European VLBI Network Newsletter
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1. Call for Proposals - Deadline 1 October 2004

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 EVN 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.

EVN Observing Sessions in 2005

2005 Session 1	Feb 17 - Mar 10	18/21cm (+MERLIN), 1.3 cm +...
2005 Session 2	Jun 02 - Jun 20	6cm, 3.6 cm + ...
2005 Session 3	Oct 20 - Nov 10	18/21 cm, 6 cm, 5 cm, +...

Proposals received by 1 October 2004 will be considered for scheduling in Session 1, 2005 or later. Finalisation of the planned observing wavelengths will depend on proposal pressure.

More information can be found at http://www.obs.u-bordeaux1.fr/vlbi/EVN/call.html

2. Message from the Chairman

The EVN experiences one breakthrough after another. After the first real-time four-station VLBI imaging experiment in April using the EVN correlator at JIVE, there has been a four-station trans-Atlantic e-VLBI test experiment on 10 September. On 22 September two four-station science observations were done of a Galactic OH maser at 1612 MHz (Cambridge, Onsala, Torun, Westerbork) and an extra-galactic OH Megamaser at 1458 MHz (Arecibo, Onsala, Torun, Westerbork). It is very exciting to see real-time fringes as the data streams in from the stations. This data will be publicly available after the observations. The discussion within EVN on the use of real-time VLBI will continue as the network connectivity at all EVN stations continues to improve. While initially this capacity will be used for network monitoring experiments and for "hot and timely science", this operational mode would eventually replace disk-based recording.

The introduction of the Mk V data recording units at all EVN stations has already made it possible to increase the data rate of routine EVN observations. After a few test experiments in earlier sessions, the October 2004-3 session has several 1 Gbps experiments scheduled. This is the highest data rate attainable with these units.

The EVN user community is looking forward to the EVN symposium 11-15 October in Toledo. Besides the many exciting presentations on VLBI results there will also be a User's Meeting. During this meeting we hope to have an active discussion about EVN priorities but also about EVN performance, reliability and user support. We trust and hope that this will be a very fruitful discussion.

3. Access and Financial Support for EVN Users via FP6 RadioNet Programme

The EVN operates as an open scientific facility offering its observing time and other resources on the basis of the scientific merit of observing proposals from the worldwide astronomical community. The use of the Network by astronomers who are unfamiliar with VLBI is particularly encouraged and supported by JIVE Support Scientists. In continuation of the effort to make VLBI a friendly and transparent astrophysical tool, EVN is offering support to the EVN users via the European Commission's Sixth Framework Programme (FP6) Integrated Infrastructure Initiative RadioNet, specifically its 'Trans-National Access (TNA) programme. The user community eligible for FP6 TNA benefits is broader than in previous Framework Programmes and currently includes investigators from the countries of the European Union (excluding investigators from the Dutch institutes) and Associated States. Specific inquiries on the FP6 EVN TNA programme should be addressed to the undersigned. The FP6 RadioNet contract has begun on 1 January 2004 and runs for 5 years. The EVN Session 2004-1 (February 2004) was the first to be supported by RadioNet. The EVN TNA support is available automatically for eligible user groups who obtain observing time on the EVN. Co-investigators associated with projects led by eligible PIs can also obtain support - including co- investigators from countries other than listed above. The EVN particularly encourages new users and PhD students to take the advantage of the Trans-National Access programme.

The support provided by this programme includes:

- full financial support for eligible users who wish to visit JIVE or any other EVN institute in order to schedule or process EVN, EVN+MERLIN or Global VLBI (EVN + NRAO) data;
- assistance from Support Scientists (located at JIVE) at all stages associated with a VLBI experiment - from proposal writing to scheduling, calibration, and data analysis;
- absentee processing (pipelining) of the data at JIVE. To apply for time on the EVN please refer to the EVN Call for Proposals (see item 1 of this Newsletter).

Further information on the EVN Access programme can also be obtained from the EVN Programme Committee Chairman, Patrick Charlot (charlot@u-bordeaux1.fr) as well as the RadioNet EVN TNA programme coordinators Leonid Gurvits (lgurvits@jive.nl) or Andy Biggs (biggs@jive.nl). In addition, information on the RadioNet EVN's TNA programme is available at the RadioNet web site www.radionet- eu.org.

Leonid Gurvits (lgurvits@jive.nl)

4. Mk5 Unit Number 16 arrives at JIVE!

Not so long ago, the EVN made the historic decision to replace the MkIV magnetic tape recorders with the new Mk5 PC-based disk recording system. The upgrade to Mk5 has led to an enormous improvement in the data quality delivered to users by the EVN - unlike tape, the process of recording on disk-based media is entirely error free - good news for everyone!

The prospect of replacing all 16 magnetic tape playback systems with the new Mk5 systems at the EVN correlator was, at least initially, a somewhat daunting prospect. As the EVN telescopes enthusiastically embraced the new Mk5 systems, the Board of Directors wisely decided that telescopes upgrading to Mk5 should also provide a corresponding Mk5 unit for JIVE. This policy of "one for the telescope and one for JIVE" has been very successful, and over the last 18 months units have been provided by the telescopes at Onsala, Effelsberg, WSRT, Jodrell Bank (including an additional unit for Cambridge), Medicina and Shanghai/Urumqi. In addition, four units were procured by JIVE directly and the remaining units have arrived via the recent agreement reached with ESA over JIVE's participation in the Huygens Mission (see the accompanying Newsletter report by Leonid Gurvits).

A few days ago the 16th Mk5 unit arrived at JIVE - courtesy of Yebes (OAN). As a result, we are now able (in principle) to replace all the old tape-based play-back units with Mk5. The Mk5 upgrade of the EVN correlator at JIVE means that its now possible for Mk5-only VLBI experiments to be correlated with high efficiency. Higher quality data is just one of the benefits astronomers will see via this upgrade, another is a much faster turn around time between observing and the receipt of correlated data. Currently the correlator is configured to take input from up to 16 telescopes chosen among 13 tape units and 8 Mk5s. This balance between magnetic tape and Mk5 playback units is continually evolving at JIVE, the main constraint being the need to maintain enough tape units to handle data from the VLBA. Another constraint is that the tape drives are now aging, and the only sensible way of maintaining and repairing units is by using parts from retired systems. Eventually this process of cannibalisation will exhaust itself, but we aim to maintain some tape-based playback capability until the end of 2005.

