Quarterly Status Update (QSU) #2 FY 2012
January – March 2012

L. Wingate, P. Jewell, et. al.

May 15, 2012

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

Agenda

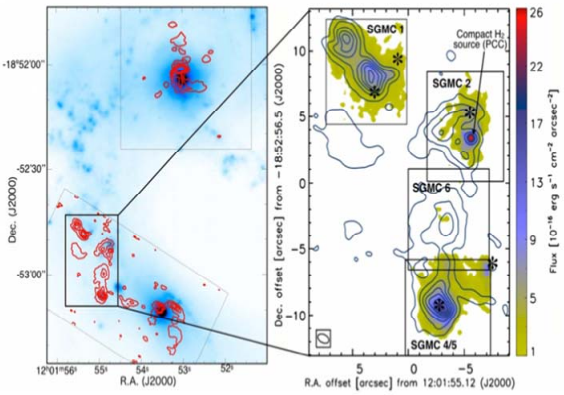
- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs
- Broader Impact
- Observatory Administrative Services
- Director's Office

First ALMA papers: Super Star Clusters

Tracing the physics of massive star formation in merging galaxies

- Super-giant molecular complexes (sGMCs) in the Antennae galaxy merger were imaged with ALMA in CO3-2 emission, and in H2 1-0 S(1) with VLT/SINFONI.
- H2/CO line ratios vary by up to a factor of 10 among SGMCs, including **a 50pc pre-cluster cloud that has not yet formed significant numbers of massive stars.**
- **These observations show that the H2 emission is powered by shocks**, and demonstrate how H2 1-0 S(1) and CO(3-2) lines can be used as tracers of energy dissipation and gas mass.

Herrera ea. 2012



Left. ALMA CO morphology shown on top of CFHT K-band continuum image (H11). Dotted boxes mark the two ALMA mosaics, the solid box marks the overlap region. Right. H2 1−0 S(1) morphology as seen with SINFONI. Boxes mark individual SINFONI fields-of-view, contours show CO(3−2). Also marked are massive and young SSCs (asterisks), and the compact H2 source PCC.

Title: ALMA CO and VLT/SINFONI H2 observations of the Antennae overlap region: mass and energy dissipation
Web link: http://adsabs.harvard.edu/abs/2012A%26A...538L...9H
Publication: Herrera, C. ea. 2012, A&A, 538, L9

Notes:

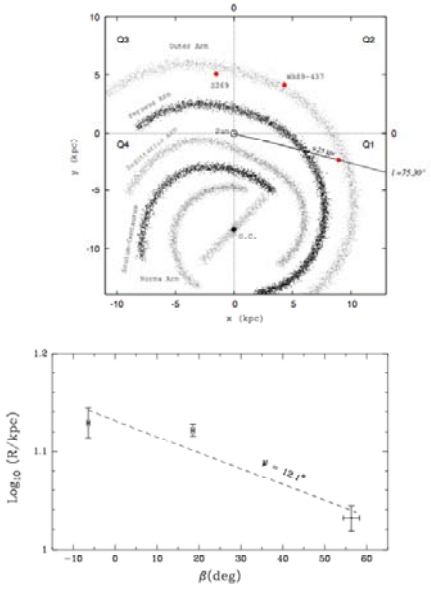
- They present an analysis of super-giant molecular complexes (SGMCs) in the overlap region of the Antennae galaxy merger, based on ALMA CO(3-2) interferometry and VLT/SINFONI imaging spectroscopy of H2 1-0 S(1)
- H2 line emission is found in all SGMCs and the kinematics of H2 and CO are well matched. H2/CO line ratios vary by up to a factor of 10 among SGMCs, including a 50pc pre-cluster cloud that has not yet formed significant numbers of massive stars.

The H2 emission is powered by shocks, and demonstrate how the H2 1-0 S(1) and the CO(3-2) lines can be used as tracers of energy dissipation and gas mass.

VLBA: mapping out the Galactic Warp

Direct measurements of the warp and rotation in the outer Galaxy

- The parallax was measured by the VLBA for the water maser in a high mass star-forming region yielding a heliocentric distance of 9.25 kpc, which places it in the Outer arm
- G75.30+1.32 lies 200 pc above the Galactic plane and is associated with a substantial H I enhancement at the border of a large molecular cloud. At a Galactocentric radius of 10.7 kpc, G75.30+1.32 is in a region of the Galaxy where the disk is significantly warped toward the North Galactic Pole. While the star-forming region has an instantaneous Galactic orbit that is nearly circular, it displays a significant motion of 18 km s^{-1} toward the Galactic plane.
- **The present results, when combined with two previous maser studies in the Outer arm, yield a pitch angle of 12° for a large section of the arm extending from the first quadrant to the third.**



Geometry and pitch angle for the outer spiral arm of the Milky Way

Sanna, A. ea 2012

Title: Trigonometric Parallaxes of Massive Star-forming Regions. IX. The Outer Arm in the First Quadrant

Web link: http://adsabs.harvard.edu/abs/2012ApJ...745...82S

Publication: Sanna, A. ea 2012ApJ...745...82

- The parallax was measured by the VLBA for the water maser in the high mass star-forming region G75.30+1.32, yielding a heliocentric distance of 9.25 kpc, which places it in the Outer arm in the first Galactic quadrant.
- G75.30+1.32 lies 200 pc above the Galactic plane and is associated with a substantial H I enhancement at the border of a large molecular cloud. At a Galactocentric radius of 10.7 kpc, G75.30+1.32 is in a region of the Galaxy where the disk is significantly warped toward the North Galactic Pole. While the star-forming region has an instantaneous Galactic orbit that is nearly circular, it displays a significant motion of 18 km s^{-1} toward the Galactic plane.
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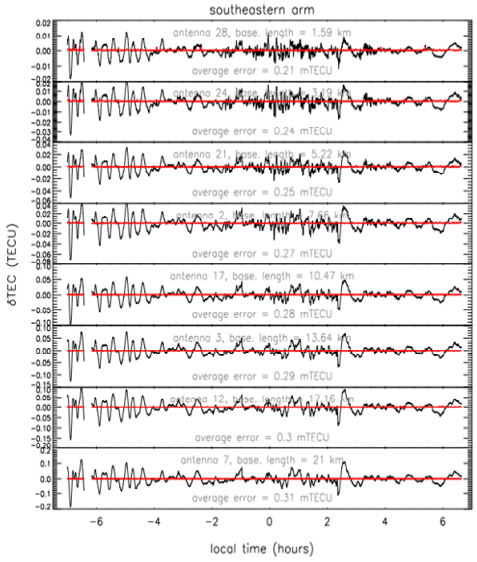
VLA: unprecedented view of the ionosphere

The VLA beats GPS for ionospheric measurements!

- The 74MHz system of the VLA has been used to measure the ionospheric total electron content (TEC) fluctuations on a much wider range of scales than is possible with many other instruments.
- They have shown that with a bright source, **the VLA can measure differential TEC values between pairs of antennas with a precision of 0.0003 TECU, yielding more than an order of magnitude better sensitivity to TEC fluctuations than can be achieved with GPS-based relative TEC measurements**
- Large amplitude, long period waves representing traveling ionospheric disturbances are visible within the δTEC data near dusk and dawn as well as other times intermittently throughout the night.



Antennas in the southeastern arm of the VLA: difference between the TEC fluctuation along the line of sight and that measured along the reference antenna's line of sight, δTEC.

Helmboldt, J ea. 2012

Title: A new technique for spectral analysis of ionospheric TEC fluctuations observed with the Very Large Array VHF system: From QP echoes to MSTIDs
Web link: http://adsabs.harvard.edu/abs/2012RaSc...47.0L02H
Publication: Helmboldt ea. 2012, RaSc...47.0L02H

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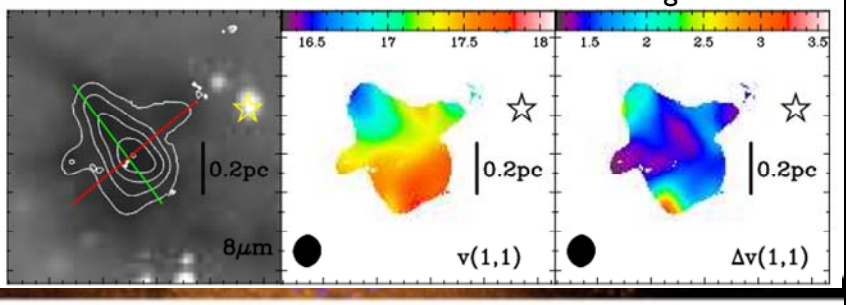
GBT and VLA reveal IR dark cloud dynamics

Direct measurement of collapse and fragmentation in protostellar clouds

- Infrared-dark clouds (IRDCs) are the birthplaces of rich clusters and contain the earliest phases of high-mass star formation. GBT and VLA maps of ammonia (NH3) measure IRDC column density, temperature, kinematic structure and energy content.
- IRDCs display organized velocity fields, with localized disruptions due to embedded star formation. The local effects seen in NH3 emission are not high velocity outflows but moderate (few km s^{-1}) increases in the line width that coincide with the mid-infrared emission tracing protostars, likely the result of infall or hidden outflow. **Not only is the kinetic energy content insufficient to support the IRDCs against collapse, but also the spatial energy distribution is inconsistent with a scenario of turbulent cloud support. The velocity signatures of the IRDCs are due to active collapse and fragmentation, in some cases augmented by local feedback from stars.**

Ragan ea. 2012

Spitzer/IRAC 8μm image with NH3(1,1) integrated intensity contours overlaid. Plus the NH3 velocity and velocity dispersion images.



Title: Very Large Array Observations of Ammonia in Infrared-Dark Clouds. II. Internal Kinematics
Web link: http://adsabs.harvard.edu/abs/2012ApJ...746..174R
Publication: Ragan, S. ea. 2012 ApJ, 746, 174

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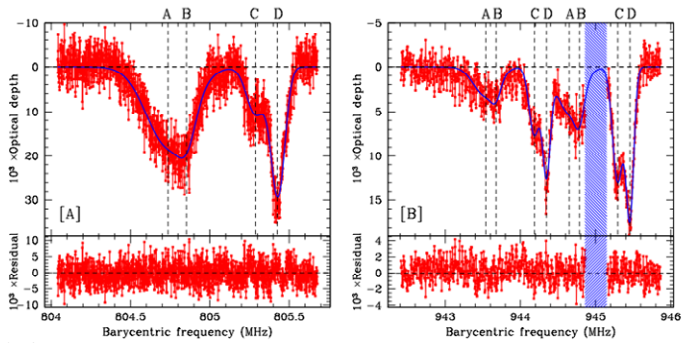
GBT studies of fundamental constants

Best limit to date on the cosmic evolution of the fine structure constant

They present GBT observations of H I 21 cm and OH 18 cm absorption at z = 0.765 toward PMN J0134-0931. A comparison between the "satellite" OH 18 cm line redshifts, or between the redshifts of the H I 21 cm and "main" OH 18 cm lines, is sensitive to changes in different combinations of the fine structure constant α, the proton-electron mass ratio $\mu \equiv m_p / m_e$, and the proton g-factor g_p . A comparison between the redshifts of the H I 21 cm and OH 18 cm lines, yields the strong constraint $[\Delta F/F] = [- 5.2 \pm 4.3] \times 10^{-6}$, where $F \equiv g_p [\mu\alpha^2]^{1.57}$. Incorporating other observations, **they obtain $[\Delta\alpha/\alpha] = (-1.7 \pm 1.4) \times 10^{-6}$ over a look-back time of 6.7 Gyr.**

GBT optical depth spectra in the redshifted [A] HI 21cm and [B] "main" OH 18cm transitions; the solid line in each upper panel shows the 4- component fit, with the fit residuals shown in the lower panels. Shaded regions indicate frequencies affected by RFI.

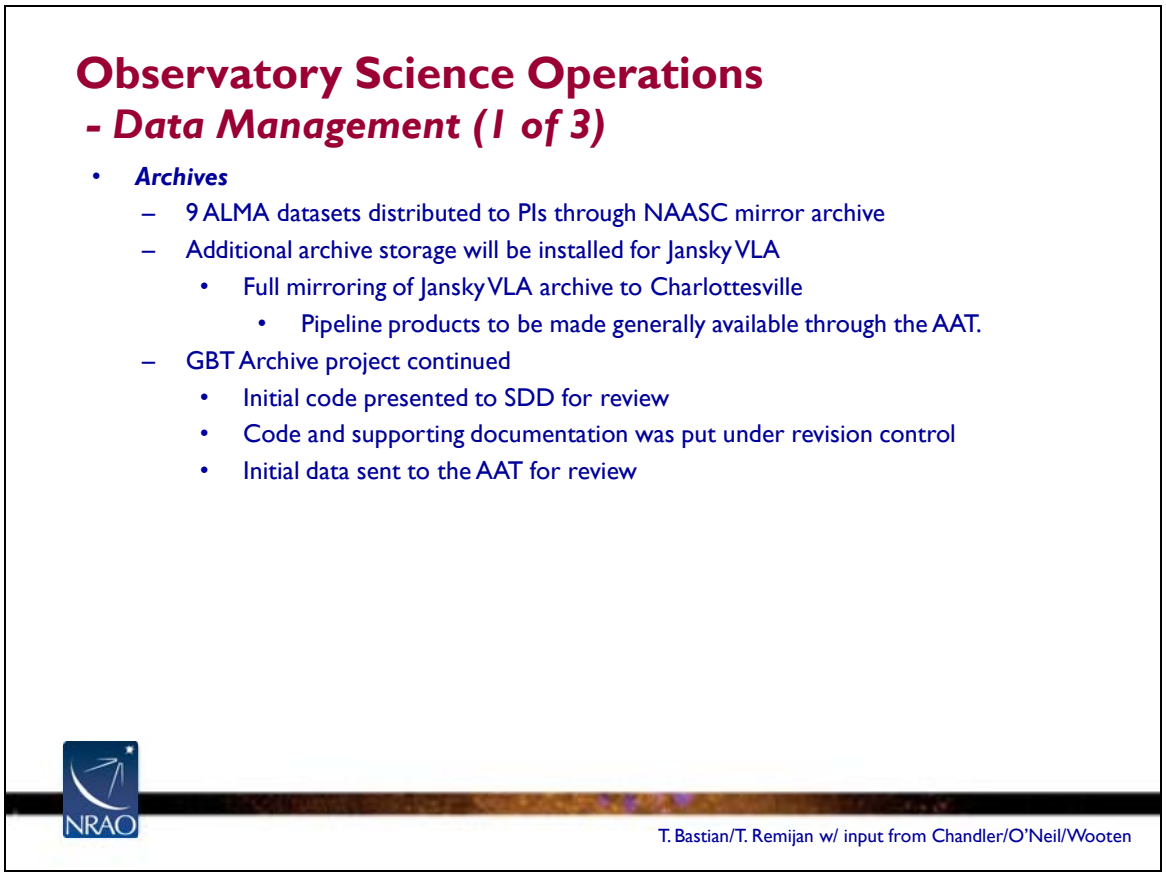


Kanekar et al. 2012

Title: Constraining Fundamental Constant Evolution with H I and OH Lines
Web link: http://adsabs.harvard.edu/abs/2012ApJ...746L..16K
Publication: Kanekar, N. et al. 2012ApJ...746L..16K
They present GBT observations of H I 21 cm and OH 18 cm absorption at z = 0.765 toward PMN J0134-0931. A comparison between the "satellite" OH 18 cm line redshifts, or between the redshifts of the H I 21 cm and "main" OH 18 cm lines, is sensitive to changes in different combinations of the fine structure constant α, the proton-electron mass ratio $\mu \equiv m_p / m_e$, and the proton g-factor g_p . A comparison between the redshifts of the H I 21 cm and OH 18 cm lines, yields the strong constraint $[\Delta F/F] = [- 5.2 \pm 4.3] \times 10^{-6}$, where $F \equiv g_p [\mu\alpha^2]^{1.57}$. Incorporating the constraint $[\Delta\mu/\mu] < 3.6 \times 10^{-7}$ from another absorber at a similar redshift and assuming that fractional changes in g_p are much smaller than those in α, we obtain $[\Delta\alpha/\alpha] = (-1.7 \pm 1.4) \times 10^{-6}$ over a look-back time of 6.7 Gyr.

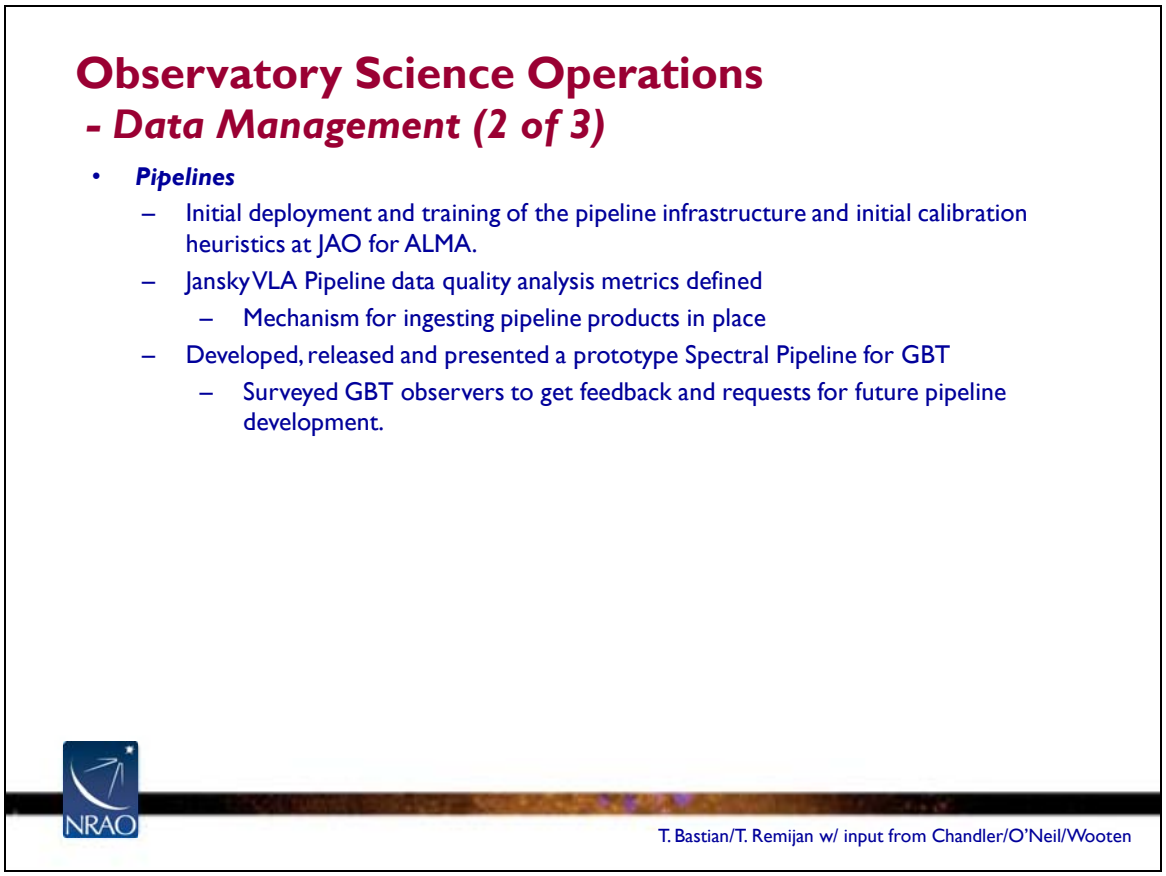
Agenda

- Science Results
- Observatory Science Operations (OSO)
  - Data Management
  - Facility-based Activities
  - Shared Services
  - Community Support Programs
  - Library/Historical Archives
  - Metrics
- Observatory Telescope Operations
- Observatory Development & Programs
- Broader Impact
- Observatory Administrative Services
- Director's Office

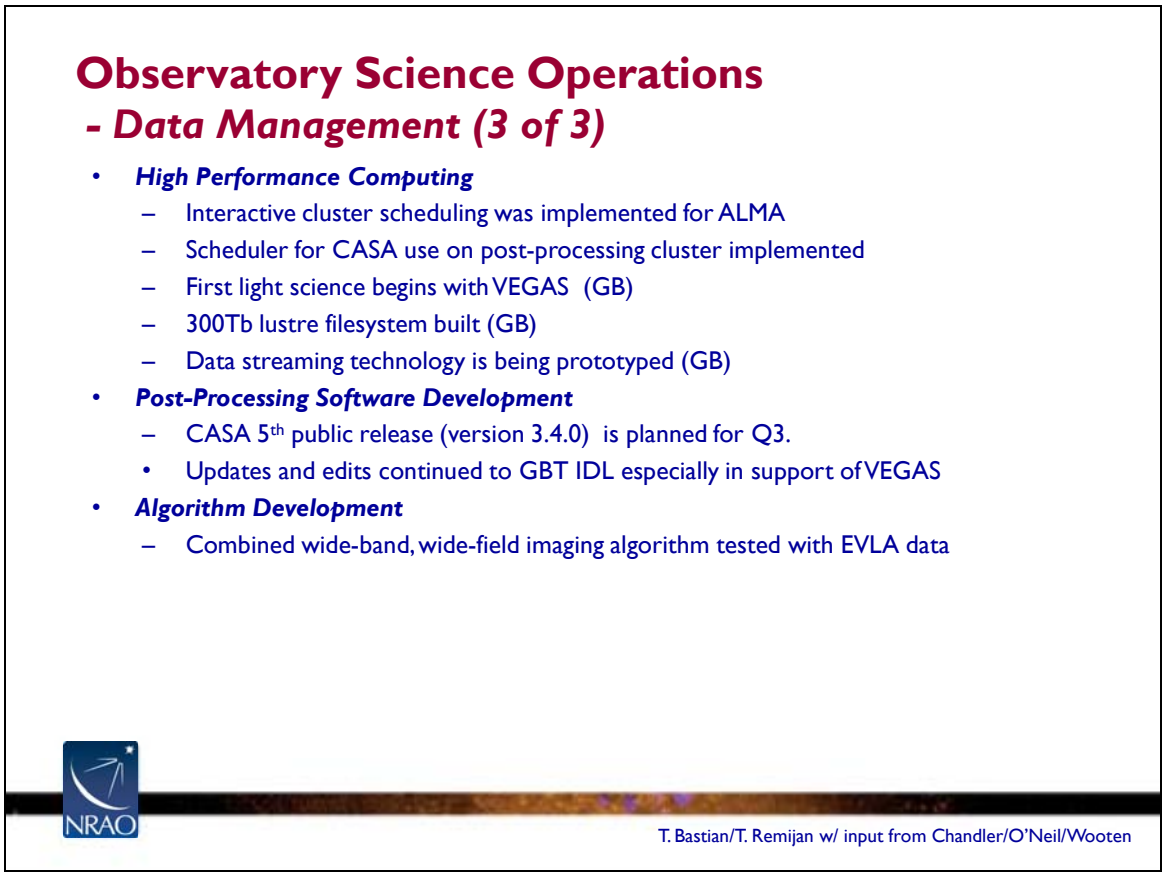


ALMA Cycle 0 observations continued through Q2 FY12. In this time, **9 datasets were delivered to North American PIs**. The data transfer took place through the NAASC mirror of the ALMA archive. Correspondence with the PIs during the data delivery continued to take place through the ALMA helpdesk.

CIS received and installed the latest 4 NGAS nodes from DSOC in Q2FY12 for a total of 12 systems. **JVLA (formally EVLA) data replication is currently faster than observe rate.** Additional NGAS storage systems will be purchased as needed to maintain the mirror. Full mirroring of the EVLA archive to CV was completed March 20th. Full mirroring includes an additional 216TB of storage (Four 54TB storage servers) activated on January 9th 2012. Prior to March 20th all but the additional storage was mirrored to CV. A final storage order charged against the EVLA construction budget to support operations through FY13 will be placed in Q4 and should add between 648TB and 860TB of storage. Final size is dependent on disk availability in Q4. A large amount of useful feedback from the GB scientific and SDD staff was incorporated into the GBT archive proposal. This was accepted and submitted to the library as GBT archive memo #278. **The initial code base for extracting GBT metadata was presented to the GB SDD for review.** We completed initial "alpha" code testing on all GBT archive early science data, GBT test data, and science data. **Code and supporting documentation was cloned from its revision control repository** by the GB SDD. **Initial samples of data were sent to J. Benson for review** - these data will likely change as we improve the code.



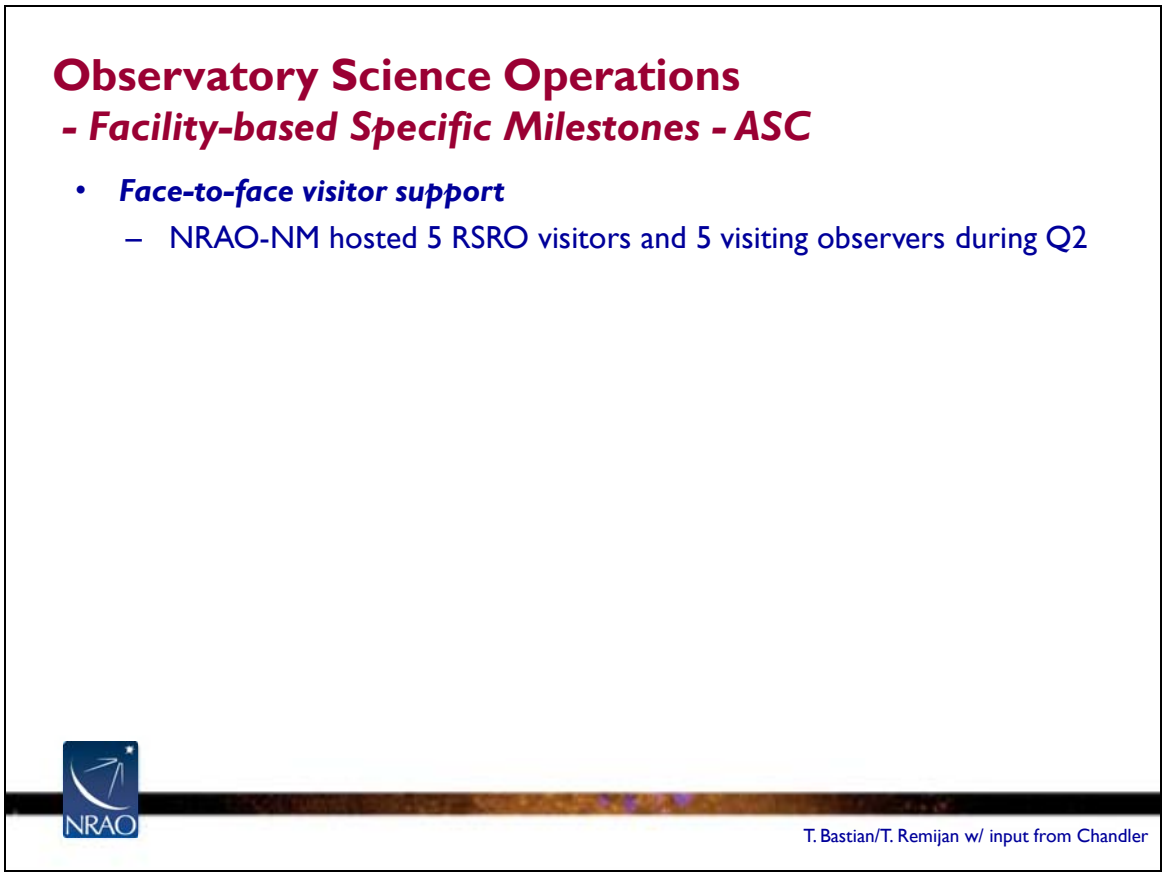
Working within the ALMA Pipeline Users' Group (PAUG), the international collaboration agreed upon and **deployed the initial pipeline infrastructure and calibration heuristics at the JAO**. ALMA Early Science Projects are being processed using a semi-automatic python script driving CASA tasks. This script will form the algorithmic basis for the ALMA Pipeline. A workshop was held in Socorro in March 2012 convened by Ed Fomalaut with representatives from the NAASC, JAO and ASC in order to coordinate the ALMA/EVLA pipelines, with emphasis on the products (QA2, Pipeline Reporting Weblogs) that will be sent to the PI and to the Pipeline Operators. The results of the meeting will be published as an internal CASA pipeline memo. The intended **EVLA calibration pipeline quality analysis (QA) metrics have been defined** as a quantitative comparison of QA-images with the visibility data in terms of phase decorrelation and gain amplitude variations. Additional QA metrics are defined as the distribution of flux with frequency, dynamic range and expected versus achieved noise level in the QA-images. The **file transport mechanism for derived products, and storage back into long-term NGAS storage (including indexing into the archive database) was defined and tested**. The GBT Pipeline Project has the following goals: 1) generate a quick-look data reduction pipeline for GBT spectroscopy data that is capable of processing at least 80% of all sessions observed with the GBT in "Standard Observing Modes"; 2) provide a set of data processing tools to help observers produce publication-quality data products and 3) accommodate and support current and future GBT development. In the past quarter, a **prototype spectral pipeline was released. Also, KFPA observers were surveyed to get feedback and requests for future pipeline development**. The pipeline group generated a prioritized listed of milestones for approx. the next 18 months which included an estimation of pipeline processing speeds.



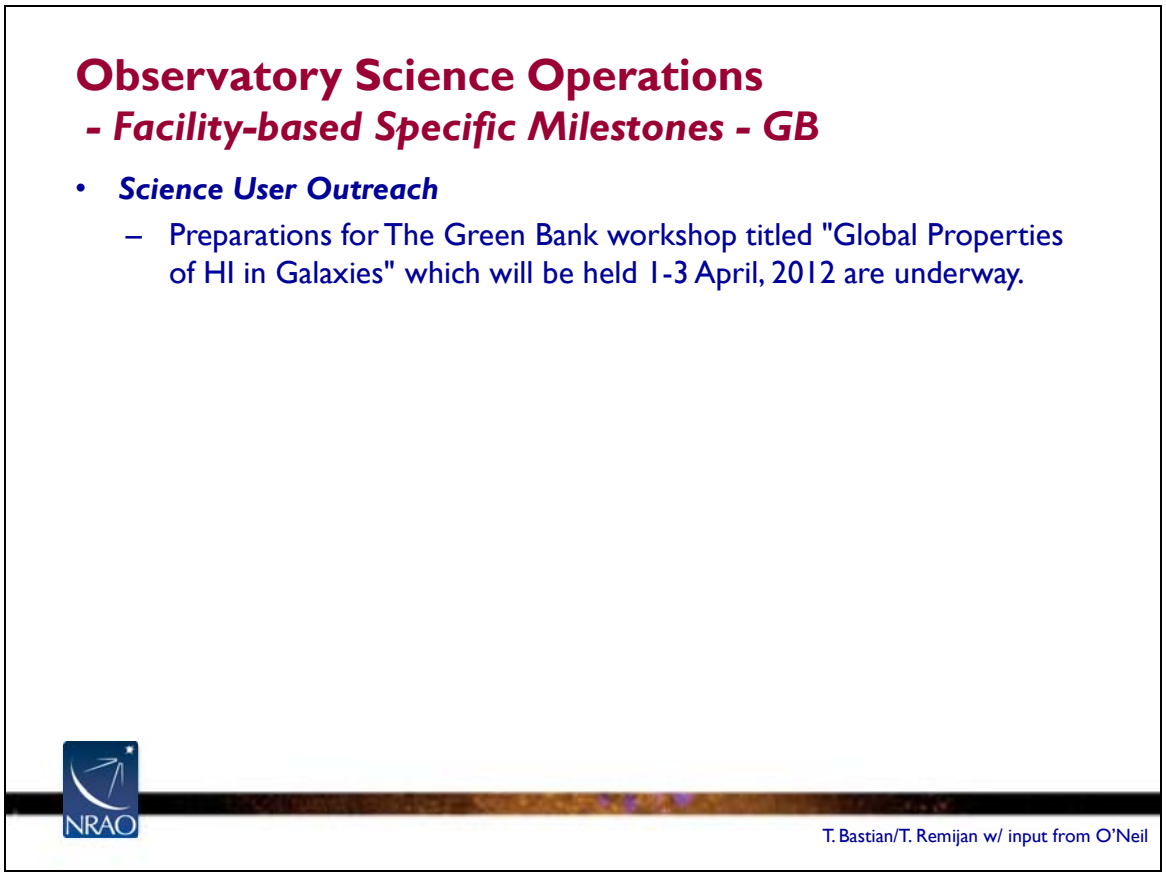
An **interactive scheduler for 16 of the 24 nodes is in active use** for Charlottesville's compute cluster. The scheduler allocates, terminates and lists current operation of the cluster by user. **A cluster scheduler based on the TORQUE resource manager and MAUI task scheduler was completed December 15th 2011, Q1 FY12**. This enabled node reservation requests to use a specified number of cluster nodes, allowing for automatic pipeline scheduling, interactive node reservation, and user based job submissions. During Q2 FY12 the ability to specify requested core count and memory was implemented. **First light science data has been taken with the new Versatile GBT Astronomical Spectrometer (VEGAS) which uses GPU's to process data**. Green Bank recently built a 300Tb lustre filesystem to act as working short term storage for the VEGAS spectrometer. Long term archival continues to be handled in Charlottesville. **Data streaming technology is being prototyped.** When deployed, this streaming technology will eliminate the bottlenecks that the current file-based technology will become as data rates increase. This new technology will impact the GB monitor and control system, the observers' interface and the GB pipeline.

Preparations are also well underway for the **5th release of CASA in Q3 FY12**. **GBTIDL effort in Q2 was focused on changes necessary to support VEGAS.** GBTIDL consumes SDFITS files as input and for VEGAS the default sdfits mode will be to write out separate SDFITS files for each VEGAS bank (each bank is a separate spectrometer, VEGAS has 8 available banks). This is being done so that the GBT pipeline can process the data from each bank in parallel. These modifications allow GBTIDL to do that automatically when necessary in online use. In the process, several bugs in the multiple SDFITS file data input case were found and fixed.

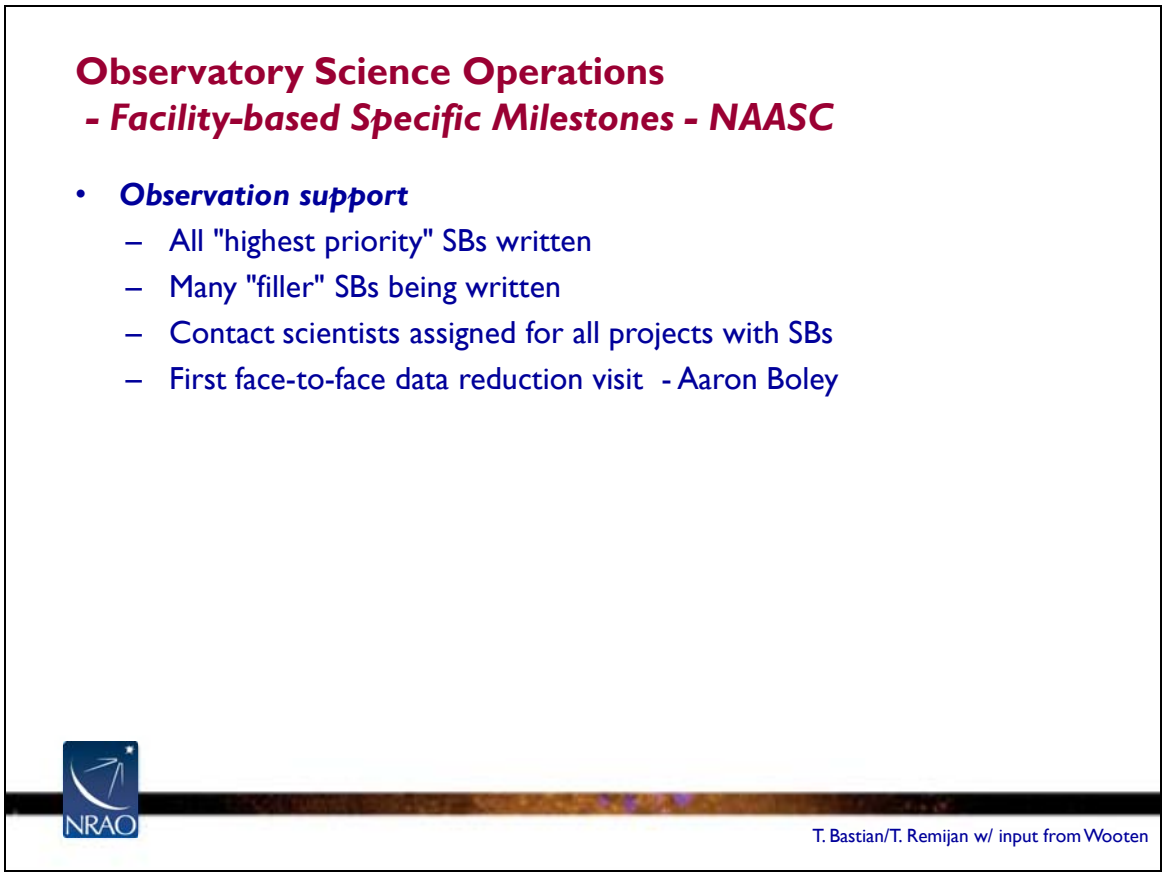
Proof-of-concept tests were carried out during Q2 FY12 on the combined wide-band wide-field imaging algorithm using simulated wide-band test data. Work to understand residual numerical and computing issues continues.



In Q2 FY12 **NRAO-NM hosted 5 RSRO scientists and 5 other scientists** for whom the main purpose of their visit was to reduce their data.

