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European VLBI Network
Call for Proposals
Deadline: 1 October 2019 23:59:59 UTC

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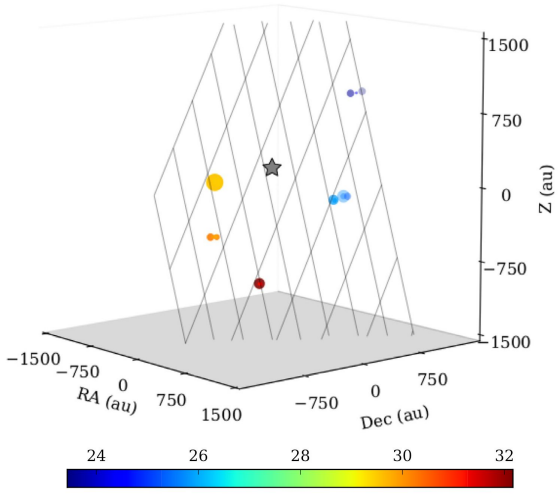
Observing proposals are invited for the European VLBI Network (EVN). The EVN facility is open to all astronomers. Astronomers with limited or no VLBI experience are particularly encouraged to apply for observing time. Student proposals are judged favorably.

Support with proposal preparation, scheduling, correlation, data reduction and analysis can be requested from the Joint Institute for VLBI ERIC (JIVE).



Three dimensional structure of maser cloudlets in the periodic methanol maser bearing high-mass star-forming region G59.633-0.192 based on 6cm EVN observations (see Olech et al. 2019, MNRAS 486, 2019). The LSR velocity is colour-coded.

The EVN is a Very Long Baseline Interferometry (VLBI) network of radio telescopes operated by an international consortium of institutes. It is located primarily in Europe and Asia, with additional antennas in South Africa and Puerto Rico. The EVN provides very high sensitivity images at angular scales of (sub-)milliarcseconds in the radio domain. EVN proposals may also request **joint e-MERLIN and EVN observations** for an improved uv-coverage at short spacings, significantly increasing the largest detectable angular size to arcsecond scales. Further improvement of the uv-coverage may be achieved in **global VLBI observations** when the EVN observes jointly with NRAO/GBO telescopes or with the Long Baseline Array.

EVN observations may be conducted with disk recording (standard) or in real-time (e-VLBI) correlation. Standard EVN observations are available on wavelengths of 92, 50, 30, 18/21, 13, 6, 5, 3.6, 1.3 and 0.7 cm. e-VLBI observations can be performed at 18/21, 6, 5, and 1.3 cm. e-MERLIN can be combined with the EVN in both standard and e-VLBI observations. Global observations are performed only with standard observations. Every year standard EVN observations occur during three sessions of approximately 21 days each and ten days of e-VLBI mode.

Proposals can be submitted for the following main classes of observations:

- **Regular proposals:** standard EVN (disk recording), e-VLBI, trigger and Out-of-Session observations, which may include large proposals, trigger proposals, global proposals, and proposals with the inclusion of additional EVN/non-EVN antennas (including integrated e-MERLIN observations)
- **Target of Opportunity (ToO) proposals**
- **Short observation proposals**
- **Correlator-only proposals**

The deadlines for proposal submission are on 1 February, 1 June or 1 October each year, except for ToO and Short Observation proposals, which can be submitted any time. More information regarding the EVN capabilities, observing sessions, proposal guidelines, and user support can be found at www.evlbi.org.

Large EVN observation proposals (>48 hrs) are encouraged by the EVN Programme Committee (PC) These will be subject to more detailed scrutiny on the feasibility of the proposal: the EVN PC may, in some cases, grant the observing time in tranches or attach conditions on the release of the data. There is in principle no upper limit to the size of an EVN large proposal and projects of more than one hundred hours have been granted. Large proposals can also be proposed as global programmes (although note the different availability levels of VLBA, versus VLA and GBT, see 'Global VLBI proposals' below) and with the integration of e-MERLIN. Large projects involving several observing epochs will be asked for progress reports by the PC.

