NEWSLETTER

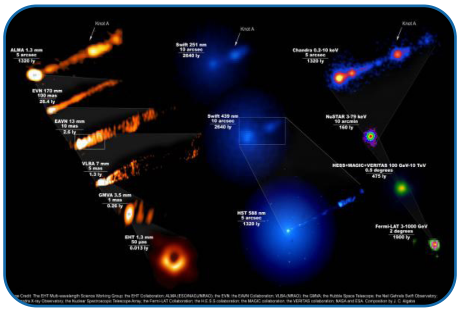
Edition 59
May 2021

EUROPEAN vlbi NETWORK

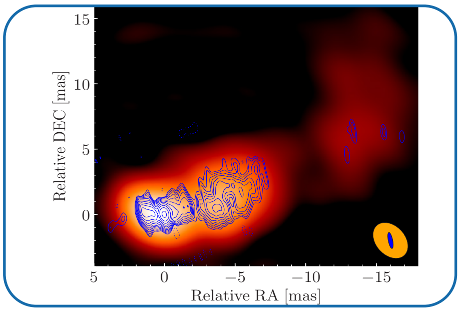
JIVE
Joint Institute for VLBI ERIC

CALL FOR PROPOSALS

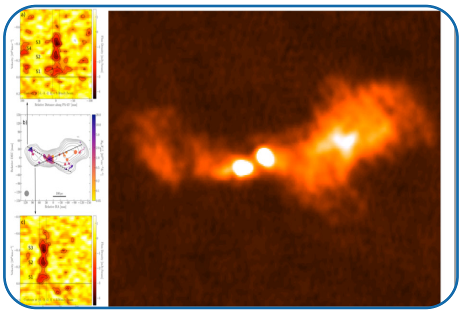
DEADLINE: 01 JUNE 2021, 16:00:00 UTC



Telescopes unite in unprecedented observations of famous black hole



First RadioAstron view of the quasar 3C 345 in polarisation



Tracing HI outflows in radio galaxies down to the pc scales

A new surface for the Lovell 76m radio telescope in Jodrell Bank

Italy joins the JIVE ERIC

EVN online mini-Symposium and Users' meeting,
12-14 July 2021

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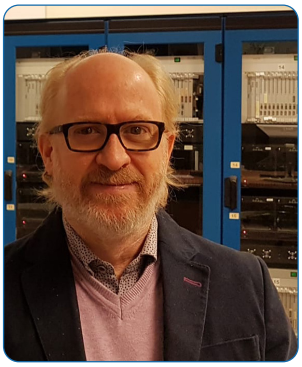
WELCOME

Tiziana Venturi, Chair of the EVN Consortium Board of Directors



Francisco "Paco" Colomer, Director of JIVE

We welcome you to the new issue of the EVN Newsletters, which is rich in new scientific results and important technical improvements.

Among the many exciting news items presented here, we wish to draw your attention to the excellent contribution of the EVN and JIVE to the global effort to study M87, the study of HI in AGNs, fast radio busts (thanks to the impressive time resolution achieved by the SFXC correlator) and polarization studies with Radioastron, all of these reinforcing the need of coordinated observations among VLBI and other facilities.

The health situation is still difficult in many European countries, however the EVN observations and operations are being carried out regularly. Session 1, 2021 has been successfully completed and the observations are being correlated. Moreover, upgrades in Jodrell Bank Observatory and Sardinia Radio Telescope are reported.

While the next 15th EVN Symposium has been postponed to July 2022, and will be held in Cork, it has been decided to hold a smaller online event, to ensure that our strong and enthusiastic VLBI community can meet and share results and discussion. This EVN mini-Symposium will take place online on 12-14 July 2021 and will include invited and contributed talks. A Users' meeting will be organized in one of the sessions. The very successful EVN online seminars are being continued, and the calendar for the next set of talks will be distributed soon.

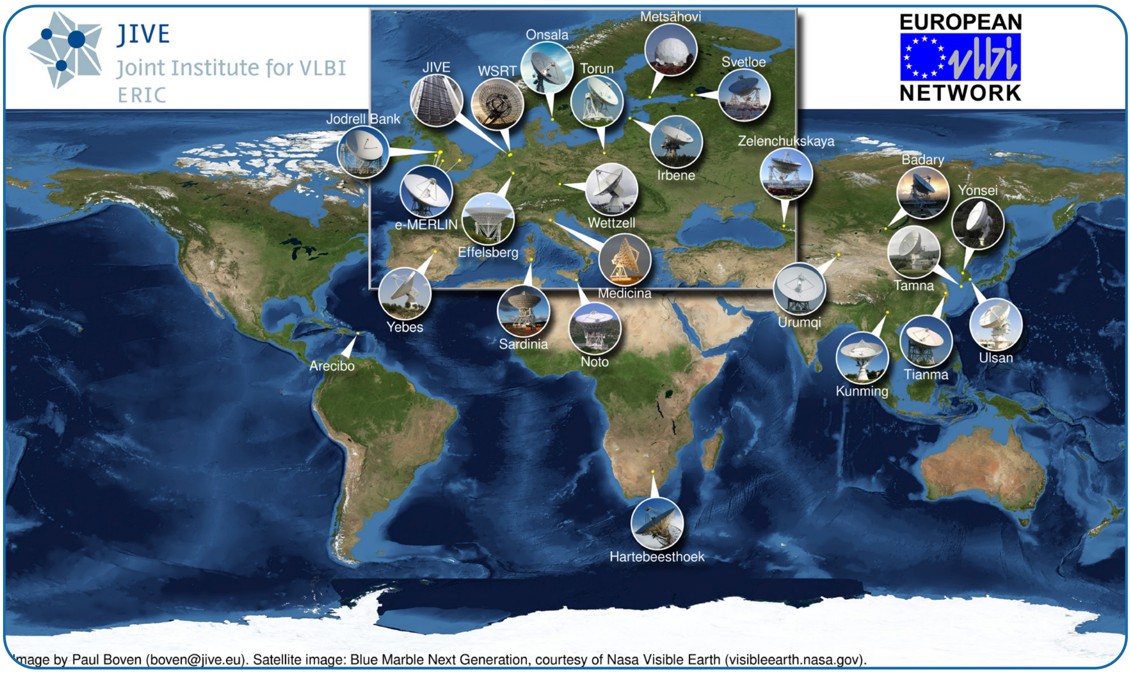
The JIVE family has expanded, and Italy is now a full member of the JIVE ERIC since 12 March 2021. This is a major achievement, considering that Italy has been one of the founding EVN institutes.

