European VLBI Network Newsletter

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Contents

Edited by Andrei Lobanov, MPIfR Bonn (alobanov@mpifr-bonn.mpg.de)

Message from the Chairman of the EVN Board of Directors

This edition of the European VLBI Newsletter appears shortly before the proposal deadline on October 1. It reports about recent results, acitvities and developments in our community. Among these are a recent science highlight from studies of massive young stellar objects, and the successful EVN observing participation by the Korean VLBI network. JIVE is now ready to begin correlation of RADIOASTRON experiments and the NEXPReS project has come to a very successful formal conclusion, although the performance improvements achieved for the EVN community will remain. The Yebes telescope has now achieved first light with it's Q-band receiver and ASTRON held a very successful European Interferometry School.

On July 1 2013, I have taken over from Simon Garrington at Jodrell Bank as Chairman of the European VLBI Network's Consortium Board of Directors. Simon has led the Board activities very capably and successfully during his two-year term of office, especially in interacting with the ASTRONET telescope review process, in fostering the transition of JIVE into a European Research Infrastructure and in achieving greater scheduling flexibility by introducing limited out-of-session scheduling opportunities. I am looking forward to working with him and all of you over the next two years.

Anton Zensus, MPIfR Bonn, Chairman of the EVN CBD

Call for the EVN Proposals: Deadline 1st October 2013

(online version)

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 specialised 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)

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2014 Session 1   Feb 20 - Mar 13   18/21cm, 6cm ...
2014 Session 2   May 29 - Jun 19   18/21cm, 6cm ...
2014 Session 3   Oct 16 - Nov 06   18/21cm, 6cm ...

Proposals received by 1st October 2013 will be considered for scheduling in Session 1, 2014 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure.

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

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2013 Nov 12 - Nov 13 (start at 13 UTC)   18/21cm, 6cm, 5cm or 1.3cm
2013 Dec 03 - Dec 04 (start at 13 UTC)   18/21cm, 6cm, 5cm or 1.3cm
2014 Jan 14 - Jan 15 (start at 13 UTC)   18/21cm, 6cm, 5cm or 1.3cm
2014 Feb 18 - Feb 19 (start at 13 UTC)   18/21cm, 6cm, 5cm or 1.3cm

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

Successful proposals with an e-VLBI component submitted by the June 1st deadline will be considered for scheduling in the above e-VLBI sessions starting from December 3rd 2013.

Note that only one wavelength will be run in each e-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 observing modes.

Features for the next regular EVN and e-VLBI sessions

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* Both Jb1 and Jb2 will be available for EVN recording, as will simultaneous EVN+e-MERLIN operations with home-station EVN recording. For such simultaneous EVN+e-MERLIN operations, VLBI data from Cm will be made available at up to 512Mbps (e.g. 64MHz in both hands of circular polarization) 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 http://www.evlbi.org/user_guide/user_guide.html for updates on the current EVN and e-VLBI array, availability of different stations per observing band and for the dates of the e-VLBI observing sessions.

Global VLBI Proposals

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* From Session 3 2013, the Global recording modes that used the legacy VLBA recording system will no longer be available. Tests are planned to establish Global standard recording modes and frequencies with the replacement VLBA Roach Digital Backend (RDBE), which will allow successful observations with both NRAO and EVN telescopes at 512 and 1024 Mbps under the new system. These will involve 'Hybrid-mode' correlation of 16 MHz sub-bands recorded with the EVN against 32 or 64 MHz sub-bands recorded with NRAO systems. Access to observing at 256 Mbps and lower rates (which will also use the VLBA RDBE but do not require Hybrid modes) should remain unaffected. Users may propose Global observations utilizing 512 and 1024 Mbps (with these standard modes only - see 'How to submit' section below) but should note that scheduling Global observations at these data rates will await the successful outcome of the tests.

Observations using these modes will be correlated at the SFXC correlator at JIVE (default) or at the DiFX correlator in Bonn (if appropriate justification is given in the proposal).

A description of the VLBA RDBE can be found at:
https://science.nrao.edu/facilities/vlba/docs/manuals/oss2013b/sig-path/rdbe

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, and Global 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.

