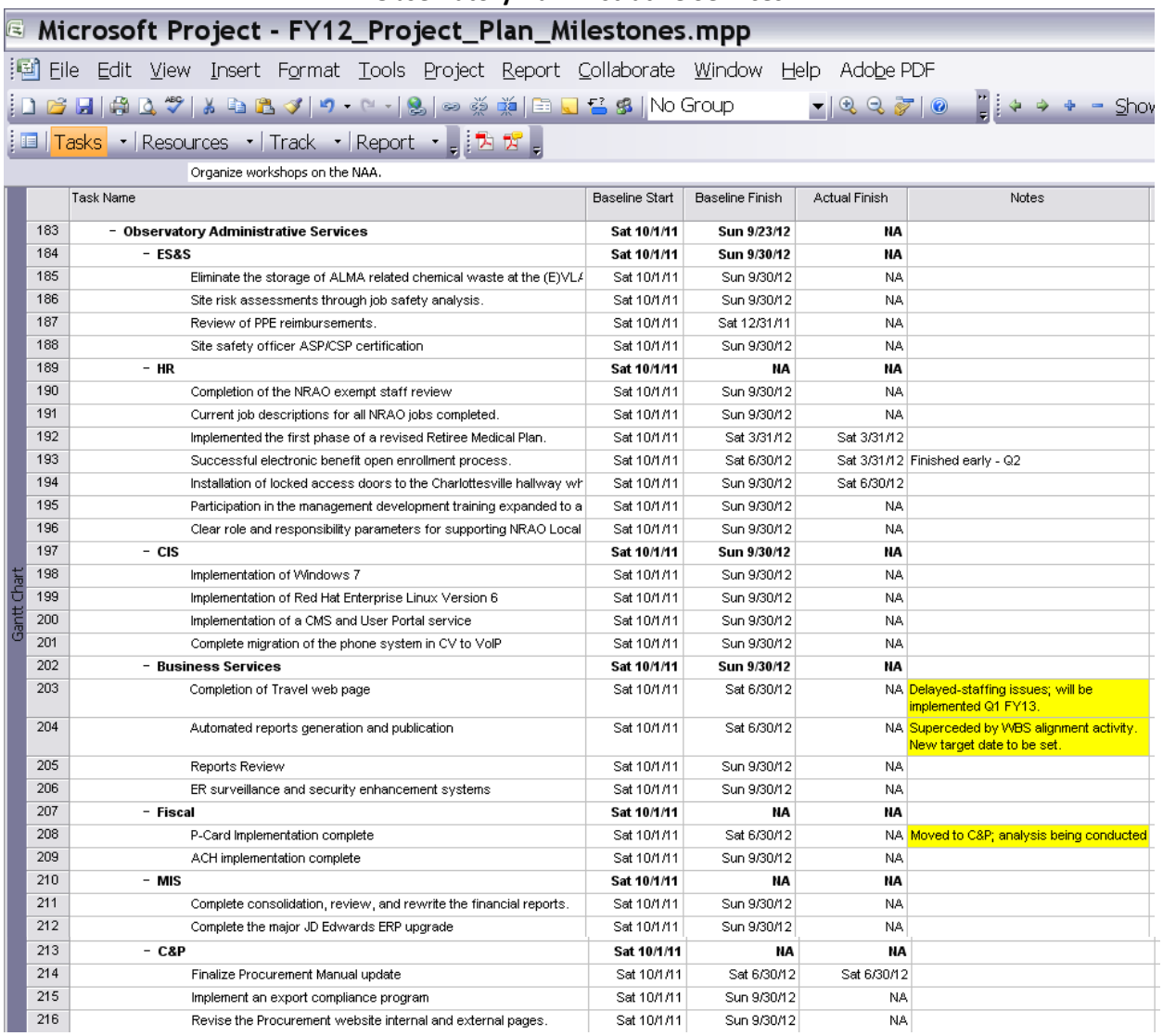
- ***Financial Performance***



S. Geiger w/ input from Lockledge/McReynolds

NRAO Operations (less EVLA) FY 2012 new funding allocation is $42,890.0K. Total available funding including prior year commitments and carryover totals $49,494K. Total expenses and commitments for the first three quarters of FY 2012 is $35,496K or 71.7% of total available funds. Benefits are ahead of spending projections due to higher than anticipated medical claims and a smaller overall pool of employees from which to recover benefits costs. NRAO budgets for 32.5% benefits rate; however, as of June the actual benefits rate was 36.4%.