Figure: The 16th Mk5 unit at JIVE, courtesy of Yebes Observatory (OAN).

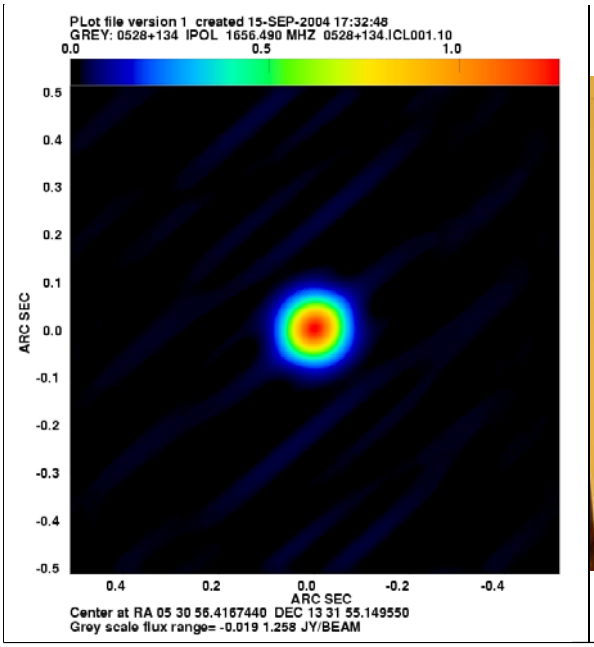
Mike Garrett, Bob Campbell & Steve Parsley (JIVE)

5. e-VLBI current status

Following the successful real-time eVLBI tests in April, the EVN directors decided that some thought should be given to how eVLBI could be used for science. To this end a series of "science demonstrations" were proposed, under the leadership of John Conway, and involving other representatives of the EVN institutes. The first of these is scheduled for Sept 22nd. This is planned to be a 32 Mbit/s spectral line experiment at 18 and 20 cm using up to five telescopes. In June a single baseline, spectral line test, between Onsala and Westerbork confirmed that real-time eVLBI could yield suitable data.
In June, Torun became connected at 1Gb/s and were able to participate in an IPERF network test, achieving a peak data rate of 350 Mb/s to JIVE. In general the results of this test were variable and well below the 900 Mb/s routinely possible over the local link between Westerbork and JIVE. This has raised some interest from the network providers who have begun to offer useful technical assistance. Bench testing in August confirmed that the real-time path between two Mark5 units can be run successfuly at 512 Mb/s but only if so-called "jumbo frames" are used. At the moment this is not universally available on the European R&E networks. Using standard frames however, real-time data transfer via Amsterdam worked reliably at 250 Mb/s suggesting this as a realistic target for the next effort to increase real-time performance.

At the beginning of September further real-time tests were performed in preparation for the first science demo later in the month. During the run-up to these tests the 305 m Arecibo telescope, with a 155 Mb/s connection and a recently acquired Mark5 system, became available as a potential participant. The addition of this telescope posed some scheduling challenges but in the end the results were worth the effort. On Friday 10th September real-time fringes were detected between Arecibo, Cambridge, Torun and Westerbork. Arecibo-Torun is believed to be the longest real-time interferometer baseline ever created (see figures below). Further details can be seen at http://www.evlbi.org/evlbi/te024/te024.html
At the time of writing preparations for the first science demo are well in-hand. Two observations will be performed over a period of eight hours involving Westerbork, Onsala, Torun, Cambridge and Arecibo. Results will be reported in the next newsletter.

Steve Parsley (JIVE, parsley@jive.nl)



Breaking News

Just as this newsletter went to press, the first e-EVN science observations were conducted by an array composed of Arecibo, Cambridge, Onsala, Westerbork and Torun. Two spectral-line projects were scheduled (see CBD also the chairman's report for more details) for a total of ~ 20 hours on Wednesday September 22. The telescopes and network performed flawlessly during the observing run. The real-time correlation was conducted at JIVE and although there were a few problems requiring the correlator to be restarted on many occassions, a significant fraction of good data was obtained. The EVN PC chair (Patrick Charlot) just happened to be around to witness the first e-EVN science observations and shared in the excitement of the day. It's rumoured that Huib Jan van Langevelde was seen to be back at the correlator "coal-face", labouring long into Wednesday night with the duty operator, Martin Leeuwinga. The e-VLBI Science observations were organised by John Conway on the request of the EVN CBD with Steve Parsley providing engineering support. The telescopes were "manned" by Paul Burgess & Alastair Gunn; Tony Foley; Michael Lindqvist, Chris Salter & Tapasi Ghosh, Eugeniusz Pazderski. Arpad Szomoru ran the correlator through the day, assisted by Cormac Reynolds and Friso Olnon (who was hacking the correlator code as the experiments ran...!). The correlated data were pipelined by Zsolt Paragi and made available to the PIs the day after the observations took place. The data were downloaded via the internet by the PIs and they are now looking at the data - surely a record for receipt of astronomical VLBI data from the EVN.
We are all looking forward to some interesting science results (soon!).

