EUROPEAN vlbi NETWORK

European VLBI Network Newsletter
Number 27
September 2010

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1. Message from the EVN Chairman

First of all I would like to thank all, who contributed to the September issue of the Newsletter, but special thanks go to the editor Magdalena Kunert-Bajraszewska for her work and patience when dealing with always busy authors.

In the issue we can read as usually about several interesting and important for the EVN developments, both in the science area and the technical improvements.

Scientific highlights reported in the newsletter contain only a small portion of that, what is currently being much better and broader reviewed at the EVN Symposium in Manchester . It has been rather difficult to collect more information on recent research activities as the most of European VLBI-ers were working hard to prepare their contributions to the Symposium . Thus we are double grateful to those who helped to make this newsletter interesting.

On the technical developments and improvements two events are of great importance.

Some of us already know that the Hartebeesthoek 26m radio telescope has been put back into operation after long brake caused by damage of polar shaft bearing. The failure occurred in October 2008, the decisions to repair the telescope were taken a year ago, and the final work started in March 2010. As an effect of intensive activity, the telescope restarted its operation on July 20th with the first VLBI observations conducted two days later. On August 26th the first scheduled e-EVN day after the summer, JIVE was very pleased to announce that good fringes were obtained with Hart in a 1024 Mbps observing mode. Inclusion of Hartebeesthoek in 1024 Mbps observations significantly improves the performance of the e-EVN for low-declination sources.

I'd like to express my congratulations and thanks to Professor Roy Booth and his team. The 26m telescope is the only of this kind in Africa, particularly important element of global and European VLBI networks. Special thanks go also to Michael Gaylard the Acting Managing Director and Jonathan Quick - Friend of VLBI. A separate congratulations and thanks to JIVE Director and the JIVE staff for the arranging the session, and for the successful real time correlation with express distribution of results.

The second important news concerns the DBBC production. The HAT Lab delivers first systems, please read details in section under the topic on VLBI techniques.

EVN involvement in the Space Science described in two news shows its growing potential and new capabilities for future projects.

To finish the chairman's introduction I ask all the readers to continuously encourage new students to use the EVN for their astronomical research. After many years of developments and improvements, the EVN is becoming a straight forward, user friendly international facility, significant part of the advanced European Research Infrastructure. The EVN stretching E-W from China to the US and N-S from Sweden to South Africa, with large antennas and multi-country participation creates the most sensitive, highest angular resolution network. It will maintain the leading position as the powerful astronomical instrument on the Northern hemisphere for many decades in the future.

Andrzej Kus, Chairman of the EVN Board of Directors.

2. Call for EVN Proposals - Deadline October 1st 2010

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 1	Feb 24 - Mar 17	18/21cm, 6cm ...
2011 Session 2	May 26 - Jun 16	18/21cm, 6cm ...
2011 Session 3	Oct 20 - Nov 10	18/21cm, 6cm ...

Proposals received by 1st October 2010 will be considered for scheduling in Session 1, 2011 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure.

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

2010 Nov 23 - Nov 24 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2010 Dec 15 - Dec 16 (start at 13 UTC)	18/21cm, 6cm, 5cm or 1.3cm
2011 Jan 25 - Jan 26 (start at 13 UTC)*	18/21cm, 6cm, 5cm or 1.3cm
2011 Feb 15 - Feb 16 (start at 13 UTC)*	18/21cm, 6cm, 5cm or 1.3cm

*Dates for 2011 still provisional. 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 October 1st deadline will be considered for scheduling in the above sessions starting from November 2010.

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

- Hartebeesthoek has been repaired and is again available for the observations with the EVN.
- Due to e-MERLIN commissioning, only a subset of the e-MERLIN array is likely to be available in early 2011. For updated information please consult the web at http://www.e-merlin.ac.uk/vlbi Please note that EVN + e-MERLIN projects will only be considered for separate EVN and e-MERLIN observations when e-MERLIN has been fully commissioned.
- 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.

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 October 2010.

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

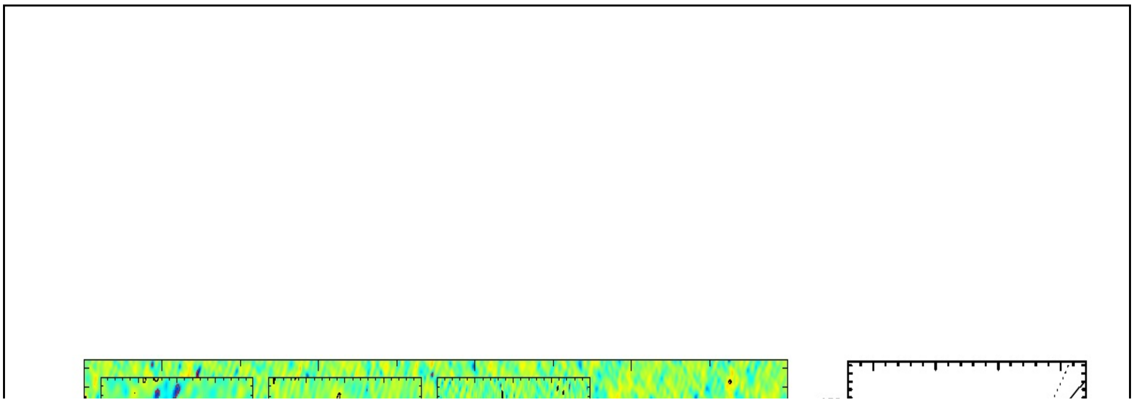
A decelerating jet observed by the EVN and VLBA in the X-ray transient XTE J1752-223

The newly discovered Galactic X-ray transient XTE J1752-223 entered its first known outburst in 2010, emitting from the X-ray to the radio regimes. Its general X-ray properties were consistent with those of a black hole candidate in various spectral states, when ejection of jet components is expected. To verify this, we performed very long baseline interferometry (VLBI) observations with the European VLBI Network (EVN) in e-VLBI mode and the Very Long Baseline Array (VLBA) at four epochs in 2010 February.

