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1 Introduction

The WP2.1 Science Dissemination focuses on supporting organisation of scientific meetings, in the form of large conferences, topic-oriented smaller meetings and informal very small workshops/discussion forums. Most of the events focus on scientific results achieved using the RadioNet facilities and/or technical developments of RadioNet activities. Additionally cross-disciplinary events are supported, with the aim to feed the collaboration between radio astronomers and scientists working in other bands of the electromagnetic spectrum. This disseminates the knowledge acquired in our field to the broader astronomical community and at the same time broadens the scientific horizon of radio astronomers.

2 Summary of the meeting

The 14th European VLBI Network (EVN) Symposium and Users Meeting (<http://evnsymp2018.iaa.es/>) was hosted by the Instituto de Astrofísica de Andalucía-CSIC (IAA-CSIC) in Granada (Spain) on behalf of the EVN Consortium Board of Directors (CBD).

The meeting took place on October 8-11, 2018 at the main auditorium of the Parque de las Ciencias of Granada, Spain, the science museum of the city.

Topics discussed included:

- Powerful AGN science
- Starburst galaxies, extragalactic masers, and supernovae
- Stellar evolution and stellar masers
- Transient sources and pulsars
- Astrometric, geodetic & space applications
- VLBI technology developments
- Users feedback
- Current and future VLBI facilities and international cooperation

Moreover, the meeting also focused on the role of EVN on:

- Very-high sensitivity VLBI with SKA
- Future multi-wavelength and multi-messenger astronomy including high angular-resolution astronomy at other wavelengths

There were 171 registered participants, with more than 80 oral presentations (and a lot of pressure to obtain time for such contributed talks) that were distributed in 11 sessions, of which four of them had to be organized in parallel sessions (AGN/Stellar Evolution) for the first time in an EVN Symposium. Almost 80 posters were also presented during the Symposium.

Finally, as a parallel activity of the EVN Symposium, a Common Astronomy Software Applications (CASA) VLBI tutorial with over 80 participants was organized by JIVE for the late afternoon of October 11th, 2018 on the premises of the IAA-CSIC.

2.1 The programme

The program of the meeting is given below with links to the abstracts of the presentations.

Sunday, October 7, 2019

20:00 Early registration

Monday, October 8, 2019

08:00 Registration opens

09:00 Opening by President of CSIC, Directors of IAA-CSIC and OAN-IGN, and Chair of EVN CBD at Auditorium

Stellar Evolution Session 1 (Chair: F. Colomer) at Auditorium

09:30 "[Studies of stellar evolution using masers](#)", A. Bartkiewicz, Nicolaus Copernicus University, PL (Review)

10:00 "[Revealing magnetic fields towards massive protostars: a multi-wavelength approach using masers and dust](#)", D. Dall'Olio, Chalmers University, SE

10:15 "[Magnetic field measurements around massive young stellar objects with the EVN](#)", G. Surcis, INAF-Osservatorio Astronomico di Cagliari, IT

10:30 "[KaVA Large Proposal for High-Mass Star-Formation StudiesJPwith Multiple Masers](#)", T. Hirota, National Astronomical Observatory of Japan, Japan

10:45 "[High-mass star formation expored with maser VLBI & thermal \(ALMA, JVLA\) observations](#)", L. Moscadelli, INAF - Osservatorio di Arcetri, IT

11:00 Coffee break

AGN Session 1 (Chair: D. Gabuzda) at Auditorium

11:30 "The sharpest view of blazar jets through space and mm-VLBI observations", J.L. Gómez, Instituto de Astrofísica de Andalucía-CSIC, ES (Review)

12:00 "[Does Cygnus A harbor a binary black hole?](#)", U. Bach, Max-Planck-Institut für Radioastronomie, DE

12:15 "[Moving cores in MOJAVE sample](#)", M. Lisakov, Max-Planck-Institut für Radioastronomie, DE

12:30 "[RadioAstron survey completed: AGN cores at unprecedented angular resolution](#)", Y. Kovalev, Lebedev Physical Institute, RU

12:45 "[Zooming in the jet formation site in AGN with RadioAstron](#)", T. Savolainen, Aalto University, FI

13:00 "[Radioastron observations of the jet launch region in 3C84](#)", G. Giovannini, IRA/INAF and Bologna University, IT

13:15 "[Innermost region of the blazar S5 0716714 from RadioAstron polarimetric observations at 22 GHz](#)", E. Kravchenko, INAF Instituto di Radioastronomia, IT

