The MOST Galactic Centre Survey – III. Images of new candidate supernova remnants

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Accepted 1994 May 16. Received 1994 April 12; in original form 1993 November 1

ABSTRACT
The Molonglo Observatory Synthesis Telescope (MOST) has recently been used to make an 843-MHz survey of the Galactic Centre region. A previous paper in this series discussed the new data on 11 objects within the survey boundaries which were already known or suspected to be supernova remnants. This paper discusses 17 new objects identified in the survey as candidate SNRs, primarily on the basis of thermal/non-thermal separations performed on the survey data. An image of each object is presented, along with a brief discussion of its properties.

Key words: supernova remnants – Galaxy: centre – radio continuum: general.

1 INTRODUCTION
As pointed out by Green (1991), searches for SNRs anywhere in the Galaxy are impeded by two main limitations. First, there is an angular size limit imposed by the instrumental beam: if an SNR is less than about two beam diameters in size then it is unlikely to be recognized as an SNR from the structure alone. Secondly, there is a limit imposed by the sensitivity and resolution of the instrument, which inhibits the detection of objects that are intrinsically faint and those that lie in complex, confused regions. This is of particular relevance to the Galactic Centre region, where there is a profusion of strong source complexes. Since SNRs typically have power-law spectra which increase with decreasing frequency, the use of low frequencies is beneficial in finding such objects. However, existing single-dish surveys of this region have relatively poor resolution at lower frequencies, so both confusion and angular size limitations apply, while at higher frequencies the emission from weaker SNRs may have decreased to the point where the sensitivity limitation becomes significant.

The Molonglo Observatory Synthesis Telescope (MOST – Mills 1981; Robertson 1991) has recently made an 843-MHz (λ = 35.6 cm) survey of the Galactic Centre, providing an unprecedented view of discrete decimetric continuum emission over a wide field (f = 355°–360°–5°, |b| < 2.5°) with a resolution of ~90 × 43.5 arcsec² PA 0° (see Gray 1993, 1994a; the latter is hereafter referred to as Paper I). Spatial scales up to ~30 arcmin were imaged with a dynamic-range-limited sensitivity of ~5 mJy beam⁻¹ in this region. This, and a companion survey of the southern Galactic Plane (Whiteoak et al. 1989; Whiteoak 1990), thus provides a powerful tool for the identification of SNRs, with its ~1-arcmin resolution at a frequency below 1 GHz simultaneously addressing the sensitivity, confusion, and angular size limitations. The objects already identified by other researchers as SNRs were readily seen (with one extraordinary exception: see Gray 1994b, hereafter Paper II), and this paper presents images and brief discussions of new SNR candidates found in the survey data.

2 THE NEW SNR CANDIDATES
Since the MOST’s synthesized beam is very ‘clean’ with small sidelobes (aside from grating responses at intervals of 1°15’), SNR candidates were initially identified from the un-deconvolved survey images (see fig. 2 of Paper I for an example of such an image). Once located, the relevant images were deconvolved to characterize better the properties of objects. Candidates were selected for having one or more of the following properties: (1) a shell-like structure, possibly with barrel (Kesteven & Caswell 1987) or bi-annular (Manchester 1987) structure typical of SNRs; (2) no indication of a thermal origin, i.e. weak or absent infrared (Arendt 1989; Broadbent, Haslam & Osborne 1989; Saken, Fesen & Shull 1992) and higher frequency radio emission, and/or an absence of radio recombination lines; (3) known or suspected non-thermal emission in other surveys; and (4) possible association with a catalogued pulsar.

A total of 18 previously unstudied objects were found with these criteria. One was subsequently identified as a wide-angle-tail radio galaxy (G357.3 + 1.2 – see Gray 1994c, hereafter referred to as Paper IV). The remaining 17 objects
are summarized in Table 1, which lists (1) the Galactic coordinates, (2) and (3) the right ascension and declination for epoch and equinox J2000.0, (4) an approximate size for each object in arcminutes, (5) a morphological classification, (6) an approximate 843-MHz integrated flux density, and (7) a brief comment on each object.

