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THE RADIO SOURCE LIST AND THE COUNT AT 1420 MHz IN THE FIELD OF ABELL 2256

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ABSTRACT

A list of radio sources in the field of Abell 2256 is presented at 1420 MHz. Also presented is the source count based on the list. This source count is taken with the sources above 7σ level at 1420 MHz. The overall characteristics of the count is consistent with that of a field where no galaxy cluster presents. The excess of radio sources due to the cluster is examined in the source count but it turned out to be unnoticiable as expected.

I. INTRODUCTION

Abell 2256 is a Coma-like cluster of galaxies exhibiting strong emission at all wavelengths (Abell *et al.* 1989). The first synthesis radio map was made by Bridle and Fomalont (1976), and further observations were made primarily to investigate the diffuse cluster radio emission (Bridle *et al.* 1979). These observations revealed two diffuse regions one of which shows very strong emission at high frequencies and extends nearly 1 Mpc, whereas the other is only marginally visible at frequencies like 610 and 1420 MHz. In addition, these observations suggested with corroborating evidence that a radio halo of about $10'$ in size exists near the cluster center. Further observations revealed more that this cluster is not a mormal; in the sense that this has an unusually high number of head-tail sources which was later confirmed with high resolution observations to contain at least five head-tails (Valentijn 1981; O'Dea and Owen 1985). Recent radio observations of the cluster are found in Röttgering, *et al.* (1994). X-ray observations with ROSAT also shows that there are two X-ray clumps near the core region suggesting that this cluster is actually in the process of merging (Briel *et al.* 1991).

All of these observational facts suggest that this cluster is an active galaxy cluster. One intriguing point is of course how does the cluster merging be related to the active nature of the cluster. One of the measure of the activeness is the number of the cluster radio sources. In fact, the number of head-tails included in the cluster is one of the largest among other clusters. Beside the head-tails, there is one other type of radio sources found frequently in a direction of a cluster. These are so-called the unidentified radio sources which show reasonably steep spectra, implying old ages of the sources perhaps due to thermal confinement within the intracluster medium. For example, the Coma cluster shows a clear excess in number of radio sources but only a fraction of the excess are identified with cluster galaxies. Many of them have not yet been identified with galaxies down to about 20th magnitude (Kim *et al.* 1994 and references therein).

Then the question is, having good pieces of convincing evidence for the activeness of the cluster, does this cluster also show an excess in number of radio sources in the source count? Here the answer of this question is investigated based on the radio observations of Abell 2256 made at 1420 MHz with the Dominion Radio Astrophysical Observatory (DRAO hereafter) synthesis telescope. The organization of this paper is the following. In § 2, the observations and data reduction are mentioned only briefly. Source counts are presented in § 3 and the excess of number of radio sources due to cluster contribution is investigated with the source count method.

Table 1. 7σ DIFFERENTIAL SOURCE COUNT AT 1420 MHz

S (Jy) (1)	< S > (Jy) (2)	NS (3)	< WT > +-ME (4)	n(S) (1/st) (5)	dN/dS (1/st/Jy) (6)	N/N0 (7)	n(>S) (1/st) (8)
0.003							0.146E+06
							0.101E+05
	0.004	24	4.28	0.384E+05	0.233E+08	0.087	
			0.87	0.784E+04	0.475E+07	0.018	
0.005							0.107E+06
							0.790E+04
	0.006	37	2.47	0.341E+05	0.133E+08	0.150	
			0.41	0.561E+04	0.219E+07	0.025	
0.007							0.730E+05
							0.602E+04
	0.009	32	1.89	0.226E+05	0.571E+07	0.192	
			0.33	0.400E+04	0.101E+07	0.034	
0.011							0.503E+05
							0.469E+04
	0.014	28	1.46	0.153E+05	0.249E+07	0.250	
			0.28	0.289E+04	0.471E+06	0.047	
0.017							0.350E+05
							0.376E+04
	0.022	28	1.22	0.128E+05	0.134E+07	0.403	
			0.23	0.241E+04	0.253E+06	0.076	
0.027							0.223E+05
							0.290E+04
	0.040	22	1.03	0.844E+04	0.315E+06	0.383	
			0.22	0.180E+04	0.671E+05	0.082	
0.054							0.138E+05
							0.227E+04
	0.080	24	1.00	0.897E+04	0.167E+06	1.150	
			0.20	0.183E+04	0.341E+05	0.235	
0.107							0.486E+04
							0.135E+04
	0.137	6	1.00	0.224E+04	0.209E+05	0.813	
			0.41	0.915E+03	0.853E+04	0.332	
0.215							0.262E+04
							0.989E+03
	0.292	6	1.00	0.224E+04	0.104E+05	2.301	
			0.41	0.915E+03	0.426E+04	0.939	
0.429							0.374E+03
							0.374E+03

Column (1) Flux density in Jy. (2) Mean flux density of the bin. (3) Number of sources in the bin. (4) Mean weight of the sources in the bin. (5) Number of sources in the bin per steradian. (6) Differential counts per seradian per Jy. (8) Accumulated counts per steradian. Second raws of each term are the corresponding errors. Note: 1) The area of sky covered in the count is 2.67585×10^{-3} steradians, which is $100.3'$ in radius of circular area. 3) Total number of sources in the count is 208. 4) The primary beam cutoff level is 0.05. 5) The sigma completness is 7σ.

