A Catalogue of Galactic Supernova Remnants
(1998 September version)

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1. The Catalogue Format

This catalogue of Galactic supernova remnants (SNRs) is an updated version of those presented in detail in Green (1984, 1988), in summary form in Green (1991, 1996) — hereafter Versions I, II, III and IV respectively — and on the World-Wide-Web (Version V, 1995 July and a revised version in 1996 August). (Note that Version IV, although published in 1996, was produced in 1993.)

This, the 1998 September version of the catalogue contains 220 SNRs (which is 5 more than in previous, 1996 August, version), with about thousand references in the detailed listings, plus notes on several dozen possible or probable remnants.

For each remnant in the catalogue the following parameters are given.

- **Galactic Coordinates** of the source centroid, quoted to the nearest tenth of a degree as is conventional. (Note: in this catalogue additional leading zeros are not used.)
- **Other Names** that are commonly used for the remnant. These are given in parentheses if the remnant is only a part of the source. For some remnants, notably the Crab Nebula, not all common names are given.
- **Right Ascension** and **Declination** of the source centroid. The accuracy of the quoted values depends on the size of the remnant; for small remnants they are to the nearest few seconds of time and the nearest minute of arc respectively, whereas for larger remnants they are rounded to coarser values, but are in every case sufficient to specify a point within the boundary of the remnant. These coordinates are almost always deduced from radio maps rather than from X-ray or optical observations, and are for B1950.0.
- **Angular Size** of the remnant, in arcminutes, usually taken from the highest resolution radio map available, although for some barely resolved sources that are thought to be SNRs the only available size is that from Gaussian models after deconvolution with the observed beam size. The boundary of most remnants approximates reasonably well to a circle or an ellipse; a single value is quoted for the angular size of the more nearly circular remnants, which is the diameter of a circle with an area equal to that of the remnant, but for elongated remnants the product of two values is quoted, and these are the major and minor axes of the remnant boundary modelled as an ellipse. In a few cases an ellipse is not a satisfactory description of the boundary of the object (refer to the description of the individual object given in its catalogue entry), although an angular size is still quoted for information. For 'filled-centre' remnants the size quoted is for the largest extent of the observed radio emission, not, as at times has been used by others, the half-width of the centrally brightened peak.

- **Flux Density** of the remnant at 1 GHz in jansky. This is *not* a measured value, but is deduced from the observed radio frequency spectrum of the source. The frequency of 1 GHz is chosen because flux density measurements at frequencies both above and below this value are usually available.
- **Spectral Index** of the integrated radio emission from the remnant, α (here defined in the sense, $S \propto \nu^{-\alpha}$, where S is the flux density at a frequency ν), either a value that is quoted in the literature, or one deduced from the available integrated flux densities of the remnant. For several SNRs a simple power law is not adequate to describe their radio spectra, either because there is evidence that the integrated spectrum is curved or the spectral index varies across the face of the remnant. In these cases the spectral index is given as ‘varies’ (refer to the description of the remnant and recent references in the catalogue entry for more information). In some cases, for example where the remnant is highly confused with thermal emission, the spectral index is given as ‘?’ since no value can be deduced with any confidence.
- **Type** of the SNR, either ‘S’, ‘F’ or ‘C’ if the remnant shows a ‘shell’, ‘filled-centre’ or ‘composite’ (or ‘combination’) radio structure (or ‘S?’, ‘F?’ or ‘C?’, respectively, if there is some uncertainty), or ‘?’ in several cases where an object is conventionally regarded as an SNR even though its nature is poorly known or not well understood. (Note: the term ‘composite’ has been used in a different sense by some authors, to describe SNRs with shell radio and centrally-brightened X-ray morphologies. An alternative, recent term used to describe such remnants is ‘mixed morphpology’, see Rho & Petre 1998.)

In the detailed listings, for each remnant, notes on a variety of topics are given. First, it is noted if other Galactic coordinates have at times been used to label it (usually before good observations have revealed the full extent of the object), if the SNR is thought to be the remnant of a historical SN, or if the nature of the source as an SNR has been questioned (in which case an appropriate reference is usually given later in the entry). Brief descriptions of the remnant from the available radio, optical and X-ray observations as applicable are then given, together with notes on available distance determinations, and any point sources or pulsars in the field of the object (although they may not necessarily be related to the remnant). Finally, appropriate references to observations are given for each remnant, complete with journal, volume, page, and a short description of what information each paper contains (for radio observations these include the telescopes used, the observing frequencies and resolutions, together with any flux density determinations). These references are *not* complete, but cover representative and recent observations of the remnant, and they should themselves include references to earlier work. The references do not generally include large observational surveys — of particular interest in this respect are: the Effelsberg 100-m survey at 2.7 GHz of the Galactic plane $358^\circ < l < 240^\circ$, $|b| < 5^\circ$ by Reich *et al.* (1990) and Fürst *et al.* (1990); reviews of the radio spectra of some SNRs by Kassim (1989) and by Kovalenko, Pynzar’ & Udal’tsov (1994); the Parkes 64-m survey at 2.4 GHz of the Galactic plane $238^\circ < l < 365^\circ$, $|b| < 5^\circ$ by Duncan *et al.* (1995) and Duncan *et al.* (1997); reviews of *Einstein* X-ray imaging and spectroscopic observations of Galactic SNRs by Seward (1990) and Lum *et al.* (1992) respectively; surveys of *IRAS* observations of SNRs and their immediate surroundings by Arendt (1989) and by Saken, Fesen & Shull (1992); the survey of HI emission towards SNRs by Koo & Heiles (1991), and the catalogue by Fesen & Hurford (1996) of UV/optical/infra-red lines identified in SNRs.

A summary of the data available for all 220 remnants in the catalogue is given in Table I. The other names for SNRs are listed in Table II, and the abbreviations for journals, proceedings and telescopes are listed in Table III. The detailed listings for each SNR are given in Table IV.

