

Quarterly Status Update (QSU)

January – March 2010



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



Primer

- The structure of this presentation has been set up in a consistent pattern for easier reading
- The milestones that are recorded here come directly from the Program Operating Plan
- Changes (change in work project or scope, slips in schedule, etc.) that are affecting the stated POP milestones are reflected through risk mitigation processes described in the body of the presentation
- New work that is being done (outside the POP) is included
- Names, titles, citations, web addresses, etc. are included in the NOTES



The **PURPLE** text reflects items specified in the Program Operating Plan 2010 (POP FY2010). Risk and mitigation against meeting required actions is included in both the SLIDE and the NOTES section.

CHANGES or NEW items to the POP are in **GREEN** text. New activities that were not previously described in the POP, and changes to activities in the POP, are included in the slides.

Agenda

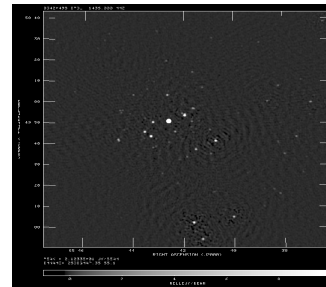
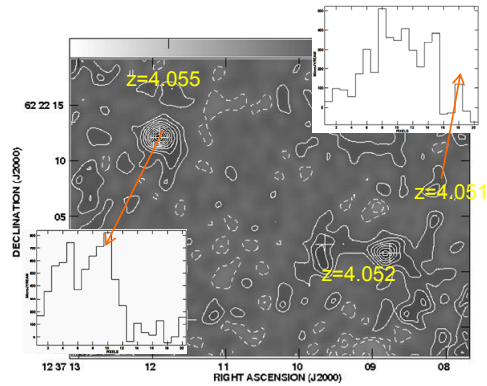
- Science Results
- Metrics/Statistics
- Observatory Science Operations
- Site Specific Activities
 - ALMA
 - VLA/EVLA
 - GBT
 - VLBA
- Observatory-wide Operations



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.

EVLA Science Results

- EVLA and PdBI reveal a cluster of molecular gas rich galaxies at $z=4$: the GN20 proto-cluster at $z=4$ has been shown to contain at least three massive, forming galaxies with gas masses $> 10^{10} M_{\odot}$ (Riechers et al. in prep).
- WIDAR correlator demonstrates stability for extreme high dynamic range imaging: The radio galaxy 3C147 has been imaged with only 12 antennas to a dynamic range of 800,000/1 (Perley et al. in prep.)



Provided by: B. Dickman/C. Carilli

4

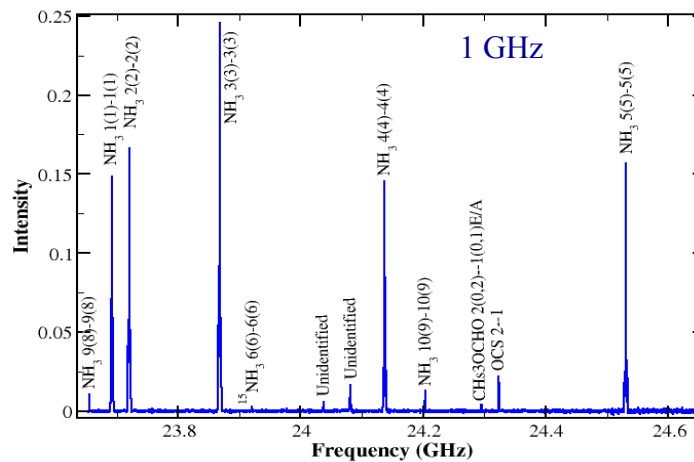
Title 1: EVLA is now performing real spectroscopy of molecular gas in the early Universe. This image shows the CO emission from three galaxies in a protocluster within 2Gyr of the Big Bang. The EVLA correlator allows for large cosmic volume searches for molecular gas, as well as high and spatial velocity resolution imaging of the gas distribution and dynamics.

Investigators: see text in all cases

Title 2: This image demonstrates the stability and accuracy of the EVLA correlator to produce ultra-high dynamic range images. This is made possible by the extremely small changes in time of the EVLA digital bandpass, leading to very small 'closure errors', and enabling accurate self-calibration and imaging.

EVLA Science Results

- EVLA performs broad-band, high resolution 22GHz imaging of the Orion molecular hot core: multiple key molecular transitions are detected from the nearest massive star forming region (Perley et al. in prep).



Provided by: B. Dickman/C. Carilli

5

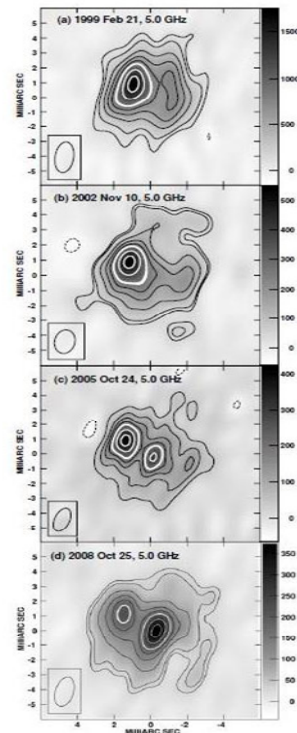
The wide band of the EVLA allows for multi-line spectroscopy with extremely high velocity resolution, and unprecedented bandpass stability. This spectrum shows just a single 1GHz band of the EVLA at 24GHz, revealing many critical spectral transitions, and also some that are currently unidentified. The full EVLA will have 8 GHz of total bandwidth.

VLBA Science Results

- New HSA images of SN1986J lead to a puzzle: is the central bright spot a compact stellar remnant (black hole or neutron star), or the localation of impact of the expanding SN shell with a dense condensation in the circumstellar medium? The small proper motion suggests the former, but the optically thin spectral index (indistiguishable from the shell) suggests the latter (Bietenholz, Bartel, Rupen 2010,ApJ, 712, 1057).
- Distance to the youngest YSO: The VLBA has determined the distance to the proto-Herbig-Haro object EC95 in Serpens. They derive a trigonometric parallax using non-thermal emission of 415 ± 5 pc to the Serpens core. This is almost a factor two larger than previously thought (Dzib, Loinard, Mioduszewski et al. 2010,ApJ, in press).



Provided by: W. Brisken/C. Carilli



6

Title: The HSA has performed deep, multi-epoch imaging of SN1986J, one of the most luminous radio supernovae ever, in NGC 891 at 10Mpc. The images of the expansion are key to understanding the early phases of SNe evolution. They have discovered a bright new source at the center of the SNe. Originally it was thought this was emission from the remnant compact stellar remnant (possibly a black hole), but further study suggests that it might be a brightening in the shell at a site of impact with the dense circumstellar medium.

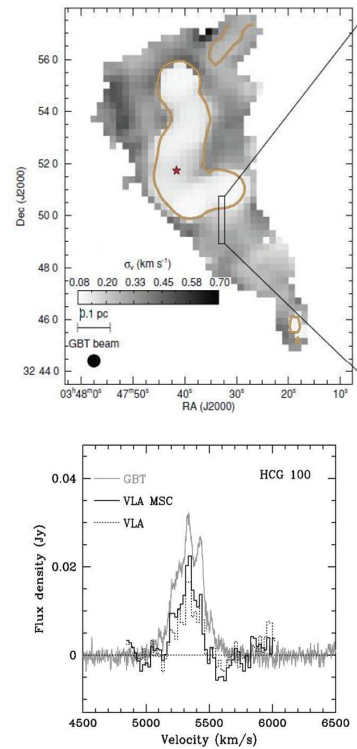
Title: Using the VLBA, this group has obtained a distance to a very young YSO. This is a massive, very young star. They have revised the distance by almost a factor 2.

GBT Science Results

- Dense cores have sub-sonic, ordered gas velocities: GBT imaging of the NH_3 emission from dense gas in star forming cores reveals non-thermal, subsonic motions, indicating a sharp transition from the highly turbulent outer clouds to more quiescent inner cores (Pineda, Goodman, Arce et al. 2010, ApJ, 712, L116).
- Diffuse inter-group gas discovered in Hickson groups: the GBT and VLA have revealed the presence of diffuse HI in Hickson groups of galaxies. This gas represents an intermediate stage in the evolution of tidal debris. Roughly 1/3 of the HI in these groups is in this form (Borthakur, Yun, Verdes 2010, ApJ, 710, 385).



Provided by: J. Lockman/K. O'Neil/C. Carilli



Title: The GBT has mapped the dense molecular gas in a star forming cloud core. They find that in the densest part of the cloud the gas turbulence is lower than in the outer parts of the cloud, with a sharp transition region. This lower turbulence may be key to understanding the final stages of cloud core collapse to a star.

Title: The GBT and VLA have provided clear evidence for extended gas around galaxies in small groups. The gas is likely part of a large scale galactic recycling of gas from galaxy outflows to subsequent infall. The surprise is the very large fraction of gas in this extended phase.

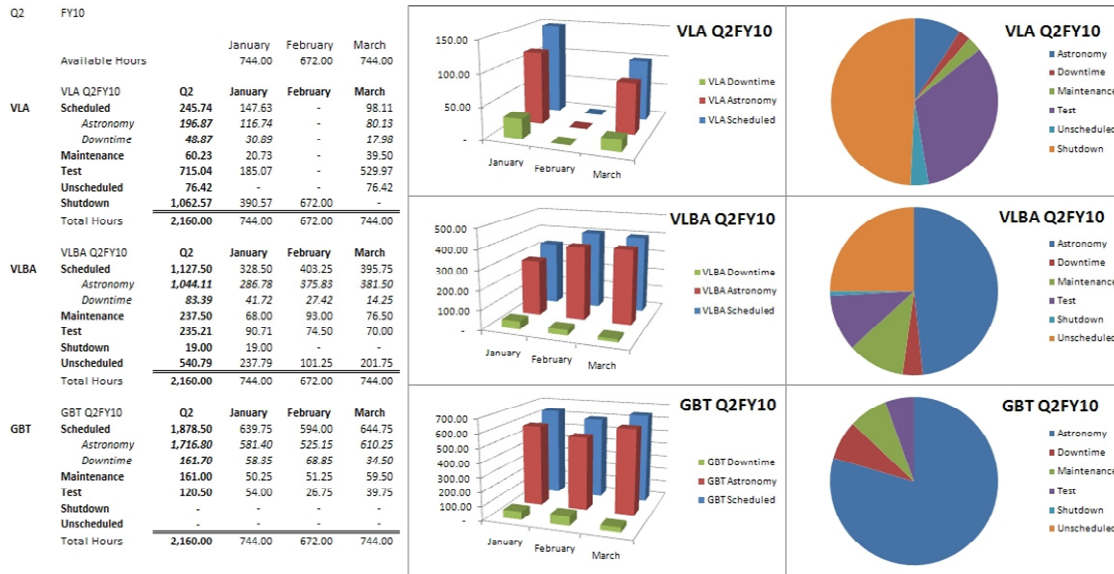
Agenda

- 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.

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



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

9

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 IOW weather environments and the tiger team visits; for VLA if no dynamic project fit, for GBT = holiday.

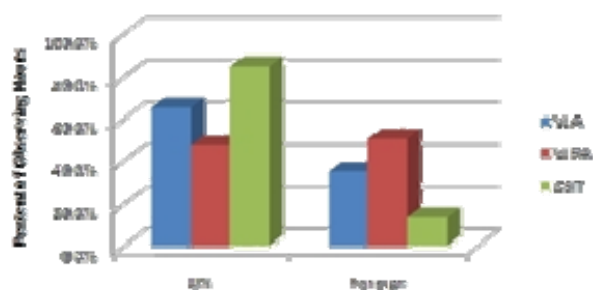
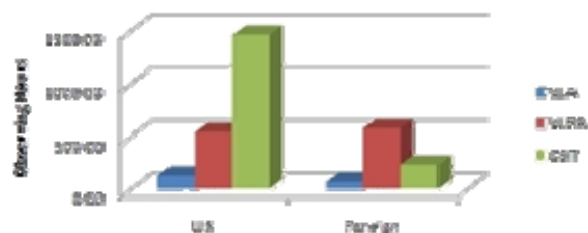
Downtime = faults that occur during a planned observation; e.g., circuit breaker fault, fraction of array unavailable, etc.

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

	U.S.	Foreign	Unpriced
VLA	128.24	68.67	6.08
VLA	316.75	55.25	56.08
GBT	1428.56	211.25	26.08

	U.S.	Foreign	Unpriced
VLA	55.1%	34.9%	0.0%
VLA	42.7%	38.8%	1.4%
GBT	43.6%	11.5%	1.5%

Domestic and Foreign Utilization



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

10

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

Top graphs are in **observing hours**.

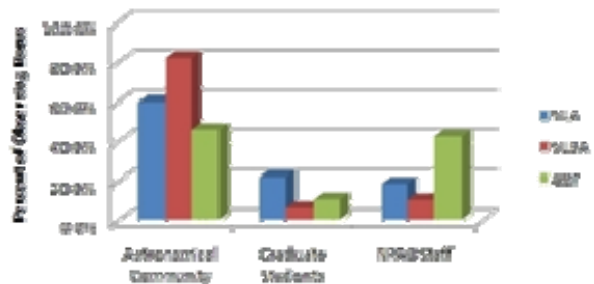
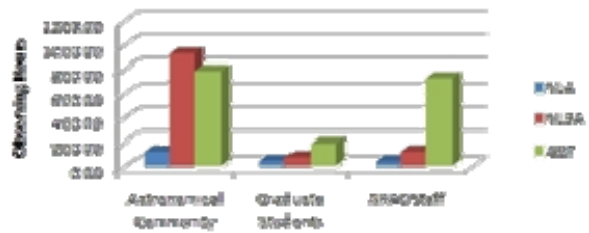
Bottom graphs are in **% of observing hours**.

