JOINT INSTITUTE FOR VLBI IN EUROPE

Report for the second quarter, 1998

Summary

Intensive testing of the data processor continued this quarter with a number of milestones being passed, including first fringes from a MkIV mode, capturing data with a prototype data handle, (preliminary) control of the correlators from the central computer, and correlation using scripts constructed automatically from VEX files.

The first of 18 production Station Units from AlliedSignal Technical Services Inc was delivered at the end of the quarter.

Fourteen of the 16 Data Playback Units have been delivered by Metrum Information Storage Ltd. Twelve of the initial 16 triple cap headstacks have been delivered; after extensive testing in Dwingeloo, two of the headstacks were rejected.

The paternoster for storing the tapes is now fully functional. A start has been made to bring the computer network in the data processor room into its operational configuration.

Support by JIVE staff for EVN operations continued during the quarter - data correlation in Bonn and Socorro, network monitoring, calibration, telescope support at Cambridge, Westerbork, Onsala, Yebes, and Medicina, and analysis of instrumental polarisation. Support was also provided for individual astronomers in scheduling and data analysis. Support continued for VSOP/HALCA observations with the EVN.

Four research papers were published in refereed journals, 16 in conference proceedings: 9 papers were submitted for publication. Two EVN documents were published, and 1 poster presentation was made at a conference.

1. Institute

European Commission

Garrett submitted a mid-term review report to the EC in Brussels. This report reviewed progress on the TMR-LSF activities and is an important element of the Commission's review of the overall effectiveness of the contract. Garrett attended a meeting of the EC Round-table "Nuclear Physics and Astrophysics", held at Jyvaskyla, Finland. Presentations were made on the TMR, Concerted Actions, and RTD contracts.

Personnel changes

Friso Olnon began work as online software engineer in the Data Processor Group on 1 April as did Nico Schonewille as chief correlator operator. Rob de Haan started work as correlator operator on 1 May. Sergei Pogrebenko's position as design engineer has been made permanent.

EVN/JIVE Symposium

Garrett created a web page for the EVN/JIVE Symposium No. 4 and released the first announcement via the VLBI exploders. The LOC account "evn_jive" has already received more than 20 replies from prospective participants and interest continues to grow. Around 80-100 participants are expected to attend the symposium in October. Garrett has negotiated an agreement with Elsevier who will publish the oral contributions in New Astronomy Reviews. The guest editors of this special edition will be Garrett, R.M. Campbell and L.I. Gurvits. The symposium LOC will be chaired by Garrett and other members will include: S. Mellema, H. de Haas, N. Vermeulen (NFRA, HoGS), L.I. Gurvits, and L.O. Sjouwerman.

Infrastructure

Sjouwerman and Philips alternated in writing the minutes of the monthly JIVE institute meetings.

Publications

The 1997 annual report for JIVE will be included together with that for the European VLBI Network. Material for both reports was ready to be sent to the printer at the end of the quarter.

Visitors:

Zsolt Paragi (Fömi Hungary), Bram van Dam (Leiden University), Simon Garrington (Jodrell Bank),

Raimund Weiss (BBW Software, Germany), Paul Maguire, Peter Shepherd, Roger Noble (Jodrell Bank), A. Kus (Torun), Jin Shengjin

(Beijing).

1. EVN/MkIV Data Processor (Anderson, Bos, Buiter, Casse, Van Langevelde, Maguire, Millenaar, Noble, Parsley, Phillips, Pogrebenko, Shepherd, Tuccari, Verkouter, Zwier)

Summary

Intensive testing of the Data Processor has been carried out in the JIVE basement during this quarter. These tests focussed on getting all software and hardware to work in an integrated fashion. Progress is measured by meeting certain milestones (see list below).

As reported via the "evntech" exploder earlier, first fringes from a MkIV mode were obtained on Monday June 15 using tapes from a test experiment (FR002) conducted on June 4, with 7 EVN stations participating. The experiment included observations of 3C84 and DA193 using 6 different MkIV modes with increasing complexity (1 to 2 bit mode, 1:1 to 1:4 fan-out, normal and double speed). Using the first tapes that arrived in Dwingeloo (Westerbork and Jodrell), strong fringes were found for the simplest mode (1:1 1 bit) on 3C84 at L-band.

On succeeding days, other milestones were passed:

- fringes to Noto, demonstrating i) correlation of "VLBA" data with modulation applied, ii) automated processing of experiments recorded in different modes, iii) a VEX-format experiment schedule can be read by the central correlator computer

- fringes to Effelsberg, Onsala and Medicina, with clock offsets per station consistent with experiment C98L2 observed just prior to FR002 and measured at the Bonn correlator

- fringes for tapes spinning in both directions

- batch operation of a test on the correlator by a single astronomer (previous operation required the whole team to be present)

The results were obtained on a prototype setup with 2 of 16 Data Playback Units equipped with Station Units (these decode the tapes and format the data for the correlator). The correlator has 1/32 of its final capacity. Hardware for the correlator is building up in the meantime.

The prototypes modules for the data processor have now been all delivered as indicated in table 1. The delivery dates for the replication of the various modules is given in table 2 which has been updated for the end of June.

2.1 Correlator section

As it can be seen in table 2, a large fraction of the parts for the correlator section to be delivered by Haystack have indeed reached Dwingeloo. The front panels for the correlator boards and the input boards were delivered separately and have all been fitted after a number of modifications had been applied.

Rob De Haan worked on the assembling and testing of the correlator racks together with Roelof Kiers. The 4 correlator racks have been completed and accepted. They have now been moved to the correlator room in the basement and powered up. The Data Distributor rack has also been completed and moved to the basement to its final location in the row of DPUs.

The testing of the prototype preselector board for the Data Distributor has been restarted.

