Minutes of the January 1998 EVN/TWG Meeting

Contents

1 Program of the meeting:

Monday, January 19 1998:

9.30 Opening, welcome and organizational matters

9.45 Approval of the agenda, nomination of secretary. Approval of minutes of last meeting, action items.

10.00 Thin Tapes in the EVN

- short history and latest developments (Ruf)
- practical experience, evaluation of mixed operation (Ruf+all)
- transit to exclusive use of thin tapes (Ruf+all)

11:00 coffee break

11:20 Terminal and recorder upgrades

- capstan replacement round (Ruf+all)
- new headblock contour (Ruf+all)
- access to and use of feedback facilities (Garrett+Mioduszewski)

13:00 lunch

14.00 field system development

- current status (Himwich+Mujunen)
- priorities and time estimate for future upgrades (Himwich+Mujunen)
- consequentials and station requirements of inclusion of cal, log,.. (Himwich+Mujunen+all)

15:30 coffee

15:50 frequency alignment

- global (Garrett?)
- geo (Perea?)
- Halca (Gurvits?)
- Merlin (Gunn?)
- conclusions (Foley??)

17:30 adjourn

Tuesday, January 20 1998:

9:00 Reports

- stations (please bring some written lines) (all)
- correlators (Alef+Garrett+Mioduszewski)
- Halca (Gurvits)

  - Network Monitoring sessions (Alef?)
  - Fringe verification (McKay)

10:30 coffee break

10:50 role of TWG in the future (Ruf+all)

2 Participants

Francisco Colomer,	OAN
Corrado Trigilio,	IRA-NOTO
Tiziana Venturi,	IRA-Bologna
Alessandro Orfei,	IRA-Bologna
Gino Tuccari,	IRA-NOTO
Amy Mioduszewski,	JIVE/NRAO
Mike Garnett,	JIVE
Leonid Gurvits,	JIVE
Ed Himwich,	NASA/GSFC
Walter Alef,	MPIfR
Michael Wunderlich,	MPIfR
Tony Foley,	NFRA (Westerbork)
David Holland,	Ny Ålesund Norway (Svalbard)
Kirsi Karlamaa,	Metsähovi Radio Research Station
Kaj Wiik,	Metsähovi Radio Research Station
Jan Buiter,	JIVE
Steve Parsley,	JIVE
Genek Pazderski,	TRAO
Jean-Francois Desmurs,	JIVE/OAN
Pablo de Vicente,	OAN
Klaus Ruf,	MPIfR
Derek McKay,	JIVE/NRAL
Antonis Polatidis,	JIVE/OSO
Alastair Gunn,	Jodrell Bank
Tony Perea	INSA/NASA
Carl Miyatake,	JPL
Cristina García	LAEFF (INTA)
Isaac López,	OAN

3 Opening

Ruf opens the meeting and says that we need to find out an agreed report on the TWG role to be presented to the EVN directors board by the end of the meeting. The agenda for the meeting was distributed. It is asked if there are any suggestions for new items or change the ones already defined.

general: Approval of Agenda.

de Vicente was appointed as secretary of the meeting.

4 Review of the action list from last TWG meeting

Still to be completed:

1. *Perea* to distribute an email to Ruf about suitable recontouring tapes. Not done.
2. *Himwich* to encourage geodetic stations to use TRACK. Not done. It will be done within 2 months.
3. *Gurvits* to ask Rolf Schwartz (MPIfR/Bonn) for an ASCII version of the block schedule. *Alef* will try again this time.
4. *Gurvits* recommend the EVN directors that manpower to scheduling software should be allocated. No decision has been taken yet. This problem will get worse when MkIV is fully operative.
5. *Altunin* to send DSN scheduling and station contact information for inclusion in JIVE/EVN Web pages. Not done. *Garret* will contact DSN to decide which is the correct way to include them in the Web pages. (Done by the time of revision of these minutes).

5 Thin Tapes

5.1 Thin/thick tape operation at the stations

Ruf says that this year will be the last year to use thick tapes. By the end of the year all operations will be performed with thin tape.

Foley comments that there is a need to have a tape eraser at the stations for thin tape.

Wiik says that Metsähovi has bought one, although he cannot remember the price. (On a later email *Mujunen* gives the price and model of the eraser)

Holland comments that *Burgess* bought one for Jodrell Bank.

Ruf added that Wettzell has a list of erasers with their prices. Ruf will distribute the list for everybody. There are two kinds, low power and high power (for military use).

Perea asks if one can prepass the thin tape at the highest speed (330 ips). There is a general positive answer. It is the best speed to prepass tapes.

Himwich asks who uses vacuum values different than 5/15 inches of water for thin/thick tape.

Polatidis answers that due to tape loading problems they use 7/15 inches of water.

Orfei also answers that they use 10 inches of water for thick tape and the SNR is good.

Alef, Himwich comment that the problem is that the head wears out faster when using thin and thick tape and 10 inches of water for thick tape.

Ruf asks who has bought and uses the Triple Cap heads from Spin Physics.

Miyatake answers that JPL has bought one but it is not installed at the recorder.

Gunn answers that Jodrell has also bought one but it is not installed.

Ruf comments that the triple Cap Heads need more time to be contoured by tapes. The data quality coming from these heads is slightly worse than conventional single step ones.

