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NRAO Call for Proposals: Trimester 2010C

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The NRAO announces the Call for Proposals for trimester 2010C. The call is open now and will close on 1 June 2010 at 17:00 EDT (21:00 UTC).

Proposers preparation and submission are via the NRAO Proposal Submission Tool (PST) available through the **NRAO Interactive Services (http://my.nrao.edu/)** . Several minor modifications to the PST have been made and will be in place starting 12:00 EDT (16:00 UTC) Tuesday, 18 May 2010. (See **PST Release Notes Jun 2010 (https://safe.nrao.edu/wiki/bin/view/Software/PSTReleaseNotesJun2010)** for details of recent changes). The principal investigator, the contact author and any students who will use the proposed observations for their dissertation thesis, must be registered users. On the registration form you will be asked for contact information which will be used for notification about proposal status, telescope schedules, funding, etc. We encourage proposers to register early.

General News for Observers

PhD Dissertations using NRAO Facilities

Students planning to use an NRAO telescope for their PhD dissertation (particularly if more than one proposal will be required) must submit a "Plan of Dissertation Research" of no more than 1000 words with their first proposal. This plan can be referred to in later proposals. At a minimum it should contain a thesis time line and an estimate of the level of 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. The plan can be submitted via **NRAO Interactive Services (http://my.nrao.edu/)** . Proposers are reminded to prepare the plan comfortably in advance of the proposal deadline. This requirement applies to all three of the major NRAO instruments: EVLA, VLBA and GBT.

Student Observing Support Program

NRAO maintains a program to support research by students, both graduate and undergraduate, at U.S. universities and colleges. This program is intended to strengthen the proactive role of the Observatory in training new generations of telescope users. Regular proposals submitted for the Green Bank Telescope (GBT), the Very Long Baseline Array (VLBA) and the Expanded Very Large Array (EVLA). Large proposals for the VLBA, GBT, EVLA, and any combination of these telescopes are also eligible. New applications to the program may be submitted along with new observing proposals at any proposal deadline. These links provide **details (http://science.nrao.edu/opportunities/sos.shtml)** and a **general overview (http://science.nrao.edu/opportunities/studentsupportintro.shtml)** of the program.

Large Proposals

Large proposals to use NRAO instruments will be considered at the 1 June 2010 proposal deadline, and at all subsequent proposal deadlines, as part of the normal proposal selection and time allocation process. There is no longer a separate call for large proposals. Please see the **Large Proposal Policy (http://www.nrao.edu/administration/directors_office/largeprop.shtml)** for further details.

Key Science Projects

Beginning with the 1 October 2009 deadline, proposals for time on the VLBA, the GBT and the EVLA are being considered for designation as "Key Science Projects." Key Science Projects should be those that have high science impact, addressing fundamental and forefront issues in astronomy and astrophysics. Key Science Project status will be based on scientific rank, recommendation by the NRAO Proposal Selection Committee (PSC), and approval by the NRAO Director. For further details please see the **Key Science Project (http://science.nrao.edu/science/keysciproj.shtml)** policy web page.

GBT Proposals

The 1 June 2010 deadline is for the Trimester 2010C observing period: 1 October 2010 through 31 January 2011. Proposals will be considered for the following receivers: 290-920 MHz (PF1), 910-1230 MHz (PF2), 1.15-1.73 GHz (L), 1.73-2.60 GHz (S), 3.8-6.1 GHz (C), 8.0-12.0 GHz (X), 12.0-15.4 GHz (Ku), 18.0-26.5 GHz (K), 18.0-26.0 (KFPA-shared risk), 26.0-39.5 GHz (Ka), 38.2-49.8 GHz (Q) receivers and MUSTANG (80-100 GHz Bolometer Array).

Available observing modes include spectral line (including cross-polarization), continuum, pulsar, and VLBI/VLBA. The VLBA back end with Mark5A disk recorder may be used as a high-time resolution (> 2 ns) backend for single-dish observing.

