G0.0+0.0 Sgr A East

RA: $17^h45^m44^s$ **1-GHz flux/Jy:** 100? **Size/arcmin:** 3.5×2.5
Dec: −29°00′ **Spectral index:** 0.8? **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″), $S_{1.4\ GHz} = 77$ Jy, $S_{5.0\ GHz} = 31$ 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 NH_3 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 & Mehringer 1995, ApJ, 452, L37. VLA of nearby H_2O masers.
Yusef-Zadeh *et al.* 1999, ApJ, 512, 230. OH maser observations.
Coil & Ho 2000, ApJ, 533, 245. NH_3 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 H_2 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. NH_3 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. CH_3OH 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. [CI] sub-mm observations of surroundings.

G0.3+0.0

RA: $17^h46^m15^s$ **1-GHz flux/Jy:** 22 **Size/arcmin:** 15×8
Dec: −28°38′ **Spectral index:** 0.6 **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: $17^h47^m21^s$ **1-GHz flux/Jy:** 18? **Size/arcmin:** 8
Dec: −28°09′ **Spectral index:** varies **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: $17^h48^m30^s$ **1-GHz flux/Jy:** 15 **Size/arcmin:** 8
Dec: −28°09′ **Spectral index:** 0.6? **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. H_2 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: $17^h49^m39^s$ **1-GHz flux/Jy:** 2? **Size/arcmin:** 10
Dec: −27°46′ **Spectral index:** ? **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±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. H_2 IR observations.
McEwen *et al.* 2016, ApJ, 826, 189. NH_3 and CH_3OH 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: $17^h48^m45^s$ **1-GHz flux/Jy:** 0.6 **Size/arcmin:** 1.5
Dec: $-27°10'$ **Spectral index:** 0.6 **Type:** S

Radio: Shell, brighter to the N, brightening; shows secular increase.
X-ray: Shell, with bright limbs to E and W.
Distance: HI 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 HI 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: $17^h55^m30^s$ **1-GHz flux/Jy:** 5 **Size/arcmin:** 52×28
Dec: $-26°35'$ **Spectral index:** 0.9? **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: $17^h55^m26^s$ **1-GHz flux/Jy:** 2.3 **Size/arcmin:** 14×11
Dec: −25°50′ **Spectral index:** 0.65 **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: $17^h52^m55^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 18
Dec: −25°28′ **Spectral index:** 0.6 **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: $18^h08^m55^s$ **1-GHz flux/Jy:** 3.2? **Size/arcmin:** 28
Dec: −27°03′ **Spectral index:** 0.6? **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. Hα observations.

G4.5+6.8 Kepler, SN1604, 3C358

RA: $17^h30^m42^s$ **1-GHz flux/Jy:** 19 **Size/arcmin:** 3
Dec: $-21°29'$ **Spectral index:** 0.64 **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, HI 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 & Pritchet 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 HI 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: $17^h33^m25^s$ **1-GHz flux/Jy:** 3 **Size/arcmin:** 18
Dec: $-21°34'$ **Spectral index:** 0.6 **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 : $S = 5.5 \pm 1.2$ Jy), and NVSS at 1.4 GHz.
Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G5.2−2.6

RA: $18^h07^m30^s$ **1-GHz flux/Jy:** 2.6? **Size/arcmin:** 18
Dec: $-25°45'$ **Spectral index:** 0.6? **Type:** S

Radio: Poorly resolved shell.

References:

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4′.3).
Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

G5.4−1.2 Milne 56

RA: $18^h02^m10^s$ **1-GHz flux/Jy:** 35? **Size/arcmin:** 35
Dec: −24°54′ **Spectral index:** 0.2? **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: HI 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 : $S = 21.9 \pm 2.4$ 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 : $S = 30.8 \pm 2.1$ Jy) and 8.4 GHz (3′ : $S = 24 \pm 3$ 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 HI 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: $17^h57^m04^s$ **1-GHz flux/Jy:** 5.5 **Size/arcmin:** 15×12
Dec: −24°00′ **Spectral index:** 0.7 **Type:** S

Has been called G5.55+0.32.

Radio: Shell.
Optical: Detected.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″: $S = 14.3 \pm 0.3$ Jy), plus other observations.
Liszt *et al.* 2009, A&A, 508, 1331. CO and IR observations of region.
Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.

G5.9+3.1

RA: $17^h47^m20^s$ **1-GHz flux/Jy:** 3.3? **Size/arcmin:** 20
Dec: −22°16′ **Spectral index:** 0.4? **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: $17^h57^m29^s$ **1-GHz flux/Jy:** 4.5 **Size/arcmin:** 18×12
Dec: −23°25′ **Spectral index:** 0.9 **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. Hα observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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: $17^h54^m55^s$ **1-GHz flux/Jy:** 4.0? **Size/arcmin:** 30×26
Dec: −23°05′ **Spectral index:** 0.3? **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: $18^h00^m30^s$ **1-GHz flux/Jy:** 310 **Size/arcmin:** 48
Dec: −23°26′ **Spectral index:** varies **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±40 Jy) and 1415 MHz (48″×88″ : S = 246±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.
Vaupreé *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. H_2 IR observations.
Maxted *et al.* 2016, MNRAS, 462, 532. NH_3 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.
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.
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: $17^h45^m10^s$ **1-GHz flux/Jy:** 1.3? **Size/arcmin:** 31
Dec: −21°22′ **Spectral index:** 0.4? **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: $18^h02^m11^s$ **1-GHz flux/Jy:** 27 **Size/arcmin:** 18
Dec: −23°34′ **Spectral index:** 0.6 **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″: $S = 60.8 \pm 0.4$ 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. Hα 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: $18^h01^m50^s$ **1-GHz flux/Jy:** 2.5? **Size/arcmin:** 15
Dec: −22°54′ **Spectral index:** 0.5? **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: $18^h01^m07^s$ **1-GHz flux/Jy:** 2.8 **Size/arcmin:** 12
Dec: −22°38′ **Spectral index:** 0.6 **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″: $S = 5.2 \pm 0.2$ 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: $18^h10^m00^s$ **1-GHz flux/Jy:** 18? **Size/arcmin:** 100
Dec: −23°10′ **Spectral index:** 0.7? **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 1814−24

RA: $18^h17^m25^s$ **1-GHz flux/Jy:** 11 **Size/arcmin:** 22
Dec: −24°04′ **Spectral index:** 0.32 **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: $18^h24^m10^s$ **1-GHz flux/Jy:** 4.4 **Size/arcmin:** 26
Dec: −23°48′ **Spectral index:** 0.3 **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: $18^h05^m30^s$ **1-GHz flux/Jy:** 80 **Size/arcmin:** 45
Dec: −21°26′ **Spectral index:** 0.5 **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′.2×9′.7: S = 190±50 Jy).
Kassim & Weiler 1990, Nature, 343, 146. VLA at 327 MHz (3′.0×3′.7).
Kassim & Weiler 1990, ApJ, 360, 184. VLA at 327 MHz (2′.8×4′.1: S = 129±11 Jy), and part at 1.4 GHz (0′.9×1′.8), plus review of flux densities.
Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz (37″×55″).
Finley & Ögelman 1994, ApJ, 434, L25. ROSAT observations, including pulsar.
Aharonian *et al.* 2005, Science, 307, 1938. 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. [Fe II] 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: $18^h03^m58^s$ **1-GHz flux/Jy:** 9 **Size/arcmin:** 24
Dec: −21°03′ **Spectral index:** 0.6 **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: $18^h07^m22^s$ **1-GHz flux/Jy:** 3.7 **Size/arcmin:** 15×11
Dec: −20°35′ **Spectral index:** 0.6 **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: $18^h05^m08^s$ **1-GHz flux/Jy:** 3.9 **Size/arcmin:** 12
Dec: −20°14′ **Spectral index:** 0.5 **Type:** S

Radio: Asymmetric shell.

References:

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Caswell 1983, MNRAS, 204, 833. Molonglo at 408 MHz (3′: $S = 5.8 \pm 0.6$ Jy).
Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (41″×63″: $S = 3.5 \pm 0.4$ Jy).
Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
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: $18^h10^m41^s$ **1-GHz flux/Jy:** 6.7 **Size/arcmin:** 12
Dec: −20°43′ **Spectral index:** 0.4 **Type:** S

Has been called G9.95−0.81.

Radio: Shell.
Optical: Detected.
Distance: H_2 emission suggests 3.8 kpc.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″: $S = 11.0 \pm 0.3$ Jy), plus other observations.
Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
Lee *et al.* 2019, AJ, 157, 123. H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h10^m04^s$ **1-GHz flux/Jy:** 1.3 **Size/arcmin:** 11×9
Dec: −19°25′ **Spectral index:** 0.6 **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″: $S = 3.1 \pm 0.2$ 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.

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: $18^h12^m46^s$ **1-GHz flux/Jy:** 1.0 **Size/arcmin:** 11×7
Dec: −19°38′ **Spectral index:** 0.7 **Type:** S

Has been called G11.15−0.71.

Radio: Partial shell.

References:

Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″), 1.5 GHz (25″), and 74 MHz.
Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″: $S = 2.3 \pm 0.1$ Jy), plus other observations.
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: $18^h09^m47^s$ **1-GHz flux/Jy:** 2.3 **Size/arcmin:** 12×10
Dec: −19°12′ **Spectral index:** 0.4 **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: $18^h11^m27^s$ **1-GHz flux/Jy:** 22 **Size/arcmin:** 4
Dec: −19°25′ **Spectral index:** 0.5 **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: HI absorption indicates 4.4 kpc, H_2 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. HI 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 HI 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. H_2 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 H_2 IR observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h10^m47^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 8
Dec: −19°05′ **Spectral index:** 0.5 **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: $18^h12^m25^s$ **1-GHz flux/Jy:** 0.7 **Size/arcmin:** 4
Dec: −18°44′ **Spectral index:** 0.3 **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: $18^h12^m11^s$ **1-GHz flux/Jy:** 3.5 **Size/arcmin:** 7?
Dec: −18°37′ **Spectral index:** 0.7 **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: $18^h11^m17^s$ **1-GHz flux/Jy:** 0.8 **Size/arcmin:** 6×5
Dec: −18°10′ **Spectral index:** 0.7 **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: $18^h12^m14^s$ **1-GHz flux/Jy:** 0.6 **Size/arcmin:** 6×5
Dec: −17°55′ **Spectral index:** 0.4 **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: $18^h13^m19^s$ **1-GHz flux/Jy:** 0.8 **Size/arcmin:** 6
Dec: −17°54′ **Spectral index:** 0.8 **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: $18^h13^m37^s$ **1-GHz flux/Jy:** 0.8 **Size/arcmin:** 3
Dec: −17°49′ **Spectral index:** 0.5 **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: $18^h16^m00^s$ **1-GHz flux/Jy:** 11? **Size/arcmin:** 38×28
Dec: −17°49′ **Spectral index:** 0.6? **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 (∼2′).

G13.3−1.3

RA: $18^h19^m20^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 70×40
Dec: −18°00′ **Spectral index:** ? **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: $18^h14^m14^s$ **1-GHz flux/Jy:** 3.5? **Size/arcmin:** 5×4
Dec: −17°12′ **Spectral index:** 1.0? **Type:** S

Has been called G13.46+0.16.

Radio: Elongated, incomplete shell.
Distance: H_2 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. H_2 IR observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h16^m40^s$ **1-GHz flux/Jy:** 0.5 **Size/arcmin:** 6×5
Dec: −16°41′ **Spectral index:** 0.6 **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: $18^h24^m00^s$ **1-GHz flux/Jy:** 5.5? **Size/arcmin:** 30×24
Dec: −16°34′ **Spectral index:** 0.0? **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. Hα 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: $18^h18^m02^s$ **1-GHz flux/Jy:** 5.6 **Size/arcmin:** 15×14
Dec: −15°27′ **Spectral index:** 0.62 **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: $18^h19^m25^s$ **1-GHz flux/Jy:** 1.2? **Size/arcmin:** 9×8
Dec: −15°32′ **Spectral index:** 0.55? **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 (∼2′).

G15.9+0.2

RA: $18^h18^m52^s$ **1-GHz flux/Jy:** 5.0 **Size/arcmin:** 7×5
Dec: −15°02′ **Spectral index:** 0.63 **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 Hα 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: $18^h21^m56^s$ **1-GHz flux/Jy:** 2.7 **Size/arcmin:** 15×10
Dec: −15°14′ **Spectral index:** 0.6 **Type:** S

Has been called G16.05−0.57.

Radio: Shell.
Distance: H_2 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. H_2 IR observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h29^m40^s$ **1-GHz flux/Jy:** 2.5 **Size/arcmin:** 17
Dec: −16°08′ **Spectral index:** 0.4 **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: $18^h20^m56^s$ **1-GHz flux/Jy:** 3.0 **Size/arcmin:** 4
Dec: −14°20′ **Spectral index:** 0.6 **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 (5: $S = 0.95$ Jy) and 1.4 GHz (15″: $S = 2.43$ Jy) and Ooty at 327 MHz ($S = 5.13$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations, including masers.
Reynoso & Mangum 2000, ApJ, 545, 874. CO observations of surroundings.
Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey 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: $18^h21^m57^s$ **1-GHz flux/Jy:** 0.5 **Size/arcmin:** 5
Dec: −14°08′ **Spectral index:** 0.5 **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: $18^h30^m55^s$ **1-GHz flux/Jy:** 5 **Size/arcmin:** 24?
Dec: −14°52′ **Spectral index:** 0.5? **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: $18^h23^m08^s$ **1-GHz flux/Jy:** 0.4 **Size/arcmin:** 6
Dec: −13°46′ **Spectral index:** 0.7 **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: $18^h32^m50^s$ **1-GHz flux/Jy:** 5 **Size/arcmin:** 24
Dec: −14°39′ **Spectral index:** 0.5 **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: $18^h24^m34^s$ **1-GHz flux/Jy:** 4.6 **Size/arcmin:** 8
Dec: −13°11′ **Spectral index:** 0.5 **Type:** S

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

Radio: Shell.
X-ray: Possibly detected.
Distance: HI absorption suggests 6.4 kpc, H_2 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″ : $S = 7.6 \pm 0.1$ Jy), plus other observations.
Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.
Paron *et al.* 2013, MNRAS, 433, 1619. CO, optical and other observations of region.
Leahy *et al.* 2014, MNRAS, 438, 1813. VGPS HI observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Voison *et al.* 2016, MNRAS, 458, 2813. Molecular line observations of region.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h25^m55^s$ **1-GHz flux/Jy:** 1.4 **Size/arcmin:** 6
Dec: −12°50′ **Spectral index:** 0.4 **Type:** S

Has been called G18.62−0.28.

Radio: Partial shell.
Distance: HI absorption suggests 4.4 kpc.

References:

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ : $S = 1.9 \pm 0.1$ Jy), plus other observations.
Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
Voison *et al.* 2016, MNRAS, 458, 2813. Molecular line observations of region.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI 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: $18^h23^m58^s$ **1-GHz flux/Jy:** 33 **Size/arcmin:** 17×11
Dec: −12°23′ **Spectral index:** 0.46 **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′ : $S = 17 \pm 7$ Jy).
Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : $S = 38$ Jy).
Caswell *et al.* 1975, A&A, 45, 239. Parkes 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 : $S = 12.9 \pm 1.0$ Jy), including polarisation.
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (2.′9×3.′5 : $S = 55$ Jy).
Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (55″×75″ : $S = 29.9 \pm 0.3$ 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 : $S = 15.3 \pm 0.9$ Jy) including polarisation and review of flux densities.
Vasquez *et al.* 2012, A&A, 545, A89. CO observations of region.
Paron *et al.* 2012, A&A, 547, A60. CO and other molecular observations of region.
Paron *et al.* 2015, A&A, 580, A51. CO observations in S.
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: $18^h29^m50^s$ **1-GHz flux/Jy:** 37 **Size/arcmin:** 33
Dec: −12°58′ **Spectral index:** 0.39 **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, H_2 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. Hα observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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 H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h24^m56^s$ **1-GHz flux/Jy:** 10 **Size/arcmin:** 27
Dec: −12°07′ **Spectral index:** 0.5 **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: $18^h28^m07^s$ **1-GHz flux/Jy:** 10 **Size/arcmin:** 10
Dec: −11°35′ **Spectral index:** 0.1 **Type:** F

Radio: Faint, filled-centre, polarised.
X-ray: Centrally brightened.
Point sources: OH source 20.1−0.1 is nearby.
Distance: HI 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 HI observations of region.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
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″: $S = 0.8$ 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: $18^h31^m12^s$ **1-GHz flux/Jy:** 1.1 **Size/arcmin:** 9×7
Dec: −10°47′ **Spectral index:** 0.6 **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: $18^h33^m33^s$ **1-GHz flux/Jy:** 7 **Size/arcmin:** 5
Dec: −10°35′ **Spectral index:** varies **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″×35″).
Becker & Kundu 1976, ApJ, 204, 427. NRAO interferometer at 2.7 GHz (5″×20″) and 8 GHz (2″×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′.4×7′.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′.3×3′.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′.6×8′.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′.53×0′.82) for expansion studies.
Tian & Leahy 2008, MNRAS, 391, L54. VGPS at 1.4 GHz (1′) including HI.
Matheson & Safi-Harb 2010, ApJ, 724, 572. Chandra observations.
Bietenholz *et al.* 2011, MNRAS, 412, 1221. VLA at 1.4 GHz (14″×18″).
Bhatnagar *et al.* 2011, ApJ, 739, L20. VLA at 6 GHz.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 6.5 \pm 0.4$ 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: $18^h33^m40^s$ **1-GHz flux/Jy:** 1.4 **Size/arcmin:** 13
Dec: −10°25′ **Spectral index:** 0.5? **Type:** S

Has been called G21.64−0.84.

Radio: Faint, irregular shell.

References:

Bietenholz *et al.* 2011, MNRAS, 412, 1221. VLA at 327 MHz (85″:S=2.8 Jy) and 1.4 GHz (14″×18″).

Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 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: $18^h41^m50^s$ **1-GHz flux/Jy:** 5 **Size/arcmin:** 60
Dec: −11°16′ **Spectral index:** 0.7 **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 Kes 69

RA: $18^h32^m45^s$ **1-GHz flux/Jy:** 65 **Size/arcmin:** 20
Dec: −10°08′ **Spectral index:** 0.56 **Type:** S

Radio: Incomplete shell.
X-ray: Detected.
Distance: Association with CO indicates 5.2 kpc, HI absorption suggests 5.6 kpc, H_2 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. H_2CO 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 HI.
Zhou *et al.* 2009, ApJ, 691, 516. CO and HCO^+ of region.
Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : S = 24.0±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. H_2 IR observations.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Sezer *et al.* 2018, MNRAS, 481, 1416. Suzaku observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h33^m15^s$ **1-GHz flux/Jy:** 33 **Size/arcmin:** 26
Dec: −09°13′ **Spectral index:** 0.6 **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:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.3×3′.4 : S = 82 Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
Becker *et al.* 2010, AJ, 140, 157. Variable radio source detection.
Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.
Su *et al.* 2014, ApJ, 796, 122. CO observations.
Su *et al.* 2015, ApJ, 811, 134. CO observations of region.
H.E.S.S. Collaboration: Abramowski *et al.* 2015, MNRAS, 446, 1163. H.E.S.S. observations.
Mori *et al.* 2017, ApJ, 848, 80. NuSTAR, Chandra and XMM-Newton observations.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Hogge *et al.* 2019, ApJ, 887, 79. Molecular line observations.
Tam *et al.* 2020, ApJ, 899, 75. Fermi 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″:$S=0.7$ Jy) including polarisation, and Spitzer observations.
Sofue *et al.* 2021, ApJS, 253, 17. Nobeyama 45-m CO observations (20″) of region.

G23.3−0.3 W41

RA: $18^h34^m45^s$ **1-GHz flux/Jy:** 70 **Size/arcmin:** 27
Dec: −08°48′ **Spectral index:** 0.5 **Type:** S

Radio: Distorted ring, in complex region, overlapping G22.7−0.2.
X-ray: Possible extended emission, with compact sources.
Point sources: Pulsar association suggested.
Distance: HI and CO observations suggest 4.2 or 4.8 kpc, optical extinction suggests 3.4 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.3×3′.4:$S=138$ Jy).
Gaensler & Johnston 1995, MNRAS, 275, L73. Possible pulsar association.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Aharonian *et al.* 2005, Science, 307, 1938. H.E.S.S. detection.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
Aharonian *et al.* 2006, ApJ, 636, 777. H.E.S.S. observations.
Albert *et al.* 2006, ApJ, 643, L53. γ-ray observations.
Landi *et al.* 2006, ApJ, 651, 190. X-ray observations.
Tian *et al.* 2007, ApJ, 657, L25. VGPS at 1.4 GHz (1′) including HI, plus XMM-Newton observations.
Leahy & Tian 2008, AJ, 135, 167. VGPS at 1.4 GHz (1′) including HI, plus CO observations.
Mukherjee *et al.* 2009, ApJ, 691, 1707. XMM-Newton and SWIFT observations.
Frail *et al.* 2013, ApJ, 773, L19. OH observations.
Castro *et al.* 2013, ApJ, 774, 36. Fermi observations.
H.E.S.S. Collaboration: Abramowski *et al.* 2015, A&A, 574, A27. H.E.S.S. observations.
Su *et al.* 2015, ApJ, 811, 134. CO observations of region.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption 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″:$S=1.8$ 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.

G24.7−0.6

RA: $18^h38^m43^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 15?
Dec: −07°32′ **Spectral index:** 0.5 **Type:** S?

Radio: Incomplete shell, defined in SW.
Distance: HI 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 ($44'' \times 56''$: $S = 1.9$ 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 HI 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: $18^h34^m10^s$ **1-GHz flux/Jy:** 20? **Size/arcmin:** 30×15
Dec: −07°05′ **Spectral index:** 0.2? **Type:** C?

Radio: Filled-centre, with faint shell, and a compact HII 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. H_2 IR observations.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 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: $18^h45^m10^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 80×30?
Dec: −08°00′ **Spectral index:** 0.5? **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 4C−04.71

RA: $18^h41^m19^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 4
Dec: −04°56′ **Spectral index:** 0.68 **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, H_2 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±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 $S_{408\ \mathrm{MHz}}$=10.4 Jy, and $S_{5\ \mathrm{GHz}}$=1.9±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.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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 H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h39^m50^s$ **1-GHz flux/Jy:** 30 **Size/arcmin:** 50×30
Dec: −04°24′ **Spectral index:** varies **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.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G28.3+0.2

RA: $18^h42^m30^s$ **1-GHz flux/Jy:** 1.3? **Size/arcmin:** 10
Dec: −03°58′ **Spectral index:** 0.7? **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 (∼2′).

G28.6−0.1

RA: $18^h43^m55^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 13×9
Dec: −03°53′ **Spectral index:** ? **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: $18^h45^m30^s$ **1-GHz flux/Jy:** 0.9? **Size/arcmin:** 9
Dec: −03°54′ **Spectral index:** 0.8? **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 (∼2′).

G28.8+1.5

RA: $18^h39^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 100?
Dec: −02°55′ **Spectral index:** 0.4? **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. H_2 IR observations.

G29.6+0.1

RA: $18^h44^m52^s$ **1-GHz flux/Jy:** 1.5? **Size/arcmin:** 5
Dec: −02°57′ **Spectral index:** 0.5? **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 Kes 75

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

Has erroneously been called G29.6+0.1.

Radio: Shell with flatter spectrum emission from centre.
X-ray: Thermal shell and non-thermal core, and central pulsar.
Point sources: X-ray pulsar.
Distance: Association with CO implies 11 kpc, and HI 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′.4 : 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 HI.
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 HI.
Kumar & Safi-Harb 2008, ApJ, 678, L43. Chandra observations.
Ng *et al.* 2008, ApJ, 686, 508. Chandra observations.
Gavriil *et al.* 2008, Science, 319, 1802. X-ray observations of pulsar.
Su *et al.* 2009, ApJ, 694, 376. CO observations of region, plus Chandra observations.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : S = 3.6±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 HI 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: $18^h54^m25^s$ **1-GHz flux/Jy:** 0.5? **Size/arcmin:** 16
Dec: −02°54′ **Spectral index:** 0.7? **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: $18^h44^m00^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 24×18
Dec: −01°32′ **Spectral index:** 0.4 **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 : $S = 3.4 \pm 0.4$ Jy), plus other flux densities.
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.6×3′.9 : $S = 8.6$ Jy).
Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 2.93 \pm 0.19$ Jy) including polarisation and review of flux densities.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G31.5−0.6

RA: $18^h51^m10^s$ **1-GHz flux/Jy:** 2? **Size/arcmin:** 18?
Dec: −01°31′ **Spectral index:** ? **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: $18^h49^m25^s$ **1-GHz flux/Jy:** 25 **Size/arcmin:** 7×5
Dec: −00°55′ **Spectral index:** varies **Type:** S

Radio: Shell, brightest in NW, with low frequency turnover.
X-ray: Diffuse with central core.
Distance: HI absorption and CO association suggests 7.1 kpc, as does H_2 emission.

References:

Radhakrishnan *et al.* 1972, ApJS, 24, 49. HI absorption.
Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′).
Green *et al.* 1975, A&A, 44, 187. Effelsberg 100-m at 15 GHz (58″ : $S > 1.6$).
Becker & Kundu 1976, ApJ, 204, 427. NRAO interferometer at 2.7 GHz (20″×23″) and 8 GHz (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 HI absorption.
Lee *et al.* 2014, MNRAS, 443, 2650. [FeII] IR survey observations.
Sato *et al.* 2014, PASJ, 66, 124. Suzaku observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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. HI and CO observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $19^h06^m00^s$ **1-GHz flux/Jy:** 22? **Size/arcmin:** 60?
Dec: −03°00′ **Spectral index:** 0.5? **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: $18^h53^m10^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 40?
Dec: −01°08′ **Spectral index:** ? **Type:** C?

Radio: Possible faint shell, not well defined.
X-ray: Diffuse, with clumps.
Distance: H_2 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. H_2 IR observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h50^m05^s$ **1-GHz flux/Jy:** 0.25? **Size/arcmin:** 6
Dec: −00°25′ **Spectral index:** ? **Type:** S

Has been called G32.45+0.1.

Radio: Shell.
X-ray: Shell.
Distance: X-ray absorption suggests 17 kpc.

References:

Yamaguchi *et al.* 2004, PASJ, 56, 1059. XMM-Newton and other observations.
Ueno *et al.* 2005, in XRRC, E4.18. XMM-Newton observations.
Acero *et al.* 2016, ApJS, 224, 8. 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 Kes 78

RA: $18^h51^m25^s$ **1-GHz flux/Jy:** 11? **Size/arcmin:** 22×15
Dec: −00°08′ **Spectral index:** 0.2? **Type:** S?

Part has been called G33.1−0.1.

Radio: Incomplete, elongated shell.
Optical: Detected.
X-ray: Patchy, elongated shell.
Distance: Association with CO and HI absorption indicate 4.8 kpc, H_2 emission suggests 5.4 kpc.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft et 2.7 GHz (5′ : $S = 7.2 \pm 0.5$ 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. Hα observations.
Zhou & Chen 2011, ApJ, 743, 4. XMM-Newton observations, plus CO of region.
Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Bamba *et al.* 2016, ApJ, 818, 63. Suzaku observations.
Miceli *et al.* 2017, A&A, 599, A45. XMM-Newton observations.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h53^m50^s$ **1-GHz flux/Jy:** 3.5 **Size/arcmin:** 18
Dec: −00°02′ **Spectral index:** varies **Type:** S

Radio: Incomplete shell.
Optical: Filaments and diffuse emission.
Distance: H_2 emission suggests 4.9 kpc.

References:

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Reich 1982, A&A, 106, 314. Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 2.6 \pm 0.3$ Jy) and 4.75 GHz (2′.5 : $S = 1.75 \pm 0.2$ Jy).
Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (52″×68″ : $S = 2.7 \pm 0.3$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Boumis *et al.* 2009, A&A, 499, 789. Optical observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 IR observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 IR 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.

G33.6+0.1 Kes 79, 4C00.70, HC13

RA: $18^h52^m48^s$ **1-GHz flux/Jy:** 20 **Size/arcmin:** 10
Dec: +00°41′ **Spectral index:** 0.51 **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: HI absorption suggests 7.8 or 3.5 kpc, and CO observations suggest 5.5 kpc.

References:

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S = 35.5$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 7.8$ Jy).
Caswell *et al.* 1975, A&A, 45, 239. HI absorption.
Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\ \mathrm{MHz}} = 69 \pm 33$ Jy.
Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′ : $S = 6.8 \pm 1.5$ Jy).
Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′.8 : $S = 11.4 \pm 1.1$ Jy).
Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz (1′), plus observations of the nearby point source.
van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT HI absorption to nearby point source, possibly extragalactic.
Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source, plus Einstein observations.
Green 1989, MNRAS, 238, 737. OH absorption.
Frail & Clifton 1989, ApJ, 336, 854. VLA at 1.4 GHz (1′×2′.9), including HI absorption.

Velusamy *et al.* 1991, AJ, 102, 676. VLA at 327 MHz (1′), 1.5 (7″×14″) and 5 GHz (7″), including spectral comparison.
Green & Dewdney 1992, MNRAS, 254, 686. Observations of adjacent molecular material.
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.6×3′.8 : S = 34.8 Jy).
Seward & Velusamy 1995, ApJ, 439, 715. ROSAT observations.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
Tsunemi & Enoguchi 2002, PASJ, 54, 735. ASCA observations.
Seward *et al.* 2003, ApJ, 584, 414. Chandra observations.
Stanimirović 2003, ApJ, 592, 953. Arecibo OH absorption.
Sun *et al.* 2004, ApJ, 605, 742. Chandra observations.
Gotthelf *et al.* 2005, ApJ, 627, 390. XMM-Newton pulsar detection.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
Halpern *et al.* 2007, ApJ, 665, 1304. X-ray pulsar timing observations.
Giacani *et al.* 2009, A&A, 507, 841. VLA at 74 MHz (36″×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.
Sun *et al.* 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.
Auchettl *et al.* 2014, ApJ, 783, 32. Fermi detection.
Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
Zhou *et al.* 2016, ApJ, 831, 192. CO and other observations.
Sato *et al.* 2016, PASJ, 68, S8. Suzaku observations.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Kuriki *et al.* 2018, ApJ, 864, 161. CO observations.
Mayer & Becker 2021, A&A, 651, A40. Multi-epoch Chandra observations for proper motion of compact source.
Dokara *et al.* 2021, A&A, 651, A86. VLA at 4 to 8 GHz (18″ : S = 1.2 Jy) including polarisation, and Spitzer 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.

G34.7−0.4 W44, 3C392

RA: $18^h56^m00^s$ **1-GHz flux/Jy:** 240 **Size/arcmin:** 35×27
Dec: +01°22′ **Spectral index:** 0.37 **Type:** C

Has been called G34.6−0.5.

Radio: Distorted shell, brighter to the E, with pulsar and associated nebula.
Optical: Diffuse emission.
X-ray: Centrally concentrated, thermal spectrum, plus pulsar wind nebula.
Point sources: Pulsar within the boundary of the remnant.
Distance: HI absorption suggests 3.0 kpc, optical absorption suggests 2.1 or 2.7 kpc, H_2 emission suggests 2.8 kpc.

References:

Caswell *et al.* 1975, A&A, 45, 239. HI absorption.
Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 299 Jy).
Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\ \mathrm{MHz}}$ = 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).
Jones *et al.* 1993, MNRAS, 265, 631. VLA at 1.4 GHz (15″), plus X-ray spectra.
Rho *et al.* 1994, ApJ, 430, 757. Optical and ROSAT observations.
Koo & Heiles 1995, ApJ, 442, 679. HI of surrounding shell.
Harrus *et al.* 1996, ApJ, 464, L161. ASCA observations.
Frail *et al.* 1996, ApJ, 464, L165. VLA at 1.5 and 8.4 GHz (7″.8×8″.9) of pulsar nebula.
Frail *et al.* 1996, AJ, 111, 1651. OH maser emission.
Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
Reach & Rho 1996, A&A, 315, L277. ISO spectroscopy.
Harrus *et al.* 1997, ApJ, 488, 781. X-ray observations.
Claussen *et al.* 1997, ApJ, 489, 143. VLA of associated OH masers.
Giacani *et al.* 1997, AJ, 113, 1379. VLA at 1.4 GHz (15″), plus optical images.
Seta *et al.* 1998, ApJ, 505, 286. CO observations of surroundings.
Cox *et al.* 1999, ApJ, 524, 179. Revision of distance.
Reach & Rho 2000, ApJ, 544, 843. ISO observations of interactions with surroundings.
see also: Reach & Rho 2001, ApJ, 558, 943. Erratum.
Roberts *et al.* 2001, ApJS, 133, 451. ASCA observations.
Petre *et al.* 2002, ApJ, 579, 404. Chandra observations of pulsar and wind nebula.
Mavromatakis *et al.* 2003, A&A, 405, 591. Optical observations.
Shelton *et al.* 2004, ApJ, 611, 906. Chandra observations of part.
Reach *et al.* 2005, ApJ, 618, 297. Molecular line and near-IR observations.
Hoffman *et al.* 2005, ApJ, 627, 803. Observations of OH masers.
Kawasaki *et al.* 2005, ApJ, 631, 935. ASCA observations.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
Neufeld *et al.* 2007, ApJ, 664, 890. Spitzer observations.
Castelletti *et al.* 2007, A&A, 471, 537. VLA at 74 MHz (36″×39″ : S = 634±70 Jy) and 324 MHz (13″ : S = 411±50 Jy).
Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
Abdo *et al.* 2010, Science, 327, 1103. Fermi observations.
Yuan & Neufeld 2011, ApJ, 726, 76. Spitzer observations.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : S = 118±6 Jy) including polarisation and review of flux densities.
Giuliani *et al.* 2011, ApJ, 742, L30. γ-ray observations.
Uchiyama *et al.* 2012, ApJ, 749, L35. Fermi observations.
Uchida *et al.* 2012, PASJ, 64, 141. Suzaku observations.
Ackermann *et al.* 2013, Science, 339, 807. Fermi observations.
Yoshiike *et al.* 2013, ApJ, 768, 179. CO and HI observations of region.
Sashida *et al.* 2013, ApJ, 774, 10. HCO^+ and CO observations of region.
Park *et al.* 2013, ApJ, 777, 14. Arecibo HI observations of region.
Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
Anderl *et al.* 2014, A&A, 569, A81. CO observations of regions in NE.
Su *et al.* 2014, IAUS, 296, 372. VGPS for HI absorption.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
McEwen *et al.* 2016, ApJ, 826, 189. NH_3 and CH_3OH observations.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Génova-Santos *et al.* 2017, MNRAS, 464, 4107. Radio observations at 10 to 20 GHz.
Egron *et al.* 2017, MNRAS, 470, 1329. SRT at 1.5 GHz (11′ : S = 214±6 Jy) and 7 GHz (2′.7 : S = 94±4 Jy).
Yamada *et al.* 2017, ApJ, 834, L3. CO and HCO^+ observations.
Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.

Beuther *et al.* 2019, A&A, 628, A90. OH maser observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $18^h57^m55^s$ **1-GHz flux/Jy:** 9 **Size/arcmin:** 15×11
Dec: +02°13′ **Spectral index:** 0.5 **Type:** S?

Re-identified as SNR in 2009.