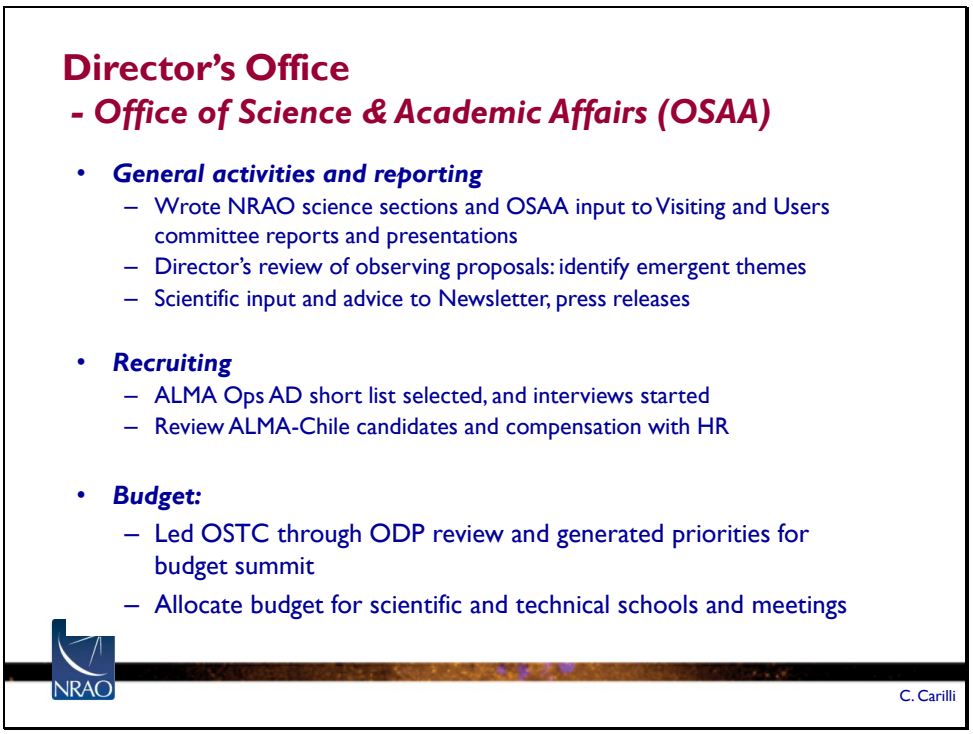
TABLE 12: Performance to Program Operating Plan Major Milestones & Functional Tasks
-Observatory Administrative Services-



	Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
183	**- Observatory Administrative Services**	**Sat 10/1/11**	**Sun 9/23/12**	**NA**	
184	**- ES&S**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
185	Eliminate the storage of ALMA related chemical waste at the (E)VLA	Sat 10/1/11	Sun 9/30/12	NA	
186	Site risk assessments through job safety analysis.	Sat 10/1/11	Sun 9/30/12	NA	
187	Review of PPE reimbursements.	Sat 10/1/11	Sat 12/31/11	NA	
188	Site safety officer ASP/CSP certification	Sat 10/1/11	Sun 9/30/12	NA	
189	**- HR**	**Sat 10/1/11**	**NA**	**NA**	
190	Completion of the NRAO exempt staff review	Sat 10/1/11	Sun 9/30/12	NA	
191	Current job descriptions for all NRAO jobs completed.	Sat 10/1/11	Sun 9/30/12	NA	
192	Implemented the first phase of a revised Retiree Medical Plan.	Sat 10/1/11	Sat 3/31/12	Sat 3/31/12	
193	Successful electronic benefit open enrollment process.	Sat 10/1/11	Sat 6/30/12	Sat 3/31/12	Finished early - Q2
194	Installation of locked access doors to the Charlottesville hallway wh	Sat 10/1/11	Sun 9/30/12	Sat 6/30/12	
195	Participation in the management development training expanded to a	Sat 10/1/11	Sun 9/30/12	NA	
196	Clear role and responsibility parameters for supporting NRAO Local	Sat 10/1/11	Sun 9/30/12	NA	
197	**- CIS**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
198	Implementation of Windows 7	Sat 10/1/11	Sun 9/30/12	NA	
199	Implementation of Red Hat Enterprise Linux Version 6	Sat 10/1/11	Sun 9/30/12	NA	
200	Implementation of a CMS and User Portal service	Sat 10/1/11	Sun 9/30/12	NA	
201	Complete migration of the phone system in CV to VoIP	Sat 10/1/11	Sun 9/30/12	NA	
202	**- Business Services**	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
203	Completion of Travel web page	Sat 10/1/11	Sat 6/30/12	NA	Delayed-staffing issues; will be implemented Q1 FY13.
204	Automated reports generation and publication	Sat 10/1/11	Sat 6/30/12	NA	Superceded by WBS alignment activity. New target date to be set.
205	Reports Review	Sat 10/1/11	Sun 9/30/12	NA	
206	ER surveillance and security enhancement systems	Sat 10/1/11	Sun 9/30/12	NA	
207	**- Fiscal**	**Sat 10/1/11**	**NA**	**NA**	
208	P-Card Implementation complete	Sat 10/1/11	Sat 6/30/12	NA	Moved to C&P; analysis being conducted
209	ACH implementation complete	Sat 10/1/11	Sun 9/30/12	NA	
210	**- MIS**	**Sat 10/1/11**	**NA**	**NA**	
211	Complete consolidation, review, and rewrite the financial reports.	Sat 10/1/11	Sun 9/30/12	NA	
212	Complete the major JD Edwards ERP upgrade	Sat 10/1/11	Sun 9/30/12	NA	
213	**- C&P**	**Sat 10/1/11**	**NA**	**NA**	
214	Finalize Procurement Manual update	Sat 10/1/11	Sat 6/30/12	Sat 6/30/12	
215	Implement an export compliance program	Sat 10/1/11	Sun 9/30/12	NA	
216	Revise the Procurement website internal and external pages.	Sat 10/1/11	Sun 9/30/12	NA	

