

# WP 5–6X2

## CMB calibration and SRT

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Preliminary procedures and  
strategies to observe and  
characterize sky calibration sources

# WP 5–6X2 – CMB calibration and SRT

## Contributing people and nodes (suggested/expected)

- **UNIMIB: Gervasi, Zannoni**
- UNIMI: Tomasi, Maino
- INAF-IASFBO: Burigana, Ricciardi
- Roma Sapienza: Piacentini, Battistelli
- INAF-OATS: Zacchei
- SISSA: Baccigalupi, Krachmalnicoff

# WP 5–6X2 – CMB calibration and SRT

Preliminary procedures and strategies to observe and characterize sky calibration sources

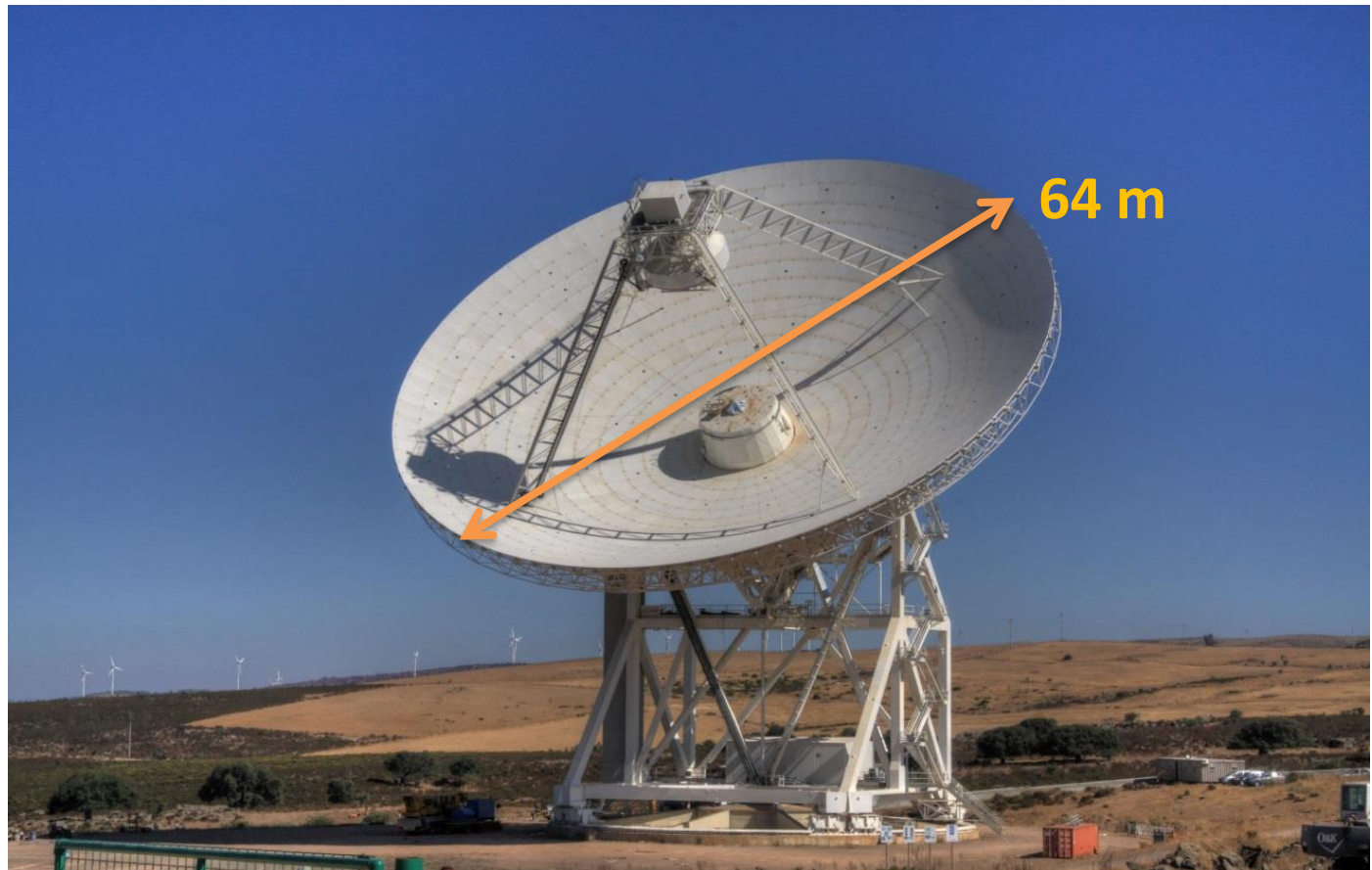


1. SRT: main features
2. SRT: receivers
3. SRT: observation plan

# WP 5–6X2 – CMB calibration and SRT

## Sardinia Radio Telescope: main features

**Primary Mirror Dish (D):** 64 m shaped profile with active surface



# WP 5–6X2 – CMB calibration and SRT

## Sardinia Radio Telescope: main features

**Prime focus:** mainly for low frequency

Focal Length (F1) = 21.0234 m;

Focal ratio (F1/D) = 0.33.

**Gregorian focus:** mainly for high frequency

Focal length (F2) = 149.87 m;