Many of these objects are weak and are not detected in existing data at other frequencies, so it is not possible to estimate spectral indices except as limits which have not proved useful in constraining the emission mechanisms (where spectral indices are quoted, the convention followed is that spectral index $\alpha$ is defined by $S_{\nu} \propto \nu^{\alpha}$, where $S_{\nu}$ is the flux density at frequency $\nu$). The flux densities found from the interferometric MOST data are also uncertain in many cases, since the objects are extended and deconvolution is difficult in the presence of baselvel fluctuations caused by the intense source complexes along the Galactic plane. The large uncertainties in the surface-brightness–diameter ($S$–$D$) relation (a factor of 2 or more – see Berkhuijsen et al. 1986; Reich et al. 1988; Green 1991) would only be compounded by the uncertainty in the MOST data, so for this reason such estimates are not made here. Brief discussions of other aspects of each of these sources are now given. Throughout this paper, reference will be made to the IRAS survey images (IRAS Catalogs and Atlases Explanatory Supplement 1988) and the Parkes Galactic Plane Survey (Haynes, Caswell & Simons 1978) without further embedded citations.

2.1 G355.4+00.7

This object is contained within a roughly circular region $\approx 25$ arcmin across, but does not show a well-defined rim except for a brightened cap at the northern edge (see Fig. 1). The total 843-MHz flux density is $\approx 5$ Jy. The wispy internal structure of this object is perhaps more reminiscent of H II regions than the more filamentary SNRs – although such a subjective classification is obviously inconclusive – and there is possibly a bridge of emission connecting it to the H II region G355.251–0.065 (at lower left in Fig. 1). IRAS HCON 3 plate 161 shows a weak ridge of 60-\mu m emission lying coincident with the north-eastern edge of the object, but no significant infrared emission is coincident with the brightest radio emission, unusual for a thermal region. There is some weak emission in the Parkes 5-GHz data coincident with the strongest 843-MHz emission, but the region is marred by prominent scanning artefacts, so estimation of a spectral index is difficult. Regardless of its nature, a remarkable feature of this object is the set of four quasi-linear structures which define the southern edge of the shell, oriented predominantly in a radial direction.

2.2 G355.6–00.0

This is a shell-type object which lies in a region of both diffuse and compact radio emission. Comparisons with IRAS and Parkes data indicate that much of this material is probably thermal, but no significant emission is detected from the candidate in either data set, indicating a non-thermal origin. The MOST image of the object is shown in Fig. 2, where a structure consistent with an SNR origin is seen. The total flux density from this 6-arcmin shell is 2.6 Jy. Note the 50 per cent enhancement in brightness on the western edge; this may be due to an interaction with the diffuse thermal gas seen here. The southern rim departs from the otherwise good circularity, showing a ‘blow-out’ which may be the result of the shell expanding into a region of lower density, perhaps an existing bubble in the interstellar medium.

2.3 G356.3–00.3

This object consists of an almost featureless, elliptical region of weak emission, perhaps with a hint of a shell but little or no other fine-scale structure. It is shown in Fig. 3. To the north-west there is a strong H II region visible in both infrared and 5-GHz radio images and with radio recombination lines (listed as G356.307–0.210 by Caswell & Haynes 1987). The SNR candidate is visible in neither the IRAS nor the Parkes 5-GHz images, but this is inconclusive because its emission is weak and may be below the sensitivity limits of those surveys. The pulsar PSR 1735–32 lies $\approx 15$ arcmin east-north-east, but its characteristic age of 15.49 Myr (see Taylor, Manchester & Lyne 1993, and references therein) is too great for it to be associated with a visible remnant.

Table 1. New SNR candidates detected by the MOST in the Galactic Centre region. The type code is ’S’ = shell, ’PS’ = partial shell, ’U’ = unclear. Since no other radio data exist that can give useful quantitative information on flux densities at other frequencies, no spectral indices can be estimated.

