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VLA observations of low luminosity radio galaxies. IV. The B2 sample revisited

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Summary. — We present in a systematic way the observational work that has been done on two complete samples of low luminosity radio galaxies from the B2 sample. We construct two new samples, a « near » sample that includes 28 galaxies brighter than $m_{pg} = 15.7$ in an area of sky of 0.76 sterad, and a « far » sample which contains 77 galaxies brighter than $m_v = 16.5$ in an area of 0.44 sterad. Most galaxies were observed with at least one configuration of the Very Large Array at 1.4 GHz ; some sources were observed by other authors and references to the relevant articles are given. New VLA B configuration observations at 1.4 GHz were made for a number of extended sources. We discuss some problems in the data reduction due to the fact that snapshot observations produce large holes in the center of the *u-v* plane. Most of the maps presented here are a combination of the B configuration observations discussed in this paper and observations with the C configuration, which were described in a previous article in this series. Thus the problem of *u-v* coverage has been overcome almost entirely.

Key words : galaxies : radio — radio continuum.

1. Introduction.

In this paper we present in a systematic way the whole body of observational work done on two complete samples of low luminosity radio galaxies with the Very Large Array (VLA) at 1.4 GHz. Previous papers by the same authors (Parma *et al.*, 1986, Paper I ; de Ruiter *et al.*, 1986, Paper II ; Fanti *et al.*, 1986, Paper III) reported on observations with the A, B and C configurations of the VLA. Here we present new B array observations for about 25 % of the sources and give what we consider to be the most comprehensive information on the two galaxy samples, by re-analysing the whole set of data.

The different array configurations were chosen in order to observe the two samples of radio galaxies with the best possible combination, relative to their detailed structure, of resolving power, sensitivity and dynamic range attainable with the VLA in single « snap-shot » mode.

The original, purely operational, distinction between the two galaxy samples does not seem appropriate anymore, and we think it more useful to re-arrange the galaxies in a different order, as explained in section 2.

We then present in section 3 the new B array observations and discuss in section 4 the relevance of the *u-v* coverage with respect to the source structure. The results for the whole set of data are given in section 5, and comments on a few individual sources in section 6.

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2. Re-definition of the sample and observational status.

Two complete samples of elliptical galaxies identified with B2 radio sources were constructed by Colla *et al.* (1975a, 1975b), and by Fanti *et al.* (1978). For details on the identification procedure we refer to these original papers. The two samples contain a total of 113 galaxies and are complete down to the limiting magnitudes of 15.7 m_{pg} (the « bright » sample, 57 galaxies) and 16.5 m_v (the « faint » sample, 56 galaxies), the second sample covering only a fraction of the sky area where the first sample is defined. Subsequent work at radio wavelengths, first with the WSRT and then with the VLA, revealed a total of eight misidentifications (0910+35, 0916+34, 1225+26, 1358+28, 1401+35, 1506+34, 1555+30 and 1602+34). Moreover the identification of 0843+31 and 1318+34 remains uncertain ; nevertheless they are still kept in the sample for safety.

The subdivision in magnitude intervals adopted until now does not seem adequate anymore, and we judge it more useful to arrange the galaxies per sky areas having different magnitude limits.

We therefore define here :

(i) a « far » sample, in the sky region of the old faint sample (Fanti *et al.*, 1978). It includes radio galaxies down to the limiting magnitude $m_v \sim 17$ but is complete only to $m_v = 16.5$. The far sample covers an area of 0.44 steradians, and contains 77 galaxies. The area consists of three disjoint regions : (i) right ascension (R.A.) between 7 and 18:30 h, and declination (DEC) between 29° 30′ and 33°, (ii) 8 h < R.A. < 12 h, and

$34° < DEC < 40°$, and (iii) $8 h < R.A. < 17 h$, and $24° < DEC < 29°30'$;

(ii) a « near » sample, which includes galaxies brighter than $m_{pg} = 15.7$ in the remaining B2 catalogue area. This corresponds to 28 galaxies in an area of 0.76 steradians located between 0 h and 24 h in R.A. and 24° and 40° in DEC.

The average redshifts of the two samples are $z = 0.075$ and $z = 0.030$, which justifies the adopted nomenclature.

On the radio side the two samples are complete down to 0.25 Jy (at 408 MHz), although fainter radio galaxies are listed down to 0.2 Jy. Conversely, due to obscuration by sidelobes of stronger radio sources (no Clean algorithm was in use at the epoch of B2 survey) a few radio galaxies, mainly of low flux density, may have been missed in the procedure of defining the original samples. We estimate this number not to exceed 10 %. Further details are found in Meier *et al.* (1979).

Eighteen radio galaxies already well studied elsewhere were not re-observed by us with the VLA. The relevant references are given in table I. The letters « f » and « n » in the second column indicate the sample to which they belong.

The remaining 87 galaxies were mapped with a resolution as far as possible appropriate for their structures and sub-structures. All radio sources known to be smaller than ~ 2 arcmin were observed with angular resolution of 3.5 arcsec (B array, Paper I) and resolution of 1.5 arcsec (A array, Paper III). More extended sources with LAS up to 6 arcmin were observed with a resolution of ~ 13 arcsec (C array, Paper II) and ~ 3.5 arcsec (B array, this Paper). Occasionally they were also observed with ~ 1.5 arcsec resolution (Paper III) in order to study fine scale structures, like cores, jets or hot-spots.

3. Data reduction of the new B array observations.

A description of the VLA and its modes of operation can be found in Thompson *et al.* (1980). Here we only mention the points relevant to the new B array observations and their reduction, while we refer to the other papers (I, II and III) for the previous VLA data.

The observations were done in May 1985 in the single « snap shot » mode. Each source was observed for 6 to 36 min, at the frequencies of 1465 and 1665 MHz, both with a 50 MHz bandwidth. The corresponding full width at half maximum of the synthesized beam is about 3.5 arcsec at 1465 MHz. The flux densities were brought on the scale of Baars *et al.* (1977) by observing primary (3C 48 and 3C 286) and secondary calibrator sources immediately before and after each program source.

All post-calibration reduction was done using the National Radio Astronomy Observatory (NRAO) AIPS package at the Istituto di Radioastronomia in Bologna. Confusion problems were generally minor and could be satisfactorily handled by the AIPS task MX, which performs the Fourier inversion of the *u-v* data and allows an efficient Cleaning of large fields, thus removing the disturbing field sources. To improve the image reconstruction we often combined the present B array data with the existing ones obtained with C configuration, as discussed in the next section.

With few exceptions the r.m.s. noise in the final maps is between 0.07 and 0.15 mJy/beam.

A systematic analysis of polarization is being carried out and the results will be presented elsewhere.

For further details on the observing technique and on the data reduction we refer to the previous papers in this series.

The list of the newly observed sources, the observing time per source, and the resolution (FWHM of the synthesized beam) and r.m.s. noise in the final (combined) map presented here are given in table II. The last column specifies whether a B or a combined B + C map is shown.

4. The B + C maps.

As said above, we observed with the B array all galaxies previously observed with the C array (Paper II) in order to map relatively small scale structures. The two arrays cover quite different ranges of *u-v* spacings and, in particular, the missing short spacings in the B array (< 1 kλ) are three times longer than those in the C array, therefore we may expect rather different responses of the telescope to the sky brightness. Since these objects generally cover a wide range of angular scales, neither the B array nor the C array maps alone are adequate to describe them satisfactorily. Therefore in order to be able to accurately map features of both small and large angular scale we combined the fringe visibilities before the Fourier inversion. This optimizes the performances of the two arrays and compensates for the limitations of either one, in particular by a better sampling of the *u-v* plane in the overlapping short spacing region (Fig. 1). These maps are shown in figure 2 in the form of contour plots.

The consequences of missing short spacings are well exemplified by the B array map of 1116+28 (see Fig. 3), which should be compared with the B + C map of figure 2. In figure 3 the extended low brightness lobes are poorly defined and the narrow, twin jet is broken up. This is just as would be expected when short spacings are missing. However, some of the emission regions are also displaced by a significant amount : this effect is much less obvious and can only be explained as being due to both the lack of short spacings and the ambiguity intrinsic to interferometric data (i.e. the well known problem of the « principal solution and invisible distributions », Bracewell and Roberts, 1954 ; Cornwell, 1982). They both conspire to create the observed differences in this and in few other cases, while the two sets of maps are equally consistent with the B array data, i.e. they are equivalent solutions of the problem.

In the VLA observing status report of March 1986, estimates are given for the largest scale structure visible at the various frequencies and array configurations. At 20 cm they indicate 40 and 120 arcsec for the B and C array respectively for single snap shot observations. We are not far from these estimates, although the situation might become worse in case of unfavorable orientation of the baselines.