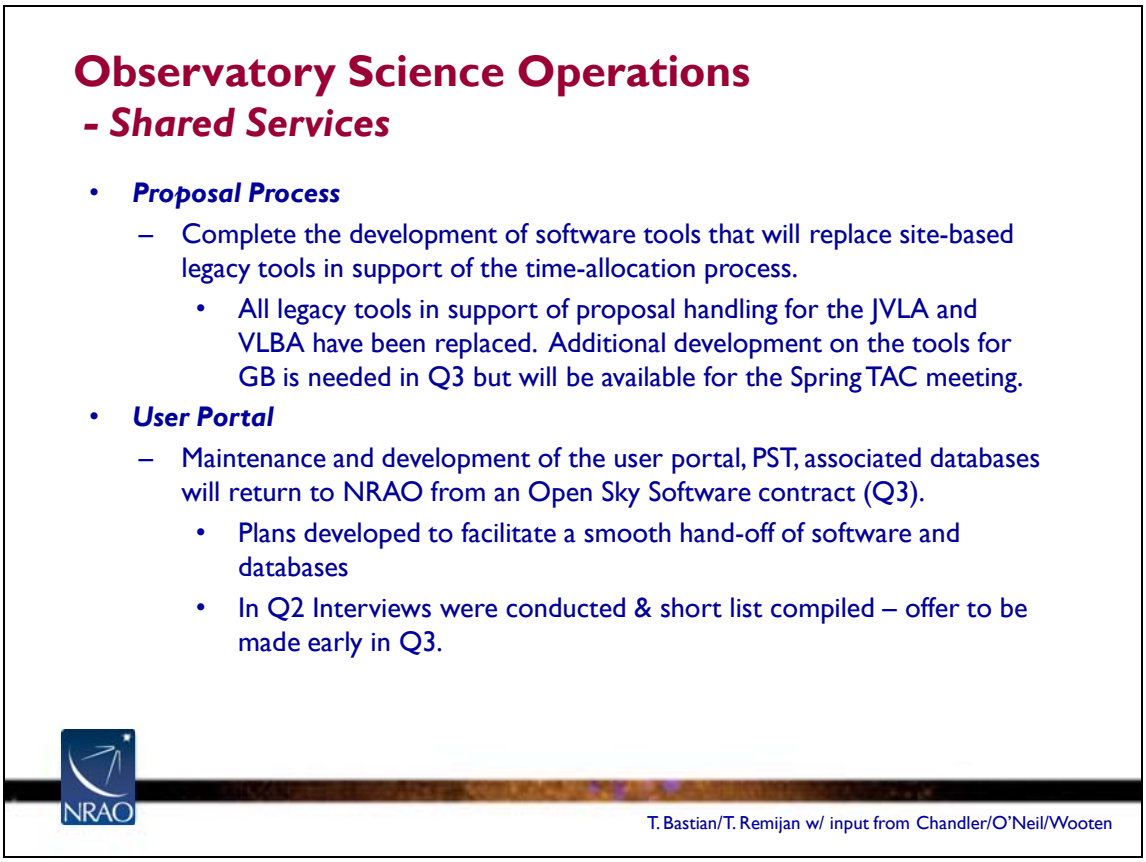


A science workshop **titled "*Global Properties of HI in Galaxies*" will be held 1-3 April 2012 at the NRAO in Green Bank, WV** in honor of the 35th anniversary of the discovery of the Tully-Fisher relationship. This workshop will bring together researchers and students to discuss recent results on HI in galaxies. An NRAO CDE event will take place in the days following the workshop.



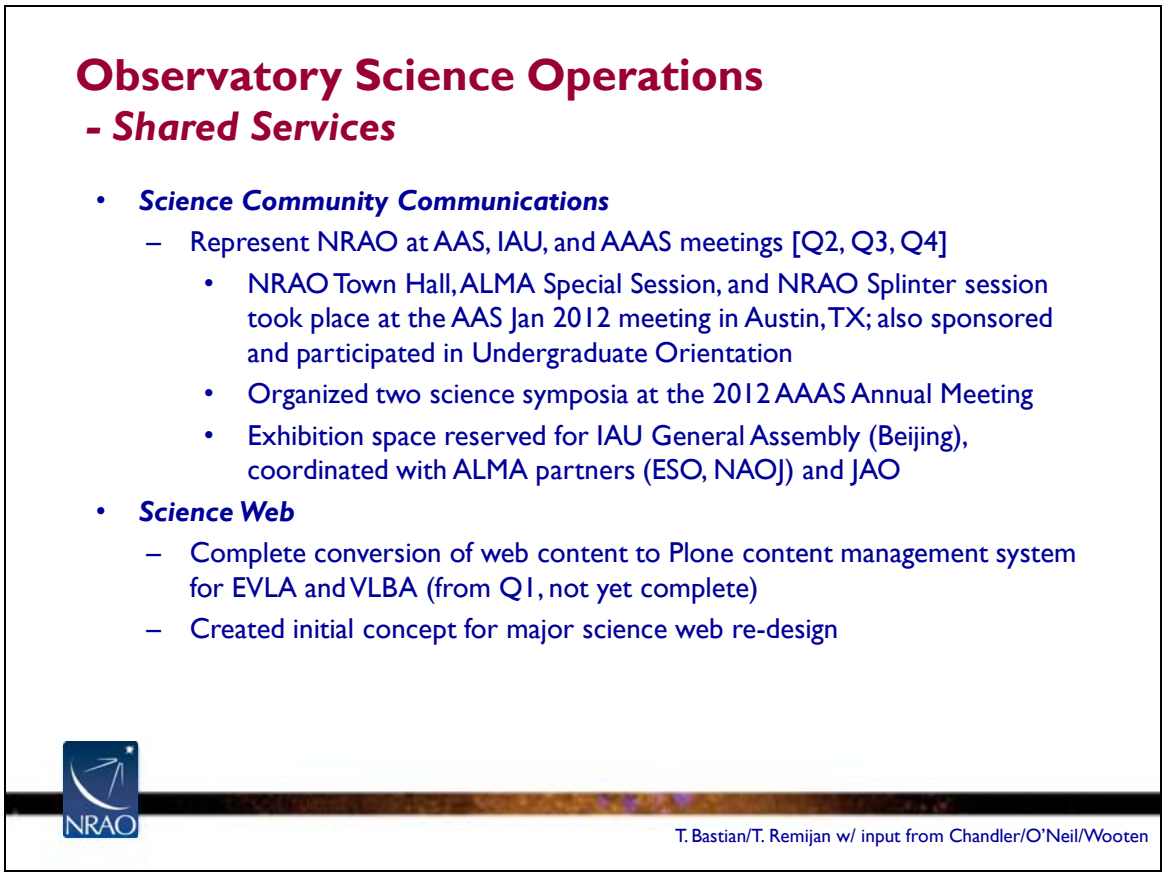
Continuing the work started in Q1 FY12, select NAASC staff (Gerald Schieven, Havzy Lizst, Kartik Sheth, and Stuartt Corder) that are part of the Phase II Group (P2G) **generated scheduling blocks for 41 "highest priority" projects and 17 "filler" projects.** Each PI on an ALMA "highest priority" project, as well as some PIs of some "filler" projects, was then assigned a contact scientist (21 NAASC contact scientists, assigned to between 1 and 4 PIs each). Contact scientists review the scheduling blocks and discuss them with PIs, with the ALMA helpdesk being the primary tool for communication. After approval from the contact scientist, PI, and P2G review, the scheduling blocks were submitted to the archive for scheduling.

ALMA PI **Aaron Boley visited our site in Socorro for 1 week to work with his collaborator and contact scientist Stuartt Corder**. The feedback given to the NAASC was very positive, and this work has been accepted as to ApJL: http://adsabs.harvard.edu/abs/2012arXiv1204.0007B. A second face-to-face visit (for Hector Arce, who will visit Charlottesville) has been arranged for mid-May.



In Q2 FY12, all **the legacy tools in support of proposal handling for JVLA and VLBA have been complete**. These new tools will be used at the next 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 will provide source conflict features and additional reports. For the GBT, **the tool replacement is roughly one month behind but the new tools will be available in time for the spring TAC meeting**. Additional work for replacing some of the TAC reports and for cleaning up the software will be ongoing through Q3 FY12.

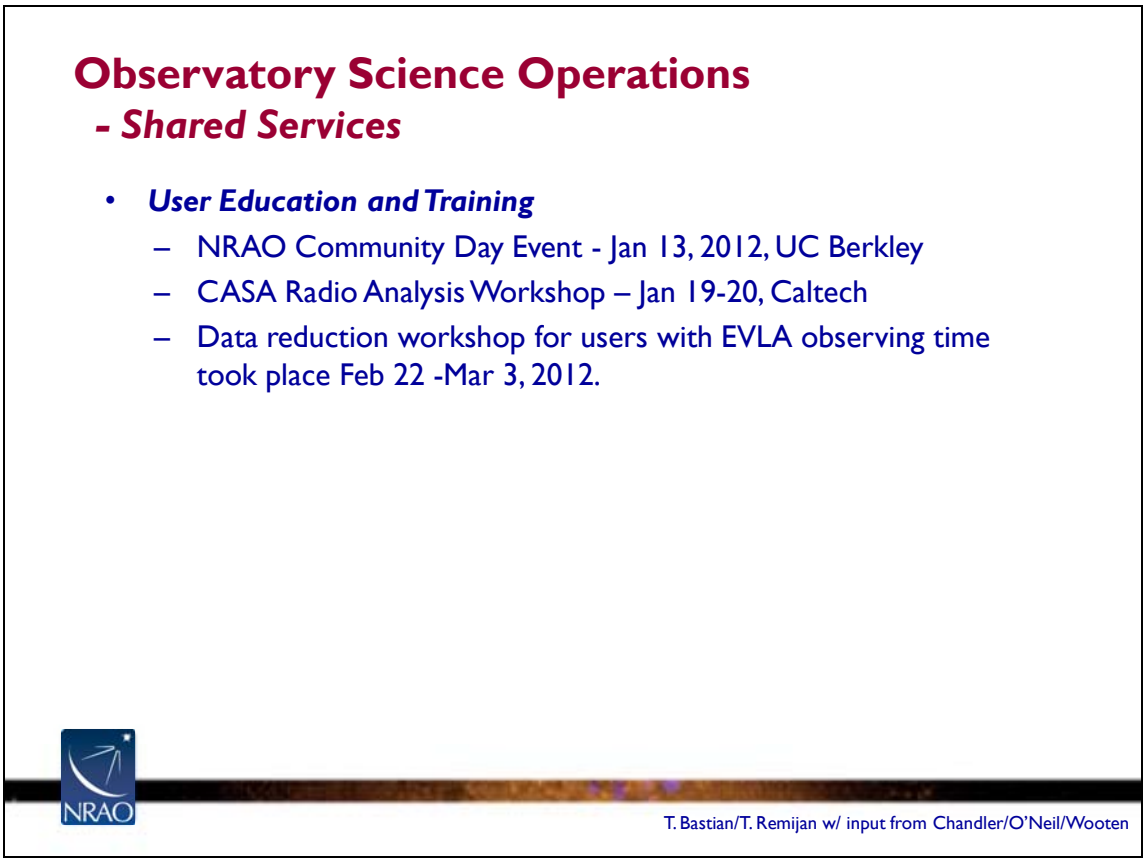
The full maintenance and development of the user portal and PST is not scheduled until Q3 FY12. However, in Q2 FY12, **a plan for taking over the maintenance and development of software and databases currently contracted to Open Sky Software was completed**. The code base has been transferred to Socorro, and action items for both NRAO and Open Sky identified leading up to the formal transition. The search process for the in-house software developer is almost complete, and **an offer is expected to be made in early Q3 FY 12**.



AAS meeting: 8-12 Jan 2012 in Austin, TX with ~2900 attendees. NRAO special events included our re-designed exhibit, an NRAO Town Hall (325 persons attended), ALMA Special Session, and NRAO Splinter Session (Proposing to Use the NRAO Telescopes). New support materials included on-line content, 2012 NRAO Research Facilities brochures, 2GB flash drives with pre-loaded content, and the 2012 NRAO Calendar

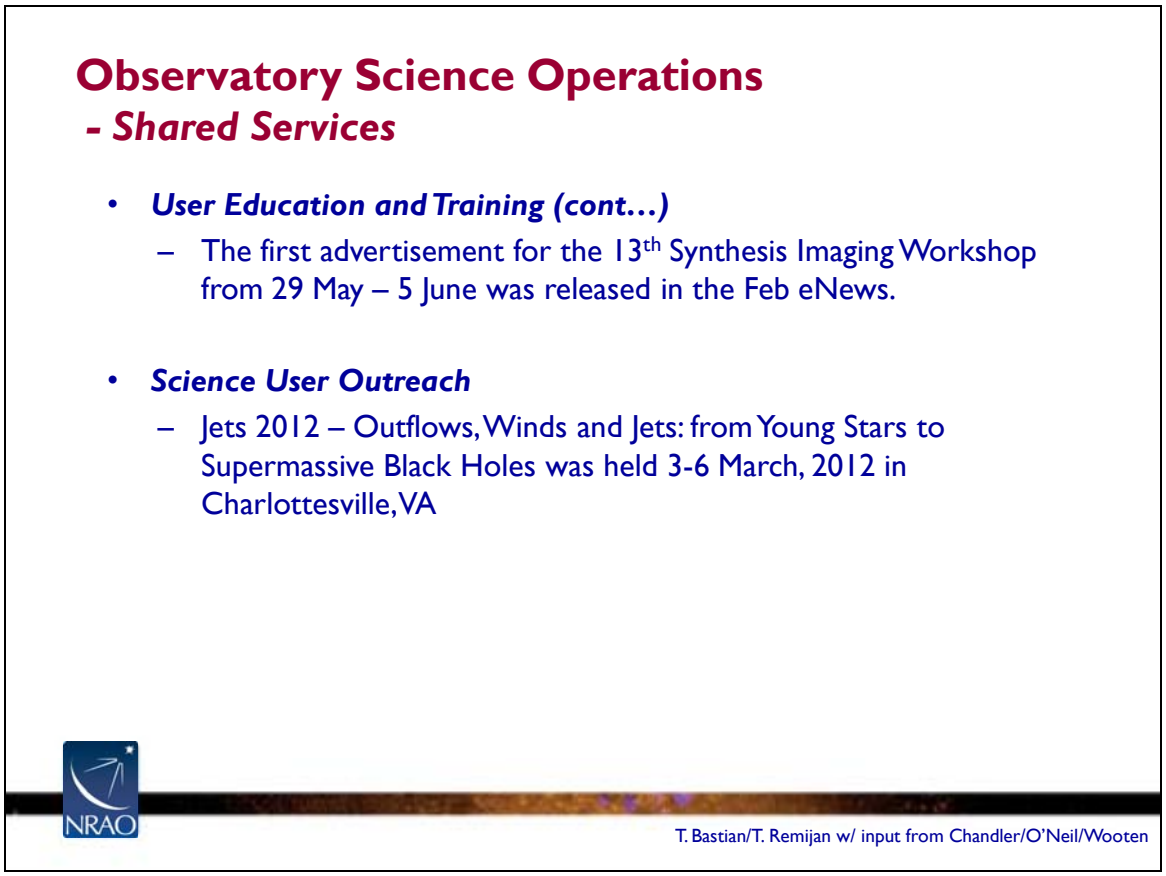
AAAS meeting: 16-20 Feb 2012 in Vancouver, BC, with ~ 6000 attendees. Organized two science symposia, each 90 minutes and featuring 3 speakers. The first symposium, titled "New Frontiers in the Radio Universe," was scheduled Friday, 17 February and discussed ALMA & EVLA Early Science and capabilities. The speakers for this symposium were David Wilner (CfA), Christine Wilson (McMaster), and Kartik Sheth (NRAO). The second, titled "Pulsars: Astronomical Gifts that Keep on Giving," was scheduled Sunday, 19 February and discussed a wide range of current pulsar research and results. The speakers for this symposium were Ingrid Stairs (Univ British Columbia), Scott Ransom (NRAO), and Benjamin Stappers (Univ Manchester).

The **conversion to the Plone content management system of all EVLA and VLBA documentation was not completed in Q2**, because of limitations in the current version of Plone for supporting large documents such as the Observational Status Summaries. All the documentation is still available online outside of Plone, so there is no risk and no mitigation needed. The most recent release of Plone will solve this problem, and the revised target date for completion is now Q3, FY2012. **Initial re-design concept of the Science Web has been reviewed to date with the Director's Office** and the OSO Science Web Working Group. A schedule will be established in Q3 for completing the design and its implementation in the Plone content management system.



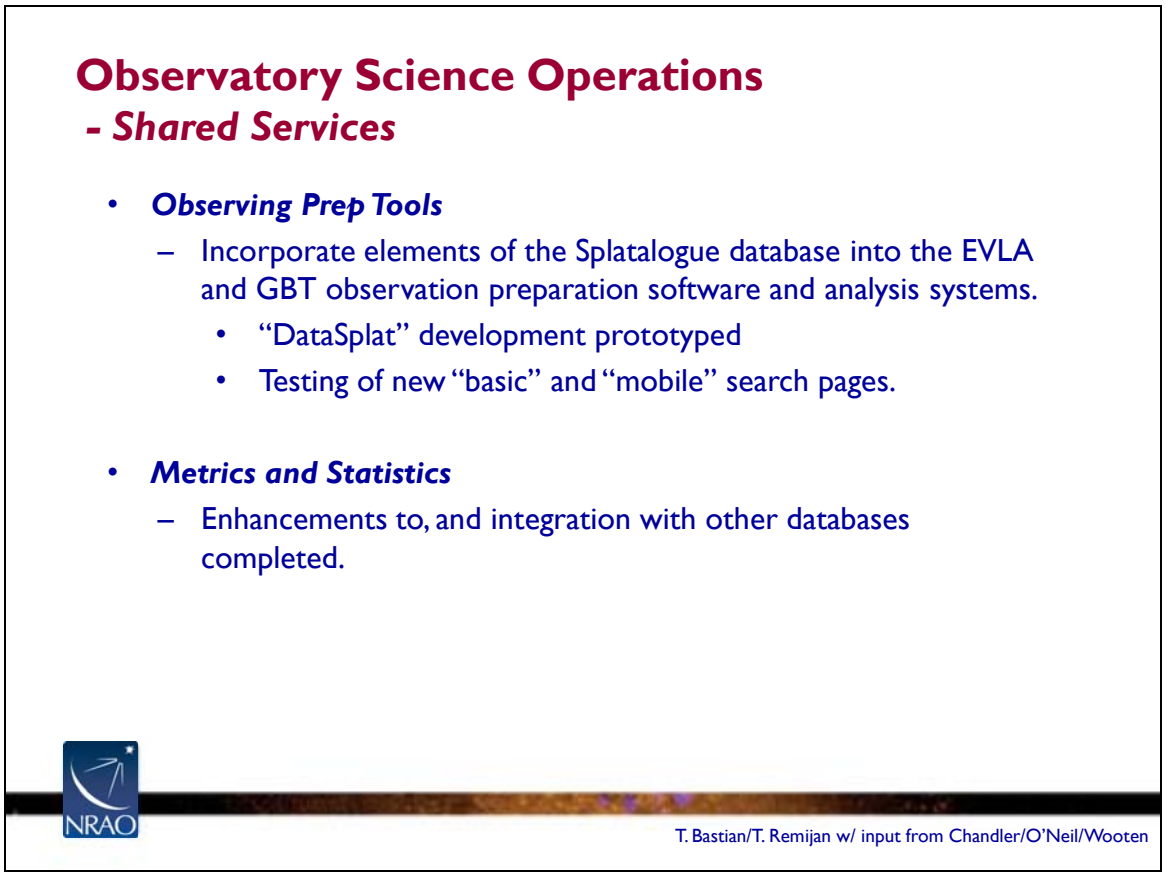
The second NRAO wide **Community Day Event was hosted by UC Berkeley on January 13, 2012**. All NRAO instruments were presented but the focus was on hands-on tutorials of EVLA observation preparation and EVLA data reduction using CASA. Over a dozen participants were on-hand for the event and planning started for additional CDEs in Q3 FY12 in anticipation of the NRAO and ALMA Call for Proposals. On 19 and 20 January NRAO staff conducted a **CASA Radio Analysis workshop hosted by Caltech** and attended by 39 participants from the greater Los Angeles area. Focus was on reducing data from the EVLA and ALMA telescopes using the CASA package, and survey results indicate participants had become much more likely to use CASA for their data reduction after attending this workshop.

The **2nd EVLA Data Reduction Workshop was held 22 February – 1 March 2012 at the Pete V. Domenici Science Operations Center in Socorro, NM**. Unlike the September 2011 workshop, this event consisted of two distinct parts. The first, from 22 – 24 February, was organized much like the September 2011 workshop, with presentations and hands-on tutorials. During the second part, from 27 February – 1 March, participants were given the opportunity to reduce their own EVLA data during which local staff will be available for consultation. Approximately 30 participants took part in the tutorial.



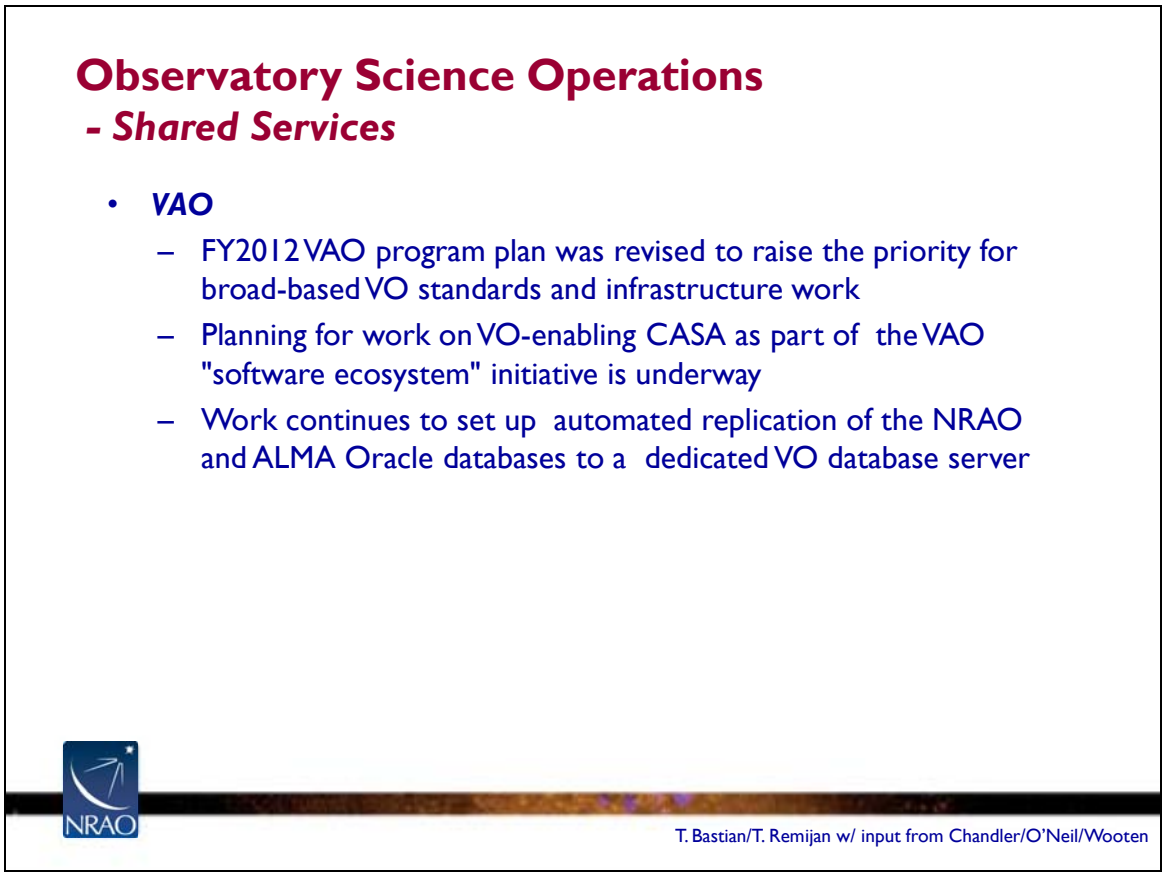
The **13th Synthesis Imaging Workshop will be held at the NRAO and the New Mexico Institute of Mining and Technology in Socorro, NM 29 May – 5 June 2012.** In addition to introductory lectures on radio interferometry, advanced topics will cover a selection of new synthesis instruments, including ALMA, JVLA, and the Long Wavelength Array. The workshop will also feature two days of hands-on data reduction tutorials, and tours of the EVLA and the Science Operations Center. Workshop attendance will be limited to 150 people.

The sixth NAASC Science Workshop – **Jets 2012 - Outflows, Winds, and Jets: From Young Stars to Supermassive Black Holes, was held 3-6 March in Charlottesville VA** and featured presentations from all NRAO instrumentation. 145 participants pondered presentations and engaged in discussion covering the wide range of astrophysical environments in which gas moves at high velocity. Both the origin of the moving gas and its impacts on nearby environments were covered. Presentations and posters are all available online at https://science.nrao.edu/facilities/alma/naasc-workshops/jets2012; presentations were also broadcast in realtime summaries on Twitter (#jets2012).

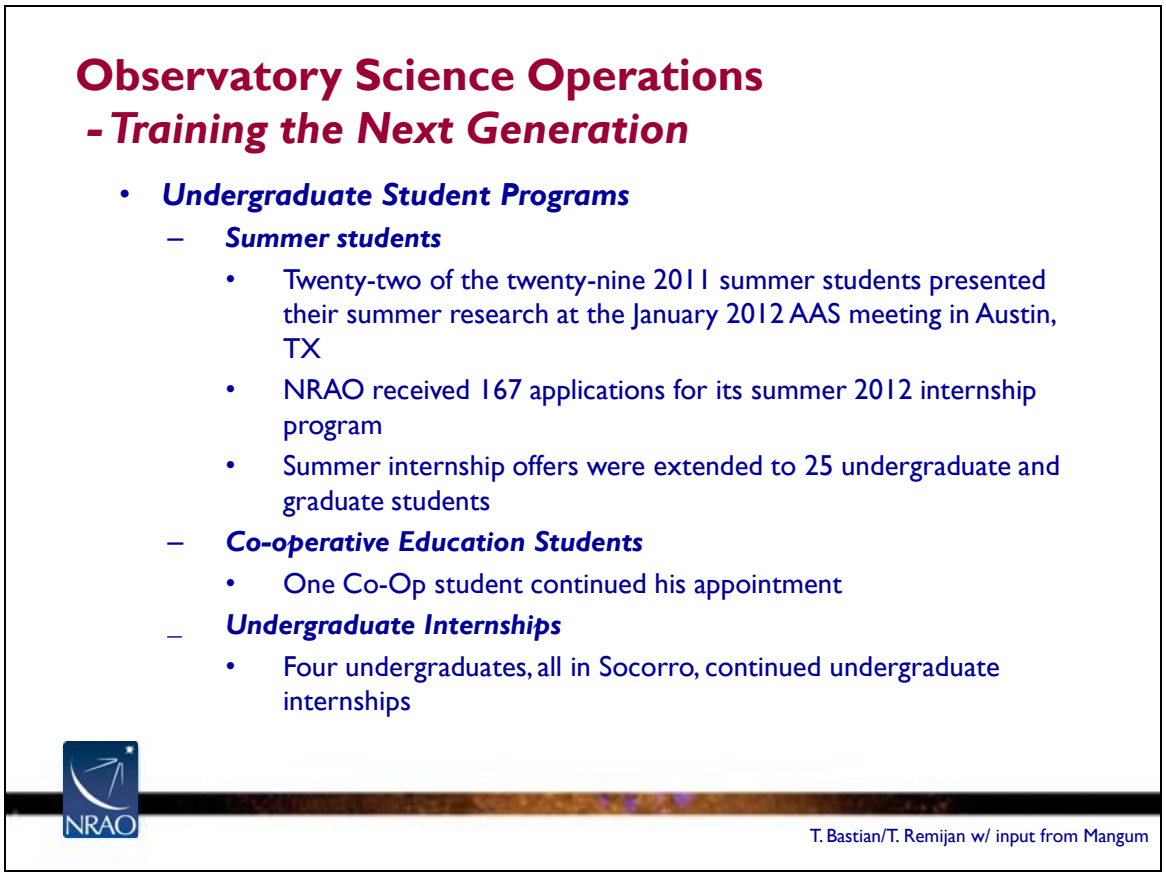


A **new web service for the Splatalogue called DataSplat was prototyped** that allows users to interact with the Splatalogue database and enable the generation of simulated spectrum of molecules using user defined input parameters. Further work on the development of DataSplat will take place in Q2 FY12 and will be delivered at end of Q3 FY12. From feedback from the user community a simpler, more efficient way of searching for and obtaining the more common spectral line features from Splatalogue has been developed and underwent internal testing by NRAO staff and an international advisory committee. **Deployment of these new "basic" and "mobile" search pages will take place in Q3 FY12**. Discussions also started to incorporate Splatalogue into the JVLA OPT including and RFI table into the Splatalogue database.

We completed the integration of metrics to use other databases. In the process, it was discovered that there is a need for a broader coordination of databases within the NRAO. Jeff Mangum and Gareth Hunt submitted an internal FY2013 proposal to pursue this coordination.



In the face of declining budgets, the VAO **FY2012 program plan was revised in this past quarter** to raise the priority for broad-based VO standards and infrastructure work while more narrowly focusing work on VAO-specific applications development. While the VAO budget cuts will adversely affect NRAO, this change in priorities is seen as beneficial to NRAO as it increases the priority for supporting development and up-take of VO technology and software by the VO-community (e.g., NRAO), for both data service and science archive facilities as well as science software such as CASA. **Planning for work on VO-enabling CASA as part of the VAO "software ecosystem" initiative is underway**. Work on providing a VO front-end to NRAO and ALMA data is progressing. Servers for VO queries and data access are now operational. **Work continues to set up automated replication of the NRAO and ALMA Oracle databases to a dedicated VO database server**, which will allow enhanced VO queries against NRAO data holdings without risk of impacting the telescope archives.

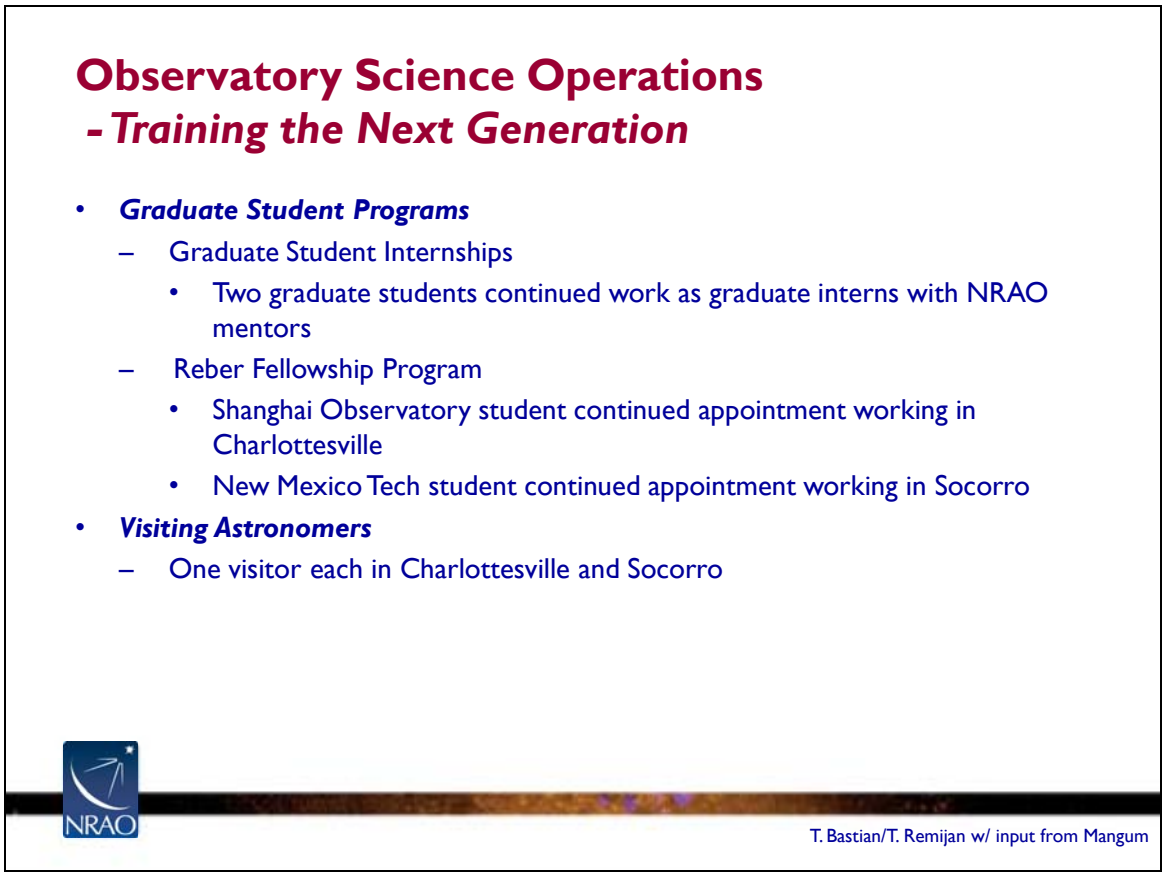


Summer Student Program: Twenty nine undergraduate and graduate students completed appointments as 2011 **summer students**. For more information on the program go to http://science.nrao.edu/opportunities/summerstudents.shtml.

25 summer student internship appointments made (SOC/GB/CV = 6/8/11)

Co-Op: One **Co-Op student** continued their appointments: Utkarsh Sinha (SO)

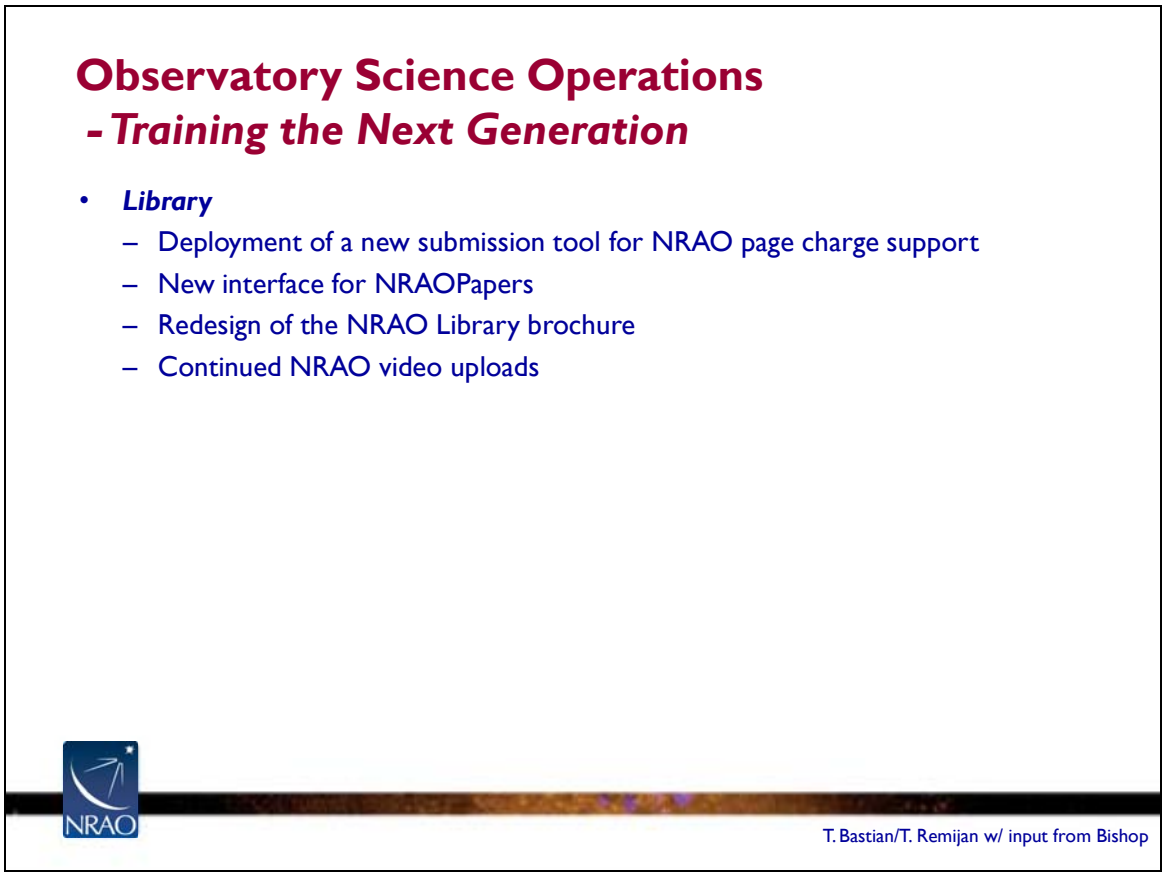
Undergraduate Interns: Five undergraduates (SO: 4) continued undergraduate internships working in the Electronics Division in Socorro: Natalie Kane, Deepak Rai, Orlando Lopez, and Loren Good (all SO).



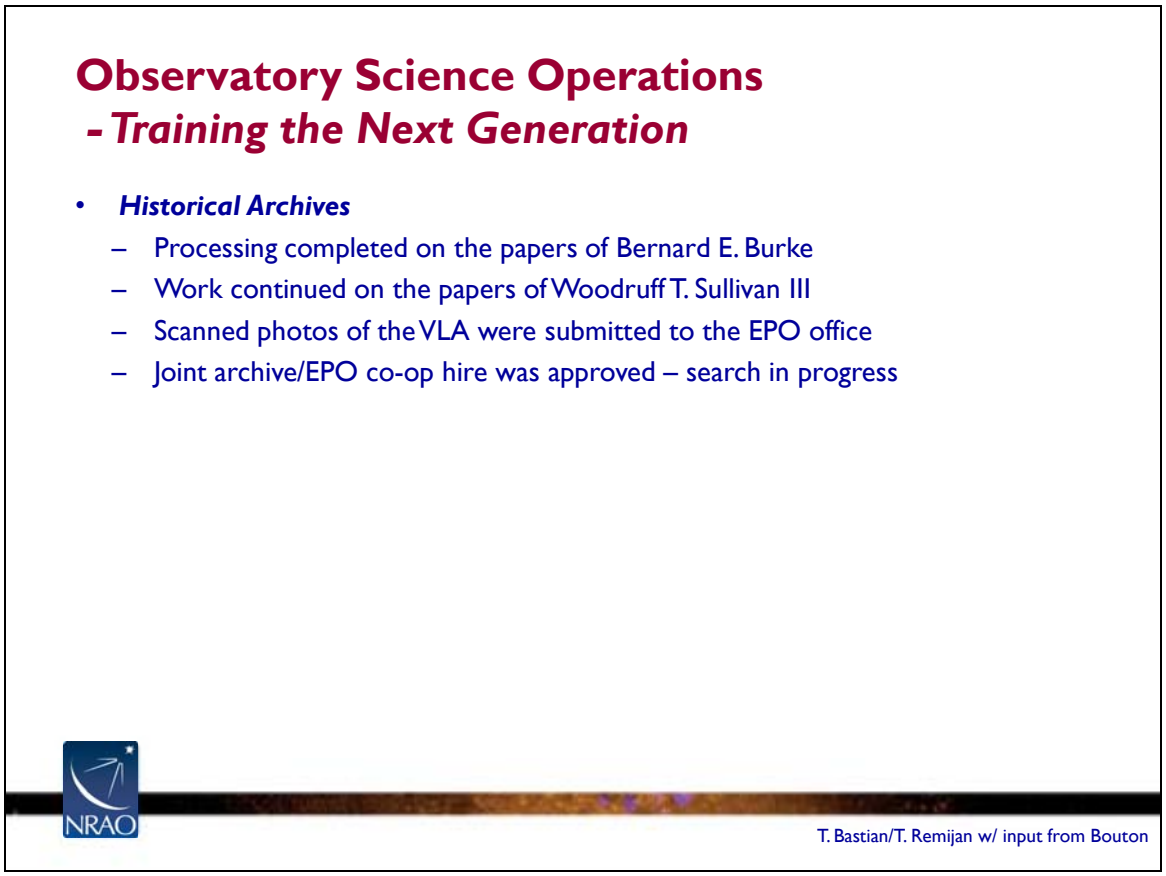
Graduate Interns: Two graduate students began or continued work as **graduate interns** with NRAO mentors. *Paul Ries (UVA)* is working with Todd Hunter on studying the long-wavelength characteristics of TNOs; *Dana Ficut-Vicas (University of Hertfordshire)* continued her project working with Michael Rupen on the Little Things project.

