

# NRAO Call for Proposals: Semester 2017A

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30 June 2016



The National Radio Astronomy Observatory (NRAO) invites scientists to participate in the Semester 2017A Call for Proposals for the Karl G. Jansky Very Large Array (VLA).

**The submission deadline for Semester 2017A proposals is Monday, 1 August 2016, at 17:00 EDT (21:00 UTC).**

The NRAO especially wishes to highlight continuing opportunities for joint observations with the **Chandra X-ray Observatory**, the **Hubble Space Telescope** and the **Swift Gamma-Ray Burst Mission**.

Proposal preparation and submission are via the NRAO Proposal Submission Tool (PST) available at [NRAO Interactive Services \(http://my.nrao.edu/\)](http://my.nrao.edu/). Note that PST use requires registration. Proposers who need assistance with proposal preparation or have questions regarding the Call or NRAO telescope capabilities should contact Observatory staff via the NRAO [Helpdesk \(https://help.nrao.edu/\)](https://help.nrao.edu/).

## News & Opportunities

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### VLA Time Allocation Under a New Organization

On 20 November 2015, the National Science Foundation (NSF) selected Associated Universities, Inc. (AUI) to manage the National Radio Astronomy Observatory (NRAO) through a new 10-year cooperative agreement. The new agreement includes the operation of the Karl G. Jansky Very Large Array (VLA), the North American share of the international Atacama Large Millimeter/submillimeter Array (ALMA), and NRAO's development laboratories and administrative and management functions, effective 1 October 2016.

The Green Bank Telescope (GBT) and Very Long Baseline Array (VLBA), which were recommended for divestment several years ago, will exit NRAO and become independent facilities known as the Green Bank Observatory (GBO), and the Long Baseline Observatory (LBO).

Because of this reorganization, the 2017A Call for Proposals is now divided into three separate calls for the VLA, LBO, and GBO. This call is for the VLA only; the call for LBO can be found [here \(https://science.nrao.edu/observing/call-for-proposals/lbo\\_2017a/\)](https://science.nrao.edu/observing/call-for-proposals/lbo_2017a/) and the call for GBO can be found [here \(https://science.nrao.edu/observing/call-for-proposals/gbo\\_2017a/\)](https://science.nrao.edu/observing/call-for-proposals/gbo_2017a/).

### Continuing Opportunities

**Joint Observations with Chandra X-ray Observatory**

In previous semesters, the community has had the opportunity to propose for observing time on NRAO facilities through a joint program with the Chandra X-ray Observatory. The NRAO would like to alert the community to the fact that, beginning in semester 2016A proposers to the NRAO will have the opportunity to request time on Chandra, to be awarded on the recommendation of the NRAO Telescope Allocation Committee (TAC) and approved by the NRAO Director. Up to 120 ksec will be made available to NRAO proposers annually. See the [Joint Observations with Chandra \(https://science.nrao.edu/observing/call-for-proposals/nrao\\_2017a/chandra\)](https://science.nrao.edu/observing/call-for-proposals/nrao_2017a/chandra) page for details.

### **Joint Observations with the Hubble Space Telescope (HST)**

By agreement between the NRAO and the Space Telescope Science Institute, STScI will be able to award up to 3% of the available time on NRAO's North American facilities to highly ranked proposals that request time on both HST and NRAO telescopes. In return, STScI has offered 30 orbits of HST time for allocation by the NRAO TAC to proposals submitted for the NRAO deadlines for Semester 2016B and Semester 2017A. See the [Joint Observations with HST \(https://science.nrao.edu/observing/call-for-proposals/nrao\\_2017a/hubble-space-telescope\)](https://science.nrao.edu/observing/call-for-proposals/nrao_2017a/hubble-space-telescope) page for details.

### **Joint Observations with Swift Gamma-Ray Burst Mission**

To foster correlative observations, a joint Swift/NRAO observing program has been established, detailed in a [Memorandum of Understanding \(http://swift.gsfc.nasa.gov/proposals/nrao.html\)](http://swift.gsfc.nasa.gov/proposals/nrao.html). By this agreement, the Swift Program permits NRAO to award up to 300 kiloseconds of Swift observing time per year. Similarly, NRAO permits the Swift Guest Investigator (GI) Program to award NRAO observing time. See the [Joint Observations with Swift \(https://science.nrao.edu/observing/call-for-proposals/nrao\\_2017a/swift\)](https://science.nrao.edu/observing/call-for-proposals/nrao_2017a/swift) page for details.