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

	Astronomical Community	Graduate Students	NRAO Staff
VLA	115.72	48.10	38.48
VLA&	921.75	72.60	112.75
GBT	289.15	214.80	24.16

	Astronomical Community	Graduate Students	NRAO Staff
VLA	59.6%	21.9%	88.9%
VLA&	51.8%	1.4%	80.4%
GBT	45.8%	38.4%	42.1%

Community and Student Utilization



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

11

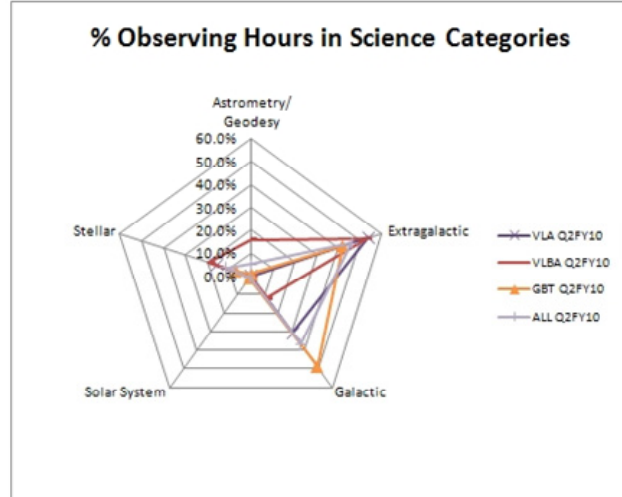
All metrics are compiled by principal investigator, not project team.

Top graphs are in **observing hours**.

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

Telescope Usage by Science Category

	GBT	VLA	VLBA
SOLAR SYSTEM	1.2%	0.0%	0.0%
STELLAR	7.2%	15.4%	19.2%
GALACTIC	48.9%	30.8%	12.0%
EXTRAGALACTIC	41.9%	53.8%	52.9%
ASTROMETRY/GEODESY	0.9%	0.0%	15.9%



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

12

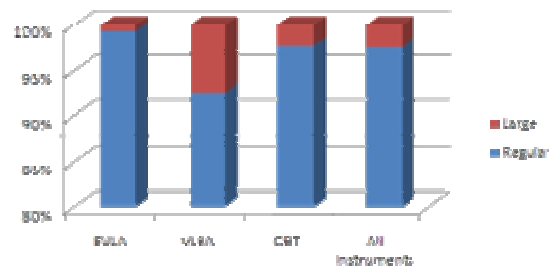
This information is obtained from the proposal coversheet which includes scientific categories. The proposals tend to include one to three scientific categories per project. The metrics are created by splitting time (minutes) evenly over the categories listed on the proposal coversheet.

Proposals Submitted during Reporting Period

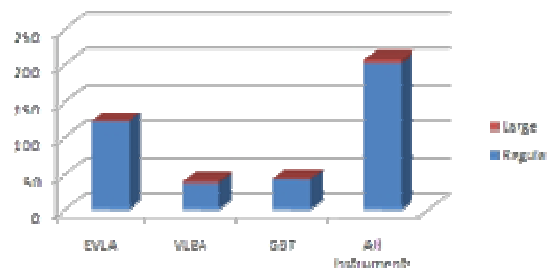
	Regular	Large	Total
EVLA	121	1	122
VLBA	38	1	41
GBT	45	1	46
All Instruments	207	3	210

Number Requesting
Student Support: 10
(9 Regular, 1 Large)
(8 GBT, 2 VLBA)

% of Proposals Submitted by Type - 108



Number of Proposals Submitted - 108



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

Top graphs are in % of large and regular proposals – y-axis zoomed in to see differences.

Bottom graphs are in counts of large and regular proposals.

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.

OSO Specific Milestones

- **Organization**
 - OSO management plan is nearing completion
 - WBS development is underway
 - OSO Head position posted internally
- **User Access & Support**
 - Helpdesk
 - Launched as a production version for EVLA, VLBA, CASA and AIPS
- **Observation Preparation**
 - The EVLA Observation Preparation Tool was released for OSRO observation preparation and commissioning tests
- **Proposal Process**
 - Initiation of the new joint system with a direct link from the new one-stop-shopping Science Web page



Provided by: P. Jewell/L. Mitchell

15

As per the POP planned milestones, the detailed definition of site-specific versus OSO roles, and the fully defined interfaces to other NRAO divisions, including the telescope sites has been completed in Q2. The **OSO management plan** is nearing completion and the **WBS development** is underway. In addition, the **OSO Head position** has been posted internally. Everything is on track to deliver a full Implementation Plan in Q3, which will include the proposed OSO organization, responsibilities, personnel and costs. OSO will be implemented in Q1 FY 2011.

Launched NRAO **helpdesk** in February 2010 with the following departments active: General, Observation Preparation (EVLA), Observation Preparation (VLBA), Archive Access, Data Processing (AIPS), Data Processing (CASA), ALMA/NAASC. Proposal Submission (EVLA/GBT/VLBA) was added in March 2010. Work on how to integrate the NRAO helpdesk with that planned for ALMA is ongoing.

EVLA observations are prepared using the **Observation Preparation Tool (OPT)**. Testing of the OPT for OSRO observations took place during Q1, and its first public release took place in Q2 in preparation for Early Science observations. All users of the EVLA are now using the OPT to prepare their observations.

The Proposal Submission Tool was integrated into the **science web** pages.

Agenda

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



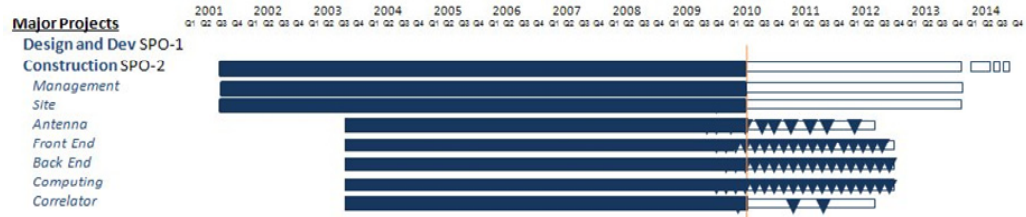
Atacama Large Millimeter/submillimeter Array (ALMA)

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

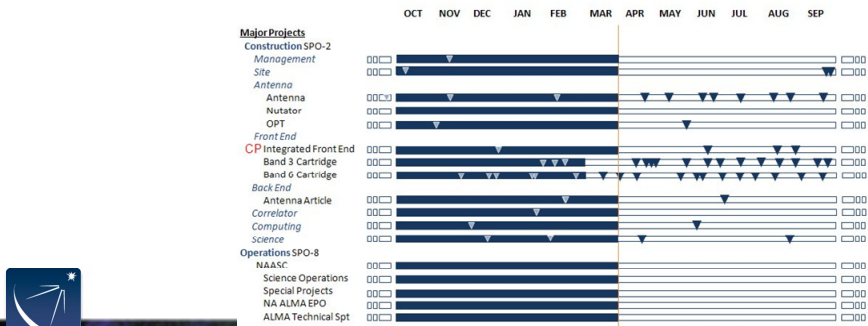


ALMA Construction Project Schedule View

PROJECT/PROGRAM OVERVIEW



Program Plan FY2010

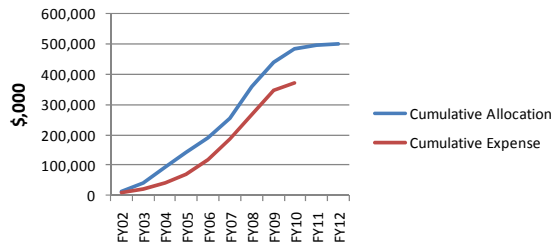


Provided by: M. Pilleux/M. McKinnon/A. Russell

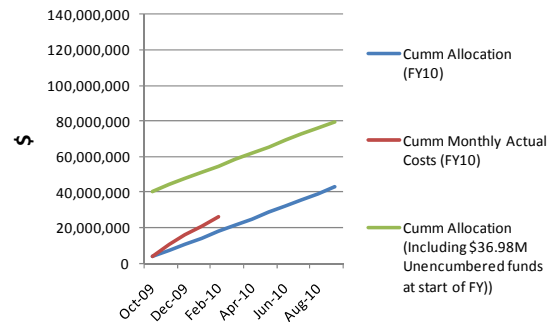
The first graph illustrates the full lifecycle. The second graph is this fiscal year view. The vertical line represents where we are today. The CP represents the critical path.

ALMA Construction Financial Performance Graphs – overall & Q2 FY2010

Overall Expenditure for the ALMA
Construction Project



Overall Spending for the
ALMA Construction Project



FY10 Spending for the ALMA
Construction Project



Provided by: M. Pilleux/M. McKinnon/A. Russell

19

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**

- New NA ALMA Project Manager: Mark McKinnon
- Front End IPT reorganized
- Implementation of Cost-to-Complete exercise
 - Completed assessment of costs remaining in all areas
- Three schedule reviews held [Q2, Q3, Q4]
 - The project reference schedule was updated in advance of the ALMA Board meeting in early April

- **Site**

- Execute the contracts for construction of the AOS power and fiber optic network
 - Contract execution ongoing
 - Contractor has performance issues that are being addressed
- Execute the contracts for AOS road construction
 - On schedule for Q4
 - Descope option for road surfacing being considered; may be added to present road contract



Provided by: M. Pilleux/M. McKinnon/A. Russell

20

Management: **Adrian Russell is leaving the project** to become the Director of Programmes for the European Southern Observatory (ESO) in Garching, Germany on 1 July 2010. Until that time, he remains as ALMA NA Project Director. **Mark McKinnon is the new ALMA NA Project Manager** as of 15 March 2010. The organization of the NA Front End (FE) IPT transitioned after the FE Critical Design Review (CDR) in February 2010, primarily as a reflection of the ALMA project's evolution from design and development engineering to recurring manufacturing operations. The **Cost-to-Complete** exercise resulted in a complete assessment of costs remaining in all areas. Following this exercise, a series of parametric cuts were initiated to restore the contingency to an acceptable level.

Site: The **AOS Roads and Utilities Contracts** are under way. The complete AOS roads and utilities work is expected to require a total contingency release of ~\$5 M. Delivery of the **electrical transformers** is complete. The delivery of **switchgear** is ongoing and will be completed on schedule during FY2010. Power and fiber optics (FO) were delivered to 22 **antenna stations** in the **ACA**, and two antennas were installed there during Q2 FY2010. This contract is 13% complete. **AOS road construction** is ongoing and is 55% complete. The **road surfacing work** will be added as a Change Order to the Road Construction Contract to be able to accrue savings due to competitive prices and the fact that the contractor has already mobilized. The current budget considers obtaining the road aggregate within the ALMA concession. The contract for the road aggregate was awarded to the same company that is building the OSF to AOS roads for the European executive.

ALMA Construction Specific Milestones

- **Antenna**

- Obtain acceptance for nutator unit #1
 - Nutator acceptance has been pushed out due to design efforts to get the servo system to perform within specification
 - If servo system implementation succeeds in Q3, acceptance may be achievable in Q4
- Deliver 4 nutator units to the OSF
 - Unlikely due to changes in design and implementation of the control system
- Delivery 3 optical pointing telescopes (OPTs) to the OSF
 - Issues with CCD camera of 1st production OPT delivered in Q4 FY09
 - OPT unit #2 remains in the US for further testing
 - Root problem with OPT design appears to be related to movement of objective lens within the lens housing. A custom lens housing is being designed and fabricated
- Obtain acceptance of 12 Vertex antennas
 - 5th Vertex antenna accepted by ALMA in Q2
 - Delay in acceptance of 6th antenna resulted from diagnosis and correction of software bug in metrology subsystem. Revision and testing of software update completed
 - Acceptance of the 6th Vertex antenna is expected in April, 7th antenna in May, 9th antenna in June



Provided by: M. Pilleux/M. McKinnon/A. Russell

21

Antenna: **Nutator unit #1 acceptance planned for Q1 FY2010 has been significantly delayed.** As a result, a change in responsibility for design and implementation of the servo control system has been implemented. The engineering team at ASIAA led by Dr. Ming-Tang Chen has been augmented with the addition of John Ford, Green Bank Electronics Division Head. John has a great deal of experience in servo control systems and has finalized the servo design for the nutator. He is assisting ASIAA in the implementation. To date, significant progress has been made in identifying and resolving fundamental problems with the mechanical system stiffness and natural frequencies. The new expected acceptance date is Q4 FY2010. The **delivery of 4 nutator units to the OSF in FY 2010 is unlikely** due to the substantial change in design and implementation of the control system. An update to the delivery schedule will be available once the major servo system design issues have been solved and verified.

The first production **optical pointing telescope (OPT) was delivered** in August 2009 and successfully integrated into the ALMA software. Additional testing has shown the centroid position on the CCD camera is sensitive to temperature gradients. Unit #2 has remained at the contractor's facility in Tucson, AZ for further testing. The root cause of this temperature dependency appears to be the mounting of the objective lens in its mechanical housing. Lens housings from two manufacturers have been tested and found to have similar magnitudes of movement in the direction of gravity, and both lenses were found to have a very small amount of movement when mounted in their mechanical housings. A custom lens housing is being fabricated by Nu-Tech Precision Optical. In addition, a software issue has arisen at the OSF and a debugging effort is ongoing to isolate the source of the problems. It is not certain whether the problem is a networking/address conflict in the ALMA network, a true problem in the OPT software, or something else not yet identified.

