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5000 MHz Flux Densities and Spectra for 325 Small-diameter Radio Sources at Low Galactic Latitudes

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Abstract

Flux density measurements at 5000 MHz are presented for 325 of the small-diameter sources detected in the Molonglo 408 MHz galactic survey. By investigating the spectra we show that probably between 10% and 15% of the sources are galactic and the remainder extragalactic.

1. Introduction

Clark and Crawford (1974) recently compiled a list of 513 small-diameter ($\lesssim 1'$ arc) sources occurring at low galactic latitudes ($|b| \leqslant 3°$), south of declination $+17°00'$; their lower flux density limit was $S_{408} = 0\cdot6$ Jy.* We have used the Parkes 64 m radio telescope at 5000 MHz (beamwidth $\sim 4'$ arc to half power) to measure flux densities for all of the stronger sources ($S_{408} \geqslant 1$ Jy) together with a sample of the weaker ones. The Molonglo telescope beam size ($2'\cdot86 \times 2'\cdot86 \times$ secant$(\delta + 35°\cdot5)$ arc) is only slightly smaller than ours and thus we were able to determine quite accurate spectral indices for most of the sources.

2. Observations at 5000 MHz

The receiver used Dicke switching of the feed horn against a cold load, and scans in right ascension and declination were made through the nominal 408 MHz position; the mean of a 'forward' and 'reverse' scan (each of length 30′ arc and at a drive rate of $1°\,\text{min}^{-1}$) was obtained for each source using 'STAKFL', a computer program due to J. V. Wall. The program allows on-line filtering of the data, baseline slope removal, intensity scaling of the results and source parameter fitting, and produces a plot of the corrected scaled data.

Scans were inspected individually for the possible presence of any adjacent confusing source which might necessitate more detailed interpretation of the flux density estimate, and to see whether in special cases either the right ascension or the declination scan should be ignored because of confusion. A check was also made that the trace was not significantly broader than the beam. For most sources with $S_{5000} > 1$ Jy we place an upper limit on the observed width of $1\cdot05$ times the beamwidth; a few exceptions which may be significantly broadened are noted in the results.

* 1 jansky (Jy) = $10^{-26}\,\text{W}\,\text{m}^{-2}\,\text{Hz}^{-1}$.

Table 1. 5000 MHz intensities and spectra for 284 small-diameter sources with $\alpha < -0\cdot35$

The positions listed are those measured at 408 MHz by Clark and Crawford (1974)

(1) Position (1950) R.A. h m s	(2) Position (1950) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}	(1) Position (1950) R.A. h m s	(2) Position (1950) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}
06 06 40·3	16 23 09	193·63−1·52	0·25	−0·79	06 45 55·8	−02 18 47	214·70−1·75	0·36	−0·74
06 13 34·2	11 57 27	198·32−2·20	0·21	−1·01	06 47 18·3	−05 35 48	217·78−2·95	0·20	−0·76
06 14 27·6	16 45 48	194·20+0·29	⩽0·04	⩽−1·31	06 50 44·0	−00 19 19	213·49+0·24	0·15	−0·88
06 16 08·0	13 38 00	197·14−0·85	0·85	−0·63	06 50 51·8	−07 15 56	219·67−2·93	0·18	−1·00
06 16 18·5	15 22 53	195·63+0·02	0·08	−1·09	06 51 11·5	04 07 27	209·59+2·38	0·13	−0·83
06 17 52·0	09 41 07	200·82−2·36	0·08	−1·12	06 51 16·8	00 08 55	213·13+0·57	0·25	−0·71
06 18 51·3	14 33 36	196·64+0·17	0·60	−1·09	06 52 09·6	02 10 56	211·43+1·71	0·07	−1·20
06 21 46·6	08 44 32	202·11−1·95	0·14	−0·92	06 52 27·7	02 55 56	210·79+2·12	0·08	−1·15
06 22 54·9	14 42 29	196·98+1·11	0·90	−0·85	06 55 18·3	02 23 15	211·60+2·50	0·10	−1·01
06 23 06·4	10 05 55	201·07−1·02	0·28	−0·53	06 55 21·7	−08 11 16	221·00−2·36	0·13	−0·83
06 26 24·1	07 45 20	203·52−1·40	0·15	−0·79	06 55 54·9	−00 58 24	214·66+1·09	0·06	−1·15
06 28 07·4	10 57 56	200·88+0·47	0·14	−1·03	06 56 01·3	−02 30 40	216·04+0·40	⩽0·05	⩽−1·20
06 29 29·4	10 24 15	201·53+0·51	0·85	−0·49	06 58 25·5	−10 39 02	223·54−2·82	0·18	−0·77
06 30 30·1	08 15 12	203·55−0·27	0·39	−0·80	07 03 38·6	−05 09 35	219·26+0·86	0·10	−1·02
06 30 53·0	11 41 36	200·55+1·41	0·11	−1·26	07 03 41·0	−13 20 15	226·52−2·92	0·38	−0·59
06 30 59·8	09 45 28	202·28+0·53	0·10	−0·94	07 04 30·2	−11 08 33	224·66−1·72	0·20	−0·67
06 32 17·1	01 58 13	209·32−2·80	0·08	−1·21	07 05 24·9	−07 54 58	221·91−0·03	0·24	−1·07
06 32 34·5	02 12 35	209·15−2·62	0·07	−1·06	07 08 35·2	−06 04 34	220·65+1·53	0·12	−0·85
06 33 27·0	04 35 05	207·14−1·33	0·40	−0·82	07 13 25·9	−11 50 31	226·30−1·11	0·14	−0·98
06 33 52·8	01 38 20	209·80−2·60	0·10	−0·94	07 14 51·3	−11 24 35	226·09+0·40	0·14	−1·03
06 34 05·4	02 10 39	209·35−2·30	0·13	−1·10	07 18 27·2	−15 13 58	229·87−0·64	0·24	−0·79
06 34 21·5	01 21 00	210·11−2·63	0·27	−0·87	07 18 29·3	−15 19 06	229·95−0·67	0·14	−0·80
06 38 26·3	00 48 40	211·06−1·97	0·18	−0·90	07 18 57·0	−15 24 44	230·08−0·62	0·40	−0·67
06 40 26·1	02 03 02	210·19−0·96	0·17	−0·95	07 19 01·2	−11 59 47	227·09+1·02	0·70	−0·58
06 42 36·5	05 34 43	207·31+1·15	0·26	−1·11	07 19 18·5	−08 41 17	224·20+2·65	0·11	−0·93
06 43 00·3	00 40 58	211·70−1·02	0·08	−1·11	07 19 57·4	−18 42 12	233·10−1·97[A]	0·46	−0·88
06 43 40·5	03 56 19	208·89+0·63	0·20	−0·83	07 21 55·3	−20 14 14	234·67−2·29	0·07	−1·06