Proposal guidelines

Standard EVN, e-VLBI and Out-of-Session proposals should be submitted through the Northstar submission tool.

Proposals must include a Science & Technical justification, and optionally, figures, tables and references. These sections shall be submitted as a single PDF document. The total length of this document is limited to 4 pages (A4 or US Letter format), with a font size no smaller than 11 points. Proposers are free to adjust the length of the various proposal sections within this overall length limit.

The strongly recommended breakdown is 2 pages for the Science & Technical justification and 2 pages for figures, tables and references. Figures and tables may be interleaved with the science justification, so that e.g. figures appear close to the location in the text where references are made to them.

Guidelines for ToO and Short observations proposals can be found here.

Questions regarding the proposal preparation can be sent to Zsolt Paragi. If you need assistance, please indicate that well in advance of the deadline.

Recording capabilities for the next standard EVN and e-VLBI Sessions

Disk recording at 2 Gbps is available at 6, 3.6, 1.3 and 0.7 cm on the majority of EVN telescopes. The remaining telescopes will record at 1 Gbps or highest possible bit-rate (mixed mode observation). The current status is given here.

e-VLBI at 2 Gbps is available at 6cm and 1.3 cm on the majority of EVN telescopes. The remaining telescopes will observe at 1 Gbps or highest possible bit-rate (mixed mode

observation). The current status is given in the 'operational modes' section on http://www.evlbi.org/capabilities.

The choice of data rate should be clearly justified in the proposal.

Upcoming standard EVN observing sessions (disk recording)

Year	Session	Dates
2020	Session 1	20 Feb - 12 Mar
2020	Session 2	21 May - 11 Jun
2020	Session 3	15 Oct - 05 Nov

Proposals received by 1 October 2019 will be considered for scheduling in Session 1, 2020 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure and grade.

Upcoming e-VLBI Observing Sessions (real-time correlation)

Year	Begin Science Time 13:00 UTC	End Science Time 13:00 UTC
2020	21 Jan	22 Jan
2020	11 Feb	12 Feb
2020	17 Mar	18 Mar
2020	07 Apr	08 Apr

Successful proposals with an e-VLBI component submitted by the October 1 deadline will be considered for scheduling in the above e-VLBI sessions starting from 21 January 2020. Note that only one wavelength will be run in each e-VLBI session which will be based on the highest graded proposal.

e-VLBI sessions are intended for rapid response science or science with temporal constraints (e.g., transients, astrometry) or projects that can justify the need for rapid turnaround (e.g., student projects). The request for e-VLBI should be clearly justified in the proposal and, if multi-epoch e-VLBI is requested, proposals should also indicate the range of temporal cadence the proposal could sustain. Please consult the 'operational modes' section on http://www.evlbi.org/capabilities to check for possible updates, and for the available array.

Out-of-Session Observing

Out-of-Session observing time on user specified dates (up to a maximum of 144 hours/year), is available for both disk recording and e-VLBI modes. Proposals requesting Out-of-Session observing time must provide full scientific (and technical if appropriate) justification as to why observations must be made outside standard sessions.

Out-of-session observing will be scheduled in blocks of no less than 12 hours in duration (although proposals may request shorter observations), and occur no more than 10 times per year. Proposals should specify which dates/GST ranges are being requested and indicate the minimum requirement in terms of numbers of telescopes (and any particular telescopes).

Proposals will only be considered for dates occurring after the regular EVN session that follows EVN proposal review.

Urgent observations requiring much shorter lead times should be submitted as "Target-of-Opportunity" (ToO) proposals.

Availability of EVN Antennas

Image by Paul Boven (boven@jive.eu). Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).

The latest status of the EVN antennas can be found here.

The three **KVAZAR** antennas are now available for e-VLBI. Their participation is planned for the 2020 e-VLBI days in: Jan, Mar, Apr, Sep, Nov and Dec.

The **Kunming 40 m telescope**, operated by the Yunnan Astronomical Observatory, became a regular EVN station and can be requested for EVN disk-recording observations at 13, 6, 5 and 3.6 cm wavelengths.