Mioduszewski says that NRAO has bought triple Cap Heads. They will be tested in the future. NRAO may benefit from them since they cost the same and have a longer lifetime than the conventional heads.

Alef says that Bonn correlator only operates on playback at 80 ips. In the future the Bonn correlator will playback tapes at 270 ips.

Ruf comments that NRAO has a page for handling thin tape. It would be very useful that everybody reads this page. `http://www.nrao.edu/vlba/html/TAPES/tapes.html`

5.2 Thin tape purchase

Ruf says that 500 tapes will be bought for the EVN. Some stations have already bought tapes for the EVN (Medicina, Noto) and some have provided money (Metsähovi). Next year the EVN will run only with thin tape.

Wiik comments that some stations are not included in the EVN network and they will have problems on the future. These are the ones that belong only to the Coordinated Millimeter Wave Array (Pico de Veleta) and to Geodesy (Ny Ålesund). And those stations running geodesy + astronomy will also have problems (Medicina, Noto and Yebes) since they have to observer with thin/thick tape.

Alef complains of the lack of information about CMVA procedures, like whose tapes they use.

Holland comments Ny Ålesund has bought thin tape.

Alef says that the transition of geodetic stations to thin tape depends on Haystack. When the correlator is ready to operate thin tape the geodetic network will begin using it.

Himwich says that he will ask to see which are the future plans to use thin tape at the geodetic network.

Alef comments that the Bonn correlator will try to finish the thick tape deadlog by August. From then on the correlator will only playback on thin tape.

Ruf summarizes the previous discussion. Only some stations will turn to thin tape operation (Jodrell Bank, Torun and Westerbork), those which only perform astronomical observations. Geodetic stations (Medicina, Noto and Yebes) and those which also perform millimeter observations (Effelsberg, Metsähovi and Onsala) will remain on thin/thick operation. The basic idea is to avoid the mixed operation at the stations and leave it for the correlator. Someone should figure out if there is a geodetic thin tape pool and plans for thin tape operation at the Haystack correlator.

Somebody proposes to do the Monitoring (CAL) with thin tapes at 160 ips.

general answer this is done now at 80 ips.

Foley proposes to postpone the discussion of operation at 160 ips to the next teleconference.

Ruf says that SONY promised 2 years ago a new thin tape and NRAO would make some tests on these tapes. NRAO will repack 400 tapes for the EVN.

Wiik asks to the assembly when will the optical fiber connect baselines.

6 Thin tape purchase and experience

By Klaus Ruf.

1. **Short history of bad EVN Tapes** Negotiations to buy thin tapes for the EVN started end of 1995. Delivery to Bonn was end of April 1996, glass reels came some weeks later. After consultation with Haystack and Socorro, repacking started late summer. Initial problems were attributed to lack of experience, however, problems to get the thin tapes onto glass reels properly persisted and made the whole process much more time and manpower consuming than anticipated. The first information about destroyed EVN tapes, recorded at Effelsberg, reached us early this year. By that time, 180 thin tapes had been transferred with a nice looking pack onto self-packing glass reels. We stopped transferring and looked for the reason of the damage of these tapes. After weeks of fishing in the dark, M. Wunderlich detected the badly slit tape edge. This was independently found by H. Hinteregger on tapes, which we had sent to Haystack for inspection. He also found out that we had got tapes from two different batches. Later this finding was confirmed by G. Peck. Having these facts in hand, J. Dowling at Socorro could convince the manufacturer that he ought to pay us our money back. 150 tapes from the bad batch are sent back to 3M from Bonn. The ones from Haystack and Socorro follow these days.

2. **Status of second round of thin tape purchase** At the same time, when we found our thin tapes to be mostly useless, NRAO surprised us with the announcement that they would switch to thin tape only operation this summer. It became clear that we would need to buy more thin tapes as soon as possible. Fortunately, another VLBI-proof type of thin tapes appeared on the market. After some negotiating we were able to order 160 tapes from Quantegy. 90 of these have already been delivered to Socorro for transferring onto glass reels. This process will start next week. Provisionally I expect all 160 tapes on glass reels to be ready and shipped to Bonn by end of this year, in time for use in session 1/98.

3. **Thin tape usage in the EVN** Most EVN stations have been upgraded to thin tape capability. Most stations took part in Halca or global experiments during session 3/97. Feedback from the Socorro

correlator to some European PI's, which I have seen, looks promising in that respect (only). No tape problems have been reported so far. Also none of the stations reported problems with thin tape handling. The possible degradation of data quality due to mixed thin and thick tape operation could not yet be investigated.

7 Recorder upgrades

Ruf makes a short query of the recorder status:

Foley says that heads have been replaced at Westerbork

Gunn comments that the inchworm was repaired. There is a second headstack for the MKIV at Jodrell Bank.

Polatidis says that Onsala has installed a new capstan.

Orfei says that Medicina has installed a new capstan.

Tuccari answers that Noto continues with the old capstan. May be in the near future they will change to a new one.

Wiik says that there is no need to change the capstan at Metsähovi.

de Vicente comments that there is no need to change the capstan at Yebes.

Ruf says that for high speeds (270 ips) with thin tape the headblock contour has to be machined. Otherwise the tape flies over the head without touching it. This is a more complex operation than exchanging the headstack. He proposes to machine the headblock when the inchworm fails. The stations should contact Bonn at that moment.

de Vicente asks for an explanation of the kind of operation to be done at the headblock.

