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The current optical identification status of the S5 radio source catalogue*

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Abstract. — Optical identifications, magnitudes, and redshifts have been compiled for the 185 radio sources of the S5 catalogue, representing its current optical identification status. Reliable optical counterparts are found for more than 75% of the sources, nearly 50% of which have measured redshifts. Our tabulation also includes radio positions, radio fluxes, and radio spectral indices. References to other catalogues and detailed supplementary notes are given for a large fraction of the sources.

Key words: catalogs — surveys — galaxies: active — quasars: general — radio continuum: galaxies; general

1. Introduction

Over the last decades, a number of high-frequency radio surveys have been conducted, yielding a series of radio source catalogues with decreasing flux density limits. Complete tabulations of the optical identifications, however, are available only for the Parkes 2 Jy all-sky survey (Wall & Peacock 1985), the 1 Jy catalogue (Kühr et al. 1981a; Stickel et al. 1994), the S4 catalogue (Pauliny-Toth et al. 1978; Stickel & Kühr 1994a), and the Parkes deep survey (Dunlop et al. 1989). Observational efforts have mainly concentrated on these surveys.

A radio survey filling the flux density gap between the latter two catalogues is the S5 survey (Kühr et al. 1981b), which covers the region $\delta \geq 70°$ and contains 185 sources with $S_{5\mathrm{GHz}} \geq 250$ mJy. The radio morphology of a large fraction of the S5 sources were mapped with the VLA and those accurate positions allowed the investigation of the radio source fields on POSS (Kühr et al. 1987). This resulted in optical identifications of nearly one third of the sources (Kühr et al. 1987). Thereafter, a program was carried out to obtain redshifts for the brighter ($m \lesssim 20$ mag), unobserved optical counterparts and to obtain CCD images for the empty fields. Results of the former have already been published (Stickel et al. 1993a; Stickel & Kühr 1993a, b; Stickel & Kühr 1994b), while imaging data for 68 S5 sources are given in Stickel & Kühr (1995).

*Table 1 also available in electronic form at the CDS via ftp 130.79.128.5

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These data together with relevant information from the literature are presented in this paper, giving an update of the optical identifications, magnitudes, and redshifts of the 185 S5 sources. Excluding marginal detections on POSS, 75% of the sources have optical counterparts, while redshifts for about 50% of the optically identified sources are available.

2. The S5 catalogue

The current optical identification status of the 185 radio sources, which comprise the S5 catalogue, is given in Table 1. It lists for each source a sequence number (Col. 1), its designation (Col. 2), the radio position (B1950, Cols. 3, 4), and the reference to the radio position (Col. 5). The brightness, the identification, and the redshift of the optical counterparts are given in Cols. 6–8. Uncertain entries are listed with a question mark. Columns 9 and 10 tabulate the radio flux density $S_{5\mathrm{GHz}}$ and the radio spectral index α_{11-6} between between 11 and 6 cm, respectively. Finally, for sources appearing in other major compilations, Col. 11 gives the reference using a specific character code. In addition, a remark is included in Col. 11 if a particular sources appears in the notes on individual objects.

For sources with a single or a triple radio morphology the radio position listed in Cols. 3 and 4 refers to the location of the unresolved or central radio component, whereas for double sources the midpoint between the radio lobes is listed. Unless described in the notes on individual objects, the identifications of the optical counterparts, the optical magnitudes, and the redshifts (Cols. 6–8) have