Table 1 (*Continued*)

(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}	(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}
07 22 32·6	−09 35 29	225·38+2·92[A]	0·30	−1·02	08 29 48·7	−41 59 13	260·72−1·54	0·09	−1·08
07 27 16·7	−22 11 52	236·99−2·13	0·22	−0·88	08 30 17·2	−38 26 31	257·93+0·65	0·20	−0·95
07 28 59·8	−23 35 24	238·40−2·46	0·60	−0·40	08 31 01·0	−38 19 03	257·91+0·84	0·11	−0·93
07 29 13·7	−22 53 28	237·81−2·07	0·14	−1·00	08 33 39·0	−44 59 41	263·55−2·78[A]	<0·2	<−1·42
07 33 47·3	−20 05 01	235·88+0·22	0·17	−0·87	08 35 17·0	−41 10 40	260·69−0·23	0·09	−1·03
07 37 47·2	−23 57 37	239·71−0·89	0·15	−1·09	08 36 54·7	−44 23 16	263·41−1·95	0·21	−0·95
07 41 05·7	−24 10 37	240·27−0·34	0·09	−1·00	08 37 20·0	−43 07 17	262·46−1·12	0·16	−0·84
07 45 16·4	−30 42 09	246·38−2·83	0·47	−0·49	08 38 16·1	−42 21 37	261·96−0·52	0·32	−0·83
07 49 51·6	−27 50 42	244·43−0·51	0·29	−0·90	08 40 31·7	−44 16 40	263·73−1·38	0·21	−0·63
07 50 22·6	−30 31 45	246·79−1·80	0·08	−1·08	08 41 51·2	−45 57 50	265·19−2·24	0·17	−0·75
07 50 25·9	−21 54 54	239·42+2·66	0·33	−0·81	08 42 31·5	−41 48 02	262·01+0·45	0·10	−1·02
07 50 50·1	−22 53 01	240·30+2·44	0·11	−1·03	08 49 10·8	−42 19 55	263·21+1·07	0·20	−0·74
07 50 54·1	−30 59 09	247·24−1·94	0·18	−0·74	08 55 38·6	−41 41 43	263·50+2·40	0·20	−0·88
07 53 01·5	−30 51 57	247·37−1·49	0·10	−0·94	09 01 04·8	−45 43 46	267·17+0·47	0·20	−1·04
08 03 24·1	−36 06 34	252·97−2·43[A]	0·20	−0·86	09 03 17·5	−50 02 40	270·63−2·15	0·09	−1·11
08 05 18·8	−33 21 36	250·87−0·61	0·29	−0·94	09 06 57·6	−43 45 42	266·43+2·57	0·31	−0·77
08 05 56·5	−33 42 35	251·24−0·69	0·09	−0·96	09 09 23·6	−44 52 15	267·53+2·13	0·24	−0·79
08 07 56·1	−38 16 16	255·28−2·85	0·08	−1·06	09 18 07·3	−53 27 20	274·68−2·84	1·53	−0·62
08 12 19·3	−35 30 07	253·45−0·59	0·34	−0·50	09 31 14·1	−49 42 27	273·56+1·28	0·34	−0·84
08 13 19·4	−38 28 53	256·04−2·09	0·13	−1·10	09 33 00·7	−49 09 18	273·41+1·88	0·26	−0·60
08 16 02·5	−31 49 16	250·84+2·12	0·14	−0·91	09 39 32·7	−51 13 45	275·56+1·02	0·13	−1·02
08 17 52·4	−40 19 51	258·06−2·40	0·16	−0·88	09 42 50·0	−54 03 26	277·78−0·81	0·26	−0·99
08 21 47·5	−34 25 03	253·66+1·63	0·19	−0·83	09 42 56·3	−55 59 30	279·04−2·28	0·10	−0·93
08 23 45·1	−42 37 07	260·57−2·82	0·14	−1·00	09 43 19·4	−49 32 05	274·92+2·70	0·25	−0·70
08 24 09·2	−35 23 30	254·74+1·46	0·33	−0·64	09 44 39·0	−51 46 21	276·52+1·12	0·08	−1·07
08 25 28·8	−33 14 42	253·15+2·93	0·20	−0·72	09 49 12·7	−54 54 57	279·04−0·88	0·09	−1·07
08 27 59·8	−40 09 59	259·05−0·73	0·12	−0·88	09 50 46·2	−54 13 25	278·78−0·20[B]	0·05	−1·02

[A] See notes on particular sources at end of table.

[B] Below the $S_{408} \geqslant 1$ Jy homogeneous sample limit.

