



The NRAO Town Hall at the January American Astronomical Society meeting will bring you the latest Observatory news and information. The NRAO Town Hall will open with a reception (heavy hors d'oeuvres & refreshments) that will be followed by brief updates on progress and scientific opportunities with the Atacama Large Millimeter/submillimeter Array, Expanded Very Large Array, Green Bank Telescope, Very Long Baseline Array, and the NRAO Square Kilometre Array Program. There will be at least 30 minutes for answering audience questions.

Upcoming Events



NRAO Town Hall at the American Astronomical Society Meeting

January 5, 2010 | 6:30 - 8:30 PM | Washington, DC

Washington Marriott Wardman Park | Thurgood Marshall Ballroom North



New Mexico Symposium

January 15, 2010 | Socorro, NM



Jansky Lecture

January 15, 2010 | Socorro, NM



NRAO Proposal Deadline

February 1, 2010 5:00 PM EST



Summer Student Application Deadline

February 1, 2010



SKA2010 - International SKA Science and Engineering Meeting

March 22-25, 2010 | Manchester, UK



12th Synthesis Imaging Workshop NRAO & New Mexico Tech

June 8-15, 2010 | Socorro, NM

Summer Student Opportunities

Jeff Mangum, NRAO Student Programs Coordinator

The NRAO is now accepting applications for the 2010 NRAO Summer Student Research Assistantships program. Each summer student conducts research under the supervision of an NRAO staff member at one of the Observatory's sites, on a project in the supervisor's area of expertise. The project may involve any aspect of astronomy, including original research, instrumentation, telescope design, or astronomical software development. See the [November eNews article](#) for details.

The application form and application process for the NRAO summer student program is available online. Required application materials include an on-line application form (including a statement of interest), official transcripts, and three letters of recommendation. The deadline for receipt of applications is **1 February 2010**.

ALMA Construction: And Then There Were Three

Al Wootten



Figure 1: Three antennas in the fledgling ALMA array track a source early on Thanksgiving morning at the ALMA site.

On 20 November, a third antenna joined the two ALMA antennas undergoing verification phases of interferometry at the 5000m Array Operation Site (AOS). The two-station interferometer at the AOS recorded fringes at a wavelength of 456 microns on the night of 21 November. Observations of the water vapor maser spectral line in the evolved star VY CMa at 658 GHz were made in good conditions (0.8 mm precipitable water vapor (PWV)) on a 160 meter baseline (fringe spacing 0.6 arcseconds). Integration and testing of an upgraded software system is under way as verification proceeds towards the first three-antenna interferometry, adding baselines of 200 and 116m to the fledgling array. One hundred fifty-two of the 192 antenna pads at the AOS have passed preliminary acceptance. In January, pads in the Atacama Compact Array (ACA) area will be available, allowing interferometry on shorter baselines.

At the 3000m elevation Operations Support Facility (OSF), holography on the two most recent antennas to join the flock has resulted in surface adjustments to the precision levels attained on the other antennas as optical pointing tests bring those antennas to a point where radiometric tests can begin. A new front end package arrived from the Front End Integration Center (FEIC) at the NRAO Technology Center to undergo testing and deployment in one of the antennas. A fifth frontend should be shipped from the FEIC in Taiwan by the end of the year. Interferometry at the OSF will resume with the newly accepted antenna and front ends in January. The control of the antennas at the AOS and the OSF has moved from temporary quarters to a fully outfitted control room in the OSF Technical Facility.

Further antenna acceptances will occur during the next month. In the contractors' camps, an AEM antenna has been outfitted with a dummy front end and back end racks in an early test of antenna cabin accommodations. Panels are also being attached to the AEM backup structure. The first of the 7m antennas from Melco destined for the ACA is being erected. New antenna shipments arrive often at all of the contractor camps; the arrival of materiel has become so frequent that it is difficult to assess how many antennas' worth of parts are on site.

Expanded Very Large Array Status

Mark McKinnon & EVLA Project Team

An external review of the de-multiplexer on the 3-bit, 4Gbps sampler board was held October 1. The samplers are used to digitize the 8 GHz of bandwidth per polarization from each EVLA antenna. The review was held to evaluate alternative de-multiplexer designs because the current design did not perform as expected. The primary recommendation from the review was to abandon the current design and adopt a new design based upon a high speed floating point gate array (FPGA). Of the alternatives considered, the FPGA-based design was technically the most feasible and had the lowest impact on the project budget and schedule. The layout of the new sampler board is nearly complete. The production order for the boards should be placed by April 2010, and we expect the installation of the boards in the antennas to be complete by September 2011. The change in de-multiplexer design delays the availability of 8 GHz observing capability, but it does not delay the overall completion of the EVLA project.

