European VLBI Network Newsletter

Number 32

May 2012

Contents

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1) Message from the EVN chairman

Dear Colleagues,

The EVN Consortium Directors met in Bonn a couple of weeks ago and it was a pleasure to welcome Alexander Ipatov, responsible for the Kvazar network. Magda Kunert-Bajraszewska represented the Torun Radio Astronomy Observatory and Ming Zhang represented Xinjiang Astronomical Observatory at Urumqi.

We were very pleased to see reports on the first fringes from the 32-m telescope at Ventspils - congratulations to Ivar Shmelds and the team at Irbene. And it was great to hear that the repair of the azimuth track and drive at Noto has been completed, bringing the telescope back into action, after the damage which occurred in 2010. Details on the re-commissioning observations are included below.

Yuri Kovalev gave an update on RadioAstron and again, congratulations to the RadioAstron team on achieving first fringes. Although the EVN has no formal MoU with the RadioAstron project, we are looking at how observations with the EVN and RadioAstron could best be supported. We also saw the first VLBI fringes between e-MERLIN telescopes via the e-MERLIN correlator and we have planned, at least on a best-efforts basis, to offer recording at least one e-MERLIN telescope at up to 512 Mb/s for simultaneous e-MERLIN and EVN observations in session 3 this year. The 32-m Cambridge telescope also came back on-line after a complete replacement of the drive system.

It was also very pleasing to see some of the results of the fringes tests with multiple telescopes using the new DBBC digital backends developed by colleagues at IRA and MPIfR. The beautifully flat pass-bands, with linear phase slopes across the entire band are shown below.

The JIVE Review was carried out in March, by distinguished panel led by Prof Malcolm Longair (Cambridge). EVN Users and officers gave some excellent presentations which really highlighted the scientific capabilities of the EVN and JIVE, and we can congratulate the JIVE Director, Huib van Langevelde and all his staff on receiving such a positive review, gaining almost a perfect score. The review panel was clearly impressed with capabilities of the EVN as well as the performance of JIVE and encouraged us all to raise awareness of the fantastic potential of the EVN among the international community.

The webpages for the 2012 EVN Symposium, which takes place in Bordeaux, starting on October has opened at http://evn2012.obs.u-bordeaux1.fr, and we look forward to seeing many of you there.

Simon Garrington

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2) Call for EVN Proposals

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European VLBI Network

Call for Proposals

Deadline 1st June 2012

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This call for proposals is also available on the web as text .

Observing proposals are invited for the EVN, a VLBI network of radio telescopes spread throughout Europe and beyond, operated by an international Consortium of institutes (http://www.evlbi.org/).

The observations may be conducted with disk recording (standard EVN or in real-time (e-VLBI).

The EVN facility is open to all astronomers. Use of the Network by astronomers not specialized in VLBI techniques is encouraged.

The Joint Institute for VLBI in Europe (JIVE) can provide support and advice on project preparation, scheduling, correlation and analysis. See EVN User Support at http://www.jive.nl

Future Standard EVN Observing Sessions (disk recording)

- 2012 Session 3 Oct 18 - Nov 08 18/21cm, 6cm ...
- 2013 Session 1 Feb 21 - Mar 14 18/21cm, 6cm ...

Proposals received by 1 June 2012 will be considered for scheduling in Session 3, 2012 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure.

Future e-EVN Observing Sessions (real-time correlation)

- 2012 Sep 17 - Sep 18 (start at 13 UTC) 18/21cm, 6cm, 5cm or 1.3cm
- 2012 Oct 09 - Oct 10 (start at 13 UTC) 18/21cm, 6cm, 5cm or 1.3cm
- 2012 Nov 13 - Nov 14 (start at 13 UTC) 18/21cm, 6cm, 5cm or 1.3cm

Please consult the e-EVN web page at http://www.evlbi.org/evlbi/e-vlbi_status.html to check for possible updates, and for the available array.

e-VLBI proposals submitted by the June 1st deadline will be considered for scheduling in the above sessions starting from Sep 2012. Note that only one wavelength will be run in each session, depending on proposal priorities.

See http://www.e-merlin.ac.uk/vlbi/evn_docs/guidelines.html for details concerning the e-VLBI observation classes and the observing modes.

Features for the next regular EVN and e-EVN sessions

* The antenna in Noto is under maintenance and it is expected to be available for EVN observations from Session 2, 2012.

* e-VLBI updates: e-VLBI is now available with Noto telescope at 512Mbps. Full 1Gbps e-VLBI data transmission is now possible from Medicina.

* The antennas at Shanghai and Urumqi are required for spacecraft tracking duties during Sep - Nov 2012. This may impact their availability for EVN operations in Session 3 2012.

* The VLBA antennas, which are used in Global proposals, are not available between GST 21:00 and 06:00 from Sep to Nov (All of Session 3 2012)

* From Session 3 2012, both Jb1 and Jb2 will be available for EVN recording, as will simultaneous EVN+e-MERLIN operations with home- station EVN recording. For simultaneous EVN+e-Merlin operations, VLBI data for Cm will be made available at up to 512Mbps on a best efforts basis. For updated information please consult the web at: http://www.e-merlin.ac.uk/vlbi/

* Please consult http://www.evlbi.org/evlbi/e-vlbi_status.html and the EVN User Guide for updates on the current EVN and e-EVN array; availability of different stations per observing band and for the dates of the e-EVN observing sessions.

Large EVN projects

Most proposals request 12-48hrs observing time. The EVN Program Committee (PC) also encourages larger projects (>48 hrs); these will be subject to more detailed scrutiny, and the EVN PC may, in some cases, attach conditions on the release of the data.

How to submit

All EVN, Global and e-VLBI proposals (except ToO proposals) must be submitted using the NorthStar on-line proposal submission tool. Global proposals will be forwarded to NRAO automatically and should not be submitted to NRAO separately. New proposers should register at http://proposal.jive.nl

The SCIENTIFIC JUSTIFICATION MUST BE LIMITED TO 2 PAGES in length. Up to 2 additional pages with diagrams may be included.

The deadline for submission is 23:59:59 UTC on 1 June 2012.

Additional information

Further information on Global VLBI, EVN+MERLIN and e-EVN observations, and guidelines for proposal submission are available at: http://www.e-merlin.ac.uk/vlbi/evn_docs/guidelines.html

The EVN User Guide describes the network and provides general information on its capabilities.

The current antenna capabilities can be found in the status tables. For the standard EVN see http://www.evlbi.org/user_guide/EVNstatus.txt. For the e-EVN array see http://www.evlbi.org/evlbi/e-vlbi_status.html.

The On-line VLBI catalogue lists sources observed by the EVN and Global VLBI.

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3) EVN Science Highlights

a) Multi-epoch EVN observations of Arp299-A

Arp299-A is a luminous infrared galaxies at a distance of 45 Mpc hosting recent and intense star-forming activity as indicated by the relatively high frequency of supernovae (SNe) discovered at optical and near-infrared (NIR) wavelengths in its outer, less extinguished, regions. The innermost 150 pc nuclear region of Arp299-A is so dusty that even NIR observations will miss a significant fraction of SNe. Only VLBI observations couple the necessary angular resolution and high sensitivity to detect new radio SNe, i.e. core-collapse SNe, allowing to measure the SN rate directly and indipendently of models.