2.2 Station Units

On schedule, the Phase Cal Module (PCM) was formally tested and accepted in April, thus all Station Unit development at Metrum is now complete. Three prototype PCMs have been delivered. The fourth has been retained by Metrum to evaluate migration of the design to E-series Xilinx.

Also on schedule, at the beginning of May, AlliedSignal Technical Services Corp. (ATSC) produced the first four production Station Units. Parsley and Buiter visited ATSC to witness and assist with Factory Acceptance Testing. This revealed problems in some units which had not been seen in the sample unit sent to Metrum for evaluation. With assistance from Pogrebenko and Hazell some of these problems were solved . At the end of June a unit exhibiting the remaining problems was sent to Metrum for further investigation. One fully working unit was also sent to JIVE for the SAT (Site Acceptance Test).

2.3 Play Back Units

At the end of June, 14 of the 16 DPU's were present in the processor room. All DPU's are being tested on arrival (Site Acceptance Test) and are undergoing mechanical and electrical modifications and upgrading such as the installation of the dry air system, clear glass door panels, mains outlet and a ground connection for ESD safe working. Also provisions are made to install the SU's in the DPU cabinet. A 15th DPU has been sent to ATSC for the tests on the production Station Units. The last of the 16 DPUs passed the FAT in June but remained at Metrum a bit longer where it was needed to sort out problems with the first production SUs. It turned out at the SAT in Dwingeloo that a total of 10 head actuator motors had excentric axes and that some head servos were oscillating. All these motors were returned to Metrum for repair. A total of 11 DPU's had passed the SAT by the end of June while 3 others were almost done.

Table 1: Delivery dates for the prototypes for the EVN MarkIV Data Processor

Item	Responsibility	Milestone set in January 95	Actual delivery
Play Back Units	P&G	1 Feb 95	30 June 98
Crate/backplane	Haystack	28 Feb 95	15 May 95
chip	Haystack	28 Feb 95	October 95
correlator board	Haystack	28 Feb 95	June 96
Input board	Haystack	15 May 95	12 Dec 95
Serial link board	Haystack	15 March 95	1 Sept 97
Control board	NFRA/JIVE	15 Feb 95	7 March 95
SUIM board	JIVE	15 March 95	August 96
TSPM board	JIVE	15 April 95	1 Nov 97
System clock board	JIVE	15 April 95	1 Nov 97
Station units	MIS	1 April 95	15 April 98 (1)
Splitter box	JIVE	TBD	1 Nov 97

(1) The last item,the PCM board, passed the FAT at that date

Table 2: Delivery dates for the replication of the boards for the EVN MarkIV Data Processor

Item	Responsibility	Milestone set @ IACC July 97	Actual delivery	Milestone set per 31 June 98
Backplanes	Haystack		January 97	
Correlator boards	Haystack	1 Dec 97		July 98 (1)
Control boards	NFRA		May 97	
Input boards	Haystack	1 Dec 97	March 98	
Station Units	ATSC	TBD		end July 98 (2)
SUIM boards	JIVE	1 Jan 98		end July 98
CLKM boards	Medicina	May 97	March 98	
TSPM boards	Medicina	May 97	March 98	
Serial link boards	Haystack	1 Dec 97		April 98 (3)
Long ext links	Haystack	1 Dec 97		April 98
short ext links	Haysatck	1 Dec 97	August 97	April 98
Splitters	JIVE	1 Jan 98	Feb 98	

(1) 40 boards delivered before the end of March

(2) 1 SU delivered end June 98

(3) 200 serial links delivered in April 98

The critical milestones in the current testing program are shown below.

Tasks Milestones

1. Correlation of the JB-CM tape with constant phase rotation 21July 97

and using local control software (Achieved)

2. Correlation of the JB-CM tape with continuous phase rotation 26 January 98

and using local control software (Achieved)

3. Correlation of the JB-CM tape controlled from C3 29 January 98

with prototype CJD, data handler from Bos (Achieved)

4. Correlation of 2 MarkIII tapes using 2 SU/DPU controlled from 4 February 98

C3 with prototype CJD Correlator control and data handler from Bos (Achieved 17 February)

5. Correlation of 2 MarkIII tapes controlled from C3 using final CJD fed 6 March 98

manually, Data handler from Bos simple correlator control from C3 (Achieved 20 February)

6. Correlation of 2 MarkIV tapes as in 5. CJD made at JIVE (Phillips) 12 March 98

(Delayed 12 May)

(Achieved 13 May; no fringes detected; complexity to be tested end of June)

(Fringes on MarkIV-VLBA formatted tapes on June 15)

7. Correlation of two tapes controlled by C3 correlator controlled by 20 March 98

C3 prototype CJD, data handler from Bos (Delayed 12 May)

(Functionnality tested 22 May; testing full messaging delayed 12 June) (Achieved 18 June)

8. AIPS++ to AIPS conversion via UVFITS and fringe fit of JIVE data 22 April 98

(Delayed 15 June)

9. Testing of functionality PCM using JB-CM tape data to be read After delivery PCM

into C3

10. Correlation of 2 tapes with CJD fed from VEX 1 May 98

Partial data handler from C3 (Achieved 22 May)

11. Correlation in MarkIV and VLBA mode with 4 stations 15 May 98

Test at all modes available (Delayed 10 June)

(Production SU not yet available; delayed to July 16)

12. Two station correlation with simple user interface 1 June 98

(Delayed July 16)

13. Two station correlation with first production SU 10 July 98

14. Full operation simple array (8 stations) 1 August 98

15. Two station correlation with prduction correlator 28 August 98

16. Correlate 16 stations (rehearse opening) 10 August 98

17.Test TSPU control 1 September 98

18. Official opening 22 October 98

In parallel with this work, considerable attention was given to the testing of headstacks and the alignment of the tape paths. A test jig for headstacks discussed during Casse's visit to the Haystack Observatory in March has been built and used for testing 12 triple cap headstacks from Spin Physics on arrival in Dwingeloo. Two of these were rejected after these acceptance tests. Since it is clear that not all 32 headstacks will be delivered before October, it was decided to equip the DPUs with a dummy headstack at head position #2. 16 dummy headstacks have been manufactured in the NFRA workshop. The old specification for headstacks has been updated at Haystack to include MarkIV operation and the triple cap model. The specification will appear soon in the MarkIV memo series.

