

VLA observations of low luminosity radio galaxies. II. Sources with angular size larger than two arcminutes

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Summary. — We present VLA observations of 35 radio sources selected from two samples of low luminosity B2 radio galaxies. All 35 sources are more extended than 2 arcmin and were observed at 20 cm with the C-configuration of the VLA, the angular resolution being about 13 arcsec. The present data, together with the observations presented in Parma *et al.* (1986, in press), cover about 80 % of the two B2 samples. The remaining 20 % consists mainly of well studied sources (e.g. 3C 31, 3C 310), so that mapping with high resolution at 20 cm of the total sample may now be considered essentially complete. We describe first the reduction procedure and discuss the quality of the radio maps. The dynamic range in the final CLEANed maps is usually around 100 : 1 or better. We give in separate tables the observational parameters and intrinsic properties derived for each source. We present contour maps for all sources, but in addition also radio photographs for sources with complicated structures that are not easily recognized from the contour maps. Information on individual sources is provided, particularly in case of interesting structures.

Key words : radio galaxies.

1. Introduction.

Many B2 radio galaxies have been observed by us at high angular resolution with the VLA. These observations were carried out at 20 cm with the VLA in the B configuration (Parma *et al.*, 1986, in press, Paper I) and in the A configuration (Fanti *et al.*, 1986, Paper III).

Several other B2 radio galaxies have an angular size larger than 2 arcmin, which makes them less suited for observation with the A and B-configurations, since significant portions of such sources would be resolved out. We therefore selected the extended sources for observation with the C-configuration (always at 20 cm wavelength) and give the results in the present paper.

The radio sources discussed here and in paper I comprise about 80 % of all sources in the two complete B2 samples (defined in Colla *et al.*, 1975, — the « bright » sample ; and Fanti *et al.*, 1978, the « faint » sample). The remaining 20 % consists of well studied sources, which have been discussed in great detail by various authors, and of a few misidentifications. It falls beyond the scope of the present article to redefine and rediscuss the entire collection of B2 low luminosity radio galaxies, but we intend to do so elsewhere in the near future.

Very little radio data existed for sources of the faint B2 sample, which happen to be on average more extended

than two arcminutes. The new observations presented here remedy this lack of information completely and open the possibility to perform a statistical study of the properties of low luminosity radio galaxies on the basis of about 100 objects.

In section 2 we discuss the selection of the 35 sources that were observed with the VLA C-configuration and the data reduction procedure.

In section 3 we give the results in the form of radio contour plots (and some radio photographs) and of tables, in which the observed and intrinsic radio source parameters are summarized.

Finally, in section 4, comments are given on a number of sources.

2. Observations and data reduction.

A description of the VLA and its modes of operation can be found in Thompson *et al.* (1980).

We selected 35 sources from the two B2 samples, almost all having an angular size larger than two arcmin, for observation at 20 cm with the C-configuration of the VLA. Three sources (0120+33, 1339+26 and 1658+32) were already included in paper I, since they had been observed also with the VLA B-configuration. Six more sources (0034+25, 0755+37, 1102+30, 1658+30, 1422+26 and 1827+32) were also observed with the B-configuration, but we present both the high and low resolution data for

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the first time here. In a few cases (1102+30 and 1658+30) the visibility data of observations done with different VLA configurations were combined and used with equal weight in the Fourier Transform. The resulting radio maps are similar in angular resolution to the maps made with the high resolution data only, but reproduce much better the extended, diffuse regions. Thus the advantage of such combined maps is that they show together high and low resolution features.

The VLA is now capable of observing simultaneously at two (not too different) frequencies. The B-configuration observations were done before this possibility existed and only one observing frequency (1465 MHz) was used. The C-configuration observations were done at 1435 and 1665 MHz. In the following we usually refer only to the 1435 MHz observations, unless otherwise stated.

The observations were done in May 1984. Each source was observed for a time between 10 and 40 min, at frequencies 1435 and 1665 MHz, both with a bandwidth of 50 MHz.

The resulting full width at half maximum of the synthesized beam is about 13 arcsec at 1435 MHz and proportionally smaller at 1665 MHz.

A calibration source was observed immediately before or after a program source. The flux densities were brought on the scale of Baars *et al.* (1977), using 3C 48 and 3C 286 as primary flux calibrators. Flux densities of other calibration sources were bootstrapped from the flux densities of 3C 48 and 3C 286. Raw data were checked for deviating amplitudes, which were edited out.

Post-calibration reduction was done at the VLA site, using the NRAO-AIPS package. The procedure followed was identical to the one described in paper I.

Since the field of view for 20 cm C-configuration observations is large, confusion by strong background sources sometimes complicated the reduction. These problems were overcome either by increasing the map size from the standard 512 by 512 to 1024 by 1024 pixels (always with a step of 4 arcsec per pixel), or by making small maps centered on the (known) positions of disturbing sources and cleaning these maps simultaneously with the central program source. The clean components thus obtained were subtracted in the UV plane and the process was then repeated on the resulting UV data until convergence was reached. (This powerful method was recently introduced into AIPS.)

The radio maps obtained in this way were usually the final ones: their r.m.s. noise was mostly within three times the thermal receiver noise. Several trials with self-calibration showed in general no significant improvement in the quality of the maps. Therefore self-calibration was applied only in a few cases (e.g. 0828+32).

Since we are interested mainly in the structure and strength of the radio sources at 20 cm (as in Papers I and III), we present only the 1435 MHz data; we just remark that 1665 MHz data (source parameters and radio maps) do exist.

Following paper I we list in tables Ia and Ib the observational parameters for the bright and faint samples respectively. We give the source name, the observing time per source, the FWHM of the synthesized beam and the r.m.s. noise in the final 1435 MHz map. The r.m.s. noise in the

final map is for most fields in the range 0.2-0.4 mJy/beam, which should be compared with a receiver noise of 0.1 to 0.2 mJy/beam, depending on the observing time.

Observational parameters of the VLA B-configuration data for the sources 0034+25, 0755+37, 1102+30, 1422+26, 1658+30 and 1827+32 can also be found in tables Ia and Ib.

No systematic analysis of polarization has been carried out, since the signal to noise ratio is not adequate to study the whole source sample. However, some sources do show significant polarization. These results will be presented elsewhere.

3. Results.

In the following we shall refer to the B- and C-configuration observations as high and low resolution data.

Source parameters are given in tables IIa and IIb. The organization of this table is identical to the one of table II in paper I. For the six sources mentioned in the previous section the high resolution data were used to derive parameters for cores and jets, while the low resolution data were used for the extended components. When no high resolution data exist, it is difficult to disentangle the radio core and jets from the surrounding emission. In such cases we use the term central component instead of core in table II.

In general the VLA total flux densities derived for the sources described here agree well (within 20 %) with the flux densities measured by us with the WSRT. There are four exceptions, however: 0828+32, 0836+29 and 1658+32 have a VLA flux density about 30 % lower than the WSRT flux. For 0915+32 the VLA flux is lower by even more than 50 %. Inspection of these sources on the WSRT maps reveals very extended low surface brightness regions. Considering that the shortest baseline in the VLA observations is 63 m, as compared to 36 m at Westerbork, we obviously have lost a large part of the low surface brightness flux. We decided to give in table III the WSRT radio powers for these four sources (marked by an asterisk).

One source (1555+30) was found to be a misidentification, since the optical position of the galaxy falls between two radio sources that are almost certainly unrelated; in the earlier lower resolution (WSRT) map the source was mistaken for a classical double. There is no other bright galaxy nearby that could be the optical counterpart of the radio sources; therefore 1555+30 should be excluded from the B2 samples of low luminosity radio galaxies. This source is neither given in the tables nor in the figure.

Another source (0843+31) is also likely to be a misidentification (see note), although its data and map are presented here.

In figures 1-47 we present contour maps. If also new high resolution data were available, contour maps of both the high and low resolution data, or a combination of them, are given. The high resolution maps are distinguished by the letter « H ».

A number of sources showed complicated structures that are not well visible in the contour maps. For this reason we added radio photographs of 0755+37, 0828+32, 1005+28, 1116+28, 1243+26, 1316+29, 1358+30 and

1528+29. The radio photo of 1658+30 represents a combined map from both high and low resolution data.

In tables IIIa and IIIb the intrinsic source parameters are given (except for 1457+29 which has no known redshift) rounded to the nearest integer or half-integer value. Linear sizes, internal energy density and magnetic field strength were derived as in paper I (using a Hubble constant of 100 km/s/Mpc).

4. Comments on individual sources.

4.1 THE BRIGHT SAMPLE.

0034+25

This source was observed before, with the WSRT, by Ekers *et al.* (1981). It is located in the Zwicky cluster 0034.4+2532, which has only eight galaxies brighter than $m_{pg} = 15.7$ ($M_{pg} = -19.5$ at the cluster distance). Even so, 0034+25 is a WAT source.

0120+33

In the higher resolution observation of paper I the very faint and diffuse eastern component was barely visible.

0755+37

The associated galaxy is rather isolated, the nearest galaxy with comparable magnitude being more than 15 arcmin away. Both high and low resolution maps and a radio photograph are shown in figures 4, 5 and 6. The source shows a strikingly large amount of substructure in both components; it may be another example of a «bubble blowing» object, like 3C 310 (see van Breugel and Fomalont, 1984). We have reobserved 0755+37 with the VLA, for several hours, in order to reach lower surface brightness levels. A detailed discussion of this source will therefore be presented elsewhere.

0915+32

Much flux was lost in the outermost regions of the source (compare with the maps given in Ekers *et al.*, 1981). A detailed analysis of 0915+32 can be found in Parma *et al.* (1985).

4.2 THE FAINT SAMPLE.

0828+32

Note the double structure of the lobes, best visible in the western component; there are two jetlike structures both terminating in their own hot spot (see the radio photograph in Fig. 12). Much flux and structure has been lost, as there are two more lobes located North and South (see Parma *et al.*, 1985). Other VLA observations can be found in Machalski and Condon (1985).

0836+29

The radio source is associated with the brightest galaxy in Abell 690 (see Valentijn, 1979, for WSRT data). The VLA flux density is considerably below the WSRT flux.

0838+32

This source is associated with the brightest galaxy in Abell 695. The extended structures to the south and west are clearly visible in the WSRT map discussed by Valentijn (1979), where the source gives the impression of being a Wide Angle Tail. The East-West elongated structure is not visible in the high resolution map of Machalski and Condon (1983), but does show up in our own highest resolution data (Paper III).

0843+31

This source was originally believed to be a classical double (Fanti *et al.*, 1978), the galaxy lying midway, but closer to the northern lobe. Further WSRT observations (Parma *et al.*, 1985) and the present ones, show a somewhat more complex situation. The southern component is unresolved and is likely to be a background object. The northern component is split in two, giving the appearance of a classical, edge brightened double, unrelated to the galaxy. A remaining possibility, although not very plausible, is that only the central component is associated to the galaxy, being therefore a head-tail type source.

0922+26

Another VLA map can be found in Machalski and Condon (1985).

1005+28

Note the ringlike structure of the southern lobe, visible in the radio photo (Fig. 18).

1116+28

A radio photo is given in figure 20. See also Parma *et al.* (1985).

1141+37

Although not clearly seen in our radio map, since it is only at the level of the r.m.s. noise, a giant halo does exist, which surrounds the whole source (Malumyan, 1984). The nucleus is very faint, but definitely present. A higher resolution map can be found in Machalski *et al.* (1982).

1243+26

The radio source is associated with the cluster Abell 1609. Two galaxies, whose positions are marked in figure 24 and are given in table II, lie within the radio contours (see also Valentijn, 1979, for a 610 MHz WSRT map).

1300+32

This source is associated with Abell 1667 (see Valentijn, 1979, for a study of this cluster with the WSRT). Several galaxies lie within the radio contours of this source. In figure 26 we marked the galaxy we believe to be the correct identification on the basis of our new highest resolution observations (Paper III). The identification suggested here is not the one given in Fanti *et al.* (1978), but corresponds to galaxy a in Valentijn (1979). The source's radio structure is therefore of the WAT-type. Note that in table II and III the redshift of the original identification is given. We assume that the right identification also belongs to the cluster and has the same redshift.

1316+29

Studied in detail by Condon and Mitchell (1984), in the context of the precessing beam model. A lot of fine structure is seen in the lobes (see the radio photo in Fig. 1).

1339+26

The radio source is associated with a pair of giant galaxies in Abell 1775. The faint western extension is a small WAT (see Paper I).

1357+28

The NE component is unrelated to the B2 source.

1358+30

Certainly one of the sources in the B2 samples with a most peculiar morphology. Note the optical position of the

galaxy. There are no sharp (point or jetlike) features; in fact our more recent observations with the VLA A configuration completely resolve out the whole source. The shape of this source reminds one of a galactic source, but of course this is very unlikely at this galactic latitude. Nevertheless, we consider the identification of the source with the galaxy as uncertain.

1447+27

Another source at $RA = 14^h47^m22^s.7$, $DEC = 27^\circ58'45''.1$, $S = 69$ mJy is unrelated to the galaxy. No map is given.

1512+30

The source is resolved in the north-south direction and could be a small double. Another source of 66 mJy at $RA = 15^h12^m03^s.8$, $DEC = 30^\circ23'11''$ is probably unrelated to the galaxy. No map is given.

1528+29

Note the knotty jet, well visible in the radio photo in figure 37.

1658+30

The radio galaxy belongs to a pair.

1658+32A

The source lies in Abell 2241. See Bijleveld and Valentijn (1982) for a WSRT map. Higher resolution data were given in paper I.

1827+32

See also Parma *et al.* (1985), for WSRT data.

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References

- BAARS, J. W. M., GENZEL, R., PAULINY-TOTH, I. I. K., WITZEL, A. : 1977, *Astron. Astrophys. Suppl. Ser.* **61**, 99.
 BIJEVELD, W., VALENTIJN, E. A. : 1982, *Astron. Astrophys.* **111**, 50.
 VAN BREUGEL, W., FOMALONT, E. B. : 1984, *Astrophys. J. Lett.* **282**, L55.
 COLLA, G., FANTI, C., FANTI, R., GIOIA, I., LARI, C., LEQUEUX, J., LUCAS, R., ULRICH, M.-H. : 1975, *Astron. Astrophys. Suppl. Ser.* **20**, 1.
 CONDON, J. J., MITCHELL, K. J. : 1984, *Astrophys. J.* **276**, 472.
 EKKERS, R. D., FANTI, R., LARI, C., PARMA, P. : 1981, *Astron. Astrophys.* **101**, 194.
 FANTI, R., GIOIA, I., LARI, C., ULRICH, M.-H. : 1978, *Astron. Astrophys. Suppl. Ser.* **34**, 341.
 MACHALSKI, J., MASLOWSKI, J., CONDON, J. J., CONDON, M. A. : 1982, *Astron. J.* **87**, 1150.
 MACHALSKI, J., CONDON, J. J. : 1983, *Astron. J.* **88**, 143.
 MACHALSKY, J., CONDON, J. J. : 1985, *Astron. J.* **90**, 5.
 MALUMYAN, V. G. : 1984, *Sov. Astron. Lett.* **10**, 35.
 PARMA, P., EKKERS, R. D., FANTI, R. : 1985, *Astron. Astrophys. Suppl. Ser.* **59**, 511.
 THOMPSON, A. R., CLARK, B. G., WADE, C. M., NAPIER, P. J. : 1980, *Astrophys. J. Suppl. Ser.* **44**, 151.
 VALENTIJN, E. A. : 1979, *Astron. Astrophys. Suppl. Ser.* **38**, 319.