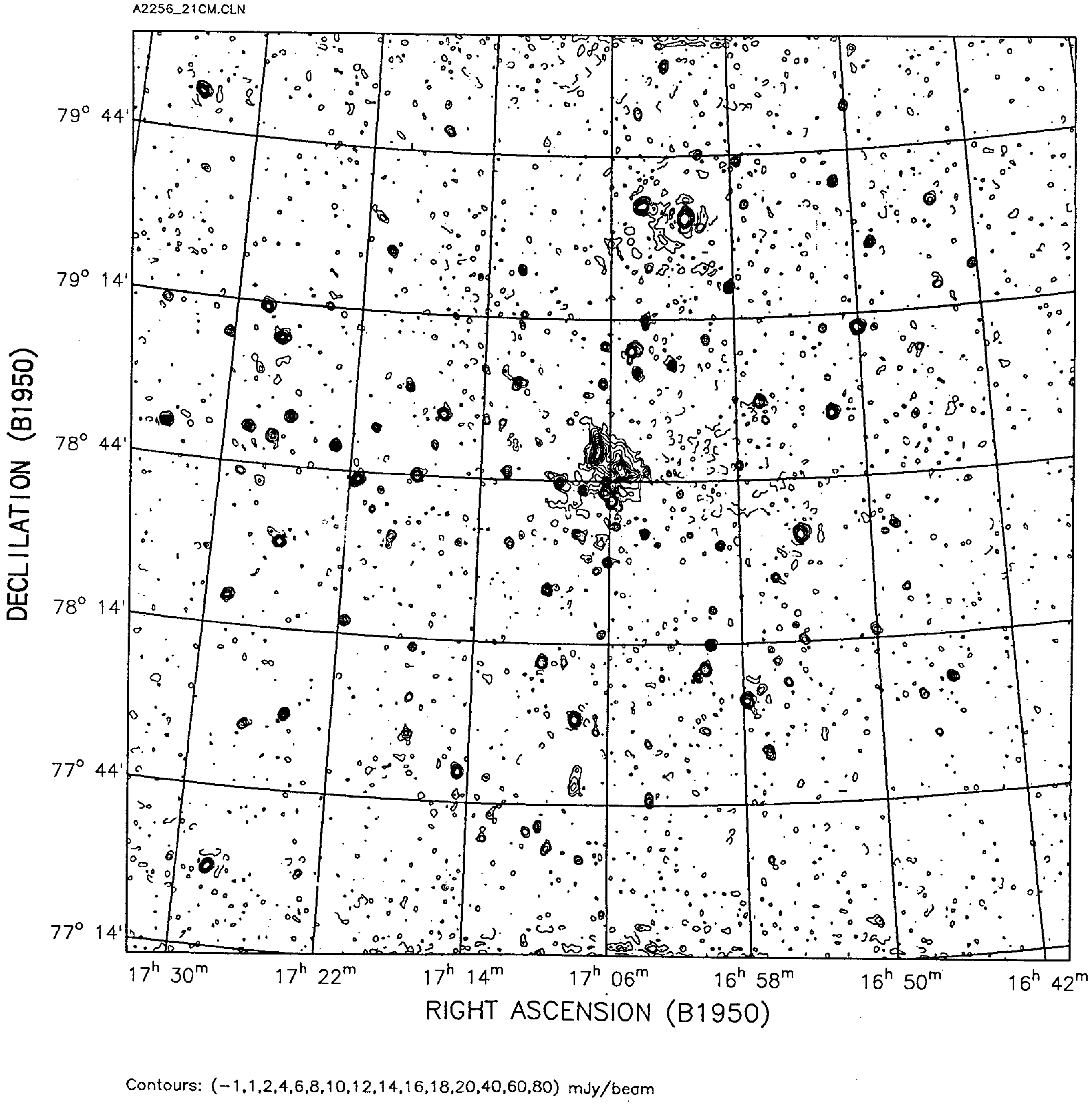

Fig. 1. The full field of view of the sky mapped at 1420 MHz. The FWHM of the primary beam at this frequency is 103 minutes of arc. The diffuse area visible near the central region belongs to Abell 2256. The contour levels are (1, 2, 4, 6, 8, 10, 12, 14, 18, 20, 40, 60, 80) mJy/beam.

