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Quarterly Status Update (QSU) Q3 FY 2011
April - June 2011

P. Jewell, L. Wingate - August 25, 2011

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

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Agenda

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

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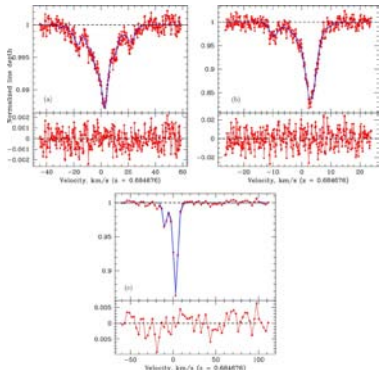
Science Results
- *GBT*

GBT Sets Limits on the Electron-proton Mass Ratio

Absorption lines from NH3, CS and H2CO at a redshift z~0.685 were measured against a background radio galaxy using the GBT. The inversion and rotational line frequencies have different dependences on the proton-electron mass ratio, mu, so a comparison between the line redshifts is a measure of any change in mu. The results give a 3-sigma limit of delta mu/mu <3.6e-7 over 6.2 Gyr. This is the best limit on changes in mu from any technique and for any look-back time (Kanekar, N. ApJL, 2011, 728:L12).



GBT spectra in the redshifted (a) NH3 (1,1), (b) CS 1-0, and (c) H2CO 000-101 transitions from the z ~ 0.685 absorber toward B0218+357. The upper panels show normalized line depth in each transition plotted against velocity relative to a heliocentric redshift of z = 0.684676; the three-component fit is overlaid on each spectrum. The lower panels show the residuals from the spectra after subtracting out the joint three-component fit; these are consistent with noise.

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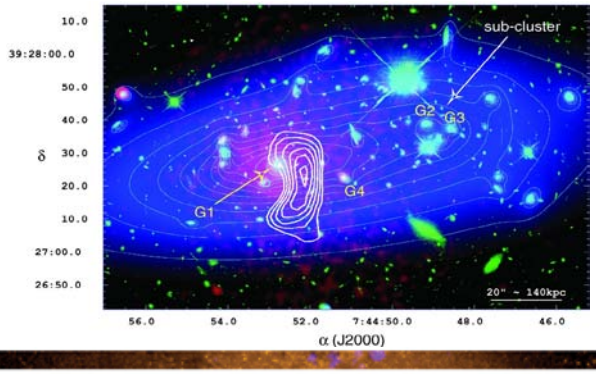
GBT/Mustang Map out a Cluster Merger

GBT observations of the galaxy cluster MACS0744 with the 3mm bolometer array MUSTANG show structure in the Sunyaev-Zeldovich effect marked by the white contours in this figure. Red colors show the X-ray emission, green the optical, and blue the inferred mass distribution reconstructed from gravitational lensing. The MUSTANG contours give evidence of a shock that is not apparent in the other tracers, and was likely produced when the infalling sub-cluster passed through the main core, losing its baryons to ram-pressure stripping (Korngut et al, 2011, ApJ, 734:1).



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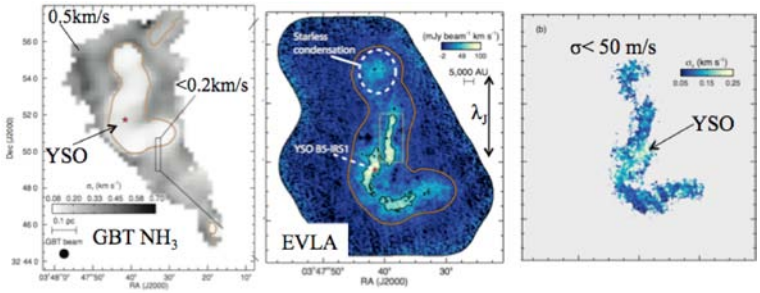
Science Results
- *EVLA*

EVLA Special Issue: Subsonic Cloud Collapse

Pineda et al. present the first clear delineation of subsonic cloud fragmentation in a low mass star forming region. They imaged the Barnard 5 molecular cloud region with the GBT and the EVLA in NH_3 , a dense gas tracer. The GBT shows a clearly-bounded region of suppressed turbulence in molecular dark cloud, where the velocity dispersion, σ falls from 0.5 km/s to < 0.2km/s. The EVLA imaging at high spatial and spectral resolution resolves the filament of dense gas, revealing substructures on scales < 1000AU and σ < 50 m/s!



Cloud fragmentation in the low mass star forming region Barnard 5. Images of the ammonia (a dense gas tracer) are shown from the GBT and the EVLA. The velocity dispersion is clearly suppressed in the fragmenting region, and the EVLA reveals structures on scales of < 1000 AU and velocity dispersions < 50 m/s (Pineda et al. 2011, ApJL EVLA special issue).

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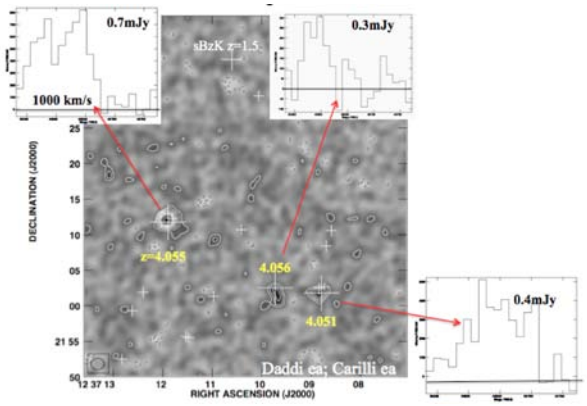
EVLA special issue: molecular protocluster

Carilli et al. have used the EVLA to image a cluster of molecular gas rich galaxies at z = 4.1, or within 1.5 Gyr of the Big Bang. Three hyperstarburst galaxies (SFR ~ 1000 M_o/yr) are found within a 30" region and a single 256 MHz bandpass of the EVLA. This region is an ideal laboratory for studying clustered, massive galaxy formation in the early Universe. The EVLA has imaged the cold gas reservoirs, the fuel for star formation in galaxies. The molecular gas masses are > 10^{10} M_o.

Images and spectra of the CO emission in the GN20 protocluster of molecule rich galaxies at z=4.1 made with the EVLA. Three submm galaxies are detected with molecular gas masses > 10^{10} Mo



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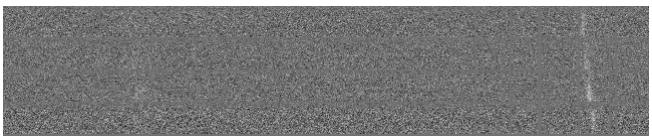
Science Results
- *VLBA*

V-FASTR: Fast Transient Detection with the VLBA

- VLBA DiFX Software Correlator has been augmented with a transient detection pipeline to look for "Lorimer" type events using commensal searches of all projects correlated in Socorro. Short term (~2ms) accumulate spectra are sent to processor. Data are reordered, flattened, and searched for dispersed pulses.
- Machine-learning algorithms are exploited (Thompson et al., 2011, ApJ 735, 98). Ten separated antennas are used as coincidence detectors. Artificial pulses are injected regularly to assess/set thresholds.
- Pulsar test datasets prove the concept (Wayth et al., 2011, ApJ 735, 97). Regular pulses from PSR B0329+54 detected, and giant pulses from the Crab Pulsar detected.



B0834+08 pulses

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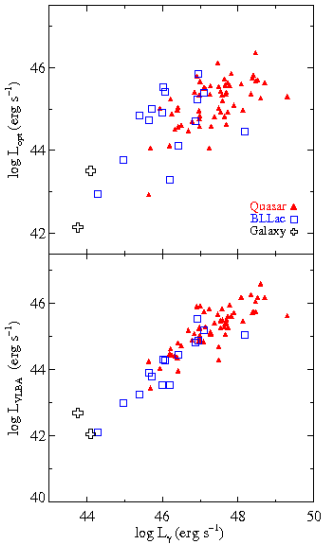
Radio-Optical-Gamma-Ray properties of AGN

Arshakian et al., A&A, 2011 observed a sample of 83 active galactic nuclei detected in 15GHz VLBA and Fermi observations. They find a strong correlation between radio, optical, and gamma luminosity. In BL-Lac objects strong positive radio-gamma correlation and negative optical-radio correlation. Modeling of these correlations with a simple leptonic jet model for blazars indicates that variations of the accretion disk luminosity (and hence the jet power) is able to reproduce the trends observed in most of the correlations. To reproduce all observed correlations, variations of several parameters, such as the accretion power, jet viewing angle, Lorentz factor, and magnetic field of the jet, are required.



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Agenda

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

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Observatory Science Operations
- *Shared Services Specific Milestones*

- ***Proposal process***
  - The new panel-based proposal evaluation process was rolled out for Semester 11B
  - Time Allocation Committee met in Socorro, April 28-30
  - Director's Review of TAC recommendations concluded on May 26
  - Proposers informed of the disposition of their proposals on June 1
- ***User Portal***
  - Discussions have begun on the integration of the ALMA Science Portal and the NRAO user portal.
- ***Helpdesk***
  - Development of integrated ALMA/NRAO helpdesk interface under discussion
  - Integration of GB operations into the Helpdesk is under development and will be implemented in Q4 before the NRAO CfP.

The proposal submission deadline was Feb 1. All proposals were submitted through the Proposal Submission Tool. The PST was also used to manage proposal review. The proposals were released for review on Feb 15 and The Science Review Panels completed their reviews of the proposals using tools available in the PST on Mar 25. The TAC recommendations were reviewed and approved at the Director's Review on May 26. Final dispositions were sent to proposers on June 1.

The re-insource of the PST from OpenSky is contingent on factors involving both the PST and the user portal. Current plans call for the re-insource to occur at the end of Q2 in FY12.

The integration of the ALMA/NRAO helpdesk was discussed at the OSO kick-off meeting in Q2. The NAASC department of the NRAO helpdesk was closed with the deployment of the ALMA helpdesk on Mar 31. A link to the ALMA helpdesk was put in place to point users to the ALMA user portal where they can register and use the ALMA helpdesk. More seamless options are under consideration.

Metrics/statistics: Interim functionality for Observatory-wide metrics/statistics queries to be deployed via Helpdesk in Q3 while OSO assesses optimum strategy for integrating sources. The helpdesk department was not deployed in Q3, rather work took place in Q3 on a web based tool to query a database for statistics used to form metrics by internal staff members. There is no risk associated with not meeting this milestone to the extent that any metrics have been, and can be, requested by e-mail. In Q4, OSO will continue to work on providing a set of observatory metrics to the public.

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Observatory Science Operations
- *Shared Services Specific Milestones*

- ***Science Web***
  - Science web began operating with the Plone content management system.
  - Content migration will continue until the end of Q4
- ***Science user outreach***
  - 35 papers accepted for the special issue of ApJL on EVLA early science, to appear in Q4
- ***High Performance Computing***
  - Data intensive astronomy workshop was held in Q3 on May 3-5 in Green Bank. Results are posted on the web.

Science Web: The science web was successfully transitioned to the Plone CMS although content migration will continue until the end of Q4.

Science user outreach: The call for papers on early EVLA science resulted in 35 acceptances; a special issue of Astrophysical Journal Letters will be published in Q4.

High Performance Computing: Data intensive astronomy workshop was held in Q3 on May 3-5 in Green Bank. Results are posted on the web.

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Observatory Science Operations
- *Facility-based Specific Milestones North American ALMA Science Center (NAASC)*

- ***Science Operations***
  - The first proposal cycle closed on June 30 with 919 unique proposals submitted, ~30% of those from NA.
  - 326 helpdesk tickets were handled and 143 knowledgebase articles were written.
  - The ALMA Helpdesk has been protected with a second, fail-over server that will immediately respond in the event of a primary server crash.
- ***Observer support***
  - ALMA Science Portal updates were made to post the Technical Handbook to proposing with ALMA and several Science Verification datasets.
  - Implemented Web and Torrent ("peer-to-peer") -based solutions for SV data deployment from the NAASC
  - Achieved first successful archive synchronization between Chile and Charlottesville

Tim Bastian w/ input from Lonsdale 12

919 unique ALMA proposals were submitted, close to the estimated number of 1000. Proposal submission peaked one day before the deadline. The helpdesk was monitored 24/7 for 3 days before the deadline. The system overloaded in the last hour of submissions causing some downtime, so the deadline was extended by 75 minutes.

The Helpdesk server was backed up with an additional fail over server that will immediately pick up operations in case of a primary helpdesk server failure. In Q4, we are adding an additional fail over server in Socorro in the unlikely event of entire service interruption in Charlottesville. Failover ALMA Helpdesk and NAASC User Portal system have also been purchased and are being configured for installation at a remote site (Socorro) in Q4.

NAASC contributed to the added user documentation that was posted to the **Science Portal, including the Technical Handbook.**

Science Verification data made available from NAASC User Portal for TW Hya (Band 7) and NGC3256 (Band 3)

Sync of ~2 TeraBytes of ALMA data pushed from Santiago to NAASC archive systems over secure network tunnel.

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Observatory Science Operations
- *Facility-based Specific Milestones NAASC*

- ***User education and training***
  - Fourteen "observing with ALMA" Community Day Events were held at different locations across North America, in collaboration with local hosts.
  - Two observing with ALMA tutorials were given at the Boston AAS meeting
- ***Data Processing and Analysis***
  - ALMA Science Verification data were analysed and CASAguides (annotated scripts) written to assist proposers in understanding the nature of ALMA data.
  - Software testing and upgrades continued, and CASA 3.2 was deployed. A strategy document for ALMA pipeline procedures was developed
  - Molecular and atomic transitions in Splatalogue were updated as well as increased functionality to ease searches as recommended by the user community.

ALMA Early Science "Community Day" events were held at STScI in Baltimore (Apr18), University of Toronto (Apr 18-19), Harvard-Smithsonian CfA (Apr 20), NRAO Charlottesville (Apr 26-27), University of Florida (May 2-3); HIA, Victoria, BC (May 4-5); University of Iowa (May 9-10); Charlottesville, VA (May 9); Universite Laval, Quebec City (May 10); University of Calgary (May 12-13); University of Arizona/NOAO (May 12-13); **AAS Meeting, Boston (May 23-24)**; University of Massachusetts, Amherst (May 25); Columbia University, NYC (May 27), UWO-London (June3). In all about 900 astronomers were reached.

Many NAASC staff participated in **processing science verification data** in order to provide the community with examples of ALMA data. Scripts with detailed descriptions **(CASAguides) were generated** to accompany the data, which were posted to the science portal. Improvement of observing scripts & data reduction scripts including application of Tsys for FDM modes in CASA were made. A work plan for compiling the calibrator catalog was completed and implemented.

NAASC Supported **testing and deployment of CASA release 3.2**. The existing CASA guides were updated for R3.2. Early Science configuration files for use with ALMA simulators were posted. Molecular and atomic transitions in Splatalogue were updated. Progress was made in pipeline development during a two week meeting in Edinburgh, including a **plan for overall pipeline strategies**.

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Observatory Science Operations
- Facility-based Specific Milestones Array Science Center (ASC)

- ***Observer support***
  - Support in place for 2 GHz bandwidth observing on the EVLA
- ***Pipeline development***
  - Develop prototype EVLA pipeline in CASA
- ***Face-to-face visitor support***
  - NM Operations supported 31 visiting scientists during Q3, 12 of which were RSRO participants.
- ***Other Science Operations Activities***
  - An EVLA Data Reduction Workshop, primarily for users with approved time in the D-configuration, will be held 14-16 September 2011; planning began during Q3

All the software sub-systems are in place to support **2 GHz bandwidth observing on the EVLA**, and updated procedures for scheduling block verification are being developed and tested ahead of the D-configuration.

The development of a prototype **CASA-based pipeline** for the EVLA is ongoing.

NM Operations supported 31 visiting scientists during Q3, 12 of which were participating in the EVLA RSRO program.

A **Data Reduction Workshop**, focusing on the new problems presented by wide bandwidth EVLA data, has been set up following consultation with the Users Committee, and will be held in September 2011. Planning for this workshop began during Q3.