Details of all GBT observing modes are in the **Proposer's Guide (http://www.gb.nrao.edu/gbtprops/man/GBTpg.pdf)** . Proposers should also consult the more general document "**The Performance of the GBT: A Guide for Planning Observations" (http://www.gb.nrao.edu/~rmaddale/GBT/ReceiverPerformance/PlaningObservations.htm)**

The development of the Green Bank Ultimate Pulsar Processing Instrument (GUPPI) pulsar backend is complete. We will begin considering GUPPI coherent de-dispersion mode observations for Trimester 10C. More information on the GUPPI coherent de-dispersion modes can be found in the recent e-News article at **http://science.nrao.edu/enews/enews_3_2/enews_3_2.shtml#guppi (http://science.nrao.edu/enews/enews_3_2/enews_3_2.shtml#guppi)** or on the GUPPI web pages at **https://safe.nrao.edu/wiki/bin/view/CICADA/NGNPP (https://safe.nrao.edu/wiki/bin/view/CICADA/NGNPP)** .

The K-band Focal Plane Array (KFPA) receiver underwent initial commissioning tests in spring 2010. The receiver is performing well and will undergo a few minor changes during summer 2010. During Trimester 10C, we will consider shared-risk proposals to use the KFPA. Proposers should be prepared to come to Green Bank to perform shared-risk observations with the KFPA. More information on the KFPA can be found at **https://safe.nrao.edu/wiki/bin/view/Kbandfpa/2010Call (https://safe.nrao.edu/wiki/bin/view/Kbandfpa/2010Call)** .

Proposals requesting GBT participation in High Sensitivity Array (HSA), Very Long Baseline Array (VLBA), or global Very Long Baseline Interferometry (VLBI) observations should be submitted to the VLBA only, and not to the GBT. Proposers requesting joint GBT and Expanded Very Large Array (EVLA) and/or VLBA observations must submit separate proposals for each instrument and indicate in these proposals that they are a joint request.

The GBT will be scheduled by the **Dynamic Scheduling System (DSS (http://www.gb.nrao.edu/DSS)**) in Trimester 2010C. Note that the DSS will result in no change to the proposal preparation and submission process: when the refereeing process is complete, project investigators will be contacted on how to modify any information brought over from the PST which they desire to have changed before the trimester begins. GBT staff will, as always, be available to help observers in working with the observing information in the DSS database and also with understanding the new dynamic scheduling scheme. Note that the DSS alters only the scheduling process for the GBT and will not affect the observing interface (e.g. Astrid) in any way. The **GBT observing policies (https://safe.nrao.edu/wiki/bin/view/GB/Observing/GbtObservingPolicies)** describe the

remote observing restrictions.

Technical questions or questions about the proposal process may be addressed to Toney Minter (+1-304-456-2275 or tminter@nrao.edu). Questions about the PST should be sent to the **NRAO helpdesk (http://help.nrao.edu/)** .

EVLA Proposals

Observing Capabilities for EVLA Early Science

The EVLA came into operation in March 2010. The 1 June deadline for trimester 2010C is for proposals to use the EVLA in the B-configuration (3 Dec 2010 – 22 Feb 2011) and the BnA configuration (25 Feb – 14 Mar 2011), along with proposals to use the reconfiguration interval from CnB to B (22 Nov – 3 Dec 2010), and the interval from B to BnA-configuration (22 – 25 Feb 2011). Proposals for future configurations will also be considered.

The conversion of VLA antennas to EVLA antennas is almost complete; the last remaining VLA antenna is undergoing its retrofit. EVLA Early Science is being enabled by two programs for the user community: the **Open Shared Risk Observing (OSRO) (http://science.nrao.edu/evla/earlyscience/osro.shtml)** program and the **Resident Shared Risk Observing (RSRO) (http://science.nrao.edu/evla/earlyscience/rsro.shtml)** program. These programs have been announced previously in **NRAO eNews (http://www.nrao.edu/news/newsletters/enews/enews_2_8/enews_2_8.shtml#evla)** . Correlator capabilities expected to be available through these programs are described at the OSRO and RSRO web pages; OSRO capabilities are also detailed in the **EVLA Observational Status Summary (http://evlaguides.nrao.edu/index.php?title=Category:Status)** . We remind users that access to the EVLA is on a shared-risk basis, and that the EVLA is undergoing commissioning through 2012. Nevertheless, NRAO will make every effort to ensure the EVLA data quality in this period.