The **fifth Vertex antenna was accepted** into ALMA in Q2 FY2010. The planned acceptance rate of 3 antennas per quarter was not achieved in Q2 due to a software **problem discovered in the antenna control system**. This software bug has been fixed and revised software has been installed on the antenna undergoing acceptance testing. The pointing acceptance testing restarted on 31 March and should be completed in the scheduled 2 week time frame. With this software fix, the acceptance rate of 3 antennas per quarter is achievable in FY2010. It is expected that 8 rather than 12 Vertex antennas will be accepted in FY2010.

ALMA Construction Specific Milestones

- **Front End**

- Reorganization of NA FE IPT management
 - FE IPT Leader (technical): Skip Thacker
 - FE IPT Project Manager (programmatic): Bill Randolph
 - Deputy FE IPT Leader: Kamaljeet Saini
 - FE Local Oscillator (LO) production group lead: Eric Bryerton
 - FE Components group lead: Stefan Michalski
 - FEIC Leader: Dr. Charles Cunningham
- Complete critical design review of FE assembly
 - Held Feb 16-18 and passed in Q2
- Deliver 5 integrated NA FE [Q1, Q2, Q3, Q4]
 - One integrated NA FE under test; delivery scheduled for Q3
- Delivered 48 LO Warm Cartridge Assemblies (WCAs) in Q2
- A total of 26 Band 3 cartridges have been delivered
 - FY2010 goal was to deliver 24 Band 3 cartridges
- A total of 15 Band 6 cartridges have been delivered
 - Goal for all of FY2010 was to deliver 24 Band 6 cartridges. On schedule
- A total of 26 production FE support structures have been shipped from NA
 - Goal for Q2 was to deliver 25 production FE support structures
- Place orders for all remaining FE purchases [Q1]
 - Delayed for technical and contractual issues
 - Will be completed early in Q3
- Commissioning of second test station [Q3]
 - On schedule



Provided by: M. Pilleux/M. McKinnon/A. Russell

Front End: The **organization of the NA FE IPT** transitioned after the FE CDR in February 2010, primarily as a reflection of the ALMA project's evolution from design and development engineering to recurring manufacturing operations. **FE IPT leadership** transferred from John Webber to Skip Thacker and Bill Randolph. **Skip is the FE IPT Leader** responsible for technical leadership, while **Bill is the FE IPT Project Manager** responsible for programmatic leadership. John will continue in his NRAO roles as Director of the Central Development Laboratory (CDL) and ALMA NA Correlator IPT Leader. **Kamaljeet Saini is now the Deputy FE IPT Leader**, concentrating on intra- and inter-IPT systems integration. Eric Bryerton assumed responsibility for the **FE Local Oscillator (LO) production group**, formerly headed by Skip. Eric will be responsible for the timely delivery of warm cartridge assemblies and cold multipliers to the three ALMA FE Integration Centers (FEICs). Furthermore, the **FE components** are no longer a responsibility of the FEIC team and has become a separate team led by Stefan Michalski. The team will have priority access to all necessary staff in order to expedite delivery of FE components. **Dr. Charles Cunningham** from the Herzberg Institute of Astrophysics (HIA) has agreed to take over as the **FEIC Leader** with the previous lead transitioning into a technical support role. The **FE CDR was held and passed** 16-18 February 2010.

One integrated NA FE underwent testing, with delivery scheduled in April 2010. Risk: Anticipated delivery of 4 integrated NA FE expected by close of FY 2010. Mitigation: The fifth FE should be delivered in early 2011. The delivery rate of FEs thereafter should be faster than what it is now since the second FE test set will be in full operation by Q3 2010.

FE LO and test source production (which compete for resources) are critical and are just keeping up with project needs. **48 LO Warm Cartridge Assemblies** were delivered in Q2. **Band 6 production** resumed testing after determining that the cross-polarization measurements are not completely understood but that the project can accept the present performance level. A total of **15 Band 6 cartridges** have been delivered. A total of **26 Band 3 cartridges** have been delivered. A total of **26 production FE support structures** have been shipped from North America, 20 in February and 6 in March. The **second FE test station** made good progress toward scheduled commissioning in Q3. Some **remaining FE purchases** were delayed because of technical issues and all are expected to be completed early in Q3. In those cases for which delay in FE assembly delivery would have occurred, further interim orders were placed while technical and contractual issues were resolved.

ALMA Construction Specific Milestones

- **Back End**
 - Deliver to OSF antenna articles
 - Antenna Articles (AA) 11-20 delivered in early Q2
 - AA 21-38 remain on schedule for FY10, with shipment of AA21-30 at the end of Q3
 - AA 31-38 expected to ship at end of Q3
 - Populate the final quadrant of the Correlator [Q2]
 - Delayed component delivery has pushed shipment to late Q3
 - Does not impact Correlator requirements.
 - Complete Central LO Article & LO Photonic Article Critical Design Review
 - Review held successfully in Charlottesville, VA in Q2



Provided by: M. Pilleux/M. McKinnon/A. Russell

23

Back End: **Antenna Articles (AAs)** have been integrated in North America according to schedule but held up in order to increase batch size of shipments to the OSF due to limited warehouse space. Prior to the scheduled December shipment of AAs 12-20, the need for a firmware revision in some of the equipment was discovered. The revision was successfully implemented and shipment occurred in late January 2010. Future shipments will be further batched into groups of 10 with an expected ship date of June 2010 for AAs 21-30.

Data Receiver Articles (DRXAs) were already delivered according to schedule for the first 3 quadrants of the Correlator. However, additional printed circuit boards (PCBs), which constitute nearly the entire article, are required to fully outfit the 4th Quadrant. Some of the PCB components are delayed, which in turn delay the PCB fabrication and work on the article. This has pushed the delivery of the DRXAs into Q3. The delay is not expected to cause any problems for the Correlator.

The **Critical Design Review for the CLOA (Central LO Article) and LPRA (LO Photonic Receiver Article)** was held on 9-10 March 2010 and successfully concluded with some action items being followed until resolution.

ALMA Construction Specific Milestones

- **Correlator**
 - Complete assembly of the fourth quadrant and begin integrated testing [Q2]
 - Completed March 15, on schedule
 - Third quadrant ready and approved for shipping on March 18 ahead of schedule
- **Science IPT**
 - Achieve closure phase at the Array Operation Site (AOS) [Q2]
 - closure phase at the AOS was achieved in Q1 FY2010 and reported in the last report
 - ALMA Science Commissioning started 22 January 2010



Provided by: M. Pilleux/M. McKinnon/A. Russell

24

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 passed PAI and disassembly for shipping began.

Computing: Preparation of ALMA Software **version R7.1** proceeded as planned. The code-freeze date of March 31 was achieved. **CASA** is preparing a patch on the previous 3.0 release which will be released to the community in April.

Science: **ALMA Commissioning started** 22 January 2010. The highlights so far are: (a) Schedule Blocks (SBs) produced by Observing Tool drive observation sets (these sets, written to ALMA Science Data Model (ASDM) files, include amplitude, pointing, phase calibrators as well as 'science' targets); ASDMs are then imported into CASA for study of, e.g., amplitude and phase behavior, visibilities; SBs drive astronomical holography and are used to verify antenna performance under AOS conditions and a range of elevations; SBs drive automated tuning over complete band ranges to verify receiver tuning and (b) water vapor radiometry is applied to data through a complex gain correction table, applied in CASA, to demonstrate improved phases.

ALMA Construction (SPO-2) Significant Events

- **Japan Partnership (SPO-7)**

- Antenna Articles 12-19 were delivered in early Q2
- LO Photonic Receiver Articles 17-24 on schedule for delivery in Q3
- Subarray Switches and Line Length Correctors for Central LO Article
 - 8 final units are in final integration and test; shipment planned for Q3
- Band 3 OMTs 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
- Development of an LO driver/frequency multiplier combination for Band 10
 - Prototype Band 10 multipliers were tested
 - Prototype Band 10 LO driver (WCA) delivered
 - New Design MMIC power amplifier chips are underdevelopment
- Frequency multipliers and WCA LO drivers of revised design
 - 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/A. Russell

25

Japan Partnership (SPO-7) 1: **Antenna Articles 12-19** were integrated and delivered in early Q2. NRAO is currently receiving **LO Photonic Receiver Articles** for test and delivery to the Front End Integration Centers. **Subarray Switches (SAS) and Line Length Correctors (LLC) for Central LO Article** units 1-16 support the Central LO Article #1 (CLOA1) at the AOS, which already has 8 each of the units, but requires an additional 8 each for full functionality. Shipment of SAS 17-24 are expected in Q3 FY2010. Frequency multipliers and WCA LO drivers were **delivered to cold cartridge manufacturers** for use with all bands. **Development of an LO driver/frequency multiplier combination for Band 10** continued and a prototype delivered. A new design power amplifier chip for Band 10 is scheduled for fabrication in Q4. **Frequency multipliers and WCA LO drivers** were delivered to cold cartridge manufacturers for use with all bands. The long-standing **issues of LO power vs. LO noise for Bands 4 and 8** were satisfactorily resolved with the new design multipliers. 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 **fourth EA FEIC FE** assembly were delivered.

Office of Chilean Affairs (OCA) Significant Events

- **Staffing**

- Expatriates are supported by the OCA
 - Two new expats arrived, one left, for a total of 23
 - Expat Support Assistant hired as employee to formalize support of NRAO expats
- ALMA local staff
 - 5 new hires, for a total of 196 (172 JAO – 24 AUI/NRAO)
 - Review of AUI's local employment of local staff was going to be reviewed, but earthquake postponed the activity to date TBD

- **Activities**

- Negotiations with the Union
 - Union rejected final proposal of the employer following a non-regulated mechanism
 - Process will resume most likely as a regulated process in April
- Purchase Orders processed
 - 120 - \$941k for NA ALMA Construction
 - 194 - \$869k for ALMA Operations (JAO)

- **Significant events**

- Earthquake hit central Chile on 27 February followed by a strong tsunami
 - No employees or immediate family were injured. Some employees suffered major material losses.
 - ALMA suffered no damage
 - Operations at the site were frozen for nearly a week to allow employees to reunite with their families and to wait for airports to reopen
 - Relief fund to help employees and their families was created
 - Counseling was provided to employees



Provided by: E. Hardy/M. Pilleux/C. Lonsdale

26

Office of Chilean Affairs (OCA): **Two new expatriates arrived** and one left, increasing the total number to 23. OCA has reviewed and signed a total of **5 new ALMA Local Staff contracts**, designated as the sole employer of local staff for ALMA in Chile, bringing the total number of employees for which OCA provides ALMA with legal, payroll and travel support to **196 local staff**. It had been 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 scheduled for the first week of March 2010, but the earthquake in central Chile on February 27 mandated postponing this event to a date yet to be determined.

OCA led the **union negotiations** that ended with the union not accepting the final offer. This round of negotiations was performed in a non-regulated way, i.e. not subjecting the process to the more stringent regulated legal mechanism. It is expected that the **negotiation process will most likely resume** as a regulated process in April 2010. 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.

At 3:30 am on 27 February 2010, the **fifth largest earthquake ever recorded** in the world hit the central section of Chile, followed by a strong tsunami. The ensuing damage was extensive and substantial loss of human life took place, especially near the coast. This event is arguably the worst natural disaster to ever take place in Chile. Fortunately, **no ALMA employees or their immediate families were injured** or lost to the earthquake, although some employees suffered major material losses. The ALMA site, located much further north, was not affected. Santiago was severely shaken, but **no serious damage to the ALMA offices** was recorded. Non-vital **activities at the site were frozen** for nearly a week, and employees were allowed to travel home and be reunited with their families. A relief fund to help employees and their families was created, and counseling was provided in order to help them overcome the psychological impact of this violent event.

ALMA Science Operations (SPO-8) Significant Events

- **Science Operations**

- First 4 archive nodes for the NA ALMA Mirror Archive ordered and shipped
- Proposal to NSF for FY 2012-15 ALMA Operations submitted
- Interviews completed for 3 scientist positions and 2 postdoc positions
- User Tests for the Pipeline, the Observing Tool and the Project Tracker
- Simulation workshop held to plan a simulation database
- An access protocol client developed for Splatalogue, and offline versions of Splatalogue for use with CASA and the OT
- The NRAO Helpdesk was deployed with an ALMA department. A visit was made to Garching for Helpdesk and User Portal discussions
- Planned a special session at the May AAS and scheduled the 5th NAASC workshop for January 2011 in Victoria, BC



Provided by: J. Hibbard/C. Lonsdale

27

Installation of the Mirror Archive began with the **ordering and shipping of the first 4 NGAS (Next Generation Archive System) nodes**, refurbishing of offices for archive personnel, completion of an upgrade to the cooling system and hiring of the first 2 archive technicians.

The **new proposal to NSF was submitted**, for the continuation of ALMA operations in the FY2012-2015 period. Effort continued on the update to the ALMA Operations Plan, led by the JAO, in preparation for presentation to the ALMA Board in April. **Interviews were completed for 3 scientist positions and 2 postdoc positions.** Offers were made for the postdoc positions and one of the scientist positions.

Development and testing of user software included finalization of the technical review forms for the proposal process and OT testing, integration of Splatalogue into CASA, import of ATCA and CARMA data in CASA, and improvements to the CASA viewer, gaussian fitting user interface, and single dish tasks. **User Test 6 for the Pipeline, User Test 7 for the OT and User Test 1 for the Project Tracker occurred. A simulation workshop was held**, with attendance by colleagues from Garching, Oxford and Japan, to plan a simulation database and an on-line time estimator. A simulation use case guide was incorporated into the casaguides tutorial wiki. NAASC staff on turno at the OSF participated in several CSV activities, including phase stability, sun-moon scans, astro-holography and correlator-mode verification. **An access protocol client was developed for Splatalogue**, and offline versions of Splatalogue were generated for use with CASA and the OT. **The NRAO Helpdesk was deployed with an ALMA department.** A visit was made to Garching to further progress on the joint ALMA Helpdesk and User Portal deployment. Materials and a Splatalogue “infomercial” were developed for the January AAS meeting, **a special session was planned at the May AAS, and the 5th NAASC workshop was scheduled for January 2011** in Victoria, BC. Assisted with planning the NRAO Synthesis Imaging Workshop.