When specifying your "Recording format" for Global modes in the EVN proposal tool, select 32. 64. 128, 256, 512, or 1024 Mbps from the "Specify aggregate bitrate (use network defaults)" menu.

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 October 2013.

Additional information

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

Tom Muxlow, University of Manchester, EVN PC Chairman,

Minor Modifications in the EVN Proposal Tool

For proposals submitted for the 1 October deadline, there are a couple minor modifications to the instructions for the scientific justification:
a) minimum font size changed from 10 to 11 point (now consistent with the VLBA proposal tool).
b) the explicit limitation to use only black-and-white figures has been removed.
Further, there is a change in the presentation of the two Jodrell Bank telescopes in the "Observing Request" tab. Both Jb1 (Lovell, 76m) and Jb2 (Mark2, 25m) can observe at 21cm, 18cm, and 6cm. Now in the "Available networks" table, which shows the telescopes available at the frequency you've selected, only one of the Jodrell telescopes will appear in the "EVN" row, and the other will appear in the "EVN with individual limitations" row. The "EVN" row will have Jb1 for 21cm and 18cm, and Jb2 for 6cm. The intention here is to avoid the default case of both telescopes being selected by clicking the box at the beginning of the "EVN" row. It is still possible

to request both Jb1 and Jb2, but this now requires explicit action on your part. To select telescopes from the "EVN with individual limiations" row, click the box at the beginning of the row to open selection boxes for each of the telescopes in it. You can then select the desired telescopes individually. There is a link to the proposal-tool help at the right-hand end of the row for further details about the telescopes in it.

Bob Campbell, JIVE, Dwingeloo

EVN Science Highlights

A correlation between magnetic field orientation and molecular outflow in massive young stellar objects

Despite the recognized importance of magnetic field in the formation of low-mass stars, its actual role in the formation of high-mass stars is still under debate. Detection of molecular outflows in massive star-forming regions makes the presence of magnetic fields during the formation of high-mass stars unavoidable. This has been demonstrated in recent numerical simulations of the high-mass star formation in which the magnetic field has played a key role in evolution and stability of the circumstellar disk and formation of bipolar outflows. This makes measurements of the orientation and strength of magnetic fields in young stellar objects (YSO) at milliarcsecond (mas) resolution fundamental for testing these models. This can be done with the help of polarization VLBI observations of the 6.7 GHz methanol maser emission in YSO, which has been the goal of a long-term program that has been conducted at the EVN during the last four years.

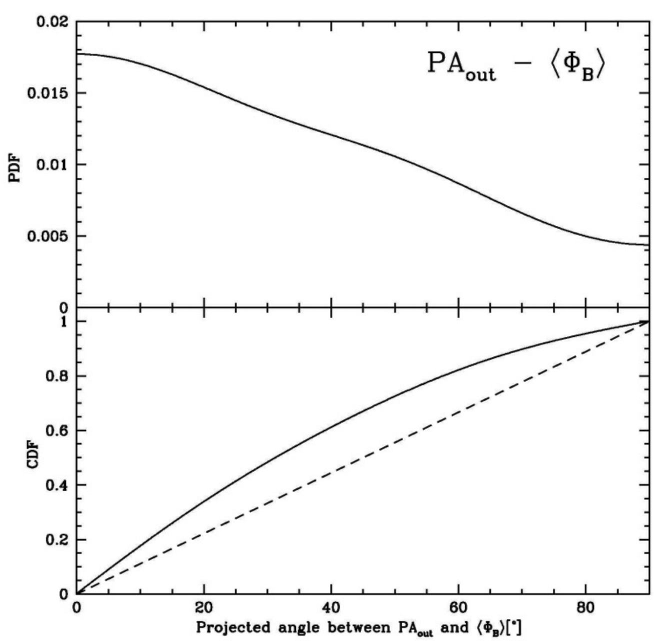

Figure 1. The probability distribution function (PDF, top panel) and the cumulative distribution function (CDF, bottom panel) of the projected angle between the magnetic field and the outflow axes. The dashed line is the CDF for random orientation of outflows and magnetic fields, i.e. all angular differences are equally likely.

