Quarterly Status Update (QSU)
April – June 2010

NSF Quarterly Status Update Briefing

August 17, 2010

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

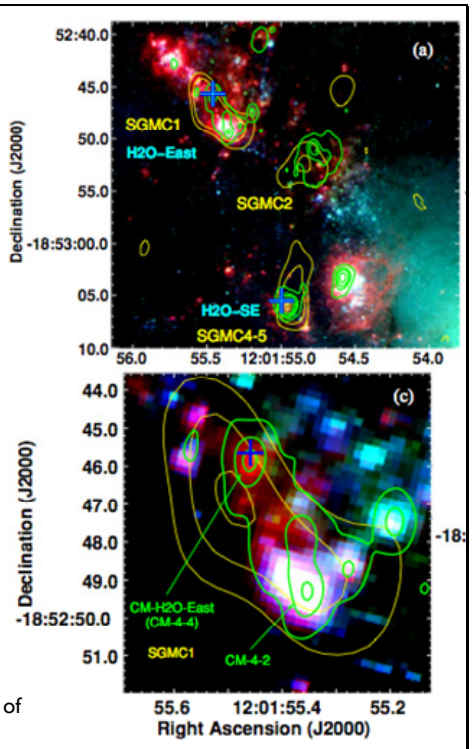
Agenda

- Science Results
- Metrics/Statistics
- Observatory Science Operations
- Site Specific Activities
  - ALMA
  - VLA/EVLA
  - GBT
  - VLBA
- Observatory-wide Operations

The format followed on this agenda provides orientation to the structure of this briefing, gives some high level science results and metrics, and then reviews Observatory Science Operations, Site Specific Activities, and then Observatory-wide operations.

VLA Science Results

Brogan et al. have studied at 80mas (9pc) resolution the Galactic–type water masers in the Antennae interacting galaxies. All three maser regions are highly obscured in the optical, and coincident with compact 3.6 cm radio continuum emission. Two are dominated by thermal ionized gas, suggesting the presence of natal super star clusters containing the equivalent of a few thousand O stars. They also present detailed comparisons between the radio data and existing HST optical and and near-IR data and find that the maser regions are also associated with Paα emission. These results highlight the potential of using H_2O masers to pinpoint sites of highly obscured young super star cluster formation with exquisite angular resolution. (ApJ 716, L51)

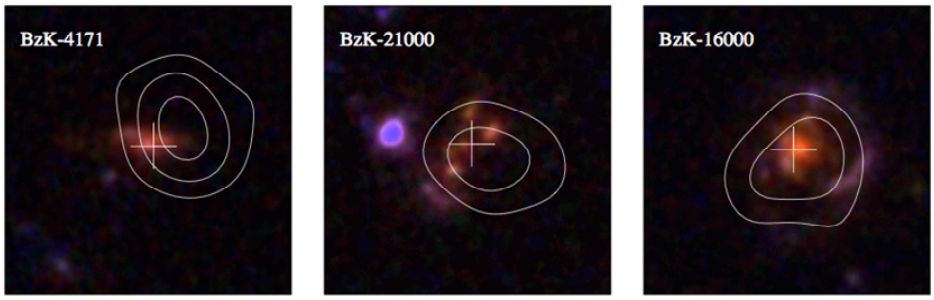


Green contours: 3.6cm, blue + show the masers, yellow contours are SMA CO3-2, and color shows a combination of optical and near-IR broad and narrow bands.

Provided by: C. Carilli

VLA Science Results

Aravena et al. imaged the cold molecular gas in normal star forming galaxies at z~1.5. They confirm the low excitation conditions, typical of Milky Way-type gas. These systems have large gas masses (> 1e10 Mo) and large sizes (> 10 kpc). The gas masses are larger than the stellar masses, suggesting an early evolutionary stage for these galaxies. (ApJ, 718, 177)

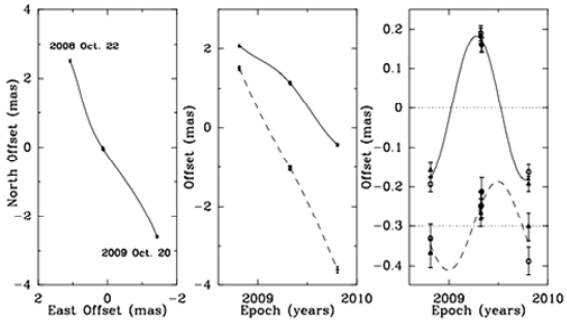


VLA CO 1-0 contours and HST color images of z~1.5 sBzK galaxies

VLBA Science Results

Sato et al. use H2O masers to determine a trigonometric parallax of W51 of 0.185 +/- 0.010 mas, implying a distance of 5.41 (+0.31/-0.28) kpc. W51 Main/South is a well-known massive star-forming region near the tangent point of the Sagittarius spiral arm of the Milky Way. The distance to W51 yields an estimate of the distance to the Galactic center of Ro = 8.3 +/- 0.46 (statistical) +/- 1.0 (systematic) kpc by simple geometry. Combining the parallax and proper motion measurements for W51, they obtained the full-space motion of this massive star forming region. W51 is in a nearly circular orbit about the Galactic center. The H2O masers trace four powerful bipolar outflows within a 0.4 pc size region, some of which are associated with dusty molecular hot cores and/or hyper- or ultra-compact HII regions. (ApJ in press)

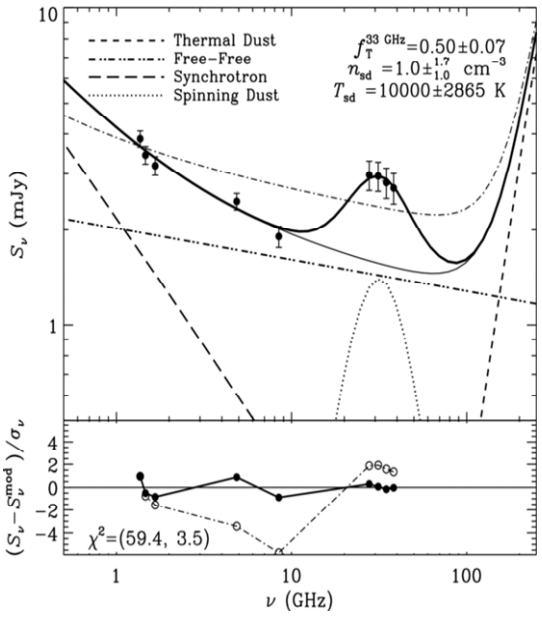
Positions for W51 derived from the H2O maser measurements



Provided by: W. Brisken/C. Carilli

GBT Science Results

Murphy et al (2010) used the GBT to measure star-forming regions in the nearby galaxy NGC 6946 at 28-38 GHz, and report detection of excess radio emission over that expected from free-free and synchrotron components in at least one location. The excess emission has the spectrum characteristic of spinning dust and indicates that this anomalous dust component exists and is detectable in extragalactic sources. These results suggest that observations of external galaxies might contain appreciable amounts of anomalous dust emission and the assumption that the measurements relate to star formation only, needs further investigation. (ApJ 2010, 708, L108)

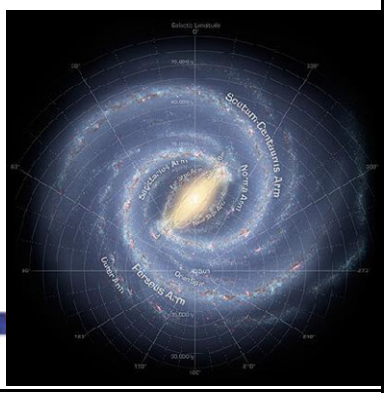


Spectrum of a star forming regions in NGC 6946

Provided by: J. Lockman/C. Carilli

GBT Science Results

Bania and collaborators have discovered a large population of previously unknown Galactic H II regions by using the Green Bank Telescope to detect their hydrogen radio recombination line emission. The targets were selected from infrared measurements made with the Spitzer Space Telescope and the NVSS survey from the VLA [X-Band receiver (8-10GHz)]. In the first quadrant of the Galaxy the GBT detected 602 discrete recombination line components from 448 lines of sight, 95% of the sample targets, which more than doubles the number of known H II regions in this part of the Milky Way. In addition to giving a more accurate census of Galactic H II regions and their properties, the new data show unambiguous evidence for major Galactic features including a concentration of nebulae at the end of the Galactic Bar, and along the kinematic locus of the 3 Kpc Arm. (ApJ 728, L106)



Artists impression of the Milky Way H II region distribution based on the Bania et al. results. CREDIT: NASA/JPL-Caltech/R. Hurt (SSC-Caltech)

Provided by: J. Lockman/C. Carilli

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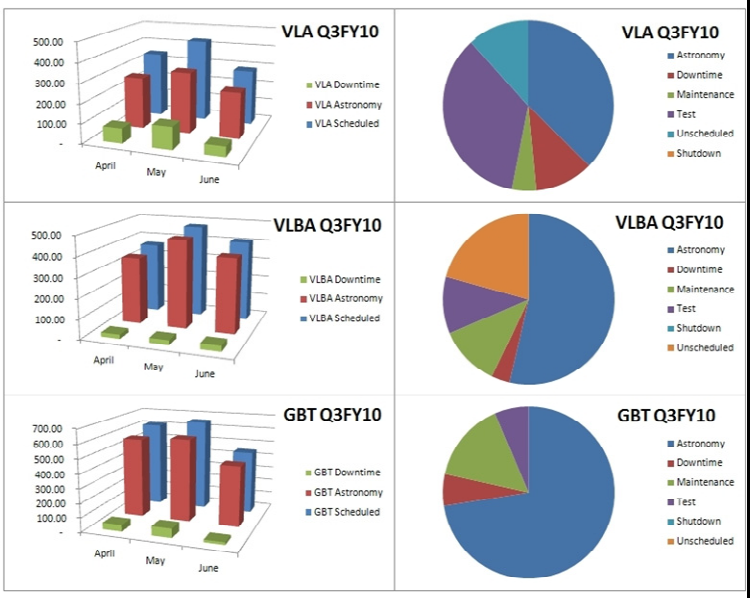
Telescope Utilization (Astronomy, Downtime, Maintenance, Test/Calibration, Unscheduled)

Q3	FY10				
			April	May	June
	Available Hours		720.00	744.00	720.00
	VLA Q3FY10	Q3	April	May	June
VLA	Scheduled	1,059.14	343.50	428.95	286.91
	Astronomy	*816.02*	*265.96*	*313.99*	*236.07*
	Downtime	*243.12*	*77.34*	*114.94*	*50.84*
	Maintenance	101.20	33.50	27.70	40.00
	Test	767.65	248.15	232.91	286.59
	Unscheduled	256.01	95.05	54.46	106.50
	Shutdown	-	-	-	-
	Total Hours	2,184.00	720.00	744.00	720.00
	VLBA Q3FY10	Q3	April	May	June
VLBA	Scheduled	1,246.75	362.50	475.00	409.25
	Astronomy	*1,170.78*	*341.11*	*450.30*	*379.37*
	Downtime	*75.97*	*21.39*	*24.70*	*29.88*
	Maintenance	251.91	106.41	67.00	78.50
	Test	233.65	60.75	58.50	114.40
	Shutdown	-	-	-	-
	Unscheduled	451.69	190.34	143.50	117.85
	Total Hours	2,184.00	720.00	744.00	720.00
	GBT Q3FY10	Q3	April	May	June
GBT	Scheduled	1,713.50	612.00	653.25	448.25
	Astronomy	*1,583.75*	*565.25*	*588.25*	*430.25*
	Downtime	*129.75*	*46.75*	*65.00*	*18.00*
	Maintenance	329.75	50.75	41.25	237.75
	Test	140.75	57.25	49.50	34.00
	Shutdown	-	-	-	-
	Unscheduled	-	-	-	-
	Total Hours	2,184.00	720.00	744.00	720.00



Provided by: R. DuPlain/N. Radziwill/G. Hunt

Scheduled = planned observing time.

Astronomy = amount of observing hours that concluded

Downtime = amount of hours lost during observing

Maintenance = scheduled period for technicians to service. Observing time is not scheduled during this time. This time is considered 'protected' and is not interrupted for targets of observing opportunity.

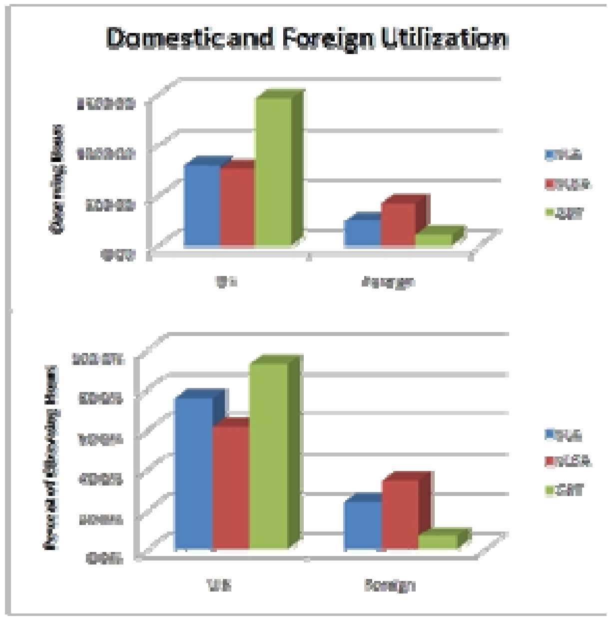
Unscheduled = time that went idle (unplanned); for example, for VLBA if no media was available or due to the 10 weather environments and the tiger team visits; for VLA if no dynamic project fit, for GBT = holiday.

Downtime = faults that occur during a planned observation; e.g., circuit breaker fault, fraction of array unavailable, etc.

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

	U.S.	Foreign	Unspecified
VLA	[illegible]	[illegible]	[illegible]
VLBA	[illegible]	[illegible]	[illegible]
GBT	[illegible]	[illegible]	[illegible]

	U.S.	Foreign	Unspecified
VLA	[illegible]	[illegible]	[illegible]
VLBA	[illegible]	[illegible]	[illegible]
GBT	[illegible]	[illegible]	[illegible]



Provided by: R. DuPlain/N. Radziwill/G. Hunt

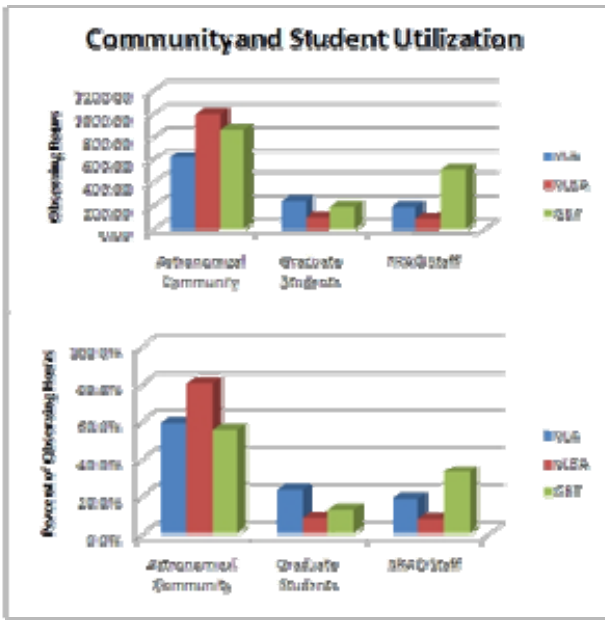
All metrics are compiled by principal investigator, not project team. The 'unspecified' category means that NRAO does not have the PI information for some reason. Part of this was the result of pre-PST project hours, where the proposal was in hard-copy form and the completeness was at the discretion of the PI. Part of the unspecified hours are likely associated with space telescope collaborations or other rapid response proposals, where the proposal process is outside the PST and the information was not available in hard-copy format.

Top graphs are in **observing hours**.
Bottom graphs are **in % of observing hours.**

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

	Astronomical Community	Graduate Students	NRAO Staff
VLA	[illegible]	[illegible]	[illegible]
VLBA	[illegible]	[illegible]	[illegible]
GBT	[illegible]	[illegible]	[illegible]

	Astronomical Community	Graduate Students	NRAO Staff
VLA	[illegible]	[illegible]	[illegible]
VLBA	[illegible]	[illegible]	[illegible]
GBT	[illegible]	[illegible]	[illegible]



Provided by: R. DuPlain/N. Radziwill/G. Hunt

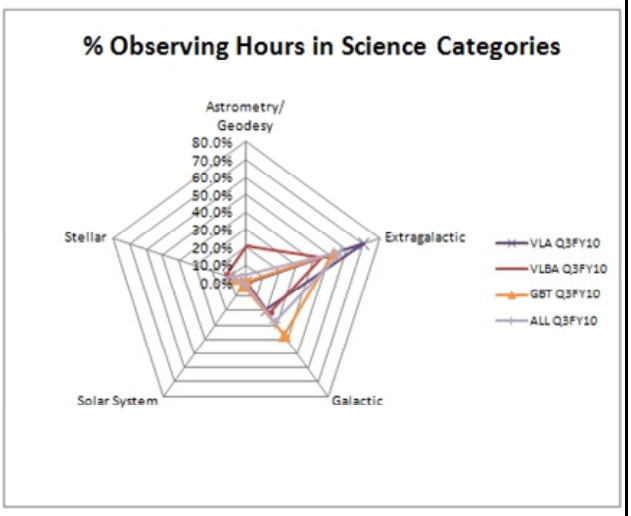
11

All metrics are compiled by principal investigator, not project team.

Top graphs are in **observing hours**.
Bottom graphs are **in % of observing hours.**

Telescope Usage by Science Category

	GBT	VLA	VLBA
SOLAR SYSTEM	2.5%	0.0%	0.0%
STELLAR	7.5%	10.2%	12.7%
GALACTIC	37.2%	19.4%	21.6%
EXTRAGALACTIC	52.1%	70.4%	45.3%
ASTROMETRY/GEODESY	0.8%	0.0%	20.5%



Provided by: R. DuPlain/N. Radziwill/G. Hunt

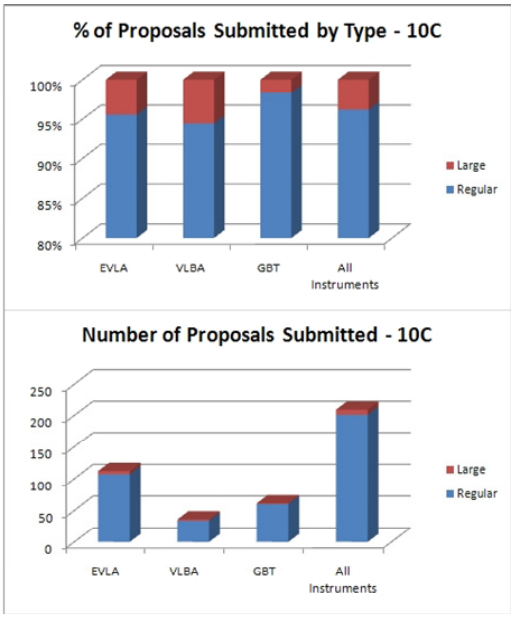
This information is obtained from the proposal coversheet which includes scientific categories. The proposals tend to include one to three scientific categories per project. The metrics are created by splitting time (minutes) evenly over the categories listed on the proposal coversheet.