Wiik draws a headblock at the board and says that the headblock has to be cut with a slope of 15 degrees from the horizontal surface.

Foley says that the inchworm may take years to fail and the headblock machining should be done before that.

Ruf says that stations should contact Bonn to contour headblocks, if an inchworm fails in the next 6 months.

8 Feedback from the correlators

Ruf comments to everybody that there is an archive of the plots generated at the correlator.

Mioduszewski showed plots for Amplitude, Phase, Rate, Delay and data weight of several baselines. Stations without important problems were EB, NO, ON, JB. problems appeared at TR and WB. The way stations should approach these plots is the following: If the data weights are not OK then one should go to the Cross Correlation and Autocorrelation plots to get information on specific problems.

Alef comments that these plots do not show problems of the individual tracks.

Garrett says that the Network Monitoring reports only check the MKIII tracks but only for a few passes (usually). He also added that, for the expt *Mioduszewski* showed the dear PI letter listed a tape recorder problem at Jodrell, and it seemed clear from the weight plots and the auto/cross correlation plots that this was an IF problem. Therefore stations cannot soley rely on the dear PI letters and that the other plots must be consulted.

Himwich says that the parity error checking should be performed at the station automatically. The new FS version will provide 4 different procedures to verify parity errors. The procedures take 2 minutes to complete.

Alef will ask *Porcas* if it is possible to include the parity checks in the individual projects.

Ruf said that it would be desirable to have a mirror site of the archived plots at Europe.

Mioduszewski comments that the NRAO plots generated at the Socorro correlator are available 1 month after the observation was done.

Alef offers the TWG members at each station to come at the Bonn correlator to investigate problems generated at the stations.

Garrett, Gurvits and Foley presented recent results from the EVN which demonstrated that the EVN had worked, but that better results could have been achieved.

Ruf asks if stations need assistance to interpret the plots. He summarizes that stations will ask for help on an individual basis at the correlators.

9 Field System developments

Himwich comments that the new FS will have support for K-4. It will include automated parity checks for all modes during schedules. There will be at least 4 different procedures for parity checking. It will provide hooks to support phase cal extraction at the station according to VEX specification (but no detailed support for VLBA DSM, Mark III DB, Mark IV decoder, or Onsala system). It may include an Odd/Even head replacement for all VLBA modes. The new FS will be running on the new kernels and therefore we urge the replacement of all the remaining TAG computers by new machines. New computers are twice as fast as one year ago and have twice their memory and they are 800 US$ cheaper. The new

FS version on a new Linux Kernel has been delayed because the multiport serial device disappeared and a replacement was investigated. The lack of hardware at NASA prevents checking the new FS features. *Himwich* asked for volunteers to check the FS new version.

de Vicente offers himself to test the new FS version at Yebes.

Himwich suggests that every station sends one representative to the Chiefs Meeting to be hold in May 1998 at Haystack. This meeting will provide training on technical aspects of VLBI at the stations.

Gurvits proposes an agreement for the log file names. The VLBA and the FS use different conventions for naming the logs. And this problem is the same for naming the GPS log files.

Alef comments that the problem is for the correlator.

Ruf suggests that the VLBA could accept both name conventions.
Mioduszewski answers she does not now if the correlator does accept both file naming conventions.

Garrett suggests to have the possibility at the FS to flag the telescope position when it is on source and off source. Without this information data have to be edited by hand and for phase-referencing experiments involving faint sources this is very difficult.

Garrett noted that a thin tape typical pass can last as long as 44 minutes and TSYS measurements are only made at the beginning and end of each pass (unless the PI stops the tape). It would be interesting to devise a system for continous calibration.

Wiik also suggests that the system temperature should be measured before and after each scan. At Metsähovi they measure total power each 20 seconds, and they interpolate Tsys during scans. He also suggests to have a snap command to get the elevation of the telescope

Himwich answers that the elevation should not be included as part of the Field System, but as part of a post analysis software, independent of the FS. However the possibility to make amplitude calibration continuously could be included at the FS in a short time.

Garrett enquired whether the FS would be able to deal with observations in which the frequency changed on many occassions during an experiment. Such observations would become possible shortly with the growing number of frequency flexible telescopes now operating in the EVN.

Himwich stated that he had started to think about how the FS would handle these problems.

Wiik points out that if the observation is done at different frequencies, we need calibration for different frequencies.

Ruf asks *Desmurs* for the status of the calibration software written by *Fredrick*

Desmurs answers that the program is as it was. They had many problems to make it work for different stations. Each station requires a different solution, and even the same stations change the way they calibrate amplitude from one session to another (Metsähovi). They have not yet began to write a new program.

Himwich comments that the program has to be more flexible. There is no need neither to make any change to the FS to adapt to Fredrick program, nor the stations need to adopt a standard way of calibration. All information needed is already provided at the log file.

Ruf The VLBI friends could include some lines in the log file explaining the way patching is done.

10 Frequency Alignment

Ruf: says that the stations should define which are the best frequencies at their places to minimize interference problems. We should review 18cm, 5cm. and 50 cm. For example *Desmurs* could tell us about 5cm for spectral lines. *Foley* can define 18cm continuum.

Foley comments that at 50cm the EVN and NRAO have different frequencies due to the TV broadcasting.