13:30 Lunch break

Fast Transients, Neutron Stars & Pulsars (Chair: J. Moldon) at Auditorium

15:00 "[The localization of a repeating Fast Radio Burst](#)", B. Marcote, JIVE, NL (Review)

15:30 "[Recent VLBI Results on SN 1986J and the Possibility of FRBs Originating from Inside the Expanding Ejecta of Supernovae](#)", M. Bietenholz, Hartebeesthoek / SARAO, ZA

15:45 "[Unravelling pulsar scattering through VLBI](#)", D. Simard, University of Toronto, CA

16:00 "[Observing pulsars with ALMA: an unprecedented opportunity to explore the millimetre wavelength regime of pulsar emission](#)", P. Torné, Instituto de Radioastronomía Milimétrica, ES

- 16:15 ["Imaging pulsar echoes at low frequencies"](#), O. Wucknitz, Max-Planck-Institut für Radioastronomie, DE
- 16:30 ["Pulsar scintillometry on the Vela pulsar with the LBA"](#), F. Kirsten, Chalmers University of Technology, SE
- 16:45 Coffee break
- 17:30 EVN Users Meeting, Chair: A. Polatidis (EVN PC Chair)
 "Welcome and updates from the EVN Program committee", A. Polatidis
 "EVN User Support provided by JIVE", Z. Paragi
 "Updates from the JIVE Correlator", B. Campbell,
 "Answer to questions from the community", EVN officers and personnel from JIVE (moderator A. Polatidis)
- Social Activities
- 19:30 EVN Symposium Football match at [Complejo Deportivo Núñez Blanca](#).

Tuesday, October 9, 2018

Starbursts, Low Luminosity AGN and Survey (Chair: A. Alberdi) at Auditorium

- 09:00 ["Continuum Observations of Starburst Galaxies"](#), J. Conway, Chalmers University of Technology, SE (Review)
- 09:30 ["Star-formation and accretion in the local Universe - LeMMING's an e-MERLIN survey"](#), R. Beswick, University of Manchester, UK
- 09:45 ["EVN imaging of the obscured nuclei of the LIRGI galaxies"](#), N. Ramírez-Olivencia, Instituto de Astrofísica de Andalucía-CSIC, ES
- 10:00 ["Searching for intermediate-mass black holes in NGC3310"](#), M. Argo, University of Central Lancashire, UK
- 10:15 ["Studying galaxy evolution through cosmic time via the \$\mu\$ Jy radio population: early results from eMERGE DR1"](#), T. Muxlow, University of Manchester, UK
- 10:30 ["Extragalactic wide-field surveys using the European VLBI Network"](#), P. Barthel, Kapteyn Institute, Univ. of Groningen, NL
- 10:45 ["SETI searches with the EVN"](#), M. Garrett, University of Manchester, UK
- 11:00 Coffee break

AGN Session 2 (Parallel) (Chair: S. Frey) at Auditorium

Stellar Evolution Session 2 (Parallel) (Chair: A. Bartkiewicz) at Faraday Room

11:30	"Extreme physics at extreme baselines" , A. Lobanov, , Max-Planck-Institut für Radioastronomie, DE	"Multiepoch observation of periodic methanol maser in G107.2985.63" , M. Olech, Nicolaus Copernicus University, PL
11:45	"Polarimetric millimeter VLBI observations of 3C 84" , J.-Y. Kim, Max-Planck-Institut für Radioastronomie, DE	"Parallaxes and proper motions of star-forming regions in the Sagittarius spiral arm" , K. Rygl, INAF-IRA, IT
12:00	"Tracing AGN feedback in powerful radio galaxies with VLBI" , R. Schulz, ASTRON, NL	"A study of the physical environments of evolved stars from the SiO and H₂O masers" , Y. Yun, Korea Astronomy and Space Science Institute, KR
12:15	"VLBI and the faint radio AGN population" , N. Herrera-Ruiz, Ruhr University Bochum, DE	"NGC6334I - Tracing the Gas Motion During A Contemporaneous Maser Flare Event" , J. Chibueze, SARA0/African VLBI Network, ZA
12:30	"Three little radio galaxies in the early Universe" , K. Gabanyi, MTA-ELTE Extragalactic Astrophysics Research Group, HU	"Measuring Magnetic Fields from Water Masers in the Synchrotron Protostellar Jet in W3(H₂O)" , C. Goddi, Radboud University Nijmegen, NL