Basic analysis (some trending may be due to seasonal variations in activities; full year trending analysis will be performed at the culmination of the fiscal year):

Proposals Submitted during Reporting Period

	Regular	Large	Total
EVLA	107	5	112
VLBA	34	2	36
GBT	60	1	61
All Instruments	201	8	209

Number Requesting Student Support: 8
(8 Regular, 0 Large)
(5 GBT, 3 VLBA)



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OSO Specific Milestones

- ***Organization***
  - An Implementation Plan was delivered in April 2010 that included the proposed OSO organization, responsibilities, personnel, and costs [Q3]
    - OSO management plan complete
    - WBS development complete
    - OSO Head position posted internally
    - Charge to the OSO Steering Committee complete
    - FTE's and $s identified – needs prioritization and scoping
- ***Proposal Process***
  - Adopted the ALMA Project Data Model into the PST [Q3]
  - Separation of user database component of the PST was completed [Q3]
- ***Observatory Statistics and Metrics***
  - A systematic approach for continually improving the management dashboard and reports was implemented this quarter [Q3]

Provided by: P. Jewell/L. Mitchell

15

As per the POP planned milestones, the **OSO management plan** is complete, with a defined **WBS** and initial FTE/costs scope identified. A charge to the OSO Steering Committee was completed to outline the remaining tasks needed for go-live in the first quarter of FY2011. The **OSO Head position** has been posted internally and interviews are ongoing. OSO will be implemented in Q1 FY 2011. The **FTEs and costs** have been initially scoped, however the prioritization process and final budget request must be completed before the implementation plan can be finalized and funding applied. This exercise continues into Q4.

For the Proposal Process, this quarter, The **ALMA Project Data Model** has been adopted into the ALMA OT; the ALMA Project Data Model was not found to be appropriate for other NRAO instruments; no risk mitigation needed. The **proposal and user databases** have been separated, per the plan, to facilitate mirroring of the user databases across NRAO sites and enable single sign-on for users of various NRAO web-based applications.

In preparation for initiating the logging of a newly-decided set of statistics and metadata by the end of the fiscal year, during this quarter, a **systematic approach** for continually improving the management dashboard and reports was defined. This activity requires additional focus which is expected to be applied after the prioritization and scoping of the funding is completed. A working database is in place, however more work is needed to create a smooth process.

On track for completion by the end of the fiscal year, 1) User Communications & Programs: the development of an Observatory-wide coordinated plan for NRAO tutorials, summer schools and materials, including the prioritization, scheduling and staffing of the tutorials and workshops; 2) User

Access & Support/Helpdesk & User Portal: the development plan for integrating ALMA specific functions into NRAO User Portal, Helpdesk and archive functions; the implementation of the Helpdesk for beta testing for the ALMA project; the upgrade NRAO User Portal to accommodate NA ALMA users; the deployment and testing of the NA ALMA User Portal, including interfaces to NA ALMA Science Archive, the ALMA prototype Helpdesk, and the ALMA proposal review tools. 3) Archive and VAO: Completion of the strategy for archive storage; finalization of planning and initiation of implementation of a scalable system in Green Bank, Socorro, and Charlottesville; the leverage of TeraGrid resources specifically at the NCSA in Urbana-Champaign for both storage and computation.

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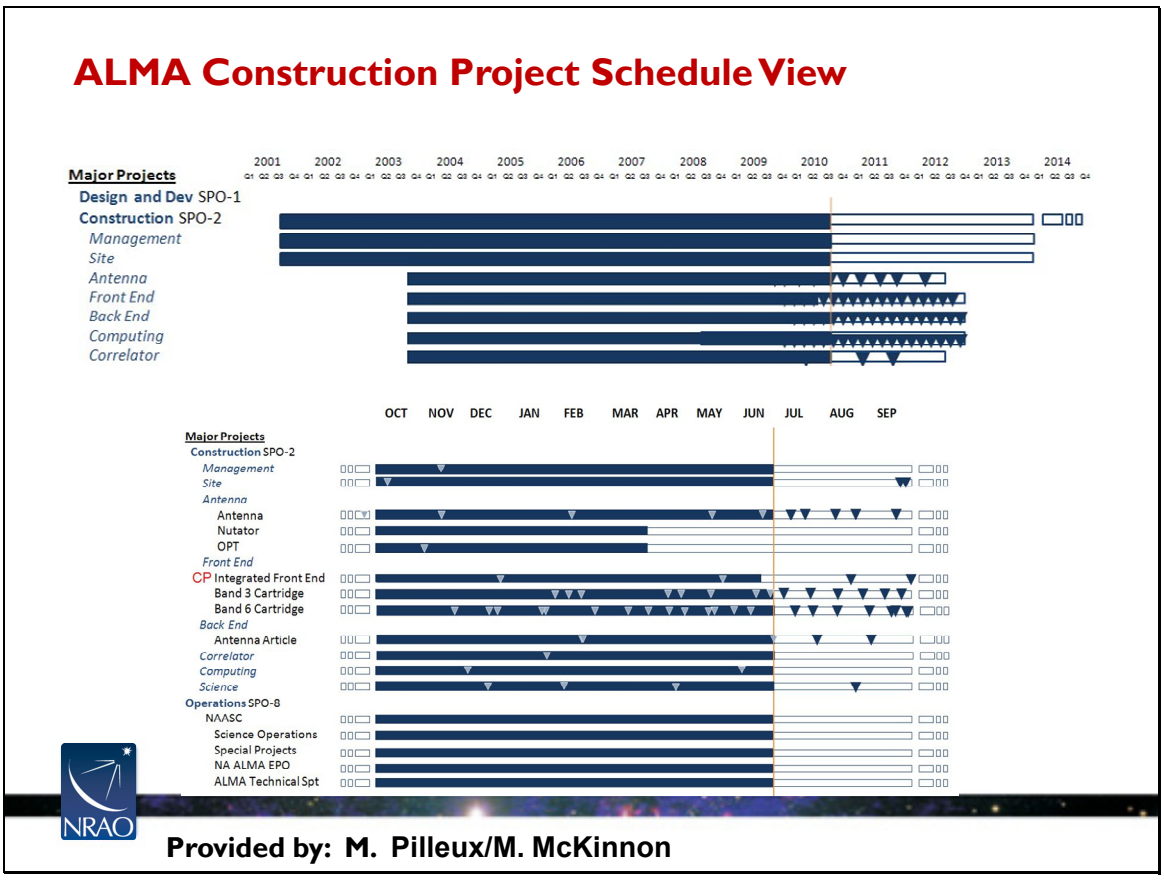
Atacama Large Millimeter/submillimeter Array (ALMA)

- Content from a combination of sources
  - ALMA Monthly Reports to NSF
  - NRAO Business Services
  - North American ALMA Science Center

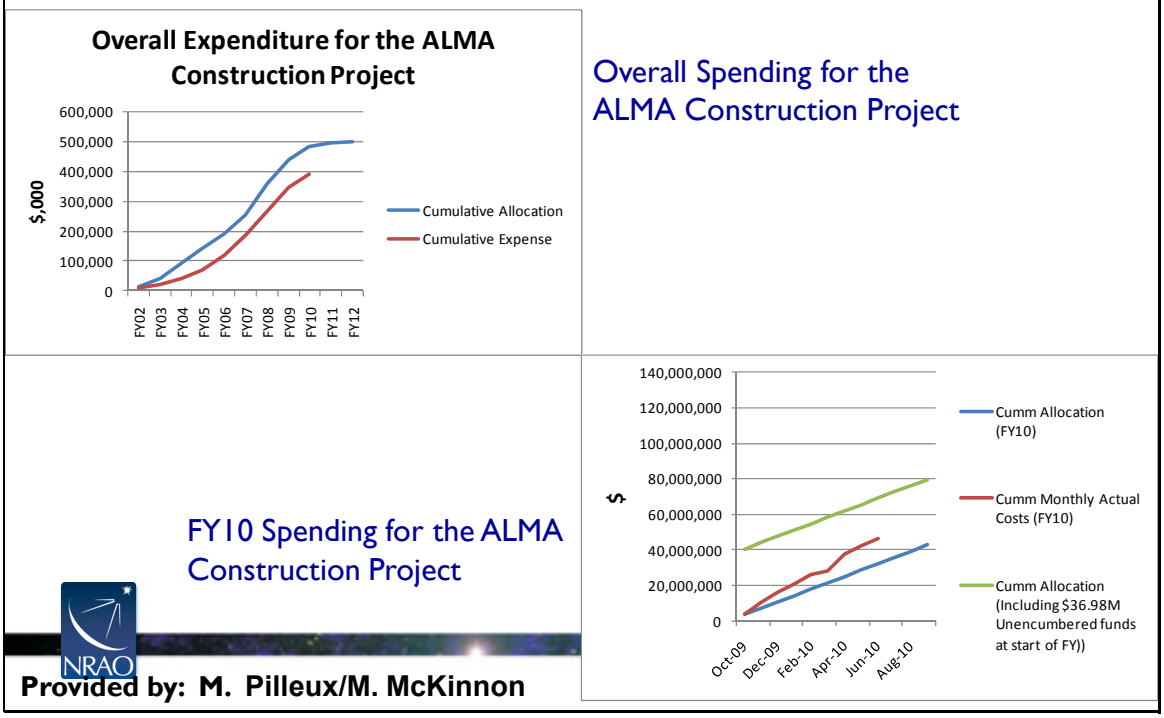


The first graph illustrates the full lifecycle. The second graph is this fiscal year view. The vertical line represents where we are today. The CP represents the critical path.

The risk posed by the delayed delivery of the nutator is a delay in the ability of the Melco (EA) antennas to provide the total power measurements required by some science projects. The risk is being mitigated with a contingency plan that implements a fast scanning technique on the Melco antennas. See slide 21 for additional detail.

The risk posed by the delayed delivery of the POPT is a delay in the all-sky pointing acceptance tests of all ALMA antennas. The risk is being mitigated as follows. A consultant is assisting the vendor with the POPT's optical-mechanical design. In the meantime, the POPT can be used over short periods of observing time where the temperature is stable. See slide 21 for additional detail.

ALMA Construction Financial Performance Graphs – overall & Q3 FY2010



Both graphs show the **NSF budget allocation**. In the case of the overall plan, the cumulative allocation is the allocation actually provided by NSF plus the planned allocations in FY10 to FY12. For the **FY10 graph**, the allocation is the planned FY10 allocation of 42.76 M$. The actual costs shown are the inception to date expenses for the bilateral project, as booked in the general ledger. These costs do not include the commitments. The FY10 graph shows that expense remains below the total available allocation.

ALMA Construction Specific Milestones

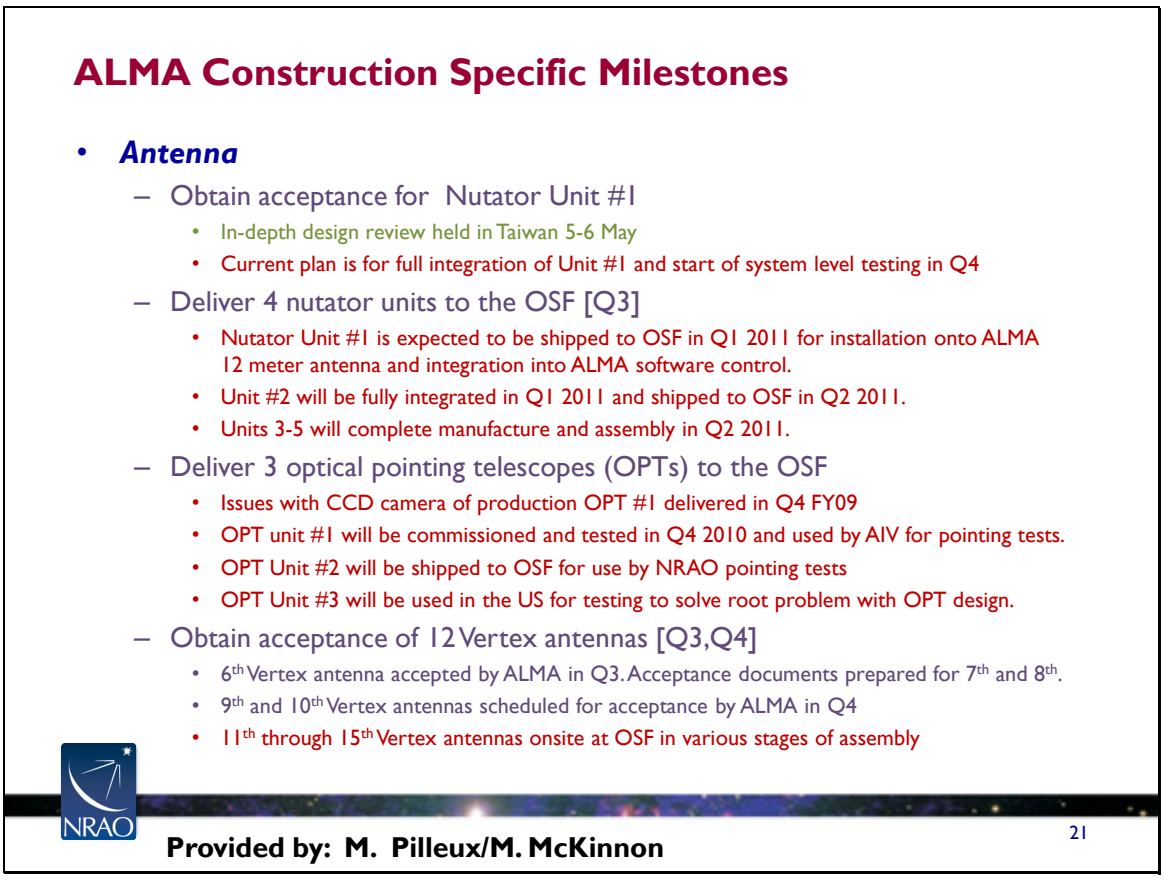
- ***Management***
  - Adrian Russell departed NRAO
  - Mark McKinnon became the NA Project Director
- ***Site***
  - Execute the contracts for construction of the AOS power and fiber optic network
    - Contractor failed to perform under the contract terms and was terminated June 30
      - Contract execution has stopped and a rebidding process is proceeding
  - Execute the contracts for AOS road construction
    - On schedule for Q1 FY11
  - Infrastructure Implementation Review conducted 7-8 June in Santiago
    - Action item list being followed up.

Provided by: M. Pilleux/M. McKinnon

MANAGEMENT: **Adrian Russell departed the project** to become the Director of Programmes for the European Southern Observatory (ESO) in Garching, Germany on 1 July 2010. Mark McKinnon became the ALMA PM in March FYQ2, and then the new **NA Project Director** as of 28 June 2010.

SITE: The delivery of **switchgears** continues and will be completed on schedule during FY2010. **The AOS Utilities Contract** had major delays compared to the schedule. The contract was terminated on June 30, 2010. The expected date for the restart of work is early October 2010. A new bid is proceeding. The risk posed by the delay in the AOS utilities work is the antenna stations in the "central cluster" may not have the fiber optic and electrical connections needed for the first science observations to be conducted next year. The risk is being mitigated by asking contractors more familiar with the work and site to bid on the project. They are also being asked to maintain the original project schedule in their bid. **AOS road construction** is ongoing and is 58% complete.

An **Infrastructure Implementation Review** was conducted in Santiago 7-8 June to evaluate the overall status of all infrastructure deliverables. An action item list was generated and is being followed up.



ANTENNA: An **interim system design review for the nutator** was held May 5-6 in Taipei to review the current state of the design. The advances in the control system design were significant, and the nutator was demonstrated to be close to achieving most of the critical performance requirements. With the review committee's endorsement, we are optimistic that system level testing and servo system enhancements will be completed in FY Q4. The current plan is to integrate and test the nutator on an antenna at the ALMA site in Q1 FY11. The risk posed by the delayed delivery of the nutator is a delay in the ability of the Melco (EA) antennas to provide the total power measurements required by some science projects. The risk is being mitigated with a contingency plan that implements a fast scanning technique on the Melco antennas. Modifications to the high-level antenna control software required by the technique are underway.

The apparent position of an image observed with **the Production OPT (POPT)** undergoes a temperature-dependent drift. The risk posed by the delayed delivery of the POPT is a delay in the all-sky pointing acceptance tests of all ALMA antennas. The risk is being mitigated as follows. A consultant is assisting the vendor with the POPT's optical-mechanical design. In the meantime, the POPT can be used over short periods of observing time where the temperature is stable. Furthermore, for long observing runs, the drift is repeatable as a function of temperature, and can be corrected with software in the POPT data analysis.

In Q3 FY2010, the **6th Vertex antenna was accepted** into ALMA, and acceptance documents for the **7th and 8th Vertex antennas were being finalized**. Thus, the planned acceptance rate of 3 antennas per quarter is close to being achieved, although events such as instabilities in software and site infrastructure, as well as weather, continually place pressure on the ability to maintain this schedule.

Two more Vertex antennas are expected to be delivered in Q4 FY2010 Progress has been further hampered by an apparent instability in the surface of DV02 and temperature-dependent effects in the antenna metrology system. All of these issues place a risk on the antenna delivery and thus the milestone for early science. The risk is being mitigated by making appropriate software "patches", improving site infrastructure, and calling upon Vertex's chief engineer to investigate the root cause problem with the antenna surface and metrology. (We note that our current prediction of 10 antennas by FY Q4 is 2 more than the 8 predicted in the last QSU.)

ALMA Construction Specific Milestones

- ***Front End***
  - Reorganization of NA FE IPT management
    - FEIPT reorganization in Q2 has progressed well
    - Transition plan to replace interim FEIC lead is in place
  - One integrated NA FE delivered in Q3 (total of 3)
  - Delivered 29 LO Warm Cartridge Assemblies (WCAs) in Q3 bringing the total WCAs delivered up to 153 (30% of the total requirement)
  - Total of 32 Band 3 cartridges have been delivered as of the end of Q3
    - FY2010 goal was to deliver 24 Band 3 cartridges. Ahead of schedule.
  - Total of 24 Band 6 cartridges have been delivered as of the end of Q3
    - FY2010 goal was to deliver 24 Band 6 cartridges. Ahead of schedule.
  - Total of 44 production FE support structures have been shipped from NA
    - Q2 goal was to deliver 25 production FE support structures
  - Place orders for all remaining FE purchases
    - Was completed early in Q3
  - Commissioning of second FE test station
    - Operational Readiness Review for the second test station was passed
    - An assembly test station was activated which increases manufacturing and testing capacity

NRAO

Provided by: M. Pilleux/M. McKinnon

22

FRONT END: The **organization of the NA FE IPT** has gone well. The **FEIC leadership will transition** over the next quarter from Dr. Charles Cunningham to John Effland and Mike Shannon, who will handle the technical and programmatic aspects respectfully. They will continue to manage the Band 6 effort. Dr. Cunningham will remain as a technical advisor.

One integrated NA FE underwent testing and delivery in Q3, for a total of 3 FE shipped to Chile. Three more front ends are in process with delivery of two scheduled for Q4. The late delivery of FEs could pose the risk of delaying the outfitting of antennas with receivers and thus limiting first science capabilities. The delay is caused primarily by late deliveries of FE components. The risk is being mitigated by implementing the management changes listed above, working closely with vendors, requesting waivers to component specifications where sensible, and optimizing the project schedule. **FE LO and test source production** (which compete for resources) are critical and are just keeping up with project needs. Technical problems with Band 7 WCAs have been solved, and we are in full production mode for all four primary bands. **Band 6 CCA is in full production** with the formal approval of the specification change for the cross polarization. **The remaining FE purchase contracts** were placed. In response to the current economic conditions, many electronics parts suppliers have scaled back their parts production resulting in shortages and rationing for some critical parts. This is a concern that we are monitoring.

ALMA Construction Specific Milestones

- ***Back End***
  - Ephraim Ford became the new BE IPT Leader, effective 21 May 2010
    - Chris Langley, former BE IPT Lead, was promoted to EVLA Project Manager
  - Deliver antenna articles (AA) to OSF
    - AA 21-30 delivered in Q3 as scheduled
    - AA 30-38 remain on schedule for FY10, with shipment of AA 31-40 at the end of Q4
    - AA 41-50 expected to ship at the end of CY2010
  - Populate the final quadrant of the Correlator
    - Population of the final quadrant was successful

Provided by: M. Pilleux/M. McKinnon

BACK END: Chris Langley, **BE IPT Leader was promoted to EVLA Project Manager** effective May 21. He was **replaced by Ephraim Ford**, who was the BE Production Manager. **Antenna Articles (AAs)** have continued to be integrated in North America according to schedule with AAs 21-30 shipped in June 2010. The next batch of 10 will be finished and ready for shipment in August 2010, with an additional 10 ready by end of December 2010. These 20 AAs will be stored in the VLA warehouse until 2011. **Data Receiver Articles (DRXAs)** were already delivered according to schedule for the first 3 quadrants of the Correlator. However, delivery of additional printed circuit boards (PCBs) were delayed, leading to the belated delivery and installation of the last quadrant in Q3. This was accomplished successfully through a campaign by Socorro staff at the Array Operations Site (AOS).