2.4 SUIM/TSPU (Station Unit Interface Module/ Test Synchronisation Pulsar gating Unit)

At the end of May, 46 fully populated SUIM boards had been received from the factory in Italy. Testing is now in full swing in Medicina and Dwingeloo. Of these 46 SUIMs (for JIVE and Haystack), 24 were sent to Dwingeloo in the middle of June for the final check-out. The front panels manufactured in the Netherlands were mounted before delivery.

2.5 High level control software

Several milestones were passed this quarter, including fringes from Mk IV tapes, capturing data with a prototype Data Handler, preliminary control of the Correlators from CCC, and correlation is now being achieved using CJD's constructed automatically from VEX files.

Maguire has spent a lot of his time with these milestones and other tests. He has completed the GUI for the Experiments Database (at least for now) and has now started on the implementation of Processor_Control. This is the module that is responsible for the overall control of the Correlator system, including starting it up, closing it down, and keeping track of what is going on between these two.

Some of Maguire's time was also spent in updating and maintaining existing code. This includes modifications to SU_Control to attempt to improve the head-peaking procedure, and to add additional status messages to it for the Status Monitor.

Apart from general support and bug-fixes, Shepherd has spent the entire quarter working on the Data Handler. He has implemented the layer of this that receives the data from the Correlators and is now working on the layer that handles the data for individual jobs. Currently there appear to be performance problems with this, and he is investigating these.

Olnon spent time familiarising himself with the system and assisting with the test programme. He has worked on and improved the VEX-to-CJD conversion code started by Klijn Hesselink, and has been incorporating this into the test software. In the final system this will become the Preparation_Job module that will build and save CJDs from VEX files and other related information.

Olnon also started on the installation of the the JIVE software onto the new Correlator Control Computer. This is a non-trivial task because it is running a later (and much changed) version of the operating system on which the code was developed.

In addition to the usual design work, Noble has continued with the development of the system Status Monitor GUI. This is now ready for linking into the remainder of the JIVE system, and work is progressing on this. This includes additions to the SU_Monitor task to handle requests for information from the GUI.

2.6. Post correlation software

Verkouter spent his time developing code to convert the contents of an AIPS++ MeasurementSet to UVFITS, to be able to export the correlator data to Classic AIPS. This is necessary since AIPS++ is not yet capable of calibrating VLBI data. This work is being done in collaboration with the AIPS++ project; the code is supposed to become part of the standard package. The conversion from AIPS++ Measurement Set to UVFITS is a critical item to get the correlator operational. The infrastructure for this software was completed. Progress was discussed with local and external specialists during a visit by Kemball (NRAO).

The Archiving program with a CGI user interface was finished by Kramer. It was tested and can be found on the web at address: http://juw04.nfra.nl:9123/cgi-bin/archive.pl. Kramer continued to work on a program for maintaining bug list and "Change Requests", also with a CGI user interface. It was completed and tested. Its address is http://juw04.nfra.nl:9123/cgi-bin/fix/fixmain.pl

2.7 Infrastructure

Mr. Raimund Weiss from BBW software, Germany, visited Dwingeloo on 29 and 30 April to install the newly developed Windows95 software together with a specific software module to let the Paternoster database computer communicate with the outside world via the TCP/IP network and a specially developed protocol on top of that. Following the visit the Paternoster was accepted as being fully functional according to our specific needs.

A start was made to bring the computer network in the basement into its operational configuration. An HP C200 computer was purchased and installed. A BRouter was setup in order to start a local network in the JIVE basemenent in order to free the IP numbers for the Station Units and other components. It also keeps other Ethernet traffic outside the correlator network. The necessary components to make this a 100 Mbit/s network were ordered.

On June 25 and 26 the entire test setup was moved to make space for operators desks and make a start with the final lay-out of the processor room.

A proposal for implementation of the World Wide Processing Activity Display (WWPAD) in the JIVE processor was written and accepted. Implementation has started.

At the beginning of April Buiter completed the installation of an independent "clean" ground system for the DPU's and the Correlator racks.

The oscilloscopes to monitor the eye patterns of the DPU's arrived in the beginning of May. Small mechanical modifications were carried out and the oscilloscopes were installed in a 19 " cabinet at the end of June.

2.8 Thin Film head array project (Hinteregger)

In the previous progress report Hinteregger described the evaluation of the Seagate (STI) Peregrine-based thin-film heads. In summary, the read performance of the Peregrine MR head is excellent, yielding about 6dB improvement in SNR over the ferrite head. The write performance of the 1 micron gap-length thin-film write head revealed, however, a 6 dB loss relative to a recording made with the current ferrite-VLBI head, which has a 0.33 micron gap-length. In the progress report, it was indicated that we request from STI certain deliverables as part of the prototype phase of the project. The agreements recently reached with STI regarding this request are outlined below: The prototype phase (Phase II) has been separated into two sub-phases:

a) In Phase IIa, STI will deliver six 1 inch long bars with three or four 8-channel headarray groups. These bars will have STI's standard 1 micron-long write elements, will be assembled with cover bars and flat lapped, and will also have their new-standard flex circuits attached. This arrangement will permit two 70-channel head assemblies to be completed. The work for this phase has already started both in STI and at Haystack. The mechanical assembly drawings have been completed at Haystack and transmitted to Seagate. The delivery of these heads is expected near the end of August 1998.

b) In Phase IIb, STI will address our concern over write gap length. They indicated that they will build one or more wafers with a reduced write gap (target 0.5 microns) and build six quad-array bars using these wafers. As manufacturing of reduced gap wafers is not in the immediate product horizon

of STI, no date for the completion of this phase has been determined yet. It is realized that STI can not make any long term commitments in delivering 1-inch long monolithic head assemblies. In order to begin developing of our own capabilities for producing the heads from processed but uncut wafers,

Haystack made a request to STI to obtain such a wafer. It is expected that we will be able to get such wafers. Haystack plan to initiate discussions with a Seagate-recommended company to construct the heads. In addition, they will also consider the development of an in-house construction capability.

