



## Express Production Real-time e-VLBI Service

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# Monthly Report- May 2007

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Co-Authors: EXPReS Management Team

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### Delivery Slip

	Name	Partner	Date	Signature
From	T. Charles Yun	JIVE	2007 Jun 14	

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### Project Information

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## Section 1.0- Introduction

This month's report was generated in two distinct time periods. The first was before the project manager took a 2 week leave. At this point, portions of the report were completed and make reference to activities which have come to pass (specifically receipt of feedback from the Annual Review). The remainder was written after the project manager's return. This time was mostly spent integrating information that was submitted during the leave. The project manager has chosen to keep the statements as they originally were written. Follow up and response will be handled in future reports.

## Section 2.1- NA1 - Management

During the past month, the final portion of the Period 1 funding was distributed to our partners. At this moment, EXPRoS has distributed 18 months of funding to our partner institutes. As this report was being prepared, the Project Office has not received feedback from our EC Science Officer regarding the annual review (we expect the report at any moment). Once the feedback cycle is complete, we expect that Period 2 funding will be released to the Project office. The project office will distribute Period 2 funding once it is received.

Under the assumption that the majority of the First Annual Report will be accepted without modification, portions of the wiki are being updated to reflect changes. There are now updated versions of the deliverables table (marked as draft) online. When the new deliverables table is shifted to a final version, the data will be mirrored in the monthly reports.

The main activity this month is the EXPRoS Board Meeting. The Chairman of the EXPRoS Board, Ari Mujinen, from Metsahovi, volunteered to host the meeting at the end of the first meeting. Details of the meeting are available via the meeting URL < <http://kurp.hut.fi/cbd-eb/> >. On this site you will find meeting details including agenda and attendees. Aside from general project updates, the main thread of the meeting will be conversations regarding the Annual Review.

Note that the EXPRoS Board Meeting is being held in conjunction with the EVN CBD (European VLBI Network Consortium Board of Directors). The EVN CBD and the EXPRoS Board share a large number of members. Holding the two meetings consecutively helps to minimize travel for the individuals and maximize attendance for each of the groups.



### **Section 2.2- NA2 - EVN-NREN**

The major deliverable, EVN-NREN Meeting 1, was completed earlier and the next meeting is not scheduled until month 18. The forum continues to be active with discussions between the VLBI and networking community. The group leader reports:

- \* The first EXPRoS point-to-point GE circuit has been configured end-to-end from Torun-JIVE
- \* The GÉANT2 section (Milan-Amsterdam) of a GE circuit between Medicina and JIVE has been configured and the full circuit is expected to be operational soon
- \* Work has also begun on providing two GE circuits from Jodrell Bank to JIVE. The GÉANT2 section of this path (London-Amsterdam) has now been configured and is ready for service.

### **Section 2.1- NA3 - e-VLBI Science Forum**

Over the past few months, a very lively debate has been held over the EVN mailing list. Extensive discussions within the eVSAG continued on the issue of a new policy for e-VLBI submission and evaluation. Eventually it was agreed that in future all e-VLBI proposals would be submitted for the standard EVN deadlines (1 Feb, 1 June, 1 Oct) and that three classes of observation would be supported:

- 1) Standard observations
- 2) Triggered observations
- 3) Short observations (< 2 hours)

The triggered class involves submitting a proposal for a known flaring source together with trigger criteria; and if evidence is received that this criteria is satisfied a triggered observation could be inserted if received within 24hrs of a scheduled observation. Short observations do not require a formal proposal but can be made up to three weeks before the observations in a letter to the EVN PC chairman. Other changes for the June 1st deadline are allowing a new wavelength band (5cm) and for the first time spectral line observations. The call for EVN e-VLBI proposals for the June 1st deadline was sent out to the astronomical community on May 12th just after the standard EVN call for proposals. A copy of the text of the full call for e-VLBI proposals is appended below.

The chair of the eVSAG attended the joint EVN directors meeting/EXPRoS board in Helsinki on 28/29th May. The eVSAG chair was involved in two policy documents submitted to the EVN directors. The first codified the EVN's present policy and procedure to deal with unpredicted Targets of Opportunity (ToO's). Another document dealt with the question posed by the directors at the previous meeting of whether the EVN should move to more than three main sessions per year in 2008. The conclusion being that we should stick to the present system of three main sessions per year during 2008, with additional e-VLBI runs in-between main sessions.

A first draft of the eVSAG working group of Paragi on mechanisms for running e-VLBI on un-prescheduled dates was created. This document looks at the science case and requirements of different types of such observation in terms of observing frequencies required, array resolution, how many observations would be needed per year their spacing and the period between trigger and first observation. This draft will be discussed at the next eVSAG face-to-face meeting in Gothenburg Sweden.

The date of the next eVSAG face to face meeting has been set, 28th June in Gothenburg Sweden. This will be the day before the EVN PC meeting in the same place. The agenda is under discussion by email.