Table 1 (*Continued*)

(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}	(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}
09 50 51·6	−53 00 58	278·04+0·75	0·31	−0·89	11 53 57·6	−59 34 25	296·08+2·29	0·13	−0·95
09 54 20·5	−50 37 02	276·98+2·97	0·22	−0·89	11 56 58·3	−61 50 34	296·90+0·14	0·23	−0·79
09 59 15·1	−57 20 32	281·63−1·94	0·14	−1·06	11 59 18·7	−64 47 45	297·74−2·70	0·25	−0·65
10 06 50·7	−56 39 07	282·06−0·77	0·33	−0·80	12 08 49·2	−59 19 15	297·89+2·88	0·12	−0·94
10 12 29·9	−57 31 52	283·20−1·06[A]	⩽0·2	⩽−0·77	12 10 25·9	−63 30 20	298·71−1·23	0·16	−0·84
10 13 20·4	−58 01 04	283·56−1·40	0·15	−0·82	12 17 39·5	−63 29 53	299·51−1·11	0·11	−1·00
10 22 22·3	−55 39 43	283·32+1·25	0·32	−1·17	12 19 05·1	−63 50 48	299·71−1·44	0·27	−1·11
10 23 53·1	−60 34 50	286·08−2·83	0·18	−0·78	12 28 17·9	−62 55 01	300·65−0·41	0·49	−0·74
10 29 14·4	−58 08 39	285·41−0·39	0·06	−1·19	12 32 44·6	−62 37 58	301·13−0·09	0·26	−0·74
10 30 50·8	−59 02 33	286·04−1·06	2·13	−0·58	12 37 30·7	−61 27 54	301·63+1·10	0·07	−1·07
10 32 36·8	−56 50 42	285·14+0·96	0·13	−0·91	12 37 48·8	−61 13 08	301·65+1·35	0·17	−0·91
10 38 47·3	−56 30 49	285·72+1·67	0·36	−0·52	12 39 57·4	−64 48 13	302·04−2·22	0·08	−1·19
10 41 42·1	−60 02 23	287·73−1·26	0·15	−1·20	12 42 31·7	−65 17 14	302·32−2·70	0·15	−0·92
10 56 15·4	−62 12 53	290·27−2·43	0·22	−0·62	12 45 21·7	−63 46 06	302·60−1·17	0·14	−0·78
11 02 33·2	−60 52 59	290·41−0·91	0·20	−0·86	12 49 59·8	−60 40 16	303·12+1·93	0·11	−1·07
11 05 35·6	−61 32 32	291·00−1·37	0·28	−0·92	12 50 38·5	−65 31 52	303·17−2·93	0·30	−0·79
11 07 48·6	−57 04 49	289·55+2·86	0·27	−0·96	12 52 56·6	−64 32 53	303·42−1·95	0·32	−0·55
11 10 37·0	−59 31 07	290·81+0·74	1·36	−0·64	12 59 29·4	−62 41 12	304·20−0·11	0·18	−0·89
11 11 52·2	−57 29 13	290·22+2·69	0·06	−1·16	13 02 26·1	−63 14 18	304·51−0·68	0·08	−1·33
11 13 35·7	−57 45 44	290·53+2·52	0·22	−0·78	13 04 00·1	−60 58 17	304·82+1·58	0·12	−1·18
11 17 54·8	−59 18 16	291·60+1·27	0·07	−1·10	13 07 13·8	−60 15 07	305·26+2·27	0·11	−0·96
11 28 14·7	−60 55 37	293·35+0·15	0·06	−1·23	13 22 58·9	−61 07 08	307·09+1·21	4·0	−0·78
11 35 35·9	−60 17 46	294·02+1·02	0·18	−0·95	13 25 13·8	−60 21 02	307·47+1·94	0·08	−1·05
11 38 13·3	−62 42 43	294·99−1·22	0·11	−0·96	13 29 31·8	−64 00 13	307·42−1·75	0·20	−0·80
11 40 42·3	−62 48 02	295·29−1·23	0·21	−1·06	13 34 19·9	−64 53 56	307·79−2·72	0·65	−0·46
11 42 33·2	−60 04 46	294·80+1·46	0·10	−0·96	13 34 57·3	−59 10 11	308·87+2·91	0·14	−0·94
11 49 16·5	−63 43 59	296·45−1·89	0·23	−0·84	13 36 46·7	−62 30 31	308·48−0·42	⩽0·04	⩽−1·34

Table 1 (*Continued*)

