LBA Calibrator Survey of the Southern Sky

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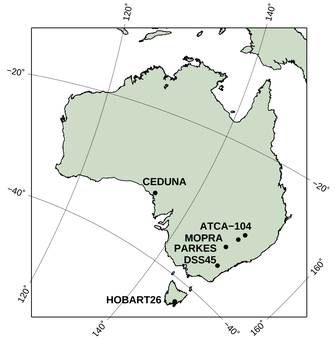
What?

The objective is to observe at 8.4 GHz 1000 candidate flat spectrum radio sources at $\delta < -40°$ and

- determine their positions with milliarcsec accuracy;
- measure their correlated flux densities;
- determine their suitability as calibrators for phase referencing and as targets for geodesy observations.

The overall goal is to match the density of phase calibrators at the southern hemisphere to the calibrator density at the northern hemisphere in order to make phase referencing observations feasible.

Where?



Observed at:

- Three stations with LBADR recording: ATCA-104, CEDUNA, MOPRA.
- Three stations with Mark-5 recording: DSS45, HOBART26, PARKES

Data transferred by: air-mail and ftp.

Correlated: at MPIfR Bonn (Germany)

Analyzed: at NASA GSFC Greenbelt (USA)

How?

Dedicated 24^h observing sessions in absolute astrometry mode with wide-band synthesis. 110–130 target sources, plus 40–50 calibrators. 3 scans per source, 2^m each. Candidate sources are taken from the **AT20G** catalogue. Scheduled with sur_sked, correlated with Mark-4, post-processed with Fourfit, analyzed with VTD/Post-Solve, and lba_amp.

What is cool

- High sensitivity: Detection limit 10–30 mJy over 2^m.
  Typical SEFD:

ATCA-104	**320**	Jy
CEDUNA	**400**	Jy
DSS45	**80**	Jy
HOBART26	**550**	Jy
MOPRA	**350**	Jy
PARKES	**40**	Jy

- Heterogeneous setup: different data acquisition terminals, different recording format, different recording rate: 256–512 Mbps, different frequency setup, dual-polarization.

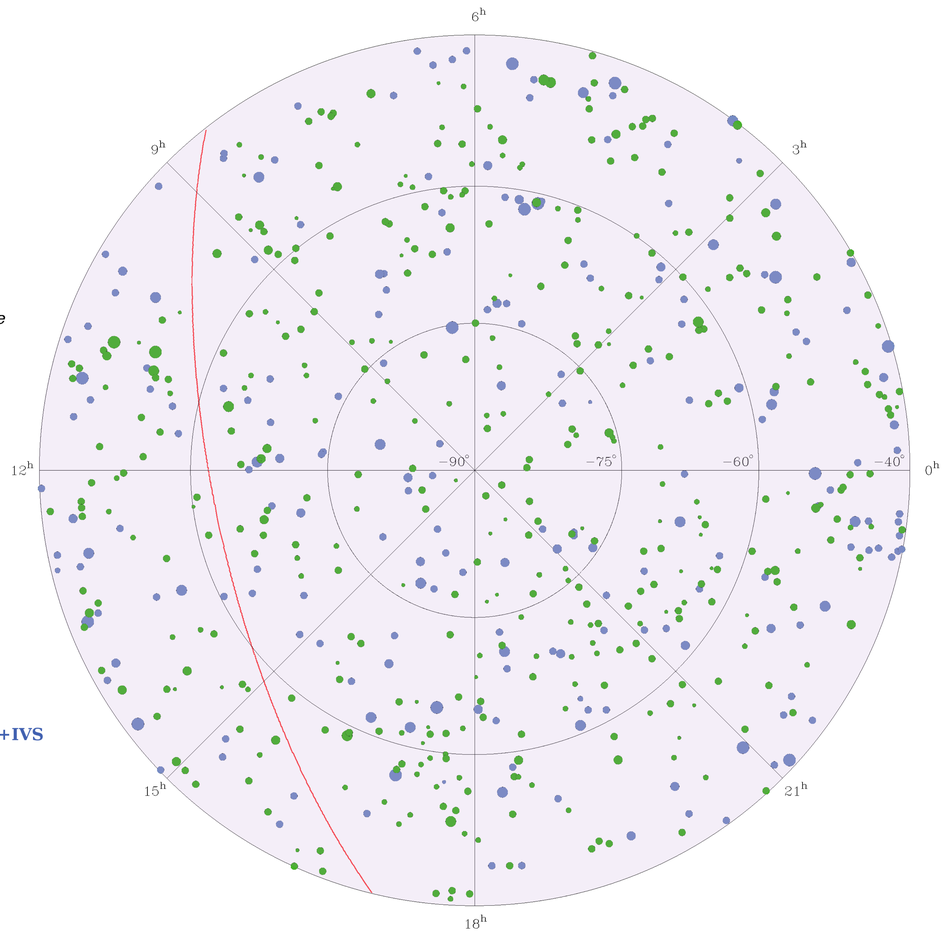
What is tricky

- Only <u>two</u> effective frequency channels. Ambiguity spacings are **3.9 ns** – size of this poster!! (Typical spacings are 50–200 ns).

