

G0.0+0.0

Sgr A East

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 W.**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 & Pramesh Rao 2004, MNRAS, 349, L25. GMRT at 620 MHz (6.6×11.4).
 Sakano *et al.* 2004, MNRAS, 350, 129. XMM-Newton observations.
 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. H.E.S.S. 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 & Miyazaki 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. Fermi 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.
 Qiao *et al.* 2018, ApJS, 239, 15. OH maser observations.
 Ono *et al.* 2019, PASJ, 71, 52. Suzaku X-ray spectroscopy.
 Ogbodo *et al.* 2020, MNRAS, 493, 199. OH maser observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18'') including polarisation, and Spitzer observations.
 Zhou *et al.* 2021, ApJ, 908, 31. Chandra observations.
 Tanaka *et al.* 2021, ApJ, 915, 79. [C] sub-mm observations of surroundings.

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, G0.30+0.04 and G0.4+0.1.

Radio: Bilateral shell, near Galactic Centre.**X-ray:** Diffuse emission.**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. Fermi observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18'') including polarisation, and Spitzer 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 (24″×43″).
 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. H.E.S.S. detection.

Dubner *et al.* 2008, A&A, 487, 1033. ATCA and VLA at 1.4 GHz (1″2×2″5 : $S = 8.3 \pm 0.7$ 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.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 2.3$ Jy) including polarisation, and Spitzer observations.
 Adams *et al.* 2021, ApJ, 913, 115. High energy 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 (24″×43″).
 see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
 Sidoli *et al.* 2001, A&A, 372, 651. BeppoSAX possible detection.
 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-Lugo & 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.
 Ogbodo *et al.* 2020, MNRAS, 493, 199. OH maser observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer 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.

X-ray: Diffuse emission.

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′4×2′7 : $S = 4.2 \pm 0.5$).
 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.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.1$ Jy) including polarisation, and Spitzer 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 (2''×4''4).
 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.
 H.E.S.S. Collaboration: Abramowski *et al.* 2014, *MNRAS*, 441, 790. H.E.S.S. 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 Fermi observations.
 Zoglauer *et al.* 2015, *ApJ*, 798, 98. NuSTAR observations.
 Borkowski *et al.* 2017, *ApJ*, 837, L7. Chandra expansion studies.
 Luken *et al.* 2020, *MNRAS*, 492, 2606. ATCA at various frequencies and epochs, including polarisation, for expansion study.
 Weinberger *et al.* 2020, *A&A*, 638, A83. INTEGRAL observations.
 Dokara *et al.* 2021, *A&A*, 651, A86. VLA at 4 to 8 GHz (18'' : S=0.3 Jy) including polarisation, and Spitzer observations.

G3.1–0.6

RA: 17^h55^m30^s
Dec: –26°35′

1-GHz flux/Jy: 5
Spectral index: 0.9?

Size/arcmin: 52×28
Type: S

Radio: Elongated shell.

References:

Gray 1994, *MNRAS*, 270, 847. MOST at 843 MHz (43''×96'' : S=6.5 Jy).
 Roy & Pramesh Rao 2002, *MNRAS*, 329, 775. GMRT at 330 MHz (25''×37'').

Hurley-Walker *et al.* 2019, *PASA*, 36, e048. MWA observations at 72 to 231 MHz (~2').

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).
 Dokara *et al.* 2021, *A&A*, 651, A86. VLA at 4 to 8 GHz (18'' : S=0.1 Jy) including polarisation, and Spitzer observations.

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.**Distance:** Optical extinction suggests 4.1 kpc.**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 (17″×27″ : S = 6.0±0.4).

Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.1 Jy) including polarisation, and Spitzer observations.**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, 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.

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_i 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''5×3''2) and 5 GHz (3''2×4''8) and Einstein image (5'').
- Dickel *et al.* 1988, ApJ, 330, 254. VLA at 1.4 (1''2×2''3) and 5 GHz (0''6×1''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 & Pritchett 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 (13''×23'') for H_i 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. H.E.S.S. 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).
- Sato & Hughes 2017, ApJ, 845, 167. Chandra expansion studies.
- Kasuga *et al.* 2018, PASJ, 70, 88. Chandra observations.
- Sun & Chen 2019, ApJ, 872, 45. Chandra observations.
- Weinberger *et al.* 2020, A&A, 638, A83. INTEGRAL observations.
- Sato *et al.* 2020, ApJ, 890, 104. Chandra observations.
- Millard *et al.* 2020, ApJ, 893, 98. Chandra spectroscopy.
- Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
- Xiang & Jiang 2021, ApJ, 908, 22. Fermi observations.
- Kasuga *et al.* 2021, ApJ, 915, 42. XMM-Newton spectroscopy.
- Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.
- Nagayoshi *et al.* 2021, PASJ, 73, 302. Suzaku observations.

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 (1'3×2'2: 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, 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.

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 E 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, optical extinction suggests 3.9 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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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 ± 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.
 Onić *et al.* 2019, A&A, 625, A93. MWA observations at 72 and 231 MHz.

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.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : $S = 0.1$ Jy) including polarisation, and Spitzer 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.

Distance: Optical extinction suggests 3.3 or 3.7 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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, optical extinction suggests 3.6 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).
- 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.
- 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.
- 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.
- 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 (52′′×97′′ : $S = 425 \pm 40$ Jy) and 1415 MHz (48′′×88′′ : $S = 246 \pm 20$ Jy), and comparison with other observations.
- Reach & Rho 2000, ApJ, 544, 843. ISO observations of interactions with surroundings.
see also: Reach & Rho 2001, ApJ, 558, 943. Erratum.
- Douvion *et al.* 2001, A&A, 373, 281. ISO observations.
- Roberts *et al.* 2001, ApJS, 133, 451. ASCA observations.
- Velázquez *et al.* 2002, AJ, 124, 2145. Parkes 64-m at 1.4 GHz (15′) for HI.
- Rho & Borkowski 2002, ApJ, 575, 201. ROSAT and ASCA observations.
- Claussen *et al.* 2002, ApJ, 580, 909. Observations of nearby source.
- Yusef-Zadeh *et al.* 2003, ApJ, 583, 267. OH observations.
- Caswell 2004, MNRAS, 349, 99. ATCA at 1.7 GHz of associated OH masers.
- Mavromatakis *et al.* 2004, A&A, 426, 567. Optical observations.
- Reach *et al.* 2005, ApJ, 618, 297. Molecular lines and near IR observations.
- Hoffman *et al.* 2005, ApJ, 620, 257. OH maser observations.
- Kawasaki *et al.* 2005, ApJ, 631, 935. ASCA observations.
- Neufeld *et al.* 2007, ApJ, 664, 890. Spitzer observations.
- Aharonian *et al.* 2008, A&A, 481, 401. H.E.S.S. 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.
- Giuliani *et al.* 2010, A&A, 516, L11. γ -ray observations.
- Marquez-Lugo & Phillips 2010, MNRAS, 407, 94. Mid-IR observations.
- Abdo *et al.* 2010, ApJ, 718, 348. Fermi observations.
- Yuan & Neufeld 2011, ApJ, 726, 76. Spitzer observations.
- Sawada & Koyama 2012, PASJ, 64, 81. Suzaku observations.
- Nichols *et al.* 2012, MNRAS, 419, 251. CO observations of selected regions.
- Gusdorf *et al.* 2012, A&A, 542, L19. CO observations of regions in NE.
- 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. Fermi 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.
- Froebrich *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. Fermi observations.
- Pannuti *et al.* 2017, ApJ, 839, 59. Optical and X-ray observations.
- H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
- Okon *et al.* 2018, PASJ, 70, 35. Suzaku observations.
- Nobukawa *et al.* 2018, ApJ, 854, 87. Suzaku observations.
- Cui *et al.* 2018, ApJ, 860, 69. Fermi observations.
- Ruiz-Lapuente *et al.* 2018, ApJ, 862, 124. HST search for progenitor companion.
- Ogodo *et al.* 2020, MNRAS, 493, 199. OH maser observations.
- Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
- Qiao *et al.* 2020, ApJS, 247, 5. ATCA of OH masers.
- Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
- Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′′) including polarisation, and Spitzer observations.
- Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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.

Distance: Optical extinction suggests 3.7 kpc.

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 observations.
 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. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer 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 (52″×97″) and 1415 MHz (48″×88″).

Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.

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.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.1 Jy) including polarisation, and Spitzer observations.

G7.5–1.7

RA: 18^h10^m00^s
Dec: –23°10′

1-GHz flux/Jy: 18?
Spectral index: 0.7?

Size/arcmin: 100
Type: S

Radio: Irregular shell.

Point sources: Pulsar within boundary.

References:

Roberts & Brogan 2008, ApJ, 681, 320. VLA at 327 MHz (2′.0×2′.6) plus IR and other observations.
 Van Etten *et al.* 2012, ApJ, 755, 151. Pulsar proper motion, away from centre.

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz (~2′).

G7.7–3.7

RA: 18^h17^m25^s
Dec: –24°04′

1-GHz flux/Jy: 11
Spectral index: 0.32

1814–24
Size/arcmin: 22
Type: S

Has been associated with the SN of AD386.

Radio: Shell, with high polarisation.

X-ray: Arc in S.

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 (35′×70′ : S = 9.9±0.1 Jy), including polarisation.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Zhou *et al.* 2018, ApJ, 865, L6. XMM-Newton observations.

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.

de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
 Feijen *et al.* 2020, PASA, 37, 56. CO and HI observations of region.

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 W edge.**Distance:** Optical extinction suggests 4.2 kpc.**References:**

Odegard 1986, AJ, 92, 1372. TPT at 57.5 MHz ($7'2'' \times 9'7'' : S = 190 \pm 50$ Jy).
 Kassim & Weiler 1990, Nature, 343, 146. VLA at 327 MHz ($3'0'' \times 3'7''$).
 Kassim & Weiler 1990, ApJ, 360, 184. VLA at 327 MHz ($2'8'' \times 4'1'' : S = 129 \pm 11$ Jy), and part at 1.4 GHz ($0'9'' \times 1'8''$), plus review of flux densities.
 Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz ($37'' \times 55''$).
 Finley & Ögelman 1994, ApJ, 434, L25. ROSAT observations, including pulsar.
 Aharonian *et al.* 2005, Science, 307, 1938. H.E.S.S. detection.
 Aharonian *et al.* 2006, ApJ, 636, 777. H.E.S.S. 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. Fermi observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] IR observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18''$) including polarisation, and Spitzer 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.**Distance:** Optical extinction suggests 3.5 kpc.**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.

Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18'' : S = 0.1$ Jy) including polarisation, and Spitzer observations.

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, G9.70–0.06 and G9.7+0.0.

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 detection.

Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
 Yeung *et al.* 2016, ApJ, 827, 41. Fermi observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18'' : S = 0.2$ Jy) including polarisation, and Spitzer 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±0.6 Jy).
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (41″×63″ : S = 3.5±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.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.3 Jy) including polarisation, and Spitzer 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.

Distance: H₂ emission suggests 3.8 kpc.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : S = 11.0±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.
 Lee *et al.* 2019, AJ, 157, 123. H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.

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, G11.03–0.05 and G11.00–0.05.

Radio: Partial shell.

X-ray: Diffuse emission.

Distance: Optical absorption suggests 2.4 kpc.

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±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.

Araya *et al.* 2018, ApJ, 859, 69. Fermi observations.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.3 Jy) including polarisation, and Spitzer observations.

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±0.1 Jy), plus other observations.

Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.8 Jy) including polarisation, and Spitzer 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″ : $S = 3.5 \pm 0.2$ 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.

Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G11.2–0.3

RA: 18^h11^m27^s
Dec: –19°25′

1-GHz flux/Jy: 2.2
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, H₂ emission suggests 4.7 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 densities.
 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 observations.
 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 (1″.8×2″.6 : $S = 16.6 \pm 0.9$ Jy) and 5 GHz (1″.5×2″.1 : $S = 8.4 \pm 0.9$ 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 observations 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 pulsar.
 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.
 Andersen *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 densities (and comparison with X-ray properties).
 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Madsen *et al.* 2020, ApJ, 889, 23. NuSTAR observations.
 Guest & Safi-Harb 2020, MNRAS, 498, 821. Chandra observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 1.9$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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. Fermi observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S=0.8$ Jy) including polarisation, and Spitzer 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.

Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G12.0–0.1

RA: 18^h12^m11^s
Dec: –18°37′

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

Size/arcmin: 7?
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.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S=0.2$ Jy) including polarisation, and Spitzer observations.

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.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S=0.1$ Jy) including polarisation, and Spitzer observations.

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.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.02$ Jy) including polarisation, and Spitzer observations.

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.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.04$ Jy) including polarisation, and Spitzer observations.

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 G12.7+0.0, G12.82–0.02, G12.83–0.02.

Radio: Shell.

X-ray: Diffuse.

Point sources: Central X-ray pulsar.

References:

Brogan *et al.* 2005, ApJ, 629, L105. VLA at 330 MHz (19″×32″), plus other observations.
Ubertini *et al.* 2005, ApJ, 629, L109. INTEGRAL and other observations.
Aharonian *et al.* 2006, ApJ, 636, 777. H.E.S.S. detection.
Albert *et al.* 2006, ApJ, 637, L41. γ -ray observations.
Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 1.2 \pm 0.1$ 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.
Araya *et al.* 2018, ApJ, 859, 69. Fermi observations.
Dzib *et al.* 2018, ApJ, 866, 100. VLA of central source.
Ho *et al.* 2020, MNRAS, 498, 4396. Chandra and other X-ray observations, for proper motions of pulsar.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
Camilo *et al.* 2021, ApJ, 917, 67. Radio detection of pulsar.
Dzib & Rodríguez 2021, ApJ, 923, 228. Pulsar proper motion.

G13.1–0.5

RA: 18^h16^m00^s
Dec: –17°49′

1-GHz flux/Jy: 11?
Spectral index: 0.6?

Size/arcmin: 38×28
Type: S

Radio: Faint shell.

References:

Gorham 1990, ApJ, 364, 187. Clark lake 30.9 MHz observations.
Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz ($\sim 2'$).

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, optical extinction suggests 4.8 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 observations.

Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

Distance: H₂ emission suggests 12.4 kpc.

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.
 Lee *et al.* 2019, AJ, 157, 123. H₂ IR observations.

Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18'' : S = 0.4$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations ($20''$) of region.

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.

Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18''$) including polarisation, and Spitzer 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.

Distance: Optical extinction suggests 2.9 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.
 H.E.S.S. Collaboration: Abramowski *et al.* 2014, A&A, 562, A40. H.E.S.S. and XMM-Newton observations.

Supan *et al.* 2015, A&A, 576, A81. GMRT at 624 MHz (10″). H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.2$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G15.5–0.1

RA: 18^h19^m25^s
Dec: –15°32′

1-GHz flux/Jy: 1.2?
Spectral index: 0.55?

Size/arcmin: 9×8
Type: ?

Has been called G15.51–0.15.

Radio: Poorly defined.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 4.2 \pm 0.2$ Jy), plus other observations.
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
 Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz ($\sim 2'$).

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.

Distance: HI absorption suggests 7 to 16 kpc.

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 (44″×58″).
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (61″×77″ : $S = 11.2 \pm 1.0$ Jy), 1.4 GHz (14″×23″ : $S = 3.9 \pm 0.1$ 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).
 Maggi & Acero 2017, A&A, 597, A65. XMM-Newton observations.
 Sasaki *et al.* 2018, MNRAS, 479, 3033. Chandra and IR observations, plus H α non-detection.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] IR observations.
 Tian *et al.* 2019, PASP, 131, 114301. HI absorption observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.6$ Jy) including polarisation, and Spitzer observations.

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.

Distance: H₂ emission suggests 4.1 kpc.

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.

Lee *et al.* 2019, AJ, 157, 123. H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.05$ Jy) including polarisation, and Spitzer 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.

G16.7+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.

Distance: HI absorption suggests about 14 kpc.

References:

Helfand *et al.* 1989, ApJ, 341, 151. VLA at 5 GHz ($S = 0.95$ Jy) and 1.4 GHz ($S = 2.43$ 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 observations.
 Helfand *et al.* 2003, ApJ, 592, 941. XMM-Newton observations.
 Bock & Gaensler 2005, ApJ, 626, 343. BIMA at 88.6 GHz (19″×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.
 Chang *et al.* 2018, MNRAS, 474, 2607. Chandra observations.
 Tian *et al.* 2019, PASP, 131, 114301. HI absorption observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.7$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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 G17.0+0.0, G17.02–0.04.

Radio: Shell.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42′ : $S = 0.7 \pm 0.1$ Jy), plus other observations.
Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′) including polarisation, and Spitzer observations.

Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′) of region.

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 : $S = 2.3 \pm 0.2$ 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′ : $S = 0.9 \pm 0.1$ Jy), plus other observations.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : $S = 0.05$ Jy) including polarisation, and Spitzer 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.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : $S = 2.23 \pm 0.13$ 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: H_I absorption suggests 6.4 kpc, H₂ emission suggests about 5.3 kpc.