Pre-Docs: Two 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; and *Josh Marvil* continued his appointment as a Reber Fellow this quarter working with Fraser Owen.

Visiting Astronomers: There were three visiting astronomers this quarter. Fabian Walter and Eva Schinnerer of MPIA in Heidelberg visited NRAO CV for two weeks in January 2012. Andreas Brunthaler from MPIfR began a one-year visit to NRAO SOC which began in June 2011.



In Q2 FY12, the **Library deployed a new submission tool for NRAO page charge support requests**. The link to this new submission tool is located at: http://www.nrao.edu/library/pagecharges.shtml. **A new and improved public interface for NRAOPapers** (the NRAO publications bibliography) (https://find.nrao.edu/papers/) was completed. Almost 6800 NRAOPapers records now have full author affiliations with more added daily. The Library also continued to accept book donations from NRAO staff to ensure that materials are added to the collection if needed or are needed at another institution. There was **a redesign of the NRAO Library brochure for new staff, students, and visitors**. Finally, based on user requests, **there was a continuation of NRAO video uploads** (available via the NRAO catalogue or http://www.nrao.edu/library/Videos/videohome.shtml) with 31 videos covering ALMA, Green Bank, Jansky Lectures, and Very Long Baseline Array. Additions to the video library should be requested by contacting the NRAO Library at libweb@nrao.edu.



Processing was completed on the Papers of Bernard F. Burke. 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 Woodruff T. Sullivan III.

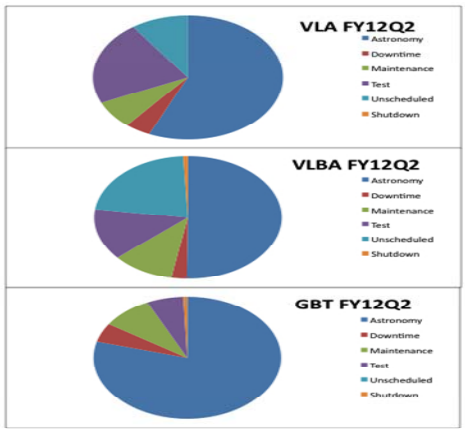
Scanned photographs were provided to EPO to assist in the development of the online "guided tour" of the VLA. We completed a long-term project to scan *The Observer*, NRAO's in-house newsletter published 1961-1981, and the issues are now available in text-searchable pdf through the finding aid for the Records of NRAO. We completed the scanning of a set of 1995 ALMA site visit slides.

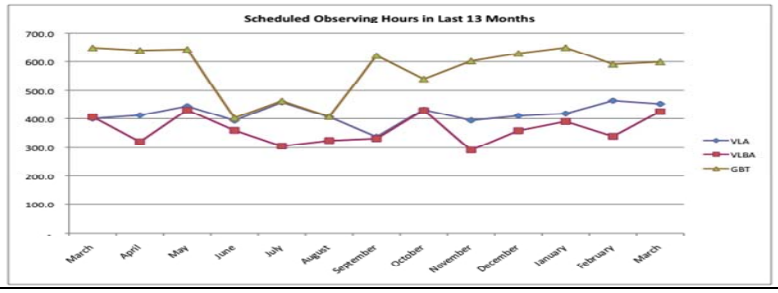
A joint proposal with EPO for a co-op student has been approved and HR is actively searching for a student with appropriate skills. The student will use EPO's Canto Cumulus software to design, test, and launch multimedia index to include all types of still image formats, audio files, video files, animations, and other file types and formats held by EPO and the NRAO Archives, the vast majority of which are currently neither inventoried nor indexed.

Evelyn Braintwain, part-time assistant in the Archives since summer 2005, retired on 28 March, thus halving the Archives working staff. Various replacement staff options are under consideration. 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)

			January	February	March
	Available Hours		744.0	696.0	744.0
	VLA FY12Q2	Q2	January	February	March
VLA	Scheduled	1,334.1	418.0	463.8	452.3
	Astronomy	*1,238.6*	*380.1*	*437.2*	*421.3*
	Downtime	*95.5*	*37.9*	*26.6*	*31.0*
	Maintenance	156.3	40.4	50.4	65.5
	Test	480.6	185.1	138.8	156.7
	Unscheduled	213.0	100.5	43.0	69.5
	Shutdown	-	-	-	-
	Total Hours	2,184.0	744.0	696.0	744.0
	VLBA FY12Q2	Q2	January	February	March
VLBA	Scheduled	1,154.6	390.3	339.5	424.8
	Astronomy	*1,096.4*	*368.4*	*323.2*	*404.8*
	Downtime	*58.2*	*21.9*	*16.3*	*20.0*
	Maintenance	232.7	70.6	85.4	76.7
	Test	299.3	97.3	114.8	87.2
	Unscheduled	479.4	167.8	156.3	155.3
	Shutdown	18.0	18.0	-	-
	Total Hours	2,184.0	744.0	696.0	744.0
	GBT FY12Q2	Q2	January	February	March
GBT	Scheduled	1,839.4	649.2	591.2	599.0
	Astronomy	*1,730.9*	*608.2*	*547.5*	*575.2*
	Downtime	*108.5*	*41.0*	*43.7*	*23.8*
	Maintenance	191.1	55.8	60.8	74.5
	Test	138.0	39.0	44.0	55.0
	Unscheduled	-	-	-	-
	Shutdown	15.5	-	-	15.5
	Total Hours	2,184.0	744.0	696.0	744.0





G. Hunt

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. There are no trends; monthly differences are within the usual monthly variations. (The summer dip in the GBT was the annual outage for painting the structure) 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.

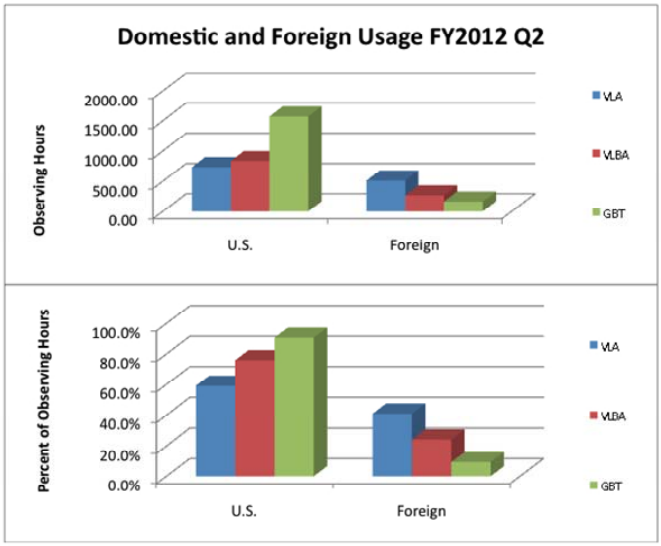
Unscheduled: idle time due to unschedulable gaps between observing programs and predicted extended inclement weather

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

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

	U.S.	Foreign	Unspecified
VLA	731.19	507.41	0.00
VLBA	831.73	264.70	0.00
GBT	1569.00	162.00	0.00

	U.S.	Foreign	Unspecified
VLA	59.0%	41.0%	0.0%
VLBA	75.9%	24.1%	0.0%
GBT	90.6%	9.4%	0.0%

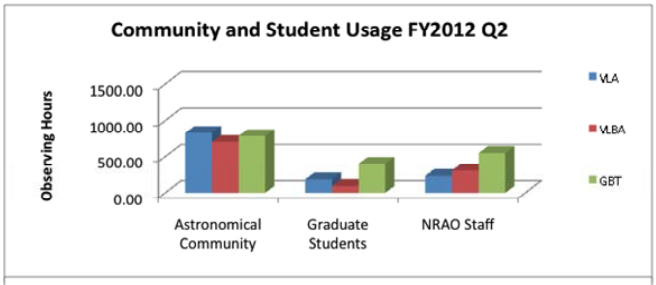


G. Hunt

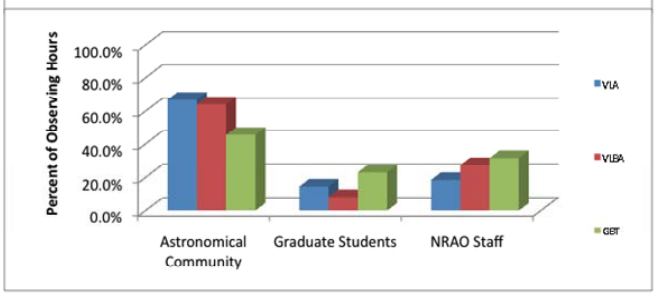
Telescope usage distributed by national institutional affiliation of the *Principal Investigator*. There is no significant trend.

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

	Astronomical Community	Graduate Students	NRAO Staff
VLA	829.69	180.47	228.44
VLBA	703.33	92.44	300.66
GBT	785.50	398.00	547.50



	Astronomical Community	Graduate Students	NRAO Staff
VLA	67.0%	14.6%	18.4%
VLBA	64.1%	8.4%	27.4%
GBT	45.4%	23.0%	31.6%

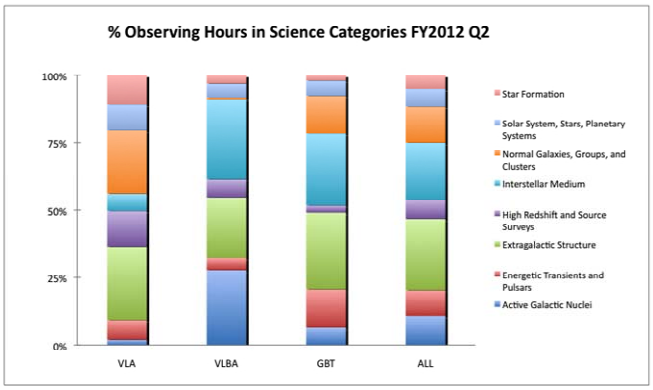


G. Hunt

Telescope usage distributed by the scientific status of the *Principal Investigator*. There is no significant trend.

Observatory Science Operations
- *Telescope Usage by Science Category*

	GBT	VLA	VLBA
Active Galactic Nuclei	6.4%	2.0%	27.8%
Energetic Transients and Pulsars	14.3%	7.4%	4.4%
Extragalactic Structure	28.4%	27.1%	22.4%
High Redshift and Source Surveys	2.7%	13.2%	6.7%
Interstellar Medium	26.6%	6.4%	29.8%
Normal Galaxies, Groups, and Clusters	14.1%	23.4%	0.7%
Solar System, Stars, Planetary Systems	5.5%	9.6%	5.0%
Star Formation	2.1%	11.0%	3.2%
Unspecified	0.0%	0.0%	0.0%



NRAO

G. Hunt

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.

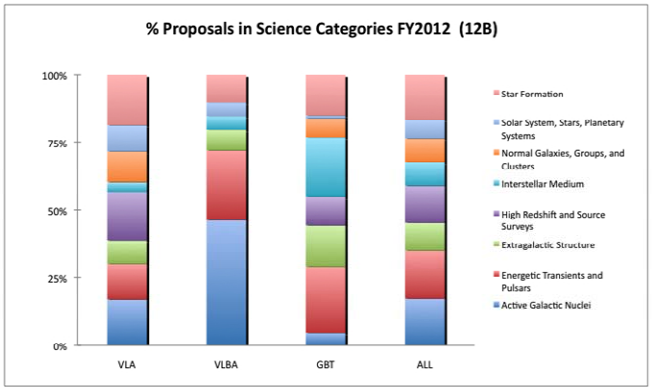
These categories were redefined starting with the Feb 1, 2011 proposal cycle.

Observatory Science Operations
- Proposals Submitted during Reporting Period

	GBT	VLA	VLBA
Active Galactic Nuclei	4.7%	16.8%	46.2%
Energetic Transients and Pulsars	24.4%	13.3%	25.6%
Extragalactic Structure	15.1%	8.7%	7.7%
High Redshift and Source Surveys	10.5%	17.9%	0.0%
Interstellar Medium	22.1%	3.6%	5.1%
Normal Galaxies, Groups, and Clusters	7.0%	11.2%	0.0%
Solar System, Stars, Planetary Systems	1.2%	9.7%	5.1%
Star Formation	15.1%	18.9%	10.3%
Unspecified	0.0%	0.0%	0.0%

	Regular	Large	Total
GBT	84	2	86
VLA	194	2	196
VLBA	39	0	39
Global VLBI	1	0	1
All Instruments	318	4	322

Number Requesting Student Support: 27
(25 Regular, 2 Large) (9 VLA, 18 GBT)
Number Requested for Dissertation: 46
(42 Regular, 4 Large) (23 VLA, 5 VLBA, 18 GBT)



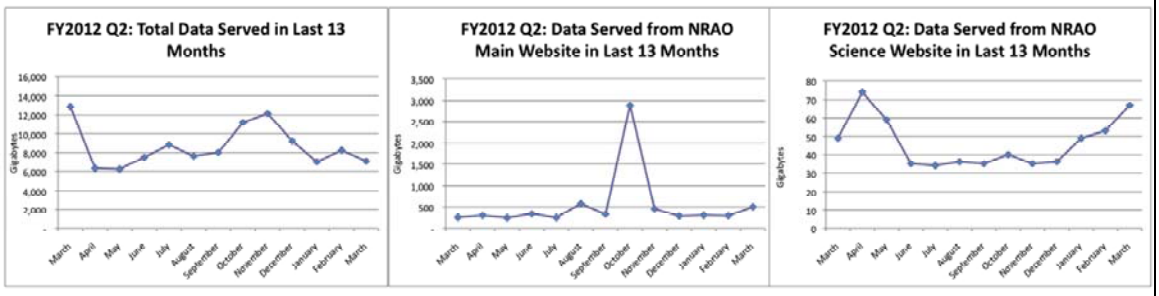
NRAO

G. Hunt

This is the count of proposals submitted for cycle 12B (to be observed Aug 2012 through Jan 2013). These proposals will undergo an extensive peer review in Q3 to select those which will be awarded observing time.

Proposals are considered in 8 distinct scientific categories.

Observatory Science Operations
- Data Serviced during Reporting Period



NRAO

G. Hunt

Total data served from all web servers. 2&3. Specific data for the main web site and for the science web site.

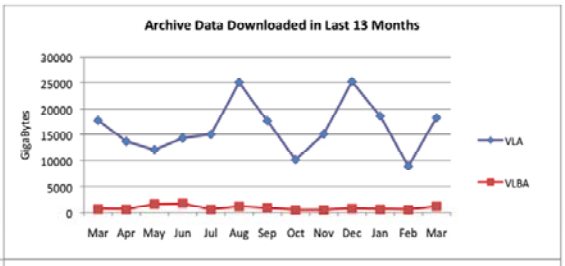
The main web site provides NRAO's presence on the web. The science website is primarily in support of the observers.

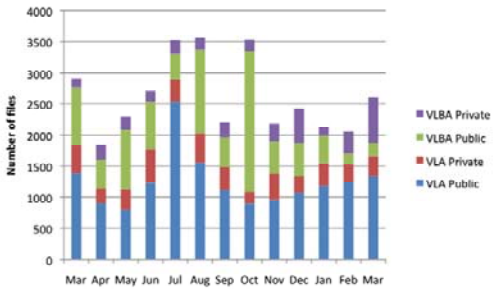
To give some perspective, these are presented for the last 13 months. (You can clearly see the response to the ALMA Opens Its Eyes announcement in October.)

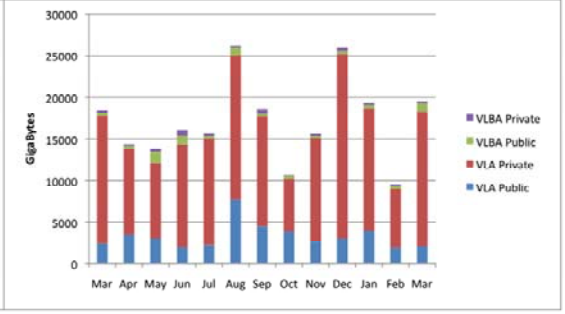
Observatory Science Operations
- *Archive Data Downloaded during Reporting Period*

FY2012 Q2 Totals

	# of Files	Data Volume (GB)
VLA		
Proprietary	974	38,024
Public	3,757	7,809
Total	**4,731**	**45,833**
VLBA		
Proprietary	1,223	764
Public	837	1,639
Total	**2,060**	**2,403**
Pipeline Images		
Downloaded	**500**	







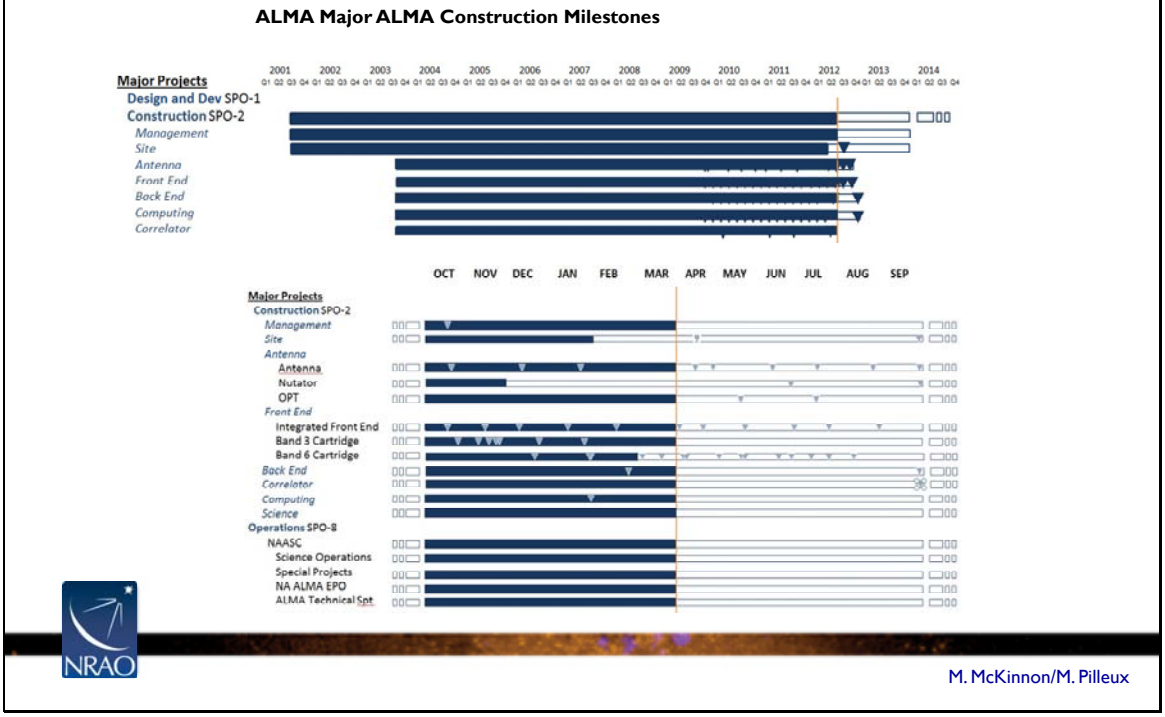
G. Hunt

This shows the data provided to the community by the NRAO Archive in Socorro. To give some perspective, these are presented for the last 13 months.

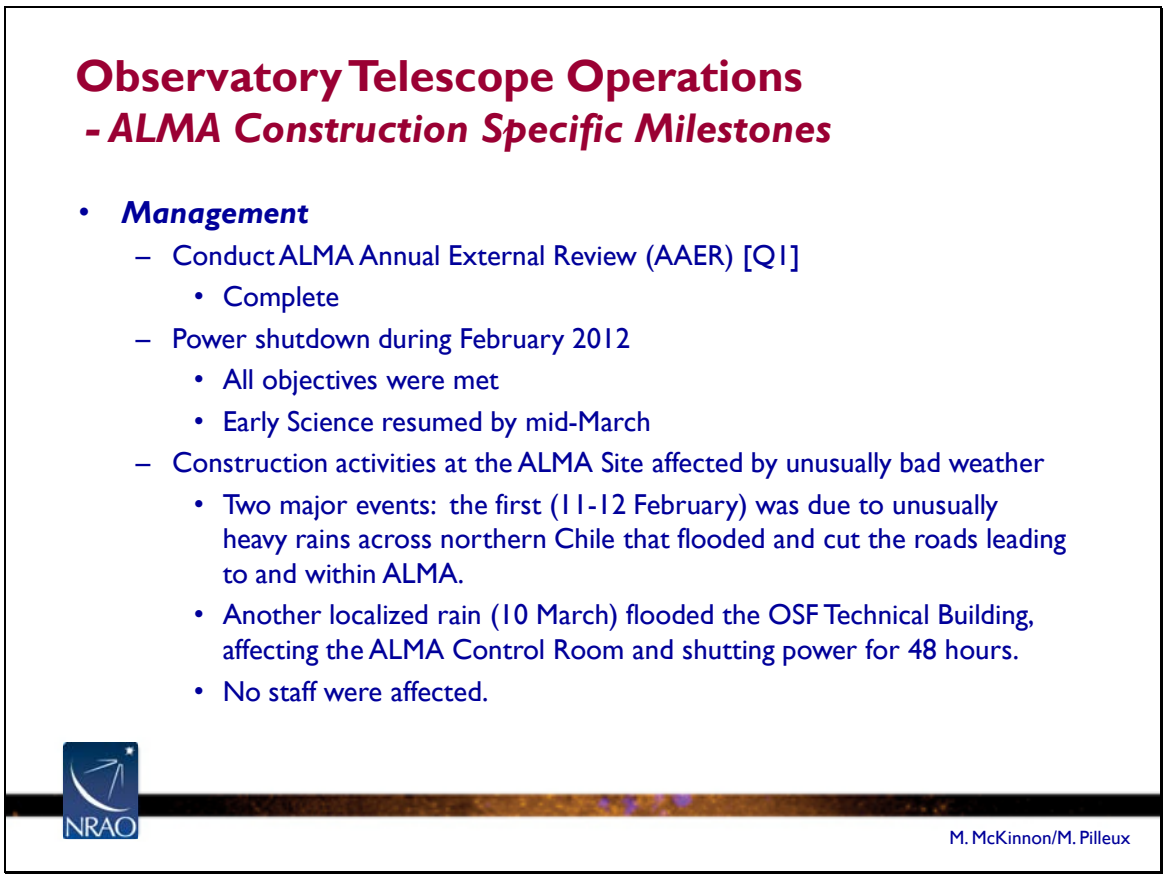
Agenda

- 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

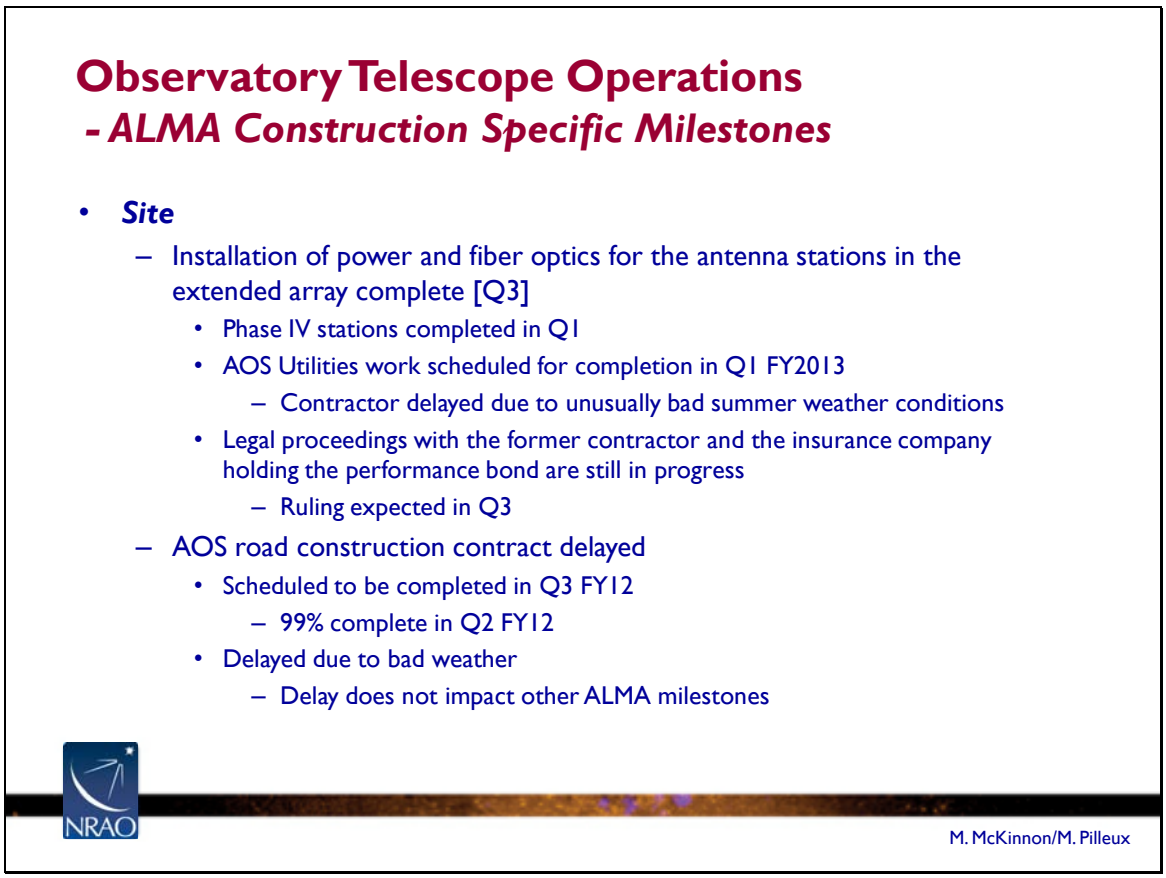
Observatory Telescope Operations
- *ALMA Construction Project Schedule View*



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

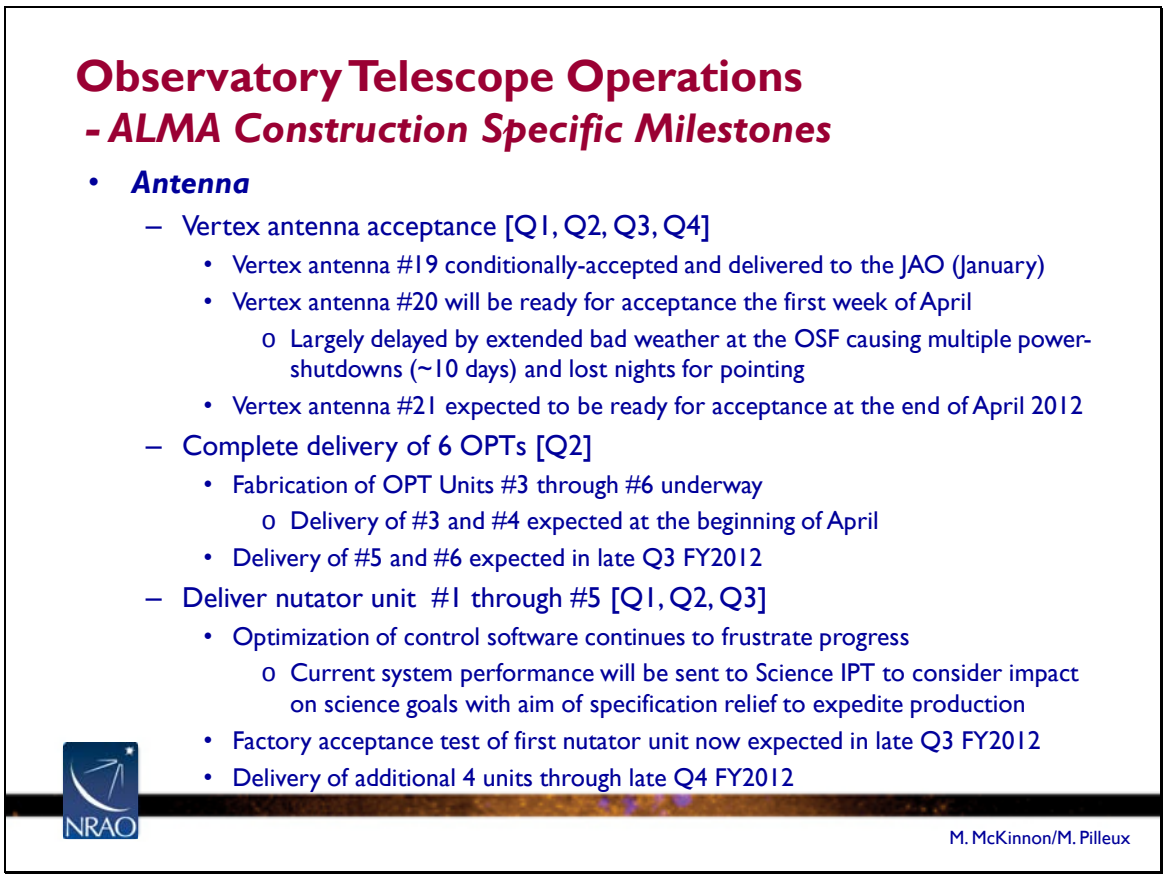


MANAGEMENT: The **ALMA Annual External Review (AAER)** was conducted in Santiago 17-20 October 2011. This was reported in Q1. Unusually **bad summer weather in the southern hemisphere** affected Region II of Chile during January-February 2012. A major **AOS power shutdown** was successfully completed during February to prepare the connection of the existing temporary power distribution network to the permanent one. The power distribution cabling was prepared and laid for the AOS Permanent Power Station, which will be connected later. After the shutdown the power was restored in stages, first to the Central Cluster on 20 February, then to the ACA on 10 March and, finally, on March 15 for all other operating antenna stations. A subsequent power shutdown is scheduled for late May 2012 to connect the multi fuel turbine generators, the AOS flywheel system, and the AOS Power Distribution System to the permanent power source. Two main **weather events** affected the operation of the ALMA site during Q2. These events did not affect the safety of ALMA or contractor personnel. A **first major event** on 11-12 Feburary was the culmination of a week of unusual heavy rains across all northern Chile that shut down public roads leading to the ALMA site and damaged the internal ALMA roads. The intersection of the ALMA road with the public highway to San Pedro served as a dike and accumulated water that required draining to avoid eroding the public road. Personnel access to the site was restricted. Water, fuel and power usage was restricted to allow provisions to extend as long as possible. The road washout uncovered and damaged the OSF to AOSF power and FO cables that run alongside the road. The **second major weather event** occurred on the evening of Saturday March 10 where the OSF was subjected to a major hailstorm followed by extremely heavy rain. Power was disconnected for safety and restored the next day to the OSF TF and on Monday to the AIV antenna pads.



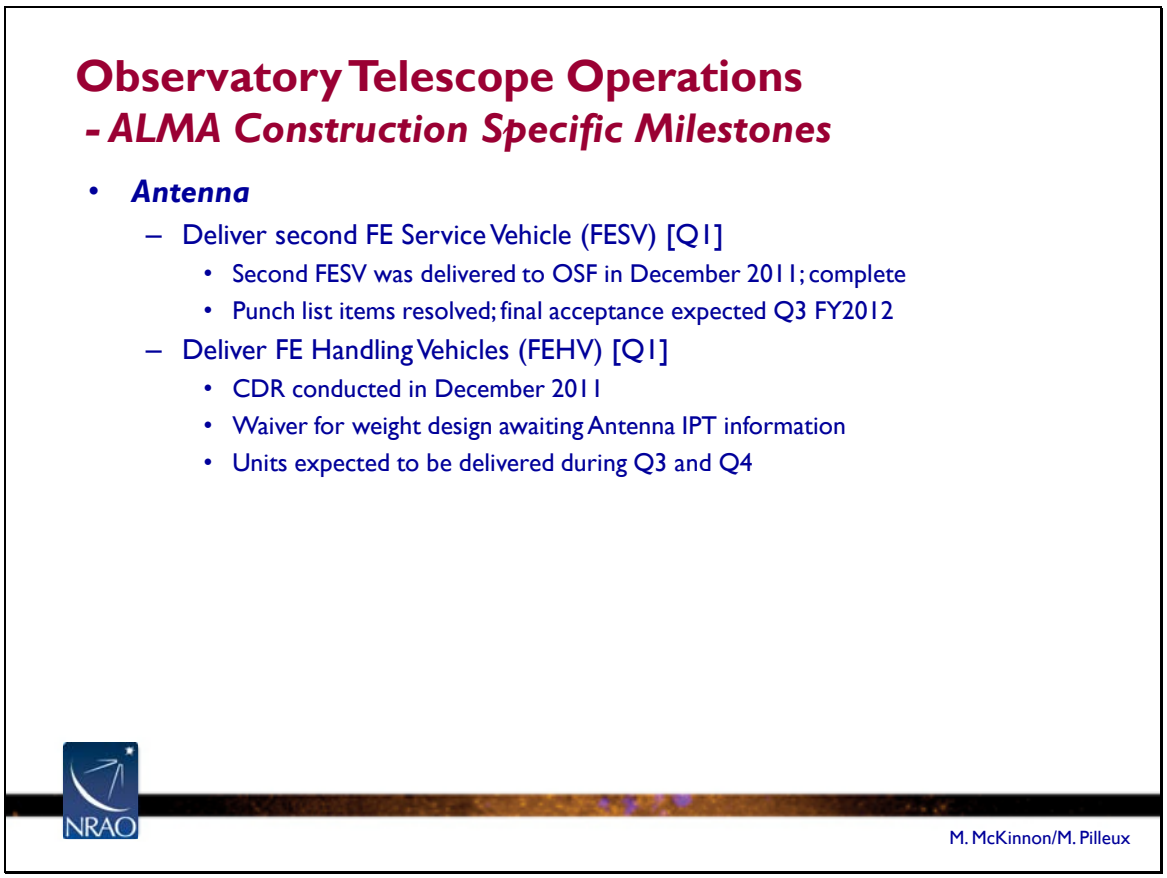
Site: The **AOS Utilities Contract** is 66% complete. The Central Cluster (CSV Phase IV) work was completed in December 2011 and acceptance of the cluster was achieved. The next milestone is the 5 km Array and this is now scheduled to be completed in Q4 FY2012. The schedule slipped due to bad weather 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, and first results are expected to be known during Q3 FY2012.

AOS Road Construction Contract work is 99% complete. This contract restarted in October 2011 after the winter break. To date, all roads are already cut or filled to subgrade level and the remaining work is to achieve the final level in the subgrade and install the crushed gravel in the loading area of the antenna stations. Since this follows the progress in the AOS Utilities Contract, it is delayed due to that work. This contract is scheduled to be completed in Q2 FY2012. Inclement weather has also delayed the road completion, but this did not affect the start of Early Science in September 2011. The ALMA acceptance process for the roads will be done during Q3 FY2012.



