NRAO eNews

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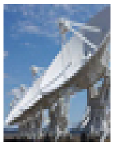
Upcoming Events



Synthesis Imaging Workshop (http://www.aoc.nrao.edu/events/synthesis/2012/)
May 29 - Jun 5, 2012 | Socorro, NM

ALMA Early Science Results & Opportunities (https://science.nrao.edu/science/meeting/aas-special-session)
Jun 14, 2012 | Anchorage, AK

ALMA Cycle 1 Early Science Observations

Carol Lonsdale

C. Padilla, NRAO/AUI/NSF

Zoom

The NRAO North American ALMA Science Center is pleased to announce that the Joint ALMA Observatory (JAO) expects to start the next cycle of Early Science observations (Cycle 1) in January 2013. A Call for Proposals for Early Science Cycle 1 will be issued at the end of May 2012, with an anticipated deadline for proposal submission in mid-July. ALMA Early Science Cycle 1 observations will start in January 2013 and span 10 months. It is anticipated that approximately 800 hours of array time will be available for Cycle 1 projects. Any astronomer may submit a proposal in response to the ALMA Early Science Cycle 1 Call for Proposals. Cycle 1 operations will be conducted on a best efforts basis, similar to the current Cycle 0 observations.

The full Cycle 1 announcement is available **on-line (https://almascience.nrao.edu/news/pre-announcement-for-cycle-1)** . Detailed information on Cycle 1 will be published in the Call for Proposals.

The announcement includes a call for Notices of Intent to submit an ALMA proposal, due by May 15.

Capabilities
The ALMA Early Science Cycle 1 anticipated capabilities will comprise:

- Thirty-two 12m antennas in the main array, nine 7m antennas (for short baselines) and two 12m antennas (for making single-dish maps) in the Atacama Compact Array (ACA)
- Receiver bands 3, 6, 7 and 9 (wavelengths of about 3, 1.3, 0.8 and 0.45 mm)
- Baselines up to 1km
- Both single field interferometry and mosaics
- Mixed correlator modes (both high and low frequency resolution in the same observation)

Use of the ACA for short baseline interferometry and single-dish observations will only be offered to complement observations with the main array, and not as a stand-alone capability. Single dish use will be limited to spectral line observations. More details will be provided in the Call for Proposals.

Half of ALMA Antennas Delivered to Chajnantor

Al Wootten

Zoom

ALMA commissioning and science verification began on the array early in March, though summer weather caused some delays. By the end of March, Early Science observations had again commenced.

During March, the 33rd and 34th ALMA antennas to emerge from the assembly, integration, and verification process arrived at the 5000m elevation Array Operations Site (AOS). These antennas marked the halfway point in construction of the final complement of 66 antennas. At month's end there were 30 antennas at the AOS: twenty-three 12m telescopes and seven 7m telescopes. Some of the full complement of antennas have returned to the lower level for maintenance or upgrades. There are now 58 antennas in various states on the site. Forty-three front ends have been delivered to the site from the three Front End Integration Centers.

The array at the AOS has been changed into its Cycle 0 extended configuration. Observations have begun in this configuration. Data has been reduced in Chile through the Quality Assurance 2 (QA2) stage, at which the r.m.s. noise from processed images may be compared to that sought in the proposal, along with other checks. After passing QA2, data are packaged, transferred to the ALMA Regional Centers and delivered to the Principal Investigators. At the end of March, all data taken thus far in the compact array has been processed through the QA2 stage. As additional antennas are delivered, the foundations comprising both the extended and compact arrays in Cycle 0 can be populated; further compact array observations should be possible late in the austral winter.

NRAO Community Day Events

Carol Lonsdale

With the anticipated due date for ALMA Cycle 1 proposals in July 2012, and the Jansky VLA, GBT, and VLBA proposal deadline of 1 August 2012, NRAO and the Office of Observatory Science Operations (OSO) announces an opportunity for the scientific community in North America to organize local NRAO Community Day(s).

We invite community members to submit proposals to host an NRAO Community Day(s) event, a one to two day event organized by the proposers. Our goal is to showcase the NRAO instruments and provide information on how to propose and observe with ALMA, Jansky VLA, VLBA, and GBT. The NRAO-led portion of the program will involve a brief overview of the capabilities of each of our instruments, including considerations for a successful NRAO proposal. Additional sessions will provide an opportunity for hands-on experience with the various observation preparation tools and post-processing systems.

