JOINT INSTITUTE FOR VLBI IN EUROPE

Report for the first quarter, 1999

Summary

The commissioning of the EVN Data processor at JIVE continued during the quarter, with several milestones being passed. The most important of these was a detailed comparison of the results of the global observation, GL034, with those obtained on the VLBA processor. Initial results were encouraging, particularly as the closure phases matched well. At the end of the quarter, it was still expected that the processor would enter operation in early July and be able to accept a small number of experiments from the second EVN session.

Work on the Mark IV upgrade during the quarter involved further tests of the formatters, the continued manufacture of the read/write electronics at Metsahovi, and organisational work in support of the MkIV upgrades at the two Chinese stations.

Support was given to EVN operations in the February session via the Network Monitoring Experiment, the Fringe Test Tape Experiment, space VLBI coordination, production of final calibration data, and telescope support. Support was given to individual astronomers in preparing their observations for the February session as well as correlating, calibrating, and analysing their data from earlier observations. An evaluation of the instrumental polarisation at the EVN stations has been made and discussed at the TOG meeting in Noto. Progress on the real-time fringe verification project has been stalled during the quarter pending receipt of software from JPL.

Eighteen scientific or technical presentations were made during the quarter; eight papers were published and four submitted.

1. Institute

European Commission

Garrett submitted the annual reports and cost statements for the "Access to Large-Scale Facilities" and the "PECO-2" contracts. In addition, a final report and the associated consolidated cost statement were submitted for PECO-2. This contract which supported VLBI activities at both TCfA (Poland) and FOMI (Hungary) is now complete. Garrett attended three EC related meetings: the FINA Round Table held at LENARO Padua/Venice, an IST information meeting held in Paris and an FP5 RTD meeting in Schiphol. He also began preparing material for the next EC "Access" proposal under FP5. Schilizzi attended the FINA and RTD/Schiphol meetings and began preparation of a proposal for an Infrastructure Cooperation Network in Radio Astronomy under FP5.

Review of the EVN and JIVE

Booth, Padrielli, Schilizzi and Weijma (NWO) attended a meeting at the European Science Foundation in Strasbourg to discuss the procedures for the review.

Publications

Material for the 1998 Annual Reports for the EVN and JIVE is being gathered by Leonid Gurvits (editor). Garrett, Campbell, and Gurvits began editing papers for the EVN/JIVE NAR special issue.

Personnel changes

Mr Hans Tenkink joined JIVE as a data processor operator on 1 January. Dr Denise Gabuzda took up her position as EVN Support Scientist at JIVE in February. She will be responsible for looking after many of the visitors to JIVE, in addition to her research work. Dr Peter Fridman completed his appointment as EVN Scientist at Westerbork at the end of January. He will continue at Westerbork as a member of staff of the observatory. In February, Dr Amy Mioduszewski, Mr Peter Shepherd and Mr Ron Heald completed their

appointments. Dr Mioduszewski spent 3 years as JIVE Support Scientist at NRAO, and Mr Shepherd almost 4 years as on-line software programmer at Jodrell Bank. Mr Heald returned to NRAO in February after a 6-month stay at JIVE working on various aspects of the on-line software. Mr Rob de Haan resigned as operator in March and took up a position at Westerbork.

Infrastructure

Sjouwerman, Philips, and Gabuzda alternated in writing the minutes of the monthly JIVE institute meetings. Schonewille maintained the JIVE web pages. Garrett arranged for the installation of new workstations, PC machines and work places for the JIVE Support Scientists in the EVN Support Group. He also assigned computing resources to visiting scientists and monitored e-mail from the generic JIVE account.

Conference

Gurvits participated in preparation for the conference "Perspectives on Radio Astronomy" (to be held in Amsterdam in April) as a member of LOC representing JIVE.

Visitors

K. Hosking (Metrum), M. Clemow (Metrum), P. Shepherd (Jodrell Bank), P. Maguire (Jodrell Bank), R. Noble (Jodrell Bank), W. Cannon (ISTS), A. Whitney (Haystack), W. Tschager (UL). P. Diamond (Jodrell Bank).

- Data Processor Group: Commissioning the EVN/MkIV Data Processor (Anderson, Bos, Buiter, Casse, De Haan, Heald, Kamphuis, Kramer, Van Langevelde, Leeuwinga, Maguire, Millenaar, Noble, Olnon, Parsley, Phillips, Pogrebenko, Schonewille, Shepherd, Tuccari, Verkouter, Zwier)

Summary

Several milestones were passed this quarter, the most important being a detailed comparison of a section of experiment GL034 with the results obtained on the VLBA data processor**.** Initial results were encouraging particularly as closure phases matched well**.**

Otherwise the team continues to work diligently to integrate software and hardware, chase out bugs and maintain the timeline to a working system**.**

2.1 Correlator Section

Phillips worked closely with Pogrebenko and Bos implementing fractional bit shift on the correlator. Turning on this feature revealed a data rate dependent de-correlation which was eventually tracked down to a bug in the SU.

2.2. Station Units

Martin Leeuwinga modified the last SU's that arrived from Allied Signal. He also assisted Steve Parsley and Nico Schonewille with the Factory AcceptanceTests of these SU's.

