European VLBI Network Newsletter

Number 43
January 2016

Contents

_____

Edited by Antonis Polatidis, EVN Secretary (ASTRON, The Netherlands; polatidis@astron.nl)

Message from the Chairman of the EVN Board of Directors

Dear Colleagues in the European VLBI Network, Dear Users of the EVN,

The Call for Proposals for the 1st February 2016 deadline has already been circulated and describes in detail some of the new options available to EVN users. More information can be found in the next section.
The EVN Programme Committee will meet on March 8 in Zaragosa to review the new proposals.

A notable addition is that integration of e-MERLIN outstation antennas into the EVN is now possible, following recent software upgrades on the e-MERLIN correlator at Jodrell Bank. EVN experiments can now include multiple e-MERLIN outstation antennas in addition to an antenna at Jodrell Bank.

Note also that proposals requesting the EVN as ground array support for RadioAstron AO4 observations in the period 1 July 2016 to 30 June 2017 may be submitted at this deadline.

This Newsletter also showcases the continued development of VLBI capabilities in the area of data analysis: Radcliffe et al. write about exciting results obtained with the new technique of multi-source self-calibration (MSSC).

For the 2016 EVN Symposium in St. Peterburg, September 20-23, a website has now been set up. The meeting will be hosted by the Institute of Applied Astronomy in St Petersburg. Further announcements about registration, submission of abstracts, travel logistics, etc. will be circulated shortly.

I also draw your attention to the announcement in this newsletter of a special session on VLBI, "Nanoradians on the sky: VLBI across the Mediterranean and beyond", during the European Week of Astronomy and Space Science (EWASS 2016, 4-8 July 2016, Athens).

The next meetings of the EVN Consortium Board of Directors and the JIVE Council will be held on May 10 and 11, respectively, in Madrid.

René Vermeulen,
Chairman, EVN Consortium Board of Directors

Call for the EVN Proposals

European VLBI Network
Call for Proposals
Deadline 1st February 2016

This text is also available on the web at: http://www.oso.chalmers.se/evn/call.txt

Observing proposals are invited for the EVN, a VLBI network of radio telescopes spread throughout Europe and beyond, operated by an international consortium of institutes (http://www.evlbi.org/).
The observations may be conducted with disk recording (standard EVN) or in real-time (e-VLBI).

The EVN facility is open to all astronomers. Use of the Network by astronomers not specialised in the VLBI technique is encouraged.

The Joint Institute for VLBI ERIC (JIVE) can provide support and advice on project preparation, scheduling, correlation and analysis. See EVN User Support at http://www.jive.eu.

Future Standard EVN Observing Sessions (disk recording)

2016 Session 2	May 26 - Jun 16	18/21cm, 6cm ...
2016 Session 3	Oct 20 - Nov 10	18/21cm, 6cm ...
2017 Session 1	Feb 23 - Mar 16	18/21cm, 6cm ...

Proposals received by 1st February 2016 will be considered for scheduling in Session 2, 2016 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure. The dates for Session 1 2017 are as yet provisional.

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

2016	Mar 15 - Mar 16 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2016	Apr 12 - Apr 13 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2016	May 10 - May 11 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2016	Jun 21 - Jun 22 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2016	Sep 21 - Sep 22 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm

2016 Oct 11 - Oct 12 (start at 13 UTC) 18/21cm, 6cm, 5cm or 1.3cm
2016 Nov 15 - Nov 16 (start at 13 UTC) 18/21cm, 6cm, 5cm or 1.3cm
2016 Dec 06 - Dec 07 (start at 13 UTC) 18/21cm, 6cm, 5cm or 1.3cm

Please consult the e-VLBI web page at http://www.evlbi.org/evlbi/e-vlbi_status.html to check for possible updates, and for the available array.

Successful proposals with an e-VLBI component submitted by the February 1 deadline will be considered for scheduling in the above e-VLBI sessions starting from March 15 2016.

Note that only one wavelength will be run in each e-VLBI session, selected based on proposal priorities.

See http://www.jive.eu/jivewiki/doku.php?id=evn:guidelines for details concerning the e-VLBI observation classes and observing modes.

Features for the Next Standard EVN and e-VLBI Sessions

For integration of e-MERLIN telescopes into the EVN, see below.

Recording at 2 Gbps is available at C-, X-, K- and Q-band at a subset of the EVN telescopes. The remaining telescopes will record at 1 Gbps (mixed mode observation). The current status is given here: https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/2Gbps

Use of this data rate should be clearly justified and limited to projects which really need it.