A proposal should not be longer than one page and must include the following information:

1. An anticipated program that provides a summary of science or other presentations that the organizer plans to make, if any.
2. The duration of the proposed events, and two or three possible dates.
3. The expected location, size of the audience, list of universities and institutions to be served, and advertisement plan.

The NRAO will support the event by providing staff to describe the NRAO facilities and community support programs, and to staff hands-on training sessions. The NRAO-led portion of the event can be expected to take one full day.

We expect to be able to support one or two Community Day event(s) starting in May 2012. Please note that availability of NRAO staff to support ALMA-related sessions is likely to be limited after June 20.

Interested members of the community should contact Anthony Remijan (**aremijan@nrao.edu (mailto:aremijan@nrao.edu)**) for further details. **Proposals should be sent to the NRAO by 20 April 2012.**

VLA Becomes the Karl G. Jansky Very Large Array

Dave Finley

Top Center: The attending officials, staff, and guests.
Bottom Left: Moreau Parsons, daughter of Karl Jansky.
Bottom Right: NRAO Director Fred Lo commands the start of first official observation of the Jansky VLA. Seated: Ethan Schreier, AUI President; and James Ulvestad, NSF Astronomical Sciences Division Director.

Zoom

Astronomers and officials from around the globe gathered on the high desert of New Mexico on 31 March to officially bestow a new name on the world's most famous radio telescope and to mark its transformation into a new and vastly more powerful tool for science. The iconic Very Large Array (VLA) now is the Karl G. Jansky Very Large Array, honoring the founder of radio astronomy.

"Just as Karl Jansky's groundbreaking discovery of cosmic radio waves in 1932 opened a new era of scientific discovery, the vastly improved capabilities of this telescope will give scientists new ways of tackling the challenges facing 21st-Century astrophysics," said NRAO Director Fred K.Y. Lo.

To celebrate the decade-long effort to bring the VLA, first dedicated in 1980, up to today's technological state of the art, Lo was joined by Ethan Schreier, President of Associated Universities, Inc.; James Ulvestad, Director of the Astronomical Sciences Division of the National Science Foundation; representatives of U.S. Senator Tom Udall and U.S. Rep. Steve Pearce; and astronomers and officials from the U.S., Canada, Mexico, Europe, China, Australia, and Japan. The event formally inaugurated the new name, and recognized those who worked on the project.

The new name, first announced at the January American Astronomical Society meeting, was selected following a call for public submissions that netted 23,331 suggestions submitted by 17,023 people from more than 65 countries. The new name was one of 16,223 unique names submitted.

"The Jansky VLA of today is, in some ways, thousands of times more powerful than the VLA of yesterday. It already has produced scientific discoveries that were not possible before. Over the coming years, we will see an impressive flow of new discoveries made possible by the efforts of many very talented and dedicated people," said Dale Frail, NRAO Assistant Director for New Mexico Operations.

"We are celebrating the emergence of a new telescope built on the foundation of its predecessor. It is a triumph of the engineering prowess of the NRAO and its partners. With this project, our team in New Mexico has elevated the state of the art for radio astronomy, just as they are doing with their contributions to the ALMA telescope in Chile, the millimeter-wavelength companion to the revitalized VLA," Schreier said.

Upon a command from Lo, the twenty-seven 230-ton dish antennas of the Jansky VLA turned toward a set of dwarf galaxies for the official first observation by the renamed facility, and the beginning of a new era of NRAO science.

Upgrading the electronics of the VLA began in 2001, and completion is scheduled for later this year. The upgrade project was funded by the National Science Foundation, and by contributions from Canada and Mexico.

