EUROPEAN vlbi NETWORK

European VLBI Network Newsletter

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Contents

Edited by Michael Lindqvist, EVN Secretary (Onsala Space Observatory, Sweden; Michael.Lindqvist@chalmers.se)

Message from the Chairman of the EVN Board of Directors

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

As the incoming chairman of the EVN Consortium Board of Directors (CBD) I welcome you to this new edition of the EVN newsletter. I would like to thank the outgoing CBD Chairman Rene Vermeulen for his excellent stewardship of EVN board over the last two years. Also elected at the Torun CBD meeting in May was the new CBD vice-chair Rafael Bachiller, IGN, Spain.

It is an honour to be selected to serve as CBD chairman during a period which I believe will be important for the EVN. Sometimes it is hard to see progress as it happening gradually in real time – but if one looks back 5 or 10 years it is evident that the EVN has greatly expanded its activities. Today the EVN is the world's most sensitive VLBI array, stretching from Europe to the far east of Asia, with additional member antennas in South Africa and Puerto Rico. In addition to the large collection of antennas which take part in EVN observations the EVN also offers many different types of observing mode (see the Call for proposals, included in this newsletter). These observing modes include regular sessions, eVLBI sessions, out-of-session observing, target of opportunity and short observations; with also opportunities for making large proposals. Collectively these observing modes allow the use of the EVN in many flexible ways. The EVN also continues to strongly collaborate, via global observing, with US telescopes including the VLBA, GBT and the JVLA. The new call for proposals provides some guidance on the relative availability of these US antennas so that global proposals can be optimally planned. Looking to the future, several new VLBI telescopes are being planned to come into operation in the coming years – in particular in Asia and in Africa. As an example of this progress this newsletter presents the exciting news of the first VLBI fringes to the 32m antenna at Kutunse, Ghana, which is a refurbished satellite communications dish. The EVN looks forward in the future to collaborating with all the world's VLBI telescopes to provide the best possible resources for radio imaging at the highest resolution.

At a time when many countries are ramping up their engagement in the SKA I believe it is important that we promote the unique capabilities provided by VLBI in general and by the EVN in particular. The EVN is of course highly complementary scientifically to the SKA, both in terms of using the SKA as a VLBI element and in following up, at high resolution, initial results from the SKA. Technically also the EVN can provide a continuing test-bed for technologies which may eventually be incorporated into SKA upgrades. Given these important future roles for the EVN, and considering the changing environment for global radio astronomy, the time is ripe to refresh the science vision for the EVN and its future technical roadmap. Given this the EU Horizon 2020 JUMPING JIVE project in conjunction with the EVN CBD has begun an effort to revise the EVN science vision based on community input. A milestone in this process will be a white paper to be discussed at the next EVN symposium in Granada, Spain, 8-11 October 2018. During the coming year the EVN user community will be contacted in various ways to collect its input. I urge all interested EVN users to contribute to this process - so that together we can plan and build the best possible future EVN.

John Conway,

Chairman, EVN Consortium Board of Directors

Call for EVN proposals

The next deadline for submitting EVN proposal is ***October 1, 2017***. The details of the call can be found here:

http://www.chalmers.se/en/researchinfrastructure/oso/radio-astronomy/vlbi/Documents/EVN_CfP.pdf

New features in the October 1 Call for Proposals include:

- The 65 m telescope at Tianma has been equipped with receivers for the 1.3 and 0.7 cm bands. The SEFDs are 70 Jy at 1.3 cm and 120 Jy at 0.7 cm at an elevation of 50 degrees.

- More detailed information about the time available on US antennas (VLBA, GBT, VLA) is included in the call in order to optimally plan Global proposals.

- Information on rules for large projects (>48 hours) have been clarified. There is in principle no upper limit to the size of an EVN large proposal that can be proposed and projects of more than one hundred hours have been granted. Note also that large projects can also be global.

- Based on requests from the EVN user community, the EVN CBD has decided that the abstracts of any proposal (including ToOs and Short observations) submitted starting from the October 1 2017 deadline that receive observing time will become public at the EVN Data Archive (http://jive.eu/select-experiment).