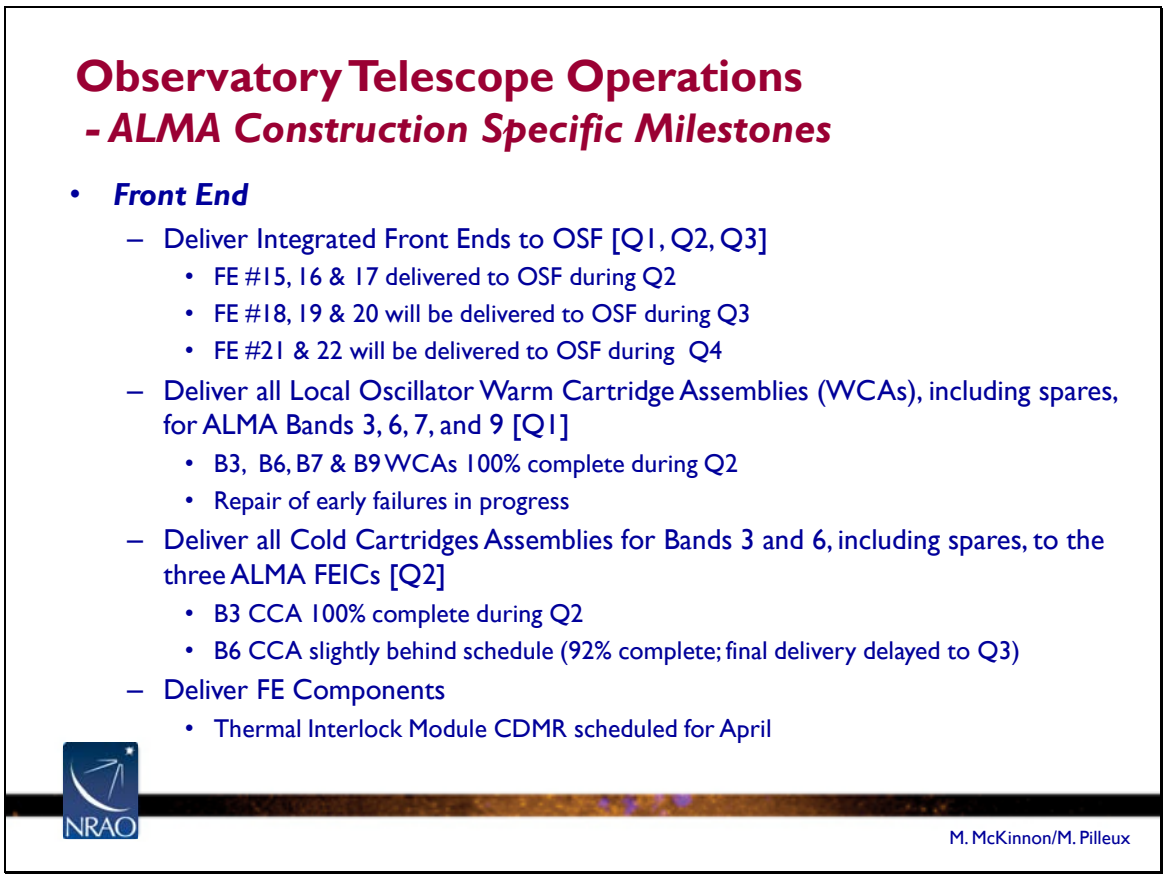
ANTENNA: During Q2 FY2012 the **19th Vertex antennas was fully accepted** by the JAO. Pointing acceptance testing began in March on the **20th Vertex antenna**, with the acceptance review initially planned for late March; unfortunately, the bad weather during March led to 2 power shut-downs and many nights of cloudy skies. These weather issues, combined with ongoing problems with the OPT mini-rack control hardware, have forced delays of the **Antenna 20** Pointing Acceptance. As a result, Acceptance of **Antenna 20** is now scheduled for the first week of April (delay of ~3 weeks). Integration, commissioning, and acceptance testing on the **21st Vertex antenna** is also nearing completion with acceptance of the antenna by the JAO expected perhaps a week ahead of schedule in early Q3 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 has been isolated by the vendor (it appears to be caused by EMC in the analog connection cable) and testing of a possible upgrade will be underway on-site in early Q4 FY2012. **Production OPT (POPT)**: Production of upgraded **POPT Units #3 through #6** by the POPT contractor is nearing completion with a Factory Acceptance Testing (FAT) for **POPT Unit #3** scheduled for mid April. Delivery of **POPT Unit #3** to the site is expected by the end of April with site commissioning to follow before transferring to ESO for their use in antenna acceptance. FAT of **POPT Units #4 through #6** should be complete by the end of May. **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. **Risk:** Delayed delivery of the POPT

potentially risks prompt delivery of EU and NA antennas. **Mitigation:** Production of new POPT units incorporating results from Antennas #18 and #19 testing is underway with delivery of the first 2 POPT units now expected by late Q3 FY2012. **Nutator**: Optimizing the performance of the servo control system has continued to limit progress and complete production and testing of the **first Nutator unit**. A NRAO control engineer in **Green Bank** continues to work in tandem with Taiwan vendor engineers to resolve design issues which now concern the system amplifier and its ability to provide adequate drive/control of the system. Plan now is to submit current performance results to ALMA Science for possible reduction of the Nutator Technical Specification requirements. FAT has now been delayed until late Q3 FY2012. With a successful FAT, **delivery of Nutator Unit #2** to Chile would be in early Q3 FY2012 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. Both FESVs are delivered to the JAO and all punch list items were resolved; final acceptance expected in Q3 FY2012

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. This information was not received during Q2 and is now is expected in Q3. If waiver is accepted, delivery of FEHV units (4) will proceed during Q3 and Q4. Currently, the delay poses no risks as other methods exist to move FEs.



FRONT END: **Front End Assemblies:** last delivery (#22) delayed until August 2012 due to increased test cycle time (primarily associated with removal and replacement of various non-conforming cold cartridges). Delay has been acknowledged by the JAO causing no impact to the overall project schedule. Additional manpower planned for the NA FEIC; cost absorbed without call on management reserve. Potential increase to NA FEIC workscope from ESO (test of 4 FE assemblies). No cost impact to NA Project. **Local Oscillator Warm Cartridge Assemblies:** 15 Band 3 WCAs were returned to NRAO because of locking failures. A Corrective Maintenance Plan to address the failures was developed, approved, and implemented during Q2. The repair schedule will postpone final delivery of B10 WCA #73 until Q2 FY2013. **Cold Cartridge Assemblies: Band 6** mixer/preamp yield rate improved and the Band 6 team has recovered schedule to the original forecasted schedule. Final delivery of Band 6 CCA (#73) scheduled for June. Last 7 deliveries are alloted to the EU FEIC and will not impede their delivery schedule. Additional manpower planned for the NA FEIC; cost will be absorbed without a call on management reserve. **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. **Thermal Interlock Module** (TIM) was a late emerging project requirement. CDMR planned for April 2012; production will run through Q4. Additional cost already incorporated in the FE IPT cost-to-complete estimate.

Observatory Telescope Operations
- *ALMA Construction Specific Milestones*

- ***Back End***
  - Decommissioning and delivery to OSF of an Antenna Article Test Stand [Q2]
    - The Antenna Article test stand is available for shipment as planned
  - Deliver all documentation required by the Configuration Item Documentation Lists (CIDL) [Q4]
    - On schedule

- ***Correlator***
  - Reassembly at the AOS of the Correlator fourth quadrant complete [Q2]
    - Early Science requested postponing this activity to Q4
    - Disassembly to ship to Chile started on March 26
    - Milestone will be complete in Q4

M. McKinnon/M. Pilleux

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 in FY12 Q2. 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 FY12 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. Subsequently, it will be reassembled and tested as a 1-quadrant correlator. This will be complete by mid-July. Finally, it will be integrated with the other 3 quadrants to form a single correlator consisting of four quadrants by late September.

Observatory Telescope Operations
- *ALMA Construction Specific Milestones*

- ***Computing***
  - ALMA software release R9.0/R 9.1 [Q1, Q3]
    - R9.0.2 in routine use (deployed) by CSV
- ***Science IPT***
  - Continues work in ALMA CSV

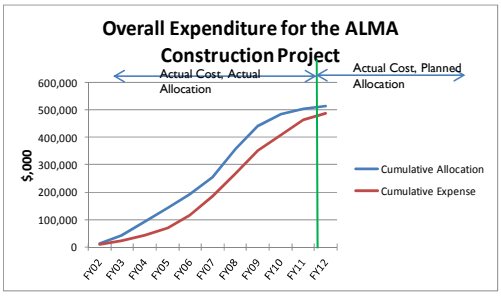
M. McKinnon/M. Pilleux

COMPUTING: **Release 9.0** is now in routine use by CSV (incremental version 9.0.2), and **release 8.1** is in routine use for Early Science observing. It is anticipated that R9.0 will be formally accepted by the JAO in Q3, after which DSO will switch to it. New incremental release process is now being fully used.

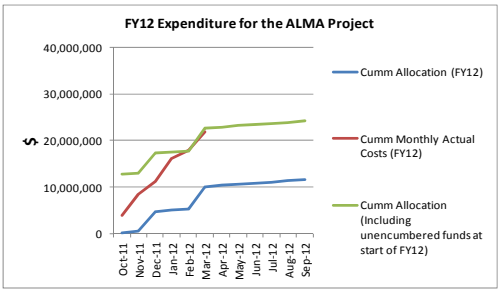
SCIENCE: Science IPT members work with the NA antenna contractor to test newly assembled antennas before delivery to ALMA. They also help to debug antenna problems uncovered by ALMA.

Observatory Telescope Operations

- *ALMA Construction Financial Performance Graphs – overall & Q2 FY2012*



Overall Spending for the ALMA Construction Project



FY12 Spending for the ALMA Construction Project

NRAO

M. McKinnon/M. Pilleux

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.

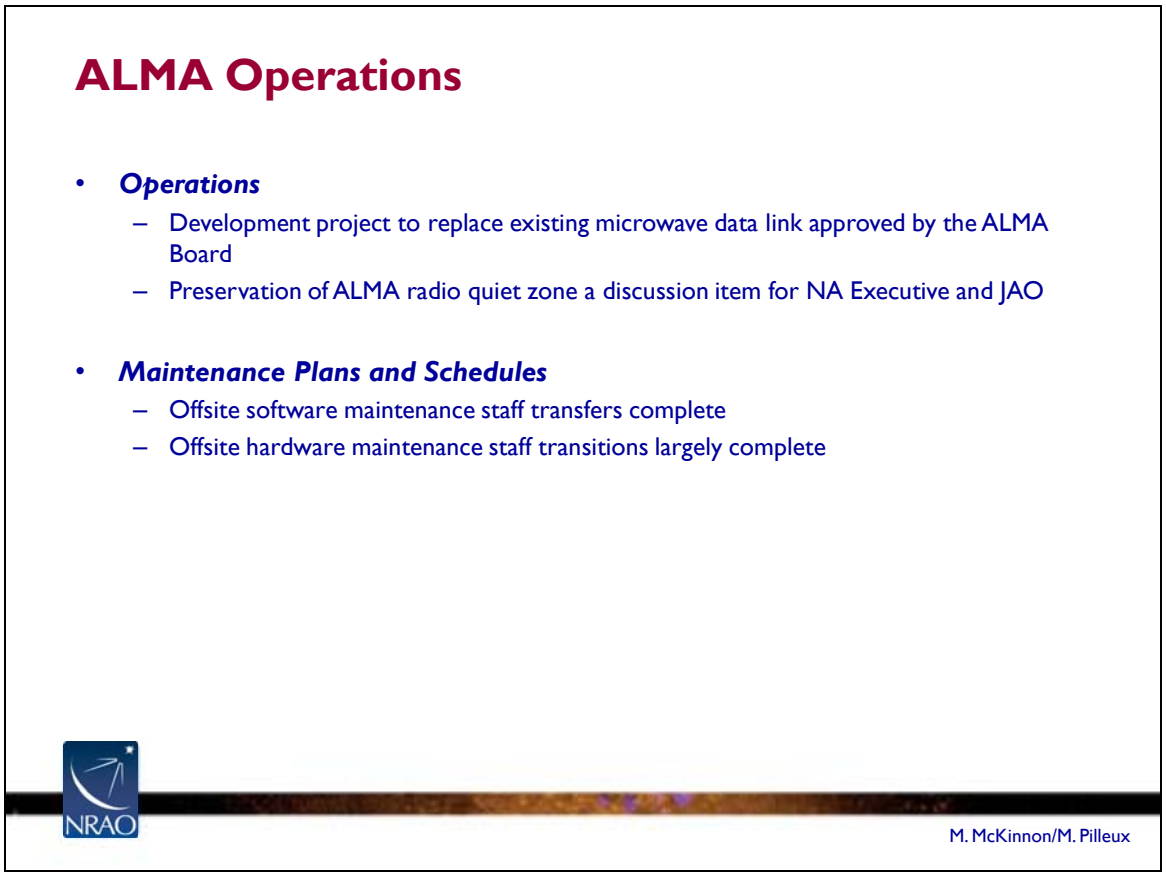
Observatory Telescope Operations
- *ALMA Construction Significant Events-Japan Partnership*

- NAOJ delivery of Band 4 & 8 CCAs delayed due to pending requests for waiver
  - NA FE #15 &16 shipped without B4 and B8 CCAs as agreed by partners
  - NA FE #17 shipped with its B4 and B8 CCAs
- Two additional Band 4 WCAs completed during Q2
  - Total delivered: 52 (71% complete)
- Two additional Band 8 WCAs delivered during Q2
  - Total delivered: 52 (71% complete)
- Two pre-production Band 10 WCAs delivered during Q2
- Additional components delivered to support NAOJ's accelerated delivery schedule.

NRAO

M. McKinnon/M. Pilleux

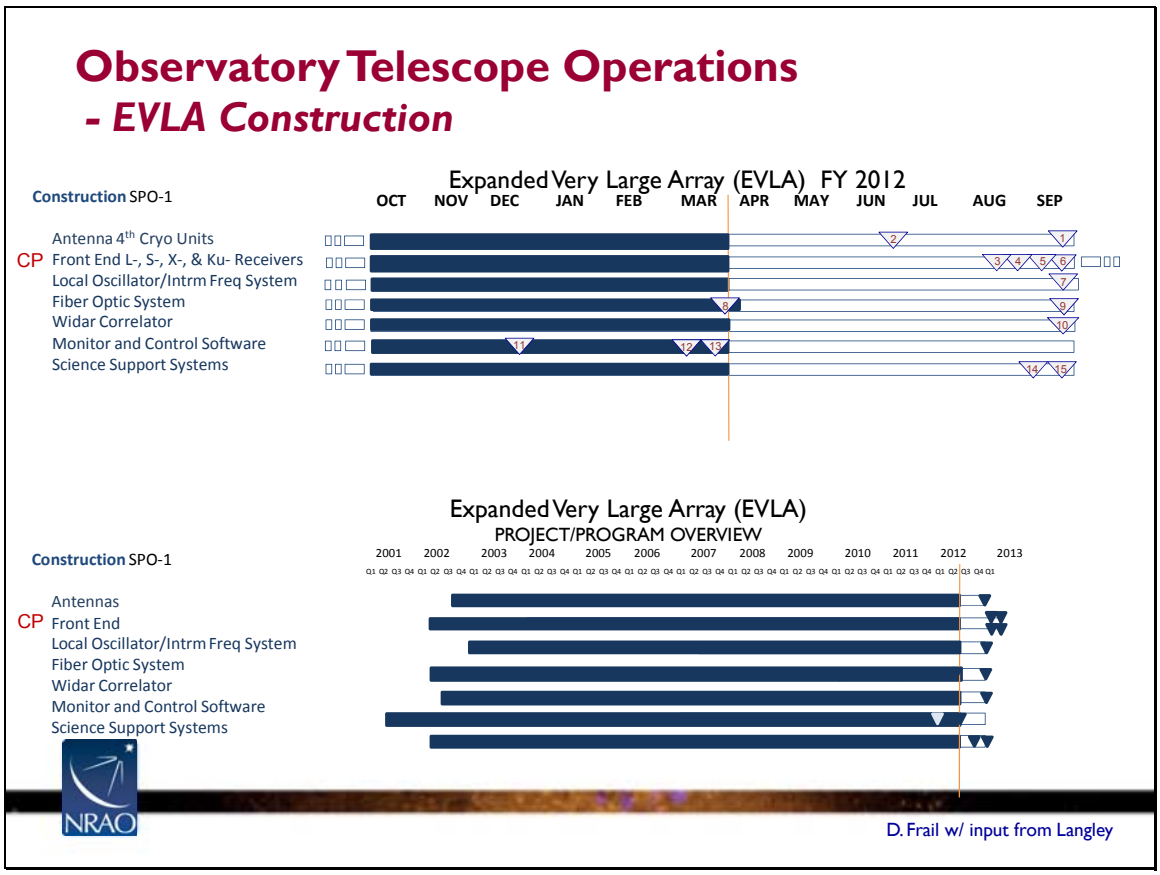
Front End Assemblies: Overall, NAOJ's delivery of Bands 4, 8, and 10 is coming later in the project than the delivery of the baseline Bands 3, 6, 7, and 9 due to NAOJ's late entry into the project. An integration plan for Band 4, 8, and 10 CCAs is under development. Some work will occur at the NA FEIC and EA FEIC; the balance of this work will occur at the OSF. **Warm Cartridge Assemblies:** NA FEs #15, 16 and 17 included Band 4 WCAs and Band 8 WCAs. The first NA FE (S/N 59) with all NAOJ WCAs (Bands 4, 8 and 10) was assembled during Q2.



An NRAO proposed development project to **replace existing microwave data link** with data transmission via optical fiber recently approved by the ALMA Board.

The North America Executive will discuss spectrum management issues and preservation of ALMA **radio quiet zone** with JAO senior management.

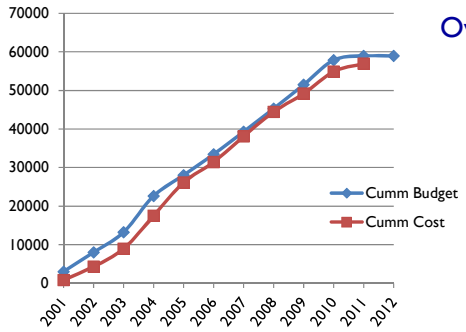
Transition of some construction computing staff to **offsite software maintenance** complete. Transition of some construction electronics staff to **offsite hardware maintenance** (photonics, backend, front end) largely complete.



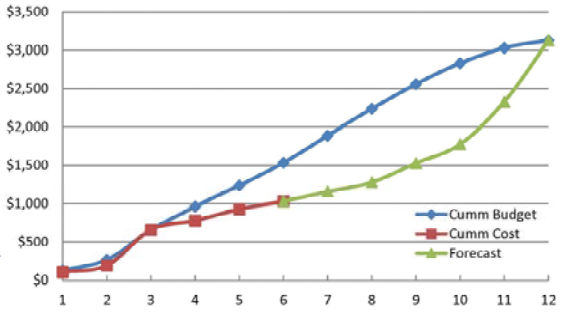
The top graph reports status on POP goals for the current fiscal year. The bottom graph illustrates the full lifecycle of the EVLA construction project. The vertical line represents where we are today. The CP represents the critical path. FE receiver production remains on the critical path, as the final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

Observatory Telescope Operations

- EVLA Construction Financial Performance Graphs – overall & Q2



Overall Spending for the EVLA Project



FY12 Budget/costs for EVLA Project

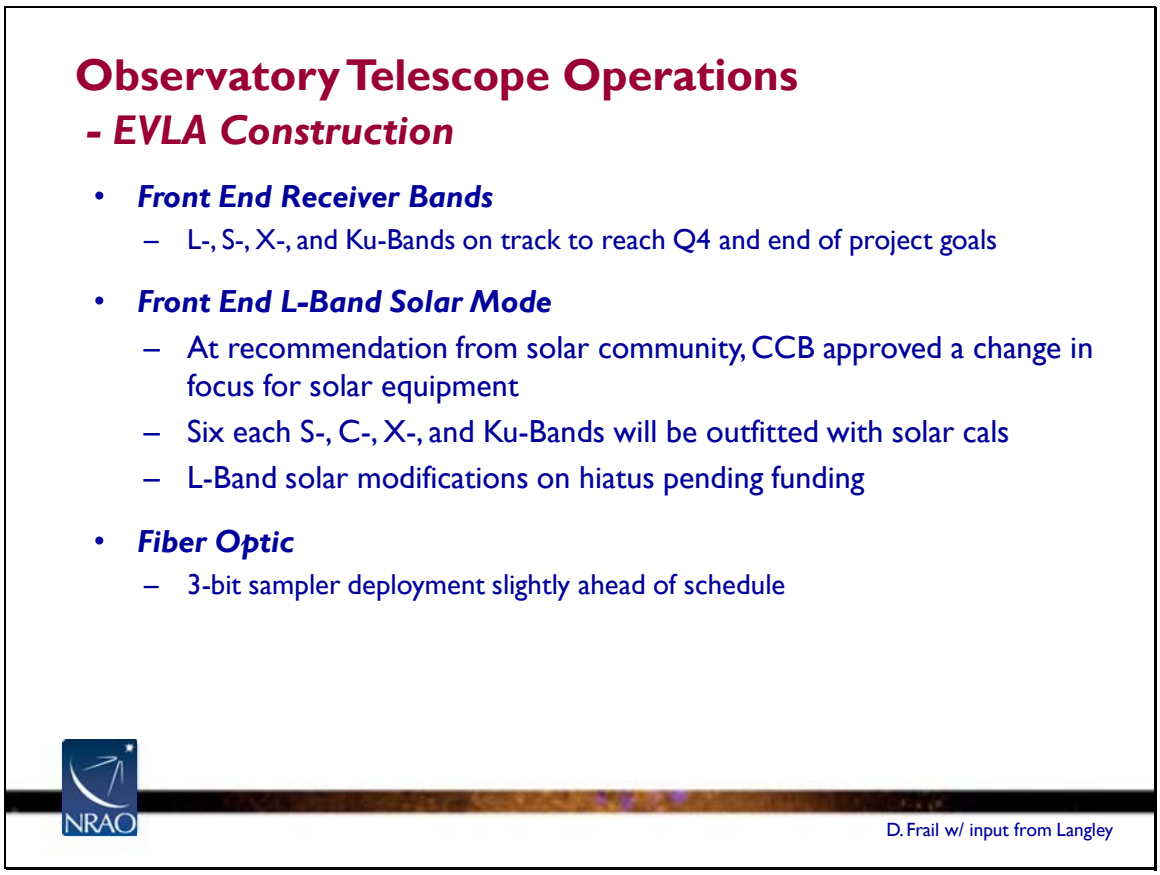
NRAO

D. Frail w/ input from Langley

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 towards the end of the fiscal year. These include the archive hardware and computing cluster (~$500k). 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 ($270k), the purchase of two new transporter generators (~$70k, in process), and items pertaining to solar observing (~$50k).

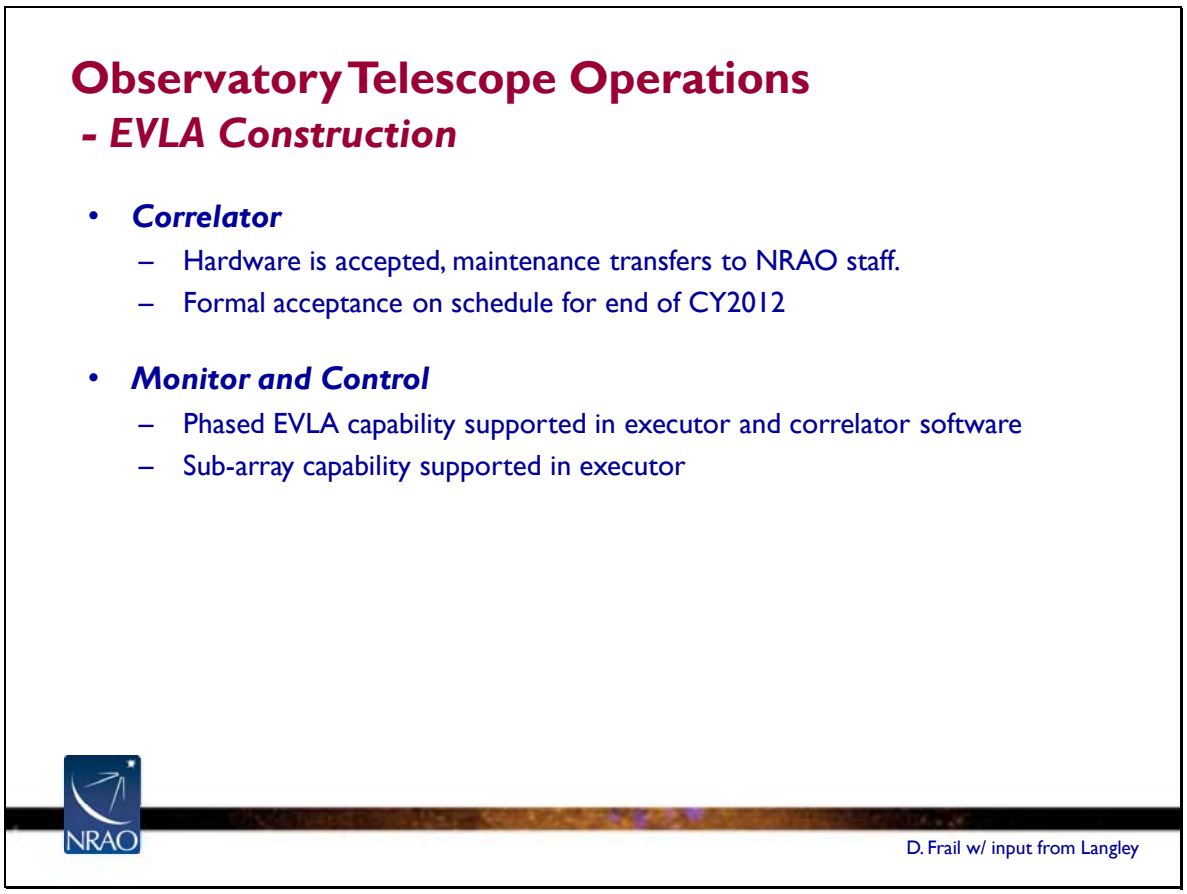
Project contingency levels change often as project needs arise. As of the end of Q2, 3/31/12, the balance stood at $637k. On 3/1/12, the CCB approved $270k be allocated from contingency and added to the budget for the purpose of developing a prototype for the Antenna Control Unit (a risk register item). Also in March, a $400k item was added to the risk register to account for a FY13 budgetary line item which could be funded out of leftover E VLA contingency. Project contingency versus cost-to-complete stands at 19.9%.



Front End Receiver Bands
Production of the remaining receiver bands is slightly behind our internal schedule, but remains on track to be completed by the end of the project. Schedule contingency is being absorbed and the Q4 goal of 27 completed receivers for L- and S-Bands remains on schedule, but with no room for slippage. X- and Ku-Bands are also on schedule for the Q4 goal of 26 completed, but with little room for error. All four of these bands are well on schedule for full implementation by the end of CY2012.

Front End L-Band Solar Mode
Encouraged by the solar science community, the EVLA Change Control Board authorized in March a change in scope regarding the outfitting of solar observing equipment. Outfitting L-Band receivers for solar observing capability has been suspended, with the funds re-directed to outfit six each of S-, C-, X-, and Ku-Bands with solar cals. The L-Band modifications may be reinstated should project funds be available after higher impact risks are retired.

Fiber Optic
Implementation of 3-bit digitizers is slightly ahead of schedule.

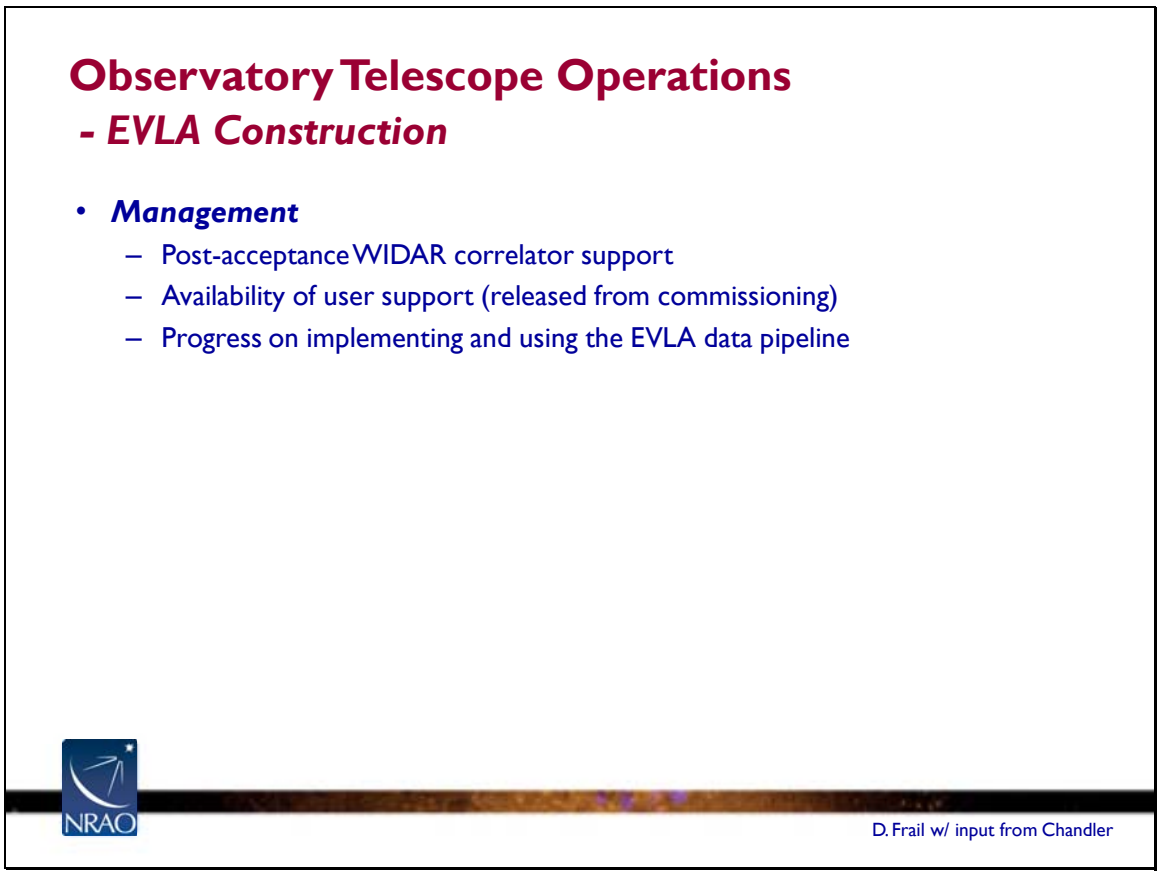


Correlator

Full acceptance of WIDAR on schedule for end of Q4. The WIDAR hardware has been officially accepted by NRAO, paving the way for test equipment and all spare components to be delivered from DRAO.

Monitor and Control

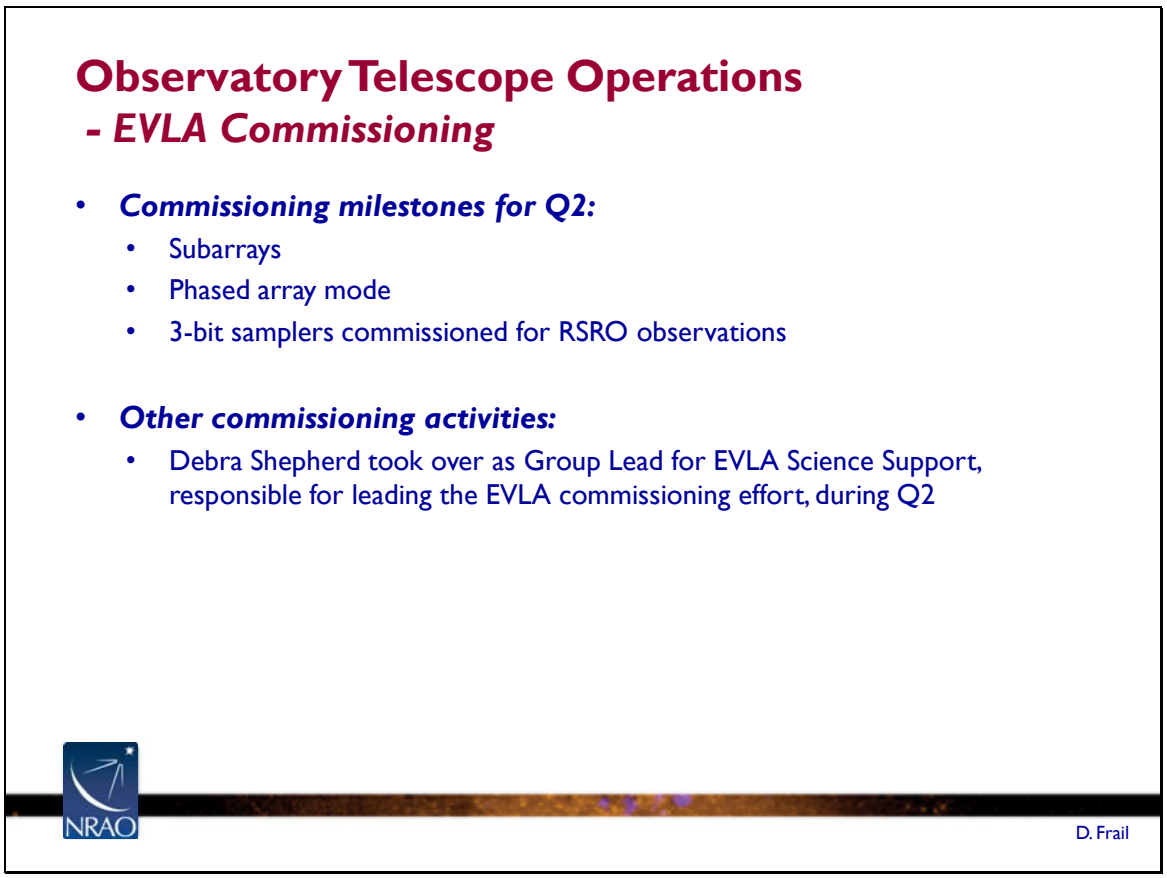
Goals are met. Phased EVLA is now supported in the executor and correlator software. Sub-array capability is also supported in the executor.



Post-acceptance WIDAR correlator support: Post-acceptance WIDAR support requirements are being identified by NRAO staff, and preliminary talks with DRAO have taken place. A draft request for continued correlator support from DRAO will be completed in Q3.

User support: JVLA commissioning will continue through the end of the EVLA construction project. User support from JVLA commissioning staff will continue at the current level until the end of CY 2012, noting that at times of high user support demand all staff within the ASC are available to respond to helpdesk tickets as needed. The level of user support required, however, is highly variable, depending on approaching proposal deadlines, and configuration changes. Many JVLA commissioning staff were involved in the data reduction tutorials during Q2.

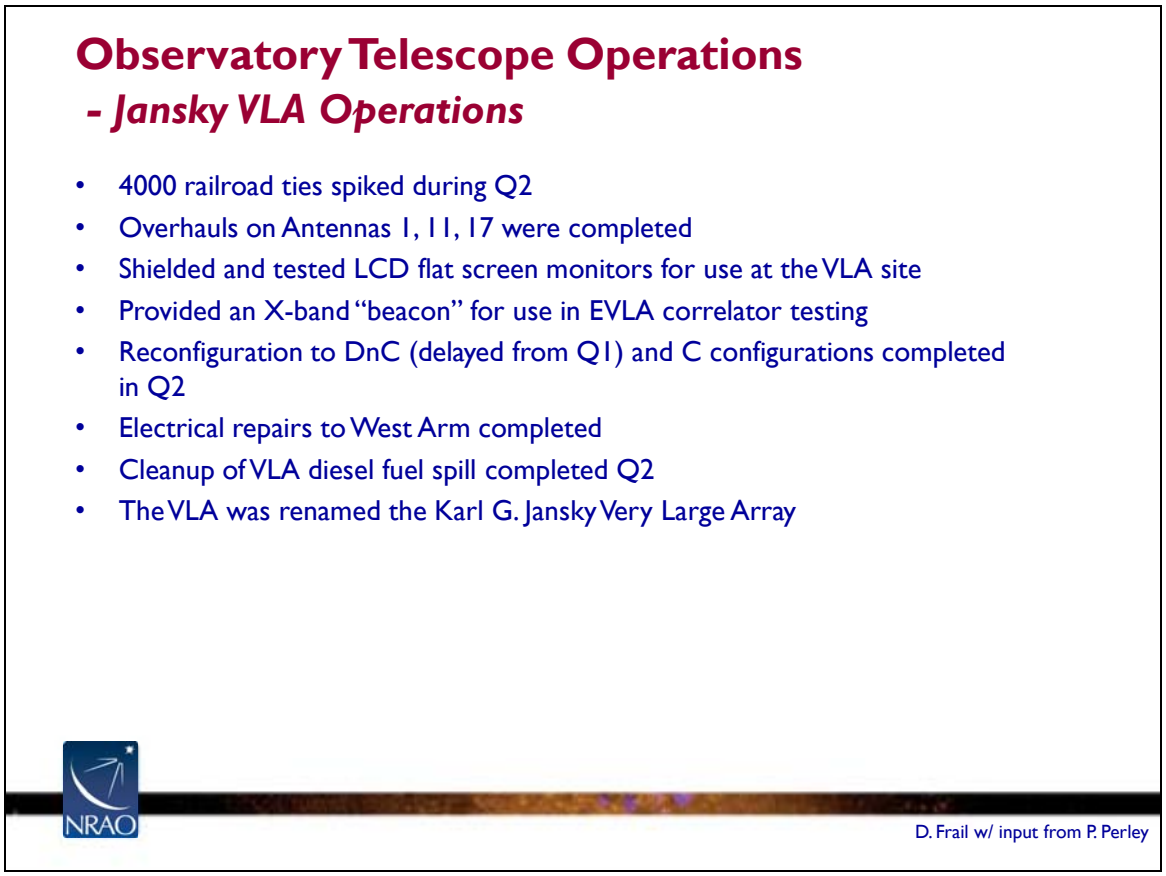
JVLA pipeline: A schedule for delivering the JVLA pipeline by the end of Q4, FY2012, was finalized during Q2. The prototype pipeline underwent testing and heuristic refinement. System integration software to allow SBs to be fed to the pipeline and results stored automatically was completed. A first version of the Pipeline Processing Request document, which includes all information relating to the dataset, the pipeline script, and post-processing cluster resource requirements, was produced. A first version of the quality assurance metrics was defined.



Subarrays: Demonstrated with 3-subarrays using different frequency bands (C, Ku & Ka bands, one with referenced pointing). Each sub-array controlled independently with a separate scheduling block queued into the observing schedule before hand. Ready for first science observation scheduled on 12 April 2012.

Phased array mode: The J VLA 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 J VLA, which will be used in the future for VLBI. Test data have been recorded to disk (i.e., not to the Mark 5C) and successfully correlated with VLBA Pie Town data. Testing of writing to the Mark 5C system with subsequent Mark 5C playback and correlation is ongoing.

3-bit sampler commissioning: At the end of Q2 9 antennas were completely populated with 3-bit samplers, and 5 antennas were half populated, enabling full imaging tests to begin. The 3-bit system has approximately 15% worse sensitivity than for the 8-bit system, for the same bandwidth, and various issues with the attenuator settings remain to be investigated. Full science verification tests, including establishing appropriate calibration procedures with the 3-bit system, will take place in Q3.



Railroad Infrastructure Maintenance and Repair: **4000 railroad ties** were spiked during Q2. Antennas: **Overhauls** on Antennas 1, 11, and 17 were completed. Array Configuration change: Reconfiguration to DnC (delayed from Q1) and C configurations completed in Q2.

Radio Frequency Interference Mitigation: Analyzed potential for X-band FE hardware burn-out due to the high power TerraSAR-X, mapping satellite (risk=0 to very low). Shielded and tested **LCD flat screen monitors** for use at the VLA site. Investigated alternate techniques for covering the front of the monitors with fewer reflections). Provided an **X-band "beacon"** for use in JVLA correlator testing.