TABLE Ia. — *Observational parameters.*

Name	Obs.time min	beam arcsec	PA degrees	noise mJy/beam
0034+25	28	16.3 x 13.5	88	0.21
	34	3.6 x 3.3	15	0.15
0120+33 NGC 507	29	17.2 x 13.2	-74	0.24
0755+37	14	12.0 x 11.8	44	0.65
NGC2484	30	3.8 x 3.4	-8	0.60
0915+32	25	13.5 x 11.4	12	0.15
1102+30	34	12.7 x 11.4	24	0.22
	37	3.6 x 3.3	-33	0.28
1422+26	15	13.5 x 12.2	-14	0.38
	31	3.8 x 3.5	0	0.14

TABLE Ib. — *Observational parameters.*

Name	Obs.time min	beam arcsec	PA degrees	noise mJy/beam
0828+32	30	17.1 x 14.6	-49	0.10
0836+29	30	13.3 x 11.8	18	0.39
0838+32	41	13.2 x 11.4	10	0.22
0843+31	12	15.5 x 14.4	54	0.28
0922+36	18	11.9 x 11.5	-41	0.29
1005+28	32	13.2 x 11.5	10	0.19
1116+28	34	13.0 x 11.6	-15	0.18
1141+37	11	13.2 x 11.8	-27	0.49
1243+26	19	13.1 x 12.0	-17	0.24
1300+32	29	12.7 x 11.4	-23	0.26
1316+29A	20	12.9 x 11.9	30	0.29
1339+26	16	13.1 x 12.1	29	0.29
1357+28	13	13.6 x 12.1	-8	0.20
1358+30	19	12.8 x 11.7	30	0.23
1441+26	16	13.2 x 12.0	-23	0.24
1447+27	10	14.0 x 12.6	0	0.35
1455+28	10	14.0 x 12.4	2	0.25
1457+29	11	13.6 x 12.3	-21	0.13
1512+30	16	13.0 x 11.8	-28	0.16
1521+28	10	13.7 x 12.2	-13	0.34
1528+29	16	12.9 x 11.9	-29	0.13
1615+32 3C332	15	12.9 x 11.7	-26	0.63
1643+27	16	13.0 x 11.9	-24	0.14
1657+32	30	12.4 x 11.2	-28	0.27
1658+30A	16	12.8 x 11.8	-33	0.45
	24	3.8 x 3.5	-8	0.32
1658+32	15	12.4 x 12.0	-38	0.43
1726+31 3C357	19	12.2 x 12.1	-44	0.55
1827+32	21	12.8 x 11.5	-24	0.21
	31	3.8 x 3.7	-30	0.20

TABLE IIa. — *Observational data.*

NAME	R.A.			DEC.		z	m pg	S(1.4) mJy	Size		P.A. deg.	LAS arcsec
	h	m	sec	°	'				FWHM arcsec			
0034+25	00	34	26.8	25	25	26	0.0321	14.8	122			183
Inn jet									27	16 x 1.7	(90)	
E tail									55			80 x 44
WS tail									40			130 x 25
0120+33	01	20	50.7	32	59	45	0.0164	13.0	70			130
NGC 507												
E lobe									27			60 x 60
W lobe									40			60 x 60
0755+37	07	55	09.2	37	55	22	0.0413	14.9	1686			138
NGC2484												
core	07	55	09.1	37	55	21			212	1.4 x 0.9	(110)	
E lobe									667			80 x 48
W lobe									675			66 x 60
E jet									132	>11 x 10	(120)	
0915+32	09	15	56.8	32	04	19	0.0620	15.5	210			334
central	09	15	58	32	04	21			18			53 x 43
N jet									50			110 x 15
S lobes									148			170 x 35
1102+30	11	02	39.7	30	25	53	0.0720	15.7	335			170
core	11	02	39.7	30	25	53			9	< 1		
E lobe									163			70 x 60
W lobe									139			70 x 60
E jet									>12	>14 x 2	(67)	
1422+26	14	22	26.5	26	51	02	0.0370	15.6	679			140
core	14	22	26.5	26	51	02			10			
E lobe									338			60 x 60
W lobe									341			65 x 65

TABLE IIb. — *Observational data.*

NAME	R.A.			DEC.	z	m _v	S(1.4) mJy	Size		P.A. deg.	LAS arcsec
	h	m	sec					FWHM arcsec			
0828+32	08	28	20.6	32 29 37	0.0507	15.1	1162				320
E lobe							429				110 x 90
W lobe							381				140 x 80
E hot spot	08	28	31.3	32 30 49			65	19.2 x 11.9	(146)		
W hot spot	08	28	10.5	32 28 33			287	18.1 x 16.7	(118)		
0836+29	08	36	13.4	29 01 17	0.0790	14.7	591				325
central	08	36	13.5	29 01 16			146	7.3 x 1.3	(20)		
N lobe							185				80 x 60
S lobe							211				100 x 20
N jet							49				44 x 7
0838+32	08	38	06.8	32 35 39	0.0680	14.8	591				128
N diffuse							66				85 x 20
N compact	08	38	06.6	32 35 42			485	11.7 x 5.5	(0)		
S lobe							41				70 x 30
0843+31	08	43	38.7	31 37 09	0.0665	16.5	49				
N lobe							24				40 x 30
S lobe							25				60 x 20
S comp.	08	43	33.6	31 35 28			54	unresolved			
0922+36	09	22	34.3	36 40 05	0.1125	15.6	639				202
central	09	22	34.2	36 40 04			9	10.4 x 11.5	(175)		
N lobe							231				85 x 40
S lobe							244				65 x 40
S compact	09	22	34.3	36 39 34			155	12.5 x 7.8	(25)		
1005+28	10	05	06.4	28 16 29	0.1476	16.4	77				230
central	10	05	06.5	28 16 24			15	26.0 x 5.2	(150)		
N lobe							35				55 x 50
S lobe							27				65 x 35
1116+28	11	16	19.1	28 10 32	0.0667	14.3	448				260
central	11	16	19.0	28 10 32			132	10.1 x 3.6	(100)		
E tail							143				95 x 75
W tail							173				130 x 60
1141+37	11	41	50.0	37 25 06	0.115	16.5	1406				270
NE compact	11	41	57.2	37 26 56			627	5.2 x 4.7	(47)		
NW compact	11	41	56.6	37 26 54			150	19.1 x 12.8	(84)		
S compact	11	41	41.8	37 23 42			522	7.0 x 2.8	(35)		
S diffuse							107				90 x 70
1243+26	12	43	54.6	26 43 39	0.0891	15.1	382				280
			52.7	26 42 32		16.0					
central	12	43	55.5	26 44 27			148				90 x 10
N lobe							57				100 x 40
S lobe							177				105 x 75
1300+32	13	00	52.9	32 06 25	(0.164)	16.9	304				165
NE lobe	13	00	56.6	32 06 32			95	14.0 x 8.7	(34)		
NW lobe	13	00	51.9	32 06 43			14	14.8 x 8.0	(119)		
S lobe	13	00	53.3	32 06 01			195				120 x 10

TABLE IIb (continued).

NAME	R.A.			DEC.			z	m	v	S(1.4) mJy	Size		P.A. deg.	LAS arcsec
	h	m	sec	°	'	"					FWHM arcsec			
1316+29	13	16	43.0	29	54	20	0.0728	15.0		1171				175
central	13	16	43.2	29	54	22				120	22.6 x 10.2	(30)		
E lobe+jet										576				90 x 80
W lobe+jet										475				90 x 65
1339+26	13	39	30.7	26	37	20	0.0757	14.2		340				198
head										231				70 x 50
tail										109				140 x 20
1357+28	13	57	45.2	28	44	28	0.0629	14.6		252				160
central	13	57	45.2	28	44	32				70				
N lobe										95				54 x 40
S lobe										87				60 x 60
1358+30	13	58	33.4	30	36	21	0.1104	15.8		330				177 x 133
1441+26	14	41	53	26	13	51	0.0621	14.3		227				210
E lobe										137				80 x 50
W lobe										90				95 x 60
1447+27	14	47	17.8	27	59	13	0.0306	14.2						
	14	47	17.8	27	59	14				60	3.6 x 1.4	(27)		
1455+28	14	55	45.5	28	44	16	0.1411	16.6		773				202
N lobe										240				100 x 65
S lobe										188				100 x 60
N hot spot	14	55	49.8	28	45	35				173	10.4 x 6.0	(29)		
S hot spot	14	55	41.2	28	42	53				172	15.3 x 3.2	(26)		
1457+29	14	57	34.4	29	15	23		17.2		309				75 x 55
N lobe										148				40 x 30
S lobe										162				30 x 26
1512+30	15	11	59.4	30	19	54	0.0931	15.4						
	15	11	59.5	30	19	53				71	23.6 x 5.2	(0)		
1521+28	15	21	21.4	28	48	07	0.0825	15.4		527				220
central	15	21	21.5	28	48	06				79	unresolved			
N lobe										133				60 x 60
S lobe										315				130 x 50
1528+29	15	28	05.9	29	10	43	0.0843	15.1		214				225
central	15	28	05.9	29	10	43				10	unresolved			
E lobe										90				105 x 60
W lobe										114				95 x 80
1615+32	16	15	46.8	32	29	49	0.1520	16.7		2290				93 x 50
3C332														
N lobe										750				35 x 15
S lobe										470				20 x 15
Bridge										1090				60 x 50
1643+27	16	43	26.6	27	25	30	0.1017	15.8		101				145
central	16	43	26.7	27	25	34				13	unresolved			
N lobe										46				58 x 58
S lobe										42				70 x 41
1657+32	16	57	08.6	32	34	04	0.0631	15.6		105				70 x 50
1658+30A	16	58	48.9	30	12	32	0.0351	15.1		571				144
core	16	58	48.9	30	12	33				69	2.3 x 1	(60)		
E lobe										184				70 x 65
W lobe										109				75 x 55
W jet										116				48 x 8
1658+32	16	58	18.7	32	39	37	0.102	16.1		136				87 x 35
1726+31	17	26	27.4	31	48	25	0.1670	16.5		2600				115
3C357														
E lobe										1300				55 x 50
W lobe										1300				55 x 50
1827+32	18	27	04.9	32	17	59	0.0659	15.1		255				355
core	18	27	05.1	32	18	02				26	2.0 x 1.5	(99)		
N lobe										72				145 x 47
S lobe										141				100 x 80

TABLE IIIa. — *Intrinsic properties.*

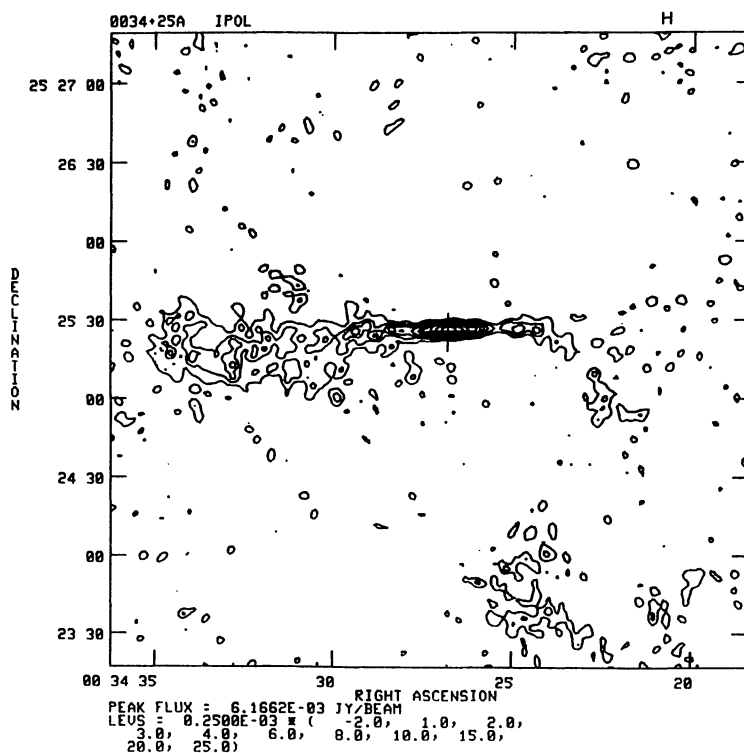
NAME	z	M pg	log P 1.4	linear resolution kpc	linear size kpc	u min E-13 erg/cm ³	H eq micro gauss
0034+25	0.0321	-20.2	23.13	7.4 x 6.1	83		
Inn jet					7.2 x 0.8	180	14
E tail					36 x 20	6.0	2.5
WS tail					59 x 11	7.0	2.7
0120+33	0.0164	-20.7	22.30	4.1 x 3.2	31		
NGC 507							
E lobe					14 x 14	4.5	2.0
W lobe					14 x 14	5.5	2.5
0755+37	0.0413	-20.7	24.49	6.8 x 6.8	79		
NGC2484							
core					.8 x .5		
E lobe					46 x 27	20	4.5
W lobe					38 x 34	17	4.0
E jet					> 6 x 5.7		
0915+32	0.0620	-20.9	24.00*	11.1 x 9.4	275		
central					44 x 36	3.0	2.0
N jet					91 x 12	12	3.5
S lobes					140 x 29	6.5	2.5
1102+30	0.0720	-20.9	24.27	11.9 x 10.7	160		
core					8 x <.9		
E lobe					66 x 56	6.0	2.5
W lobe					66 x 56	5.5	2.5
E jet					>13 x 1.9		
1422+26	0.0370	-19.6	24.00	7.0 x 6.3	72		
E lobe					31 x 31	12.5	3.5
W lobe					34 x 34	11.0	3.5

TABLE IIIb. — *Intrinsic properties.*

NAME	z	M v	log P 1.4	linear resolution Kpc	linear size Kpc	u min E -13 erg/cm ³	H eq micro gauss
0828+32	0.0507	-21.0	24.71*	8.6 x 8.0	220		
E lobe					76 x 62	5.5	2.5
W lobe					96 x 55	5.0	2.5
E hot spot					13 x 8	24	5.0
W hot spot					12 x 11	26	5.5
0836+29	0.0790	-22.4	24.73*	13.5 x 12.0	331		
central					7.4 x 1.3		
N lobe					81 x 61	5.4	2.5
S lobe					102 x 20	19	4.5
N jet					45 x 7	44	7.0
0838+32	0.0680	-22.0	24.47	11.8 x 10.1	115		
N diffuse					76 x 18	11	3.5
N compact					10 x 5	216	15
S lobe					64 x 27	6.0	2.5
0843+31	0.0665	-20.2	23.37	13.6 x 12.6			
N lobe					35 x 26	6.0	2.5
S lobe					53 x 18	7.5	3.0
0922+36	0.1125	-22.2	24.94	16.2 x 15.7	136		
central					14 x <16		
N lobe					116 x 55	9.0	3.0
S lobe					89 x 55	11.0	3.5
S compact					17 x 11	42	6.5
1005+28	0.1476	-22.0	24.25	22.2 x 19.2	387		
central					44 x 9		
N lobe					92 x 84	3.0	2.0
S lobe					109 x 59	3.5	2.0
1116+28	0.0667	-22.3	24.33	11.4 x 10.2	229		
central					8.9 x 3.2		
E tail					84 x 66	3.5	2.0
W lobe					114 x 53	4.5	2.0
1141+37	0.115	-21.2	25.30	18.3 x 16.4	375		
NE compact					7.2 x 6.5	408	21
NW compact					26 x 18	27	5.5
S compact					10 x 4	560	25
S diffuse					125 x 97	2.5	2.0
1243+26	0.0891	-22.1	24.51	14.8 x 13.5	315		
central					101 x 11	> 35	>6.0
N lobe					113 x 45	4.0	2.0
S lobe					118 x 85	3.5	2.0
1300+32	(0.164)	-21.6	24.95	23.0 x 20.7	299		
NE lobe					25 x 16	25	5.0
NW lobe					27 x 14.5	9	3.0
S lobe					218 x 18	31	5.5

TABLE IIIb (continued).