### **Section 2.1- NA4 - Public Outreach**

The biggest activity over the next handful of weeks will be the creation of a display board as associated with deliverable 49. The display board will be a portable, stand up unit that can easily be moved between locations. EXPReS partners will be able to use the display when they attend meetings or host events. The first draft of the display was circulated inside of the Project Office. A final draft will be distributed throughout the project when it is ready. Before that point, we expect several iterations of the design along with some final modifications that will be necessary to deal with specific printing issues. We hope to have the order for the display into the printer by mid-summer.

### **Section 3.1- SA1- Production e-VLBI Correlation**

During May, a large number of changes and upgrades took place, both locally at JIVE and at the stations. The first GEANT lightpath was established, between Poznan and JIVE, and the local network at JIVE was re-organized around the newly purchased networking equipment. All Mark5A units at JIVE used in e-VLBI were upgraded with new powerful motherboard/cpu combinations, as were the Mark5A units at the stations (apart from the one at Onsala). New operating systems had to be used as well, and new StreamStor drivers were installed after testing showed they performed well in e-VLBI mode.

As it was felt that too many parameters had changed simultaneously, the May e-VLBI time slot was not advertised for science but reserved for testing.

Overall, the test went quite well. The lightpath to Torun did not work; this was later found to be a problem within GEANT and has since been fixed. Through the efforts of our networking engineer Paul Boven, working remotely from the TERENA conference in Copenhagen, the original non-lightpath connection to Torun was re-established. Before this, 512 Mbps was reached easily for more than one hour from all five other stations. Unfortunately, after Torun was added to the array, a human error occurred that caused 512 Mbps to fail and by the time the error was discovered the session had finished.

Software efforts continued, with good progress being made in the development of a messaging system for the new Mark5B code and adaptive observing.

A lightpath connection Hong Kong-JIVE was established and testing started on the various parts of the connection Seshan-JIVE. After some initial problems, data rates of up to ~800 Mbps were reached between Seshan and Hong Kong, while the 622 Mbps lightpath between Hong Kong and JIVE proved to be practically without any packet loss at all.

### **Section 3.2- SA2- Telescope Network Connections**

The Feasibility Study for sites has been updated and the current table is presented below. The highlight is news from South Africa. Quoting the report:

The situation with regards to e-VLBI in South Africa is a lot more positive than in previous reporting periods. Parliamentary funding has been set aside in the current financial year to setup a new research network communications infrastructure (SANReN) with e-VLBI as a stated goal. To this end, external funding has been provided towards the last mile connection at Hartbeesthoek, and the new fiber trench is already in sight of the main telescope control building, with completion of the project expected within six weeks.

The full report will be uploaded to the wiki and submitted as official once final status information is available for all sites.

Code	Description	Status
D13 SA2 SA2.01	Feasibility study of the last-mile connection to the nearest NREN node for participant CNIG-IGN	finished
D14 SA2 SA2.02	Feasibility study of the last-mile connection to the nearest NREN node for participant MPIfR	finished
D15 SA2 SA2.03	Equipment of the last-mile infrastructure for participant INAF (telescope in Medicina)	finished
D16 SA2 SA2.04	Feasibility study of the last-mile connections to the nearest GEANT NREN node for participant CAS (Shanghai, Urumqi, Miyun, Yunnan)	finished
D17 SA2 SA2.05	Feasibility study of the last-mile connection to the nearest NREN node for participant VIRAC	finished
D18 SA2 SA2.06	Feasibility study of the last-mile connection to the nearest NREN node for participant HRAO	ongoing
D19 SA2 SA2.07	Feasibility study of the last-mile connection to the nearest NREN node for participant NAIC (Arecibo)	finished
D20 SA2 SA2.08	Feasibility study of the last-mile connection to the nearest NREN node for participant TIGO	finished
D21 SA2 SA2.09	Feasibility study of the last-mile connection to AARNET for participant CSIRO	finished
D29 SA2 SA2.10	e-VLBI test observations, Medicina	finished
D37 SA2 SA2.011	Equipment of the last-mile infrastructure for participant MRO	finished
D38 SA2 SA2.12	Construction and equipment of the last-mile infrastructure for participant CNIG-IGN	ongoing
D39 SA2 SA2.13	Construction and equipment of the last-mile infrastructure for participant MPIfR	ongoing

#### Section 4.1- JRA1- FABRIC

FABRIC will lose Ruud Oerlertmans at the end of June. An email was shared with the FABRIC mailing list indicating that Oerlertmans would be leaving EXPRoS to begin work at a different organization. A copy of the note announcing his departure is attached as an appendix.

A series of meetings have already been held to determine the effects of his departure. Unfortunately, we fear that Oerlertmans's departure will cause delays. We are hoping to minimize the loss of knowledge, but project deliverables will inevitably slip as internal resources are used to cover for the lost manpower while simultaneously looking for a replacement. We are currently determining which deliverables will most likely be delayed and by how long.

JIVE is actively searching to fill the position. An open position note has been circulated through the community.

Our partners from Poznan have also initiated a conversation regarding several deliverables as they attempt to synchronize efforts between the GRID and network aspects of this work. Delays related to Oerlertmans' departure have the possibility to cascade. These conversations are ongoing and will be reported on in more detail in coming months.