2. Revisions and Notes

2.1 Objects no longer thought to be SNRs

The following objects, which were listed in Version I of the catalogue were removed because they were no longer thought to be remnants, or are poorly observed (see Version II for references and further details): G2.4+1.4 (see also Gray 1994a; Goss & Lozinskaya 1995; Polcaro *et al.* 1995), G41.9−4.1 (=CTB 73, PKS 1920+06), G47.6+6.1 (=CTB 63), G53.9+0.3 (part of HC40), G93.4+1.8 (=NRAO 655), G123.2+2.9, G194.7+0.4 (the Origem Loop), G287.8−0.5 (see below), G322.3−1.2 (=Kes 24) and G343.0−6.0 (see below).

G350.1−0.3, which was listed in Version II of the catalogue, was removed as it is no longer thought to be a SNR (see Version III for details).

G358.4−1.9, which was listed in Version IV of the catalogue, was removed, as following the discussion of Gray (1994a), as it is not clear that this is a SNR.

G240.9−0.9, G299.0+0.2 and G328.0+0.3, which were listed in Version V of the catalogue, were removed from the 1996 August version, following the improved observations of Duncan *et al.* (1996) and Whiteoak & Green (1996).

No objects listed in the previous, 1996 August, version of the catalogue have since been removed (but note also that G350.0−1.8 is now incorporated into G350.0−2.0, and that G337.0−0.1 refers to a smaller remnant than that previously catalogued with the same name, see below).

The following objects, which have been reported as SNRs, but have not been included in any of the versions of the SNR catalogue, have subsequently been shown not to be SNRs.

- G70.7+1.2, which was reported as a SNR by Reich *et al.* (1985), but this has not been confirmed by later observations (see Green 1986; de Muizon *et al.* 1988; Becker & Fesen 1988; Caswell 1988; Bally *et al.* 1989; Phillips, Onello & Kulkarni 1993; Onello *et al.* 1995).
- G81.6+1.0 a possible SNR in W75 reported by Ward-Thompson & Robson (1991). From the published data (see the observations in Wendker, Higgs & Landecker 1991) it was noted in Version IV of the catalogue that this is thermal source not a SNR, because of its thermal radio spectrum, and high infrared-to-radio emission (see also the subsequent discussion by Wendker *et al.* 1993).
- Green & Gull (1984) suggested that G227.1+1.0 as a very young SNR, but subsequent observations (Channan *et al.* 1986; Green & Gull 1986) have shown that this is most likely an extragalactic source, not an SNR.
- A candidate SNR, G274.7−2.8, identified by Helfand & Channan (1989), has been shown not to be a SNR by Caswell & Stewart (1991).
- G25.5+0.2, which was reported as a very young SNR by Cowan *et al.* (1989), although this identification was not certain (see White & Becker 1990; Green 1990; Zijlstra 1991). Sramek *et al.* (1992) report the detection of recombination lines from this source (also see Subrahmanyan *et al.* 1993). Becklin *et al.* (1994) identify G25.5+0.2 as a ring nebula around a luminous blue star.
- Most of the possible SNRs listed by Gorham (1990) — following up SNR candidates suggested by Kassim (1988) — have been shown not to be SNRs by Gorham, Kulkarni & Prince (1993).

Some entries in the catalogue have been renamed, due to improved observations revealing a larger true extent for the object (previously G5.3−1.0 is now G5.4−1.2; G193.3−1.5 is now G192.8−1.1; G308.7+0.0 is now incorporated into G308.8−0.1). In this version of the catalogue, G337.0−0.1 now refers to a small (1.5 arcmin) remnant, rather than larger supposed remnant at this position (see Sarma *et al.* 1997), and G350.0−2.0 now incorporates the previously catalogued G350.0−1.8, based on the improved observations of Gaensler (1998).

2.2 New SNRs

The following remnants were added to Version II of the catalogue: G0.9+0.1, G1.9+0.3, G5.9+3.1, G6.4+4.0, G8.7−0.1, G16.8−1.1, G18.9−1.1, G20.0−0.2, G27.8+0.6, G30.7+1.0, G31.5−0.6, G36.6−0.7, G42.8+0.6, G45.7−0.4, G54.1+0.3, G73.9+0.9, G179.0+2.6, G312.4−0.4, G357.7+0.3 and G359.1−0.5.

The following remnants were added to Version III of the catalogue: G4.2−3.5, G5.2−2.6, G6.1+1.2, G8.7−5.0, G13.5+0.2, G15.1−1.6, G16.7+0.1, G17.4−2.3, G17.8−2.6, G30.7−2.0, G36.6+2.6, G43.9+1.6, G59.8+1.2, G65.1+0.6, G68.6−1.2, G69.7+1.0, G279.0+1.1, G284.3−1.8 (=MSH 10−5*3*), G358.4−1.9 and G359.0−0.9.

The following remnants were added to Version IV of the catalogue: G59.5+0.1, G67.7+1.8, G84.9+0.5, G156.2+5.7, G318.9+0.4, G322.5−0.1, G343.1−2.3, and G348.5−0.0.

The following remnants were added to Version V of the catalogue: G1.0−0.1, G1.4−0.1, G3.7−0.2, G3.8+0.3, G28.8+1.5, G76.9+1.0, G272.2−3.2, G341.2+0.9, G354.1+0.1, G355.6−0.0, G356.3−0.3, G356.3−1.5 and G359.1+0.9.

The following remnants were added to the 1996 August version of the catalogue: G13.3−1.3 G286.5−1.2, G289.7−0.3, G294.1−0.0, G299.2−2.9 G299.6−0.5, G301.4−1.0, G308.1−0.7, G310.6−0.3, G310.8−0.4, G315.9−0.0, G317.3−0.2, G318.2+0.1, G320.6−1.6, G321.9−1.1, G327.4+1.0, G329.7+0.4, G342.1+0.9, G343.1−0.7, G345.7−0.2, G349.2−0.1, G351.7+0.8, G351.9−0.9 and G354.8−0.8.

The following remnants have been added to this version of the catalogue.