NAME	z	M _v	log P 1.4	linear resolution Kpc	linear size Kpc	u _{min} ³ E -13 erg/cm ³	H _{eq} micro gauss
1316+29 central E lobe W lobe	0.0728	-21.8	24.82	12.2 x 11.3	166 22 x 10 85 x 76 85 x 62	7.5 8.5	3.0 3.0
1339+26 head tail	0.0757	-22.6	24.32	12.9 x 11.9	194 69 x 49 137 x 20	8.5 11	3.0 3.5
1357+28 N lobe S lobe	0.0629	-21.9	24.03	11.3 x 10.1	134 45 x 33 50 x 50	8.5 4.5	3.0 2.0
1358+30	0.1104	-22.0	24.63	17.2 x 15.7	238 x 179	2.0	1.5
1441+26 E lobe W lobe	.0621	-22.2	23.97	10.9 x 9.9	173 66 x 41 79 x 50	6.5 3.5	2.5 2.0
1447+27	0.0306	-20.7	22.78	6.1 x 5.4	1.6 x 0.6	575	25
1455+28 N lobe S lobe N hot spot S hot spot	0.1411	-21.6	25.22	22.8 x 20.1	328 162 x 106 162 x 98 17 x 10 25 x 5	4.5 4.5 64 106	2.0 2.0 8.0 11
1512+30	0.0931	-21.9	23.82	15.25 x 13.8	28 x 6	31	6.0
1521+28 N lobe S lobe	0.0825	-21.7	24.58	14.5 x 12.9	232 63 x 63 137 x 53	5.5 7.0	2.5 3.0
1528+29 E lobe W lobe	0.0843	-22.0	24.21	13.9 x 12.8	242 113 x 65 102 x 86	3.0 2.5	2.0 2.0
1615+32 3C332 N lobe S lobe Bridge	0.1520	-21.9	25.75	22.2 x 20.1	160 60 x 26 34 x 26 103 x 86	56 44 10	8.0 7.0 3.5
1643+27 N lobe S lobe	0.1017	-21.8	24.05	16.3 x 14.9	182 73 x 73 88 x 52	3.0 4.0	2.0 2.0
1657+32	0.0631	-21.0	23.65	10.4 x 9.4	59 x 42	6.0	2.
1658+30A core E lobe W lobe W jet	0.0351	-20.6	23.88	10.7 x 9.9	71 1.0 x 0.5 34 x 32 37 x 27 24 x 4	7.5 6.5 80	3.0 2.5 9.3
1658+32	0.102	-21.6	24.18	15.6 x 15.1	110 x 44	8.0	3.0
1726+31 3C357 E lobe W lobe	0.1670	-22.4	25.89	22.4 x 22.3	212 101 x 92 101 x 92	22 22	5.0 5.0
1827+32 core N lobe S lobe	0.0659	-21.9	24.07	11.1 x 10.1	309 1.7 x 1.3 126 x 41 87 x 70	3.5 3.5	2.0 2.0



FIGURES 1-11. — Contour maps and radio photographs for sources from the « bright » sample (see text). High resolution maps are distinguished by the letter « H ». The restoring beam is about 13 arcsec for low resolution and 3.5 arcsec for high resolution maps. Levels are in mJy/beam. For two sources (0120+33 and 1657+32) the peak flux given below the contour map is that of another, stronger, source in the field and not of the program source. A black dot in the caption of these contour maps serves as a reminder. The cross marks the position of the optical identification.

FIGURES 12-47. — Same as above, but for the « faint » sample.

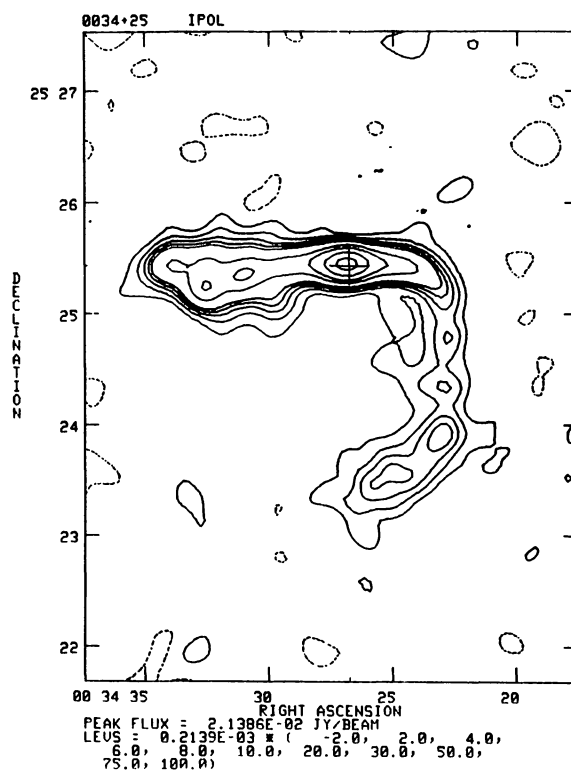


FIGURE 2.

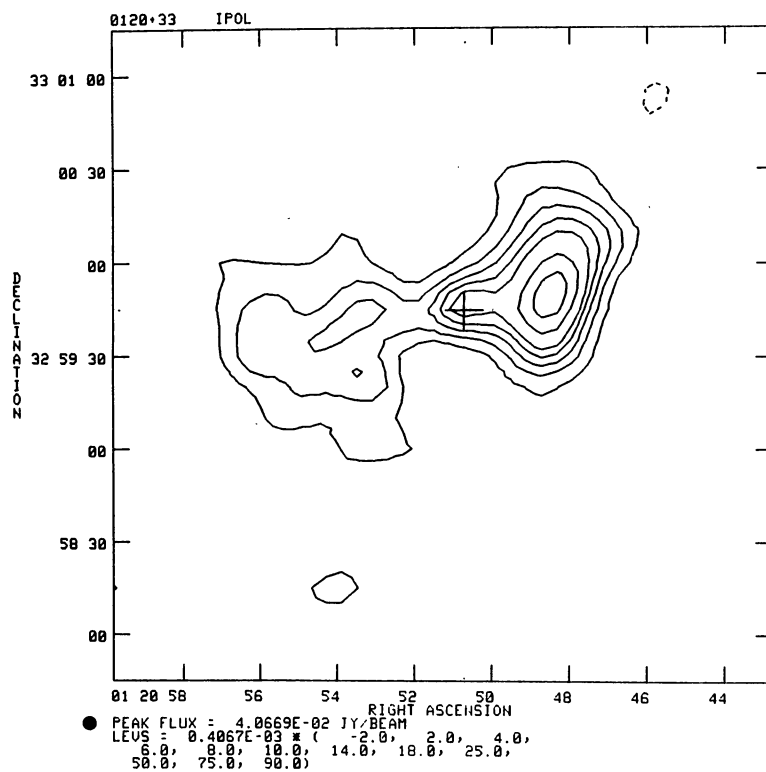


FIGURE 3.

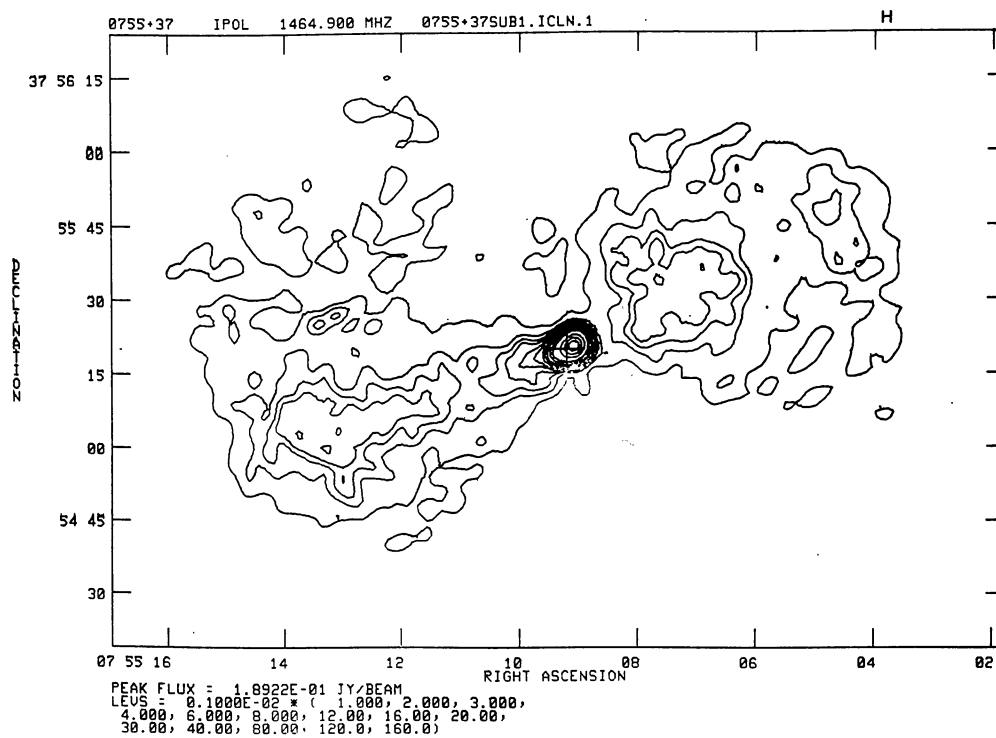
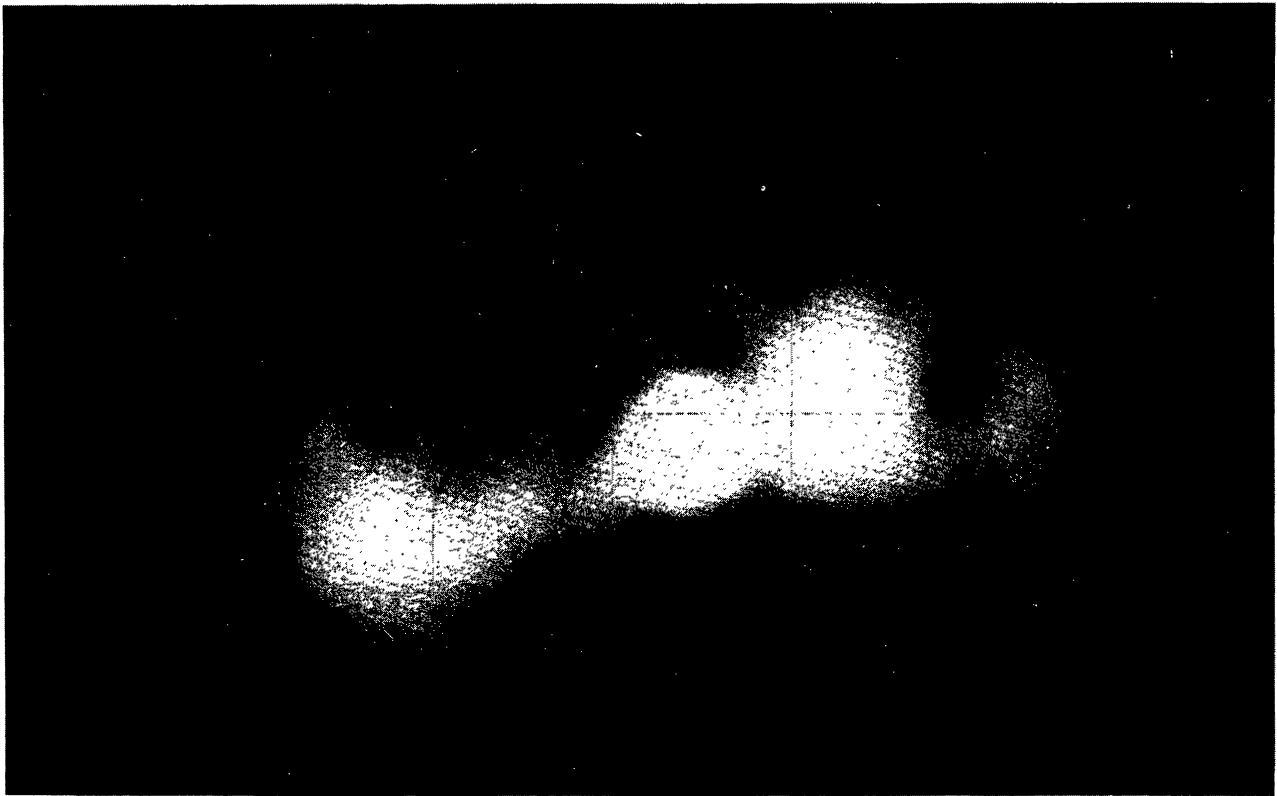


FIGURE 4.



0755 37

FIGURE 5.

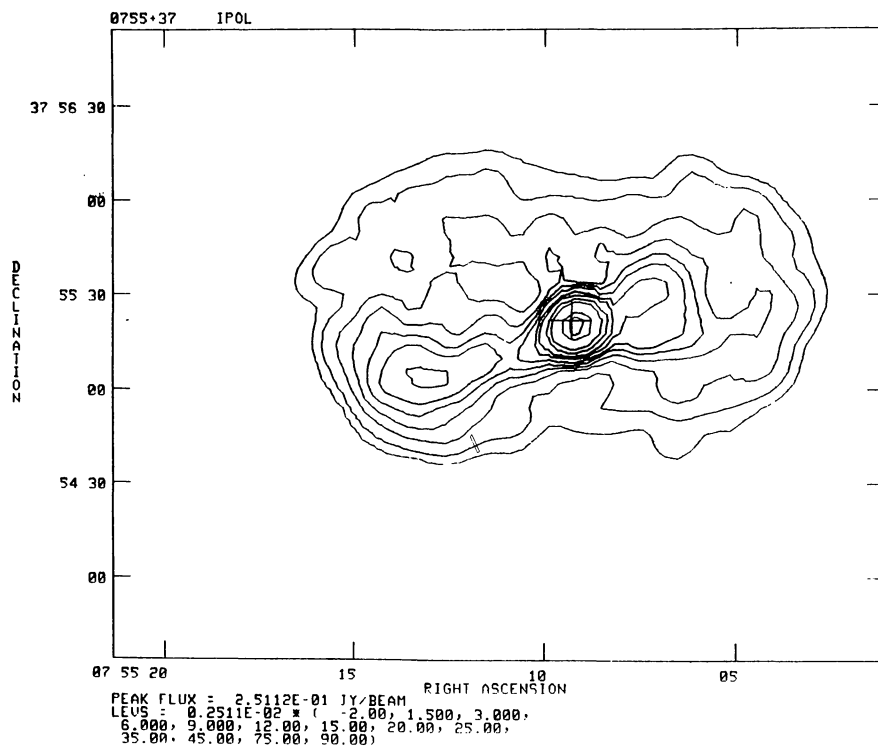


FIGURE 6.