For Trimester 2010C, we will be offering extended EVLA tuning ranges at L, C, K, Ka, and Q-bands. We will also be offering access to the new S-band receivers (2 - 4 GHz). Some L- and C-band systems are "interim," which means they use old VLA polarizers. At C-band the EVLA antennas with receivers containing the old polarizers are able to tune from 4.2 to 7.7 GHz. The ranges outside the nominal VLA frequencies for C- and L-bands have poor sensitivity and polarization performance for the interim receivers, as compared with the nominal VLA frequencies. Further details of the sensitivity as a function of frequency is available in the new **EVLA Observational Status Summary (http://evlaguides.nrao.edu/index.php?title=Category:Status)** .

The numbers of receiver systems available at the beginning of the EVLA B-configuration are approximately as follows:

Band	Tuning range	Receiver availability: Dec 2010
L	1-2 GHz	9 (EVLA) + 17 (interim)
S	2-4 GHz	13
C	4-8 GHz	24 (EVLA) + 3 (interim)
X	8.0-8.8 GHz	2 (EVLA) + 25 (VLA)
K	18-26.5 GHz	27
Ka	26.5-40 GHz	27
Q	40-50 GHz	27

New EVLA-style X-band receivers will be included in astronomical observations along with the existing narrow-band VLA receivers as soon as they have been tested. However, observers should continue to assume

the tuning range of the VLA receivers at X-band for trimester 2010C. For those EVLA antennas whose receivers support the wide bandwidths it is now possible to separate the two IF pairs by 10 GHz. There are some limitations on the tuning of the IFs for the Ka-band receiver. Please consult the **EVLA Observational Status Summary (http://evlaguides.nrao.edu/index.php?title=Category:Status)** for details.

Proposals to use the EVLA Ku-band receivers will not be considered at the 1 June 2010 proposal deadline. It is expected that a subset of the final EVLA Ku-band receivers will be tested and commissioned ahead of the 1 October 2010 proposal deadline. The EVLA currently has no receivers operating below 1.0 GHz, so no proposals for 327 MHz or 74 MHz will be considered at the 1 June deadline. However, we aim to mount and test the 74 MHz dipole system with the EVLA electronics in the C-configuration, and will either make a special call for proposals to use the 74 MHz system in B/BnA/A configurations later in the year or at the 1 October proposal deadline, depending on the test results.

Subarrays and VLBI observing modes are not available initially with the EVLA correlator. Users will be notified when these observing modes have been commissioned.

All EVLA observations are set up using the new **Observation Preparation Tool (OPT) (http://science.nrao.edu/evla/observing/opt.shtml)** . Use of the OPT requires registration in the NRAO User Database. Most, if not all, projects will be observed dynamically with a 0.5 hour granularity, so users should submit scheduling blocks early in the configuration to maximize the opportunity of being observed.

Proposal preparation and submission are via the Proposal Submission Tool at **NRAO Interactive Services (http://my.nrao.edu/)** . The different capabilities available for the OSRO and RSRO programs may be selected in the "resources" section of VLA proposals.

EVLA Impact and Availability

- **Short term: December 2010 - May 2011**
  The wide-band Q-, Ka-, K-, and C-band receiver systems are expected to be completed. Approximately half of the S-, U-, and L-band receiver systems should also be available by May 2011.
- **Medium Term: 2011**
  New capabilities will continue to be commissioned throughout 2011, with the goal of being able to offer up to 2 GHz bandwidth for Open Shared Risk Observing by the second trimester of 2011 for the next D-configuration. The fast samplers required to access the full 8 GHz of bandwidth at high frequencies will be installed in all antennas in 2011.
- **Long Term: 2012**
  The fast samplers will be commissioned throughout 2011 and 2012, and access to wide bandwidths for general use is expected in 2012. The remaining receiver bands will be completed by Q4, 2012.

Updated EVLA Observational Status Summary

An updated **EVLA Observational Status Summary (http://evlaguides.nrao.edu/index.php?title=Category:Status)** is available that summarizes the OSRO capabilities and expected sensitivities of the EVLA for the 1 June proposal deadline.