<table>
<thead>
<tr>
<th>Gal. Coords</th>
<th>Position (J2000.0)</th>
<th>Size (arcmin)</th>
<th>Type code</th>
<th>S_{604 MHz} (Jy)</th>
<th>Comment</th>
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<td>$-32 25 40$</td>
<td>25</td>
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<td>17 55 17</td>
<td>$-25 14 51$</td>
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<td>S?</td>
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Figure 1. SNR candidate G355.4+00.7. The saturated source in the south-east is the H\textsuperscript{II} complex G355.251−0.065 (Caswell & Haynes 1987), which has multiple identifications in the IRAS point source catalogue. The bright point source in the south is the H\textsuperscript{II} region G354.934 + 0.327 (IRAS 17284−3300).

Figure 2. SNR candidate G355.6−00.0. The source near the bottom of the frame is an H\textsuperscript{II} region (IRAS 17316−3244). The diffuse emission to the west of the shell is also thermal.
Figure 3. SNR candidate G356.3–00.3. Base level uncertainties arising from nearby complex objects cause the asymmetry in baselevel on either side of the object. The vertical striping seen over the western portion of the image is caused by short-time-scale gain errors affecting a strong point source some 40 arcmin north. The bright object in the north-west is an \text{H}_\text{II} region (IRAS 17341–3208).

Figure 4. SNR candidate G356.3–01.5. A grating response due to G357.7–0.1 runs across the southern portion of the object. An attempt was made to remove this, which was not entirely successful, so the weak ridge running from the northern end of the bright eastern rim, across the remnant and down to the lower-right corner of the frame is an artefact, as is the trough to the south of this ridge where it passes through the shell interior.
Figure 5. SNR candidate G356.6 + 00.1. The saturated source at the bottom of the shell is almost certainly an H II region (IRAS 17335 – 3136).

Figure 6. SNR candidate G357.1 – 00.2. The weak point-like source to the west of the strongest part of the extended emission is coincident with pulsar PSR B1736 – 31 (Clifton et al. 1992), marked by a cross. The cross is shown much larger than the positional error of the pulsar for the sake of clarity.
2.4 G356.3−01.5

A classic barrel structure typical of SNRs is seen in the MOST image of this object (Fig. 4). The raw image in this case was marred by a grating response to G357.7−0.1 crossing the shell obliquely, so a smooth model of this artefact was subtracted prior to deconvolution. The total flux density in this modified image is 2.8 Jy. Suggestions that SNRs are brightest on the side closest to the Galactic plane, where the density is presumed to be higher (Caswell & Lerche 1979), are refuted by this object. The long axis is almost parallel to the Galactic plane, yet the brighter rim is further from the plane. It is thus likely that the brightness distribution is dominated more by variations in the local gas density than by the global density gradient perpendicular to the Galactic plane.

2.5 G356.6+00.1

The identification of this object as an SNR is uncertain. Shown in Fig. 5, this object consists of a strong (240 mJy beam$^{-1}$ peak), slightly extended source at the southern edge with several weaker, curved filaments extending north and east to form a roughly circular shell. The strong component here is almost certainly HI emission, as this source is coincident with IRAS 17335−3136, appears in 5-GHz radio images – indicating a flat spectrum – and has radio recombination lines (G356.650+0.129; Caswell & Haynes 1987). It is not necessarily linked to the weaker shell emission, however, which is not seen in either the infrared or the 5-GHz data, although this may be due to the weaker emission falling below the sensitivity limit of those surveys. Further studies are needed to identify conclusively the shell's nature.

2.6 G357.1−00.2

This object was catalogued at 5 GHz by Haynes, Caswell & Simons (1979) and suggested as an SNR candidate (G357.2−0.2) by Broadbent et al. (1989) on the basis of a low infrared/radio flux density ratio. One aspect not previously noted is that it lies adjacent to pulsar PSR B1736−31 (Clifton & Lyne 1986; Clifton et al. 1992). The MOST image of this region (Fig. 6) is the first with resolution finer than 4 arcmin, and shows an unusual structure with a diffuse halo. The pulsar (marked by a cross in Fig. 6) is coincident with a 23-mJy point source (see Paper IV). A weak loop-like feature is also evident, extending ~10 arcmin to the south-west and surrounding the pulsar.

