NRAO Call for Proposals: Semester 2023A

1 July 2022

The National Radio Astronomy Observatory (NRAO) invites scientists to participate in the Semester 2023A Call for Proposals for the Karl G. Jansky Very Large Array (VLA) and the Very Long Baseline Array (VLBA), High Sensitivity Array (HSA), and Global 3mm VLBI Array (GMVA).

The submission deadline for Semester 2023A proposals is Monday, 1 August 2022, at 17:00 EDT (21:00 UTC).

We would like to highlight that the AGN science category will be split into two in order to manage the increasing number of proposals received in this science area. Please see News & Opportunities (https://science.nrao.edu/observing/call-for-proposals/2023a/news-opportunities) for more information.

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

News & Opportunities

Joint NRAO and GBO Telescope Time Allocation Process

Proposals to the National Radio Astronomy Observatory (NRAO (https://science.nrao.edu/observing/)) and the Green Bank Observatory (GBO (http://greenbankobservatory.org/)) for the scientific use of its telescopes are evaluated on the basis of scientific merit and technical feasibility using a panel-based proposal review system (http://go.nrao.edu/prop-review) . This joint process is run by the NRAO in accordance with its policy of non-discrimination and inclusion. (https://public.nrao.edu/odi/)

The NRAO 2023A Call for Proposals is for observations with the VLA and VLBA/HSA/GMVA; the corresponding call for the GBT can be found at the GBO Call for Proposals (https://greenbankobservatory.org/science/gbt-observers/proposals/2023a-call-for-proposals/) .

Change to the Science Categories

The AGN science category will be split into two in order to manage the increasing number of proposals received in this science area. The new categories will be

HLA - High-Luminosity AGN: AGN, high-luminosity: FR II radio galaxies, quasars, QSOs, blazars, BL Lacs

LLA - Low-Luminosity AGN: AGN, low-luminosity: FR I radio galaxies, FR 0 radio galaxies, Seyfert galaxies, quiescent SMBH, Sgr A*

All proposals submitted on or after 1 July 2022 will need to specify one of the following ten science categories: SSP, GWT, PCO, SFM, ISM, NGA, EGS, HLA, LLA, or HIZ.

Continuing Opportunities

Joint Observing program

Access to the Joint Observing program will continue for the VLA, VLBA and GBT for semester 23A. This includes joint observations with the XMM-Newton Project, the Chandra X-ray Observatory, the Hubble Space Telescope (HST), the Swift Gamma-Ray Burst Mission, and the Fermi Gamma-ray Space Telescope. For more details see the Joint Proposal page (https://science.nrao.edu/observing/call-for-proposals/2023a/joint-proposals) .

Director's Discretionary Time Including 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/) . DDT proposals are intended to address targets of opportunity (http://go.nrao.edu/prop-too) , high-risk/high-return exploratory time (http://go.nrao.edu/prop-explore) , 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 an 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:

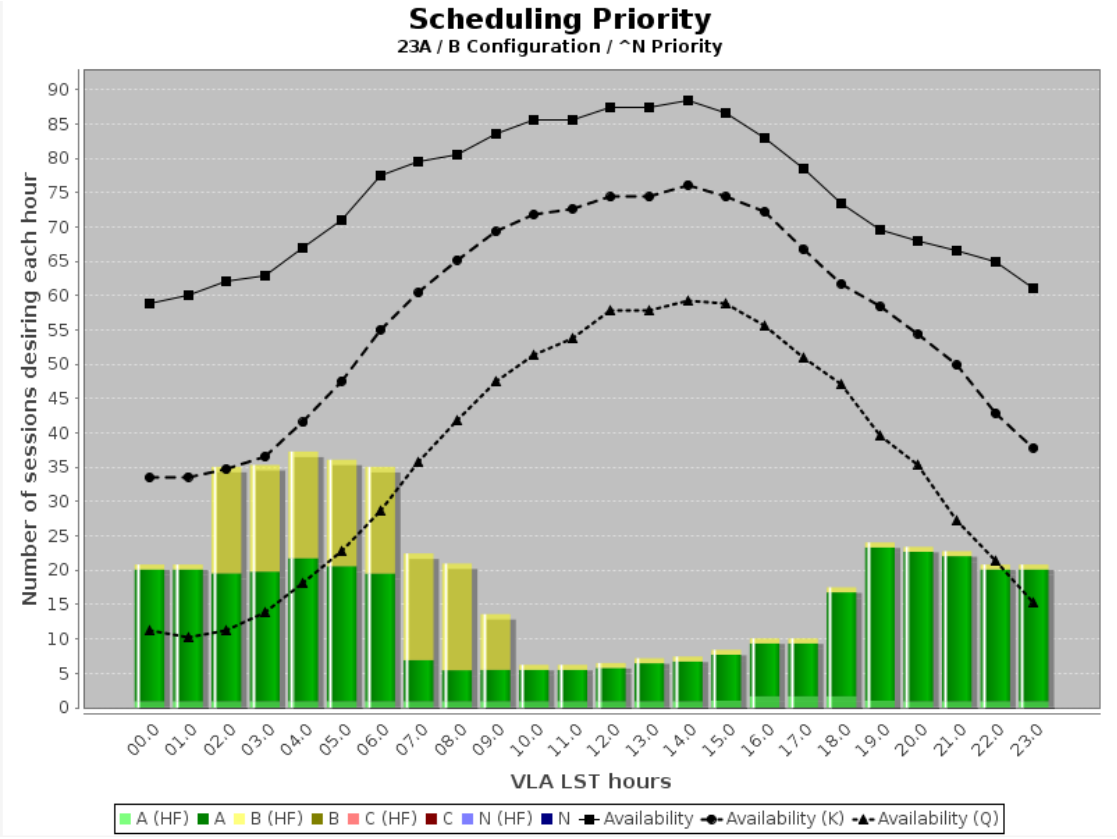
- **High Risk Proposals:** As a means of maximizing its scientific impact through cutting-edge observations, the Observatory encourages the submission of high-risk/high-reward proposals.
- **Commensal Observing**: Commensal observations can be an effective way to maximize observing hours on NRAO telescopes, by allowing multiple experiments or systems to run simultaneously, when resources allow. The Observatory may support two kinds of commensal observing: commensal observing projects, and commensal systems. For more information see the Commensal Observing with NRAO Telescopes (http://go.nrao.edu/prop-commensal) page.
- **Filler Programs:** Some programs are not time critical, not strongly dependent on array configuration, or do not require highly subscribed LST ranges. Such programs may be able to take advantage of "filler" time.

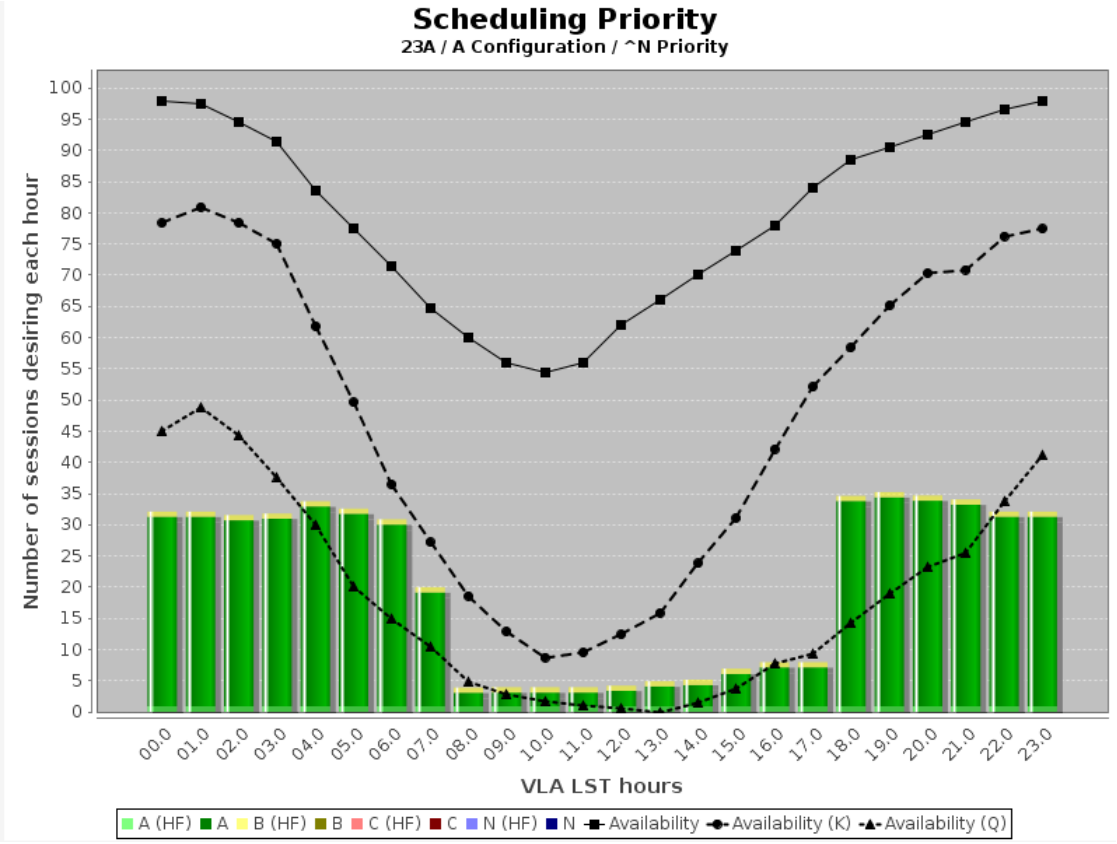
Further information about each of these programs can be found on the Proposal Opportunities (http://go.nrao.edu/prop-opp) page.