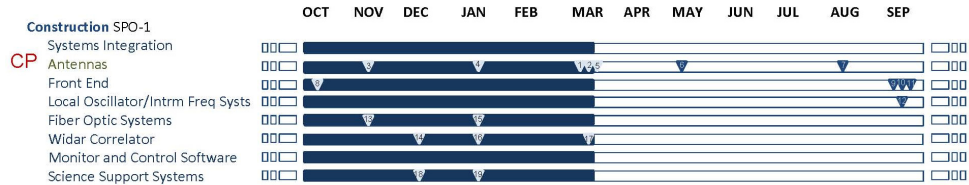
Agenda

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

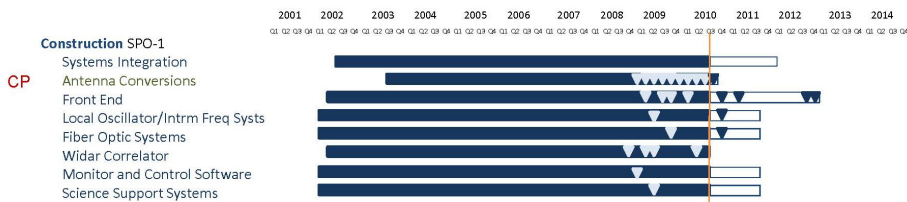


EVLA (SPO I) Complete Project Schedule View

Expanded Very Large Array (EVLA) FY 2010



Expanded Very Large Array (EVLA) PROJECT/PROGRAM OVERVIEW



Provided by: M. McKinnon/B. Dickman

29

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.

NOTES:

Fabrication of X-band (8-12 GHz) feed horns completed in February [1]

Fabrication of S-band (2-4 GHz) feed horns completed in March [2]

25th antenna converted ahead of schedule in Q1 FY10 [4]

26th antenna converted in Q2 FY10 [5]

Antenna conversions to EVLA design on track for completion by Q4 FY10 [6,7]

Production and installation of EVLA K- (18-22 GHz) and Q-band (40-50 GHz) receivers are on track for completion by September [9,11]

Installation of last two (27 & 28) Ka-band (26-40 GHz) receivers will likely extend into Q1 2012 [10]

Assembly of all local oscillator and intermediate frequency (LO/IF) modules is on track for completion by Q4 FY10 [12]

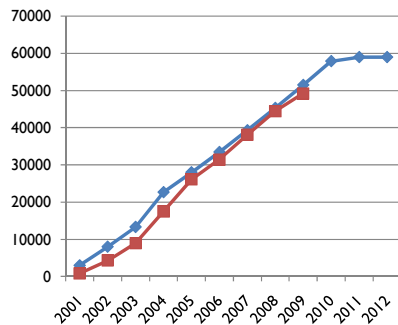
Deformatters were relocated to the WIDAR correlator during the correlator swap in early January 2010 [15]

VLA correlator was shut down on January 11, as scheduled [16]

Delivery of remaining 44 baseline boards to be complete in April [17]

Observation Preparation Tool (OPT) was released to observers for use in the EVLA's OSRO program on January 15 [19]

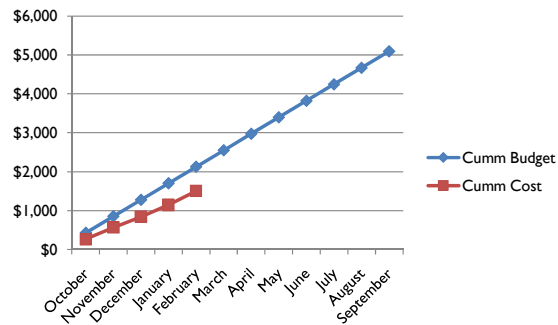
EVLA Construction Financial Performance Graphs – overall & Q2



FY10 Budget/costs for EVLA Project



Overall Spending for the EVLA Project



Provided by: M. McKinnon/B. Dickman

30

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 February 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.

EVLA Construction Specific Milestones

- **Systems Integration**

- Antenna conversions to EVLA design on track for completion by Q4 FY10
 - 26th antenna converted in Q2 FY10
 - 25th antenna converted ahead of schedule in Q1 FY10
 - Critical path will shift to front end after antenna conversions are complete

- **Antenna**

- Mechanical overhauls completed for 26th and 27th EVLA antennas
- Fabrication of X-band (8-12 GHz) feed horns completed in February
- Fabrication of S-band (2-4 GHz) feed horns completed in March

- **Front End**

- Production and installation of EVLA K- (18-22 GHz) and Q-band (40-50 GHz) receivers are on track for completion by September
- Installation of last two (27 & 28) Ka-band (26-40 GHz) receivers will likely extend into Q1 2012
- Production and installation of other EVLA receivers continues.



Provided by: M. McKinnon/B. Dickman

31

Systems Integration: The antenna conversions to EVLA design continue to be on track for completion by Q4, FY10. The 26th antenna was converted in Q2.

Antenna: The fabrication of S-band feed horn has outpaced receiver production. The fabrication of the X-band horns was completed before receiver production began.

Front End: The time required to select the OMT design for the X-band receiver delayed its deployment start date to August 2010. However, the production and installation of the receivers are still scheduled for completion in December 2010. Other EVLA receivers include L- (1-2 GHz), S- (2-4 GHz), and C-bands (4-8 GHz). Impact of 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.

EVLA Construction Specific Milestones

- **Fiber Optic**

- Deployment of 3-bit, 4Gbps sampler delayed due to longer than anticipated delivery of FPGAs
 - Routine installation in antennas to start in December 2010
 - Deployment may be accelerated to completion on schedule (May 2011) by adding staff to module assembly effort (currently under study)

- **WIDAR Correlator**

- Deformatters were relocated to the WIDAR correlator during the correlator swap in early January 2010
- All circuit boards for the new WIDAR correlator will be fabricated in FY 2010, delivered to the EVLA site, and installed in the correlator racks [Q2]
 - Delivery of remaining 44 baseline boards to be complete in April
 - 44 boards are not needed for early science observations
- VLA correlator was shut down on January 11, as scheduled
 - Hardware modifications to enable correlator swap completed January 15
 - General user observations with WIDAR resumed on March 2, ahead of schedule



Provided by: M. McKinnon/B. Dickman

32

Fiber Optic: The late deployment of the 3-bit, 4Gbps samplers has delayed the availability of 8GHz observing capability, but it does not delay the overall completion of the EVLA project. (FPGA = floating point gate array. Used to build the de-multiplexer for the sampler module.)

LO/IF: Assembly of all local oscillator and intermediate frequency (LO/IF) modules is on track for completion by Q4 FY10. EVLA LO racks were relocated in the control building as part of the VLA/EVLA correlator swap. There were no Q2 milestones in this area.

Correlator: A sufficient number of baseline boards are on hand for the WIDAR OSRO observations that will begin in Q2. Remaining baseline boards will be delivered in April with no risk to overall schedule.

Monitor and Control: There were no Q2 milestones; however, integration of the WIDAR correlator with the EVLA M&C System continues.

EVLA Construction Specific Milestones

- **Science Support Systems**

- Observation Preparation Tool (OPT) was released to observers for use in the EVLA's OSRO program on January 15



Science: The Observation Preparation Tool (OPT) was released to observers for use in the EVLA's OSRO program on January 15th per the plan.

EVLA Science Operations Significant Events

- **EVLA Data Access**

- Access to EVLA data was incorporated into the Archive Access Tool, Q1; improvements in access speed to the archive were achieved by installing a new server in Q2
- The link from the DSOC to the outside world was increased from 20 Mbps to 200 Mbps in Q1, and further increased to 1 Gbps in Q2

- **Shared Risk Observing**

- The first science observations with the new EVLA correlator took place on March 2, 2010, through the Open Shared Risk Observing (OSRO) program
- The Resident Shared Risk Observing (RSRO) program began in January 2010 with the participation of the first resident in EVLA commissioning; by the end of March there were 6 visitors in residence; RSRO observations will begin in April 2010



Provided by: C. Chandler/B. Dickman

34

EVLA Data Access: EVLA datasets are expected to be up to three orders of magnitude larger than any ever produced by the VLA by the time the EVLA construction project is complete. In order to provide access to these data for the user community requires modifications to the VLA archiving system and increased bandwidth for data downloads. The Archive Access Tool (AAT) was modified during 2010 Q1 to provide access to EVLA data as well as VLA data, and also to include some amount of pre-processing of the data to reduce dataset sizes by averaging in time and frequency. Access speeds were further improved in 2010 Q2 by installing a new archive server. The link to the outside world from the Domenici Science Operations Center was increased in speed from 20 Mbps to 200 Mbps during Q1, and was further increased to 1 Gbps in March 2010.

Shared Risk Observing: Access to the EVLA Early Science is provided by two shared risk observing programs for the user community, the Open Shared Risk Observing (OSRO) program and the Resident Shared Risk Observing (RSRO) program, and one for EVLA Commissioning Staff Observing (ECSO). These programs were advertised to the community for the October 1, 2009, proposal deadline, and the response to all programs was excellent. Following the shutdown of the VLA correlator on January 11, 2010, hardware was transferred to the new EVLA correlator. The first astronomical observation with all available stations connected to the EVLA correlator took place on March 2, 2010, through the OSRO program. Subsequently the fraction of time being used for astronomical observations rather than system integration is steadily increasing with time. Initial observations have focused on OSRO projects, but it is expected that RSRO and ECSO projects, which have access to wider bandwidths in the correlator, will begin to be observed in April 2010. By the end of Q2 there were six visiting scientists in residence contributing to EVLA commissioning through the RSRO program. It is expected that the level of participation in this program will remain at approximately 6 or 7 visitors in Socorro at any one time for the next two years.

EVLA Science Operations Significant Events

- **Observation Preparation**
 - The EVLA Observation Preparation Tool was released for OSRO observation preparation and commissioning tests
- **EVLA Commissioning and Science Verification (ECSV)**
 - Most of the observing modes needed for OSRO were tested and verified during Q2, with the exception of being able to switch between correlator modes within an observation, and the ability to use the narrowest bandwidths of the correlator. These continue under development. ECSV for OSRO observing will continue into Q3



Provided by: C. Chandler/B. Dickman

35

Observation Preparation: EVLA observations are prepared using the Observation Preparation Tool (OPT). Testing of the OPT for OSRO observations took place during Q1, and its first public release took place in Q2 in preparation for Early Science observations. All users of the EVLA are now using the OPT to prepare their observations.

EVLA Commissioning and Science Verification: The commissioning effort following the shutdown of the VLA correlator has focused on system integration of the new EVLA correlator, and bringing up the observing modes needed for OSRO observations. Most of the observing modes needed for OSRO were tested and verified during Q2. Two exceptions were (1) being able to switch between correlator set-ups within an observation, and (2) the ability to use the narrowest bandwidths of the correlator. This has not limited the science output so far, since there are many projects that can run that do not need these capabilities. Commissioning and science verification of these modes will continue into Q3, along with the commissioning of the wider bandwidths needed for RSRO and ECSO projects.

(E)VLA Operations: Significant Events

- **ARRA Funds use in process**
 - Purchase Track repair materials
 - Purchase Tamper and Tie Puller and Spiker
 - Repair VSQ Sprinkler System: Have requested that NSF allow use of this funding to retire VSQ's from residence hall usage
 - Purchase Azimuth Bearings
 - Purchase Transformer and spare dry-type Transformers
 - Purchase buses
- **Engineering Services**
 - Replace Az. Gear boxes on antennas #6 and #7 [Q4]
 - Reconfiguration into C-array and B-array [Q3, Q4]
- **Computer Infrastructure**
 - Upgrade VLA-DSOC link to 1 Gbit/sec [Q1] - complete



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. Awaiting NSF approval for VSQ demolition.

Management, Hardware, Software, Telescope Operations, and Facilities – no significant events to report, mostly because these items are covered in EVLA.

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. The reconfiguration into C-Array has been moved to Q3 from Q2. The reconfiguration to B-array remains planned for Q4. RISK: none; no impact on EVLA schedule. Program decision to move 4-6 weeks out to facilitate OSRO and RSRO program activity.

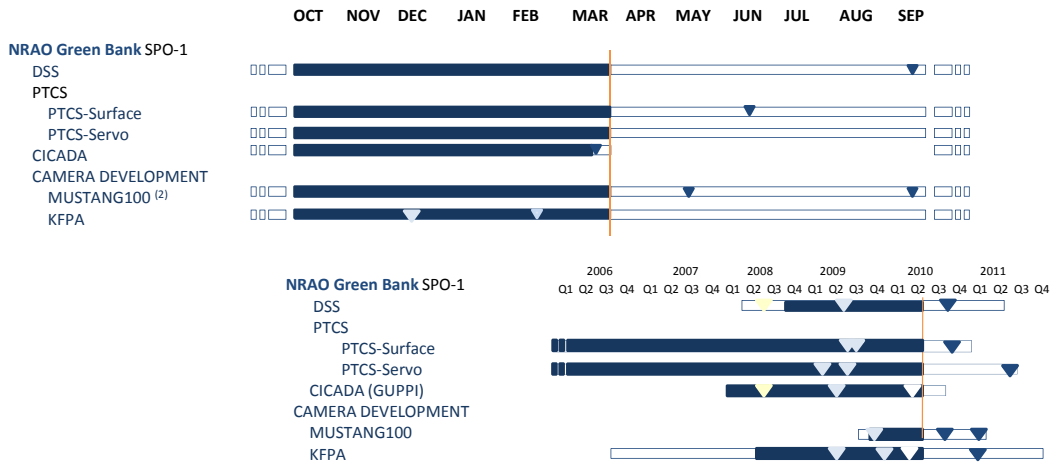
Computer Infrastructure: NRAO internal work has been completed for this milestone. However, New Mexico Tech was having trouble providing promised connectivity to Internet 2 at full 1 Gbps bandwidth. This problem was resolved in April 2010.