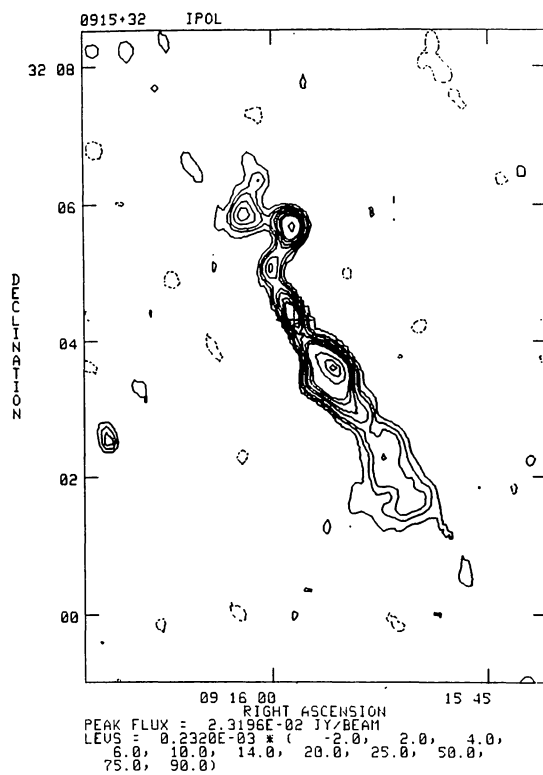


FIGURE 7.

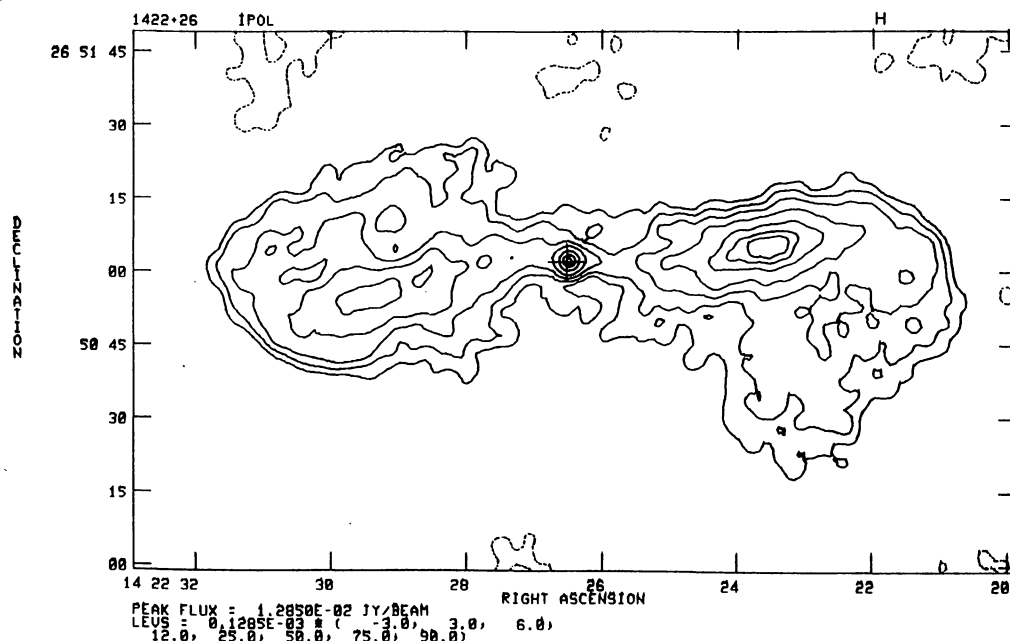


FIGURE 10.

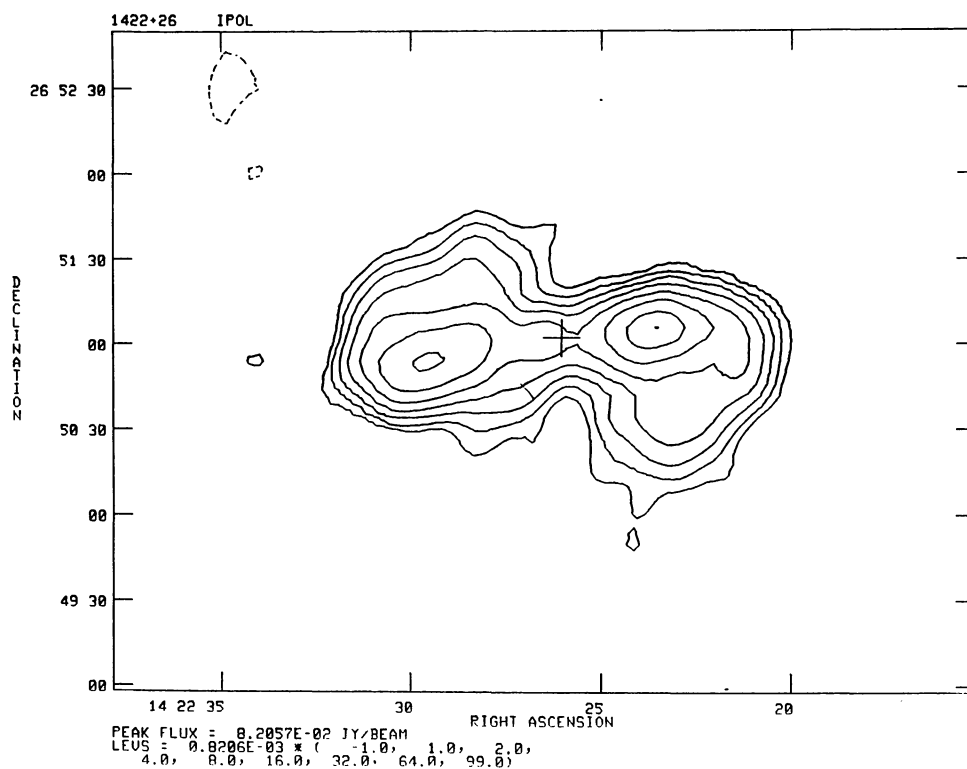
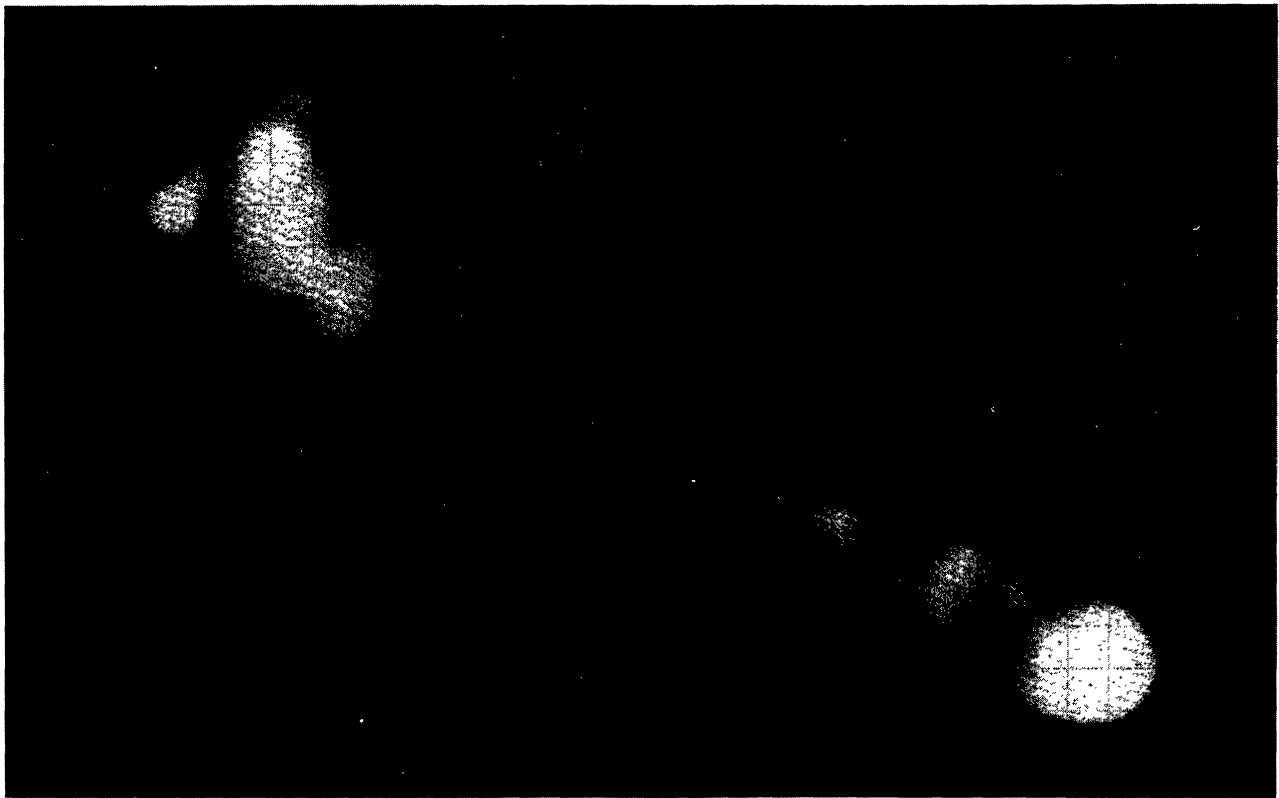


FIGURE 11.



08 28 32

FIGURE 12.

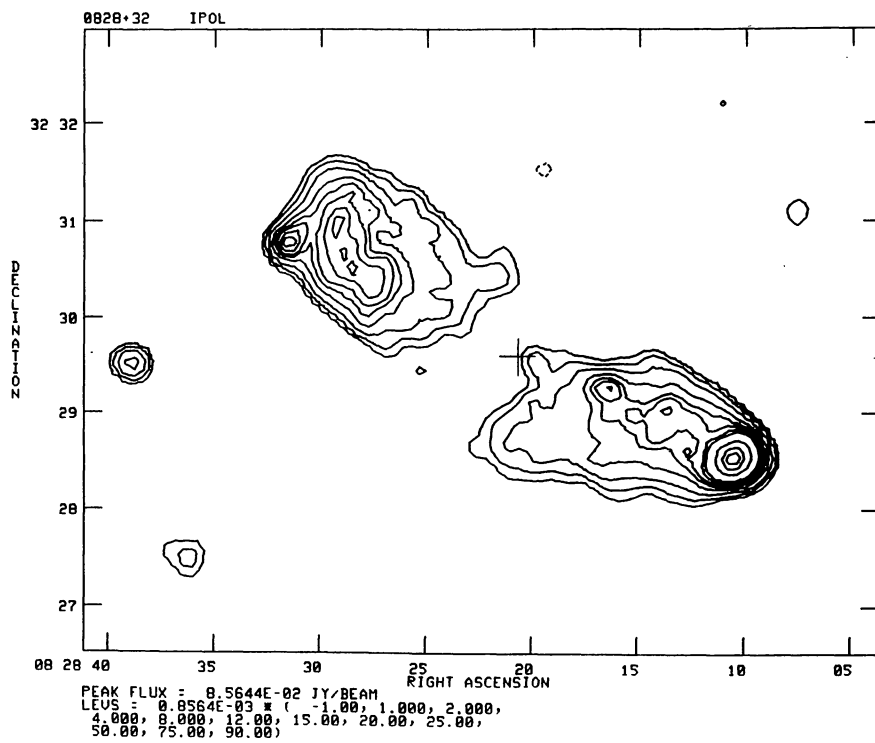


FIGURE 13.

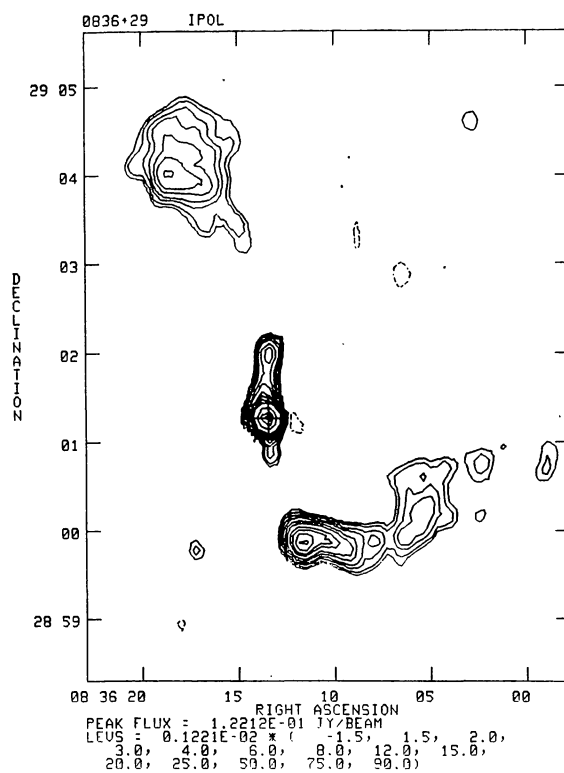


FIGURE 14.

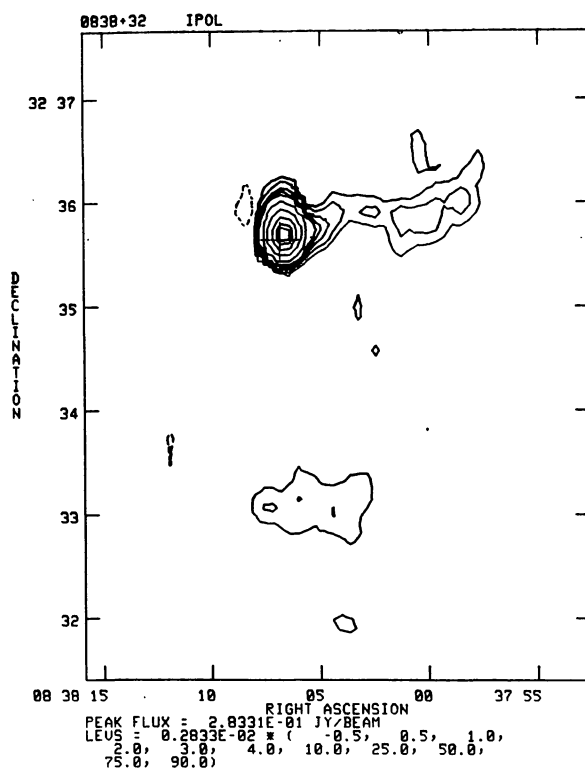


FIGURE 15.

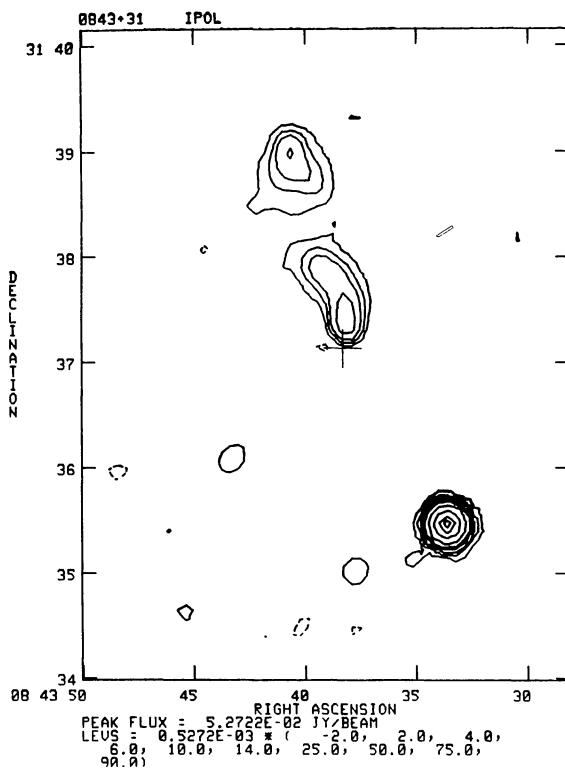


FIGURE 16.