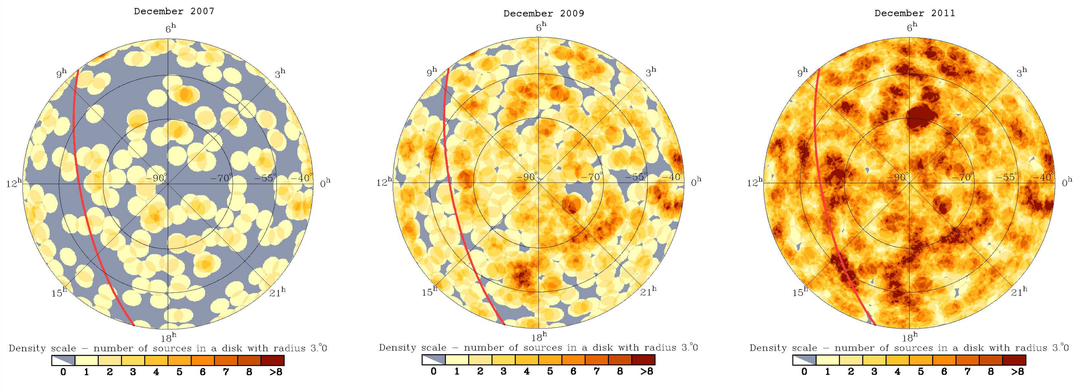
What is not so cool

- 8.4Ghz band only (ionospheric errors are large)
- Parkes scheduling constraints (slow slewing, 30°.5 elevation limit)
- long turn-around (3–5 months);

Compact radio sources at the southern sky



Source sky density: yesterday, today, tomorrow



What is done

4 observing sessions analyzed, 1 waits for correlation.

Preliminary results

Results are available at **http://astrogeo.org/lcs**

Out of 422 scheduled target sources, 410 are detected. Catalogue of positions of 410 new sources and estimates of the correlated flux density for 484 objects are derived. Formal errors of source positions 1–3 mas, errors of flux density estimates 15%.

Excerpt from the catalogue

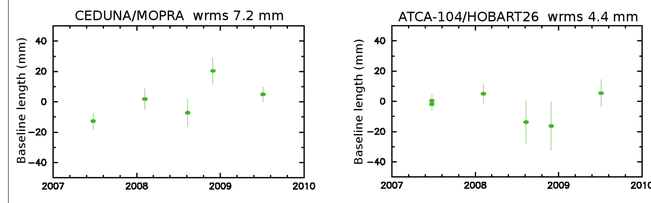
Name	#	Flux corr (Jy)			α	δ	σ
J1617-5848 1613-586	22	2.14	1.98	0.90	16 17 17.89024	-58 48 07.8633	2.36
J1038-5311 1036-529	30	1.43	1.40	1.32	10 38 40.65685	-53 11 43.2691	0.81
J0519-4546 0518-458	60	0.98	0.87	0.75	05 19 49.72306	-45 46 43.8534	0.67
J0515-4556 0514-459	30	0.92	0.86	0.85	05 15 45.25012	-45 56 43.1964	0.81
J1101-6325 1059-631	24	0.89	0.87	0.83	11 01 54.37873	-63 25 22.5968	2.25
J1051-5344 1049-534	30	0.87	0.82	0.75	10 51 09.09988	-53 44 46.5413	0.79
J1321-4342 1318-434	26	0.62	0.57	0.47	13 21 12.84465	-43 42 16.8404	0.92
J0214-6149 0212-620	40	0.60	0.53	0.60	02 14 16.20462	-61 49 33.6593	0.76
J1945-5520 1941-554	25	0.60	0.34	0.38	19 45 24.22873	-55 20 48.8397	0.86
J1050-4719 1048-470	30	0.56	0.49	0.35	10 50 53.40347	-47 19 04.5548	0.89
J1252-6737 1249-673	22	0.54	0.52	0.47	12 52 43.21090	-67 37 38.7462	2.04
J0746-5618 0745-561	22	0.02	0.02	0.02	07 46 58.22483	-56 18 32.5312	9.69
J2343-5626 2340-567	17	0.02	0.02	0.02	23 43 27.09822	-56 26 24.1025	4.89
J0820-5705 0819-569	25	0.01	0.01	0.01	08 20 58.76327	-57 05 33.4013	6.88

— the number of used observations; correlated flux density estimates are for the range of 0–6 $M\lambda$, 6–25 $M\lambda$, 25–50$M\lambda$; σ — formal semi-major error ellipse in mas.

What is not yet done

- 5 other observing sessions;
- modeling the ionosphere contribution using GPS TEC maps;
- analysis of systematic errors.

Geodetic results



Want to help?

Volunteers are needed for imaging the data.

References: L. Petrov, C. Phillips, A. Bertarini, A. Deller, S. Pogrebenko, A. Mujunen, "The use of the Long Baseline Array in Australia for precise geodesy and absolute astrometry", *Publications of the Astronomical Society of Australia*, **26**(1), 75–84, 2009. http://arXiv.org/abs/0809.0627

This poster is available at **http://astrogeo.org/lcs/poster_2010a.pdf**