Despite their spatial coincidence, it is unlikely that G357.1−00.2 is an SNR arising from the supernova that gave birth to PSR B1736−31, since the latter's characteristic age of 0.46 Myr (Clifton et al. 1992) is an order of magnitude greater than those of confirmed pulsar/SNR associations (see Kulkarni et al. 1993) and also greater than the observable lifetime of SNRs (see, for example, Braun, Goss & Lyne 1989). The spectrum of G357.1−00.2 is unclear, since the only previous flux density measurement is that of Broadbent et al. (1989), who reported 0.8 Jy at 5 GHz. The 843-MHz value is probably ~10 Jy, but the presence of a diffuse halo and the baselevel fluctuations make this uncertain. None the less, the implied spectral index of $\alpha \approx -1.5$ supports a non-thermal nature, although it is too negative for a plerion or even a normal shell SNR (see, for example, Weiler & Panagia 1980). However, the possibility that G357.1−00.2 is some form of energetic phenomenon powered by the pulsar cannot be conclusively ruled out.

A further possibility is that G357.1−00.2 is an extragalactic core–lobe object viewed at an oblique angle with the lobes extended along the line of sight. The adjacent source G357.7−0.1, although suggested as an SNR (see, for example, Shaver et al. 1985), has also been proposed as an extragalactic object (Caswell et al. 1989). Two possible radio galaxies in the same region of sky may indicate that there is a cluster of galaxies behind the Galactic Centre, but conclusive identification of G357.1−00.2 and clarification of its relationship to PSR B1736−31 await higher resolution investigations to constrain better the detailed structure and emission characteristics.

2.7 G358.1+01.0

This source is a very low-surface-brightness partial shell. Fig. 7 shows an MEM deconvolution of four averaged observations. The major features seen here, notably the vertical feature running from the southern rim to the centre of the shell, were present in all four images and are not artefacts. There is a suggestion of infrared emission in the IRAS images and a possible detection at 5 GHz, but scanning artefacts in both made positive identification difficult. Emission from this region was reported by Jones & Finlay (1974) in their 29.9-MHz Galactic plane survey, and it coincides with extensive enhanced emission seen in the Effelsberg 21-cm survey (Reich, Reich & Fürst 1990) and a similar region of polarized emission seen in the Parkes 4.85-GHz polarimetric survey of the Galactic Centre (Haynes et al., in preparation). However, while these latter three features are probably related to each other – and imply a non-thermal emission mechanism – it is unlikely that they are directly related to the new SNR candidate, since all subextend several degrees.

2.8 G358.5−00.9

This is a faint, barrel-type object badly affected by artefacts arising from residual calibration errors on Sgr A, ~1.5 to the north. A large vertical stripe across the eastern half of the shell was removed by subtraction of a smooth model to show the candidate better, with the resulting image being displayed in Fig. 8. Owing to the complexity of this region and the presence of strong artefacts, no attempt was made to deconvolve this image, and no flux density estimates were made. None the less, the south-western stave of the barrel is clear, but the north-eastern one [near 17°46'20", -30°33' (J2000.0)] is very weak and is superimposed on the weak southern arc of SNR G359.0−0.9 (see Paper II). Within the barrel of the new object, but off-centre, lies pulsar PSR B1742−30, coincident with the 31-mJy point source marked by a cross in Fig. 8. The characteristic age of this pulsar is 0.55 Myr (see Taylor, Manchester & Lyne 1993, and references therein), considerably greater than the expected age of a visible remnant (Braun et al. 1989). This suggests that the two are unrelated (see also Paper IV).

2.9 G358.7+00.7

The image containing this object is corrupted by sidelobes from both Sgr A and G357.7−0.1, two of the most intense sources in the Galactic Centre region. Nevertheless, a faint
Figure 7. SNR candidate G358.1+01.0. Four separate 12-h observations were combined to produce this image. Artefacts from the nearby G357.7−0.1 cross the field.