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Observatory Science Operations
- Facility-based Specific Milestones ASC

- ***Commissioning – EVLA***
  - Observation Preparation Tool modified to allow the preparation of observing scripts with 16 correlator sub-bands and up to 2 GHz bandwidth in anticipation of D configuration observing
  - Plan for disseminating large data sets finalized
  - Commissioning milestones achieved during Q3:
    - First astronomical observations at 74 MHz with the EVLA
    - First tests of multiple sub-arrays

The test version of the **Observation Preparation Tool** has been updated to support the increased number of correlator sub-bands being offered for the D-configuration, scheduled to begin at the end of September 2011. This version of the OPT is being tested into Q4, and will be released for users in August. A **data distribution plan** has been developed and was presented to the NRAO Users Committee in May 2011. Data will continue to be available to users via FTP. However, many users have slow internet connections at their home institutions, so in the near term users will also be able to request that their data be shipped to them on a disk drive.

Two **EVLA commissioning** milestones were met during Q3: (1) the first astronomical observations at 74 MHz were made during a special campaign that covered the B, BnA, and A configurations. The 74 MHz dipoles have to be mounted on the antennas especially for these campaigns, since they affect the sensitivity and polarization performance of the 1-2 GHz system while they are installed. The system was tested and commissioned in Q2, in time for the science campaign in Q3; (2) the first tests of dividing the EVLA into multiple sub-arrays was made during Q3, and the first science verification observations will be made in Q4.

Begin mirroring the EVLA archive to Charlottesville: This milestone was not achieved in Q3 due to technical difficulties associated with achieving the necessary network bandwidth, but concerted effort will take place in Q1 FY12 now that many of the archive machines for ALMA and the EVLA have been installed. RISK: A redundancy of the EVLA archive will not be maintained outside of New Mexico. MITIGATION: EVLA data are routinely backed up in Socorro as part of New Mexico operations so there is always a redundant copy of the archive available. The risk in not meeting this milestone is very low yet due diligence will take place to ensure that a second and up to date copy of the archive is available.

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Observatory Science Operations
- Facility-based Specific Milestones GBSO

- ***User education and training***
  - Preparation underway for Sixth Single Dish Summer School which will take place in Q4 on July 10-16 in Green Bank.
- ***Pipeline development***
  - The final GBT KFPA end-to-end pipeline was delivered in Q3
  - Work has turned to data reduction and pipeline development for new GBT spectrometer (VEGAS) and 4mm receiver
- ***Face-to-face visitor science support***
  - 1-2 visitors per week on site

User education and training: We have received over 70 applicants to attend the school, which is in collaboration with Arecibo. Awaiting confirmation of the NSF grant that will provide financial aid to students.

Pipeline development: The final GBT KFPA end-to-end pipeline will not be delivered before the end of April (Q3). The group is reforming to be the GBT pipeline group and will be expanding their scope to include the new spectrometer and 4mm receiver. The plans have always been for the KFPA pipeline to be the first step in creating a more general pipeline for the GBT. Within those plans has also been the statement that no new instrument will go onto the GBT (as a general user instrument) without a pipeline. As a result, with the completion of the GBT KFPA pipeline we are now closing that project and moving forward with the plans to expand the pipeline to now include the next two new instruments - the new spectrometer and the 4mm receiver.

Face-to-Face Visitor Science Support: Green Bank continues to host 1-2 visitors per week on site as well as provide significant help to remote observers.

Other Science Operations Activities: *CICADA (FPGA Spectrometer):* Q2FY11 – Interim milestone of Preliminary Design Review complete. Q3FY11 - Proposal call for shared risk observations starting in fall (one mode and one spectrometer in October) was cancelled. Scheduled determined to be too tight to do shared risk observation call. A shared risk observation call for the next Observing period is being planned. **Risk**: none; the action of having the shared risk observation call was not announced to the user population. **Mitigation**: not required.

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Observatory Science Operations

- ***Graduate Student Programs***
  - Graduate Student Internships
    - Four graduate students began or continued work as graduate interns with NRAO mentors
  - Predoctoral Program
    - University of Virginia student continued appointment working in Charlottesville
    - New Mexico Tech student continued appointment working in Socorro
  - Student Observing Support
    - SOS Selection Committee received 24 proposals for observing support for the 11B observing term,16 of which were granted observing time by the NRAO TAC
    - SOS Selection Committee awarded a total of $167,549 to 7 SOS proposals
- ***Visiting Astronomers***
  - One visitor at each of the three NRAO sites

Graduate Interns: Five 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; Srikanth Bussa *(University of Akron)* is working with John Ford on research in digital signal process for the Green Bank telescopes; *Dana Ficut-Vicas (University of Hertfordshire)* is working with Michael Rupen on the Little Things project; and *Nimish Sane (UMd)* is working with John Ford on a multiple frequency window processor for the GBT.

Predoctoral Program: The University of Virginia student, *Cheng-Yu Kuo*, continued working with Jim Braatz in Charlottesville on reducing and analyzing VLBI observations of water maser emission from galactic nuclei as part of the Megamaser Cosmology Project. The New Mexico Tech student, *Josh Marvil,* continued his appointment as a this quarter, working with Fraser Owen in Socorro.

SOS Awards: The SOS committee recommended funding a total of **$167,549 to 7 of the 24 proposals submitted** (only 16 of which were allocated observing time and considered for SOS funding) this period. They are as follows: GBT11B-126, supervisor, Stuartt Corder, student Adele Plunkett, Yale University, for **$34,495**; GBT11B-027, supervisor Martha Haynes, student Gregory Hallenbeck, Cornell University, for **$35,000**; GBT11B-066, supervisor Dan Werthimer, students Siemion/Wharton/Chennamangalam, Berkeley/Cornell/WVU, **$7,500**; GBT11B-001, supervisor Mark Devlin, student Tony Mroczkowski, University of Pennsylvania, **$35,000**; GBT11B-053, supervisor Tony Remijan, student Joanna Corby, University of Virginia, **$3,000**; GBT11B-051, supervisor D J Pisano, student Spencer Wolfe, WVU, **$29,184**; VLA11B-156, supervisor Lawrence Rudnick, student Damon Farnsworth, University of Minnesota, **$23,370.** Information on the SOS Program can be found at *http://science.nrao.edu/opportunities/sos.shtml*.

Visiting Astronomers: There were three visiting astronomers this quarter. Yancy Shirley of University of Arizona visited NRAO CV for the month of June 2011. D.J. Pisano of WVU began a two-month visit to NRAO GB in June. Andreas Brunthaler from MPIfR began a one-year visit to NRAO SOC in June 2011.

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Observatory Science Operations

Community Support Programs

- ***Undergraduate Student Programs***
  - Summer students
    - Twenty nine students began appointments as 2011 summer students
    - Activities include science research, observing experience with the GBT or EVLA, and attending the Single Dish Summer School
  - Co-operative Education Students
    - Three Co-Op students continued their appointments
  - Undergraduate Internships
    - Eight undergraduates (SO: 7, CV: 1) continued undergraduate internships
    - Two students from Howard University working with members of the scientific staff

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

Co-Op: Four **Co-Op students** continued their appointments in the Electronics Division in Socorro: Deepak Rai, Edward Menne, Cameron Welch (all SO)

Undergraduate Interns: Eight undergraduates (SO: 7, CV: 1) continued undergraduate internships working in the Electronics Division in Socorro and SAA in Charlottesville: Scott Davidson, Matt Tibbetts, Dana Sills, Cameron Welch, Aaron Cunningham, Deepak Rai, Orlando Lopez, Loren Good (all SO), and Patrick McCauley (CV). Christina DeBianchi is working with Richard Prestage at the CDL and Seth Jackson is working with Aaron Evans at Edgemont Rd.

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Observatory Science Operations

- ***Library***
  - A NRAO Library Virtual Tour was provided to the summer students.
  - NRAO memos and reports are being catalogued to ensure access and to complete holdings
  - A collaboration area was created in support of a LAC (Library Advisory Committee) request.
  - Proposal Cover Sheets through year 2000 have been digitized for archival purposes.
  - This quarter was devoted to testing various software and tools for future use

The NRAO Library prepared an NRAO Library Virtual Tour and provided this to the summer students; this was geared to students at Green Bank and Socorro, although all students received the information. The NRAO Library followed up this mailing with an invitation to CV summer students to a Q & A session at the Library. The Virtual Tour is posted on the NRAO Library Web page and provided to new employees.

NRAO memos and reports are being catalogued to ensure access and to complete holdings (only about 4% had previously been catalogued).

The NRAO Library rearranged the library space in CV to create a collaboration area in support of an LAC (Library Advisory Committee) request.

Some Proposal Cover Sheets, held in the NRAO Library, have been OCRed for archival purposes. With the assistance of Socorro providing complete VLA and VLBA Proposal Cover sheets, the NRAO Library can archive capture these, resulting in these historical Proposal Cover Sheets permanent availability.

This quarter the NRAO Library staff devoted much time to: testing eReaders for purchase and check-out, testing the new catalogue interface, testing the new version of NRAOPapers (NRAO publications) software.

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Observatory Science Operations

- ***Historical Archives***
  - Processing was completed on the Papers of Mark A. Gordon on planning and development for the MMA (ALMA)
  - Processing was also completed on the working papers on MMA and ALMA in the Papers of Paul A. Vanden Bout.
  - The preliminary inventory of the Papers of Donald C. Backer was completed
  - Work is ongoing on digitizing Sullivan's audio-taped interviews with the help of student intern funded by award received last quarter.
  - Processing began on additional materials donated by A. Richard Thompson
  - Processing of the Papers of Ronald N. Bracewell was completed
  - Two visitors to the archives this quarter

Historical Archives: Processing of the Papers of **Ronald N. Bracewell** was completed; work on this collection was begun in mid-2008 after the first donation of materials, and the completed collection comprises 63 linear feet of personal and professional papers. Processing was also completed on the Papers of **Mark A. Gordon** on planning and development for the MMA and the beginnings of the transition from MMA to ALMA, and on working papers on MMA and ALMA in the Papers of **Paul A. Vanden Bout**. The preliminary inventory of the Papers of **Donald C. Backer** was completed. Processing began on additional materials donated by **A. Richard Thompson**; processing continues on Director's Office materials. With the arrival of the summer intern funded by the **Herbert C. Pollock Award** from Dudley Observatory, work is ongoing on digitizing **Sullivan's** 255 audio-taped interviews of 20th century radio astronomers, on obtaining permissions from interviewees and/or their heirs, and on organizing Sullivan's working files on the interviewees. **Visitors** to the Archives during this quarter included the manager of the **Grote Reber Museum in Tasmania** and a **Dutch researcher** using interviews and other materials from the in-process Sullivan collection. Finding aids for the Archives collection and the Archives online catalog are linked from the NRAO Archives home page, http://www.nrao.edu/archives/.

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Agenda

- Science Results
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  - ALMA Construction
  - EVLA Construction
  - EVLA/VLBA Operations
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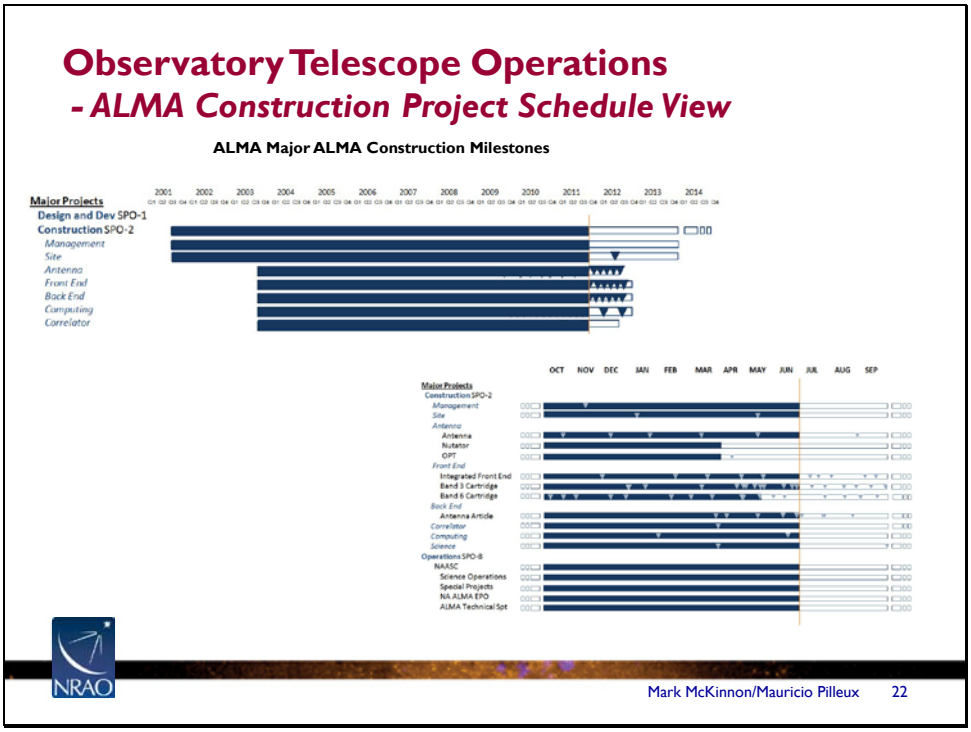

The first graph illustrates the full lifecycle. The second graph is this fiscal year view. The vertical line represents where we are today.

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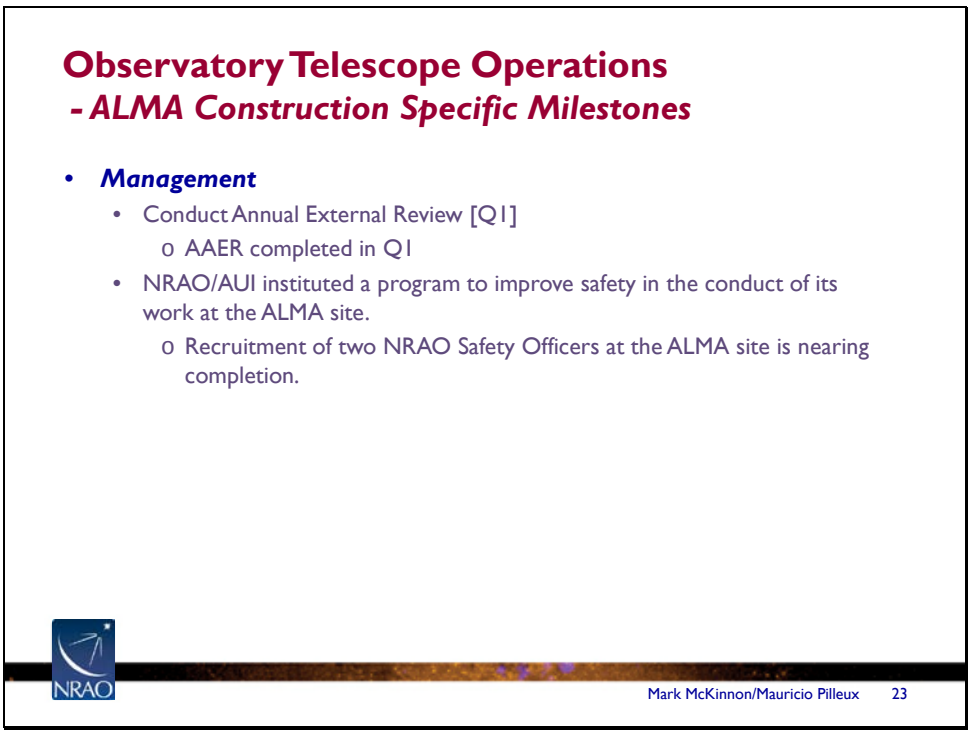

NRAO/AUI instituted a program to improve safety in the conduct of its work at the ALMA site. The program involves placing two safety officers, one per 8x6 shift, at the site. The primary focus of the safety officers is the work performed by local Chilean companies under contract with AUI. The safety officers will not be involved with the work conducted by the other ALMA Executives. The recruitment process was initiated during March 2011 and is expected to finalize in early Q4.

