SiMPlE

THE SIMULTANEOUS MEDICINA-Planck EXPERIMENT

data acquisition, reduction and first results

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Outline

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- Sample selection
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SiMPlE

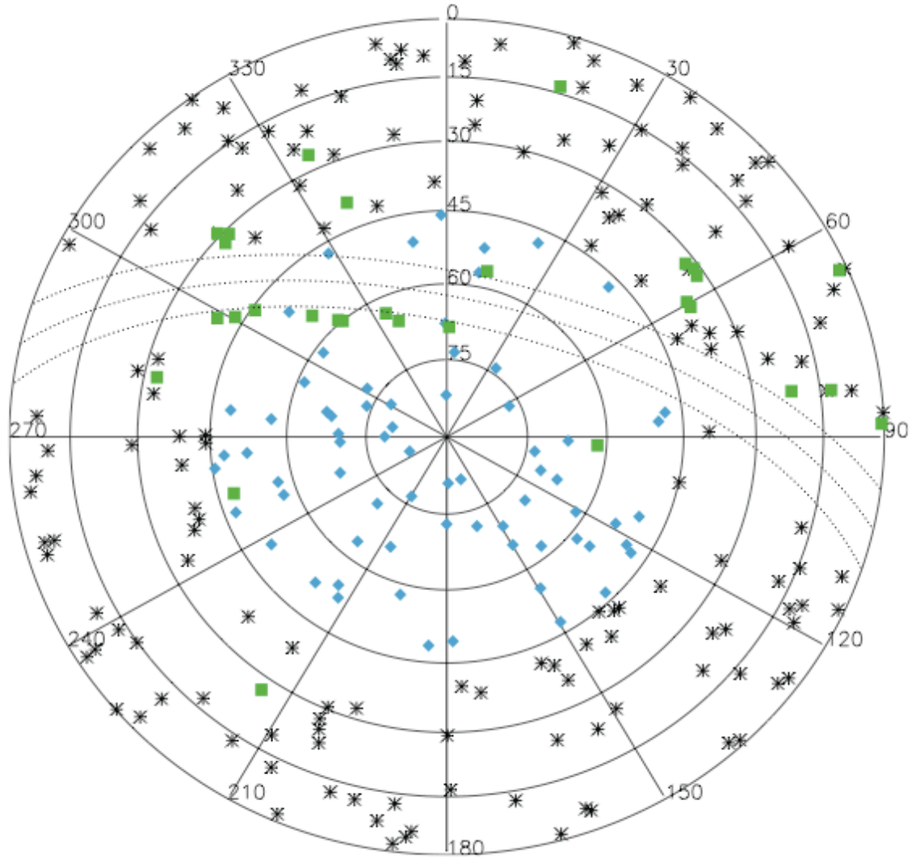
Sample selection

NEWPS catalogue: sources extracted with blind and non-blind approaches (Massardi et al. 2009) from WMAP maps → 516 sources with |b| > 5° (91% complete above 1 Jy).

SiMPlE focuses on the 253 sources with declination δ > 0° :
234 with NVSS/GB6/FIRST/etc counterparts (11 multiple associations), 18 without any match;
↘ 225 extragalactic, 9 Galactic

In addition to these, the project included the monitoring of a sample of 10 sources representative of various classes of highly variable objects, in case they showed a strong outburst during the Planck mission:
- massive X-ray binaries (e.g. Cyg X-3);
- Luminous Blue Variable stars (e.g. Eta Carinae);
- active binary stars (e.g. Algol and RS CVn).

Because of the large WMAP beam we used low-frequency counterparts coordinates.
In case of spurious or multiple associations we mapped regions centred on WMAP positions.



The Northern Sample

δ > 45° 5 and 8.3 GHz

The Simultaneous Medicina-*Planck* Experiment: data acquisition, reduction and first results

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The Medicina 32 m dish
2010-2011 upgrades

Continuum backend

18-26.5 GHz receiver (SRT)

ACS-based Control System

Data reduction tools

(2012: ongoing major maintenance and new additions)

(Not so) SiMPlE Observations

Shared-risk observations during the **commissioning** phase: testing all the new hardware-software facilities at the same time.

First sessions: **5** and **8.3 GHz** only (June-December 2010)
Further observations: addition of **21 GHz**, using the SRT multi-feed receiver (up to April 2011)

On-The-Fly (OTF) cross-scan mode
Typical Tsys were about 30 K for the 5 GHz and 90 K for the 8.3 GHz (the X band cryogenic system was not working properly), Tsys for the 21 GHz receiver ranged from 65 K to 80 K according to weather conditions.