Table 1. The S5 radio source catalogue

Sequ. (1)	Object (2)	RA (1950) (3)	Dec (1950) (4)	Pos.Ref (5)	m (6)	type (7)	z (8)	S_{5GHz} (9)	α_{11-6} (10)	Comments (11)
1	0010+775	00 10 22.31	+77 32 06.4	S5	18.0	GAL	0.326	0.781	−0.85	R, V, see special notes
2	0013+790	00 13 36.13	+79 00 10.1	S5	22.0	GAL	0.840	1.044	−1.06	Be, C, G, J, R
3	0014+813	00 14 04.46	+81 18 28.5	S5	16.5	QSO	3.384	0.551	−0.16	B, R, V
4	0016+731	00 16 54.20	+73 10 51.3	RO	18.0	QSO	1.781	1.654	+0.16	B, J, R, V
5	0018+729	00 18 34.43	+72 56 03.8	S5	22.4	GAL	*	0.364	−0.67	see special notes
6	0036+744	00 36 34.80	+74 26 56.5	S5	*	SS_EF	*	0.285	−1.04	see special notes
7	0040+734	00 40 43.07	+73 27 45.0	S5	19.5	QSO	*	0.248	−0.75	
8	0048+892	00 48 18.92	+89 12 41.8	S5	*	SS_EF	*	0.540	−1.14	R, see note 0036+744
9	0049+746	00 49 10.99	+74 40 43.0	S5	18.0	GAL	*	0.315	−0.75	
10	0106+729	01 06 12.91	+72 56 28.9	S5	19.5	GAL	0.181	0.890	−1.20	Be, C, R
11	0122+725	01 22 08.37	+72 30 10.3	S5	19.8	GAL	*	0.476	−0.94	R
12	0123+731	01 23 10.33	+73 07 39.3	S5	*	SS_EF	*	0.259	−0.63	see note 0036+744
13	0124+845	01 24 55.27	+84 30 44.8	S5	23.7	GAL ?	*	0.257	−0.89	see special notes
14	0153+744	01 53 04.33	+74 28 05.5	PA	17.5	QSO	2.338	1.513	−0.32	B, J, R, V, see special notes
15	0159+723	01 59 13.04	+72 18 29.1	S5	19.3	BL/QSO	*	0.330	+0.05	V
16	0200+751	02 00 54.19	+75 07 48.1	S5	*	SS_EF	*	0.467	−0.81	see note 0036+744
17	0201+796	02 01 37.22	+79 41 44.5	S5	22.2	GAL	*	0.418	−1.00	see special notes
18	0205+722	02 05 26.86	+72 15 16.4	S5	20.7	QSO	*	0.549	−0.38	see special notes
19	0210+860	02 10 41.44	+86 03 34.9	S5	19.0	QSO	0.186	1.679	−1.12	B, C, J, R
20	0212+735	02 12 49.91	+73 35 40.0	RO	19.0	QSO	2.367	2.196	−0.12	B, J, R, V
21	0219+767	02 19 34.41	+76 42 19.6	S5	19.5	GAL	*	0.541	−1.06	R
22	0223+774	02 23 39.66	+77 29 52.2	S5	19.5	GAL	*	0.682	−1.13	R, see special notes
23	0223+814	02 23 07.68	+81 28 06.6	S5	*	GAL ?	*	0.411	−0.77	see special notes
24	0236+718	02 36 29.35	+71 49 35.0	S5	*	GAL ?	*	0.553	−0.90	R, see note 0223+814
25	0238+711	02 38 50.07	+71 07 33.8	S5	18.2	BL/QSO	*	0.272	−0.02	V, see special notes
26	0251+785	02 51 29.41	+78 31 42.4	S5	*	QSO ?	*	0.340	−0.01	see special notes
27	0252+818	02 52 09.16	+81 50 38.9	S5	*	GAL ?	*	0.398	−1.09	see note 0223+814
28	0258+772	02 58 48.29	+77 15 48.9	S5	21.5	GAL	*	0.459	−0.78	see special notes
29	0325+716	03 25 11.75	+71 39 55.7	S5	*	SS_EF	*	0.476	−0.89	R
30	0328+740	03 28 48.25	+74 00 32.2	S5	20.7	GAL	0.600	0.474	−1.15	R, V, see special notes
31	0330+707	03 30 32.83	+70 45 58.6	S5	*	SS_EF	*	0.256	−1.13	see note 0036+744
32	0346+800	03 46 49.38	+80 00 33.6	S5	*	QSO ?	*	0.396	−0.24	see special notes
33	0349+727	03 49 18.02	+72 45 50.2	S5	*	SS_EF	*	0.457	−1.01	see note 0036+744
34	0358+703	03 58 28.00	+70 18 36.2	S5	*	SS_EF	*	0.257	−0.93	see note 0036+744
35	0403+768	04 03 59.21	+76 48 52.5	S5	21.2	GAL	0.5985	2.790	−0.58	J, see special notes
36	0407+747	04 07 06.06	+74 43 24.4	S5	19.1	GAL	0.373	0.962	−0.90	see special notes
37	0415+763	04 15 22.57	+76 19 59.7	S5	21.9	GAL	*	0.285	−1.03	see special notes
38	0437+785	04 38 00.52	+78 33 23.0	S5	17.7	QSO	0.454	0.258	−0.72	V, see special notes
39	0440+732	04 41 00.49	+73 14 10.3	S5	19.6	QSO	1.290	0.296	−0.75	V, see special notes
40	0450+711	04 50 00.87	+71 08 38.8	S5	*	GAL ?	*	0.421	−0.64	R, see note 0223+814
41	0454+844	04 54 57.13	+84 27 53.0	SO	16.5	BL/QSO	0.112	1.398	+0.38	B, J, R, V, see special notes
42	0459+791	04 59 18.53	+79 08 51.0	S5	20.0	GAL	*	0.248	−0.85	
43	0518+705	05 18 33.12	+70 32 04.8	S5	20.0	QSO	*	0.250	−0.34	see special notes
44	0546+726	05 46 45.33	+72 40 00.7	S5	18.0	QSO	1.554	0.376	−0.23	see special notes
45	0601+712	06 01 22.26	+71 16 32.4	S5	*	SS_EF	*	0.278	−0.44	see note 0036+744
46	0604+728	06 04 39.19	+72 49 27.1	PA	20.3	QSO	*	0.557	−0.55	see special notes
47	0609+710	06 09 48.20	+71 03 10.2	S5	12.8	GAL	0.0135	0.333	−1.01	R, V
48	0610+784	06 10 40.30	+78 22 28.0	S5	11.0	GAL	0.00297	0.398	−1.05	R
49	0615+820	06 15 32.71	+82 03 56.5	FY1	17.5	QSO	0.710	0.999	−0.03	B, J, R, V, see special notes
50	0623+765	06 22 59.48	+76 34 39.6	S5	19.5	GAL	*	0.447	−1.00	
51	0625+842	06 24 59.84	+84 13 24.1	S5	21.1	GAL	*	0.275	−1.06	see special notes
52	0633+734	06 33 06.40	+73 27 35.9	PA	18.2	QSO	1.851	0.665	−0.32	R, see special notes
53	0638+779	06 38 17.57	+77 57 56.9	S5	*	SS_EF	*	0.286	−0.91	see note 0036+744
54	0647+733	06 47 11.91	+73 20 33.2	S5	*	SS_EF	*	0.248	−0.87	see special notes
55	0702+748	07 02 47.41	+74 54 14.0	S5	18.5	GAL	0.2957	0.789	−1.00	C, G
56	0716+714	07 16 13.03	+71 26 15.3	FY1	15.5	BL/QSO	*	1.121	+0.23	B, J, R, V
57	0718+792	07 18 08.39	+79 17 22.8	S5	*	FS_EF	*	0.631	+0.03	see note 0036+744
58	0734+705	07 33 58.80	+70 30 01.5	S5	21.5	GAL	0.994	0.586	−1.22	Be, C, R
59	0734+805	07 34 20.40	+80 33 32.9	S5	17.0	GAL	0.1182	1.134	−0.85	Be, C, G, J, R, V
60	0740+767	07 40 26.53	+76 46 35.9	S5	20.0	GAL ?	*	0.592	+0.86	R, see special notes
61	0740+828	07 40 33.20	+82 49 24.2	S5	18.5	QSO	1.991	0.931	−0.53	V, see special notes
62	0743+744	07 43 14.65	+74 28 10.0	S5	19.3	QSO	1.629	0.330	−0.05	V, see special notes
63	0802+733	08 02 32.33	+73 23 53.5	S5	*	GAL ?	*	0.405	−0.22	see note 0223+814
64	0816+714	08 16 14.33	+71 29 12.6	S5	*	GAL ?	*	0.393	−0.68	see note 0223+814

