

**G0.0+0.0**

Sgr A East

**RA:** 17<sup>h</sup>45<sup>m</sup>44<sup>s</sup>  
**Dec:** –29°00′**1-GHz flux/Jy:** 100?  
**Spectral index:** 0.8?**Size/arcmin:** 3.5×2.5  
**Type:** S**Radio:** Non-thermal shell, in complex region, interacting with molecular material to the west.**X-ray:** Diffuse emission, centrally peaked.**Point sources:** Compact X-ray/radio source.**References:**

- Ekers *et al.* 1983, A&A, 122, 143. VLA at 1.4 GHz and 5 GHz (both 5''×8''),  $S_{1.4\text{ GHz}}=77\text{ Jy}$ ,  $S_{5.0\text{ GHz}}=31\text{ Jy}$ .
- Pedlar *et al.* 1989, ApJ, 342, 769. VLA at 332 MHz (12''), 1.4 GHz (1''3×2''5) and 5 GHz (1''3×2''5).
- Mezger *et al.* 1989, A&A, 209, 337. Nearby molecular material.
- Ho *et al.* 1991, Nature, 350, 309. VLA of NH<sub>3</sub> 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<sub>2</sub>O masers.
- Yusef-Zadeh *et al.* 1999, ApJ, 512, 230. OH maser observations.
- Coil & Ho 2000, ApJ, 533, 245. NH<sub>3</sub> observations of surroundings.
- LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (24''×43''). see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
- Fatuzzo *et al.* 2001, ApJ, 549, 293. Electron–positron lines from the vicinity.
- Yusef-Zadeh *et al.* 2001, ApJ, 560, 749. Observations of nearby molecular hydrogen.
- Maeda *et al.* 2002, ApJ, 570, 671. Chandra observations.
- Sakano *et al.* 2003, AN, 324 (No S1), 197. XMM-Newton observations.
- Roy & Rao 2004, MNRAS, 349, L25. GMRT at 620 MHz (6'6×11'4).
- Sakano *et al.* 2004, MNRAS, 350, 129. XMM-Newton 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. HESS detection.
- Koyama *et al.* 2007, PASJ, 59, S237. Suzaku observations.
- Lee *et al.* 2008, ApJ, 674, 247. Molecular H<sub>2</sub> observations of surroundings.
- Sjouwerman & Pihlström 2008, ApJ, 681, 1287. VLA at 1.7 GHz of OH masers.
- Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.
- Tsuboi *et al.* 2012, PASJ, 64, 111. CO observations of SW.
- Minh *et al.* 2013, ApJ, 773, 31. NH<sub>3</sub> 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<sub>3</sub>OH maser observations in region.
- Qiao *et al.* 2018, ApJS, 239, 15. OH maser observations.

**G0.3+0.0****RA:** 17<sup>h</sup>46<sup>m</sup>15<sup>s</sup>  
**Dec:** –28°38′**1-GHz flux/Jy:** 22  
**Spectral index:** 0.6**Size/arcmin:** 15×8  
**Type:** S

Has been called G0.33+0.04, G0.30+0.04 and G0.4+0.1.

**Radio:** Bilateral shell, near Galactic Centre.**X-ray:** Diffuse emission.**References:**

- Kassim & Frail 1996, MNRAS, 283, L51. VLA at 333 MHz (23''×42''), plus review of flux densities and other observations.
- LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (30''). see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.
- Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (30'').
- Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.
- Ajello *et al.* 2016, ApJ, 819, 44. Fermi observations.

**G0.9+0.1**

**RA:** 17<sup>h</sup>47<sup>m</sup>21<sup>s</sup>  
**Dec:** –28°09′

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

**Size/arcmin:** 8  
**Type:** C

**Radio:** Flat spectrum core within steep spectrum shell.

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

**Point sources:** Central pulsar.

**References:**

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

Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (8″6×11″3).  
 Aharonian *et al.* 2005, A&A, 432, L25. HESS 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.  $\gamma$ -ray observations.  
 Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.

**G1.0–0.1**

**RA:** 17<sup>h</sup>48<sup>m</sup>30<sup>s</sup>  
**Dec:** –28°09′

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

**Size/arcmin:** 8  
**Type:** S

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

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

**X-ray:** Possibly detected.

**References:**

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

Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (30″).  
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Nobukawa *et al.* 2009, AdSpR, 43, 1045. Suzaku observations.  
 Marquez-Lopez & Phillips 2010, MNRAS, 407, 94. Mid-IR observations.  
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.  
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G1.4–0.1**

**RA:** 17<sup>h</sup>49<sup>m</sup>39<sup>s</sup>  
**Dec:** –27°46′

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

**Size/arcmin:** 10  
**Type:** S

**Radio:** Shell, brightest in E.

**X-ray:** Diffuse emission.

**References:**

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×92″ :  $S = 2$  Jy).  
 Yusef-Zadeh *et al.* 1999, ApJ, 527, 172. VLA of nearby OH masers.  
 Bhatnagar 2002, MNRAS, 332, 1. GMRT at 327 MHz (2′.4×2′.7 :  $S = 4.2 \pm 0.5$ ).  
 Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz (8″2×12″2).

Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Pihlström *et al.* 2014, AJ, 147, 73. VLA observations of methanol masers.  
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.  
 McEwen *et al.* 2016, ApJ, 826, 189. NH<sub>3</sub> and CH<sub>3</sub>OH observations.

**G1.9+0.3**

**RA:** 17<sup>h</sup>48<sup>m</sup>45<sup>s</sup>  
**Dec:** –27°10′

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

**Size/arcmin:** 1.5  
**Type:** S

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

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

**Distance:** H<sub>I</sub> 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.  
 Abramowski *et al.* 2014, *MNRAS*, 441, 790. HESS observations.  
 Borkowski *et al.* 2014, *ApJ*, 790, L18. Chandra expansion studies.  
 Roy & Pal 2014, *IAUS*, 296, 197. GMRT H<sub>I</sub> 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.

**G3.7–0.2**

**RA:** 17<sup>h</sup>55<sup>m</sup>26<sup>s</sup>  
**Dec:** –25°50′

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

**Size/arcmin:** 14×11  
**Type:** S

Has been called G003.8–00.3.

**Radio:** Double arc.

**References:**

Gray 1994, *MNRAS*, 270, 847. MOST at 843 MHz (43''×99'' : S=2.4 Jy).  
 Gaensler 1998, *ApJ*, 493, 781. VLA at 1.4 GHz (9''×15'' : S=1.7±0.1 Jy).

Yusef-Zadeh *et al.* 2004, *ApJS*, 155, 421. VLA at 1.4 GHz (8''4×11''4).

**G3.8+0.3**

**RA:** 17<sup>h</sup>52<sup>m</sup>55<sup>s</sup>  
**Dec:** –25°28′

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

**Size/arcmin:** 18  
**Type:** S?

**Radio:** Incomplete shell.

**References:**

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

**G4.2–3.5**

**RA:** 18<sup>h</sup>08<sup>m</sup>55<sup>s</sup>  
**Dec:** –27°03′

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

**Size/arcmin:** 28  
**Type:** S

**Radio:** Elongated shell.

**Optical:** Detected.

**References:**

Reich *et al.* 1988, *IAUCo*, 101, 293. Summary of parameters.  
 Reich *et al.* 1990, *A&AS*, 85, 633. Effelsberg 100-m at 2.7 GHz (4'3).  
 Hewitt & Yusef-Zadeh 2009, *ApJ*, 694, L16. OH maser search.  
 Stupar & Parker 2011, *MNRAS*, 414, 2282. H $\alpha$  observations.

**G4.5+6.8**

**RA:** 17<sup>h</sup>30<sup>m</sup>42<sup>s</sup>  
**Dec:** –21°29′

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

Kepler, SN1604, 3C358

**Size/arcmin:** 3  
**Type:** S

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

**Radio:** Incomplete shell, brighter to the N.

**Optical:** Faint filaments.

**X-ray:** Shell, brighter to the N.

**Distance:** Optical expansion and proper motion indicates about 2.9 kpc, H<sub>I</sub> 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<sup>h</sup>5×3<sup>h</sup>2) and 5 GHz (3<sup>h</sup>2×4<sup>h</sup>8) and Einstein image (5<sup>h</sup>).  
 Dickel *et al.* 1988, ApJ, 330, 254. VLA at 1.4 (1<sup>h</sup>2×2<sup>h</sup>3) and 5 GHz (0<sup>h</sup>6×1<sup>h</sup>0) at two epochs.  
 Smith *et al.* 1989, ApJ, 347, 925. EXOSAT observations.  
 Hatsukade *et al.* 1990, PASJ, 42, 279. X-ray spectrum.  
 Blair *et al.* 1991, ApJ, 366, 484. Optical imaging and spectroscopy.  
 Bandiera & van den Bergh 1991, ApJ, 374, 186. Optical changes.  
 van den Bergh 1991, PASP, 103, 194. Optical imaging.  
 Predehl & Schmitt 1995, A&A, 293, 889. ROSAT of dust scattered halo.  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Hughes 1999, ApJ, 527, 298. ROSAT and Einstein image comparison for expansion studies.  
 Reynoso & Goss 1999, AJ, 118, 926. VLA at 1.4 GHz (13<sup>h</sup>×23<sup>h</sup>) for H<sub>I</sub> 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<sup>h</sup>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. HESS upper limit.  
 Enomoto *et al.* 2008, ApJ, 683, 383.  $\gamma$ -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.

**G4.8+6.2**

**RA:** 17<sup>h</sup>33<sup>m</sup>25<sup>s</sup>  
**Dec:** –21°34′

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

**Size/arcmin:** 18  
**Type:** S

Has been called G4.5+6.2.

**Radio:** Faint shell.

**References:**

Duncan *et al.* 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10<sup>h</sup>4).  
 Bhatnagar 2000, MNRAS, 317, 453. GMRT at 327 MHz (1<sup>h</sup>3×2<sup>h</sup>2: S=5.5±1.2 Jy), and NVSS at 1.4 GHz.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.

**G5.2–2.6**

**RA:** 18<sup>h</sup>07<sup>m</sup>30<sup>s</sup>  
**Dec:** –25°45′

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

**Size/arcmin:** 18  
**Type:** S

**Radio:** Poorly resolved shell.

**References:**

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

**G5.4–1.2**

**RA:** 18<sup>h</sup>02<sup>m</sup>10<sup>s</sup>  
**Dec:** –24°54′

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

Milne 56  
**Size/arcmin:** 35  
**Type:** C?

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

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

**Optical:** Detected.

**X-ray:** Pulsar detected, with faint extension.

**Point sources:** Pulsar nearby, in flat spectrum source.

**Distance:** H<sub>I</sub> absorption suggests > 4.3 kpc.

**References:**

Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 38 Jy).  
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′).  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′8 : S = 21.9 ± 2.4 Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).  
 Zealey *et al.* 1979, A&AS, 38, 39. Optical detection.  
 Becker & Helfand 1985, Nature, 313, 115. VLA at 1.4 and 5 GHz.  
 Helfand & Becker 1985, Nature, 313, 118. Suggesting it is not a SNR.  
 Manchester *et al.* 1985, MNRAS, 212, 975. Pulsar detection.  
 Caswell *et al.* 1987, MNRAS, 225, 329. MOST at 843 MHz (42″ × 110″).  
 Frail & Kulkarni 1991, Nature, 352, 785. Pulsar and remnant association.  
 Manchester *et al.* 1991, MNRAS, 253, 7P. Pulsar and remnant association.

Milne *et al.* 1992, MNRAS, 255, 707. Parkes 64-m at 4.75 (4′5 : S = 30.8 ± 2.1 Jy) and 8.4 GHz (3′ : S = 24 ± 3 Jy), including polarisation.  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′0 × 4′9 : S = 38 Jy).  
 Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz (68″ × 73″), plus H<sub>I</sub> absorption.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Gaensler & Frail 2000, Nature, 406, 158. Pulsar observations, including proper motion.  
 Kaspi *et al.* 2001, ApJ, 562, L163. X-ray detection of pulsar, and upper limit for remnant.  
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 10.6 GHz, including polarisation.  
 Blazek *et al.* 2006, ApJ, 652, 1523. Proper motion study of pulsar.  
 Zeiger *et al.* 2008, ApJ, 674, 271. Proper motion study of pulsar.  
 Liszt *et al.* 2009, A&A, 508, 1331. CO and IR observations of region.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser detection.  
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.

**G5.5+0.3**

**RA:** 17<sup>h</sup>57<sup>m</sup>04<sup>s</sup>  
**Dec:** –24°00′

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

**Size/arcmin:** 15 × 12  
**Type:** S

Has been called G5.55+0.32.

**Radio:** Shell.

**Optical:** Detected.

**References:**

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

Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H<sub>α</sub> observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G5.9+3.1**

**RA:** 17<sup>h</sup>47<sup>m</sup>20<sup>s</sup>  
**Dec:** –22°16′

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

**Size/arcmin:** 20  
**Type:** S

**Radio:** Asymmetric shell.

**References:**

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

**G6.1+0.5**

**RA:** 17<sup>h</sup>57<sup>m</sup>29<sup>s</sup>  
**Dec:** –23°25′

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

**Size/arcmin:** 18×12  
**Type:** S

Has been called G6.10+0.53.

**Radio:** Partial shell.

**Optical:** Detected.

**References:**

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ :  $S = 13.4 \pm 0.2$  Jy), plus other observations.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G6.1+1.2**

**RA:** 17<sup>h</sup>54<sup>m</sup>55<sup>s</sup>  
**Dec:** –23°05′

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

**Size/arcmin:** 30×26  
**Type:** F

Has been called G6.1+1.15.

**Radio:** Faint, diffuse emission.

**References:**

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

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

**G6.4–0.1**

W28

**RA:** 18<sup>h</sup>00<sup>m</sup>30<sup>s</sup>  
**Dec:** –23°26′**1-GHz flux/Jy:** 310  
**Spectral index:** varies**Size/arcmin:** 48  
**Type:** C

Has been called G6.6–0.2.

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

- Kundu & Velusamy 1972, A&A, 20, 237. NRAO 140-ft at 10 GHz (3′).
- van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.
- Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).
- Dopita *et al.* 1977, ApJ, 214, 179. Some optical line ratios.
- Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).
- Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.
- Andrews *et al.* 1983, ApJ, 266, 684. VLA at 1.4 GHz (8′′) 4.9 GHz (3′′) and 15 GHz (1′′) of central region only, plus Einstein image of central region.
- Bohigas *et al.* 1983, RMxAA, 8, 155. Optical spectra.
- 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. HESS observations.
- Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -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.  $\gamma$ -ray observations.
- Marquez-Lopez & 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 *et al.* 2012, PASJ, 64, 81. Suzaku observations.
- Nichols *et al.* 2012, MNRAS, 419, 251. CO observations of selected regions.
- Gusdorf *et al.* 2012, A&A, 542, L19. CO observations of regions in NE.
- Vaupréé *et al.* 2014, A&A, 568, A50. CO, HCO<sup>+</sup> and DCO<sup>+</sup> 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<sub>2</sub> IR observations.
- Maxted *et al.* 2016, MNRAS, 462, 532. NH<sub>3</sub> observations of region.
- Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
- Pannuti *et al.* 2017, ApJ, 839, 59. Optical and X-ray observations.
- Abdalla *et al.* 2018, A&A, 612, A1. HESS 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.
- Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.
- Ruiz-Lapuente *et al.* 2018, ApJ, 862, 124. HST search for progenitor companion.

**G6.4+4.0**

**RA:** 17<sup>h</sup>45<sup>m</sup>10<sup>s</sup>  
**Dec:** –21°22′

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

**Size/arcmin:** 31  
**Type:** S

**Radio:** Faint asymmetric shell.

**References:**

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

**G6.5–0.4**

**RA:** 18<sup>h</sup>02<sup>m</sup>11<sup>s</sup>  
**Dec:** –23°34′

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

**Size/arcmin:** 18  
**Type:** S

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

**Radio:** Shell, overlapping G6.4–0.1.

**Optical:** Detected.

**References:**

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

Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -ray observations.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.  
 Ajello *et al.* 2016, ApJ, 819, 44. Fermi observations.

**G7.0–0.1**

**RA:** 18<sup>h</sup>01<sup>m</sup>50<sup>s</sup>  
**Dec:** –22°54′

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

**Size/arcmin:** 15  
**Type:** S

Has been called G7.06–0.12.

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

**References:**

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

**G7.2+0.2**

**RA:** 18<sup>h</sup>01<sup>m</sup>07<sup>s</sup>  
**Dec:** –22°38′

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

**Size/arcmin:** 12  
**Type:** S

Has been called G7.20+0.20.

**Radio:** Partial shell.

**References:**

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

**G7.7–3.7**

1814–24

**RA:** 18<sup>h</sup>17<sup>m</sup>25<sup>s</sup>  
**Dec:** –24°04′**1-GHz flux/Jy:** 11  
**Spectral index:** 0.32**Size/arcmin:** 22  
**Type:** S

Has been associated with the SN of AD386.

**Radio:** Shell, with high polarisation.**X-ray:** Arc in S.**References:**

Dickel & Milne 1976, *AJPh*, 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.

**G8.3–0.0****RA:** 18<sup>h</sup>04<sup>m</sup>34<sup>s</sup>  
**Dec:** –21°49′**1-GHz flux/Jy:** 1.2  
**Spectral index:** 0.6**Size/arcmin:** 5×4  
**Type:** S

Has been called G8.31–0.09.

**Radio:** Shell.**References:**

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

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

**G8.7–5.0****RA:** 18<sup>h</sup>24<sup>m</sup>10<sup>s</sup>  
**Dec:** –23°48′**1-GHz flux/Jy:** 4.4  
**Spectral index:** 0.3**Size/arcmin:** 26  
**Type:** S**Radio:** Asymmetric shell.**References:**

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

Hewitt & Yusef-Zadeh 2009, *ApJ*, 694, L16. OH maser search.  
 de Wilt *et al.* 2017, *MNRAS*, 468, 2093. Molecular line observations of region.

**G8.7–0.1**

(W30)

**RA:** 18<sup>h</sup>05<sup>m</sup>30<sup>s</sup>  
**Dec:** –21°26′**1-GHz flux/Jy:** 80  
**Spectral index:** 0.5**Size/arcmin:** 45  
**Type:** S?

Has been called G8.6–0.1.

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

Odegard 1986, *AJ*, 92, 1372. TPT at 57.5 MHz (7′2×9′7 : S=190±50 Jy).  
 Kassim & Weiler 1990, *Nature*, 343, 146. VLA at 327 MHz (3′0×3′7).  
 Kassim & Weiler 1990, *ApJ*, 360, 184. VLA at 327 MHz (2′8×4′1 : S=129±11 Jy), and part at 1.4 GHz (0′9×1′8), plus review of flux densities.  
 Frail *et al.* 1994, *AJ*, 107, 1120. VLA at 327 MHz (37″×55″).  
 Finley & Ögelman 1994, *ApJ*, 434, L25. ROSAT observations, including pulsar.  
 Aharonian *et al.* 2005, *Science*, 307, 1938. HESS detection.

Aharonian *et al.* 2006, *ApJ*, 636, 777. HESS 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.

**G8.9+0.4**

**RA:** 18<sup>h</sup>03<sup>m</sup>58<sup>s</sup>  
**Dec:** –21°03′

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

**Size/arcmin:** 24  
**Type:** S

Has been called G8.90+0.40.

**Radio:** Shell.

**References:**

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

**G9.7–0.0**

**RA:** 18<sup>h</sup>07<sup>m</sup>22<sup>s</sup>  
**Dec:** –20°35′

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

**Size/arcmin:** 15×11  
**Type:** S

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

**Radio:** Shell.

**References:**

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

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

**G9.8+0.6**

**RA:** 18<sup>h</sup>05<sup>m</sup>08<sup>s</sup>  
**Dec:** –20°14′

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

**Size/arcmin:** 12  
**Type:** S

**Radio:** Asymmetric shell.

**References:**

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6).  
 Caswell 1983, MNRAS, 204, 833. Molonglo at 408 MHz (3′ :  $S = 5.8 \pm 0.6$  Jy).

Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (41″×63″ :  $S = 3.5 \pm 0.4$  Jy).  
 Frail *et al.* 1994, AJ, 107, 1120. VLA at 327 MHz.  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

**G9.9–0.8**

**RA:** 18<sup>h</sup>10<sup>m</sup>41<sup>s</sup>  
**Dec:** –20°43′

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

**Size/arcmin:** 12  
**Type:** S

Has been called G9.95–0.81.

**Radio:** Shell.

**Optical:** Detected.

**References:**

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

Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.  
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.

**G10.5–0.0**

**RA:** 18<sup>h</sup>09<sup>m</sup>08<sup>s</sup>  
**Dec:** –19°47′

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

**Size/arcmin:** 6  
**Type:** S

Has been called G10.59–0.04.

**Radio:** Partial shell.

**X-ray:** Possibly detected.

**References:**

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

**G11.0–0.0**

**RA:** 18<sup>h</sup>10<sup>m</sup>04<sup>s</sup>  
**Dec:** –19°25′

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

**Size/arcmin:** 11×9  
**Type:** S

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

**Radio:** Partial shell.

**X-ray:** Diffuse emission.

**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.

**G11.1–1.0**

**RA:** 18<sup>h</sup>14<sup>m</sup>03<sup>s</sup>  
**Dec:** –19°46′

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

**Size/arcmin:** 18×12  
**Type:** S

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

**Radio:** Shell.

**Optical:** Detected.

**References:**

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

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9″.5 :  
 $S = 3.40 \pm 0.25$  Jy) including polarisation and review of flux  
 densities.

**G11.1–0.7**

**RA:** 18<sup>h</sup>12<sup>m</sup>46<sup>s</sup>  
**Dec:** –19°38′

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

**Size/arcmin:** 11×7  
**Type:** S

Has been called G11.15–0.71.

**Radio:** Partial shell.

**References:**

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

**G11.1+0.1**

**RA:** 18<sup>h</sup>09<sup>m</sup>47<sup>s</sup>  
**Dec:** –19°12′

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

**Size/arcmin:** 12×10  
**Type:** S

Has been called G11.18+0.11.

**Radio:** Shell.

**References:**

Brogan *et al.* 2004, AJ, 127, 355. VLA at 330 MHz (25″), 1.5 GHz (25″), and 74 MHz.  
 Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ :  $S = 3.5 \pm 0.2$  Jy), plus other observations.

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

**G11.2–0.3**

**RA:** 18<sup>h</sup>11<sup>m</sup>27<sup>s</sup>  
**Dec:** –19°25′

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

**Size/arcmin:** 4  
**Type:** C

Probably associated with the SN of AD386.

**Radio:** Symmetrical clumpy shell, with flatter spectrum core.

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

**Point sources:** Central pulsar.

**Distance:** HI absorption indicates 4.4 kpc.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Radhakrishnan *et al.* 1972, ApJS, 24, 49. 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  $3.8 \pm 0.4$ ).  
 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<sub>2</sub> 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).

**G11.4–0.1**

**RA:** 18<sup>h</sup>10<sup>m</sup>47<sup>s</sup>  
**Dec:** –19°05′

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

**Size/arcmin:** 8  
**Type:** S?

**Radio:** Incomplete shell, possibly with central core.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz ( $3' : S = 9.4$  Jy) contaminated by sidelobes of a nearby source, and Parkes 64-m at 5 GHz ( $4' : S = 2.8$  Jy).  
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz ( $6.8 : S = 2.0 \pm 0.4$  Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ( $2.6$ ).  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ( $3.2 \times 4.1 : S = 18$  Jy).

Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz ( $44'' \times 63'' : S = 5.1 \pm 0.6$  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 ( $4.4 \times 8.3$ ) and CO observations of region.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

**G11.8–0.2**

**RA:** 18<sup>h</sup>12<sup>m</sup>25<sup>s</sup>  
**Dec:** –18°44′

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

**Size/arcmin:** 4  
**Type:** S

Has been called G11.89–0.21.

**Radio:** Shell.

**X-ray:** Possibly detected.

**References:**

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

**G12.0–0.1**

**RA:** 18<sup>h</sup>12<sup>m</sup>11<sup>s</sup>  
**Dec:** –18°37′

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

**Size/arcmin:** 7?  
**Type:** ?

**Radio:** Incomplete shell, defined in E only.

**X-ray:** Detected, including possible PWN.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz ( $3' : S = 6.6$  Jy) and Parkes 64-m at 5 GHz ( $4' : S = 1.1$  Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ( $2.6$ ).  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ( $3.2 \times 4.1$ ).  
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz ( $41'' \times 61'' : S = 0.7$  Jy).

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

**G12.2+0.3**

**RA:** 18<sup>h</sup>11<sup>m</sup>17<sup>s</sup>  
**Dec:** –18°10′

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

**Size/arcmin:** 6×5  
**Type:** S

Has been called G12.26+0.30.

**Radio:** Partial shell.

**References:**

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

**G12.5+0.2**

**RA:** 18<sup>h</sup>12<sup>m</sup>14<sup>s</sup>  
**Dec:** –17°55′

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

**Size/arcmin:** 6×5  
**Type:** C?

Has been called G12.58+0.22.

**Radio:** Diffuse, central brightened.

**References:**

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

**G12.7–0.0**

**RA:** 18<sup>h</sup>13<sup>m</sup>19<sup>s</sup>  
**Dec:** –17°54′

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

**Size/arcmin:** 6  
**Type:** S

Has been called G12.72–0.00.

**Radio:** Shell.

**References:**

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

**G12.8–0.0**

**RA:** 18<sup>h</sup>13<sup>m</sup>37<sup>s</sup>  
**Dec:** –17°49′

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

**Size/arcmin:** 3  
**Type:** C?

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

**Radio:** Shell.

**X-ray:** Diffuse.

**Point sources:** Central X-ray pulsar.

**References:**

Brogan *et al.* 2005, ApJ, 629, L105. VLA at 330 MHz (19″×32″), plus other observations.  
 Ubertaini *et al.* 2005, ApJ, 629, L109. INTEGRAL and other observations.  
 Aharonian *et al.* 2006, ApJ, 636, 777. HESS detection.  
 Albert *et al.* 2006, ApJ, 637, L41.  $\gamma$ -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.

**G13.3–1.3**

**RA:** 18<sup>h</sup>19<sup>m</sup>20<sup>s</sup>  
**Dec:** –18°00′

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

**Size/arcmin:** 70×40  
**Type:** S?

**Radio:** Amorphous emission.

**Optical:** Filaments in S.

**X-ray:** Elongated emission.

**Distance:** Absorption indicates 2–4 kpc.

**References:**

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

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

**G13.5+0.2**

**RA:** 18<sup>h</sup>14<sup>m</sup>14<sup>s</sup>  
**Dec:** –17°12′

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

**Size/arcmin:** 5×4  
**Type:** S

Has been called G13.46+0.16.

**Radio:** Elongated, incomplete shell.

**References:**

Helfand *et al.* 1989, ApJ, 341, 151. VLA at 5 GHz ( $S = 0.65 \pm 0.05$  Jy) and 1.4 GHz ( $15'' : S = 2.67 \pm 0.5$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G14.1–0.1**

**RA:** 18<sup>h</sup>16<sup>m</sup>40<sup>s</sup>  
**Dec:** –16°41′

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

**Size/arcmin:** 6×5  
**Type:** S

Has been called G14.18–0.12.

**Radio:** Shell.

**References:**

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

**G14.3+0.1**

**RA:** 18<sup>h</sup>15<sup>m</sup>58<sup>s</sup>  
**Dec:** –16°27′

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

**Size/arcmin:** 5×4  
**Type:** S

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

**Radio:** Partial shell.

**References:**

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

**G15.1–1.6**

**RA:** 18<sup>h</sup>24<sup>m</sup>00<sup>s</sup>  
**Dec:** –16°34′

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

**Size/arcmin:** 30×24  
**Type:** S?

**Radio:** Elongated, incomplete shell.

**Optical:** Diffuse shell.

**References:**

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.  
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4'3).  
 Boumis *et al.* 2008, A&A, 481, 705. Optical detection.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9'5 :  $S = 4.8 \pm 0.3$  Jy) including polarisation and review of flux densities.

**G15.4+0.1**

**RA:** 18<sup>h</sup>18<sup>m</sup>02<sup>s</sup>  
**Dec:** –15°27′

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

**Size/arcmin:** 15×14  
**Type:** C?

Has been called G15.42+0.18.

**Radio:** Shell.

**X-ray:** Centrally brightened.

**Distance:** HI observations suggest 4.8 kpc.

**References:**

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ :  $S = 10.9 \pm 0.3$  Jy), plus other observations.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″ :  $S = 2.1 \pm 0.2$  Jy) including polarisation and review of flux densities.

Castelletti *et al.* 2013, A&A, 557, L15. GMRT at 1.4 GHz (15″) plus SGPS HI and CO observations of region.  
 Abramowski *et al.* 2014, A&A, 562, A40. HESS and XMM-Newton observations.  
 Supan *et al.* 2015, A&A, 576, A81. GMRT at 624 MHz (10″).  
 Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.

**G15.9+0.2**

**RA:** 18<sup>h</sup>18<sup>m</sup>52<sup>s</sup>  
**Dec:** –15°02′

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

**Size/arcmin:** 7×5  
**Type:** S?

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

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

**Point sources:** Central X-ray source.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ :  $S = 7.7$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S = 1.9$  Jy).  
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz (6′8″ :  $S = 1.1 \pm 0.2$  Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6″).  
 Caswell *et al.* 1982, MNRAS, 200, 1143. FIRST at 1415 MHz (44″×58″).  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (61″×77″ :  $S = 11.2 \pm 1.0$  Jy), 1.4 GHz (14″×23″ :  $S = 3.9 \pm 0.1$  Jy) and 4.9 GHz (13″×16″).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Reynolds *et al.* 2006, ApJ, 652, L45. Chandra observations.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″ :  $S = 2.0 \pm 0.3$  Jy) including polarisation and review of flux densities.  
 Klochov *et al.* 2016, A&A, 592, L12. Chandra observations.  
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).  
 Maggi & Acero 2017, A&A, 597, A65. XMM-Newton observations.  
 Sasaki *et al.* 2018, MNRAS, 479, 3033. Chandra and IR observations, plus H $\alpha$  non-detection.

**G16.0–0.5**

**RA:** 18<sup>h</sup>21<sup>m</sup>56<sup>s</sup>  
**Dec:** –15°14′

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

**Size/arcmin:** 15×10  
**Type:** S

Has been called G16.05–0.57.

**Radio:** Shell.

**References:**

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42″ :  $S = 4.9 \pm 0.2$  Jy), plus other observations.  
 Hewitt & Yusef-Zadeh 2009, ApJ, 694, L16. OH maser search.  
 Beaumont *et al.* 2011, ApJ, 741, 14. CO of region.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G16.2–2.7**

**RA:** 18<sup>h</sup>29<sup>m</sup>40<sup>s</sup>  
**Dec:** –16°08′

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

**Size/arcmin:** 17  
**Type:** S

**Radio:** Double rim.

**References:**

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

**G16.4–0.5**

**RA:** 18<sup>h</sup>22<sup>m</sup>38<sup>s</sup>  
**Dec:** –14°55′

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

**Size/arcmin:** 13  
**Type:** S

Has been called G16.41–0.55.

**Radio:** Partial shell.

**References:**

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42'' :  $S =$   
 $10.0 \pm 0.3$  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 :  $S = 3.0 \pm 0.3$  Jy) including polarisation and review of flux  
 densities.

**G16.7+0.1**

**RA:** 18<sup>h</sup>20<sup>m</sup>56<sup>s</sup>  
**Dec:** –14°20′

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

**Size/arcmin:** 4  
**Type:** C

Has been called G16.73+0.08.

**Radio:** Asymmetric shell with flat-spectrum core.

**X-ray:** Non-thermal core.

**References:**

Helfand *et al.* 1989, ApJ, 341, 151. VLA at 5 GHz (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.

**G17.0–0.0**

**RA:** 18<sup>h</sup>21<sup>m</sup>57<sup>s</sup>  
**Dec:** –14°08′

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

**Size/arcmin:** 5  
**Type:** S

Has been called G17.02–0.04.

**Radio:** Shell.

**References:**

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

**G17.4–2.3**

**RA:** 18<sup>h</sup>30<sup>m</sup>55<sup>s</sup>  
**Dec:** –14°52′

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

**Size/arcmin:** 24?  
**Type:** S

**Radio:** Incomplete, poorly defined shell.

**Optical:** Filaments to SE, and diffuse emission.

**References:**

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

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

**G17.4–0.1**

**RA:** 18<sup>h</sup>23<sup>m</sup>08<sup>s</sup>  
**Dec:** –13°46′

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

**Size/arcmin:** 6  
**Type:** S

Has been called G17.48–0.12.

