

G0.0+0.0

RA: 17^h45^m44^s
Dec: –29°00′

1-GHz flux/Jy: 100?
Spectral index: 0.8?

Size/arcmin: 3.5×2.5
Type: S

Radio: Non-thermal shell, in complex region, interacting with molecular material to the west.

X-ray: Diffuse emission, centrally peaked.

Point sources: Compact X-ray/radio source.

References:

Ekers *et al.* 1983, A&A, 122, 143. VLA at 1.4 GHz and 5 GHz (both 5''×8''), $S_{1.4\text{ GHz}}=77\text{ Jy}$, $S_{5.0\text{ GHz}}=31\text{ Jy}$.
 Pedlar *et al.* 1989, ApJ, 342, 769. VLA at 332 MHz (12''), 1.4 GHz (1''3×2''5) and 5 GHz (1''3×2''5).
 Mezger *et al.* 1989, A&A, 209, 337. Nearby molecular material.
 Ho *et al.* 1991, Nature, 350, 309. VLA of NH₃ emission from surroundings.
 Anantharamaiah *et al.* 1991, MNRAS, 249, 262. VLA at 330 MHz (17''×33'').
 Serabyn *et al.* 1992, ApJ, 395, 166. Nearby molecular material.
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43''×88'').
 Yusef-Zadeh & Mehninger 1995, ApJ, 452, L37. VLA of nearby H₂O masers.
 Yusef-Zadeh *et al.* 1999, ApJ, 512, 230. OH maser observations.
 Coil & Ho 2000, ApJ, 533, 245. NH₃ observations of surroundings.
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (24''×43'').
see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Fatuzzo *et al.* 2001, ApJ, 549, 293. Electron–positron lines from the vicinity.
 Yusef-Zadeh *et al.* 2001, ApJ, 560, 749. Observations of nearby molecular hydrogen.
 Maeda *et al.* 2002, ApJ, 570, 671. Chandra observations.
 Sakano *et al.* 2003, AN, 324 (No S1), 197. XMM-Newton observations.
 Roy & Rao 2004, MNRAS, 349, L25. GMRT at 620 MHz (6'6×11'4).
 Sakano *et al.* 2004, MNRAS, 350, 129. XMM-Newton observa-

tions.
 Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (1''×2''2).
 Park *et al.* 2005, ApJ, 631, 964. Chandra observations.
 Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray detection.
 Koyama *et al.* 2007, PASJ, 59, S237. Suzaku observations.
 Lee *et al.* 2008, ApJ, 674, 247. Molecular H₂ observations of surroundings.
 Sjouwerman & Pihlström 2008, ApJ, 681, 1287. VLA at 1.7 GHz of OH masers.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Tsuboi *et al.* 2012, PASJ, 64, 111. CO observations of SW.
 Minh *et al.* 2013, ApJ, 773, 31. NH₃ observations of region.
 Zhao *et al.* 2013, ApJ, 777, 146. VLA at 4.8 GHz (0''5×0''7), 5.5 GHz (0''6×1''6), and 8.3 GHz (1''0×2''0).
 Nynka *et al.* 2013, ApJ, 778, L31. NuSTAR of compact X-ray source.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA observations of methanol masers.
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
 Tsuboi *et al.* 2015, PASJ, 67, 109. CO observations of region.
 Lau *et al.* 2015, Science, 348, 413. IR observations.
 Ajello *et al.* 2016, ApJ, 819, 44. γ -ray observations.
 Yusef-Zadeh *et al.* 2016, ApJ, 819, 60. VLA at 1.5 GHz (0''5×1''4) and other frequencies.
 McEwen *et al.* 2016, ApJ, 832, 129. CH₃OH maser observations in region.

G0.3+0.0

RA: 17^h46^m15^s
Dec: –28°38′

1-GHz flux/Jy: 22
Spectral index: 0.6

Size/arcmin: 15×8
Type: S

Has been called G0.33+0.04 and G0.4+0.1.

Radio: Bilateral shell, near Galactic Centre.

References:

Kassim & Frail 1996, MNRAS, 283, L51. VLA at 333 MHz (23''×42''), plus review of flux densities and other observations.
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (30'').
see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.

Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (30'').
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
 Ajello *et al.* 2016, ApJ, 819, 44. γ -ray observations.

G0.9+0.1

RA: 17^h47^m21^s
Dec: –28°09′

1-GHz flux/Jy: 18?
Spectral index: varies

Size/arcmin: 8
Type: C

Radio: Flat spectrum core within steep spectrum shell.

X-ray: Central core, with non-thermal spectrum.

Point sources: Central pulsar.

References:

Helfand & Becker 1987, ApJ, 314, 203. VLA at 1.4 and 5 GHz, and Einstein observations.
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×91″).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Mereghetti *et al.* 1998, A&A, 331, L77. X-ray detection.
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (43″×24″).
see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Sidoli *et al.* 2000, A&A, 361, 719. BeppoSAX observations.
 Gaensler *et al.* 2001, ApJ, 556, L107. Chandra observations.
 Porquet *et al.* 2003, A&A, 401, 197. XMM-Newton observations.

Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (8″6×11″3).
 Aharonian *et al.* 2005, A&A, 432, L25. γ -ray detection.
 Dubner *et al.* 2008, A&A, 487, 1033. ATCA and VLA at 1.4 GHz (1″2×2″5: $S=8.3\pm0.7$ Jy), 5 GHz (1″6×2″5) and 8.3 GHz (0″8×1″5).
 Camilo *et al.* 2009, ApJ, 700, L34. Pulsar detection.
 Holler *et al.* 2012, A&A, 539, A24. Chandra and XMM-Newton observations.
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
 Archer *et al.* 2016, ApJ, 821, 129. γ -ray observations.

G1.0–0.1

RA: 17^h48^m30^s
Dec: –28°09′

1-GHz flux/Jy: 15
Spectral index: 0.6?

Size/arcmin: 8
Type: S

Has been called G1.05–0.1 and G1.05–0.15.

Radio: Incomplete shell, to the S of Sgr D.

X-ray: Possibly detected.

References:

Downes *et al.* 1979, A&AS, 35, 1. Review of flux densities.
 Anantharamaiah *et al.* 1991, MNRAS, 249, 262. VLA at 330 MHz (64″×100″: $S=12.3$ Jy).
 Liszt 1992, ApJS, 82, 495. VLA at 1.6 GHz (13″×23″).
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×91″).
 Mehringer *et al.* 1998, ApJ, 493, 274. VLA at 1.6 GHz (15″×28″) and 5 GHz, including masers observations.
 Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (43″×24″).
see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Sidoli *et al.* 2001, A&A, 372, 651. BeppoSAX possible detec-

tion.
 Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (30″).
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Nobukawa *et al.* 2009, AdSpR, 43, 1045. Suzaku observations.
 Marquez-Lopez & Phillips 2010, MNRAS, 407, 94. Mid-IR observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G1.4–0.1

RA: 17^h49^m39^s
Dec: –27°46′

1-GHz flux/Jy: 2?
Spectral index: ?

Size/arcmin: 10
Type: S

Radio: Shell, brightest in E.

References:

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×92″: $S=2$ Jy).
 Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.
 Bhatnagar 2002, MNRAS, 332, 1. GMRT at 327 MHz (2″7×2″4: $S=4.2\pm0.5$).
 Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (8″2×12″2).
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for

OH masers.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA observations of methanol masers.
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 McEwen *et al.* 2016, ApJ, 826, 189. NH₃ and CH₃OH observations.

G1.9+0.3

RA: 17^h48^m45^s
Dec: –27°10′

1-GHz flux/Jy: 0.6
Spectral index: 0.6

Size/arcmin: 1.5
Type: S

Radio: Shell, brighter to the N, brightening; shows secular increase.

X-ray: Shell, with bright limbs to E and W.

Distance: H_I absorption gives < 10 kpc.

References:

Green & Gull 1984, *Nature*, 312, 527. VLA at 5 GHz (4′′4×2′′).
 Gray 1994, *MNRAS*, 270, 835. MOST at 843 MHz (43′′×94′′).
 Green *et al.* 1997, *AJ*, 114, 2058. Parkes 64-m OH observations.
 Yusef-Zadeh *et al.* 2004, *ApJS*, 155, 421. VLA at 1.4 GHz (8′′3×12′′).
 Nord *et al.* 2004, *AJ*, 128, 1646. VLA at 330 MHz (7′′×12′′).
 Green 2004, *BASI*, 32, 335. VLA at 1.5 GHz (7′′2×9′′4).
 Reynolds *et al.* 2008, *ApJ*, 680, L41. Chandra observations.
 Green *et al.* 2008, *MNRAS*, 387, L54. VLA at 4.86 GHz (4′′×10′′), for expansion studies.
 Murphy *et al.* 2008, *MNRAS*, 389, L23. MOST at 843 MHz for flux increase.
 Gómez & Rodríguez 2009, *RMxAA*, 45, 91. VLA at 1.5 GHz

(5′′1×10′′6).
 Reynolds *et al.* 2009, *ApJ*, 695, L149. Chandra spectroscopy.
 Borkowski *et al.* 2010, *ApJ*, 724, L161. Chandra observations.
 Carlton *et al.* 2011, *ApJ*, 737, L22. Chandra expansion studies.
 Borkowski *et al.* 2013, *ApJ*, 771, L9. Chandra observations.
 Abramowski *et al.* 2014, *MNRAS*, 441, 790. γ -ray observations.
 Borkowski *et al.* 2014, *ApJ*, 790, L18. Chandra expansion studies.
 Roy & Pal 2014, *IAUS*, 296, 197. GMRT H_I observations.
 De Horta *et al.* 2014, *SerAJ*, 189, 41. ATCA at 1.4 (5′′.4×10′′.4), 2.4 (2′′.9×6′′.1) and 5 GHz (1′′.2×2′′.8).
 Gök & Ergin 2015, *AdSpR*, 56, 1793. Suzaku and γ -ray observations.
 Zoglauer *et al.* 2015, *ApJ*, 798, 98. NuSTAR observations.

G3.7–0.2

RA: 17^h55^m26^s
Dec: –25°50′

1-GHz flux/Jy: 2.3
Spectral index: 0.65

Size/arcmin: 14×11
Type: S

Has been called G003.8–00.3.

Radio: Double arc.

References:

Gray 1994, *MNRAS*, 270, 847. MOST at 843 MHz (43′′×99′′ : $S=2.4$ Jy).
 Gaensler 1998, *ApJ*, 493, 781. VLA at 1.4 GHz (9′′×15′′ : $S=$

1.7±0.1 Jy).
 Yusef-Zadeh *et al.* 2004, *ApJS*, 155, 421. VLA at 1.4 GHz (8′′4×11′′4).

G3.8+0.3

RA: 17^h52^m55^s
Dec: –25°28′

1-GHz flux/Jy: 3?
Spectral index: 0.6

Size/arcmin: 18
Type: S?

Radio: Incomplete shell.

References:

Gray 1994, *MNRAS*, 270, 847. MOST at 843 MHz (43′′×100′′ : $S=3.5$ Jy).
 Bhatnagar 2002, *MNRAS*, 332, 1. GMRT at 327 MHz (27′′×17′′ : $S=6.0±0.4$).

G4.2–3.5

RA: 18^h08^m55^s
Dec: –27°03′

1-GHz flux/Jy: 3.2?
Spectral index: 0.6?

Size/arcmin: 28
Type: S

Radio: Elongated shell.

Optical: Detected.

References:

Reich *et al.* 1988, IAUCom, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G4.5+6.8

RA: 17^h30^m42^s
Dec: –21°29′

1-GHz flux/Jy: 19
Spectral index: 0.64

Kepler, SN1604, 3C358

Size/arcmin: 3
Type: S

This is the remnant of Kepler’s SN of AD1604.

Radio: Incomplete shell, brighter to the N.

Optical: Faint filaments.

X-ray: Shell, brighter to the N.

Distance: Optical expansion and proper motion indicates about 2.9 kpc, H α observations suggest 3.4 to 6.4 kpc.

References:

van den Bergh & Kamper 1977, ApJ, 218, 617. Optical proper motions.
 Leibowitz & Danziger 1983, MNRAS, 204, 273. Optical spectra.
 White & Long 1983, ApJ, 264, 196. Einstein observations.
 Matsui *et al.* 1984, ApJ, 287, 295. VLA at 1.4 (2.5 \times 3.2) and 5 GHz (3.2 \times 4.8) and Einstein image (5.5).
 Dickel *et al.* 1988, ApJ, 330, 254. VLA at 1.4 (1.2 \times 2.3) and 5 GHz (0.6 \times 1.0) at two epochs.
 Smith *et al.* 1989, ApJ, 347, 925. EXOSAT observations.
 Hatsukade *et al.* 1990, PASJ, 42, 279. X-ray spectrum.
 Blair *et al.* 1991, ApJ, 366, 484. Optical imaging and spectroscopy.
 Bandiera & van den Bergh 1991, ApJ, 374, 186. Optical changes.
 van den Bergh 1991, PASP, 103, 194. Optical imaging.
 Predehl & Schmitt 1995, A&A, 293, 889. ROSAT of dust scattered halo.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Hughes 1999, ApJ, 527, 298. ROSAT and Einstein image comparison for expansion studies.
 Reynoso & Goss 1999, AJ, 118, 926. VLA at 1.4 GHz (23.5 \times 13.5) for H α studies.
 Kinugasa & Tsunemi 1999, PASJ, 51, 239. ASCA observations.
 Gerardy & Fesen 2001, AJ, 121, 2781. IR spectroscopy and imaging.
 DeLaney *et al.* 2002, ApJ, 580, 914. VLA at 1.3 to 1.5 GHz and 5 GHz (7.2) for spectral index studies.
 Morgan *et al.* 2003, ApJ, 597, L33. Sub-mm dust observations.

Sollerman *et al.* 2003, A&A, 407, 249. Optical spectroscopy.
 Cassam-Chenaï *et al.* 2004, A&A, 414, 545. XMM-Newton observations.
 Bamba *et al.* 2005, ApJ, 621, 793. Chandra observations of rim.
 Riesgo & López 2005, RMxAA, 41, 57. Optical observations of filament (previously classified as PN, H 2-12).
 Blair *et al.* 2007, ApJ, 662, 998. Spitzer observations.
 Reynolds *et al.* 2007, ApJ, 668, L135. Chandra observations.
 Sankrit *et al.* 2008, AJ, 135, 538. HST observations.
 Aharonian *et al.* 2008, A&A, 488, 219. γ -ray upper limit.
 Enomoto *et al.* 2008, ApJ, 683, 383. γ -ray upper limit.
 Katsuda *et al.* 2008, ApJ, 689, 225. Chandra proper motion studies.
 Vink *et al.* 2008, ApJ, 689, 231. Chandra proper motion studies.
 Gomez *et al.* 2012, MNRAS, 420, 3557. Herschel IR dust observations.
 Williams *et al.* 2012, ApJ, 755, 3. Spitzer spectroscopy.
 Burkey *et al.* 2013, ApJ, 764, 63. Chandra observations.
 Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.
 Park *et al.* 2013, ApJ, 767, L10. Suzaku observations.
 Katsuda *et al.* 2015, ApJ, 808, 49. XMM-Newton, Chandra and Suzaku observations.
 Sankrit *et al.* 2016, ApJ, 817, 36. HST for proper motion studies.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G4.8+6.2

RA: 17^h33^m25^s
Dec: –21°34′

1-GHz flux/Jy: 3
Spectral index: 0.6

Size/arcmin: 18
Type: S

Has been called G4.5+6.2.

Radio: Faint shell.

References:

Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10.4).
 Bhatnagar 2000, MNRAS, 317, 453. GMRT at 327 MHz (2.2×1.3 : S=5.5±1.2 Jy), and NVSS at 1.4 GHz.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G5.2–2.6

RA: 18^h07^m30^s
Dec: –25°45′

1-GHz flux/Jy: 2.6?
Spectral index: 0.6?

Size/arcmin: 18
Type: S

Radio: Poorly resolved shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G5.4–1.2

RA: 18^h02^m10^s
Dec: –24°54′

1-GHz flux/Jy: 35?
Spectral index: 0.2?

Milne 56
Size/arcmin: 35
Type: C?

Part been called G5.3–1.0. Has been suggested that this is not a SNR.

Radio: Incomplete shell, including wide ‘v’ of emission to east with small flat-spectrum source at apex.

Optical: Detected.

X-ray: Pulsar detected, with faint extension.

Point sources: Pulsar nearby, in flat spectrum source.

Distance: H_I absorption suggests > 4.3 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 38 Jy).
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8.4) and 5 GHz (4.4).
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6.8 : S = 21.9±2.4 Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).
 Zealey *et al.* 1979, A&AS, 38, 39. Optical detection.
 Becker & Helfand 1985, Nature, 313, 115. VLA at 1.4 and 5 GHz.
 Helfand & Becker 1985, Nature, 313, 118. Suggesting it is not a SNR.
 Manchester *et al.* 1985, MNRAS, 212, 975. Pulsar detection.
 Caswell *et al.* 1987, MNRAS, 225, 329. MOST at 843 MHz (42″×110″).
 Frail & Kulkarni 1991, Nature, 352, 785. Pulsar and remnant association.
 Manchester *et al.* 1991, MNRAS, 253, 7P. Pulsar and remnant association.
 Milne *et al.* 1992, MNRAS, 255, 707. Parkes 64-m at 4.75 (4.5 :

S = 30.8±2.1 Jy) and 8.4 GHz (3′ : S = 24±3 Jy), including polarisation.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3.0×4.9 : S = 38 Jy).
 Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz (68″×73″), plus H_I absorption.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Gaensler & Frail 2000, Nature, 406, 158. Pulsar observations, including proper motion.
 Kaspi *et al.* 2001, ApJ, 562, L163. X-ray detection of pulsar, and upper limit for remnant.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 10.6 GHz, including polarisation.
 Blazek *et al.* 2006, ApJ, 652, 1523. Proper motion study of pulsar.
 Zeiger *et al.* 2008, ApJ, 674, 271. Proper motion study of pulsar.
 Liszt *et al.* 2009, A&A, 508, 1331. CO and IR observations of region.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser detection.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.

G5.5+0.3

RA: 17^h57^m04^s
Dec: –24°00′

1-GHz flux/Jy: 5.5
Spectral index: 0.7

Size/arcmin: 15×12
Type: S

Has been called G5.55+0.32.

Radio: Shell.

Optical: Detected.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 14.3 \pm 0.3$ Jy), plus other observations.
 Liszt *et al.* 2009, A&A, 508, 1331. CO and IR observations of region.

Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G5.9+3.1

RA: 17^h47^m20^s
Dec: –22°16′

1-GHz flux/Jy: 3.3?
Spectral index: 0.4?

Size/arcmin: 20
Type: S

Radio: Asymmetric shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Effelsberg 100-m at 2.7 GHz (4′.3).
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G6.1+0.5

RA: 17^h57^m29^s
Dec: –23°25′

1-GHz flux/Jy: 4.5
Spectral index: 0.9

Size/arcmin: 18×12
Type: S

Has been called G6.10+0.53.

Radio: Partial shell.

Optical: Detected.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 13.4 \pm 0.2$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G6.1+1.2

RA: 17^h54^m55^s
Dec: –23°05′

1-GHz flux/Jy: 4.0?
Spectral index: 0.3?

Size/arcmin: 30×26
Type: F

Has been called G6.1+1.15.

Radio: Faint, diffuse emission.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4′.3), including polarisation.

Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4′.3).
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G6.4–0.1

W28

RA: 18^h00^m30^s
Dec: –23°26′**1-GHz flux/Jy:** 310
Spectral index: varies**Size/arcmin:** 48
Type: C

Has been called G6.6–0.2.

Radio: Several non-thermal sources in a ring, with flat spectrum core.**Optical:** Diffuse emission.**X-ray:** Diffuse emission from most of the remnant.**Point sources:** Young pulsar near edge of remnant, but not thought to be related.**Distance:** HI observations suggest 1.9 kpc.**References:**

- Kundu & Velusamy 1972, *A&A*, 20, 237. NRAO 140-ft at 10 GHz (3').
- van den Bergh *et al.* 1973, *ApJS*, 26, 19. Optical observations.
- Dickel & Milne 1976, *AuJPh*, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8'4) and 5 GHz (4'4).
- Dopita *et al.* 1977, *ApJ*, 214, 179. Some optical line ratios.
- Altenhoff *et al.* 1979, *A&AS*, 35, 23. Effelsberg 100-m at 4.9 GHz (2'6).
- Lozinskaya 1981, *SvAL*, 7, 17. Mean optical velocity.
- Andrews *et al.* 1983, *ApJ*, 266, 684. VLA at 1.4 GHz (8'') 4.9 GHz (3'') and 15 GHz (1'') of central region only, plus Einstein image of central region.
- Bohigas *et al.* 1983, *RMxAA*, 8, 155. Optical spectra.
- Odenwald *et al.* 1984, *ApJ*, 279, 162. Nearby IR source.
- Andrews *et al.* 1985, *AJ*, 90, 310. VLA of central component.
- Long *et al.* 1991, *ApJ*, 373, 567. Einstein and optical observations.
- Kassim 1992, *AJ*, 103, 943. VLA at 327 MHz (3'.1×4'.4 : S = 660 Jy).
- Kaspi *et al.* 1993, *ApJ*, 409, L57. Pulsar association.
- Frail *et al.* 1993, *Nature*, 365, 136. VLA at 327 MHz (smoothed to 65''), plus pulsar association.
- Frail *et al.* 1994, *ApJ*, 424, L111. VLA of associated OH masers.
- Esposito *et al.* 1996, *ApJ*, 461, 820. Possible associated γ -ray emission.
- Frail *et al.* 1996, *AJ*, 111, 1651. OH maser emission.
- Biggs & Lyne 1996, *MNRAS*, 282, 691. Pulsar search.
- Claussen *et al.* 1997, *ApJ*, 489, 143. VLA of OH masers.
- Claussen *et al.* 1999, *ApJ*, 522, 349. High resolution observations of OH masers.
- Arikawa *et al.* 1999, *PASJ*, 51, L7. Observations of shocked CO.
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- Neufeld *et al.* 2007, *ApJ*, 664, 890. Spitzer observations.
- Aharonian *et al.* 2008, *A&A*, 481, 401. γ -ray observations.
- Casandjian & Grenier 2008, *A&A*, 489, 849. γ -ray observations.
- Hewitt *et al.* 2008, *ApJ*, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
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- Abdo *et al.* 2010, *ApJ*, 718, 348. Fermi observations.
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- Sawada *et al.* 2012, *PASJ*, 64, 81. Suzaku observations.
- Nichols *et al.* 2012, *MNRAS*, 419, 251. CO observations of selected regions.
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- Vaupréé *et al.* 2014, *A&A*, 568, A50. CO, HCO⁺ and DCO⁺ molecular line observations.
- Pihlström *et al.* 2014, *AJ*, 147, 73. VLA observations of methanol masers.
- Neufeld *et al.* 2014, *ApJ*, 781, 102. Herschel and Spitzer IR spectroscopy.
- Hanabata *et al.* 2014, *ApJ*, 786, 145. γ -ray observations of region.
- Zhou *et al.* 2014, *ApJ*, 791, 87. XMM-Newton observations.
- Gusdorf *et al.* 2014, *IAUS*, 296, 178. CO observations.
- Nakamura *et al.* 2014, *PASJ*, 66, 62. XMM-Newton observations of NE.
- Froeblich *et al.* 2015, *MNRAS*, 454, 2586. H₂ IR observations.
- Maxted *et al.* 2016, *MNRAS*, 462, 532. NH₃ observations of region.
- Acero *et al.* 2016, *ApJS*, 224, 8. γ -ray observations.

G6.4+4.0

RA: 17^h45^m10^s
Dec: –21°22′

1-GHz flux/Jy: 1.3?
Spectral index: 0.4?

Size/arcmin: 31
Type: S

Radio: Faint asymmetric shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Effelsberg 100-m at 2.7 GHz (4.3).
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G6.5–0.4

RA: 18^h02^m11^s
Dec: –23°34′

1-GHz flux/Jy: 27
Spectral index: 0.6

Size/arcmin: 18
Type: S

Has been called G6.51–0.48, and part has been called G6.67–0.42.

Radio: Shell, overlapping G6.4–0.1.

Optical: Detected.

References:

Yusef-Zadeh *et al.* 2000, ApJ, 540, 842. VLA at 330 MHz (2.6×5.5) and 1.4 GHz (0.7×1.1).
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : S = 60.8±0.4 Jy), plus other observations.
 Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observa-

tions.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Ajello *et al.* 2016, ApJ, 819, 44. γ -ray observations.

G7.0–0.1

RA: 18^h01^m50^s
Dec: –22°54′

1-GHz flux/Jy: 2.5?
Spectral index: 0.5?

Size/arcmin: 15
Type: S

Has been called G7.06–0.12.

Radio: Double rim, brightest in W, confused by bright HII region M20 in SE.

References:

Yusef-Zadeh *et al.* 2000, ApJ, 540, 842. VLA at 327 MHz (2.6×5.5) and 1.48 GHz (40″×65″).
 Dubner *et al.* 2000, AJ, 120, 1933. VLA at 328 MHz (97″×52″) and 1415 MHz (88″×48″).

G7.2+0.2

RA: 18^h01^m07^s
Dec: –22°38′

1-GHz flux/Jy: 2.8
Spectral index: 0.6

Size/arcmin: 12
Type: S

Has been called G7.20+0.20.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : S = 5.2±0.2 Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G7.7–3.7

1814–24

RA: 18^h17^m25^s
Dec: –24°04′**1-GHz flux/Jy:** 11
Spectral index: 0.32**Size/arcmin:** 22
Type: S**Radio:** Shell, with high polarisation.**References:**

Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8.4) and 5 GHz (4.4).
 Milne *et al.* 1986, MNRAS, 223, 487. MOST at 843 MHz (44"×108") and Parkes 64-m at 8.4 GHz (3' : S=4.6±0.5 Jy),

with polarisation, plus review of flux densities.
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (70"×35" : S=9.9±0.1 Jy), including polarisation.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G8.3–0.0**RA:** 18^h04^m34^s
Dec: –21°49′**1-GHz flux/Jy:** 1.2
Spectral index: 0.6**Size/arcmin:** 5×4
Type: S

Has been called G8.31–0.09.

Radio: Shell.**References:**

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42" : S=2.3±0.1 Jy), plus other observations.
 Higashi *et al.* 2008, ApJ, 683, 957. γ -ray detection.

Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

G8.7–5.0**RA:** 18^h24^m10^s
Dec: –23°48′**1-GHz flux/Jy:** 4.4
Spectral index: 0.3**Size/arcmin:** 26
Type: S**Radio:** Asymmetric shell.**References:**

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G8.7–0.1

(W30)

RA: 18^h05^m30^s
Dec: –21°26′**1-GHz flux/Jy:** 80
Spectral index: 0.5**Size/arcmin:** 45
Type: S?

Has been called G8.6–0.1.

Radio: Clumpy non-thermal shell, with low-frequency turnover.**X-ray:** Northern edge detected.**Point sources:** Pulsar inside western edge.**References:**

Odegard 1986, AJ, 92, 1372. TPT at 57.5 MHz (7.2×9.7 : S=190±50 Jy).
 Kassim & Weiler 1990, Nature, 343, 146. VLA at 327 MHz (3.0×3.7).
 Kassim & Weiler 1990, ApJ, 360, 184. VLA at 327 MHz (2.8×4.1 : S=129±11 Jy), and part at 1.4 GHz (0.9×1.8), plus review of flux densities.
 Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz (37"×55").
 Finley & Ögelman 1994, ApJ, 434, L25. ROSAT observations, including pulsar.
 Aharonian *et al.* 2005, Science, 307, 1938. γ -ray detection.

Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray observations.
 Landi *et al.* 2006, ApJ, 651, 190. X-ray observations.
 Briskin *et al.* 2006, ApJ, 652, 554. Pulsar proper motion.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser detection.
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.
 Ajello *et al.* 2012, ApJ, 744, 80. Fermi observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G8.9+0.4

RA: 18^h03^m58^s
Dec: –21°03′

1-GHz flux/Jy: 9
Spectral index: 0.6

Size/arcmin: 24
Type: S

Has been called G8.90+0.40.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 18.2 \pm 0.5$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G9.7–0.0

RA: 18^h07^m22^s
Dec: –20°35′

1-GHz flux/Jy: 3.7
Spectral index: 0.6

Size/arcmin: 15×11
Type: S

Has been called G9.7–0.1 and G9.70–0.06.

Radio: Shell.

References:

Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 6.5 \pm 0.2$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser detec-

tion.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Yeung *et al.* 2016, ApJ, 827, 41. γ -ray observations.

G9.8+0.6

RA: 18^h05^m08^s
Dec: –20°14′

1-GHz flux/Jy: 3.9
Spectral index: 0.5

Size/arcmin: 12
Type: S

Radio: Asymmetric shell.

References:

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Caswell 1983, MNRAS, 204, 833. Molonglo at 408 MHz (3′ : $S = 5.8 \pm 0.6$ Jy).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz

(41″×63″ : $S = 3.5 \pm 0.4$ Jy).
 Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G9.9–0.8

RA: 18^h10^m41^s
Dec: –20°43′

1-GHz flux/Jy: 6.7
Spectral index: 0.4

Size/arcmin: 12
Type: S

Has been called G9.95–0.81.

Radio: Shell.

Optical: Detected.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 11.0 \pm 0.3$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

G10.5–0.0

RA: 18^h09^m08^s
Dec: –19°47′

1-GHz flux/Jy: 0.9
Spectral index: 0.6

Size/arcmin: 6
Type: S

Has been called G10.59–0.04.

Radio: Partial shell.

X-ray: Possibly detected.

References:

Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 1.4 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G11.0–0.0

RA: 18^h10^m04^s
Dec: –19°25′

1-GHz flux/Jy: 1.3
Spectral index: 0.6

Size/arcmin: 11×9
Type: S

Has been called G11.0+0.0 and G11.03–0.05.

Radio: Partial shell.

X-ray: Diffuse emission.

References:

Bamba *et al.* 2003, ApJ, 589, 253. ASCA observations.
 Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″), 1.5 GHz (25″), and 74 MHz.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 3.1 \pm 0.2$ Jy), plus other observations.
 Castelletti *et al.* 2016, A&A, 587, A71. VLA at 1.4 GHz (4″4×8″3) and CO observations of region.

G11.1–1.0

RA: 18^h14^m03^s
Dec: –19°46′

1-GHz flux/Jy: 5.8
Spectral index: 0.5

Size/arcmin: 18×12
Type: S

Has been called G11.2–1.1 and G11.17–1.04.

Radio: Shell.

Optical: Detected.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 11.0 \pm 0.3$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 3.40 \pm 0.25$ Jy) including polarisation and review of flux densities.

G11.1–0.7

RA: 18^h12^m46^s
Dec: –19°38′

1-GHz flux/Jy: 1.0
Spectral index: 0.7

Size/arcmin: 11×7
Type: S

Has been called G11.15–0.71.

Radio: Partial shell.

References:

Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″), 1.5 GHz (25″), and 74 MHz.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 2.3 \pm 0.1$ Jy), plus other observations.

G11.1+0.1

RA: 18^h09^m47^s
Dec: –19°12′

1-GHz flux/Jy: 2.3
Spectral index: 0.4

Size/arcmin: 12×10
Type: S

Has been called G11.18+0.11.

Radio: Shell.

References:

Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″),
 1.5 GHz (25″), and 74 MHz.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S =$

3.5 ± 0.2 Jy), plus other observations.
 Castelletti *et al.* 2016, A&A, 587, A71. VLA at 1.4 GHz
 (4″4×8″3) and CO observations of region.

G11.2–0.3

RA: 18^h11^m27^s
Dec: –19°25′

1-GHz flux/Jy: 22
Spectral index: 0.5

Size/arcmin: 4
Type: C

Probably associated with the SN of AD386.

Radio: Symmetrical clumpy shell, with flatter spectrum core.

X-ray: Shell, with hard spectrum centrally brightened region around pulsar.

Point sources: Central pulsar.

Distance: H_I absorption indicates 4.4 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz
 (3′) and Parkes 64-m at 5 GHz (4′).
 Radhakrishnan *et al.* 1972, ApJS, 24, 49. H_I absorption.
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz
 (3′).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at
 4.9 GHz (2.6).
 Downes 1984, MNRAS, 210, 845. VLA at 1465 MHz
 (20″×25″) and Einstein observations, with review of flux den-
 sities.
 Becker *et al.* 1985, ApJ, 296, 461. VLA at 1.4 and 5 GHz, plus
 H_I absorption, Einstein observations.
 Morsi & Reich 1987, A&AS, 71, 189. Effelsberg 100-m at
 32 GHz (26″5 : $S = 4.04 \pm 0.24$ Jy).
 Green *et al.* 1988, MNRAS, 231, 735. VLA at 1.4 and 5 GHz.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′2×4′1 : $S =$
 39 Jy).
 Reynolds *et al.* 1994, MNRAS, 271, L1. ROSAT image and
 spectra.
 Vasisht *et al.* 1996, ApJ, 456, L59. ASCA observations.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-
 tions.
 Torii *et al.* 1997, ApJ, 489, L145. ASCA detection of pulsar.
 Torii *et al.* 1999, ApJ, 523, L69. X-ray timing observations of
 pulsar.
 Kothes & Reich 2001, A&A, 372, 627. Effelsberg 100-m at
 4.25, 10.45, 14.9 and 32 GHz (2′5, 1′1, 0′86 and 0′45 : $S =$
 $9.6 \pm 0.5, 6.3 \pm 0.4, 5.7 \pm 0.4$ and 3.8 ± 0.4).
 Kaspi *et al.* 2001, ApJ, 560, 371. Chandra observations.
 Tam *et al.* 2002, ApJ, 572, 202. VLA at 1.4/1.5 GHz (2″6×1″8 :

$S = 16.6 \pm 0.9$ Jy) and 5 GHz (2″1×1″5 : $S = 8.4 \pm 0.9$ Jy) for
 spectral studies.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 14.7 GHz.
 Roberts *et al.* 2003, ApJ, 588, 992. Chandra observations.
 Tam & Roberts 2003, ApJ, 598, L27. Multi-epoch VLA obser-
 vations at 1.4/1.5 GHz and 5 GHz, for expansion studies.
 Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″),
 1.5 GHz (25″), and 74 MHz.
 Bock & Gaensler 2005, ApJ, 626, 343. BIMA at 88.6 GHz
 (18″).
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Kaplan & Moon 2006, ApJ, 644, 1056. IR upper limit for pul-
 sar.
 Koo *et al.* 2007, ApJ, 657, 308. IR observations.
 Dean *et al.* 2008, MNRAS, 384, L29. INTEGRAL observations
 of pulsar and nebula.
 Moon *et al.* 2009, ApJ, 703, L81. IR spectroscopy.
 Mizuno *et al.* 2010, AJ, 139, 1542. Spitzer observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz
 (9′5 : $S = 9.0 \pm 0.5$ Jy) including polarisation and review of
 flux densities.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Lee *et al.* 2013, ApJ, 770, 143. IR observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including
 broad lines.
 Borkowski *et al.* 2016, ApJ, 819, 160. Chandra observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux den-
 sities (and comparison with X-ray properties).

G11.4–0.1

RA: 18^h10^m47^s
Dec: –19°05′

1-GHz flux/Jy: 6
Spectral index: 0.5

Size/arcmin: 8
Type: S?

Radio: Incomplete shell, possibly with central core.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 9.4$ Jy) contaminated by sidelobes of a nearby source, and Parkes 64-m at 5 GHz (4′ : $S = 2.8$ Jy).
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′8 : $S = 2.0 \pm 0.4$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′2×4′1 : $S = 18$ Jy).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz

(44″×63″ : $S = 5.1 \pm 0.6$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″), 1.5 GHz (25″), and 74 MHz.
 Rangelov *et al.* 2014, ApJ, 796, 34. X-ray upper limit.
 Castelletti *et al.* 2016, A&A, 587, A71. VLA at 1.4 GHz (4″4×8″3) and CO observations of region.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G11.8–0.2

RA: 18^h12^m25^s
Dec: –18°44′

1-GHz flux/Jy: 0.7
Spectral index: 0.3

Size/arcmin: 4
Type: S

Has been called G11.89–0.21.

Radio: Shell.

X-ray: Possibly detected.

References:

Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 0.9 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G12.0–0.1

RA: 18^h12^m11^s
Dec: –18°37′

1-GHz flux/Jy: 3.5
Spectral index: 0.7

Size/arcmin: ??
Type: ?

Radio: Incomplete shell, defined in E only.

X-ray: Detected, including possible PWN.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 6.6$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 1.1$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′2×4′1).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (41″×61″ : $S = 0.7$ Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Yamauchi *et al.* 2014, PASJ, 66, 20. Suzaku observations of possible PWN.

G12.2+0.3

RA: 18^h11^m17^s
Dec: –18°10′

1-GHz flux/Jy: 0.8
Spectral index: 0.7

Size/arcmin: 6×5
Type: S

Has been called G12.26+0.30.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 1.5 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

G12.5+0.2

RA: 18^h12^m14^s
Dec: –17°55′

1-GHz flux/Jy: 0.6
Spectral index: 0.4

Size/arcmin: 6×5
Type: C?

Has been called G12.58+0.22.

Radio: Diffuse, central brightened.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 0.8 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G12.7–0.0

RA: 18^h13^m19^s
Dec: –17°54′

1-GHz flux/Jy: 0.8
Spectral index: 0.8

Size/arcmin: 6
Type: S

Has been called G12.72–0.00.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 2.0 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G12.8–0.0

RA: 18^h13^m37^s
Dec: –17°49′

1-GHz flux/Jy: 0.8
Spectral index: 0.5

Size/arcmin: 3
Type: C?

Has been called G12.82–0.02 and G12.83–0.02.

Radio: Shell.

X-ray: Diffuse.

Point sources: Central X-ray pulsar.

References:

Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Brogan *et al.* 2005, ApJ, 629, L105. VLA at 330 MHz (19″×32″), plus other observations.
 Ubertini *et al.* 2005, ApJ, 629, L109. X-ray, γ -ray and other observations.
 Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray detection.
 Albert *et al.* 2006, ApJ, 637, L41. γ -ray observations.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S =$

1.2±0.1 Jy), plus other observations.
 Landi *et al.* 2006, ApJ, 651, 190. X-ray observations.
 Funk *et al.* 2007, A&A, 470, 249. XMM-Newton observations, CO observations of surroundings.
 Helfand *et al.* 2007, ApJ, 665, 1297. Chandra observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Gotthelf & Halpern 2009, ApJ, 700, L158. Pulsar detection.
 Halpern *et al.* 2012, ApJ, 753, L14. Pulsar observations.

G13.3–1.3

RA: 18^h19^m20^s
Dec: –18°00′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 70×40
Type: S?

Radio: Amorphous emission.

Optical: Filaments in S.

X-ray: Elongated emission.

Distance: Absorption indicates 2–4 kpc.

References:

Seward *et al.* 1995, ApJ, 449, 681. ROSAT detection, optical studies and observations of CO.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

G13.5+0.2

RA: 18^h14^m14^s
Dec: –17°12′

1-GHz flux/Jy: 3.5?
Spectral index: 1.0?

Size/arcmin: 5×4
Type: S

Has been called G13.46+0.16.

Radio: Elongated, incomplete shell.

References:

Helfand *et al.* 1989, ApJ, 341, 151. VLA at 5 GHz ($S = 0.65 \pm 0.05$ Jy) and 1.4 GHz ($15'' : S = 2.67 \pm 0.5$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G14.1–0.1

RA: 18^h16^m40^s
Dec: –16°41′

1-GHz flux/Jy: 0.5
Spectral index: 0.6

Size/arcmin: 6×5
Type: S

Has been called G14.18–0.12.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz ($42'' : S = 0.9 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G14.3+0.1

RA: 18^h15^m58^s
Dec: –16°27′

1-GHz flux/Jy: 0.6
Spectral index: 0.4

Size/arcmin: 5×4
Type: S

Has been called G14.30+0.14. Has been suggested this is not an SNR.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz ($42'' : S = 1.2 \pm 0.1$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Pinheiro Gonçalves *et al.* 2011, AJ, 142, 47. IR observations.

G15.1–1.6

RA: 18^h24^m00^s
Dec: –16°34′

1-GHz flux/Jy: 5.5?
Spectral index: 0.0?

Size/arcmin: 30×24
Type: S?

Radio: Elongated, incomplete shell.