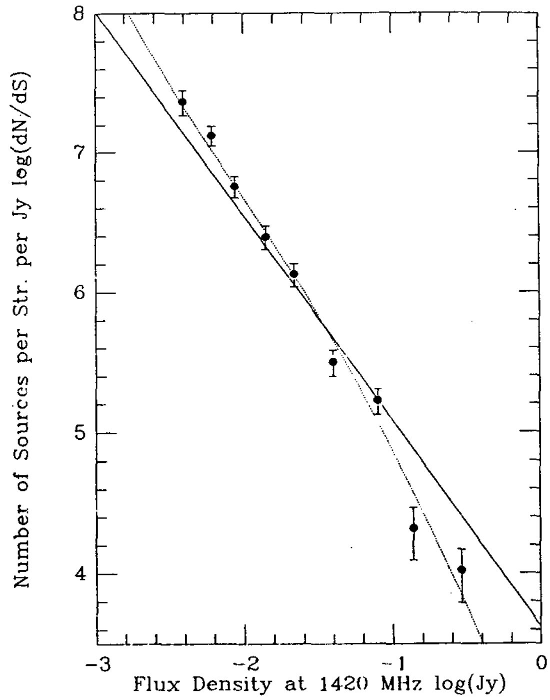

Fig. 2. The differential count at 1420 MHz is shown. Dotted line is the expected count of a background where no galaxy cluster is found (Windhorst *et al.* 1985). The straight line is the excess due to the Coma cluster of galaxies (Kim *et al.* 1994). Comparing with these lines, the excess due to Abell 2256 is seemed to be negative in the count.

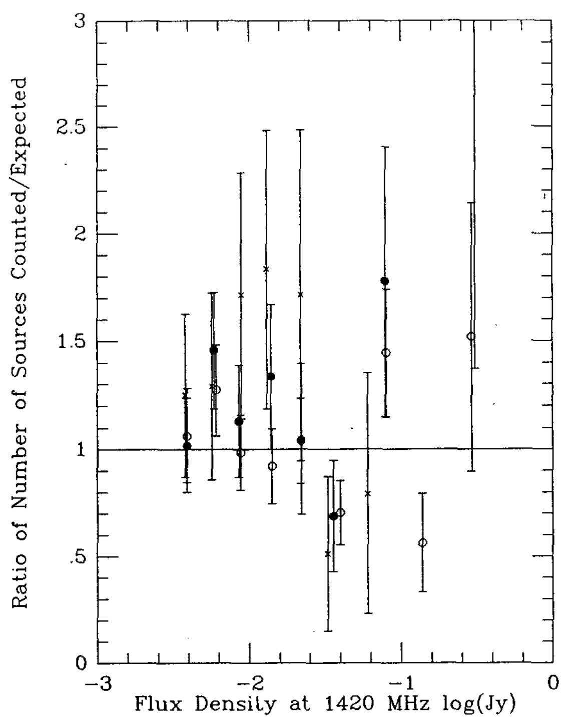

Fig. 3. The excesses were examined by varying the sample size: areas of radius of (filled circle) 100 arcmin [208], (cross) 52 arcmin [114], and (stellated) 30 arcmin [47]. The numbers in [ ] are the total numbers of sources included in the counts, respectively. Error bars (σ) are too large that no excess iswell separated away more than 3σ from unity, implying that the excesses are insignificant. Note that taking the redshift of Abell 2256 to be 0.0601 (Struble and Rood 1987), the Abell radius (Abell 1958) becomes $R_A = 1.7/z\ arcmin\ =\ 3h_{50}^{-1}\ Mpc\ =\ 28.3\ arcmin$. Here $H_0 = 50\ Mpc\ km^{-1}s^{-1}$ ($\equiv h_{50}$) and $q = 0$ are used.