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

Michael Lindqvist, Onsala Space Observatory, EVN PC Chairman

JIVE
Joint Institute for VLBI
ERIC

EUROPEAN vlbi NETWORK

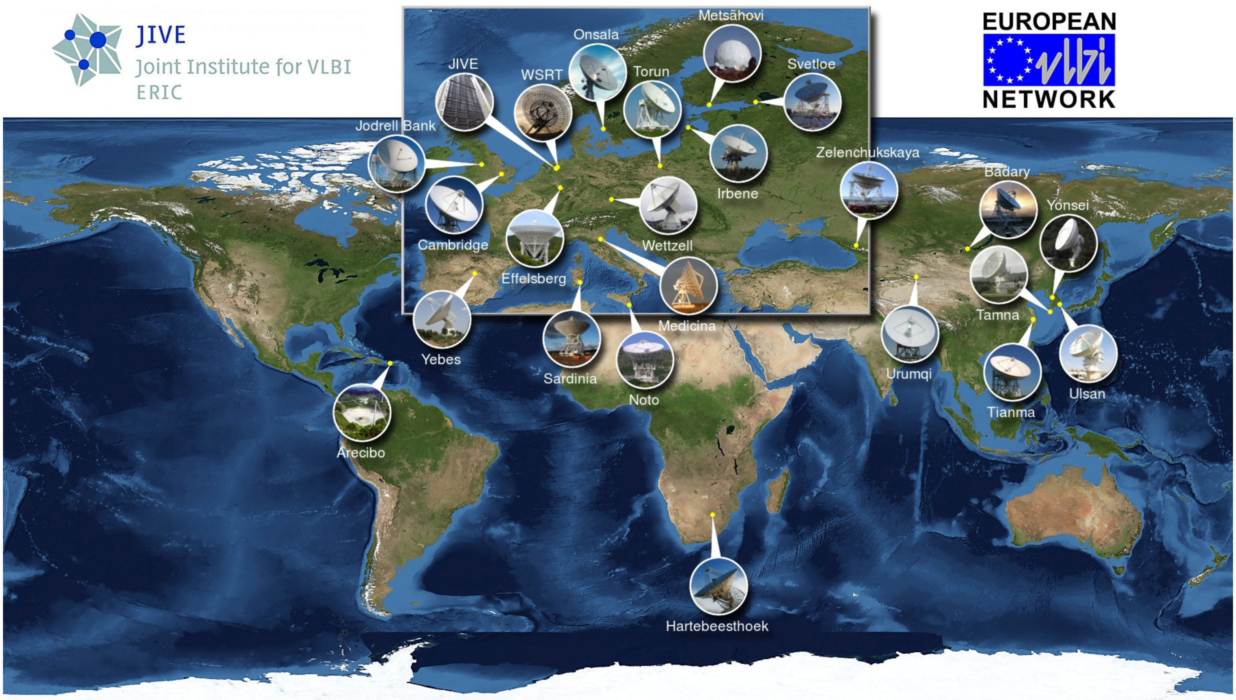


Image by Paul Boven (boven@jive.eu). Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).

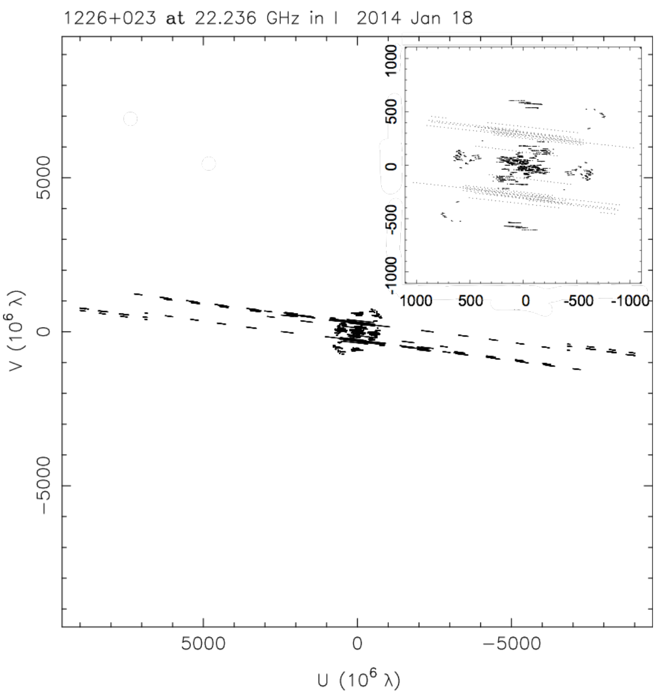
EVN science highlights

Probing the innermost regions of AGN jets and their magnetic fields with RadioAstron II. Observations of 3C 273 at minimum activity

RadioAstron is a 10 m diameter orbiting radio telescope mounted on the Spektr-R satellite, launched in 2011. It operates at cm-wavelengths, and since 2013 is routinely performing observations, offered through yearly announcement of opportunities (AO), supported by a global network of ground radio telescopes including the EVN. The RadioAstron active galactic nuclei (AGN) polarization Key Science Project (KSP) aims at exploiting the unprecedented angular resolution provided by RadioAstron to study jet launching/collimation and magnetic-field configuration in AGN jets. The targets of the KSP are some of the most powerful blazars in the sky (BL Lac, 3C 273, 3C 279, OJ 287, 0716+714, 3C 345, 3C 454.3, CTA 102), observed during all the AO until now (from 1 to 5). As a first result of the KSP, space-VLBI with RadioAstron reached for the first time an angular resolution of 21 μas at 22 GHz, during observations of BL Lac (Gómez et al. 2016). At these angular scales, not probed before in a blazar jet, evidence for emission upstream of the VLBI core was found, together with evidence of helical magnetic fields threading the jet.

Observations of 3C273 at 22 GHz presented in Bruni et al. (2017), see Fig. 1 and 2, were performed during AO-1 (2014), one year after the ones carried out for the early science program on the same source, that resulted in an extremely high brightness temperature measurement (10^{13} K, Kovalev et al. 2016). A global array composed by VLBA (Sc, Hn, Nl, Fd, La, Kp, Pt, Ov, Br, Mk), EVN (Hh, Mc, Nt, Tr, Jb, Ef, Ys), LBA (At, Mp, Ho, Cd), and two Kvazar antennas (Sv, Zc), plus Kalyazin (managed by ASC, Russia), and Green Bank (formerly NRAO, USA) supported observations, that were designed to reach a maximum baseline of about 9 Earth diameters (ED). However, fringes on space-baselines were detected at maximum distance of about 1 ED due to the low-state of the source, as also shown by OVRO single-dish monitoring at 15 GHz.