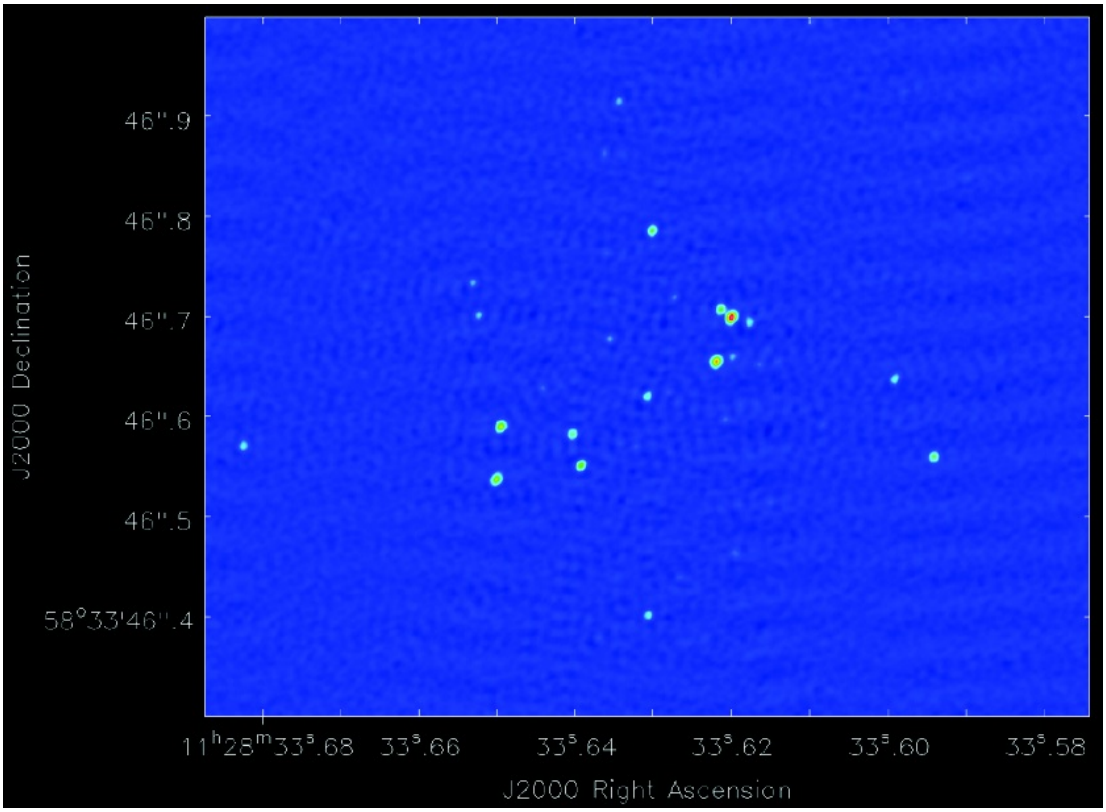

Fig.EVN image at 5 GHz of Arp299-A obtained by stacking all six epochs. The resolution is (10 x 8) mas. The peak is 907 microJy/beam and the 1-sigma sensitivity is 18.5 microJy/beam.

The EVN has been monitoring Arp299-A at 6 cm with one observation every 6 months since April 2008, and partial results have been published in Perez-Torres et al. (Letters to A&A, 2009; see also EVN Newsletter No. 25 - Jan 2010) and Perez-Torres et al. (Letters to A&A, 2010; see also EVN Newsletter No. 28 - Jan 2011). The outcome of the first 6 epochs of observations is illustrated in Figure 1, which shows the EVN image at 5 GHz of Arp299-A obtained stacking all six epochs, the deepest image ever of Arp 299-A at this frequency. The image has a resolution of (10 x 8 mas; i.e. 2.2 x 1.7 pc) and a 1-sigma sensitivity of 18.5 microJy/beam. Twenty-six compact sources are detected in a region of about (150 x 110) pc, eight of which are new objects. The radio luminosity, time variability behaviour and spectral index (derived using previous observations) of the compact objects are consistent with them being a mixed population of core-collapse SNe and supernova remnants (SNR). We find clear evidence

for at least two new CCSNe in less than two years, implying a lower limit to the CCSNe rate in the nuclear region of Arp 299-A of 0.80 SN/yr. This value is essentially the CCSN rate expected for the whole Arp 299-A galaxy, indicating that most of the SN activity is taking place in a very compact, nuclear starburst, as previously suggested by us. The monitoring of Arp 299-A using the e-EVN and the full EVN is currently underway and more spectacular results from this supernova factory are expected.

Authors: Marco Bondi (INAF-IRA), Miguel Perez-Torres (IAA-CSIC), Ruben Herrero-Illana (IAA-CSIC), Antonio Alberdi (IAA-CSIC)

Reference: Bondi et al. 2012, A & A, 539, 134.

b) Direct measurement of protostellar gas infall from the 3-D velocity field of methanol masers

VLBI studies of molecular masers provide an excellent tool to investigate the mass-accretion/ejection processes in high-mass star formation at small radii (10-1000 AU) from the protostars. In this work, we have reported a detailed study of the accretion and outflow structure around a protostar powering strong water and methanol masers in the high-mass star-forming region AFGL 5142 (D~1.8 kpc). In particular, 6.7 GHz Class II methanol masers were observed with the EVN at 3 epochs spanning six years, which provided us with the 3-D velocity field of circumstellar molecular gas with a resolution of ~0.005 arcseconds and at radii < 0.16 arcseconds (or 300 AU) from the protostar (Figure 1). The methanol maser data acquired with the EVN provided, for the first time, a direct measurement of infall of molecular material onto an intermediate- to high-mass protostar from the 3-D velocity field of the circumstellar gas.