ALMA Construction Specific Milestones

- ***Correlator***
  - Complete assembly of the fourth quadrant and begin integrated testing [Q2]
    - Completed in Q2, now in use for software development.
  - Third quadrant shipped to the AOS TB, reassembled, and tested.
    - Ahead of schedule
- ***Computing***
  - ALMA software version R7.1 released
  - CASA patch 3.0.2 released
- ***Science IPT***
  - Achieved closure amplitude with 4 antennas 2010 May 20
  - Obtained aperture synthesis data with 5 antennas June 2010
  - Surface errors measured on astronomical sources indicate they are well within the 25 micron specification

Provided by: M. Pilleux/M. McKinnon

CORRELATOR: In order to meet the project need for **operating 2 quadrants of the Correlator** simultaneously by April 2010, the delivery plan for quadrant 2 was changed to an earlier date so that engineering tests using quadrants 2 and 3 can be used to verify the 2-quadrant operation while quadrant 1 is used for AIV/CSV activities. Quadrant 4 construction was completed so that a software test bed remains available in Charlottesville. Quadrant 3 was shipped to the AOS Technical Building (TB), reassembled, and passed all engineering tests. PAS testing of Quadrant 3 began.

COMPUTING: Preparation of ALMA Software **version R7.1** proceeded as planned and was released for use shortly after June 1st. **CASA released a patch** (3.0.2) on June 14 which was used during the NRAO Synthesis Summer School, where CASA was the primary data reduction package used in the tutorials for the first time.

SCIENCE: ALMA Commissioning started 22 January 2010. The highlights of Q3 included (a) **achieving closure amplitude with 4 antennas** on 20 May 2010. The process of radio-astronomical imaging requires at least three antennas; noise is suppressed through application to the data of a mathematical relation, known as closure phase, achieved by ALMA in 2009. A further relation, known as closure amplitude, may be used with 4 antennas to further suppress noise and improve imaging. Closure amplitude is called a "good observable", since, under certain assumptions, it is not sensitive to measurement error. This was achieved with 4 antennas during May 2010. (b) Building on this achievement, **data were obtained with 5 antennas** during June. As the number of baselines goes roughly as the square of the number of antennas, the ten baselines in these datasets mark advances over the three baselines in the three antenna array available at the beginning of the period. (c) Commissioning involves understanding the performance of the instrument and ensuring that its performance meets

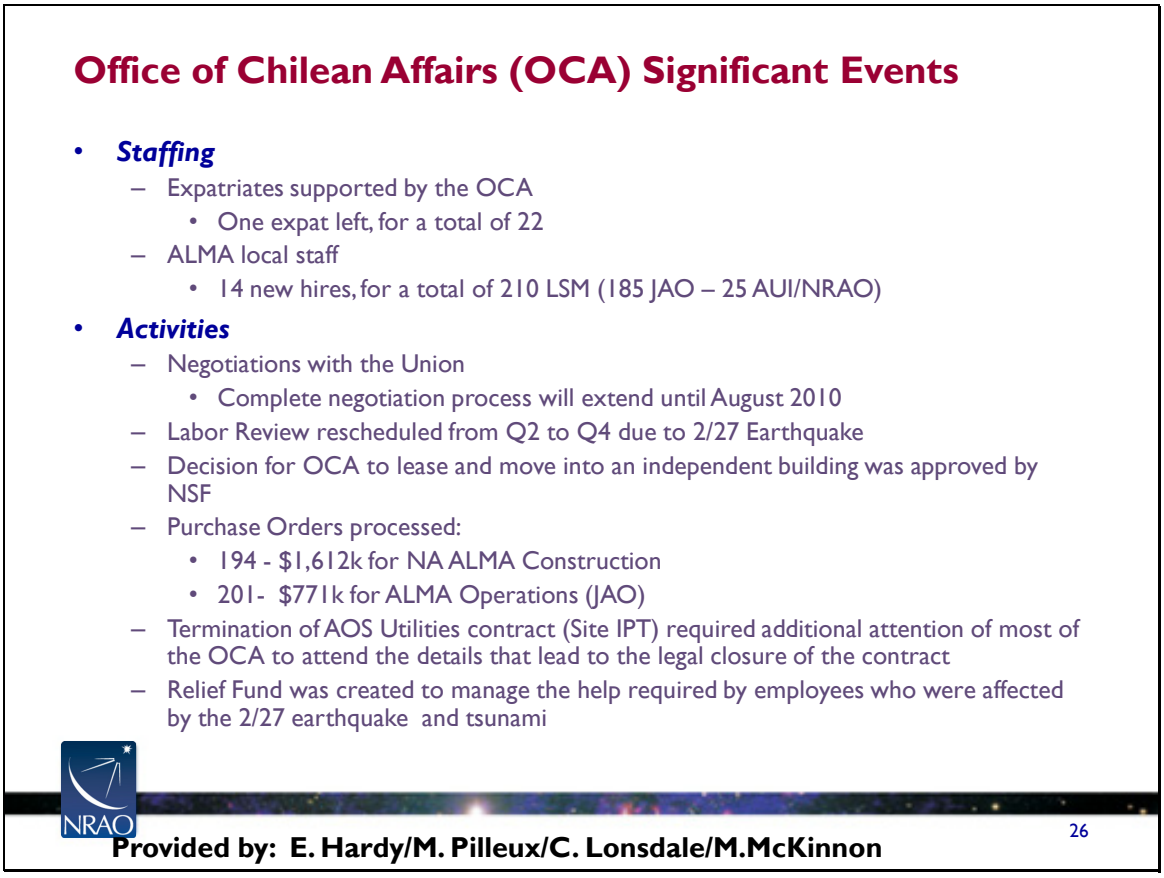
specifications. Measurement of the antenna surfaces through the use of planets allows a range of frequencies and elevations to be used to explore antenna behavior. The accuracy of the surface images informs our understanding of antenna thermal and gravitational behavior. **Surface errors are well within the 25 micron specification**. More data were taken and analyzed on other aspects of antenna performance, including small-scale surface errors, pointing and tracking and focus stability. Performance appears to be good, but investigation continues into instrument behavior.

ALMA Construction (SPO-2) Significant Events

- ***Japan Partnership (SPO-7)***
  - LO Photonic Receiver Articles 17-24 delivered in Q3
  - Subarray Switches and Line Length Correctors for Central LO Article
    - Final 8 units were shipped and installed at AOS in Q3
  - Band 3 OMTs were delivered to HIA for use in cartridge production
  - Band 6 cold cartridge supplied to the EA FEIC and construction continued
  - WCA LO drivers delivered to EA FEIC via the cold cartridge manufacturers for Bands 3, 6, 7, and 9
  - The first pre-production Band 4 and 8 CCAs were successfully integrated into the third NA FE delivered by the NA-FEIC and extensively tested.
    - Two minor problems were discovered and are being addressed by the Band 4 and Band 8 team
  - Development of an LO driver/frequency multiplier combination for Band 10
    - New Design MMIC power amplifier chips are under development
  - Frequency multipliers and WCA LO drivers for band 4 and 8
    - Delivered to Band 4 and Band 8 cartridge manufacturers
  - Components for assembling the fourth EA FEIC FE assembly were delivered

Provided by: M. Pilleux/M. McKinnon

JAPAN PARTNERSHIP (SPO-7) 1: NRAO has received all SPO-7 **LO Photonic Receiver Articles** for test and delivery to the Front End Integration Centers. CLOA1 already had 8 each of the units, but required an additional 8 each for full functionality. Shipment and installation of these remaining units was made in Q3 FY2010. **The first pre-production Band 4 and Band 8 Cold Cartridge Assemblies (CCA) were integrated and tested** in NA FE#3. It was determined that Band 4 will need magnets added to the SIS mixer blocks to suppress Josephson current and that Band 8 will need filtered connectors on the cold IF amplifiers. **Development of an LO driver/frequency multiplier combination for Band 10** continues. The prototype that was delivered last quarter failed and was repaired and returned. A new design power amplifier chip for Band 10 that was scheduled for fabrication in Q4 will not be ready for tests until Q1 of next FY. **Frequency multipliers and WCA LO drivers were delivered** to cold cartridge manufacturers for use with all bands. More tests on the long-standing **issues of LO power vs. LO noise for Bands 4 and 8** were done which increased our confidence in the LO design for Band 4 and 8. Components for assembling Front Ends, including Band 6 cold cartridges, were delivered to all integration centers. The NA FEIC assisted the other integration centers with assembly and test of Front Ends. Support was provided for integrating Front End assemblies into antennas. Components for assembling the **fifth EA FEIC FE** assembly were delivered.



OFFICE OF CHILEAN AFFAIRS (OCA): **One expatriate departed**, leaving the total number at 22. OCA has reviewed and signed a total of **14 new ALMA Local Staff Member contracts**, bringing the total number of employees for which OCA provides ALMA with legal, payroll and travel support to **210 local staff**. Of these staff, 25 are assigned exclusively for AUI/NRAO activities. It was agreed that **AUI's local employment of local staff be reviewed after three years** to evaluate its compliance with Chilean legal matters, the cost efficiency of its operations, and responsiveness to programmatic requirements. This review was rescheduled for late August 2010.

OCA was heavily involved in the **union negotiations** that ended with the union not accepting the final offer. The **negotiation process resumed** on 25 May 2010 as a regulated process when the Union presented its proposal. Complete negotiation process will occur during Q4.

Decision for **OCA to lease and move into an independent building was approved by NSF**. The new OCA office will be 220 square meters in area and will be 500 meters away from the new ALMA Santiago Central Offices. Design and outfitting will occur in Q1 FY2011.

OCA has provided the legal and institutional support for contracts and procurements for ALMA as follows: a total of **120 purchase orders were made for ALMA Construction (941 k$)** and **194 for ALMA Operations (JAO) (869 k$)**. 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. 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** involved additional activities required to legally close the contract.

A **relief fund** was created for employees who were affected by the 2/27 earthquake and tsunami. Employees and families affected were all interviewed by a social worker and help was directed per her recommendations. This had an excellent effect on employee morale. Some psychological counseling activities will continue for a period of up to 6 months. Legal counseling was provided to employees.

ALMA Science Operations (SPO-8) Significant Events

- ***Science Operations***
  - ***Staffing***
    - Two of the three open user support scientist positions were filled
  - ***Hardware and Software***
    - NA ALMA Mirror archive racks and Oracle database servers installed
    - Deployed instance of ALMA helpdesk and configured it for Single Sign-On
    - Integrated tests of the observation planning software performed
    - Developed data reduction and Simdata guides on CASAguides
    - Pipeline Heuristics User Test 6 and tests of CASA updates completed
  - ***Workshops and Meetings***
    - A special session, "Preparing for ALMA", held at the May AAS meeting
    - CASA and Simdata tutorials given at the NRAO Synthesis Imaging School
    - Observing tool and Splatalogue walkthroughs given at the Summer School

Provided by: C. Lonsdale/J. Hibbard

Staffing: **Two of the three open user support scientist positions were filled**. Scott Schnee of the Herzberg Institute, Victoria, Canada, will fill a NAASC user support scientist position, October 1 2010 (Assistant Scientist/Astronomer). Adam Leroy, currently a Hubble Fellow at NRAO, will fill a NAASC user support position, March 1 2011 (Assistant Astronomer).

Hardware and Software: The first NA ALMA Mirror **archive racks and Oracle database** servers were installed and improvements to the archive room cooling system were completed. An instance of the **ALMA helpdesk was deployed** in preparation for integrated testing of the observation planning software, and it was configured for Single Sign-On. Integrated tests of the **observation planning software**, from Helpdesk questions through to technical assessments and mock proposal review meetings were performed together with the JAO and the other ARCs. **Pipeline Heuristics User Test 6 and tests of CASA updates** were completed.

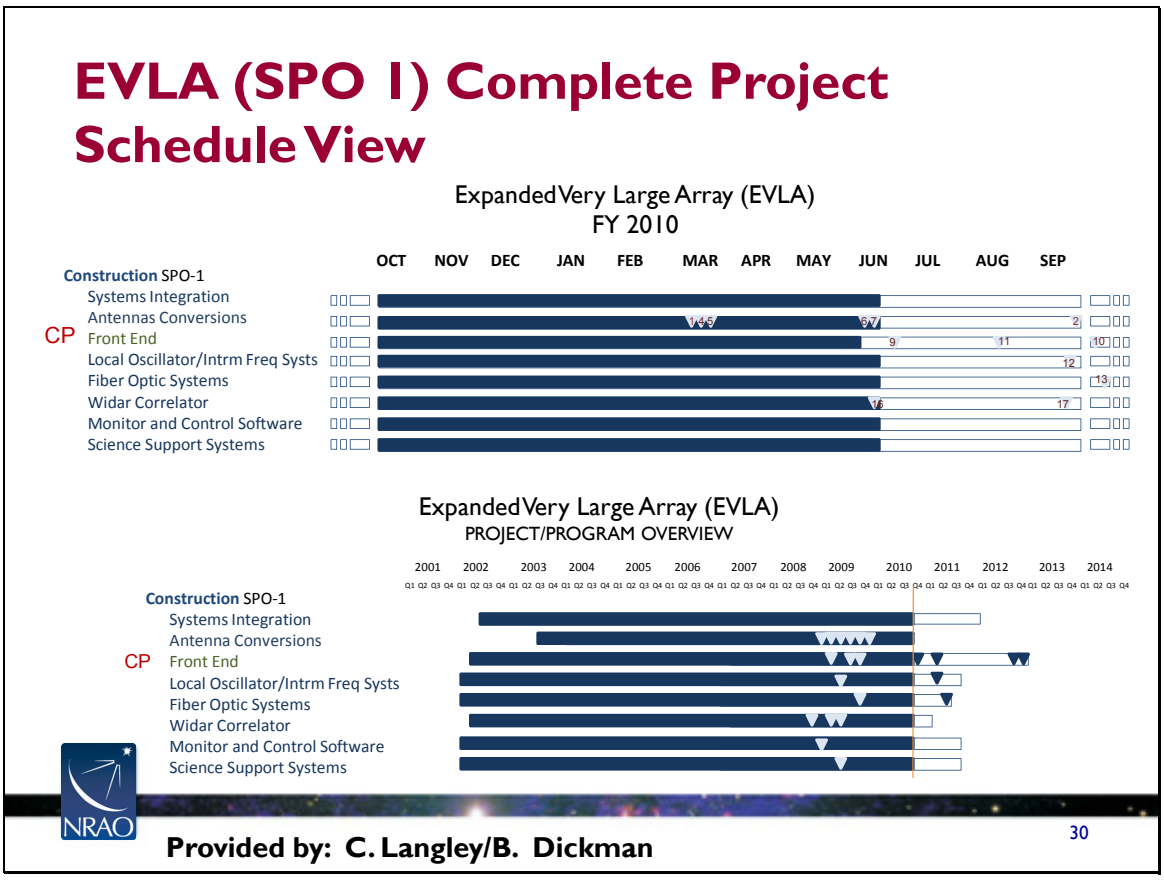
Workshops and Meetings: A special session, "**Preparing for ALMA", was held at the May AAS meeting** and a session on Observing with ALMA was scheduled for the January 2011 AAS meeting in Seattle. Several **data reduction and Simdata guides were developed for CASAguides** in preparation for the NRAO Synthesis Imaging School. **CASA and Simdata tutorials and Observing tool and Splatalogue walkthroughs** were given at the NRAO Synthesis Imaging School, and an ALMA Townhall was held.

Agenda

- Science Results/Metrics
- Observatory Science Operations
- Site Specific Activities
  - ALMA
  - VLA/EVLA
  - GBT
  - VLBA
- Observatory-wide Operations

Expanded Very Large Array (EVLA)

- The content was provided by
  - EVLA project Team
  - NRAO Business Services
- VLA and EVLA project tracked and presented to NSF through SPO 1

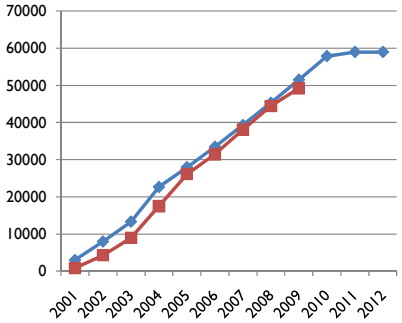


Milestones 6 and 7 have been satisfied. Milestones 9, 11, and 12 are well within reach for the end of the FY.

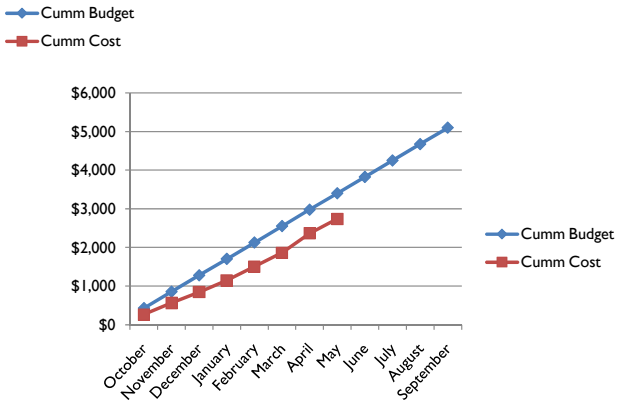
The bottom graph illustrates the full lifecycle. The top graph is this fiscal year view. The vertical line represents where we are today. The CP represents the critical path.

In the Front End area, the production and installation of the receivers are still scheduled for completion in December 2010 with no expected impact to the overall project plan. The risk impact of the late Ka-band Rx should be slight since only 27 antennas/receivers can be used at a time. The 28th antenna will be in the antenna assembly building for maintenance. 27th Rx to be installed in Oct. 28th Rx to be installed in Dec. There is not expected to be a negative impact to the overall project plan. See slide 32 for additional information.