6. First meeting of RadioNet's Engineering Forum

Under the umbrella of RadioNet (see: http://www.radionet-eu.org/), the task of the RadioNet Engineering Forum is to organize about 2 workshops per year for engineers from the partner institutes.
The first meeting of the Engineering Forum with the title "Digital Backends" was held at the MPIfR in Bonn on September 6, 2004. The topic of the meeting was chosen to support the project for developing digital baseband converters, which has just been started in the EVN. After a slow start of the registration (probably because of summer holidays all over Europe) finally more than 40 people from Europe, Australia, China, and USA plus 2 people from industry attended. The agenda of the 1-day meeting was densely packed with 12 presentations (see: http://www.radionet-eu.org/wikiattach/WorkshopOnDigitalBackends/attachments/DigitalBackendsProgramme.pdf) covering topics from FFT spectrometers and polyphase digital filterbanks to VLBI baseband converters, digital receivers for ALMA, baseband conversion in the LBA and description of a remote LOFAR station. In addition 11 posters were presented.
Most of the posters (http://www.radionet-eu.org/RNwiki/DigitalBackendsPosters) and the presentations (http://www.radionet-eu.org/RNwiki/DigitalBackendsPresentations) are available on the RadioNet webpages. A workshop summary and comments from the participants will be published on the website soon. First comments from participants indicate that the Digital Backend meeting was considered a success.
Interested parties met on a second day after the workshop to discuss the status and future course of action of the EVN digital BBC project which is being led by Gino Tuccari from Noto. The aim of the project is to build 4 digital BBC prototypes within 2 years.

Report from the TOG

In the May session the first 2 observations at 1 Gbit/s could not be scheduled because of the lack of disks at some stations; a single 12-hour observation with 1 Gbit/s recording needs about 5.5 TB of disk space per station, which is a third of the typical disk usage in a session. Those observations are now scheduled for the October session.
In the meantime nearly all stations have acquired a Mk 5 system (see http://www.mpifr-bonn.mpg.de/div/vlbicor/evn_tog/EVN_Mark_5_Status.html), but the disk supply has not yet improved dramatically. It might be that some stations which had expected to be MK5-only in the October session will still have to use tapes for some experiments, as the disks have to be used for the 1 Gbit observations.
Closer network monitoring with ftp transfer of small parts of recorded data is still on the agenda of the TOG. It is an important tool to improve the reliability of the network. But its full implementation and automization depends much on the priorities at JIVE and developments in the field system which is used to control VLBI observations at the telescopes.

Walter Alef, chairman of the TOG

7. The scheduler's diary - 3

May 13: I travel with the TOG Chairman, Walter Alef, to Onsala for the EVN Consortium Directors' Meeting. This involves a 2-hour drive from Bonn to Frankfurt-Hahn airport from where there is a direct flight to Gothenborg-City airport. Frankfurt-Hahn is Ryanair's "hub" in Germany - a desolate, ex-USAF base in the middle of nowhere, and about as far from Frankfurt as it is from Bonn. In the CBD meeting on the 14th my suggestion for later dates for the first two sessions in 2005 is accepted (subject to the proviso that we do not interfere with mid-summer celebrations in Sweden starting on June 21st). We also finalise observing wavelengths for session3 this year - 90cm, 6 and 5cm with MERLIN, and either 18 or 1.3cm. The Directors approve a project to develop some prototype digital baseband converters (subject to firming up the work plan) with a view to eventual replacement of the ageing analogue units in the MK4 and VLBA racks.
There is much discussion of the growing e-VLBI capabilities around the network, both in the CBD meeting and also in the JIVE board meeting which I attend in Gothenborg on the 15th. A working group under John Conway is set up to investigate ways in which these new capabilities might be incorporated into an EVN observing opportunity available to users. I am included in this group to advise on scheduling aspects. The initial plan is to perform 2 "science demonstration" experiments in September (spectral line) and December (wideband continuum) in order to understand how real observations, as opposed to tests, can be performed.
May 28: The Westerbork VLBI friend, Tony Foley, warns me that an open-day is planned for 24th October, in the middle of session3. (They also had a visit by school teachers in session2 which I was asked to keep clear from observations.) I take note, but do not see how I can guarantee observing-free days within the sessions for all EVN observatories. The session dates were agreed a year ago.
June 2nd: Day after the proposal deadline. We are down a little compared with the February deadline (11 EVN-only and 7 Global projects).
June 3rd: In response to delicate enquiries at Jodrell Bank regarding availability of receivers for session3 I receive the following information from the VLBI Director: "We fished the 327 MHz receiver out of the pond, dusted it down, scraped the rust off and it's as good as new."
June 8th: A transit of Venus has been scheduled by a higher scheduling authority after a wait of 122 years. (EVN proposers don't usually have to wait THAT long !) I observe the first contact from my local cemetery and then later from my front garden when the Sun comes into view. An excellent cloudless sky for the whole event. Well scheduled, I have to say !
June 22nd: Peter Thomasson, the MERLIN manager sends some comments on the feasibility of some of the proposed EVN+MERLIN projects at 5cm. These are, of course, all spectral line projects with relatively complex VLBI