There have also been positive activities. A large deliverable was submitted- The Protocols Performance report, D41. Partners at Manchester have submitted the report as a draft and plan to have an updated version based on comments in June of next year. The draft version has been posted to the wiki and distributed with a request for comments internally to the project. The final version will be shared once completed.



WP1 has also announced a meeting to be held immediately after the e-VLBI Workshop hosted by MPIfR. The agenda is currently in draft and will be posted on the web and linked via the wiki <[http://www.jive.nl/dokuwiki/doku.php/expres:wp1\\_2007sep\\_mtg](http://www.jive.nl/dokuwiki/doku.php/expres:wp1_2007sep_mtg)>. The goal of the meeting is to gather the WP1 participants and encourage additional collaboration via face to face meetings. Details of the Bonn meeting are available via <[http://www.mpifr.de/old\\_mpifr/div/vlbi/6th\\_evlbi/index.html](http://www.mpifr.de/old_mpifr/div/vlbi/6th_evlbi/index.html)>.



### Appendix - EXPReS Contact Points

For convenience, a list of the activities and the associated contact points are listed here for reference.

ID	Description	Contact	email
PC	Interim Project Coordinator	Huib Jan van Langevelde	langevelde // jive nl
NA1	Management of I3	T. Charles Yun	tcyun // jive nl
NA2	EVN-NREN Forum	John Chevers	john.chevers // dante org uk
NA3	e-VLBI Science Forum	John Conway	jconway // oso chalmers se
NA4	Public outreach	Kristine Yun	kyun // jive nl
SA1	Production Services	Arpad Szomoru	szomoru // jive nl
SA2	Network provisioning	Francisco Colomer	f.colomer // oan es
JRA1	FABRIC	Huib Jan van Langevelde	langevelde // jive nl

### Appendix - TORUN 512 Mbps announcement

The following announcement was sent out regarding stable tests from Torun.

Subject: EVNtech: first 512 Mbps e-VLBI transfer from Tr  
 Date: Mon, 7 May 2007 17:03:06 +0200 (CEST)  
 From: Arpad Szomoru <szomoru@jive.nl>  
 To: evntech@jb.man.ac.uk

Today, during a formatter test involving Tr, Mc, Cm and Jb, we reached stable 512 Mbps data transfer from Tr for the first time. This has only become possible after Tr staff upgraded their Mark5A with a new motherboard/CPU/power supply.  
 We will test sustained 512 Mbps operations from all stations during the next e-VLBI run, on the 22nd of May.

Cheers, Arpad

### Appendix - e-VLBI announcement

the announcement for e-VLBI proposals for the 1 June deadline was sent out earlier in the month by eVSAG leader John Conway. Note that the new e-VLBI observation classes are discussed. This text is the first result of the larger discussions that have evolved due to EXPReS's ability to push the operational capabilities of e-VLBI.

Date: Sun, 13 May 2007 11:06:43 +0200 (CEST)  
 From: John Conway <jconway@oso.chalmers.se>  
 To: vlbi@nrao.edu, evntech@jb.man.ac.uk, merlin-announce@jb.man.ac.uk  
 CC: John Conway <jconway@oso.chalmers.se>

Note: The following is a Call for Proposals for EVN e-VLBI observations. For the Call for Proposals for regular EVN disk recording observations see the separate email sent out by Patrick Charlot on Friday.

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CALL FOR EVN e-VLBI SCIENCE PROPOSALS - DEADLINE 1st JUNE

Proposals for use of EVN e-VLBI runs after June 2007 will use new proposal rules with deadlines synchronised with the standard EVN disk VLBI deadlines (for all except short observations - see details below).

Other significant changes are;

- \* Standard e-VLBI proposals are no longer restricted only to rapid response science.
- \* A new class of 'triggered' e-VLBI proposal has been defined in which a pre-approved project can be activated up to 24 hours before a



scheduled e-VLBI run based on evidence of a flaring state.

- \* For the first time spectral line observations are supported.
- \* Requests for short observations (<2 hours) to check on calibrator or target compactness may be submitted up to 3 weeks before each e-VLBI run.

Scheduled e-VLBI runs for which observations can be proposed for the June 1st EVN deadline are;

	Run start	Run end
Tue	21 Aug 13:00 UTC	Wed 22 Aug 13:00 UTC
Thu	6 Sep 13:00 UTC	Fri 7 Sep 13:00 UTC
Tue	9 Oct 13:00 UTC	Wed 10 Oct 13:00 UTC

Participating EVN antennas are Wb14 (tied array), Tr, On85, Mc, Jb2 and Cm. Supported bands are 18/21cm, 6cm and 5cm. Both spectral line and continuum observations can be proposed for. There are however some restrictions on the antenna/band combinations possible for continuum and spectral line observations respectively (see below) In addition there is the chance that some antennas (in particular Cm) may not be available for some runs due to essential engineering work.

In addition to the above time slots there is also a scheduled e-VLBI run on June 25/26th (which will use the old proposal rules and for which a separate call for proposals will be made in early June).