Radio: Diffuse, with some limb brightening.
Distance: HI 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.
Zhu *et al.* 2013, ApJ, 775, 95. HI and other observations.
Paredes *et al.* 2014, A&A, 561, A56. GMRT at 610 MHz (4″.8×12″.2).
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Beuther *et al.* 2019, A&A, 628, A90. OH maser observations.
Cui *et al.* 2021, A&A, 646, A114. Fermi observations of region, and X-ray limit.
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: $19^h00^m35^s$ **1-GHz flux/Jy:** 1.0 **Size/arcmin:** 25?
Dec: +02°56′ **Spectral index:** 0.7? **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: $S = 0.39 \pm 0.04$ 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: $18^h48^m49^s$ **1-GHz flux/Jy:** 0.7? **Size/arcmin:** 17×13?
Dec: +04°26′ **Spectral index:** 0.5? **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: $19^h06^m40^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 32×19?
Dec: +04°28′ **Spectral index:** ? **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:

Schaudel *et al.* 2002, ASPC, 271, 391. ROSAT of E, and radio survey observations.
Sabin *et al.* 2013, MNRAS, 431, 279. Hα and radio survey observations.
Huang *et al.* 2014, ApJ, 785, 118. XMM-Newton and Chandra observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G39.2−0.3

3C396, HC24, NRAO 593

RA: $19^h04^m08^s$ **1-GHz flux/Jy:** 18 **Size/arcmin:** 8×6
Dec: +05°28′ **Spectral index:** 0.34 **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: HI absorption suggests 8.5 kpc, H_2 emission suggests 9.5 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′).
Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\ \mathrm{MHz}} = 54 \pm 38$ Jy.
Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′ : $S = 4.1 \pm 1.0$ Jy).
Caswell *et al.* 1975, A&A, 45, 239. HI 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.
Patnaik *et al.* 1990, A&A, 232, 467. VLA at 1.5 GHz (25″) and 1.4 GHz (7″.5×7″.8) and 5 GHz (25″) including polarisation, plus Ooty at 327 MHz (31″×100″), including review of flux densities.
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.5×3′.6 : $S = 42.5$ Jy).
Anderson & Rudnick 1993, ApJ, 408, 514. VLA at 1.45 and 4.89 GHz for spectral index studies.

Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.
Harrus & Slane 1999, ApJ, 516, 811. ASCA observations.
Aharonian *et al.* 2001, A&A, 375, 1008. H.E.S.S. limit.
Olbert *et al.* 2003, ApJ, 592, L45. Chandra observations.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
Scaife *et al.* 2007, MNRAS, 377, L69. 33 GHz observations.
Lee *et al.* 2009, ApJ, 691, 1042. IR observations.
Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 8.8 \pm 0.5$ Jy) including polarisation and review of flux densities.
Su *et al.* 2011, ApJ, 727, 43. Chandra and CO observations of region.
Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
Cruciani *et al.* 2016, MNRAS, 459, 4224. Parkes 64 m at 8.4, 13.5, 18.6 and 21.5 GHz, plus review of flux densities.
Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] and H_2 IR observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 IR observations.
Sezar *et al.* 2020, MNRAS, 492, 1484. Suzaku observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
de Oña Wilhelmi *et al.* 2020, MNRAS, 497, 3581. Fermi and CO observations.
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 W50, SS433

RA: $19^h12^m20^s$ **1-GHz flux/Jy:** 85? **Size/arcmin:** 120×60
Dec: +04°55′ **Spectral index:** 0.7? **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 Hα and [SII].
Zealey *et al.* 1980, MNRAS, 192, 731. Optical spectra.
van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT HI absorption to nearby point source (not SS433).
Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source.
Watson *et al.* 1983, ApJ, 273, 688. X-ray observations.

Downes *et al.* 1986, MNRAS, 218, 393. Effelsberg 100-m at 4.75 GHz (2′.4 : $S = 34 \pm 4$ Jy), plus previous 1.7 and 2.7 GHz data.
Romney *et al.* 1987, ApJ, 321, 822. VLBI of SS433, including distance.
Elston & Baum 1987, AJ, 94, 1633. Mosaic with VLA at 1.4 GHz (30″) of fine structure only.
Kawai *et al.* 1989, PASJ, 41, 491. X-ray observations of SS433.
Band 1989, ApJ, 336, 937. Einstein and EXOSAT observations.
Yamauchi *et al.* 1994, PASJ, 46, L109. X-ray spectral observations.
Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
Brinkmann *et al.* 1996, A&A, 312, 306. ROSAT observations.
Kotani *et al.* 1996, PASJ, 48, 619. X-ray line emission from SS433.
Safi-Harb & Ögelman 1997, ApJ, 483, 868. ROSAT observations.
Dubner *et al.* 1998, AJ, 116, 1842. VLA at 328 MHz (60″×64″ : $S = 160 \pm 20$ Jy), and 1.4 GHz (54″×56″), plus NRAO 140-ft at 1.4 GHz (21′) for HI observations.
Safi-Harb & Petre 1999, ApJ, 512, 784. X-ray observations.
Aharonian *et al.* 2001, A&A, 375, 1008. H.E.S.S. limit.
Brinkmann *et al.* 2007, A&A, 463, 611. XMM-Newton observations of E lobe.
Boumis *et al.* 2007, MNRAS, 381, 308. Optical observations.
Lockman *et al.* 2007, MNRAS, 381, 881. 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 Hα observations.
Broderick *et al.* 2018, MNRAS, 475, 5360. LOFAR at 115 to 189 MHz, including 140 MHz (55″×78″).
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: $19^h07^m10^s$ **1-GHz flux/Jy:** 11 **Size/arcmin:** 22
Dec: +06°31′ **Spectral index:** 0.4 **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.
Yang *et al.* 2006, ChJAA, 6, 210. CO observations of surroundings.
Abdo *et al.* 2007, ApJ, 664, L91. γ-ray observations.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 6.4 \pm 0.3$ Jy) including polarisation and review of flux densities.
Aliu *et al.* 2014, ApJ, 787, 166. γ-ray observations of region.
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: $19^h07^m34^s$ **1-GHz flux/Jy:** 25 **Size/arcmin:** 4.5×2.5
Dec: +07°08′ **Spectral index:** 0.50 **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 $S_{430\ \mathrm{MHz}} = 82 \pm 51$ Jy, also Algonquin 46-m at 10.6 GHz (3′ : $S = 12 \pm 2$ Jy), and Haystack 36-m at 15.5 GHz (2.′3 : $S = 8.5 \pm 3.0$ Jy).
Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S = 29.8$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 8.7$ Jy).
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.′6).
Caswell *et al.* 1982, MNRAS, 200, 1143. FIRST at 1.4 GHz (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: $19^h05^m50^s$ **1-GHz flux/Jy:** 1? **Size/arcmin:** 10
Dec: +07°46′ **Spectral index:** ? **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: $19^h08^m10^s$ **1-GHz flux/Jy:** 0.5? **Size/arcmin:** 8
Dec: +08°00′ **Spectral index:** ? **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: $19^h07^m20^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 24
Dec: +09°05′ **Spectral index:** 0.5? **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 : $S = 1.5 \pm 0.2$ Jy), plus other flux densities.
Vasisht *et al.* 1994, ApJ, 431, L35. VLA at 327 MHz (3′.2×3′.4).
Hurley *et al.* 1996, ApJ, 463, L13. Observations of soft gamma repeater field.
Lorimer & Xilouris 2000, ApJ, 545, 385. Pulsar detection.
Aharonian *et al.* 2001, A&A, 375, 1008. 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 W49B

RA: $19^h11^m08^s$ **1-GHz flux/Jy:** 38 **Size/arcmin:** 4×3
Dec: +09°06′ **Spectral index:** 0.46 **Type:** S

Radio: Shell, brightest to the SE and W, near the HII region W49A.
X-ray: Centrally brightened, elongated E--W.
Point sources: Compact X-ray source.
Distance: HI absorption suggests 11.3 kpc, H_2 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″ : $S = 9.0 \pm 0.7$ Jy).
Lockhart & Goss 1978, A&A, 67, 355. HI absorption.
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.′6).
Pye *et al.* 1984, MNRAS, 207, 649. Einstein observations, and VLA at 1.4 and 5 GHz (both 12″).
Smith *et al.* 1985, ApJ, 296, 469. EXOSAT spectrum.
Morsi & Reich 1987, A&AS, 71, 189. Effelsberg 100-m at 32 GHz (smoothed to 30″ : $S = 6.90 \pm 0.38$ Jy).

Moffett & Reynolds 1994, ApJ, 437, 705. VLA at 330 MHz (6.″7×7.″7 : $S = 64.4$ Jy), 1.48 GHz (4.″8×5.″2 : $S = 31.8$ Jy) and 4.85 GHz (4.″0×4.″1), including polarisation.
Fujimoto *et al.* 1995, PASJ, 47, L31. ASCA observations.
Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Hwang *et al.* 2000, ApJ, 532, 970. ROSAT image and ASCA spectroscopy.
Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.
Aharonian *et al.* 2001, A&A, 375, 1008. H.E.S.S. limit.
Brogan & Troland 2001, ApJ, 550, 799. VLA at 1.4 GHz (24″×27″ and 5″) for HI 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 : $S = 19.1 \pm 1.0$ Jy) including polarisation and review of flux densities.
Rodes-Roca 2013, A&A, 555, A115. IR of compact X-ray source.
Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.
Lopez *et al.* 2013, ApJ, 777, 145. Chandra spectroscopy.
Zhu *et al.* 2014, ApJ, 793, 95. Spitzer and other observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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 HI 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. [FeII] and H_2 IR observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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: $19^h05^m50^s$ **1-GHz flux/Jy:** 9.0 **Size/arcmin:** 60?
Dec: +10°30′ **Spectral index:** 0.5 **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, IAUCo, 101, 293. Summary of parameters.
Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4′.3).
Vasisht *et al.* 1994, ApJ, 431, L35. VLA at 327 MHz (3′.2×3′.4).
Hurley *et al.* 1996, ApJ, 463, L13. Observations of soft gamma repeater field.
Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 333 MHz (50″), and other observations of the region.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 4.55 \pm 0.24$ Jy) including polarisation and review of flux densities.
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: $19^h16^m25^s$ **1-GHz flux/Jy:** 4.2? **Size/arcmin:** 22
Dec: +11°09′ **Spectral index:** 0.4? **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 : $S = 2.6 \pm 0.3$ Jy), plus other flux densities.
Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
Acero *et al.* 2016, ApJS, 224, 8. 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 (HC30)

RA: $19^h18^m10^s$ **1-GHz flux/Jy:** 17 **Size/arcmin:** 15
Dec: +12°09′ **Spectral index:** 0.54 **Type:** S

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′ : $S = 9.8 \pm 0.9$ Jy), and 37-m at 1.7 GHz ($S = 14.5 \pm 5.5$ Jy).
Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : $S = 20.3$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 7.1$ Jy).
Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\,\mathrm{MHz}} = 46 \pm 21$ Jy.
Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′.8 : $S = 5.9 \pm 0.6$ Jy).
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″ : $S = 13.3 \pm 0.1$ Jy).
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 7.02 \pm 0.18$ Jy) including polarisation and review of flux densities.
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: $19^h23^m50^s$ **1-GHz flux/Jy:** 160? **Size/arcmin:** 30
Dec: +14°06′ **Spectral index:** 0.3? **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, HI absorption suggests 5.4 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Parkes 64-m at 5 GHz (4′).
Sato 1973, PASJ, 25, 135. HI absorption.
Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′), $S = 51.5 \pm 3.2$ Jy, for the non-thermal component, but probably confused.
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Seward 1990, ApJS, 73, 781. Einstein observations.
Copetti & Schmidt 1991, MNRAS, 250, 127. 151 MHz observations.
Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′.1×3′.5).
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 HI.

Koo & Moon 1997, ApJ, 485, 263. NRAO 12-m CO and HCO^+ observations.
Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.
Mavromatakis *et al.* 2001, A&A, 370, 265. Optical observations.
Koo *et al.* 2002, AJ, 123, 1629. ASCA observations.
Koo *et al.* 2005, ApJ, 633, 946. Chandra observations.
Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
Abdo *et al.* 2009, ApJ, 706, L1. Fermi observations.
Koo *et al.* 2010, AJ, 140, 262. HI Zeman splitting observations.
Ceccarelli *et al.* 2011, ApJ, 740, L4. Molecular line observations of region.
Aleksić *et al.* 2012, A&A, 541, A13. γ-ray observations.
Hanabata *et al.* 2013, PASJ, 65, 42. Suzaku observations.
Tian & Leahy 2013, ApJ, 769, L17. HI observations of region.
Brogan *et al.* 2013, ApJ, 771, 91. VLA at 74 MHz (84″×92″) and 320 MHz (33″×35″), plus OH, molecular line and other observations.
Park *et al.* 2013, ApJ, 777, 14. Arecibo of HI in region.
Sasaki *et al.* 2014, A&A, 563, A9. XMM-Newton observations.
Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
Dumes *et al.* 2014, ApJ, 786, L24. Molecular line observations.
Jogler & Funk 2016, ApJ, 816, 100. Fermi observations.
McEwen *et al.* 2016, ApJ, 826, 189. NH_3 and CH_3OH 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 HI absorption observations.
Lee *et al.* 2019, AJ, 157, 123. [FeII] 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: $19^h29^m57^s$ **1-GHz flux/Jy:** 1.5 **Size/arcmin:** 10?
Dec: +18°10′ **Spectral index:** 0.6? **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 3C400.2, NRAO 611

RA: $19^h38^m50^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 33×28
Dec: +17°14′ **Spectral index:** 0.50 **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 HI 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 $S_{430\,\mathrm{MHz}} = 20 \pm 10$ Jy, $S_{318\,\mathrm{MHz}} = 20 \pm 3.6$ Jy.
Goss *et al.* 1975, A&A, 43, 459. WSRT at 610 MHz (1′×3′ : $S = 13.2 \pm 1.6$ Jy).
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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 HI 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: $19^h30^m31^s$ **1-GHz flux/Jy:** 0.5 **Size/arcmin:** 12?
Dec: +18°52′ **Spectral index:** 0.1 **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: HI 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″×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.
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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″.6×6″.8), 4.7 GHz (3″.2×3″.3), and 8.2 GHz (3″.0×3″.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 HI 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: $19^h33^m20^s$ **1-GHz flux/Jy:** 28 **Size/arcmin:** 40
Dec: +18°56′ **Spectral index:** 0.5 **Type:** S

Has been called G54.5−0.3.

Radio: Shell, in complex region.
Optical: Faint filaments.
Point sources: Pulsar outside NW rim.
Distance: HI and CO observations suggest 6.6 kpc, H_2 emission suggests 5.4 kpc, optical extinction suggests 6.6 kpc.

References:

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′: S = 34.4±5.0 Jy).
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Caswell 1985, AJ, 90, 1224. DRAO at 1.4 GHz (1′.3×2′.6: S = 18±4 Jy).
Velusamy *et al.* 1986, JApA, 7, 105. WSRT at 609 MHz (50″×191″ smoothed to 100″×200″).
Junkes *et al.* 1992, A&AS, 96, 1. Surrounding CO.
Junkes *et al.* 1992, A&A, 261, 289. Nearby IRAS sources.
Boumis *et al.* 2005, A&A, 443, 175. Optical observations.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.
Park *et al.* 2013, ApJ, 777, 14. Arecibo of HI in region.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 IR observations.
Karpova *et al.* 2017, MNRAS, 466, 1757. X-ray observations of pulsar.

Ranasinghe & Leahy 2017, ApJ, 843, 119. HI and CO observations.
Lee *et al.* 2019, AJ, 157, 123. H_2 IR observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.
Lee *et al.* 2020, AJ, 160, 263. H_2 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″: $S = 0.6$ Jy) including polarisation, and Spitzer observations.

G55.0+0.3

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

Has been called G55.2+0.5.

Radio: Faint, partial shell.
Point sources: Old pulsar nearby.
Distance: Association with HI features implies 14 kpc, optical extinction suggests 10.2 kpc.

References:

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′.0×2′.5), and northern sky survey at 4.9 GHz.
Matthews *et al.* 1998, ApJ, 493, 312. WSRT at 327 MHz (1′.0×2′.9 : $S = 0.98 \pm 0.15$ Jy), DRAO at 1.4 GHz (1′.0×2′.9 : $S = 0.25 \pm 0.12$ Jy), plus HI observations.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
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.

G55.7+3.4

RA: $19^h21^m20^s$ **1-GHz flux/Jy:** 1? **Size/arcmin:** 23
Dec: +21°44′ **Spectral index:** 0.3? **Type:** S

Radio: Incomplete shell.
Point sources: Old pulsar within the boundary of the remnant.

References:

Goss *et al.* 1977, A&A, 61, 93. WSRT observations at 610 MHz (57″×156″ : $S = 1.9 \pm 0.2$ Jy) and 1415 MHz (27″×72″ : $S = 1.0 \pm 0.1$ Jy).
Bhatnagar *et al.* 2011, ApJ, 739, L20. VLA at 1.3 to 1.9 GHz (30″).
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 0.52 \pm 0.03$ Jy) including polarisation and review of flux densities.

G57.2+0.8 (4C21.53)

RA: $19^h34^m59^s$ **1-GHz flux/Jy:** 1.8 **Size/arcmin:** 12?
Dec: +21°57′ **Spectral index:** 0.35 **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 : $S = 0.74 \pm 0.04$ Jy) including polarisation and review of flux densities.
Surnis *et al.* 2016, ApJ, 826, 184. GMRT at 610 MHz and VLA at 1.4 GHz.
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: $19^h42^m33^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 15
Dec: +23°35′ **Spectral index:** ? **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 : $S = 5.1 \pm 0.2$ Jy), and northern sky survey at 4.9 GHz.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Gök *et al.* 2008, Ap&SS, 318, 207. Optical observations.
Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
Xu & Wang 2012, A&A, 543, A24. CO observations of SE.
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: $19^h47^m52^s$ **1-GHz flux/Jy:** 1.8 **Size/arcmin:** 8
Dec: +27°45′ **Spectral index:** 0.24 **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 : $S = 1.12 \pm 0.06$ Jy) including polarisation and review of flux densities.
Matheson *et al.* 2016, ApJ, 825, 134. XMM-Newton and Chandra observations.

G64.5+0.9

RA: $19^h50^m25^s$ **1-GHz flux/Jy:** 0.15? **Size/arcmin:** 8
Dec: +28°16′ **Spectral index:** 0.5 **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 HI.
Hurley-Walker *et al.* 2009, MNRAS, 398, 249. Radio identification.
Neustadt *et al.* 2017, MNRAS, 469, 516. Optical observations.