### **Joint Observations with Fermi Gamma-ray Space Telescope**

We remind the community that it is possible to propose for observing time on NRAO facilities through the Fermi Gamma-ray Space Telescope Joint Proposal Opportunity or the Cooperative Proposal Opportunity. See the [Joint Observations with Fermi \(https://science.nrao.edu/observing/call-for-proposals/nrao\\_2017a/fermi\)](https://science.nrao.edu/observing/call-for-proposals/nrao_2017a/fermi) page for details.

### **Joint Proposals Between the GBT, LBO, and NRAO**

Observing programs that require combinations of the GBT, VLBA, and/or the VLA should submit a proposal for each of the requested telescopes, with a clear justification for each, as has been the case to date. The proposals will be reviewed as before and considered jointly by the Time Allocation Committee. VLBI proposals which request the GBT or VLA (or the HSA, for example) as elements of the VLBI array do not need separate proposals---those telescopes can be selected as separate VLBI stations from a VLBA/HSA proposal.

### **Director's Discretionary Time for Education and Public Outreach**

Proposals for Director's Discretionary Time (DDT) may be submitted at any time. They must be submitted through the [PST \(https://my.nrao.edu/\)](https://my.nrao.edu/). DDT proposals are intended to address [targets of opportunity \(https://science.nrao.edu/observing/proposal-types/too\)](https://science.nrao.edu/observing/proposal-types/too), high-risk/high-return [exploratory time \(https://science.nrao.edu/observing/proposal-types/exploratoryproposals\)](https://science.nrao.edu/observing/proposal-types/exploratoryproposals), or other science opportunities deemed sufficiently urgent to justify prompt action.

DDT proposals may also be submitted for the purpose of education and public outreach - for example, to image an iconic source or to support a educational opportunity for students. Such proposals should clearly justify the requirements for the requested time allocation and observing mode on any given instrument, and should describe the anticipated impact of the observation.

While there is not an *a priori* limit to time that can be requested via DDT, it is expected that no more than 5% of the observing time on each telescope will be allocated for this purpose.

## Other Proposal Opportunities

The NRAO would like to make users aware that there are additional proposal opportunities as follows:

- **High Risk Proposals:** As a means of maximizing its scientific impact through cutting-edge observations, the Observatory encourages the submission of high-risk/high-reward proposals.
- **Commensal Observing:** NRAO telescopes and backends are sufficiently flexible in many cases to allow two experiments to run commensally. To the degree that this enhances science return from the telescopes, NRAO wishes to support commensal projects subject to resource and scheduling constraints.
- **Filler Programs:** Some programs are not time critical, strongly dependent on array configuration, or require highly subscribed LST ranges. Such programs may be able to take advantage of "filler" time.

Further information about each of these programs can be found [here](https://science.nrao.edu/observing/proposal-types/proposal-opportunities) (<https://science.nrao.edu/observing/proposal-types/proposal-opportunities>).