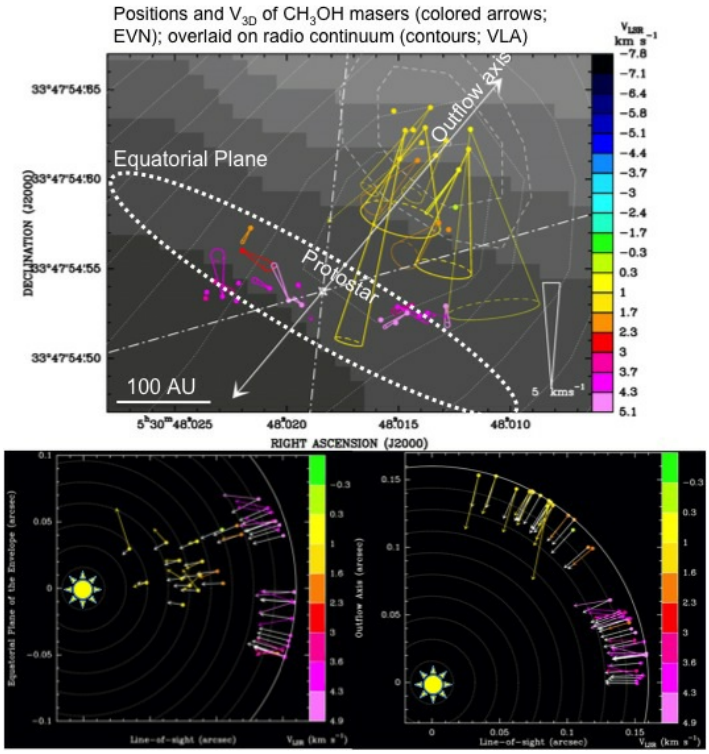

Fig. Gas infall from 3D velocities of methanol masers in AFGL 5142. Upper panel: The cones indicate orientation and uncertainties of measured proper motions and colors denote l.o.s. velocities. Contour maps show the 22 GHz (dotted line) and 8.4 GHz (dashed line) continuum emissions observed with the VLA. The long white arrow identifies the axis of a molecular outflow observed in water masers (the small-dashed lines indicate the opening angle), while the dashed ellipse represents the equatorial plane containing the protostar and perpendicular to the outflow. The red-shifted l.o.s. velocities and the orientation of the proper motions towards the protostar, provide the most direct evidence to date of gas infall in a (massive) protostar. Lower panel: Measured (color arrows) and best-fit model (black arrows) 3-D velocity vectors of methanol masers, projected onto the equatorial plane (left) and a plane containing the l.o.s. and the outflow axis (right), respectively. The modeled infalling envelope has a radius of 0.16 arcseconds or 290 AU and an infall velocity of 5 km/s. The dotted lines indicate concentric circles at steps of 10% of the radius around the protostar at the (0,0) position.

Authors: Ciriaco Goddi (ESO), Luca Moscadelli (INAF), Alberto Sanna (MPIfR)

Reference: Goddi, Moscadelli, Sanna 2011 A & A, 535L, 8

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c)e-MERLIN and VLBI observations of the luminous infrared galaxy IC883: a nuclear starburst and an AGN candidate revealed

IC883 is a luminous infrared galaxy (LIRG; L_FIR > 10^11 L_sun) in an advanced merger stage. We have used e-MERLIN at a median central frequency of 6.9GHz, and the e-EVN at 5GHz, to observe contemporaneously the circumnuclear and nuclear regions of this LIRG (see the IC883 contour images in Figure 1). An AGN candidate source dominates the radio emission at both circumnuclear and nuclear scales, and yet, IC883 displays very active star formation as indicated by the detection of nuclear radio SNe and SNe discovered by near-IR observations. This work has been recently accepted for publication in A&A (eprint arXiv:1205.2257) and represents the first publication based on e-MERLIN observations.

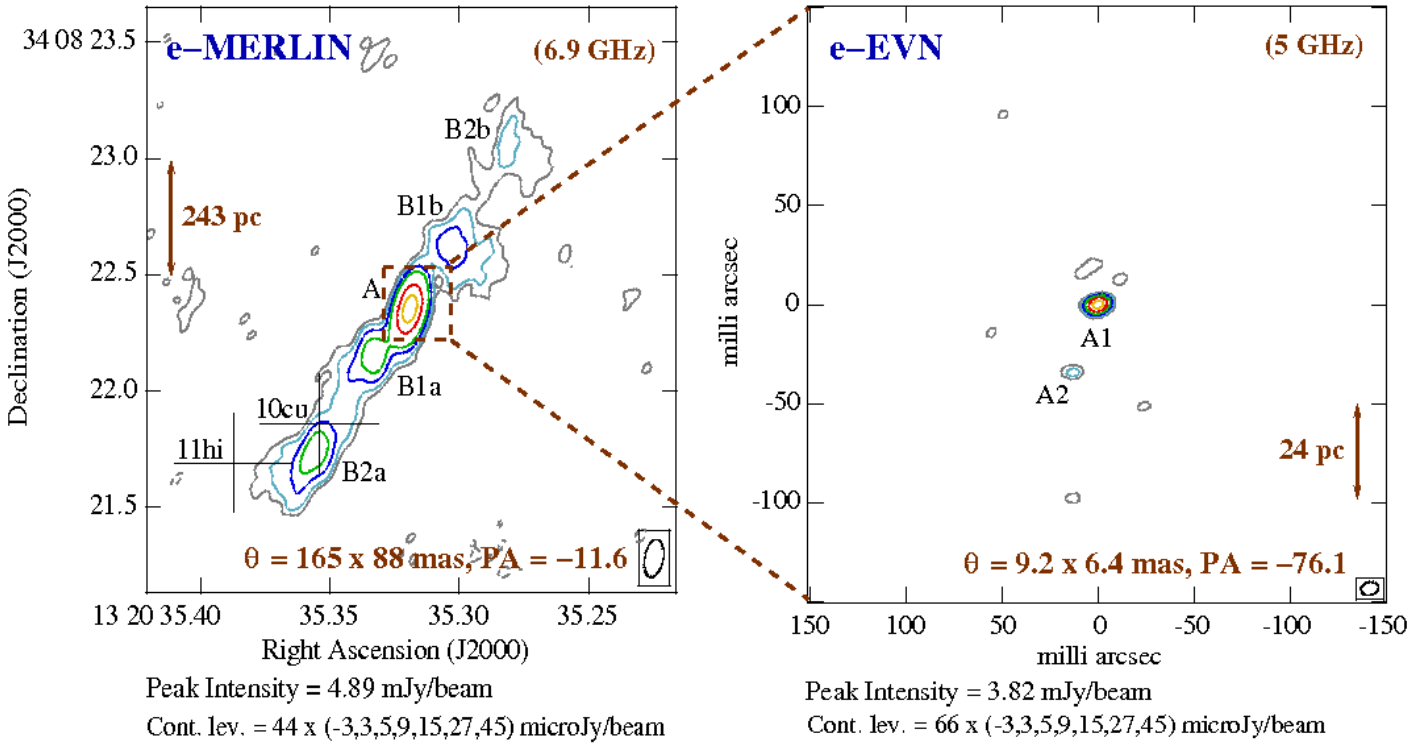

Fig.e-MERLIN and EVN imaging of the central region of IC883.

Authors: Cristina Romero-Cañizales (crroca@utu.fi), Miguel A. Perez-Torres, Antxon Alberdi, Megan K. Argo, Rob J. Beswick, Erkki Kankare, Fabien Batejat, Andreas Efstathiou, Seppo Mattila, John E. Conway, Simon T. Garrington, Tom W. B. Muxlow, Stuart D. Ryder and Petri Väisänen.

Reference: Romero-Cañizales et al 2012, A&A in press (eprint arXiv:1205.2257)

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3) EVN Technical Highlights

a) First fringes to Irbene

One 12 April, we obtained the first ever fringes in an EVN array to the 32m telescope of the Ventspils International Radio Astronomy Center (VIRAC), located at Irbene in northwest Latvia (fig.1).

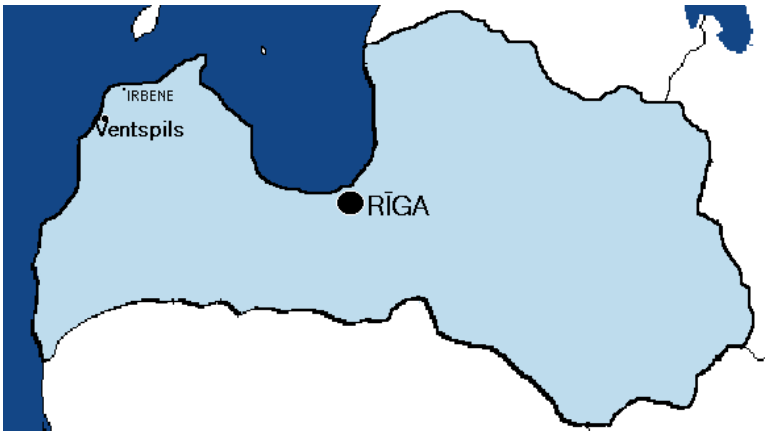

Fig 1. Location of Irbene in northwest Latvia.

