

## Upcoming Events



[17th Synthesis Imaging Workshop \(http://www.event.com/events/17th-synthesis-imaging-workshop/event-summary-od59eb6cd1474978bce811194b2ff961.aspx\)](http://www.event.com/events/17th-synthesis-imaging-workshop/event-summary-od59eb6cd1474978bce811194b2ff961.aspx)

Jun 29 - Jul 17, 2020 | Virtual



[Compact Objects and Energetic Phenomena in the Multi-Messenger Era Mini Conference \(http://go.nrao.edu/ngvla20\)](http://go.nrao.edu/ngvla20)

Jul 14 - 15, 2020 | Virtual

## NRAO/GBO Return to Full Operations

Tony Beasley (NRAO Director, AUI Vice President for Radio Astronomy)



The North American research facilities of the National Radio Astronomy Observatory (NRAO) and the Green Bank Observatory (GBO) emerged from Infectious Disease Operations Status and returned to normal operating status, effective Monday, 8 June 2020. The North American NRAO/GBO instruments are all operational, including the

Jansky Very Large Array, the Very Long Baseline Array, and the Green Bank Telescope. IT systems are nominal. In Chile, the Office of Chilean Affairs and our NRAO International Staff Members in the Joint ALMA Observatory (JAO) remain in Infectious Disease Operations Status for now, with Chile passing through some challenging times due to COVID-19. The JAO has begun publishing plans to bring ALMA online in coming months.

The NRAO/GBO return and ramp-up to full operations will continue through June, July, and August, with a target of 5 September 2020 to achieve full operations. To date, our initial steps in the return to operations has gone well at all sites. New processes and procedures have been developed, refined, communicated, and are in place. Any problems are being noted and quickly addressed. Over the next few weeks, the number of staff who require NRAO/GBO facility access will increase, and we have plans and processes in place to enable this.

We will continue to carefully monitor the status of COVID-19 in all our communities. We are committed to doing everything possible to successfully navigate past this crisis for our staff, our communities, and the observatories.

## ngVLA Project News

Eric Murphy

### ngVLA Project Progress

Over the past year, the next generation Very Large Array (ngVLA) project has continued to make substantial progress despite the added challenges of the COVID-19 pandemic. In March of this year, with the ngVLA



Science Book and Reference Design Concept in-hand, the ngVLA Project Office produced written responses to requests for information from the Astro2020 Radio, Millimeter, and Submillimeter (RMS) Observations from the Ground project panel, in addition to making an in-person presentation. At this point, we are waiting for the Decadal Survey process to run its course, and are optimistically looking forward to a prominent ranking by the steering committee when their final report is released, hopefully sometime early next year.

While formal input into the Astro2020 Decadal Survey appears to now be behind us, the project continues to increase the overall maturity of facility design as is necessary to be considered a NSF Major Research Equipment and Facilities Construction (MREFC) candidate. A major activity associated with this effort is the design and construction of a prototype antenna. NRAO/ngVLA recently awarded three antenna costed concept studies with a final design downselect set to occur this fall in time to support the construction (contingent on additional funding) of a prototype to be delivered in 2023. Our Science and Technical Advisory Councils (SAC and TAC) have played integral roles by helping to review associated proposal materials.

As the project continues to progress towards a final Conceptual Design, the ngVLA remains closely engaged with the scientific and engineering communities. While, to date, this has largely been done through support of in-person meetings, COVID-19 has required finding alternatives. For example, while the 2020 ngVLA Science Meeting on *Compact Objects and Multi-Messenger Astronomy* has been moved to June 2021, we are still supporting a virtual mini-meeting 14-15 July 2020 where invited speakers will give brief talks and participate in a group discussion. The ngVLA SAC is also organizing the *ngVLA Summer Short Talk Series*, a weekly ~20-minute talk with scientific experts followed by Q&A sessions to keep the excitement of the project going. All talks and Q&A sessions will be archived for download by those unable to attend.