We thank our community for continuing to deliver excellent science even in these difficult times.

CALL FOR PROPOSALS

DEADLINE: 01 JUNE 2021, 16:00:00 UTC

Details of the call: https://www.evlbi.org



Observing proposals are invited for the European VLBI Network (EVN). The EVN facility is open to all astronomers. Astronomers with limited or no VLBI experience are particularly encouraged to apply for observing time. Student proposals are judged favorably.
Support with proposal preparation, scheduling, correlation, data reduction and analysis can be requested from the [Joint Institute for VLBI ERIC](#) (JIVE).

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

EVN observations may be conducted with disk recording (standard) or in real-time correlation (e-VLBI), which guarantees a rapid turnaround. Standard EVN observations are available at wavelengths of 92, 21/18, 13, 6, 5, 3.6, 1.3 and 0.7 cm. e-VLBI observations can be performed at 21/18, 6, 5, and 1.3 cm. e-MERLIN can be combined with the EVN in both standard and e-VLBI observations. Global observations are performed only with standard observations. Every year standard EVN observations occur during three sessions of approximately 21 days each and ten separate days are available for e-VLBI observations. More information regarding the EVN capabilities, availabilities of EVN antennas, observing sessions, proposal guidelines, and user support can be found at www.evlbi.org.

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; telescopes that cannot usefully reach this will use the highest possible bit-rate (mixed mode observation). The present recording status is given here.

New: Disk recording at 4 Gbps is now available at 6, 3.6, 1.3 and 0.7 cm for a subset of antennas for a limited amount of time and on a best-effort basis. Telescopes that cannot usefully reach this data rate will use the highest possible bit-rate (mixed mode observation). Proposals requesting 4 Gbps should clearly justify the need for this data rate. Given the limited opportunity for such shared-risk 4 Gbps observations, proposals for that bit-rate should therefore include whether they could also be performed at 2 Gbps (mentioning the observing time needed at 2 Gbps) or if the science objectives are impossible to reach at data rates < 4 Gbps. See here for the current 4 Gbps recording status.

e-VLBI at 2 Gbps is available at 6 cm and 1.3 cm; telescopes that cannot usefully reach this will use the highest possible bit-rate (mixed mode observation). Network circumstances might also impose total bit-rate limitations on a particular e-VLBI day. The current status is given in the 'operational modes' section on http://www.evlbi.org/capabilities.

Observations at 18/21 cm in either disk-recording or e-VLBI are limited to a data rate of 1 Gbps due to bandwidth limitations.
The choice of data rate should be clearly justified in the proposal.

Availability of EVN antennas

The latest status of the EVN antennas can be found on http://www.evlbi.org/capabilities.

The Sardinia Radio Telescope will not be offered in the second semester of 2021 due to the planned upgrade at higher frequencies. When more information is available, this will be published on https://www.radiotelescopes.inaf.it/info.html.

Possibilities of including a 12m antenna at Arecibo Observatory in EVN observations are being discussed. For more information see http://www.naic.edu.

The three Quasar antennas of the Russian VLBI Network (Badary, Svetloe and Zelenchukskaya) are also available for e-VLBI.

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

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

TRACING HI OUTFLOWS IN RADIO GALAXIES DOWN TO THE PC SCALES

Rafaella Morganti, ASTRON, the Netherlands

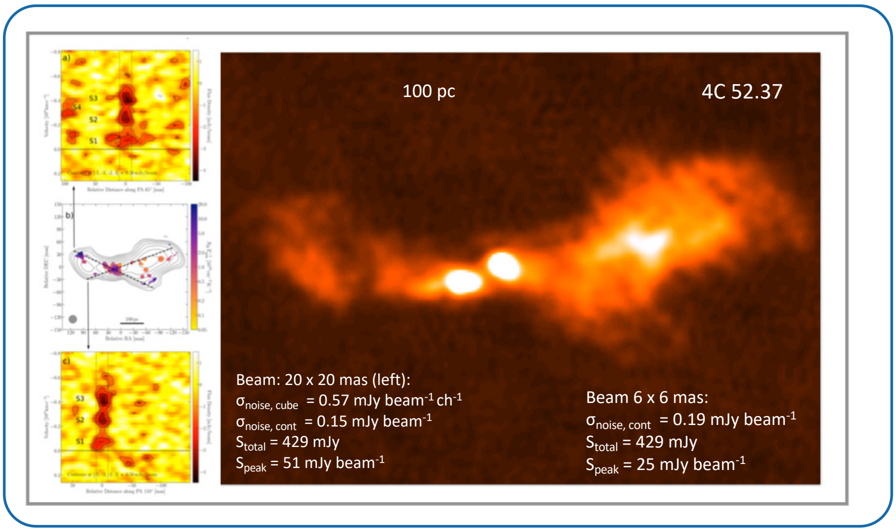
Supermassive black holes (SMBH) are ubiquitous in the centre of massive galaxies and play an important role in the evolution of galaxies. When active, they can release huge amounts of energy which affects the gas around them. One of the manifestations of this is fast and massive gas outflows. They are important for the evolution of the host galaxy: expelling the gas and thereby stopping or decreasing the formation of new stars. Observations confirm that gas outflows are common in these active galactic nuclei (AGN) and cosmological simulations need them for predicting the properties of observed galaxies.