frequency set-ups, not all of which are compatible with the capabilities of the MERLIN correlator. I pass these on to the PIs for their consideration.
J**uly 1st:** I start getting fidgety about the plan for session3. I ask Arecibo about possible observing slots for the 90cm pulsar VLBI projects (there is little point in having a 90cm session without these). I also enquire of the DSN whether a suitable GST slot is available for a 1.3cm project in Robledo. This will determine whether we should have 1.3cm or 18cm.
July 7th: Pam Wolken informs me that there is, indeed, a reasonably appropriate Robledo slot. This more or less fixes the pattern of frequencies for the session.
July 8th: I fly to Cork for the EVN Program Committee meeting. This is the most westerly location for a PC meeting in its whole 24-year history. I feel quite at home as a taxi from the airport drives through narrow lanes on the left-hand side of the road (well, in those places where there are 2 sides) to the hotel near the University, where a cup of tea is promptly offered by the owner. In the afternoon we have a special pre-meeting discussion of the forthcoming EVN Users Meeting to take place at the EVN Symposium in Toledo in October. We agree that it would be useful to distribute a questionnaire to recent EVN users and symposium participants, to help give some form to the Users Meeting.
July 9th: We spend most of the day, as usual, discussing and rating the new proposals, with some discussion of matters arising from older proposals, and also various aspects of the EVN, including e-vlbi. One of the proposals requests a total of 21 antennas, which the committee reduces to 16 to ensure that correlation at the EVN correlator at JIVE can be done in one pass. This puts me in mind of the interesting puzzle of determining how many passes, p, are required when correlating recordings from n antennas with a correlator which can play back only k recordings in one pass. There is not, in fact, a simple formula for determining this in the general case. There is a lower limit, known as the Schonheim bound, given by "ceiling(n/k*ceiling((n-1)/(k-1)))", where "ceiling(i/j)" means the integer-divide of i by j, rounded up to the next highest integer. Note that for n > k, p is always 3 or greater. There is more. For some special values of n and k it is possible to find combinations of passes (mathematicians say a "covering design") in which no redundancy occurs - all baselines are correlated once and only once (in addition to the trivial case of n=k). These are known as Steiner systems. For k=3 this occurs for n equal to both 7 and 9, as we discovered experimentally years ago with the old 3-station MK2 correlator in Bonn. In fact it happens for n=k**2 if k is a prime number, or for n=k(k-1)+1 if (k-1) is a prime number. Try enumerating a covering design and you'll see why this property is important ! For the VLBA correlator (k=20) a Steiner system therefore exists for n=381. I take it on faith from Greg Kuperberg at UC Davis, to whom I am indebted for instruction, that Steiner systems also exist in the same way if k or (k-1) are prime powers. Thus n=73 or n=81 for the Bonn 9-station correlator and n=256 for the JIVE 16-station correlator have non-redundant coverings.
July 28th: Hector Hernandez at Arecibo replies positively to my suggested times for the 90cm pulsar projects. GBT time is also needed for these, but we will not exceed our GBT "ration" in this session since the observing slots are short.
August 5th: Barry Clark sends me the VLBA scheduling committee grades for the global projects and serious finalising of a first draft block schedule can begin. I plan to go on holiday for 2 weeks on August 22nd; as the EVN TOG has decided that PIs must deposit their schedules 3 weeks prior to the start of session3, I consider it wise to get a first public version out before I leave.
August 13th: Barry and I agree a first draft and circulate it to the EVN observatories. New EVN features this time are two 1Gb/s projects at 6cm, making full use of the MK5A capabilities, and EVN+MERLIN at 5cm.
August 16th: It seems that the Westerbork open-day will in fact cause a "major problem with interference (from extra stuff being turned on for demos and the public)". The only way I see to change things without affecting the GBT and Arecibo 90cm arrangements is to schedule an additional (EVN-only) part for one of the pulsar projects affected.
August 18th: Phil Diamond sends some more details regarding the availability of 5cm receivers for MERLIN. In addition to those on the Jodrell-MK2 and Cambridge telescopes, there will be 3 new receivers. Together with the PC Chairman, Patrick Charlot, we agree that it is best to put the new receivers on MERLIN outstation antennas to provide short-baseline coverage, rather than to put one on the Lovell Telescope.
August 19th: I send out version1 to observatories and PIs. Cormac Reynolds at JIVE confirms that new set-up files for the SCHED scheduling program are needed for 90cm, since the last time we observed at this wavelength was in the MK3 era, and scheduled with PC-SCHED.
August 20th: Last day at work before my holiday, but hopes of a quiet day are dashed. Noto confirms that their tape drive is not operating (they are now truly "MK5-only"), so cannot observe for projects being correlated at the VLBA correlator (which is "tape-only"). In addition they inform me that the 90cm receiver which they used "last time" has long since been scrapped ! There is a new, but untested, receiver which covers this band, which they offer on an experimental basis. I note this information down for inclusion in version2. An email arrives from a proposer asking about the fate of a proposal he submitted for June 1st. With great embarrassment we discover that it had got missed when proposals were processed on June 2nd. It is located, lurking in cyber-limbo. Fortunately the required wavelength is not being run in session3 so its possible scheduling has not been delayed.
September 6th: Back in the office after an unexpectedly sunny week at the English south coast. There have been surprisingly few reactions to the version1 schedule (is it all perfect ? or perhaps it hasn't been received anywhere ? The scheduler's paranoia suggests the latter...) Now I face some deadlines of my own: write-up for my talk in the EVN Symposium (13 September) and this contribution to the EVN Newsletter (20 September). Here we go again.

Richard Porcas, EVN Scheduler

8. Watching the Solar system through a VLBI magnifier

How often do we, VLBIers, express the distance to an object of our investigation in astronomical units (AU), let alone kilometres? And do we check anxiously whether or not our target is outside the Fresnel near-zone?

Since 2003, these units and concerns became a daily reality for an international group led by JIVE scientists. The group embarked for an effort in a somewhat new area of research for EVN radio astronomers . ultra-precise tracking of deep space probes. Such the task has become highly topical as the European part of the joint NASA-ESA mission Cassini-Huygens is about to reach its final destination . one of the Saturn's satellites, the planet Titan. The 3-billion-euro mission is arguably the most sophisticated interplanetary endeavour undertaking by mankind so far. It involves two spacecraft named after the pioneers who studied Saturn and its satellites in XVII century, Giovanni Cassini and Christiaan Huygens. The larger spacecraft, Cassini, will orbit Saturn for four years, studying the planet, its famous rings and numerous moons. The smaller spacecraft, Huygens will enter the atmosphere of the Saturn's largest moon, Titan, for in-situ investigation of the planet's atmosphere and surface.