This program has brought the first opportunity to analyze statistical properties of a representative YSO sample. The analysis has shown no evident correlation between the linear distributions of methanol masers and the outflows or the linear polarization vectors of the masers. On the other hand, it has revealed the first statistical evidence that the magnetic field on scales 10-100 AU is primarily oriented along the large-scale outflow direction (shown in Figure 1). Estimates of the magnetic field strength based on the Zeeman splitting of the methanol lines are presently underway. Upcoming EVN observations of methanol masers in 15 massive star forming regions should further improve this unique statistics.

G. Surcis, W.H.T., Vlemmings, H.J. van Langevelde, B. Hutawarakorn Kramer, and L.H. Quiroga-Nunez 2013, A&A, 556, 73.

EVN/JIVE Technical Developments

Fringes to Korean VLBI Network at 22 and 43 GHz

On June 14th 2013, a VLBI experiment at 22 and 43 GHz was undertaken by the Yebes 40m radio-telescope in Spain and the 3 radio-telescopes of the Korean VLBI Network; Yonsei, Ulsan and Tamna. The observation spanned 1 hour and 30 minutes and alternated between scans at 22 and 43 GHz. The target was the compact source NRAO150, with a bandwidth of 128 MHz divided into 8 Intermediate Frequencies and with both circular polarisations. Data was recorded on Mark5B systems at 1024 Mbps at all stations and transferred after the experiment via the Internet to a DiFX software correlator in Korea.

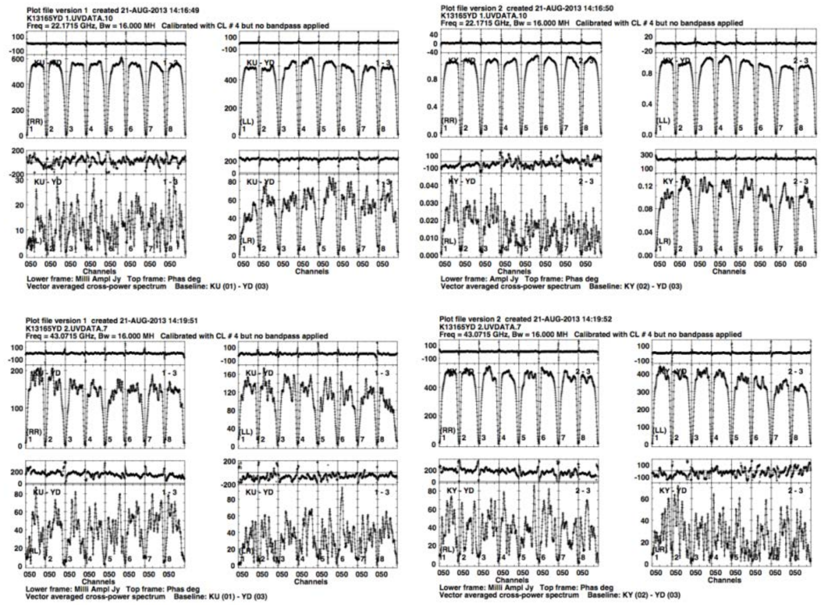

Figure 2. Amplitudes and Phases of the time averaged visibilities for all IFs and all 4 Stokes (RR, LL, RL & LR). On the left Ulsan (KU) to Yebes (YD) and on the right Yonsei (KY) to Yebes. Plotted on the upper row is the data recorded at 22GHz and the lower row is at 43GHz.

The correlation required no special effort, once the correct Mark5B channel mapping was resolved for Yebes. It was run on the KVN computing cluster dedicated for DiFX correlation, polaris. Post-correlation processing involved fringe fitting to find the residual delays (with AIPS task FRING) and amplitude scaling with the nominal SEFD values of the different antennas (with AIPS task CLCOR).