**Radio:** Partial shell.

**References:**

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

**G17.8–2.6**

**RA:** 18<sup>h</sup>32<sup>m</sup>50<sup>s</sup>  
**Dec:** –14°39′

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

**Size/arcmin:** 24  
**Type:** S

**Radio:** Well defined shell.

**References:**

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

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

**G18.1–0.1**

**RA:** 18<sup>h</sup>24<sup>m</sup>34<sup>s</sup>  
**Dec:** –13°11′

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

**Size/arcmin:** 8  
**Type:** S

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

**Radio:** Shell.

**X-ray:** Possibly detected.

**Distance:** HI absorption suggests 6.4 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<sub>2</sub> IR observations.  
 Voison *et al.* 2016, MNRAS, 458, 2813. Molecular line observations of region.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.

**G18.6–0.2**

**RA:** 18<sup>h</sup>25<sup>m</sup>55<sup>s</sup>  
**Dec:** –12°50′

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

**Size/arcmin:** 6  
**Type:** S

Has been called G18.62–0.28.

**Radio:** Partial shell.

**Distance:** H I absorption suggests 4.4 kpc.

**References:**

Brogan *et al.* 2006, ApJ, 639, L25. VLA at 330 MHz (42′ :  $S = 1.9 \pm 0.1$  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 H I absorption observations.

**G18.8+0.3**

**RA:** 18<sup>h</sup>23<sup>m</sup>58<sup>s</sup>  
**Dec:** –12°23′

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

**Size/arcmin:** 17×11  
**Type:** S

Kes 67

Has been called G18.9+0.3.

**Radio:** Incomplete shell, in complex region near the H II region W39.

**Distance:** Association with molecular cloud suggests 12 kpc, and H I 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 H I absorption.  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).  
 Milne *et al.* 1989, PASA, 8, 187. Parkes 64-m at 8.4 GHz (3′0 :  $S = 12.9 \pm 1.0$  Jy), including polarisation.  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (2′9×3′5 :  $S = 55$  Jy).  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (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 H I, 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 H I, plus CO observations of region.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :  $S = 15.3 \pm 0.9$  Jy) including polarisation and review of flux densities.  
 Vasquez *et al.* 2012, A&A, 545, A89. CO observations of region.  
 Paron *et al.* 2012, A&A, 547, A60. CO and other molecular observations of region.  
 Paron *et al.* 2015, A&A, 580, A51. CO observations in S.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H I absorption observations.

**G18.9–1.1**

**RA:** 18<sup>h</sup>29<sup>m</sup>50<sup>s</sup>  
**Dec:** –12°58′

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

**Size/arcmin:** 33  
**Type:** C?

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

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

**Optical:** Detected.

**X-ray:** Partial shell.

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

**Distance:** Optical absorption suggests 1.8 kpc.

**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 H<sub>i</sub>.  
 Aschenbach *et al.* 1991, *A&A*, 246, L32. ROSAT observations.  
 Fürst *et al.* 1997, *A&A*, 319, 655. ROSAT observations, and Effelsberg 100-m at 10.6 GHz (1′1″).

Reich 2002, in NSPS, p1. Effelsberg 100-m at 10.6 GHz, including polarisation.  
 Harrus *et al.* 2004, *ApJ*, 603, 152. ROSAT and ASCA observations.  
 Tüllmann *et al.* 2010, *ApJ*, 720, 848. Chandra detection of compact source.  
 Sun *et al.* 2011, *A&A*, 536, A83. Urumqi 25-m at 5 GHz (9′5″ : S = 19.6±1.0 Jy) including polarisation and review of flux densities.  
 Stupar & Parker 2011, *MNRAS*, 414, 2282. H $\alpha$  observations.  
 Froebrich *et al.* 2015, *MNRAS*, 454, 2586. H<sub>2</sub> IR observations.  
 Acero *et al.* 2016, *ApJS*, 224, 8. Fermi observations.  
 Shan *et al.* 2018, *ApJS*, 238, 35. Optical absorption for distance.

**G19.1+0.2**

**RA:** 18<sup>h</sup>24<sup>m</sup>56<sup>s</sup>  
**Dec:** –12°07′

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

**Size/arcmin:** 27  
**Type:** S

Has been called G19.15+0.27.

**Radio:** Partial shell.

**References:**

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

**G20.0–0.2**

**RA:** 18<sup>h</sup>28<sup>m</sup>07<sup>s</sup>  
**Dec:** –11°35′

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

**Size/arcmin:** 10  
**Type:** F

**Radio:** Faint, filled-centre, polarised.

**X-ray:** Centrally brightened.

**Point sources:** OH source 20.1–0.1 is nearby.

**Distance:** H<sub>i</sub> 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±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±0.5 Jy) including polarisation and review of flux densities.  
 Petriella *et al.* 2013, *A&A*, 554, A73. Chandra observations, plus CO and H<sub>i</sub> observations of region.  
 Acero *et al.* 2016, *ApJS*, 224, 8. Fermi observations.  
 Ranasinghe & Leahy 2018, *AJ*, 155, 204. VGPS H<sub>i</sub> absorption observations.

**G21.0–0.4**

**RA:** 18<sup>h</sup>31<sup>m</sup>12<sup>s</sup>  
**Dec:** –10°47′

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

**Size/arcmin:** 9×7  
**Type:** S

Has been called G21.04–0.47.

**Radio:** Shell.

**References:**

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

**G21.5–0.9**

**RA:** 18<sup>h</sup>33<sup>m</sup>33<sup>s</sup>  
**Dec:** –10°35′

**1-GHz flux/Jy:** 7  
**Spectral index:** varies

**Size/arcmin:** 5  
**Type:** C

Early observations relate to the central core only.

**Radio:** Filled-centre, with high frequency turnover.

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

**Point sources:** Central pulsar.

**Distance:** H<sub>I</sub> 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 H<sub>I</sub> 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. H<sub>I</sub> 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 H<sub>I</sub>.  
 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.  
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 70, 100 and 143 GHz.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> absorption observations.  
 Aharonian *et al.* 2018, PASJ, 70, 38. Hitomi observations.

**G21.6–0.8**

**RA:** 18<sup>h</sup>33<sup>m</sup>40<sup>s</sup>  
**Dec:** –10°25′

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

**Size/arcmin:** 13  
**Type:** S

Has been called G21.64–0.84.

**Radio:** Faint, irregular shell.

**References:**

Bietenholz *et al.* 2011, MNRAS, 412, 1221. VLA at 327 MHz (85″ :  $S = 2.8$  Jy) and 1.4 GHz (14″×18″).  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G21.8–0.6**

Kes 69

**RA:** 18<sup>h</sup>32<sup>m</sup>45<sup>s</sup>  
**Dec:** –10°08′**1-GHz flux/Jy:** 65  
**Spectral index:** 0.56**Size/arcmin:** 20  
**Type:** S**Radio:** Incomplete shell.**X-ray:** Detected.**Distance:** Association with CO indicates 5.2 kpc, and H<sub>I</sub> 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′).  
 Wilson 1972, A&A, 19, 354. H<sub>2</sub>CO absorption.  
 Kundu *et al.* 1974, AJ, 79, 132. NRAO 140-ft at 5 GHz (6′) and 10 GHz (3′).  
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft et 2.7 GHz (5′ :  $S=42.3\pm 4.6$  Jy).  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).  
 Seward 1990, ApJS, 73, 781. Einstein observations.  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′3×3′5 :  $S=132$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations, including masers.  
 Yusef-Zadeh *et al.* 2003, ApJ, 585, 319. X-ray observations.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.
- Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Wood *et al.* 2008, AJ, 135, 2358. VLA at 4.8 GHz, including polarisation.  
 Tian & Leahy 2008, MNRAS, 391, L54. VGPS at 1.4 GHz (1′) including H<sub>I</sub>.  
 Zhou *et al.* 2009, ApJ, 691, 516. CO and HCO<sup>+</sup> of region.  
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :  $S=24.0\pm 1.3$  Jy) including polarisation and review of flux densities.  
 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<sub>2</sub> IR observations.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> absorption observations.  
 Sezer *et al.* 2018, MNRAS, 481, 1416. Suzaku observations.

**G22.7–0.2****RA:** 18<sup>h</sup>33<sup>m</sup>15<sup>s</sup>  
**Dec:** –09°13′**1-GHz flux/Jy:** 33  
**Spectral index:** 0.6**Size/arcmin:** 26  
**Type:** S?**Radio:** Non-thermal ring in complex region, overlapping G23.3–0.3.**X-ray:** Possible detection.**Point sources:** Variable radio source near centre, and  $\gamma$ -ray source near edge.**Distance:** Association with CO indicates 4.4 kpc, and H<sub>I</sub> absorption 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.  
 Abramowski *et al.* 2015, MNRAS, 446, 1163. HESS observations.  
 Mori *et al.* 2017, ApJ, 848, 80. NuSTAR, Chandra and XMM-Newton observations.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> absorption observations.

**G23.3–0.3**

W41

**RA:** 18<sup>h</sup>34<sup>m</sup>45<sup>s</sup>  
**Dec:** –08°48′

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

**Size/arcmin:** 27  
**Type:** S

**Radio:** Distorted ring, in complex region, overlapping G22.7–0.2.

**X-ray:** Possible extended emission, with compact sources.

**Point sources:** Pulsar association suggested.

**Distance:** HI and CO observations suggest 4.2 or 4.8 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. HESS detection.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.  
 Aharonian *et al.* 2006, ApJ, 636, 777. HESS observations.  
 Albert *et al.* 2006, ApJ, 643, L53.  $\gamma$ -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.  
 Abramowski *et al.* 2015, A&A, 574, A27. HESS 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.

**G24.7–0.6**

**RA:** 18<sup>h</sup>38<sup>m</sup>43<sup>s</sup>  
**Dec:** –07°32′

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

**Size/arcmin:** 15?  
**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 ± 0.5 Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).

Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (44″ × 56″ : S = 1.9 Jy).  
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Ranasinghe & Leahy 2018, MNRAS, 477, 2243. VGPS HI absorption, plus CO observations.

**G24.7+0.6**

**RA:** 18<sup>h</sup>34<sup>m</sup>10<sup>s</sup>  
**Dec:** –07°05′

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

**Size/arcmin:** 30 × 15  
**Type:** C?

**Radio:** Filled-centre, with faint shell, and a compact HII region to the S.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′.6).  
 Reich *et al.* 1984, A&A, 133, L4. Effelsberg 100-m at 2.7 GHz (4′.3 : S = 19 ± 3 Jy) and 4.75 GHz (2′.4 : S = 17 ± 4 Jy) and NRO 45-m at 10.2 GHz (2′.7 : S = 15 ± 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<sub>2</sub> IR observations.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

**G25.1–2.3**

**RA:** 18<sup>h</sup>45<sup>m</sup>10<sup>s</sup>  
**Dec:** –08°00′

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

**Size/arcmin:** 80 × 30?  
**Type:** S

**Radio:** Incomplete shell, extent not well defined.

**References:**

Gao *et al.* 2011, A&A, 532, A144. Urumqi 25-m at 5 GHz (9′.5 : S = 3.7 ± 0.4 Jy), plus other observations.

**G27.4+0.0**

**RA:** 18<sup>h</sup>41<sup>m</sup>19<sup>s</sup>  
**Dec:** –04°56′

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

4C–04.71  
**Size/arcmin:** 4  
**Type:** S

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

**Radio:** Incomplete shell.

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

**Point sources:** Central AXP.

**Distance:** HI absorption suggests 7.5 to 9.8 kpc or 5.8 kpc, and association with CO suggests 9 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  $S_{408 \text{ MHz}} = 10.4 \text{ Jy}$ , and  $S_{5 \text{ GHz}} = 1.9 \pm 0.2 \text{ Jy}$ .  
 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<sub>2</sub> 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.

**G27.8+0.6**

**RA:** 18<sup>h</sup>39<sup>m</sup>50<sup>s</sup>  
**Dec:** –04°24′

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

**Size/arcmin:** 50 × 30  
**Type:** F

**Radio:** Filled-centre, with spectral turnover.

**X-ray:** Possible pulsar wind nebula.

**References:**

Reich *et al.* 1984, A&A, 133, L4. Effelsberg 100-m at 2.7 GHz (4′3 : S = 23 ± 2 Jy), and 4.75 GHz (2′4 : S = 18 ± 2 Jy) and NRO 45-m at 10.2 GHz (smoothed to 4′3 : S = 8.5 ± 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.  $\gamma$ -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 ± 1.1 Jy) including polarisation and review of flux densities.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G28.6–0.1**

**RA:** 18<sup>h</sup>43<sup>m</sup>55<sup>s</sup>  
**Dec:** –03°53′

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

**Size/arcmin:** 13 × 9  
**Type:** S

**Radio:** Poorly defined regions of non-thermal emission.

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

**Point sources:** Pulsar in NE.

**Distance:** HI absorption and CO suggests 9.6 kpc.

**References:**

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

Ebisawa *et al.* 2005, ApJ, 635, 214. Chandra observations.  
 Zyuzin *et al.* 2018, MNRAS, 476, 2177. Pulsar observations.  
 Ranasinghe & Leahy 2018, MNRAS, 477, 2243. VGPS HI absorption, plus CO observations.

**G28.8+1.5**

**RA:** 18<sup>h</sup>39<sup>m</sup>00<sup>s</sup>  
**Dec:** –02°55′

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

**Size/arcmin:** 100?  
**Type:** S?

**Radio:** Part of rim detected.

**X-ray:** Diffuse, Centrally brightened.

**References:**

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

Misanovic *et al.* 2010, ApJ, 725, 931. XMM-Newton pulsar/wind nebula search.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G29.6+0.1**

**RA:** 18<sup>h</sup>44<sup>m</sup>52<sup>s</sup>  
**Dec:** –02°57′

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

**Size/arcmin:** 5  
**Type:** S

**Radio:** Diffuse shell.

**Point sources:** AXP associated.

**References:**

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

**G29.7–0.3**

**RA:** 18<sup>h</sup>46<sup>m</sup>25<sup>s</sup>  
**Dec:** –02°59′

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

**Kes 75**  
**Size/arcmin:** 3  
**Type:** C

Has erroneously been called G29.6+0.1.

**Radio:** Shell with flatter spectrum emission from centre.

**X-ray:** Thermal shell and non-thermal core, and central pulsar.

**Point sources:** X-ray pulsar.

**Distance:** Association with CO implies 11 kpc, and H<sub>I</sub> absorption suggests 5.6 kpc.

**References:**

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

Mereghetti *et al.* 2002, ApJ, 574, 873. BeppoSAX observations of pulsar.  
 Helfand *et al.* 2003, ApJ, 582, 783. Chandra observations.  
 Bock & Gaensler 2005, ApJ, 626, 343. BIMA at 88.6 GHz (10''×13'').  
 Morton *et al.* 2007, ApJ, 667, 219. Spitzer and Chandra observations.  
 McBride *et al.* 2008, A&A, 477, 249. INTEGRAL and Chandra observations.  
 Leahy & Tian 2008, A&A, 480, L25. VGPS at 1.4 GHz (1') including H<sub>I</sub>.  
 Kumar & Safi-Harb 2008, ApJ, 678, L43. Chandra observations.  
 Ng *et al.* 2008, ApJ, 686, 508. Chandra observations.  
 Gavriil *et al.* 2008, Science, 319, 1802. X-ray observations of pulsar.  
 Su *et al.* 2009, ApJ, 694, 376. CO observations of region, plus Chandra observations.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9'5 : S=3.6±0.6 Jy) including polarisation and review of flux densities.  
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.  
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> absorption observations.  
 Reynolds *et al.* 2018, ApJ, 856, 133. Chandra observations for expansion and brightness change studies.

**G30.7–2.0**

**RA:** 18<sup>h</sup>54<sup>m</sup>25<sup>s</sup>  
**Dec:** –02°54′

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

**Size/arcmin:** 16  
**Type:** ?

**Radio:** Poorly defined.

**References:**

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

**G30.7+1.0**

**RA:** 18<sup>h</sup>44<sup>m</sup>00<sup>s</sup>  
**Dec:** –01°32′

**1-GHz flux/Jy:** 6  
**Spectral index:** 0.4

**Size/arcmin:** 24×18  
**Type:** S?

**Radio:** Non-thermal, highly polarised part shell?

**Point sources:** Compact source near centre.

**References:**

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

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

**G31.5–0.6**

**RA:** 18<sup>h</sup>51<sup>m</sup>10<sup>s</sup>  
**Dec:** –01°31′

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

**Size/arcmin:** 18?  
**Type:** S?

Has been called G31.55–0.65.

**Radio:** Distorted shell? near HII region.

**Optical:** Diffuse, incomplete shell.

**References:**

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′4), plus other flux densities.  
 Mavromatakis *et al.* 2001, A&A, 370, 265. Optical observations.

**G31.9+0.0**

3C391

**RA:** 18<sup>h</sup>49<sup>m</sup>25<sup>s</sup>  
**Dec:** –00°55′**1-GHz flux/Jy:** 25  
**Spectral index:** varies**Size/arcmin:** 7×5  
**Type:** S**Radio:** Shell, brightest in NW, with low frequency turnover.**X-ray:** Diffuse with central core.**Distance:** H<sub>I</sub> absorption and CO association suggests 7.1 kpc.**References:**

Radhakrishnan *et al.* 1972, ApJS, 24, 49. H<sub>I</sub> 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<sup>+</sup> 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, IAU, 296, 178. CO observations.  
 Su *et al.* 2014, IAU, 296, 372. VGPS for H<sub>I</sub> 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<sub>2</sub> IR observations.  
 Kilpatrick *et al.* 2016, ApJ, 816, 1. CO observations, including broad lines.  
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).  
 Ranasinghe & Leahy 2017, ApJ, 843, 119. H<sub>I</sub> and CO observations.

**G32.0–4.9**

3C396.1

**RA:** 19<sup>h</sup>06<sup>m</sup>00<sup>s</sup>  
**Dec:** –03°00′**1-GHz flux/Jy:** 22?  
**Spectral index:** 0.5?**Size/arcmin:** 60?  
**Type:** S?**Radio:** Possible large shell?**References:**

Milne & Hill 1969, AuJPh, 22, 211. Parkes 64-m at 635 MHz (31′:  $S = 25 \pm 30\%$  Jy), 1410 MHz (15′:  $S = 19 \pm 15\%$  Jy) and 2650 MHz (8.4:  $S = 8.6 \pm 30\%$  Jy). Fluxes if size is 60′, plus review of flux densities.

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

**G32.1–0.9****RA:** 18<sup>h</sup>53<sup>m</sup>10<sup>s</sup>  
**Dec:** –01°08′**1-GHz flux/Jy:** ?  
**Spectral index:** ?**Size/arcmin:** 40?  
**Type:** C?**Radio:** Possible faint shell, not well defined.**X-ray:** Diffuse, with clumps.**References:**

Folgheraiter *et al.* 1997, MNRAS, 292, 365. ROSAT and ASCA observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G32.4+0.1**

**RA:** 18<sup>h</sup>50<sup>m</sup>05<sup>s</sup>  
**Dec:** –00°25′

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

**Size/arcmin:** 6  
**Type:** S

Has been called G32.45+0.1.

**Radio:** Shell.

**X-ray:** Shell.

**Distance:** X-ray absorption suggests 17 kpc.

**References:**

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

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

**G32.8–0.1**

**RA:** 18<sup>h</sup>51<sup>m</sup>25<sup>s</sup>  
**Dec:** –00°08′

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

**Size/arcmin:** 22×15  
**Type:** S?  
 Kes 78

Part has been called G33.1–0.1.

**Radio:** Incomplete, elongated shell.

**Optical:** Detected.

**X-ray:** Patchy, elongated shell.

**Distance:** Association with CO and H<sub>I</sub> absorption indicate 4.8 kpc.

**References:**

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ( $S' : S = 7.2 \pm 0.5$  Jy).  
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo at 430 MHz ( $S = 19.0 \pm 15.5$  Jy).  
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz ( $3'$ ).  
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz ( $3' : S = 12.8$  Jy) and Parkes 64-m at 5 GHz ( $4' : S = 7.7$  Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ( $2.6$ ).  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ( $3.6 \times 3.8 : S = 31.3$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Koralesky *et al.* 1998, AJ, 116, 1323. VLA detection of compact OH emission.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  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<sub>2</sub> 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 H<sub>I</sub> absorption observations.

**G33.2–0.6**

**RA:** 18<sup>h</sup>53<sup>m</sup>50<sup>s</sup>  
**Dec:** –00°02′

**1-GHz flux/Jy:** 3.5  
**Spectral index:** varies

**Size/arcmin:** 18  
**Type:** S

**Radio:** Incomplete shell.

**Optical:** Filaments and diffuse emission.

**References:**

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ( $2.6$ ).  
 Reich 1982, A&A, 106, 314. Effelsberg 100-m at 2.7 GHz ( $4.4 : S = 2.6 \pm 0.3$  Jy) and 4.75 GHz ( $2.5 : S = 1.75 \pm 0.2$  Jy).  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz ( $52'' \times 68'' : S = 2.7 \pm 0.3$  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<sub>2</sub> IR observations.

**G33.6+0.1**

**RA:** 18<sup>h</sup>52<sup>m</sup>48<sup>s</sup>  
**Dec:** +00°41′

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

Kes 79, 4C00.70, HC13

**Size/arcmin:** 10  
**Type:** S

Has been called G33.7+0.0.

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

**X-ray:** Multiple shells and filaments.

**Point sources:** Central X-ray pulsar.

**Distance:** H<sub>I</sub> absorption suggests 7.8 kpc 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. H<sub>I</sub> absorption.  
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo  $S_{430}$  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 H<sub>I</sub> absorption to nearby point source, possibly extragalactic.  
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source, plus Einstein observations.  
 Green 1989, MNRAS, 238, 737. OH absorption.  
 Frail & Clifton 1989, ApJ, 336, 854. VLA at 1.4 GHz ( $1'\times 2'9$ ), including H<sub>I</sub> absorption.  
 Velusamy *et al.* 1991, AJ, 102, 676. VLA at 327 MHz ( $1'$ ), 1.5 ( $7''\times 14''$ ) and 5 GHz ( $7''$ ), including spectral comparison.  
 Green & Dewdney 1992, MNRAS, 254, 686. Observations of adjacent molecular material.  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz ( $3'6\times 3'8$ :  $S=34.8$  Jy).  
 Seward & Velusamy 1995, ApJ, 439, 715. ROSAT observations.  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.  
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.  
 Tsunemi & Enoguchi 2002, PASJ, 54, 735. ASCA observations.  
 Seward *et al.* 2003, ApJ, 584, 414. Chandra observations.  
 Stanimirović 2003, ApJ, 592, 953. Arecibo OH absorption.  
 Sun *et al.* 2004, ApJ, 605, 742. Chandra observations.  
 Gotthelf *et al.* 2005, ApJ, 627, 390. XMM-Newton pulsar detection.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.  
 Halpern *et al.* 2007, ApJ, 665, 1304. X-ray pulsar timing observations.  
 Giacani *et al.* 2009, A&A, 507, 841. VLA at 74 MHz ( $36''\times 39''$ :  $S=76\pm 10$  Jy), 324 MHz ( $13''$ :  $S=39\pm 8$  Jy) and 1.5 GHz ( $17''\times 19''$ :  $S=11.5\pm 1.5$  Jy), plus review of flux densities and XMM-Newton observations.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ( $9'5$ :  $S=9.4\pm 0.5$  Jy) including polarisation and review of flux densities.  
 Auchettl *et al.* 2014, ApJ, 783, 32. 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 H<sub>I</sub> absorption observations.  
 Kuriki *et al.* 2018, ApJ, 864, 161. CO observations.

**G34.7–0.4**

**RA:** 18<sup>h</sup>56<sup>m</sup>00<sup>s</sup>  
**Dec:** +01°22′

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

W44, 3C392

**Size/arcmin:** 35×27  
**Type:** C

Has been called G34.6–0.5.

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

**Optical:** Diffuse emission.

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

**Point sources:** Pulsar within the boundary of the remnant.

**Distance:** H<sub>I</sub> absorption suggests 3.0 kpc, and optical absorption suggests 2.1 kpc.

**References:**

- Caswell *et al.* 1975, A&A, 45, 239. H<sub>I</sub> absorption.  
 Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 299 Jy).  
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo S<sub>430</sub> MHz = 540±187 Jy.  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).  
 Smith *et al.* 1985, MNRAS, 217, 99. Einstein observations.  
 Wolszczan *et al.* 1991, ApJ, 372, L99. Pulsar detection.  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3′6×3′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. H<sub>I</sub> of surrounding shell.  
 Esposito *et al.* 1996, ApJ, 461, 820. Possible associated  $\gamma$ -ray emission.  
 Harrus *et al.* 1996, ApJ, 464, L161. ASCA observations.  
 Frail *et al.* 1996, ApJ, 464, L165. VLA at 1.5 and 8.4 GHz (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.  $\gamma$ -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 H<sub>I</sub> observations of region.  
 Sashida *et al.* 2013, ApJ, 774, 10. HCO<sup>+</sup> and CO observations of region.  
 Park *et al.* 2013, ApJ, 777, 14. Arecibo H<sub>I</sub> 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 H<sub>I</sub> absorption.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.  
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 30, 44 and 70 GHz.  
 Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).  
 McEwen *et al.* 2016, ApJ, 826, 189. NH<sub>3</sub> and CH<sub>3</sub>OH 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<sup>+</sup> observations.  
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> absorption observations.

**G35.6–0.4**

**RA:** 18<sup>h</sup>57<sup>m</sup>55<sup>s</sup>  
**Dec:** +02°13′

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

**Size/arcmin:** 15×11  
**Type:** S?

Re-identified as SNR in 2009.

**Radio:** Diffuse, with some limb brightening.

**Distance:** 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<sup>″</sup>8×12<sup>″</sup>2).  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.

**G36.6–0.7**

**RA:** 19<sup>h</sup>00<sup>m</sup>35<sup>s</sup>  
**Dec:** +02°56′

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

**Size/arcmin:** 25?  
**Type:** S?

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

**References:**

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2<sup>′</sup>4), plus other flux densities.  
 Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3<sup>′</sup>4×3<sup>′</sup>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<sup>′</sup>5 : S = 0.39±0.04 Jy) including polarisation and review of flux densities.

**G36.6+2.6**

**RA:** 18<sup>h</sup>48<sup>m</sup>49<sup>s</sup>  
**Dec:** +04°26′

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

**Size/arcmin:** 17×13?  
**Type:** S

**Radio:** Poorly resolved shell.

**References:**

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

**G38.7–1.3**

**RA:** 19<sup>h</sup>06<sup>m</sup>40<sup>s</sup>  
**Dec:** +04°28′

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

**Size/arcmin:** 32×19?  
**Type:** S

G38.7–1.4 refers to the E portion.

**Radio:** Incomplete shell.

**Optical:** Arc of filaments, brighter to E.

**X-ray:** Detected in E.

**References:**

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

Huang *et al.* 2014, ApJ, 785, 118. XMM-Newton and Chandra observations.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H<sub>2</sub> IR observations.

**G39.2–0.3**

**RA:** 19<sup>h</sup>04<sup>m</sup>08<sup>s</sup>  
**Dec:** +05°28′

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

3C396, HC24, NRAO 593

**Size/arcmin:** 8×6  
**Type:** C

**Radio:** Shell, brighter to W, with faint ‘tail’ to E.

**X-ray:** Diffuse, brighter to W, with central core.

**Point sources:** Central X-ray source.

**Distance:** H<sub>I</sub> absorption suggests 8.5 kpc.

**References:**

- Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′).  
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo  $S_{430}$  MHz =  $54 \pm 38$  Jy.  
 Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′ :  $S = 4.1 \pm 1.0$  Jy).  
 Caswell *et al.* 1975, A&A, 45, 239. H<sub>I</sub> 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. HESS 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<sub>2</sub> 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 H<sub>I</sub> absorption observations.

**G39.7–2.0**

**RA:** 19<sup>h</sup>12<sup>m</sup>20<sup>s</sup>  
**Dec:** +04°55′

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

W50, SS433

**Size/arcmin:** 120×60  
**Type:** ?

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

**Radio:** Elongated shell, containing SS433, adjacent to the HII region S74.

**Optical:** Faint filaments at the edge of the radio emission.

**X-ray:** Emission from SS433 and two lobes.

**Point sources:** SS433 is the compact source in the centre of the W50.

**Distance:** HI absorption and CO observations indicate 4.9 kpc.

**References:**

van den Bergh 1980, ApJ, 236, L23. Optical in H $\alpha$  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. HESS 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 H $\alpha$  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.

**G40.5–0.5**

**RA:** 19<sup>h</sup>07<sup>m</sup>10<sup>s</sup>  
**Dec:** +06°31′

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

**Size/arcmin:** 22  
**Type:** S

**Radio:** Shell, brightest to the NE.

**Point sources:** Central pulsar.

**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. HESS limit.  
 Yang *et al.* 2006, ChJAA, 6, 210. CO observations of surroundings.

Abdo *et al.* 2007, ApJ, 664, L91.  $\gamma$ -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.  $\gamma$ -ray observations of region.  
 Lyne *et al.* 2017, ApJ, 834, 137. Pulsar detection.

**G41.1–0.3**

3C397

**RA:** 19<sup>h</sup>07<sup>m</sup>34<sup>s</sup>  
**Dec:** +07°08′**1-GHz flux/Jy:** 25  
**Spectral index:** 0.50**Size/arcmin:** 4.5×2.5  
**Type:** S**Radio:** 3C397 is two sources: the E is the SNR, the W is a HII region.**X-ray:** Brighter to the E and W, with central component.**Distance:** HI absorption suggest 8.5 kpc.**References:**

- Kundu *et al.* 1974, AJ, 79, 132. NRAO 140-ft at 10 GHz (3′) and 5 GHz (6′).  
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′:  $S=21.3\pm 1.2$  Jy for both components).  
 Caswell *et al.* 1975, A&A, 45, 239. HI absorption.  
 Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo  $S_{430}$  MHz =  $82\pm 51$  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. HESS 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.

**G41.5+0.4****RA:** 19<sup>h</sup>05<sup>m</sup>50<sup>s</sup>  
**Dec:** +07°46′**1-GHz flux/Jy:** 1?  
**Spectral index:** ?**Size/arcmin:** 10  
**Type:** S?**Radio:** Partial clumpy shell, brighter to NE.**References:**

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

**G42.0–0.1****RA:** 19<sup>h</sup>08<sup>m</sup>10<sup>s</sup>  
**Dec:** +08°00′**1-GHz flux/Jy:** 0.5?  
**Spectral index:** ?**Size/arcmin:** 8  
**Type:** S?**Radio:** Irregular shell.**References:**

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

**G42.8+0.6**

**RA:** 19<sup>h</sup>07<sup>m</sup>20<sup>s</sup>  
**Dec:** +09°05′

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

**Size/arcmin:** 24  
**Type:** S

Has been called G42.8+0.65.

**Radio:** Faint shell.

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

**References:**

- Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′4″:  $S=1.5\pm 0.2$  Jy), plus other flux densities.  
 Vasisht *et al.* 1994, ApJ, 431, L35. VLA at 327 MHz (3′2″×3′4″).  
 Hurley *et al.* 1996, ApJ, 463, L13. Observations of soft gamma repeater field.
- Lorimer & Xilouris 2000, ApJ, 545, 385. Pulsar detection.  
 Aharonian *et al.* 2001, A&A, 375, 1008. HESS limit.  
 Kaplan *et al.* 2002, ApJ, 566, 378. VLA at 333 MHz (50″), and other observations of the region.

**G43.3–0.2**

**RA:** 19<sup>h</sup>11<sup>m</sup>08<sup>s</sup>  
**Dec:** +09°06′

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

**W49B**  
**Size/arcmin:** 4×3  
**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.

**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. HESS 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<sub>2</sub> 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).  
 Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS HI absorption observations.  
 Abdalla *et al.* 2018, A&A, 612, A5. HESS 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.

**G43.9+1.6**

**RA:** 19<sup>h</sup>05<sup>m</sup>50<sup>s</sup>  
**Dec:** +10°30′

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

**Size/arcmin:** 60?  
**Type:** S?

**Radio:** Large, poorly defined faint shell.

**Point sources:** Soft gamma repeater nearby.

**References:**

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

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

**G45.7–0.4**

**RA:** 19<sup>h</sup>16<sup>m</sup>25<sup>s</sup>  
**Dec:** +11°09′

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

**Size/arcmin:** 22  
**Type:** S

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

**References:**

Fürst *et al.* 1987, A&AS, 69, 403. Effelsberg 100-m at 4.75 GHz (2′4 : S = 2.6±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.