One mechanism that can drive these outflows is the interaction of radio plasma jets with the surrounding gas. Particularly interesting is the fact that, despite the extremely energetic phenomena, these outflows can be traced also by the cold component of the gas (atomic neutral hydrogen and molecular gas). In fact, these components are found to be the most massive.

A growing number of radio galaxies are found to have outflows of atomic hydrogen (HI), detected by observing this gas in absorption. This gives us the unique possibility to explore the properties of the outflows down to the smallest scales thanks to HI observations using VLBI. In this way, we can accurately probe the location, extent and physical properties of the outflowing gas.

A few years ago, we have started a project to image some of the best low redshift cases of HI outflows in radio galaxies using broad-band, spectral-line observations with the global VLBI network. The observations, the data reduction and analysis are rather demanding and making progresses requires time. But the final results are very rewarding! The first results for two famous radio galaxies (4C12.50 and 3C236) obtained in this campaign were presented in Morganti et al. 2013 and Schulz et al. 2018 (see also the EVN Newsletter Number 52 - January 2019). In a new paper, now in press in Astronomy and Astrophysics, Robert Schulz and collaborators present the results obtained for two more objects, as well as an overview of the general conclusions which can be drawn about the properties of the HI outflows in the small sample studied so far.

In press: Schultz et al, 2021, A&A, 647, A63



Right: high spatial resolution (6 mas) continuum image of 4C52.17. Left - Top panel: position-velocity (PV) diagram of 4C 52.37 along a cut aligned with the largest extent of the central absorption feature. The solid, horizontal line corresponds to the systemic velocity. The dashed, vertical lines mark the size of the synthesized beam. Middle panel: The contour lines show the continuum radio emission at lower resolution (20 mas) the colormap corresponding to column density x spin temperature. The dashed lines represent the cuts for the PV diagram. Bottom panel: same as top panel, but a cut along a different position angle.

The paper presents the distribution of HI on pc scales for the sources 4C 52.37 and 3C 293 observed with global VLBI with 16 MHz band and 512 channels. The radio galaxy 3C 293 is a well-studied object in VLBI, but never before HI observations were done with such a broad band, allowing to trace the HI outflow. The figure below shows the results for 4C 52.37. This object, like most sources where HI outflows are observed, is a young radio galaxy. It was previously observed in VLBI continuum by de Vries et al. 2009, but now for the first time in HI. The depth of the new observations shows the entire structure of the radio lobes (figure on the right), only a few hundred pc in size. The position-velocity plots (left in the figure) show that features blueshifted up to 500 km s^{-1} compared the systemic velocity – and therefore tracing the outflowing HI - are observed in a nuclear region just a few tens of pc (in projections) in size. The outflowing HI appears to be distributed in clouds with masses in the range of 10^4 – 10^5 M⊙. This indicates that the outflow is, at least to some extent, clumpy. This is an important result because numerical simulations (Wagner et al. 2012 and refs therein) predict that the coupling of the radio jet with the surrounding ISM (and therefore its impact) is highly enhanced when the jet enters a clumpy medium. The objects in our sample were selected to represent radio galaxies at different stages in the evolution. The effect of this is seen in the properties of the outflowing gas. We find indications that the HI outflow also might have a diffuse component, and that this component becomes more prominent in larger sources (often associated to restarted sources like 3C 236 and 3C 293), i.e. when the jet has interacted for a longer time with the surrounding medium. Also this is consistent with what predicted by numerical simulations (see e.g. Mukherjee et al. 2018).

For more details and the observations and the results see the full paper: Schulz R., Morganti R., Nyland K., Paragi Z., Mahony E.K., Oosterloo T., 2021. The parsec-scale HI outflows in powerful radio galaxies.

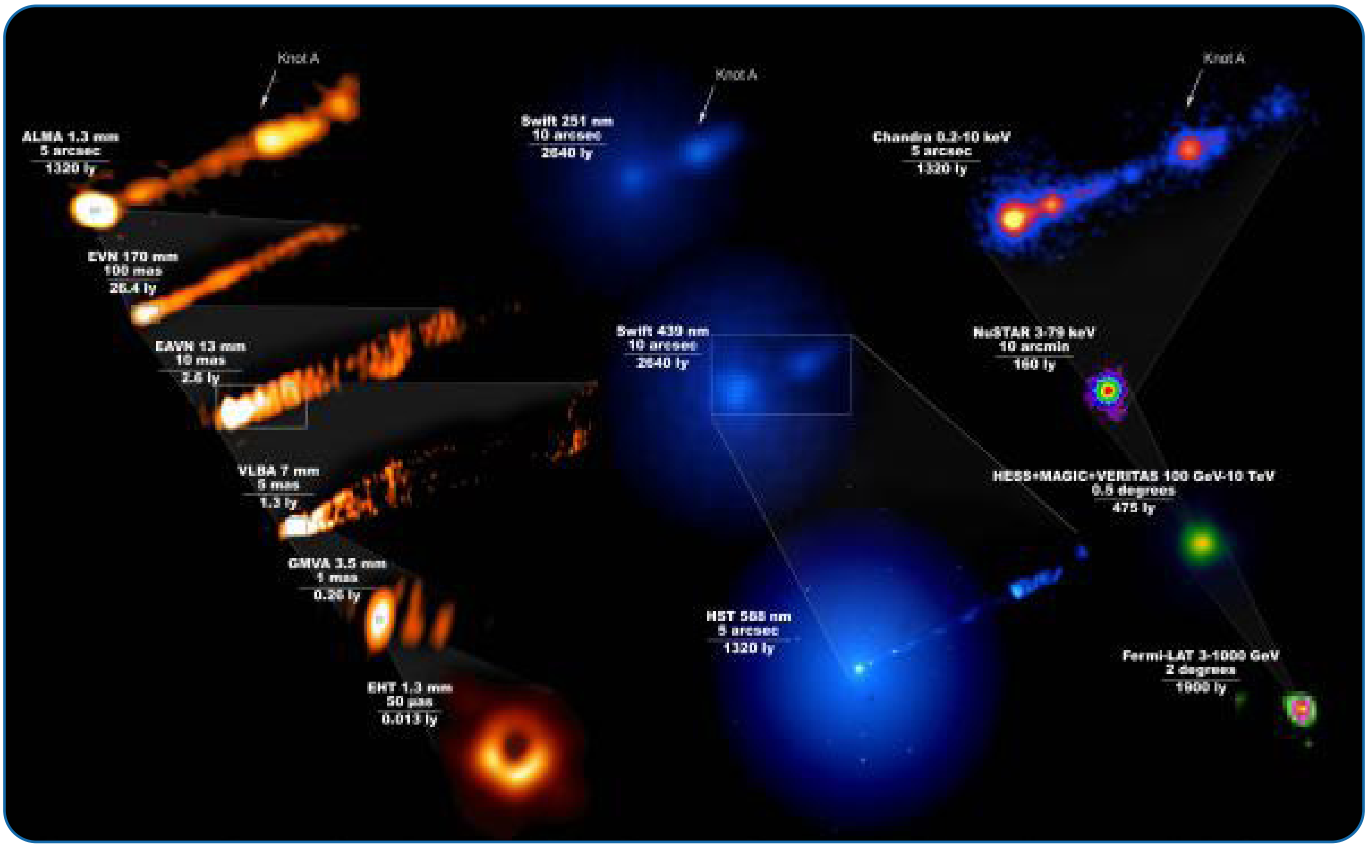
The project is still continuing with more observations obtained for other objects and more intriguing results starting to appear!