A new e-VLBI class is available: "Automated e-VLBI trigger observations". It is an observation to be scheduled automatically during an e-VLBI run only if a specific set of triggering criteria is met. The expected response time to execute a new program may be as low as 10 minutes. For details see:
http://www.jive.eu/jivewiki/doku.php?id=evn:guidelines&#automated_e-vlbi_trigger_observations

The rules for the e-VLBI class "Triggered e-VLBI observations" have been modified in such a way that a triggered project can override the scheduled observing frequency for a given e-VLBI session. For details see:
http://www.jive.eu/jivewiki/doku.php?id=evn:guidelines&#triggered_e-vlbi_observations

Please consult http://www.evlbi.org/evlbi/e-vlbi_status.html and the EVN User Guide http://www.evlbi.org/user_guide/user_guide.html for updates on the current EVN and e-VLBI array, availability of different stations per observing band and for the dates of the e-VLBI observing sessions.

Global VLBI Proposals

Global proposals can be proposed up to 2 Gbps including VLBA, GBT and the JVLA.

Some modes may require different bandwidth channels from EVN & NRAO telescopes; correlation at JIVE can handle this.

JIVE support staff and Amy Mioduszewski at Socorro will assist 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 for RadioAstron AO4 observations in the period 1 July 2016 to 30 June 2017 may be submitted at this deadline.

Large EVN Projects

Most proposals request 12-48 hrs observing time. The EVN Program Committee (PC) also encourages larger projects (>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.

Availability of EVN Antennas

The WSRT will be participating with a single telescope, equipped with dual circular polarization receivers. The frequency coverage will remain the same. Pending characterization of the new receiver, proposers who wish to use the EVN Calculator, should select "W1" instead of "Wb".

Tm65 is the 65 m telescope at Tianma, 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 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.

Integration of e-MERLIN Telescopes into the EVN

Integration of e-MERLIN outstation antennas into the EVN is now possible following recent software upgrades on the e-MERLIN correlator at Jodrell Bank. EVN experiments can now include multiple e-MERLIN outstation antennas in addition to an antenna at Jodrell Bank. The total recorded bandwidth for the outstations will be limited to 1 Gb/s but can be divided between 1, 2 or 4 e-MERLIN antennas. PIs of proposals should indicate in the scientific justification which e-MERLIN antennas they wish to record. These data will then be available for correlation with all other EVN stations in mixed mode, providing a fully integrated additional set of short spacing EVN data for the first time. For example, within e-MERLIN, the baseline coverage from Jb to Da, Kn, De, and Cm would span separations of 11 to 220 km.

Proposers can alternatively still request a full bandwidth e-MERLIN observation for high sensitivity lower surface brightness imaging where the e-MERLIN telescopes are correlated at JBO. At L-Band the maximum bandwidth is 2x512MHz, from Session 3 2016, we envisage that at C- and K-Band a maximum bandwidth of 2x2GHz will be available.

For any technical queries contact: vlbi@jb.man.ac.uk

Use of Korean VLBI Network Antennas

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://kvn-web.kasi.re.kr/en/en_normal_info.php

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. 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.

Any proposals for joint EVN+LBA observations submitted to the LBA by its (provisional) 15 June 2016 deadline should also be submitted to the EVN by the 1 February 2016 deadline and will first be eligible for scheduling in EVN Session 3/2016.

For more details regarding proposing time on the LBA, see:
http://www.atnf.csiro.au/observers/apply/avail.html & http://www.atnf.csiro.au/vlbi/index.html

EVN+LBA observations should be possible at all principal EVN wavebands from 21 cm to 1.3 cm.
See: http://www.evlbi.org/user_guide/freq_cov.html and http://www.evlbi.org/user_guide/EVNstatus.txt .

Out of Session Observing

Out-of-Session observing time (up to a maximum of 144 hours/year) is now available to all proposals disk recording or e-VLBI). 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 blocks should be no less than 12 hours in duration (although individual observations can be shorter), 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. Observations requiring much shorter lead times should be submitted as "Target-of-Opportunity" (ToO) proposals.

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.

How to Submit

All EVN and Global proposals (except ToO proposals) must be submitted using the NorthStar on-line proposal submission tool. Global proposals will be forwarded to NRAO automatically and should not be submitted to NRAO separately.

New proposers should register at http://proposal.jive.eu.