EVLA Construction Financial Performance Graphs – overall & Q3



Overall Spending for the EVLA Project

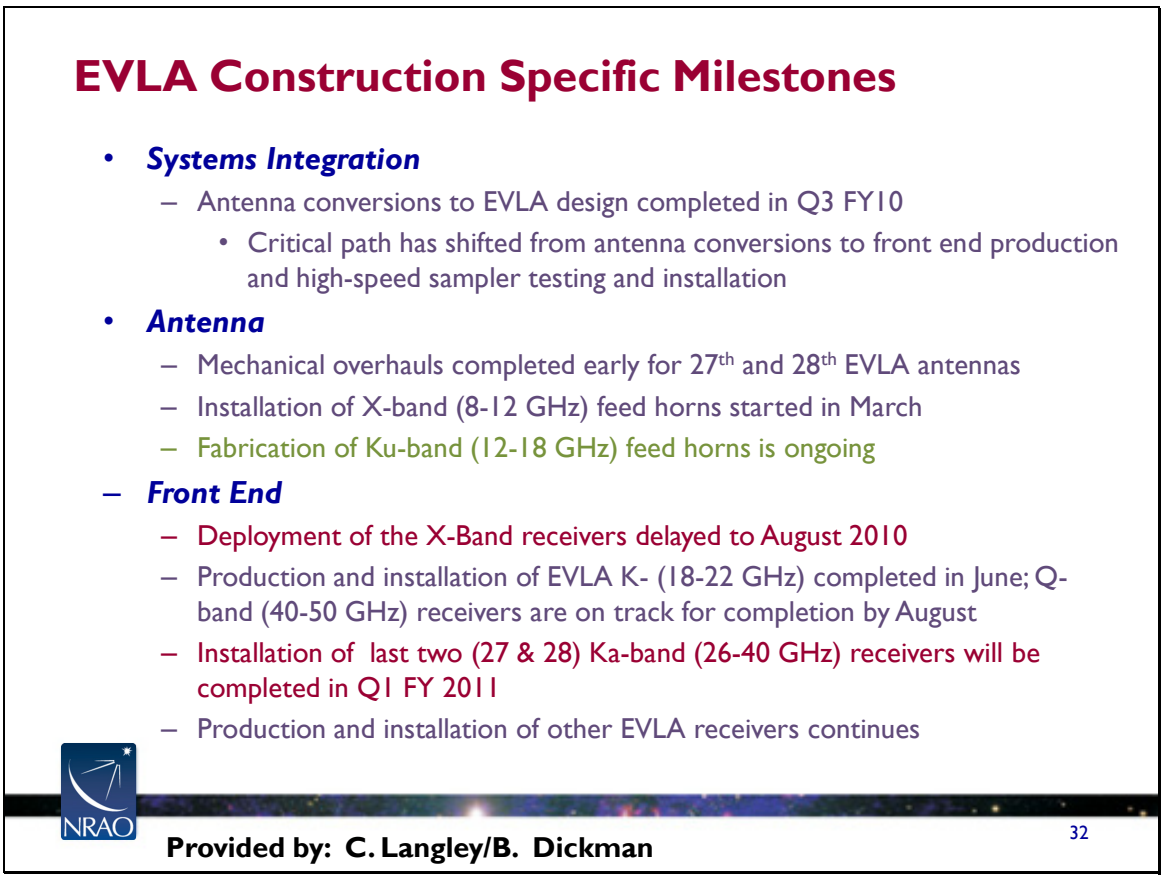


FY10 Budget/costs for EVLA Project

Provided by: C. Langley / B. Dickman

31

Spending in FY10 is slightly behind schedule due to the delayed deployment of X-band receivers ($205K) and 3-bit sampler modules ($317K). Financials are reported through May 2010. The FY10 graph is different from that in the Q1 report due to an error in fiscal reporting for Q1. The FY10 budget/cost figure shows funds allocated for expenditure in FY10, only. Additional funds are on hand, but they are assigned to project activities, such as receiver production and installation, to be completed in FY11 and FY12 and to the retirement of project risk. The amount of these additional funds currently totals about $3.6M.



Systems Integration: The project critical path has shifted from **antenna conversions** and **mechanical overhauls**, which were completed in Q3 (earlier than planned), to front end production and high speed sampler testing and installation. [6,7=numbers refer to icons on the schedule view chart.]

Antenna: The fabrication of the **X-band (8-12 GHz)** feed horns was completed in Q2 before receiver production began and the installation of these feed horns started in March [1]. The fabrication of the **Ku-band (12-18 GHz)** feed horns is also ongoing with no FY2010 milestones planned.

Front End: The final design of the **X-Band OMT** was to be selected in early FY 2010, with full production of the X- and Ku-Band receivers commencing in Q1. However, the time required to select the OMT design for the X-band receiver delayed its deployment start date to August 2010. The production and installation of the receivers are still scheduled for completion in December 2010 with no expected impact to the overall project plan. Production and installation of **EVLA** K- (18-22 GHz) was completed in June; **Q-band (40-50 GHz)** receivers are on track for completion by August [9,11]. The installation of last two (27 & 28) **Ka-band (26-40 GHz)** receivers will be completed in Q1 FY 2011 [10], versus the planned installation date within this fiscal year. [10] The risk impact of the late Ka-band Rx should be slight since only 27 antennas/receivers can be used at a time. The 28th antenna will be in the antenna assembly building for maintenance. 27th Rx to be installed in Oct. 28th Rx to be installed in Dec. There is not expected to be a negative impact to the overall project plan. The production and installation of the fully EVLA-compliant L-Band (1-2 GHz), S-Band (2-4 GHz), and C-Band (4-8 GHz) receivers continues per plan and no milestone is recorded in Q3.

EVLA Construction Specific Milestones

- ***LO/IF***
  - Assembly of all local oscillator and intermediate frequency (LO/IF) modules are completed
- ***Fiber Optic***
  - Evaluation of 3-bit, 4Gsps sampler prototype on 4 antennas has started
    - First tests successful
    - Deployment to be completed on schedule (orig. September 2011)
  - Data Transmission System (DTS) test rack completed
- ***WIDAR Correlator***
  - Delivery of remaining 44 baseline circuit boards to be completed in September
  - A draft correlator Acceptance Plan was sent to DRAO for comment
  - General user observations with WIDAR resumed in March
- ***Science Support Systems***
  - Archive Access Tool (AAT) has been modified to work with EVLA data

Provided by: C. Langley/B. Dickman

LO/IF: The assembly of all **local oscillator and intermediate frequency modules (LO/IF)** were completed early to plan. Compliant updates to specific modules are on track for completion by Q2 FY11. [12] EVLA central LO racks were updated following the VLA/EVLA correlator swap. Modules for the digital transmission system, formatter, and deformatter met the antenna conversion schedule per plan.

Fiber Optic: Evaluation of **3-bit, 4Gsps sampler** prototype on 4 antennas has started. There is some risk in a delay of deployment of the 3-bit, 4Gsps samplers that has impacted the availability of the 8GHz observing capability. However, it does not delay the overall completion of the EVLA project and the mitigation is a wait and see strategy. The first tests have been successful and the first delivery of production boards are expected in October with an expected routine installation in antennas to start in December 2010 [13]. Deployment is expected on schedule but may be accelerated to support scientific programs. **Data Transmission System (DTS)** test rack was completed Q3 FY 2010 which allows for simultaneous testing of 4 transmitter – receiver module pairs.

WIDAR Correlator: Delivery of remaining **44 baseline circuit boards** to be completed in this fiscal year [17]. These 44 boards are not needed for early science observations. The final four baseline boards to be delivered in September, 2010. A draft correlator Acceptance Plan was sent to DRAO for comment [16]. **General user observations** with WIDAR resumed in March in parallel with testing and commissioning, as well as for expansion of capabilities.

Science Support Systems: Continued use of Observations Preparation Tool (OPT) for OSRO. Extended use with Resident Shared Risk Observing (RSRO) near deployment. Observation Scheduling Tool (OST) being used to dynamically schedule selected observing. **Archive Access Tool (AAT)** has been modified to work with EVLA data.

EVLA Science Operations Significant Events

- ***EVLA Data Access***
  - Planning begun to manage dataset sizes
- ***Shared Risk Observing***
  - The Resident Shared Risk Observing (RSRO) program is continuing with an average of 6-7 participants in residence
  - Test observations and correlator commissioning for the RSRO program took place throughout Q3
  - D configuration has been extended to accommodate RSRO science observing, which began in July 2010

Provided by: C. Chandler/B. Dickman

EVLA Data Access: Access to Open Shared Risk EVLA data via an Archive Access Tool and ftp was enabled in Q1 and Q2. Dataset sizes obtained through the **Open Shared Risk Observing** program are up to an order of magnitude larger than any obtained previously be the VLA. These are currently being made available to the user community through an Archive Access Tool and ftp, via a fast 1 Gbps link from the Domenici Science Operations Center to the Internet-2 hub in Albuquerque which is an adequate interim solution. Planning for a long-term solution has begun.

Shared Risk Observing: Access to the EVLA Early Science is provided by two shared risk observing programs for the user community: Resident Shared Risk Observing (RSRO) program begun in January, and Open Shared Risk Observing (OSRO) program begun in March, along with one for EVLA Commissioning Staff Observing (ECSO). The **Resident Shared Risk Observing (RSRO)** program is continuing with an average of 6-7 participants in residence. The fraction of time being used for astronomical observations through these programs, rather than system integration and commissioning, is steadily increasing with time. Initial observations focused on OSRO projects. The user community was warned that the projects most "at risk" during the commissioning of the EVLA would be rapid response science, but in fact target of opportunity and small exploratory projects have comprised more than 10% of the total observing time so far. It was hoped that observing in wide bandwidth modes for RSRO and ECSO projects would begin in Q3, but **test observations** and correlator commissioning took longer than expected and delayed the start of wide bandwidth observing. Nevertheless, readiness tests for most RSRO and ECSO projects have been performed, and observing is now expected to begin in early Q4. Mitigation: The delay in the start of wideband observing, along with NRAO's moral obligation to the visiting scientists taking part in the RSRO program, has led to a decision to **delay the move from the D-configuration** to the DnC hybrid, in order to accommodate wideband science observing.

EVLA Science Operations Significant Events

- ***CASA and the 12th Synthesis Imaging Workshop***
  - A patch to CASA was released (version 3.0.2) to support the data reduction tutorials at the 12th Synthesis Imaging Workshop in June 2010
  - 130 students took the CASA data reduction tutorial
- ***EVLA Commissioning and Science Verification (ECSV)***
  - Remaining OSRO observing modes not commissioned in Q2 were commissioned in Q3
  - Tests of wide bandwidth observing began in Q3

Provided by: C. Chandler/B. Dickman

CASA and the 12th Synthesis Imaging Workshop: The **first public CASA release** was in Q1, which was patched with updates and released as version 3.0.2 to support the data reduction tutorials for the 12th Synthesis Imaging Workshop, which took place June 8-15, 2010. The Synthesis Imaging Workshop takes place every two years, teaching the fundamentals of synthesis imaging through lectures and hands-on tutorials to 150 students. At this year's workshop 130 of the 150 students learned to reduce EVLA data in CASA; the remaining 20 students worked on VLBA data in AIPS.

EVLA Commissioning and Science Verification: The commissioning effort in Q3 focused on (1) enabling **remaining OSRO observing modes** not completed in Q2, such as switching between correlator set-ups and narrow bandwidth observing; (2) improving overall system stability and (3) commissioning wideband observing modes, in preparation for RSRO and ECSO science observing.

EVLA Operations: Significant Events

- ***Management***
  - PSC and RSRO proposal evaluation (April 2010)
  - 12th NRAO Synthesis Imaging School (June 2010)
- ***ARRA Funds use***
  - Purchase Track repair materials – Complete
  - Purchase Tamper and Tie Puller and Spiker – Complete
  - Repair VSQ Sprinkler System: Have requested that NSF allow use of this funding to retire VSQ's from residence hall usage – Awaiting NSF approval Q4
  - Purchase Azimuth Bearings – Complete
  - Purchase Transformer and spare dry-type Transformers – Complete
  - Purchase buses – Complete
- ***Computer Infrastructure***
  - Upgrade VLA-DSOC link to 1 Gbit/sec [Q1] - complete
- ***Engineering Services***
  - Moved into D array [Q1]
  - Replace Az. Gear boxes on antennas #6 and #7 [Q4]
  - 5000 ties will be replaced along the ~ 44 miles of array tracks [Q4]
  - Reconfiguration into C-array and B-array [Q2, Q4] – delayed to Q4, 2011Q1 to support RSRO science on EVLA

NRAO

Provided by: P. Perley/B. Dickman

36

ARRA funds use: VSQ sprinkler replacement is to be replaced by retirement of VSQs as a result of mouse infestation in the VSQ's is still awaiting NSF approval for VSQ demolition.

The reconfiguration into C-Array has been moved to Q4 from Q2 to support RSRO science observations. The reconfiguration to B-array will slip to Q1 of 2011. RISK: none; no impact on EVLA schedule. Program decision to move 4-6 weeks out to facilitate OSRO and RSRO program activity.

Computer Infrastructure: NRAO internal work has been completed for this milestone. However, New Mexico Tech was having trouble providing promised connectivity to Internet 2 at full **1 Gbps bandwidth**. This problem was resolved in April 2010.

Engineering Services: In work items include **5000 ties** being replaced along the ~ 44 miles of array tracks by the end of Q4. Az gear boxes on antennas #6 and #7 will be replaced by Q4; this is an unplanned item and a slip in schedule in replacing #6.

Agenda

- Science Results/Metrics
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  - ALMA
  - VLA/EVLA
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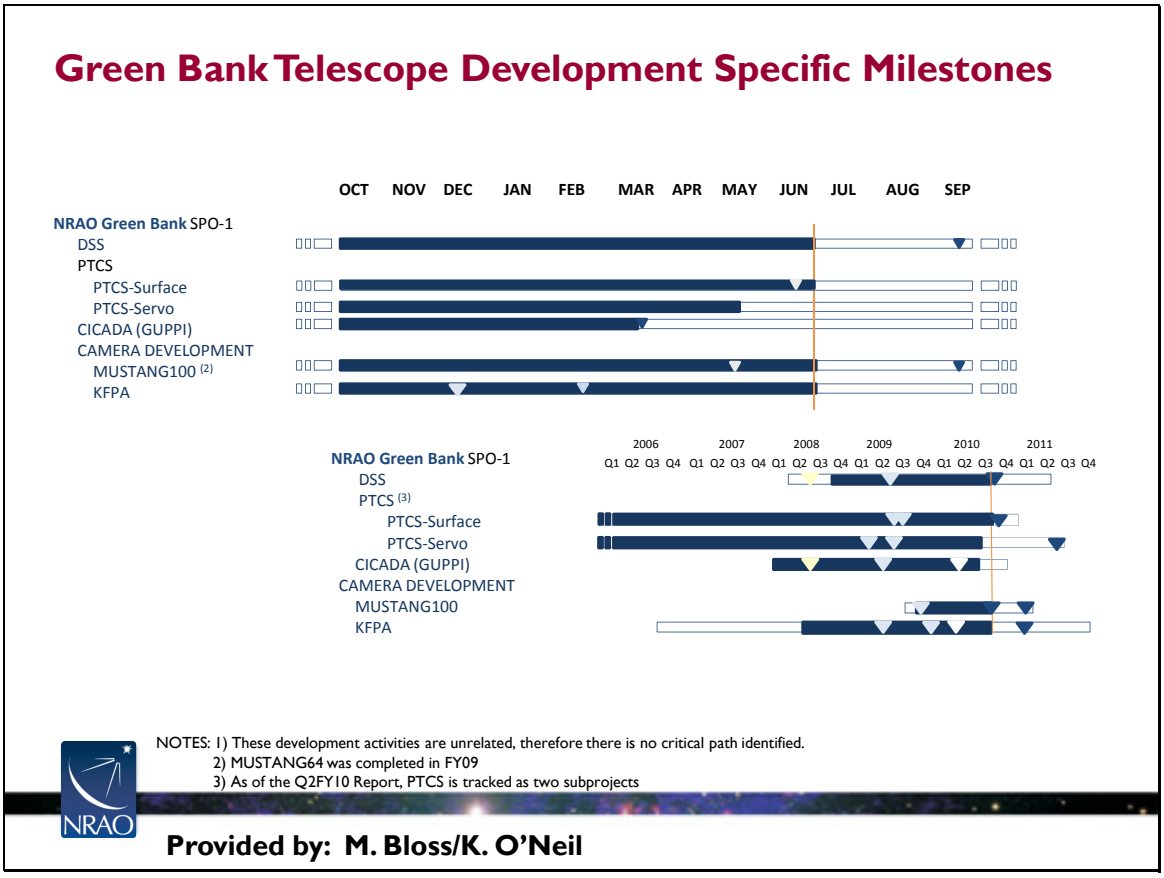


DSS: Work continues on interim enhancement releases and the next major capabilities release in Q4FY10

PTCS: NOTE: Beginning this Quarter, for clarity, PTCS will be tracked on this page as two sub-projects

PTCS-Surface: The surface RMS goals for the GBT main reflector in benign conditions was met in Q3FY10. Transition into an operational mode for monitoring and maintenance continues.

PTCS-Servo: Acceptance testing for the digital servo has been rescheduled for Q2FY11 due to operational calls on project personnel. Risk: Advanced modeling for servo is delayed, additional operational funds will be required once the Lockheed/Martin funds are depleted to finish the project. Mitigation: The schedule to begin work on model-based servo control will be delayed. See slide on PTCS for additional detail.

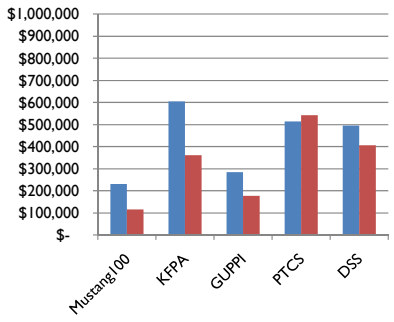
CICADA (GUPPI): The planned initial release of the GUPPI de-dispersion modes has been delayed into Q4FY10 and release of additional modes and ease-of-use improvements will continue through Q4FY10. Risk: not all modes are available. Mitigation: Observers will use the other modes. See slide on CICADA for additional detail.

Camera Development:

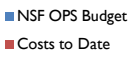
MUSTANG100: For FY10 we have established the MUSTANG100 project to track the potential upgrade to a 100-pixel array in the existing MUSTANG receiver. The delivery of a new array by NIST did not happen in Q3FY10, now planned for Q4FY10. Risk: MUSTANG100 will not be ready for the

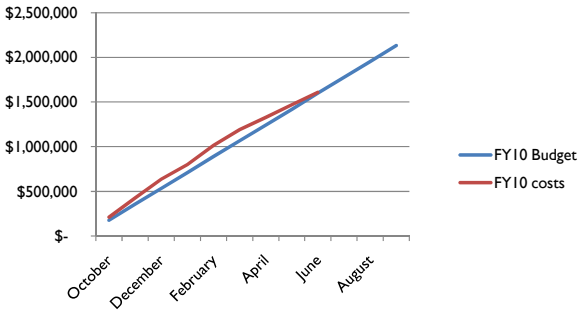
upcoming high frequency observing season. Mitigation: Use Mustang 64 for the next season. Note: The schedule for the 100-pixel array is in NIST, not NRAO control (NIST is donating the array).
KFPA: Initial commissioning successfully completed. Final commissioning prior to shared risk observing in Q1FY11.
Note: In the Program Operating Plan, the milestones #7 and #8 were reversed. Mustang 64 was released for general use in Q1FY10; KFPA commissioning begins in Q2FY10

GBT Overall Development Financial Performance Graphs



FY 2010 Spending for the GBT Development Projects





FY2010 Spending for GBT Development

NRAO

Provided by: M. Bloss/K. O'Neil

39

Expenses are tracking the budget very closely for most Green Bank Development projects. The **DSS** project is over budget by 7% due to additional contract labor added to keep the project on schedule while key vacant positions were in recruitment. **PTCS** is 30% over budget due to 1) overlap of scientists as T. Hunter completes the surface work, transitioning off to ALMA slower than projected, 2) addition of a new project scientist to the project and, 3) the unbudgeted extensive use of two technicians to built multiple prototype motor interface cards for the PTCS servo project. However, primarily due to lower expenses than projected for KFPA, the year-to-date development expenses are within 0.4% of budget as of the close of Q3FY10.