Focal ratio (F2/D) = 2.34.

**Beam Wave Guide foci (F3 and F4):**

M3 + M4 Focal length (F3) = 83.91m; Focal ratio (F3/D) = 1.37;

M3 + M5 Focal length (F4) = 179.87m; Focal ratio (F4/D) = 2.81

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## Sardinia Radio Telescope: main features

**Total surface accuracy (RSS):** 305  $\mu\text{m}$

Active surface system compensating for gravitational deformations.

**Aperture Efficiency** (theoretical maximum  $\approx 60\%$ )

52% @  $\lambda = 5$  cm (measured);

56% @  $\lambda = 1.3$  cm (measured);

43% @  $\lambda = 0.7$  cm (expected with 305 micron).

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Sardinia Radio Telescope: main features

**Pointing Accuracy**  $\approx 7.2$  arcsec

On both axes, azimuth and elevation;

No calibration is required during standard antenna operations.

**Angular resolution**  $\approx 32$  arcsec ( $\lambda/1\text{cm}$ )

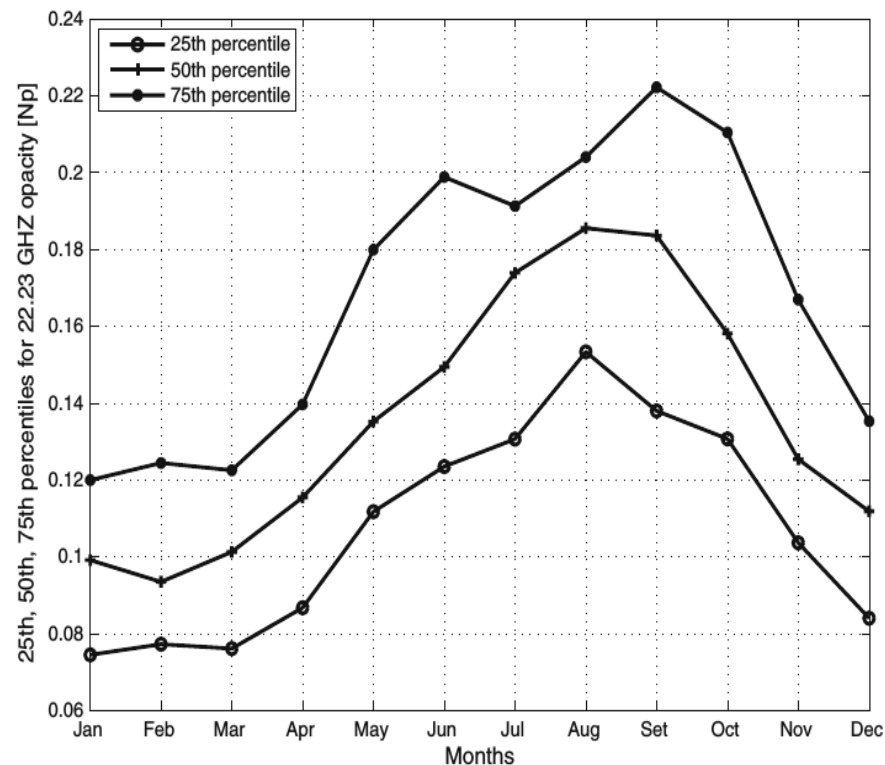
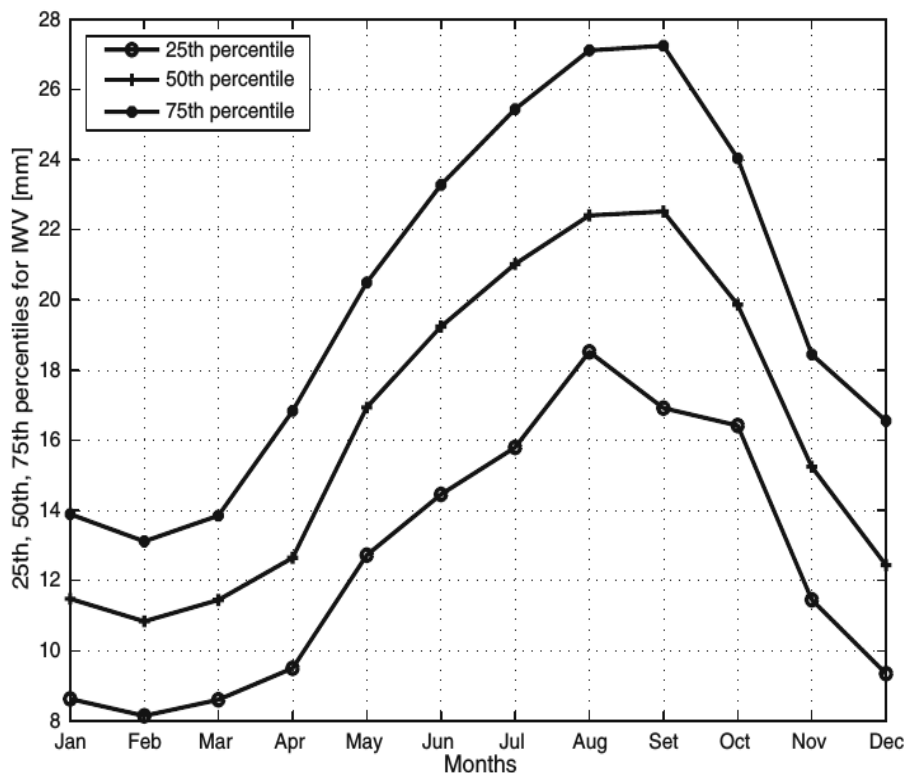
Depending on the feed system optics at each frequency.

