J/A+A/622/A4 LOFAR observations XMM-LSS field (Hale+, 2019)

LOFAR observations of the XMM-LSS field.
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Rottgering H.J.A., Sabater J., Smith D.J.B., van Weeren R.J.
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=2019A&A...622A...4H (SIMBAD/NED BibCode)

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Abstract:
We present observations of the XMM Large-Scale Structure (XMM-LSS) field observed with the LOw Frequency ARray (LOFAR) at 120-168MHz. Centred at a J2000 declination of -4.5°, this is a challenging field to observe with LOFAR because of its low elevation with respect to the array. The low elevation of this field reduces the effective collecting area of the telescope, thereby reducing sensitivity. This low elevation also causes the primary beam to be elongated in the north-south direction, which can introduce side lobes in the synthesised beam in this direction. However the XMM-LSS field is a key field to study because of the wealth of ancillary information, encompassing most of the electromagnetic spectrum. The field was observed for a total of 12 hours from three four-hour LOFAR tracks using the Dutch array. The final image presented encompasses ~27deg^2, which is the region of the observations with a >50% primary beam response. Once combined, the observations reach a central rms of 280uJy/beam at 144MHz and have an angular resolution of 7.5x8.5". We present our catalogue of detected sources and investigate how our observations compare to previous radio observations. This includes investigating the flux scale calibration of these observations compared to previous measurements, the implied spectral indices of the sources, the observed source counts and corrections to obtain the true source counts, and finally the clustering of the observed radio sources.

Description:
Catalogues of the LOFAR sources observed in the XMM-LSS Field.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
lxmmmerg.dat	300	3044	*Catalogue with merged sources combined and artefacts removed.
LXMMmerg.fit	2880	249	FITS version of lxmmmerg.dat
lxmmorig.dat	413	3169	*Original PyBDSF output catalogue
LXMMorig.fit	2880	388	FITS version of lxmmorig.dat

Note on lxmmmerg.dat, lxmmorig.dat: Description of the parameters here are more fully described in http://www.astron.nl/citt/pybdsf/write_catalog.html#definition-of-output-columns

See also:
J/ApJ/591/640 : XMM-LSS low-frequency radio counterparts (Cohen+, 2003)
J/A+A/456/791 : XMM-LSS field at 74 and 325MHz (Tasse+, 2006)
J/MNRAS/382/279 : XMM-LSS catalogue. Version I. (Pierre+, 2007)
J/A+A/471/1105 : XMM-LSS at 240MHz and 610MHz (Tasse+, 2007)
J/A+A/474/473 : XMM-LSS survey: AGN classifications (Garcet+, 2007)
J/A+A/490/879 : XMM-LSS field optical identifications (Tasse+, 2008)
J/MNRAS/401/294 : Optical identification of XMM-LSS sources (Stalin+, 2010)
J/A+A/557/A81 : XMM-LSS field X-ray sources classification (Melnyk+, 2013)
J/MNRAS/429/1652 : XMM-LSS catalogue. Version II. (Chiappetti+, 2013)

J/A+A/622/A1 : LOFAR Two-metre Sky Survey DR1 source catalog (Shimwell+, 2019)
J/A+A/622/A8 : NGC 3184, 4736, 5055 & 5194 LOFAR & WSRT maps (Heesen+ 2019)
J/A+A/622/A11 : LoTSS/HETDEX. Optical quasars. I. (Guerkan+, 2019)
J/A+A/622/A13 : VLA double-double radio galaxy candidates images (Mahatma+, 2019)
J/A+A/622/A15 : Broad absorption line quasars in LDR1 (Morabito+, 2019)
J/A+A/622/A23 : LoTSS HCG and MLCG systems (Nikiel-wroczynski+, 2019)

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

Bytes	Format	Units	Label	Explanations
1- 19	A19	---	IAUsourceID	Source ID in IAU convention ($IAU_{SourceID}$)
21- 24	I4	---	SourceID	[0/3043] Source ID in catalogue (Source_ID)
26- 29	I4	---	PMSourceID	[0/3165] Source ID from Original