**G46.8–0.3**

**RA:** 19<sup>h</sup>18<sup>m</sup>10<sup>s</sup>  
**Dec:** +12°09′

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

(HC30)  
**Size/arcmin:** 15  
**Type:** S

Has been called G46.6–0.2.

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

**Distance:** H<sub>I</sub> absorption suggests 5.7 to 11.4 kpc.

**References:**

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

Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2′6).  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (53″×58″ : S = 13.3±0.1 Jy).  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 : S = 7.02±0.18 Jy) including polarisation and review of flux densities.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> absorption observations.

**G49.2–0.7**

(W51)

**RA:** 19<sup>h</sup>23<sup>m</sup>50<sup>s</sup>  
**Dec:** +14°06′**1-GHz flux/Jy:** 160?  
**Spectral index:** 0.3?**Size/arcmin:** 30  
**Type:** S?

Has erroneously been called G49.1–0.1.

**Radio:** In complex region, parameters uncertain.**Optical:** Some diffuse emission possibly associated.**X-ray:** Elongated east–west.**Distance:** Association with CO gives 6 kpc, optical absorption suggests 5.7 kpc, and H $\alpha$  absorption suggests 5.4 kpc.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Parkes 64-m at 5 GHz (4').

Sato 1973, PASJ, 25, 135. H $\alpha$  absorption.

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5'),  $S=51.5\pm 3.2$  Jy, for the non-thermal component, but probably confused.

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

Seward 1990, ApJS, 73, 781. Einstein observations.

Copetti & Schmidt 1991, MNRAS, 250, 127. 151 MHz observations.

Kassim 1992, AJ, 103, 943. VLA at 327 MHz (3'1×3'5).

Subrahmanyan & Goss 1995, MNRAS, 275, 755. VLA at 330 MHz (1'1).

Koo *et al.* 1995, ApJ, 447, 211. ROSAT observations.

Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.

Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.

Green *et al.* 1997, AJ, 114, 2058. OH masers.

Koo & Moon 1997, ApJ, 475, 194. Arecibo (3') and VLA (40''×42'') at 1.4 GHz for H $\alpha$ .

Koo & Moon 1997, ApJ, 485, 263. NRAO 12-m CO and HCO<sup>+</sup> observations.

Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.

Mavromatakis *et al.* 2001, A&A, 370, 265. Optical observations.

Koo *et al.* 2002, AJ, 123, 1629. ASCA observations.

Koo *et al.* 2005, ApJ, 633, 946. Chandra observations.

Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity H $\alpha$ .

Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.

Abdo *et al.* 2009, ApJ, 706, L1. Fermi observations.

Koo *et al.* 2010, AJ, 140, 262. H $\alpha$  Zeeman splitting observations.

Ceccarelli *et al.* 2011, ApJ, 740, L4. Molecular line observations of region.

Aleksić *et al.* 2012, A&A, 541, A13.  $\gamma$ -ray observations.

Hanabata *et al.* 2013, PASJ, 65, 42. Suzaku observations.

Tian & Leahy 2013, ApJ, 769, L17. H $\alpha$  observations of region.

Brogan *et al.* 2013, ApJ, 771, 91. VLA at 74 MHz (84''×92'') and 320 MHz (33''×35''), plus OH, molecular line and other observations.

Park *et al.* 2013, ApJ, 777, 14. Arecibo of H $\alpha$  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 $_3$ OH observations.

Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

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

Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H $\alpha$  absorption observations.

**G53.4+0.0****RA:** 19<sup>h</sup>29<sup>m</sup>57<sup>s</sup>  
**Dec:** +18°10′**1-GHz flux/Jy:** 1.5  
**Spectral index:** 0.6?**Size/arcmin:** 10?  
**Type:** S

Has been called G53.41+0.03.

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

Anderson *et al.* 2017, A&A, 605, A58. VLA at 1 to 2 GHz.

Drissen *et al.* 2018, ApJ, 860, 133. LOFAR at 140 MHz, plus other radio observations, and XMM-Newton observations.

**G53.6–2.2**

**RA:** 19<sup>h</sup>38<sup>m</sup>50<sup>s</sup>  
**Dec:** +17°14′

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

3C400.2, NRAO 611

**Size/arcmin:** 33×28  
**Type:** S

Has been called G53.7–2.2.

**Radio:** Ring of emission, with extension to NW.

**Optical:** Filaments and diffuse emission.

**X-ray:** Centrally brightened, offset to NW.

**Distance:** Association with H<sub>I</sub> gives 2.8 kpc.

**References:**

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

Winkler *et al.* 1993, ApJ, 405, 608. Optical imaging.  
 Dubner *et al.* 1994, AJ, 108, 207. VLA at 327 MHz ( $59''$ ) and 1.49 GHz ( $52''$ ), plus X-rays.  
 Saken *et al.* 1995, ApJ, 443, 231. ROSAT observations.  
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.  
 Giacani *et al.* 1998, A&AS, 133, 61. DRAO at 1.4 GHz for H<sub>I</sub> 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.

**G54.1+0.3**

**RA:** 19<sup>h</sup>30<sup>m</sup>31<sup>s</sup>  
**Dec:** +18°52′

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

**Size/arcmin:** 12?  
**Type:** C?

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

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

**Point sources:** Central pulsar.

**Distance:** H<sub>I</sub> absorption suggests 4.9, association with CO suggests 8.2 kpc, and optical absorption suggests 6.3 kpc.

**References:**

Green 1985, MNRAS, 216, 691. Radio at 2.7 GHz ( $7'' \times 20''$ ).  
 Reich *et al.* 1985, A&A, 151, L10. Effelsberg 100-m at 4.75 GHz ( $2'4 : S = 0.37 \pm 0.04$  Jy)  
 Velusamy & Becker 1988, AJ, 95, 1162. VLA at 1.4 ( $14'' : S = 0.48 \pm 0.03$  Jy), 1.6 ( $14'' : S = 0.42 \pm 0.03$  Jy) and 5 GHz ( $5'' : S = 0.33 \pm 0.02$  Jy), Ooty at 327 MHz ( $S = 0.50 \pm 0.08$  Jy), plus review of flux densities.  
 Seward 1989, AJ, 97, 481. Einstein observations.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Lu *et al.* 2001, A&A, 370, 570. ROSAT and ASCA observations.  
 Lu *et al.* 2002, ApJ, 568, L49. Chandra observations.  
 Camilo *et al.* 2002, ApJ, 574, L71. Pulsar detection.  
 Kaplan & Moon 2006, ApJ, 644, 1056. IR upper limit for pulsar.  
 Leahy *et al.* 2008, AJ, 136, 1477. VGPS at 1.4 GHz ( $1'$ ) including H<sub>I</sub>.  
 Koo *et al.* 2008, ApJ, 673, L147. Akari observations of surroundings.

Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.  
 Bocchino *et al.* 2010, A&A, 520, A71. XMM-Newton and Suzaku observations.  
 Lang *et al.* 2010, ApJ, 709, 1125. VLA at 1.4 GHz ( $6''6 \times 6''8$ ), 4.7 GHz ( $3''2 \times 3''3$ ), and 8.2 GHz ( $3''0 \times 3''2$ ) and Spitzer observations.  
 Acciari *et al.* 2010, ApJ, 719, L69.  $\gamma$ -ray observations.  
 Lee *et al.* 2012, JKAS, 45, 117. CO observations of region.  
 Krivonos *et al.* 2017, MNRAS, 470, 512. INTEGRAL observations.  
 Temim *et al.* 2017, ApJ, 836, 129. Spitzer, Herschel and Akari observations.  
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.  
 Ranasinghe & Leahy 2018, AJ, 155, 204. VGPS H<sub>I</sub> 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.

**G54.4–0.3**

(HC40)

**RA:** 19<sup>h</sup>33<sup>m</sup>20<sup>s</sup>  
**Dec:** +18°56′**1-GHz flux/Jy:** 28  
**Spectral index:** 0.5**Size/arcmin:** 40  
**Type:** S

Has been called G54.5–0.3.

**Radio:** Shell, in complex region.**Optical:** Faint filaments.**Point sources:** Pulsar outside NW rim.**Distance:** HI and CO observations suggest 6.6 kpc.**References:**

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ( $5' : S = 34.4 \pm 5.0$  Jy).  
 Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz ( $2'6$ ).  
 Caswell 1985, AJ, 90, 1224. DRAO at 1.4 GHz ( $1'3 \times 2'6 : S = 18 \pm 4$  Jy).  
 Velusamy *et al.* 1986, JApA, 7, 105. WSRT at 609 MHz ( $50'' \times 191''$  smoothed to  $100'' \times 200''$ ).  
 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<sub>2</sub> IR observations.  
 Karpova *et al.* 2017, MNRAS, 466, 1757. X-ray observations of pulsar.  
 Ranasinghe & Leahy 2017, ApJ, 843, 119. HI and CO observations.

**G55.0+0.3****RA:** 19<sup>h</sup>32<sup>m</sup>00<sup>s</sup>  
**Dec:** +19°50′**1-GHz flux/Jy:** 0.5?  
**Spectral index:** 0.5?**Size/arcmin:** 20×15?  
**Type:** S

Has been called G55.2+0.5.

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

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz ( $1'0 \times 2'5$ ), and northern sky survey at 4.9 GHz.

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

**G55.7+3.4****RA:** 19<sup>h</sup>21<sup>m</sup>20<sup>s</sup>  
**Dec:** +21°44′**1-GHz flux/Jy:** 1?  
**Spectral index:** 0.3?**Size/arcmin:** 23  
**Type:** S**Radio:** Incomplete shell.**Point sources:** Old pulsar within the boundary of the remnant.**References:**

Goss *et al.* 1977, A&A, 61, 93. WSRT observations at 610 MHz ( $57'' \times 156'' : S = 1.9 \pm 0.2$  Jy) and 1415 MHz ( $27'' \times 72'' : S = 1.0 \pm 0.1$  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.

|  |   |  |                        |
|--|---|--|------------------------|
| <b>G57.2+0.8</b>   |   |  | (4C21.53)              |
| <b>RA:</b> 19 <sup>h</sup> 34 <sup>m</sup> 59 <sup>s</sup><br><b>Dec:</b> +21°57′  | <b>1-GHz flux/Jy:</b> 1.8<br><b>Spectral index:</b> 0.35  | <b>Size/arcmin:</b> 12?<br><b>Type:</b> S?   |                        |
| <b>Radio:</b> Extended non-thermal arc.  |   |  |                        |
| <b>Point sources:</b> Central magnetar.  |   |  |                        |
| <b>Distance:</b> HI observations suggest 12.5 kpc.   |   |  |                        |
| <b>References:</b>   |   |  |                        |
| 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.                             |   | Surnis <i>et al.</i> 2016, ApJ, 826, 184. GMRT at 610 MHz and VLA at 1.4 GHz.  |                        |
| Caswell <i>et al.</i> 1985, AJ, 90, 488. DRAO at 1.4 GHz (1′×3′).  |   | Israel <i>et al.</i> 2016, MNRAS, 457, 3448. Chandra, XMM-Newton and Swift observations of magnetar.   |                        |
| Hurley-Walker <i>et al.</i> 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.   |   | Kothes <i>et al.</i> 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. |                        |
| Sun <i>et al.</i> 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: S = 0.74±0.04 Jy) including polarisation and review of flux densities.                                  |   |  |                        |
| <hr/>  |   |  |                        |
| <b>G59.5+0.1</b>   |   |  | <b>Size/arcmin:</b> 15 |
| <b>RA:</b> 19 <sup>h</sup> 42 <sup>m</sup> 33 <sup>s</sup><br><b>Dec:</b> +23°35′  | <b>1-GHz flux/Jy:</b> 3?<br><b>Spectral index:</b> ?      | <b>Type:</b> S   |                        |
| Has been called G59.6+0.1.   |   |  |                        |
| <b>Radio:</b> Incomplete shell.  |   |  |                        |
| <b>Optical:</b> Diffuse shell.   |   |  |                        |
| <b>References:</b>   |   |  |                        |
| Taylor <i>et al.</i> 1992, AJ, 103, 931. WSRT at 327 MHz (1′0″×2′5″: S = 5.1±0.2 Jy), and northern sky survey at 4.9 GHz.  |   | Gök <i>et al.</i> 2008, Ap&SS, 318, 207. Optical observations.   |                        |
| Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.  |   | Hurley-Walker <i>et al.</i> 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.   |                        |
|  |   | Xu & Wang 2012, A&A, 543, A24. CO observations of SE.  |                        |
| <hr/>  |   |  |                        |
| <b>G63.7+1.1</b>   |   |  | <b>Size/arcmin:</b> 8  |
| <b>RA:</b> 19 <sup>h</sup> 47 <sup>m</sup> 52 <sup>s</sup><br><b>Dec:</b> +27°45′  | <b>1-GHz flux/Jy:</b> 1.8<br><b>Spectral index:</b> 0.24  | <b>Type:</b> F   |                        |
| <b>Radio:</b> Centrally brightened, with core.   |   |  |                        |
| <b>X-ray:</b> Diffuse emission.  |   |  |                        |
| <b>References:</b>   |   |  |                        |
| Taylor <i>et al.</i> 1992, AJ, 103, 931. WSRT at 327 MHz (1′0″×2′2″), and northern sky survey at 4.9 GHz.  |   | Sun <i>et al.</i> 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: S = 1.12±0.06 Jy) including polarisation and review of flux densities.                    |                        |
| Wallace <i>et al.</i> 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. |   | Matheson <i>et al.</i> 2016, ApJ, 825, 134. XMM-Newton and Chandra observations.   |                        |
| Hurley-Walker <i>et al.</i> 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.   |   |  |                        |
| <hr/>  |   |  |                        |
| <b>G64.5+0.9</b>   |   |  | <b>Size/arcmin:</b> 8  |
| <b>RA:</b> 19 <sup>h</sup> 50 <sup>m</sup> 25 <sup>s</sup><br><b>Dec:</b> +28°16′  | <b>1-GHz flux/Jy:</b> 0.15?<br><b>Spectral index:</b> 0.5 | <b>Type:</b> S?  |                        |
| <b>Radio:</b> Shell with central source.   |   |  |                        |
| <b>Optical:</b> Filaments in N and W.  |   |  |                        |
| <b>References:</b>   |   |  |                        |
| Hurley-Walker <i>et al.</i> 2009, MNRAS, 398, 249. Radio identification.   |   |  |                        |
| Neustadt <i>et al.</i> 2017, MNRAS, 469, 516. Optical observations.  |   |  |                        |

**G65.1+0.6**

**RA:** 19<sup>h</sup>54<sup>m</sup>40<sup>s</sup>  
**Dec:** +28°35′

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

**Size/arcmin:** 90×50  
**Type:** S

**Radio:** Large, faint shell.

**Point sources:** Old pulsar nearby.

**Distance:** Possible association with H<sub>I</sub> suggests 9 kpc.

**References:**

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

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$  :  $S = 9.1 \pm 1.0$  Jy) and 1420 MHz ( $\sim 1'$  :  $S = 3.9 \pm 0.5$  Jy), including review of flux densities.  
 Aleksić *et al.* 2010, ApJ, 725, 1629.  $\gamma$ -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<sub>2</sub> IR observations.

**G65.3+5.7**

**RA:** 19<sup>h</sup>33<sup>m</sup>00<sup>s</sup>  
**Dec:** +31°10′

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

**Size/arcmin:** 310×240  
**Type:** S?

Has been called G65.2+5.7.

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

**Optical:** Filamentary ring.

**X-ray:** Diffuse, centrally brightened.

**Distance:** Optical proper motions and velocities indicates 0.8 kpc.

**References:**

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

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

**G65.7+1.2**

**RA:** 19<sup>h</sup>52<sup>m</sup>10<sup>s</sup>  
**Dec:** +29°26′

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

DA 495

**Size/arcmin:** 22  
**Type:** F

Has mistakenly been called G55.7+1.2.

**Radio:** Centrally brightened with thick shell?

**X-ray:** Centrally brightened.

**Point sources:** Compact X-ray source near centre.

**Distance:** HI polarisation observations suggest 1.5 kpc.

**References:**

Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz ( $5' : S = 2.8 \pm 0.4$  Jy), and 37-m at 1.7 GHz ( $S = 4.4 \pm 0.5$  Jy), plus review of flux densities.

see also: Willis 1973, A&A, 27, 483. Erratum.

Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo  $S_{430}$  MHz =

$8.7 \pm 4.9$  Jy,  $S_{318}$  MHz =  $9.7 \pm 2.2$  Jy.

Landecker & Caswell 1983, AJ, 88, 1810. DRAO at 1.4 GHz

( $0'9 \times 1'5 : S = 4.4 \pm 0.2$  Jy).

Velusamy *et al.* 1989, JApA, 10, 161. Ooty at 327 MHz

( $36'' \times 64''$ ), WSRT at 610 MHz ( $62''$ ) and VLA at 1.4 GHz

( $36''$  and  $12''$ ), including IRAS imaging.

Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.

Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.

Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.

Kothes *et al.* 2004, ApJ, 607, 855. HI polarisation absorption.

Arzoumanian *et al.* 2004, ApJ, 610, L101. ROSAT and ASCA observations of compact source.

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3' : S = 6.5 \pm 0.6$  Jy) and 1420 MHz ( $\sim 1' : S = 4.0 \pm 0.2$  Jy), including polarisation and review of flux densities.

Arzoumanian *et al.* 2008, ApJ, 687, 505. Chandra observations.

Kothes *et al.* 2008, ApJ, 687, 516. CGPS at 408 MHz ( $2'9 \times 6'0 : S = 6.5 \pm 0.5$  Jy) and 1.4 GHz ( $0'82 \times 1'75 : S = 4.0 \pm 0.2$  Jy), Effelsberg 100-m at 4.85 GHz ( $2'45 : S = 1.6 \pm 0.1$  Jy) and 10.55 GHz (smoothed to  $2'45 : S = 1.1 \pm 0.1$  Jy), plus review of flux densities.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ( $9'5 : S = 1.95 \pm 0.10$  Jy) including polarisation and review of flux densities.

Karpova *et al.* 2015, MNRAS, 453, 2241. Chandra and XMM-Newton observations.

**G66.0–0.0**

**RA:** 19<sup>h</sup>57<sup>m</sup>50<sup>s</sup>  
**Dec:** +29°03′

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

**Size/arcmin:** 31×25?  
**Type:** S

**Radio:** Some emission in N.

**Optical:** Incomplete shell.

**Distance:** Optical absorption suggests 2.3 kpc.

**References:**

Sabin *et al.* 2013, MNRAS, 431, 279. H $\alpha$  and radio survey observations.

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

**G67.6+0.9**

**RA:** 19<sup>h</sup>57<sup>m</sup>45<sup>s</sup>  
**Dec:** +30°53′

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

**Size/arcmin:** 50×45?  
**Type:** S

**Radio:** Arc in S.

**Optical:** Filamentary shell.

**Distance:** Optical absorption suggests 2.0 kpc.

**References:**

Sabin *et al.* 2013, MNRAS, 431, 279. H $\alpha$  and radio survey observations.

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

**G67.7+1.8**

**RA:** 19<sup>h</sup>54<sup>m</sup>32<sup>s</sup>  
**Dec:** +31°29′

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

**Size/arcmin:** 15×12  
**Type:** S

**Radio:** Double arc shell.

**Optical:** Filaments in N.

**X-ray:** Detected.

**Point sources:** Compact X-ray source.

**Distance:** Optical absorption suggests 1.5–5.7 kpc.

**References:**

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′0×1′9 :  
 $S = 1.9 \pm 0.1$  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 observa-  
 tions.

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$  :  
 $S = 1.1 \pm 0.1$  Jy) and 1420 MHz ( $\sim 1'$  :  $S = 0.68 \pm 0.04$  Jy), in-  
 cluding polarisation and review of flux densities.

Gök *et al.* 2008, Ap&SS, 318, 207. Optical observations.

Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observa-  
 tions at 14 to 18 GHz.

Hui & Becker 2009, A&A, 494, 1005. Chandra observations.

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :  
 $S = 0.30 \pm 0.03$  Jy) including polarisation and review of flux  
 densities.

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

**G67.8+0.5**

**RA:** 20<sup>h</sup>00<sup>m</sup>00<sup>s</sup>  
**Dec:** +30°51′

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

**Size/arcmin:** 7×5  
**Type:** ?

**Radio:** Poorly resolved arc.

**Optical:** Diffuse shell, brighter to W.

**References:**

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

**G68.6–1.2**

**RA:** 20<sup>h</sup>08<sup>m</sup>40<sup>s</sup>  
**Dec:** +30°37′

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

**Size/arcmin:** 23  
**Type:** ?

**Radio:** Faint, poorly defined source.

**References:**

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.

Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz  
 (4′3), including polarisation.

Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz  
 (4′3).

Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.

Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 1420 MHz ( $\sim 1'$  :  
 $S = 0.57 \pm 0.08$  Jy), including review of flux densities

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :  
 $S = 0.80 \pm 0.04$  Jy), including polarisation and review of flux  
 densities.

**G69.0+2.7**

CTB 80

**RA:** 19<sup>h</sup>53<sup>m</sup>20<sup>s</sup>  
**Dec:** +32°55′**1-GHz flux/Jy:** 120?  
**Spectral index:** varies**Size/arcmin:** 80?  
**Type:** ?

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

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

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

**X-ray:** Diffuse emission with compact source.

**Point sources:** Pulsar at western edge of core.

**Distance:** HI observations suggest 1.5 kpc, 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.  $\gamma$ -ray observations of pulsar.
- Mavromatakis *et al.* 2001, A&A, 371, 300. Optical observations.
- Butler *et al.* 2002, A&A, 395, 845. HST detection of pulsar.
- Migliazzo *et al.* 2002, ApJ, 567, L141. Pulsar proper motion study.
- Castelletti *et al.* 2003, AJ, 126, 2114. GMRT at 240 and 618 MHz (17''×26'' and 6''×10'') and VLA at 324 and 1380 MHz (63''×73'' and 78''×93'').
- Moon *et al.* 2004, ApJ, 610, L33. Chandra and HST observations of core.
- Li *et al.* 2005, ApJ, 628, 931. Chandra observations of pulsar and surroundings.
- Golden *et al.* 2005, ApJ, 635, L153. High resolution radio observations of pulsar and surroundings.
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$  : S = 72±7 Jy) and 1420 MHz ( $\sim 1'$  : S = 56±5 Jy), including polarisation and review of flux densities.
- Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.
- Albert *et al.* 2007, ApJ, 669, 1143.  $\gamma$ -ray observations.
- Zeiger *et al.* 2008, ApJ, 674, 271. Proper motion of pulsar.
- Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9'5 : S = 36±4 Jy), including polarisation and review of flux densities.
- Leahy & Ranasinghe 2012, MNRAS, 423, 718. CGPS at 1.4 GHz, including HI, plus ROSAT observations.
- Park *et al.* 2013, ApJ, 777, 14. Arecibo of HI in region.
- 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.

**G69.7+1.0****RA:** 20<sup>h</sup>02<sup>m</sup>40<sup>s</sup>  
**Dec:** +32°43′**1-GHz flux/Jy:** 2.0  
**Spectral index:** 0.7**Size/arcmin:** 16×14  
**Type:** S

**Radio:** Poorly resolved source.

**X-ray:** Detected.

**References:**

- Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.
- Junkes *et al.* 1988, LNP, 316, 134. Effelsberg 100-m at 2.7 GHz (4'3), including polarisation.
- Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz (4'3).
- Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
- Yoshita *et al.* 2000, PASJ, 52, 867. ROSAT and ASCA observations.
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$  : S = 3.2±0.4 Jy) and 1420 MHz ( $\sim 1'$  : S = 1.5±0.1 Jy), including review of flux densities.
- Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9'5 : S = 0.78±0.07 Jy) including polarisation and review of flux densities.

**G70.0–21.5**

**RA:** 21<sup>h</sup>24<sup>m</sup>00<sup>s</sup>  
**Dec:** +19°23′

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

**Size/arcmin:** 330×240  
**Type:** S

**Radio:** Not detected.

**Optical:** Large, faint shell of filaments.

**X-ray:** Partially detected.

**References:**

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

**G73.9+0.9**

**RA:** 20<sup>h</sup>14<sup>m</sup>15<sup>s</sup>  
**Dec:** +36°12′

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

**Size/arcmin:** 27  
**Type:** S?

**Radio:** Diffuse, centrally brightened to SW.

**Optical:** Faint shell.

**References:**

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

Mavromatakis 2003, A&A, 398, 153. Optical observations.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S=10.0\pm 1.7$  Jy) and 1420 MHz ( $\sim 1'$ :  $S=7.6\pm 0.6$  Jy), including polarisation and review of flux densities.  
 Sitnik 2010, ARep, 54, 317. H $\alpha$  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.

**G74.0–8.5**

Cygnus Loop

**RA:** 20<sup>h</sup>51<sup>m</sup>00<sup>s</sup>  
**Dec:** +30°40′**1-GHz flux/Jy:** 210  
**Spectral index:** varies**Size/arcmin:** 230×160  
**Type:** S

Has been suggested that this is two overlapping remnants.

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

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

**X-ray:** Shell in soft X-rays.

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

**Distance:** Stellar interactions gives 0.74 kpc.

**References:**

- Green 1990, AJ, 100, 1927. DRAO at 408 MHz (3′3×6′7) for spectral index study, plus X-ray and optical.
- Graham *et al.* 1991, AJ, 101, 175. Shocked molecular H outside rim in NE.
- Shull & Clarke 1991, PASP, 103, 811. Optical spectroscopy of nearside filaments.
- Fesen *et al.* 1992, AJ, 104, 719. H $\alpha$  imagery.
- Long *et al.* 1992, ApJ, 400, 214. Optical of Balmer dominated filament.
- Arendt *et al.* 1992, ApJ, 400, 562. IRAS observations.
- Hester *et al.* 1994, ApJ, 420, 721. H $\alpha$ , [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.
- Ghavamian *et al.* 2001, ApJ, 547, 995. Optical spectroscopy.
- Miyata *et al.* 2001, ApJ, 550, 1023. ASCA observations of compact X-ray sources.
- Danforth *et al.* 2001, AJ, 122, 938. Far-UV spectroscopy, H $\alpha$  and other optical observations of NE region.
- Levenson & Graham 2001, ApJ, 559, 948. HST of SE region.
- Uyaniker *et al.* 2002, A&A, 389, L61. Effelsberg 100-m at 2.7 GHz (4′3) including polarisation, and comparison with ROSAT data.
- Leahy 2002, AJ, 123, 2689. DRAO at 1.4 GHz (2′×4′) for H $\alpha$ .
- Blair *et al.* 2002, ApJS, 140, 367. UV spectroscopy.
- Levenson *et al.* 2002, ApJ, 576, 798. Chandra observations of W edge.
- Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5:  $S = 184 \pm 18$  Jy).
- Leahy 2004, MNRAS, 351, 385. Chandra observations of SW.
- Uyaniker *et al.* 2004, A&A, 426, 909. Effelsberg 100-m at 2.7 GHz (4′3), with comparison with other data for spectral index studies.
- Blair *et al.* 2005, AJ, 129, 2268. HST of outer filaments.
- Leahy 2005, AJ, 130, 165. DRAO at 1.4 GHz of SE.
- Levenson & Graham 2005, ApJ, 622, 366. Chandra observations of knot in SE.
- Sun *et al.* 2006, A&A, 447, 937. Urumqi 25-m at 4.8 GHz (9′5:  $S = 90 \pm 9$  Jy), with comparisons with other data for spectral index studies.
- Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.
- Seon *et al.* 2006, ApJ, 644, L175. Far UV observations.
- Sankrit *et al.* 2007, AJ, 133, 1383. UV observations of part.
- Tsunemi *et al.* 2007, ApJ, 671, 1717. XMM-Newton observations of NE to SW.
- Nemes *et al.* 2008, ApJ, 675, 1293. XMM-Newton observations of NE.
- Katsuda *et al.* 2008, ApJ, 680, 1198. Chandra observations of NE.
- Uchida *et al.* 2008, ApJ, 688, 1102. XMM-Newton observations.
- Uchida *et al.* 2009, PASJ, 61, 503. Suzaku observations of N.
- Kimura *et al.* 2009, PASJ, 61, S137. Suzaku observations from NE to SW.
- Tsunemi *et al.* 2009, PASJ, 61, S147. Suzaku observations of SE.
- Kosugi *et al.* 2010, PASJ, 62, 1035. Suzaku observations of SE.
- Sankrit *et al.* 2010, ApJ, 712, 1092. Spitzer observations.
- McEntaffer & Brantseg 2011, ApJ, 730, 99. Chandra observations of E.
- Katagiri *et al.* 2011, ApJ, 741, 44. Fermi observations.
- Katsuda *et al.* 2012, ApJ, 754, L7. Suzaku and XMM-Newton observations.
- Leahy & Hassan 2013, ApJ, 764, 55. Suzaku and XMM-Newton observations of SW.
- Oakley *et al.* 2013, ApJ, 766, 51. X-ray spectroscopy.
- Kim *et al.* 2014, ApJ, 784, 12. Far UV observations.
- Sankrit *et al.* 2014, ApJ, 787, 3. Spitzer spectroscopy in SE.
- Medina *et al.* 2014, ApJ, 791, 30. Optical spectroscopy in NE.
- Raymond *et al.* 2015, ApJ, 805, 152. HST observations in NE. *see also:* Raymond *et al.* 2015, ApJ, 814, 165. Erratum.
- Roberts & Wang 2015, MNRAS, 449, 1340. Suzaku observations.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux density 30 GHz.
- Katsuda *et al.* 2016, ApJ, 819, L32. H $\alpha$  spectroscopy of NE.
- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
- Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
- Boubert *et al.* 2017, A&A, 606, A14. Gaia search for runaway progenitor companion.
- Fesen *et al.* 2018, MNRAS, 481, 1786. Optical observations for distance.

**G74.9+1.2**

CTB 87

**RA:** 20<sup>h</sup>16<sup>m</sup>02<sup>s</sup>  
**Dec:** +37°12′**1-GHz flux/Jy:** 9  
**Spectral index:** varies**Size/arcmin:** 8×6  
**Type:** F**Radio:** Filled-centre, with high polarisation and high frequency turnover.**X-ray:** Centrally brightened.**Point sources:** Compact X-ray source in SE.**Distance:** Optical extinction gives 6.1 kpc.**References:**

Dickel & DeNoyer 1975, AJ, 80, 437. Arecibo  $S_{430}$  MHz =  $12.2 \pm 9.7$  Jy,  $S_{318}$  MHz =  $17.7 \pm 5.0$  Jy.  
 Weiler & Shaver 1978, A&A, 70, 389. WSRT at 610 MHz ( $57'' \times 94''$ :  $S = 9.1 \pm 1.2$  Jy), 1.4 ( $24'' \times 40''$ :  $S = 8.7 \pm 1.2$  Jy) and 5 GHz ( $24'' \times 40''$ :  $S = 5.6 \pm 1.3$  Jy).  
 Geldzahler *et al.* 1980, A&A, 84, 237. Effelsberg 100-m at 2.7 GHz ( $4.4$ :  $S = 7.6 \pm 0.5$  Jy).  
 Wilson 1980, ApJ, 241, L19. Einstein observations.  
 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT H $\alpha$  absorption of nearby compact source.  
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source.  
 Morsi & Reich 1987, A&AS, 69, 533. Effelsberg 100-m at 32 GHz (smoothed to  $40''$ :  $S = 1.47 \pm 0.19$  Jy).  
 Green & Gull 1989, MNRAS, 237, 555. VLA at 1.4 GHz ( $1.2 \times 1.4$ ) including H $\alpha$ .  
 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 ( $3.4 \times 5.8$ :  $S = 11.6 \pm 0.4$  Jy) and 1.4 GHz ( $1.0 \times 1.7$ :  $S = 7.2 \pm 0.3$  Jy).  
 Asaoka & Koyama 1990, PASJ, 42, 625. Ginga X-ray spectrum.  
 Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz ( $3.5 \times 5.2$ :  $S = 13.3 \pm 0.8$  Jy) and Effelsberg 100-m at 4.8 GHz ( $S = 7.5 \pm 0.7$  Jy).  
 Wallace *et al.* 1994, A&A, 286, 565. H $\alpha$  of surroundings.  
 Cho *et al.* 1994, AJ, 108, 634. CO of adjacent molecular clouds.

