EUROPEAN VLBI NETWORK

European VLBI Network Newsletter
Number 29
May 2011

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1. Message from the EVN Chairman

Dear Readers,

This latest EVN Newsletter provides you with the updates on EVN activities, its technological development and on some of the most interesting scientific results. As usual I'd like to start with the information on outcomes of recent EVN Board of Directors Meeting which was held at Torun, Poland. All the EVN services function normally, and we confirmed sustainable progress in Network operation, the technical development , improved reliability, and high quality of scientific results. Thus the European VLBI Network seems to be at good condition however, the future funds for VLBI may not look so good, especially when ALMA starts and SKA project begins. The VLBA has already encountered problem to get sufficient NSF support, yet for the next 5 years the NRAO with external support help managed to secure the Array operation.

At the same time the European VLBI Network is growing in number of available telescopes, total collecting surface, broad band receivers and back-ends, fast speed real time connectivity. With the IAA as a new member with three 32m KVAZAR antennas and soon (within a year) availability of the 70m in Ussurisk, and recent restart of the 26m at Hartebeesthek Observatory, the EVN reinforced its power. Over last few years the status of the EVN has changed significantly. The new stations are aspiring towards the EVN membership or the allied co-operation. One of them the Simeiz CrRO with 22m antenna has a long and fruitful history in VLBI, currently being well equipped and partner in IVS, declares full commitment to EVN. The Simeiz contribution will be particularly valuable at high frequency bands. The decision on Simeiz accession has been shifted to the next CBD meeting as there were not yet direct successful observations made with EVN. The 32m Venspils antenna (Latvia) should finally start its lengthy prepared service in VLBI, the Japanese telescopes consider formal engagement to EVN. There are new large Chinese antennas coming soon into operation, and the 70m Evpatoria (Ukraine) telescope considers VLBI participation, all the above present great challenge to the EVN.

Many EVN telescopes are already connected via fiber-optical dedicated cables allowing more e-EVN experiments and science sessions with 1 Gbps transmission rate obtained routinely. Recent (March 9-12) record of 65 hours of continuous operation with 10 stations showed the strength of European real time VLBI.

The JIVE correlators are fully operational and cope with the sessions data very efficient way. The coordination of e-EVN and fast data release to the PIs make JIVE a very strong and fundamentally important Institute. The work to change the status to ERIC is on the way. It may secure EC funds to support present and future development. It is in the interest of all the Network Observatories.

ToO procedures were discussed and steps were taken to put high priority at the stations (responsibility of Directors) and to ease proposal.s submission process.

Prof. Mike Gaylard the new Director of HartRAO presented detailed information of MeerKAT and possible connection to the EVN. He also described potentials of African VLBI Network based on existing communication antennas located on the continent. This ambitious project has initially started with the support by HartRAO team to Ghana to install VLBI instrumentation on 32m antenna in Kuntunse near Accra.

In conclusion, it is clear, that with Arecibo included, the EVN is truly Global Network with the bright future. At the moment it is the most advanced and the largest Radio Astronomy instrument in the world. Its leading position on Northern hemisphere will remain strong also after the SKA completion. The high resolution images and high precision astrometry makes the science based on EVN results the forefront astronomical research.

The current EVN chairship concluded the two year activity. The CBD has elected new Chairman . Prof. Simon Garrington (JBAC, Manchester) and Vice Chairman - Prof. Anton Zensus, (MPIfR, Bonn). There are changes in chairpersons of EVN Program Committee - the new Chairman is Dr. Tom Muxlow (JBAC), and EVN Technical and Operations Group, with the new Chairman Dr. Michael Lindqvist (OSO, Onsala). My congratulations and best wishes.

Special thanks and congratulations for the excellent work done for the EVN community are forwarded to Tiziana Venturi. She chaired the PC for many years and at the same time being very active in science and chairing the Science Working Group of EC RadioNet FP7, all for the benefits of EVN users and young scientists.