The observations used a standard 512 Mbps Network Monitoring Experiment (NME) set-up at C-band, with Torun and Onsala85 rounding out the array. The data were correlated on the EVN software correlator at JIVE (SFXC) using the standard ftp fringe-test procedures. Figure 2 is a collage of pictures from that observation: the participating stations, the phase and amplitude as a function of frequency across the subbands on all three baselines (from correlation of 4s of data of a scan of 3C84), and snapshots of activity at JIVE as the observations were underway.

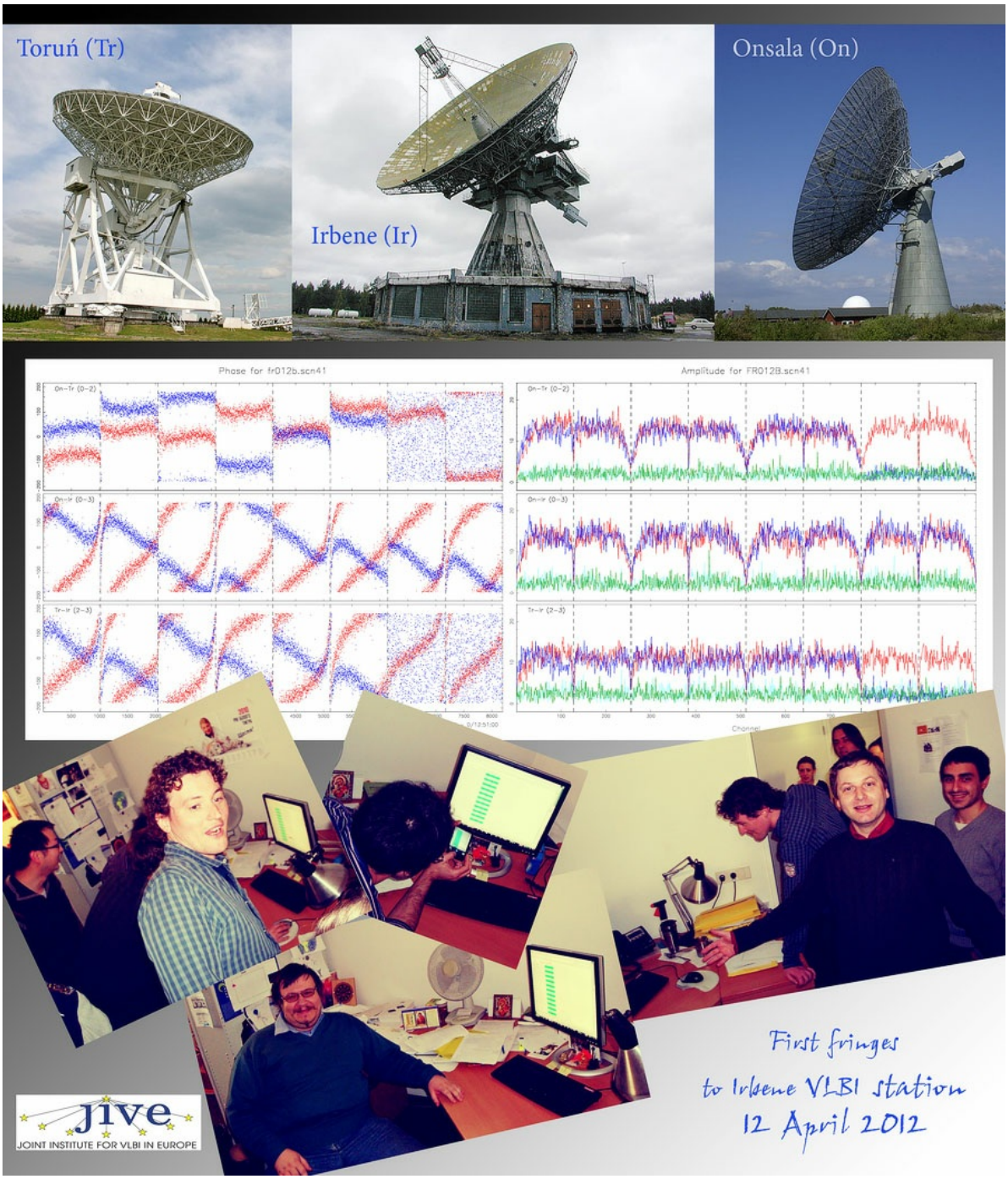

Fig 2. First Fringes.The color-coding of the Stokes products in each subband is: Red = RR, Blue = LL, Cyan = RL, Green = LR.

These fringes represent the culmination of a great deal of effort by the scientists and engineers at VIRAC and other EVN institutes, and the success portends well for Irbene joining more EVN observations. In the May/June session, they will be participating in two NMEs (C-, L-band). More details about the observations leading to these first Irbene fringes can be found on the JIVE/ASTRON daily image

b) Progress testing the DBBC back-ends in the Feb/March session

In the February/March EVN session, three stations recorded through analog and digital back-ends in parallel during some Network Monitoring and Fringe Test Experiments. Onsala and Hartebeesthoek used the DBBCs (with Hart using two different DBBCs in some observations). Effelsberg had already shifted over to using the DBBC. Thus with three stations using DBBCs, we had our first opportunity to see baselines with DBBCs on both ends. Figure 1 shows baselines from Ef to both analog mark4 (On) and digital DBBC (Od) back-ends at Onsala. The top two plots show amplitude as a function of frequency across the subbands and the bottom two show phase.