The mission was launched in October 1997 and now, after an almost seven- year trip, is orbiting Saturn as the first human-made addition to the variety of natural satellites of the sixth planet of the Solar system. On Christmas Day this year, the Huygens probe will separate from the Cassini spacecraft and 20 days later, on 14 January 2005 will enter the atmosphere of Titan. This is going to be the most distant controlled landing on a planet undertaken by mankind so far and for several decades to come. At the time of the Huygens atmospheric entry, the distance from Titan to Earth will be about 8 AU (~1.2 billion km). It will take about 70 minutes for the radio waves transmitted by Huygens to reach the Earth. It is this most challenging part of the mission in which radio astronomers will come on the scene. Huygens will descend to the surface of Titan under parachute for about three hours. The parachute will be driven by the wind. Thus, by measuring the position of the Huygens Probe during the parachute descent, one can effectively measure the dynamics of the Titan atmosphere. Such information is of paramount importance for planetologists who believe that Titan is a "frozen" copy of early Earth. In addition to the VLBI measurements other techniques will be used to obtain as much information as possible on the dynamics of the Titan atmosphere. These include measurements of the Doppler shift on the Huygens signal between the probe and the Cassini orbiter and between the probe and several Earth-based radio observatories. Probe vertical velocity will be inferred from in situ measurements of atmospheric pressure and temperature. The VLBI measurements along with these other measurements will be combined to obtain the best estimate of the 3-dimensional Titan wind profile with altitude. The measurements of the Huygens position will be conducted using the VLBI phase-referencing technique in its extreme. This technique makes it possible, in particular, to detect very weak signals from target sources and measure the source position in the framework of reference sources. The Huygens S-band signal is very weak indeed and is very narrow-band. In addition, the Huygens transponder was designed to transmit at the standard up-link frequency of near 2000 MHz. Such the unusually low S-band frequency is carefully avoided in radio astronomy observations due to a high risk of strong radio interference. The background reference sources surrounding Titan on 14 January 2005 happen to be also very weak (an order of several mJy total flux density). This necessitates use of the broadest available bandwidth for data acquisition and largest available telescopes. To complicate situation further, the Huygens will fly in the Titan atmosphere at the time when Saturn culminates over Eastern Pacific and is observable by radio telescopes in the United States (except Eastern-most sites, such as St. Croix and Hancock), Australia and Eastern Asia (China, Japan). Such the ad-hoc "circum-pacific" VLBI network is not a standard configuration for astronomical observations. Technical compatibility of VLBI instrumentation of radio telescopes in this network is not a negligible issue. In order to conduct the Huygens VLBI tracking experiment, a massive preparatory work began in the second half of 2003. It started from "reconnaissance" observations of the celestial field, surrounding the Titan's position at the time of the parachute descent, the so called Huygens Field, with the Westerbork Synthesis Radio Telescope, Australia Telescope Compact Array (ATCA), MERLIN, VLA and EVN. Engineers and radio astronomers from JIVE, ASTRON and Helsinki University of Technology in Europe, the National Radio Astronomy Observatory (NRAO) and NASA Jet Propulsion Laboratory (JPL) in the United States, the Australia Telescope National Facility and University of Tasmania in Australia, the National Astronomical Observatories of China in Shanghai and Urumqi, and the National Institute of Information Technologies in Japan are preparing the "Pacific Rim" VLBI network to perform "once-in-a-life" observation. This preparation includes tuning-up (and upgrading in some cases) the telescopes' front-ends to enable them to operate at the unusual frequency near 2000 MHz. Another pressing necessity of the Huygens VLBI tracking experiment is disk-based high data rate recording. The telescopes in the Northern hemisphere and Hobart (Australia) will record data using the disk-based Mark 5 system. The telescopes in China and at Hobart are already equipped with such the system. The Huygens experiment has helped to accelerate the upgrade of the NRAO telescopes to Mk5 by supplying three Mk5 recording systems in the framework of this joint activity . one for the Green Bank Telescope and two for VLBA stations. Supplemented by NSF- and NASA-funded Mk5 systems, GBT and eight VLBA stations will be able to record Huygens data on the Mk5 disks. I note that outside Huygens-related tests and observations NRAO-based Mk5 units will eventually become available to the radio astronomy community through the regular proposal-based procedures.

Other than the Hobart telescope, the Australian participants of the Huygens network will record data on the hybrid units based on the elements of the Australian S2 VLBI data acquisition system (LBA-DAS) and disk-based recorders developed and upgraded jointly by the ATNF, JIVE, Helsinki University of Technology, Swinburne University of Technology and the University of Tasmania.

In preparation for the Huygens experiment, the EVN Data Processor at JIVE has received 5 Mk5 playback units loaned by ESA (see the article by M.Garrett in this issue of the EVN Newsletter). Last but not least, the "hardware" correlator at JIVE will be augmented by a specially designed software correlator which will be used for extracting and processing the narrow-band Huygens signal from the wide-band Mk5 data streams.

During the months preceding the Huygens entry in the Titan's atmosphere, a number of tests and "drills" are to be conduced. The first one, involving most of the "Huygens network" telescopes has been conducted on 27 August 2004. It was quite successful as a test . a lot of bottle-necks and bugs became apparent. However, fringes were detected at most baselines, including the first Mk5 fringes with the Green Bank telescope.

This project will culminate in January-February 2005 when the real signal from Huygens is expected to reach

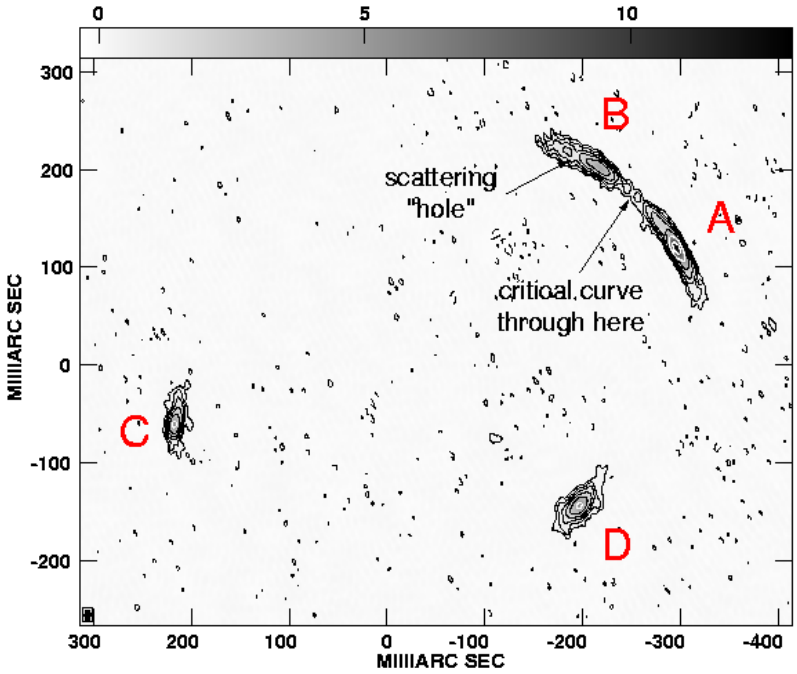
Dwingeloo on high-capacity disks. With these disks in our hands, the international Huygens VLBI tracking team hopes to "see" the gliding flight of the probe in the atmosphere of Titan. Hopefully, the next issue of the EVN Newsletter will continue the story.

