JIVE

Joint Institute for VLBI ERIC

Annual Report 2025

annual report '25

THE JOINT INSTITUTE FOR VLBI ERIC (JIV-ERIC) WAS ESTABLISHED BY A DECISION OF THE EUROPEAN COMMISSION IN DECEMBER 2014. IT ASSUMED THE ACTIVITIES AND RESPONSIBILITIES OF THE JIVE FOUNDATION, WHICH WAS ESTABLISHED IN DECEMBER 1993. JIVE'S MANDATE IS TO SUPPORT THE OPERATIONS AND USERS OF THE EUROPEAN VLBI NETWORK (EVN) IN THE BROADEST SENSE.

ERIC established by the European
Commision Implementing Decision
2014/923/EU.

JIVE MEMBERS

The French Republic: National Centre for Scientific Research (CNRS)

The Kingdom of the Netherlands: Dutch Research Council (NWO) and the Netherlands Institute for Radio Astronomy (ASTRON)

The Kingdom of Sweden: Swedish Research Council (VR)

The Republic of Latvia: Ministry of Education and Science of the Republic of Latvia

The Kingdom of Spain: Spanish National Geographic Institute (IGN)

The United Kingdom of Great Britain and Northern Ireland: Science and Technology Facilities Council (STFC)

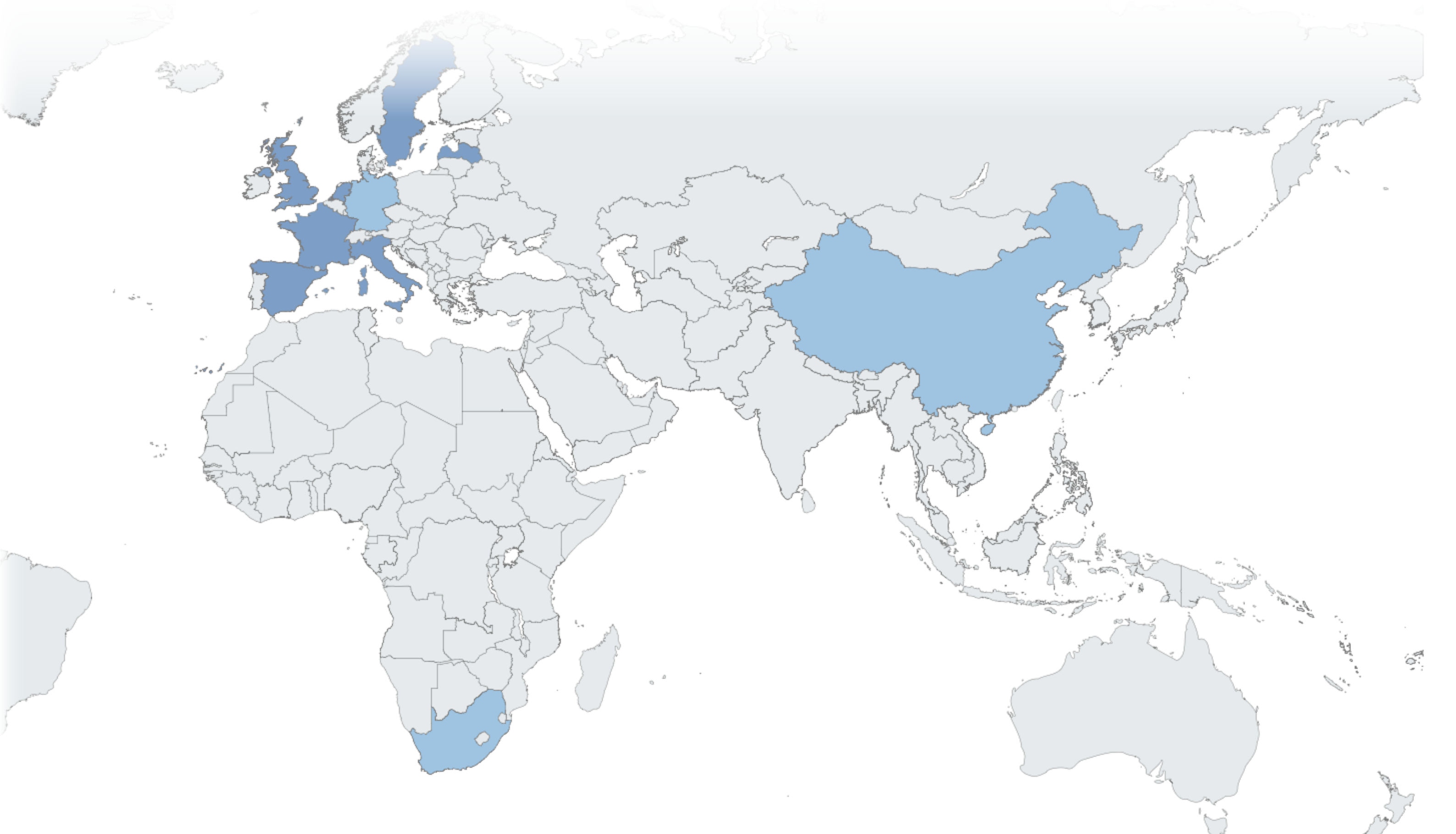
The Italian Republic: National Institute for Astrophysics (INAF)

JIVE PARTICIPATING RESEARCH INSTITUTES

China: National Astronomical Observatories of the Chinese Academy of Sciences (NAOC)

South Africa: National Research Foundation (NRF)

Germany: Max Planck Institute for Radio Astronomy (MPIfR)



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2025

PROF. JESSICA DEMPSEY

Chair,
JIV-ERIC Council

It is my pleasure to introduce the 2025 Annual Report of the Joint Institute for VLBI ERIC.

As a research infrastructure providing central support to the European VLBI Network, JIVE delivers the scientific, technical, and operational foundation that enables world-leading radio astronomy at centimetre wavelengths.

A defining milestone of 2025 was the successful completion of the first science observations combining the European VLBI Network with MeerKAT in the L-band. This achievement, made possible through the collaboration between the teams at SARAO and JIVE, together with the wider EVN community, has significantly enhanced the sensitivity and imaging capabilities of the network. Beyond its immediate scientific impact, it marks an important step towards future SKA-VLBI operations, demonstrating the potential of integrating next-generation radio astronomy facilities into global VLBI networks.

As Chair of the JIVE Council, I would like to express my sincere appreciation to the JIVE Director and staff, our Member States, participating institutes, EVN stations, and all our international partners for their continued commitment and collaboration. Together, we are not only enabling outstanding science today but also building the foundation for the next generation of discoveries and preparing the international radio astronomy community for the SKA era.

I would also like to thank Prof. Anton Zensus for his many years of dedication and outstanding service to the EVN, the JIVE Council, and RadioNet, where he served as Spokesperson. His commitment has made a lasting contribution to the European radio astronomy community.

As I take on the role of Director-General of the SKA Observatory in 2026, I will also be stepping down as Chair of the JIVE Council. I would like to wish JIVE continued success and extend my very best wishes to the new Chair, Dr Violette Impellizzeri of ASTRON. I am confident that, under her leadership, the JIVE Council will continue to support JIVE in delivering scientific excellence and preparing for the exciting opportunities of the SKA era.

I hope this Annual Report provides an inspiring overview of the achievements of 2025 and reflects the ambition, excellence, and collaborative spirit that continue to define JIVE.

Our Mission

The Joint Institute for VLBI ERIC was established to support, progress, and promote the use of Very Long Baseline Interferometry (VLBI). VLBI is a technique in which radio telescopes, located hundreds to thousands of kilometers apart, simultaneously observe the same radio source in the sky. These telescope observations are recorded as digital signals, which are then combined at a central, dedicated data processor known as the correlator. Astronomers use the resulting data to produce extremely high-resolution images of the radio sky and measure the positions of bright radio sources with very high accuracy.

In Europe, VLBI is organised through the European VLBI Network (EVN), a consortium that includes members from other continents. JIVE hosts the correlator that provides central data processing for the EVN and supports most interactions with astronomers who use the facility. The EVN is an open-sky facility that accepts observation proposals from anyone.

JIVE receives data from the telescope stations via computer hard disk recordings, offline downloads, or direct streaming over fiber links (e-VLBI). The JIVE support team verifies data quality, interacts with staff at the telescopes, and provides support to end users through subsequent processing and analysis as requested. The final user product includes calibration data and images from a standard data pipeline.

To keep the EVN and JIVE at the forefront of scientific research, JIVE harbours a team of scientists and engineers who continually develop new techniques and software to enhance the scientific capabilities of VLBI. The team's primary focus is to develop observing modes by investigating new methods to record and transport data, thus increasing the research infrastructure's sensitivity and flexibility. Novel data processing techniques and platforms are also explored. JIVE engineers work on various user interfaces, such as the software astronomers use to schedule their observations and process their data. Additionally, JIVE has considerable expertise in deploying VLBI for space applications.

JIVE staff members also conduct scientific research in several exciting areas, ranging from active galactic nuclei at cosmological distances to star evolution in the Galaxy. This research is essential for maintaining expertise and providing excellent service to EVN stations and users.

JIVE has developed a reputation for fostering coordination, innovation, and capacity building for European and global VLBI. As a central entity in the EVN and through its status as an ERIC, JIVE shares these qualities with multiple institutes and European Commission (EC) projects.

JIVE in Numbers

24
JIVE staff

3
Participating research institutes

104
Experiments completed in 2025

7
Member countries

800.5
Network hours completed in 2025

34
JIVE staff publications

1010
Correlated hours within 2025

3
EC projects

216.8
Total size of user-experiment data in the Archive [TB]

700k+
Reached via comms

Director's Overview

DR. AGNIESZKA SŁOWIKOWSKA

Director, JIV-ERIC

Throughout 2025, JIVE continued to fulfil its mission to operate and develop the European VLBI Network, supporting a vibrant international user community while preparing the next generation of radio astronomy capabilities.

Among this year's highlights, the first EVN science observations with MeerKAT in the L-band stand out as a landmark achievement. This accomplishment not only demonstrates the scientific and technical excellence of the collaboration between SARAO, JIVE, and the EVN community but also marks an important milestone on the path towards SKA-VLBI. It illustrates how strategic investments in research infrastructures create lasting scientific value while laying the foundations for future global facilities.

Beyond scientific operations, JIVE continued to expand its activities in user support, software development, data processing, research and development, training, outreach, and international cooperation. Highlights included the JIVE VLBI School 2025, the EVN online seminar series and training activities, as well as the many scientists, students, and visitors who spent time at JIVE, making our institute an active hub for collaboration and knowledge exchange.

I want to express my sincere gratitude to our support scientists, Suma Murthy and Gábor Orosz, for their dedication and valuable contributions to JIVE. I wish them every success in the next stage of their scientific careers. At the same time, I am delighted to welcome our new support scientists, Miriam Nyamai and Florian Eppel, as well as Mislav Baloković, who joined our team to strengthen CRAF's activities in spectrum management and radio frequency protection.

While we continue to deliver the ambitious programme of the Radioblocks project, we are also looking firmly towards the future. Together with our partners, we are preparing the next generation of infrastructure and technology initiatives, including a new proposal under the Horizon Europe INFRA-TECH programme. By investing in advanced VLBI technologies, software, digital capabilities, and the integration of the EVN with next-generation facilities such as the SKA, we are helping to shape the future of global radio astronomy.

Looking ahead, I see JIVE playing an even stronger role within the European research infrastructure landscape. As Europe prepares the next Framework Programme (FP10), research infrastructures will be essential not only for scientific excellence, but also for technological innovation, resilience, skills development, and international competitiveness. JIVE will continue to strengthen its partnerships across Europe and worldwide, contribute to strategic European initiatives, and explore new opportunities where radio astronomy technologies can create impact beyond astronomy, including resilience, security, and dual-use research and innovation.

By working closely with our Members and partners, and by exploring opportunities for new members and the broader research infrastructure community, we will ensure that JIVE remains at the forefront of scientific and technological excellence.

I want to thank our Members, the JIVE Council, EVN partners, users, collaborators, and, above all, the JIVE staff for their outstanding commitment and enthusiasm.

I invite you to explore this Annual Report and discover the many accomplishments that together made 2025 another exceptional year for JIVE.

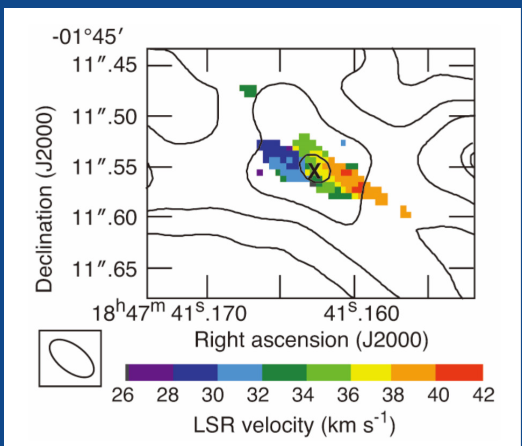
Science Highlights

THE “WATER FOUNTAIN” SOURCE W43A

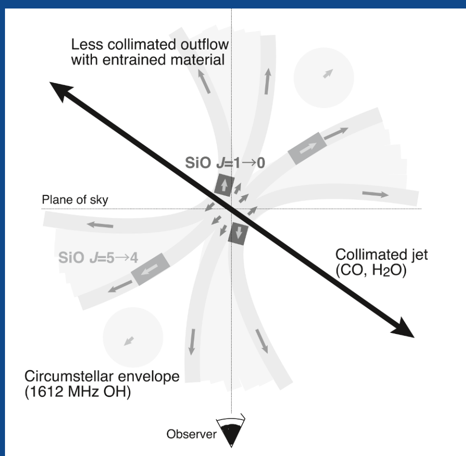
IMAI ET AL. 2025, THE ASTROPHYSICAL JOURNAL, VOLUME 987, 114

A team led by Hiroshi Imai and including Gábor Orosz from JIVE reported the first mapping of SiO v=1 J=5→4 maser emission toward the water fountain source W43A, in order to explore the central stellar system driving the collimated, bipolar, fast jet. SiO masers are known to probe the innermost region of envelopes associated with the final evolution of stars, but sometimes they are related to bipolar outflows in massive young stellar objects or in dying stars. In water fountain sources the highly collimated, fast (>100 km/s) bipolar outflows have been traced by H2O masers. These sources have very short dynamical time scales (some 100 years), but the mass-loss rate associated with this state is extremely high. The process behind these massive outflows is unclear.

The team carried out observations with ALMA (230 GHz) and the VLA (43 GHz), to probe different SiO maser transitions. They found that the maser source has a systemic line-of-sight velocity consistent with that of CO J=2→1 emission tracing the jet within ~2 km/s but a velocity gradient opposite that of the jet. The dynamical centre of the maser source was found to be located within ~10 mas (or ~20 AU) of the brightness peak of the central 1.3 mm continuum emission. The spatiokinematic properties of the SiO J=5→4 and J=1→0 masers suggest that they are associated with the root of a slow (10 km/s < Voutflow << 100 km/s) outflow with a large opening angle, and the central stellar system is contained within the inner maser region (~20 AU). This is broadly consistent with the earlier suggestion that water fountains are the result of common envelope evolution (CEE) in binary or multiple systems whose primary component has a relatively low initial mass (<4 $M_\odot$)



First moment map of SiO v = 1 J = 5 → 4 maser emission in W 43A. The pixel size is 6 milliarcseconds. Only the emission brighter than a 4σ noise level is integrated. The synthesised beam pattern and a colour bar indicating the LSR velocity are shown below the diagram.



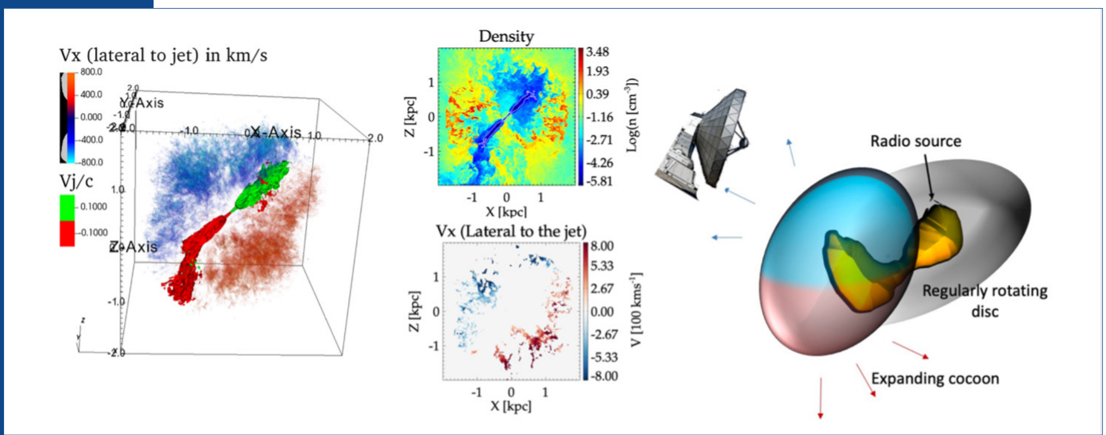
Sketch of a model that is composed of a highly collimated, bipolar jet, a less collimated, moderate-velocity outflow around the jet, and an outer, slowly expanding CSE in W 43A, which may host H2O SiO (both of the J = 5 → 4 and J = 1→ 0 transitions), and 1612 MHz OH masers, respectively.

