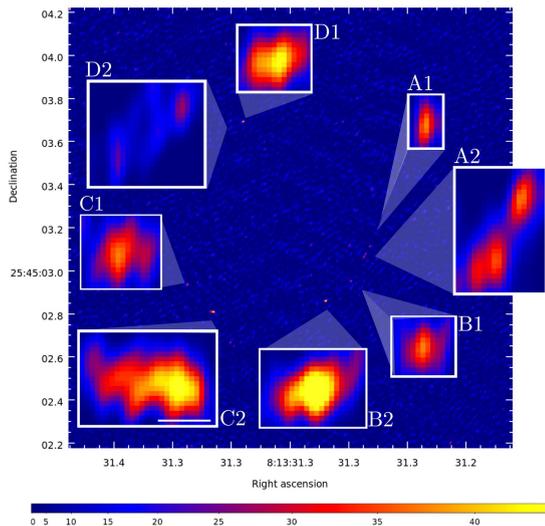

European VLBI Network
Call for Proposals
Deadline: 1 June 2019 23:59:59 UTC



EVN 18cm image of the lensed radio quiet quasar HS 0810+2554 at $z=1.51$ from Hartley et al., 2019, MNRAS 485.

Observing proposals are invited for the European VLBI Network (EVN). The EVN is a very long baseline interferometry (VLBI) network of radio telescopes located primarily in Europe and Asia, with additional antennas in South Africa and Puerto Rico, operated by an international consortium of institutes. The EVN provides very high sensitivity images at angular scales of (sub-)milliarcseconds in the radio domain. EVN proposals can also request additional combination data from e-MERLIN to extend the spatial sensitivity to (sub-)arcsecond angular scales. Furthermore, global spatial (uv-) coverage may be requested by incorporating NRAO telescopes for high angular resolution imaging.

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. Every year standard (disk recording) EVN observations occur during three sessions of approximately 21 days each and ten days of e-VLBI mode.

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).

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

- **Standard EVN observing sessions** including global and integrated e-MERLIN observations
- **e-VLBI observing sessions**, including e-MERLIN
- **Out-of-Session observations**
- **Target of Opportunity (ToO)**
- **Short observations**

The first 3 classes have deadlines on 1 February, 1 June or 1 October each year, while proposals for ToO and Short observations 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 Projects

The EVN Programme Committee (PC) encourages the submission of large proposals (>48 hrs); these will be subject to more detailed scrutiny, and the EVN PC may, in some cases, 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 andGBT, 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:

<http://www.jive.eu/jivewiki/doku.php?id=evn:guidelines> or the Operational modes section on <http://www.evlbi.org/capabilities>.

Questions regarding the proposal preparation can be sent to Zsolt Paragi zparagi@jive.eu. In case 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:

https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/2Gbps

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 here: http://old.evlbi.org/evlbi/e-vlbi_status.html.

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

Upcoming standard EVN observing sessions (disk recording)

2019 Session 3 Oct 17 - Nov 07 18/21 cm, 6 cm ...
2020 Session 1 Feb 20 - Mar 12 18/21 cm, 6 cm ...
2020 Session 2 May 21- Jun 11 18/21 cm, 6cm ..

Proposals received by 1 June 2019 will be considered for scheduling in Session 3, 2019 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure and grade.

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

2019 Sep 17 13:00 UTC - Sep 18 13:00 UTC 18/21 cm, 6 cm, 5 cm, 1.3 cm
2019 Oct 15 13:00 UTC - Oct 16 13:00 UTC 18/21 cm, 6 cm, 5 cm, 1.3 cm
2019 Nov 12 13:00 UTC - Nov 13 13:00 UTC 18/21 cm, 6 cm, 5 cm, 1.3 cm
2019 Dec 03 13:00 UTC - Dec 04 13:00 UTC 18/21 cm, 6 cm, 5 cm, 1.3 cm

Successful proposals with an e-VLBI component submitted by the June 1 deadline will be considered for scheduling in the above e-VLBI sessions starting from 17 September 2019. 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 (transients, astrometry). 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 [e-VLBI website](http://www.evlbi.org) or 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



The latest status of the EVN antennas can be consulted on:

http://old.evlbi.org/user_guide/EVNstatus.txt

The **Arecibo Observatory** is again 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), 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 the 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.