Agenda

- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs
- Observatory Administrative Services
- Director's Office
  - Office of Science and Academic Affairs (OSAA)
  - Communications
  - Spectrum Management



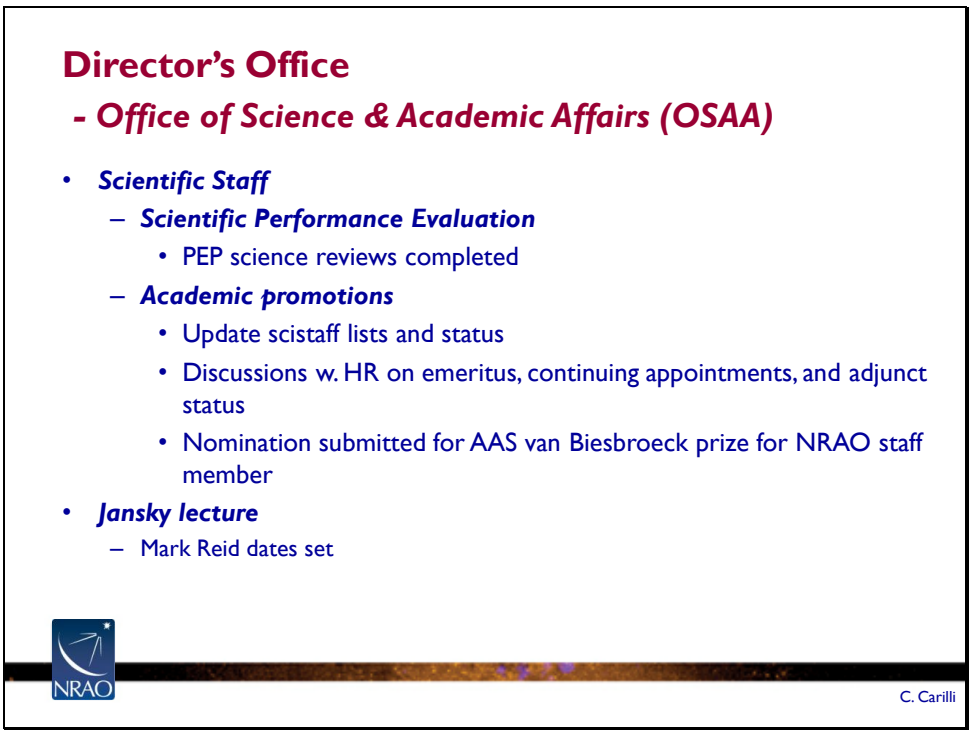
A key part of the chief scientist role is scientific input into numerous reporting documents and venues, such as the Visiting and Users committees, as well as scientific press releases and EPO-related highlights.