Gorham *et al.* 1996, ApJ, 458, 257. Pulsar search.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Wallace *et al.* 1997, A&A, 317, 212. DRAO at 408 MHz ( $3.4 \times 5.5$ ) and 1.4 GHz ( $1.0 \times 1.6$ ) including H $\alpha$  (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 ( $1' \times 1.6'$ ) including H $\alpha$ , plus CO observations.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S = 11.9 \pm 0.9$  Jy) and 1420 MHz ( $\sim 1'$ :  $S = 7.1 \pm 1.1$  Jy), including polarisation and review of flux densities.  
 Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.  
 Sitnik 2010, ARep, 54, 317. H $\alpha$  and CO observations of region.  
 Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ( $9.5$ :  $S = 6.4 \pm 0.4$  Jy) including polarisation and review of flux densities.  
 Matheson *et al.* 2013, ApJ, 774, 33. Chandra observations.  
 Bassani *et al.* 2014, A&A, 561, A108. X-ray and  $\gamma$ -ray observations.  
 Aliu *et al.* 2014, ApJ, 788, 78.  $\gamma$ -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.  $\gamma$ -ray observations.

**G76.9+1.0****RA:** 20<sup>h</sup>22<sup>m</sup>20<sup>s</sup>  
**Dec:** +38°43′**1-GHz flux/Jy:** 2?  
**Spectral index:** ?**Size/arcmin:** 9  
**Type:** C**Radio:** Bipolar shell.**Point sources:** Central pulsar.**References:**

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz ( $1.0 \times 1.6$ ), 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 ( $13'' \times 16''$ ) and 8.55 GHz ( $11'' \times 12''$ ), including polarisation and review of flux densities.  
 Landecker *et al.* 1997, A&AS, 123, 199. Miyun at 232-MHz ( $3.8 \times 5.4$ ).  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S = 2.3 \pm 0.2$  Jy) and 1420 MHz ( $\sim 1'$ :  $S = 1.35 \pm 0.07$  Jy), including polarisation and review of flux densities.

Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio 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 ( $51'' \times 54''$ ), 1160 MHz ( $2.2 \times 3.4$ ), and Chandra observations of central source.  
 Arzoumanian *et al.* 2011, ApJ, 739, 39. Pulsar detection.  
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

**G78.2+2.1**

**RA:** 20<sup>h</sup>20<sup>m</sup>50<sup>s</sup>  
**Dec:** +40°26′

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

DR4,  $\gamma$  Cygni SNR

**Size/arcmin:** 60  
**Type:** S

Has been called G78.1+1.8.

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

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

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

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

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

**References:**

Higgs *et al.* 1977, AJ, 82, 718. DRAO at 1.4 GHz ( $2' \times 3'$ :  $S = 270 \pm 40$  Jy) plus some 10 GHz ( $4'$ ) survey data, reveals true extent of remnant.  
 d'Odorico & Sabbadin 1977, A&AS, 28, 439. Optical spectra.  
 van den Bergh 1978, ApJS, 38, 119. Optical observations.  
 Landecker *et al.* 1980, A&AS, 39, 133. DRAO HI observations ( $2' \times 3.1'$ ).  
 Higgs *et al.* 1983, AJ, 88, 97. CO of surroundings.  
 Bohigas *et al.* 1983, RMxAA, 8, 155. Optical spectra, find thermal only.  
 Braun & Strom 1986, A&AS, 63, 345. WSRT HI observations.  
 Fukui & Tatematsu 1988, 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 ( $3.4 \times 5.8$ :  $S = 480 \pm 60$  Jy) and 1.4 GHz ( $1.0 \times 1.7$ :  $S = 270 \pm 40$  Jy).  
 Wendker *et al.* 1991, A&A, 241, 551. DRAO at 408 MHz ( $3.5 \times 5.2$ :  $S = 540 \pm 40$  Jy) and Effelsberg 100-m at 4.8 GHz ( $S = 150 \pm 15$  Jy).  
 Esposito *et al.* 1996, ApJ, 461, 820. Associated  $\gamma$ -ray emission.  
 Brazier *et al.* 1996, MNRAS, 281, 1033.  $\gamma$ -ray and X-ray point source.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Zhang *et al.* 1997, A&A, 324, 641. Multi-frequency radio comparison.  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Roberts *et al.* 2001, ApJS, 133, 451. ASCA observations.

Uchiyama *et al.* 2002, ApJ, 571, 866. ASCA observations.  
 Mavromatakis 2003, A&A, 408, 237. Optical observations.  
 Bykov 2004, A&A, 427, L21. Hard X-ray observations.  
 Becker *et al.* 2004, ApJ, 615, 897. Chandra and other observations of compact sources.  
 Weisskopf *et al.* 2006, ApJ, 652, 387. Chandra and other observations of compact sources.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S = 500 \pm 35$  Jy) and 1420 MHz ( $\sim 1'$ :  $S = 226 \pm 19$  Jy), including review of flux densities.  
 Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI.  
 Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -ray observations.  
 Ladouceur & Pineault 2008, A&A, 490, 197. CGPS at 408 MHz ( $2.9 \times 4.5$ ) and 1.4 GHz ( $0.8 \times 1.5$ ).  
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz ( $9.5$ :  $S = 170 \pm 18$  Jy), including polarisation and review of flux densities.  
 Leahy *et al.* 2013, MNRAS, 436, 968. ROSAT and Chandra observations, and CGPS for HI.  
 Aliu *et al.* 2013, ApJ, 770, 93.  $\gamma$ -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.  $\gamma$ -ray observations.

**G82.2+5.3**

**RA:** 20<sup>h</sup>19<sup>m</sup>00<sup>s</sup>  
**Dec:** +45°30′

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

W63

**Size/arcmin:** 95  $\times$  65  
**Type:** S

Has been called G82.5+5.3.

**Radio:** Shell in the Cygnus X complex.

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

**X-ray:** Detected.

**Distance:** Optical absorption suggests 3.2 kpc.

**References:**

Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz ( $5'$ :  $S = 59.0 \pm 3.5$  Jy).  
 Sabbadin 1976, A&A, 51, 159. Optical spectra.  
 Angerhofer *et al.* 1977, A&A, 55, 11. NRAO 140-ft at 5 GHz ( $6.8$ ). Incomplete mapping.  
 Rosado & González 1981, RMxAA, 5, 93. Optical spectra.  
 Seward 1990, ApJS, 73, 781. Einstein observations.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz ( $14.5$ :  $S = 82.5 \pm 5.5$  Jy).

Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz ( $1'$ ) including polarisation, of part.  
 Mavromatakis *et al.* 2004, A&A, 415, 1051. ROSAT, ASCA and optical observations.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S = 144 \pm 12$  Jy) and 1420 MHz ( $\sim 1'$ :  $S = 93 \pm 5$  Jy), including review of flux densities.  
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz ( $9.5$ :  $S = 49 \pm 5$  Jy), including polarisation and review of flux densities.  
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.

**G83.0–0.3**

**RA:** 20<sup>h</sup>46<sup>m</sup>55<sup>s</sup>  
**Dec:** +42°52′

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

**Size/arcmin:** 9×7  
**Type:** S

**Radio:** Incomplete shell.

**References:**

Taylor *et al.* 1992, AJ, 103, 931. WSRT at 327 MHz (1′0×1′5), and northern sky survey at 4.9 GHz.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3′$ :  $S=1.2\pm 0.3$  Jy) and 1420 MHz ( $\sim 1′$ :  $S=0.8\pm 0.1$  Jy, including polarisation and review of flux densities.

**G84.2–0.8**

**RA:** 20<sup>h</sup>53<sup>m</sup>20<sup>s</sup>  
**Dec:** +43°27′

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

**Size/arcmin:** 20×16  
**Type:** S

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

**X-ray:** Detected.

**Distance:** H I absorption suggests 6 kpc.

**References:**

Mathews *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).  
 Mathews & 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 H I, plus CO observations.  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz (1′) including polarisation.

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

**G85.4+0.7**

**RA:** 20<sup>h</sup>50<sup>m</sup>40<sup>s</sup>  
**Dec:** +45°22′

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

**Size/arcmin:** 24?  
**Type:** S

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

**X-ray:** Centrally brightened.

**Distance:** H I observations suggest 3.5 kpc, and optical absorption suggests 4.4 kpc.

**References:**

Kothes *et al.* 2001, A&A, 376, 641. CGPS at 408 MHz (2′8″×4′4″:  $S < 0.45$  Jy) and 1.4 GHz (0′8″×1′1″), plus H I and X-ray data.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3′$ :  $S=2.9\pm 0.5$  Jy) and 1420 MHz ( $\sim 1′$ :  $S=2.3\pm 0.2$  Jy), including review of flux densities.

Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and H I observations.  
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.  
 Shan *et al.* 2018, ApJS, 238, 35. Optical absorption for distance.

**G85.9–0.6**

**RA:** 20<sup>h</sup>58<sup>m</sup>40<sup>s</sup>  
**Dec:** +44°53′

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

**Size/arcmin:** 24  
**Type:** S

**Radio:** Faint, incomplete shell.

**Optical:** Diffuse shell.

**X-ray:** Centrally brightened.

**Distance:** HI observations suggest 4.8 kpc.

**References:**

Kothes *et al.* 2001, A&A, 376, 641. CGPS at 408 MHz (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 ( $\sim 3'$  :  $S = 3.0 \pm 1.3$  Jy) and 1420 MHz ( $\sim 1'$  :  $S = 2.2 \pm 0.8$  Jy), including review of flux densities.

Jackson *et al.* 2008, ApJ, 674, 936. XMM-Newton and HI observations.

Gök *et al.* 2009, Ap&SS, 324, 17. Optical observations.

Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

**G89.0+4.7**

**RA:** 20<sup>h</sup>45<sup>m</sup>00<sup>s</sup>  
**Dec:** +50°35′

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

**Size/arcmin:** 120×90  
**Type:** S

HB21

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

**Optical:** Filaments and patches.

**X-ray:** Centrally brightened.

**Distance:** Various associations suggest 0.8 kpc, and optical absorption suggests 1.9 kpc.

**References:**

Hirabayashi & Takahashi 1972, PASJ, 24, 231. 30-m dish at 4.2 GHz (11′ :  $S = 160 \pm 40$  Jy).  
 Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′ :  $S = 148 \pm 16$  Jy), plus optical filaments.  
 Hill 1974, MNRAS, 169, 59. Half-Mile Telescope at 1.4 GHz (3′×3′9).  
 Haslam *et al.* 1975, A&A, 39, 453. Effelsberg 100-m at 2.7 GHz (4′4).  
 Fukui & Tatematsu 1988, IAUCo, 101, 261. CO observations of the vicinity (2′7).  
 Tatematsu *et al.* 1990, A&A, 237, 189. DRAO at 408 MHz (3′5×4′5) and 1.4 GHz (1′0×1′3), including HI, plus CO observations of adjacent molecular cloud.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Leahy & Aschenbach 1996, A&A, 315, 260. ROSAT observations.  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Koo *et al.* 2001, ApJ, 552, 175. NRAO 12-m and other CO observations (27″ and 45″) of eastern part.  
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5 :  $S = 228 \pm 5$  Jy).  
 Uyaniker *et al.* 2003, ApJ, 585, 785. CGPS at 1.4 GHz (1′) including polarisation.  
 Byun *et al.* 2006, ApJ, 637, 283. CO observations of 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 ( $\sim 3'$  :  $S = 259 \pm 19$  Jy) and 1420 MHz ( $\sim 1'$  :  $S = 183 \pm 9$  Jy), including polarisation and review of flux densities.

Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity HI. Mavromatakis *et al.* 2007, A&A, 461, 991. Optical observations.

Shinn *et al.* 2009, ApJ, 693, 1883. IR observations.

Pannuti *et al.* 2010, AJ, 140, 1787. ASCA and observations.

Shinn *et al.* 2010, AdSpR, 45, 445. IR observations in S.

Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 :  $S = 107 \pm 11$  Jy), including polarisation and review of flux densities.

Reichardt *et al.* 2012, A&A, 546, A21. Fermi detection.

Shinn *et al.* 2012, ApJ, 759, 34. Akari observations of H<sub>2</sub>.

Pivato *et al.* 2013, ApJ, 779, 179. Fermi observations.

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

Acero *et al.* 2016, ApJS, 224, 8. 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.

|   |   |  |
|---|---|--|
| <b>G93.3+6.9</b>  |   | DA 530, 4C(T)55.38.1                         |
| <b>RA:</b> 20 <sup>h</sup> 52 <sup>m</sup> 25 <sup>s</sup><br><b>Dec:</b> +55°21′   | <b>1-GHz flux/Jy:</b> 9<br><b>Spectral index:</b> 0.45  | <b>Size/arcmin:</b> 27×20<br><b>Type:</b> C? |
| Has been called G93.2+6.7.  |   |  |
| <b>Radio:</b> Shell, with two bright limbs, highly polarised.   |   |  |
| <b>X-ray:</b> Compact central source.   |   |  |
| <b>Distance:</b> H <sub>I</sub> observations suggest 2.2 kpc.   |   |  |
| <b>References:</b>  |   |  |
| Roger & Costain 1976, A&A, 51, 151. DRAO at 1.42 GHz (2′×2′4″: S=6.9 Jy).   | Foster & Routledge 2003, ApJ, 598, 1005. H <sub>I</sub> for distance.   |  |
| Haslam <i>et al.</i> 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.    | Kaplan <i>et al.</i> 2004, ApJS, 153, 269. Chandra limits for any compact source.   |  |
| Lalitha <i>et al.</i> 1984, A&A, 131, 196. Effelsberg 100-m at 4.75 GHz (smoothed to 3′: S=4.01±0.57 Jy).   | Kothes <i>et al.</i> 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′: S=10.5±0.7 Jy) and 1420 MHz, including review of flux densities.                               |  |
| Lorimer <i>et al.</i> 1998, A&A, 331, 1002. Pulsar search.  | Jiang <i>et al.</i> 2007, ApJ, 670, 1142. Chandra observations.   |  |
| Landecker <i>et al.</i> 1999, ApJ, 527, 866. DRAO at 408 MHz (3′5″×4′3″) and 1.4 GHz (1′0″×1′2″), including polarisation and H <sub>I</sub> .                     | Bocchino <i>et al.</i> 2008, AdSpR, 41, 407. XMM-Newton observations.   |  |
|   | Jeong <i>et al.</i> 2012, Ap&SS, 342, 389. CO observations of region.   |  |
| <hr/>   |   |  |
| <b>G93.7–0.2</b>  |   | CTB 104A, DA 551                             |
| <b>RA:</b> 21 <sup>h</sup> 29 <sup>m</sup> 20 <sup>s</sup><br><b>Dec:</b> +50°50′   | <b>1-GHz flux/Jy:</b> 65<br><b>Spectral index:</b> 0.65   | <b>Size/arcmin:</b> 80<br><b>Type:</b> S     |
| Has been called G93.6–0.2 and G93.7–0.3.  |   |  |
| <b>Radio:</b> Distorted, faint shell.   |   |  |
| <b>Distance:</b> Association with H <sub>I</sub> features suggests 1.5 kpc.   |   |  |
| <b>References:</b>  |   |  |
| Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′: S=18.4±1.0 Jy).  | Koralesky <i>et al.</i> 1998, AJ, 116, 1323. VLA search for OH emission.  |  |
| Mantovani <i>et al.</i> 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.                                    | Uyaniker <i>et al.</i> 2002, ApJ, 565, 1022. CGPS 1.4 GHz (49′′×54′′), including H <sub>I</sub> , and 408 MHz (2′8″×3′7″).                                      |  |
| Landecker <i>et al.</i> 1985, AJ, 90, 1082. DRAO at 1.4 GHz (smoothed to 2′: S=58±6 Jy).  | Uyaniker <i>et al.</i> 2003, ApJ, 585, 785. CGPS at 1.4 GHz (1′) including polarisation.  |  |
| Mantovani <i>et al.</i> 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. | Kothes <i>et al.</i> 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. |  |
| Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  | Gao <i>et al.</i> 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5″: S=25.0±2.5 Jy), including polarisation and review of flux densities.                        |  |
| Lorimer <i>et al.</i> 1998, A&A, 331, 1002. Pulsar search.  |   |  |
| <hr/>   |   |  |
| <b>G94.0+1.0</b>  |   | 3C434.1                                      |
| <b>RA:</b> 21 <sup>h</sup> 24 <sup>m</sup> 50 <sup>s</sup><br><b>Dec:</b> +51°53′   | <b>1-GHz flux/Jy:</b> 13<br><b>Spectral index:</b> 0.45   | <b>Size/arcmin:</b> 30×25<br><b>Type:</b> S  |
| <b>Radio:</b> Incomplete shell, containing H <sub>I</sub> shell.  |   |  |
| <b>Distance:</b> Association with stellar wind bubble implies 5.2 kpc.  |   |  |
| <b>References:</b>  |   |  |
| Willis 1973, A&A, 26, 237. NRAO 300-ft at 2.7 GHz (5′: S=6.1±0.8 Jy), and 37-m at 1.7 GHz (S=11±3 Jy).  | Foster <i>et al.</i> 2004, A&A, 417, 79. DRAO at 1.4 GHz, including H <sub>I</sub> .  |  |
| Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at 2.7 GHz (5′: S=5.8±0.4 Jy). Also NRAO 140-ft at 5 GHz (6′).   | 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.                           |  |
| Mantovani <i>et al.</i> 1982, A&A, 105, 176. Effelsberg 100-m at 1.7 GHz (7′6″: S=12.0±1.3 Jy), plus review of flux densities.                                    | Kothes <i>et al.</i> 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′: S=20±2 Jy) and 1420 MHz (~1′: S=11.3±1.0 Jy), including review of flux densities.              |  |
| Goss <i>et al.</i> 1984, A&A, 138, 469. WSRT at 610 MHz (smoothed to 100′′: S=16±1.7 Jy) and Effelsberg 100-m at 4.75 GHz (2′4″: S=7.2±0.5 Jy).                   | Sun <i>et al.</i> 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5″: S=6.2±0.4 Jy) including polarisation and review of flux densities.                           |  |
| Landecker <i>et al.</i> 1985, AJ, 90, 1082. DRAO at 1.4 GHz (smoothed to 2′: S=16±3 Jy).  | Jeong <i>et al.</i> 2012, Ap&SS, 342, 389. CO observations of region.   |  |
| Lorimer <i>et al.</i> 1998, A&A, 331, 1002. Pulsar search.  | Jeong <i>et al.</i> 2013, ApJ, 770, 105. CO observations of region.   |  |
| Uyaniker <i>et al.</i> 2003, ApJ, 585, 785. CGPS at 1.4 GHz (1′) including polarisation.  |   |  |

**G96.0+2.0**

**RA:** 21<sup>h</sup>30<sup>m</sup>30<sup>s</sup>  
**Dec:** +53°59′

**1-GHz flux/Jy:** 0.35  
**Spectral index:** 0.6

**Size/arcmin:** 26  
**Type:** S

**Radio:** Faint, arc in S, poorly defined in N.

**Distance:** Association for H<sub>I</sub> 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 H<sub>I</sub>.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : S=0.42±0.06 Jy) and 1420 MHz (~1′ : S=0.24±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±0.02 Jy) including polarisation and review of flux densities.

**G106.3+2.7**

**RA:** 22<sup>h</sup>27<sup>m</sup>30<sup>s</sup>  
**Dec:** +60°50′

**1-GHz flux/Jy:** 6  
**Spectral index:** 0.6

**Size/arcmin:** 60×24  
**Type:** C?

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

**Radio:** Faint extended source, which brighter ‘head’ to NE.

**X-ray:** Pulsar and wind nebula.

**Point sources:** Pulsar.

**References:**

Pineault & Joncas 2000, AJ, 120, 3218. DRAO at 408 MHz (3′5×3′9 : S=10.5±0.3 Jy) and 1.4 GHz (1′0×1′2 : S=4.9±0.6 Jy), plus H<sub>I</sub>.  
 Halpern *et al.* 2001, ApJ, 547, 323. X-ray and radio observations of the ‘head’.  
 Halpern *et al.* 2001, ApJ, 552, L125. Pulsar detection.  
 Kothes *et al.* 2001, ApJ, 560, 236. CGPS at 1.4 GHz, including H<sub>I</sub>, plus CO and other observations.  
 Ng & Romani 2004, ApJ, 601, 479. Chandra detection of pulsar wind nebula.  
 Kothes *et al.* 2004, ApJ, 607, 855. H<sub>I</sub> 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±1.0 Jy) and 1420 MHz (~1′ : S=4.8±0.5 Jy), including polarisation and review of flux densities.  
 Abdo *et al.* 2007, ApJ, 664, L91.  $\gamma$ -ray observations.  
 Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -ray observations.  
 Acciari *et al.* 2009, ApJ, 703, L6.  $\gamma$ -ray observations.  
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : S=2.0±0.3 Jy), including polarisation and review of flux densities.

**G108.2–0.6**

**RA:** 22<sup>h</sup>53<sup>m</sup>40<sup>s</sup>  
**Dec:** +58°50′

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

**Size/arcmin:** 70×54  
**Type:** S

**Radio:** Faint shell.

**Distance:** Possible associated H<sub>I</sub> structures suggest 3.2 kpc.

**References:**

Tian *et al.* 2007, A&A, 465, 907. DRAO at 408 MHz (2′8×3′3 : S=11.5±1.2 Jy) and 1.4 GHz (1′0×1′2 : S=6.6±0.7 Jy) including H<sub>I</sub>.

**G109.1–1.0**

CTB 109

**RA:** 23<sup>h</sup>01<sup>m</sup>35<sup>s</sup>  
**Dec:** +58°53′**1-GHz flux/Jy:** 20  
**Spectral index:** 0.45**Size/arcmin:** 28  
**Type:** S**Radio:** Semicircular shell, with the Molecular cloud S152 is to the immediate W.**Optical:** Faint optical filaments.**X-ray:** Semicircular shell, with pulsar at W edge.**Point sources:** Long period X-ray pulsar (magnetar).**Distance:** Various observations imply 3.2 kpc.**References:**

- Hughes *et al.* 1981, ApJ, 246, L127. WSRT at 610 MHz ( $1' : S = 40 \pm 5$  Jy) shows bad CLEAN artefacts.
- Blair & Kirshner 1981, Nature, 291, 132. Optical spectra.
- Downes 1983, MNRAS, 203, 695. Effelsberg 100-m at 2.7 GHz ( $4.4' : S = 13.0 \pm 1.5$  Jy).
- Sofue *et al.* 1983, PASJ, 35, 447. NRO 45-m at 10.2 GHz ( $2.7'$ ).
- Hughes *et al.* 1984, ApJ, 283, 147. WSRT at 610 MHz ( $20'' : S = 26 \pm 3$  Jy) 1.4 GHz ( $10''$ ), DRAO at 1.4 GHz ( $1' \times 1.2' : S = 16.8 \pm 2$  Jy) and Algonquin 46-m at 6.5 GHz ( $4.5' : S = 6.7 \pm 1$  Jy).
- Braun & Strom 1986, A&AS, 63, 345. WSRT H<sub>i</sub> observations.
- Tatematsu *et al.* 1987, PASJ, 39, 755. NRO 45-m at 10 GHz ( $2.7'$ ), plus polarisation.
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- 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.
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- Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz ( $9.5' : S = 9.8 \pm 0.5$  Jy) including polarisation and review of flux densities.
- Kothes & Foster 2012, ApJ, 746, L4. H<sub>i</sub> 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.
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- Nakano *et al.* 2017, PASJ, 69, 40. Suzaku observations.
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**G111.7–2.1**

Cassiopeia A, 3C461

**RA:** 23<sup>h</sup>23<sup>m</sup>26<sup>s</sup>  
**Dec:** +58°48′**1-GHz flux/Jy:** 2300  
**Spectral index:** 0.77**Size/arcmin:** 5  
**Type:** S

Presumably the remnant of a late 17th century SN.

**Radio:** Bright shell with compact knots and extended plateau of emission; shows secular decline.**Optical:** Fast knots and quasi-stationary flocculi, with many filaments at large radii, and NE ‘jet’.**X-ray:** Incomplete shell, with hard spectral component.**Point sources:** Central compact X-ray source.**Distance:** Optical expansion gives 3.3 kpc.**References:**

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- Hwang *et al.* 2001, ApJ, 560, L175. Chandra observations of Doppler shifted lines.
- Fesen *et al.* 2001, AJ, 122, 2644. HST observations.
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- Kang & Koo 2007, ApJS, 173, 85. SGPS of high velocity H I.
- Rho *et al.* 2008, ApJ, 673, 271. Spitzer observations.
- Rest *et al.* 2008, ApJ, 681, L81. SN light echo.
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- Helmboldt & Kassim 2009, AJ, 138, 838. Low radio frequency temporal variations.
- Patnaude & Fesen 2009, ApJ, 697, 535. X-ray proper motions.
- 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.
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- Fesen *et al.* 2011, ApJ, 736, 109. HST variability studies.
- Besel & Krause 2012, A&A, 541, L3. IR light echoes.
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- 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.
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- Patnaude & Fesen 2014, ApJ, 789, 138. Multi-epoch optical and X-ray observations.
- Lee *et al.* 2014, ApJ, 789, 7. Spitzer and CO observations.
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- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
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- Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
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- Sato *et al.* 2017, ApJ, 836, 225. Multi-epoch Chandra observations.
- Lee *et al.* 2017, ApJ, 837, 118. IR observations.
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- 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.

**G113.0+0.2**

**RA:** 23<sup>h</sup>26<sup>m</sup>50<sup>s</sup>  
**Dec:** +61°26′

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

**Size/arcmin:** 40×17?  
**Type:** ?

**Radio:** Elongated, extent not well defined.

**Point sources:** Contains old pulsar.

**Distance:** Association for H<sub>I</sub> indicates 3.1 kpc.

**References:**

Kothes *et al.* 2005, A&A, 444, 871. CGPS at 408 MHz (2′8×3′1) and 1.4 GHz (49′×55′) including H<sub>I</sub>.  
 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±0.5 Jy) including polarisation and review of flux densities.

**G114.3+0.3**

**RA:** 23<sup>h</sup>37<sup>m</sup>00<sup>s</sup>  
**Dec:** +61°55′

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

**Size/arcmin:** 90×55  
**Type:** S

**Radio:** Shell, with H<sub>II</sub> region S165 within the boundary of the remnant.

**Optical:** Faint emission in centre and to S.

**Point sources:** Pulsar near centre of remnant.

**Distance:** Association with H<sub>I</sub> 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<sub>1.4 GHz</sub> = 4.4 Jy from 1.4 GHz survey data, plus H<sub>I</sub> from Maryland–Green Bank survey.  
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 Fesen *et al.* 1997, AJ, 113, 767. Optical observations.  
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.  
 Mavromatakis *et al.* 2002, A&A, 383, 1011. Optical observations.

Yar-Uyaniker *et al.* 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49′×55′), including H<sub>I</sub> (1′0×1′1).  
 Tian & Leahy 2006, ChJAA, 6, 543. CGPS at 408 MHz (3′4×3′9 : S = 12.0±6.0 Jy) and 1.4 GHz (1′0×1′1 : S = 9.8±0.8 Jy).  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 1420 MHz (~1′ : S = 5.4±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±0.7 Jy), including polarisation and review of flux densities.

**G116.5+1.1**

**RA:** 23<sup>h</sup>53<sup>m</sup>40<sup>s</sup>  
**Dec:** +63°15′

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

**Size/arcmin:** 80×60  
**Type:** S

**Radio:** Distinct shell, with high polarisation.

**Optical:** Detected.

**Distance:** Association with H<sub>I</sub> 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±0.4 Jy) and S<sub>1.4 GHz</sub> = 8.0±0.8 Jy from 1.4 GHz survey data, plus H<sub>I</sub> from Maryland–Green Bank survey.  
 Fesen *et al.* 1997, AJ, 113, 767. Optical observations.  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Yar-Uyaniker *et al.* 2004, ApJ, 616, 247. CGPS at 1.4 GHz (49′×55′), including H<sub>I</sub> (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±1.5 Jy) and 1.4 GHz (1′0×1′1 : S = 10.6±0. Jy).  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz (~3′ : S = 12.5±1.6 Jy) and 1420 MHz (~1′ : S = 10.3±0.70 Jy), including polarisation and review of flux densities.  
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : S = 5.7±0.6 Jy), including polarisation and review of flux densities.

**G116.9+0.2**

CTB 1

**RA:** 23<sup>h</sup>59<sup>m</sup>10<sup>s</sup>  
**Dec:** +62°26′**1-GHz flux/Jy:** 8  
**Spectral index:** 0.57**Size/arcmin:** 34  
**Type:** S

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

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

- Willis 1973, *A&A*, 26, 237. NRAO 300-ft at 2.7 GHz ( $S' : S = 3.9 \pm 1.0$  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.
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- Angerhofer *et al.* 1977, *A&A*, 55, 11. NRAO 140-ft at 5 GHz ( $6'8 : S = 3.0 \pm 0.3$  Jy).
- Dickel & Willis 1980, *A&A*, 85, 55. WSRT at 610 MHz ( $56'' \times 64''$ ) and 1.4 GHz ( $22'' \times 25''$ ).
- Reich & Braunsfurth 1981, *A&A*, 99, 17. Effelsberg 100-m at 2.7 GHz ( $4'4 : S = 4.8 \pm 0.4$  Jy) and  $S_{1.4 \text{ GHz}} = 7.8 \pm 0.8$  Jy from 1.4 GHz survey data, plus H I from Maryland–Green Bank survey.
- Lozinskaya 1981, *SvAL*, 7, 17. Mean optical velocity.
- Landecker *et al.* 1982, *AJ*, 87, 1379. DRAO at 1.42 GHz and H I ( $2' \times 2'3 : S = 8.3 \pm 0.5$  Jy), plus review of flux densities. see also: Landecker *et al.* 1983, *AJ*, 88, 877. Erratum.
- Fesen *et al.* 1985, *ApJ*, 292, 29. Optical spectra.
- 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-Uyaniker *et al.* 2004, *ApJ*, 616, 247. CGPS at 1.4 GHz ( $49'' \times 55''$ ), including H I ( $1'0 \times 1'1$ ).
- Lazendic & Slane 2006, *ApJ*, 647, 350. X-ray observations.
- Tian & Leahy 2006, *ChJAA*, 6, 543. CGPS at 408 MHz ( $3'4 \times 3'8 : S = 15.0 \pm 1.5$  Jy) and 1.4 GHz ( $1'0 \times 1'1 : S = 8.1 \pm 0.4$  Jy).
- Kothes *et al.* 2006, *A&A*, 457, 1081. CGPS at 408 MHz ( $\sim 3' : S = 10.5 \pm 0.8$  Jy) and 1420 MHz ( $\sim 1' : S = 7.0 \pm 0.8$  Jy), including review of flux densities.
- Pannuti *et al.* 2010, *AJ*, 140, 1787. ASCA and Chandra observations.
- Sun *et al.* 2011, *A&A*, 536, A83. Urumqi 25-m at 5 GHz ( $9'5 : S = 3.6 \pm 0.4$  Jy) including polarisation and review of flux densities.
- Clark *et al.* 2017, *ApJ*, 834, 106. Fermi pulsar detection.
- Wu *et al.* 2018, *ApJ*, 854, 99. Radio detection of pulsar.
- Zyuzin *et al.* 2018, *MNRAS*, 476, 2177. X-ray observations of pulsar.
- Katsuragawa *et al.* 2018, *PASJ*, 70, 110. Suzaku observations.

**G119.5+10.2**

CTA 1

**RA:** 00<sup>h</sup>06<sup>m</sup>40<sup>s</sup>  
**Dec:** +72°45′**1-GHz flux/Jy:** 36  
**Spectral index:** 0.6**Size/arcmin:** 90?  
**Type:** S

Has been called G119.5+10.3.

