

Aspen - 20 January 2013

*SRT: a new large
single dish in Sardinia*

Marta Burgay – INAF, Cagliari Astronomical Observatory

Sergio Poppi



SRT ID

fully steerable 64m
diameter radio telescope

alt-azimuth mounting

wide frequency range:
from 300MHz to 100GHz.

3 main focal positions

can host up to 20 receivers

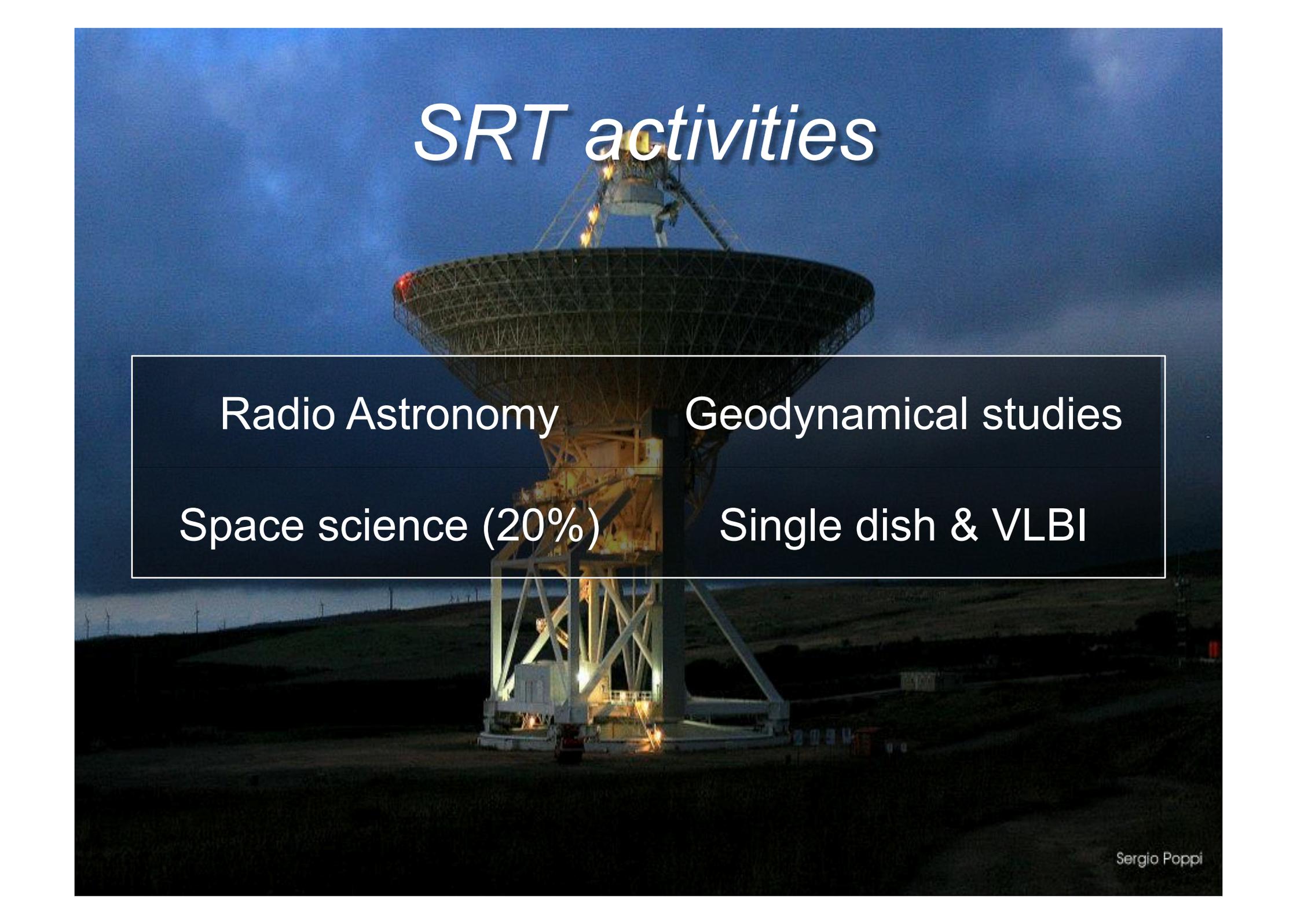
active surface: efficiency
ranges from ~63% (at
10GHz) to ~35% (at
100GHz)

3,000 t
entirely welded



Pranu Sanguni [Lat. 39°29'50" N - Long. 9°14'40" E] - 700 m asl

SRT activities



Radio Astronomy

Geodynamical studies

Space science (20%)