References:

Odegard 1986, AJ, 92, 1372. TPT at 57.5 MHz (8′).
 Kassim *et al.* 1989, ApJ, 338, 152. VLA at 330 MHz (2′8×3′2) and 1.5 GHz (0′9×1′5).
 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 H_I observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.

Voison *et al.* 2016, MNRAS, 458, 2813. Molecular line observations of region.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2020, A&A, 644, A112. H.E.S.S. observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.2 Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) 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.

Distance: H_I absorption suggests 4.4 kpc.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : S = 1.9±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.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.

Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2020, A&A, 644, A112. H.E.S.S. observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.4 Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G18.8+0.3

Kes 67

RA: 18^h23^m58^s
Dec: –12°23′**1-GHz flux/Jy:** 33
Spectral index: 0.46**Size/arcmin:** 17×11
Type: S

Has been called G18.9+0.3.

Radio: Incomplete shell, in complex region near the HII region W39.**Distance:** Association with molecular cloud suggests 12 kpc, HI absorption suggests 13.8 kpc.**References:**

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ : S = 17±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 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).
 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±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 (55″×75″ : S = 29.9±0.3 Jy).
 Dubner *et al.* 1999, AJ, 118, 930. Parkes 64-m at 1.6 GHz (15″) for HI, VLA at 1.6 GHz (12″×17″) 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 HI, plus CO observations of region.
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : S = 15.3±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.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 2.2 Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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:** Optical absorption suggests 1.8 kpc, H₂ emission suggests 4.7 kpc, optical extinction suggests 3.1 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±15 Jy), plus review of flux densities.
 Barnes & Turtle 1988, IAUCo, 101, 347. Molonglo at 408 MHz (2′.9×3′.1 : S = 58±9 Jy) and Parkes 64-m at 5 GHz (4′.1×4′.4 : S = 23±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 (14″×19″), and Effelsberg 100-m at 1.4 GHz (9″) for HI.
 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±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. Fermi observations.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer 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.

Distance: Optical extinction suggests 3.6 kpc.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 17.4 \pm 0.4$ Jy), plus other observations.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer 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.

Distance: H_I absorption suggests 11.2 kpc.

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 H_I observations of region.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.8$ Jy) including polarisation, and Spitzer observations.
Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.05$ Jy) including polarisation, and Spitzer 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 suggests 4.4 kpc.

References:

- Wilson & Weiler 1976, A&A, 53, 89. WSRT at 5 GHz ($6'' \times 35''$).
 Becker & Kundu 1976, ApJ, 204, 427. NRAO interferometer at 2.7 GHz ($5'' \times 20''$) and 8 GHz ($2'' \times 7''$), 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 ($26''.5 : S = 5.64 \pm 0.29$ Jy).
 Fürst *et al.* 1988, PASJ, 40, 347. NRO array at 22.3 GHz ($4''.4 \times 7''.3$).
 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 ($29''.5 : S = 3.8 \pm 0.4$ Jy) and 141.9 GHz ($S = 2.5 \pm 1.2$ Jy).
 Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz ($S = 3.94 \pm 0.70$ 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 ($3''.3 \times 3''.4 : S = 9$ 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 observations of X-ray halo.
 Bock *et al.* 2001, ApJ, 561, L203. BIMA at 94 GHz ($4''.6 \times 8''.6$).
 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 ($0''.53 \times 0''.82$) 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 ($14'' \times 18''$).
 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 ($9''.5 : S = 6.5 \pm 0.4$ 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.
 Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 70, 100 and 143 GHz.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
 Aharonian *et al.* 2018, PASJ, 70, 38. Hitomi observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] IR observations.
 Guest *et al.* 2019, MNRAS, 482, 1031. Deep Chandra observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Guest & Safi-Harb 2020, MNRAS, 498, 821. Chandra observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18'' : S = 5.8$ Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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 ($14'' \times 18''$).
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Lee *et al.* 2019, AJ, 157, 123. H₂ IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18'' : S = 0.03$ Jy) including polarisation, and Spitzer observations.

G21.8–3.0

RA: 18^h41^m50^s
Dec: –11°16′

1-GHz flux/Jy: 5
Spectral index: 0.7

Size/arcmin: 60
Type: S

Radio: Shell, polarised in E.

Optical: Filaments in N.

References:

Gao *et al.* 2020, MNRAS, 493, 2188. Urumqi 25-m at 5 GHz (9′.5), Effelsberg 100-m at 2.4 to 2.7 GHz (4′.7 to 4′.2) including polarisation, and other 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, H_I absorption suggests 5.6 kpc, H₂ emission suggests 4.1 kpc, optical extinction suggests 4.9 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±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 H_I.
 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±1.3 Jy) including polarisation and review of flux densities.
 Andersen *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.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
 Sezer *et al.* 2018, MNRAS, 481, 1416. Suzaku observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S=1.8 Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′) of region.

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.

X-ray: Possible detection.

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

Distance: Association with CO indicates 4.4 kpc, HI absorption suggests 4.7 kpc, optical extinction suggests 4.7 kpc.

References:

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|---|---|
| <p>Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Altenhoff <i>et al.</i> 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 <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer observations.
 Becker <i>et al.</i> 2010, AJ, 140, 157. Variable radio source detection.
 Andersen <i>et al.</i> 2011, ApJ, 742, 7. Spitzer observations.
 Su <i>et al.</i> 2014, ApJ, 796, 122. CO observations.
 Su <i>et al.</i> 2015, ApJ, 811, 134. CO observations of region.</p> | <p>H.E.S.S. Collaboration: Abramowski <i>et al.</i> 2015, MNRAS, 446, 1163. H.E.S.S. observations.
 Mori <i>et al.</i> 2017, ApJ, 848, 80. NuSTAR, Chandra and XMM-Newton observations.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
 Hogge <i>et al.</i> 2019, ApJ, 887, 79. Molecular line observations.
 Tam <i>et al.</i> 2020, ApJ, 899, 75. Fermi observations of region.
 Wang <i>et al.</i> 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara <i>et al.</i> 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 0.7 Jy) including polarisation, and Spitzer observations.
 Sofue <i>et al.</i> 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′′) of region.</p> |
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G23.3–0.3

RA: 18^h34^m45^s
Dec: –08°48′

1-GHz flux/Jy: 70
Spectral index: 0.5

Size/arcmin: 27
Type: S

W41

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 suggest 4.2 or 4.8 kpc, optical extinction suggests 3.4 kpc.

References:

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|---|---|
| <p>Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
 Altenhoff <i>et al.</i> 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 <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Aharonian <i>et al.</i> 2005, Science, 307, 1938. H.E.S.S. detection.
 Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer possible detection.
 Aharonian <i>et al.</i> 2006, ApJ, 636, 777. H.E.S.S. observations.
 Albert <i>et al.</i> 2006, ApJ, 643, L53. γ-ray observations.
 Landi <i>et al.</i> 2006, ApJ, 651, 190. X-ray observations.
 Tian <i>et al.</i> 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.</p> | <p>Mukherjee <i>et al.</i> 2009, ApJ, 691, 1707. XMM-Newton and SWIFT observations.
 Frail <i>et al.</i> 2013, ApJ, 773, L19. OH observations.
 Castro <i>et al.</i> 2013, ApJ, 774, 36. Fermi observations.
 H.E.S.S. Collaboration: Abramowski <i>et al.</i> 2015, A&A, 574, A27. H.E.S.S. observations.
 Su <i>et al.</i> 2015, ApJ, 811, 134. CO observations of region.
 Acero <i>et al.</i> 2016, ApJS, 224, 8. Fermi observations.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
 Lee <i>et al.</i> 2019, AJ, 157, 123. [FeII] IR observations.
 Wang <i>et al.</i> 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara <i>et al.</i> 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 1.8 Jy) including polarisation, and Spitzer observations.
 Castelletti <i>et al.</i> 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sofue <i>et al.</i> 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′′) of region.</p> |
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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.

Distance: H_I absorption and CO suggests 3.8 kpc.

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 : $S = 2.2 \pm 0.5$ 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.
 Ranasinghe & Leahy 2018, MNRAS, 477, 2243. VGPS H_I absorption, plus CO observations.
 Sun *et al.* 2020, MNRAS, 494, 3405. Fermi observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.7$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.

Distance: Optical extinction suggests 2.7 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).
 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. Fermi observations.
 Lee *et al.* 2019, AJ, 157, 123. H₂ IR observations.
 MAGIC Collaboration, Acciari *et al.* 2019, MNRAS, 483, 4578. γ -ray observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S = 0.9$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.

Distance: Optical extinction suggests 3.5 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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: HI absorption suggests 7.5 to 9.8 or 5.8 kpc, association with CO suggests 9 kpc, H₂ emission suggests 5.8 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 (45″×60″: $S = 3.5$ 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 HI 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 HI.
- Mizuno *et al.* 2010, AJ, 139, 1542. Spitzer observations.
- An *et al.* 2013, ApJ, 779, 163. NuSTAR and other observations.
- Kumar *et al.* 2014, ApJ, 781, 41. Chandra and XMM-Newton observations.
- Froeblich *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).
- Yeung *et al.* 2017, ApJ, 837, 69. Fermi observations.
- Borkowski & Reynolds 2017, ApJ, 846, 13. Chandra expansion studies.
- Liu *et al.* 2017, ApJ, 851, 37. Fermi and CO observations.
- Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
- Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
- Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
- Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″: $S = 0.8$ Jy) including polarisation, and Spitzer observations.
- Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
- Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.

Distance: Optical extinction suggests 4.0 kpc.

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.
- Froeblich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
- Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
- Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G28.3+0.2

RA: 18^h42^m30^s
Dec: –03°58′

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

Size/arcmin: 10
Type: S

Has been called G28.36+0.21.

Radio: Asymmetric shell.

References:

Helfand *et al.* 2006, AJ, 131, 2525. VLA at 327 MHz and 1.4 GHz and IR.
 Anderson *et al.* 2017, A&A, 605, A58. THOR radio and IR survey data.

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz ($\sim 2'$).

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.

Point sources: Pulsar in NE.

Distance: HI absorption and CO suggests 9.6 kpc.

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.
 Zyuzin *et al.* 2018, MNRAS, 476, 2177. Pulsar observations.
 Ranasinghe & Leahy 2018, MNRAS, 477, 2243. VGPS HI absorption, plus CO observations.

Lee *et al.* 2019, AJ, 157, 123. [FeII] IR observations.
 Devin *et al.* 2021, A&A, 647, A68. Fermi observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18'': S = 1.2 Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20'') of region.

G28.7–0.4

RA: 18^h45^m30^s
Dec: –03°54′

1-GHz flux/Jy: 0.9?
Spectral index: 0.8?

Size/arcmin: 9
Type: S

Has been called As G28.7–0.44.

Radio: Asymmetric shell.

References:

Helfand *et al.* 2006, AJ, 131, 2525. VLA at 327 MHz and 1.4 GHz and IR.
 Anderson *et al.* 2017, A&A, 605, A58. THOR radio and IR survey data.

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz ($\sim 2'$).

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.

Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′′ : S = 0.1 Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′′) of region.

G29.7–0.3

RA: 18^h46^m25^s
Dec: –02°59′

1-GHz flux/Jy: 10
Spectral index: 0.63

Size/arcmin: 3
Type: C

Kes 75

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, and H_I absorption suggests 5.6 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′ : S = 5 ± 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 (7′′ × 20′′) and 8 GHz (8′′ × 25′′), 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 H_I.
 Morsi & Reich 1987, A&AS, 71, 189. Effelsberg 100-m at 32 GHz (26′.5 : S = 1.02 ± 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 observations.
 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. INTEGRAL and Chandra observations.
 Leahy & Tian 2008, A&A, 480, L25. VGPS at 1.4 GHz (1′) including H_I.
 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 ± 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).
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
 Reynolds *et al.* 2018, ApJ, 856, 133. Chandra observations for expansion and brightness change studies.
 Temin *et al.* 2019, ApJ, 878, L19. Herschel observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Guest & Safi-Harb 2020, MNRAS, 498, 821. Chandra observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′′ : S = 2.0 Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Gotthelf *et al.* 2021, ApJ, 908, 212. Chandra and NuSTAR observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′′) of region.
 Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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.

Distance: Optical extinction suggests 3.6 kpc.

References:

Reich *et al.* 1986, A&A, 155, 185. Effelsberg 100-m at 4.75 GHz (2′4 : S = 3.4±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±0.19 Jy) including polarisation and review of flux densities.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G31.5–0.6

RA: 18^h51^m10^s
Dec: –01°31′

1-GHz flux/Jy: 2?
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.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 0.3 Jy) including polarisation, and Spitzer observations.

Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′) of region.

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:** H_I absorption and CO association suggests 7.1 kpc, as does H₂ emission.**References:**

- Radhakrishnan *et al.* 1972, ApJS, 24, 49. H_I 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 (9′×24′), 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. Fermi and Suzaku observations.
 Gusdorf *et al.* 2014, IAUS, 296, 178. CO observations.
 Su *et al.* 2014, IAUS, 296, 372. VGPS for H_I 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).
 Ranasinghe & Leahy 2017, ApJ, 843, 119. H_I and CO observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : $S = 1.5$ Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′) of region.

G32.0–4.9

3C396.1

RA: 19^h06^m00^s
Dec: –03°00′**1-GHz flux/Jy:** 22?
Spectral index: 0.5?**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.

Distance: H₂ emission suggests 5 kpc, optical extinction suggests 4.7 kpc.

References:

Folgheraiter *et al.* 1997, MNRAS, 292, 365. ROSAT and ASCA observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 Lee *et al.* 2019, AJ, 157, 123. H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.

Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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 XRRRC, E4.18. XMM-Newton observations.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G32.8–0.1

RA: 18^h51^m25^s
Dec: –00°08′

1-GHz flux/Jy: 11?
Spectral index: 0.2?

Size/arcmin: 22×15
Type: S?

Kes 78

Part has been called G33.1–0.1.

Radio: Incomplete, elongated shell.

Optical: Detected.

X-ray: Patchy, elongated shell.

Distance: Association with CO and H_i absorption indicate 4.8 kpc, H₂ emission suggests 5.4 kpc.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 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 (3.6×3.8 : $S=31.3$ 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. H₂ IR observations.
 Bamba *et al.* 2016, ApJ, 818, 63. Suzaku observations.
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 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.

Distance: H₂ emission suggests 4.9 kpc.

References:

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| <p>Altenhoff <i>et al.</i> 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).</p> <p>Reich 1982, A&A, 106, 314. Effelsberg 100-m at 2.7 GHz (4′4 : S = 2.6±0.3 Jy) and 4.75 GHz (2′5 : S = 1.75±0.2 Jy).</p> <p>Dubner <i>et al.</i> 1996, AJ, 111, 1304. VLA at 1.4 GHz (52″×68″ : S = 2.7±0.3 Jy).</p> <p>Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.</p> <p>Boumis <i>et al.</i> 2009, A&A, 499, 789. Optical observations.</p> | <p>Froebrich <i>et al.</i> 2015, MNRAS, 454, 2586. H₂ IR observations.</p> <p>Lee <i>et al.</i> 2019, AJ, 157, 123. H₂ IR observations.</p> <p>Chawner <i>et al.</i> 2020, MNRAS, 493, 2706. Herschel observations.</p> <p>Lee <i>et al.</i> 2020, AJ, 160, 263. H₂ IR observations.</p> <p>Dokara <i>et al.</i> 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 0.2 Jy) including polarisation, and Spitzer observations.</p> <p>Sofue <i>et al.</i> 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.</p> |
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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 and G33.7+0.05.

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

X-ray: Multiple shells and filaments.

Point sources: Central X-ray pulsar.

Distance: H_i absorption suggests 7.8 or 3.5 kpc, and CO observations suggest 5.5 kpc.