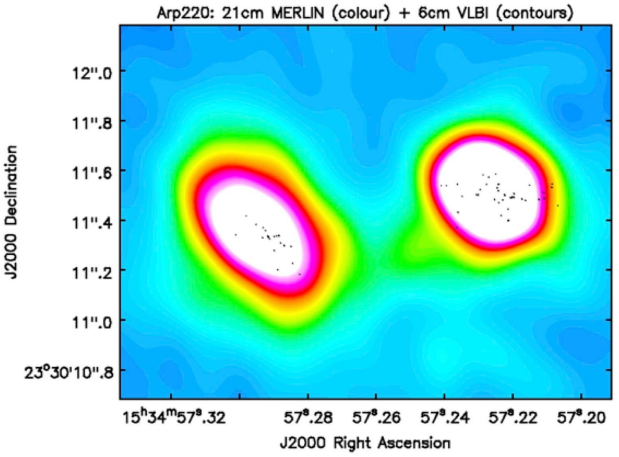
The **Arecibo Observatory** is available for VLBI observations. However, severe flooding following Hurricane Maria, has caused a deformation of a localised area of the dish affecting its exact sphericity. This has resulted in a drop of Arecibo's high-frequency gain that can be quantified at 18cm as an SEFD of ~3.1-3.5 Jy (cf. an SEFD of ~2.2-2.5 Jy normally expected for zenith angles less than 16 deg) and at 6 cm as an SEFD of ~7.3 Jy (cf. an expected SEFD of ~3.5 Jy between zenith angles 3 and 15 deg). The dish deformation has been surveyed, and the readjustment to return the surface to be truly spherical is expected to be realised in 2019.

The **Tianma 65m telescope** (Tm65) is located about 6 km away from the 25 m Seshan telescope (Sh). The 2-letter abbreviation for Tm65 telescope is T6. Both of these telescopes can observe at 18, 13, 6, 5, 3.6 and 3.6/13 cm. Tm65 can also observe at 21, 1.3 and 0.7 cm. Tm65 is the default telescope; Sh will be used if Tm65 is not available for some reason. If you select both, you should also discuss the motivation for the very short baseline in the proposal.

The **Korean VLBI Network** (KVN) is an Associate Member of the EVN. KVN telescopes may be requested for EVN observations at 1.3 cm and 7 mm wavelengths. For more details regarding the KVN, see: http://radio.kasi.re.kr/kvn/main_kvn.php

Integration of e-MERLIN Telescopes into the EVN

Integrated **e-MERLIN + EVN** observations are now available using up to 5 e-MERLIN outstations at 512Mbps; in addition to the selected Jodrell Bank home station. This additional capability provides short-spacing coverage between 11 and 220 km within e-MERLIN, together with intermediate and long baselines between e-MERLIN and EVN antennas in both disk-recording and e-VLBI mode. Principal Investigators (PIs) can request multiple e-MERLIN outstation antennas (all, or a subset of Pi, Da, Kn, De, Cm) in addition to an EVN homestation antenna at JBO (Jb1 or Jb2).



Radio emission from the starburst galaxy Arp 220, illustrating the angular scales covered by EVN+eMERLIN observations, showing the two nuclei of Arp220, dominated by star formation, (e-MERLIN) and the large population of supernovae and supernovae remnants (VLBI). This e-MERLIN (colour), with a resolution of 0.2 arcseconds, and VLBI (contours, visible as dots) at ~1.5 milliarcsecond resolution overlay image shows data presented by Varenius et al., 2014, A&A 593 and Varenius et al., 2019, A&A 632, respectively.

It is essential that e-MERLIN+EVN proposals **provide clear scientific/technical justification for the inclusion of e-MERLIN**

outstation telescopes, including why e-MERLIN outstation antennas are required for the delivery of the scientific goal. This is because in addition to EVN PC approval, the e-MERLIN outstation contribution has to be approved by the e-MERLIN Time Allocation Group (TAG). For e-MERLIN TAG approved projects e-MERLIN outstation data will then be available for full correlation with other EVN antennas at JIVE. Note that EVN proposals requesting only Jb1 or Jb2 are still considered as standard EVN proposals and will only require approval by the EVN PC.