The chief scientist also participates in the Director's review of selected observing programs to identify emerging science themes

Head of OSAA participates in all scientific staff hiring either directly on the selection committee, or via a post-selection review to set appointment level (assistant, associate…) with HR. This includes NRAO hires to ALMA in Chile, for which we had a few this quarter.

A major task for the chief scientist and chief technologist (R. Fisher) is to guide the OSTC through the review of ODP proposals, and provide prioritized lists for the budget summit. This year Tony Kerr again was of great assistance in helping coordinate. We will be revising the process next year, based on lessons learned.

OSAA provides budgetary support for schools and scientific meetings sponsored in whole or part by the NRAO. These schools and meetings are a key part of NRAO education and professional out-reach and development, and foster a vibrant community in the use of NRAO facilities. OSAA supported the synthesis summer school, and other events.

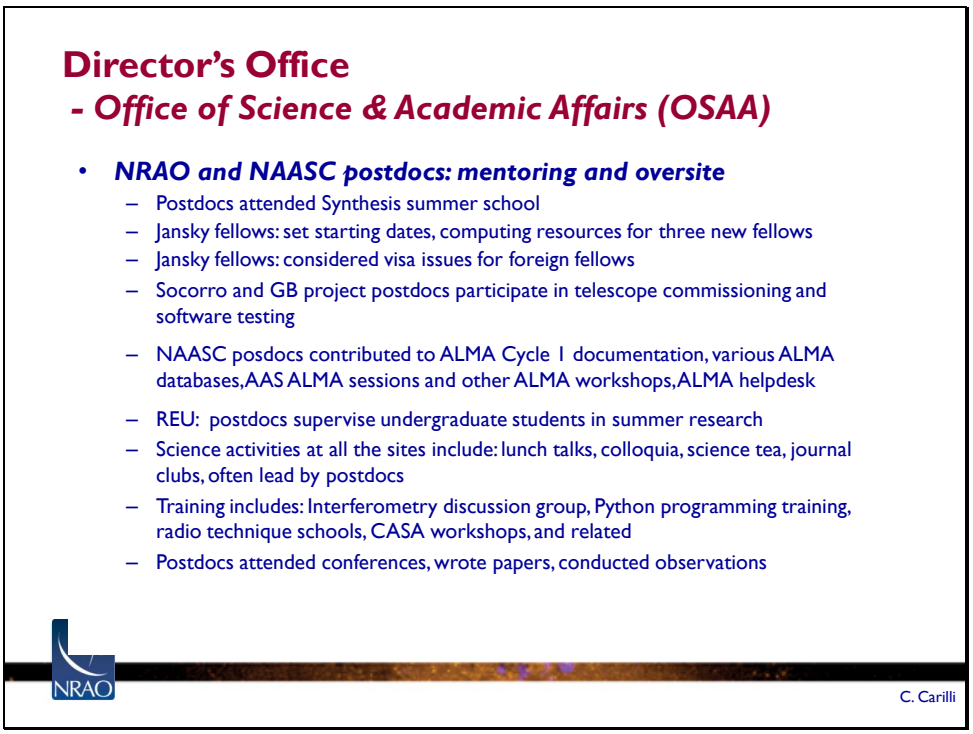


OSAA performs the scientific review of section 3 or all scistaff, including astronomers, scientists, research engineers and computer scientists (roughly 90). This process is now complete for 2012, barring a few stragglers.

Annually update the scitaff list and status, and compare with HR records.

Questions arose on the nature and status of some aspects of scistaff appointments, and meetings were held with HR. These are continuing.

OSAA organizes the Jansky lecture.



Postdoc:

- In Socorro, N. Roy participated in RSRO commissioning. Minnie Mao started as a project postdoc for EVLA. Goss advised Jy fellow on career development.
- Socorro pizza lunch is organized by Jansky fellow N. Roy.
- Cville tuna lunch is organized by postdocs N. Marcelino & JC Munoz.
- GB journal club and colloquia are organized by postdoc M. Johnson.
- Cville astroph discussion group led by postdocs K. Scott, JC Carlos, J. Tobin, as well as numerous informal topical discussion group.