Gurvits says that at C band there is a complete mess:

4800-4832 MHz Halca (Japan)
4930-4962 EVN and Green Bank
4964-4996 VLA and VLBA

and HALCA frequencies cannot be moved. May be the EVN should shift their frequencies.

General comment complaining that this is not the place to redefine the frequency bands for observing. A proposal for the new frequencies should be discussed for, based on a proposal.

Ruf concludes that stations who have problems with interference, should talk among them to find out which are the best frequencies at their places and to find out a common band.

11 Station reports

11.1 Jodrell Bank

1. September 1997 session. Modifications have been made to our local software after problems at the start of the session. Two and a half experiments were observed at the wrong mode (Mk III not VLBA) and all data subsequently lost. Some data was lost due to incorrect MERLIN/VLBI switch during one experiment. We had some spurious tape motion errors probably as a symptom of the vacuum level. The modem link to Cambridge failed once during the session.

2. Hardware and Timing. The capstan motor on the Mk IV terminal has been upgraded to the latest specification. Some evidence of 'flying' thin tape was found but has been improved by increasing the vacuum to about 7.5 inches. Due to excessive wear rates on the P& G heads, we have switched to a Metrum head 'borrowed' from our VLBA recorder. In the VLBA recorder a number of tracking faults have been traced to a small crack on the Inchworm motor inner part. Lesly Parry has

just visited Socorro for assistance with a replacement from George Peck. A replacement has been ordered from Burleigh but problems with the order may mean a repair is a better option. A second upgraded capstan motor has been ordered for the VLBA recorder and will be in place before the February session. The VLBA recorder has been fitted with a Metrum 'triple-cap' head which at speeds of up to 270 ips). A second triple-cap head is to be purchased after February (US$ 8000) also from Spin Physics. A series of electricity supply failures during December caused damage to the ST Maser and the VLBI TRAK GPS Receiver. The maser fault has been repaired but clock characteristics may have changed. The TRAK GPS has gone for repair and has been replaced by a TAC unit. Additional UPS support is to be introduced over the next year along with further surge suppressors.

3. Procedures Derek McKay and Alastair Gunn have made considerable additions to documentation and the Jodrell Bank Web pages, particularly in the VLBI area. Currently the VLBI Web site is not available by direct link but will be released within a few months. The new site will include real-time VLBI system and telescope control checking and, eventually, the results of real-time fringing experiments. Derek McKay has made progress on the software for the Cambridge phase correctors. Experiment logging has again been significantly extended, and additional data quality checks introduced. Our system checking procedures have continued to be useful and have successfully revealed any problems with antenna tracking, data recording and timing. Data for local calibration is continually being acquired during VLBI sessions and analysis is proceeding. The polarization checking hardware has been successfully installed and is working well.

11.2 Onsala

1. New 6 cm receivers and polarizer. In the last EVN session we observed with a new 6 cm receiver, which has a TREC=15K (compared with the previous 45K) yielding a system temperature Tsys(50K (650Jy) but still only at LCP. The second channel and the new polarizer have now been installed and we will be testing the new system by doing a 3 hour observation with Medicina on January 28 (morning).

2. Problems noted in the VLBA correlator feedback. A problem with loss of data for 15-20 minutes after midnight was noted in experiment VT906 (PI Schilizzi). This was traced to a bug in the telescope control software. The software did not update to the new day number until a new SOURCE command was issued. This problem had not been noticed in the past since scans were usually scheduled not to cross midnight.

11.3 Medicina

From last meeting thin tape capability was installed at the station with good results. Anyway our playback test at 160ips gave very high parity errors (around 10000).

The mystery of our videoconverter number 5 continues, in the sense that Bonn correlator advice us about problems but in the same period we didn't have any warning coming from Socorro correlator or from geo experiments. Anyway we used the spare videoconverter in the last session.

11.4 Noto

Antenna will be down from July 1st, up to the end of August. During this period the new automatic subreflector positioning system will be mounted and tested. This is the first step in the frequency agility program, that allows to switch between primary and secondary focus receiver systems. The second step will bring a new multifrequency cooled receiver in the primary focus and hopefully will be realized before the end of this year.

Noto started operation to get MKIV upgrade of the VLBA terminal. It's our intention to keep both formatter operating, the VLBA one and the new MKIV in order to have useful testing possibility and as backup. They will be both fed with the BBC signals, while their output will be connected to the recorder depending on the formatter to use.

We have recording problems in the first pass, where sometime the forward and reverse pass are superimposed. The fact is due to the head that is missing of a small portion of its surface in one edge. When the first passes are selected part of the tape is running on a not well defined surface, and during a full pass, it run in orthogonal direction, with respect to the motion, of about 20 (m. Contacted the Italian representative for Metrum, I was said the head very probably will be replaced no cost, but they need to examine it. This means that before a new head acquisition, we have to live with this problem or to use the old one, also new, but with a track missing.

11.5 Effelsberg

A 750-1200 MHz prime-focus receiver has been built and successfully used in December 1997. The interference situation in this band is difficult as expected.

The MK4 terminal has finally been converted to thick/thin tape operation.

The mesh panels from 80-100 m are being replaced by perforated aluminum sheets. Some of these are already in the antenna. Unfortunately there are problems with rivets in the new panels, one of them fell out of the antenna. All the new panels must now be checked and possibly repaired.