References:

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| <p>Caswell <i>et al.</i> 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).</p> <p>Caswell <i>et al.</i> 1975, A&A, 45, 239. H_i absorption.</p> <p>Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S₄₃₀ MHz = 69±33 Jy.</p> <p>Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′ : S = 6.8±1.5 Jy).</p> <p>Angerhofer <i>et al.</i> 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′8 : S = 11.4±1.1 Jy).</p> <p>Caswell <i>et al.</i> 1981, MNRAS, 195, 89. FIRST at 1415 MHz (1′), plus observations of the nearby point source.</p> <p>van Gorkom <i>et al.</i> 1982, MNRAS, 198, 757. WSRT H_i absorption to nearby point source, possibly extragalactic.</p> <p>Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source, plus Einstein observations.</p> <p>Green 1989, MNRAS, 238, 737. OH absorption.</p> <p>Frail & Clifton 1989, ApJ, 336, 854. VLA at 1.4 GHz (1′×2′9), including H_i absorption.</p> <p>Velusamy <i>et al.</i> 1991, AJ, 102, 676. VLA at 327 MHz (1′), 1.5 (7″×14″) and 5 GHz (7″), including spectral comparison.</p> <p>Green & Dewdney 1992, MNRAS, 254, 686. Observations of adjacent molecular material.</p> <p>Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′6×3′8 : S = 34.8 Jy).</p> <p>Seward & Velusamy 1995, ApJ, 439, 715. ROSAT observations.</p> <p>Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.</p> <p>Koralesky <i>et al.</i> 1998, AJ, 116, 1323. VLA search for OH emission.</p> <p>Sugizaki <i>et al.</i> 2001, ApJS, 134, 77. ASCA survey observations.</p> <p>Tsunemi & Enoguchi 2002, PASJ, 54, 735. ASCA observations.</p> | <p>Seward <i>et al.</i> 2003, ApJ, 584, 414. Chandra observations.</p> <p>Stanimirović 2003, ApJ, 592, 953. Arecibo OH absorption.</p> <p>Sun <i>et al.</i> 2004, ApJ, 605, 742. Chandra observations.</p> <p>Gotthelf <i>et al.</i> 2005, ApJ, 627, 390. XMM-Newton pulsar detection.</p> <p>Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer possible detection.</p> <p>Halpern <i>et al.</i> 2007, ApJ, 665, 1304. X-ray pulsar timing observations.</p> <p>Giacani <i>et al.</i> 2009, A&A, 507, 841. VLA at 74 MHz (36″×39″ : S = 76±10 Jy), 324 MHz (13″ : S = 39±8 Jy) and 1.5 GHz (17″×19″ : S = 11.5±1.5 Jy), plus review of flux densities and XMM-Newton observations.</p> <p>Sun <i>et al.</i> 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : S = 9.4±0.5 Jy) including polarisation and review of flux densities.</p> <p>Auchettl <i>et al.</i> 2014, ApJ, 783, 32. Fermi detection.</p> <p>Kilpatrick <i>et al.</i> 2016, ApJ, 816, 1. CO observations, including broad lines.</p> <p>Zhou <i>et al.</i> 2016, ApJ, 831, 192. CO and other observations.</p> <p>Sato <i>et al.</i> 2016, PASJ, 68, S8. Suzaku observations.</p> <p>Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_i absorption observations.</p> <p>Kuriki <i>et al.</i> 2018, ApJ, 864, 161. CO observations.</p> <p>Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.</p> <p>Dokara <i>et al.</i> 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 1.2 Jy) including polarisation, and Spitzer observations.</p> <p>Sofue <i>et al.</i> 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.</p> <p>Millard <i>et al.</i> 2021, ApJS, 257, 36. ISO far-IR spectroscopy.</p> |
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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: H_I absorption suggests 3.0 kpc, optical absorption suggests 2.1 or 2.7 kpc, H₂ emission suggests 2.8 kpc.

References:

- Caswell *et al.* 1975, A&A, 45, 239. H_I absorption.
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 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S₄₃₀ 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).
 Wolszczan *et al.* 1991, ApJ, 372, L99. Pulsar detection.
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′6×3′8 : S = 469 Jy).
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 Frail *et al.* 1996, ApJ, 464, L165. VLA at 1.5 and 8.4 GHz (7′8×8′9) of pulsar nebula.
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 Harrus *et al.* 1997, ApJ, 488, 781. X-ray observations.
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 Giacani *et al.* 1997, AJ, 113, 1379. VLA at 1.4 GHz (15′), plus optical images.
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 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Beuther *et al.* 2019, A&A, 628, A90. OH maser observations.
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 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Okon *et al.* 2020, ApJ, 890, 62. XMM-Newton observations.
 Peron *et al.* 2020, ApJ, 896, L23. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′) of region.

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.

Distance: H I absorption suggests 3.8 kpc.

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.
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 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″:S=0.3 Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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?

Distance: Optical extinction suggests 8.7 kpc.

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±0.04 Jy) including polarisation and review of flux densities.

Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.

Distance: Optical extinction suggests 4.1 kpc.

References:

Schudel *et al.* 2002, ASPC, 271, 391. ROSAT of E, and radio survey observations.
 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. H₂ IR observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G39.2–0.3

RA: 19^h04^m08^s
Dec: +05°28′

1-GHz flux/Jy: 18
Spectral index: 0.34

3C396, HC24, NRAO 593

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 8.5 kpc, H₂ emission suggests 9.5 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′).
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S₄₃₀ MHz = 54±38 Jy.
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′ : S=4.1±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 (48″×65″).
 Becker & Helfand 1987, AJ, 94, 1629. VLA at 1.4 GHz (12″ : S=14 Jy) and 5 GHz, plus Einstein observations.
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 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
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 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : S=8.8±0.5 Jy) including polarisation and review of flux densities.
 Su *et al.* 2011, ApJ, 727, 43. Chandra and CO observations of region.
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 Lee *et al.* 2019, AJ, 157, 123. [FeII] and H₂ IR observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
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 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
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 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S=1.0 Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G39.7–2.0

RA: 19^h12^m20^s
Dec: +04°55′

1-GHz flux/Jy: 85?
Spectral index: 0.7?

W50, SS433
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 HII 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: HI absorption and CO observations indicate 4.9 kpc, optical emission gives 4.7 kpc.

References:

van den Bergh 1980, ApJ, 236, L23. Optical in H α and [SII].
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 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT HI absorption to nearby point source (not SS433).
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 Aharonian *et al.* 2001, A&A, 375, 1008. H.E.S.S. limit.
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 Boumis *et al.* 2007, MNRAS, 381, 308. Optical observations.
 Lockman *et al.* 2007, MNRAS, 381, 881. HI 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.
 Farnes *et al.* 2017, MNRAS, 467, 4777. ATCA at 1.4 to 3.1 GHz, including polarisation and H α observations.
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 Su *et al.* 2018, ApJ, 863, 103. CO and HI observations.
 Sun *et al.* 2019, A&A, 626, A113. Fermi observations.
 Liu *et al.* 2020, ApJ, 892, 143. CO and CN observations of W edge.
 Rosado *et al.* 2021, MNRAS, 506, 4263. Optical spectroscopy, including distance.

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.

Point sources: Central pulsar.

Distance: Optical extinction suggests 5.1 kpc.

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. H.E.S.S. limit.
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 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.
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Lyne *et al.* 2017, ApJ, 834, 137. Pulsar detection.
 Duvidovich *et al.* 2020, MNRAS, 491, 5732. VLA at 1.5 GHz (39.5×51.1''), and CO observations of part.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18'' : $S = 0.05$ Jy) including polarisation, and Spitzer observations.
 Li *et al.* 2021, ApJ, 913, L33. Fermi observations of region.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20'') of region.
 Crestan *et al.* 2021, MNRAS, 505, 2309. Fermi observations of region.

G41.1–0.3

3C397

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**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 8.5 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} MHz = 82 ± 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 (52″×58″).
 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 observations.
 Dyer & Reynolds 1999, ApJ, 526, 365. VLA at 1.5 GHz (6′6×6′9) and 4.8 GHz (5′6×6′4), 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. H.E.S.S. limit.
 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. Fermi 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).
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″: $S=1.3$ Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Ohshiro *et al.* 2021, ApJ, 913, L34. XMM-Newton observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Ergin *et al.* 2021, MNRAS, 501, 4226. Fermi limit.

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.
 Lee *et al.* 2019, AJ, 157, 123. [FeII] IR observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″: $S=0.7$ Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

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.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer 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.

Distance: Optical extinction suggests 4.2 kpc.

References:

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′.4 : S = 1.5 ± 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. H.E.S.S. limit.
 Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 333 MHz (50′), and other observations of the region.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 0.04 Jy) including polarisation, and Spitzer observations.

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: H I absorption suggests 11.3 kpc, H₂ emission suggests 7.5 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 ± 0.7 Jy).
 Lockhart & Goss 1978, A&A, 67, 355. H I 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 ± 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. H.E.S.S. limit.
 Brogan & Troland 2001, ApJ, 550, 799. VLA at 1.4 GHz (24′ × 27′ and 5′) for H I Zeeman splitting.
 Lacey *et al.* 2001, ApJ, 559, 954. VLA at 74 MHz (23′ × 26′ : S = 55.6 Jy) and 326 MHz (6′.2 × 6′.6 : 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 ± 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. Fermi 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).
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H I absorption observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A5. H.E.S.S. observations.
 Zhou & Vink 2018, A&A, 615, A150. Chandra observations.
 Tanaka *et al.* 2018, ApJ, 866, L26. NuSTAR observations.
 Yamaguchi *et al.* 2018, ApJ, 868, L35. NuSTAR observations.
 Lee *et al.* 2019, AJ, 157, 123. [Fe II] and H₂ IR observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Lee *et al.* 2020, AJ, 160, 263. H₂ IR observations.
 Sun & Chen 2020, ApJ, 893, 90. XMM-Newton observations.
 Holland-Ashford *et al.* 2020, ApJ, 903, 108. XMM-Newton observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 3.3 Jy) including polarisation, and Spitzer observations.
 Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density, and other low-frequency radio flux densities.
 Sano *et al.* 2021, ApJ, 919, 123. ALMA CO observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′) of region.

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.

Distance: Association with CO suggests 3.1 kpc, optical extinction suggests 1.5 kpc.

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).
 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±0.24 Jy) including polarisation and review of flux densities.
 Zhou *et al.* 2020, ApJ, 900, 155. CO observations of region.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

Distance: Optical extinction suggests 6.0 kpc.

References:

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2.4 : S = 2.6±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. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18'' : S = 0.15 Jy) including polarisation, and Spitzer observations.
 Zhang *et al.* 2021, ApJ, 923, 106. Fermi observations of region.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20'') of region.

G46.8–0.3

RA: 19^h18^m10^s
Dec: +12°09′

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

Size/arcmin: 15
Type: S

(HC30)

Has been called G46.6–0.2.

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

Distance: HI absorption suggests 5.7 to 11.4 kpc.

References:

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5' : S = 9.8±0.9 Jy), and 37-m at 1.7 GHz (S = 14.5±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 S₄₃₀ MHz = 46±21 Jy.
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6.8 : S = 5.9±0.6 Jy).
 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 (53''×58'' : S = 13.3±0.1 Jy).
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9.5 : S = 7.02±0.18 Jy) including polarisation and review of flux densities.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18'' : S = 0.9 Jy) including polarisation, and Spitzer observations.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20'') of region.

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, optical absorption suggests 5.7 kpc, H_I absorption suggests 5.4 kpc.**References:**

- Shaver & Goss 1970, AuJPA, 14, 133. Parkes 64-m at 5 GHz (4′).
Sato 1973, PASJ, 25, 135. H_I 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).
Subrahmanyan & 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 H_I.
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 H_I.
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. H_I 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. H_I 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 H_I 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. Fermi observations.
McEwen *et al.* 2016, ApJ, 826, 189. NH₃ and CH₃OH observations.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
Lee *et al.* 2019, AJ, 157, 123. [FeI] IR observations.
Beuther *et al.* 2019, A&A, 628, A90. OH maser observations.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S=0.8$ Jy) including polarisation, and Spitzer observations.
Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G53.4+0.0**RA:** 19^h29^m57^s
Dec: +18°10′**1-GHz flux/Jy:** 1.5
Spectral index: 0.6?**Size/arcmin:** 10?
Type: S

Has been called G53.41+0.03.

Radio: Asymmetric shell.**X-ray:** Detected.**References:**

- Anderson *et al.* 2017, A&A, 605, A58. VLA at 1 to 2 GHz.
Driessen *et al.* 2018, ApJ, 860, 133. LOFAR at 140 MHz, plus other radio observations, and XMM-Newton observations.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : $S=0.03$ Jy) including polarisation, and Spitzer 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 observations.
 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.
 Ergin *et al.* 2017, ApJ, 842, 22. Suzaku and Fermi observations.
 Sett *et al.* 2021, A&A, 647, A183. Pulsar search.

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 possible faint diffuse emission.

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

Point sources: Central pulsar.

Distance: H_I absorption suggests 4.9, association with CO suggests 8.2 kpc, and optical absorption suggests 6.3 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.
 Krivonos *et al.* 2017, MNRAS, 470, 512. INTEGRAL observations.
 Temim *et al.* 2017, ApJ, 836, 129. Spitzer, Herschel and Akari observations.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H_I absorption observations.
 Rho *et al.* 2018, MNRAS, 479, 5101. Spitzer, Herschel and other observations.
 Driessen *et al.* 2018, ApJ, 860, 133. LOFAR observations at 144 MHz, plus other observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Guest & Safi-Harb 2020, MNRAS, 498, 821. Chandra observations.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18''$) including polarisation, and Spitzer observations.
 Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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.**Point sources:** Pulsar outside NW rim.**Distance:** H_I and CO observations suggest 6.6 kpc, H₂ emission suggests 5.4 kpc, optical extinction suggests 6.6 kpc.**References:**

- | | |
|--|---|
| <p>Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ($S = 34.4 \pm 5.0$ Jy).</p> <p>Altenhoff <i>et al.</i> 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).</p> <p>Caswell 1985, AJ, 90, 1224. DRAO at 1.4 GHz ($1.3 \times 2.6 : S = 18 \pm 4$ Jy).</p> <p>Velusamy <i>et al.</i> 1986, JApA, 7, 105. WSRT at 609 MHz ($50'' \times 191''$ smoothed to $100'' \times 200''$).</p> <p>Junkes <i>et al.</i> 1992, A&AS, 96, 1. Surrounding CO.</p> <p>Junkes <i>et al.</i> 1992, A&A, 261, 289. Nearby IRAS sources.</p> <p>Boumis <i>et al.</i> 2005, A&A, 443, 175. Optical observations.</p> <p>Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer observations.</p> <p>Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity H_I.</p> | <p>Andersen <i>et al.</i> 2011, ApJ, 742, 7. Spitzer observations.</p> <p>Park <i>et al.</i> 2013, ApJ, 777, 14. Arecibo of H_I in region.</p> <p>Froeblich <i>et al.</i> 2015, MNRAS, 454, 2586. H₂ IR observations.</p> <p>Karpova <i>et al.</i> 2017, MNRAS, 466, 1757. X-ray observations of pulsar.</p> <p>Ranasinghe & Leahy 2017, ApJ, 843, 119. H_I and CO observations.</p> <p>Lee <i>et al.</i> 2019, AJ, 157, 123. H₂ IR observations.</p> <p>Chawner <i>et al.</i> 2020, MNRAS, 493, 2706. Herschel observations.</p> <p>Lee <i>et al.</i> 2020, AJ, 160, 263. H₂ IR observations.</p> <p>Wang <i>et al.</i> 2020, A&A, 639, A72. Optical extinction for distance.</p> <p>Dokara <i>et al.</i> 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18'' : S = 0.6$ Jy) including polarisation, and Spitzer observations.</p> |
|--|---|

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 H_I features implies 14 kpc, optical extinction suggests 10.2 kpc.**References:**

- | | |
|--|--|
| <p>Taylor <i>et al.</i> 1992, AJ, 103, 931. WSRT at 327 MHz (1.0×2.5), and northern sky survey at 4.9 GHz.</p> <p>Matthews <i>et al.</i> 1998, ApJ, 493, 312. WSRT at 327 MHz ($1.0 \times 2.9 : S = 0.98 \pm 0.15$ Jy), DRAO at 1.4 GHz ($1.0 \times 2.9 : S = 0.25 \pm 0.12$ Jy), plus H_I observations.</p> | <p>Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer possible detection.</p> <p>Wang <i>et al.</i> 2020, A&A, 639, A72. Optical extinction for distance.</p> <p>Dokara <i>et al.</i> 2021, A&A, 651, A86. VLA at 4 to 8 GHz ($18''$) including polarisation, and Spitzer observations.</p> |
|--|--|

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:**

- | | |
|---|---|
| <p>Goss <i>et al.</i> 1977, A&A, 61, 93. WSRT observations at 610 MHz ($57'' \times 156'' : S = 1.9 \pm 0.2$ Jy) and 1415 MHz ($27'' \times 72'' : S = 1.0 \pm 0.1$ Jy).</p> <p>Bhatnagar <i>et al.</i> 2011, ApJ, 739, L20. VLA at 1.3 to 1.9 GHz ($30''$).</p> | <p>Sun <i>et al.</i> 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.</p> |
|---|---|

G57.2+0.8

(4C21.53)

RA: 19^h34^m59^s**Dec:** +21°57′**1-GHz flux/Jy:** 1.8**Spectral index:** 0.35**Size/arcmin:** 12?**Type:** S?**Radio:** Extended non-thermal arc.**Point sources:** Central magnetar/SGR.**Distance:** HI observations suggest 12.5 kpc, other associations suggests 4.4 to 9.0 kpc.**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±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.Israel *et al.* 2016, MNRAS, 457, 3448. Chandra, XMM-Newton and Swift observations of magnetar.Kothes *et al.* 2018, ApJ, 852, 54. DRAO at 408 MHz (2′8×8′5) and 1.4 GHz (0′82×2′5), including HI and polarisation, plus other radio observations.Zhong *et al.* 2020, ApJ, 898, L5. Distance from association with FRB.Mereghetti *et al.* 2020, ApJ, 898, L29. INTEGRAL observations of FRB, for distance.Zhou *et al.* 2020, ApJ, 905, 99. CO observations.Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 0.2 Jy) including polarisation, and Spitzer observations.**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′0×2′5 : S = 5.1±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.

Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18′ : S = 0.03 Jy) including polarisation, and Spitzer observations.**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:**Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′0×2′2), and northern sky survey at 4.9 GHz.Wallace *et al.* 1997, AJ, 114, 2068. WSRT at 1.4 GHz (14′′×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±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.