Table A. THE LIST OF SOURCES IN THE FIELD OF ABELL 2256 AT 1420 MHZ

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S$\pm\Delta$S	Size
1	16 36 34.95	0.51	78 57 41.0	1.4	87.8±13.9	
2	16 39 15.99	1.06	79 29 25.5	2.6	55.2± 6.0	1.3× 0.2 117°
3	16 40 50.33	1.12	79 02 25.0	2.4	19.9± 3.1	
4	16 41 04.12	1.38	77 58 25.4	4.8	24.7± 4.9	
5	16 42 01.22	0.78	77 33 40.4	5.2	54.6±10.1	
6	16 42 17.93	0.34	79 21 28.1	1.4	56.8± 6.8	
7	16 43 51.89	1.29	78 42 01.7	3.3	9.2± 1.9	
8	16 44 41.30	0.55	79 18 11.8	1.7	18.1± 3.4	
9	16 44 43.62	0.46	79 33 43.3	1.6	62.7± 4.9	0.9× 0.4 49°
10	16 45 45.00	0.19	78 05 57.7	1.1	77.5± 8.9	
11	16 46 11.40	0.80	79 07 02.1	3.2	11.4± 2.0	
12	16 46 15.46	1.43	78 31 43.7	3.8	3.8± 0.9	
13	16 46 45.64	0.38	77 55 43.3	1.8	25.6± 4.1	
14	16 46 48.22	0.66	78 54 45.3	2.7	10.5± 1.4	1.0× 0.3 168°
15	16 47 30.26	0.34	78 03 02.9	1.6	24.7± 3.2	
16	16 47 30.36	1.01	78 49 58.6	5.2	7.2± 1.4	
17	16 47 51.50	1.55	78 20 42.7	5.2	5.2± 1.2	
18	16 48 05.42	0.58	78 23 07.6	2.0	13.9± 1.3	
19	16 48 34.00	1.05	78 03 13.7	4.2	6.6± 1.3	
20A	16 48 29.32	0.27	78 34 47.8	1.2	17.7± 2.2	
20B	16 49 09.19	0.56	78 33 30.9	1.9	6.8± 1.2	
21	16 48 55.59	0.18	79 26 44.0	1.1	52.9± 2.2	
22	16 49 01.13	0.85	79 11 19.1	3.0	7.1± 1.3	
23	16 50 01.36	0.32	79 52 13.3	1.7	67.6± 8.4	
24	16 50 04.20	0.29	78 15 32.1	1.5	17.6± 2.1	
25	16 50 04.57	0.13	79 11 24.4	1.0	144.2± 4.6	0.9× 0.1 54°
26	16 50 46.23	0.71	78 54 46.7	2.4	11.4± 1.2	1.3× 1.0 152°
27	16 50 54.98	0.72	77 21 25.3	2.5	87.2±12.8	
28	16 50 58.47	1.18	77 56 30.1	3.3	6.5± 1.8	
29	16 51 08.15	0.21	79 38 16.2	1.2	51.3± 5.9	
30	16 51 45.39	1.04	77 48 22.2	5.4	7.7± 2.2	

Table A. THE LIST OF SOURCES - continues

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S$\pm\Delta$S	Size
31	16 51 59.26	0.11	78 55 56.7	1.0	79.0± 2.5	
32	16 52 08.27	0.59	79 02 30.1	2.0	6.5± 1.1	
33	16 52 18.61	0.37	79 11 32.2	1.6	9.4± 1.5	
34	16 53 21.70	0.77	77 56 51.8	6.2	18.8± 2.9	2.3× 0.8 3°
35	16 53 42.42	1.30	79 39 46.8	3.0	8.6± 1.6	
36	16 54 17.36	0.11	78 33 43.9	1.0	355.0±11.0	
37	16 54 18.85	0.46	78 14 20.7	1.7	13.9± 1.8	
38	16 54 37.55	0.62	78 19 17.9	2.4	3.1± 0.7	
39	16 54 46.18	0.66	78 42 34.8	3.5	5.5± 1.0	
40	16 54 47.52	0.60	78 17 07.8	2.1	4.7± 0.8	
41	16 54 52.55	0.73	77 47 30.7	3.3	9.7± 1.4	
42	16 55 10.59	1.00	78 50 15.1	3.2	3.3± 0.7	
43	16 55 15.23	0.85	77 38 59.1	5.8	10.8± 2.4	
44	16 55 19.27	0.48	78 06 34.6	1.8	7.5± 1.4	
45	16 55 45.09	0.45	78 16 37.4	2.3	4.2± 0.6	
46	16 55 53.40	0.32	78 25 54.2	1.4	7.9± 1.4	
47	16 55 55.98	0.76	78 10 29.2	2.6	6.2± 1.3	
48	16 56 12.86	0.37	78 55 11.2	1.6	7.6± 0.7	
49	16 56 18.87	0.75	78 12 39.7	2.8	4.2± 0.8	
50	16 56 32.61	0.10	78 58 31.4	1.0	97.7± 3.1	
51	16 56 35.34	0.27	77 53 42.0	1.6	39.5± 2.1	1.4× 0.6 15°
52	16 56 40.64	0.57	77 33 34.7	3.2	18.6± 3.2	
53	16 56 58.73	0.94	78 05 08.9	3.3	16.0± 2.0	1.6× 0.4 135°
54	16 57 06.29	0.39	79 34 49.0	1.6	17.2± 1.5	
55	16 57 32.52	0.44	79 42 53.3	1.9	28.3± 5.2	
56	16 57 47.86	0.10	78 03 14.2	1.0	273.5± 8.3	
57	16 57 53.43	0.27	78 46 49.9	1.4	12.2± 1.5	
58	16 58 01.98	0.33	78 58 42.1	2.0	5.8± 0.9	
59	16 58 15.81	0.14	79 19 50.6	1.1	44.1± 3.0	
60	16 58 37.54	0.97	79 09 29.7	4.7	3.8± 0.7	