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## Sardinia Radio Telescope: main features

### Atmosphere opacity at *SRT*

Median opacity at 22.23 GHz: 0.10 Np (winter); 0.16 Np (summer).





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## Sardinia Radio Telescope: receivers

Receivers in operation		
Receiver ID	Frequency coverage [GHz]	
	Min	Max
SRT P/L	0,305	0,410
	1,3	1,8
SRT Chigh	5,7	7,7
SRT K	18,0	26,5
SRT X/Ka	8,2	8,6
	31,85	32,25

- C-high-band:  
mono-feed
- K-band:  
7-pixel  
multi-feed

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## Sardinia Radio Telescope: receivers

Receivers under development / under evaluation		
Receiver ID	Frequency coverage [GHz]	
	Min	Max
SRT S	3	4,5
SRT Clow	4,2	5,6
SRT Q	33	50
SRT W (ex-IRAM)	84	116

- S-band: 7-pixel
- Q-band: 19-pixel
- W-band:  
mono-feed  
ex-IRAM  
500 MHz band  
tunable: 84-116 GHz

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## Sardinia Radio Telescope: receivers

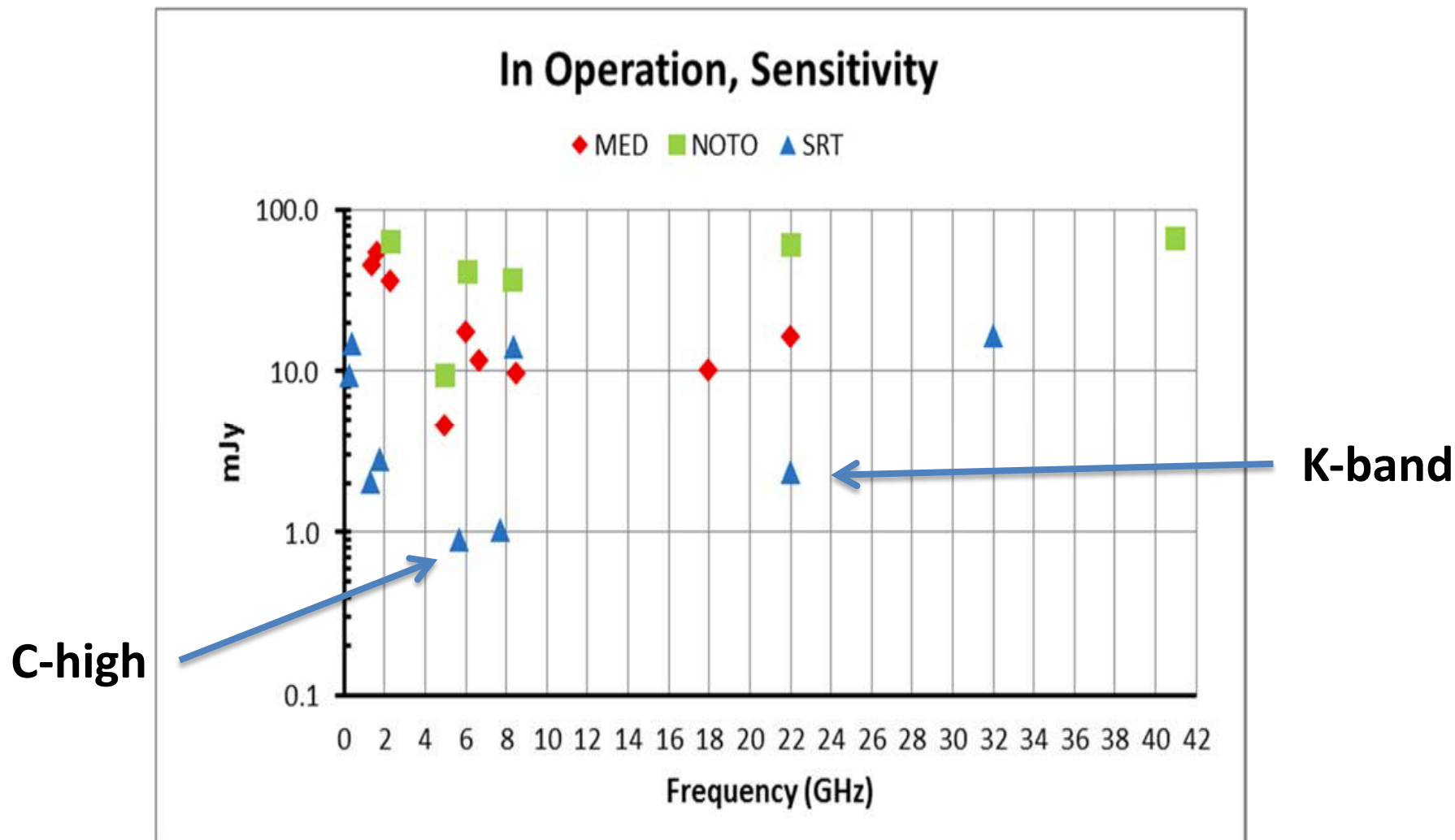
### **Polarization properties**

Almost all receivers have **dual circular polarization** (LCP and RCP) outputs.

This configuration is recommended for single-dish polarimetric observations, due to a more accurate determination of the Q and U Stokes parameters.

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## Sardinia Radio Telescope: receivers