Similar thanks are also directed to Walter Alef. He was the TOG Chair from January 2003 leading the technical development of EVN. Shortly summing up, from tapes and MkIII to MkIV and finally MKV with disk recordings and implementation of DBBC and finally to e-VLBI. TOG under his dedicated and professional leadership helped us through nearly all important technical developments to the high quality technology sustainable, leading interferometry Network.

I am much obliged to Magdalena Kunert-Bajraszewska the secretary of EVN Consortium Board, who did a lot of work related to CBD meetings, the EVN Newsletters, and made various co-ordinations required to proceed smoothly with CBD activities.

On behalf of the EVN CBD Chair and Magdalena I would like to thank for your fruitful cooperation and your activities during our 2 year leadership. It has been demanding but enjoyable and useful time of our work for the EVN.

Andrzej Kus, Chairman of the EVN Board of Directors.

2. Call for EVN Proposals - Deadline June 1st 2011

ALL EVN, GLOBAL, and e-VLBI PROPOSALS must now be submitted

with the ONLINE PROPOSAL SUBMISSION tool Northstar.

Email submission is no longer accepted

Detailed Call for Proposals

(This text is also available on the web at http://www.ira.inaf.it/evn_doc/call.txt)

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 is open to all astronomers. **Use of the Network by astronomers not specialized in the VLBI technique 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)

2011 Session 3	Oct 20 - Nov 10	18/21cm, 6cm ...
2012 Session 1	Feb 23 - Mar 15	18/21cm, 6cm ...

Dates for Session 1, 2012 are still provisional.
Proposals received by 1st June 2011 will be considered for scheduling in Session 3, 2011 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure.

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

2011 Aug 25 - Aug 26 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2011 Sep 6 - Sep 7 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2011 Oct 18 - Oct 19 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2011 Nov 23 - Nov 24 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2011 Dec 14 - Dec 15 (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 August 25.

Note that only one wavelength will be run in each session, depending on proposal priorities. See http://www.ira.inaf.it/evn_doc/guidelines.html for details concerning the e-VLBI observation classes and the observing modes.

Features for the next regular EVN and e-VLBI sessions

- From April 2011 due to e-MERLIN commissioning, VLBI at e-MERLIN out-stations will not be possible, and JB1 will be the only homestation available. After commissioning, only separate EVN and e-MERLIN observations will initially be scheduled. For updated information please consult the web at http://www.e-merlin.ac.uk/vlbi Proposals requesting EVN + e-MERLIN should indicate clearly whether separate EVN and e-MERLIN observations are sufficient, or whether scheduling should await simultaneous VLBI at e-MERLIN outstations. Simultaneous wide-bandwidth VLBI and e-MERLIN operations at e-MERLIN outstations are planned for 2012.
- The antenna in Noto is under repair and it will not be available until early 2012.
- Please consult http://www.evlbi.org/evlbi/e-vlbi_status.html and the EVN User Guide (http://www.evlbi.org/user_guide/user_guide.html" 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.

Global proposals

NRAO has now moved from a trimester system to a semester system with proposal deadlines of February 1st and August 1st. The first semester-based deadline will be 2011 February 1 (see http://www.nrao.edu/admin/do/vlba-gvlbi.shtml). PIs wishing to apply for Global VLBI time should continue to submit their proposals at the EVN deadlines using the Northstar on-line proposal submission tool.

Large EVN projects

Most proposals request 12-48 hrs 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 on-line proposal submission tool Northstar. Global proposals

will be forwarded to NRAO automatically and do not need to 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 May 2011.

Additional information

Further information on Global VLBI, EVN+MERLIN and e-VLBI observations, and guidelines for proposal submission are available at: http://www.ira.inaf.it/evn_doc/guidelines.html

The EVN User Guide (http://www.evlbi.org/user_guide/user_guide.html) 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-VLBI array see http://www.evlbi.org/evlbi/e-vlbi_status.html

The On-line VLBI catalogue (http://db.ira.inaf.it/evn/) lists sources observed by the EVN and Global VLBI.