COLD GAS BUBBLE INFLATED BY A LOW-LUMINOSITY RADIO JET

MURTHY ET AL. 2025, ASTRONOMY & ASTROPHYSICS, VOLUME 694, A110

The radio jets arising from active supermassive black holes are becoming increasingly relevant in the context of galaxy evolution given their role in impacting the gas within their host galaxies. A growing number of theoretical and observational studies have shown that these jets, starting from a very early stage of their evolution, interact with the interstellar medium (ISM) and make the gas highly turbulent, driving multi-phase outflows and enhancing the line ratios of different molecular transitions.

A team led by Suma Murthy at JIVE carried out NOEMA CO(2-1) observations of a nearby, young, low-luminosity radio source, B2 0258+35. In an earlier CO(1-0) study they had already shown the presence of strong jet-ISM interaction and a massive molecular gas outflow involving 75% of the circumnuclear gas. The new NOEMA CO(2-1) observations have revealed even more complex gas kinematics, where the southern radio jet is driving out molecular gas in the form of a swiftly expanding bubble, with velocities up to almost 400 km/s. They found a highly elevated CO(2-1)/CO(1-0) line ratios for the gas belonging to the bubble and also further away from the radio jets. Previous observations have shown that the active galactic nucleus (AGN) in the host galaxy, NGC 1167, is in a very low-accretion state. Thus, they attribute the high line ratios to the high gas excitation caused by the jet–ISM interaction.
The radio jets, despite exhibiting a relatively low luminosity (1.3 x 1044 erg/s), are solely responsible for the observed extreme gas kinematics. This is one of the clearest detections of an expanding cold gas bubble in such a type of source, showing that the jets are affecting both the kinematics and physical conditions of the gas. The study adds to the growing store of evidence that low-luminosity radio sources can also affect the kinematics and physical conditions of the cold gas, which fuels star formation, in their host galaxies to a significant extent. Hence, such sources should be considered in models seeking to quantify feedback from radio AGN.



Left: 3D volume rendering of the velocity component lateral to the jet axis for dense gas, from the simulations of jet-ISM interaction in Fabbiano et al. (2022). The red and blue colours show oppositely directed flows with respect to the jet-axis, expanding as a bubble. Middle: The cross-section of the gas density in X−Z plane. Right: Cartoon image representing the proposed model of the evolution of a jet-driven bubble in the southern jet, where the line of sight traces both sides of the expanding bubble.

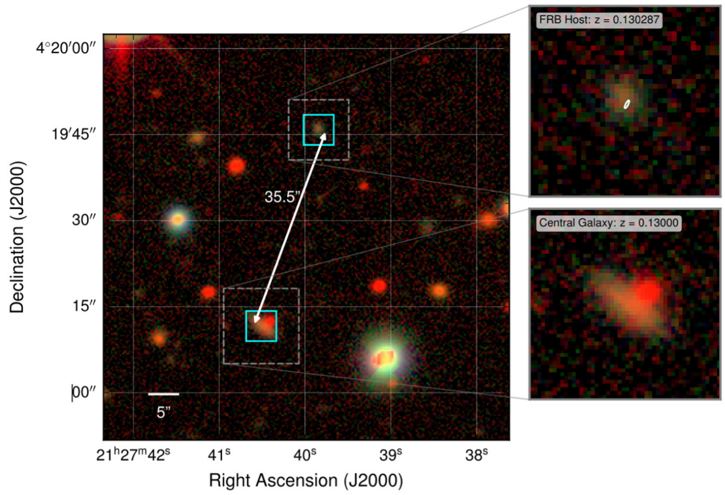
FAST RADIO BURST IN AN SMC-LIKE SATELLITE HOST GALAXY

[BHARDWAJ ET AL. 2025, THE ASTROPHYSICAL JOURNAL LETTERS, VOLUME 992, L35]

Fast radio bursts (FRBs) are brief flashes of radio waves at extragalactic distances. Given the observed energetics and timescales of FRBs they must come from compact objects, but their exact origin and emission mechanism remain unclear. A small fraction (~2%) of the FRB population has been observed to repeat, with more than one burst coming from the same position on the sky. Among repeating FRBs, a rare subset of a few sources show orders-of-magnitude higher burst rate than other repeaters.

A team led by Mohit Bhardwaj and including Benito Marcote and Zsolt Paragi from JIVE studied the hyperactive repeater FRB 20240114A. Using the European VLBI Network (EVN), they localized the bursts to a precision better than about 90 x 30 milliarcseconds, improving on the previously known position by more than an order of magnitude. This precision places the burst 0.5 kpc from the nucleus of its low-metallicity star-forming dwarf host at a spectroscopic redshift of z = 0.130287. Spectroscopic follow-up observations by the Gran Telescopio CANARIAS revealed that the dwarf FRB host is gravitationally bound to a more massive, star-forming spiral galaxy. This establishes the first known instance of an FRB residing in a satellite galaxy within a larger galactic system.

This configuration, analogous to the Small Magellanic Cloud orbiting the Milky Way (but at a lower overall mass scale), expands the known diversity of FRB host environments and offers important insights for interpreting seemingly “hostless” or highly offset FRBs. Furthermore, the detailed dispersion measure (DM) budget analysis indicates that the dominant contribution to FRB 20240114A’s DM likely originates from the foreground galaxy halos. This finding addresses the anomalously high DM observed for this FRB and underscores the significant role of intervening foreground structures in shaping observed FRB DMs, which is important for accurate FRB-based cosmological measurements. The results highlight the importance of deep, high-resolution optical/infrared observations (e.g., with the Hubble or James Webb Space Telescopes) to fully leverage on precise radio localisation and probe the immediate astrophysical birthplaces of FRB progenitors within these complex galactic systems.



Wide-field RGB view of the FRB 20240114A field using DESI g (blue), r (green), and z (red) band images. The FRB host galaxy at z = 0.130287, likely a satellite of a nearby central galaxy at the same systemic redshift, is marked with a cyan box along with its companion; their projected separation of 35.5″ (85 kpc transverse distance) is marked by the double-headed arrow. Grey dashed boxes indicate the zoom regions shown in the upper (host) and lower (central galaxy) insets. In the host inset, the EVN-derived FRB position is highlighted by a white ellipse whose semi-axes represent the 10σ localisation uncertainty (inflated to be visible on this scale).

OPERATIONS

OVERVIEW

The core of JIVE's service is the correlation of astronomers' observations conducted with the EVN and global VLBI arrays. The amount of correlation decreased in 2025, a delayed reaction to the number of user observations that were deferred because of station outages in 2024, but nonetheless it was the seventh year in a row with over 1000 correlator hours produced. Throughout 2025, the backlog to correlate and distribute remained at the reduced level achieved during the course of 2024, despite the turnover of half of the support-scientist team. JIVE has also coordinated various tests for telescopes that could be new additions to the EVN, with the most significant result being the participation of the phased-up MeerKAT array in South Africa in selected user observations.

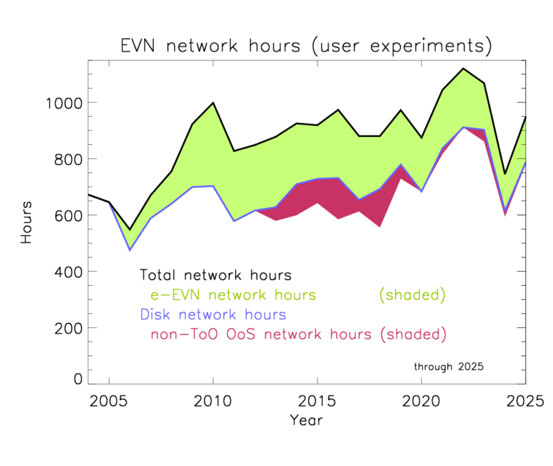
CORRELATION

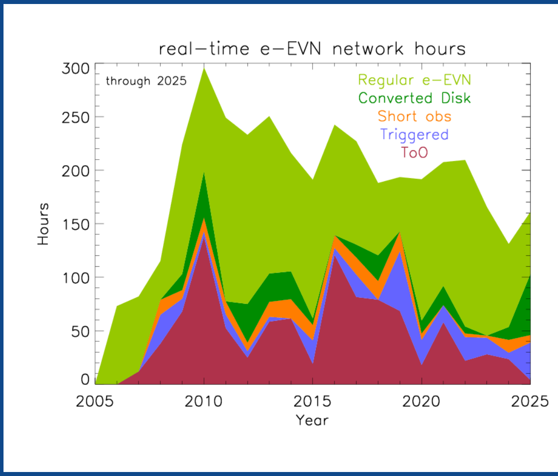
The table below summarises experiments whose correlation finished in 2025, and for user observations, those that were distributed in 2025, together with the number of network and correlator hours they comprised. For a detailed list of the user experiments, see “Correlator Activity”.

	User Experiments			Test & Network Monitoring		
	N	Ntwk_hr	Corr_hr	N	Ntwk_hr	Corr_hr
Correlated	104	800.5	980	12	36	39
Distributed	100	705	983	22	65	65
e-EVN experiments	25	161	237			
e-EVN ToO/Triggers	7	39	63			

Summary of experiments for which correlation or distribution to Principal Investigators (PIs) finished in 2025. Here, “network hours” sum the total duration of experiments, while “correlator hours” are the network hours multiplied by any multiple correlation passes required. The actual time to correlate may be several times larger than this for the more complex correlations. Note that for the e-EVN observations, there are more correlator hours than network hours because some were spectral-line projects that were recorded onto FlexBuffs at JIVE in parallel with the real-time correlation to enable subsequent additional high spectral-resolution correlation passes.

The left-hand panel of the figure below traces the evolution of the annual EVN network hours. The total for 2025 recovered to some degree from 2024; one contributing factor was fewer PIs deferring their observations, but the shifting pattern of station outages did continue. The right-hand panel focuses on e-EVN experiments, showing their division among the proposal categories. 2025 showed the first increase of 10% or more in total e-EVN hours from the previous year since 2015-16, and set a new record for the most e-EVN hours converted from disk-proposals and the second-most ever hours in triggered observations.

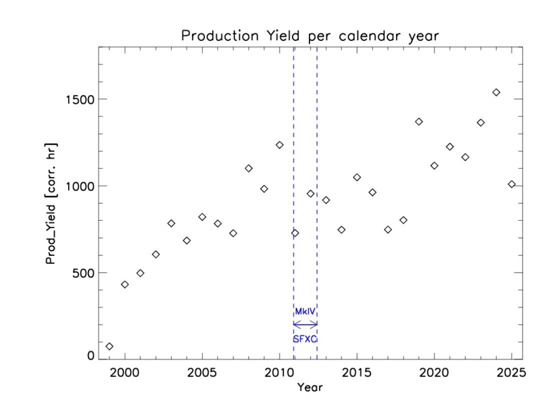


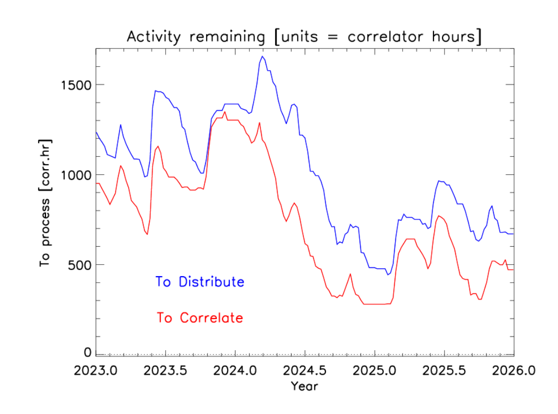


Left: Annual EVN network hours, with separate color-coded areas for different categories of user observations, from top to bottom: real-time e-EVN (light green), non-ToO out-of-session disk-based (dark red), and “traditional” disk-based (white). Right: e-EVN network hours, with separate color-coded areas for different proposal categories, from bottom to top: target-of-opportunity, triggered, short observations, converted from disk, and regular.

The number of user-experiment correlator hours produced within 2025 was 1010. The left-hand figure below shows the evolution of this annual statistic over time. Note that this quantity, accumulating correlator hours within 2025 independently of the completion of all correlator passes for an observation, differs from the quantity in the table above, which accumulates the correlation for all passes of observations that finished in 2025 regardless of when the correlation of each pass took place. These statistics can diverge when different correlation passes for an experiment happen in different years.

2025 also saw the departure of two experienced support scientists at the end of September and the arrival of two new ones in October. Despite this, and the preparatory work required for the JIVE VLBI school, the amount of correlation and distribution remaining to be processed did not increase appreciably, after having been reduced significantly in 2024, as illustrated in the right-hand figure below.

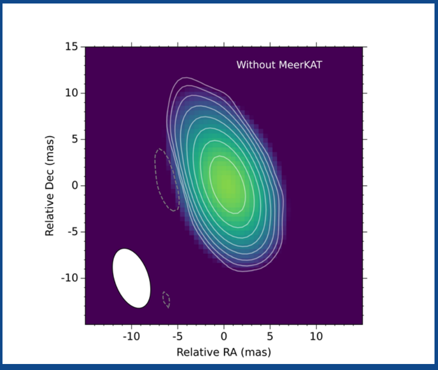


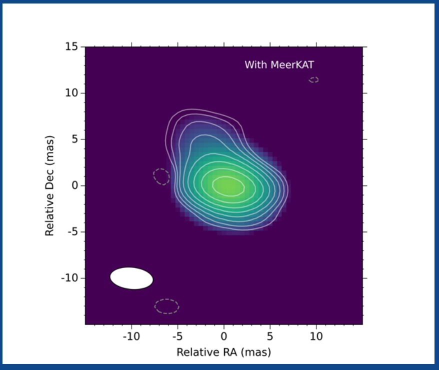


Left: Evolution of the number of correlator hours in user experiments produced per calendar year. The transition period from the MkIV to SFXC correlators is annotated.
Right: Size of the correlator queue at different stages in the processing cycle. The red line shows the number of correlator hours that remain to be correlated. The blue line shows the number of correlator hours in experiments whose data remain to be distributed to the observing teams.

2025 HIGHLIGHTS

Following a series of successful testing, phased-up MeerKAT joined the network monitoring experiments (NMEs) and 2–3 user experiments per session starting in session 1/2025. The user experiments were those that had already been placed in the EVN block schedule which MeerKAT could observe (e.g. low enough declination targets, UT-range compatible with its other obligations). The presence of an extremely sensitive station in South Africa to join Hartebeesthoek at 18 cm significantly improves north–south image resolution as well as overall dynamic range (see figure below). MeerKAT also becomes the first southern-hemisphere EVN station at 21 cm; in the near future, the combination of MeerKAT and GMRT should revolutionise EVN capabilities for more southerly targets at that wavelength.





Left: Image of J0123+3044, the phase-reference calibrator for the 12-hour user experiment EM181A, with Hartebeesthoek but no MeerKAT data.
Right: Image of the same source using the same data, but including four hours of MeerKAT data. The improved north–south resolution is evident from the beam shape, as well as the now clearly resolved jet structure in the NNE direction.

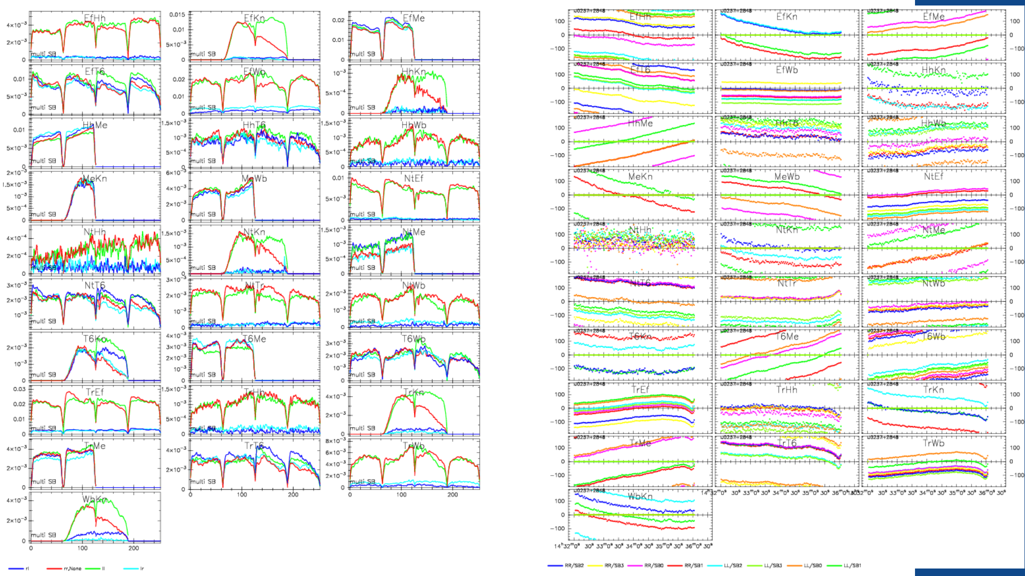
There were four EVN target of opportunity (ToO) observations (one via the e-EVN) and six e-EVN triggered observations (with another triggered observation that was able to be included in a disk session). These eleven observations arose from seven different projects; scientific topics covered included: searching for a persistent radio source associated with the nearest FRB detected to date, a magnetar displaying radio bursts, a soft X-ray transient, a microquasar candidate very close to the Galactic center (within 18'' of Sgr A*, a luminous fast blue optical transient showing rapid brightening in the radio, flaring methanol masers around Cepheus A, and the near-Earth asteroid 2025 FA22.