Simultaneous Wide-field Continuum & Spectral Index Imaging with the Jansky VLA

S. Bhatnagar, U. Rau, D. A. Green (Cambridge, UK), and M. P. Rupen

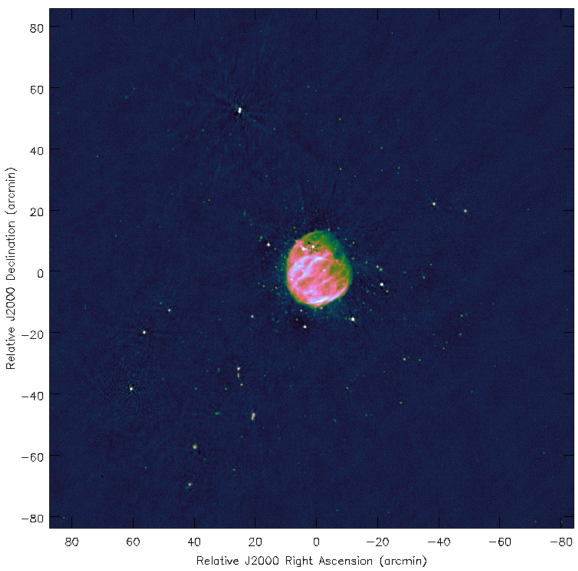


Figure-1. A 2 x 2 deg L-Band image centered on the SNR G55.7+ 3.4 that demonstrates the excellent wideband continuum sensitivity pattern of the Jansky VLA. Sources 1.5 deg from the pointing center are easily detected. The SNR at the center shows numerous filaments with spectral index different from the ambient. The compact source close to the northern edge of the SNR is an unrelated pulsar in the field. The residual imaging artifacts are due to time- and frequency-dependent PB effects.

Zoom

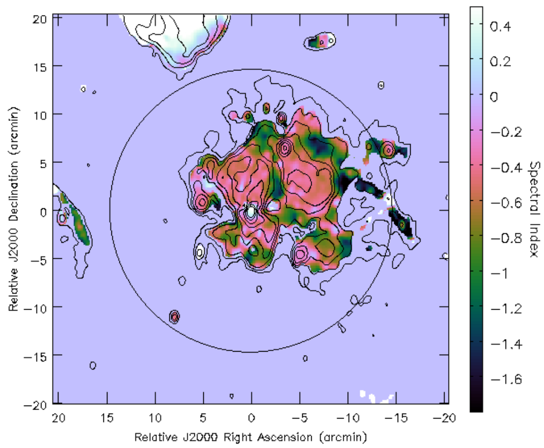


Figure-2. The spectral index image of the SNR G19.6-0.2. Sources of thermal emission with positive spectral index (displayed in white) are clearly separated in this image from the surrounding diffuse non-thermal emission with negative values. The circle indicates the half-power point of the PB.

Zoom

A typical field in the Galactic plane has unresolved compact sources superimposed on diffuse emission at much larger scales. In addition, the radio continuum emission from the Galaxy has a rich mix of thermal and non-thermal components. The strength of emission therefore not only varies as a function of frequency, but the frequency dependence also varies with the scale of emission. Together, these effects make astrophysical interpretation challenging, e.g., in the existing narrow band radio surveys of the Galactic plane, a small region of emission might be a supernova remnant (SNR), an HII region, or a complex combination of both.

While wideband observations can, in principle, disentangle even superimposed regions of thermal and non-thermal emission, wide-band wide-field imaging poses additional challenges. Since the emission from the sky varies with frequency, imaging algorithms now must solve for the frequency dependence of the emission at different spatial scales and correct for the frequency dependent primary beam (PB) effects to recover the true frequency dependence of the emission.

The combination of wide instantaneous bandwidth capabilities of the Jansky Very Large Array (JVLA) and the recently developed MS-MFS algorithm for wide-band imaging[1] now allow, for the first time, simultaneous continuum and spectral-index mapping of complex emission at the highest allowed resolution. With the final goal of wide-band Galactic Plane survey, our group recently used the JVLA for wideband observation and the new MS-MFS algorithm for simultaneous continuum and spectral-index imaging[2].