Olnon and Hazell looked a bit further into the possibility of maintaining the SUCCs (Station Unit Control Computer Software) locally at JIVE. The software was developed, and is still maintained, in a fairly old version of the pSOS supporting environment. Some more structural upgrading of the code is required to port it to the modern environment provided by the installed pRISM+ package.

As agreed with AlliedSignal, the last few Station Units were delivered without a Factory Acceptance Test (FAT). Parsley set-up a test station and revised the test procedures to comply with the latest generation of software and firmware. The last five Station Units were tested by Leeuwinga and Schonewille. Two were accepted and three were rejected. All track recovery modules were also tested. A total of 20 TRMs were found to be faulty, half of these from the untested units. All faulty units were returned to AlliedSignal for repair or replacement.

During the above tests a gap in the FAT was identified. The FAT has no thorough test of the odd tracks in the TRMs. When these were checked it was found that some tracks, especially those in the 7th slot, produce no data. This phenomenon is currently under investigation. Early indications are that there is a cross-talk or marginal timing problem in the TRM.

Prototype Phase Cal Modules were tested with E-series Xilinx by Metrum Information Storage. This resulted in one more iteration of the design. Manufacturing information was released and a production contract was placed with Metrum.

Phillips worked with Hazell fixing a number of outstanding bugs in the SUCC code. This included a number of memory leaks which limited the operation of the SU to around 5 configurations (before re-booting), problems with timeouts on the position to footage command to DPU and other miscellaneous problems.

Phillips turned on the 2 bit data stream on the station unit and verified that it yielded the expected S/N improvement in the data**.**

2.3. Play Back Units

An investigation has been carried out to evaluate the performance of the DPUs at 320 ips. For this investigation, the 17 thin tapes recorded last year for the demonstration held at the opening of the Data Processor have been used. The results of the investigation

are available in EVN DOC #87.

Martin Leeuwinga finished work on the second Tape Position Test Box required to facilitate the adjustment of the tape path of the DPUs. This ended in a properly working and well calibrated tool with an accuracy of 5 m in a 200 m range. He also re-calibrated the existing P&G device to the same accuracy.

New Tape Guide Caps made from a more resistant material (Aluminium Nitride or Shapal-M) have been delivered and installed on one of the DPUs for extensive wear testing. This material has a Vickers hardness of 560 Kgf/mm2. The caps will replace the current aluminium caps which wear faster and are then prone to damage the edge of the tapes.

A start was made to analyse the problems that we regularly have with the capstan motors of some DPU's.

Some time has also been spent writing a document describing the detailed procedure for mounting the headstacks on the headblocks of the DPUs.

2.4 SUIM/TSPU

The major activity in the project area was held in Medicina by Andrea Maccaferri and Sandro Cattani to convert all Xilinx designs from UNIX based to the newest PC based version of ViewLogic and XACT. Now all the documentation is ready for a release on a CD-ROM compatible with PC-based design tools.

2.5 High level control software

A fair amount of time was spent this quarter in testing all the new software coded during and since the code freeze prior to the opening in October of last year. Noble, Maguire and Shepherd visited JIVE for a week at the beginning of February and installed all of the modified software, and Maguire visited for a further week to fix some bugs found in it. This version of the software, now the running version, appears to be stable and is regularly updated.

A change was made to the options requested of the Station Units to enable running with a continuous BOCF signal. This has reduced some of the timed waits in the Correlator_Control module which is now closer to its original planned form.

Maguire added support for the tape motion commands from the Status_Monitor GUI to Processor_Control and SU_Control. He then started work on the second version of the Processing_Job GUI, which is now nearing completion. Maguire also started on the implementation of a dedicated editor for the Correlation Job Descriptor.

Noble defined formats for the "auxiliary" files in the Data Formats document which is now complete. Other documentation and design work took up the remainder of his time.

During the quarter Ron Heald returned to NRAO, and Shepherd did some additional work on the Tapes Database that Heald had been working on. Apart from this Shepherd did some more work on the Location Broker.

Peter Shepherd left us for new employment at the end of February, and we wish him well. He made significant contributions to the JIVE software, and his expertise will be missed.

Olnon furthered the evolution of the JIVE Correlator Control Software (JCCS) from development to operational phase. This quarter, a clear split was realized between fully self-contained development, test and operational systems for the Correlator Control Computer (CCC). We can now easily and quickly "release" a new system and switch between the available systems. The operational systems are time-tagged and can be reconstructed any time from the CVS code database.

Olnon also started to bring the software running on the real-time computers under version control (again CVS). Full integration with the CCC software is not yet feasible, because the architecture of the packages and their maintenance rules are quite different. Moreover, the RT software is still in development and partly shared with the WSRT. For now, we use CVS only to record the history at regular intervals and maintain the RT system by its own rules as before.

Olnon continued to carefully monitor the JCCS' sanity by at least weekly updates and rebuilds of the development system and by creating new test systems whenever system components had been upgraded or modified significantly. In addition, he spends more and more time supporting other users of the JCCS and its working environment, e.g. software developers, testers and operators.