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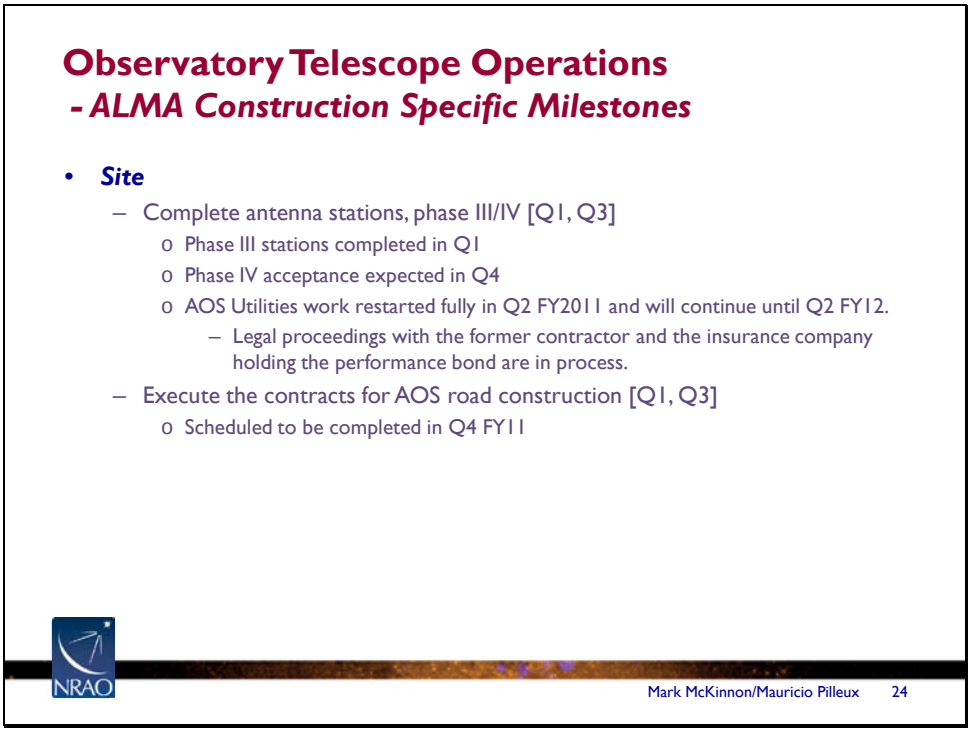

Site: The AOS Utilities contract was delayed due to the termination of the former contractor on June 30, 2010. The new contract was signed in December 2010 and work restarted on site on January 3, 2011. The milestone in the ALMA schedule to deliver phase 4 stations for CSV was met by a partial delivery in early March and the rest was finished in June 2011. Acceptance of the complete Central Cluster (CSV Phase IV) is expected in July 2011. The next milestone is the 5 km Array, scheduled for Q4 FY2011. Bad weather at the AOS has further delayed the completion of the AOS Utilities work, but the delay should not affect the overall completion of the project. The Utilities Contract work is 45% complete. Legal proceedings with the former contractor and the insurance company holding the performance bond are in process.

AOS road construction work is 89% 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. This contract is schedule to be finished in Q4 FY20111. Recent bad weather has delayed the road completion also, but the delayed completion should not affect Early Science in 2011.

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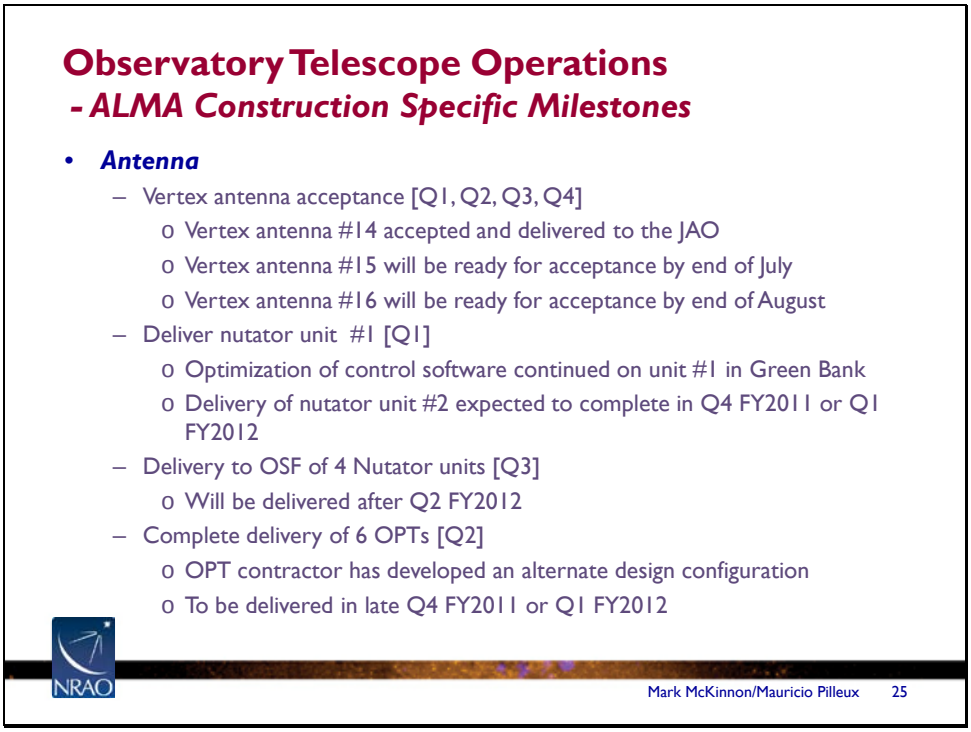
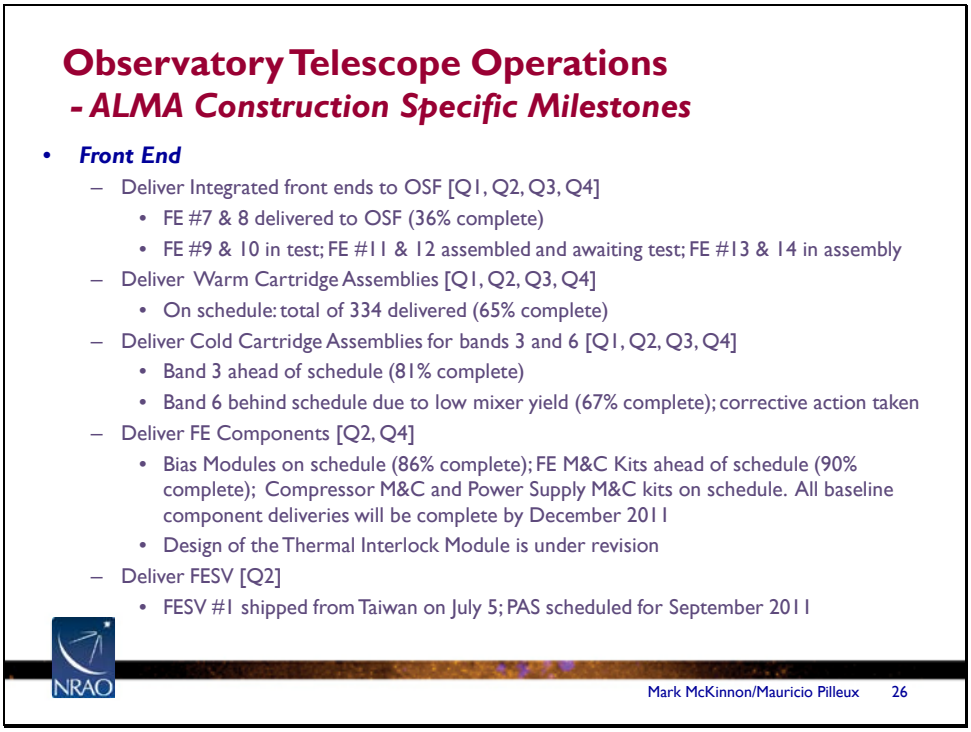


Antenna: **Vertex antenna DV14 was fully accepted** into the JAO in Q3 FY2011. Pointing acceptance testing began in late June on **DV15**, but the pointing campaign has been delayed by problems including failure of a power supply on both Production OPT units, failure of an azimuth drive gearbox, and continued bad weather. Integration, commissioning, and acceptance testing on **DV16** is also nearing completion with acceptance expected shortly after the end of Q3 FY2011. Repair of the DV03 quadrupod structure damage incurred by an AIV manlift accident was also completed by Vertex. NAAIPT continues to work with AIV to provide a high level of antenna availability.

Nutator: The rocker arm and stow mechanism redesign for the nutator was completed in Taiwan. Work continues on optimizing the performance of the servo control system with **nutator unit #1** in Green Bank. Completion of the servo control has taken longer than anticipated and is now expected in Q3 FY2011, at which point unit #1 will be returned to Taiwan for refurbishment and then transported on to Chile. Delivery of **Nutator Unit #2** to Chile is now expected in Q4 FY2011 or Q1 FY2012 for on-site engineering and interface tests. **Risk:** The risk inherent in the late delivery of the nutator is a delay in science capability of obtaining short spacing information. **Mitigation:** A fast scanning technique is being implemented in the antenna software to replicate the nutator function. Project management visited the nutator vendor in Taiwan on June 25 to expedite schedule.

Production OPT (POPT): **Units #1 & #2** were used by AIV and NRAO/Vertex to perform acceptance testing on DV11 through DV14. Unit #2 is now being used for acceptance on DV15. Acceptance testing of DV14 revealed that increasing the operating temperature of the POPT CCD unit improved pointing performance. The **POPT contractor** has developed an alternate design configuration for Unit #3 that incorporates a new doublet lens, CCD, and focusing mechanism. **Risk:** Delayed delivery of the POPT potentially risks delivery of EU and NA antennas. **Mitigation:** Conduct a rigorous engineering review of the alternate POPT design prior to allowing the contractor to proceed with its fabrication. Additional expertise in mechanical/optical design is being assigned to the OPT effort. Project management visited the OPT vendor to expedite delivery and emphasize its urgency.

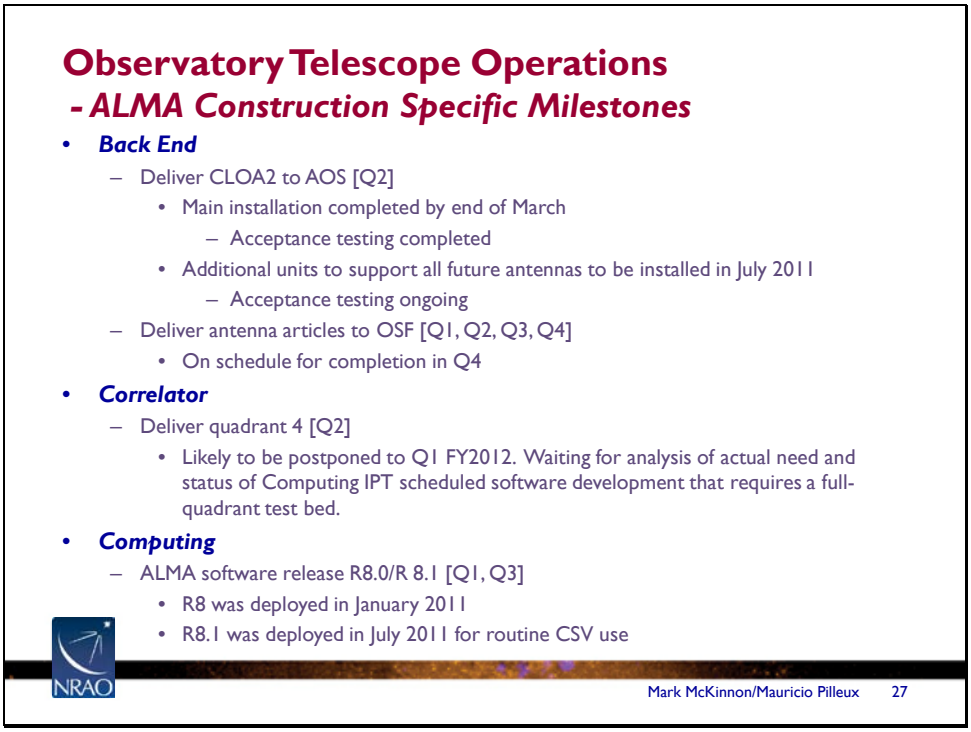
Slide 26



At the NA FEIC, **four FEs are completely assembled** and two more are in assembly. Additional software to automate test operations is being developed to enable off-shift, unattended test operations and accelerate the test process. The goal is to deliver the 14th NA Front End during FY2011. NA Front Ends are off the critical path (all antennas at the OSF have a "PAS'ed" FE.) Production of WCA bands 3, 6, 7, and 9 is on schedule. Band 3 CCA deliveries ahead of schedule. Band 6 CCA mixer production yield was low due to an unnecessarily stringent internal acceptance criterion. The criterion (amplitude stability) has been reset and production yields have increased correspondingly; total delivered: 49 (67% complete). Bias Modules production schedule recovered. Total modules delivered: 435 (86% complete). Production of FE Monitoring & Control Kits (including IF Switches) is ahead of schedule; total delivered: 63 (90% complete). Production hardware for Compressor M&C Kits and Power Supply M&C Kits in stock. Production operations underway. All Compressor M&C kits will be delivered during Q4 FY2011. All Power Supply M&C Kits will be delivered by Q1 FY 2012.

The Front End Service Vehicle (FESV) #1 successfully completed its PAI on June 28 in Taiwan. It was placed on a ship on July 5 and is now heading to Chile. The PAS for the FESV is scheduled for the first week of September 2011 in time for Early Science. Proactive support of the Taiwanese vendor proved to be effective in getting FESV #1 finished and shipped.

Slide 27

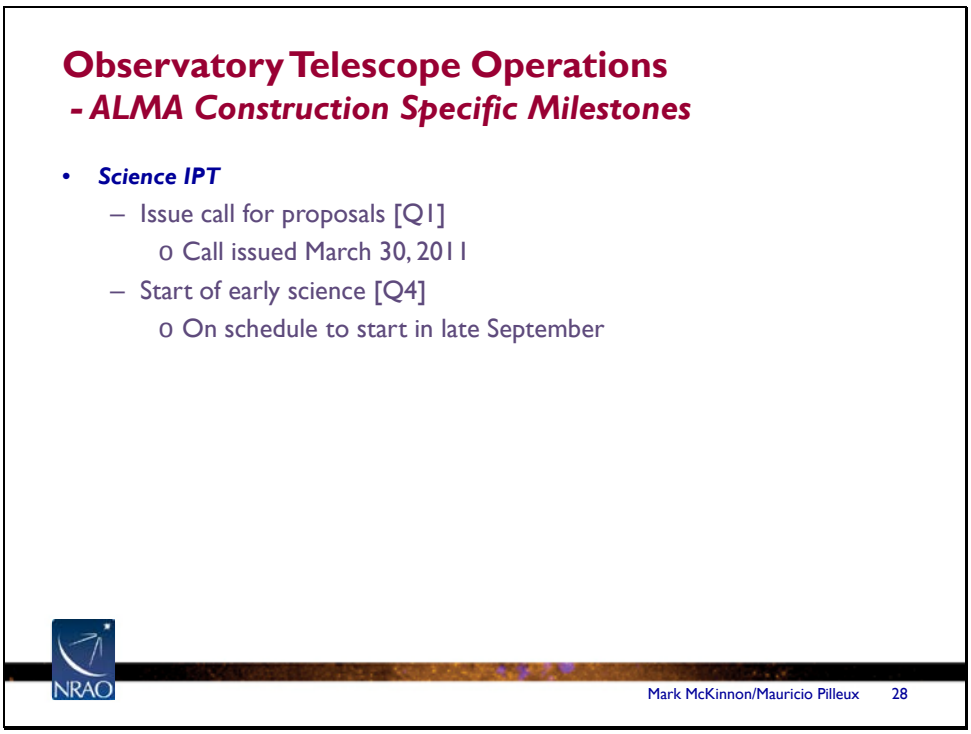


BACK END: The Central LO Article 2 was shipped on schedule in early February and installed in mid March 2011. In Q3 and into early Q4, a short final installation campaign has begun to install and accept the remaining cable harnessing and Subarray Switch and Line Length Corrector modules needed to complete distribution to the full 66 antenna array. Antenna Articles are continuing to be assembled and accepted for shipment in Socorro. By end of June 2011, articles 56-60 had undergone successful testing in preparation for Q4 shipment. Antenna Articles 61-66 have slipped a month in acceptance but remain on schedule for completion (66) in Q4.