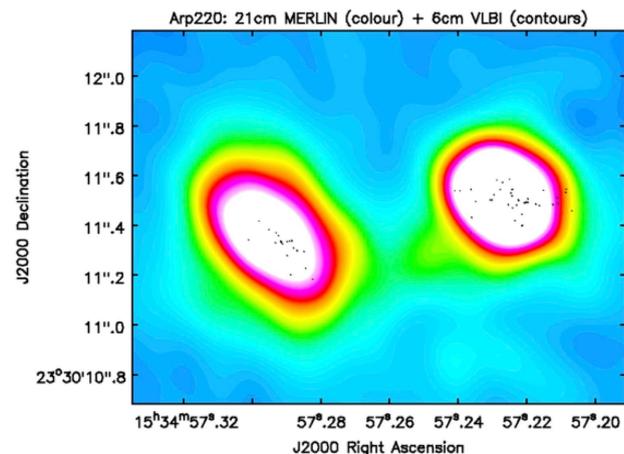
The **Korean VLBI Network** (KVN) is an Associate Member of the EVN. KVN telescopes may be requested for EVN observations at 1.3 cm and 7 mm wavelengths. For more details regarding the KVN, see: http://radio.kasi.re.kr/kvn/main_kvnp.php

The **Kunming 40 m telescope**, an affiliated EVN station situated on Phoenix Mountain, about 10 km east of the city of Kunming, China, may be requested (and will participate on a best efforts basis) for EVN disk-recording observations at 13, 6, 5 and 3.6 cm wavelengths.

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). Such proposals should clearly indicate that they are e-MERLIN+EVN observing requests and provide clear scientific/technical justification for the inclusion of e-MERLIN telescopes, including why e-MERLIN outstation antennas are required for the science goal delivery. In addition to EVN PC approval, these requests will be forwarded by the EVN to the e-MERLIN TAG for approval of the specific e-MERLIN contribution. For approved projects e-MERLIN outstation data will then be available for full correlation with other EVN antennas. EVN proposals requesting only Jb1 or Jb2 are still considered as standard EVN proposals and will only require approval by the EVN PC. Full bandwidth e-MERLIN observations will require a separate linked e-MERLIN proposal which should be submitted by the PI to e-MERLIN. For more information see: <http://www.e-merlin.ac.uk/>



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.

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 homestation 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 Web page: <http://www.e-merlin.ac.uk/contact.html> or alternatively email to vlbi@jb.man.ac.uk

Global VLBI Proposals

Global VLBI proposals can be proposed up to 2 Gbps including VLBA, GBT and the JVLA. Global proposals will be forwarded to NRAO automatically and should not be submitted to NRAO separately. Given the constraints in the availability, particularly of the large aperture telescopes in the US, proposers are asked to clearly justify the need for and illustrate the plan of use for these antennae.

The **Green Bank Telescope**, has transitioned into a new partnership arrangement, the Green Bank Observatory (GBO). Time available for global VLBI on the GBT is small (VLBI typically accounts for 10% of Open Skies observing at the GBT), 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 (more than 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** (VLA) follows the same model as VLBA in that there are no restrictions on total hours of joint observing time but telescope time access is quite competitive so a good justification is required.

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).

RadioAstron Observations

Proposals requesting the EVN as ground array support or correlation at JIVE for **RadioAstron** A07 (July 2019 till June 2020 inclusive) observations may be submitted at this deadline. As the current status of RadioAstron observations is uncertain, the proposals should include a section dedicated to the science achievable without RadioAstron allowing the PC to evaluate the proposal also as an EVN or global standalone proposal if RadioAstron is unavailable. For more information on RadioAstron see <http://www.asc.rssi.ru/radioastron/>.

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 June 2019 deadline should also be submitted to the LBA by their (provisional) 15 June 2019 deadline and will first be eligible for scheduling in EVN Session 3/2019. 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 Innovation Programme under grant agreement No 730562. This transnational access support, includes also travel reimbursement **for visits to JIVE in order to analyse and process EVN, EVN+e-MERLIN or global VLBI Data**. Further information can be found at: <http://www.evlbi.org/travel-support>