Figure 8. SNR candidate G358.5−00.9. The prominent vertical features are sidelobes of the Sgr A complex some 15" north of this region. Within the proposed shell lies PSR B1742−30, marked by a cross far larger than its positional uncertainty for clarity. North of the shell can be seen the southern extremity of the known SNR G359.0−0.9.
Figure 9. SNR candidate G358.7 + 00.7. This region is badly affected by sidelobes of Sgr A and G357.7 − 0.1. Note the elliptical region devoid of emission lying in the western half of the shell, defined by the concave western edge of the bright northern rim and extending to the southern rim of this otherwise circular object. The point-like sources in the field are probably unrelated background objects.

Figure 10. SNR candidate G359.1 + 00.9. This is an MEM deconvolution of the data. The pulsar PSR B1736 − 29 lies in the source immediately to the north of the shell's rim (marked by a cross much larger than the positional uncertainty of the pulsar for clarity), although its age would seem to preclude the possibility that the two might be related (see text).
partial shell is visible and is shown in Fig. 9, an image derived by averaging two observations. The presence of the strong sidelobes makes flux density estimates difficult to derive, but the total flux density is probably ~2 Jy. Because of its very weak emission, it is difficult to be sure that it is absent from IRAS and Parkes images, and so the emission mechanism is not clear. For the most part the object is very circular, but there appears to be a roughly elliptical region of weaker emission over the western half of the shell, with its eastern edge bounded by the concave western edge of the bright northern rim, passing near the centre of the remnant and joining the southern rim near 17°39′20″, −29°42′ (J2000.0). This structure may arise from different portions of the remnant expanding into media of differing densities, in the manner of SNR G166.0 + 4.3 (VRO 42.05.01: Landecker et al. 1989).

2.10 G359.1 + 00.9

Shown in Fig. 10, this shell-like object lies a few arcminutes south of PSR B1736 − 29 (Clifton & Lyne 1986), visible here as the 14-mJy source (marked by a cross) lying just off the northern rim of the shell. The characteristic age of the pulsar is 0.65 Myr (Clifton et al. 1992), however, well in excess of the expected visible lifetime of SNRs (see Braun et al. 1989), thereby making an association with this SNR candidate unlikely (see also Paper IV). The total flux density of the SNR at 843 MHz is ~4.8 Jy, although this may be in error owing to baselevel uncertainties caused by the proximity to the first-order grating response to Sgr A.

2.11 G359.2 − 01.1

Located adjacent to G359.0 − 0.9, this asymmetric shell-type object (Fig. 11) has rather diffuse edges, as opposed to the sharp edges normally associated with SNRs. This is perhaps more typical of thermal regions, but no significant infrared emission is seen from this object in the IRAS images, nor is it prominent in the Parkes 5-GHz survey. It is therefore included here as a possible SNR. Determination of a baselevel is difficult in this region, so the total 843-MHz flux density is estimated with considerable uncertainty to be ~1.3 Jy.

2.12 G000.3 + 00.0

Anantharamaiah et al. (1991) noted the presence of this ‘asymmetric shell-type structure’ in their 330-MHz data. It lies partially superimposed on the so-called ‘Northern Galactic Lobe’ (NGL = LaRosa & Kassim 1985; Kassim, LaRosa & Erickson 1986; see also Paper I), so, in order to characterize better the structure of the new candidate object, a smooth model of the NGL emission was subtracted from the MOST image. The result is shown in Fig. 12. Note that at no point did the boundary of the subtracted model follow that of the proposed shell, nor did it contain structure on the scales present in the shell. The structure revealed is that of an almost complete, slightly elliptical ring ~8 arcmin across, lying immediately above the emission from Sgr A, and west of the point-like source near 17°46′30″, −28°36′ (J2000.0). The object is of low contrast in this complex region, but none the less appears to display barrel-type characteristics, although the gap in the southern edge may be due to inadequacies in the subtracted model of the NGL. The estimation of a total flux density in this confused region faces insurmountable difficulties, and it is not possible to see this object in the IRAS or Parkes 5-GHz data, because their resolutions are not sufficient to separate it from the intense emission from Sgr A. Its presence in emission at 330 MHz (Anantharamaiah et al. 1991) suggests, however, that it is not thermal, since other thermal emission in the region is optically thick at this frequency (see also Pedlar et al. 1989; Goss et al. 1989).