Table 1. continued

Sequ. (1)	Object (2)	RA (1950) (3)	Dec (1950) (4)	Pos.Ref (5)	m (6)	type (7)	z (8)	S_{5GHz} (9)	α_{11-6} (10)	Comments (11)
65	0817+710	08 17 04.28	+71 02 41.5	S5	*	GAL ?	*	0.258	−0.73	see note 0223+814
66	0819+770	08 19 22.70	+77 02 59.0	S5	18.3	GAL	0.309	0.248	−0.85	see special notes
67	0820+742	08 20 03.98	+74 14 16.5	S5	20.9	GAL	*	0.295	−1.07	see special notes
68	0824+802	08 24 55.20	+80 16 07.8	S5	21.3	GAL	*	0.276	−0.95	see special notes
69	0829+728	08 29 56.73	+72 49 02.4	S5	20.0	GAL	*	0.324	−0.95	
70	0836+710	08 36 21.54	+71 04 22.5	PA	16.5	QSO	2.172	2.573	−0.33	B, J, R, V, see special notes
71	0841+786	08 41 51.80	+78 41 04.8	S5	18.9	GAL	*	0.361	−1.07	
72	0916+718	09 16 39.64	+71 48 57.3	PA	19.5	QSO	0.594	0.270	−0.37	see special notes
73	0916+864	09 16 13.28	+86 25 17.1	S5	19.0	BL/QSO	*	0.253	+0.21	V
74	0925+745	09 25 52.65	+74 33 16.5	S5	*	FS_EF	*	0.302	+0.09	see special notes
75	0926+793	09 26 32.42	+79 19 44.0	S5	20.5	GAL	0.620	0.522	−1.17	Be, C, R, see special notes
76	0931+834	09 31 12.09	+83 28 54.6	S5	20.5	GAL	0.685	0.519	−1.44	Be, C, R, see note 0926+793
77	0936+831	09 36 55.99	+83 07 50.9	S5	19.9	GAL	*	0.248	−0.79	see special notes
78	0944+734	09 44 24.34	+73 27 45.0	S5	15.9	GAL	0.0581	0.656	−1.01	Be
79	0950+748	09 50 04.54	+74 50 07.7	S5	21.7	GAL	*	0.690	−0.57	see special notes
80	1003+830	10 03 25.79	+83 04 56.6	S5	18.3	GAL	0.322	0.716	−0.14	see special notes
81	1004+861	10 04 04.11	+86 08 39.8	S5	17.5	GAL	0.147	0.257	−0.90	see special notes
82	1007+716	10 07 26.14	+71 39 29.1	S5	17.1	QSO	1.192	0.590	−0.95	R, V, see special notes
83	1009+748	10 09 50.07	+74 52 32.5	S5	20.9	GAL	*	0.607	−1.11	R, see special notes
84	1011+813	10 11 50.39	+81 20 16.5	S5	18.5	GAL	*	0.470	−0.57	
85	1018+807	10 18 02.55	+80 48 01.0	S5	18.0	GAL	*	0.523	−1.00	R, see special notes
86	1024+791	10 24 37.43	+79 08 01.0	S5	20.0	GAL	*	0.421	−0.74	
87	1027+749	10 27 13.39	+74 57 22.7	S5	17.2	GAL	0.123	0.319	−0.20	V, see special notes
88	1039+811	10 39 27.74	+81 10 23.8	FY1	16.5	QSO	1.254	1.144	+0.40	B, V, see special notes
89	1042+736	10 42 23.53	+73 36 58.8	S5	14.7	GAL	0.021	0.306	−0.63	R, see special notes
90	1044+719	10 44 49.73	+71 59 27.0	PA	17.8	QSO	1.15	0.707	−0.08	see special notes
91	1049+722	10 49 01.32	+72 15 48.5	S5	19.5	GAL	*	0.374	−0.53	
92	1053+704	10 53 27.74	+70 27 47.6	S5	19.0	QSO	2.493	0.710	+0.16	see special notes
93	1053+815	10 53 36.22	+81 30 35.6	S5	18.4	QSO	0.706	0.770	−0.36	R, V, see special notes
94	1058+726	10 58 20.09	+72 41 45.0	PA	17.9	QSO	1.46	0.778	−0.52	B, R, V, see special notes
95	1100+772	11 00 27.45	+77 15 08.4	S5	15.7	QSO	0.311	0.772	−0.88	B, C, R, V
96	1100+798	11 00 00.03	+79 49 02.9	S5	20.4	GAL	*	0.278	−0.58	see special notes