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

- Sieber *et al.* 1979, A&A, 74, 361. Effelsberg 100-m at 2.7 GHz ( $4'4'' : S = 23.6 \pm 2.8$  Jy).
- Sieber *et al.* 1981, A&A, 103, 393. Effelsberg 100-m at 2.7 GHz and 1.7 GHz ( $7'6'' : S = 31.6 \pm 2.5$  Jy), and 151 MHz ( $4' : S = 62.6 \pm 6$  Jy).
- Fesen *et al.* 1981, ApJ, 247, 148. Optical, including spectra.
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- Seward 1990, ApJS, 73, 781. Einstein observations.
- Simonetti 1992, ApJ, 386, 170. VLA observations of background sources for rotation measure studies.
- Pineault *et al.* 1993, AJ, 105, 1060. DRAO at 1.4 GHz ( $1' : S = 34 \pm 4$  Jy), plus H I and IRAS.
- Seward *et al.* 1995, ApJ, 453, 284. ROSAT observations.
- Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.
- Slane *et al.* 1997, ApJ, 485, 221. ASCA and ROSAT observations.
- Pineault *et al.* 1997, A&A, 324, 1152. DRAO at 408 MHz ( $3'5''$ ) and 1.4 GHz ( $1'0''$ ).
- Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
- Brazier *et al.* 1998, MNRAS, 295, 819. Studies of central, compact  $\gamma$ -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.  $\gamma$ -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.  $\gamma$ -ray observations.
- Li *et al.* 2016, ApJ, 831, 19. Fermi observations of pulsar.
- Ackermann *et al.* 2018, ApJS, 237, 32. Fermi observations.

**G120.1+1.4**

**RA:** 00<sup>h</sup>25<sup>m</sup>18<sup>s</sup>  
**Dec:** +64°09′

**1-GHz flux/Jy:** 50  
**Spectral index:** 0.58

Tycho, 3C10, SN1572

**Size/arcmin:** 8  
**Type:** S

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

**Radio:** Shell, brightest to the NE.

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

**X-ray:** Shell, brighter to the NE.

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

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

**References:**

- Duin & Strom 1975, A&A, 39, 33. WSRT at 610 MHz (57''×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±0.8 Jy), plus review of flux densities.
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- Dickel *et al.* 1982, ApJ, 257, 145. Comparison of radio, X-ray and optical observations.
- Reid *et al.* 1982, ApJ, 261, 485. Einstein observations.
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- Tan & Gull 1985, MNRAS, 216, 949. Radio at 2.7 GHz (4'') from 1980 and 1983, and One-Mile Telescope at 1.4 GHz (23'') from 1965 and 1980, for expansion.
- Albinson *et al.* 1986, MNRAS, 219, 427. HI observations.
- Green & Gull 1987, MNRAS, 224, 1055. VLA HI absorption observations towards central radio source.
- Wood *et al.* 1992, AJ, 103, 1338. VLA at 5 GHz (1''.5) polarisation studies.
- Vancura *et al.* 1995, ApJ, 441, 680. X-ray spectra and ROSAT image.
- Predehl & Schmitt 1995, A&A, 293, 889. ROSAT of dust scattered halo.
- Schwarz *et al.* 1995, A&A, 299, 193. WSRT and Effelsberg 100-m at 1.4 GHz (50''), and VLA at 1.4 GHz (13''), for neutral hydrogen studies.
- Hwang & Gotthelf 1997, ApJ, 475, 665. ASCA observations.
- Reynoso *et al.* 1997, ApJ, 491, 816. VLA at 1.4 GHz (1''.4×1''.5) from 1984 and 1994 for expansion studies.
- Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.
- Reynoso *et al.* 1999, AJ, 117, 1827. VLA at 1.4 GHz (13''), for HI studies.
- Katz-Stone *et al.* 2000, ApJ, 529, 453. VLA at 333 MHz and 1.4 GHz (7''.7×9''.5), for spectral index studies.
- Ghavamian *et al.* 2000, ApJ, 535, 266. Optical observations of shock precursors.  
*see also:* Ghavamian *et al.* 2017, ApJ, 843, 77. Erratum.
- Hughes 2000, ApJ, 545, L53. ROSAT X-ray expansion.
- Decourchelle *et al.* 2001, A&A, 365, L218. XMM-Newton observations.
- Ghavamian *et al.* 2001, ApJ, 547, 995. Optical spectroscopy.
- Douvion *et al.* 2001, A&A, 373, 281. ISO observations.
- 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±5 Jy) and 1420 MHz (~ 1' : S = 40.5±1.5 Jy), including polarisation and review of flux densities.
- Cassam-Chenaï *et al.* 2007, ApJ, 665, 315. Chandra observations.
- Rest *et al.* 2008, ApJ, 681, L81. SN light echo.
- Krause *et al.* 2008, Nature, 456, 617. SN light echo spectrum.
- Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
- Raymond *et al.* 2010, ApJ, 712, 901. H $\alpha$  spectroscopy.
- Lee *et al.* 2010, ApJ, 715, L146. H $\alpha$  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±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.
- Yang *et al.* 2013, ApJ, 766, 44. Suzaku spectroscopy.
- Williams *et al.* 2013, ApJ, 770, 129. Spitzer observations.
- Yamaguchi *et al.* 2014, ApJ, 780, 136. Suzaku observations.
- Wang & Li 2014, ApJ, 789, 123. INTEGRAL observations.
- Troja *et al.* 2014, ApJ, 797, L6. Swift observations.
- Miceli *et al.* 2015, ApJ, 805, 120. XMM-Newton observations.
- Lu *et al.* 2015, ApJ, 805, 142. Chandra observations.
- Katsuda *et al.* 2015, ApJ, 808, 49. Suzaku observations.
- Tran *et al.* 2015, ApJ, 812, 101. Chandra observations.
- Lopez *et al.* 2015, ApJ, 814, 132. NuSTAR observations.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 5 frequencies between 30 and 143 GHz.
- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
- Williams *et al.* 2016, ApJ, 823, L32. Multi-epoch X-ray and radio observations for expansion.
- Zhou *et al.* 2016, ApJ, 826, 34. CO observations.
- Chen *et al.* 2017, A&A, 604, A113. CO observations.
- Yamaguchi *et al.* 2017, ApJ, 834, 124. Suzaku observations of E rim.
- Archambault *et al.* 2017, ApJ, 836, 23.  $\gamma$ -ray observations.
- Sato & Hughes 2017, ApJ, 840, 112. Chandra and Suzaku observations.
- Williams *et al.* 2017, ApJ, 842, 28. Multi-epoch Chandra observations for expansion studies.
- Knežević *et al.* 2017, ApJ, 846, 167. H $\alpha$  observations of NE.
- Kerzendorf *et al.* 2018, MNRAS, 479, 5696. HST search for progenitor companion.
- Vinyaikin *et al.* 2018, ARep, 62, 130. Time evolution of radio emission.

**G126.2+1.6**

**RA:** 01<sup>h</sup>22<sup>m</sup>00<sup>s</sup>  
**Dec:** +64°15′

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

**Size/arcmin:** 70  
**Type:** S?

**Radio:** Poorly defined shell.

**Optical:** Filaments, mostly in W.

**References:**

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

**G127.1+0.5**

**RA:** 01<sup>h</sup>28<sup>m</sup>20<sup>s</sup>  
**Dec:** +63°10′

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

**Size/arcmin:** 45  
**Type:** S

R5

Has been called G127.3+0.7.

**Radio:** Distinct shell, with bright central source.

**Optical:** Detected.

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

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

**References:**

Caswell 1977, MNRAS, 181, 789. Half-Mile Telescope at 1.42 GHz ( $3′.5 \times 3′.9$ ), 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 ( $56'' \times 62''$ ) 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 ( $3′.5 \times 3′.9 : S = 17.9 \pm 2.0$  Jy) and 1.4 GHz ( $1′.0 \times 1′.13 : S = 10.1 \pm 0.8$  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 ( $3′.4 \times 3′.8 : S = 17.1 \pm 1.7$  Jy) and 1.4 GHz ( $1′.0 \times 1′.2 : S = 10.0 \pm 0.8$  Jy).  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3′ : S = 15.9 \pm 1.0$  Jy) and 1420 MHz ( $\sim 1′ : S = 9.7 \pm 0.6$  Jy), including polarisation and review of flux densities.  
 Sun *et al.* 2007, A&A, 463, 993. Urumqi 25-m at 5 GHz ( $9′.5 : S = 6.3 \pm 0.7$  Jy), including polarisation.  
 see also: Sun *et al.* 2007, A&A, 469, 1003. Erratum.  
 Zhou *et al.* 2014, ApJ, 791, 109. CO observations.

**G130.7+3.1**

**RA:** 02<sup>h</sup>05<sup>m</sup>41<sup>s</sup>  
**Dec:** +64°49′

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

3C58, SN1181

**Size/arcmin:** 9×5  
**Type:** F

This is the remnant of the SN of AD1181.

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

**Optical:** Faint filaments.

**X-ray:** Centrally brightened, with faint jet.

**Point sources:** Central pulsar.

**Distance:** H<sub>I</sub> 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. H<sub>I</sub> absorption distance.
- Fesen 1983, ApJ, 270, L53. Optical spectra.
- Reynolds & Aller 1985, AJ, 90, 2312. VLA at 1.4 GHz (2′), for limits of shell.
- Davelaar *et al.* 1986, ApJ, 300, L59. EXOSAT spectrum.
- Green 1986, MNRAS, 218, 533. 151 MHz observations (1.2×1.3 :  $S = 36 \pm 4$  Jy), plus 2.7 GHz (4″), plus Einstein observations for limit on shell.
- Green 1987, MNRAS, 225, 11P. Flux density increase at 408 MHz.
- Morsi & Reich 1987, A&AS, 69, 533. Effelsberg 100-m at 32 GHz (26″5 :  $S = 24.2 \pm 1.4$  Jy).
- Reynolds & Aller 1988, ApJ, 327, 845. VLA at 1.4 (2″4) and 4.9 GHz (2″5).
- Salter *et al.* 1989, ApJ, 338, 171. NRAO 12-m at 84.2 GHz (90″ :  $S = 15.0 \pm 2.0$  Jy), plus review of flux densities.
- Asaoka & Koyama 1990, PASJ, 42, 625. Ginga X-ray spectrum.
- Green & Scheuer 1992, MNRAS, 258, 833. IRAS upper limits.
- Roberts *et al.* 1993, A&A, 274, 427. H<sub>I</sub> absorption.
- Wallace *et al.* 1994, A&A, 286, 565. H<sub>I</sub> of surroundings.
- Helfand *et al.* 1995, ApJ, 453, 741. ROSAT observations.
- Torii *et al.* 2000, PASJ, 52, 875. ASCA observations.
- Bietenholz *et al.* 2001, ApJ, 560, 772. VLA at 74 MHz (26″ :  $S = 33.6$  Jy) and 327 MHz (8″2 :  $S = 33.9$  Jy), for spectral index and expansion studies.
- Bocchino *et al.* 2001, A&A, 369, 1078. XMM-Newton observations.
- Murray *et al.* 2002, ApJ, 568, 226. Chandra pulsar detection.
- Camilo *et al.* 2002, ApJ, 571, L41. Pulsar detection in radio.
- Reich 2002, in NSPS, p1. Effelsberg 100-m at 32 GHz (26″) for polarised intensity.
- Slane *et al.* 2002, ApJ, 571, L45. Chandra observations.
- Slane *et al.* 2004, ApJ, 616, 403. Deep Chandra imaging.
- Bietenholz 2006, ApJ, 645, 1180. VLA at 1.4 GHz (1″36) for expansion studies.
- Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$  :  $S = 32.2 \pm 2.0$  Jy) and 1420 MHz ( $\sim 1'$  :  $S = 31.9 \pm 1.0$  Jy), including polarisation and review of flux densities.
- Gotthelf *et al.* 2007, ApJ, 654, 267. XMM-Newton observations.
- Slane *et al.* 2008, ApJ, 676, L33. Spitzer and other IR observations.
- Fesen *et al.* 2008, ApJS, 174, 379. Optical observations for proper motion studies.
- Shearer & Neustroev 2008, MNRAS, 390, 235. Optical observations of pulsar nebula.
- Shibanov *et al.* 2008, A&A, 486, 273. Optical observations of pulsar nebula.
- Abdo *et al.* 2009, ApJ, 699, L102. Fermi observations of pulsar.
- Livingstone *et al.* 2009, ApJ, 706, 1163. Pulsar observations.
- Hurley-Walker *et al.* 2009, MNRAS, 396, 365. Radio observations at 14 to 18 GHz.
- Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :  $S = 31.7 \pm 3.0$  Jy) including polarisation and review of flux densities.
- Bietenholz *et al.* 2013, MNRAS, 431, 2590. Proper motion study of pulsar.
- Kothes *et al.* 2013, A&A, 560, A18. CGPS H<sub>I</sub> observations for distance.
- Aleksić *et al.* 2014, A&A, 567, L8.  $\gamma$ -ray detection.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 7 frequencies between 30 and 353 GHz.

**G132.7+1.3**

HB3

**RA:** 02<sup>h</sup>17<sup>m</sup>40<sup>s</sup>  
**Dec:** +62°45′**1-GHz flux/Jy:** 45  
**Spectral index:** 0.6**Size/arcmin:** 80  
**Type:** S

Has been called G132.4+2.2.

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

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.  
 Velusamy & Kundu 1974, A&A, 32, 375. NRAO 300-ft at  
 2.7 GHz ( $S' : S = 33.8 \pm 7.0$  Jy).  
 d'Odorico & Sabbadin 1977, A&AS, 28, 439. Optical spectra.  
 Read 1981, MNRAS, 194, 863. Radio at 151 MHz (4'.4) and  
 1.4 GHz (2') showing H $\alpha$  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 $\times$ 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 $\times$ 1'.1) for H $\alpha$ , plus CO observations.  
 Fesen *et al.* 1995, AJ, 110, 2876. Optical imaging and spec-  
 troscopy, DRAO at 408 MHz (3'.5 $\times$ 4'.  
 (1'.0 $\times$ 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 $\times$ 3'.8:) and 1.4 GHz (1'.0 $\times$ 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.  $\gamma$ -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.

**G150.3+4.5****RA:** 04<sup>h</sup>27<sup>m</sup>00<sup>s</sup>  
**Dec:** +55°28′**1-GHz flux/Jy:** ?  
**Spectral index:** ?**Size/arcmin:** 180 $\times$ 150  
**Type:** S**Radio:** Faint radio shell.**References:**

Gao & Han 2014, A&A, 567, A59. Radio surveys at 1.4, 2.7  
 and 5 GHz (9'.4, 4'.3, 9'.5).  
 Ackermann *et al.* 2017, ApJ, 843, 139. Fermi observations.  
 Ackermann *et al.* 2018, ApJS, 237, 32. Fermi observations.

**G152.4–2.1****RA:** 04<sup>h</sup>07<sup>m</sup>50<sup>s</sup>  
**Dec:** +49°11′**1-GHz flux/Jy:** 3.5?  
**Spectral index:** 0.7?**Size/arcmin:** 100 $\times$ 95  
**Type:** S**Radio:** Bilateral shell.**References:**

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

**G156.2+5.7**

**RA:** 04<sup>h</sup>58<sup>m</sup>40<sup>s</sup>  
**Dec:** +51°50′

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

**Size/arcmin:** 110  
**Type:** S

**Radio:** Faint shell, brighter in E and W.

**Optical:** Filamentary ring and smaller patchy ring.

**X-ray:** Faint shell.

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

**References:**

- |   |  |
|---|--|
| <p>Pfeffermann <i>et al.</i> 1991, A&amp;A, 246, L28. ROSAT detection.</p> <p>Reich <i>et al.</i> 1992, A&amp;A, 256, 214. Effelsberg 100-m at 1.4 (9′ : <math>S=4.2\pm 1.0</math> Jy) and 2.7 GHz (4′3 : <math>S=3.0\pm 1.0</math> Jy), plus Hi and IRAS.</p> <p>Yamauchi <i>et al.</i> 1993, PASJ, 45, 795. Hard X-ray observations.</p> <p>Lorimer <i>et al.</i> 1998, A&amp;A, 331, 1002. Pulsar search.</p> <p>Yamauchi <i>et al.</i> 1999, PASJ, 51, 13. ASCA observations of some regions.</p> <p>Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz, including polarisation.</p> <p>Pannuti &amp; Allen 2004, AdSpR, 33, 434. ASCA and RXTE observations.</p> | <p>Kaplan <i>et al.</i> 2006, ApJS, 163, 344. X-ray upper limit on compact sources.</p> <p>Kothes <i>et al.</i> 2006, A&amp;A, 457, 1081. CGPS at 408 MHz (<math>\sim 3′</math> : <math>S=8.1\pm 1.3</math> Jy), including review of flux densities.</p> <p>Xu <i>et al.</i> 2007, A&amp;A, 470, 969. Urumqi 25-m at 4.8 GHz (9′5 : <math>S=2.5\pm 0.5</math> Jy), including polarisation.</p> <p>Gerardy &amp; Fesen 2007, MNRAS, 376, 929. Optical observations.</p> <p>Katsuda <i>et al.</i> 2009, PASJ, 61, S155. Suzaku observations.</p> <p>Uchida <i>et al.</i> 2012, PASJ, 64, 61. Suzaku observations.</p> <p>Katsuda <i>et al.</i> 2016, ApJ, 826, 108. Multi-epoch H<math>\alpha</math> observations for expansion.</p> |
|---|--|

**G159.6+7.3**

**RA:** 05<sup>h</sup>20<sup>m</sup>00<sup>s</sup>  
**Dec:** +50°00′

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

**Size/arcmin:** 240×180?  
**Type:** S

**Radio:** Not detected.

**Optical:** Large, faint shell.

**X-ray:** Possible emission.

**References:**

- |   |  |
|---|--|
| <p>Fesen &amp; Milisavljevic 2010, AJ, 140, 1163. H<math>\alpha</math> and ROSAT observations</p> |  |
|---|--|

**G160.9+2.6**

HB9

**RA:** 05<sup>h</sup>01<sup>m</sup>00<sup>s</sup>  
**Dec:** +46°40′**1-GHz flux/Jy:** 110  
**Spectral index:** 0.64**Size/arcmin:** 140×120  
**Type:** S

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

**Radio:** Large, filamentary shell.**Optical:** Incomplete shell.**X-ray:** Centrally brightened.**Point sources:** Pulsar within boundary of the remnant, plus several nearby compact radio sources.**Distance:** Various observations suggests less than 4 kpc.**References:**

d’Odorico & Sabbadin 1977, A&AS, 28, 439. Optical spectra.  
 Damashek *et al.* 1978, ApJ, 225, L31. Pulsar.  
 Lozinskaya 1981, SvAL, 7, 17. Mean optical velocity.  
 Dwarakanath *et al.* 1982, JApA, 3, 207. Radio observations at 34.5 MHz (26′×40′:  $S = 750 \pm 150$  Jy), plus review of flux densities.  
 van Gorkom *et al.* 1982, MNRAS, 198, 757. WSRT H $\alpha$  absorption to nearby point source.  
 Seaquist & Gilmore 1982, AJ, 87, 378. VLA observations of nearby source.  
 Leahy 1987, ApJ, 322, 917. Einstein observations.  
 Leahy & Roger 1991, AJ, 101, 1033. DRAO at 408 MHz (3′5″×4′8″) and 1.4 GHz (1′0″×1′4″), including H $\alpha$  and discussion of distance.  
 Yamauchi & Koyama 1993, PASJ, 45, 545. Hard X-ray observations.  
 Leahy & Aschenbach 1995, A&A, 293, 853. ROSAT observations.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Leahy *et al.* 1998, A&A, 339, 601. 232 MHz (3′8″×5′2″), 151 MHz (4′2″×5′8″) and Effelsberg 100-m at 4.7 GHz (2′5″) for spectral index studies.

Roger *et al.* 1999, A&AS, 137, 7. 22 MHz flux density ( $S = 1130 \pm 340$  Jy).  
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5″:  $S = 91 \pm 3$  Jy).  
 Fürst & Reich 2004, in MIM, p141. Effelsberg 100-m at 1.4 and 2.7 GHz (9′3″), including polarisation.  
 Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S = 102 \pm 7$  Jy) and 1420 MHz ( $\sim 1'$ :  $S = 54.0 \pm 2.9$  Jy), including polarisation and review of flux densities.  
 Leahy & Tian 2007, A&A, 461, 1013. CGPS at 408 MHz (2′8″×3′9″:  $S = 117.8 \pm 5.3$  Jy) and 1.4 GHz (58″×80″:  $S = 65.9 \pm 3.4$  Jy).  
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5″:  $S = 34 \pm 3$  Jy), including polarisation and review of flux densities.  
 Gosachinskii 2013, AstL, 39, 179. H $\alpha$  observations of region.  
 Araya *et al.* 2014, MNRAS, 444, 860. Fermi detection.

**G166.0+4.3**

VRO 42.05.01

**RA:** 05<sup>h</sup>26<sup>m</sup>30<sup>s</sup>  
**Dec:** +42°56′**1-GHz flux/Jy:** 7  
**Spectral index:** 0.37**Size/arcmin:** 55×35  
**Type:** S**Radio:** Two arcs of strikingly different radii.**Optical:** Nearly complete ring.**X-ray:** Predominantly in SW.**Distance:** H $\alpha$  indicates 4.5 kpc.**References:**

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

Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Guo & Burrows 1997, ApJ, 480, L51. ASCA observations.  
 Lorimer *et al.* 1998, A&A, 331, 1002. Pulsar search.  
 Leahy & Tian 2005, A&A, 440, 929. CGPS at 408 MHz (3′4″×5′0″) and 1.4 GHz (1′0″×1′4″), for spectral index studies. see also: Tian & Leahy 2006, A&A, 451, 991. Erratum.  
 Kothes *et al.* 2006, A&A, 457, 1081. CGPS at 408 MHz ( $\sim 3'$ :  $S = 8.1 \pm 0.9$  Jy) and 1420 MHz ( $\sim 1'$ :  $S = 5.1 \pm 0.4$  Jy), including polarisation and review of flux densities.  
 Bocchino *et al.* 2009, A&A, 498, 139. XMM-Newton observations.  
 Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5″:  $S = 3.3 \pm 0.3$  Jy), including polarisation and review of flux densities.  
 Araya 2013, MNRAS, 434, 2202. Fermi observations.  
 Matsumura *et al.* 2017, PASJ, 69, 30. Suzaku observations.

**G178.2–4.2**

**RA:** 05<sup>h</sup>25<sup>m</sup>05<sup>s</sup>  
**Dec:** +28°11′

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

**Size/arcmin:** 72×62  
**Type:** S

**Radio:** Faint shell, brighter in NE.

**References:**

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

**G179.0+2.6**

**RA:** 05<sup>h</sup>53<sup>m</sup>40<sup>s</sup>  
**Dec:** +31°05′

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

**Size/arcmin:** 70  
**Type:** S?

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

**Optical:** Nearly complete shell.

**Point sources:** Pulsar near centre.

**References:**

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

Gao *et al.* 2011, A&A, 529, A159. Urumqi 25-m at 5 GHz (9′5 : S=3.2±0.3 Jy), including polarisation and review of flux densities.  
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.  
 Pletsch *et al.* 2013, ApJ, 779, L11. Pulsar detection.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.  
 How *et al.* 2018, MNRAS, 478, 1987. Optical observations.

**G180.0–1.7**

**RA:** 05<sup>h</sup>39<sup>m</sup>00<sup>s</sup>  
**Dec:** +27°50′

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

**Size/arcmin:** 180  
**Type:** S

S147

**Radio:** Large faint shell, with spectral break.

**Optical:** Wispy ring.

**X-ray:** Possible detection.

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

**Distance:** Various observations suggest about 1.2 kpc.

**References:**

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.  
 Sofue *et al.* 1980, PASJ, 32, 1. Effelsberg 100-m at 5 GHz (2′6) of parts.  
 Kundu *et al.* 1980, A&A, 92, 225. Effelsberg 100-m at 2.7 GHz (5′5 : S=34.9±4 Jy) and 1.6 GHz (10′ : S=60.2±6 Jy).  
 Angerhofer & Kundu 1981, AJ, 86, 1003. Arecibo at 430 MHz (9′ : S=97±20 Jy).  
 Fürst *et al.* 1982, A&A, 115, 428. Observations of compact radio sources near the remnant.  
 Fesen *et al.* 1985, ApJ, 292, 29. Optical spectra.  
 Fürst & Reich 1986, A&A, 163, 185. Effelsberg 100-m at 1.4, 2.7 and 4.7/5.0 GHz (9′4, 4′3 and 2′4/2′6).  
 Sauvageot *et al.* 1990, A&A, 227, 183. EXOSAT possible detection.  
 Biggs & Lyne 1996, MNRAS, 282, 691. Pulsar search.  
 Anderson *et al.* 1996, ApJ, 468, L55. Pulsar detection.  
 Reich 2002, in NSPS, p1. Effelsberg 100-m at 2.7 GHz.  
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′5 : S=77±10 Jy).  
 Romani & Ng 2003, ApJ, 585, L41. Chandra of pulsar.

Kramer *et al.* 2003, ApJ, 593, L31. Pulsar observations.  
 Sallmen & Welsh 2004, A&A, 426, 555. Optical absorption towards background stars.  
 Drew *et al.* 2005, MNRAS, 362, 753. H $\alpha$  imaging.  
 Ng *et al.* 2007, ApJ, 654, 487. Pulsar and wind nebula observations.  
 Xiao *et al.* 2008, A&A, 482, 783. Urumqi 25-m at 4.8 GHz (9′5 : S=15.4±3.0 Jy) and Effelsberg 100-m at 2.6 GHz (4′4 : S=34.6±4.0 Jy).  
 Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.  
 Katsuta *et al.* 2012, ApJ, 752, 135. Fermi observations.  
 Dinçel *et al.* 2015, MNRAS, 448, 3196. Identification of OB runaway star near centre.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.  
 Boubert *et al.* 2017, A&A, 606, A14. Gaia search for runaway progenitor companion.  
 Chen *et al.* 2017, MNRAS, 472, 3924. Optical and IR observations, including distance.  
 Ren *et al.* 2018, RAA, 18, 111. Optical spectroscopy.

**G181.1+9.5**

**RA:** 06<sup>h</sup>26<sup>m</sup>40<sup>s</sup>  
**Dec:** +32°30′

**1-GHz flux/Jy:** ?  
**Spectral index:** 0.45?

**Size/arcmin:** 74  
**Type:** S

**Radio:** Faint shell.

**X-ray:** Detected.

**Distance:** HI observations suggest 0.5–2.5 kpc.

**References:**

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

**G182.4+4.3**

**RA:** 06<sup>h</sup>08<sup>m</sup>10<sup>s</sup>  
**Dec:** +29°00′

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

**Size/arcmin:** 50  
**Type:** S

**Radio:** Incomplete shell.

**Optical:** Brighter in S and NW.

**X-ray:** Diffuse emission.

**References:**

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

Sun *et al.* 2011, A&A, 536, A83. Urumqi 25-m at 5 GHz (9′5 :  $S = 0.26 \pm 0.5$  Jy) including polarisation and review of flux densities.

Sezer *et al.* 2012, MNRAS, 427, 1168. Optical and XMM-Newton observations.

Jeong *et al.* 2012, Ap&SS, 342, 389. CO observations of region.

**G184.6–5.8**

**RA:** 05<sup>h</sup>34<sup>m</sup>31<sup>s</sup>  
**Dec:** +22°01′

**1-GHz flux/Jy:** 900  
**Spectral index:** 0.30

Crab Nebula, 3C144, SN1054

**Size/arcmin:** 7×5  
**Type:** F

This is the remnant of the SN of AD1054.

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

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

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

**Point sources:** Pulsar powering the remnant.

**Distance:** Proper motions and radial velocities give 2 kpc.

**References:**

- Velusamy 1984, *Nature*, 308, 251. VLA at 1.4 GHz, radio detection of ‘jet’.
- Velusamy 1985, *MNRAS*, 212, 359. VLA at 1.4 GHz (15’).
- Aller & Reynolds 1985, *ApJ*, 293, L73. Radio flux density decrease.
- Fesen & Gull 1986, *ApJ*, 306, 259. Deep [OIII] imagery of ‘jet’.
- Marcelin *et al.* 1990, *A&A*, 228, 471. Optical of ‘jet’.
- Bietenholz & Kronberg 1990, *ApJ*, 357, L13. VLA at 1.4 GHz (1’8).
- Hester *et al.* 1990, *ApJ*, 357, 539. Optical and IR images.
- Hickson & van den Bergh 1990, *ApJ*, 365, 224. Optical polarisation.
- Bietenholz & Kronberg 1992, *ApJ*, 393, 206. VLA at 1.5 and 5 GHz (1’8) and 1.5 and 14 GHz (6’5) for spectral studies.
- Fesen & Staker 1993, *MNRAS*, 263, 69. [OIII] imaging of ‘jet’, and proper motion studies.
- Kassim *et al.* 1993, *AJ*, 106, 2218. VLA at 74 MHz (20’).
- Véron-Cetty & Woltjer 1993, *A&A*, 270, 370. Continuum and [OIII] photometry.
- Wallace *et al.* 1994, *A&A*, 286, 565. HI of surroundings.
- Frail *et al.* 1995, *ApJ*, 454, L129. VLA at 333 MHz (20’’) for limits on shell.
- Bietenholz *et al.* 1997, *ApJ*, 490, 291. Comparison of VLA observations at 74 MHz, 327 MHz, 1.5 GHz and 5 GHz for spectral index studies.
- Blair *et al.* 1997, *ApJS*, 109, 473. HST imaging.
- Fesen *et al.* 1997, *AJ*, 113, 354. Limits on H $\alpha$  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. HESS 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.  $\gamma$ -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. HESS observations
- Seward *et al.* 2006, *ApJ*, 652, 1277. Chandra observations.
- MacAlpine *et al.* 2007, *AJ*, 133, 81. Optical spectroscopy.
- Kaplan *et al.* 2008, *ApJ*, 677, 1201. HST proper motion of pulsar.
- Rudie *et al.* 2008, *MNRAS*, 384, 1200. [OIII] observations of ‘jet’, for proper motion.
- Hurley-Walker *et al.* 2009, *MNRAS*, 396, 365. Radio observations at 14 to 18 GHz.
- Tziamtzis *et al.* 2009, *A&A*, 497, 167. Limits on H $\alpha$  halo.
- Carlebois *et al.* 2010, *AJ*, 139, 2083. Optical imaging spectroscopy.
- Aumont *et al.* 2010, *A&A*, 514, A70. IRAM 30-m at 150 GHz (16’7: S=244±24 Jy) and GBT at 90 GHz (9’3).
- Satterfield *et al.* 2012, *AJ*, 144, 27. Optical spectroscopy.
- Temim *et al.* 2012, *ApJ*, 753, 72. Spitzer observations of dust.
- Gomez *et al.* 2012, *ApJ*, 760, 96. Herschel IR and sub-mm observations of dust.
- Loh *et al.* 2012, *MNRAS*, 421, 789. IR observations of H $_2$ .
- Lundqvist & Tziamtzis 2012, *MNRAS*, 423, 1571. Optical limits on outer shell.
- Loll *et al.* 2013, *ApJ*, 765, 152. HST optical line and continuum observations.
- Barlow *et al.* 2013, *Science*, 342, 1343. Herschel far-IR spectroscopy.
- Black & Fesen 2015, *MNRAS*, 447, 2540. [OIII] observations of ‘jet’.
- Owen & Barlow 2015, *ApJ*, 801, 141. Herschel and Spitzer observations.
- Bietenholz & Nugent 2015, *MNRAS*, 454, 2416. Multi-epoch VLA and optical observations for expansion study.
- 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.

**G189.1+3.0**

**RA:** 06<sup>h</sup>17<sup>m</sup>00<sup>s</sup>  
**Dec:** +22°34′

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

**IC443, 3C157**

**Size/arcmin:** 45  
**Type:** C

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

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

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

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

**Distance:** Optical observations imply 1.9 kpc.

**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 northeast, including polarisation.  
 Asaoka & Aschenbach 1994, A&A, 284, 573. X-ray, including possible overlapping remnant.  
 Tauber *et al.* 1994, ApJ, 421, 570. Observations of shocked molecular species.  
 Claussen *et al.* 1999, ApJ, 522, 349. High resolution observations of OH masers.  
 Rho *et al.* 2001, ApJ, 547, 885. ISO and 2Mass IR spectroscopy and imaging.  
 Olbert *et al.* 2001, ApJ, 554, L205. Chandra of compact X-ray source and surrounding nebula.  
 Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at 863 MHz (14′.5 : S = 160±5 Jy).  
 Welsh & Sallmen 2003, A&A, 408, 545. Optical absorption studies.  
 Leahy 2004, AJ, 127, 2277. DRAO at 408 MHz (3′.3×8′.6) and 1.4 GHz (1′.0×2′.6), for spectral index studies.  
*see also:* Leahy 2004, AJ, 128, 1478. Addendum.  
 Bykov *et al.* 2005, ApJ, 624, L41. Chandra observations of compact source.  
 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″).  
 Rosado *et al.* 2007, AJ, 133, 89. Observations of shocked H<sub>2</sub>.  
 Albert *et al.* 2007, ApJ, 664, L87.  $\gamma$ -ray observations.  
 Troja *et al.* 2008, A&A, 485, 777. XMM-Newton observations.  
 Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -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.  $\gamma$ -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<sub>2</sub>.  
 Lee *et al.* 2012, ApJ, 749, 34. CO and HCO<sup>+</sup> 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.  
 Hezareh *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.  
 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<sub>3</sub> and CH<sub>3</sub>OH 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±4 Jy) and 7 GHz (2′ : S = 67±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.