2.13 G001.4 − 00.1

This is a shell-type object lying north-east of the Sgr D complex (see, for example, Liszt 1992; see also Paper II). It was noted at 1616 MHz by Liszt (1992) as ‘an arc or incomplete shell of diameter ~7′′, but the MOST image shows it to be a complete shell (Fig. 13). Baselevel uncertainties imposed by the close proximity of the Sgr A grating response make quantification of this object difficult, but a tentative estimate for the 843-MHz flux density is ~2 Jy. The compact source seen at the eastern rim in this image is probably an unrelated background source or perhaps a pulsar, since its spectrum between 843 and 1616 MHz is steeper than α = −1. Liszt (1992) seems to associate the shell with a thermal source detected in the radio recombination-line survey of Caswell & Haynes (1987), but the nearest object in that catalogue is G1.323 + 0.086. This association must be an inadvertent error by Liszt, since he discusses this latter object immediately before his mention of the shell.

2.14 G003.1 − 00.6

The largest object identified in this study, G003.1 − 00.6 spans over 50 arcmin in declination (Fig. 14). Much of the region containing this object is fortunately devoid of emission other than a few isolated point sources; if it lay in a more complex region then it may not have been so easily recognized. Most of the emission lies in narrow filaments, with an estimated total flux density of approximately 6.5 Jy if the contribution of the (presumably unrelated) point-like sources is removed. This is likely to be an underestimate, since the object is sufficiently large that the large-scale emission is lost through the missing short interferometer spacings. The overall structure bears some resemblance to that of SNR G166.0 + 4.3 (VRO 42.05.01: Landecker et al. 1989), with a set of curved filaments at the western edge defining a smaller diameter shell than the extensive eastern filaments.

2.15 G003.7 − 00.2

Displaying a bright, well-defined shell (Fig. 15), this object probably owes its previous anonymity to several nearby, extended H II regions from which it is not well separated in previous radio images. The 11 × 14 arcmin 2 shell has a total flux density of ~2.4 Jy, and is almost certainly an SNR based purely on morphological grounds, since it shows evidence of both the barrel-like structure noted by Kesteven & Caswell (1987) and the bi-annularity proposed by Manchester (1987). Seeing both in one remnant, however, is at odds with at least the hypothesis of Manchester, who argues that non-uniformities in the brightness distribution along the ‘staves’
Figure 11. SNR candidate G359.2−01.1. The ridge of emission in the south-west corner is the edge of shell SNR G359.0−0.9 (see Paper II).

Figure 12. SNR candidate G000.3+00.0, located just north of Sgr A, part of which is seen as the saturated region at the bottom of the image. The image resolution is 88.0 × 42.8 arcsec² PA 0°1, and the rms noise of this MEM solution is 16 mJy beam⁻¹ (assumed to be the dynamic-range-limited rms noise). In order to show the shell structure better, a simple model of the Northern Galactic Lobe was subtracted from this image (see text). Paper I shows this region without the subtraction.
Figure 13. SNR candidate G001.4-00.1. The base-level in this region is highly uncertain owing to the Sgr A grating response. The emission at the top of the image and the white regions to the right and bottom are all spurious base-level irregularities. None the less, the shell object is quite clear.

Figure 14. SNR candidate G003.1-00.6. The filamentary emission across the central region of the image is the proposed remnant. Various point sources dot the field, but none can currently be tied to the remnant. The saturated region in the upper right is an H\alpha region on the Galactic plane.
Figure 15. SNR candidate G003.7−00.2. This object is almost certainly an SNR, as it displays a clear barrel structure. The weaker emission to the north-west is part of an extended emission complex lying on the Galactic plane, and the white patch to the south-west is a baseline error caused by incomplete removal of the negative bowls around nearby extended sources.