- G0.3+0.0, which has previously been suggested as a SNR by various authors, which has been clearly identified as a SNR at radio wavelengths by Kassim & Frail (1996).
- G32.1−0.9, a new SNR identified in X-rays by Folgheraiter *et al.* (1997).
- G55.0+0.3, which was suggested as a possible SNR (G55.2+0.2) by Taylor, Wallace & Goss (1992), has been confirmed as an old, faint remnant from radio observations by Matthews, Wallace & Taylor (1998).
- G63.7+1.1, which was suggested as a possible SNR by Taylor, Wallace & Goss (1992), has been confirmed as a filled-centre SNR by Wallace, Landecker & Taylor (1997).
- G182.4+4.3, identified from radio observations by Kothes, Fürst & Reich (1998).

2.3 Possible and probable SNRs not listed in the catalogue

The following are possible or probable SNRs for which further observations are required to confirm their nature or parameters, or for which observations are not yet in the published literature.

2.3.1 Radio

- A possible SNR near the Galactic centre reported by Ho *et al.* (1985) from radio observations.
- Gosachinskiĭ (1985) reported evidence for non-thermal radio emission, presumably from SNRs, associated with several bright, thermal Galactic sources (also see Odegard 1986, who questions the reliability of some of Gosachinskiĭ's results).
- G300.1+9.4, a possible SNR nearly 2° in diameter reported by Dubner, Colomb & Giacani (1986) from radio observations.
- Routledge & Vaneldik (1988) report a possible faint shell SNR nearly 2° in diameter at radio wavelengths, near the young pulsar PSR 1930+22 (see also Gómez-González & del Romero 1983, who report a smaller (about 40 arcmin) possible SNR (G57.1+1.7) associated with this pulsar, and see Caswell, Landecker & Feldman 1985 and Kovalenko 1989).
- G28.6−0.2, a possible SNR reported by Helfand *et al.* (1989) from radio observations.
- Five possible remnants (G45.9−0.1, G71.6−0.5, G72.2−0.3, G83.0−0.2 and G85.2−1.2) of the eleven reported by Taylor, Wallace & Goss (1992) from a radio survey of part of the Galactic plane. (Three of the other possible SNRs reported by Taylor *et al.*, are included in the catalogue as G55.0+0.3, G63.7+1.1 and G76.9+1.0.)

- A faint, poorly defined possible remnant G41.1+1.2 reported by Gorham, Kulkarni & Prince (1993) from radio observations.
- G9.7−0.1, a possible SNR report by Frail, Kassim & Weiler (1994) from radio observations.
- G355.4+0.7, G356.6+0.1, G357.1−0.2, G358.1+1.0, G358.5−0.9, G358.7+0.7, G359.2−1.1, G3.1−0.6 and G4.2+0.0, which are among the possible SNRs listed by Gray (1994b) from radio observations near the Galactic centre.
- G104.7+2.8, a possible SNR reported by Green & Joncas (1994) from radio observations. However, recent observations at 10.7 GHz (W. Reich, private communication) cast doubt on this identification, as they do not support a non-thermal radio spectrum for the source.
- G310.6−0.2 and G310.8−0.4, two possible radio SNRs listed by Whiteoak, Cram & Large (1994).
- G11.2−1.1, a possible SNR listed by Kovalenko, Pynzar' & Udal'tsov (1994), based on unpublished radio studies (Trushkin 1988, preprint).
- Duncan *et al.* (1995) and Duncan *et al.* (1997) list several large-scale (1.5 to 10 degree), and smaller, low radio surface-brightness candidate SNRs from the Parkes 2.4-GHz survey of $270^\circ < l < 360^\circ$.
- Whiteoak & Green (1996), from their radio survey of much of the southern Galactic plane, list 16 possible SNRs (G308.4−1.4, G317.5+0.9, G319.9−0.7, G320.6−0.9, G322.7+0.1, G322.9−0.0, G323.2−1.0, G324.1+0.1, G325.0−0.3, G331.8−0.0, G337.2+0.1, G339.6−0.6, G345.1+0.2, G345.1−0.2, G348.8+1.1 and G350.1−0.3).
- G359.87+0.18, a possible young SNR near the Galactic Centre reported by Yusef-Zadeh, Cotton & Reynolds (1998).
- Several candidate SNRs reported by Combi & Romero (1998), Combi, Romero & Arnal (1998) and Combi, Romero & Benaglia (1998).

2.3.2 UV/Optical/Infra-red

- G343.0−6.0 was listed in Version I as a SNR, identified optically by Meaburn & Rovithis (1977). However, it was removed from the catalogue in Version II as its extent is uncertain, and it has not been identified at other wavelengths (also see Bedford *et al.* 1984 and Meaburn *et al.* 1991).
- A possible SNR overlapping G296.1−0.5, identified from optical (and X-ray) observations by Hutchings, Crampton & Cowley (1981).
- A SNR (G260.4−3.3) about 4 arcmin in diameter within the Puppis A remnant identified optically by Winkler *et al.* (1989). This has not been detected at radio wavelengths (see Dubner *et al.* 1991).
- A possible SNR (G32.1+0.1) reported from optical spectroscopy by Thompson, Djorgovski & de Carvalho (1991), following up radio and infrared observations of Jones, Garwood & Dickey (1988).
- G203.2−12.3, a optical ring about 3 arcmin in diameter, which was identified as a SNR by Winkler & Reipurth (1992).
- G75.5+2.4, a possible large (about 2°) old SNR in Cygnus suggested by Nichols-Bohlin & Fesen (1993) from infra-red and optical observations (see also Dewdney & Lozinskaya 1994; Marston 1996; Esipov *et al.* 1996).
- A possible optical SNR (G247.8+4.9) noted by Weinberger (1995), which may be Balmer dominated (see also Weinberger *et al.* 1998).
- An optical shell around the Coalsack Nebula (near $l = 300^\circ$, $b = 0^\circ$) identified by Walker & Zealey (1998). This coincides with on the the large possible SNRs suggested by Duncan *et al.* (1995), from radio observations.