Table A. THE LIST OF SOURCES - continues

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S±ΔS	Size
61	16 59 11.97	0.22	78 32 01.2	1.2	14.2± 1.6	
62	16 59 44.26	0.36	78 20 08.8	1.6	7.1± 1.1	
63	16 59 45.43	0.46	79 05 26.7	2.1	3.8± 0.5	
64	16 59 50.93	0.32	79 10 11.7	1.6	10.8± 0.7	0.9× 0.2 16°
65	16 59 52.85	0.11	78 13 42.4	1.0	33.9± 1.1	
66	17 00 08.82	0.42	79 44 08.8	1.8	21.0± 2.8	
67	17 00 14.41	0.76	77 57 42.8	2.3	9.9± 1.2	
68A	17 00 13.81	0.11	78 09 14.0	1.0	92.7± 2.9	
68B	17 00 39.98	0.16	78 07 50.4	1.1	25.7± 2.9	
69	17 00 39.53	0.62	77 59 53.7	3.7	7.9± 2.2	0.9× 0.6 26°
70	17 00 51.82	1.02	77 46 19.4	2.6	7.5± 1.4	
71	17 01 02.65	0.48	78 33 59.1	1.6	4.3± 0.5	
72	17 01 06.87	0.10	79 32 29.6	1.0	961.0±29.1	
73	17 01 09.45	0.36	77 06 50.2	2.7	108.3±13.0	
74	17 01 29.75	0.84	78 29 22.2	4.6	2.1± 0.5	
75	17 01 37.63	0.43	78 41 37.7	1.8	5.6± 0.7	
76	17 02 02.01	0.17	79 05 31.8	1.1	23.5± 2.0	
77	17 02 16.15	0.92	78 13 22.5	3.8	3.1± 0.9	
78	17 02 18.57	0.34	78 45 24.6	1.7	5.3± 0.7	
79	17 02 24.38	0.22	80 00 49.7	1.3	73.3± 8.5	
80	17 02 36.96	1.27	80 04 42.7	1.9	74.6± 8.9	
81	17 02 48.02	0.50	78 07 37.4	2.6	5.1± 1.0	
82	17 03 03.66	0.61	78 32 17.8	2.1	3.1± 0.5	
83	17 03 32.11	1.13	79 23 34.7	3.6	6.2± 1.2	0.8× 0.4 118°
84	17 03 35.70	0.18	77 84 48.1	1.4	36.3± 1.8	
85	17 03 37.96	0.58	77 55 27.9	2.7	7.4± 1.1	
86	17 03 46.05	0.35	78 45 54.6	1.7	7.8± 1.0	
87	17 03 47.02	0.19	79 13 39.9	1.3	25.1± 2.9	
88	17 03 50.14	0.17	78 34 15.7	1.1	11.7± 0.5	
89	17 03 56.93	0.33	79 34 51.0	1.2	162.2± 7.3	1.5× 0.5 104°
90	17 04 14.39	0.41	79 51 58.9	2.1	38.2± 2.9	1.2× 0.5 20°

Table A. THE LIST OF SOURCES - *continues*

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S$\pm\Delta$S	Size
91	17 04 19.57	0.14	79 04 08.5	1.1	17.9± 2.0	
92	17 04 23.11	1.24	78 13 09.4	3.8	7.6± 1.0	2.0× 0.6 48°
93A	17 04 39.64	0.16	79 08 12.4	1.1	57.2± 2.2	
93B	17 04 51.13	1.55	79 06 17.9	4.4	4.6± 1.4	
94	17 05 37.12	0.52	78 35 41.5	2.0	5.4± 0.9	
95	17 06 04.18	0.70	79 27 52.2	2.9	6.2± 1.3	
96	17 06 05.76	0.19	78 29 02.4	1.2	11.4± 0.6	
97B	17 05 51.85	0.20	78 40 24.4	1.2	63.6± 3.1	1.0× 0.4 175°
97C	17 06 14.02	0.53	78 43 51.3	1.7	23.0± 2.4	
97A	17 06 15.92	0.12	78 41 54.5	1.0	128.3± 4.3	
98	17 06 17.02	0.85	77 23 42.1	4.6	18.5± 3.7	
99	17 06 22.45	0.24	79 09 06.7	1.2	14.3± 1.8	
100	17 06 23.00	1.04	77 34 23.0	5.7	8.6± 2.2	
101	17 06 26.02	0.32	78 15 49.2	1.4	8.9± 0.6	
102	17 06 27.85	0.16	79 02 02.7	1.1	10.3± 0.4	
103B	17 06 21.93	4.26	78 33 43.8	5.7	3.8± 1.9	
103A	17 06 32.20	1.16	78 32 28.4	3.3	5.3± 1.1	1.3× 0.6 107°
104	17 06 41.20	0.45	77 57 34.5	2.2	6.8± 1.2	
105	17 06 43.91	0.77	77 59 49.9	10.0	7.1± 1.7	
106	17 06 45.55	0.54	78 27 26.9	1.7	3.7± 0.5	
107	17 07 17.14	1.00	78 29 37.6	2.9	2.0± 0.4	
108	17 07 26.83	0.69	79 00 03.8	1.9	9.3± 1.5	1.4× 0.6 83°
109	17 07 35.80	0.32	77 33 43.1	1.4	26.8± 3.3	
110	17 07 39.04	0.28	78 42 21.7	1.2	12.6± 1.5	
111B	17 07 47.28	1.02	77 50 10.5	10.4	21.5± 4.5	2.9× 1.0 166°
111A	17 07 55.21	0.37	77 47 20.5	3.7	31.7± 2.7	1.8× 0.8 166°
112B	17 07 38.80	0.93	78 33 44.5	3.3	6.1± 1.0	1.2× 0.4 162°
112A	17 08 00.92	0.57	78 34 13.3	1.5	8.2± 1.1	
113	17 07 55.98	0.10	77 59 51.1	1.0	289.3± 8.8	
114	17 08 07.80	0.64	78 12 01.7	2.9	13.7± 2.5	1.6× 1.1 14°