Artists impression of the Huygen's probe descending through the atmosphere of Titan

L.Gurvits (JIVE, lgurvits@jive.nl)

9. EVN 1.4-GHz imaging of the lens system B0128+437

Lens systems tell us not only about the mass/mass distribution of galaxies and the expansion and fate of the universe (via measurements of the Hubble parameter, universal matter density and "cosmological constant"), but also about the astrophysics of high-redshift galaxies. For example, polarised lensed sources can be subject to Faraday rotation (and depolarisation) if the interstellar medium (ISM) of the lensing galaxy contains a (clumpy) magnetoionic medium. This is seen in a number of lens systems as are a variety of effects such as dust obscuration, absorption by atomic and molecular gas and scatter-broadening in a turbulent ionised medium. By studying these effects over a range of frequencies it is often possible to measure or constrain important astrophysical parameters of high-redshift galaxies.
One such lens that exhibits two of the above effects is CLASS B0128+437 (Phillips et al., 2000, MNRAS, 319, L7), a four-image lens system that was discovered as part of the JVAS/CLASS surveys. A VLBA 5-GHz image made shortly after the lens was identified from MERLIN observations found that one of the images looked significantly different to the other three (Biggs et al., 2004, MNRAS, 350, 949). Subsequent follow-up at 2.3 and 8.4 GHz confirmed this finding and strongly suggested that this image was being scatter-broadened. Our recent EVN map (see figure below), made from data observed at 1.4GHz, shows the area of scattering very clearly. Recent NICMOS imaging shows that the same image is also strongly obscured in the infrared, presumably by dust associated with the scattering cloud.
Also exciting about the new radio data is the very large size of the images, image A having grown by a factor of about 4-5 between 5 and 1.4 GHz. This results in images A and B "merging". We have therefore detected emission across a portion of the critical curve, a locus of points that marks where images appear and disappear and where the magnification is very high. A very nice feature of the new map is the detection of two sub-components close to the point where A and B meet and which tightly constrain the position of the critical curve. This can be used as a constraint in the construction of a lens model as can all the emission shown in the figure with the use of suitable algorithms such as LensClean.



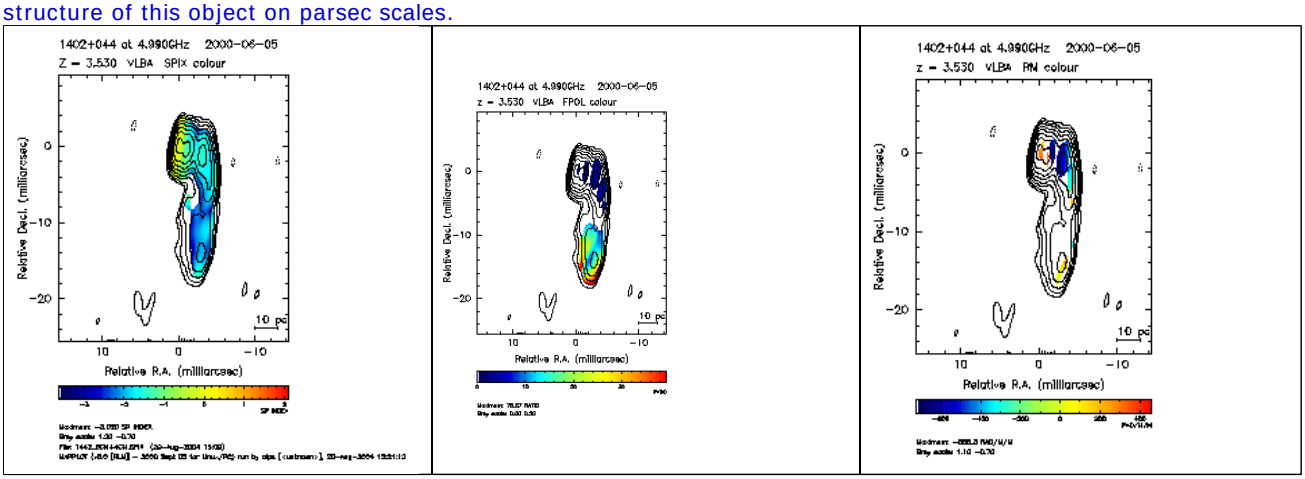
Andy Biggs (JIVE, biggs@jive.nl)

10. Rich polarisation structure in the high-z quasar 1442+044

We have made 5 GHz and 8.4 GHz global polarisation VLBI images of a number of high-redshift quasars using data obtained in June 2000. This was one of the first experiments to implement rapid frequency switching at the Effelsberg antenna and Westerbork array. We are in the process of analysing these images in order to compare their properties with the characteristic VLBI polarisation properties of lower-redshift quasars and BL Lac objects.

One surprise to come from these observations was the unexpectedly rich and complex polarisation structure of one of the sources -- 1442+044 -- whose jet displays a nearly ninety degree bend roughly 5 mas from the core. The 5--8.4 GHz spectral-index distribution (left) is typical of most compact extragalactic radio sources, with a flat-spectrum (partially opaque) core and steep-spectrum (optically thin) jet. The degree of polarisation (middle) is modest over most of the source, but rises to values exceeding 30% toward the end of the jet.