The second tape drive will be changed from MK4 to VLBA standard with two heads. It can then be used on the MK-4 terminal and as a second drive on the VLBA terminal, allowing flexible operation and high bitrate 'burst' modes.

11.6 Westerbork

1. Acquisition
   (a) Vacuum switching has been installed and works
   (b) Track # 32 has a very high parity error rate
   (c) We plan to install a triple-cap headstack which arrived just before session 4 of 1997
2. Receivers
   (a) There is a delay in arrival of the MFFE series and I expect about 2 in April 1998.
   (b) There will not be enough MFFEs to use the tied array in session 2, but I expect there to be enough in session 3
   (c) The series MFFEs will have circular polarization at S and X band, all other bands having linear polarization (to be combined in IF). The prototype has circular polarization at 6 and 18cm, but only one linear polarization at X band.
3. Other
   (a) Geodesists have moved their equipment to Westerbork and have been surveying the site.
   (b) RT7 has been designated as the antenna for single-dish and geodetic VLBI.

(c) An apex phasecal injection plan has been agreed on, but it has no manpower or money yet. The system will radiate circular polarization to allow testing the polarization of the frontend.

(d) The new tied-array upgrade, which is combined with the new IF system, will have its funding decided in April 1998.

(e) The new correlator in Westerbork, a twin of the new JIVE correlator, has its hardware apparently working well, but has some software problems.

(f) A new head of the observing group, Willem Baan, will be arriving in February 1998.

11.7 Ny Ålesund

The Ny Ålesund 20 m antenna is located on the island of Spitsbergen in the Svalbard islands, 79 deg N 12 deg E. It is operated by the Norwegian mapping authority (Statens Kartverk) and the station is manned all the year round by a staff of three, thus allowing observations to be made at any time of the year. Ny Ålesund is designated a large scale scientific facility and in addition to the radio telescope there are several countries represented at various scientific stations located in Ny lesund. The airstrip, basic infrastructure and services for all of Ny lesund are run and maintained by the Norwegian King's Bay Coal Company, the name coming from coal mining activities earlier this century. The Ny Ålesund antenna is usually used for geodetic experiments, observing on s and x bands. Over the last eighteen months the station has been upgraded to full MKIV compliance. As of November 1997, the station was declared a "thin tape only station" and the first high density recordings were made in December on the VLBA RDV06 experiment. Results from the correlator were satisfactory with fringes being obtained.

Problems encountered over the last year.

1. The severe cold had been causing problems with the oil circulation system for the azimuth and elevation motor gear boxes. The result was usually a low pressure warning and halting of the antenna. This problem was addressed by adding heating cables and insulation round the gear boxes. So far, there have been no repeats of this problem since installation of these mods.

2. The new formatter did not work correctly when the synthesizer mods were installed. Had to make some additional changes which seem to work OK. There have been no complaints form the correlators!

3. Re contouring the heads for thin tape using the Haystack suggested method appears very difficult at Ny lesund. A likely problem is the very low humidity, around 18%, this does not appear to give sufficient friction between head and tape to allow quick re contouring. The problem was solved by sending a spare set of heads to Haystack for this work. These are now fitted in the tape drive.

Other items. Last summer the observatory had various building work done in the basement. This is to provide workshop and storage facilities and it is expected that final fitting out will be completed this year. This should allow much more maintenance work to be carried on indoors, a great advantage in the harsh winter months.

Special problems. The remote location and harsh environment often make it difficult to get spares quickly, there are only two flights a week in the winter, weather permitting. There are also time limits on the amount of time staff can work at Ny Ålesund, creating a requirement for constant re training of replacement staff.

11.8 Metsähovi

1. VLBA terminal Some of the BBC's are not working, mainly due to VCO problems. The thin tape upgrade was installed in May and it seems to be working well at both high and low vacuo (thick and thin tape). The upgrade was tested by recording a thin test tape and it showed a very good SNR (27 dB) and low error rates when it was read back at the Socorro correlator. Tape speed jitter problem has been solved (simple adjustment).

2. mm-VLBI The first 3 mm fringes were found to Metshovi in the April CMVA session. Starting from the June session Metshovi has been participating routinely in the CMVA experiments at 3 mm.

3. 43 GHz receiver The 43 GHz receiver is now ready and available for use despite of the low proposal pressure. Receiver noise temperature is around 100 K and SEFD about 4500 Jy. The receiver is dual polarization (L+R) with two NRAO HEMT amplifiers. The performance is expected to be very close to the VLBA receivers.

4. Maser and timing A new HP-58503A GPS receiver has been installed (GPSMH2) and it shows about 13 ns RMS noise in the daily averages compared with the 40 ns of our old Magnavox (GPSMH1). GPSMH2 shows currently about 150 ms lower offsets than GPSMH1 due to different cable lengths.

5. Personnel Dr. Silja Pohjolainen has been appointed as acting Director of the Metshovi Radio Research Station from Aug 1997 till Aug 1998.

11.9 Torun

1. Antennas The troublesome overcurrent, observed always when the 32 m antenna followed the sources located at such parts of the sky, for which the azimuth speed was very close to 0(/min, was eliminated by the new software. For winter conditions the maximal values of the azimuth and elevation velocities reach 75

2. Receivers The dual channel 5 cm receiver is ready for operation. IF patching system is under construction, planned to be finished at the end of February. 22 GHz receiver is under development. Its single channel version will be ready at the end of March.