2.3.3 X-ray

- H1538−32 a large X-ray source in Lupus, near l = 307°, b = +20° (Riegler, Agrawal & Gull 1980, see also Colomb, Dubner & Giacani 1984) which is a possible old SNR;
- The Monogem ring, near l = 203°, b = +12°, is a possible old SNR (see Nousek *et al.* 1981, Plucinsky *et al.* 1996, and references therein).
- X-ray emission in the Gum Nebula near l = 250°, b = 0° (Leahy, Nousek & Garmire 1992, see also Reynolds 1976, Dubner *et al.* 1992 and Duncan *et al.* 1996) which, together with optical spectroscopy indicate the existence of a possible old remnant in this region.
- An X-ray enhancement near l = 200°, b = −40°, which is possibly due due to an old SNR in Eridanus (Naranan *et al.* 1976, see also Burrows *et al.* 1993 and Snowden *et al.* 1995).
- G189.6+3.3, a faint, possible SNR overlapping G189.1+3.0 (=IC443) identified by Asaoka & Aschenbach (1994) from ROSAT X-ray observations.
- G117.7+0.6, a faint shell of soft X-ray emission near CTB1 (=G116.9+0.2), which contains a pulsar (Hailey & Craig 1995).
- A possible SNR identified in X-rays around the pulsar B1828−13 (see Finley, Srinivasan & Park 1996).
- A shell SNR near l = 347°, b = 0° suggested by Pfeffermann & Aschenbach (1996) (see also Koyama *et al.* 1997).

2.3.4 Other

- G287.8−0.5, which is associated with η Carinae, was listed in Version I as a SNR, but was removed from the catalogue in Version II as its parameters are uncertain (see Jones 1973, Retallack 1984, Tateyama, Strauss & Kaufmann 1991, and the discussion in Version II).
- G359.2−0.8 (the 'mouse'), near the Galactic centre, which has been suggested as being analogous to the central region of CTB 80 (=G69.0+2.7) by Predehl & Kulkarni (1995).

Finally, it should be noted that some radio loops in the Galactic plane (see, for example, Berkhuijsen 1973) may be parts of very large, old SNRs, but they have not been included in the catalogue (see also Combi *et al.* 1995; Maciejewski *et al.* 1996).

2.4 Questionable SNRs listed in the catalogue

As noted in Versions II and IV of the catalogue, the following sources are listed as SNRs, although, as discussed in each case, the identifications are not certain: G5.4−1.2, G39.7−2.0 (=W50), G65.7+1.2 (=DA 495), G69.0+2.7 (=CTB 80), G318.9+0.4 and G357.7−0.1. The nature of G76.9+1.0 (an unusual radio source similar to G65.7+1.2 (=DA 495)), and of G354.1+0.1 (which appears may be similar to G357.7−0.1 (=MHS 17−3*9*)) are also uncertain (see Landecker, Higgs & Wendker 1993 and Frail, Goss & Whiteoak 1994 respectively).

There are also some objects that have been identified as SNRs and are listed in the catalogue, although they have been barely resolved in the available observations, or are faint, and have not been well separated from confusing background or nearby thermal emission, and their identification as SNRs, or at least their parameters remain uncertain.

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l	*b*	RA (1950.0) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
0.0	+0.0	17 42 33	−28 59	3.5 × 2.5	S	100?	0.8?	Sgr A East
0.3	+0.0	17 43 05	−28 37	15 × 8	S	22	0.6	
0.9	+0.1	17 44 12	−28 08	8	C	18?	varies	
1.0	−0.1	17 46 20	−28 25	8	S	15	0.6?	
1.4	−0.1	17 46 30	−27 45	10	S	2?	?	
1.9	+0.3	17 45 37	−27 09	1.2	S	0.6	0.7	
3.7	−0.2	17 52 20	−25 50	11 × 14	S	2.3	0.65	
3.8	+0.3	17 49 50	−25 27	18	S?	4?	?	
4.2	−3.5	18 05 45	−27 04	28	S	3.2?	0.6?	
4.5	+6.8	17 27 42	−21 27	3	S	19	0.64	Kepler, SN1604, 3C358
5.2	−2.6	18 04 25	−25 45	18	S	2.6?	0.6?	
5.4	−1.2	17 59 00	−24 55	35	C?	35?	0.2?	Milne 56
5.9	+3.1	17 44 20	−22 15	20	S	3.3?	0.4?	
6.1	+1.2	17 51 55	−23 05	30 × 26	F	4.0?	0.3?	
6.4	−0.1	17 57 30	−23 25	42	C	310	varies	W28
6.4	+4.0	17 42 10	−21 20	31	S	1.3?	0.4?	
7.7	−3.7	18 14 20	−24 05	22	S	11	0.32	1814−24
8.7	−5.0	18 21 05	−23 50	26	S	4.4	0.3	
8.7	−0.1	18 02 35	−21 25	45	S?	80	0.5	(W30)
9.8	+0.6	18 02 10	−20 14	12	S	3.9	0.5	
10.0	−0.3	18 05 40	−20 26	8?	?	2.9	0.8	
11.2	−0.3	18 08 30	−19 26	4	C	22	0.49	
11.4	−0.1	18 07 50	−19 06	8	S?	6	0.5	
12.0	−0.1	18 09 15	−18 38	7?	?	3.5	0.7	
13.3	−1.3	18 16 30	−18 01	70 × 40	S?	?	?	
13.5	+0.2	18 11 20	−17 13	5 × 4	S	3.5?	1.0?	
15.1	−1.6	18 21 05	−16 36	30 × 24	S	5.5?	0.8?	
15.9	+0.2	18 16 00	−15 03	7 × 5	S?	5	0.6?	
16.7	+0.1	18 18 05	−14 21	4	C	3.0	0.6	
16.8	−1.1	18 22 30	−14 48	30 × 24?	?	2?	?	
17.4	−2.3	18 28 05	−14 54	24?	S	4.8?	0.8?	
17.8	−2.6	18 30 00	−14 41	24	S	4.0?	0.3?	
18.8	+0.3	18 21 10	−12 25	17 × 11	S	33	0.4	Kes 67
18.9	−1.1	18 27 00	−13 00	33	C?	37	varies	
20.0	−0.2	18 25 20	−11 37	10	F	10	0.0	
21.5	−0.9	18 30 47	−10 37	1.2	F	6	0.0	
21.8	−0.6	18 30 00	−10 10	20	S	69	0.5	Kes 69
22.7	−0.2	18 30 30	−09 15	26	S?	33	0.6	
23.3	−0.3	18 32 00	−08 50	27	S	70	0.5	W41
23.6	+0.3	18 30 20	−08 15	10?	?	8?	0.3	
24.7	−0.6	18 36 00	−07 35	15?	S?	8	0.5	
24.7	+0.6	18 31 30	−07 07	30 × 15	C?	20?	0.2?	
27.4	+0.0	18 38 40	−04 59	4	S	6	0.68	4C−04.71
27.8	+0.6	18 37 06	−04 28	50 × 30	F	30	varies	
28.8	+1.5	18 36 30	−02 40	100?	S?	?	0.4?	