## Proposal Guide

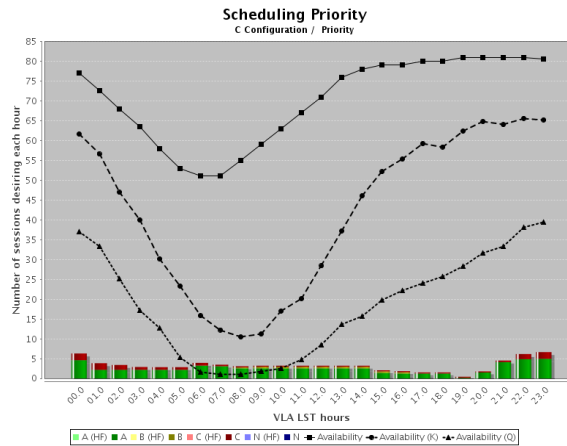
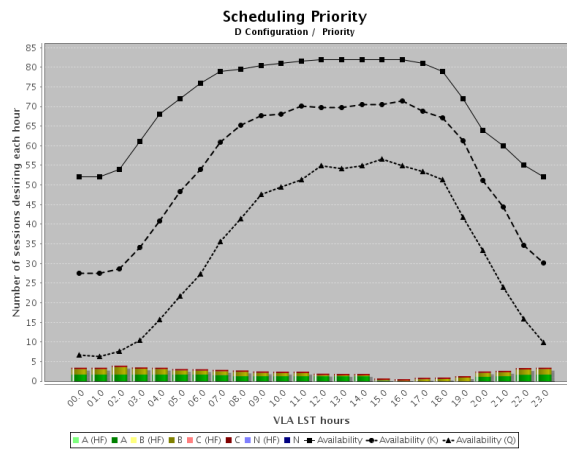
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### VLA Configuration Plans and Science Time Available

The 1 August 2016 deadline covers the observing period 10 February 2017 through 28 August 2017 (Semester 2017A), corresponding to the D and C configurations. Multi-configuration proposals that include the D or C configuration may also be submitted. Additionally, proposals requesting only configurations that will fall in semester 2017B (or later) may be submitted if the Principal Investigator is a graduate student. NRAO offers this service to provide scientific and technical feedback for students, and to provide them with an opportunity to re-submit their proposals for their principal semester with this information in hand. Students should ensure that their status is up to date and correct in the NRAO User Database. Please refer to the [VLA Configuration Plans](http://go.nrao.edu/vla-plan) (<http://go.nrao.edu/vla-plan>) for details and availability of upcoming configurations.

**Note that semester 2016A was the last semester NRAO offered any hybrid configuration. Proposers with very southern or northern targets should consult the [Array Configurations](http://go.nrao.edu/array) (<http://go.nrao.edu/array>) section of the [Guide to Proposing for the VLA](http://go.nrao.edu/vla-prop) (<http://go.nrao.edu/vla-prop>) on how to combine principal configurations to obtain similar surface brightness sensitivity to the hybrids.**

Plots of estimated available observing hours as a function of LST and weather conditions for the D and C configurations in semester 2017A are below. In these plots, engineering, maintenance, and testing cause the solid (upper) line to be less than the total number of LST days in the configuration; such activities occur predominantly during daytime.



Estimated science time available per LST hour is shown by the solid (upper) black line for all frequencies, the dashed (middle) line for K-band conditions, and dotted (lower) line for Q-band conditions. The colored bars show time already committed in previous proposal rounds, where green represents priority A, yellow priority B, and red priority C. For the net available time in either configuration per LST hour subtract the bars of the pre-committed time from the black curve.

## Observing Capabilities for Semester 2017A

The capabilities offered for 2017A through our General Observing (GO) program are identical to those offered for 2016B; details are given in the [Offered VLA Capabilities during the Next Semester \(http://go.nrao.edu/vla-capabilities\)](http://go.nrao.edu/vla-capabilities) section of the [Observational Status Summary \(http://go.nrao.edu/vla-oss\)](http://go.nrao.edu/vla-oss) (OSS) and are summarized in the following table. Several additional capabilities are available to proposers through the Shared Risk Observing (SRO) and Resident Shared Risk Observing (RSRO) programs, as described below.