The ngVLA Project Office continues to be very busy and highly motivated. The project is extremely grateful to its community members and the NSF for their continued support. We are looking forward to the day when we are able to open up a new window on scientific discovery by delivering them the most powerful and sophisticated radio telescope in the world.

## ngVLA Memo Series

We wish to draw attention to the growing body of scientific, technical, and computing memos published in the [ngVLA Memo Series \(https://ngvla.nrao.edu/page/memos\)](https://ngvla.nrao.edu/page/memos). Browse titles and download memos of interest. Contributions to the series are welcomed. [Submission instructions are online \(http://library.nrao.edu/memsub.shtml\)](http://library.nrao.edu/memsub.shtml).

## Virtual Multi-Messenger Mini-Conference: 14-15 July 2020

Please join our two-day virtual [\*Compact Objects and Energetic Phenomena in the Multi-Messenger Era \(https://go.nrao.edu/ngvla20\)\*](https://go.nrao.edu/ngvla20) mini-conference this summer on 14-15 July 2020. Each day will consist of a two-hour session featuring a series of six compelling 15-minute talks.

The talks will cover twelve topic areas pivotal to the future of multi-messenger astronomy, and bring together scientists with expertise in a wide range of fields to discuss current progress, future directions, and how to best utilize the suite of multi-messenger facilities for the 2020s and beyond. [Registration, the schedule, and the invited speaker list are online \(https://go.nrao.edu/ngvla20\)](https://go.nrao.edu/ngvla20).

Please stay tuned for more information on our live, multi-messenger conference that will be held next summer, 23-25 June 2021, in Saint Paul, Minnesota.

# Semester 2020B Proposal Time Allocation

Dale A. Frail



The NRAO has completed the Semester 2020B proposal review and [time allocation process](https://science.nrao.edu/observing/proposal-types/peta) (<https://science.nrao.edu/observing/proposal-types/peta>) for the [Very Large Array \(VLA\)](https://science.nrao.edu/facilities/evla) (<https://science.nrao.edu/facilities/evla>) and the [Very Long Baseline Array \(VLBA\)](https://science.nrao.edu/facilities/vlba) (<https://science.nrao.edu/facilities/vlba>).

For the VLA the A-configuration will be available in the 2020B semester and 201 new proposals were received by the 3 February 2020 submission deadline, including three large and 25 time critical (triggered) proposals. The oversubscription rate (by proposal number) was 2.9 and the proposal pressure (hours requested over hours available) was 2.8, both of which are similar to recent semesters.

For the VLBA, 38 new proposals were submitted. The oversubscription rate was 2.0 and the proposal pressure was 2.8, both of which are similar to recent semesters.

There was significant demand for the time made available on space observatories through inter-observatory agreements, and ten proposals requesting time on HST, Swift, Chandra, or XMM-Newton (together with AUI/NRAO telescope time) were submitted.

Proposals submitted to the GBO were assessed through the same process. Sixty-five proposals for the Green Bank Telescope (GBT) were received for the 2020B Semester, including four large proposals. The oversubscription rate is 2.2 and the proposal pressure is 3.0. For information on proposals for GBT observations see the [GBO website](https://greenbankobservatory.org/science/gbt-observers/proposals/past-proposal-calls/2020b-results/) (<https://greenbankobservatory.org/science/gbt-observers/proposals/past-proposal-calls/2020b-results/>).

The proposals were reviewed for scientific merit by nine Science Review Panels (SRPs) and for technical feasibility by NRAO staff. These reviews were completed in February – March 2020 and then considered by the [Time Allocation Committee \(TAC\)](https://science.nrao.edu/observing/proposal-types/time-allocation-committee) (<https://science.nrao.edu/observing/proposal-types/time-allocation-committee>) during a remote meeting on 23-24 April 2020. The TAC – comprising the 9 SRP chairs – was charged with recommending a science program for Semester 2020B to the Observatory Director. The recommended program was reviewed and approved on 6 May 2020.