Forward look - in November there will be two 24-hour runs within a week, (starting 12th and 15th November respectively) which will allow for 'adaptive' e-VLBI observations (in which the schedule for the second run is changed in response to the results of the first run). In addition 24 hour runs in December and (to be finalised) in January and February 2008 and beyond are planned. For the proposed runs in 2008 further e-VLBI capable EVN telescopes may be available. Details of these future e-VLBI runs will be advertised for the October 1st EVN deadline. Note that no commitment of time in e-VLBI runs beyond October will be given for proposals submitted for the June 1st deadline.

TECHNICAL DETAILS

CONTINUUM OBSERVATIONS - will be run at the highest possible reliable bit rate. Based on recent experience it is expected that at least 256 Mbit/s will be achieved (however Cm is presently limited to 128 Mbit/s by its microwave link). Continuum observations can be proposed for either the 6cm and 18cm bands but not both within the same run. Participating e-EVN antennas are Wb14 (tied array), Tr, On85, Mc, Jb2, and Cm. Standard, triggered and short observation types (see below for definitions) are all possible for continuum observations.

SPECTRAL LINE OBSERVATIONS - can be carried out at recording rates between a minimum of 32 Mbit/s and a maximum of 256Mbit/s. For two-bit, dual-polarisation observations, the lower limit implies at least 4 channels of 4 Msample/sec sampling (Nyquist channel bandwidth = 2MHz; with oversampling possible down to spanned channel bandwidths of 0.5MHz). Observations may be proposed for the 18cm/21cm band or 5cm bands. Participating e-EVN antennas are Wb14 (18cm/21cm only, not 5cm), Tr, On85, Mc, Jb2 and Cm. Only standard and short observation proposal types (see below for definitions) are allowed for spectral line observations. Triggered spectral line proposals will not be accepted.

e-VLBI OBSERVATION CLASSES

The new e-VLBI submission policy defines three classes of EVN e-VLBI observation. Time within the first two classes will only be allocated in





response to proposals submitted for the 1st June deadline. PI's should make clear in the proposal text which class of observation is being requested.

#### 1) Standard e-VLBI proposals

Any proposal requesting e-VLBI observing time during one or several e-VLBI sessions, excluding triggered response science. Such proposals may also request observing time during the regular EVN session 3/2007 (October/November) using disks. Monitoring proposals may be submitted but observations cannot be guaranteed in every requested session as they may be overridden by higher rated, triggered e-VLBI proposals. Standard proposals can be either continuum or spectral line. Scheduling will be done by JIVE staff using the technical information included in the proposal; it is therefore vital that all technical aspects are fully specified.

#### 2) Triggered e-VLBI proposals

A proposal to be scheduled during an e-VLBI run only if a specific triggering criterion is met. The intention is to support observations of known transient sources whose positions are well known at the time of proposal submission. Only continuum observations can be proposed for within this class. In addition to the accurate source/calibrator positions, frequency and GST range information etc required for all e-VLBI proposals (see below), triggered proposals must include a precise and justified triggering criterion and a minimum number and configuration of telescopes required. The latter information is needed in case a triggered observation forces a change of observing frequency for an e-VLBI slot. In such a case all participating EVN stations will endeavor to change observing frequency at short notice on a 'best effort basis'; however the participation of every advertised antenna in such triggered observations is not 100% assured. To check the current status of an advertised e-VLBI run before submitting a trigger request please check [http://www.e-VLBI.org/e-VLBI/per\\_session\\_status.html](http://www.e-VLBI.org/e-VLBI/per_session_status.html)

PIs of successful proposals in this class will be informed after proposal review that their trigger requests will be accepted. Such trigger requests should be sent by e-mail to the EVN PC Chair (Patrick Charlot <charlot@obs.u-bordeaux1.fr>) with copies to the EVN Scheduler (Richard Porcas <porcas@mpifr-bonn.mpg.de> and JIVE/EXPRES (Bob Campbell <campbell@jive.nl>, Zsolt Paragi <zparagi@jive.nl>).

These trigger requests must be received no later than 0800 UT the day before the e-VLBI run. The email should provide evidence that the trigger criterion in the original proposal has been met and give the exact GST range requested. This requested GST range cannot exceed that requested in the original proposal. All technical parameters must also match those in the original proposal. The PC Chairman will evaluate the trigger request (and decide on priorities if more than one conflicting trigger request is received) and will inform the PI by 1700UT whether their experiment is to be observed. The experiment will be scheduled by JIVE staff in accordance with the instructions given in the original proposal.