CORRELATOR: Quadrants 1 and 2 were reconfigured and verified for 2-quadrant operation, servicing up to 32 antennas. Quadrants 3, at the AOS, and 4, in Charlottesville, are in use for firmware and software verification as more functionality is added. Quadrant 4 is ready for disassembly and shipping, but the actual ship date depends on when it will be needed to support 33 or more antennas; at present, it is extremely useful as a test bed as features are activated. A document detailing what remaining tasks require a full-quadrant test bed is in preparation. The delayed delivery of quadrant 4 currently poses no risk to budget or schedule.

COMPUTING: Release 8.0 of the ALMA software was deployed in January 2011. R8.1 was deployed in July 2011 for routine CSV use. The Project will decide in early September whether or not to use R8.1 or R8.0.3 for Early Science (R8.0.3 is the default).

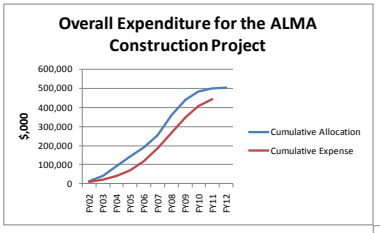
Slide 28



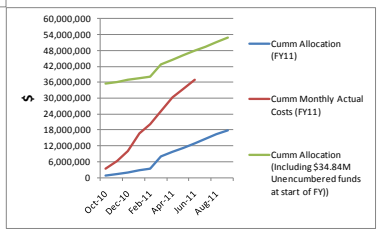
SCIENCE: The Plan for ALMA Early Science Cycle 0, which was announced at the end of Q2 FY 2011, is on schedule. The Science IPT participates in an Imaging Tiger Team at the NAASC which works with the CSV imaging team through analysis of ALMA data to verify performance of the array. Several science verification images made with ALMA data during Q3 2011 show that the performance of the array is already impressive, equal in sensitivity and spectral capacity to the best millimeter arrays in the world today. Two datasets were released as part of the Science Verification program. The Cycle 0 Early Science Proposal Deadline occurred in Q3 FY 2011, with Early Science to begin at the end of Q4 FY 2011.

Slide 29

Observatory Telescope Operations
- *ALMA Construction Financial Performance Graphs – overall & Q3 FY2011*



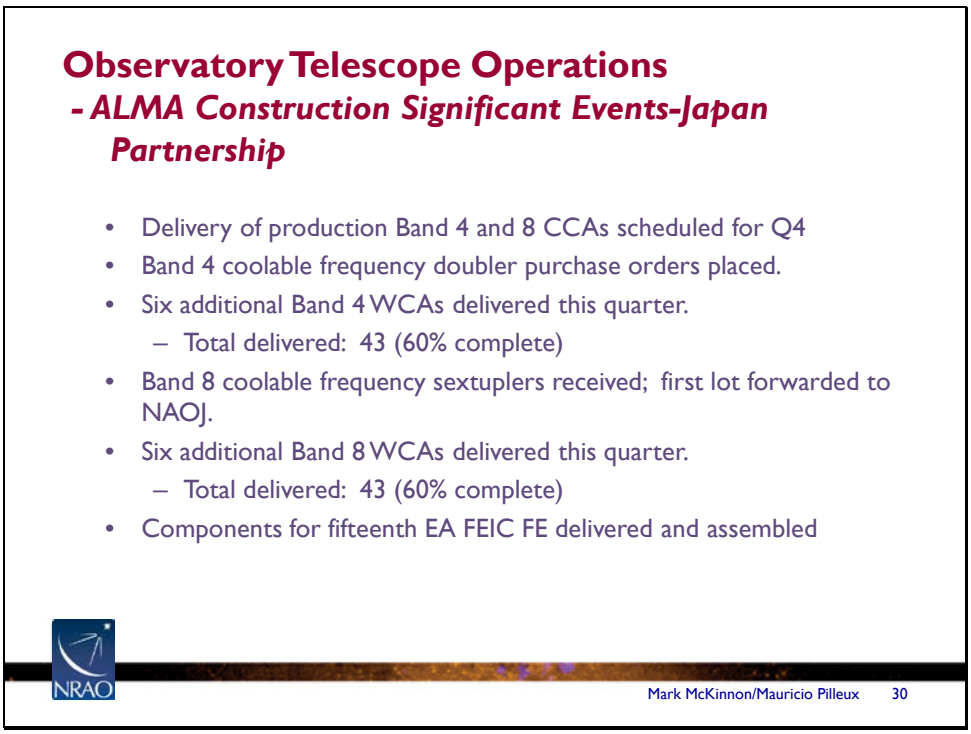
Overall Spending for the ALMA Construction Project



FY11 Spending for the ALMA Construction Project

The blue line (cumulative allocation) is the profile for the NSF allocation for FY11. The green line is the sum of the cumulative allocation and the carryover over of prior-year, uncommitted funds. Red line is actual expenditures. Profile is OK as long as red is below green.

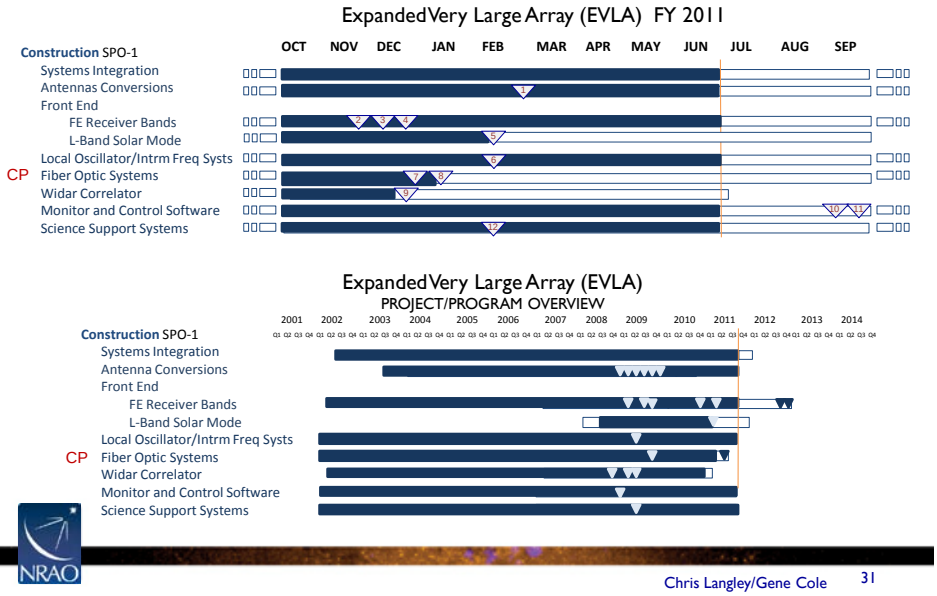
Slide 30



SPO-7 activities: Delivery of production Band 4 and 8 CCAs are scheduled for Q4. Six additional Band 4 WCAs were delivered this quarter; total delivered: 43 (60% complete). Six additional Band 8 WCAs were delivered this quarter; total delivered: 43 (60% complete). The NA FEIC is prepared to retrofit these cold cartridges into assembled (and untested) Front Ends. Test operations plans for both Bands is complete. The aforementioned test automation initiative is key to absorbing the additional test workload (50% increase; going from test of 4 bands to 6 bands). Components for assembling the 17th EA FEIC FE assembly were delivered. "On-wafer" test data for Band 10 WCA Power Amplifiers is positive. Band 4 Coolable Frequency Doubler design complete; POs placed. Band 8 Coolable Frequency Sextuplers received and 1st lot forwarded to NAOJ. EA FEIC has delivered 11 FEs; two FEs are in test; another two FEs are assembled and in the test queue. A formal Statement of Work is being prepared to cover the transferred production of five FEs from the NA FEIC to the EA FEIC.

Slide 31

Observatory Telescope Operations
- *EVLA Construction*

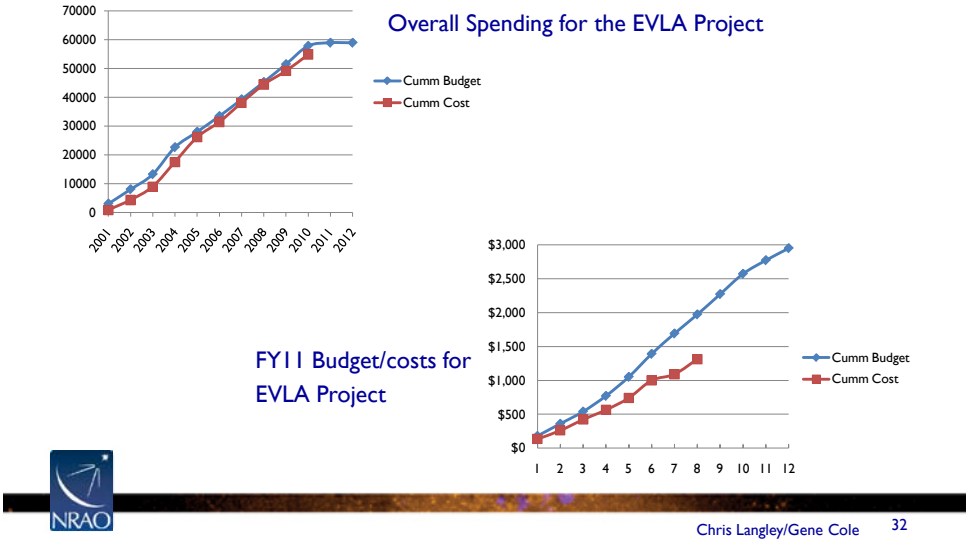


The top graph is this fiscal year view. The bottom graph illustrates the full lifecycle. The vertical line represents where we are today. The CP represents the critical path.

The Fiber Optic System remains on the critical path due to the delay in the qualification (resolved) and installation of the 3-bit samplers (milestones 5 & 6). 12 modules are expected to be received from ACDI in August for testing. If successful, schedule can be recovered rapidly.

Slide 32

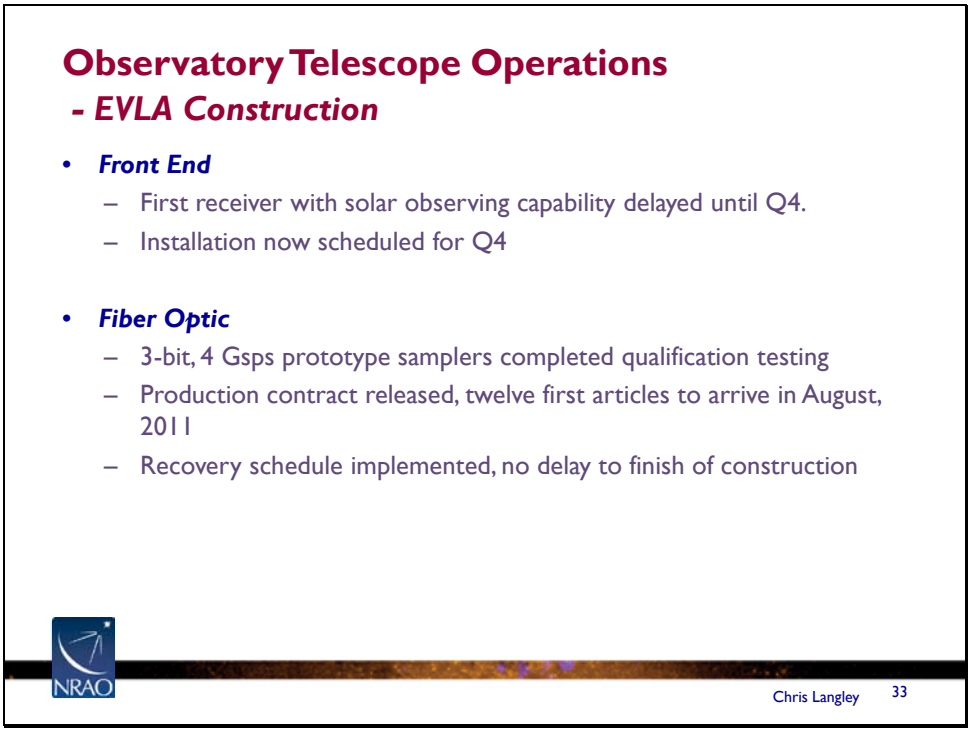
Observatory Telescope Operations
- *EVLA Construction*



The FY 2011 budget was reviewed and reduced in Q3, moving planned spending of $772k to FY 2012. Computing was under-spent so this funding was moved to FY 2012 due to a conscious effort not to purchase archive hardware until it is needed. By delaying this, we anticipate receiving more value for the dollar. Front End spending is lower than planned due to L-band solar observing capability not yet being in production, and the relatively early stage of X-band construction. Also, other components, such as the LNAs, are scheduled to be delivered throughout the fiscal year, and are paid for on an ongoing basis, which is not reflected here.

This budget curve shown in the chart does not reflect contingency. The project contingency was spent down this quarter ~7%, primarily to enact ~$112K of redesign/production risk associated with the 3-bit samplers. Two large contingency allocations anticipated in early Q4 are for RF switch mitigation and to extend the contract of the project mechanical engineer. Despite this, project contingency will remain at a healthy level. It is actively managed and should adequately cover known risks through the project closure date.

Slide 33



NOTE: [numbers] refer to corresponding numbers on the EVLA milestone chart in the FY2011 POP. These three areas: Front End, Fiber Optic and Correlator are currently running behind schedule. Risks and Mitigations are defined below.

Engineering development work proceeded on the **first receiver with solar observing capability** [5]. Defining and characterizing the attenuation paths within the L-Band receiver proved to be a very involved task, requiring a considerable amount of engineering time and resources. A prototype will be tested on an antenna in Q4. If the test is successful as expected, purchase orders will be placed and parts replaced in antennas as they are cycled through for maintenance. Risk to Construction Project: Low Risk-Solar Observing can be done now. Mitigation: Test of capability already planned for end August. If test is unsuccessful, L-Band receiver will be returned to lab and the milestone pushed out with no impact to the overall construction project.

Begin installation of 3-bit/DTS modules [8] in Q2 was delayed as a result of the redesign and delay in sampler assembly testing (resolved). The installation of the first production 3-bit/DTS modules are scheduled for Q4. Complete production and installation schedule re-examined, risk to an on time project completion is minimal. **Mitigation:** 12 modules are expected to be received from ACDI by first week of September for testing. If successful, schedule can be recovered rapidly. Use contingency funds to accelerate installation schedule if necessary.

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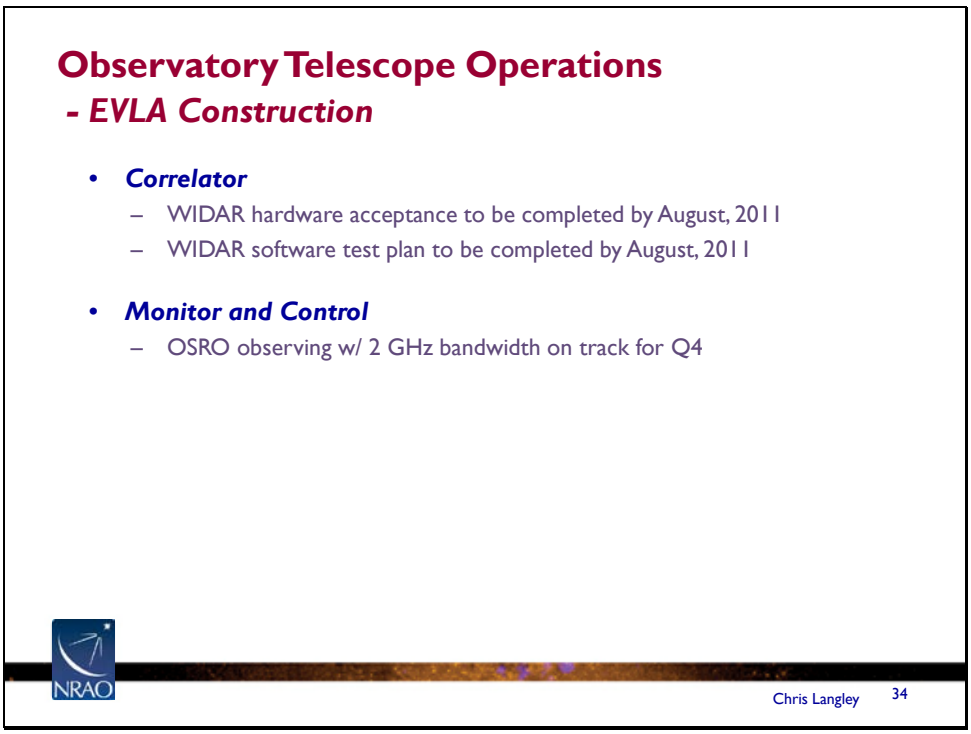

NOTE: [numbers] refer to corresponding numbers on the EVLA milestone chart in the FY2011 POP.