(1) Position (1950) R.A. h m s	(2) Position (1950) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}	(1) Position (1950) R.A. h m s	(2) Position (1950) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}
13 39 33·1	−61 09 58	309·06+0·84	0·25	−1·19	16 00 50·2	−50 32 13	331·17+1·29	0·05	−1·50
13 50 13·6	−59 22 21	310·74+2·31	0·18	−1·23	16 02 02·4	−54 00 55	329·01−1·44	0·13	−1·22
14 04 20·3	−63 30 11	311·29−2·12	0·08	−1·06	16 09 36·6	−47 59 11	333·95+2·23	0·13	−0·83
14 18 19·5	−59 08 50	314·24+1·49[B]	0·11	−0·76	16 10 35·5	−52 32 38	330·95−1·21	0·23	−1·02
14 22 25·3	−61 21 36	313·95−0·76	0·06	−1·13	16 26 19·5	−44 25 29	338·51+2·73[B]	0·06	−1·10
14 22 41·8	−59 39 25	314·59+0·82	0·18	−0·71	16 27 20·4	−51 32 02	333·49−2·31[B]	0·09	−0·93
14 35 16·4	−62 31 55	314·92−2·41[B]	0·08	−0·80	16 28 18·5	−49 03 07	335·40−0·71	0·13	−1·01
14 36 39·3	−60 40 54	315·81−0·78	0·07	−1·15	16 29 20·5	−43 50 34	339·31+2·74[B]	0·11	−0·84
14 39 08·8	−56 53 59	317·64+2·54	0·21	−0·96	16 29 29·9	−45 03 12	338·44+1·89	0·15	−1·00
14 41 33·5	−56 38 34	318·05+2·64	0·23	−0·94	16 35 16·1	−47 20 34	337·44−0·40	0·53	−0·58
14 45 30·8	−59 13 39	317·42+0·08	0·07	−1·32	16 39 12·2	−43 54 58	340·45+1·37	0·08	−1·06
14 52 26·3	−58 32 07	318·53+0·30	0·14	−0·84	16 39 24·7	−46 42 17	338·38−0·50	0·10	−1·11
14 55 13·0	−57 28 34	319·34+1·07	0·46	−0·96	16 41 48·4	−47 37 27	337·96−1·41[B]	0·11	−0·85
15 02 29·6	−58 43 36	319·59−0·48	0·05	−1·20	16 44 56·7	−48 21 15	337·75−2·29	0·40	−0·84
15 05 27·1	−56 56 05	320·82+0·88	0·17	−1·14	16 49 53·9	−41 56 22	343·22+1·17[A]	0·14	−0·86
15 16 32·1	−57 56 55	321·57−0·76	0·82	−0·91	16 50 02·3	−42 25 51	342·86+0·84	0·05	−1·35
15 19 33·7	−53 38 55	324·25+2·64	0·09	−0·97	16 50 28·2	−40 32 35	344·37+1·97	0·18	−0·87
15 30 03·4	−56 31 58	323·88−0·59	0·12	−0·88	16 50 48·1	−46 46 44	339·59−2·03	0·09	−1·01
15 34 15·7	−54 03 16	325·81+1·08	0·23	−0·98	16 55 25·7	−43 20 11	342·78−0·50[B]	0·07	−1·02
15 36 42·2	−52 26 30	327·05+2·17	0·13	−0·83	17 01 28·4	−45 27 08	341·78−2·66[B]	0·06	−1·10
15 37 40·7	−53 04 24	326·80+1·57	0·09	−1·01	17 03 00·8	−37 17 30	348·44+2·08	0·22	−1·10
15 40 03·4	−55 09 07	325·83−0·30	0·09	−1·08	17 05 58·5	−35 21 30	350·34+2·77	1·15	−0·41
15 41 21·1	−56 10 24	325·36−1·22	⩽0·05	⩽−1·39	17 07 32·2	−35 24 52	350·48+2·48	0·11	−1·13
15 44 18·1	−56 31 34	325·46−1·75	0·14	−0·94	17 13 05·4	−34 14 54	352·10+2·25	0·18	−0·81
15 52 20·8	−49 33 44	330·77+2·92	0·14	−0·89	17 14 10·2	−34 39 28	351·90+1·83	0·15	−0·93
15 54 06·7	−53 39 50	328·35−0·41	0·29	−0·68	17 14 10·3	−39 45 32	347·75−1·14	1·33	−0·51
15 56 10·3	−50 36 33	330·57+1·72	0·10	−0·99	17 14 32·1	−36 34 15	350·38+0·66	0·10	−0·94

[A] See notes on particular sources at end of table.

[B] Below the $S_{408} \geqslant 1$ Jy homogeneous sample limit.

Table 1 (*Continued*)

(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}	(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}
17 14 36·8	−37 23 09	349·73+0·17	8·60	−0·47	18 22 43·4	−14 57 47	16·73−1·19	0·15	−0·82
17 25 50·8	−38 24 14	350·15−2·23	0·08	−1·03	18 30 29·5	−08 57 32	22·93−0·05	0·12	−0·98
17 29 08·3	−35 33 42	352·89−1·21	0·08	−1·33	18 30 38·9	−07 33 38	24·18+0·56	0·14	−0·95
17 30 59·1	−30 31 09	357·31+1·24	0·30	−0·73	18 31 22·9	−03 05 42	28·22+2·48	0·08	−1·06
17 34 29·4	−31 29 40	356·90+0·08	0·69	−0·64	18 32 16·9	−09 28 02	22·68−0·68	⩽0·05	⩽−1·24
17 35 39·0	−36 12 11	353·07−2·66	0·14	−0·78	18 32 32·1	−04 24 47	27·19+1·61	⩽0·05	⩽−1·64
17 39 45·3	−35 25 22	354·17−2·95	0·18	−0·93	18 32 32·8	−11 18 34	21·08−1·59	0·10	−1·14
17 40 45·1	−26 09 36	2·15+1·77	⩽0·10	⩽−0·93	18 34 27·5	−04 27 08	27·37+1·17	0·10	−1·09
17 45 15·5	−32 40 12	357·12−2·48	0·16	−0·84	18 34 42·2	−01 53 22	29·68+2·30	0·19	−0·98
17 45 35·8	−27 09 05	1·87+0·33	0·20	−0·71	18 35 11·2	−06 56 14	25·26−0·14	⩽0·7	⩽−0·67
17 49 31·8	−22 29 36	6·32+1·97	0·54	−0·93	18 35 18·7	−12 48 28	20·06−2·89	0·11	−0·94
17 49 46·6	−28 06 16	1·53−0·95	⩽0·05	⩽−1·28	18 36 05·3	−01 32 52	30·14+2·15	0·05	−1·20
17 52 45·1	−23 32 48	5·79+0·80	0·12	−0·93	18 36 09·2	−04 30 32	27·52+0·77[A]	⩽0·04	⩽−1·51
17 54 26·1	−22 38 52	6·76+0·92	0·24	−0·75	18 38 49·0	−07 17 17	25·36−1·10	0·11	−1·04
18 01 17·9	−20 20 54	9·55+0·69	0·13	−0·90	18 40 05·3	−07 59 26	24·88−1·71	0·50	−0·68
18 01 34·4	−18 00 53	11·61+1·79	0·13	−0·82	18 43 29·9	−00 06 55	32·26+1·17	0·32	−0·54
18 02 09·2	−19 36 12	10·30+0·88	0·20	−1·09	18 47 23·0	−01 36 18	31·39−0·38	0·35	−0·86
18 04 55·7	−14 06 53	15·41+3·00	0·09	−1·12	18 48 08·4	03 54 41	36·38+1·99	⩽0·07	⩽−1·12
18 08 06·1	−20 55 59	9·82−0·99	0·31	−0·62	18 48 45·0	02 55 51	35·57+1·40	0·15	−0·84
18 08 09·7	−18 29 09	11·97+0·19	0·31	−0·70	18 51 08·6	03 11 02	36·07+0·99	0·10	−1·01
18 11 47·9	−11 13 33	18·75+2·93	0·17	−1·08	18 53 21·7	02 52 33	36·05+0·36	0·16	−0·96
18 17 43·2	−12 31 01	18·31+1·04	⩽0·05	⩽−1·21	18 55 16·8	−00 52 04	32·95−1·79	0·26	−0·75
18 17 52·8	−09 48 42	20·71+2·29	0·34	−0·73	18 55 46·8	−01 40 51	32·29−2·28	0·12	−0·87
18 17 59·3	−11 49 06	18·96+1·32	0·17	−0·92	18 56 23·6	00 03 34	33·90−1·61	0·08	−1·04
18 19 21·2	−13 11 22	17·91+0·37	0·15	−0·92	19 01 00·8	11 25 07	44·51+2·61	0·11	−1·15
18 19 43·4	−09 40 25	21·05+1·96	2·07	−0·65	19 01 16·1	05 48 11	39·56−0·04	0·30	−0·64
18 20 25·0	−13 06 06	18·11+0·19	0·12	−0·85	19 02 57·4	05 25 35	39·42−0·59[B]	0·13	−0·78

