reflect the light through ninety degrees onto a parabolic mirror. One of the plane mirrors is fixed in position and the other can move in such a way that their surfaces remain parallel, but their planes are displaced by δ from each other. This displacement introduces the required path difference into one beam. The parabolic mirror focuses the light onto a detector which is fixed at the centre of the diffraction pattern.

The interferometer has been aligned using a laser. The interference pattern predicted was observed over the whole range of travel of the mirror, showing that the moving and fixed mirrors do remain parallel. The linearity of the motion has been checked using a differential transformer displacement transducer. The motion is not linear over its whole range. The main source of non-linearity is the lever. The zero path difference position has been found using a broad band filter with the Sun as a source and obtaining an interferogram. The zero position is easily identified as the largest of a short series of maxima.

The interferometer is designed for use on a balloon. It is intended to measure the spectrum of the Sun at various altitudes as the balloon ascends and obtain measures of the water vapour and carbon dioxide content of the atmosphere. For this, the interferometer is provided with an oscillating mirror which acts as a chopper and also provides sky cancellation. It is intended to fly the interferometer early in January.

### Long Coherence Intercontinental Interferometry

**J. S. Gubray**  
*Weapons Research Establishment, Salisbury*

Compact radio sources have been observed over several years at 2.3 GHz by interferometers of the NASA-JPL Deep Space Network with trans- or inter-continental baselines to study the secular behaviour of fine structure appearing in these sources. A comparison of the variation in flux density of components of diameter < 0.001 arcsec with the corresponding variation in total flux density of the source at the same frequency indicated that variations could be wholly ascribed to components of this order of magnitude.

A sister station of the Deep Space Network near Johannesburg monitors the total flux from 70 compact sources. Of these the total flux from 3C120 and from P0727-11 have undergone rapid fluctuations over the period 1968.0 to 1970.5, indicating that the fine structure in them was complex.

Interferometer observations with a trans-Pacific baseline on day 355/1969 (1970.0) and day 23/1971 (1971.1) included both these sources. Two runs were made on each source on both occasions. Although data was recorded over 660 seconds on each run, the stability characteristics of the independent rubidium frequency standards at the stations limit the phase coherent period for the intermediate interferometer mode data reduction to 10 seconds. Thus in general not possible to discriminate between components separated by less than about half a minute of arc.

The total flux density of 3C120, communicated by Dr Nicolson at Johannesburg, has decreased over the period 1970.0 to 1971.1 whereas there was a significant apparent increase over the same interval in the component flux density observed with a trans-Pacific interferometer at the same operating frequency. There are two possible explanations. A resolved component may be decreasing more rapidly than the unresolved component is increasing in flux density. Alternatively, the earlier measurement at least may have suffered from interference between two unresolved components separated by less than half a minute of arc.

There was no significant apparent rise in the component flux density of PO727 over the same period although there was probably a significant rise in total flux density.

By contrast the figure in reference 2 shows how the component and total flux densities compare for an unresolved simple source 3C279, a simply resolved source 3C273 and, P1510-08, a source classified as complex by Andrew, Locke and Medd who had observed its variations in total intensity.

Thus the intermediate interferometer mode of reduction using a phase coherent period of 10 seconds gives an ambiguous result for complex sources. However, with the introduction of H-maser frequency standards at the stations (at least over the period of the Mariner Mars mission) the data could be treated as fully phase coherent throughout the tape. Components corresponding to Doppler difference frequencies 2 millihertz apart can be distinguished. In general, this means that components separated by about 0.5 arcsec can be observed separately.

An experiment using the Woomera to Goldstone (in California) baseline took place on day 164/1971 (1971.4). Two stations in California took part in these experiments.
it was necessary to correct the position of the stations for the effect of reducing our threshold to about half a flux unit. However, and the correction for UT1-UTC was —90 ms, the origin of both figures should be displaced by +1.35 sec. As UT1-UTC was —90 ms, the source has not been applied. As UT1-UTC was —90 ms, the central component is displaced in longitude by about half a second of arc and is probably the component observed by Cohen and Shaffer in 1969.4, although their error limits include the position of the main component about 3 seconds of arc away. The central component is at threshold about 0.4 f.u. whereas the main component has a flux density exceeding 1.0 f.u. The source has not been optically identified. Figure 2 compares the error field of the present system when only 2 runs 20 minutes apart are obtained against that for the NRAO system for 1969.4.

The study of component structure and the study of geodetics using long coherence VLBI are complementary in that the former requires highly accurate station positions and the latter requires a knowledge of the behaviour and relative positions of ephemeral source components at the epoch of observation.

The author took part in conducting the trans-Pacific experiments with A. J. Legg and Dr D. S. Robertson at the Australian station DSS42 and later DSS41, while Professor A. T. Moffet, Dr D. Shaffer and D. Spitzmesser operated the Californian stations DSS14 and also DSS11, later DSS12. The use of the Deep Space Network was by kind permission of NASA and JPL.

Preliminary Results Obtained with an Aperture Synthesis Telescope at 30 MHz

E. A. FINLAY and B. B. JONES
School of Electrical Engineering, University of Sydney

A 30 MHz radio telescope has recently been completed at Fleurs, N.S.W. There has been need for a high resolution sky survey to be carried out in the Southern Hemisphere at a frequency intermediate between 19.7 MHz (Shain et al.) and 85.7 MHz (Mills et al.). One particular reason lies in the fact that some HII regions which

---

4 Nicolson, G. D., private communication.
7 Andrew, B. H., Locke, J. L. and Medd, W. J., BREE Division, NRC Canada, 18, 45 (1968).