



## UvA-DARE (Digital Academic Repository)

### Search and detection of low frequency radio transients

Spreeuw, J.N.

**Publication date**  
2010

[Link to publication](#)

#### **Citation for published version (APA):**

Spreeuw, J. N. (2010). *Search and detection of low frequency radio transients*. [Thesis, fully internal, Universiteit van Amsterdam].

#### **General rights**

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

#### **Disclaimer/Complaints regulations**

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, P.O. Box 19185, 1000 GD Amsterdam, The Netherlands. You will be contacted as soon as possible.

---

# Contents

---

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Preparing for LOFAR . . . . .	1
1.2	Source extraction in maps . . . . .	4
1.3	Scientific expertise from studying transients with "classical" radio telescopes at low frequencies . . . . .	9
1.4	Theoretical predictions for the detection of radio emission from extrasolar planets with LOFAR . . . . .	11
<b>2</b>	<b>LOFAR's Transients Key Project: Detailed description of the Source Extraction System</b>	<b>17</b>
2.1	Abstract . . . . .	17
2.2	LOFAR . . . . .	17
2.3	The LOFAR Key Projects . . . . .	18
2.4	The Transients Key Project (TKP) . . . . .	18
2.5	Automated transient finding in the TKP pipeline . . . . .	19
2.6	A brief rationale behind the current design of the Source Extraction System . . . . .	24
2.7	The TKP Python Source Extractor (PYSE) . . . . .	29
<b>3</b>	<b>Zeroth order validation of TKP source extraction and source measurement code</b>	<b>55</b>
3.1	Abstract . . . . .	55
3.2	Description . . . . .	55
3.3	General . . . . .	56
3.4	Source free maps . . . . .	56
3.5	Validation of the TKP background mean and background noise estimation . . . . .	58
3.6	False Discovery Rate algorithm . . . . .	72

3.7	Deblending . . . . .	75
3.8	Determination of peak flux densities and positions . . . . .	78
3.9	Conclusions . . . . .	84
<b>4</b>	<b>A new perspective on GCRT J1745-3009</b>	<b>89</b>
4.1	Abstract . . . . .	89
4.2	Introduction . . . . .	90
4.3	Data reduction . . . . .	91
4.4	The source on the opposite side of the supernova remnant . . . . .	96
4.5	Overview of flux measurements of GCRT J1745-3009 . . . . .	97
4.6	Reanalysis of the 2002 discovery dataset . . . . .	99
4.7	Discussion . . . . .	105
4.8	Conclusions . . . . .	108
4.9	Acknowledgements . . . . .	109
<b>5</b>	<b>Low frequency observations of the radio nebula produced by the giant flare from SGR 1806-20:</b>	
	<b>Polarimetry and total intensity measurements</b>	<b>113</b>
5.1	Abstract . . . . .	113
5.2	Introduction . . . . .	114
5.3	Observation and data reduction . . . . .	114
5.4	Results . . . . .	119
5.5	Discussion . . . . .	124
5.6	Conclusions . . . . .	126
5.7	Acknowledgements . . . . .	126
<b>6</b>	<b>Predicting low-frequency radio fluxes of known extrasolar planets</b>	<b>129</b>
6.1	Abstract . . . . .	129
6.2	Introduction . . . . .	130
6.3	Exoplanetary radio emission theory . . . . .	131
6.4	Required parameters . . . . .	134
6.5	Expected radio flux for know exoplanets . . . . .	142
6.6	Conclusions . . . . .	149
6.7	Acknowledgements . . . . .	150
6.8	Appendix . . . . .	150
<b>7</b>	<b>Samenvatting in het Nederlands</b>	<b>161</b>
7.1	LOFAR . . . . .	161
7.2	Voorbereiden op LOFAR . . . . .	165
<b>8</b>	<b>Epilogue</b>	<b>175</b>
<b>9</b>	<b>Dankwoord</b>	<b>177</b>
<b>10</b>	<b>Publication list</b>	<b>179</b>