Green Bank Telescope Development Specific Milestones

- ***Dynamic Scheduling System (DSS)***
  - Target improvements improve the scheduling performance for MUSTANG & Low Frequency Projects
    - Expanded scheduling algorithm to include data from: climate models, historical weather data, & improved receiver temperature modeling
  - Added features to the observer's interface
- ***PTCS***
  - AutoOOF performance for Ka/CCB improved
  - New Zernike model installed
  - Ongoing holography maps identify failed surface actuators for summer repair
  - PTCS Team executed "before" measurements of the GBT pointing and track before azimuth foundation work
  - Expanded servo system RFI mitigation effort successful in Q3FY10
  - New motor controller test facility designed to replicate "full-up" GBT control network in servo lab

Provided by: M. Bloss/K. O'Neil

DSS:
A large portion of the software effort this quarter was devoted to expanding the scheduling algorithm infrastructure to include hooks for climate models, usage of historical weather data, and more realistic modeling of receiver temperatures. This expansion is expected to be complete in time for next high frequency season and targets better scheduling of the Mustang Bolometer Array and low frequency projects as well as the ability to include both single pixel and cameras through 120 GHz. Also work was done to improve the ease of use and capabilities of the GBT Schedulers Interface including feedback as to the overall efficiency of the schedule, rearranged calendar to give it maximum screen real estate while scheduling, and added support for ephemerides. The Observer's Interface was also updated to include color-coding of events on the project calendar, configurable time zone display, quick links to weather forecasts, and behind-the-scenes caching of data to speed up page loads

PTCS:
Surface: The performance of **AutoOOF** for the Ka/CCB receiver/backend combination was improved significantly by fixing a bug in the pre-processing of the data. Good surface solutions can now be obtained from fainter pointing sources (< 1 Jy). A **traditional holography** observation taken in May identified several new failed actuators which will be fixed during summer maintenance.
Pointing: The PTCS team performed a set of **pointing measurements** to identify any possible effect of the GBT azimuth track deterioration and to provide a baseline of data for which a comparison of the measurements after the work may be performed. The measurements will be re-executed after the work is complete. (note: measurements completed on July 1&2 and confirmed successful completion; measurements will be reported in Q4FY10 report)

Servo: Much of the work in Q3FY10 was the **RFI mitigation** from the motor control interface (MCI) cards as a combination of unexpectedly high levels of EMI and after receiving a revised specification for installation in the GBT servo room. Design of a **new testing platform** for running all the MCI cards in the same network configuration as the GBT was completed and submitted for fabrication in Q4FY10. Installation of servo hardware begins in Q3FY10 but is due to staff members diverted to work on other important operational issues and unscheduled telescope maintenance the completion and acceptance testing schedule are delayed. The POP calls for the replacement of the current servo system with a digital system by the end of Q4, however this deployment is now delayed until Q2 FY2011. Risk: Advanced modeling for servo is delayed, additional operational funds will be required once Lockheed/Martin funds are depleted. Mitigation: None. Risk will be assumed. The performance at the various milestones is meeting spec and expectations while the schedule to achieve the associated milestones slips. The PTCS work is so fundamental to the GBT strategic future, it must be completed, even if operational funds are required.

Green Bank Telescope Development Specific Milestones

- ***GUPPI***
  - Initial de-dispersion mode development is completing (delayed into Q4FY10)
  - New time-domain data acquisition mode added
- ***Camera Development***
  - **Bolometer Arrays**
    - MUSTANG64 in general use for observers
    - MUSTANG100 replacement array fabrication underway at NIST (updated target delivery in Q4FY10)
    - MUSTANG2 Proposal submitted for 2009 NSF-ATI proposal round rejected
  - **KFPA**
    - 7-pixel 18-26 GHz array commissioning concluded
    - KFPA data pipeline design review completed

Provided by: M. Bloss/K. O'Neil

CICADA (**GUPPI**): Testing and integration of the de-dispersion modes is under way, but was temporarily suspended to add a new feature for time-domain data acquisition. The resulting delay extends the release of the de-dispersion modes into Q4FY10. GUPPI is still on track for completion by end of the fiscal year. Risk: Release of de-dispersion mode is delayed. Mitigation: The already released GUPPI capabilities are in use by observers so the delay if the last major function will be assumed

CAMERA DEVELOPMENT:
MUSTANG100: **MUSTANG64** on the GBT and in use for regular observations, closing out that project. Per the POP, the array for this instrument will be replaced with a 100-pixel array produced by the National Institute of Standards and Technology (NIST), and the instrument, **MUSTANG100**, will then be released for general GBT observer use. NIST most recent estimate for a new array is Q4FY10, but the timing is purely at the discretion of NIST as this is a voluntary effort on their part. While getting many favorable reviews, the 2009 ATI proposal for a new horn-fed array for MUSTANG (**MUSTANG2)** was rejected

KFPA: **Commissioning** of the KFPA was completed during this quarter. A series of commissioning observations verified hardware functionality, M&C functionality and quantified spectral purity. The data was analyzed and is available for review on the KFPA wiki page. Also a map of the moon with analysis by the data pipeline verified the calibration of the instrument. Finally with system performance quantified maps of OH in Orion were generated to further vet the pipeline and demonstrate the improvement in mapping speed and fidelity with the seven pixel array. The data analysis pipeline implementation and verification continued during this quarter. Calibrated images of the moon agreed with the predicated performance of the receiver given the uncertainties in system temperature. Also images of Orion were generated and reviewed internally by the staff as part of a **design review.**

Green Bank Science Operations Specific Milestones

- New hybrids for the Ka correlation receiver have been fabricated in the Green Bank shops and pass unit tests
- The replacement motor and drive system for the GBT turret motor completed in Q3FY10
- Planning meetings for upgrades to the 20M telescope with UNC

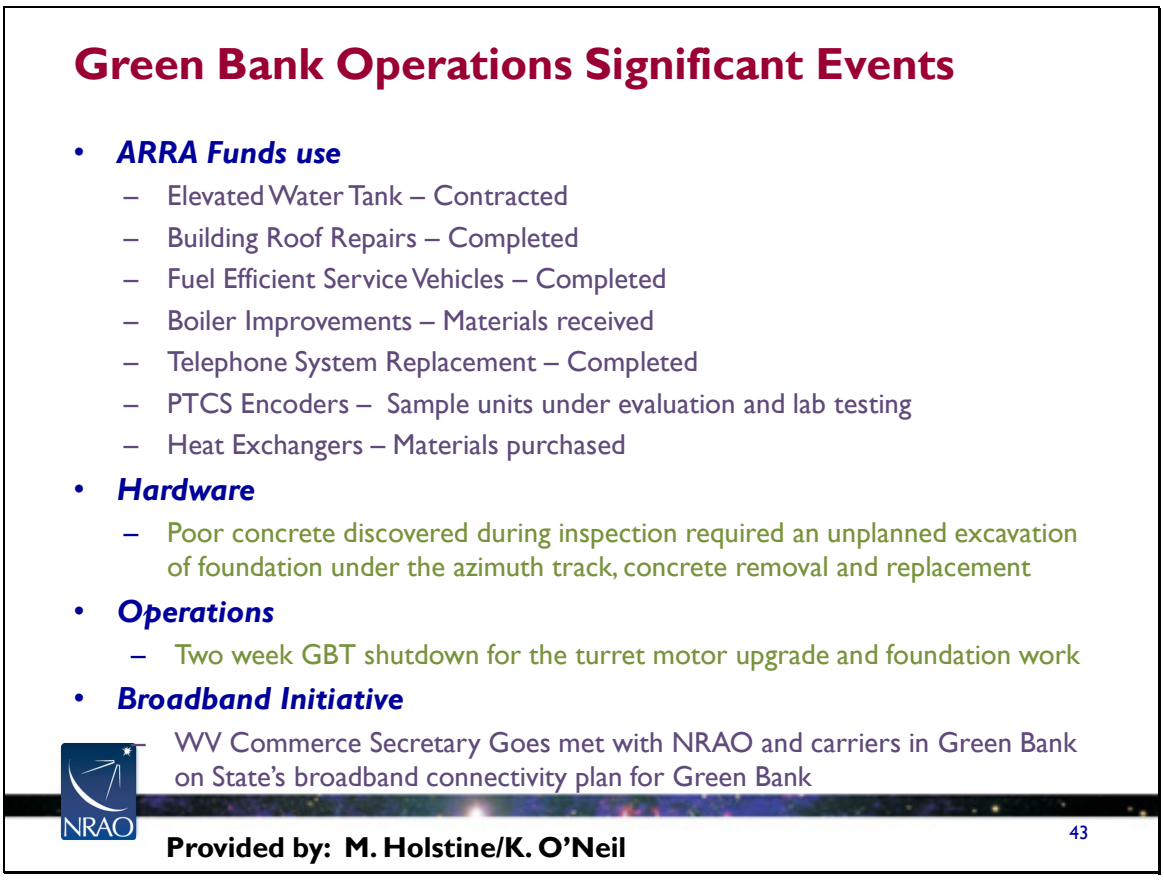
Provided by: M. Bloss/K. O'Neil

New hybrids were constructed for the **Ka correlation receiver.** The receiver will be reassembled and retested in Q4FY10. Risk: The Ka Receiver and Zpectrometer were unavailable for observations in Q3FY10. Mitigation: Unfinished projects will be rescheduled through consultation with project PIs .

The **turret** motor and controller installation was completed and tests of the new ability to change receivers while at elevation was demonstrated. In spite of the fact that the repair required new procedures for raising the turret, the mechanical installation was completed ahead of schedule, and without any problems. The removed turret rotator will be reconditioned for use as an emergency spare.

Green Bank and the University of North Carolina's met to plan the expansion of its Skynet observing program, which includes the **20M telescope**.

Plans remain in effect to poll the GBT users in an effort to find ways to **streamline publication of GBT data** and science results. Start of this effort is estimated to begin in Q3FY10.



There is activity on all of the projects funded by the American Recovery and Reinvestment Act (**ARRA**). Three projects are complete and materials purchased for two others. Contracts are in place for one remaining projects and the PTCS Encoders in a specification status.

During routine GBT inspection an area of deteriorating concrete was discovered on the **GBT azimuth track foundation**. Contractors drilled test holes to determine the extent of the substandard concrete and a second construction contractor removed and replaced the concrete in accordance with NRAO specifications. Two areas were affected totaling about 16 feet, spanning two azimuth track sections. Measurements confirming the work met specifications were conducted after completion, but not in Q3FY10. These and any subsequent measurements will be reported in the Q4FY10 report.

Secretary Goes of the WV Department of Commerce traveled to Green Bank with representatives of WV Homeland Security and the WV Broadband initiatives office to meet with NRAO, Verizon, and Frontier on the carrier's plans for high speed broadband from Green Bank to WVU, ultimately linking to LambdaRail and Internet2 via the Pittsburgh PA supercomputing center. A working group with representatives from all stakeholder parties was established to refine the specifications and recommend a design to the state.

Agenda

- Science Results/Metrics
- Observatory Science Operations
- Site Specific Activities
  - ALMA
  - VLA/EVLA
  - GBT
  - VLBA
- Observatory-wide Operations

VLBA Development & Projects Significant Events

- ***Sensitivity Upgrade Project***
  - Trial installation of DBE at Pie Town slipped from Q2 to Q4
  - Installation of trial DBE at Los Alamos completed in Q3
- ***New Receiver Systems Project***
  - 33 GHz receivers will be designed, built, and installed on the VLBA using ARRA funds only if MOU with NASA and USNO is signed
  - Installation of full coverage C-Band (4-8 GHz) VLBA receivers:
    - MRI to NSF proposal rejected
    - NSF encouraged the submission of a new MRI proposal, submitted [Q3]

Provided by: W. Brisken/B. Dickman

The **trial installation** of Digital Back End at Pie Town and Los Alamos were not met in Q2 due to collaborator delays (Haystack). Installation of trial DBE at Los Alamos was, however, completed in Q3. Initial electronic connections will be made to the Pie Town and Mauna Kea VLBA antennas in Q4. The design and production of all DBE support hardware was completed in Q3 Risk: this delay does not present a significant risk since it is a demonstration project. Mitigation: Still on track for initiating the installation of DBE/Mark 5C recorder systems at all ten sites, demonstrating 2 Gbps recording capability [Q1 2011].

33 GHz receivers will be designed, built, and installed on the VLBA using ARRA funds only if MOU with NASA and USNO is signed. Installation of full coverage **C-Band** is dependent on acceptance of new MRI proposal.

VLBA Operations Significant Events

- ***ARRA Funds use***
  - Build and install Ka band receivers: Funding expenditures remain on hold pending signing of MoUs with NSF, NASA and USNO
- ***Partnerships***
  - As of end of Q3, NASA and USNO had not signed the Memorandum of Understanding
- ***Engineering Services***
  - Fort Davis VLBA station received its major maintenance visit by the VLBA Tiger Team [Q3]
  - Engineering and painting visit to Saint Croix completed
  - Major failure in Pie Town antenna track – repaired by welding
- ***Hardware***
  - Install Security systems at Pie Town and North Liberty

Provided by: P. Perley/W. Brisken/B. Dickman

ARRA Funds: Funding expenditures for the VLBA with **ARRA funds** remains on hold pending signing of MoUs with NSF, NASA and USNO.

Partnerships: As of the end of Q3, NASA and USNO had not signed the **Memorandum of Understanding**.

Engineering Services: Mauna Kea, Brewster, Hancock, and Fort Davis VLBA stations were all scheduled to receive **major maintenance visits** by the VLBA Tiger Team in FY2010. [Q1, Q2, Q3] Mauna Kea was completed in Q1, Hancock was completed in Q2, Fort Davis was completed in Q3. An engineering and **painting visit to St. Croix** also was completed in Q3. Brewster will receive its major maintenance visit in Q4 and will also have the azimuth track repaired. North Liberty and Hancock will also have their azimuth tracks repaired in Q4. There was a **major failure in Pie Town** with the antenna track which was repaired by welding.

Hardware: **Security systems** were installed at Hanover, Owens Valley, North Liberty, Pie Town, Brewster, and Saint Croix [Q1-Q3]. Completed Pie Town and North Liberty in Q3; Brewster and Saint Croix to be completed in Q4.

Agenda

- Science Results/Metrics
- Observatory Science Operations
- Site Specific Activities
- Observatory-wide Operations
  - Central Development Laboratory
  - New Initiatives
  - Education and Public Outreach
  - Communications
  - Spectrum Management
  - Science and Academic Affairs
  - Computer & Information Systems
  - Management & Administration Infrastructure

Central Development Laboratory (CDL) Production, Upgrade and Repair/Maintenance

- ***Amplifier Production, Repair, and Development***
  - Delivered 16 amplifiers to EVLA
  - Upgraded, repaired, and retested 12 amplifiers for the EVLA and CARMA
  - 230-470 MHz amplifier is in the design stage
- ***Electromagnetic Support***
  - Design, build and measure corrugated waveguide phase shifter for the 38-50 GHz band

Provided by: J.Webber

Amplifier Production, Repair, and Development: Design of 230-470 MHz amplifier and evaluation of receiver components for EVLA P-band receiver continues. Experimental evaluation of ALMA band #1 and #2 amplifiers awaits the availability of technician time. New amplifier Production Milestones included six 4-8 GHz, two 8-18 GHz, two 18-26 GHz and four 38-50 GHz amplifiers. **Repair, upgrade,** and **retesting of amplifiers included one 1-2 GHz, two 18-26 GHz, nine 26-36 GHz (for CARMA), one 26-40 GHz and one 38-50 GHz amplifiers.** In total, 28 amplifiers were shipped. The EVLA amplifier production is on schedule. The deliveries of 18-26 GHz , 26-36 GHz and 38-50 GHz amplifiers in support of MPI Receiver Group and CARMA are on schedule. The deliveries of 38-50 GHz amplifiers for Korean VLBI network and 18-26 GHz amplifiers for JPL DSN have been completed this quarter.

Electromagnetic Support: Two of the three **phase shifters** built were found to meet the specifications. The goal is to develop components for building wide band receivers.

Central Development Laboratory (CDL) Research and Development

- ***Amplifier Production and Development***
  - Research into general noise properties of three terminal active devices and in particular on noise properties of heterostructure bipolar transistors (HBTs) and CMOS MOSFET continues. The first paper has been accepted for publication in IEEE Microwave Magazine.
- ***Electromagnetic Component Support***
  - Compare broad band feed and narrow band feeds (W-band)
  - Evaluate cross-polarization of the GBT as a function of elevation angle
- ***Millimeter & Submillimeter-Wave Receiver Development (R&D only)***
  - 450 GHz optics verified and test set complete
  - Superconducting RF hybrid measurements ongoing
  - Optimization of processing parameters for Nb/AlN/NbTiN junctions ongoing
  - Began initial mixer design for 900-GHz SIS mixer

Provided by: J.Webber

Amplifier Development: Research on general noise properties of three terminal active devices and in particular on noise properties of heterostructure bipolar transistors (HBTs) and CMOS MOSFET continues. Paper covering initial results has been accepted for publication in IEEE Microwave Magazine.

Electromagnetic Component Support: Compared the performance of a broad band feed (68-116 GHz) with that of two narrower band feeds (68-92 GHz and 90-116 GHz) for the GBT W-band array receiver. The subreflector of the GBT is translated to track the focus as the telescope is moved in elevation. A study to analyze the cross-polarization performance as a function of elevation is underway.

Millimeter & Submillimeter-Wave Receiver Development (R&D only): Initial set of 700um SIS circuits had too thin AlN barriers, and therefore too high current densities. We therefore have stepped back to optimize the processing parameters, specifically the nitridation growth time, in order to accurately produce junctions with the correct current density. This optimization study is expected to finish in the next quarter. Helping this process is a new spectroscopic ellipsometer, which was delivered to UVML (obtained via an internal proposal to the Engineering School for unused Equipment Trust Funds) and tests are underway using it to monitor the growth of Al oxide. This new tool will also allow quantitative monitoring of AlN barrier growth from run to run, which is critical to producing junctions with repeatable current densities. Replacement of the evaporated SiOx system with a diode sputtered SiO2 film, which has a much lower pinhole density and lower dielectric constant, is also being investigated with promising initial results. After optimization of the AlN barrier growth conditions, we will re-fabricate and test the 700um SIS mixer circuit. Meanwhile we are testing, at 4K, the superconducting hybrids which will be used to produce balanced mixers. The test cryostat is now ready for SIS mixer testing after verification of the 700um optics. Design of the 350um SIS mixer has also begun. The design procedure is being thoroughly documented. This R&D project was also presented as a poster at the SOFIA New Instrumentation Workshop held June 6-8, 2010 at Asilomar, CA.

Central Development Laboratory (CDL) Research and Development (cont.)

- ***Advanced Receiver Development***
  - A paper, "Compact Orthomode Transducers Using Digital Polarization Synthesis" was submitted for publication in the IEEE Transactions on Microwave Theory and Techniques
  - The sideband separating mixer with integrated analog to digital converters was tested successfully
- ***Phased Array Feed (collaboration with Brigham Young University)***
  - GB Machine shop completed the following 19-element components:
    - Full Cryostat
    - All Dual LNA and thermal transitions
  - All 20 dual LNAs with thermal transitions mounted in cryostat
  - Initial cryostat tests complete and heat load calculations verified
  - Phase and amplitude tests completed for analog fiber link from GBT to Jansky lab

Provided by: J.Webber

Advanced Receiver Development: A paper entitled **"Compact Orthomode Transducers Using Digital Polarization Synthesis"** was submitted by M. Morgan, R. Fisher, and Tod Boyd for publication in the MTT Transactions, summarizing our development of the Digital Orthomode Transducers from theory to final results.

The compact **sideband separating mixer with integrated analog to digital converters** was tested successfully. A twelve and a half minute integration (limited by hard drive storage) revealed no evidence of self-generated RFI from the L-Band receiver, though we did detect the 33.3 MHz and 66.6 MHz PXI bus clocks from our test equipment and the 125 kHz plus odd-numbered harmonic transmissions from the access card readers outside the lab.

A hardware demonstration of the **unformatted digital serial link** is being designed by Dan Klopp (no bullet on slide).

The **35nm MMIC LNAs** are still in fabrication at Northrop Grumman (no bullet on slide).

The **W-Band Focal Plane Array (WFPA)** project remains in the conceptual design phase. No progress this quarter (no bullet on slide).

Phased Array Feed: Head loads in cryostat well within capacity of the refrigerator. L-band fiber modems selected for transmission of array element signals to Jansky lab so that all other receiver and data acquisition components can reside in the Jansky lab.

Central Development Laboratory (CDL) Research and Development (cont.)