NAASC postdocs:

- Contributed to ALMA Cycle 1 documentation
- Contributed to ALMA splinter/special talks at AAS
- Contributed to Splatalogue database
- Contributed to ALMA calibrator database
- Lead weekly lunch talk series and journal club discussion group
- Conducted ALMA data calibration and imaging for delivery to Pis/community
- Interferometry Discussion Group
- Python programming training
- Journal club
- Various science topic specific group meetings

Users Committee (UC) and Visiting Committee (VC): Worked with Director's Office and NRAO staff to prepare and edit NRAO reports to these committees, and prepare online and hardcopy support materials. Worked with Director's Office staff and Users Committee co-chairs Dave Wilner (CfA) and Gordon Richard (Drexel) to establish and communicate the UC meeting agenda. VC meeting was held 16-17 May in Green Bank; UC meeting was held 21-22 May in Socorro.

CORF/NSMA: NSMA=National Association of Spectrum Managers. Meeting is always in the same week as CORF at NAS. This is where I encountered the lawyer with whom the coordination agreement regarding level-probing radars was reached, see just below.

FCC comment: These level-probing radars operate in bands from 6 to 85 GHz. The coordination agreement provides for 4 km-radius exclusion zones and an 80 km-radius zone providing for height restrictions on radar operations.

FCC comment: Qualcomm wishes to use for downlinks a band at 14 – 14.5 GHz that normally is used for uplinks. NRAO and CORF agreed with Qualcomm's suggestion to try to coordinate this use through the NSF Spectrum Management Office.

CloudSat: Concluded a series of orbital maneuvers occurring over several months to rejoin its original orbit partners following a battery incident nearly two years ago that severely restricted its operation and caused a substantial wobble of its downward pointing.

TABLE 13: Performance to Program Operating Plan Major Milestones & Functional Tasks
-Director's Office-

Task Name	Baseline Start	Baseline Finish	Actual Finish	Notes
– Director's Office	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
– EPO	**Sat 10/1/11**	**Sun 9/30/12**	**NA**	
Produce and install new, colorful outdoor tour signage for the VLA Walking Tour p	Sat 10/1/11	Sun 9/30/12	NA	
Organize a press event and associated materials to coincide with the symposium	Sat 10/1/11	Sun 9/30/12	NA	
Implement a fee structure for tourists who wish to take the Green Bank bus tour	Sat 10/1/11	Sat 12/31/11	Sat 12/31/11	

TABLE 14: Performance to Program Operating Plan Financial Projections
-OAS and Director's Office-

	Total NSF New Funds (PRL) and Carryover	FY12 Thru Q3 Actuals	% Spent	Notes (75% fiscal year elapsed)
Observatory Administrative Services (OAS)	**3,864,178**	**4,721,003**	**122.17%**	
Administration	683,775	355,978	52.06%	Head of Budgets position was open in Q1 and most of Q2. Also, FY11 ERP expenses were accrued at FY11 year end, resulting in a reversing credit in Q1. Some general underspending by a few of the Admin divisions.
Human Resources	823,062	631,904	76.77%	
Computer and Information Services	1,346,596	1,066,676	79.21%	
ALMA Office of Chile Affairs	1,010,745	635,096	62.83%	General underspend is due to reversing accruals of FY11 expenses reversed in October 2011.
Administration Cost Recovery to Rest of CSA-1		2,031,350		The FY12 POP was the first version on the POP prepared using the new Cost Pool Recovery mechanism. As such, the budget numbers were calculated using a version of the Cost Pool Recovery system that was based partly on the former Directly Associated Costs (DAC) method. This line item is the liquidated overhead Administration costs that pertain to the support of the rest of funding sources CSA-1, NRAO Ops.
Director's Office (DO)	**4,370,997**	**3,047,984**	**69.73%**	
Director's Office	1,363,109	1,011,004	74.17%	
Science Staff (OSAA)	1,325,886	704,888	53.16%	Some budgeted Post-Doc positions have not been filled as of Q3.
Education and Public Outreach	1,628,630	1,292,252	79.35%	
Spectrum Management	53,371	39,840	74.65%	
ARRA Stimulus Funds	965,700	580,072	60.07%	Funding expected to be used by end of Fiscal year.
Interagency Agreements Assoc. with Base Operations	-			
Subtotal Interagency Agreements Assoc. with Base Operations	-			
AUI IDC/Mgmt Fee	3,466,000	2,599,992	75.01%	
NRAO Operations Carryover	3,995,000			Carryover is distributed throughout the NRAO Operations Divisions.
Observatory Grand Totals (carryover plus new NSF AST funding)	**161,188,593**	**87,005,088**	**53.98%**	