The imaging results are displayed in Fig. 1. These images show that a moving jet component, marked as "A", is decelerated at a rate of 0.34 milliarcsecond per square day by the last epoch, when a new jet component ("B") appears that is likely to be associated with the receding jet side. The overall picture is consistent with an initially mildly relativistic jet, interacting with the interstellar medium or with swept-up material along the jet. The brightening of the receding component can be well interpreted by initial Doppler deboosting of the emission in the decelerating jet. The discovery provides strong evidence for the existence of interaction around the jet at an early stage of its evolution.

Further details of this work can be found in Yang et al. 2010, MNRAS Letters (accepted), arXiv:1009.1367 http://arxiv.org/abs/1009.1367

Authors: J. Yang (JIVE), C. Brocksopp (MSSL-UCL), S. Corbel (Univ. Paris Diderot, CEA Saclay - AIM), Z. Paragi (JIVE), T. Tzioumis (ATNF), R.P. Fender (Univ. Southampton)



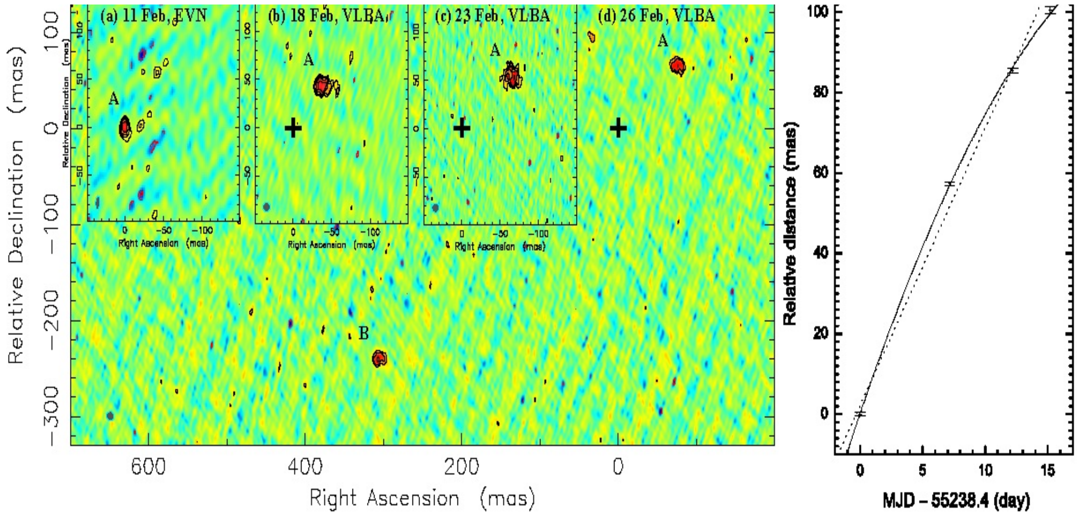


Fig.1: *The decelerating jet of the black hole candidate XTE J1752-223. All the colour images are centred at the location of component A on 2010 Feb. 11 (MJD 55238.4), indicated by a cross. The contours start from 3 sigma off-source noise level and increase by a factor of -1.4, -1, 1, 1.4, 2, 2.8. In the right panel, we fitted the proper motion data of component A to the models with (solid curve) and without deceleration rate (dotted line). It is clearly that the solid curve fits the data much better than the dotted line.*

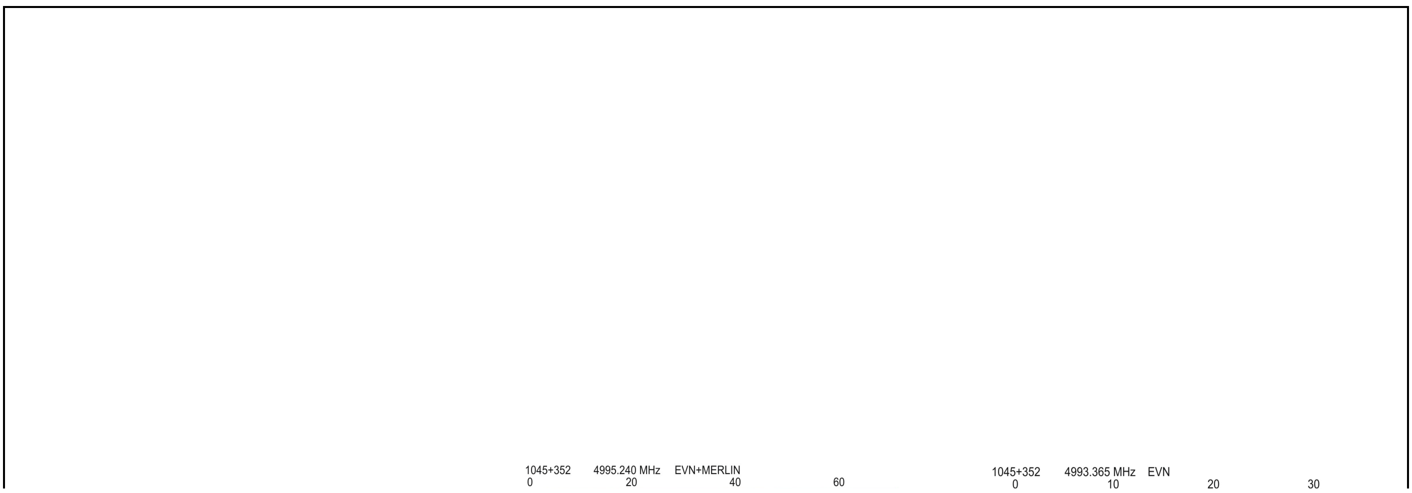
Origin of the complex radio structure in BALQSO 1045+352

We present new more sensitive high-resolution radio observations of a compact BAL quasar, 1045+352, made with the EVN+MERLIN at 5 GHz. They allowed us to trace the connection between the arcsecond structure and the radio core of the quasar. The radio morphology of 1045+352 is dominated by a knotty jet showing several bends (Fig.1). We discuss possible scenarios explaining such complex morphology: galaxy merger, accretion disc instability, precession of the jet and jet-cloud interactions. It is possible that we are whitnessing in this source an ongoing jet precession due to internal instabilities within the jet flow, however, a dense environment detected in the submillimeter band and an outflowing material suggested by the X-ray absorption can strongly interact with the jet. It is difficult to establish the orientation between the jet axis and the observer in 1045+352 because of the complex structure. Nevertheless taking into account the most recent inner radio structure we conclude the radio jet is oriented close to the line of sight which can mean that the opening angle of the accretion disc wind can be large in this source. We also suggest that there is no direct correlation between jet-observer orientation and a possibility of observing BALs.