Capability	Description
8-bit samplers	<p>Standard default setups for:</p> <ul style="list-style-type: none"> <li>○ 2 GHz bandwidth continuum observations at S/C/X/Ku/K/Ka/Q bands (16 × 128 MHz subbands)</li> <li>○ 1 GHz bandwidth continuum observations at L-band (16 × 64 MHz subbands)</li> <li>○ 256 MHz bandwidth continuum observations at P-band (16 × 16 MHz subbands)</li> </ul> <p>Flexible setups for spectroscopy, using two, independently tunable, 1 GHz baseband pairs, each of which can be split into up to 16 flexibly tunable subbands</p> <p>Single, dual, and full polarization products</p>
3-bit samplers	<p>Standard default setups for:</p> <ul style="list-style-type: none"> <li>○ 8 GHz bandwidth continuum observations at K/Ka/Q-bands</li> <li>○ 6 GHz bandwidth at Ku-band</li> <li>○ 4 GHz bandwidth at C/X-bands</li> </ul> <p>Flexible setups for spectroscopy, using four, independently tunable, 2 GHz baseband pairs, each of which can be split into up to 16 flexibly tunable subbands</p> <p>Single, dual, and full polarization products</p>
Mixed 3-bit and 8-bit samplers	Allows more flexibility for simultaneous continuum and high-resolution spectral line observing
Sub-arrays	Up to 3 independent subarrays using standard 8-bit continuum setups
Phased array for VLBI	See <a href="https://science.nrao.edu/observing/call-for-proposals/lbo_2017a/">LBO Call for Proposals (https://science.nrao.edu/observing/call-for-proposals/lbo_2017a/)</a>

Both single pointing and mosaics with discrete, multiple field centers will be supported. Data rates up to 25 MB/s (90 GB/hour) will be available to all users and, with additional justification, data rates up to 60 MB/s (216 GB/hour) will be available. [Correlator integration time limits per band and per array configuration \(http://go.nrao.edu/tim-res\)](http://go.nrao.edu/tim-res) also apply as described in the OSS. The data rate and total data volume required by a proposal will be a consideration in its technical evaluation.

There are some [limitations on frequency settings and tuning ranges \(http://go.nrao.edu/vla-frq\)](http://go.nrao.edu/vla-frq), especially at Ka-band; please consult the OSS for further details. Additionally, the [Exposure Calculator \(http://go.nrao.edu/ect\)](http://go.nrao.edu/ect) has been updated and other special tools are available to assist users with the development of correlator setups for the proposal deadline (see [VLA Proposal Submission Guidelines \(http://go.nrao.edu/vla-steps\)](http://go.nrao.edu/vla-steps)). All antennas employ electronics and receiver systems that provide continuous frequency coverage from 1–50 GHz in the following observing bands: 1–2 GHz (L-band); 2–4 GHz (S-band); 4–8 GHz (C-band); 8–12 GHz (X-band);

12–18 GHz (Ku-band); 18–26.5 GHz (K-band); 26.5–40 GHz (Ka-band); and 40–50 GHz (Q-band). In addition to these, all VLA antennas are equipped with 230–470 MHz (P-band) receivers and 14 of them are equipped with 54–86 MHz (4-band) receivers. For details see the Low Frequency Observing section below.

We continue to offer shared risk programs to our user community for those who would like to push the capabilities of the VLA beyond those offered for general use.

## VLA Shared Risk Observing

The VLA Shared Risk Observing (SRO) program allows users access to capabilities that can be set up via the Observation Preparation Tool (OPT) and run through the dynamic scheduler without intervention, but are not well tested. The following capabilities are offered under the SRO program in Semester 2017A:

- On-the-Fly (OTF) mosaicing (used when each pointing on the sky is no more than a few seconds)
- 32 subbands per baseband with the 8-bit samplers

See the [VLA Proposal Submission Guidelines \(http://go.nrao.edu/vla-steps\)](http://go.nrao.edu/vla-steps) web page for information about tools and other advice on proposing for Shared Risk observing capabilities.

## VLA Resident Shared Risk Observing

The VLA Resident Shared Risk Observing (RSRO) program provides access to extended capabilities of the VLA that require additional testing. This access is provided in exchange for a period of residence to help commission those capabilities. Examples of capabilities that would fall under the RSRO program in Semester 2017A include:

- correlator dump times shorter than 50 msec, including integration times as short as 5 msec for transient detection;
- pulsar observations;
- data rates above 60 MB/s;
- recirculation beyond a factor of 64 in the correlator;
- P-band system (230–470 MHz) polarimetry and spectroscopy;
- 4-band system (54–86 MHz; see Low Frequency Observing section below);
- more than 3 subarrays, or subarrays with the 3-bit system;
- complex phased array observations (e.g., pulsar and complex VLBI observing modes); and
- frequency averaging in the correlator: a new capability for averaging to wider frequency channels in the correlator has been developed that will reduce the data volume for all continuum subbands

A detailed description of the VLA RSRO program for semester 2017A and beyond is available at the [VLA Proposal Submission Guidelines \(http://go.nrao.edu/vla-steps\)](http://go.nrao.edu/vla-steps) web page.