12:45	"Multi-frequency studies of the jet in the high-redshift quasar S5 0836+710" , L. Vega-García, Max-Planck-Institut für Radioastronomie, DE	"COBRaS: The e-MERLIN 21cm Legacy Survey of Cygnus OB2" , D. Fenech, University of Cambridge, UK
13:00	"Gravitational lensing at milliarcsecond resolution with global VLBI observations" , C. Spingola, Kapteyn Astronomical Institute / ASTRON, NL	"Investigating Black hole formation using VLBI" , P. Atri, International Centre for Radio Astronomy Research, IN
13:15	"Insights into galaxy evolution with strong gravitational lensing" , H. Stacey, Kapteyn Astronomical Institute / ASTRON, NL	
13:45	Lunch break	
Multi-Messenger and Multi-Wavelength (Chair: Z. Paragi) at Auditorium		
15:00	"Multi messenger astronomy", M. Branchesi, Gran Sasso Science Institute/INFN-LNGS, IT (Review)	
15:30	"The Synergy between VLBI and Gaia astrometry" , H. van Langevelde, JIVE/Leiden, NL	
15:45	"The radio view of Gravitational waves counterparts: GW/GRB170817" , G. Ghirlanda, INAF-Osservatorio Astronomico di Brera, IT	
16:00	"A dust-enshrouded tidal disruption event with a resolved radio jet in a galaxy merger" , M. Perez-Torres, Instituto de Astrofísica de Andalucía-CSIC, ES	
16:15	"Synergies between VLBI and high-resolution IR/optical interferometry" , J. C. Guirado, University of Valencia, ES (Review)	
16:45	"Synergies between CTA and VLBI" , M. Orienti, INAF-IRA Bologna, IT (Review)	
17:15	Coffee break	
17:45	EVN Vision Discussion, T. Venturi, INAF, INAF-IRA Bologna, IT	
21:00	Night visit to the Alhambra Nazari Palaces .	

Wednesday, October 10, 2019

09:00	"Precise Astrometry today and tomorrow, with Next-generation Observatories" , M. Rioja, ICRAR/CSIRO (AU); OAN (ES) (Review, Plenary) at Auditorium	
	AGN Session 3 (Parallel) (Chair: B. W. Sohn) at Auditorium	Astrometry (Parallel) (Chair: P. Charlot) at Faraday Room
09:30	"Evolution of AGN jets from multi-epoch core-shift studies" , A. Plavin, Astro Space Center, RU	"Where are you, Scutum? Tracking down a spiral arm with maser astrometry" , K. Immer, JIVE, NL
09:45	"Exploring the non-linear motion of the parsec-scale jet of FSRQ 1633382" , H. Ro, Yonsei University / Korea Astronomy and Space Science Institute, KR	"Sensing the astrophysical influence within VLBI astrometric measurements of extragalactic radio-sources" , C. Gattano, Laboratoire d'Astrophysique de Bordeaux, FR
10:00	"Gamma-ray emission in radio galaxies under the VLBI scope" , R. Angioni, Max-Planck-Institut für Radioastronomie, DE	"Einstein Equivalence Principle test with RadioAstron: preliminary results" , D. Litvinov, SAI and ASC LPI, RU
10:15	"Resolving the Radio-Loudest Quasar known to date at z~6" , E. Momjian, National Radio Astronomy Observatory, USA	"Tying multiple Radio Wavelength Celestial Frames to the Gaia Optical Frame" , C. Jacobs, JPL, USA
10:30	"Asymmetric jet production in NGC1052" , A.-K. Baczko, Max-Planck-Institut für Radioastronomie, DE	"Progress update of the VGOS radio telescope at Metsähovi Gedodetic Research Station" , G. Molera Calvés, Finnish Geospatial Research Institute, FI