Verkouter started to work on the implementation of the Correlator Output Format (COF) in the data handler. This work is taken over from Peter Shepard who wasn't able to implement it. The COF will replace the existing intermediate format, which basically is a binary dump of everything that comes from the correlator with a couple of home-grown databases to deliver additional information (e.g. frequency setups, antenna positions etc.) to go with it.

Phillips helped the Jodrell team test a large number of new features introduced into the CCC control software. Much of this debugging was without the Jodrell team present in Dwingeloo.

Phillips cleaned up the default diagnostic printout of the communication "messages". Changes to some of the libraries had left these printouts unreadable. The correlator model polynomial update time was increased to 2 minutes rather than once per scan.

Van Langevelde started a proposal for VEX 1.6 which is supposed to accommodate correlator configurations and is needed for the operational correlator.

2.6 Post correlation software

Verkouter finished the implementation of the new aips++ MeasurementSet filler. Some refinements had to be made to accommodate specific user requests. In the nearby future this version will be able to read the intermediate format as well as the Correlator Output Format.

Phillips worked with Verkouter testing a new version of j2ms which creates AIPS++ measurement sets from the raw data from the correlator.

2.7 Infrastructure

The setup of the water detector under the computer floor was changed according to the recommendations made in the "Equipment Rescue Plan" (10-12-98 by J. Buiter). The new arrangement is such that in case of flooding or a fire, all equipment is automatically switched off.

Martin Leeuwinga installed a terminal server with fibre optic connections in the network distribution cabinet. This is for monitoring the correlator racks and the DDU.

The registration of all JIVE Equipment was finished this quarter. On 31-03-99 we had a total of 136 registered and labelled instruments like PC's, Workstations, X-terminals, Hard Disks, Dat Tape Drives, Oscilloscopes and so on. The total investment is: Fl.673.574,88. Copies of the report are available from Jan Buiter.

Van Langevelde and Stuurwold ordered the new computer hardware on which the correlator output will be collected in the future (DDD). A choice was made to buy a Sun workstation, even though the CCC is an HP machine.

2.8 Testing and preparing for operations

Kramer wrote a Perl script that automatically takes care of updating the relevant log and GPS files from Bologna. Further he created a script that converts important information from the logfiles into vexformat.

Schonewille assisted with the operational test of the EVN MkIV data processor and studied operational aspects of the EVN MkIV data processor. From 15-17 March he visited the Max Planck Institute in Bonn in order to obtain an overview of the logistics around the correlator. For part of the quarter, he tested and repaired the sampler modules for the DZB correlator system (NFRA).

Phillips, Van Langevelde and Pogrebenko made the first spectral line detection on February 17, by observing the unresolved OH maser line in W3OH, which was observed in the November 98 session.

After most of the problems with the model were sorted out, Van Langevelde and Phillips started to push for a comparison between VLBA and JIVE data. A small fraction of GL034 had previously been processed at the VLBA. The first step was to put time ticks on the data. This required changes in the code by Bos and some interpretation software by Verkouter.

It was then possible to process the data through aips++ and into AIPS. At first the data did not show the expected closure properties. Pogrebenko and Van Langevelde eventually diagnosed this as a shift in the correlation function, resulting from the vernier delay tracking. A simple fix for this was possible in aips++.

In order to make a direct comparison with data from the VLBA possible, Van Langevelde made an effort to mimic the model used at the VLBA as closely as possible. This required some changes in the model software as the previous version did not allow for clock drifts.

Various properties of the data could be compared in AIPS or aips++. It was shown that the overall shape of the bandpasses are

similar to the data from the VLBA correlator, although some edge effects remain. The amplitudes agreed to the few percent level. It seems the JIVE correlator currently reports slightly larger values. The phase properties of the two correlators showed impressive

similarities. All closure phases agreed within the errors. For direct comparison of baseline phases (including delays and rates) differences could be attributed to differences in the model, probably in the earth orientation parameters.

The comparison with VLBA data milestone was passed on March 23. After inspection of the closure properties the next target for the team was to produce an image. It was decided to make this with data from 8 EVN station, with the GL034 tapes on which 8 hours of data on 3C380 was present.

The last days of the quarter saw the first production correlation ever. Phillips taught Tenkink how to run the data processor who then processed a subset of 8 stations fro GL034. The software for running the processor was still in an early stage, forcing a new start for every 11 minute tape pass. It took about 3 working days to process an 8 hour experiment.

Van Langevelde worked out a plan for the number of experiments that could be accepted in various sessions. This plan was reflected in the EVN call for proposals and discussed at the EVN PC meeting.

Phillips, Van Langevelde and Pogrebenko. processed an EVN only test experiment FR003. This was a spectral-line observation of the 1665~MHz OH masers in W3(OH).

2.9 Thin Film Head array project

At the beginning of the year, Seagate informed Haystack that they no longer had the resources to manufacture wafers for the thin film head arrays to the VLBI specification, namely the 0.3 micron gap width. Following this, a lot of activity took place, including a teleconference on March 3 between all involved parties on the radio astronomy side. Part of the activity concerned the investigation of the

possibility of having another, smaller company for the manufacture of the wafers. This road proved not to be feasible and Seagate was informed. On March 3, Haystack answered a request from Seagate for the terms for the delivery of all the required thin film wafers and a restatement of the specification. A cost proposal is expected in the second quarter.

