An Accurate Determination of the Positions of Four Radio Stars

THE use of an interferometer aerial system on a wave-length of 3·7 m. to measure the positions of a number of radio stars has already been described[1]. The present communication contains the results of recent more accurate determinations of the positions of four intense radio stars with this interferometer, together with results for the same stars obtained by using another interferometer the individual aerials of which employ parabolic reflectors. This latter interferometer has been used at wave-lengths of 3·7 m. and 1·4 m.

With the new interferometer, it is possible to determine the 'collimation error' either by the interchange of the individual interferometer aerial elements, or by observations of both upper and lower culmination of the circumpolar star 23·01 [1]. In addition, the electrical centres of the aerials are defined more precisely than those of the broadside arrays originally used at 3·7 m.

Declination has been determined from the periodicity of the record, as in the previous observations, and also by two new independent methods. In the first method the times of transit of the star across two 'collimation planes' displaced on either side of the axial plane of the interferometer are determined: the interval between these times is related to the declination. These displaced collimation planes are produced by increasing the electrical path to one or other of the aerials. In the second method, the time-interval between the transits at the upper and lower culminations of a circumpolar star provides a measure of the declination, since the axis of the interferometer is inclined at a considerable angle to the east–west line. The collimation error must here be determined by interchanging the interferometer aerials. A more detailed account of these and other methods of position-finding will be published elsewhere.

Table 1 gives the positions of the four stars, with their probable errors, as determined from the time of transit and the periodicity of the record obtained with the three interferometer systems. It also shows results obtained by the two new methods, which have been used at 1·4 m. Allowance has been made for atmospheric refraction. The co-ordinates refer to the epoch of 1950.

It has been pointed out[1] that, in addition to the instrumental errors, the position may be in error due to the radiation from other nearby weaker stars. It can be shown that, in the present observations, this factor is unlikely to cause an error greater than ¼ sec. in the R.A. of the stars 19·01 and 23·01, or greater than about 2 sec. in the R.A. of the less-intense stars 05·01 and 12·01.

Table 1

Star	Constellation	Wave-length and method	Right Ascension	Declination
			h. m. s.	
05·01	Taurus	3·7 m., broadside	05 31 35 ±5	22° 05′ ±40′
		3·7 m., paraboloid	05 31 35 ±5	22° 11′ ±20′
		1·4 m., paraboloid	05 31 34·5 ±2	22° 09′ ±5′
		1·4 m., displaced collimation plane	— — —	22° 01′ ±3′
12·01	Virgo	3·7 m., broadside	12 28 17 ±5	12° 50′ ±1°
		3·7 m., paraboloid	12 28 18 ±5	12° 46′ ±20′
		1·4 m., paraboloid	12 28 18·8 ±2	12° 33′ ±15′
		1·4 m., displaced collimation plane	— — —	12° 31′ ±15′
19·01	Cygnus	3·7 m., broadside	19 57 45 ±5	40° 37′ ±5′
		3·7 m., paraboloid	19 57 45 ±5	40° 32′ ±5′
		1·4 m., paraboloid	19 57 45·3 ±1	40° 34·5 ±1′
		1·4 m., displaced collimation plane	— — —	40° 35·3′ ±0·7′
23·01	Cassiopeia	3·7 m., broadside	23 21 13 ±5	58° 30′ ±3′
		3·7 m., paraboloid	23 21 12 ±3	58° 32′ ±2′
		1·4 m., paraboloid	23 21 12·0 ±1	58° 32·1′ ±0·7′
		1·4 m., displaced collimation plane	— — —	58° 32·9′ ±0·5′
		1·4 m., double transit	— — —	58° 30′ ±3′

The final positions are given in Table 2.

Table 2

Star	Constellation	Right Ascension	Declination
		h. m. s.	
05·01	Taurus	05 31 34·5 ±3	22° 04′ ±5′
12·01	Virgo	12 28 18 ±3	12° 37′ ±10′
19·01	Cygnus	19 57 45·3 ±1	40° 35·0′ ±1′
23·01	Cassiopeia	23 21 12·0 ±1	58° 32·1′ ±0·7′

This work was carried out at the Cavendish Laboratory as part of a programme of radio research supported by the Department of Scientific and Industrial Research. Thanks are due to Mr. M. Ryle for his most valuable advice and help, and to Mr. J. E. Jackson of the Department of Geography for assistance in surveying the positions of the aerials of the new interferometer.

F. G. SMITH

Cavendish Laboratory,
Cambridge.
Aug. 6.

[1] Ryle, M., Smith, F. G., and Elsmore, B., *Mon. Not. Roy. Astro. Soc.*, **110**, 508 (1950).

A Search for Long-Period Variations in the Intensity of Radio Stars

CERTAIN classes of visible star are characterized by well-marked variations of intensity; the period of these variations may be as short as a few hours, or as long as several hundred days. In this communication an account is given of an investigation which has been made to determine whether any of the known radio stars exhibit similar variations of intensity.

The present observations were made on a wave-length of 3·7 m. with an interferometer aerial which has already been described[1]. This system employs two fixed aerials, each of which has a large aperture in an east–west direction and a small aperture in a north–south direction; the interferometer is therefore receptive in a narrow strip which extends along the meridian from about declination + 10° to declination + 80°. Daily observations can therefore be made of radio stars situated throughout most of the northern hemisphere. The number of radio stars which can be distinguished is limited by confusion between the traces produced by adjacent stars and not by the random fluctuations on the record. Thus, although it is only possible to locate about fifty of the most intense radio stars, other sections of the record show well-defined periodic traces due to the simultaneous reception of the radiation from two or three weaker stars. It is not possible to deduce the absolute intensity or the accurate positions of these weaker sources; but by making a detailed comparison of the records obtained each day, it is possible to detect small variations in their intensity.