Agenda

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



Green Bank Telescope Development Specific Milestones



NOTES: 1) These development activities are unrelated, therefore there is no critical path identified.
2) MUSTANG64 was completed in FY09

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

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.

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 will be met in Q3FY10.

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.

CICADA (GUPPI): The planned initial release of the GUPPI de-dispersion modes has been delayed into Q3FY10 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 and scheduling will flag projects as necessary.

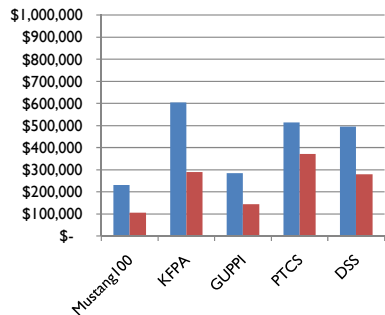
Camera Development:

MUSTANG100: For FY10 we have established the MUSTANG100 project to track the potential upgrade to a 100-pixel array in the existing MUSTANG receiver. A replacement is hoped for Q3FY10, but the schedule is in NIST, not NRAO control (NIST is donating the array).

KFPA: Engineering tests will complete in Q2FY10, Commissioning in Q1FY11.

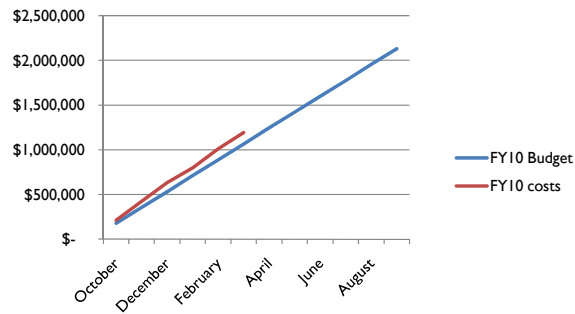
Note: In the Program Operating Plan, the milestones #7 and #8 were reversed. Mustang 64 was released for general use in Q1FY10; KFPA commissioning begins in Q2FY10.

GBT Overall Development Financial Performance Graphs



FY 2010 Spending for the GBT Development Projects

FY2010 Spending for GBT Development



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

Expenses are tracking the budget very closely for most Green Bank Development projects. The **DSS** project is over budget by 6% due to additional contract labor added to keep the project on schedule while key vacant positions were in recruitment. **PTCS** is 22% over budget due to 1) added scope for the Auto-OOF software that was developed by non-PTCS software staff, 2) overlap of scientists as Todd completes the surface work, transitioning off to ALMA slower than projected, 3) the unbudgeted extensive use of two technicians to build multiple prototype motor interface cards for the PTCS servo project. These overages account for the nearly 12% difference (\$126,000) between the Green Bank overall development budget and expenditures at the close of Q2FY10.

Green Bank Telescope Development Specific Milestones

- **Dynamic Scheduling System (DSS)**

- Release of the first version of the new dynamic scheduling system
 - Improved scheduling of 'windowed' observations
- Updates to the scheduler tools
- Added information and documentation to observer's interface
- New tool to better manage DSS software development process

- **PTCS**

- New Zernike model extends MUSTANG efficiency to >850 elevation
- New AutoOOF user interface improvements promote daytime W-Band observing
- Project Note describing wind effects on GBT released demonstrating that Quadrant Detector can be used to correct long-timescale pointing errors
- Digital servo deployment delayed until Q2FY11 due to diversion of resources



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

40

DSS: A number of improvements were made to the DSS this quarter for both observers and staff. The scheduling algorithm is now scheduling windowed observations reliably; easing the need to manually manipulate the daily schedule. The scheduler's tools are continually improving in both functionality and ease of use. The observers' user interface has also been updated to include more information and documentation. Also this quarter we begin using Pivotal Tracker for project management, which has greatly improved our management process.

PTCS:

Surface: Continued improvement in Q2 in the high-frequency performance of the GBT. New MUSTANG out-of-focus (OOF) holography data led to a new improved Zernike model. The efficiency at 90 GHz now remains good up to elevations of (at least) 85 degrees. These data also indicate that the elevation dependence of the surface deformation has remained stable over 5 years. Improvements to the AutoOOF user interface (which promotes daytime high-frequency observations) were installed and tested this quarter using non-PTCS software developers. A successful proof-of-concept for spectral-line OOF holography (using 43 GHz vibrationally-excited SiO Masers) may enable future daytime observations with a W-band receiver.

Pointing: A project note written by UVa grad student Paul Ries describes displacement of the feedarm by the force of wind. These results demonstrate that the quadrant detector can be used to correct longer timescale pointing shifts due to steady wind, in addition to periodic errors due to structural vibrations or rapidly varying winds.

Servo: Sub-components of the **servo** system were received and added into the integration test facility in the servo lab. 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

- **CICADA/GUPPI**

- Initial de-dispersion mode development is completing (~1 month delayed)
- Ongoing integration of GUPPI into GBT systems for astronomer use

- **Camera Development**

- **Bolometer Arrays**

- MUSTANG64 in general use for observers
- MUSTANG100 replacement array fabrication underway at NIST
- **MUSTANG2 Proposal drafted for MRI proposal call**

- **KFPA**

- 7-pixel 18-26 GHz array engineering tests and commissioning concluding
- First “two-pixel” prototype data pipeline used to create images from KFPA commissioning data



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

41

CICADA (GUPPI): The resumed work is proceeding according to the revised schedule and the testing and integration of the de-dispersion modes is under way. The work was halted in FY09 due to a lack of funding. When funding was restored, a revised delivery date of Q2 for coherent de-dispersion mode was published. The original date for release of the first de-dispersion mode has been delayed by approximately 1 month, resulting in a Q3 FY10 release. Further de-dispersion modes will be release in Q3 FY10 and the final ease-of-use features for the instrument will be released in Q4FY10. GUPPI is still on track for completion by end of the fiscal year. Risk: Release of de-dispersion mode is delayed by one month. 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 believes they *may* have another array in the Q3, but the timing is purely at the discretion of NIST as this is a voluntary effort on their part. A proposal for a new horn-fed array for MUSTANG (**MUSTANG2**) was drafted for submission to the NSF's MRI Proposal Call in Q3FY10

KFPA: All functioning beams were completely tested*, system temperature measured, noise calibration measured, and tested for gain and stability in the laboratory. The receiver was installed on the telescope and all functions tested. Pointing scan were completed with the DCR. Commissioning of the receiver under way and due to end in mid-April. Each beam spectrum was been characterized by the spectrometer in 50 MHz bandwidth mode and in 800 MHz mode, confirming stability and spectrum purity. A prototype pipeline was implemented and tested using two pixel K band data, and used to image the KFPA data.

*Beam 5 R is not functioning pending replacement of defective parts that did not arrive in time for substitution before GBT installation.

Green Bank Science Operations Specific Milestones

- Ka correlation receiver installed on GBT after mitigation work with stability improvements but no definitive answers as to baseline ripple issues affecting the Zpectrometer wideband spectrometer
- The replacement motor and drive system for the GBT turret motor remains on delayed schedule installation for Q3
- Planning begins for upgrades to the 20M telescope with receipt of MRI-R2 sub-award from UNC



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

42

Ka correlation receiver installed on GBT after mitigation work with stability improvements but no definitive answers as to baseline ripple issues affecting the wide spectral line observing modes. Risk: The Ka Receiver and Zpectrometer were available for limited observations in Q2FY10. Mitigation: Unfinished projects will be rescheduled through consultation with project PIs.

The **turret** motor and controller exhibited instability during lab integration tests at Green Bank. Factory engineers came to Green Bank and verified the problem. The unit was returned to the manufacturer for repair. Contingency time in the schedule can cover this rework if it lasts less than approximately one month. Risk: New motor drive proves unreliable resulting in significant GBT downtime. Mitigation: More extensive testing of the integrated drive unit when it is returned by the manufacturer.

Green Bank was notified that the University of North Carolina's expansion of its Skynet observing program, which includes the **20M telescope** at Green Bank was awarded. Planning for the work commenced in Q2FY10 and work to commission and integrate the telescope into Skynet will continue for approximately one year.

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.

Green Bank Operations Significant Events

- **ARRA Funds use**

- Elevated Water Tank – Bids received
- Building Roof Repairs – Contracted
- Fuel Efficient Service Vehicles – PO issued for purchase
- Boiler Improvements – Boiler, PTAC units contracted
- Telephone System Replacement – PBX contracted, installation bids received
- PTCS Encoders – Sample units under evaluation and lab testing
- Heat Exchangers – Specifications complete - out for bid

- **Hardware**

- Additional painters budgeted for FY11 based on Engineer's recommendation

- **Software**

- Changes to VLBI backend at GBT await final specifications from VLBI Team

- **Community Service**

- Observatory & staff recognized for support in rescue of crashed military helicopter crew



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

43

There is activity on all of the projects funded by the American Recovery and Reinvestment Act (**ARRA**). Contracts are in place for three projects and all others are in a specification or out for bid status.

The informal report from the summer 2009 structural analysis recommended increasing the percentage of the structure painted each year. As part of the FY11 budget the number of painters and material were increased to meet this recommendation. The formal report from the engineering firm is due in Q3FY10.

The Green Bank Software engineers and astronomers are working with colleagues in Socorro to implement the changes that will be needed at the GBT to accommodate the **upgraded VLBI backend** and storage systems. This project is behind schedule due to a delay in obtaining the full requirements on the system.

On February 19 a military helicopter crashed in the mountains near the Observatory during a training mission. The Green Bank facility was opened to the Army as a forward command post and Observatory staff assisted both at the observatory and in the field. Commendations to NRAO were received from both the Army and National Guard, who had crew members involved in the crash and rescue.

Agenda

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



VLBA Development Significant Events

- **Sensitivity upgrade**
 - Trial installation of DBE at Pie Town [Q2] and Los Alamos [Q2] – not met due to collaborator delays
 - Distributed FX (DiFX) correlator full operational readiness [Q2] - completed Q1
 - Full-time data reduction using DiFX correlator completed Q1
- **New Receiver Systems**
 - 33 GHz receivers will be designed, built, and installed on the VLBA using ARRA funds only if MOU w/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 [Q3]



Provided by: **W. Briskin/B. Dickman**

45

The trial installation of DBE at Pie Town and Los Alamos were not met in Q2 due to collaborator delays (Haystack). Still on track for following VLBA activities: Design and production of all DBE support hardware [Q3]; Initial electronic connections will be made to the Pie Town and Mauna Kea VLBA antennas [Q4]; Initiate the installation of DBE/Mark 5C recorder systems at all ten sites, demonstrating 2 Gbps recording capability [Q4]. The distributed FX correlator reached full operational readiness in Q2.

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 on hold pending signing of MoU between NSF, NASA and USNO
- **Partnerships**
 - As of end of Q2, NASA and USNO had not signed the Memorandum of Understanding
- **Engineering Services**
 - Mauna Kea, Brewster, Hancock, and Fort Davis VLBA stations are scheduled to receive major maintenance visits by the VLBA Tiger Team . [Q1, Q2, Q3] MK completed Q1, HN completed Q2
 - Engineering and painting visit to Saint Croix [Q3]
 - Azimuth wheel replacement at Hancock [Q2]
 - Repair azimuth track at Brewster, North Liberty and Hancock [Q4]
- **Hardware**
 - Install Security systems at HN,OV, NL, PT, BR, SC [Q3] – completed at OV, HN in Q1, PT Q2



Provided by: J. Ulvestad (Partnerships)P. Perley/W. Briskin/B. Dickman⁴⁶

Draft MoU completed and awaiting signature by NASA and USNO. Both agencies committed to the development of the MOU, but found that they did not actually have committed funding when it was time to sign. Both agencies are being “worked” informally through several channels.

Azimuth wheel replacement at Hancock required because old wheel broke January 3, 2010. An engineering and painting visit to St Croix has been delayed to Q3 with no expected impact.

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 19 new amplifiers to EVLA
 - Upgraded, repaired, and retested 10 amplifiers for the EVLA and CARMA
- **Electromagnetic Support**
 - Measured and tuned 2 orthomode transducers for the 38-50 GHz band.
 - Measured an X-band phase shifter for the EVLA project.



Provided by: S.K. Pan/J. Webber

48

Amplifier Production, Upgrade, and Repair/Maintenance: New amplifier production included **19 new amplifiers**: five 1-2 GHz, four 2-4 GHz, six 8-18 GHz, and four 26-40 GHz amplifiers. **Repair, upgrade, and retesting of amplifiers included 10 amplifiers for EVLA, GBT and VLBA**: one 1-2 GHz, one 4-8 GHz, one 12-18 GHz, two 26-36 GHz (for CARMA), one 26-40 GHz, and four 38-50 GHz amplifiers. In total, 29 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 Korean VLBI network, MPI Receiver Group, JPL DSN, and CARMA are on schedule.

Electromagnetic Support: Measured and tuned 2 **orthomode transducers** for the 38-50 GHz band. The tuning is done by varying the position of the septum in the main arm of the OMT for good input match. Measured an **X-band phase shifter** for the EVLA project to validate simulated performance. This is a new design, where the length is smaller by 0.6" compared to an earlier design.