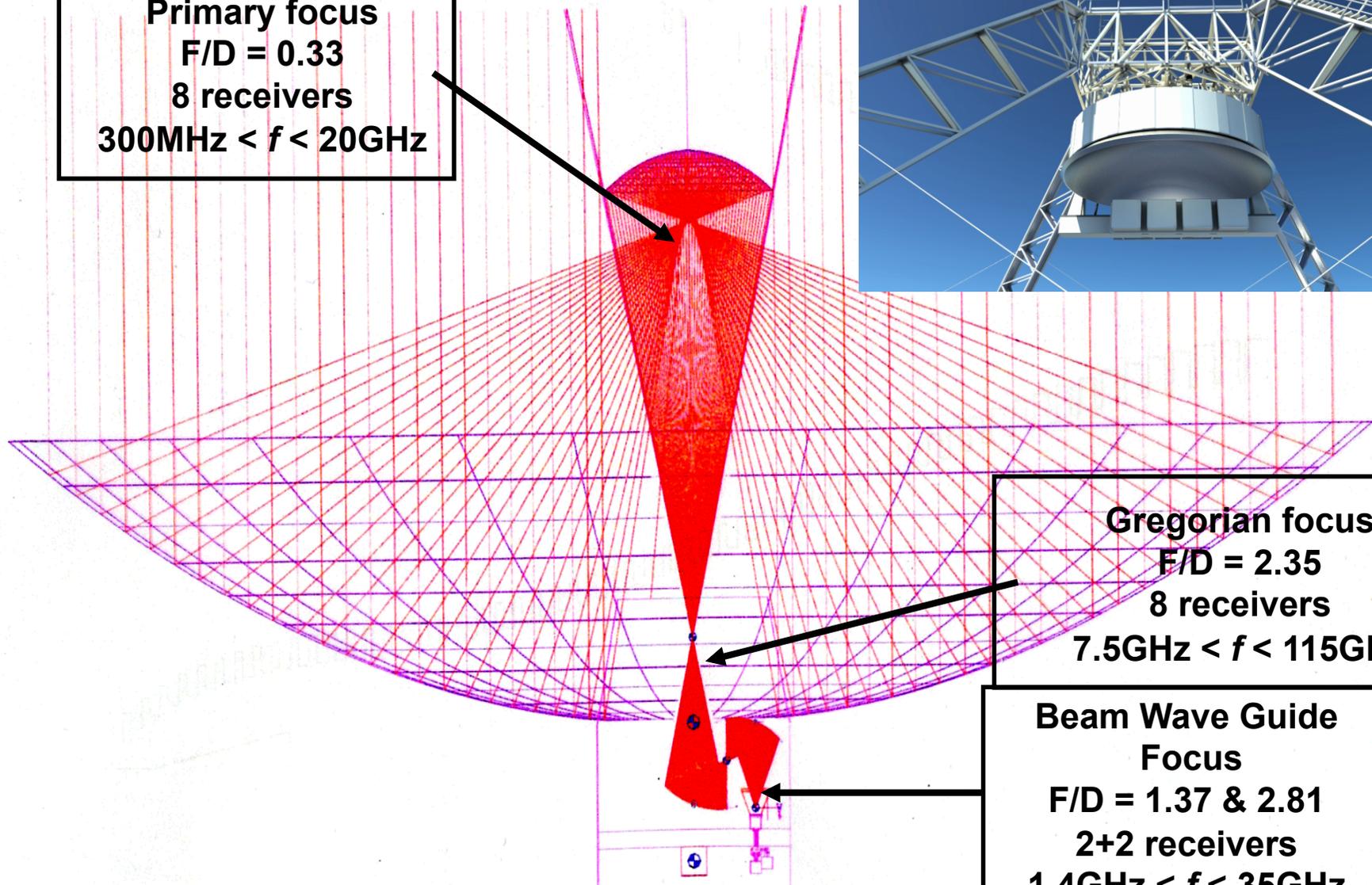
Single dish & VLBI

General specs

Configuration	EL over AZ	Parameter	Precision	Normal
Elevation range	5° - 90°	Wind(km/h)	< 15	< 40
Azimuth range	± 270°	Sun	Absent	Clear
Azimuth speed	51 deg/min (wind<60 km/h)	Rain	Absent	Absent
Elevation speed	30 deg/min (wind< 60 km/h)	Temperature	- 10°C to 30°C	- 10°C to 40°C
Surface accuracy (rms)	300 μm (photogrammetry)	Thermal drift	< 3°C/h	< 10°C/h
	150 μm (holography)	Umidity	< 85%	< 90%
Pointing accuravy (rms)	11 ÷ 2.7 arcsec (normal)			
	5 ÷ 1.8 arcsec (precision)			