STI's new flex circuit for their new standard heads, is not much more compact than the previous one. It therefore appears that these flex circuits will not be appropriate for use in the VLBI head-assembly due to space considerations. Custom-made flex circuits will have to be designed and built for a full implementation prototype.

2.9 Preparing for operations

Schonewille has began studying operational aspects of the EVN MkIV data-processor. For practical training he attended the VLBI session in Westerbork in May. He made himself familiar with the working environment at JIVE (unix, website, e-mail).

Phillips worked with Van Langevelde, Pogrebenko and Maguire testing the functionality and reliability of the data processor, particularly the CCC control software. After an initial lack of success with poor quality test tapes, new test tapes observed were observed specifically for testing the data processor in the May session (002). This MkIV experiment scheduled by van Langevelde and Phillips, observed strong sources in 6 different modes of increasing complexity.

This experiment has allowed a number of the Mark IV observing modes to be tested. Fringes have been successfully obtained for a range of different modes including 2 bit sampled data, double speed recording and fan-out recording. Fringes were detected to all 6 stations that participated in the experiment. These tests have all been run using Olnon's VEX to CJD software.

During these tests numerous reliability problems have been identified, a number of which still require a fix.

A 17 station project (GL034) was scheduled by van Langevelde and observed on May 27. This project will test 16 station operations as well as the imaging capabilities of the correlator. EVN and VLBA stations participated in these 6cm observations of 3C380. Five tapes of the experiment were correlated in Socorro as a check on quality and to measure the clock values.

- Recording terminal upgrade, MkIII to MkIV (Spencer et al)

(not available)

- Network Support Group Activities (Garrett, Aaron, Desmurs, Fridman, Gurvits, Van Langevelde, Massi, McKay, Mioduszewski, Polatidis, Sjouwerman)

4.1 Network Monitoring, Reliability and Performance:

Sjouwerman scheduled a Fringe Test Tape experiment and the Network Monitoring Experiments (NME) for the May/June EVN session. Again in this session the 18cm NME observations were scheduled with simultaneous thin and thick tape recordings at different stations using PC-SCHED. The results of the Network Monitoring Experiment, as well as a summary of making the mixed tape schedules in PC-SCHED, were presented at the EVN Technical and Operations Group meeting in Onsala.

McKay is continuing work on an Internet based software correlator for the EVN. This facility is aimed at detecting fringes in near-real-time in order to verify correct array operation. It is also a test-bed for ideas on future e-VLBI experiments.

Negotiations are continuing with JPL, concerning use of their existing software correlator algorithms for the EVN real-time fringe checking project. Until that matter has been settled no further resources are being expended on the correlation software itself. However, the data acquisition software, data collection infrastructure and correlation scheduling program have been completed and interfaced to some dummy correlation algorithms for testing.

Data acquisition software to replace RTGET has been written and tested. The new program (called DBGET) allows successful capture of data from a VLBI terminal equipped with a MkIII data buffer. During the May/June 1998 EVN session, four stations (Cambridge, Jodrell Bank, Westerbork and Medicina) took part in trials using the software as a test for the software correlator. These trials proved successful and within minutes, auto-correlation spectra and error statistics were available via the World Wide Web.

4.2 Calibration

During this period, Desmurs edited the ANTAB files of the second session of EVN (27 May - 10 June). All the ANTAB files were released the day after the end of session 2 1998. Major improvements were made to the log2ant program to try and make it more stable and to automate the process of ANTAB file production. Without problems such as mis-labeling (which represents most of the errors), the program will now generate all the ANTAB files automatically, without "human intervention", sending a warning message in case of problems. This is a considerable improvement over previous versions of the software. Further improvements are envisaged w.r.t. the format of the INDEX line.

4.3 Data Correlation

Aaron (Bonn) has supervised the correlation of the final 6cm NME projects from the May/June 1997 session. These data, along with data from three other NME projects from the February and May/June 1997 session have been processed in the AIPS software package. However, amplitude calibration of these data has proved difficult and reliable determination of the instrumental polarization terms has not been made. Aaron also supervised the correlation of EB005, EP014D, ER004A and B, and GS011 from the February 1997 session, which was thereby completed. From the May/June 1997 session, Aaron supervised the correlation of EG017A, EL021, GL020, EF003A, EH002A, EG015C, and EF003B. Correlation of the remaining 2 projects from the May/June session, EG017B and EH002B is in progress, as is correlation of EH003 and ES018 from the November 1997 session.

Desmurs spent one week in Bonn supporting the correlation of an EVN spectral-line project ED011 (PI C. Codella). He also made an evaluation of the number of line projects awaiting correlation in Bonn and the man-power required to process these. A quick look at the correlated data of project ED011 was made to checked the quality of the correlation.

Mioduszewski (Socorro) was contact person for space VLBI experiments V053F3, V053F4, V030B4, V030R, V032A, V030W, V030Z, V030T, V090A2, V022C2 and V085Q. This involves checking schedules, facilitating correlation and checking correlator output. Mioduszewski also tested new AIPS space VLBI capabilities.

4.4 Space VLBI

Gurvits monitored operations and logistics of the EVN participation in VSOP observations during and outside the EVN observing session 1998-2 (May-June 1998).