- ***PAPER***
  - 32 element South African Array – Initial data run completed
  - Receiver modeling underway
  - 32 element engineering array now deployed in Green Bank
- ***Broadband Active Feed (R&D only)***
  - Design of 150-3000 MHz ambient temperature version for the Green Bank 43m telescope is underway
  - Pattern measurements on the ambient temperature feed from 2-7 GHz was obtained in GB
  - 1-3 GHz cryogenic version was assembled;Vacuum leak repaired. Initial evaluation underway.
- ***LUNAR***
  - Satellite downlink antenna measurement system is being used to evaluate prototype helical antenna.

Provided by: J.Webber

The Precision Array to Probe the Epoch of Reionization (PAPER), a collaboration with UC Berkeley: Calibration activities of the 32-element array are underway. The 32 element correlator was delivered. **32 element arrays are now deployed in South Africa and GB.** Laboratory-based **receiver modeling has** focused on determining the temperature coefficients for gain and noise temperature. The **satellite downlink antenna is being prepared for deployment in Green Bank. This system is used to measure the beam patterns of** low frequency antennas such as the PAPER antennas by receiving 137.5 MHz downlink signals from an array of 35 Low-Earth-Orbit ORBCOMM satellites that pass through the beam. The receiver modeling is a graduate student project.

Broadband Active Feed: **Pattern measurements for the 1-3 GHz sinuous feed were carried out at MIT/Lincoln** lab. Mechanical modifications are being carried out to improve the assembly of the cryogenic version of this feed.

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 activities are centered around the **development of a helical antenna** for use in the Self-Tending Array Node and Communications Element (STANCE), a concept first introduced under NASA Award NNX08AM30G and is extended under this LUNAR subcontract. Over the past year, the work have been **focused on improving the electromagnetic performance** of the helical antenna along with developing a system for accurately measuring the beam pattern of the antenna *in situ*.

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New Initiatives- Square Kilometer Array (SKA)

- ***SKA Program Office will increase its SKA effort from the recent level of 2.0 FTEs to 3.5 FTEs [Q4]***
  - NSPO effort will be 3.05 FTEs [2010 Q3]
- ***Develop the overall plan for the Dish Verification Program, including beginning the design of an implementation at the EVLA [Q4]***
  - A series of telecons and discussions defining the scope and deliverables for a DVA-1 project have been ongoing during Q2 2010
  - DVA stakeholders met at USSKA Consortium meeting 3-4 June
  - NRAO has agreed in principle to manage the DVA-1 (Chris Langley)
  - Work has started on defining the Specifications and Plan of Work
  - The draft DVA Letter of Intent (LOI) is still being negotiated between partners

Provided by: S. Myers

NSPO **3.05 FTE** in 2010 Q3: Kellermann (1.0), Myers (0.25), Shepherd (0.9 with 0.5 paid by South Africa), Norrod (0.5), Webber (0.4 though has been spending most time on CDL/ALMA),

Dish Verification Program (DVA) negotiations are ongoing, and will require significant defining of the goals, scope, timeline, detailed plans, responsibilities, and resources (e.g. in the Project Book and Plan of Work). An LOI is being drafted for the DVA-1 project for all partners to sign. We have in principle agreed to manage the **DVA-1** as a 3-part project: (1) producing a design for a SKA Prototype Antenna as a deliverable of the TDP to SPDO, culminating in a CoDR around or before March 1, 2011; (2) a costed preliminary design and plan for construction and testing of a DVA-1 antenna likely at the EVLA site; (3) assuming resources are identified, actual construction and testing of DVA-1. There are milestones between each step, with opportunity for re-assessment. The DVA-1 project management plan is being developed under the leadership of Chris Langley, who is targeted to take the role of DVA project manager.

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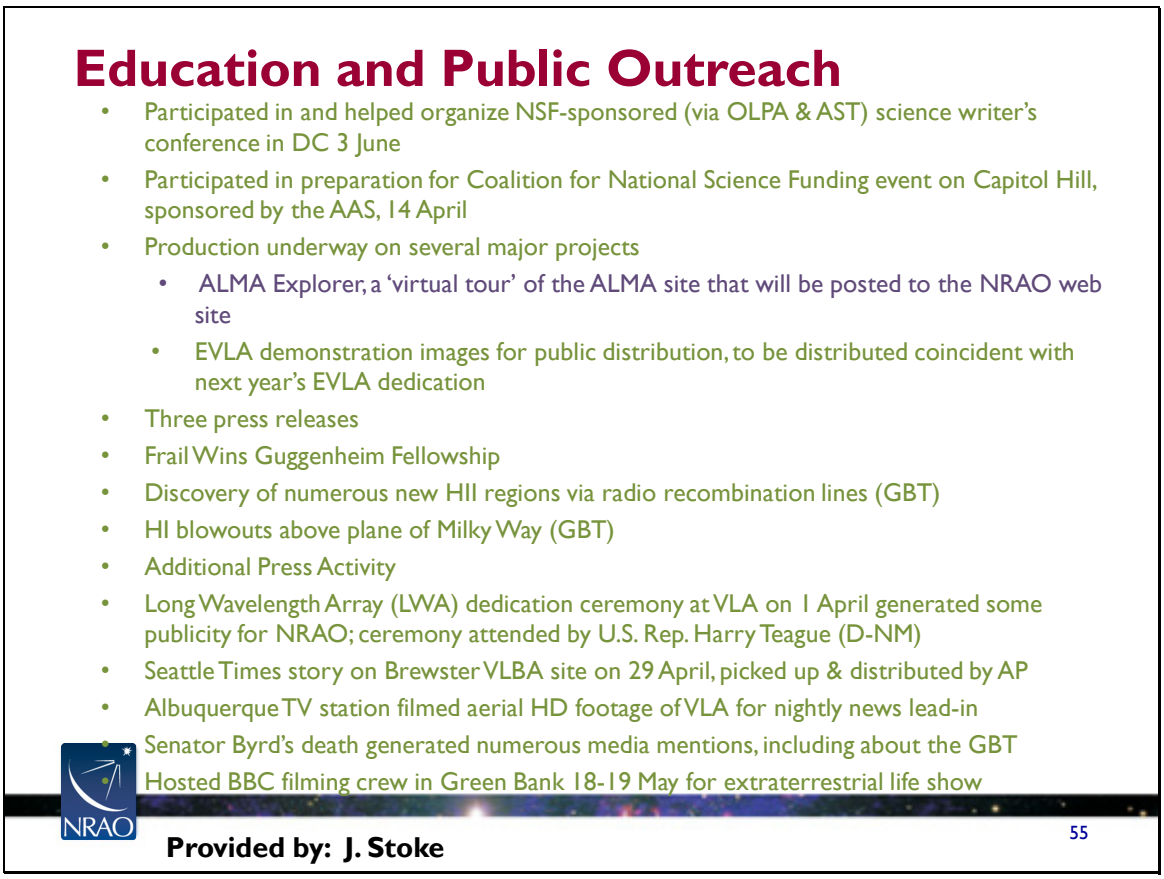

For NSF OLPA/AST Science Writer's Conference, NRAO functioned as co-organizer of the event. This entailed several telecons, numerous emails and private phone calls, meeting with NSF and TMT personnel, and assisting with the video shoots of all the speakers the day before the workshop. NRAO also wrote two of the four "white papers" for the handouts and web site. This extensive involvement helped cement an already-excellent relationship between NRAO and NSF-OLPA.

The Coalition for National Science Funding sponsors an annual exhibition for members of congress and their staff. The AAS is a member of CNSF and selects one observatory each year to represent astronomy at the exhibition; this year NRAO was selected, and we worked with the AAS's Public Policy Fellow to prepare our exhibition.

The EVLA demonstration images project now underway will utilize the new capabilities of the EVLA for some celestial 'landscape photography' that will endeavor to use the full power of the EVLA (including multiple observations of the same objects at different array configurations and at multiple frequencies. The goal is to produce for fall 2011 distribution a series of beautiful celestial images in which normal photographic conventions are followed (e.g., brightness means brightness and color means color). It will take a year+ to acquire the data at all four EVLA configurations, and then some additional time for processing and distribution.

The HII regions and HI blowouts press releases were presented at AAS meeting in Miami. While NRAO's press officer did not attend the meeting because of budget considerations, we arranged for Tom Bania and Jay Lockman to appear in a press conference at the meeting. The HII regions work also

involved Spitzer, and the Spitzer press office assisted by printing and distributing the release for us and also by rehearsing both speakers prior to the press conference (Thank you, Whitney Clavin!).

For the LWA dedication ceremony at the VLA on 1 April, the UNM had not provided a press officer, so NRAO's press officer assisted with the event, including assisting the TV helicopter landing at the site and helping escort U.S. Rep. Harry Teague (D-NM).

Seattle Times story on Brewster VLBA site on 29 April was picked up by AP and distributed very widely, generating many queries from media and also queries from the general public about tours of the site. Dealing with the reporter while he was researching/writing involved NSF-OLPA, due to some peripheral issues he uncovered.

Education and Public Outreach (2)

- Overnight educational events held in GB with students from 11 institutions, each conducting research with 40-foot telescope
- 3 Longer Educational Events conducted in Green Bank
- Carried out pilot test of May Term Astronomy Institute for undergraduate students, 11 students from WVU, Concord University, Norfolk State University (diversity)
- Grants received
  - WV Space Grant Consortium to support a workshop entitled "From Ozma to the Enterprise: SETI in the Next 50 Years" was approved for funding ($10K)
  - WV Division of Tourism to promote month-long series of public events at GB Science Center celebrating the search for life in the universe ($7.5K)
- 2 podcasts completed for 365 Days of astronomy
- 2 Summer Interns hired from NM Highland University (Hispanic Serving Institution) to work with EPO to develop VLA Visitor Center exhibits and materials for VLA Visitor Awareness program
- Exhibited at Boy Scout Stonewall Jackson Council Fair – Saturday 8 May
- Efforts to invigorate NRAO's Facebook page have increased fan base from 1,200 to 1,800
- Pulsar Search Collaboratory selected by the NSF's Directorate of Education and Human Resources (EHR) as one of its 2010 Highlights

NRAO

Provided by: J. Stoke

Overnight educational events held with the following institutions:

- Easton Area High School (PA)
- Fairmont State University (WV)
- Glenville State College (WV)
- West Liberty University (WV)
- GW Community School (VA)
- Exeter School (PA)
- Preston County Gifted Students (WV)
- Rutgers University (NJ)
- Spring Ridge STEM Academy (VA)
- Capitol High School (DC)
- CLEA Workshop (College and High school teachers of science and astronomy – nat'l program)

Longer Educational Events:

- Glenville State College Summer Research Academy (28 WV high school students)
- Educational Research in Radio Astronomy (led by UNC for undergrad/high school students from all over)
- Pulsar Search Collaboratory Capstone Seminar in Morgantown – 65 students from three states participated in the 3-day event

Agenda

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  - Education and Public Outreach
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Communications

- ***External & Internal Stakeholder Communications***
  - Completed exhibit and support material design, and led the NRAO presence at the 14 April CNSF exhibition for lawmakers and staffers on Capitol Hill
  - Worked with Lewis-Burke Associates to schedule and conduct Congressional visits in conjunction with the CNSF exhibition
  - Continued design work on new NRAO Intranet (internal web site)
- ***Science Community Outreach***
  - Organized the NRAO exhibition at May AAS meeting (Miami)
  - Organized & chaired *"Preparing for ALMA"* Special Session at May AAS meeting
  - Completed initial design and text for 2009 NRAO Annual Report [Q3]
  - Science symposium proposal submitted for the 2011 AAAS Annual Meeting
  - Proposals submitted and accepted for an NRAO Town Hall, an ALMA Special Session, and an EVLA Special Session at the Jan 2011 AAS meeting (Seattle)

Provided by: M. Adams

External & Internal Stakeholder Communications: Completed exhibit and support material design and led the NRAO presence at the 14t April **Coalition for National Science Funding (CNSF)** exhibition titled "*Building the Foundations of Innovation: STEM Research and Education"*. The CNSF is a collection of science organizations that advocates for US support for science. The American Astronomical Society (AAS) is a member of CNSF and sponsors one observatory each year to participate in this springtime exhibition for lawmakers and staffers on Capitol Hill. Congressional visits were organized by Lewis-Burke Associates for NRAO representatives (Mark Adams, F. Jay Lockman, Aaron Evan). The NRAO reps visited 7 WV, VA, and NM offices in the US Senate and House of Representatives on the morning of 14 April. For internal stakeholders, work continued on a new NRAO Intranet site designed and focused on helping to improve internal communication.

Science Community Outreach: The attendance at this summer **May 2010 AAS meeting** was typical: 762 persons. Our "Preparing for ALMA" Special Session and reception attracted 80 attendees and featured 5 speakers: Carol Lonsdale (NRAO-NAASC), Alison Peck (JAO), Kelsey Johnson (UVA/NRAO), Al Wootten (NRAO-ALMA), and Tony Remijan (NRAO-NAASC). The Session included an introduction to the major tools that scientists will use to prepare their ALMA observations and analyze their data, including the ALMA Observing Tool for proposal preparation and submission, the Common Astronomy Software Applications (CASA) package that will be used to reduce ALMA science data and includes an "observing simulator" task, and Splatalogue, an on-line VO-queryable spectral line database. In addition to the re-designed exhibit that debuted in January 2010, the support materials developed for this meeting included extensive high-definition video, the 2010 NRAO Research Facilities brochure, NRAO-branded 2 GB flash drives with pre-loaded content, and the ALMA Primer created by our NRC-Canada colleagues.

The initial design and text for the NRAO Annual Report has been completed. The target audience includes funding agencies (NSF-AST et al), AUI, the AUI Board, Observatory Libraries and Directors around the world. A copy will also be provided to every NRAO/AUI employee. After review by the Director's Office in July, the report is expected to go to the printer in August, then be published and distributed in September.

A 90-minute **AAAS science symposium proposal** titled "*The Universe Revealed by High Resolution, High Precision Astronomy"* was written and submitted for the 2011 AAAS Annual Meeting, 17-21 February 2011 in Washington, D.C. Three speakers were recruited and have committed to participate if the proposal is accepted: Mark Reid (Harvard Smithsonian CfA), Geoffrey Bower (UC-Berkeley), and James Braatz (NRAO). Mark Adams will organize and chair the session. AAAS science symposium proposals are peer-reviewed. We will be notified in July 2010 whether our proposal is accepted.

Proposals were submitted 15 May for an evening NRAO Town Hall, an ALMA Special Session -- *"Observing with ALMA"* – and an EVLA Special Session – *"Early Science with the EVLA"* -- for the **January 2011 AAS meeting** in Seattle, WA. We were notified in late June that all 3 proposals had been accepted and will be scheduled for the Seattle meeting.

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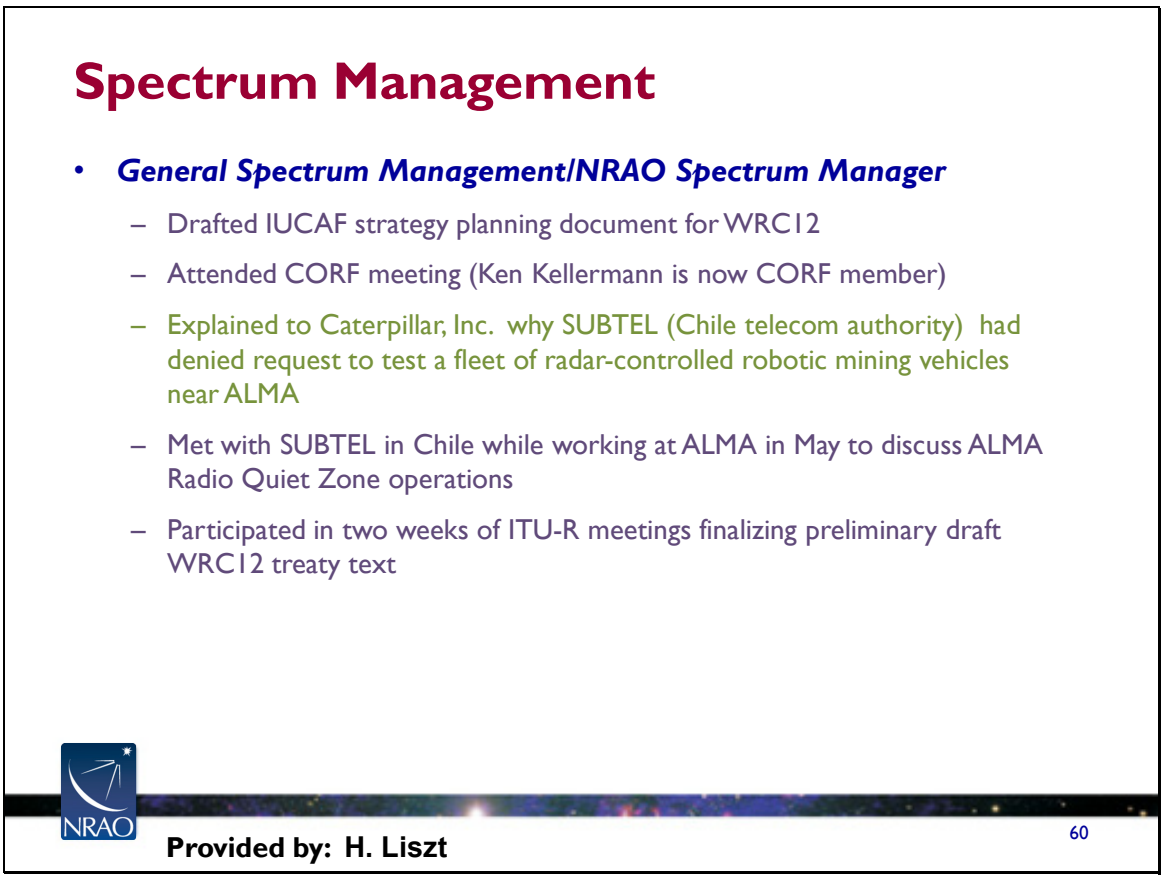

Harvy Liszt is vice-chair of **IUCAF** and began drafting IUCAF's overall strategy-planning document for WRC12.

Ken Kellermann replaced Paul vanden Bout on **CORF.** Ken attended CORF meeting.

Explained to **Caterpillar, Inc.** why SUBTEL (Chile telecom authority) had denied request to test a fleet of radar-controlled robotic mining vehicles near ALMA. The robot vehicles would have been controlled using 76-77 GHz car radars. Caterpillar claimed to be unaware of ALMA when it submitted its application and unaware of the Radio Quiet Zone around ALMA even after SUBTEL had denied their request.

Met with **SUBTEL** in Chile while working at ALMA in May to discuss ALMA Radio Quiet Zone operations. Chile recently allocated 71 –76 GHz and 81 – 86 GHz spectrum for fixed microwave links in advance of the US, but extended Quiet Zone protections to these bands and made provision to exclude such links from the vicinity of ALMA.

Participated in two weeks of **ITU-R** meetings finalizing preliminary draft WRC12 treaty text. WRC12 in Geneva in 2012 January will be preceded by the CPM meeting in 2011 February to finalize the draft input treaty text. Input to the CPM meeting was recently finalized in Geneva in a flurry of last-minute activity.

Spectrum Management

- ***National Radio Quiet Zone administration and GB RFI activities***
  - ***Quiet Zone Administration***
    - Processed 168 requests for 345 frequency assignments at 483 geographic sites, year-to-date
    - Continued development of web-based and database tools for QZ application and license monitoring
  - ***GB Interference Protection Group (IPG)***
    - Completed anechoic chamber testing of PAPER project correlator
    - Gave talks and tours to Chautauqua group and FAST project team
    - Tested and shielded ethernet cabling for GBT servo drives
    - Continued survey and maintenance of regions subject to the West Virginia Radio Astronomy Zoning Act (WVRAZ)

Provided by: H. Liszt

Quiet Zone Administration: Processed **168 requests** for 345 frequency assignments at 483 geographic sites, year-to-date. Is developing much-needed **database** management tools for monitoring frequency assignments, along with a web-based front-end for frequency assignment application.