Table A. THE LIST OF SOURCES - continues

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S±ΔS	Size
115A	17 08 06.63	1.82	77 09 02.9	5.8	231.7±50.5	2.8× 0.7 74°
115B	17 08 18.33	0.52	77 10 55.0	4.6	376.1±29.5	2.4× 0.5 37°
116	17 08 31.46	0.51	78 55 02.3	1.7	4.2± 0.7	
117	17 08 38.37	0.68	78 10 26.3	4.4	7.4± 1.3	
118A	17 09 05.71	0.16	78 43 33.3	1.2	20.6± 0.8	0.6× 0.3 128°
118B	17 09 35.86	1.86	78 44 55.2	2.6	10.0± 1.3	2.8× 0.4 74°
119	17 09 15.97	1.12	77 57 01.5	4.3	4.1± 0.7	
120	17 09 27.50	0.33	77 35 44.6	1.8	33.9± 4.9	
121	17 09 33.10	0.98	78 00 49.1	3.7	4.4± 0.9	
122	17 09 41.91	0.12	78 23 47.0	1.0	29.9± 3.4	
123	17 09 55.05	0.11	78 10 23.0	1.0	91.6± 2.9	
124	17 09 57.09	0.39	77 39 54.8	2.0	22.4± 3.7	
125	17 10 28.65	1.32	78 51 11.5	5.1	3.9± 0.8	
126	17 10 37.68	0.33	77 38 49.8	1.6	12.8± 1.2	
127	17 11 22.80	0.62	78 33 55.0	3.4	3.8± 0.6	
128	17 11 36.56	0.67	79 14 41.9	1.9	5.6± 1.0	
129	17 11 43.76	0.72	79 12 41.1	6.4	5.7± 1.1	
130	17 11 49.71	0.18	79 22 47.9	1.1	21.3± 2.5	
131C	17 11 28.77	1.97	79 02 04.2	4.1	3.1± 0.7	
131A	17 11 53.17	0.30	79 02 16.6	1.5	23.3± 3.0	
131B	17 12 03.60	1.47	79 01 14.4	4.4	4.4± 1.2	
132B	17 11 54.73	1.64	78 51 25.4	7.9	2.5± 0.9	
132A	17 11 55.48	0.92	78 49 56.3	9.3	3.9± 1.2	
133	17 12 04.58	0.20	78 32 11.9	1.3	10.3± 0.6	
134	17 12 23.68	0.28	78 45 16.5	1.6	11.4± 0.9	
135	17 12 40.53	0.85	77 41 54.7	3.7	7.7± 1.4	
136	17 12 41.92	0.74	79 04 25.7	3.0	16.8± 4.2	2.2× 0.8 168°
137	17 12 47.03	0.56	78 54 35.5	2.3	5.2± 0.8	
138	17 12 58.92	0.68	77 48 47.5	2.0	10.4± 1.1	
139	17 13 03.37	1.28	78 07 15.6	3.9	14.7± 2.4	2.0× 1.4 46°
140	17 13 05.51	0.67	77 37 28.2	2.3	15.8± 2.4	
141	17 13 46.05	0.36	78 55 00.5	2.0	7.9± 0.7	1.1× 0.1 10°
142	17 13 52.28	0.92	78 43 10.6	2.8	3.3± 0.6	1.0× 0.3 53°

