# NEWSLETTER

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*May 2022*

EUROPEAN VLBI NETWORK

JIVE
Joint Institute for VLBI ERIC

## CALL FOR PROPOSALS

**DEADLINE: 1 JUNE 2022, 16:00:00 UTC**

## ONLINE VERSION OF NEWSLETTER

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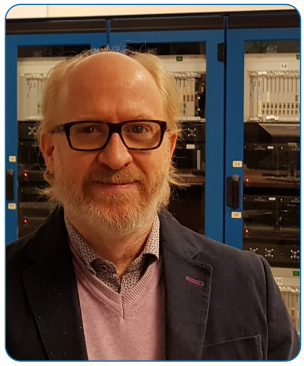
# WELCOME

Tiziana Venturi,
EVN Consortium Board of Directors Chair



Francisco "Paco" Colomer,
JIVE Director

Welcome to the new issue of the EVN/JIVE Newsletter.

If anything is really important at this time are the recent dramatic events unfolding in Ukraine, which are a severe challenge to the founding spirit of the EVN, based on mutual cooperation and collaboration towards the common goal of improving knowledge and progress in science. The EVN Consortium Board of Directors have issued a statement that, in accordance with the decisions and policies set by the European Commission and many European governments, freezes the cooperation with Russian institutions until further notice. The EVN Directors are aware of the impact of this decision for the whole community of astronomers and radio astronomers worldwide, and very much hope that peace will soon be re-established, and that full operations can be resumed as soon as possible.

This happens in a moment when the restrictions for COVID-19 are being generally lifted, and many activities are returning to a "new normality". Events are starting to be scheduled in person again; we look forward to the next EVN Scientific Symposium and Users' meeting that will take place in Cork (Ireland) on 11-15 July, moreover, EVN and VLBI will be featured at the URSI AT-AP-RASC 2022 meeting in Gran Canaria (Spain) and at the IAU General Assembly in Busan (Republic of Korea, with a special session on the Global VLBI Alliance on 8 August).

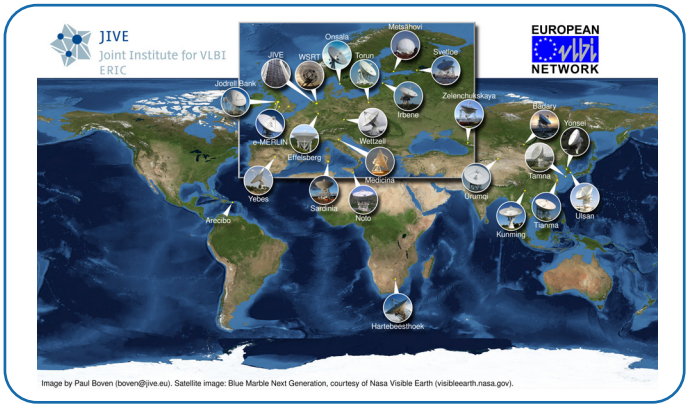
This issue also reports on new exciting scientific results, as well as updates on international projects and collaborations. We wish to draw your attention to the results highlighted on this newsletter regarding Tidal Disruption Events, masers and Fast Radio Bursts where the contribution of the EVN has been invaluable. Furthermore, don't miss out on the article discussing the celebrations of the International Day of Women and Girls in Science at Yebes Observatory (Spain). All this and much more are included in this issue.

We thank our community for the continuous dedication which, at all times, ensures advances, observations and excellent science delivery.

# CALL FOR PROPOSALS

## DEADLINE: 1 JUNE 2022, 16:00:00 UTC

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




Observing proposals are invited for the European VLBI Network (EVN). Deadline: 1 June 2022, 16:00:00 UTC. The EVN facility is open to all astronomers. Astronomers with limited or no VLBI experience are particularly encouraged to apply for observing time. Student proposals are judged favorably. Support with proposal preparation, scheduling, correlation, data reduction and analysis can be requested from the JIVE. Check details of the call for proposals here.

**Join the first online EVN Users' Training Event**

On 11 May 2022, JIVE organises the first online EVN Users' Training Event with the aim to support first-time users of the network. EVN Support Scientists will guide participants through the different steps to allow them to prepare and submit an observing proposal as well as the scheduling of observations. Participation on the webinar is free for everyone but registration is mandatory. Find more information here.

EVN Support+ programme

JIVE/EVN has a pilot programme to provide extended support to teams new to the EVN, with little or no direct VLBI experience. This includes the scheduling of the VLBI run and the VLBI-specific parts of the data reduction (including a-priori amplitude calibration and fringe-fitting). Imaging, and the interpretation of the data is the responsibility of the team. We aim to support some standard VLBI projects, evaluated by the EVN Program Committee with the highest grades. See the call for proposals for more information. For further questions please contact the Chair of the EVN PC, Zsolt Paragi (evnpc@jive.eu).

# SCIENCE HIGHLIGHTS

# HIGH-RESOLUTION VLBI OBSERVATIONS AND MODELLING OF THE RADIO EMISSION FROM THE TDE AT2019DSG

*by Prashanth Mohan (SHAO, China), Tao An (SHAO, China), Yinkang Zhang (SHAO, China), Jun Yang (Chalmers, OSO, Sweden), Xiaolong Yang (SHAO, China) and Ailing Wang (SHAO, China)*

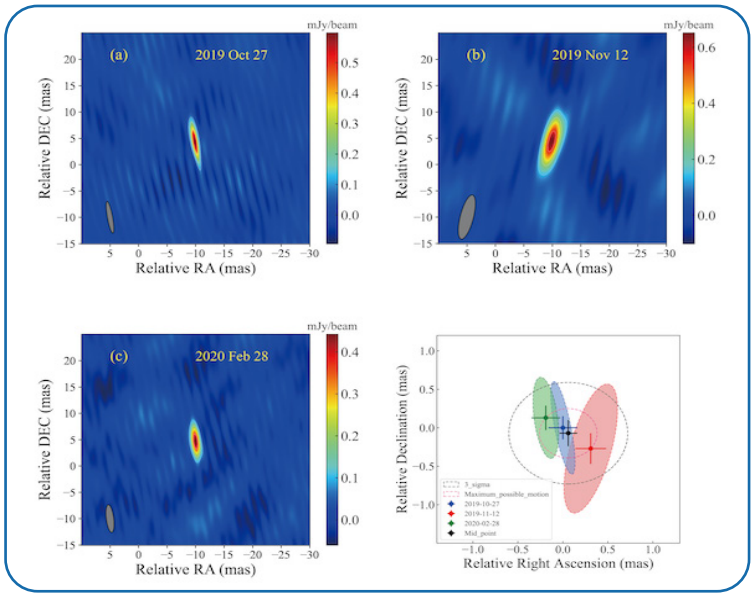



*Figure 1: Top row and bottom left: high-resolution images from the three EVN 5 GHz observations showing a compact, unresolved source. Bottom right: constraints on the-source; emission centre from astrometric measurements the inner red circle denotes the maximum relative position change, and the outer black circle denotes the 3-sigma error on this, indicating no significant proper motion.*

