

## NEW 6 AND 3-cm RADIO-CONTINUUM MAPS OF THE SMALL MAGELLANIC CLOUD: PART II – POINT SOURCE CATALOGUE

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**SUMMARY:** We present two new catalogues of radio-continuum sources in the field of the Small Magellanic Cloud (SMC). These catalogues contain sources found at 4800 MHz ( $\lambda=6$  cm) and 8640 MHz ( $\lambda=3$  cm). Some 457 sources have been detected at 3 cm with 601 sources at 6 cm created from new high-sensitivity and resolution radio-continuum images of the SMC from Crawford et al. (2011).

**Key words.** Magellanic Clouds – radio continuum : galaxies – catalogs

### 1. INTRODUCTION

The Small Magellanic Cloud (SMC), well known for its close proximity ( $\sim 60$  kpc; Hilditch et al. 2005) and ideal location in one of the coldest areas of the radio sky (also towards the South Celestial Pole), allows observations of radio emission to be made without interference from the Galactic foreground radiation (Haynes et al. 1986). Therefore, the SMC is an ideal location to study radio sources like supernova remnants (SNRs; Filipović et al. 2005, 2008, Payne et al. 2007, Owen et al. 2011, Haberl et al. 2012), H II regions (Reid et al. 2006) and Planetary Nebulae (PNe; Filipović et al. 2009a, Crawford et al. 2012) which may otherwise be difficult to study in our own and other more distant galaxies.

Extensive radio-continuum surveys of the SMC have been made over the last 40 years using various interferometric observations like the Munglo Observatory Synthesis Telescope (MOST; Ye et

al. 1995) and Australia Telescope Compact Array (ATCA; Filipović et al. 2002, Payne et al. 2004, Filipović et al. 2009b, Mao et al. 2008, Dickel et al. 2010), and single dish observations from the 64-m Parkes radio-telescope (Filipović et al. 1997, 1998).

Catalogues of radio-continuum point sources covering the region of the SMC have been created from these surveys, and from wider surveys of the southern sky (see the summary of these catalogues in Wong et al. 2011a,b).

We recently published a set of new high-resolution radio-continuum maps of the SMC at 6 and 3-cm, created by combining observations from ATCA (Crawford et al. 2011, hereafter Paper I). We now present a catalogue of radio-continuum sources in the region of the SMC derived from our 6 and 3 cm radio-continuum maps (Fig. 1 and Fig. 3 in Paper I).

In Section 2 we describe the data used to derive the radio-continuum point sources. In Section 3 we describe our source fitting and detection methods. Section 4 contains our conclusions and the appendix contains the radio-continuum source catalogue.

## 2. DATA

The 6 and 3 cm maps (Fig. 1 and Fig. 3 in Paper I) were created by combining data from various ATCA projects that covered the SMC (Table 1 in Paper I). The majority of the data used come from ATCA project C1207 (Dickel *et al.* 2010). The 3 and 6 cm maps have a resolution of  $20''$  and  $30''$ , and sensitivity of 0.8 and 0.7 mJy/beam, respectively.

Table 1 contains the field size of all the images used to derive the radio-continuum sources contained in this paper (Tables A1 and A2).

**Table 1.** Field size (in J2000) of images used in this study.

Image	RA <sub>1</sub>	RA <sub>2</sub>	Dec <sub>1</sub>	Dec <sub>2</sub>
3 cm	00 <sup>h</sup> 26 <sup>m</sup>	01 <sup>h</sup> 27 <sup>m</sup>	-70°35'	-75°21'
6 cm	00 <sup>h</sup> 26 <sup>m</sup>	01 <sup>h</sup> 28 <sup>m</sup>	-70°29'	-75°29'
13 cm	00 <sup>h</sup> 27 <sup>m</sup>	01 <sup>h</sup> 35 <sup>m</sup>	-70°30'	-75°15'
20 cm	00 <sup>h</sup> 10 <sup>m</sup>	01 <sup>h</sup> 43 <sup>m</sup>	-69°16'	-75°40'
36 cm	00 <sup>h</sup> 16 <sup>m</sup>	01 <sup>h</sup> 40 <sup>m</sup>	-72°30'	-74°38'

## 3. SOURCE FITTING AND DETECTION

The MIRIAD task IMSAD (Sault *et al.* 1995) was used to detect sources in the 3 cm and 6 cm images, requiring a fitted Gaussian flux density  $>5\sigma$  (3.5 mJy). All sources were then visually examined to confirm that they are genuine point sources, excluding extended emission, bright side lobes, etc.

The catalogue of radio-continuum sources contains positions RA(J2000), Dec(J2000) and integrated flux densities at 3 cm (Table A1) and 6 cm (Table A2). Table 2 provides a summary of the images and resulting catalogues of radio-continuum sources used in this study. In addition, the 13, 20 and 36 cm information from Wong *et al.* (2011a,b) is repeated for comparison. Table 2 also contains the number of sources identified within the field of the 13 cm image (see Table 1), the smallest of all the survey regions compared.

**Table 2.** Information on the images and catalogue of radio-continuum sources.

$\lambda$ (cm)	RMS (mJy/beam)	Number of Sources	Within the Field of the 3 cm image	Beam Size (arcsec)
3	0.8	457	457	20
6	0.7	601	601	30
13	0.4	743*	743*	45
20	0.7	1560	824	14.8×12.2
36	0.7	1689	1198	40

\* Values include the original catalogue retrieved from Filipović *et al.* (2002)

## 4. CONCLUSION

We present a new catalogue of radio-continuum sources towards the SMC, containing sources found at 3 cm and 6 cm.

The 3 cm and 6 cm catalogue, containing 457 and 601 sources respectively, has been created from new high-sensitivity and resolution radio-continuum maps of the SMC from Paper I.

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## APPENDIX

Tables A1 and A2 in Appendix are available online at <http://saj.matf.bg.ac.rs/184/pdf/Appendix.pdf>.

НОВО ПРОУЧАВАЊЕ МАЛОГ МАГЕЛАНОВОГ ОБЛАКА У  
РАДИО-КОНТИНУУМУ НА 6 И 3 cm: ДЕО II - КАТАЛОГ ТАЧКАСТИХ ИЗВОРА

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*Стручни чланак*

У другом делу ове студије представљамо нове АТСА радио-континуум каталоге тачкастих објеката у пољу Малог Магелановог Облака (ММО) на  $\lambda=6$  cm

( $\nu=4800$  MHz) и  $\lambda=3$  cm ( $\nu=8640$  MHz). Укупно, у овом новом каталогу представљено је 457 тачкастих објеката детектованих на 3 cm и 601 на 6 cm.