A review to select the design of the orthomode transducer (OMT) for the EVLA X-band receiver was held October 13. Three different designs were considered. Originally, the selection of the final design was thought to be closely coupled to the ability of a CTI Model 22 refrigerator to cool the receiver. However, an evaluation of the cryogenic and electrical infrastructure at the VLA site indicated that the current versions of these systems would operate at the margin of their capacity, thereby placing the long-term telescope reliability in jeopardy. Thus, for operational reasons, a decision was made to upgrade the cryogenic and electrical infrastructure and use a larger, Model 350 refrigerator on the X-band receiver. The Model 350 is the same refrigerator used on the adjacent C- and Ku-band receivers. The infrastructure upgrades include the addition of a fourth cryogenic compressor and a new electrical power panel on each EVLA antenna, and two new utility transformers at the VLA site. This decision effectively decoupled the refrigerator issue from the OMT design selection. The decision also mitigated the highest impact risk to the EVLA project. A quad-ridge style OMT, similar to those on the EVLA L-, S-, and C-band receivers, was chosen for the X-band receiver. The installation of fully EVLA-compliant X-band receivers will start later than predicted but should still be complete in late 2012 as scheduled. In the meantime, the Ku-band receiver deployment will advance since its design is mature and tested.

An inspection of the azimuth and elevation gearboxes on all antennas was completed in November. The inspection was conducted because a pinion gear in the azimuth gearbox of antenna 5 failed in April 2009, and we wanted to know if other antennas in the array had similar problems. Overall, the inspection results were not as dire as initially feared. The inspection revealed that all elevation gearboxes are in good condition. Gears in an azimuth gearbox on each of antennas 6 and 7 showed extreme wear. They will be repaired as part of routine mechanical overhauls of the antennas once all EVLA antenna conversions are completed in summer 2010. A plan has been instituted to replace the lubricating oil in all gearboxes more frequently.

Twenty-four antennas have been converted to the EVLA design; the twenty-fifth antenna will be converted by 1 January 2010.

The production, installation, and testing of the circuit boards for the new WIDAR correlator continues. The last set of station boards was delivered to the VLA site in early November. These boards are needed for the Early Science observations that will be made with WIDAR beginning March 2010. The number of baseline

boards currently on hand is sufficient to accommodate Early Science observations. The last set of baseline boards will be delivered to the VLA site by April 2010. Tests with an initial subset of the correlator, called WIDAR-0, have been hampered by system timing instabilities, which have been attributed to phase lock loops (PLLs) on the station boards. The PLLs were recently removed from the boards.

The configuration mapper is the low level software that automatically configures the correlator for observations. The software has been written and is being tested with WIDAR-0. The correlator configurations for Early Science observations are supported in a recent version of the Observation Preparation Tool, the high level software used by observers to set up their observations.

Science observations with the VLA correlator will cease on 11 January 2010 so that the final transition to the new WIDAR correlator can be made. The hardware modifications to be made during the transition include the transfer of the intermediate frequency (IF) signal path from the VLA correlator to the WIDAR correlator, a rebuild of the IF distribution racks, a rework of the central local oscillator (LO) racks for the antennas, and the overhaul of the master LO rack. The hardware modifications will be complete by 9 February. Science observations with WIDAR are expected to commence in March after a period of test observations.

EVLA-VLBA-VLBI Proposals & Scheduling

EVLA-VLBA Scheduling Officers schedsoc@nrao.edu

Expanded Very Large Array/Very Long Baseline Array Proposals and Scheduling

The table lists information and configurations for the next regular and large proposal deadline for the Expanded Very Large Array (EVLA) and the Very Long Baseline Array (VLBA). The future order of the EVLA configurations will be D → DnC → C → CnB → B → BnA → A.

Array	Deadline	Observing Period	Configuration
EVLA	2010 Feb 1	2010 Jun 25 - 2010 Sep 13	C
		2010 Sep 13 - 2010 Sep 17	Move
		2010 Sep 17 - 2010 Oct 04	CnB
VLBA	2010 Feb 1	2010 mid May - 2010 mid Sep	

- [EVLA details](#)
- [VLBA details](#)
- [Proposal submission](#) (use your "my.nrao" account or create one)
- [Scheduling](#) (dynamic and fixed date)

VLBI High Sensitivity Array Proposals and Scheduling

The NRAO handles regular proposals for the VLBI High Sensitivity Array (HSA) at the same deadlines as for the VLBA. The HSA includes the VLBA, GBT, and Arecibo in the U.S., plus Effelsberg in Germany.

There will be an interval of up to 2 months, beginning in January 2010, during which the VLA will be unavailable to the HSA due to the replacement of the VLA correlator with the new EVLA correlator. When observing resumes with the EVLA correlator, it will lack VLBI capabilities. Although it is expected that EVLA commissioning will eventually include VLBI capabilities, a timescale for implementing this has not yet been determined.