A tidal disruption event (TDE) involves the cataclysmic shredding of a star that approaches the vicinity (at or within the tidal radius) of a galactic supermassive blackhole (SMBH of a million - 100 million times the solar mass, e.g. Rees 1988, Evans & Kochanek 1989). The accreting stellar debris powers a predominantly optical — X-ray flare (thermal blackbody emission) during the early phase (timescale of days, e.g. Saxton et al. 2020). An outflow (relativistic/collimated or non-relativistic/wider angled) can be subsequently produced and accelerated. Synchrotron radio emission is produced by electrons accelerated by an expanding shock (over timescales of months to years, e.g. Alexander et al. 2020). The shock can originate 1) from the interaction between the outflow and the surrounding circum-nuclear medium, and 2) can be intrinsic to the outflow (e.g.

*Published in: Mohan et al., 2022, ApJ, 927, 74*

injection events, magnetic re-connections in the relativistic jets of active galactic nuclei AGN). Monitoring the radio emission can address its origin, outflow nature (relativistic or non-relativistic), constrain the density and distribution of the surrounding environment, and help discern the TDE physical and geometric properties (e.g. Alexander et al. 2020).

AT2019dsg is a TDE discovered on 9 April 2019 by the Zwicky Transient Factory at a redshift z = 0.051 (distance of ~ 230 Mpc; van Velzen et al. 2021). It is highly luminous (peak optical luminosity of ~ 3.51044erg/s) and the first TDE with a potential neutrino association (peta-electron volt, PeV) based on the detection by the IceCube neutrino observatory (IC191001A ~ 180 days post TDE; Stein et al. 2021). The study of non-thermal emission (evolution of flux density and source structure) and its origin, either from activity associated with a relativistic jet (collimated, beamed emission) or a non-relativistic outflow (wider angled) is key to understanding the origin of the PeV neutrino from this source. Multi-wavelength and interpretational studies of AT2019dsg provided divergent views on the nature of the emission and hence on the neutrino origin (see for e.g. Stein et al. 2021, Winter & Lunardini 2021, Cendes et al. 2021).

Our Very Long Baseline Interferometry (VLBI) high resolution C-band radio observations (5 GHz) were conducted with telescopes from the European VLBI Network (EVN; that can resolve emitting structures a few tens of light-years in the host galaxy situated ~ 750 million light-years away). This included three sessions (RSM04, EM140A and EM140B covering ~ 4 months during 2019 — 2020) and involved up to 20 participating radio telescopes across the UK, Europe, Russia and China. The objectives were: 1) To detect and monitor the radio emitting component and its evolution (in brightness and structure), 2) To potentially detect a relativistic jet (putatively driving the production of neutrinos and cosmic rays in blazars, a type of AGN), and 3) Inputs to discern the TDE properties and address the neutrino association. The observations successfully imaged the compact fading emission structure in all three sessions (see Figure 1), enabling the integration with previous C-band studies in order to aid in the modelling of the emission and understanding its origin.

The EVN astrometric measurements (precise position of the emission peak) and flux density evolution provide less evidence for a relativistic component in AT2019dsg (at the 3-sigma uncertainty level, see Figure 1). This and modelling the evolution of the 5 GHz radio flux densities indicate a decelerating shock produced by a fast outflow with a speed of ~ 0.1c that had interacted with a dense surrounding medium. The transient involved the disruption of a ~2 solar mass star. The base of the outflow is found to offer suitable conditions for the production and acceleration of cosmic ray protons and neutrinos. The findings promote an expanded inventory of multi-messenger (electromagnetic, particles: cosmic rays and neutrinos, gravitational waves) producing transients, not necessarily requiring a powerful accelerating mechanism such as a relativistic jet.

# 6.7 GHz CH3OH masers polarisation in massive star-forming regions: the flux-limited sample

*by Gabriele Surcis (INAF - Osservatorio Astronomico di Cagliari, Italy)*

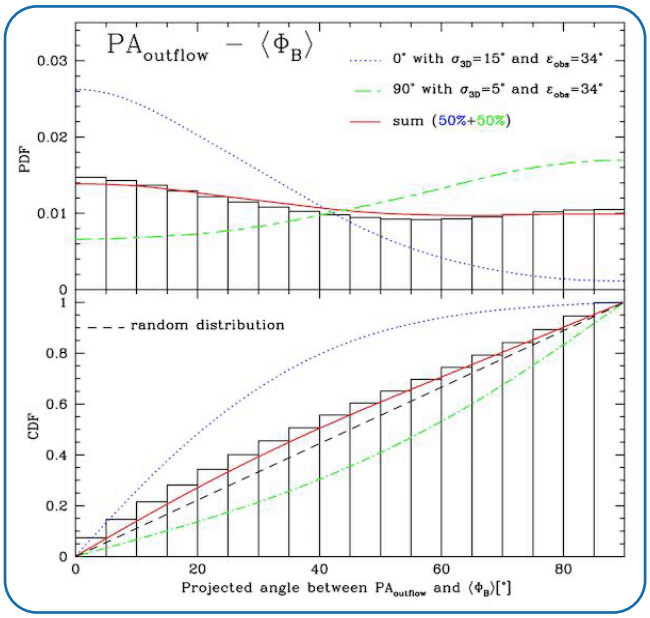



*Figure 1: Probability distribution function (PDF, top panel) and the cumulative distribution function (CDF, bottom panel) of the projected angle between the magnetic field and the outflow axis (|PAoutflow-<ΦB>|). The dashed black line is the CDF for a completely random orientation of outflows and magnetic fields. More details in Surcis et al. (2022, A&A, 658, A78).*

One of the still open questions of modern astrophysics is the formation process of high-mass stars, which have masses greater than 10 solar masses. The observational and theoretical efforts made in the last decades have shown that a common and essential component in the formation of high-mass stars is the presence of molecular outflows during the protostellar phase, similarly to what is observed during the formation of low-mass stars. Theoretically, it has been convincingly demonstrated that the magnetic field plays an important role in launching molecular outflows in massive young stellar objects. Here, for instance, the presence of a magnetic field helps the formation of early outflows that can reduce the radiation pressure through cavities; this partially solves the well-known radiation problem of high-mass star formation allowing the protostar mass to grow further. In addition, the intensity of the magnetic field may influence the collimation of the outflows. Although there is a large consensus on the theoretical importance of magnetic fields in launching the outflows, there are still some open issues from an observational point of view. For instance, the alignment of the magnetic field lines with the outflows. Therefore, providing new measurements of magnetic fields close (10s-100s astronomical units) to massive young stellar objects is of great importance. This can be achieved only by observing the polarised emission of molecular masers by using the very long baseline interferometry (VLBI) technique. Indeed, dust polarimetric observations towards massive star-forming regions are often limited to low density regions and/or envelopes at scales of several thousands astronomical units making them not suitable for probing the full structure of the magnetic field close to the protostars where the outflows are launched. Among the different maser species, the best probes for this purpose are the methanol masers, and in particular the 6.7 GHz transition.