GB Interference Protection Group (IPG): The GB Interference Protection Group replaced the 2-18 GHz amplifiers in the test chamber during this quarter and gave several EPO talks and demos of its use for RFI protection, also explained layering of the protection environment on and near the site. Continued survey and maintenance of regions subject to the **West Virginia Radio Astronomy Zoning Act** (WVRAZ). Within 10 miles of any radio astronomy facility, WVA state law governs the operation of unshielded electrical apparatus to protect radio astronomy operations.

Spectrum Management

- ***Activities in New Mexico and the VLBA sites***
  - **eVLA site RFI mitigation**
    - Tested RF emissions from new copiers and office devices
    - Converted 2 commercial LCD monitors into ultra-low emissions devices (below eVLA protection thresholds)
    - Tested the shielding effectiveness of LWA electronics container, analyzed data in light of the anticipated RFI load
  - **Coordination with**
    - WSMR, Hanscom AFB, US Space Command, Ku-band downlink operators, Canadian AF, border radar and Bureau of Indian Affairs
  - **Wind farms and power transmission**
    - Review of 6 wind farm proposals for eastern NM
    - Field tests of UHF RFI generated by HV power transmission lines and power distribution sub-station

Provided by: H. Liszt

eVLA site RFI Mitigation: New wide-band eVLA receivers demand a new level of quiet from on-site operating equipment, LWA, etc. Tested RF emissions from new copiers and office devices, converted 2 commercial LCD monitors into ultra-low emissions devices (below eVLA protection thresholds), tested the shielding effectiveness of LWA electronics container, and analyzed data in light of the anticipated RFI load this quarter.

Coordination: WSMR, Hanscom AFB, US Space Command, Ku-band downlink operators, Canadian AF, border radar and Bureau of Indian Affairs. This is a sample of the range of outside organizations whose operations affect eVLA/VLBA observing.

Wind Farms: Wind energy can generate RFI from reflection off towers and blades, from sparking, and from transmission lines used to tie them to the power grid. Power lines must not be allowed too near the eVLA: coordination with state officials is required to keep at a safe remove. This quarter, reviewed 6 wind farm proposals for eastern New Mexico, field tests of UHF RFI generated by HV power transmission lines and power distribution sub-station.

Agenda

- Science Results/Metrics
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  - New Initiatives
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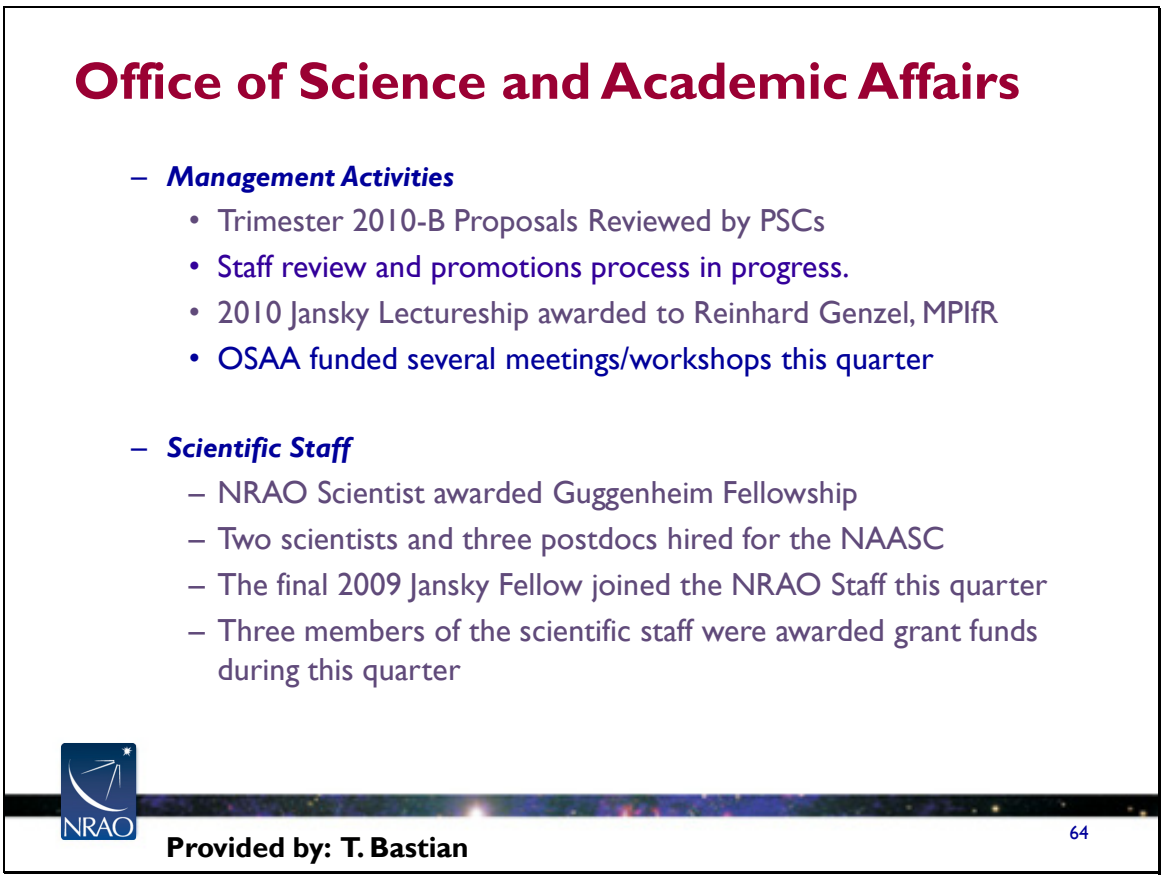
  - Communications
  - Spectrum Management
  - Science and Academic Affairs
  - Computer & Information Systems
  - Management & Administration Infrastructure



Management Activities – During the Feb 2010 call for proposals last quarter, we received a total of 210 proposals. The **GBT and the VLA/VLBA Proposal Selection Committees (PSC)** met in the third week of April to review the referee rankings and technical reports for all proposals (see *http://science.nrao.edu/observing/programs2010b.shtml*) with the goal of providing a recommended science program to the NRAO Director's Office.

A list of the approved EVLA, GBT and VLBA/High Sensitivity Array (HSA) observing programs for Trimester 2010-B will soon be online. The evaluation of the joint NRAO/Fermi and NRAO/Chandra proposals is still underway. These results will be reported separately.

Jansky Lecture will be presented this fall by *Dr. Reinhard Genzel* in Charlottesville, Virginia, and Socorro, New Mexico.

Meetings that were funded either partially or in full this quarter by the OSAA were the *2010 Postdoctoral Symposium* held in Green Bank, 18-20 April; the *Cometary Radio Astronomy Workshop* also in Green Bank, 17-19 May; and the *Twelfth Synthesis Imaging Workshop* held in Socorro, June 8-15.

Scientific Staff – *Dale Frail***,** Scientist-Astronomy, at the NRAO in Socorro was awarded a prestigious **Guggenheim Fellowship**. The Guggenheim Foundation describes its fellowships as "mid-career" awards "intended for men and women who have already demonstrated exceptional capacity for productive scholarship or exceptional creative ability in the arts."

NAASC scientist hires were *Adam Leroy* as Assistant Astronomer, Tenure Track; *Scott Schnee* hired at Assistant Scientist/A, and the **NAASC postdoc hires** were *Amy Kimball*, U. Washington; *Robin Pulliam*, U. Arizona; *Nuria Marcelino*, Lab for Molecular Astrophysics, Madrid.

Fourth 2009 Jansky Fellow (non-resident) *Ran Wang* from Peking University began her appointment at her host institution, University of Arizona, this quarter.

NRAO received the following funds during this quarter for **grants awarded** to these members of the NRAO scientific staff:
-$38,000, from NASA, Recipient *Dale Frail,* for "NRA/ Research Opportunities in Space and Earth Sciences" from Apr 2010 to Apr 2011.
-$135,215, from NSF, Recipient *Tim Bastian*, for "Imaging Spectroscopy of Coherent Radio Bursts on the Sun: a New Probe of Magnetic Energy Release" from Jun 2010 to May 2013.
-$507,258, from NSF, Recipient *R. Craig Walker,* for "MRI-R2 VLBA Sensitivity" from Apr 2010 to Mar 2011.

Office of Science and Academic Affairs

- ***Student and Visiting Scientist Programs***
  - NRAO Summer Student Program
    - The thirty 2010 summer student program participants began their 10-12 week appointments at their assigned NRAO sites
      - Nineteen of the 2010 summer students attended the Twelfth Synthesis Imaging Workshop June 8-15 2010 in Socorro
  - Pre-Docs
    - University of Virginia student continued appointment working in Charlottesville
    - New Mexico Tech student completed her pre-doctoral fellowship in Socorro in May 2010
    - New Mexico Tech student transitioned from Graduate Internship to Pre-Doc appointment working in Socorro

Provided by: T. Bastian

Summer Student Program: For more information on the program go to *http://www.nrao.edu/index.php/learn/education/re* .

Pre-Docs: *Cheng-Yu Kuo* (Univ of Virginia) continued working w/ Jim Braatz in Charlottesville on reducing and analyzing VLBI observations of water maser emission from galactic nuclei as part of the Megamaser Cosmology Project; and *Urvashi Rao-Venkata* (New Mexico Tech) working at NRAO in Socorro with Frazer Owen on wide-band imaging algorithms and techniques, completed her pre-doc appointment after completing her PhD, she will return as a member of the scientific staff later this summer; and *Josh Marvil* completed his internship and began an appointment as a PreDoc this quarter.

Office of Science and Academic Affairs

- ***Student and Visiting Scientist Programs cont.***
  - Graduate and Undergraduate Interns
    - Three graduate students, two from the University of Virginia and a third from Universidad Nacional Autonoma de Mexico began work as graduate interns with NRAO mentors
    - Nine undergraduates (all New Mexico Tech) continued undergraduate internships working in the Electronics Division in Socorro
  - Visiting Astronomers
    - Charlottesville Visiting Assistant Astronomer completed her appointment this quarter. Four visitors continued their appointments and two new visitors arrived, in Socorro
    - Key Science Project awardee visited Socorro to work on his proposal
    - Charlottesville hosted several short term visitors during this quarter

Provided by: T. Bastian

Graduate Interns: *Charles Romero (UVA)* is working with Brian Mason on quantifying the observational signatures uniquely accessible through high resolution SZE data (e.g., shocks and cold fronts, helium sedimentation), and applying them to MUSTANG data and if available data from GISMO on the IRAM 30m at 150 GHz; *Timothy Pennucci (UVA)* is working with Scott Ransom on the NANOGRav project; and *Sergio Dzib (UNAM)* is working with Amy Mioduszewski on research projects related to the distance of young stars which will be part of his Ph.D. thesis.

Visiting Astronomers: *Jack Gallimore and Michelle Thornley* of Bucknell University continue their visit with the NAASC in Charlottesville until this summer; *Robert Sault* working in Socorro as a visitor funded by Socorro Ops; *Sheila Kannappan,* UNC**, completed** her appointment in Charlottesville at the end of May, *Jake Hartman* and *Miriam Krauss-Hartman* as well as *Sarah Spolaor* from Swinburne University and *Pat Palmer* from U Chicago, are working at Socorro under the Visitor Program during this quarter. *Jacqueline van Gorkom* is Socorro on sabbatical from Columbia University.

Carl Melis, UC San Diego, visited Socorro in May to work on proposal BM321, entitled "Towards a VLBA Resolution of the Pleiades Distance Controversy, " which was recently designated as a **Key Science Project** by the NRAO Proposal Selection Committee.

Office of Science and Academic Affairs

Support Programs

- **Student Observatory Support**
  - SOS Selection Committee met in May
    - ✓ Selected six10B applications for funding
- **Observatory Library**
  - To ensure standardization throughout the NRAO Library, the Exchange Collection is catalogued and organized, in a separate section, by Library of Congress Call Numbers; all Exchange materials are now entered in the Library catalogue
  - Modifications to the NRAO Library facilities are under way
  - Theses now available via the Library catalogue
  - All 1,501 International Symposium on Space Terahertz Technology bibliographic records, with full-text links, have been added to ADS
  - NRAO Library hosted the April Virginia Special Libraries Association (VASLA) meeting; the NRAO Library staff presented a Blacklight tutorial and demonstration and presented a Virtual Tour of the Library. This was one of the better attended VASLA meetings

Provided by: T. Bastian

SOS Awards: The SOS committee recommended funding a total of **$158,400 to 6 of the 7 proposals under review** this period. They are as follows: GBT10B-019, supervisor, John Bally , student Adam Ginsburg , University of Colorado, Boulder, for **$35,000**; GBT10B-026, supervisor Jeremy Darling, student Kyle Willett, University of Colorado, Boulder, for **$35,000**; GBT10B-027, supervisor Snezana Stanimirovic, student Min-Young Lee, U. Wisconsin, Madison, **$3,000**; GBT10B-033, supervisor Maura McLaughlin, student Benetge Perera, WVU, **$22,400**; GBT10B-036, supervisor Jeff Peterson, student Enrique Suarez, Carnegie Mellon, **$35,000**; VLBA10B-105, supervisor Greg Taylor, student Justin Linford, UNM, **$28,000**

Information on the SOS Program can be found at *http://science.nrao.edu/opportunities/sos.shtml*.

Observatory Library: The **theses link** for the Library Catalogue is *http://69.63.217.22/N10017Staff/OPAC/Index.asp?database=4663326*.
To search with **Blacklight** go to *http://search.space-thz.org/*.

Office of Science and Academic Affairs

- ***Support Programs cont.***
  - **Historical Archives**
    - Various papers from the NRAO as well as individual members of the scientific community have been processed
    - Work continued on the project to digitize audio cassette tapes by converting the 1971 symposium on High Velocity Hydrogen to raw audio files.
    - This summer a part-time student will be working 8 hrs/wk for the Archives
    - Received two sets of blueprints for the 85 foot telescope control building from the family of a man who had worked for the building's contractor
    - An archivist from the National Archives and Records Administration spent a day visiting the NRAO Archives
    - The NRAO Archivist gave the annual summer student lecture on archives and the NRAO Archives, and had the annual showing of the movies on construction of the 140 foot and of the 300 foot
    - Continuing to provide information and resources in response to queries from both NRAO staff and outside researchers

Provided by: T. Bastian

Archives: **Processing** was completed on the Papers of *Kenneth I. Kellermann* received to date. These papers, combined with those of *Marshall H. Cohen, A. Richard Thompson*, as well as materials from the *NRAO Director's Office*, form a comprehensive suite of materials on history and development of US VLBI and the VLBA. The division received the final shipment of the Papers of *Ronald N. Bracewell* from his family, and work has begun on processing the new materials and incorporating them into the Bracewell papers already received. Processing was also begun on the *Papers of David S. Heeschen* dating from the time before he came to NRAO.

The Archives online catalogs are linked from the NRAO Archives home page, *http://www.nrao.edu/archives/*.

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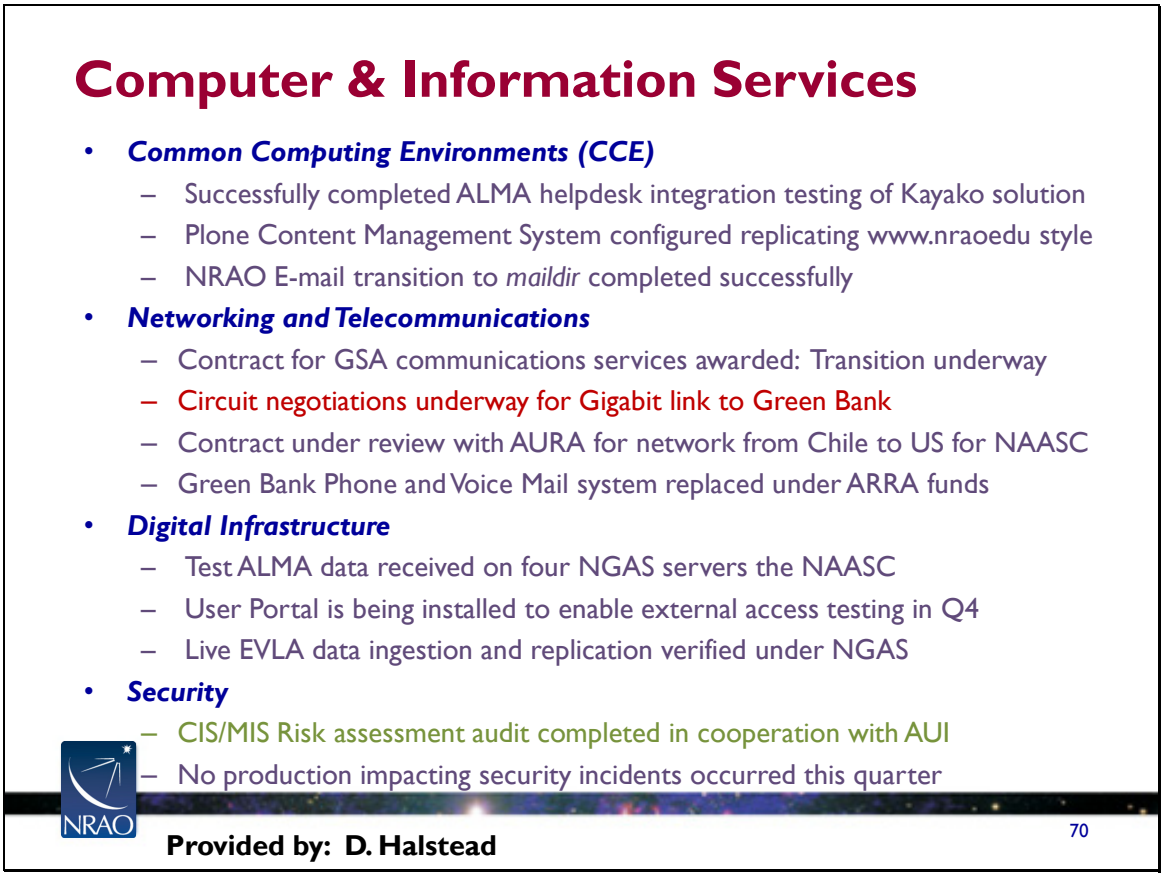

CCE: ALMA/NRAO User Portal development continuing with the Plone architecture adopted for the web-based Content Management System and Portal release scheduled for Q4. Successful integration test against requirements for ALMA observer supporting **helpdesk**. NRAO **Plone** installed and configured to replicate the style and structure of www.nrao.edu, which will allow for workflow control over online document and content publication. E-mail solution for UNIX users updated to **maildir** (improved performance and supports hierarchical mail folders).

Network: Ongoing commitment to upgrade ALL major sites to 1Gigabit/Second to facilitate data access: Complete for C'ville and Socorro; WV State awarded $130 million in economic stimulus funds to expand high-speed broadband Internet access (specifically including the Observatory in **Green Bank),** NRAO is now working with Verizon/Frontier communications, West Virginia University and Pittsburgh SuperComputer Center on a fiber build. There are risks in that Frontier has not provided this type of service prior and the WV state is unresponsive in facilitating a cohesive strategy for the Observatory. The mitigation is to continue to provide service at the current capability. A contract is under negotiation with AURA for a shared 1Gigabit/Second link from Santiago (ALMA SCO) to the NA-ASC.

Completed **replacement of phone system** in Green Bank. ARRA funds have been used to successfully replace the PBX and Voicemail system used throughout the Green Bank WV site.

Digital Infrastructure: ALMA archive servers, **User Portal** and Oracle Database now running in Charlottesville with initial **test data** now on-line. Power feeds and racks installed for NAASC servers and storage. The Next Generation **Science Data Archive** System servers now storing and replicating production **EVLA data** in Socorro. Access to 200 TeraBytes of Archive storage and 100,000 hours of

computer time being leveraged from NSF TeraGrid to support the re-use of the 350MHz GBT pulsar survey data.