For the two sources 0844+31 and 1511+26 we have no C-array data, therefore we present here the B map only. In connection with the above discussion we are aware that some extended structure was lost in 1511+26 and much more in 0844+31 (see note to this source). Problems like those described above are not likely to occur for radio galaxies of paper I (B array only), since those sources have a much smaller angular size (three quarter are less than 1 arcmin in size) and had longer integration periods.

5. Results.

The new maps are given in figure 2. Also for 0843+41, 1457+29, 1512+30, 1726+31 we give the B-array map since the combined B + C does not add any significative information. The galaxy 1447+27 is the only one in the sample observed in C configuration only. Due to a confusing field source, it was originally thought to be larger than 2 arcmin. It has instead a small angular size, therefore it does not deserve any better observation.

Table III presents a summary of the data from papers I, II, III and from the present one. From each paper we selected the data which we judged the most significant and accurate. In some cases re-examination of the available material as a whole may have brought to a revision of a few parameters. So the reader should not be surprised to find differences here and there with respect to the previous works. The latest B array data are not presented separately, but treated as those from the previous papers. The column marked « Notes » refers to the other papers in this series where earlier maps are shown ; an asterisk after the serial number indicates that the object was described in a note in the previous article.

As in the previous papers the first line gives optical and radio information on the whole source. The following lines refer to radio sub-components. The meaning of the columns is self-explanatory.

We recall a few points.

The total flux densities were calculated by integration over the source region comprising sub-components or over the whole source. In the majority of cases they agree well with the flux densities measured at the same frequency with lower resolution, e.g. WSRT fluxes (Fig. 4). Discrepant cases have already been discussed in the previous papers of this series, or are given in the notes here. The column marked FWHM contains diameters at half maximum measured by means of a Gaussian fit for slightly resolved components ; the column marked LAS gives the angular size(s) of the lowest reliable contour on the map for more extended features. For very elongated and sometimes distorted structures (wings, jets, tails, etc.) we prefer to give only their length. Clearly angular sizes thus defined are more ambiguous since the surface brightness of these sources often gradually fades out into the background. The angular size may therefore depend on the observations and its determination is necessarily subjective. Sizes much smaller than the resolving power used for their determination (e.g. in cores and hot-spots from Paper III) may also be very uncertain. We still report them in table III to give an idea of the compactness of such features.

In spite of the new definitions given in section 2 of the « far » and the « near » samples, in the presentation of the results we keep the sample subdivision adopted in the earlier works in order to facilitate the recovery of the old data, if so desired. Figure 2 and table III are therefore split according to the former bright-faint classification, while the letters « n » and « f » in the last column of the table denote inclusion of the radio galaxy in either the near or the far sample.

6. Comments on individual sources.

0844+31. Only B array observations are available ; about 80 % of the total flux (S_t = 1350 mJy) has been lost due to the large size of the source. A map at lower resolution that represents the extended structure much better is given by Machalski and Condon (1985).

0915+32. Also this source is very extended ; about 50 % of the flux is resolved out in our observation. The extended structure is reproduced better in the WSRT map shown by Ekers *et al.* (1981).

1101+38. Our present observation only shows a slightly resolved core (map not shown). In another map at lower resolution (Machalski and Condon, 1985) extended emission was detected in an area with a diameter of about two arcmin.

1254+27. Cordey (1985) found (at a frequency of 150 MHz) emission in a region extending about five arcmin to the west and south-west of the radio source shown in figure 2.

1300+32. The faint component at R.A. = 13 00 52, DEC = 32 06 40 is most probably a separate WAT source.

1358+30. Also with the higher resolution of the B array this source remains rather amorphous (see the note in Paper II). It was completely resolved out by the A array observations (Paper III).

1511+26. Other VLA observations of this source (3C 315) at lower resolution were made by Leahy and Williams (1984).

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TABLE I. — *Objects observed by other authors.*

Name	Sample	References
0055+30 NGC315	n	Bridle et al., 1979 Willis et al., 1981 Fomalont et al., 1980
0055+26 NGC326	n	Ekers et al., 1978a
0104+32 NGC383 3C 31	n	Burch 1979 Fomalont et al., 1980 Bridle et al., 1980 Strom at al., 1983
0116+31	n	VLA calibrator
0326+39	n	Ekers et al., 1981 Bridle et al., in prep
0924+30	f	Ekers et al., 1981
1003+35 3C 236	f	Barthel et al., 1985
1217+29 NGC4278	f	Schilizzi et al., 1983
1251+27 3C277.3 Coma A	f	Bridle et al., 1981a
1256+28 NGC4869	f	O'Dea and Owen, 1985
1257+28 NGC4874	f	Jaffe and Perola, 1974 Feretti and Giovannini, 1985
1321+31 NGC5127	f	Ekers et al., 1981 Fanti et al., 1982
1350+31 3C 293	f	Bridle at al., 1981b
1502+26 3C 310	f	van Breugel and Fomalont, 1984
1615+35 NGC 6109	n	Ekers et al., 1978b Fanti et al., 1981
1637+29	f	de Ruiter et al., in prep. Parma et al., 1985
2229+39 3C 449	n	Perley et al., 1979
2335+26 NGC7720 3C 465	n	van Breugel, 1980 Eilek et al., 1984 Leahy, 1984

TABLE II. — *Observational parameters.*

Name	Obs.time min	beam arcsec	PA degrees	noise mJy/beam	Map
0828+32 4C32.25	2x16	5.0 x 4.8	37	0.15	B+C
0836+29	9	4.9 x 4.3	24	0.12	B+C
0838+32 4C32.26	9	5.3 x 4.1	5	0.12	B+C
0843+31	16	5.7 x 4.8	5	0.10	B
0844+31 4C31.32	15	4.5 x 3.6	14	0.10	B
0915+32	16	4.5 x 3.8	9	0.08	B+C
0922+36 4C34.16	9	5.3 x 4.1	7	0.23	B+C
1005+28	15	4.9 x 3.8	1	0.09	B+C
1101+38	8	5.7 x 4.6	6	0.22	B
1116+28	8	5.4 x 4.4	15	0.12	B+C
1141+37 4C37.32	2x12	4.4 x 4.3	40	0.40	B+C
1243+26	16	4.5 x 4.0	28	0.09	B+C
1300+32	25	4.4 x 3.7	27	0.08	B+C
1316+29 4C29.47	16	3.9 x 3.2	1	0.11	B+C
1357+28	12	4.2 x 3.7	5	0.09	B+C
1358+30	25	4.7 x 4.7		0.09	B+C
1441+26	25	4.8 x 4.4	15	0.09	B+C
1455+28 4C28.38	3x8	5.4 x 4.3	7	0.14	B+C
1457+29	7	4.9 x 3.9	6	0.10	B
1511+26 3C 315	16	4.5 x 3.6	9	0.48	B
1512+30	16	5.5 x 4.7	2	0.11	B
1521+28 4C28.39	24	4.7 x 3.6	-6	0.10	B+C
1528+29	3x12	4.3 x 3.5	-21	0.08	B+C
1615+32 3C332	8	5.2 x 4.1	-10	0.15	B+C
1643+27	25	4.2 x 3.4	-15	0.07	B+C
1657+32 4C32.52	6	5.4 x 4.6	-23	0.12	B+C
1726+31 3C357	12	4.3 x 3.6	-23	0.30	B