#### 3) Short e-VLBI observations

Short e-VLBI observations may be requested for checking calibrator or target source compactness in preparation for a larger VLBI observation or proposal. These projects are limited to less than 2 hours in length. Such requests may be submitted up to three weeks prior to the start of any e-VLBI run directly to the EVN PC Chairman. There is no need to submit a full proposal via Northstar but the email to the Chairman must clearly indicate the purposes and observing details of the proposed observation including all information needed for scheduling (including position information of targets and calibrators). To check the current status of an advertised e-VLBI run before making a short request please check [http://www.e-VLBI.org/e-VLBI/per\\_session\\_status.html](http://www.e-VLBI.org/e-VLBI/per_session_status.html)

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PROPOSAL DETAILS



Proposals requesting observing time for the above runs should be submitted by the 1 June 2007 deadline. Proposals can be made for any length of time within the above advertised slots up to 24 hours in length. In all cases proposed projects should take account of the number of telescopes and bandwidth available, carefully justifying that the science goals can be reached. Short time requests (defined below) up to 2 hours in length can be submitted directly to the PC Chairman up to three weeks before each run. Proprietary rights on all e-VLBI data are the standard ones of one year after data distribution (see archive policy at [www.e-VLBI.org/user\\_guide/archive\\_policy.html](http://www.e-VLBI.org/user_guide/archive_policy.html)). All standard and triggered proposals must use the Northstar online submission tool (see details below).

Because detailed scheduling of e-VLBI runs will be done by JIVE staff all e-VLBI proposals must include, accurate source positions, the observing frequency, the requested GST range, list of phase calibrators, the minimum bit rate and a minimum number and configuration of telescopes required. Note all proposals should be checked by Bob Campbell ([campbell@jive.nl](mailto:campbell@jive.nl)) prior to submission in order to ensure that all necessary technical information to allow scheduling by JIVE staff is included. Proposers should therefore contact Bob, in good time before the proposal deadline, so that he can then check the technical aspects of the proposal.

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**HOW TO SUBMIT**

The on-line proposal submission tool Northstar replaces the old LaTeX-email way of submission for all proposals which involve the EVN, including proposals for e-VLBI runs.

To use Northstar proposers should register at <http://proposal.jive.nl> (only for the first proposal submission), complete technical information on-line (equivalent to that previously in the coversheet), and upload a scientific justification in pdf or ps format. Standard page limitations apply and will be enforced. If advice is needed about submitting via Northstar please contact Cormac Reynolds ([reynolds@jive.nl](mailto:reynolds@jive.nl)) or other JIVE staff. The deadline for submission of standard and triggered proposals is 23:59:59 UTC on 1st June 2007.

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**ACKNOWLEDGEMENT**

The continuing development of e-VLBI within the EVN is made possible via the EXPReS project funded by the EC FP6 IST Integrated infrastructure initiative contract #026642 - with a goal to achieve 1 Gbit/s e-VLBI real time data transfer.

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John Conway - Chairman EVN eVSAG (e-VLBI Science Advisory Group)

## **Appendix - Ruud Oerlemans announcement**

----- Original Message -----  
Subject: Ruud Oerlemans' departure from FABRIC  
Date: Tue, 15 May 2007 14:14:07 +0200  
To: [fabric@jive.nl](mailto:fabric@jive.nl)

I would like to announce and congratulate Ruud Oerlemans on his new position with SenterNovem. As you know, Ruud has been working with FABRIC since the beginning of the project. His contributions and steady hand have helped us maintain regular progress.

It is always difficult to lose a productive member of a team. We have come to expect Ruud's broad experience in our day to day matters. I suspect these are some of the capabilities that



interested his new employer. A difficult element of Ruud's transition is the speed of his departure- he will be leaving JIVE by mid-June.

We have already begun steps for knowledge transfer but hope that all of you who are working with Ruud will take a moment to make sure that you have identified any outstanding items you may have. Ruud will be working to ensure that his transition is as smooth as possible for us, but this requires work on our side as well.

On behalf of EXPReS, I wish Ruud the best of luck in his next steps,

- Charles

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## Appendix - Deliverables Table

The deliverables table will be updated to include modifications submitted during the first annual report. The table below reflects the modified information, taken from the project wiki, 2007 Jun.

D#	A	AD#	Descrip	Plan	Actual	Status	Nature	DisLev
D1	NA4	NA4.01	Creation of Public EXPReS web-site	2	1	4	O	PU
D2	JRA1	J1.1	Data acquisition requirements document	2	3	4	R	PU
D3	JRA1	J1.2	Protocols strategic document	2	2	4	R	PU
D4	NA2	NA2.01	EVN-NREN meeting No. 1 (under auspices of EXPReS) (minutes)	3	6	4	R	PP
D5	SA1	SA1.1	Central data link control, Correlator Control Code modifications (not documented)	3	7	4	D	PU
D6	NA3	NA3.1	First meeting of eVSAG under auspices of EXPReS (minutes)	4	9	4	R	PP
D7	NA4	NA4.02	Creation of EXPReS web-based management tools	4	4	4	O	PP
D8	JRA1	J1.3	Visualization software	4		—>	P	PU
D9	JRA1	J1.4	Correlator design specification 1)	5		3	R	PU
D10	NA4	NA4.03	Generation of PR material (phase 1: logos and posters, PowerPoint template, press releases and news clippings, brochure)	6	1	x	O	PU
D11	SA1	SA1.2	Job preparation utilities	6		2	D	PU
D12	SA1	SA1.3	Fast/adaptive scheduling tools	6		1	D	PU
D13	SA2	SA2.01	Feasibility study (via protected link) of the last-mile connection to the nearest NREN node for participant CNIG-IGN	6	9	4	R	PU
D14	SA2	SA2.02	Feasibility study (via protected link) of the last-mile connection to the nearest NREN node for participant MPIfR	6	9	4	R	PU
D15	SA2	SA2.03	Equipment of the last-mile infrastructure for participant INAF (telescope in Medicina) (via protected link)	6	9	4	O	PU
D16	SA2	SA2.04	Feasibility study (via protected link) of the last-mile connections to the nearest GEANT NREN node for participant CAS (Shanghai, Urumqi, Miyun, Yunnan)	6	9	4	R	PU
D17	SA2	SA2.05	Feasibility study (via protected link) of the last-mile connection to the nearest NREN node for participant VIRAC	6	9	4	R	PU
D18	SA2	SA2.06	Feasibility study (via protected link) of the last-mile connection to the nearest NREN node for participant HRAO	6	9	4	R	PU
D19	SA2	SA2.07	Feasibility study (via protected link) of the last-mile connection to the nearest NREN node for participant NAIC (Arecibo)	6	9	4	R	PU

