European VLBI Network Newsletter

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Contents

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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 European VLBI Network (EVN) Consortium Board of Directors (CBD) met on 9 and 10 May 2017 in Torun (Poland). There were discussions on reports from the PC, the TOG, the correlators, JIVE, the stations, and partner organisations.

The PC Chair reported a greater diversity in recent proposals with regard to the nature of the observing time requested. A working group of the CBD has been formed to discuss tailoring the mix of EVN observing options: issues to be considered included the balance between eVLBI and regular session time, and catering to large-scale, or possibly long-term proposals. Following an interesting presentation by W. Brisken, director of the LBO, the working group may consider further opportunities for Global VLBI. The CBD also discussed several rotations in the membership of the EVN PC. In order to increase the utility of the information in the EVN Archive, the CBD decided that the abstracts of accepted proposals will become publicly available once the first dataset resulting from a proposal is uploaded into the EVN Archive; this will be implemented starting with proposals submitted for the October 2017 Call for Proposals, and will be clearly announced in that call.

Figure 1: EVN CBD meeting participants and their hosts in front of the 32m telescope at Torun Radio Observatory

The CBD also discussed the TOG report. It was noted in particular that a very substantial subset of the EVN stations now has the capability for 2 Gbps observing, and development continues. The CBD has therefore confirmed its aim to build up in the short term enough recording capacity to establish 2 Gbps as the standard recorded bitrate for continuum projects. The TOG has been asked to report the investment that each station would have to make to realize this aim.

T. Venturi presented the process and timeline for the creation of an EVN Future Vision document, which will be an overview of the scientific strengths of the EVN as we move into the next decade, and can also serve to guide priorities for further technology steps (for which there is so much potential, e.g. leading on from current development projects supported through RadioNet4 and JumpingJIVE, which kicked off in January and February). By September 2018 a complete draft Vision document will be ready to be presented to the Users' Meeting at the 14th EVN Symposium. Refinements to that draft will be made in the year following.

As I am nearing the end of my term as CBD Chair on 1 July, it is my privilege indeed to report that John Conway has been appointed as the next CBD Chair – we all look forward to working with him in that role! I am also very happy to report that Rafael Bachiller will be the next vice-Chair of the CBD.

Looking back on my term, I see that a steadily continuing development of the EVN. Data rates are increasing, as mentioned already, both for eVLBI and recorded VLBI. Capabilities, and the flexibility of observing and processing were further enhanced, and many other issues have been successfully tackled by the TOG.
A highlight for me, and I am sure for my colleagues as well, was the entry, in October 2016, of the Ventspils International Radio Astronomy Centre (VIRAC) with its Irbene observatory as a new full member of the EVN! Many colleagues in the EVN have provided support in one way or another to make possible this addition to our family, which is furthermore a tribute to the dedication and competence of the VIRAC staff in accomplishing a truly major overhaul of their 16-meter and 32-meter Soviet-vintage radio telescopes. The new availability of the Kunming 40m telescope as an affiliated station (advertised for the first time in the 1 June 2017 Call for Proposals) is another very welcome step, showing that the growth of the capabilities of the EVN is certain to continue.

Of course all of these EVN developments are crowned by seeing the science results come out. In recent CBD meetings I have asked that the EVN PC Chair publicly presents the traditional update on new science highlights, during a lunch or tea talk to which all staff of the host institute are invited. The capabilities of VLBI were also showcased recently at other meetings with a broad audience, such as the workshop on "Nanoradians on the sky: VLBI across the Mediterranean and beyond" during the 2016 European Week of Astronomy and Space Science (EWASS). A highlight was of course the press attention that was attracted by

the first localization of a Fast Radio Burst (FFRB), in which the EVN played a prominent role, presented at the January 2017 American Astronomical Society's meeting in Grapevine, Texas. But to me the best recent broad overview of the excellent state of EVN science was the 13th EVN Symposium (2016); thanks again to the IAA colleagues for hosting it!

All the more reason, therefore, to look forward to the dates now decided for the 14th EVN Symposium, to be held in Granada, Spain**:** October 8-11, 2018.

The next meeting of the EVN Consortium Board of Directors will be held in November 2017, in Onsala, Sweden. Meanwhile, the 1st June 2017 deadline for Call for Proposals is approaching. The EVN Programme Committee will next meet on June 27, 2017, in Bologna to review the proposals.

