

AT. 39.2/021

AUSTRALIA TELESCOPE NATIONAL FACILITY
Paul Wild Observatory, Narrabri



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MEMORANDUM

Attention:

22nd November 1993

- Narrabri:- G. Nelson, D. McConnell, P. Hall, R. Beresford,
R. Gough, B. Reddall, L. Kent, D. Allman, R. Wark,
D. McKay, J. Grenenger, O. Dowd, C. Leven.
- Parkes:- Euan Troup.
- Epping:- J. Brooks, M. Sinclair, G. Moorey, W. Wilson,
W. Brouw, T. Tzioumis, R. Otrupcek.

From: G. Baines

Subject: Mopra Meeting Minutes and Their Update

Attachment: AT Technical Document Number AT 39.2/021, Mopra Meeting Minutes, 19th July 1993.

The attached minutes of the meeting held at Mopra on the 19th of July 1993 are provided for your reference.

I will shortly be producing an action items list and timetable for activities at Mopra. To assist me in this regard can you please review these minutes and, in light of the elapsed time and changes made since the meeting, provide me with an update for your area of interest. By so doing you will be assisting me to produce current documents to which we all can refer. It is my intention to then update these documents on an ongoing basis.

Thank you in anticipation of your prompt response.

Regards,

Graham Baines...

Mopra Co-ordinator



MOPRA MEETING MINUTES

19th July 1993

These are the minutes of the CSIRO ATNF meeting held at the Mopra Observatory on the 19th of July, 1993 to discuss the Observatory's ongoing development and operation.

Attendance:

Narrabri :- G. Nelson, D. McConnell, P. Hall, R. Beresford,
Staff R. Gough, G. Baines, B. Reddall, L. Kent,
D. Allman, R. Wark, D. McKay, J. Grenenger,
O. Dowd, C. Leven.

Parkes Staff :- Euan Troup.

Epping Staff :- J. Brooks, M. Sinclair, G. Moorey, W. Wilson,
W. Brouw, T. Tzioumis, R. Otrupcek.

Meeting opened: 10:30am AEST

Development:

- 1/ *Correlator*: - four block chassis and delay units are now in place but only one block is populated with boards. The remaining boards will be installed as needed.
 - the existing block is capable of supporting 256 channels at 256 MHz bandwidth.
 - boards to populate a second block to be available for winter 1994. (It is possible all four blocks will be populated by this time.)
- 2/ *Acousto-optic Spectrograph*: - presently in Chile.
 - it should be available for installation in the Mopra vertex room in January 1994.
 - initial use may be stand alone but it will then need integration with the VAX/Spectra. (The correlator will be more useful for initial preparation of a system.)
 - return of the instrument to Germany is uncertain. Time on the antenna may be traded for use of the instrument.
 - approx. 10 rack units of space is required in the vertex room and half a rack in the control room.
 - digitised data is sent from the vertex room equipment to a PC in the control room. A fibre optic link may be used for this data transfer. What are the cabling/fibre requirements? Is there enough room in existing conduits?
 - must ensure that any cables/fibres installed do not result in any long term interference problems.