The observed fields contain superimposed thermal and non-thermal emission at multiple scales. In three of these fields, the spatial extent of the diffuse emission was well sampled in our observations, and small compared to the frequency-dependent PB, allowing reliable spectral index imaging. While the field centered on the composite SNR G16.7+ 0.1 contains flat-spectrum core (spectral index $\alpha = -0.54$; $S \propto \nu^{\alpha}$) surrounded by diffuse emission with steeper spectral index, the field centered on the filled-center SNR G21.5− 0.9 contains extended emission with a relatively uniform spectral index $\alpha = -0.12$). At an r.m.s. noise of 11 μJy and 30 μJy respectively, the spectral distribution was reliably reconstructed in the spectral-index maps of both fields. Another field contains the candidate SNR G19.6-0.2 with weak diffuse emission surrounding strong compact sources, making it difficult to determine the nature of the object based on Stokes-I morphology alone. However, our spectral-index maps clearly separate compact sources of thermal emission near the center from the surrounding diffuse non-thermal emission. This SNR is therefore now re-classified as an irregularly shaped, filled-center SNR.

We also made an 8 hour observation of a field centered on a known but poorly studied SNR G55.7+ 3.4 to evaluate the wide-band imaging performance of the telescope. Comparing images made using the entire data against images made using multiple snapshots we show that, for the purposes of imaging, the instantaneous wide bandwidth adequately compensates for the reduced uv-coverage of snapshots. The emission from this SNR fills the PB at the highest frequency. This scale was not well sampled in our D-array observations. Consequently a reliable spectral-index map covering all scales could not be made. However, the spectral index of an unrelated pulsar as well as of the numerous relatively compact filaments in the field, revealed by our observations, were reliably reconstructed.

Accurate reconstruction of the spectral index distribution beyond just the inner 30-50% of the PB area requires integration of the MS-MFS algorithm for spectral-index mapping with the wideband A-Projection algorithm[3] to account for the effects of the frequency-dependent antenna PB. Work for this is in advanced stages. Once ready, we plan to apply this combined algorithm to image a Galactic Plane area much larger than the antenna PB using wideband mosaic observations with the JVLA and the GBT. Data for this has already been acquired and we will report the results in future papers.

References

1. Parameterized Deconvolution for Wide-band Radio Synthesis Imaging, U. Rau 2010, PhD thesis, New Mexico Institute of Mining and Technology, Socorro, New Mexico, USA
2. EVLA Observations of Galactic Supernova Remnants: Wide-field Continuum and Spectral-index Imaging, S. Bhatnagar, U. Rau, D. A. Green, M. P. Rupen, 2011 ApJ, 739, L20
3. Correcting direction-dependent gains in the deconvolution of radio interferometric images, S.Bhatnagar, T.J.Cornwell, K.Golap, & J. M. Uson, 2008 A&A, 487, 419-429

VLA Explorer Launched

Tania Burchell

(http://www.nrao.edu/explorer/vla/TheVLAExplorer.php)

View the VLA Explorer (http://www.nrao.edu/explorer/vla/TheVLAExplorer.php)

In honor of the VLA's re-dedication as the Karl G. Jansky Very Large Array, the NRAO Education and Public Outreach team launched the VLA Explorer, the latest in our Explorer series of interactive video tours.

Like its cousin, the ALMA Explorer, the VLA Explorer showcases dozens of exclusive videos acquired and edited by us to educate the general public about the engineering, astronomy, STEM careers, and operations of this unique radio telescope observatory. The VLA Explorer’s expert host is Rick Perley, and several other familiar faces join him as he gives guided tours in and around the VLA and the Pete V. Domenici Science
Operations Center.

Both these and future Explorers are built in HTML5 for improved cross-platform stability (including mobile devices) and the ease of adding new and updated stops.

Enjoy your virtual tour of the VLA!

This Month @ the NAASC

Splatalogue

Anthony Remijan, Robin Pulliam, and Dong-Chan Kim

Since 2006, Splatalogue has attempted to collate, rationalize and extend existing spectroscopic resources for use by the astronomical community. Splatalogue is a transition-resolved compilation of data from numerous sources, including JPL, CDMS, Lovas/NIST, as well as Frank Lovas' Spectral Line Atlas of Interstellar Molecules (SLAIM). Splatalogue also includes H, He and C recombination lines; data from the Toyama Microwave Atlas for spectroscopists and astronomers; data from Frank De Lucia's Ohio State University lab; and new 13C1-methyl formate data, provided by spectroscopists working on internal rotors. Splatalogue currently contains over 6.1 million lines in 1395 individual entries that are available **on-line (http://www.splatalogue.net)** and via the ALMA Observing Tool (OT).