G65.1+0.6

RA: $19^h54^m40^s$ **1-GHz flux/Jy:** 5.5 **Size/arcmin:** 90×50
Dec: +28°35′ **Spectral index:** 0.61 **Type:** S

Radio: Large, faint shell.
Point sources: Old pulsar nearby.
Distance: Possible association with HI 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 HI.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 9.1 \pm 1.0$ Jy) and 1420 MHz (∼1′ : $S = 3.9 \pm 0.5$ Jy), including review of flux densities.
Aleksić *et al.* 2010, ApJ, 725, 1629. 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. H_2 IR observations.

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

G65.3+5.7

RA: $19^h33^m00^s$ **1-GHz flux/Jy:** 42 **Size/arcmin:** 310×240
Dec: +31°10′ **Spectral index:** 0.6 **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±1.6 Jy), estimate $S_{408\ \mathrm{MHz}}$ = 91±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±3 Jy), and Urumqi 25-m at 4.8 GHz (9′.5: S = 16.8±1.8 Jy) including polarisation and review of flux densities.
Gosachinskii 2010, AstL, 36, 260. HI 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 DA 495

RA: $19^h52^m10^s$ **1-GHz flux/Jy:** 5.1 **Size/arcmin:** 22
Dec: +29°26′ **Spectral index:** varies **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±0.4 Jy), and 37-m at 1.7 GHz (S = 4.4±0.5 Jy), plus review of flux densities.
see also: Willis 1973, A&A, 27, 483. Erratum.
Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo $S_{430\ \mathrm{MHz}}$ = 8.7±4.9 Jy, $S_{318\ \mathrm{MHz}}$ = 9.7±2.2 Jy.
Landecker & Caswell 1983, AJ, 88, 1810. DRAO at 1.4 GHz (0′.9×1′.5: S = 4.4±0.2 Jy).

Velusamy *et al.* 1989, JApA, 10, 161. Ooty at 327 MHz (36″×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.′9×6.′0 : $S = 6.5 \pm 0.5$ Jy) and 1.4 GHz (0.′82×1.′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: $19^h57^m50^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 31×25?
Dec: +29°03′ **Spectral index:** ? **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. Hα 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: $19^h57^m45^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 50×45?
Dec: +30°53′ **Spectral index:** ? **Type:** S

Radio: Arc in S.
Optical: Filamentary shell.
Distance: Optical absorption suggests 2.0 kpc.

References:

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

G67.7+1.8

RA: $19^h54^m32^s$ **1-GHz flux/Jy:** 1.0 **Size/arcmin:** 15×12
Dec: +31°29′ **Spectral index:** 0.61 **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 : $S = 1.9 \pm 0.1$ Jy), and northern sky survey at 4.9 GHz ($S = 0.42 \pm 0.05$ 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′ : $S = 1.1 \pm 0.1$ Jy) and 1420 MHz (∼1′ : $S = 0.68 \pm 0.04$ Jy), including polarisation and review of flux densities.
Gök *et al.* 2008, Ap&SS, 318, 207. Optical observations.
Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio 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 : $S = 0.30 \pm 0.03$ Jy) including polarisation and review of flux densities.
Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.

G67.8+0.5

RA: $20^h00^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 7×5
Dec: +30°51′ **Spectral index:** ? **Type:** ?

Radio: Poorly resolved arc.
Optical: Diffuse shell, brighter to W.

References:

Sabin *et al.* 2013, MNRAS, 431, 279. Hα and radio survey observations.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

G68.6−1.2

RA: $20^h08^m40^s$ **1-GHz flux/Jy:** 1.1 **Size/arcmin:** 23
Dec: +30°37′ **Spectral index:** 0.2 **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′ : $S = 0.57 \pm 0.08$ Jy), including review of flux densities.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 0.80 \pm 0.04$ Jy), including polarisation and review of flux densities.

G69.0+2.7 CTB 80

RA: $19^h53^m20^s$ **1-GHz flux/Jy:** 120? **Size/arcmin:** 80?
Dec: +32°55′ **Spectral index:** varies **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 (∼3′ : S = 72±7 Jy) and 1420 MHz (∼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 : $S = 36 \pm 4$ 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: $20^h02^m40^s$ **1-GHz flux/Jy:** 2.0 **Size/arcmin:** 16×14
Dec: +32°43′ **Spectral index:** 0.7 **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 (∼3′ : $S = 3.2 \pm 0.4$ Jy) and 1420 MHz (∼1′ : $S = 1.5 \pm 0.1$ Jy), including review of flux densities.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 0.78 \pm 0.07$ Jy) including polarisation and review of flux densities.

G70.0−21.5

RA: $21^h24^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 330×240
Dec: +19°23′ **Spectral index:** ? **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. Hα 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: $20^h14^m15^s$ **1-GHz flux/Jy:** 9 **Size/arcmin:** 27
Dec: +36°12′ **Spectral index:** 0.23 **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 : $S = 6.7 \pm 0.5$ Jy), plus other flux densities.
Chastenay & Pineault 1988, IAUCo, 101, 297. DRAO at 408 MHz (3′.5×5′.9) and 1.4 GHz (1′.0×1′.7).
Pineault & Chastenay 1990, MNRAS, 246, 169. DRAO at 408 MHz (3′.4×5′.8 : $S = 12.7 \pm 1.2$ Jy) and 1.4 GHz (1′.0×1′.7 : $S = 7.4 \pm 1.0$ Jy).
Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.
Pineault *et al.* 1996, AJ, 112, 201. DRAO at 1.4 GHz (smoothed to 2′) for HI.
Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
Mavromatakis 2003, A&A, 398, 153. Optical observations.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 10.0 \pm 1.7$ Jy) and 1420 MHz (∼1′ : $S = 7.6 \pm 0.6$ Jy), including polarisation and review of flux densities.
Sitnik 2010, ARep, 54, 317. Hα and CO observations of region.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 6.2 \pm 0.3$ Jy) including polarisation and review of flux densities.
Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
Acero *et al.* 2016, ApJS, 224, 8. 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: $20^h51^m00^s$ **1-GHz flux/Jy:** 210 **Size/arcmin:** 230×160
Dec: +30°40′ **Spectral index:** varies **Type:** S

Has been suggested that this is two overlapping remnants.

Radio: Shell, brightest to the NE, with fainter breakout region to S, with spectral variations.
Optical: Large filamentary loop, brightest to the NE, not well defined to the S or W.
X-ray: Shell in soft X-rays.
Point sources: Several compact radio sources within the boundary of the remnant.
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. Hα imagery.
Arendt *et al.* 1992, ApJ, 400, 562. IRAS observations.
Hester *et al.* 1994, ApJ, 420, 721. Hα, [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, Hα and other optical observations of NE region.
Levenson & Graham 2001, ApJ, 559, 948. HST of SE region.
Uyanıker *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.
Uyanıker *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.
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Raymond *et al.* 2015, ApJ, 805, 152. HST observations in NE.
see also: Raymond *et al.* 2015, ApJ, 814, 165. Erratum.
Roberts & Wang 2015, MNRAS, 449, 1340. Suzaku observations.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux density 30 GHz.
Katsuda *et al.* 2016, ApJ, 819, L32. Hα 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.
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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 CTB 87

RA: $20^h16^m02^s$ **1-GHz flux/Jy:** 9 **Size/arcmin:** 8×6
Dec: +37°12′ **Spectral index:** varies **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 $S_{430\,\mathrm{MHz}}=12.2\pm9.7$ Jy, $S_{318\,\mathrm{MHz}}=17.7\pm5.0$ Jy.
Weiler & Shaver 1978, A&A, 70, 389. WSRT at 610 MHz (57″×94″: $S=9.1\pm1.2$ Jy), 1.4 (24″×40″: $S=8.7\pm1.2$ Jy) and 5 GHz (24″×40″: $S=5.6\pm1.3$ Jy).
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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″: $S=1.47\pm0.19$ 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: $S=11.6\pm0.4$ Jy) and 1.4 GHz (1′.0×1′.7: $S=7.2\pm0.3$ Jy).
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Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz (3′.5×5′.2: $S=13.3\pm0.8$ Jy) and Effelsberg 100-m at 4.8 GHz ($S=7.5\pm0.7$ 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 (∼3′: $S=11.9\pm0.9$ Jy) and 1420 MHz (∼1′: $S=7.1\pm1.1$ 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. Hα and CO observations of region.
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5: $S=6.4\pm0.4$ Jy) including polarisation and review of flux densities.
Matheson *et al.* 2013, ApJ, 774, 33. Chandra observations.
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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: $20^h22^m20^s$ **1-GHz flux/Jy:** 2? **Size/arcmin:** 9
Dec: +38°43′ **Spectral index:** ? **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 (∼3′ : $S = 2.3 \pm 0.2$ Jy) and 1420 MHz (∼1′ : $S = 1.35 \pm 0.07$ 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 : $S = 0.79 \pm 0.07$ 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 DR4, γ Cygni SNR

RA: $20^h20^m50^s$ **1-GHz flux/Jy:** 320 **Size/arcmin:** 60
Dec: +40°26′ **Spectral index:** 0.51 **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′×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′×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, IAUCo, 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±60 Jy) and 1.4 GHz (1′.0×1′.7 : S = 270±40 Jy).
Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz (3′.5×5′.2 : S = 540±40 Jy) and Effelsberg 100-m at 4.8 GHz (S = 150±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 (∼3′ : S = 500±35 Jy) and 1420 MHz (∼1′ : S = 226±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±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 W63

RA: $20^h19^m00^s$ **1-GHz flux/Jy:** 120? **Size/arcmin:** 95×65
Dec: +45°30′ **Spectral index:** 0.5? **Type:** S

Has been called G82.5+5.3.

Radio: Shell in the Cygnus X complex.
Optical: In complex region, but spectra indicate SNR filaments.
X-ray: Detected.
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±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 (∼3′ : $S = 144 \pm 12$ Jy) and 1420 MHz (∼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: $20^h46^m55^s$ **1-GHz flux/Jy:** 1 **Size/arcmin:** 9×7
Dec: +42°52′ **Spectral index:** 0.4 **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′ : $S = 1.2 \pm 0.3$ Jy) and 1420 MHz (∼1′ : $S = 0.8 \pm 0.1$ Jy, including polarisation and review of flux densities.

G84.2−0.8

RA: $20^h53^m20^s$ **1-GHz flux/Jy:** 11 **Size/arcmin:** 20×16
Dec: +43°27′ **Spectral index:** 0.5 **Type:** S

Radio: Elongated shell, with a filament aligned with the major axis.
X-ray: Detected.
Distance: HI absorption suggests 6 kpc.

References:

Matthews *et al.* 1977, A&A, 55, 1. WSRT at 610 MHz (56″×81″ : $S = 12.4 \pm 1.5$ Jy) and Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 6.8 \pm 1.3$ Jy).
Matthews & Shaver 1980, A&A, 87, 255. WSRT at 1415 MHz (23″×32″), and Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 5.6 \pm 0.5$ Jy).
Feldt & Green 1993, A&A, 274, 421. DRAO at 1.4 GHz (1′×1′.5), including HI, 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′ : $S = 14.5 \pm 0.5$ Jy) and 1420 MHz (∼1′ : $S = 7.2 \pm 0.8$ Jy), including review of flux densities.
Leahy & Green 2012, ApJ, 760, 25. CGPS, including HI, plus Chandra observations.
Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

G85.4+0.7

RA: $20^h50^m40^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 24?
Dec: +45°22′ **Spectral index:** 0.2 **Type:** S

Radio: Faint, incomplete shell, within larger thermal shell.
X-ray: Centrally brightened.
Distance: HI 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 HI and X-ray data.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 2.9 \pm 0.5$ Jy) and 1420 MHz (∼1′ : $S = 2.3 \pm 0.2$ Jy), including review of flux densities.
Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and HI 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: $20^h58^m40^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 24
Dec: +44°53′ **Spectral index:** 0.2 **Type:** S

Radio: Faint, incomplete shell.
Optical: Diffuse shell.
X-ray: Centrally brightened.
Distance: HI 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 HI, X-ray and optical data.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 3.0 \pm 1.3$ Jy) and 1420 MHz (∼1′ : $S = 2.2 \pm 0.8$ Jy), including review of flux densities.
Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and HI observations.
Gök *et al.* 2009, Ap&SS, 324, 17. Optical observations.
Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G89.0+4.7 HB21

RA: $20^h45^m00^s$ **1-GHz flux/Jy:** 220 **Size/arcmin:** 120×90
Dec: +50°35′ **Spectral index:** 0.38 **Type:** S

Radio: Distorted shell (4C50.52, an extragalactic double, is within the boundary of the remnant).
Optical: Filaments and patches.
X-ray: Centrally brightened.
Distance: Various associations 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 HI, plus CO observations of adjacent molecular cloud.
Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
Leahy & Aschenbach 1996, A&A, 315, 260. ROSAT observations.
Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
Koo *et al.* 2001, ApJ, 552, 175. NRAO 12-m and other CO observations (27″ and 45″) of eastern part.
Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14.′5: S = 228±5 Jy).
Uyanıker *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.
Leahy 2006, ApJ, 647, 1125. CGPS at 408 MHz (2.′8×3.′7) and 1.4 GHz (0.′8×1.′1).
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′: S = 259±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 HI.
Mavromatakis *et al.* 2007, A&A, 461, 991. Optical observations.
Shinn *et al.* 2009, ApJ, 693, 1883. IR observations.
Pannuti *et al.* 2010, AJ, 140, 1787. ASCA and observations.
Shinn *et al.* 2010, AdSpR, 45, 445. IR observations in S.
Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9.′5: S = 107±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 H_2.
Pivato *et al.* 2013, ApJ, 779, 179. Fermi observations.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30 and 44 GHz.
Acero *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.
Ambrogi *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 DA 530, 4C(T)55.38.1

RA: $20^h52^m25^s$ **1-GHz flux/Jy:** 9 **Size/arcmin:** 27×20
Dec: +55°21′ **Spectral index:** 0.45 **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 CTB 104A, DA 551

RA: $21^h29^m20^s$ **1-GHz flux/Jy:** 65 **Size/arcmin:** 80
Dec: +50°50′ **Spectral index:** 0.65 **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 : $S = 25.0 \pm 2.5$ 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 HI 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 HI.
Foster 2005, A&A, 441, 1043. CGPS at 408 MHz (2′.8×3′.6) and 1.4 GHz (0′.8×1′.0) for spectral index studies, plus other observations.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 20 \pm 2$ Jy) and 1420 MHz (∼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 HI indicates 4 kpc.

References:

Kothes *et al.* 2005, A&A, 444, 871. CGPS at 408 MHz (2′.8×3′.5) and 1.4 GHz (50″×61″) including HI.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 0.42 \pm 0.06$ Jy) and 1420 MHz (∼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: $22^h27^m30^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 60×24
Dec: +60°50′ **Spectral index:** 0.6 **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 (∼3′ : $S = 8.6 \pm 1.0$ Jy) and 1420 MHz (∼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 ASγ 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: $22^h01^m00^s$ **1-GHz flux/Jy:** 11? **Size/arcmin:** 180?
Dec: +66°30′ **Spectral index:** 0.9? **Type:** ?

Radio: Faint extended emission.
Optical: Filaments.

References:

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

G108.2−0.6

RA: $22^h53^m40^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 70×54
Dec: +58°50′ **Spectral index:** 0.5 **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 : $S = 11.5\pm1.2$ Jy) and 1.4 GHz (1′.0×1′.2 : $S = 6.6\pm0.7$ Jy) including HI.
Zhao *et al.* 2020, ApJ, 891, 137. Optical extinction for distance.

G109.1−1.0 CTB 109

RA: $23^h01^m35^s$ **1-GHz flux/Jy:** 20 **Size/arcmin:** 28
Dec: +58°53′ **Spectral index:** 0.45 **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′ : $S = 40\pm5$ 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 : $S = 13.0\pm1.5$ Jy).
Sofue *et al.* 1983, PASJ, 35, 447. NRO 45-m at 10.2 GHz (2′.7).
Hughes *et al.* 1984, ApJ, 283, 147. WSRT at 610 MHz (20″ : $S = 26\pm3$ Jy) 1.4 GHz (10″), DRAO at 1.4 GHz (1′×1′.2 : $S = 16.8\pm2$ Jy) and Algonquin 46-m at 6.5 GHz (4′.5 : $S = 6.7\pm1$ Jy).
Braun & Strom 1986, A&AS, 63, 345. WSRT HI 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″×68″), including HI, 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 HI 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. HI 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.
Tendulakar *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: $23^h23^m26^s$ **1-GHz flux/Jy:** 2300 **Size/arcmin:** 5
Dec: +58°48′ **Spectral index:** 0.77 **Type:** S

Presumably the remnant of a late 17th century SN.

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

Optical: Fast knots and quasi-stationary flocculli, 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 HI 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.
Gotthelf *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″.0×6″.4) for H_2CO 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 HI.
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.
Milisavljevic & 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 ^{44}Ti observations.
Grefenstette *et al.* 2015, ApJ, 802, 15. NuSTAR observations.
Lee *et al.* 2015, ApJ, 808, 98. WISE, Spitzer and other IR observations.
Milisavljevic & Fesen 2015, Science, 347, 526. Near-IR observations.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 7 frequencies between 30 and 353 GHz.
Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.
Fesen & Milisavljevic 2016, ApJ, 818, 17. HST [S III] and [S II] observations.
Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
Wang & Li 2016, ApJ, 825, 102. INTEGRAL observations.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Oonk *et al.* 2017, MNRAS, 465, 1066. LOFAR observations, including H and C lines, 33 to 78 MHz, including 69 MHz (9.″8×11.″2).
De Looze *et al.* 2017, MNRAS, 465, 3309. Spitzer and Herschel observations.
Trotter *et al.* 2017, MNRAS, 469, 1299. Time evolution of radio emission.
Grefenstette *et al.* 2017, ApJ, 834, 19. NuSTAR observations.
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 Hα 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: $23^h26^m50^s$ **1-GHz flux/Jy:** 4 **Size/arcmin:** 40×17?
Dec: +61°26′ **Spectral index:** 0.5? **Type:** ?

Radio: Elongated, extent not well defined.
Point sources: Contains old pulsar.
Distance: Association for HI indicates 3.1 kpc.

References:

Kothes *et al.* 2005, A&A, 444, 871. CGPS at 408 MHz (2′.8×3′.1) and 1.4 GHz (49″×55″) including HI.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′) and 1420 MHz (∼1′).
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 1.9 \pm 0.5$ Jy) including polarisation and review of flux densities.