- Recording terminal upgrade to MkIV (Spencer et al)

A meeting of the EMU/VIV group took place in Noto on Sunday 28th March.

Software

Jan Buiter spend 2 days in Westerbork to measure, readjust and recalibrate the tape path of the MK IV recorder.

Formatters

MkIV upgrade

Further test observations for the narrow band modes using external filters took place during the February network session. These tests were successful, and the Socorro OK modes table is now complete. Thanks are due to Derek Mackay, Huib van Langevelde, Jon Romney and the station friends for their efforts in making these verification tests work.

Van Langevelde and Walker (NRAO) started an upgrade of Sched, which will allow more robust frequency and bandwidth switching during an experiment. Also the concept of observing bands was introduced to phase out the large numbers of frequency setups that are currently necessary in Sched.

VLBA upgrade

Only three formatter remain to be delivered and checked out at MPI, Bonn. Two are about to be delivered and the remaining one will follow on soon after checks at Haystack are complete.

NIM bins for the formatters are being supplied by MPI Bonn.

Manual

We are still waiting for the final version for this from GMR Associates.

Read/Write Electronics

The manufacture of read/write electronics at Metsahovi is almost complete, with delivery in a few weeks. Installation at EVN stations could take place in the autumn.

Metsähovi are supplying head assembly kits, but soldering needs to take place. This is a difficult operation and means of achieving this are being investigated.

China Upgrades

A set of 4 MHz filters for Urumqi has arrived. A set of narrow band filters is also required. Terms of agreement with the Chinese have been arranged by L. Gurvits. Availability of manpower suggests that the optimum time for a trip to install thin tape capability and the new formatter etc. at Urumqi is in June. There may also be time to install the MKiV upgrade for Shanghai during the same trip. Further negotiations are underway.

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

4.1 Network Monitoring, Reliability and Performance

Sjouwerman scheduled and partially correlated the 6 and 18 cm Network Monitoring Experiments from EVN session 1. The NME report was written-up and distributed around the network. Sjouwerman imported the NME data into AIPS where the long-standing problem with the Medicina Video-convertor was shown to be due to a large phase-offset between the upper and lower side-bands. Further analysis of the data set by Garrett allowed the sensitivities of the antennas to be determined. In particular, the WSRT phased array was determined to have a SEFD of ~ 37 Jy implying that the array had phased-up correctly. These and other results were reported by Garrett at the TOG meeting in Noto.

Polatidis scheduled the Fringe Test Tape experiment FT002, for the February EVN session. Fringes were found to all stations.

In order to evaluate the level of instrumental polarization at the various EVN stations at 18 and 6cm, a total of 9 Network Monitoring experiments have been processed within AIPS by Massi. The results are available on the Technical Page of the EVN Operations web page, and are described in an EVN-memo (M. Massi, in progress). The level of variability of the instrumental polarization (in amplitude and phase) at the stations during the consecutive runs of 12 February and 20 February 1997 and again during the consecutive runs of 5 June and 11 June 1997 have also been investigated. At both 6 and 18cm Westerbork, Medicina, Onsala and Shanghai all exhibit levels of instrumental

polarization which are higher than the reccomended limit (5 percent). This work was reported at the TOG meeting in Catania. In order to continue the monitoring of the instrumental polarization,

Massi prepared complete correlation files for the NME experiments at 6cm and 18 cm (session 1, 1999).

McKay has continued work on the EVN real-time fringe verification project. Unfortunately, progress on the transfer of the code of the JPL software correlator has stalled. We are now waiting for JPL to

authorise release of this material. Documentation on the DBGET data acquisition system is now complete and available (EVN Doc #88).

4.2 Calibration

Desmurs generated the ANTAB files of the first EVN session. The program log2ant was updated to correct for a few minor problems. A programme to present the Tsys stability of the EVN antennas from the ANTAB files was also produced.

4.3 Data Correlation

Amy Mioduszewski's term as JIVE Support Scientist at NRAO, Socorro ended in this quarter after 3 years of service to EVN PIs and stations. During the period 1996-1999 Mioduszewski had been ultimately responsible for overseeing the correlation of all EVN experiments in Socorro. She had also been involved in providing feedback to the EVN stations regarding their performance and represented NRAO at meetings of the TOG/TWG. Bob Campbell continued to support the correlation of EVN projects at the MPIfR correlator in Bonn. EG018, EL020B, ET004A/B, EC007 were correlated to completion. Campbell also supported the full correlation of the NME. Preparations began for the correlation of EH004, EH005, EK009A, EP025, GC021A/B. J-F Desmurs prepared for his visit to Bonn in order to push through the remain spectral line projects that are not associated with a MPIfR PI or co-I.

4.4 Observing and Telescope Support

Polatidis supported the EVN observations at Onsala Space Observatory for the February-March 1999 EVN session.