l	*b*	RA (1950.0) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
29.7	−0.3	18 43 48	−03 02	3	C	10	0.7	Kes 75
30.7	−2.0	18 51 50	−02 58	16	?	0.5?	0.7?	
30.7	+1.0	18 42 10	−01 35	24 × 18	S?	6	0.4	
31.5	−0.6	18 48 35	−01 35	18?	S?	2?	?	
31.9	+0.0	18 46 50	−00 59	5 × 7	S	24	0.55	3C391
32.0	−4.9	19 03 00	−03 00	60?	S?	22?	0.5?	3C396.1
32.1	−0.9	18 50 30	−01 12	40?	C?	?	?	
32.8	−0.1	18 48 50	−00 12	17	S?	11?	0.2?	Kes 78
33.2	−0.6	18 51 12	−00 05	18	S	3.5	varies	
33.6	+0.1	18 50 15	+00 37	10	S	22	0.5	Kes 79, 4C00.70, HC13
34.7	−0.4	18 53 30	+01 18	35 × 27	S	230	0.30	W44, 3C392
36.6	−0.7	18 58 05	+02 52	25?	S?	?	?	
36.6	+2.6	18 46 20	+04 23	17 × 13?	S	0.7?	0.5?	
39.2	−0.3	19 01 40	+05 23	8 × 6	S	18	0.6	3C396, HC24, NRAO 593
39.7	−2.0	19 10 00	+04 50	120 × 60	?	85?	0.7?	W50, SS433
40.5	−0.5	19 04 45	+06 26	22	S	11	0.5	
41.1	−0.3	19 05 08	+07 03	4.5 × 2.5	S	22	0.48	3C397
42.8	+0.6	19 04 55	+09 00	24	S	3?	0.5?	
43.3	−0.2	19 08 44	+09 01	4 × 3	S	38	0.48	W49B
43.9	+1.6	19 03 30	+10 25	60?	S?	8.6?	0.2?	
45.7	−0.4	19 14 05	+11 04	22	S	4.2?	0.4?	
46.8	−0.3	19 15 50	+12 04	17 × 13	S	14	0.5	(HC30)
49.2	−0.7	19 21 30	+14 00	30	S?	160?	0.3?	(W51)
53.6	−2.2	19 36 30	+17 08	28 × 33	S	8	0.75	3C400.2, NRAO 611
54.1	+0.3	19 28 18	+18 46	1.5	F?	0.5	0.1	
54.4	−0.3	19 31 10	+18 50	40	S	28	0.5	(HC40)
55.0	+0.3	19 30 00	+19 45	15 × 20?	S	0.5?	0.5?	
55.7	+3.4	19 19 10	+21 38	23	S	1.4	0.6	
57.2	+0.8	19 32 50	+21 50	12?	S?	1.8?	?	(4C21.53)
59.5	+0.1	19 40 25	+23 28	5	S	3?	?	
59.8	+1.2	19 36 50	+24 12	20 × 16?	?	1.6	0.5	
63.7	+1.1	19 45 50	+27 37	8	F	1.8	0.3	
65.1	+0.6	19 52 30	+28 25	90 × 50	S	6	0.6	
65.3	+5.7	19 31 00	+31 05	310 × 240	S?	52?	0.6?	
65.7	+1.2	19 50 10	+29 18	18	?	5.1	0.6	DA 495
67.7	+1.8	19 52 34	+31 21	9	S	1.4	0.3	
68.6	−1.2	20 06 40	+30 28	28 × 25?	?	0.7?	0.0?	
69.0	+2.7	19 51 30	+32 45	80?	?	120?	varies	CTB 80
69.7	+1.0	20 00 45	+32 35	16	S	1.6	0.8	
73.9	+0.9	20 12 20	+36 03	22?	S?	9?	0.3?	
74.0	−8.5	20 49 00	+30 30	230 × 160	S	210	varies	Cygnus Loop
74.9	+1.2	20 14 10	+37 03	8 × 6	F	9	varies	CTB 87
76.9	+1.0	20 20 30	+38 33	9 × 12	?	2	0.6	
78.2	+2.1	20 19 00	+40 15	60	S	340	0.5	DR4, γ Cygni
82.2	+5.3	20 17 30	+45 20	95 × 65	S	120?	0.5?	W63