Optical: Filaments in N and W.

References:

Tian & Leahy 2006, A&A, 455, 1053. CGPS at 408 MHz (2′8×5′9) and 1.4 GHz (0′8×1′7) including H_I.
 Hurley-Walker *et al.* 2009, MNRAS, 398, 249. Radio identification.
 Neustadt *et al.* 2017, MNRAS, 469, 516. Optical observations.

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, optical extinction suggests 4.2 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 ($\sim 3'$: $S = 9.1 \pm 1.0$ Jy) and 1420 MHz ($\sim 1'$: $S = 3.9 \pm 0.5$ Jy), including review of flux densities.
 Aleksić *et al.* 2010, ApJ, 725, 1629. γ -ray 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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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, optical extinction suggests 1.5 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 observations.

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 25-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.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

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 ($5' : S = 2.8 \pm 0.4$ 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} MHz = 8.7 ± 4.9 Jy, S_{318} MHz = 9.7 ± 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.
 Coerver *et al.* 2019, ApJ, 878, 126. γ -ray 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

Has been called G66.0+0.0.

Radio: Some emission in N.

Optical: Incomplete shell.

Distance: Optical absorption suggests 2.3 or 3.9 kpc.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey observations.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

Distance: Optical absorption suggests 2.0 kpc.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. H α and radio survey observations.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.

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.

Distance: Optical absorption suggests 1.5–5.7 kpc.

References:

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′0×1′9 : S = 1.9±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 observations.

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : S = 1.1±0.1 Jy) and 1420 MHz (~1′ : S = 0.68±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 observations 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±0.03 Jy) including polarisation and review of flux densities.

Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.

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 observations.

Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

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 (~1′ : S = 0.57±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±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 W edge of core.

Distance: HI observations suggest 1.5 kpc, and optical absorption suggests 4.6 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 (17''×26'' and 6''×10'') and VLA at 324 and 1380 MHz (63''×73'' and 78''×93'').

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.

Kothes *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. Arecibo of HI in region.

Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30 and 44 GHz.

Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.

Li *et al.* 2020, RAA, 20, 186. Radio study from various surveys.

Araya & Herrera 2021, MNRAS, 502, 472. Fermi observations.

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 observations.

Kothes *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

Radio: Not detected.

Optical: Large, faint shell of filaments.

X-ray: Partially detected.

Point sources: Possible associated WD.

Distance: Association with WD implies 1 kpc.

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.

Shen *et al.* 2018, ApJ, 865, 15. GAIA of WD.
 Raymond *et al.* 2020, ApJ, 888, 90. Optical observations.
 Bracco *et al.* 2020, A&A, 636, L8. Optical, IR and dust 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.

Distance: Optical extinction suggests 4.0 kpc.

References:

Reich *et al.* 1986, A&A, 155, 185. Effelsberg 100-m at 4.75 GHz (2′4″:S=6.7±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±1.2 Jy) and 1.4 GHz (1′0″×1′7″:S=7.4±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 H α .
 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±1.7 Jy) and 1420 MHz (\sim 1′:S=7.6±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±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. Fermi observations.
 Zdziarski *et al.* 2016, MNRAS, 455, 1451. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G74.0–8.5

Cygnus Loop

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

Distance: Stellar interactions gives 0.73 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.
- Fesen *et al.* 1992, AJ, 104, 719. H α imagery.
- 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.
- Leahy *et al.* 1997, AJ, 114, 2081. DRAO at 1.4 GHz (1′×2′), including polarisation.
- Leahy & Roger 1998, ApJ, 505, 784. DRAO at 1.4 GHz (1′0×1′9) and 408 MHz (3′4×6′9), for spectral index studies in comparison with other radio observations.
- 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.
- Danforth *et al.* 2000, AJ, 119, 2319. UV, optical and X-ray comparison of selected regions.
- Miyata *et al.* 2001, ApJ, 550, 1023. ASCA observations of compact X-ray sources.
- 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 (2′×4′) for HI.
- Blair *et al.* 2002, ApJS, 140, 367. UV spectroscopy.
- 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.
- Nemes *et al.* 2008, ApJ, 675, 1293. XMM-Newton observations of NE.
- Katsuda *et al.* 2008, ApJ, 680, 1198. Chandra observations of NE.
- 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.
- Tsunemi *et al.* 2009, PASJ, 61, S147. Suzaku observations of SE.
- Kosugi *et al.* 2010, PASJ, 62, 1035. Suzaku observations of SE.
- Sankrit *et al.* 2010, ApJ, 712, 1092. Spitzer observations.
- McEntaffer & Brantseg 2011, ApJ, 730, 99. Chandra observations of E.
- Katagiri *et al.* 2011, ApJ, 741, 44. Fermi observations.
- Leahy & Hassan 2013, ApJ, 764, 55. Suzaku and XMM-Newton observations of SW.
- Oakley *et al.* 2013, ApJ, 766, 51. X-ray spectroscopy.
- Kim *et al.* 2014, ApJ, 784, 12. Far UV observations.
- Sankrit *et al.* 2014, ApJ, 787, 3. Spitzer spectroscopy in SE.
- Medina *et al.* 2014, ApJ, 791, 30. Optical spectroscopy in NE.
- 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.
- Planck Collaboration: 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. Fermi observations.
- Boubert *et al.* 2017, A&A, 606, A14. Gaia search for runaway progenitor companion.
- Seok *et al.* 2020, ApJ, 893, 79. Optical spectroscopy.
- Raymond *et al.* 2020, ApJ, 903, 2. Optical spectroscopy.
- Fesen *et al.* 2021, MNRAS, 507, 244. Gaia observations for distance.
- Sun *et al.* 2021, RAA, 21, 282. FAST at 1.0 to 1.5 GHz (4′), including polarisation.

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: Optical extinction gives 6.1 kpc.

References:

Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S_{430} MHz = 12.2±9.7 Jy, S_{318} MHz = 17.7±5.0 Jy.
 Weiler & Shaver 1978, A&A, 70, 389. WSRT at 610 MHz (57″×94″ : $S=9.1±1.2$ Jy), 1.4 (24″×40″ : $S=8.7±1.2$ Jy) and 5 GHz (24″×40″ : $S=5.6±1.3$ Jy).
 Geldzahler *et al.* 1980, A&A, 84, 237. Effelsberg 100-m at 2.7 GHz (4.4′ : $S=7.6±0.5$ 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″ : $S=1.47±0.19$ Jy).
 Green & Gull 1989, MNRAS, 237, 555. VLA at 1.4 GHz (1.2′×1.4′) including HI.
 Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz, plus review of flux densities.
 Pineault & Chastenay 1990, MNRAS, 246, 169. DRAO at 408 MHz (3.4′×5.8′ : $S=11.6±0.4$ Jy) and 1.4 GHz (1.0′×1.7′ : $S=7.2±0.3$ Jy).
 Asaoka & Koyama 1990, PASJ, 42, 625. Ginga X-ray spectrum.
 Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz (3.5′×5.2′ : $S=13.3±0.8$ Jy) and Effelsberg 100-m at 4.8 GHz ($S=7.5±0.7$ 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′×5.5′) and 1.4 GHz (1.0′×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′×1.6′) including HI, plus CO observations.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′$: $S=11.9±0.9$ Jy) and 1420 MHz ($\sim 1′$: $S=7.1±1.1$ 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′ : $S=6.4±0.4$ 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. Fermi observations.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Liu *et al.* 2018, ApJ, 859, 173. CO observations.
 Abeysekara *et al.* 2018, ApJ, 861, 134. γ -ray observations.
 Guest *et al.* 2020, MNRAS, 491, 3013. XMM-Newton observations.
 Kothes *et al.* 2020, MNRAS, 496, 723. Effelsberg 100-m at 4.75 (2.5), 10.55 (1.2), 14.7 (0.85) and 32 GHz (0.45), plus other radio survey observations.

G76.9+1.0

RA: 20^h22^m20^s
Dec: +38°43′

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

Size/arcmin: 9
Type: C

Radio: Bipolar shell.

Point sources: Central pulsar.

References:

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1.0′×1.6′), and northern sky survey at 4.9 GHz.
 Landecker *et al.* 1993, A&A, 276, 522. VLA at 1.49 GHz (14″), 4.86 GHz (13″×16″) and 8.55 GHz (11″×12″), including polarisation and review of flux densities.
 Landecker *et al.* 1997, A&AS, 123, 199. Miyun at 232-MHz (3.8′×5.4′).
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3′$: $S=2.3±0.2$ Jy) and 1420 MHz ($\sim 1′$: $S=1.35±0.07$ Jy), including polarisation and review of flux densities.

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′ : $S=0.79±0.07$ Jy) including polarisation and review of flux densities.
 Marthi *et al.* 2011, MNRAS, 416, 2560. GMRT at 618 MHz (51″×54″), 1160 MHz (2.2′×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, optical extinction suggests 0.98 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 (3.4×5.8 : $S = 480 \pm 60$ Jy) and 1.4 GHz (1.0×1.7 : $S = 270 \pm 40$ Jy).
 Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz (3.5×5.2 : $S = 540 \pm 40$ 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 (2.9×4.5) and 1.4 GHz (0.8×1.5).
 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. Fermi observations.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Abeysekara *et al.* 2018, ApJ, 861, 134. γ -ray observations.
 Piano *et al.* 2019, ApJ, 878, 54. γ -ray observations.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
 Sett *et al.* 2021, A&A, 647, A183. Pulsar search.

G82.2+5.3

RA: 20^h19^m00^s
Dec: +45°30′

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

Size/arcmin: 95 \times 65
Type: S

W63

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.

Distance: Optical absorption suggests 3.2 kpc, optical extinction suggests 1.3 kpc.

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).

Uyaniker *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.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

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:

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′0×1′5), and northern sky survey at 4.9 GHz.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~ 3′ : S = 1.2±0.3 Jy) and 1420 MHz (~ 1′ : S = 0.8±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″×81″ : S = 12.4±1.5 Jy) and Effelsberg 100-m at 2.7 GHz (4′4 : S = 6.8±1.3 Jy).
 Matthews & Shaver 1980, A&A, 87, 255. WSRT at 1415 MHz (23″×32″), and Effelsberg 100-m at 2.7 GHz (4′4 : S = 5.6±0.5 Jy).
 Feldt & Green 1993, A&A, 274, 421. DRAO at 1.4 GHz (1′×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′) including 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 (~ 3′ : S = 14.5±0.5 Jy) and 1420 MHz (~ 1′ : S = 7.2±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, optical absorption suggests 4.4 or 3.8 kpc.

References:

Kothes *et al.* 2001, A&A, 376, 641. CGPS at 408 MHz (2′8×4′4 : S < 0.45 Jy) and 1.4 GHz (0′8×1′1), plus H_I and X-ray data.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~ 3′ : S = 2.9±0.5 Jy) and 1420 MHz (~ 1′ : S = 2.3±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.
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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: H_I observations suggest 4.8 kpc, optical extinction suggests 3.3 kpc.

References:

- Kothes *et al.* 2001, A&A, 376, 641. CGPS at 408 MHz (2′8×4′4 : S < 0.9 Jy) and 1.4 GHz (0′8×1′1), plus H_I, X-ray and optical data.
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : S = 3.0±1.3 Jy) and 1420 MHz (~1′ : S = 2.2±0.8 Jy), including review of flux densities.
- Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and H_I observations.
- Gök *et al.* 2009, Ap&SS, 324, 17. Optical observations.
- Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
- Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G89.0+4.7

RA: 20^h45^m00^s
Dec: +50°35′

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

Size/arcmin: 120×90
Type: S

HB21

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 suggest 0.8 kpc, optical extinction suggests 2.3 kpc.

References:

- Hirabayashi & Takahashi 1972, PASJ, 24, 231. 30-m dish at 4.2 GHz (11′ : S = 160±40 Jy).
- Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ : S = 148±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 H_I, 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±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 surroundings.
- Lazendic & Slane 2006, ApJ, 647, 350. X-ray observations.
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- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : S = 259±19 Jy) and 1420 MHz (~1′ : S = 183±9 Jy), including polarisation and review of flux densities.
- Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity H_I.
- Mavromatakis *et al.* 2007, A&A, 461, 991. Optical observations.
- Shinn *et al.* 2009, ApJ, 693, 1883. IR observations.
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- Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : S = 107±11 Jy), including polarisation and review of flux densities.
- Reichardt *et al.* 2012, A&A, 546, A21. Fermi detection.
- Shinn *et al.* 2012, ApJ, 759, 34. Akari observations of H₂.
- Pivato *et al.* 2013, ApJ, 779, 179. Fermi observations.
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- Acerro *et al.* 2016, ApJS, 224, 8. Fermi observations.
- Boubert *et al.* 2017, A&A, 606, A14. Gaia search for runaway progenitor companion.
- Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
- Suzuki *et al.* 2018, PASJ, 70, 75. Suzaku observations.
- Ambrogio *et al.* 2019, A&A, 623, A86. Fermi detection.
- Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
- Sett *et al.* 2021, A&A, 647, A183. Pulsar search.

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±0.52 Jy) and 2.7 GHz (4′4″:S=5.64±0.64 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±0.57 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 (~3′:S=10.5±0.7 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, optical extinction suggests 2.2 or 2.0 kpc.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′:S=18.4±1.0 Jy).
 Mantovani *et al.* 1982, A&A, 105, 176. Effelsberg 100-m at 1.7 GHz (7′6″:S=53.5±5.0 Jy), plus review of flux densities.
 Landecker *et al.* 1985, AJ, 90, 1082. DRAO at 1.4 GHz (smoothed to 2′:S=58±6 Jy).
 Mantovani *et al.* 1991, A&A, 247, 545. Effelsberg 100-m at 4.75 GHz (smoothed to 3′:S=33.5±4.0 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 emission.

Uyaniker *et al.* 2002, ApJ, 565, 1022. CGPS 1.4 GHz (49″×54″), including HI, and 408 MHz (2′8″×3′7″).
 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 (~3′:S=67±6 Jy) and 1420 MHz (~1′:S=35±4 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±2.5 Jy), including polarisation and review of flux densities.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G94.0+1.0

3C434.1

RA: 21^h24^m50^s**1-GHz flux/Jy:** 13**Size/arcmin:** 30×25**Dec:** +51°53′**Spectral index:** 0.45**Type:** S**Radio:** Incomplete shell, containing H_I shell.**X-ray:** extended emission.**Distance:** Association with stellar wind bubble implies 5.2 kpc, optical extinction suggests 2.5 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.
 Doroshenko *et al.* 2019, A&A, 631, A179. XMM-Newton observations.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

G96.0+2.0**RA:** 21^h30^m30^s**1-GHz flux/Jy:** 0.35**Size/arcmin:** 26**Dec:** +53°59′**Spectral index:** 0.6**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′.5×3′.9 : $S = 10.5 \pm 0.3$ Jy) and 1.4 GHz (1′.0×1′.2 : $S = 4.9 \pm 0.6$ Jy), plus HI.
 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 HI, plus CO and other observations.
 Ng & Romani 2004, ApJ, 601, 479. Chandra detection of pulsar wind nebula.
 Kothes *et al.* 2004, ApJ, 607, 855. HI 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.
 Xin *et al.* 2019, ApJ, 885, 162. Fermi observations.
 Albert *et al.* 2020, ApJ, 896, L29. γ -ray observations.
 Fujita *et al.* 2021, ApJ, 912, 133. Suzaku observations.
 Tibet AS γ Collaboration: Amenomori *et al.* 2021, NatAs, 5, 460. High energy γ -ray observations.
 Ge *et al.* 2021, The Innovation, 2, 100118. Chandra and XMM-Newton observations.

G107.0+9.0

RA: 22^h01^m00^s
Dec: +66°30′

1-GHz flux/Jy: 11?
Spectral index: 0.9?

Size/arcmin: 180?
Type: ?

Radio: Faint extended emission.

Optical: Filaments.

References:

Fesen *et al.* 2020, MNRAS, 498, 5194. H α and [OIII] imaging.
 Reich *et al.* 2021, A&A, 655, A10. Urumqi 25-m at 4.8 GHz (9′.5), Effelsberg 1.4-GHz (9′.4) including polarisation, and other observations.