Table 1 (*Continued*)

(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}	(1) Position (1950) R.A. h m s	(2) Dec. ° ′ ″	(3) Galactic source number[A]	(4) S_{5000} (Jy)	(5) α_{408}^{5000}
19 04 13·3	11 55 05	45·32+2·14	0·20	−0·95	19 15 22·0	06 15 47	41·60−2·93	0·34	−1·15
19 05 18·6	09 02 10	42·89+0·57	0·23	−0·82	19 21 04·7	13 01 37	48·23−0·97	≤0·05	≤−1·28
19 07 45·0	11 43 00	45·54+1·28	0·22	−0·90	19 22 56·8	13 53 40	49·21−0·96	0·21	−0·87
19 10 05·6	16 11 33	49·77+2·86	0·11	−1·12	19 28 38·0	15 26 03	51·22−1·42	0·30	−0·67
19 11 10·6	09 13 49	43·74−0·62	0·12	−0·98	19 30 43·1	13 06 56	49·44−2·99	0·35	−0·81
19 14 26·9	14 58 32	49·19+1·37	0·14	−0·88	19 32 35·6	17 25 52	53·43−1·28	0·20	−0·67
19 14 33·1	15 53 19	50·00+1·78	0·10	−0·92	19 33 30·5	16 42 32	52·91−1·82	0·14	−1·03

[A] Notes on particular sources:

233·10−1·97. Galactic longitude and latitude given by Clark and Crawford (1974) are incorrect.

225·38+2·92 (PKS 0722−09, 3C 178). 5000 MHz position is at R.A. $07^h 22^m 34^s\cdot0$, Dec. −09° 34′ 00″. Independent declination measurements (Moseley *et al.* 1970) are in better agreement with the 5000 MHz value than the 408 MHz value.

252·97−2·43. 5000 MHz position is at R.A. $08^h 03^m 31^s\cdot6$, Dec. −36° 07′ 24″.

263·55−2·78 (Vela pulsar). 5000 MHz upper limit is quite high because of confusion from portions of the surrounding supernova remnant.

283·20−1·06. S_{5000} upper limit from the map of Goss and Shaver (1970).

343·22+1·17. 5000 MHz position is at R.A. $16^h 49^m 56^s\cdot1$, Dec. −41° 58′ 43″.

27·52+0·77. Galactic longitude and latitude given by Clark and Crawford (1974) are incorrect.

[B] Below the $S_{408} \geqslant 1$ Jy homogeneous limit.

Table 2. Data for 41 sources with $\alpha > -0 \cdot 35$

The positions listed are those measured at 408 MHz

Galactic source number	Position (1950) R.A. h m s	Position (1950) Dec. ° ′ ″	S_{408} (Jy)	S_{5000} (Jy)	α	Optical data HII region	Optical data Reference[A]	H 109α data V_{1sr} (km s^{-1})	H 109α data Reference[A]	Notes[A]
237·32−1·77	07 29 21·1	−22 18 44	1·43	0·82	−0·22	None	SS			
233·59+1·44	07 33 31·6	−17 29 07	1·59	1·82	+0·05	None	SS			PKS 0733−17; near RCW 7, 8, 12
245·16+2·77	08 04 08·1	−26 43 51	1·11	0·54	−0·29	None	SS			
254·66+0·21	08 18 55·2	−36 02 51	2·48	3·90	+0·18	1′ arc diam.	SS	+68	CaH	5000 MHz position at R.A. $08^h 19^m 01^s \cdot 1$, Dec. −36° 03′ 25″
256·56+0·64	08 26 08·7	−37 20 50	2·11	1·99	−0·02	None	SS	—	CaH	H 109α upper limit $T_L/T_c < 3\%$
263·62−0·53	08 43 49·3	−43 40 07	1·75	1·87	+0·03	Faint ring 1′ arc diam.	SS			Within Vela SNR
264·29+1·47	08 54 38·9	−42 54 22	1·54	2·63	+0·21	RCW 34	RCW			
281·17−1·64	09 57 50·0	−56 49 31	1·55	1·50	−0·01					Adjacent to RCW 46
284·72+0·31	10 27 30·4	−57 11 48	4·37	3·00	−0·15			+10	CaH	Adjacent to RCW 49
291·05−2·08	11 03 33·9	−62 12 51	0·73	0·63	−0·06	RCW 56	RCW			
293·03−1·03	11 22 34·0	−61 56 51	1·87	1·74	−0·03					
297·65−0·98	12 01 27·4	−63 04 59	2·24	1·13	−0·27					
300·97+1·16	12 32 02·4	−61 22 29	3·00	2·68	−0·04	RCW 65	RCW	−46·6	WMGM	Also observed by GS
301·12+0·97	12 33 09·3	−61 34 30	2·23	3·60	+0·19	RCW 66	RCW	−48·1	WMGM	Also observed by GS
302·80+1·29	12 47 19·7	−61 18 30	1·15	0·95	−0·08	RCW 71	RCW			
310·05−1·46	13 52 07·8	−63 12 01	1·03	0·59	−0·22					
319·88+0·79	14 59 44·4	−57 28 09	1·10	1·22	+0·04	Sm 9	Sm			SG in their Tables 1 and 8 suggest source is non-thermal but their data do not support this; source is probably thermal. Deconvolved equiv. gaussian width is 2′ arc in R.A.
320·17+0·80	15 01 32·2	−57 19 22	4·44	7·70	+0·22	RCW 87	RCW	−36·0	WMGM	Also observed by GS
321·48+1·02	15 09 05·0	−56 29 04	3·73	1·77	−0·30					
325·58+1·70	15 30 33·6	−53 41 13	1·27	0·85	−0·16					
326·45+0·91	15 38 29·2	−53 48 57	2·93	7·20	+0·36	Faint 0′·5 arc diam.	SG	−39·0	WMGM	Near RCW 94, 95; also observed by GS
332·15+2·57	16 00 10·0	−48 55 54	1·60	0·94	−0·21	None	SS (M. Ext)			
334·78−0·02	16 22 40·7	−49 01 08	0·98	0·74	−0·11	None	SS (M. Ext)			
338·47−0·27	16 38 42·8	−46 29 14	1·90	1·08	−0·23	None	SS (M. Ext)			Incorrect latitude sign given by ClCr; also observed by GS