Left to right: Splatalogue Basic Search Page, Splatalogue for smartphones, and the QR code for access to the mobile version of Splatalogue.

Over the past several years, there has been an active effort to improve the overall functionality and usability of Splatalogue. The NAASC scientists developing the Splatalogue interface have worked closely with the developers of the ALMA OT and the Common Astronomy Software Applications (CASA) package. For example, users of the ALMA OT can access the online version of Splatalogue through standard Virtual Astronomical Observatory SLAP protocols. Information on configuring your tools to access Splatalogue via the Internet is **on-line (http://www.cv.nrao.edu/php/splat/SLAPNotes.html)** . Users of both the ALMA OT and CASA have "offline" versions of Splatalogue and CASA users can load their own line catalogs using the "Dump to CASA" feature off the Splatalogue homepage.

We are now offering new options to navigate the spectral lines available via Splatalogue. The user community has suggested a simpler, more efficient way of searching for and obtaining the more common spectral line features from the radio to submillimeter wavelength.

The Splatalogue search page has several new and quick search features including:

1. **The Quick Picker:** Located on the far left. Popular species are included. Click on your favorite, hit search and the results will pop up. You can also limit the frequency by entering in your preferred range in GHz.
2. **Search Bar:** Located in the center of the page. Type in the name (or in some cases, the formula) of your favorite molecule and all species with that molecule name, including isotopologues of that species, will be displayed. Again, you can limit the frequency displayed by entering in your preferred range in GHz.
3. **Telescope Band Search:** Located at the center of the page. This feature allows users to search molecules by telescope bands of the GBT, Jansky VLA, and ALMA. Instead of limiting your search by typing in a specific frequency range, you can choose your favorite telescope band of interest. NOTE: the current version only allows searching one band at a time!
4. **Astronomical Filters:** Located on the far right. This option allows you to limit your search to the species currently known within certain astronomical environments. Also available is the "Top 20 list" which is the same as in the ALMA OT. When selected, the Top 20 species will be displayed. You can also choose your own desired frequency range here as well to limit the output.

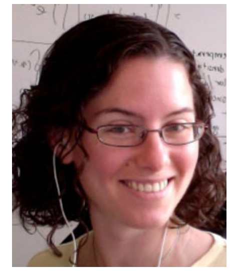
However, you can always return to the original Splatalogue homepage but clicking on the "Advanced" tab from the basic page. This view will become the new Splatalogue home page.

Finally, if you just need a frequency of a select few molecules and you do not have full access to your computer, www.splatalogue.net now has a mobile version for use on smartphones. This limited view gives selected Quick Picker molecules, allows a frequency range search and has access to all the astronomical filters of the basic search page. The display is limited to only the molecular name, formula and recommended NRAO rest frequency and the resolved quantum numbers for the selected interstellar molecule. A screenshot of this page is shown in the figure above, and can be accessed via the accompanying QR code.

Do you have questions, comments, suggestions or concerns about Splatalogue? We would love to hear from you! Please submit a Help Desk ticket through the ALMA Science Portal. The Help Desk is readily accessed via the **ALMA Science Portal (http://www.almascience.org)** . Select your preferred ALMA Regional Center (ARC) on the map, then clicking on the Help Desk link located on the left panel under "User Services at ARCs." You must first register with the ALMA Science Portal to submit a Help Desk ticket. A direct link to the Help Desk has also been placed under "Navigate" in the top left menu of the advanced Splatalogue search page.

New NAASC postdoc

In addition to the Jansky Fellowship program, the NRAO also offers a Postdoctoral Fellow program that provides the opportunity for hands-on training in areas of technical expertise and observatory operations, in addition to offering exciting research opportunities with NRAO facilities. We are very pleased to announce that Jennifer Donovan Meyer, an NRAO Postdoctoral Fellow, will be joining NRAO in January 2013, working in areas directly related to the new capabilities provided by ALMA. Jennifer is currently a postdoc at Stony Brook University, and received her PhD from Columbia University in 2009. At NRAO, Jennifer will study the evolution of early-type galaxies.



