1.0 SUMMARY

By comparing the performance of the 4 station LBA with that of MERLIN, it is shown that the LBA, even with only 4 telescopes, is capable of producing high resolution synthesis maps. Furthermore, the high sensitivity and resolution of the LBA mean that it will be the only instrument in the world capable of mapping some classes of structure, and the tapping of these unexplored fields is likely to produce a flow of new discoveries. In this note, the potential of the LBA is evaluated, and two concrete proposals regarding its development are formulated.
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The OH and H2O masers in circumstellar shells show structure from a few arcsec (representing the overall shell structure) down to milliarcsec (representing the amplified thermal stellar emission). Observations of the small scale structure could be used to study the mass loss mechanism, and perhaps even answer the question of how stars lose their angular momentum. In addition, recent VLBI observations (Norris et al. 1984) indicate that the maser hotspot represents the amplified stellar image, so that studies of the very compact structure may be used both for imaging of late type stars and binary systems, and for astrometry, in which capacity they will provide an important link between the radio and optical reference frames.

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The history of studies of radio stars is one of frustration because of the simultaneous requirements of high sensitivity and high resolution, which have heretofore been difficult to achieve. The LBA satisfies these requirements, so that we may confidently expect rapid progress to follow LBA observations of these stars.

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The CA presents a greater technological challenge than the LBA, and will certainly be capable of tackling many outstanding problems in astrophysics. However, this should not be allowed to obscure the likelihood that the LBA in 1988-89 will have just as much impact on the astronomical community as the CA, because the LBA will be able to map classes of objects which just cannot be mapped with any other real-time instrument. This being so, perhaps consideration should be given to the following two proposals:

1) If progress on the AT seems to be slowing for any reason, such that there is a danger of its completion date falling after 1988, the LBA completion date should be maintained within 1988. This is because the technical problems of the LBA are likely to be less severe than for the CA, and, in this fall-back position we would still have a major world-class instrument completed in 1988.

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Such a working group need only meet occasionally as and when necessary, but once formed would provide both a forum and a focus for dealing with questions specific to the LBA.
9.0 REFERENCES


Erratum to Filenote AT/20.1/012

There seems to be some uncertainty in the way in which the sensitivity of an array should be defined. In particular, the published sensitivity of the VLBA (VLBA Design Study, Feb 1981, Table I-1), upon which the sensitivity comparisons in this note were based, appear rather pessimistic. Consequently, the following two comments should be deleted:

p.2, para 2, "(greater....bandwidth)"

p.5, last para, "and in fact....world"

The arguments and conclusions of the filenote are unaffected.

RPN 18/4/84
Figure 1. MERLIN maps of the circumstellar shell around OH127.8 (declination +62°), from Morris et al. 1982. Each map represents a different velocity. They were made using closure phase and CLEAN on 4 telescopes of MERLIN.
Figure 2. MERLIN maps of the GM around the putative bipolar nebula IRC10420 (declination +1°), from Diamond et al. 1983.
Figure 3. MERLIN map of the integrated OH and continuum emission from the Starburst galaxy IC4553 (declination +23°), from Norris et al. 1984b.
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The CA presents a greater technological challenge than the LBA, and will certainly be capable of tackling many outstanding problems in astrophysics. However, this should not be allowed to obscure the likelihood that the LBA in 1988-89 will have just as much impact on the astronomical community as the CA, because the LBA will be able to map classes of objects which just cannot be mapped with any other real-time instrument. This being so, perhaps consideration should be given to the following two proposals:

1) If progress on the AT seems to be slowing for any reason, such that there is a danger of its completion date falling after 1988, the LBA completion date should be maintained within 1988. This is because the technical problems of the LBA are likely to be less severe than for the CA, and, in this fall-back position we would still have a major world-class instrument completed in 1988.

2) A working group should be set up to examine the problems peculiar to the LBA. The reasons for this are twofold. Firstly, as the CA is the most technically challenging part of the AT, there is a danger that the needs of the CA alone will largely determine the conclusions of the various working groups concerned with the different aspects of the AT. Secondly, there are aspects of the LBA design and operation (e.g. atmospheric stability, use of other telescopes within Australia) which do not come within the terms of reference of any other working group, and so may not receive the attention they deserve.

Such a working group need only meet occasionally as and when necessary, but once formed would provide both a forum and a focus for dealing with questions specific to the LBA.
9.0 REFERENCES


Figure 1. MERLIN maps of the circumstellar shell around OH127.8 (declination +62°), from Norris et al. 1982. Each map represents a different velocity. They were made using closure phase and CLEAN on 4 telescopes of MERLIN.
Figure 2. MERLIN maps of the OH around the putative bipolar nebula IRC10420 (declination $+11^\circ$), from Diamond et al. 1983.
Figure 3. MERLIN map of the integrated OH and continuum emission from the Starburst galaxy IC4553 (declination +23°), from Norris et al. 1984b.
Figures 4 and 5. The uv coverage of the 4 telescope MERLIN at declinations 60° and 10° respectively.
Figures 6 and 7. The UV coverage of the 4 telescope LBA at declinations -30° and -60° respectively.
Figure 8. A simulated map of the Virgo jet observed with the 4 telescope LBA, at declination $-60^\circ$. Boxing and further cleaning would remove the sidelobes to the North and South. Contours are at 1% intervals.
Figure 9. A simulated LBA map of the active galactic nucleus IC4553, at declination $-60^\circ$. The absence of sidelobes is due to the simpler structure. Contours are at 2% intervals.
Figure 10. A simulated LBA map of the test source "Spirall", suitably scaled, at declination $-60^\circ$. This source would be virtually unmappable by any other synthesis array presently operating (see text). Contours are at 1% intervals.