**G190.9–2.2**

**RA:** 06<sup>h</sup>01<sup>m</sup>55<sup>s</sup>  
**Dec:** +18°24′

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

**Size/arcmin:** 70×60  
**Type:** S

**Radio:** Incomplete shell.

**References:**

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

**G205.5+0.5**

**RA:** 06<sup>h</sup>39<sup>m</sup>00<sup>s</sup>  
**Dec:** +06°30′

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

Monoceros Nebula

**Size/arcmin:** 220  
**Type:** S

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

**Optical:** Large ring, near Rosette nebula.

**X-ray:** Possibly detected.

**Distance:** Association with molecular cloud suggests 1.6 to 2.0 kpc.

**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  $S_{610\text{ MHz}}=245$  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′ :  $S=97.6\pm 12.5$  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  $\gamma$ -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.  $\gamma$ -ray detection.  
 Aharonian *et al.* 2004, A&A, 417, 973. HESS limit.  
 Kaplan *et al.* 2006, ApJS, 163, 344. X-ray upper limit on compact sources.  
 Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -ray observations.  
 Xiao & Zhu 2012, A&A, 545, A86. Review of radio, HI and H $\alpha$  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.

**G206.9+2.3**

**RA:** 06<sup>h</sup>48<sup>m</sup>40<sup>s</sup>  
**Dec:** +06°26′

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

PKS 0646+06

**Size/arcmin:** 60×40  
**Type:** S?

**Radio:** Diffuse source near the Monoceros Nebula.

**Optical:** Filaments detected.

**X-ray:** Possibly detected.

**References:**

Davies & Meaburn 1978, A&A, 69, 443. Optical observations.  
 Nousek *et al.* 1981, ApJ, 248, 152. HEAO-1 X-ray limit.  
 Graham *et al.* 1982, A&A, 109, 145. Effelsberg 100-m at 2.7 GHz (4′ :  $S=4.1\pm 0.6$  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.

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**G213.0–0.6****RA:** 06<sup>h</sup>50<sup>m</sup>50<sup>s</sup>**Dec:** –00°30′**1-GHz flux/Jy:** 21**Spectral index:** 0.4**Size/arcmin:** 160×140?**Type:** S

Has also been called G213.3–0.4.

**Radio:** Large, faint shell.

**Optical:** Filamentary shell.

**Point sources:** Central X-ray source.

**Distance:** Association with molecular cloud suggests about 1 kpc.

**References:**

Reich *et al.* 2003, A&A, 408, 961. Effelsberg 100-m at  
863 MHz ( $14'5 : S = 22.0 \pm 3.7$  Jy).

Stupar & Parker 2012, MNRAS, 419, 1413. H $\alpha$ , radio survey  
and other observations.

Su *et al.* 2017, ApJ, 836, 211. CO observations.

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**G260.4–3.4**

**RA:** 08<sup>h</sup>22<sup>m</sup>10<sup>s</sup>  
**Dec:** –43°00′

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

Puppis A, MSH 08–44

**Size/arcmin:** 60×50  
**Type:** S

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

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

**Optical:** Nebulosity and wisps.

**X-ray:** Brightest to the E.

**Point sources:** Central possible pulsating X-ray source.

**Distance:** Association with H<sub>I</sub> implies 1.3 kpc.

**References:**

- Green 1971, AuJPh, 24, 773. Molonglo at 408 MHz (3′ : S = 198±20 Jy).
- Goudis & Meaburn 1978, A&A, 62, 283. H $\alpha$ +[NII] optical image.
- Petre *et al.* 1982, ApJ, 258, 22. Einstein observations.
- Milne *et al.* 1983, MNRAS, 204, 237. FIRST at 1415 MHz (50′′), large scale emission missing.
- Teske & Petre 1987, ApJ, 318, 370. Coronal optical line emission.
- Dubner & Arnal 1988, A&AS, 75, 363. H<sub>I</sub> and CO observations of surroundings.
- Arendt *et al.* 1990, ApJ, 350, 266. MOST at 843 MHz (44′′×65′′), with large scale emission added, plus IR, optical and X-ray observations.
- Dubner *et al.* 1991, AJ, 101, 1466. VLA at 327 MHz (43′′×73′′) and 1.5 GHz (43′′×77′′).
- Arendt *et al.* 1991, ApJ, 368, 474. IR observations.
- Milne *et al.* 1993, MNRAS, 261, 366. Parkes 64-m at 4.75 (4′.5 : S = 59±5 Jy) and 8.4 GHz (3′ : S = 38±4 Jy), plus polarisation.
- Berthiaume *et al.* 1994, ApJ, 425, 132. X-ray spectroscopy.
- 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.
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- Woermann *et al.* 2000, MNRAS, 317, 421. OH observations.
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- 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±8 Jy) and 327 MHz (45′′×90′′ : S = 263±20 Jy).
- Winkler & Petre 2007, ApJ, 670, 635. Chandra proper motion study of central source.
- Paron *et al.* 2008, A&A, 480, 439. CO observations of E.
- 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.
- Abramowski *et al.* 2015, A&A, 575, A81. HESS limit.
- Reynoso & Walsh 2015, MNRAS, 451, 3044. ATCA at 1.4 GHz (51′′×82′′) and 1.7 GHz for spectral index study.
- Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.
- Luna *et al.* 2016, A&A, 590, A70. XMM-Newton and Chandra observations.
- Koo *et al.* 2016, ApJ, 821, 20. Spitzer and Herschel flux densities (and comparison with X-ray properties).
- Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.
- Reynoso *et al.* 2017, MNRAS, 464, 3029. ATCA at 1.4 GHz including H<sub>I</sub>.
- 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.

**G261.9+5.5**

**RA:** 09<sup>h</sup>04<sup>m</sup>20<sup>s</sup>  
**Dec:** –38°42′

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

**Size/arcmin:** 40×30  
**Type:** S

**Radio:** Faint shell with little limb brightening.

**References:**

- Hill 1967, AuJPh, 20, 297. Parkes 64-m at 2650 MHz (7′.5 : S = 7 Jy) also S<sub>1410 MHz</sub> = 8 Jy, S<sub>81.5 MHz</sub> = 25 Jy.
- Colomb & Dubner 1980, A&A, 82, 244. Argentine 30-m dish at 1.4 GHz, for H<sub>I</sub> possibly associated with remnant.
- Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44′′×71′′).
- Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

**G263.9–3.3**

**RA:** 08<sup>h</sup>34<sup>m</sup>00<sup>s</sup>  
**Dec:** –45°50′

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

Vela (XYZ)

**Size/arcmin:** 255  
**Type:** C

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

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

**Optical:** Filaments.

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

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

**Distance:** Vela pulsar parallax gives 0.3 kpc, optical spectra and H<sub>I</sub> studies suggest 0.25 kpc.

**References:**

- Milne 1968, *AJPh*, 21, 201. Parkes 64-m at various frequencies, including 408 MHz (48′ :  $S = 2300 \pm 300$  Jy), 635 MHz (31′ :  $S = 2360 \pm 300$  Jy), 1410 MHz (14′ :  $S = 1640 \pm 300$  Jy) and 2650 MHz (7.5′ :  $S = 1400 \pm 250$  Jy), plus discussion of the distance.
- Milne 1980, *A&A*, 81, 293. Maps of Vela X with Parkes 64-m at 1.66, 2.7 and 5 GHz (12′.8, 4 and 4.4).
- 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 H<sub>I</sub>.
- 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.  $\gamma$ -ray observations of pulsar.
- Jenkins *et al.* 1998, *ApJ*, 492, L147. UV absorption to background star.
- Dubner *et al.* 1998, *AJ*, 116, 813. Parkes 64-m at 1.4 GHz (15′) for H<sub>I</sub> 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  $\gamma$ -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. HESS 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.
- 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.
- Abdalla *et al.* 2018, *A&A*, 612, A1. HESS observations of Vela X.

**G266.2–1.2**

**RA:** 08<sup>h</sup>52<sup>m</sup>00<sup>s</sup>  
**Dec:** –46°20′

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

RX J0852.0–4622

**Size/arcmin:** 120  
**Type:** S

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

**Radio:** Incomplete shell, confused by the Vela SNR.

**Optical:** Nebulosity offset to NE.

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

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

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

**References:**

Aschenbach 1998, *Nature*, 396, 141. ROSAT identification.  
 Iyudin *et al.* 1998, *Nature*, 396, 142.  $\gamma$ -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. HESS observations.  
 Katagiri *et al.* 2005, *ApJ*, 619, L163.  $\gamma$ -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.  $\gamma$ -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. HESS 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 H<sub>i</sub> observations.  
 Maxted *et al.* 2018, *ApJ*, 866, 76. ATCA at 1.4 to 2.9 GHz, plus other observations.  
 Abdalla *et al.* 2018, *A&A*, 612, A7. HESS observations.

**G272.2–3.2**

**RA:** 09<sup>h</sup>06<sup>m</sup>50<sup>s</sup>  
**Dec:** –52°07′

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

**Size/arcmin:** 15?  
**Type:** S?

**Radio:** Diffuse shell.

**Optical:** Detected.

**X-ray:** Centrally brightened.

**References:**

Greiner *et al.* 1994, *A&A*, 286, L35. ROSAT observations, plus optical observations.  
 Duncan *et al.* 1997, *MNRAS*, 289, 97. Parkes 64-m at 1.4 GHz (18′ :  $S = 0.38 \pm 0.09$  Jy) 2.4 GHz (10′6 :  $S = 0.25 \pm 0.04$  Jy) and 4.8 GHz (5′7 :  $S = 0.17 \pm 0.02$  Jy), MOST at 843 MHz (45″×70″ :  $S = 0.45 \pm 0.10$  Jy), and ATCA at 2.4 GHz (37″×52″), plus ROSAT observations.

Harrus *et al.* 2001, *ApJ*, 552, 614. ASCA and ROSAT observations, plus review of earlier observations.  
 Kamitsukasa *et al.* 2016, *PASJ*, 68, S7. Suzaku observations.

**G279.0+1.1**

**RA:** 09<sup>h</sup>57<sup>m</sup>40<sup>s</sup>  
**Dec:** –53°15′

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

**Size/arcmin:** 95  
**Type:** S

**Radio:** Faint, incomplete shell.

**Optical:** Detected.

**Point sources:** Pulsar nearby.

**References:**

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

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

**G284.3–1.8**

**RA:** 10<sup>h</sup>18<sup>m</sup>15<sup>s</sup>  
**Dec:** –59°00′

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

**MSH 10–53**  
**Size/arcmin:** 24?  
**Type:** S

Has been called G284.2–1.8.

**Radio:** Incomplete, poorly defined shell.

**Optical:** Faint filament near edge.

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

**Point sources:** Central X-/ $\gamma$ -ray source, not thought to be related.

**References:**

Ruiz & May 1986, ApJ, 309, 667. CO and optical observations.  
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz (43″ × 50″) and Parkes 64-m at 8.4 GHz (3′ :  $S = 5.4 \pm 0.8$  Jy) including polarisation, plus earlier flux densities.  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m and ATCA OH observations.  
 Camilo *et al.* 2001, ApJ, 557, L51. Observations of nearby pulsar.

Camilo *et al.* 2004, ApJ, 616, 1118. Chandra observations of pulsar and nebula.  
 Abramowski *et al.* 2012, A&A, 541, A5. HESS observations.  
 Williams *et al.* 2015, ApJ, 808, L19. Chandra and XMM-Newton observations.  
 Marcote *et al.* 2018, A&A, 619, A76. Observations of central source.

**G286.5–1.2**

**RA:** 10<sup>h</sup>35<sup>m</sup>40<sup>s</sup>  
**Dec:** –59°42′

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

**Size/arcmin:** 26 × 6  
**Type:** S?

**Radio:** Double, elongated arc.

**Optical:** Detected.

**References:**

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

**G289.7–0.3**

**RA:** 11<sup>h</sup>01<sup>m</sup>15<sup>s</sup>  
**Dec:** –60°18′

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

**Size/arcmin:** 18 × 14  
**Type:** S

**Radio:** Incomplete shell.

**Point sources:** Compact radio source near centre.

**References:**

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

**G290.1–0.8**

**RA:** 11<sup>h</sup>03<sup>m</sup>05<sup>s</sup>  
**Dec:** –60°56′

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

**MSH 11–61A**

**Size/arcmin:** 19×14  
**Type:** S

**Radio:** Elongated, clumpy shell.

**Optical:** Filaments detected.

**X-ray:** Centrally brightened.

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

**Distance:** H $\alpha$  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 H $\alpha$ .  
 Pavan *et al.* 2014, A&A, 562, A122. Chandra and ATCA observations at 2 GHz (4″1×5″2) of PWN.  
 Halpern *et al.* 2014, ApJ, 795, L27. XMM-Newton observations of PWN.  
 Auchettl *et al.* 2015, ApJ, 810, 43. Fermi and Suzaku observations.  
 Kamitsukasa *et al.* 2015, PASJ, 67, 16. Suzaku observations.  
 Pavan *et al.* 2016, A&A, 591, A91. Chandra observations, including PWN and ‘jet’.

**G291.0–0.1**

**RA:** 11<sup>h</sup>11<sup>m</sup>54<sup>s</sup>  
**Dec:** –60°38′

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

**(MSH 11–62)**

**Size/arcmin:** 15×13  
**Type:** C

**Radio:** Centrally brightened core, with surrounding arcs.

**Optical:** Detected.

**X-ray:** Centrally brightened.

**Point sources:** Central compact X-ray source.

**References:**

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

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

**G292.0+1.8**

**RA:** 11<sup>h</sup>24<sup>m</sup>36<sup>s</sup>  
**Dec:** –59°16′

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

MSH 11–54

**Size/arcmin:** 12×8  
**Type:** C

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

**Optical:** Oxygen rich.

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

**Point sources:** Central pulsar.

**Distance:** 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.  
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 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  $8.8\pm0.1$ ), 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.

**G292.2–0.5**

**RA:** 11<sup>h</sup>19<sup>m</sup>20<sup>s</sup>  
**Dec:** –61°28′

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

**Size/arcmin:** 20×15  
**Type:** S

**Radio:** Shell.

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

**Point sources:** Central, young pulsar.

**Distance:** 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″:  $S=5.6\pm0.3$  Jy) and 2.5 GHz (20″×21″).  
 Pivovarov *et al.* 2001, ApJ, 554, 161. ROSAT and ASCA observations.  
 Gonzalez & Safi-Harb 2003, ApJ, 591, L143. Chandra observations of pulsar.  
 Caswell *et al.* 2004, MNRAS, 352, 1405. ATCA at 5 GHz (1′:  $S=2.8$  Jy), including polarisation, and 1.4 GHz for 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 *et al.* 2008, ApJ, 684, 532. Chandra observations of pulsar and nebula.  
 Kumar *et al.* 2012, ApJ, 754, 96. Chandra and XMM-Newton observations.  
 Ng *et al.* 2012, ApJ, 761, 65. XMM-Newton observations.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

**G293.8+0.6**

**RA:** 11<sup>h</sup>35<sup>m</sup>00<sup>s</sup>  
**Dec:** –60°54′

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

**Size/arcmin:** 20  
**Type:** C

**Radio:** Central source, with faint extended plateau.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ :  $S = 9.0$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S = 2.1$  Jy).  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″ × 51″).

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

**G294.1–0.0**

**RA:** 11<sup>h</sup>36<sup>m</sup>10<sup>s</sup>  
**Dec:** –61°38′

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

**Size/arcmin:** 40  
**Type:** S

**Radio:** Faint shell.

**References:**

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

**G296.1–0.5**

**RA:** 11<sup>h</sup>51<sup>m</sup>10<sup>s</sup>  
**Dec:** –62°34′

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

**Size/arcmin:** 37 × 25  
**Type:** S

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

**Radio:** Irregular shell, with nearby H<sub>II</sub> regions.

**Optical:** Detected.

**X-ray:** Irregular, incomplete shell.

**References:**

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

**G296.5+10.0**

**RA:** 12<sup>h</sup>09<sup>m</sup>40<sup>s</sup>  
**Dec:** –52°25′

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

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

Has been called G296.5+9.7, and erroneously G295.5+9.7.

**Radio:** Shell with two bright limbs.

**Optical:** Detected.

**X-ray:** Incomplete shell, with central pulsar.

**Point sources:** Central pulsar.

**References:**

Irvine & Irvine 1974, ApJ, 192, L111. Optical observations.  
 Danziger & Dennefeld 1976, PASP, 88, 44. Optical spectra.  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier  
 Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Tuohy *et al.* 1979, ApJ, 230, L27. X-ray detection with HEAO-1  
 A2 experiment.  
 Ruiz 1983, AJ, 88, 1210. Optical spectra.  
 Dubner *et al.* 1986, AJ, 91, 343. Argentine 30-m dish at  
 1.4 GHz (34′), plus H<sub>I</sub>.  
 Kellett *et al.* 1987, MNRAS, 225, 199. EXOSAT of the west of  
 the remnant, including the compact source.  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz  
 (44″×56″).  
 Matsui *et al.* 1988, ApJ, 329, 838. Einstein observations, includ-  
 ing 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 :  $18.8 \pm 3$ ), 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 neu-  
 tron star.  
 Zavlin *et al.* 1998, A&A, 331, 821. ROSAT and ASCA observa-  
 tions of neutron star.  
 Giacani *et al.* 2000, AJ, 119, 281. ATCA at 1.4 GHz (2′7×4′0)  
 for H<sub>I</sub> studies.  
 Zavlin *et al.* 2000, ApJ, 540, L25. Chandra observations of cen-  
 tral pulsar.  
 Gotthelf & Halpern 2007, ApJ, 664, L35. X-ray timing observa-  
 tions of pulsar.  
 Harvey-Smith *et al.* 2010, ApJ, 712, 1157. ATCA at 1.4 GHz  
 (1′8×3′3), including polarisation.  
 Araya 2013, MNRAS, 434, 2202. Fermi observations.  
 Halpern & Gotthelf 2015, ApJ, 812, 61. Two epoch Chandra  
 observations for pulsar proper motion.  
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4  
 frequencies between 30 and 100 GHz.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.  
 Ackermann *et al.* 2018, ApJS, 237, 32. Fermi observations.

**G296.7–0.9**

**RA:** 11<sup>h</sup>55<sup>m</sup>30<sup>s</sup>  
**Dec:** –63°08′

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

**Size/arcmin:** 15×8  
**Type:** S

**Radio:** Bilateral shell.

**X-ray:** Brighter to SE.

**References:**

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

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

**G296.8–0.3**

**RA:** 11<sup>h</sup>58<sup>m</sup>30<sup>s</sup>  
**Dec:** –62°35′

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

**1156–62**  
**Size/arcmin:** 20×14  
**Type:** S

**Radio:** Shell, brighter to the NW.

**X-ray:** Detected.

**Distance:** H<sub>I</sub> absorption gives 9.6 kpc.

**References:**

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ :  
 $S = 15.0$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S = 3.2$  Jy).  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier  
 Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Hwang & Markert 1994, ApJ, 431, 819. ROSAT observations.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz  
 (43″×48″ :  $S = 9.2$  Jy).

Gaensler *et al.* 1998, MNRAS, 296, 813. ATCA at 1.3 GHz  
 (22″×24″ :  $S = 7.0 \pm 0.3$  Jy), including polarisation and H<sub>I</sub> ob-  
 servations, 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<sup>h</sup>12<sup>m</sup>40<sup>s</sup>  
**Dec:** –62°52′

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

**Size/arcmin:** 5?  
**Type:** ?

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

**References:**

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

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

**G298.6–0.0**

**RA:** 12<sup>h</sup>13<sup>m</sup>41<sup>s</sup>  
**Dec:** –62°37′

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

**Size/arcmin:** 12×9  
**Type:** S

Has been called G298.6–0.1.

**Radio:** Incomplete shell, in complex region.

**X-ray:** Centrally brightened.

**References:**

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

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

**G299.2–2.9**

**RA:** 12<sup>h</sup>15<sup>m</sup>13<sup>s</sup>  
**Dec:** –65°30′

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

**Size/arcmin:** 18×11  
**Type:** S

**Radio:** Faint source.

**Optical:** Filaments in W.

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

**References:**

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

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

**G299.6–0.5**

**RA:** 12<sup>h</sup>21<sup>m</sup>45<sup>s</sup>  
**Dec:** –63°09′

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

**Size/arcmin:** 13  
**Type:** S

**Radio:** Faint shell, brightest to E.

**References:**

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

**G301.4–1.0**

**RA:** 12<sup>h</sup>37<sup>m</sup>55<sup>s</sup>  
**Dec:** –63°49′

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

**Size/arcmin:** 37×23  
**Type:** S

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

**References:**

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

**G302.3+0.7**

**RA:** 12<sup>h</sup>45<sup>m</sup>55<sup>s</sup>  
**Dec:** –62°08′

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

**Size/arcmin:** 17  
**Type:** S

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

**References:**

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

**G304.6+0.1**

**RA:** 13<sup>h</sup>05<sup>m</sup>59<sup>s</sup>  
**Dec:** –62°42′

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

**Size/arcmin:** 8  
**Type:** S  
 Kes 17

**Radio:** Incomplete shell.

**X-ray:** Detected.

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

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′ : S = 6.9 Jy).  
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H I absorption.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 48″ : S = 18 Jy).  
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.  
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.  
 Combi *et al.* 2010, A&A, 523, A76. XMM-Newton observations  
 Lee *et al.* 2011, ApJ, 740, 31. Akari and Spitzer observations.

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

**G306.3–0.9**

**RA:** 13<sup>h</sup>21<sup>m</sup>50<sup>s</sup>  
**Dec:** –63°34′

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

**Size/arcmin:** 4  
**Type:** S?

**Radio:** Diffuse emission.

**X-ray:** Partial shell.

**References:**

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

Sezar *et al.* 2017, MNRAS, 466, 3434. Suzaku and Fermi observations.

**G308.1–0.7**

**RA:** 13<sup>h</sup>37<sup>m</sup>37<sup>s</sup>  
**Dec:** –63°04′

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

**Size/arcmin:** 13  
**Type:** S

**Radio:** Faint shell.

**References:**

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

**G308.4–1.4**

**RA:** 13<sup>h</sup>41<sup>m</sup>30<sup>s</sup>  
**Dec:** –63°44′

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

**Size/arcmin:** 12×6?  
**Type:** S?

W part has been called G308.3–1.4.

**Radio:** Complex structure, with multiple arcs.

**X-ray:** Limb brightened partial shell in W.

**References:**

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

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

**G308.8–0.1**

**RA:** 13<sup>h</sup>42<sup>m</sup>30<sup>s</sup>  
**Dec:** –62°23′

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

**Size/arcmin:** 30×20?  
**Type:** C?

Incorporates previous catalogued remnant G308.7+0.0.

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

**Point sources:** Pulsar near centre of remnant.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:  $S=$   
 16.7 Jy) and Parkes 64-m at 5 GHz (4′:  $S=7.0$  Jy).  
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz  
 (4.4′:  $S=6.5$  Jy).  
 Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz  
 (50″).  
 Wilson 1986, ApJ, 302, 718. 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 observa-  
 tions.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

**G309.2–0.6**

**RA:** 13<sup>h</sup>46<sup>m</sup>31<sup>s</sup>  
**Dec:** –62°54′

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

**Size/arcmin:** 15×12  
**Type:** S

Has been called G309.2–0.7.

**Radio:** Distorted shell.

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

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:  $S=$   
 10.0 Jy) and Parkes 64-m at 5 GHz (4′:  $S=3.9$  Jy).  
 Caswell *et al.* 1981, MNRAS, 195, 89. FIRST at 1415 MHz  
 (1.5′).  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz  
 (44″×50″).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz  
 (43″×48″:  $S=6$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observa-  
 tions.

Gaensler *et al.* 1998, MNRAS, 299, 812. ATCA at 1.3 GHz  
 (23″×24″:  $S=5.2±0.2$  Jy).  
 Rakowski *et al.* 2001, ApJ, 548, 258. ASCA and ROSAT obser-  
 vations.  
 Rakowski *et al.* 2006, ApJ, 649, L111. Observations of central  
 source.  
 Safi-Harb *et al.* 2007, ApJ, 659, 407. Observations of central  
 source.

**G309.8+0.0**

**RA:** 13<sup>h</sup>50<sup>m</sup>30<sup>s</sup>  
**Dec:** –62°05′

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

**Size/arcmin:** 25×19  
**Type:** S

**Radio:** Distorted shell.

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

**References:**

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

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

**G310.6–1.6**

**RA:** 14<sup>h</sup>00<sup>m</sup>45<sup>s</sup>  
**Dec:** –63°26′

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

**Size/arcmin:** 2.5  
**Type:** C?

**Radio:** Not detected.

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

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

**References:**

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

**G310.6–0.3**

**RA:** 13<sup>h</sup>58<sup>m</sup>00<sup>s</sup>  
**Dec:** –62°09′

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

**Kes** 20B  
**Size/arcmin:** 8  
**Type:** S

Has been called G310.65–0.29.

**Radio:** Asymmetric shell.

**References:**

Whiteoak *et al.* 1994, MNRAS, 269, 294. MOST at 843 MHz.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ :  $S = 5.4$  Jy).  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

**G310.8–0.4**

**RA:** 14<sup>h</sup>00<sup>m</sup>00<sup>s</sup>  
**Dec:** –62°17′

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

**Kes** 20A  
**Size/arcmin:** 12  
**Type:** S

Has been called G310.80–0.41.

**Radio:** Arc in E, in complex region.

**References:**

Whiteoak *et al.* 1994, MNRAS, 269, 294. MOST at 843 MHz.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×49″ :  $S = 6.9$  Jy).  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.  
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.

**G311.5–0.3**

**RA:** 14<sup>h</sup>05<sup>m</sup>38<sup>s</sup>  
**Dec:** –61°58′

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

**Size/arcmin:** 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.

**G312.4–0.4**

**RA:** 14<sup>h</sup>13<sup>m</sup>00<sup>s</sup>  
**Dec:** –61°44′

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

**Size/arcmin:** 38  
**Type:** S

Has been called G312.44–0.36.

**Radio:** Irregular, incomplete shell.

**X-ray:** Weak emission in W.

**Point sources:** Nearby  $\gamma$ -ray sources and pulsars.

**Distance:** H $\alpha$  absorption suggests > 6 kpc and possibly > 14 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 ( $S=30\pm2$  Jy) and 8.55 GHz ( $S=17\pm4$  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  $\gamma$ -ray sources.  
 Doherty *et al.* 2003, MNRAS, 339, 1048. ATCA at 1.4 GHz (25″) plus H $\alpha$  absorption, and Chandra observations.

**G312.5–3.0**

**RA:** 14<sup>h</sup>21<sup>m</sup>00<sup>s</sup>  
**Dec:** –64°12′

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

**Size/arcmin:** 20×18  
**Type:** S

**Radio:** Distorted shell.

**References:**

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

**G315.1+2.7**

**RA:** 14<sup>h</sup>24<sup>m</sup>30<sup>s</sup>  
**Dec:** –57°50′

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

**Size/arcmin:** 190×150  
**Type:** S

**Radio:** Poorly defined shell.

**Optical:** Filaments, brighter in NE.

**References:**

Duncan *et al.* 1997, MNRAS, 287, 722. Parkes 64-m at 2.4 GHz (11′:  $S=19\pm3$  Jy).  
 Combi *et al.* 1998, A&A, 333, 298. Radio survey observations.

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

**G315.4–2.3**

**RA:** 14<sup>h</sup>43<sup>m</sup>00<sup>s</sup>  
**Dec:** –62°30′

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

RCW 86, MSH 14–63

**Size/arcmin:** 42  
**Type:** S

Possibly the remnant of the SN of AD185?

**Radio:** Shell, brightest to the SW.

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

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

**Point sources:** Several X-ray sources.

**Distance:** Optical observations imply 2.3 kpc.

**References:**

van den Bergh *et al.* 1973, ApJS, 26, 19. Optical observations.  
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz ( $3' : S=86$  Jy) and Parkes 64-m at 5 GHz ( $4' : S=18.2$  Jy).  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz ( $8.4'$ ) and 5 GHz ( $4.4'$ ).  
 Winkler 1978, ApJ, 221, 220. X-ray detection.  
 Leibowitz & Danziger 1983, MNRAS, 204, 273. Optical spectra.  
 Pisarski *et al.* 1984, ApJ, 277, 710. Einstein observations  
 Nugent *et al.* 1984, ApJ, 284, 612. X-ray spectrum.  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz ( $44'' \times 50''$ ).  
 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 ( $43'' \times 48'' : S > 22$ ).  
 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.  
 Norkowski *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. HESS 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.  
 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.  
 Abramowski *et al.* 2018, A&A, 612, A4. HESS observations.

**G315.4–0.3**

**RA:** 14<sup>h</sup>35<sup>m</sup>55<sup>s</sup>  
**Dec:** –60°36′

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

**Size/arcmin:** 24×13  
**Type:** ?

**Radio:** Irregular non-thermal emission, with HII region superposed in E.

**Optical:** Detected.

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

**G315.9–0.0**

**RA:** 14<sup>h</sup>38<sup>m</sup>25<sup>s</sup>  
**Dec:** –60°11′

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

**Size/arcmin:** 25×14  
**Type:** S

Has been called G315.8–0.0.

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

**Point sources:** Pulsar at end of radio trail.

**References:**

Kesteven *et al.* 1987, AuJPh, 40, 855. MOST at 843 MHz (44″×50″).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:  $S=0.9$  Jy).

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

Camilo *et al.* 2009, ApJ, 703, L55. Pulsar detection.

Ng *et al.* 2012, ApJ, 746, 105. ATCA at 1.4, 2.5, 5 and 9 GHz, including polarisation, of pulsar trail.

**G316.3–0.0**

**RA:** 14<sup>h</sup>41<sup>m</sup>30<sup>s</sup>  
**Dec:** –60°00′

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

(MSH 14–57)  
**Size/arcmin:** 29×14  
**Type:** S

**Radio:** Distorted shell, with possible ‘blowout’.

**X-ray:** Detected.

**Distance:** H<sub>I</sub> absorption data suggests > 7.2 kpc.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).

Caswell *et al.* 1975, A&A, 45, 239. Parkes H<sub>I</sub> 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.

Acerro *et al.* 2016, ApJS, 224, 8. Fermi observations.

**G317.3–0.2**

**RA:** 14<sup>h</sup>49<sup>m</sup>40<sup>s</sup>  
**Dec:** –59°46′

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

**Size/arcmin:** 11  
**Type:** S

**Radio:** Incomplete shell.

**Optical:** Detected.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:  $S=5.2$  Jy).

Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.

**G318.2+0.1**

**RA:** 14<sup>h</sup>54<sup>m</sup>50<sup>s</sup>  
**Dec:** –59°04′

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

**Size/arcmin:** 40×35  
**Type:** S

**Radio:** Faint shell, with central H<sub>II</sub> region.

**X-ray:** Sources within remnant.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×50″:  $S>4.3$ ).

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

Bocchino *et al.* 2001, A&A, 367, 629. BeppoSAX and ROSAT observations.

Onako *et al.* 2016, ApJ, 829, 106. Akari observations.

**G318.9+0.4**

**RA:** 14<sup>h</sup>58<sup>m</sup>30<sup>s</sup>  
**Dec:** –58°29′

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

**Size/arcmin:** 30×14  
**Type:** C

May not be a SNR?

**Radio:** Complex arcs, with off-centre core.

**References:**

Whiteoak 1990, *Nature*, 347, 157. MOST at 843 MHz (43″×51″).  
 Whiteoak 1993, *ApJ*, 415, 701. MOST at 843 MHz (43″×51″:  $S=4.8\pm0.6$  Jy), Parkes 64-m at 4.5 GHz (4′7″:  $S=3.7\pm0.2$  Jy) and 8.4 GHz (2′8″:  $S=3.0\pm0.4$  Jy) including polarisation, and ATCA at 1.4 GHz and 4.8 GHz (11″×13″) of core.