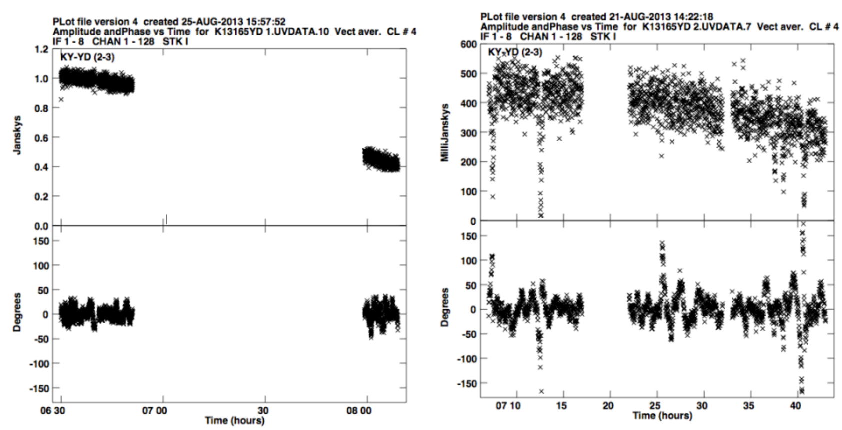

Figure 3. Amplitude and Phase of the Stokes I visibility average of all IFs and all channels for Baseline Yonsei to Yebes. Plotted on the left is the data recorded at 22GHz and right is at 43GHz.

Fringes were found at 22 GHz and 43 GHz in all IFs and for all stations. Figure 2 shows the averaged amplitude and phase of the correlated signal for all channels in two KVN to Yebes baselines at 22 and 43 GHz respectively, from the AIPS task POSSM. The upper panels show the parallel hand (RCP-RCP and LCP-LCP) correlation and the lower panels show the cross correlated signals (RCP-LCP, LCP-RCP).

Figure 3 shows the amplitude and phase of the correlated signal as a function of time on the Yonsei to Yebes baseline at 22 (left panel) and 43 GHz (right panel), from the AIPS task VPLOT.

These are the first fringes from the new Q-band system at Yebes, and follow hot on the heels of the Single Dish first light, also reported in this issue. The IGN team at the Yebes telescope is very satisfied with the outcomes and looks forward to future Q-band VLBI experiments with the EVN and global networks. These are also the first global VLBI fringes at Q-band for the KVN.

This result opens the possibility to perform VLBI observations at 43 GHz with very long baselines between Europe and Korea and validates the equipment and receivers at this frequency for the telescopes that took part in the observation. The longer term goal is to implement simultaneous multifrequency recording at Yebes, in a similar fashion to that done in the KVN, at these and higher frequencies. This would allow phase stabilised mm- and sub-mm global VLBI, using the calibration at the lower frequencies.

Richard Dodson, KASI, South Korea, on behalf of the Korean VLBI Network and Yebes Observatory

RadioAstron Fringes at JIVE

In the middle of 2013, the teams of JIVE, Astro Space Center of P.N. Lebedev Physical Institute (Russia) and MPIfR (Germany) combined forces for several trial correlations of Space VLBI data obtained with the RadioAstron mission. The test runs included continuum observations at 1.35, 6 and 18 cm and one spectral line observation at 1.35 cm at various extra-terrestrial baseline lengths exceeding several Erath diameters. The data were processed on the EVN software correlator at JIVE (SFXC). After fixing inevitable bugs and sorting out data formatting “misunderstandings”, fringes were obtained at all wavelengths in all experiments.

This positive outcome has two important implications. First, the tests offered an independent verification of the results obtained with the other two RadioAstron correlatrs, the DiFX (at MPIfR and ASC) and ASC’s own software correlator. The fringes obtained on all these correlators are in good agreement. It is worth noticing that the correlation at JIVE was based on the homemade delay model originally developed in the framework of the Planetary Radio Interferometry and Doppler Experiment (PRIDE) for other than RadioAstron applications.

Second, perhaps even more important, the successful SVLBI-SFXC tests pave the way for broadening operational correlation of joint observations of the RadioAstron and EVN.

Indeed, the EVN Consortium Board of Directors (CBD) and RadioAstron International Science Council (RISC) at their respective recent meetings in April and June 2013 have recommended to the RadioAstron mission and EVN to establish the mechanism of joint observations including correlation of data at the operational JIVE correlator for user-led experiments. This kind of colaboration is particularly attractive as the RadioAstron mission is switching to the more intensive operational scenario of the Key Science Programmes after completion of the Early Science Programme in the second half of 2013. It is foreseen that correlation at JIVE will be offered as an option to the prospective RadioAstron users in the upcoming observational Announcements of Opportunity.