Tiziana Venturi - Chairperson of the EVN Program Committee

3. EVN Scientific Highlights

Milliarcsecond morphology of water masers obtained using the EVN

We have recently finished our pilot project of 22 GHz water masers associated with two methanol maser sources from the EVN survey of 31 sources presented in Bartkiewicz et al. (2009). From our previous observations using the VLA of that sample we already knew that at least 27 sources exhibited 22 GHz water maser emission (Bartkiewicz et al. 2011). The goal of the new EVN project(s) is to study the morphology of water maser emission at a mas scale with a high velocity resolution towards the whole sample, also to obtain better astrometry.

The preliminarly results from the October 2010 session shows that the EVN with 6 antennas (Jb, Ef, Mc, Mh, On, Ys) enables us to map the water masers with a beamsize of 2 mas x 1 mas at PA=-40 deg. The weakest detected maser spot had a strength of 90 mJy/beam, about 13 times the rms. Althought the EVN observed at the low declination (0.5 deg and -1 deg), the phase-referencing worked well, using a cycle time of 90s (target) and 60s (phase-calibrator). The absolute astrometric accuracy is probably at the level of a few mas in RA and ca.20 mas in Dec. The differences between VLA and EVN measurements of the same components are 60 mas for G31.581+00.077 and 110 mas for G33.641-00.228 and are mostly in Dec.

In Fig.1 we present the EVN results on G31.581+00.077. The spectra of 22 GHz water (three top panels) and 6.7 GHz methanol masers (bottom panel) were taken with similar velocity resolution (ca.100 m/s). It is clear that the EVN data show more details than the VLA revealed, however some emission seems to be resolved. The distributions of water and methanol masers are presented by squares and circles, respectively. The panels on the right show the enlarged regions. The EVN enabled us to resolve water emission from both regions into two clumps separated by ca.50 mas. In one position the water masers are mixed with the methanol masers, hinting at a common origin, possibly in shocks close to the massive young star, while the water-only region may be in the outflow.

In Fig.2 we present the same for G33.641-00.228. The water maser spectrum is clearly complex but 10 times weaker comparing with the VLA spectrum. We also note that no emission is seen above 60 km/s (Bartkiewicz et al. 2011). That may be due to VLBI resolution and/or emission variability. Water masers are perpendicularly distributed to the methanol masers. More accurate astrometric observations show that the water masers (in particular, the northern components) are again closely associated with methanol masers.

Authors: Anna Bartkiewicz (TCfA), Marian Szymczak (TCfA) and Huib Jan van Langevelde (JIVE/Leiden)