Although it is not possible to unambiguously determine the Faraday rotation measure (RM) distribution based on data at only two frequencies due to +/-180 degree ambiguities, we can nevertheless draw some conclusions about whether the Faraday rotation is uniform over the source emission region. In the case of 1442+044, there is no single rotation that can be applied between the observed polarisation position angles at 5 GHz and 8.4 GHz to make the two align at all points in the source, demonstrating that the parsec-scale RM distribution is clearly non-uniform. This may suggest the presence of a non-uniform distribution of free electrons in the vicinity of the VLBI structure. The right-hand panel shows the RM distribution that is obtained by assigning the smallest possible RM to each pixel based on the difference between the observed 5 GHz and 8.4 GHz polarisation angles -- in this case, both the sign and magnitude of the Faraday rotation vary markedly from region to region in the source. More detailed multi-frequency observations will be needed to resolve ambiguities in the rotation measure and derive the magnetic-field structure of this object on parsec scales.



Denise Gabuzda, Shane O'Sullivan (University College Cork)
Leonid Gurvits (JIVE)

11. 2004 YERAC at University College Cork

The Young European Radio Astronomer's Conference (YERAC) has been occurring nearly every year for more than thirty years, at a wide range of institutions across Europe. The main idea behind the YERAC is to bring together young scientists (usually advanced undergraduate or postgraduate students) working in radio astronomy, and allow them to get to know each other, exchange their knowledge, and experience the atmosphere of an informal international conference.

This year, the YERAC took place in Ireland for the first time, at University College Cork, from August 30 -- September 3, 2004. Forty-seven participants from thirteen countries came to Cork for the meeting. The YERAC was funded primarily by the EU FP6 RadioNet Network, with some additional support from the UCC Physics Department. The scientific programme included short talks from the participants, as well as several review talks by lecturers and researchers from University College Cork, University College Dublin, the Dublin Institute for Advanced Studies, the National University of Ireland - Galway and and the Cavendish Laboratory. For many of the participants, YERAC is their first international meeting, and it provides them with a good opportunity to get practice giving talks about their research. You can see a list of participants and the scientific programme for the 2004 YERAC at UCC at http://www.physics.ucc.ie/YERAC.html.

The participants also went on an all-day excursion to west Cork, visiting the Timoleague Friary, Lissnagun Ring Fort, Drombeg Stone Circle and Knockdrum Ring Fort. The photo shows some of the participants encircling the Drombeg Stone Circle near Rosscarbery, which is more than two thousand years old.

It has tentatively been proposed that the 2005 YERAC will be hosted by the Cagliari Observatory on the island of Sardinia.

Figure -YERAC (Young European Radio Astronomers Circle) at the ancient Stone Circle at Drombeg

Denise Gabuzda (University College Cork, gabuzda@physics.ucc.ie)

12. ASTRON/JIVE Summer student programme

Also this year ASTRON and JIVE have organised the annual Summer Student Programme. The selected students have spent their summer (from the beginning of June to the end of August) working hard on a scientific project under the supervision of a staff member as well as following lectures covering a broad range of topics. This year there were 6 summer students (4 at ASTRON and 2 at JIVE) coming from different countries.
Johannes Spreeuw, has studied at the University of Amsterdam and he has worked on data from the Initial Test Station of Lofar with Ger de Bruyn. **Bi-Qing For**, originally from Malaysia, she has just completed the third year as an undergraduate in astronomy and physics at the University of Arizona, U.S.A.. With the supervision of Willem van Straten, she has worked on WSRT observation of the pulsar PSR J0218+4232.
Kalle Torstensson received his masters degree from Chalmers University of Technology this spring. As summer student has been working under the supervision of Hans-Rainer Klockner and Hagiwara on EVN data of the galaxy NGC 7469. **Carmen Blasco** came from the LAEFF laboratory near Madrid, Spain. Her advisors were Huib Jan van Langevelde, Hayley Bignall, and Cormac Reynolds, and she has worked with VLBA data to study the ionised gas in

galaxies via the measurement of angular broadening in intervening galaxy/quasar pairs.
Monica Orienti is doing her PhD at the Institute of Radio Astronomy, Bologna. As a summer student at JIVE, she has been working with Mike Garrett, Cormac Reynolds and Zsolt Paragi on various projects, including a detailed comparison of multi-wavelength data associcated with the Spitzer First Look Survey, in particular deep 1.4 GHz WSRT observations and Mid-IR data at 24, 70 & 160 microns.
Tobias Westmeier is in his first year of a PhD programme at the Radioastronomical Institute of the University of Bonn. His project as a summer student, under the supervision of Robert Braun, was to reduce and analyse WSRT HI synthesis observations of the high-velocity gas in the vicinity of M31.

The announcement for the ASTRON/JIVE Summer Student Programme 2005 will circulate in December.

Figure: Summer students visiting the WSRT

Raffaella Morganti (ASTRON, morganti@astron.nl)

Announcements

1. PhD position on Deep Field Surveys

The Joint Institute for VLBI in Europe (JIVE) and The Kapteyn Institute (U of Groningen), The Netherlands, are co-funding a a post-graduate student to work on the area of High Resolution Radio Deep Field Studies, as part of a 4-year PhD programme. Part of the project will involve the analysis of Global VLBI observations of the Hubble Deep Field. In addition to VLBI, the student can expect to be involved in the analysis and interpretation of data from a number of different telescopes including MERLIN, WSRT, Spitzer Space Telescope and SCUBA instruments. The following URL contains more details of the position:

www.jive.nl/phd/phd_position.pdf

Interested candidates should contact us directly (garrett@jive.nl & pdb@astro.rug.nl). The position will remain open until a suitable candidate is found. Please bring this opportunity to any graduate students that you think might be good candidates.
Mike Garrett (JIVE) & Peter Barthel (RuG Kapteyn Inst).

2. The Astrophysics Network for Galaxy Lensing Studies: ANGLES. Postdoctoral positions in gravitational lensing and related studies.