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 HI structures suggest 3.2 kpc, optical extinction suggests 1.0 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 HI.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

G109.1–1.0

RA: 23^h01^m35^s
Dec: +58°53′

1-GHz flux/Jy: 20
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, optical extinction suggests 2.8 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).
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- 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 ($1' \times 1.2' : S = 16.8 \pm 2$ 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.
- Fesen & Hurford 1995, AJ, 110, 747. Optical observations.
- 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 ($59'' \times 68''$), 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.
- Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
- Nakano *et al.* 2017, PASJ, 69, 40. Suzaku observations.
- Sánchez-Cruces *et al.* 2018, MNRAS, 473, 1705. Optical observations.
- Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
- Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

G111.7–2.1

Cassiopeia A, 3C461

RA: 23^h23^m26^s
Dec: +58°48′**1-GHz flux/Jy:** 2300
Spectral index: 0.77**Size/arcmin:** 5
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:**

- Anderson & Rudnick 1995, ApJ, 441, 307. VLA at 1.4 GHz and 4.8 GHz, for proper motion studies.
- Kassim *et al.* 1995, ApJ, 455, L59. VLA at 74 (25'') and 332 MHz (6''), including spectral index comparisons.
- Anderson & Rudnick 1996, ApJ, 456, 234. VLA for spectral index comparisons.
- Schwarz *et al.* 1997, A&AS, 123, 43. WSRT at 1.4 GHz (30'') for H_I absorption.
- O’Sullivan & Green 1999, MNRAS, 303, 575. Flux density changes at 13.5, 15.5 and 16.5 GHz.
- Agüeros & Green 1999, MNRAS, 305, 957. 151 MHz observations for bulk expansion studies.
- Gottlieb *et al.* 2001, ApJ, 552, L39. Chandra observations, showing outer shock.
- Hwang *et al.* 2001, ApJ, 560, L175. Chandra observations of Doppler shifted lines.
- Fesen *et al.* 2001, AJ, 122, 2644. HST observations.
- Reynoso & Goss 2002, ApJ, 575, 871. VLA at 5 GHz (6''×6'') for H₂CO absorption studies.
- Krause *et al.* 2005, Science, 308, 1604. Spitzer light echoes from surroundings.
- Ennis *et al.* 2006, ApJ, 652, 376. Spitzer observations.
- Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity H_I.
- Rho *et al.* 2008, ApJ, 673, 271. Spitzer observations.
- Rest *et al.* 2008, ApJ, 681, L81. SN light echo.
- Krause *et al.* 2008, Science, 320, 1195. SN light echo spectrum.
- Helmboldt & Kassim 2009, AJ, 138, 838. Low radio frequency temporal variations.
- Barlow *et al.* 2010, A&A, 518, L138. Herschel observations.
- Sibthorpe *et al.* 2010, ApJ, 719, 1553. Akari and sub-mm observations of region.
- DeLaney *et al.* 2010, ApJ, 725, 2038. Spitzer and Chandra observations for 3-D structure.
- Patnaude *et al.* 2011, ApJ, 729, L28. Chandra observations of fading.
- Rest *et al.* 2011, ApJ, 732, 3. SN light echo observations.
- Fesen *et al.* 2011, ApJ, 736, 109. HST variability studies.
- Besel & Krause 2012, A&A, 541, L3. IR light echoes.
- Vogt *et al.* 2012, ApJ, 750, 155. Spitzer light echoes.
- Asgekar *et al.* 2013, A&A, 551, L11. LOFAR of carbon recombination lines.
- Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.
- Rutherford *et al.* 2013, ApJ, 769, 64. Chandra spectroscopy.
- Milislavljevic & Fesen 2013, ApJ, 772, 134. Optical spectroscopy for 3-D structure.
- Koo *et al.* 2013, Science, 342, 1346. IR spectroscopy.
- 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.
- Lee *et al.* 2014, ApJ, 789, 7. Spitzer and CO observations.
- Vinyaikin 2014, ARep, 58, 626. Time evolution of radio emission.
- Alarie *et al.* 2014, MNRAS, 441, 2996. Optical imaging/spectroscopy, including distance from expansion.
- Grefenstette *et al.* 2014, Nature, 506, 339. NuSTAR ⁴⁴Ti observations.
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- Wang & Li 2016, ApJ, 825, 102. INTEGRAL observations.
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- De Looze *et al.* 2017, MNRAS, 465, 3309. Spitzer and Herschel observations.
- Trotter *et al.* 2017, MNRAS, 469, 1299. Time evolution of radio emission.
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- Sato *et al.* 2017, ApJ, 836, 225. Multi-epoch Chandra observations.
- Lee *et al.* 2017, ApJ, 837, 118. IR observations.
- Arias *et al.* 2018, A&A, 612, A110. LOFAR at 30 to 77 MHz (7''×17'').
- Salas *et al.* 2018, MNRAS, 475, 2496. LOFAR C recombination lines as 43, 54, 148 and 340 MHz (70'').
- Sato *et al.* 2018, ApJ, 853, 46. Chandra and NuSTAR observations.
- Zhou *et al.* 2018, ApJ, 865, 6. CO observations.
- Raymond *et al.* 2018, ApJ, 866, 128. IR observations.
- Koo *et al.* 2018, ApJ, 866, 139. IR observations. *see also:* Koo *et al.* 2020, ApJ, 896, 177. Erratum.
- Chowdhury & Chengalur 2019, MNRAS, 486, 42. GMRT at 410 to 460 MHz for C recombination lines.
- Weinberger *et al.* 2020, A&A, 638, A83. INTEGRAL observations.
- Koo *et al.* 2020, NatAs, 4, 584. Near IR spectroscopy of surroundings.
- Weil *et al.* 2020, ApJ, 891, 116. Deep H α of surroundings.
- Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.
- Domček *et al.* 2021, MNRAS, 502, 1026. Radio to IR spectral study.

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:

- | | |
|---|--|
| <p>Kothes <i>et al.</i> 2005, A&A, 444, 871. CGPS at 408 MHz (2′8×3′1) and 1.4 GHz (49″×55″) including H_I.
 Kothes <i>et al.</i> 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′) and 1420 MHz (~1′).</p> | <p>Sun <i>et al.</i> 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : S = 1.9±0.5 Jy) including polarisation and review of flux densities.</p> |
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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:

- | | |
|---|---|
| <p>Reich & Braunsfurth 1981, A&A, 99, 17. Effelsberg 100-m at 2.7 GHz (4′4 : S = 3.6 Jy) and S_{1.4 GHz} = 4.4 Jy from 1.4 GHz survey data, plus H_I from Maryland–Green Bank survey.
 Kulkarni <i>et al.</i> 1993, Nature, 362, 135. Pulsar association.
 Fürst <i>et al.</i> 1993, A&A, 276, 470. Pulsar association.
 Becker <i>et al.</i> 1996, A&A, 306, 464. ROSAT of pulsar.
 Fesen <i>et al.</i> 1997, AJ, 113, 767. Optical observations.
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.
 Mavromatakis <i>et al.</i> 2002, A&A, 383, 1011. Optical observations.</p> | <p>Yar-Uyaniker <i>et al.</i> 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±6.0 Jy) and 1.4 GHz (1′0×1′1 : S = 9.8±0.8 Jy).
 Kothes <i>et al.</i> 2006, A&A, 457, 1081. CGPS at 1420 MHz (~1′ : S = 5.4±0.8 Jy), including review of flux densities.
 Gao <i>et al.</i> 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : S = 6.9±0.7 Jy), including polarisation and review of flux densities.</p> |
|---|---|

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:

- | | |
|--|---|
| <p>Reich & Braunsfurth 1981, A&A, 99, 17. Effelsberg 100-m at 2.7 GHz (4′4 : S = 4.7±0.4 Jy) and S_{1.4 GHz} = 8.0±0.8 Jy from 1.4 GHz survey data, plus H_I from Maryland–Green Bank survey.
 Fesen <i>et al.</i> 1997, AJ, 113, 767. Optical observations.
 Lorimer <i>et al.</i> 1998, A&A, 331, 1002. Pulsar search.
 Yar-Uyaniker <i>et al.</i> 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49″×55″), including H_I (1′0×1′1).
 Mavromatakis <i>et al.</i> 2005, A&A, 435, 141. Optical observations.</p> | <p>Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz (3′4×3′8 : S = 15.0±1.5 Jy) and 1.4 GHz (1′0×1′1 : S = 10.6±0. Jy).
 Kothes <i>et al.</i> 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : S = 12.5±1.6 Jy) and 1420 MHz (~1′ : S = 10.3±0.70 Jy), including polarisation and review of flux densities.
 Gao <i>et al.</i> 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : S = 5.7±0.6 Jy), including polarisation and review of flux densities.</p> |
|--|---|

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 outside rim to E, with radio tail.**Distance:** Association with H_I features implies 1.6 kpc, optical extinction suggests 4.3 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.
- 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 ($5' : S = 4.2 \pm 0.2$ Jy).
- Angerhofer *et al.* 1977, *A&A*, 55, 11. NRAO 140-ft at 5 GHz ($6'8 : S = 3.0 \pm 0.3$ Jy).
- Dickel & Willis 1980, *A&A*, 85, 55. WSRT at 610 MHz ($56'' \times 64''$) and 1.4 GHz ($22'' \times 25''$).
- Reich & Braunsfurth 1981, *A&A*, 99, 17. Effelsberg 100-m at 2.7 GHz ($4'4 : S = 4.8 \pm 0.4$ Jy) and $S_{1.4 \text{ GHz}} = 7.8 \pm 0.8$ Jy from 1.4 GHz survey data, plus H_I from Maryland–Green Bank survey.
- Lozinskaya 1981, *SvAL*, 7, 17. Mean optical velocity.
- Landecker *et al.* 1982, *AJ*, 87, 1379. DRAO at 1.42 GHz and H_I ($2' \times 2'3 : S = 8.3 \pm 0.5$ Jy), plus review of flux densities. see also: Landecker *et al.* 1983, *AJ*, 88, 877. Erratum.
- Fesen *et al.* 1985, *ApJ*, 292, 29. Optical spectra.
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- Hailey & Craig 1995, *ApJ*, 455, L151. ROSAT of nearby pulsar.
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- Reich 2002, in NSPS, p1. Effelsberg 100-m at 10.6 GHz ($69''$), including polarisation.
- Yar-Uyaniker *et al.* 2004, *ApJ*, 616, 247. CGPS at 1.4 GHz ($49'' \times 55''$), including H_I ($1'0 \times 1'1$).
- 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.
- Clark *et al.* 2017, *ApJ*, 834, 106. Fermi pulsar detection.
- Wu *et al.* 2018, *ApJ*, 854, 99. Radio detection of pulsar.
- Zyuzin *et al.* 2018, *MNRAS*, 476, 2177. X-ray observations of pulsar.
- Katsuragawa *et al.* 2018, *PASJ*, 70, 110. Suzaku observations.
- Schinzal *et al.* 2019, *ApJ*, 876, L17. VLA observations of pulsar tail, and Fermi timings of pulsar.
- Zhao *et al.* 2020, *ApJ*, 891, 137. Optical extinction for distance.
- Sett *et al.* 2021, *A&A*, 647, A183. Pulsar search.

G119.5+10.2

CTA 1

RA: 00^h06^m40^s**1-GHz flux/Jy:** 36**Size/arcmin:** 90?**Dec:** +72°45′**Spectral index:** 0.6**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.
- Seward 1990, ApJS, 73, 781. Einstein observations.
- Simonetti 1992, ApJ, 386, 170. VLA observations of background sources for rotation measure studies.
- Pineault *et al.* 1993, AJ, 105, 1060. DRAO at 1.4 GHz ($1' : S = 34 \pm 4$ Jy), plus H_I and IRAS.
- Seward *et al.* 1995, ApJ, 453, 284. ROSAT observations.
- Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
- Slane *et al.* 1997, ApJ, 485, 221. ASCA and ROSAT observations.
- 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. Fermi observations of pulsar.
- Ackermann *et al.* 2018, ApJS, 237, 32. Fermi observations.

G120.1+1.4

RA: 00^h25^m18^s
Dec: +64°09′

1-GHz flux/Jy: 50
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 ($1'2 : S = 13.1 \pm 0.8$ 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.
- Seward *et al.* 1983, ApJ, 266, 287. Einstein observations.
- Tan & Gull 1985, MNRAS, 216, 949. Radio at 2.7 GHz ($4''$) from 1980 and 1983, and One-Mile Telescope at 1.4 GHz ($23''$) from 1965 and 1980, for expansion.
- Albinson *et al.* 1986, MNRAS, 219, 427. HI observations.
- Green & Gull 1987, MNRAS, 224, 1055. VLA HI absorption observations towards central radio source.
- Wood *et al.* 1992, AJ, 103, 1338. VLA at 5 GHz ($1''.5$) polarisation studies.
- Vancura *et al.* 1995, ApJ, 441, 680. X-ray spectra and ROSAT image.
- Predehl & Schmitt 1995, A&A, 293, 889. ROSAT of dust scattered halo.
- 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.
- Hwang & Gotthelf 1997, ApJ, 475, 665. ASCA observations.
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- 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 ($7''.7 \times 9''.5$), for spectral index studies.
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- 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.
- Lee *et al.* 2004, ApJ, 605, L113. Observations of molecular clouds in vicinity.
- 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.
- Cassam-Chenaï *et al.* 2007, ApJ, 665, 315. Chandra observations.
- Rest *et al.* 2008, ApJ, 681, L81. SN light echo.
- Krause *et al.* 2008, Nature, 456, 617. SN light echo spectrum.
- Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
- Raymond *et al.* 2010, ApJ, 712, 901. H α spectroscopy.
- 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.
- 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.
- Williams *et al.* 2013, ApJ, 770, 129. Spitzer observations.
- Wang & Li 2014, ApJ, 789, 123. INTEGRAL observations.
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- Lu *et al.* 2015, ApJ, 805, 142. Chandra observations.
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- Tran *et al.* 2015, ApJ, 812, 101. Chandra observations.
- Lopez *et al.* 2015, ApJ, 814, 132. NuSTAR observations.
- Planck Collaboration: 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.
- Chen *et al.* 2017, A&A, 604, A13. CO observations.
- Yamaguchi *et al.* 2017, ApJ, 834, 124. Suzaku observations of E rim.
- Archambault *et al.* 2017, ApJ, 836, 23. γ -ray observations.
- Sato & Hughes 2017, ApJ, 840, 112. Chandra and Suzaku observations.
- Williams *et al.* 2017, ApJ, 842, 28. Multi-epoch Chandra observations for expansion studies.
- Knežević *et al.* 2017, ApJ, 846, 167. H α observations of NE.
- Kerzendorf *et al.* 2018, MNRAS, 479, 5696. HST search for progenitor companion.
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- Williams *et al.* 2020, ApJ, 898, L51. XMM-Newton spectroscopy.
- Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density.
- Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.
- Tanaka *et al.* 2021, ApJ, 906, L3. Multi-epoch Chandra observations for expansion.

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±0.7 Jy) and 2.7 GHz (4′4″:S=3.9±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±2.5 Jy) and part at 1.4 GHz (1′0″×1′1″), 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±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±3.9 Jy) and 1.4 GHz (1′0″×1′1″: S=6.7±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±0.7 Jy) and 1420 MHz (~1′:S=6.4±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±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±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±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±2.0 Jy) and 1.4 GHz (1′0″×1′13″:S=10.1±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±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±1.7 Jy) and 1.4 GHz (1′0″×1′2″:S=10.0±0.8 Jy).
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′:S=15.9±1.0 Jy) and 1420 MHz (~1′:S=9.7±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±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″: $S=26.7\pm 0.5$ 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.
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- 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.
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- Camilo *et al.* 2002, ApJ, 571, L41. Pulsar detection in radio.
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- 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 ($\sim 3′$: $S=32.2\pm 2.0$ Jy) and 1420 MHz ($\sim 1′$: $S=31.9\pm 1.0$ 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.
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- Kothes *et al.* 2013, A&A, 560, A18. CGPS HI observations for distance.
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- Guest & Safi-Harb 2020, MNRAS, 498, 821. Chandra observations.
- Castelletti *et al.* 2021, A&A, 653, A62. VLA 74-MHz survey flux density.
- Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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 ($S':S=33.8\pm 7.0$ 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' : $S=75\pm 15$ 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 spectroscopy, 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 : $S=51.5\pm 3.5$ 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 studies. see also: Tian & Leahy 2006, A&A, 451, 991. Erratum.
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ($\sim 3'$: $S=61\pm 9$ Jy) and 1420 MHz ($\sim 1'$: $S=29.4\pm 2.7$ Jy), including review of flux densities.
 Lazencic & 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 observations.
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Katagiri *et al.* 2016, ApJ, 818, 114. Fermi observations.
 Zhou *et al.* 2016, ApJ, 833, 4. CO observations of region.
 Rho *et al.* 2021, ApJ, 917, 47. Spitzer and WISE H₂ plus CO observations.

G150.3+4.5**RA:** 04^h27^m00^s
Dec: +55°28′**1-GHz flux/Jy:** ?
Spectral index: ?**Size/arcmin:** 180×150
Type: S**Radio:** Faint radio shell.**References:**

Gao & Han 2014, A&A, 567, A59. Radio surveys at 1.4, 2.7 and 5 GHz (9'4, 4'3, 9'5).
 Ackermann *et al.* 2017, ApJ, 843, 139. Fermi observations.

Ackermann *et al.* 2018, ApJS, 237, 32. Fermi observations.
 Devin *et al.* 2020, A&A, 643, A28. Fermi observations and ROSAT limit.

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.**Distance:** Optical extinction suggests 0.6 kpc.**References:**

Foster *et al.* 2013, A&A, 549, A107. Effelsberg 100-m at 2.7 GHz, including polarisation, plus various radio survey observations.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

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, optical extinction suggests 0.7 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±1.0 Jy) and 2.7 GHz (4′3 : S=3.0±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, including polarisation.
 Pannuti & Allen 2004, AdSpR, 33, 434. ASCA and RXTE observations.

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 (~3′ : S=8.1±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±0.5 Jy), including polarisation.
 Gerardy & Fesen 2007, MNRAS, 376, 929. Optical observations.
 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 observations for expansion.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
 Sett *et al.* 2021, A&A, 647, A183. Pulsar search.