# WP 5–6X2 – CMB calibration and SRT

## Sardinia Radio Telescope: receivers

Receiver	Freq.	Beam-size	T-sys [K]	Gain[%]
BWG-focus C-band mono-feed	5.7 - 7.7 GHz	2.8'	(19) 33	(66) 48
Secondary-focus K-band multi-feed	18 - 26.5 GHz	50"	(45 - 75) 70 - 90	(57) 44

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## Sardinia Radio Telescope: receivers

### Back-ends

#### *Total Power*

- **Number of inputs** Up to seven dual polarization or 14 single polarization;
- **IF bandwidth** 300 MHz, 730 MHz, 1250 MHz, 2000 MHz;
- **Integration time** 1-1000 ms;

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## Sardinia Radio Telescope: receivers

### Back-ends

*SARDARA (spectro-polarimeter)*

- **Number of inputs** 1 pair of IF signals, i.e. the output of a full polarization receiver;
- **IF bandwidth** 500-2300 MHz;
- **Integration time** Up to 0.5 ms;
- **Spectral channels** 1024 or 16384;
- **Spectral resolution** About 90 KHz;

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## Sardinia Radio Telescope: observation plan

- The commissioning terminated in 2015 and a 6-month Early Science Program has been run from February to August 2016.
- **The telescope has now entered a shutdown phase that will last till the end of 2018** for: migration of control room and equipment room to the new buildings; and repair of the active surface actuators.