- the AOS is a single channel device with an I/F bandwidth of approx. 750 MHz. Circular polarisation will need to be formed from the two linears in the vertex room.
- 3/ Computer:- the proposed Dec Alpha for Narrabri will change the interface requirements for the correlator. What ever is implemented at Narrabri should also be implemented at Mopra and Parkes to maintain standard configuration.
- what is the possibility of implementing 2 Vax Station computers at Mopra? (one for the correlator and one for the station computer.) Cost approx. \$15K each. Computer for correlator needed first quarter 1994 and is not yet funded.
 - the AOS uses a Q-bus interface but this is not supported by a Vax Station. How best to resolve?
 - station computer needed in place/working for SETI support. A second computer to act as on-site spare is highly desirable for this support.
- 4/ Communications:- the ISDN was installed last week but the semi-permanent link to Narrabri did not work initially. This is being pursued.
- the computer and telephone lines to Mopra are noisy. A thorough checkout of the cabling is required.
 - the ISDN path (Mopra - Narrabri - Epping - Parkes) is of concern to SETI from a security point of view. A dedicated Mopra - Parkes link would be billed as an additional cost to SETI.
 - unattended operation of the site and risk of fire is of concern. Extension of the Mopra fire alarm to the Siding Spring fire alarm panel is being pursued. An order has been placed with Telecom to install a cable from Mopra to the pump station where a maximum of 4 available lines can be picked up to get to the Siding Spring panel. The Mopra receivers will not be left running until this alarm is in place.
 - a personal emergency and an antenna safety / Primary Monitor alarm may also be included in the run to Siding Spring.
 - the Mopra Primary Monitor link to Narrabri should go on the ISDN link in a hardware-like fashion rather than Vax to Vax. What about use of the ISDN "B-channel" for this purpose?
 - use of the spare fibre optic cable fibres between the alidade and control rooms for ACC communications is being planned and should be installed shortly. This should overcome the problems experienced on the existing copper cables. (Earth loop problems are suspected.) Note that more fibre optic cables may be needed onto the antenna so perhaps the ACC coms should be run in cheaper fibre.

- the Vax serial ports are all in use. A Friendly styled server is planned but funding (approx. \$2K) is still to be established. An increase in the number of ports will be required to support the correlator. (16 additional ports needed?) The Narrabri ACC server may be available for this purpose if it becomes surplus in time.
- Problems with the existing server need to be addressed.
- two more terminals are needed. The Epping graveyard may contain some which could be resurrected.

5/ UPS:-

- the order for a new 3 ϕ 30KVA UPS is being processed. Delivery is expected in October and installation is planned for November.
- the old CISE unit will be sold - is there any Parkes interest?
 - the new unit will be placed in the same position in the alidade room. Heavier cables will need to be run between the alidade room and the control room. Other cables in this run could be installed at the same time.
 - the new UPS will have sufficient capacity to stow the antenna. It will also have a maintenance by-pass capability requiring an additional switch-board.
 - a review of the earthing system will be conducted prior to UPS installation.

- 6/ Hydrogen Maser:- SETI require 1/10th Hz frequency accuracy at Mopra and 1 Hz accuracy at Parkes. A Hydrogen Maser could provide this but the cost would have to be born by SETI. (additional to ATNF offer).
- how large is the Chinese Maser? What magnetic field variation occurs in the vicinity of the existing plinth? Would an external room be required?

- 7/ Synthesiser:- required for SETI 1 \rightarrow 3 GHz down-conversion as well as Doppler tracking.
- require a synthesiser tunable in 1 MHz steps to 3.6 GHz for SETI lower side-band conversion to limit mirroring problems. mm-wave receiver requires a 2 GHz synthesiser eg. Fluke.
 - so need a 2 GHz Fluke with GP-IB interface and a doubler. Cost approx. \$30K. Mal Sinclair to pursue.
 - how to control the GP-IB? Options:
 - update ACC hardware and software to provide a GP-IB interface;
 - add hardware and software to Vax (not done elsewhere);
 - modify a Data Set to provide the GP-IB interface;