Electricians and Carpentry group performed numerous upgrades to the Visitor Center. Repaired loose panels and loose roofing on Antenna Assembly Building. Electrical repairs to **West Arm** completed. An internal fault occurred on the west arm on 2011/12/23, tripping the utility vacuum breaker. The backup generators started and powered the site until the fault recurred and tripped out the generators. These events caused ancillary damage which misdirected the recovery effort, but site power was finally restored. The problem was isolated to an area beyond where the antennas currently on the West Arm extended, so power was left off for the West arm pads beyond that point. Cleanup of JVLA **diesel fuel spill** completed Q2. A solenoid in the diesel fuel pump failed, which caused approximately 60-100 gallons of fuel to spill in the area around the generator shack. The failure was traced to the fuel supplier not providing a proper winter mix for the fuel tanks earlier in the winter.

Dedication ceremony: The EVLA was renamed the **Karl G. Jansky Very Large Array** in a ceremony on March 31, in recognition of the vast improvements of the telescope's capabilities, and to honor the founder of radio astronomy.

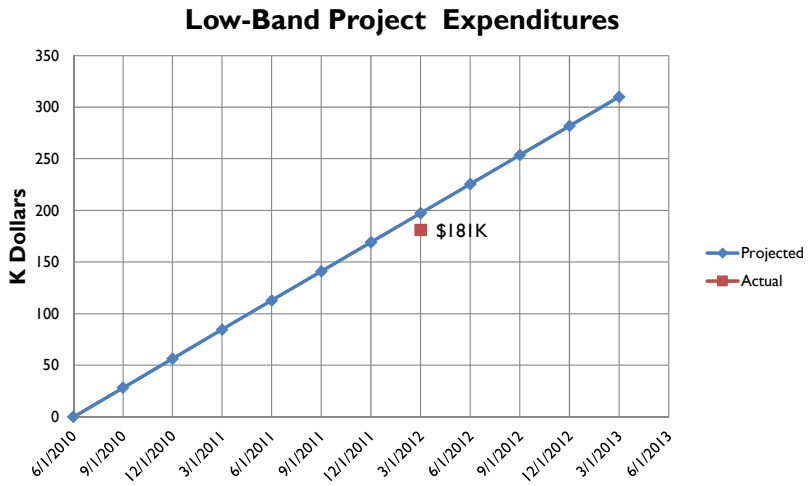
Observatory Telescope Operations
- *Jansky VLA Low-Band Receiver Project*

- ***Milestones***
  - Four receivers have been installed on Antennas 11, 19, 20 25
  - Cabling installed in an additional 3 antennas for a total of 7
  - A complete set of receiver boards is in house
  - Low-band receiver performance documentation delivered to NRL on schedule
- ***The project is on schedule for completion by FY2013-Q2***

D. Frail w/ input from P. Perley

J VLA low-band receivers: The original goal of 4 receivers installed during Q1 was not met due to cabling problems. The cabling problems have been resolved, and 4 receivers were installed during Q2.

Observatory Telescope Operations
- JVLA Low Band Project Financial Performance



D. Frail w/ input from S. Durand

The Low Band project was funded by NRL ($270k) and by NMOps ($40k). Expenditures up to FY2012-Q2 is $181.068k. This project is on schedule to complete FY2013-Q2.

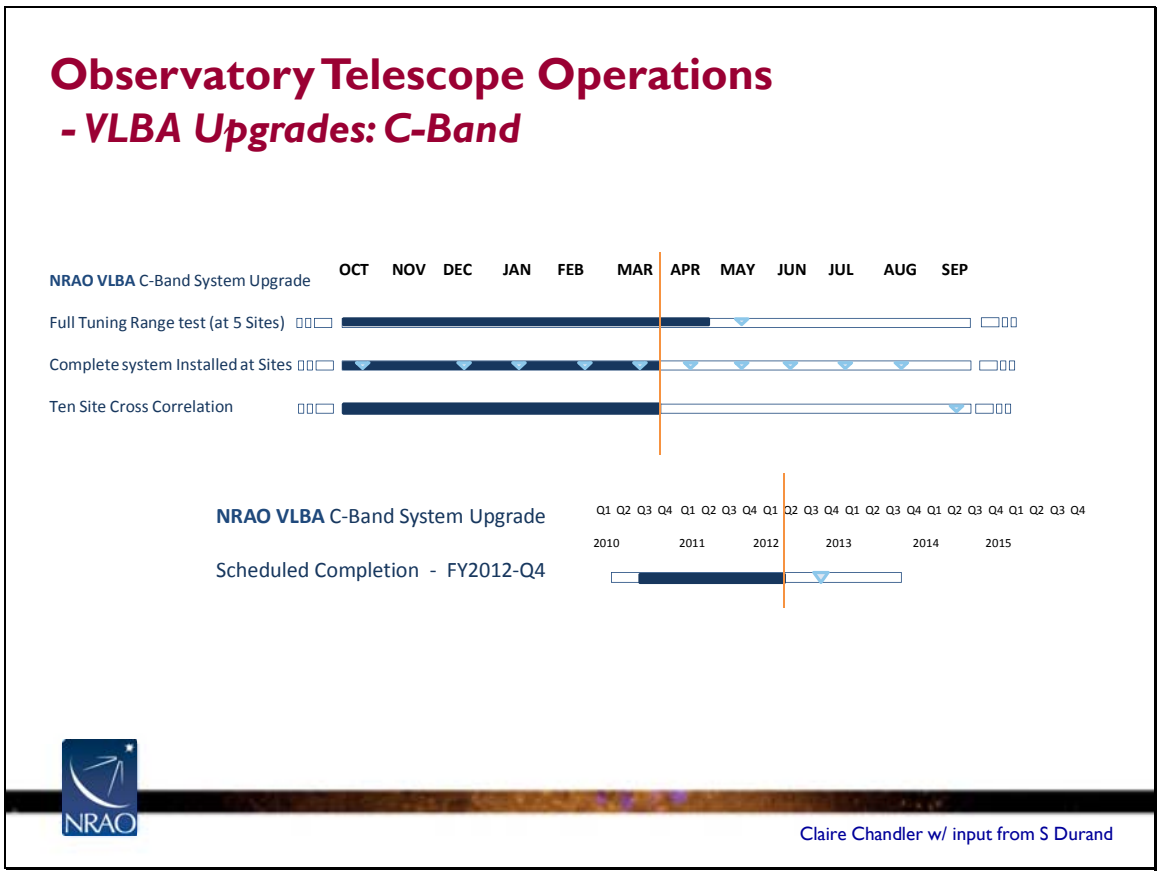
Observatory Telescope Operations
- *VLBA Operations*

- Coordinated a GPS-L3 (1381 MHz) RFI Mitigation testing event
- Coordinated a TARS RFI Mitigation radar test at Yuma, AZ
- Major Maintenance performed at KP in Q2

D. Frail w/ input from Perley/Brisken

Radio Frequency Interference Mitigation: Coordinated a **GPS-L3** (1381 MHz) testing event between the US Space Command and the RA community world-wide. Coordinated a **TARS radar test** at Yuma, AZ, which had potential impact on VLBA-KP observing. Daily UT1-UTC for USNO did not begin in Q2 as the contract has not been finalized**.**

Maintenance Plans and Schedules: Major Maintenance performed at **Kitt Peak** in Q2.



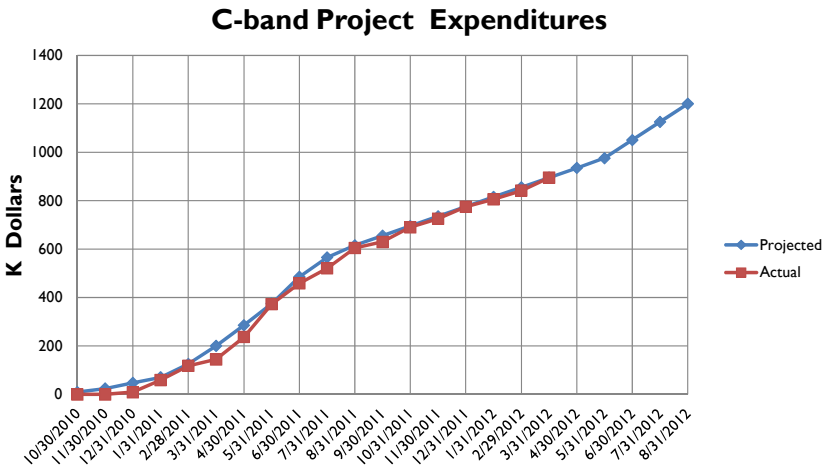
OV, FD, and KP were outfitted with complete C-band systems during Q2, meeting the goal of 5 complete systems ahead of schedule.

VLBA C-Band Project Support: GB Machine Shop has fabricated 9/10 the required C-Band Feeds. They will complete the fabrication by FY2012-Q3. 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.

Observatory Telescope Operations

- *VLBA C-Band Project Financial Performance*



NRAO

Dale Frail w/ input from S. Durand

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 September 2012. Procurement of the parts to build the 20 Synthesizers will be made at the end of this fiscal year.

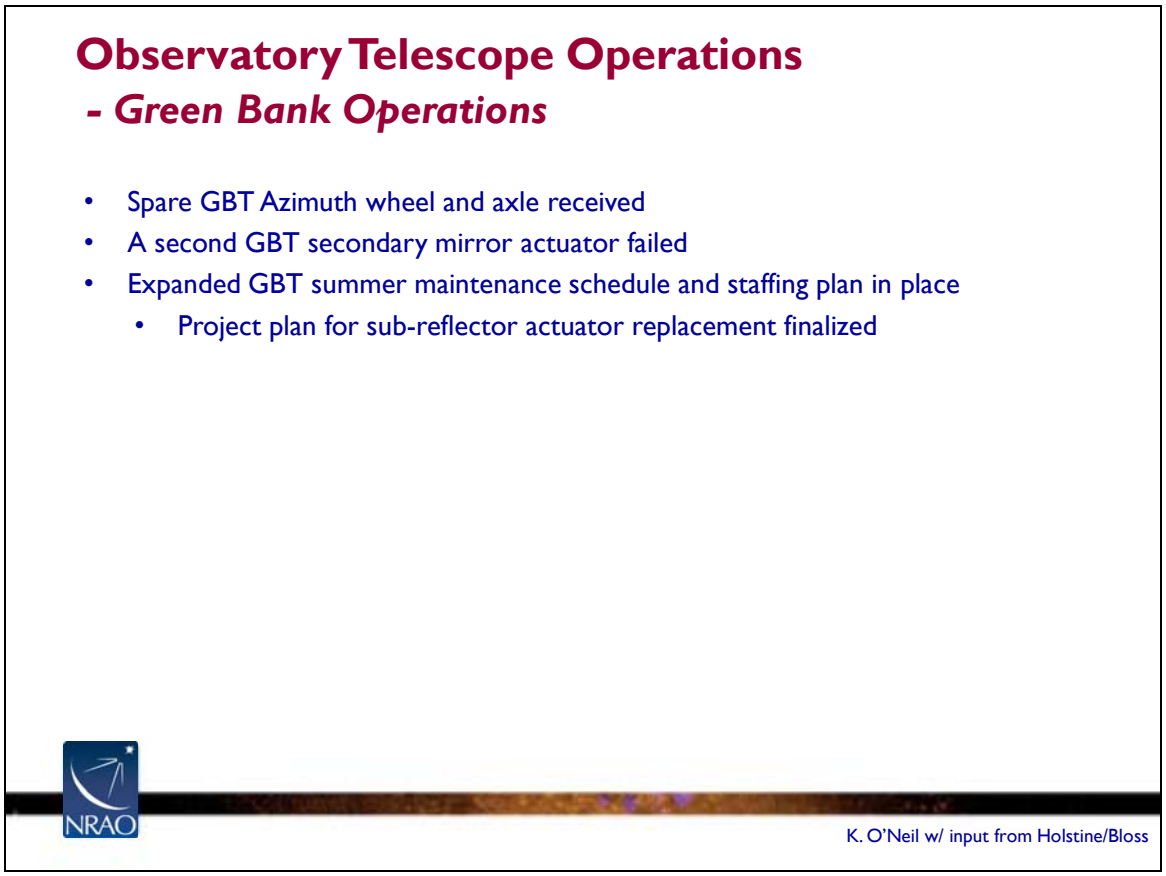
The project is on track to spend the allocated funds this fiscal year.

Observatory Telescope Operations
- *New Mexico Operations*

- Projects (Work for Others)
  - USNO DiFX Correlator
  - C-band receiver for Arecibo

A proposal was submitted to USNO to build a 15 station **DiFX correlator** in Q2. The contract wasn't signed and approved until April. USNO – awaiting resolution of funds transfer from USNO to NSF to NRAO.

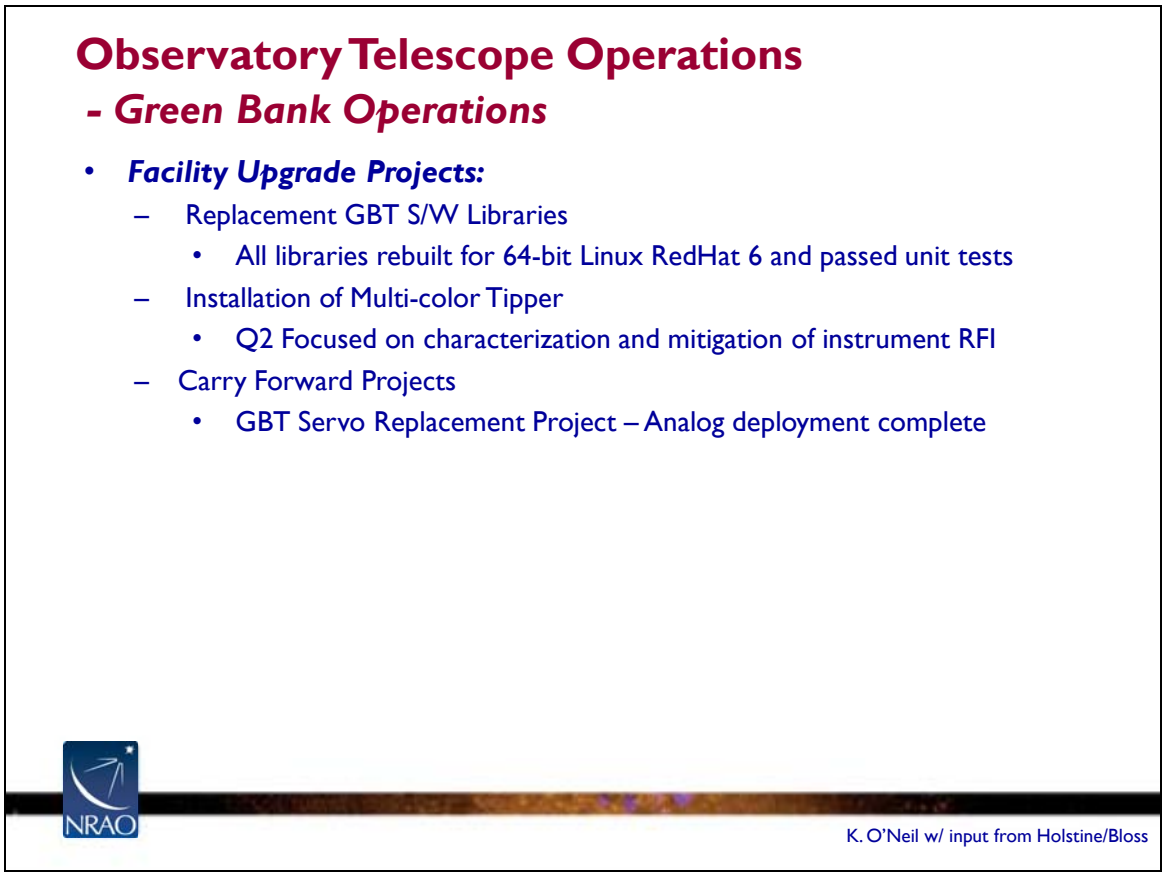
Projects (work for others): **C-band receiver** for Arecibo completed and shipped in Q2.



A spare wheel and axle purchased for the GBT were delivered this quarter.

The Y2 **sub-reflector actuator** failed in service in March and was replaced with the spare. The X2 actuator is still at the manufacturer being refurbished. A plan is in place to take each of the actuators out of service for overhaul and modification. (see Maintenance Plans and Schedules)

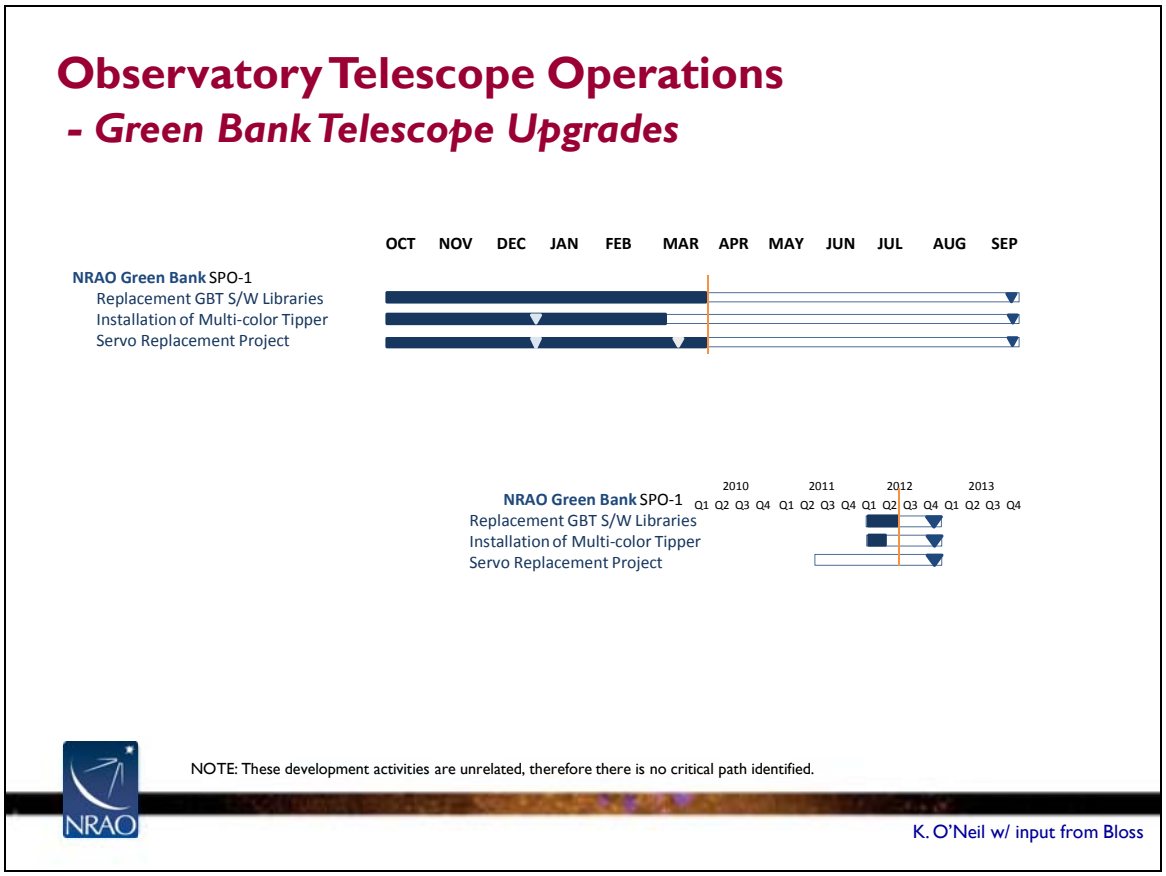
Maintenance Plans and Schedules: **Staffing plans and extended maintenance** windows established for GBT painting and structural inspections. A project plan that accommodates rotating **GBT sub-reflector actuators** through the manufacturer for rebuilding was established in Q2FY2012. This is a critical plan for completing the actuator refurbishment in the summer maintenance period without major GBT shutdown periods.



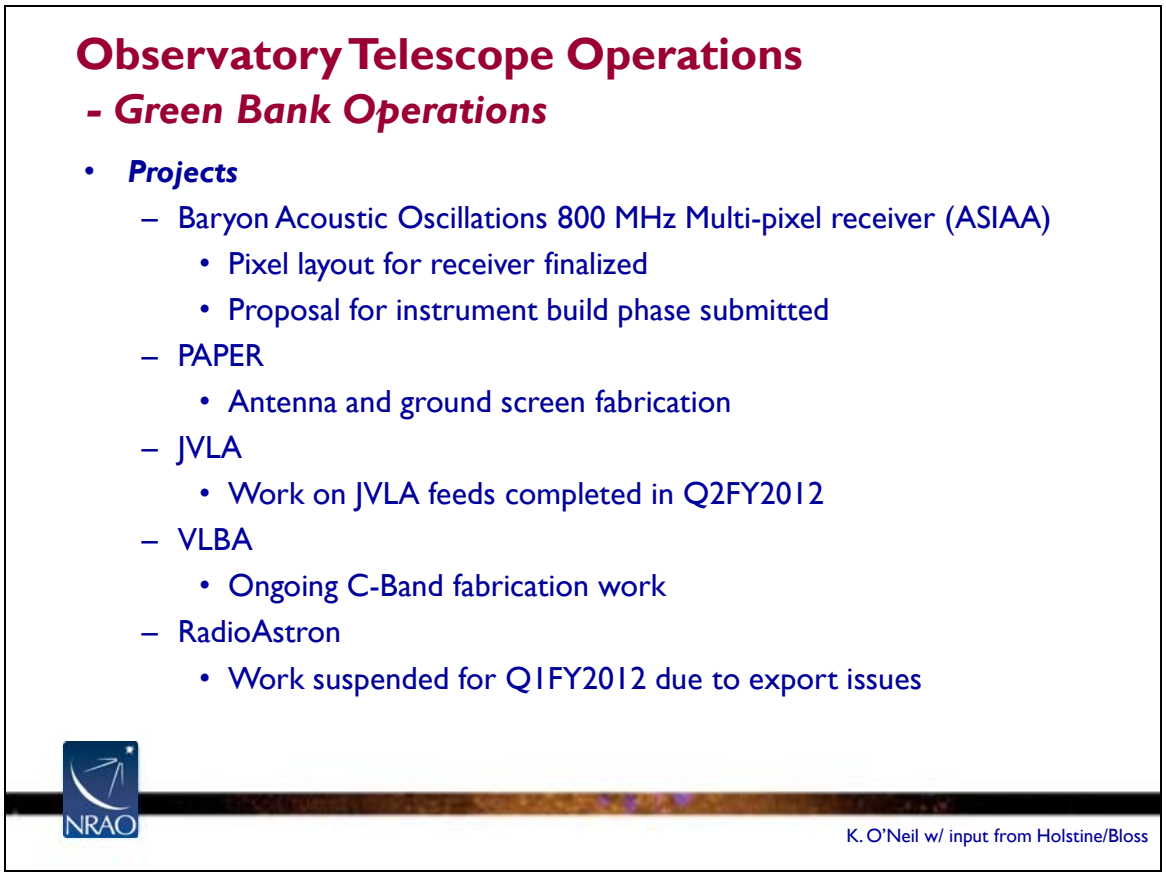
The **GBT Software Library rebuild** continues on schedule with all libraries rebuilt for 64-bit RH 6, Computing Division provision of 64-bit RH 6 resources for the SDD GBT simulator, and testing all software on the simulator.

Installation of the **Multi-color Tipper** was suspended in Q2FY2012 while above-limit levels of RFI are evaluated and a mitigation activity undertaken. 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.

The **GBT servo replacement** (PTCS) deployment continues in Q2FY2012 with the installation of the analog components of the new system and tests of the ability to switch between the old and new servo systems – a crucial aspect of deployment and testing on the GBT.



Installation of Multi-color Tipper – The data collection has been delayed by RFI issues that affect both the instrument site selection and the ability to operate with GBT.



NRAO and the **ASIAA** project team have completed an overall pixel configuration for the BAO 800 MHz receiver. A proposal for the build phase of the project was submitted for the FY2013 project planning process. Significant issues of overall receiver weight, mechanical balance, and noise performance remain to be resolved. NRAO involvement is limited to attending weekly team meetings and is included in their base time allocations.

The Green Bank Mechanical Shop is fabrication antennas and ground screens for the **PAPER project** in South Africa. This work was taken on as fill-in work around scheduled shop activities.

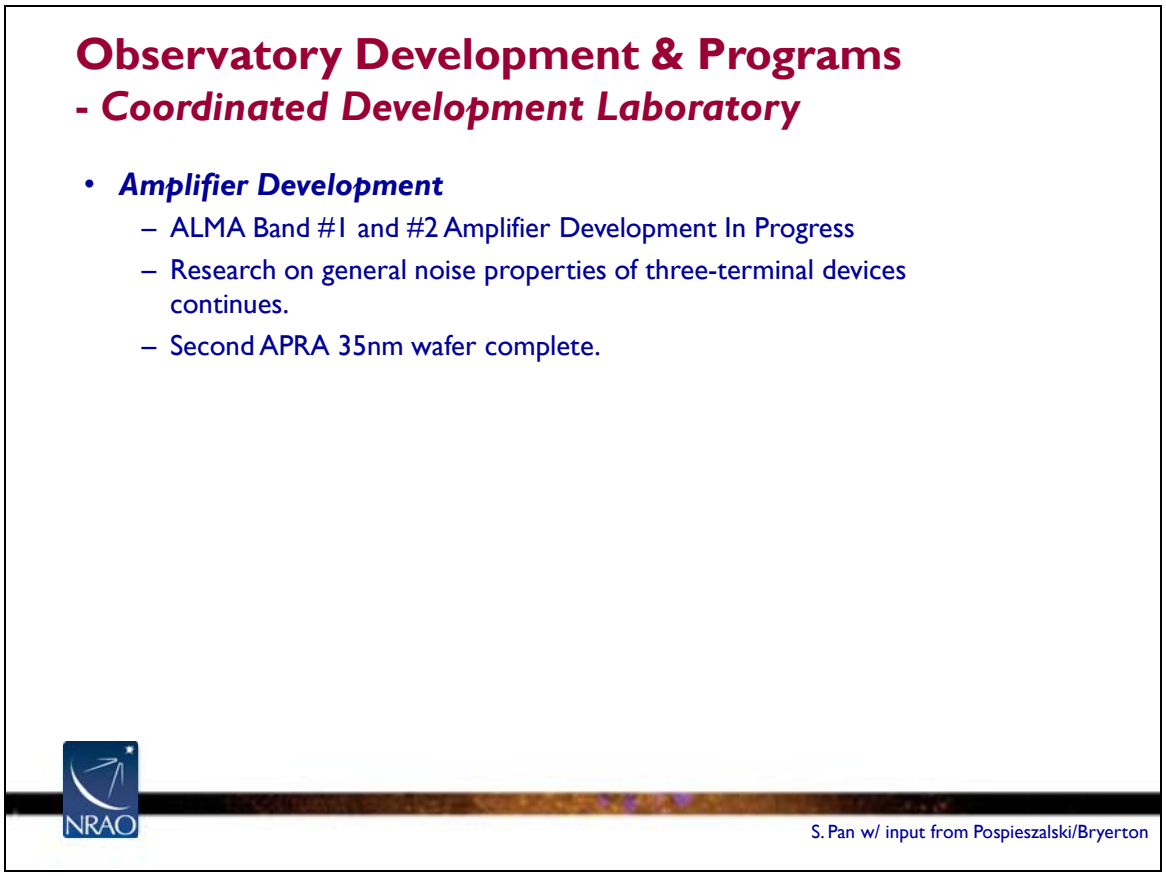
Work on the **J VLA feeds** was completed in Q2FY2012. This work was in the FY2012 operational plan.

Work on **VLBA C-Band** feeds continued in Q2FY2012. This work was in the FY2012 operational plan. Overall the Green Bank shop spent ~46% of hours worked on other NRAO projects.

Design and planning work for the **RadioAstron data relay station** in Green Bank was suspended as export issues are resolved with the State Department.

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

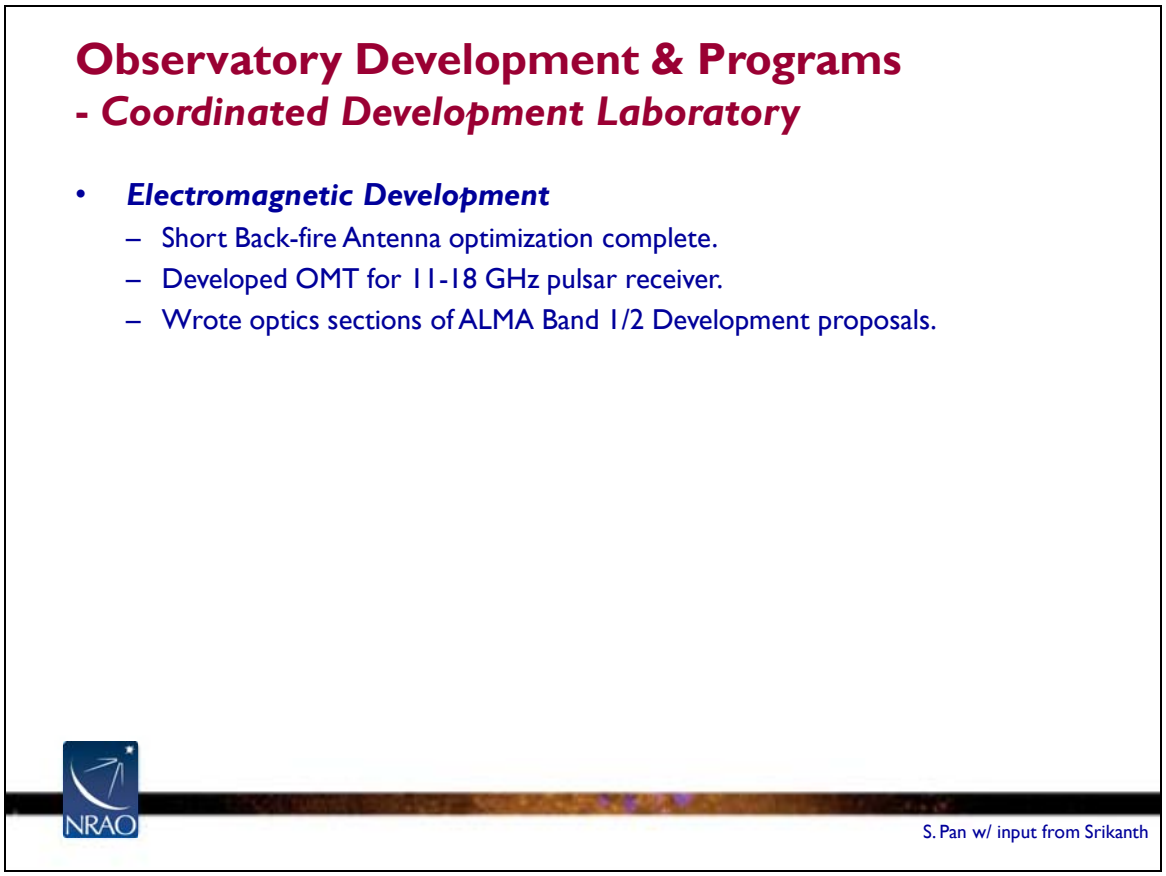


Development of **ALMA bands #1 and # 2 amplifiers** using NGST cryo3 devices continues. A test amplifier covering 75-115 GHz with under 80 K noise temperature and under 40 K in 78-100 GHz range has been demonstrated.

Research into **general noise properties of three terminal active devices** and in particular on noise properties of heterojunction bipolar transistors (HBTs) and CMOS MOSFET continues. A paper covering the design and performance of JVLA amplifiers has been accepted for conference presentation -- M. W. Pospieszalski, "Cryogenic Amplifiers for Very Large Array Receivers," to be presented at MIKON 2012 Conference, Warsaw, Poland, May 2012.

Second **APRA 35nm wafer** complete, currently in cryogenic probe testing at Caltech.

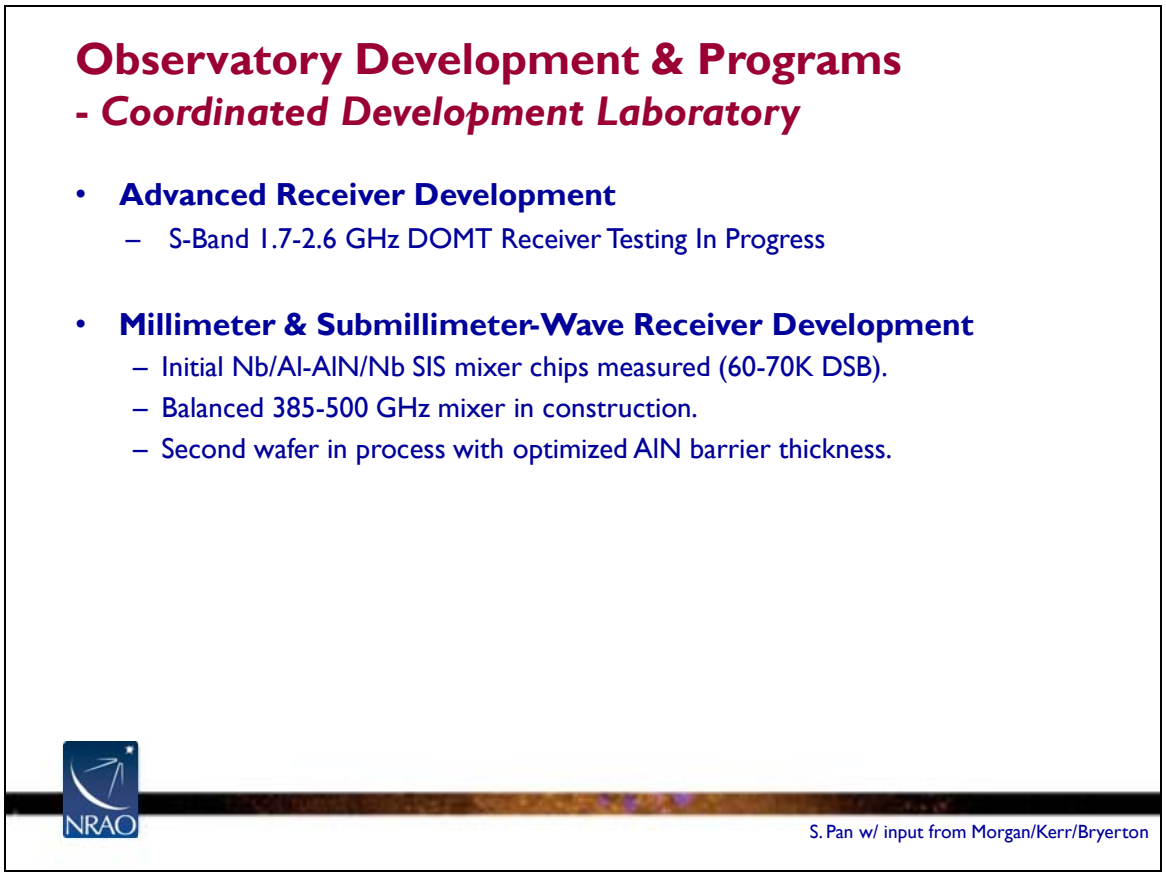
M. W. Pospieszalski, "Cryogenic Amplifiers for Very Large Array Receivers," to be presented at MIKON 2012 Conference, Warsaw, Poland, May 2012.



Completed optimization of a **Short Back-fire Antenna** feed for the 800 MHz multi-beam receiver on the GBT. The pattern was optimized for low spillover by varying the size of the two reflectors in front of the dipole.

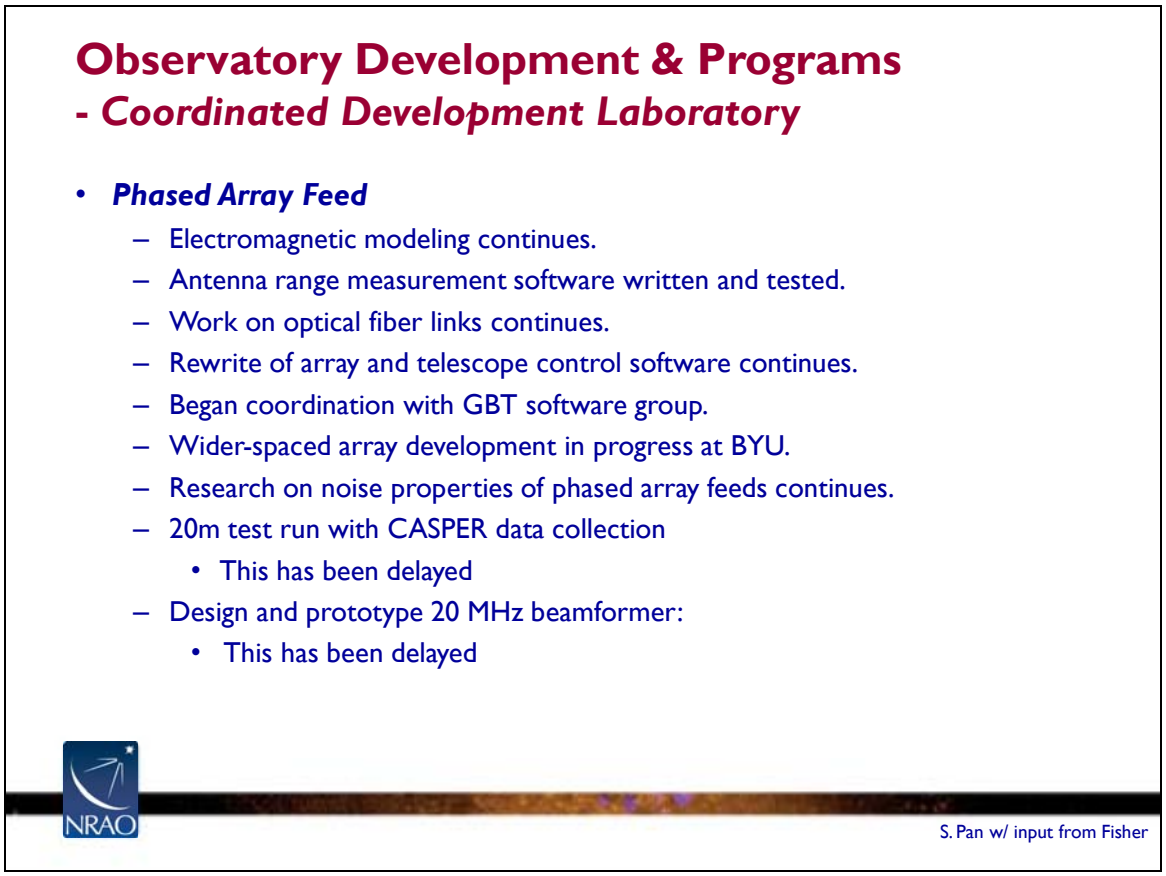
Developed an orthomode transducer (**OMT**) based on a turnstile junction for the **11-18 GHz pulsar receiver** for the GBT. This OMT also serves as a prototype for ALMA Bands 1 and 2.