4.5 Telescope and Observing Support

Desmurs supported VLBI activities at the Yebes telescope. The problems concerning the formatter at Yebes are still not resolved. Unfortunately, the formatter failed just before the geodetic VLBI session, EURO 43. Desmurs attended the TOG meeting in Onsala.

Fridman proposed an APEX signal injection system for the WSRT. All the necessary components. One of the main elements, a wideband helix conical antenna, was purchased and its technical parameters were estimated in the special chamber for antenna measurements. Test observations in VLBI mode were made using RT7 and the other radio telescopes at Westerbork.

Polatidis supported the setup, observations and the antenna calibration for the April 1998 CMVA session (2-6 April) and the May/June 1998 EVN (May 27-June 11) session.

McKay supported observations at Cambridge and Jodrell Bank for the May/June 1998 EVN session. Work is continuing on the Cambridge phase correction project; it is expected that the first "live" test will be carried out in the next EVN session.

McKay has also contributed to the new web sites for the NRAL VLBI group as well as the www.jb.man.ac.uk site in general.

4.6 General Network Support

Garrett completed a web based "EVN User guide" and released it via the EVN WWW Pages. Since its release in early June until the end of this quarter, more than 70 external "hits" have been recorded from outside users. Several new pages were added to the EVN web pages, in particular the "EVN TOG" and "EVN Support Group at JIVE". Many pages were also updated during this period, including "Access to the EVN". Work continued on the EVN poster but progress has been slow. Garrett also updated the JIVE web pages. Sjouwerman updated the "EVN Institute Contact Information" Pages. Garrett continuously updated the "feedback from Socorro pages". Sjouwerman generated the Experiment Feedback Facility web pages for the May/June EVN session. Sjouwerman maintained the EVNtech VLBI exploder and together with staff at MPIfR (Graham and Porcas) updated the PC-SCHED scheduling software. Garrett attended a meeting at Jodrell Bank with the chairman of the TOG and the EVN Consortium director, Roy Booth. The structure of the EVN TOG was discussed in preparation for its first meeting. Garrett attended the first TOG general and executive meetings held at Onsala Space Observatory and together with Simon Garrington (Jodrell Bank) presented some recent results from experiment GG034. These show relatively high phase rates to all EVN antennas at 6cm (1 turn in phase in ~ 30 minutes) compared to the VLBA antennas (1 turn in ~ several hours) Garrett wrote and distributed a script that generates UVFLG files from the summary files produced by SCHED.

Garrett attended the VLBI Operations Workshop held at Haystack and gave a presentation on the EVN and EVN Operations. He also attended a meeting of the Asia Pacific Telescope and a Real-Time Correlation Workshop, both held at Haystack after the Chiefs meeting. At the APT meeting Garrett presented some recent VLBI results.

Gurvits negotiated with appropriate authorities in China and Poland concerning procedures for importing MkIV formatters to these countries.

4.7 EVN PI support

4.7.1 Scheduling

A number of investigators were directly assisted by van Langevelde in the preparation of their global experiments with Sched. This included Yates (Herfordshire), Greenhill (CfA) and Migenes (Guanajuato). Desmurs helped PI of project EE002 to re-write the cover sheet of her project to request correlation time at Socorro. Sjouwerman supported the scheduling of the global 18cm spectral line experiment GP020 for the May/June session.

4.7.2 Support of Visitors to JIVE:

During this period there were 5 visitors to JIVE for EVN data analysis including: B. van Dam, J. Chengjin, Z. Paragi, A. Kus, M. Masheder and S. Garrington.

Sjouwerman maintained the JIVE "visitor-friendly" workstation environment with its standard settings and setups and updated it for Solaris 2.6. He installed and maintained the test version of AIPS (15OCT98) and its "midnight job", and updated the 15APR98 version. Several scripts were developed to aid the management of the data disks that are used by visitors to JIVE.

- Space VLBI

VSOP/HALCA

Gurvits is one of the EVN representatives in the VSOP In-orbit Checkout (IOC) group and has continued to participate extensively in the scheduling and preparation of the VSOP in-orbit operations and evaluation of their quality. As "regional VSOP expert", Gurvits maintained a VSOP help-desk in support of the Second VSOP Announcement of Opportunity (12.02 - 08.05.1998) and assisted several PI's from Europe and China in preparation of their observing proposals.

RADIOASTRON

Gurvits began preparatory work for the scientific workshop "Radio Astrophysics of Extremely High Angular Resolution" (to be held in Massachusetts in October 1998) and organized a technical working meeting on the RadioAstron Moon-perturbed orbit (to be held in Moscow in July 1998).

- Research

Aaron

Aaron made new VLBA+Y1 observations of Mrk 501 (1652+398) in May, observing at 6 frequencies. This project was made in collaboration with Andrew Lobanov of the MPIfR. With these data, he expects to be able to map the rotation measure and spectral turnover frequency distributions across the source. The RM traces interactions of the jet with the ambient material, by which the ambient gas is ionized, and the spectral turnover frequency traces fluid instabiities and shocks in the emitting plasma. These data have been correlated and are currently being processed.

Aaron processed the 18cm portion of his observation of 0814+425. The new image showed that the "jet" found in snapshot imaging of the source at 18cm (Aaron, Ph.D thesis) that was interpreted as part a "spiral" structure was in reality the brightest part of a more diffuse region of emission, likely an extension of the diffuse emission detected in his 6cm image.

Desmurs

Desmurs re-submitted a proposal for the Effelsberg antenna concerning a new survey on OH masers.

He started the reduction of project EW003 (P.I. T.Wilson) on methanol masers in Ultra Compact HII regions. The observations were made in May 94 during the first session of EVN at 6GHz using Effelsberg, Medicina and Jodrell Bank.