G159.6+7.3

RA: 05^h20^m00^s
Dec: +50°00′

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

Size/arcmin: 240×180?
Type: S

Radio: Not detected.

Optical: Large, faint shell.

X-ray: Possible emission.

References:

Fesen & Milisavljevic 2010, AJ, 140, 1163. H α and ROSAT observations.

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, optical extinction suggests 0.5 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_I 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_I 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).
 Fürst & Reich 2004, in MIM, p141. Effelsberg 100-m at 1.4 and 2.7 GHz (9′.3), including polarisation.
 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, A&A, 39, 179. H_I observations of region.
 Araya *et al.* 2014, MNRAS, 444, 860. Fermi detection.
 Sezer *et al.* 2019, MNRAS, 489, 4300. Suzaku observations.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
 Saito *et al.* 2020, PASJ, 72, 65. Suzaku observations.

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_I indicates 4.5 kpc, optical extinction suggests 3.2 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_I 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_I.
 Burrows & Guo 1994, ApJ, 421, L19. ROSAT images and spectra.
 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.
 Matsumura *et al.* 2017, PASJ, 69, 30. Suzaku observations.
 Arias *et al.* 2019, A&A, 622, A6. LOFAR at 143 MHz (2′.5).
 Arias *et al.* 2019, A&A, 627, A75. CO observations of region.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

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.

Optical: Nearly complete shell.

Point sources: Pulsar 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.
 Pletsch *et al.* 2013, ApJ, 779, L11. Pulsar detection.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 How *et al.* 2018, MNRAS, 478, 1987. Optical 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: Various observations suggest about 1.2 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. Fermi observations.
 Boubert *et al.* 2017, A&A, 606, A14. Gaia search for runaway progenitor companion.
 Chen *et al.* 2017, MNRAS, 472, 3924. Optical and IR observations, including distance.
 Ren *et al.* 2018, RAA, 18, 111. Optical spectroscopy.
 Greimel *et al.* 2021, A&A, 655, A49. H α image.

G181.1+9.5

RA: 06^h26^m40^s
Dec: +32°30′

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

Size/arcmin: 74
Type: S

Radio: Faint shell.

X-ray: Detected.

Distance: HI observations suggest 0.5–2.5 kpc.

References:

Kothes *et al.* 2017, A&A, 597, A116. DRAO at 1.4 GHz (50''×90'') including HI and Effelsberg 100-m at 4850 MHz (2'45) including polarisation, plus ROSAT survey 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.

Distance: Optical extinction suggests 1.1 kpc.

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±0.08 Jy, 4'4 : S=0.25±0.04 Jy, 2'5 : S=0.20±0.02 Jy and 1'2 : S=0.15±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±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.
 Fesen *et al.* 2019, MNRAS, 486, 4701. Optical observations.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

G184.6–5.8

Crab Nebula, 3C144, SN1054

RA: 05^h34^m31^s
Dec: +22°01′**1-GHz flux/Jy:** 900
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.
- Nugent 1998, *PASP*, 110, 831. Optical expansion.
- Sankrit *et al.* 1998, *ApJ*, 504, 344. HST images.
- Wallace *et al.* 1999, *ApJS*, 124, 181. DRAO at 1.4 GHz (1’0×2’8), plus Effelsberg 100-m, for HI studies.
- Greiveldinger & Aschenbach 1999, *ApJ*, 510, 305. X-ray variability of torus.
- Weisskopf *et al.* 2000, *ApJ*, 536, L81. Chandra observations.
- Sollerman *et al.* 2000, *ApJ*, 537, 861. HST observations.
- Aharonian *et al.* 2000, *ApJ*, 539, 317. H.E.S.S. observations.
- Willingale *et al.* 2001, *A&A*, 365, L212. XMM-Newton observations.
- Douvion *et al.* 2001, *A&A*, 373, 281. ISO observations.
- Bietenholz *et al.* 2001, *ApJ*, 560, 254. Multi-epoch VLA observations, showing variations near the pulsar.
- Bandiera *et al.* 2002, *A&A*, 386, 1044. 1.3 mm observations.
- Hester *et al.* 2002, *ApJ*, 577, L49. HST and Chandra multi-epoch observations.
- Atkins *et al.* 2003, *ApJ*, 595, 803. γ -ray observations.
- Green *et al.* 2004, *MNRAS*, 355, 1315. Sub-mm and ISO observations.
- Mori *et al.* 2004, *ApJ*, 609, 186. Chandra observations.
- Čadež *et al.* 2004, *ApJ*, 609, 797. Optical observations.
- Bietenholz *et al.* 2004, *ApJ*, 615, 794. VLA at 5 GHz (1’’4) and HST multi-epoch observation for proper motion studies.
- Melatos *et al.* 2005, *ApJ*, 633, 931. Multi-epoch near-IR observations central region.
- Seward *et al.* 2006, *ApJ*, 636, 873. Chandra observations of scattering halo.
- Temim *et al.* 2006, *AJ*, 132, 1610. Spitzer observations. see also: Temim *et al.* 2009, *AJ*, 137, 5155. Erratum.
- Aharonian *et al.* 2006, *A&A*, 457, 899. H.E.S.S. observations.
- Seward *et al.* 2006, *ApJ*, 652, 1277. Chandra observations.
- MacAlpine *et al.* 2007, *AJ*, 133, 81. Optical spectroscopy.
- Kaplan *et al.* 2008, *ApJ*, 677, 1201. HST proper motion of pulsar.
- Rudie *et al.* 2008, *MNRAS*, 384, 1200. [OIII] observations of ‘jet’, for proper motion.
- Hurley-Walker *et al.* 2009, *MNRAS*, 396, 365. Radio observations at 14 to 18 GHz.
- Tziamtzis *et al.* 2009, *A&A*, 497, 167. Limits on H α halo.
- Carlebois *et al.* 2010, *AJ*, 139, 2083. Optical imaging spectroscopy.
- Aumont *et al.* 2010, *A&A*, 514, A70. IRAM 30-m at 150 GHz (16’’7: S=244±24 Jy) and GBT at 90 GHz (9’’3).
- Satterfield *et al.* 2012, *AJ*, 144, 27. Optical spectroscopy.
- Temim *et al.* 2012, *ApJ*, 753, 72. Spitzer observations of dust.
- Gomez *et al.* 2012, *ApJ*, 760, 96. Herschel IR and sub-mm observations of dust.
- Loh *et al.* 2012, *MNRAS*, 421, 789. IR observations of H $_2$.
- Lundqvist & Tziamtzis 2012, *MNRAS*, 423, 1571. Optical limits on outer shell.
- Loll *et al.* 2013, *ApJ*, 765, 152. HST optical line and continuum observations.
- Barlow *et al.* 2013, *Science*, 342, 1343. Herschel far-IR spectroscopy.
- Black & Fesen 2015, *MNRAS*, 447, 2540. [OIII] observations of ‘jet’.
- Owen & Barlow 2015, *ApJ*, 801, 141. Herschel and Spitzer observations.
- Bietenholz & Nugent 2015, *MNRAS*, 454, 2416. Multi-epoch VLA and optical observations for expansion study.
- Planck Collaboration: Arnaud *et al.* 2016, *A&A*, 586, A134. Planck flux densities at 9 frequencies between 30 and 857 GHz.
- Trotter *et al.* 2017, *MNRAS*, 469, 1299. Time evolution of radio emission.
- Dubner *et al.* 2017, *ApJ*, 840, 82. VLA, HST and Chandra observations, plus ALMA of central region, and UV observations.
- Ritacco *et al.* 2018, *A&A*, 616, A35. Observations 150 GHz (18’’), including polarisation.
- Pshirkov *et al.* 2020, *MNRAS*, 496, 5227. Fermi observations of variability.
- Millard *et al.* 2021, *ApJS*, 257, 36. ISO far-IR spectroscopy.
- Martin *et al.* 2021, *MNRAS*, 502, 1864. Optical imaging spectroscopy for 3D study.

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: Optical observations imply 1.9 kpc, optical extinction suggests 1.8 kpc.

References:

- Fesen 1984, ApJ, 281, 658. Optical of filament to far NE.
 Erickson & Mahoney 1985, ApJ, 290, 596. TPT at 4 frequencies between 31 and 74 MHz (11′×13′ to 4′7×5′4), plus review of flux densities.
 Braun & Strom 1986, A&A, 164, 193. WSRT at 327 MHz (72″×185″) and 1.4 GHz (17″×43″), plus HI and IRAS.
 Green 1986, MNRAS, 221, 473. 151 MHz observations (1′2×3′1) and Half-Mile Telescope at 1.4 GHz (2′1×5′4).
 Mufson *et al.* 1986, AJ, 92, 1349. Radio, IR, optical, UV and X-ray comparison, including VLA at 1.6 GHz (3′3×3′8 and 40″).
 Petre *et al.* 1988, ApJ, 335, 215. Einstein and other X-ray observations.
 Dickel *et al.* 1989, AJ, 98, 1363. VLA at 1.4 GHz (1′1×1′2) of NE.
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 Koo *et al.* 2010, AJ, 140, 262. HI Zeeman splitting observations.
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 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
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 Nobukawa *et al.* 2019, PASJ, 71, 115. Suzaku observations of FeI emission.
 Alarie & Drissen 2019, MNRAS, 489, 3042. Optical spectroscopy of NE.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
 Dell’Ova *et al.* 2020, A&A, 644, A64. CO observations of part.
 Kokusho *et al.* 2020, ApJ, 899, 49. [FeII] and H₂ IR observations.
 Okon *et al.* 2021, ApJ, 921, 99. XMM-Newton spectroscopy.
 Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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.

Distance: Association with dust and optical extinction suggest about 1 kpc.

References:

Foster *et al.* 2013, A&A, 549, A107. Various radio survey observations.
 Yu *et al.* 2019, MNRAS, 488, 3129. Study of nearby dust.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

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: Association with molecular cloud suggests 1.6 to 2.0 kpc, association with dust or and optical extinction suggests about 1.1 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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 Katagiri *et al.* 2016, ApJ, 831, 106. Fermi observations.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Boubert *et al.* 2017, A&A, 606, A14. Gaia search for runaway progenitor companion.
 Su *et al.* 2017, ApJ, 836, 211. CO observations.
 Zhao *et al.* 2018, ApJ, 855, 12. IR observations.
 Yu *et al.* 2019, MNRAS, 488, 3129. Study of nearby dust.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.
 Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′′) of region.

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.

Distance: Optical extinction suggests about 0.9 kpc.

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′:S=4.1±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′:S=2.9±0.3 Jy), including polarisation and review of flux densities.
 Ambrocio-Cruz *et al.* 2014, RMxAA, 50, 323. [SiII] spectroscopy.
 Su *et al.* 2017, ApJ, 836, 211. CO observations.
 Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

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.**Distance:** Association with molecular cloud or dust and optical extinction suggest about 1 kpc.**References:**Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5″: $S=22.0\pm 3.7$ Jy).Stupar & Parker 2012, MNRAS, 419, 1413. H α , radio survey and other observations.Su *et al.* 2017, ApJ, 836, 211. CO observations.Yu *et al.* 2019, MNRAS, 488, 3129. Study of nearby dust.Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20′′) of region.**G249.5+24.5****RA:** 09^h34^m00^s**Dec:** –17°00′**1-GHz flux/Jy:** 27**Spectral index:** 0.7

Hoinga

Size/arcmin: 260**Type:** S**Radio:** Faint limb-brightened shell..**X-ray:** Extended emission.**References:**Becker *et al.* 2021, A&A, 648, A30. eROSITA detection, and various survey 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 implies 1.3 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'').
- Arendt *et al.* 1991, *ApJ*, 368, 474. IR observations.
- Milne *et al.* 1993, *MNRAS*, 261, 366. Parkes 64-m at 4.75 (4.5 : S = 59±5 Jy) and 8.4 GHz (3' : S = 38±4 Jy), plus polarisation.
- Berthiaume *et al.* 1994, *ApJ*, 425, 132. X-ray spectroscopy.
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- Blair *et al.* 1995, *ApJ*, 454, L35. Far UV spectroscopy.
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- Woermann *et al.* 2000, *MNRAS*, 317, 421. OH observations.
- Gaensler *et al.* 2000, *ApJ*, 537, L35. Radio limit for nebula around possible pulsar.
- 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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- Castelletti *et al.* 2006, *A&A*, 459, 535. VLA at 1.4 GHz (16''×34'' : S = 114±8 Jy) and 327 MHz (45''×90'' : S = 263±20 Jy).
- 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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- Katsuda *et al.* 2010, *ApJ*, 714, 1725. Chandra and XMM-Newton observations.
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- H.E.S.S. Collaboration: Abramowski *et al.* 2015, *A&A*, 575, A81. H.E.S.S. limit.
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- Luna *et al.* 2016, *A&A*, 590, A70. XMM-Newton and Chandra observations.
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- Acero *et al.* 2016, *ApJS*, 224, 8. Fermi observations.
- Reynoso *et al.* 2017, *MNRAS*, 464, 3029. ATCA at 1.4 GHz including H_I.
- García *et al.* 2017, *A&A*, 604, L5. XMM-Newton observations of SW.
- Slane *et al.* 2018, *ApJ*, 865, 86. XMM-Newton and Chandra observations of Vela X.
- Reynoso *et al.* 2018, *MNRAS*, 477, 2087. ATCA at 1.3 to 2.6 GHz, including polarisation.
- Mayer *et al.* 2020, *ApJ*, 899, 138. Proper motion study of compact source.
- Mayer & Becker 2021, *A&A*, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.

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 ($S_{7.5} = 7$ 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 Hi possibly associated with remnant.

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

G263.9–3.3

Vela (XYZ)

RA: 08^h34^m00^s**1-GHz flux/Jy:** 1750**Size/arcmin:** 255**Dec:** –45°50′**Spectral index:** varies**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 HI studies suggest 0.25 kpc.

References:

- Milne 1968, *AuPh*, 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.
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- Weiler & Panagia 1980, *A&A*, 90, 269. Clarification of notation of this region and review previous observations.
- 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 HI.
- Strom *et al.* 1995, *Nature*, 373, 590. Radio of X-ray extensions.
- Markwardt & Ögelman 1995, *Nature*, 375, 40. X-ray jet from pulsar.
- 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.
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- 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 HI studies.
- Bock *et al.* 1998, *AJ*, 116, 1886. MOST at 843 MHz (43″ × 60″).
- Cha *et al.* 1999, *ApJ*, 515, L25. Optical spectra, for distance.
- Lu & Aschenbach 2000, *A&A*, 362, 1083. ROSAT spatially resolved spectroscopy.
- Chadwick *et al.* 2000, *ApJ*, 537, 414. Limit on high energy γ -rays from pulsar.
- 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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- Alvarez *et al.* 2001, *A&A*, 372, 636. Radio spectral index studies. see also: Alvarez *et al.* 2001, *A&A*, 379, 323. Erratum.
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- Hales *et al.* 2004, *ApJ*, 613, 977. Vela X at 31 GHz (4′.1).
- Mongano *et al.* 2005, *A&A*, 436, 917. XMM-Newton and other X-ray observations of pulsar nebula.
- Miceli *et al.* 2005, *A&A*, 442, 513. XMM-Newton observations of N rim.
- Katsuda & Tsunemi 2005, *PASJ*, 57, 621. XMM-Newton observations of E.
- Aharonian *et al.* 2006, *A&A*, 448, L43. H.E.S.S. 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.
- Nishikida *et al.* 2006, *ApJ*, 644, L171. Far UV observations.
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- Grondin *et al.* 2013, *ApJ*, 774, 110. Fermi observations of Vela X.
- Planck Collaboration: Arnaud *et al.* 2016, *A&A*, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
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- H.E.S.S. Collaboration: Abdalla *et al.* 2018, *A&A*, 612, A1. H.E.S.S. observations of Vela X.
- Ogbodo *et al.* 2020, *MNRAS*, 493, 199. OH maser observations.
- Kameswara Rao *et al.* 2020, *MNRAS*, 493, 497. Time variation of optical absorption to background stars.
- Sapienza *et al.* 2021, *A&A*, 649, A56. XMM-Newton observations of clump in SW.

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.
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 Kargaltsev *et al.* 2002, *ApJ*, 580, 1060. Chandra observations of central source.
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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″×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. H.E.S.S. 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. Fermi observations.
 Takeda *et al.* 2016, *PASJ*, 68, S10. Suzaku observations.
 Fukui *et al.* 2017, *ApJ*, 850, 71. CO and HI observations.
 Maxted *et al.* 2018, *ApJ*, 866, 76. ATCA at 1.4 to 2.9 GHz, plus other observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, *A&A*, 612, A7. H.E.S.S. observations.
 Mignami *et al.* 2019, *MNRAS*, 486, 5716. Near IR observations of central source.
 Weinberger *et al.* 2020, *A&A*, 638, A83. INTEGRAL 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″×70″ : $S = 0.45 \pm 0.10$ Jy), and ATCA at 2.4 GHz (37″×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.
 Xiang & Jiang 2021, *ApJ*, 918, 24. Fermi 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.