G114.3+0.3

RA: $23^h37^m00^s$ **1-GHz flux/Jy:** 5.5 **Size/arcmin:** 90×55
Dec: +61°55′ **Spectral index:** 0.5 **Type:** S

Radio: Shell, with HII 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 HI and other features implies 0.7 kpc.

References:

Reich & Braunsfurth 1981, A&A, 99, 17. Effelsberg 100-m at 2.7 GHz (4′.4 : $S = 3.6$ Jy) and $S_{1.4\ \mathrm{GHz}} = 4.4$ Jy from 1.4 GHz survey data, plus HI from Maryland--Green Bank survey.
Kulkarni *et al.* 1993, Nature, 362, 135. Pulsar association.
Fürst *et al.* 1993, A&A, 276, 470. Pulsar association.
Becker *et al.* 1996, A&A, 306, 464. ROSAT of pulsar.
Fesen *et al.* 1997, AJ, 113, 767. Optical observations.
Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.
Mavromatakis *et al.* 2002, A&A, 383, 1011. Optical observations.
Yar-Uyanıker *et al.* 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49″×55″), including HI (1′.0×1′.1).
Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz (3′.4×3′.9 : $S = 12.0 \pm 6.0$ Jy) and 1.4 GHz (1′.0×1′.1 : $S = 9.8 \pm 0.8$ Jy).
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 1420 MHz (∼1′ : $S = 5.4 \pm 0.8$ Jy), including review of flux densities.
Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5 : $S = 6.9 \pm 0.7$ Jy), including polarisation and review of flux densities.

G116.5+1.1

RA: $23^h53^m40^s$ **1-GHz flux/Jy:** 10 **Size/arcmin:** 80×60
Dec: +63°15′ **Spectral index:** 0.5 **Type:** S

Radio: Distinct shell, with high polarisation.
Optical: Detected.
Distance: Association with HI features implies 1.6 kpc.

References:

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

G116.9+0.2 CTB 1

RA: $23^h59^m10^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 34
Dec: +62°26′ **Spectral index:** 0.57 **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 HI 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″×64″) and 1.4 GHz (22″×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 $S_{1.4\ \mathrm{GHz}} = 7.8 \pm 0.8$ Jy from 1.4 GHz survey data, plus HI 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 HI (2′×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.
Hailey & Craig 1994, ApJ, 434, 635. Optical spectroscopy.
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Fesen *et al.* 1997, AJ, 113, 767. Optical observations.
Craig *et al.* 1997, ApJ, 488, 307. ROSAT observations.
Reich 2002, in NSPS, p1. Effelsberg 100-m at 10.6 GHz (69″), including polarisation.
Yar-Uyanıker *et al.* 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49″×55″), including HI (1′.0×1′.1).
Lazendic & Slane 2006, ApJ, 647, 350. X-ray observations.
Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz (3′.4×3′.8 : $S = 15.0 \pm 1.5$ Jy) and 1.4 GHz (1′.0×1′.1 : $S = 8.1 \pm 0.4$ Jy).
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 10.5 \pm 0.8$ Jy) and 1420 MHz (∼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.
Schinzel *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 HI 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.
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Pineault *et al.* 1993, AJ, 105, 1060. DRAO at 1.4 GHz (1′ : $S = 34 \pm 4$ Jy), plus HI 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).
Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
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 Tycho, 3C10, SN1572

RA: $00^h25^m18^s$ **1-GHz flux/Jy:** 50 **Size/arcmin:** 8
Dec: +64°09′ **Spectral index:** 0.58 **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″×64″) and 5 GHz (7″×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″×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.
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Vancura *et al.* 1995, ApJ, 441, 680. X-ray spectra and ROSAT image.
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Schwarz *et al.* 1995, A&A, 299, 193. WSRT and Effelsberg 100-m at 1.4 GHz (50″), and VLA at 1.4 GHz (13″), for neutral hydrogen studies.
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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′.7×9′.5), for spectral index studies.
Hughes 2000, ApJ, 545, L53. ROSAT X-ray expansion.
Decourchelle *et al.* 2001, A&A, 365, L218. XMM-Newton observations.
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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 (∼3′ : $S = 86 \pm 5$ Jy) and 1420 MHz (∼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. Hα spectroscopy.
Lee *et al.* 2010, ApJ, 715, L146. Hα 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.
Troja *et al.* 2014, ApJ, 797, L6. Swift observations.
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Lu *et al.* 2015, ApJ, 805, 142. Chandra observations.
Katsuda *et al.* 2015, ApJ, 808, 49. Suzaku observations.
Tran *et al.* 2015, ApJ, 812, 101. Chandra observations.
Lopez *et al.* 2015, ApJ, 814, 132. NuSTAR observations.
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Williams *et al.* 2016, ApJ, 823, L32. Multi-epoch X-ray and radio observations for expansion.
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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.
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Kerzendorf *et al.* 2018, MNRAS, 479, 5696. HST search for progenitor companion.
Vinyaikin *et al.* 2018, ARep, 62, 130. Time evolution of radio emission.
Arias *et al.* 2019, AJ, 158, 253. LOFAR at 58 (41″) and 143 MHz (6″).
Weinberger *et al.* 2020, A&A, 638, A83. INTEGRAL observations.
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Okuno *et al.* 2020, ApJ, 894, 50. Multi-epoch Chandra study.
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: $01^h22^m00^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 70
Dec: +64°15′ **Spectral index:** 0.5 **Type:** S?

Radio: Poorly defined shell.
Optical: Filaments, mostly in W.

References:

Reich *et al.* 1979, A&A, 78, L13. Effelsberg 100-m at 1.4 GHz (9′ : $S = 6.8 \pm 0.7$ Jy) and 2.7 GHz (4′.4 : $S = 3.9 \pm 0.4$ Jy).
Blair *et al.* 1980, ApJ, 242, 592. Optical detection and spectra.
Rosado 1982, RMxAA, 5, 127. Optical spectra.
Fesen *et al.* 1983, ApJS, 51, 337. Deep [OIII] imagery.
Fürst *et al.* 1984, A&A, 133, 11. Effelsberg 100-m at 2.7 GHz (4′.4) and 4.8 GHz (2′.6).
Joncas *et al.* 1989, A&A, 219, 303. DRAO at 408 MHz (3′.5×3′.9 : $S = 12 \pm 2.5$ Jy) and part at 1.4 GHz (1′.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 : $S = 6.1 \pm 1.6$ Jy).
Boumis *et al.* 2005, A&A, 443, 175. Optical observations.
Tian & Leahy 2006, A&A, 447, 205. CGPS at 408 MHz (3′.4×3′.8 : $S = 9.7 \pm 3.9$ Jy) and 1.4 GHz (1′.0×1′.1 : $S = 6.7 \pm 2.1$ Jy), plus other observations for spectral index studies.
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 5.7 \pm 0.7$ Jy) and 1420 MHz (∼1′ : $S = 6.4 \pm 1.1$ Jy), including review of flux densities.
Sun *et al.* 2007, A&A, 463, 993. Urumqi 25-m at 5 GHz (9′.5 : $S = 2.6 \pm 0.6$ Jy), including polarisation.
see also: Sun *et al.* 2007, A&A, 469, 1003. Erratum.

G127.1+0.5 R5

RA: $01^h28^m20^s$ **1-GHz flux/Jy:** 12 **Size/arcmin:** 45
Dec: +63°10′ **Spectral index:** 0.45 **Type:** S

Has been called G127.3+0.7.

Radio: Distinct shell, with bright central source.

Optical: Detected.

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

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

References:

Caswell 1977, MNRAS, 181, 789. Half-Mile Telescope at 1.42 GHz (3′.5×3′.9), plus other observations of central source.
Pauls 1977, A&A, 59, L13. Effelsberg 100-m at 1.4 GHz (9′ : $S = 8 \pm 1$ Jy).
Salter *et al.* 1978, A&A, 66, 77. Effelsberg 100-m at 2.7 GHz (4′.4), plus 5 and 8.7 GHz of the central source.
Reich *et al.* 1979, A&A, 78, L13. Effelsberg 100-m at 1.4 GHz (9′ : $S = 10.8 \pm 1.3$ Jy).
Pauls *et al.* 1982, A&A, 112, 120. WSRT at 610 MHz (56″×62″) and HI absorption to the point source with the VLA.
Geldzahler & Shaffer 1982, ApJ, 260, L69. Observations of central source.
Fürst *et al.* 1984, A&A, 133, 11. Effelsberg 100-m at 2.7 GHz (4′.4) and 4.8 GHz (2′.6).
Goss & van Gorkom 1984, JApA, 5, 425. WSRT HI absorption of central source.
Joncas *et al.* 1989, A&A, 219, 303. DRAO at 408 MHz (3′.5×3′.9 : $S = 17.9 \pm 2.0$ Jy) and 1.4 GHz (1′.0×1′.13 : $S = 10.1 \pm 0.8$ Jy), plus review of flux densities.
Xilouris *et al.* 1993, A&A, 270, 393. Optical imaging.
Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′.5 : $S = 14.6 \pm 0.8$ Jy).
Kaplan *et al.* 2004, ApJS, 153, 269. Chandra limits for any compact sources.
Leahy & Tian 2006, A&A, 451, 251. CGPS at 408 MHz (3′.4×3′.8 : $S = 17.1 \pm /1.7$ Jy) and 1.4 GHz (1′.0×1′.2 : $S = 10.0 \pm /0.8$ Jy).
Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (∼3′ : $S = 15.9 \pm 1.0$ Jy) and 1420 MHz (∼1′ : $S = 9.7 \pm 0.6$ Jy), including polarisation and review of flux densities.
Sun *et al.* 2007, A&A, 463, 993. Urumqi 25-m at 5 GHz (9′.5 : $S = 6.3 \pm 0.7$ Jy), including polarisation.
see also: Sun *et al.* 2007, A&A, 469, 1003. Erratum.
Zhou *et al.* 2014, ApJ, 791, 109. CO observations.

G130.7+3.1 3C58, SN1181

RA: $02^h05^m41^s$ **1-GHz flux/Jy:** 33 **Size/arcmin:** 9×5
Dec: +64°49′ **Spectral index:** 0.07 **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.
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Wallace *et al.* 1994, A&A, 286, 565. HI of surroundings.
Helfand *et al.* 1995, ApJ, 453, 741. ROSAT observations.
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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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Murray *et al.* 2002, ApJ, 568, 226. Chandra pulsar detection.
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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 (∼3′: $S = 32.2 \pm 2.0$ Jy) and 1420 MHz (∼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.
Shearer & Neustroev 2008, MNRAS, 390, 235. Optical observations of pulsar nebula.
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Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.

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Aleksić *et al.* 2014, A&A, 567, L8. γ-ray detection.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 7 frequencies between 30 and 353 GHz.
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: $02^h17^m40^s$ **1-GHz flux/Jy:** 45 **Size/arcmin:** 80
Dec: +62°45′ **Spectral index:** 0.6 **Type:** S

Has been called G132.4+2.2.

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

References:

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.
Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′ : $S = 33.8 \pm 7.0$ Jy).
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Read 1981, MNRAS, 194, 863. Radio at 151 MHz (4′.4) and 1.4 GHz (2′) showing HI 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 HI, 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.
Lazendic & Slane 2006, ApJ, 647, 350. X-ray observations.
Green 2007, BASI, 35, 77. Review of radio spectrum.
Shi *et al.* 2008, A&A, 487, 601. Urumqi 25-m at 4.8 GHz (9′.5), plus other survey observations for spectral studies.
Casandjian & Grenier 2008, A&A, 489, 849. γ-ray 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 H_2 plus CO observations.

G150.3+4.5

RA: $04^h27^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 180×150
Dec: +55°28′ **Spectral index:** ? **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: $04^h07^m50^s$ **1-GHz flux/Jy:** 3.5? **Size/arcmin:** 100×95
Dec: +49°11′ **Spectral index:** 0.7? **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: $04^h58^m40^s$ **1-GHz flux/Jy:** 5 **Size/arcmin:** 110
Dec: +51°50′ **Spectral index:** 0.5 **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′ : $S = 4.2 \pm 1.0$ Jy) and 2.7 GHz (4′.3 : $S = 3.0 \pm 1.0$ Jy), plus HI and IRAS.
Yamauchi *et al.* 1993, PASJ, 45, 795. Hard X-ray observations.
Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
Yamauchi *et al.* 1999, PASJ, 51, 13. ASCA observations of some regions.
Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz, 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′ : $S = 8.1 \pm 1.3$ Jy), including review of flux densities.
Xu *et al.* 2007, A&A, 470, 969. Urumqi 25-m at 4.8 GHz (9′.5 : $S = 2.5 \pm 0.5$ Jy), including polarisation.
Gerardy & Fesen 2007, MNRAS, 376, 929. Optical 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 Hα 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: $05^h20^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 240×180?
Dec: +50°00′ **Spectral index:** ? **Type:** S

Radio: Not detected.
Optical: Large, faint shell.
X-ray: Possible emission.

References:

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

G160.9+2.6 HB9

RA: $05^h01^m00^s$ **1-GHz flux/Jy:** 110 **Size/arcmin:** 140×120
Dec: +46°40′ **Spectral index:** 0.64 **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 HI 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 HI 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 (∼3′ : S = 102±7 Jy) and 1420 MHz (∼1′ : S = 54.0±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±5.3 Jy) and 1.4 GHz (58″×80″ : S = 65.9±3.4 Jy).
Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5 : S = 34±3 Jy), including polarisation and review of flux densities.
Gosachinskii 2013, AstL, 39, 179. HI 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^{h}26^{m}30^s **1-GHz flux/Jy:** 7 **Size/arcmin:** 55×35
Dec: +42°56′ **Spectral index:** 0.37 **Type:** S

Radio: Two arcs of strikingly different radii.
Optical: Nearly complete ring.
X-ray: Predominantly in SW.
Distance: HI 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±1.0 Jy).
Lozinskaya 1979, AuJPh, 32, 113. Hα 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 HI 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 HI.
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 (∼3′ : S = 8.1±0.9 Jy) and 1420 MHz (∼1′ : S = 5.1±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±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: $05^h25^m05^s$ **1-GHz flux/Jy:** 2 **Size/arcmin:** 72×62
Dec: +28°11′ **Spectral index:** 0.5 **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 : $S = 1.0 \pm 0.1$ Jy), plus other observations.

G179.0+2.6

RA: $05^h53^m40^s$ **1-GHz flux/Jy:** 7 **Size/arcmin:** 70
Dec: +31°05′ **Spectral index:** 0.4 **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 : $S = 3.2 \pm 0.3$ 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 S147

RA: $05^h39^m00^s$ **1-GHz flux/Jy:** 65 **Size/arcmin:** 180
Dec: +27°50′ **Spectral index:** varies **Type:** S

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 : $S = 34.9 \pm 4$ Jy) and 1.6 GHz (10′ : $S = 60.2 \pm 6$ Jy).
Angerhofer & Kundu 1981, AJ, 86, 1003. Arecibo at 430 MHz (9′ : $S = 97 \pm 20$ 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 : $S = 77 \pm 10$ 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. Hα 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 : $S = 15.4 \pm 3.0$ Jy) and Effelsberg 100-m at 2.6 GHz (4′.4 : $S = 34.6 \pm 4.0$ 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. Hα image.

G181.1+9.5

RA: $06^h26^m40^s$ **1-GHz flux/Jy:** 0.4? **Size/arcmin:** 74
Dec: +32°30′ **Spectral index:** 0.4? **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: $06^h08^m10^s$ **1-GHz flux/Jy:** 0.5 **Size/arcmin:** 50
Dec: +29°00′ **Spectral index:** 0.4 **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 : $S = 0.36 \pm 0.08$ Jy, 4′.4 : $S = 0.25 \pm 0.04$ Jy, 2′.5 : $S = 0.20 \pm 0.02$ Jy and 1′.2 : $S = 0.15 \pm 0.03$ Jy), plus X-ray upper limit.
Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz and 4.9 GHz (3′).
Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′.5 : $S = 0.26 \pm 0.5$ Jy) including polarisation and review of flux densities.

Sezer *et al.* 2012, MNRAS, 427, 1168. Optical and XMM-Newton observations.
Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.
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: $05^h34^m31^s$ **1-GHz flux/Jy:** 900 **Size/arcmin:** 7×5
Dec: +22°01′ **Spectral index:** 0.30 **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 Hα 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. [O III] 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 Hα halo.
Carlebois *et al.* 2010, AJ, 139, 2083. Optical imaging spectroscopy.
Aumount *et al.* 2010, A&A, 514, A70. IRAM 30-m at 150 GHz (16″.7 : $S = 244 \pm 24$ 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. [O III] 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 IC443, 3C157

RA: $06^h17^m00^s$ **1-GHz flux/Jy:** 165 **Size/arcmin:** 45
Dec: +22°34′ **Spectral index:** 0.36 **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.
Wood *et al.* 1991, AJ, 102, 224. VLA at 5 GHz (3.″6×3.″8) of NE, including polarisation.
Asaoka & Aschenbach 1994, A&A, 284, 573. X-ray, including possible overlapping remnant.
Claussen *et al.* 1999, ApJ, 522, 349. High resolution observations of OH masers.
Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14.′5 : S = 160±5 Jy).
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see also: Leahy 2004, AJ, 128, 1478. Addendum.
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Gaensler *et al.* 2006, ApJ, 648, 1037. Chandra of X-ray source and nebula.
Hewitt *et al.* 2006, ApJ, 652, 1288. GBT at 1.6 and 1.7 GHz (7.′2) for OH, and VLA at 330 MHz (64″×74″).
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Albert *et al.* 2007, ApJ, 664, L87. γ-ray observations.
Troja *et al.* 2008, A&A, 485, 777. XMM-Newton observations.
Casandjian & Grenier 2008, A&A, 489, 849. γ-ray observations.
Bykov *et al.* 2008, ApJ, 676, 1050. XMM-Newton, Chandra and Spitzer observations.
Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
Lee *et al.* 2008, AJ, 135, 796. VLA at 1.4 GHz (39″×42″) including HI.
Bocchino *et al.* 2008, AdSpR, 41, 396. INTEGRAL observations.
Bocchino *et al.* 2009, A&A, 498, 139. XMM-Newton observations.
Acciari *et al.* 2009, ApJ, 698, L133. γ-ray observations.
Yamaguchi *et al.* 2009, ApJ, 705, L6. Suzaku observations.
Koo *et al.* 2010, AJ, 140, 262. HI Zeeman splitting observations.
Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9.′5 : S = 85±9 Jy), including polarisation and review of flux densities.
Castelletti *et al.* 2011, A&A, 534, A21. VLA at 74 MHz (35″ : S = 470±51 Jy) and 330 MHz (17″ : S = 248±15 Jy), plus review of flux densities.
Yuan & Neufeld 2011, ApJ, 726, 76. Spitzer observations.
Xu *et al.* 2011, ApJ, 727, 81. CO observations of region.
Shinn *et al.* 2011, ApJ, 732, 124. Akari observations of H_2.
Lee *et al.* 2012, ApJ, 749, 34. CO and HCO^+ of region.
Taylor *et al.* 2012, ApJ, 750, L15. Optical absorption of background stars.
Yuan *et al.* 2012, ApJ, 753, 126. Spitzer spectroscopy.
Ackermann *et al.* 2013, Science, 339, 807. Fermi observations.
Hezareth *et al.* 2013, A&A, 558, A45. CO observations, including polarisation, of region.
Kokusho *et al.* 2013, ApJ, 768, L8. IR observations of [FeII], plus Akari and Spitzer observations.
Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
Ohnishi *et al.* 2014, ApJ, 784, 74. Suzaku observations.
Yamaguchi *et al.* 2014, ApJ, 785, L27. Suzaku observations.
Su *et al.* 2014, ApJ, 788, 122. CO observations.
Gusdorf *et al.* 2014, IAUS, 296, 178. CO observations.
Mitra *et al.* 2014, IAUS, 296, 376. Combined GMRT and CLFST observations at 150 MHz (19″×24″).