- obtain a serial to GP-IB interface controller and communicate serially with it from either the ACC or Vax.
 - control of commercial equipment (via a GP-IB interface) is a likely ongoing requirement for Mopra. Modified Data Sets are not necessarily the best option. Narrabri methods are not necessarily applicable to Mopra.
 - the Computing Committee should address this problem and provide a decision by the 1st of October.
 - implementation of the synthesiser and its interface should be complete by March 1994.
- 8/ *Clock*:- Andrew Hunt target for his clock delivery is 8 off by January 1994. This will supply all sites with two to go to Mopra.
- the present clock is causing unwanted phase noise on the 5 MHz distribution system.
 - the Narrabri Crapps Clock is gracefully failing.
- 9/ *5 MHz Distribution*:- distribution system presently being fabricated for Narrabri with a like system to be built for Mopra. System is not manpower or \$'s cheap. It is however essential that it be done.
- December 1993 installation at Mopra would be in line with mm-wave receiver check-out. Must be in by March 1994.
- 10/ *Turret Control*:- will be the same as at Narrabri (uses the same software).
- 11/ *Subreflector Control*:- how important is it for SETI needs? Mal Sinclair to ask Trevor Bird about the feed/focus impact for the optimised SETI horns.
- subreflector control should also be pursued to maximise VLBI sensitivity.
 - subreflector can already be manually driven. Software to automate its control still has to be written. What functions are needed and how should they be implemented?
 - what impact will subreflector movement have on antenna pointing?
- 12/ *Reflector Surface Alignment*:- the primary reflector needs characterisation versus temperature prior to the mm-wave receiver installation. This is because the mm-wave receiver will sit on the same turret location as the holography receiver requires.
- need to characterise effects brought about by the temperature stabilised hub in the middle of the rest of the structure (which experiences variable temperature).
 - focus versus ambient temperature should also be characterised.

- two holography 12 GHz receivers are ready for installation and test on the antenna. This will be done in mid-August.
- software to control both antenna motion and the correlator is required. Warwick Wilson and Dave McConnell to resolve requirements and provide the necessary software. Aim for mid-September to have a working system.
- holography set-up should be such that Robina can routinely conduct data gathering to characterise the antenna in the long term.
- this task needs an assigned co-ordinator to arrange hardware installation, software development, routine observations and antenna characterisation.

13/ *Pointing*:- pointing parameters are different from those at Narrabri. Temperature effects need characterisation.

- some software exists to gather pointing data but measured data and position on sky are not rigorously related. New software for pointing calibration using total power is required.
- mm-wave receiver pointing could use SiO maser sources as pointing calibrators since spectral line observations should give the best results.
- integrated total power needs to be produced by the correlator and forwarded to the Vax. Warwick Wilson has just developed some hardware to do this.
- Wim Brouw to act as co-ordinator for this development task.

14/ *Software*:- Spectra package is nearly up and running. Completion expected around the end of October. On-line analysis software remains to be completed. Another terminal is required for on-line plotting of results. LO tuning capability still has to be tested. Will the "SETI" synthesiser replace the existing LO? Will alternate control software need to be developed?

- an alternate L4 module providing finer frequency steps and mechanical tuning of the mm-wave receiver will require new interfaces. Can a Data Set handle this? What about software? Refer to Dave McConnell. Decision by 16 August.
- for Mopra there will be strong incentive to have software control of antenna mounted equipment. Significant software will be needed as well as additional computing hardware.
- once the ISDN link is working and Robina starts on site ease of software control/development should improve.

15/ *Primary Monitor*:- what cryogenics/other alarms are required with what response?
- should be similar to Narrabri capability.

- Mopra Primary Monitor should communicate via the semi-permanent link and alarm at Narrabri. Details to be worked out. Link interface to be hardware-like rather than Vax to Vax. Does this pose a SETI security concern?
- fire and antenna failure to alarm at Siding Springs.
- the Primary Monitor should autostow the antenna as at Narrabri.
- the Primary Monitor link to Narrabri should be in place within six months and certainly before SETI installation starts.

16/ mm-wave Receiver:- 2 channel / dual polarisation receiver using SIS mixers cryogenically cooled to 4K. Initial operating frequency range is 90 to 116 GHz but the system may well work down to 86 GHz. The output I/F into the conversion chain will be at 1.5 GHz.

- Modification of Hitachi scroll compressors for the refrigerator is nearly-- complete. An additional (larger diameter) helium line may need to be installed on the antenna to allow for both a JT supply and return line. It may not be necessary to have an additional air-conditioner for cooled air supply to the compressor heat exchanger.
- the receiver will be mounted in a C/X receiver frame. Mirrors for the feed are presently being built. Beam switching between the subreflector, sky and a hot load will be incorporated.
- a good knowledge of receiver performance should have been established by the end of the year. Installation on the antenna is planned for early 1994 (probably using Epping staff). Once installed on the antenna it is preferred that the receiver be kept cold until SETI activities commence. At that time the receiver would be removed from the antenna. Note that this would exclude any holography or 12 GHz VLBI observations.
- future 80 → 90 GHz receivers may use in-house built mixers.