				PyBDSF Catalogue (Pre$_{matched}$Source_ID)
31- 39	F9.6	deg	RAdeg	Right ascension (J2000.0) (RA)
41- 48	F8.6	deg	e_RAdeg	Error in Right ascension (E_RA)
50- 58	F9.6	deg	DEdeg	Declination (J2000.0) (DEC)
61- 68	F8.6	deg	e_DEdeg	Error in Declination (E_DEC)
70- 81	F12.6	mJy	FTotal	Total Flux Density at 144MHz (Total_flux)
83- 91	F9.6	mJy	e_FTotal	Error in Total Flux Density at 144MHz (E$_{Total}$flux)
93-103	F11.6	mJy/beam	FPeak	Peak Flux Density per beam at 144MHz (Peak_flux)
105-112	F8.6	mJy/beam	e_FPeak	Error in Peak Flux Density per beam at 144MHz (E$_{Peak}$flux)
114-122	F9.6	arcsec	Maj	?=- Major axis (Maj)
124-132	F9.6	arcsec	e_Maj	?=- Error in Major Axis (E_Maj)
134-142	F9.6	arcsec	Min	?=- Minor Axis (Min)
144-151	F8.6	arcsec	e_Min	?=- Error in Minor axis (E_Min)
153-162	F10.6	deg	PA	?=- Position Angle (PA)
164-173	F10.6	deg	e_PA	?=- Error in Position Angle (E_PA)
175-183	F9.6	arcsec	DCMaj	?=- Deconvolved Major axis (DC_Maj)
185-193	F9.6	arcsec	e_DCMaj	?=- Error in Deconvolved Major axis (E$_{DC}$Maj)
195-203	F9.6	arcsec	DCMin	?=- Deconvolved Minor axis (DC_Min)
205-212	F8.6	arcsec	e_DCMin	?=- Error in Deconvolved Minor axis (E$_{DC}$Min)
214-223	F10.6	deg	DCPA	?=- Deconvolved Position Angle (DC_PA)
225-234	F10.6	deg	e_DCPA	?=- Error in Deconvolved Position Angle (E$_{DC}$PA)
236-245	F10.6	arcsec	CompSize	?=- Size of composite sources (Composite_Size)
247	I1	---	Nsources	Number of sources combined together (N_sources)
249-252	I4	---	MatchID1	?=0 Matched component ID from original PyBDSF catalogue (Matched$_{ID}$1)
254-257	I4	---	MatchID2	?=0 Matched component ID from original PyBDSF catalogue (Matched$_{ID}$2)
259-262	I4	---	MatchID3	?=0 Matched component ID from original PyBDSF catalogue (Matched$_{ID}$3)
264-267	I4	---	MatchID4	?=0 Matched component ID from original PyBDSF catalogue (Matched$_{ID}$4)
269	I1	---	Edge	[0/1] Flagged if near edge of field (1 = near edge) (Edge) (1)
271	I1	---	Bright	[0/1] Flagged if bright source with artefacts (1 = bright) (Bright) (2)
273-280	F8.6	mJy/beam	rmscentral	rms value in map at central position (rms_central)
282-290	F9.6	deg	RAFdeg	Right ascension corrected to FIRST (RA_FIRST)
292-300	F9.6	deg	DEFdeg	Declination corrected to FIRST (DEC_FIRST)

Note (1): Flag as follows:
1 = near edge
Note (2): Flag as follows:
1 = bright

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

Bytes	Format	Units	Label	Explanations
1- 4	I4	---	PMSourceID	[0/3168] Source ID in catalogue (Source_ID)
6- 9	I4	---	IslID	[0/3191] Island ID in catalogue (Isl_ID)
11- 19	F9.6	deg	RAdeg	Right ascension (J2000.0) (RA)
21- 28	F8.6	deg	e_RAdeg	Error in Right ascension (E_RA)
30- 38	F9.6	deg	DEdeg	Declination (J2000.0) (DEC)
40- 47	F8.6	deg	e_DEdeg	Error in Declination (E_DEC)
49- 57	F9.6	Jy	FTotal	Total Flux at 144MHz (Total_flux)
59- 66	F8.6	Jy	e_FTotal	Error in Total Flux at 144MHz (E$_{Total}$flux)
68- 75	F8.6	Jy/beam	FPeak	Peak Flux at 144MHz (Peak_flux)
77- 84	F8.6	Jy/beam	e_FPeak	Error in Peak Flux at 144MHz (E$_{Peak}$flux)
86- 94	F9.6	deg	RAdegmax	Right ascension at the maximum of the source (J2000.0) (RA_max)
96-103	F8.6	deg	e_RAdegmax	Error in Right ascension at the maximum of the source (E$_{RA}$max)
105-113	F9.6	deg	DEdegmax	Declination at the maximum of the source (J2000.0) (DEC_max)
115-122	F8.6	deg	e_DEdegmax	Error in Declination at the maximum of the source (E$_{DEC}$max)
124-131	F8.6	deg	Maj	Major axis (Maj)
133-140	F8.6	deg	e_Maj	Error in Major Axis (E_Maj)
142-149	F8.6	deg	Min	Minor Axis (Min)
151-158	F8.6	deg	e_Min	Error in Minor axis (E_Min)
160-169	F10.6	deg	PA	Position Angle (PA)
171-180	F10.6	deg	e_PA	Error in Position Angle (E_PA)
182-189	F8.6	deg	Majimgpl	Major axis--image plane (Maj$_{img}$plane)
191-198	F8.6	deg	e_Majimgpl	Error in Major Axis--image plane