VLA Configuration Plans and Science Time Available

The August 1, 2022 deadline nominally covers the observing period January 19, 2023 through October 9, 2023 (Semester 2023A), encompassing the **B** and **A** configurations of the VLA. Multi-configuration proposals that include either of these two configurations may also be submitted. Additionally, proposals requesting only configurations that will fall in semester 2023B (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) for details and availability of upcoming configurations.

The plots of estimated available observing hours as a function of LST for the **B** and **A** configurations in semester 2023A are shown below. In these plots, engineering, maintenance, and testing cause the solid (upper) line to be less than the total number of LST days in each configuration; such activities occur predominantly during daytime. Also subtracted from the total available science time estimate for the B-configuration is the 658 hours allocated for the VLA Sky Survey (VLASS).





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 pre-committed time where green represents priority A and yellow priority B. The lighter green and yellow represent high frequency (HF; K through Q bands) priority A and B, respectively. There is no red shown because there is no priority C pre-committed time this semester. For the net available time in each configuration per LST hour subtract the bars of the pre-committed time from the black curve. The pre-committed time in these plots consists of A-priority not completed in the previous B and A configurations and proposals from previous semesters that requested future configurations. This latter category includes the VLA extra-large proposal that has been approved for 206 hours in **B** configuration and 374 hours in **A** configuration in semester 2023A. More details on the VLA extra-large proposal (X-proposal) may be found in the NRAO eNEWS (https://science.nrao.edu/enews/14.6/index.shtml) .

Observing Capabilities for Semester 2023A

For the 2023A semester the General Observing (GO) capabilities are given in the Offered VLA Capabilities during the Next Semester (http://go.nrao.edu/vla-capabilities) section of the Observational Status Summary (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	Standard full polarization default setups for: • 2 GHz bandwidth continuum observations at S/C/X/Ku/K/Ka/Q bands (16 × 128 MHz subbands) • 1 GHz bandwidth continuum observations at L-band (16 × 64 MHz subbands) • 256 MHz bandwidth continuum observations at P-band (16 × 16 MHz subbands) • 12 MHz bandwidth for Stokes I continuum observations only* at 4-band (3 × 4 MHz subbands) • Dual 4/P-band for Stokes I continuum observations only* Flexible setups for spectroscopy, using two, independently tunable, 1 GHz baseband pairs, each of which can be split into up to 32 flexibly tunable subbands. Single, dual, and full polarization products for non-default setups. *Note: 4-band and dual 4/P-band observations are offered for Stokes I continuum only using standard full polarization default setups. Spectral line and/or polarization science carried out in these bands, or the use of non-standard setups, should to be submitted as a RSRO proposal.
3-bit samplers	Standard full polarization default setups for: • 8 GHz bandwidth continuum observations at K/Ka/Q-bands • 6 GHz bandwidth at Ku-band • 4 GHz bandwidth at C/X-bands 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. Single, dual, and full polarization products for non-default setups.
Mixed 3-bit and 8-bit samplers	Allows more flexibility for simultaneous continuum and high-resolution spectral line observing
Subarrays	Up to 3 independent subarrays using standard 8-bit continuum setups *(only one 8-bit continuum setup per subarray).*
Y27 or Y1 for VLBI	VLA Phased Array (Y27) or single VLA antenna (Y1) for VLBI. See the VLBA Call for Proposals (https://science.nrao.edu/observing/call-for-proposals/2023a/vlba-proposal-guide) for more details.
Solar observing	All solar observing except the L-band reverse-coupled system
On-The-Fly Mosaicing (OTF)	P-, L-, S-, and C-bands only; no subarrays
Pulsar	Phase-binned and coherent-dedispersion (YUPPI) pulsar observing, except 4-band YUPPI

Both single pointing and mosaics with discrete, multiple field centers are supported. Data rates up to 60 MB/s (216 GB/hour) are considered GO. Correlator integration time limits per band and per array configuration (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) , especially at Ka-band; please consult the OSS for further details. Additionally, the Exposure Calculator (http://go.nrao.edu/ect) is available to estimate sensitivities, while 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)). 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 200-500 MHz (P-band) and 54-84 MHz (4-band) receivers near the prime focus.