TELESCOPES UNITE IN UNPRECEDENTED OBSERVATIONS OF FAMOUS BLACK HOLE

EHT MWL collaboration

In April 2019, scientists released the first image of a black hole in the galaxy M87 using the Event Horizon Telescope (EHT). However, that remarkable achievement was just the beginning of the science story to be told. Scientists from JIVE contributed to this global effort. Data from 19 observatories are being released that promise to give unparalleled insight into this black hole and the system it powers, and to improve tests of Einstein's General Theory of Relativity.

The immense gravitational pull of a supermassive black hole can power jets of particles that travel at almost the speed of light across vast distances. M87's jets produce light spanning the entire electromagnetic spectrum, from radio waves to visible light to gamma rays. This pattern is different for each black hole. Identifying this pattern gives crucial insight into a black hole's properties (for example, its spin and energy output), but this is a challenge because the pattern changes with time.



Compilation of the quasi-simultaneous M87 jet images at various scales during the 2017 campaign. The instrument, observing wavelength, and scale are shown on the top-left side of each image. Note that the color scale has been chosen to highlight the observed features for each scale, and should not be used for rms or flux density calculation purposes. Location of the Knot A (far beyond the core and HST-1) is shown in the top figures for visual aid.

Scientists compensated for this variability by coordinating observations with many of the world's most powerful telescopes on the ground and in space, collecting light from across the spectrum. This is the largest simultaneous observing campaign ever undertaken on a supermassive black hole with jets. Telescopes of the European VLBI Network (EVN) were involved in this observing campaign. The EVN is one of the prime instruments in studying radio jets produced by supermassive black holes. In particular, the jets of M87 have been in the focus for years now.

Each telescope delivers different information about the behavior and impact of the 6.5-billion-solar-mass black hole at the center of M87, which is located about 55 million light-years from Earth. The data were collected by a team of 760 scientists and engineers from nearly 200 institutions, spanning 32 countries or regions, and using observatories funded by agencies and institutions around the globe. The observations were concentrated from the end of March to the middle of April 2017. The data from the EVN telescopes have been processed using the EVN Software Correlator (SFXC) at JIVE, providing an important contribution to this unprecedented effort.

The first results show that the intensity of the light produced by material around M87's supermassive black hole was the lowest that had ever been seen. This produced ideal conditions for viewing the 'shadow' of the black hole, as well as being able to isolate the light from regions close to the event horizon from those tens of thousands of light-years away from the black hole.

The combination of data from these telescopes, and current (and future) EHT observations, will allow scientists to conduct important lines of investigation into some of astrophysics' most significant and challenging fields of study. For example, scientists plan to use these data to improve tests of Einstein's Theory of General Relativity. Currently, uncertainties about the material rotating around the black hole and being blasted away in jets, in particular the properties that determine the emitted light, represent a major hurdle for these GR tests.

A related question that is addressed by today's study concerns the origin of energetic particles called "cosmic rays", which continually bombard the Earth from outer space. Their energies can be a million times higher than what can be produced in the most powerful accelerator on Earth, the Large Hadron Collider. The huge jets launched from black holes, like the ones shown in today's images, are thought to be the most likely source of the highest energy cosmic rays, but there are many questions about the details, including the precise locations where the particles get accelerated. Because cosmic rays produce light via their collisions, the highest-energy gamma rays can pinpoint this location, and the new study indicates that these gamma-rays are likely not produced near the event horizon-at least not in 2017. A key to settling this debate will be comparison to the observations from 2018, and the new data being collected through the 2021 campaign.

Published in: EHT MWL SWG, 2021, ApJL, 911, L11

HIGHLY POLARISED MICROSTRUCTURE IN A FAST RADIO BURST

Kenzie Nimmo, University of Amsterdam, the Netherlands

Fast radio bursts (FRBs) are bright (fluence ~ 1 Jy), short duration (~ 1ms), coherent radio flashes. FRBs were first discovered in 2007, and over the past decade we have learned a lot about these energetic transients. We still do not know, however, what type(s) of astrophysical objects produce fast radio bursts or what emission physics is required to produce such a large amount of energy in a short time. Compact objects (especially neutron stars) are promising progenitors for the production of FRBs.