TABLE III(a). — *Observational data.*

NAME	R.A. h m sec	DEC. ° ′ ″	z	m pg	S(1.4) mJy	Size FWHM arcsec	Size P.A. deg.	LAS arcsec	Notes
0034+25	00 34 26.8	25 25 26	0.0321	14.8	122			183	n II* III*
core	26.77	26.4			5.4	1.1 x 0.5	96		
W jet					19.0			40	
SW lobe					40.0			120	
E jet					19.8			40	
E lobe					55.0			80	
0120+33	01 20 50.7	32 59 45	0.0164	13.0	70			130	n I* II*
NGC 507									
core	50.92	43			2				
E lobe					22			40 x 25	
W lobe					33			35 x 30	
0149+35	01 49 50.0	35 54 20	0.0160	14.5	78			58	n I* III
NGC 703									
core	50.02	20.4			12.7	1.2 x 0.7	44		
E jet ?					9.7			12	
E lobe					18.3			24 x 15	
W jet ?					20.0			16	
W lobe					15			24 x 15	
0206+35	02 06 39.3	35 33 41	0.0375	14.9	2050			89	n I* III
4C35.03									
core	39.35	41.6			128	1.2 x 0.2	135		
E jet					144			34	
W jet					198			33	
Halo					1580			89 x 51	
0207+38	02 07 07.1	38 57 22	0.0181	13.0	111				n I* III
NGC 828								17 x 10	
0222+36	02 22 23.9	36 56 57	0.0327	15.0	204			7 x 5	n I* III
core	23.94	56.9			187	0.5 x 0.2	48		
0258+35	02 58 35.6	35 00 31	0.0160	14.0	1815				n I* III
NGC 1167									
4C34.09									
core	35.4	32			1780	1.0 x 0.5	116		
0331+39	03 31 01.0	39 11 25	0.0202	14.2	904			68	n I* III
4C39.12									
core	00.95	23.6			222	0.5 x 0.3	154		
halo					682			68 x 31	
0648+27	06 48 54.9	27 31 18	0.0409	14.9					n I* III
core	54.84	18			152	< 0.9			
0722+30	07 22 27.5	30 03 14	0.0191	15.6	138			35	f I* III
core	27.51	14.1			27	0.7 x 0.4	144		
W lobe					57			13	
E lobe					54			11	
0755+37	07 55 09.2	37 55 22	0.0413	14.9	>1686			138	n II*
NGC 2484									
core	09.12	21.4			212	1.4 x 0.9	110		
E lobe					609			80 x 48	
W lobe					675			66 x 60	
E jet					190			48	
0800+24	08 00 16.3	24 49 02	0.0433	15.7	100			90	f I* III*
core ?					1.0				
Head					26			28 x 5	
N tail					38			84 x 9	
S tail					35			56 x 9	
0836+29A	08 36 59.1	29 59 42	0.0650	15.7	580			64	f I* III*
4C29.30									
core	59.01	41.3			21	1.0 x 0.4	23		
N lobe					155			13 x 7	
N h. spot	59.3	53			48	1.4 x 0.5	26		
S h.spot	58.39	25.7			45	0.9 x 0.6	106		
S jet					49			25	
S lobe					142			9 x 7	
S diffuse					120			34 x 24	

TABLE III(a) *(continued)*.

NAME	R.A. h m sec	DEC. ° ' "	z	m_{pg}	S(1.4) mJy	Size FWHM arcsec	Size P.A. deg.	LAS arcsec	Notes
0844+31	08 44 54.2	31 58 12	0.0675	15.5	---			300	f
4C31.32									
core	08 44 54.21	31 58 14.0			25.1	< 1.2			
N jet					15			67	
N hot spot					150			34 x 31	
S lobe					60			60 x 70	
0915+32	09 15 58.4	32 04 19	0.062	15.5	---			>270	f II*
core	58.5	20.9			10.7	< 3			
N jet					21			55	
N extention					36			~50	
S jet					20			60	
S extention					100			100	
1040+31	10 40 31.0	31 46 45	0.0360	15.5	770			54	f I III*
core	31.13	50.6			43	1.0 x 0.5	163		
S hot spot	31.53	35.0			14	1.2 x 0.7	0		
jet					30			14	
N hot spot	30.8	58			3	< 2.5			
halo					660			54 x 42	
1101+38	11 01 40.6	38 28 43	0.030	13.1	537				f
core	40.56	42.9			518	1.0 x 0.8	82		
1102+30	11 02 39.7	30 25 53	0.072	15.7	335			170	f II III
core	39.62	53.8			10	< 1			
E jet					> 15			~10	
E lobe					163			70 x 60	
W lobe					139			70 x 60	
1108+27	11 08 44.3	27 14 06	0.0331	14.6	85			72	f I* III
core	44.06	07.2			14	< 0.5			
W jet					56			40	
E jet					7			25	
1113+29	11 13 53.4	29 31 34	0.0489	15.1	1810			91	f I* III
4C29.41									
core	53.4	39			34	0.9 x 0.2	78		
E lobe					740			48 x 47	
W lobe					830			44 x 31	
W jet					88			32	
W hot-spot	51.3	35			124				
1122+39	11 22 01.4	39 02 19	0.0067	11.6	92			75	f I*
NGC 3665									
core	01.2	16			20	5.8 x 1.9	138		
E jet					38			34	
W jet					32			40	
1144+35	11 44 45.5	35 17 49	0.063	15.7	595			25	f I* III
core	45.50	47.5			568	0.4 x 0.1	28		
E jet ?					27			25	
1254+27	12 54 59.4	27 46 02	0.0249	13.6	65			34	f I* III
NGC 4839									
core ?	59.10	04.8			2.3	< 2			
N jet					25			14	
N lobe					12			24 x 14	
S jet					18			18	
S lobe					10			17 x 12	
1317+33	13 17 55.8	33 24 19	0.0379	15.0	79			17	n I* III
NGC 5098									
core	55.79	19.0			11	< 0.8			
N lobe					35			8 x 7	
S lobe					33			8 x 8	
1318+34	13 18 16.9	34 23 56	0.0232	14.8	94				n I* III
core	17.0	24 04			84	1.5 x 0.4	146		
1322+36	13 22 35.4	36 38 19	0.0175	13.9	808			53	n I III
NGC 5141									
4C36.24									
core	35.33	18.7			73	0.7 x 0.1			
N lobe					320			21 x 10	
S lobe					317			17 x 12	
N blob					< 10			~5	
S jet					88			27	
1346+26	13 46 34.1	26 50 28	0.0633	15.5	820			11 x 9	f I*
4C26.42									
1422+26	14 22 26.5	26 51 02	0.0370	15.6	679			140	f II III
core	26.47	02.3			12	< 0.7			
E jet					12			>25	
E lobe					326			50 x 40	
W jet					15			>27	
W lobe					326			60 x 45	

TABLE III(a) *(continued)*.

NAME	R.A. (h m sec)	DEC. (° ' ")	z	m_{pg}	S(1.4) mJy	Size FWHM arcsec	P.A. deg.	LAS arcsec	Notes
1525+29	15 25 39.6	29 05 28	0.0653	15.4	220			23	f I* III
N jet					44			11	
N lobe					37			11 x 8	
S jet					57			11	
S lobe					61			10 x 8	
1553+24	15 53 56.3	24 35 32	0.0426	15.4	124			55	f I III
core	56.18	32.7			53	< 1.0			
N jet					45			36	
S jet					26			28	
1610+29	16 10 36.6	29 36 52	0.0313	14.8	82			135	f I*
NGC 6086									
E lobe					28			63 x 58	
W lobe					54			77 x 39	
1621+38	16 21 16.9	38 02 17	0.0310	14.1	395			40	n I* III
NGC 6137									
core	16.81	15.0			31	1.1 x 0.4	169		
N blob	16.7	18			14	2.6 x 0.7	160		
S blob	16.8	13			21	1.6 x 1.2	20		
tail					329			35 x 15	
1626+39	16 26 55.4	39 39 36	0.0303	13.9	3255			103	n I* III
NGC 6166									
3C 338									
core	55.31	36.5			146	0.5 x 0.4	68		
W blob	54.8	37.0			33	3.0 x 1.3	76		
E lobe					1144			38 x 23	
W lobe					1120			47 x 23	
Sjet+blob	~54.5 - 57.4	~25			450			23	
SW blob	~53.5	~30			363			13	
1652+39	16 52 11.8	39 50 25	0.0337	13.7					n I*
4C39.49									
core	11.7	25			1382	0.5 x 0.5	97		
1833+32	18 33 12.0	32 39 18	0.0585	15.5	3217			170	n I*
3C 382									
core	12.0	18			194	1.3 x 0.9	59		
E lobe					1434			90 x 36	
W lobe					983			50 x 48	
E hot spot	18.0	58			526	4.7 x 4.1			
W hot spot	07.2	25			80	3.4 x 3.5	90		
1855+37	18 55 54.3	37 56 27	0.0552	14.9	273			10	n I III
N lobe	54.3	31			82	6 x 1.3	64		
central	54.3	28			54				
S lobe	54.2	24			137	2 x 1.7	44		
2116+26	21 16 20.7	26 14 08	0.0164	14.0	105			78	n I III
core	20.80	08.9			42	0.4 x 0.2	54		
N jet					16			40	
S jet					28			40	
2236+35	22 36 12.3	35 04 11	0.0277	15.0	348			47	n I III
core	12.27	09.4			6.7	0.6 x 0.4	44		
E lobe					93			19 x 15	
W lobe					76			19 x 16	
E jet					85			24	
W jet					(94)			22	