Wrote the **optics sections** of the ALMA Development proposals for Bands 1 and 2.



Advanced Receiver Development: Thermal loading issues with this test set have been largely resolved. However, the previously known issue associated with gold bond wires on the aluminum pads of the SiGe transistors has necessitated a repair of one of the amplifiers. The project awaits technician time to complete this repair, not expected for at least another month. This and all other aspects of the **Advanced Receiver Development** Program remain effectively stalled until technician support is restored.

Millimeter & Submillimeter-Wave Receiver Development: Several SIS chips with **Nb/Al-AlN/Nb** trilayer for 385-500 GHz packaged and measured with **60-70K DSB** average noise temperature over band. A **balanced 385-500 GHz mixer** is under construction using these chips. **Second SIS wafer** for 385-500 GHz in process with optimized AlN barrier thickness.



Phased Array Feed: This quarter was primarily devoted to transitioning the array system to use on the GBT and making array testing more efficient based on earlier experience.

Continued **electromagnetic modeling** of array at NRAO.

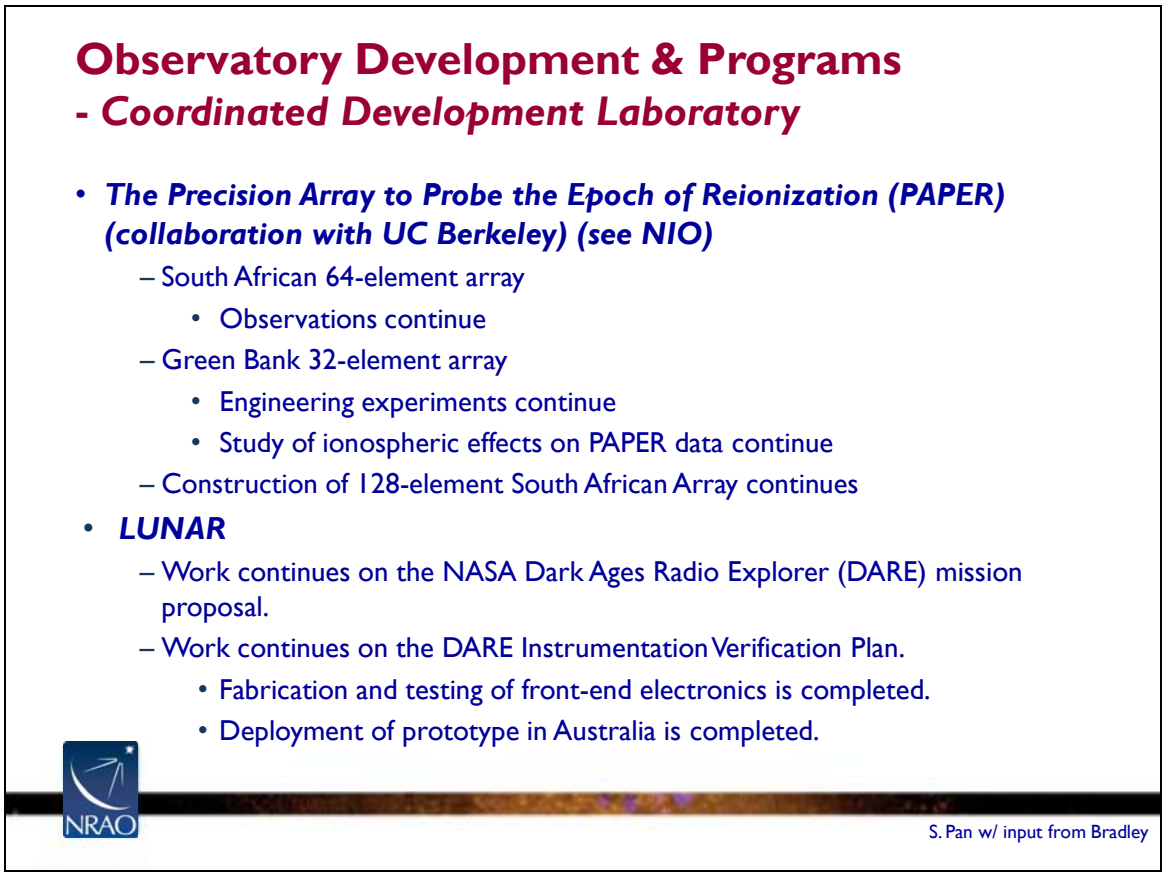
Software for array **measurements** on Green Bank outdoor **antenna range** written and tested.

Continued work on **optical fiber links** from lab building and 20-meter, outdoor test building, and GBT. Continued rewrite of array and telescope **control software** and array data formats in anticipation of array testing and use on the GBT. Began **coordination with GBT software group** on control of the array system from GBT control software.

BYU worked on design of **wider-spaced array** optimized for GBT optics.

20m test run with CASPER data collection and design and prototype 20 MHz beamformer have been delayed due to under-estimation of the size of the task of building the CASPE system at BYU. NRAO has begun a parallel effort to develop a CASPER data acquisition system and beamformer in house.

Initial work on improved data acquisition and digital signal processing hardware at Green Bank was interrupted by the departure of the engineer assigned to the task.



The Precision Array to Probe the Epoch of Reionization (PAPER): Components are being ordered for the expanded South African Array. Data analysis and observations continue with the existing arrays. Construction of additional elements for the 128-element continues.

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. Engineering prototype was constructed and deployed during the current quarter.

Observatory Development & Programs
- *CDL Production, Maintenance and Repair*

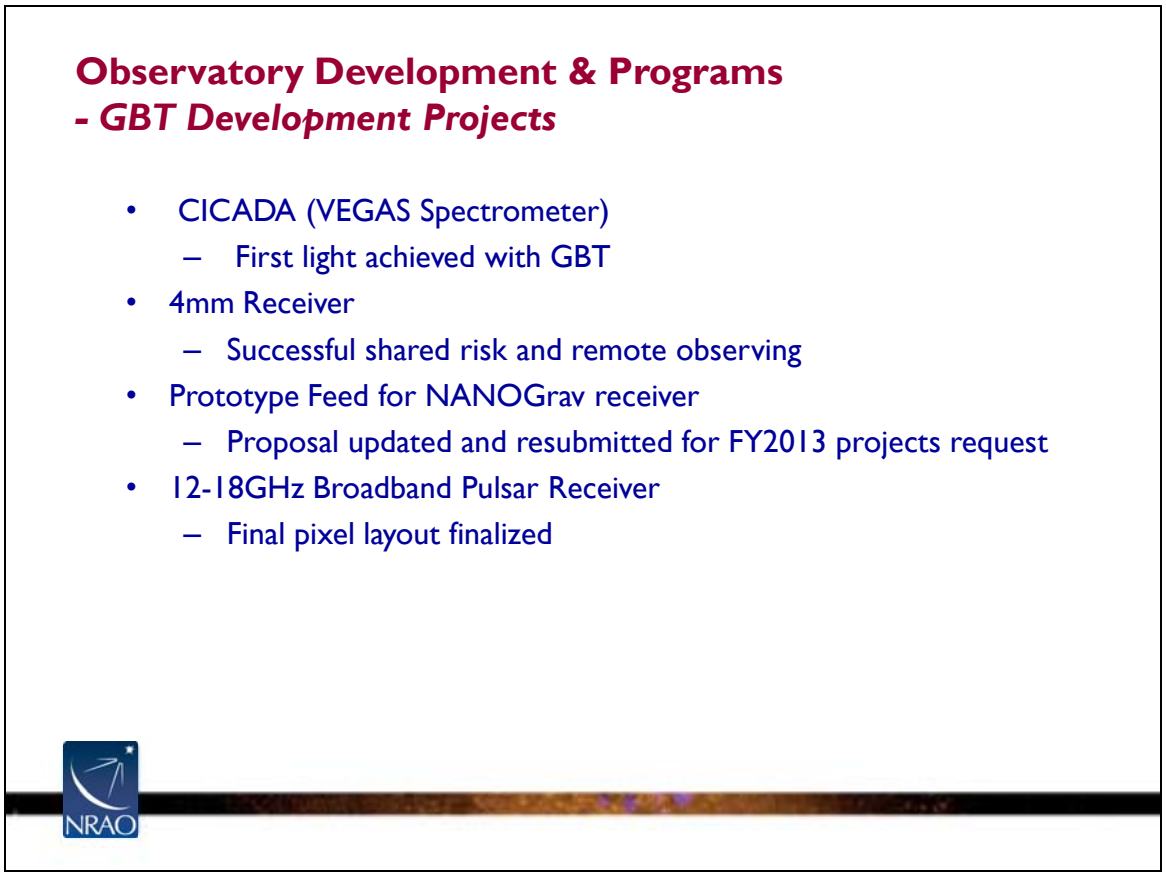
- ***HFET Amplifiers Productions***
  - Delivered 18 new amplifiers to JVLA (on schedule).
  - Delivered 4 C-band (4 – 8 GHz) amplifiers to VLBA
    - 4 including 2 spares remain to be delivered.
  - Production of P-band (230 – 470 MHz) amplifiers for USNO nearly complete
    - 6 spares remain
  - Repaired 15 amplifiers for EVLA , GBT, and VLBA.
  - Upgrade of CARMA amplifiers complete.

- ***Electromagnetic Devices Production***
  - Production of S-band (2 – 4 GHz) feeds continues.
  - Production of Ku-band (12 – 18 GHz) feeds continues.
  - Production other Ku-band EM components underway.

NRAO

S. Pan w/ input from Pospieszalski/Srikanth

Amplifier Production Milestones: New amplifier production included four 1-2 GHz, two 2-4 GHz, four 4-8 GHz, and twelve 8 -12 GHz. Repair, upgrade, and retesting of amplifiers included eight 1-2 GHz, one 2-4 GHz, five 4- 8 GHz, and one 12-18 GHz. In total, 37 amplifiers were shipped. The EVLA and VLBA amplifier and production is approximately on schedule.



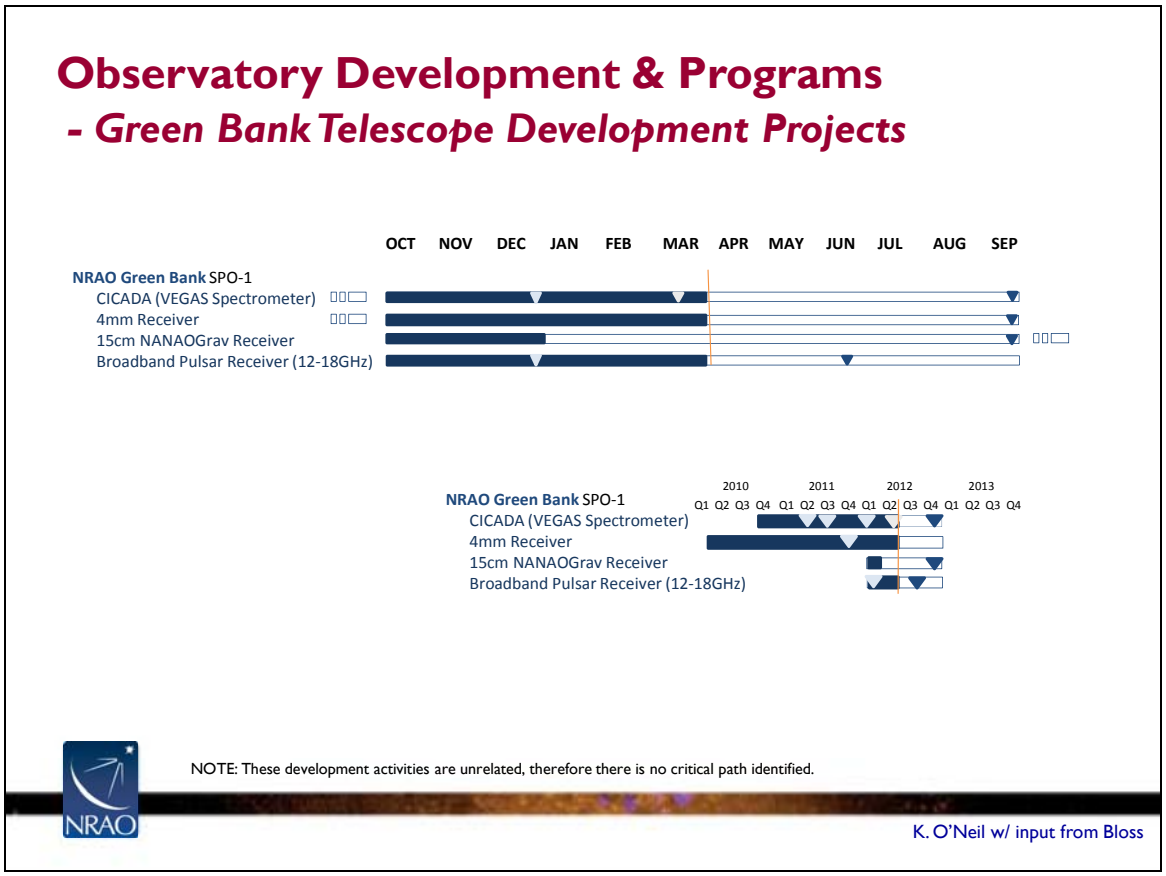
The **VEGAS** team achieved the scheduled milestone of first light with the GBT using Mode #1 of the new spectrometer. See-

(https://safe.nrao.edu/wiki/pub/CICADA/GreenBankSpectrometer/GB_VEGAS_1b_edited.jpg)

The **4mm Receiver** continued to be used for shared risk observing, including the first remote observer usage. Observational efficiency and integration into the GBT systems continues with deployment of AutoOOF and 4mm updates to the GBT Config-tool.

The **NanoGRAV** science team has completed a number of simulations and analysis of alternative designs for the wide-band receiving system. This work was has delayed the project. The milestone of completing the R&D may not be completed in FY2012. A proposal for mid-level R&D was submitted to for the FY2013 planning process. Risk: R&D will carry forward into FY2013. Mitigation: None. The final feasibility and design will be delayed by six to eight months.

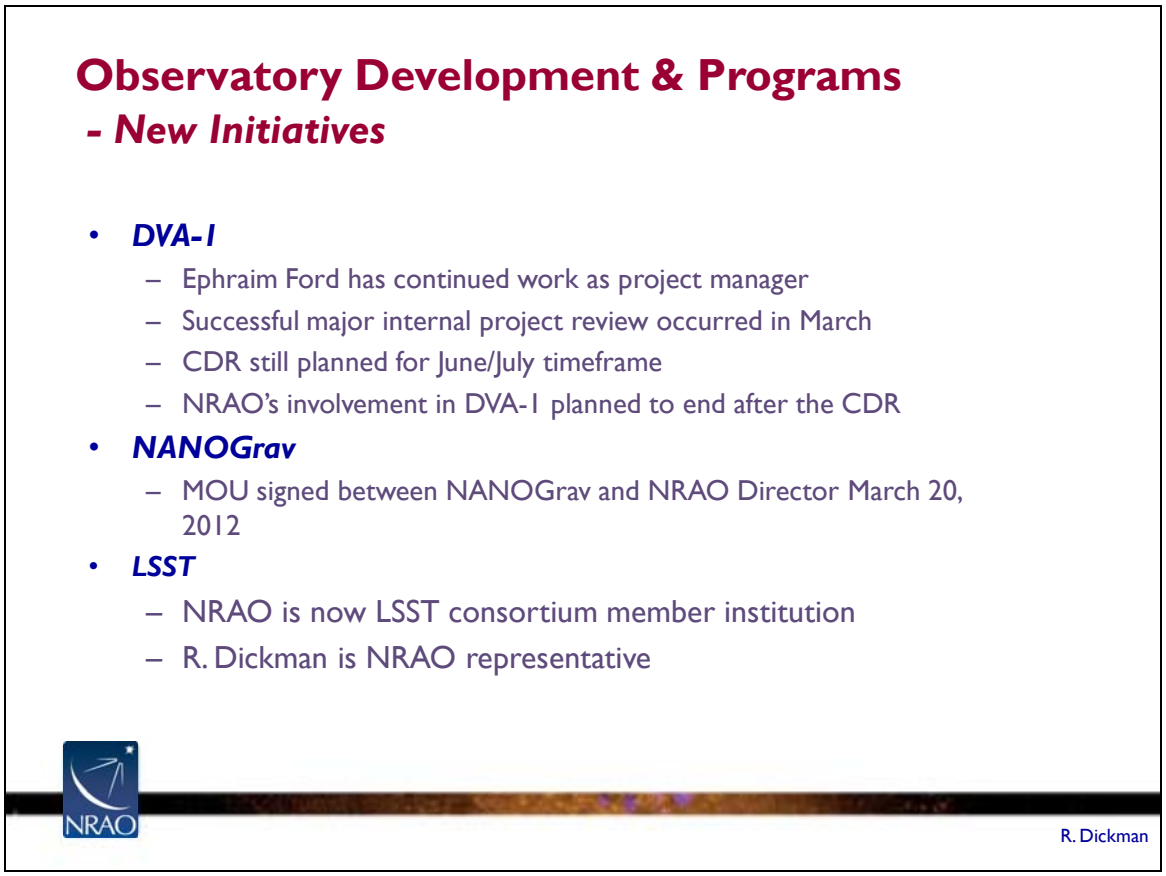
A breakthrough in accommodating both pulsar and spectral line observing with the **12-18 MHz Ku-Band receiver** was achieved with the design of a single wideband, low noise pixel for pulsar observing that will be added into the existing Ku-Band receiver dewar. With this design pulsar and spectral observations may be interspersed without any receiver adjustments; a great improvement in observational efficiency for this receiver.



CICADA (VEGAS Spectrometer) – First light achieved with the GBT as scheduled in Q2FY2012.

15cm NANAOGrav Receiver – Simulation activities have proven to take longer than scheduled. A revised proposal for4 mid-level R&D was submitted to the Internal Development process for consideration as a carried forward project into FY2013.

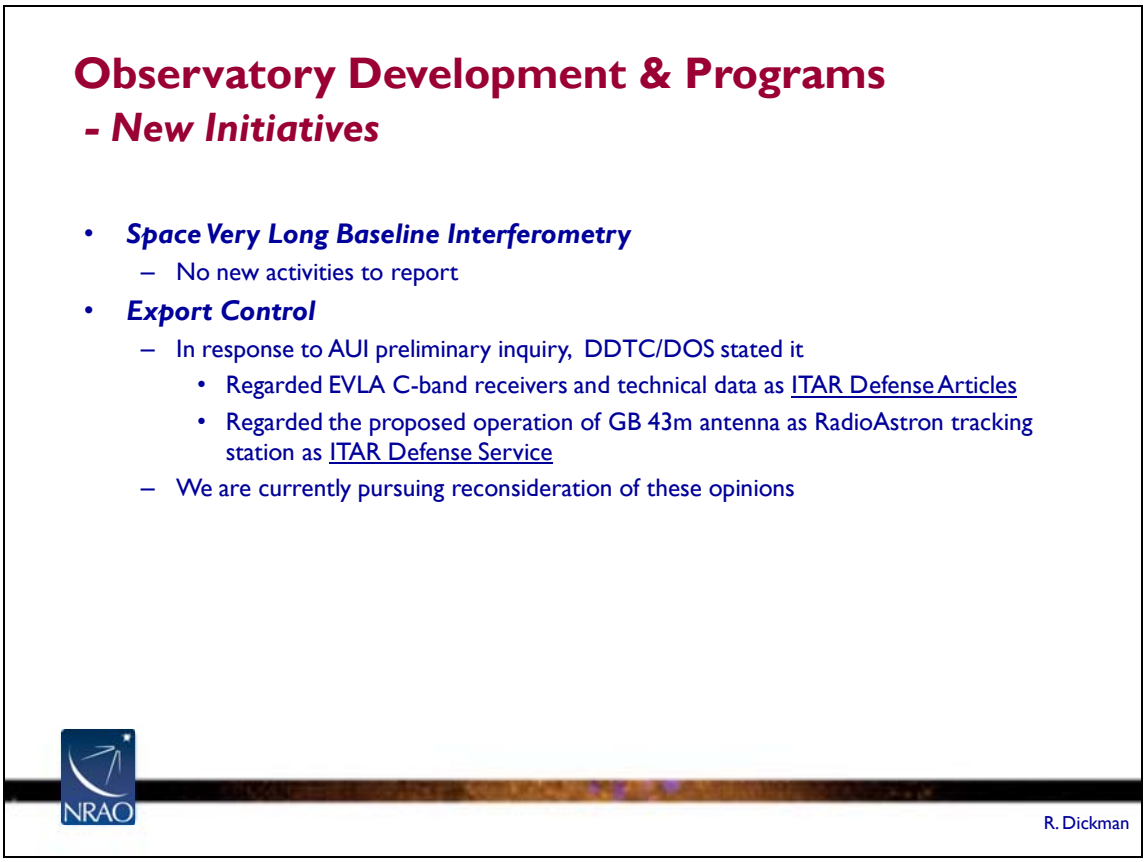
Broadband Pulsar Receiver – Issues with the internal design have been resolved with the addition of a single broadband pixel exclusively for pulsar observations.



DVA-1: Ephraim Ford's work **fully supported by external TDP funds**; a **small amount of funding remains** for his PM work; his remaining time will be selectively used to prepare for the CDR. NRAO leaving DVA-1 due to termination of NSF support in Q1.

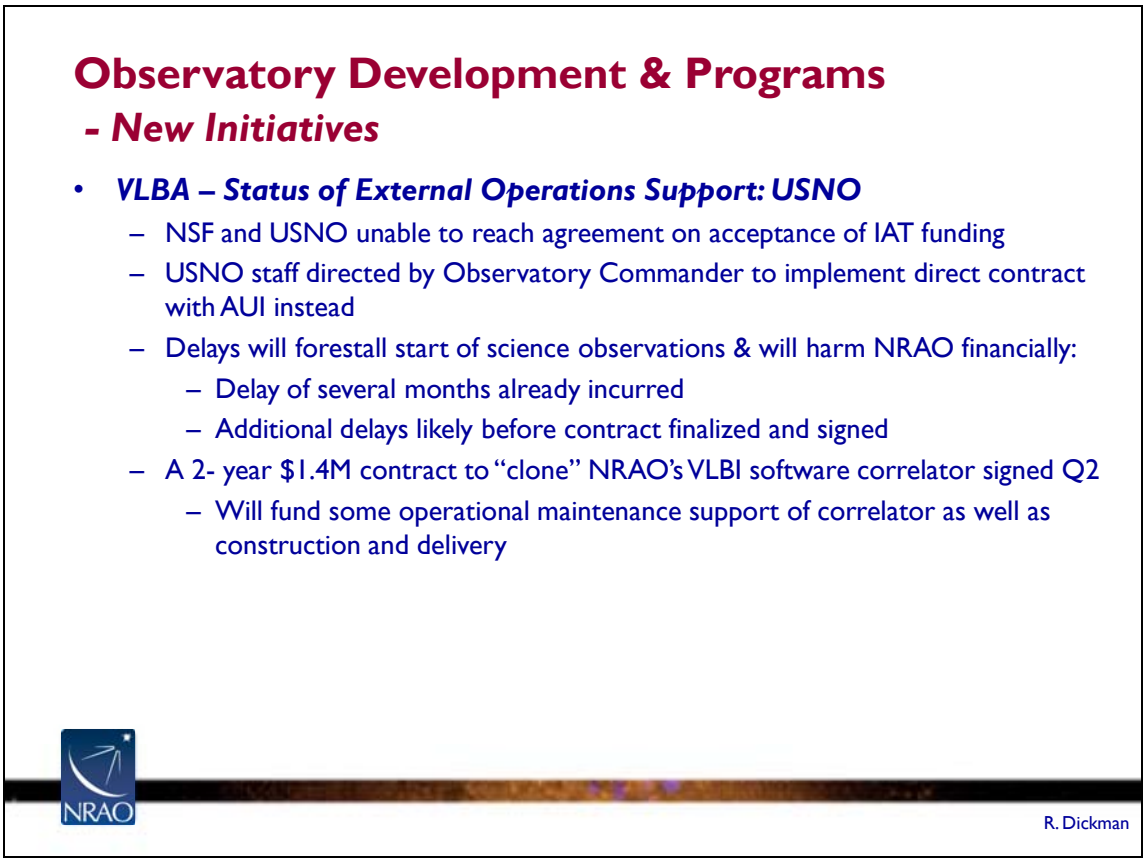
NANOGrav: NRAO **now an institutional member** of NANOGrav consortium.

LSST: NRAO accepted as institutional member of LSST consortium October 2011. **R. Dickman appointed** NRAO institutional representative on LSST Board by NRAO director**.**



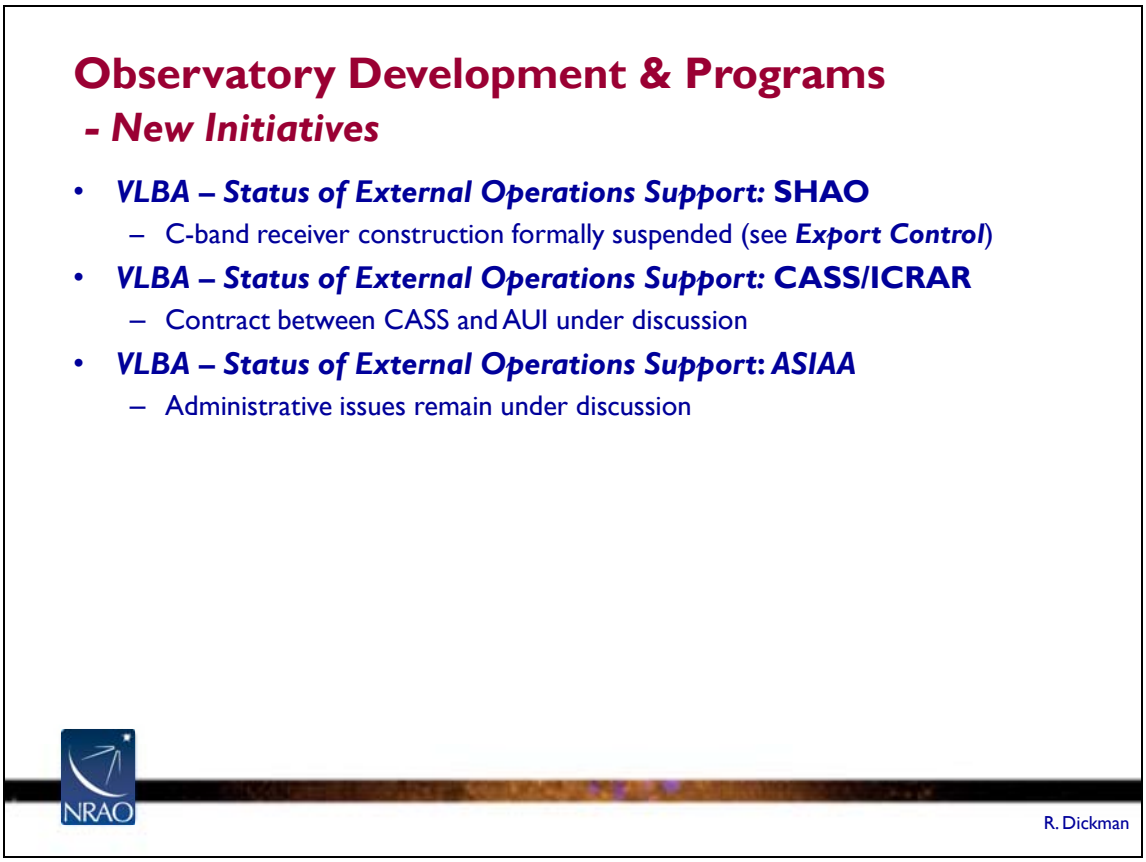
Export Control: Advisory Opinion request inquiry submitted to DDTC/DOS 3/9/2012. Requested confirmation of non-ITAR status for (i) proposed construction and export of **C-band** receiver for SHAO; (ii) export to SHAO of technical information associated with this receiver; (iii) permission to sign proposed contract with FIAN to operate **Green Bank 43m antenna** as a RadioAstron downlink station.

We believe that these opinions are not appropriate, and are pursuing strategies to have them reconsidered, and not have them affect other observatory work.



Funding disagreement: The USNO-NSF Letter of Intent to fund $1M in VLBA operations in support for Earth rotation geodetic timing called for funding to be transferred to NSF using interagency transfer (IAT). NSF and USNO were unable to agree on the fiscal parameters of the transfer.

Correlator Contract: Between AUI and USNO to support the production of a "clone" of NRAO's DiFX correlator at the USNO. Will be used for reducing VLBA geodetic observations that are made for the Naval Observatory.



C-band receiver construction for **SHAO:** Shanghai Astronomical Observatory was suspended pending export control resolution.

A contract is under discussion between CASS: CSIRO Astronomy and Space Science division; **CSIRO**: Commonwealth Science and Industrial Research Organisation (Australia) /**ICRAR:** International Centre for Radio Astronomy Research, University of Western Australia, and AUI for Operations Support of the VLBA.

The agreement to provide external operations support to VLBA by ASIAA: Academia Sinica Institute of Astronomy and Astrophysics (Taipei, Taiwan) **is under discussion.**

Observatory Development & Programs
- *New Initiatives*

- ***GB – Status of External Operations Support:***
  - Contract proposed by FIAN ($2M/year for 3 years) to operate GB 43m as second RadioAstron tracking station
  - DDTC ITAR opinion (see ***Export Control*** above) has temporarily forced suspension of technical discussions, but contract work continues
  - No impact on scientific collaborations, which continue
- ***NAA Workshop Organization:***
  - Organization of Workshop continues
  - Will focus on enabling technologies for next large US Radio Telescope project
  - Workshop planned for FY Q4

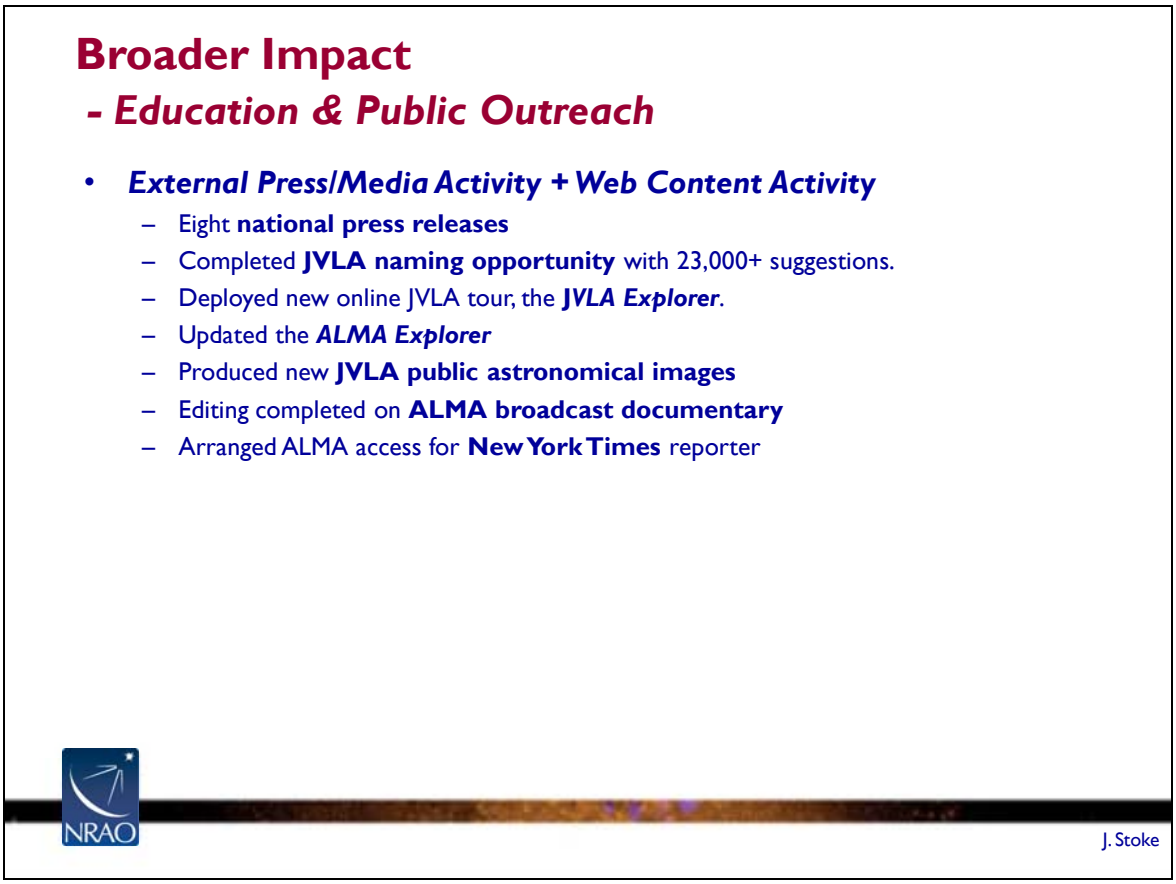
R. Dickman

A contract has been proposed by RAN to operate the Green Bank 43M as a tracking station for **RadioAstron**: Russian space interferometry satellite, launched July 18, 2011. Technical discussions are pending outcome of export control discussions. **Second tracking station** (besides main station at Pushchino, Russia) **required to observe 24 hours per day with satellite.**

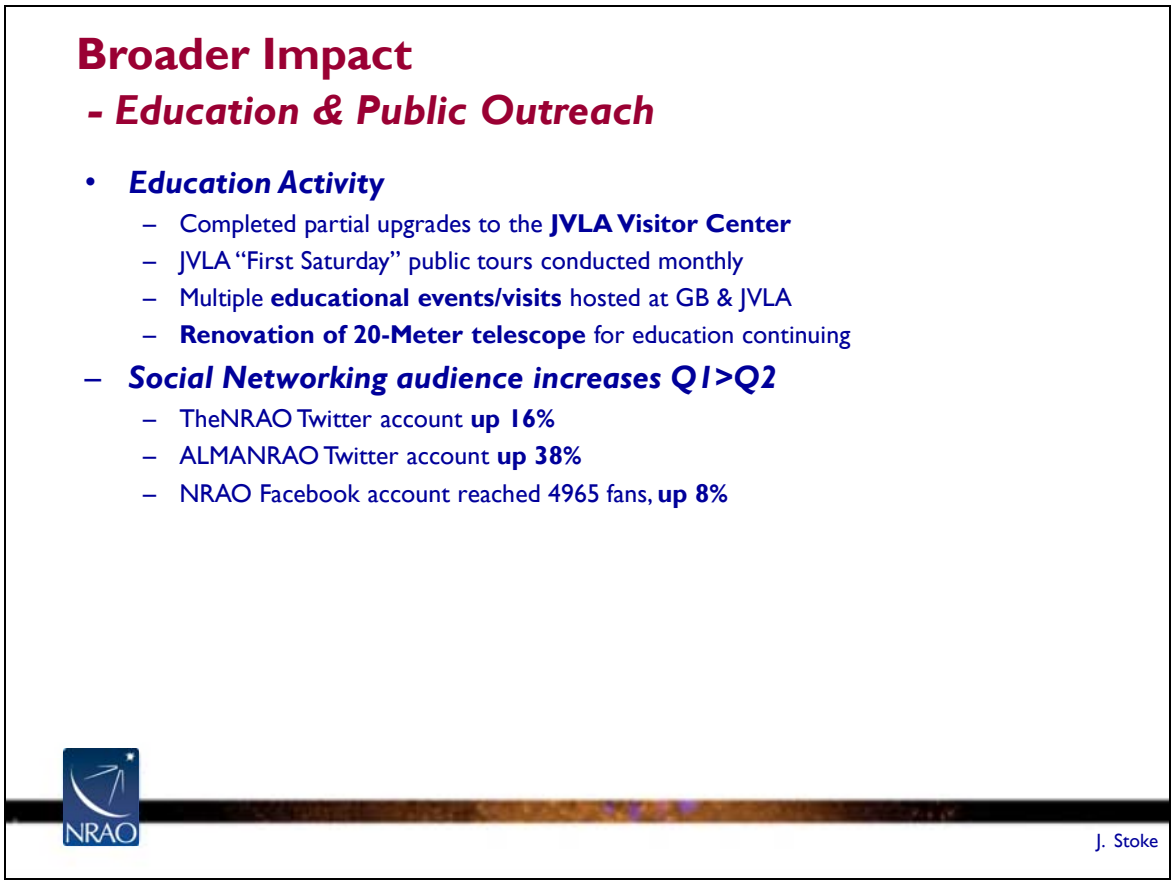
FIAN: Fisicheskii Institut Akademii Nauk = Physical Institute of the Russian Academy of Sciences, home of RadioAstron project
DDTC: Directorate of Defense Trade Controls (State Dept.)
AO = Advisory Opinion

Agenda

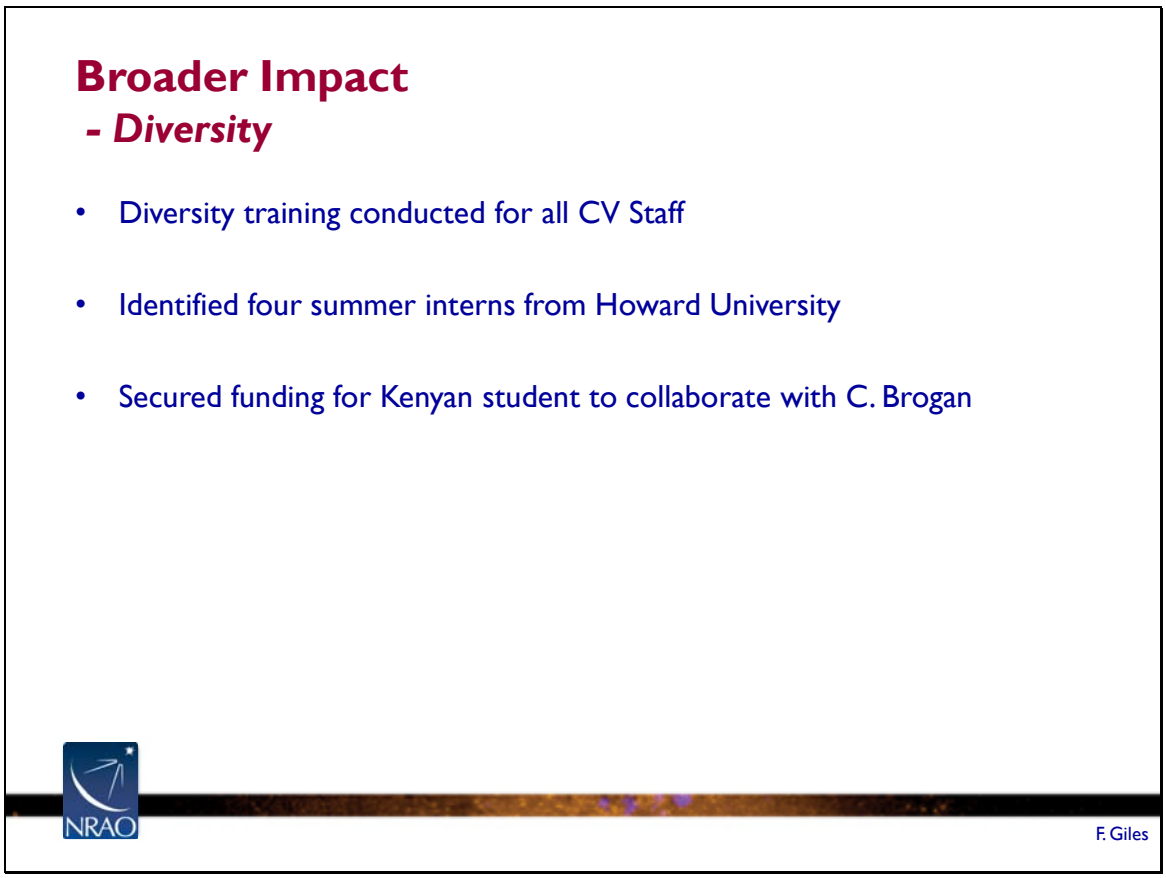
- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs (ODP)
  - Coordinated Development Laboratory
  - New Initiatives Office
- Broader Impact
  - Education and Public Outreach
  - Diversity
- Observatory Administrative Services
- Director's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



National press releases: (1) "VLBA, RXTE Team Up to Pinpoint Black Hole's Outburst" (http://www.nrao.edu/pr/2012/diskjet/); (2) "Iconic Telescope Renamed to Honor Founder of Radio Astronomy" (http://www.nrao.edu/pr/2012/jansky/); (3) "ALMA Early Science Result Reveals Starving Galaxies" (http://www.nrao.edu/pr/2012/almastarvinggalaxies/); (4) "From Earth's Water to Cosmic Dawn: New Tools Unveiling Astronomical Mysteries" (http://www.nrao.edu/pr/2012/aaasdisks/), issued in conjunction with an NRAO-sponsored science symposium at the February AAAS meeting, and featuring an ALMA science result; (5) "Pulsars: The Universe's Gift to Physics" (http://www.nrao.edu/pr/2012/aaaspulsars/), issued in conjunction with an NRAO-sponsored science symposium at the February AAAS meeting; (6) "Anthony Beasley Appointed Director of NRAO" (http://www.nrao.edu/pr/2012/beasley/); "Astronomers Get Rare Peek at Early Stage of Star Formation" (http://www.nrao.edu/pr/2012/clumpcores/), "Famous Radio Telescope Officially Gets New Name" (http://www.nrao.edu/pr/2012/rededicate/). JVLA Explorer (virtual tour) details: Site is at http://www.nrao.edu/explorer/vla/TheVLAExplorer.php and features 57 exclusive, narrated or guided video tours of the Jansky Very Large Array, its facilities, and its surroundings. ALMA Explorer (virtual tour): http://www.nrao.edu/explorer/alma/TheAlmaExplorer.php. NYT Article: http://www.nytimes.com/2012/04/08/world/americas/high-in-chilean-desert-a-huge-astronomy-project.html?_r=2&ref=world. JVLA Public astronomical images: Created from multi-configuration JVLA observations of M51, M82, W50, and Hercules A for display during the JVLA official re-dedication ceremony, and public release in the upcoming quarter. New York Times: Visited GD/Vertex facility at ALMA in March (article published in April).