The SCIENTIFIC JUSTIFICATION MUST BE LIMITED TO 2 PAGES in length. Up to 2 additional pages with diagrams may be included.

When specifying requested antennas from the LBA, please specify 'LBA' under the "other" row in the telescope-selection box - this selects all that are available for joint observations.

The deadline for submission is 23:59:59 UTC on 1st February 2016.

Additional information

Further information on EVN, EVN+MERLIN, Global VLBI and e-VLBI observations, and guidelines for proposal submission are available at: http://www.jive.eu/jivewiki/doku.php?id=evn:guidelines
The EVN User Guide (http://www.evlbi.org/user_guide/user_guide.html) describes the network and provides general information on its capabilities.
The current antenna capabilities can be found in the status tables. For the standard EVN see: http://www.evlbi.org/user_guide/EVNstatus.txt
For the e-EVN array see: http://www.evlbi.org/evlbi/e-vlbi_status.html
The On-line VLBI catalogue (http://db.ira.inaf.it/evn) lists sources observed by the EVN and Global VLBI.

Michael Lindqvist, Onsala Space Observatory, EVN PC Chairman

EVN Science Highlights

Unveiling the microJy Regime of Compact Radio Sources using Multi-Source Self-Calibration

A team led by Jack Radcliffe (University of Manchester, Groningen and ASTRON), Michael Garrett (ASTRON/ Leiden), Adam Deller (ASTRON) and Enno Middelberg (Ruhr-Universitat Bochum) have developed a new calibration technique for wide-field VLBI observations. Termed multi-source self-calibration (MSSC), this technique uses the combined response of many sources across the field-of-view in order to perform self-calibration on the target field. MSSC solves for any residual phase errors arising from standard phase-referenced calibration using nearby, compact sources and, as such, can greatly improve the dynamic range of target sources.

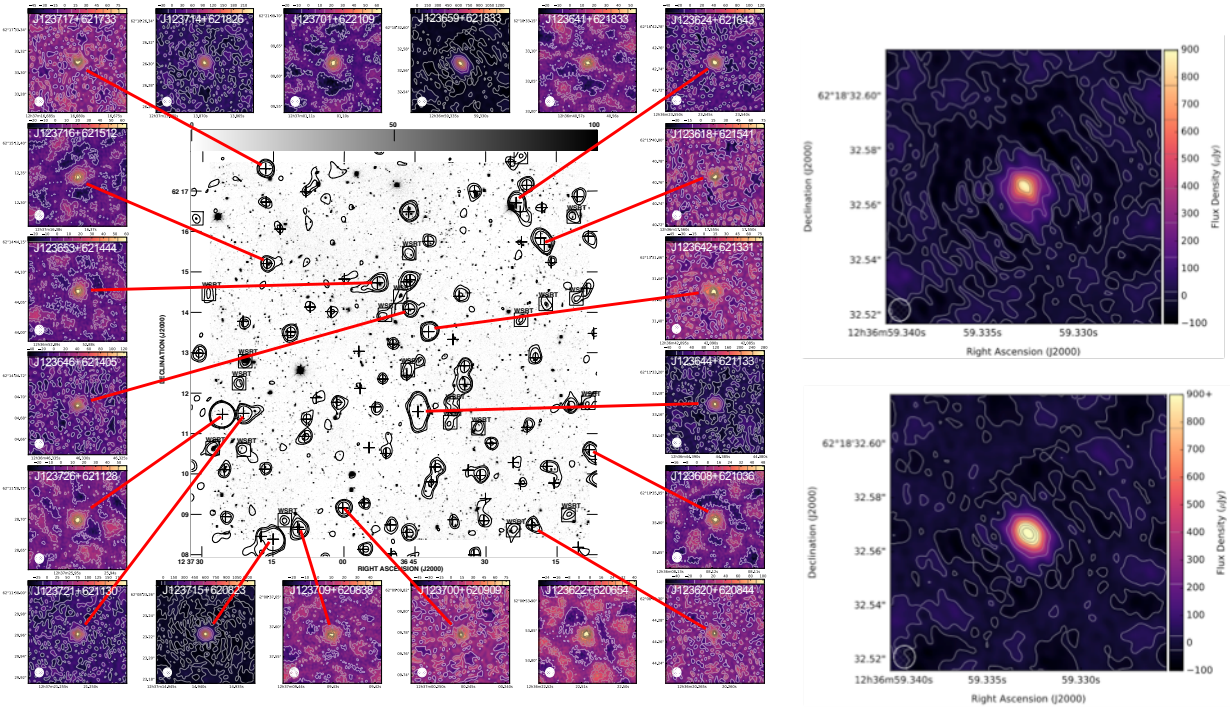

Figure: *Left:* a composite view of the HDF-N field with the 19 sources detected. Right: Compact radio source, J123659+621833, top: before MSSC corrections, the signal to noise is 56.1; bottom: after MSSC corrections, the signal to noise has increased to 115.8