In closing: we all know that the EVN owes its successes to a large and dedicated group of people who are based both at the EVN observatories and at JIVE (it was satisfying that last year Huib Jan van Langevelde and I were able to sign an SLA on the many ways in which the JIV-ERIC supports the EVN). But I am sure nobody will object when I single out for personal thanks the officers of the EVN, PC Chair Michael Lindqvist, TOG Chair Pablo de Vicente, and EVN Scheduler Alastair Gunn, for their many interactions with me during my term as Chair, for having to deal with my sometimes difficult or cumbersome questions, but mostly for their excellent and tireless efforts, which are absolutely required to keep the EVN running. I am also grateful to EVN Secretary Antonis Polatidis for his support in many ways, including the editing of this Newsletter.

René Vermeulen,
Chairman, EVN Consortium Board of Directors

Call for the EVN Proposals

European VLBI Network
Call for Proposals
Deadline 1st June 2017

This text is also available on the web at
http://www.chalmers.se/en/centres/oso/radio-astronomy/vlbi/Documents/EVN_CfP.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 proposal preparation, scheduling, correlation and analysis. See EVN User Support at http://www.jive.eu.

Future Standard EVN Observing Sessions (disk recording)

2017 Session 3	Oct 19 - Nov 09	18/21 cm, 6 cm ...
2018 Session 1	Feb 22 - Mar 15	18/21 cm, 6 cm ...
2018 Session 2	May 24 - Jun 14	18/21 cm, 6 cm ...

2018 Session 3 Oct 18 - Nov 08 18/21 cm, 6 cm ...

Proposals received by 1st June 2017 will be considered for scheduling in Session 3, 2017 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure.

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

2017 Sep 19 - Sep 20 (start at 13 UTC) 18/21 cm, 6 cm, 5 cm or 1.3 cm
2017 Oct 10 - Oct 11 (start at 13 UTC) 18/21 cm, 6 cm, 5 cm or 1.3 cm
2017 Nov 14 - Nov 15 (start at 13 UTC) 18/21 cm, 6 cm, 5 cm or 1.3 cm
2017 Dec 14 - Dec 15 (start at 13 UTC) 18/21 cm, 6 cm, 5 cm or 1.3 cm

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 September 19, 2017.

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.

New Features for the Next Standard EVN and e-VLBI Sessions

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

e-VLBI at 2 Gbps is available at 6 cm and 1.3 cm at a subset of the EVN telescopes. The remaining telescopes will observe at 1 Gbps (mixed mode observation). The current status is given here:

http://www.evlbi.org/evlbi/e-vlbi_status.html

Disk recording at 2 Gbps is available at 6 cm, 3.6 cm, 1.3 cm and 0.7 cm 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 that really need it.

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 at different telescopes; correlation at JIVE can handle this.

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 AO5 observations in the period: 19 October 2017 to 30 June 2018, 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 SRT will be offline for at least the entire 2017 and VLBI operations are expected to restart at some time in 2018. Exact date will be communicated at a later stage when closer to resume operations.

The Irbene 32 m telescope is a new EVN station located 30 km north of Ventspils, Latvia. The telescope may be requested for EVN disk recording observations at 18 (single pol., RCP, uncooled receiver), 6, 5 and 3.6 cm wavelengths.

The WSRT will be participating with a single telescope, equipped with dual circular polarization receivers. The frequency coverage will remain the same. 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 on a shared risk basis. 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 Gbps 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 + 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. This contemporaneous mode will be offered as a fall back to simultaneous observations

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://radio.kasi.re.kr/kvn/main_kvn.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 EVN by its 1 June 2017 deadline should also be submitted to the LBA by their (provisional) 15 December 2017 deadline and will first be eligible for scheduling in EVN Session 1/2018.

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 and short-observation proposals, see http://www.jive.eu/jivewiki/doku.php?id=evn:guidelines) 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.

Proposals must include the following sections:

1. Science & technical justification
2. Figures, tables and references (optional)

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.

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 June 2017.

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.

A selection of recent highlights is presented here:
http://www.jive.eu/jivewiki/doku.php?id=evn:evn_science

A selection of recent refereed EVN publications is presented here:
http://www.jive.eu/jivewiki/doku.php?id=evn:evn_publications

Michael Lindqvist, Onsala Space Observatory, EVN PC Chairman

EVN Science Highlights: VLBI observations of four radio quasars at z>4: blazars or not?

Blazars are active galactic nuclei (AGN) whose relativistic jets point nearly to the line of sight. Their compact radio structure can be imaged with very long baseline interferometry (VLBI) on parsec scales. Blazars at extremely high redshifts provide a unique insight into the AGN phenomena in the early Universe. Four radio sources at redshift z>4 were observed with the European VLBI Network (EVN) in e-VLBI mode at 1.7 and 5 GHz in 2015 and 2016 (project code: EC054). The targets were previously classified as blazar candidates based on X-ray observations. VLBI imaging was used to confirm the blazar nature of these sources.