				(E_{Maj}img_plane)
200-207	F8.6	deg	Minimgpl	Minor Axis--image plane (Min_{img}plane)
209-216	F8.6	deg	e_Minimgpl	Error in Minor axis--image plane (E_{Min}img_plane)
218-227	F10.6	deg	PAimgpl	Position Angle--image plane (PA_{img}plane)
229-238	F10.6	deg	e_PAimgpl	Error in Position Angle--image plane (E_{PA}img_plane)
240-247	F8.6	deg	DCMaj	Deconvolved Major axis (DC_Maj)
249-256	F8.6	deg	e_DCMaj	Error in Deconvolved Major axis (E_{DC}Maj)
258-265	F8.6	deg	DCMin	Deconvolved Minor axis (DC_Min)
267-274	F8.6	deg	e_DCMin	Error in Deconvolved Minor axis (E_{DC}Min)
276-285	F10.6	deg	DCPA	Deconvolved Position Angle (DC_PA)
287-296	F10.6	deg	e_DCPA	Error in Deconvolved Position Angle (E_{DC}PA)
298-305	F8.6	deg	DCMajimgpl	Deconvolved Major axis - image plane (DC_{Maj}img_plane)
307-314	F8.6	deg	e_DCMajimgpl	Error in Deconvolved Major axis - image plane ($E_{DC}Maj_{img}$plane)
316-323	F8.6	deg	DCMinimgpl	Deconvolved Minor axis - image plane (DC_{Min}img_plane)
325-332	F8.6	deg	e_DCMinimgpl	Error in Deconvolved Minor axis - image plane ($E_{DC}Min_{img}$plane)
334-343	F10.6	deg	DCPAimgpl	Deconvolved Position Angle - image plane (DC_{PA}img_plane)
345-354	F10.6	deg	e_DCPAimgpl	Error in Deconvolved Position Angle-image plane ($E_{DC}PA_{img}$plane)
356-365	F10.6	Jy	IslFTotal	Total Flux at 144MHz in the Island (Isl_{Total}flux)
367-374	F8.6	Jy	e_IslFTotal	Error in Total Flux in the Island (E_{Isl}Total_flux)
376-383	F8.6	Jy/beam	Islrms	Average rms within island (Isl_rms)
385-392	F8.6	Jy/beam	Islmean	[0] Mean background within island (Isl_mean)
394-401	F8.6	Jy/beam	ResidIslrms	Average residual rms within island ($Resid_{Isl}$rms)
403-411	F9.6	Jy/beam	ResidIslmean	Mean residual background within island ($Resid_{Isl}$mean)
413	A1	---	SCode	[SMN] Defines type of Source (S_Code) (1)

Note (1): type of Source code as follows:
S = a single-Gaussian source that is the only source in the island
C = a single-Gaussian source in an island with other sources
M = a multi-Gaussian source

Acknowledgements:
Catherine Hale, catherine.hale(at)physics.ox.ac.uk

References:

Shimwell et al.,	Paper I	2019A&A...622A...1S	
Williams et al.,	Paper II	2019A&A...622A...2W	
Duncan et al.,	Paper III	2019A&A...622A...3D	
Hale et al.,	Paper IV	2019A&A...622A...4H	Cat. J/A+A/622/A4
de Gasperin et al.,	Paper V	2019A&A...622A...5D	
Arias et al.,	Paper VI	2019A&A...622A...6A	
Emig et al.,	Paper VII	2019A&A...622A...7E	
Heesen et al.,	Paper VIII	2019A&A...622A...8H	Cat, J/A+A/622/A8
Miskolczi et al.,	Paper IX	2019A&A...622A...9M	
Croston et al.,	Paper X	2019A&A...622A..10C	
Gurkan et al.,	Paper XI	2019A&A...622A..11G	Cat. J/A+A/622/A11
Hardcastle et al.,	Paper XII	2019A&A...622A..12H	
Mahatma et al.,	Paper XIII	2019A&A...622A..13M	Cat. J/A+A/622/A13
Mooney et al.,	Paper XIV	2019A&A...622A..14M	
Morabito et al.,	Paper XV	2019A&A...622A..15M	Cat. J/A+A/622/A15
O'Sullivan et al.,	Paper XVI	2019A&A...622A..16O	
Sabater et al.,	Paper XVII	2019A&A...622A..17S	
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Mandal et al.,	Paper XXII	2019A&A...622A..22M	Cat. J/A+A/622/A22
Nikiel-Wroczynski et al.,	Paper XXIII	2019A&A...622A..23N	
Savini et al.,	Paper XXIV	2019A&A...622A..24S	
Wiber et al.,	Paper XXV	2019A&A...622A..25W	

(End) Patricia Vannier [CDS] 19-Nov-2018

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