McKay supported observations at Cambridge and Jodrell Bank for the February 1999 EVN session. He was also involved with the

general software systems for the MERLIN array and assisted in the publicity effort at NRAL in order to secure additional funding for the MERLIN upgrades.

Desmurs has taken part in the observations of the first EVN session at 43 GHz with the Yebes antenna. The malfunctioning VLBA formatter was replaced by the new MKIV formatter before the start of the session. The new set-up appeared to work correctly.

Polatidis, McKay and Desmurs participated in the TOG meeting in Catania, Italy.

4.5 General Network Support

McKay and Van Langevelde scheduled experiment FT004 for the verification of the remaining MkIV modes on the NRAO correlator. This experiment was observed on 19 February, and correlation was completed on 16 March by Romney (NRAO). A total of six modes were scheduled and observed by seven EVN stations and Hartebeesthoek. The results demonstrated interoperability between the MkIV formatters and the VLBA correlator in all modes tested. It has therefore validated the modes

that had failed in the FT003 experiment from the last quarter. As a result, NRAO has marked all "listed" modes in the "Validated VLBA and VLBA-Compatible Mark 4 Recording Modes" document as valid (the only exceptions now being the two 512-Mbps modes and one 1024-Mbps mode which have not been validated for either format). In the second part of the FT004 experiment, two wide-band modes were tested on the new Mark IV system at Hartebeesthoek. The observed scans were sufficient to demonstrate satisfactory performance in both modes for that station.

Desmurs generated Sched setup files for EVN antennas at 43GHz. Sjouwerman generated the Experiment Feedback Facility web pages for the February EVN session and updated the "EVN contacts" web page.

Garrett re-stated and updated the "Bologna rules" and circulated this to members of the TOG for comment.

Gurvits obtained an import license from the Polish Ministry of Trade for the MkIV formatter for the Torun Radio Astronomy Observatory in accordance with the requirements of the US Department of Commerce.

Gurvits also prepared materials for the contract between JIVE and the Chinese observatories w.r.t the delivery to China of components for the MkIV upgrade at Nanshan and Sheshan. He held talks in Shanghai with the Oriental Scientific Instruments Ltd., the designated foreign trade company of the Chinese Academy of Sciences. The contract is ready to be signed in the second quarter of 1999. He also began to participate in preparations for the trip to China of the EVN-US team for installation of the MkIV equipment at Nanshan and Sheshan. While in China, Gurvits had talks with the management and engineering staff of the Beijing, Shanghai and Urumqi observatories on various technical and operational issues, and gave five presentations on VLBI for the observatories' staff and students. The trip to China was funded from the KNAW fund for the scientific Sino-Dutch scientific collaboration.

Gurvits assisted in preparations for the visit to Urumqi of Dr. C.Stanghellini (IRA-Noto) in May 1999. C.Stanghellini will install AIPS on a UNIX WS (the first installation at the UAO) and will work with the

UAO staff on several scientific projects. Gurvits also assisted in the organisation of attendance of the representatives of the Shanghai and Urumqi observatories at the EVN TOG (March 1999) and EVN CBD (April 1999) meetings.

4.6 EVN PI Support

4.6.1 Scheduling

Desmurs supported the PIs of projects EC006, GJ009, GP021 and EE003B (session 1, 1999) with respect to schedule production. Similarly Polatidis supported EP025 and GS014 and Sjouwerman supported EK009a. Desmurs also helped a PI generate a spectral line proposal. Van Langevelde supported schedule preparation of the MkIV experiments by Yates and Snellen. Garrett supported projects EW010, Gurvits supported EH004/5.

4.6.2 Support of Visitors to JIVE

Sjouwerman maintained the JIVE visitor friendly workstation environment with its standard settings and setups. He maintained the AIPS 'midnight job' of the 15APR99 version. Sjouwerman also maintained the EVNtech VLBI exploder and PC-SCHED software.

- Space VLBI

VSOP/HALCA

As an EVN representative in the VSOP In-orbit Checkout (IOC) group, Gurvits continued to extensively participate in scheduling and planning of the HALCA operations and observing programme for the VSOP AO2 period.

Gurvits participated in the activities of the VSOP Survey Working Group. The Group will conduct a data reduction workshop at ISAS (July 1999) after which the first batch of Survey data will be released.

Gurvits participated in the ESA ISS-SVLBI study in his capacity of the project scientist. During the first quarter of 1999, the study concentrated on the analysis of the overall ISS-SVLBI mission scenario and logistics. the study has been reviewed at a progress meeting in February 1999.

As members of the international ARISE (Advanced Radio Interferometer between Space and Earth) science advisory group Garrett and Gurvits participated in drafting a document on the scientific case on the ARISE mission and its executive summary. The documents were presented to the NAS Decadal Committee and the NASA Space Science Advisory Group in March 1999.

- Research

Desmurs

Desmurs submitted an article to A&A on the results obtained for SiO masers in evolved stars at 43GHz (part of these results were presented during the 4th EVN /JIVE meeting).

He started the reduction of data on a project on the gravitational lens PKS 1830-211. The aim of the project is to study the absorption line of C3H2. The first step of the reduction indicates that the continuum emission has been detected but the absorption line seems very weak.