1045+352 is a CSS object and a HiBAL quasar at a medium redshift. Its linear size (~4 kpc) indcate it is a young object in the early phase of quasar evolution. The radio morphology of 1045+352 is dominated by the strong radio jet resolved into many sub-components and changing the orientation during propagation in the central regions of the host galaxy. As a consequence we observe at least three phases of jet activity indicate different directions of the jet outflow: components A_2-A_3 as the oldest one, structure A_1-B as the younger one, and the jet A as the current activity direction (Fig.1).

The above results have been published in Kunert-Bajraszewska et al.(2009), ApJ, 705, 1356 and Kunert-Bajraszewska et al. (2010), ApJ, 718, 1345

Authors: M. Kunert-Bajraszewska (TCfA), M. Gawronski (TCfA), A. Janiuk (CAMK), A.Siemiginowska (SAO)



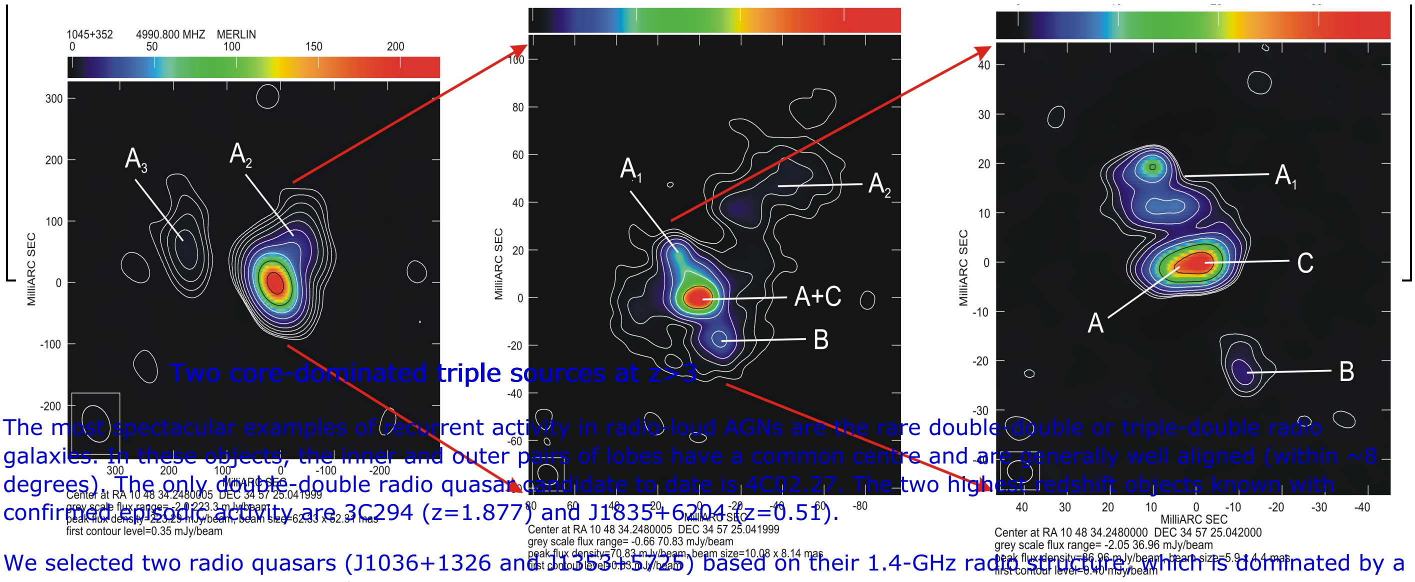


Fig.1: Radio images of 1045+352 at 5 GHz made with (from left): MERLIN, EVN+MERLIN, EVN. Contours increase by a factor 2 and the first contour level corresponds to 3 sigma. Indications: C - radio core, $A-A_3$ - radio jet, B - probable counter-jet.

Two core-dominated triple sources at z>3

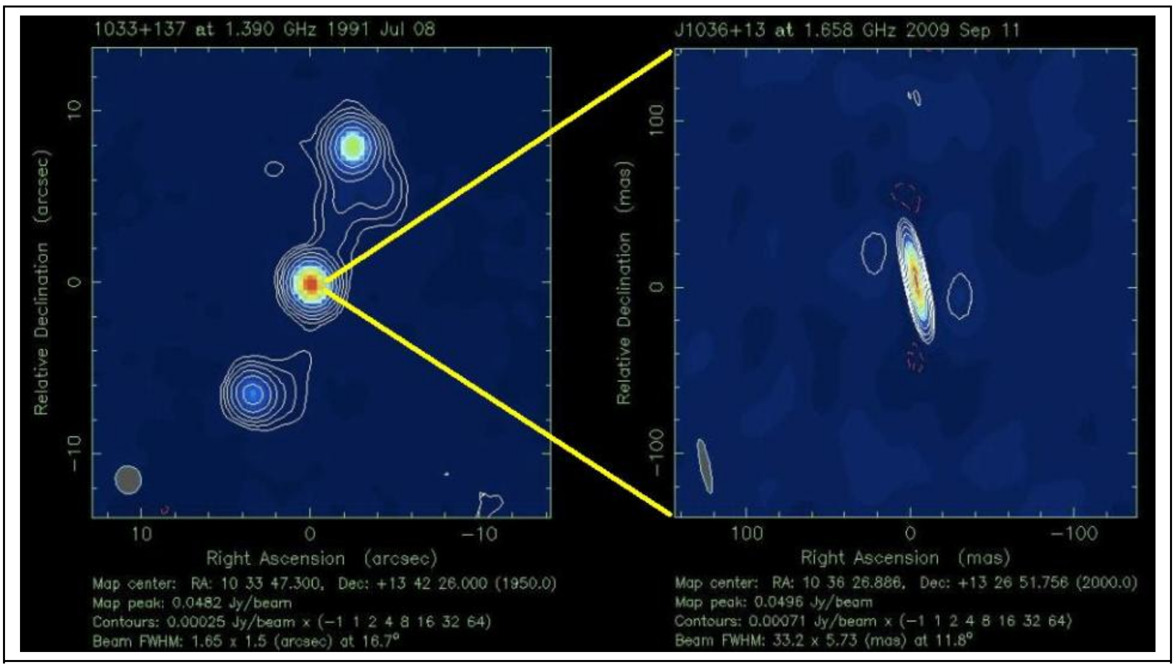
The most spectacular examples of recurrent activity in radio-loud AGNs are the rare double-double or triple-double radio galaxies. In these objects, the inner and outer pairs of lobes have a common centre and are generally well aligned (within ~8 degrees). The only double-double radio quasar candidate to date is 4C02.27. The two highest redshift objects known with confirmed episodic activity are 3C294 (z=1.877) and J1835+6204 (z=0.51).