Optical: Diffuse shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
 Boumis *et al.* 2008, A&A, 481, 705. Optical detection.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : $S = 4.8 \pm 0.3$ Jy) including polarisation and review of flux densities.

G15.4+0.1

RA: 18^h18^m02^s
Dec: –15°27′

1-GHz flux/Jy: 5.6
Spectral index: 0.62

Size/arcmin: 15×14
Type: C?

Has been called G15.42+0.18.

Radio: Shell.

X-ray: Centrally brightened.

Distance: HI observations suggest 4.8 kpc.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 10.9 \pm 0.3$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : $S = 2.1 \pm 0.2$ Jy) including polarisation and review of flux densities.

Castelletti *et al.* 2013, A&A, 557, L15. GMRT at 1.4 GHz (15″) plus SGPS HI and CO observations of region.
 Abramowski *et al.* 2014, A&A, 562, A40. γ -ray and XMM-Newton observations.
 Supan *et al.* 2015, A&A, 576, A81. GMRT at 624 MHz (10″).

G15.9+0.2

RA: 18^h18^m52^s
Dec: –15°02′

1-GHz flux/Jy: 5.0
Spectral index: 0.63

Size/arcmin: 7×5
Type: S?

Radio: Incomplete shell, with bright concentration to the E.

X-ray: Shell, brighter to S and E.

Point sources: Central X-ray source.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 7.7$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 1.9$ Jy).
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6.8 : $S = 1.1 \pm 0.2$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).
 Caswell *et al.* 1982, MNRAS, 200, 1143. FIRST at 1415 MHz (58″ × 44″).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (77″ × 61″ : $S = 11.2 \pm 1.0$ Jy), 1.4 GHz (23″ × 14″ : $S =$

3.9 ± 0.1 Jy) and 4.9 GHz (13″ × 16″).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Reynolds *et al.* 2006, ApJ, 652, L45. Chandra observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : $S = 2.0 \pm 0.3$ Jy) including polarisation and review of flux densities.
 Klochov *et al.* 2016, A&A, 592, L12. Chandra observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G16.0–0.5

RA: 18^h21^m56^s
Dec: –15°14′

1-GHz flux/Jy: 2.7
Spectral index: 0.6

Size/arcmin: 15×10
Type: S

Has been called G16.05–0.57.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 4.9 \pm 0.2$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Beaumont *et al.* 2011, ApJ, 741, 14. CO of region.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G16.2–2.7

RA: 18^h29^m40^s
Dec: –16°08′

1-GHz flux/Jy: 2.5
Spectral index: 0.4

Size/arcmin: 17
Type: S

Radio: Double rim.

References:

Trushkin 1999, A&A, 352, L103. Review of radio observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :
 $S = 1.28 \pm 0.10$ Jy) including polarisation and review of flux
 densities.

G16.4–0.5

RA: 18^h22^m38^s
Dec: –14°55′

1-GHz flux/Jy: 4.6
Spectral index: 0.3?

Size/arcmin: 13
Type: S

Has been called G16.41–0.55.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42′ : $S =$
 10.0 ± 0.3 Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz
 (9′5 : $S = 3.0 \pm 0.3$ Jy) including polarisation and review of
 flux densities.

G16.7+0.1

RA: 18^h20^m56^s
Dec: –14°20′

1-GHz flux/Jy: 3.0
Spectral index: 0.6

Size/arcmin: 4
Type: C

Has been called G16.73+0.08.

Radio: Asymmetric shell with flat-spectrum core.

X-ray: Non-thermal core.

References:

Helfand *et al.* 1989, ApJ, 341, 151. VLA at 5 GHz ($S : S =$
 0.95 Jy) and 1.4 GHz ($15'' : S = 2.43$ Jy) and Ooty at 327 MHz
 ($S = 5.13$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations,
 including masers.
 Reynoso & Mangum 2000, ApJ, 545, 874. CO observations of
 surroundings.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observa-
 tions.
 Helfand *et al.* 2003, ApJ, 592, 941. XMM-Newton observa-
 tions.
 Bock & Gaensler 2005, ApJ, 626, 343. BIMA at 88.6 GHz

($19'' \times 25''$).
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for
 OH masers.
 Bhatnagar *et al.* 2011, ApJ, 739, L20. VLA at 6 GHz.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :
 $S = 1.23 \pm 0.11$ Jy) including polarisation and review of flux
 densities.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol
 masers.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including
 broad lines.

G17.0–0.0

RA: 18^h21^m57^s
Dec: –14°08′

1-GHz flux/Jy: 0.5
Spectral index: 0.5

Size/arcmin: 5
Type: S

Has been called G17.02–0.04.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42′ : $S =$
 0.7 ± 0.1 Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G17.4–2.3

RA: 18^h30^m55^s
Dec: –14°52′

1-GHz flux/Jy: 5
Spectral index: 0.5?

Size/arcmin: 24?
Type: S

Radio: Incomplete, poorly defined shell.

Optical: Filaments to SE, and diffuse emission.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Boumis *et al.* 2002, A&A, 385, 1042. Optical observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : S = 2.3±0.2 Jy) including polarisation and review of flux densities.

G17.4–0.1

RA: 18^h23^m08^s
Dec: –13°46′

1-GHz flux/Jy: 0.4
Spectral index: 0.7

Size/arcmin: 6
Type: S

Has been called G17.48–0.12.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42'' : S = 0.9±0.1 Jy), plus other observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G17.8–2.6

RA: 18^h32^m50^s
Dec: –14°39′

1-GHz flux/Jy: 5
Spectral index: 0.5

Size/arcmin: 24
Type: S

Radio: Well defined shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

tions.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : S = 2.23±0.13 Jy) including polarisation and review of flux densities.

G18.1–0.1

RA: 18^h24^m34^s
Dec: –13°11′

1-GHz flux/Jy: 4.6
Spectral index: 0.5

Size/arcmin: 8
Type: S

Has been called G18.1–0.2 and G18.16–0.16.

Radio: Shell.

X-ray: Possibly detected.

Distance: HI absorption suggests 5.6 kpc.

References:

Odegard 1986, AJ, 92, 1372. TPT at 57.5 MHz (8').
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42'' : S = 7.6±0.1 Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

Paron *et al.* 2013, MNRAS, 433, 1619. CO, optical and other observations of region.
 Leahy *et al.* 2014, MNRAS, 438, 1813. VGPS HI observations.
 Froeblich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Voison *et al.* 2016, MNRAS, 458, 2813. Molecular line observations of region.

G18.6–0.2

RA: 18^h25^m55^s
Dec: –12°50′

1-GHz flux/Jy: 1.4
Spectral index: 0.4

Size/arcmin: 6
Type: S

Has been called G18.62–0.28.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 1.9 \pm 0.1$ Jy), plus other observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including

broad lines.
 Voison *et al.* 2016, MNRAS, 458, 2813. Molecular line observations of region.

G18.8+0.3

RA: 18^h23^m58^s
Dec: –12°23′

1-GHz flux/Jy: 33
Spectral index: 0.46

Size/arcmin: 17×11
Type: S
 Kes 67

Has been called G18.9+0.3.

Radio: Incomplete shell, in complex region near the HII region W39.

Distance: Association with molecular cloud and H I absorption suggests 12 kpc.

References:

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ : $S = 17 \pm 7$ Jy).
 Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : $S = 38$ Jy).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H I absorption.
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Milne *et al.* 1989, PASA, 8, 187. Parkes 64-m at 8.4 GHz (3′0 : $S = 12.9 \pm 1.0$ Jy), including polarisation.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (2′9×3′5 : $S = 55$ Jy).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (75″×55″ : $S = 29.9 \pm 0.3$ Jy).

Dubner *et al.* 1999, AJ, 118, 930. Parkes 64-m at 1.6 GHz (15″) for H I, VLA at 1.6 GHz (17″×12″) for OH, plus CO observations.
 Dubner *et al.* 2004, A&A, 426, 201. CO observations of environment.
 Tian *et al.* 2007, A&A, 474, 541. VGPS at 1.4 GHz (1′) including H I, plus CO observations of region.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 15.3 \pm 0.9$ Jy) including polarisation and review of flux densities.
 Vasquez *et al.* 2012, A&A, 545, A89. CO observations of region.
 Paron *et al.* 2012, A&A, 547, A60. CO and other molecular observations of region.
 Paron *et al.* 2015, A&A, 580, A51. CO observations in S.

G18.9–1.1

RA: 18^h29^m50^s
Dec: –12°58′

1-GHz flux/Jy: 37
Spectral index: 0.39

Size/arcmin: 33
Type: C?

Has been called G18.95–1.1 and G18.94–1.04.

Radio: Non-thermal, diffuse partially limb-brightened, with central ridge.

Optical: Detected.

X-ray: Partial shell.

Point sources: Compact X-ray source, with diffuse nebula.

Distance: Various observations suggest 2 kpc.

References:

Fürst *et al.* 1985, Nature, 314, 720. Effelsberg 100-m at 4.75 GHz (2′4 : $S = 23.8$ Jy), plus other flux densities.
 Odegard 1986, AJ, 92, 1372. TPT at 57.5 MHz (7′2×8′ : $S = 82 \pm 15$ Jy), plus review of flux densities.
 Barnes & Turtle 1988, IAUCom, 101, 347. Molonglo at 408 MHz (2′9×3′1 : $S = 58 \pm 9$ Jy) and Parkes 64-m at 5 GHz (4′4×4′1 : $S = 23 \pm 6$ Jy).
 Patnaik *et al.* 1988, Nature, 332, 136. Ooty at 327 MHz (0′6×1′6).
 Fürst *et al.* 1989, A&A, 209, 361. Effelsberg 100-m at 4.75 GHz (2′45 : $S = 23.8$ Jy) and VLA at 1.5 and 4.9 GHz (19″×14″), and Effelsberg 100-m at 1.4 GHz (9′) for H I.
 Aschenbach *et al.* 1991, A&A, 246, L32. ROSAT observations.
 Fürst *et al.* 1997, A&A, 319, 655. ROSAT observations, and

Effelsberg 100-m at 10.6 GHz (1′1).
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 10.6 GHz, including polarisation.
 Harrus *et al.* 2004, ApJ, 603, 152. ROSAT and ASCA observations.
 Tüllmann *et al.* 2010, ApJ, 720, 848. Chandra detection of compact source.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 19.6 \pm 1.0$ Jy) including polarisation and review of flux densities.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G19.1+0.2

RA: 18^h24^m56^s
Dec: –12°07′

1-GHz flux/Jy: 10
Spectral index: 0.5

Size/arcmin: 27
Type: S

Has been called G19.15+0.27.

Radio: Partial shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 17.4 \pm 0.4$ Jy), plus other observations.

G20.0–0.2

RA: 18^h28^m07^s
Dec: –11°35′

1-GHz flux/Jy: 10
Spectral index: 0.1

Size/arcmin: 10
Type: F

Radio: Faint, filled-centre, polarised.

X-ray: Centrally brightened.

Point sources: OH source 20.1–0.1 is nearby.

References:

Becker & Helfand 1985, ApJ, 297, L25. VLA at 1.4 and 5 GHz (12″).
 Odegard 1986, AJ, 92, 1372. TPT at 57.5 MHz (7′.2×8′ : $S = 8.5 \pm 2$ Jy), plus review of flux densities.
 Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4′.3), including polarisation.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 9.2 \pm 0.5$ Jy) including polarisation and review of flux densities.
 Petriella *et al.* 2013, A&A, 554, A73. Chandra observations, plus CO and Hi observations of region.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G20.4+0.1

RA: 18^h27^m51^s
Dec: –11°00′

1-GHz flux/Jy: 9?
Spectral index: 0.1?

Size/arcmin: 8
Type: S?

Has been called G20.47+0.16.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 4.2 \pm 0.1$ Jy), plus other observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 7.5 \pm 0.5$ Jy) including polarisation and review of flux densities.

G21.0–0.4

RA: 18^h31^m12^s
Dec: –10°47′

1-GHz flux/Jy: 1.1
Spectral index: 0.6

Size/arcmin: 9×7
Type: S

Has been called G21.04–0.47.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 2.3 \pm 0.2$ Jy), plus other observations.

G21.5–0.9**RA:** 18^h33^m33^s
Dec: –10°35′**1-GHz flux/Jy:** 7
Spectral index: varies**Size/arcmin:** 5
Type: C

Early observations relate to the central core only.

Radio: Filled-centre, with high frequency turnover.

X-ray: Central core, with extended, faint halo.

Point sources: Central pulsar.

Distance: HI absorption indicates 4.6 kpc.

References:

Wilson & Weiler 1976, A&A, 53, 89. WSRT at 5 GHz (6''×35'').

Becker & Kundu 1976, ApJ, 204, 427. NRAO interferometer at 2.7 GHz (20''×5'') and 8 GHz (7''×2''), plus review of flux densities.

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).

Becker & Szymkowiak 1981, ApJ, 248, L23. VLA at 5 GHz (8''), and Einstein observations.

Davelaar *et al.* 1986, ApJ, 300, L59. EXOSAT X-ray spectrum, and VLA HI observations.

Morsi & Reich 1987, A&AS, 69, 533. Effelsberg 100-m at 32 GHz (26''5 : S=5.64±0.29 Jy).

Fürst *et al.* 1988, PASJ, 40, 347. NRO array at 22.3 GHz (4''4×7''3).

Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4.3), including polarisation.

Salter *et al.* 1989, A&A, 225, 167. Observations at 90.7 (29''5 : S=3.8±0.4 Jy) and 141.9 GHz (S=2.5±1.2 Jy).

Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz (S=3.94±0.70 Jy), plus review of flux densities.

Asaoka & Koyama 1990, PASJ, 42, 625. Ginga X-ray spectrum.

Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3'3×3'4 : S=9 Jy).

Wallace *et al.* 1994, A&A, 286, 565. HI of surroundings.

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Slane *et al.* 2000, ApJ, 533, L29. Chandra observations identifying X-ray halo.

Warwick *et al.* 2001, A&A, 365, L248. XMM-Newton observa-

tions of X-ray halo.

Bock *et al.* 2001, ApJ, 561, L203. BIMA at 94 GHz (8''6×4''6).

Safi-Harb *et al.* 2001, ApJ, 561, 308. Chandra and other X-ray observations.

Reich 2002, in NSPS, p1. Effelsberg 100-m at 22 GHz (8'') and 32 GHz, including polarisation.

La Palombara & Mereghetti 2002, A&A, 383, 916. XMM-Newton upper limit on pulsations.

Bocchino *et al.* 2005, A&A, 442, 539. XMM-Newton and Chandra observations.

Gupta *et al.* 2005, CSci, 89, 853. Pulsar discovery.

Camilo *et al.* 2006, ApJ, 637, 456. Pulsar discovery.

Bietenholz & Bartel 2008, MNRAS, 386, 1411. VLA at 4.75 GHz (0''53×0''82) for expansion studies.

Tian & Leahy 2008, MNRAS, 391, L54. VGPS at 1.4 GHz (1') including HI.

Matheson & Safi-Harb 2010, ApJ, 724, 572. Chandra observations.

Bietenholz *et al.* 2011, MNRAS, 412, 1221. VLA at 1.4 GHz (14''×18'').

Bhatnagar *et al.* 2011, ApJ, 739, L20. VLA at 6 GHz.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9'5 : S=6.5±0.4 Jy) including polarisation and review of flux densities.

Zajczyk *et al.* 2012, A&A, 542, A12. IR observations, including polarisation.

Nynka *et al.* 2014, ApJ, 789, 72. NuSTAR observations.

Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 70, 100 and 143 GHz.

G21.5–0.1**RA:** 18^h30^m50^s
Dec: –10°09′**1-GHz flux/Jy:** 0.4
Spectral index: 0.5**Size/arcmin:** 5
Type: S

Has been called G21.56–0.10.

Radio: Partial shell.

X-ray: Possibly detected.

References:

Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42'' : S=0.5±0.1 Jy), plus other observations.

G21.6–0.8

RA: 18^h33^m40^s
Dec: –10°25′

1-GHz flux/Jy: 1.4
Spectral index: 0.5?

Size/arcmin: 13
Type: S

Has been called G21.64–0.84.

Radio: Faint, irregular shell.

References:

Bietenholz *et al.* 2011, MNRAS, 412, 1221. VLA at 327 MHz (85′ : $S=2.8$ Jy) and 1.4 GHz (14″ × 18″).
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G21.8–0.6

RA: 18^h32^m45^s
Dec: –10°08′

1-GHz flux/Jy: 65
Spectral index: 0.56

Size/arcmin: 20
Type: S
 Kes 69

Radio: Incomplete shell.

X-ray: Detected.

Distance: Association with CO indicates 5.2 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Wilson 1972, A&A, 19, 354. H₂CO absorption.
 Kundu *et al.* 1974, AJ, 79, 132. NRAO 140-ft at 5 GHz (6′) and 10 GHz (3′).
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft et 2.7 GHz (5′ : $S=42.3\pm 4.6$ Jy).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′.4) and 5 GHz (4′.4).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
 Seward 1990, ApJS, 73, 781. Einstein observations.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.3 × 3′.5 : $S=132$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations, including masers.
 Yusef-Zadeh *et al.* 2003, ApJ, 585, 319. X-ray observations.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Wood *et al.* 2008, AJ, 135, 2358. VLA at 4.8 GHz, including polarisation.
 Tian & Leahy 2008, MNRAS, 391, L54. VGPS at 1.4 GHz (1′) including HI.
 Zhou *et al.* 2009, ApJ, 691, 516. CO and HCO⁺ of region.
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S=24.0\pm 1.3$ Jy) including polarisation and review of flux densities.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G22.7–0.2

RA: 18^h33^m15^s
Dec: –09°13′

1-GHz flux/Jy: 33
Spectral index: 0.6

Size/arcmin: 26
Type: S?

Radio: Non-thermal ring in complex region, overlapping G23.3–0.3.

Point sources: Variable radio source near centre, and γ -ray source near edge.

Distance: association with CO indicates 4.4 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.3 × 3′.4 : $S=82$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Becker *et al.* 2010, AJ, 140, 157. Variable radio source detection.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Su *et al.* 2014, ApJ, 796, 122. CO observations.
 Su *et al.* 2015, ApJ, 811, 134. CO observations of region.
 Abramowski *et al.* 2015, MNRAS, 446, 1163. γ -ray observations.

G23.3–0.3

W41

RA: 18^h34^m45^s
Dec: –08°48′**1-GHz flux/Jy:** 70
Spectral index: 0.5**Size/arcmin:** 27
Type: S**Radio:** Distorted ring, in complex region, overlapping G22.7–0.2.**X-ray:** Possible extended emission, with compact sources.**Point sources:** Pulsar association suggested.**Distance:** HI and CO observations indicate 4.2 kpc.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′3×3′4 : S = 138 Jy).
 Gaensler & Johnston 1995, MNRAS, 275, L73. Possible pulsar association.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Aharonian *et al.* 2005, Science, 307, 1938. γ -ray detection.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray observations.

Albert *et al.* 2006, ApJ, 643, L53. γ -ray observations.
 Landi *et al.* 2006, ApJ, 651, 190. X-ray observations.
 Tian *et al.* 2007, ApJ, 657, L25. VGPS at 1.4 GHz (1′) including HI, plus XMM-Newton observations.
 Leahy & Tian 2008, AJ, 135, 167. VGPS at 1.4 GHz (1′) including HI, plus CO observations.
 Mukherjee *et al.* 2009, ApJ, 691, 1707. XMM-Newton and γ -ray observations.
 Frail *et al.* 2013, ApJ, 773, L19. OH observations.
 Castro *et al.* 2013, ApJ, 774, 36. Fermi observations.
 Abramowski *et al.* 2015, A&A, 574, A27. γ -ray observations.
 Su *et al.* 2015, ApJ, 811, 134. CO observations of region.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G23.6+0.3**RA:** 18^h33^m03^s
Dec: –08°13′**1-GHz flux/Jy:** 8?
Spectral index: 0.3**Size/arcmin:** 10?
Type: ?

Has been suggested this is not an SNR.

Radio: Not well resolved, in complex region.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.
 Pinheiro Gonçalves *et al.* 2011, AJ, 142, 47. IR observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

G24.7–0.6**RA:** 18^h38^m43^s
Dec: –07°32′**1-GHz flux/Jy:** 8
Spectral index: 0.5**Size/arcmin:** 15?
Type: S?**Radio:** Incomplete shell, defined in SW.**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S = 12.3 Jy) and Parkes 64-m at 5 GHz (4′ : S = 3.6 Jy).
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′8 : S = 2.2 ± 0.5 Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at

4.9 GHz (2′6).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (44″ × 56″ : S = 1.9 Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.

G24.7+0.6

RA: 18^h34^m10^s
Dec: –07°05′

1-GHz flux/Jy: 20?
Spectral index: 0.2?

Size/arcmin: 30×15
Type: C?

Radio: Filled-centre, with faint shell, and a compact H_{II} region to the S.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).
 Reich *et al.* 1984, A&A, 133, L4. Effelsberg 100-m at 2.7 GHz (4.3: $S=19\pm 3$ Jy) and 4.75 GHz (2.4: $S=17\pm 4$ Jy) and NRO

45-m at 10.2 GHz (2.7: $S=15\pm 3$ Jy).
 Becker & Helfand 1987, ApJ, 316, 660. VLA at 1.4 GHz (12′), and X-ray upper limit.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G25.1–2.3

RA: 18^h45^m10^s
Dec: –08°00′

1-GHz flux/Jy: 8
Spectral index: 0.5?

Size/arcmin: 80×30?
Type: S

Radio: Incomplete shell, extent not well defined.

References:

Gao *et al.* 2011, A&A, 532, A144. Urumqi 25-m at 5 GHz (9.5: $S=3.7\pm 0.4$ Jy), plus other observations.

G27.4+0.0

RA: 18^h41^m19^s
Dec: –04°56′

1-GHz flux/Jy: 6
Spectral index: 0.68

4C–04.71
Size/arcmin: 4
Type: S

Early references refer to G27.3–0.1 (Kes 73), a supposed larger remnant.

Radio: Incomplete shell.

X-ray: Diffuse emission, with central low period pulsar.

Point sources: Central AXP.

Distance: H_I absorption suggests 7.5 to 9.8 kpc.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′).
 Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′: $S=4.4$ Jy).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8.4′) and 5 GHz (4.4′).
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6.8: $S=2.0\pm 0.5$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).
 Caswell *et al.* 1982, MNRAS, 200, 1143. FIRST at 1415 MHz (60′×45′: $S=3.5$ Jy). Revise $S_{408\text{ MHz}}=10.4$ Jy, and $S_{5\text{ GHz}}=1.9\pm 0.2$ Jy.
 Kriss *et al.* 1985, ApJ, 288, 703. Einstein observations, plus VLA at 1.4 and 5 GHz (12′).
 Sanbonmatsu & Helfand 1992, AJ, 104, 2189. VLA at 1.4 GHz for H_I absorption.
 Helfand *et al.* 1994, ApJ, 434, 627. ROSAT observations, particularly of central source.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations, including nearby masers.
 Vasisht & Gotthelf 1997, ApJ, 486, L129. ASCA detection of

pulsar.
 Gotthelf & Vasisht 1997, ApJ, 486, L133. ASCA observations.
 Gotthelf *et al.* 1999, ApJ, 522, L49. X-ray timing observations of pulsar.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Mereghetti *et al.* 2001, MNRAS, 321, 143. Search for optical/IR counterpart to pulsar.
 Kuiper *et al.* 2004, ApJ, 613, 1173. X-ray observations of pulsar.
 Tian & Leahy 2008, ApJ, 677, 292. VGPS at 1.4 GHz (1′) including H_I.
 Mizuno *et al.* 2010, AJ, 139, 1542. Spitzer observations.
 An *et al.* 2013, ApJ, 779, 163. NuSTAR and γ -ray observations.
 Kumar *et al.* 2014, ApJ, 781, 41. Chandra and XMM-Newton observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G27.8+0.6

RA: 18^h39^m50^s
Dec: –04°24′

1-GHz flux/Jy: 30
Spectral index: varies

Size/arcmin: 50×30
Type: F

Radio: Filled-centre, with spectral turnover.

X-ray: Possible pulsar wind nebula.

References:

Reich *et al.* 1984, A&A, 133, L4. Effelsberg 100-m at 2.7 GHz (4′3″: $S=23\pm 2$ Jy), and 4.75 GHz (2′4″: $S=18\pm 2$ Jy) and NRO 45-m at 10.2 GHz (smoothed to 4′3″: $S=8.5\pm 2$ Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observations.

Misanovic *et al.* 2010, ApJ, 725, 931. XMM-Newton pulsar/wind nebula search.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: $S=21.0\pm 1.1$ Jy) including polarisation and review of flux densities.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G28.6–0.1

RA: 18^h43^m55^s
Dec: –03°53′

1-GHz flux/Jy: 3?
Spectral index: ?

Size/arcmin: 13×9
Type: S

Radio: Poorly defined regions of non-thermal emission.

X-ray: Diffuse shell, with thermal and non-thermal emission.

References:

Helfand *et al.* 1989, ApJ, 341, 151. VLA at 1.4 GHz (15″) and 5 GHz (15″).
 Bamba *et al.* 2001, PASJ, 53, L21. ASCA observations.
 Ueno *et al.* 2003, ApJ, 588, 338. Chandra observations.
 Ebisawa *et al.* 2005, ApJ, 635, 214. Chandra observations.

G28.8+1.5

RA: 18^h39^m00^s
Dec: –02°55′

1-GHz flux/Jy: ?
Spectral index: 0.4?

Size/arcmin: 100?
Type: S?

Radio: Part of rim detected.

X-ray: Diffuse, Centrally brightened.

References:

Schwentker 1994, A&A, 286, L47. ROSAT observations.
 Song *et al.* 2000, PASJ, 52, 181. ASCA observations.
 Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observations.

Misanovic *et al.* 2010, ApJ, 725, 931. XMM-Newton pulsar/wind nebula search.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G29.6+0.1

RA: 18^h44^m52^s
Dec: –02°57′

1-GHz flux/Jy: 1.5?
Spectral index: 0.5?

Size/arcmin: 5
Type: S

Radio: Diffuse shell.

Point sources: AXP associated.

References:

Gaensler *et al.* 1999, ApJ, 526, L37. VLA at 5 GHz (13″) and 8 GHz (8″).
 Vasisht *et al.* 2000, ApJ, 542, L49. X-ray observations of AXP.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

G29.7–0.3

Kes 75

RA: 18^h46^m25^s
Dec: –02°59′**1-GHz flux/Jy:** 10
Spectral index: 0.63**Size/arcmin:** 3
Type: C

Has erroneously been called G29.6+0.1.

Radio: Shell with flatter spectrum emission from centre.**X-ray:** Thermal shell and non-thermal core, and central pulsar.**Point sources:** X-ray pulsar.**Distance:** Association with CO implies 11 kpc.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz (8′4″: $S=5\pm 20\%$ Jy).
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′).
 Becker & Kundu 1976, ApJ, 204, 427. NRAO interferometer at 2.7 GHz (20″×7″) and 8 GHz (25″×8″), plus review of flux densities.
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6″).
 Becker *et al.* 1983, ApJ, 268, L93. VLA at 1.4 GHz (3″), plus Einstein observations.
 Becker & Helfand 1984, ApJ, 283, 154. VLA at 5 GHz (2′6″), plus HI.
 Morsi & Reich 1987, A&AS, 71, 189. Effelsberg 100-m at 32 GHz (26′5″: $S=1.02\pm 0.07$ Jy).
 Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz of core, plus review of flux densities.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′4″×3′7″: $S=27.4$ Jy).
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Blanton & Helfand 1996, ApJ, 470, 961. ASCA observations.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Gotthelf *et al.* 2000, ApJ, 542, L37. X-ray pulsar detection.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observa-

tions.
 Mereghetti *et al.* 2002, ApJ, 574, 873. BeppoSAX observations of pulsar.
 Helfand *et al.* 2003, ApJ, 582, 783. Chandra observations.
 Bock & Gaensler 2005, ApJ, 626, 343. BIMA at 88.6 GHz (10″×13″).
 Morton *et al.* 2007, ApJ, 667, 219. Spitzer and Chandra observations.
 McBride *et al.* 2008, A&A, 477, 249. γ -ray and Chandra observations.
 Leahy & Tian 2008, A&A, 480, L25. VGPS at 1.4 GHz (1′) including HI.
 Kumar & Safi-Harb 2008, ApJ, 678, L43. Chandra observations.
 Ng *et al.* 2008, ApJ, 686, 508. Chandra observations.
 Gavriil *et al.* 2008, Science, 319, 1802. X-ray observations of pulsar.
 Su *et al.* 2009, ApJ, 694, 376. CO observations of region, plus Chandra observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: $S=3.6\pm 0.6$ Jy) including polarisation and review of flux densities.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G30.7–2.0**RA:** 18^h54^m25^s
Dec: –02°54′**1-GHz flux/Jy:** 0.5?
Spectral index: 0.7?**Size/arcmin:** 16
Type: ?**Radio:** Poorly defined.**References:**

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4′3″).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G30.7+1.0**RA:** 18^h44^m00^s
Dec: –01°32′**1-GHz flux/Jy:** 6
Spectral index: 0.4**Size/arcmin:** 24×18
Type: S?**Radio:** Non-thermal, highly polarised part shell?**Point sources:** Compact source near centre.**References:**

Reich *et al.* 1986, A&A, 155, 185. Effelsberg 100-m at 4.75 GHz (2′4″: $S=3.4\pm 0.4$ Jy), plus other flux densities.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′6″×3′9″: $S=8.6$ Jy).

Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: $S=2.93\pm 0.19$ Jy) including polarisation and review of flux densities.

G31.5–0.6

RA: 18^h51^m10^s
Dec: –01°31′

1-GHz flux/Jy: ??
Spectral index: ?

Size/arcmin: 18?
Type: S?

Has been called G31.55–0.65.

Radio: Distorted shell? near HII region.

Optical: Diffuse, incomplete shell.

References:

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2.4), plus other flux densities.
 Mavromatakis *et al.* 2001, A&A, 370, 265. Optical observations.

G31.9+0.0

3C391

RA: 18^h49^m25^s
Dec: –00°55′

1-GHz flux/Jy: 25
Spectral index: varies

Size/arcmin: 7×5
Type: S

Radio: Shell, brightest in NW, with low frequency turnover.

X-ray: Diffuse with central core.

Distance: HI absorption suggests 7.2 kpc.

References:

Radhakrishnan *et al.* 1972, ApJS, 24, 49. HI absorption.
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3').
 Green *et al.* 1975, A&A, 44, 187. Effelsberg 100-m at 15 GHz (58' : $S > 1.6$).
 Becker & Kundu 1976, ApJ, 204, 427. NRAO interferometer at 2.7 GHz (20'×23') and 8 GHz (24'×9'), plus review of flux densities.
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).
 Goss *et al.* 1979, A&A, 78, 75. FIRST at 1.4 GHz (54'×66' : $S = 20 \pm 2$ Jy) and Effelsberg 100-m at 10.7 GHz (77' : $S = 7.5 \pm 0.8$ Jy).
 Wang & Seward 1984, ApJ, 279, 705. Einstein observations.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3.4×3.7 : $S = 44.8$ Jy).
 Reynolds & Moffett 1993, AJ, 105, 2226. VLA at 1.4 GHz (6''), including possible associated CO.
 Moffett & Reynolds 1994, ApJ, 425, 668. VLA at 330 MHz (smoothed to 30' : $S = 38.5 \pm 0.5$ Jy) 1.46 GHz (6.7'') and 4.85 GHz (6.2×6.4), including spectral index and polarisation studies.
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Reach & Rho 1996, A&A, 315, L277. ISO spectroscopy.
 Rho & Petre 1996, ApJ, 467, 698. ROSAT observations.
 Wilner *et al.* 1998, AJ, 115, 247. CO observations of surroundings.
 Reach & Rho 1998, ApJ, 507, L93. ISO observations.
 Reach & Rho 1999, ApJ, 511, 836. CO, HCO⁺ and CS observations of surroundings.
 Reach & Rho 2000, ApJ, 544, 843. ISO observations of interactions with surroundings.
 see also: Reach & Rho 2001, ApJ, 558, 943. Erratum.

Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Chen & Slane 2001, ApJ, 563, 202. ASCA observations.
 Reach *et al.* 2002, ApJ, 564, 302. Observations of shocked molecular species.
 Chen *et al.* 2004, ApJ, 616, 885. Chandra observations.
 Brogan *et al.* 2005, AJ, 130, 148. VLA at 74 MHz, 330 MHz and 1.5 GHz (70').
 Kawasaki *et al.* 2005, ApJ, 631, 935. ASCA observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Neufeld *et al.* 2007, ApJ, 664, 890. Spitzer observations.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.
 Yuan & Neufeld 2011, ApJ, 726, 76. Spitzer observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : $S = 8.9 \pm 0.6$ Jy) including polarisation and review of flux densities.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Neufeld *et al.* 2014, ApJ, 781, 102. Spitzer and Herschel IR spectroscopy.
 Ergin *et al.* 2014, ApJ, 790, 65. γ -ray and Suzaku observations.
 Gusdorf *et al.* 2014, IAUS, 296, 178. CO observations.
 Su *et al.* 2014, IAUS, 296, 372. VGPS for HI absorption.
 Lee *et al.* 2014, MNRAS, 443, 2650. [FeII] IR survey observations.
 Sato *et al.* 2014, PASJ, 66, 124. Suzaku observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G32.0–4.9

RA: 19^h06^m00^s
Dec: –03°00′

1-GHz flux/Jy: 22?
Spectral index: 0.5?

3C396.1
Size/arcmin: 60?
Type: S?

Radio: Possible large shell?

References:

Milne & Hill 1969, AuJPh, 22, 211. Parkes 64-m at 635 MHz (31′ : $S = 25 \pm 30\%$ Jy), 1410 MHz (15′ : $S = 19 \pm 15\%$ Jy) and 2650 MHz (8′.4 : $S = 8.6 \pm 30\%$ Jy). Fluxes if size is 60′, plus review of flux densities.

Caswell 1970, AuJPh, 23, 105. Revision of low frequency flux densities.
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo at 111 MHz ($S = 105 \pm 30$ Jy).

G32.1–0.9

RA: 18^h53^m10^s
Dec: –01°08′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 40?
Type: C?

Radio: Possible faint shell, not well defined.

X-ray: Diffuse, with clumps.

References:

Folgheraiter *et al.* 1997, MNRAS, 292, 365. ROSAT and ASCA observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G32.4+0.1

RA: 18^h50^m05^s
Dec: –00°25′

1-GHz flux/Jy: 0.25?
Spectral index: ?

Size/arcmin: 6
Type: S

Has been called G32.45+0.1.

Radio: Shell.

X-ray: Shell.

Distance: X-ray absorption suggests 17 kpc.

References:

Yamaguchi *et al.* 2004, PASJ, 56, 1059. XMM-Newton and other observations.
 Ueno *et al.* 2005, in XRRC, E4.18. XMM-Newton observations.

Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

G32.8–0.1

Kes 78

RA: 18^h51^m25^s
Dec: –00°08′**1-GHz flux/Jy:** 11?
Spectral index: 0.2?**Size/arcmin:** 17
Type: S?

Part has been called G33.1–0.1.

Radio: Elongated shell?**Optical:** Detected.**X-ray:** Detected.**Distance:** Association with CO indicates 4.8 kpc.**References:**

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft et 2.7 GHz ($S' : S = 7.2 \pm 0.5$ Jy).
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo at 430 MHz ($S = 19.0 \pm 15.5$ Jy).
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz ($3'$).
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz ($3' : S = 12.8$ Jy) and Parkes 64-m at 5 GHz ($4' : S = 7.7$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ($2'6$).
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ($3'6 \times 3'8 : S = 31.3$ Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact OH emission.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Zhou & Chen 2011, ApJ, 743, 4. XMM-Newton observations, plus CO of region.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H $_2$ IR observations.
 Bamba *et al.* 2016, ApJ, 818, 63. Suzaku observations.

G33.2–0.6**RA:** 18^h53^m50^s
Dec: –00°02′**1-GHz flux/Jy:** 3.5
Spectral index: varies**Size/arcmin:** 18
Type: S**Radio:** Incomplete shell.**Optical:** Filaments and diffuse emission.**References:**

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ($2'6$).
 Reich 1982, A&A, 106, 314. Effelsberg 100-m at 2.7 GHz ($4'4 : S = 2.6 \pm 0.3$ Jy) and 4.75 GHz ($2'5 : S = 1.75 \pm 0.2$ Jy).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz ($68'' \times 52'' :$

$S = 2.7 \pm 0.3$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Boumis *et al.* 2009, A&A, 499, 789. Optical observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H $_2$ IR observations.

G33.6+0.1

RA: 18^h52^m48^s
Dec: +00°41′

1-GHz flux/Jy: 20
Spectral index: 0.51

Kes 79, 4C00.70, HC13

Size/arcmin: 10
Type: S

Has been called G33.7+0.0.

Radio: Shell, with bright central region, in complex region.

X-ray: Multiple shells and filaments.

Point sources: Central X-ray pulsar.

Distance: HI absorption gives about 7.8 kpc.

References:

- Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz ($3'$: $S=35.5$ Jy) and Parkes 64-m at 5 GHz ($4'$: $S=7.8$ Jy).
 Caswell *et al.* 1975, A&A, 45, 239. HI absorption.
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S_{430} MHz = 69 ± 33 Jy.
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz ($3'$: $S=6.8 \pm 1.5$ Jy).
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz ($6.8'$: $S=11.4 \pm 1.1$ Jy).
 Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz ($1'$), plus observations of the nearby point source.
 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT HI absorption to nearby point source, possibly extragalactic.
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source, plus Einstein observations.
 Green 1989, MNRAS, 238, 737. OH absorption.
 Frail & Clifton 1989, ApJ, 336, 854. VLA at 1.4 GHz ($1' \times 2.9'$), including HI absorption.
 Velusamy *et al.* 1991, AJ, 102, 676. VLA at 327 MHz ($1'$), 1.5 GHz ($7'' \times 14''$) and 5 GHz ($7''$), including spectral comparison.
 Green & Dewdney 1992, MNRAS, 254, 686. Observations of adjacent molecular material.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ($3.6 \times 3.8'$: $S=34.8$ Jy).
 Seward & Velusamy 1995, ApJ, 439, 715. ROSAT observations.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Tsunemi & Enoguchi 2002, PASJ, 54, 735. ASCA observations.
 Seward *et al.* 2003, ApJ, 584, 414. Chandra observations.
 Stanimirović 2003, ApJ, 592, 953. Arecibo OH absorption.
 Sun *et al.* 2004, ApJ, 605, 742. Chandra observations.
 Gotthelf *et al.* 2005, ApJ, 627, 390. XMM-Newton pulsar detection.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Halpern *et al.* 2007, ApJ, 665, 1304. X-ray pulsar timing observations.
 Giacani *et al.* 2009, A&A, 507, 841. VLA at 74 MHz ($36'' \times 39''$: $S=76 \pm 10$ Jy), 324 MHz ($13''$: $S=39 \pm 8$ Jy) and 1.5 GHz ($17'' \times 19''$: $S=11.5 \pm 1.5$ Jy), plus review of flux densities and XMM-Newton observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9.5'$: $S=9.4 \pm 0.5$ Jy) including polarisation and review of flux densities.
 Auchettl *et al.* 2014, ApJ, 783, 32. γ -ray detection.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Zhou *et al.* 2016, ApJ, 831, 192. CO and other observations.
 Sato *et al.* 2016, PASJ, 68, S8. Suzaku observations.

G34.7–0.4

RA: 18^h56^m00^s
Dec: +01°22′

1-GHz flux/Jy: 240
Spectral index: 0.37

W44, 3C392

Size/arcmin: 35×27
Type: C

Has been called G34.6–0.5.

Radio: Distorted shell, brighter to the E, with pulsar and associated nebula.

Optical: Diffuse emission.

X-ray: Centrally concentrated, thermal spectrum, plus pulsar wind nebula.

Point sources: Pulsar within the boundary of the remnant.

Distance: HI absorption indicates ~ 3 kpc.