Finalization of the WIDAR acceptance plan [9], milestone previously divided into two parts: Hardware acceptance and Software acceptance. Hardware acceptance to be complete in Q4 (July). Software acceptance plan is being finalized while correlator is being exercised continuously. RISK: Supplier will roll off personnel before correlator is accepted; they can no longer assist in troubleshooting and modifications. MITIGATION: Low risk; revising the original concept of the acceptance plan and separating out the hardware from the software.

Milestone [11], OSRO observing with **2 GHz bandwidth**, will allow 16 x 128 MHz sub-band pairs, for a total of 2 GHz bandwidth per polarization. This is on track for Q4, when the array moves into the D configuration.

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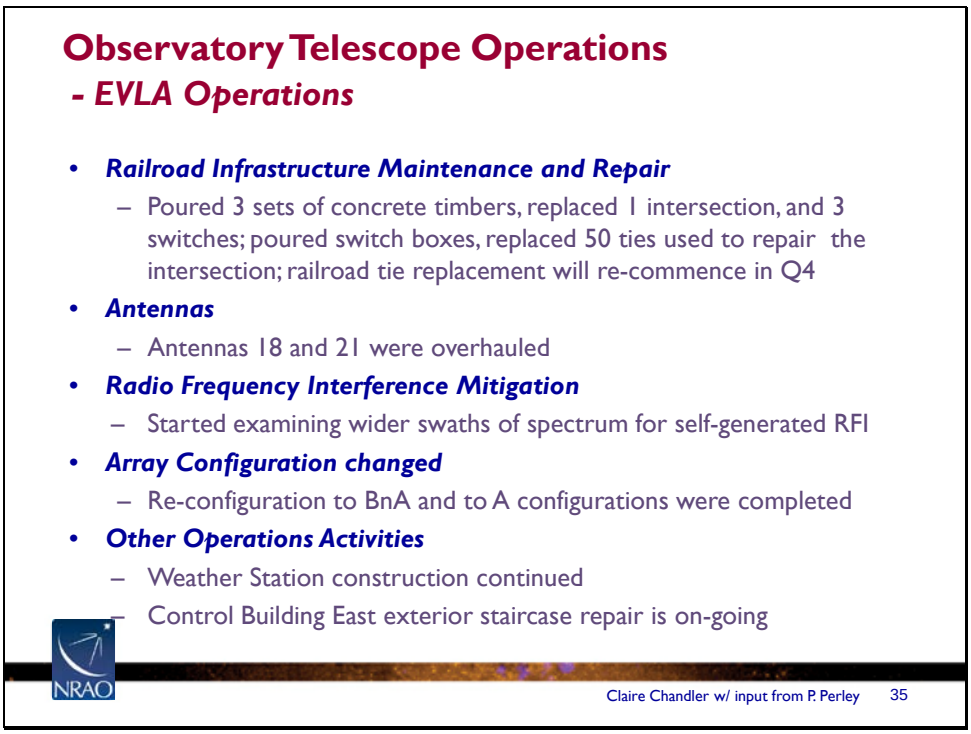

Railroad infrastructure maintenance focused on intersections and switches during Q3; replacement of railroad track ties will re-commenced in Q4.

The new wider bandwidths and complete frequency coverage that are available for EVLA require examination of much wider swaths of spectrum for self-generated RFI.

The weather station is scheduled to be completed and ready for use in Q4.

The Control Building exterior staircase repair will be completed in Q4.

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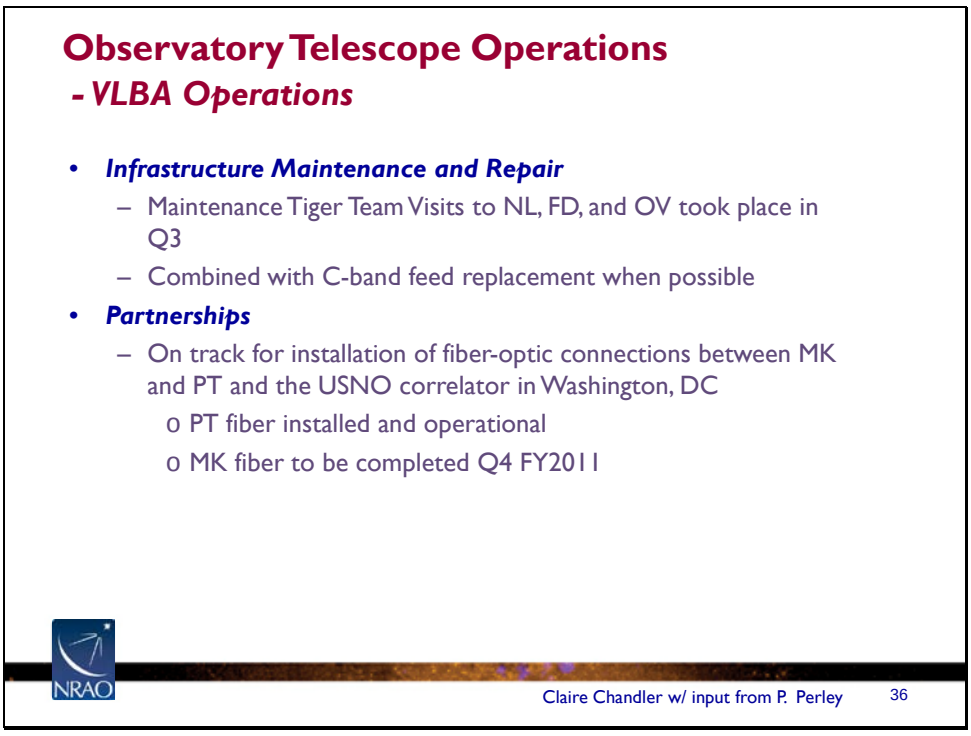

VLBA Tiger Team visits occurred at North Liberty, Fort Davis (elevation bearing only), and Owens Valley in Q3. Saint Croix is scheduled for Q4. The major mechanical work related to the C-band upgrade (namely feed replacement and installation of monitor and control fiber optics) is being done opportunistically with each tiger team visit to reduce total travel costs associated with that upgrade.

VLBA Partnerships: The USNO is funding the installation of fiber-optic connections between MK and PT and the USNO correlator in Washington, DC. The PT fiber link was completed in Q3; the MK fast fiber link is expected to be installed in Q4, and is being coordinated and managed by USNO.

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Observatory Telescope Operations
- *Green Bank Operations*

- ***Infrastructure Maintenance and Repair***
  - GBT summer maintenance schedule began June 6
    - Initiated GBT summer painting program with expanded crew
    - Started scheduled maintenance of drive motors and brakes
    - Performed inspection, necessary replacements , and alignment of GBT track wear plates
- ***Site activities***
  - Accommodations, work spaces, and computer accounts established for summer school students.
  - Parts and assemblies for the Skynet X-Band receiver, Phased Array Feed, and 4mm receiver fabricated Central Instrument Shop in Green Bank
  - Post amplifiers for the 4mm receiver in fabrication at NTC
  - Accommodations, work spaces, and computer accounts established for summer school students

The **GBT summer schedule** of four ten-hour days per week began in June. Twelve painters were added for the summer maintenance period to paint both the backup structure and selected GBT main reflector panels. The first group of azimuth and elevation motors were inspected and preventative maintenance performed on the motors and brakes. Modified wear plate transition pieces to use this summer were received, and during a one-week shutdown telescope mechanics replaced any necessary track parts, shifted and shimmed all track plates, and performed a full GBT track alignment.

In Q3FY11, the Central Instrument Shop in GB fabricated parts and assemblies for Green Bank projects Skynet X-Band receiver, Phased Array Feed, and 4mm receiver (66.4% of shop time). Work for non-Green Bank projects includes ALMA, EVLA, CDL, and VLBA (33.6% of shop time). Post amplifiers for the 4mm receiver based on ALMA LO amplifiers were modified by CDL engineers and will be delivered by NTC in Q4FY11. Eight summer students are currently in Green Bank participating in the REU and Co-op programs.

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Observatory Telescope Operations
- *Green Bank Operations*

- ***Green Bank and the National Radio Quiet Zone***
  - Green Bank formulated a new public policy statement for use in mitigation of RFI arising from electrical equipment within 10 miles of the site, subject to the W Va. Radio Astronomy Zoning Act.
  - One member of the GB Interference Protection Group took advantage of NRAO's early retirement program.
  - Many new sources of interference in S-band near 2 GHz were found from wireless devices in household use near the site

It is a delicate matter to convey the importance of protecting the GB site and obeying the WVA Radio Astronomy Zoning Act without appearing menacing or over-bearing. Wes Sizemore retired, who was responsible for identifying and ameliorating RFI in the vicinity of the GB site. It is unclear when this position will be refilled. Pulsar observing near 2 GHz saw RFI that Wes identified as arising from newer DECT cordless phones, which use 1.9 GHz to avoid interfering with WiFi at 2.4 or 5.8 GHz.

Agenda

- Science Results
- Observatory Science Operations
- Observatory Telescope Operations
- Observatory Development & Programs (ODP)
  - Coordinated Development Laboratory
  - New Initiatives Office
- Boarder Impact
- Observatory Administrative Services
- Director's Office

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Observatory Development & Programs - *VLBA*

- ***VLBA Performance & Capability Enhancements***
  - All 10 VLBA antennas, and the GBT, are now equipped with 2 Gbps capable hardware; successful observing demonstrated at all sites
  - First successful engineering tests of the digital downconverter have been made on a single antenna [originally Q1]
    - VLBI test now scheduled for Q4

The **VLBA sensitivity upgrade** project is deep into testing phase for the maturing polyphase filterbank (PFB) personality. Transition to operations has begun. In addition to successful observations at all VLBA antennas and the GBT, fringes to Arecibo have been demonstrated. **Risk**: While we now have the capability to observe 2 Gbps with all 10 VLBA antennas, the Mark5C recorders are not operating as stably as required. **Mitigation**: Focused attention from NRAO and the supplier is going into solving this problem simultaneously on several fronts, including testing of power supplies, temperature control, quality of the hard drives being used, and the correctness of software.

The more flexible **digital downconverter** (DDC) personality is progressing as well, with engineering tests on a single antenna completed in Q3; however, an aliasing problem was found and interferometric testing will continue into Q4. It is expected that the modes offered by this more flexible personality will likely be available to users in Q2 FY2012; in the mean time the capability to continue to make use of the legacy equipment for spectral line work and the PFB personality for broad-band continuum on all VLBA antennas, and the GBT, has been implemented.

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Observatory Development & Programs - *VLBA*

- ***VLBA C-band System Upgrade***
  - Will provide frequency coverage of 4.0-7.9 GHz; enables access to the 6.7 GHz methanol maser line for Galactic parallax measurements
  - Requires new feeds, receivers, IF downconverters, and M&C system
  - Status:
    - A new receiver has been installed at PT; its system temperature of 22K is better than performance expectations
    - Three additional antennas have been outfitted with upgraded feeds and are awaiting upgraded receivers
    - Nominal completion date for this project is end of FY2012

The **VLBA C-band upgrade project** was started after the POP was developed so there are no POP milestones. It is making good progress, with a project completion date at the end of FY2012-Q3. **Risk:** The VLBA C-band upgrade project is adequately funded but is being performed on a best–effort basis using resources partially allocated to the EVLA project which must take priority. **Mitigation:** We are prepared to accept delays in the final delivery if necessary.

VLBA C-Band Project Support: GB Central Instrument Shop is fabricating the feeds; four delivered during Q3 (for a total of six now in house; the remaining articles will be delivered through Q1 FY2012). VLA Machine shop is fabricating the dewars, OMTs, and modules [Q3,Q4]. CDL is providing the LNAs [FY2011-Q3 to FY2012-Q2].

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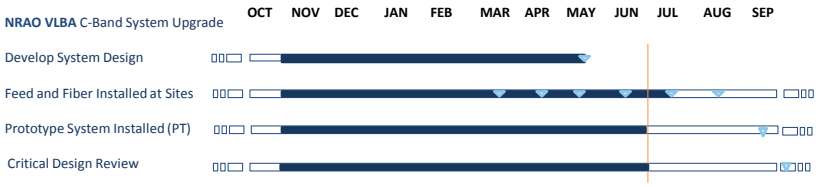
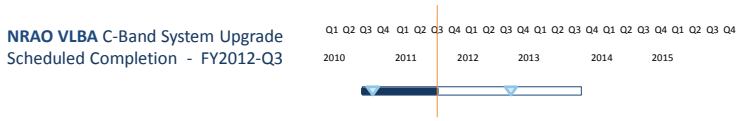
Observatory Development & Programs
- *VLBA Development Specific Milestones*





The first graph is this fiscal year view of the VLBA C-band project. The second graph illustrates the full project. The vertical line represents where we are today. The project is on track to be completed FY 2012-Q3. The first VLBA site to be commissioned will be Pie Town in September 2011. A critical design review will be held after the Pie Town system is installed in October 2011.

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Observatory Development & Programs - *Green Bank*

- ***Green Bank Telescope***
  - ***MUSTANG2:***
    - MUSTANG2 (was MUSTANG100)-Work has been suspended awaiting FY12 budget decisions on upgrades to existing MUSTANG or MUSTANG2.
  - ***KFPA:***
    - KFPA upgraded to add a wideband mode to two beams.
  - ***CICADA-FPGA-based Spectrometer***
    - Modes and supporting infrastructure designed.
  - ***PTCS:***
    - Iterative advances in control kernel added into servo system code base. Paper on GBT quadrant detector accepted by PASP.

MUSTANG100: Proposals were submitted under the ODP development projects process for the **MUSTANG2** receiver along with a smaller second proposal to upgrade the cryogenics on the existing MUSTANG on the GBT. No further development action will be taken on MUSTANG until the announcement of approved FY12 projects is official in Q4FY11.

K-Band Focal Plane Array (KFPA): The **KFPA** receiver was returned to the lab in Q3FY11 for an enhancement to add a wideband mode for two beams.

CICADA/FPGA Spectrometer: Following the Q2FY11 Conceptual Design Review for the **FPGA Spectrometer**, detailed designs for the various modes and M&C interfaces were developed in Q3FY11. The infrastructure design for the new spectrometer was completed and work started on the IF routing, clock routing, and signal switching systems.

Precision Telescope Control System (PTCS): In Q3FY11, an enhanced control kernel was added into the **servo system** code base running on the system simulator in the servo lab. A journal paper describing the design and operation of the **Quadrant Detector** system was accepted by the PASP, and a second paper on the **traditional holography** techniques used to improve the GBT's surface was submitted and received favorable referee comments.