We selected two radio quasars (J1036+1326 and J1353+5725) based on their 1.4-GHz radio structure, which is dominated by a bright central core and a pair of weaker and nearly symmetric lobes at ~10" angular separation (i.e. core-dominated triples, CDTs). They are optically identified in the Sloan Digital Sky Survey (SDSS) at spectroscopic redshifts z>3. We investigated the possibility that their CDT morphology can be a sign of restarted radio activity, involving a significant repositioning of the radio jet axis. To check whether the VLA cores of J1036+1326 and J1353+5725 are resolved (for example, show a small separation double structure, thus indicating a restarting AGN activity) or unresolved (thus showing evidence of a compact jet) on 10 milli-arcsecond scales, we carried out EVN observations at 1.6 GHz. The 6-hour observations were accommodated in the 2009 September 10-11 e-VLBI run. To investigate if the large-scale morphology is dominated by beamed or unbeamed emission, we estimated the arm-length ratio. We assumed that the observed ratios are the result of relativistic motions over the lifetime of the sources rather than the difference in the environment on the two sides. In particular, from the arm-length ratio alone, we can infer that there is mildly relativistic motion in the case of J1353+5725.

As a starting hypothesis, we assumed that the inner radio jets that remain compact with VLBI are well aligned with the ~100-kpc scale radio structure we see in the VLA images. Using the estimated range of the allowed viewing angles, we can calculate the Doppler boosting factors and compare the expected brightness temperatures with our measured values, in order to determine whether we need to introduce large misalignments to describe the observed morphology. In case of J1036+1326, even the possible maximum value of the estimated viewing angle can be made consistent if the Lorentz factor is ~11. However, models of the inner jet with much higher Lorentz factors, hence smaller viewing angles, should be considered because of the quasar identification of the source. If we allow for a very high Lorentz factor of ~30, the misalignment would be ~40 degrees. In case of J1353+5725, we can construct a set of reasonable physical and geometric parameters which does not require jet repositioning and is fully consistent with our observations. On the other hand, the largest possible misalignment could reach about 70 degrees. Considering the steep spectra of the lobes, if one places these sources at e.g. z=0.5, then the (observed) 1.4-GHz flux density of the brighter lobes in these objects would far exceed that of the flat-spectrum core. In summary, we found that it is not necessary to invoke large misalignment between the VLBI jet and the large-scale radio structure to explain the observed properties of these two sources.

The paper describing the results in more details is accepted for publication in Astronomy & Astrophysics. The preprint is available at http://arxiv.org/abs/1008.5335

Authors: D. Cseh (CEA SAp), S. Frey (FOMI SGO), Z. Paragi (JIVE), L.I. Gurvits (JIVE), K.E. Gabanyi (FOMI SGO)



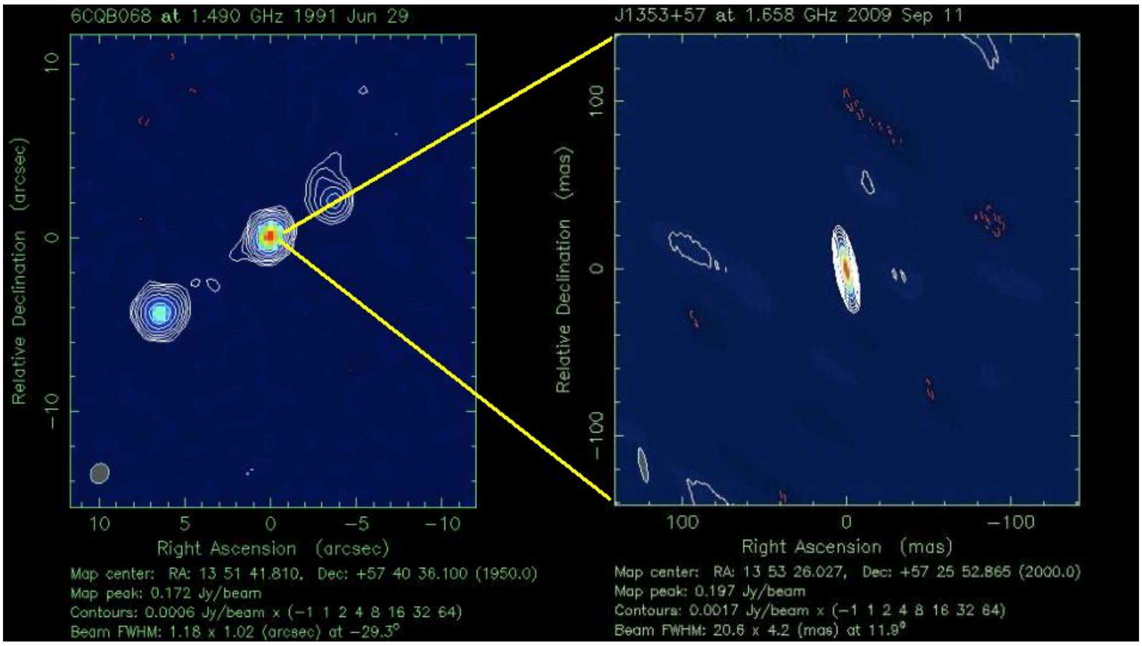


Fig.1: *1.4-GHz VLA and 1.6-GHz EVN images of J1036+1326 (z=3.10, top) and J1353+5725 (z=3.46, bottom).*