A disposition letter was sent to the Principal Investigator and Co-Investigators of each proposal on 15 May 2020 and a [TAC report](https://science.nrao.edu/observing/proposal-types/tac-reports/20b-tac-report) (<https://science.nrao.edu/observing/proposal-types/tac-reports/20b-tac-report>) containing information for proposers and observers, including statistics and telescope pressure plots, was released the same day. The [approved science program](https://science.nrao.edu/science/science-program) (<https://science.nrao.edu/science/science-program>) for the VLA and the VLBA has been posted to the [NRAO science website](http://science.nrao.edu/) (<http://science.nrao.edu/>). The authors, title, abstract, and scheduled hours for each approved proposal can be accessed from the [Proposal Finder Tool](http://library.nrao.edu/proposals) (<http://library.nrao.edu/proposals>).

The [Student Observing Support program](https://science.nrao.edu/opportunities/student-programs/sos) (<https://science.nrao.edu/opportunities/student-programs/sos>) continues to be available for NRAO observing programs, and we encourage Principal Investigators of highly ranked VLA and VLBA proposals to consider applying for support.

The NRAO welcomes community feedback on the [proposal review and time allocation process](https://science.nrao.edu/observing/proposal-types/proposal-review-system) (<https://science.nrao.edu/observing/proposal-types/proposal-review-system>). Please provide such feedback via the Proposal Review department of the [NRAO Helpdesk](http://help.nrao.edu/) (<http://help.nrao.edu/>).

## ALMA Program News

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Al Wootten



On 9 June 2010, five ALMA antennas made test observations from the antenna stations currently used by the Atacama Compact Array, under the guidance of Richard Hills, Alison Peck, and the commissioning team.

### ALMA Science Sustainability

The schedule for the Cycle 8 Call for North American Development *Project* Proposals is delayed by six months due to COVID-19. The schedule for the Cycle 8 call for North American Development *Study* Proposals proceeds as planned: Study Proposals are now being refereed.

### The [ALMA Development Projects Implementation Plan](https://science.nrao.edu/facilities/alma/alma-development-cfp/supporting-documents/alma-development-studies-implementation-plan)

(<https://science.nrao.edu/facilities/alma/alma-development-cfp/supporting-documents/alma-development-studies-implementation-plan>) is available for review and

describes the fundamental processes for project proposal and review. The call for proposals will be open to the North American (NA) ALMA Operations Partnership, which is defined as the community of astronomers and scientists in related fields from NA ALMA partner countries. Projects will be funded for Cycle 8 in an integrated, multi-year award. Priority will be given to those Projects which align with the ALMA Development Roadmap ([ALMA Memo 612](http://library.nrao.edu/public/memos/alma/main/memo612.pdf) (<http://library.nrao.edu/public/memos/alma/main/memo612.pdf>)). Topics of particular interest to the NA ALMA Partnership include larger bandwidths and improved receiver sensitivity, such as would be provided by an upgraded correlator and receivers.

Second Generation Correlator proposals must meet the specifications of the Correlator Working Group report, the first draft of which is expected by the proposal call date. All proposals and resulting instrumentation must comply fully with ALMA standards for system interfaces, interoperability, and documentation. NRAO staff can help applicants develop plans or steer them toward relevant documentation, upon request and with sufficient notice.

The date of issue for the Call for Proposals will be 15 January 2021. Project execution can only begin after adjudication at the April 2022 ALMA Board Meeting. If you are planning or even considering proposing in response to this Call, you must file a Notice of Intent before 28 February 2021. In contrast to previous Calls, **submission of a Notice of Intent is mandatory**. Additional details will be released with the Call in January 2021. The deadline for receiving the proposals will be 15 April 2021.