Gregorian optical design

Primary focus
 $F/D = 0.33$
8 receivers
 $300\text{MHz} < f < 20\text{GHz}$

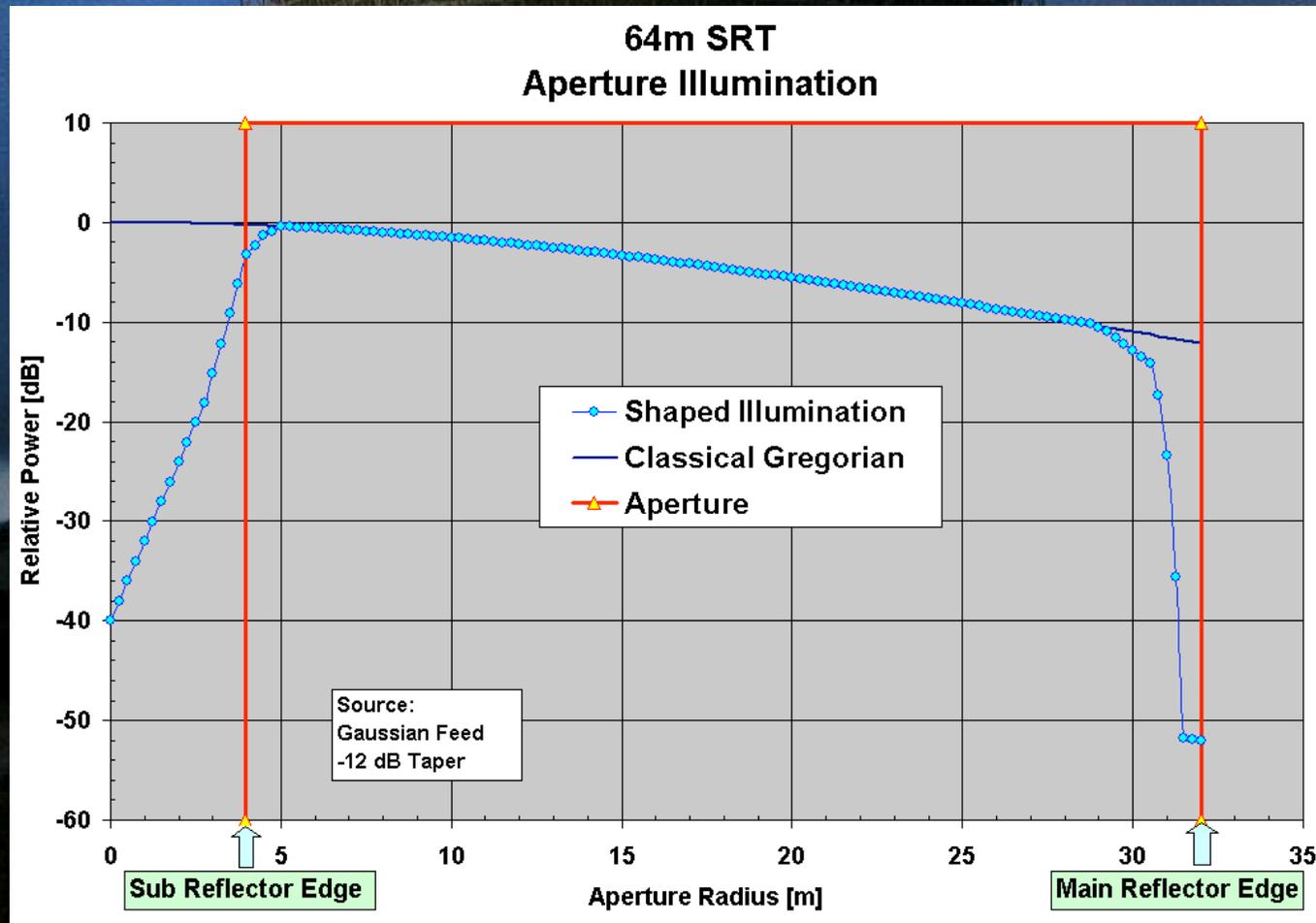


Gregorian focus
 $F/D = 2.35$
8 receivers
 $7.5\text{GHz} < f < 115\text{GHz}$

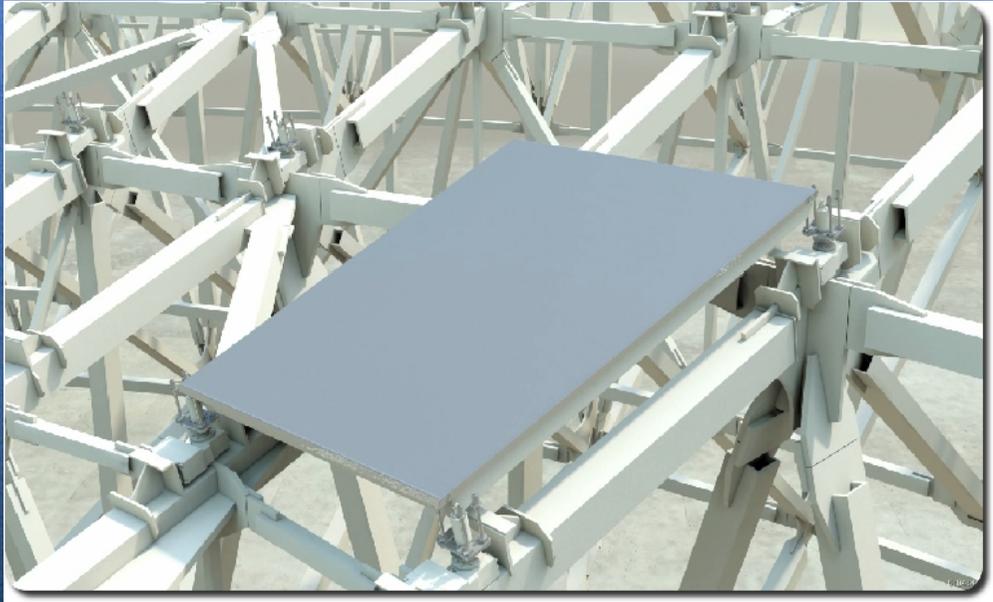