17/ SETI:- existing receiver bandwidth needs to be extended to 1 → 3 GHz. This will be achieved by installing amplifier pairs covering the bands 1 → 1.7 GHz and 1.63 → 3 GHz. Work has commenced on extending OMT performance particularly towards the 3 GHz band end. The existing band-splitters will be replaced by coaxial switches (reduces the loss). The switch will be controllable from a Data Set via an existing card. The RF modules also need modification to cover the band.

- the conversion system 256 MHz I/F modules must be replaced with units designed to operate at 600 MHz ± 100 MHz.

- Electro-magnetics and Optics Group to produce two feeds to match LNA passbands. The existing L/S horn is to be removed and one at a time of the two SETI horns installed as required by the observing program. A strategy needs to be developed as to how and by whom the horns will be switched. Mal Sinclair to organise using staff from Epping and the Narrabri Receiver and Facilities Groups.
- delivery of the amplifiers will drive when the receiver should be removed from the antenna and modified. This should occur in October 1993 with the receiver being returned to the antenna shortly after modification. The existing feed would continue to be used until much later when the new horns become available. This activity must be scheduled around other antenna usage.
- reliability of the Mopra Observatory will be progressively improved through system use to shake out any problems. To this end OH observations are planned for the observing period beginning in December 1993.
- remote operation of Mopra should be implemented in a manner similar to that intended for Narrabri. Mopra remote operation should commence ASAP so that confidence can be built in this capability.
- Dave McConnell has already made initial contact with the SETI software person Gary Harligman. A simple interface is to be pursued. Monitor data is to be returned to SETI down their command line.
- we should provide an over-all co-ordinated approach to software development for the SETI people. This would include software for both Mopra and Parkes. We should provide interfaces as they request and to which we have agreed rather than drive their requirements.
- SETI security requirements are not yet defined. The alidade room may need an extra lock and/or alarm. Computer link security will also need addressing.
- a 4 hour response to problems from Narrabri has been guaranteed. This will require a different approach to the on-call roster or perhaps even placing people at Mopra. Concepts need to be developed.

- 18/ VLBI:- use of the Mark II hardware is being wound down. It will be replaced by an S2 System next year.
- phase noise in the 5 MHz distribution system is leading to problems with coherence. An alternate approach providing improved isolation between the various outputs is required.
 - VLOBS has problems. It needs updating or else replacement.

- 19/ S2 Recorders:- options for implementation include reconstituting the analog from sampler 4 bit digital outputs, and, bringing the analog I/F (64 → 128 MHz) direct to the control room (preferred by Warwick Wilson).
- I/F processing will require a "mini-Parkes" like panel. S2 data acquisition terminal requires $\frac{1}{2}$ rack space. The recorder equipment requires another $\frac{1}{2}$ rack space. Rack space needs co-ordination. Ron Beresford to draft a rack layout drawing for the Mopra control room racks and establish the preferred location.
 - earliest installation would be March or April 1994. Testing will need to be factored in with everything else (needs correlator). The Mark II and S2 Systems would initially be operated in parallel.
- 20/ General Electrical:- a new UPS and UPS sub-mains are to be installed.
- UPS load shedding should be done sensibly rather than all or nothing. Faults should result in only the affected equipment being taken off-line.
 - a site wide earthing review is required.
 - other identified needs include:-
 - more UPS power points in the control room,
 - separate air-conditioning plant for the control room operations area,
 - separate air-conditioning units for the bedrooms,
 - UPS power points and terminal sockets in the control room partition wall,
 - more power outlets in the racks,
 - UPS outlets in the alidade room for SETI,
 - UPS outlets should be so labelled,
 - options for low level lighting at night to be pursued by Dennis Allman,
 - split the control room operations area and equipment room lighting control,
 - incandescent light over operations desk fed from UPS.
- 21/ General Mechanical:- elevation angle encoder ducting requires rework.
- generator batteries to be replaced.
 - gear box oil level bulbs to be enlarged.
 - Narrabri safety committee to review operation of interlock on stair-way gate. E-stop should be installed on the ground-level steps.
 - painting of antenna needs to be scheduled (3 weeks).
 - should panel adjustment be done after holography and before painting the antenna? Before or after SETI?
 - grease again to be removed from track. Track will be protected with a suitable lubricant.