### ALMA Operations

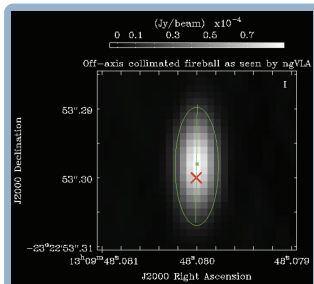
The COVID-19 pandemic continues to impact the global community. ALMA users and staff have not been idle, however. While ALMA operations remain suspended, staff have been working actively on plans to restart operations as soon as feasible. In these unprecedented circumstances, ALMA's first priority is the health and safety of all staff, many of whom travel long distances by bus and plane to reach the remote ALMA telescope site in the Atacama Desert of northern Chile. Given the current evolution of the COVID-19 outbreak in Chile at their winter's onset, it is unclear when a ramp-up to start operations could begin, or when a restart of science

operations will be possible. ALMA is working on guidelines and considerations for the restart of operations and will provide an update to the community soon.

In the meantime, Caretaker teams continue to maintain the safety of the ALMA equipment and infrastructure in Santiago and San Pedro, while all other staff continue to work remotely from their homes. The ALMA Regional Centers continue to provide support to their communities. If you have any questions, comments, or concerns related to the situation at ALMA, please contact the [ALMA Helpdesk \(https://help.almascience.org/\)](https://help.almascience.org/).

## Compact Binary Mergers with an ngVLA

Dario Carbone (Univ Virgin Islands) & Alessandra Corsi (Texas Tech Univ)



Simulated 4-hr ngVLA observation at 2.4 GHz (Corsi et al. 2018b) of a top-hat collimated fireball from a NS-NS merger observed off-axis at day  $\approx 150$  since merger. The off-axis collimated ejecta appears to have an emission centroid (green dot) offset from the centroid at early times or optical wavelengths (red cross). The emission centroid moved over time as the collimated jet propagated, enabling us to trace milli-arcsec scale expansion.

On 17 August 2017, we observed for the first time the merger of two neutron stars (NSs) in both gravitational waves (GW) and in electromagnetic (EM) waves (Abbott et al. 2017a (<https://ui.adsabs.harvard.edu/abs/2017ApJ...848L..13A/abstract>), Abbott et al. 2017b (<https://ui.adsabs.harvard.edu/abs/2017ApJ...848L..12A/abstract>)). A massive observing campaign led to the discovery of the EM counterpart to this source in all bands, from gamma-rays to radio. A plethora of information was obtained from this single event, on the slower thermally-emitting material (kilonova and the r-process nucleosynthesis) traced by UV-optical-IR emission, and on the non-thermal fastest-moving ejecta traced by radio and X-ray emission (Abbott et al. 2017b (<https://ui.adsabs.harvard.edu/abs/2017ApJ...848L..12A/abstract>)).

Compact binary mergers containing at least one NS are laboratories of extreme physics. Increasing the sample of those systems with extensive GW and EM observations is crucial to answer some of the most pressing questions left open by GW170817. To this end, it is of utmost importance that the community invests in a next generation Very Large Array (ngVLA) with  $\sim 10x$  the Jansky VLA sensitivity, a compact core for high surface-brightness sensitivity, and extended baselines for high-resolution imaging (Bolatto et al. 2017 (<https://ui.adsabs.harvard.edu/abs/2017arXiv171109960B/abstract>)). Indeed, GW170817 was at a distance of only 40 Mpc, and its afterglow peaked at a radio flux density of only 100 microJy (Dobie et al. 2018 (<https://ui.adsabs.harvard.edu/abs/2018ApJ...858L..15D/abstract>), Carbone & Corsi 2018 (<https://ui.adsabs.harvard.edu/abs/2018ApJ...867..135C/abstract>)), implying that similar events located at the horizon distance of current and future generation GW observatories would not be detectable with current radio arrays.