He received the correlated data of projects ED009, ED010, ED013 and GB026. Preliminary investigation shows that despite some

technical problems, fringes have been found and these projects will be reduced in a near future.

Gabuzda

Gabuzda, A. Pushkarev (ASC), and Cawthorne were notified that their paper "The 6cm VLBI polarization structure of nine BL Lacertae objects" was accepted for publication in Monthly Notices of the Royal Astronomical Society.

Gabuzda continued work on 5 and 1.6 GHz VSOP polarization data of the compact BL Lacertae object 1803+784.

Garrett

Garrett visited the Nordic Optical Telescope in La Palma together with Polatidis (OSO/JIVE). The aim was to image and classify optical counterparts to the faint radio sources from the FIRST survey currently being investigated by Garrett, Garrington (NRAL) and Polatidis. Unfortunately, the weather conditions were atrocious and over the 4 days of observing time no data were obtained. Garrett and Polatidis were rescued from the mountain by IAC staff after getting stuck in a severe snow storm during an aborted attempt to leave the mountain. During the quarter Garrett gave colloquia at the IGN and MPIfR. Garrett was involved in 5 proposals submitted for the Feb 1 VLBI deadline. In particular, a proposal to observe the Hubble Deep Field with the EVN (PI Muxlow, NRAL) at 18cm was submitted to the EVN PC. A proposal to obtain funding for a PhD student to work on the HDF and Faint source surveys was also submitted to NWO.

Gurvits

Gurvits together with K.Kellermann and S.Frey "The "angular size - redshift" relation for milliarcsecond radio structures in quasars and radio galaxies". The revised paper has been accepted for the publication in A&A. The preprint is published on the astro-ph server, at JIVE, NRAO and CDS.

Gurvits together with S.Frey, Zs.Paragi, R.T.Schilizzi et al. revised the paper "VLBI imaging of extremely high redshift quasars at 5 GHz". The paper has been accepted for publication by A&A and posted as a Web JIVE and astro-ph preprints.

Gurvits finalized data reduction of the pre-launch VLBA observations of 380 VSOP survey sources at 5 GHz (project BH019). A paper is in preparation.

Gurvits continued to supervise data reduction of EVN observation of three high-redshift galaxies by B. van Dam (RUL).

Gurvits continued to act as a guest editor of Advances in Space Research, the COSPAR scientific journal.

Schilizzi and Gurvits provided a contribution on AGN studies to the proposal "Science with the Square Kilometre Array" (eds. A.R.Taylor and R.Braun), released in March 1999.

Van Langevelde

Van Langevelde worked with Vlemmings (Leiden) on the parallax and proper motion of nearby Mira variables. A new observing proposal was written and work was started on water maser studies. Several attempts were made to improve on the calibration aspects of the phase connection.

Massi

The data of the EVN run EM009 on the X-ray binary source LSI 61303 have been reduced and the image processing is in progress. The schedule for the VLBA (plus VLA as tied array) observation of an other X-ray binary LS 5039 has been prepared.

McKay

McKay continued work on GRO1655-40, in which observations from 1994 are being re-analysed. This work is being done in collaboration with Diana Hannikainen (Helsinki). Results presented at the 19th Texas Symposium, Paris, have now been submitted to the proceedings.

Phillips

Phillips visited ATNF to correlate S2 VLBI data obtained with the Australian LBA network and for discussions about methanol masers with Ray Norris.

Polatidis

Polatidis, in collaboration with S. Aalto (OSO) and J.E. Conway (OSO), continued the analysis of MERLIN observations of the nucleus of the starburst/OH megamaser galaxy IC694. Preliminary results show a disk-like continuum emission. Both the HI absorption and the OH maser emission appear to come from a similar rotating disk-like gaseous structure with the OH maser extending up to 80 pc and the HI up to 300 pc.

Polatidis with M. Marcha (Obs of Lisbon, Portugal) continued the study of a sample of flat spectrum radio sources, with declination 0 to -20 degrees to investigate the differences between BL Lac objects and radio galaxies. Spectroscopic observations of 20 objects in the sample were made with the 1.5m Danish telescope at ESO, La Silla (Feb 5-6). An interesting result form these observations was the discovery of another three 'hybrid' objects with spectral characteristics characteristic of both radio galaxies and quasars.

Polatidis continuing the project on the investigation of the molecular gas properties of OH megamasers. In collaboration with S. Aalto (OSO), he made CO(2-1), 13CO and HCN observations of five southern OH megamaser galaxies with the SEST telescope (La Silla, Chile, Feb 1-8).

Polatidis with Garrett (JIVE) were assigned 4 nights of observations with the Nordic Optical Telescope (NOT) in La Palma, Spain, to do imaging of weak radio sources from the FIRST/MERLIN sample. Due to adverse weather (snowstorms) all 4 nights were lost. A new proposal to do the observations next year will be submitted.

Sjouwerman

In Onsala, Sjouwerman and Lindqvist wrote up a survey for H_2O and SiO masers in Galactic center OH/IR stars. In Stockholm, Sjouwerman and Sandqvist worked on VLA observations of all four 1.6 GHz maser lines of the OH molecule in the Galactic center.