Desmurs has nearly finished the reduction of a project of V. Bujarabal concerning SiO masers around late type stars observed with the VLBA at 42 and 43GHz. He has measured the angle of the linear polarization in SiO masers in three envelopes and for the two lines except for R Aqr for which only one line has been possible to map. The polarization angle calibration is uncertain but observations realized with Yebes at the same epoch may fix the problem. With the calibration used so far, the results are in good agreement with the model developed by V. Bujarabal.

Garrett

Garrett submitted 2 proposals for VSOP AO2 and was a co-author on several others. Garrett was also involved in several proposals submitted by Hong to the MERLIN, WSRT TACs and EVN PC. He contributed a section on data analysis to a paper being prepared by A. Pedlar (Jodrell Bank) which presents the recent EVN observations of SNRs in M82.

He continued to supervise Jin Chengjin's work on the gravitational lens 1830-211. As well as analysing the 8 VLBA epochs from 1997, Chengjin has re-analysed 1 epoch from 1996 VLBA data. A careful comparison of the images is required in order to test for motion of the radio components in each image.

Garrett and Garrington rapidly analysed a recent 18-station global VLBI data set (GG034) in which ~ 30 faint sources were observed using the technique of phase-referencing. All 30 sources are located within 1.5 degrees of the well know blazar, 1156+295. Over 70% of the faint sources targeted were detected, the vast majority show peak flux densities in the range 1-3 mJy. The rms noise is ~ 0.27mJy/beam and the total on source observing time is ~ 10 minutes.

Gurvits

Gurvits, K.Kellermann and S.Frey finalized a study of cosmological applications of VLBI surveys data at 6 cm. The paper has been submitted. Gurvits and J.Roland (IAP) continued to investigate various approaches for evaluation of VLBI survey data for cosmological tests.

Gurvits continued data reduction of VSOP observations of high-redshift quasars. The preliminary results have been included in the "first science" VSOP paper (submitted to Science) and will be presented at the COSPAR Scientific Assembly (Nagoya, July 1998). In response to the VSOP second Announcement of Opportunity, Gurvits prepared one VSOP proposal as PI and participated in preparation of four proposals as a Co-I. He prepared schedules for VLBA survey observations at 15 GHz in support to the VSOP Survey Programme (BG077, observed in June 1998).

Gurvits, X.Hong (Shanghai) and M.Garrett reduced data from several observations of the quasar 1156+295 aimed at tracing the helical structure of its jet on milli- to arcsecond scales. A paper is in preparation.

Gurvits and Schilizzi prepared a section on "Active Galactic Nuclei" for the scientific case for the SKAI/1kT project. The overall case is to be discussed at a SKAI/1kT meeting in Calgary (July 1998).

Gurvits participated in preparation for the COSPAR Symposium E1.3 "VSOP Results and the Future of Space VLBI" (to be held in Nagoya, July 19980 as co-organizer and a co-editor of its proceedings.

As a member of the SOC, Gurvits participated in preparation for the ARISE Science Workshop (Green Bank, WVa, August 1998).

Gurvits continued to elaborate the scientific and technical case for the next generation Space VLBI mission. A concept for such a the mission based on a Free-Flying module was discussed in June 1998 with the ISS (International Space Station) utilization office at ESTEC.

Van Langevelde

Van Langevelde continued to work on the project to measure a parallax for the OH masers around the Mira variable U Her. A PhD student project was advertised to extend the sample in the coming years. Because of this, the reduction process was speeded up in order to strengthen requests for more observing time. Three more epochs were processed, mostly yielding satisfactory results for the phase referencing.

Massi

Massi, Ruf (MPIfri-Bonn) and Orfei (IRA-Medicina) finished an investigation on the origin of the high instrumental polarization at the Medicina telescope. The conclusion is that the error very likely occurs in the directional coupler and not in the polarizer itself. Suggestions are given to produce a new coupler and front-end similar to those present at the Effelsberg telescope.

The results of two epoch VLBI observations at 6cm of the X-ray binary system, LSI+61303, during an outburst, are consistent with a source expanding with time from 2 to 7 mas at a velocity of 2200 Km/sec. In addition to this flaring component evidence is found for the presence of a quiescient component.

McKay

McKay continued to work on recent MERLIN observations of GRS1915+105.

Mioduszewski

Mioduszewski with M. Rupen and R. Hjellming (NRAO) obtained 5 target of opportunity observations to observe X-ray transient and symbiotic star CI Cam with the VLBA. This star flared in the X-ray and radio at the beginning of April. The X-ray flare is very unusual both because of its strength and its short duration (2 days). Also at the beginning of June VLA observations by Hjellming, Rupen (NRAO) and Mioduszewski of another X-ray transient, J1748-288, showed a radio counterpart. This radio counterpart has since shown a jet-like expansion on VLA scales and Mioduszewski with Rupen and Hjellming have received a target of opportunity observation to observe this transient with the VLBA.

Phillips

Phillips' PhD thesis was accepted by its examiners, subject to some minor corrections which have been completed.

He continued processing VLBI observations of methanol masers obtained using the Australian LBA at 6.7 and 12.2-GHz. These observations are part of a multi-epoch proper-motion study of methanol masers.

Polatidis

Polatidis analyzed the second epoch of 43 GHz VLBA observations of the quasar 1928+738, which is a part of multi-wavelength monitoring observations with VSOP (5 GHz), the CMVA (86 GHz) and the VLBA (43 GHz) in collaboration with D. Murphy (JPL) and J. Conway (OSO). This second epoch was severely affected by bad weather at most telescope sites and the resulting image is of low quality. However comparison of the first epoch 43 GHz VLBA map with the quasi-simultaneous 5 GHz Space VLBI image, identifies unambiguously the location of the core and show the spectral shape of the jet components. These first results were presented at the AAS by D. Murphy.