Bruni et al. (2017) found that the nuclear brightness temperature is two orders of magnitude lower than the exceptionally high value detected in 2013 with RadioAstron at the same frequency (1.4×10^{13} K, source-frame) and with the same instrumental setup, and even one order of magnitude lower than the equipartition value. The kinematics analysis at 43 GHz (from VLBA-BU-BLAZAR data) shows that a new component was ejected about 2 months after the 2013 epoch, visible also in our 22 GHz map presented here. Consequently, this was located upstream of the core during the brightness temperature peak. These observations confirm that the previously detected extreme brightness temperature in 3C 273, exceeding the inverse Compton limit, is a short-lived phenomenon caused by a temporary departure from equipartition. Thus, the availability of interferometric baselines capable of providing μas angular resolution does not systematically imply measured brightness temperatures over the known physical limits for astrophysical sources.



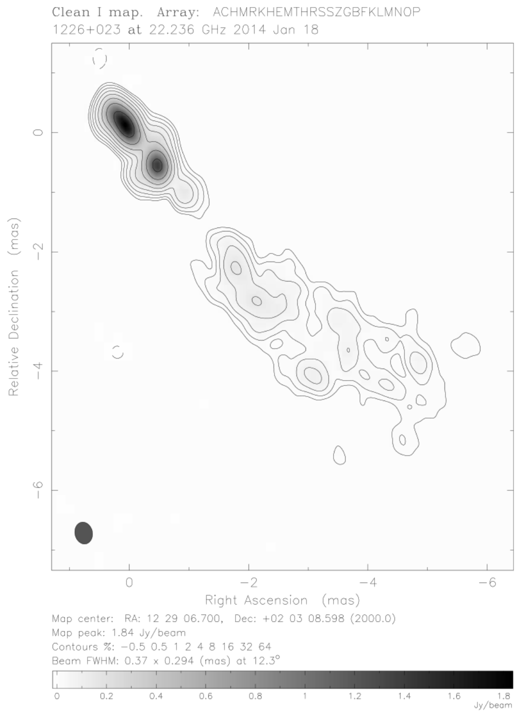


Figure 1 (left). UV coverage for 3C 273 at 22 GHz. The ground global array, covering the Earth diameter, is visible in the middle, while wings result from RA baselines. In the inset, a zoom on the part giving space-fringes is shown.

Figure 2 (right). Map of 3C 273 at 22 GHz obtained with the global ground array plus RA, using uniform weighting. The lowest contour significance is 5-sigma.

Published in: G. Bruni, J. L. Gómez, C. Casadio, A. Lobanov, Y. Y. Kovalev, K. V. Sokolovsky, M. M. Lisakov, U. Bach, A. Marscher, S. Jorstad, J. M. Anderson, T. P. Krichbaum, T. Savolainen, L. Vega-García, A. Fuentes, J. A. Zensus, A. Alberdi, S.-S. Lee, R.-S. Lu, M. Pérez-Torres and E. Ros: **Probing the innermost regions of AGN jets and their magnetic fields with RadioAstron - II. Observations of 3C 273 at minimum activity**, (2017, A&A, 604, A111).

Gabriele Bruni, INAF – National institute for Astrophysics, Rome

Is there a hidden AGN in NGC1614?

Luminous Infrared Galaxies (LIRGs), with IR luminosities above 10^{11} $L_\odot$ are known for having large amounts of dust in their nuclear regions. This turns VLBI into one of the few tools that can probe deep into their innermost pc-size regions, thus allowing us to pinpoint the precise location of the putative AGN as well as to determine the contribution of the starburst and the AGN to the total luminosity output of these galaxies. NGC1614 is a LIRG at a distance of 64 Mpc which hosts a powerful circumnuclear starburst ring with a controversial nuclear engine. While the majority of studies points towards a pure starburst galaxy, some indirect observational evidences suggest the presence of an AGN.

A team led by Rubén Herrero-Illana (ESO, Chile), Antxon Alberdi (IAA-CSIC, Spain) and Miguel Ángel Pérez-Torres (IAA-CSIC, Spain) has obtained deep dual-frequency EVN observations of the complete circumnuclear region of NGC1614 aimed at obtaining direct evidence or a tight upper limit to the luminosity of any putative AGN, as well as to detect and characterize any other compact radio structure across the circumnuclear ring, Fig. 3. The results show no compact sources in the innermost region, with an rms (30 µJy/b) that imposes a very tight upper limit luminosity of 3.7×10^{36} erg s^{-1} for any putative AGN, favoring a pure starburst scenario. In any case, the contribution of the AGN to the radio and IR emissions of the galaxy is negligible. The large dishes of the EVN were crucial to achieve such a good sensitivity. In addition, the EVN observations reveal a compact source at both C- and X-bands in one of the knots of star formation of the circumnuclear ring, whose luminosity (9×10^{36} erg s^{-1}) and spectral index is compatible with a supernova origin, possibly a type IIn or Ic.