In order to accommodate triggered-observation overrides within the 24-hr e-EVN sessions, while also avoiding the consequent need to drop/delay the originally scheduled overriden observation, use of a second 24-hr period immediately following the nominal e-EVN “day” was authorised. The new flexibility was exploited six times (for four triggered and two ToO observations) within the ten scheduled e-EVN sessions.

Began operationally creating a Digital Object Identifier (DOI) for the sets of FITS files per observation within the EVN Archive in November, including retroactively for observations already archived.

EVN SUPPORT

Urumqi successfully tested 4 Gbps modes in session 1/2025, and shifted to Mark6 recording in session 2/2025 to enable regular operational use of the higher bit-rate.
Phased-up MeerKAT participated in all 18/21cm NMEs in 2025 along with selected user observations, with consistently good fringes throughout. In the first two sessions, they organised their observing outside of the experiment schedules and JIVE added them a posteriori to correlation-control vex-files. But for session 3/2025, JIVE added MeerKAT to the pySCHED catalogs, and it were directly included directly in the experiment schedules. MeerKAT was added as a requestable antenna within the NorthStar proposal tool for the October 2025 EVN proposal deadline.



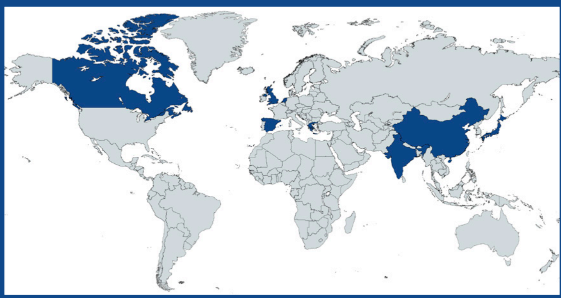
Fringes to MeerKAT in its first regularly-scheduled EVN observation, the 18 cm NME from session 1/2025. Amplitude versus frequency (left panel) and phase versus time (right panel). Note that MeerKAT (Me) uses linear polarisations which had not yet been transformed to a circular basis at the time of these plots, and can observe 64 MHz of the total 128 MHz band.

Tests for single-dish and phased-up GMRT continued, participating in the session 2/2025 18/21cm NME and in a dedicated test observation in session 3/2025. Fringes were detected on the single-dish / tied-array baseline, but not yet from either to other EVN stations. Residuals in the “local” baseline suggest paths forward to investigate in 2026.

The first operational e-shipping of data for VLBA stations occurred in August: 11.4 TB from VLBA_OV in GC040B, e-shipped from Socorro. The achieved transfer throughput in this initial instance was around 300 Mbps, rising to around 800 Mbps in subsequent sessions.

Initial discussions began about testing with the IAR 30m telescope in Argentina (1300–1550 MHz). With a maximum declination of -11 degrees and an hour-angle range of 2 hours either side of its meridian, this will be a niche addition, but baselines from it to eastern VLBAs do provide samples in otherwise empty regions of the u-v plane.

EVN User Support

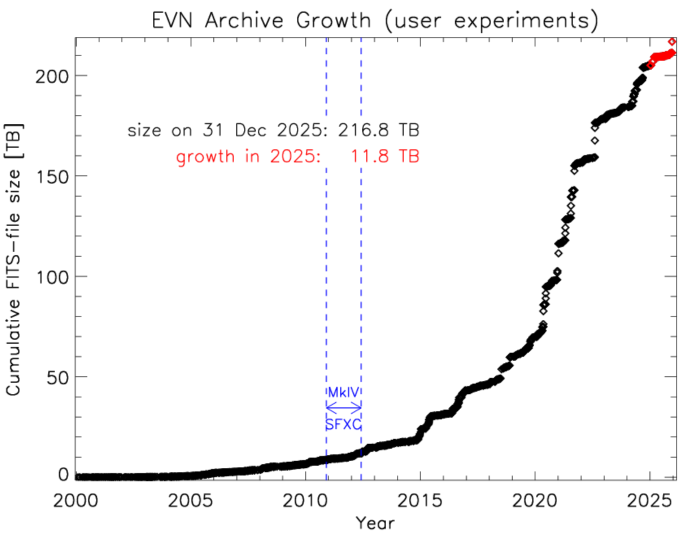


JIVE provides support in all stages of a user's EVN observation, from proposal definition to data analysis, including providing experiment-specific set-up templates when needed to track the evolving configurations of equipment at EVN stations, and making corresponding updates to the pySCHED catalogs. There were 19 first-time PIs in 2025 observations (34% of all PIs); eight of these were students. The former is a new record for new PIs in any given year (by a significant margin — the previous high was 15, in 2015), and the latter ties the record for new student-PIs (previously set in 2024). First-time PIs led four of the seven triggered or ToO projects, and three of those four were students.

Countries represented by the first-time PIs include China (7), the Czech Republic, France, Germany, Italy (3), Latvia, the Netherlands, Poland, South Africa, and Sweden. The first-time users from Germany, South Africa, one from Italy, and three from China were from non-EVN institutes. The observations arising from projects led by first-time PIs accounted for 178 network hours (19% of the total in 2025); and at least two of these projects continue into 2026.

EVN ARCHIVE

The EVN Archive remains the entry point for users to retrieve their correlated EVN data, and provides open access to others following the one-year proprietary period (six months for ToO projects). The total size of user-experiment FITS files in the Archive reached 216.8 TB by the end of 2025, increasing by 6% during the year.



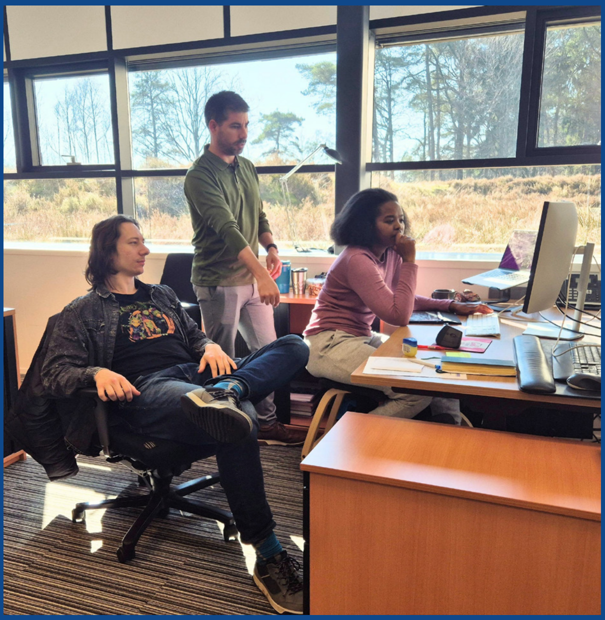
Growth of user experiments in the EVN Archive. The experiments archived in 2025 are plotted in red. Vertical dashed lines show the transition period between the MkIV and SFXC correlators.

GENERAL SUPPORT AND PREPARATIONS FOR THE SKA

Besides supporting the EVN sessions and providing end-to-end help for EVN projects, support scientists worked closely with the R&D group to improve our user support services. As the SKA construction phase started in 2025, preparations for supporting users in the SKA era became a priority. We had a meeting at the SKAO HQ between JIVE and SKAO staff on 20 May 2025 to continue activities in this area in the spirit of our collaboration, going back to the JUMPING JIVE project's work on VLBI with the SKA. One of the new milestones was the demonstration of the readiness of the phased-array MeerKAT telescope for VLBI observations, on which JIVE R&D and support staff have been working for years together with SARAO colleagues. At the SKA Science meeting in Görlitz, Germany (16–20 June 2025) we announced fringes to MeerKAT and the availability of MeerKAT for EVN observations in regular user projects. At the meeting, there were discussions on how to realise SKA-VLBI at low and mid frequencies in special sessions.

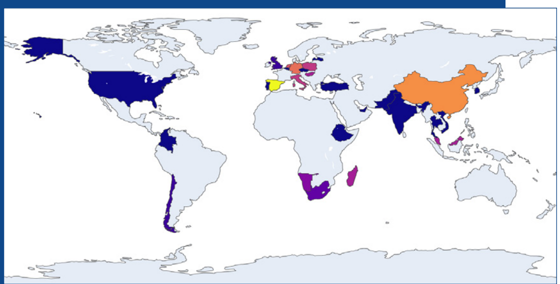
CHANGES IN THE SUPPORT GROUP

In September 2025, we said goodbye to Suma Murthy and Gábor Orosz. Miriam Nyamai and Florian Eppel joined as new support scientists on 1 October. Related to user support, ACME opened an online portal to access user support services from the Joint Centres of Expertise. JIVE will keep in touch with the EVN user community through our regular channels, but we will also answer tickets received from the ACME portal.



Top: At the weekly Support Group meeting with former support scientists Gábor Orosz (in the background, right) and Suma Murthy (in the foreground).
Right: Support scientist Benito Marcote working with new support scientists Miriam Nyamai (right) and Florian Eppel (left). Photos: JIVE

Training and Seminars



Top: The 3rd EVN Users Training Event was organised by JIVE's EVN support team. Photo: JIVE
Bottom: Geographical distribution of participants.

THE THIRD EVN ONLINE USERS' TRAINING

JIVE organised the third edition of the EVN Online Users' Training on 29 April 2025, continuing the tradition of guiding first-time and prospective users through the practical steps of proposing, planning, and scheduling EVN observations. The one-day workshop covered the fundamentals of the network's capabilities and the science enabled by VLBI, providing participants with a solid foundation for their own observing projects.

Ninety-one participants registered from 27 countries across Europe, Asia, Africa, and the Americas, reflecting the genuinely global reach that the training has achieved over its three editions. Of these, 68 attended the live sessions — the highest real-time attendance since the series began in 2022 — a clear sign of growing engagement from the community. As in previous editions, recordings were made available to all registered participants, ensuring that the material remained accessible to those in different time zones or with scheduling conflicts.

The three editions held so far — in 2022 (64 registered participants from 20 countries), 2024 (105 registered participants from 33 countries), and 2025 (91 registered participants from 27 countries) — have collectively introduced hundreds of astronomers from around the world to the EVN, building a broader and more diverse user community for the network. Given the strong level of participation, we will continue to organise these online training events in 2026.

Feedback from participants across all editions has consistently pointed to EVN data reduction as the most requested topic. In direct response to this demand, JIVE organised the JIVE VLBI School in September 2025.

JIVE VLBI SCHOOL

The JIVE VLBI School (JVS) successfully resumed its activities, after a 25-year hiatus, from 15 to 19 September 2025. Organised by JIVE in collaboration with the University of Pretoria and supported by the ACME project, the JVS offered a comprehensive one-week course on the fundamentals of VLBI and EVN data reduction. This edition adopted a hybrid format, with a primary hub at JIVE, an additional hub in Pretoria, locally-arranged hub in Hungary, and a significant number of online participants.

The school attracted a diverse group of participants, primarily early-career astronomers, alongside some experienced researchers. This marked the fourth official JIVE VLBI School, following earlier editions up to 1999, and represented a significant evolution from the previous CASA-VLBI workshops, expanding the programme's scope.

Emphasising practical learning, the school provided hands-on data reduction and VLBI tutorials in small groups led by dedicated tutors. A total of 197 participants from 52 countries registered, including undergraduate and MSc students, postdocs, and senior staff, fostering a truly international atmosphere.

For the first time, attendees witnessed the full VLBI data workflow in real time, including data acquisition during live e-EVN observations. This was complemented by in-person and streamed guided tours of the JIVE correlator and the Hartebeesthoek and Westerbork antennas, followed by data analysis of the collected observations.

Feedback was overwhelmingly positive, with lectures rated 4.5/5 and tutorials rated 4.1/5. Participants particularly valued the small-group format and the active engagement of the tutors. Suggestions for improvement included longer and more concise sessions, along with more in-depth lectures on calibration and flagging. Throughout the week, lightning talks provided fresh perspectives on multi-wavelength research and the current state of VLBI, while the streamed tours of JIVE's correlator and the Hartebeesthoek station enhanced the immersive experience.

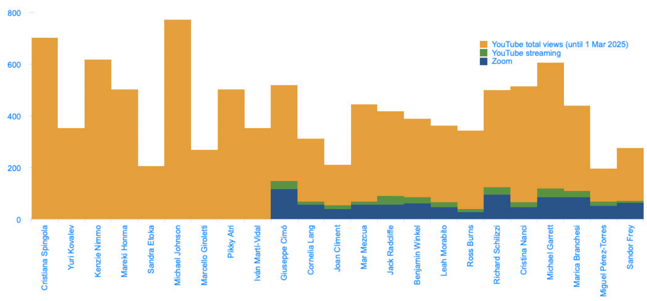
Looking ahead, future editions will continue to broaden their geographic reach and inclusivity by introducing more multi-hub hybrid formats. They will also reduce expertise barriers by incorporating more pipeline-based workflows and strengthen connections between VLBI and multi-wavelength/multi-messenger astrophysics, preparing the next generation of astronomers to tackle future challenges.

EVN SEMINARS: SHOWCASING VLBI SCIENCE

The EVN Seminar series continued to grow in 2025, cementing its role as a key venue for bringing cutting-edge VLBI science to the broader astronomical community. Across four talks spanning the full calendar year, the series demonstrated the remarkable range of topics where VLBI can contribute — from the boundaries of fundamental physics to the most exotic transients and the long-standing quest for signs of intelligence beyond our planet.

The year opened in February with Michael Garrett (Jodrell Bank Centre for Astrophysics, University of Manchester) making the case for interferometers as powerful tools in the search for extraterrestrial intelligence. In May, Marica Branchesi (Gran Sasso Science Institute / INFN / INAF / ASI) traced the remarkable rise of multi-messenger astronomy.She also introduced the ACME project, which is working to broaden access to multi-messenger infrastructures and expertise across Europe. In the second half of the year, Miguel Pérez-Torres (Instituto de Astrofísica de Andalucía, IAA-CSIC) delivered a compelling account of Arp 299, the nearby merging galaxy system that has become one of the richest VLBI laboratories known. Closing the year in December, Sandor Frey (Konkoly Observatory, HUN-REN Research Centre for Astronomy and Earth Sciences) explored the powerful synergy between VLBI and the ESA Gaia mission in advancing AGN astrophysics.

Across the four seminars, participants from across the astronomical community logged in to follow the talks live, with 70–100 attendees joining in real time. The recordings, available on the EVN/JIVE YouTube channel, have collectively accumulated over 8,000 views, with an average of around 400 views per seminar — a clear indication that these presentations continue to find audiences well beyond the live event, serving as a lasting resource for researchers and students alike.



Statistics on the views each seminar has reached to date, where the blue and green bars show the real-time viewers who joined via Zoom and YouTube, respectively. The gold bars represent the total views to date, as people watch the YouTube recordings. Note that real-time statistics were not available for the first seminars

SUMMER STUDENTS 2025

We welcomed two summer students in 2025. Unfortunately, Samaneh Aghelpasand (Iran) was unable to obtain a visa and was supported remotely by Benito Marcote. Seung-Yeon Lee (Kyungpook National University, South Korea) spent the summer at JIVE, working with Suma Murthy on a spectral line VLBI dataset.

Support scientist Suma Murthy working with summer student Seung-Yeon Lee. Photo: JIVE

Technical Operations and R&D

TECHNICAL OPERATIONS

RESEARCH AND DEVELOPMENT

SOFTWARE CORRELATION

USER SOFTWARE

OVERVIEW

No disruptive events took place during 2025; hardware failures, if they occurred, did not result in the loss of data or impacted production correlation, analysis, or archiving workflows.

The EVN Storage pool at JIVE now stands at ~10 PB of nominal storage, divided over twenty-two individual storage units. An analysis of the age of the disk pool showed that more than 40% of the hard-disk drives (HDDs) — four hundred in total — are six years or older, representing a serious risk for increased double-disk failures if not addressed proactively. More details are provided in the Technical Operations section.

The GPU version of the sfxc software correlator ("sfxc-gpu"), after finalising the VLBI-grade delay compensation block, was updated to use ASTRON's Tensor-Core Correlator (TCC) and the performance is nothing less but spectacular and potentially transformative. Work on GPU-accelerated versions of the Multiple-Phase-Center and Coherent De-Dispersion modules was largely completed by December 2025 because of a pending deliverable deadline in February 2026. With RADIOBLOCKS funding, a local GPU server was purchased to enable in-situ FlexBuff-to-GPU-correlator performance tests on actual production hardware. More details on sfxc-gpu developments are provided in the Technical Operations and Software Correlation sections.