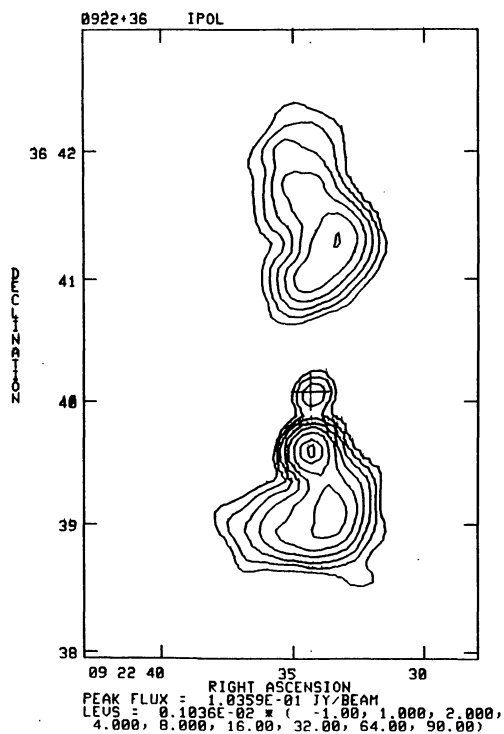
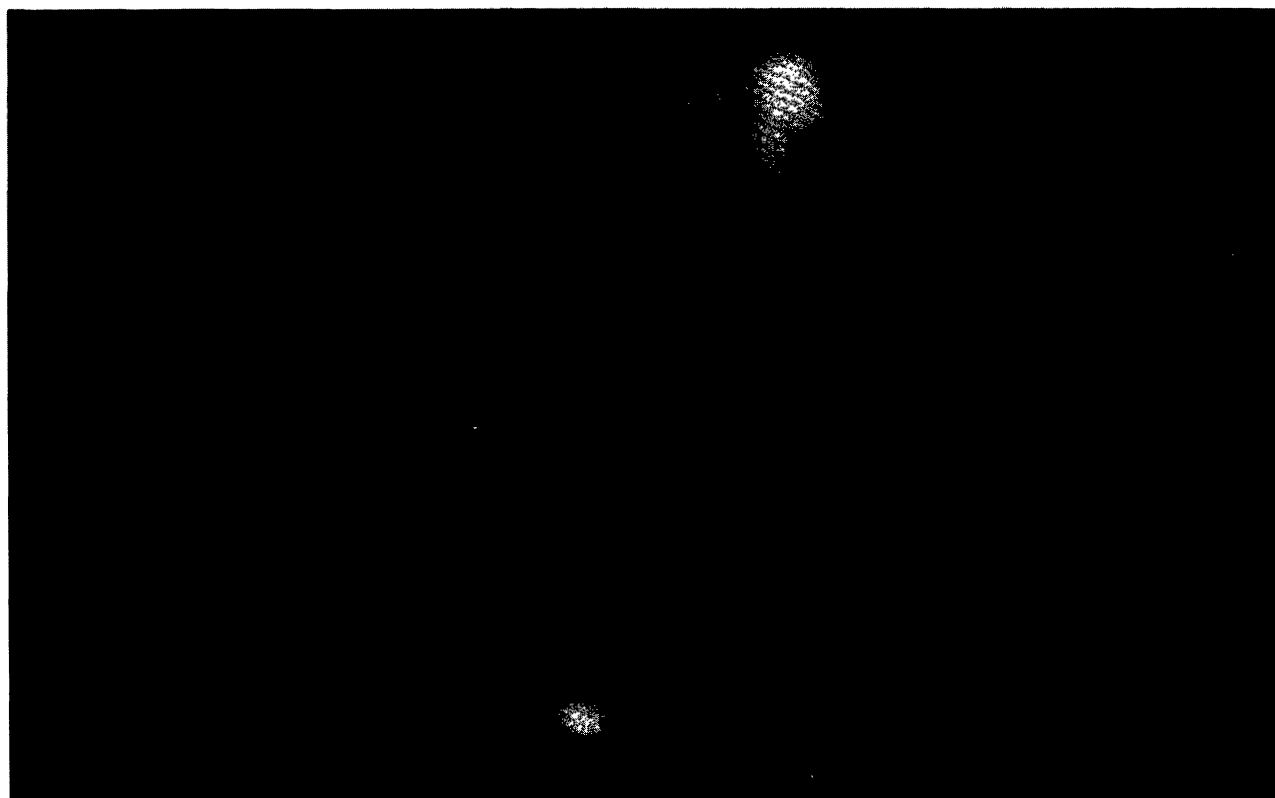


FIGURE 17.



1005 28

FIGURE 18.

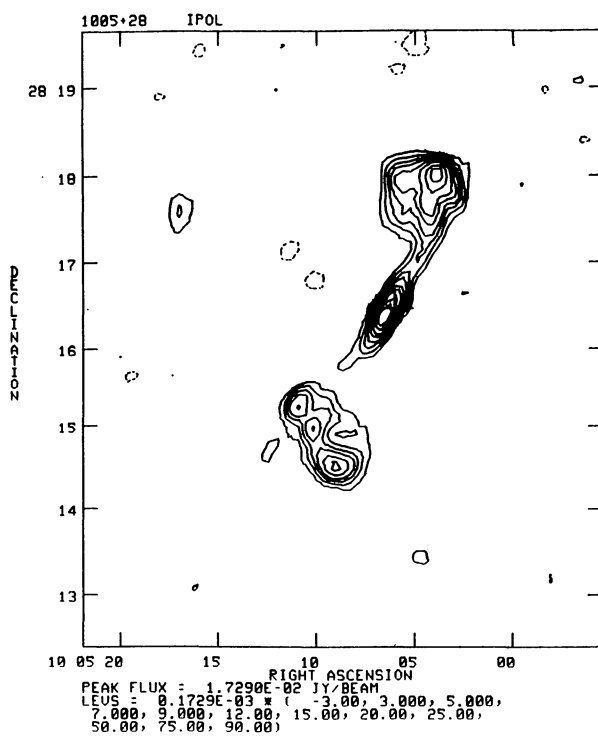


FIGURE 19.



1116 28

FIGURE 20.

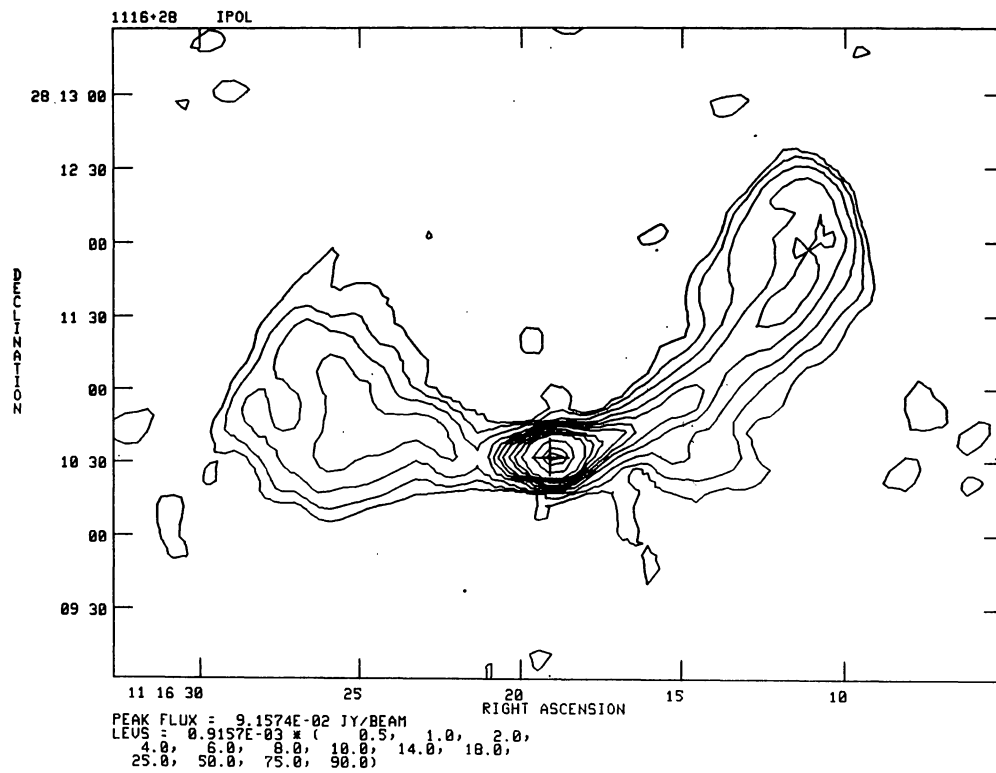


FIGURE 21.

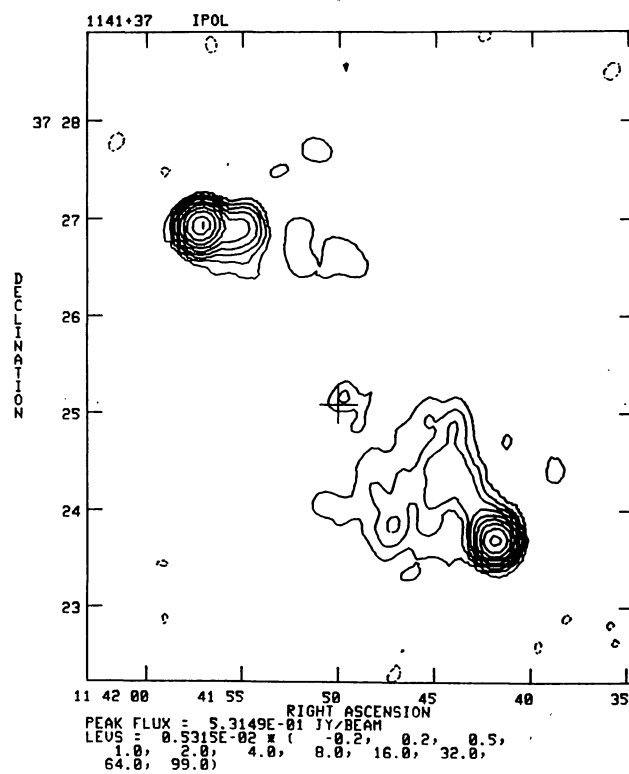


FIGURE 22.



1243 26

FIGURE 23.

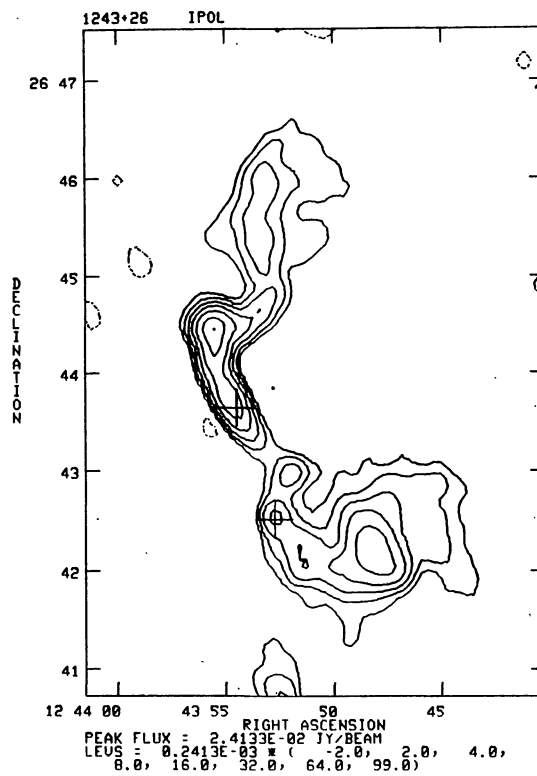
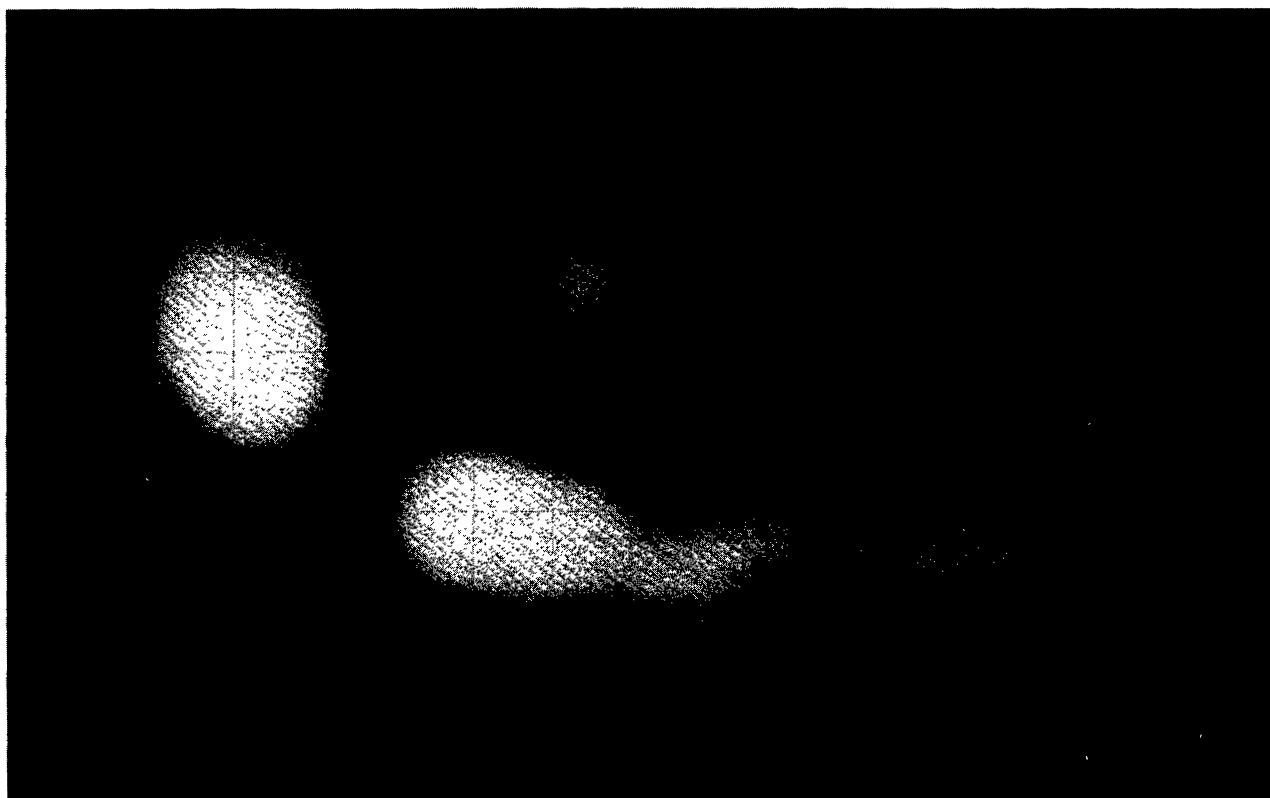


FIGURE 24.



13 00 32

FIGURE 25.