- [HSA details](#)

- **Proposal submission** (use your "my.nrao" account or create one)
- **Scheduling** (fixed date)

Global cm VLBI Proposals and Scheduling

The NRAO and the European VLBI Network (EVN) jointly handle proposals for observing time on the Global VLBI Network at centimeter wavelengths. The deadline is 1 Feb 2010 for the session in May/June 2010.

- **VLBA details**
- **EVN details**
- **Proposal submission** (use your "NorthStar" account or create one)
- Scheduling is on fixed dates during global sessions

Global 3mm VLBI Proposals and Scheduling

The NRAO and a set of European observatories jointly handle proposals for VLBI observing time at a wavelength of 3mm on the Global mm-VLBI Array (GMVA). The deadline is 1 February 2010 for the session in October 2010.

- **GMVA details**
- **Proposal preparation** (via a LaTeX template)
- Proposal submission is via e-mail to propsoc@nrao.edu and propvlbi@mpifr-bonn.mpg.de
- Scheduling is on fixed dates during global sessions

VLBA Begins Production Processing Using the DiFX Software Correlator

Jon Romney

Production processing of a subset of VLBA observations with the DiFX software correlator began 30 November, 2009. It is expected that by the end of December all VLBA scientific observations will be processed by DiFX.

DiFX offers these new capabilities and advantages:

- Spectral resolution as high as 4096 points per baseband channel, for any polarization configuration. Compared to the original VLBA hardware-based correlator, this is an increase by a factor of 4 for non-polar, and a factor of 32 for cross-polar processing. This resolution is available even for extreme narrow-band observations, and there is no limitation on spectral points across multiple baseband channels.
- Significantly shorter integration periods, in principle as short as twice the reciprocal frequency resolution.
- A substantially increased correlator output data rate limit of 10 MB per second of observing time, a ten-fold increase over the most recent maximum rate available (at speedup factor 1) on the original correlator.
- Processing of any recorded data bit rate in a single correlation pass. In particular, the current maximum recordable rate of 512 Mbps no longer requires two passes. However, this recording rate remains a limited resource since it is constrained by the VLBA Mark 5 media pool, and its use must be justified in proposals.
- Processing of any mix of VLBA, Mark 4, and Mark 5B formatted data.

- Sophisticated pulsar processing modes.

The maxima specified above are flexible, and can be waived on the basis of a sufficiently compelling scientific justification.

Please consult the updated [VLBA Observational Status Summary](#) for detailed information. Most aspects of DiFX are discussed in Section 7, while the new pulsar gating options are presented in Section 16, and Section 18 explains how wide-field observations could exploit the expanded output data rates now available. Current information is maintained on the [“DiFX Arrives” web page](#).

Career Opportunities

New Postings

Senior RF Engineer: The Atacama Large Millimeter/submillimeter Array (ALMA) in San Pedro de Atacama, Chile seeks a Senior RF Engineer for the Electronics Group with the Department of Technical Services. This position will be vital to the setup and early operations of the Electronics Group and will require extensive RF knowledge and experience as it supports highly complex and newly commissioned ALMA Front end Electronics.

Systems Administrator II: The North American ALMA Science Center (NAASC) is seeking a Systems Administrator II to support science users accessing archive, high performance computing and storage systems to support their data analysis needs. This Unix system administrator will also evaluate, deploy and maintain the hardware and software systems providing these services, as well as supporting the day-to-day technical needs of users in a highly dynamic science research environment.

NRAO Postdoc: We invite applications for a Postdoctoral Fellow to work with the Joint ALMA Observatory (JAO) scientific staff as it gears up for the commissioning and validation of ALMA. The role of the ALMA Postdoctoral Fellow will be to assist the ALMA Commissioning Team in planning and executing the scientific commissioning of ALMA.

ALMA Science Operations Astronomers: The Joint Atacama Large Millimeter/submillimeter Array (ALMA) Office invites applications for the position of Science Operations Astronomer, based primarily in the ALMA offices in Santiago, Chile. The successful candidates will support the Commissioning and Science Verification team, assisting the Project Scientist in planning and executing the scientific commissioning of ALMA before ALMA early science operations (2011) and will participate in tests and evaluations of the ALMA control software and software tools for science operations, and in the planning of science operations.

Telescope Operator: The National Radio Astronomy Observatory Robert C. Byrd Green Telescope (GBT) in Green Bank, WV seeks a Telescope Operator to monitor and operate one or more telescopes and assist engineers and technicians in diagnosing telescope equipment failures.