10:45	"Substantial winds from the accreting supermassive black hole in M87 revealed by Faraday rotation observations" , J. Park, Seoul National University, KR	"VLBI and Doppler tracking of spacecraft for planetary atmospheric studies" , T. Bocanegra, TUDelft/JIVE, NL
11:00	Coffee break <i>AGN Session 4 (Parallel) (Chair: S. Pushkare) at Auditorium</i>	<i>Stellar Evolution Session 3 (Parallel) (Chair: M. Lindqvist) at Faraday Room</i>
11:30	"What the iMOGABA tells us about Gamma-ray bright AGNs" , S.S. Lee, Korea Astronomy and Space Science Institute, KR	"Jets from massive protostars: clues on their role in the formation process from masers and high resolution radio / NIR imaging" , F. Bacciotti, INAF - Osservatorio Astrofisico di Arcetri, IT
11:45	"Toroidal magnetic fields and associated currents in AGN jets on kiloparsec scales" , S. Knuettel, University College Cork, IR	"Detailed SiO proper motion analysis: slow net expansion and a small correlation with the magnetic field" , A. Richards, University of Manchester, UK
12:00	"Double nuclear structure discovered in 3C84" , J. Oh, Seoul National University, KR	"Studies of galactic masers in RadioAstron space VLBI mission" , A. Sobolev, Ural Federal University, RU
12:15	"Radio structures in radio-quiet quasars with extremely powerful X-ray outflows" , J. Yang, Onsala Space Observatory, SE	"Short-lived episodic outflow in a water fountain star" , R. Burns, JIVE, NL
12:30	"Global Millimeter VLBI Array Survey of Ultracompact Extragalactic Radio Sources at 86 GHz" , D.G. Nair, Max-Planck-Institut für Radioastronomie, DE	"3D Models of Maser Flares" , M. Gray, University of Manchester, UK
12:45	"Parameter study of a semi-analytical relativistic MHD jet model in comparison with recent VLBI observations" , C. Ceccobello, Chalmers Institute of Technology, SE	"Resolving discrepancy in the pPN OH231" , J.-F. Desmurs, Observatorio Astronómico Nacional, ES
13:00	"Use of VLBI/Gaia position offsets for AGN physics" , Y. Kovalev, Lebedev Physical Institute, RU	"Multi-epoch VLBI of a double maser super-burst" , R. Burns, JIVE, NL
13:15	"Expanding VLBI in East Asia and AGN science" , K. Hada, Mizusawa VLBI Observatory, NAOJ, JP	"Radio emission in ultracool dwarfs: the nearby triple system VHS 1256 – 1257" , J. Climent, Universidad de Valencia, ES
13:30	Lunch break	
13:30	Visit to IRAM 30m Telescope	
18:30	Public talk: "Agujeros negros: los límites del espacio y el tiempo", E. Ros (conference venue, in Spanish)	
20:30	Conference dinner at Palacio de Santa Paula .	

Thursday, October 11, 2019

EHT and new VLBI Developments (Chair: B. Campbell) at Auditorium

09:00	"Imaging Black Holes" , H. Falcke, Radboud University, NL(Review)
09:30	"Probabilistic fringe-fitting and source model comparison" , I. Natarajan, Rhodes University, ZA
09:45	"CASA on the fringe" , I. van Bemmelen, JIVE, NL
10:00	"RPICARD: A CASA-based Calibration Pipeline for VLBI Data" , M. Janssen, Radboud University, NL
10:15	"BRAND - the next generation receiver for VLBI" , W. Alef, Max-Planck-Institut für Radioastronomie, DE

- 10:30 ["A development of compact triple band receiver for millimeter-wave radio astronomy"](#), S.-T. Han, Korea Astronomy and Space Science Institute, KR
- 10:45 ["Comparing remote atomic clocks via VLBI networks and fiber optic links: the LIFT/MetGeSp perspective"](#), R. Ricci, INAF-IRA, IT
- 11:00 Coffee break
- High Sensitivity VLBI with SKA and other VLBI Arrays (Chair: P. de Vicente) at Auditorium**
- 11:30 ["The science impact of high sensitivity VLBI with SKA"](#), C. García-Miró, SKA Organisation, UK (Review)
- 12:00 ["SKA-VLBI Key Science Programmes"](#), Z. Paragi, JIVE, NL
- 12:15 ["Investigations on MultiView VLBI for SKA"](#), R. Dodson, ICRAR/UWA, AU
- 12:30 ["Activities of VERA and East Asian VLBI network"](#), H. Kobayashi, National Astronomical Observatory of Japan, JP
- 12:45 ["Status of the Very Long Baseline Array"](#), W. Brisken, National Radio Astronomy Observatory, USA
- 13:00 EVN Symposium 2018 Summary, T. Venturi, INAF-IRA, IT; and H. J. van Langevelde, JIVE/Leiden, NL
- 13:30 Lunch
- 15:30 [CASA-VLBI tutorial](#) organized by JIVE.