L.I. Gurvits, JIVE Dwingeloo and TU Delft

e-VLBI at 4 Gigabits per Second

A successful demonstration of 4Gbps e-VLBI capability was made on September 18 as part of the final review of the EC-sponsored NEXPReS programme, using five telescopes of the European VLBI Network, equipped with the next generation of European-built VLBI digital receiver systems (DBBC).

Radio telescopes located in Metsahovi (Finland), Effelsberg (Germany), Yebes (Spain), Onsala (Sweden) and Hartebeesthoek (South Africa) observed the source J1800+3848, a distant quasar at z=2, in the X-band experiment TE110. 512MHz of sky bandwidth was observed in both polarizations. After correcting for the clock offsets at the participating stations a strong fringe was observed, as shown in the plots.

This observing mode quadruples the sampled sky bandwidth and with that doubles the sensitivy of the array compared to the current maximum observing data rate of 1Gbps.

Using the FiLa10G card, part of the DBBC system, each 4Gbps data stream was duplicated onto its two 10GE ports. One copy of the data was recorded locally. The other copy was split into four 1Gbps streams on-the-fly. Each stream was sent off to one of four SFXC instances (running at JIVE) for immediate correlation, showcasing the capability of distributed correlation. Due to limited network bandwidth (only 20Gbps of incoming bandwidth is available to JIVE) and cluster capacity, only four out of the five stations could be correlated simultaneously.

This demonstration could not have been done without the financial support of the EC and an enormous amount of coordinated effort by a lot of individuals at the various institutes across Europe and Africa. Its succes demonstrates the strength of the international collaboration that forms the basis of the EVN. A big thank you goes out to everyone who participated.

Arpad Szomoru, JIVE, Dwingeloo, on behalf of the NEXPReS Team

NEXPReS Concludes

The project Novel Explorations Pushing Robust e-VLBI Services (NEXPReS) successfully concluded in the last week of June, after three years oftechnology development for Very Long Baseline Interferometry (VLBI). The aim of NEXPReS was to work towards eliminating the distinction between traditional disk-based VLBI and real-time e-VLBI by incorporating aspects of each into every observation by the European VLBI Network (EVN).

NEXPReS has made significant improvements to the EVN services offered to radio astronomers around the world, and also explored VLBI technology questions shared with other next-generation telescope arrays.

NEXPReS's accomplishments included: the development of a distributed software correlator; creation of Network Services Infrastructure (NSI) based Bandwidth on Demand (BoD) tools; high-bandwidth, high-capacity networked storage on demand; and a large number of tools to smooth the process of observation and integrate technology that was not designed to work together. NEXPReS also fostered communication between the project members, the radio astronomy community, network providers and the community at large.

Having submitted the final report September 5, the project's final review is scheduled for 19 September 2013. The European Commission will send a review team of three experts and a project officer to Dwingeloo, the Netherlands, to receive the project reports and presentations. The event will include a live demo featuring many of the delivered prototype tools.

NEXPReS was an e-Infrastructure project funded by the European Union's Seventh Framework Programme under Grant Agreement RI-261525. It was comprised of 15 partner institutes in eleven countries and coordinated by the Joint Institute for VLBI in Europe (JIVE) in the Netherlands.

Huib van Langevelde, JIVE Dwingeloo

EVN Scheduler's Report: September 2013

1) SESSIONS SCHEDULED SINCE THE LAST NEWSLETTER

2013 Session 2: 23 May - 13 June

Wavelengths: 6, 5, 18/21, 3.6, 1.3 cm

Number of different user projects observed: 17

SESSION DURATION: 20.9 days: Efficiency: 52.3 %

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

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jun13               N-OBS  HOURS   DAYS T-BYTES
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jun13  TOTAL          44  263.0   11.0   763.1

       EVN-only       28  215.0    9.0   712.6
       GLOBAL          1   13.0    0.5     3.0
       Short Obs.      0    0.0    0.0     0.0
       Tests          15   35.0    1.5    47.5

       User: Cont.    21  163.0    6.8   699.9
       User: Line      8   65.0    2.7    15.7
       User: Pulsar    0    0.0    0.0     0.0