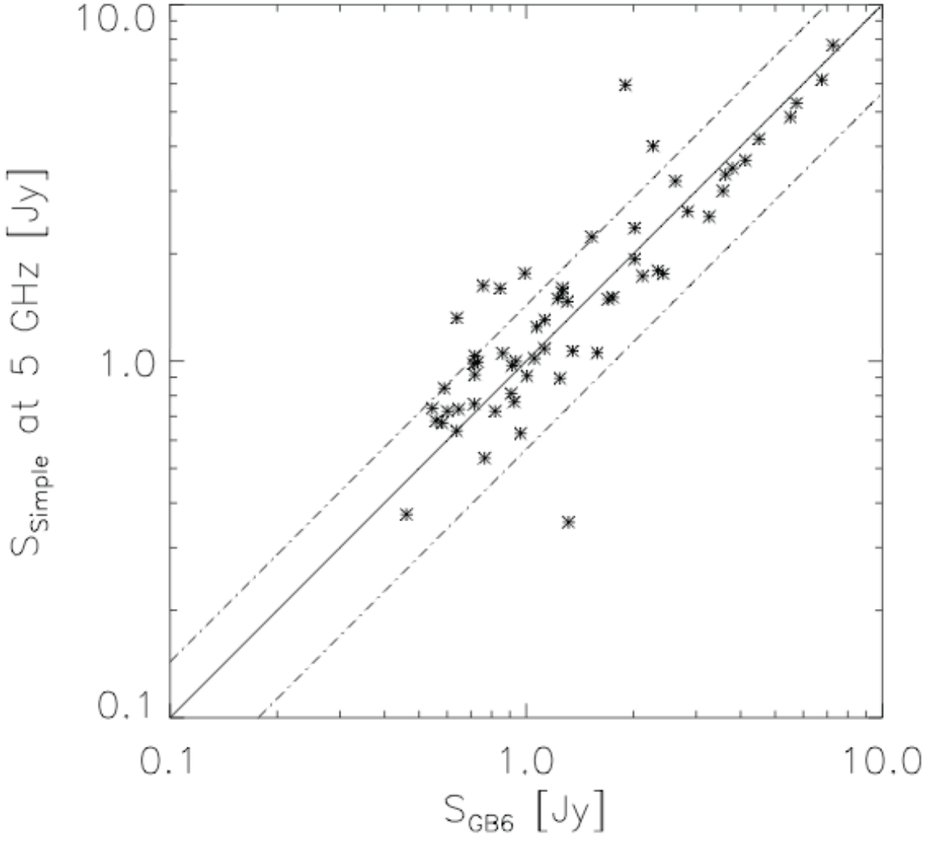
Group members contributed to deeply test the new facilities and to the development of observation scheduling and high-frequency calibration/data reduction tools, soon to be available to any observer.

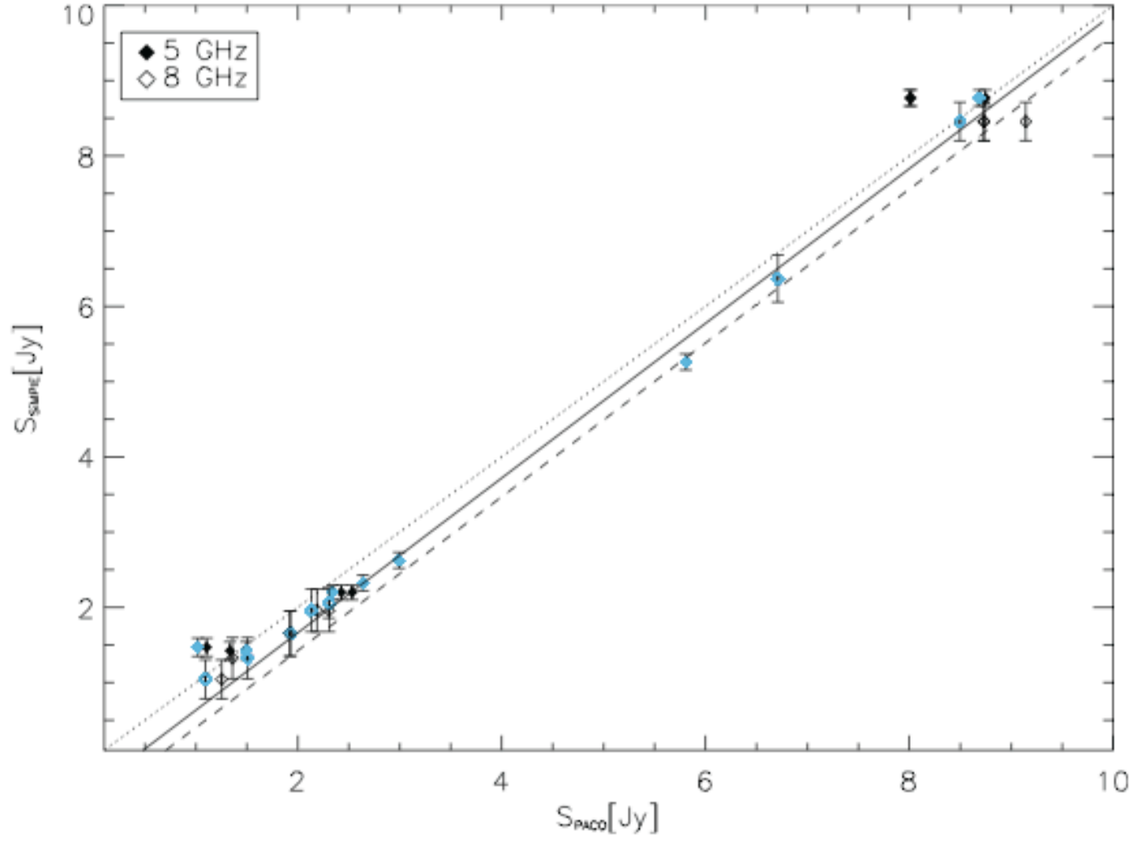
Frequency [GHz]	Beam size [′]	Scan length [HPBW]	Scan speed [′/min]	Usable bandwidth [MHz]	Tsys [K]	Instant rms [mJy]
5.0	7.5	5	180	2× 80	30	74.1
8.3	4.8	5	120	2× 230	80	132.7