The results were partly expected - and partly surprising. Dual-frequency EVN data show that the source J2134-0419 (z=4.35) has a compact one-sided core-jet structure extended to ~10-mas angular scale. The core brightness temperature indicates a relativistically beamed jet, as expected from a blazar.

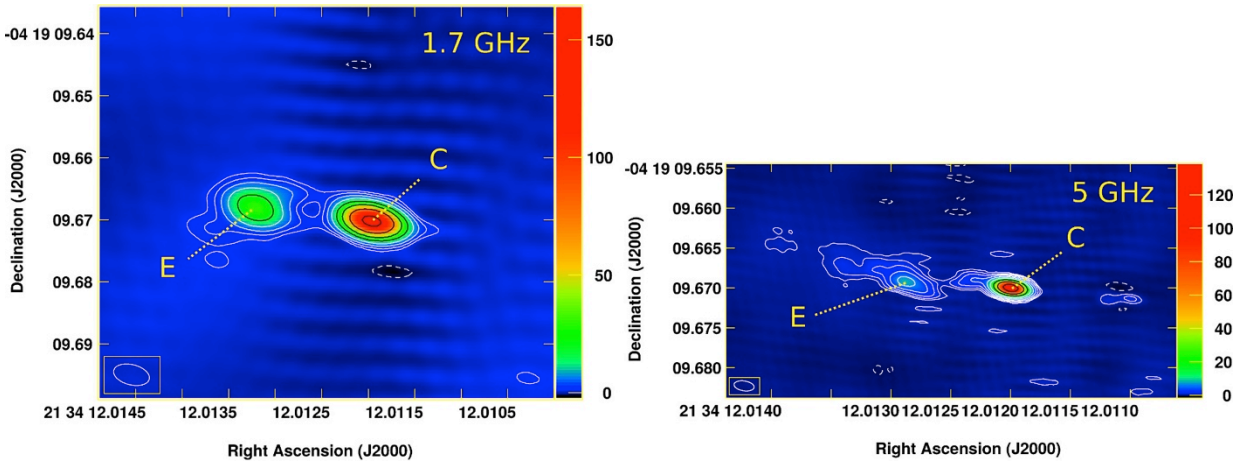

Figure 2: Dual-frequency EVN images of J2134-0419, a genuine blazar with a one-sided jet and a Doppler-boosted compact core (C). The colour scale indicates the intensity in mJy/beam.

Another target, J0839+5112 (z=4.39) has a compact radio structure typical of quasars. There is evidence for flux density variability and its radio core has a flat spectrum. However, the less extreme brightness temperature derived from the EVN data suggest that its emission is not Doppler-boosted.

The real surprise came from the remaining two targets, J1420+1205 (z=4.03) and J2220+0025 (z=4.21). Both of them show radio properties totally unexpected from radio AGN with small-inclination jet. Their radio emission extends to arcsec scales and the Doppler factors of the central components are well below unity. Their weak nuclear radio emission is incompatible with the blazar scenario. These two sources rather resemble double-lobed radio AGN with large inclination with respect to the line of sight. This is in contrast with the blazar-type modeling of their multiband spectral energy distribution (SED).