Swartz *et al.* 2015, ApJ, 808, 84. Chandra observations of compact source and nebula.
Kokusho *et al.* 2015, P&SS, 116, 92. IR [FeII] observations.

Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 9 frequencies between 30 and 857 GHz.
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).
McEwen *et al.* 2016, ApJ, 826, 189. NH_3 and CH_3OH observations.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Egron *et al.* 2017, MNRAS, 470, 1329. SRT at 1.5 GHz ($11' : S = 134 \pm 4$ Jy) and 7 GHz ($2'.7 : S = 67 \pm 3$ Jy).
Ambrocio-Cruz *et al.* 2017, MNRAS, 472, 51. Optical observations of NW, for distance.
Madsen *et al.* 2017, ApJ, 841, 56. NuSTAR observations.
Greco *et al.* 2018, A&A, 615, A157. XMM-Newton observations.
Zhang *et al.* 2018, ApJ, 859, 141. NuSTAR, XMM-Newton and Chandra observations.
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 H_2 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: $06^h01^m55^s$ **1-GHz flux/Jy:** 1.3? **Size/arcmin:** 70×60
Dec: +18°24′ **Spectral index:** 0.7? **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 Monoceros Nebula

RA: $06^h39^m00^s$ **1-GHz flux/Jy:** 140 **Size/arcmin:** 220
Dec: +06°30′ **Spectral index:** 0.4 **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.
Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo at 111 MHz ($1' : S = 462 \pm 180$ Jy) and $S_{610\ \mathrm{MHz}} = 245$ Jy.
Davies *et al.* 1978, A&AS, 31, 271. Deep optical plates.
Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
Graham *et al.* 1982, A&A, 109, 145. Effelsberg 100-m at 2.7 GHz ($4'.4 : S = 97.6 \pm 12.5$ Jy), plus review of flux densities.

Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
Leahy *et al.* 1986, MNRAS, 220, 501. Einstein observations.
Odegard 1986, ApJ, 301, 813. TPT at 20.6, 25.6 and 30.9 MHz (24′, 19′ and 16′).
Esposito *et al.* 1996, ApJ, 461, 820. Possible associated γ-ray emission.
Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
Oliver *et al.* 1996, A&A, 315, 578. CO observations of some of surroundings.
Jaffe *et al.* 1997, ApJ, 484, L129. γ-ray detection.
Aharonian *et al.* 2004, A&A, 417, 973. H.E.S.S. limit.
Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.
Casandjian & Grenier 2008, A&A, 489, 849. γ-ray observations.
Xiao & Zhu 2012, A&A, 545, A86. Review of radio, HI and Hα observations.
Dirks & Meyer 2016, ApJ, 819, 45. Time variation of optical line absorption.
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 PKS 0646+06

RA: $06^h48^m40^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 60×40
Dec: +06°26′ **Spectral index:** 0.5 **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′.4 : $S = 4.1 \pm 0.6$ Jy), plus review of flux densities.
Rosado 1982, RMxAA, 5, 127. Optical observations.
Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.
Leahy 1986, A&A, 156, 191. Einstein observations.
Odegard 1986, ApJ, 301, 813. TPT at 20.6, 25.6 and 30.9 MHz (24′, 19′ and 16′).
Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′.5 : $S = 2.9 \pm 0.3$ Jy), including polarisation and review of flux densities.
Ambrocio-Cruz *et al.* 2014, RMxAA, 50, 323. [SII] 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: 06h50m50s **1-GHz flux/Jy:** 21 **Size/arcmin:** 160×140?
Dec: −00°30′ **Spectral index:** 0.4 **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. Hα, 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 Hoinga

RA: 09h34m00s **1-GHz flux/Jy:** 27 **Size/arcmin:** 260
Dec: −17°00′ **Spectral index:** 0.7 **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 Puppis A, MSH 08−44

RA: 08h22m10s **1-GHz flux/Jy:** 130 **Size/arcmin:** 60×50
Dec: −43°00′ **Spectral index:** 0.5 **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 HI 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. Hα+[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. HI 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 : $S = 59 \pm 5$ Jy) and 8.4 GHz (3′ : $S = 38 \pm 4$ Jy), plus polarisation.
Berthiaume *et al.* 1994, ApJ, 425, 132. X-ray spectroscopy.
Sutherland & Dopita 1995, ApJ, 439, 365. Spectrophotometry.
Reynoso *et al.* 1995, AJ, 110, 318. VLA at 1.4 GHz (90″) including neutral hydrogen.
Blair *et al.* 1995, ApJ, 454, L35. Far UV spectroscopy.
Petre *et al.* 1996, ApJ, 465, L43. ROSAT of central source.
Bock *et al.* 1998, AJ, 116, 1886. MOST at 843 MHz (43″×60″).
Pavlov *et al.* 1999, ApJ, 511, L45. Possible pulsation detection from central X-ray source.
Zavlin *et al.* 1999, ApJ, 525, 959. X-ray observations of central source.
Bocchino *et al.* 2000, A&A, 359, 316. Optical studies of selected filaments in N.
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 HI 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.
Hui & Becker 2006, A&A, 457, L33. Chandra proper motion study of central source.
Castelletti *et al.* 2006, A&A, 459, 535. VLA at 1.4 GHz (16″×34″ : $S = 114 \pm 8$ Jy) and 327 MHz (45″×90″ : $S = 263 \pm 20$ 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.
Hwang *et al.* 2008, ApJ, 676, 378. Suzaku observations.
Katsuda *et al.* 2008, ApJ, 678, 297. XMM-Newton observations.
Mignani *et al.* 2009, A&A, 500, 1211. Optical limits for compact X-ray source.
Katsuda *et al.* 2010, ApJ, 714, 1725. Chandra and XMM-Newton observations.
Arendt *et al.* 2010, ApJ, 725, 585. Spitzer observations.
Becker *et al.* 2012, ApJ, 755, 141. Chandra proper motion study of central X-ray source.
Katsuda *et al.* 2012, ApJ, 756, 49. XMM-Newton spectroscopy.
Hewitt *et al.* 2012, ApJ, 759, 89. Fermi and WMAP 23 to 90 GHz observations.
Dubner *et al.* 2013, A&A, 555, A9. XMM-Newton and Chandra observations.
Katsuda *et al.* 2013, ApJ, 768, 182. XMM-Newton observations.
H.E.S.S. Collaboration: Abramowski *et al.* 2015, A&A, 575, A81. H.E.S.S. limit.
Reynoso & Walsh 2015, MNRAS, 451, 3044. ATCA at 1.4 GHz (51″×82″) and 1.7 GHz for spectral index study.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.
Luna *et al.* 2016, A&A, 590, A70. XMM-Newton and Chandra observations.
Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Reynoso *et al.* 2017, MNRAS, 464, 3029. ATCA at 1.4 GHz including HI.
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: $09^h04^m20^s$ **1-GHz flux/Jy:** 10? **Size/arcmin:** 40×30
Dec: −38°42′ **Spectral index:** 0.4? **Type:** S

Radio: Faint shell with little limb brightening.

References:

Hill 1967, AuJPh, 20, 297. Parkes 64-m at 2650 MHz (7′.5 : $S = 7$ Jy) also $S_{1410\ \mathrm{MHz}} = 8$ Jy, $S_{81.5\ \mathrm{MHz}} = 25$ 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″×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, AuJPh, 21, 201. Parkes 64-m at various frequencies, including 408 MHz (48′ : S = 2300±300 Jy), 635 MHz (31′ : S = 2360±300 Jy), 1410 MHz (14′ : S = 1640±300 Jy) and 2650 MHz (7′.5 : S = 1400±250 Jy), plus discussion of the distance.
Milne 1980, A&A, 81, 293. Maps of Vela X with Parkes 64-m at 1.66, 2.7 and 5 GHz (12′, 8′.4 and 4′.4).
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.
Frail *et al.* 1997, ApJ, 475, 224. VLA at 330 MHz (1′×1′.8) and comparison with ROSAT observations of Vela X.
Markwardt & Ögelman 1997, ApJ, 480, L13. ASCA observations of pulsar 'jet'.
Raymond *et al.* 1997, ApJ, 482, 881. UV spectroscopy.
Yoshikoshi *et al.* 1997, ApJ, 487, L65. γ-ray observations of pulsar.
Jenkins *et al.* 1998, ApJ, 492, L147. UV absorption to background star.
Dubner *et al.* 1998, AJ, 116, 813. Parkes 64-m at 1.4 GHz (15′) for 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.
Miyata *et al.* 2001, ApJ, 559, L45. Chandra of X-ray extension.
Alvarez *et al.* 2001, A&A, 372, 636. Radio spectral index studies.
see also: Alvarez *et al.* 2001, A&A, 379, 323. Erratum.
Caraveo *et al.* 2001, ApJ, 561, 930. HST parallax observations of pulsar.
Moriguchi *et al.* 2001, PASJ, 53, 1025. CO observations.
Dodson *et al.* 2003, MNRAS, 343, 116. ATCA at 1.4, 2.4, 5.2 and 8.5 GHz (6″.2×8″.1, 26″×36″, 10″.5×12″.1 and 10″.6×11″.2) of pulsar nebula.
Sankrit *et al.* 2003, ApJ, 589, 242. Optical nebulosity to NE of G266.2−1.2.
Nichols & Slavin 2004, ApJ, 610, 285. UV absorption toward background sources.
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.
Miceli *et al.* 2008, ApJ, 676, 1064. XMM-Newton observations.
LaMassa *et al.* 2008, ApJ, 689, L121. XMM-Newton observations of Vela X.
Grondin *et al.* 2013, ApJ, 774, 110. Fermi observations of Vela X.
Planck Collaboration: Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.
Rao *et al.* 2016, MNRAS, 455, 2529. Time variation of optical line absorption.
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 RX J0852.0−4622

RA: $08^h52^m00^s$ **1-GHz flux/Jy:** 50? **Size/arcmin:** 120
Dec: −46°20′ **Spectral index:** 0.3? **Type:** S

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

Radio: Incomplete shell, confused by the Vela SNR.

Optical: Nebulosity offset to NE.

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

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

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

References:

Aschenbach 1998, Nature, 396, 141. ROSAT identification.
Iyudin *et al.* 1998, Nature, 396, 142. γ-ray observations.
Combi *et al.* 1999, ApJ, 519, L177. Radio observations.
Duncan & Green 2000, A&A, 364, 732. Parkes 64-m at 1.4 GHz (14′.0), and comparison with other observations.
Redman *et al.* 2000, ApJ, 543, L153. Optical of nearly nebulosity.
Tsunemi *et al.* 2000, PASJ, 52, 887. ASCA spectral observations.
Slane *et al.* 2001, ApJ, 548, 814. ASCA observations.
Mereghetti *et al.* 2001, ApJ, 548, L213. BeppoSAX observations of central sources.
Pavlov *et al.* 2001, ApJ, 559, L131. Chandra of central X-ray source.
Moriguchi *et al.* 2001, PASJ, 53, 1025. CO observations.
Pellizzoni *et al.* 2002, A&A, 393, L65. Optical observations of central source.
Redman *et al.* 2002, MNRAS, 336, 1093. Optical nebulosity to NE.
Kargaltsev *et al.* 2002, ApJ, 580, 1060. Chandra observations of central source.
Sankrit *et al.* 2003, ApJ, 589, 242. Optical nebulosity to NE.
Redman & Meaburn 2005, MNRAS, 356, 969. Possible pulsar association.
Iyudin *et al.* 2005, A&A, 429, 225. XMM-Newton observations.
Aharonian *et al.* 2005, A&A, 437, L7. H.E.S.S. observations.
Katagiri *et al.* 2005, ApJ, 619, L163. γ-ray observations.
Bamba *et al.* 2005, ApJ, 632, 294. Chandra of NW rim.
Reynoso *et al.* 2006, A&A, 449, 243. ATCA at 1.38 GHz (32″×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: $09^h06^m50^s$ **1-GHz flux/Jy:** 0.4 **Size/arcmin:** 15?
Dec: −52°07′ **Spectral index:** 0.6 **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: $09^h57^m40^s$ **1-GHz flux/Jy:** 30? **Size/arcmin:** 95
Dec: −53°15′ **Spectral index:** 0.6? **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. Hα observations.
Shan *et al.* 2019, RAA, 19, 92. Optical extinction for distance.
Araya 2020, MNRAS, 492, 5980. Fermi observations.

G284.3−1.8 MSH 10−53

RA: $10^h18^m15^s$ **1-GHz flux/Jy:** 11? **Size/arcmin:** 24?
Dec: −59°00′ **Spectral index:** 0.3? **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±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: $10^h35^m40^s$ **1-GHz flux/Jy:** 1.4? **Size/arcmin:** 26×6
Dec: −59°42′ **Spectral index:** ? **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. Hα observations.

G289.7−0.3

RA: $11^h01^m15^s$ **1-GHz flux/Jy:** 6.2 **Size/arcmin:** 18×14
Dec: −60°18′ **Spectral index:** 0.2? **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±0.5 Jy), plus Parkes 64-m at 4.5 GHz (S = 7.5±2.5 Jy) and 8.55 GHz (S = 3.6±0.9 Jy).

G290.1−0.8 MSH 11−61A

RA: $11^h03^m05^s$ **1-GHz flux/Jy:** 42 **Size/arcmin:** 19×14
Dec: −60°56′ **Spectral index:** 0.4 **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±11 Jy), and Parkes 64-m at 8.4 GHz (3′ : S = 19.5±1.0 Jy), including polarisation.
Seward 1990, ApJS, 73, 781. Einstein observations.
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ : S = 43 Jy).
Rosado *et al.* 1996, A&A, 315, 243. Optical kinematics.
Kaspi *et al.* 1997, ApJ, 485, 820. Pulsar detection.
Gotthelf & Kaspi 1998, ApJ, 497, L29. ASCA observations of pulsar.
Slane *et al.* 2002, ApJ, 564, 284. ASCA observations.
Filipović *et al.* 2005, SerAJ, 170, 47. ATCA at 1.4 GHz (21″), plus other observations, including CO of surroundings.
Reynoso *et al.* 2006, MNRAS, 369, 416. ATCA at 1.4 GHz (22.″5×25.″0) including 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 (MSH 11−62)

RA: $11^h11^m54^s$ **1-GHz flux/Jy:** 16 **Size/arcmin:** 15×13
Dec: −60°38′ **Spectral index:** 0.29 **Type:** C

Radio: Centrally brightened core, with surrounding arcs.
Optical: Detected.
X-ray: Centrally brightened.
Point sources: Central compact X-ray source.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
Roger *et al.* 1986, MNRAS, 219, 815. MOST at 843 MHz (43″×50″ : S = 17.2±1.0 Jy), and Parkes 64-m at 5 and 8.4 GHz (4.′6 and 3′ : S = 10.4±0.4 Jy and 9.′1±0.2), with polarisation.
Wilson 1986, ApJ, 302, 718. Einstein observations.
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ : S = 12.7 Jy).
Harrus *et al.* 1998, ApJ, 499, 273. ASCA observations.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα 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 MSH 11−54

RA: $11^h24^m36^s$ **1-GHz flux/Jy:** 15 **Size/arcmin:** 12×8
Dec: −59°16′ **Spectral index:** 0.4 **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: HI 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: $S=11.9\pm0.1, 11.4\pm0.1$ and 8.8 ± 0.1), plus HI observations.
Park *et al.* 2004, ApJ, 602, L33. Chandra observations.
Vink *et al.* 2004, NuPhS, 132, 62. XMM-Newton observations.
Ghavamian *et al.* 2005, ApJ, 635, 365. Optical imaging spectroscopy.
Winkler & Long 2006, AJ, 132, 360. Optical observations.
Park *et al.* 2007, ApJ, 670, L121. Chandra observations.
Zharikov *et al.* 2008, A&A, 492, 805. Possible optical counterpart to pulsar and nebula.
Winkler *et al.* 2009, ApJ, 692, 1489. Optical proper motion studies.
Ghavamian *et al.* 2009, ApJ, 696, 1307. Spitzer spectroscopy.
Lee *et al.* 2009, ApJ, 706, 441. IR observations.
Lee *et al.* 2010, ApJ, 711, 861. Chandra observations.
Ghavamian *et al.* 2012, ApJ, 750, 39. Spitzer observations.
Zharikov *et al.* 2013, A&A, 554, A120. IR of pulsar wind nebula.
Yamaguchi *et al.* 2014, ApJ, 785, L27. Suzaku observations.
Kamitsukasa *et al.* 2014, PASJ, 66, 64. Suzaku observations.
Bhalerao *et al.* 2015, ApJ, 800, 65. Chandra observations.
Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
Ghavamian & Williams 2016, ApJ, 831, 188. Spitzer observations.
Acero *et al.* 2016, ApJS, 224, 8. 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: $11^h19^m20^s$ **1-GHz flux/Jy:** 7 **Size/arcmin:** 20×15
Dec: −61°28′ **Spectral index:** 0.5 **Type:** S