A fraction of the FRB population have been seen to repeat. These repeating sources are particularly rich sources for follow-up: e.g. searching for a range of burst energies; searching for bursts at multiple radio frequencies (and even simultaneous observations with X-ray or gamma-ray instruments); monitoring burst properties as a function of time; and using long-baseline interferometers to precisely localise bursts and thereafter perform multi-wavelength follow-up to identify and study the host galaxy and local environment.

In 2019, we observed one such repeating FRB source, FRB 20180916B, with the European VLBI Network (EVN). In these observations we detected four bursts from this source. Early in 2020, we published the localisation of these bursts to the apex of a v-shaped star-forming region in the arm of a spiral galaxy at a distance of 149Mpc. Using these data, we could zoom in spatially on the bursts to figure out exactly where the bursts were coming from.

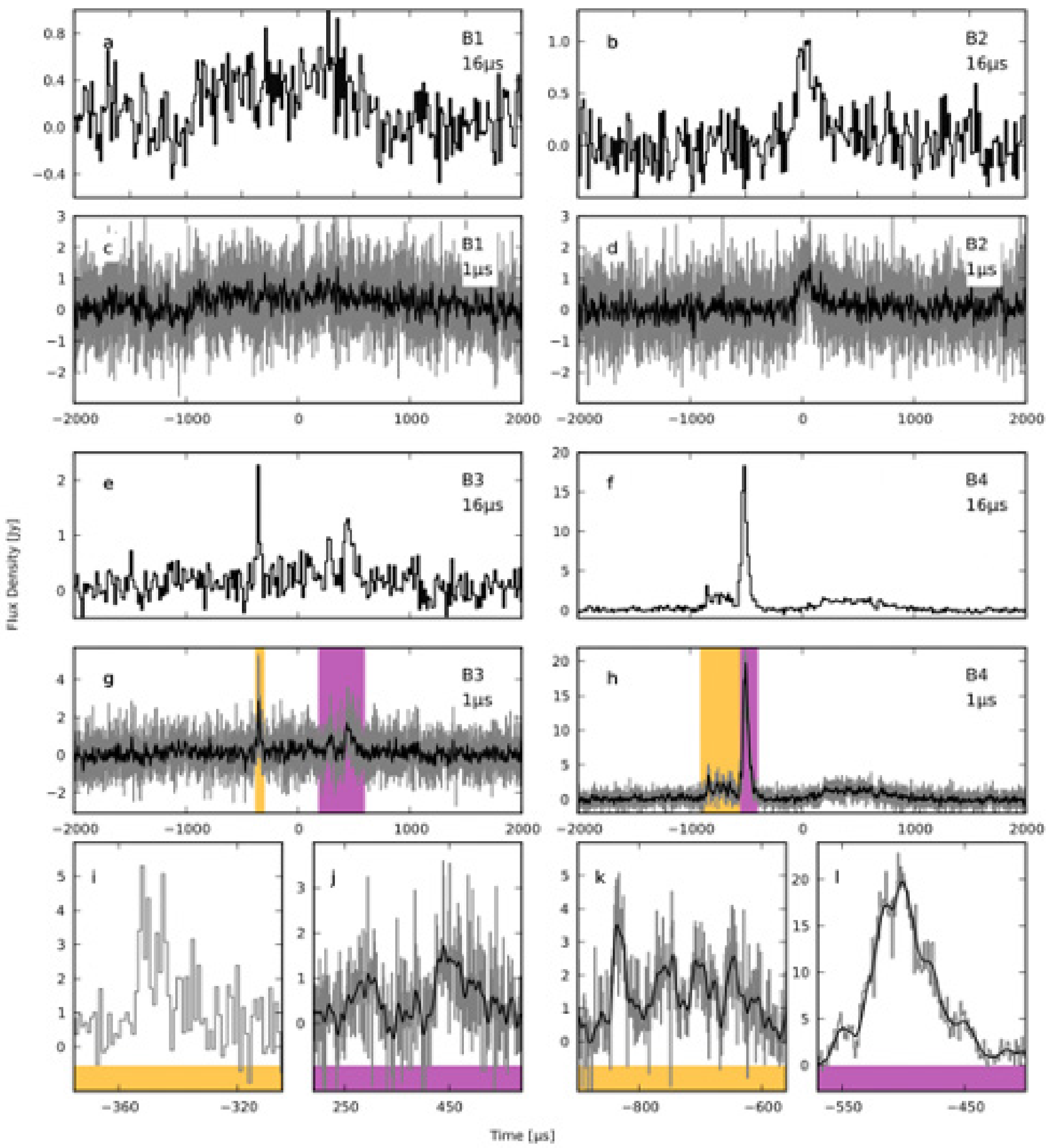
Additionally, we can use the same data to zoom in on the bursts in time. In this work, we find burst temporal structure as short as 3-4 μs in this sample of bursts; moreover, we see that the timescales range from a few μs to a few ms (see figure). The short timescale structure we see in the bursts implies that the size of the emission region is on the order of a kilometre.

We also find that the bursts are highly polarised, showing ~100% linear polarisation fractions. The polarisation properties (high linear polarisation, no circular polarisation, constant polarisation angle across the burst profile) are consistent with measurements of bursts from FRB 20180916B at lower frequencies, and are also consistent with observations of another well-studied repeating FRB, FRB 20121102A. This is in contrast with the wide variety of polarisation properties seen from the FRB population as a whole, and may hint at a characteristic polarisation signature for repeating FRBs. By going to very high time resolution, we see significant variations in the polarisation angle across the burst profile.

Neutron star progenitor models for FRBs come in two "flavours": one in which the emission originates within the magnetosphere, and one in which the neutron star flares and produces a shock which propagates far

Published in: [Marcote et al, 2020, Nature, 577, 190]

from the compact object and interacts with surrounding material to produce an FRB. Our observations of μs temporal structure, three orders of magnitude range of temporal structures (μs to ms), and short timescale variations in the polarisation angle are most naturally explained in a magnetospheric origin of the emission.