Work on a Single-Sign-On infrastructure progressed through Keycloak pilot deployments and LDAP integration testing. As a nice surprise, towards the end of the year, the first successful electronic shipment of NRAO data from Socorro to JIVE was tested because of a flaw in the disk-shipping logic: one VLBA disk pack was missed in the shipment. The current performance is likely not enough to e-transfer a complete "global" VLBA / EVN session, but further tests between JIVE and NRAO network experts are planned.

TECHNICAL OPERATIONS

One double-disk failure happened, but, surprisingly, the data on the RAID storage pool could be completely recovered. Nominally, the RAID setup at JIVE is designed to recover only from single disk failures in a six-disk pool without data loss. Several factors contributed to the unexpected success: the actual disk failures were not fatal to the drives, and the early warning provided by the in-depth monitoring and warning system that has been rolled out over the last few years meant the failing disk(s) could be put into read-only mode before “dying”. A novel method of rebuilding the RAID array was also tested.

With respect to the latter, the FlexBuffs at JIVE have no spare hard-disk slots; they’re entirely filled with production hard-disks. Until now, a disk would have to be physically removed to make place for the replacement. The new method tested connecting the new disk via USB-3, allowing the failing disks to remain online (seated, powered, and spinning) whilst the RAID is being rebuilt. After the rebuild, the failing disk can be physically replaced. The fact that the old disks could be kept online whilst rebuilding no doubt contributed to the success of recovering from this double-disk failure without data loss.

HARDWARE

The PetaBuffs and FlexBuffs that arrived at the end of 2024 were installed in a newly purchased 19-inch rack. The PetaBuff chassis are (significantly) deeper than the regular FlexBuff ones: 120 cm vs 90 cm. Combined with a sudden influx of several PetaBuffs — a fourth, the joint Urümqi/Toruń PetaBuff, arrived in April 2025 — this necessitated a proper mounting solution in the form of using an appropriate 19-inch rack. The PetaBuffs are not only deeper but weigh around 150 kg per unit, with implications for handling in accordance with local health & safety regulations. Rack-mounting and installation of the PetaBuffs was delayed until the new rack was installed. By June, all five (in total) Peta- and FlexBuffs received since November 2024 were operational. This increased the total size of the EVN Storage pool at JIVE to just over 10 PB.

Several second-hand DIMM memory modules and ConnectX-5 network interface cards (NICs) were sourced from sites like eBay and refurbished equipment online stores to unify the FlexBuffs hardware across the units in terms of a minimum amount of RAM (64 GB or more) and network performance. The reason for needing this was that previous testing identified “lack of RAM” (< 64 GB) and the use of Intel-based NICs caused real-time VLBI issues: the FlexBuffs with such configurations were identified as causes of unnecessary packet loss during real-time EVN observations.

The Radioblocks project financed the purchase of a GPU server for local performance testing of the GPU-version of sfxc operating in a FlexBuff environment. In order to support RDMA-based data transfer development and testing, six Mellanox ConnectX4 25 Gbps cards were sourced from eBay and refurbished hardware resellers to replace the non-RDMA capable ethernet cards in some of the FlexBuffs. The GPU server hosts four NVIDIA RTX4000 Pro, Blackwell generation (the newest generation, released in 2025), workstation grade TensorCore-powered GPUs. This specific model was selected based on performance tests run on the RADIOBLOCKS cluster on various different GPUs, and provides a good balance between I/O and compute performance and GPU memory size, and appears to be a budget-friendly fit for the EVN correlator requirements, including an expected future increase in data rate. The machine further features a 64-core AMD EPYC CPU, 512 GB of RAM, two 100 Gbps network interfaces, and two 2 TB NVMe storage (for mirroring). For production EVN correlation this is clearly overkill, but otherwise it would be impossible to meet the 20k€ target budget for this machine. (The underlying implication is that EVN correlation can easily be done on a machine << 20k€, see next section.)

This year, again, not as many Hard-Disk Drives (HDDs) failed as in previous years, most likely because most of the old 8 TB HDDs have now been replaced. The number of drives that were replaced under warranty remains extremely low, indicating an ageing pool and impacting the Technical Operations group’s budget. To address this ageing-ageing-disk issue in the EVN Storage pool at JIVE — four hundred disks (≥50% of the pool) are six years old or more (!) — a proposal was submitted to the EVN CBD in November. The proposal discussed options and their respective financial impact for the EVN Members for repair and for initiating preventive maintenance to avoid ending up in a similar situation in the near future: the next large cohort of hard disks will reach the same age in two years’ time. The CBD selected the Technical Operations group’s recommended option for implementation in 2026.

The new server rack includes four BetaBuffs, one FlexBuff, and a GPU server above them.

Two of the four GPUs.

1

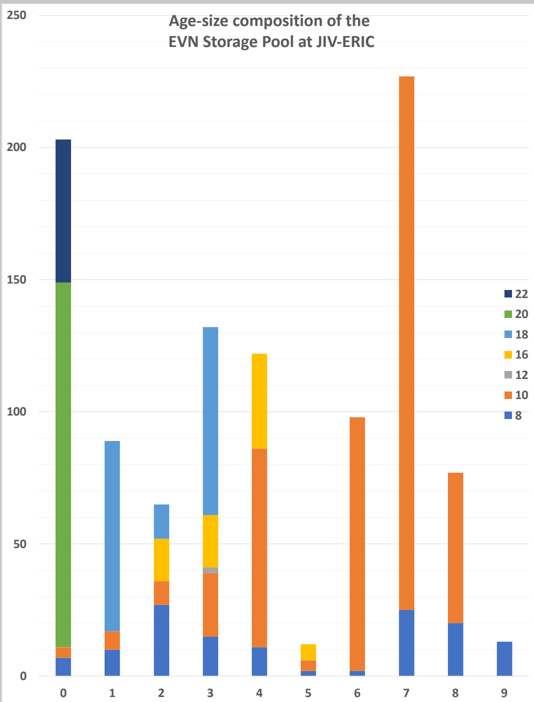
Replaced HDDs	Warranty		
Year	no	yes	Total
2025	13	1	14
2024	12	1	13
2023	30	2	32
2022	29	2	31

HDD replacement under warranty over time.

Regarding the EVN Storage pool HDD age issue, see the figure in Box 2. A document with the analysis and proposed solutions and rough cost estimates was presented to the EVN CBD in November 2025. The decision was made to continue with HDD-based storage units for the near future, requiring a significant investment of ~100 k€. Following that decision a plan for rolling out this preventive maintenance will be initiated in 2026. After an initial “repair” phase — replacing the four hundred oldest disks as soon as possible — a maintenance scheme will be deployed where HDDs older than five years, the typical warranty period of a HDD, will be proactively replaced. This scheme is funded by annual contributions from EVN members, with the goal of avoiding a situation similar to the current one, in which more than two hundred HDDs are older than seven years (!).

JIVE’s host institute, ASTRON, made several modifications to the cooling system design, which has resulted in a much more stable cooling-water supply temperature than before. At the same time, JIVE has chosen to move the trigger points for generating temperature alarms to a more appropriate part of the FlexBuffs, monitoring each FlexBuff’s operating temperature. The motivation behind this is that hard-disks are the components that suffer most from long-duration overheating. The new temperature measurements, combined with some BIOS configuration changes, resulted in a reduction of the operating temperatures of the FlexBuffs, thereby hopefully improving the lifetime of the hard disks.

2



Age–size distribution of the EVN Storage Pool HDDs: the x-axis shows HDD operational time in years, the y-axis shows the number of HDDs of this age, and the colour indicates the size of the disks in TB.

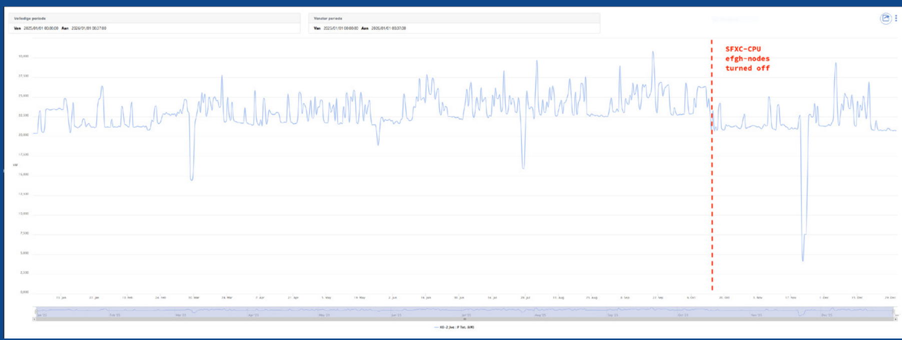
Power consumption monitoring and finding possible reductions remain a topic of active research. After the first sfxc correlator workshop, held in September, the then-oldest tranche of the sfxc CPU cluster (the e-, f-, g-, and h nodes, used for workshop participants to correlate on) were switched off in early October. The impact on the instantaneous power consumption is clearly visible in the graph in Box 3.

The table in Box 4 summarises the monthly power consumption, which does not reflect this as much: the power consumption baseline remains high. It should be noted that whilst the sfxc CPU nodes were switched off, four PetaBuffs and a FlexBuff were added to the EVN Storage pool. Taking that into account, not increasing the total power consumption is a good result.

The graph in Box 5 illustrates the total power consumption of the EVN data processor (storage and compute cluster), network equipment, and JIVE services over the last six years. Whilst a more significant reduction would be desirable, the drop since 2023 at least remains stable despite a changing total hardware setup.

If the total power consumption over time is compared to the growth of the EVN Storage pool over the same period, it is evident that implemented power consumption reduction measures have compensated for this increase so far. Note: the Total EVN Storage pool size lists the gross sum of all hard-disk sizes. Because of the RAID setup, the net EVN Storage pool size ends up being lower, at ~10 PB.

3



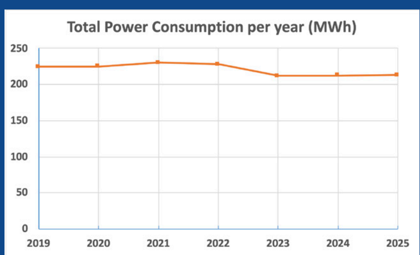
EVN correlator power usage at JIVE under varying (production) workloads.

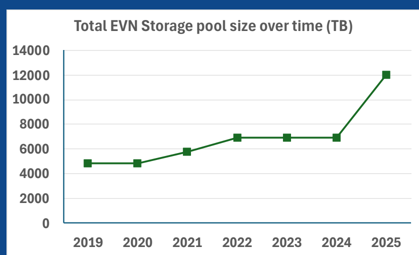
4

2025	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
MWh	17,72	15,68	18,06	17,38	18,03	18,17	18,68	18,87	19,03	18,11	15,68	17,70	213,11

Monthly and total power consumption, in megawatt-hours, of the EVN Correlator system as billed to JIVE.

5





JIVE “correlator” power consumption per year since 2019 (left) compared to the growth of the EVN Storage pool at JIVE over the same period (right).

SOFTWARE

The monitoring system was extensively "upgraded". This was done by adding new classes of monitoring data points such as power-supply units, the database processes (in addition to the database server hardware), the FlexBuff operating temperatures, and several web services that JIVE offers. It was found that knowing if a machine was up-and-running (as is already in the monitoring system) was insufficient to tell if an expected service or process was actually running and reachable at the expected location for clients.

A Nextcloud-based self-hosted collaborative cloud environment was set up, initially to evaluate the current state of open-source implementations of such platforms as a potential digitally sovereign replacement of US-based Big Tech platforms. Since its implementation, the environment was already used to collaboratively work on shared documents with researchers and partners outside JIVE in a production-like environment. No formal evaluation mechanism or trial-period is planned, but if deemed useful the very quickly set-up environment may need to be revised and become an officially supported service offered by JIVE.

An important development, cross-cutting several applications, including e.g. a future officially supported Nextcloud instance, is a Single-Sign-On (SSO) environment. Further steps towards deploying and setting up such an environment for JIVE, EVN member staff, and the EVN users to centrally manage access to digital services that JIVE offers have been made. Other example services that would benefit are Mattermost, feedback, and the (planned) POLARIS proposal submission tools, and widening support for eduGAIN-based Identity Providers. So far it appears that not all our tools are out-of-the-box compatible with such an SSO environment and mitigation strategies — which usually imply "extra work" — are being investigated for technical feasibility and impact on maintenance/support.

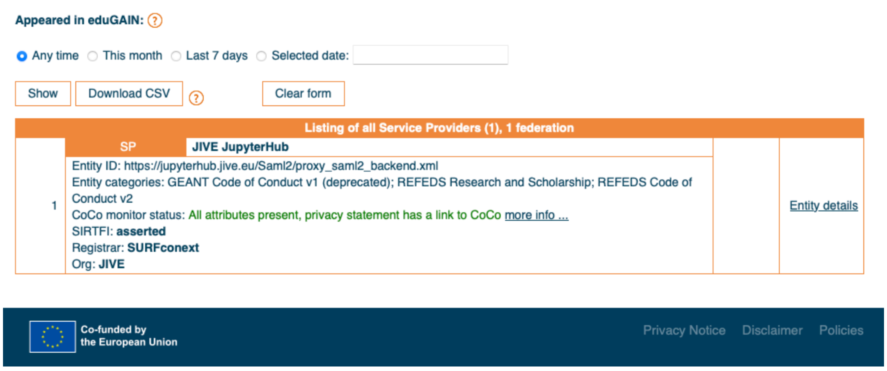
For the SWEEPS commensal project a test cluster environment was built, with the aim that the JIVE Technical Ops and SWEEPS teams can respectively gain experience with setting up a priority-separated SLURM-based batch-queued operating environment and adapt to running sfxc correlation jobs in such an environment. Related to this the JIVE correlator control software is being adapted to this environment to support both disk-based and real-time correlation observing modes. External access for the SWEEPS team members is in preparation; enabling this remote access is expected in early 2026, following addressing security implications associated with this.

RESEARCH AND DEVELOPMENT

Technical Operations/R&D staff participated in several EC-funded projects and contributed to several deliverables and milestones.

ACME

In order to support accessibility for the multi-messenger community brought together by this project, the JupyterHub service at JIVE — developed in the ESCAPE project — was federated with eduGAIN, a global federation of Identity Providers (IdPs) and Service Providers (SPs). This means that any user from an institute that is also federated with eduGAIN can use their own account and credentials to log in to JIVE's JupyterHub for notebook-based CASA data reduction on hardware (physically) close to the EVN Archive. A login workflow was added to screen and authorise new accounts before granting direct access to the resources, thereby helping to prevent abuse of the server.



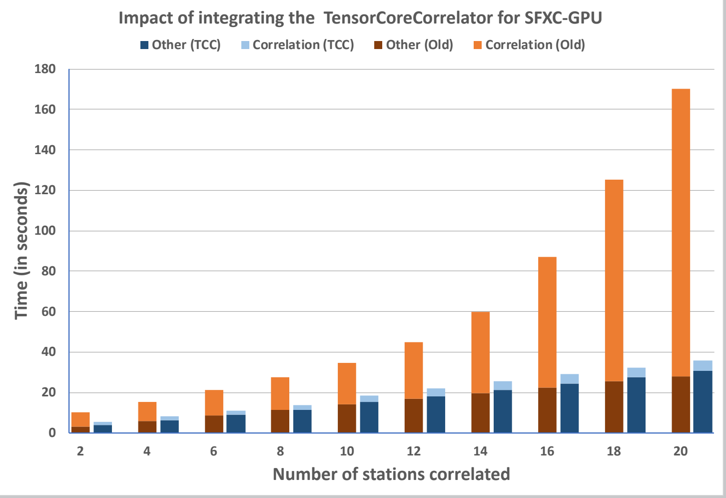
JIVE's JupyterHub Service Provider entry in the global eduGAIN table of service providers.

RADIOBLOCKS

The ASTRON TensorCoreCorrelator (TCC) was integrated into the VLBI-grade delay compensation and filter block and the result is nothing short of spectacular. Performance analysis has shown that, effectively, for up to at least thirty-two inputs ("stations" for VLBI) the time-to-correlate stays flat, i.e. constant, or independent of the number of stations correlated, compared to the usual quadratic scaling of the correlation time with the number of stations.

The figure in Box 6 illustrates this exceptionally well: with the old correlator implementation, the compute scales quadratically, but after integrating the TCC the correlation time is negligible compared to the per-station delay compensation and filtering, resulting in only a linear growth of the total time-to-compute with the number-of-stations to correlate.

6



Impact of integrating the TensorCoreCorrelator into the GPU version of SFXC on time-to-compute (in seconds; lower is better) as a function of number of input stations. The compute is split into "correlation" and "other" processing, to highlight time spent in correlation.