Table A. THE LIST OF SOURCES - continues

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S$\pm\Delta$S	Size
143	17 13 59.37	0.63	79 04 27.1	2.6	6.1$\pm$ 0.9	
144	17 14 19.96	1.22	79 08 37.6	3.8	3.1$\pm$ 0.7	
145	17 14 33.35	0.62	79 21 19.9	2.4	6.0$\pm$ 1.3	
146	17 14 35.39	0.12	77 49 36.9	1.0	106.9$\pm$12.0	
147	17 14 38.89	0.79	77 45 19.6	4.3	7.1$\pm$ 1.7	
148	17 14 54.95	0.71	77 57 11.7	2.9	4.5$\pm$ 1.1	
149	17 14 57.63	1.17	77 28 10.3	5.3	15.8$\pm$ 4.0	
150	17 15 09.04	0.65	78 32 09.5	2.9	5.9$\pm$ 0.9	1.0$\times$ 0.0 160°
151	17 16 00.23	0.69	79 13 56.1	2.1	7.3$\pm$ 1.1	
152	17 16 11.04	1.45	78 29 55.3	4.3	2.1$\pm$ 0.5	
153	17 16 26.76	0.11	78 55 38.6	1.0	61.4$\pm$ 2.0	
154	17 16 53.74	0.37	78 49 45.7	2.2	6.5$\pm$ 0.9	
155	17 16 59.00	0.35	79 47 57.7	1.6	32.7$\pm$ 5.1	
156	17 17 13.05	0.51	79 52 49.6	2.6	20.9$\pm$ 2.6	
157	17 17 18.56	0.53	79 09 42.9	1.6	4.9$\pm$ 0.8	
158	17 17 34.42	0.21	78 12 25.1	1.2	14.7$\pm$ 1.7	
159	17 17 36.58	0.34	78 03 02.5	1.6	11.2$\pm$ 1.4	
160	17 17 36.95	0.30	77 56 16.4	1.4	21.3$\pm$ 2.6	
161	17 17 54.61	0.11	78 43 56.8	1.0	88.2$\pm$10.1	
162	17 18 39.40	0.28	79 00 25.9	1.4	17.7$\pm$ 2.2	
163A	17 19 16.17	0.35	78 32 31.2	1.8	16.2$\pm$ 1.3	1.2$\times$ 0.3 164°
163B	17 19 22.21	0.80	78 30 40.6	3.3	4.4$\pm$ 1.0	
164	17 19 38.71	0.68	77 48 53.9	3.1	9.8$\pm$ 1.8	
165	17 20 03.97	0.60	78 40 54.0	2.9	6.7$\pm$ 1.0	
166	17 20 04.30	1.36	79 02 06.3	4.9	5.5$\pm$ 1.0	
167	17 20 20.26	0.28	79 25 12.2	1.3	26.0$\pm$ 4.5	
168	17 20 29.76	0.65	78 37 14.9	2.3	5.8$\pm$ 0.9	
169	17 20 36.62	0.25	78 52 26.3	1.2	17.1$\pm$ 2.7	
170	17 21 08.59	1.12	79 31 12.4	3.3	14.9$\pm$ 2.2	
171A	17 21 24.63	1.07	78 42 44.4	1.3	40.5$\pm$ 7.4	
171B	17 21 39.63	1.77	78 42 20.5	3.9	32.1$\pm$ 6.1	
172	17 21 38.66	1.45	78 45 34.7	8.3	5.2$\pm$ 1.3	

Table A. THE LIST OF SOURCES - continues

No	RA (1950)	$\Delta\alpha$	DEC (1950)	$\Delta\delta$	S±ΔS	Size
173	17 21 42.15	0.20	78 16 25.5	1.1	26.0± 1.2	
174	17 23 01.51	0.13	78 48 25.8	1.0	35.5± 1.2	
175	17 23 10.54	0.73	77 28 49.3	2.8	45.0± 7.6	
176	17 24 04.27	0.51	79 14 07.1	1.6	12.4± 2.2	
177	17 24 40.96	0.14	77 58 06.5	1.1	102.9± 3.8	
178	17 24 56.95	0.91	78 15 47.0	4.3	7.2± 1.4	
179	17 25 36.92	0.80	78 57 43.9	2.9	7.6± 1.3	
180	17 25 56.26	0.17	78 53 18.6	1.1	37.5± 1.5	
181A	17 25 54.74	0.12	78 29 58.6	1.0	103.2± 3.3	
181B	17 26 10.60	3.96	78 31 33.5	7.3	82.6±17.2	5.5× 1.7 67°
182	17 26 57.13	0.30	78 49 19.9	1.4	41.8± 2.3	1.1× 0.5 11°
183	17 26 57.14	0.31	77 55 47.1	1.3	49.5± 4.6	
184	17 26 57.94	0.15	79 07 39.2	1.0	133.9± 4.5	
185	17 27 29.90	1.06	78 40 49.2	3.8	14.2± 2.1	1.5× 0.5 34°
186	17 28 03.85	0.14	79 13 06.6	1.0	147.5± 5.3	
187A	17 28 10.49	0.53	79 01 40.0	2.3	15.3± 1.8	
187B	17 28 36.08	0.87	79 03 29.4	3.1	6.9± 1.3	
188	17 28 31.43	0.15	78 50 45.6	1.0	66.2± 2.3	
189	17 28 40.69	0.21	78 19 23.2	1.1	94.6± 3.8	0.7× 0.5 140°
190	17 28 43.81	0.57	78 42 24.6	1.7	20.4± 3.0	
191	17 29 20.86	2.44	79 24 13.6	9.1	7.3± 2.2	
192	17 30 15.43	0.71	78 27 50.1	2.3	15.2± 2.9	
193	17 30 19.25	0.32	79 07 47.0	1.3	44.0± 5.2	
194	17 30 19.89	0.47	77 29 52.8	2.3	224.2±19.8	
195	17 30 48.32	1.02	79 51 59.3	4.9	43.2± 7.9	
196	17 33 08.59	0.89	79 37 04.3	2.8	49.4± 8.8	
197	17 33 39.87	0.19	78 50 05.4	1.1	224.9± 8.3	
198	17 33 57.32	0.25	79 51 18.0	1.2	1428.5±160.5	
199	17 34 34.55	0.30	79 12 43.5	1.2	86.4±10.0	

Right Ascensions are in (^{h}, ^{m}, ^{s}) and declinations are (°, ′, ″). Errors in RA and DEC are $\Delta\alpha$ and $\Delta\delta$ and these are in second of time and second of arc, respectively. Flux densities S and its error ΔS in mJy. Sizes and position angles are listed in the last column: maj×min axis in units of arcmin and the position angles are in degree.