Results

60 objects in the Northern Sample have a counterpart in the the 4.85 GHz GB6 catalogue.
Left fig. shows the 5 GHz flux density comparison and the best linear fit gives
$S_{simple}/[Jy] = (0.900 \pm 0.057) * S_{GB6} + (0.250 \pm 0.130)$ → Variability!

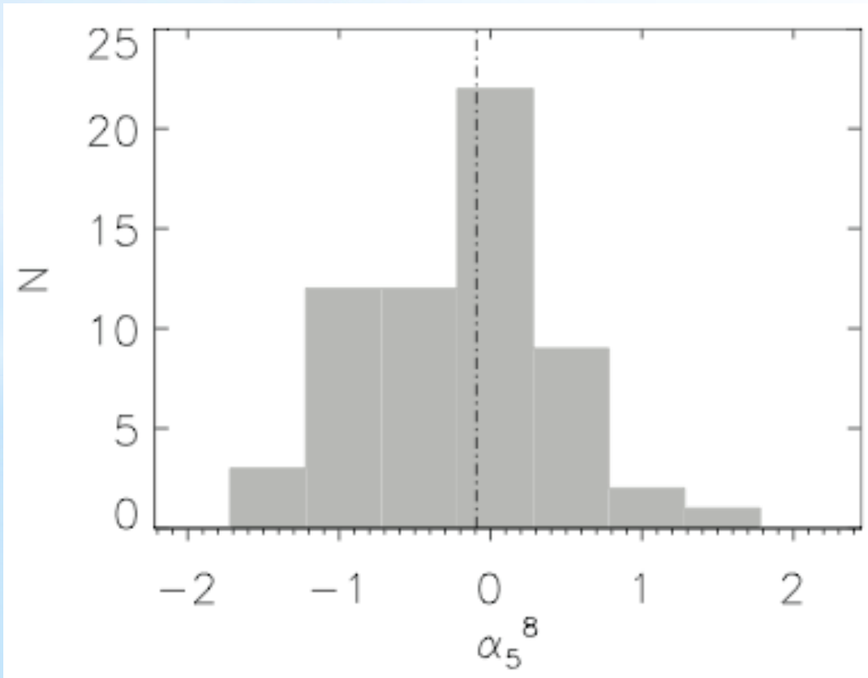
Right fig. shows the flux density comparison at 5 (filled diamonds) and 8.3 GHz (empty ones) with coeval observations performed from the ATCA facilities (**PACO project**) of a selected sample of sources. The best fitting line at 5GHz has a slope equal to 1.03 ± 0.10 and it crosses the y-axis at (-0.39 ± 0.36) Jy, while at 8.3 GHz the slope is 1.02 ± 0.20 and the y-axis intersection is (-0.62 ± 0.65) Jy. Flux density is consistent whitin the error bars between the two instruments.