Beam Wave Guide
Focus
 $F/D = 1.37 \text{ \& } 2.81$
2+2 receivers
 $1.4\text{GHz} < f < 35\text{GHz}$

Reflector shaping

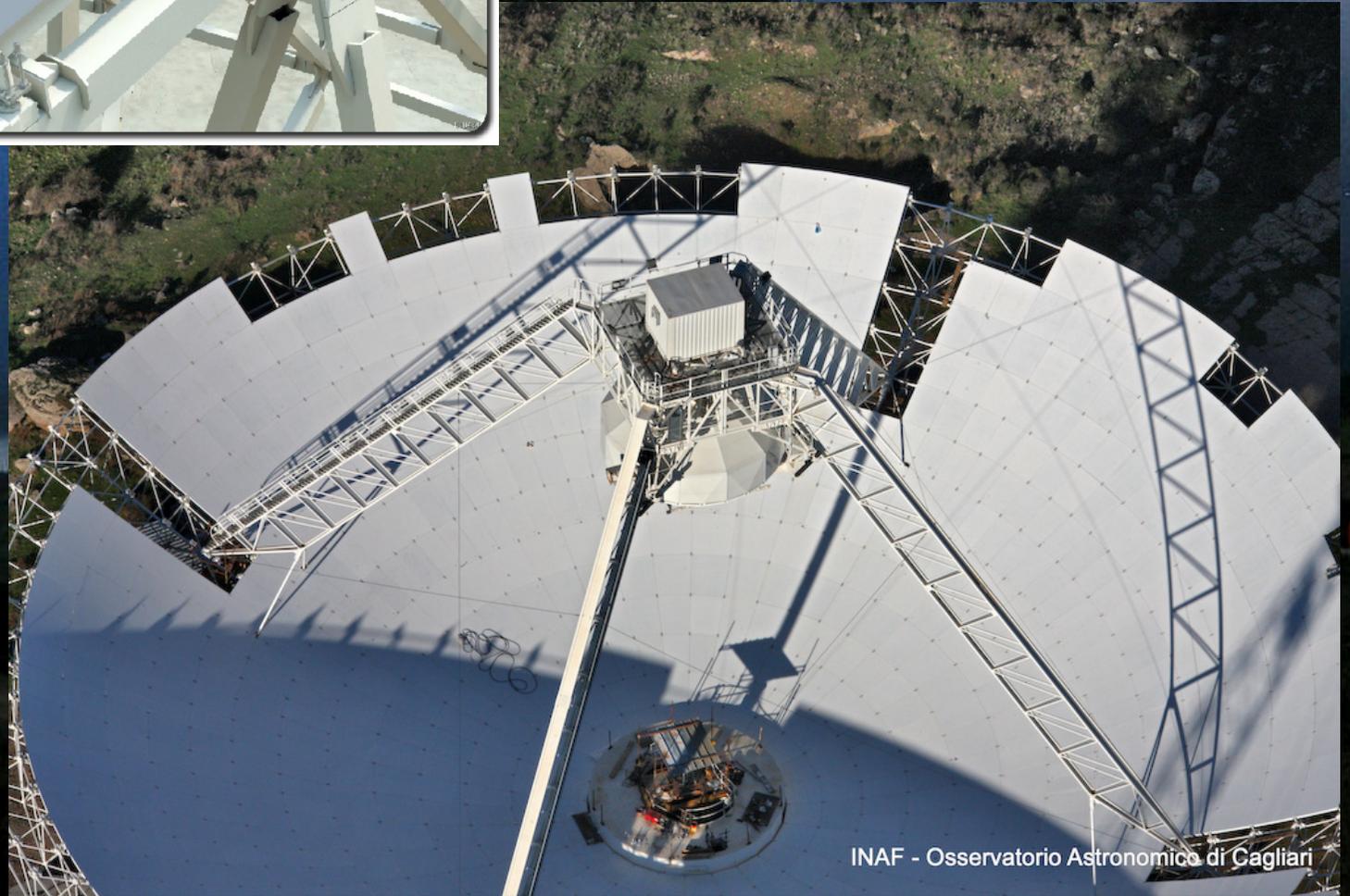
The SRT primary & secondary mirrors are shaped: not true parabolic – elliptic profiles.