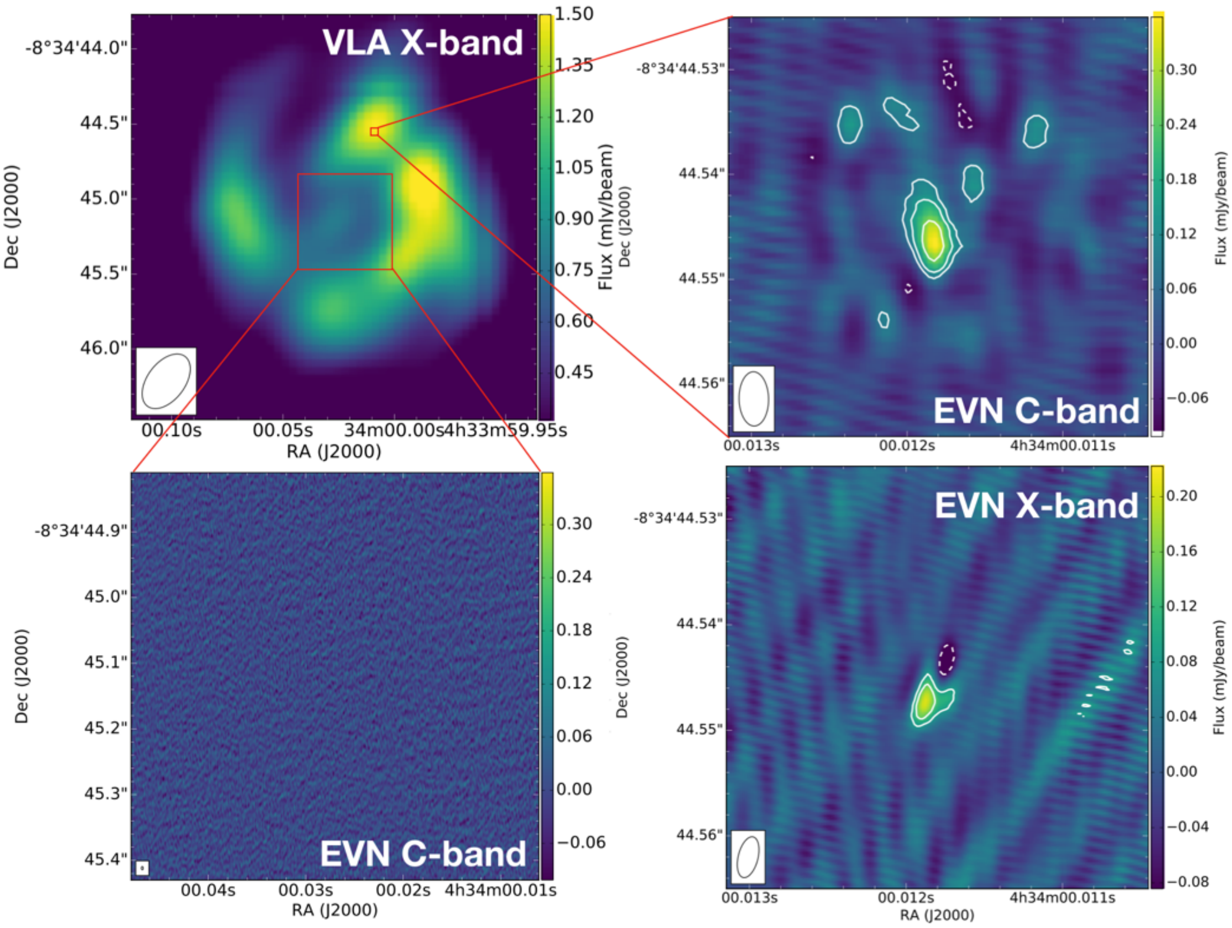


Figure 3. The circumnuclear ring observed with the VLA (top left), as well the EVN maps for the nuclear region (bottom left) and the region to the north where the supernova has been found (right panels).

Published in: R. Herrero-Illana, A. Alberdi, M. Ángel Pérez-Torres, A. Alonso-Herrero, D. González-Millán, M. Pereira-Santaella: **No AGN evidence in NGC 1614 from deep radio VLBI observations**, (2017, MNRAS, 470, L112)

Rubén Herrero-Illana, ESO, Chile

News from JUMPING JIVE

The EC H2020 project "Joining up Users for Maximizing the Profile, the Innovation and Necessary Globalization of JIVE" ("JUMPING JIVE") aims to take VLBI into the next decade, with JIVE and the EVN as globally recognized centres of excellence in radio astronomy. It stresses the importance of preparing and position European VLBI in the SKA era, while raising the profile of JIVE among scientists, operators of European (and global) research infrastructures, and the European Commission. The project therefore brings together scientists and engineers to define the future of VLBI for scientific applications, and identify the required technological innovation to realise such a future. The project work packages cover a number of topics, which include encouraging existing telescopes to join the EVN, connecting with future instruments (SKA, African VLBI Network), and finding new JIVE partners to expand the membership base. In addition, there are resources for a dedicated outreach effort, since it becomes essential to widely advocate the science capabilities of the EVN, inside and outside the current group of users, as well as its role as research infrastructure provider.

JIVE is leading the project from its base in Dwingeloo (the Netherlands). Twelve institutes from eight different European countries have teamed up in JUMPING JIVE. This project has been awarded nearly 3 million euros, over a period of 4 years, from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730884. Detailed information on the project can be found at: http://www.jive.eu/jumping-jive

Figure 4. Kick-off meeting of the JUMPING JIVE project, Leiden, the Netherlands, February 20-21 2017.