Figure 16. SNR candidate G003.8+00.3. The VLA calibrator 1748−253 lies just off the western edge of the displayed field, and the white region at the bottom of the image is a residual bowl artefact arising from adjacent, extended H II regions. Note the well-centred point-like source; its nature is at present unknown.
of barrel-type remnants are seen as complete or partial annuli when viewed from the end of the barrel, i.e. at a viewing angle perpendicular to that required to see the staves.

2.16 G003.8 + 00.3

This object shows a fairly weak, incomplete ring structure almost perfectly centred on a slightly extended source (see Fig. 16). The relationship between this source and the ring is not clear; no significant emission is seen from the ring or the central object in either the IRAS survey or the Parkes 5-GHz data, and no pulsar has been detected anywhere in the vicinity of this shell. It is possibly a chance alignment of an unrelated background source, although there is a horizontal band of emission which appears to link this source to the western edge of the shell. The total 843-MHz flux density from this region is \( \sim 3.5 \) Jy, but, without significant detections at other frequencies, the emission mechanisms of both shell and central source remain unknown.

2.17 G004.2 + 00.0

At just over 3.5 arcmin across, this is the smallest diameter candidate found in this search. Super-resolved imaging enhances the hint of shell-like structure seen in the normal-resolution image (Fig. 17), and suggests a possible barrel-like structure. The IRAS images show no significant infrared emission from this region, so it is probably not a compact, shell-like H\( \alpha \) region or a planetary nebula. The total flux density is \( \sim 200 \) mJy, but no other radio detections have been reported, so no spectral information can be derived. The estimated 1-GHz surface brightness (for a spectral index of \( \alpha = -0.4 \)) is \( \sim 2 \times 10^{-21} \) W m\(^{-2}\) Hz\(^{-1}\) sr\(^{-1}\), marginally acceptable for an SNR provided that it lies at a distance of \( > 20 \) kpc – consistent with its location close to the Galactic plane – and has a physical diameter of \( > 20 \) pc (derived using a crude \( \Sigma - D \) estimate; see Green 1991).

3 CONCLUSIONS

The MOST Galactic Centre Survey has proved valuable in the identification of extended objects with low surface brightness. By this means, 17 new SNR candidates have been found in the Galactic Centre region. Four have some weak evidence of thermal emission characteristics (G355.4 + 00.7, G356.6 + 00.1, G358.1 + 01.0 and G359.2 – 01.1), but several others are very strong candidates on morphological

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**Figure 17.** SNR candidate G004.2 + 00.0. The strong emission at top right is the edge of an H\( \alpha \) complex ([IRAS] 17522 – 2504).
grounds alone, with barrel or bi-annular structures (e.g. G356.3–01.5 and G003.7–00.2). None the less, it remains to confirm that these objects are indeed non-thermal emitters; although none showed strong infrared or higher frequency radio detections, several are so weak that their emission may be below the sensitivity of the comparison surveys used, and the presence of a shell is not in itself conclusive (e.g. the HII region G1.1 – 0.1 is morphologically very similar to the adjacent SNR G1.05 – 0.1), and barrel structure is also seen in planetary nebulae (see, for example, Walton et al. 1988). Observations revealing a non-thermal spectrum and/or the detection of polarized radio emission and/or the absence of radio recombination lines would be of great benefit.

The number of new objects reported here substantially exceeds the 10 SNRs previously known in this region (see Paper II for a discussion of the 11th object, G358.4 – 1.9). On the assumption that the majority of the objects presented here are indeed SNRs, there is a significant impact on the observed distribution of SNRs in this region and the Galaxy as a whole. A discussion of this is given in Paper IV.

ACKNOWLEDGMENTS

The Molonglo Observatory Synthesis Telescope is operated by the School of Physics, with funds from the Australian Research Council and the Science Foundation for Physics within the University of Sydney. The author thanks Lawrence Cram, Ron Ekers and David Crawford for useful discussions and advice in the course of the work discussed in this paper. The author also acknowledges financial support in the form of an Australian Postgraduate Research Award. Finally, some useful comments from an anonymous referee are also acknowledged.

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