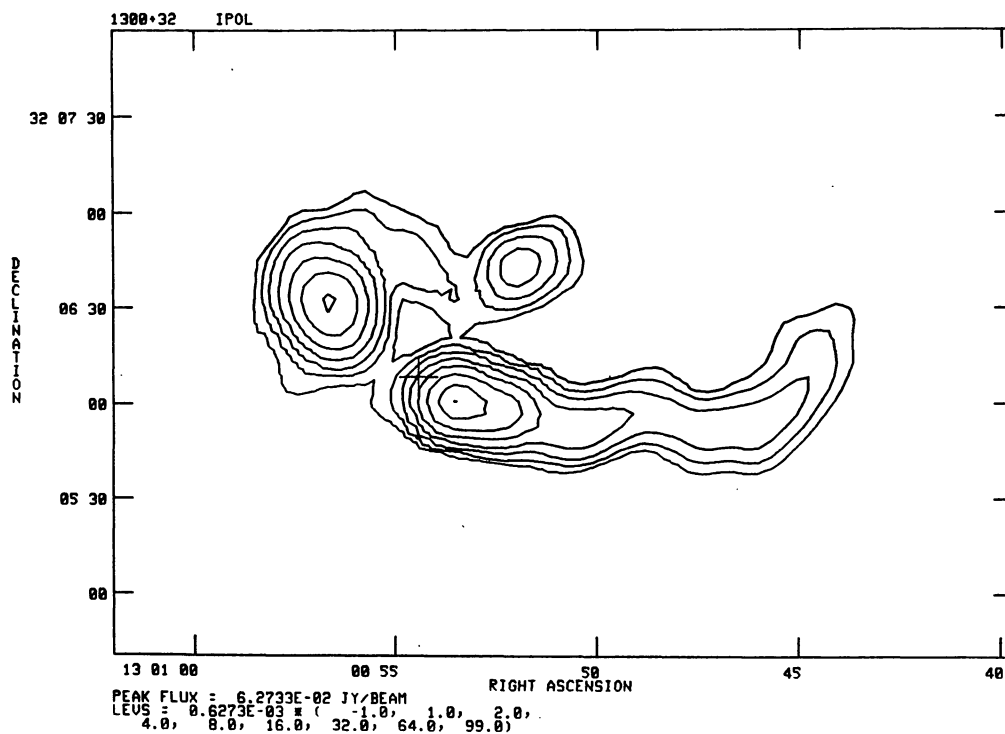
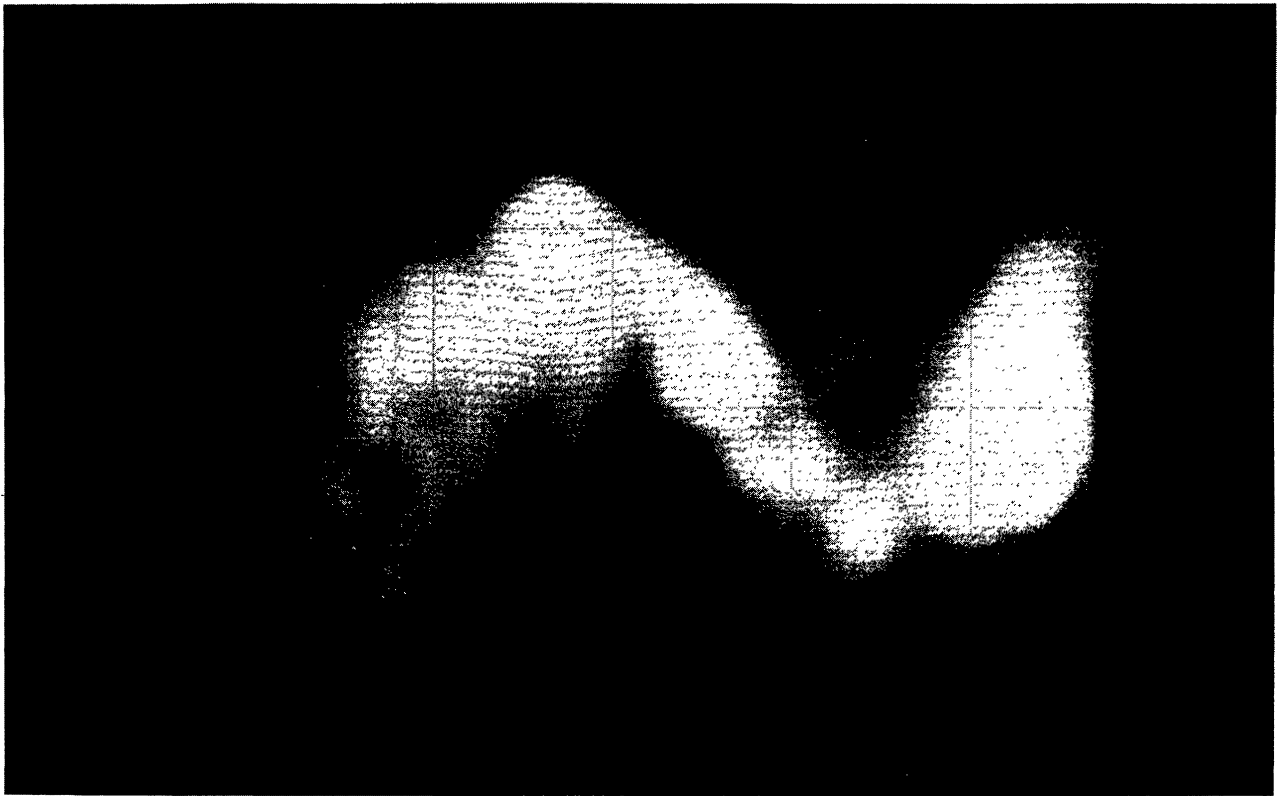


FIGURE 26.



13 16 29

FIGURE 27.

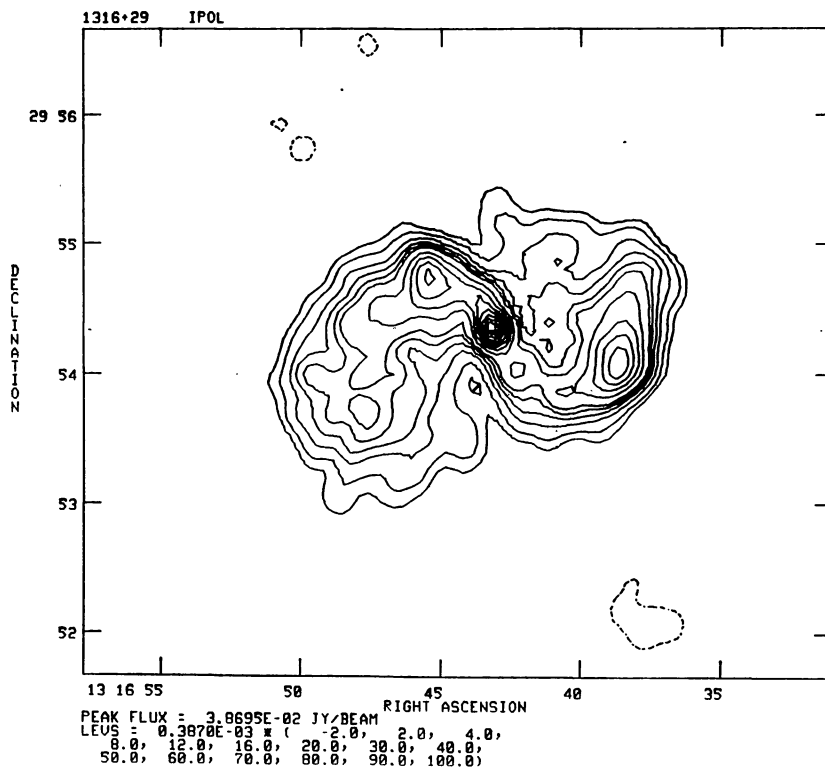


FIGURE 28.

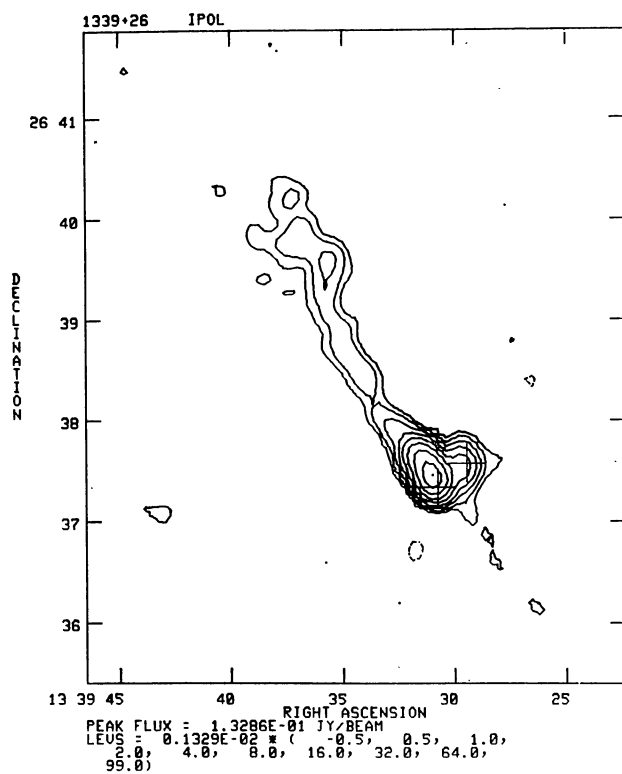


FIGURE 29.

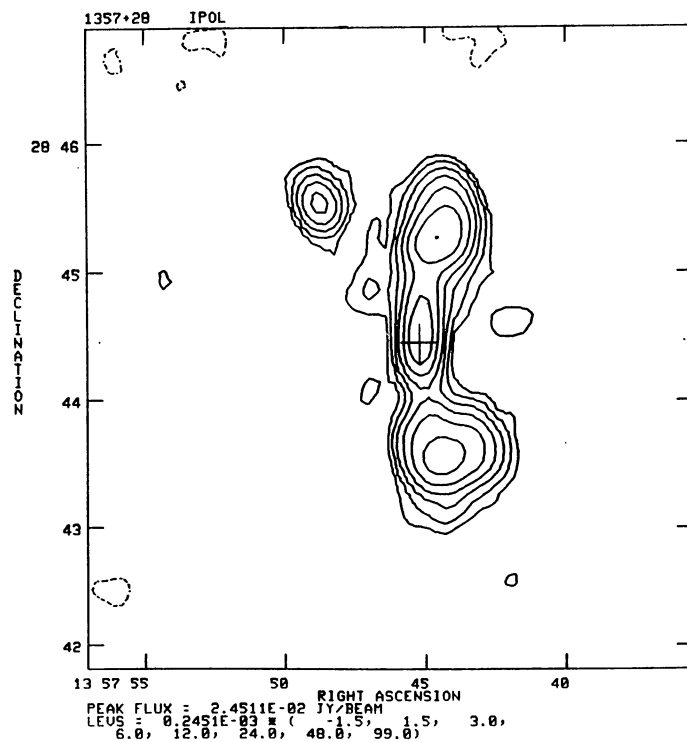


FIGURE 30.

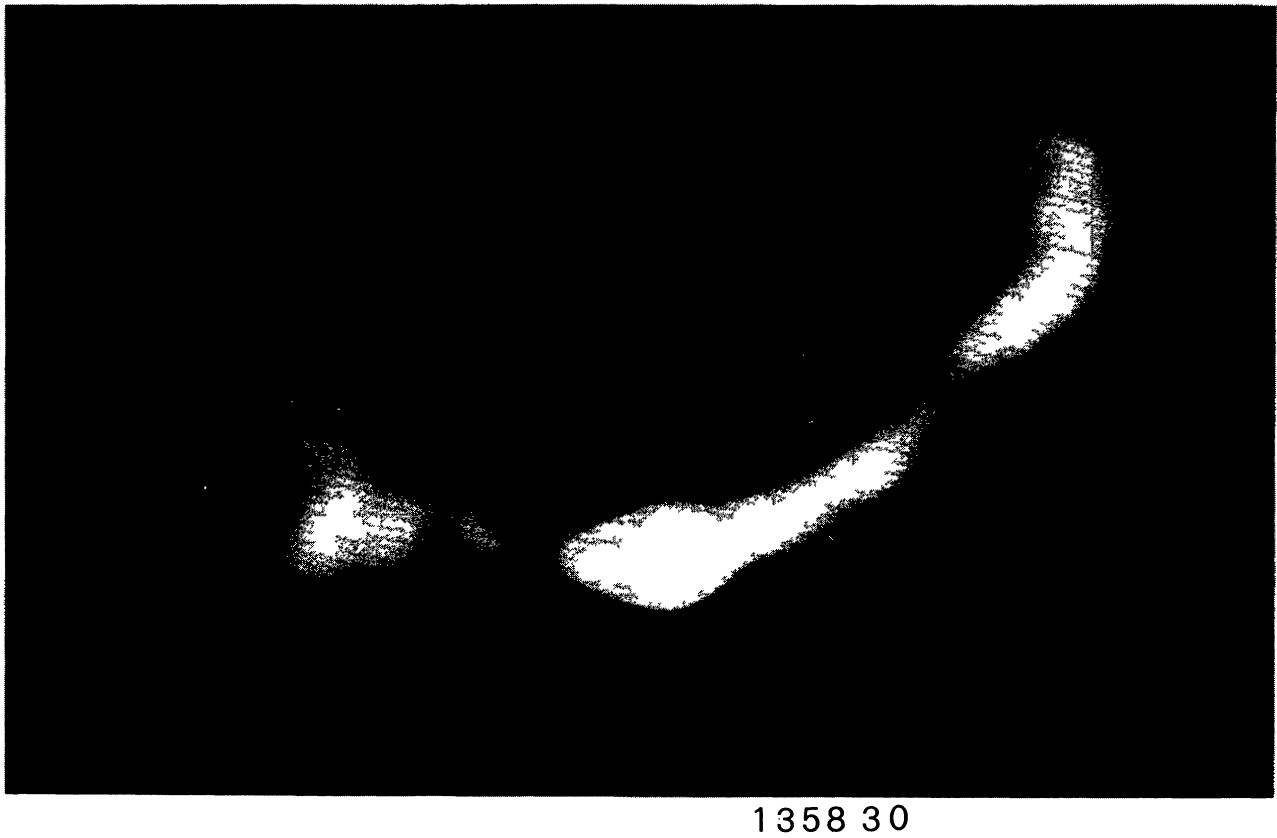


FIGURE 31.

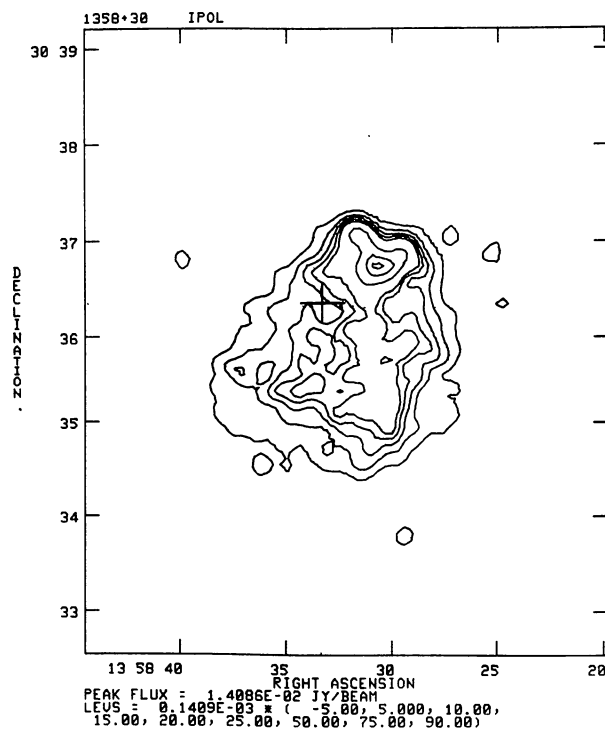


FIGURE 32.