The kick-off meeting of the project took place on February 20-21 2017 in Leiden, the Netherlands, Fig. 4. Rene Vermeulen (ASTRON) was elected as chair of the JJ board, and John Conway (Onsala Space Observatory) as vicechair. During the first months, several workpackages have stated their grounds: WP2 (Outreach, PI Ilse van Bemmel) refurbished the JIVE web, and set a network of outreach people as contacts at EVN+ partners to handle PRs. WP3 (New partners, PI Leonid Gurvits) delivered the first report describing the situation on accession to JIVE/EVN/VLBI of different countries/institutes/communities. WP7 (The VLBI future, PI Tiziana Venturi) set an expert group to prepare an updated Science Case for the EVN. WP8 (Global VLBI interfaces, PI Arpad Szomoru) delivered two reports, on the status of VLBI scheduling software, and an evaluation of software packages for system monitoring. WP9 (VLBI in Africa, PI Rob Beswick) has been busy organizing training exchanges, very timely since the first fringes for Ghana are just obtained. And WP10 (VLBI with the SKA, PI Zsolt Paragi and Antonio Chrysostomou) contracted Cristina Garcia-Miro (well known to the EVN people, since she was the former VLBI friend at NASA DSN in Robledo, Spain). There is also activity in all the other WPs, which will be reported in future newsletters.

Paco Colomer JJ Project Manager, JIVE, the Netherlands

EVN/JIVE Technical Developments

Ghana and South Africa celebrate first success of African network of telescopes

Ghana and South Africa have announced the first successful detection of fringes during a VLBI test experiment with the EVN. A 32 m converted telecommunications antenna at Kutunse, Ghana, was used in the 'first fringe' detection, Fig. 5. The experiment is one of three positive detections, with the other two successes including methanol maser detection and pulsar observations. This is an exciting milestone in the development of the African VLBI Network (AVN), and indicates that the Kutunse antenna can be used as a radio telescope for single dish observations and as part of a VLBI network. The fringes were found by combining data from Kutunse and other participating EVN stations using the SFXC software correlator, designed by the Joint Institute for VLBI ERIC (JIVE). Confirmation of the success came with a joint announcement from the ministers of Ghana and South Africa.

For more details, see the press release.

Figure 5. The team in Ghana and Dr. Jay Blanchard from JIVE in front of the telescope involved in the first successful VLBI experiment. Image courtesy of Bernard Asabere, Ghana Space Science and Technology Institute.

BRoad bAND EVN

BRAND stands for BRoad bAND EVN, a project to build a prototype primary focus receiver for the EVN (and other telescopes) with the very wide frequency range from 1.5 GHz to 15.5 GHz. As quite a few EVN telescopes require secondary focus receiver we will investigate secondary focus solutions. In order to set the stage for equipping all EVN stations with such a receiver as soon as possible, part of the project is a survey of the EVN telescopes, so that the receiver can be mounted and interfaced to as many telescopes as possible. The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730562 and is a Joint Research Activity (JRA) in the RadioNet programme. The kick-off meeting of the project took place on January 17-18 2017 in Alcala, Spain, Fig. 6.

Figure 6. Kick-off meeting of the BRAND project, University of Alcala, Spain, January 17-18, 2017.

Up to date, a radio astronomical receiver with a frequency ratio of 10:1 has never been realised before, and therefore BRAND is a very challenging project. The project engineer is Gino Tuccari from INAF/MPIfR, the project manager is Walter Alef from MPIfR. BRAND EVN is a truly European project with partners in Germany (MPIfR), Italy (INAF), Sweden (Onsala), Spain (IGN), The Netherlands (ASTRON), and Latvia (VIRAC). Initially we will develop and build a prototype for prime focus, as wide-band prime focus feeds are much more advanced than similar feeds for secondary focus. But, as EVN has a lot of antennas which can only mount secondary focus receivers, another work package will also do research in a wide-band feed for secondary focus. The timeline for a first VLBI test at Effelsberg is summer 2020, which is ambitious but not unrealistic. The aim of BRAND EVN for the next decade is to enable all EVN stations to install a BRAND receiver as soon as possible!

Assuming that all telescopes of a network are equipped with wide-band BRAND receivers, simultaneous multi-frequency observations will be possible similar to VGOS, but with much wider frequency coverage. While it is expected that such a wide-band system will be less sensitive than modern narrow-band receivers, the enormous bandwidth and data-rate of the BRAND receiver will overcompensate the sensitivity losses. To make full use of this bandwidth, fringe-fitting has to be done over the very wide frequency range, thus integrating coherently all the data. Of course, a precondition is that the ionospheric contribution to the delay is determined by fringe-fitting a quadratic term over frequency in addition to the traditional linear slope. This problem has been solved already for VGOS. A solution for astronomy will be developed in the framework of CASA by the RadioNet JRA RINGS. Another advantage of this coherent fringe-fit is that precise registration of simultaneous images at different frequencies will become possible, as the phases as a function of frequency are all related to each other, which is not the case for fast frequency switching. Gaps on the frequency band will be caused by RFI which will be treated in two stages. The strongest RFI will be suppressed right after the receiving horn by High Temperature Super Conducting (HTSC) filters. Remaining weaker RFI will be suppressed in the digital stage. The UV-coverage will also be vastly improved due to wide frequency band. This still holds even though images will have to made for several frequency ranges.