      EVN-Corr.       34  194.0    8.1   673.6
      Bonn-Corr.       3   24.0    1.0    89.5
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jun13	N-OBS	HOURS	DAYS	T-BYTES
VLBA-Corr.	0	0.0	0.0	0.0
eEVN-Corr.	2	25.0	1.0	
Other-Corr.	0	0.0	0.0	0.0
CAL-only	5	20.0	0.8	
MERLIN	2			
Arecibo	4			
VLBA	1			
GBT	0			
VLA	0			
Robledo	0			
Goldstone	0			
RadioAstron	0			

2) e-VLBI SCHEDULING

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SESSION	DATE	WAVELENGTH	HOURS	Normal	Short	e-VLBI Disk	PROPOSAL ToO	TYPE Trigger
13e06	18JUN13	6cm	22h	3	1	-	-	2 sched 1 trig
13e07	17SEP13	6cm	15h	2	0	-	-	1 sched

Richard Porcas, MPIfR, Germany

Reports from EVN Institutes

First Light with Q-band Receiver at Yebes 40-meter Radiotelescope

The technical team at Yebes Observatory installed in May 2013 a Q-band receiver at the 40m radiotelescope. It is a single pixel dual polarization receiver with an instantaneous band of 2 GHz and an observing sky frequency which ranges from 41 to 49 GHz. The frontend, including the horn, is housed in a cryostat which also holds the K band receiver. Figure 4 shows the QuiK cryostat opened. Both horns are clearly visible. Simultaneous operation of the two frontends is not possible since the cryostat has two windows, one per frontend, and only one will point to the sky at a time. In order to switch between one and the other, the cryostat is automatically moved 20 cms approximately. This operation requires 30 seconds at most. The IF is also shared by both receivers.

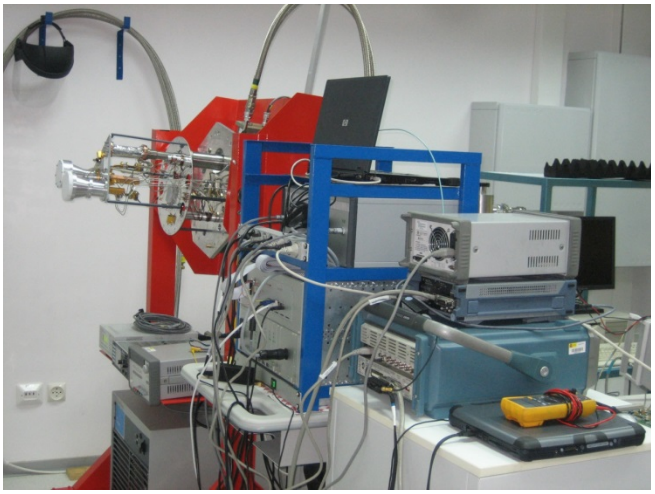

Figure 4. Photograph of the QuiK cryostat of the Yebes 40-meter radiotelescope, with 22 and 43 GHz horns visible.

Current Q band receiver temperatures are between 60 (RCP) and 90 K (LCP) and system temperatures between 100 and 130 K with good weather towards zenith. In the near future both cooled amplifiers will be replaced by two units designed and built at Yebes which will lower the receiver temperature by 25 K. Calibration is achieved either with a hot load or a noise diode. The first method is very reliable but very slow due to the limited velocity of the motor that moves the load. The noise diode, much faster, is less reliable and fails to work correctly above 45 GHz. This system is also available at 22 GHz and we have used it to test the validity of both systems.

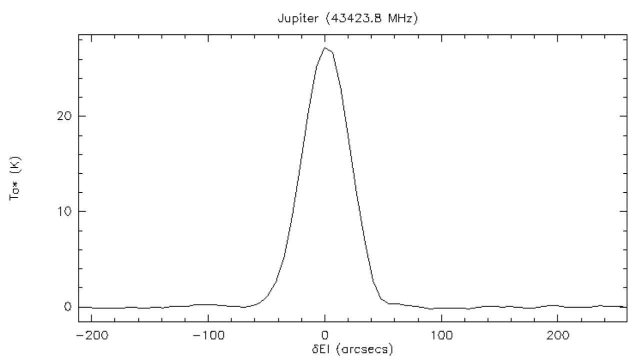

Figure 5. Total power (512 MHz) elevation pointing drift obtained from a scan on Jupiter at 43 GHz .