References:

Kundu & Velusamy 1972, A&A, 20, 237. NRAO 140-ft at 10.7 GHz ($3' : S = 105 \pm 7$ Jy).
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ($5' : S = 177 \pm 10$ Jy).
 Caswell *et al.* 1975, A&A, 45, 239. HI absorption.
 Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz ($3' : S = 299$ Jy).
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S_{430} MHz = 540 ± 187 Jy.
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8'4) and 5 GHz (4'4).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2'6).
 Smith *et al.* 1985, MNRAS, 217, 99. Einstein observations.
 Wolszczan *et al.* 1991, ApJ, 372, L99. Pulsar detection.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ($3'6 \times 3'8 : S = 469$ Jy).
 Jones *et al.* 1993, MNRAS, 265, 631. VLA at 1.4 GHz (15''), plus X-ray spectra.
 Rho *et al.* 1994, ApJ, 430, 757. Optical and ROSAT observations.
 Koo & Heiles 1995, ApJ, 442, 679. HI of surrounding shell.
 Esposito *et al.* 1996, ApJ, 461, 820. Possible associated γ -ray emission.
 Harrus *et al.* 1996, ApJ, 464, L161. ASCA observations.
 Frail *et al.* 1996, ApJ, 464, L165. VLA at 1.5 and 8.4 GHz ($8''9 \times 7''8$) of pulsar nebula.
 Frail *et al.* 1996, AJ, 111, 1651. OH maser emission.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Reach & Rho 1996, A&A, 315, L277. ISO spectroscopy.
 Harrus *et al.* 1997, ApJ, 488, 781. X-ray observations.
 Claussen *et al.* 1997, ApJ, 489, 143. VLA of associated OH masers.
 Giacani *et al.* 1997, AJ, 113, 1379. VLA at 1.4 GHz (15''), plus optical images.
 Seta *et al.* 1998, ApJ, 505, 286. CO observations of surroundings.
 Cox *et al.* 1999, ApJ, 524, 179. Revision of distance.
 Reach & Rho 2000, ApJ, 544, 843. ISO observations of interactions with surroundings.
 see also: Reach & Rho 2001, ApJ, 558, 943. Erratum.
 Roberts *et al.* 2001, ApJS, 133, 451. ASCA observations.
 Petre *et al.* 2002, ApJ, 579, 404. Chandra observations of pulsar and wind nebula.
 Mavromatakis *et al.* 2003, A&A, 405, 591. Optical observa-

tions.
 Shelton *et al.* 2004, ApJ, 611, 906. Chandra observations of part.
 Reach *et al.* 2005, ApJ, 618, 297. Molecular line and near-IR observations.
 Hoffman *et al.* 2005, ApJ, 627, 803. Observations of OH masers.
 Kawasaki *et al.* 2005, ApJ, 631, 935. ASCA observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Neufeld *et al.* 2007, ApJ, 664, 890. Spitzer observations.
 Castelletti *et al.* 2007, A&A, 471, 537. VLA at 74 MHz ($36'' \times 39'' : S = 634 \pm 70$ Jy) and 324 MHz ($13'' : S = 411 \pm 50$ Jy).
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Abdo *et al.* 2010, Science, 327, 1103. Fermi observations.
 Yuan & Neufeld 2011, ApJ, 726, 76. Spitzer observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'5 : S = 118 \pm 6$ Jy) including polarisation and review of flux densities.
 Giuliani *et al.* 2011, ApJ, 742, L30. γ -ray observations.
 Uchiyama *et al.* 2012, ApJ, 749, L35. Fermi observations.
 Uchida *et al.* 2012, PASJ, 64, 141. Suzaku observations.
 Ackermann *et al.* 2013, Science, 339, 807. Fermi observations.
 Yoshiike *et al.* 2013, ApJ, 768, 179. CO and HI observations of region.
 Sashida *et al.* 2013, ApJ, 774, 10. HCO⁺ and CO observations of region.
 Park *et al.* 2013, ApJ, 777, 14. Arecibo HI observations of region.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Anderl *et al.* 2014, A&A, 569, A81. CO observations of regions in NE.
 Su *et al.* 2014, IAUS, 296, 372. VGPS for HI absorption.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 McEwen *et al.* 2016, ApJ, 826, 189. NH₃ and CH₃OH observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G35.6–0.4

RA: 18^h57^m55^s
Dec: +02°13′

1-GHz flux/Jy: 9
Spectral index: 0.5

Size/arcmin: 15×11
Type: S?

Re-identified as SNR in 2009.

Radio: Diffuse, with some limb brightening.

References:

Green 2009, MNRAS, 399, 177. Identification in the radio as a SNR.
 Paron & Giacani 2010, A&A, 509, L4. CO and IR observations of region.

Zhu *et al.* 2013, ApJ, 775, 95. HI and other observations.
 Paredes *et al.* 2014, A&A, 561, A56. GMRT at 610 MHz (12″2×4″8).

G36.6–0.7

RA: 19^h00^m35^s
Dec: +02°56′

1-GHz flux/Jy: 1.0
Spectral index: 0.7?

Size/arcmin: 25?
Type: S?

Radio: polarised arc, possibly part of a larger shell?

References:

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′4), plus other flux densities.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′4×3′7 : $S = 6.7$ Jy).
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 0.39 \pm 0.04$ Jy) including polarisation and review of flux densities.

G36.6+2.6

RA: 18^h48^m49^s
Dec: +04°26′

1-GHz flux/Jy: 0.7?
Spectral index: 0.5?

Size/arcmin: 17×13?
Type: S

Radio: Poorly resolved shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4′3).

G38.7–1.3

RA: 19^h06^m40^s
Dec: +04°28′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 32×19?
Type: S

G38.7–1.4 refers to the E portion.

Radio: Incomplete shell.

Optical: Arc of filaments, brighter to E.

X-ray: Detected in E.

References:

Schaudel *et al.* 2002, ASPC, 271, 391. ROSAT observations of E.
 Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey observations.

Huang *et al.* 2014, ApJ, 785, 118. XMM-Newton and Chandra observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H $_2$ IR observations.

G39.2–0.3

3C396, HC24, NRAO 593

RA: 19^h04^m08^s
Dec: +05°28′**1-GHz flux/Jy:** 18
Spectral index: 0.34**Size/arcmin:** 8×6
Type: C**Radio:** Shell, brighter to W, with faint ‘tail’ to E.**X-ray:** Diffuse, brighter to W, with central core.**Point sources:** Central X-ray source.**Distance:** H I absorption suggests > 7.7 kpc.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′).
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\text{ MHz}} = 54 \pm 38$ Jy.
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′ : $S = 4.1 \pm 1.0$ Jy).
 Caswell *et al.* 1975, A&A, 45, 239. H I absorption.
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Caswell *et al.* 1982, MNRAS, 200, 1143. FIRST at 1.4 GHz (65″ × 48″).
 Becker & Helfand 1987, AJ, 94, 1629. VLA at 1.4 GHz (12″ : $S = 14$ Jy) and 5 GHz, plus Einstein observations.
 Patnaik *et al.* 1990, A&A, 232, 467. VLA at 1.5 GHz (25″) and 1.4 GHz (7″8 × 7″5) and 5 GHz (25″) including polarisation, plus Ooty at 327 MHz (100″ × 31″), including review of flux densities.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′5 × 3′6 : $S = 42.5$ Jy).
 Anderson & Rudnick 1993, ApJ, 408, 514. VLA at 1.45 and 4.89 GHz for spectral index studies.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
 Harrus & Slane 1999, ApJ, 516, 811. ASCA observations.
 Aharonian *et al.* 2001, A&A, 375, 1008. Limit on high energy γ -rays.
 Olbert *et al.* 2003, ApJ, 592, L45. Chandra observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Scaife *et al.* 2007, MNRAS, 377, L69. 33 GHz observations.
 Lee *et al.* 2009, ApJ, 691, 1042. IR observations.
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 8.8 \pm 0.5$ Jy) including polarisation and review of flux densities.
 Su *et al.* 2011, ApJ, 727, 43. Chandra and CO observations of region.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 Cruciani *et al.* 2016, MNRAS, 459, 4224. Parkes 64 m at 8.4, 13.5, 18.6 and 21.5 GHz, plus review of flux densities.

G39.7–2.0

W50, SS433

RA: 19^h12^m20^s
Dec: +04°55′**1-GHz flux/Jy:** 85?
Spectral index: 0.7?**Size/arcmin:** 120×60
Type: ?

Eastern part has been called G40.0–3.1. Is this a SNR?

Radio: Elongated shell, containing SS433, adjacent to the H II region S74.**Optical:** Faint filaments at the edge of the radio emission.**X-ray:** Emission from SS433 and two lobes.**Point sources:** SS433 is the compact source in the centre of the W50.**Distance:** H I absorption indicates 6.0±0.5 kpc.**References:**

van den Bergh 1980, ApJ, 236, L23. Optical in H α and [S II].
 Zealey *et al.* 1980, MNRAS, 192, 731. Optical spectra.
 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT H I absorption to nearby point source (not SS433).
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source.
 Watson *et al.* 1983, ApJ, 273, 688. X-ray observations.
 Downes *et al.* 1986, MNRAS, 218, 393. Effelsberg 100-m at 4.75 GHz (2′4 : $S = 34 \pm 4$ Jy), plus previous 1.7 and 2.7 GHz data.
 Romney *et al.* 1987, ApJ, 321, 822. VLBI of SS433, including distance.
 Elston & Baum 1987, AJ, 94, 1633. Mosaic with VLA at 1.4 GHz (30″) of fine structure only.
 Kawai *et al.* 1989, PASJ, 41, 491. X-ray observations of SS433.
 Band 1989, ApJ, 336, 937. Einstein and EXOSAT observations.
 Yamauchi *et al.* 1994, PASJ, 46, L109. X-ray spectral observations.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.

Brinkmann *et al.* 1996, A&A, 312, 306. ROSAT observations.
 Kotani *et al.* 1996, PASJ, 48, 619. X-ray line emission from SS433.
 Safi-Harb & Ögelman 1997, ApJ, 483, 868. ROSAT observations.
 Dubner *et al.* 1998, AJ, 116, 1842. VLA at 328 MHz (64″ × 60″ : $S = 160 \pm 20$ Jy), and 1.4 GHz (56″ × 54″), plus NRAO 140-ft at 1.4 GHz (21′) for H I observations.
 Safi-Harb & Petre 1999, ApJ, 512, 784. X-ray observations.
 Aharonian *et al.* 2001, A&A, 375, 1008. Limit on high energy γ -rays.
 Brinkmann *et al.* 2007, A&A, 463, 611. XMM-Newton observations of E lobe.
 Boumis *et al.* 2007, MNRAS, 381, 308. Optical observations.
 Lockman *et al.* 2007, MNRAS, 381, 881. H I observations.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : $S = 37 \pm 4$ Jy), including polarisation and review of flux densities.

G40.5–0.5

RA: 19^h07^m10^s
Dec: +06°31′

1-GHz flux/Jy: 11
Spectral index: 0.4

Size/arcmin: 22
Type: S

Radio: Shell, brightest to the NE.

References:

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Downes *et al.* 1980, A&A, 92, 47. Effelsberg 100-m at 1.7 GHz (7.6: $S=9.3\pm 1.3$ Jy), and 2.7 GHz (4′4: $S=7.2\pm 0.5$ Jy), plus review of flux densities.
 Aharonian *et al.* 2001, A&A, 375, 1008. Limit on high energy γ -rays.

Yang *et al.* 2006, ChJAA, 6, 210. CO observations of surroundings.
 Abdo *et al.* 2007, ApJ, 664, L91. γ -ray observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5: $S=6.4\pm 0.3$ Jy) including polarisation and review of flux densities.
 Aliu *et al.* 2014, ApJ, 787, 166. γ -ray observations of region.

G41.1–0.3

RA: 19^h07^m34^s
Dec: +07°08′

1-GHz flux/Jy: 25
Spectral index: 0.50

Size/arcmin: 4.5×2.5
Type: S

3C397

Radio: 3C397 is two sources: the E is the SNR, the W is a HII region.

X-ray: Brighter to the E and W, with central component.

Distance: HI absorption suggest 8 to 10 kpc.

References:

Kundu *et al.* 1974, AJ, 79, 132. NRAO 140-ft at 10 GHz (3′) and 5 GHz (6′).
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′: $S=21.3\pm 1.2$ Jy for both components).
 Caswell *et al.* 1975, A&A, 45, 239. HI absorption.
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\text{ MHz}} = 82\pm 51$ Jy, also Algonquin 46-m at 10.6 GHz (3′: $S=12\pm 2$ Jy), and Haystack 36-m at 15.5 GHz (2′3: $S=8.5\pm 3.0$ Jy).
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′: $S=29.8$ Jy) and Parkes 64-m at 5 GHz (4′: $S=8.7$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Caswell *et al.* 1982, MNRAS, 200, 1143. FIRST at 1.4 GHz (58′×52′).
 Becker *et al.* 1985, ApJ, 296, 461. VLA at 1.4 and 5 GHz (8′′), plus Einstein observations.
 Morsi & Reich 1987, A&AS, 71, 189. Effelsberg 100-m at 32 GHz (smoothed to 30′′: $S=4.10\pm 0.19$ Jy).
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′5×3′6: $S=46.3$ Jy).
 Anderson & Rudnick 1993, ApJ, 408, 514. VLA at 1.45 and 4.89 GHz, for spectral index studies.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Chen *et al.* 1999, ApJ, 520, 737. ASCA and ROSAT observa-

tions.
 Dyer & Reynolds 1999, ApJ, 526, 365. VLA at 1.5 GHz (6′9×6′6) and 4.8 GHz (46′4×5′6), including polarisation and comparison with ROSAT image.
 Safi-Harb *et al.* 2000, ApJ, 545, 922. ROSAT, ASCA and other X-ray observations.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Aharonian *et al.* 2001, A&A, 375, 1008. Limit on high energy γ -rays.
 Safi-Harb *et al.* 2005, ApJ, 618, 321. Chandra observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Jiang *et al.* 2010, ApJ, 712, 1147. CO observations of region.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5: $S=18.5\pm 1.1$ Jy) including polarisation and review of flux densities.
 Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.
 Yamaguchi *et al.* 2015, ApJ, 801, L31. Suzaku observations.
 Clark *et al.* 2015, ApJ, 809, L2. γ -ray observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Leahy & Ranasinghe 2016, ApJ, 817, 74. VGPS for HI absorption.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G41.5+0.4

RA: 19^h05^m50^s
Dec: +07°46′

1-GHz flux/Jy: 1?
Spectral index: ?

Size/arcmin: 10
Type: S?

Radio: Partial clumpy shell, brighter to NE.

References:

Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 332 MHz (20′′: $S=1.8\pm 0.4$ Jy).
 Alves *et al.* 2012, MNRAS, 422, 2429. Radio observations.

G42.0–0.1

RA: 19^h08^m10^s
Dec: +08°00′

1-GHz flux/Jy: 0.5?
Spectral index: ?

Size/arcmin: 8
Type: S?

Radio: Irregular shell.

References:

Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 332 MHz (20′ : $S = 1.8 \pm 0.4$ Jy).
 Alves *et al.* 2012, MNRAS, 422, 2429. Radio observations.

G42.8+0.6

RA: 19^h07^m20^s
Dec: +09°05′

1-GHz flux/Jy: 3?
Spectral index: 0.5?

Size/arcmin: 24
Type: S

Has been called G42.8+0.65.

Radio: Faint shell.

Point sources: Near soft gamma repeater, and young pulsar.

References:

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′4 : $S = 1.5 \pm 0.2$ Jy), plus other flux densities.
 Vasisht *et al.* 1994, ApJ, 431, L35. VLA at 327 MHz (3′2×3′4).
 Hurley *et al.* 1996, ApJ, 463, L13. Observations of soft gamma repeater field.

Lorimer & Xilouris 2000, ApJ, 545, 385. Pulsar detection.
 Aharonian *et al.* 2001, A&A, 375, 1008. Limit on high energy γ -rays.
 Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 333 MHz (50′), and other observations of the region.

G43.3–0.2

RA: 19^h11^m08^s
Dec: +09°06′

1-GHz flux/Jy: 38
Spectral index: 0.46

Size/arcmin: 4×3
Type: S

W49B

Radio: Shell, brightest to the SE and W, near the HII region W49A.

X-ray: Centrally brightened, elongated E–W.

Point sources: Compact X-ray source.

Distance: HI absorption indicates 10 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 2.7 GHz (4′).
 Downes & Wilson 1974, A&A, 34, 133. Effelsberg 100-m at 10.7 GHz (1′3).
 Green *et al.* 1975, A&A, 44, 187. Effelsberg 100-m at 15.0 GHz (58′ : $S = 9.0 \pm 0.7$ Jy).
 Lockhart & Goss 1978, A&A, 67, 355. HI absorption.
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Pye *et al.* 1984, MNRAS, 207, 649. Einstein observations, and VLA at 1.4 and 5 GHz (both 12′).
 Smith *et al.* 1985, ApJ, 296, 469. EXOSAT spectrum.
 Morsi & Reich 1987, A&AS, 71, 189. Effelsberg 100-m at 32 GHz (smoothed to 30′ : $S = 6.90 \pm 0.38$ Jy).
 Moffett & Reynolds 1994, ApJ, 437, 705. VLA at 330 MHz (6′7×7′7 : $S = 64.4$ Jy), 1.48 GHz (4′8×5′2 : $S = 31.8$ Jy) and 4.85 GHz (4′0×4′1), including polarisation.
 Fujimoto *et al.* 1995, PASJ, 47, L31. ASCA observations.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Hwang *et al.* 2000, ApJ, 532, 970. ROSAT image and ASCA spectroscopy.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Aharonian *et al.* 2001, A&A, 375, 1008. Limit on high energy γ -rays.
 Brogan & Troland 2001, ApJ, 550, 799. VLA at 1.4 GHz

(27′×24′ and 5′) for HI Zeeman splitting.
 Lacey *et al.* 2001, ApJ, 559, 954. VLA at 74 MHz (26′×23′ : $S = 55.6$ Jy) and 326 MHz (6′6×6′2 : $S = 56.0$ Jy).
 Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 333 MHz (50′), and other observations of the region.
 Kawasaki *et al.* 2005, ApJ, 631, 935. ASCA observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Miceli *et al.* 2006, A&A, 453, 567. XMM-Newton observations.
 Keohane *et al.* 2007, ApJ, 654, 938. IR and Chandra observations.
 Ozawa *et al.* 2009, ApJ, 706, L71. Suzaku observations.
 Abdo *et al.* 2010, ApJ, 722, 1303. Fermi observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 19.1 \pm 1.0$ Jy) including polarisation and review of flux densities.
 Rodes-Roca 2013, A&A, 555, A115. IR of compact X-ray source.
 Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.
 Lopez *et al.* 2013, ApJ, 777, 145. Chandra spectroscopy.
 Zhu *et al.* 2014, ApJ, 793, 95. Spitzer and other observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G43.9+1.6

RA: 19^h05^m50^s
Dec: +10°30′

1-GHz flux/Jy: 9.0
Spectral index: 0.5

Size/arcmin: 60?
Type: S?

Radio: Large, poorly defined faint shell.

Point sources: Soft gamma repeater nearby.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4′.3).
 Vasisht *et al.* 1994, ApJ, 431, L35. VLA at 327 MHz (3′.2×3′.4).
 Hurley *et al.* 1996, ApJ, 463, L13. Observations of soft gamma

repeater field.
 Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 333 MHz (50″), and other observations of the region.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 4.55 \pm 0.24$ Jy) including polarisation and review of flux densities.

G45.7–0.4

RA: 19^h16^m25^s
Dec: +11°09′

1-GHz flux/Jy: 4.2?
Spectral index: 0.4?

Size/arcmin: 22
Type: S

Radio: Shell, brightest to the SE, poorly defined to NW.

References:

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′.4 : $S = 2.6 \pm 0.3$ Jy), plus other flux densities.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G46.8–0.3

RA: 19^h18^m10^s
Dec: +12°09′

1-GHz flux/Jy: 17
Spectral index: 0.54

(HC30)
Size/arcmin: 17×13
Type: S

Has been called G46.6–0.2.

Radio: Shell, two bright arcs to NNW and SSE.

Distance: HI absorption suggests 6.8–8.8 kpc.

References:

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ : $S = 9.8 \pm 0.9$ Jy), and 37-m at 1.7 GHz ($S = 14.5 \pm 5.5$ Jy).
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S = 20.3$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 7.1$ Jy).
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S_{430} MHz = 46 ± 21 Jy.
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′.8 : $S = 5.9 \pm 0.6$ Jy).

Sato 1979, ApL, 20, 43. HI observations.
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (58″×53″ : $S = 13.3 \pm 0.1$ Jy).
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 7.02 \pm 0.18$ Jy) including polarisation and review of flux densities.

G49.2–0.7

(W51)

RA: 19^h23^m50^s
Dec: +14°06′**1-GHz flux/Jy:** 160?
Spectral index: 0.3?**Size/arcmin:** 30
Type: S?

Has erroneously been called G49.1–0.1.

Radio: In complex region, parameters uncertain.**Optical:** Some diffuse emission possibly associated.**X-ray:** Elongated east–west.**Distance:** Association with CO gives 6 kpc. HI suggest 4.3 kpc.**References:**

- Shaver & Goss 1970, AuJPA, 14, 133. Parkes 64-m at 5 GHz (4').
- Sato 1973, PASJ, 25, 135. HI absorption.
- Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5'), $S = 51.5 \pm 3.2$ Jy, for the non-thermal component, but probably confused.
- Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2'6).
- Seward 1990, ApJS, 73, 781. Einstein observations.
- Copetti & Schmidt 1991, MNRAS, 250, 127. 151 MHz observations.
- Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3'1×3'5).
- Subrahmanyam & Goss 1995, MNRAS, 275, 755. VLA at 330 MHz (1'1).
- Koo *et al.* 1995, ApJ, 447, 211. ROSAT observations.
- Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
- Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
- Green *et al.* 1997, AJ, 114, 2058. OH masers.
- Koo & Moon 1997, ApJ, 475, 194. Arecibo (3') and VLA (40''×42'') at 1.4 GHz for HI.
- Koo & Moon 1997, ApJ, 485, 263. NRAO 12-m CO and HCO⁺ observations.
- Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.
- Mavromatakis *et al.* 2001, A&A, 370, 265. Optical observations.
- Koo *et al.* 2002, AJ, 123, 1629. ASCA observations.
- Koo *et al.* 2005, ApJ, 633, 946. Chandra observations.
- Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
- Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
- Abdo *et al.* 2009, ApJ, 706, L1. Fermi observations.
- Koo *et al.* 2010, AJ, 140, 262. HI Zeeman splitting observations.
- Ceccarelli *et al.* 2011, ApJ, 740, L4. Molecular line observations of region.
- Aleksić *et al.* 2012, A&A, 541, A13. γ -ray observations.
- Hanabata *et al.* 2013, PASJ, 65, 42. Suzaku observations.
- Tian & Leahy 2013, ApJ, 769, L17. HI observations of region.
- Brogan *et al.* 2013, ApJ, 771, 91. VLA at 74 MHz (84''×92'') and 320 MHz (33''×35''), plus OH, molecular line and other observations.
- Park *et al.* 2013, ApJ, 777, 14. Arecibo of HI in region.
- Sasaki *et al.* 2014, A&A, 563, A9. XMM-Newton observations.
- Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
- Dumes *et al.* 2014, ApJ, 786, L24. Molecular line observations.
- Jogler & Funk 2016, ApJ, 816, 100. γ -ray observations.
- McEwen *et al.* 2016, ApJ, 826, 189. NH₃ and CH₃OH observations.
- Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G53.6–2.2

RA: 19^h38^m50^s
Dec: +17°14′

1-GHz flux/Jy: 8
Spectral index: 0.50

3C400.2, NRAO 611

Size/arcmin: 33×28
Type: S

Has been called G53.7–2.2.

Radio: Ring of emission, with extension to NW.

Optical: Filaments and diffuse emission.

X-ray: Centrally brightened, offset to NW.

Distance: Association with H_I gives 2.8 kpc.

References:

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz ($5' : S = 5.3 \pm 0.6$ Jy).
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ($5' : S = 4.8 \pm 0.3$ Jy).
 Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz ($3' : S = 11.7$ Jy).
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S_{430} MHz = 20 ± 10 Jy, S_{318} MHz = 20 ± 3.6 Jy.
 Goss *et al.* 1975, A&A, 43, 459. WSRT at 610 MHz ($1' \times 3' : S = 13.2 \pm 1.6$ Jy).
 Sabbadin & d'Odorico 1976, A&A, 49, 119. Optical spectra.
 van den Bergh 1978, ApJS, 38, 119. Optical observations.
 Rosado 1983, RMxAA, 8, 59. Optical spectra.
 Blair & Long 1988, PASP, 100, 461. Optical imaging and spectroscopy.
see also: Blair & Long 1988, PASP, 100, 651. Erratum.
 Long *et al.* 1991, ApJ, 373, 567. Einstein and optical observa-

tions.
 Winkler *et al.* 1993, ApJ, 405, 608. Optical imaging.
 Dubner *et al.* 1994, AJ, 108, 207. VLA at 327 MHz ($59''$) and 1.49 GHz ($52''$), plus X-rays.
 Saken *et al.* 1995, ApJ, 443, 231. ROSAT observations.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Giacani *et al.* 1998, A&AS, 133, 61. DRAO at 1.4 GHz for H_I studies, including distance.
 Yoshita *et al.* 2001, PASJ, 53, 93. ASCA observations, and spectral comparison with ROSAT.
 Ambrocio-Cruz *et al.* 2006, RMxAA, 42, 241. Optical imaging and spectroscopy.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'5' : S = 4.00 \pm 0.22$ Jy) including polarisation and review of flux densities.
 Broersen & Vink 2015, MNRAS, 446, 3885. Chandra observations.

G54.1+0.3

RA: 19^h30^m31^s
Dec: +18°52′

1-GHz flux/Jy: 0.5
Spectral index: 0.1

Size/arcmin: 12?
Type: C?

Radio: Filled-centre core, with faint diffuse emission.

X-ray: Centrally concentrated, with more extended diffuse emission.

Point sources: Central pulsar.

Distance: H_I absorption suggests 4.5–9 kpc, association with CO suggest 8.2 kpc.

References:

Green 1985, MNRAS, 216, 691. Radio at 2.7 GHz ($7'' \times 20''$).
 Reich *et al.* 1985, A&A, 151, L10. Effelsberg 100-m at 4.75 GHz ($2'4' : S = 0.37 \pm 0.04$ Jy)
 Velusamy & Becker 1988, AJ, 95, 1162. VLA at 1.4 ($14'' : S = 0.48 \pm 0.03$ Jy), 1.6 ($14'' : S = 0.42 \pm 0.03$ Jy) and 5 GHz ($5'' : S = 0.33 \pm 0.02$ Jy), Ooty at 327 MHz ($S = 0.50 \pm 0.08$ Jy), plus review of flux densities.
 Seward 1989, AJ, 97, 481. Einstein observations.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Lu *et al.* 2001, A&A, 370, 570. ROSAT and ASCA observations.
 Lu *et al.* 2002, ApJ, 568, L49. Chandra observations.
 Camilo *et al.* 2002, ApJ, 574, L71. Pulsar detection.

Kaplan & Moon 2006, ApJ, 644, 1056. IR upper limit for pulsar.
 Leahy *et al.* 2008, AJ, 136, 1477. VGPS at 1.4 GHz ($1'$) including H_I.
 Koo *et al.* 2008, ApJ, 673, L147. Akari observations of surroundings.
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
 Bocchino *et al.* 2010, A&A, 520, A71. XMM-Newton and Suzaku observations.
 Lang *et al.* 2010, ApJ, 709, 1125. VLA at 1.4 GHz ($6''6 \times 6''8$), 4.7 GHz ($3''2 \times 3''3$), and 8.2 GHz ($3''0 \times 3''2$) and Spitzer observations.
 Acciari *et al.* 2010, ApJ, 719, L69. γ -ray observations.
 Lee *et al.* 2012, JKAS, 45, 117. CO observations of region.

G54.4–0.3

(HC40)

RA: 19^h33^m20^s
Dec: +18°56′**1-GHz flux/Jy:** 28
Spectral index: 0.5**Size/arcmin:** 40
Type: S

Has been called G54.5–0.3.

Radio: Shell, in complex region.**Optical:** Faint filaments.**References:**

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′: $S=34.4\pm 5.0$ Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
 Caswell 1985, AJ, 90, 1224. DRAO at 1.4 GHz (1′3×2′6: $S=18\pm 4$ Jy).
 Velusamy *et al.* 1986, JApA, 7, 105. WSRT at 609 MHz (50″×191″ smoothed to 100″×200″).

Junkes *et al.* 1992, A&AS, 96, 1. Surrounding CO.
 Junkes *et al.* 1992, A&A, 261, 289. Nearby IRAS sources.
 Boumis *et al.* 2005, A&A, 443, 175. Optical observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Park *et al.* 2013, ApJ, 777, 14. Arecibo of HI in region.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G55.0+0.3**RA:** 19^h32^m00^s
Dec: +19°50′**1-GHz flux/Jy:** 0.5?
Spectral index: 0.5?**Size/arcmin:** 20×15?
Type: S

Has been called G55.2+0.5.

Radio: Faint, partial shell.**Point sources:** Old pulsar nearby.**Distance:** Association with HI features implies 14 kpc.**References:**

Matthews *et al.* 1998, ApJ, 493, 312. WSRT at 327 MHz (1′0×2′9: $S=0.98\pm 0.15$ Jy), DRAO at 1.4 GHz (1′0×2′9: $S=0.25\pm 0.12$ Jy), plus HI observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G55.7+3.4**RA:** 19^h21^m20^s
Dec: +21°44′**1-GHz flux/Jy:** 1?
Spectral index: 0.3?**Size/arcmin:** 23
Type: S**Radio:** Incomplete shell.**Point sources:** Old pulsar within the boundary of the remnant.**References:**

Goss *et al.* 1977, A&A, 61, 93. WSRT observations at 610 MHz (57″×156″: $S=1.9\pm 0.2$ Jy) and 1415 MHz (27″×72″: $S=1.0\pm 0.1$ Jy).
 Bhatnagar *et al.* 2011, ApJ, 739, L20. VLA at 1.3 to 1.9 GHz

(30″).
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5: $S=0.52\pm 0.03$ Jy) including polarisation and review of flux densities.

G57.2+0.8

(4C21.53)

RA: 19^h34^m59^s
Dec: +21°57′**1-GHz flux/Jy:** 1.8
Spectral index: 0.62**Size/arcmin:** 12?
Type: S?**Radio:** Extended non-thermal arc.**Point sources:** Central magnetar.**References:**

Sieber & Seiradakis 1984, A&A, 130, 257. Effelsberg 100-m at 1.4 GHz (8′8: 1.34 ± 0.1), 2.7 GHz (4′3: 0.86 ± 0.1), plus other surveys of the area.
 Caswell *et al.* 1985, AJ, 90, 488. DRAO at 1.4 GHz (1′×3′).
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5:

$S=0.74\pm 0.04$ Jy) including polarisation and review of flux densities.
 Surnis *et al.* 2016, ApJ, 826, 184. GMRT at 610 MHz and VLA at 1.4 GHz.
 Isreal *et al.* 2016, MNRAS, 457, 3448. Chandra, XMM-Newton and Swift observations of magnetar.

G59.5+0.1

RA: 19^h42^m33^s
Dec: +23°35′

1-GHz flux/Jy: 3?
Spectral index: ?

Size/arcmin: 15
Type: S

Has been called G59.6+0.1.

Radio: Incomplete shell.

Optical: Diffuse shell.

References:

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz ($1'.0 \times 2'.5$: $S = 5.1 \pm 0.2$ Jy), and northern sky survey at 4.9 GHz.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Gök *et al.* 2008, Ap&SS, 318, 207. Optical observations.
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
 Xu & Wang 2012, A&A, 543, A24. CO observations of SE.

G59.8+1.2

RA: 19^h38^m55^s
Dec: +24°19′

1-GHz flux/Jy: 1.5
Spectral index: 0.0

Size/arcmin: 20×16?
Type: ?

Has been called G59.7+1.2.

Radio: Poorly defined source.

Optical: Faint diffuse emission and filaments.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4.3), including polarisation.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).

Boumis *et al.* 2005, A&A, 443, 175. Optical observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'.5$: $S = 1.43 \pm 0.08$ Jy) including polarisation and review of flux densities.

G63.7+1.1

RA: 19^h47^m52^s
Dec: +27°45′

1-GHz flux/Jy: 1.8
Spectral index: 0.24

Size/arcmin: 8
Type: F

Radio: Centrally brightened, with core.

X-ray: Diffuse emission.

References:

Wallace *et al.* 1997, AJ, 114, 2068. WSRT at 1.4 GHz ($14'' \times 26''$: $S = 1.63$ Jy), DRAO at 1.4 GHz (smoothed to $2'$), plus review of flux densities and other observations.
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'.5$: $S = 1.12 \pm 0.06$ Jy) including polarisation and review of flux densities.
 Matheson *et al.* 2016, ApJ, 825, 134. XMM-Newton and Chandra observations.

G64.5+0.9

RA: 19^h50^m25^s
Dec: +28°16′

1-GHz flux/Jy: 0.15?
Spectral index: 0.5

Size/arcmin: 8
Type: S?

Radio: Shell with central source.

References:

Hurley-Walker *et al.* 2009, MNRAS, 398, 249. Radio identification.

G65.1+0.6

RA: 19^h54^m40^s
Dec: +28°35′

1-GHz flux/Jy: 5.5
Spectral index: 0.61

Size/arcmin: 90×50
Type: S

Radio: Large, faint shell.

Point sources: Old pulsar nearby.

Distance: Possible association with H_I suggests 9 kpc.

References:

Landecker *et al.* 1990, A&A, 232, 207. DRAO at 408 MHz (3′.5×7′.0 : $S = 9.5 \pm 0.1$ Jy), and 1.4 GHz (1′.0×2′.0 : $S = 5.4 \pm 1.0$ Jy).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Tian & Leahy 2006, A&A, 455, 1053. CGPS at 408 MHz (2′.8×5′.9 : $S = 8.6 \pm 0.8$ Jy) and 1.4 GHz (0′.8×1′.7 : $S = 4.9 \pm 0.5$ Jy) including H_I.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~

3′ : $S = 9.1 \pm 1.0$ Jy) and 1420 MHz (~ 1′ : $S = 3.9 \pm 0.5$ Jy), including review of flux densities.
 Aleksić *et al.* 2010, ApJ, 725, 1629. Fermi observations.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5 : $S = 3.2 \pm 0.3$ Jy), including polarisation and review of flux densities.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G65.3+5.7

RA: 19^h33^m00^s
Dec: +31°10′

1-GHz flux/Jy: 42
Spectral index: 0.6

Size/arcmin: 310×240
Type: S?

Has been called G65.2+5.7.

Radio: Large, faint ring, near S91 and S94.

Optical: Filamentary ring.

X-ray: Diffuse, centrally brightened.

Distance: Optical proper motions and velocities indicates 0.8 kpc.

References:

Gull *et al.* 1977, ApJ, 215, L69. Optical plates.
 Reich *et al.* 1979, A&A, 72, 270. Effelsberg 100-m observations at 1.42 GHz (smoothed to 11′ : $S = 42.4 \pm 1.6$ Jy), estimate $S_{408 \text{ MHz}} = 91 \pm 5$ Jy from previous sky survey.
 Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
 Rosado 1981, ApJ, 250, 222. Optical interferometry.
 Fesen *et al.* 1983, ApJS, 51, 337. Deep [OIII] imagery.
 Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
 Seward 1990, ApJS, 73, 781. Einstein observations.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Mavromatakis *et al.* 2002, A&A, 388, 355. Optical observa-

tions.
 Boumis *et al.* 2004, A&A, 424, 583. Optical observations.
 Shelton *et al.* 2004, ApJ, 615, 275. ROSAT observations.
 Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.
 Xiao *et al.* 2009, A&A, 503, 827. Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 22 \pm 3$ Jy), and Urumqi 21-m at 4.8 GHz (9′.5 : $S = 16.8 \pm 1.8$ Jy) including polarisation and review of flux densities.
 Gosachinskii 2010, AstL, 36, 260. H_I observations.
 Kim *et al.* 2010, ApJ, 722, 388. Far UV observations.

G65.7+1.2

RA: 19^h52^m10^s
Dec: +29°26′

1-GHz flux/Jy: 5.1
Spectral index: varies

DA 495
Size/arcmin: 22
Type: F

Has mistakenly been called G55.7+1.2.

Radio: Centrally brightened with thick shell?

X-ray: Centrally brightened.

Point sources: Compact X-ray source near centre.

Distance: HI polarisation observations suggest 1.5 kpc.

References:

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz ($S' : S = 2.8 \pm 0.4$ Jy), and 37-m at 1.7 GHz ($S = 4.4 \pm 0.5$ Jy), plus review of flux densities.
 see also: Willis 1973, A&A, 27, 483. Erratum.
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\text{ MHz}} = 8.7 \pm 4.9$ Jy, $S_{318\text{ MHz}} = 9.7 \pm 2.2$ Jy.
 Landecker & Caswell 1983, AJ, 88, 1810. DRAO at 1.4 GHz ($0'.9 \times 1'.5 : S = 4.4 \pm 0.2$ Jy).
 Velusamy *et al.* 1989, JApA, 10, 161. Ooty at 327 MHz ($36'' \times 64''$), WSRT at 610 MHz ($62''$) and VLA at 1.4 GHz ($36''$ and $12''$), including IRAS imaging.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Kothes *et al.* 2004, ApJ, 607, 855. HI polarisation absorption.
 Arzoumanian *et al.* 2004, ApJ, 610, L101. ROSAT and ASCA

observations of compact source.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3' : S = 6.5 \pm 0.6$ Jy) and 1420 MHz ($\sim 1' : S = 4.0 \pm 0.2$ Jy), including polarisation and review of flux densities.
 Arzoumanian *et al.* 2008, ApJ, 687, 505. Chandra observations.
 Kothes *et al.* 2008, ApJ, 687, 516. CGPS at 408 MHz ($2'.9 \times 6'.0 : S = 6.5 \pm 0.5$ Jy) and 1.4 GHz ($0'.82 \times 1'.75 : S = 4.0 \pm 0.2$ Jy), Effelsberg 100-m at 4.85 GHz ($2'.45 : S = 1.6 \pm 0.1$ Jy) and 10.55 GHz (smoothed to $2'.45 : S = 1.1 \pm 0.1$ Jy), plus review of flux densities.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'.5 : S = 1.95 \pm 0.10$ Jy) including polarisation and review of flux densities.
 Karpova *et al.* 2015, MNRAS, 453, 2241. Chandra and XMM-Newton observations.

G65.8–0.5

RA: 19^h59^m20^s
Dec: +28°38′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 10×6?
Type: S

Radio: Arc in W.

Optical: Diffuse shell, brighter in W.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey observations.

G66.0–0.0

RA: 19^h57^m50^s
Dec: +29°03′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 31×25?
Type: S

Radio: Some emission in N.

Optical: Incomplete shell.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey observations.

G67.6+0.9

RA: 19^h57^m45^s
Dec: +30°53′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 50×45?
Type: S

Radio: Arc in S.

Optical: Filamentary shell.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey observations.

G67.7+1.8

RA: 19^h54^m32^s
Dec: +31°29′

1-GHz flux/Jy: 1.0
Spectral index: 0.61

Size/arcmin: 15×12
Type: S

Radio: Double arc shell.

Optical: Filaments in N.

X-ray: Detected.

Point sources: Compact X-ray source.

References:

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′.9×1′.0 :
 $S = 1.9 \pm 0.1$ Jy), and northern sky survey at 4.9 GHz ($S =$
 0.42 ± 0.05 Jy).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Mavromatakis *et al.* 2001, A&A, 370, 265. Optical observa-
 tions.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$:
 $S = 1.1 \pm 0.1$ Jy) and 1420 MHz ($\sim 1'$: $S = 0.68 \pm 0.04$ Jy),

including polarisation and review of flux densities.
 Gök *et al.* 2008, Ap&SS, 318, 207. Optical observations.
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observa-
 tions at 14 to 18 GHz.
 Hui & Becker 2009, A&A, 494, 1005. Chandra observations.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 :
 $S = 0.30 \pm 0.03$ Jy) including polarisation and review of flux
 densities.

G67.8+0.5

RA: 20^h00^m00^s
Dec: +30°51′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 7×5
Type: ?

Radio: Poorly resolved arc.

Optical: Diffuse shell, brighter to W.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey ob-
 servations.

G68.6–1.2

RA: 20^h08^m40^s
Dec: +30°37′

1-GHz flux/Jy: 1.1
Spectral index: 0.2

Size/arcmin: 23
Type: ?