97	1133+704	11 33 32.36	+70 26 03.3	S5	14.5	BL/GAL	0.0458	0.251	−0.10	B, R, V
98	1142+702	11 42 20.67	+70 14 55.3	S5	*	SS_EF	*	0.485	−0.98	see special notes
99	1150+812	11 50 23.48	+81 15 10.4	RU	18.5	QSO	1.250	1.181	−0.09	B, J, V, see special notes
100	1152+758	11 52 24.05	+75 51 23.0	S5	21.6	GAL	*	0.325	−0.74	see special notes
101	1154+815	11 54 31.04	+81 35 05.8	S5	*	GAL ?	*	0.421	−0.70	see note 0223+814
102	1157+732	11 57 44.26	+73 17 27.4	S5	22.0	GAL	0.9737	2.629	−0.73	Be, C, J, R, see note 0926+793
103	1217+713	12 17 46.14	+71 22 09.4	S5	20.0	QSO	0.451	0.304	+0.47	see special notes
104	1221+809	12 21 47.55	+80 56 42.1	S5	19.0	BL/QSO	*	0.518	+0.43	R, V
105	1236+842	12 36 17.53	+84 13 36.4	S5	18.9	GAL	0.226	0.286	−0.79	see special notes
106	1241+735	12 41 18.55	+73 32 24.2	PA	17.0	GAL	*	0.276	−0.86	see special notes
107	1259+811	12 59 52.90	+81 10 45.8	S5	22.3	GAL	*	0.265	−1.23	see special notes
108	1304+791	13 04 02.21	+79 10 38.1	S5	19.4	GAL	*	0.271	−0.10	
109	1305+770	13 05 53.89	+77 05 18.5	S5	*	SS_EF	*	0.267	−0.90	see note 0036+744
110	1305+804	13 05 25.92	+80 24 22.4	S5	*	FS_EF	*	0.375	−0.45	see note 0036+744
111	1317+825	13 17 40.12	+82 34 59.4	S5	*	SS_EF	*	0.247	−0.94	see note 0036+744
112	1322+835	13 22 34.51	+83 31 51.3	S5	*	FS_EF	*	0.506	+0.24	see special notes
113	1323+799	13 23 30.99	+79 58 27.6	VLA	21.5	GAL ?	*	0.458	+0.22	see special notes
114	1345+736	13 45 14.84	+73 35 50.2	S5	17.4	QSO	0.290	0.452	−0.48	V, see special notes
115	1357+769	13 57 42.12	+76 57 53.4	VLA	19.0	QSO	*	0.844	+0.61	R
116	1406+787	14 06 56.66	+78 42 22.6	S5	19.0	GAL	*	0.271	−0.10	
117	1419+762	14 19 48.57	+76 14 15.8	S5	19.6	QSO	*	0.314	−0.87	
118	1436+763	14 36 04.39	+76 18 24.6	S5	*	QSO ?	*	0.585	−0.63	see special notes
119	1443+773	14 43 53.69	+77 20 03.8	S5	19.0	GAL	0.267	0.407	−1.19	Be, C, G, R
120	1447+771	14 47 49.32	+77 08 46.1	S5	21.4	GAL	1.132	0.408	−1.11	Be, C, G, R, see note 0926+793
121	1448+762	14 48 56.59	+76 13 33.7	S5	22.3	QSO	0.899	0.683	+0.32	see special notes
122	1458+718	14 58 56.64	+71 52 11.3	FY2	16.8	QSO	0.905	3.340	−0.67	B, C, J, R, V
123	1510+709	15 10 11.41	+70 57 09.3	C	17.0	GAL	0.1197	0.331	−1.26	Be, C, R
124	1510+835	15 10 55.66	+83 30 49.0	S5	20.0	QSO	*	0.281	−0.05	
125	1520+725	15 20 56.79	+72 35 46.4	S5	16.5	QSO	0.799	0.486	−0.87	R, V, see special notes
126	1531+722	15 31 45.73	+72 16 45.1	S5	17.7	QSO	0.899	0.456	−0.04	V, see special notes
127	1550+703	15 49 59.92	+70 21 54.5	PA	20.4	QSO	*	0.307	−0.52	R
128	1557+708	15 57 37.10	+70 49 45.0	S4	12.6	GAL	0.025	1.020	−0.89	R, see special notes
129	1612+797	16 12 23.72	+79 47 33.9	S5	*	SS_EF	*	0.575	−0.59	
130	1616+851	16 16 22.73	+85 09 26.4	S5	17.4	GAL	0.183	0.345	−0.60	V, see special notes