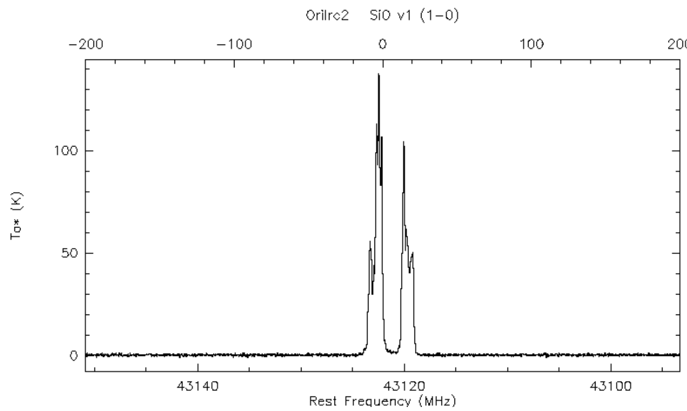

Figure 6. Spectrum of the SiO 1-0 v=1 maser towards OriIrc2 obtained with the new Q-band system over a total integration time of 30 seconds.

Continuum, pseudocontinuum and spectral single dish observations have been performed to test the system. Figure 5 shows a total power (512 MHz) elevation pointing drift towards Jupiter at 43 GHz. Figure 6 shows the spectrum of the SiO 1-0 v=1 maser towards OriIrc2 with a total integration time of 30 seconds. The backend is an FFT with 16842 channels and a spectral resolution of 30 KHz. Higher resolution of 6 KHz is also available.

Continuum observations towards planets have been used to estimate the SEFD of the telescope and the aperture efficiency, and skydips to determine the forward efficiency.

SEFD at 43 GHz is 480 Jy approximately, aperture efficiency 45 % and forward efficiency 95 % approximately. Aperture efficiency depends on the ambient temperature and hence this value may increase in winter, when low temperatures reduce astigmatism. The beam is circular with a HPBW of ~ 45 arcsecs.

Pablo de Vicente on behalf of the Technical Group of Yebes Observatory

Miscellaneous

Recent and Future Meetings

European Radio Interferometry School (ERIS) – 2013

The Fifth European Radio Interferometry School (ERIS) was hosted by Astron and JIVE in Dwingeloo, the Netherlands, between 9-13 September 2013. The event was sponsored by RadioNet, the host institutes, the DAGAL Network and the University of Groningen, as well as by the Leids Kerkhoven-Bosscha Fonds (LKBF) in the Netherlands. ERIS has provided a week of lectures and tutorials on how to achieve scientific results with interferometry. There were more 80 regular participants, together with the lecturers, tutors and helpers we have accommodated about 100 people. The lectures and tutorials took place in the brand new Auditorium in the new building of Astron/JIVE. The topics ranged from low-frequency to mm radio astronomy, from connected element interferometers to very long baseline interferometry. The social events included a conference dinner at Westerbork (where the group photo was made), visit to the LOFAR core, and a football match. It has been a tiring but very fruitful and successful week.

Figure 7. Participants of the Fifth European Radio interferometry School held on 9-13 September at ASTRON in Dwingeloo.

Zsolt Paragi, JIVE Dwingeloo

Job Announcements

RadioAstron Support Scientist Position at the Bonn VLBI Correlator

The Max Planck Institute for Radio Astronomy (MPIfR) in Bonn, Germany is seeking a Support Scientist for the correlation of VLBI observations with RadioAstron and the GMVA. The Bonn DiFX VLBI correlator is jointly operated by the MPIfR and the Federal Agency for Cartography and Geodesy (BKG). We are looking for candidates who

- have a Masters degree/PhD in radio astronomy or geodesy and have experience in VLBI
- preferably have experience with VLBI data correlation and analysis
- have experience with Linux and programming in Python or Perl
- have good communication skills and are able to work in a team
- have sufficient scientific background to communicate with PIs of observations to be correlated

We offer a two year contract with payment according to the public pay scale TVÖD (generally TVÖD/E13, but also subject to age and experience). Comprehensive benefits include paid vacation, sick leave, parental leave, and social security benefits. Applications should include a CV, a statement of interests and experience and three letters of reference. Electronic applications should be sent to walef@mpifr-bonn.mpg.de

Walter Alef, MPIfR Bonn