4. EVN Technical Development and Operations

SPIDER enhances outreach at Yebes

The activities performed at the National Astronomical Observatory in Spain will be soon enhanced by the installation of a new instrument at Yebes: SPIDER ("Small Parabolic Instrument for Demonstration, Education, and Research"). Built by the Swedish company Are Elektronik following the principles of the SALSA instrument developed by Onsala Space Observatory, SPIDER is a fully operational 2.3 meter radio telescope equipped with an L-band (21cm - 1420MHz) receiver and a spectrograph (352 channel correlator, 2.4MHz total bandwidth). The beam width is 7 degrees. A low noise preamplifier is mounted in the antenna focus and a coax cable feeds the signal to a cabinet which contains the receiver, power supplies and a modem. In the antenna vertex a small dipole antenna is installed for calibration purposes.

This radio telescope is ideal for observing hydrogen in our galaxy, the Milky Way. The main aim is to map the spiral arms of the Galaxy. The Onsala software Qradio is used for controlling the radio telescope. This software communicates with "kstars".

The goal of SPIDER is to provide the opportunity to operate a real radiotelescope to students and visitors, in the environment of the Yebes observatory, where the big 40 meter dish is closeby but not accessible to them. The instrument could be operated remotely via internet from the other OAN centres in Madrid or University of Alcalá, even directly from the schools. Many of the applications are still to be designed, in coordination with other EVN observatories which are part of the network of Visitor Centres (VC-Net) sponsored by the EC FP7 project "RadioNet".

Francisco Colomer, José Manuel Serna, Beatriz Vaquero (OAN, Spain)


Fig.1: *SPIDER installed next to the Yebes 40m radiotelescope.*

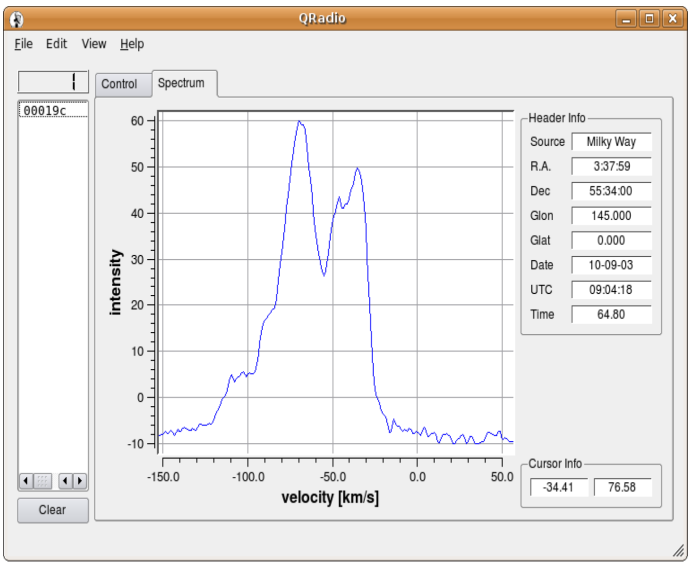


Fig.2: *Example of SPIDER data.*

Note: Contact details for the company Are Elektronik: Rune Bystrom Are Elektronik; Ann Nissevagen 4. S-830 15 DUVED, Sweden Ph: +46 647 50758; Fax: +46 70 6703293; Email: are.elektronik@telia.com

NEXPReS Funded and Launched

As anticipated, the EC approved 3.5M EUR funding for the NEXPReS project (Novel EXplorations Pushing Robust e-VLBI Services), and work began 1 July to build on progress made during EXPReS.

NEXPReS aims to incorporate e-VLBI into every astronomical observation conducted by the EVN by marrying "the best of both worlds" - data archiving and reprocessing afforded by traditional disk-based VLBI with the speed and flexibility of e-VLBI.

All activities are beginning work, and the first Board meeting is scheduled for September in Manchester, prior to the EVN Symposium. Additional information about the project is available at http://www.nexpres.eu/.

Kristine Yun (JIVE)

HAT-LAB delivers the first DBBC systems

The first batch of the DBBC back-end production has been completed at the beginning of this September from HAT-Lab. This company is a spin-off of the Italian INAF (Istituto Nazionale di Astrofisica) established to produce the DBBC backend and its components in collaboration with IRA (Istituto di Radioastronomia) and MPI (Max Planck Institute fuer Radioastronomie). The construction of the systems has been realized in Noto, Catania and Bonn.

The first batch was composed by seven units to be delivered to: Onsala (Sweden), SRT (Italy), Pico Veleta (Spain), APEX (Chile), Auscope (two systems, Australia), Auckland (New Zealand). These together with the already deployed systems at: Noto (Italy), Effelsberg (Germany), Yebes (Spain), Wettzell (three systems, Germany), Auscope (Tasmania), provides a number of fourteen systems on the field. Other four units are at present under construction in the HAT-Lab laboratories.

Delivery time for the first batch from HAT-Lab has been around one year, longer than expected, and due to the initial operations to be set with the sub-contractor companies that had in charge the realization of the boards composing the system. Full assembly and testing has been done by HAT-Lab, IRA and MPI. Delivery time for new orders is now expected around four months.