After the successful pilot observations of the

*Published in Surcis et al. 2022, A&A, 658, A78*

polarised emission of 6.7 GHz methanol maser made with the European VLBI Network (EVN) in 2009 (Surcis et al. 2009), we started a large EVN campaign to measure the magnetic field orientation and strength towards a sample of 30 massive star-forming regions. This is called the "flux-limited sample". The flux-limited sample is composed of massive star-forming regions with declination greater than -9° and with a total methanol single-dish flux density >50 Jy, as reported in the catalogue of 6.7 GHz methanol masers compiled by Pestalozzi et al. (2005, A&A, 432,737). The EVN campaign lasted more than ten years and the results have been published in a series of papers (Surcis et al., 2011, 2012, 2013, 2015, 2019, 2022). In the last one, Surcis et al. (2022, A&A, 658, A78), besides reporting the results of the last five sources, we have presented the statistical analysis of the entire sample.

We were able to measure the magnetic field orientation in all sources but one. This allowed us to compare the orientation of the magnetic field (<ΦB>) with the orientation of the outflows (PAoutflow) on the plane of the sky. The probability distribution of the angles |PAoutflow-<ΦB>| is shown in Figure 1. To investigate the distribution of these angles in the 3D space we have performed two Monte Carlo simulation runs, one considering the outflow and the magnetic field parallel in the 3D space and then projected on the plane of the sky (dot-dashed green line in Figure1) and the other when they are perpendicular in the 3D space and then projected on the plane of the sky (dotted blue line in Figure 1). We found that only a combination of the two distributions (50%-50%, red line in Figure 1) represents what we observe. Therefore, we see a perfect bimodal distribution in the difference between the 3D magnetic field direction and the outflow axis. A slightly similar distribution was observed by Zhang et al. (2014, ApJ, 781, 89) on scales greater than 1000 au obtained by observing dust polarised emissions, although due to their small sample size they concluded that the data were consistent more with a random distribution.

Furthermore, because we measured in total linear polarisation fraction (Pl) and circular polarisation fraction (PV) for 233 and 33 6.7 GHz methanol maser features towards the sources of the flux-limited sample, we were also able to determine for this maser transition the typical values of Pl , PV, and of the Zeeman-splitting (ΔVz). These are Pl = 1.0-2.5%, PV = 0.5-0.75%, and ΔVz = 0.5-2.0 ms-1 (see Figure 2) that would correspond to 9 mG <|B|||< 40 mG if F = 3 ☐ 4 is the hyperfine transition that contributes most to the 6.7 GHz methanol maser emission.

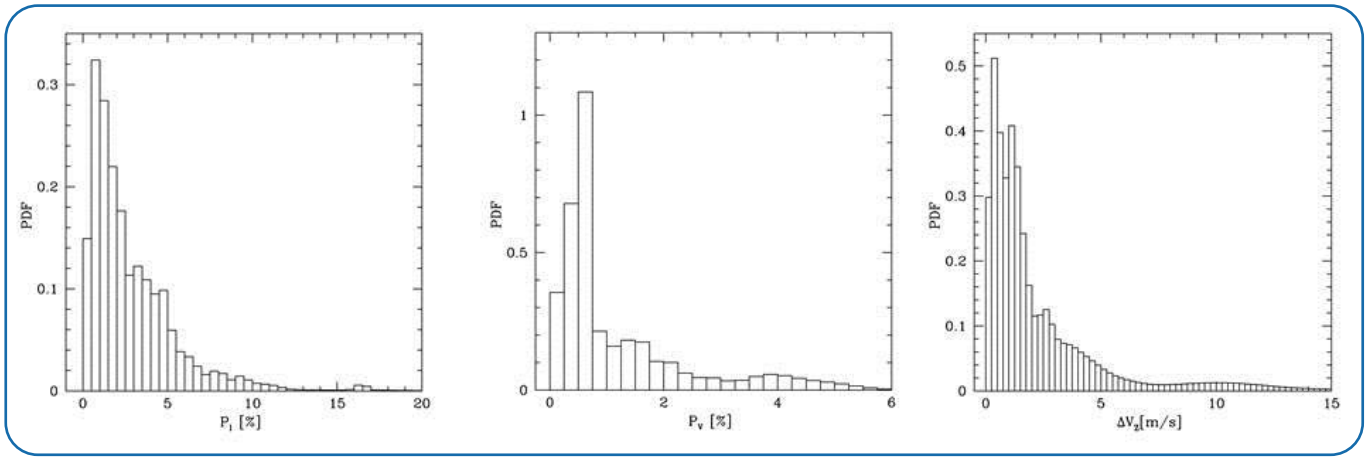



*Figure 2: Probability distribution function (PDF) of Pl (left panel), of PV (middle panel), and of ΔVz (right panel). More details in Surcis et al. (2022, A&A, 658, A78).*

# FRB 121102: DRASTIC CHANGES IN THE BURST POLARISATION CONTRASTS WITH THE STABILITY OF THE PERSISTENT EMISSION

*by A. V. Plavin (Astro Space Centre of Lebedev Physical Institute, Russia), Z. Paragi (Joint Institute for VLBI ERIC), B. Marcote (Joint Institute for VLBI ERIC, the Netherlands), A. Keimpema (Joint Institute for VLBI ERIC, the Netherlands), J. W. T. Hessels (ASTRON, The Netherlands Institute for Radio Astronomy, Anton Pannekoek Institute for Astronomy, University of Amsterdam, the Netherlands), K. Nimmo (ASTRON, The Netherlands Institute for Radio Astronomy, Anton Pannekoek Institute for Astronomy, University of Amsterdam, the Netherlands), H. K. Vedantham (ASTRON, The Netherlands Institute for Radio Astronomy, the Netherlands), L. G. Spitler (Max-Planck-Institut fur Radioastronomie, Germany)*

