

A DOUBLE RADIO SOURCE WITH A WIDE COMPONENT SEPARATION*

By F. F. GARDNER† and J. G. BOLTON†

Moffet (1964, 1965) has recently drawn attention to two double radio sources which have unusually large ratios of separation to component size. One of these, 3C 33, an interferometric double, has an angular separation of $250''$ and a component size of $16''$, giving a ratio of $16 : 1$. The distance of the parent galaxy is such that the physical separation of the two components is at least 200 kpc. The other double consists of the sources 3C 343 and 3C 343·1 (revised Third Cambridge Catalogue

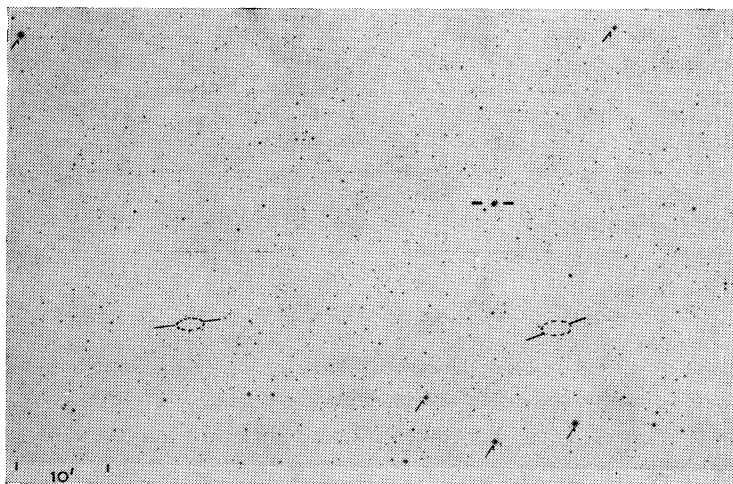


Fig. 1.—The region of the two sources 0453—30 and 0456—30, reproduced from the Palomar Sky Survey print. North-east is at the top left-hand corner. The dotted lines indicate the locations and approximate dimensions of the sources, and the solid lines through them indicate the intrinsic position angle of the linearly polarized components. The suggested parent galaxy is indicated by heavy horizontal bars. Reference stars in the Yale catalogue are shown by short arrows.

(Bennett 1962)). Their angular separation is $29'$, and the size of the components, of the order of $8''$, gives a ratio of at least $200 : 1$. The parent galaxy is not known; the nearest bright galaxy is a fourteenth-magnitude spiral lying some $8'$ NE. of the centre of the two components. Moffet argues that the two sources are a physical double from the fact that they have almost the same flux densities and similarly curved spectra. Since sources with curved spectra are rare, the close proximity of two of them with the same flux density would be unlikely to occur by chance.

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† Division of Radiophysics, CSIRO, University Grounds, Chippendale, N.S.W.

Somewhat similar arguments may be applied to the pair of sources 0453—30 and 0456—30 as listed in "The Parkes catalogue of radio sources, declination zone -20° to -60° " (Bolton, Gardner, and Mackey 1964). The sources were not resolved at the survey wavelength of 75 cm but were clearly seen as individual objects at both 11 and 21 cm wavelength. Both sources show noticeable beam broadening in

TABLE 1
DATA ON SOURCES 0453—30 AND 0456—30

Source		0453—30	0456—30
Position (1950.0)	R.A.	04 ^h 53 ^m 21 ^s	04 ^h 56 ^m 33 ^s
	Dec.	$-30^\circ 11' \cdot 3$	$-30^\circ 10' \cdot 8$
Flux density (10^{-26} W m $^{-2}$ (c/s) $^{-1}$)	11 cm	1.9	1.6
	21 cm	3.4	2.7
Spectral index		-0.9	-0.8
Percentage polarization	11 cm	6.6 ± 0.8	7.0 ± 1.0
	21 cm	4.9 ± 0.5	5.1 ± 0.8
Intrinsic position angle of linear polarization		$100 \pm 5^\circ$	$122 \pm 5^\circ$
Angular dimensions	R.A.	$\sim 3' \cdot 5$	$\sim 3' \cdot 0$
	Dec.	$< 2' \cdot 0$	$< 2' \cdot 5$

right ascension at 11 cm but no detectable broadening in declination. The sources are thought to be a physical pair for the following reasons.

- (1) Both sources have flux densities and spectral indices that are almost the same.
- (2) Both sources are elongated, and the directions of elongation are close to that of the line of centres.
- (3) Both sources are highly polarized and have the same rate of depolarization with wavelength.
- (4) The intrinsic E vectors are almost the same and approximately parallel to the line of centres.

Full data are given in Table 1. The region of the two sources, reproduced from a Palomar Sky Survey print, is shown in Figure 1. The brightest galaxy in the area is an elliptical, of apparent magnitude 13.5, at R.A. 04^h 53^m 54^s, Dec. $-29^\circ 57'$. This position is at a considerable distance from either the centroid of the two sources or the line of centres, but it does lie within a circle with the two components as diameter, as does Moffet's suggested identification for 3C 343 and 3C 343.1. If this galaxy is the parent and its absolute magnitude is similar to that of other radio galaxies, namely -21 (Bolton 1960), then its distance modulus is -34.5 and its distance, taking Hubble's constant as $100 \text{ km s}^{-1} \text{ Mpc}^{-1}$, is 80 Mpc. On this basis, the minimum spatial separation of the two sources is 900 kpc.

If the $13\cdot5^m$ galaxy is not the parent, then identification with the next brightest galaxy in the area, at least two magnitudes fainter, would imply a considerable increase in the spatial separation of the components. There always remains the slight possibility that the source is closer but has no optical counterpart, although at present satisfactory identifications have been obtained for all sources greater than a few minutes of arc in diameter.

The possibility of a third component midway between the two, or in the location of the suggested identification, was investigated at 11 cm. However, no other source with a flux density greater than $0\cdot2 \times 10^{-26} \text{ W m}^{-2} (\text{c/s})^{-1}$ was found in the area shown in Figure 1.

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