HAT-Lab is going to produce now also the FILA10G board, a 10Gbps Ethernet network card to be used to join the MK5C recorder or any standard 10G network. It is also available the optical-copper interface GLAPPER, to link the glass connection media coming from the FILA10G with the copper CX4 interface present on the MK5C or any other device using such type of interface.

G. Tuccari - IRA (INAF)

Fig.1: *DBBC VLBI Backend System*

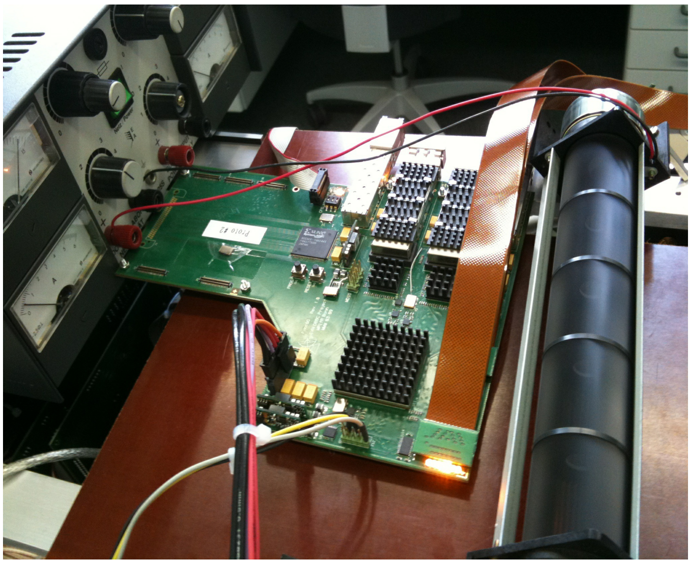


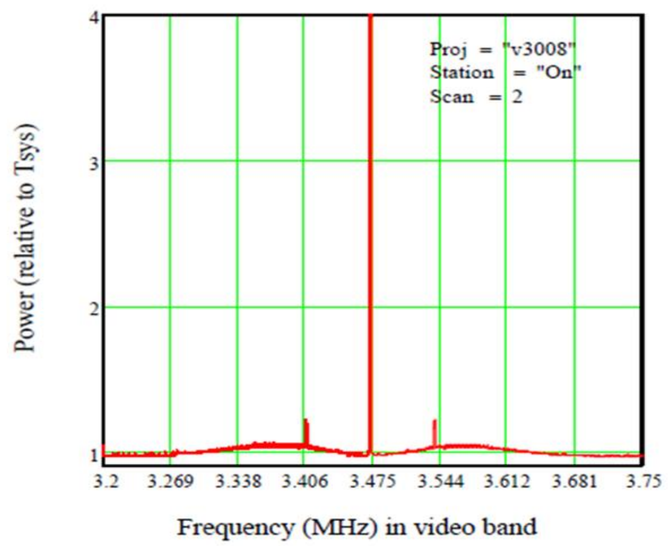
Fig.2: *FILA10G network interface to MK5C*

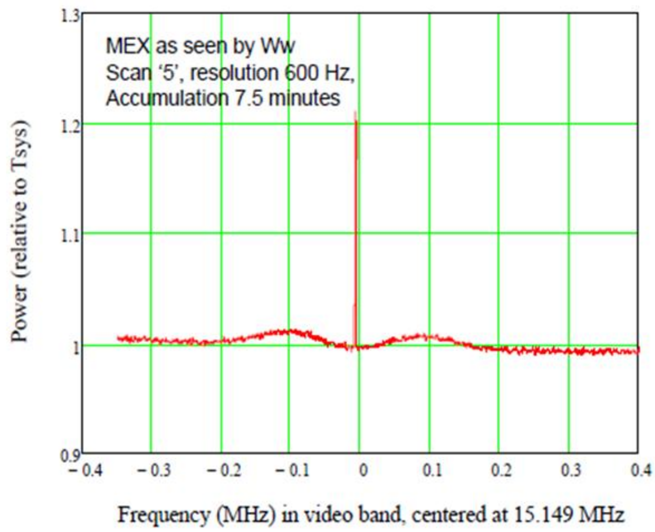
EVN Space Science Applications extend across Europe, the Earth and the Solar system

The summer of 2010 was successful for EVN Space Science Applications in practical observational work, data analysis and interpretation. We are happy to welcome new observers from the Onsala (Sweden) and Warkworth (New Zealand) observatories who have joined the group of Metsähovi (Finland), Medicina, Noto, Matera (Italy), Wettzell (Germany), Yebes (Spain) and Pushchino (Russia). The ESA Venus Express (VEX) spacecraft was observed in a single dish mode with Onsala 20-m dish on 2010 August 30, and showed a robust detection. About the same time, the brand new Warkworth antenna, observed the ESA Mars Express (MEX) spacecraft. This 12-m Cassegrain located in a picturesque Hobbit-like neighbourhood of Auckland on the other side of Earth (see the great picture of it), is operated by the Institute for Radio Astronomy and Space Research of Auckland University of Technology.

Photo: Alex Wallace

Onsala observed VEX with a standard MkIV/Mk5/PCEVN data acquisition system. The Warkworth antenna observed MEX with their home-made single channel BBC with a bandwidth of 32 MHz, an 8-bit sampler and a PCEVN data capturer. The recorded data were electronically transferred from both stations to Metsähovi for processing and then to JIVE for analysis. Plots below show the detected spectra for both Onsala and Warkworth on VEX and MEX, respectively.





Earlier in September a team of Warkworth and Metsähovi scientists, when observing the MEX spacecraft, tested a direct eVLBI streaming of data from New Zealand to Finland at data rate of 512 Mbps, over probably the longest fibre path in the World. The data were streamed from the Warkworth PCEVN data capture unit directly to a Linux RAID at Metsähovi using the tsunami protocol. First tests were successful and we hope a good science can be done soon with such observations, although more test are needed.