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 as well tested as GO capabilities. Data rates higher than 60 MB/s (216 GB/hour) and up to 100 MB/s (360 GB/hour) are considered SRO. The following capabilities are offered under the SRO program during this semester:

- Up to 3 independent subbarays using standard 3-bit continuum setups, or a mix of standard 3-bit and standard 8-bit continuum setups, and up to 3 independent subarrays with changing standard continuum setups in a given subarray (e.g., to perform reference pointing at X-band for high frequency observations).
- On-the-Fly (OTF) mosaicing for X-, Ku-, K-, Ka-, and Q-bands (used when each pointing on the sky is no more than a few seconds), but not using subarrays.
- eLWA: Joint LWA and VLA 4-band observations using a single 8 MHz subband centered at 76 MHz, and 4-bit VDIF output.

See the VLA Proposal Submission Guidelines (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 this semester include:

- correlator dump times shorter than 50 msec, including integration times as short as 5 msec for transient detection;
- data rates above 100 MB/s;
- recirculation beyond a factor of 64 in the correlator;

- 4-band polarization or spectral line;
- 4-band coherent-dedispersion (YUPPI) pulsar observing;
- subarray observations with setups other than the default continuum setups, or observations with more than 3 subarrays;
- complex phased array observations (e.g., pulsar and complex VLBI observing modes);
- Frequency averaging in the correlator‡, including setups with mixed subband bandwidths, e.g., for spectral line+continuum with the averaging used in subbands designated for continuum;
- Rapid response capability: Automatically scheduling VLA observations in response to a trigger on shorter timescales than standard triggered proposals;
- eLWA: Joint LWA and VLA 4-band observations and correlations using options other than offered under SRO (e.g., a different center frequency, 16 MHz bandwidth, and/or 8-bit VDIF output for a higher dynamic range).

‡While frequency averaging by a factor of 2 or 4 was offered as GO in the past, our operational experience suggests that it is best offered as RSRO at this time.

A detailed description of the VLA RSRO program is available at the VLA Proposal Submission Guidelines (http://go.nrao.edu/vla-steps) web page.

Commensal Observing Systems at the VLA

There are currently two commensal systems in operation on the VLA that may take data at the same time as your proposed observation. The first is the VLITE (http://vlite.nrao.edu/) system, which will take data at P-band during regular observations that use bands other than P-band. Hence, VLITE is turned off by default during P-band or dual 4/P-band observations. The VLITE system is deployed on up to eighteen 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/) web page for doing so. The second is the *realfast (http://realfast.io/)* system, which takes data at very fast dump rates in an effort to detect Fast Radio Bursts (FRBs). This system is fully commissioned for observing at L- through X-bands, in parallel with standard continuum correlator configurations. A third commensal system, COSMIC SETI (https://go.nrao.edu/cosmic-seti) , is expected to become operational at the start of the 2023A semester. This system enables the search for extraterrestrial intelligence (SETI) using the VLA, and will collect data during unconflicted PI science observations. For information about commensal observing see the Commensal Observing with NRAO Telescopes (http://go.nrao.edu/prop-commensal) page.

Proposal and Observation Preparation

Proposal preparation and submission are via the Proposal Submission Tool (PST) at NRAO Interactive Services (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) web page.

When constructing sessions in the PST, proposers should be cognizant of their use by the Telescope Allocation Committee (TAC). Specifically taking into account the time available as a function of LST, software will assign an initial scheduling priority to each session in each proposal, which can be modified by the TAC if they desire.

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 atmospheric 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 other proposals requesting time at similar LSTs. Please see this description (http://go.nrao.edu/obs-session) for guidance on how to set up sessions in the PST, and this document (http://go.nrao.edu/vla-prioritizer) 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) . Most projects will be observed dynamically; *users granted dynamic, non-triggered time, must either submit their scheduling blocks before the start of the configuration or contact the VLA Scheduler (schedsoc@nrao.edu) before that date to avoid a reduction in scheduling priority*. Early submission also maximizes the opportunity of them being observed and helps us to schedule the VLA most efficiently. 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) 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) , at the Guide to Proposing for the VLA (http://go.nrao.edu/vla-prop) , and at the Guide to Observing with the VLA (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) .