3 Participants

Among the participants there were 171 attendees from 25 countries inside and outside Europe (see Fig. 1), of which a significant fraction were young researchers and students, 21% of participants were women. The full list of the participants is at the event page: <http://evnsymp2018.iaa.es/content/list-fully-registered-participants>

There were 12 invited reviewers, of which 6 requested RadioNet funding support. The conference picture is shown in Fig. 2.

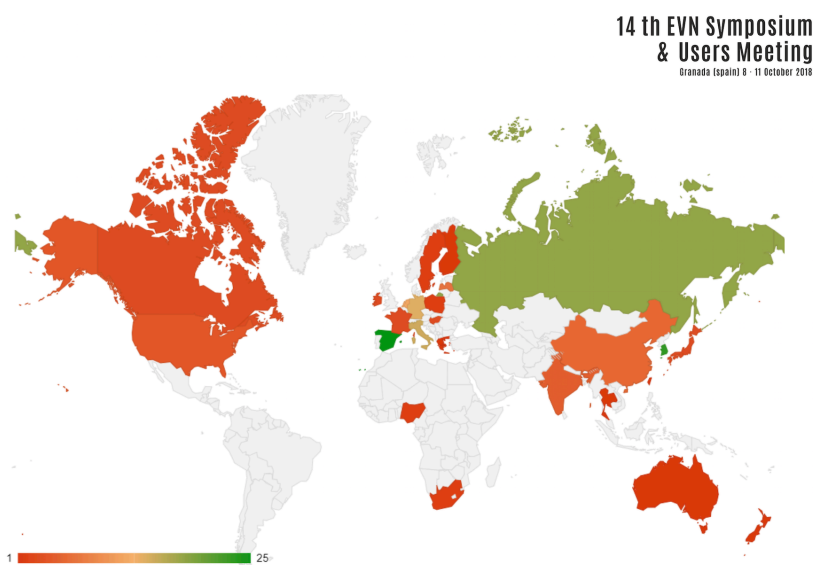


Figure 1. Map of participation at the EVN Symposium 2018 by countries.



Figure 2. Conference group picture.

4 Impact

This biennial meeting has a relevant impact on the RadioNet community, of which the EVN community represents a large fraction of it. The EVN Symposium is the main forum for discussion of the latest VLBI scientific results and technical and technological developments within the EVN member countries. This makes the European VLBI Network an actively evolving consortium and adds the current capability to lead relevant state-of-the-art scientific and technological projects like those presented during the meeting (see below). At this 14th EVN Symposium there was also a chance for user input into the future Science Vision for the EVN.

Scientific highlights presented during the meeting included e.g.:

- a) New ideas about the structure of the innermost relativistic jets in active galactic nuclei that are unveiled by space VLBI involving the EVN (as well as short millimeter VLBI).
- b) The relevant role of VLBI in disentangling star formation and AGN activity in future large AGN surveys with high sensitivity instruments (e.g. as SKA), and in covering the redshift space.
- c) The role of VLBI in inferring information on the circumnuclear environment of galaxies and AGN.
- d) The prominence of new synergies and multi-wavelength projects beyond multimessenger science reflected by a large fraction of VLBI projects that involve other facilities than VLBI and studies closely related to results in other bands, like e.g. the electromagnetic counterparts of gravitational waves, or cosmological studies.
- e) The potential of near future wide field VLBI programs both for extragalactic population studies and to detect potential extraterrestrial artificial signals in SETI-like projects.
- f) The plans for new and enhanced VLBI arrays, e.g. in East Asia. This will be of significant importance for the EVN and thus the RadioNet users.
- g) The current status of the Event Horizon Telescope and its potential for impressive new results on the supermassive black hole at the center of our Galaxy and other AGNs.

- h) The plans for ultra-sensitive VLBI with SKA, again very important for the EVN and the RadioNet users.
- i) The latest advances on VLBI spacecraft tracking and space VLBI results with RadioAstron.
- j) Recent results on the location and kinematics of spiral arms on the Milky Way, and measurements of magnetic fields in young stellar objects and proto-stars.

5 RadioNet contribution

The total amount of support offered by RadioNet was 10000€, of which 4900€ was used to support 17 participants of which 7 were female, and 3000€ was used to support the expenses of the local organisers: conference room and areas at the conference venue.

6 Publications

The proceedings of the 14th EVN Symposium and Users Meeting can be found here: <https://pos.sissa.it/344>. The organizers has take good care to insert the acknowledgement of the RadioNet support. The presentations from the Symposium are also available on the meeting web page: <http://evnsymp2018.iaa.es/content/program>

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