Table 1. continued

Sequ.	Object	RA (1950)	Dec (1950)	Pos.Ref	m	type	z	S_{5GHz}	α_{11-6}	Comments
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
131	1631+859	16 31 16.35	+85 56 03.1	S5	*	GAL ?	*	0.572	−0.84	see note 0223+814
132	1635+742	16 35 02.39	+74 11 53.9	S5	22.9	GAL ?	*	0.372	−0.81	see special notes
133	1637+826	16 37 56.97	+82 38 18.5	VLA	14.0	GAL	0.0234	0.978	−0.55	Be, G, R, V
134	1650+758	16 50 21.49	+75 51 31.6	S5	19.2	GAL	*	0.648	−0.93	see special notes
135	1654+866	16 54 31.42	+86 37 07.0	S5	*	SS_EF	*	0.315	−0.79	see note 0036+744
136	1701+795	17 01 07.01	+79 32 30.0	S5	20.5	QSO	*	0.286	−0.83	
137	1726+769	17 26 09.48	+76 55 43.6	S5	19.2	QSO	0.680	0.339	−0.11	V, see special notes
138	1728+738	17 28 58.53	+73 53 09.6	S5	20.0	GAL	*	0.390	−0.98	
139	1728+774	17 28 14.07	+77 28 47.0	S5	*	SS_EF	*	0.401	−0.77	see note 0036+744
140	1733+714	17 33 16.38	+71 26 08.7	S5	15.5	GAL	0.059	0.249	−0.64	see special notes
141	1733+737	17 33 16.82	+73 42 05.5	S5	18.0	GAL	0.226	0.277	−0.71	see note 1042+736
142	1746+712	17 46 26.42	+71 16 49.5	S5	18.8	GAL	0.216	0.268	−0.69	see special notes
143	1749+701	17 49 03.41	+70 06 39.7	SO	17.0	BL/QSO	0.770	1.450	−0.26	B, J, V, see special notes
144	1803+784	18 03 39.24	+78 27 54.3	RO	16.4	BL/QSO	0.684	2.633	+0.26	B, J, V
145	1807+707	18 07 24.41	+70 44 13.0	S5	17.5	GAL	0.204	0.476	−0.88	R, see note 1042+736
146	1811+738	18 11 34.20	+73 49 42.3	S5	20.1	GAL	*	0.332	−1.16	see special notes
147	1825+743	18 25 53.24	+74 19 06.6	S5	18.0	GAL	0.256	0.728	−0.59	Be, C, G, R
148	1826+796	18 26 43.26	+79 36 59.8	S5	17.9	GAL	0.224	0.577	+0.40	R, see special notes
149	1845+797	18 45 37.63	+79 43 06.4	VLA	15.4	GAL	0.0561	4.323	−0.69	Be, C, G, R, V
150	1856+737	18 56 07.00	+73 47 19.5	S5	17.5	QSO	0.460	0.407	−0.02	V, see special notes
151	1914+855	19 15 00.21	+85 31 50.5	S5	21.1	GAL	*	0.276	−0.87	see special notes
152	1920+744	19 20 21.53	+74 27 42.1	S5	21.6	GAL	*	0.315	−0.76	see special notes
153	1928+738	19 28 49.38	+73 51 44.9	RO	15.5	QSO	0.302	3.337	−0.01	B, J, V, see special notes
154	1936+714	19 36 31.68	+71 24 43.2	S5	19.5	QSO	1.864	0.338	−0.35	V, see special notes
155	1939+813	19 39 33.50	+81 23 21.3	S5	21.1	GAL	*	0.339	−0.12	see special notes
156	1945+726	19 45 55.35	+72 40 32.7	S5	18.7	QSO	0.303	0.276	−0.81	V, see note 1042+736
157	1946+708	19 46 11.97	+70 48 21.2	S5	18.0	GAL	0.101	0.636	−0.33	R, see note 1042+736
158	1950+849	19 50 38.82	+84 54 31.1	S5	19.5	GAL	*	0.247	−1.02	
159	2007+777	20 07 20.48	+77 43 58.1	A	16.7	BL/QSO	0.342	1.279	+0.71	B, R, V
160	2010+723	20 10 16.14	+72 20 20.6	S5	19.5	BL/QSO	*	0.917	−0.26	R, V, see special notes
161	2017+745	20 17 59.42	+74 31 21.8	FY2	18.3	QSO	2.191	0.370	+0.12	see special notes
162	2018+732	20 18 52.83	+73 17 26.7	S5	21.1	GAL	*	0.267	−0.97	see special notes
163	2023+760	20 23 40.85	+76 01 40.6	VLA	17.1	BL/QSO	*	0.426	−0.13	V, see special notes
164	2043+748	20 43 32.67	+74 52 11.0	S5	*	SS_EF	*	0.379	−1.17	see note 0036+744
165	2043+749	20 43 24.83	+74 57 08.5	S5	15.4	QSO	0.104	0.319	−1.65	V
166	2046+762	20 46 32.55	+76 14 07.1	S5	18.9	GAL	*	0.286	−0.86	
167	2051+745	20 51 57.45	+74 30 18.1	S5	19.0	BL/QSO	*	0.528	+0.33	R, V, see special notes
168	2059+732	20 59 47.50	+73 16 37.8	S5	*	SS_EF	*	0.298	−0.53	see note 0036+744
169	2104+763	21 04 47.26	+76 20 59.0	VLA	21.1	GAL	0.572	0.997	−1.07	C, see special notes
170	2111+801	21 11 07.67	+80 08 51.8	S5	18.9	QSO	0.524	0.260	−0.37	V , see note 1042+736
171	2116+818	21 16 39.09	+81 52 13.7	S5	15.7	GAL	0.086	0.376	−0.22	V, see special notes
172	2118+749	21 18 24.07	+74 59 02.0	S5	*	SS_EF	*	0.343	−0.84	see special notes
173	2120+717	21 20 40.27	+71 42 20.7	S5	20.2	GAL	*	0.315	−0.74	see special notes
174	2133+837	21 33 49.48	+83 44 01.2	S5	21.0	GAL	*	0.561	−0.92	S5, see special notes
175	2134+846	21 34 11.40	+84 40 09.5	S5	21.0	GAL	*	0.323	−1.12	R, see note 2133+837
176	2135+842	21 35 50.60	+84 16 47.0	S5	20.0	QSO	*	0.276	−0.86	R
177	2136+824	21 36 02.32	+82 25 39.0	S5	19.6	QSO	2.350	0.509	−0.47	R, see special notes
178	2154+726	21 54 13.04	+72 37 24.1	S5	*	SS_EF	*	0.312	−0.76	see note 0036+744
179	2205+743	22 05 08.89	+74 21 41.7	S5	22.5	GAL	*	0.261	−0.20	see special notes
180	2248+712	22 48 58.82	+71 13 23.8	S5	22.0	GAL	1.841	0.273	−1.46	Be, C, see special notes
181	2323+790	23 23 23.43	+79 00 46.2	S5	19.5	GAL	*	0.448	−0.87	
182	2325+822	23 25 20.83	+82 15 26.7	S5	21.1	GAL	*	0.285	−1.00	see special notes
183	2342+821	23 42 06.37	+82 10 01.3	S5	20.2	QSO	0.735	1.304	−0.92	B, J, V, see special notes
184	2352+796	23 52 58.47	+79 38 35.6	S5	22.5	GAL	1.336	0.408	−1.08	Be, C
185	2353+816	23 53 58.61	+81 36 10.7	S5	20.3	BL/QSO	*	0.476	+0.12	V, see special notes

References :

A	Waltman et al. (1981)
B	Hewitt & Burbidge (1993)
Be	Hewitt & Burbidge (1991)
C	Spinrad et al. (1985)
FY1	Fey et al. (1992)
FY2	Fey et al. (1994)
G	Burbidge & Crowne (1979)
J	Kühr et al. (1981a), Stickel et al. (1994)
PA	Patnaik et al. (1992)
R	Véron-Cetty & Véron (1983)
RO	Robertson et al. (1993)
RU	Russell et al. (1992)
S4	Pauliny-Toth et al. (1978)
S5	Kühr et al. (1987)
SO	Sovers et al. (1988)
V	Véron-Cetty & Véron (1993)
VLA	VLA Calibrator position

been taken from the catalogues listed in Col. 11 and the tables given in Kühr et al. (1987). The latter has not explicitly been noted since almost all of the brighter ($m \lesssim$ 20 mag) identifications are listed there. For all but a few sources, finding charts derived from POSS can be found in Kühr et al. (1987) and deeper CCD images of more than 60 S5 sources will be given in Stickel & Kühr (1995). Except for 1577+708 and 1749+701, the radio fluxes as well as the radio spectral indices (Cols. 9, 10) were taken from the original S5 survey (Kühr et al. 1981b). The optical counterparts of the BL Lac objects have been divided into BL / GAL and BL / QSO, depending on whether the hostgalaxy or the central point source dominates the appearance on direct images.