II. THE OBSERVATIONS AND THE SOURCE LIST

A deep radio continuum survey of Abell 2256 and its immediate vicinity was carried out at both 1420 and 408 MHz using the DRAO synthesis telescope * The details of the observations and the data reduction can be found elsewhere (Kim 1995). Observations were made during the season in 1990 January-June which field center was chosen at RA $17^h\ 06^m\ 18.0^s$ DEC $+78^\circ\ 41'\ 57''$ (epoch 1950.0 throughout this work), the position of the strongest source in Abell 2256 and only a few arcmin offset from the cluster center. The theoretical rms sensitivities (σ) of the observations at 1420 and 408 MHz are 0.35 and 3.3 mJy/beam respectively. Here the 1420 MHz data are presented only, because the 408 MHz data were badly corrupted by interferences during the observations.

Data reduction yielded synthesized beams of $1.06' \times 0.90'$ at 1420 MHz and the CLEANed regions 256 arcmin square. The CLEANed map is shown in Fig. 1. The dynamic range reached about 700, which is the best obtainable without applying self-calibration. Low spacing data from Stockert 25-m observations (Reich 1982; Reich and Reich 1986) were added into the 1420 MHz data but did not change the map, hence no large scale emission is missing. The rms noise on the CLEAN map is 0.4 mJy/beam. The flux densities of sources were determined using an elliptical Gaussian fitting routine, yielding a total of 216 sources within the −10 db attenuation level of the primary beam. The source list at 1420 is presented in Table A. Note that when a source was not fitted with a single gaussian component, two or three components were needed and the resulting multiple components were designated with A, B, C.

III. THE SOURCE COUNT

(a) The Overall Count

Noise on a map tends to cause the flux and size of a source to be statistically overestimated, while a peak flux density of a partially resolved source is statistically underestimated by the so-called resolution effect. Since those effects bias a source count in S/N dependent fashion, a statistical correction should be made for a case of small S/N (less than 7 typically). A statistical correction for the population bias (namely the noise and the confusion effect) and the resolution bias can be obtained from a flux density contingency table. That is: given a source population with a realistic distribution of total fluxes, angular sizes, and component flux ratios (the f-distribution), such a table describes the redistribution of the real input fluxes over intervals of observed total flux.

In this source count, each source is given a weight inversely proportional to its visibility area within which the peak flux of a source appears brighter than a limiting S/N. For 1420 MHz case, only those sources which are located within 5% level of the primary beam attenuation and which are stronger than 7σ are counted. This selection criteria effectively minimize the aforementioned undesirable effects in the source counts. The result of the count at 1420 MHz is summarized in Table 1 and the differential source count is shown in Fig. 2. As to compare with this, the source count in the Lynx area by Windhorst *et al.* (1985) and the Coma cluster (Kim *et al.* 1994) are shown in the same Figure.

(b) The Excess in Number of Sources

The counts of radio sources in directions of clusters of galaxies have been received poor attention. Comparing with a background radio survey, one expects a certain excess in number of raio sources due to cluster radio galaxies. However, since the excess in number spreads over a wide range of flux density, this can hardly show up in the differential source count. Thus, unless the excess is sufficiently large, one can hardly detect this. Although therefore it seems pessimistic, the excess is searched with the method described below.

The larger the sampling area, the more the dilution of the number of the cluster sources occurs over the larger area so the spread becomes dominant. This effect reaches minimal if the portion of the sky covered by the cluster becomes maximal. Therefore, the excess was searched as the sample area was being decreased. The sampling area of the sky can easily be changed by choosing a proper level of the primary beam attenuation. Reduction of the sampling area was continued to the size of an Abell radius as long as the source count has a sufficient number of

* The DRAO Synthesis Telescope is operated as a national facility by the National Research Council of Canada.

sources in each bin. The results are shown in Fig. 3, implying that the excess is insignificant (given the error sizes shown in the Fig. 3) as expected.

The number of sources that are identified so far with the cluster galaxies are 15 (Kim 1995), which fluxes range from 128 mJy (No. 94A) to 2.1 mJy (No. 74). Assuming that these are spread over the bins in Table 1, excesses in each bin is only two or so. This amount of excess is insignificant both for a bin contaning a large number sources and for that containing only a few sources; the latter being is due to insifficient S/N of the excess.

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