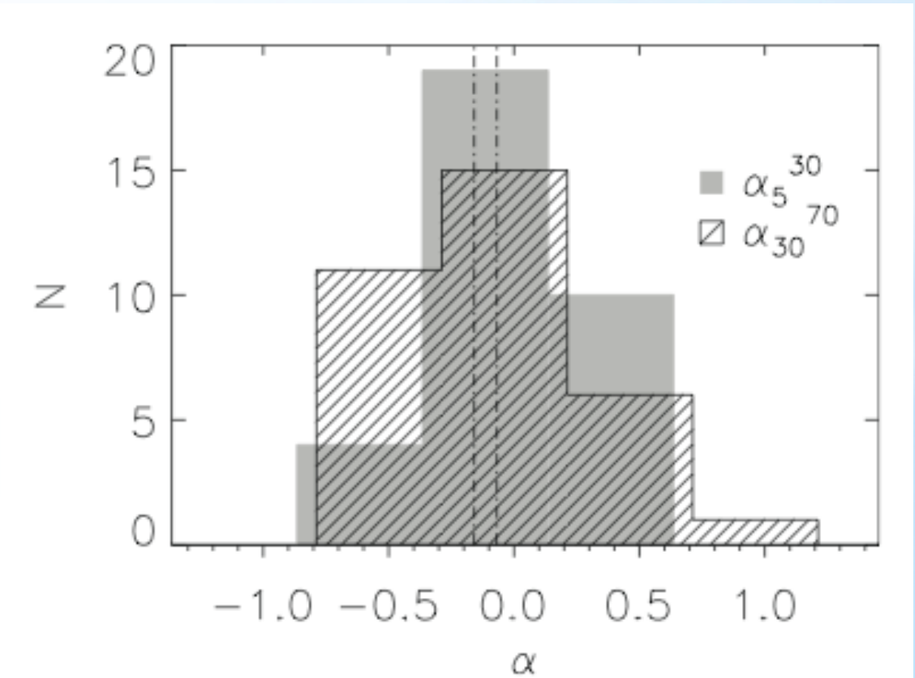




For 61 sources we achieved both 5 and 8.3 GHz data.
The median $\alpha_5^{8.3}$ spectral index is -0.09 with a standard deviation of the distribution equal to 0.62. This is compatible with the 5-10 GHz spectral index found for the PACO bright sample (selection based on 20 GHz flux densities > 500 mJy).

33 sources have counterparts in the Early Release Compact Source Catalogue (Planck Collaboration 2011). The median of the α_5^{30} spectral index is -0.07, indeed the bright high-frequency selected samples are mostly constituted by flat spectrum sources in this frequency range.