l	*b*	RA (1950.0) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
84.2	−0.8	20 51 30	+43 16	20 × 16	S	11	0.5	
84.9	+0.5	20 48 45	+44 42	6	S	0.8	0.4	
89.0	+4.7	20 43 30	+50 25	120 × 90	S	220	0.40	HB21
93.3	+6.9	20 51 00	+55 10	27 × 20	S	9	0.54	DA 530, 4C(T)55.38.1
93.7	−0.2	21 27 45	+50 35	80	S	65	0.3	CTB 104A, DA 551
94.0	+1.0	21 23 10	+51 40	30 × 25	S	15	0.44	3C434.1
109.1	−1.0	22 59 30	+58 37	28	S	20	0.50	CTB 109
111.7	−2.1	23 21 10	+58 32	5	S	2720	0.77	Cassiopeia A, 3C461
112.0	+1.2	23 13 40	+61 30	30?	S?	7?	0.6?	
114.3	+0.3	23 34 45	+61 38	90 × 55	S	6?	0.3?	
116.5	+1.1	23 51 20	+62 58	80 × 60	S	11?	0.8?	
116.9	+0.2	23 56 40	+62 10	34	S	9?	0.5?	CTB 1
117.4	+5.0	23 52 30	+67 30	60 × 80?	S?	30?	0.5?	
119.5	+10.2	00 04 00	+72 30	90?	S	36	0.6	CTA 1
120.1	+1.4	00 22 30	+63 52	8	S	56	0.61	Tycho, 3C10, SN1572
126.2	+1.6	01 18 30	+64 00	70	S?	7	varies	
127.1	+0.5	01 25 00	+62 55	45	S	13	0.6	R5
130.7	+3.1	02 01 55	+64 35	9 × 5	F	33	0.10	3C58, SN1181
132.7	+1.3	02 14 00	+62 30	80	S	45	0.6	HB3
152.2	−1.2	04 05 30	+48 24	110?	S?	16?	0.7?	
156.2	+5.7	04 54 40	+51 47	110	S	5	0.5	
160.9	+2.6	04 57 00	+46 36	140 × 120	S	110	0.6	HB9
166.0	+4.3	05 23 00	+42 52	55 × 35	S	7?	0.4?	VRO 42.05.01
166.2	+2.5	05 15 30	+41 50	90 × 70	S	11	0.5	OA 184
179.0	+2.6	05 50 30	+31 05	70	S?	7	0.4	
180.0	−1.7	05 36 00	+27 50	180	S	65	varies	S147
182.4	+4.3	06 05 00	+29 00	50	S	1.2	0.4	
184.6	−5.8	05 31 30	+21 59	7 × 5	F	1040	0.30	Crab Nebula, 3C144, SN1054
189.1	+3.0	06 14 00	+22 36	45	S	160	0.36	IC443, 3C157
192.8	−1.1	06 06 30	+17 20	78	S	20?	0.6?	PKS 0607+17
205.5	+0.5	06 36 00	+06 30	220	S	160	0.5	Monoceros Nebula
206.9	+2.3	06 46 00	+06 30	60 × 40	S?	6	0.5	PKS 0646+06
211.7	−1.1	06 43 10	+00 24	70?	S?	15?	0.5?	
260.4	−3.4	08 20 30	−42 50	60 × 50	S	130	0.5	Puppis A, MSH 08−4*4*
261.9	+5.5	09 02 20	−38 30	40 × 30	S	10?	0.4?	
263.9	−3.3	08 32 30	−45 35	255	C	1750	varies	Vela (XYZ)
272.2	−3.2	09 05 15	−51 50	15?	S?	0.4	0.6	
279.0	+1.1	09 56 00	−53 00	95	S	30?	0.6?	
284.3	−1.8	10 16 30	−58 45	24?	S	11?	0.3?	MSH 10−5*3*
286.5	−1.2	10 33 50	−59 26	26 × 6	S?	1.4?	?	
289.7	−0.3	10 59 10	−60 02	18 × 14	S	6.2	0.2?	
290.1	−0.8	11 01 00	−60 40	19 × 14	S	42	0.4	MSH 11−6*1*A
291.0	−0.1	11 09 45	−60 22	15 × 13	C	16	0.29	(MSH 11−6*2*)
292.0	+1.8	11 22 20	−59 00	12 × 8	C?	15	0.4	MSH 11−5*4*
293.8	+0.6	11 32 40	−60 37	20	C	5?	0.6?	

l	*b*	RA (1950.0) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
294.1	−0.0	11 33 50	−61 22	40	S	>2?	?	
296.1	−0.5	11 48 40	−62 17	37 × 25	S	8?	0.6?	
296.5	+10.0	12 07 00	−52 10	90 × 65	S	48	0.5	PKS 1209−51/52
296.8	−0.3	11 56 00	−62 18	20 × 14	S	9	0.6	1156−62
298.5	−0.3	12 10 00	−62 35	5?	?	5?	0.4?	
298.6	−0.0	12 11 00	−62 20	12 × 9	S	5?	0.3	
299.2	−2.9	12 12 30	−65 13	18 × 11	S	0.5?	?	
299.6	−0.5	12 19 00	−62 52	13	S	1.0?	?	
301.4	−1.0	12 35 00	−63 33	37 × 23	S	2.1?	?	
302.3	+0.7	12 42 55	−61 52	17	S	5?	0.4?	
304.6	+0.1	13 02 50	−62 26	8	S	14	0.5	Kes 17
308.1	−0.7	13 34 10	−62 49	13	S	1.2?	?	
308.8	−0.1	13 39 00	−62 08	20 × 30?	C?	15?	0.4?	
309.2	−0.6	13 43 00	−62 39	15 × 12	S	7?	0.4?	
309.8	+0.0	13 47 00	−61 50	25 × 19	S	17	0.5	
310.6	−0.3	14 01 40	−62 23	8	S	5?	?	Kes 20B
310.8	−0.4	14 03 40	−62 31	12	S	6?	?	Kes 20A
311.5	−0.3	14 02 00	−61 44	5	S	3?	0.5	
312.4	−0.4	14 09 20	−61 29	38	S	45	0.36	
315.4	−2.3	14 39 00	−62 17	42	S	49	0.6	RCW 86, MSH 14−6*3*
315.4	−0.3	14 32 10	−60 23	24 × 13	?	8	0.4	
315.9	−0.0	14 34 40	−59 58	25 × 14	S	0.8?	?	
316.3	−0.0	14 37 40	−59 47	29 × 14	S	20?	0.4	(MSH 14−5*7*)
317.3	−0.2	14 45 50	−59 34	11	S	4.7?	?	
318.2	+0.1	14 51 00	−58 51	40 × 35	S	>3.9?	?	
318.9	+0.4	14 54 40	−58 17	30 × 14	C	4?	0.2?	
320.4	−1.2	15 10 30	−58 58	35	C	60?	0.4	MSH 15−5*2*, RCW 89
320.6	−1.6	15 21 50	−59 27	60 × 30	S	?	?	
321.9	−1.1	15 19 50	−58 02	28	S	>3.4?	?	
321.9	−0.3	15 16 45	−57 23	31 × 23	S	13	0.3	
322.5	−0.1	15 19 30	−56 55	15	C	1.5	0.4	
323.5	+0.1	15 24 50	−56 11	13	S	3?	0.4?	
326.3	−1.8	15 49 00	−56 00	38	C	145	varies	MSH 15−5*6*
327.1	−1.1	15 50 30	−55 00	18	C	7?	?	
327.4	+0.4	15 44 30	−53 40	21	S	30?	0.6	Kes 27
327.4	+1.0	15 43 00	−53 11	14	S	1.9?	?	
327.6	+14.6	14 59 35	−41 44	30	S	19	0.6	SN1006, PKS 1459−41
328.4	+0.2	15 51 40	−53 08	6	F	16?	0.2	(MSH 15−5*7*)
329.7	+0.4	15 57 30	−52 11	40 × 33	S	>34?	?	
330.0	+15.0	15 05 00	−39 30	180?	S	350?	0.5?	Lupus Loop
330.2	+1.0	15 57 20	−51 26	11	S?	5?	0.3	
332.0	+0.2	16 09 30	−50 45	12	S	8?	0.5	
332.4	−0.4	16 13 45	−50 55	10	S	28	0.5	RCW 103
332.4	+0.1	16 11 30	−50 35	15	S	26	0.5	MSH 16−5*1*, Kes 32
335.2	+0.1	16 24 00	−48 40	21	S	16	0.5	