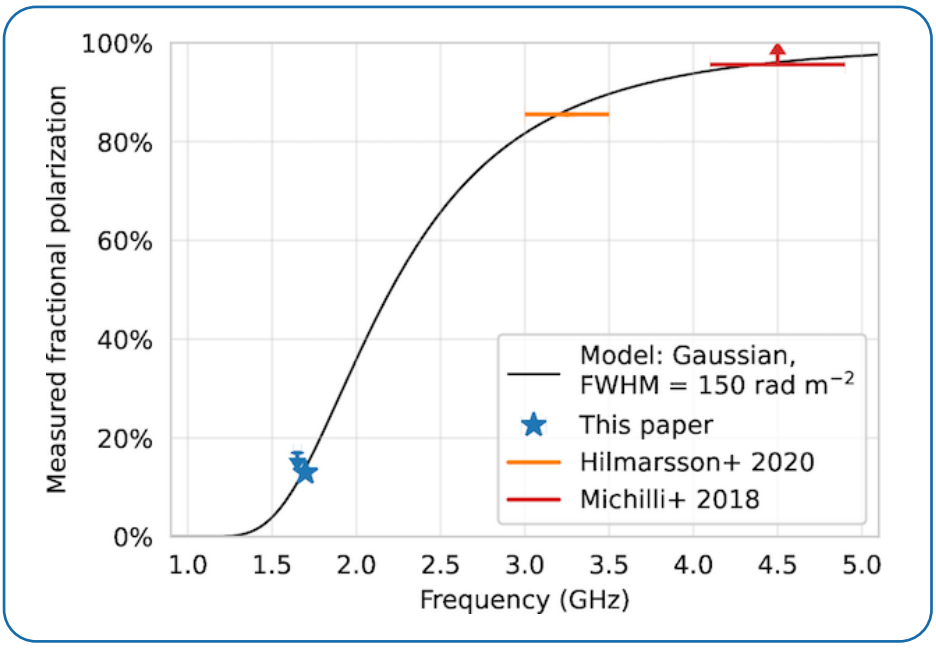



*Figure 1: Measured fractional polarisation of bursts at different frequencies. The phenomenological model assumes 100% intrinsic polarisation with an effective width of 150 rad/m2 in the RM space. This model is consistent with our measurements at 1.7 GHz and with higher 3-5 GHz measurements*

Fast radio bursts (FRBs) are bright millisecond-duration transients of an extragalactic origin. A great number of theories has been developed to explain this phenomenon in the past decade, many of those invoking neutron stars. Some FRBs are repeating, making it possible to organise detailed follow-up observations that include interferometers, so that to probe the emission regions with extreme resolution and sensitivity.

FRB 121102 is the first repeater discovered, and its properties make the source unique among FRBs. It lies within a star-forming region of a dwarf galaxy at a redshift of 0.19. The high rotation measure (RM) exceeding 105 rad/m2 indicates dense highly magnetised plasma around the emitter. This plasma is likely related to the persistent radio source colocated with the bursts. The persistent source also has multiple alternative explanations, including an AGN or a young nebula. More focused studies of the source properties on milliarcsecond scales, and its relation to the bursts RM, would let us constrain all these models better. In Plavin et al. (2022), we present such studies, including both EVN and single-dish observations, and discuss the results.

*Published in Plavin et al. 2022, MNRAS, 511, 4, 6033–6041*

The brightest burst of FRB 121102 within the observation campaign was caught on 20 September 2016. Thanks to the VLBI backend at Effelsberg, we managed to reanalyse the data at the highest spectral resolution of 4 kHz; this became crucial for the polarisation studies. We detected a significant linear polarisation of FRB 121102 bursts for the first time at a low frequency of 1.7 GHz. The rotation measure was the highest to date at 1.27 x 105 rad/m2, qualitatively consistent with the falling trend on the years timescales. Linear polarisation fraction turned out to be much lower at 1.7 GHz: only 15%, compared to almost 100% observed at 5 GHz. This low fraction, combined with the requirement of a high spectral resolution, is the likely reason why no burst polarisation was detected at 1-2 GHz before. We explain this striking difference between frequencies with minor non-uniformities in the screen, leading to spatial depolarization: the emission Faraday width of just 150 rad/m2, or 0.1% of the total RM, is enough.

Our dedicated EVN observations throughout 2017 caught no bursts, but this dataset provides invaluable information about the persistent radio counterpart. The observations included more telescopes than previous studies, leading to a better spatial frequency coverage and a higher sensitivity. The radio source flux density is only 0.2 mJy, so we used both a regular phase-referencing calibrator, and a secondary in-beam one for relative comparisons. As it turns out, the persistent emission is surprisingly stable: flux variations are less than 10% over a year; the apparent position stays the same up to 0.1 mas, and is consistent between 1.7 and 4.8 GHz. The upper limits on the source size of 1 pc further constrains the maximal potential expansion rate to ~104 km/s. The lack of variations in observed parameters of the persistent emission, combined with changes in the bursts rate and their RM, put strong constraints on models explaining the environment of FRB 121102. For example, an expanding supernova would show a decaying luminosity trend; an AGN could have frequency-dependent apparent positions, or a general flux variability; a nebula inflated by a magnetar outflow would lead to a correlation between the burst rate and the persistent emission.

Unique and dedicated observations of FRB 121102 performed by the EVN and the Effelsberg telescope lead to these results we present in Plavin et al. (2022). More observations, including polarisation, simultaneously at a wide frequency range and consistently over multiple years, would further help understanding the FRB environment evolution and the mechanisms underlying the bursting and persistent emission.

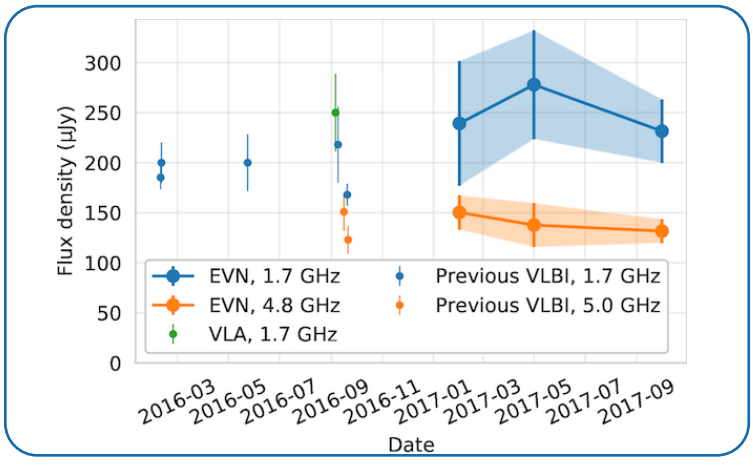



*Figure 2: Flux density measurements of the persistent radio counterpart. Our EVN measurements in 2017 are shown in comparison with earlier VLA, VLBA, and EVN observations. Variability within each frequency band is insignificant and lies below 10%*

# NETWORK HIGHLIGHTS

## STATEMENT OF THE EVN DIRECTORS ON THE EVENTS UNFOLDING IN UKRAINE

The European VLBI Network (EVN) is a consortium of individual radio observatories which commit a fraction of their time for joint observations of scientific projects. These projects are selected on the basis of scientific merit alone and the EVN has always been and remains open to scientists from all countries. Starting from a network including five observatories in central Europe, it now extends east, west and south to embrace China, Puerto Rico and South Africa. Since its foundation, in 1985, the EVN has been based on mutual cooperation and collaboration towards the common goal of improving knowledge and progress in science. This goal has always been successfully achieved, and the inclusion of more and more observatories in new countries has been possible thanks to the generous dedication of their staff and sharing of knowledge.