Using the EVN we detected four fast radio bursts (FRBs) from FRB 20180916B, a repeating FRB source. Shown here are the burst profiles at both 16 μs and 1 μs time resolution. Panels i and j zoom-in on the structure seen in burst B3 at 1 μs resolution, and likewise panels k and l show the equivalent for burst B4. The structure in panel i is only approximately 3-4 μs wide.

FIRST RADIOASTRON VIEW OF THE QUASAR 3C 345 IN POLARISATION

Felix Pötzl, MPIfR, Germany

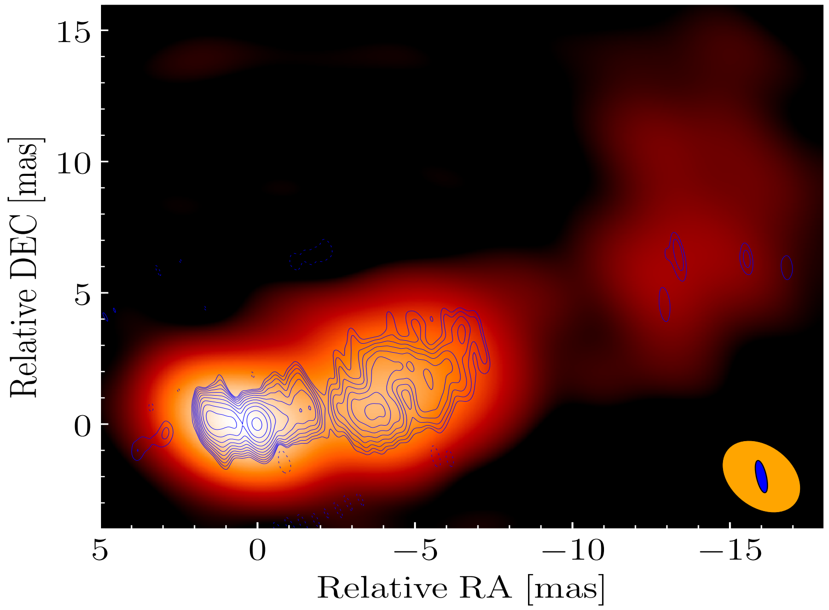


Figure 1: Total intensity image of 3C 345 at 1.6 GHz with the ground array data (orange colour scale) and all data including the space baselines (blue contours). The different beam sizes are displayed in the bottom right corner. We reach a for this source unprecedented resolution of 1.25 +/- 0.32 mas with RadioAstron (3.0 +/- 2.1 mas with the ground-array).

A fraction of active galactic nuclei (AGN) produce collimated, relativistic outlows, termed jets. They are visible across the electromagnetic spectrum, and their synchrotron emission can most prominently be seen in the radio. In the case of the archetypical quasar 3C 345, the jet has a small viewing angle (~5°) with the line of sight, leading to signicant relativistic boosting of the observed emission.

3C 345 has been observed with the space VLBI mission RadioAstron in March 2016 at a frequency of 1.6 GHz. The observations included the 10m antenna on board the Spektr-R spacecraft together with a ground array comprised of the Very Long Baseline Array (VLBA) as well as several European VLBI Network (EVN) stations. The source was observed in full polarisation, enabling us to study magnetic fields at the smallest possible scales to date in the source at this frequency.

Our reconstructed image in total intensity, with a resolution of ~300 microarcseconds along the jet direction, can be seen in Fig. 1. This marks an improvement of a factor of about 7 compared to the ground-array image, displayed in orange colour scale. Fig. 2 shows the linearly polarised intensity in colours overlaid onto the total intensity in contours, as well as our best Gaussian component representation as crossed circles. The core is identied at the jet base, and appears self-absorbed and largely depolarised, with a polarisation fraction of ~1%. A visibly curved jet then extends further downstream.

Published in: [Pötzl et al., 2021, A&A, 648, A82]

At ~2 mas from the core, the peak in total and polarised intensity is observed in the jet, reaching ~5% fractional polarisation. The electric vector position angles (EVPAs) seem to largely follow the jet direction, indicating a predominantly toroidal magnetic eld in the jet on the scales we observe here. Together with our brightness temperature analysis, which indicates jet regions above the inverse-Compton limit, this suggests a shock travelling down the jet.

A second paper (currently in preparation) will deal with the RadioAstron data in conjunction with a multi-frequency VLBI dataset, where we will investigate the spectrum, core shift and rotation measure in the source. This will give further insight into the underlying jet physics in 3C 345.