In a recent paper, MSSC was applied to the largest wide-field VLBI data set ever undertaken by the EVN. This is a follow up to Chi et al. 2013 (A&A, 550, A68) and uses 699 phase centres to target a 15 arcminute diameter area centred on the Hubble Deep Field-North. With standard phase referencing 19 sources were detected of which 9 were combined to derive phase corrections using MSSC. On average, with MSSC applied, they found an improvement in signal to noise of 27% in naturally weighted images, and a 63% increase in uniformly weighted images. In addition, MSSC allowed one more source to be detected, taking the total to 20. MSSC corrections provided a vast improvement in the dynamic range and the noise profiles of the imaged sources. The technique is extremely flexible and could be used on any wide-field VLBI data set targeting multiple sources. A Parseltongue script which implements MSSC was released with the paper (http://arxiv.org/abs/1601.04452) and can be found at https://github.com/jradcliffe5/multi_self_cal.

Jack F. Radcliffe, Jodrell Bank Centre for Astrophysics/ASTRON/University of Groningen

EVN Technical Operations Group Report:

During the last months of 2015 progress has continued towards 2 Gbps eVLBI observations in VDIF mode. We aim to having this mode as standard in as much stations as possible in the near term future. The current limitation for going above 1 Gbps for eVLBI at stations comes from the Mark5B's bus. In order to avoid it, it is necessary to transfer the data directly from the DBBC to the correlator. This operation requires the usage of the Fila10G module equipped with 10 Gb/s connections. The support for Fila10G operations at the FS was already present in the latest FS version which was released in September 2015, some weeks previous to EVN session 3.

The Fila10G produces VDIF data which can be of two types, single-thread or multi-thread. The latter allows the send the data to different correlators. In November 2015 a test between Onsala, Effelsberg, Medicina, Yebes and Hartebeesthoek was run to test both modes. The test was successful with single thread VDIF format. We discovered some tuning was required for multithread VDIF mode. This has been worked out by Gino Tuccari and will be tested again in 2016. On the other hand some additional work has to be developed for the correlator to be able to start and stop the data flow of data from the stations. This is also an ongoing work and should be completed in the next months.

Continuous calibration, that is calibration by a noise diode, which works with a cycle of 80 Hz, is also supported by the Field System and has been used in the last session in 3 stations of the EVN. This was a long desired goal and it seems to start being fulfilled. The usage of this mode uncovered some issues, which have been already addressed. `More stations` will use this mode in the near future.

Pablo de Vicente, Observatorio Astronómico Nacional, Yebes, Spain, EVN TOG Chairman

EVN Scheduler's Report

2015 Session 3: 15 October – 05 November
Wavelengths: 18/21, 5.0, 3.6, 6.0 cm
Number of different user experiments observed: 23
Session Duration: 21.0 days Efficiency: 38.1%
Breakdown of observations by type and correlator. TBYTES indicates the estimated disk usage (in TB).

Session-3, 2015	N-OBS	HOURS	DAYS	T-BYTES
TOTAL	28	192.0	8.0	940.3
EVN-only	20	150.0	6.3	561.2
Global	2	27.0	1.1	337.6

Short Obs.	1	2.0	0.1	11.0
Tests	5	13.0	0.5	30.5
EVN Correlator	28	192.0	8.0	940.3
Bonn Correlator	0	0.0	0.0	0.0
VLBA Correlator	0	0.0	0.0	0.0
eEVN Correlator	0	0.0	0.0	0.0
Other Correlator	0	0.0	0.0	0.0
CAL-only	4	16.0	0.7	0.0

MERLIN	4
Arecibo	0
VLBA	2
GBT	1
VLA	0
Robledo	3
Goldstone	0
RadioAstron	5
KVN	0
Wettzell	3