Table 2 (*Continued*)

Galactic source number	Position (1950) R.A. h m s	Position (1950) Dec. ° ′ ″	S_{408} (Jy)	S_{5000} (Jy)	α	Optical data HII region	Optical data Reference[A]	H 109α data V_{lsr} (km s^{-1})	H 109α data Reference[A]	Notes[A]
339·84+0·30	16 41 30·3	−45 04 50	1·27	1·26	−0·00	None	SS (W. Ext)			Deconvolved equiv. gaussian width is 2′ arc in R.A.
342·07+0·42	16 49 00·1	−43 18 21	2·05	3·08	+0·16	None	SS (W. Ext)	−65	CaCl	Deconvolved equiv. gaussian width is 3′ arc in R.A.
347·90+0·04	17 09 40·4	−38 56 25	1·37	1·80	+0·11	None	SS (W. Ext)			
352·73+2·38	17 14 20·6	−33 39 16	1·08	0·46	−0·34	None	SS (W. Ext)			
351·47−0·46	17 22 11·8	−36 19 09	1·68	3·07	+0·24	None	SS (W. Ext)			
353·41−0·37	17 27 10·2	−34 39 55	4·26	9·39	+0·32	None	SS (W. Ext)	−12·8	RWBMA	
351·48−2·30	17 29 50·4	−37 20 18	0·89	1·16	+0·11	None	SS (W. Ext)			
8·14+0·23	17 59 58·8	−21 48 09	3·00	5·73	+0·26	None	SS	+19·3	RWBMA	
10·45+0·02	18 05 39·4	−19 53 29	0·94	1·80	+0·26	None	SS			Also observed by GS
21·34−0·62	18 29 33·0	−10 37 36	1·30	0·89	−0·15	None	SS			
21·49−0·88	18 30 46·0	−10 36 42	4·98	6·20	+0·09	None	SS	—	DM	H 109α upper limit $T_L/T_c < 1·7\%$; see text
33·50+0·19	18 49 13·5	+00 31 47	1·74	0·77	−0·33	None	SS			
34·26+0·14	18 50 50·2	+01 10 52	4·40	11·7	+0·39	None	SS	+53·9	RWBMA	
40·50+2·54	18 53 48·0	+07 49 41	2·71	2·90	+0·03	Faint	SS			Central core of W45; deconvolved equiv. gaussian width is 4′ arc in R.A. by 2′·7 arc in Dec.
37·37−0·23	18 57 52·4	+03 46 21	1·50	0·68	−0·32	None	SS			
35·19−1·75	18 59 13·4	+01 08 09	9·00	15·5	+0·22	None	SS	+46·5	RWBMA	W48; also observed by GS
49·66+2·91	19 09 43·3	+16 06 34	0·83	0·66	−0·09	None	SS			

[A] Abbreviations used: SS, SS (W. Ext), SS (M. Ext), from inspection of prints of Palomar Sky Survey, or to the southern extensions of it by Whiteoak and by Matthews; CaH, Caswell and Haynes (previously unpublished data); RCW, Rodgers *et al.* (1960); WMGM, Wilson *et al.* (1970); Sm, Smith (1972); SG, Shaver and Goss (1970); CaCl, Caswell and Clark (1975); RWBMA, Reifenstein *et al.* (1970); DM, Dickel and Milne (1972); GS, Goss and Shaver (1970); ClCr, Clark and Crawford (1974).

In general our 5000 MHz pointing accuracy is slightly lower than at 408 MHz and position errors as great as 1′arc may occasionally be present; we draw attention below to a few instances where discrepancies are greater than this, since such large values are unlikely to be due to 5000 MHz pointing errors alone.