VLBA, HSA, and GMVA Proposal Guide

Proposal submission information for the following three combinations of telescopes are detailed in individual sections below:

- Very Long Baseline Array (https://science.nrao.edu/facilities/vlba) (VLBA) and High Sensitivity Array (http://go.nrao.edu/vlba-hsa) (HSA) proposals requesting time in Semester 2023A (2023 February 01 - 2023 July 31) or multi-semester proposals.
- Global mm VLBI Array (http://go.nrao.edu/globalmm) (GMVA) proposals for 2023 Session I (May 04 - 09), or later sessions.

VLBA Proposals

The VLBA provides ultra-high angular resolution for astrophysical studies including:

- Non-thermal continuum emission, including polarimetry, from active galactic nuclei (AGN), Galactic micro-quasars, pulsars, and other sources.
- Maser emission lines of OH (1.7 and 6.0 GHz), CH3OH (6.7 and 12.2 GHz), H2O (22 GHz), SiO (43 and 86 GHz) and other molecules, and numerous thermal absorption lines, in a variety of Galactic and extragalactic circumstances.
- Multiple-phase-center surveys across the primary beam.
- Parallax and proper motion via differential astrometry of a variety of stars, star-forming regions, and nearby extragalactic objects, at accuracies as good as 10 microarcsec.
- Absolute astrometry at accuracies of ~200 microarcsec to expand the International Celestial Reference Frame.

Overall information about the VLBA is available in the VLBA Observational Status Summary (http://go.nrao.edu/vlba-oss) (OSS); specific sections relevant to various proposal types are linked below.

VLBA proposals must be prepared and submitted using the NRAO Proposal Submission Tool (PST), accessible via NRAO Interactive Services (http://my.nrao.edu/) . Use of the PST requires registration by all proposers, including co-investigators, in the NRAO User Database.

Approximately 1000 hours of VLBA observing time are expected to be available for Open Skies in observing semester 2023A. **In recent semesters, there has been less pressure in the GST range 0600 - 1800 hours as compared to 1800 - 0600 GST, and we expect this trend to continue.**

Most approved VLBA observations are performed dynamically; for those dynamic observations, *users must either submit their observing (.key) files (to vlbiobs@nrao.edu) before the beginning of the semester (February 01 or August 01 for **A** and **B** semesters, respectively), or contact the VLBA Scheduler (schedsoc@nrao.edu) before those dates to avoid a reduction in scheduling priority*. Early submission of schedules maximizes the opportunity of dynamic observing and assists in the efficient scheduling of the VLBA.

VLBA Large and Filler Proposals

Large proposals (those which request 200 hours or more) are encouraged and welcome on the VLBA. Such proposals should follow the Large Proposal Policy (https://go.nrao.edu/largeproppolicy) . Large proposals which

require multi-semester observations are often supported.

Filler proposals are also encouraged - these are scientifically useful programs that can be scheduled over a large range of GST, requiring fewer than eight VLBA stations, with low-frequency weather constraints, and short (2 - 6 hours) scheduling blocks. Such projects can help to fill gaps in the dynamic observing schedule. Filler proposals can be submitted as Regular proposals or even Large proposals (the Large proposal policy still applies); either Large or Regular filler proposals can be multi-semester proposals if scientifically justified.

Observing Capabilities for 2023A

For the 2023A semester the General Observing (GO) capabilities are given in the Offered VLBA Capabilities during the Next Semester (http://go.nrao.edu/vlba-capabilities) section of the Observational Status Summary (http://go.nrao.edu/vlba-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.

The **GO** capabilities being offered are:

Capability	Description
4096 Mbps recording (requires DDC data system)	• Available for the 6cm, 4cm, 1cm, 7mm, and 3mm receivers* • 1024 MHz polarization-summed bandwidth • Available for VLBA, global VLBI, VLBA+Y1, and HSA • We expect to be able to support this recording rate for most of the available open-skies observing time *Note: 90cm, 50cm, 21/18cm, and 13cm bands require recording rates of 2048 Mbps or less due to their limited bandwidth
S/X Simultaneous Observations	Up to 4096 Mbps recording rate (but slightly reduced sensitivity at both bands (https://go.nrao.edu/vlba-frq))
VLBA + Y1	Adds a single VLA antenna (Y1) to the VLBA to provide a short (~50 km) baseline to the VLBA Pt station
Multiple Phase Centers	Up to 300 (or 150) phase centers at 4096 Mbps with a single correlator pass for dual polarization (or full polarization) products
Flexible Frequency Setup with the DDC data system	• 1, 2, 4, or 8 data channels with bandwidths anywhere from 1 MHz to 128 MHz (all data channels must use the same bandwidth within an observing scan) • Data channels may be placed nearly anywhere in the IF
Flexible Spectral Resolution	• Up to 4096 spectral channels per data channels for routine DiFX processing • Minimum spectral channel spacing of 2 Hz
Spectral Zooming	During correlation, allows the selection of a narrower frequency window to have a large number of spectral channels
Pulsar Modes	Binary gating, matched-filter gating, and pulsar binning correlation modes for pulsar observations