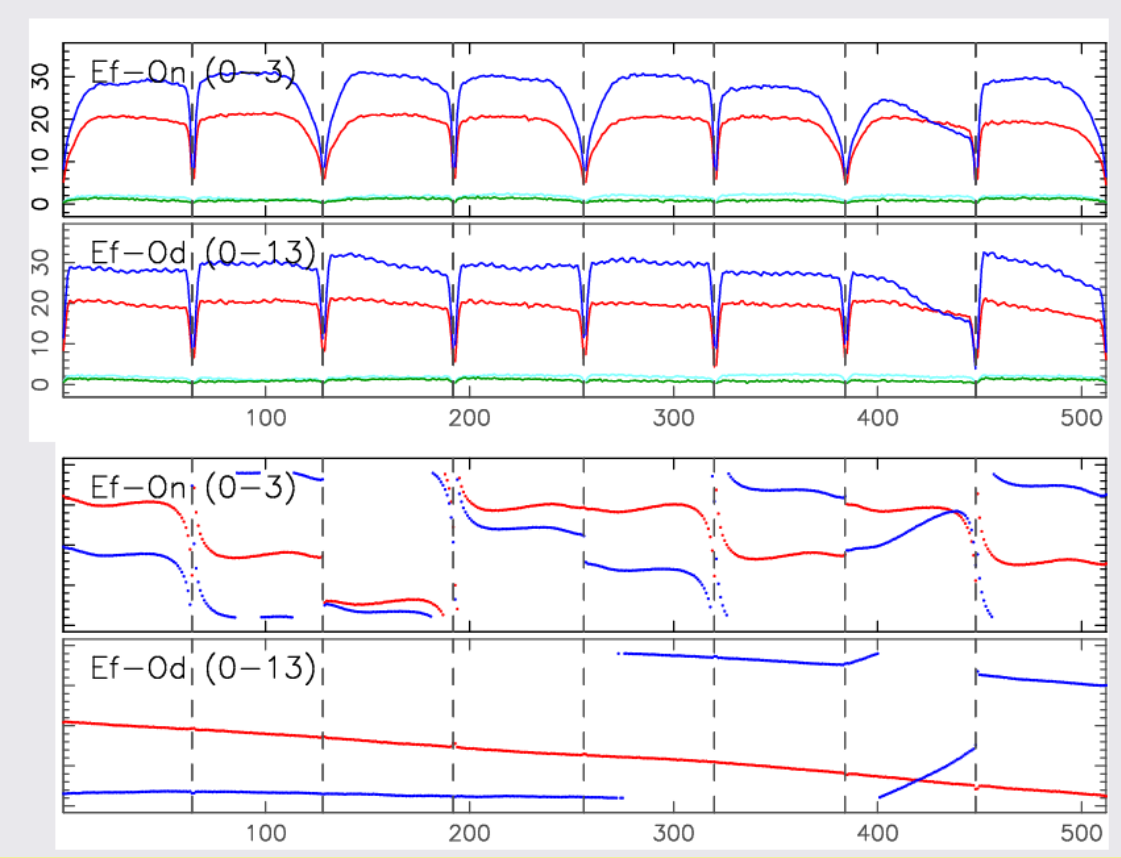

Fig 1. Baselines from Ef to both analog mark4 (On) and digital DBBC (Od) back-ends at Onsala. The color coding of the Stokes products in each subband is Red = RR and Blue = LL.

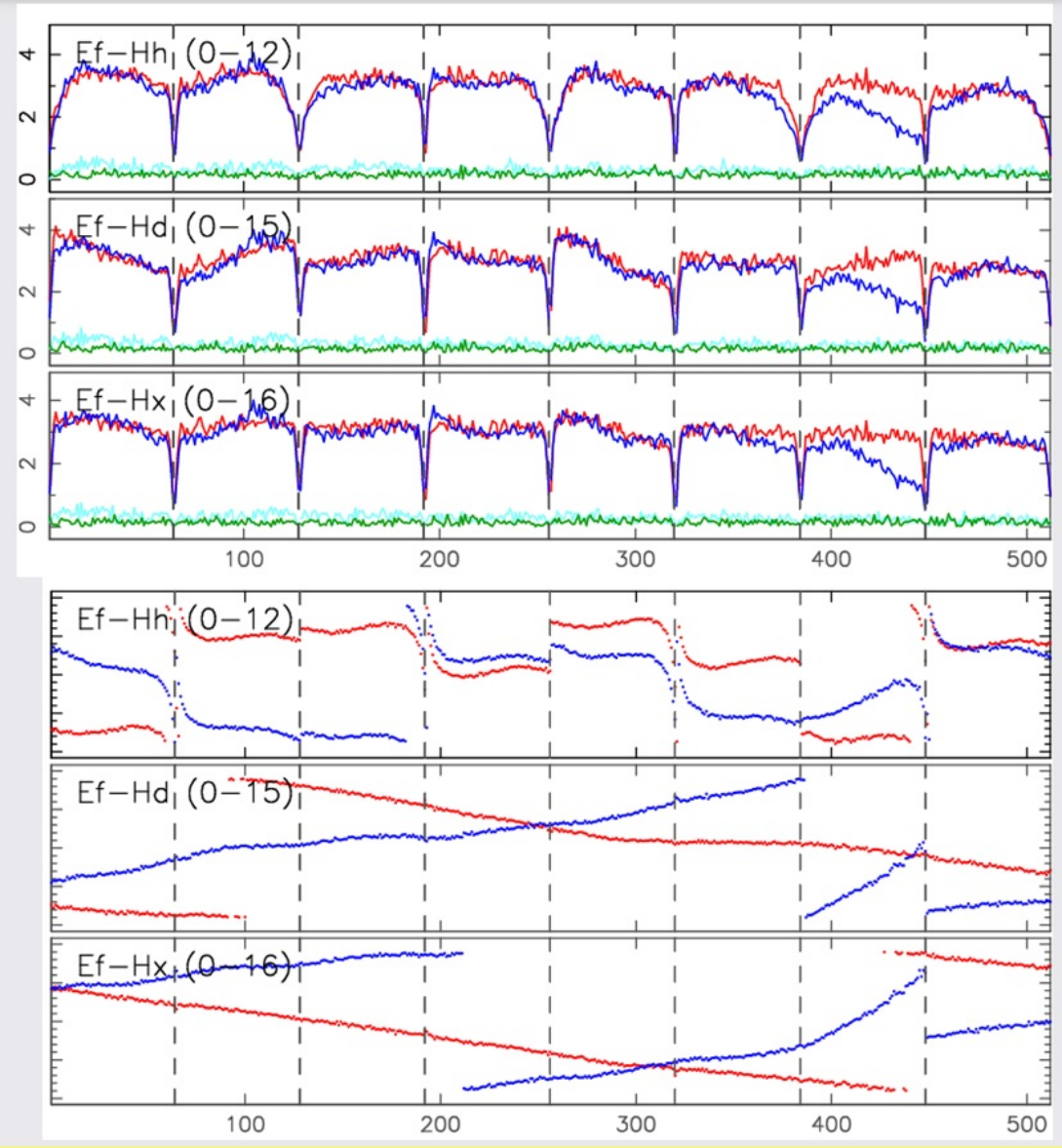

Fig 2. Baselines from Ef to Hart using the mark4 (Hh), a first DBBC (Hd), and a second DBBC (Hx) back-ends. The color coding as Fig. 1.

The plots show raw correlator (SFXC) output; no fringing has been applied (clock searching has roughly centered the fringes by adjusting the apriori clock-offset parameter). The amplitude of the passbands (8MHz subbands in these observations) is more rectangular for the all-DBBC case, and the phase is linear across the entirety of each subband and aligned across the subbands ab initio (no phase-cal phases were used in the correlation). The slightly different delay in RR of the 7th subband results from a known and already fixed problem at Ef.