TABLE III(b). — *Observational data.*

NAME	R.A. h m sec	DEC. ' "	z	m_v	S(1.4) mJy	Size FWHM arcsec	P.A. deg.	LAS arcsec	Notes
0708+32	07 08 33.6	32 23 37	0.0672	15.8	57			8	f I III
N Lobe	33.6	42			16	1.4 x 1.0	170		
Central	33.58	37.9			22	0.6 x <.6	180		
S Lobe	20.3	33.6			20	1.4 x 0.9	160		
0828+32	08 28 20.6	32 29 37	0.0507	15.1	1300			320	f II*
E lobe					534			140 x 90	
E hot spot	31.54	30 47.3			36	8.6 x 6.6	151		
W lobe					460			170 x 90	
W hot spot	10.5	28 33			270	19 x 16	132		
0836+29	08 36 13.4	29 01 17	0.079	14.7	845			345	f II* III
core	13.56	15.3			110	< 0.5			
N jet					127			>52	
N lobe					249			85 x 75	
S lobe					366			100 x 40	
0838+32	08 38 06.8	32 35 39	0.068	14.8	530			116	f II* III
4C32.26									
N compact	06.0	45			150			7 x 6	
S compact	06.5	38			220			6 x 5	
W tail					68			110 x 22	
NE wing					50			~15	
0843+31	08 43 38.3	31 37 09	0.0665	16.5	49			130	f II*
N lobe	40	39 00			24			40 x 30	
S compact	38.07	19.1			7				
S diffuse					18				
0908+37	09 08 45.4	37 36 33	0.1040	15.5	638			51	f I* III
core	45.29	33.0			25	0.7 x 0.5	57		
N lobe					175			20 x 18	
N jet					134			23	
S lobe					254			18 x 18	
S jet					50			18	
0913+38	09 13 39.1	38 30 41	0.0711	15.7	343			42	f I III
E lobe					145			16 x 14	
E jet					15			>8	
W lobe					143			20 x 11	
W jet					47			17	
0922+36	09 22 34.3	36 40 05	0.1125	15.6	729			167	f II* III
4C36.14									
core	34.16	36 40 04.6			9	< 0.4			
S bright	34.3	39 35			139	7 x 4			
S diffuse					296			49 x 24	
N lobe					286			49 x 28	
1003+26	10 03 49.4	26 09 24	0.1165	16.5	69			6	f I* III
S comp	49.4	22			36	2.2 x 0.6	172		
N comp.	49.5	25			33	2.7 x 1.1	162		
1005+28	10 05 06.4	28 16 29	0.1476	16.4	90			240	f II* III*
N lobe					35			55 x 47	
N jet					9			25	
S lobe					27			80 x 30	
S jet					20			55	
1037+30	10 37 42.7	30 13 38	0.0908	16.4	360			3	f I* III
4C30.19									
core ?	42.80	38.4			260	< 1.2			
E comp	42.90	37.5			98	< 0.8			
1113+24	11 13 24.0	24 57 24	0.1021	15.0	37			~30	f I* III
N comp.					10			4	
S comp.					14			4	
N arc					13			~30	
1116+28	11 16 19.1	28 10 32	0.0667	14.3	520			260	f II*
core					<= 58				
E lobe					154			100 x 67	
E jet					32			50	
W lobe					183			100 x 60	
W jet					95			75	
1141+37	11 41 50.0	37 25 06	0.1154	16.5	2310			270	f II*
core					4.5				
N tail					175			25 x 18	
N hot spot	57.15	26 56.2			802	6.2 x 4.8	99		
S lobe					508	-		90 x 70	
S hot spot	41.79	23 41.4			548	6.2 x 2.8	35		
1204+24	12 04 34.3	24 11 06	0.0769	15.2	134			29	f I III
core	34.4	07			12	0.7 x 0.1	166		
N jet					12				
S jet					10				
ext. em.					100			30 x 25	

TABLE III(b) *(continued)*.

NAME	R.A. h m sec	DEC. ° ' "	z	m_v	S(1.4) mJy	Size FWHM arcsec	P.A. deg.	LAS arcsec	Notes
1204+34	12 05 00.5	34 09 21	0.0788	15.8	437			51	f I* III
core	00.4	22			17	0.3 x 0.2	124		
E lobe					184			31 x 24	
W lobe					160			28 x 28	
W hot-spot	12 04 58.73	34 09 38.2			46	5.7 x 2.4	45		
W " "	59.33	34.5			9	2.6 x 0.9	114		
E " "	05 01.92	07.5			21	0.9 x 0.9			
1243+26	12 43 54.6	26 43 39	0.0891	15.1	280			200	f II* III*
	52.7	42 32		16.0	200			115	
N core	54.65	43 39.7			7.7	1.9 x 0.5	34		
N lobe+plume					154			95	
N jet					50			40	
S jet					26			45	
S core	52.77	42 32.0			3.8	0.9 x 0.5			
SW comp.					192			90 x 60	
1300+32	13 00 54.4	32 06 10	(0.164)	16.5	370			~200	f II* III*
core	54.45	07.9			0.9				
W tail					211			118	
NE comp.					140			33 x 18	
N comp.					19			12 x 8	
1303+31	13 03 28.3	31 10 20	0.1816	16.7	68			16	f I* III
head	28.18	20.2			14	1.1 x 0.7	51		
body					38	1.6 x 0.4	23		
tail	27.9	12.0			16			7 x 3	
1316+29	13 16 43.0	29 54 20	0.0728	15.0	1171			175	f II*
4C29.47									
core	43.14	20.0			42	3.4 x 2.1	21		
E lobe+jet					576			115 x 105	
W lobe+jet					475			100 x 85	
1339+26					340				f I* II* III
head tail	13 39 30.7	26 37 20	0.0757	14.2	320			200	
WAT	29.4	35	0.0688	14.2	21			15	
1347+28	13 47 56.3	28 31 34	0.0724	15.2	194			47	f I* III
core	56.4	35			3.3	< 1.0			
E lobe					98			18 x 15	
W lobe					93			17 x 13	
1357+28	13 57 45.2	28 44 28	0.0629	14.6	251			139	f II* III
core	45.16	30.1			6.8	1.6 x 0.6	180		
N jet					38			28	
S jet					26			26	
S lobe					80			43 x 40	
N lobe					100			47 x 31	
1358+30	13 58 33.4	30 36 21	0.1104	15.8	374			150	f II* III
diffuse					280			150 x 120	
N head	31	36.8			92			20 x 20	
1430+25	14 30 26.9	25 08 28	0.0813	15.7				50	f I* III
4C25.46									
head					127			[illegible]	
tail					95			12 x 10	
1441+26	14 41 53.9	26 13 51	0.0621	14.3	241			230	f II
E lobe					152			120 x 50	
W lobe					89			80 x 50	
1447+27	14 47 17.8	27 59 13	0.0306	14.2					f II*
	17.8	14			60	3.6 x 1.4	27		
1450+28	14 50 23.8	28 10 05	0.1265	16.5	111			53	f I* III
core	23.86	06.5			6	0.9 x 0.2	129		
E lobe					27			20 x 14	
E jet					39			10	
W jet					15			17	
W lobe					24			18 x 15	
1455+28	14 55 45.5	28 44 16	0.1411	16.6	773			213	f II
4C28.38									
core	45.43	17.8			5.0	7 x 6	26		
NE lobe					260			95 x 70	
N hot spot	49.8	45 35			153	7.8 x 6.3	125		
SW lobe					249			90 x 60	
S hot spot	41.2	42 53			111	4.3 x 1.9			
1457+29	14 57 34.4	29 15 23		17.2	336			81	f II III
Central	34.32	25.7			29	4.4			
N lobe					154			54 x 33	
S lobe					153			42 x 33	

TABLE III(b) (*continued*).