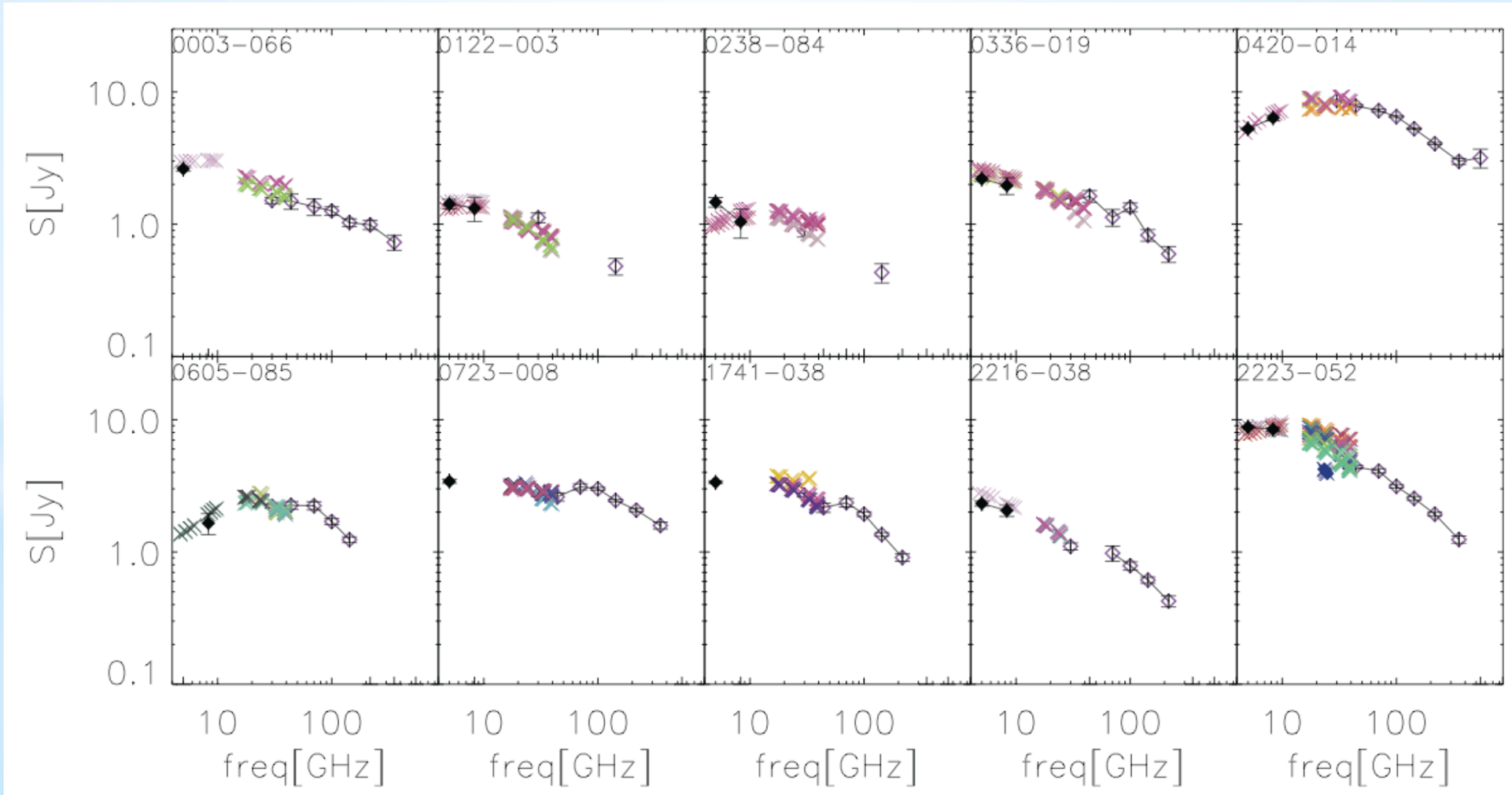


Simultaneous ATCA-Medicina observations

We also observed a list of 12 sources with $\delta < 0°$ among the targets of the Planck-ATCA Coeval Observation project project (**PACO**, see Laura Bonavera's talk).

Almost all targets were observed on the same day (18 July 2010), within 10 days from the Planck satellite observations. The two projects are characterised by the use of different telescopes, data-reduction pipelines, and completely different calibration schemes and sources.

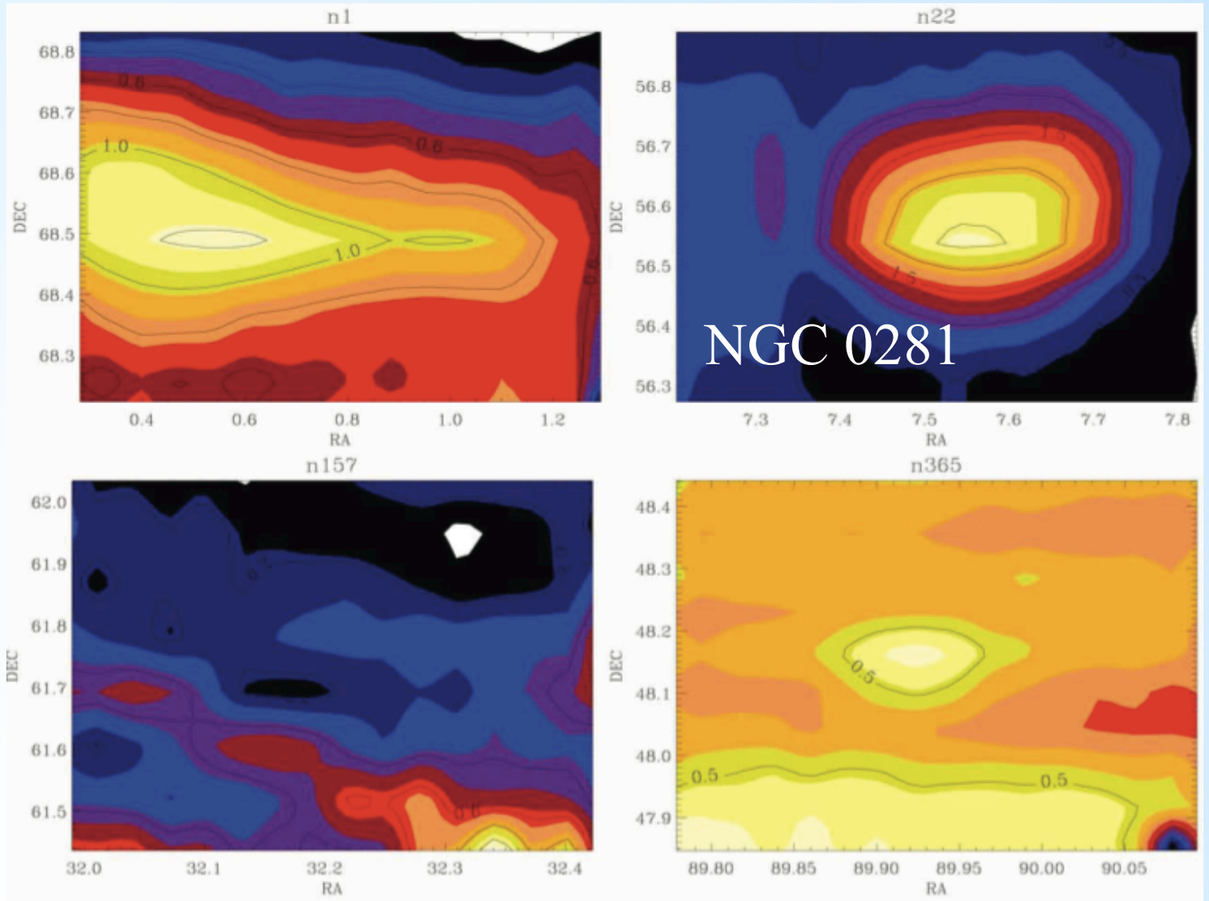
The SEDs show a fairly good agreement *(filled diamonds: SiMPlE flux densities, empty diamonds: Planck data, crosses: PACO measurements)*. More observations, 21 GHz included, in 2011.