- Education and training

SUPERVISION				
Staff member	**Student**	**Institute**	**Degree**	**Subject**
Gabuzda	A. Pushkarev	ASC, Moscow	PhD	Polarization Properties of BL Lac Objects
Gabuzda	P. Kochenov	ASC, Moscow	PhD	Polarization Intraday Variability in Compact AGN
Gurvits	Van Dam	Leiden Univ.	Master	VLBI studies of high redshift radio galaxies
Gurvits	S. Frey	FOMI Satellite Geodetic Obs./ Eötvös Univ.	PhD	Cosmological applications of VLBI techniques
Gurvits and Vermeulen	Z. Paragi	FOMI Satellite Geodetic Obs./ Eötvös Univ.	PhD	Milliarcsecond structures in galactic and extra galactic radio sources
Van Langevelde	W. Vlemmings	Leiden Univ.	PhD	Astronomy of OH masers
Schilizzi	W. Tschager	Leiden Univ.	PhD	Peaked spectrum sources

Olnon and Phillips attended the in-house course on "glish", the interface language for AIPS++ application programmers and users.

Van Langevelde followed a Management course on "Leading a team of professionals" in Utrecht.

Gurvits began to advise Zhang Hai-yan (Beijing Normal University and Beijing Astronomical Observatory) in her PhD study (supervisor - Prof. Nan Rendong, BAO).

- Meetings, work visits, symposia, conferences

Meetings, work visits, symposia, conferences First Quarter 1999		
meetings, work visits, symposia, conferences	**date**	**name**
Onsala Space Observatory, Onsala, Sweden	4-8 Jan	Sjouwerman
Observations with the NOT telescope, La Palma, Spain	8-13 Jan	Garrett, Polatidis
Stockholm Observatory, Stockholm, Sweden	11-15 Jan	Sjouwerman

CERES mid-term review and science workshop, Lisbon, Portugal	21-23 Jan	Gurvits
EVN MkIII Correlation Support for JIVE, Bonn, Germany	25 Jan-6 Feb	Campbell
Meetings at the Beijing, Shanghai and Urumqi observatories, China	26 Jan-11 Feb	Gurvits
Observations with SEST and the 1.5m Danish telescope, ESO, La Silla, Chile	26 Jan-11 Feb	Polatidis
Round Table, Brussels, Belgium	1-2 Feb	Schilizzi
EU Round Table, Venice, Italy	4-5 Feb	Garrett, Schilizzi
MkIV Contract negotiations, Oriental Scientific Instruments Ltd. Shanghai	5 Feb	Gurvits
ESF Meeting on EVN and JIVE Review, Strasbourg, France	8-9 Feb	Schilizzi
IST Meeting, Paris, France	22-23 Feb	Garrett
Egyptian National Radio Science Meeting, Cairo, Egypt	22-26 Feb	Schilizzi
ISS-SVLBI progress meeting, ESTEC, Noordwijk, NL	23 Feb	Gurvits
Colloquium, Bonn, Germany	4-5 Mar	Garrett
EVN PC, Granada, Spain	5 Mar	Van Langevelde
MPIfR Bonn, Germany	15-19 Mar	Schonewille, Sjouwerman
Meeting on RTD proposal for FP5, Schiphol, The Netherlands	19 Mar	Garrett, Schilizzi
JIVE/EVN Support at the Bonn MkIII Correlator, Bonn, Germany	22 Mar - 26 Mar	Campbell
EMU/VIV, Noto, Italy	28 Mar	Van Langevelde
TOG, Noto, Italy	28-29 Mar	Buiter, Desmurs, Gabuzda, Garrett, Van Langevelde, McKay, Polatidis
Visit collaborators at ATNF and correlate S2 data, Sydney, Australia	29 Mar-2 Apr	Phillips
EVN TOG Executive meeting, Noto, Italy	30 Mar	Garrett, Van Langevelde
Working visit, Noto, Italy	31 Mar	McKay

- Presentations

Gabuzda

"The Small-Scale Magnetic Field Structure of 1803+784 from 5 and 1.6-GHz VSOP Polarization Observations", NFRA/JIVE weekly scientific seminar, 14 Mar

Garrett

"New Results in VLBI", IGN, OAN, Spain, 15 Jan

"VLBI's Widening Horizons", MPIfR Bonn, Germany, 5 Mar

Gurvits

"Cosmological tests with milliarcsecond radio structures in extragalactic radio sources", Leiden University, NL, 14 Jan

"High redshift quasars as seen with the extraterrestrial baselines, CERES meeting", Lisbon, Portugal, 22 Jan

"The first century of interferometry: from Michelson to Space VLBI", Beijing Astron. Observatory, China, 29 Jan

"VLBI technique: basics, status and prospects", Urumqi Astron. Observatory, China, 1 Feb

"Milliarcsecond radio structures in extragalactic radio sources: physics of AGN and cosmology", Urumqi Astron. Observatory, China, 2 Feb

"The first century of interferometry: from Michelson to Space VLBI", Shanghai Astron. Observatory, China, 5 Feb