Among the 146 sources which are classified as QSO or GAL, there are 16 sources, where the classification of the optical counterparts is considered uncertain. These tentative classifications are based on the inspection of the radio position on POSS. It can be expected that additional CCD images with magnitude limits of $m \approx 22-23$ mag will clarify the nature of most of them. Of the 25 sources currently classified as empty fields, however, all but two sources (0325+716, 1612+797) have already been imaged to this depth and no optical identification was found. Therefore, the search for the optical counterparts of these empty fields sources requires much deeper optical and IR imaging data. Some of them may actually be related to the 1 Jy/S4 source 1413+349, where a counterpart has possibly been detected in the IR (O'Dea et al. 1992), but not in the Optical ($m > 24$ mag).

A summary of the current identification status of the S5 catalogue is given in Table 2. Together with the statistics of the 1 Jy (Stickel et al. 1994) and the S4 (Stickel & Kühr 1994a) radio source catalogues, an interesting trend is noticed for the number of sources classified as QSOs and GALs and the number of steep and flat spectrum sources. Both the 1 Jy catalogue and the S4 catalogue contain more QSOs and flat spectrum sources than galaxies and steep spectrum sources. The S5, however, with its flux density limit of $S_{5\mathrm{GHz}} \geq 250$ mJy, contains more galaxies (most of them with steep radio spectra) than quasars. The overall distribution of quasars, galaxies, and sources with flat and steep radio spectra is quite similar to that found in the PKS 100 mJy Deep Survey (Dunlop et al. 1989). In general, the relative fraction of less powerful steep spectrum galaxies increases among identifications of high frequency radio surveys with decreasing flux density limits.

Table 2. Statistics of the S5 radio sources

total number of sources	185
Quasars (QSO)	51
uncertain classification	3
redshifts known	38
missing redshifts	13
Galaxies (GAL)	95
uncertain classification	13
redshifts known	39
missing redshifts	56
BL Lac objects (both types)	14
BL/GAL	1
BL/QSO	13
redshifts known	5
missing redshifts	9
Empty Fields (both types)	25
Flat radio spectra (FS_EF, $\alpha_{11-6} \geq -0.5$)	4
Steep radio spectra (SS_EF, $\alpha_{11-6} < -0.5$)	21
Sources with flat radio spectra ($\alpha_{11-6} \geq -0.5$)	62
Quasars	32
Galaxies	12
BL Lac Objects	14
Empty Fields	4
Sources with steep radio spectra ($\alpha_{11-6} < -0.5$)	123
Quasars	19
Galaxies	83
BL Lac Objects	0
Empty Fields	21

3. Notes on individual S5 sources

0010 + 775: The optical spectrum and redshift is given in Stickel et al. (1993a). The redshift has also been listed by Xu et al. (1994).

0018 + 729: The identification and optical magnitude have been taken from Stanghellini et al. (1993a)

0036 + 744: The classification as an empty field (Kühr et al. 1987) has been confirmed with a deeper CCD image (Stickel & Kühr 1995)

0124 + 845: The tentative classification as a faint ($m =$ 23.7 mag) galaxy is given in Stickel & Kühr (1995).

0153 + 744: The optical brightness is given in Stickel & Kühr (1995).

0201 + 796: The identification and classification of the optical counterpart as a $m = 22.2$ mag galaxy is given in Stickel & Kühr (1995).

0205 + 722: The identification and classification of the optical counterpart as a $m = 20.7$ mag QSO is given in Stickel & Kühr (1995). The identification listed by Taylor et al. (1994) is incorrect (see also Kühr et al. 1987).

0223 + 774: The optical identification has also been given by Riley (1989).

0223 + 814: The tentative classification as a galaxy is given in Kühr et al. (1987).

0238 + 711: The optical brightness is given in Stickel & Kühr (1995).

0251 + 785: The tentative classification as a QSO is given in Kühr et al. (1987).

0258 + 772: The identification and classification of the optical counterpart as a $m = 21.5$ mag galaxy is given in Stickel & Kühr (1995).

0328 + 740: The revised identification and optical magnitude as well as the optical spectrum and redshift were given in Stickel & Kühr (1993b).

0346 + 800: The tentative classification as a QSO is given in Kühr et al. (1987).

0403 + 768: The optical identification as a galaxy given by Peacock et al. (1981) has been confirmed with a deeper CCD image (Stickel & Kühr 1995), from which the optical magnitude of $m = 21.2$ mag has been derived. The redshift has been listed by O'Dea et al. (1991).

0407 + 747: The redshift has been taken from Herbig & Readhead (1992). However, Xu et al. (1994) observed a featureless optical spectrum characteristic for a BL Lac object.

0415 + 763: The tentative identification as a galaxy (Kühr et al. 1987) has been confirmed with a deeper CCD image (Stickel & Kühr 1995), from which the optical magnitude of $m = 21.9$ mag has been derived.

0437 + 785: The optical brightness was taken from Stickel & Kühr (1995). The optical spectrum and redshift have been given in Stickel et al. (1993a).

0440 + 732: The optical brightness has been taken from Stickel & Kühr (1995). The optical spectrum and redshift have been given in Stickel et al. (1993a).

0454 + 844: The redshift of $z = 0.112$ has been made available to us by C. Lawrence (1993, priv. comm.). This value is in obvious contrast to the lower limit of $z > 0.2$ suggested in Stickel et al. (1993b) on the basis of the unresolved appearance on the direct image. This indicates that the host galaxy of this BL Lac object has an unusually low optical luminosity (see the discussion in Stickel et al. 1993b).