Radio: Faint, poorly defined source.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz
 (4′.3), including polarisation.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz
 (4′.3).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 1420 MHz ($\sim 1'$:
 $S = 0.57 \pm 0.08$ Jy), including review of flux densities
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 :
 $S = 0.80 \pm 0.04$ Jy), including polarisation and review of flux
 densities.

G69.0+2.7

CTB 80

RA: 19^h53^m20^s
Dec: +32°55′**1-GHz flux/Jy:** 120?
Spectral index: varies**Size/arcmin:** 80?
Type: ?

An association with a SN in AD1408 has been suggested. Has been called G68.8+2.8.

Radio: Compact core, flat spectrum plateau, and steeper spectrum extensions, with spectral break?

Optical: Expanding nebulosity near centre, with filaments to the SW and far NE.

X-ray: Diffuse emission with compact source.

Point sources: Pulsar at western edge of core.

Distance: HI observations suggest 1.5 kpc.

References:

Angerhofer *et al.* 1981, A&A, 94, 313. WSRT at 610 MHz (56"×103") 1.4 GHz (24"×44") and 5 GHz (7"×13"), plus optical.
Becker *et al.* 1982, ApJ, 255, 557. X-ray observations.
Sofue *et al.* 1983, PASJ, 35, 437. NRO 45-m at 10.2 GHz (2.7).
Velusamy & Kundu 1983, JApA, 4, 253. VLA of compact sources.
Blair *et al.* 1984, ApJ, 282, 161. Optical images and spectra.
Wang & Seward 1984, ApJ, 285, 607. Einstein observations.
Strom *et al.* 1984, A&A, 139, 43. Radio observations of flat spectrum component, VLA 5 GHz (1.7) and 1.4 GHz.
Mantovani *et al.* 1985, A&A, 145, 50. Bologna at 408 MHz (2.6×4.9: S=67.5±10.5 Jy), Effelsberg 100-m at 1.41 (9': S=62±9 Jy), 1.72 (7.6: S=66±5 Jy), 2.7 (4.5: S=52±4 Jy) and 4.75 GHz (2.4: S=44±3.3 Jy), plus review of flux densities.
Kulkarni *et al.* 1988, Nature, 331, 50. Pulsar detection.
Angelini *et al.* 1988, ApJ, 330, L43. EXOSAT spectra.
Fesen *et al.* 1988, Nature, 334, 229. IRAS of surrounding shell.
Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4.3), including polarisation.
Whitehead *et al.* 1989, MNRAS, 237, 1109. Optical of core.
Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz of core, plus review of flux densities.
Hester & Kulkarni 1989, ApJ, 340, 362. Optical imaging and spectroscopy.
Koo *et al.* 1990, ApJ, 364, 178. Large, expanding HI shell.
Greidanus & Strom 1990, A&A, 240, 376. Optical kinematics of core.
Koo *et al.* 1993, ApJ, 417, 196. VLA at 1.4 GHz of surrounding HI (1'), plus IRAS.

Safi-Harb *et al.* 1995, ApJ, 439, 722. ROSAT observations.
Srinivasan 1997, ApJ, 489, 170. γ -ray observations of pulsar.
Mavromatakis *et al.* 2001, A&A, 371, 300. Optical observations.
Butler *et al.* 2002, A&A, 395, 845. HST detection of pulsar.
Migliazzo *et al.* 2002, ApJ, 567, L141. Pulsar proper motion study.
Castelletti *et al.* 2003, AJ, 126, 2114. GMRT at 240 and 618 MHz (26"×17" and 10"×6") and VLA at 324 and 1380 MHz (73"×63" and 93"×78").
Moon *et al.* 2004, ApJ, 610, L33. Chandra and HST observations of core.
Li *et al.* 2005, ApJ, 628, 931. Chandra observations of pulsar and surroundings.
Golden *et al.* 2005, ApJ, 635, L153. High resolution radio observations of pulsar and surroundings.
Koches *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: S=72±7 Jy) and 1420 MHz ($\sim 1'$: S=56±5 Jy), including polarisation and review of flux densities.
Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
Albert *et al.* 2007, ApJ, 669, 1143. γ -ray observations.
Zeiger *et al.* 2008, ApJ, 674, 271. Proper motion of pulsar.
Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9.5: S=36±4 Jy), including polarisation and review of flux densities.
Leahy & Ranasinghe 2012, MNRAS, 423, 718. CGPS at 1.4 GHz, including HI, plus ROSAT observations.
Park *et al.* 2013, ApJ, 777, 14. Arcicibo of HI in region.
Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30 and 44 GHz.

G69.7+1.0**RA:** 20^h02^m40^s
Dec: +32°43′**1-GHz flux/Jy:** 2.0
Spectral index: 0.7**Size/arcmin:** 16×14
Type: S

Radio: Poorly resolved source.

X-ray: Detected.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4.3), including polarisation.
Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4.3).
Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
Yoshita *et al.* 2000, PASJ, 52, 867. ROSAT and ASCA observa-

tions.
Koches *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: S=3.2±0.4 Jy) and 1420 MHz ($\sim 1'$: S=1.5±0.1 Jy), including review of flux densities.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5: S=0.78±0.07 Jy) including polarisation and review of flux densities.

G70.0–21.5

RA: 21^h24^m00^s
Dec: +19°23′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 330×240
Type: S

Optical: Large, faint shell of filaments.

X-ray: Partially detected.

References:

Boumis *et al.* 2002, A&A, 396, 225. Optical and ROSAT observations.
 Fesen *et al.* 2015, ApJ, 812, 37. H α and other optical/UV line and ROSAT observations.

G73.9+0.9

RA: 20^h14^m15^s
Dec: +36°12′

1-GHz flux/Jy: 9
Spectral index: 0.23

Size/arcmin: 27
Type: S?

Radio: Diffuse, centrally brightened to SW.

Optical: Faint shell.

References:

Reich *et al.* 1986, A&A, 155, 185. Effelsberg 100-m at 4.75 GHz (2′4″: $S=6.7\pm 0.5$ Jy), plus other flux densities.
 Chastenay & Pineault 1988, IAUCo, 101, 297. DRAO at 408 MHz (3′5″×5′9″) and 1.4 GHz (1′0″×1′7″).
 Pineault & Chastenay 1990, MNRAS, 246, 169. DRAO at 408 MHz (3′4″×5′8″: $S=12.7\pm 1.2$ Jy) and 1.4 GHz (1′0″×1′7″: $S=7.4\pm 1.0$ Jy).
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Pineault *et al.* 1996, AJ, 112, 201. DRAO at 1.4 GHz (smoothed to 2′) for HI.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Mavromatakis 2003, A&A, 398, 153. Optical observations.

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S=10.0\pm 1.7$ Jy) and 1420 MHz ($\sim 1'$: $S=7.6\pm 0.6$ Jy), including polarisation and review of flux densities.
 Sitnik 2010, ARep, 54, 317. H α and CO observations of region.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: $S=6.2\pm 0.3$ Jy) including polarisation and review of flux densities.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Zdziarski *et al.* 2016, MNRAS, 455, 1451. γ -ray observations.

G74.0–8.5

Cygnus Loop

RA: 20^h51^m00^s**1-GHz flux/Jy:** 210**Size/arcmin:** 230×160**Dec:** +30°40′**Spectral index:** varies**Type:** S

Has been suggested that this is two overlapping remnants.

Radio: Shell, brightest to the NE, with fainter breakout region to S, with spectral variations.

Optical: Large filamentary loop, brightest to the NE, not well defined to the S or W.

X-ray: Shell in soft X-rays.

Point sources: Several compact radio sources within the boundary of the remnant, including CL4, plus X-ray sources in S.

Distance: Optical proper motion and shock velocity gives 0.44 kpc.

References:

- Green 1990, AJ, 100, 1927. DRAO at 408 MHz (3'3×6'7) for spectral index study, plus X-ray and optical.
- Graham *et al.* 1991, AJ, 101, 175. Shocked molecular H outside rim in NE.
- Shull & Clarke 1991, PASP, 103, 811. Optical spectroscopy of nearside filaments.
- Fesen *et al.* 1992, AJ, 104, 719. H α imagery.
- Long *et al.* 1992, ApJ, 400, 214. Optical of Balmer dominated filament.
- Arendt *et al.* 1992, ApJ, 400, 562. IRAS observations.
- Hester *et al.* 1994, ApJ, 420, 721. H α , [OIII] and other optical observations of Balmer dominated filaments in NE.
- Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
- Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
- Levenson *et al.* 1997, ApJ, 484, 304. ROSAT observations.
- Leahy *et al.* 1997, AJ, 114, 2081. DRAO at 1.4 GHz (1'×2'), including polarisation.
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- Levenson *et al.* 1998, ApJS, 118, 541. Optical images.
- Roger *et al.* 1999, A&AS, 137, 7. 22 MHz flux density ($S = 1400 \pm 400$ Jy).
- Bohigas *et al.* 1999, ApJ, 518, 324. Optical spectroscopy of surroundings.
- Levenson *et al.* 1999, ApJ, 526, 874. ROSAT images.
- Blair *et al.* 1999, AJ, 118, 942. HST observations, for distance.
- Aschenbach & Leahy 1999, A&A, 341, 602. ROSAT image, and comparison with radio.
- Danforth *et al.* 2000, AJ, 119, 2319. UV, optical and X-ray comparison of selected regions.
- Ghavamian *et al.* 2001, ApJ, 547, 995. Optical spectroscopy.
- Miyata *et al.* 2001, ApJ, 550, 1023. ASCA observations of compact X-ray sources.
- Miyata & Tsunemi 2001, ApJ, 552, 624. ASCA spectroscopy of regions in N and E.
- Danforth *et al.* 2001, AJ, 122, 938. Far-UV spectroscopy, H α and other optical observations of NE region.
- Levenson & Graham 2001, ApJ, 559, 948. HST of SE region.
- Uyaniker *et al.* 2002, A&A, 389, L61. Effelsberg 100-m at 2.7 GHz (4'3) including polarisation, and comparison with ROSAT data.
- Leahy 2002, AJ, 123, 2689. DRAO at 1.4 GHz (4'×2') for H α .
- Blair *et al.* 2002, ApJS, 140, 367. UV spectroscopy.
- Welsh *et al.* 2002, A&A, 391, 705. Optical absorption to background stars.
- Sankrit & Blair 2002, ApJ, 565, 297. UV observations of NE filament.
- Levenson *et al.* 2002, ApJ, 576, 798. Chandra observations of W edge.
- Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14'5 : $S = 184 \pm 18$ Jy).
- Leahy 2004, MNRAS, 351, 385. Chandra observations of SW.
- Uyaniker *et al.* 2004, A&A, 426, 909. Effelsberg 100-m at 2.7 GHz (4'3), with comparison with other data for spectral index studies.
- Blair *et al.* 2005, AJ, 129, 2268. HST of outer filaments.
- Leahy 2005, AJ, 130, 165. DRAO at 1.4 GHz of SE.
- Levenson & Graham 2005, ApJ, 622, 366. Chandra observations of knot in SE.
- Sun *et al.* 2006, A&A, 447, 937. Urumqi 25-m at 4.8 GHz (9'5 : $S = 90 \pm 9$ Jy), with comparisons with other data for spectral index studies.
- Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.
- Seon *et al.* 2006, ApJ, 644, L175. Far UV observations.
- Sankrit *et al.* 2007, AJ, 133, 1383. UV observations of part.
- Tsunemi *et al.* 2007, ApJ, 671, 1717. XMM-Newton observations of NE to SW.
- Miyata *et al.* 2007, PASJ, 59, S163. Suzaku observations of NE.
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- Uchida *et al.* 2008, ApJ, 688, 1102. XMM-Newton observations.
- Uchida *et al.* 2009, PASJ, 61, 503. Suzaku observations of N.
- Kimura *et al.* 2009, PASJ, 61, S137. Suzaku observations from NE to SW.
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- McEntaffer & Brantseg 2011, ApJ, 730, 99. Chandra observations of E.
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- Sankrit *et al.* 2014, ApJ, 787, 3. Spitzer spectroscopy in SE.
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- Raymond *et al.* 2015, ApJ, 805, 152. HST observations in NE. see also: Raymond *et al.* 2015, ApJ, 814, 165. Erratum.
- Roberts & Wang 2015, MNRAS, 449, 1340. Suzaku observations.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux density 30 GHz.
- Katsuda *et al.* 2016, ApJ, 819, L32. H α spectroscopy of NE.
- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
- Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G74.9+1.2

RA: 20^h16^m02^s
Dec: +37°12′

1-GHz flux/Jy: 9
Spectral index: varies

CTB 87
Size/arcmin: 8×6
Type: F

Radio: Filled-centre, with high polarisation and high frequency turnover.

X-ray: Centrally brightened.

Point sources: Compact X-ray source in SE.

Distance: HI absorption indicates 12 kpc, optical extinction gives 6.1 kpc.

References:

Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\text{ MHz}}$ = 12.2 ± 9.7 Jy, $S_{318\text{ MHz}}$ = 17.7 ± 5.0 Jy.
 Weiler & Shaver 1978, A&A, 70, 389. WSRT at 610 MHz ($57'' \times 94''$: $S = 9.1 \pm 1.2$ Jy), 1.4 ($24'' \times 40''$: $S = 8.7 \pm 1.2$ Jy) and 5 GHz ($24'' \times 40''$: $S = 5.6 \pm 1.3$ Jy).
 Geldzahler *et al.* 1980, A&A, 84, 237. Effelsberg 100-m at 2.7 GHz ($4.4'$: $S = 7.6 \pm 0.5$ Jy).
 Wilson 1980, ApJ, 241, L19. Einstein observations.
 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT HI absorption of nearby compact source.
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source.
 Morsi & Reich 1987, A&AS, 69, 533. Effelsberg 100-m at 32 GHz (smoothed to $40''$: $S = 1.47 \pm 0.19$ Jy).
 Green & Gull 1989, MNRAS, 237, 555. VLA at 1.4 GHz ($1.2' \times 1.4'$) including HI.
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 Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz ($3.5' \times 5.2'$: $S = 13.3 \pm 0.8$ Jy) and Effelsberg 100-m at 4.8 GHz ($S = 7.5 \pm 0.7$ Jy).
 Wallace *et al.* 1994, A&A, 286, 565. HI of surroundings.

Cho *et al.* 1994, AJ, 108, 634. CO of adjacent molecular clouds.
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Wallace *et al.* 1997, A&A, 317, 212. DRAO at 408 MHz ($3.4' \times 5.5'$) and 1.4 GHz ($1.0' \times 1.6'$) including HI (smoothed to $2'$).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Kothes *et al.* 2003, ApJ, 588, 852. CGPS at 1.4 GHz ($1.6' \times 1'$) including HI, plus CO observations.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 11.9 \pm 0.9$ Jy) and 1420 MHz ($\sim 1'$: $S = 7.1 \pm 1.1$ Jy), including polarisation and review of flux densities.
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
 Sitnik 2010, ARep, 54, 317. H α and CO observations of region.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9.5'$: $S = 6.4 \pm 0.4$ Jy) including polarisation and review of flux densities.
 Matheson *et al.* 2013, ApJ, 774, 33. Chandra observations.
 Bassani *et al.* 2014, A&A, 561, A108. X-ray and γ -ray observations.
 Aliu *et al.* 2014, ApJ, 788, 78. γ -ray detection.
 Saha 2016, MNRAS, 460, 3563. γ -ray observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G76.9+1.0

RA: 20^h22^m20^s
Dec: +38°43′

1-GHz flux/Jy: ??
Spectral index: ?

Size/arcmin: 9
Type: C

Radio: Bipolar shell.

Point sources: Central pulsar.

References:

Landecker *et al.* 1993, A&A, 276, 522. VLA at 1.49 GHz ($14''$), 4.86 GHz ($13'' \times 16''$) and 8.55 GHz ($11'' \times 12''$), including polarisation and review of flux densities.
 Landecker *et al.* 1997, A&AS, 123, 199. Miyun at 232-MHz ($3.8' \times 5.4'$).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 2.3 \pm 0.2$ Jy) and 1420 MHz ($\sim 1'$: $S = 1.35 \pm 0.07$ Jy), including polarisation and review of flux densities.
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observa-

tions at 14 to 18 GHz.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9.5'$: $S = 0.79 \pm 0.07$ Jy) including polarisation and review of flux densities.
 Marthi *et al.* 2011, MNRAS, 416, 2560. GMRT at 618 MHz ($51'' \times 54''$), 1160 MHz ($2.2' \times 3.4'$), and Chandra observations of central source.
 Arzoumanian *et al.* 2011, ApJ, 739, 39. Pulsar detection.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G78.2+2.1

RA: 20^h20^m50^s
Dec: +40°26′

1-GHz flux/Jy: 320
Spectral index: 0.51

DR4, γ Cygni SNR

Size/arcmin: 60
Type: S

Has been called G78.1+1.8.

Radio: In complex region (early catalogues refer to other proposed remnants in this region).

Optical: Faint filaments, spectra indicate a SNR superposed on a HII region.

X-ray: Weak emission from the SE of the remnant.

Point sources: X-ray pulsar at edge of remnant, with nebula.

Distance: Associations with other objects suggests 1.7 to 2.6 kpc.

References:

Higgs *et al.* 1977, AJ, 82, 718. DRAO at 1.4 GHz ($2' \times 3'$: $S = 270 \pm 40$ Jy) plus some 10 GHz ($4'$) survey data, reveals true extent of remnant.
 d'Odorico & Sabbadin 1977, A&AS, 28, 439. Optical spectra.
 van den Bergh 1978, ApJS, 38, 119. Optical observations.
 Landecker *et al.* 1980, A&AS, 39, 133. DRAO Hi observations ($2' \times 3'1$).
 Higgs *et al.* 1983, AJ, 88, 97. CO of surroundings.
 Bohigas *et al.* 1983, RMxAA, 8, 155. Optical spectra, find thermal only.
 Braun & Strom 1986, A&AS, 63, 345. WSRT Hi observations.
 Fukui & Tatematsu 1988, IAUCom, 101, 261. CO observations of the vicinity ($2'7$).
 Green 1989, MNRAS, 238, 737. OH observations.
 Pineault & Chastenay 1990, MNRAS, 246, 169. DRAO at 408 MHz ($3'4 \times 5'8$: $S = 480 \pm 60$ Jy) and 1.4 GHz ($1'0 \times 1'7$: $S = 270 \pm 40$ Jy).
 Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz ($3'5 \times 5'2$: $S = 540 \pm 40$ Jy) and Effelsberg 100-m at 4.8 GHz ($S = 150 \pm 15$ Jy).
 Esposito *et al.* 1996, ApJ, 461, 820. Associated γ -ray emission.
 Brazier *et al.* 1996, MNRAS, 281, 1033. γ -ray and X-ray point source.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Zhang *et al.* 1997, A&A, 324, 641. Multi-frequency radio comparison.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Roberts *et al.* 2001, ApJS, 133, 451. ASCA observations.

Uchiyama *et al.* 2002, ApJ, 571, 866. ASCA observations.
 Mavromatakis 2003, A&A, 408, 237. Optical observations.
 Bykov 2004, A&A, 427, L21. Hard X-ray observations.
 Becker *et al.* 2004, ApJ, 615, 897. Chandra and other observations of compact sources.
 Weisskopf *et al.* 2006, ApJ, 652, 387. Chandra and other observations of compact sources.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 500 \pm 35$ Jy) and 1420 MHz ($\sim 1'$: $S = 226 \pm 19$ Jy), including review of flux densities.
 Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity Hi.
 Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observations.
 Ladouceur & Pineault 2008, A&A, 490, 197. CGPS at 408 MHz ($2'9 \times 4'5$) and 1.4 GHz ($0'8 \times 1'5$).
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz ($9'5$: $S = 170 \pm 18$ Jy), including polarisation and review of flux densities.
 Leahy *et al.* 2013, MNRAS, 436, 968. ROSAT and Chandra observations, and CGPS for Hi.
 Aliu *et al.* 2013, ApJ, 770, 93. γ -ray observations.
 Lin *et al.* 2013, ApJ, 770, L9. Pulsar detection.
 Hui *et al.* 2015, ApJ, 799, 76. XMM-Newton and Chandra observations of pulsar, including proper motion.
 Fraija & Araya 2016, ApJ, 826, 31. γ -ray observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G82.2+5.3

RA: 20^h19^m00^s
Dec: +45°30′

1-GHz flux/Jy: 120?
Spectral index: 0.5?

W63

Size/arcmin: 95 \times 65
Type: S

Has been called G82.5+5.3.

Radio: Shell in the Cygnus X complex.

Optical: In complex region, but spectra indicate SNR filaments.

X-ray: Detected.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ($5'$: $S = 59.0 \pm 3.5$ Jy).
 Sabbadin 1976, A&A, 51, 159. Optical spectra.
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz ($6'8$). Incomplete mapping.
 Rosado & González 1981, RMxAA, 5, 93. Optical spectra.
 Seward 1990, ApJS, 73, 781. Einstein observations.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz ($14'5$: $S = 82.5 \pm 5.5$ Jy).

Uyamker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz ($1'$) including polarisation, of part.
 Mavromatakis *et al.* 2004, A&A, 415, 1051. ROSAT, ASCA and optical observations.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 144 \pm 12$ Jy) and 1420 MHz ($\sim 1'$: $S = 93 \pm 5$ Jy), including review of flux densities.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz ($9'5$: $S = 49 \pm 5$ Jy), including polarisation and review of flux densities.

G83.0–0.3

RA: 20^h46^m55^s
Dec: +42°52′

1-GHz flux/Jy: 1
Spectral index: 0.4

Size/arcmin: 9×7
Type: S

Radio: Incomplete shell.

References:

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 1.2 \pm 0.3$ Jy) and 1420 MHz ($\sim 1'$: $S = 0.8 \pm 0.1$ Jy), including polarisation and review of flux densities.

G84.2–0.8

RA: 20^h53^m20^s
Dec: +43°27′

1-GHz flux/Jy: 11
Spectral index: 0.5

Size/arcmin: 20×16
Type: S

Radio: Elongated shell, with a filament aligned with the major axis.

X-ray: Detected.

Distance: H I absorption suggests 6 kpc.

References:

Matthews *et al.* 1977, A&A, 55, 1. WSRT at 610 MHz ($56'' \times 81''$: $S = 12.4 \pm 1.5$ Jy) and Effelsberg 100-m at 2.7 GHz (4.4 : $S = 6.8 \pm 1.3$ Jy).
 Matthews & Shaver 1980, A&A, 87, 255. WSRT at 1415 MHz ($23'' \times 32''$), and Effelsberg 100-m at 2.7 GHz (4.4 : $S = 5.6 \pm 0.5$ Jy).
 Feldt & Green 1993, A&A, 274, 421. DRAO at 1.4 GHz ($1' \times 1.5$), including H I, plus CO observations.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz ($1'$) in-

cluding polarisation.
 Kaplan *et al.* 2004, ApJS, 153, 269. Chandra limits for any compact source.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 14.5 \pm 0.5$ Jy) and 1420 MHz ($\sim 1'$: $S = 7.2 \pm 0.8$ Jy), including review of flux densities.
 Leahy & Green 2012, ApJ, 760, 25. CGPS, including H I, plus Chandra observations.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G85.4+0.7

RA: 20^h50^m40^s
Dec: +45°22′

1-GHz flux/Jy: ?
Spectral index: 0.2

Size/arcmin: 24?
Type: S

Radio: Faint, incomplete shell, within larger thermal shell.

X-ray: Centrally brightened.

Distance: H I observations suggest 3.5 kpc.

References:

Kothes *et al.* 2001, A&A, 376, 641. CGPS at 408 MHz (4.4×2.8 : $S < 0.45$ Jy) and 1.4 GHz (1.1×0.8), plus H I, X-ray and optical data.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S = 2.9 \pm 0.5$ Jy) and 1420 MHz ($\sim 1'$: $S = 2.3 \pm 0.2$ Jy),

including review of flux densities.
 Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and H I observations.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G85.9–0.6

RA: 20^h58^m40^s
Dec: +44°53′

1-GHz flux/Jy: ?
Spectral index: 0.2

Size/arcmin: 24
Type: S

Radio: Faint, incomplete shell.

Optical: Diffuse shell.

X-ray: Centrally brightened.

Distance: HI observations suggest 4.8 kpc.

References:

Kothes *et al.* 2001, A&A, 376, 641. CGPS at 408 MHz (4.4×2.8 : $S < 0.9$ Jy) and 1.4 GHz (1.1×0.8), plus HI, X-ray and optical data.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~ 3′ : $S = 3.0 \pm 1.3$ Jy) and 1420 MHz (~ 1′ : $S = 2.2 \pm 0.8$ Jy), including review of flux densities.

Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and HI observations.
 Gök *et al.* 2009, Ap&SS, 324, 17. Optical observations.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G89.0+4.7

HB21

RA: 20^h45^m00^s
Dec: +50°35′

1-GHz flux/Jy: 220
Spectral index: 0.38

Size/arcmin: 120×90
Type: S

Radio: Distorted shell (4C50.52, an extragalactic double, is within the boundary of the remnant).

Optical: Filaments and patches.

X-ray: Centrally brightened.

Distance: Various associations imply 0.8 kpc.

References:

Hirabayashi & Takahashi 1972, PASJ, 24, 231. 30-m dish at 4.2 GHz (11′ : $S = 160 \pm 40$ Jy).
 Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ : $S = 148 \pm 16$ Jy), plus optical filaments.
 Hill 1974, MNRAS, 169, 59. Half-Mile Telescope at 1.4 GHz (3′×3.9′).
 Haslam *et al.* 1975, A&A, 39, 453. Effelsberg 100-m at 2.7 GHz (4.4′).
 Fukui & Tatematsu 1988, IAUCo, 101, 261. CO observations of the vicinity (2.7′).
 Tatematsu *et al.* 1990, A&A, 237, 189. DRAO at 408 MHz (3.5×4.5′) and 1.4 GHz (1.0×1.3′), including HI, plus CO observations of adjacent molecular cloud.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Leahy & Aschenbach 1996, A&A, 315, 260. ROSAT observations.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Koo *et al.* 2001, ApJ, 552, 175. NRAO 12-m and other CO observations (27″ and 45″) of eastern part.
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14.5′ : $S = 228 \pm 5$ Jy).
 Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz (1′) including polarisation.
 Byun *et al.* 2006, ApJ, 637, 283. CO observations of surround-

ings.
 Lazendic & Slane 2006, ApJ, 647, 350. X-ray observations.
 Leahy 2006, ApJ, 647, 1125. CGPS at 408 MHz (2.8×3.7′) and 1.4 GHz (0.8×1.1′).
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~ 3′ : $S = 259 \pm 19$ Jy) and 1420 MHz (~ 1′ : $S = 183 \pm 9$ Jy), including polarisation and review of flux densities.
 Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
 Mavromatakis *et al.* 2007, A&A, 461, 991. Optical observations.
 Shinn *et al.* 2009, ApJ, 693, 1883. IR observations.
 Pannuti *et al.* 2010, AJ, 140, 1787. ASCA and observations.
 Shinn *et al.* 2010, AdSpR, 45, 445. IR observations in S.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9.5′ : $S = 107 \pm 11$ Jy), including polarisation and review of flux densities.
 Reichardt *et al.* 2012, A&A, 546, A21. γ -ray detection.
 Shinn *et al.* 2012, ApJ, 759, 34. Akari observations of H₂.
 Pivato *et al.* 2013, ApJ, 779, 179. Fermi observations.
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30 and 44 GHz.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G93.3+6.9

RA: 20^h52^m25^s
Dec: +55°21′

1-GHz flux/Jy: 9
Spectral index: 0.45

DA 530, 4C(T)55.38.1

Size/arcmin: 27×20
Type: C?

Has been called G93.2+6.7.

Radio: Shell, with two bright limbs, highly polarised.

X-ray: Compact central source.

Distance: HI observations suggest 2.2 kpc.

References:

Roger & Costain 1976, A&A, 51, 151. DRAO at 1.42 GHz (2′×2′.4: $S=6.9$ Jy).
 Haslam *et al.* 1980, A&A, 92, 57. Effelsberg 100-m at 1.72 GHz (7′.6: $S=6.47\pm0.52$ Jy) and 2.7 GHz (4′.4: $S=5.64\pm0.64$ Jy), plus review of flux densities.
 Lalitha *et al.* 1984, A&A, 131, 196. Effelsberg 100-m at 4.75 GHz (smoothed to 3′: $S=4.01\pm0.57$ Jy).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Landecker *et al.* 1999, ApJ, 527, 866. DRAO at 408 MHz (3′.5×4′.3) and 1.4 GHz (1′.0×1′.2), including polarisation and HI.

Foster & Routledge 2003, ApJ, 598, 1005. HI for distance.
 Kaplan *et al.* 2004, ApJS, 153, 269. Chandra limits for any compact source.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′$: $S=10.5\pm0.7$ Jy) and 1420 MHz, including review of flux densities.
 Jiang *et al.* 2007, ApJ, 670, 1142. Chandra observations.
 Bocchino *et al.* 2008, AdSpR, 41, 407. XMM-Newton observations.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G93.7–0.2

RA: 21^h29^m20^s
Dec: +50°50′

1-GHz flux/Jy: 65
Spectral index: 0.65

CTB 104A, DA 551

Size/arcmin: 80
Type: S

Has been called G93.6–0.2 and G93.7–0.3.

Radio: Distorted, faint shell.

Distance: Association with HI features suggests 1.5 kpc.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′: $S=18.4\pm1.0$ Jy).
 Mantovani *et al.* 1982, A&A, 105, 176. Effelsberg 100-m at 1.7 GHz (7′.6: $S=53.5\pm5.0$ Jy), plus review of flux densities.
 Landecker *et al.* 1985, AJ, 90, 1082. DRAO at 1.4 GHz (smoothed to 2′: $S=58\pm6$ Jy).
 Mantovani *et al.* 1991, A&A, 247, 545. Effelsberg 100-m at 4.75 GHz (smoothed to 3′: $S=33.5\pm4.0$ Jy), including polarisation, plus review of flux densities.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emis-

sion.
 Uyaniker *et al.* 2002, ApJ, 565, 1022. CGPS 1.4 GHz (54″×49″), including HI, and 408 MHz (3′.7×2′.8).
 Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz (1′) including polarisation.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′$: $S=67\pm6$ Jy) and 1420 MHz ($\sim 1′$: $S=35\pm4$ Jy), including polarisation and review of flux densities.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5: $S=25.0\pm2.5$ Jy), including polarisation and review of flux densities.

G94.0+1.0

3C434.1

RA: 21^h24^m50^s
Dec: +51°53′**1-GHz flux/Jy:** 13
Spectral index: 0.45**Size/arcmin:** 30×25
Type: S**Radio:** Incomplete shell, containing H_I shell.**Distance:** Association with stellar wind bubble implies 5.2 kpc.**References:**

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz ($5' : S = 6.1 \pm 0.8$ Jy), and 37-m at 1.7 GHz ($S = 11 \pm 3$ Jy).
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ($5' : S = 5.8 \pm 0.4$ Jy). Also NRAO 140-ft at 5 GHz (6').
 Mantovani *et al.* 1982, A&A, 105, 176. Effelsberg 100-m at 1.7 GHz ($7'6'' : S = 12.0 \pm 1.3$ Jy), plus review of flux densities.
 Goss *et al.* 1984, A&A, 138, 469. WSRT at 610 MHz (smoothed to $100'' : S = 16 \pm 1.7$ Jy) and Effelsberg 100-m at 4.75 GHz ($2'4'' : S = 7.2 \pm 0.5$ Jy).
 Landecker *et al.* 1985, AJ, 90, 1082. DRAO at 1.4 GHz (smoothed to $2' : S = 16 \pm 3$ Jy).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz ($1'$) including polarisation.

Foster *et al.* 2004, A&A, 417, 79. DRAO at 1.4 GHz, including H_I.
 Foster 2005, A&A, 441, 1043. CGPS at 408 MHz ($2'8 \times 3'6$) and 1.4 GHz ($0'8 \times 1'0$) for spectral index studies, plus other observations.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3' : S = 20 \pm 2$ Jy) and 1420 MHz ($\sim 1' : S = 11.3 \pm 1.0$ Jy), including review of flux densities.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'5'' : S = 6.2 \pm 0.4$ Jy) including polarisation and review of flux densities.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
 Jeong *et al.* 2013, ApJ, 770, 105. CO observations of region.

G96.0+2.0**RA:** 21^h30^m30^s
Dec: +53°59′**1-GHz flux/Jy:** 0.35
Spectral index: 0.6**Size/arcmin:** 26
Type: S**Radio:** Faint, arc in S, poorly defined in N.**Distance:** Association for H_I indicates 4 kpc.**References:**

Kothes *et al.* 2005, A&A, 444, 871. CGPS at 408 MHz ($2'8 \times 3'5$) and 1.4 GHz ($50'' \times 61''$) including H_I.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3' : S = 0.42 \pm 0.06$ Jy) and 1420 MHz ($\sim 1' : S = 0.24 \pm 0.02$ Jy),

including review of flux densities.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'5'' : S = 0.14 \pm 0.02$ Jy) including polarisation and review of flux densities.

G106.3+2.7**RA:** 22^h27^m30^s
Dec: +60°50′**1-GHz flux/Jy:** 6
Spectral index: 0.6**Size/arcmin:** 60×24
Type: C?

Incorporates the pulsar wind nebula G106.6+2.9 (the ‘Boomerang’).

Radio: Faint extended source, which brighter ‘head’ to NE.**X-ray:** Pulsar and wind nebula.**Point sources:** Pulsar.**References:**

Pineault & Joncas 2000, AJ, 120, 3218. DRAO at 408 MHz ($3'9 \times 3'5 : S = 10.5 \pm 0.3$ Jy) and 1.4 GHz ($1'2 \times 1'0 : S = 4.9 \pm 0.6$ Jy), plus H_I.
 Halpern *et al.* 2001, ApJ, 547, 323. X-ray and radio observations of the ‘head’.
 Halpern *et al.* 2001, ApJ, 552, L125. Pulsar detection.
 Kothes *et al.* 2001, ApJ, 560, 236. CGPS at 1.4 GHz, including H_I, plus CO and other observations.
 Ng & Romani 2004, ApJ, 601, 479. Chandra detection of pulsar wind nebula.
 Kothes *et al.* 2004, ApJ, 607, 855. H_I polarisation absorption.
 Kothes *et al.* 2006, ApJ, 638, 225. Effelsberg 100-m at 4.85

($2'4$), 8.35 ($1'4$), 10.5 ($1'2$) and 32 GHz ($0'45$) of pulsar wind nebula, including polarisation.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3' : S = 8.6 \pm 1.0$ Jy) and 1420 MHz ($\sim 1' : S = 4.8 \pm 0.5$ Jy), including polarisation and review of flux densities.
 Abdo *et al.* 2007, ApJ, 664, L91. γ -ray observations.
 Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observations.
 Acciari *et al.* 2009, ApJ, 703, L6. γ -ray observations.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz ($9'5'' : S = 2.0 \pm 0.3$ Jy), including polarisation and review of flux densities.

G108.2–0.6

RA: 22^h53^m40^s
Dec: +58°50′

1-GHz flux/Jy: 8
Spectral index: 0.5

Size/arcmin: 70×54
Type: S

Radio: Faint shell.

Distance: Possible associated H_I structures suggest 3.2 kpc.

References:

Tian *et al.* 2007, A&A, 465, 907. DRAO at 408 MHz (2′8×3′3 :
 $S = 11.5 \pm 1.2$ Jy) and 1.4 GHz (1′0×1′2 : $S = 6.6 \pm 0.7$ Jy)
 including H_I.

G109.1–1.0

RA: 23^h01^m35^s
Dec: +58°53′

1-GHz flux/Jy: 22
Spectral index: 0.45

CTB 109
Size/arcmin: 28
Type: S

Radio: Semicircular shell, with the Molecular cloud S152 is to the immediate W.

Optical: Faint optical filaments.

X-ray: Semicircular shell, with pulsar at W edge.

Point sources: Long period X-ray pulsar (magnetar).

Distance: Various observations imply 3.2 kpc.

References:

Hughes *et al.* 1981, ApJ, 246, L127. WSRT at 610 MHz (1′ : $S = 40 \pm 5$ Jy) shows bad CLEAN artefacts.
 Blair & Kirshner 1981, Nature, 291, 132. Optical spectra.
 Downes 1983, MNRAS, 203, 695. Effelsberg 100-m at 2.7 GHz (4′4 : $S = 13.0 \pm 1.5$ Jy).
 Sofue *et al.* 1983, PASJ, 35, 447. NRO 45-m at 10.2 GHz (2′7).
 Hughes *et al.* 1984, ApJ, 283, 147. WSRT at 610 MHz (20′′ : $S = 26 \pm 3$ Jy) 1.4 GHz (10′′), DRAO at 1.4 GHz (1′×1′2 : $S = 16.8 \pm 2$ Jy) and Algonquin 46-m at 6.5 GHz (4′5 : $S = 6.7 \pm 1$ Jy).
 Braun & Strom 1986, A&AS, 63, 345. WSRT H_I observations.
 Tatematsu *et al.* 1987, PASJ, 39, 755. NRO 45-m at 10 GHz (2′7), plus polarisation.
 Tatematsu *et al.* 1987, A&A, 184, 279. CO observations of the surroundings (2′7).
 Hanson *et al.* 1988, A&A, 195, 114. EXOSAT of pulsar. see also: Hanson *et al.* 1988, A&A, 207, 204. Erratum.
 Morini *et al.* 1988, ApJ, 333, 777. EXOSAT observations.
 Koyama *et al.* 1989, PASJ, 41, 461. X-ray observations of pulsar.
 Coe *et al.* 1989, MNRAS, 238, 649. IRAS observations of surroundings.
 Green 1989, MNRAS, 238, 737. OH observations.
 Tatematsu *et al.* 1990, ApJ, 351, 157. CO of surroundings, plus X-ray observations.
 Davies & Coe 1991, MNRAS, 249, 313. Optical and IR observations near pulsar.
 Hurford & Fesen 1995, MNRAS, 277, 549. ROSAT imaging.
 Rho & Petre 1997, ApJ, 484, 828. ROSAT observations.

Parmar *et al.* 1998, A&A, 330, 175. X-ray observations.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
 Patel *et al.* 2001, ApJ, 563, L45. Chandra observations of pulsar.
 Kothes *et al.* 2002, ApJ, 576, 169. CGPS at 1.4 GHz (68′′×59′′), including H_I, plus CO observations.
 Sasaki *et al.* 2004, ApJ, 617, 322. XMM-Newton observations.
 Sasaki *et al.* 2006, ApJ, 642, L149. CO observations of surroundings, plus Chandra observations.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′$: $S = 26 \pm 3$ Jy) and 1420 MHz ($\sim 1′$: $S = 17.4 \pm 1.2$ Jy), including polarisation and review of flux densities.
 Tian *et al.* 2010, MNRAS, 404, L1. CGPS for H_I absorption.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : $S = 9.8 \pm 0.5$ Jy) including polarisation and review of flux densities.
 Kothes & Foster 2012, ApJ, 746, L4. H_I and CO observations of region.
 Castro *et al.* 2012, ApJ, 756, 88. Fermi observations.
 Sasaki *et al.* 2013, A&A, 552, A45. Chandra observations of NE.
 Tendulkar *et al.* 2013, ApJ, 772, 31. Pulsar proper motion study.
 Vogel *et al.* 2014, ApJ, 789, 75. NuSTAR observations of pulsar.
 Nakano *et al.* 2015, PASJ, 67, 9. Suzaku observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G111.7–2.1

Cassiopeia A, 3C461

RA: 23^h23^m26^s**1-GHz flux/Jy:** 2400**Size/arcmin:** 5**Dec:** +58°48′**Spectral index:** 0.77**Type:** S

Presumably the remnant of a late 17th century SN.

Radio: Bright shell with compact knots and extended plateau of emission; shows secular decline.

Optical: Fast knots and quasi-stationary flocculi, with many filaments at large radii, and NE ‘jet’.

X-ray: Incomplete shell, with hard spectral component.

Point sources: Central compact X-ray source.

Distance: Optical expansion gives 3.3 kpc.