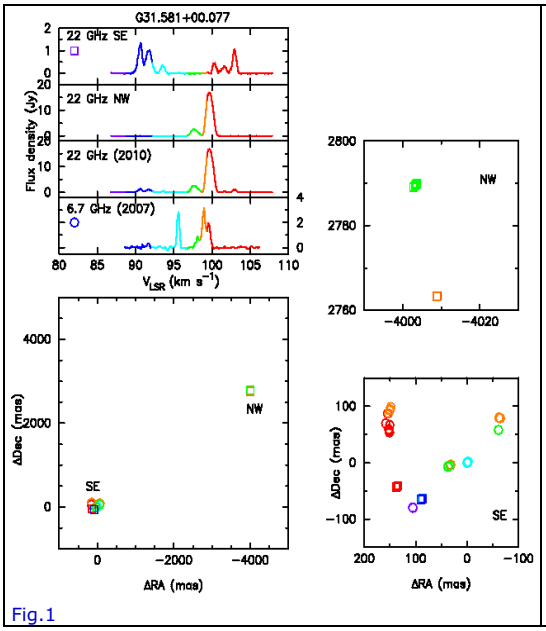

Fig.1

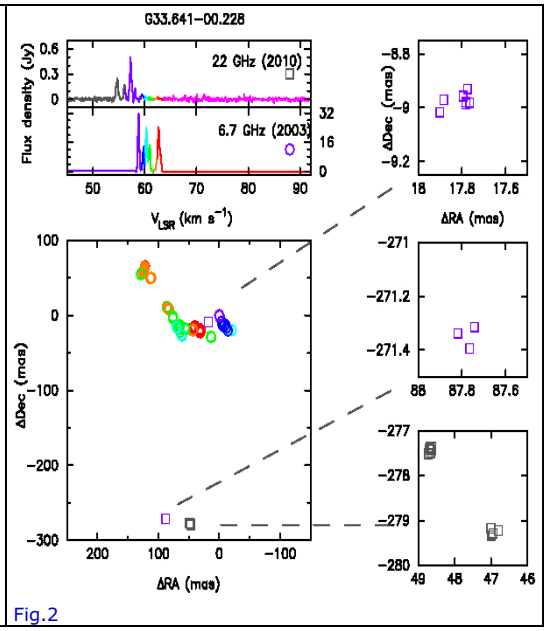

Fig.2

ToO observations of the gamma-ray binary candidate HESS J0632+057 with the EVN

HESS J0632+057 is a variable TeV gamma-ray source (Aharonian et al. 2007; Acciari et al. 2009). The likely low energy counterparts of the source are the X-ray source XMMU J063259.3+054801, the B0pe-type star MWC 148 (Hinton et al. 2009), and a point-like radio source (Skilton et al. 2009). The spectral energy distribution of the source, the positional coincidence with a Be star and the point-like nature at TeV energies, seem to indicate that HESS J0632+057 is a new member of the selected class of gamma-ray binaries. This has been recently supported by a periodicity of 320 days found in the X-ray emission (Bongiorno et al. 2011).

The only known binaries displaying TeV emission are PSR B1259-63, LS 5039, and LS I +61 303, being their emission periodic, and Cygnus X-1, which displayed one short TeV flare (see Paredes 2010 and references therein). The former three sources produce variable non-thermal emission from radio to very high energy gamma rays correlated with the orbital phase. The non-thermal emission is though to be produced by electrons accelerated in the shock between the relativistic wind of a young non-accreting pulsar and the wind of the stellar companion, in particular when the system is close to the periastron passage.

Recently, Falcone et al. 2011 reported increased X-ray activity from HESS J0632+057 detected by Swift-XRT between January 23 and February 6, 2011. The VERITAS and MAGIC collaborations reported increased activity at energies above 200 GeV between February 7 and 9, 2011 (Ong et al. 2011; Mariotti et al. 2011), confirming the VHE active state.

Following the reports of high energy activity of HESS J0632+057 we observed the source with the European VLBI Network (EVN) in Target of Opportunity mode. The radio continuum observations were conducted at 1.6 GHz using 7 stations (Ef, Jb, Mc, On, Tr, Wb, and Hh) during 8 hours on February 15, 2011, 7 days after the publication of the X-ray alert. A data rate of 1024 Mbps per station was directly streamed to the central processor at JIVE and correlated in real-time (e-VLBI).

We produced a preliminary naturally weighted image with a restoring beam of 29 x 18 mas in PA -0.9 deg, and an rms noise of 45 microJy/beam (see Fig. 1). A faint radio source is detected with a total flux density of 780 +/- 80 microJy, and a peak flux density of 580 +/- 40 microJy. These results suggest the presence of slightly extended radio emission at mas scales. The corresponding brightness temperature of the source is above 10^6 K, compatible with the previoulsy proposed non-thermal nature. The measured source position, with errors of the order of 1 mas, is clearly compatible with the UCAC3 catalogue position of MWC 148, which has an uncertainty of 14 mas in each coordinate (Zacharias et al. 2010). Therefore, the detected radio source is unambiguously related to the Be star, and gives support to the non-thermal nature of the radio counterpart. More details can be found in Moldon et al. (2011). The rapid response of the EVN committee, the scheduler and the data correlation made possible to allocate a full EVN disk-recorded observation, including 12 antennas. This has allowed us to observe the source on March 17, 2011, at the end of the radio outburst. The preliminary data reduction shows an extended source and a displacement of the peak of the emission, as also seen in other gamma-ray binaries. Our results give further support to HESS J0632+057 being a binary system, and a new member of the selected class of gamma-ray binaries. The complete data analysis and discussion will be published in Moldon et al. (in preparation).