3. VLBA terminal and FS The signal from our P& G VLBA terminal BBC01 is not recorded on the tape. The converter itself works well, so there is probably a fault in the "switch board". Our efforts to remove the bug were unsuccessful until now. Our trials to tune headstack currents were not quite successful. The new headstack mounted in the P& G recorder doesn't work much better than the old one.

4. Phase cal The new phase cal system was used in the last VLBI session, no one commented it, we hope it works fine.

5. Interferences We lost a chance to stop the project of 224 kHz high power (1 MW) transmitter and it is now under construction near the Observatory.

11.10 Yebes

Yebes VLBA recorder tape path was upgraded to thin tape guidance on September 1997. A test tape was sent to Socorro for qualification and the SNR was good, the error rates within specs and the head contoured for thin tape operation.

We took part in the October session at 3.6 cm but no fringes were found due to a formatter problem which we had already spotted but that got worse with time. The problem is related with extrasamples coming into the flow of data which cause the signal to shift in time. Originally the problem affected the odd channels which were shifted 1 multiple of the sampling interval from the correct time. We have not yet solved the problem since we are waiting for some FIFOs that we will replace in the HC module. Since last October Yebes has not participated in any VLBI observation.

12 VSOP Update

1. General
   - 1.6 and 5 GHz -fully commissioned.
   - 22 GHz - In-Orbit checkout likely to continue through 1998.
   - Long-time schedule (until end of 1998) is being finalized.
   - All PI's (of successful 1st AO proposals) to be contacted in Jan 1998.
   - More information, including Operations, Schedules and latest highlights at http://www.vsop.isas.ac.jp/
   - Scientific results to date - stay tuned, coming...
   - Important dates in your agenda:
     - 12 February 1998: Release of the 2nd AO
     - 15 May 1998: Proposals due
     - February-June 1998: Help desk at JIVE open:

       `vsop_help@jive.nfra.nl`

     - Fall 1998-1999: AO# 2 observations
2. Logistics of EVN/VSOP operations: schedule files, tapes, logs, GPS data, etc.

   With the end of IOC period, the VSOG promises to supply schedule files as requested, at least two weeks prior to a session start.

   Similarly, tapes (both MkIV and S2) are to be dispatched by the correlators timely.

   "Bologna Rules" - to be reinforced:

   - During a session, tapes are to be sent to Socorro every Monday and to Bonn every Tuesday.
   - Observing logs are to be posted within 72 hours after an experiment ends.
   - If no useful data produced in scheduled experiment, a "dummy" observing log is to be posted.
   - During a session, GPS data must be updated weekly and posted on the server preferably before 15:00 UTC Wednesday.
   - Late tapes, logs, GPS files are no longer tolerated by the correlators!

13 Bonn Correlator report

Since summer 1997 the correlator throughput could be increased further to about 77% (net correlation time/wall clock time). In August/September this year all of the observations from 1997 will have been correlated. We expect 3.5 months of correlation from the February session (minus possible failures).

A series of bad recordings led to delays and losses in the correlation. Possible explanations for the bad recordings are broken capstan motors, idler rollers and inchworm motors. Test of the tape drive tracking performance should be conducted before each session according to the recommendations by Haystack, e.g. see draft document under

http://dopey.haystack.edu:80/staff/Recorder/Rec-manual/rec-man-1.html

As a means to reduce the correlator backlog, A. Zensus has agreed that bad recordings can be excluded from the correlation, if these slow down the correlation significantly.

The number of operators of the correlator has been increased from 1 to 2.5 since the beginning of 1998. Most of the operating budget of the correlator goes into new heads. We also had to replace Metrum capstans and idler rollers while the old Honeywell components had a significantly longer lifetime.

All 8 tape drives of the correlator are VLBA/MK4 style drives now. All drives can switch between thick and thin tapes. The playback quality is good for thick and thin tapes the latter both at low and high density (assuming reasonable recordings). One drive is equipped with a so-called 'triple cap head' from Spin Physics. While its performance was not satisfactory right after it had been installed, it is now nearly as good as that of the standard heads. Thick and thin tapes can be played back at the same vacuum of 10" with his head. We anticipate buying more triple cap heads, if NRAO has found similar positive results with their heads. We are using a couple of standard heads from Spin Physics which give comparable performance to the Metrum heads.

A 9th recorder will be upgraded this year. It cannot be used on the MK3 correlator though, but only on the new MK4 correlator the delivery of which is expected in 1999 (according to Haystack's plans). We hope that the preparations for the MK4 correlator - modifications to the tape drives - will not affect the throughput of the MK3 correlator significantly.

The Penny & Giles drive is only used for fringe searching. Its reliability is now too low for production correlation.

The standard archiving of the correlated data has been complemented by continuously copying the data to a UNIX computer and archiving it on a TAR tape. Tar tapes both written by the standard archiving process and the UNIX tar archiving procedure can be read into AIPS via the new task M3TAR which is about a factor o 2 faster than the traditional MK3IN program.

New procedures for verifying the integrity and quality of spectral line correlations have been implemented. They are based on the UNIX archiving process, the Haystack HOPS software and M3TAR.