The improved sensitivity of an ngVLA, combined with the superior angular resolution, would enable a more accurate investigation of the properties of the relativistic outflows from compact binary mergers (see figure). Of particular relevance would be the capability of an ngVLA in breaking the degeneracy between outflow spatial structure and magnetic field properties (see e.g. Corsi et al. 2018a (<https://ui.adsabs.harvard.edu/abs/2018ApJ...861L..10C/abstract>), Lazzati et al. 2018 (<https://ui.adsabs.harvard.edu/abs/2018PhRvL.120x1103L/abstract>), Gill & Granot 2018 (<https://ui.adsabs.harvard.edu/abs/2018MNRAS.478.4128G/abstract>), Mooley et al. 2018 (<https://ui.adsabs.harvard.edu/abs/2018Natur.561.355M/abstract>), Ghirlanda et al. 2019 (<https://ui.adsabs.harvard.edu/abs/2019Sci...363..968G/abstract>)).

Last but not least, the surface brightness sensitivity of an ngVLA would help us trace the properties of the host galaxies of compact binary mergers, and the potential correlation with recent star formation rate. This in turn would help us shed light on the properties of their progenitors, their environments, and formation history.

## Recent Media Releases

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### [Supergiant Atmosphere of Antares Revealed by Radio Telescopes](https://public.nrao.edu/news/supergiant-atmosphere-of-antares-revealed-by-radio-telescopes/)

[\(https://public.nrao.edu/news/supergiant-atmosphere-of-antares-revealed-by-radio-telescopes/\)](https://public.nrao.edu/news/supergiant-atmosphere-of-antares-revealed-by-radio-telescopes/)

16 June 2020



### [New Distance Measurements Bolster Challenge to Basic Model of Universe](https://public.nrao.edu/news/challenge-model-of-universe/)

[\(https://public.nrao.edu/news/challenge-model-of-universe/\)](https://public.nrao.edu/news/challenge-model-of-universe/)

11 June 2020



### [Astronomers Find Elusive Target Hiding Behind Dust](https://public.nrao.edu/news/target-hiding-behind-dust/) (<https://public.nrao.edu/news/target-hiding-behind-dust/>)

8 June 2020



### [Astronomers Discover New Class of Cosmic Explosions](https://public.nrao.edu/news/new-class-cosmic-explosions/) (<https://public.nrao.edu/news/new-class-cosmic-explosions/>)

26 May 2020



### [ALMA Discovers Massive Rotating Disk in Early Universe](https://public.nrao.edu/news/alma-discovers-massive-rotating-disk-in-early-universe/)

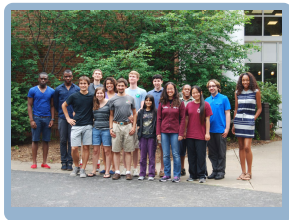
[\(https://public.nrao.edu/news/alma-discovers-massive-rotating-disk-in-early-universe/\)](https://public.nrao.edu/news/alma-discovers-massive-rotating-disk-in-early-universe/)

20 May 2020

## From the Archives

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Ellen Bouton



**About this month's photo:** Charlottesville summer students in 2013 [Left to right]: Ayodotun Agbale, Ekene Elodimuor, Nicholas Kern, Jared Keown, Laiya Ackman, Diana Powell, Rafael Hagen, Adrian Mead, Zaarah Mohamed, Daniel Calem, Anna Ho, Ajamu Abdullah, Jennifer Kadowaki, Adrian Lucy, Aara'L Yarber. Not in the photo: Sierra Smith, Sinclair Manning. (Thanks to Jeff Mangum for identifications.)

For over six decades, NRAO has welcomed summer students to our sites to work on a wide variety of research projects with NRAO staff mentors. COVID-19 protocols have changed (but not canceled!) the summer 2020 program, which will run remotely, and we expect to deliver a rich and unique research and professional development experience for our incoming class of 38 students. The kickoff *Radio Astronomy Bootcamp* will be fully online this year, following which all students will work remotely on their research under supervision of their mentors. Since its inception in 1959, the summer student program has engaged over 1,200 young people in scientific research, and many NRAO summer students have gone on to distinguished careers in astronomy and other physical sciences.

**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 \(mailto:archivist@nrao.edu\)](mailto:archivist@nrao.edu).



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