JVLA Visitor Center upgrades (partially completed for 31 March array rededication): New super-large HD video screen showing selected clips from the JVLA Explorer Virtual Tour; New transparencies (first since 1983!) for the lightbox structure (which was electrically renovated and brought up to code); new internal paint scheme; new products for the gift shop. Additional improvements in the works. GB overnight educational events participants (conducting research with the 40-foot telescope): Calvert County Northern Middle School (MD); Davis and Elkins College (WV); Radford University (VA); Boy Scout troop 50 (VA); Cub Scout Pack 91 (VA); Fort Hill High School (MD); Civil Air Patrol (WV); Carnegie Mellon University (PA); Granby High School (VA); Linwood Holton Governor's School (VA); Providence Day School (NC); Glenville State College/Fairmont State University (WV). Other Green Bank event: Hosted the first annual Pocahontas County Science Fair at the Science Center. VLA Event: Tour given to UNM Continuing Education Department. Renovation of GB 20-Meter: Renovated GB 20 Meter Telescope will be used as a development platform for a radio version of Skynet, with the goals of: (1) providing radio astronomy research and research training opportunities to a larger community; (2) expanding the reach of NRAO-Green Bank's EPO programs from regional to national and international scales, and; (3) enabling collaborative research and development in radio astronomy instrumentation. During the reporting period a fully functional 20 Meter telescope was realized, with the following milestones completed: (a) Completion of the 20 Meter backend and execution of several modes of data acquisition; (b) Completion and installation of the 20 Meter X-band receiver; (c) Installation of 20 Meter monitor and control station in the NRAO telescope control room; (d) Successful integration with Skynet telescope control interface at the University of North Carolina.



Conducted three diversity sessions at ER. Staff provided feedback and suggestions in regards to diversity initiatives that would be relevant to CV. Several staff members have expressed interest in being members of the employee diversity group. We are in the process of planning lunch and learn sessions with a cadre of diversity topics.

We have secured an engineering internship with a Howard University student and Richard Bradley has committed to serving as his advisor. Aaron Evans will serve as advisor for three Howard University students this summer.

Crystal Brogan will serve as advisor to a Kenyan student for two weeks in June.

Broader Impact
- Diversity New Hires

- ***Green Bank***
  - None
- ***Socorro***
  - Hispanic Male (Array Operator)
- ***Charlottesville***
  - White Female (Head of Observatory Budgets)

J. Firmani w/ input from Giles/Franks

Broader Impact
- *Diversity Promotions*

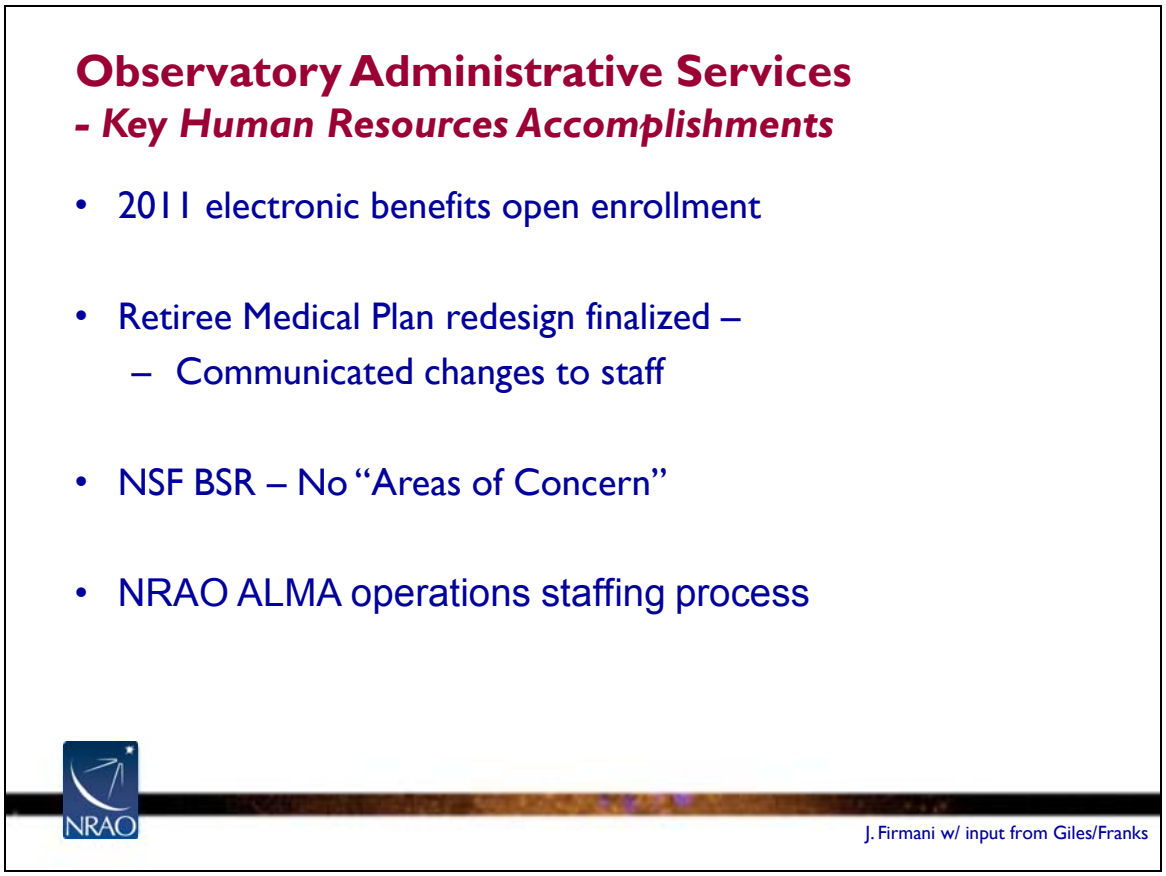
- ***Green Bank***
  - White Female (Budget Manager Sr.)
- ***Socorro***
  - None
- ***Charlottesville***
  - White Female (Associate Scientist) – JAO
  - African American Male (Grants Administrator)

J. Firmani w/ input from Giles

Green Bank – Christine Plumley
CV – Alison Peck, Anthony Turner

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



2011 Electronic Benefits Open Enrollment – HR successfully concluded the electronic open enrollment process, which included troubleshooting HRIS problems that were impacting employee paycheck deductions and benefit selections. Post enrollment review of HRIS problems aided in establishing a course of action that NRAO's MIS will take to correct problems and test in time for the 2013 Electronic Benefits Open Enrollment process.

Retiree Medical Plan Redesign – The milestone of implementing the first phase of the Retiree Medical Plan was met in Qtr 2 FY 2012 as outlined in the Program Operating Plan. The final plan changes to the AUI Retiree Medical Plan were made during the quarter. Changes include freezing the current plan to new hires effective January 1, 2012; establish grandfather rules for the current plan for existing employees based on age (45 during CY 2012) and years of service (at least 15 during CY 2012); increase eligibility rules to age 60 and 10 years of service equaling 70 or above; charging premiums for new over age 65 retirees effective January 1, 2013; and establish a Health Savings Account/High Deductible Health Plan for employees not eligible for the current retiree medical plan effective January 1, 2013. An all employee communication was sent out on March 25th that included a letter from Drs. Schreier and Lo announcing the changes to the AUI/NRAO Retiree Medical Plan, which included a link to a Q&A on the NRAO HR Retiree Medical webpage. Employee meetings are scheduled for the end of April.

NSF BSR – No "Areas of Concern" – Completed the NSF Business Systems Review in March with no "Areas of Concern" reported by NSF. Three suggested improvements were reported, which HR will institute as part of its goals and objectives.

NRAO ALMA Operations Staffing Process – HR worked with the NRAO ALMA management team to develop and execute a process that completes the transition of employees from AMLA construction to ALMA operations positions. The process included creating jobs descriptions for all operations positions and identifying which positions would be posted (majority) and those that could be filled directly (five) with the appropriate supporting documentation (completed and approved).

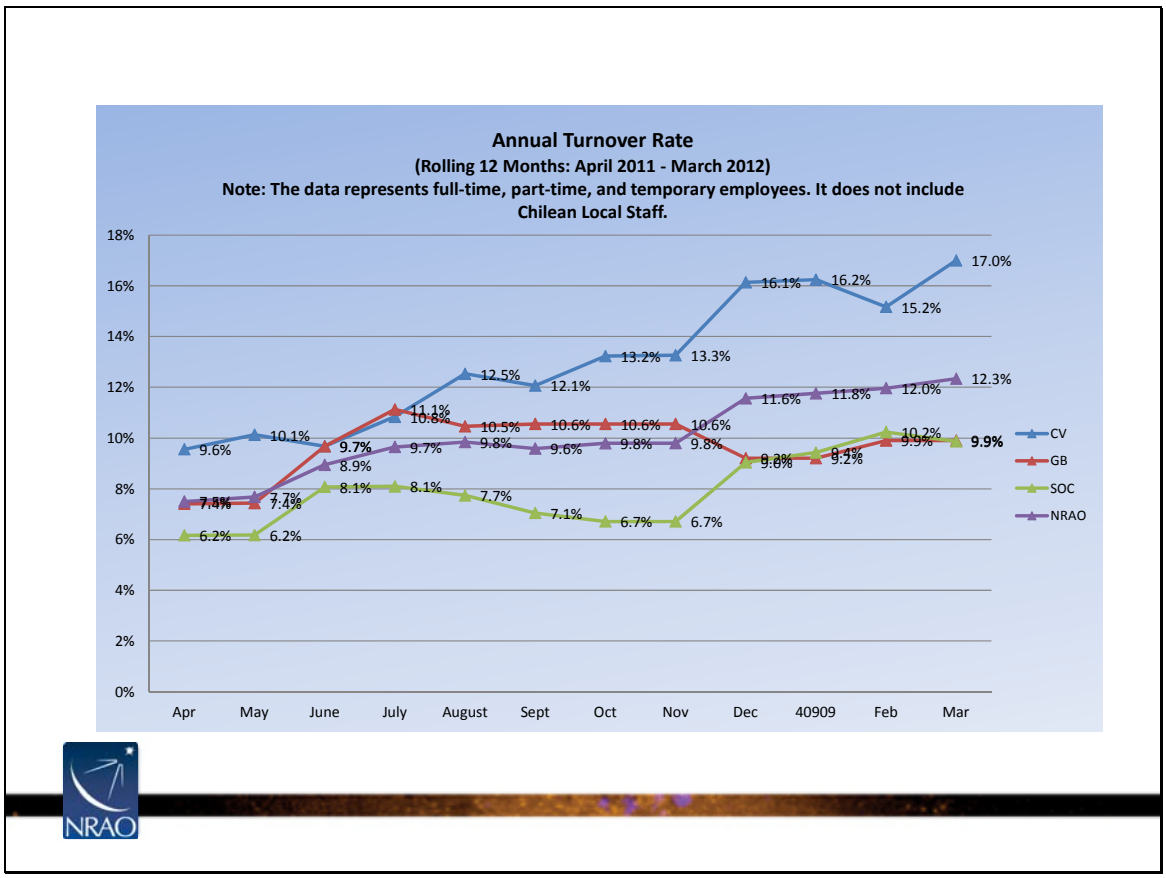
Developed proposal for 2012 Promotion and Equity Process – In preparation for the FY2013 budget, NRAO Human Resources advised the NRAO Management that an employee promotion and equity review process similar to the one used last year is under consideration for 2012, dependent on AUI approval and availability of funds.

Pay increase would still take place during 2012 under the following circumstances:

• An employee applies and is selected for a higher grade position.
• A department is restructured and certain jobs receive a significant increase in responsibility.
• Temporary management supplement.
• To address an EEO (Equal Employment Opportunity) pay inequity.

HR security doors installed - HIPAA compliance – Electronically locked security doors were installed to add a further layer of protection of HIPAA information during non-business hours. Access is provided only to people who need access to the area during non-business hours. The primary protection for HIPAA sensitive information includes encrypted HR computers, locked/fireproof files cabinets located behind a locked (key) door (key access only to people that need to access room).

Lactation Room Completed - NRAO completed the renovation of an empty room to provide a fully furnished and compliant lactation room for NRAO employees and post-docs.



The annual termination levels from Qtr 3, 2011 through Qtr 2, 2012 reflect a mixture of voluntary resignations, ALMA Construction Roll-Offs and the Early Retirement Option.

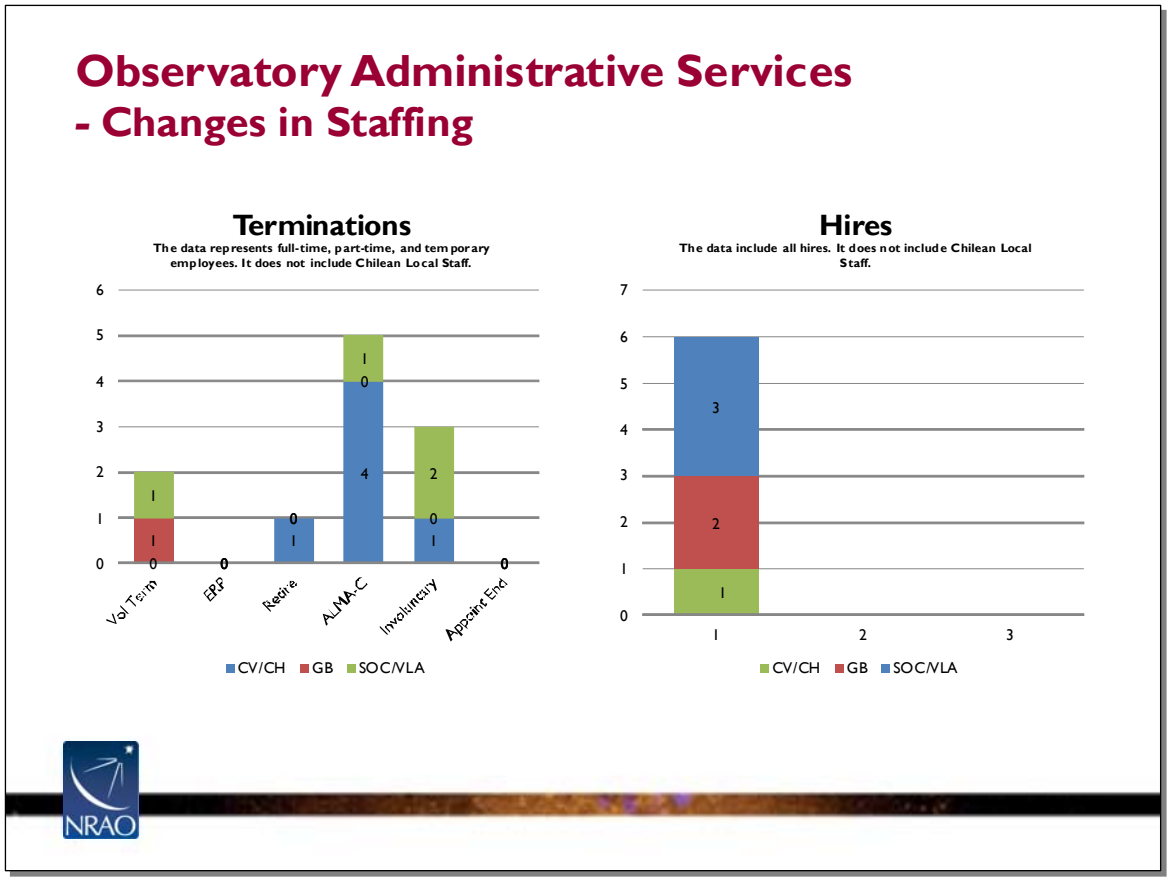
In consideration of the ALMA Roll- Off schedule, it is projected that the turnover rate will continue to rise. Of the 131 employees who are scheduled to roll off of the project, 32 employees have left the Observatory while 32 employees have transitioned into other jobs within the Observatory. 54 employees have received notice of separation. In Qtr 4, 6 employees are scheduled to roll off.

Qtr 3, 2011 - there were 5 voluntary terminations in GB; and 2 in SOC and CV. There were 4 Early Retirements is GB and SOC and 1 in CV. 7 ALMA C Roll- Offs 3- in CV & 4 in SOC.

Qtr 4, 2011 - voluntary terminations included 3 in CV; 1 in GB and 1 in SOC. 1 retiree in SOC. ALMA Roll-offs 3 in CV and 1 in SOC. The 20 GB summer hires were terminated.

Qtr 1, 2012 – 6 voluntary terminations – 4 in CV and 2 in SOC; Early retirements 2 in CV and 3 in SOC. Of the 3 ALMA Roll-offs 2 were in SOC and one in CV. 6 GB Summer hires terminated.

Appointments ended: 3 in CV, 2 in GB and 1 in SOC.
Qtr 2, 2012 – 2 voluntary terminations 1 GB and 1 SOC; 1 Retirement in CV, ALMA Roll- Offs 4 in CV and 1 in SOC.



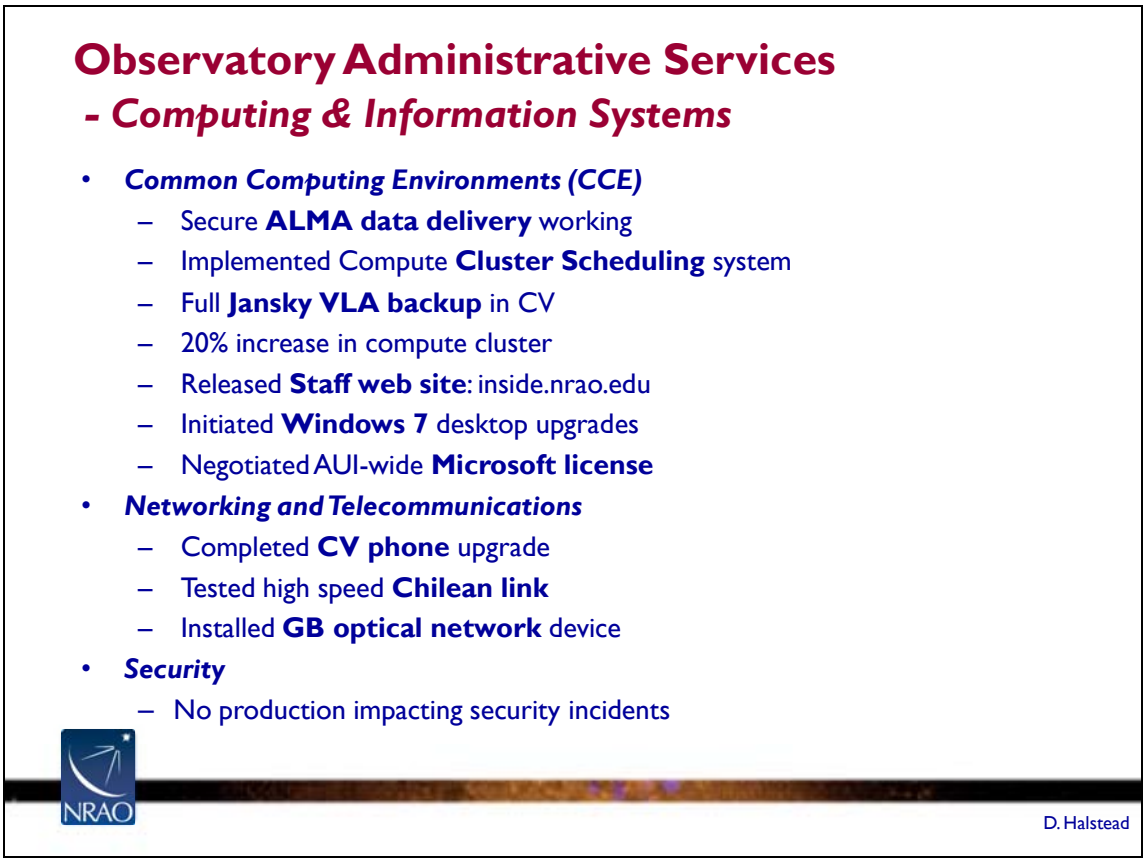
Charts provide a breakdown of terminations and hires for Qtr 2 2012.

Terminations:

Voluntary Terminations: 1 Hispanic Male – SOC
1 White Male – GB
ERP: None
Retirement: 1 White Female - CV
ALMA – C Roll-offs: 1 White Male - CV
1 African American Female - CV
1 Asian Male - CV
1 White Male - CV
1 White Male – SOC
Involuntary terminations: 1 Hispanic Male – LOA ended – eligible for LTD
1 Asian Male – Term/cause
Voluntary termination: 1 White Male
Appointments ended: None

Hires:

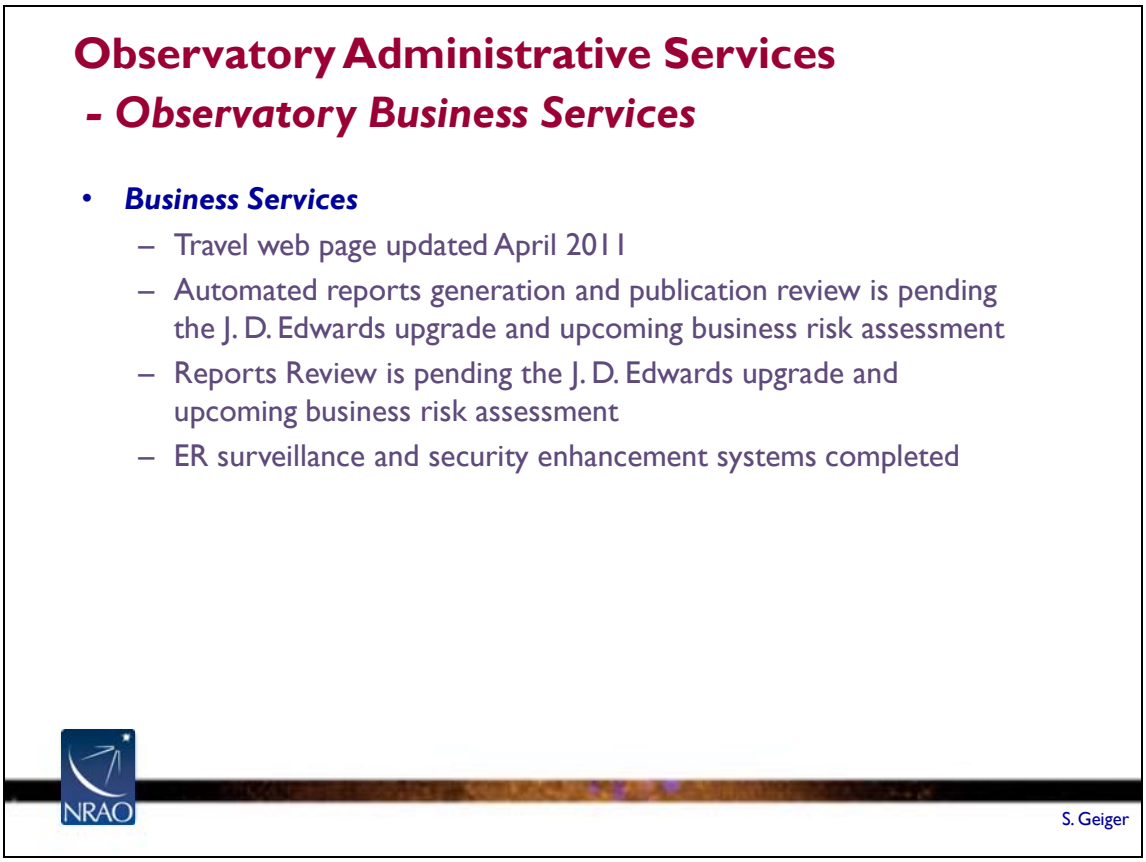
1 Head of Obs Budgets (CV)
2 Systems Admin (GB) and (SOC)
1 Co-Op student (SOC)
1 Array Operator (SOC)
1 Scientific Associate (GB)



Common Computing Environments (CCE): Interim solution provided for Cycle 0 ALMA data delivery running well with secure login for PIs. Torque parallel system scheduler now running on 16 NAASC compute cluster nodes (in preparation for ALMA Pipeline testing in Q3). Full replica of J VLA archive now in CV. 4 file storage and 4 compute nodes added to facilitate JVLA and GBT data processing. Released inside.nrao.edu staff web site with updated computing guide. System Center for Microsoft now managing Windows 7 OS distribution. Negotiated AUI-wide software contract with Microsoft to cover all AUI employees

Networking and Telecommunications: Completed last part of CV phone upgrade with Emergency 911 call location alert. US link to JAO Chile was tested and confirmed at 100+Megabit/sec in preparation for Q3 delivery to NAASC. Installation and fiber build-out for Green Bank high speed Internet link continues (Q4 delivery).

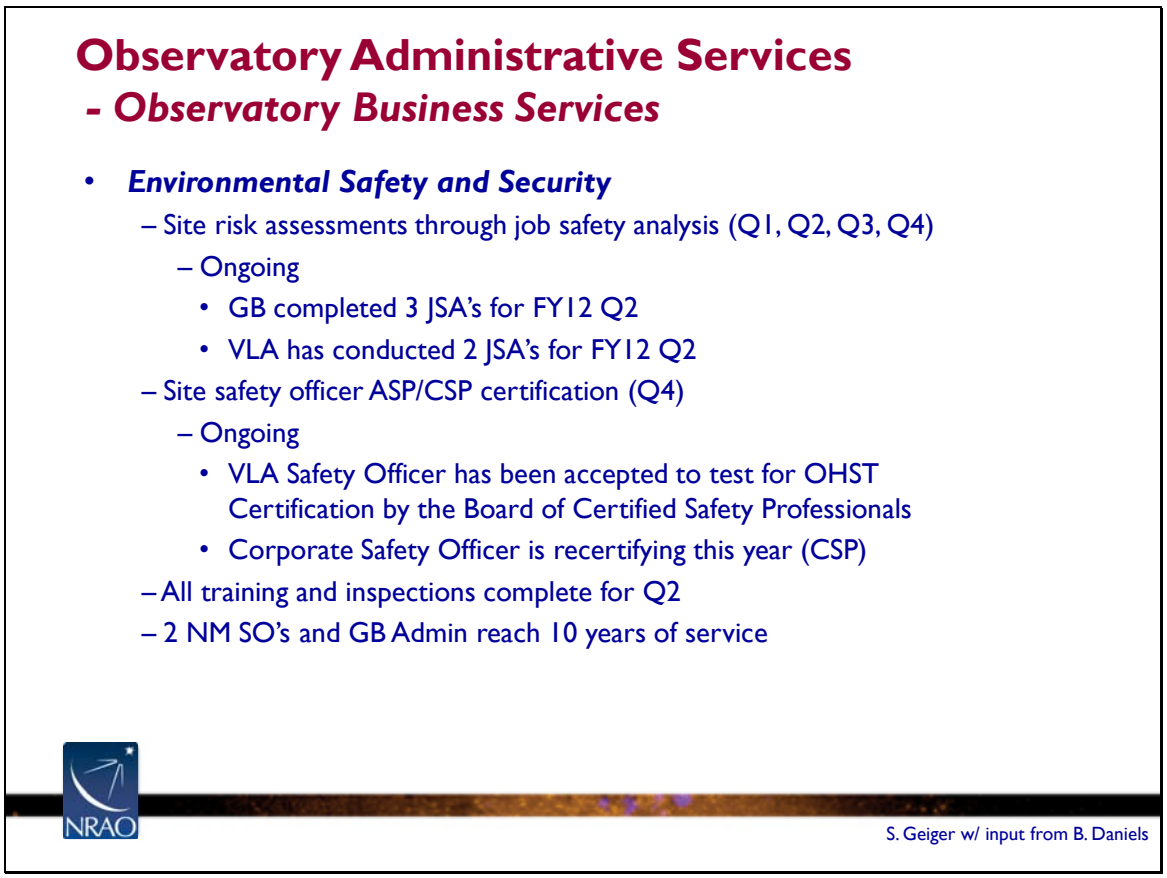
Security- No major issues, although an increase was seen in frequency and sophistication of socially engineered attacks targeting staff



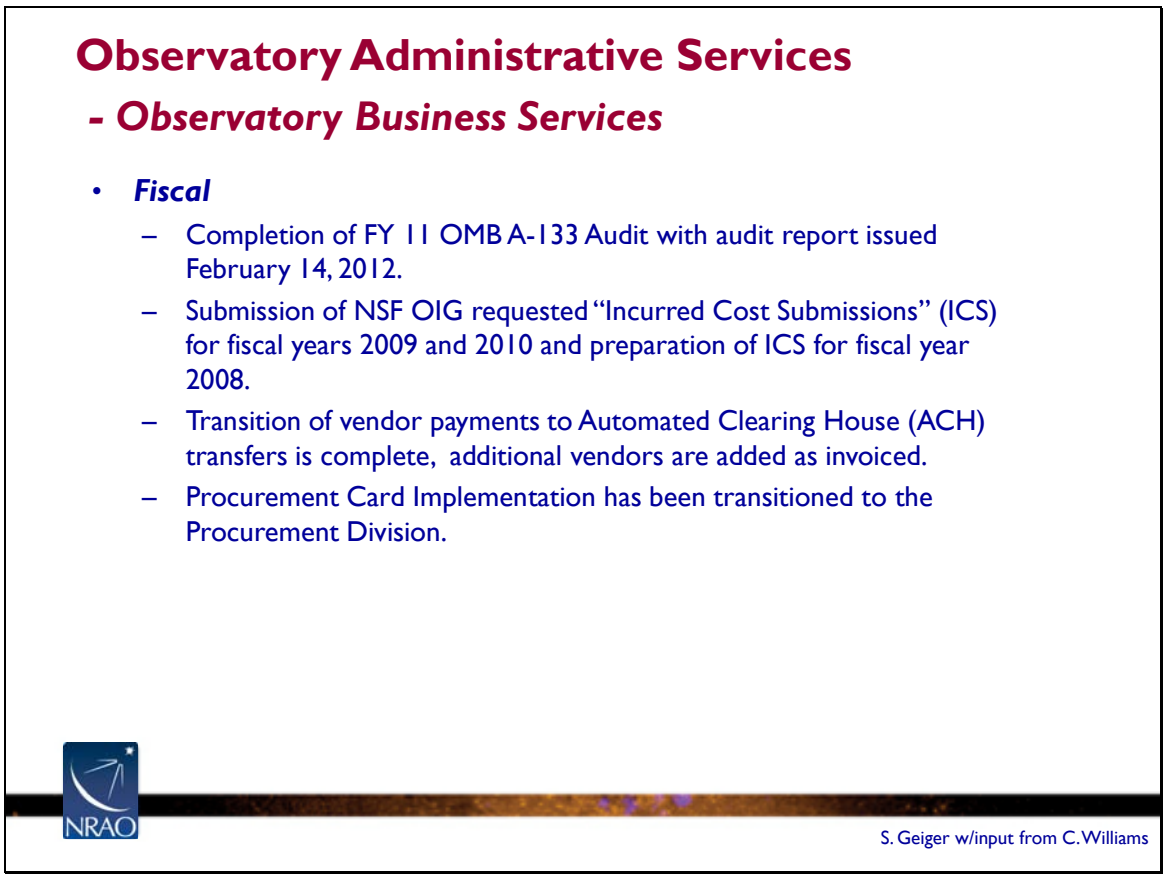
The travel web page was updated to link to the updated travel policies pages.

The J.D. Edwards upgrade should be completed in June 2012. The **Automated reports** and **reports review** will be part of the upcoming business risk assessment. The NRAO Fiscal Office and AUI Audit Committee will begin the assessment process in the 4th Quarter of FY 2012 via the AUI internal audit firm.

The ER **surveillance review** and **security enhancements** were completed in the 2nd Quarter of FY 2012, including the installation of a new door securing the HR and Budget corridor during not working hours.



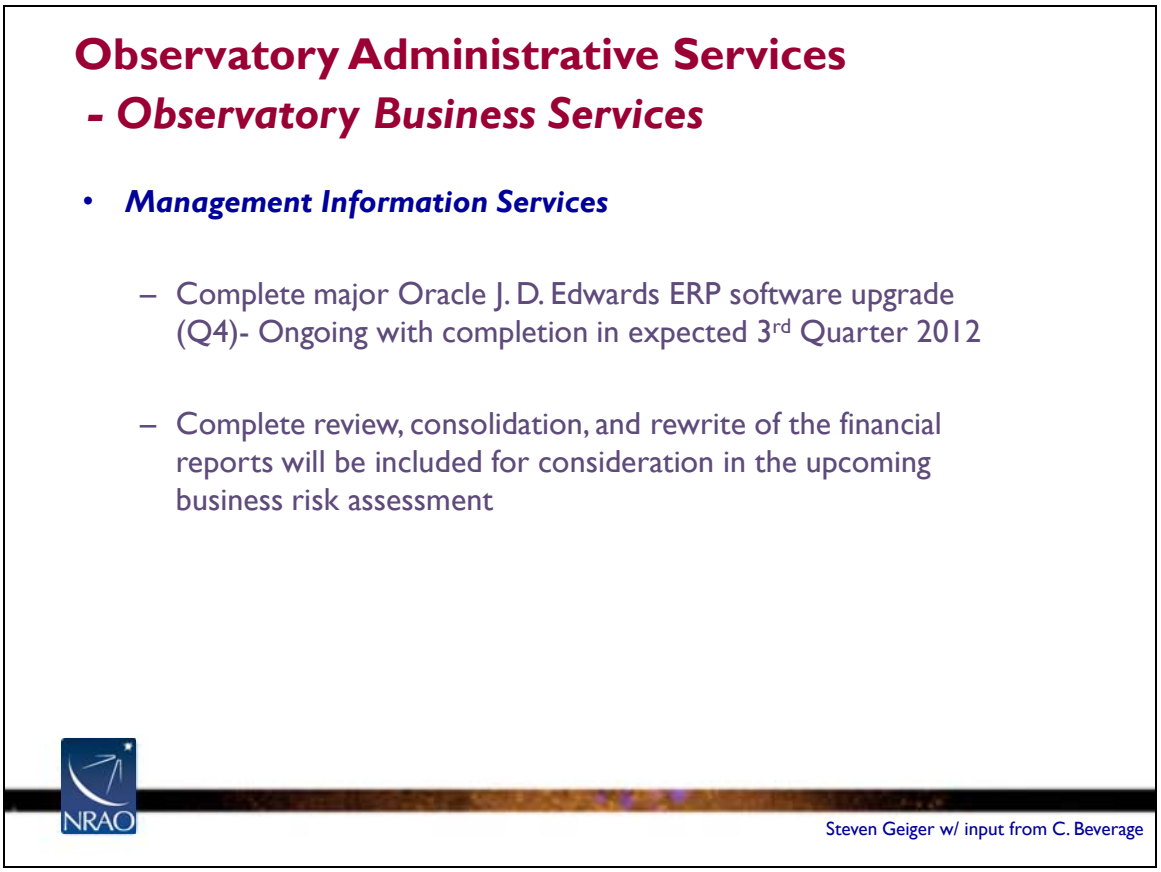
Both GB & the VLA are conducting **Job Safety Analysis (JSA) activities**. **Formal JSA** is taking place for extremely high risk work (HV Electrical for instance) with simple toolbox meetings for lower risk jobs. **PPE** for Safety Consumables are within norms (quarter to quarter) and rational for the number of people assigned at the sites. **Site training** included hazard communication, confined space refresher, lockout/tagout, and CPR/AED/First Aid. GB/CV **Recycled** 70 pounds of small batteries via the "Big Green Box" (2 boxes) and NM recycled 1550 pounds of aluminum scrap and 600 lbs steel chips. The **annual fire extinguisher inspections** were conducted at GB/CV/NTC/SO/VLA, as well as the **annual hazard communication** programs updating (MSDS/HazCom). **One Environmental incident** was reported at the VLA – minor Diesel fuel oil spill due to power failure – all related issues closed without regulatory activity (no NoV, no citation; spill lost less than 50 gallons and was cleaned up per Fed/State requirements). NM has now fully complied with the NM Petroleum Tank Storage Board training requirements issued in 2011. James Sullivan, Lonnie Guin and Andrea Taggart (half-time Safety Division) reach the 10 year milestone.