0518 + 705: The revised identification of the stronger radio component of 0518+705 with a faint ($m = 20.0$ mag) QSO lying only 1″ west of a $m = 18$ mag galactic star has been given in Stickel & Kühr (1993b).

0546 + 726: The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope.

0604 + 728: The identification and classification of the optical counterpart as a $m = 20.3$ mag QSO is given in Stickel & Kühr (1995).

0615 + 820: The redshift listed by Eckart et al. (1986) is based on spectra taken by one of us (H.K.) with the Steward Observatory 90″ telescope and the Multiple Mirror Telescope.

0625 + 842: The identification and classification of the optical counterpart as a $m = 21.1$ mag galaxy is given in Stickel & Kühr (1995).

0633 + 734: The confirmed identification and classification of the optical counterpart as a $m = 18.2$ mag quasar is given in Stickel & Kühr (1995). The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope.

0647 + 733: Although no optical counterpart has been found exactly at the radio position, the Head-Tail radio structure (Kühr et al. 1987) suggests that one of the galaxies detected around the radio position is the correct optical identification (Stickel & Kühr 1995).

0740 + 767: The tentative classification as a galaxy is given in Kühr et al. (1987). The optical magnitude has been taken from Kühr (1980).

0740 + 828: The optical brightness has been taken from Stickel & Kühr (1995). The optical identification has also been given by Riley (1989). The redshift has been taken from Xu et al. (1994). The single emission line redshift given in Stickel et al. (1993a) and listed in Véron-Cetty & Véron (1993) is incorrect.

0743 + 744: This radio source lies close to the galaxy Mkn 11 and the identification with a QSO has also been made by Condon & Broderick (1988). The optical spectrum and redshift is given in Stickel et al. (1993a).

0819 + 770: The optical brightness has been taken from Stickel & Kühr (1995). The optical spectrum and redshift have been given in Stickel et al. (1993a).

0820 + 742: The identification and classification of the optical counterpart as a $m = 20.9$ mag galaxy is given in Stickel & Kühr (1995).

0824 + 802: The identification and classification of the optical counterpart as a $m = 21.3$ mag galaxy is given in Stickel & Kühr (1995).

0836 + 710: The optical spectrum and redshift is given in Stickel & Kühr (1993a). The redshift has previously been listed by Eckart et al. (1986), based on spectra taken by one of us (H.K.) with the Steward Observatory 90″ telescope and the Multiple Mirror Telescope.

0916 + 718: The redshift has been derived from spectra taken by one of us (H.K.) with the Steward Observatory 90″ telescope and the Multiple Mirror Telescope.

0925 + 745: The classification as an empty field is given in Stickel & Kühr (1995). The faint optical couterpart proposed in Kühr et al. (1987) could not be confirmed.

0926 + 793: The redshift has been taken from McCarthy (1988).

0936 + 831: The identification and classification of the optical counterpart as a $m = 19.9$ mag galaxy is given in Stickel & Kühr (1995).

0950 + 748: The identification and classification of the optical counterpart as a $m = 21.7$ mag galaxy is given in Stickel & Kühr (1995).

1003 + 830: The redshift has been taken from Xu et al. (1994).

1004 + 861: The confirmed identification and classification of the optical counterpart as a $m = 17.5$ mag galaxy is given in Stickel & Kühr (1995). The optical spectrum and redshift of the optical counterpart have been given in Stickel et al. (1993a).

1007 + 716: The optical spectrum and redshift of the optical counterpart have been given in Stickel et al. (1993a).

1009 + 748: The confirmed identification and classification of the optical counterpart as a $m = 20.9$ mag galaxy is given in Stickel & Kühr (1995).

1018 + 807: The optical identification has also been given by Riley (1989).

1027 + 749: The confirmed identification and classification of the optical counterpart as a galaxy with a possible point source in its center is given in Stickel & Kühr (1995). The optical spectrum and redshift have been given in Stickel & Kühr (1993a).

1039 + 811: The redshift is derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope and has previously been listed by Eckart et al. (1986).

1042 + 736: The optical spectrum and redshift have been given in Stickel & Kühr (1993a).

1044 + 719: The identification and classification of the optical counterpart as a $m = 17.8$ mag QSO is given in Stickel & Kühr (1995). The redshift has been listed by Poladitis et al. (1995).

1053 + 704: The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope. The redshift has also been listed by Xu et al. (1994).

1053 + 815: The classification of 1053+815 as a quasar rather than a galaxy (as listed in Kühr et al. 1987) is based on the observed emission lines ($z = 0.706$, Xu et al. 1994). The optical brightnesses listed in Kühr et al. (1987) and Kühr & Schmidt (1990) indicate optical variability of a least one magnitude.

1058 + 726: The redshift has been taken from Véron-Cetty & Véron (1993). The redshift listed in Kühr et al. (1987) is incorrect.

1100 + 798: The identification and classification of the optical counterpart as a $m = 20.4$ mag galaxy is given in Stickel & Kühr (1995).

1142 + 702: The classification as an empty field is given in Stickel & Kühr (1995). The faint optical couterpart proposed in Kühr et al. (1987) could not be confirmed.

1150 + 812: The redshift is derived from spectra taken by one of us (H.K.) with Steward Observatory 90″ telescope and has previously been listed by Eckart et al. (1986).

1152 + 758: The identification and classification of the optical counterpart as a $m = 21.6$ mag galaxy is given in Stickel & Kühr (1995).

1217 + 713: The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope.

1236 + 842: The optical spectrum and redshift have been given in Stickel & Kühr (1994b). The optical brightness of $m = 18.9$ listed in Table 1 has been derived from the CCD image given there.

1241 + 735: The radio position listed in Kühr et al. (1987) is incorrect and superseded by that given in Patnaik et al. (1992). The optical counterpart of 1241+735 is a bright, $m = 17$ mag galaxy (Stickel & Kühr 1995), member of a small group of galaxies (see finding chart in Kühr et al. 1987).