Central Development Laboratory (CDL): Research and Development

- **Amplifier Development**

- Continue research on noise properties of heterostructure bipolar transistors (HBTs) and CMOS MOSFET
- 230-470 MHz amplifier is in the design stage

- **Electromagnetic Component Support**

- Designed power divider, circular-to-square and test transitions for the 38-50 GHz band.
- A paper titled “A Full Waveguide Band Turnstile Junction Orthomode Transducer”, was submitted for publication to IEEE Microwave and Wireless Components Letters.

- **Millimeter & Submillimeter-Wave Receiver Development (R&D only)**

- Second wafer of 700 μ m SIS mixers currently in DC testing
- London penetration depth of Nb and NbTiN films measured on-wafer
- UVML received the delivery of the hot deposition system
- 700- μ m mixer test set under construction



Provided by: S.K. Pan/J.Webber

49

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. **Design of 230-470 MHz amplifier** for EVLA P-band receiver continues; the goal is to provide significantly better noise performance at room temperature than commercial low-noise amplifiers. Experimental evaluation of ALMA band #1 and #2 amplifiers awaits the availability of technician time.

Electromagnetic Component **Support**: Completed designs of **power divider, circular-to-square transition** and test transitions for the **38-50 GHz** band. These components are developed for future wide band receivers for the GBT. This receiver will yield better performance on the EVLA in the 38-40 GHz range compared to the Ka-band receiver in the same band. A paper titled “**A Full Waveguide Band Turnstile Junction Orthomode Transducer**” was submitted for publication to IEEE Microwave and Wireless Components Letters. Wrote a section on the GBT sidelobes calculations as part of a paper titled “Stray Radiation Correction for HI Observations at the NRAO Green Bank Telescope” by A. I. Boothroyd et al. for the Astronomy and Astrophysics Journal.

Millimeter & Submillimeter-Wave Receiver Development (R&D only): After DC verification of **second 700- μ m (450 GHz) SIS wafer**, DSB mixer will be assembled and tested next quarter in new THz mixer test set. Superconducting quadrature hybrid for 700- μ m band will also be tested cold next quarter. If successful, this will be used to build balanced SIS mixer for 700- μ m band. Precise on wafer measurement of **London penetration depth of Nb and NbTiN films** using cryogenic probe station is in progress. The new **hot deposition system** is the key equipment needed for the Submillimeter-Wave SIS mixer development. It allows the deposition of superconducting films with lower RF loss than can be obtained with these materials deposited at room temperature. Construction of the test set to characterize the 700- μ m and 350- μ m (850 GHz) SIS mixers and development of software to allow for semi-automated testing continues. This work is supported in part by ALMA Operations.

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

- **Advanced Receiver Development**
 - Digital Ortho-Mode Transducers (OMTs) re-tested with improved performance and exceptional stability.
 - Four new layouts for 35nm InP MMIC LNAs submitted for fabrication
 - Studies of design concepts for a GBT W-band (68-116 GHz) focal plane array
- **Phased Array Feed (collaboration with Brigham Young University)**
 - Completed drawings for cryogenic PAF
 - GB Machine shop completed parts for:
 - Cryostat 80%
 - Dual LNA and thermal transition – 20 at 100%
 - Assembled 18 of 20 dual LNAs, 2 of 20 thermal transitions, cryogenic testing underway
 - Completed purchasing for cryostat



Provided by: S.K. Pan/J.Webber

50

Advanced Receiver Development: The first prototype 3-probe and 4-probe versions of the **Digital Ortho-Mode Transducer** (DOMT) have been tested successfully. This not only proves the concept for the 3-probe version whose feasibility was not intuitively obvious, but shows excellent initial results with better than 40 dB linear polarization isolation. Circular polarization has not yet been synthesized from the data due to an error in the phase calibration equations, which we are now in the process of tracking down. The prototype Digital Sideband-Separating Mixer (DSSM) with integrated **analog-to-digital converters** (ADC's) is complete and awaits testing.

NRAO has partnered with the Keck Institute on their proposal for these **35nm InP MMIC wafer runs** and will be receiving modest funds to support the design effort for their wafer run. This is the first of the three wafer runs planned for this year. The NRAO designs are for 68-90 GHz, 84-116 GHz, and 68-116 GHz, the possible frequency ranges for a GBT W-band focal plane array.

Continued the design concepts and performance parameters studies for a GBT W-Band (68-116 GHz) focal plane array.

Phased Array Feed: Drawings were completed for the Dewar; Green Bank machine shop has nearly completed the fabrication of the parts for the **Cryostat** and **Dual LNA** and **thermal transitions**. The LNAs are commercial MMIC's from Caltech.

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

- **PAPER**

- 32 elements now deployed in South Africa
- Receiver modelling underway (1)
- Satellite downlink antenna measurement system calibration completed (1)

- **Broadband Active Feed (R&D only)**

- Design of 150-3000 MHz ambient temperature version for the Green Bank 43m telescope is underway
- Pattern measurements for the 1-3 GHz version were obtained at MIT/Lincoln Labs
- 1-3 GHz cryogenic version was assembled; mechanical modifications are underway to repair a vacuum leak and reduce assembly time.



Provided by: S.K. Pan/J. Webber

51

The Precision Array to Probe the Epoch of Reionization (PAPER), a collaboration with UC Berkeley: Calibration activities of the 32-element array were on hold this quarter due to severe winter weather. The 32 element correlator is pending. The **32 element array** is now deployed in South Africa. Preliminary sky maps were obtained with small correlator. The 32 element correlator is pending. 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.

(1) 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.

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



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 “interim head” position transitioned from Jim Ulvestad to Steve Myers on March 1, 2010
 - NSPO effort will be 2.80 FTEs [2010 Q2]
- **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-I project have been ongoing during Q1 2010
 - A face-to-face meeting of the DVA stakeholders at NSF headquarters was held 15-16 April 2010
 - A Project Management Plan is being developed
 - A draft DVA Letter of Intent is being developed for signature by all partners
 - NRAO has agreed in principle to manage the DVA-I (Chris Langley)



Provided by: J. Ulvestad, S. Myers

53

NSPO 2.80 FTE in 2010 Q2: minus Ulvestad (0.5) and Luce (1.0 redirected) but plus Myers (0.25) and Langley (0.25 starting end of May).

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). An LOI is being drafted for the DVA-I project for all partners to sign.

We have in principle agreed to manage the DVA-I 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-I antenna likely at the EVLA site; (3) assuming resources are identified, actual construction and testing of DVA-I. There are milestones between each step, with opportunity for re-assessment.

The DVA-I project management plan is being developed under the leadership of Chris Langley, who is targeted to take the role of DVA project manager.

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



Education and Public Outreach

- Science Writer (Tania Burchell) hired in January to join new EPO Media Team
- Substantially completed production on short ViewSpace program on Astro-Chemistry
- Developed plan for EVLA dedication-related outreach activities; awaiting word on funding
- Received NSF approval for pilot test of May Term Astronomy Institutes for Undergraduates; now soliciting students from Minority-Serving Institutions
- Additional staff reorganization within EPO underway
- Six science press releases
 - ALMA Phase Closure (4 January at AAS)
 - Giant Intergalactic Gas Stream (4 January at AAS)
 - Millisecond Pulsar/Grav Wave Detection tools (5 January at AAS; also part of AAS press conference)
 - Giant Magnetic Loop between Stellar Pair (13 January)
 - West Virginia Student Discovers Pulsar (19 January; second result from Pulsar Search Collaboratory)
 - Supernova – Gamma Ray Burst connection (27 January)



Provided by: J. Stoke

55

New Science Writer (Burchell) comes with extensive experience in both the academic side of science (Harvard astrophysics undergraduate degree, employment at CfA and University of Leicester [U.K.]) and in the world of astronomy outreach and popularization (worked at Boston's Museum of Science, the U.K.'s National Space Centre [a space-themed astronomy museum], and as a state part naturalist and guide in Florida). Will research and write new web content, scripts for media projects and videos, popular-level publications, etc. Already scripts are in advanced development for the ALMA Virtual Tour project, EVLA outdoor tour signage, and EVLA booklet.

ViewSpace program was created in cooperation with the UVA's Center for Chemistry of the Universe. Will show on the 220+ screen network of displays at informal education venues (science museums, planetariums, libraries, observatory visitor centers, nature centers, etc.).

EVLA dedication-related outreach activities include new outdoor tour signage, new booklet, new virtual "behind the scenes tour for NRAO website, and enhanced public open house and tour events. Funding is sought to enable the cost of Travel and ME&S associated with these projects, which are not funded in the EPO budget. Research and photography trip by Stoke and Burchell to prepare for these projects occurred 16-19 February.

May Term Astronomy Institutes will use un-spent RET (Research Experiences for Teachers) funding to bring freshman/sophomore students from minority-serving institutions to Green Bank and Charlottesville for an intensive "immersion" experience into the world of science. Details: <http://www.gb.nrao.edu/epo/mayterm.shtml>

EPO staff reorganization: As part of ongoing efforts to further the goal of a "one Observatory" organization and develop centers of excellence, we are continuing to develop Green Bank as the primary NRAO center for STEM Education, and Charlottesville as the primary NRAO center for EPO multimedia. Artist/illustrator Bill Saxton will be relocating to Charlottesville from Green Bank during Q3. Meanwhile, recruiting is underway for an Education Specialist in Green Bank.

Education and Public Outreach (2)

- Worked with Fortune magazine for full-page ALMA feature in the March 22 edition
- Helicopter rescue in Green Bank generated good press for NSF/NRAO
- Hosted 12 overnight school/scout group “40 foot telescope field trips” in GB
- Began planning for modest enhancements to education offerings at the VLA
- Submitted two grant proposals-awaiting results
- Awarded \$300K+ NSF funding to renovate 20-Meter telescope as part of UNC's Skynet Robotic Telescope project.
- Began work on several unanticipated outreach opportunities:
 - Coalition for National Science Funding event on Capitol Hill – Wednesday 14 April
 - Boy Scout Stonewall Jackson Council Fair – Saturday 8 May
 - NSF/OLPA-sponsored press event on future of ground-based astronomy in DC – Thursday 3 June (tentative), in cooperation with TMT
 - USA Science and Engineering Festival on DC Mall – Saturday/Sunday 23/24 October
- New ALMA HD video footage acquired on-site 30-31 March (and 1 April)
- Conducted several outreach programs in Chile



Provided by: J. Stoke

56

Helicopter Rescue: <http://www.dailymail.com/News/201002220526>

<http://www.wvgazette.com/News/201002180482>

http://www2.wsls.com/sls/news/state_regional/article/navy_helicopter_crash_near_virginia-west_virginia_border/82195/

Green Bank Field Trips: Radford University (VA), Fort Hill High School (MD), Boy Scout Troop 39 (Salem VA), Boy Scout Troop 236 (PA), Charleston Catholic High School (WV), Western Albemarle High School (VA), St Catherine's School (Richmond VA), Providence Day School (Charlotte, NC), Penn State U- Abington (PA), Sidwell Friends School (DC area), Linwood Holton Governor's School (VA), Easton Area High School (PA)

Grant Proposals Submitted:

- NSF ITEST (with UNC, and Yerkes Observatory) Proposal #1029954 - Title: Collaborative Strategies: Skynet Junior Scholars (NRAO: \$165,400.00)
- WV Space Grant Consortium Proposal. Title: From Ozma to the Enterprise: The Next 50 Years of SETI Workshop (\$10,000)
- More on Skynet: <http://college.unc.edu/features/march2010/article.2010-03-25.4478250329>

Chilean outreach:

- 7 January: 22 teachers from across Chile attended a two day workshop in Santiago. This event was organized between NRAO Chile and University of California, Berkeley and taught the teachers how to improve and make more interactive the teaching of Astronomy in their classrooms (using i.e. web cams, free software, virtual telescopes, etc.)
- 15-23 January: The workshop Astrobio 2010, organized by the Department of Astronomy from Pontificia Universidad Católica de Chile, and focused on Astrobiology area, was held at the Economic Commission for Latin America (ECLA), and got together more than 300 professional scientists, PhD students and postdocs from Chile and abroad. Fair “AstroDay” got together almost 10,000 people in one day (mostly average audience), who visited booths from different scientific institutions. The presence of NRAO Chile in both activities consisted in a booth containing scientific pictures and images of its facilities, and corporate material (brochures, calendars, etc.).

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



Communications

- **External & Internal Stakeholder Communications**

- Initiated re-design of the NRAO internal website
- Designed prototype of new internal newsletter: NRAO iNews
- Designed exhibit visuals and prepared support materials for the 14 Apr 2010 CNSF exhibition for lawmakers and staffers on Capitol Hill
- Delivered video for NSF-AST large-format display
- Assisted with NAASC proposal preparation and review

- **Science Community Outreach**

- Organized the NRAO exhibition and NRAO Town Hall at the Jan 2010 AAS meeting in Washington, D.C.
- Organized the “Preparing for ALMA” Special Session for the May 2010 AAS meeting in Miami, FL
- Created initial graphic design and content for 2009 “NRAO Science Report” [Q3]
- Conducted a major review and update of the GB science web content



Provided by: M.Adams

58

Internal Communications: We have created a beta construction site for our new internal web site and begun to populate it with existing and new content. It is consistent with the NRAO brand and style guide we created last year. We will initially conduct usability testing with the site's key stakeholders (Business Services, Human Resources, Communications, etc.) and then all employees. The design of the prototype internal newsletter, NRAO iNews, is modeled on our science community electronic newsletter, NRAO eNews.