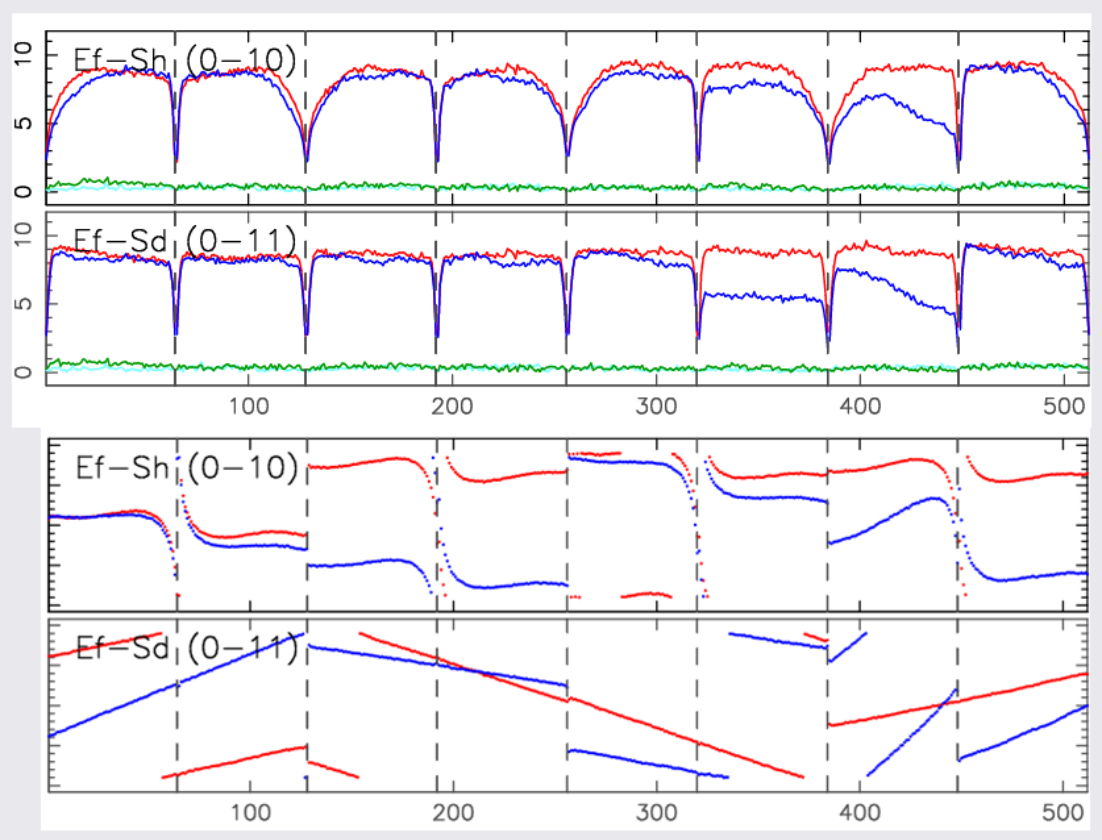

Fig 3. Baselines from Ef to Shanghai, using their analog VLBA4 (Sh) and digital CDAS (Sd) back-ends. The color coding as Fig. 1.

These baselines thus do not have the same digital back-end on each station, but the improvements in the rectangularity of the passbands and the linearity of the phase across each subband is obvious. There are different delays in each LSB/USB pair of subbands, but no LSB-USB phase offset is needed for the DDBC-CDAS combination. The KVAZAR stations shifted over to their new R1002 digital back-ends for the entirety of the Feb/March session.

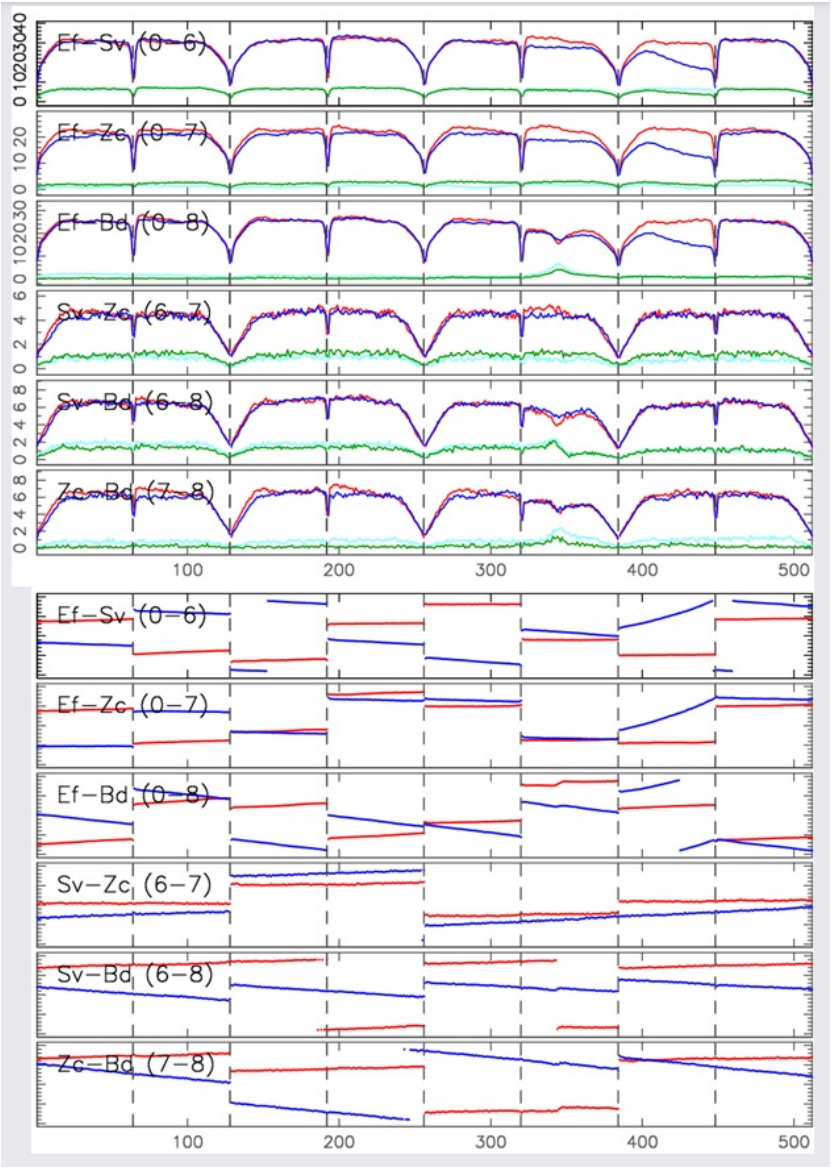

Fig 4. All the baselines to Effelsberg, as well as the 3 inter-KVAZAR baselines.

There are no explicit comparisons with the previous back-ends, but again the flatness of the passbands and linearity of the phase across each subband is clear. The R1002-R1002 baselines also show no LSB-USB phase offset.

These tests illustrate the improvement to data quality that can be expected for user experiments by the shift to digital back-ends across the EVN. Digital back-ends also hold the promise for boosting total data rates above the current Gbps limit; testing continues in this regard.

c) Return of Noto, first Noto e-fringes

Following its successful telescope repair, Noto participated in some of the Feb/March session Network Monitoring and Fringe Test Experiments.