The recent dramatic events unfolding in Ukraine are in conflict with and challenge the founding spirit of the EVN.

Until further notice, data from the Quasar VLBI Network antennas, operated by the Institute of Applied Astronomy in Russia, will not be used in joint observations. Proposals submitted to the EVN PC will, as always, be considered for observation purely based on scientific merit, irrespective of the affiliation or nationality of the researchers.

The EVN Directors are aware of the impact of this decision for the whole community of astronomers and radio astronomers worldwide, and very much hope that peace will soon be re-established, and that full operations can be resumed as soon as possible.

# YEBES OBSERVATORY CELEBRATES THE INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCE

*by Cristina García Miró (Yebes Observatory - Observatorio Astronómico Nacional, Spain)*

*Figure 1: Some of the women scientists that work at Yebes Observatory in front of the 40-meter diameter radio telescope. Credits: Yebes Observatory.*

The International Day of Women and Girls in Science was celebrated on February 11th, and Yebes Observatory (Spain) wanted to commemorate this event in a very special way. Some of the talented women working in the observatory shared their views and feelings about working in science, in an extensive interview published in the provincial newspaper El Decano de Guadalajara. According to Laura Barbas, a telecommunications engineer who is the head of the Control Systems Service at the Yebes Observatory, women represent 24% of the staff of this observatory, one of the most important of the Spanish National Geographic Institute, under the Ministry of Transport, Mobility and Urban Agenda. Laura emphasises the importance of promoting family reconciliation policies, "since this allows everyone, but specifically women, to develop their professional careers, whether in the field of research and science or in any other field".

The day of the international observance, the observatory also welcomed a group of school children from the Jocelyn Bell Primary School in the Yebes village. These children had the opportunity to learn first-hand about the work done by women at the observatory. These same students had previously participated in

a contest in their school to name a project they were carrying out after a famous scientist. Only one of them proposed the name of a famous woman scientist.

On arrival to the visits' pavilion, the astronomer Cristina García Miró guided them to discover the "Colours of light", colours that our eyes cannot detect, from radio frequencies to gamma rays, and how the information provided by all the wavelengths is fundamental for understanding the different phenomena occurring in the Cosmos. Cristina took advantage of the school's connection with the famous astronomer Jocelyn Bell to tell them that, apart from having discovered pulsars, as a young scientist she suffered from "imposter syndrome", which she overcame by working hard and believing in herself. This astronomer believes that women have the same opportunities for accessing scientific careers as men, but "during the long and arduous process of becoming a professional researcher, the dropout rate is higher for women".

Once inside the observatory, they visited the amplifier laboratory with engineers Inmaculada Malo and Mamen Díez, who showed them the instrumentation needed to develop these devices and observed the different details of the amplifiers through the microscope. Inmaculada Malo holds a PhD in Telecommunications and is a senior radio frequency design engineer. As she explains, her work consists of designing, manufacturing, measuring and testing the characteristics and operation of components that detect electromagnetic waves coming from the universe. It is what is called the first stage or cold stage of the heterodyne receivers used in radio telescopes around the world. Inmaculada believes that today's girls need female role models, so the role of women in research should be highlighted: "Nowadays, young girls are looking for role models. You only have to look at the number of influencers that exist". Mamen Díez, a Telecommunications engineer who also works in the amplifiers and cryogenic devices group, states that women have been made invisible for centuries in scientific careers and that "even men, in some cases, have taken the merits that belonged to them". She thinks that today, "things are changing, but there are still, however, glass ceilings" and she believes that motherhood can be a handicap when it comes to progress and "can even slow down our careers".

The engineer María Patino was in charge of presenting the receivers laboratory where she designs, builds and tests radio astronomy receivers and associated instrumentation. Among other things, the students were able to observe and manipulate different electronic boards manufactured at the observatory, but not before learning about the effects that electrostatic discharges from our own hands can produce in the different electronic components. María assures that there are people that "don't know that technology 'made in Spain' is exported internationally". She also adds that "it is difficult to value research and science when you don't see an immediate benefit, but COVID has made them much more visible".

A colleague from María is Marta Bautista, who studied a bachelor's and master's degree in Telecommunications Engineering at the University of Alcalá de Henares, and currently works as a radio frequency engineer, monitoring radio frequency interference (RFI) and building and testing frequency converters. This engineer perceives that women are gaining more and more ground in all fields, in the media, in the educational portfolio, on the Internet, etc. and values initiatives such as this International Day of Women and Girls in Science: "There are publishers that have books about famous women throughout history aimed at a young audience", she adds. However, she believes that "there are still many people from previous generations who find it difficult to make women visible in

certain professions".

The visit to the 40-metre diameter radio telescope was long awaited. At the control room, the operator that day, Daniel Sastre, explained to them what was being done at that moment: a Very Long Baseline Interferometric (VLBI) observation in which radio telescopes from all over the world observe in a coordinated way. This form of observation is equivalent to using an antenna the size of the Earth, one of the largest instruments ever used, which provides more zoom in the images than any other technique in astronomy.

A very important aspect of the Yebes Observatory focuses on the study of the Earth. The mathematician Beatriz Vaquero works in the field of Space Geodesy. At the moment, she explains, "we are developing a project that consists of the construction of a satellite tracking and observation station through a laser telemetry system (SLR, satellite laser ranging)". Beatriz is the project manager of this new facility. Among her references is Hypatia of Alexandria, "for being one of the first known women scientists", although she admits that no example of a woman has guided her steps. She encourages new generations to be genuine, "because there are no men's careers or women's careers, there are just careers".

To conclude the visit, geographer engineer Elena Martínez told the students that the Earth has a "life of its own", which manifests in different types of movements, studied using space geodetic techniques. It was clear to Elena that she was going to follow the path of science since she was a child. In fact, her female scientific reference was her mother, because "when she studied Topography, only five women in Madrid were doing it". In addition, she indicates that she was motivated to choose this specialty by "the fact of being able to contribute with my work to the study of climate change and its effects on the Earth's surface".