(images/postdoc.jpg)

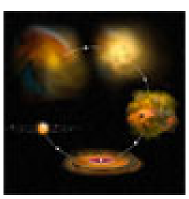
Jennifer Donovan Meyer

Zoom (images/postdoc.jpg)

Recent Press Releases

Famous Radio Telescope Officially Gets New Name (http://www.nrao.edu/pr/2012/rededicate/)
31 March 2012

Astronomers and officials from around the globe gathered on the high desert of New Mexico Saturday to officially bestow a new name on the world's most famous radio telescope and to mark its transformation into a new and vastly more powerful tool for science. **Read More ... (http://www.nrao.edu/pr/2012/rededicate/)**



Astronomers Get Rare Peek at Early Stage of Star Formation (http://www.nrao.edu/pr/2012/clumpcores/)
14 March 2012

Using radio and infrared telescopes, astronomers have obtained a first tantalizing look at a crucial early stage in star formation. The new observations promise to help scientists understand the early stages of a sequence of events through which a giant cloud of gas and dust collapses into dense cores that, in turn, form new stars. **Read More ... (http://www.nrao.edu/pr/2012/clumpcores/)**

Career Opportunities

New Postings

Pipeline Engineer (https://careers.nrao.edu/applicants/Central?quickFind=50782) : The NRAO in Charlottesville, Virginia is accepting applications for a scientific software developer to assist in the development of software to script and schedule data processing and reprocessing pipeline runs on the NAASC computing cluster, including the development of a web-based interface within which users will specify parameters with which to run the pipeline.

Assistant Director, ALMA North American Operations: (https://careers.nrao.edu/applicants/Central?quickFind=50783) The NRAO in Charlottesville, Virginia is seeking an Assistant Director for ALMA North American Operations to ensure ALMA NA operations achieve maximum scientific and cost effectiveness of ALMA, and to work in close coordination with the NRAO Director.

Assistant Director, Coordinated Development Lab: (https://careers.nrao.edu/applicants/Central?quickFind=50762) The NRAO in Charlottesville, Virginia is recruiting for an Assistant Director for its Coordinated Development Laboratory (CDL). The Head of the Observatory-wide CDL will provide vision and leadership and address key technical challenges of the next generation of instruments while maintaining the performance of current NRAO facilities at state of the art.

Tenure Track Astronomer (https://careers.nrao.edu/applicants/Central?quickFind=50784) : The NRAO in Charlottesville, Virginia is recruiting for a tenure track Astronomer. The tenure track astronomer system at the NRAO parallels the tenure track system in research universities, with the support of the science mission of the Observatory substituting for teaching. Astronomers are expected to assume a leading role at the Observatory, and in the wider astronomical community.

From the Archives

Ellen Bouton

About this month's photo: The Charlottesville computer room in 1967. Standing is Sandy Braun, and at the console is Mary Jennings, an IBM employee. There were computer operators on duty 24/7, and tapes of data taken in Green Bank, at the 140ft, the 300ft, and the interferometer, came over daily on the shuttle to be processed in Charlottesville. Processing programs were handwritten on paper and transferred to cards using a keypunch, then read into the computer from decks of punched cards to process the data from the tapes (Note the punched cards in Sandy's hand and in the box just to her right). The output, often spectral data from our autocorrelators, was hundreds of pages of numbers which had to be assessed by eye for quality control. The trick was to get the stacks of paper back to Green Bank in time for the observers to change their observing program to take the new data into consideration. To Mary's right is the console. The system was controlled from it - the operating system or diagnostics were loaded by selecting various switch options. Mary is at the main terminal with a "standard" setup for those days: a teletype keyboard with printer output. Operating system directives were entered here by the computer operator, since this was prior to the days of video terminals (aka Cathode Ray Terminals or CRTs) with associated keyboards. The computer is an IBM 360 series, and the operating system was known as OS/360; programs were probably written in PL/1 or Fortran. Thanks to Bob Burns and Gene Runion for identifying the people, and to Dave Hogg and Gareth Hunt for caption information.

From the Archives is an ongoing series illustrating NRAO and U.S. radio astronomy history via images selected from our collections of individuals' and institutional papers. If readers have images they believe would be of interest to the Archives, please contact Ellen Bouton, **ebouton@nrao.edu (mailto:ebouton@nrao.edu)** .

Staff | Policies | Diversity

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