J/ApJ/793/82 LOFAR Bootes and 3C295 field sources (van Weeren+, 2014)

LOFAR low-band antenna observations of the 3C 295 and Bootes fields: source counts and ultra-steep spectrum sources.

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=2014ApJ...793...82V (SIMBAD/NED BibCode)

ADC_Keywords: Galaxies, Seyfert ; Interferometry ; Surveys ; Radio sources

Keywords: galaxies: active - radio continuum: general - surveys - techniques: interferometric

Abstract:

We present Low Frequency Array (LOFAR) Low Band observations of the Bootes and 3C 295 fields. Our images made at 34, 46, and 62 MHz reach noise levels of 12, 8, and 5 mJy/beam, making them the deepest images ever obtained in this frequency range. In total, we detect between 300 and 400 sources in each of these images, covering an area of 17-52 deg^2. From the observations, we derive Euclidean-normalized differential source counts. The 62 MHz source counts agree with previous GMRT 153 MHz and Very Large Array 74 MHz differential source counts, scaling with a spectral index of -0.7. We find that a spectral index scaling of -0.5 is required to match up the LOFAR 34 MHz source counts. This result is also in agreement with source counts from the 38 MHz 8C survey, indicating that the average spectral index of radio sources flattens toward lower frequencies. We also find evidence for spectral flattening using the individual flux measurements of sources between 34 and 1400 MHz and by calculating the spectral index averaged over the source population. To select ultra-steep spectrum ($\alpha \leftarrow 1.1$) radio sources that could be associated with massive high-redshift radio galaxies, we compute spectral indices between 62 MHz, 153 MHz, and 1.4 GHz for sources in the Bootes field. We cross-correlate these radio sources with optical and infrared catalogs and fit the spectral energy distribution to obtain photometric redshifts. We find that most of these ultra-steep spectrum sources are located in the $0.7 \lesssim z \lesssim 2.5$ range.

Description:

The Bootes and 3C 295 fields were simultaneously observed on 2012 April 12 as part of a multi-beam observation with the LOFAR LBA stations. The idea behind the multi-beam setup is that we use the 3C 295 observations as a calibrator field to transfer the gain amplitudes to the (target) Bootes field. The total integration time on both fields was 10.25 hr. Complete frequency coverage was obtained between 54 and 70 MHz for both fields, while non-contiguous frequency coverage was obtained between 30 and 54 MHz for the 3C 295 only. All four correlation products were recorded. By default, the frequency band was divided into sub-bands, each 195.3125 kHz wide. Each sub-band was further divided in 64 channels and the integration time was 1 s.

Objects:

RA (ICRS)	DE	Designation(s)
14 11 20.47	+52 12 09.5	3C 295 = 2C 1175

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
table3.dat	66	1417	Combined LOFAR Bootes and 3C295 field source catalogs

See also:

J/AJ/130/923 : Faint radio sources in the NOAO Bootes field (Wrobel+, 2005)
J/A+A/598/A104 : LOFAR Two-metre Sky Survey (Shimwell+, 2017)

Byte-by-byte Description of file: table3.dat

Bytes	Format	Units	Label	Explanations
1- 6	A6	---	Field	Field identifier
8- 9	I2	MHz	Freq	Observational frequency (34, 46 or 62)
11- 26	A16	---	ID	Source identifier (JHHMMSS.s+DDMMSS)
28- 36	F9.5	deg	RAdeg	Right Ascension in decimal degrees (J2000)
38- 41	F4.1	arcsec	e_RAdeg	The 1σ uncertainty in RAdeg
43- 50	F8.5	deg	DEdeg	Declination in decimal degrees (J2000)
52- 55	F4.1	arcsec	e_DEdeg	The 1σ uncertainty in DEdeg
57- 61	I5	mJy	S	LOFAR flux density at Freq
63- 66	I4	mJy	e_S	The 1σ uncertainty in S

History:
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