NAME	R.A. h m sec	DEC. ° ' "	z	m_v	S(1.4) mJy	Size FWHM arcsec	Size P.A. deg.	LAS arcsec	Notes
1511+26	15 11 30.8	26 18 32	0.1078	16.7					f
	30.8	39			1804			125	
3C 315									
core	15 11 30.8	26 18 39.3			315	2 x 1			
N lobe					547			78 x 30	
S lobe					842			68 x 35	
1512+30	15 11 59.4	30 19 54	0.0931	15.4	73			22	f II*
N lobe	59.44	20 01.8			38	9 x 7	8		
S lobe	59.48	19 45.0			35	9 x 6	163		
1521+28	15 21 21.4	28 48 07	0.0825	15.4	685			200	f II III
4C28.39									
core	21.41	08.2			44	0.7 x 0.1	142		
jet					90			50	
N lobe					198			32 x 27	
S lobe					350			86 x 30	
1527+30	15 27 43.3	30 52 49	0.1143	15.0	81			45	f I* III
central	43.3	50			22	1.3 x 0.5			
E tail					28			34 x 10	
W tail					33			31 x 7	
1528+29	15 28 05.9	29 10 43	0.0843	15.1	207			235	f II* III*
core	05.89	43.1			2.7	< 1.0			
W hot spot	27 57.84	19.4			1.3	1.1 x 0.7			
SW jet					23			52	
SW lobe					90			72 x 66	
NE lobe					50			50 x 37	
NE jet					>40			79	
1557+26	15 57 45.9	26 04 51	0.0442	14.3					f I
core	46.0	51			31	2.3 x 1.1	64		
W source	44.0	58			118	0.8 x 0.3	102		
1609+31	16 09 42.3	31 10 41	0.0944	15.6	141			25	f I III
N lobe					87			10 x 10	
S lobe					61			10 x 9	
1613+27	16 13 28.9	27 34 21	0.0647	14.9	233			31	f I III
core	28.75	22.2			11	1.5 x 0.3			
S lobe					66			15 x 9	
N lobe					67			11 x 11	
S jet					40			15	
N jet					25			12	
1615+32	16 15 46.8	32 29 49	0.1520	16.7	2547			91	f II
3C 332									
core	46.96	50.5			11	1.2 x 1.1			
N hot spot	47.43	30 24.1			51	1.2 x 0.9	102		
N lobe					955			25	
S lobe					750			30	
bridge					710			50 x 30	
S jet ?					90			30	
1638+32	16 38 34.9	32 11 09	0.1398	15.8	218			60	f I III
core	34.98	09.9			56	0.8 x 0.2	89		
jet					56			17	
tail					66			60	
1643+27	16 43 26.6	27 25 30	0.1017	15.8	110			140	f II III
core	26.63	30.3			5	1.5 x 1.0	17		
N jet					13			14	
N lobe					45			26 x 22	
S hot spot	25.90	07.0			5.5	2.4 x 1.6			
S lobe					42			30 x 8	
1657+32	16 57 08.6	32 34 04	0.0631	15.6	105			65	f II
core	08.28	06.6			6.8	2.6 x 1.2	174		
Ext. emis.					98			87 x 54	
1658+32	16 58 18.7	32 39 37	0.102	16.1	136			90	f I* II
head	58 18.6	39 32			45	14 x 4	4		
tail					91			60	
1658+30A	16 58 48.9	30 12 32	0.0351	15.1	571			160	f II* III*
4C30.31									
core	48.94	33.0			59	< 1.0			
W jet					116			48	
E Lobe					184			80 x 60	
W Lobe					109			70 x 60	

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TABLE III(b) *(continued)*.

NAME	R.A. h m sec	DEC. ° ' "	z	m_v	S(1.4) mJy	Size FWHM arcsec	P.A. deg.	LAS arcsec	Notes
1726+31	17 26 27.4	31 48 25	0.167	16.5	2691			107	f II III
3C 357									
core	27.32	24.3			7.4	3.2 x 1.2	136		
E lobe					1317			51 x 26	
W lobe					1367			43 x 34	
1736+32	17 36 45.2	32 57 36	0.0741	15.1	129			42	f I* III*
E comp					50				
core	45.06	38.9			14	< 1.7			
Twin jets					30			>17	
W comp					40			18 x 12	
1747+30	17 47 56.3	30 18 55	0.1297	16.7	49			98	f I* III
core	56.30	56.3			4.5	< 1.0			
N jet					13			19	
S lobe					29			43 x 20	
1752+32	17 52 44.5	32 34 45	0.0449	14.3	127			95	f I III
Bright jet	44.4	44			27	~ 4			
E jet					35			20	
W jet					65			45	
1827+32	18 27 04.9	32 17 59	0.0659	15.1	331			360	f II* III
core	05.1	18 01.9			26	1.0 x 0.3	75		
E jet					13			70	
NE Lobe					84			150 x 45	
W jet					16			33	
SW Lobe					192			115 x 105	

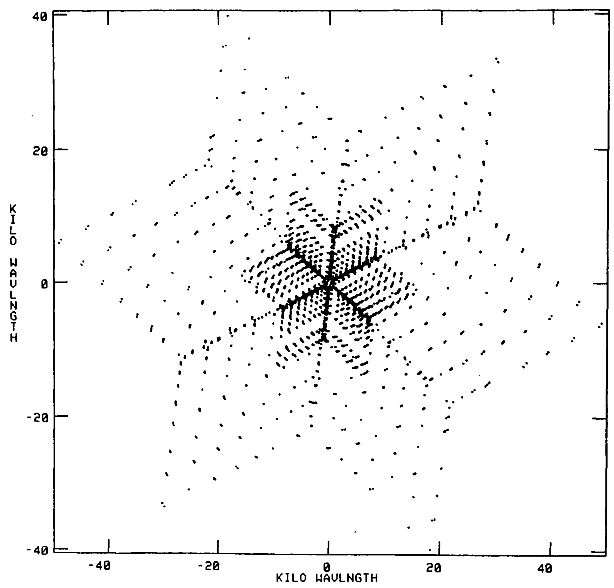


FIGURE 1. — Example of *u-v* coverage after combining B and C configuration data. The points in the inner part of the *u-v* plane come from the C data, those in the outer part from the B data.

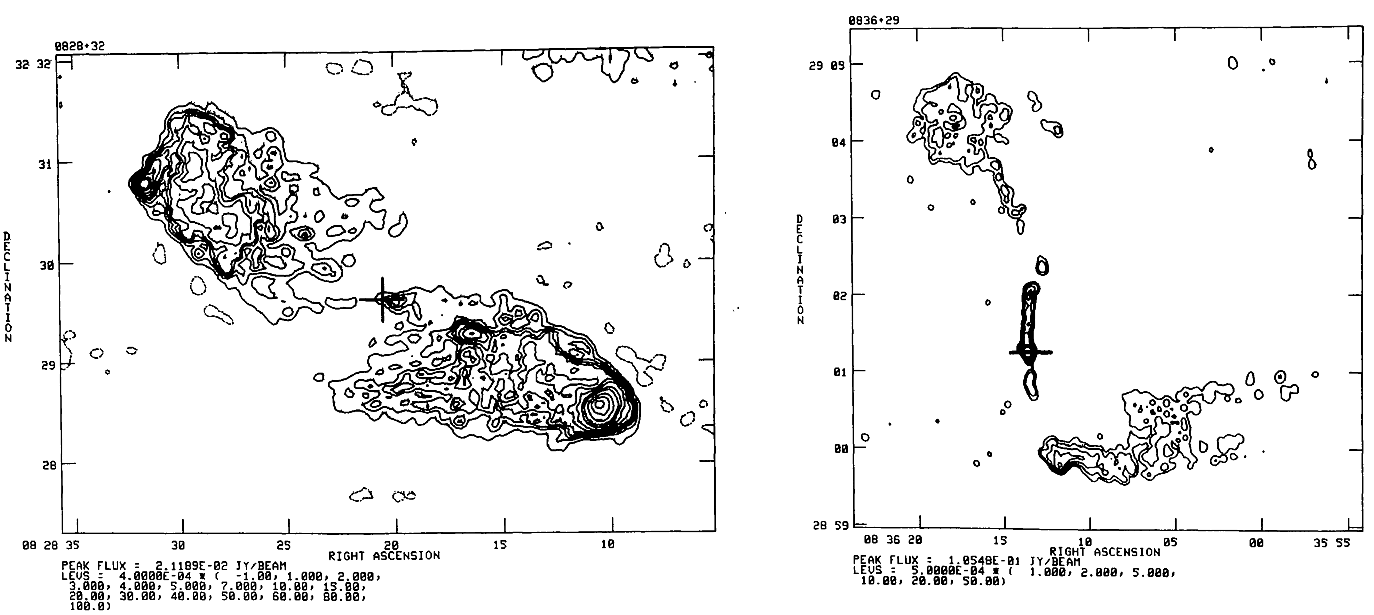


FIGURE 2. — Contour plots of the radio maps. The cross in each plot represents the optical position of the galaxy.