We thank the EVN PC Chair, Tiziana Venturi, for supporting our ToO observations, and to the EVN stations who made this possible. e-VLBI developments in Europe are supported by NEXPReS, an Integrated Infrastructure Initiative (I3), funded by the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement RI-261525. The European VLBI Network (http://www.evlbi.org/) is a joint facility of European, Chinese, South African and other radio astronomy institutes funded by their national research councils.

Authors: Javier Moldon, Marc Ribo, Josep M. Paredes (Departament d'Astronomia i Meteorologia and Institut de Ciencies del Cosmos (ICC), Universitat de Barcelona (IEEC-UB))

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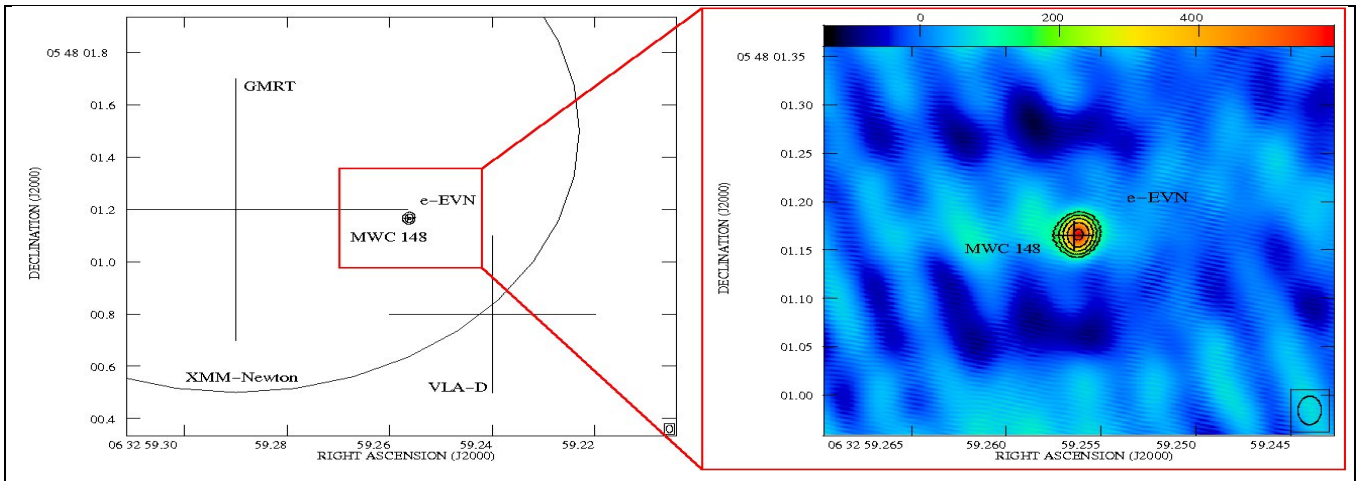

Fig.1: *Left: clean map of HESS J0632+057 during the February 15, 2011 ToO observation with the e-EVN. We have indicated the position of the X-ray counterpart and of the previous radio observations, conducted with the GMRT and the VLA. The small cross in the middle marks the position of the Be star MWC 148 in UCAC3. Right: zoom of the central region of the image to the left. The noise level of the image is 48 microJy/beam, and the peak of the emission corresponds to 580 microJy.*

4. EVN Technical Development and Operations

Multiple phase centers using the SFXC software correlator

Wide field VLBI offers the possibility to combine the high spatial resolution of VLBI with a large field of view. If the number of spectral points and integration times are choosen to keep bandwidth and time-average smearing at an acceptable level it is possible to image the entire primary beam. This opens up opportunities not only for surveying applications but also for innovative in-beam calibration techniques.