References:

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- Gothelf *et al.* 2001, ApJ, 552, L39. Chandra observations, showing outer shock.
- Hwang *et al.* 2001, ApJ, 560, L175. Chandra observations of Doppler shifted lines.
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- Reynoso & Goss 2002, ApJ, 575, 871. VLA at 5 GHz (6'' \times 6'' \times 0) for H₂CO absorption studies.
- Morse *et al.* 2004, ApJ, 614, 727. HST proper motion studies.
- Krause *et al.* 2004, Nature, 432, 596. IR and molecular line observations of surroundings.
- Bamba *et al.* 2005, ApJ, 621, 793. Chandra observations of rim.
- Wilson & Batrla 2005, A&A, 430, 561. Observational constraints on dust.
- Krause *et al.* 2005, Science, 308, 1604. Spitzer light echoes from surroundings.
- Fesen *et al.* 2006, ApJ, 636, 848. Optical and IR limits for central sources.
- Laming *et al.* 2006, ApJ, 644, 260. Chandra observations, particularly of NE ‘jet’.
- Fesen *et al.* 2006, ApJ, 645, 283. HST observations for expansion studies.
- Renaud *et al.* 2006, ApJ, 647, L41. γ -ray line observations.
- Lazendic *et al.* 2006, ApJ, 651, 250. Chandra spectroscopy of bright knots.
- Ennis *et al.* 2006, ApJ, 652, 376. Spitzer observations.
- Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity H_I.
- Albert *et al.* 2007, A&A, 474, 937. γ -ray observations.
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- Patnaude & Fesen 2009, ApJ, 697, 535. X-ray proper motions.
- Pavlov & Luna 2009, ApJ, 703, 910. Chandra observations of central source.
- Barlow *et al.* 2010, A&A, 518, L138. Herschel observations.
- Abdo *et al.* 2010, ApJ, 710, L92. Fermi observations.
- Acciari *et al.* 2010, ApJ, 714, 163. γ -ray observations.
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- DeLaney *et al.* 2014, ApJ, 785, 7. VLA plus Pie Town at 74 MHz (9'') and comparison with higher frequencies.
- Arendt *et al.* 2014, ApJ, 786, 55. Spitzer and Herschel IR observations.
- Patnaude & Fesen 2014, ApJ, 789, 138. Multi-epoch optical and X-ray observations.
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- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 7 frequencies between 30 and 353 GHz.
- Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
- Fesen & Milisavljevic 2016, ApJ, 818, 17. HST [SIII] and [SII] observations.
- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
- Wang & Li 2016, ApJ, 825, 102. INTEGRAL observations.
- Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G113.0+0.2

RA: 23^h26^m50^s
Dec: +61°26′

1-GHz flux/Jy: 4
Spectral index: 0.5?

Size/arcmin: 40×17?
Type: ?

Radio: Elongated, extent not well defined.

Point sources: Contains old pulsar.

Distance: Association for H_I indicates 3.1 kpc.

References:

Kothes *et al.* 2005, A&A, 444, 871. CGPS at 408 MHz (2′.8×3′.1) and 1.4 GHz (49′′×55′′) including H_I.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′) and 1420 MHz (~1′).

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 1.9 \pm 0.5$ Jy) including polarisation and review of flux densities.

G114.3+0.3

RA: 23^h37^m00^s
Dec: +61°55′

1-GHz flux/Jy: 5.5
Spectral index: 0.5

Size/arcmin: 90×55
Type: S

Radio: Shell, with H_{II} region S165 within the boundary of the remnant.

Optical: Faint emission in centre and to S.

Point sources: Pulsar near centre of remnant.

Distance: Association with H_I and other features implies 0.7 kpc.

References:

Reich & Braunsfurth 1981, A&A, 99, 17. Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 3.6$ Jy) and $S_{1.4 \text{ GHz}} = 4.4$ Jy from 1.4 GHz survey data, plus H_I from Maryland–Green Bank survey.
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 Fürst *et al.* 1993, A&A, 276, 470. Pulsar association.
 Becker *et al.* 1996, A&A, 306, 464. ROSAT of pulsar.
 Fesen *et al.* 1997, AJ, 113, 767. Optical observations.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.
 Mavromatakis *et al.* 2002, A&A, 383, 1011. Optical observations.

Yar-Uyaniker *et al.* 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49′′×55′′), including H_I (1′.0×1′.1).
 Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz (3′.4×3′.9 : $S = 12.0 \pm 6.0$ Jy) and 1.4 GHz (1′.0×1′.1 : $S = 9.8 \pm 0.8$ Jy).
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 1420 MHz (~1′ : $S = 5.4 \pm 0.8$ Jy), including review of flux densities.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5 : $S = 6.9 \pm 0.7$ Jy), including polarisation and review of flux densities.

G116.5+1.1

RA: 23^h53^m40^s
Dec: +63°15′

1-GHz flux/Jy: 10
Spectral index: 0.5

Size/arcmin: 80×60
Type: S

Radio: Distinct shell, with high polarisation.

Optical: Detected.

Distance: Association with H_I features implies 1.6 kpc.

References:

Reich & Braunsfurth 1981, A&A, 99, 17. Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 4.7 \pm 0.4$ Jy) and $S_{1.4 \text{ GHz}} = 8.0 \pm 0.8$ Jy from 1.4 GHz survey data, plus H_I from Maryland–Green Bank survey.
 Fesen *et al.* 1997, AJ, 113, 767. Optical observations.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Yar-Uyaniker *et al.* 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49′′×55′′), including H_I (1′.0×1′.1).
 Mavromatakis *et al.* 2005, A&A, 435, 141. Optical observations.

Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz (3′.4×3′.8 : $S = 15.0 \pm 1.5$ Jy) and 1.4 GHz (1′.0×1′.1 : $S = 10.6 \pm 0.7$ Jy).
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : $S = 12.5 \pm 1.6$ Jy) and 1420 MHz (~1′ : $S = 10.3 \pm 0.70$ Jy), including polarisation and review of flux densities.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5 : $S = 5.7 \pm 0.6$ Jy), including polarisation and review of flux densities.

G116.9+0.2

CTB 1

RA: 23^h59^m10^s
Dec: +62°26′**1-GHz flux/Jy:** 8
Spectral index: 0.57**Size/arcmin:** 34
Type: S

Has been called G117.3+0.1 and G116.9+0.1.

Radio: Incomplete shell.**Optical:** Filaments on sky survey.**X-ray:** Centrally brightened, with NE ‘breakout’.**Point sources:** Pulsar to NE.**Distance:** Association with H I features implies 1.6 kpc.**References:**

- Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz ($5' : S = 3.9 \pm 1.0$ Jy), and 37-m at 1.7 GHz ($S = 5.5 \pm 2.0$ Jy), plus review of flux densities.
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- Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
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- Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
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- Lazendic & Slane 2006, ApJ, 647, 350. X-ray observations.
- Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz ($3'4 \times 3'8 : S = 15.0 \pm 1.5$ Jy) and 1.4 GHz ($1'0 \times 1'1 : S = 8.1 \pm 0.4$ Jy).
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3' : S = 10.5 \pm 0.8$ Jy) and 1420 MHz ($\sim 1' : S = 7.0 \pm 0.8$ Jy), including review of flux densities.
- Pannuti *et al.* 2010, AJ, 140, 1787. ASCA and Chandra observations.
- Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9'5 : S = 3.6 \pm 0.4$ Jy) including polarisation and review of flux densities.

G119.5+10.2

CTA 1

RA: 00^h06^m40^s
Dec: +72°45′**1-GHz flux/Jy:** 36
Spectral index: 0.6**Size/arcmin:** 90?
Type: S

Has been called G119.5+10.3.

Radio: Incomplete shell, with ‘breakout’ to NW.**Optical:** Faint diffuse nebulosities.**X-ray:** Centrally brightened.**Point sources:** Central pulsar.**Distance:** Associated H_I shell indicates 1.4 kpc.**References:**

- Sieber *et al.* 1979, A&A, 74, 361. Effelsberg 100-m at 2.7 GHz (4′4″: $S=23.6\pm 2.8$ Jy).
- Sieber *et al.* 1981, A&A, 103, 393. Effelsberg 100-m at 2.7 GHz and 1.7 GHz (7′6″: $S=31.6\pm 2.5$ Jy), and 151 MHz (4′: $S=62.6\pm 6$ Jy).
- Fesen *et al.* 1981, ApJ, 247, 148. Optical, including spectra.
- Fesen *et al.* 1983, ApJS, 51, 337. Deep [OIII] imagery.
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- Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
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- Pineault *et al.* 1997, A&A, 324, 1152. DRAO at 408 MHz (3′5″) and 1.4 GHz (1′0″).
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- Brazier *et al.* 1998, MNRAS, 295, 819. Studies of central, compact γ -ray source.
- Mavromatakis *et al.* 2000, A&A, 353, 371. Optical imagery.
- Roberts *et al.* 2001, ApJS, 133, 451. ASCA observations.
- Reich 2002, in NSPS, p1. Effelsberg 100-m at 1.4 GHz (9′4″).
- Slane *et al.* 2004, ApJ, 601, 1045. XMM-Newton observations of central source.
- Halpern *et al.* 2004, ApJ, 612, 398. Chandra observations of central nebula, plus optical and radio limits for compact source.
- Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observations.
- Abdo *et al.* 2008, Science, 322, 1218. Fermi detection of pulsar.
- Lin *et al.* 2010, ApJ, 725, L1. XMM-Newton observations of pulsar.
- Caraveo *et al.* 2010, ApJ, 725, L6. XMM-Newton observations of pulsar.
- Sun *et al.* 2011, A&A, 535, A64. Urumqi 25-m at 4.8 GHz (9′5″: $S=11.6\pm 1.2$ Jy) and Effelsberg 100-m at 2.6 GHz (4′4″: $S=20.3\pm 2.0$ Jy) including polarisation.
- Lin *et al.* 2012, MNRAS, 426, 2283. Suzaku observations.
- Mignani *et al.* 2013, MNRAS, 430, 1354. Optical limits for pulsar.
- Aliu *et al.* 2013, ApJ, 764, 38. γ -ray observations.
- Li *et al.* 2016, ApJ, 831, 19. γ -ray observations of pulsar.

G120.1+1.4

RA: 00^h25^m18^s
Dec: +64°09′

1-GHz flux/Jy: 56
Spectral index: 0.58

Tycho, 3C10, SN1572

Size/arcmin: 8
Type: S

This is the remnant of the Tycho's SN of AD1572.

Radio: Shell, brightest to the NE.

Optical: Faint filaments/knots to the NNW, NE and E.

X-ray: Shell, brighter to the NE.

Point sources: Faint radio source near centre of the remnant, thought to be extragalactic.

Distance: HI observations suggest 2.3–3 kpc, optical proper motion and shock velocity gives 2.4 kpc.

References:

- Duin & Strom 1975, A&A, 39, 33. WSRT at 610 MHz ($57'' \times 64''$) and 5 GHz ($7'' \times 8''$).
- Klein *et al.* 1979, A&A, 76, 120. Effelsberg 100-m at 10.7 GHz ($1':S=13.1 \pm 0.8$ Jy), plus review of flux densities.
- Strom *et al.* 1982, MNRAS, 200, 473. WSRT at 1415 MHz ($27'' \times 31''$) from 1971 and 1979, for expansion.
- Dickel *et al.* 1982, ApJ, 257, 145. Comparison of radio, X-ray and optical observations.
- Reid *et al.* 1982, ApJ, 261, 485. Einstein observations.
- Seward *et al.* 1983, ApJ, 266, 287. Einstein observations.
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- Albinson *et al.* 1986, MNRAS, 219, 427. HI observations.
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- Schwarz *et al.* 1995, A&A, 299, 193. WSRT and Effelsberg 100-m at 1.4 GHz ($50''$), and VLA at 1.4 GHz ($13''$), for neutral hydrogen studies.
- Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
- Hwang & Gotthelf 1997, ApJ, 475, 665. ASCA observations.
- Reynoso *et al.* 1997, ApJ, 491, 816. VLA at 1.4 GHz ($1''.4 \times 1''.5$) from 1984 and 1994 for expansion studies.
- Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
- Reynoso *et al.* 1999, AJ, 117, 1827. VLA at 1.4 GHz ($13''$), for HI studies.
- Katz-Stone *et al.* 2000, ApJ, 529, 453. VLA at 333 MHz and 1.4 GHz ($9''.5 \times 7''.7$), for spectral index studies.
- Ghavamian *et al.* 2000, ApJ, 535, 266. Optical observations of shock precursors.
- Hughes 2000, ApJ, 545, L53. ROSAT X-ray expansion.
- Decourchelle *et al.* 2001, A&A, 365, L218. XMM-Newton observations.
- Ghavamian *et al.* 2001, ApJ, 547, 995. Optical spectroscopy.
- Douvion *et al.* 2001, A&A, 373, 281. ISO observations.
- Aharonian *et al.* 2001, A&A, 373, 292. Upper limit on high energy γ -rays.
- Hwang *et al.* 2002, ApJ, 581, 1101. Chandra observations.
- Lee *et al.* 2004, ApJ, 605, L113. Observations of molecular clouds in vicinity.
- Bamba *et al.* 2005, ApJ, 621, 793. Chandra observations of rim.
- Warren *et al.* 2005, ApJ, 634, 376. Chandra observations.
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S=86 \pm 5$ Jy) and 1420 MHz ($\sim 1'$: $S=40.5 \pm 1.5$ Jy), including polarisation and review of flux densities.
- Lee *et al.* 2007, ApJ, 659, L133. H α observations.
- Cassam-Chenai *et al.* 2007, ApJ, 665, 315. Chandra observations.
- Rest *et al.* 2008, ApJ, 681, L81. SN light echo.
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- Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
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- Lee *et al.* 2010, ApJ, 715, L146. H α observations.
- Hayato *et al.* 2010, ApJ, 725, 894. Suzaku observations of expansion.
- Ishihara *et al.* 2010, A&A, 521, L61. Akari observations.
- Tian & Leahy 2011, ApJ, 729, L15. HI and CO observations.
- Acciari *et al.* 2011, ApJ, 730, L20. γ -ray observations.
- Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ($9''.5$: $S=20.0 \pm 2.0$ Jy) including polarisation and review of flux densities.
- Giordano *et al.* 2012, ApJ, 744, L2. Fermi observations.
- Gomez *et al.* 2012, MNRAS, 420, 3557. Herschel IR dust observations.
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- Williams *et al.* 2013, ApJ, 770, 129. Spitzer observations.
- Yamaguchi *et al.* 2014, ApJ, 780, 136. Suzaku observations.
- Wang & Li 2014, ApJ, 789, 123. INTEGRAL observations.
- Troja *et al.* 2014, ApJ, 797, L6. Swift observations.
- Miceli *et al.* 2015, ApJ, 805, 120. XMM-Newton observations.
- Lu *et al.* 2015, ApJ, 805, 142. Chandra observations.
- Katsuda *et al.* 2015, ApJ, 808, 49. Suzaku observations.
- Tran *et al.* 2015, ApJ, 812, 101. Chandra observations.
- Lopez *et al.* 2015, ApJ, 814, 132. NuSTAR observations.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 5 frequencies between 30 and 143 GHz.
- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
- Williams *et al.* 2016, ApJ, 823, L32. Multi-epoch X-ray and radio observations for expansion.
- Zhou *et al.* 2016, ApJ, 826, 34. CO observations of region.

G126.2+1.6

RA: 01^h22^m00^s
Dec: +64°15′

1-GHz flux/Jy: 6
Spectral index: 0.5

Size/arcmin: 70
Type: S?

Radio: Poorly defined shell.

Optical: Filaments, mostly in W.

References:

Reich *et al.* 1979, A&A, 78, L13. Effelsberg 100-m at 1.4 GHz (9′ : $S=6.8\pm 0.7$ Jy) and 2.7 GHz (4′4 : $S=3.9\pm 0.4$ Jy).
 Blair *et al.* 1980, ApJ, 242, 592. Optical detection and spectra.
 Rosado 1982, RMxAA, 5, 127. Optical spectra.
 Fesen *et al.* 1983, ApJS, 51, 337. Deep [OIII] imagery.
 Fürst *et al.* 1984, A&A, 133, 11. Effelsberg 100-m at 2.7 GHz (4′4) and 4.8 GHz (2′6).
 Joncas *et al.* 1989, A&A, 219, 303. DRAO at 408 MHz (3′5×3′9 : $S=12\pm 2.5$ Jy) and part at 1.4 GHz (1′1×1′0), plus review of flux densities.
 Xilouris *et al.* 1993, A&A, 270, 393. Optical imaging.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at

863 MHz (14′5 : $S=6.1\pm 1.6$ Jy).
 Boumis *et al.* 2005, A&A, 443, 175. Optical observations.
 Tian & Leahy 2006, A&A, 447, 205. CGPS at 408 MHz (3′4×3′8 : $S=9.7\pm 3.9$ Jy) and 1.4 GHz (1′0×1′1 : $S=6.7\pm 2.1$ Jy), plus other observations for spectral index studies.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~ 3′ : $S=5.7\pm 0.7$ Jy) and 1420 MHz (~ 1′ : $S=6.4\pm 1.1$ Jy), including review of flux densities.
 Sun *et al.* 2007, A&A, 463, 993. Urumqi 25-m at 5 GHz (9′5 : $S=2.6\pm 0.6$ Jy), including polarisation.
 see also: Sun *et al.* 2007, A&A, 469, 1003. Erratum.

G127.1+0.5

RA: 01^h28^m20^s
Dec: +63°10′

1-GHz flux/Jy: 12
Spectral index: 0.45

Size/arcmin: 45
Type: S

R5

Has been called G127.3+0.7.

Radio: Distinct shell, with bright central source.

Optical: Detected.

Point sources: Flat radio spectrum (extragalactic) source at centre of remnant.

Distance: 1.2–1.3 kpc if associated with NGC 559.

References:

Caswell 1977, MNRAS, 181, 789. Half-Mile Telescope at 1.42 GHz (3′5×3′9), plus other observations of central source.
 Pauls 1977, A&A, 59, L13. Effelsberg 100-m at 1.4 GHz (9′ : $S=8\pm 1$ Jy).
 Salter *et al.* 1978, A&A, 66, 77. Effelsberg 100-m at 2.7 GHz (4′4), plus 5 and 8.7 GHz of the central source.
 Reich *et al.* 1979, A&A, 78, L13. Effelsberg 100-m at 1.4 GHz (9′ : $S=10.8\pm 1.3$ Jy).
 Pauls *et al.* 1982, A&A, 112, 120. WSRT at 610 MHz (56″×62″) and HI absorption to the point source with the VLA.
 Geldzahler & Shaffer 1982, ApJ, 260, L69. Observations of central source.
 Fürst *et al.* 1984, A&A, 133, 11. Effelsberg 100-m at 2.7 GHz (4′4) and 4.8 GHz (2′6).
 Goss & van Gorkom 1984, JApA, 5, 425. WSRT HI absorption of central source.
 Joncas *et al.* 1989, A&A, 219, 303. DRAO at 408 MHz

(3′5×3′9 : $S=17.9\pm 2.0$ Jy) and 1.4 GHz (1′13×1′0 : $S=10.1\pm 0.8$ Jy), plus review of flux densities.
 Xilouris *et al.* 1993, A&A, 270, 393. Optical imaging.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5 : $S=14.6\pm 0.8$ Jy).
 Kaplan *et al.* 2004, ApJS, 153, 269. Chandra limits for any compact sources.
 Leahy & Tian 2006, A&A, 451, 251. CGPS at 408 MHz (3′4×3′8 : $S=17.1\pm 1.7$ Jy) and 1.4 GHz (1′0×1′2 : $S=10.0\pm 0.8$ Jy).
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~ 3′ : $S=15.9\pm 1.0$ Jy) and 1420 MHz (~ 1′ : $S=9.7\pm 0.6$ Jy), including polarisation and review of flux densities.
 Sun *et al.* 2007, A&A, 463, 993. Urumqi 25-m at 5 GHz (9′5 : $S=6.3\pm 0.7$ Jy), including polarisation.
 see also: Sun *et al.* 2007, A&A, 469, 1003. Erratum.
 Zhou *et al.* 2014, ApJ, 791, 109. CO observations.

G130.7+3.1

RA: 02^h05^m41^s
Dec: +64°49′

1-GHz flux/Jy: 33
Spectral index: 0.07

3C58, SN1181

Size/arcmin: 9×5
Type: F

This is the remnant of the SN of AD1181.

Radio: Filled-centre, highly polarised, with high frequency turnover.

Optical: Faint filaments.

X-ray: Centrally brightened, with faint jet.

Point sources: Central pulsar.

Distance: HI absorption indicates 2 kpc.

References:

- Green *et al.* 1975, A&A, 44, 187. Effelsberg 100-m at 15.0 GHz (58″: $S=26.7\pm0.5$ Jy).
- Wilson & Weiler 1976, A&A, 49, 357. WSRT at 610 MHz (58″×64″), 1.4 GHz (24″×27″) and 5 GHz (7″×8″).
- van den Bergh 1978, ApJ, 220, L9. Optical observations.
- Becker *et al.* 1982, ApJ, 255, 557. X-ray observations.
- Green & Gull 1982, Nature, 299, 606. HI absorption distance.
- Fesen 1983, ApJ, 270, L53. Optical spectra.
- Reynolds & Aller 1985, AJ, 90, 2312. VLA at 1.4 GHz (2′), for limits of shell.
- Davelaar *et al.* 1986, ApJ, 300, L59. EXOSAT spectrum.
- Green 1986, MNRAS, 218, 533. 151 MHz observations (1′2″×1′3″: $S=36\pm4$ Jy), plus 2.7 GHz (4′), plus Einstein observations for limit on shell.
- Green 1987, MNRAS, 225, 11P. Flux density increase at 408 MHz.
- Morsi & Reich 1987, A&AS, 69, 533. Effelsberg 100-m at 32 GHz (26′′5: $S=24.2\pm1.4$ Jy).
- Reynolds & Aller 1988, ApJ, 327, 845. VLA at 1.4 (2′′4) and 4.9 GHz (2′′5).
- Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz (90′′: $S=15.0\pm2.0$ Jy), plus review of flux densities.
- Asaoka & Koyama 1990, PASJ, 42, 625. Ginga X-ray spectrum.
- Green & Scheuer 1992, MNRAS, 258, 833. IRAS upper limits.
- Roberts *et al.* 1993, A&A, 274, 427. HI absorption.
- Wallace *et al.* 1994, A&A, 286, 565. HI of surroundings.
- Helfand *et al.* 1995, ApJ, 453, 741. ROSAT observations.
- Torii *et al.* 2000, PASJ, 52, 875. ASCA observations.
- Bietenholz *et al.* 2001, ApJ, 560, 772. VLA at 74 MHz (26′′: $S=33.6$ Jy) and 327 MHz (8′′2: $S=33.9$ Jy), for spectral index and expansion studies.
- Bocchino *et al.* 2001, A&A, 369, 1078. XMM-Newton observations.
- Murray *et al.* 2002, ApJ, 568, 226. Chandra pulsar detection.
- Camilo *et al.* 2002, ApJ, 571, L41. Pulsar detection in radio.
- Reich 2002, in NSPS, p1. Effelsberg 100-m at 32 GHz (26′′) for polarised intensity.
- Slane *et al.* 2002, ApJ, 571, L45. Chandra observations.
- Slane *et al.* 2004, ApJ, 616, 403. Deep Chandra imaging.
- Bietenholz 2006, ApJ, 645, 1180. VLA at 1.4 GHz (1′′36) for expansion studies.
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S=32.2\pm2.0$ Jy) and 1420 MHz ($\sim 1'$: $S=31.9\pm1.0$ Jy), including polarisation and review of flux densities.
- Gotthelf *et al.* 2007, ApJ, 654, 267. XMM-Newton observations.
- Slane *et al.* 2008, ApJ, 676, L33. Spitzer and other IR observations.
- Fesen *et al.* 2008, ApJS, 174, 379. Optical observations for proper motion studies.
- Shearer & Neustroev 2008, MNRAS, 390, 235. Optical observations of pulsar nebula.
- Shibanov *et al.* 2008, A&A, 486, 273. Optical observations of pulsar nebula.
- Abdo *et al.* 2009, ApJ, 699, L102. Fermi observations of pulsar.
- Livingstone *et al.* 2009, ApJ, 706, 1163. Pulsar observations.
- Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
- Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: $S=31.7\pm3.0$ Jy) including polarisation and review of flux densities.
- Bietenholz *et al.* 2013, MNRAS, 431, 2590. Proper motion study of pulsar.
- Kothes *et al.* 2013, A&A, 560, A18. CGPS HI observations for distance.
- Aleksić *et al.* 2014, A&A, 567, L8. γ -ray detection.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 7 frequencies between 30 and 353 GHz.

G132.7+1.3

HB3

RA: 02^h17^m40^s
Dec: +62°45′**1-GHz flux/Jy:** 45
Spectral index: 0.6**Size/arcmin:** 80
Type: S

Has been called G132.4+2.2.

Radio: Faint shell, adjacent to W3/4/5 complex.**Optical:** Complete, filamentary shell, shock excited spectra.**X-ray:** Partial shell.**Point sources:** Pulsar nearby.**Distance:** Interaction with surroundings gives 2 kpc.**References:**

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at
 2.7 GHz (5′:S=33.8±7.0 Jy).
 d’Odorico & Sabbadin 1977, A&AS, 28, 439. Optical spectra.
 Read 1981, MNRAS, 194, 863. Radio at 151 MHz (4′.4) and
 1.4 GHz (2′) showing H_I shell.
 Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
 Fesen & Gull 1983, PASP, 95, 196. Optical image.
 Leahy *et al.* 1985, ApJ, 294, 183. Einstein observations.
 Landecker *et al.* 1987, AJ, 94, 111. DRAO at 408 MHz
 (3′.5×4′:S=75±15 Jy), plus review of flux densities.
 Routledge *et al.* 1991, A&A, 247, 529. DRAO at 1.4 GHz
 (1′.0×1′.1) for H_I, plus CO observations.
 Fesen *et al.* 1995, AJ, 110, 2876. Optical imaging and spec-
 troscopy, DRAO at 408 MHz (3′.5×4′) and 1.4 GHz
 (1′.0×1′.1).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact
 OH emission.
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at

863 MHz (14′.5:S=51.5±3.5 Jy).
 Tian & Leahy 2005, A&A, 436, 187. CGPS at 408 MHz
 (3′.4×3′.8) and 1.4 GHz (1′.0×1′.1), for spectral index stud-
 ies.
 see also: Tian & Leahy 2006, A&A, 451, 991. Erratum.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′:
 S=61±9 Jy) and 1420 MHz (~1′:S=29.4±2.7 Jy), including
 review of flux densities.
 Lazendic & Slane 2006, ApJ, 647, 350. X-ray observations.
 Green 2007, BASI, 35, 77. Review of radio spectrum.
 Shi *et al.* 2008, A&A, 487, 601. Urumqi 25-m at 4.8 GHz (9′.5),
 plus other survey observations for spectral studies.
 Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observa-
 tions.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including
 broad lines.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Katagiri *et al.* 2016, ApJ, 818, 114. γ -ray observations.
 Zhou *et al.* 2016, ApJ, 833, 4. CO observations of region.

G152.4–2.1**RA:** 04^h07^m50^s
Dec: +49°11′**1-GHz flux/Jy:** 3.5?
Spectral index: 0.7?**Size/arcmin:** 100×95
Type: S**Radio:** Bilateral shell.**References:**

Foster *et al.* 2013, A&A, 549, A107. Effelsberg 100-m at
 2.7 GHz, including polarisation, plus various radio survey
 observations.

G156.2+5.7

RA: 04^h58^m40^s
Dec: +51°50′

1-GHz flux/Jy: 5
Spectral index: 0.5

Size/arcmin: 110
Type: S

Radio: Faint shell, brighter in E and W.

Optical: Filamentary ring and smaller patchy ring.

X-ray: Faint shell.

Distance: Optical/X-ray observations imply >1.7 kpc.

References:

Pfeffermann *et al.* 1991, A&A, 246, L28. ROSAT detection.
 Reich *et al.* 1992, A&A, 256, 214. Effelsberg 100-m at 1.4 (9′ :
 $S = 4.2 \pm 1.0$ Jy) and 2.7 GHz (4.3 : $S = 3.0 \pm 1.0$ Jy), plus HI
 and IRAS.
 Yamauchi *et al.* 1993, PASJ, 45, 795. Hard X-ray observations.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Yamauchi *et al.* 1999, PASJ, 51, 13. ASCA observations of
 some regions.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz, includ-
 ing polarisation.
 Pannuti & Allen 2004, AdSpR, 33, 434. ASCA and RXTE ob-
 servations.

Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on com-
 pact sources.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′$:
 $S = 8.1 \pm 1.3$ Jy), including review of flux densities.
 Xu *et al.* 2007, A&A, 470, 969. Urumqi 25-m at 4.8 GHz (9.5 :
 $S = 2.5 \pm 0.5$ Jy), including polarisation.
 Gerardy & Fesen 2007, MNRAS, 376, 929. Optical observa-
 tions.
 Katsuda *et al.* 2009, PASJ, 61, S155. Suzaku observations.
 Uchida *et al.* 2012, PASJ, 64, 61. Suzaku observations.
 Katsuda *et al.* 2016, ApJ, 826, 108. Multi-epoch H α observa-
 tions for expansion.

G159.6+7.3

RA: 05^h20^m00^s
Dec: +50°00′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 240×180?
Type: S

Optical: Large, faint shell.

X-ray: Possible emission.

References:

Fesen & Milisavljevic 2010, AJ, 140, 1163. H α and other obser-
 vations.

G160.9+2.6

HB9

RA: 05^h01^m00^s
Dec: +46°40′

1-GHz flux/Jy: 110
Spectral index: 0.64

Size/arcmin: 140×120
Type: S

Has been called G160.5+2.8 and G160.4+2.8.

Radio: Large, filamentary shell.

Optical: Incomplete shell.

X-ray: Centrally brightened.

Point sources: Pulsar within boundary of the remnant, plus several nearby compact radio sources.

Distance: Various observations suggests less than 4 kpc.

References:

d’Odorico & Sabbadin 1977, A&AS, 28, 439. Optical spectra.
 Damashek *et al.* 1978, ApJ, 225, L31. Pulsar.
 Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
 Dwarakanath *et al.* 1982, JApA, 3, 207. Radio observations at 34.5 MHz (26′×40′ : $S = 750 \pm 150$ Jy), plus review of flux densities.
 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT H α absorption to nearby point source.
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source.
 Leahy 1987, ApJ, 322, 917. Einstein observations.
 Leahy & Roger 1991, AJ, 101, 1033. DRAO at 408 MHz (3′5″×4′8″) and 1.4 GHz (1′0″×1′4″), including H α and discussion of distance.
 Yamauchi & Koyama 1993, PASJ, 45, 545. Hard X-ray observations.
 Leahy & Aschenbach 1995, A&A, 293, 853. ROSAT observations.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Leahy *et al.* 1998, A&A, 339, 601. 232 MHz (3′8″×5′2″),

151 MHz (4′2″×5′8″) and Effelsberg 100-m at 4.7 GHz (2′5″) for spectral index studies.
 Roger *et al.* 1999, A&AS, 137, 7. 22 MHz flux density ($S = 1130 \pm 340$ Jy).
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5″ : $S = 91 \pm 3$ Jy).
 Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′ : S = 102 \pm 7$ Jy) and 1420 MHz ($\sim 1′ : S = 54.0 \pm 2.9$ Jy), including polarisation and review of flux densities.
 Leahy & Tian 2007, A&A, 461, 1013. CGPS at 408 MHz (2′8″×3′9″ : $S = 117.8 \pm 5.3$ Jy) and 1.4 GHz (58″×80″ : $S = 65.9 \pm 3.4$ Jy).
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5″ : $S = 34 \pm 3$ Jy), including polarisation and review of flux densities.
 Gosachinskii 2013, AstL, 39, 179. H α observations of region.
 Araya *et al.* 2014, MNRAS, 444, 860. γ -ray detection.

G166.0+4.3

VRO 42.05.01

RA: 05^h26^m30^s
Dec: +42°56′

1-GHz flux/Jy: 7
Spectral index: 0.37

Size/arcmin: 55×35
Type: S

Radio: Two arcs of strikingly different radii.

Optical: Nearly complete ring.

X-ray: Predominantly in SW.

Distance: H α indicates 4.5 kpc.

References:

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.
 Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ : $S = 5.2 \pm 1.0$ Jy).
 Lozinskaya 1979, AuJPh, 32, 113. H α interferometry.
 Landecker *et al.* 1982, ApJ, 261, L41. DRAO at 1.4 GHz (1′0″×1′4″), plus review of flux densities.
 Fesen *et al.* 1983, ApJS, 51, 337. Deep [OIII] imagery.
 Pineault *et al.* 1985, A&A, 151, 52. VLA at 1.4 GHz (16″×20″) of part of remnant, and optical observations.
 Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
 Braun & Strom 1986, A&AS, 63, 345. WSRT H α Observations.
 Pineault *et al.* 1987, ApJ, 315, 580. DRAO and VLA combined at 1.4 GHz (20″).
 Landecker *et al.* 1989, MNRAS, 237, 277. DRAO at 1.4 GHz (1′0″×1′4″), including H α .
 Burrows & Guo 1994, ApJ, 421, L19. ROSAT images and spec-

tra.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Guo & Burrows 1997, ApJ, 480, L51. ASCA observations.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Leahy & Tian 2005, A&A, 440, 929. CGPS at 408 MHz (3′4″×5′0″) and 1.4 GHz (1′0″×1′4″), for spectral index studies. see also: Tian & Leahy 2006, A&A, 451, 991. Erratum.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′ : S = 8.1 \pm 0.9$ Jy) and 1420 MHz ($\sim 1′ : S = 5.1 \pm 0.4$ Jy), including polarisation and review of flux densities.
 Bocchino *et al.* 2009, A&A, 498, 139. XMM-Newton observations.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5″ : $S = 3.3 \pm 0.3$ Jy), including polarisation and review of flux densities.
 Araya 2013, MNRAS, 434, 2202. Fermi observations.

G178.2–4.2

RA: 05^h25^m05^s
Dec: +28°11′

1-GHz flux/Jy: 2
Spectral index: 0.5

Size/arcmin: 72×62
Type: S

Radio: Faint shell, brighter in NE.

References:

Gao *et al.* 2011, A&A, 532, A144. Urumqi 25-m at 5 GHz (9′5″:S=1.0±0.1 Jy), plus other observations.

G179.0+2.6

RA: 05^h53^m40^s
Dec: +31°05′

1-GHz flux/Jy: 7
Spectral index: 0.4

Size/arcmin: 70
Type: S?

Radio: Thick shell, with background extragalactic sources near centre.

References:

Fürst & Reich 1986, A&A, 154, 303. Effelsberg 100-m at 1.4 (9′4″), 2.7 (4′3″) and 4.75 GHz (2′4″).
 Fürst *et al.* 1989, A&A, 223, 66. Observations of central, extragalactic source.
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.

Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5″:S=3.2±0.3 Jy), including polarisation and review of flux densities.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G180.0–1.7

RA: 05^h39^m00^s
Dec: +27°50′

1-GHz flux/Jy: 65
Spectral index: varies

Size/arcmin: 180
Type: S

S147

Radio: Large faint shell, with spectral break.

Optical: Wispy ring.

X-ray: Possible detection.

Point sources: Pulsar within boundary, with faint wind nebula.

Distance: Optical absorption towards stars indicates > 0.36 and < 0.88 kpc.

References:

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.
 Sofue *et al.* 1980, PASJ, 32, 1. Effelsberg 100-m at 5 GHz (2′6″ of parts).
 Kundu *et al.* 1980, A&A, 92, 225. Effelsberg 100-m at 2.7 GHz (5′5″:S=34.9±4 Jy) and 1.6 GHz (10′:S=60.2±6 Jy).
 Angerhofer & Kundu 1981, AJ, 86, 1003. Arecibo at 430 MHz (9′:S=97±20 Jy).
 Fürst *et al.* 1982, A&A, 115, 428. Observations of compact radio sources near the remnant.
 Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
 Fürst & Reich 1986, A&A, 163, 185. Effelsberg 100-m at 1.4, 2.7 and 4.7/5.0 GHz (9′4″, 4′3″ and 2′4″/2′6″).
 Sauvageot *et al.* 1990, A&A, 227, 183. EXOSAT possible detection.
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Anderson *et al.* 1996, ApJ, 468, L55. Pulsar detection.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at

863 MHz (14′5″:S=77±10 Jy).
 Romani & Ng 2003, ApJ, 585, L41. Chandra of pulsar.
 Kramer *et al.* 2003, ApJ, 593, L31. Pulsar observations.
 Sallmen & Welsh 2004, A&A, 426, 555. Optical absorption towards background stars.
 Drew *et al.* 2005, MNRAS, 362, 753. H α imaging.
 Ng *et al.* 2007, ApJ, 654, 487. Pulsar and wind nebula observations.
 Xiao *et al.* 2008, A&A, 482, 783. Urumqi 25-m at 4.8 GHz (9′5″:S=15.4±3.0 Jy) and Effelsberg 100-m at 2.6 GHz (4′4″:S=34.6±4.0 Jy).
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
 Katsuta *et al.* 2012, ApJ, 752, 135. Fermi observations.
 Dinçel *et al.* 2015, MNRAS, 448, 3196. Identification of OB runaway star near centre.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G182.4+4.3

RA: 06^h08^m10^s
Dec: +29°00′

1-GHz flux/Jy: 0.5
Spectral index: 0.4

Size/arcmin: 50
Type: S

Radio: Incomplete shell.

Optical: Brighter in S and NW.

X-ray: Diffuse emission.

References:

Kothes *et al.* 1998, A&A, 331, 661. Effelsberg 100-m at 1.4, 2.7, 4.9 and 10.5 GHz (9′4 : $S = 0.36 \pm 0.08$ Jy, 4′4 : $S = 0.25 \pm 0.04$ Jy, 2′5 : $S = 0.20 \pm 0.02$ Jy and 1′2 : $S = 0.15 \pm 0.03$ Jy), plus X-ray upper limit.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz and 4.9 GHz (3′).
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :

$S = 0.26 \pm 0.5$ Jy) including polarisation and review of flux densities.
 Sezer *et al.* 2012, MNRAS, 427, 1168. Optical and XMM-Newton observations.
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G184.6–5.8

Crab Nebula, 3C144, SN1054

RA: 05^h34^m31^s
Dec: +22°01′**1-GHz flux/Jy:** 960
Spectral index: 0.30**Size/arcmin:** 7×5
Type: F

This is the remnant of the SN of AD1054.

Radio: Filled-centre, central pulsar, with faint ‘jet’ (or tube) extending from the N edge; shows secular decline.

Optical: Strongly polarised filaments, diffuse synchrotron emission, with ‘jet’ faintly visible.

X-ray: Central ‘torus’ around the pulsar.

Point sources: Pulsar powering the remnant.

Distance: Proper motions and radial velocities give 2 kpc.

References:

- Velusamy 1984, *Nature*, 308, 251. VLA at 1.4 GHz, radio detection of ‘jet’.
- Velusamy 1985, *MNRAS*, 212, 359. VLA at 1.4 GHz (15’’).
- Aller & Reynolds 1985, *ApJ*, 293, L73. Radio flux density decrease.
- Fesen & Gull 1986, *ApJ*, 306, 259. Deep [OIII] imagery of ‘jet’.
- Marcelin *et al.* 1990, *A&A*, 228, 471. Optical of ‘jet’.
- Bietenholz & Kronberg 1990, *ApJ*, 357, L13. VLA at 1.4 GHz (1’’8).
- Hester *et al.* 1990, *ApJ*, 357, 539. Optical and IR images.
- Hickson & van den Bergh 1990, *ApJ*, 365, 224. Optical polarisation.
- Bietenholz & Kronberg 1992, *ApJ*, 393, 206. VLA at 1.5 and 5 GHz (1’’8) and 1.5 and 14 GHz (6’’5) for spectral studies.
- Fesen & Staker 1993, *MNRAS*, 263, 69. [OIII] imaging of ‘jet’ and proper motion studies.
- Kassim *et al.* 1993, *AJ*, 106, 2218. VLA at 74 MHz (20’’).
- Véron-Cetty & Woltjer 1993, *A&A*, 270, 370. Continuum and [OIII] photometry.
- Wallace *et al.* 1994, *A&A*, 286, 565. HI of surroundings.
- Frail *et al.* 1995, *ApJ*, 454, L129. VLA at 333 MHz (20’’) for limits on shell.
- Bietenholz *et al.* 1997, *ApJ*, 490, 291. Comparison of VLA observations at 74 MHz, 327 MHz, 1.5 GHz and 5 GHz for spectral index studies.
- Blair *et al.* 1997, *ApJS*, 109, 473. HST imaging.
- Fesen *et al.* 1997, *AJ*, 113, 354. Limits on H α halo.
- van der Meulen *et al.* 1998, *A&A*, 330, 321. γ -ray observations.
- Tanimori *et al.* 1998, *ApJ*, 492, L33. γ -ray observations.
- Nugent 1998, *PASP*, 110, 831. Optical expansion.
- Sankrit *et al.* 1998, *ApJ*, 504, 344. HST images.
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G189.1+3.0

RA: 06^h17^m00^s
Dec: +22°34′

1-GHz flux/Jy: 165
Spectral index: 0.36

IC443, 3C157

Size/arcmin: 45
Type: C

Radio: Limb-brightened to NE, with faint extension to the E.