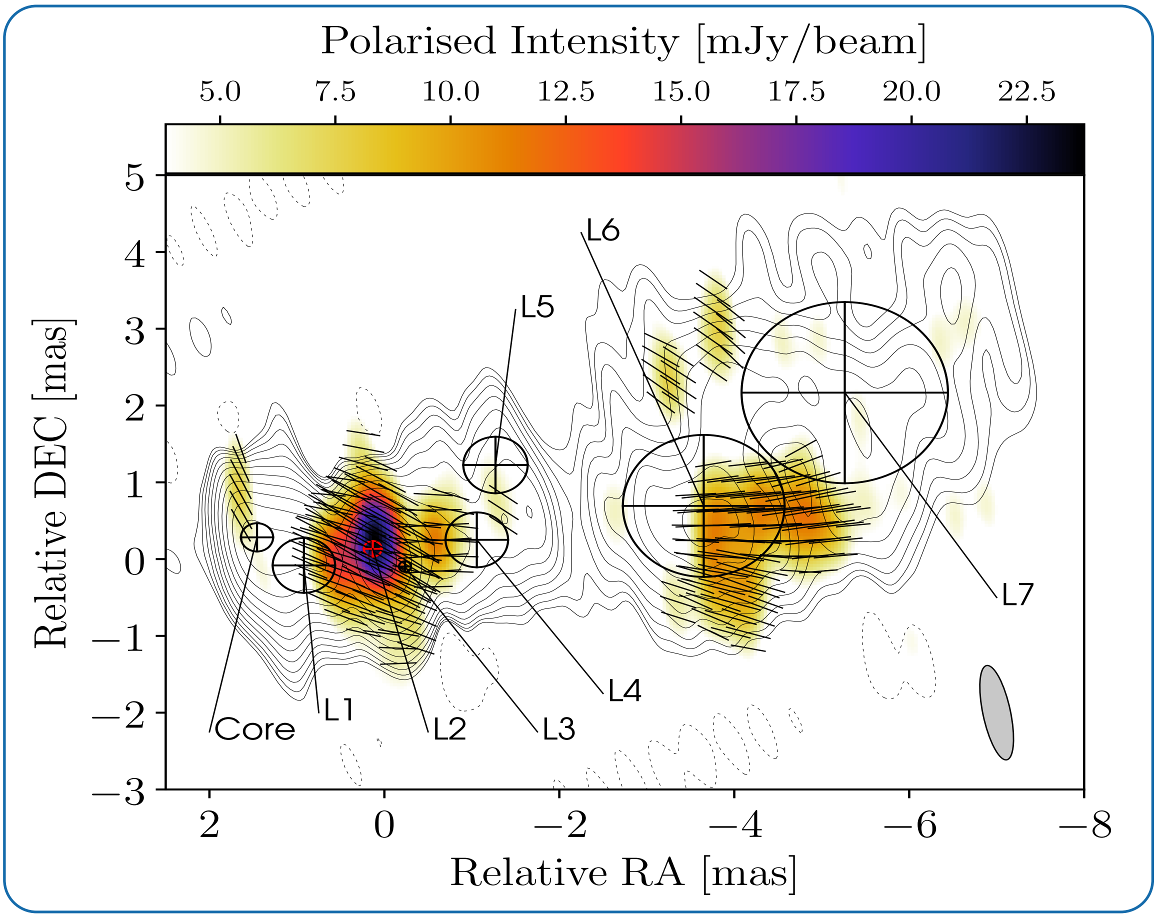


Figure 2: Total intensity contours from Fig. 1 with overlaid linearly polarised intensity in colour-scale. The lines show the EVPAs the length of which is proportional to the polarised intensity. The jet seems to display a predominantly toroidal magnetic eld conguration.

NEWS FROM JODRELL BANK

Michael Garrett, UMAN, Jodrell Bank, UK

Quite a lot has been happening at the Jodrell Bank world heritage site, even with the various COVID-19 restrictions in place since March 2020. In particular, many improvements have been made to the structure of the 76-m Lovell Telescope. This has culminated in the recent replacement of the original 1957 surface (see Figure 1) – a job that only finished at the end of last year. The project was on schedule and within budget, part of a 15M€ upgrade to the site infrastructure that will help ensure the Lovell telescope continues to operate well into the next decade. Changes to the telescope's pointing system also mean the performance at C-band is greatly improved – this also holds for the other e-MERLIN telescopes.

This summer, work will continue with further strengthening of the wheel girder and other parts of the main telescope structure.

Figure 1. The new surface – photo credit Frank Manning, JBCA

Figure 2. Construction of the Discovery Centre's First Light Pavilion at Jodrell Bank – photo credit Keir Construction

Major improvements have also been made to various buildings on the south side of the Observatory around the green, and this will include an internal upgrade to the "Development labs" likely to start soon. The original huts in the Botany station which Sir Bernard Lovell used during his first days on site in December 1945 have also been secured.

A major upgrade to the site's general infrastructure has also occurred in order to support the demands of the SKA Headquarters and an expansion to the Jodrell Bank Discovery Centre. Despite all the difficulties of the last year, the construction of the First Light Pavilion (see Figure 2) has made excellent progress and is expected to open to the public in the autumn of this year.

Hopefully some of the VLBI community will get a chance to visit the Observatory and First Light Pavillion later next year

UPDATES FROM THE SARDINA RADIO TELESCOPE

Tiziana Venturi, INAF, Italy

Due to major upgrade of the antenna, we foresee a stop of the SRT observations starting on July 1st, 2021 for a period no shorter than 6 months.

When the upgrade will be finalised, SRT will be performing at full steam, with receivers from 0.3 to 110 GHz, and all the three Italian antennas will be equipped with a tri-band receiver optimised for VLBI.

ITALY JOINS THE JIVE ERIC

Tiziana Venturi, INAF, Italy

Since March 12th, 2021, Italy is member of the JIVE ERIC. Such membership formalizes the scientific and technological contribution that Italy has provided to the development of VLBI in Europe since its origin.

The interest of the Italian radio astronomers towards the scientific potentials of very long baseline interferometry started in the late '70ies, and Italy was among the five countries (together with UK, The Netherlands, Sweden and Germany) which "called the EVN into being" on March 5, 1980.

At the time the antenna in Medicina was still under construction, but the plan for three antennas suitable for astronomical and geodetic VLBI observations on the Italian territory had already started, and a scientific VLBI community was developing at the Institute of Radio Astronomy in Bologna.

The first EVN Programme Committee, which was formed in 1980, included Prof. Roberto Fanti as Italian member, and the first meeting of the EVN Consortium Board of Directors, in 1985, was under the Italian chairmanship of Prof. Setti.

1985: First meeting of the EVN Consortium. Photo credit: Richard Porcas (presentation given at the 10th EVN Symposium, Manchester 2010

It is interesting to remember that the EVN CBD was formed with the main aim to find funding for a large correlator centre. A lot has happened since then. The EVN correlator at JIVE is indeed the heart of the EVN, and the scope of JIVE has considerably expanded beyond the initial aim of running the correlation of EVN (and global) experiments.

At the same time, in 2014 Italy finally completed its project for an Italian VLBI array, and it now participates in the EVN with three telescopes, one of them being the large and technologically innovative Sardinia Radio Telescope.