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Observatory Development & Programs
- *Green Bank*

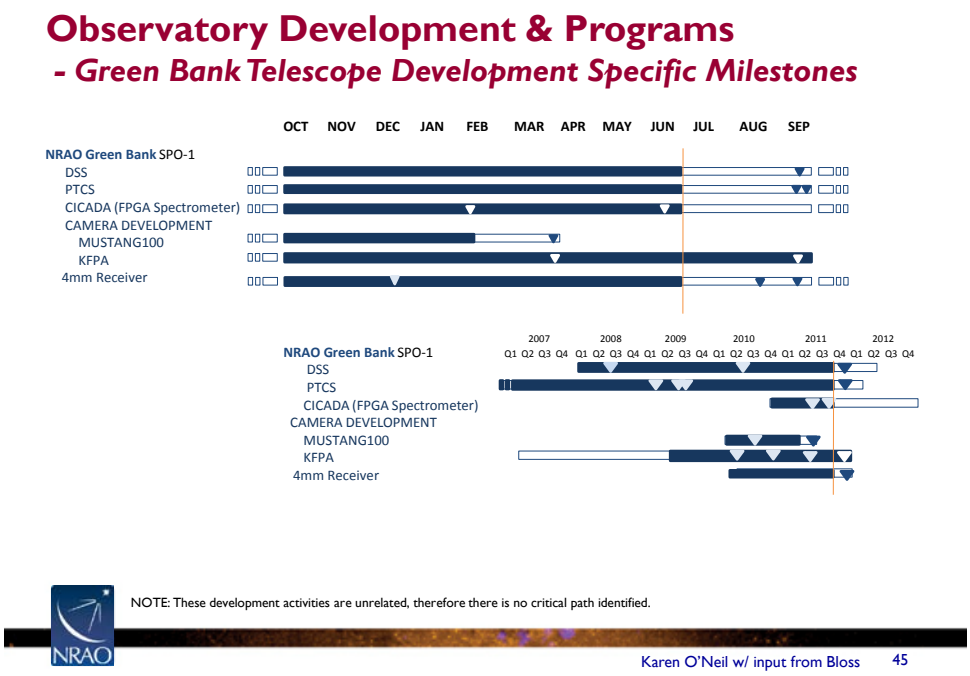
- ***Green Bank Telescope (cont.)***
  - ***4MM Rx:***
    - First light for the 4mm receiver on the GBT. Ten shared risk proposals received for one month observing window.
  - ***Dynamic Scheduling***
    - Scheduling algorithm improvements, new resource calendar, new sensitivity calculator and scheduler tool enhancements added to DSS in Q2FY11.
- ***Other Projects***
  - X-Band receiver installed on 20-meter Telescope in preparation for use with UNC Skynet telescope network

4mm Receiver: **First light** was received by the new **4mm receiver** in Q3FY11 using LNAs and post amplifiers from other projects and Green Bank stock. The optical table mechanism and control circuitry designs were tested on the GBT and were found to need some rework in Q4FY11 before the fall receiver commissioning. The M&C manager software was completed and tested with the receiver hardware on the GBT. Ten responses to the first call for **shared-risk proposals** for the last month of semester 11-B were received.

Dynamic Scheduling (DSS): The **Dynamic Scheduling** team continued its improvements to the scheduling algorithm and its ease-of-use this quarter. Improvements included: usability and robustness improvements to the Schedulers' Tools, completion of the new Resource Calendar to ease the scheduling of maintenance days and activities, release of the new sensitivity calculator for GBT proposers, and continued improvements to the scheduling algorithm inspired by continued simulation as well as scheduler feedback.

20-meter Telescope Skynet Project: The **X-Band receiver was installed** on the 20m telescope and connected to M&C systems, cryogenic systems, local oscillator, and IF system to control room and demonstrated to the **UNC Skynet** team. All interfaces passed tests and the receiver performance equated to what was seen in the lab. Higher than predicted receiver noise temperature seen in both the lab and telescope will be investigated in Q4FY11.

Slide 45



CICADA (FPGA Spectrometer): Q2FY11 – Interim milestone of Preliminary Design Review complete. Q3FY11 - Proposal call for shared risk observations starting in fall (one mode and one spectrometer in October) was cancelled. Scheduled determined to be too tight to do shared risk observation call. A shared risk observation call for the next Observing period is being planned. **Risk**: none; the action of having the shared risk observation call was not announced to the user population. **Mitigation**: not required.

Camera Development

MUSTANG100: Milestone for delivery, testing, and installation complete has been removed from FY11 schedule and project suspended. The 100 pixel array failed to meet the performance goals required to replace the existing 64-pixel array (Q1). After evaluating the test results, the collaborators agreed to focus on development and funding of a feed-horn coupled bolometer array (MUSTANG2). Proposals were submitted under the ODP development projects process for the MUSTANG2 receiver along with a smaller second proposal to upgrade the cryogenics on the existing MUSTANG on the GBT. No further development action will be taken on MUSTANG until the announcement of approved FY12 projects is official in Q4. **Risk**: MUSTANG observations use existing 64-pixel array; **Mitigation**: (Short term) – None required; (Long term) Focus development resources on design and funding of feedhorn-coupled bolometer array.

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Observatory Development & Programs
- *Coordinated Development Laboratory*

- ***Amplifier Production and Development***
  - New 35 nm 68-118 GHz LNA MMICs being assembled into test blocks
  - 35nm 67-90 GHz MMIC LNA modules delivered to GBT for 4mm receiver
  - Delivered 19 new amplifiers to EVLA and 4 to VLBA
  - Delivered 3 amplifiers to MPI
  - Delivered 24 P-band amplifiers to USNO/NRAO P-band receiver project
  - Repaired, and retested 10 amplifiers for the EVLA and one to VLBA.
  - Development of ALMA bands #1 and # 2 amplifiers using NGST cryo3 devices continues.
  - 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.
  - Research into noise properties of phased array feeds continues

Amplifier Development: Several samples from new 35nm InP HEMT wafer of three different designs were delivered for packaging and testing. These include two wideband 68-116 GHz designs and one improved 67-90 GHz design. LNAs using the first iteration of the 67-90 GHz design were delivered to GB for use in the new GBT 4mm receiver. The work is continuing on understanding the performance of 30 micron wide cryo3 devices at W-band frequencies, following the development of a 75-120 GHz demonstration amplifier the previous quarter. The commercial L-band amplifiers from MITEQ to be used in MeerKat Array receivers have been successfully evaluated at cryogenic temperatures. Experimental evaluation of ALMA band #1 amplifier awaits the availability of technician time.

Amplifier Production: New amplifier production included twenty-four 230-470 MHz amplifiers, two 1-2 GHz, four 2-4 GHz, four 4-8 GHz, five 8-12 GHz, eight 12-18 GHz, and three 18-26 GHz amplifiers. Repair, upgrade, and retesting of amplifiers included six 1-2 GHz, one 4-8 GHz, one 8-12 GHz, and two 12-18 GHz. In total, 60 amplifiers were shipped. The EVLA and VLBA amplifier and production is approximately on schedule. The delivery of K-band amplifiers to MPI has been completed this quarter.

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Observatory Development & Programs
- *Coordinated Development Laboratory*

- ***Electromagnetic Development***
  - Completed a VLBA Sensitivity Upgrade memo titled "Design and Measurement of VLBA C-Band Feed Horn".
  - Completed measurement of a prime focus X-band (8-10 GHz) feed for the Skynet Project.
  - Design of a spline profile smooth-wall horn for the 1200-1500 GHz range was completed.

Electromagnetic Development: Far-field patterns of the X-band feed were measured in the E-, H- and 45° -planes and found to be satisfactory. The taper at the edge of the main reflector varies from -10.9 dB to -15.1 dB between 8 and 10 GHz. Cross-polarization in the 45° -plane is lower than -31 dB. Patterns were also measured with a 4" diameter G10 cylinder around the feed, as if mounted in a cryostat. The can holds the radome. Co-polarized patterns essentially remain the same; cross-polarization deteriorates to -22 dB at the worst. Measured return loss is better than 15 dB. The spline profile horn has a diameter of 0.0616 and a length of 0.201. This test horn supports high frequency R&D relevant to SOFIA and other future initiatives such as ALMA Band 11, CCAT, etc.

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Observatory Development & Programs
- *Coordinated Development Laboratory*

- **Advanced Receiver Development**
  - LNAs using ST Microelectronics' SiGe transistors in testing.
  - S-Band (1.7-2.6 GHz) cryogenic DOMT receiver is complete.

- **Millimeter & Submillimeter-Wave Receiver Development**
  - SIS junctions with AlN barrier again approaching mixer quality
  - Development of balanced and sideband-separating SIS mixers continues for 780-950 GHz
  - Prototype1.2-1.5 THz waveguide HEB mixer blocks being fabricated
  - Proposed high-precision submillimeter waveguide flange IEEE standard undergoing further refinement

Advanced Receiver Development: Three experimental LNAs using SiGe (Silicon Germanium) transistors from a new wafer run have been built and tested. This required the addition of Aluminum wire-bonding capability in the lab -- a material system and technique not previously used in radio astronomy instrumentation but which will be important in the future to leverage commercial advances in Silicon-based technology. The amplifiers exhibit 6K minimum noise at 2 GHz, higher than the predicted 3K. The cause of this discrepancy is under investigation. Nonetheless, this is an encouraging first result. All components of the S-Band cryogenic DOMT receiver are complete. If successful, this receiver will be more compact than our current state-of-the art designs, and will enhance the sensitivity of cm-wave observations roughly 10-20% by reducing the noise contribution of input losses in front of the cryogenic amplifiers. Testing has been delayed by a failure in one of the data acquisition cards of the test setup and the search for supporting equipment to make the cryogenic test Dewar from Green Bank operational (vacuum pump, controller, temperature sensors, etc.). A follow-up design to the S-Band DOMT receiver has been roughed out in a paper design study. Based on triple-ridged waveguide, this innovative design would achieve 1-3 GHz instantaneous bandwidth with no compromise in receiver noise temperature compared to our current best instruments. This distinguishes it from most other broadband receiver technologies currently proposed, where system temperature is sacrificed in favor of instantaneous bandwidth.

Millimeter & Submillimeter-Wave Receiver Development (R&D only): The ability to manufacture SIS junctions is vital to the maintenance and continued development of ALMA and other sub-mm telescopes. The University of Virginia Microfabrication Laboratory (UVML) is one of the few locations in the world with this capability. A high level of contamination was found following factory modification of the Inductively Coupled Plasma (ICP) source at the UVML. The ICP system was rebuilt, cleaned, and is being purged of contaminant. SIS junction characteristics with AlN barriers are now approaching mixer quality and continue to improve as ICP continues to operate. After one more ICP run to determine barrier thickness versus nitridation time, the 385-500 GHs SIS mixers will be fabricated. Development of ALMA Band 10 (780-950) mixers based on 385-500 GHz prototype work continues. NASA call for proposals for SOFIA 2nd Generation Instrumentation has been released. In addition to concept development of multi-pixel 1.2-1.5 THz HEB receiver for proposal, prototype fabrication has begun of a 1.5 THz mixer block with feedhorn. The high precision submillimeter waveguide flange proposed as part of a new IEEE standard is undergoing further refinement to allow backward compatibility with most existing standards

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Observatory Development & Programs
- *Coordinated Development Laboratory*

- ***Phased Array Feed***
  - Data analysis on tests of the improved prototype of ambient temperature, single polarization array on 20-meter continues:
    - Improvements to noise match to LNAs taking account of mutual coupling are apparent, but …
    - Some penalty in aperture illumination from resultant dipole design
    - Weak source detection tests consistent with processing bandwidth and sensitivity determined with strong calibration source
  - Cryogenic dual-polarized array installed for testing in outdoor test building and then on 20-meter telescope
    - Individual dipole noise consistent with lab measurements of individual components
    - Tsys/Aperture Efficiency approximately 50 K (Tsys approx 35 K)
    - Suspect that spillover temperature is higher than expected

Phased Array Feed (formerly called Beam Forming Array): The phased array feed is an innovative approach to form seven beams on the sky by combining the signals from 19 dipoles placed in the telescope focal plane. This will have applications for HI mapping, pulsar surveys, and EOR science on the GBT. The primary objective of the ambient-temperature array measurements was to test the design assumptions that the array system noise can be improved with an optimal impedance match between the array-embedded dipoles and the low-noise amplifiers. The cryogenic version is the first cryogenic phased array feed ever tried and has the lowest system temperature of any PAF to date.

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Observatory Development & Programs
- *Coordinated Development Laboratory*

- ***The Precision Array to Probe the Epoch of Reionization (PAPER) (collaboration with UC Berkeley) (see NIO)***
  - South African 64-element array
    - Deployment of 64-element array was successful
    - Observations continue
  - Green Bank 32 element array
    - Re-configured the array for maximum redundancy
    - Observations continue
  - Engineering experiments continue
    - Study of ionospheric effects on PAPER data

The Precision Array to Probe the Epoch of Reionization (PAPER): The components for the 64 element array in South Africa were fabricated, shipped and deployed, successfully. The Green Bank array has been reconfigured into three north–south lines and astronomy observations continue with emphasis on the study of cross-coupling among the elements. The study of ionospheric effects will continue. Additional information on the PAPER collaboration can be found in the New Initiatives section.

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Observatory Development & Programs
- *Coordinated Development Laboratory*

- ***LUNAR***
  - Work continued on the NASA Dark Ages Radio Explorer (DARE) mission proposal, which is now in external review by NASA.
  - Completed the detailed analysis of the antenna configuration.
  - Work on the DARE Instrumentation Verification Plan has begun

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.

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Observatory Development & Programs
- *New Initiatives*

- ***Administrative***
  - R. Dickman formally became head of New Initiatives Office ca. 1 April 2011
- ***USSKA Consortium***
  - USSKA Consortium Meeting in June, 2011
  - NSF decision that there will be no support of US SKA activities in the foreseeable future was a major factor in decision of USSKAC to disband at the end of 2011
  - NRAO is prepared to honor its earlier commitment to DVA-1 prototype fabrication and testing program should NSF approve continued work by the TDP
- ***NANOGrav***
  - Positive review of year 1 of PIRE award
  - White paper on NANOGrav status and consortium plans is under development, with draft expected Q4

During the last quarter, NIO continued to work with TDP, DRAO and the SPDO to refine the DVA-1 Program Letter of Intent. However, NRAO believes that the strategic relationship of the proposed work to the needs of the US astronomy community for DVA-1 requires further discussion.

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Observatory Development & Programs
- *New Initiatives*

- ***Space Very Long Baseline Interferometry***
  - RadioAstron launch currently scheduled for July 18, 2011
  - The Lebedev Physical Institute (Moscow), operator of RadioAstron, has approached NRAO about funding the refurbishment of a large antenna in GB and supporting ground station operations for the RadioAstron mission.
- ***PAPER***
  - Refurbishment and expansion of PAPER in South Africa (ZA) to 64 antennas was successfully completed during June by teams from NRAO, UVA, UCB, and Penn. Long-duration PAPER observing has now begun on 64 element array.
  - Power and internet fiber were installed from KAT-7 to PAPER site by ZA collaborators; 3 undergraduate engineering students from Durban University assisted.
  - Work at the GB PAPER site has focused on understanding cross-coupling among the array elements. Several coupling modes have been identified and the study continues with emphasis on mitigation measures.

RadioAstron launch currently set for July 18, 2011. RadioAstron has a nominal 5-year lifetime. Formal negotiations for a ground station agreement would not begin until the RadioAstron satellite is successfully placed in orbit and is found to be healthy.

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Observatory Development & Programs
- *New Initiatives*

- ***VLBA***
  - Pledges totaling ~$1M per year in additional support for VLBA operations were received from 5-6 of the institutions that participated in the January workshop convened by NRAO
  - Work on formalizing these pledges for FY 2012 has begun:
    - Memorandum of Understanding with Shanghai Astronomical Observatory (SHAO) signed in May, along with Memoranda of Agreement to (i) support VLBA operations at $100k per year and (ii) to build a C-band receiver for the new 65m SHAO antenna. Contract for (ii) awaits assessment of export requirements (now underway) and permission from US government
    - MPIfR is seeking support for its $200k per year pledge and an agreement has been drafted
    - ASIAA has offered to assume roughly half of the ~$400k per year operations costs for the MK site. Details are being worked out.
    - Contacts also underway with NAOJ and CSIRO
  - We have also begun exploring how to broaden the USNO collaboration and raise the current $1M per year level. We are exploring:
    - Providing a software correlator to USNO with possible maintenance contract
    - Adding other VLBA sites to the two USNO will use for UTI-UTC observations

SHAO agreements signed by the NRAO Director and Director of SHAO Xiaoyu Hong on May 20. Export assessments for C-band Rx and future hardware to SHAO are underway and we are examining both Dept. of Commerce and Department of State (ITAR) regulations.

NRAO has begun exploring how to broaden the USNO collaboration.