Polatidis scheduled and analyzed simultaneous multi-frequency (5, 15 and 43 GHz) VLBA observations of the quasar 3C380. The results from the 5 GHz and those from the two previous 5 GHz epochs (Feb and Sep 1997) were added to the previously published results to study the long term (1982-1998) kinematics of components in the parsec scale jet. The results will be presented by P.N. Wilkinson at the Herstmoneux Castle workshop, in July 1998.

Sjouwerman

Sjouwerman and Van Langevelde wrote a proposal to use the EVN to measure the linear diameter of the OH masing shell of V720 Oph. This should resolve whether V720 Oph is a member of the globular cluster NGC 6171, and put constraints on the metallicity of OH masing shells around AGB stars. They have requested to correlate this project on the JIVE correlator.

- Education and training

Gurvits continued to supervise a Doctorandus degree project by B. van Dam (Leiden University) on VLBI studies of high-redshift radio galaxies. He also continued to supervise S. Frey and Z. Paragi (former JIVE fellows) on their PhD theses.

Gurvits assisted Liu Xiang (Urumqi Observatory) and his collaborators in preparation of an EVN observing proposal.

Schonewille attended an English course.

- Meetings, work visits, symposia, conferences

Meetings, work visits, symposia, conferences Second Quarter 1998		
meetings, work visits, symposia, conferences	**date**	**name**
Work visit Institut d'Astrophysique, Paris	1 April	Desmurs
National Astronomy Meeting, St. Andrews, UK	1-3 Apr 98	McKay
FAT of DPUs, Metrum, Wookey Hole, UK	3-8 April	Buiter, Parsley
Workvisit Observatoire de Paris, Paris	7 April	Desmurs
TOG discussions (Jodrell Bank, UK)	8 April	Garrett
Set up of DPU for SU testing, ATSC, Columbia, USA	15-19 April	Buiter
FAT of PCM module, Metrum Wookey Hole, UK	15-19 April	Parsley
EVN CBD meeting, Bologna, Italy	17 April	Garrett, Gurvits, Schilizzi
JIVE Board meeting, Bologna, Italy	18 April	Garrett, Schilizzi
JIVE-MPIfR Symposium Bonn, Germany	28 April	Aaron, Garrett, Gurvits, van Langevelde, Masheder, Massi, Phillips, Schilizzi, Sjouwerman, Verkouter
Station Unit Acceptance Tests, ATSC, Columbia, USA	2-10 May	Buiter, Parsley
Nederlandse Astronomen Conferentie, Hengelhoef, Belgium	6-8 May	van Langevelde
VLBI Operations Workshop, APT meeting, Real Time Correlation meeting (Haystack, USA)	10-19 May	Garrett, McKay, Parsley, Polatidis, Schonewille
Work visit Leiden	18 May	Sjouwerman
FAT of DPUs, Metrum, Bristol, UK	3-6 June	Buiter Parsley
Work visit ESTEC Noordwijk, NL	4 June	Gurvits
Meeting of the American Astronomical Society, USA	7-12 June	Mioduszewski
Work visit MPIfR, Germany	8-12 June	Sjouwerman
Work visit IAP, Paris, France	9-11 June	Gurvits
Work visit MPIfR, Bonn, Germany	12 June	Gurvits
Workvisit, Metrum, Bristol, UK	20 June-5 July	Parsley
Conference on the "BL Lac Phenomenon", Turku Finland	22-26 June	Polatidis, Aaron
"Barry Clark at 60" symposium, Socorro, NM, USA	24-27 June	Schilizzi
TOG meeting, Onsala, Sweden	27 June	Desmurs, Garrett, van Langevelde Mioduszewski, McKay, Polatidis, Sjouwerman
TOG executive meeting, Onsala, Sweden	28 June	Garrett
Round Table Meeting, Jyvaskyla, Finland	29 June	Garrett
Visit to MPIfR, Bonn (discussion of VLBI, results and techniques)		Philips

- Presentations

Garrett

Several presentations at the EVN Consortium, JIVE board, TOG, EC Round Table, APT & Chiefs meetings.

Two lectures at Leiden on Gravitational lenses and VLBI

Gurvits

"EVN/VSOP operations", EVN CBD meeting Bologna, Italy 17 April

"Milliarcseconds across the cosmological scale", JIVE-MPIfR Symposium, Bonn, Germany, 28 April

"SVLBI-2: concept and requirements", ESTEC, Noordwijk, 4 June

van Langevelde

"VLBI Observations of OH stars", Nederlandse Astronomen Conferentie, Hengelhoef, Belgium, 6-8 May

"JIVE: the Joint Institute for VLBI in Europe". Nederlandse Astronomen, Conferentie, Hengelhoef, Belgium, 6-8 May

Massi

"Hybrid mapping in VLBI and Spurious Symmetrization", JIVE-MPIfR workshop, Bonn 28 April

McKay

"A software correlator for the EVN", Real-Time VLBI Forum, Haystack, USA, 13 May

Mioduszeswki

"VLBI Images of Relativistic Galactic Jet Sources: SS433 and CI Cam", AAS Meeting, Washington DC, 12 June

"Report from the VLBA Correlator", TOG Meeting, Onsala, 27 June

Philips

"Methanol Masers at High Resolution", JIVE/MPIfR Workshop, Bonn, April 28

"Methanol Masers at High Resolution", NFRA colloquium, Dwingeloo, 12 June

Sjouwerman:

"Stellar positions from SiO masers in the Galactic center", JIVE/MPIfR Symposium, Bonn, 28 April

"EVN Network Monitoring Reports" and "Mixed MkIII thick/thin tape scheduling in PC-SCHED", OSO, Onsala, 27 June

- Publications

Published:

I. Owsianik, J.E. Conway, A.G. Polatidis, "An extragalactic radio source of age 370 years: a recently reborn source?", A&A Letters

S.J. Newell, M.A. Garrett, R.E. Spencer, "Apparent superluminal expansion in Cygnus X-3", MNRAS, 293, L17.