Walter Alef, MPIfR, Bonn, Germany

Successful combined use of linear and circular polarizers in the eEVN.

Pioneering eEVN observations at C band in a "mixed polarization" basis (i.e., where stations with linear and circular polarizers are observing simultaneously) were carried out on December 2016, during experiment EO014. Effelsberg used a receiver with linear polarizers, whereas the other 6 participating eEVN stations were using circular-polarization receivers. Fringes were successfully correlated in this "mixed polarization" basis and the program PolConvert (Marti-Vidal et al. 2016) was used to calibrate and transform these fringes into a pure circular basis (see Fig. 7).

PolConvert uses a novel calibration approach, where a global fit of the cross-polarization gains of all stations (i.e., linear and circular, combined) is performed, using (cross-polarization) visibility ratios as observables. The outcome of PolConvert are RR, LL, RL and LR visibilities with fully-calibrated cross-hand phases. Hence, if a PolConverted station is used as the reference antenna in the fringe fitting of RR and LL, the cross-hand visibilities (RL and LR) of the whole interferometer will be automatically calibrated, even in absolute EVPA. This absolute EVPA calibration still holds if the polarization calibrator *is unpolarized.*

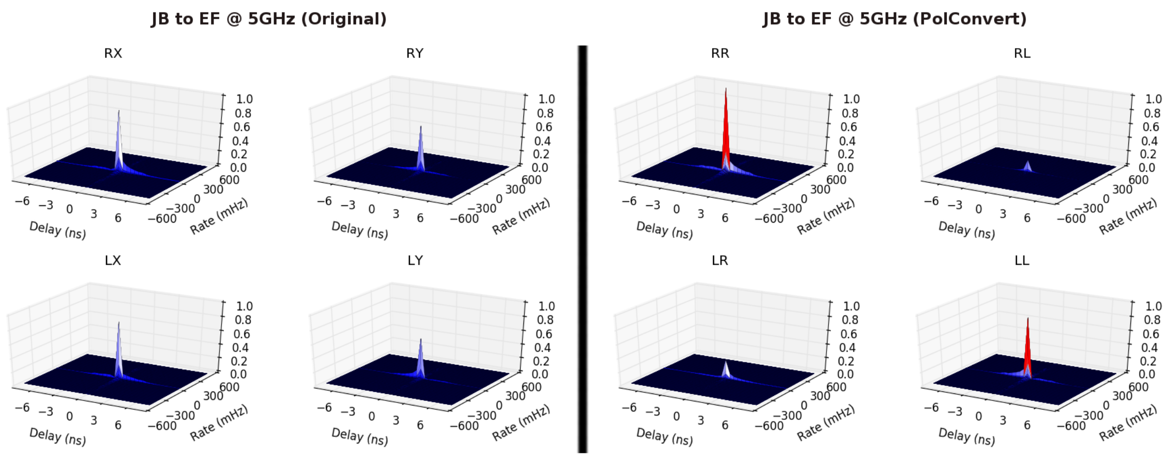


Figure 7. Fringes of a snapshot of the polarization calibrator (J0927+3902) between the Lovell telescope and Effelsberg. Left, output from the correlation (i.e., in a "mixed polarization" basis). Right, after running PolConvert.

Ivan Marti-Vidal, Onsala Space Observatory, Sweden

Reports from Meetings

EWASS 2017 Gaia Symposium session "Synergies with Radio Astrometry"

Today, both radio and optical astrometry can reach absolute accuracies of the order of 100 µas (Fig 8), while achieving differential astrometry uncertainties of the order of 10 µas. This gives rise to a wealth of new and interesting scientific studies from tracing the orbits of nearby binary stars, measuring distances of star-forming regions across the Milky Way, to imaging the base of the AGN jet.

