



The Australia Telescope 20GHz (AT20G) Survey: analysis of the extragalactic source sample

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The Australia Telescope 20 GHz (AT20G) survey is a blind survey of the whole Southern sky at 20 GHz with follow-up observations at 4.8, 8.6, and 20 GHz carried out with the Australia Telescope Compact Array (ATCA). In this paper we present an analysis of radio spectral properties in total intensity and polarisation, sizes, optical identifications, and redshifts of the sample of the 5808 extragalactic sources in the survey catalogue of confirmed sources over the whole Southern sky excluding the strip at Galactic latitude $|b| < 1.5 \text{ deg}$. The sample has a flux density limit of 40 mJy. Completeness has been measured as a function of scan region and flux density. Averaging over the whole survey area the follow-up survey is 78% complete above 50mJy and 93% complete above 100mJy. 3332 sources with declination $< -15 \text{ deg}$ have good quality almost simultaneous observations at 4.8, 8.6, and 20GHz. The spectral analysis shows that the sample is dominated by flat-spectrum sources. The fraction of flat-spectrum sources decreases from 81% for 20GHz flux densities $S > 500 \text{ mJy}$, to 60% for $S < 100 \text{ mJy}$. There is also a clear spectral steepening at higher frequencies with the median spectral index decreasing from -0.16 between 4.8 and 8.6GHz to -0.28 between 8.6 and 20GHz. Simultaneous observations in polarisation are available for all the sources at all the frequencies. 768 sources have a good quality detection of polarised flux density at 20GHz; 467 of them were also detected in polarisation at 4.8 and/or at 8.6GHz so that it has been possible to compare the spectral behaviour in total intensity and polarisation. We have found that the polarised fraction increases slightly with frequency and decreases with flux density. Cross matches and comparisons have been made with other catalogues at lower radio frequencies, and in the optical, X-ray and gamma-ray bands. Redshift

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estimates are available for 825 sources.

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