The VLBA operates two data systems, a Polyphase Filterbank (PFB), and a Digital Downconverter (DDC). These are described in detail in the Roach Digital Backend (RDBE) (https://go.nrao.edu/rdbe) section of the VLBA OSS, which also includes suggestions for selecting the optimal observing system for various scientific goals. For the best continuum sensitivity (i.e. 4096 Mbps) at most receiver bands, or for the most flexible

observing setups, the DDC is the better choice. For continuum observations using the 20cm or 13cm receiver bands, the PFB provides a setup using 2048 Mbps that can reduce the impact of prevalent radio-frequency interference (RFI).

Proposals requiring significant additional correlator resources, such as multiple phase centers per field or multiple pulsar phase bins, should consider mechanisms to support the correlation without adversely affecting the throughput of other projects. These should be entered in the technical justification section of the proposal.

VLBA Shared Risk Observing

The VLBA Shared Risk Observing (SRO) program allows observers access to capabilities that are essentially commissioned, but are not well tested. The following capability is offered under the SRO program during the 2023A semester:

- Baseband Data Copy: Limited amounts of raw data recorded at each station can be copied to user-supplied media for correlation at a different location. See the VLBA OSS SRO section (https://go.nrao.edu/vlba-oss-sro) for more details.

VLBA Resident Shared Risk Observing

The VLBA Resident Shared Risk Observing (RSRO) program provides users with early access to new capabilities in exchange for a period of residency in Socorro to help commission those capabilities. For example, the phased-VLA system was developed through RSRO programs. **Users are encouraged to conceive and propose innovative ideas for new VLBA capabilities**. Some staff suggestions can be found at the VLBA RSRO program (https://go.nrao.edu/vlba-oss-rsro) . For details about participating in the RSRO program, see the RSRO Considerations (https://go.nrao.edu/vlba-rsro-subm) section in the Guide to Proposing for the VLBA. (https://go.nrao.edu/vlba-prop-doc)

Proposers should be aware that RSRO capabilities are generally not approved at priority A, owing to the level of risk associated with these observations.

High Sensitivity Array (HSA) Proposals

The HSA (https://go.nrao.edu/vlba-hsa-oss) comprises the VLBA, phased VLA, GBT, and Effelsberg telescopes. Similar to the VLBA, all of the HSA stations can observe at 4096 Mbps (General Observing). The EVN Sensitivity Calculator (http://go.nrao.edu/ect-evn) can select 4096 Mbps for HSA sensitivity estimates. Details on the HSA telescopes are documented in the HSA section (http://go.nrao.edu/vlba-hsa-oss) of the VLBA OSS, and special considerations on proposing and observing are listed in the HSA page (https://go.nrao.edu/vlba-hsa-prop) of the Guide to Proposing for the VLBA (https://go.nrao.edu/vlba-prop-doc) .

VLBI observations combining the VLBA with any one or more of the other three HSA stations can be requested in a single HSA proposal. However, separate proposals must be submitted for any *non-VLBI use* of any requested telescopes.

HSA proposals must be prepared and submitted using the NRAO Proposal Submission Tool (PST), accessible via NRAO Interactive Services (http://my.nrao.edu/) . Use of the PST requires registration by all proposers, including co-investigators, in the NRAO User Database. The inclusion of HSA stations should be quantitatively justified in the proposal.

HSA Station Notes

• **The phased Very Large Array (Y27)** will be available for HSA observing in Semester 2023A, mostly in the **B** (~ Feb 2023 - May 2023) configuration, although a limited amount of time should be available in the **A** (~ July 2023) configuration, and during reconfiguration. Please note that high frequencies (at receiver bands 22 GHz and above) have better phasing in the more compact configurations (**C** and **D**). High frequency phasing in the extended configurations in the summer can be quite difficult.

• **The Green Bank Telescope's (Gb)** has significant scheduling constraints because of reduced open-skies time. Therefore, HSA proposals requesting Gb will likely have to be ranked at least in or near the top 10-15% of all AUI telescope proposals in order for GBT time to be approved. Proposers should clearly justify the need for the GBT in the text of the proposal. All proposers requesting the GBT should include any needed setup and overhead time in the total time request for their proposals. Additionally, proposers should be aware that long scheduling blocks (more than 6 hours) will be difficult to schedule owing to constraints coming from non-open skies time. Proposers are encouraged to make clear in the technical justification section any constraints about how observing time could be broken into smaller pieces without adversely affecting the proposed science; include information as relevant regarding maximum elapsed time of a split schedule and minimum scheduling block lengths.