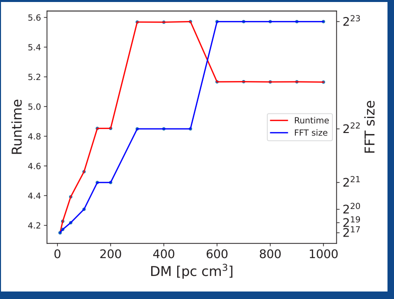
This leads us to believe that, in principle, for VLBI, "correlation is a solved problem", once the total data rate can be shared over several GPUs in parallel; it would be unrealistic to assume that a single GPU would be able to handle all the correlation load.

However, given the timeline for deliverable D4.5, "Beamforming and Coherent Dedispersion Modules" (scheduled for February 2026), most effort went into finalising efficient GPU-accelerated multiple phase-center correlation (MPC) and coherent de-dispersion modules. The authors concluded "that we can retain the significant gains described in deliverable D4.4 for these metrics." (see Radioblocks D4.4 "Basic correlator on TensorCore architecture", https://zenodo.org/records/15269985).

The initial approach for MPC proved to be too limiting in the number of phase centers and was not ultimately efficient either. That line of development was abandoned and a new approach — applying the MPC rotations and integrations in time and frequency at a different phase in the correlator — was pursued, resulting in a, for all practical purposes, "unlimited" number of phase centers computed at reasonable cost.

Supporting coherent de-dispersion comes at a computational penalty of at least ×4 compared to regular correlation (see the figure in Box 7). This ratio is also true for CPU-based coherent de-dispersion computation, implying that gains from moving to GPU-based signal processing translate 1:1 to this application.

7

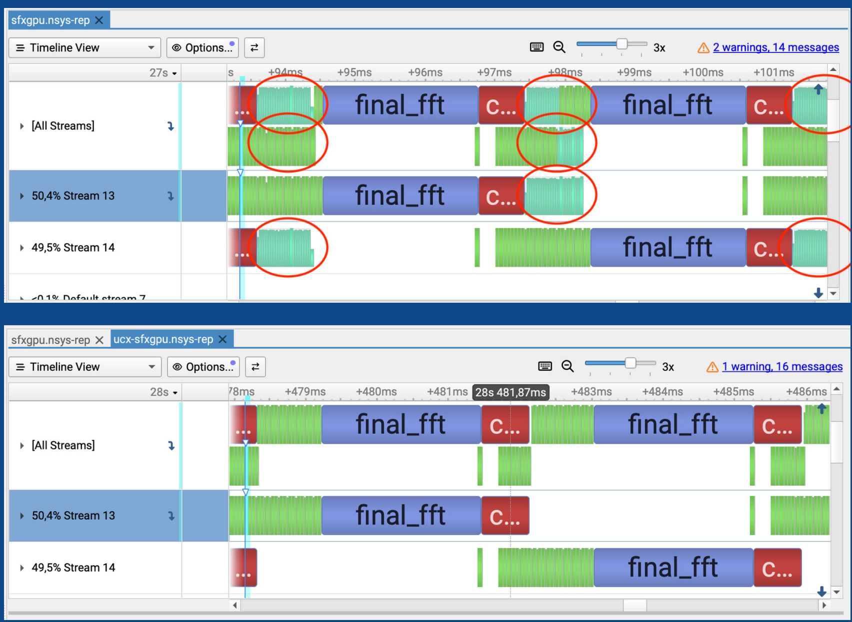


Runtime "penalty" for coherent de-dispersion (as a ratio compared to regular correlation) as a function of Pulsar- or FRB Dispersion Measure (DM).

The Radioblocks funded GPU-server (4× NVIDIA RTX4000 PRO, Blackwell generation (=latest, late 2025)) was used for those performance tests after it was integrated into the local JIVE storage and compute cluster network.

The FlexBuffs that were upgraded with ConnectX-4 Remote Direct Memory Access (RDMA)- capable network cards were used to test a simpler method compared to using the Data Plane Development Kit (DPDK) to write data over the network into GPU-memory directly. Whilst DPDK is performant (it was used to demonstrate 1.2 Tbps (!) written from one system over the network into another system's GPU memory), it is far too difficult to configure and set up.

JIVE staff started a network-based data transfer mechanism built on top of the Unified Communication X ("UCX", https://openucx.org) library, which itself is built around the technique of ib_verbs, an InfiniBand interface library. It was demonstrated that using UCX a 25 Gbps RDMA link from a FlexBuff into the new GPU server could be saturated, writing into the destination GPU's memory directly at that speed. The figure below illustrates the impact of UCX on the GPU workload: the GPU does not correlate or process faster, but the highlighted pieces of work carried out by the GPU are not present using UCX because that work now happens "behind the GPUs back". Effectively, this results in less processing power required by the GPU, leading to both an energy saving as well as potentially leaving more room for extra or other GPU processing.



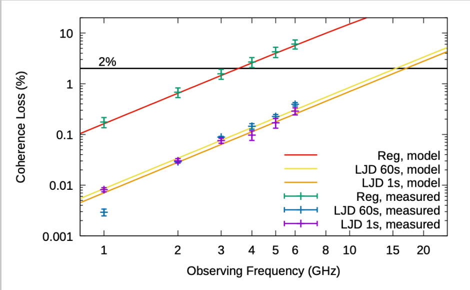
8

The impact of UCX-based RDMA: workloads related to data transfer are removed from the GPU (highlighted in top figure), resulting in an energy saving as well as freeing up GPU computational resources (bottom figure).

In the Data Processing Toolkit workp package of Radioblocks, JIVE staff implemented FFT- and global stages for fringefit in the MeasurementSet v4 (MSv4) and a Python Dask-based scalable radio astronomical data processing framework (RADPS). In order to test the algorithm, a minimally usable calibration framework — including definition and deployment of calibration tables — needs to be available; JIVE staff contributed fundamental work to this by proposing a calibration table schema and implementing calibration application using large Nx2x2 Jones tensors.

Simulated low-frequency dispersed data was passed through an experimental multi-dimensional FFT method as well as experimental application on LOFAR data, resulting in successful fringefitting on well-behaved superterp baselines but presenting challenges when applied to more complex data.

9



Coherence loss when an interferometer clock is distributed over a White Rabbit link versus observing frequency; lines show the model, crosses (1σ) are SDR testbed measurements for standard and low-jitter WRS3-18 switches.

WHITE RABBIT

A JIVE staff member working on their PhD has submitted, under gold open access, the "White Rabbit in Radio Interferometry" paper, which was accepted for publication on January 3 2026, DOI: 10.1007/s10686-025-10038-4. The paper discusses a closed-form analysis of the White Rabbit jitter noise on the signal degradation resulting from coherence loss.

The figure in Box 9 illustrates the modelled and measured one-sigma errors/loss of coherence as a function of observing frequency if one of the elements of the baseline is synchronised via a White Rabbit link and shows that a coherence loss of well below 2% is measured up to 6 GHz observing frequency, and that, if the model and measurement correlation indeed extends beyond that, even up to 15 GHz.

SOFTWARE CORRELATION

4-bit per sample correlation was implemented to support the ongoing upgrade of the e-Merlin RFSoC-based digital front-ends. JIVE staff supported installing and configuring an sfxc installation on a cluster at Jodrell Bank. Initial testing shows that with the cluster, a software-based real-time correlator is just about possible for the intended 512 MHz bandwidth. An upgrade path towards GPU-based operation is becoming more realistic following the developments in this area (see Research and Development section).

Owing to the first two-day SFXC Correlator workshop, organised at ASTRON/JIVE's facilities in Dwingeloo, a lot of documentation was written regarding installation and configuration, and base use cases. External tutors, running sfxc for their specific science cases, lectured on how they incorporate sfxc into their pipeline leading to, in this case, exciting FRB results (e.g. localisation). The marked-for-decommissioning oldest sfxc CPU cluster nodes were temporarily changed into a cluster environment for the participants. After the workshop the nodes were shut down and physically removed from the racks.

Omar Ould-Bakkattine (UvA/ASTRON) giving a talk on "SFXC and duct-type: a single dish FRB workflow" at the first SFXC Correlator workshop at JIVE.

The investment in the first SFXC Correlator workshop has hugely improved ease of use of sfxc for external users, for example by also making the relevant scripts and tools around sfxc pip-installable. Improvements include, but are not limited to, a script that augments SCHED VEX files with required correlation sections, simplified correlator job creation, a Singularity recipe to build a containerised SFXC version, and an updated weightplot utility that allows for easier assessment of correlation success. The last remaining Python2-based scripts were ported to Python3, removing that barrier too. All documents, lectures, and tutorials are kept online at this website for future reference: https://jive-vlbi.github.io/sfxc_workshop_2025/.

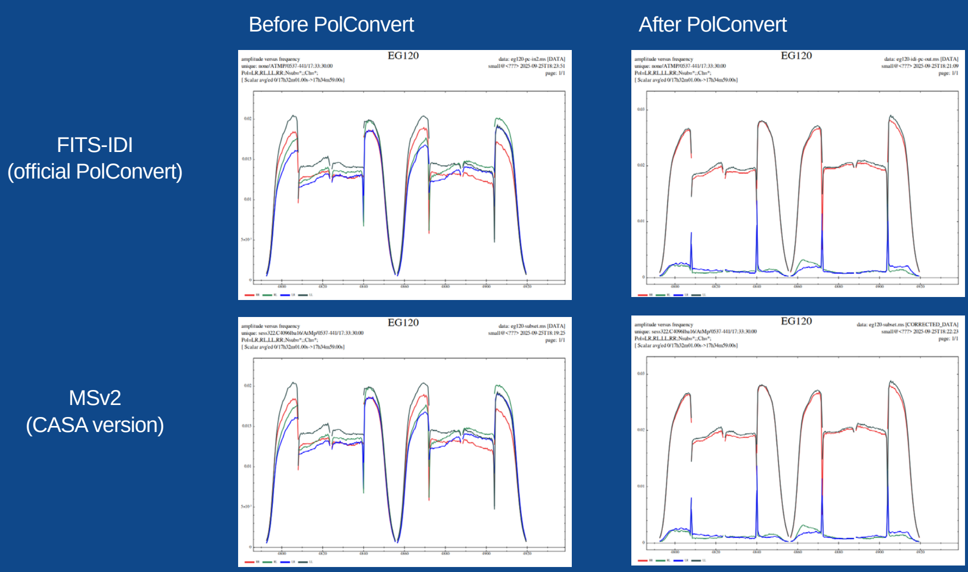
Based on positive feedback, JIVE's intent is to organise another instance in 2027, albeit somewhat longer — participants were unanimous in the conclusion that two days is really too short given the complexity of the course material.

USER SOFTWARE

CASA

PolConvert, a tool developed by Ivan Martí-Vidal (Universitat de València) as a standalone tool operating on MeasurementSet v2, was put up for scientific validation, which has not concluded yet. Results on test cases available to the developer indicate results similar to the official PolConvert (see the figure in Box 10).

10



Other CASA improvements involved bugfixes (such as channel selection when combining spectral windows in `fringefit`), the addition of the `appendantab` task for ingesting ANTAB files, experimental support for Beam Waveguide antennas, and fixing the concatenation of Tsys data for disparate spectral setups.

In `importfitsidi` field positions are now more correctly labeled having ICRS as reference frame instead of J2000 (a realisation thereof), after verifying that this would not impact known VLBI arrays. A bug was reported (and fixed) where multiple FITS-IDI chunks with distinctly named fields with common phase centres were imported (i.e. concatenated into a single MSv2): the concatenation logic now distinguishes them.

POLARIS

JIVE staff started to investigate the POLARIS proposal-submission-toolkit for intended replacement of the past-its-due-date Northstar instance. The toolkit allows observatories to build their own proposal submission tool (PST) using the building blocks from the toolkit — i.e. supporting the functionality of Northstar is not built in by default but has to be added by an observatory that requires this. Assessment of the toolkit showed that it has good potential and that changes can be made. A security issue was reported to the POLARIS developers and was fixed. Through the deployment of a test instance and investigating it in depth we now have a better understanding of how much time implementing changes would realistically take.

The most impactful difference between POLARIS and Northstar is that in a current POLARIS proposal the Principal Investigator does not request resources (telescopes, observing time), but merely science requirements as “angular resolution”, “dynamic range”, and “sensitivity”. It is clear that implementing those Northstar features will be undesirable and too much effort, but also it is clear that some solution needs to be found to make POLARIS proposal authors provide sufficient information in their proposals such that Time Allocation Committees/Groups can perform their role efficiently. Together with the Operations and Support groups discussions on what those required features are and how to prioritise them were started.

Tools built on POLARIS rely on user management happening in a Keycloak instance (an instance of a popular implementation of an Identity and Access Management system (IAM)) — very much used for Single Sign-On services (SSO). With SSO the user logs in with a single account, preferably their institutional account, e.g. federated with eduGAIN, to access multiple services. Within JIVE an ongoing effort to support SSO for various services is very much aligned with this, so work started to integrate POLARIS user/group management in JIVE's test Keycloak deployment.

SCHED/pySCHED

NRAO (finally) decided to move the SCHED codebase to the Git version control system. Because pySCHED had moved to this since its inception in 2019, merging the svn-based commits from the official SCHED distribution into our Github version (https://github.com/jive-vlbi/sched) this caused *a lot* of headache. The root cause is that we want to base our pySCHED edits onto the new NRAO-SCHED Git version, but all commits that are in the NRAO-SCHED Git already are in the pySCHED tree. Version control systems take a very dim view of this and rarely handle this gracefully. Through a coordinated effort and discussions with several Git experts this could be resolved after a substantial investment of effort.

The upshot is that it is now *far* more easy to follow NRAO-SCHED updates, so the investment will pay off over time, as changes from the official SCHED distribution need to be included.

DOIs

Since 3 November 2025, ***all datasets*** in the EVN Archive have been assigned an official DOI that can be used in publications (or other communications) to refer to ***any specific data set*** in the EVN Archive or, when using the “project DOI”, refer to all data from a ***specific experiment***. This should enhance traceability and citability of EVN Archive data significantly. The procedure was applied on existing EVN Archive entries but will operate equally on every new experiment or data set added to the EVN Archive.

PapersDB

The automatic collection of candidate publications that may use or refer to EVN Archive data was redesigned, and a cron-job now runs regularly to find new candidates for (manual) classification in the PapersDB. The hope is that in the future the heuristics-based approach can be mitigated by tracing DOIs as users start to cite EVN Archive data using their DOI(s).

VIRTUAL OBSERVATORY (VO) AND STANDARDS

JIVE staff remained active and visible as International Virtual Observatory Alliance (IVOA) Radio special Interest Group chair, and were involved in finalising the ObsCore-radio note, and started to collaborate with the High-Energy Physics (HEP) domain partners to work on an ObsCore-HEP note. Within the ACME project, JIVE staff is co-leading a workgroup to inventorise and improve Virtual Access (VA) methods and tools, with a goal towards harmonisation of standards.

NEXTCLOUD

In an effort to investigate how to improve Digital Sovereignty in the face of a changing geo-political environment, JIVE staff installed a Nextcloud (https://nextcloud.com) instance for testing the capabilities of this open-source, possible to self-host, cross-platform, built on open standards collaborative cloud environment. By self-hosting, or hosting on a European cloud-provider, JIVE, being a European legal entity, gains complete control over where the (sensitive, private) data is hosted and who has access. The JIVE Nextcloud instance will be coupled to JIVE’s Keycloak SSO instance, providing a pathway into easing access to the platform.

If the test installation turns out to be useful (some use cases have already demonstrated that they work well), the service can be re-organised to a properly installed, configured, and integrated into JIVE’s service portfolio.

Space and Planetary Science

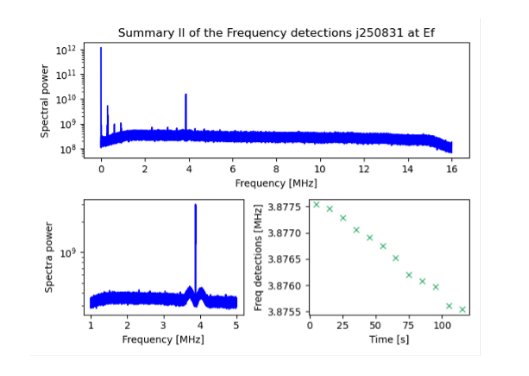
EXPANDING THE VLBI COMMUNITY THROUGH SPACE APPLICATIONS

In 2025, the Space Science and Innovative Applications department continued its effort to engage with groups outside the traditional radio astronomy user base to advocate for VLBI. The institute participated in the "Supporting Ukraine’s post-war recovery through Astronomy" initiative to help Ukrainian scientists join the European VLBI Network (EVN).

ADVANCING SPACECRAFT OBSERVATIONS AND PRIDE

The JIVE-led Planetary Radio Interferometry and Doppler Experiment (PRIDE) successfully applied for new funding and completed several observations. Although the news was officially released in January 2026, the main work to secure a €237,000 PI Support grant from the Netherlands Space Agency was mainly carried out in 2025.