14 Socorro Correlator

Mioduszewski presents some graphics with figures from the Socorro production. NRAO switched to thin tape operation in September 1997. In October 1997 the number of data processed has moved from 200 Kb/s to 500 Kb/s. In November 1997 18 of the 24 recorders were operating correctly. The backlog at Socorro is 13 days by now. If corrections to the masers and these are reflected on the GPS offsets an email has to be sent to `analyst@nrao.edu`. Future projects for 1998 are, the pulsar gate (February), automatic transfer of calibration tables with VLBA-TSM format which includes Tsys, Gain and Weather and automatic tape allocation.

Alef asks if she can provide the VLBA-TSM format and if it is an ASCII file.

Mioduszewski answers that somewhere it is defined the format and that the calibration files are ASCII.

Ruf asks *Mioduszewski* to send an email with the format of the calibration files.

Garret suggests that *Desmurs* works on this for the EVN. He also noted that NRAOs move to include calibration data in the exported FITS files from the Socorro correlator would require the EVN to provide ANTAB format calibration data on the same time-scale as the logs (currently 72 hours). Otherwise the EVN telescopes run the risk of not being included in the calibration tables.

Ruf concludes that a subgroup should study the way the EVN offers calibration tables and present a format to be discussed in the next TWG meeting.

15 JIVE Correlator

Garrett presented an organogram of the structure of JIVE and with the responsible people in various JIVE departments: Schilizzi (director), Garrett (EVN Support), Gurvits (Space VLBI), van Langevelde (Correlator Operations manager), Casee/Parsley (correlator technical manager).

1. Play Back Units from P&G, UK (Wookey Hole and Dwingeloo)

   - P&G taken over by Metrum Information Storage and a number of experts have left
   - FAT 160 ips (high density) showed to work i.e. good PER 1E-5 except a number of tracks indicating a guiding problem (mechanical): being worked on at P&G..
   - electronics improved (SNR and grounding)
   - PER performance 320 ips (3E-4) not achieved
   - All DPU manufactured but not yet demonstrated; delivery planned for end of March
   - Two Triple Cap Headstacks purchased from Spin Physics, tested against stepped ones and found satisfactory. JIVE decided to use TCH on all DPU's.

2. Station Units from P&G SUIM from JIVE (Wookey Hole, Dwingeloo and Medicina)

   - All 4 units successfully demonstrated and delivered to JIVE and Haystack
   - Phase Cal Module not included, FAT expected at the end of January
   - Problem with fan-in option (not in spec) discovered recently
   - replication job granted to Allied Signal, USA
   - replacement for obsolete components designed and manufactured
   - SUIM designed and tested; replication started

3. Correlator (Dwingeloo)

   - All prototype boards successfully demonstrated and accepted
   - All prototype boards delivered (except for 5 serial links transmitters)

- orders for replication issued and some items already delivered (see table)
- work currently concentrating on writing/debugging control software
- correlator rack delivered

4. Data Distributor (Dwingeloo)
   - all prototype boards designed; as last input selector board has been manufactured but not tested yet
   - a number of boards in replication phase
   - DD rack manufactured
5. TSPU (timing, gating, testing,...) (Medicina and Dwingeloo)
   - design and testing complete of TSPM, Clock module and splitter
   - replication of all modules started
6. Control software (Jodrell Bank and Dwingeloo)
   - Henk Klijn Hesselink joined the project in September
   - Plan for testing software with hardware drawn and tests started
   - Software is on the critical path
7. Off-line software (Dwingeloo)
   - tool written to write raw correlator data in FITS format
   - tool used to display first fringes in AIPS++
8. Infrastructure (Dwingeloo)
   - Paternoster hardware delivered and tested; software in test phase
   - Air cooling distribution system installed and tested
   - Cabling for inter-rack communication manufactured
   - peripheral equipment ordered (oscilloscopes, etc..)
9. System testing (Dwingeloo)
   - first fringes in Dwingeloo on July 21, 1997
   - test with 2 stations planned for immediate future

16 Network Monitoring Sessions

Alef presents a table with results at the Bonn Correlator.

Perea wishes that the DSN antennas at Madrid be included in the NM sessions.

*Alef*proposes that NM sessions are shorter, 1 hour per frequency and 3 hours per session and frequency.

Ruf concludes that it is the role of each station to study the Network Monitoring Report and to contact Bonn correlator to solve any problem found then. In order to solve technical problems quickly, the EVN has spares for pieces which fail more frequently, like capstan motors, idler rollers and headstacks. The stations have to replace the used parts later to keep the pool in the same situation as before.

17 Real Time Fringe Verification

McKay presented a project on real time fringe verification. The system would consist on recording a small amount of data on tape, recovering it using a specific program on the FS PC and transferring the data via FTP to the Real Time Correlator. The data would be recorded during 0.25 s and data files of 200 Kbyte would be sent through Internet. FTP transfer times estimated are less than 2 minutes. The time for correlation would be approx. 2 minutes and the results would be available on the WWW in less than 10 minutes.

Alef asked for the time to complete such project

McKay answered that it would be feasible to complete it in one year.

18 Discussion on the future role of the TWG

Every person attending the TWG received a copy of R. Booth proposal for restructuring the EVN.

Ruf reporting R. Booth: The EVN still lacks reliability. TWG should be reduced in size and only devoted to purely technical issues. Therefore the operational issues should be discussed in a different forum. This proposal was discussed in the previous Directors meeting but no agreement was reached.

Ruf: The solution for the lack of reliability must come from each station.