D20	SA2	SA2.08	Feasibility study (via protected link) of the last-mile connection to the nearest NREN node for participant TIGO	6	9	4	R	PU
D21	SA2	SA2.09	Feasibility study (via protected link) of the last-mile connection to AARNET for participant CSIRO	6	9	4	R	PU
D22	JRA1	J1.5	Overall design document	6		0	R	PU
D23	JRA1	J1.6	eVLBI-Grid design document	6	9	4	R	PU
D24	JRA1	J1.7	eVLBI fringes PC-EVN (Month 7 Demo report)	7	7	4	D	PU
D25	JRA1	J1.8	LOFAR connection strategic document	7	11	4	R	PU
D26	JRA1	J1.9	Data acquisition design document	8	11	4	R	PU
D27	SA1	SA1.4	eMERLIN VSI interfaces design	9		1	P	PU
D28	SA1	SA1.5	Selective data processor controls	9	9	4	D	PU
D29	SA2	SA2.10	e-VLBI test observations, Medicina (256 Mbps fringes) (science announcement)	10	3	4	R	PU
D30	JRA1	J1.10	eVLBI-Grid interface document	10	10	4	R	PU
D119	MRO	SA2.11	Equipment of the last-mile infrastructure for participant MRO	12		ongoing	O	PU
D120	CNIG-IGN	SA2.12	Construction and equipment of the last-mile infrastructure for participant CNIG-IGN	12		ongoing	R	PU
D121	MPIfR	SA2.13	Construction and equipment of the last-mile infrastructure for participant MPIfR	12		ongoing		
D32	NA1	NA1.01	Annual report (incl. Financial information) to EC	12			R	PP
D33	NA2	NA2.02	NA2 annual report No. 1 (as part of EXPReS Ann. Rep No. 1)	12			R	PP
D34	NA4	NA4.04	e-VLBI Demonstration and attendance at Network events (events, presentations)	12	12	x	O	PU
D35	SA1	SA1.5	Network Protocol decision: A Simulation model for e-VLBI traffic on network links in the Netherlands, Comparing Simulation and Network Monitoring Results, On Network Monitoring of end-to-end paths used for e-VLBI, UDP-like TCP	12		2	D	PU
D36	SA1	SA1.7	Monitored information handling modules	12		?	D	PU
D37	SA2	SA2.01 1	Equipment of the last-mile infrastructure for participant MRO	12	5	4	O	PU
D38	SA2	SA2.12	Construction and equipment of the last-mile infrastructure for participant CNIG-IGN	12			O	PU
D39	SA2	SA2.13	Construction and equipment of the last-mile infrastructure for participant MPIfR	12			O	PU
D40	SA1	SA1.8	Monitoring processes	12	7	4	D	PU
D122	JBO	DJ1.11a	Interim Protocols performance report	13				
D123	JIVE	DJ1.4	Correlator design specification	13				
D41	JRA1	J1.11	Protocols performance report 2)	13	15	3	R	PU
D42	JRA1	J1.12	Software correlator core	14	6	3	P	PU
D43	JRA1	J1.13	Software data product	15			P	PU
D44	SA1	SA1.10	Real-time data processor control software (no document)	15	4	4	P	PU
D45	SA1	SA1.9	Tests using local Jodrell Bank home e-MERLIN telescope	15		?	D	PU
D124	JIVE	SA1.22	Mark5 hardware upgrade	16				
D46	NA3	NA3.2	eVSAG meeting No. 2	16			R	PP
D47	SA1	SA1.11	Real-time Pipeline	16	9	4	D	PU
D125	JIVE	DJ1.5	Overall design document	17				
D126	JIVE	SA1.23	Use of WSRT synthesis data for e-VLBI calibration	17				
D127	O/S	SA1.24	Mark5A code modifications	17				
D128	O/S	SA1.25	Mark5B code modifications	17				
D129	HRAO	SA2.06	Feasibility study of the last-mile connection to the nearest NREN node for participant HRAO	18		ongoing		
D130	MERLIN, JIVE	SA2.14	10 Gbps link upgrade between MERLIN and JIVE	18		pendent		
D131	MRO	SA2.15	e-VLBI test observations, Metsähovi	18	13			
D132	AARNET, CSIRO	SA2.17	Construction and equipment of the last-mile infrastructure in AARNET to allow	18				