The errors in the 5000 MHz flux densities are compounded from a number of independent causes, and we will now assess their magnitude. The flux density calibration is relative to an assumed flux density of 13·5 Jy for Hydra A. Uncorrected gain variations of up to 10% may be present (including residual zenith-angle-dependent effects). The positional errors at 5000 MHz can cause a systematic underestimate of the flux density by up to 10%. Receiver noise contributes an r.m.s. fluctuation of $\sim 0 \cdot 01$ Jy. Atmospheric effects are small, since observations made in poor weather conditions and repeated later showed that even in recognizably bad weather the flux density (mean from right ascension and declination scans) was not grossly in error. Finally, the effects of confusion are difficult to assess in the galactic plane and can be as great as all of the previously mentioned errors combined. Although regions confused at 408 MHz were avoided by Clark and Crawford (1974) there are nonetheless some areas where the higher frequency of 5000 MHz together with the slightly larger beam size results in increased confusion errors, principally by adjacent HII regions. On account of this, for the source at R.A. $18^{h}21^{m}50^{s}\cdot 4$, Dec. $-13°10'22''$ the upper limit which we were able to place (<1 Jy) was so poor as to be of little value and we have omitted it from our list of results.

Taking all the above errors into account, we believe that, for most of the sources, random errors in our spectral index estimates are less than 0·1 (i.e. less than 28% relative error in flux densities at the two frequencies); a systematic error is also probably present (caused by the underestimation of the 5000 MHz flux density) whereby all spectral indices are more negative by $\sim 0 \cdot 03$.

The results are given in Tables 1 and 2. In Table 1 (sources with $\alpha < -0 \cdot 35$) we give positions (as measured at 408 MHz by Clark and Crawford 1974) in both equatorial coordinates and corresponding galactic source number (l and b in degrees quoted to two decimal places), together with S_{5000} and α_{408}^{5000}, where α is defined in the sense $S \propto \nu^{\alpha}$. The flat spectrum ($\alpha > -0 \cdot 35$) sources are of additional interest since they are, we believe, largely galactic (see Section 3); they have therefore been listed separately (Table 2), with additional information.

Our positions measured at 5000 MHz are not given, since as noted earlier, they are generally expected to be of slightly lower accuracy than Clark and Crawford's (1974) positions. However, in notes to the tables we draw attention to four sources where the position discrepancy appeared significant and in at least one case it seems from independent data that the Clark and Crawford position is poor. It is also noted that for three other sources the quoted galactic coordinates of Clark and Crawford are incorrect.

Many equivalences between 4C sources and the present list have been noted by Clark and Crawford (1974), and some of the sources correspond to sources listed in the Parkes 2700 MHz galactic survey (Day *et al.* 1972, and references therein). These other surveys had poorer resolution and were thus subject to increased confusion errors relative to our results but, within this limitation, their measurements are generally compatible with our derived spectra.

3. Interpretation

(a) *Number Counts*

Clark and Crawford (1974) commented that, from comparison of the spatial density of sources in their survey with the density at much higher latitudes, there appeared to be a low galactic latitude excess. This conclusion is incorrect and resulted from a simple error in deriving the 'expected' number. In fact the data of Mills *et al.* (1973) indicate that 867 sources are to be expected with $S_{408} \geqslant 0 \cdot 62$ Jy in an area of $0 \cdot 40$ sr, whereas Clark and Crawford detected only 508 (a further 5 have $0 \cdot 60 \leqslant S < 0 \cdot 62$). Thus no more than 59% of the expected sources were found. In search of an explanation for this deficit we inspected the differential number counts. It appears that in the galactic region, above $0 \cdot 88$ Jy, 68% of the expected number of extragalactic sources are found, whereas below $0 \cdot 88$ Jy the percentage drops to 39%.

These values are approximate and allow for some statistical fluctuations in the high latitude sample (the area covered by Mills *et al.* is less than half the area covered by Clark and Crawford), and also allow for the fact that ~13% of the Clark and Crawford sources are probably galactic (see below).

A generally lower spatial density of sources is expected because of the rejection of some galactic areas as too confused for analysis, and an additional falloff in completeness near the low flux density limit of the survey is not surprising. However, although Clark and Crawford (1974) estimate that their selection criteria would eliminate at least 10% of the area searched, it seems unlikely that 32% would be eliminated. We also find that the deficit in the latitude range $1^\circ \cdot 5 < |b| \leqslant 3^\circ$ is just as great as that in the region $|b| \leqslant 1^\circ \cdot 5$ and likewise shows no significant dependence on galactic longitude; this is surprising if the deficit of sources is due to the areas omitted, since such areas of high galactic confusion would occur more commonly at the lower latitudes and at longitudes concentrated towards the galactic centre.

Regardless of the explanation for the deficit, it is clear that number counts alone yield no evidence for the presence of galactic sources in the list; however, we now show that a galactic population can be recognized from the distribution of spectral indices.

(b) *Overall Distribution of Spectral Indices*

In order to search for a recognizable galactic population we have used two approaches. Firstly, histograms of the distribution of spectral index have been prepared separately for the regions $|b| \leqslant 1^\circ \cdot 5$ and $1^\circ \cdot 5 < |b| \leqslant 3^\circ$ and are shown in Figs 1*a* and 1*b*. One would expect any disc population of galactic objects to be more prominent in Fig. 1*a* than in 1*b* and indeed it is noticeable that, relative to Fig. 1*b*, Fig. 1*a* shows a significant tail in the distribution towards positive spectral index.

Our second approach has been to compare both of these histograms with the comparable Bologna one for high latitudes given by Grueff and Vigotti (1973). Their results are reproduced in Fig. 1*c*, where the histogram is scaled to approximately the same area in the spectral index range $-0 \cdot 7$ to $-1 \cdot 1$. For this comparison it is important to note the similar observational selection of the Bologna sample, namely, it is selected from a 408 MHz survey, complete to a similar lower flux density limit ($0 \cdot 9$ Jy as opposed to 1 Jy), and their spectra, like ours, are mean values over the frequency range 408 to 5000 MHz. Our spectral indices may be systematically more negative (by up to 0·05) on the average, since (1) our 408 MHz flux density scale is slightly higher (the Wyllie (1969) scale rather than the Kellermann *et al.* (1969) scale) and (2) our 5000 MHz flux densities may be systematically low by about 5–10% owing to the use of 408 MHz positions without corrections for our own telescope pointing errors.