Distance: Optical extinction suggests about 2.7 kpc.

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.
 Shan *et al.* 2019, RAA, 19, 92. Optical extinction for distance.
 Araya 2020, MNRAS, 492, 5980. Fermi 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.

X-ray: Diffuse emission, brighter in N and W.

Point sources: Central X-/ γ -ray source, not thought to be related.

Distance: Optical extinction suggests about 5.5 kpc.

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.

H.E.S.S. Collaboration: Abramowski *et al.* 2012, A&A, 541, A5. H.E.S.S. observations.
 Williams *et al.* 2015, ApJ, 808, L19. Chandra and XMM-Newton observations.
 Marcote *et al.* 2018, A&A, 619, A26. Observations of central source.
 Shan *et al.* 2019, RAA, 19, 92. Optical extinction for distance.

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″ : $S=6.4\pm0.5$ Jy), plus Parkes 64-m at 4.5 GHz ($S=7.5\pm2.5$ Jy) and 8.55 GHz ($S=3.6\pm0.9$ 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: HI 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′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″ : $S=45\pm11$ Jy), and Parkes 64-m at 8.4 GHz (3′ : $S=19.5\pm1.0$ 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 HI.
 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. Fermi 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″ : $S=17.2\pm1.0$ Jy), and Parkes 64-m at 5 and 8.4 GHz (4′6 and 3′ : $S=10.4\pm0.4$ Jy and $9′1\pm0.2$), 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).

Harris *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. Fermi 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 (8″0×9″6, 6″2×7″2 and 4″8×5″5 : $S = 11.9 \pm 0.1, 11.4 \pm 0.1$ 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.
 Kamatsukasa *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. Fermi observations.
 Bhalerao *et al.* 2019, *ApJ*, 872, 31. Chandra observations.
 Millard *et al.* 2021, *ApJS*, 257, 36. ISO far-IR spectroscopy.

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 (25″×29″ : $S=5.6 \pm 0.3$ Jy) and 2.5 GHz (20″×21″).
 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 & Kumar 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. Fermi 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 H_{II} regions.

Optical: Detected.

X-ray: Irregular, incomplete shell.

Distance: Optical extinction suggests about 4.3 or 3.8 kpc.

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 observations.

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.
 Shan *et al.* 2019, RAA, 19, 92. Optical extinction for distance.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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, and erroneously G295.5+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 HI.
 Kellett *et al.* 1987, MNRAS, 225, 199. EXOSAT of the W 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 densi-
 ties.
 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 ob-
 servations.
 Vasisht *et al.* 1997, ApJ, 476, L43. ASCA observations of neutron
 star.
 Zavlin *et al.* 1998, A&A, 331, 821. ROSAT and ASCA observa-
 tions of neutron star.
 Giacani *et al.* 2000, AJ, 119, 281. ATCA at 1.4 GHz (2′.7×4′.0) for
 HI studies.
 Zavlin *et al.* 2000, ApJ, 540, L25. Chandra observations of central
 pulsar.
 Gotthelf & Halpern 2007, ApJ, 664, L35. X-ray timing observa-
 tions 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 obser-
 vations for pulsar proper motion.
 Planck Collaboration: 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. Fermi observations.
 Ackermann *et al.* 2018, ApJS, 237, 32. Fermi 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 observa-
 tions.
 Green *et al.* 2014, PASA, 31, 42. Radio observations at 843 MHz
 (45′′×50′′).

G296.8–0.3

1156–62

RA: 11^h58^m30^s
Dec: –62°35′**1-GHz flux/Jy:** 9
Spectral index: 0.6**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″ : $S = 7.0 \pm 0.3$ 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. Fermi observations.
 Bamba *et al.* 2016, PASJ, 68, S5. Suzaku observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel 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.**Distance:** H I column density suggests about 2.8 kpc.**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.
 Post *et al.* 2014, ApJ, 792, L20. Chandra observations.
 Shan *et al.* 2019, RAA, 19, 92. H I column density for distance.

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 SW.

Distance: Optical extinction suggests 2.7 kpc.

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 HI 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 HI 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.
 Andersen *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±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. Fermi observations.
 Washino *et al.* 2016, PASJ, 68, S4. Suzaku observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel 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.

Sezar *et al.* 2017, MNRAS, 466, 3434. Suzaku and Fermi observations.
 Sawada *et al.* 2019, PASJ, 71, 61. Suzaku observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel 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.

Distance: H I column density suggests about 3.1 kpc.

References:

Schudel *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 observations.
 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″).
 Shan *et al.* 2019, RAA, 19, 92. H I column density for distance.
 Eppens & Reynoso 2021, BAAA, 62, 131. ATCA at 2.3 GHz (9″6×9″8).

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 N, and arc to S.

Point sources: Pulsar near centre of remnant.

Distance: Optical extinction suggests 3.9 kpc.

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. Einstein upper limit.

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 observations.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

Distance: HI column density suggests about 2.8 kpc.

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 observations.

Gaensler *et al.* 1998, MNRAS, 299, 812. ATCA at 1.3 GHz (23″×24″ : $S = 5.2 \pm 0.2$ Jy).
 Rakowski *et al.* 2001, ApJ, 548, 258. ASCA and ROSAT observations.
 Rakowski *et al.* 2006, ApJ, 649, L111. Observations of central source.
 Safi-Harb *et al.* 2007, ApJ, 659, 407. Observations of central source.
 Shan *et al.* 2019, RAA, 19, 92. HI column density for distance.

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.

Distance: Optical extinction suggests 3.1 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G310.6–1.6

RA: 14^h00^m45^s
Dec: –63°26′

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

Size/arcmin: 2.5
Type: C?

Radio: Not detected.

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.
 Reynolds & Borkowski 2019, ApJ, 887, 233. Chandra observations.

G310.6–0.3 Kes 20B

RA: 13^h58^m00^s
Dec: –62°09′

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

Size/arcmin: 8
Type: S

Has been called G310.65–0.29.

Radio: Asymmetric shell.

References:

Whiteoak *et al.* 1994, MNRAS, 269, 294. MOST at 843 MHz.
 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 Kes 20A

RA: 14^h00^m00^s
Dec: –62°17′

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

Size/arcmin: 12
Type: S

Has been called G310.80–0.41.

Radio: Arc in E, in complex region.

References:

Whiteoak *et al.* 1994, MNRAS, 269, 294. MOST at 843 MHz.
 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.
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

G311.5–0.3 Size/arcmin: 5

RA: 14^h05^m38^s
Dec: –61°58′

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

Type: S

Has been called G311.52–0.37.

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 *et al.* 1994, MNRAS, 269, 294. MOST at 843 MHz.

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.
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Pannuti *et al.* 2014, AJ, 147, 55. ASCA observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

G312.4–0.4 Size/arcmin: 38

RA: 14^h13^m00^s
Dec: –61°44′

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

Type: S

Has been called G312.44–0.36.

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, optical extinction suggests 4.4 kpc.

References:

Caswell & Barnes 1985, MNRAS, 216, 753. Molonglo at 408 MHz
 (3′: $S=56$ Jy).
 Whiteoak *et al.* 1994, MNRAS, 269, 294. MOST at 843 MHz.
 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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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 (116″×129″) and 2.4 GHz (67″×75″).

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±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, optical extinction suggest <2 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. H.E.S.S. 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. Fermi 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. Fermi observations.
 Tsubone *et al.* 2014, in EFXU, p72. Suzaku observations.
 Broersen *et al.* 2014, MNRAS, 441, 3040. XMM-Newton observations.
 Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
 Ajello *et al.* 2016, ApJ, 819, 98. Fermi 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).
 Tsubone *et al.* 2017, ApJ, 835, 34. Suzaku observations.
 Sano *et al.* 2017, JHEAp, 15, 1. CO and HI observations.
 H.E.S.S. Collaboration: Abramowski *et al.* 2018, A&A, 612, A4. H.E.S.S. observations.
 Shan *et al.* 2019, RAA, 19, 92. Optical extinction for distance.

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 HII region superposed in E.

Optical: Detected.

Distance: Optical extinction suggests 3.3 kpc.

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 and G315.9+0.0.

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

Point sources: Pulsar at end of radio trail.

Distance: Optical extinction suggests 3.7 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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)

Has been called G316.3+0.0.

Radio: Distorted shell, with possible ‘blowout’.

X-ray: Detected.

Distance: H α absorption data suggests > 7.2 kpc, optical extinction suggests 3.8 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 α absorption.
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′.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. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.
 Xiang *et al.* 2021, ApJ, 911, 49. Fermi 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.

Distance: Optical extinction suggests 3.3 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

Distance: Optical extinction suggests 3.5 kpc.

References:

Whiteoak 1990, *Nature*, 347, 157. MOST at 843 MHz (43″×51″).
 Whiteoak 1993, *ApJ*, 415, 701. MOST at 843 MHz (43″×51″: $S=4.8\pm 0.6$ Jy), Parkes 64-m at 4.5 GHz (4′.7: $S=3.7\pm 0.2$ Jy) and 8.4 GHz (2′.8: $S=3.0\pm 0.4$ 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.
 Wang *et al.* 2020, *A&A*, 639, A72. Optical extinction for distance.

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: H α absorption indicates 5.2 kpc, optical extinction suggests 3.0 kpc.

References:

Caswell *et al.* 1975, *A&A*, 45, 239. Parkes H α 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.
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 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: $S=37\pm 7$ Jy) and 8.4 GHz (3′.0: $S=24\pm 4$ 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 (21″×24″), plus H α observations, and 5.3 GHz (10″×15″).
 Sako *et al.* 2000, *ApJ*, 537, 422. Possible 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 (2′.7×4′.0), plus H α observations.
 Aharonian *et al.* 2005, *A&A*, 435, L17. H.E.S.S. 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.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, *A&A*, 612, A1. H.E.S.S. observations.
 Borkowski *et al.* 2020, *ApJ*, 895, L32. Chandra observations.
 Wang *et al.* 2020, *A&A*, 639, A72. Optical extinction for distance.
 Millard *et al.* 2021, *ApJS*, 257, 36. ISO far-IR spectroscopy.

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.

Distance: Optical extinction suggests 3.2 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

Distance: Optical extinction suggests 3.3 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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: Pulsar near E edge.

Distance: Optical extinction suggests 5.5 kpc.

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.
 Pletsch *et al.* 2013, ApJ, 779, L11. Pulsar detection.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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).
 Coriat *et al.* 2019, MNRAS, 484, 1672. ATCA at 2.1, 5.5, 9.0, 33 and 35 GHz, mostly of Cir X-1 jet.

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.

G323.7–1.0

RA: 15^h34^m30^s
Dec: –57°12′

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

Size/arcmin: 51×38
Type: S

Radio: Faint shell.

X-ray: Faint diffuse emission.

Distance: CO and H_I observations suggest 3.5 kpc.

References:

Green *et al.* 2014, PASA, 31, 42. MGPS observations at 843 MHz (43''×51'').
 Araya *et al.* 2017, ApJ, 843, 12. Fermi observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A8. H.E.S.S. observations.
 Maxted *et al.* 2018, MNRAS, 480, 134. CO and H_I observations.
 Saji *et al.* 2018, PASJ, 70, 23. Suzaku observations.

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 ($2'2 : S = 69 \pm 8$ 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 ($44'' \times 53''$).
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz ($43'' \times 52'' : S = 153 \pm 40$ Jy), and Parkes 64-m at 8.4 GHz ($3' : S = 68 \pm 5$ 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 ($43'' \times 52'' : S > 130$).

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 ($6'4 \times 8'5 : S > 60$ 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.
 Planck Collaboration: 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. Fermi observations.
 Temim *et al.* 2017, ApJ, 851, 128. Chandra proper motion study of central source.
 Devin *et al.* 2018, A&A, 617, A5. Fermi observations.
 Cesur *et al.* 2019, AdSpR, 64, 759. Suzaku observations.

G327.1–1.1

RA: 15^h54^m25^s
Dec: –55°09′

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

Size/arcmin: 18
Type: C

Radio: Shell, with off-centre core.

X-ray: Diffuse, with core.

Distance: Optical extinction suggests 4.5 kpc.

References:

Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz ($8'4 : S = 10 \pm 15\%$ 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 ($43'' \times 52'' : S = 7.6$ 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 observations.
 Bocchino & Bandiera 2003, A&A, 398, 195. BeppoSAX observations.

Temim *et al.* 2009, ApJ, 691, 895. Chandra and XMM-Newton observations.
 Temim *et al.* 2015, ApJ, 808, 100. Chandra observations.
 Ma *et al.* 2016, ApJ, 820, 100. ATCA at 1.4 ($19'' \times 23''$), 2.3 ($11'' \times 16''$), 4.8 ($13'' \times 15''$) and 8.6 GHz ($8'' \times 10''$) of core, including polarisation.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Xiang *et al.* 2021, ApJ, 912, 117. Fermi observations.

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 of magnetar, and 843 GHz ($43'' \times 53'' : S = 0.5 \pm 0.1$ Jy) and SGPS at 1.4 GHz ($S = 0.3 \pm 0.1$ Jy).

G327.4+0.4

Kes 27

RA: 15^h48^m20^s**1-GHz flux/Jy:** 30?**Size/arcmin:** 21**Dec:** –53°49′**Spectral index:** 0.6**Type:** S

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:** H_I absorption indicates 4.3 to 5.4 kpc, optical extinction suggests 2.8 kpc.**References:**

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|---|--|
| <p>Caswell <i>et al.</i> 1975, AuJPA, 37, 39. Molonglo at 408 MHz ($3' : S = 58$ Jy) and Parkes 64-m at 5 GHz ($4' : S = 12.4$ Jy).</p> <p>Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz ($8'.4$) and 5 GHz ($4'.4$).</p> <p>Lamb & Markert 1981, ApJ, 244, 94. Einstein observations.</p> <p>Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz ($44'' \times 55''$).</p> <p>Milne <i>et al.</i> 1989, PASA, 8, 187. MOST at 843 MHz ($43'' \times 53'' : S = 32.2 \pm 6$ Jy), and Parkes 64-m at 8.4 GHz ($3' : S = 9.4 \pm 0.8$ Jy), including polarisation.</p> <p>Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 53'' : S = 25$ Jy).</p> | <p>Seward <i>et al.</i> 1996, ApJ, 471, 887. ROSAT observations.</p> <p>Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.</p> <p>McClure-Griffiths <i>et al.</i> 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz ($1'.8 \times 2'.0$), plus H_I.</p> <p>Enoguchi <i>et al.</i> 2002, PASJ, 54, 229. ASCA observations.</p> <p>Kawasaki <i>et al.</i> 2005, ApJ, 631, 935. ASCA observations.</p> <p>Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer possible detection.</p> <p>Chen <i>et al.</i> 2008, ApJ, 676, 1040. Chandra observations.</p> <p>Minami <i>et al.</i> 2014, in EFXU, p48. Suzaku observations.</p> <p>Xing <i>et al.</i> 2015, ApJ, 805, 19. Fermi observations.</p> <p>Wang <i>et al.</i> 2020, A&A, 639, A72. Optical extinction for distance.</p> |
|---|--|

G327.4+1.0**RA:** 15^h46^m48^s**1-GHz flux/Jy:** 1.9?**Size/arcmin:** 14**Dec:** –53°20′**Spectral index:** ?**Type:** S**Radio:** Asymmetric shell.**References:**

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|---|--|
| <p>Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 54'' : S = 2.1$ Jy).</p> <p>Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.</p> <p>McClure-Griffiths <i>et al.</i> 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz ($1'.8 \times 2'.0$), plus H_I.</p> | |
|---|--|

G327.6+14.6

RA: 15^h02^m50^s
Dec: –41°56′

1-GHz flux/Jy: 19
Spectral index: 0.6

SN1006, PKS 1459–41

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 1.85 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).
 Schweizer & Middleditch 1980, ApJ, 241, 1039. Possible stellar remnant.
 Caswell *et al.* 1983, MNRAS, 204, 921. FIRST at 1415 MHz (77").
 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.
 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.
 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 (3'0 \times 4'7) 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.
 Winkler *et al.* 2005, ApJ, 624, 189. HST absorption towards background sources.
 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.
 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.
 Broersen *et al.* 2013, A&A, 552, A9. XMM-Newton observations of NW knot.
 Miceli *et al.* 2013, A&A, 556, A80. XMM-Newton observations.
 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. Fermi limit.
 Sparls *et al.* 2015, ApJ, 815, L9. Polarised optical line observations.
 Li *et al.* 2015, MNRAS, 453, 3953. XMM-Newton observations. *see also:* Li *et al.* 2020, MNRAS, 499, 5679. Erratum.
 Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.
 Li *et al.* 2016, MNRAS, 462, 158. XMM-Newton observations.
 Raymond *et al.* 2017, ApJ, 851, 12. UV and optical spectra, for proper motions and distance.
 Condon *et al.* 2017, ApJ, 851, 100. Fermi observations.
 Kerzendorf *et al.* 2018, MNRAS, 479, 192. Optical search for progenitor companion.
 Li *et al.* 2018, ApJ, 864, 85. NuSTAR observations of NE and SW limbs.
 Xing *et al.* 2019, PASJ, 71, 77. Fermi 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±0.1 Jy) and 4.5 GHz (1′5×2′0 : S = 12.5±0.2 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±0.4 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.