Observations using the GBT 6-cm receiver as part of the HSA must be taken, correlated, and calibrated in full Stokes mode. Due to the large cross-talk between polarizations, only total intensity (Stokes I) data will be usable.

• **The Effelsberg (Eb) 100-m telescope** supports both the PFB and DDC observing systems available on the VLBA. Consult this web page (https://go.nrao.edu/eb-hsa) for more detailed information about the Eb HSA station.

Global 3mm VLBI Array (GMVA) Proposals

GMVA proposals submitted by the 2022 August 01 deadline will be considered for scheduling in 2023 Session I (May 04 - 09), or later sessions.

Complete information on the GMVA is available at the GMVA website (https://go.nrao.edu/globalmm) . Ongoing special considerations are documented in the GMVA section (http://go.nrao.edu/vlba-gmva-oss) of the VLBA OSS; new features and/or special cases are cited here.

As noted in the HSA section above, GBT time available for VLBI has been reduced due to its new partnership arrangements.

GMVA proposals must be prepared and submitted using the NRAO Proposal Submission Tool (PST), accessible via NRAO Interactive Services (http://my.nrao.edu/) . Use of the PST requires registration by all proposers, including co-investigators, in the NRAO User Database. The inclusion of the GBT in a GMVA proposal should be quantitatively justified. The KVN, or the Greenland Telescope (GLT) must be specified by entering "KVN" or "GLT" as "Other" entries in the PST. Observations with VLBA telescopes at 7mm may be scheduled on the GMVA during pointing/calibration gaps on other GMVA telescopes; such 7mm observations can be proposed for.

The GMVA will record at the highest bit rate which instrumentation and resources permit. Currently all telescopes will record at 4096 Mbps.

New GMVA proposals requesting phased ALMA should not be submitted at the August 01 2022 (2023A semester) deadline. Only proposals which were re-proposed at the Cycle 9 ALMA deadline - those that were approved for GMVA Session 2022/I but failed at ALMA - will be considered.

Documentation and Assistance

Detailed information about the VLBA instrument, its capabilities, observing strategies, proposal preparation and submission, and observation preparation, can be found in the VLBA Observational Status Summary (http://go.nrao.edu/vlba-oss) , at the Guide to Proposing for the VLBA (https://go.nrao.edu/vlba-prop-doc) , and at the Observing with the VLBA (https://go.nrao.edu/vlba-obs) web pages. Questions may also be directed to the NRAO Helpdesk (http://go.nrao.edu/obshelp) .

Joint Proposals

Joint Proposals with External Facilities

Here we list opportunities for joint proposals with several external (non-AUI) facilities. Agreements for Joint Observations with external facilities were made at different times across the boundaries when the NRAO was split into multiple observatories (NRAO, GBO, and LBO) in 2017, and when the LBO was reintegrated back into the NRAO in 2019. Therefore, the agreements below will sometimes mention various combinations of the NRAO, GBO, and LBO. Regardless, access to the Joint Observing program will continue for the VLA, VLBA, and GBT for semester 23A.

Joint Observations with XMM-Newton Project

By agreement with the NRAO and GBO Observatories, detailed in a Memorandum of Understanding (http://go.nrao.edu/joint-xmm) , the XMM-Newton Project may award up to 3% of NRAO/GBO open skies observing time. Similarly the NRAO/GBO Time Allocation Committee may award up to 150 ks of XMM-Newton time per year. See the Joint Observations with XMM-Newton (https://science.nrao.edu/observing/call-for-proposals/2023a/new-opportunity-joint-observations-with-xmm-newton) page for details.

Joint Observations with Chandra X-ray Observatory

The community has the opportunity to propose for observing time on NRAO facilities through a joint program with the Chandra X-ray Observatory. Proposers to the NRAO have the opportunity to request time on Chandra, to be awarded on the recommendation of the NRAO Telescope Time Allocation Committee (TAC) and approved by the NRAO Director. Up to 120 ksec will be made available to NRAO proposers annually. The NRAO has allocated up to 3% of the open skies observing time on the VLA, the VLBA, and the GBT for Chandra joint proposals.