Optical: Brightest to the NE, with faint filaments outside the NE boundary.

X-ray: Shell, brightest to the NE, plus compact source with nebula.

Point sources: X-ray source and nebula in S.

Distance: Mean optical velocity suggests 0.7–1.5 kpc, association with S249 gives 1.5–2 kpc.

References:

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 Snell *et al.* 2005, ApJ, 620, 758. Molecular line and IR observations of shocked material.
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 Hewitt *et al.* 2006, ApJ, 652, 1288. GBT at 1.6 and 1.7 GHz (7′.2) for OH, and VLA at 330 MHz (74″×64″).
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 Acciari *et al.* 2009, ApJ, 698, L133. γ -ray observations.
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 Castelletti *et al.* 2011, A&A, 534, A21. VLA at 74 MHz (35″ : S = 470 ± 51 Jy) and 330 MHz (17″ : S = 248 ± 15 Jy), plus review of flux densities.
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 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 McEwen *et al.* 2016, ApJ, 826, 189. NH₃ and CH₃OH observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G190.9–2.2

RA: 06^h01^m55^s
Dec: +18°24′

1-GHz flux/Jy: 1.3?
Spectral index: 0.7?

Size/arcmin: 70×60
Type: S

Radio: Incomplete shell.

References:

Foster *et al.* 2013, A&A, 549, A107. Various radio survey observations.

G205.5+0.5

RA: 06^h39^m00^s
Dec: +06°30′

1-GHz flux/Jy: 140
Spectral index: 0.4

Monoceros Nebula

Size/arcmin: 220
Type: S

Radio: In complex region, parts may be HII regions.

Optical: Large ring, near Rosette nebula.

X-ray: Possibly detected.

Distance: Mean optical velocity suggests 0.8 kpc, low frequency radio absorption suggests 1.6 kpc.

References:

Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz (9′).
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′), part only.
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 Davies *et al.* 1978, A&AS, 31, 271. Deep optical plates.
 Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
 Graham *et al.* 1982, A&A, 109, 145. Effelsberg 100-m at 2.7 GHz (4.4: $S=97.6\pm 12.5$ Jy), plus review of flux densities.
 Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
 Leahy *et al.* 1986, MNRAS, 220, 501. Einstein observations.
 Odegard 1986, ApJ, 301, 813. TPT at 20.6, 25.6 and 30.9 MHz (24′, 19′ and 16′).
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emission.
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 Aharonian *et al.* 2004, A&A, 417, 973. γ -ray limits.
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 Katagiri *et al.* 2016, ApJ, 831, 106. γ -ray observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G206.9+2.3

RA: 06^h48^m40^s
Dec: +06°26′

1-GHz flux/Jy: 6
Spectral index: 0.5

PKS 0646+06

Size/arcmin: 60×40
Type: S?

Radio: Diffuse source near the Monoceros Nebula.

Optical: Filaments detected.

X-ray: Possibly detected.

References:

Davies & Meaburn 1978, A&A, 69, 443. Optical observations.
 Nousek *et al.* 1981, ApJ, 248, 152. HEAO-1 X-ray limit.
 Graham *et al.* 1982, A&A, 109, 145. Effelsberg 100-m at 2.7 GHz (4.4: $S=4.1\pm 0.6$ Jy), plus review of flux densities.
 Rosado 1982, RMxAA, 5, 127. Optical observations.
 Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
 Leahy 1986, A&A, 156, 191. Einstein observations.
 Odegard 1986, ApJ, 301, 813. TPT at 20.6, 25.6 and 30.9 MHz

(24′, 19′ and 16′).
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9.5: $S=2.9\pm 0.3$ Jy), including polarisation and review of flux densities.
 Ambrocio-Cruz *et al.* 2014, RMxAA, 50, 323. [SiII] spectroscopy.

G213.0–0.6**RA:** 06^h50^m50^s**Dec:** –00°30′**1-GHz flux/Jy:** 21**Spectral index:** 0.4**Size/arcmin:** 160×140?**Type:** S

Has also been called G213.3–0.4.

Radio: Large, faint shell.**Optical:** Filamentary shell.**Point sources:** Central X-ray source**References:**Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at
863 MHz (14′5″: S=22.0±3.7 Jy).Stupar & Parker 2012, MNRAS, 419, 1413. H α , radio survey
and other observations.

G260.4–3.4

RA: 08^h22^m10^s
Dec: –43°00′

1-GHz flux/Jy: 130
Spectral index: 0.5

Puppis A, MSH 08–44

Size/arcmin: 60×50
Type: S

This remnant overlaps the Vela SNR (G263.9–3.3).

Radio: Angular shell, brightest to the E, poorly defined to the W.

Optical: Nebulosity and wisps.

X-ray: Brightest to the E.

Point sources: Central possible pulsating X-ray source.

Distance: Association with H_I gives 2.2 kpc.

References:

Green 1971, AuJPh, 24, 773. Molonglo at 408 MHz (3′ : $S = 198 \pm 20$ Jy).
 Goudis & Meaburn 1978, A&A, 62, 283. H α +[NII] optical image.
 Petre *et al.* 1982, ApJ, 258, 22. Einstein observations.
 Milne *et al.* 1983, MNRAS, 204, 237. FIRST at 1415 MHz (50′′), large scale emission missing.
 Teske & Petre 1987, ApJ, 318, 370. Coronal optical line emission.
 Dubner & Arnal 1988, A&AS, 75, 363. H_I and CO observations of surroundings.
 Arendt *et al.* 1990, ApJ, 350, 266. MOST at 843 MHz (44′′×65′′), with large scale emission added, plus IR, optical and X-ray observations.
 Dubner *et al.* 1991, AJ, 101, 1466. VLA at 327 MHz (43′′×73′′) and 1.5 GHz (43′′×77′′).
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 Milne *et al.* 1993, MNRAS, 261, 366. Parkes 64-m at 4.75 (4.5′ : $S = 59 \pm 5$ Jy) and 8.4 GHz (3′ : $S = 38 \pm 4$ Jy), plus polarisation.
 Berthiaume *et al.* 1994, ApJ, 425, 132. X-ray spectroscopy.
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 Bock *et al.* 1998, AJ, 116, 1886. MOST at 843 MHz (43′′×60′′).
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 Reynoso *et al.* 2003, MNRAS, 345, 671. ATCA at 1.4 GHz (90′′) for H_I near central X-ray source.
 Hwang *et al.* 2005, ApJ, 635, 355. Chandra observations of E

edge.
 Hui & Becker 2006, A&A, 454, 543. XMM-Newton and Chandra observations.
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 Winkler & Petre 2007, ApJ, 670, 635. Chandra proper motion study of central source.
 Paron *et al.* 2008, A&A, 480, 439. CO observations of E.
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 Mignani *et al.* 2009, A&A, 500, 1211. Optical limits for compact X-ray source.
 Katsuda *et al.* 2010, ApJ, 714, 1725. Chandra and XMM-Newton observations.
 Arendt *et al.* 2010, ApJ, 725, 585. Spitzer observations.
 Becker *et al.* 2012, ApJ, 755, 141. Chandra proper motion study of central X-ray source.
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 Hewitt *et al.* 2012, ApJ, 759, 89. Fermi and WMAP 23 to 90 GHz observations.
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 Katsuda *et al.* 2013, ApJ, 768, 182. XMM-Newton observations.
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 Reynoso & Walsh 2015, MNRAS, 451, 3044. ATCA at 1.4 GHz (51′′×82′′) and 1.7 GHz for spectral index study.
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.
 Luna *et al.* 2016, A&A, 590, A70. XMM-Newton and Chandra observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G261.9+5.5

RA: 09^h04^m20^s
Dec: –38°42′

1-GHz flux/Jy: 10?
Spectral index: 0.4?

Size/arcmin: 40×30
Type: S

Radio: Faint shell with little limb brightening.

References:

Hill 1967, AuJPh, 20, 297. Parkes 64-m at 2650 MHz (7.5′ : $S = 7$ Jy) also $S_{1410 \text{ MHz}} = 8$ Jy, $S_{81.5 \text{ MHz}} = 25$ Jy.
 Colomb & Dubner 1980, A&A, 82, 244. Argentine 30-m dish at 1.4 GHz, for H_I possibly associated with remnant.

Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44′′×71′′).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G263.9–3.3

RA: 08^h34^m00^s
Dec: –45°50′

1-GHz flux/Jy: 1750
Spectral index: varies

Vela (XYZ)

Size/arcmin: 255
Type: C

This refers to the whole Vela XYZ complex, of which X has at times been classified as a separate (filled-centre) remnant. This remnant is overlapped by G260.4–3.4 and G266.2–1.2.

Radio: Large shell, with flatter spectrum component (Vela X), and pulsar nebula.

Optical: Filaments.

X-ray: Patchy shell, with extensions, central nebula and pulsar.

Point sources: Pulsar within Vela X, with one-sided ‘jet’.

Distance: Vela pulsar parallax gives 0.3 kpc, optical spectra and H_I studies suggest 0.25 kpc.

References:

- Milne 1968, AuJPh, 21, 201. Parkes 64-m at various frequencies, including 408 MHz (48′ : $S = 2300 \pm 300$ Jy), 635 MHz (31′ : $S = 2360 \pm 300$ Jy), 1410 MHz (14′ : $S = 1640 \pm 300$ Jy) and 2650 MHz (7.5′ : $S = 1400 \pm 250$ Jy), plus discussion of the distance.
- Milne 1980, A&A, 81, 293. Maps of Vela X with Parkes 64-m at 1.66, 2.7 and 5 GHz (12′, 8.4′ and 4.4′).
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- Bignami & Caraveo 1988, ApJ, 325, L5. Pulsar proper motion from optical observations.
- Dwarakanath 1991, JApA, 12, 199. Gauribidanur ‘T’ array at 34.5 MHz (26′ × 84′ : $S = 1800$ Jy for Vela X and $S = 3900$ Jy for Vela YZ), plus review of flux densities.
- Bietenholz *et al.* 1991, ApJ, 376, L41. VLA at 5 GHz in vicinity of pulsar.
- Willmore *et al.* 1992, MNRAS, 254, 139. Hard X-ray observations.
- Dubner *et al.* 1992, A&AS, 96, 505. Argentine 30-m at 1.4 GHz (30′) of surrounding H_I.
- Strom *et al.* 1995, Nature, 373, 590. Radio of X-ray extensions.
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- Jenkins & Wallerstein 1995, ApJ, 440, 227. Optical absorption of associated neutral carbon cloud.
- Milne 1995, MNRAS, 277, 1435. Parkes 64-m at 8.4 GHz (3′), including polarisation, of Vela X.
- Danks & Sembach 1995, AJ, 109, 2627. Optical spectroscopy of background stars.
- Blair *et al.* 1995, AJ, 110, 312. UV spectroscopy.
- Duncan *et al.* 1996, MNRAS, 280, 252. Parkes 64-m at 2.4 GHz (8.9′).
- Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 62″) of part.
- Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.
- Frail *et al.* 1997, ApJ, 475, 224. VLA at 330 MHz (1′ × 1.8′) and comparison with ROSAT observations of Vela X.
- Markwardt & Ögelman 1997, ApJ, 480, L13. ASCA observations of pulsar ‘jet’.
- Raymond *et al.* 1997, ApJ, 482, 881. UV spectroscopy.
- Yoshikoshi *et al.* 1997, ApJ, 487, L65. γ -ray observations of pulsar.
- Jenkins *et al.* 1998, ApJ, 492, L147. UV absorption to background star.
- Dubner *et al.* 1998, AJ, 116, 813. Parkes 64-m at 1.4 GHz (15′) for H_I studies.
- Bock *et al.* 1998, AJ, 116, 1886. MOST at 843 MHz (43″ × 60″).
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- Sankrit *et al.* 2001, ApJ, 549, 416. Far-UV observations of selected region.
- Pavlov *et al.* 2001, ApJ, 554, L189. Chandra two epoch observations of pulsar nebula.
- Helfand *et al.* 2001, ApJ, 556, 380. Chandra observations of pulsar and its nebula.
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 see also: Alvarez *et al.* 2001, A&A, 379, 323. Erratum.
- Caraveo *et al.* 2001, ApJ, 561, 930. HST parallax observations of pulsar.
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- Dodson *et al.* 2003, MNRAS, 343, 116. ATCA at 1.4, 2.4, 5.2 and 8.5 GHz (6.2″ × 8.1″, 26″ × 36″, 12.1″ × 10.5″ and 11.2″ × 10.6″) of pulsar nebula.
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- Katsuda & Tsunemi 2005, PASJ, 57, 621. XMM-Newton observations of E.
- Aharonian *et al.* 2006, A&A, 448, L43. γ -ray observations.
- McConnell *et al.* 2006, AJ, 131, 648. ATCA at 4.9 GHz (12′) including polarisation.
- Katsuda & Tsunemi 2006, ApJ, 642, 917. XMM-Newton observations of NE.
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- LaMassa *et al.* 2008, ApJ, 689, L121. XMM-Newton observations of Vela X.
- Grondin *et al.* 2013, ApJ, 774, 110. Fermi observations of Vela X.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
- Rao *et al.* 2016, MNRAS, 455, 2529. Time variation of optical line absorption.

G266.2–1.2

RA: 08^h52^m00^s
Dec: –46°20′

1-GHz flux/Jy: 50?
Spectral index: 0.3?

RX J0852.0–4622
Size/arcmin: 120
Type: S

This remnant overlaps the Vela SNR (G263.9–3.3).

Radio: Incomplete shell, confused by the Vela SNR.

Optical: Nebulosity offset to NE.

X-ray: Non-thermal shell, confused by the Vela SNR, with central source, and possible associated pulsar.

Point sources: Central X-ray source, with optical nebula, and possible associated pulsar.

Distance: X-ray data suggest an upper limit of 1 kpc.

References:

- Aschenbach 1998, *Nature*, 396, 141. ROSAT identification.
 Iyudin *et al.* 1998, *Nature*, 396, 142. γ -ray observations.
 Combi *et al.* 1999, *ApJ*, 519, L177. Radio observations.
 Duncan & Green 2000, *A&A*, 364, 732. Parkes 64-m at 1.4 GHz (14'0), and comparison with other observations.
 Redman *et al.* 2000, *ApJ*, 543, L153. Optical of nearly nebulosity.
 Tsunemi *et al.* 2000, *PASJ*, 52, 887. ASCA spectral observations.
 Slane *et al.* 2001, *ApJ*, 548, 814. ASCA observations.
 Mereghetti *et al.* 2001, *ApJ*, 548, L213. BeppoSAX observations of central sources.
 Pavlov *et al.* 2001, *ApJ*, 559, L131. Chandra of central X-ray source.
 Moriguchi *et al.* 2001, *PASJ*, 53, 1025. CO observations.
 Pellizzoni *et al.* 2002, *A&A*, 393, L65. Optical observations of central source.
 Redman *et al.* 2002, *MNRAS*, 336, 1093. Optical nebulosity to NE.
 Kargaltsev *et al.* 2002, *ApJ*, 580, 1060. Chandra observations of central source.
 Sankrit *et al.* 2003, *ApJ*, 589, 242. Optical nebulosity to NE.
 Redman & Meaburn 2005, *MNRAS*, 356, 969. Possible pulsar association.
 Iyudin *et al.* 2005, *A&A*, 429, 225. XMM-Newton observations.
 Aharonian *et al.* 2005, *A&A*, 437, L7. γ -ray observations.
 Katagiri *et al.* 2005, *ApJ*, 619, L163. γ -ray observations.
 Bamba *et al.* 2005, *ApJ*, 632, 294. Chandra of NW rim.
 Reynoso *et al.* 2006, *A&A*, 449, 243. ATCA at 1.38 GHz (32'' \times 37'').
 Enomoto *et al.* 2006, *ApJ*, 652, 1268. γ -ray observations.
 Mignani *et al.* 2007, *A&A*, 473, 883. Deep optical observations of compact X-ray source.
 Aharonian *et al.* 2007, *ApJ*, 661, 236. γ -ray observations.
 Katsuda *et al.* 2008, *ApJ*, 678, L35. XMM-Newton proper motion study.
 Pannuti *et al.* 2010, *ApJ*, 721, 1492. Chandra observations of NW.
 Allen *et al.* 2015, *ApJ*, 798, 82. Two epoch Chandra observations for expansion.
 Acero *et al.* 2016, *ApJS*, 224, 8. γ -ray observations.
 Takeda *et al.* 2016, *PASJ*, 68, S10. Suzaku observations.

G272.2–3.2

RA: 09^h06^m50^s
Dec: –52°07′

1-GHz flux/Jy: 0.4
Spectral index: 0.6

Size/arcmin: 15?
Type: S?

Radio: Diffuse shell.

Optical: Detected.

X-ray: Centrally brightened.

References:

- Greiner *et al.* 1994, *A&A*, 286, L35. ROSAT observations, plus optical observations.
 Duncan *et al.* 1997, *MNRAS*, 289, 97. Parkes 64-m at 1.4 GHz (18' : $S = 0.38 \pm 0.09$ Jy) 2.4 GHz (10'6 : $S = 0.25 \pm 0.04$ Jy) and 4.8 GHz (5'7 : $S = 0.17 \pm 0.02$ Jy), MOST at 843 MHz
 (45'' \times 70'' : $S = 0.45 \pm 0.10$ Jy), and ATCA at 2.4 GHz (37'' \times 52''), plus ROSAT observations.
 Harrus *et al.* 2001, *ApJ*, 552, 614. ASCA and ROSAT observations, plus review of earlier observations.
 Kamitsukasa *et al.* 2016, *PASJ*, 68, S7. Suzaku observations.

G279.0+1.1

RA: 09^h57^m40^s
Dec: –53°15′

1-GHz flux/Jy: 30?
Spectral index: 0.6?

Size/arcmin: 95
Type: S

Radio: Faint, incomplete shell.

Optical: Detected.

Point sources: Pulsar nearby.

References:

Woermann & Jonas 1988, MNRAS, 234, 971. Hartesbeesthoek 26-m at 1.6 (30′ : $S = 25.2 \pm 4$ Jy) and 2.3 GHz (20′ : $S = 20.7 \pm 3$ Jy).
 Duncan *et al.* 1995, MNRAS, 277, 319. Parkes 64-m at 1.4 (18′ : $S = 28 \pm 3$ Jy) and 2.4 GHz (11′ : $S = 20 \pm 2$ Jy), including polarisation.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 53″) of part.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G284.3–1.8

RA: 10^h18^m15^s
Dec: –59°00′

1-GHz flux/Jy: 11?
Spectral index: 0.3?

MSH 10–53
Size/arcmin: 24?
Type: S

Has been called G284.2–1.8.

Radio: Incomplete, poorly defined shell.

Optical: Faint filament near edge.

Point sources: Central X-/ γ -ray source.

References:

Ruiz & May 1986, ApJ, 309, 667. CO and optical observations.
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz (43″ × 50″) and Parkes 64-m at 8.4 GHz (3′ : $S = 5.4 \pm 0.8$ Jy) including polarisation, plus earlier flux densities.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.

Camilo *et al.* 2001, ApJ, 557, L51. Observations of nearby pulsar.
 Camilo *et al.* 2004, ApJ, 616, 1118. Chandra observations of pulsar and nebula.
 Abramowski *et al.* 2012, A&A, 541, A5. γ -ray observations.
 Williams *et al.* 2015, ApJ, 808, L19. Chandra observations.

G286.5–1.2

RA: 10^h35^m40^s
Dec: –59°42′

1-GHz flux/Jy: 1.4?
Spectral index: ?

Size/arcmin: 26 × 6
Type: S?

Radio: Double, elongated arc.

Optical: Detected.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 50″ : $S = 1.6$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G289.7–0.3

RA: 11^h01^m15^s
Dec: –60°18′

1-GHz flux/Jy: 6.2
Spectral index: 0.2?

Size/arcmin: 18 × 14
Type: S

Radio: Incomplete shell.

Point sources: Compact radio source near centre.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 50″ : $S = 6.4 \pm 0.5$ Jy), plus Parkes 64-m at 4.5 GHz ($S = 7.5 \pm 2.5$ Jy) and 8.55 GHz ($S = 3.6 \pm 0.9$ Jy).

G290.1–0.8

RA: 11^h03^m05^s
Dec: –60°56′

1-GHz flux/Jy: 42
Spectral index: 0.4

MSH 11–61A

Size/arcmin: 19×14
Type: S

Radio: Elongated, clumpy shell.

Optical: Filaments detected.

X-ray: Centrally brightened.

Point sources: Pulsar nearby, with PWN and extended ‘jet’ in X-rays.

Distance: H_I absorption indicates 7±1 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′:S=20.2 Jy).
 Elliott & Malin 1979, MNRAS, 186, 45P. Optical image and spectra.
 Kirshner & Winkler 1979, ApJ, 227, 853. Optical observations.
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44′×50′′).
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz (43′×49′′ : S = 45±11 Jy), and Parkes 64-m at 8.4 GHz (3′ : S=19.5±1.0 Jy), including polarisation.
 Seward 1990, ApJS, 73, 781. Einstein observations.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′×49′′ : S=43 Jy).
 Rosado *et al.* 1996, A&A, 315, 243. Optical kinematics.
 Kaspi *et al.* 1997, ApJ, 485, 820. Pulsar detection.

Gotthelf & Kaspi 1998, ApJ, 497, L29. ASCA observations of pulsar.
 Slane *et al.* 2002, ApJ, 564, 284. ASCA observations.
 Filipović *et al.* 2005, SerAJ, 170, 47. ATCA at 1.4 GHz (21′′), plus other observations, including CO of surroundings.
 Reynoso *et al.* 2006, MNRAS, 369, 416. ATCA at 1.4 GHz (22′′5×25′′0) including H_I.
 Pavan *et al.* 2014, A&A, 562, A122. Chandra and ATCA observations at 2 GHz (4′′1×5′′2) of PWN.
 Halpern *et al.* 2014, ApJ, 795, L27. XMM-Newton observations of PWN.
 Auchettl *et al.* 2015, ApJ, 810, 43. γ -ray and Suzaku observations.
 Kamitsukasa *et al.* 2015, PASJ, 67, 16. Suzaku observations.
 Pavan *et al.* 2016, A&A, 591, A91. Chandra observations, including PWN and ‘jet’.

G291.0–0.1

RA: 11^h11^m54^s
Dec: –60°38′

1-GHz flux/Jy: 16
Spectral index: 0.29

(MSH 11–62)

Size/arcmin: 15×13
Type: C

Radio: Centrally brightened core, with surrounding arcs.

Optical: Detected.

X-ray: Centrally brightened.

Point sources: Central compact X-ray source.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Roger *et al.* 1986, MNRAS, 219, 815. MOST at 843 MHz (43′×50′′ : S = 17.2±1.0 Jy), and Parkes 64-m at 5 and 8.4 GHz (4′6 and 3′ : S = 10.4±0.4 Jy and 9′1±0.2), with polarisation.
 Wilson 1986, ApJ, 302, 718. Einstein observations.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′×49′′ : S=12.7 Jy).
 Harrus *et al.* 1998, ApJ, 499, 273. ASCA observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Slane *et al.* 2012, ApJ, 749, 131. Chandra, XMM-Newton and Fermi observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G292.0+1.8

RA: 11^h24^m36^s
Dec: –59°16′

1-GHz flux/Jy: 15
Spectral index: 0.4

MSH 11–54

Size/arcmin: 12×8
Type: C

Radio: Centrally brightened source surrounded by a plateau of faint emission.

Optical: Oxygen rich.

X-ray: Ring of emission, with diffuse central nebula and pulsar.

Point sources: Central pulsar.

Distance: H I absorption implies 6.0 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Lockhart *et al.* 1977, MNRAS, 179, 147. Fleurs at 1415 MHz (50′ : $S=13.0$ Jy).
 Goss *et al.* 1979, MNRAS, 188, 357. Optical spectra.
 Clark *et al.* 1980, MNRAS, 193, 129. X-ray spectrum.
 Tuohy *et al.* 1982, ApJ, 260, L65. Einstein observations.
 Dopita & Tuohy 1984, ApJ, 282, 135. Optical spectra.
 Braun *et al.* 1986, A&A, 162, 259. MOST at 843 MHz (0.8) and IRAS.
 Hughes & Singh 1994, ApJ, 422, 126. EXOSAT spectrum.
 Sutherland & Dopita 1995, ApJ, 439, 365. Spectrophotometry.
 Hughes *et al.* 2001, ApJ, 559, L153. Chandra observations, including central nebula.
 Park *et al.* 2002, ApJ, 564, L39. Chandra observations.
 Camilo *et al.* 2002, ApJ, 567, L71. Pulsar detection.
 Gonzalez & Safi-Harb 2003, ApJ, 583, L91. Chandra observations.
 Hughes *et al.* 2003, ApJ, 591, L139. Chandra observations of pulsar.
 Gaensler & Wallace 2003, ApJ, 594, 326. ATCA at 1.4, 2.3 and 5.2 GHz (9″6×8″0, 7″2×6″2 and 5″5×4″8 : $S=11.9\pm0.1, 11.4\pm0.1$ and 8.8 ± 0.1), plus H I observations.
 Park *et al.* 2004, ApJ, 602, L33. Chandra observations.

Vink *et al.* 2004, NuPhS, 132, 62. XMM-Newton observations.
 Ghavamian *et al.* 2005, ApJ, 635, 365. Optical imaging spectroscopy.
 Winkler & Long 2006, AJ, 132, 360. Optical observations.
 Park *et al.* 2007, ApJ, 670, L121. Chandra observations.
 Zharikov *et al.* 2008, A&A, 492, 805. Possible optical counterpart to pulsar and nebula.
 Winkler *et al.* 2009, ApJ, 692, 1489. Optical proper motion studies.
 Ghavamian *et al.* 2009, ApJ, 696, 1307. Spitzer spectroscopy.
 Lee *et al.* 2009, ApJ, 706, 441. IR observations.
 Lee *et al.* 2010, ApJ, 711, 861. Chandra observations.
 Ghavamian *et al.* 2012, ApJ, 750, 39. Spitzer observations.
 Zharikov *et al.* 2013, A&A, 554, A120. IR of pulsar wind nebula.
 Yamaguchi *et al.* 2014, ApJ, 785, L27. Suzaku observations.
 Kamitsukasa *et al.* 2014, PASJ, 66, 64. Suzaku observations.
 Bhalerao *et al.* 2015, ApJ, 800, 65. Chandra observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 Ghavamian & Williams 2016, ApJ, 831, 188. Spitzer observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G292.2–0.5

RA: 11^h19^m20^s
Dec: –61°28′

1-GHz flux/Jy: 7
Spectral index: 0.5

Size/arcmin: 20×15
Type: S

Radio: Shell.

X-ray: Shell, brighter to W, with central nebula.

Point sources: Central, young pulsar.

Distance: H I absorption indicates 8.4 kpc.

References:

Camilo *et al.* 2000, ApJ, 541, 367. Pulsar detection.
 Crawford *et al.* 2001, ApJ, 554, 152. ATCA at 1.4 GHz (29″×25″ : $S=5.6\times0.3$ Jy) and 2.5 GHz (21″×20″).
 Pivovarov *et al.* 2001, ApJ, 554, 161. ROSAT and ASCA observations.
 Gonzalez & Safi-Harb 2003, ApJ, 591, L143. Chandra observations of pulsar.
 Caswell *et al.* 2004, MNRAS, 352, 1405. ATCA at 5 GHz (1′ : $S=2.8$ Jy), including polarisation, and 1.4 GHz for H I absorption.

Gonzalez & Safi-Harb 2005, ApJ, 619, 856. Chandra observations.
 Gonzalez *et al.* 2005, ApJ, 630, 489. XMM-Newton observations of pulsar.
 Safi-Harb *et al.* 2008, ApJ, 684, 532. Chandra observations of pulsar and nebula.
 Kumar *et al.* 2012, ApJ, 754, 96. Chandra and XMM-Newton observations.
 Ng *et al.* 2012, ApJ, 761, 65. XMM-Newton observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G293.8+0.6

RA: 11^h35^m00^s
Dec: –60°54′

1-GHz flux/Jy: 5?
Spectral index: 0.6?

Size/arcmin: 20
Type: C

Radio: Central source, with faint extended plateau.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′: $S=9.0$ Jy) and Parkes 64-m at 5 GHz (4′: $S=2.1$ Jy).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz

(44″×51″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″: $S=2.6$ Jy).

G294.1–0.0

RA: 11^h36^m10^s
Dec: –61°38′

1-GHz flux/Jy: >2?
Spectral index: ?

Size/arcmin: 40
Type: S

Radio: Faint shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″: $S>2$).

G296.1–0.5

RA: 11^h51^m10^s
Dec: –62°34′

1-GHz flux/Jy: 8?
Spectral index: 0.6?

Size/arcmin: 37×25
Type: S

Incorporates the previously catalogued remnant G296.1–0.7. Has been called G296.05–0.50.

Radio: Irregular shell, with nearby HII regions.

Optical: Detected.

X-ray: Irregular, incomplete shell.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′: $S=6.9$ Jy) and Parkes 64-m at 5 GHz (4′: $S>0.74$).
 Longmore *et al.* 1977, MNRAS, 181, 541. Optical spectra.
 van den Bergh 1978, ApJS, 38, 119. Optical observations.
 Markert *et al.* 1981, ApJ, 248, L17. Einstein observations.
 Caswell & Barnes 1983, ApJ, 271, L55. Molonglo at 408 MHz (3′: $S=12.4$ Jy).
 Bignami *et al.* 1986, ApJ, 302, 606. EXOSAT and Einstein ob-

servations.
 Hwang & Markert 1994, ApJ, 431, 819. ROSAT observations.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×48″: $S>2.4$).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Castro *et al.* 2011, ApJ, 734, 86. XMM-Newton observations.
 Gök & Sezer 2012, MNRAS, 419, 1603. Suzaku observations.

G296.5+10.0

RA: 12^h09^m40^s
Dec: –52°25′

1-GHz flux/Jy: 48
Spectral index: 0.5

PKS 1209–51/52
Size/arcmin: 90×65
Type: S

Has been called G296.5+9.7.

Radio: Shell with two bright limbs.

Optical: Detected.

X-ray: Incomplete shell, with central pulsar.

Point sources: Central pulsar.

References:

Irvine & Irvine 1974, ApJ, 192, L111. Optical observations.
 Danziger & Dennefeld 1976, PASP, 88, 44. Optical spectra.
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8.4) and 5 GHz (4.4).
 Tuohy *et al.* 1979, ApJ, 230, L27. X-ray detection with HEAO-1 A2 experiment.
 Ruiz 1983, AJ, 88, 1210. Optical spectra.
 Dubner *et al.* 1986, AJ, 91, 343. Argentine 30-m dish at 1.4 GHz (34′), plus H_I.
 Kellett *et al.* 1987, MNRAS, 225, 199. EXOSAT of the west of the remnant, including the compact source.
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×56″).
 Matsui *et al.* 1988, ApJ, 329, 838. Einstein observations, including compact source.
 Roger *et al.* 1988, ApJ, 332, 940. MOST at 843 MHz (44″×56″).
 Bignami *et al.* 1992, ApJ, 389, L67. Optical in vicinity of X-ray source.
 Milne & Haynes 1994, MNRAS, 270, 106. Parkes 64-m at 2.4 GHz (8.3 : S = 33±3 Jy), 4.8 GHz (4.5 : S = 23.3±3 Jy) and 8.4 GHz (3.0 : 18.8±3), including polarisation and review of flux densities.

Mereghetti *et al.* 1996, ApJ, 464, 842. Radio, optical and X-ray observations of central source.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.
 Vasisht *et al.* 1997, ApJ, 476, L43. ASCA observations of neutron star.
 Zavlin *et al.* 1998, A&A, 331, 821. ROSAT and ASCA observations of neutron star.
 Giacani *et al.* 2000, AJ, 119, 281. ATCA at 1.4 GHz (2.7×4.0) for H_I studies.
 Zavlin *et al.* 2000, ApJ, 540, L25. Chandra observations of central pulsar.
 Gotthelf & Halpern 2007, ApJ, 664, L35. X-ray timing observations of pulsar.
 Harvey-Smith *et al.* 2010, ApJ, 712, 1157. ATCA at 1.4 GHz (1.8×3.3), including polarisation.
 Araya 2013, MNRAS, 434, 2202. Fermi observations.
 Halpern & Gotthelf 2015, ApJ, 812, 61. Two epoch Chandra observations for pulsar proper motion.
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G296.7–0.9

RA: 11^h55^m30^s
Dec: –63°08′

1-GHz flux/Jy: 3
Spectral index: 0.5

Size/arcmin: 15×8
Type: S

Radio: Bilateral shell.

X-ray: Brighter to SE.

References:

Schaudel *et al.* 2002, ASPC, 271, 391. ROSAT observations.
 Robbins *et al.* 2012, MNRAS, 419, 2623. ATCA at 1.4 GHz (33″×45″ : S = 2.5±0.2 Jy), plus MOST at 843 MHz (43″×49″), plus other observations.

Prinz & Becker 2013, A&A, 550, A33. XMM-Newton observations.
 Green *et al.* 2014, PASA, 31, 42. Radio observations at 843 MHz (45″×50″).

G296.8–0.3

RA: 11^h58^m30^s
Dec: –62°35′

1-GHz flux/Jy: 9
Spectral index: 0.6

1156–62
Size/arcmin: 20×14
Type: S

Radio: Shell, brighter to the NW.

X-ray: Detected.

Distance: H_I absorption gives 9.6 kpc.

References:

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : S = 15.0 Jy) and Parkes 64-m at 5 GHz (4′ : S = 3.2 Jy).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8.4) and 5 GHz (4.4).
 Hwang & Markert 1994, ApJ, 431, 819. ROSAT observations.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43″×48″ : S = 9.2 Jy).
 Gaensler *et al.* 1998, MNRAS, 296, 813. ATCA at 1.3 GHz (22″×24″ : S = 7.0±0.3 Jy), including polarisation and H_I observations, plus review of flux densities.
 Sánchez-Ayaso *et al.* 2012, Ap&SS, 337, 573. XMM-Newton and IR observations.

G298.5–0.3

RA: 12^h12^m40^s
Dec: –62°52′

1-GHz flux/Jy: 5?
Spectral index: 0.4?

Size/arcmin: 5?
Type: ?

Radio: Not well resolved, may be part of a larger ring?

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Hwang & Markert 1994, ApJ, 431, 819. ROSAT upper limit.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×48″: $S=1.8$ Jy).
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G298.6–0.0

RA: 12^h13^m41^s
Dec: –62°37′

1-GHz flux/Jy: 5?
Spectral index: 0.3

Size/arcmin: 12×9
Type: S

Has been called G298.6–0.1.

Radio: Incomplete shell, in complex region.

X-ray: Centrally brightened.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×50″).
 Hwang & Markert 1994, ApJ, 431, 819. ROSAT upper limit.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×48″: $S=7.4$ Jy).
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Bamba *et al.* 2016, PASJ, 68, S5. Suzaku observations.

G299.2–2.9

RA: 12^h15^m13^s
Dec: –65°30′

1-GHz flux/Jy: 0.5?
Spectral index: ?

Size/arcmin: 18×11
Type: S

Radio: Faint source.

Optical: Filaments in W.

X-ray: Centrally brightened with shell at higher energies.

References:

Busser *et al.* 1996, A&A, 310, L1. ROSAT detection, plus optical studies.
 Slane *et al.* 1996, ApJ, 465, 840. Einstein, IRAS and radio observations.

Bai & Wang 2000, ApJ, 539, 760. ASCA observations.
 Park *et al.* 2007, ApJ, 665, 1173. Chandra observations.
 Part *et al.* 2014, ApJ, 792, L20. Chandra observations.

G299.6–0.5

RA: 12^h21^m45^s
Dec: –63°09′

1-GHz flux/Jy: 1.0?
Spectral index: ?

Size/arcmin: 13
Type: S

Radio: Faint shell, brightest to E.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×48″: $S=1.1$ Jy).

G301.4–1.0

RA: 12^h37^m55^s
Dec: –63°49′

1-GHz flux/Jy: 2.1?
Spectral index: ?

Size/arcmin: 37×23
Type: S

Radio: Faint, incomplete shell, with possible extension to southwest.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×48″: $S=2.3$ Jy).

G302.3+0.7

RA: 12^h45^m55^s
Dec: –62°08′

1-GHz flux/Jy: 5?
Spectral index: 0.4?

Size/arcmin: 17
Type: S

Radio: Distorted shell, in complex region, with possibly associated filament.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S=7.5$ Jy) and Parkes 64-m at 5 GHz (4′ : $S=3.0$ Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 49″ : $S=3.2$ Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.

G304.6+0.1

RA: 13^h05^m59^s
Dec: –62°42′

1-GHz flux/Jy: 14
Spectral index: 0.5

Size/arcmin: 8
Type: S
 Kes 17

Radio: Incomplete shell.

X-ray: Detected.

Distance: Possible limit of > 9.7 kpc from H I absorption.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4.4 : $S=6.9$ Jy).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H I absorption.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 48″ : $S=18$ Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
 Combi *et al.* 2010, A&A, 523, A76. XMM-Newton observations

Lee *et al.* 2011, ApJ, 740, 31. Akari and Spitzer observations.
 Wu *et al.* 2011, ApJ, 740, L12. Fermi observations.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Gök & Sezer 2012, MNRAS, 423, 1215. Suzaku observations.
 Gelfand *et al.* 2013, ApJ, 777, 148. ATCA at 1.4 GHz (8″ × 23″ : $S=10.9 \pm 0.4$ Jy), plus other observations.
 Pannuti *et al.* 2014, AJ, 147, 55. ASCA and XMM-Newton observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Washino *et al.* 2016, PASJ, 68, S4. Suzaku observations.

G306.3–0.9

RA: 13^h21^m50^s
Dec: –63°34′

1-GHz flux/Jy: 0.16?
Spectral index: 0.5?

Size/arcmin: 4
Type: S?

Radio: Diffuse emission.

X-ray: Partial shell.

References:

Reynolds *et al.* 2013, ApJ, 766, 112. Chandra observations, and ATCA at 5.5 GHz (23″ × 26″), and 9 GHz.
 Combi *et al.* 2016, A&A, 592, A125. XMM-Newton and Chandra observations.

G308.1–0.7

RA: 13^h37^m37^s
Dec: –63°04′

1-GHz flux/Jy: 1.2?
Spectral index: ?

Size/arcmin: 13
Type: S

Radio: Faint shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 48″ : $S=1.3$ Jy).

G308.4–1.4

RA: 13^h41^m30^s
Dec: –63°44′

1-GHz flux/Jy: 0.4?
Spectral index: ?

Size/arcmin: 12×6?
Type: S?

W part has been called G308.3–1.4.

Radio: Complex structure, with multiple arcs.

X-ray: Limb brightened partial shell in W.

References:

Schaudel *et al.* 2002, ASPC, 271, 391. ROSAT observations.
 Prinz & Becker 2012, A&A, 544, A7. ATCA at 1.4 GHz
 (53″×64″ : $S=0.33$ Jy) and 2.5 GHz (29″×35″ : $S=0.24$ Jy),
 plus Chandra and other observations.
 Hui *et al.* 2012, ApJ, 750, 7. XMM-Newton and other observa-

tions.
 De Horta *et al.* 2013, MNRAS, 428, 1980. ATCA at 1.4 GHz
 (54″×65″) and 2.5 GHz (29″×35″), plus other observations.
 Green *et al.* 2014, PASA, 31, 42. Radio observations at
 843 MHz (45″×50″).

G308.8–0.1

RA: 13^h42^m30^s
Dec: –62°23′

1-GHz flux/Jy: 15?
Spectral index: 0.4?

Size/arcmin: 30×20?
Type: C?

Incorporates previous catalogued remnant G308.7+0.0.