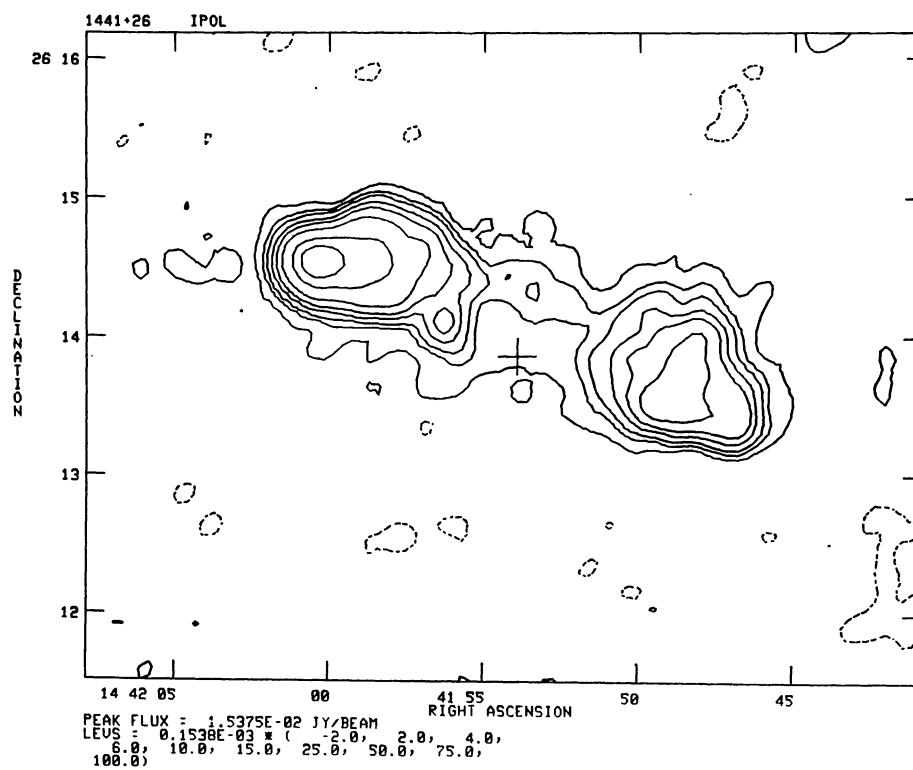


FIGURE 33.

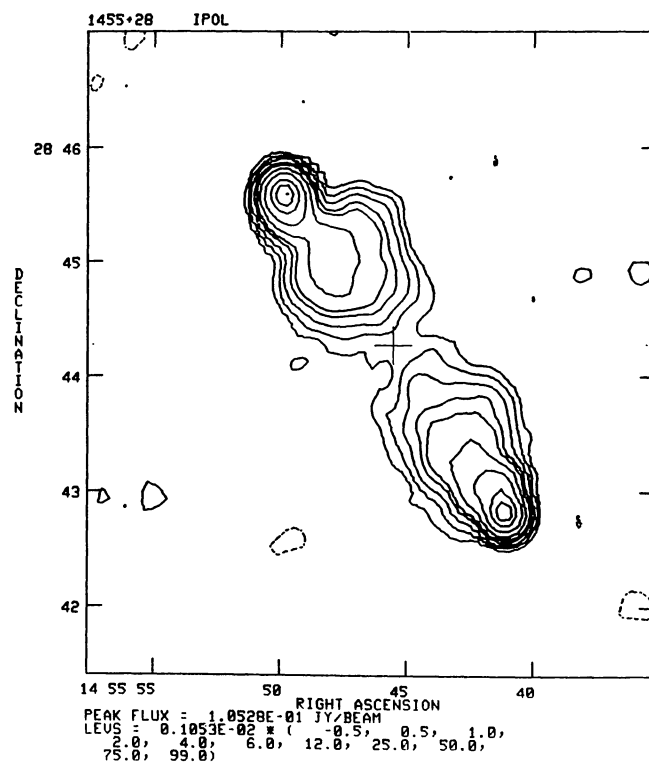


FIGURE 34.

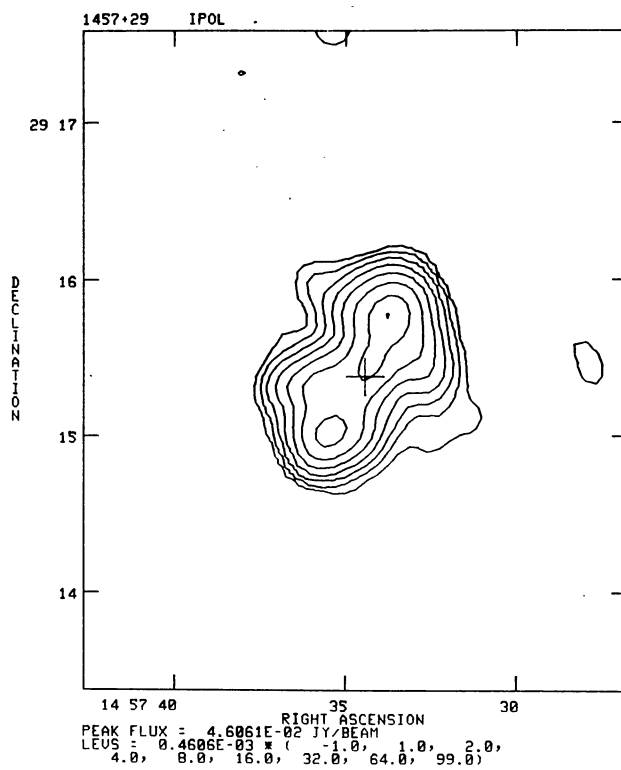


FIGURE 35.

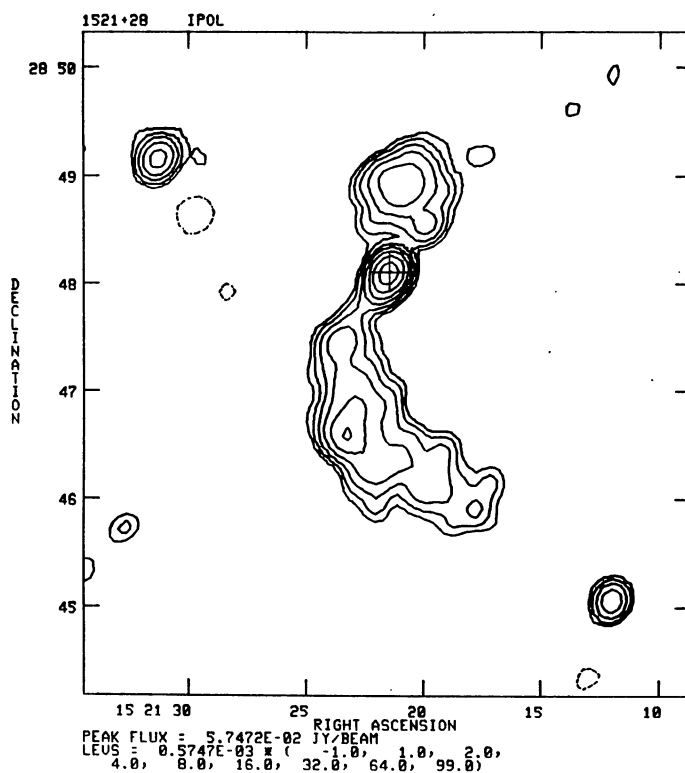
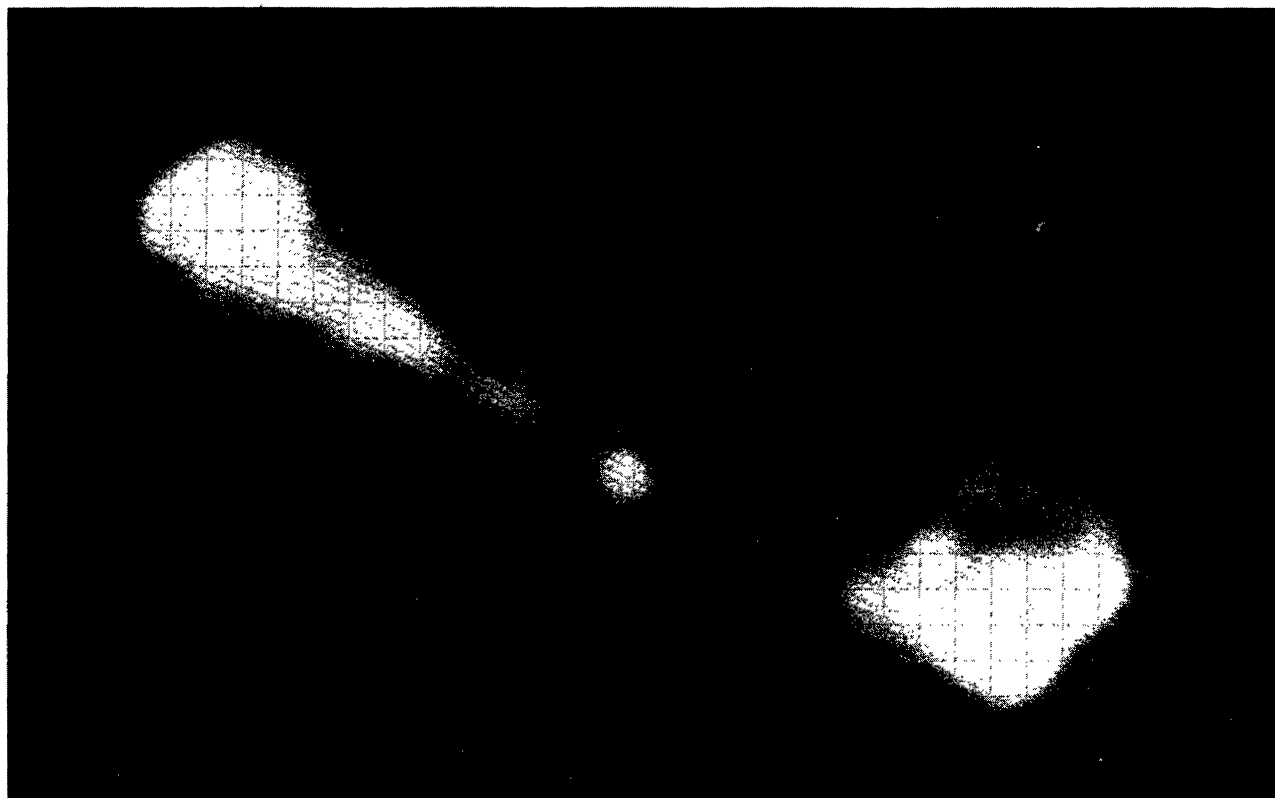


FIGURE 36.



15 28 29

FIGURE 37.

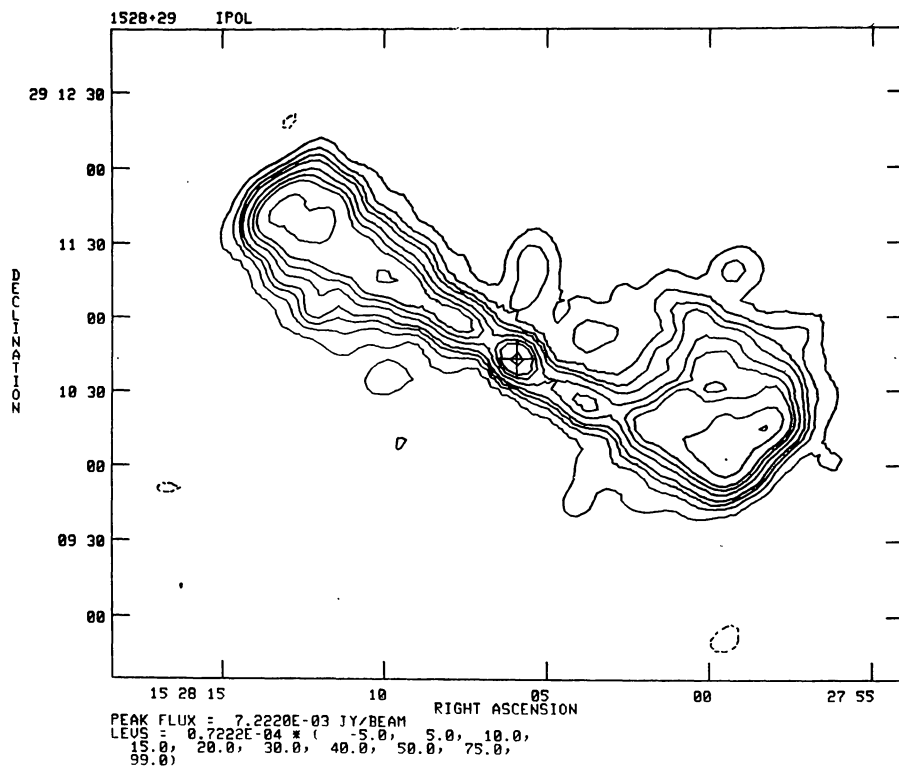


FIGURE 38.

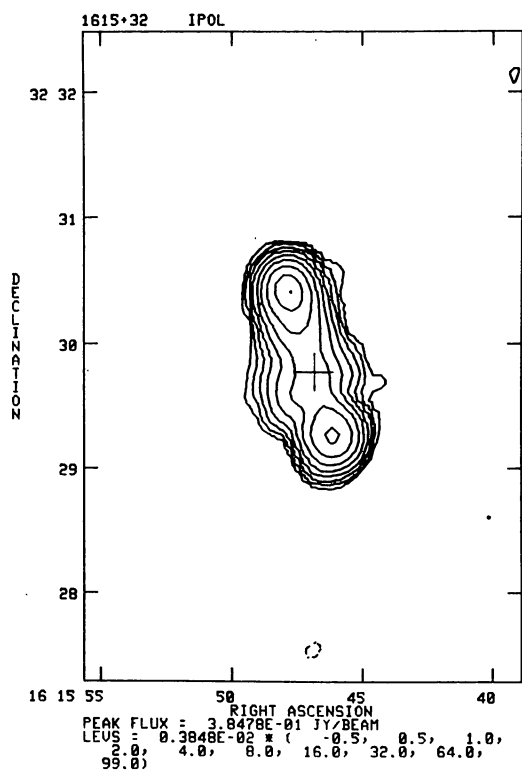


FIGURE 39.