Security: An unplanned **IT Risk Assessment** review was successfully completed with Cherry, Bekaert & Holland, L.L.P. (engaged by AUI); report submitted, but additional work will be required to action their expected recommendations. No **production** downtime from security vulnerabilities occurred this quarter.

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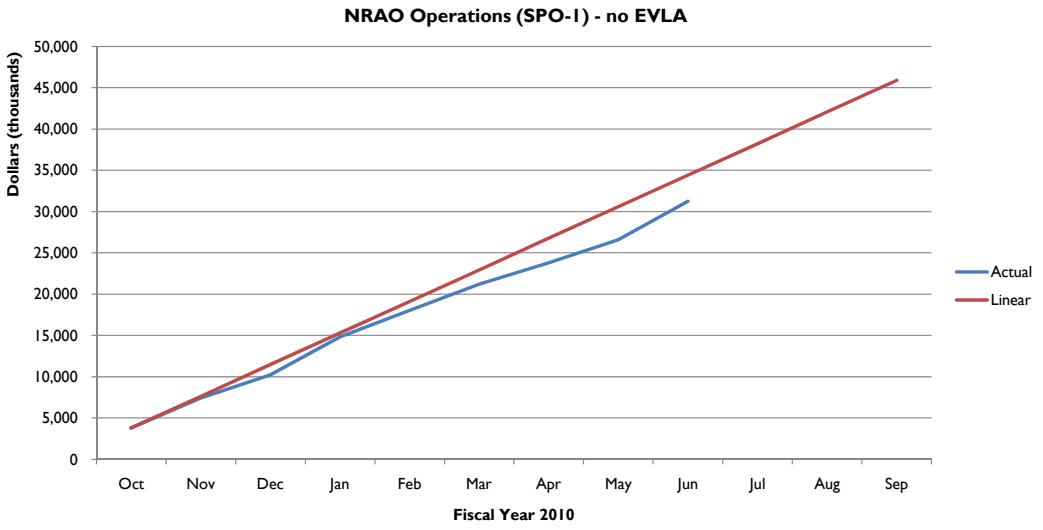
Observatory Management Services Financial Performance



NRAO

Provided by: T. Miller/G. Clark

72

NRAO Operations (less EVLA) FY 2010 new funding allocation is $43,149k. Total available funding including prior year commitments, prepaids, and carryover totals $48,889.5k. Expected total spending for FY 2010 is $46,963k with $1,925k of uncommitted carryover remaining to cover anticipated FY 2011 and FY 2012 funding shortfalls. As of the end of the third quarter total expenses plus commitments total $31,260.3k (63.9% of available funds, 66.6% of expected spending). Elapsed work days is 74.4%.

Observatory Management Services

- ***Fiscal Division***
  - NSF IG/DCAA Audit
    - An entrance conference with representatives of NSF, DCAA, AUI and NRAO was held on March 3, 2010
    - Audit fieldwork was conducted in Socorro the week of June 28
  - The re-design of the current "Fringe Pool" design has been rescheduled to September to coincide with the fiscal year end
  - To develop a proposal to implement an electronic data archiving system, the Fiscal Department conducted on-site evaluations of two companies that implemented archiving systems.

Provided by: C. Williams/G. Clark

To the initial scope of work, **IG/DCAA** was requested by NSF to audit and review expenditures in FY 10 pertaining to the ARRA funding. An **entrance conference** with representatives of NSF, DCAA, AUI and NRAO was held on March 3, 2010. **Audit fieldwork** was conducted in Socorro the week of June 28. The NRAO Fiscal Department continues to work with the DCAA to provide additional information as required. Audit fieldwork will be conducted at the Green Bank and Charlottesville sites in early September. [Q3/Q4]

The re-design of the current **"Fringe Pool"** design has been rescheduled to September to coincide with the fiscal year end.

The Fiscal Division completed a site visit to two companies and reviewed both the LaserFiche and COTT **archiving systems**. Currently, the Fiscal department is working with MIS to determine the hardware requirements to implement each system. To develop a proposal to implement an electronic data archiving system, the Fiscal Department conducted on-site evaluations of two companies that implemented archiving systems. Based on evaluations of the system, hardware/software requirements, and continuing maintenance costs, a cost-benefit analysis and proposal will be developed for management review in the fourth quarter.

Observatory Management Services

- ***Contracts and Procurement***
  - Final Contractor Procurement System Review Report was issued by the internal auditors (CBH) and provided to AUI Board
  - NSF IG/DCAA audit support (Q3 &Q4)
  - BDO Seidman, the external auditor, and NSF IG/Booz Allen to conduct an audit of ARRA awards (Q1_FY2011)
  - Conducted a procurement review in Chile for FY10 Q1 activity
    - FY10 Q2 and Q3 review scheduled for early Q4
  - ARRA efforts resulted in commitments of approximately 55.5% of the $5.4M funds during Q2
    - Coordinating with NSF for re-alignment of ARRA funds
  - C&P All-Hands Mandatory Training completed (Q3)
  - Manuals
    - New P-Card Manual draft and final by the end of Q4
    - Procurement Manual complete update by FY11, Q1

Provided by: P. Donahue/G. Clark

In the Contracts and Procurement area in Q3, the final **Contractor Procurement System Review Report** was issued by the internal auditors (CBH) and provided to AUI Board. Several recommendations have been implemented and other recommendations are being assessed for future implementation. New administrative requirements, and audits, are increasing Buyer's workload resulting in overtime and increasing the GB Buyer for .5 to .75FTE.

Significant time and energy was used to support the continuous, and increasing number of audits, including **NSF IG/DCAA, BDO Seidman, and Booz Allen**, all impacting existing resources and ability to process PR's and conduct the procurement process in a thorough and complete manner.

A **procurement review** was conducted in Chile for Q1 FY10 activity. Q2 & Q3 scheduled for July. Due to AUI's directive that changed the travel budgeting/charging methodology, the NA ALMA Business Manager is performing the reviews in lieu of C&P, thereby reducing risks that could result if a review wasn't conducted.

ARRA efforts resulted in commitments of approximately 55.5% of the $5.4M funds during Q2. ARRA expenditures continue to be a major focus, and soon ARRA audits. Working with NSF in Q4 to re-align remaining ARRA funds (~$500k) to new projects.

C&P All-Hands Mandatory Training was Completed (Q3).

There is an initiative for FY2010 to establish an expanded and user-friendly web presence in which internal and external customers will be able to obtain standard procurement forms, terms and conditions, representations and certifications, and proposal materials. The website is at risk and will not be updated as planned. Due the number of audits and re-prioritizations, the website update is being moved to FY2011.

Observatory Management Services

- ***Management Information Services (MIS)***
  - Design and initial planning of NRAO Cost Pools
  - Further discussions and design of the NRAO OSO realignment which includes NRAO chart of accounts changes, realignment, and information extraction
  - Continue the stabilization and enhanced data mining for the NRAO Electronic TimeKeeping (ETK) systems Q1
  - Design began to establish the MIS business systems as the central repository for employee information
  - Participated in AUI Internal Audit of Information Technology(IT) Risk Assessment – Complete Q3
  - Participated in NSF IG/DCAA audit Q3

Provided by: C. Beverage/G. Clark

This quarter, MIS designed and completed initial planning of **NRAO Cost Pools**. Further discussions and design of the NRAO **OSO realignment** which includes NRAO chart of accounts changes, realignment, and information extraction continued. Continued the stabilization and enhanced data mining for the NRAO **Electronic TimeKeeping (ETK)** systems. Design began to establish the MIS business systems as the **central repository** for employee information with exports to the NRAO phone directory and business services has been included in the NRAO Cost Pool project. Participated in **AUI Internal Audit** of Information Technology(IT) Risk Assessment. Participated in **NSF IG/DCAA** audit.

Observatory Management Services

- **Environmental Safety and Security**
  - Began development of an Observatory-wide crisis management plan
  - – ***Charlottesville***
    - – ***Edgemont***
      - Fire Drill conducted May 27
      - Building Fire Systems inspected
      - Met with UVA Environmental Activities Committee
    - – ***NTC***
      - FEIC Safety Inspection conducted
      - Hazard Communications Training complete for 2010

Provided by: R. Daniels/G. Clark

Began the development of an Observatory-wide **crisis management plan**. This plan will integrate each site plan into a cohesive overarching plan, which will address all major categories of crisis and levels of severity, with a clearly defined communications process for each type. The plan will include scheduled drills.

Edgemont Road Facility – Fire drill conducted May 27th. Outstanding performance. The building was cleared in approximately 90 secs. An additional 90 secs was required to confirm the clear building but the drill was a success.
NRAO ES&S Manager addressed the **UVA Environmental Activities Committee** in an attempt to build a relationship with the active "Green" effort at UVA. Liaison was established and we will monitor going forward.

NTC – NA Front End Integration Center was inspected. The second Testing Chamber is in good shape. There were only minor defects and all were corrected (blocked emergency equipment). Next steps in the FEIC will include crane inspection and maintenance program along with a chain fall & lift strap inspection. NTC is planning to issue Safety Shoes to affected ALMA employees. This is expected to be completed by July – September time period.

Observatory Management Services

- **Environmental Safety and Security**
  - ***New Mexico***
    - Assisted with county-wide emergency response drill
    - Liaise with NMT Security and local police organizations for security for NRAO employees at Socorro facilities
    - Liaison for Socorro County and Region II EMS
    - Safety support for the VLA site Synthesis Imaging Workshop tour
    - Providing Safety oversight for unusual maintenance activities

Provided by: R. Daniels/G. Clark

New Mexico Facilities: Attended Safety Committee meetings (4/8, 5/13, 6/17). Conducted New Hire Safety training as required.

NRAO supported the Socorro **Countywide Emergency Response Drill**. ES&S provided local police, fire & rescue liaison.

ES&S (Security Role) also worked with **New Mexico Tech Security** to manage personal safety risks during this period. Risks escalated due to local mugger on the campus. All routine (Monthly/Quarterly) VLA Inspection & Emergency Systems maintenance, support & inspection items complete (Fire Extinguishers, Generator logs for EPA, fuel tank inspections, etc. Specify and provide 1st Aid Kits meeting Region II EMS requirements. Working with EPO, provided security & safety support for the **Synthesis Imaging Workshop tour.** Antenna 6 & 7 required a **full separation for bearing maintenance**. These are **unusual maintenance activities** and require specialized hazard assessments. There were no injuries during this dangerous work.

Observatory Management Services

- **Environmental Safety and Security**
  - ***Green Bank***
    - Recycled 300 pounds of cardboard along with 40 pounds of batteries
    - Sewer treatment system continues in compliance since January 2007
    - Performed inspection of Green Bank cafeteria
    - Safety Training completed
    - Accidents/Injuries frequency & severity below Observatory's operating units average
  - ***VLBA Sites***
    - Fort Davis compliance and behavioral audit completed
  - ***Chile Sites***
    - Completed an assessment of safety in Chile, and conveyed some concerns to the JAO

Provided by: R. Daniels/G. Clark

Green Bank Facilities: Recycling efforts continue with 300 pounds of cardboard and 40 pounds of batteries this quarter. **Site sewer water treatment system** continues within limits performance for the third successive year. Semi-annual **cafeteria inspection** was conducted on June 7 with no major issues to report. **Training was conducted** in the area of Hazard Communication for the cafeteria staff.

VLBA Facilities: Compliance and Behavioral audit completed. For Tiger Team Activity we audit: the proper use of appropriate PPE, proper lifting techniques, appropriate communication between employees of potentially hazardous working conditions or jobs, and observed work practices. The Fort Davis Behavioral Inspection found the employees, at the time of contact, all displayed a deliberate effort to comply with appropriate safe work practices including use of PPE. It was noted that there has been a marked improvement in demonstrated safe practices since the first FD/TT behavioral audit. The supervisor on-site deliberately sought information re: safe work practices and compliance (e.g., safe storage of materials).

An assessment of **safety in Chile** was concluded and concerns submitted to the JAO for consideration. Details are available upon request.

Observatory Management Services

Name of Grant	Funding Institution	Grant Value	PI
MRI-R2: Acquisiton of Recording Media to Triple the Sensitivity of the VLBA	NSF	$507,258	Robert Walker
SWIFT - Studies of Radio Afterglows of Gamma Ray Bursts in the ERA of the EVLA	NASA	$38,000	Dale Frail

Provided by: T. Miller/G. Clark

MRI-R2 VLBA Sensitivity period of performance: April 1, 2010 to March 8, 2011
Research Opportunities in Space and Earth Science: April 15, 2010 to April 14, 2011

Observatory Management Services

- ***Human Resources***
  - ***Recruitment/applications tracking***
    - Completed the process of evaluating the effectiveness of NRAO recruitment efforts
      - Monthly requisition report included in FLASH report
      - Track recruitment sources and make recommendations
  - ***Compensation***
    - Thorough review of NRAO's compensation process including the grade structures and market surveys continues

Provided by: F. Giles/J. Firmani

Recruitment/applications tracking: Completed the process of evaluating the effectiveness of **NRAO recruitment** efforts. Monthly requisition report included in FLASH report. Tracking recruitment sources and making recommendations.

Compensation: Thorough review of NRAO's **compensation process** including the grade structures and market surveys continues.

Observatory Management Services

- ***Human Resources***
  - ***Diversity Outreach***
    - Completed development of an action plan that builds a diversity support network from site level up to the Charlottesville headquarters
      - Distributed cultural awareness posters to all sites
      - Developed Diversity Advocate model (role definition)
      - Incorporated broader impact/diversity goals into PEP process
      - Launched new diversity webpage on NRAO website
      - Recognized as Best Diversity company by readers of Diversity Careers
      - Design, develop and conduct broader impact/diversity training across Observatory
    - Completed an initiative to assist Howard University in further developing it astronomy program
      - Working with Richard Prestage in GB to create internship opportunities

Provided by: F. Giles/J. Firmani

Diversity Outreach: Completed development of an action plan that builds a **diversity support network** from site level up to the Charlottesville headquarters. Distributed cultural awareness posters to all sites. Developed Diversity Advocate model (role definition). Incorporated broader impact/diversity goals into PEP process. Recognition in Diversity Careers magazine resulted in # diversity applicants seeking employment at NRAO (www.diversitycareers.com). Completed an initiative to assist **Howard University** in further developing its astronomy program and working with Green Bank to create internship opportunities.

Observatory Management Services

- ***Human Resources - New Hires***
  - Diversity Employment Results Q3

Socorro

- Technician, Junior – (Minority)
- Jansky Fellow – (Female/Minority)
- CO-OP – (Female/Minority)
- Post Doc – (Female)

Green Bank

- Housekeeper/Food Handler – (5) (Females)
- Maintenance Trainee – (Female)
- Tour Guide (2) – (Females)

Charlottesville

- Post Doc – (Female)

Provided by: F. Giles/J. Firmani

Observatory Management Services

- ***Human Resources – Promotions***

  – Diversity Employment Results Q3

  Socorro

  - Software Engineer I – (Minority)

  Green Bank

  - Assistant Scientist – (Minority)

  Charlottesville

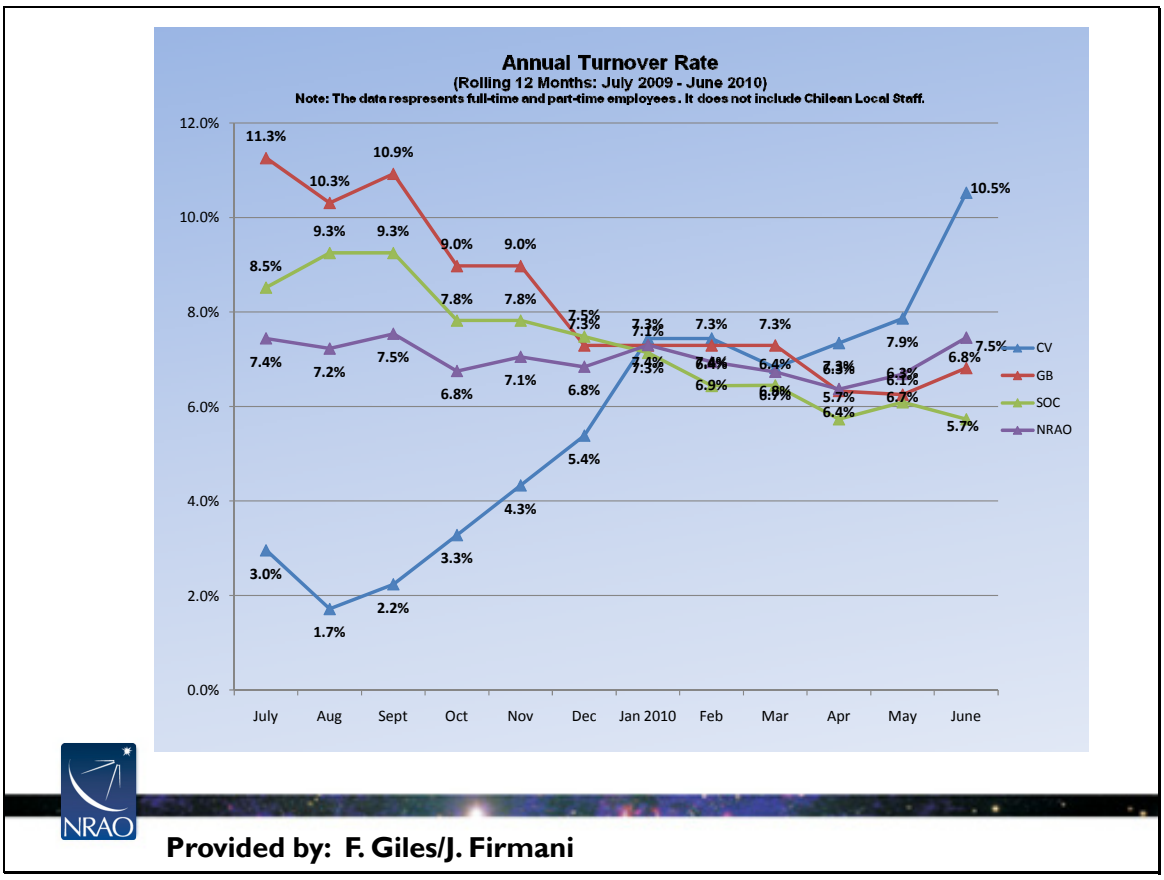
  - Technical Spec I – (Female)

Observatory Management Services

- ***Human Resources***
  - ***Workforce Management Planning***
    - ***Observatory Staffing Plan***
      - Complete the survey of all NRAO staff
      - Developing Skills Mix Database [Q3]
      - Focus group of scientists/technologists to continues to develop picture of strategic staffing needs
      - Match current skills sets based on questionnaires with strategic staffing needs [July-August]
        - Develop ALMA and CDL staff transition plans
        - Develop succession plans
      - Modify and implement processes for employee career development and succession planning [September]

Provided by: F. Giles/J. Firmani

In order to develop a robust **Observatory Staffing Plan**, a series of surveys were piloted and implemented across the Observatory. The results of that survey (~55% overall response rate) is providing a view of the skills mix and career interests across the staff that responded. Strategic staffing needs are being developed with the Chief Scientist, Chief Technologist, and key strategic thinkers throughout the Observatory. The next step in the process is to match the current skills sets with the strategic staffing needs and to develop the final staff transition plans for ALMA, EVLA and CDL. These activities are progressing according to plan.



Turnover rates dropped for both New Mexico (Socorro and VLA) and Green Bank sites during the first half of the 12-month look back period, bringing the annualized attrition in-line with the NRAO-wide rates (6% to 7%). Charlottesville turnover increased over the same period due to the departure of two employees per month from October through December. The reasons for their departures were not alarming in nature and varied from moving out of state to ending appointments.