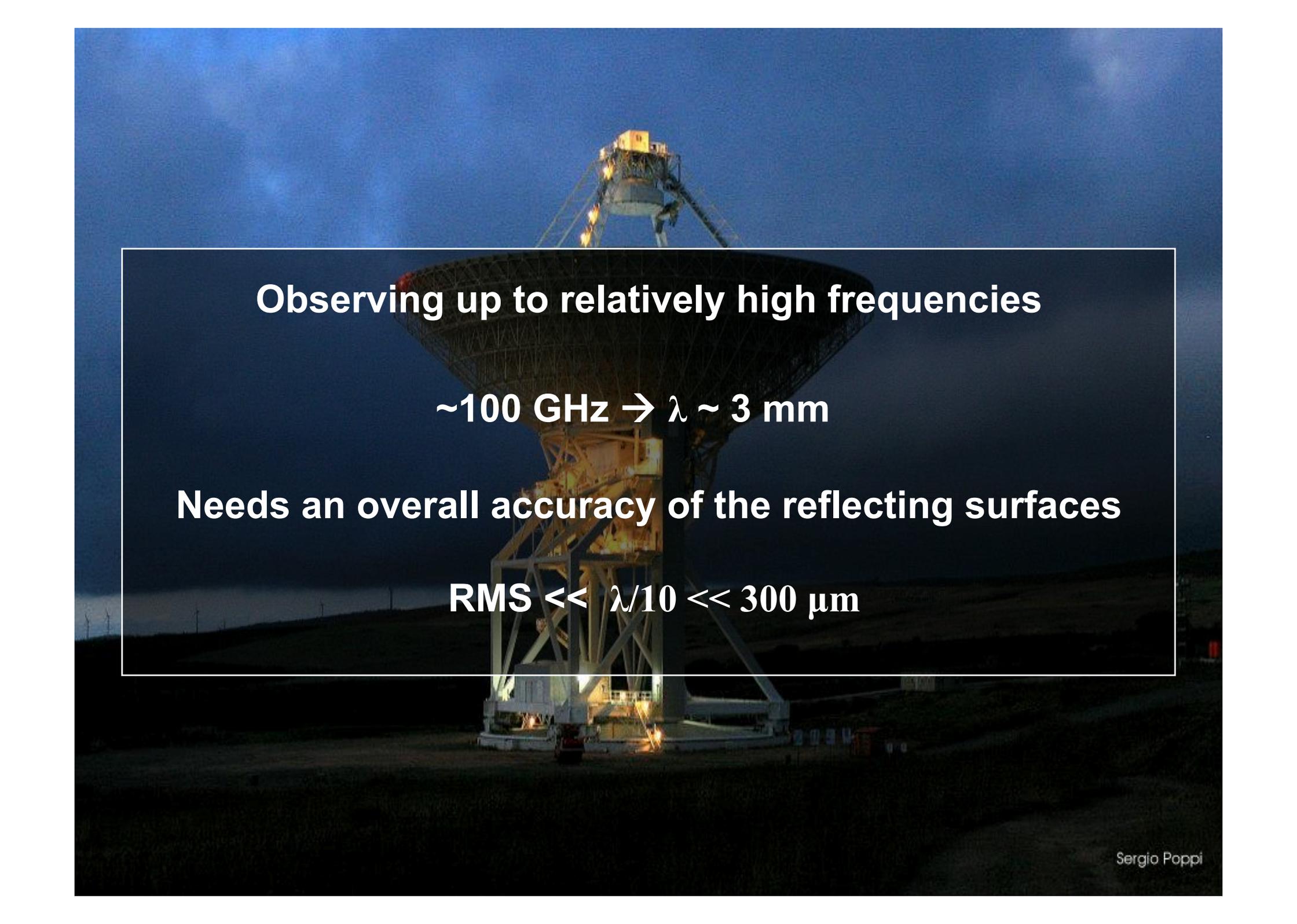
Avoids
standing
waves and
spill-over



1008 panels