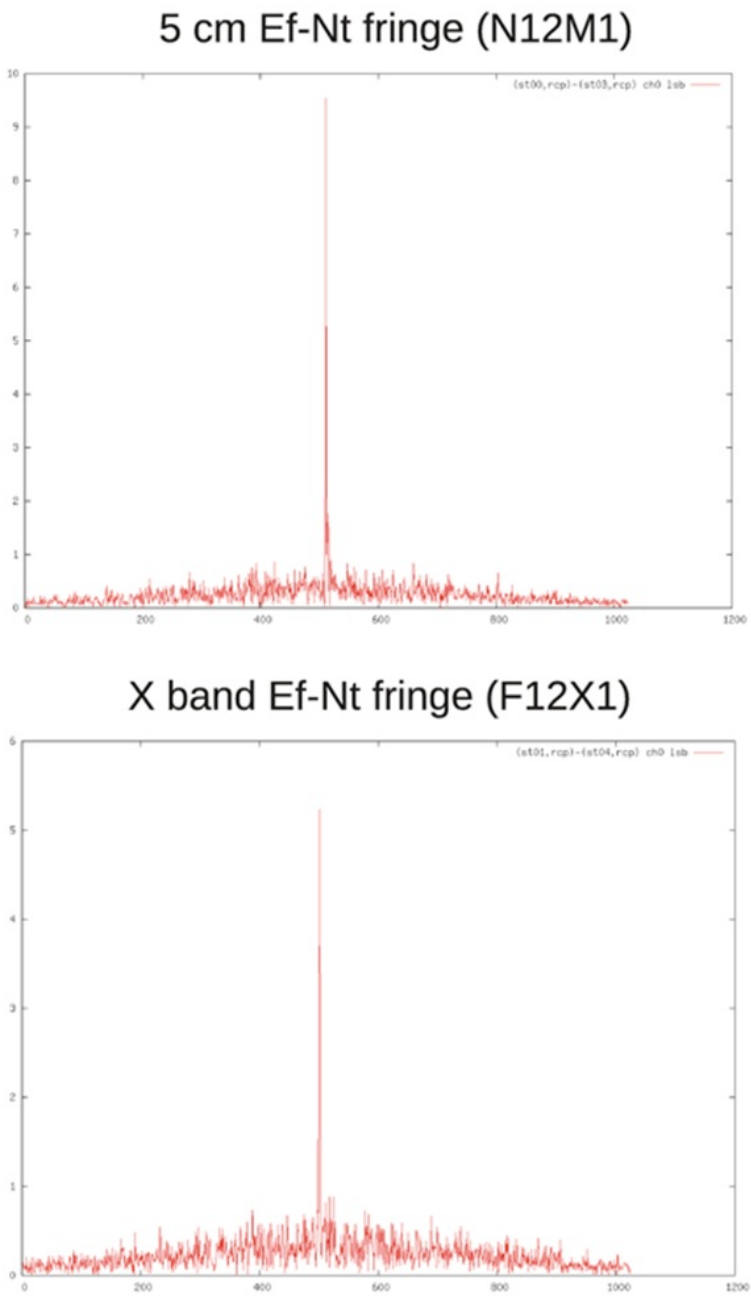

Fig 1. The first two resulting fringes (5cm, 3.6 cm) between Noto and Effelsberg from the ftp fringe-test scans .

Noto is scheduled to participate in all of the May/June session experiments. Further, on 15 May Noto provided their first ever e-VLBI fringes.

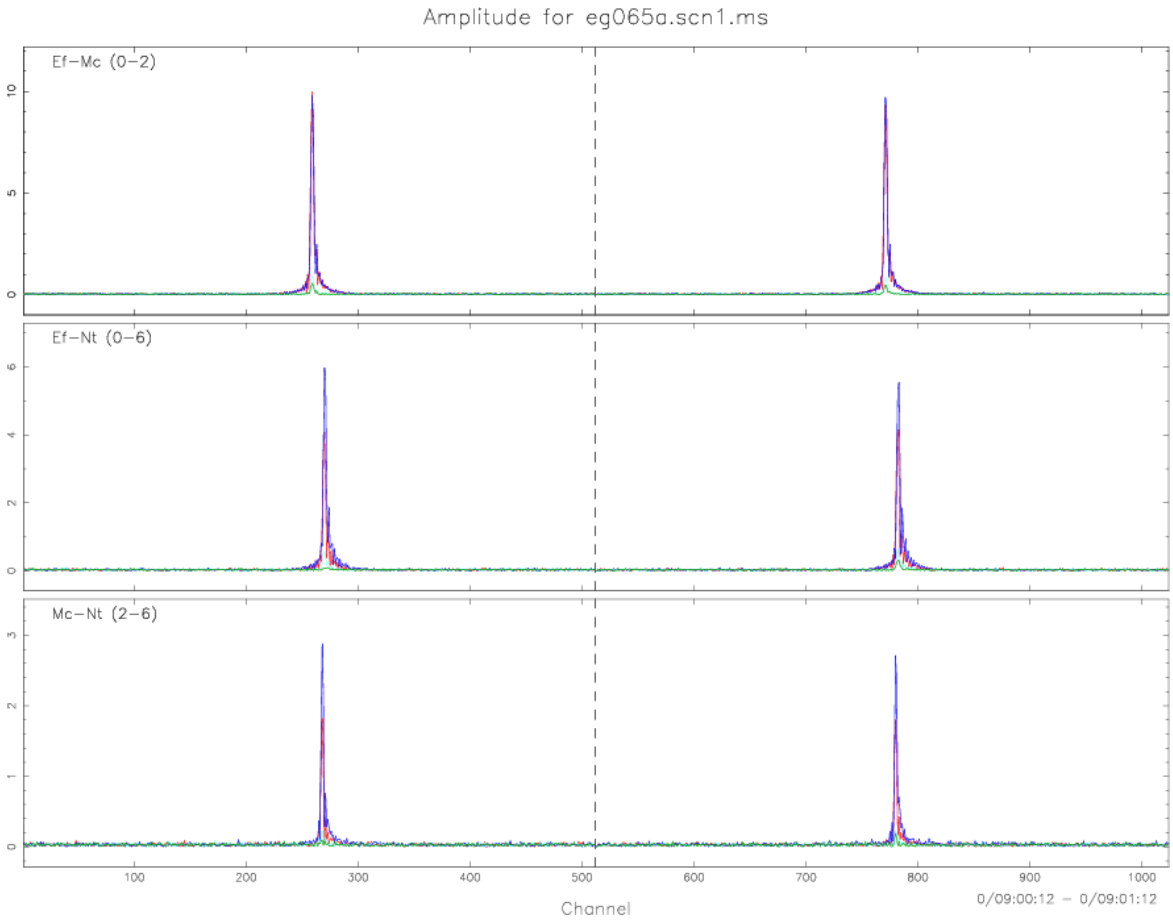

Fig 2. Fringes from the first minute of the experiment (in a 256 Mbps mode using two dual-pol 16MHz subbands).The color-coding of the Stokes products in each subband is: Red = RR, Blue = LL, Cyan = RL, Green = LR.

This is a welcome accomplishment, as it strengthens the geometry of the available e-VLBI array.

Also in the Gbps mode of same observations, Medicina was able to transmit the full 1024 Mbps rate, thanks in part to a new 10G connection from the telescope to Bologna. Previously, bottlenecks at 1G required dropping one of the 8 subbands for Mc in Gbps e-VLBI observations.