A fundamental problem with this technique is the size of the resulting data sets. E.g. to map the primary beam of a 100m station (9.5 arcmin) at 21cm with 16 Mhz bands and a maximum baseline of 10000 km would require 50ms integrations and 4096 spectral points to keep smearing losses within 10%. For a nyquist sampled 1 Gb/s experiment with 10 stations this would give an output data rate of at least 275 MiB/s. However, even though in this

arrangement the entire primary beam can be imaged, the radio sky is essentially empty. On average only about a dozen sources of at least 0.1 mJ are expected within a 10 arcmin field of view. Therefore, an order of magnitude reduction in data volume can be achieved by producing conventional narrow field data sets centered around each point of interest within the primary beam.

As a first step the correlation is performed at the required high spectral and temporal resolution. The phase center is then shifted to each point of interest. The phase center is shifted by performing an additional delay and phase correction which is proportional to the difference in delay between the current phase center and the original correlation center. Before writing the results to disk the data is averaged down in time and frequency. Each source is written to a separate IDI-FITS file. A similar implementation exists in the DiFX correlator.

We demonstrate the multiple phase center feature by comparing the visibilities obtained with the multiple phase center feature to the case when the correlation center coincides with the source. In Fig. 1 we show the visibility amplitude and phase for both these cases as a function of time for source 4C39.25 on the Effelsberg - Hartebeesthoek baseline observed in C-band (4998.49 MHz). The green circles are obtained by setting the correlation center 1.4 arcmin away from 4C39.25 and then shifting back to the source. Internally 8192 spectral points and sub-integrations of 50ms were used. The end result is averaged in time and frequency to 32 spectral points and 2 second integrations. The agreement between both cases is very close. This is further demonstrated in Fig. 2 where we show the difference in phase obtained by subtracting the phases from Fig. 1.

Aard Keimpema, Mark Kettenis (JIVE)

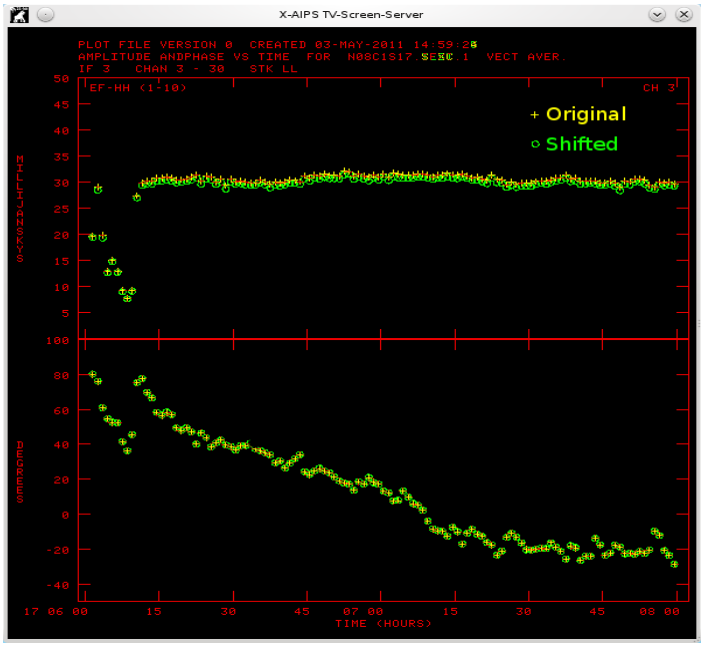

Fig.1 Yellow plus : Visibility amplitude and phase for source 4C39.25 at C-band. Green circle : Visibilities obtained by setting the correlation center 1.4 arcmin away from 4C39.25 and then shifting back to the source using the multiple phase center feature.

