

ATNF ATUC MEMORANDUM

To: ATUC
From: Bob Sault
Date: 31 May 2004
Subject **Flexible scheduling for ATCA millimetre observing**

Background

The ATCA can make scientifically useful observations in all weather conditions except severe thunderstorms and high winds. For example, 20cm observing is largely unaffected by weather. This capability is essentially unique amongst 3-mm instruments.

Because of the potential impact of poor weather on 3mm observations, the ATCA has used a “swap” system of flexible scheduling for these observations. This has been running since winter 2002. This system partners a 3mm program with a centimetre program, with the two typically scheduled two days apart. The first program that is observed is determined on the day by the weather and the weather forecast. An analysis of historical weather data suggested that this should increase the probability of a successful 3mm observation from about 65% to 85% during the winter. Experience over the last two years suggests that the weather is somewhat better than the analysis suggests, although the analysis is broadly correct. Since the introduction of the scheme, 9 out of a possible 54 slots have had swaps initiated, two 3mm slots have been ruined by poor weather, and a number carried out in less than ideal weather. Although swaps would also be useful for 12mm observers, the pool of available partners has usually meant that this cannot be supported.

A basic difference of the swap system from backup schemes is that both the 3mm and centimetre programs have been well ranked by the TAC, and both are schedulable in their own right.

Since 2003 service mode observing has been offered to centimetre swap partners. This was both to encourage more proposals that could be used as swaps and to reduce the burden of swapping (the swap system tends to discriminate against the centimetre observer). To date, no proposals have taken advantage of this offer.

With the swap scheme, it had been hoped that a number of observing teams would have effective self-swapping proposals – i.e. the one team had a well-ranked centimetre and a 3mm observing slot that could be interchanged. However this has not often happened: the science that observers do tend to make them either centimetre or millimetre oriented, with few spanning the gap. At the same time, self-swapping proposals are simple and effective: they should always be supported where they are possible.

A key requirement of the swap system is that there is an adequate pool of centimetre observations that can be used as swap partners.

In 2002 the scheme worked reasonably well, whereas in 2003 it was less effective. With the current winter (the first season with a complete 3mm system), the swap scheme is showing that the pool of centimetre proposals (in the array configurations and LST ranges of interest to 3mm observers) is quite inadequate. The system as it was intended is quite unworkable.

In the current winter, swaps have been achieved by providing a generous allocation of Directors Time, and by several slots of a given proposal vying for the one Directors Time swap slot. In the H75, H168 and EW214 arrays, 9% of possible observing time has been specifically left as Directors Time for possible swaps. This fraction is approximately equal to the amount of 3mm time that typically would be lost to weather in these arrays. Hence it is likely that a significant fraction of lost weather time can be made up for. Note that if all 3mm slots were to be given a swap slot, the fraction of Directors Time would increase significantly. This winter, the swap slots (whether a swap is initiated or not) will be allocated to observers following the pre-existing practise of handling Directors Time.

Possible Future Approaches

In light of the usage pattern that is emerging, the swap scheme needs to be re-assessed. Some options are:

- Continue the practise of this winter of allocating swap partners where possible, and allocating Directors Time swaps otherwise. The 3mm proposal could use only one slot, with the partnering slot being allocated using the existing Directors Time rules. Leaving the swap slots unscheduled well in advance has the advantage that it gives flexibility to make the most of extended periods of good weather. For example Directors Time could be used for 3mm proposals if there was no bad weather (this would not be possible if a centimetre swap were mandated). The amount of Directors Time allocated could be sufficient either to allow each 3mm slot to swap or just to accommodate the typical amount of lost 3mm time.
- Abolish the swap system. In poor weather the time allocation of a 3mm proposal would be lost, and the time would be used for a backup proposal.
- An alternative to the above options would be for “make-up” time (Directors Time) to be scheduled at the end of each array configuration. This time could then be used for 3mm observing time that was lost to poor weather, as well as more usual Directors Time requests. The time required would amount to the typical 3mm observing lost to weather. This may make better use of the available time and simpler to administer. Generally it would be less convenient for observers as they may be required to return to Narrabri for a second observing run.

Many other alternatives have been considered in the past, and have not been pursued for sound reasons. Previous memos on these alternatives are available if ATUC wishes to reconsider them.

Centimetre proposals

Regardless of the way the 3mm proposals are handled in poor weather, there is a basic fact that an appreciable fraction of time in compact arrays will not be useable for 3mm observing. At these times the telescope should be used at centimetre wavelengths. In the current term, there were inadequate centimetre proposals (in the right array configuration and LST range) to fill this time. We need to be actively attracting centimetre proposals, whether they are treated as “fillers”, “backup proposals” or “swap partners” that can be used in compact arrays. Although there

has been some discussion on “key projects” that could be done in this time, no firm proposals have materialised.

The current practise of allocating Directors Time might need to be made more rigorous if this time was to be used significantly in any scheme. It may be appropriate for a delegate of the TAC may be involved in allocating Directors Time.

Advice sought

ATUC's advice is sought on the following issues/questions:

- Does ATUC have suggestions for the method for flexible scheduling of 3mm observations. In particular, how does ATUC view the three suggestions made above.
- What approach would ATUC recommend to ensure that there is adequate centimetre requests (either as backups, swaps, fillers etc) for the compact arrays favoured by 3mm observers.