Radio: Bright ridge in north, and arc to south.

Point sources: Pulsar near centre of remnant.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S=16.7$ Jy) and Parkes 64-m at 5 GHz (4′ : $S=7.0$ Jy).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz
 (4′4″ : $S=6.5$ Jy).
 Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz
 (50″).
 Wilson 1986, ApJ, 302, 718. Lack of detection with Einstein.

Caswell *et al.* 1992, ApJ, 399, L151. MOST at 843 MHz
 (43″×49″).
 Kaspi *et al.* 1992, ApJ, 399, L155. Pulsar observations.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-
 tions.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G309.2–0.6

RA: 13^h46^m31^s
Dec: –62°54′

1-GHz flux/Jy: 7?
Spectral index: 0.4?

Size/arcmin: 15×12
Type: S

Has been called G309.2–0.7.

Radio: Distorted shell.

X-ray: Extended emission, with unrelated central source.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S=10.0$ Jy) and Parkes 64-m at 5 GHz (4′ : $S=3.9$ Jy).
 Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz
 (1′5″).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz
 (44″×50″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
 (43″×48″ : $S=6$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.
 Gaensler *et al.* 1998, MNRAS, 299, 812. ATCA at 1.3 GHz
 (24″×23″ : $S=5.2\pm0.2$ Jy).
 Rakowski *et al.* 2001, ApJ, 548, 258. ASCA and ROSAT obser-
 vations.
 Rakowski *et al.* 2006, ApJ, 649, L111. Observations of central
 source.
 Safi-Harb *et al.* 2007, ApJ, 659, 407. Observations of central
 source.

G309.8+0.0

RA: 13^h50^m30^s
Dec: –62°05′

1-GHz flux/Jy: 17
Spectral index: 0.5

Size/arcmin: 25×19
Type: S

Radio: Distorted shell.

Point sources: Steep radio spectrum source near the centre of the remnant.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 26.4$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 7.4$ Jy).
 Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (1′).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ : $S > 8.8$).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G310.6–1.6

RA: 14^h00^m45^s
Dec: –63°26′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 2.5
Type: C?

X-ray: Bright central nebula, with faint shell.

Point sources: X-ray pulsar, and extended emission.

References:

Tomsick *et al.* 2009, ApJ, 701, 811. Chandra observations.
 Renaud *et al.* 2010, ApJ, 716, 663. Chandra and other observations.

G310.6–0.3

RA: 13^h58^m00^s
Dec: –62°09′

1-GHz flux/Jy: 5?
Spectral index: ?

Kes 20B
Size/arcmin: 8
Type: S

Radio: Asymmetric shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ : $S = 5.4$ Jy).
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G310.8–0.4

RA: 14^h00^m00^s
Dec: –62°17′

1-GHz flux/Jy: 6?
Spectral index: ?

Kes 20A
Size/arcmin: 12
Type: S

Radio: Arc in E, in complex region.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ : $S = 6.9$ Jy).
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.

G311.5–0.3

RA: 14^h05^m38^s
Dec: –61°58′

1-GHz flux/Jy: 3?
Spectral index: 0.5

Size/arcmin: 5
Type: S

Radio: Shell, not well resolved.

X-ray: Detected.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Caswell & Barnes 1985, MNRAS, 216, 753. Molonglo at 408 MHz (3′).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43″×49″: $S=2.9$ Jy).
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Pannuti *et al.* 2014, AJ, 147, 55. ASCA observations.

G312.4–0.4

RA: 14^h13^m00^s
Dec: –61°44′

1-GHz flux/Jy: 45
Spectral index: 0.36

Size/arcmin: 38
Type: S

Radio: Irregular, incomplete shell.

X-ray: Weak emission in W.

Point sources: Nearby γ -ray sources and pulsars.

Distance: HI absorption suggests > 6 kpc and possibly > 14 kpc.

References:

Caswell & Barnes 1985, MNRAS, 216, 753. Molonglo at 408 MHz (3′: $S=56$ Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″: $S > 19$), plus Parkes 64-m at 4.5 GHz ($S = 30 \pm 2$ Jy) and 8.55 GHz ($S = 17 \pm 4$ Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.

Roberts *et al.* 1999, ApJ, 515, 712. MOST at 843 MHz (43″×49″).
 Case & Bhattacharya 1999, ApJ, 521, 246. Nearby γ -ray sources.
 Doherty *et al.* 2003, MNRAS, 339, 1048. ATCA at 1.4 GHz (25″) plus HI absorption, and Chandra observations.

G312.5–3.0

RA: 14^h21^m00^s
Dec: –64°12′

1-GHz flux/Jy: 3.5?
Spectral index: ?

Size/arcmin: 20×18
Type: S

Radio: Distorted shell.

References:

Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10′.4)
 Kane & Vaughan 2003, MNRAS, 344, 625. ATCA at 1.4 GHz (129″×116″) and 2.4 GHz (75″×67″).

G315.1+2.7

RA: 14^h24^m30^s
Dec: –57°50′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 190×150
Type: S

Radio: Poorly defined shell.

Optical: Filaments, brighter in NE.

References:

Duncan *et al.* 1997, MNRAS, 287, 722. Parkes 64-m at 2.4 GHz (11′: $S=19 \pm 3$ Jy).
 Combi *et al.* 1998, A&A, 333, 298. Radio survey observations.

Stupar *et al.* 2007, MNRAS, 374, 1441. Optical and various radio observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G315.4–2.3

RA: 14^h43^m00^s
Dec: –62°30′

1-GHz flux/Jy: 49
Spectral index: 0.6

RCW 86, MSH 14–63

Size/arcmin: 42
Type: S

Possibly the remnant of the SN of AD185?

Radio: Shell, brightest to the SW.

Optical: Bright, radiative filaments, with some faint Balmer dominated filaments.

X-ray: Partial shell, with thermal and non-thermal emission.

Point sources: Several X-ray sources.

Distance: Optical observations imply 2.3 kpc.

References:

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : S=86 Jy) and Parkes 64-m at 5 GHz (4′ : S=18.2 Jy).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).
 Winkler 1978, ApJ, 221, 220. X-ray detection.
 Leibowitz & Danziger 1983, MNRAS, 204, 273. Optical spectra.
 Pisarski *et al.* 1984, ApJ, 277, 710. Einstein observations
 Nugent *et al.* 1984, ApJ, 284, 612. X-ray spectrum.
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″ × 50″).
 Long & Blair 1990, ApJ, 358, L13. Balmer dominated optical filaments.
 Greidanus & Strom 1990, A&A, 240, 385. IRAS observations.
 Kaastra *et al.* 1992, A&A, 264, 654. Ginga X-ray spectra.
 Strom 1994, MNRAS, 268, L5. Historical association
 Chin & Huang 1994, Nature, 371, 398. Questioning of historical association.
 Schaefer 1995, AJ, 110, 1793. Questioning of historical association.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 48″ : S > 22).
 Rosado *et al.* 1996, A&A, 315, 243. Optical kinematics.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Smith *et al.* 1997, AJ, 114, 2664. Observations of Balmer dominated filaments.
 Vink *et al.* 1997, A&A, 328, 628. ASCA spectroscopy.
 Bocchino *et al.* 2000, A&A, 360, 671. BeppoSAX observations of N and SW.
 Bamba *et al.* 2000, PASJ, 52, 1157. ASCA observations.
 Dickel *et al.* 2001, ApJ, 546, 447. ATCA at 1.34 GHz (8″), including polarisation.
 Ghavamian *et al.* 2001, ApJ, 547, 995. Optical spectroscopy.
 Borkowski *et al.* 2001, ApJ, 550, 334. ASCA observations.

Rho *et al.* 2002, ApJ, 581, 1116. Chandra observations.
 Gvaramadze & Vikhlinin 2003, A&A, 401, 625. Chandra point source search.
 Sollerman *et al.* 2003, A&A, 407, 249. Optical spectroscopy.
 Kaplan *et al.* 2004, ApJS, 153, 269. Chandra limits for any compact source.
 Bamba *et al.* 2005, ApJ, 621, 793. Chandra observations of rim.
 Vink *et al.* 2006, ApJ, 648, L33. Chandra and XMM-Newton observations.
 Ueno *et al.* 2007, PASJ, 59, S171. Suzaku observations.
 Aharonian *et al.* 2009, ApJ, 692, 1500. γ -ray observations.
 Yamaguchi *et al.* 2011, PASJ, 63, S837. Suzaku observations.
 Helder *et al.* 2011, ApJ, 737, 85. XMM-Newton and optical observations.
 Williams *et al.* 2011, ApJ, 741, 96. Spitzer observations.
 Mignani *et al.* 2012, MNRAS, 425, 2309. X-ray and optical observations of compact X-ray sources.
 Lemoine-Goumard *et al.* 2012, A&A, 545, A28. γ -ray observations.
 Helder *et al.* 2013, MNRAS, 435, 910. Optical proper motion studies.
 Castro *et al.* 2013, ApJ, 779, 49. Chandra of NW.
 Yuan *et al.* 2014, ApJ, 785, L22. γ -ray observations.
 Tsubone *et al.* 2014, in EFXU, p72. Suzaku observations.
 Broersen *et al.* 2014, MNRAS, 441, 3040. XMM-Newton observations.
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
 Ajello *et al.* 2016, ApJ, 819, 98. γ -ray observations, and ATCA HI of surroundings.
 Yamaguchi *et al.* 2016, ApJ, 820, L3. Chandra observations of NE.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).

G315.4–0.3

RA: 14^h35^m55^s
Dec: –60°36′

1-GHz flux/Jy: 8
Spectral index: 0.4

Size/arcmin: 24 × 13
Type: ?

Radio: Irregular non-thermal emission, with H_{II} region superposed in E.

Optical: Detected.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S=15.9 Jy) and Parkes 64-m at 5 GHz (4′ : S=4.9 Jy).
 Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz (50″ : S=6.25 Jy), re-assessment of earlier flux densities.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43″ × 49″ : S=3.1 Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G315.9–0.0

RA: 14^h38^m25^s
Dec: –60°11′

1-GHz flux/Jy: 0.8?
Spectral index: ?

Size/arcmin: 25×14
Type: S

Has been called G315.8–0.0.

Radio: Faint, distorted shell, with elongated trail to pulsar.

Point sources: Pulsar at end of radio trail.

References:

Kesteven *et al.* 1987, AuJPh, 40, 855. MOST at 843 MHz (44″×50″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:S=0.9 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH

observations.
 Camilo *et al.* 2009, ApJ, 703, L55. Pulsar detection.
 Ng *et al.* 2012, ApJ, 746, 105. ATCA at 1.4, 2.5, 5 and 9 GHz, including polarisation, of pulsar trail.

G316.3–0.0

RA: 14^h41^m30^s
Dec: –60°00′

1-GHz flux/Jy: 20?
Spectral index: 0.4

Size/arcmin: 29×14
Type: S

(MSH 14–57)

Radio: Distorted shell, with possible ‘blowout’.

X-ray: Detected.

Distance: H_I absorption data suggests > 7.2 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H_I absorption.
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′:S=16.7 Jy).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×51″).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:S=20 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G317.3–0.2

RA: 14^h49^m40^s
Dec: –59°46′

1-GHz flux/Jy: 4.7?
Spectral index: ?

Size/arcmin: 11
Type: S

Radio: Incomplete shell.

Optical: Detected.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:S=5.2 Jy).
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G318.2+0.1

RA: 14^h54^m50^s
Dec: –59°04′

1-GHz flux/Jy: >3.9?
Spectral index: ?

Size/arcmin: 40×35
Type: S

Radio: Faint shell, with central H_{II} region.

X-ray: Sources within remnant.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:S>4.3).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Bocchino *et al.* 2001, A&A, 367, 629. BeppoSAX and ROSAT observations.
 Onako *et al.* 2016, ApJ, 829, 106. Akari observations.

G318.9+0.4

RA: 14^h58^m30^s
Dec: –58°29′

1-GHz flux/Jy: 4?
Spectral index: 0.2?

Size/arcmin: 30×14
Type: C

May not be a SNR?

Radio: Complex arcs, with off-centre core.

References:

Whiteoak 1990, *Nature*, 347, 157. MOST at 843 MHz (43″×51″).
 Whiteoak 1993, *ApJ*, 415, 701. MOST at 843 MHz (43″×51″ : $S=4.8\pm0.6$ Jy), Parkes 64-m at 4.5 GHz (4′7 : $S=3.7\pm0.2$ Jy) and 8.4 GHz (2′8 : $S=3.0\pm0.4$ Jy) including polarisation, and

ATCA at 1.4 GHz and 4.8 GHz (11″×13″) of core.
 Whiteoak & Green 1996, *A&AS*, 118, 329. MOST at 843 MHz (43″×50″ : $S=4.8$ Jy).
 Green *et al.* 1997, *AJ*, 114, 2058. Parkes 64-m OH observations.

G320.4–1.2

RA: 15^h14^m30^s
Dec: –59°08′

1-GHz flux/Jy: 60?
Spectral index: 0.4

MSH 15–52, RCW 89

Size/arcmin: 35
Type: C

Has been suggested as the remnant of the SN of AD185?

Radio: Ragged shell.

Optical: RCW 89 is the H α emitting region to the NW.

X-ray: Partial shell, central nebula and pulsar and ‘jet’.

Point sources: Radio and X-ray pulsar, with wind nebula.

Distance: HI absorption indicates 5.2 kpc.

References:

Caswell *et al.* 1975, *A&A*, 45, 239. Parkes HI absorption.
 Dickel & Milne 1976, *AuJPh*, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).
 Dopita *et al.* 1977, *ApJ*, 214, 179. Optical spectra.
 Caswell *et al.* 1981, *MNRAS*, 195, 89. FIRST at 1415 MHz (50″).
 Seward & Harnden 1982, *ApJ*, 256, L45. X-ray observations of pulsar.
 Manchester *et al.* 1982, *ApJ*, 262, L31. Radio observations of pulsar.
 Seward *et al.* 1983, *ApJ*, 267, 698. X-ray, Optical and IR.
 van den Bergh & Kamper 1984, *ApJ*, 280, L51. Optical expansion.
 Seward *et al.* 1984, *ApJ*, 281, 650. X-ray observations of pulsar and nebulosity.
 Lortet *et al.* 1987, *A&A*, 180, 65. Optical observations.
 Trussoni *et al.* 1990, *A&A*, 234, 403. EXOSAT observations.
 Asaoka & Koyama 1990, *PASJ*, 42, 625. Ginga X-ray spectrum.
 Arendt 1991, *AJ*, 101, 2160. IRAS observations, including compact source.
 Milne *et al.* 1993, *MNRAS*, 264, 853. Parkes 64-m at 4.8 GHz (4′5 : $S=37\pm7$ Jy) and 8.4 GHz (3′0 : $S=24\pm4$ Jy), including polarisation and review of flux densities.
 Strom 1994, *MNRAS*, 268, L5. Historical association.
 Chin & Huang 1994, *Nature*, 371, 398. Questioning of historical association.
 Matz *et al.* 1994, *ApJ*, 434, 288. X-ray observations of pulsar.
 Schaefer 1995, *AJ*, 110, 1793. Questioning of historical association.
 Du Plessis *et al.* 1995, *ApJ*, 453, 746. Hartesbeesthoek 26-m at 2.3, 5 and 8.5 GHz ($S=42,35.6$ and 14.5 Jy).
 Greiveldinger *et al.* 1995, *ApJ*, 454, 855. ROSAT observations.

Trussoni *et al.* 1996, *A&A*, 306, 581. ROSAT observations.
 Tamura *et al.* 1996, *PASJ*, 48, L33. ASCA observations.
 Whiteoak & Green 1996, *A&AS*, 118, 329. MOST at 843 MHz (43″×50″ : $S=62$ Jy).
 Green *et al.* 1997, *AJ*, 114, 2058. Parkes 64-m OH observations.
 Marsden *et al.* 1997, *ApJ*, 491, L39. X-ray spectroscopy.
 Brazier & Becker 1997, *MNRAS*, 284, 335. ROSAT observations.
 Gaensler *et al.* 1999, *MNRAS*, 305, 724. ATCA at 1.4 GHz (24″×21″), plus HI observations, and 5.3 GHz (15″×10″).
 Sako *et al.* 2000, *ApJ*, 537, 422. Possible high energy γ -ray detection of pulsar.
 Mineo *et al.* 2001, *A&A*, 380, 695. BeppoSAX observations.
 Gaensler *et al.* 2002, *ApJ*, 569, 878. Chandra observations of pulsar and nebula.
 Dubner *et al.* 2002, *AJ*, 123, 337. ATCA at 1.4 GHz (4′0×2′7), plus HI observations.
 Aharonian *et al.* 2005, *A&A*, 435, L17. γ -ray detection.
 Yatsu *et al.* 2005, *ApJ*, 631, 312. Chandra observations of pulsar and jet.
 DeLaney *et al.* 2006, *ApJ*, 640, 929. Chandra and ROSAT multi-epoch observations of pulsar wind nebula.
 Kaplan & Moon 2006, *ApJ*, 644, 1056. Possible IR detection of pulsar.
 Forot *et al.* 2006, *ApJ*, 651, L45. X-ray observations of pulsar and nebula.
 Nakamori *et al.* 2008, *ApJ*, 677, 297. γ -ray observations.
 Yatsu *et al.* 2009, *PASJ*, 61, 129. Chandra observations of pulsar wind nebula.
 Koo *et al.* 2011, *ApJ*, 732, 6. Akari and Spitzer observations.
 An *et al.* 2014, *ApJ*, 793, 90. NuSTAR observations of PWN.

G320.6–1.6

RA: 15^h17^m50^s
Dec: –59°16′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 60×30
Type: S

Radio: Faint shell, overlapping G320.4–1.2 in W.

Optical: Detected.

References:

Milne *et al.* 1993, MNRAS, 264, 853. Parkes 64-m at 4.8 GHz (4′5) and 8.4 GHz (3′0), including polarisation.
 Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10′4).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:S>9.3).
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G321.9–1.1

RA: 15^h23^m45^s
Dec: –58°13′

1-GHz flux/Jy: >3.4?
Spectral index: ?

Size/arcmin: 28
Type: S

Radio: Faint shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×51″:S>3.8).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G321.9–0.3

RA: 15^h20^m40^s
Dec: –57°34′

1-GHz flux/Jy: 13
Spectral index: 0.3

Size/arcmin: 31×23
Type: S

Radio: Shell brighter to the W, with Cir X-1 to N.

Point sources: Compact, probably thermal source at S edge.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:S=18.3 Jy) and Parkes 64-m at 5 GHz (4′:S=7.8 Jy).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×52″).
 Stewart *et al.* 1993, MNRAS, 261, 593. ATCA at 1.5 GHz (21″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43″×51″:S>8.3).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Mignani *et al.* 2002, A&A, 386, 487. HST proper motion study of Cir X-1.
 Tudose *et al.* 2006, MNRAS, 372, 417. MOST at 843 MHz.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G322.1+0.0

RA: 15^h20^m49^s
Dec: –57°10′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 8×4.5?
Type: S?

Radio: Circular shell, with extension to S.

X-ray: Diffuse emission.

Point sources: Cir X-1 HMXB at centre.

References:

Heinz *et al.* 2013, ApJ, 779, 171. Chandra observations and ATCA at 1.1–3.1 GHz (4′0×4′9).

G322.5–0.1

RA: 15^h23^m23^s
Dec: –57°06′

1-GHz flux/Jy: 1.5
Spectral index: 0.4

Size/arcmin: 15
Type: C

Radio: Shell with central extended source.

Point sources: PN Pe 2-8 within boundary.

References:

Whiteoak 1992, MNRAS, 256, 121. MOST at 843 MHz
(43″×51″ : S=2.0±0.3 Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
(43″×51″ : S = 1.7 Jy), plus Parkes 64-m at 4.5 GHz

(=0.89±0.13).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G323.5+0.1

RA: 15^h28^m42^s
Dec: –56°21′

1-GHz flux/Jy: 3?
Spectral index: 0.4?

Size/arcmin: 13
Type: S

Radio: Distorted shell, confused with thermal emission.

Point sources: Compact, probably thermal source near centre.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S = 4.2 Jy) and Parkes 64-m at 5 GHz (4′ : S=1.5 Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
(43″×52″ : S=4.2 Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G326.3–1.8

RA: 15^h53^m00^s
Dec: –56°10′

1-GHz flux/Jy: 145
Spectral index: varies

MSH 15–56

Size/arcmin: 38
Type: C

Has been called G326.2–1.7.

Radio: Shell, with elongated, flat-spectrum core.

Optical: Emission around the shell.

X-ray: Shell, with central extended emission.

Point sources: Compact X-ray source.

References:

Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 180 Jy).

Caswell *et al.* 1975, A&A, 45, 239. Parkes HI absorption.

Milne *et al.* 1979, MNRAS, 188, 437. FIRST at 1415 MHz
(0′.8 : S > 95) and Parkes 64-m at 14.7 GHz (2′.2 : S = 69±8 Jy).

van den Bergh 1979, ApJ, 227, 497. Optical observations.

Zealey *et al.* 1979, A&AS, 38, 39. Optical observations.

Dennefeld 1980, PASP, 92, 603. Optical spectra.

Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz
(44″×53″).

Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz
(43″×52″ : S = 153±40 Jy), and Parkes 64-m at 8.4 GHz
(3′ : S=68±5 Jy), including polarisation.

Seward 1990, ApJS, 73, 781. Einstein observations.

Kassim *et al.* 1993, ApJ, 419, 733. ROSAT image.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
(43″×52″ : S > 130).

Rosado *et al.* 1996, A&A, 315, 243. Optical kinematics.

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Dickel *et al.* 2000, ApJ, 543, 840. ATCA at 1.34 GHz
(8′.5×6′.4 : S > 60 Jy), 4.80 GHz (3′.8 : S = 25 Jy for core
only) and 8.64 GHz (3′.2 : S = 15 Jy for core only).

Temim *et al.* 2013, ApJ, 768, 61. XMM-Newton and Chandra
observations.

Yatsu *et al.* 2013, ApJ, 773, 25. XMM-Newton and Chandra
observations.

Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 5
frequencies between 30 and 143 GHz.

Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G327.1–1.1

RA: 15^h54^m25^s
Dec: –55°09′

1-GHz flux/Jy: 7?
Spectral index: ?

Size/arcmin: 18
Type: C

Radio: Shell, with off-centre core.

X-ray: Diffuse, with core.

References:

Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz (8′:S=10±15% Jy).
 Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:S=10.6 Jy) and Parkes 64-m at 5 GHz (4′:S=4.3 Jy).
 Lamb & Markert 1981, ApJ, 244, 94. Einstein observations.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×52″:S=7.6 Jy).
 Seward *et al.* 1996, ApJ, 471, 887. ROSAT observations.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Sun *et al.* 1999, ApJ, 511, 274. ASCA and ROSAT observa-

tions.
 Bocchino & Bandiera 2003, A&A, 398, 195. BeppoSAX observations.
 Temim *et al.* 2009, ApJ, 691, 895. Chandra and XMM-Newton observations.
 Acero *et al.* 2011, ICRC, 7, 185. γ -ray observations.
 Temim *et al.* 2015, ApJ, 808, 100. Chandra observations.
 Ma *et al.* 2016, ApJ, 820, 100. ATCA at 1.4 (19″×23″), 2.3 (11″×16″), 4.8 (13″×15″) and 8.6 GHz (8″×10″) of core, including polarisation.

G327.2–0.1

RA: 15^h50^m55^s
Dec: –54°18′

1-GHz flux/Jy: 0.4
Spectral index: ?

Size/arcmin: 5
Type: S

Has been called G327.24–0.13.

Radio: Shell, possibly with central emission.

Point sources: Central pulsar (magnetar).

References:

Camilo *et al.* 2007, ApJ, 666, L93. Pulsar observations.
 Gelfand & Gaensler 2007, ApJ, 667, 1111. Chandra and XMM-Newton observations, and 843 GHz (43″×53″:S=0.5±0.1 Jy) and SGPS at 1.4 GHz (S=0.3±0.1 Jy).

G327.4+0.4

RA: 15^h48^m20^s
Dec: –53°49′

1-GHz flux/Jy: 30?
Spectral index: 0.6

Size/arcmin: 21
Type: S
Kes 27

Has been called G327.3+0.4 and G327.3+0.5.

Radio: Incomplete, multi-arc shell, brightest to the SE.

X-ray: Diffuse, brighter in E.

Distance: HI absorption indicates 4.3 to 5.4 kpc.

References:

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′:S=58 Jy) and Parkes 64-m at 5 GHz (4′:S=12.4 Jy).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′) and 5 GHz (4′).
 Lamb & Markert 1981, ApJ, 244, 94. Einstein observations.
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×55″).
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz (43″×53″:S=32.2±6 Jy), and Parkes 64-m at 8.4 GHz (3′:S=9.4±0.8 Jy), including polarisation.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×53″:S=25 Jy).

Seward *et al.* 1996, ApJ, 471, 887. ROSAT observations.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (2′0″×1′8″), plus HI.
 Enoguchi *et al.* 2002, PASJ, 54, 229. ASCA observations.
 Kawasaki *et al.* 2005, ApJ, 631, 935. ASCA observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Chen *et al.* 2008, ApJ, 676, 1040. Chandra observations.
 Minami *et al.* 2014, in EFXU, p48. Suzaku observations.
 Xing *et al.* 2015, ApJ, 805, 19. γ -ray observations.

G327.4+1.0**RA:** 15^h46^m48^s**Dec:** –53°20′**1-GHz flux/Jy:** 1.9?**Spectral index:** ?**Size/arcmin:** 14**Type:** S**Radio:** Asymmetric shell.**References:**Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
(43′×54′; $S=2.1$ Jy).Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.

McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes
64-m at 1.4 GHz (2′0×1′8), plus HI.

G327.6+14.6

SN1006, PKS 1459–41

RA: 15^h02^m50^s
Dec: –41°56′**1-GHz flux/Jy:** 19
Spectral index: 0.6**Size/arcmin:** 30
Type: S

This is the remnant of the SN of AD1006.

Radio: Shell, with two bright arcs.

Optical: Filaments to the NW, with broad H α component.

X-ray: Thermal shell, with non-thermal limb-brightened arcs.

Point sources: The background Schweizer–Middleditch star is near the middle of the remnant.

Distance: Optical spectra and proper motion indicate 2.2 kpc.

References:

- van den Bergh 1976, ApJ, 208, L17. Optical observations.
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8'4) and 5 GHz (4'4).
 Becker *et al.* 1980, ApJ, 240, L33. X-ray spectroscopy.
 Schweizer & Middleditch 1980, ApJ, 241, 1039. Possible stellar remnant.
 Pye *et al.* 1981, MNRAS, 194, 569. Einstein observations.
 Caswell *et al.* 1983, MNRAS, 204, 921. FIRST at 1415 MHz (7'').
 Reynolds & Gilmore 1986, AJ, 92, 1138. VLA at 1.37 and 1.67 GHz (16'' \times 20'').
 Kirshner *et al.* 1987, ApJ, 315, L135. Broad H α optical component.
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44'' \times 66'').
 Fesen *et al.* 1988, ApJ, 327, 164. UV absorption spectra of the Schweizer–Middleditch star.
 Roger *et al.* 1988, ApJ, 332, 940. MOST at 843 MHz (44'' \times 66'': $S=17.5\pm 1.5$ Jy).
 Long *et al.* 1988, ApJ, 333, 749. Optical proper motion for distance.
 Jones & Pye 1989, MNRAS, 238, 567. EXOSAT observations.
 Leahy *et al.* 1991, ApJ, 374, 218. HEAO-1 X-ray spectra.
 Wu *et al.* 1993, ApJ, 416, 247. UV spectra.
 Reynolds & Gilmore 1993, AJ, 106, 272. VLA at 1.37 and 1.67 GHz (24''), including polarisation.
 Moffett *et al.* 1993, AJ, 106, 1566. VLA at 1.37 and 1.67 GHz (10'' \times 14''), for proper motion studies.
 Ozaki *et al.* 1994, PASJ, 46, 367. X-ray observations.
 Raymond *et al.* 1995, ApJ, 454, L31. Far UV spectroscopy.
 Koyama *et al.* 1995, Nature, 378, 255. ASCA observations.
 Willingale *et al.* 1996, MNRAS, 278, 749. ROSAT observations.
 Blair *et al.* 1996, ApJ, 468, 871. Optical absorption studies.
 Laming *et al.* 1996, ApJ, 472, 267. Modelling of optical spectra, including distance.
 Wu *et al.* 1997, ApJ, 477, L53. Far UV absorption spectra of the Schweizer–Middleditch star.
 Winkler & Long 1997, ApJ, 486, L137. UV absorption spectra of background quasar.
 Winkler & Long 1997, ApJ, 491, 829. ROSAT and optical images.
 Tanimori *et al.* 1998, ApJ, 497, L25. γ -ray detection.
 Vink *et al.* 2000, A&A, 354, 931. X-ray spectroscopy.
 Burleigh *et al.* 2000, A&A, 356, 585. Optical spectroscopy of the Schweizer–Middleditch star.
 Allen *et al.* 2001, ApJ, 558, 739. ASCA, ROSAT and other X-ray observations.
 Dubner *et al.* 2002, A&A, 387, 1047. ATCA at 1.4 GHz (4'7 \times 3'0) for H α , plus CO observations.
 Ghavamian *et al.* 2002, ApJ, 572, 888. Optical of filaments in NW.
 Sollerman *et al.* 2003, A&A, 407, 249. Optical spectroscopy.
 Winkler *et al.* 2003, ApJ, 585, 324. Optical proper motion studies.
 Vink *et al.* 2003, ApJ, 587, L31. XMM-Newton observations.
 Bamba *et al.* 2003, ApJ, 589, 827. Chandra observations of NE.
 Korreck *et al.* 2004, ApJ, 615, 280. Far-uv observations.
 Aharonian *et al.* 2005, A&A, 437, 135. γ -ray limit.
 Winkler *et al.* 2005, ApJ, 624, 189. HST absorption towards background sources.
 Kalemci *et al.* 2006, ApJ, 640, L55. γ -ray limit upper limit.
 Kalemci *et al.* 2006, ApJ, 644, 274. INTEGRAL observations.
 Acero *et al.* 2007, A&A, 475, 883. XMM-Newton observations.
 Raymond *et al.* 2007, ApJ, 659, 1257. HST H α observations.
 Hamilton *et al.* 2007, MNRAS, 381, 771. UV spectroscopy of the Schweizer–Middleditch star.
 Bamba *et al.* 2008, AdSpR, 41, 411. Suzaku observations.
 Cassam-Chenaï *et al.* 2008, ApJ, 680, 1180. ATCA and VLA at 1.5 GHz (6'' \times 9'') plus Chandra observations.
 Yamaguchi *et al.* 2008, PASJ, 60, S141. Suzaku observations.
 Bamba 2008, PASJ, 60, S153. Suzaku observations.
 Dyer *et al.* 2009, AJ, 137, 2956. GBT and VLA observations at 1.4 GHz.
 Winkler *et al.* 2011, ApJ, 742, 80. Multi-epoch UV spectroscopy of the Schweizer–Middleditch star.
 Miceli *et al.* 2012, A&A, 546, A66. XMM-Newton observations.
 Miceli *et al.* 2013, A&A, 550, A80. XMM-Newton observations.
 Broersen *et al.* 2013, A&A, 552, A9. XMM-Newton observations of NW knot.
 Katsuda *et al.* 2013, ApJ, 763, 85. Chandra proper motion study of NW.
 Winkler *et al.* 2013, ApJ, 764, 156. Spitzer observations.
 Uchida *et al.* 2013, ApJ, 771, 56. Suzaku observations.
 Reynoso *et al.* 2013, AJ, 145, 104. VLA and ATCA at 1.4 GHz (10''), including polarisation.
 Nikolić *et al.* 2013, Science, 340, 45. Optical spectroscopy.
 Winkler *et al.* 2014, ApJ, 781, 65. Chandra observations and H α spectroscopy.
 Miceli *et al.* 2014, ApJ, 782, L33. XMM-Newton observations of SW.
 Acero *et al.* 2015, A&A, 580, A74. γ -ray limit.
 Sparls *et al.* 2015, ApJ, 815, L9. Polarised optical line observations.
 Li *et al.* 2015, MNRAS, 453, 3953. XMM-Newton observations.
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.
 Xing *et al.* 2016, ApJ, 823, 44. γ -ray observations.
 Li *et al.* 2016, MNRAS, 462, 158. XMM-Newton observations.

G328.4+0.2

RA: 15^h55^m30^s
Dec: –53°17′

1-GHz flux/Jy: 15
Spectral index: 0.0

(MSH 15–57)

Size/arcmin: 5
Type: F

Radio: Amorphous emission, with central bar.

X-ray: Detected at high energies.

Distance: H_I absorption indicates > 17.4 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50′).
 Wilson 1986, ApJ, 302, 718. Lack of detection with Einstein.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′×54′: $S=15$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Gaensler *et al.* 2000, ApJ, 542, 380. ATCA at 1.4 GHz

(16′5×19′5 : $S=14.3\pm0.1$ Jy) and 4.5 GHz (2′0×1′5 : $S=12.5\pm0.2$ Jy).
 Hughes *et al.* 2000, ApJ, 542, 386. ASCA observations.
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (1′8×2′0), plus H_I.
 Johnston *et al.* 2004, MNRAS, 348, L19. ATCA at 19 GHz (6′1×7′7), including polarisation.
 Gelfand *et al.* 2007, ApJ, 663, 468. ATCA at 1.4 GHz (5′8×7′0 : $S=13.8\pm0.4$ Jy), plus XMM-Newton observations.

G329.7+0.4

RA: 16^h01^m20^s
Dec: –52°18′

1-GHz flux/Jy: >34?
Spectral index: ?

Size/arcmin: 40×33
Type: S

Radio: Diffuse shell, in complex region.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′×53′: $S>38$).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (2′0×1′8), plus H_I.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G330.0+15.0

RA: 15^h10^m00^s
Dec: –40°00′

1-GHz flux/Jy: 350?
Spectral index: 0.5?

Lupus Loop

Size/arcmin: 180?
Type: S

Radio: Low surface brightness loop with H_I shell.

X-ray: Detected, with central source.

Point sources: Central, possibly pulsating, X-ray source.

References:

Milne 1971, AuJPh, 24, 757. Parkes 64-m at 408 MHz (48′), 635 MHz (31′) and 1410 MHz (15′).
 Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz (8′4: $S=120\pm30\%$ Jy).
 Toor 1980, A&A, 85, 184. X-ray image and spectrum.
 Colomb & Dubner 1982, A&A, 112, 141. Argentine 30-m dish

at 1.42 GHz (30′), H_I observations.
 Leahy *et al.* 1991, ApJ, 374, 218. HEAO-1 X-ray spectra.
 Ozaki *et al.* 1994, PASJ, 46, 367. X-ray observations.
 Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.
 Shinn *et al.* 2006, ApJ, 644, L189. Far UV observations.

G330.2+1.0

RA: 16^h01^m06^s
Dec: –51°34′

1-GHz flux/Jy: 5?
Spectral index: 0.3

Size/arcmin: 11
Type: S?

Radio: Clumpy non-thermal emission, possibly a distorted shell.

X-ray: Shell.

Point sources: Central compact X-ray source.

Distance: H I absorption indicates > 4.9 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 8.6$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 4.0$ Jy).
 Caswell *et al.* 1983, MNRAS, 204, 915. FIRST at 1415 MHz (52″ × 47″), and MOST at 843 MHz (43″ × 55″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 55″ : $S = 4.7$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (2.0 × 1.8), plus H I.
 Torii *et al.* 2006, PASJ, 58, L11. ASCA detection.
 Park *et al.* 2009, ApJ, 695, 431. XMM-Newton and Chandra observations.
 Abramowski *et al.* 2014, MNRAS, 441, 790. γ -ray upper limit.

G332.0+0.2

RA: 16^h13^m17^s
Dec: –50°53′

1-GHz flux/Jy: 8?
Spectral index: 0.5

Size/arcmin: 12
Type: S

Radio: Incomplete shell.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″ × 57″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 55″ : $S = 8.9$ Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (2.0 × 1.8), plus H I.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G332.4–0.4

RA: 16^h17^m33^s
Dec: –51°02′

1-GHz flux/Jy: 28
Spectral index: 0.5

RCW 103

Size/arcmin: 10
Type: S

Radio: Shell, brightest to the S.

Optical: Filaments correspond well to the radio shell, brightest in SE.

X-ray: Brightest to NW, with point source near centre.

Point sources: Central, variable X-ray source, and nearby pulsar.

Distance: HI absorption indicates 3.1 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes HI absorption.
 Tuohy & Garmire 1980, ApJ, 239, L107. Einstein detection of X-ray point source.
 Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50″).
 Lamb & Markert 1981, ApJ, 244, 94. Einstein observations.
 Ruiz 1983, AJ, 88, 1210. Optical spectra.
 Tuohy *et al.* 1983, ApJ, 268, 778. X-ray observations.
 Leibowitz & Danziger 1983, MNRAS, 204, 273. Optical spectra.
 Nugent *et al.* 1984, ApJ, 284, 612. X-ray spectrum (and Einstein image from Tuohy, private communication).
 Meaburn & Allen 1986, MNRAS, 222, 593. Optical spectra.
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×57″).
 Oliva *et al.* 1990, A&A, 240, 453. IR spectroscopy.
 Dickel *et al.* 1996, AJ, 111, 340. ATCA at 1.36 (8″) and 2.37 GHz (4″5″), including polarisation.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×55″:S=34 Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Gotthelf *et al.* 1997, ApJ, 487, L175. ASCA observations of compact X-ray source.
 Carter *et al.* 1997, PASP, 109, 990. Optical expansion.
 Torii *et al.* 1998, ApJ, 494, L207. ASCA detection of nearby pulsar.

Kaspi *et al.* 1998, ApJ, 503, L161. Pulsar observations.
 Gotthelf *et al.* 1999, ApJ, 514, L107. X-ray variability of central source.
 Oliva *et al.* 1999, A&A, 343, 943. ISO spectroscopy.
 Torii *et al.* 2000, ApJ, 534, L71. X-ray timing on pulsar, including glitch.
 Reynoso *et al.* 2004, PASA, 21, 82. ATCA at 1.4 GHz (50″), including HI absorption to central source.
 Russeil *et al.* 2005, A&A, 429, 497. H α observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Paron 2006, PASA, 23, 69. CO and HCO⁺ observations of surroundings.
 De Luca 2006, Science, 313, 814. XMM-Newton observations of central source.
 De Luca 2007, Ap&SS, 308, 231. XMM-Newton observation of periodicity of central source.
 Matsumoto *et al.* 2007, PASJ, 59, S199. Suzaku observations.
 De Luca 2008, ApJ, 682, 1185. IR observations of central source.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Xing *et al.* 2014, ApJ, 781, 64. γ -ray observations.
 Frank *et al.* 2015, ApJ, 810, 113. Chandra observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 Rea *et al.* 2016, ApJ, 828, L13. Chandra, NuSTAR and Swift observations.

G332.4+0.1

RA: 16^h15^m20^s
Dec: –50°42′

1-GHz flux/Jy: 26
Spectral index: 0.5

MSH 16–51, Kes 32

Size/arcmin: 15
Type: S

Has been called G332.4+0.2.

Radio: Distorted shell, with thermal jet and plume adjacent.

Optical: Detected.

X-ray: Shell, brightest to NW.

Point sources: Pulsar nearby.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Roger *et al.* 1985, Nature, 316, 44. MOST at 843 MHz (44″×57″).
 Caraveo 1993, ApJ, 415, L111. Nearby pulsar.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×56″:S=29 Jy).

Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Brinkmann *et al.* 1999, A&A, 346, 599. ROSAT image of remnant and nearby pulsar.
 Vink *et al.* 2004, ApJ, 604, 693. Chandra observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G332.5–5.6

RA: $16^{\text{h}}43^{\text{m}}20^{\text{s}}$
Dec: $-54^{\circ}30'$

1-GHz flux/Jy: 2?
Spectral index: 0.7?

Size/arcmin: 35
Type: S

Radio: Bipolar shell, with central emission also.

Optical: Patchy filaments.

X-ray: Emission from centre.

Distance: Optical extinction suggests 3 kpc.

References:

Reynoso & Green 2007, MNRAS, 375, 92. ATCA at 1.4 GHz ($40'' : S = 1.90 \pm 0.15$ Jy) and 2.4 GHz ($90'' : S = 1.3 \pm 0.2$ Jy) including polarisation, and 843 MHz ($43'' \times 53''$) plus ROSAT observations.