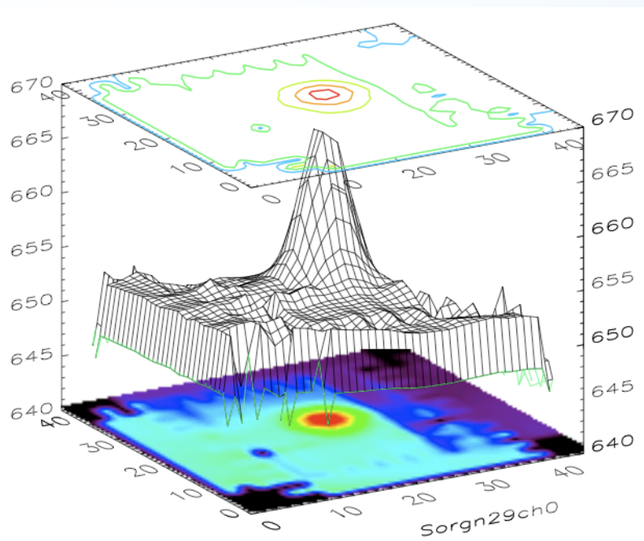


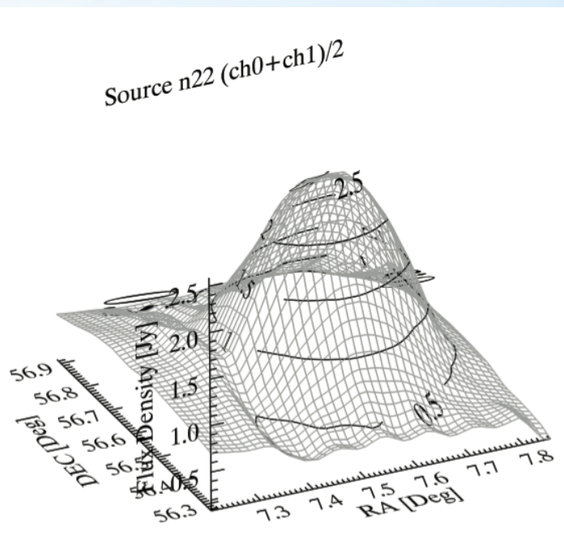
Maps

5 of the 10 mapped region with $\delta > 45°$ were identified as candidate sources, but only three of them have (peak) SNR > 5.

NEWPS ID	RA [deg]	δ [deg]	$S_{peak\,5GHz}$ [Jy]	σ [Jy]	candidate flag
n1	0.6122	68.4806	1.24	0.11	1
n22	13.2354	56.5897	2.59	0.26	1
n157	92.5883	62.8457	1.17	0.35	0
n365	254.4456	48.1424	0.71	0.35	1
n432	303.904	46.8515	21.82	0.34	0
n440	313.2987	55.2197	2.05	0.78	0
n448	318.3489	59.3642	0.79	0.32	0
n449	320.133	60.0461	1.22	0.36	1
n474	332.985	63.0615	3.08	0.14	0
n479	338.4203	65.7394	50.69	0.46	1







What's next

The **complete SiMPlE sample at 5, 8.3, and 21 GHz** will be released in the first half of 2012, constituting a useful reference catalogue of bright sources over the whole Northern Hemisphere.