The celebration of the International Day of Women and Girls in Science was a memorable day in Yebes Observatory. There is no doubt that these girls and boys will remember it all their lives, an experience from which we hope scientific vocations will emerge. We also trust that next time they are asked about a famous scientist, they will remember that there are also women scientists, and even famous ones.

*Figure 2: Jocelyn Bell Primary School visit to Yebes Observatory. Credits: Yebes Observatory.*

# 15TH EUROPEAN VLBI NETWORK SYMPOSIUM SET FOR IRELAND IN JULY!

*by Denise Gabuzda (University College Cork, Ireland)*

*Figure 1: University College Cork campus. Credit: UCC.*

The 15th EVN Symposium, "Providing the Sharpest View of the Universe," was originally scheduled to take place at University College Cork, Ireland, in July 2020, but had to be cancelled due to the COVID-19 pandemic. It was originally hoped to reschedule it for July 2021, but even with vaccines becoming available, this wasn't possible, and an "EVN Mini-Symposium" was held online instead. This online symposium was successful and it was great to be able to include participants from locations all around the globe. However, many of us still longed to be able to gather in person.

Now the 15th EVN Symposium is again scheduled to take place in person in Cork, Ireland during 11-15 July 2022. However, we don't want to lose the participation of colleagues whose circumstances would prevent them from coming in person, and there will therefore also be the option of online participation for those who are not able to come to Cork in person. It will be possible to make presentations both in person and online.

The EVN Symposium normally happens every two years, and provides a forum for discussion of the latest VLBI scientific results and technical and technological developments both within the EVN member countries and farther afield. A wide array of topics and results will be discussed, ranging from solar system applications of VLBI to studies of the most distant galaxies in the Universe. Another important part of the symposium is the EVN Users' Meeting, which provides information about current and future VLBI capabilities and resources that are available for EVN users, as well as providing the opportunity for users to ask questions and give feedback about their experiences. There will be an afternoon off on the Wednesday to give time for those present in person to explore the beautiful and historic area in and around Cork City.

The EVN Symposium 2022 website is live at https://www.ucc.ie/en/evn2022/, where you can find a registration link, as well as information about how to submit talk and poster abstracts, book accommodation, etc. It is planned to publish the proceedings of the Symposium online in Proceedings of Science.

The deadline for early registration is 31 May 2022. A limited number of waivers will be given for the online registration fee for early career scientists. Application forms can be obtained by emailing evnsymp2022@ucc.ie, and that's also the email to use more generally to contact the symposium organisers.

We hope to see many of you in Cork in July, and more again on our Zoom screens!

# NEXT ONLINE EVN SEMINAR ON 5 MAY 2022 - 10:00 CEST


The European VLBI Network (EVN) is pleased to announce a new seminar within the 2nd series of online seminars "The Sharpest view of the Radio Universe: VLBI - Connecting Astronomers Worldwide".This will be the last seminar before the EVN Symposium, which will take place on 11-15 July July 2022 in Cork, Ireland.

The seminar will take place on Thursday 5 May at 10:00 CEST. Our speaker, Mar Mezcua, from the Institute of Space Sciences (ICE-CSIC), will talk about "Intermediate-mass black holes in the era of radio astronomy"

Full information about the webinars, which will be run using Zoom & YouTube, can be found at evlbi.org/evn-seminars.

# OTHER NEWS

## VLBI IN THE SKA ERA: THE SYMPOSIUM HIGHLIGHTS

*by Olga Bayandina (INAF, Italy; JIVE, the Netherlands), George Heald (CSIRO, Australia), Tiziana Venturi (INAF, Italy), Tao An (SHAO, China), and SKA-VLBI SOC*


*Figure 1: Gather Town SKA-VLBI 2022 conference picture. Credit: SKA-VLBI TOC*

On 14 February 2022, we fell in love with the prospects and planned capabilities of VLBI observations with the SKA arrays as the symposium "VLBI in the SKA Era" kicked off.

To accommodate both a large number of participants from all over the world and ongoing COVID restrictions, the meeting was held in an online format. The event platform Whova provided a wide range of opportunities for successful presentations, discussions, and interactions during the conference. The topic of the event ignited a great interest in the scientific community and attracted more than 400 participants from around 40 countries. The event could be tracked on social media

using the hashtag #SKAVLBI2022.

The conference agenda was split into 'morning' and 'evening' sessions to provide opportunity for attendees from different time zones to watch talks in real time. Nevertheless, since the placement of the sessions could not suit everyone, recordings of all the talks were available directly on the conference platform, almost immediately after each conference day.

Around 80 talks were presented in 9 scientific sessions. Much attention was given to gender balance in the selection of invited and contributed talks. Invited speakers were around 50/50 in gender balance; the overall speaker list had better gender balance than the full participant list. A broad set of topics was covered in 5 days of the conference, such as, for example, geodesy and astrometry, AGN, spectral line, transients. The invited speakers presented an overview of the technical and scientific aspects of the operation of the currently functioning VLBI facilities as well as the outlined perspectives of the cooperation of the SKA telescopes with the global VLBI networks.

To take into account the expertise held within the broad audience of the conference, 9 discussion sessions were organised. The discussions focused on a set of topics from technical issues like RFI and astrometric calibration to broader themes like SKA-VLBI requirements and the Global VLBI Alliance.

Another attempt to compensate for the lack of face-to-face interactions during the online conference was made during the poster sessions which were held in Gather Town. The intense programmes of the conference succeeded in accommodating most of the submitted contributions in the oral format, however some of the contributions were delivered in the form of poster presentations. The best poster prize was awarded to a JIVE Support Scientist Benito Marcote.

The outcomes of the conference will be summarised in a paper, which will serve as a basis for future actions towards the integration of VLBI as SKA observing mode. The conference's SOC is currently working on the white paper. Among the topics that will be addressed in this paper are the following: SKA-VLBI requirements, SKA-VLBI data chain and products, software developments and data reduction packages. The outcome of the very lively discussion concerning the VLBI requirements for the SKA Regional Centres will be reported, as well as the preliminary issues raised concerning the SKA operations and integration with the other arrays.

The roadmap leading to SKA-VLBI operations includes several milestones, and it is exciting to see that the community is enthusiastic and ready to face this challenging adventure.