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

**G320.4–1.2**

**RA:** 15<sup>h</sup>14<sup>m</sup>30<sup>s</sup>  
**Dec:** –59°08′

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

**MSH 15–52, RCW 89**

**Size/arcmin:** 35  
**Type:** C

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

**Radio:** Ragged shell.

**Optical:** RCW 89 is the H $\alpha$  emitting region to the NW.

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

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

**Distance:** H $\alpha$  absorption indicates 5.2 kpc.

**References:**

Caswell *et al.* 1975, *A&A*, 45, 239. Parkes H $\alpha$  absorption.  
 Dickel & Milne 1976, *AuJPh*, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4″) and 5 GHz (4′4″).  
 Dopita *et al.* 1977, *ApJ*, 214, 179. Optical spectra.  
 Caswell *et al.* 1981, *MNRAS*, 195, 89. FIRST at 1415 MHz (50″).  
 Seward & Harnden 1982, *ApJ*, 256, L45. X-ray observations of pulsar.  
 Manchester *et al.* 1982, *ApJ*, 262, L31. Radio observations of pulsar.  
 Seward *et al.* 1983, *ApJ*, 267, 698. X-ray, Optical and IR.  
 van den Bergh & Kamper 1984, *ApJ*, 280, L51. Optical expansion.  
 Seward *et al.* 1984, *ApJ*, 281, 650. X-ray observations of pulsar and nebulosity.  
 Lortet *et al.* 1987, *A&A*, 180, 65. Optical observations.  
 Trussoni *et al.* 1990, *A&A*, 234, 403. EXOSAT observations.  
 Asaoka & Koyama 1990, *PASJ*, 42, 625. Ginga X-ray spectrum.  
 Arendt 1991, *AJ*, 101, 2160. IRAS observations, including compact source.  
 Milne *et al.* 1993, *MNRAS*, 264, 853. Parkes 64-m at 4.8 GHz (4′5″:  $S=37\pm7$  Jy) and 8.4 GHz (3′0″:  $S=24\pm4$  Jy), including polarisation and review of flux densities.  
 Strom 1994, *MNRAS*, 268, L5. Historical association.  
 Chin & Huang 1994, *Nature*, 371, 398. Questioning of historical association.  
 Matz *et al.* 1994, *ApJ*, 434, 288. X-ray observations of pulsar.  
 Schaefer 1995, *AJ*, 110, 1793. Questioning of historical association.  
 Du Plessis *et al.* 1995, *ApJ*, 453, 746. Hartesbeesthoek 26-m at 2.3, 5 and 8.5 GHz ( $S=42, 35.6$  and 14.5 Jy).  
 Greiveldinger *et al.* 1995, *ApJ*, 454, 855. ROSAT observations.  
 Trussoni *et al.* 1996, *A&A*, 306, 581. ROSAT observations.

Tamura *et al.* 1996, *PASJ*, 48, L33. ASCA observations.  
 Whiteoak & Green 1996, *A&AS*, 118, 329. MOST at 843 MHz (43″×50″:  $S=62$  Jy).  
 Green *et al.* 1997, *AJ*, 114, 2058. Parkes 64-m OH observations.  
 Marsden *et al.* 1997, *ApJ*, 491, L39. X-ray spectroscopy.  
 Brazier & Becker 1997, *MNRAS*, 284, 335. ROSAT observations.  
 Gaensler *et al.* 1999, *MNRAS*, 305, 724. ATCA at 1.4 GHz (21″×24″), plus H $\alpha$  observations, and 5.3 GHz (10″×15″).  
 Sako *et al.* 2000, *ApJ*, 537, 422. Possible  $\gamma$ -ray detection of pulsar.  
 Mineo *et al.* 2001, *A&A*, 380, 695. BeppoSAX observations.  
 Gaensler *et al.* 2002, *ApJ*, 569, 878. Chandra observations of pulsar and nebula.  
 Dubner *et al.* 2002, *AJ*, 123, 337. ATCA at 1.4 GHz (2′7″×4′0″), plus H $\alpha$  observations.  
 Aharonian *et al.* 2005, *A&A*, 435, L17. HESS 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.  $\gamma$ -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.  
 Abdalla *et al.* 2018, *A&A*, 612, A1. HESS observations.

**G320.6–1.6**

**RA:** 15<sup>h</sup>17<sup>m</sup>50<sup>s</sup>  
**Dec:** –59°16′

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

**Size/arcmin:** 60×30  
**Type:** S

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

**Optical:** Detected.

**References:**

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

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

**G321.9–1.1**

**RA:** 15<sup>h</sup>23<sup>m</sup>45<sup>s</sup>  
**Dec:** –58°13′

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

**Size/arcmin:** 28  
**Type:** S

**Radio:** Faint shell.

**References:**

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

**G321.9–0.3**

**RA:** 15<sup>h</sup>20<sup>m</sup>40<sup>s</sup>  
**Dec:** –57°34′

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

**Size/arcmin:** 31×23  
**Type:** S

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

**Point sources:** Pulsar near E edge.

**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.

**G322.1+0.0**

**RA:** 15<sup>h</sup>20<sup>m</sup>49<sup>s</sup>  
**Dec:** –57°10′

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

**Size/arcmin:** 8×4.5?  
**Type:** S?

**Radio:** Circular shell, with extension to S.

**X-ray:** Diffuse emission.

**Point sources:** Cir X-1 HMXB at centre.

**References:**

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

**G322.5–0.1**

**RA:** 15<sup>h</sup>23<sup>m</sup>23<sup>s</sup>  
**Dec:** –57°06′

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

**Size/arcmin:** 15  
**Type:** C

**Radio:** Shell with central extended source.

**Point sources:** PN Pe 2-8 within boundary.

**References:**

Whiteoak 1992, MNRAS, 256, 121. MOST at 843 MHz  
(43″×51″:  $S=2.0\pm0.3$  Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz  
(43″×51″:  $S=1.7$  Jy), plus Parkes 64-m at 4.5 GHz (= 0.89±0.13).

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

**G323.5+0.1**

**RA:** 15<sup>h</sup>28<sup>m</sup>42<sup>s</sup>  
**Dec:** –56°21′

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

**Size/arcmin:** 13  
**Type:** S

**Radio:** Distorted shell, confused with thermal emission.

**Point sources:** Compact, probably thermal source near centre.

**References:**

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

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

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

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

**G323.7–1.0**

**RA:** 15<sup>h</sup>34<sup>m</sup>30<sup>s</sup>  
**Dec:** –57°12′

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

**Size/arcmin:** 51×38  
**Type:** S

**Radio:** Faint shell.

**X-ray:** Faint diffuse emission.

**Distance:** CO and H<sub>I</sub> 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.

Abdalla *et al.* 2018, A&A, 612, A8. HESS observations.

Maxted *et al.* 2018, MNRAS, 480, 134. CO and H<sub>I</sub> observations.

Saji *et al.* 2018, PASJ, 70, 23. Suzaku observations.

**G326.3–1.8**

**RA:** 15<sup>h</sup>53<sup>m</sup>00<sup>s</sup>  
**Dec:** –56°10′

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

MSH 15–56

**Size/arcmin:** 38  
**Type:** C

Has been called G326.2–1.7.

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

**Optical:** Emission around the shell.

**X-ray:** Shell, with central extended emission.

**Point sources:** Compact X-ray source.

**References:**

- Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′:  $S=180$  Jy).  
 Caswell *et al.* 1975, A&A, 45, 239. Parkes HI absorption.  
 Milne *et al.* 1979, MNRAS, 188, 437. FIRST at 1415 MHz (0′8:  $S>95$ ) and Parkes 64-m at 14.7 GHz (2′2:  $S=69\pm 8$  Jy).  
 van den Bergh 1979, ApJ, 227, 497. Optical observations.  
 Zealey *et al.* 1979, A&AS, 38, 39. Optical observations.  
 Dennefeld 1980, PASP, 92, 603. Optical spectra.  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×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.  
 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.

**G327.1–1.1**

**RA:** 15<sup>h</sup>54<sup>m</sup>25<sup>s</sup>  
**Dec:** –55°09′

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

**Size/arcmin:** 18  
**Type:** C

**Radio:** Shell, with off-centre core.

**X-ray:** Diffuse, with core.

**References:**

- Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz (8′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.  
 Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.

**G327.2–0.1**

**RA:** 15<sup>h</sup>50<sup>m</sup>55<sup>s</sup>  
**Dec:** –54°18′

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

**Size/arcmin:** 5  
**Type:** S

Has been called G327.24–0.13.

**Radio:** Shell, possibly with central emission.

**Point sources:** Central pulsar (magnetar).

**References:**

- Camilo *et al.* 2007, ApJ, 666, L93. Pulsar observations.  
 Gelfand & Gaensler 2007, ApJ, 667, 1111. Chandra and XMM-Newton observations of magnetar, and 843 GHz (43″×53″:  $S=0.5\pm 0.1$  Jy) and SGPS at 1.4 GHz ( $S=0.3\pm 0.1$  Jy).

**G327.4+0.4**

Kes 27

**RA:** 15<sup>h</sup>48<sup>m</sup>20<sup>s</sup>  
**Dec:** –53°49′**1-GHz flux/Jy:** 30?  
**Spectral index:** 0.6**Size/arcmin:** 21  
**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.**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 ( $44''\times 55''$ ).  
 Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz ( $43''\times 53''$ :  $S = 32.2\pm 6$  Jy), and Parkes 64-m at 8.4 GHz ( $3'$ :  $S = 9.4\pm 0.8$  Jy), including polarisation.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ( $43''\times 53''$ :  $S=25$  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 ( $1'8\times 2'0$ ), 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.

**G327.4+1.0****RA:** 15<sup>h</sup>46<sup>m</sup>48<sup>s</sup>  
**Dec:** –53°20′**1-GHz flux/Jy:** 1.9?  
**Spectral index:** ?**Size/arcmin:** 14  
**Type:** S**Radio:** Asymmetric shell.**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz ( $43''\times 54''$ :  $S=2.1$  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 ( $1'8\times 2'0$ ), plus HI.

**G327.6+14.6**

**RA:** 15<sup>h</sup>02<sup>m</sup>50<sup>s</sup>  
**Dec:** –41°56′

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

SN1006, PKS 1459–41

**Size/arcmin:** 30  
**Type:** S

This is the remnant of the SN of AD1006.

**Radio:** Shell, with two bright arcs.

**Optical:** Filaments to the NW, with broad H $\alpha$  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, AuPh, 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 H $\alpha$  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":  $S = 17.5 \pm 1.5$  Jy).  
 Long *et al.* 1988, ApJ, 333, 749. Optical proper motion for distance.  
 Wu *et al.* 1993, ApJ, 416, 247. UV spectra.  
 Reynolds & Gilmore 1993, AJ, 106, 272. VLA at 1.37 and 1.67 GHz (24"), including polarisation.  
 Moffett *et al.* 1993, AJ, 106, 1566. VLA at 1.37 and 1.67 GHz (10"×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 H $\alpha$ , plus CO observations.  
 Ghavamian *et al.* 2002, ApJ, 572, 888. Optical of filaments in NW.  
 Sollerman *et al.* 2003, A&A, 407, 249. Optical spectroscopy.  
 Winkler *et al.* 2003, ApJ, 585, 324. Optical proper motion studies.  
 Vink *et al.* 2003, ApJ, 587, L31. XMM-Newton observations.  
 Bamba *et al.* 2003, ApJ, 589, 827. Chandra observations of NE.  
 Winkler *et al.* 2005, ApJ, 624, 189. HST absorption towards background sources.  
 Kalemci *et al.* 2006, ApJ, 644, 274. INTEGRAL observations.  
 Acero *et al.* 2007, A&A, 475, 883. XMM-Newton observations.  
 Raymond *et al.* 2007, ApJ, 659, 1257. HST H $\alpha$  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.  
 Miceli *et al.* 2013, A&A, 550, A80. XMM-Newton observations.  
 Broersen *et al.* 2013, A&A, 552, A9. XMM-Newton observations of NW knot.  
 Katsuda *et al.* 2013, ApJ, 763, 85. Chandra proper motion study of NW.  
 Winkler *et al.* 2013, ApJ, 764, 156. Spitzer observations.  
 Uchida *et al.* 2013, ApJ, 771, 56. Suzaku observations.  
 Reynoso *et al.* 2013, AJ, 145, 104. VLA and ATCA at 1.4 GHz (10"), including polarisation.  
 Nikolić *et al.* 2013, Science, 340, 45. Optical spectroscopy.  
 Winkler *et al.* 2014, ApJ, 781, 65. Chandra observations and H $\alpha$  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.  
 Arnaud *et al.* 2016, A&A, 586, A134. Planck flux densities at 4 frequencies between 30 and 100 GHz.  
 Xing *et al.* 2016, ApJ, 823, 44. Fermi observations.  
 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.

**G328.4+0.2**

**RA:** 15<sup>h</sup>55<sup>m</sup>30<sup>s</sup>  
**Dec:** –53°17′

**1-GHz flux/Jy:** 15  
**Spectral index:** 0.0

(MSH 15–57)

**Size/arcmin:** 5  
**Type:** F

**Radio:** Amorphous emission, with central bar.

**X-ray:** Detected at high energies.

**Distance:** H<sub>I</sub> absorption indicates > 17.4 kpc.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50′).  
 Wilson 1986, ApJ, 302, 718. Lack of detection with Einstein.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×54″:S=15 Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Gaensler *et al.* 2000, ApJ, 542, 380. ATCA at 1.4 GHz (16′5×19′5 : S = 14.3±0.1 Jy) and 4.5 GHz (1′5×2′0 : S = 12.5±0.2 Jy).  
 Hughes *et al.* 2000, ApJ, 542, 386. ASCA observations.  
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (1′8×2′0), plus H<sub>I</sub>.  
 Johnston *et al.* 2004, MNRAS, 348, L19. ATCA at 19 GHz (6′1×7′7), including polarisation.  
 Gelfand *et al.* 2007, ApJ, 663, 468. ATCA at 1.4 GHz (5′8×7′0:S=13.8±0.4 Jy), plus XMM-Newton observations.

**G329.7+0.4**

**RA:** 16<sup>h</sup>01<sup>m</sup>20<sup>s</sup>  
**Dec:** –52°18′

**1-GHz flux/Jy:** >34?  
**Spectral index:** ?

**Size/arcmin:** 40×33  
**Type:** S

**Radio:** Diffuse shell, in complex region.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×53″:S>38).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (1′8×2′0), plus H<sub>I</sub>.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.

**G330.0+15.0**

**RA:** 15<sup>h</sup>10<sup>m</sup>00<sup>s</sup>  
**Dec:** –40°00′

**1-GHz flux/Jy:** 350?  
**Spectral index:** 0.5?

Lupus Loop

**Size/arcmin:** 180?  
**Type:** S

**Radio:** Low surface brightness loop with H<sub>I</sub> shell.

**X-ray:** Detected, with central source.

**Point sources:** Central, possibly pulsating, X-ray source.

**References:**

Milne 1971, AuJPh, 24, 757. Parkes 64-m at 408 MHz (48′), 635 MHz (31′) and 1410 MHz (15′).  
 Milne & Dickel 1974, AuJPh, 27, 549. Parkes 64-m at 2.7 GHz (8′4 : S = 120±30% Jy).  
 Toor 1980, A&A, 85, 184. X-ray image and spectrum.  
 Colomb & Dubner 1982, A&A, 112, 141. Argentine 30-m dish at 1.42 GHz (30′), H<sub>I</sub> 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<sup>h</sup>01<sup>m</sup>06<sup>s</sup>  
**Dec:** –51°34′

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

**Size/arcmin:** 11  
**Type:** S?

**Radio:** Clumpy non-thermal emission, possibly a distorted shell.

**X-ray:** Shell.

**Point sources:** Central compact X-ray source.

**Distance:** H<sub>I</sub> absorption indicates > 4.9 kpc.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ :  $S = 8.6$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S = 4.0$  Jy).  
 Caswell *et al.* 1983, MNRAS, 204, 915. FIRST at 1415 MHz (47″ × 52″), and MOST at 843 MHz (43″ × 55″).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 55″ :  $S = 4.7$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (1′8 × 2′0), plus H<sub>I</sub>.

Torii *et al.* 2006, PASJ, 58, L11. ASCA detection.  
 Park *et al.* 2009, ApJ, 695, 431. XMM-Newton and Chandra observations.  
 Abramowski *et al.* 2014, MNRAS, 441, 790. HESS upper limit.  
 Doroshenko *et al.* 2018, A&A, 619, A26. 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.

**G332.0+0.2**

**RA:** 16<sup>h</sup>13<sup>m</sup>17<sup>s</sup>  
**Dec:** –50°53′

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

**Size/arcmin:** 12  
**Type:** S

**Radio:** Incomplete shell.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″ × 57″).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 55″ :  $S = 8.9$  Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 McClure-Griffiths *et al.* 2001, ApJ, 551, 394. ATCA and Parkes 64-m at 1.4 GHz (1′8 × 2′0), plus H<sub>I</sub>.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

**G332.4–0.4**

**RA:** 16<sup>h</sup>17<sup>m</sup>33<sup>s</sup>  
**Dec:** –51°02′

**1-GHz flux/Jy:** 28  
**Spectral index:** 0.5

RCW 103

**Size/arcmin:** 10  
**Type:** S

**Radio:** Shell, brightest to the S.

**Optical:** Filaments correspond well to the radio shell, brightest in SE.

**X-ray:** Brightest to NW, with point source near centre.

**Point sources:** Central, variable X-ray source, and nearby pulsar.

**Distance:** H $\alpha$  absorption indicates 3.1 kpc.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H $\alpha$  absorption.  
 Tuohy & Garmire 1980, ApJ, 239, L107. Einstein detection of X-ray point source.  
 Caswell *et al.* 1980, MNRAS, 190, 881. FIRST at 1415 MHz (50′′).  
 Lamb & Markert 1981, ApJ, 244, 94. Einstein observations.  
 Ruiz 1983, AJ, 88, 1210. Optical spectra.  
 Tuohy *et al.* 1983, ApJ, 268, 778. X-ray observations.  
 Leibowitz & Danziger 1983, MNRAS, 204, 273. Optical spectra.  
 Nugent *et al.* 1984, ApJ, 284, 612. X-ray spectrum (and Einstein image from Tuohy, private communication).  
 Meaburn & Allen 1986, MNRAS, 222, 593. Optical spectra.  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44′′×57′′).  
 Oliva *et al.* 1990, A&A, 240, 453. IR spectroscopy.  
 Dickel *et al.* 1996, AJ, 111, 340. ATCA at 1.36 (8′′) and 2.37 GHz (4′5′′), including polarisation.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′′×55′′:  $S=34$  Jy).  
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.  
 Gotthelf *et al.* 1997, ApJ, 487, L175. ASCA observations of compact X-ray source.  
 Carter *et al.* 1997, PASP, 109, 990. Optical expansion.  
 Torii *et al.* 1998, ApJ, 494, L207. ASCA detection of nearby pulsar.  
 Kaspi *et al.* 1998, ApJ, 503, L161. Pulsar observations.

Gotthelf *et al.* 1999, ApJ, 514, L107. X-ray variability of central source.  
 Oliva *et al.* 1999, A&A, 343, 943. ISO spectroscopy.  
 Torii *et al.* 2000, ApJ, 534, L71. X-ray timing on pulsar, including glitch.  
 Reynoso *et al.* 2004, PASA, 21, 82. ATCA at 1.4 GHz (50′′), including H $\alpha$  absorption to central source.  
 Russeil *et al.* 2005, A&A, 429, 497. H $\alpha$  observations.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.  
 Paron 2006, PASA, 23, 69. CO and HCO<sup>+</sup> 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.

**G332.4+0.1**

**RA:** 16<sup>h</sup>15<sup>m</sup>20<sup>s</sup>  
**Dec:** –50°42′

**1-GHz flux/Jy:** 26  
**Spectral index:** 0.5

MSH 16–51, Kes 32

**Size/arcmin:** 15  
**Type:** S

Has been called G332.4+0.2.

**Radio:** Distorted shell, with thermal jet and plume adjacent.

**Optical:** Detected.

**X-ray:** Shell, brightest to NW.

**Point sources:** Pulsar nearby.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Roger *et al.* 1985, Nature, 316, 44. MOST at 843 MHz (44′′×57′′).  
 Caraveo 1993, ApJ, 415, L111. Nearby pulsar.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43′′×56′′:  $S=29$  Jy).

Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.  
 Brinkmann *et al.* 1999, A&A, 346, 599. ROSAT image of remnant and nearby pulsar.  
 Vink *et al.* 2004, ApJ, 604, 693. Chandra observations.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.

**G332.5–5.6**

**RA:** 16<sup>h</sup>43<sup>m</sup>20<sup>s</sup>  
**Dec:** –54°30′

**1-GHz flux/Jy:** 2?  
**Spectral index:** 0.7?

**Size/arcmin:** 35  
**Type:** S

**Radio:** Bipolar shell, with central emission also.

**Optical:** Patchy filaments.

**X-ray:** Emission from centre.

**Distance:** Optical extinction suggests 3 kpc.

**References:**

Reynoso & Green 2007, MNRAS, 375, 92. ATCA at 1.4 GHz (40'' :  $S = 1.90 \pm 0.15$  Jy) and 2.4 GHz (90'' :  $S = 1.3 \pm 0.2$  Jy) including polarisation, and 843 MHz (43'' × 53'') plus ROSAT observations.  
 Stupar *et al.* 2007, MNRAS, 381, 377. Optical observations, plus ATCA at 1.4 GHz (58'') and 2.4 GHz (95'') including polarisation, and other observations.

Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  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<sup>h</sup>27<sup>m</sup>45<sup>s</sup>  
**Dec:** –48°47′

**1-GHz flux/Jy:** 16  
**Spectral index:** 0.5

**Size/arcmin:** 21  
**Type:** S

**Radio:** Well defined shell.

**Point sources:** Old pulsar within remnant boundary.

**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.

**G336.7+0.5**

**RA:** 16<sup>h</sup>32<sup>m</sup>11<sup>s</sup>  
**Dec:** –47°19′

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

**Size/arcmin:** 14 × 10  
**Type:** S

**Radio:** Irregular shell.

**Optical:** Detected.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3') and Parkes 64-m at 5 GHz (4').  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44'' × 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. H $\alpha$  observations.

**G337.0–0.1**

(CTB 33)

**RA:** 16<sup>h</sup>35<sup>m</sup>57<sup>s</sup>  
**Dec:** –47°36′**1-GHz flux/Jy:** 1.5  
**Spectral index:** 0.6?**Size/arcmin:** 1.5  
**Type:** S

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

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

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3') and Parkes 64-m at 5 GHz (4').  
Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43''×58'' : S=21 Jy).  
Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.  
Sarma *et al.* 1997, ApJ, 483, 335. ATCA at 1.4 GHz (12'') including H<sub>I</sub>, 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<sup>h</sup>39<sup>m</sup>28<sup>s</sup>  
**Dec:** –47°51′**1-GHz flux/Jy:** 1.5  
**Spectral index:** 0.4**Size/arcmin:** 6  
**Type:** S**Radio:** Shell, brighter in S.**X-ray:** Extended emission.**Distance:** H<sub>I</sub> absorption suggests 2.0 to 9.3 kpc.**References:**

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

Rakowski *et al.* 2001, ApJ, 548, 258. ASCA and ROSAT observations.  
Rakowski *et al.* 2006, ApJ, 646, 982. ATCA observations at 1.3 GHz (15'' : S = 1.55±0.05 Jy) and 5 GHz (15'' : S = 0.93±0.02 Jy), plus H<sub>I</sub> 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<sup>h</sup>35<sup>m</sup>55<sup>s</sup>  
**Dec:** –47°20′**1-GHz flux/Jy:** 1.5?  
**Spectral index:** ?**Size/arcmin:** 3×2  
**Type:** ?**Radio:** Not well defined.**X-ray:** Detected.**Distance:** Association with H<sub>I</sub> 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. HESS observations of nearby source.  
Combi *et al.* 2006, ApJ, 653, L41. XMM-Newton observations.

**G337.3+1.0**

Kes 40

**RA:** 16<sup>h</sup>32<sup>m</sup>39<sup>s</sup>  
**Dec:** –46°36′**1-GHz flux/Jy:** 16  
**Spectral index:** 0.55**Size/arcmin:** 15×12  
**Type:** S**Radio:** Nearly complete shell.**References:**

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ :  $S=24.6$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S=7.2$  Jy).  
 Dickel & Milne 1976, AuJPh, 29, 435. Comparison of earlier Parkes 64-m maps at 2.7 GHz (8′4) and 5 GHz (4′4).  
 Kesteven & Caswell 1987, A&A, 183, 118. MOST at 843 MHz (44″×61″).

Milne *et al.* 1989, PASA, 8, 187. MOST at 843 MHz (43″×59″ :  $S = 14.8 \pm 3.0$  Jy), and Parkes 64-m at 8.4 GHz (3′ :  $S = 5.1 \pm 0.6$  Jy), including polarisation.  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″ :  $S=20$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

**G337.8–0.1**

Kes 41

**RA:** 16<sup>h</sup>39<sup>m</sup>01<sup>s</sup>  
**Dec:** –46°59′**1-GHz flux/Jy:** 15  
**Spectral index:** 0.5**Size/arcmin:** 9×6  
**Type:** S**Radio:** Distorted shell.**X-ray:** Centrally brightened.**Distance:** 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.

**G338.1+0.4****RA:** 16<sup>h</sup>37<sup>m</sup>59<sup>s</sup>  
**Dec:** –46°24′**1-GHz flux/Jy:** 4?  
**Spectral index:** 0.4**Size/arcmin:** 15?  
**Type:** S**Radio:** Arc in NE, merging with thermal emission in S.**Optical:** Detected.**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Zealey *et al.* 1979, A&AS, 38, 39. Optical detection.

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″ :  $S=3.8$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

**G338.3–0.0**

**RA:** 16<sup>h</sup>41<sup>m</sup>00<sup>s</sup>  
**Dec:** –46°34′

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

**Size/arcmin:** 8  
**Type:** C?

**Radio:** Irregular shell, in complex region.

**X-ray:** Central X-ray source and nebula.

**Point sources:** Central pulsar.

**Distance:** HI observations suggest 8 to 13 kpc.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″:S=7.4 Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.  
 Aharonian *et al.* 2005, Science, 307, 1938. HESS detection.  
 Aharonian *et al.* 2006, ApJ, 636, 777. HESS 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. HESS observations.  
*see also:* 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.

**G338.5+0.1**

**RA:** 16<sup>h</sup>41<sup>m</sup>09<sup>s</sup>  
**Dec:** –46°19′

**1-GHz flux/Jy:** 12?  
**Spectral index:** ?

**Size/arcmin:** 9  
**Type:** ?

**Radio:** Circle of non-thermal emission in complex region, not well defined.

**Distance:** HI absorption suggests 11 kpc.

**References:**

Shaver & Goss 1970, AuJPA, 14, 133. Molonglo at 408 MHz (3′) and Parkes 64-m at 5 GHz (4′).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×59″:S=13 Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including HI.

Abramowski *et al.* 2014, ApJ, 794, L1. HESS 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.

**G340.4+0.4**

**RA:** 16<sup>h</sup>46<sup>m</sup>31<sup>s</sup>  
**Dec:** –44°39′

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

**Size/arcmin:** 10×7  
**Type:** S

**Radio:** Distorted shell, elongated east–west.

**Optical:** Detected.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′:S=8.2 Jy) and Parkes 64-m at 5 GHz (4′:S=2.9 Jy).  
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50″).  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (48″×75″:S=9.8±0.9 Jy) and 1.4 GHz (9″×27″:S=3.6±0.1 Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×61″:S=5.9 Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.

**G340.6+0.3**

**RA:** 16<sup>h</sup>47<sup>m</sup>41<sup>s</sup>  
**Dec:** –44°34′

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

**Size/arcmin:** 6  
**Type:** S

**Radio:** Incomplete shell.

**Optical:** Possible associated filaments.

**Distance:** H<sub>i</sub> absorption suggests 15 kpc.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ :  $S=7.0$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S=2.8$  Jy).  
 Zealey *et al.* 1979, A&AS, 38, 39. Optical observations.  
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50″).  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 330 MHz (48″×75″ :  $S=9.2\pm 0.9$  Jy) and 1.4 GHz (9″×27″ :  $S=5.8\pm 0.1$  Jy).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×61″ :  $S=4.5$  Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer possible detection.  
 Kothes & Dougherty 2007, A&A, 468, 993. SGPS at 1.4 GHz including H<sub>i</sub>.

**G341.2+0.9**

**RA:** 16<sup>h</sup>47<sup>m</sup>35<sup>s</sup>  
**Dec:** –43°47′

**1-GHz flux/Jy:** 1.5?  
**Spectral index:** 0.6?

**Size/arcmin:** 22×16  
**Type:** C

**Radio:** Incomplete shell, with extension to SW.

**Point sources:** Pulsar in W, with wind nebula.

**References:**

Frail *et al.* 1994, ApJ, 437, 781. VLA at 330 MHz (54″×116″ :  $S=3.0\pm 0.1$  Jy) and 1.4 GHz (21″×25″ :  $S=12.5\pm 0.05$  Jy).  
 Giacani *et al.* 2001, AJ, 121, 3133. VLA at 1.4 and 4.9 GHz (25″) of pulsar wind nebula.

**G341.9–0.3**

**RA:** 16<sup>h</sup>55<sup>m</sup>01<sup>s</sup>  
**Dec:** –44°01′

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

**Size/arcmin:** 7  
**Type:** S

**Radio:** Incomplete shell, brightest to NE.

**References:**

Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ :  $S=7.4$  Jy) and Parkes 64-m at 5 GHz (4′ :  $S=1.7$  Jy).  
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50″), revision of previous flux densities.  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (11″×35″ :  $S=2.2\pm 0.1$  Jy).

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×62″ :  $S=2.7$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

**G342.0–0.2**

**RA:** 16<sup>h</sup>54<sup>m</sup>50<sup>s</sup>  
**Dec:** –43°53′

**1-GHz flux/Jy:** 3.5?  
**Spectral index:** 0.4?

**Size/arcmin:** 12×9  
**Type:** S

**Radio:** Distorted shell.

**References:**

Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (50″), estimate  $S_{408\text{ MHz}} = 5$  Jy,  $S_{5\text{ GHz}} = 2$  Jy from previous maps.  
 Dubner *et al.* 1996, AJ, 111, 1304. VLA at 1.4 GHz (11″×35″).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×62″ :  $S=3.5$  Jy).

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

**G342.1+0.9**

**RA:** 16<sup>h</sup>50<sup>m</sup>43<sup>s</sup>  
**Dec:** –43°04′

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

**Size/arcmin:** 10×9  
**Type:** S

**Radio:** Incomplete shell.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×63″:  $S=0.6$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

**G343.0–6.0**

**RA:** 17<sup>h</sup>25<sup>m</sup>00<sup>s</sup>  
**Dec:** –46°30′

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

**RCW 114**  
**Size/arcmin:** 250  
**Type:** S

**Radio:** Faint, poorly defined.

**Optical:** Filamentary shell.

**References:**

Walker & Zealey 2001, MNRAS, 325, 287. Optical observations, and review of earlier observations.  
 Welsh *et al.* 2003, A&A, 403, 605. Optical spectroscopy.  
 Casandjian & Grenier 2008, A&A, 489, 849.  $\gamma$ -ray observations.  
 Kim *et al.* 2010, ApJ, 709, 823. UV observations.

**G343.1–2.3**

**RA:** 17<sup>h</sup>08<sup>m</sup>00<sup>s</sup>  
**Dec:** –44°16′

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

**Size/arcmin:** 32?  
**Type:** C?

**Radio:** Incomplete shell?

**X-ray:** Pulsar wind nebula.

**Point sources:** Pulsar near edge, with wind nebula.

**References:**

McAdam *et al.* 1993, Nature, 361, 516. MOST at 843 MHz (smoothed to 2′).  
 Frail *et al.* 1994, ApJ, 437, 781. VLA at 330 MHz (56″×111″:  $S=10.6$  Jy) and 1.4 GHz (22″×27″) near pulsar.  
 Becker *et al.* 1995, A&A, 298, 528. ROSAT of pulsar, and limit for remnant.  
 Giacani *et al.* 2001, AJ, 121, 3133. VLA at 1.4, 4.9 and 8.5 GHz (25″) of pulsar wind nebula.

Gotthelf *et al.* 2002, ApJ, 567, L125. Pulsar x-ray detection.  
 Dodson & Golap 2002, MNRAS, 334, L1. ATCA at 1.4 GHz (47″×70″) including polarisation, and Chandra observations of pulsar wind nebula.  
 Aharonian *et al.* 2005, A&A, 432, L9. HESS limit.  
 Abramowski *et al.* 2011, A&A, 528, A143. HESS observations.