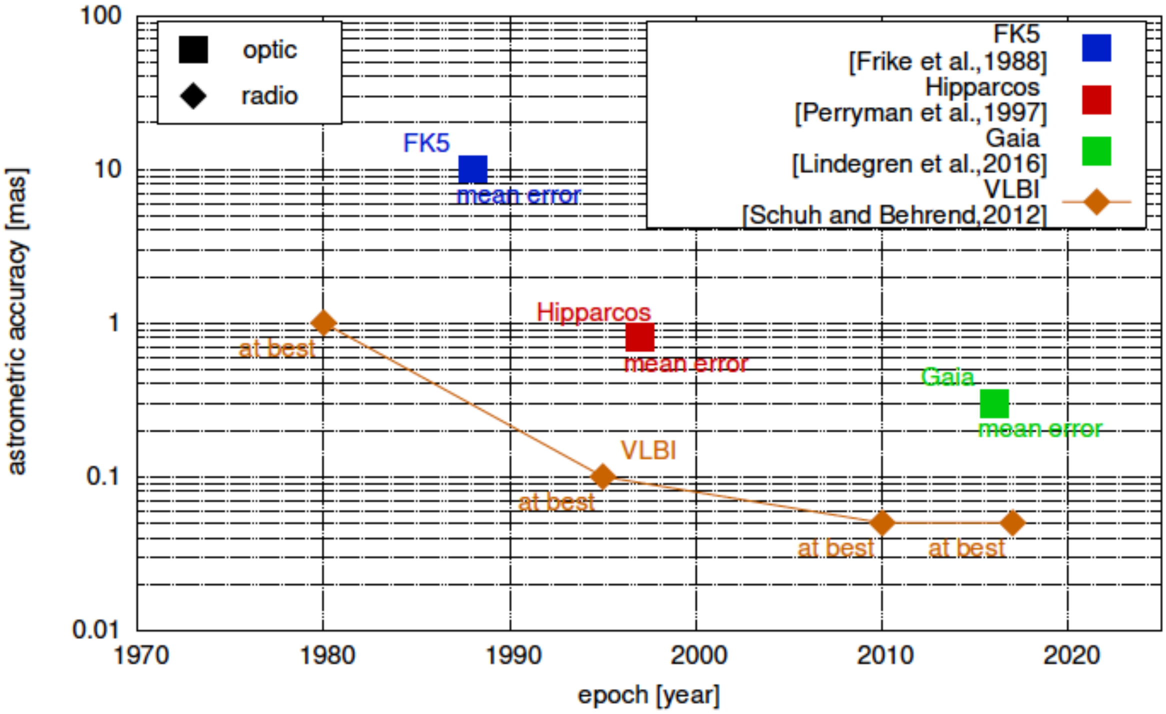


Figure 8. Astrometric accuracy improvement (see talk by Gattano)

Currently, several systematic radio astrometry programs are being carried out, such as the VLBI-Exploration-of-Radio-Astrometry, the Bar-and-Spiral-Structure-Legacy survey and the Gould's-Belt-Distances survey. In 2018, the third realization of the International Celestial Reference Frame (ICRF3) is expected. From 2016, optical astrometry has seen a boom with the publication of the first Gaia catalogue DR1, of which the final catalogue is foreseen in the early 2020s. Given the impact both radio and optical astrometry will have on the scientific community, we organized a "Synergies with Radio Astrometry" session within the Gaia symposium at the 2017 EWASS conference in Prague, opening a dialog between these two communities for discussing and starting new collaborations. In particular, the session aimed to emphasize the scientific merit from the combination of radio and optical astrometry.

As the speakers were addressing scientists from two different communities the session was kicked off by an introduction to Radio Astrometry by Mareki Honma (NAOJ). He gave a general introduction of interferometry and VLBI, and an overview of the wide range of science that is being done with radio astrometry. The session included several contributed talks and 2 posters, see Gozdziewski and Kovalev.

The contributed talks started with the future of the ICRF. Patrick Charlot (LAB) presented the preparation of the new ICRF3, emphasizing the significant improvements with respect to the current ICRF2 due to improved modelling, a larger amount and more precise data, and a better assessment of source structure, Tab. 1.

	ICRF	ICRF2	ICRF3
Frequency (GHz)	8.4 / 2.3	8.4 / 2.3	tbd
Nb of observations	1.6 Million	6.5 Million	> 10 Million
Time range of obs.	1979-1995	1979-2009	1979-2017
Nb of sources	609	3414	4000-5000
Nb of defining sources	212	295	tdb
Noise floor (μas)	250	40	?
Adoption by IAU	1997	2009	2018

Table 1. Comparison of the ICRFs from Patrick Charlot's talk.

Cesar Gattano (Paris Obs.), continued within the ICRF3 topic, and presented his algorithm to characterize source stability by looking at the Allan Variance of its time series. Using this method on the wealth of VLBI data available they can improve and increase the target selection for building the new ICRF.

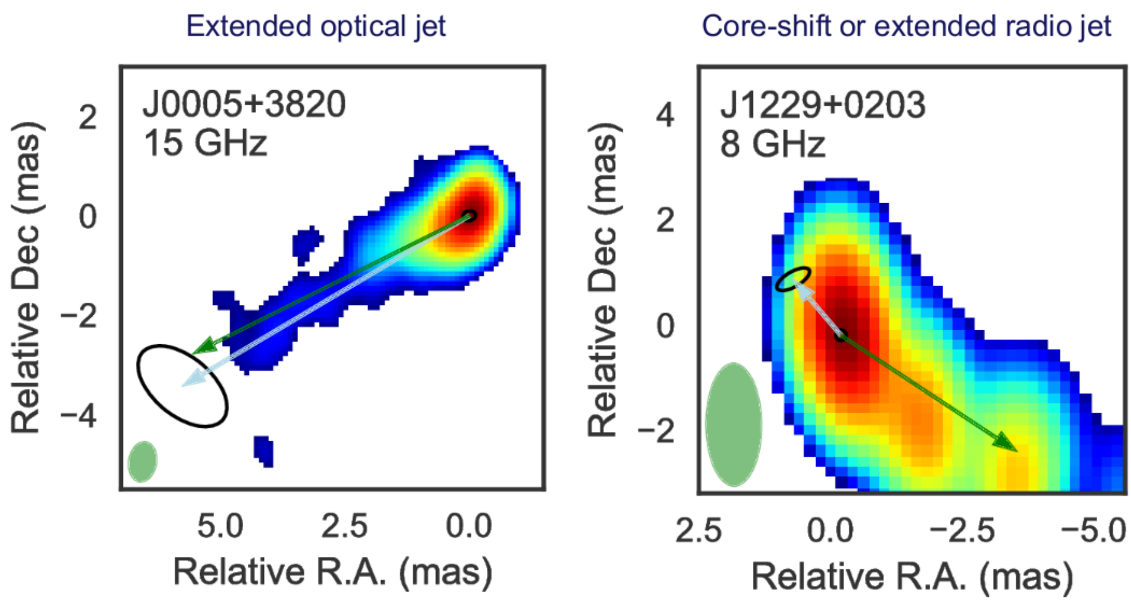


Figure 9. Radio-optical offset (light blue arrow) and jet direction (green arrow) from Yuri Kovalev's talk