2015 e-VLBI Observations

				e-VLBI PROPOSAL TYPE				
RUN	DATE	λ	HRS	Normal	Short	Disk	ToO	Trigger
15e01	13JAN15	18cm	24	2	0	-	0	0 sched 0 trig
15e02	10FEB15	18cm	19	2	1	-	0	0 sched 0 trig
15e03	24MAR15	6cm	22.5	3	0	-	0	2 sched 0 trig
15e04	14APR15	18cm	10	1	1	-	0	0 sched 0 trig
15e05	12MAY15	18cm	16.5	2	1	-	0	0 sched 0 trig
15e06	23JUN15	18cm	22.0	2	0	-	0	0 sched 0 trig
15e07	15SEP15	18cm	14.0	2	0	-	0	1 sched 0 trig
15e08	06OCT15	6cm	21.5	3	0	-	0	3 sched 0 trig
15e09	17NOV15	6cm	24.0	1	1	-	1	0 sched 0 trig
15e10	01DEC15	18cm	19.5	2	1	-	1	1 sched 0 trig

Alastair Gunn, University of Manchester, EVN Scheduler

News from EVN Institutes

Remote atomic clock delivery to the VLBI station in Toruń

On Nov. 26, 2015 Toruń Radio Astronomy Observatory was connected to the Polish fiber optic network distributing time and frequency (T&F) signals from UTC(PL) and UTC(AOS) laboratories. This paved the way for the investigation of alternative methods of T&F synchronization during VLBI observations. The technology of T&F distribution was developed at AGH University.

Typically, T&F signals for VLBI observations are provided by a local standard, usually an H- maser. Here, we report how the fiber network allows remote synchronization of the station with optical strontium clock operated in Toruń and with both Polish UTC laboratories. Additionally, the local H-maser may be disciplined by these remote sources.

The first proof-of-concept VLBI observation using remote synchronization via optical fiber link was carried out on Dec. 18 2015. Data from Toruń, Westerbork, Medicina, Yebes, and Onsala were correlated in real-time (e-VLBI) at the JIVE correlator. *Additionally, the raw data from the stations were recorded at JIVE for*

possible further processing. The T&F signals from a remote H-maser, i.e. 1 PPS and 10 MHz, were delivered from UTC(AOS) via cascaded link Borowiec- Toruń (330 km) and Toruń-Piwnice (15 km). To make the comparison of both methods of synchronization possible, the observation began under local synchronization (from the in-situ H-maser) and shifted to remote synchronization, with each segment lasting about an hour.

The initial analysis carried out at JIVE showed that the fringe visibility phase noise is very similar for both synchronization schemes for all four baselines to the Toruń station, over time-scales ranging from two seconds to 45 minutes. The initial success was confirmed in the operational use of the remote H-maser in the e-VLBI session of Jan 12-13, 2016.

The next step, testing that remote synchronisation to the T&F signal from the optical strontium clock (transmitting via fiber), will be better than the H-maser, as predicted, will take place in early 2016.

Andrzej Marecki, Torun Observatory.

Recent and Upcoming Meetings

EWASS 2016: Nanoradians on the sky

During the European Week of Astronomy and Space Science (EWASS 2016, 4-8 July 2016) in Athens, Greece, a special session will be organized for VLBI:

Nanoradians on the sky: VLBI across the Mediterranean and beyond
(see http://eas.unige.ch/EWASS2016/session.jsp?id=SS10)

This session is dedicated to the future of European (and Global) VLBI in general, but more specifically to how we will do VLBI with the Square Kilometre Array (SKA-VLBI).
The 1.5-hour long blocks will be organized around three probable SKA-VLBI Key Science areas. These are: Astrometry, AGN and wide-FoV Surveys, and Explosive Phenomena/Transients. We will consider whether SKA KSP for VLBI should be formed and how a Global SKA-VLBI network will be operated. This meeting will demonstrate the community's interest in very high-resolution science with the Phase-I SKA components.

Please come and share your ideas with the participants of the EWASS2016 Special Session 10, on Friday July 8. We remind you that the deadline for Abstract submission is March 15, 2016. Please check the conference website for further information on registration deadlines.

Zsolt Paragi,JIVE, for the SOC

20-23 September 2016: The 13th European VLBI Network Symposium

The 13th European VLBI Network (EVN) Symposium and the EVN Users meeting will be hosted by the Institute of Applied Astronomy of the Russian Academy of Sciences (IAA RAS) in St.Petersburg, Russia, on September 20-23, 2016. An early announcement is available at the conference web site: http://www.ipa.nw.ru/EVN2016.

Yuri Bondarenko (IAA, Chair of LOC)