# ERIS 2022

*by John Mckean (ASTRON, the Netherlands)*

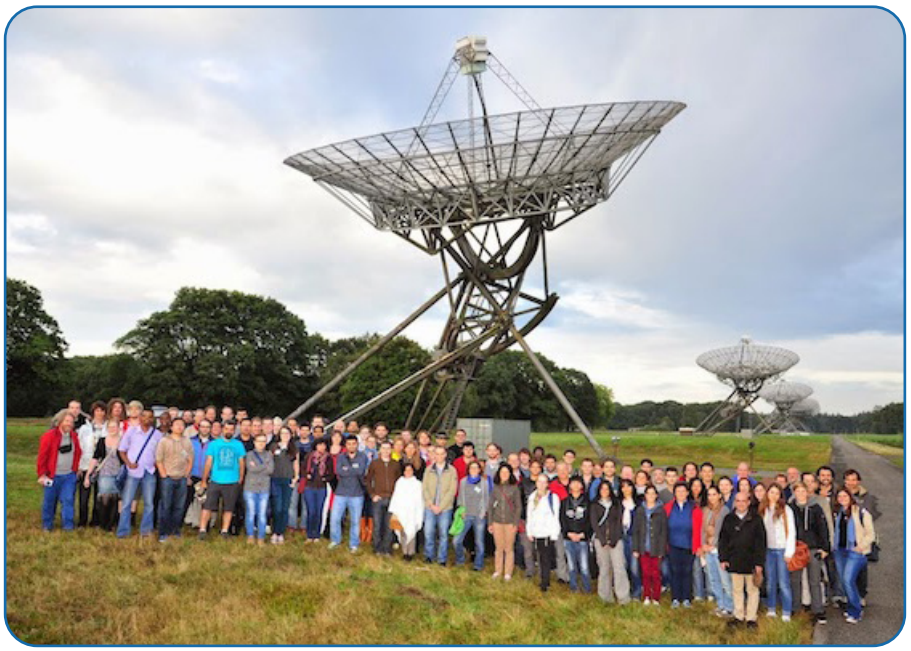


*Figure 1: Group Picture ERIS 2013 School organised in Dwingeloo, the Netherlands.*

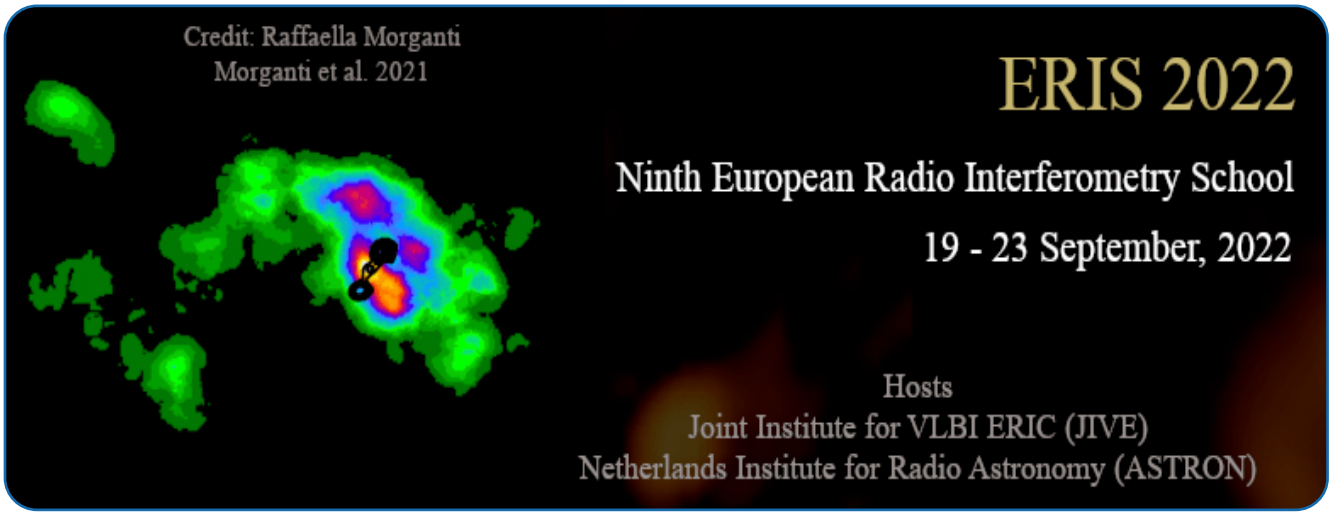
This September sees the return of the European Radio Interferometry School (ERIS), which is the flagship training activity for new users within the RadioNet community. ERIS aims to provide a foundation course in the theory of radio interferometry at m to mm-wavelengths, while also giving advanced lectures on the techniques associated with our RadioNet facilities (ALMA, e-MERLIN, EVN, LOFAR and NOEMA). A key component of the school is the hands-on practical tutorials that give the students direct experience in the reduction and the analysis of interferometric data. The school will be organised by JIVE and ASTRON in Dwingeloo (the Netherlands), and is held from 19 to 23 September 2022.

ERIS 2022 is the 9th edition of the school, which was first held in Manchester (UK) in 2005, and has so far trained over five hundred budding radio astronomers the skills they need to analyse the data for their research projects. Over the last (almost) two decades, ERIS has evolved from a mainly EVN-centric school to include all of the major astronomical facilities within Europe (and beyond). This has seen the change from relatively simple datasets, to complex wide-band observations over a large parameter-space of angular resolution and sensitivity. In addition, the school has seen the evolution in data analysis techniques and has now fully moved from AIPS to CASA-based data reduction. The continuing evolution of ERIS has made it one of the premier interferometric schools world-wide and is now typically attended by over 100 participants every two years. Finally, ERIS has also provided an important stage for training the next generation of teachers and tutors that pass on their experience and knowledge to the school attendees.

The latest edition will be the first of two schools to be organised as part of the

Opticon-RadioNet Pilot (ORP) project, where we expect to also welcome many colleagues from the optical and infrared astronomical community. It will also be held in-person so that the attendees can directly interact with their peers, and discuss their particular data-analysis needs with the tutors.

The registration is now open, and further details can be found at the [ERIS 2022 website].



# NEWS FROM ORP

*Hélène Dworak, Jean-Gabriel Cuby, CNRS/LAM, France*

*Figure 1: Artist's impression of a magnetar in a cluster of ancient stars (in red) close to the spiral galaxy Messier 81 (M81). Credit: Daniëlle Futselaar/ASTRON*

OPTICON RadioNet Pilot (ORP) is one of the European Commission's transnational access 'pilot' programs under EC H2020, launched in March 2021. This four-year project brings together 37 institutions to support and develop seamless access to radio and optical facilities. A new Scientific Coordinator, Stephane Basa was appointed by the Board on 28 March 2022, follwoing CNRS's proposal, responding to the nomination of Jean-Gabriel Cuby as Executive Director of the CFHT. Through various processes, ORP brings together radio and optical astronomers to create a stronger community to better exploit the opportunities of multi-wavelength science and to benefit from each other's expertise.