l	*b*	RA (1950.0) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
336.7	+0.5	16 28 30	−47 13	14 × 10	S	6	0.5	
337.0	−0.1	16 32 15	−47 30	1.5	S	1.5	0.6?	(CTB 33)
337.2	−0.7	16 35 45	−47 45	6	S	2?	0.7	
337.3	+1.0	16 29 00	−46 30	15 × 12	S	16	0.55	Kes 40
337.8	−0.1	16 35 20	−46 53	9 × 6	S	18	0.5	Kes 41
338.1	+0.4	16 34 20	−46 18	15?	S	4?	0.4	
338.3	−0.0	16 37 20	−46 28	8	S	7?	?	
338.5	+0.1	16 37 30	−46 13	9	?	12?	?	
340.4	+0.4	16 42 55	−44 34	10 × 7	S	5	0.4	
340.6	+0.3	16 44 05	−44 29	6	S	5?	0.4?	
341.2	+0.9	16 44 00	−43 42	16 × 22	C?	1.5?	0.6?	
341.9	−0.3	16 51 25	−43 56	7	S	2.5	0.5	
342.0	−0.2	16 51 15	−43 48	12 × 9	S	3.5?	0.4?	
342.1	+0.9	16 47 10	−42 59	10 × 9	S	0.5?	?	
343.1	−2.3	17 04 25	−44 12	32?	C?	8?	0.5?	
343.1	−0.7	16 56 50	−43 10	27 × 21	S	7.8	0.55	
344.7	−0.1	17 00 20	−41 38	10	C?	2.5?	0.5	
345.7	−0.2	17 03 50	−40 49	6	S	0.6?	?	
346.6	−0.2	17 06 50	−40 07	8	S	8?	0.5?	
348.5	−0.0	17 12 00	−38 25	10?	S?	10?	0.4?	
348.5	+0.1	17 10 40	−38 29	15	S	72	0.3	CTB 37A
348.7	+0.3	17 10 30	−38 08	17?	S	26	0.3	CTB 37B
349.2	−0.1	17 13 50	−38 01	9 × 6	S	1.4?	?	
349.7	+0.2	17 14 35	−37 23	2.5 × 2	S	20	0.5	
350.0	−2.0	17 24 20	−38 30	45	S	26	0.4	
351.2	+0.1	17 19 05	−36 08	7	C?	5?	0.4	
351.7	+0.8	17 17 40	−35 24	18 × 14	S	10?	?	
351.9	−0.9	17 25 30	−36 14	12 × 9	S	1.8?	?	
352.7	−0.1	17 24 20	−35 05	8 × 6	S	4	0.6	
354.1	+0.1	17 27 10	−33 44	15 × 3?	C?	?	varies?	
354.8	−0.8	17 32 40	−33 40	19	S	2.8?	?	
355.6	−0.0	17 32 00	−32 36	6 × 8	S	3?	?	
355.9	−2.5	17 42 35	−33 42	13	S	8	0.5	
356.3	−0.3	17 34 40	−32 14	7 × 11	S	3?	?	
356.3	−1.5	17 39 20	−32 51	15 × 20	S	3?	?	
357.7	−0.1	17 37 15	−30 56	3 × 8?	?	37	0.4	MSH 17−3*9*
357.7	+0.3	17 35 20	−30 42	24	S	10	0.4?	
359.0	−0.9	17 43 35	−30 15	23	S	23	0.5	
359.1	−0.5	17 42 20	−29 56	24	S	14	0.4?	
359.1	+0.9	17 36 25	−29 09	11 × 12	S	5?	?	