The Astrophysics Network for Galaxy Lensing Studies (ANGLES) has Postdoctoral Research posts available through the Marie Curie research training networks programme which is funded by the EU under FP6. The appointments are for two years and can start from Jan 1, 2005. The Institutes in ANGLES are:

- Jodrell Bank Observatory, University of Manchester, UK (PI Ian Browne)
- Max-Planck-Institut fuer Radioastronomie Bonn, Germany (PI Richard Porcas)
- The Institute of Astronomy, Cambridge, UK (PI Wyn Evans)
- The university of Copenhagen, Denmark (PI Jens Hjorth)
- University of California, Davis, US (PI Chris Fassnacht)
- JIVE, Dwingeloo, The Netherlands (PI Michael Garrett)
- Rechen-Institut Heidelberg, Germany (PI Joachim Wambsganss)
- Shanghai Astronomical Observatory, China (PI Yi-Peng Jing)
- University of Valencia, Spain (PI Jose Munoz)

In all, six two year post-doctoral positions are on offer. They are available at JBO, MPIfR, IoA, JIVE, Heidelberg and Valencia. Applicants interested in gravitational lensing and related subjects are encouraged.
Candidates should have, or be about to complete, a PhD in astronomy. The rules of the Marie Curie research training networks require candidates should have no more than ten years of research experience (from starting a

PhD) nor have been resident in the country in which they propose to work for more than 12 months in the three years prior to appointment. The posts are
open to all nationalities. The Network is committed to an equal opportunities policy.

Enquiries should be sent to Ian Browne (iwb@jb.man.ac.uk) or to any of the partner PIs listed above. The closing date for applications is
December 15, 2004. See also http://www.angles.eu.org/.

3. PhD Position to Study Compact Radio and Optical Variability of Blazars

Funding is available for a three-year PhD position in radio/optical studies
of compact, rapidly variable Active Galactic Nuclei (AGN), to be carried out at University College Cork and Cork Institute of Technology (Ireland). The position is funded by the ENIGMA EU Research Network.Two of the key characteristics of blazars are the compactness of their emission at essentially all wavelengths and their variability, which can be present on timescales as short as hours, with such "intraday variability" being frequently present in the most compact flat-spectrum radio sources. While intraday variability at optical wavelengths must be intrinsic to the sources, it is possible that a significant fraction of the rapid variability observed in the radio is due to propagation effects, such as scintillation in the interstellar medium. Little is known about possible lower-amplitude variability on even shorter time scales.
The PhD project will involve the reduction and joint analysis of multi-frequency VLBA polarisation observations and fast-photometry optical observations obtained using Low-Light-Level (L3) CCDs for a sample of compact AGN. This will enable the PhD student to investigate possible relationships between the compact radio total-intensity and polarisation (magnetic field) structure, on the one hand, and the properties of the optical variability of these sources on various timescales, on the other. Many of the new optical observations taken with for the PhD project will be acquired using robotic telescopes that are currently being developed at the Cork Institute of Technology, and will be coordinated with future VLBI observations whenever possible.
To apply for this position, please send a CV and list of publications (if any), as well as two letters of reference, to Denise Gabuzda (gabuzda@phys.ucc.ie) and Niall Smith (nsmith@cit.ie), who will be jointly supervising the project. Funding is available immediately, and although there is some flexibility with regard to the start date, we would like the project to start as soon as possible.

4. RadioNet scientific workshop: Stellar end products (Granada 13-15 Apr 2005)

A RadioNet Scientific Workshop on "STELLAR END PRODUCTS" will be held 13 through 15 April 2005 at the Instituto de Astrofisica de Andalucia (IAA-CSIC) in Granada. This meeting is the third in a series of scientific workshops sponsored and organized by the EU RadioNet Consortium within the Sixth Framework Program of the European Commission.

Online forms and further information about the workshop will be soon available through a website http://www.iaa.csic.es/endproducts. The contact email address of the symposium: endproducts@iaa.es (web site and email will be operational after the 1st November, for information please contact Miguel Perez-Torres, torres@iaa.csic.es)

SCIENTIFIC OBJECTIVES
The meeting in Granada aims at bringing together scientists involved in the study of the "end products" of stellar evolution, favouring an atmosphere suitable for scientific discussion. While special emphasis will be put on studies of those phases of stellar evolution through radio observations, a significant number of invited and contributed talks will include studies in other bands of the electromagnetic spectrum. We hope this approach will bring together specialists working in a number of different spectral bands.
The workshop will be divided in different sessions, and will focus on the following topics:
* Supernovae and Supernova Remnants
* Pulsars and Neutron Stars
* GRBs
* Compact objects in binary systems
* Planetary Nebulae

The workshop should set a stage for addressing unsolved issues in our understanding of stellar end products, and how to approach them with the use of the present and future new
generation telescopes (VLTI, ALMA, SKA....). The workshop should also serve to discuss the relevance and connection of stellar end products with other astrophysical fields.
Critical aspects of each topic will be highlighted in a small number of invited reviews, and further explored in the contributed talks and discussion forums at the end of each day.

PROGRAM OF THE WORKSHOP
The workshop will have about ten review and invited talks covering the main research topics, and setting the stage for about 25-30 oral presentations. A modest number of posters can be accommodated in the main hall of the IAA. Each working day of the meeting will end with a joint discussion. Because of time and space limitations, attendance at the workshop is limited to 55 participants, all of whom are expected to contribute either an oral or poster presentation.

A preliminary list of invited speakers includes: Antxon Alberdi, Nichi D'Amico, Dale Frail, Elena Gallo, Dave Green, Martin Guerrero, Josep Marti, Luis F. Miranda,
The scientific organizing committee includes: Rob Fender (University of Amsterdam), Michael Kramer (University of Manchester), Alan Pedlar (Jodrell Bank, Manchester), Miguel A. Perez-Torres (IAA-CSIC, Granada, Chairman), Jose Maria Torrelles (IEEC-CSIC, Barcelona)

Miguel A. Perez-Torres (IAA-CSIC, torres@iaa.csic.es)

The European VLBI Network (EVN) website (http://www.evlbi.org/) is hosted by the Joint Institute for VLBI in Europe (http://www.jive.nl/).