To realise these ambitions, a process of coordinated community involvement at the strategic level is taking place within the project. For example, the first ORP Telescope Directors' Forum took place on 1-2 December 2021 in Paris (France) as a hybrid meeting. This forum, traditional in the OPTICON programmes, was attended by over 50 participants from both the optical and radio communities. It provided a stimulating platform for discussion and collaboration, to present and raise awareness of the main radio and optical infrastructures that are part of ORP, and to discuss issues relevant to the development and implementation of ORP's mission and strategy.

The ORP is providing a coordinated platform to address the key challenges of our communities, such as protecting Dark and Quiet Skies for future astronomical observations. In just the last two months, four meetings have taken place bringing together policy and technical experts. The ORP is creating material to inform and complement the advocacy and

lobbying in response to the external threats posed by mega-constellations of satellites. Through its policy-oriented forum and technical activities, led by Michael Kramer (MPIfR), ORP will contribute to the IAU Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference.

Providing Transnational and Virtual Access to observatories and nodes around the world is the main action of ORP. For the optical and infrared telescopes and networks of telescopes, a Common Time Allocation Committee (CTAC) allocates the time across infrastructures based on scientific merit. Since the project began, 504.6 nights were granted to 55 PIs applications. The fourth CTAC meeting for 2022B will be organised on 25-26 April 2022. Moreover, virtual access to a network of small telescopes is continuously provided through a dedicated tool, dubbed BHTOM, maintained by the University of Warsaw (Poland). It enables the scientists to request and collect long-term time-domain observations of their targets of interest, e.g. alerts from the ESA's Gaia space mission. The multi-wavelength extension of BHTOM is currently under construction in collaboration between Universities of Warsaw, Torun and JIVE.

The ORP portfolio of radio infrastructures consists of four arrays (among them European VLBI Network), the four world-class single dish telescopes , the European ARC nodes, and virtual access to the archives of LOFAR and WSRT. Since March 2021, a total of 3,616.5 observing hours have been provided for 89 projects and additionally 7 ALMA projects have been supported by ARCs.

Through the ORP program, astronomers can also benefit from recent technical developments of the participating infrastructures. For example, in January 2022, the Northern Extended Millimetre Array (NOEMA) operated by IRAM reached its full sensitivity with the commissioning of its 12th antenna. In addition, the Yebes Observatory has recently completed the design, implementation and installation of a new broadband receiver for its 40-m diameter radio telescope. The receiver is sensitive in the 4.5 to 9 GHz frequency range, and replaces two older, frequency-limited receivers in C-band (5 and 6 GHz) and X-band (8 GHz), allowing simultaneous observation in these two bands and in additional, previously unavailable frequencies.

State-of-the art equipment such as these allow astronomers at an international level to contribute to scientific excellence and discoveries. The time allocated by ORP to EVN and Effelsberg telescopes enabled the publication of the article "A repeating fast radio burst source in a globular cluster" by F. Kirsten, B. Marcote, K. Nimmo and al. in Nature, as well as the article "Burst timescales and luminosities as links between young pulsars and fast radio bursts" also by K. Nimmo, F. Kirsten, with J.W.T. Hessels and al. in Nature Astronomy.

In parallel, ORP is leading the adoption of a set of common principles and tools to enable all scientists and researchers to have simplified and improved access to ORP facilities. Following several meetings on common standards and a data model, and an audit of available Proposal Submission tools (PST), the work package led by Paul Harrison (UNIMAN) is focusing on Northstar as the baseline for a common tool where modern features may be incorporated. This will be defined though a widened audit and a review involving multi-facility involvement. Via an open architecture model from the start, and engagement with radio and optical ORP facilities, PC members and potential users, it is envisaged that the common standards and data model will be adopted across multiple ORP facilities and wider adoption of common standards beyond ORP is also a possibility (e.g. SKA).

ORP also contributes to improving key infrastructure services through targeted

technical developments. Two workshops on Adaptive Optics (AO) were organised in December 2021 and January 2022, one on the Wave-Front Sensor 2021 (WFS2021) to share and discuss the latest advancements in WFS technologies and applications, and the other on AO Telemetry Standard, where the first implementation developed by the University of Porto was presented to different users. Deployment of the method to specific AO instruments will be tested in the coming months. On the Very Large Telescope Interferometer (VLTI) side, one of the three joint research activities planned to support the integration of new observing modes has started in February 2022 at KU Leuven (Belgium) and a big community-wide ORP-supported meeting is planned in Exeter (UK) at the end of April 2022.
Training events are also being scheduled for users in the radio and optical fields. John McKean (ASTRON) and Heidi Korhonen (ESO), leaders of the radio and optical trainings respectively, developed a common registration form and satisfactory survey to be used for all ORP funded schools, to monitor the training quality and impact.

The ORP IRAM 30m School took place on 15-19, and 22-23 November 2021, the online event welcomed 167 students. The school combined topics on (sub)millimetre astronomy with technical lectures on instrumentation, observing techniques, and data processing and, very importantly, with observations carried out at the 30m telescope. Moreover, the 9th European Radio Interferometry School (ERIS 2022) will be hosted by JIVE and ASTRON in Dwingeloo (the Netherlands) on 19-23 September 2022. Registration for the school is open until 15 May 2022 .

For more information, please visit the ORP website, follow us on Twitter and subscribe to the ORP newsletter to be informed of the development.

# CYCLE-14 E-MERLIN CALL FOR PROPOSALS

e-MERLIN requests proposals from the international astronomical community for observations to be made during Cycle-14. Deadline for proposal submission: 18 May 2022 13:59:59 UT.

e-MERLIN is open to all users with projects allocated solely on the basis of scientific merit and technical feasibility. Additionally, e-MERLIN is one of the participating infrastructures in the Horizon 2020 OPTICON-RadioNet PILOT project. This programme will provide facility access and financial support for users from eligible projects in Cycle-14.

See the full call information here.

# UPCOMING MEETINGS

- **18th NRAO Synthesis Imaging Workshop**, Online - 18-25 May 2022;
- **3rd URSI Atlantic Radio Science Meeting**, Gran Canaria, Spain & Online - 30 May - 4 June 2022;
- **LOFAR Famility Meeting 2022**, Cologne, Germany - 13-17 June 2022;
- **EAS 2022**, Valencia, Spain - 27 June - 2 July 2022;
- **2022 EVN Symposium**, Cork, Ireland & Online - 11-15 July 2022;
- **PARI 2022**, Manchester, UK & Online - 18-20 July 2022;
- **XXXI IAU General Assembly**, Busan, Republic of Korea & Online - 2-11 August 2022;
- **European Radio Interferometry School (ERIS 2022)**, Dwingeloo, The Netherlands - 19-23 September 2022

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