The enthusiasm and dedication of the Italian radio astronomers and engineers and their contribution to the growth and development of VLBI has remained unchanged over these many years, and it is a pleasure and a honour for Italy to be finally member of JIVE.

ERIC FORUM ELECTS FRANCISCO COLOMER, DIRECTOR OF JIVE, AS NEW CHAIR

The ERIC Forum is pleased to announce the election of Francisco Colomer, Director of JIVE, as the new Chair of the ERIC Forum.

The new Chair, with the support of members from the Executive Board, will be in charge of the strategic management and planning of the ERIC Forum, strengthening its dialogue and relations with key stakeholders such as the European Commission and the ESFRI.

Francisco Colomer remarks that "the best researchers need the best research infrastructures to produce the best science". The ERIC Forum, which is one of the leading science policy voices in Europe, "emphasises the critical role of European research infrastructures as high level service providers to those researchers, to make science and innovation possible, while increasing the visibility and relevance of ERICs in the individual European member states".

Each member of the Executive Board is representing a scientific cluster (Social Sciences and Humanities, Life Sciences, Environment and Earth Sciences clusters), in addition to the chair and vice-chair who, in their turn, represent the two remaining clusters (respectively: Physical Sciences and Engineering, and Health and Food clusters).

The ERIC Forum brings together 21 large-scale European Research Infrastructures, and aims to advance operations of ERICs and to strategically contribute to the development of ERIC-related policies. The ERIC Forum is also a consultation body for EU policies related to Research Infrastructures. It centralises the type of challenges that ERICs face in this regard and the potential solutions which are being implemented.

For more information, visit the ERIC Forum website: www.eric-forum.eu.

EVN ONLINE MINI-SYMPOSIUM AND USERS MEETING IN 2021

EVN Mini-Symposium & Users' Meeting July 12 – 14, 2021

The 15th European VLBI Network (EVN) Symposium was originaly planned for July 2020, but was canceled due to the Covid-19 pandemic. The decision has been made to hold an online EVN Mini-Symposium and Users Meeting during July 12-14, 2021. It is hoped that the full 15th EVN Symposium and EVN Users Meeting will then be hosted by University College Cork (Ireland) on behalf of the EVN Consortium Board of Directors, provisionally during July 11-15, 2022.

The EVN Symposium normally takes place every two years, and is the main forum for discussion of the latest Very Long Baseline Interferometry scientific results and technical and technological developments within the EVN member countries. Topics to be discussed at the symposium include:

- The innermost structure of AGNs and the origin of jets
- Starburst galaxies
- Stellar evolution and stellar masers
- FRBs and pulsars
- Astrometry
- Space applications
- The relationship of EVN with other VLBI facilities
- Synergies with other wavelengths/multi-messenger astronomy
- New VLBI developments, new technical capabilities

The online EVN mini-symposium will be shorter than usual, with six two-hour sessions over the three days, one of which will be taken up by the Users' Meeting; thus, only a limited number of talks can be presented. Some review talks will be given in the months before and after the mini-symposium, as EVN Seminars. Abstracts for proposed posters will also be accepted.

The website of the symposium is available at: https://www.ucc.ie/en/evn2021/ and includes the registration link and information about abstract submission. The programme will also be made available on this site.

Timeline for the EVN Mini-Symposium:

- 25 March 2021 - Registration opens
- **15 May 2021 - Deadline for submission of abstracts**
- 31 May 2021 - Participants informed of outcome of submission of abstracts
- 12-14 July 2021 - 15th EVN Symposium

It is provisionally planned that the Proceedings of the EVN Mini-Symposium will be published in Proceedings of Science.

EVN E-SEMINARS 2021

The EVN presents a series of virtual seminars focused on how very long baseline interferometry (VLBI) observations can significantly contribute to different astronomical fields. These seminars are oriented to the broad astronomical community and provide an engaging introduction to cutting-edge research from different groups across the world.

The seminars have a duration of 40 minutes (plus around 20 minutes of questions and discussion), and can be joined by Zoom or watched in streaming in YouTube.

The videos will be recorded and published at the JIVE/EVN YouTube channel and could be watched at any time.

Upcoming e-Seminars:

- May 19, Marcello Giroletti on Synergies with other wavebands/multimessenger;
- June 9, Pikky Atri on VLBI observations of compact stellar systems;
- Ivan Marti-Vidal on July 2 (VLBI Astrometry)

OPTICON-RADIONET PILOT STARTED

Until now, Europe has had two major collaborative networks for ground-based astronomy, one in the optical domain and the other in the radio-wave domain.

Starting 1 March 2021 OPTICON and RadioNet have come together to form Europe's largest ground-based astronomy collaborative network. Launched with funding to the tune of €15 million under the H2020 programme, the project aims to harmonise observational methods and tools, and provide access to a wider range of astronomy facilities.

CNRS will coordinate the project, together with the University of Cambridge and the Max-Planck Institute for Radio Astronomy.

https://www.orp-h2020.eu

OPTICON RadioNet Pilot

UPCOMING MEETINGS

- **European Astronomical Society (EAS) General Assembly:**
  28 June - 2 July 2021, online;
  https://eas.unige.ch/EAS2021/

  Including a special session "Extreme astrophysics at extremely high resolution"

- **EVN mini-Symposium and Users' meeting:**
  12– 14 July 2021, online;
  https://www.ucc.ie/en/evn2021/
  Deadline for submission of abstracts 15 May 2021

- **YERAC:**
  24 - 27 August 2021, online;
  https://www.iram-institute.org/EN/content-page-422-7-67-422-0-0.html

  Deadline registration 28 May 2021

- **URSI GASS:**
  28 August–4 September 2021, hybrid - Rome, Italy;
  https://www.ursi2021.org/

- **EVN e-Seminars:**
  https://www.evlbi.org/evn-seminars

Next Newsletter: September 2021

Contributions can be submitted until
10 August 2021

Newsletter edited by Aukelien van den Poll at JIVE (communications@jive.eu).
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