Software Engineer II (CASA): The National Radio Astronomy Observatory is seeking a Software Engineer II for their Common Astronomy Software Applications (CASA) division in Socorro, New Mexico. Astronomers and programmers from US, Europe, Canada, Japan, and Chile are actively developing and using CASA. There are several Qt based applications that will need to be extended and supported by the Software Engineer.

ALMA Commissioning Scientists: The Joint ALMA Office invites applications for the position of Commissioning Scientists to be based in Santiago, Chile. The role of ALMA Commissioning Scientists is to assist the Project Scientist and Deputy Project Scientist in planning and executing the scientific commissioning of ALMA.

Software Engineer III: The National Radio Astronomy Observatory in Socorro, NM is seeking a skilled developer to participate in the development of the observation scheduling and pipeline data-reduction subsystems. The successful candidate will display a strong working knowledge of Java and of object-oriented analysis and design. The ability to learn new computer techniques (languages, methodologies, etc.) quickly and independently is required. Excellent software technical documentation skills are required.

Research Associates (Postdoctoral Scholars): The North America ALMA Science Center (NAASC) is inviting applications for one or two Postdoctoral Scholars at its headquarters in Charlottesville, Virginia to work with the S4G (Spitzer Survey of Stellar Structure in Galaxies) team. The S4G is designed to be the ultimate legacy survey for the distribution of stellar structure in the nearby universe. For more information on the S4G, visit <http://web.ipac.caltech.edu/~kartik/s4goverview.pdf>

Science Writer: The National Radio Astronomy Observatory in Charlottesville, Virginia is recruiting a Science Writer. Working in collaboration with observatory scientific, technical, and media design staff, the Science Writer will research, plan, and write articles and multimedia/video scripts for web pages, exhibits, and media programs that communicate scientific and technical concepts to science-attentive public audiences (including students).

NRAO Postdoctoral Fellow: The North American ALMA Science Center (NAASC) invites applications for a Postdoctoral Fellow to work with the NAASC scientific staff. The focus will primarily be on independent research, with an emphasis on exercising ALMA end-to-end software and databases from a scientific perspective, in particular the Splatalogue spectral line database.

Scientists (NAASC): The North American ALMA Science Center (NAASC) seeks applicants with research interests in areas related to the goals of ALMA to join its User Support staff. They will provide advanced scientific and technical support to members of the North American ALMA community, and will have the opportunity to pursue a vigorous and independent research program. These positions will be filled at the assistant, associate, or scientist level, commensurate with experience.

Software Engineer II: The Software Development Division in Green Bank, WV is seeking a Software Engineer to help design, develop, implement, and support the Dynamic Scheduling System for the Green Bank Telescope. The Dynamic Scheduling System is broken into three major components: a web application built with the Django web development framework, a series of custom user interfaces built with Ext GWT, and the core scheduler implemented in the functional programming language, Haskell. The Dynamic Scheduling team uses agile software development methods and automated unit testing to provide a working system for sponsors at every step of system development.

Assistant Scientist/A: The team of scientists at the Green Bank Telescope (GBT) is seeking an Assistant Scientist/A to provide full scientific support to the GBT and the NRAO. Responsibilities will include supporting observers who use the telescope as well as working on a diverse variety of projects, which may include the development and commissioning of new instrumentation on the telescope, working with the engineering staff to improve the overall telescope performance, and aiding with the data reduction pipelines needed for the GBT. The position will be filled at the assistant, associate, or scientist level, depending on experience.

Software Engineer III: The Software Development Division in Green Bank, WV, is seeking a Software Engineer to provide support for the scientists who use the Green Bank Telescope (GBT). Work will be

directed initially toward improvements in the post-observing data analysis and reduction software as well as developing data reduction and analysis software infrastructure for existing instrumentation.

From the Archives

Ellen Bouton



Children's holiday parties, held annually at all sites, are a long tradition at NRAO. In this photo from the 1977 party in Green Bank, Santa and his reindeer make their grand entrance.

With this eNews issue, we begin monthly publication of photographs from the NRAO Archives. We hope readers will enjoy seeing a selection from the wide array of Archives photos that illustrate and document NRAO history, as well as selected photos of interest from our various collections of individuals' papers.

About this month's photograph: Children's holiday parties, held annually at all sites, are a long tradition at NRAO. In this photo from the 1977 party in Green Bank, Santa and his reindeer make their grand entrance. Can anyone identify who is beneath the Santa or reindeer costumes?

If readers have photographs they believe would be of interest to the Archives, please contact Ellen Bouton, ebouton@nrao.edu.

[Staff](#) | [Contact Us](#) | [Careers](#) | [Help](#) | [Policies](#) | [Diversity](#) | [Site Map](#)



The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.

Copyright © 2009 Associated Universities, Inc.