**G343.1–0.7**

**RA:** 17<sup>h</sup>00<sup>m</sup>25<sup>s</sup>  
**Dec:** –43°14′

**1-GHz flux/Jy:** 7.8  
**Spectral index:** 0.55

**Size/arcmin:** 27×21  
**Type:** S

**Radio:** Shell, with smaller thermal shell adjacent.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×63″:  $S=8.5\pm 0.6$ ), plus Parkes 64-m at 4.5 GHz ( $S=3.9\pm 0.6$  Jy) and 8.55 GHz ( $S=2.4\pm 0.5$  Jy)

Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.  
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.

**G344.7–0.1**

**RA:** 17<sup>h</sup>03<sup>m</sup>51<sup>s</sup>  
**Dec:** –41°42′

**1-GHz flux/Jy:** 2.5?  
**Spectral index:** 0.3?

**Size/arcmin:** 8  
**Type:** C?

**Radio:** Asymmetric shell, with possible core.

**X-ray:** Detected.

**Distance:** HI absorption and association with features suggests 6.3 kpc.

**References:**

- |   |  |
|---|--|
| <p>Clark <i>et al.</i> 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).<br/>         Dubner <i>et al.</i> 1993, AJ, 105, 2251. VLA at 1.47 GHz (30″ × 43″ : S = 1.7 ± 0.1 Jy).<br/>         Whiteoak &amp; Green 1996, A&amp;AS, 118, 329. MOST at 843 MHz (43″ × 65″ : S = 2.5 Jy).<br/>         Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.<br/>         Sugizaki <i>et al.</i> 2001, ApJS, 134, 77. ASCA survey observations.</p> | <p>Yamauchi <i>et al.</i> 2005, PASJ, 57, 459. ASCA observations.<br/>         Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer observations.<br/>         Giacani <i>et al.</i> 2011, A&amp;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.<br/>         Andersen <i>et al.</i> 2011, ApJ, 742, 7. Spitzer observations.<br/>         Yamaguchi <i>et al.</i> 2012, ApJ, 749, 137. Suzaku observations.<br/>         Yang <i>et al.</i> 2013, ApJ, 766, 44. Suzaku spectroscopy.</p> |
|---|--|

**G345.7–0.2**

**RA:** 17<sup>h</sup>07<sup>m</sup>20<sup>s</sup>  
**Dec:** –40°53′

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

**Size/arcmin:** 6  
**Type:** S

**Radio:** Poorly defined diffuse shell.

**Point sources:** Old pulsar nearby.

**References:**

- |  |  |
|--|--|
| <p>Whiteoak &amp; Green 1996, A&amp;AS, 118, 329. MOST at 843 MHz (43″ × 66″ : S = 0.7 Jy).<br/>         Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.</p> |  |
|--|--|

**G346.6–0.2**

**RA:** 17<sup>h</sup>10<sup>m</sup>19<sup>s</sup>  
**Dec:** –40°11′

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

**Size/arcmin:** 8  
**Type:** S

**Radio:** Irregular shell.

**X-ray:** Centrally brightened, clumpy.

**References:**

- |   |  |
|---|--|
| <p>Clark <i>et al.</i> 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).<br/>         Dubner <i>et al.</i> 1993, AJ, 105, 2251. VLA at 1.47 GHz (31″ × 43″ : S = 8.1 ± 0.9 Jy).<br/>         Whiteoak &amp; Green 1996, A&amp;AS, 118, 329. MOST at 843 MHz (43″ × 67″ : S = 8.7 Jy).<br/>         Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.<br/>         Koralesky <i>et al.</i> 1998, AJ, 116, 1323. VLA detection of compact OH emission.</p> | <p>Reach <i>et al.</i> 2006, AJ, 131, 1479. Spitzer observations.<br/>         Hewitt <i>et al.</i> 2009, ApJ, 694, 1266. Spitzer spectroscopy.<br/>         Sezer <i>et al.</i> 2011, MNRAS, 415, 301. Suzaku observations.<br/>         Andersen <i>et al.</i> 2011, ApJ, 742, 7. Spitzer observations.<br/>         Yamauchi <i>et al.</i> 2013, PASJ, 65, 6. Suzaku observations.<br/>         Pihlström <i>et al.</i> 2014, AJ, 147, 73. VLA search for methanol masers.<br/>         Pannuti <i>et al.</i> 2014, AJ, 147, 55. ASCA observations.<br/>         Auchettl <i>et al.</i> 2017, ApJ, 847, 121. XMM-Newton observations.</p> |
|---|--|

**G347.3–0.5**

**RA:** 17<sup>h</sup>13<sup>m</sup>50<sup>s</sup>  
**Dec:** –39°45′

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

RX J1713.7–3946

**Size/arcmin:** 65×55  
**Type:** S?

**Radio:** Faint emission.

**X-ray:** Non-thermal, limb-brightened to W, with central source.

**Point sources:** Central X-ray source.

**Distance:** Association with molecular clouds and X-ray observations imply 1.3 kpc.

**References:**

Koyama *et al.* 1997, PASJ, 49, L7. ASCA of NW.  
 Slane *et al.* 1999, ApJ, 525, 357. ASCA and other observations.  
 Muraishi *et al.* 2000, A&A, 354, L57.  $\gamma$ -ray detection.  
 Butt *et al.* 2001, ApJ, 562, L167. Associated  $\gamma$ -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.  $\gamma$ -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. HESS 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. HESS 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 HESS 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.  
 Abdalla *et al.* 2018, A&A, 612, A6. HESS observations.

**G348.5–0.0**

**RA:** 17<sup>h</sup>15<sup>m</sup>26<sup>s</sup>  
**Dec:** –38°28′

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

**Size/arcmin:** 10?  
**Type:** S?

**Radio:** Arc, overlapping G348.5+0.1.

**References:**

Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz (46''×53''), 1.4 GHz (18''×33'') and part at 5 GHz (2''5×3''9).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43''×69'': S=10.2 Jy).  
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.  
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.  
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.  
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.  
 Pannuti *et al.* 2014, AJ, 147, 55. XMM-Newton upper limit.

**G348.5+0.1**

**RA:** 17<sup>h</sup>14<sup>m</sup>06<sup>s</sup>  
**Dec:** –38°32′

**1-GHz flux/Jy:** 72  
**Spectral index:** 0.3

**CTB 37A**  
**Size/arcmin:** 15  
**Type:** S

**Radio:** Shell, poorly define to S and W, overlapping G348.5–0.0 in E.

**X-ray:** Brighter to W.

**Distance:** H<sub>I</sub> absorption indicates 8.0 kpc.

**References:**

- Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 97 Jy).  
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′4″ : S = 43 Jy).  
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H<sub>I</sub> 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. HESS observations.  
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.  
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.  
 Sezer *et al.* 2011, MNRAS, 417, 1387. Suzaku observations.  
 Tian & Leahy 2012, MNRAS, 421, 2593. SGPS H<sub>I</sub> 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.

**G348.7+0.3**

**RA:** 17<sup>h</sup>13<sup>m</sup>55<sup>s</sup>  
**Dec:** –38°11′

**1-GHz flux/Jy:** 26  
**Spectral index:** 0.3

**CTB 37B**  
**Size/arcmin:** 17?  
**Type:** S

**Radio:** Incomplete shell with faint eastern extensions.

**X-ray:** Diffuse emission.

**Point sources:** X-ray pulsar.

**Distance:** H<sub>I</sub> absorption suggests 13 kpc.

**References:**

- Clark *et al.* 1975, AuJPA, 37, 75. Molonglo at 408 MHz (3′ : S = 34 Jy).  
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′4″ : S = 32 Jy).  
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H<sub>I</sub> absorption.  
 Milne *et al.* 1979, MNRAS, 188, 437. FIRST at 1415 MHz (0′8″ : S > 20) and Parkes 64-m at 14.7 GHz (2′2″ : S = 8 ± 3 Jy).  
 Downes 1984, MNRAS, 210, 845. VLA at 1465 MHz (20″ × 45″).  
 Kassim *et al.* 1991, ApJ, 374, 212. VLA at 333 MHz (46″ × 53″).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″ × 69″ : S = 33 Jy).
- Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant.  
 Aharonian *et al.* 2006, ApJ, 636, 777. HESS detection.  
 Aharonian *et al.* 2008, A&A, 486, 829. HESS and Chandra observations.  
 Nakamura *et al.* 2009, PASJ, 61, S197. Suzaku and Chandra observations.  
 Halpern & Gotthelf 2010, ApJ, 710, 941. Chandra detection of pulsar.  
 Halpern & Gotthelf 2010, ApJ, 725, 1384. Chandra observations of pulsar.  
 Tian & Leahy 2012, MNRAS, 421, 2593. SGPS H<sub>I</sub> observations.  
 Xin *et al.* 2016, ApJ, 817, 64. Fermi observations.

**G349.2–0.1**

**RA:** 17<sup>h</sup>17<sup>m</sup>15<sup>s</sup>  
**Dec:** –38°04′

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

**Size/arcmin:** 9 × 6  
**Type:** S

**Radio:** Elongated shell, adjacent to bright H<sub>II</sub> 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<sup>h</sup>17<sup>m</sup>59<sup>s</sup>  
**Dec:** –37°26′

**1-GHz flux/Jy:** 20  
**Spectral index:** 0.5

**Size/arcmin:** 2.5×2  
**Type:** S

**Radio:** Incomplete clumpy shell, with enhancement to the S.

**X-ray:** Irregular shell, brighter to S and E.

**Distance:** H<sub>I</sub> absorption indicates 11.5 kpc.

**References:**

Becker & Kundu 1975, AJ, 80, 679. NRAO 140-ft at 10.6 GHz (3′).  
 Caswell *et al.* 1975, AuJPA, 37, 39. Molonglo at 408 MHz (3′ : S = 31.0 Jy) and Parkes 64-m at 5 GHz (4′ : S = 9.1 Jy), no maps.  
 Caswell *et al.* 1975, A&A, 45, 239. Parkes H<sub>I</sub> absorption.  
 Shaver *et al.* 1985, Nature, 313, 113. VLA at 1.4 GHz (3′4″×14′5″).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×71″ : S = 22 Jy).  
 Frail *et al.* 1996, AJ, 111, 1651. OH emission near remnant, including masers.  
 Brogan *et al.* 2000, ApJ, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.  
 Reynoso & Mangum 2001, AJ, 121, 347. CO observations of the vicinity.  
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.  
 Slane *et al.* 2002, ApJ, 580, 904. ASCA observations.  
 Dubner *et al.* 2004, A&A, 426, 201. CO observations of surroundings.  
 Lazendic *et al.* 2005, ApJ, 618, 733. Chandra observations.  
 Reach *et al.* 2006, AJ, 131, 1479. Spitzer observations.

Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Hewitt *et al.* 2009, ApJ, 694, 1266. Spitzer spectroscopy.  
 Castro & Slane 2010, ApJ, 717, 372. Fermi observations.  
 Lazendic *et al.* 2010, MNRAS, 409, 371. OH, CO and other molecular line observations of region.  
 Andersen *et al.* 2011, ApJ, 742, 7. Spitzer observations.  
 Pihlström *et al.* 2014, AJ, 147, 73. VLA search for methanol masers.  
 Tian & Leahy 2014, ApJ, 783, L2. SGPS H<sub>I</sub> observations.  
 Yasumi *et al.* 2014, PASJ, 66, 68. Suzaku observations.  
 Abramowski *et al.* 2015, A&A, 574, A100. HESS observations. *see also:* 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.  
 Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.

**G350.0–2.0**

**RA:** 17<sup>h</sup>27<sup>m</sup>50<sup>s</sup>  
**Dec:** –38°32′

**1-GHz flux/Jy:** 26  
**Spectral index:** 0.4

**Size/arcmin:** 45  
**Type:** S

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

**Radio:** Shell, brightest in NW.

**Optical:** Detected.

**X-ray:** Brighter to NW.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S = 49.5 Jy) and Parkes 64-m at 5 GHz (4′ : S = 13.6 Jy).  
 Milne & Dickel 1975, AuJPh, 28, 209. Parkes 64-m at 5 GHz (4′4″).

Gaensler 1998, ApJ, 493, 781. VLA and Parkes 64-m at 1.4 GHz (18″×21″ : S = 22.3±0.3 Jy), clarifying extent of remnant.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.  
 Karpova *et al.* 2016, MNRAS, 462, 3845. XMM-Newton observations.

**G350.1–0.3**

**RA:** 17<sup>h</sup>21<sup>m</sup>05<sup>s</sup>  
**Dec:** –37°27′

**1-GHz flux/Jy:** 6?  
**Spectral index:** 0.8?

**Size/arcmin:** 4?  
**Type:** ?

**Radio:** Several clumps of emission.

**X-ray:** Diffuse emission, with compact source.

**Point sources:** X-ray source.

**Distance:** H<sub>I</sub> 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.

**G351.0–5.4**

**RA:** 17<sup>h</sup>46<sup>m</sup>00<sup>s</sup>  
**Dec:** –39°25′

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

**Size/arcmin:** 30  
**Type:** S

**Radio:** Faint shell, brighter to E and W.

**References:**

de Gasperin *et al.* 2014, A&A, 568, A107. GMRT at 325 MHz  
 (89″×141″), plus other observations.

**G351.2+0.1**

**RA:** 17<sup>h</sup>22<sup>m</sup>27<sup>s</sup>  
**Dec:** –36°11′

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

**Size/arcmin:** 7  
**Type:** C?

Has been called G351.3+0.2.

**Radio:** Distorted shell, with possible flat-spectrum core.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S =  
 8.1 Jy) and Parkes 64-m at 5 GHz (4′ : S = 3.1 Jy).  
 Becker & Helfand 1988, AJ, 95, 883. VLA at 5 GHz (15″), and  
 at 15 GHz of core.  
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (32″×36″ :  
 S = 4.8±0.2 Jy).

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

**G351.7+0.8**

**RA:** 17<sup>h</sup>21<sup>m</sup>00<sup>s</sup>  
**Dec:** –35°27′

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

**Size/arcmin:** 18×14  
**Type:** S

**Radio:** Elongated shell, adjacent to bright HII region.

**Point sources:** Pulsar nearby.

**References:**

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

**G351.9–0.9**

**RA:** 17<sup>h</sup>28<sup>m</sup>52<sup>s</sup>  
**Dec:** –36°16′

**1-GHz flux/Jy:** 1.8?  
**Spectral index:** ?

**Size/arcmin:** 12×9  
**Type:** S

**Radio:** Asymmetric shell.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz  
 (43″×73″ : S = 2.0 Jy).

**G352.7–0.1**

**RA:** 17<sup>h</sup>27<sup>m</sup>40<sup>s</sup>  
**Dec:** –35°07′

**1-GHz flux/Jy:** 4  
**Spectral index:** 0.6

**Size/arcmin:** 8×6  
**Type:** S

**Radio:** Distorted shell.

**X-ray:** Detected.

**Distance:** H<sub>I</sub> absorption indicates 6.8 to 8.4 kpc.

**References:**

Clark *et al.* 1975, AuJPA, 37, 1. Molonglo at 408 MHz (3′ : S = 9.6 Jy) and Parkes 64-m at 5 GHz (4′ : S = 2.3 Jy).  
 Caswell *et al.* 1983, MNRAS, 203, 595. FIRST at 1415 MHz (1′.1).  
 Dubner *et al.* 1993, AJ, 105, 2251. VLA at 1.47 GHz (34″ : S = 3.4±0.4 Jy).  
 Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×75″ : S = 4.4 Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

Kinugasa *et al.* 1998, PASJ, 50, 249. ASCA observations.  
 Koralesky *et al.* 1998, AJ, 116, 1323. VLA search for OH emission.  
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.  
 Giacani *et al.* 2009, A&A, 507, 841. VLA at 4.8 GHz (9″×12″), plus H<sub>I</sub> and XMM-Newton observations.  
 Pannuti *et al.* 2014, ApJ, 782, 102. XMM-Newton and Chandra observations.  
 Sezer & Gök 2014, ApJ, 790, 81. Suzaku observations.

**G353.6–0.7**

**RA:** 17<sup>h</sup>32<sup>m</sup>00<sup>s</sup>  
**Dec:** –34°44′

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

**Size/arcmin:** 30  
**Type:** S

Has erroneously been called G353.6–0.37.

**Radio:** Shell, brighter to S.

**X-ray:** Patchy shell, brighter to E.

**Point sources:** Central X-ray source.

**Distance:** Various observations suggest 3.2 kpc.

**References:**

Tian *et al.* 2008, ApJ, 679, L85. SGPS at 1.4 GHz (100″), plus 843 MHz (43″) and X-ray observations.  
 Halpern & Gotthelf 2010, ApJ, 710, 941. XMM-Newton observations.  
 Tian *et al.* 2010, ApJ, 712, 790. XMM-Newton, Suzaku and CO observations.  
 Abramowski *et al.* 2011, A&A, 531, A81. HESS 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. HESS, SGPS H<sub>I</sub> 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.  
 Abdalla *et al.* 2018, A&A, 612, A1. HESS observations.  
 Maxted *et al.* 2018, MNRAS, 474, 662. CO and H<sub>I</sub> observations.

**G353.9–2.0**

**RA:** 17<sup>h</sup>38<sup>m</sup>55<sup>s</sup>  
**Dec:** –35°11′

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

**Size/arcmin:** 13  
**Type:** S

**Radio:** Shell, with central double source.

**References:**

Green 2001, MNRAS, 326, 283. VLA at 327 MHz (2′.7×3′.0) and 1.4 GHz (36″×42″), plus 8.4 GHz (6′.1×8′.4) of central source only.

**G354.1+0.1**

**RA:** 17<sup>h</sup>30<sup>m</sup>28<sup>s</sup>  
**Dec:** –33°46′

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

**Size/arcmin:** 15×3?  
**Type:** C?

Is this a SNR?

**Radio:** Elongated N–S.

**Point sources:** Pulsar at S tip.

**References:**

Frail *et al.* 1994, ApJ, 437, 781. VLA at 330 MHz (47″×99″) and 1.4 GHz (8″8×21″).  
 Ajello *et al.* 2016, ApJ, 819, 44. Fermi observations.

**G354.8–0.8**

**RA:** 17<sup>h</sup>36<sup>m</sup>00<sup>s</sup>  
**Dec:** –33°42′

**1-GHz flux/Jy:** 2.8?  
**Spectral index:** ?

**Size/arcmin:** 19  
**Type:** S

**Radio:** Distorted shell.

**References:**

Whiteoak & Green 1996, A&AS, 118, 329. MOST at 843 MHz (43″×78″:  $S=3.1$  Jy).  
 Green *et al.* 1997, AJ, 114, 2058. Parkes 64-m OH observations.

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

**G355.4+0.7**

**RA:** 17<sup>h</sup>31<sup>m</sup>20<sup>s</sup>  
**Dec:** –32°26′

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

**Size/arcmin:** 25  
**Type:** S

**Radio:** Faint, incomplete shell.

**References:**

Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×77″).  
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz (1′:  $S=8.9\pm 1.3$  Jy).  
 Ajello *et al.* 2016, ApJ, 819, 44. Fermi observations.  
 Acero *et al.* 2016, ApJS, 224, 8. Fermi observations.

**G355.6–0.0**

**RA:** 17<sup>h</sup>35<sup>m</sup>16<sup>s</sup>  
**Dec:** –32°38′

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

**Size/arcmin:** 8×6  
**Type:** S

**Radio:** Well defined shell.

**X-ray:** Centrally brightened.

**References:**

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×80″:  $S=2.6$  Jy).  
 Sugizaki *et al.* 2001, ApJS, 134, 77. ASCA survey observations.  
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz (1′:  $S=3.3\pm 0.5$  Jy).

Marquez-Lopez & Phillips 2010, MNRAS, 407, 94. Mid-IR observations.  
 Minami *et al.* 2013, PASJ, 65, 99. Suzaku observations.

**G355.9–2.5**

**RA:** 17<sup>h</sup>45<sup>m</sup>53<sup>s</sup>  
**Dec:** –33°43′

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

**Size/arcmin:** 13  
**Type:** S

**Radio:** Distorted shell, brightest to SE.

**References:**

|  |   |
|--|---|
| <p>Clark <i>et al.</i> 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).<br/>         Dubner <i>et al.</i> 1993, AJ, 105, 2251. VLA at 1.47 GHz (32″ × 34″ : S = 5.0 ± 0.3 Jy).<br/>         Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″ × 77″).</p> | <p>Green <i>et al.</i> 1997, AJ, 114, 2058. Parkes 64-m OH observations.<br/>         Marquez-Lopez &amp; Phillips 2010, MNRAS, 407, 94. Mid-IR observations.</p> |
|--|---|

**G356.2+4.5**

**RA:** 17<sup>h</sup>19<sup>m</sup>00<sup>s</sup>  
**Dec:** –29°40′

**1-GHz flux/Jy:** 4  
**Spectral index:** 0.7

**Size/arcmin:** 25  
**Type:** S

Has been called G356.2+4.4.

**Radio:** Faint shell.

**References:**

|  |  |
|--|--|
| <p>Duncan <i>et al.</i> 1995, MNRAS, 277, 36. Parkes 64-m at 2.4-GHz (10′4).<br/>         Bhatnagar 2000, MNRAS, 317, 453. GMRT at 327 MHz (1′5 × 3′ : S = 8.1 ± 1.7 Jy), and NVSS at 1.4 GHz.</p> |  |
|--|--|

**G356.3–1.5**

**RA:** 17<sup>h</sup>42<sup>m</sup>35<sup>s</sup>  
**Dec:** –32°52′

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

**Size/arcmin:** 20 × 15  
**Type:** S

**Radio:** Double arc.

**References:**

|   |  |
|---|--|
| <p>Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″ × 79″ : S = 2.8 Jy).<br/>         Bhatnagar 2002, MNRAS, 332, 1. GMRT at 327 MHz (0′8 × 1′7 : S = 5.7 ± 0.2).</p> |  |
|---|--|

**G356.3–0.3**

**RA:** 17<sup>h</sup>37<sup>m</sup>56<sup>s</sup>  
**Dec:** –32°16′

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

**Size/arcmin:** 11 × 7  
**Type:** S

Has been suggested this part of a larger SNR.

**Radio:** Diffuse emission.

**References:**

|  |  |
|--|--|
| <p>Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″ × 81″ : S = 2.6 Jy).<br/>         Roy &amp; Pramesh Rao 2002, MNRAS, 329, 775. GMRT at 330 MHz (2′7 × 4′8).<br/>         Acero <i>et al.</i> 2016, ApJS, 224, 8. Fermi observations.</p> |  |
|--|--|

**G357.7–0.1**

**RA:** 17<sup>h</sup>40<sup>m</sup>29<sup>s</sup>  
**Dec:** –30°58′

**1-GHz flux/Jy:** 37  
**Spectral index:** 0.4

**MSH 17–39**

**Size/arcmin:** 8×3?  
**Type:** ?

Has been suggested that this is not a SNR.

**Radio:** Multiple arcs and filaments, brighter to NW ‘head’.

**X-ray:** Detected from NW ‘head’, and SW ‘tail’.

**Distance:** HI absorption suggests beyond Galactic Centre.

**References:**

- Caswell *et al.* 1975, *AuJPA*, 37, 39. Molonglo at 408 MHz ( $3' : S=54.2$  Jy) and Parkes 64-m at 5 GHz ( $4' : S=18.5$  Jy).  
 Milne & Dickel 1975, *AuJPh*, 28, 209. Parkes 64-m at 5 GHz ( $4.4' : S=14.6$  Jy).  
 Altenhoff *et al.* 1979, *A&AS*, 35, 23. Effelsberg 100-m at 4.9 GHz ( $2'6$ ).  
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 Weiler & Panagia 1980, *A&A*, 90, 269. Effelsberg 100-m at 9 GHz ( $1'5$ ) (private communication from Baker).  
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 Becker & Helfand 1985, *Nature*, 313, 115. VLA at 1.4 GHz and 5 GHz.  
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 Shaver *et al.* 1985, *A&A*, 147, L23. Observations of peripheral compact source.  
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 Gray 1994, *MNRAS*, 270, 835. MOST at 843 MHz ( $43'' \times 84''$ ).  
 Stewart *et al.* 1994, *ApJ*, 432, L39. ATCA at 4.79 and 5.84 GHz ( $12'' \times 22''$ ) and Effelsberg 100-m at 10.6 GHz ( $1'$ ), including polarisation.  
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 Yusef-Zadeh *et al.* 1999, *ApJ*, 527, 172. VLA of nearby OH masers.  
 LaRosa *et al.* 2000, *AJ*, 119, 207. VLA at 333 MHz ( $24'' \times 43''$ ). see also: LaRosa *et al.* 2000, *AJ*, 119, 3145. Erratum.  
 Brogan *et al.* 2000, *ApJ*, 537, 875. VLA at 1.7 GHz for OH Zeeman splitting.  
 Brogan & Goss 2003, *AJ*, 125, 272. VLA at 1.4 GHz ( $11'4 \times 13'6$ ), including HI, and 8.3 GHz ( $6'8 \times 14'3$ ) recombination line observation of HII region.  
 Gaensler *et al.* 2003, *ApJ*, 594, L35. Chandra detection.  
 Lazendic *et al.* 2003, *AN*, 324 (No S1), 157. Molecular line observations.  
 Burton *et al.* 2004, *MNRAS*, 348, 638. IR and radio observations of HII region.  
 Lazendic *et al.* 2004, *MNRAS*, 354, 393. IR and molecular line observations.  
 Hewitt *et al.* 2008, *ApJ*, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Phillips *et al.* 2009, *MNRAS*, 397, 1215. Observations of interactions with surroundings.  
 Castro *et al.* 2013, *ApJ*, 774, 36. Fermi observations.  
 Pihlström *et al.* 2014, *AJ*, 147, 73. VLA search for methanol masers.  
 Acero *et al.* 2016, *ApJS*, 224, 8. Fermi observations.  
 Qiao *et al.* 2018, *ApJS*, 239, 15. OH maser observations.

**G357.7+0.3**

**RA:** 17<sup>h</sup>38<sup>m</sup>35<sup>s</sup>  
**Dec:** –30°44′

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

**Size/arcmin:** 24  
**Type:** S

**Radio:** Non-thermal shell in complex region.

**References:**

- Reich & Fürst 1984, *A&AS*, 57, 165. Effelsberg 100-m at 2.7 GHz ( $4.3' : S=7 \pm 1.5$  Jy),  $S_{5\text{ GHz}} = 5.5 \pm 1.5$  Jy from surveys.  
 Gray 1994, *MNRAS*, 270, 835. MOST at 843 MHz ( $43'' \times 84''$ ).  
 Yusef-Zadeh *et al.* 1999, *ApJ*, 527, 172. VLA of nearby OH masers.  
 Hewitt *et al.* 2008, *ApJ*, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Phillips & Marquez-Lugo 2010, *MNRAS*, 409, 701. Spitzer observations of region.  
 Pihlström *et al.* 2014, *AJ*, 147, 73. VLA search for methanol masers.  
 Froebrich *et al.* 2015, *MNRAS*, 454, 2586. H<sub>2</sub> IR observations.  
 Rho *et al.* 2017, *ApJ*, 834, 12. Molecular line observations.

**G358.0+3.8**

**RA:** 17<sup>h</sup>26<sup>m</sup>00<sup>s</sup>  
**Dec:** –28°36′

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

**Size/arcmin:** 38  
**Type:** S

**Radio:** Faint shell.

**References:**

- Duncan *et al.* 1995, *MNRAS*, 277, 36. Parkes 64-m at 2.4-GHz ( $10'4$ ).  
 Bhatnagar 2000, *MNRAS*, 317, 453. GMRT at 327 MHz ( $1'3 \times 2'2 : S=2.5 \pm 1.3$  Jy), and NVSS at 1.4 GHz.

**G358.1+1.0**

**RA:** 17<sup>h</sup>37<sup>m</sup>00<sup>s</sup>  
**Dec:** –29°59′

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

**Size/arcmin:** 20  
**Type:** S

Was erroneously called G358.1+0.1.

**Radio:** Faint shell.

**References:**

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43″×77″).  
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz  
 (1′:S=6.0±2.5 Jy).

**G358.5–0.9**

**RA:** 17<sup>h</sup>46<sup>m</sup>10<sup>s</sup>  
**Dec:** –30°40′

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

**Size/arcmin:** 17  
**Type:** S

**Radio:** Shell, brighter to NE.

**References:**

Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×77″).  
 Roy & Bhatnagar 2006, JPhCS, 54, 152. GMRT at 330 MHz  
 (1′:S=8.0±2.5 Jy).

**G359.0–0.9**

**RA:** 17<sup>h</sup>46<sup>m</sup>50<sup>s</sup>  
**Dec:** –30°16′

**1-GHz flux/Jy:** 23  
**Spectral index:** 0.5

**Size/arcmin:** 23  
**Type:** S

**Radio:** Incomplete shell.

**Optical:** Detected.

**X-ray:** Partial shell.

**References:**

Reich *et al.* 1988, IAUCo, 101, 293. Summary of parameters.  
 Reich *et al.* 1990, A&AS, 85, 633. Effelsberg 100-m at 2.7 GHz  
 (4′3).  
 Gray 1994, MNRAS, 270, 835. MOST at 843 MHz (43″×86″).  
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (24″×43″).  
 see also: LaRosa *et al.* 2000, AJ, 119, 3145. Erratum.  
 Bamba *et al.* 2000, PASJ, 52, 259. ASCA observations.  
 Yusef-Zadeh *et al.* 2004, ApJS, 155, 421. VLA at 1.4 GHz  
 (8′4×12′8) of part.

Bamba *et al.* 2009, ApJ, 691, 1854. Suzaku observations.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  observations.  
 Ponti *et al.* 2015, MNRAS, 453, 172. XMM-Newton observa-  
 tions.  
 Froebrich *et al.* 2015, MNRAS, 454, 2586. H $_2$  IR observations.  
 de Wilt *et al.* 2017, MNRAS, 468, 2093. Molecular line observa-  
 tions of region.

**G359.1–0.5**

**RA:** 17<sup>h</sup>45<sup>m</sup>30<sup>s</sup>  
**Dec:** –29°57′

**1-GHz flux/Jy:** 14  
**Spectral index:** 0.4?

**Size/arcmin:** 24  
**Type:** S

Has been called G359.10–0.5.

**Radio:** Non-thermal shell in complex region, crossed by the ‘snake’.

**Optical:** Detected.

**X-ray:** Centrally brightened.

**Point sources:** Several compact radio sources near centre, OH masers around edge.

**References:**

Downes *et al.* 1979, A&AS, 35, 1. From observations by Altenhoff *et al.* 1979, A&AS, 35, 23. Effelsberg 100-m at 4.9 GHz (2.6 :  $S=13$  Jy).  
 Reich & Fürst 1984, A&AS, 57, 165. Effelsberg 100-m at 2.7 GHz (4.3 :  $S=10\pm 1.5$  Jy) and 4.8 GHz (2.4 :  $S=8.1\pm 0.5$  Jy).  
 Uchida *et al.* 1992, ApJ, 398, 128. VLA at 1.5 GHz (10'' $\times$ 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'' $\times$ 85'').  
 Yusef-Zadeh *et al.* 1995, Science, 270, 1801. VLA at 1.4 GHz (31'' $\times$ 33''), and 1.7 GHz for OH survey.  
 LaRosa *et al.* 2000, AJ, 119, 207. VLA at 333 MHz (24'' $\times$ 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'' $\times$ 12.8'').

Aharonian *et al.* 2008, A&A, 483, 509. XMM-Newton and HESS observations.  
 Hewitt *et al.* 2008, ApJ, 683, 189. GBT at 1.6 and 1.7 GHz for OH masers.  
 Bamba *et al.* 2009, ApJ, 691, 1854. Suzaku observations.  
 Stupar & Parker 2011, MNRAS, 414, 2282. H $\alpha$  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<sub>2</sub> 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.

**G359.1+0.9**

**RA:** 17<sup>h</sup>39<sup>m</sup>36<sup>s</sup>  
**Dec:** –29°11′

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

**Size/arcmin:** 12 $\times$ 11  
**Type:** S

**Radio:** Shell, brightest in E.

**References:**

Gray 1994, MNRAS, 270, 847. MOST at 843 MHz (43'' $\times$ 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'' $\times$ 15.9'' :  $S=1.3\pm 0.5$  Jy).