## Low Frequency Observing

The new low frequency receiver system developed in collaboration with the Naval Research Laboratory is available for Stokes I continuum observations at P-band (230–470 MHz) through the GO program. Use of the P-band system for polarimetry and/or spectroscopy is through the RSRO Program. The new receivers also work at 4-band (54–86 MHz), and new feeds have been deployed on fourteen VLA antennas. Both 4-band and P-band can be observed simultaneously, but access to the 4-band system is only available through the RSRO program.



Finally, the commensal [VLITE \(http://vlite.nrao.edu/\)](http://vlite.nrao.edu/) system will take data at P-band during regular observations that use bands other than P-band. The VLITE system is deployed on ten VLA antennas.

Observers wishing to gain access to the commensal VLITE data taken during their VLA observations should follow the instructions on the [VLITE \(http://vlite.nrao.edu/\)](http://vlite.nrao.edu/) web page for doing so.

## Proposal and Observation Preparation

Proposal preparation and submission are via the Proposal Submission Tool (PST) at [NRAO Interactive Services \(https://my.nrao.edu/\)](https://my.nrao.edu/). Use of the PST requires registration in the NRAO User Database. There are various tools and documentation to help users in this process. Descriptions of all updated documentation and tools, along with an outline of the steps required to write a proposal, are available at the [Guide to Proposing for the VLA \(http://go.nrao.edu/vla-prop\)](http://go.nrao.edu/vla-prop) web page.

When constructing sessions in the PST, proposers should be cognizant of their use by the Time Allocation Committee (TAC). Specifically taking into account the time available as a function of LST, the TAC will assign a scheduling priority to each session in each proposal. The assigned scheduling priority will depend on the linear-rank score of the proposal from its scientific review, the LSTs involved in the session (daytime is harder to accommodate than nighttime, for instance), the predicted conditions for observing over that LST range at the time of year of the configuration, the total time requested in the session, and the competition from better-ranked proposals requesting time at similar LSTs. Please see [this description \(http://go.nrao.edu/obs-session\)](http://go.nrao.edu/obs-session) for guidance on how to set up sessions in the PST, and [this document \(http://www.aoc.nrao.edu/~schedsoc/VLAPrioritizerMemo.pdf\)](http://www.aoc.nrao.edu/~schedsoc/VLAPrioritizerMemo.pdf) for a complete description of the VLA Prioritizer (the software that generates the initial scheduling priorities for all sessions that are subsequently used by the TAC to derive the final priorities).

All approved VLA observations are set up using the [Observation Preparation Tool \(OPT\) \(http://go.nrao.edu/opt-doc\)](http://go.nrao.edu/opt-doc). Most, if not all, projects will be observed dynamically; users should submit scheduling blocks early in the configuration to maximize the opportunity of them being observed. Advice on the optimal length of scheduling blocks and other useful information may be found at the [Observing FAQ \(http://go.nrao.edu/vla-obsfaq\)](http://go.nrao.edu/vla-obsfaq) web page.

Information about VLA capabilities, proposal preparation and submission, observing strategies, and calibration overhead can be found in the [VLA Observational Status Summary \(http://go.nrao.edu/vla-oss\)](http://go.nrao.edu/vla-oss), at the [Guide to Proposing for the VLA \(http://go.nrao.edu/vla-prop\)](http://go.nrao.edu/vla-prop), and at the [Guide to Observing with the VLA \(http://go.nrao.edu/vla-obs\)](http://go.nrao.edu/vla-obs). Answers to Frequently Asked Questions are contained in these proposing and observing guides. Questions may also be directed to the [NRAO Helpdesk \(http://go.nrao.edu/obshelp\)](http://go.nrao.edu/obshelp).