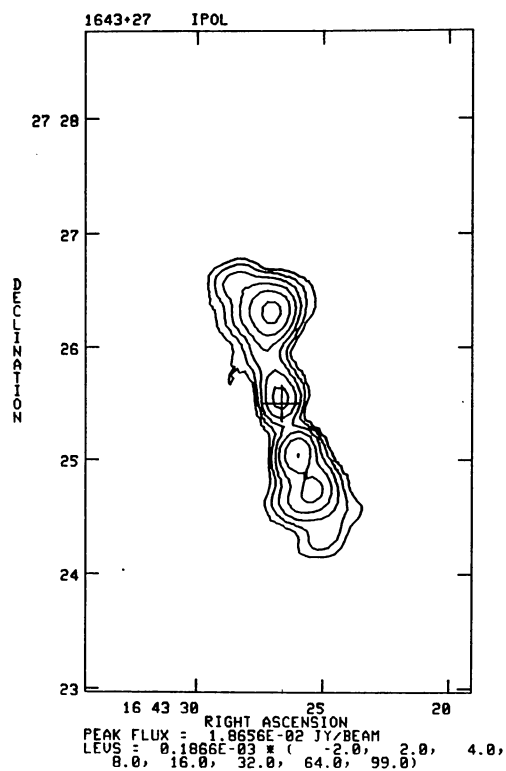


FIGURE 40.

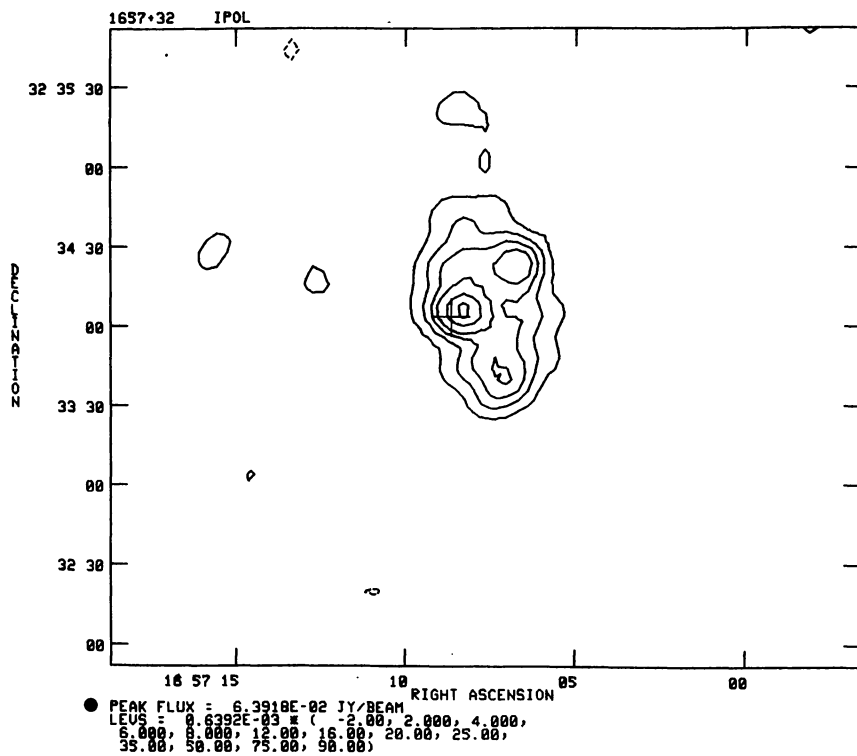


FIGURE 41.

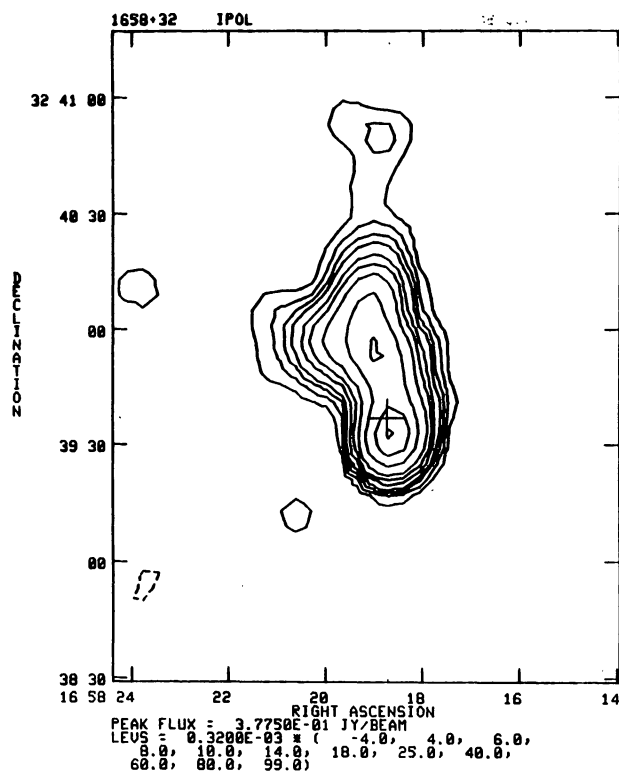
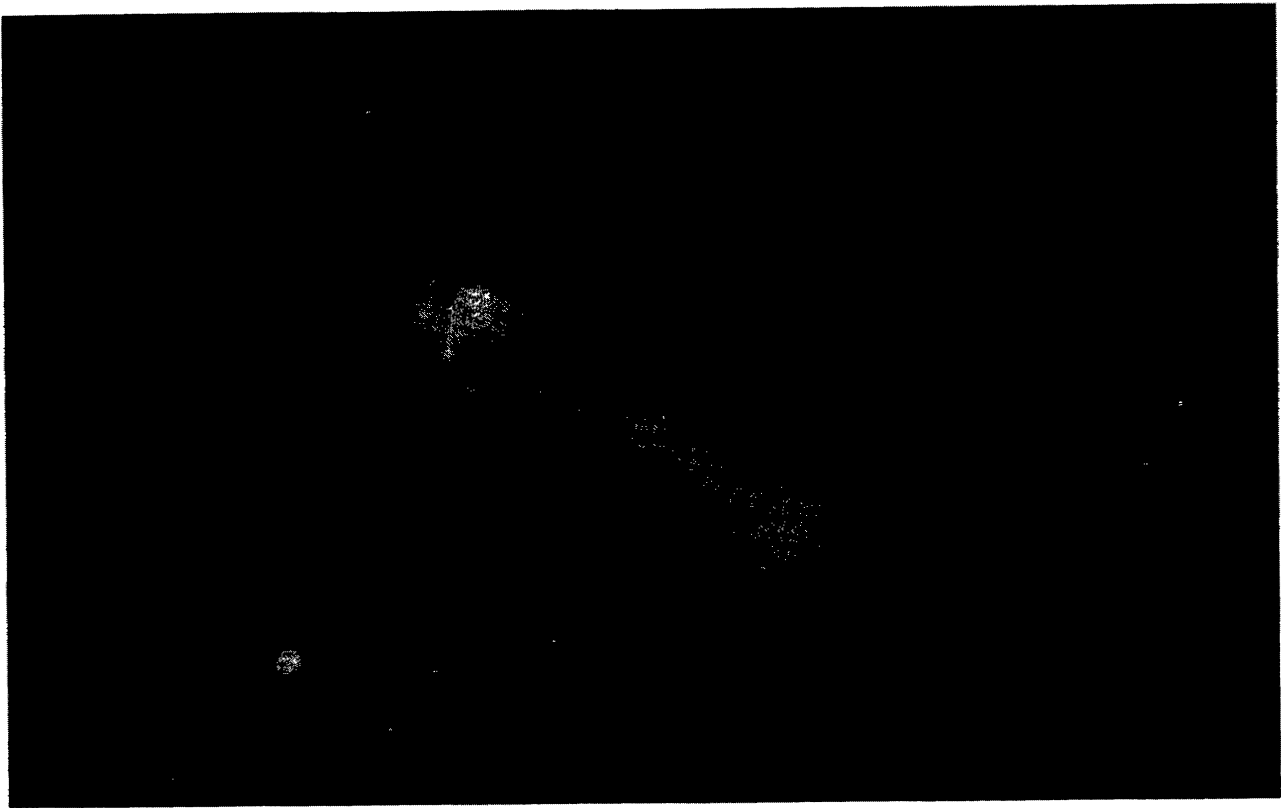


FIGURE 42.



16 58 30

FIGURE 43.

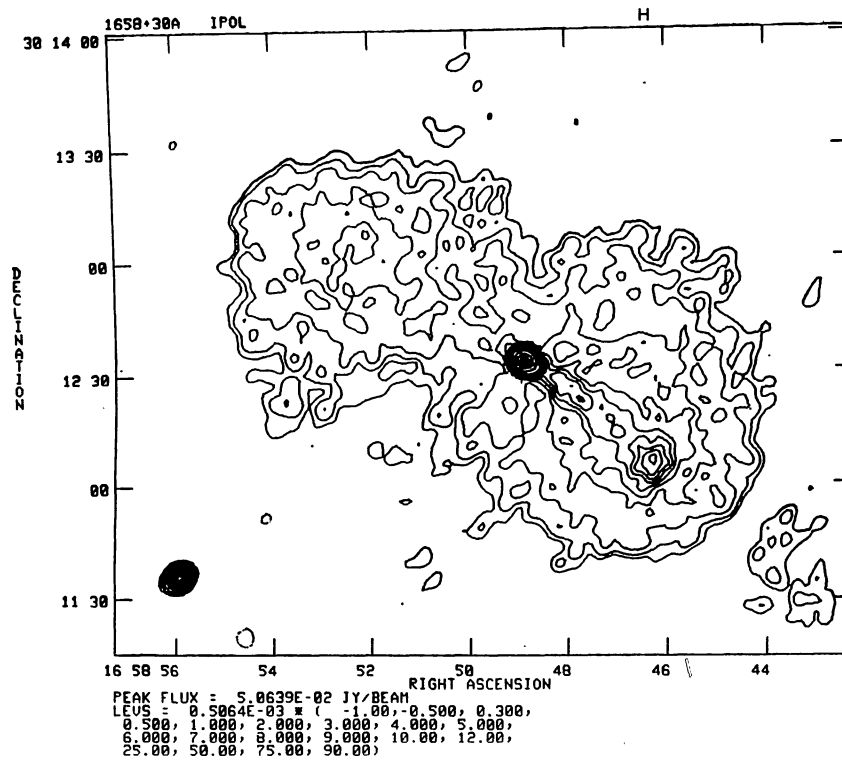


FIGURE 44.

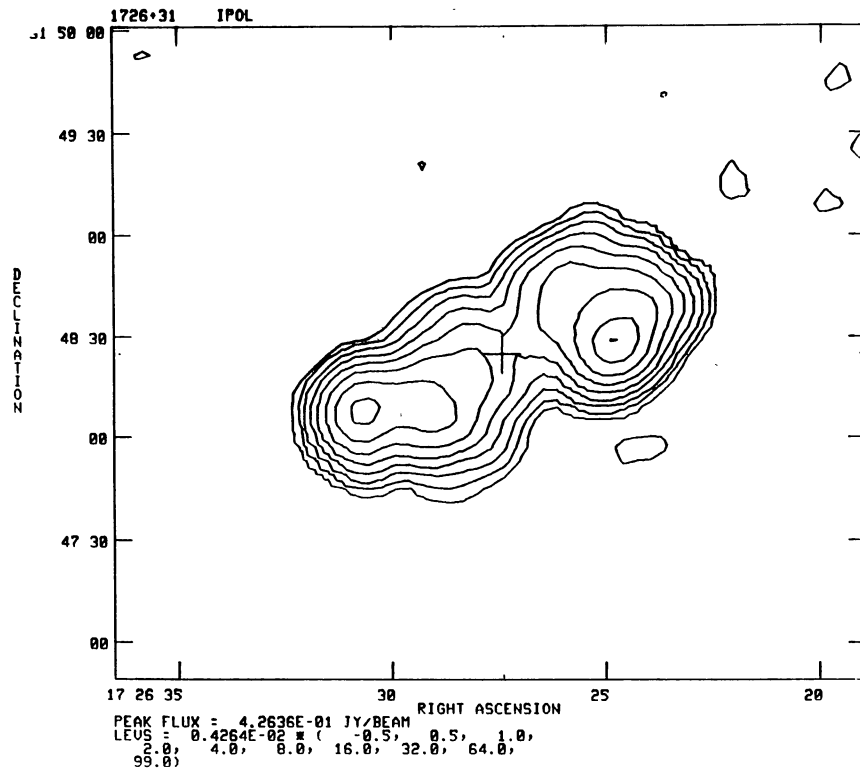


FIGURE 45.

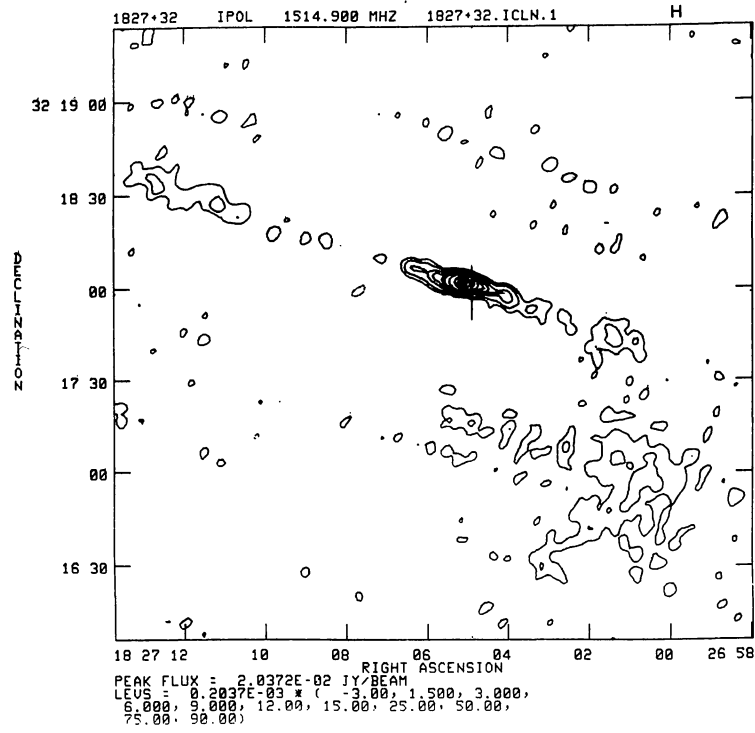


FIGURE 46.

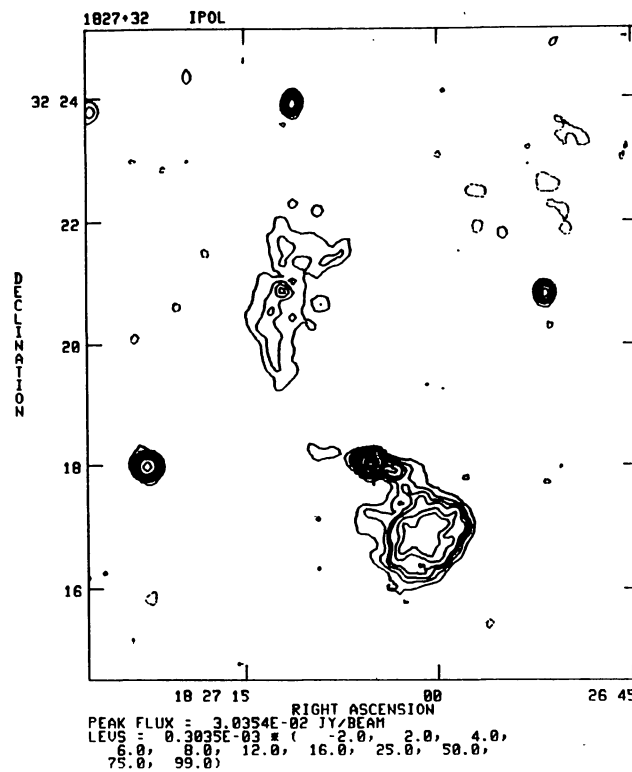


FIGURE 47.