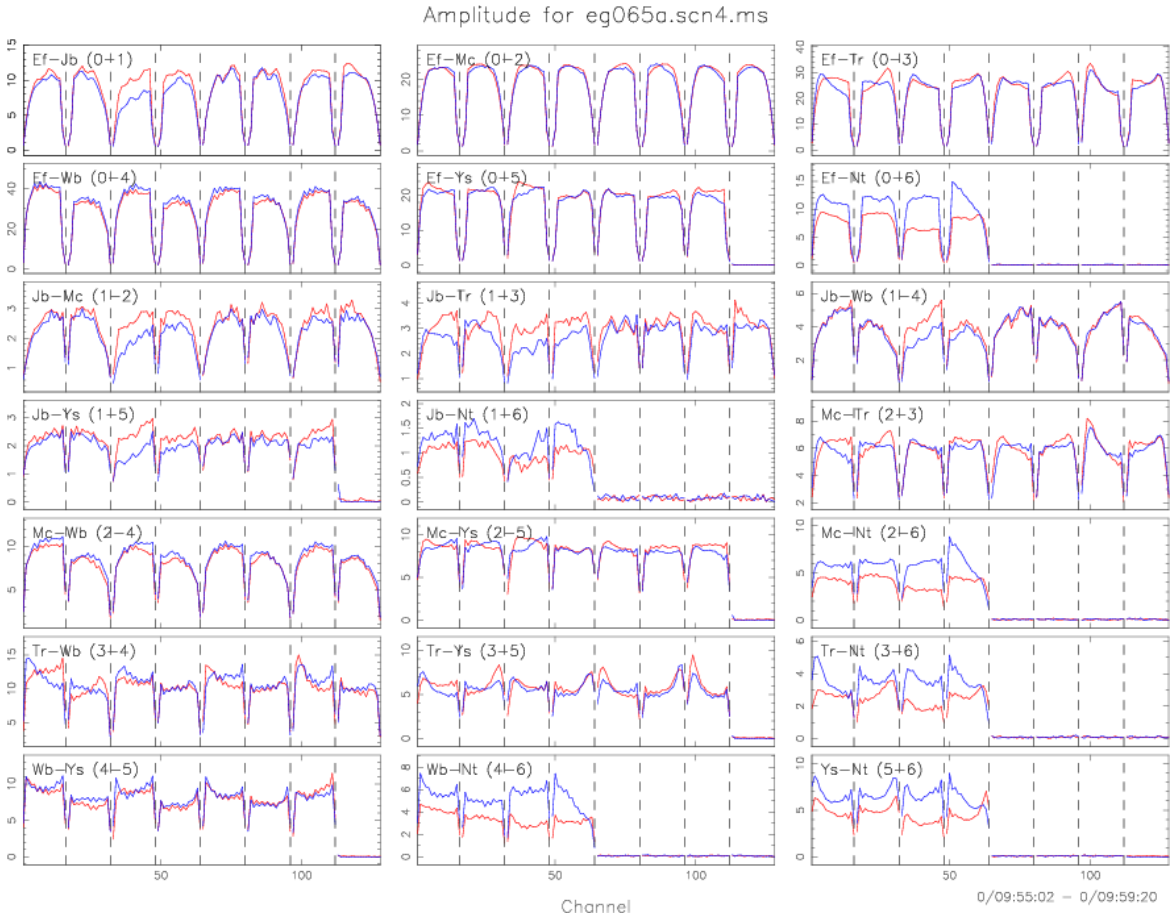

Fig 3. The passbands for a portion of a scan in the Gbps mode. Mc has signal in all eight subbands. Ys still requires channel-dropping, and Noto is

currently limited to 512 Mbps

5) EVN Scheduler's Report may 2012

a) SESSIONS SCHEDULED SINCE THE LAST NEWSLETTER

2012 Session 1: 23 February - 15 March

Wavelengths: 5, 3.6, 1.3, 18, 6cm

Number of different user projects observed: 14

SESSION DURATION: 21.4 days

Scheduling efficiency: 41.6 %

Breakdown of observations by type and correlator. T-BYTES indicates the estimated disk useage (in TB) at EVN telescopes.

	N-OBS	HOURS	DAYS	T-BYTES
TOTAL	34	213.5	8.9	601.3
EVN-only	20	173.0	7.2	558.9
GLOBAL	0	0.0	0.0	0.0
Short Obs.	0	0.0	0.0	0.0
Tests	14	40.5	1.7	42.4
User: Cont.	15	143.0	6.0	515.4
User: Line	2	16.0	0.7	7.0
User: Pulsar	3	14.0	0.6	36.5
EVN-Corr.	23	150.0	6.3	551.8
Bonn-Corr.	1	6.0	0.3	29.9
VLBA-Corr.	0	0.0	0.0	0.0
eEVN-Corr.	0	0.0	0.0	
ASC-Corr	5	36.0	1.5	19.6
CAL-only	5	21.5	0.9	
MERLIN	0			
Arecibo	0			
VLBA	0			
GBT	0			
VLA	0			
Robledo	0			
Goldstone	0			
RadioAstrpn	5			

b) e-VLBI SCHEDULING

SESSION	DATE	WAVELENGTH	HOURS	e-VLBI	PROPOSAL	TYPE	
				Normal / Short	Disk / ToO	Trigger	
12e02	17FEB12	6cm	17h	2 / -	- / -	2	no triggers
12e03	20MAR12	6cm	4h	1 / -	- / -	2	no triggers
12e04	17APR12	18cm	15h	1 / -	- /-	1	no triggers
12e05	15MAY12	6cm	24h	1 / -	- /-	2	1 trigger

6) South Africa's National Research Foundation joins JIVE

At its most recent board meeting in Bonn in May, JIVE signed a memorandum of agreement with the National Research Foundation (NRF) of South Africa, officially making NRF a full member of JIVE.

NRF's HartRAO has been an active member of the EVN since 2001, and its 26m dish has participated in EVN observations for even longer. Now HartRAO is currently commissioning a 15m telescope for VLBI, based on the first prototype for the Karoo Array Telescope. It is also working with other African countries to convert obsolete satellite communications dishes into radio telescopes to create an African VLBI network which, it is planned, will also collaborate with JIVE. South Africa is augmenting its radio astronomical capabilities with the Karoo Array Telescope (KAT-7 array and MeerKAT), which will also be used for VLBI.

The NRF partnership commits JIVE to actively assist in making these facilities successful new additions to the VLBI network. Hartebeesthoek's participation in VLBI observations over the past several years has improved performance of the EVN tremendously. We look forward to observing together with these new South African telescopes to further strengthen the EVN.

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7) JIVE Review: "excellent" overall

JIVE was thrilled to have received an overall "excellent" rating in its five-year review. In the final report published in March, the review panel had especially high praise for: JIVE's support to the EVN and its users; JIVE's R&D activities concerning digital technology, connectivity, space science applications, and astronomical software; and the science output from JIVE staff.

The panel also recommended making the power of VLBI better known across the astronomy community, stating that "VLBI should no longer be regarded as a niche specialism accessible only by 'black-belt' radio astronomers. Rather, it should be a normal part of the arsenal of observational techniques available to astronomers at large." Furthermore, VLBI with the EVN is now so user-friendly that "any astronomer should be able to obtain and reduce their data with the help and guidance of the JIVE staff."

In its report the committee endorsed all the elements of JIVE's strategy for the future, including the UniBoard correlator programme, the e-VLBI

developments and the strong space applications expertise. It encourages JIVE to proceed with the ERIC process to transform into a legal entity and all the EVN partners to support JIVE financially.

We extend our thanks and congratulations to all JIVE and EVN staff, EVN stations, and EVN users, in particular those who contributed to the review by filling out the questionnaire, writing reports and making presentations. Without you the review and - indeed the past five years - would not have been so successful.

The official report can be downloaded at www.jive.nl/jive-review-2012.

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Edited by Rob Beswick (JBCA/e-MERLIN)