Due to Chandra's increasingly challenging thermal constraints, the amount of Chandra exposure time available for High Ecliptic Latitude (HEL) targets with |bGal| > 55deg is extremely limited. If you request joint time on Chandra, please avoid long exposures on such targets if at all possible. You must note explicitly the requested amount of Chandra HEL time in the body of your science justification. *N.B., Chandra ToO proposals are **not supported** under the Chandra-NRAO joint program*. See the Joint Observations with Chandra (https://science.nrao.edu/observing/call-for-proposals/2023a/chandra) page for details.

Joint Observations with the Hubble Space Telescope (HST)

By agreement between the NRAO and the Space Telescope Science Institute, STScI can 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 per year. *N.B., HST "Snapshot" observations are **not supported** under the HST-NRAO Joint program since there is no guarantee that Snapshot targets will be completed*. See the Joint Observations with HST (https://science.nrao.edu/observing/call-for-proposals/2023a/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://go.nrao.edu/joint-swift) . 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 no more than 5% of the NRAO scientific observing time on the VLA (https://science.nrao.edu/facilities/vla) , GBT (https://science.nrao.edu/facilities/gbt) and VLBA (https://science.nrao.edu/facilities/vlba) , or up to 200-300 hours per year on each telescope. See the Joint Observations with Swift (https://science.nrao.edu/observing/call-for-proposals/2023a/swift) page for details.

Joint Observations with Fermi Gamma-ray Space Telescope

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. A maximum of 5% of the NRAO open skies observing time is made available on the VLA, the VLBA and the GBT, or up to 200-325 hours per year on each telescope. See the Joint Observations with Fermi (https://science.nrao.edu/observing/call-for-proposals/2023a/fermi) page for details.

Joint Proposals Between the VLA, GBT, and VLBA

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 and considered jointly by the Time Allocation Committee. VLBI proposals which request the GBT or VLA (or any other HSA telescope) 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.

Alerts & Tips for Proposers

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 PROPOSING to use an NRAO telescope for their PhD dissertation MUST submit a "Plan of Dissertation Research" IF THEY CHECK THE THESIS BOX ON THE PST. THE PLAN SHOULD BE no more than 1000 words, AND SUBMITTED with their first proposal. This plan can be referred to in later proposals. **The Plan of Dissertation is important in the proposal review process and should be well written; it is not a placeholder.** At a minimum it should contain:

- A summary of thesis science and goals.
- The role played by NRAO observations being proposed.
- A thesis time line.
- The adviser name and institution.
- An estimate of the total NRAO telescope resources needed.

The plan provides some assurance against a dissertation being impaired by adverse referee comments on one proposal, when the referees do not see the full scope of the project. This requirement applies to all three of the AUI major instruments: VLA, VLBA and GBT.

The Plan of Dissertation Research can be uploaded either from the Author's page or from the student's user profile at: Profile > My Profile > User Preferences. The Plan of Dissertation Research is associated with an Author which can then be used in one or more proposals. The Plan of Dissertation Research field here is only used to display the current status. For example, if there are no students listed on the proposal who are observing for their thesis the text box will display: Dissertation Research Plan(s) not required"

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 the Science Review Panels (http://go.nrao.edu/prop-review) . 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

Note: you must be a registered NRAO user to access some of these resources. Please go to NRAO Interactive Services (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/) .

Proposal Finder Tool

The Proposal Finder Tool (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)
- Guide to Proposing for the VLA (http://go.nrao.edu/vla-prop)
- Guide to Observing with the VLA (http://go.nrao.edu/vla-obs)
- VLA Configuration Plans and Science Time Available (http://go.nrao.edu/vla-plan)
- VLA Exposure Calculator (http://go.nrao.edu/ect)

Very Long Baseline Array (VLBA)

- VLBA Observational Status Summary (https://go.nrao.edu/vlba-oss)
- Guide to Proposing for the VLBA (https://go.nrao.edu/vlba-prop-doc)
- High Sensitivity Array
  - VLBA+ Observing (https://go.nrao.edu/vlba-plus)
  - Observing with the High Sensitivity Array (https://go.nrao.edu/vlba-hsa)
  - VLBI at the VLA (https://go.nrao.edu/vla-vlbi)
  - VLBI on the GBT (http://go.nrao.edu/gbt-hsa)
- VLBA/HSA Sensitivity (via EVN Sensitivity Calculator) (https://go.nrao.edu/ect-evn)
- Observing
  - SCHED User Manual (http://go.nrao.edu/sched-man)
  - VLBA Calibrator Search Tool (https://go.nrao.edu/vlba-calman)

NRAO Helpdesk

For help on any aspect of proposing or observing not found in our documentation, please file a ticket with the NRAO helpdesk (https://help.nrao.edu/) .