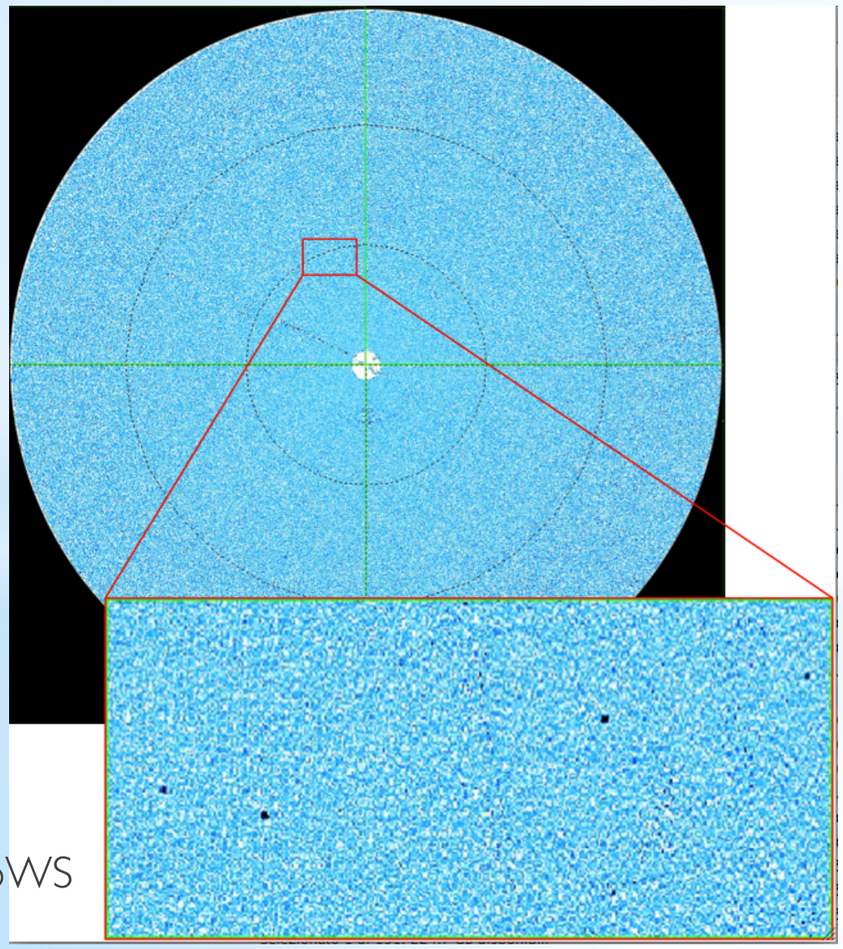
More data achieved contemporarily with other instruments (ATCA, AMI, …) is being gathered with the aim of developing a method for telescope **cross-calibration**.

Parallel projects

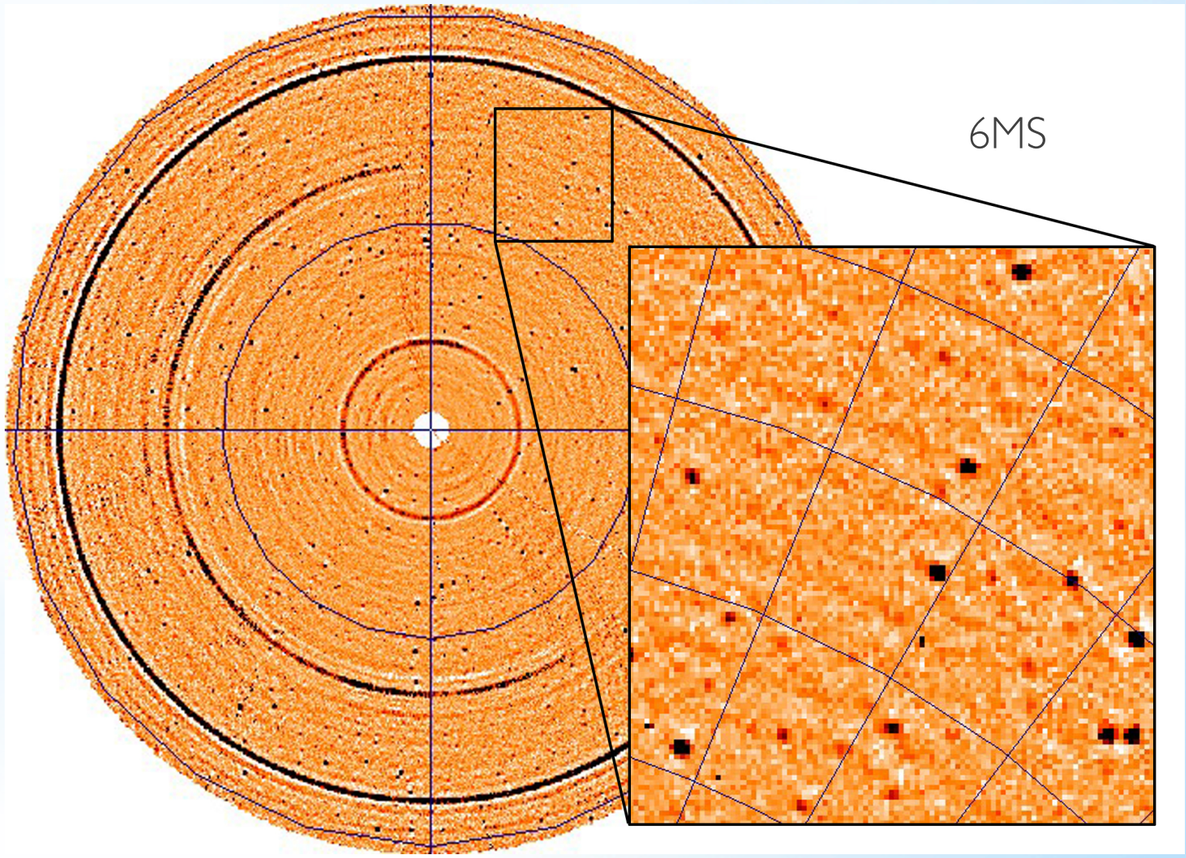
Exploiting the same, new single-dish facilities, two **pilot blind surveys** were performed on a large circumpolar sky patch:

- **KNoWS** (K-band Northern Wide Survey), $\delta > 73.2°$, 20 GHz
- **6MS** (6-cm Medicina Survey), $\delta > 70°$, 5 GHz

→ Forthcoming papers (Righini et al., Ricci et al. + Righini et al. in preparation)

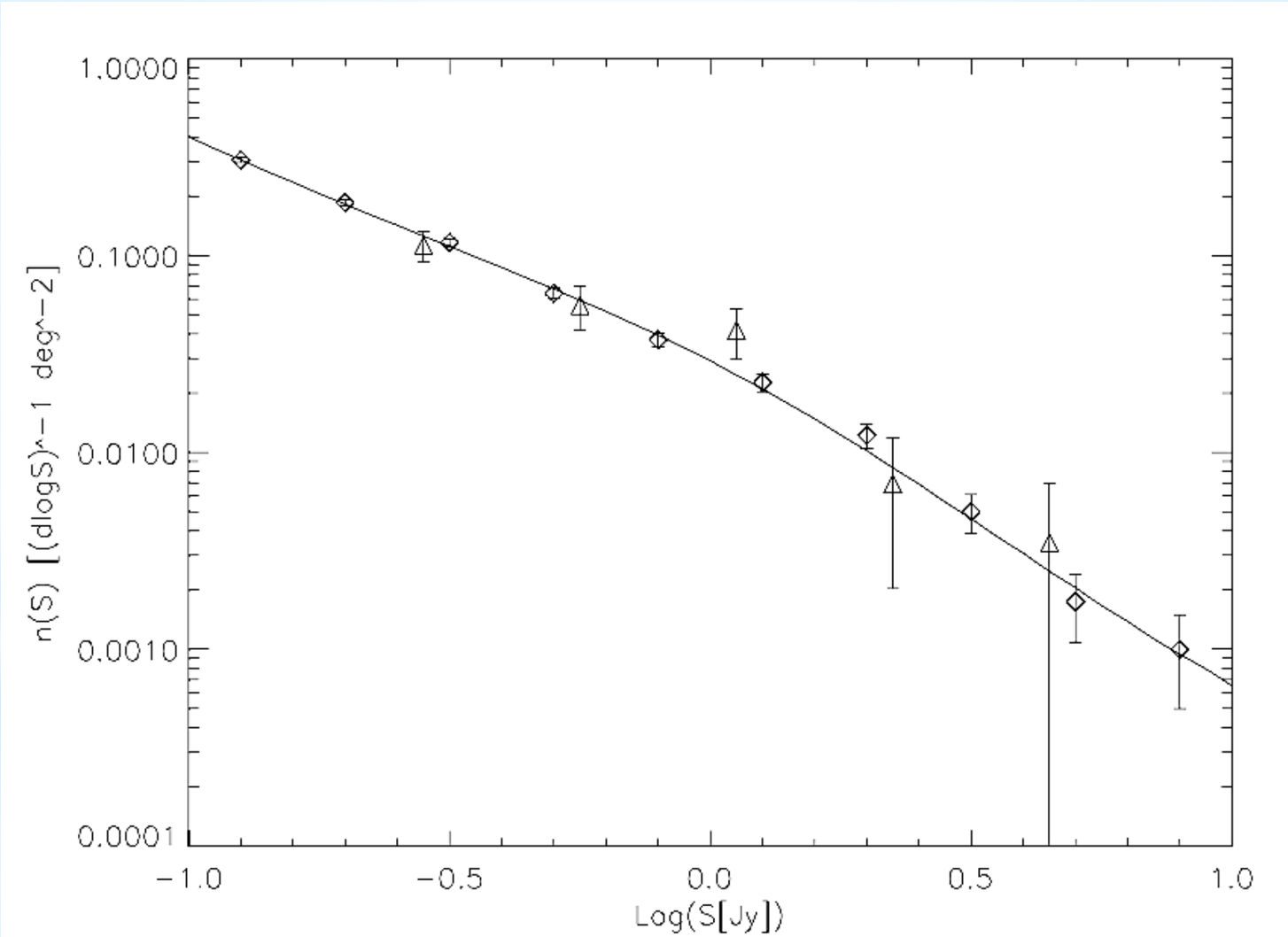


KNoWS



KNoWS sneak preview

The KNoWS pilot survey allowed to identify more than 250 source candidates down to 80 mJy. A partial 20 GHz follow-up confirmed 73 bright sources.
Source counts indicate that this bright catalogue is complete down to 200 mJy.
→ ***Foregrounds!***



Courtesy of Roberto Ricci