γ Cygni	G78.2 + 2.1
1156−62	G296.8 − 0.3
1814−24	G7.7 − 3.7
3C10	G120.1 + 1.4
3C58	G130.7 + 3.1
3C144	G184.6 − 5.8
3C157	G189.1 + 3.0
3C358	G4.5 + 6.8
3C391	G31.9 + 0.0
3C392	G34.7 − 0.4
3C396	G39.2 − 0.3
3C396.1	G32.0 − 4.9
3C397	G41.1 − 0.3
3C400.2	G53.6 − 2.2
3C434.1	G94.0 + 1.0
3C461	G111.7 − 2.1
4C−04.71	G27.4 + 0.0
4C00.70	G33.6 + 0.1
(4C21.53)	G57.2 + 0.8
4C(T)55.38.1	G93.3 + 6.9
CTA 1	G119.5 + 10.2
CTB 1	G116.9 + 0.2
(CTB 33)	G337.0 − 0.1
CTB 37A	G348.5 + 0.1
CTB 37B	G348.7 + 0.3
CTB 80	G69.0 + 2.7
CTB 87	G74.9 + 1.2
CTB 104A	G93.7 − 0.2
CTB 109	G109.1 − 1.0
Cassiopeia A	G111.7 − 2.1
Crab Nebula	G184.6 − 5.8
Cygnus Loop	G74.0 − 8.5
DA 495	G65.7 + 1.2
DA 530	G93.3 + 6.9
DA 551	G93.7 − 0.2
DR4	G78.2 + 2.1
HB3	G132.7 + 1.3
HB9	G160.9 + 2.6
HB21	G89.0 + 4.7
HC13	G33.6 + 0.1
HC24	G39.2 − 0.3
(HC30)	G46.8 − 0.3
(HC40)	G54.4 − 0.3
IC443	G189.1 + 3.0
Kepler	G4.5 + 6.8
Kes 17	G304.6 + 0.1
Kes 20A	G310.6 − 0.3
Kes 20B	G310.8 − 0.4
Kes 27	G327.4 + 0.4
Kes 32	G332.4 + 0.1
Kes 40	G337.3 + 1.0
Kes 41	G337.8 − 0.1
Kes 67	G18.8 + 0.3
Kes 69	G21.8 − 0.6
Kes 75	G29.7 − 0.3
Kes 78	G32.8 − 0.1
Kes 79	G33.6 + 0.1
Lupus Loop	G330.0 + 15.0
MSH 08−4*4*	G260.4 − 3.4
MSH 10−5*3*	G284.3 − 1.8
MSH 11−5*4*	G292.0 + 1.8
MSH 11−6*1*A	G290.1 − 0.8
(MSH 11−6*2*)	G291.0 − 0.1
(MSH 14−5*7*)	G316.3 − 0.0
MSH 14−6*3*	G315.4 − 2.3
MSH 15−5*2*	G320.4 − 1.2
MSH 15−5*6*	G326.3 − 1.8
(MSH 15−5*7*)	G328.4 + 0.2
MSH 16−5*1*	G332.4 + 0.1
MSH 17−3*9*	G357.7 − 0.1
Milne 56	G5.4 − 1.2
Monoceros Nebula	G205.5 + 0.5
NRAO 593	G39.2 − 0.3
NRAO 611	G53.6 − 2.2
OA 184	G166.2 + 2.5
PKS 0607+17	G192.8 − 1.1
PKS 0646+06	G206.9 + 2.3
PKS 1209−51/52	G296.5 + 10.0
PKS 1459−41	G327.6 + 14.6
Puppis A	G260.4 − 3.4
R5	G127.1 + 0.5
RCW 86	G315.4 − 2.3
RCW 89	G320.4 − 1.2
RCW 103	G332.4 − 0.4
S147	G180.0 − 1.7
SN1006	G327.6 + 14.6
SN1054	G184.6 − 5.8
SN1181	G130.7 + 3.1
SN1572	G120.1 + 1.4
SN1604	G4.5 + 6.8
SS433	G39.7 − 2.0
Sgr A East	G0.0 + 0.0
Tycho	G120.1 + 1.4
Vela (XYZ)	G263.9 − 3.3
VRO 42.05.01	G166.0 + 4.3
W28	G6.4 − 0.1
(W30)	G8.7 − 0.1
W41	G23.3 − 0.3
W44	G34.7 − 0.4
W49B	G43.3 − 0.2
W50	G39.7 − 2.0
(W51)	G49.2 − 0.7
W63	G82.2 + 5.3

Journals

A&A	Astronomy & Astrophysics
A&AS	Astronomy & Astrophysics Supplement
AJ	Astronomical Journal
ApJ	Astrophysical Journal
ApJS	Astrophysical Journal Supplement
AstL	Astronomy Letters
ARep	Astronomy Reports (Astronomicheskiĭ Zhurnal translation)
AuJPh	Australian Journal of Physics
AuJPA	Australian Journal of Physics Astrophysical Supplement
JApA	Journal of Astrophysics & Astronomy
JRASC	Journal of the Royal Astronomical Society of Canada
MNRAS	Monthly Notices of the Royal Astronomical Society
Natur	Nature
PASAu	Proceedings of the Astronomical Society of Australia
PASJ	Publications of the Astronomical Society of Japan
PASP	Publications of the Astronomical Society of the Pacific
RMxAA	Review of Mexican Astronomy & Astrophysics
Sci	Science
SvA	Soviet Astronomy
SvAL	Soviet Astronomy Letters

Proceedings

SNRISM is *Supernova Remnants and the Interstellar Medium*, (IAU Colloquium 101), eds Roger, R.S. & Landecker, T.L., (Cambridge University Press), 1988.

Radio Telescopes

5km	Cambridge 5-km Telescope
6C	Cambridge low frequency northern survey
ATCA	Australia Telescope Compact Array
CLFST	Cambridge Low Frequency Synthesis Telescope
DRAO	Dominion Radio Astrophysical Observatory
FIRST	Fleurs Synthesis Telescope
HMT	Cambridge Half-Mile Telescope
MOST	Molonglo Observatory Synthesis Telescope
NRAO	National Radio Astronomy Observatory
NRO	Nobeyama Radio Observatory
OMT	Cambridge One-Mile Telescope
OSRT	Ooty Synthesis Radio Telescope
TPT	Clark Lake TPT telescope
VLA	Very Large Array
VRO	Vermillion River Observatory
WSRT	Westerbork Synthesis Radio Telescope

Satellites

HST	Hubble Space Telescope
ISO	Infrared Space Observatory

X-ray:

EXOSAT	European X-ray Observatory Satellite
ROSAT	Röntgensatellit
ASCA	Advanced Satellite for Cosmology and Astrophysics

On board Einstein (HEAO-2):

HRI	High Resolution Imager
IPC	Imaging Proportional Counter