The session continued with AGNs. Yuri Kovalev (ASC Lebedev) presented the results of comparing radio and optical astrometry for 6000 AGNs present in both VLBI Radio Fundamental Catalog and Gaia DR1 data: radio and optical data show an offset which favor a parsec scale jet direction and seem thus physical in nature, Fig. 9. One of the possible explanations, the core-shift effect due to synchrotron opacity, was the topic of Alexander Plavin's (ASC Lebedev) talk where he discussed the core shift between 2 and 8 GHz for quasars observed over the last 22 years.

The session ended with astrometry of nearby star-forming regions of the Gould's Belt. Gisela Ortiz Leon (MPIfR) presented results of the (VLBI) GOBELINS survey - from measuring the orbits of short period binaries (see Fig. 10) to revealing the 3D structures of the star forming clouds via parallaxes. Finally, a VLA proper motion study of the Orion stars was discussed by Sergio Dzib (MPIfR) where he found no evidence of the previously claimed large scale radial expansion or rotation.

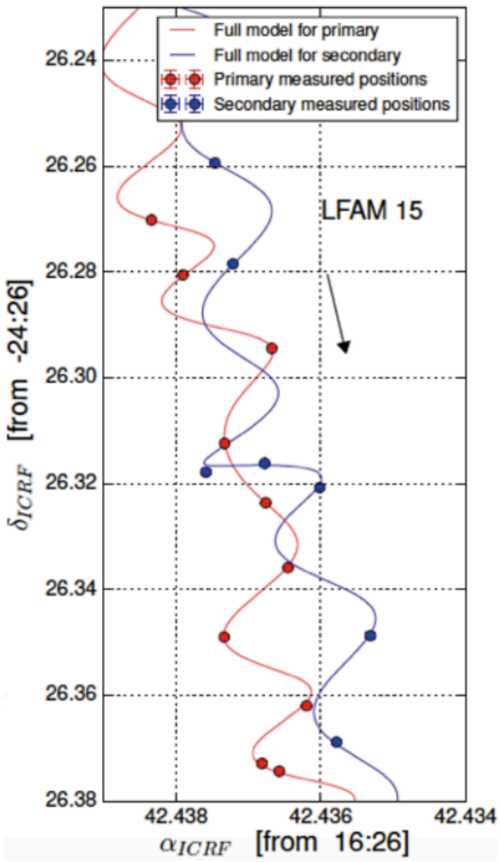


Figure 10. Binary trajectory measure from the talk of Gisela Ortiz Leon.

After the talks, participants could continue their private discussions regarding possible collaborations in view of the next release of the Gaia catalogue DR2 in April 2018. With the rapid advances expected for radio and optical astrometry it is important to keep the optical-radio dialog alive.

The Scientific Organizing Committee: Kazi Rygl (INAF-IRA), Teresa Antoja (ICCUB), Geraldine Bourda (LAB), Francois Mignard (OCA), Nobuyuki Sakai (NAOJ), Alberto Sanna (MPIfR), Huib van Langevelde (JIVE/Sterrewacht Leiden)

Upcoming Meetings

e-MERLIN and EVN in the SKA era (JBO, 11-12 September 2017)

This will be the second of a series of open meetings and workshops to allow the astronomical community to discuss and contribute to the future developments and operations of the UK's National Radio Astronomy Facility, e-MERLIN and the European VLBI Network (EVN). This follows on from the first highly successful meeting held in September 2016 at JBO (JBO in SKA era). The main purpose of the meeting will be to inform the community of the existing and upgraded capabilities of e-MERLIN and the EVN and discuss the scientific and technical priorities for these facilities in the coming years.

The meeting will take place at Jodrell Bank Observatory, 11-12 September 2017. For further details, see http://www.jb.man.ac.uk/meetings/JBOinSKAeraII/

47th Young European Radio Astronomers Conference (YERAC, 18-22 September 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 (16-20 October 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, http://www.astron.nl/eris2017

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

6th International VLBI Technology Workshop (9-11 October 2017)

Rapid advances in technologies relevant to VLBI are foreseen in many fields: data recording, transmission, correlation and data analysis. It has, in some cases, brought about a major re-thinking of the traditional ways of the VLBI observing technique and how we make prominent scientific progresses in both astronomy and geodesy. In addition to reports on current and near-term VLBI technology plans and achievements, an important focus of this meeting will be the opportunity for forward-looking views of VLBI technology in the decade of the 2020s. Some suggested areas of interest in this regard may include:

- Direct-RF-sampling,
- Tbps-scale data recording/transmission/correlation,
- Time and Frequency Distribution,
- Developments on software including fringe-fitting,
- Combination of linear and circular polarization in VLBI observations,
- Potential VLBI facilities at low frequencies, and at mm and sub-mm wavelengths.

The meeting will take place in Bologna, Italy, 9-11 October 2017. For further details see:
https://indico.ira.inaf.it/event/2/overview