Radio: Shell.
X-ray: Shell, brighter to W, with central nebula.
Point sources: Central, young pulsar.
Distance: HI 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″).
Pivovaroff *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 HI 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: $11^h35^m00^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 20
Dec: −60°54′ **Spectral index:** 0.6? **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: $11^h36^m10^s$ **1-GHz flux/Jy:** >2? **Size/arcmin:** 40
Dec: −61°38′ **Spectral index:** ? **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: $11^h51^m10^s$ **1-GHz flux/Jy:** 8? **Size/arcmin:** 37×25
Dec: −62°34′ **Spectral index:** 0.6? **Type:** S

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

Radio: Irregular shell, with nearby HII regions.
Optical: Detected.
X-ray: Irregular, incomplete shell.
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 PKS 1209−51/52

RA: $12^h09^m40^s$ **1-GHz flux/Jy:** 48 **Size/arcmin:** 90×65
Dec: −52°25′ **Spectral index:** 0.5 **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 : $S = 33 \pm 3$ Jy), 4.8 GHz (4′.5 : $S = 23.3 \pm 3$ Jy) and 8.4 GHz (3′.0 : 18.8 ± 3), including polarisation and review of flux densities.
Mereghetti *et al.* 1996, ApJ, 464, 842. Radio, optical and X-ray observations of central source.
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.
Vasisht *et al.* 1997, ApJ, 476, L43. ASCA observations of neutron star.
Zavlin *et al.* 1998, A&A, 331, 821. ROSAT and ASCA observations of neutron star.
Giacani *et al.* 2000, AJ, 119, 281. ATCA at 1.4 GHz (2′.7×4′.0) for HI studies.
Zavlin *et al.* 2000, ApJ, 540, L25. Chandra observations of central pulsar.
Gotthelf & Halpern 2007, ApJ, 664, L35. X-ray timing observations of pulsar.
Harvey-Smith *et al.* 2010, ApJ, 712, 1157. ATCA at 1.4 GHz (1′.8×3′.3), including polarisation.
Araya 2013, MNRAS, 434, 2202. Fermi observations.
Halpern & Gotthelf 2015, ApJ, 812, 61. Two epoch Chandra observations for pulsar proper motion.
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: $11^h55^m30^s$ **1-GHz flux/Jy:** 3 **Size/arcmin:** 15×8
Dec: −63°08′ **Spectral index:** 0.5 **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″ : $S = 2.5 \pm 0.2$ Jy), plus MOST at 843 MHz (43″×49″), plus other observations.
Prinz & Becker 2013, A&A, 550, A33. XMM-Newton observations.
Green *et al.* 2014, PASA, 31, 42. Radio observations at 843 MHz (45″×50″).

G296.8−0.3 1156−62

RA: $11^h58^m30^s$ **1-GHz flux/Jy:** 9 **Size/arcmin:** 20×14
Dec: −62°35′ **Spectral index:** 0.6 **Type:** S

Radio: Shell, brighter to the NW.
X-ray: Detected.
Distance: HI 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 HI 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: $12^h12^m40^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 5?
Dec: −62°52′ **Spectral index:** 0.4? **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: $12^h13^m41^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 12×9
Dec: −62°37′ **Spectral index:** 0.3 **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: $12^h15^m13^s$ **1-GHz flux/Jy:** 0.5? **Size/arcmin:** 18×11
Dec: −65°30′ **Spectral index:** ? **Type:** S

Radio: Faint source.
Optical: Filaments in W.
X-ray: Centrally brightened with shell at higher energies.
Distance: HI 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. HI column density for distance.

G299.6−0.5

RA: $12^h21^m45^s$ **1-GHz flux/Jy:** 1.0? **Size/arcmin:** 13
Dec: −63°09′ **Spectral index:** ? **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: $12^h37^m55^s$ **1-GHz flux/Jy:** 2.1? **Size/arcmin:** 37×23
Dec: −63°49′ **Spectral index:** ? **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: $12^h45^m55^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 17
Dec: −62°08′ **Spectral index:** 0.4? **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 Kes 17

RA: $13^h05^m59^s$ **1-GHz flux/Jy:** 14 **Size/arcmin:** 8
Dec: −62°42′ **Spectral index:** 0.5 **Type:** S

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 ($8'' \times 23'' : S = 10.9 \pm 0.4$ Jy), plus other observations.
Pannuti *et al.* 2014, AJ, 147, 55. ASCA and XMM-Newton observations.
Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
Acero *et al.* 2016, ApJS, 224, 8. 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: $13^h21^m50^s$ **1-GHz flux/Jy:** 0.16? **Size/arcmin:** 4
Dec: −63°34′ **Spectral index:** 0.5? **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 ($23'' \times 26''$), 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: $13^h37^m37^s$ **1-GHz flux/Jy:** 1.2? **Size/arcmin:** 13
Dec: −63°04′ **Spectral index:** ? **Type:** S

Radio: Faint shell.

References:

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

G308.4−1.4

RA: $13^h41^m30^s$ **1-GHz flux/Jy:** 0.4? **Size/arcmin:** 12×6?
Dec: −63°44′ **Spectral index:** ? **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: HI column density suggests about 3.1 kpc.

References:

Schaudel *et al.* 2002, ASPC, 271, 391. ROSAT observations.

Prinz & Becker 2012, A&A, 544, A7. ATCA at 1.4 GHz (53″×64″: S = 0.33 Jy) and 2.5 GHz (29″×35″: S = 0.24 Jy), plus Chandra and other observations.
Hui *et al.* 2012, ApJ, 750, 7. XMM-Newton and other 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. HI column density for distance.
Eppens & Reynoso 2021, BAAA, 62, 131. ATCA at 2.3 GHz (9.″6×9.″8).

G308.8−0.1

RA: $13^h42^m30^s$ **1-GHz flux/Jy:** 15? **Size/arcmin:** 30×20?
Dec: −62°23′ **Spectral index:** 0.4? **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: $13^h46^m31^s$ **1-GHz flux/Jy:** 7? **Size/arcmin:** 15×12
Dec: −62°54′ **Spectral index:** 0.4? **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±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: $13^h50^m30^s$ **1-GHz flux/Jy:** 17 **Size/arcmin:** 25×19
Dec: −62°05′ **Spectral index:** 0.5 **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: $14^h00^m45^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 2.5
Dec: −63°26′ **Spectral index:** ? **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: $13^h58^m00^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 8
Dec: −62°09′ **Spectral index:** ? **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: $14^h00^m00^s$ **1-GHz flux/Jy:** 6? **Size/arcmin:** 12
Dec: −62°17′ **Spectral index:** ? **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

RA: $14^h05^m38^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 5
Dec: −61°58′ **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

RA: $14^h13^m00^s$ **1-GHz flux/Jy:** 45 **Size/arcmin:** 38
Dec: −61°44′ **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: $14^h21^m00^s$ **1-GHz flux/Jy:** 3.5? **Size/arcmin:** 20×18
Dec: −64°12′ **Spectral index:** ? **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: $14^h24^m30^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 190×150
Dec: −57°50′ **Spectral index:** ? **Type:** S

Radio: Poorly defined shell.
Optical: Filaments, brighter in NE.

References:

Duncan *et al.* 1997, MNRAS, 287, 722. Parkes 64-m at 2.4 GHz (11′ : $S = 19 \pm 3$ Jy).
Combi *et al.* 1998, A&A, 333, 298. Radio survey observations.
Stupar *et al.* 2007, MNRAS, 374, 1441. Optical and various radio observations.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα observations.

G315.4−2.3 RCW 86, MSH 14−63

RA: $14^h43^m00^s$ **1-GHz flux/Jy:** 49 **Size/arcmin:** 42
Dec: −62°30′ **Spectral index:** 0.6 **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: $14^h35^m55^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 24×13
Dec: −60°36′ **Spectral index:** 0.4 **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. Hα observations.

G315.9−0.0

RA: $14^h38^m25^s$ **1-GHz flux/Jy:** 0.8? **Size/arcmin:** 25×14
Dec: −60°11′ **Spectral index:** ? **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 (MSH 14−57)

RA: $14^h41^m30^s$ **1-GHz flux/Jy:** 20? **Size/arcmin:** 29×14
Dec: −60°00′ **Spectral index:** 0.4 **Type:** S

Has been called G316.3+0.0.

Radio: Distorted shell, with possible ‘blowout’.
X-ray: Detected.
Distance: HI 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 HI 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: $14^h49^m40^s$ **1-GHz flux/Jy:** 4.7? **Size/arcmin:** 11
Dec: −59°46′ **Spectral index:** ? **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. Hα observations.
Xiang *et al.* 2021, ApJ, 911, 49. Fermi observations.

G318.2+0.1

RA: $14^h54^m50^s$ **1-GHz flux/Jy:** >3.9? **Size/arcmin:** 40×35
Dec: −59°04′ **Spectral index:** ? **Type:** S

Radio: Faint shell, with central HII 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: $14^h58^m30^s$ **1-GHz flux/Jy:** 4? **Size/arcmin:** 30×14
Dec: −58°29′ **Spectral index:** 0.2? **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±0.6 Jy), Parkes 64-m at 4.5 GHz (4′.7 : S = 3.7±0.2 Jy) and 8.4 GHz (2′.8 : S = 3.0±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 MSH 15−52, RCW 89

RA: $15^h14^m30^s$ **1-GHz flux/Jy:** 60? **Size/arcmin:** 35
Dec: −59°08′ **Spectral index:** 0.4 **Type:** C

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

Radio: Ragged shell.
Optical: RCW 89 is the Hα emitting region to the NW.
X-ray: Partial shell, central nebula and pulsar and 'jet'.
Point sources: Radio and X-ray pulsar, with wind nebula.
Distance: HI absorption indicates 5.2 kpc, optical extinction suggests 3.0 kpc.

References:

Caswell *et al.* 1975, A&A, 45, 239. Parkes HI absorption.
Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′.4) and 5 GHz (4′.4).
Dopita *et al.* 1977, ApJ, 214, 179. Optical spectra.
Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz (50″).
Seward & Harnden 1982, ApJ, 256, L45. X-ray observations of pulsar.
Manchester *et al.* 1982, ApJ, 262, L31. Radio observations of pulsar.
Seward *et al.* 1983, ApJ, 267, 698. X-ray, Optical and IR.
van den Bergh & Kamper 1984, ApJ, 280, L51. Optical expansion.
Seward *et al.* 1984, ApJ, 281, 650. X-ray observations of pulsar and nebulosity.
Lortet *et al.* 1987, A&A, 180, 65. Optical observations.
Trussoni *et al.* 1990, A&A, 234, 403. EXOSAT observations.
Asaoka & Koyama 1990, PASJ, 42, 625. Ginga X-ray spectrum.
Arendt 1991, AJ, 101, 2160. IRAS observations, including compact source.
Milne *et al.* 1993, MNRAS, 264, 853. Parkes 64-m at 4.8 GHz (4′.5 : $S = 37 \pm 7$ 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 HI 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 HI 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: $15^h17^m50^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 60×30
Dec: −59°16′ **Spectral index:** ? **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. Hα observations.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G321.9−1.1

RA: $15^h23^m45^s$ **1-GHz flux/Jy:** >3.4? **Size/arcmin:** 28
Dec: −58°13′ **Spectral index:** ? **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: $15^h20^m40^s$ **1-GHz flux/Jy:** 13 **Size/arcmin:** 31×23
Dec: −57°34′ **Spectral index:** 0.3 **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: $15^h20^m49^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 8×4.5?
Dec: −57°10′ **Spectral index:** ? **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: $15^h23^m23^s$ **1-GHz flux/Jy:** 1.5 **Size/arcmin:** 15
Dec: −57°06′ **Spectral index:** 0.4 **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″ : $S = 2.0 \pm 0.3$ 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 ($= 0.89 \pm 0.13$).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

G323.5+0.1

RA: $15^h28^m42^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 13
Dec: −56°21′ **Spectral index:** 0.4? **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: $15^h34^m30^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 51×38
Dec: −57°12′ **Spectral index:** ? **Type:** S

Radio: Faint shell.
X-ray: Faint diffuse emission.
Distance: CO and HI 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 HI observations.
Saji *et al.* 2018, PASJ, 70, 23. Suzaku observations.

G326.3−1.8 MSH 15−56

RA: $15^h53^m00^s$ **1-GHz flux/Jy:** 145 **Size/arcmin:** 38
Dec: −56°10′ **Spectral index:** varies **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″×53″).

Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz (43″×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″×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″.4×8″.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: $15^h54^m25^s$ **1-GHz flux/Jy:** 7? **Size/arcmin:** 18
Dec: −55°09′ **Spectral index:** ? **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″×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″×23″), 2.3 (11″×16″), 4.8 (13″×15″) and 8.6 GHz (8″×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: $15^h50^m55^s$ **1-GHz flux/Jy:** 0.4 **Size/arcmin:** 5
Dec: −54°18′ **Spectral index:** ? **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″×53″: S=0.5±0.1 Jy) and SGPS at 1.4 GHz (S=0.3±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: HI absorption indicates 4.3 to 5.4 kpc, optical extinction suggests 2.8 kpc.

References:

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

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:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×54″: S=2.1 Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (1′.8×2′.0), plus HI.

G327.6+14.6 SN1006, PKS 1459−41

RA: $15^h02^m50^s$ **1-GHz flux/Jy:** 19 **Size/arcmin:** 30
Dec: −41°56′ **Spectral index:** 0.6 **Type:** S

This is the remnant of the SN of AD1006.

Radio: Shell, with two bright arcs.
Optical: Filaments to the NW, with broad Hα 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″×20″).
Kirshner *et al.* 1987, ApJ, 315, L135. Broad Hα optical component.
Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×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″×66″: S=17.5±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″×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′.0×4′.7) for HI, 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 Hα 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″×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 Hα 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 (MSH 15−57)

RA: $15^h55^m30^s$ **1-GHz flux/Jy:** 15 **Size/arcmin:** 5
Dec: −53°17′ **Spectral index:** 0.0 **Type:** F

Radio: Amorphous emission, with central bar.
X-ray: Detected at high energies.
Distance: HI 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 HI.
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 : $S = 13.8 \pm 0.4$ Jy), plus XMM-Newton observations.

G329.7+0.4

RA: $16^h01^m20^s$ **1-GHz flux/Jy:** >34? **Size/arcmin:** 40×33
Dec: −52°18′ **Spectral index:** ? **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 HI.
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 Lupus Loop

RA: $15^h10^m00^s$ **1-GHz flux/Jy:** 350? **Size/arcmin:** 180?
Dec: −40°00′ **Spectral index:** 0.5? **Type:** S

Radio: Low surface brightness loop with HI 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 : $S = 120 \pm 30\%$ 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′), HI 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: $16^h01^m06^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 11
Dec: −51°34′ **Spectral index:** 0.3 **Type:** S?

Radio: Clumpy non-thermal emission, possibly α distorted shell.
X-ray: Shell.
Point sources: Central compact X-ray source.
Distance: HI 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 HI.
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: $16^h13^m17^s$ **1-GHz flux/Jy:** 8? **Size/arcmin:** 12
Dec: −50°53′ **Spectral index:** 0.5 **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 HI.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

G332.4−0.4 RCW 103

RA: $16^h17^m33^s$ **1-GHz flux/Jy:** 28 **Size/arcmin:** 10
Dec: −51°02′ **Spectral index:** 0.5 **Type:** S

Radio: Shell, brightest to the S.
Optical: Filaments correspond well to the radio shell, brightest in SE.
X-ray: Brightest to NW, with point source near centre.
Point sources: Central, variable X-ray source, and nearby pulsar.
Distance: HI absorption indicates 3.1 kpc, 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 HI absorption.
Tuohy & Garmire 1980, ApJ, 239, L107. Einstein detection of X-ray point source.
Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50″).
Lamb & Markert 1981, ApJ, 244, 94. Einstein observations.
Ruiz 1983, AJ, 88, 1210. Optical spectra.
Tuohy *et al.* 1983, ApJ, 268, 778. X-ray observations.
Leibowitz & Danziger 1983, MNRAS, 204, 273. Optical spectra.

Nugent *et al.* 1984, ApJ, 284, 612. X-ray spectrum (and Einstein image from Tuohy, private communication).
Meaburn & 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 HI absorption to central source.
Russeil *et al.* 2005, A&A, 429, 497. Hα 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 MSH 16−51, Kes 32

RA: $16^h15^m20^s$ **1-GHz flux/Jy:** 26 **Size/arcmin:** 15
Dec: −50°42′ **Spectral index:** 0.5 **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. Hα observations.

G332.5−5.6

RA: $16^h43^m20^s$ **1-GHz flux/Jy:** 2? **Size/arcmin:** 35
Dec: −54°30′ **Spectral index:** 0.7? **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″×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. Hα 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: $16^h27^m45^s$ **1-GHz flux/Jy:** 16 **Size/arcmin:** 21
Dec: −48°47′ **Spectral index:** 0.5 **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″×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: $16^h32^m11^s$ **1-GHz flux/Jy:** 6 **Size/arcmin:** 14×10
Dec: −47°19′ **Spectral index:** 0.5 **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″×60″).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×58″: $S = 6.1$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα observations.

G337.0−0.1 (CTB 33)

RA: $16^h35^m57^s$ **1-GHz flux/Jy:** 1.5 **Size/arcmin:** 1.5
Dec: −47°36′ **Spectral index:** 0.6? **Type:** S

This entry refers to a small (1′.5) SNR, not the larger previously catalogued G337.0−0.1. Has mistakenly been called G337.7−0.1.