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Agenda

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

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Observatory Support Services
- *Education & Public Outreach*

- ***Public Website***
  - Design and initial content outline for site completed and content management system (CMS) selected
  - External contract programmer identified to create CMS modules (templates)
  - Staff web programmer hired in Q2 from ALMA construction has returned to ALMA construction full time to complete critical work
- ***External Press/Media Activity***
  - Press release & press conference on EVLA Early Science at AAS Boston (http://www.nrao.edu/pr/2011/evlaearly/)
  - Editing for ALMA broadcast documentary under way; animations being spec'd
  - Hosted film crews at VLA from History Channel and Smithsonian Channel
  - NRAO received mention in 160 articles in U.S. publications
  - NRAO received mention in 72 articles in international publications from 24 countries
  - Worked with Popular Science on articles about world's biggest science projects and "college labs" (featuring NRAO summer students)

New public website design features clean, luminous "app-like" design and multiple "stage configurations" for display of visual content. The Joomla content management system was selected as being most compatible with the need for multiple page templates. An external contract programmer with expertise in the creation of Joomla modules has been identified and will be engaged to create the modules/templates. Press release and press conference on ALMA Early Science at the May AAS in Boston was well attended and generated significant press coverage. With all but pick-up filming (e.g., shots identified as being needed during the editing process) completed, the ALMA documentary has moved into the editing stage. EPO has filmed several pick-up shots of ALMA receivers and the University of Virginia grounds per request from the editor. History channel shooting was for production about New Mexico. Smithsonian Channel aerial filming was for program called "Aerial America."

NRAO received mention in 160 articles in U.S. publications having a total *potential* audience (that is, assuming everyone views/reads the articles) in excess of 98 million persons. NRAO received mention in 72 articles in international publications from 24 countries. Popular Science article on world's biggest science projects will feature both EVLA and VLBA. Popular Science feature on "College Labs" will feature photos of NRAO summer students at the VLA. Additional noteworthy media activities: Videos of NRAO technicians, etc. at work beginning to appear as part of New Mexico State University series on careers (http://vimeo.com/22586230). Provided extensive information to Alaska Airlines magazine for article about the EVLA and VLBA. Approved multiple external media usage permission requests.

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Observatory Support Services
- *Education & Public Outreach (continued)*

- ***Education Activity***
  - VLA guided tours and family activities first Saturday of each month
  - Numerous educational events, held in Green Bank, including conducting research with the 40-foot telescope
- ***Internet Media Activity & Media Production***
  - NRAO Twitter followers now exceed 1,200; (20% growth from Q2); alma NRAO Twitter account created
  - Facebook fans have topped 3,600; (20% growth from Q2)
  - First public-style image from ALMA data (of Antennae galaxies) produced in support of NAOJ's needs for an image to submit to funding agency
  - Videos of Green Bank SETI Workshop produced and posted; ready for linking by Green Bank conference organizers on conference site

VLA guided tours, part of the new "First Saturdays" program, are generating visitation and gift shop sales triple that of comparable Saturdays in previous years. Numerous overnight educational events, conducting research with the 40-foot telescope, held in Green Bank. Green Bank **overnight educational event** participants:

- Fairmont State U/Glenville State college mini institute (WV)
- Blacksburg high School (VA)
- Summersville Middle School (WV)
- Manassas City Public Schools (VA)
- South Charleston High (WV)
- Harrisonburg Girl Scouts (VA)
- Grosse Pointe High (MI)
- Ceredo Elementary (WV)
- Rutgers University (NJ)
- Howard Community College (DC)
- Northern Dauphin Christian Schoo l(PA)
- Washington and Lee (VA)
- Roberto Clemente Middle School (MD)
- Spring Risge STEM Academy (VA)
- Newburg Free Academy (NY)
- Chautauqua Short Course
- LSAMP students with the CCU
- Educational Research in Radio Astronomy (UNC)
- Society of Amateur Radio Astronomy
- StarQuest Star Party

ALMA image processing exercise provided EPO with needed experience handling and visually interpreting ALMA data. Image was universally praised by NRAO's international ALMA EPO partners.

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Diversity - Broader Impact

- Formalized Employee Diversity Groups in Green Bank, Socorro and Charlottesville
- Training for EDGs – August & September 2011
- Assist Dr. Alfred in further developing Howard University's astronomy program, which includes curriculum development, in-class presentations by NRAO astronomers, scientists and engineers. Aaron Evans and Kartik Sheth will provide lectures.
- Dr. James Lindsey (Howard University Professor) will be colloquium guest at NRAO
- Long term objective is to develop a program model that can be used to develop similar relationships with new universities in the future.
- Assisted Kartik Sheth with Professional Development session with the summer REU students

As referenced in the AUI Broadening Participation Plan, the formation of the Employee Diversity Groups (EDG) will ensure a bottom up approach by encouraging and supporting the EDGs to actively participate in NRAO's diversity efforts.

- SOC – Reps from Scientific, Admin, VLA and Engineering
- CV – NAACS, NTC, CDL, Admin
- Green Bank – reps from divisions across the site – Electronics, Software Eng, Scientific, Plant Maint, Cafeteria, Mech Engin, Telescope Ops.

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Broader Impact

- Establishment of partnership with African American Teaching Fellows to collaborate on STEM initiatives
- Establish partnership with the Boys & Girls Club of Central Virginia to create STEM opportunities for underrepresented youth in the community
- Collaborating with Tony Remijan and Dr. Marcus Martin (UVA Chief Diversity Officer) to establish internship opportunities for underrepresented minorities
- Assisted Kartik Sheth and Aaron Evans – BISO (Broader Impact Scientific Outreach) – advanced undergraduate internship program – MSI/HBCU
- Collaborating with Richard Prestage and UVA Center for Diversity in Engineering
- Participate in the National Society of Black Engineers Conference

AATF – NRAO provided two scholarship to African American students who will teach in the STEM field. Collaborating with Exec Director at the B & G Club to create opportunities for underrepresented youth to travel to GB and the NTC – also working on visits from Scientific and Engineering Staff to visit the local clubs.

Support two early career undergraduates working closely with the Scientific Staff to participate in the Center for Chemistry of the Universe (CCU). VA-NC. This is a Louis Stokes Alliance for Minority participation (LSAMP) Summer research program. NSF funded. VA-NC LSAMP are NSF funded partnerships with multiple institutions. 4 HBCUs in VA and 4 Universities in North Carolina. Program strives to increase student interest in scientific research and provides activities to develop learning skills for physical sciences. Hands on research using lab instruments, observations from GBT and the VLA and advanced software applications to investigate kinetics of molelcule formations. Scientists from Emory, Harvard cFA, NIST, NRAO, The Ohio State Univ, and UVA. Placed in small research groups focusing on observational radio astronomy, chemical reactivity and spectroscopy, and instrument development.

BISO – Kartik & Aaron – work with two MSIs Howard and one other institution. Scientific staff will travel to MSIs to meet faculty and staff to assess needs of MSIs and present opportunities for collaboration. Review NRAO science highlights and discuss current and future direction of NRAO. Second part – initiate a research experience program aimed at advance undergraduate or graduate level under represented students. Two – three students who will spend eight months at home institutions doing prep work and three months on-site at NRAO on a focused research program. Involves “peer monitoring”, process support, on hands instrumentation experience, science time that will lead to becoming published.

UVA Center for Diversity - met with Center’s Director to discuss future collaborations/ partnerships on NSF funded grants for minority engineering students. Several grants require sponsorship by MSIs.

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Agenda

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

Observatory Administrative Services
- *Observatory Business Services*

- ***Observatory Business Services***
  - Relocation status WIKI page [Q2]. Delayed to Q4 while new Administrative Assistant is trained.
  - Install electronic passkey doors at CIS server area, communications room, and OBS/Human Resources hallway to meet HIPPA and other security requirements [Q3]. Have found available vendors and in process of obtaining quotes. Selection and installation will be made in within Q4.
  - Replace Edgemont Road phone and voicemail system [Q4] Quotes are being obtained. Will implement during FY 2011 Q4 and FY 2012 Q1.
  - Complete installation of cell phone booster [Q4] Have incorporated cell phone boosters into phone and voicemail quote. If pricing is acceptable will implement during Q4 FY 2011 and Q1 FY 2012.

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Observatory Administrative Services
- *Observatory Business Services*

- ***Contracts & Procurement***
  - Prepare and support audits/reviews by DCAA, BDO, Booz Allen, CBH, Chilean Procurement Review [Q1, Q2, Q3, Q4] Ongoing
  - Implement P-Card Program [Q3]. Will not make Q3 deadline. Fiscal has taken implementation lead. Updated completion date is end of Q2 FY 2012.
  - Complete commitment of ARRA funds [Q3]. Delayed into Q4 due to resolution of Davis-Bacon Act issues.
  - Revise the Procurement website internal and external pages [Q4]

Note: Resignation of Contracts & Procurement Manager has slowed advancement of projects however progress is being made through load sharing with Fiscal and Business Services.

Implement P-Card Program [Q3]. Contract with US Bank has been signed and implementation team is working with Bank on procedures and data. Full details of phased roll-out and procedures manual are in-work.

Complete commitment of ARRA funds [Q3]. Two of the ARRA tasks remain open while determining if they have satisfied Davis-Bacon act provisions. Awaiting determination of path forward before contracts can be closed out.

Observatory Administrative Services
- *Observatory Business Services*

- ***Contracts & Procurement (cont.)***
  - Grants and Contract Administered

Grant Contract #	Name of Grant	Funding Institution	Grant Value	PI	Period of Performance	
OCI-1135316	Innovations In Data-Intensive Astronomy Workshop	NSF	$49,977	Karen O'Neil	04/15/11	03/31/12
7000149702	MIT/Lincoln Labs - Wideband Cryogenic Feed for the NRAO Bi-Static Radar Station	MIT	$518,378	Karen O'Neil	04/04/11	11/04/11
00007521	Advanced Multibeam Spectrometer for the GBT	Regents of the University of California	$118,149	John Ford	09/15/10	08/31/12
RSA1433857	Measuring Emissivity Indices of Dust in Dense Cores with the SPIRE/FTS	JPL	$36,704	Scott Schnee	05/19/11	12/31/13
RSA1433643	Searching for Interrupted Mass-Loss in AGB Stars	JPL	$20,609	Alwyn Wootten	05/17/11	12/31/13
RSA1433873	First Steps Toward Star Formation:Unveiling the Atomic to Molecular Transition in the Diffuse Interstellar Medium	JPL	$18,886	Felix Lockman	05/19/11	12/31/13

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Observatory Administrative Services
- *Obseratory Business Services*

- ***Fiscal***
  - Organization and preparation of the Internal Audit for the NRAO Office of Chile Affairs (OCA) being conducted by AUI.
  - Completion of planning phase of the NRAO Procurement Card Implementation.
  - Transitioning method of NRAO vendor payments from paper check issuance to electronic ACH remittances.

The purpose of the scheduled Internal Audit by AUI is to review the business functions of the OCA specific to the areas of contracts administration, local staff payroll, accounts receivable, travel reimbursements and unallowable costs.

The NRAO Procurement Card Program will replace the current Departmental Credit Card Program and will allow for electronic monthly statement reconciliation and approval. The initial planning phase was concluded in FY 11 Q2 and full implementation is targeted for Q1 of FY 12.

The Fiscal Division has completed the preliminary planning to transition vendor payments to electronic ACH remittance and will complete transition for a select group in FY 11 Q4 with full implementation, for all vendors, scheduled for Q2 FY 12.

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Observatory Administrative Services
- *Observatory Business Services*

- ***Management and Information Systems***
  - Plan and implement NRAO "Shared Cost Allocation Pool" [Q1] Updated forecast for completion and full testing during Q4. All four pools have been automated. In process of end to end testing of data and results.
  - Update JD Edwards ERP software from 8.1 to 9.x [Q1, Q2, Q3, Q4]

Shared cost allocation pool is progressing toward completion, but has required considerably more time and resources than initially expected. This is a combined effort with support from Business Services, MIS, and Fiscal.

Observatory Administrative Services
- *Observatory Business Services*

- ***Environmental Safety and Security***
  - Finalize Crises Management Plan [Q1] Delayed to end of Q4
  - Create an OSHA 10-hour compliant course for NM to be delivered by ES&S personnel [Q1] Course is in review, will finalize end of FY 2011.

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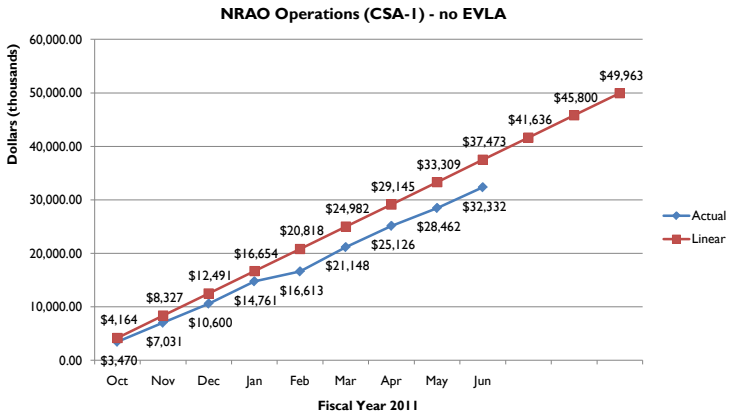
Observatory Administrative Services
- *Observatory Business Services*

- ***Financial Performance***



FY 2011 budget based on President's Request and without consideration for the continuing resolution:

NRAO Operations (less EVLA) FY 2011 new funding allocation is $43,176.8k. Total available funding including prior year commitments and carryover totals $49,963.5k. Total expenses and commitments for the first three quarters of FY 2011 is $32,332k or 64.7% of total available funds.

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Observatory Administrative Services
- *Human Resources*

- ***Human Resources***
  - Employee Climate Survey
- ***Promotions***
  - CV
    - 1 Female

The NRAO completed its analysis of the results of the Employee Climate Survey and established an action plan that focuses on four key issues:

1. Improve Morale
2. Clarify NRAO Management Roles
3. Build Management Experience
4. Balance Compensation and Benefits with Workforce

NRAO briefed the AUI Board in June on the survey results and the action plan. The survey results and action plan will be made available to employees on the NRAO website in July.

Promotions: Joyce Ford

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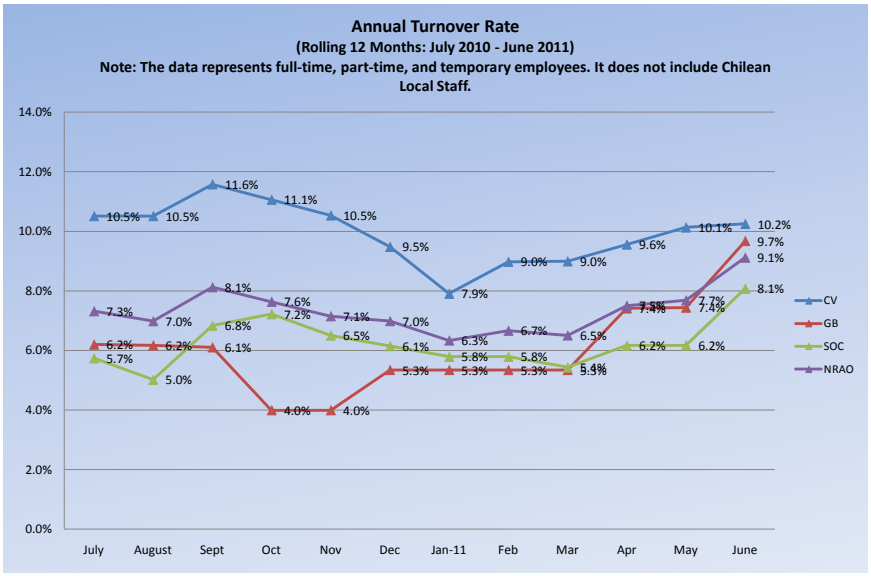

See Next Slide for information.