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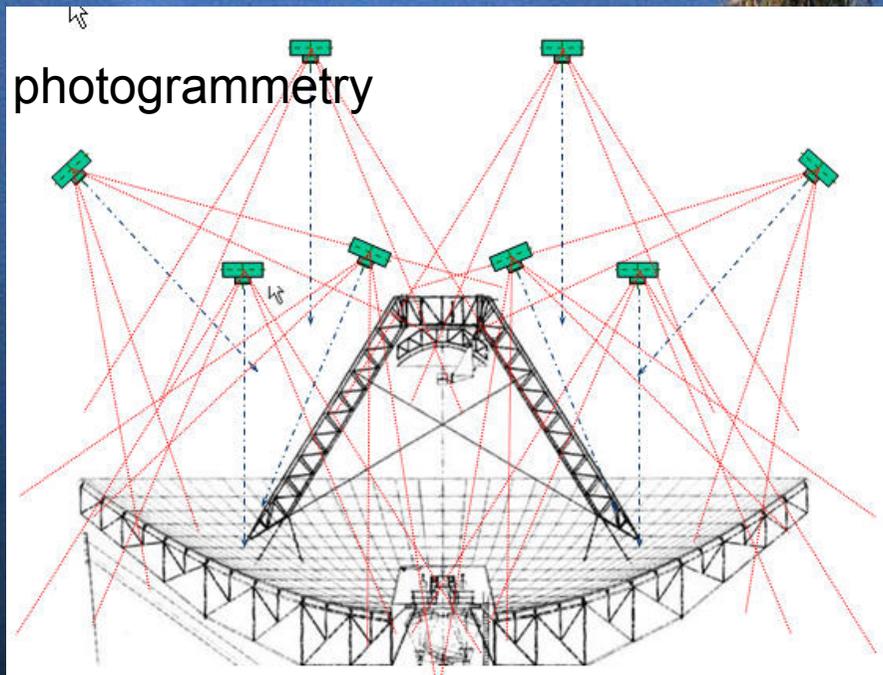