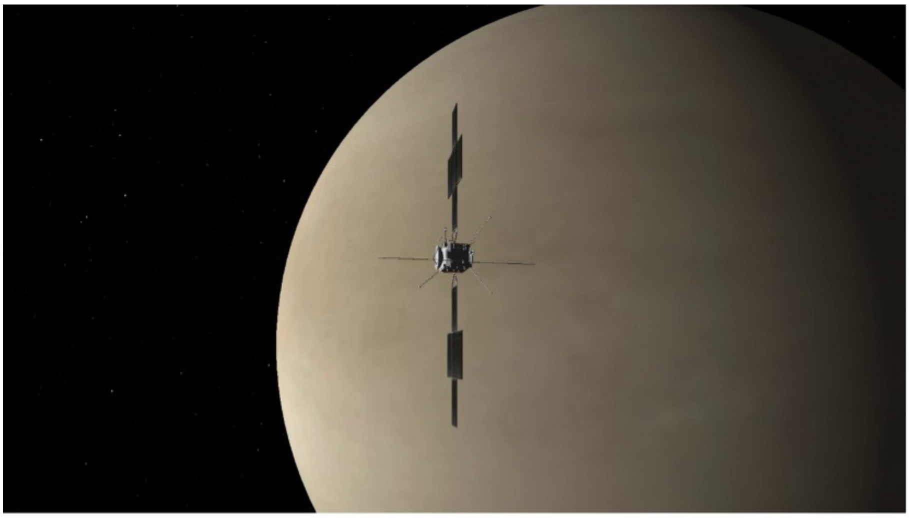
On August 31, 2025, the ESA JUICE spacecraft executed a gravity assist manoeuvre around Venus. This event provided a critical opportunity for the PRIDE team to conduct VLBI observations in preparation for the mission’s science phase in the Jupiter system. The primary scientific objective was the refinement of the Venus planetary ephemerides and the validation of the PRIDE techniques for the future characterisation of the Jovian moons.



Initial detection of JUICE frequency by Effelsberg.
Image: PRIDE team

The European VLBI Network tracked the spacecraft carrier signal. The participating stations included Effelsberg (Germany), Hartebeesthoek (South Africa), Irbene (Latvia), Onsala (Swe den), Tianma (China), Torun (Poland), and Yebes (Spain). The analysis confirms the successful detection of the carrier signal with high accuracy. The plot shows the frequency detection at the Effelsberg radio telescope. The combination of the VLBI lateral positions with the radial velocity derived from Doppler data will help improve the determination of the spacecraft state vector and the ephemerides of Venus.

JIVE hosted a PRIDE meeting in Delft in June to coordinate this research. PRIDE can also track objects closer to Earth. JIVE staff met with industry partners to discuss using PRIDE to track Near-Earth Objects, GNSS, lunar missions, and space debris.



Artistic representation of JUICE approaching Venus. Image: ESA

FORGING THE FUTURE OF SPACE VLBI AND LUNAR EXPLORATION

Placing radio telescopes in orbit allows researchers to observe at different frequencies and resolutions. In 2025, JIVE contributed to planning for future orbital missions. JIVE staff co-authored the white paper for NovaMoon, an ESA technology mission intended to build a navigation and geodesy system on and around the Moon. The proposal includes PRIDE as a ground-based scientific payload.

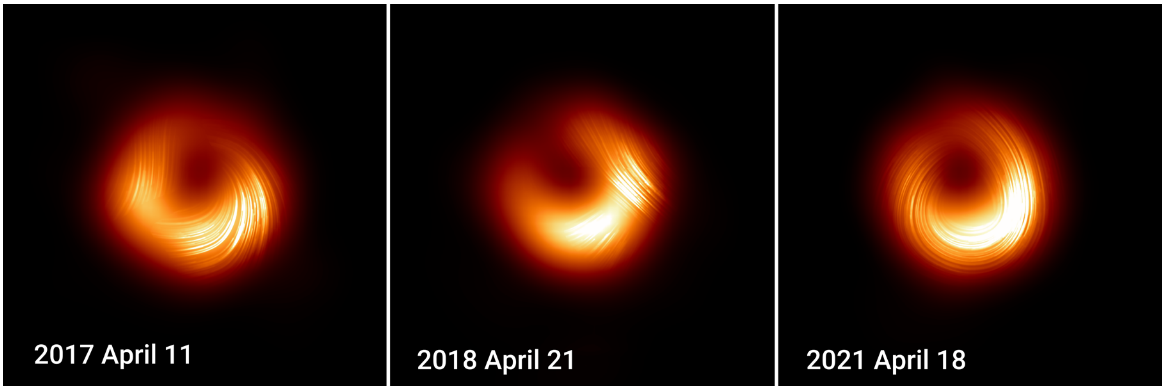
JIVE also supported preparatory studies for other ESA missions, including low-frequency F-class proposals for solar physics and high-frequency M-class missions to study black holes. Unfortunately, the proposals did not pass the first selection at ESA, though they have been a starting point for continuing a more technical collaboration to develop space VLBI technology.

Event Horizon Telescope

The Event Horizon Telescope (EHT) Collaboration deploys a global VLBI network operating at (sub)millimetre wavelengths to zoom in on supermassive black holes. Such observations have revealed ring-like images from gravitational lensing of the plasma in the vicinity of the black holes' extreme gravity. The collaboration has started to focus on the temporal evolution of these phenomena, trying to understand the minute scale dynamics in SgrA*.

In the other source, M87, variations are three orders of magnitude slower. The first constraints on the variability in the image comes from the polarimetric images from three different observing campaigns. The figure shows how the source varied in flux distribution and polarisation between 2017, 2018, and 2021 (EHT Collaboration, 2025 A&A 704 A91). Preparations started to organise a VLBI observing campaign that will sample the M87 variations on the timescale of several days.

JIVE co-authors include Mark Kettenis, Des Small, Junghwan Oh, and Huib van Langevelde. In 2025 Huib van Langevelde ended his term as EHT Project Director after a five-year period.



New images from the Event Horizon Telescope (EHT) collaboration have revealed a dynamic environment with changing polarisation patterns in the magnetic fields of the supermassive black hole M87*. As shown in the images above, while M87*'s magnetic fields appeared to spiral in one direction in 2017, they settled in 2018 and reversed direction in 2021. The cumulative effects of this polarisation change over time suggest that M87* and its surrounding environment are constantly evolving. Image: EHT Collaboration

Committee on Radio Astronomy Frequencies

Committee on Radio Astronomy Frequencies (CRAF) continued its work on both technical and regulatory aspects of the protection of radio astronomy operations at regional and international levels. CRAF members participated in many international (ITU-R), European (CEPT/ECC), as well as national spectrum management meetings, contributing compatibility studies and contributions to regulatory texts to national delegations and various working groups of CEPT/ECC and ITU-R. Topics that CRAF members focused on include the upper 6 GHz band used by mobile and wireless networks, terrestrial mobile networks in general, short-range devices such as car radars using high-frequency bands, wireless power transfer facilities radiating at low frequencies, radio astronomy on the Moon, and — perhaps most critically — radio communication services employing very large satellite constellations.

Some of the recent and upcoming publications with major CRAF contributions are ECC Report 363 on aggregated satellite constellation interference, ECC Report 364 on WiFi in the upper 6 GHz band, and ITU-R reports on mobile phone 5G networks at 43 GHz and 2nd-harmonics interference in radio astronomy bands. Compatibility studies, for which CRAF collaborated with international partners SKAO and IUCAF, were submitted to ITU-R to progress work on radio astronomy protection from mobile phone networks at 5 and 15 GHz (WRC-27 agenda item 1.7) and from satellite-based direct-to-device mobile phone services (WRC-27 agenda item 1.13). Studies on several other satellite-related WRC-27 agenda items were prepared toward the end of 2025 for presentation at international meetings in early 2026. Finally, the work on limiting the impact of unintended electromagnetic radiation from satellite constellations progressed in a new direction, as CRAF formally became involved in the international standardisation organisations CISPR and ISO.

Group photo from the in-person CRAF Meeting 2025 in Grenoble, France, in front of the dishes of the Northern Extended Millimeter Array (NOEMA). Photo: Mike Peel

In July 2025, Dr. Mislav Baloković joined CRAF to further support its spectrum management efforts in preparation for the World Radiocommunication Conference 2027. With this addition, JIVE now hosts an expanded team of two CRAF spectrum managers.

Communications and Outreach

In 2025, JIVE's communication activities continued to focus on two pillars: reinforcing its leading role in building partnerships and communities, and strengthening the visibility of its multidimensional activities in science, user support, technological innovation, and space science.

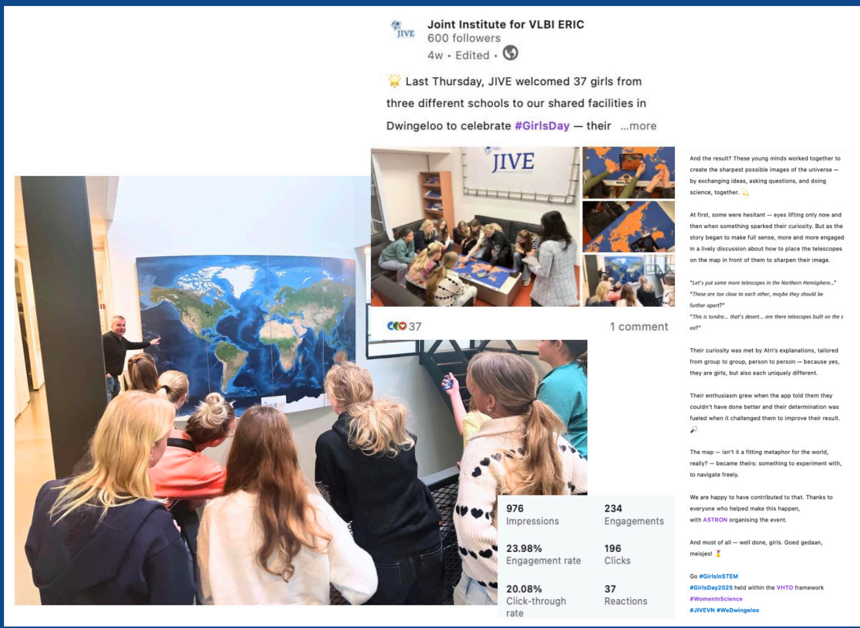
Curated content for JIVE's website and social media platforms (LinkedIn, Facebook, and X/Twitter) played a key role in achieving these objectives. The consistent use of thematic hashtags across communication channels contributed to making JIVE's diverse fields of activity more recognisable and easier for audiences to navigate. The Communications Officer also provided input on communication matters to the management team, enhancing visibility efforts.

The EVN/JIVE newsletter, published online three times per year and edited by JIVE, was redesigned as planned, with the first renewed edition released in May 2025 (issue 71). The objective of creating a publication that better reflects the excellence of EVN science and the breadth of its activities, while offering a clearer, more engaging, and easily shareable format, was achieved. The updated newsletter introduced two new sections, enhancing the visibility of EVN science and scientists and improving the flow of information between the EVN community and its stations: a Q&A feature and a section highlighting news from the EVN stations. A new "Portraits" section, presenting members of the JIVE/EVN community, particularly newcomers, was planned for future editions.

Special emphasis was placed on reporting major community events organised or contributed to by JIVE staff. Three events were especially prominent: the JIVE VLBI School at JIVE and the University of Pretoria, the SFXC workshop at JIVE, and the European Astronomical Society (EAS) Annual Meeting in Cork, where JIVE participated as an EAS Organisational Sponsor for the first time. Communications surrounding these events highlighted JIVE's contribution to knowledge sharing, community-building, and the scientific exchange fostered through these events. The focus on the EVN seminar series also continued throughout the year, with seminars promoted in advance through JIVE's social media channels and their outcomes reported in the newsletter.

A major communication effort supported the dissemination of the results of the joint MeerKAT–EVN observations. The Communications Officer contributed substantially to the preparation of JIVE's press release and created a comprehensive press kit, which was shared with EVN partners, SARAO, the SKAO communications team, and journalists. These coordinated efforts helped maximise the visibility of this important scientific milestone. An in-depth article on the year-long collaboration between JIVE and SARAO that led to this success was prepared for the newly created "From the Station" section of the next issue of the newsletter.

Teaser image for the first issue of the updated EVN/JIVE Newsletter.



During Girls' Day 2025, 37 high school students visited Dwingeloo and took part in an interferometry experiment at JIVE's offices.

JIVE also continued its public engagement activities. The Communications Officer contributed to Girls' Day 2025, organised by ASTRON at its headquarters in Dwingeloo, demonstrating how VLBI works and emphasising the wide range of disciplines involved in the EVN and in astronomy more broadly. The educational app used during the event was planned to be customised for use at the EAS Annual Meeting in Lausanne in 2026. An outreach package for schools is also under development in collaboration between the Communications Officer and other JIVE staff members.

PROJECTS

JIVE continued to support the communication and dissemination activities of the European projects to which it contributes.

For Radioblocks, the project website was completed and a roll-up banner was produced. Informational leaflets presenting the project's objectives and results were in preparation and were expected to be released shortly. Short interviews were conducted with the project's Work Package leaders, which will be used to produce a video explaining the project, its objectives, and its achievements.

The redesigned EVN/JIVE newsletter also expanded its coverage of Radioblocks, providing more in-depth reporting on the project's progress. Within the ERIC Forum project, the Communications Officer supported the dissemination of project news. She also participated in its communications training sessions in Vienna. In addition, she is scheduled to give a talk in the online Skills Café series organised for 2026, further strengthening JIVE's engagement and visibility within the European research infrastructure communications community.

For ACME, communication activities focused on ensuring that the project's activities were regularly featured in the EVN/JIVE Newsletter, and that JIVE's contributions to ACME were represented in the project's dissemination activities.

European Commission Projects

HORIZON EUROPE ERIC FORUM 2

The ERIC Forum project aims to strengthen the coordination within the European Research Infrastructure Consortium (ERIC) community and enhance collaboration between partners. The strategic approach of the ERIC Forum contributes to addressing critical challenges, developing best practices and framing the necessary knowledge to support ERICs in various aspects. Moreover, this will contribute to building the brand identity of ERICs as an important body and stakeholder in consultation of related policy action.

Participating in the ERIC Forum has allowed JIVE to explore a network of infrastructures that share common challenges, such as long-term sustainability, reporting, VAT exemption practices, and training of governance representatives.

JIVE had a prominent role in the project, with Paco Colomer (JIVE director at the time) serving as Chair of the Forum. From 12 to 13 November, the ERIC Forum held its Annual Meeting in Brussels. Giuseppe Cimò, Head of Space Science and Innovative Applications at JIVE contributed with a talk on the main challenges of the ERIC Regulation in distributed research infrastructures. Representing JIVE at this meeting were also Director Agnieszka Słowikowska, and Aukelien van den Poll, Finance and Project Officer.

Group photo of the attendees at the 2025 ERIC Forum Annual Meeting in Brussels. Photo: ERIC Forum

ERIC FORUM

HORIZON EUROPE RADIOBLOCKS

Radioblocks unites leading European radio astronomy institutes, industry, and academia to strengthen Europe's role in global radio astronomy. Officially launched on March 1, 2023, and set to run for four years under the coordination of JIVE, the project includes 33 partners working across five targeted work packages.

Radioblocks aims to develop new technological components that will enhance the entire data chain, from signal reception to data processing. These building blocks have been recognised as essential by radio astronomy research infrastructures for achieving higher sensitivity, wider frequency coverage, larger fields of view, and more advanced data processing.

Developments across these themes will open up new opportunities for breakthroughs in radio astronomy and provide a significant boost to Europe's scientific competitiveness.

On 5 February 2025, the Radioblocks executive team met with the Industry Advisory Board (IAB) to enhance industry engagement in the project and ensure the long-term impact of its innovations.

The IAB established in 2024 and composed of distinguished industry representatives, aims to play a crucial role in aligning Radioblocks' outputs with industry needs. The meeting provided a platform for exchanging insights and recommending strategic directions to maximise the project's relevance to both the scientific and industrial communities. The discussion focused on further integrating the project's work into industrial applications, developing a targeted value proposition for industry partners, and strengthening dissemination efforts within industry.

The progress of Radioblocks and its future were presented and discussed at a meeting with the project's Executive and Board members on 9 October 2025 in Schiphol, Amsterdam. The meeting was also attended by external industrial advisors and was followed by a closed Board meeting.

JIVE Director Aga Słowikowska opened the meeting in Schiphol in her capacity as Radioblocks coordinator. Photo: JIVE

HORIZON EUROPE ACME

The Astrophysics Centre for Multimessenger Studies in Europe (ACME) officially launched with its kick-off meeting in Paris on 16–17 September 2024. Funded under the EU Horizon Europe programme and coordinated by the Centre National de la Recherche Scientifique (CNRS), the project brings together 40 partner institutions from 15 countries to strengthen collaboration between the astronomy and astroparticle physics communities.

ACME aims to improve access to research infrastructures, data, expertise, and services for multi-messenger astrophysics by enhancing interoperability, establishing Joint Centres of Expertise, expanding training opportunities, and improving systems for the rapid identification and follow-up of astrophysical events.