Distance: Optical extinction suggests 2.8 kpc.

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 (1′8×2′0), plus H_I.
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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±30% 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 (47″ × 52″), 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 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.
 Torii *et al.* 2006, PASJ, 58, L11. ASCA detection.

Park *et al.* 2009, ApJ, 695, 431. XMM-Newton and Chandra observations.
 H.E.S.S. Collaboration: Abramowski *et al.* 2014, MNRAS, 441, 790. H.E.S.S. upper limit.
 Doroshenko *et al.* 2018, A&A, 618, A76. XMM-Newton observations of central source.
 Williams *et al.* 2018, ApJ, 855, 118. XMM-Newton observations.
 Borkowski *et al.* 2018, ApJ, 868, L21. Chandra observations for expansion study.
 Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.

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 (1′8 × 2′0), plus H I.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi 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: H_I absorption indicates 3.1 kpc, optical extinction suggests about 3 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.
 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 & Allan 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 H_I 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.
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.
 Xing *et al.* 2014, ApJ, 781, 64. Fermi 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.
 Borghese *et al.* 2018, MNRAS, 478, 741. NuSTAR and Swift observations of central source.
 Shan *et al.* 2019, RAA, 19, 92. Optical extinction for distance.
 Esposito *et al.* 2019, A&A, 626, A19. XMM-Newton and optical observations of central source flare.
 Braun *et al.* 2019, MNRAS, 489, 4444. Chandra and XMM-Newton observations of central source.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Millard *et al.* 2021, ApJS, 257, 36. ISO far-IR spectroscopy.

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^h43^m20^s
Dec: –54°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.
 Ackermann *et al.* 2018, ApJS, 237, 32. Fermi observations.

G335.2+0.1

RA: 16^h27^m45^s
Dec: –48°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.

Distance: Optical extinction suggests 3.9 kpc.

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.
 de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G336.7+0.5

RA: 16^h32^m11^s
Dec: –47°19′

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

Size/arcmin: 14 \times 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 H_I, 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: H_I 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 observations.

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 H_I 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 H_I 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. H.E.S.S. 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″ : $S = 14.8 \pm 3.0$ Jy), and Parkes 64-m at 8.4 GHz (3′ : $S = 5.1 \pm 0.6$ 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:** 15
Spectral index: 0.5**Size/arcmin:** 9×6
Type: S**Radio:** Distorted shell.**X-ray:** Centrally brightened.**Distance:** H I 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 H I 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 H I.

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. Fermi observations.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Qiao *et al.* 2016, ApJS, 227, 26. OH maser observations.
 Supan *et al.* 2018, A&A, 619, A108. CO, H I and Spitzer observations.
 Supan *et al.* 2018, A&A, 619, A109. Fermi observations and review of radio flux densities.
 Ogbodo *et al.* 2020, MNRAS, 493, 199. OH maser observations.

G338.1+0.4**RA:** 16^h37^m59^s
Dec: –46°24′**1-GHz flux/Jy:** 4?
Spectral index: 0.4**Size/arcmin:** 15?
Type: S**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: 7?
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. H.E.S.S. detection.
 Aharonian *et al.* 2006, ApJ, 636, 777. H.E.S.S. 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. Fermi observations.
 Abramowski *et al.* 2014, MNRAS, 439, 2828. H.E.S.S. observations.
 see also: H.E.S.S. Collaboration: Abramowski *et al.* 2014, MNRAS, 441, 3640. Erratum.
 Supan *et al.* 2016, A&A, 589, A51. SGPS HI and other observations.
 Lau *et al.* 2017, MNRAS, 464, 3757. CO and other molecular line observations, plus HI observations.
 de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
 Xin *et al.* 2018, ApJ, 867, 55. Fermi observations.
 Mares *et al.* 2021, ApJ, 912, 158. Fermi 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.
 Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including HI.

Abramowski *et al.* 2014, ApJ, 794, L1. H.E.S.S. observations.
 Lau *et al.* 2017, MNRAS, 464, 3757. CO and other molecular line observations, plus HI observations.
 de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
 Mares *et al.* 2021, ApJ, 912, 158. Fermi 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 (48″×75″:S=9.8±0.9 Jy) and 1.4 GHz (9″×27″: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 (48″×75″ : $S = 9.2 \pm 0.9$ Jy) and 1.4 GHz (9″×27″ : $S = 5.8 \pm 0.1$ 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.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

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.

Distance: Optical extinction suggests 4.3 kpc.

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.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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 (11″×35″ : $S = 2.2 \pm 0.1$ 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 (11″×35″).

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.

Point sources: Pulsar near edge.

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.
 Shternin *et al.* 2019, ApJ, 877, 78. Pulsar proper motion.

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.

Distance: Optical extinction suggests 3.1 kpc.

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
 (47″×70″) including polarisation, and Chandra observations of
 pulsar wind nebula.
 Aharonian *et al.* 2005, A&A, 432, L9. H.E.S.S. limit.
 H.E.S.S. Collaboration: Abramowski *et al.* 2011, A&A, 528, A143.
 H.E.S.S. observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 de Vries *et al.* 2021, ApJ, 908, 50. Pulsar proper motion.

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±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 observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emis-
 sion.

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: HI 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 ± 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.

Combi *et al.* 2010, A&A, 522, A50. XMM-Newton and Chandra and other 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 HI from SGPS.
 Andersen *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.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Fukushima *et al.* 2020, ApJ, 897, 62. Chandra observations.
 Eagle *et al.* 2020, ApJ, 904, 123. Fermi observations.

G345.1–0.2

RA: 17^h05^m21^s
Dec: –41°26′

1-GHz flux/Jy: 1.4?
Spectral index: 0.7?

Size/arcmin: 6
Type: S

Radio: Asymmetric shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 65″ : S = 1.8 Jy).
 Green *et al.* 2014, PASA, 31, 42. MGPS at 843 MHz (45″ × 45″ cosec(δ)).

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz (~2′).

G345.1+0.2

RA: 17^h03^m40^s
Dec: –41°05′

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

Size/arcmin: 10
Type: S

Has been called G345.2+0.2.

Radio: Irregular shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 65″ : S = 0.7 Jy).
 Green *et al.* 2014, PASA, 31, 42. MGPS at 843 MHz (45″ × 45″ cosec(δ)).

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz (~2′).

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, clumpy.

Distance: CO and H_I suggest 11.1 kpc.

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 ± 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.
 Andersen *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.
 Auchettl *et al.* 2017, ApJ, 847, 121. XMM-Newton observations.
 Qiao *et al.* 2020, ApJS, 247, 5. ATCA of OH masers.
 Sano *et al.* 2021, ApJ, 923, 15. CO, H_I and other 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, association with dust suggests 1.1 kpc, optical extinction suggests 4.6 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. 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 (36″ × 46″), 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. H.E.S.S. 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. H.E.S.S. 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.

Ajero *et al.* 2009, A&A, 505, 157. XMM-Newton observations, plus other radio, IR and H.E.S.S. observations.
 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 H_I and Suzaku observations.
 Federici *et al.* 2015, A&A, 577, A12. Fermi detection.
 Sano *et al.* 2015, ApJ, 799, 175. Suzaku observations.
 Katsuda *et al.* 2015, ApJ, 814, 29. XMM-Newton observations.
 Ajero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Tsuji & Uchiyama 2016, PASJ, 68, 108. Chandra observations of NW.
 Ajero *et al.* 2017, A&A, 597, A106. XMM-Newton observations for proper motion studies.
 Okuno *et al.* 2018, PASJ, 70, 77. Chandra observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A6. H.E.S.S. observations.
 Kuznetsova *et al.* 2019, MNRAS, 489, 1828. INTEGRAL observations.
 Tsuji *et al.* 2019, ApJ, 877, 96. NuSTAR observations.
 Higurashi *et al.* 2020, ApJ, 899, 102. Chandra of NW.
 Tanaka *et al.* 2020, ApJ, 900, L5. Chandra of SW.
 Sano *et al.* 2020, ApJ, 904, L24. ALMA CO observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.
 Fukui *et al.* 2021, ApJ, 915, 84. H.E.S.S. observations.
 Tateishi *et al.* 2021, ApJ, 923, 187. XMM-Newton spectroscopy.
 Leike *et al.* 2021, NatAs, 5, 832. Dust clouds, including distance.

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 emission.
 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.
 Andersen *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 upper limit.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Abdollahi *et al.* 2020, ApJ, 896, 76. Fermi observations.

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. H.E.S.S. observations.
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.
 Andersen *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. Fermi observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Qiao *et al.* 2020, ApJS, 247, 5. ATCA of OH masers.

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 9.8 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 ($2'2 : S = 8 \pm 3$ Jy).
 Downes 1984, MNRAS, 210, 845. VLA at 1465 MHz ($20'' \times 45''$).
 Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz ($46'' \times 53''$).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 69'' : S = 33$ Jy).
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
 Aharonian *et al.* 2006, ApJ, 636, 777. H.E.S.S. detection.
 Aharonian *et al.* 2008, A&A, 486, 829. H.E.S.S. 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. Fermi observations.
 Blumer *et al.* 2019, MNRAS, 487, 5019. XMM-Newton, Chandra and H_I observations.
 Watanabe *et al.* 2019, PASJ, 71, 84. XMM-Newton observations of pulsar.
 Gotthelf *et al.* 2019, ApJ, 882, 173. Chandra, XMM-Newton and NuSTAR observations of pulsar.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

G348.8+1.1

RA: 17^h11^m29^s
Dec: –37°36′

1-GHz flux/Jy: 0.6?
Spectral index: 0.7?

Size/arcmin: 10
Type: S

Has been called G348.9+1.1.

Radio: Faint, Incomplete shell.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 70'' : S = 0.1$ Jy).
 Green *et al.* 2014, PASA, 31, 42. MGPS at 843 MHz ($45'' \times 45''$ cosec(δ)).

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz ($\sim 2'$).

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 ($43'' \times 70'' : S = 1.6$ 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 α 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 α 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.
- Andersen *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 α observations.
- Yasumi *et al.* 2014, PASJ, 66, 68. Suzaku observations.
- H.E.S.S. Collaboration: Abramowski *et al.* 2015, A&A, 574, A100. H.E.S.S. observations.
see also: H.E.S.S. Collaboration: Abramowski *et al.* 2015, A&A, 580, C1. Corrigendum.
- Ergin *et al.* 2015, ApJ, 804, 124. Fermi 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).
- Acerro *et al.* 2016, ApJS, 224, 8. Fermi observations.
- H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
- Ogbodo *et al.* 2020, MNRAS, 493, 199. OH maser observations.
- Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
- Qiao *et al.* 2020, ApJS, 247, 5. ATCA of OH masers.

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±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″ × 10″.4) and 4.8 GHz (15″ × 35″) and 15 GHz (2″ × 5″).
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 71″).
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
 Gaensler *et al.* 2008, ApJ, 680, L37. VLA at 4.8 GHz (5″.6 × 11″.4) plus XMM-Newton observations.

Lovchinsky *et al.* 2011, ApJ, 731, 70. Chandra and Spitzer observations.
 Yasumi *et al.* 2014, PASJ, 66, 68. Suzaku observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Borkowski *et al.* 2020, ApJ, 905, L19. Chandra observations, including expansion.
 Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.
 Tsuchioka *et al.* 2021, ApJ, 912, 131. Chandra observations, including expansion.

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″ × 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″ × 36″ : S = 4.8 ± 0.2 Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 73″ : S = 5.5 Jy).
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel 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.

Distance: Optical extinction suggests 3.4 kpc.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 74″ : S = 11 Jy).
 Tian *et al.* 2007, MNRAS, 378, 1283. SGPS at 1.4 GHz (100″ : S = 8.4 ± 0.7 Jy) including H_I.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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.

G353.3–1.1

RA: 17^h33^m10^s
Dec: –35°12′

1-GHz flux/Jy: 24?
Spectral index: 0.85?

Size/arcmin: 60
Type: S

Radio: Faint shell.

References:

Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10′4).
 Duncan *et al.* 1997, MNRAS, 287, 722. Parkes 64-m at 2.4 GHz (11′).

Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz (~2′).

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: Patchy shell, brighter to E.

Point sources: Central X-ray source.

Distance: Various observations suggest 3.2 kpc, optical extinction suggests 3.5 kpc.

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.
 H.E.S.S. Collaboration: Abramowski *et al.* 2011, A&A, 531, A81. H.E.S.S. observations.
 Bamba *et al.* 2012, ApJ, 756, 149. Suzaku observations. see also: Bamba *et al.* 2012, ApJ, 761, 80. Erratum.
 Klochkov *et al.* 2013, A&A, 556, A41. XMM-Newton and other X-ray observations.
 Fukuda *et al.* 2014, ApJ, 788, 94. H.E.S.S., SGPS HI and CO observations.

Nayana *et al.* 2017, MNRAS, 467, 155. GMRT at 325 MHz (97''×135'') and 610 MHz (105''×150''), plus other observations.
 de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
 Doroshenko *et al.* 2017, A&A, 608, A23. XMM-Newton observations.
 Condon *et al.* 2017, ApJ, 851, 100. Fermi observations.
 Guo *et al.* 2018, ApJ, 853, 2. Fermi observations.
 H.E.S.S. Collaboration: Abdalla *et al.* 2018, A&A, 612, A1. H.E.S.S. observations.
 Maxted *et al.* 2018, MNRAS, 474, 662. CO and HI observations.
 Cui *et al.* 2019, ApJ, 887, 47. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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 (2'7''×3'0'') and 1.4 GHz (36''×42''), plus 8.4 GHz (6'1''×8'4'') 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. Fermi 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 observations.
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

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.

Distance: Optical extinction suggests 4.2 kpc.

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. Fermi observations.
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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 observations.
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz (1′: $S=3.3\pm 0.5$ Jy).

Marquez-Lugo & Phillips 2010, MNRAS, 407, 94. Mid-IR observations.
 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-Lugo & 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 (1′.5×3′: S=8.1±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±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. Fermi 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 ($3''8 \times 10''9$) and 5 GHz ($12'' \times 26''$).
 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 ($43'' \times 83''$).
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz ($43'' \times 84''$).
 Stewart *et al.* 1994, ApJ, 432, L39. ATCA at 4.79 and 5.84 GHz ($12'' \times 22''$) 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 ($24'' \times 43''$). 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 ($11''4 \times 13''6$), including HI, and 8.3 GHz ($6''8 \times 14''3$) 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. Fermi observations.
 Qiao *et al.* 2018, ApJS, 239, 15. OH maser observations.
 Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
 Chawner *et al.* 2020, MNRAS, 499, 5665. Spitzer and Herschel observations.
 Guan *et al.* 2021, ApJ, 920, 6. Observations at 90 GHz ($0'5$).

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.

Distance: Optical extinction suggests 3.8 kpc.

References:

- Reich & Fürst 1984, A&AS, 57, 165. Effelsberg 100-m at 2.7 GHz ($4'3 : S = 7 \pm 1.5$ Jy), $S_{5 \text{ GHz}} = 5.5 \pm 1.5$ Jy from surveys.
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz ($43'' \times 84''$).
 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.
 Rho *et al.* 2017, ApJ, 834, 12. Molecular line observations.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

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 (1′3×2′2: 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).
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.

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).
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer observations.

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.

Distance: Optical extinction suggests 3.5 or 3.3 kpc.

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 (24″×43″).
 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 observations.
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
 de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
 Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
 Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″) including polarisation, and Spitzer 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

Has been called G359.10–0.5.

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.

Distance: H_I column density suggests 3.7 kpc, association with CO suggests 4 kpc, optical extinction suggests 3.3 or 3.2 kpc.

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′: $S=13$ 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 (10″×11″), 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 (31″×33″), and 1.7 GHz for OH survey.
- LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (24″×43″). 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 H.E.S.S. 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.
- Froeblich *et al.* 2015, MNRAS, 454, 2586. H₂ IR observations.
- Hui *et al.* 2016, MNRAS, 457, 4262. Fermi observations of region.
- de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observations of region.
- Qiao *et al.* 2018, ApJS, 239, 15. OH maser observations.
- Ogbodo *et al.* 2020, MNRAS, 493, 199. OH maser observations.
- Eppens *et al.* 2020, MNRAS, 493, 3947. CO observations of region.
- Suzuki *et al.* 2020, ApJ, 893, 147. Suzaku and CO observations.
- Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.
- Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″: $S=0.8$ Jy) including polarisation, and Spitzer observations.

G359.1+0.9

RA: 17^h39^m36^s
Dec: –29°11′

1-GHz flux/Jy: 2?
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).
- Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″: $S=0.07$ Jy) including polarisation, and Spitzer observations.

G359.2–1.1

RA: 17^h48^m14^s
Dec: –30°12′

1-GHz flux/Jy: 0.4?
Spectral index: 1.1?

Size/arcmin: 5×4
Type: S?

Radio: Poorly defined, asymmetric.

References:

- Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×86″).
- Hurley-Walker *et al.* 2019, PASA, 36, e048. MWA observations at 72 to 231 MHz ($\sim 2'$).