AUSTRALIA TELESCOPE

The following are some thoughts on the Australia Telescope project. Undoubtedly many of them have been independently considered by others and some of them have arisen from discussion with others. Never-the-less they represent my own views. Many of them are not fully developed and require further work to establish their feasibility and/or desirability. Some of them may be impracticable. The main purpose of listing them is to provoke discussion.

1. Antenna diameters should be as large as possible within economic constraints and not less than 22m.

   HI and VLBI observations will be sensitivity limited. Field-of-view limitations can be overcome by beam switching or multiple observations.

2. All receiver packages should be dual polarization, dual frequency with coaxial feeds.

   Dual polarization is needed to give full sensitivity and polarization capability. Dual frequency packages will minimise receiver costs and improve observing efficiency.

3. The 6km Culgoora array should be oriented EW and have continuous rail track.

   EW arrays maximise resolution south of $\delta = -30°$ - we can't afford to compete with the VLA. Continuous rail track allows maximum flexibility for configurations.

4. There should be a minimum of 5 antennas on the 6 km array.

   Any less is very inefficient and slow.

5. In order of decreasing priority, sites for additional antennas are:

   (i) Siding Spring
   (ii) Between Siding Spring and Culgoora
   (iii) " " " " "
   (iv) At a site to optimise VLBI coverage in a network with existing Australian antennas.

6. Over all resolutions, available spacings should be distributed in an approximately logarithmic way.

   This provides highest resolution with high dynamic range in the shortest time.

7. All new antennas should operate under remote control.

   We can't afford to establish fully serviced sites at all antenna locations.

8. The control centre for the Australia Telescope should be in the control room of the Parkes telescope.

   This is the only antenna which must be manned. We can't afford two control centres.

9. The correlator for the 6km array and the medium baseline array (MBA - Culgoora, SS, Pks + intermediate sites) should be at Culgoora.

   Correlation and control data can be sent to Parkes on a radio link of modest bandwidth.

10. We should work toward establishment of a VLBI network involving development of existing sites as much as possible.

    VLBI will be a part-time activity and hence can share facilities including the Culgoora array.

11. The VLBI network should use satellite LO phase stabilization.

    We can't afford H-masers.

12. The VLBI network should use a development of Mk II cassette recording system.

    We can't afford Mk III.

13. A separate VLBI correlator should be located at Parkes. It should provide for simultaneous processing of multiple fields.

    With VLSI, correlators are relatively cheap. With off-line processing, the correlator will be required much of the time and hence the AT correlator can't be used. Parkes is reasonably central - an advantage for possible future real-time processing.

14. All arrays (including VLBI) should utilize the basic principles of TEST, in particular, fringe stopping and IF digitization at the receiver.

    Digital delays are cheap and compact. Phase controlled sampling avoids a lot of problems associated with fractional λ delay stepping.

15. For the 6km array IF transmission and maybe LO distribution should be by optical fibre.

    The technology is now commercially available. Bandwidth/cost ratio is high.

16. For the MBA LO and IF transmission should be by radio link.

Optical fibres are too expensive.

17. Mapping processors for all arrays should be based on DFT processors.

Mapping of small fields without aliasing will be essential.