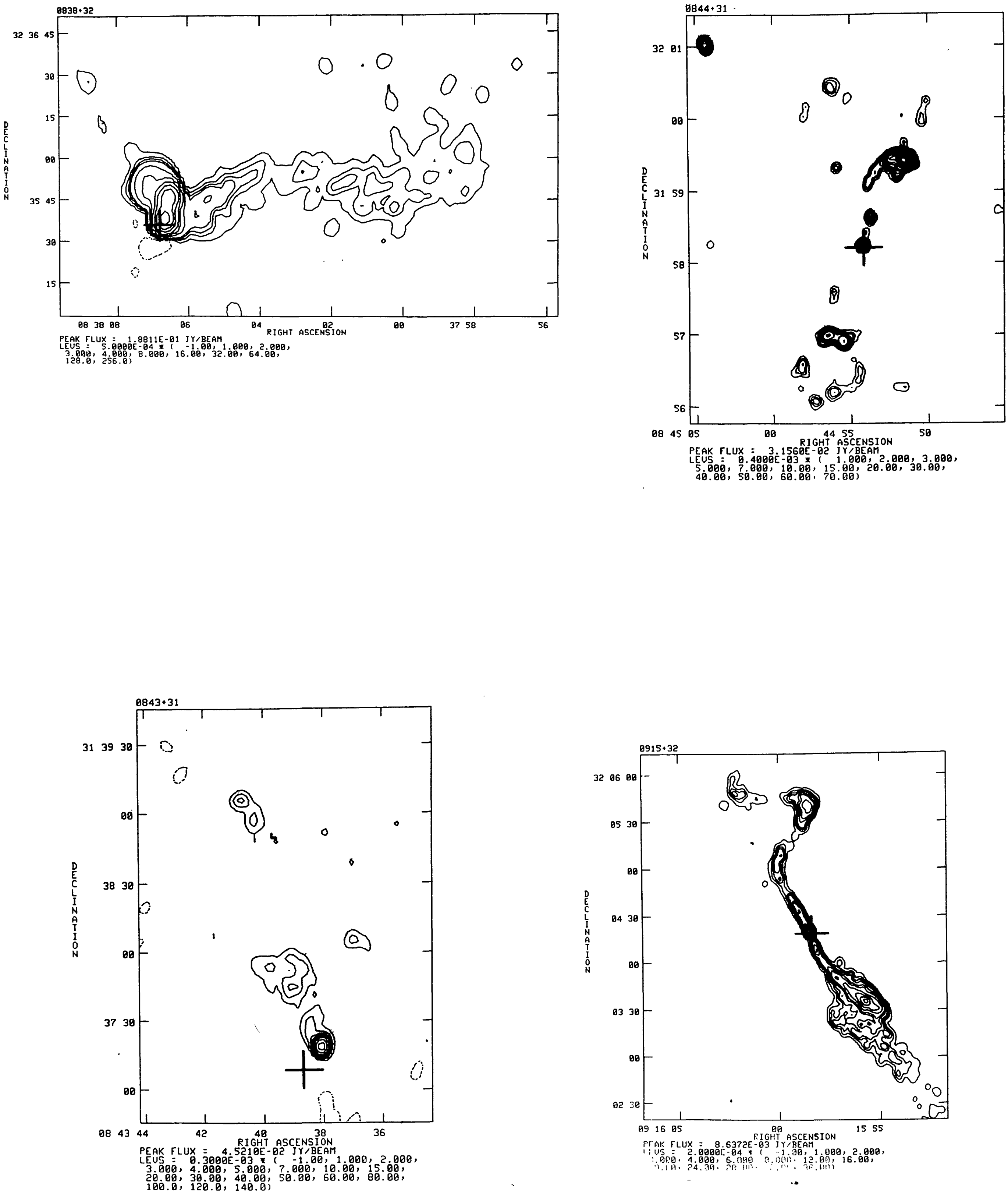
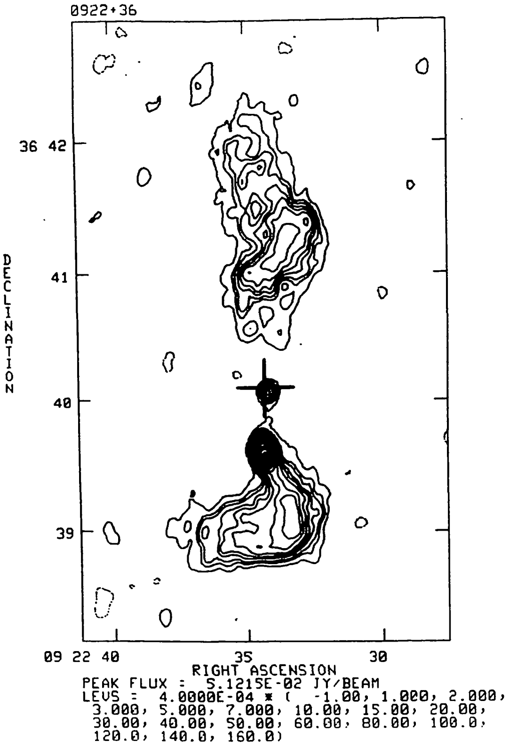
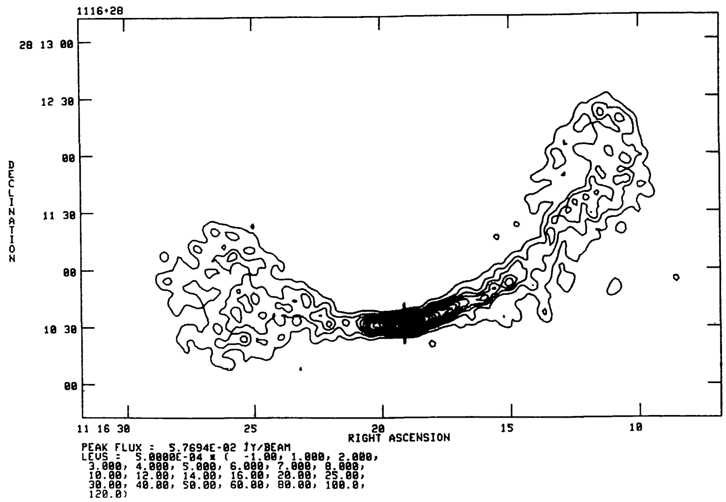
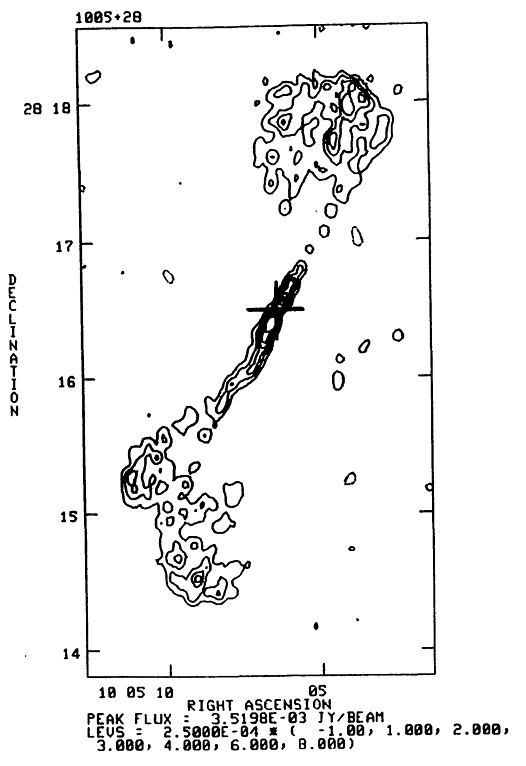


FIGURE 2 *(continued)*.







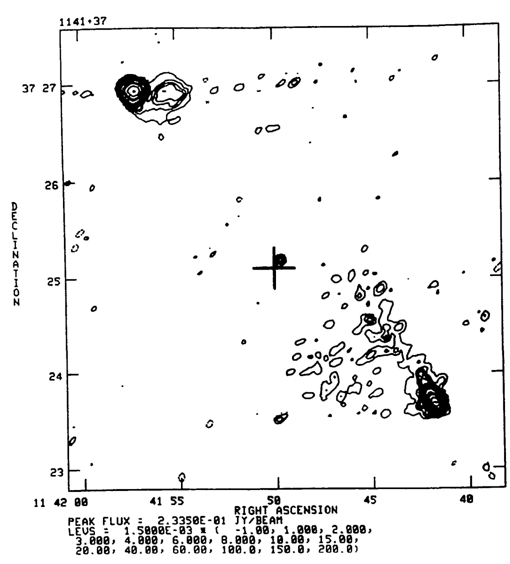


FIGURE 2 *(continued)*.