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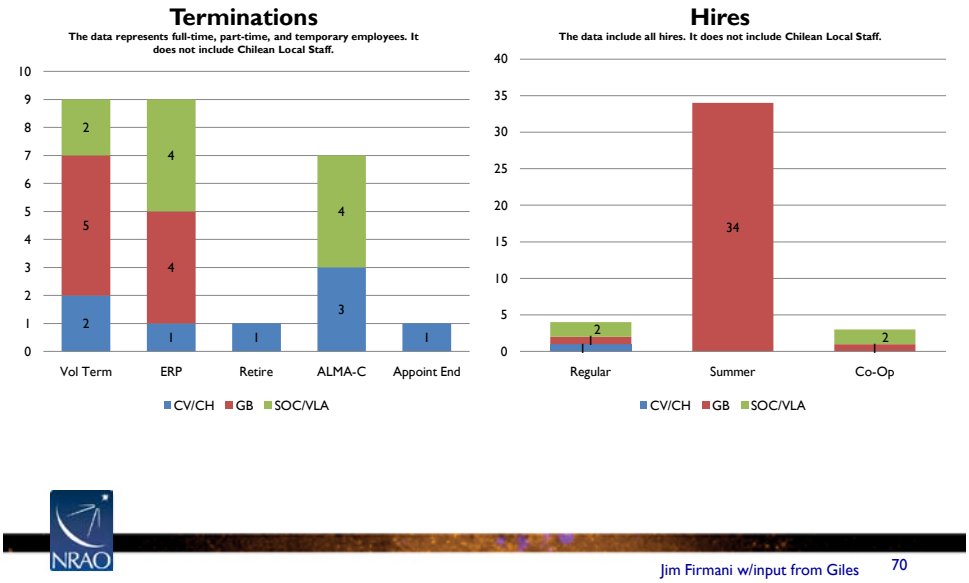

Terminations – Chart provides a breakdown of terminations for the 3rd quarter. Nine (9) out of 20 ERP volunteers retired during this period along with the first group of ALMA construction roll offs. Of the 7 ALMA-C roll offs, 4 were able to find new jobs and left NRAO during the period. Existing ALMA-C staff were shifted to cover the work for the early departures.

Voluntary terminations were higher than normal. Three valued members of NRAO's supervisor/management staff left for new opportunities and one Research Associate due to the relocation of the spouse.

Hires – New Chart. NRAO uses temporary hires to cover seasonal work and support its Broader Impact and Diversity programs (CV-Ops). The summer and Co-Op hires will leave NRAO by the end of the 4th quarter.

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Observatory Administrative Services
- *Computing & Information Systems*

- ***Common Computing Environments (CCE)***
  - NAASC User Portal and Helpdesk successfully supported Early Science proposal call with 923 proposals received
  - ALMA-Wide helpdesk solution tailored for regional affiliation
  - Green Bank departments configured in NRAO observer helpdesk
  - science.nrao.edu site successfully transitioned to new content platform
  - Successful initial archive sync to Chile for ALMA data
  - Compute cluster and parallel storage nodes received for ALMA processing
- ***Networking and Telecommunications***
  - Configured network tunnel to JAO (for Archive sync)
  - Network hardware request submitted to WV state for GB/WVU link
  - Approval to proceed with replacement of legacy phone system in CV
- ***Security***
  - CIS/MIS validated HIPAA Risk Assessment audit findings

NAASC User Portal and ALMA-Wide Helpdesk (hosted at NAASC) successfully supported the call for Early Science leading up to June 30th deadline. The ALMA-wide high availability helpdesk server was successfully configured to appear appropriately depending on the region of each observer. NRAO helpdesk configured to include Green Bank site for observation and data processing support. Successful migration of the science.nrao.edu to the new Content Management System with complete documentation and multiple training sessions for content owners.

Santiago Metropolitan Link and secure network tunnel installed with successful archive replication test. 96 CPU core cluster and 50 TeraByte parallel file system with 40Gigbit/sec local network delivered in NAASC to support early Science (identical system being installed in SCO for JAO). Measured progress with 10Gigabit/sec link for Green Bank internet link via West Virginia Univ. working with BTOP stimulus funds and WV State coordination.

Proceeding with migration of CV phone system to VoIP in Q4.

HIPAA audit identified physical access to HR space and server room to be a risk. Installation of swipe card door has been recommended. See Observatory Business Services for plan. No security incidents with impact on operations occurred this quarter.

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Observatory Administrative Services
- Office of Chile Affairs (OCA) Significant Events

- ***Staffing***
  - Expatriates supported by the OCA: 22
  - ALMA local staff
    - 28 new hires, for a total of 246 LSM (221 JAO, 25 AUI/NRAO)
  - Coordination with new ALMA HR management
    - Shifts for night operators signed by Union
    - Internal Rules and Regulations Manual updated to include new "Alcohol and Drug Misuse Policy" at the ALMA Site.
- ***Activities***
  - Outfitting of new OCA offices near ALMA Santiago Central Office completed.
  - Purchase Orders processed:
    - 75 ($1,554k) for ALMA Construction
    - 239 ($1,148k) for JAO Operations

OFFICE OF CHILE AFFAIRS (OCA): The number of expatriates decreased by one as two departed and one arrived. OCA has increased the total number of ALMA Local Staff Member contracts in the quarter, bringing the total number of employees for which OCA provides ALMA with legal, payroll and travel support to 246 local staff (221 under JAO supervision and 25 under AUI/NRAO's). The shift forms for night operators was signed by the Union, thus completing regularization of all work shifts for ALMA. The Internal Rules & Regulations Manual was updated to include the new "ALMA Alcohol and Drugs Misuse Policy." Additionally, a document with "Procedures for Off-Duty Trips" was released.

OCA has provided the legal and institutional support for contracts and procurements for ALMA as follows: a total of 75 purchase orders were made for ALMA Construction (1,554 k$) and 239 for ALMA Operations (1,148 k$). The activities for ALMA Construction involve those described in the Site IPT section, namely AOS Roads Construction Contract, AOS Utilities – Electrical and FO cables installation contract, Fiber Optic Cable supply and Contractors' Camp expansion (JAO activity). Monthly reports were issued to CONAMA (environmental authority) related to flora/fauna and archaeological follow-ups. The termination of the AOS Utilities – Electrical and FO cables installation contract with Echeverría & Kelly Ltda. continues to involve additional litigation.

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Agenda

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

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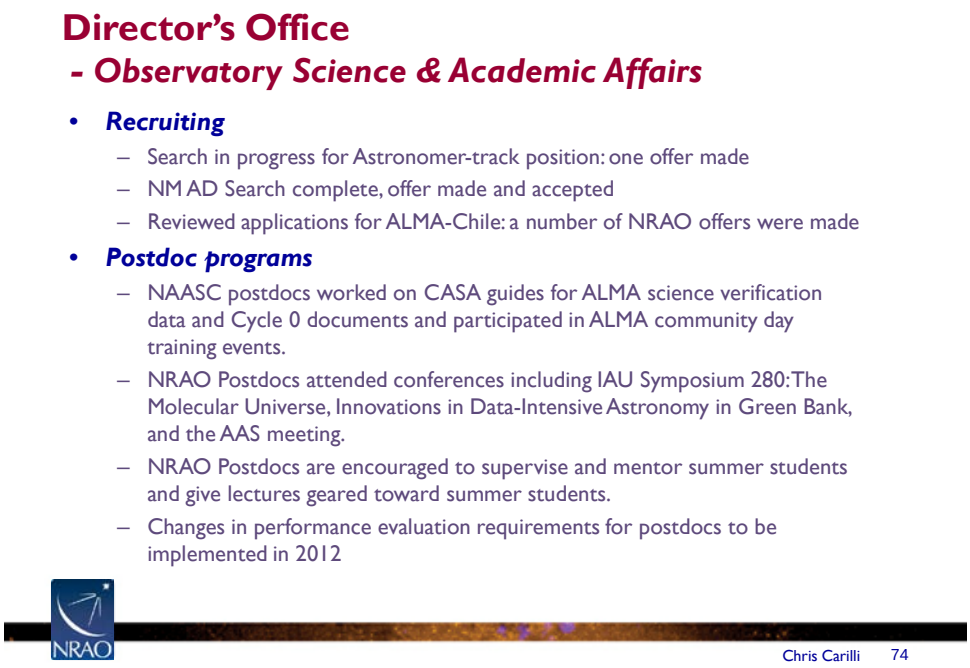

Dale Frail named new NM AD this quarter.

NAASC postdocs worked on CASA guides for ALMA science verification data and Cycle 0 documents, the Splatalogue database, and participated in ALMA community day training events. EVLA postdoc leads CASA commissioning. The annual NRAO postdoc symposium was held in Charlottesville in April, with talks by all postdocs, plus outside experts. Postdocs attended **conferences**, including IAU Symposium 280: The Molecular Universe, Innovations in Data-Intensive Astronomy in Green Bank, AAS meeting, other Postdocs participate in lunch talks, colloquia, science tea, weekly postdoc lunch, and literature discussion groups. The postdocs are asked to organize some of these activities. NRAO hosts numerous summer schools on radio astronomy techniques and science topics. The postdocs are encouraged to participate, and help organize in some cases. NRAO runs one of the longest-standing and most successful REU programs, and the postdocs are encouraged to supervise **undergraduate students in summer research**. They also are asked to give summer student lectures in areas of their particular expertise. Each site has various lectures and formal instruction on key skill areas, such as python programming, training in the use of astronomical tools, and career development.

Jansky fellows submit biannual progress reports to OSAA, and have an annual interview by program director and/or Head of OSAA. For external fellows, we will require an annual progress report from the host institution, including discussion of the points delineated in Section 1. Starting in CY2012, the project postdocs will participate in the annual **NRAO Performance Evaluation** Process as per standard scientific staff policy. This includes a functional review by the immediate supervisor, and a scientific review by OSAA.

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Director's Office
- *Observatory Science & Academic Affairs*

- ***Jansky lecture***
  - Dr. Sander Weinreb named 2011 Jansky Lecturer
- ***OSTC completed review of development proposals for budget cycle***
- ***Scientific Staff***
  - NRAO scistaff were deeply involved in numerous RSRO programs at EVLA
  - NRAO staff organized science meetings on:
    - "observing with ALMA" tutorials (Q3)
    - Sixth Single Dish Summer School in GB (Q4)
    - Data intensive astronomy workshop in GB (Q3)
    - EVLA Data Reduction Workshop (Q4)
  - NRAO staff are participating in URSI 2011 in Istanbul (Q4)
- ***Scientific Performance Evaluation by OSAA is complete***
- ***Academic promotions***
  - Academic promotions committees for all staff are organized
  - Process initiated for tenure consideration for one staff member

The **Jansky Lecture** Selection Committee met in April to collate the nominations for Jansky Lecturer. There were 9 nominees in all. The Director was informed of the final determination and agreed to inform S. Weinreb of his nomination for 2011 Jansky Lecture.

Scientific Performance Evaluation by OSAA is complete as of early June. Academic promotion committees are being confirmed and organized for current cycle. 20 scientific staff members are up for triennial (in-depth) review. Process initiated for tenure consideration for one staff member.

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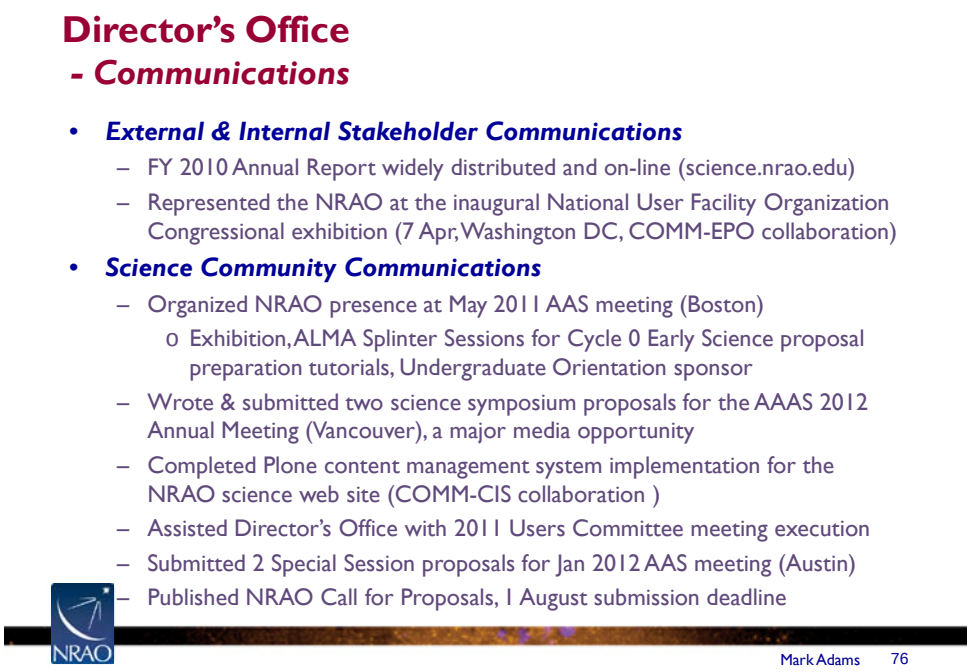

FY 2010 Annual Report: 500 copies of the Annual Report were distributed to international astronomical institutions, observatories, funding agencies, and key individuals. The on-line version is available via a flash application and as a pdf download. **National User Facility Organization exhibition:** This event was held in the Rayburn House Office Building and highlighted the important role that scientific user facilities play in science education, economic competitiveness, fundamental knowledge, and scientific achievements. **Summer American Astronomical Society (AAS) meeting [22-26 May, 1350 attendees, Boston]:** The ALMA Splinter Sessions were "Early Science Proposal Preparation Tutorials", two 3-hour intensive training sessions, 50 attendees, led by NAASC staff. **Plone content management system implementation:** Plone training was conducted across the NRAO March-April 2010; the bulk import of our science web site into Plone occurred mid April; Plone was fully operational by May. **American Association for the Advancement of Science (AAAS) Annual Meeting [16-21 Feb 2012, Vancouver]:** These science symposium proposals feature pulsar science, including strong gravity, nuclear physics, and NANOGrav [speakers Scott Ransom (NRAO), Ingrid Stairs (UBC), Ben Stappers (Manchester)]; and EVLA/ALMA Early Science highlights from relatively nearby star and planet-forming regions in our Galaxy to high-z [speakers Christine Wilson (McMaster), Dave Wilner (CfA), and Kartik Sheth (NRAO)]. **Users Committee:** 11-12 May, Green Bank. **Winter AAS Meeting [9-13 January 2012, Austin]:** Submitted Special Session proposals for an NRAO Town Hall, and an ALMA Special Session re Cycle 0 Early Science & Cycle 1 Capabilities. **NRAO Call for Proposals:** Published as a special eNews edition, 30 June.

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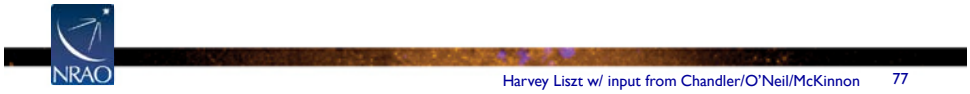
Director's Office
- *Spectrum Management*

- ***General Spectrum Management***
  - Attended Space Frequency Coordination Group meeting in San Francisco to finalize details of a new website that will provide comprehensive information on high-power orbiting radars.
  - Attended CORF meeting at National Academy in DC and met there with employees of Bosch to discuss forthcoming 77-81GHz car radar
  - Attended ITU-R meetings of Study Group 1 Working Parties in Geneva, discussing such matters as RFI from implementations of broadband over power lines, use of cognitive radio, etc.
  - Agreed to serve on review panel for competing SKA bids as regards protection of prospective host sites through spectrum management regulation



SFCG is composed of national and international space agencies that operate remote earth-sensing and deep space missions (NOAA, NASA, ESA,JAXA…). The new website will provide comprehensive and current information on orbiting space missions that could damage radio astronomy receivers if seen too close to the telescope boresight.

CORF- Their annual Spring meeting. Ken Kellerman of NRAO is a CORF member.

ITU-R – The annual meeting of this particular interest group that also deals with such outlandish matters as orbiting solar power generation satellites.

SKA- Having retrenched on its SKA involvement the USA is now seen as an impartial arbiter. The spectrum management panel will report its verdict in August 2011.