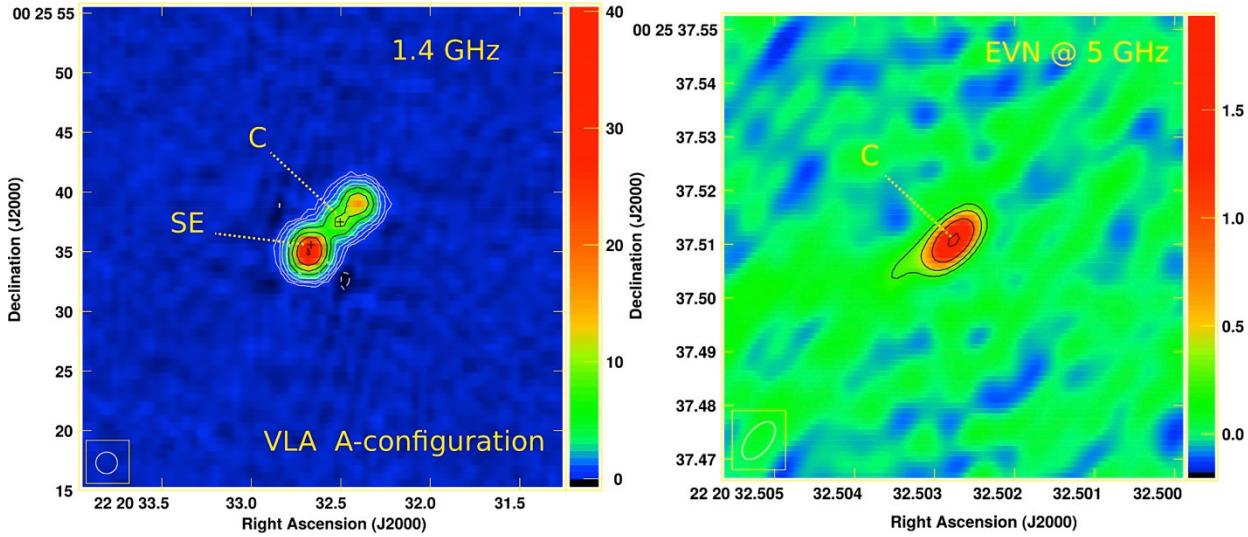

Figure 3: The left panel shows the 1.4-GHz VLA A-configuration image of J2220+0025 (Hodge et al. 2011, AJ, 142, 3). The two crosses indicate the positions of our weak EVN-detected components at 1.7 GHz. The central component (labeled as C) is also seen at 5 GHz with the EVN (the tapered image is on the right) and is coincident with the optical quasar position. The colour scale indicates the intensity in mJy/beam.

It is possible that other X-ray emitting, highly radio-loud AGN also mimic the typical blazar properties, yet they belong to different types of sources. This may contribute to the apparently larger fraction of blazars found in the early Universe. Sensitive imaging at intermediate resolution with e-MERLIN has recently been proposed to map the extended structure in J1420+1205, J2220+0025, and another similar radio source known from the literature, to possibly reveal both of the symmetric lobes and the large-scale jets.

These EVN results call for the refinement of the broad-band SED modeling, pose an interesting question about the physical origin of the high-energy emission in J1420+1205 and J2220+0025, and draw the attention to the importance of VLBI imaging observations for reliably classifying blazars at high redshifts.

Published at: Hong-Min Cao, Sándor Frey, Krisztina É. Gabányi, Zsolt Paragi, Jun Yang, Dávid Cseh, Xiao-Yu Hong, Tao An: VLBI observations of four radio quasars at z>4: blazars or not? (2017, MNRAS, 467, 950) http://dx.doi.org/10.1093/mnras/stx160

Sandor Frey, Konkoly Observatory, Hungarian Academy of Sciences

JIVE UniBoard Correlator (JUC)

The JIVE Uniboard Correlator (JUC) is an FPGA-based correlator that can correlate two polarizations of four subbands with a bandwidth of up to 64MHz for 32 stations on a single board. The correlation engine is now well-tested and commissioning is progressing.

The Uniboard correlator's low power consumption and high data throughput makes it a very attractive candidate for eVLBI operations among other modes. Tests of this functionality are underway. A single 2.5-min scan of J1955+5131 from a recent EVN observation at 6 cm with seven stations: Effelsberg, Medicina, Noto, Onsala, Tianma, Zelenchukskaya, and Badary was correlated with both the production SFXC software correlator and the JUC FPGA correlator, with eight subbands of 1024 channels each. The output signals after correlation agree within 1% (Figure 4).