VLBA, HSA, & VLBI

Proposal deadline is 2010 June 1 for trimester 2010C

This deadline applies to regular observing proposals requesting the:

- Very Long Baseline Array (VLBA), alone or with affiliate(s)

    - **VLBA details (http://science.nrao.edu/vlba/)**
    - **Proposal submission (http://my.nrao.edu/)** must use the Proposal Submission Tool at NRAO Interactive Services)
- High Sensitivity Array (HSA)
    - **HSA details (http://www.nrao.edu/HSA/)**
    - **Proposal submission (http://my.nrao.edu/)** must use the Proposal Submission Tool at NRAO Interactive Services
- European VLBI Network (EVN)
    - **EVN details (http://www.evlbi.org/)**
    - **Proposal submission (http://proposal.jive.nl/)** via your "NorthStar" account or create one
- Global cm VLBI (EVN+VLBA) in the October 2010 session
    - **EVN details (http://www.evlbi.org/)**
    - **VLBA details (http://science.nrao.edu/vlba/)**
    - **Proposal submission (http://proposal.jive.nl/)** (use your "NorthStar" account or create one)

This deadline also applies to **large observing proposals (http://www.nrao.edu/administration/directors_office/largeprop.shtml)** requesting the VLBA, alone or with other NRAO resources.

The observing period is mid-September 2010 through mid-January 2011.

Projects with Less Demanding Scheduling Requirements

Dynamic scheduling is used for most VLBA-only projects. Dynamic scheduling greatly enhances the proportion of projects that are observed under conditions that allow their scientific goals to be met, which very often requires that nearly all antennas be available and in good weather. There are many times that do not meet these criteria. To allow effective utilization of such time, and to help fill short gaps between projects, we encourage users to consider submitting proposals that have one or more of the following properties:

- The project can be broken into multiple scheduling blocks of 1 to 4 hours that are easy to insert into scheduling gaps. Indeed, over-subscribing the dynamic scheduling queue with many such blocks maximizes the flexibility of the scheduler. This may be attractive for weak source detections and astrometry by allowing most of the observing time to be accumulated at high elevation. It may not be as useful for imaging because of source variability.
- The project can be observed in bad weather. This would apply to most observations at frequencies of 10 GHz and below.
- The project can be observed when there are 6-8 antennas. With 10 widely dispersed antennas, there is a fairly small fraction of the time when 9 or 10 antennas have good weather. However, it is uncommon for less than 7 to have good weather. Projects that could use time where a few antennas are out due to weather or maintenance therefore have an advantage as far as being scheduled. Such projects include those that do not need full UV coverage, or that are accumulating integration time in multiple sessions so not every session needs all antennas.

Projects conforming to one or more of the above criteria are more likely to be scheduled, and also help to optimize the overall use of the VLBA.

VLBA capabilities

- **Increased bit rate**

  A bit rate of 512 Mbps will be the standard rate for continuum projects on the VLBA in this proposal cycle. This is an increase from the 256 Mbps standard rate of recent cycles. Since 512 Mbps is also the maximum rate allowed by the current hardware, there are no longer circumstances where an increased

bandwidth request must be justified in the proposal. A bit rate of 512 Mbps is commonly achieved by recording a total bandwidth of 128 MHz (usually 64 MHz per polarization) with 2-bit sampling. One-bit sampling is discouraged because the DiFX correlator processing load scales linearly with bandwidth. One-bit sampling doubles the bandwidth and slows the correlator. Therefore one-bit sampling must still be clearly justified in the proposal text. One-bit sampling may be desired to match bandwidth with non-VLBA systems recording 1 Gbps.

We plan on being able to offer the full 2 Gbps bit rate towards the end of 2010. Further information will be provided for the 1 October 2010 Call for Proposals.

- **Production correlation via the DiFX software correlator system**

  Some of the new capabilities and other advantages provided by DiFX were summarized in the **December 2009 NRAO e-News (http://www.nrao.edu/news/newsletters/enews/enews_2_12/enews_2_12.shtml)** and are also listed below; detailed information is available in Section 7 of the **VLBA Observational Status Summary (http://www.vlba.nrao.edu/astro/obstatus/current)** .