The low-latitude excess of flat spectrum sources is clearly confirmed from the comparison of Figs 1*a* and 1*c*. There is also a weak suggestion of an excess of steep spectrum sources, but this may be due, in part, to the systematic difference in spectral index estimates.

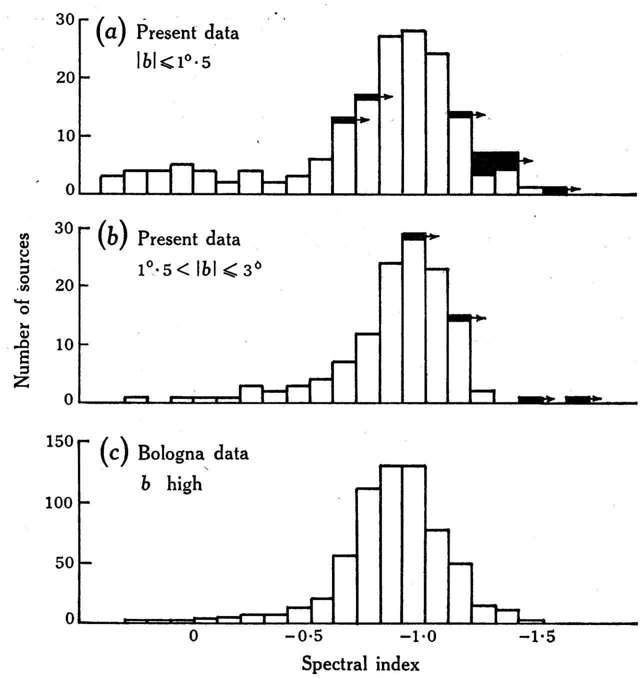

Fig. 1. Histograms of spectral index α_{408}^{5000} for sources selected at 408 MHz with $S_{408} \geqslant 1 \cdot 0$ Jy, showing (*a*) the present data in the region $|b| \leqslant 1°\cdot5$, (*b*) the present data in the region $1°\cdot5 < |b| \leqslant 3°$, and (*c*) Bologna survey data for high galactic latitudes. The solid areas of the histograms refer to sources with only a *limit* to α (as indicated by an arrow).

(*c*) *Galactic Source Excess*

The major class of galactic sources expected to be detectable is HII regions. Sources with apparently thermal spectra are unlikely to be planetary nebulae since radio measurements to date (e.g. Milne and Aller 1975) suggest that in order for S_{408} to be >1 Jy the nebula would need to be closer than 1 kpc and have an angular diameter $\gtrsim 1'$ arc; optical counterparts would probably then be easily detected, relatively unaffected by obscuration.

Many of the flat spectrum sources in Table 2 are clearly HII regions, as shown by their optical identification or by the presence of H 109α recombination line emission. Additional optical data are required for sources south of the Palomar Sky Survey limits, although obscuration will no doubt prevent optical identification in many cases; recombination line data would be especially valuable for sources in such obscured fields. An unusual source with a flat spectrum is G 21·5–0·9. For this source Slee and Higgins (1975) report a flux density at 80 MHz of 8 Jy, and furthermore Becker and Kundu (1974) report 20% polarization at 8·1 GHz. Both results indicate that it is nonthermal (contrary to Caswell and Clark's (1975) suggestion that it might be an HII region) and may even be a flat spectrum galactic supernova remnant. Caswell *et al.* (1975) show that the source is indeed galactic but their distance does not support its classification as a typical supernova remnant since it would be unusually subluminous for its linear diameter. Additional enigmatic sources of this type would be of great interest and it is possible that some are present in Table 2.

The time-averaged intensities of three known pulsars in the region are large enough for the sources to be contained in the Clark and Crawford (1974) list. Two of these, G 263·55–2·78 and G 1·53–0·95, have $S_{408} > 1$ Jy and are thus in our list also; like most pulsars, they have α_{408}^{5000} steeper than $-1\cdot1$. It seems likely that several as yet undiscovered pulsars are also present in our list: they may even be present in sufficient numbers to cause the slight apparent excess of steep spectrum sources. Since any additional pulsars of such high intensity would be very valuable for further detailed study, it would seem well worth while to search for pulses from all the sources in Table 1 with α steeper than $-1\cdot1$ and especially from those which have not been positively detected at 5000 MHz. The pulse-search technique should be sensitive to short periods and possible large dispersion and scattering effects.

One source in Table 1, G 349·7+0·2, is believed to be a supernova remnant (SNR), and another source, G 307·1+1·2, is a somewhat more doubtful possible SNR (Milne 1970). The spectra of SNRs typically are not so different from those of extragalactic sources as to give rise to a detectable excess on the spectral index histograms, but it is possible that a few as yet unidentified young small-diameter SNRs could be present in the catalogue.

It is not clear whether any 'radio stars' are likely to be present in the source list, since such objects are at present too small a class to have well-documented 'typical' radio spectra; it is possible only to await other observations (e.g. of X-ray or unusual optical objects) and use the current list as a useful preliminary check for coincidences. A recently proposed identification for Circinus X-1 (Clark *et al.* 1975) has S_{408} only just below the intensity limit of the present list and has an interestingly flat spectrum. However, any variability over the time interval between 408 and 5000 MHz measurements could invalidate the spectrum determination.

4. Conclusions

The flat spectrum sources of Table 2 are believed to be largely galactic: principally HII regions which are quite compact and isolated and thus of considerable interest. From certain steep spectrum sources, a search for pulsed emission seems warranted, since the value of additional intense pulsars would make even a low success rate well worth while. For those sources whose interpolated spectra suggest that they are quite intense at 1420 MHz, interferometric HI absorption measurements would be of value in determining whether these sources are galactic or extragalactic; such measurements on small-diameter sources at such low galactic latitudes would also yield valuable information on the cloud structure of the interstellar medium.

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