1259 + 811: The identification and classification of the optical counterpart as a $m = 22.3$ mag galaxy is given in Stickel & Kühr (1995).

1322 + 835: The classification as an empty field is given in Stickel & Kühr (1995). The faint optical counterpart proposed by Kühr et al. (1987) could not be confirmed.

1323 + 799: The tentative classification of the optical counterpart as a $m = 21.5$ mag galaxy is given in Stickel & Kühr (1995).

1345 + 736: The optical spectrum and redshift have been given in Stickel & Kühr (1994b).

1436 + 763: The tentative classification as a QSO is given in Kühr et al. (1987).

1448 + 762: The identification with a faint object ($m = 22.3$ mag) is given in Stickel & Kühr (1995). The classification as a QSO is based on the observed emission line spectrum at $z = 0.899$ (Vermeulen & Taylor 1995).

1520 + 725: The optical identification has also been given by Riley (1989). The optical spectrum and redshift have been given in Stickel & Kühr (1994b).

1531 + 722: The optical spectrum and redshift have been given in Stickel et al. (1993). The optical brightness has been taken from Stickel & Kühr (1995). The quasar lies only 4″ away from the center of a foreground galaxy ($z = 0.102$), which itself is possibly member of a foreground galaxy group (see CCD image in Stickel & Kühr 1995).

1557 + 708: The optical spectrum and redshift was given in Stickel et al. (1993a). The redshift has also been listed by Herbig & Readhead (1992) and Xu et al. (1994). Because no radio flux and spectral index ware tabulated in the original S5 catalogue (Kühr et al. 1981b), these values have been taken from the S4 catalogue (Pauliny-Toth et al. 1978)

1616 + 851: The revised classification as a $m = 17.4$ mag galaxy as well as the optical spectrum and the redshift have been given in Stickel & Kühr (1993a).

1635 + 742: The tentative classification of the optical counterpart as a $m = 22.9$ mag galaxy is given in Stickel & Kühr (1995).

1650 + 758: The identification and classification of the optical counterpart as a $m = 19.2$ mag galaxy is given in Stickel & Kühr (1995).

1726 + 769: The optical spectrum and redshift have been given in Stickel & Kühr (1994b).

1733 + 714: The optical spectrum and redshift have been given in Stickel et al. (1993a).

1746 + 712: The optical spectrum and redshift have been given in Stickel & Kühr (1994b).

1749 + 701: Since the flux density and spectral index had not been listed in the original S5 catalogue (Kühr et al. 1981b), these values have been taken from the updated 1 Jy catalogue (Stickel et al. 1994).

1811 + 738: The identification and classification of the optical counterpart as a $m = 20.1$ mag galaxy is given in Stickel & Kühr (1995).

1826 + 796: The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope.

1856 + 737: The optical spectrum and redshift have been given in Stickel & Kühr (1994b). The entry for 1856+737 in the catalogue of Véron-Cetty & Véron (1993) has an incorrect object name.

1914 + 855: The identification and classification of the optical counterpart as a $m = 21.1$ mag galaxy is given in Stickel & Kühr (1995).

1920 + 744: The identification and classification of the optical counterpart as a $m = 21.6$ mag galaxy is given in Stickel & Kühr (1995).

1928 + 738: The redshift listed in Kühr et al. (1987) is incorrect. The correct redshift is given in Lawrence et al. (1986) and Stickel et al. (1993a).

1936 + 714: The optical spectrum and redshift have been given in Stickel et al. (1993a).

1939 + 813: The identification and classification of the optical counterpart as a $m = 21.1$ mag galaxy is given in Stickel & Kühr (1995).

2010 + 723: The classification as a BL Lac object is based on featureless spectra observed by Stickel & Kühr (1993b) and Xu et al. (1994). The optical brightness has been taken from Stickel & Kühr (1995). The optical counterpart is unresolved, suggesting a lower redshift limit of of $z > 0.2$ (Stickel & Kühr 1995).

2017 + 745: The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope.

2018 + 732: The identification and classification of the optical counterpart as a $m = 21.1$ mag galaxy is given in Stickel & Kühr (1995).

2023 + 760: The optical brightness has been taken from Stickel & Kühr (1995). The classification as a BL Lac object is based on a featureless spectrum (Stickel et al. 1993). The optical counterpart is unresolved, suggesting a lower redshift limit of $z > 0.2$ (Stickel & Kühr 1995).

2051 + 745: The optical brightness has been taken from Stickel & Kühr (1995).

2104 + 763: The identification, optical magnitude, and redshift have been taken from Smith et al. (1976).

2116 + 818: The optical spectrum and redshift have been given in Stickel et al. (1993a).

2118 + 749: The classification as an empty field (Kühr et al. 1987) has been confirmed with a deeper CCD image (Stickel & Kühr 1995).

2120 + 717: The identification and classification of the optical counterpart as a $m = 20.2$ mag galaxy is given in Stickel & Kühr (1995).

2133 + 837: The identification and optical magnitude have been taken from Kristian et al. (1978).

2136 + 824: The confirmed identification and classification of the optical counterpart as a $m = 19.6$ QSO is given in Stickel & Kühr (1995). The redshift has been derived from a spectrum taken by one of us (H.K.) with the Steward Observatory 90″ telescope.

2205 + 743: The identification and classification of the optical counterpart as a $m = 22.5$ mag galaxy is given in Stickel & Kühr (1995).

2248 + 7123: The identification, magnitude, and redshift have been taken from Djorgovski et al. (1988).

2325 + 822: The identification and classification of the optical counterpart as a $m = 21.1$ mag galaxy is given in Stickel & Kühr (1995).

2342 + 821: The optical brightness has been taken from Stickel & Kühr (1995).

2353 + 816: The classification as a BL Lac object is based on a featureless spectra. The optical counterpart is unresolved, suggesting a lower redshift limit of $z > 0.2$ (Stickel & Kühr 1993b).

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