JIVE plays a multifaceted role in the project. It provides expertise to the European VLBI Network (EVN) and serves as the central node for the radio astronomy domain. JIVE scientists, including Zsolt Paragi, who co-leads the work package for setting up the Joint Centres of Expertise in all domains, and experts from the R&D Group, who focus on improving access to the EVN JupyterHub and the Virtual Observatory interface to the EVN Archive, work diligently to meet the challenges and expectations of the project.

Team members from WPs 2 and 3 at the Paris meeting in January 2025. Head of the User Support Group at JIVE, Zsolt Paragi (right), the JIVE Director (fourth from the left), and Head of the Science Operations Group Bob Campbell (top left, online) attended.

JIVE Finances

BALANCE

(AFTER ALLOCATION OF RESULTS)

ASSETS	31-12-2025	31-12-2024
TANGIBLE FIXED ASSETS		
Tangible fixed assets	€ 51,570	€ 87,190
Total of tangible fixed assets	*€ 51,570*	*€ 87,190*
CURRENT ASSETS		
Work in process	€ 0	€ 0
Receivables	€ 803,536	€ 545,764
Cash at bank	€ 2,510,774	€ 2,827,592
Total of current assets	*€ 3,314,310*	*€ 3,373,356*
TOTAL ASSETS	**€ 3,365,880**	**€ 3,460,546**

LIABILITIES	31-12-2025	31-12-2024
CAPITAL		
General Reserves	€ 1,729,859	€ 1,457,185
Designated funds	€ 300,000	€ 300,000
Total capital	*€ 2,029,859*	*€ 1,757,185*
OTHER LIABILITIES		
Short term debts	€ 1,336,021	€ 1,703,361
Total of current liabilities	€ 1,336,021	€ 1,703,361
TOTAL ASSETS	**€ 3,365,880**	**€ 3,460,546**

STATEMENT OF PROFIT AND LOSS

	2025			2024
	BUDGET	ACTUAL	DIFFERENCE	ACTUAL
REVENUES				
INCOME				
Contributions/subsidies third parties	€ 2,799,211	€ 3,001,682	€ 202,471	€ 2,517,056
Interest	€ 65,000	€ 68,348	€ 3,348	€ 117,648
Other	€ 206,975	€ 286,716	€ 19,741	€ 227,462
Total income	*€ 3,071,186*	*€ 3,356,746*	*€ 285,560*	*€ 2,862,166*
TOTAL REVENUES	*€ 3,071,186*	***€ 3,356,746***	*€ 285,560*	***€ 2,862,166***

	2025			2024
	BUDGET	ACTUAL	DIFFERENCE	ACTUAL
EXPENDITURES				
OPERATIONS				
Grants/Expenditures	€ 2,967,824	€ 3,084,072	€ 116,248	€ 2,904,339
Total operations	*€ 2,967,824*	€ 3,084,072	*€ 116,248*	*€ 2,904,339*
TOTAL EXPENDITURES	***€ 2,967,824***	***€ 3,084,072***	***€ 116,248***	***€ 2,904,339***

RESULT	***€ 103,362***	***€ 272,674***	***€ 169,312***	***- € 42,173***

Tables and Metrics 2025

Council Members

JIVE MEMBER REPRESENTATIVES

Dr. Patrick Charlot	*Laboratoire d'Astrophysique de Bordeaux,* Pessac, France
Dr. Chiara Ferrari	*Observatoire de la Côte d'Azur*, France
Dr. Tiziana Venturi	*Istituto di Radioastronomia (IRA-INAF)*, Italy
Michele Crisafi	*Ministero dell'Istruzione, dell'Università e della Ricerca,* Roma, Italy
Dr. Mārcis Donerblics	*Ventspils University of Applied Sciences,* Ventspils, Latvia
Prof. Dr. Andrejs Krauklis	*Ministry of Education and Science,* Latvia
Prof. Dr. Jessica Dempsey	*ASTRON,* Dwingeloo, the Netherlands (Chair)
Mrs. Saskia Matheussen	*NWO,* Den Haag, the Netherlands
Dr. José Antonio López Fernández	*Instituto Geográfico Nacional, MITMA*, Madrid, Spain
Dr. Pablo de Vicente	*Instituto Geográfico Nacional, MITMA,* Madrid, Spain (Vice Chair)
Tomas Andersson	*Swedish Research Council,* Stockholm, Sweden
Prof. John Conway	*Onsala Space Observatory,* Onsala, Sweden
Prof. Simon Garrington	*Jodrell Bank Centre for Astrophysics,* Manchester, UK
Dr. Jenny Hiscock	*Science and Technology Facilities Council,* Swindon, UK

ASSOCIATE RESEARCH INSTITUTES REPRESENTATIVES

Prof. Zhinqiang Shen	*Shanghai Astronomical Observatory, NAOC,* Shanghai, China
Dr. Fernando Camilo	*National Research Foundation, South African Radio Astronomy Observatory,* Cape Town, South Africa
Prof. Anton Zensus	*Max-Planck-Institut für Radioastronomie,* Bonn, Germany

JIVE Staff

Dr. Mislav Balokovic	*Assistant CRAF Spectrum Manager (from 7 July 2025)*
Mr. Paul Boven	*Netwerk Systems Engineer*
Mr. Wybren Buijs	*Linux/Netwerk Specialist*
Dr. Bob Campbell *	*Head of Science Operations*
Dr. Giuseppe Cimò *	*Head of Space Science and Innovative Applications Group*
Drs. Bob Eldering	*Software Engineer*
Mr. Florian Eppel	*Support Scientist (from 1 October 2025)*
Mr. Bert Harms	*Chief Operator*
Dr. Ioanna Kazakou	*Communications Officer*
Dr. Ing. Aard Keimpema	*Scientific Software Engineer*
Dr. Ir. Mark Kettenis	*Software Project Scientist*
Mrs. Yvonne Kool-Boeser	*Senior Secretary*
Mr. Martin Leeuwinga	*Hardware Support Engineer*
Dr. Waleed Madkour	*CRAF Frequency Manager*
Dr. Benito Marcote Martin	*Support Scientist*
Dr. Mas Md Said	*Postdoctoral Near-field VLBI Support Scientist*
Dr. Suma Murthy	*Support Scientist (until 30 September 2025)*
Dr. Miriam Nyamai	*Support Scientist (from 1 October 2025)*
Dr. Junghwan Oh	*Support Scientist*
Dr. Gábor Orosz	*Support Scientist ((until 30 September 2025)*
Dr. Zsolt Paragi *	*Head of User Support*
Dr. Agnieszka Słowikowska *	*Director*
Dr. Des Small	*Scientific Software Engineer*
Drs. Aukelien van den Poll	*Finance and Project Officer*
Prof. Huib Jan van Langevelde	*Chief Scientist*
Drs. Marjolein Verkouter *	*Head Technical Operations and R&D*

* MT member

Visitors to JIVE

Name	Institute	Period	Host
J. Leung	University of Toronto, Canada	13-24 January	Marcote
A. Aberfelds	VIRAC Ventspils, Latvia	20-31 January	Paragi
A. Kalina	VIRAC Ventspils, Latvia	20-31 January	Paragi
A. Egliene	VIRAC Ventspils, Latvia	20-31 January	Paragi
J. Park	Kyung Hee University, South Korea	4-7 February	Oh
Y. Zhang	University of Science and Technology, Hefei, Anhui, China	4-31 March	Paragi
S. Garriatana	INAF-IRA, Italy	2-10 May	Marcote
F. Jaron	TU Vienna, Austria	21-22 May	Verkouter
P. Kharb	National Centre for Radio Astrophysics (NCRA) - Tata Institute of Fundamental Research (TIFR) in Pune, India	6-13 July	Murthy
H. Ding	Mizusawa VLBI Observatory, National Astronomical Observatory of Japan	2-6 June	Paragi
T. An	Shanghai Astronomical Observatory, China	11-13 June	Paragi
Y. Liu	Shanghai Astronomical Observatory, China	11-13 June	Paragi
S.Y. Lee	Ulsan National Institute of Science and Technology, Republic of Korea	23 June - 27 August	Murthy
A.G. Tegenge	XinJiang Obsevatory, China	1 Sept - 13 Oct	Paragi
W. Baan	XinJiang Obsevatory, China	1 Sept - 13 Oct	Paragi
J. Radcliffe	University of Manchester, UK	14-26 Sept	Paragi
O. Bayandina	SKAO, South Africa	20-26 Sept	Verkouter
C. Phillips	CSIRO, Australia	15-20 October	Verkouter
Y. Zhang	University of Science and Technology of China	10 Nov - 8 Dec	Paragi

Correlator Activity

Project Code	Month or Session	PI	Title
EA077C	jan.25	Atri	Parallax of an unclassified, circularly polarized source
EA077D	mar.25	Atri	Parallax of an unclassified, circularly polarized source
EB104A-I	s.1/25	Bhandari	Multi-frequency study of persistent radio sources
EB105A	s.1/25	Bhandari	Doubling the known FRB-PRS population
EB105B	s.2/25	Bhandari	Doubling the known FRB-PRS population
EB109A	s.2/25	Baan	Revisit two prominent OH megamasers
EB113A	s.1/25	Bronzini	NGC4278: The First VHE Emitting Low-Luminosity AGN
EB114A	mar.25	Burns	Transient masers VI
EB114B	s.2/25	Burns	Transient masers VI
EB114C	oct.25	Burns	Transient masers VI
EB115A	feb.25	Bloot	Astrometric observations of an ultra-long period transient
EB115B	apr.25	Bloot	Astrometric observations of an ultra-long period transient
EB115C	jun.25	Bloot	Astrometric observations of an ultra-long period transient
EB115D	sep.25	Bloot	Astrometric observations of an ultra-long period transient
EB115E	nov.25	Bloot	Astrometric observations of an ultra-long period transient
EB116A-B	s.2/25	Bruni	Three candidate FRB persistent radio sources
EC097A-B	s.1/25	Chang	Hyper-eddington accretion: pc-scale radio structures in IRAS 04416+1215
EC098A	s.3/24	Cala	The magnetized 'water fountain' and circumstellar structure of a nascent planetary nebula
EC098B	s.1/25	Cala	The magnetized 'water fountain' and circumstellar structure of a nascent planetary nebula
EC098C	s.2/25	Cala	The magnetized 'water fountain' and circumstellar structure of a nascent planetary nebula
EC100A	s.3/25	Castangia	Nucleus of megamaser galaxy IC485
EC100B	s.2/25	Castangia	Nucleus of megamaser galaxy IC485
ED051A-B	s.2/25	Deane	Is there an obscured active nucleus in MeerKAT's highest-redshift OH megamaser?
ED054A-B	s.3/25	H.Ding	Enriching radio stars within 10 degrees of the Galactic plane for refining Gaia parallax zero-points
ED055	s.3/25	HC.Ding	Probing the jet structure of a possibly relativistic fast blue optical transient
EF033A-B	s.1/25	Frey	Towards efficient selection of potential VLBI phase-reference sources
EG131G-H	s.1/25	Ghosh	Tracing the Radio Outflows in Radio Quiet AGN from pc- to kpc-scales
EH046A-B	s.1/25	Hu	EVN Probe of Two Isolated Local Red Nugget Analogs
EH047A_B	s.2/25	Hilton	A potential triple AGN system with 5 kpc separation in a redshift 0.83 galaxy cluster
EJ029	s.1/25	Jiang	Magnetic propeller J0240+1952

Project Code	Month or Session	PI	Title
EK050C	feb.22	Kirsten	Correlation of an ad-hoc VLBI array monitoring CHIME repeating FRBs II
EK050D	mar.22	Kirsten	Correlation of an ad-hoc VLBI array monitoring CHIME repeating FRBs II
EK050F	may.22	Kirsten	Correlation of an ad-hoc VLBI array monitoring CHIME repeating FRBs II
EK050G	jul.22	Kirsten	Correlation of an ad-hoc VLBI array monitoring CHIME repeating FRBs II
EK051A-B	aug.22	Kirsten	Correlation of an ad-hoc VLBI array monitoring CHIME repeating FRBs III
EK051D	aug.22	Kirsten	Correlation of an ad-hoc VLBI array monitoring CHIME repeating FRBs III
EK061	s.2/25	Kalnina	Structure and variability of astrophysical masers
EL073B	s.1/25	Leung	High-resolution imaging of late-time radio rebrightening in SN2022xxf
EL074	s.1/25	Li	OH gas in Megamaser Galaxies: imaging the diffuse and compact emission
EL076	s.2/25	Leung	High-resolution imaging of late-time radio rebrightening in SN 2022xxf II
EL079A-B	s.3/25	Shangguan	Linking Multi-Scale Outflows with VLBI Observations of Mrk 509
EM164G-H	s.1/24	McKean	Testing AGN evolution and feedback by combining the ILT and e-MERLIN/EVN
EM164I	s.1/25	McKean	Testing AGN evolution and feedback by combining the ILT and e-MERLIN/EVN
EM174A	s.3/23	Murthy	AGN feedback only 430 Myr after Big Bang
EM179	s.3/25	Marti	Microblazar candidate IRAS 18293-0941
EM180A-D	s.2/25	Mezcua	Dwarf galaxy merger cores
EM181A-B	s.1/25	Murthy	Polarisation in young radio source 4C 31.04
EN015	s.3/24	Nakagawa	Validation of circumstellar mass transfer and acceleration scenario in NSV17351
EN016A-D	s.1/25	Nair	M84 EVN-eMerl-EHT synergy
EP133A	may.25	Puchalska	Magnetar XTE J1810-197
EP134A	apr.25	Pelliciari	Probing the compactness of persistent radio source candidates at pc scales
EP134B-C	s.2/25	Pelliciari	Probing the compactness of persistent radio source candidates at pc scales
EP134D	sep.25	Pelliciari	Probing the compactness of persistent radio source candidates at pc scales
ES111	s.3/25	Shu	Mas-scale imaging of a nuclear radio outburst from a massive quiescent galaxy
ES112	s.1/25	Shu	Corroborating the resolved radio jet in a candidate 'turn-on' AGN
ES116A-C	s.1/25	Spingola	Lensed-cluster test of the H0 tension
ES121A	dec.25	Shu	Mas-scale imaging of two radio-selected off-axis jetted tidal disruption events
ET053A	s.2/25	Thorat	X-shaped radio galaxies
EW040B	jan.25	HC.Wang	Searching for dual-quasar candidates with projected separations below 0.1 kpc
EW040C	s.1/25	HC.Wang	Searching for dual-quasar candidates with projected separations below 0.1 kpc
EW040D	mar.25	HC.Wang	Searching for dual-quasar candidates with projected separations below 0.1 kpc
EW040E	s.2/25	HC.Wang	Searching for dual-quasar candidates with projected separations below 0.1 kpc
EW045A	sep.25	AL.Wang	Soft X-ray transients with the Einstein Probe
EW045B	nov.25	AL.Wang	Soft X-ray transients with the Einstein Probe
EW045C	dec.25	AL.Wang	Soft X-ray transients with the Einstein Probe

Project Code	Month or Session	PI	Title
EW052A	sep.25	HC.Wang	Puzzling Large EVN-Gaia Offsets in Extremely Stable Quasars
EW052B	s.3/25	HC.Wang	Puzzling Large EVN-Gaia Offsets in Extremely Stable Quasars
EY042	s.2/24	Yu	EVN+MERLIN observations of OH gigamaser galaxy IRAS 14070+0525
EY043B	s.1/25	Yang	NGC1068: probing its thermal outflow disc and nonthermal shocks
EY044A	s.3/24	Yang	Search for an unprecedented radio jet from a nearby thermal TDE
EY044B	s.2/25	Yang	Search for an unprecedented radio jet from a nearby thermal TDE
EY045A-B	s.1/25	Yan	Episodic Compact Symmetric Objects: a unique window on relativistic jets
EY049	s.1/25	Yang	Hidden ULX Cyg X-3
EY051	may.25	Yang	Dwarf-dwarf galaxy mergers: a newborn jet from an accreting IMBH?
EY053	s.3/25	Yuan	High-Redshift Blazar Candidate PSO J1011-01: Verification through EVN
EZ035	apr.25	Zhang	Identifying the possible compact radio jet of NGC 925 ULX1
EZ036	s.2/25	Zheng	Resolving the pc-scale structures of an IMBH with giant jets
GC040B	s.1/25	Charlot	Improving the K-band celestial reference frame for the next multi-wave-band ICRF
GG088	s.3/24	Giarratana	The expanding afterglow of GRB 221009A
RG015	may.25	Grollimund	Revealing the intriguing nature of the core of a possibly new microquasar
RL008	mar.25	Lazda	A search for compact radio emission associated with a local Universe fast radio burst
RS004	s.3/25	Sevilla	Late Radio Brightening in in the Luminous Fast Blue Optical Transient AT2024aehp: An Off-axis Jet?
RSM06B	feb.25	Marti	Scatter-broadening in the direction to IRAS 18293-0941
RSO04	s.2/25	Orosz	Methanol maser activity in G85.410+0.003
RSY12	s.1/25	Yang	Verifying the compactness of a faint flat-spectrum source near M60*