  - Spectral resolution as high as 4096 points per baseband channel, for any polarization configuration. There is no additional limitation for full cross-polarization processing and no overall limitation across multiple baseband channels. There are also no special limitations for narrow baseband channels.
  - Very short integration periods can be supported, in principle as short as twice the reciprocal frequency resolution.
  - The correlator output data rate limit is 10 Mbyte per second of observing time. Higher rates are possible, in principle, but must be carefully justified.
  - A sophisticated pulsar gate that allows binning.
  - Correlation of any mix of VLBA, Mark4 and Mark5B formatted data.
  - The full bandwidth of 512 Mbps now and up to 4 Gbps soon are processed in one pass avoiding the need to glue together portions of the data from separate passes.

- **New observing modes available for trimester 2010C**

  The DiFX software correlator will support two new observing modes for trimester 2010C: multiple phase centers and spectral zooming. These have been summarized in the **May 2010 NRAO e-News (http://science.nrao.edu/enews/enews_3_4/enews_3_4.shtml)** and are also listed below; detailed information is available in Section 7 of the **VLBA Observational Status Summary (http://www.vlba.nrao.edu/astro/obstatus/current)** .

  - In a single correlator pass, DiFX will now be able to produce multiple phase centers. The effective VLBA field-of-view has traditionally been limited to less than a thousandth of the available primary beam area due to time and bandwidth smearing, which meant that imaging widely separated sources within the primary beam required multiple correlator passes. DiFX now allows a near-arbitrary number of fields (up to 500 has been tested) in a single correlator pass, using a uv-shift inside the correlator. This new mode consumes ~ 2.5 times more correlator resources than a "normal" correlation due to the higher initial frequency resolution required to support the uv-shifting, but each additional field of view is effectively free; for example, correlating 200 fields-of-view carries only a 20% overhead compared to 2 fields-of-view.

  - Selection of a subset of the spectral channels in a recorded band will now be possible within the correlator. This enables faster post-processing and reduced visibility dataset sizes when high spectral resolution is desired in a small section of a wide recorded band. The main beneficiary of

this mode of operation will be maser astrometry with faint in-beam calibrators. Previously, attaining high spectral resolution on maser targets required either the use of narrower recorded bands, which reduces sensitivity to faint continuum in-beam calibrators, or the production of extremely large visibility datasets. With this new DiFX capability, wide bands can be retained for more sensitivity on in-beam calibrators, but spectral selection can be used to create a dataset of high resolution but reasonable size on the maser target. Selecting spectral regions around multiple maser lines from a single wide band will also be possible.

Both of these new correlator features consume additional correlator resources compared to correlating with standard parameters, and so the amount of time scheduled in each mode may be limited to prevent correlator over-subscription. In both cases, care should be taken to justify the correlator setup if the output data rate from the correlator will exceed the currently imposed 10 MB/sec soft limit.

VLBI scheduling program: SCHED

The VLBI scheduling program SCHED will continue to be updated in 2010 in order to support new DiFX capabilities and the new digital backend systems and recording hardware that are part of the bandwidth upgrades occurring on the VLBA and EVN. These equipment changes will bring additional flexibilities and constraints to the way observations are configured. The changes make it especially important that users obtain the latest version of SCHED before producing observing schedules. SCHED releases, and information about configuration issues that users will need to be aware of, will be announced on the VLBI email exploder as they become available. If you wish to receive these announcements and are not on that list, please **sign up (http://listmgr.cv.nrao.edu/mailman/listinfo/vlbi)** . Note that the exploder is moderated and typically has low traffic, usually a couple of messages per month.

VLBA Observational Status Summary

An updated version of the "VLBA Observational Status Summary" is available in **html (http://www.vlba.nrao.edu/astro/obstatus/current/)** , **pdf (http://www.vlba.nrao.edu/astro/obstatus/current/obssum.pdf)** , or **ps (http://www.vlba.nrao.edu/astro/obstatus/current/obssum.ps)** formats.

VLBI at the EVLA

The EVLA is currently not available for VLBI observations. Although it is expected that EVLA commissioning will eventually include VLBI capabilities, no definite timescale for implementing this has yet been set.