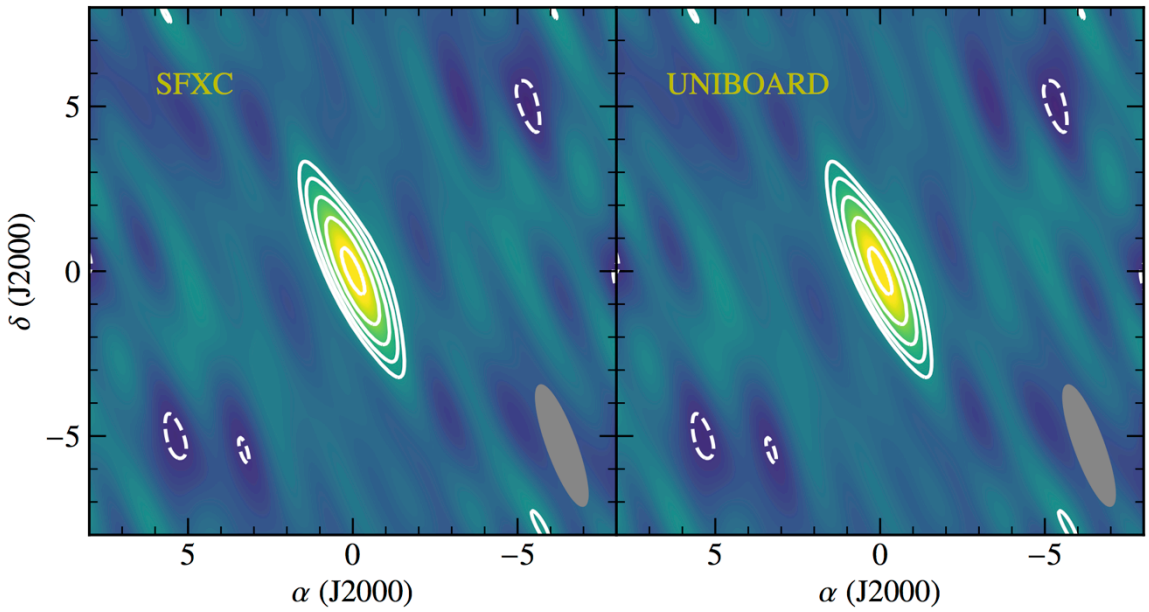

Figure 4: The final images obtained from this scan with the two correlations. It can be clearly seen that both images are identical, showing a compact source with a peak brightness of 5.16 mJy/beam and a noise rms level of 0.39 mJy/beam. The synthesized beam is 3.9 x 0.86 mas, and contours start at 3 times the noise level with increments of square root of 2

Arpad Szomoru, Joint Institute for VLBI ERIC

Upcoming Meetings

IAU Symposium 336 Astrophysical Masers: Unlocking the Mysteries of the Universe. (4-8 Sept. 2017)

Registration is still open for the International Astronomical Union Symposium 336 on Astrophysical Masers which will be held on September 4-8, 2017 in Cagliari (Sardinia), Italy.

On the past five years there has been an explosion of work on masers, especially related to the cosmic distance scale, the structure of the Milky Way, and the masses of (AGN) black holes. Specific topics for this symposium will include:

- The Structure of the Milky Way
- Local Group Cosmology
- The Cosmic Distance Scale and the Hubble Constant
- Galaxy Kinematics and Black Hole Masses
- The Formation of Massive Stars
- Pulsation and Outflows in Evolved Stars
- Theory of masers and maser sources

Details are available on the conference website: http://iaus336.oa-cagliari.inaf.it

47th Young European Radio Astronomers Conference (YERAC, 18-22 Sept. 2017)

The Young European Radio Astronomers Conference (YERAC) for 2017, will be hosted by the Istituto di Radioastronomia in Bologna on September 18-22, 2017. The Istituto di Radioastronomia hosted the YERAC three times in the past: in 1972, 1980 and 1996.

YERAC has been held almost every year since 1968, hosted by the various European Radio Astronomical Institutes. The purpose of YERAC is for undergraduate, graduate and young post-doctoral students in radio astronomy from all over Europe to meet each other and present their work. 'Europe' includes any country from Russia in the East to Portugal in the west, plus affiliates of the European VLBI Network, RadioNet or other current bodies. Due to its nature, YERAC covers all aspects of radio astronomy, from the Sun out to the cosmic microwave background, from stars and planets to the most distant galaxies, using single dish and interferometric techniques, models and theoretical work.

Participation in YERAC is by nomination only. A maximum of about 50 participants will be accepted. Directors of radio astronomical institutes and University Departments are invited to send one student and inform the organization of the YERAC as soon as possible.

Further information can is given at the school's website: http://indico.ira.inaf.it/event/4/ .

M. Bondi & T. Venturi, IRA for the YERAC 2017 organising committee

2017 European Radio Interferometry School (ERIS, 16-20 Oct. 2017)

The Seventh European Radio Interferometry School (ERIS) will take place in Dwingeloo (The Netherlands) during the week of 16 - 20 October 2017.

ERIS will provide a week of lectures and tutorials on how to achieve scientific results from radio interferometry. The topics covered by the lectures/tutorials will include:

- Calibration and imaging of continuum, spectral line, and polarisation data;
- Low-freq. (LOFAR domain), high-freq. (ALMA/IRAM domain), and VLBI-interferometry; • Extracting information from the data and interpreting the results;
- Choosing the most suitable array and observing plan for your project.

Participants are expected to bring their own laptops, equipped with AIPS and CASA pre-installed. Examples will be drawn from m-, cm- and mm-wave instruments such as LOFAR, JVLA, EVN, e- MERLIN and ALMA. Further information can be found at the school website, www.astron.nl/eris2017

For the ERIS 2017 SOC: J. McKean (RuG/ASTRON) & H. J. van Langevelde (Joint Institute for VLBI ERIC)