PhD students G. Molera Calves (Aalto University, Helsinki, Finland) and D. Duev (Moscow State University, Moscow, Russia) and

MSc student T. Bocanegra Bahamon (Delft University of Technology, Delft, The Netherlands), all working at JIVE during this summer, made significant contribution for the observations and analysis of the spacecraft tracking data. The results of the busy observing and data processing summer pave the way for future EVN observations in the framework of the Planetary Radio Interferometry and Doppler Experiment (PRIDE) - a multidisciplinary component of science programmes of several prospective deep space missions.

Sergei Pogrebenko - JIVE

Observations of Mars Express and Venus Express spacecraft and first EVN VLBI Space Science session.

The ESA Mars Express (MEX) and Venus Express (VEX) spacecraft have been observed for the last two years with the European VLBI radio telescopes of Metsähovi (Finland), Wettzell (Germany), Yebes (Spain), Medicina (Italy), Matera (Italy), Noto (Italy), Puschino (Russia) and the latest ones Onsala (Sweden) and Warkworth (New Zealand). The campaign is in a framework of the assessment study of the possible contribution of the European VLBI Network to the upcoming ESA deep space missions and it also brings new opportunities for the radio astronomy science. Observations are carried out either in single- or multi-dish mode when spacecraft is locked to the ESTRACK ground station (Cebreros or New Nortia) observing the two-way link (up- and down-link channel).

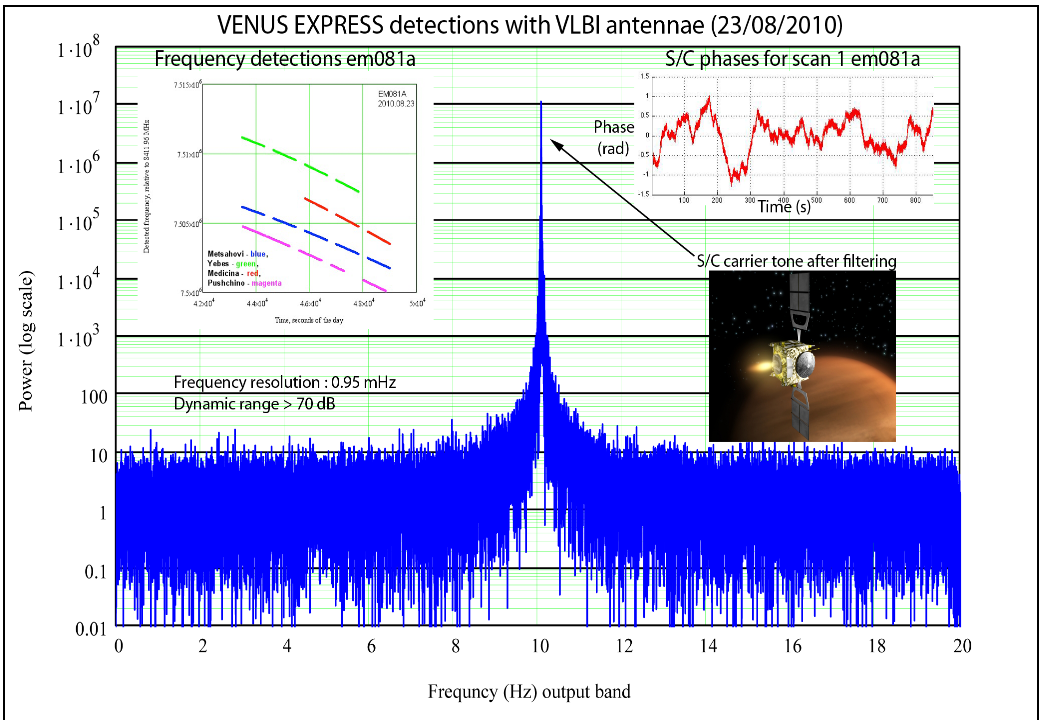


Fig.1: *VEX Spacecraft detection on 23 August 2010, session EM081a. Subplot on the left corner shows the frequency detections for all the antennas and at the right is the extracted phase for the first S/C scan from Yebes.*

On 23th of August 2010 there was the first VLBI Venus Express tracking session EM081A supported by the EVN program committee. VEX and the sources J2156-0547 were alternatively observed along the six hours session. The radio telescopes participants were Metsähovi, Medicina, Onsala, Yebes and Puschino. Data was locally recorded in the stations using common VLBI equipment and transferred almost immediately after the session using tsunami-UDP software to Metsähovi Radio Observatory and to JIVE for the processing, pre and post-analysis and the correlation. The high dynamic range of the detections allowed us to determine the apparent topocentric frequency of the S/C carrier line and down to milli-Hz spectral accuracy and to extract the phase of the spacecraft signal carrier line. With such multi-station observations the respective phases can be calibrated per-baseline basis using VLBI phase referencing technique and observations of near-by quasars using the far-field VLBI delay model for quasars and near-field model for spacecraft.

The post-analysis of the spacecraft tracking data enables us to study several parameters of the spacecraft signals, among which the phase fluctuations of the signal can be used for characterization of the interplanetary plasma (IP) density fluctuations along the signal propagation line at different spatial and temporal scales and different Solar elongations. These fluctuations are well represented by a near-Kolmogorov spectrum.

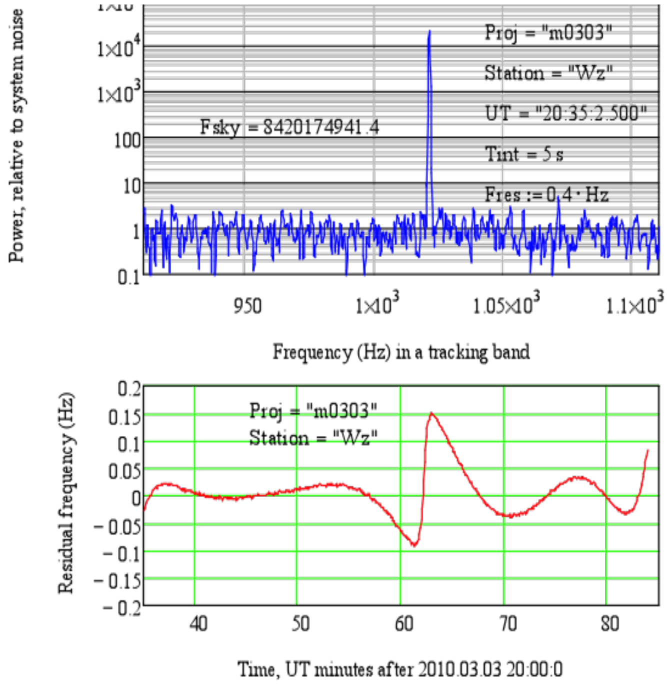


Fig.2: *Observational results of the MEX detections with Wettzell radio telescope on March 03 2010, during the Phobos fly-by.*