			connection of participant CSIRO					
D133	VIRAC	SA2.21	Construction and equipment of the last-mile infrastructure for participant VIRAC	18				
D134	TIGO	SA2.23	Construction and equipment of the last-mile infrastructure for participant TIGO	18				
D135	AARNET	SA2.24	AARNET connectivity enhancements	18				
D48	NA2	NA2.03	EVN-NREN meeting No. 2	18			R	PP
D49	NA4	NA4.05	Generation of new PR material (phase 2: display stand and merchandise)	18			O	PU
D50	SA1	SA1.12	Visibility monitor	18	4	4	D	PU
D51	SA1	SA1.13	Tested software for operational improvements	18		0	D	PU
D52	SA1	SA1.14	Test using remote e-MERLIN telescope	18		?	D	PU
D53	SA1	SA1.16	VSI support software	18		0	D	PU
D54	SA1	SA1.15	VSI Interfaces	18		0	D	PU
D55	SA2	SA2.14	10 Gbps link upgrade between MERLIN and JIVE	18			O	PU
D56	SA2	SA2.15	e-VLBI test observations, Metsahovi	18	13	4	R	PU
D57	SA2	SA2.16	Construction and equipment of the last-mile infrastructure for participant Shanghai	18			O	PU
D58	SA2	SA2.17	Construction and equipment of the last-mile infrastructure in AARNET to allow connection of participant CSIRO	18			O	PU
D59	SA2	SA2.18	Construction and equipment of the last-mile infrastructure for participant Urumqi	18			O	PU
D60	SA2	SA2.19	Construction and equipment of the last-mile infrastructure for participant Miyun	18			O	PU
D61	SA2	SA2.20	Construction and equipment of the last-mile infrastructure for participant Kunming	18			O	PU
D62	SA2	SA2.21	Construction and equipment of the last-mile infrastructure for participant VIRAC	18			O	PU
D63	SA2	SA2.22	Equipment of the last-mile infrastructure for participant NAIC	18			O	PU
D64	SA2	SA2.23	Construction and equipment of the last-mile infrastructure for participant TIGO	18			O	PU
D65	SA2	SA2.24	AARNET connectivity enhancements	18			O	PU
D66	JRA1	J1.14	Data acquisition interface document	18			R	PU
D67	JRA1	J1.15	LOFAR station interface report	18			R	PU
D68	JRA1	J1.16	Software for workflow management	18		2	P	PU
D136	JIVE	SA1.26	Investigating a 1024M sub-array	20				
D137	INAF	SA2.25	Feasibility study of the last-mile connection to the nearest GÉANT node for participant INAF (Sardinia)	20				
D138	UniMan, OSO	SA2.26	10 Gbps link between UniMan and OSO for ultra-VLBI tests	20				
D69	SA2	SA2.25	Feasibility study of the last-mile connection to the nearest GÉANT node for participant INAF (Sardinia)	20			R	PU
D70	SA2	SA2.26	10 Gbps link between UniMan and OSO for ultra-VLBI tests	20			O	PU
D139	JIVE	DJ1.3	Visualization software	21				
D140	ShAO	SA2.16	Construction and equipment of the last-mile infrastructure for participant Shanghai	21				
D141	ShAO	SA2.18	Construction and equipment of the last-mile infrastructure for participant Urumqi	21				
D142	ShAO	SA2.19	Construction and equipment of the last-mile infrastructure for participant Miyun	21				
D143	ShAO	SA2.20	Construction and equipment of the last-mile infrastructure for participant Kunming	21				
D144	MPIfR	SA2.27	e-VLBI test observations, Effelsberg	21				
D71	SA1	SA1.17	Flexible local GE network	21		1	D	PU
D72	SA2	SA2.27	e-VLBI test observations, Effelsberg	21			R	PU
D145	MRO, CSIRO	SA2.28	e-VLBI test observations, Metsahovi / CSIRO	22				
D146	OAN	SA2.29	e-VLBI test observations, Yebes	22				
D73	SA2	SA2.28	e-VLBI test observations, Metsahovi	22			R	PU
D74	SA2	SA2.29	e-VLBI test observations, Yebes	22			R	PU
D75	JRA1	J1.17	Software for correlation on cluster	23		2	P	PU