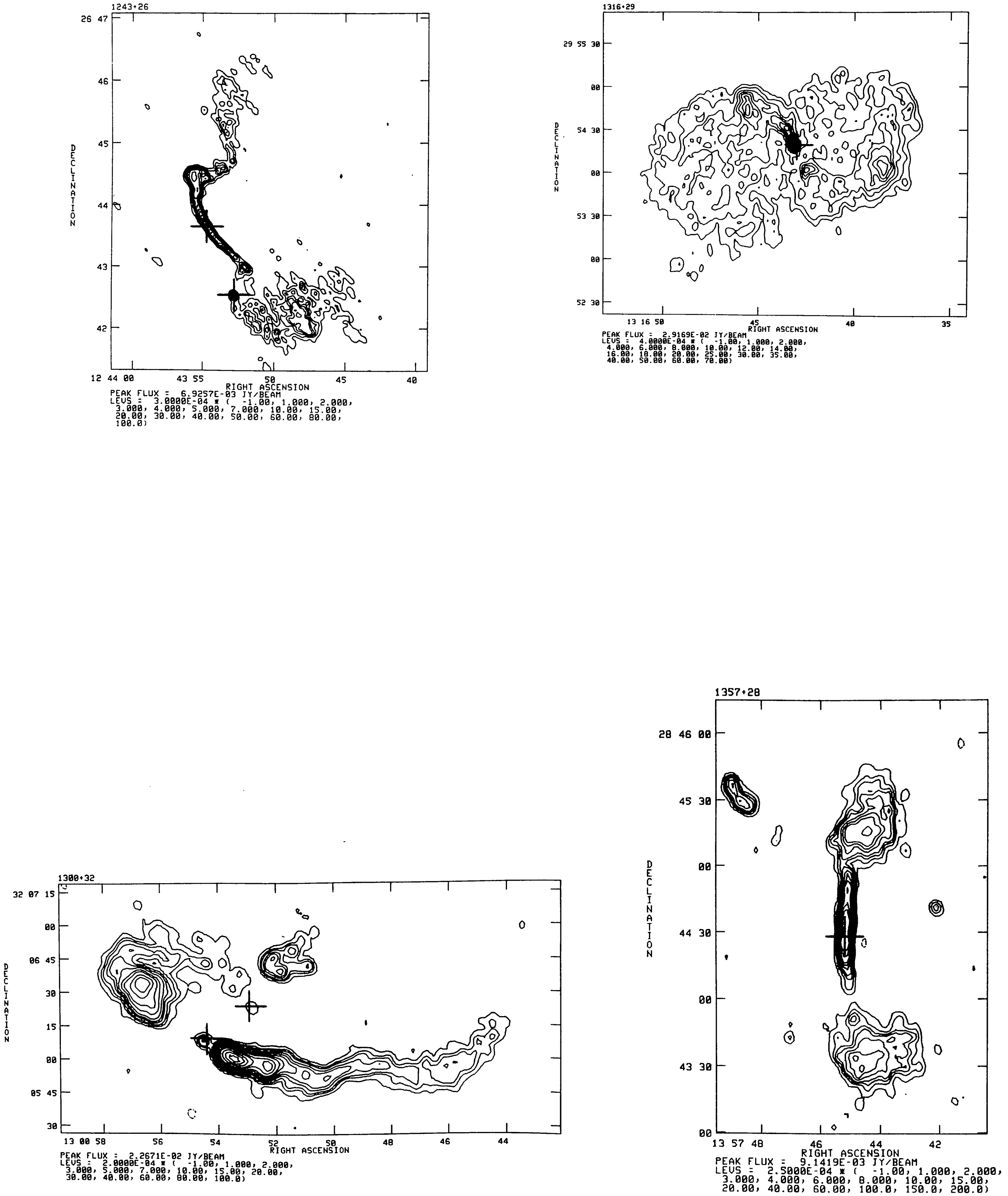
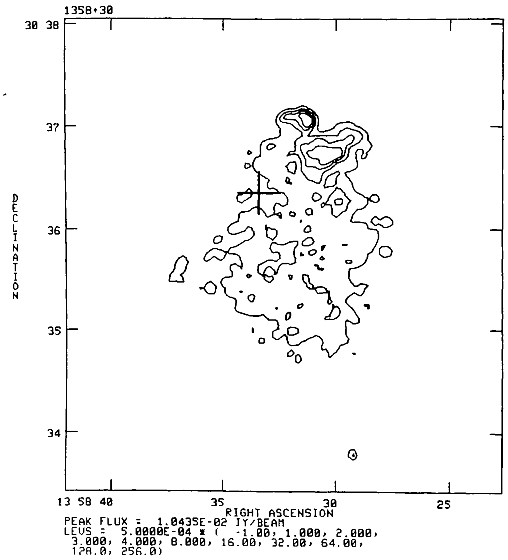
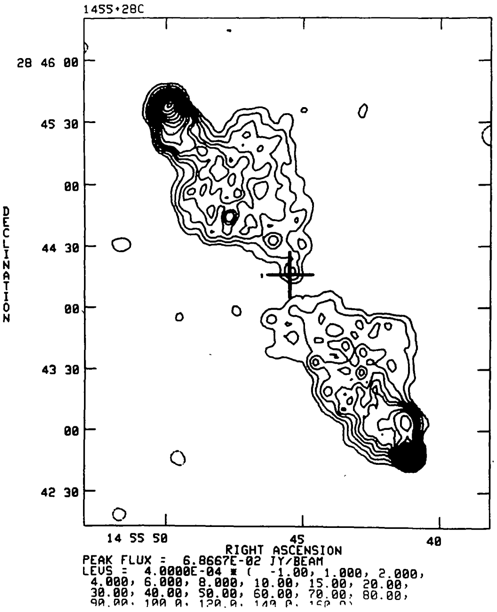
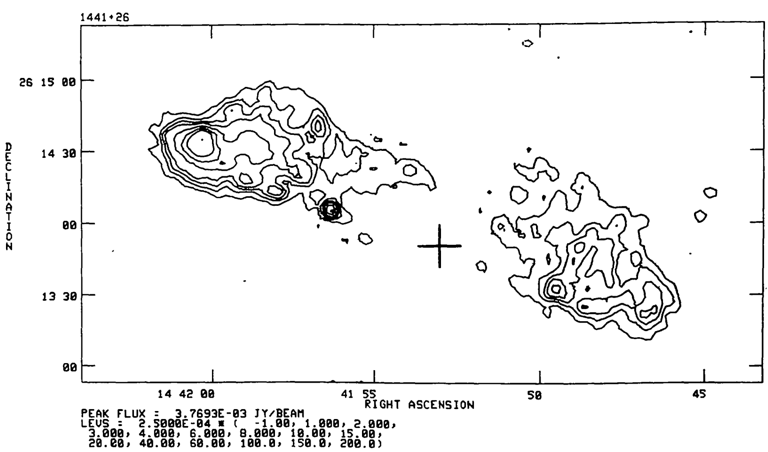


FIGURE 2 *(continued)*.







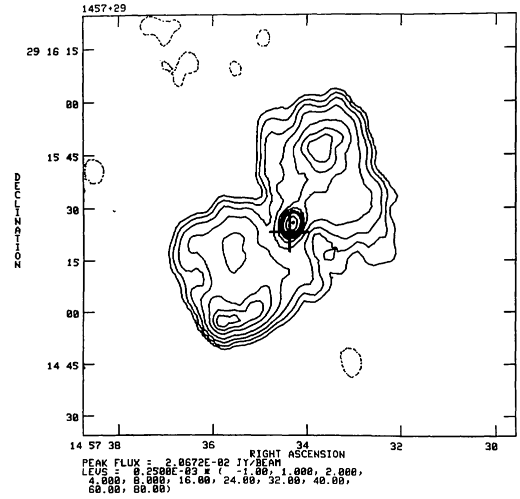
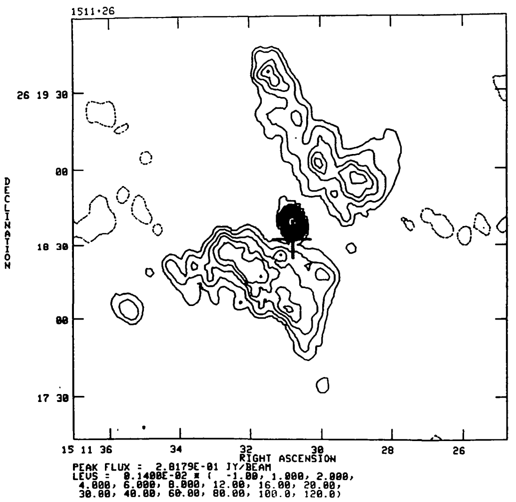
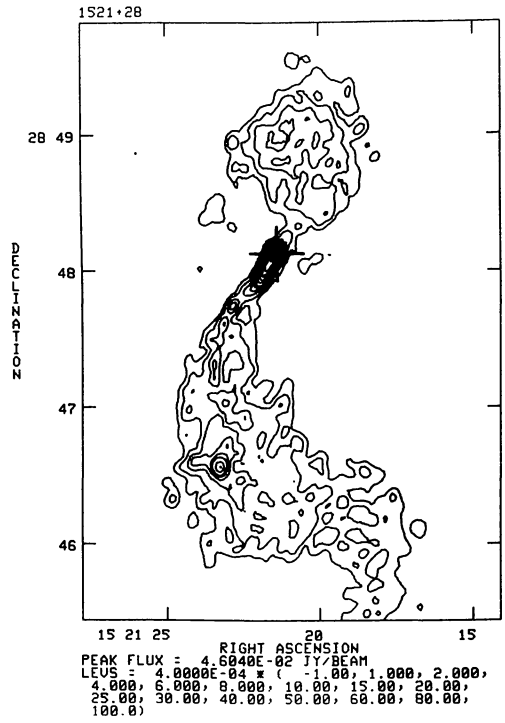
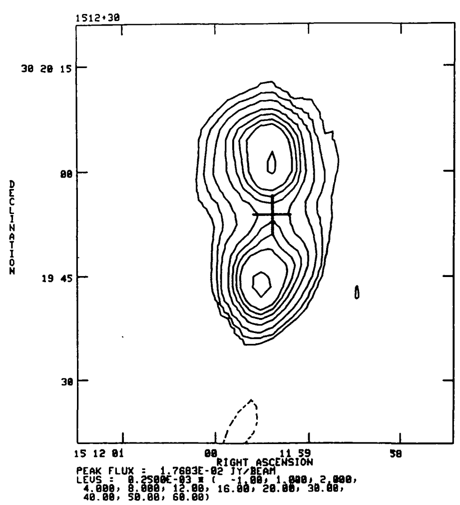


FIGURE 2 *(continued)*.