External Communications: CNSF: The Coalition for National Science Funding is a collection of science organizations that advocates for US support for science. The American Astronomical Society (AAS) is a member of CNS and sponsors one observatory every year to participate in a springtime exhibition for lawmakers and staffers on Capitol Hill. Images from the 2009 event are at <http://www.cnsfweb.org/>. Congressional visits will be scheduled by Lewis-Burke Associates for NRAO representatives prior to the CNSF evening exhibition on 14 April. **NSF video display:** We updated the video content from our Jan 2010 AAS exhibit in March, re-formatted to widescreen, and delivered it to the NSF-AST (Vern Pankonin and Andrew Clegg) for prominent display on a large-format monitor in the NSF-AST Arlington offices. **January 2010 AAS meeting:** The new NRAO exhibit set and space was redesigned to create a more open, welcoming, and visually attractive space to interact with the community at major science meetings such as the AAS. The NRAO Town Hall attracted a record 400 attendees and included presentations about science highlights and project status that were given by the NRAO Director, the JAO Director, the NAASC Director and the EVLA Project Scientist. The Town Hall concluded with a vigorous audience Q&A session. **NRAO Science Report:** This is more accurately described as a 2009 NRAO Annual Report. Its target audience includes funding agencies (including but not limited to NSF-AST), AUI, the AUI Board, Observatory Libraries and Directors around the world. A copy will also be provided to every NRAO/AUI employee. It is on track to be completed and published in Q3. **Science Internet:** The NRAO science web site, <http://science.nrao.edu>, was completely redesigned, including its structure, navigation and content in 2009. The new science web site debuted smoothly on 31 Dec 2009. We continue to work with scientists around the Observatory to improve its structure, content, and function.

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



Spectrum Management

- **General Spectrum Management**

- Continental United States

- Met with Chief Republican Counsel for House Subcommittee on Homeland Security regarding the electronic border fence
 - Filed FCC comments in response to an auto industry request for higher-power operation of 76-77 GHz vehicular radars

- International

- ITU-R activities leading up to WRC-12
 - Finalized ITU-R report detailing input power levels sufficient to burn out radio astronomy receivers
 - Assumed vice-chairmanship of IUCAF

- **Green Bank Spectrum Management**

- Spectrum Management - NRQZ/WVRAZ

- 168 coordination requests resulted in 494 sites reviewed in Q1
 - Worked with NASA to correct NRQZ frequency coordination errors in NASA documentation



Provided by: H. Liszt

60

General Spectrum Management

- **Continental United States**

- + The NRAO Spectrum Manager, along with the Director of KPNO and a representative of SAO, discussed the effect of the electronic border fence project SBInet on astronomy activities in Arizona. After some prodding, SBInet has generally recognized the requirement to coordinate their installation of radio transmitters the US Government

- + Toyota has requested that the allowed power for 76-77 GHz vehicular radars be greatly increased and requirements on radar operation be relaxed. NRAO was the only body that was able to respond with timely comments to the FCC. Like airbags twenty years ago, these radars will proliferate. Unfortunately such radars could burn out a radio astronomy receiver if pointed near the boresight of a telescope and they will create strong RFI at 76 and 220 GHz (13CO J=2-1). They must not be allowed to operate near radio telescopes.

- **International**

- + Preparations are well underway for the next World Radiocommunications Conference in Geneva in January 2012. The most visible item of concern is revision of the Table Frequency Allocations where it mentions frequencies above 275 GHz, which are not currently allocated.

- + With A.R. Thompson (NRAO), the spectrum manager wrote an ITU-R report detailing input power levels and incident power flux densities sufficient to burn out HEMT and SiS receivers. Cloud radars and synthetic aperture imaging radars in low-earth orbit exceed these power levels if seen at/very near a radio telescope main beam.

- + The NRAO Spectrum Manager joined IUCAF (the Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science) as its vice-chair.

In Green Bank, metrics for **National Radio Quiet Zone/West Virginia Radio Astronomy Zone (NRQZ/WVRAZ)** are tabulated one quarter in arrears.

Green Bank **NRQZ** office completed a six-month cooperative effort with **NASA** to correct errors in the official NASA frequency coordination rules in NASA documentation, bringing them into compliance.

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



Office of Science and Academic Affairs

- **Management Activities**

- Selection process for three new NAASC scientists ongoing.
- Staff review and promotions process reorganized and in progress.
- OSC reviewed NAASC NSF proposal, GBT development plan, and MRI project proposals.
- Second presentation of the 2009 Jansky Lecture by Dr. Anthony Readhead in association with the New Mexico Symposium in January.
- Nominations for 2010 Jansky Lecturer received and presented to Selection Committee for consideration and review.

- **Scientific Staff**

- 38 members of the NRAO scientific staff presented papers at the January AAS
- NRAO Astronomer Scott Ransom wins the AAS Warner Prize.
- NRAO Scientist Jim Ulvestad accepts NSF MPS-AST Directorship
- Two engineers promoted to Assoc. Scientist/RE, and a new CASA project scientist was announced.
- Jansky Fellowship Program Selection process concluded



Provided by: T. Bastian

62

Jansky Lecture - See <http://www.nrao.edu/jansky/janskyprize.shtml> for full details.

Scientific Staff – *Scott Ransom (Charlottesville)* was awarded the 2010 Helen B. Warner Prize for Astronomy by the American Astronomical Society (AAS), "for a significant contribution to observational or theoretical astronomy during the five years preceding the award."

Jim Ulvestad accepted an appointment to be Division Director for Astronomical Sciences (AST) in the Mathematical and Physical Sciences Directorate of the National Science Foundation (NSF).

Bill Shillue (Charlottesville, NTC) and *Gordon Coutts (Socorro)* were promoted to the Scientific Staff on the recommendation of the SPRC-RE committee and OSAA AD, with approval by the Director.

Juergen Ott (Socorro) agreed to serve as the NRAO CASA Project Scientist, replacing Steve Myers.

Laura Chomiuk will be a Jansky Fellow resident at CfA and *Gregg Hallinan* will be a Jansky Fellows resident at UCB beginning this fall.

Office of Science and Academic Affairs

- **Scientific Staff cont.**
 - The Observatory received funds for three awards granted to several members of the NRAO staff during this quarter.
- **Student and Visiting Scientist Programs**
 - **NRAO Summer Student Program**
 - The 2010 summer student program received 163 applicants and 30 were selected. Students will begin arriving to NRAO sites in late May.
 - Nine REU summer students from 2009 and one RET presented papers at the January AAS
 - **Pre-Docs**
 - Vanderbilt University student completed her pre-doctoral fellowship in GB in March 2010.
 - University of Virginia student continued appointment in CV.
 - New Mexico Tech student continued appointment working in SO.
 - All predocs present papers at January AAS



Provided by: T. Bastian

63

Scientific Staff cont: The NRAO received the following funds during this quarter for **grants awarded** to NRAO scientific staff:

- \$61,983.49 from UVA, Recipient *Rich Bradley* for PAPER #2 from Mar to Dec 2010.
- \$395,575 from UNC, Recipient *Sue Ann Heatherly* or MRI-R2 Consortium Acquisition/ Skynet from Mar 2010 to Feb 2013.
- \$21,402 from JPL/Spitzer, Recipient *Carol Lonsdale* for IRS Observation of Four Exceptionally Red 24 Micron Sources from Mar 2010 to Sept 2011

Summer Student Program: The nine REUs are *Jennifer Shitanishi, Missy Louie, Michael Lam, Brian Roper, Patrick McCauley, Katy Wyman, Evan Kornacki, Melissa Pastorius, and Rogerio Fernando Cardoso*; the RET was *Eric Fagrelus*. The deadline for the 2010 program was Feb 1 and offers were made on Mar 1. For more information go to <http://www.nrao.edu/index.php/learn/education/re>.

Pre-Docs: *Katie Chynoweth* completed her work under the supervision of Glenn Langston (NRAO-GB) and Dr. Kelly Holley-Bockelmann (Vanderbilt) on HI observations of interacting galaxies observed by the GBT and VLA; *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) continued working at NRAO in Socorro with Frazer Owen on wide-band imaging algorithms and techniques.

Office of Science and Academic Affairs

– **Student and Visiting Scientist Programs cont.**

- Graduate and Undergraduate Interns
 - Three graduate students, from the Univ of Maryland, Univ of North Carolina, and New Mexico Tech continued to work as graduate interns with NRAO mentors.
 - Six undergraduates (all New Mexico Tech) continued undergraduate internships, three working with Steve Durand on EVLA electronics.
 - One undergraduate student (West Virginia University) worked with John Ford at NRAO Green Bank as an undergraduate intern on the continuation of a project from the previous summer.
- Visiting Astronomers
 - Three Visiting Astronomers in Charlottesville and four in Socorro.



Provided by: T. Bastian

64

Graduate Interns: *Joshua Marvil* (New Mexico Tech) worked with Frazer Owen in CV on an EVLA study of local star-forming galaxies with a goal towards understanding the physical origin of the radio-FIR correlation. *Amanda Moffett* (University of North Carolina at Chapel Hill) worked with Visiting Assistant Scientist Sheila Kannappan in CV on the GALEX space mission's recent discovery of extended ultraviolet-bright disks representing very young stars around seemingly ordinary disk galaxies. *Nimish Sane* (Univ of Maryland) continued a graduate internship working with John Ford in Green Bank on digital processing for radio spectroscopy.

Undergraduate Interns: *Dana Sills*, *Scott Davidson*, and *Matt Tibbetts* (all New Mexico Tech) continued undergraduate internships working on EVLA electronics; *Emily Jones* (West Virginia Univ) worked at NRAO Green Bank as an undergraduate intern working on the construction of an encoder test fixture.

Visiting Astronomers: *Jack Gallimore* and *Michelle Thornley* of Bucknell University continue their visit with the NAASC in Charlottesville; *Robert Sault* arrived in Socorro as a visitor funded by Socorro Ops; *Sheila Kannappan* came to Charlottesville in January for a five month sabbatical from UNC, *Jake Hartman* and *Miriam Krauss-Hartman* as well as *Sarah Spolaor*, from Swinburne University, are or have visited Socorro under the Visitor Program during this quarter.

Office of Science and Academic Affairs

- **Support Programs**

- **Student Observing Support**

- ✓ SOS Selection Committee met in January
 - ✓ Selected five IOA applications for funding
 - ✓ SOS Program web page reorganized and updated for ease of use by the awardees as well as NRAO staff.



Provided by: T. Bastian

65

SOS Awards: Proposals GBT10A-016 (Jackson, Lowell Observatory), GBT10A-030 (Allen,); GBT10A-039 (Rabidoux, West Virginia Univ); GBT10A-050 (Walker, Univ of Virginia); and GBT10A-058 (Ries, Univ of Virginia). These students were awarded SOS funding for the IOA observing period at a total of \$99,784.

SOS Program web page updated: <http://science.nrao.edu/opportunities/sos.shtml>.

Office of Science and Academic Affairs

- **Support Programs cont.**

- **NRAO Library**

- Completed, with the assistance of IT and e2e, the new ISSTT Web Page complete with the Blacklight user interface. In addition, Blacklight was used as the front-end interface for NRAOTheses and will be further utilized as the front-end interface for the new NRAOPapers.
 - Hosted the April Virginia Special Libraries Association (VASLA) meeting; staff presented a Blacklight tutorial and demonstration, and provided a Virtual Tour of the Library.
 - Working with Catholic University to offer practicum to Library School students, benefitting both the student and our Library.
 - Library and Archive staff attended a disaster planning/preparedness seminar for cultural collections.



Provided by: T. Bastian

66

See the **ISSTT** web page with the **Blacklight** user interface at <http://www.nrao.edu/meetings/isstt/index.shtml>.

See the **NRAOPapers** search engine at <https://safe.nrao.edu/php/library/search.shtml>.

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



Computer & Information Services

- **Common Computing Environments (CCE)**
 - Production support for the Observer Helpdesk now live @ help.nrao.edu
 - Leverages existing Observer accounts from my.nrao.edu portal
 - ALMA will be evaluating complementary solution in Q3
 - User Portal and Web Masters participated in ESO's Plone workshop in March
- **Networking and Telecommunications**
 - Socorro and CV Internet bandwidth upgraded to 1 Gigabit /second
 - Negotiating shared access with AURA network from Chile to US
- **Digital Infrastructure**
 - Hosting of the Science Data Archive for EVLA on NGAS servers in place
 - Initial four ALMA NGAS servers installed in the NA-ASC
 - 200TeraBytes of Archive storage awarded from TeraGrid for GBT survey data
- **Security**
 - CIS/MIS Risk assessment audit underway in cooperation with AUI
 - No production impacting incidents occurred this quarter



Provided by: D. Halstead

68

CCE: Production support for the **Observer Helpdesk** is now in place to support EVLA go-live using a customized Kayako Helpdesk solution. The same solution is under evaluation for ALMA regional support.

ALMA/NRAO **User Portal** development continuing with the Plone architecture adopted for the web-based Content Management System and Portal release scheduled for Q4. ALMA hosted a Plone training course in March in support of the ALMA User Portal which will integrate such services as **Helpdesk**, Proposal Submission and Archive access.

Network: Ongoing commitment to upgrade ALL major sites to **1 Gigabit/Second** to facilitate data access: Complete for Charlottesville 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 and West Virginia University on a fiber build. A Memorandum of Understanding is under negotiation with AURA for 1 Gigabit/Second link from ALMA SCO to NA-ASC. Vendor has been engaged for a replacement phone system in GB, which will occur in Q3.

Digital Infrastructure: The Next Generation **Science Data Archive** System servers now storing production EVLA data in Socorro. ALMA archive servers on-site in Charlottesville for Q3 go-live. Replacement of **Computer Room cooling** completed in CV for Archive and Compute systems. A request for 200 TeraBytes of Archive storage and 100,000 hours of computer time has been awarded from NSF TeraGrid to support the re-use of the 350MHz GBT pulsar survey data.

Security: **IT Risk Assessment** review underway working with Cherry, Bekaert & Holland, L.L.P. (engaged by AUI); report in Q3. No **production** downtime from security vulnerabilities occurred this quarter.