The AUI/NRAO OMB A-133 Audit report for fiscall year ended 09/30/11 contained an unqualified opinion with no findings, material weaknesses, questioned costs or required audit adjustments. In the report on Internal Control on Compliance, the auditors noted one significant deficiency pertaining to support of salaries and wages specific to the Office of Chilean Affairs. Management's response to the deficiency documented three actions that were immediately implemented to correct the deficiency.

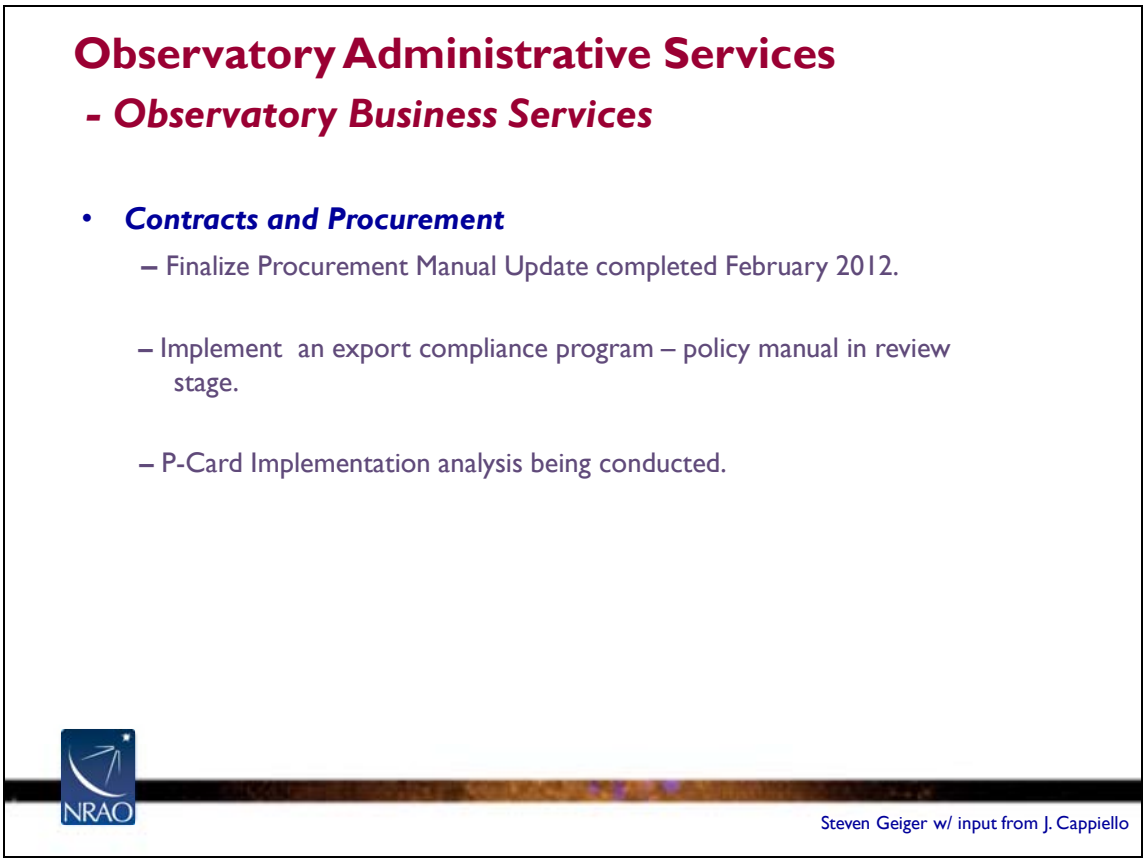
AUI/NRAO received a request via the NSF Contracting Officer from the NSF OIG on 06/28/11 to submit the Incurred Cost Proposals for fiscal years 2008, 2009 and 2010. Due to scheduling conflicts with the OMB A-133 External Audit and fiscal year close process, the request for extension of time to file was granted by the Cognizant Agent.

The Vendor ACH implementation process is complete with approximately 35 % of total vendor population on active ACH status. Additional vendors are added as invoices and required banking information and approvals are received.



The **upgrade to the J. D. Edwards** system is nearing completion. Testing is under way in the 3rd Quarter of 2012 and is expected to be completed before the end of the quarter.

Automated reports and **reports review** will be part of the upcoming business risk assessment. The NRAO Fiscal Office and AUI Audit Committee will begin the assessment process in the 4th Quarter of FY 2012 via the AUI internal audit firm.

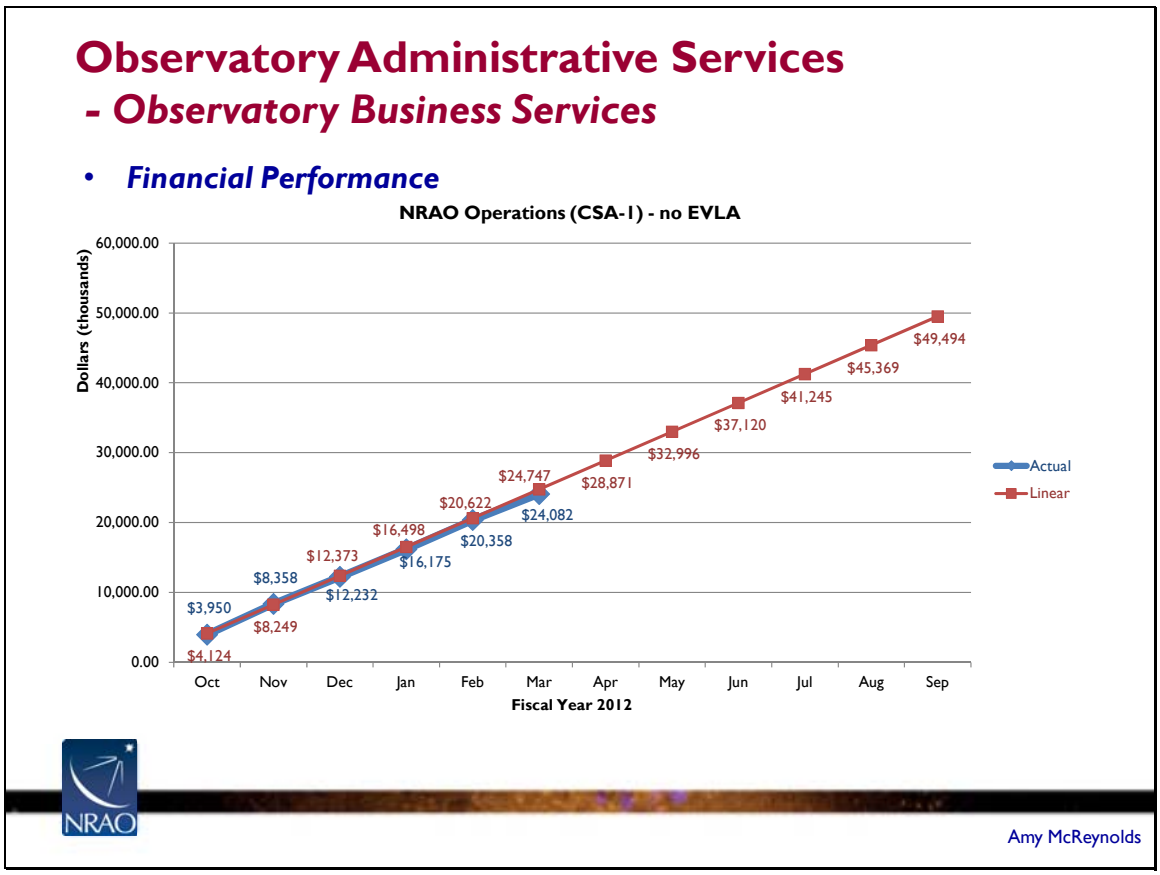


The **updated procurement manual** was completed in February 2012, posted to the NRAO website, and distributed per the plan.

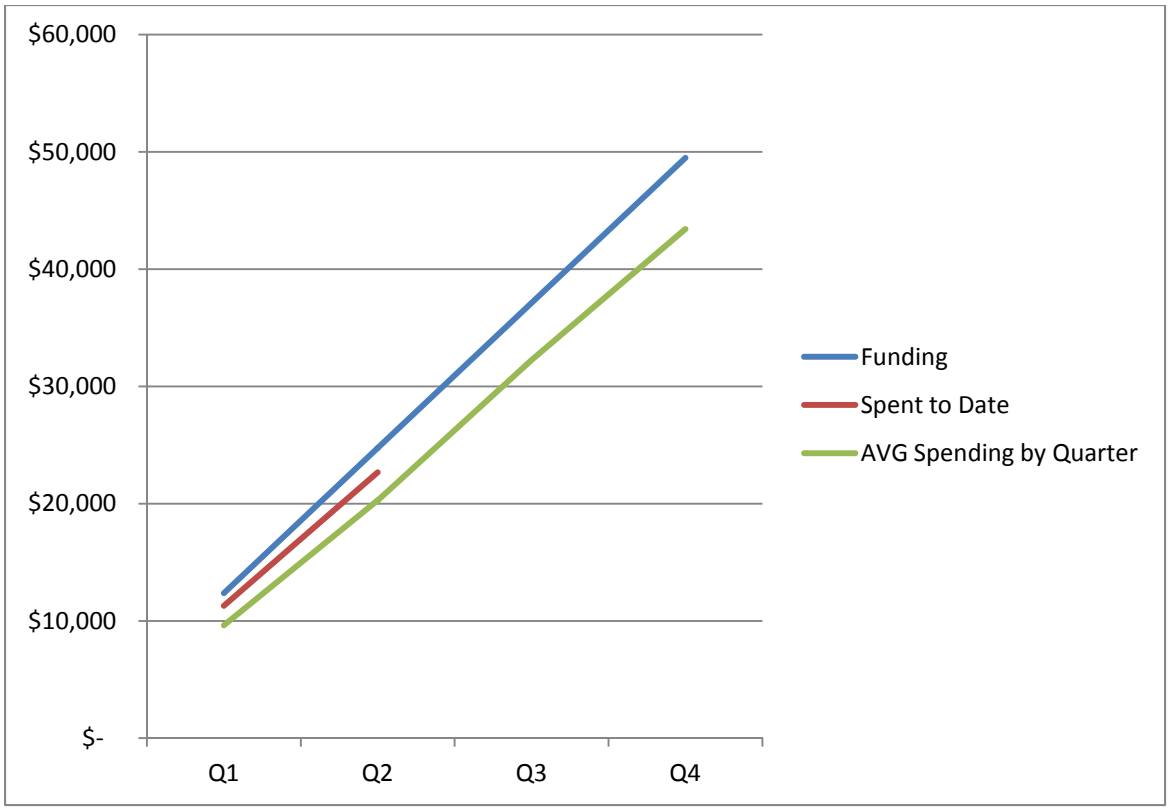
Observatory business Services had an objective this fiscal year to implement an export compliance program. One of the activities leading to the full implementation is in providing an **Export Compliance Program Manual.** The manual is currently in review with a projected Implementation date end of May 2012.

The procurement website internal and external pages have been updated and are now complete. In addition, a revised **Procurement Manual** has been posted to the NRAO webpage.

An analysis of whether to proceed with the **P-Card** is being conducted to determine if implementing this process will be beneficial in saving processing time or not. The determination will be made by end of April 2012.

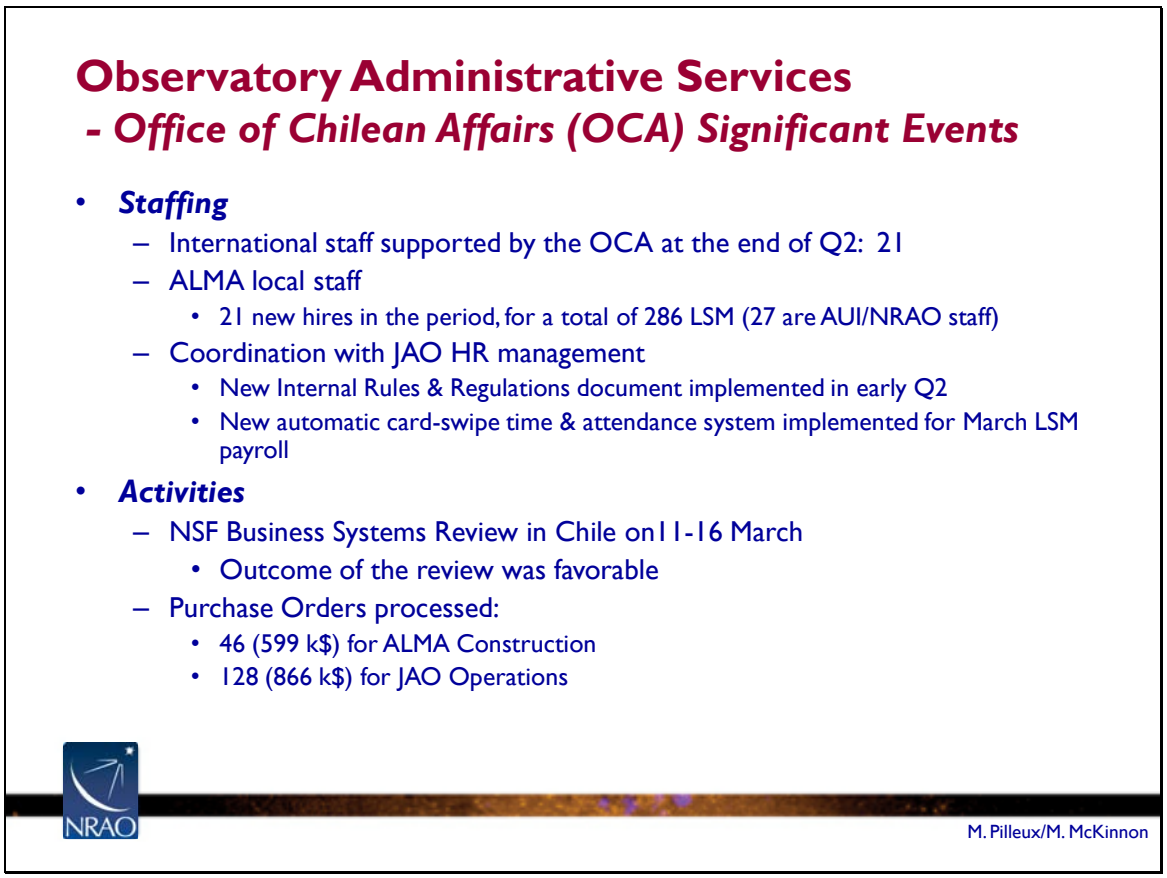


NRAO Operations (less J VLA) FY 2012 new funding allocation is $42,890.0K. Total available funding including prior year commitments and carryover totals $49,494K. Total expenses and commitments for the first half of FY 2012 is $24,082K or 45.8% of total available funds. Benefits are ahead of spending projections due to higher than anticipated medical claims. NRAO budgets for 32.5% benefits rate, however, as of March the actual benefits rate was 36.6%.



CSA-1 only. (Graph does not include CSA-2, SPO-2, EVLA-C, other SPOs and CSAs.) Includes carryover, NSF authorization + prior year commitments. Spending excludes commitments.

- OSO
  - Community Support spending usually occurs in 3-4th quarters as students come to NRAO for summer projects.
- OTO
  - Green Bank's general expenditure trends are weighted toward 3-4th quarters with summer programs, summer maintenance including telescope painting.
- ODP
  - Underspend in CDL due to FTEs charging to ALMA-C.
  - NIO paid 50% of severance/vacation payout to a department employee in Q1 and also has more FTEs charged to NIO projects than originally budgeted for.
- DO
  - Some budgeted Post-Doc positions have not been filled as of Q2.



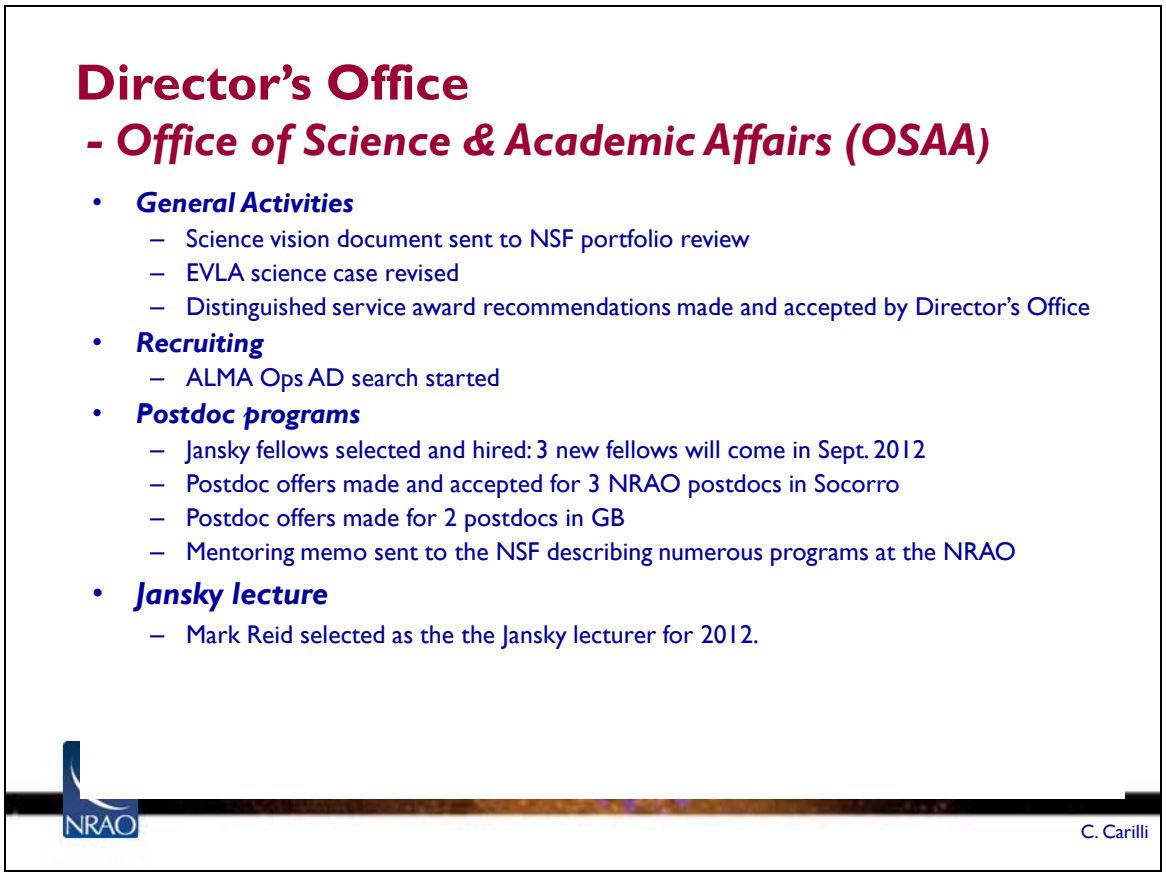
OFFICE OF CHILEAN AFFAIRS (OCA): The number of **international staff** at the end of Q2 is 21 FTE. OCA has increased the total number of **Local Staff Members** employed in the quarter, bringing the total number of employees for which OCA provides ALMA with legal, payroll and travel support to 286 local staff on 31 March 2012 (27 are under AUI/NRAO direct supervision).

The **NSF Business Systems Review** of the NRAO was held in Chile on 11-16 March to review the activities of the OCA in support of ALMA. The review included a visit of the ALMA OSF and AOS facilities. The review panel was able to see the damage that occurred the previous weekend due to a localized rain event. The BSR team indicated they were satisfied with their review of the OCA.

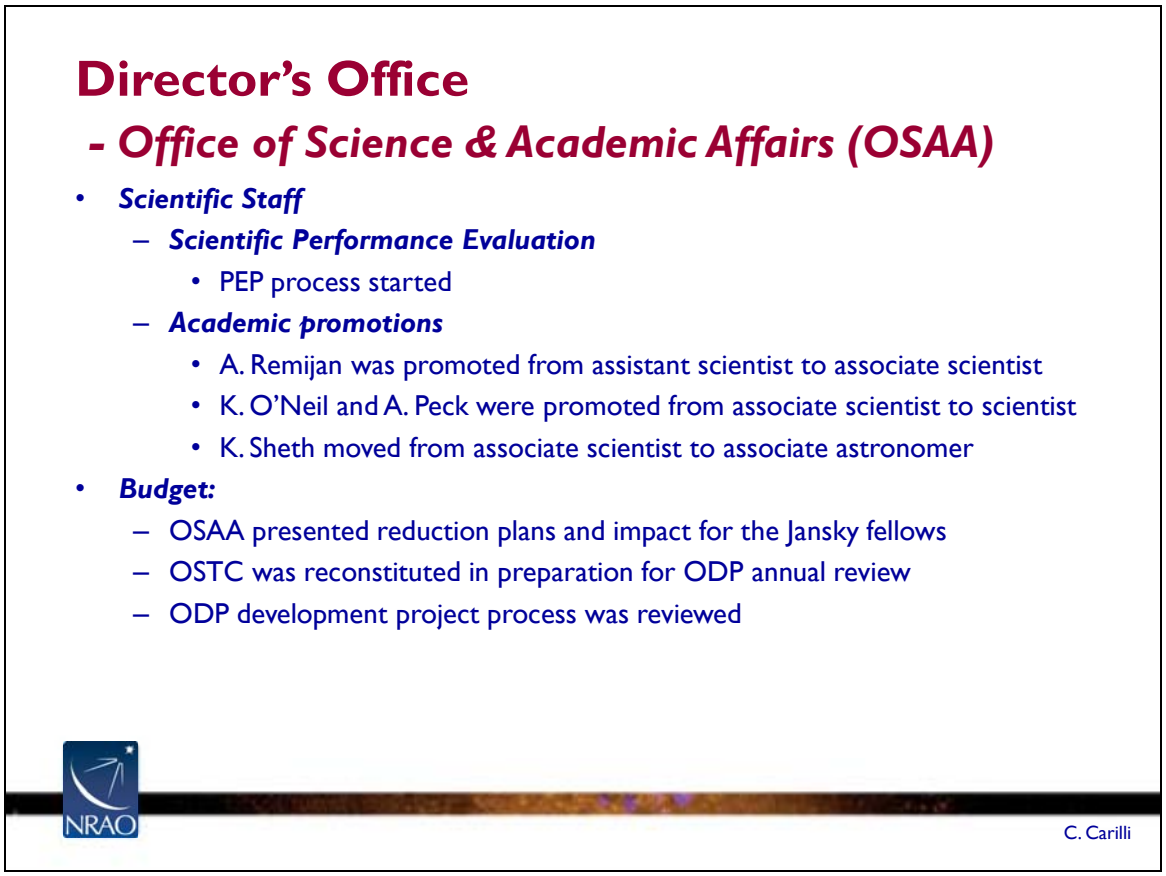
OCA has provided the legal and institutional support for contracts and procurements for ALMA as follows: a total of 46 purchase orders were issued for ALMA Construction (599 k$) and 128 for ALMA Operations (866 k$). The termination of the AOS Utilities – Electrical and FO cables installation contract with Echeverría & Kelly Ltda. continued to involve additional litigation with a ruling expected during Q3 FY2012. Reports were issued to CONAMA (environmental authority) related to flora/fauna and archaeological follow-ups.

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)
  - Communication
  - Spectrum Management



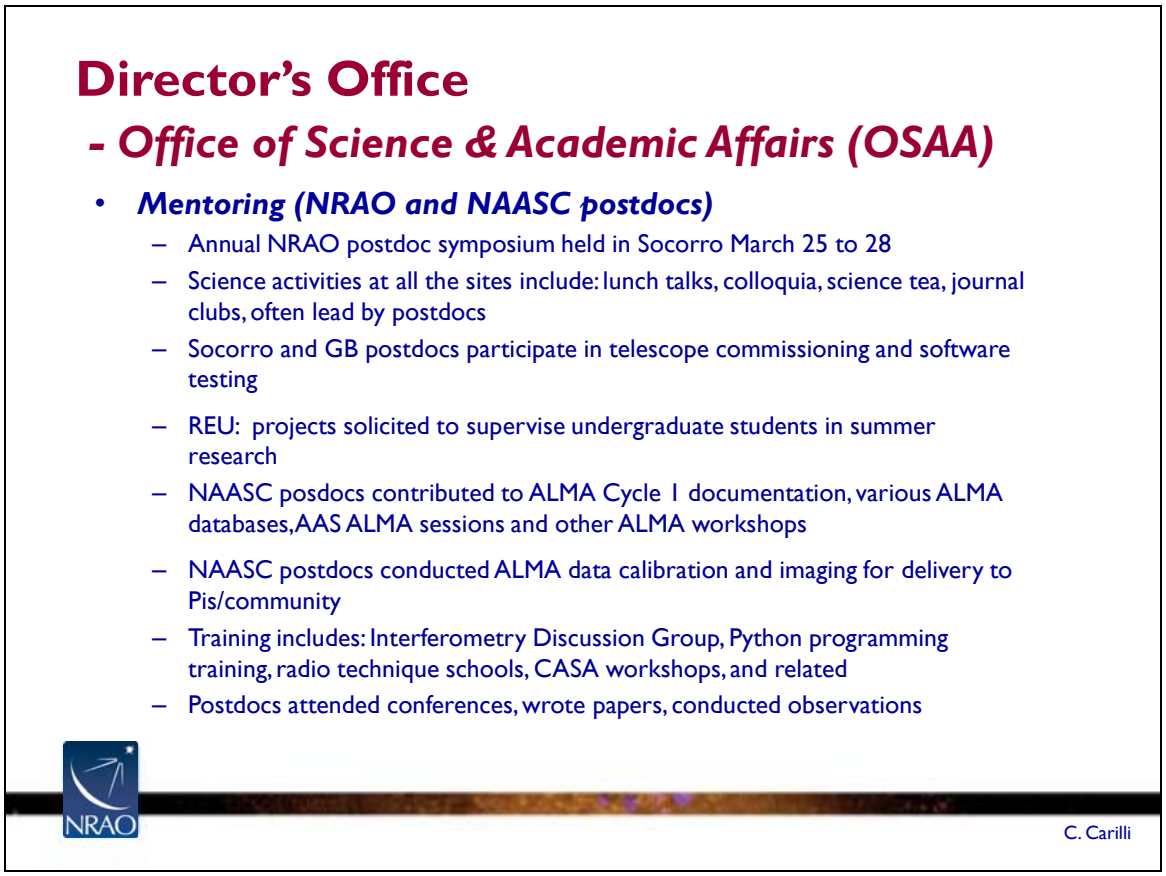
Nominations were received from the community for 7 outstanding candidates. The committee reached a clear consensus this year to award Mark Reid of the CfA with the Jansky lecture, for his seminal work on VLBI studies of the Galaxy, and in particular for his pioneering work on Galactic astrometry using the VLBA. Mark was nominated by R. Genzel, J. Moran, and A. Readhead.



Staff were contacted by HR and OSAA to begin the PEP process. OSAA has developed a timeline for PRCs that is consistent with PEP process.

Sheth moved to Astronomer track as per his agreement with previous OSAA Head and NRAO Director.

Jansky program will have 9 fellows in FY2013, which is a reduction of 3 relative to normal steady-state, reflecting budget constraints. We hope to restore steady-state level in the coming two years.

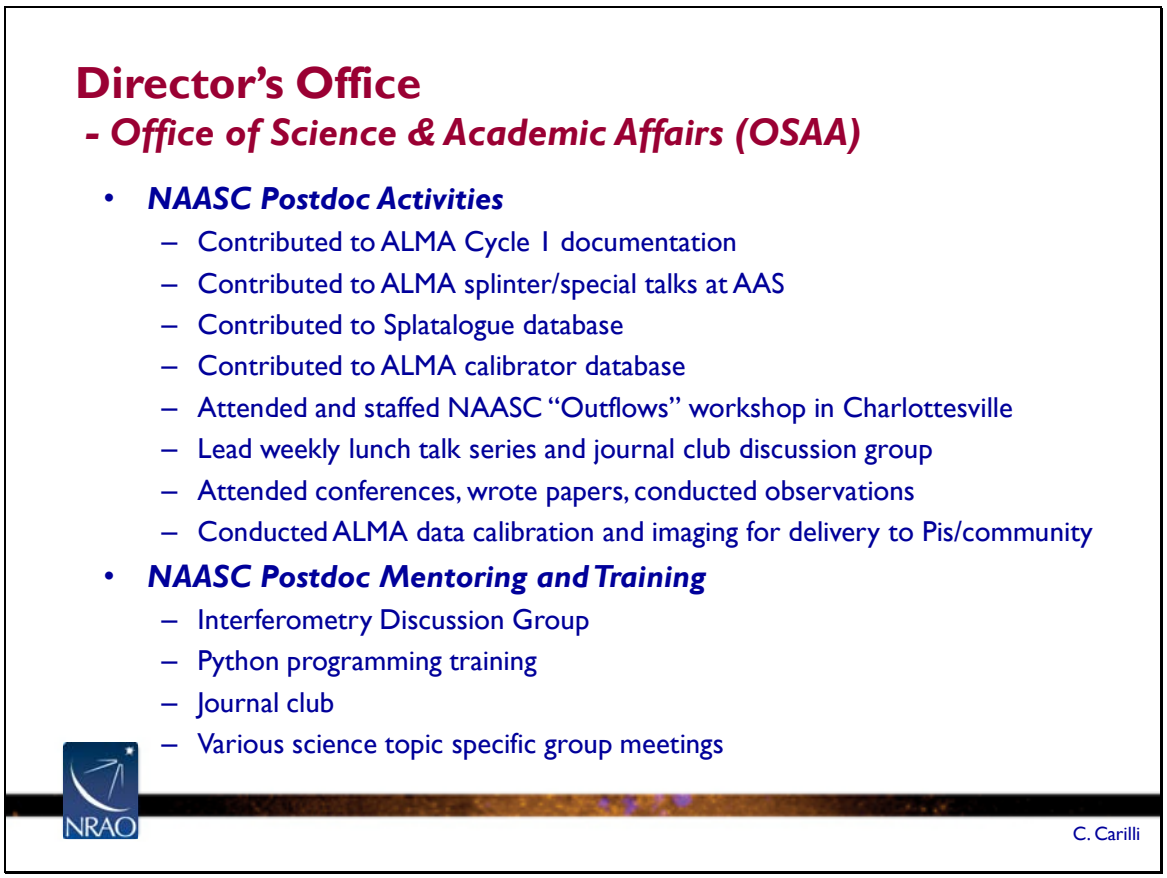


Postdoc symposium: 17 postdocs attended, and gave talks. Yancy Shirley from the Univ. of Arizona was this year's guest speaker. Socorro Jansky Fellow N. Roy helped organize the meeting http://www.aoc.nrao.edu/events/pdsym2012/. In Socorro, N. Roy participated in RSRO commissioning. M. Krauss led the CASA data reduction workshop at Caltech in January, and helped with the EVLA data reduction tutorial in Socorro in February as a tutor. Socorro pizza lunch is organized by Jansky fellow N. Roy.

Cville tuna lunch is organized by postdocs N. Marcelino & JC Munoz. Cville astroph discussion group led by postdocs K. Scott, JC Carlos, J. Tobin, as well as numerous informal topical discussion group.

GB journal club and colloquia are organized by postdoc M. Johnson.

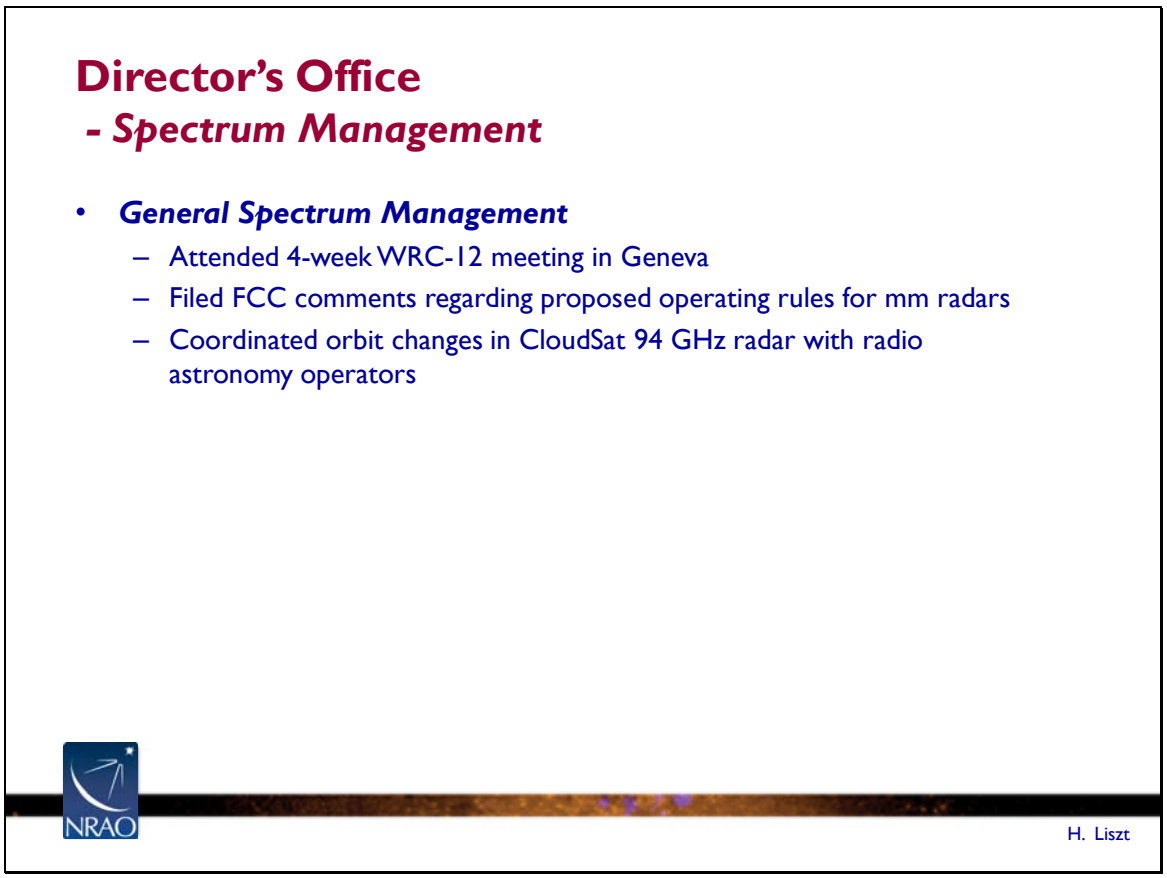
NAASC postdocs: Contributed to ALMA Cycle 1 documentation, contributed to ALMA splinter/special talks at AAS, contributed to Splatalogue database, contributed to ALMA calibrator database, attended and staffed NAASC "Outflows" workshop in Charlottesville, lead weekly lunch talk series and journal club discussion group, attended conferences, wrote papers, conducted observations, 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.



Postdoc Activities contributed to the operation of the NAASC, testing the Cycle 1 documentation, and giving talks and staffing the NAASC "Jets, Winds, & Outflows" conference we held in Charlottesville. Postdocs are getting more involved in ALMA data reduction for Science Verification data as well as PI data.

Postdoc Mentoring and Training was advanced by holding weekly discussion sessions on how interferometry works in practice, teaching an introductory Python class. Postdocs lead the daily journal club and lunch talk series and attend the various weekly meetings of the research groups at NRAO and UVa.

National Users Facilities Organization (NUFO) exhibition: This was the second NUFO exhibition on Capitol Hill; 45 physics and astronomy research facilities were represented. Last year's inaugural exhibition was held only in the House, while this year there were exhibitions in the Senate (Dirksen Office Building, 28 March, 2-6 pm) and in the House (Cannon House Office Building 29 March, 2-6 pm). The House event saw significantly more traffic.
See http://nufo.org/news.aspx?id=38



WRC-12: Led radio astronomy delegation as IUCAF rep. Main issues included proposed use of 15.4 GHz spectrum for drone aircraft control; use of various bands at 4 – 16 GHz for satellite phone uplinks; new airport surface radar at C-band. All except one serious threat to radio astronomy eventually dissipated for largely unrelated reasons. Remaining issue was Australian government support for use of aerostats as microwave links in remote inland areas.

FCC comment: FCC is in process of setting operating rules for a variety of mm-wave radars ranging (pun!) from collision avoidance on cars to detecting debris on airport runways. NRAO is arguing for standoff zones, off-switches on car radars and general restrictions on operation of such devices within line of sight of radio telescopes. NRAO is often the only public body making comments on behalf of astronomy, even when they are specifically requested by the FCC**.**

CloudSat: Is using 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.