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## Sardinia Radio Telescope: observation plan

- A commissioning period will follow.  
Commissioning activity is expected to last until the end of 2018.
- **Full SRT operations are expected to resume in 2019.**

# WP 5–6X2 – CMB calibration and SRT

## Summary

- K-band (18.0-26.5 GHz) multi-feed: already developed
- Chigh-band (5.7-7.7 GHz) mono-feed: already available
- SRT operations are expected to resume in 2019.
- **Alternative telescopes ????**

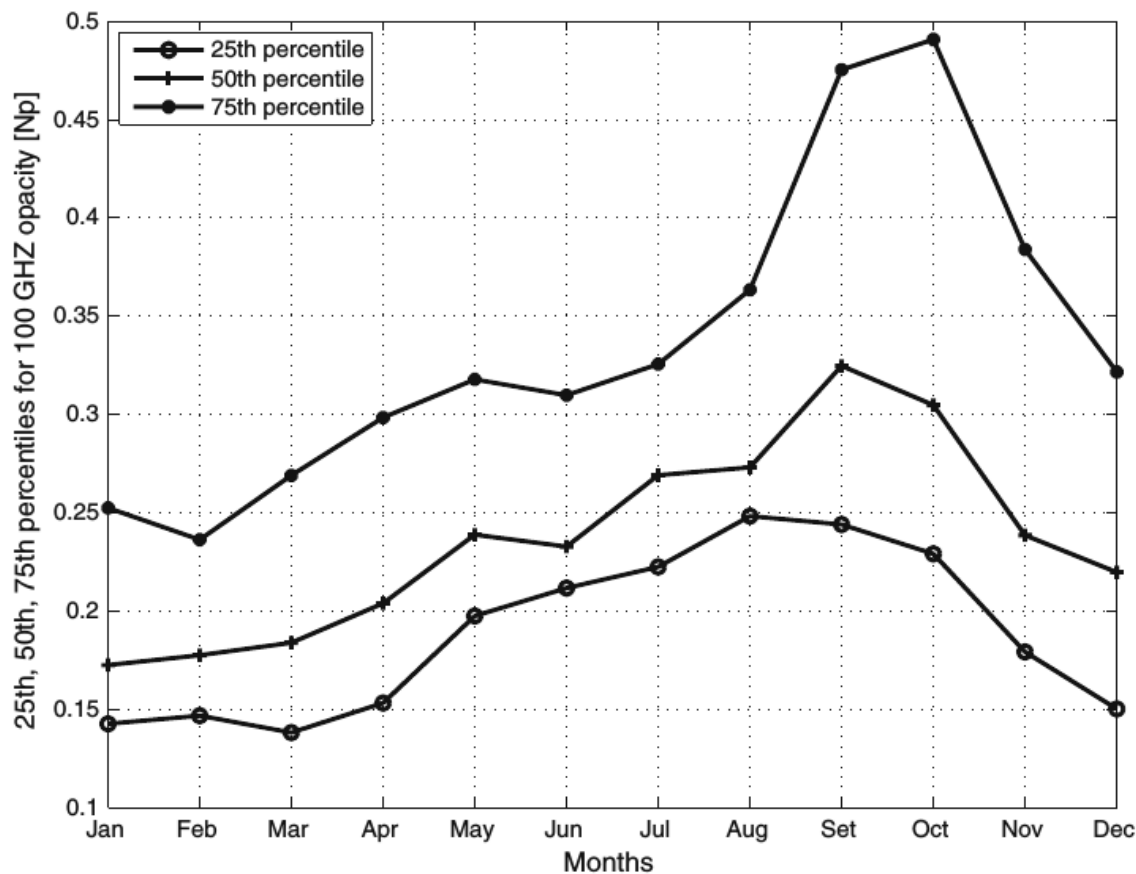
# **WP 5–6X2 – CMB calibration and SRT**

Extra slides

# WP 5–6X2 – CMB calibration and SRT

Sardinia Radio Telescope: main features

Atmosphere opacity at *SRT*



# WP 5–6X2 – CMB calibration and SRT

## Sardinia Radio Telescope: receivers