D76	JRA1	J1.18	Data acquisition test report	23			R	PU
D77	JRA1	J1.19	Data acquisition prototype at telescope	23			P	PU
D78	JRA1	J1.20	Overall broadband demonstration	23			D	PU
D79	JRA1	J1.21	Software cluster correlation	23			P	PU
D80	JRA1	J1.22	First fringes software correlator	23			D	PU
D147	NAIC	SA2.22	Equipment of the last-mile infrastructure for participant NAIC	24				
D31	NA2	n/a	NA2 annual report No. 2 (as part of EXPReS Ann. Rep No. 2)	24				
D81	NA1	NA1.02	Annual report (incl. Financial information) to EC	24			R	PP
D82	NA2	NA2.04	NA2 annual report No. 2 (as part of EXPReS Ann. Rep No. 2)	24			R	PP
D83	NA4	NA4.06	e-VLBI Demonstration and attendance at Network events.	24			O	PU
D84	SA1	SA1.18	Network monitoring tools	24		0	D	PU
D85	SA1	SA1.19	Multiple e-MERLIN telescope tests	24		?	D	PU
D86	SA2	SA2.30	Construction and equipment of the last-mile infrastructure for participant HartRAO	24			O	PU
D87	JRA1	J1.23	Software to collect distributed output	24			P	PU
D88	NA2	NA2.05	EVN-NREN meeting No. 3	26			R	PP
D89	NA2	NA2.06	EVN-NREN representatives present EXPReS networking results at the e-VLBI Science & Technology Workshop	26			R	PU
D91	NA3	NA3.3	eVSAG meeting No. 3	26			R	PP
D148	JIVE	SA1.27	Space craft tracking correlator mode	27				
D149	HRAO	SA2.30	Construction and equipment of the last-mile infrastructure for participant HartRAO	27				
D92	JRA1	J1.24	Software to create data product from distributed correlation	27			P	PU
D150	JBO	DJ1.11b	Final Protocols performance report	28				
D151	JIVE	SA1.28	On-the-fly fringe fitting	28				
D93	JRA1	J1.25	Software routing	29			P	PU
D100	SA2	SA2.34	e-VLBI test observations, VIRAC	30			R	PU
D101	SA2	SA2.35	e-VLBI test observations, HRAO	30			R	PU
D102	SA2	SA2.36	e-VLBI test observations, NAIC, Arecibo	30			R	PU
D103	SA2	SA2.37	e-VLBI test observations, TIGO	30			R	PU
D104	SA2	SA2.38	Construction and equipment of the last-mile infrastructure for participant INAF (Sardinia)	30			O	PU
D105	JRA1	J1.26	eMERLIN interface available	30			P	PU
D152	JIVE	SA1.29	Real-time download and extraction of station information	30				
D153	VIRAC	SA2.34	e-VLBI test observations, VIRAC	30				
D154	TIGO	SA2.37	e-VLBI test observations, TIGO	30				
D155	INAF	SA2.38	Construction and equipment of the last-mile infrastructure for participant INAF (Sardinia)	30				
D94	NA3	NA3.4	e-VLBI Workshop held in Onsala	30			O	PU
D95	SA1	SA1.20	Improved network applications	30		0	D	PU
D96	SA1	SA1.21	Monitoring user interfaces	30	7	4	D	PU
D97	SA2	SA2.31	e-VLBI test observations, Urunqi	30			R	PU
D98	SA2	SA2.32	e-VLBI test observations, Mijun	30			R	PU
D99	SA2	SA2.33	e-VLBI test observations, Kunming	30			R	PU
D106	JRA1	J1.27	Fringes with new routing	31			D	PU
D107	NA3	NA3.5	Publication of e-VLBI Workshop proceedings	32			R	PU
D108	JRA1	J1.28	Software distributed correlation	33			P	PU
D156	JIVE	SA1.30	Automated correlator diagnostics	33				
D157	ShAO	SA2.31	e-VLBI test observations, Urunqi	33				
D158	ShAO	SA2.32	e-VLBI test observations, Mijun	33				
D159	ShAO	SA2.33	e-VLBI test observations, Kunming	33				
D160	HRAO	SA2.35	e-VLBI test observations, HRAO	33				
D109	JRA1	J1.29	First fringes Grid correlator	34			D	PU
D161	JIVE	SA1.31	Removing/adding stations from the correlation process on the fly	34				
D110	JRA1	J1.30	First fringes on FABRIC	35			D	PU

D111	NA1	NA1.03	Annual report (incl. Financial information) to EC	36			R	PP
D112	NA1	NA1.04	Final Report to Board and EC	36			R	PP
D113	NA1	NA1.05	Final Plan for using and disseminating knowledge	36			R	PP
D114	NA1	NA1.06	Implementation of the Gender Action Plan	36			R	PP
D115	NA1	NA1.07	Raising public participation and awareness	36			R	PU
D116	NA2	NA2.07	NA2 annual & Final reports	36			R	PP
D117	NA4	NA4.07	e-VLBI Demonstration and attendance at network events.	36			O	PU
D118	JRA1	J1.31	Final report	36			R	PU
D162	JIVE	SA1.32	Enhancements & additions to real-time pipeline	36				
D163	JIVE	SA1.33	Enhancements & additions to existing monitoring tools	36				
D164	NAIC	SA2.36	e-VLBI test observations, NAIC, Arecibo	36				
D90	NA2	n/a	EVN-NREN meeting	n/a				