Selected JIVE Publications

- Hase, H., Duran, M. Bautista, García-Castellano, A. et al. (including **Madkour, W.**), Status of the Spectrum Management for VGOS, 2025, Proceedings of the 27th European VLBI Group for Geodesy and Astrometry Working Meeting, 30
- Event Horizon Telescope Collaboration Horizon (including **Kettenis, M., Small, D., van Langevelde, H.J.**) , scale variability of M87* from 2017–2021 EHT observations, Event Horizon Telescope Collaboration, Akiyama, Kazunori, Albentosa-Ruíz, Ezequiel et al., 2025, Astronomy and Astrophysics, 704, A91
- Bartkiewicz, A., Bayandina, O., Sanna, A. et al. (including **van Langevelde, H. J.**) Detections of Compact Radio Continuum toward Methanol Maser Rings Using the VLA, 2025, The Astrophysical Journal, 995, 176
- Roderik A., Aydar, Catarina et al. (including **Paragi, Z**.), JWST observes the assembly of a massive galaxy at z~4, 2025, Saxena, Aayush, Overzier, , arXiv e-prints, arXiv:2511.13650
- Lorey, C., Bommert, E., Duerr, S. et al. (including **Eppel, F.**), Historical Optical Flaring of the BL Lac Object S2 0109+22, 2025, The Astronomer's Telegram, 17508, 1
- Gabányi, K. É., Frey, S., Gurvits, L. I. et al. (including **Paragi, Z.**), High-resolution radio imaging of TGSSJ1530+1049, a radio galaxy in a dense environment at z=4, 2025, arXiv e-prints, arXiv:2511.13651
- Snelders, M. P., Hessels, J. W. T., Huang, J. et al. (including **Marcote, B.**), Revisiting FRB 20121102A: milliarcsecond localisation and a decreasing dispersion measure, 2025, arXiv e-prints, arXiv:2510.11352
- Gisolfi, L., Dirkx, D., Fayolle, S. et al. (including **Cimò,G.**),Open-Source High-Fidelity Orbit Estimation for Planetary Science and Space Situational Awareness Using the Tudat Software, 2025, arXiv e-prints, arXiv:2510.23179
- M., Snelders, M. P., Hessels, J. W. T. et al. (including **Marcote, B., Paragi, Z.**), A Hyperactive Fast Radio Burst Pinpointed in an SMC-like Satellite Host Galaxy, Bhardwaj, 2025, The Astrophysical Journal, 992, L35
- Sánchez-Monge, Á., Gómez, J. F., Torrelles, J. M. et al. (including **van Langevelde, H. J.**), A compact Keplerian-like disc and H30 α emission towards the radio jet in the massive protostar W75N(B)-VLA3, 2025, Monthly Notices of the Royal Astronomical Society, 543, 662
- Limaye, P., Spitler, L. G., Manaswini, N. et al. (including **Eppel, F.**), A broadband study of FRB20240114A with the Effelsberg 100-m radio telescope, 2025, arXiv e-prints, arXiv:2510.08367
- Emonts, B., van Bemmel, I., Moellenbrock, G. et al. (including **Kettenis, M., Small, D.**), CASA, the Common Astronomy Software Applications for Radio Astronomy and VLBI: a Reference Summary, 2025, Astronomical Data Analysis Software and Systems XXXII, 538, 154
- Hyland, L. J., Reid, M. J., **Orosz, G.** et al., VizieR Online Data Catalog: Inverse MultiView. II. 6.7GHz methanol masers (Hyland+, 2023), 2025, VizieR Online Data Catalog, 195, J/ApJ/953/21
- Goddi, C., Carlos, D. F., Crew, G. B. et al. (including **Kettenis, M., Oh, J., Small, D., van Langevelde, H.J.**)First polarization study of the M87 jet and active galactic nuclei at submillimeter wavelengths with ALMA, 2025, Astronomy and Astrophysics, 699, A265
- Dahale, R., Cho, I., Moriyama, K. et al. (including **Kettenis, M., Oh, J., Small, D., van Langevelde, H.J.**), Origin of the ring ellipticity in the black hole images of M87[*], 2025, Astronomy and Astrophysics, 699, A279
- Imai, H., Hoshino, T., Tafoya, D. et al. (including **Orosz, G.**), SiO v = 1 J = 5 → 4 Maser Emission from the Root of the "Water Fountain" Source W 43A, 2025, The Astrophysical Journal, 987, 114
- Benaglia, P., del Palacio, S., Saponara, J. et al. (including **Marcote, B.**), Radio study of the colliding-wind binary HD 93129A near periastron and its surroundings, 2025, Astronomy and Astrophysics, 698, A23
- von Fellenberg, S.D., García, R., Janssen, M. et al. (including **Small, D.**), CASA/rPICARD Calibration Strategy and PolyFiX Firmware Update for Phased NOEMA in the Context of Event Horizon Telescope Observations, 2025, Research Notes of the American Astronomical Society, 9, 134
- Nayana, A. J., Margutti, R., Wiston, E. et al. (including **Marcote, B.**), Dinosaur in a Haystack: X-Ray View of the Entrails of SN 2023ixf and the Radio Afterglow of Its Interaction with the Medium Spawned by the Progenitor Star (Paper I), 2025, The Astrophysical Journal, 985, 51
- Edwards, J., Calvés, G. Molera, Kummamuru, P. et al. (including **Said, N. M. M.**), Studying the Inner Heliosphere Using Radio Signals Transmitted From Spacecraft Orbiting Mars, 2025, Space Weather, 23, e2024SW004225
- Pallichadath, V., Dirkx, D., Fayolle, M. S. et al. (including **Boven, P., Cimò, G., Said, N.M.M.**), Planetary radio interferometry and Doppler experiment as an operational component of the Jupiter Icy Moons Explorer mission, 2025, CEAS Space Journal, 17, 339

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- Ould-Boukattine, O. S., Blaauw, R., Buchsteiner, T. et al. (including **Marcote, B.**), Non-detection of repeat radio bursts from FRB 20250316A in a high-cadence observing campaign, 2025, The Astronomer's Telegram, 17124, 1
- Brinkerink, C. D., Arts, M. J., Bentum, M. J. et al. (including **Paragi, Z.**), The Dark Ages Explorer (DEX): a filled-aperture ultra-long wavelength radio interferometer on the lunar far side, 2025, arXiv e-prints, arXiv:2504.03418
- Molera Calves, G., White, O., Edwards, J. et al. (including **Cimo, G.**), Deep space weather radio observations of JUICE spacecraft with VLBI radio telescopes, 2025, EGU General Assembly Conference Abstracts, EGU25-17634
- Kummamuru, P.K., Molera Calvés, G., Dirkx, D. et al. (including **Cimò, G., Md Said, N.M.M.**), Estimating the noise budget and system noise levels in closed-loop Doppler tracking of ESA's Mars Express with VLBI radio telescopes, 2025, Publications of the Astronomical Society of Australia, 42, e054
- Charlot, P., Gómez, M.E., Collioud, A. et al. (including **Campbell, R. M., Keimpema, A., Kettenis, M.**), Geodesy, Astrometry and High-resolution Imaging at K band with the European VLBI Network, 2025, International VLBI Service for Geodesy and Astrometry 2024 General Meeting Proceedings, 259
- Röder, J., Wielgus, M., Lobanov, A.P. et al. (including **Kettenis, M., Oh, J., Small, D., van Langevelde, H.J.**), A multifrequency study of sub-parsec jets with the Event Horizon Telescope, 2025, Astronomy and Astrophysics, 695, A233
- Long, Jeff, Morman, Josh, Abele, Jason et al. (including **Boven, P.**), GNU Radio, 2025, Zenodo
- **Murthy, S.**, Morganti, R., Oosterloo, T. et al., Cold gas bubble inflated by a low-luminosity radio jet, 2025, Astronomy and Astrophysics, 694, A110
- Kőmíves, J., Gabányi, K. É., Frey, S. et al. (including **Paragi, Z.**), High-resolution radio observations of TeV candidate sources, 2025, arXiv e-prints, arXiv:2502.03097
- Gokus, A., Boettcher, M., Errando, M. et al. (including **Eppel, F.**), Blazar flares at the cosmic dawn: uncovering high-energy processes at z>4, 2025, American Astronomical Society Meeting Abstracts #245, 245, 324.03
- Roeder, J., Wielgus, M., Lobanov, A. P. et al. (including **Kettenis, M., Oh, J., Small, D., van Langevelde, H.J.**), VizieR Online Data Catalog: VLBI core fluxes and brightness temperatures (Roeder+, 2025), 2025, VizieR Online Data Catalog, 369, J/A+A/695/A233
- Event Horizon Telescope Collaboration, et al. (including **Kettenis, M., Oh, J., Small, D., van Langevelde, H.J.**), The persistent shadow of the supermassive black hole of M87: II. Model comparisons and theoretical interpretations, 2025, Astronomy and Astrophysics, 693, A265

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- Toscano, Teresa et al.: Revisiting 3C 279 jet morphology with space VLBI at 26 microarcsecond resolution (2025) Astronomy and Astrophysics 704, A225 (**GG083B**)
- Gabányi, K. É. et al.: High-resolution radio imaging of TGSSJ1530+1049, a radio galaxy in a dense environment at z=4 (2025) arXiv e-prints , arXiv:2511.13651 (**RSG11**)
- McKean, J. P. et al.: An extended and extremely thin gravitational arc from a lensed compact symmetric object at redshift of 2.059 (2025) Monthly Notices of the Royal Astronomical Society 544, L24 (**GM068**)
- Powell, D. M. et al.: A million-solar-mass object detected at a cosmological distance using gravitational imaging (2025) Nature Astronomy 9, 1714 (**GM068**)
- Snelders, M. P. et al.: Revisiting FRB 20121102A: milliarcsecond localisation and a decreasing dispersion measure (2025) arXiv e-prints , arXiv:2510.11352 (**EK051**)
- Bhardwaj, M. et al.: A Hyperactive Fast Radio Burst Pinpointed in an SMC-like Satellite Host Galaxy (2025) The Astrophysical Journal 992, L35 (**EK056A**, **EK056B**)
- Stock, Ashley M. et al.: Scintillation Properties of PSR B1133+16 Measured with Very Long Baseline Interferometry (2025) The Astrophysical Journal 992, 192 (**GK049E**)
- Tegegne, A. G. et al.: IRAS 15250+3609: minor merger revealed as an OH MegaMaser (2025) Monthly Notices of the Royal Astronomical Society 543, 841 (**EP111C**)
- Kobak, A. et al.: A search for the favored hyperfine transition of a 6.7 GHz methanol maser line (2025) Astronomy and Astrophysics 701, A101 (**EK052**)
- Wu, Jianfeng et al.: Radio continuum and H I 21-cm line observations of the nearby luminous infrared galaxy IRAS 17526+3253 (2025) Astronomy and Astrophysics 701, A121 (**EH010**, **EP065**, **EW022A**, **EW022B**)
- Moscadelli, L.; Massi, F.; Bayandina, O.: Protostellar Outflows at the EarliesT Stages (POETS): VIII. The jets in the intermediate-mass star-forming region G105.42+9.88 (alias LkH? 234) (2025) Astronomy and Astrophysics 701, A66 (**GM082**)
- CHIME/FRB Collaboration et al.: FRB 20250316A: A Brilliant and Nearby One-off Fast Radio Burst Localized to 13 pc Precision (2025) The Astrophysical Journal 989, L48 (**EL071**, **EN006**, **RL008**)
- Wang, Ailing et al.: A Relativistic Jet in the Radio-quiet Active Galactic Nucleus Mrk 110 (2025) The Astrophysical Journal 987, L26 (EW034)
- Cao, Hongmin et al.: An Ejection Event Captured by Very Long Baseline Interferometry during the Outburst of Swift J1727.8–1613 (2025) The Astrophysical Journal 987, L14 (**RM019**)
- Williams-Baldwin, D. et al.: An e-MERLIN & EVN radio counterpart to the ultraluminous X-ray source M82 X?1 (2025) Monthly Notices of the Royal Astronomical Society 540, 239 (**EM148**)
- Pallichadath, Vidhya et al.: Planetary radio interferometry and Doppler experiment as an operational component of the Jupiter Icy Moons Explorer mission (2025) CEAS Space Journal 17, 339 (**EP129**)
- Koller, Dávid; Frey, Sándor: Superluminal Motion and Jet Parameters in the High-Redshift Blazar J1429+5406 (2025) Universe 11, 157 (EF022)
- Cheng, Xiaopeng et al.: VLBI Imaging of Parsec-scale Radio Structures in Nearby Low-luminosity Active Galactic Nuclei (2025) The Astrophysical Journal Supplement Series 277, 56 (**B, C, D, E, EC082A, F**)
- Paraschos, G. F.; Mpisketzis, V.: Unravelling the dynamics of cosmic vortices: Probing a Kelvin-Helmholtz instability in the jet of 3C 84 (2025) Astronomy and Astrophysics 696, L7 (**GP058**)
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- Ren, T.; Garrett, M. A.; Siemion, A. P. V.: High-resolution imaging of the radio source associated with Project Hephaistos Dyson Sphere Candidate G (2025) Monthly Notices of the Royal Astronomical Society 538, L56 (**RSG19**)
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- Frey, Sándor et al.: What Is Inside the Double-Double Structure of the Radio Galaxy J0028+0035? (2025) Symmetry 17, 171 (**EM152**)
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- Álvarez-Ortega, D. et al.: VIPCALs: A fully automated calibration pipeline for very long baseline interferometry data (2025) Astronomy and Astrophysics 703, A196
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- Yan, Xi; Cui, Lang; Ho, Luis C.: Multifrequency Very Long Baseline Interferometry Study of Emission and Absorption in the Two-sided Jets of NGC 3998 (2025) The Astrophysical Journal 983, 169
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EUROPEAN vlbi NETWORK

Acronyms and Abbreviations

ACME	Astrophysics Centre for Multimessenger Studies in Europe
AGN	Active Galactic Nucleus
ALMA	Atacama Large Millimeter/submillimeter Array
ASTRON	Netherlands Institute for Radio Astronomy
CASA	Common Astronomy Software Applications
CBD	EVN Consortium Board of Directors
CEE	Common Envelope Evolution
CNRS	Centre national de la recherche scientifique
CRAF	Committee on Radio Astronomy Frequencies
DOI	Digital Object Identifier
DM	Dispersion Measure
EC	European Commission
ECC	Electronic Communications Committee
EHT	Event Horizon Telescope
e-EVN	electronic (realtime) European VLBI Network
ERIC	European Research Infrastructure Consortium
ERIS	European Radio Interferometry School
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
e-VLBI	electronic Very Long Baseline Interferometry (implies real-time correlation: e-EVN)
EVN	European VLBI Network
FITS	Flexible Image Transport System
FRB	Fast Radio Burst
Gbps	Gigabit per second
GHz	Gigahertz
GMRT	Giant Metrewave Radio Telescope

GNSS	Global Navigation Satellite System
GPU	Graphics Processing Unit
HDD	Hard Disk Drive
IAB	Industry Advisory Board
IAU	International Astronomical Union
ICRS	International Celestial Reference System
INAF	Istituto Nazionale di Astrofisica, Italian National Institute of Astrophysics
ISM	Interstellar Medium
JVS	JIVE VLBI School
JUICE	JUpiter ICy moons Explorer
LOFAR	Low Frequency Array
Mbps	Megabit per second
MHz	Megahertz
MITMA	Ministerio de Transportes y Movilidad Sostenible (Spain)
MPIfR	Max-Planck-Institut für Radioastronomie
NAOC	National Astronomical Observatories of the Chinese Academy of Sciences
NARIT	National Astronomical Research Institute of Thailand
NIC	Network Interface Card
NRF	National Research Foundation (South Africa)
NME	Network Monitoring Experiment
NOEMA	Northern Extended Millimeter Array
NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek, Netherlands Organisation for Scientific Research
OPTICON	Optical Infrared Coordination Network for Astronomy
ORP	OPTICON RadioNet Pilot
PB	PetaByte
PI	Principle Investigator
POLARIS	Proposal-submission toolkit
PRIDE	Planetary Radio Interferometry and Doppler Experiment
PySCHED	Python-based SCHED tools
R&D	Research and Development
RAID	Research Activity Identifier
RFSoC	Radio Frequency System-on-Chip

SARAO	South African Radioastronomy Observatory
SCHED	VLBI Scheduling software
SFXC	Software Correlator at JIVE
SKA	Square Kilometre Array
SLURM	Simple Linux Utility for Resource Management
SMC	Small Magellanic Cloud
SWEEPS	Synoptic Wide-field EVN-e-MERLIN commensal Public Survey
TB	Terabyte
TCC	Tensor-Core Correlator
TDE	Tidal Disruption Event
TNRT	Thai National Radio Telescope
ToO	Target of Opportunity
VDIF	VLBI Data Interchange Format
VEX	VLBI Experiment Description
VIRAC	Ventspils International Radio Astronomy Centre
VLBA	Very Long Baseline Array, United States of America
VLBI	Very Long Baseline Interferometry
VLA	Very Large Array
VR	Vetenskapsrådet, Swedish Research Council
WRC-27	World Radiocommunication Conference 2027

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