## Alerts & Tips for Proposers

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### Source Lists

The Observatory requires proposers to specify their source lists in full. This enables the Observatory to identify potential conflicts between observing programs and to better understand scheduling pressure on the instruments it operates. It may be the case that the final target list has not been selected at the time a proposal is submitted. In such cases, all potential targets and fields should be listed. The only exceptions to this requirement are for Triggered proposals to observe targets that are unknown a priori. Proposal source lists are not made public by the Observatory.

### Dissertation Plans

Students planning to use one or more NRAO telescopes for their PhD dissertation must submit a "Plan of Dissertation Research" of no more than 1000 words with their first proposal. This plan must be referred to in later proposals for time allocations relevant to the thesis work described in the plan. It is the responsibility of the student to ensure that the information contained in the plan is up-to-date at the time a given proposal is submitted. By the same token, a proposal for work that is relevant to a student thesis should refer to the plan and clearly state the relevance of the proposal to the plan. At a minimum the plan should contain:

1. An overview of the research program
2. The thesis timeline, including the expected date of completion
3. An estimate of the NRAO telescope resources needed to complete the program of research
4. Clear statements about the importance of each proposal to the thesis as a whole.

The plan provides some assurance against a dissertation being impaired by an adverse review of a proposal when the full scope of the thesis is not seen. The plan can be submitted via [NRAO Interactive Services \(http://my.nrao.edu/\)](http://my.nrao.edu/). Students are reminded to submit their plan comfortably in advance of the proposal deadline. Thesis plans must be in pdf format so science reviewers can easily access the plans. Students who have not yet graduated but have active plans on file should update those plans to a pdf format if they are not already in that form.

## Tips for Proposers

The NRAO proposal evaluation and time allocation process is panel based. That is, members of the scientific community are responsible for reviewing proposals based on their scientific merit through eight [Science Review Panels \(https://science.nrao.edu/observing/proposal-types/sciencereviewpanels\)](https://science.nrao.edu/observing/proposal-types/sciencereviewpanels). As a means of broadening the scientific perspective of its reviewers, and of increasing the participation of the wider astronomy and astrophysics community in the science program of NRAO facilities, SRP membership is deliberately selected to include some colleagues that are not necessarily experts in radio observational techniques. This being the case, we encourage proposers to consider the following when preparing their proposals:

1. Avoid the use of radio astronomy jargon
2. Do not assume the reader is familiar with a particular observing technique - explain it briefly
3. Do not assume the reader is familiar with an earlier rationale for a developing line of research - provide adequate historical context and connect the dots as necessary
4. Describe previous observations and publications relevant to the proposed observations
5. If a particular point source or brightness temperature sensitivity is required, justify it.

## Useful Resources & Tools

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**Note:** you must be a registered NRAO user to access many of these resources. Please go to [NRAO Interactive Services \(http://my.nrao.edu/\)](http://my.nrao.edu/). If you are already a registered user, you are encouraged to update your profile.

### Proposal Submission Tool

The Proposal Submission Tool and associated documentation is accessed through [NRAO Interactive Services \(http://my.nrao.edu/\)](http://my.nrao.edu/).

### Proposal Finder Tool



The [Proposal Finder Tool \(http://library.nrao.edu/proposals\)](http://library.nrao.edu/proposals) (PFT) may be used to search cover sheets of proposals approved for time on NRAO telescopes. The PFT returns the proposal's authors, title, abstract, and, if available, approved hours.

## Very Large Array (VLA)

- [VLA Observational Status Summary \(http://go.nrao.edu/vla-oss\)](http://go.nrao.edu/vla-oss)
- [Guide to Proposing for the VLA \(http://go.nrao.edu/vla-prop\)](http://go.nrao.edu/vla-prop)
- [Guide to Observing with the VLA \(http://go.nrao.edu/vla-obs\)](http://go.nrao.edu/vla-obs)
- [VLA Configuration Plans and Science Time Available \(http://go.nrao.edu/vla-plan\)](http://go.nrao.edu/vla-plan)
- [VLA Exposure Calculator \(http://go.nrao.edu/ect\)](http://go.nrao.edu/ect)

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Contact the Editor ([mailto:mtadams@nrao.edu?subject=NRAO eNews Editor](mailto:mtadams@nrao.edu?subject=NRAO%20eNews%20Editor))



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