Observing up to relatively high frequencies

$\sim 100 \text{ GHz} \rightarrow \lambda \sim 3 \text{ mm}$

Needs an overall accuracy of the reflecting surfaces

$\text{RMS} \ll \lambda/10 \ll 300 \mu\text{m}$

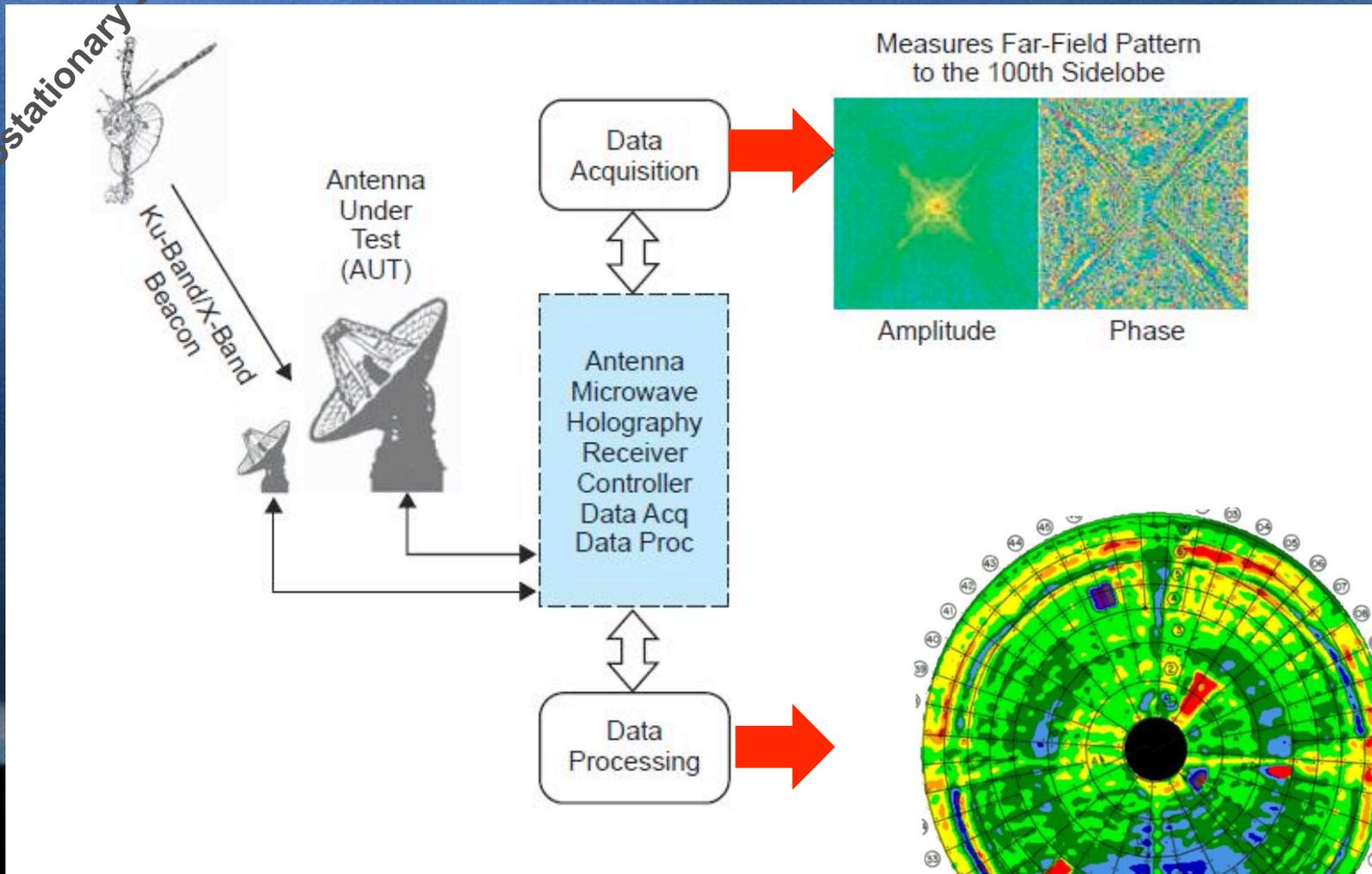


Achieved
RMS $\approx 290 \mu\text{m}$
at 45° elevation



Holography

Geostationary satellite

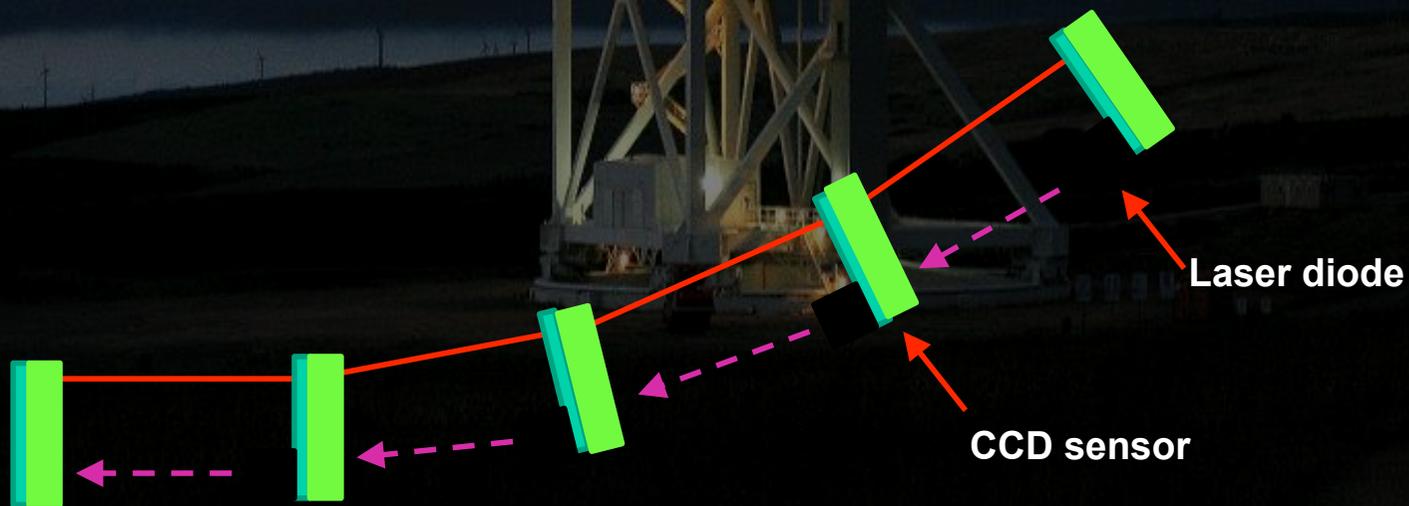


Capability to measure
RMS $\sim 150 \mu\text{m}$

A challenge: the “segmented profile” method for measuring relative deformations of the reflector

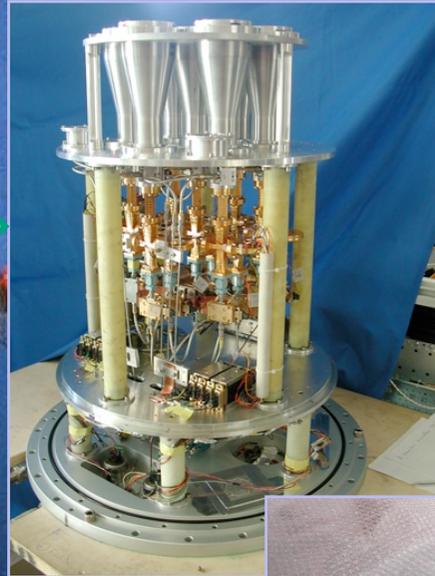