- grease trays under azimuth bogies.
- latch on gate between lower and upper vertex rooms requires repair.

22/ *General Site*:- septic tank needs an extended collar.

- Kurrajong tree to be left as is until proven guilty of causing interference to the antenna beam / observations.
- Aussat dish area to be tidied up.
- access road requires repair.
- plant shade trees around back of building.

23/ *General Electronics*:- a new box is required to terminate the coaxial cables (2) at the rear of the subreflector and provide direct protection from the weather. Cables may need reterminating.

- 4 off 256 MHz (1-bit) signal paths to be installed and working in approx. a years time.

Operations:

24/ *Mopra Access*:- access to equipment and accommodation at Mopra will continue to be co-ordinated and prioritised by Narrabri staff during the weekly planning meetings.

- Narrabri Admin. staff will continue to organise accommodation bookings and advise Epping.
- a single person focus for all applications is required to feed the planning meeting and produce timetables and action plans.

25/ *Scheduling*:- observation scheduling will continue to be done through the time assignment committee as for Narrabri.

26/ *Robina's Role*:- once a replacement in Epping is identified she will move to Coonabarabran probably during the October school holidays. The move may not be permanent - 18 months is currently mooted.

- she will work for Dave McConnell and the Mopra Co-ordinator.
- she will visit Narrabri one day in every one or two weeks.
- she will assist in the development of a Mopra library.
- she will maintain a site log (to be filled in by all staff attending the site) which should detail all activities on a daily basis. It should be copied (when a photocopier becomes available) and faxed to Narrabri daily.

27/ *Mopra Co-ordinator*:- role to be defined and person identified before the end of the year.

28/ *Library*:- should contain both technical manuals and general documentation.

- Robina to assist in its development.

- 29/ *Routine Maintenance*:- Narrabri Facilities Group should continue their 2 → 3 week visit rate to perform routine maintenance. This will need to be more closely co-ordinated with the observing program as it develops.
- SETI allows one only 8 hour maintenance session per week.
- 30/ *Administration*:- local purchase arrangements will be put in place with Robina.
- 31/ *Office Accommodation*:- additional space may be required. Prefabricated buildings from Epping could be an option.
- 32/ *Spares*:- storage options include both on-site and in the Narrabri truck. A decision on the approach to be adopted is required.
- 33/ *Safety*:- Robina should lunch "on the mountain" to provide daily contact with other people during quiet times.
- a dead mans button needs to be provided for Robina's safety.
 - no one should go onto an antenna if alone on site unless someone at Narrabri is informed and monitors their progress.
 - an Occupational Health and Safety form should be completed for Mopra in general and with respect to Robina specifically ASAP.
 - a "dos and don'ts" safety note should be prepared for review by all staff as they enter the site.
- 34/ *General*:- a photocopier should be provided for the site.
- a wardrobe for each bedroom and a sofa / foldout bed in the lounge room would improve the accommodation area.
 - an IISE review of the ATNF program will be held in early August. Engineering and computer groups will be under review this time.
 - a site vehicle will be provided for Robina's and observers use.
- 35/ *Timetable and Action List*:- the timetable and action list arising from this meeting is to be prepared by G. Nelson.

Meeting closed: 4:00pm AEST

Thanks to all participants for their contribution to a most profitable day.