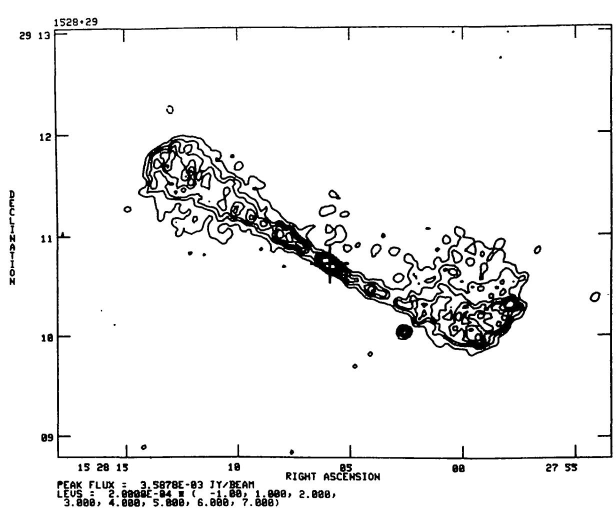


FIGURE 2 *(continued)*.

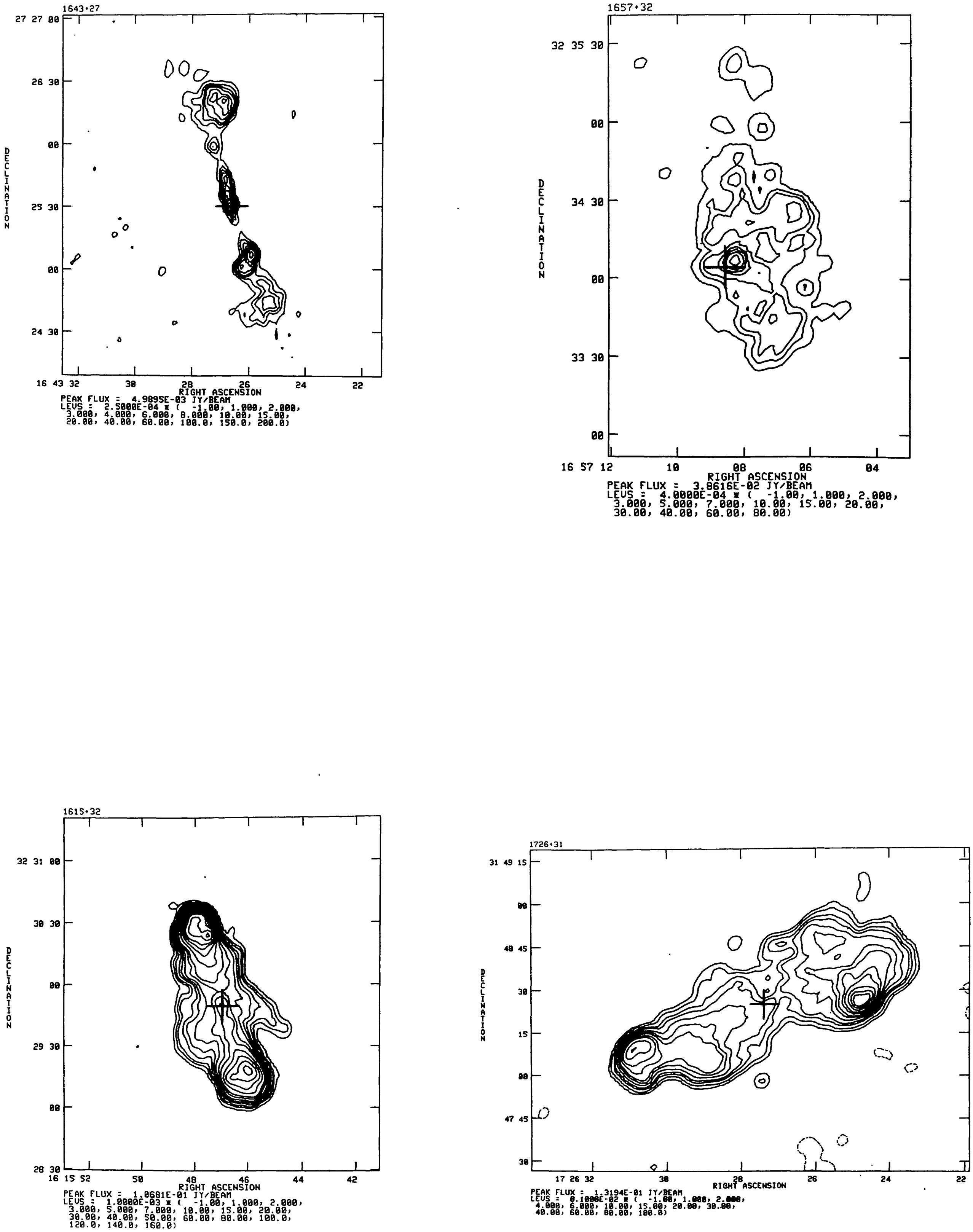


FIGURE 2 *(continued)*.

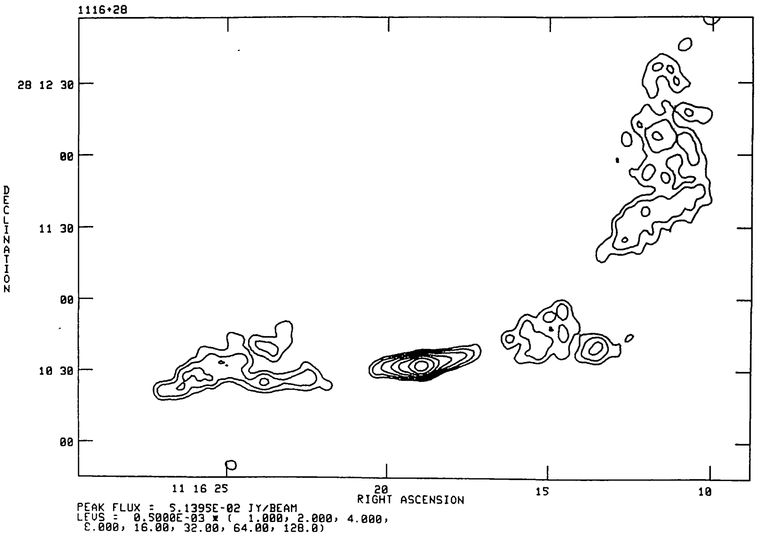


FIGURE 3. — B array map of 1116+28. The outer structure is not only broken up and detached from the core, but also shifted in position with respect to the B + C map shown in figure 2.

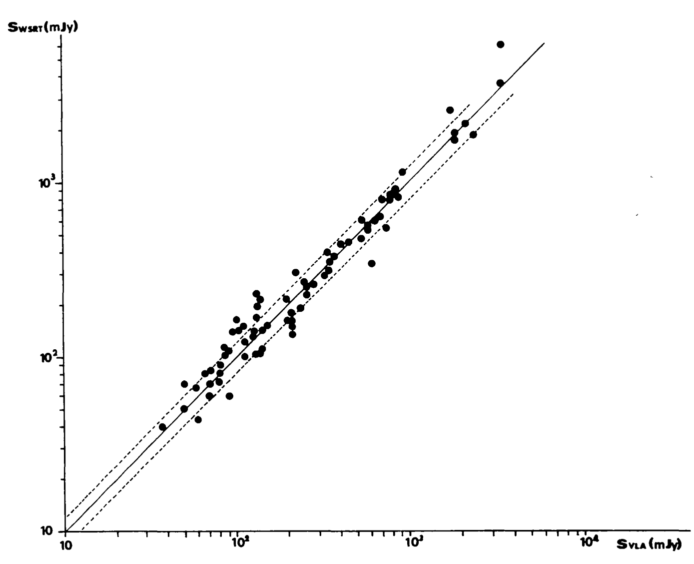


FIGURE 4. — Comparison of VLA with WSRT flux densities. The broken lines represent a flux difference of 20 %.