We also demonstrated such a high accuracy of Doppler tracking with 3 EVN stations (Metsähovi, Wettzell and Yebes) during the MEX-Phobos flyby occurred last 03th of March 2010. These multi-station observations sessions could help to better determine the Phobos gravity field and together with phase referencing can provide additional geometrical constrains on the orbiter/Phobos trajectories. PRIDE-EVN observations of the Phobos-Grunt Lander, which launch is planned to 2011 are also foreseen.

Guifré Molera Calvés, Aalto University Metsähovi Radio Observatory, on behalf of PRIDE team.

5. VLBI related news

First resolved images of the Sun with LOFAR

LOFAR, Europe's first and only dedicated low-frequency e-VLBI array, has recently imaged the Sun for the first time. The observations were initiated by the Solar Physics group at the AIP (Astrophysikalisches Institut Potsdam) led by Prof. Gottfried Mann. Also involved in the preparations were Frank Breitling and Christian Vocks (AIP), James Anderson (MPIfR, Bonn), Antonis Polatidis (ASTRON, Dwingeloo) and Olaf Wucknitz (AIfA, Bonn). Eight ten-minute scans were taken on 9th June 2010 between 9:48 and 15:50 UT, four in the low band (LBA) and four in the high band (HBA). This date was chosen to have a couple of bright calibrator sources in the field to allow a proper phase calibration. The preliminary results shown here, however, are based on self-calibration. This was made possible by the help of a compact active region on the Sun acting as a compact phase-calibrator source. The calibration and imaging was done by Olaf Wucknitz using a combination of own software and difmap.

Additional material including movies of the time-variability can be found here: http://www.astro.uni-bonn.de/~wucknitz/publications/pub.php?2010_bochum_glow

Olaf Wucknitz (AIfA Bonn)
on behalf of the Solar KSP. LOFAR is a project of ASTRON (Dwingeloo).

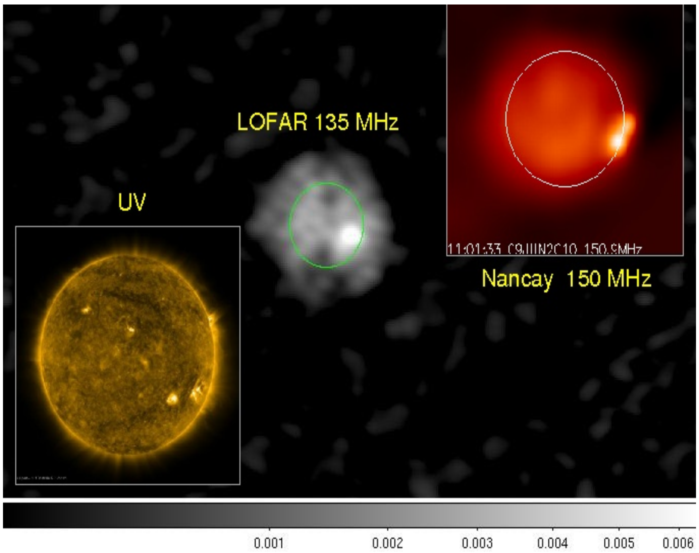


Fig.1: *One of the first resolved LOFAR HBA images of the Sun in a narrow frequency band near 135 MHz (centre) compared to a 150 MHz image from the Nancay Radioheliograph (right) and a UV images (left) taken at approximately the same time. Only short baselines were included in the LOFAR images to avoid the sparse uv coverage further outwards. We see that (a) the Sun appears larger at these frequencies than in the optical (green circle)) and that (b) there is a compact active region that can also be seen in the comparison images. The resolution is a couple of arcmin, quite unusual for the EVN newsletter.*

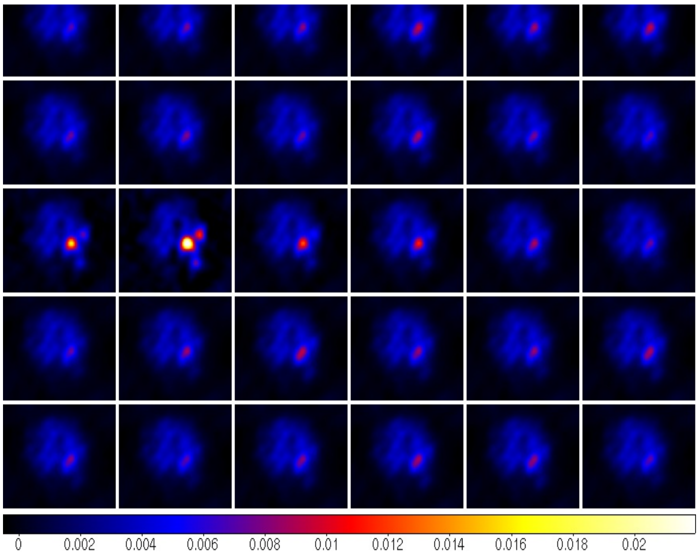


Fig.2: *The active region varies on timescales of seconds or below as seen in this sequence of 1 sec snapshots spanning an overall duration of 30 sec. Currently it is not clear whether the double structure of the brightest flare is real or an imaging artefact. A relatively narrow band was used for these images. Dynamic spectra show that the emission is highly variable not only as a function of time but also as a function of frequency. Details of this still have to be investigated.*

6. Meeting Point

EVN Symposium, Manchester, 20th-24th September 2010

A few, very fresh photos from the EVN Symposium.

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