Radio: Shell, in a complex region.
Point sources: Associated with a soft gamma repeater.
Distance: Association with CTB 33 gives 11 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×58″: $S = 21$ Jy).
Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.
Sarma *et al.* 1997, ApJ, 483, 335. ATCA at 1.4 GHz (12″) including HI, and 8.9 GHz (13″×15″) for recombination lines, clarifying extent of the remnant.
Woods *et al.* 1999, ApJ, 519, L139. Soft gamma repeater observations.
Hurley *et al.* 2000, ApJ, 528, L21. ASCA observations of soft gamma repeater.
Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.
Castro *et al.* 2013, ApJ, 774, 36. Fermi observations.

G337.2−0.7

RA: $16^h39^m28^s$ **1-GHz flux/Jy:** 1.5 **Size/arcmin:** 6
Dec: −47°51′ **Spectral index:** 0.4 **Type:** S

Radio: Shell, brighter in S.
X-ray: Extended emission.
Distance: HI absorption suggests 2.0 to 9.3 kpc.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′: $S = 3.8$ Jy) and Parkes 64-m at 5 GHz (4′: $S = 0.70$ Jy).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×58″: $S = 2.0$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Rakowski *et al.* 2001, ApJ, 548, 258. ASCA and ROSAT observations.

Rakowski *et al.* 2006, ApJ, 646, 982. ATCA observations at 1.3 GHz (15″ : $S = 1.55 \pm 0.05$ Jy) and 5 GHz (15″ : $S = 0.93 \pm 0.02$ Jy), plus HI and Chandra observations.
Yamaguchi *et al.* 2014, ApJ, 785, L27. Suzaku observations.
Takata *et al.* 2016, PASJ, 68, S3. Suzaku observations.

G337.2+0.1

RA: $16^h35^m55^s$ **1-GHz flux/Jy:** 1.5? **Size/arcmin:** 3×2
Dec: −47°20′ **Spectral index:** ? **Type:** ?

Radio: Not well defined.
X-ray: Detected.
Distance: Association with HI hole gives 14 kpc.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″ : $S = 1.6$ Jy).
Combi *et al.* 2005, A&A, 431, L9. ASCA and other observations.
Aharonian *et al.* 2006, ApJ, 636, 777. 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: $16^h32^m39^s$ **1-GHz flux/Jy:** 16 **Size/arcmin:** 15×12
Dec: −46°36′ **Spectral index:** 0.55 **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: $16^h39^m01^s$ **1-GHz flux/Jy:** 15 **Size/arcmin:** 9×6
Dec: −46°59′ **Spectral index:** 0.5 **Type:** S

Radio: Distorted shell.
X-ray: Centrally brightened.
Distance: HI absorption suggests 11 kpc.

References:

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).
Caswell *et al.* 1975, A&A, 45, 239. Parkes HI absorption.
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″ : $S = 18$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact OH emission.
Caswell 2004, MNRAS, 349, 99. ATCA at 1.7 GHz, for associated OH masers.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.
Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including HI.
Combi *et al.* 2008, A&A, 488, L25. XMM-Newton observations.
Zhang *et al.* 2015, ApJ, 799, 103. XMM-Newton, Chandra and CO observations.
Liu *et al.* 2015, ApJ, 809, 102. 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, HI 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: $16^h37^m59^s$ **1-GHz flux/Jy:** 4? **Size/arcmin:** 15?
Dec: −46°24′ **Spectral index:** 0.4 **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: $16^h41^m00^s$ **1-GHz flux/Jy:** 7? **Size/arcmin:** 8
Dec: −46°34′ **Spectral index:** ? **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.
Lemiere *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: $16^h41^m09^s$ **1-GHz flux/Jy:** 12? **Size/arcmin:** 9
Dec: $-46°19'$ **Spectral index:** ? **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 ($43''\times59'' : S = 13$ 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: $16^h46^m31^s$ **1-GHz flux/Jy:** 5 **Size/arcmin:** 10×7
Dec: $-44°39'$ **Spectral index:** 0.4 **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 ($48''\times75'' : S = 9.8\pm0.9$ Jy) and 1.4 GHz ($9''\times27'' : S = 3.6\pm0.1$ Jy).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43''\times61'' : S = 5.9$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα observations.

G340.6+0.3

RA: $16^h47^m41^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 6
Dec: $-44°34'$ **Spectral index:** 0.4? **Type:** S

Radio: Incomplete shell.
Optical: Possible associated filaments.
Distance: HI 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 ($48'' \times 75'' : S = 9.2 \pm 0.9$ Jy) and 1.4 GHz ($9'' \times 27'' : S = 5.8 \pm 0.1$ Jy).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 61'' : S = 4.5$ 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 HI.
Chawner *et al.* 2020, MNRAS, 493, 2706. Herschel observations.

G341.2+0.9

RA: $16^h47^m35^s$ **1-GHz flux/Jy:** 1.5? **Size/arcmin:** 22×16
Dec: $-43°47'$ **Spectral index:** 0.6? **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 ($54'' \times 116'' : S = 3.0 \pm 0.1$ Jy) and 1.4 GHz ($21'' \times 25'' : S = 12.5 \pm 0.05$ 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: $16^h55^m01^s$ **1-GHz flux/Jy:** 2.5 **Size/arcmin:** 7
Dec: $-44°01'$ **Spectral index:** 0.5 **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 ($11'' \times 35'' : S = 2.2 \pm 0.1$ Jy).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ($43'' \times 62'' : S = 2.7$ 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: $16^h54^m50^s$ **1-GHz flux/Jy:** 3.5? **Size/arcmin:** 12×9
Dec: −43°53′ **Spectral index:** 0.4? **Type:** S

Radio: Distorted shell.

References:

Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50″), estimate $S_{408\ \mathrm{MHz}}=5$ Jy, $S_{5\ \mathrm{GHz}}=2$ 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: $16^h50^m43^s$ **1-GHz flux/Jy:** 0.5? **Size/arcmin:** 10×9
Dec: −43°04′ **Spectral index:** ? **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 RCW 114

RA: $17^h25^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 250
Dec: −46°30′ **Spectral index:** ? **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: $17^h08^m00^s$ **1-GHz flux/Jy:** 8? **Size/arcmin:** 32?
Dec: −44°16′ **Spectral index:** 0.5? **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: $17^h00^m25^s$ **1-GHz flux/Jy:** 7.8 **Size/arcmin:** 27×21
Dec: −43°14′ **Spectral index:** 0.55 **Type:** S

Radio: Shell, with smaller thermal shell adjacent.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×63″ : S8.5±0.6), plus Parkes 64-m at 4.5 GHz (S = 3.9±0.6 Jy) and 8.55 GHz (S = 2.4±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 emission.

G344.7−0.1

RA: $17^h03^m51^s$ **1-GHz flux/Jy:** 2.5? **Size/arcmin:** 8
Dec: −41°42′ **Spectral index:** 0.3? **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: $17^h05^m21^s$ **1-GHz flux/Jy:** 1.4? **Size/arcmin:** 6
Dec: −41°26′ **Spectral index:** 0.7? **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: $17^h03^m40^s$ **1-GHz flux/Jy:** 0.6? **Size/arcmin:** 10
Dec: −41°05′ **Spectral index:** 0.6? **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: $17^h07^m20^s$ **1-GHz flux/Jy:** 0.6? **Size/arcmin:** 6
Dec: −40°53′ **Spectral index:** ? **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: $17^h10^m19^s$ **1-GHz flux/Jy:** 8? **Size/arcmin:** 8
Dec: −40°11′ **Spectral index:** 0.5? **Type:** S

Radio: Irregular shell.
X-ray: Centrally brightened, clumpy.
Distance: CO and HI 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″ : $S = 8.1 \pm 0.9$ Jy).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×67″ : $S = 8.7$ Jy).
Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.
Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact OH emission.
Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.
Sezer *et al.* 2011, MNRAS, 415, 301. Suzaku observations.
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, HI and other observations.

G347.3−0.5

RX J1713.7−3946

RA: $17^h13^m50^s$ **1-GHz flux/Jy:** 30? **Size/arcmin:** 65×55
Dec: −39°45′ **Spectral index:** ? **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.
Acero *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 HI 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.
Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
Tsuji & Uchiyama 2016, PASJ, 68, 108. Chandra observations of NW.
Acero *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: $17^h15^m26^s$ **1-GHz flux/Jy:** 10? **Size/arcmin:** 10?
Dec: −38°28′ **Spectral index:** 0.4? **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 CTB 37A

RA: $17^h14^m06^s$ **1-GHz flux/Jy:** 72 **Size/arcmin:** 15
Dec: −38°32′ **Spectral index:** 0.3 **Type:** S

Radio: Shell, poorly define to S and W, overlapping G348.5−0.0 in E.
X-ray: Brighter to W.
Distance: HI 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 HI 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 HI 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 CTB 37B

RA: $17^h13^m55^s$ **1-GHz flux/Jy:** 26 **Size/arcmin:** 17?
Dec: −38°11′ **Spectral index:** 0.3 **Type:** S

Radio: Incomplete shell with faint eastern extensions.
X-ray: Diffuse emission.
Point sources: X-ray pulsar.
Distance: HI 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 HI 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″×45″).
Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz (46″×53″).
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×69″ : $S = 33$ Jy).
Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.
Aharonian *et al.* 2006, ApJ, 636, 777. 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 HI observations.
Xin *et al.* 2016, ApJ, 817, 64. Fermi observations.
Blumer *et al.* 2019, MNRAS, 487, 5019. XMM-Newton, Chandra and HI 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: $17^h11^m29^s$ **1-GHz flux/Jy:** 0.6? **Size/arcmin:** 10
Dec: −37°36′ **Spectral index:** 0.7? **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″×70″ : $S = 0.1$ 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′).

G349.2−0.1

RA: $17^h17^m15^s$ **1-GHz flux/Jy:** 1.4? **Size/arcmin:** 9×6
Dec: −38°04′ **Spectral index:** ? **Type:** S

Radio: Elongated shell, adjacent to bright HII region.

References:

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×70″ : $S = 1.6$ Jy).
Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.

G349.7+0.2

RA: $17^h17^m59^s$ **1-GHz flux/Jy:** 20 **Size/arcmin:** 2.5×2
Dec: −37°26′ **Spectral index:** 0.5 **Type:** S

Radio: Incomplete clumpy shell, with enhancement to the S.
X-ray: Irregular shell, brighter to S and E.
Distance: HI 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 HI 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 HI 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).
Acero *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: $17^h27^m50^s$ **1-GHz flux/Jy:** 26 **Size/arcmin:** 45
Dec: −38°32′ **Spectral index:** 0.4 **Type:** S

Incorporates the previously catalogued G350.0−1.8 in the NW.

Radio: Shell, brightest in NW.
Optical: Detected.
X-ray: Brighter to NW.

References:

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : $S = 49.5$ Jy) and Parkes 64-m at 5 GHz (4′ : $S = 13.6$ Jy).
Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4.′4).
Gaensler 1998, ApJ, 493, 781. VLA and Parkes 64-m at 1.4 GHz (18″×21″ : $S = 22.3 \pm 0.3$ Jy), clarifying extent of remnant.
Stupar & Parker 2011, MNRAS, 414, 2282. Hα observations.
Karpova *et al.* 2016, MNRAS, 462, 3845. XMM-Newton observations.

G350.1−0.3

RA: $17^h21^m05^s$ **1-GHz flux/Jy:** 6? **Size/arcmin:** 4?
Dec: −37°27′ **Spectral index:** 0.8? **Type:** ?

Radio: Several clumps of emission.
X-ray: Diffuse emission, with compact source.
Point sources: X-ray source.
Distance: HI 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: $17^h46^m00^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 30
Dec: −39°25′ **Spectral index:** ? **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: $17^h22^m27^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 7
Dec: −36°11′ **Spectral index:** 0.4 **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″ : $S = 4.8 \pm 0.2$ 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: $17^h21^m00^s$ **1-GHz flux/Jy:** 10 **Size/arcmin:** 18×14
Dec: −35°27′ **Spectral index:** 0.5? **Type:** S

Radio: Elongated shell, adjacent to bright HII 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″: $S = 8.4 \pm 0.7$ Jy) including HI.
Wang *et al.* 2020, A&A, 639, A72. Optical extinction for distance.

G351.9−0.9

RA: $17^h28^m52^s$ **1-GHz flux/Jy:** 1.8? **Size/arcmin:** 12×9
Dec: −36°16′ **Spectral index:** ? **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: $17^h27^m40^s$ **1-GHz flux/Jy:** 4 **Size/arcmin:** 8×6
Dec: −35°07′ **Spectral index:** 0.6 **Type:** S

Radio: Distorted shell.
X-ray: Detected.
Distance: HI 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″: $S = 3.4 \pm 0.4$ 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 HI 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: $17^h33^m10^s$ **1-GHz flux/Jy:** 24? **Size/arcmin:** 60
Dec: −35°12′ **Spectral index:** 0.85? **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: $17^h32^m00^s$ **1-GHz flux/Jy:** 2.5? **Size/arcmin:** 30
Dec: −34°44′ **Spectral index:** ? **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: $17^h38^m55^s$ **1-GHz flux/Jy:** 1? **Size/arcmin:** 13
Dec: −35°11′ **Spectral index:** 0.5? **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: $17^h30^m28^s$ **1-GHz flux/Jy:** ? **Size/arcmin:** 15×3?
Dec: −33°46′ **Spectral index:** varies **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: $17^h36^m00^s$ **1-GHz flux/Jy:** 2.8? **Size/arcmin:** 19
Dec: −33°42′ **Spectral index:** ? **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: $17^h31^m20^s$ **1-GHz flux/Jy:** 5? **Size/arcmin:** 25
Dec: −32°26′ **Spectral index:** ? **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: $17^h35^m16^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 8×6
Dec: −32°38′ **Spectral index:** ? **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: $17^h45^m53^s$ **1-GHz flux/Jy:** 8 **Size/arcmin:** 13
Dec: −33°43′ **Spectral index:** 0.5 **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: $17^h19^m00^s$ **1-GHz flux/Jy:** 4 **Size/arcmin:** 25
Dec: −29°40′ **Spectral index:** 0.7 **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′: $S = 8.1 \pm 1.7$ Jy), and NVSS at 1.4 GHz.

G356.3−1.5

RA: $17^h42^m35^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 20×15
Dec: −32°52′ **Spectral index:** ? **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: $17^h37^m56^s$ **1-GHz flux/Jy:** 3? **Size/arcmin:** 11×7
Dec: −32°16′ **Spectral index:** ? **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 MSH 17−39

RA: $17^h40^m29^s$ **1-GHz flux/Jy:** 37 **Size/arcmin:** 8×3?
Dec: −30°58′ **Spectral index:** 0.4 **Type:** ?

Has been suggested that this is not a SNR.

Radio: Multiple arcs and filaments, brighter to NW 'head'.
X-ray: Detected from NW 'head', and SW 'tail'.
Distance: HI absorption suggests beyond Galactic Centre.

References:

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : S=54.2 Jy) and Parkes 64-m at 5 GHz (4′ : S=18.5 Jy).
Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′.4 : S=14.6 Jy).
Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).
Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50″).
Weiler & Panagia 1980, A&A, 90, 269. Effelsberg 100-m at 9 GHz (1′.5) (private communication from Baker).
Shaver *et al.* 1985, Nature, 313, 113. VLA at 1.4 GHz (3″.8×10″.9) and 5 GHz (12″×26″).
Becker & Helfand 1985, Nature, 313, 115. VLA at 1.4 GHz and 5 GHz.
Helfand & Becker 1985, Nature, 313, 118. Suggest it is not a SNR.
Shaver *et al.* 1985, A&A, 147, L23. Observations of peripheral compact source.
Caswell *et al.* 1989, PASA, 8, 184. MOST at 843 MHz (43″×83″).
Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×84″).
Stewart *et al.* 1994, ApJ, 432, L39. ATCA at 4.79 and 5.84 GHz (12″×22″) and Effelsberg 100-m at 10.6 GHz (1′), including polarisation.
Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.
Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.
LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (24″×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″.4×13″.6), including HI, and 8.3 GHz (6″.8×14″.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: $17^h38^m35^s$ **1-GHz flux/Jy:** 10 **Size/arcmin:** 24
Dec: $-30°44'$ **Spectral index:** 0.4? **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 : $S = 7\pm1.5$ Jy), $S_{5\ \mathrm{GHz}} = 5.5\pm1.5$ Jy from surveys.
Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×84″).
Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.
Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
Phillips & Marquez-Lugo 2010, MNRAS, 409, 701. Spitzer observations of region.
Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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: $17^h26^m00^s$ **1-GHz flux/Jy:** 1.5? **Size/arcmin:** 38
Dec: $-28°36'$ **Spectral index:** ? **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 : $S = 2.5\pm1.3$ Jy), and NVSS at 1.4 GHz.

G358.1+1.0

RA: $17^h37^m00^s$ **1-GHz flux/Jy:** 2? **Size/arcmin:** 20
Dec: $-29°59'$ **Spectral index:** ? **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′ : $S = 6.0\pm2.5$ 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: $17^h46^m10^s$ **1-GHz flux/Jy:** 4? **Size/arcmin:** 17
Dec: −30°40′ **Spectral index:** ? **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′: $S = 8.0 \pm 2.5$ 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: $17^h46^m50^s$ **1-GHz flux/Jy:** 23 **Size/arcmin:** 23
Dec: −30°16′ **Spectral index:** 0.5 **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. Hα observations.
Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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: $17^h45^m30^s$ **1-GHz flux/Jy:** 14 **Size/arcmin:** 24
Dec: −29°57′ **Spectral index:** 0.4? **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: HI 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′.6 : S = 13 Jy).
Reich & Fürst 1984, A&AS, 57, 165. Effelsberg 100-m at 2.7 GHz (4′.3 : S = 10±1.5 Jy) and 4.8 GHz (2′.4 : S = 8.1±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. Hα observations.
Ohnishi *et al.* 2011, PASJ, 63, 527. Suzaku observations.
Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.
Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
Froebrich *et al.* 2015, MNRAS, 454, 2586. H_2 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: $17^h39^m36^s$ **1-GHz flux/Jy:** 2? **Size/arcmin:** 12×11
Dec: −29°11′ **Spectral index:** ? **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: $17^h48^m14^s$ **1-GHz flux/Jy:** 0.4? **Size/arcmin:** 5×4
Dec: −30°12′ **Spectral index:** 1.1? **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 (∼2′).