"Cosmological applications of extragalactic VLBI surveys", Shanghai Astron. Observatory, China,

6 Feb

"Review of the ISS-SVLBI mission scenario and logistics", ESTEC, Noordwijk, NL, 23 Feb

Van Langevelde

"Status of the EVN MkIV data processor at JIVE", March 5, Granada

"Recent developments at JIVE", March 29, Catania

Phillips

"The EVN MarkIV Data Processor at JIVE", ATNF, Sydney, 30 March

"Methanol Masers at High Resolution", ATNF, Sydney, 31 March

Schilizzi

"Enhancing the European VLBI Network of radio telescopes", FINA meeting, Padua, Italy, 5 February

" The European VLBI Network, its new data processor at JIVE, and opportunities for expansion" National Radio Science Conference, Cairo, Egypt, 22 February

Sjouwerman

"OH/IR stars as signposts for ancient starburst activity in the Galactic center" Stockholm Observatory, Stockholm, Sweden, 15 Jan

"OH/IR stars as signposts for ancient starburst activity in the Galactic center" Kapteyn Institute, Groningen, 25 Jan

- Publications

Published:

L.I. Gurvits, K.I. Kellermann, S. Frey, "Measuring cosmological parameters with Very Long Baseline Interferometry" 1999, Cosmological Parameters and the Evolution of the Universe, Proceedings of the IAU Symposium No.183, ed. K.Sato, Kluwer Acad. Press, p. 67

L.I. Gurvits, "The International Space Station and VLBI Radio Astronomy", 1999, in Second European Symposium on the Utilisation of the International Space Station, ed. A. Wilson, ESA SP-433, p. 629

L.I. Gurvits, K.I. Kellermann, S. Frey, "The 'angular size -- redshift' relation for compact radio structures in quasars and radio

galaxies", 1999, A&A 342, 378

M. Massi, S. Aaron, "Space VLBI and Spurious Symmetrization", A&A Suppl. Ser. 136, 211

D.J. McKay, "DBGET v2: Automated data Acquisition from MkIII / MkIV VLBI terminals", EVN Doc #88, 1999.

R.T. Schilizzi, L.I. Gurvits, G.K. Miley, M.A.R. Bremer, H.J.A. Röttgering, R. Nan, K.C. Chambers, W.J.M. van Breugel, "VLBI observations of galaxies at high redshift", 1999, in "The most distant Radio Galaxies", eds. H.J.A. Röttgering, P.N. Best and M.D. Lehnert, Royal Netherlands Academy of Arts and Science, p. 139

A.M. Stirling, R.E. Spencer, M.A. Garrett, "Radio jets in Cygnus X-1", 1998, Acta Cosmologica, fasciculus 23, 2 p171

Other reports

Contribution on AGN, R.T. Schilizzi, L.I. Gurvits, "Science with the Square Kilometre Array", eds. A.R.Taylor and R.Braun, March 1999

Submitted:

J.-F. Desmurs, V. Bujarrabal, F. Colomer, J. Alcolea, "VLBA observations of SiO masers: Arguments in favor of radiative pumping mechanisms", 1999, A&A

D. Hannikainen, R. Hunstead, K. Wu, D. McKay, R. Sault, "ATCA Radio Observations of GRO J1655-40", Proceedings of the 19th Texas Symposium, Paris, France, 14-18 Dec 1998

S. Nair, M.A. Garrett, "Fresh Results from Modelling the Gravitationally Lensed System PKS1830-211", Bull. Astron. Soc. India

W. Tschager, R. T. Schilizzi, I. A. G. Snellen, A. G. de Bruyn, G. K. Miley, H. J. A. Rottgering, H. J. van Langevelde, C. Fanti, R. Fanti, " VSOP/global VLBI observations of 2021+614: detection of hotspot advance", 1998, Proc. 4th EVN/JIVE VLBI Symposium, eds. M. A. Garrett, R. Campbell, L. I. Gurvits, New Astronomy Reviews

- Summary of work effort

	Support	Administration/ infrastructure	Scientific Research	Engineering R & D	Meetings/ Work visits	Vacation/ Illness	TOTAL
J. Buiter		19		31.5	4	10.5	65
J.L. Casse				56	1	6	63
J.F. Desmurs	12		43	5	3		63
M.A. Garrett	8	30	12		9	4	63
L.I. Gurvits	30		10		18	5	63
D.C. Gabuzda	5	9	13		3		30
R. Heald							19
B. Kramer				61		2	63
H.J. v Langevelde	4	22	10.5	17.5	7	2	63
M. Leeuwinga				56.5	1	5.5	63
M. Massi			31		2		33
D.J. McKay	40	1	4	10	5	3	63
F. Olnon				56		7	63
S. Parsley		20		23	6	14	63
C. Phillips	1	5	1	44.5	9	2.5	63
A. Polatidis	20		18		25	4	63
S.V. Pogrebenko				63			63
N. Schonewille	36	10		3 (Astron)	7	7	63
L.O. Sjouwerman	20		30			13	63
H. Verkouter		1.5		58.5		3	63