For e-MERLIN outstations correlated within the EVN, the maximum bitrate available for each outstation correlation at JIVE (both disk and e-VLBI) is 512Mbps – equivalent to 2 polarizations at 64 MHz bandwidth. Thus the PI may request up to 5 outstation telescopes in dual polarization mode with a bandwidth of 64 MHz per polarization in addition to the e-MERLIN home station antenna at up to 1 Gbps depending on the observing wavelength (2 polarizations at 128 MHz bandwidth).

For further enquiries regarding e-MERLIN + EVN observations please see the e-MERLIN Contact Webpage, or alternatively email: vlbi@jb.man.ac.uk

Global VLBI Proposals

Global VLBI proposals can be proposed up to 2 Gbps including VLBA, JVLA and the GBT. Global proposals will be forwarded to the NRAO and GBO Time Allocation Committees (TAC) automatically and should not be submitted to NRAO and GBO separately.

Given the constraints in the availability, particularly of the GBT and JVLA, proposers are asked to **clearly justify the need for and illustrate the plan of use for these antennae**.

The **Green Bank Telescope** is operated by the Green Bank Observatory (GBO). Time available for global VLBI on the GBT is small (VLBI typically accounts for 10% of Open Skies observing), and only the most highly rated proposals across all GBT observation types will be awarded time. Additionally, proposers should be aware that long scheduling blocks (>6 hours) will be very difficult to schedule owing to constraints coming from non-NSF GBO partners. 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 must be taken, correlated, and calibrated in full Stokes mode. Due to the large cross talk between polarisations, only total intensity (Stokes I) data will be usable.

The **Very Long Baseline Array** (VLBA) has no limit to hours spent performing global VLBI. Use of VLBA for Open Skies observing is guided by the scientific merit of the proposal.

The **Karl G. Jansky Very Large Array** (JVLA) follows the same observing model as the VLBA, in that there are no restrictions on total hours of joint observing time but telescope time access is quite competitive so strong justification for its use is required. Note that phasing of the array at high frequencies (≤1.3cm) is done only in the compact antenna configurations (C and D) of the JVLA.

Some modes may require different bandwidth channels at different telescopes, which can be handled by the software correlator (SFXC). JIVE support staff will work with Socorro to assist you during the scheduling process of such observations. Global observations will be correlated at the SFXC correlator at JIVE (default) or at the DiFX correlator in Bonn or at the DiFX correlator in Socorro (if appropriate justification is given in the proposal).

For further inquiries regarding the GBT, VLBA and JVLA in global observations please contact the JIVE User Support.

Use of Australian VLBI Network Antennas

Some Australian **Long Baseline Array** (LBA) time will be made available for simultaneous scheduling with the EVN, thus enabling the possibility of joint LBA/EVN observations. The easternmost stations of the EVN are in a similar longitude range to the LBA telescopes, and for sources in equatorial regions, baselines to western European stations are also achievable for a brief period of time. Joint LBA time is likely to be heavily oversubscribed, and authors are requested to note whether they are prepared to accept scheduling without LBA antennas being present. EVN+LBA observations should be possible at all principal EVN wavebands from 21 cm to 1.3 cm. When specifying requested antennas from the LBA in the Northstar Proposal tool, please specify 'LBA' under the "other" row in the telescope-selection box - this selects all antennas that are available for joint observations.

Any proposals for joint EVN+LBA observations submitted to the EVN by its 1 October 2019 deadline should also be submitted to the LBA by their (provisional) 15 December 2019 deadline and will first be eligible for scheduling from EVN Session 1/2020. For more details regarding proposing time on the LBA, see:
https://www.atnf.csiro.au/observers/index.html

Joint observations with other facilities

For joint observations with other facilities, e.g., EVN+XMM, separate proposals should be submitted to the EVN and to the other facility. Such proposals will be considered by the EVN PC on a case-by-case basis.

EVN Travel support through the Transnational Access Programme

Travel support to the EVN is supported, for eligible projects, by the Transnational Access programme of the RadioNet project, funded by the EC Horizon 2020 Research and