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
 - Observatory Management Services



Observatory Management Services

- **Fiscal Division**

- OMB A-133 and Financial Audit was completed on schedule in Q2. The audit report, dated February 4, 2010, provided an unqualified with no reported findings or questioned costs. There were no audit adjustments and no management letter comments.
- To alleviate immediate record storage limitation a cost benefit analysis and review of electronic data archiving will be developed. [Q4]
- Re-design of the “Fringe Pool” to increase the efficiency of the allocation of fringe benefits [Q3]
- Research and initiate implementation of ACH payments to vendors for all categories of payments [Q4]
- NSF IG/DCAA audit review continuing



Provided by: C. Williams/G. Clark

70

OMB A-133 Audit - The Fiscal Division resources are dedicated to the preparation and completion of the A-133 audit for six months of the year. Included in the preparation is year-end closing, audit schedule preparation, audit fieldwork and financial statement preparation.

Electronic data archiving - the Fiscal Division completed a site visit to assess a company that had recently implemented LaserFiche, an electronic archiving system. A demonstration of the system was provided and the hardware and software requirements were analyzed. The Fiscal Division will be scheduling a second on-site visit in Q3 to review an alternative electronic filing system.

Observatory Management Services

- **Management Information Services (MIS)**

- Design and initial planning of NRAO Cost Pools for DAC and IDC
- Discussions on MIS involvement in the NRAO OSP
- Initial designs of Program Office Initiatives involving WBS alignment and information extraction
- Continue consolidation, review, and rewrite of most financial reports
- Continue the stabilization and enhanced data mining for the NRAO Electronic TimeKeeping (ETK) systems
- Initial design to establish the MIS business systems as the central repository for employee information with exports to the NRAO phone directory and business services
- CIS/MIS Risk Assessment audit underway in cooperation with AUI



Observatory Management Services

- **Contracts and Procurement**

- The Observatory-wide contractor procurement system review (CPSR) management response submitted to internal auditors - Completed
- Conducted a procurement review in Chile for FY10 Q1 activity
- ARRA efforts resulted in commitments of approximately 50% of the \$5.4M funds during Q2.
 - Received an additional \$507.3k of ARRA funds for an MRI Grant
- Due to reclassification of an export duty code for an ALMA's product, NRAO received \$23.5k refund from the Government.



Provided by: P. Donahue/G. Clark

72

In the Contracts and Procurement area in Q2, the final draft of the management Response to Contractor Procurement System Review Report was provided to the external auditors (CBH). Several recommendations have been implemented and other recommendations are being assessed for future implementation.

A procurement review was conducted in Chile for Q1 FY10 activity. However future travel budget limitations may curtail the on-site Chilean procurement review.

NRAO must expend some portion of each project's fund before September 30, 2010 in order to preserve ARRA carryover. Of the ARRA \$5.4M awarded funds, there is a hold on \$1.6M for the VLBA KA Band Receiver project. An additional \$507.3k was awarded for the MRI-R2: Acquisition of Recording Media to Triple the Sensitivity of the VLBA Grant and award expires 3/31/2011.

Contracts and Procurement and has shifted resources and workload to place a continued focus on ARRA projects. In addition, C&P increased the Green Bank Buyer from .5 FTE to .75 FTE and allowing overtime for Socorro resources.

A full time dedicated Import/Export Specialist has resulted in ALMA savings and Government refunds in excess of \$1M.

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. There is a risk that the website will not be updated as planned. The current mitigation is to identify resources (C&P, MIS, AUI and Legal) to update the website and set time aside to revise and acquire approval for forms, terms and conditions and certifications.

Observatory Management Services

- **Environmental Safety and Security**

- **Charlottesville**

- **Edgemont**

- HVAC system replacement completed by local facilities team
 - All quarterly building emergency systems inspections completed

- **NTC**

- Routine hazard communication training being scheduled out of GB



Provided by: R. Daniels/G. Clark

73

Edgemont Road Facility: All planned cameras are installed. Replacement of the **HVAC system** is complete. **Quarterly Building Maintenance Inspections completed.** Fire Extinguisher Inspections completed. Fire main and alarm maintenance completed in Stone Hall. Alarm tests successful.

NTC routine **hazard communication training** is now being done to facilitate OSHA compliance for FEIC. Additional work is being done to update the MSDS index.

Observatory Management Services

- **Environmental Safety and Security**

- **New Mexico**

- Safety committee meetings and presentations held
 - Safety audits and inspections completed
 - Assisted with community outreach activities
 - Training sessions conducted
 - Laser Safety Officer training completed
 - FM-200 fire suppression system tested/inspected
 - NM ES&S personnel participating in planning for Spring 2011 dedication



Provided by: R. Daniels/G. Clark

74

New Mexico Facilities: Monthly **Safety Committee meetings** held with participants from VLA and Socorro facilities, quarterly **Safety Presentation** at Electronics Division staff meeting, weekly safety topics written and distributed. **Annual ES&S audit/inspection** of facilities' first aid kits and shortfalls rectified, generator building inspection and carpenter shop inspection with no major defects, fire extinguishers, emergency lights, eye wash and shower and exit sign inspections. **Community Outreach/Science Fair** judging done by ES&S personnel, worked with Socorro-based Public Education Officer to establish safe practices for upcoming American Cancer Society fundraiser at the Domenici Science Operations Center. **Training sessions** included: hearing conservation, safety awareness, bloodborne pathogens, hazard communication, fire extinguisher, accident/incident reporting, safety action reporting, fire brigade wild land fire fighting, new employee safety orientation, respirator fit testing and training and a CDL/DOT drug test was conducted. **Laser Safety Officer** training requirements met. **FM-200 test/inspection** of the EVLA correlator completed with no compliance issues.

Observatory Management Services

- **Environmental Safety and Security**

- **Green Bank**

- Recycled used oil
 - 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**

- North Liberty and Pie Town VLBA sites security upgrade in process



Provided by: R. Daniels/G. Clark

75

Green Bank Facilities: Recycling efforts continue with 550 gallons of oil this quarter. **Site sewer water treatment system** continues within limits performance for the third successive year. Semi-annual **cafeteria inspection** was conducted on January 6 with no major issues to report. **Training** of 24 employees on AED/CPR/first aid, Green Bank trainers conducted a forklift certification class for an ALMA employee who works out of the NTC.

VLBA Facilities: NRAO is currently upgrading its VLBA sites which have been assessed as "vulnerable". Six sites are being enhanced; Hancock & Owens Valley site security improvements completed; **North Liberty and Pie Town** are expected to be completed by mid-April; St. Croix and Brewster are in process. Mauna Kea, Fort Davis, Los Alamos, Kitt Peak are secure due to location.

Observatory Management Services

Name of Grant	Funding Institution	Grant Value	PI
PAPER #2	NSF via University of Virginia	\$61,983	Rich Bradley
MRI-R2 Consortium Acquisition/ Skynet	NSF via University of North Carolina	\$395,575	Sue Ann Heatherly
IRS Observation of Four Exceptionally Red 24 Micron Sources	NASA - Jet Propulsion Lab	\$21,402	Carol Lonsdale



Provided by: T. Miller/G. Clark

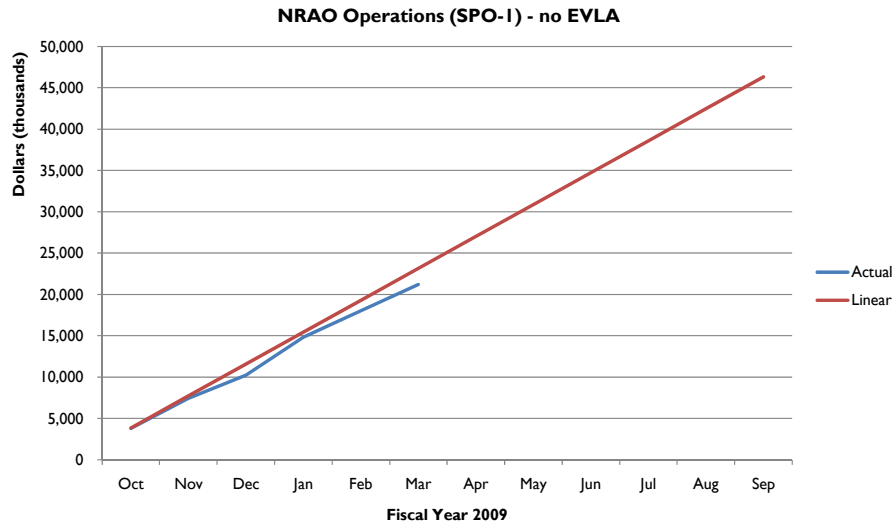
76

PAPER #2 period of performance: March 4, 2010 to December 31, 2010

MRI-R2 Skynet period of performance: March 15, 2010 to February 28, 2013

IRS Observation period of performance: March 4, 2010 to September 30, 2011

Observatory Management Services Financial Performance



Provided by: T. Miller/G. Clark

77

NRAO Operations (less EVLA) FY 2010 new funding allocation is \$43,149k. Total available funding including prior year commitments and carryover totals \$48,884k. Expected total spending for FY 2010 is \$46,248k with \$2,600k remaining to cover anticipated FY 2011 and FY 2012 funding shortfalls.

As of the end of the first quarter total expenses plus commitments total \$21,191.5k (43.4% of available funds, 45.8% of expected spending). Elapsed work days is 49.0%.

Observatory Management Services

- **Human Resources**

- **Recruitment/applications tracking**

- Developing a process of evaluating the effectiveness of NRAO recruitment efforts

- **Compensation**

- Thorough review of NRAO's compensation process including the grade structures and market surveys [Q1]

- **Diversity Outreach**

- Development of an action plan that builds a diversity support network from site level up to the Charlottesville headquarters
 - Assist Howard University in further developing its astronomy program



Observatory Management Services

- **Human Resources**

- **Diversity Employment Results**

- **Promotions**

- Q1: Sr. Public Education Officer – GB (Female)
 - Q2: Associate Director – CV (Female)
 - Q2: Technician, Sr. – SOC (Minority)
 - Q2: Track Equipment Operator III – SOC (Minority)
 - Q2: General Office Assistant II – SOC (Minority)
 - Q2: Technical Specialist III – CV (Minority)



Provided by: F. Giles/J. Firmani

79

Five promotions were made to diverse employees. One female and four minority males.

Observatory Management Services

- **Human Resources**

- **Diversity Employment Results**

- **New Hires**

- Q1: Electrical Engineer II – CV (Female/Minority)
 - Q1: Associate Scientist A – CV (Minority)
 - Q1: Deputy Division Head – CV (Female/Minority)
 - Q1: Telescope Mechanic III – SOC (Minority)
 - Q1: Jansky Fellow – SOC (Minority)
 - Q1: Sales Clerk – GB (Female)
 - Q2: Electronics Assembler – CV (Female)
 - Q2: Science Writer – CV (Female)
 - Q2: Post Doc – SOS (Female)
 - Q2: Auto Diesel Mechanic (Minority)
 - Q2: General Office Assistant (Female/Minority)
 - Q2: Employment & Diversity Specialist (Female/Minority)



Provided by: F. Giles/J. Firmani

80

Six new diverse employees were hired during the quarter; five female, two of which are minority, plus one minority male.

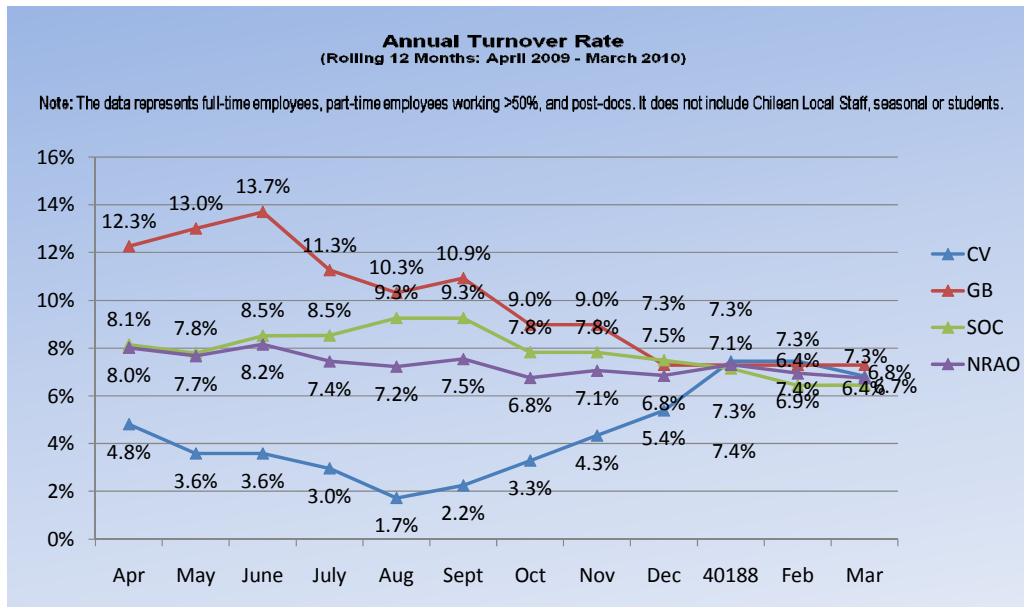
Observatory Management Services

- **Human Resources**

- **Observatory Staffing Plan**

- OSP Concept Development/Process Framework developed [October-January/COMPLETE]
 - Questionnaire Developed [January-April/COMPLETE]
 - Pilot with ALMA [April-May/IN-PROCESS]
 - Complete all NRAO staff [May-June]
 - Develop and put under Configuration Control – Skills Mix Database [April – June]
 - Form focus group of scientists/technologists to develop strategic staffing needs [April-June/IN-PROCESS]
 - 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

Turnover rates remained relatively flat during the second quarter across the Observatory.