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SOME QUESTIONS ON THE OPERATION OF THE AT

Ray Norris

1 May 1985

1.0 INTRODUCTION

It has become apparent in the course of thinking about AT software that there are some important issues about how the AT is to be operated which have not yet been discussed, let alone resolved. In most of these 'grey areas', it appears that many individuals have assumptions about how the AT is to be run, but that these assumptions vary widely.

As an example, it has not yet been formally stated anywhere whether the AT observations are to be run by a visiting astronomer, resident astronomer, engineer, or technician. Each of these four categories requires very different software: it is not enough to write 'user-friendly' software, since prompts which might be essential for a visiting astronomer could be irritating and time-consuming for an 'expert' astronomer or engineer.

Here I list a set of questions and assumptions about how the AT is to be run, and suggest that these areas be discussed, and the resolutions of these issues be formalised.

2.0 DEFINITION OF A RESIDENT ASTRONOMER

For the purposes of this document, I define a <u>resident</u> astronomer as one who has some knowledge and experience of the AT, and who works for Radiophysics or for the AT, although his permanent location might be Epping, Culgoora, Parkes, etc. Thus I use the term to include those staff astronomers (numbering perhaps half a dozen or so) who might reasonably be called upon to look after the AT for a period. It would <u>not</u> include all the astrophysics group, most of whom would not wish to be placed in such a 'service' role.

3.0 ASSUMPTIONS AND DEDUCTIONS

1. Time on the AT will be allocated purely on scientific merit of the proposals, and will not depend on the institution or nationality of the proposer. To do otherwise would be to ignore the large amounts of time granted to Radiophysics

astronomers on other facilities (e.g. the VLA), and would cause irreparable damage to the relations between Radiophysics and other astronomical institutions.

2. A considerable proportion of AT time will therefore be allocated to non-Radiophysics scientists. In particular, many of these will be from overseas institutions.

3. Non-Radiophysics scientists will often be able to process their data (using AIPS) at their home institutions. In that case, they will be sent calibrated data on FITS tapes. However, when desirable or necessary, the AT will provide the necessary data processing facilities at Epping.

4. Since many compact array (CA) observations will be made as a series of 12-hour runs separated by perhaps weeks, there is little point in an astronomer travelling to Culgoora for his observations.

5. For many observations, therefore, the preparation of the observing schedule will take place many weeks before the observations are completed. Few overseas astronomers will therefore be able to come to Epping to schedule their observations, even if they plan to come to process their data. Detailed scheduling of observations will therefore usually need to be done by resident scientists.

6. There will always be resident astronomers at Culgoora. To avoid isolation of Culgoora from Epping (and thus perhaps avoid the type of rift which seems to have arisen between Parkes and Epping), this might be implemented best by rotating personnel, with a 'duty time' of a week or so. To facilitate this, a cottage suitable for families should be provided at Culgoora.

7. The CA will be operated by a technician (here called the Array Operator), with a resident astronomer always on the site, on call. Detailed scheduling (and re-scheduling in the event of faults) will be the responsibility of the resident astronomer. A visiting astronomer may re-schedule the details of his observations by negotiating with the resident astronomer.

8. It is assumed here that LBA data playback will occur at Culgoora. However, it should be noted that this is not necessary now that radio links have been abandoned in favour of tapes, and that the LBA correlator has been separated from the CA correlator. On the other hand, maintenance might be facilitated by having the two processors together.

9. There will be a technician (here called the LBA Technician) responsible for the maintenance and running of the LBA playback processor. The LBA observations will be operated by the Array Operator, but the playback may be the joint responsibility of the Array Operator and the LBA Technician.

10. The resident astronomer has responsibility for overseeing the playback of LBA data, and checking the calibration of both CA and LBA data.

11. Provisions will also be made for those visiting scientists who wish to come to Culgoora. Again, the family cottage might be made available to them if the resident astronomers at that time were being accomodated in 'Parkes-type' quarters. Accomodation (e.g. a unit) will be provided at Epping for visiting scientists.

4.0 CALIBRATION

At the VLA, a visiting astronomer is required to do his own calibration. This (at least in the case of most users) involves following a predetermined set of rules given in the 'VLA Calibrator manual', and then laboriously editing an observation file, placing calibrator observations every 15 minutes or so. Post-observation calibration then takes place following a similar cook-book recipe. Clearly, such adherence to a predetermined set of rules could easily be implemented in software, and VLA calibration is tremendously wasteful of manpower and (because of inevitable errors) of observing time. In some cases (e.g. 'expert' users making non-standard observations) such a system is essential, but most users do no more than adhere rigourously to the recipe.

I suggest we do not follow their example. Instead, a visiting astronomer should be able to ask for 'the usual

calibration', and this will be done invisibly for him, so that he obtains a fully calibrated data set. An expert user will of course be free to adopt whatever calibration scheme he chooses.

An additional point relating to calibration is that calibration runs interspersed throughout the data will occur at the same hour angles on all baselines, so that wedge-shaped pieces of data will be missing from the u-v plane. This has two consequences:

1. One-day (and perhaps even multi-day) observations will suffer from artefacts corresponding to these wedges. The significance of these artefacts should be evaluated by simulations.

2. Multi-day observations should have their calibration observations scheduled for different hour angle ranges, to minimise this effect.

5.0 COPING WITH FAULTS

It is common practice on many large instruments (e.g. VLA, AAT) to allocate time slots rigidly to an individual. Observations lost because of weather or equipment malfunction are simply written off: the telescope stands idle and the astronomer goes home data-less. In the case of the AT, we can make more efficient use of the telescope because of several factors:

1. Visiting astronomers will not in general be present for their observations, so there is little inconvenience caused by last-minute re-scheduling.

2. If a VLA telescope fails, observations may continue because there are 26 others and one less doesn't hurt too much. On the AT, the loss of a telescope may be disastrous for one type of observation (e.g. a 1-day map) but of only marginal loss to another type (e.g. 12-day observations). Thus if a telescope fails during a 1-day observation the observation may be aborted and replaced by part of a 12-day observation.

3. Because of the simultaneous availability of different bands on the telescopes, if a receiver should fail (probably a major source of

malfunctions) then observations at a different band may still be carried out.

The possibility of flexible re-scheduling should be borne in mind during software design.

6.0 COMMENTS

The operation of the AT seems to diminish the need for outside astronomers to visit Epping or Culgoora at all. This has two adverse consequences:

1. Resident astronomers will not get the stimulation of a steady flux of visitors.

2. Non-resident astronomers will not get the chance to discuss characteristics peculiar to the AT, and so may not get the best out of their data.

One solution to this problem might be to encourage non-resident astronomers to process their data at Epping when they first use the AT, but encourage them to process at their home institution for subsequent observations (thus relieving our potential processing bottleneck), unless they have any special requirements or difficulties with their data.

Another type of solution would be to encourage LBA users to go to Culgoora for the observations or data playback (but not both, since there will generally be an interval of a week or so between observation and playback), and/or to come to Epping for subsequent processing.

OVERALL SYSTEMS AND PERFORMANCE

AT/20.1.1/008

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