Burgess (Ruf spoke for him): The TWG is too big to be efficient so lets divide it into subgroups plus general meeting.

Tuccari: It would be very positive to come with better prepared contributions so decisions are more easily taken at the TWG.

Ruf: The EVN has grown and therefore the TWG has grown. The increase of people is a direct consequence of that.

Alef: Nobody is superfluous in this meeting. In the old TWG meetings we saw that one person (technical) per station was not enough, a friend of VLBI was needed. Even having users here is healthy.

Gunn: If operations and technical issues are divided, people attending to the operational 'meeting' will not be responsible for solving the problems at individual stations, and responsibility will dilute.

Foley: Operations could be discussed in teleconferences after the session, hastening the TWG meetings.

Alef: To spread the know-how among people, they should go to other meetings and places (for example chiefs meetings)

Ruf: This time there is a good opportunity for attending to the Chiefs meeting at Boston. At least one person per station should go.

Alef: the impact of TWG on the directors is worthless

Ruf: This is not so. They accept recommendations.

Ruf: The lack of EVN reliability is not general, because there are some stations who with little personnel do very well, (for example Medicina).

Alef: We need quality people. VLBI staff needs to be experienced, like in Medicina, Noto and Effelsberg. Onsala and Jodrell are the opposite, always post docs who come and leave.

Orfei: In Medicina there is a small permanent staff, but they devote to the antenna, and not only to VLBI.

Orfei: Operational and technical discussions must live together. It is not good to separate them. The TWG is OK and not other committee is needed.

Tuccari: The TWG should address particular subgroups for particular problems (specialization). And there should be permanent members in the TWG.

Garrett: maybe there is no continuous contact between TWG members

Ruf: Not all TWG members devote only to VLBI matters.

de Vicente: Subgroups in the TWG would make it more operative. We also need that the subgroups be transparent to the whole TWG so that there is a flow of information on developments to everybody.

Gurvits: TWG does not have a clear aim and does not know which is its responsibility. There should be a new TWG only for technical matters: development/maintenance and engineering of the network. Operational matters should go to another meeting. May be the Directors should define the role of the TWG.

Ruf: We cannot ask to the Directors to solve the problem. We are responsible for finding a solution that makes the TWG more operative and EVN operations more reliable. The TWG is free to restructure itself to be more operative

Gunn+Tuccari+Garrett: solutions to problems should come from subgroups so that we do not entangle in long and irrelevant discussions.

Gunn: First day subgroups meet, then a general discussion on the TWG.

Ruf: This not going to work. People read the reports too late, and that is a too rigid structure and generates too much bureaucracy. However subgroups seem to be necessary.

Ruf: In case of technical problems at stations they should address the TWG chairman and he redirects the question to the appropriate person.

Alef: We need to identify persons who know about certain technical matters so that they can be asked.

Parsley: We could make a table with: technical issue - person who knows more about it, and make it public.

Alef: There should be an input to the TWG coming from the users for new developments. Fortunately there are users on this meeting.

Ruf: The TWG cannot make all kind of developments. We are here to maintain the quality and reliability of the network.
Alef: No, we have to include the technical developments that users ask for.

Alef+Gunn: Developments affect the reliability of the network

Ruf: we cannot do everything. Priorities have to be set. The Directors have to filter out priorities.

Alef: The EVN is only used for sentimental reasons and ...... ??

Wiik: We still have higher frequencies than the VLBA.

Garrett: We must assure that users input suggestions to the TWG. PI,s know if their EVN data are discarded at the VLBA correlator and why. There should be a graphical summarizing the EVN structure similar to the one prepared for JIVE.

Ruf: So there is quite general agreement in the necessity to make subgroups. We will send the proposal to the next chairman and to the directors.

Gurvits: I would separate operational matters from technical ones.

Ruf: The chairman should be the connection between the directors and the users with the TWG.

Garrett: New Name: TOG = Technical and Operations Group

Summary of the main points (by P. de Vicente):

- The TWG would benefit for the sake of operativity by making subgroups that address specific problems. However we do not want a too rigid structure and do not want to increase the bureaucracy.
- The subgroups would work in between the TWG meetings through electronic mail, and it was not clear if there should be meetings. The TWG meetings would be to discuss the proposals of subgroups and to address new problems to them. The proposals of the subgroups should be formally presented, if possible some days in advance of the TWG meeting.
- Subgroups have to be transparent to the EVN people, so that in case of technical problems one knows who to contact. However in these cases the TWG chairman should be informed, so that he directs the question to the most adequate person.
- Subgroups will discuss on these particular matters:
  - Calibration
  - Field System
  - MkIV Upgrade
  - Recorder Problems
  - Operations
  - Thin Tape
  - Polarization
  - Network Monitoring Reliability
  - Frequency Bands
- Operations and technical issues should not be treated at different forums. That would be very dangerous. Both should remain at the new TWG.
- We would like permanent staff devoted to VLBI at the stations. They are experienced people who are the final responsibles for the reliability of their stations. These people should attend the TWG meetings.
- Two people per station at the TWG is OK.
- Input from users is needed for development and for keeping the EVN alive. The proposal is: a users' meeting who passes its suggestions to the directors board. The directors act as a filter and pass the proposal to the chairman of the TWG. The chairman of the TWG informs the TWG groups.
- We propose a new name to identify the role of the new TWG: TOG = Technical and Operations Group