I.A.G. Snellen, R.T. Schilizzi, A.G. de Bruyn, G.K. Miley, "Deceleration of Relativistic Radio Components and the Morphologies of Gigahertz Peaked Spectrum Sources", A&A, 333, 70-78

N. Jackson, S. Nair, I.W.A. Browne, P.N. Wilkinson, T.W.B. Muxlow, A.G. de Bruyn, L. Koopmans, M. Bremer, I.A.G. Snellen, G.K. Miley, R.T. Schilizzi, S. Myers, C.D. Fassnacht, D.S. Womble, A.C.S. Readhead, R.D. Blandford, T.J. Pearson, "B0712+472: a new radio four-image gravitational lens", MNRAS 296, 483-490

The following publications were published in the Proceedings of IAU 164 "Radio Emission from Galactic and Extragalactic Compact Sources", eds. J.A. Zensus, J.M. Wrobel, G.B. Taylor

A.G. Polatidis, P.N. Wilkinson, "Superluminal Motion in the Parsec-Scale Jet of 3C380"

M.J. Rioja, R.W. Porcas, "Multi-Frequency VLBA+Effelsberg Observations of 1038+528 A/B

S.E. Aaron, J.F.C. Wardle, D.H. Roberts, "A Multi-Frequency VLBI Polarization Study of the CSS Quasar 3C309.1"

D. Dallacasa, R.T. Schilizzi, Nan Rendong, "X-band VLBA Polarization of 3C287"

H.J. van Langevelde, A. Beasley, "VLBA Studies of Molecular Gas towards Centaurus A"

A.J. Mioduszewski, P.A. Hughes, J.G.C. Duncan, "The Effects of Light Travel Time on the Appearance of Relativistic Jets"

M.A. Garrett, S.T. Garrington, "A MERLIN and VLBI Survey of Faint Compact Radio Sources"

E. Lüdke, W.D. Cotton, H.S. Sanghera, D. Dallacasa, "3C216: Is it the CSS Source with the Highest Rotation Measure?"

E. Lüdke, W.D. Cotton, H.S. Sanghera, D. Dallacasa, "Milliarcsecond Structure of the Faraday Effects in 3C147: "The CSS Prototype with Highest Rotation Measure" (Which is not)"

I.A.G. Snellen, R.T. Schilizzi, H.J. van Langevelde et al., "Evidence for Self-Similar Evolution of Gigahertz-Peaked-Spectrum Sources"

M.A. Garrett, K.J. Leppänen, R.W. Porcas, et al., "PKS1830-211: VLBA 7mm Polarization Observations"

A.J. Mioduszewski, R.M. Hjellming, M.P. Rupen, et al., "An Image of a Highly Relativistic Jet from a Large Flare in the X-ray Binary Cyg X-3"

J.M. Marcaide, A. Alberdi, E. Ros, et al., "Deceleration in the Expansion of SN 1993J"

H.J. van Langevelde, L.O. Sjouwerman, P.J. Diamond et al., "Phase-Referencing Observations of Galactic Circumstellar Masers"

J.F. Desmurs, A. Baudry, "First EVN Maps of 6-GHz OH Lines in Star Forming Regions"

T.J. Galama, J. van Paradijs, E.P.J. van den Heuvel et al., "Determining Motions and Birthplaces of Pulsars through VLBI Astrometry"

Submitted:

J. M. Paredes, M. Massi, R. Estalella, M. Peracaula, "Milliarcsecond radio structure of LSI+61 303", A & A in press.

L.I. Gurvits, K.I. Kellermann, S. Frey, "The "angular size - redshift" relation for compact radio structures in quasars and radio galaxies", A&AS, submitted

H. Hirabayashi, L.I. Gurvits, A.J. Mioduszewski, R.T. Schilizzi, et al. "First Results from the Very Long Baseline Interferometry Space Observatory Programme (VSOP)", Science, submitted

R.P. Fender, S.T. Garrington, D.J. McKay, et al. "MERLIN observations of GRS1915+105: a progress report", Proceedings of Relativistic Jets workshop, Open University, UK.

D.J. McKay, "A software correlator for the EVN", Proceedings of Real-Time VLBI Forum.

"The complex gravitational lens system B1933+503", C.M. Sykes, S. Nair, I.W.A. Browne, N. Jackson, P.N. Wilkinson, R.D. Blandford, J. Cohen, C.J. Fassnacht, D. Hogg, A.C.S. Readhead, D.S. Womble, S.T. Myers, A.G. de Bruyn, M. Bremer, G.K. Miley, R.T. Schilizzi, MNRAS, submitted

I.A.G. Snellen, R.T. Schilizzi, A.G. de Bruyn, G.K. Miley, R.B. Rengelink, H.J.A. Röttgering, M.N. Bremer, "A New Sample of Faint Gigahertz Peaked Spectrum Radio Sources", A&A, in press.

I.A.G. Snellen, R.T. Schilizzi, A.G. de Bruyn, G.K. Miley, M.N. Bremer, H.J.A. Röttgering, R.G. McMahon, I. Perez, "Optical and near-infrared imaging of faint Gigahertz Peaked Spectrum sources", Not. N.R. astr. Soc., submitted.

M.J. Kukula, T. Ghosh, A. Pedlar, R.T. Schilizzi, "Parsec-scale radio structures in the nuclei of four Seyfert galaxies" submitted to MNRAS.

Other papers:

M. Massi, K. Ruf, A. Orfei, "Investigation on the Origin of the High Instrumental Polarization at the Medicina Telescope", EVN Doc. 85

D.J. McKay, "DBGET: Data acquisition on the MkIII/MkIV VLBI terminals", EVN, Doc 86.

Poster Presentation

A. Polatidis, J.E. Conway, "VLBA images of X-ray selected BL LAc objects from the EMSS survey" at the "BL Lac Phenomenon" conference, Turku, Finland