Stupar *et al.* 2007, MNRAS, 381, 377. Optical observations, plus ATCA at 1.4 GHz ($58''$) and 2.4 GHz ($95''$) including

polarisation, and other observations.

Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

Zhu *et al.* 2015, MNRAS, 452, 3470. Suzaku observations, and distance estimate.

Suárez *et al.* 2015, A&A, 583, A84. XMM-Newton observations of central region.

G335.2+0.1

RA: $16^{\text{h}}27^{\text{m}}45^{\text{s}}$
Dec: $-48^{\circ}47'$

1-GHz flux/Jy: 16
Spectral index: 0.5

Size/arcmin: 21
Type: S

Radio: Well defined shell.

Point sources: Old pulsar within remnant boundary.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz ($3' : S = 27.1$ Jy) and Parkes 64-m at 5 GHz ($4' : S = 8.6$ Jy).

Kaspi *et al.* 1996, AJ, 111, 2028. Pulsar observations.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

($43'' \times 57'' : S = 16$ Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

G336.7+0.5

RA: $16^{\text{h}}32^{\text{m}}11^{\text{s}}$
Dec: $-47^{\circ}19'$

1-GHz flux/Jy: 6
Spectral index: 0.5

Size/arcmin: 14×10
Type: S

Radio: Irregular shell.

Optical: Detected.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz ($3'$) and Parkes 64-m at 5 GHz ($4'$).

Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz ($44'' \times 60''$).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

($43'' \times 58'' : S = 6.1$ Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G337.0–0.1

(CTB 33)

RA: 16^h35^m57^s**1-GHz flux/Jy:** 1.5**Size/arcmin:** 1.5**Dec:** –47°36′**Spectral index:** 0.6?**Type:** S

This entry refers to a small (1′5) SNR, not the larger previously catalogued G337.0–0.1. Has mistakenly been called G337.7–0.1.

Radio: Shell, in a complex region.**Point sources:** Associated with a soft gamma repeater.**Distance:** Association with CTB 33 gives 11 kpc.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×58″:S=21 Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.
 Sarma *et al.* 1997, ApJ, 483, 335. ATCA at 1.4 GHz (12″) including HI, and 8.9 GHz (13″×15″) for recombination lines,

clarifying extent of the remnant.
 Woods *et al.* 1999, ApJ, 519, L139. Soft gamma repeater observations.
 Hurley *et al.* 2000, ApJ, 528, L21. ASCA observations of soft gamma repeater.
 Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.
 Castro *et al.* 2013, ApJ, 774, 36. Fermi observations.

G337.2–0.7**RA:** 16^h39^m28^s**1-GHz flux/Jy:** 1.5**Size/arcmin:** 6**Dec:** –47°51′**Spectral index:** 0.4**Type:** S**Radio:** Shell, brighter in S.**X-ray:** Extended emission.**Distance:** HI absorption suggests 2.0 to 9.3 kpc.**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:S=3.8 Jy) and Parkes 64-m at 5 GHz (4′:S=0.70 Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×58″:S=2.0 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Rakowski *et al.* 2001, ApJ, 548, 258. ASCA and ROSAT obser-

vations.
 Rakowski *et al.* 2006, ApJ, 646, 982. ATCA observations at 1.3 GHz (15″:S=1.55±0.05 Jy) and 5 GHz (15″:S=0.93±0.02 Jy), plus HI and Chandra observations.
 Yamaguchi *et al.* 2014, ApJ, 785, L27. Suzaku observations.
 Takata *et al.* 2016, PASJ, 68, S3. Suzaku observations.

G337.2+0.1**RA:** 16^h35^m55^s**1-GHz flux/Jy:** 1.5?**Size/arcmin:** 3×2**Dec:** –47°20′**Spectral index:** ?**Type:** ?**Radio:** Not well defined.**X-ray:** Detected.**Distance:** Association with HI hole gives 14 kpc.**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″:S=1.6 Jy)
 Combi *et al.* 2005, A&A, 431, L9. ASCA and other observations.

Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray observations of nearby source.
 Combi *et al.* 2006, ApJ, 653, L41. XMM-Newton observations.

G337.3+1.0

Kes 40

RA: 16^h32^m39^s
Dec: –46°36′**1-GHz flux/Jy:** 16
Spectral index: 0.55**Size/arcmin:** 15×12
Type: S**Radio:** Nearly complete shell.**References:**

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S=24.6$ Jy) and Parkes 64-m at 5 GHz (4′ : $S=7.2$ Jy).
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′.4) and 5 GHz (4′.4).
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×61″).
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz

(43″×59″ : $S=14.8\pm3.0$ Jy), and Parkes 64-m at 8.4 GHz (3′ : $S=5.1\pm0.6$ Jy), including polarisation.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″ : $S=20$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G337.8–0.1

Kes 41

RA: 16^h39^m01^s
Dec: –46°59′**1-GHz flux/Jy:** 18
Spectral index: 0.5**Size/arcmin:** 9×6
Type: S**Radio:** Distorted shell.**X-ray:** Centrally brightened.**Distance:** HI absorption suggests 11 kpc.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes HI absorption.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″ : $S=18$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact OH emission.
 Caswell 2004, MNRAS, 349, 99. ATCA at 1.7 GHz, for associated OH masers.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including HI.
 Combi *et al.* 2008, A&A, 488, L25. XMM-Newton observations.
 Zhang *et al.* 2015, ApJ, 799, 103. XMM-Newton, Chandra and CO observations.
 Liu *et al.* 2015, ApJ, 809, 102. γ -ray observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Qiao *et al.* 2016, ApJS, 227, 26. OH maser observations.

G338.1+0.4**Size/arcmin:** 15?
Type: S**RA:** 16^h37^m59^s
Dec: –46°24′**1-GHz flux/Jy:** 4?
Spectral index: 0.4**Radio:** Arc in NE, merging with thermal emission in S.**Optical:** Detected.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Zealey *et al.* 1979, A&AS, 38, 39. Optical detection.
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43″×59″ : $S=3.8$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G338.3–0.0

RA: 16^h41^m00^s
Dec: –46°34′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 8
Type: C?

Radio: Irregular shell, in complex region.

X-ray: Central X-ray source and nebula.

Point sources: Central pulsar.

Distance: HI observations suggest 8 to 13 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″:S=7.4 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Aharonian *et al.* 2005, Science, 307, 1938. γ -ray detection.
 Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray observations.
 Landi *et al.* 2006, ApJ, 651, 190. X-ray observations.
 Funk *et al.* 2007, ApJ, 662, 517. XMM-Newton observations.
 Lemièrre *et al.* 2009, ApJ, 706, 1269. Chandra observations of central source and nebula.

Slane *et al.* 2010, ApJ, 720, 266. Fermi observations.
 Castelletti *et al.* 2011, A&A, 536, A98. GMRT at 235 MHz (10″×26″), 610 MHz (5″0×12″6) and 1280 MHz (5″0×6″4), plus ATCA at 2.3 GHz (4″3×4″8).
 Gotthelf *et al.* 2014, ApJ, 788, 155. NuSTAR observations.
 Lemoine-Goumard *et al.* 2014, ApJ, 794, L16. γ -ray observations.
 Abramowski *et al.* 2014, MNRAS, 439, 2828. γ -ray observations.
 see also: Abramowski *et al.* 2014, MNRAS, 441, 3640. Erratum.
 Supan *et al.* 2016, A&A, 589, A51. SGPS HI and other observations.

G338.5+0.1

RA: 16^h41^m09^s
Dec: –46°19′

1-GHz flux/Jy: 12?
Spectral index: ?

Size/arcmin: 9
Type: ?

Radio: Circle of non-thermal emission in complex region, not well defined.

Distance: HI absorption suggests 11 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″:S=13 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

tions.
 Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including HI.
 Abramowski *et al.* 2014, ApJ, 794, L1. γ -ray observations.

G340.4+0.4

RA: 16^h46^m31^s
Dec: –44°39′

1-GHz flux/Jy: 5
Spectral index: 0.4

Size/arcmin: 10×7
Type: S

Radio: Distorted shell, elongated east–west.

Optical: Detected.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:S=8.2 Jy) and Parkes 64-m at 5 GHz (4′:S=2.9 Jy).
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50″).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (75″×48″:S=9.8±0.9 Jy) and 1.4 GHz (27″×9″:S=

3.6±0.1 Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×61″:S=5.9 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.

G340.6+0.3

RA: 16^h47^m41^s
Dec: –44°34′

1-GHz flux/Jy: 5?
Spectral index: 0.4?

Size/arcmin: 6
Type: S

Radio: Incomplete shell.

Optical: Possible associated filaments.

Distance: H I absorption suggests 15 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 7.0$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 2.8$ Jy).
 Zealey *et al.* 1979, A&AS, 38, 39. Optical observations.
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50′′).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (75′′×48′′ : $S = 9.2 \pm 0.9$ Jy) and 1.4 GHz (27′′×9′′ : $S = 5.8 \pm 0.1$ Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43′′×61′′ : $S = 4.5$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including H I.

G341.2+0.9

RA: 16^h47^m35^s
Dec: –43°47′

1-GHz flux/Jy: 1.5?
Spectral index: 0.6?

Size/arcmin: 22×16
Type: C

Radio: Incomplete shell, with extension to SW.

Point sources: Pulsar in W, with wind nebula.

References:

Frail *et al.* 1994, ApJ, 437, 781. VLA at 330 MHz (54′′×116′′ : $S = 3.0 \pm 0.1$ Jy) and 1.4 GHz (21′′×25′′ : $S = 12.5 \pm 0.05$ Jy).
 Giacani *et al.* 2001, AJ, 121, 3133. VLA at 1.4 and 4.9 GHz (25′′) of pulsar wind nebula.

G341.9–0.3

RA: 16^h55^m01^s
Dec: –44°01′

1-GHz flux/Jy: 2.5
Spectral index: 0.5

Size/arcmin: 7
Type: S

Radio: Incomplete shell, brightest to NE.

References:

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S = 7.4$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 1.7$ Jy).
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50′′), revision of previous flux densities.
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (35′′×11′′ : $S = 2.2 \pm 0.1$ Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′′×62′′ : $S = 2.7$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

G342.0–0.2

RA: 16^h54^m50^s
Dec: –43°53′

1-GHz flux/Jy: 3.5?
Spectral index: 0.4?

Size/arcmin: 12×9
Type: S

Radio: Distorted shell.

References:

Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50′′), estimate $S_{408 \text{ MHz}} = 5$ Jy, $S_{5 \text{ GHz}} = 2$ Jy from previous maps.
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (35′′×11′′).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz

(43′′×62′′ : $S = 3.5$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

G342.1+0.9

RA: 16^h50^m43^s
Dec: –43°04′

1-GHz flux/Jy: 0.5?
Spectral index: ?

Size/arcmin: 10×9
Type: S

Radio: Incomplete shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×63″: $S=0.6$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G343.0–6.0

RA: 17^h25^m00^s
Dec: –46°30′

1-GHz flux/Jy: ?
Spectral index: ?

RCW 114
Size/arcmin: 250
Type: S

Radio: Faint, poorly defined.

Optical: Filamentary shell.

References:

Walker & Zealey 2001, MNRAS, 325, 287. Optical observations, and review of earlier observations.
 Welsh *et al.* 2003, A&A, 403, 605. Optical spectroscopy.

Casandjian & Grenier 2008, A&A, 489, 849. γ -ray observations.
 Kim *et al.* 2010, ApJ, 709, 823. UV observations.

G343.1–2.3

RA: 17^h08^m00^s
Dec: –44°16′

1-GHz flux/Jy: 8?
Spectral index: 0.5?

Size/arcmin: 32?
Type: C?

Radio: Incomplete shell?

X-ray: Pulsar wind nebula.

Point sources: Pulsar near edge, with wind nebula.

References:

McAdam *et al.* 1993, Nature, 361, 516. MOST at 843 MHz (smoothed to 2′).
 Frail *et al.* 1994, ApJ, 437, 781. VLA at 330 MHz (56″×111″: $S=10.6$ Jy) and 1.4 GHz (22″×27″) near pulsar.
 Becker *et al.* 1995, A&A, 298, 528. ROSAT of pulsar, and limit for remnant.
 Giacani *et al.* 2001, AJ, 121, 3133. VLA at 1.4, 4.9 and

8.5 GHz (25″) of pulsar wind nebula.
 Gotthelf *et al.* 2002, ApJ, 567, L125. Pulsar x-ray detection.
 Dodson & Golap 2002, MNRAS, 334, L1. ATCA at 1.4 GHz (70″×47″) including polarisation, and Chandra observations of pulsar wind nebula.
 Aharonian *et al.* 2005, A&A, 432, L9. γ -ray limit.
 Abramowski *et al.* 2011, A&A, 528, A143. γ -ray observations.

G343.1–0.7

RA: 17^h00^m25^s
Dec: –43°14′

1-GHz flux/Jy: 7.8
Spectral index: 0.55

Size/arcmin: 27×21
Type: S

Radio: Shell, with smaller thermal shell adjacent.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×63″: $S=8.5\pm 0.6$), plus Parkes 64-m at 4.5 GHz ($S=3.9\pm 0.6$ Jy) and 8.55 GHz ($S=2.4\pm 0.5$ Jy)
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

G344.7–0.1

RA: 17^h03^m51^s
Dec: –41°42′

1-GHz flux/Jy: 2.5?
Spectral index: 0.3?

Size/arcmin: 8
Type: C?

Radio: Asymmetric shell, with possible core.

X-ray: Detected.

Distance: H_I absorption and association with features suggests 6.3 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 4.7$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 1.3$ Jy).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (30″ × 43″ : $S = 1.7 \pm 0.1$ Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 65″ : $S = 2.5$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.

Yamauchi *et al.* 2005, PASJ, 57, 459. ASCA observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Giacani *et al.* 2011, A&A, 531, A138. VLA and ATCA at 1.4 GHz (5″6 × 8″), ATCA at 5 GHz (10″ × 13″) and 8.4 GHz (5″ × 10″), plus XMM-Newton observations and H_I from SGPS.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Yamaguchi *et al.* 2012, ApJ, 749, 137. Suzaku observations.
 Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.

G345.7–0.2

RA: 17^h07^m20^s
Dec: –40°53′

1-GHz flux/Jy: 0.6?
Spectral index: ?

Size/arcmin: 6
Type: S

Radio: Poorly defined diffuse shell.

Point sources: Old pulsar nearby.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 66″ : $S = 0.7$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G346.6–0.2

RA: 17^h10^m19^s
Dec: –40°11′

1-GHz flux/Jy: 8?
Spectral index: 0.5?

Size/arcmin: 8
Type: S

Radio: Irregular shell.

X-ray: Centrally brightened.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 14.9$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 4.3$ Jy).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (31″ × 43″ : $S = 8.1 \pm 0.9$ Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 67″ : $S = 8.7$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact

OH emission.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
 Sezer *et al.* 2011, MNRAS, 415, 301. Suzaku observations.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Yamauchi *et al.* 2013, PASJ, 65, 6. Suzaku observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Pannuti *et al.* 2014, AJ, 147, 55. ASCA observations.

G347.3–0.5

RA: 17^h13^m50^s
Dec: –39°45′

1-GHz flux/Jy: 30?
Spectral index: ?

RX J1713.7–3946

Size/arcmin: 65×55
Type: S?

Radio: Faint emission.

X-ray: Non-thermal, limb-brightened to W, with central source.

Point sources: Central X-ray source.

Distance: Association with molecular clouds and X-ray observations imply 1.3 kpc.

References:

Koyama *et al.* 1997, PASJ, 49, L7. ASCA of NW.
 Slane *et al.* 1999, ApJ, 525, 357. ASCA and other observations.
 Muraishi *et al.* 2000, A&A, 354, L57. High energy γ -ray detection.
 Butt *et al.* 2001, ApJ, 562, L167. Associated γ -ray emission.
 Ellison *et al.* 2001, ApJ, 563, 191. ATCA at 1.4 GHz (46''×36''), and ASCA observations.
 Enomoto *et al.* 2002, Nature, 416, 823. γ -ray observations.
 Uchiyama *et al.* 2002, PASJ, 54, L73. ASCA observations.
 Uchiyama *et al.* 2003, A&A, 400, 567. Chandra spectroscopy.
 Pannuti *et al.* 2003, ApJ, 593, 377. ROSAT, ASCA and RXTE observations.
 Lazendic *et al.* 2003, ApJ, 593, L27. Chandra, XMM-Newton and other X-ray observations of central source.
 Fukui *et al.* 2003, PASJ, 55, L61. CO observations of surroundings.
 Cassam-Chenaï *et al.* 2004, A&A, 427, 199. XMM-Newton and other observations.
 Aharonian *et al.* 2004, Nature, 432, 75. γ -ray detection.
 Lazendic *et al.* 2004, ApJ, 602, 271. Chandra observations of parts, and ATCA at 1.4 GHz (36''×46'').
 Hiraga *et al.* 2005, A&A, 431, 953. XMM-Newton observations.
 Moriguchi *et al.* 2005, ApJ, 631, 947. CO observations of surroundings.

Aharonian *et al.* 2007, A&A, 464, 235. γ -ray observations.
see also: Aharonian *et al.* 2011, A&A, 531, C1. Erratum.
 Uchiyama *et al.* 2007, Nature, 449, 576. Chandra multi-epoch observations for study of small-scale variability.
 Tanaka *et al.* 2008, ApJ, 685, 988. Suzaku observations.
 Takahashi *et al.* 2008, PASJ, 60, S131. Suzaku observations of SW.
 Mignani *et al.* 2008, A&A, 484, 457. Optical and IR observations of central source.
 Acero *et al.* 2009, A&A, 505, 157. XMM-Newton observations, plus other radio, IR and γ -ray data.
 Sano *et al.* 2010, ApJ, 724, 59. CO observations of region.
 Maxted *et al.* 2012, MNRAS, 422, 2230. Molecular line observations.
see also: Maxted *et al.* 2013, MNRAS, 430, 2511. Erratum.
 Sano *et al.* 2013, ApJ, 778, 59. CO, SGPS HI and Suzaku observations.
 Federici *et al.* 2015, A&A, 577, A12. γ -ray detection.
 Sano *et al.* 2015, ApJ, 799, 175. Suzaku observations.
 Katsuda *et al.* 2015, ApJ, 814, 29. XMM-Newton observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.
 Tsuji & Uchiyama 2016, PASJ, 68, 108. Chandra observations of NW.

G348.5–0.0

RA: 17^h15^m26^s
Dec: –38°28′

1-GHz flux/Jy: 10?
Spectral index: 0.4?

Size/arcmin: 10?
Type: S?

Radio: Arc, overlapping G348.5+0.1.

References:

Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz (46''×53''), 1.4 GHz (18''×33'') and part at 5 GHz (2''5×3''9).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43''×69'':S=10.2 Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emis-

sion.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Pannuti *et al.* 2014, AJ, 147, 55. XMM-Newton observations for upper limit.

G348.5+0.1

RA: 17^h14^m06^s
Dec: –38°32′

1-GHz flux/Jy: 72
Spectral index: 0.3

CTB 37A

Size/arcmin: 15
Type: S

Radio: Shell, poorly define to S and W, overlapping G348.5–0.0 in E.

X-ray: Brighter to W.

Distance: H_I absorption indicates 8.0 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 97 Jy).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′4″ : S = 43 Jy).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H_I absorption.
 Milne *et al.* 1979, MNRAS, 188, 437. FIRST at 1415 MHz (0′8″ : S > 50) and Parkes 64-m at 14.7 GHz (2′2″ : S = 18±5 Jy).
 Downes 1984, MNRAS, 210, 845. VLA at 1465 MHz (20″ × 45″).
 Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz (46″ × 53″), 1.4 GHz (18″ × 33″) and part at 5 GHz (2″5 × 3″9).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 69″ : S = 71 Jy).
 Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH

Zeeman splitting.
 Reynoso & Mangum 2000, ApJ, 545, 874. CO observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Aharonian *et al.* 2008, A&A, 490, 685. γ -ray observations.
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Sezer *et al.* 2011, MNRAS, 417, 1387. Suzaku observations.
 Tian & Leahy 2012, MNRAS, 421, 2593. SGPS H_I absorption observations.
 Maxted *et al.* 2013, MNRAS, 434, 2188. Molecular line observations of region.
 Pannuti *et al.* 2014, AJ, 147, 55. XMM-Newton and Chandra observations.
 Yamauchi *et al.* 2014, PASJ, 66, 2. Suzaku observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G348.7+0.3

RA: 17^h13^m55^s
Dec: –38°11′

1-GHz flux/Jy: 26
Spectral index: 0.3

CTB 37B

Size/arcmin: 17?
Type: S

Radio: Incomplete shell with faint eastern extensions.

X-ray: Diffuse emission.

Point sources: X-ray pulsar.

Distance: H_I absorption suggests 13 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 34 Jy).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′4″ : S = 32 Jy).
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H_I absorption.
 Milne *et al.* 1979, MNRAS, 188, 437. FIRST at 1415 MHz (0′8″ : S > 20) and Parkes 64-m at 14.7 GHz (2′2″ : S = 8±3 Jy).
 Downes 1984, MNRAS, 210, 845. VLA at 1465 MHz (20″ × 45″).
 Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz (46″ × 53″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 69″ : S = 33 Jy).

Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Aharonian *et al.* 2006, ApJ, 636, 777. γ -ray detection.
 Aharonian *et al.* 2008, A&A, 486, 829. γ -ray and Chandra observations.
 Nakamura *et al.* 2009, PASJ, 61, S197. Suzaku and Chandra observations.
 Halpern & Gotthelf 2010, ApJ, 710, 941. Chandra detection of pulsar.
 Halpern & Gotthelf 2010, ApJ, 725, 1384. Chandra observations of pulsar.
 Tian & Leahy 2012, MNRAS, 421, 2593. SGPS H_I observations.
 Xin *et al.* 2016, ApJ, 817, 64. γ -ray observations.

G349.2–0.1

RA: 17^h17^m15^s
Dec: –38°04′

1-GHz flux/Jy: 1.4?
Spectral index: ?

Size/arcmin: 9×6
Type: S

Radio: Elongated shell, adjacent to bright H_{II} region.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 70″ : S = 1.6 Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.

G349.7+0.2

RA: 17^h17^m59^s
Dec: –37°26′

1-GHz flux/Jy: 20
Spectral index: 0.5

Size/arcmin: 2.5×2
Type: S

Radio: Incomplete clumpy shell, with enhancement to the S.

X-ray: Irregular shell, brighter to S and E.

Distance: H_I absorption indicates 11.5 kpc.

References:

Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′).
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S = 31.0$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 9.1$ Jy), no maps.
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H_I absorption.
 Shaver *et al.* 1985, Nature, 313, 113. VLA at 1.4 GHz (3′4″×14′5″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′′×71′′ : $S = 22$ Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.
 Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.
 Reynoso & Mangum 2001, AJ, 121, 347. CO observations of the vicinity.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Slane *et al.* 2002, ApJ, 580, 904. ASCA observations.
 Dubner *et al.* 2004, A&A, 426, 201. CO observations of surroundings.
 Lazendic *et al.* 2005, ApJ, 618, 733. Chandra observations.

Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.
 Lazendic *et al.* 2010, MNRAS, 409, 371. OH, CO and other molecular line observations of region.
 Anderson *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Tian & Leahy 2014, ApJ, 783, L2. SGPS H_I observations.
 Yasumi *et al.* 2014, PASJ, 66, 68. Suzaku observations.
 Abramowski *et al.* 2015, A&A, 574, A100. γ -ray observations. see also: Abramowski *et al.* 2015, A&A, 580, C1. Correction.
 Ergin *et al.* 2015, ApJ, 804, 124. γ -ray and Suzaku observations.
 Rho *et al.* 2015, ApJ, 812, 44. Herschel observations.
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G350.0–2.0

RA: 17^h27^m50^s
Dec: –38°32′

1-GHz flux/Jy: 26
Spectral index: 0.4

Size/arcmin: 45
Type: S

Incorporates the previously catalogued G350.0–1.8 in the NW.

Radio: Shell, brightest in NW.

Optical: Detected.

X-ray: Brighter to NW.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 49.5$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 13.6$ Jy).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′.4).
 Gaensler 1998, ApJ, 493, 781. VLA and Parkes 64-m at

1.4 GHz (18′′×21′′ : $S = 22.3 \pm 0.3$ Jy), clarifying extent of remnant.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Karpova *et al.* 2016, MNRAS, 462, 3845. XMM-Newton observations.

G350.1–0.3

RA: 17^h21^m05^s
Dec: –37°27′

1-GHz flux/Jy: 6?
Spectral index: 0.8?

Size/arcmin: 4?
Type: ?

Radio: Several clumps of emission.

X-ray: Diffuse emission, with compact source.

Point sources: X-ray source.

Distance: H_I absorption indicates 4.5 to 10.7 kpc, possible interaction with molecular cloud indicates 4.5 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz ($3' : S = 10.7$) and Parkes 64-m at 5 GHz ($4' : S = 1.7$).
 Salter *et al.* 1986, A&A, 162, 217. VLA at 1.5 ($4'' \times 10''$) and 4.8 GHz ($15'' \times 35''$) and 15 GHz ($5'' \times 2''$).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 71''$).
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observa-

tions.
 Gaensler *et al.* 2008, ApJ, 680, L37. VLA at 4.8 GHz ($11'' \times 5''$) plus XMM-Newton observations.
 Lovchinsky *et al.* 2011, ApJ, 731, 70. Chandra and Spitzer observations.
 Yasumi *et al.* 2014, PASJ, 66, 68. Suzaku observations.

G351.0–5.4

RA: 17^h46^m00^s
Dec: –39°25′

1-GHz flux/Jy: ?
Spectral index: ?

Size/arcmin: 30
Type: S

Radio: Faint shell, brighter to E and W.

References:

de Gasperin *et al.* 2014, A&A, 568, A107. GMRT at 325 MHz ($89'' \times 141''$), plus other observations.

G351.2+0.1

RA: 17^h22^m27^s
Dec: –36°11′

1-GHz flux/Jy: 5?
Spectral index: 0.4

Size/arcmin: 7
Type: C?

Has been called G351.3+0.2.

Radio: Distorted shell, with possible flat-spectrum core.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz ($3' : S = 8.1$ Jy) and Parkes 64-m at 5 GHz ($4' : S = 3.1$ Jy).
 Becker & Helfand 1988, AJ, 95, 883. VLA at 5 GHz ($15''$), and at 15 GHz of core.
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz

($32'' \times 36'' : S = 4.8 \pm 0.2$ Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 73'' : S = 5.5$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G351.7+0.8

RA: 17^h21^m00^s
Dec: –35°27′

1-GHz flux/Jy: 10
Spectral index: 0.5?

Size/arcmin: 18×14
Type: S

Radio: Elongated shell, adjacent to bright H_{II} region.

Point sources: Pulsar nearby.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 74'' : S = 11$ Jy).
 Tian *et al.* 2007, MNRAS, 378, 1283. SGPS at 1.4 GHz ($100'' : S = 8.4 \pm 0.7$ Jy) including H_I.

G351.9–0.9

RA: 17^h28^m52^s
Dec: –36°16′

1-GHz flux/Jy: 1.8?
Spectral index: ?

Size/arcmin: 12×9
Type: S

Radio: Asymmetric shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
 (43″×73″ : S=2.0 Jy).

G352.7–0.1

RA: 17^h27^m40^s
Dec: –35°07′

1-GHz flux/Jy: 4
Spectral index: 0.6

Size/arcmin: 8×6
Type: S

Radio: Distorted shell.

X-ray: Detected.

Distance: H I absorption indicates 6.8 to 8.4 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S = 9.6 Jy) and Parkes 64-m at 5 GHz (4′ : S = 2.3 Jy).
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (1.1).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (34″ : S = 3.4±0.4 Jy).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×75″ : S=4.4 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Kinugasa *et al.* 1998, PASJ, 50, 249. ASCA observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Giacani *et al.* 2009, A&A, 507, 841. VLA at 4.8 GHz (9″×12″), plus H I and XMM-Newton observations.
 Pannuti *et al.* 2014, ApJ, 782, 102. XMM-Newton and Chandra observations.
 Sezer & Gök 2014, ApJ, 790, 81. Suzaku observations.

G353.6–0.7

RA: 17^h32^m00^s
Dec: –34°44′

1-GHz flux/Jy: 2.5?
Spectral index: ?

Size/arcmin: 30
Type: S

Has erroneously been called G353.6–0.37.

Radio: Shell, brighter to S.

X-ray: Detected.

Point sources: Central X-ray source.

References:

Tian *et al.* 2008, ApJ, 679, L85. SGPS at 1.4 GHz (100″), plus 843 MHz (43″) and X-ray observations.
 Halpern & Gotthelf 2010, ApJ, 710, 941. XMM-Newton observations.
 Tian *et al.* 2010, ApJ, 712, 790. XMM-Newton, Suzaku and CO observations.
 Abramowski *et al.* 2011, A&A, 531, A81. γ -ray observations.
 Bamba *et al.* 2012, ApJ, 756, 149. Suzaku observations.

see also: Bamba *et al.* 2012, ApJ, 761, 80. Erratum.
 Klochov *et al.* 2013, A&A, 556, A41. XMM-Newton and other X-ray observations.
 Yang *et al.* 2014, A&A, 567, A23. γ -ray limit.
 Fukuda *et al.* 2014, ApJ, 788, 94. γ -ray, SGPS H I and CO observations.
 Acero *et al.* 2015, A&A, 580, A74. γ -ray limit.

G353.9–2.0

RA: 17^h38^m55^s
Dec: –35°11′

1-GHz flux/Jy: 1?
Spectral index: 0.5?

Size/arcmin: 13
Type: S

Radio: Shell, with central double source.

References:

Green 2001, MNRAS, 326, 283. VLA at 327 MHz (3′0×2′7) and 1.4 GHz (42″×36″), plus 8.4 GHz (8″4×6″.1) of central source only.

G354.1+0.1

RA: 17^h30^m28^s
Dec: –33°46′

1-GHz flux/Jy: ?
Spectral index: varies

Size/arcmin: 15×3?
Type: C?

Is this a SNR?

Radio: Elongated N–S.

Point sources: Pulsar at S tip.

References:

Frail *et al.* 1994, ApJ, 437, 781. VLA at 330 MHz (47″×99″)
 and 1.4 GHz (8″8×21″).
 Ajello *et al.* 2016, ApJ, 819, 44. γ -ray observations.

G354.8–0.8

RA: 17^h36^m00^s
Dec: –33°42′

1-GHz flux/Jy: 2.8?
Spectral index: ?

Size/arcmin: 19
Type: S

Radio: Distorted shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz
 (43″×78″: $S=3.1$ Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-

tions.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emis-

G355.4+0.7

RA: 17^h31^m20^s
Dec: –32°26′

1-GHz flux/Jy: 5?
Spectral index: ?

Size/arcmin: 25
Type: S

Radio: Faint, incomplete shell.

References:

Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×77″).
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz
 (1′: $S=8.9\pm 1.3$ Jy).
 Ajello *et al.* 2016, ApJ, 819, 44. γ -ray observations.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G355.6–0.0

RA: 17^h35^m16^s
Dec: –32°38′

1-GHz flux/Jy: 3?
Spectral index: ?

Size/arcmin: 8×6
Type: S

Radio: Well defined shell.

X-ray: Centrally brightened.

References:

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×80″ :
 $S=2.6$ Jy).
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observa-
 tions.
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz

(1′: $S=3.3\pm 0.5$ Jy).
 Marquez-Lopez & Phillips 2010, MNRAS, 407, 94. Mid-IR ob-
 servations.
 Minami *et al.* 2013, PASJ, 65, 99. Suzaku observations.

G355.9–2.5

RA: 17^h45^m53^s
Dec: –33°43′

1-GHz flux/Jy: 8
Spectral index: 0.5

Size/arcmin: 13
Type: S

Radio: Distorted shell, brightest to SE.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S=12.3$ Jy) and Parkes 64-m at 5 GHz (4′ : $S=3.4$ Jy).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (32″ × 34″ : $S=5.0 \pm 0.3$ Jy).
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″ × 77″).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Marquez-Lopez & Phillips 2010, MNRAS, 407, 94. Mid-IR observations.

G356.2+4.5

RA: 17^h19^m00^s
Dec: –29°40′

1-GHz flux/Jy: 4
Spectral index: 0.7

Size/arcmin: 25
Type: S

Has been called G356.2+4.4.

Radio: Faint shell.

References:

Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10′.4).
 Bhatnagar 2000, MNRAS, 317, 453. GMRT at 327 MHz (3′ × 1′.5 : $S=8.1 \pm 1.7$ Jy), and NVSS at 1.4 GHz.

G356.3–1.5

RA: 17^h42^m35^s
Dec: –32°52′

1-GHz flux/Jy: 3?
Spectral index: ?

Size/arcmin: 20 × 15
Type: S

Radio: Double arc.

References:

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″ × 79″ : $S=2.8$ Jy).
 Bhatnagar 2002, MNRAS, 332, 1. GMRT at 327 MHz (0′.8 × 1′.7 : $S=5.7 \pm 0.2$).

G356.3–0.3

RA: 17^h37^m56^s
Dec: –32°16′

1-GHz flux/Jy: 3?
Spectral index: ?

Size/arcmin: 11 × 7
Type: S

Has been suggested this part of a larger SNR.

Radio: Diffuse emission.

References:

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″ × 81″ : $S=2.6$ Jy).
 Roy & Pramesh Rao 2002, MNRAS, 329, 775. GMRT at 330 MHz (2′.7 × 4′.8).
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G357.7–0.1

RA: 17^h40^m29^s
Dec: –30°58′

1-GHz flux/Jy: 37
Spectral index: 0.4

MSH 17–39

Size/arcmin: 8×3?
Type: ?

Has been suggested that this is not a SNR.

Radio: Multiple arcs and filaments, brighter to NW ‘head’.

X-ray: Detected from NW ‘head’, and SW ‘tail’.

Distance: HI absorption suggests beyond Galactic Centre.

References:

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : S=54.2 Jy) and Parkes 64-m at 5 GHz (4′ : S=18.5 Jy).
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′4″ : S=14.6 Jy).
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6″).
 Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50″).
 Weiler & Panagia 1980, A&A, 90, 269. Effelsberg 100-m at 9 GHz (1′5″) (private communication from Baker).
 Shaver *et al.* 1985, Nature, 313, 113. VLA at 1.4 GHz (3″8×10″9) and 5 GHz (12″×26″).
 Becker & Helfand 1985, Nature, 313, 115. VLA at 1.4 GHz and 5 GHz.
 Helfand & Becker 1985, Nature, 313, 118. Suggest it is not a SNR.
 Shaver *et al.* 1985, A&A, 147, L23. Observations of peripheral compact source.
 Caswell *et al.* 1989, PASA, 8, 184. MOST at 843 MHz (43″×83″).
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×84″).
 Stewart *et al.* 1994, ApJ, 432, L39. ATCA at 4.79 and 5.84 GHz (12″×22″) and Effelsberg 100-m at 10.6 GHz (1′), including polarisation.
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.

Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (43″×24″).
see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.
 Brogan & Goss 2003, AJ, 125, 272. VLA at 1.4 GHz (13″6×11″4), including HI, and 8.3 GHz (14″3×6″8) recombination line observation of HII region.
 Gaensler *et al.* 2003, ApJ, 594, L35. Chandra detection.
 Lazendic *et al.* 2003, AN, 324 (No S1), 157. Molecular line observations.
 Burton *et al.* 2004, MNRAS, 348, 638. IR and radio observations of HII region.
 Lazendic *et al.* 2004, MNRAS, 354, 393. IR and molecular line observations.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Phillips *et al.* 2009, MNRAS, 397, 1215. Observations of interactions with surroundings.
 Castro *et al.* 2013, ApJ, 774, 36. Fermi observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Acero *et al.* 2016, ApJS, 224, 8. γ -ray observations.

G357.7+0.3

RA: 17^h38^m35^s
Dec: –30°44′

1-GHz flux/Jy: 10
Spectral index: 0.4?

Size/arcmin: 24
Type: S

Radio: Non-thermal shell in complex region.

References:

Reich & Fürst 1984, A&AS, 57, 165. Effelsberg 100-m at 2.7 GHz (4′3″ : S=7±1.5 Jy), S_{5 GHz} = 5.5±1.5 Jy from surveys.
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×84″).
 Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for

OH masers.
 Phillips & Marquez-Lugo 2010, MNRAS, 409, 701. Spitzer observations of region.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

G358.0+3.8

RA: 17^h26^m00^s
Dec: –28°36′

1-GHz flux/Jy: 1.5?
Spectral index: ?

Size/arcmin: 38
Type: S

Radio: Faint shell.

References:

Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10′4″).
 Bhatnagar 2000, MNRAS, 317, 453. GMRT at 327 MHz (2′2″×1′3″ : S=2.5±1.3 Jy), and NVSS at 1.4 GHz.

G358.1+1.0

RA: 17^h37^m00^s
Dec: –29°59′

1-GHz flux/Jy: 2?
Spectral index: ?

Size/arcmin: 20
Type: S

Was erroneously called G358.1+0.1.

Radio: Faint shell.

References:

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×77″).
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz
 (1′:S=6.0±2.5 Jy).

G358.5–0.9

RA: 17^h46^m10^s
Dec: –30°40′

1-GHz flux/Jy: 4?
Spectral index: ?

Size/arcmin: 17
Type: S

Radio: Shell, brighter to NE.

References:

Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×77″).
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz
 (1′:S=8.0±2.5 Jy).

G359.0–0.9

RA: 17^h46^m50^s
Dec: –30°16′

1-GHz flux/Jy: 23
Spectral index: 0.5

Size/arcmin: 23
Type: S

Radio: Incomplete shell.

Optical: Detected.

X-ray: Partial shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz
 (4′3).
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×86″).
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz
 (43″×24″).
 see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Bamba *et al.* 2000, PASJ, 52, 259. ASCA observations.

Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz
 (8′4×12′8) of part.
 Bamba *et al.* 2009, ApJ, 691, 1854. Suzaku observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observa-
 tions.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H $_2$ IR observations.

G359.1–0.5**RA:** 17^h45^m30^s
Dec: –29°57′**1-GHz flux/Jy:** 14
Spectral index: 0.4?**Size/arcmin:** 24
Type: S**Radio:** Non-thermal shell in complex region, crossed by the ‘snake’.**Optical:** Detected.**X-ray:** Centrally brightened.**Point sources:** Several compact radio sources near centre, OH masers around edge.**References:**

Downes *et al.* 1979, A&AS, 35, 1. From observations by Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6: $S=13$ Jy).
 Reich & Fürst 1984, A&AS, 57, 165. Effelsberg 100-m at 2.7 GHz (4.3 : $S = 10 \pm 1.5$ Jy) and 4.8 GHz (2.4 : $S = 8.1 \pm 0.5$ Jy).
 Uchida *et al.* 1992, ApJ, 398, 128. VLA at 1.5 GHz (11"×10"), and observations of nearby molecular material.
 Uchida *et al.* 1992, AJ, 104, 1533. VLA at 1.4 GHz.
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43"×85").
 Yusef-Zadeh *et al.* 1995, Science, 270, 1801. VLA at 1.4 GHz (33"×31"), and 1.7 GHz for OH survey.
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (43"×24").
 see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Bamba *et al.* 2000, PASJ, 52, 259. ASCA observations.
 Lazendic *et al.* 2002, MNRAS, 331, 537. Observations of

shocked molecular gas where the ‘snake’ crosses the remnant.
 Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (8"4×12"8).
 Aharonian *et al.* 2008, A&A, 483, 509. XMM-Newton and γ -ray observations.
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
 Bamba *et al.* 2009, ApJ, 691, 1854. Suzaku observations.
 Stupar & Parker 2011, MNRAS, 414, 2282. H α observations.
 Ohnishi *et al.* 2011, PASJ, 63, 527. Suzaku observations.
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Hui *et al.* 2016, MNRAS, 457, 4262. γ -ray observations of region.

G359.1+0.9**RA:** 17^h39^m36^s
Dec: –29°11′**1-GHz flux/Jy:** ??
Spectral index: ?**Size/arcmin:** 12×11
Type: S**Radio:** Shell, brightest in E.**References:**

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43"×88" : $S=4.3$ Jy).
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz

(1' : $S=4.3 \pm 1.0$ Jy).
 Law *et al.* 2008, ApJS, 177, 515. VLA at 1.4 GHz (10"9×15"9 : $S=1.3 \pm 0.5$ Jy).