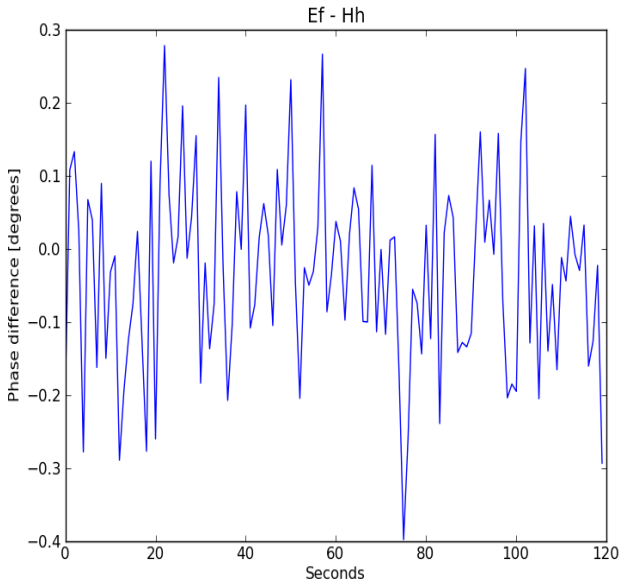

Fig.2 Phase error computed by differencing the phases from Fig. 1.

EVN Scheduler's Report

SESSIONS SCHEDULED SINCE THE LAST NEWSLETTER

1)
2011 SESSION 1: 24 February - 17 March
Wavelengths: 6, 5, 18, 13/3.6 cm
Number of different user projects observed: 17
SESSION DURATION: 21.0 days
Scheduling efficiency: 51.5 %

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	31	260.0	10.8	435.3
EVN-only	17	174.5	7.3	346.2
GLOBAL	3	44.0	1.8	56.8
Short Obs.	0	0.0	0.0	0.0
Tests	11	41.5	1.7	32.3
User: Cont.	9	120.5	5.0	181.9
User: Line	6	58.0	2.4	65.2
User: Pulsar	5	40.0	1.7	155.9
EVN-Corr.	16	104.5	4.4	300.9
Bonn-Corr.	4	39.0	1.6	95.0
VLBA-Corr.	2	38.0	1.6	39.4
e-VLBI	4	57.0	2.4	
CAL-only	5	21.5	0.9	
Arecibo	1			

VLBA	3			
GBT	1			
VLA	0			
Robedo	0			

2) e-VLBI SCHEDULING

Session	Date	l	Hours	e-VLBI PROPOSAL TYPE				
				Normal	Short	Disk	ToO	Trigger
11e01	25JAN11	18cm	15h	1	1	-	1	-
11e02	15FEB11	18cm	12h	1	-	-	1	-
11e03	22MAR11	6cm	10h	2	-	-	1	1 (not triggered)
11e04	12APR11	6cm	24h	2	-	-	1	1 (not triggered)
11e05	17MAY11	18cm	12h	1	1	-	-	1 (not triggered)

3) DATES FOR SESSIONS IN 2012

The following dates for sessions in 2012 were provisionally agreed at the CBD meeting in Torun on 11 May.

SESSION 1: 23 Feb - 15 Mar
SESSION 2: 24 May - 12 Jun
SESSION 3: 18 Oct - 8 Nov

4) NON-AVAILABILITY OF EVN TELESCOPES

Jb2:Currently unavailable due to eMERLIN commissioning. Expected to be available for 2011 Session 3.
Cm:Currently unavailable. Expected to be available for VLBI in 2012.
Nt:Currently unavailable. Expected to be available for 2012 Session 3.
Wb-14: WSRT will begin transition to APERTIV from 2012 Session 3, after which a reduced number of antennas will be available for VLBI.
Mc:No 1.3cm receiver currently available
Ur: No 1.3cm receiver currently available
Hh:1.3cm receiver available on an experimental basis

Richard Porcas

6. Meeting Point

The EVN Consortium Board of Directors (CBD) Meeting took place at the Torun Centre for Astronomy of Nicolaus Copernicus University in Piwnice (Poland) on May 11th. This was the last meeting with the leadership of Andrzej Kus and during it **Simon Garrington** was appointed for the new Chairman for the next 2 years.

This is also the last EVN Newsletter issue with me, Magdalena Kunert-Bajraszewska, as the Editor. It was a pleasure to do this work. Thank you to all of you for the fruitful cooperation!

Magdalena Kunert-Bajraszewska (EVN CBD Secretary and EVN Newsletter Editor)



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