Measuring the deformations of several radial profiles



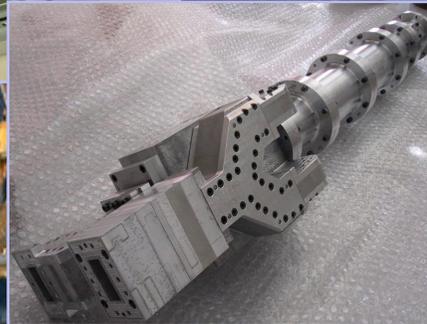
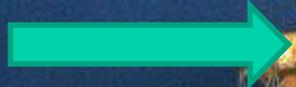
"First light" receiver fleet

Already installed and working



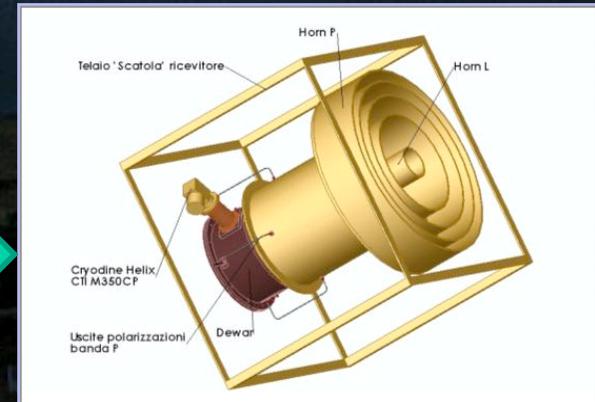
22 GHz multibeam, 7 beams, 8 GHz BW
(Gregorian focus)

Recently installed and tested in BWG focus



6.7 GHz mono feed, 2 GHz BW (BWG focus)

Under test in Medicina



Dual frequency (300 MHz, 100 MHz BW / 1400 MHz, 500 MHz BW) coaxial
(Primary focus)

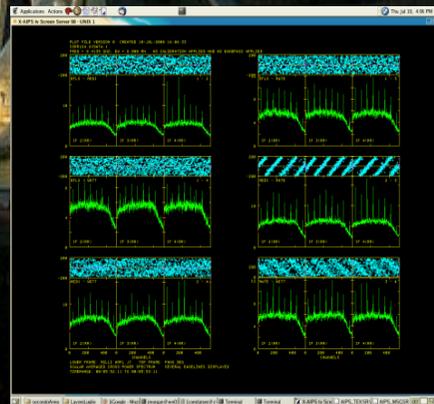
LP dual-frequency receiver



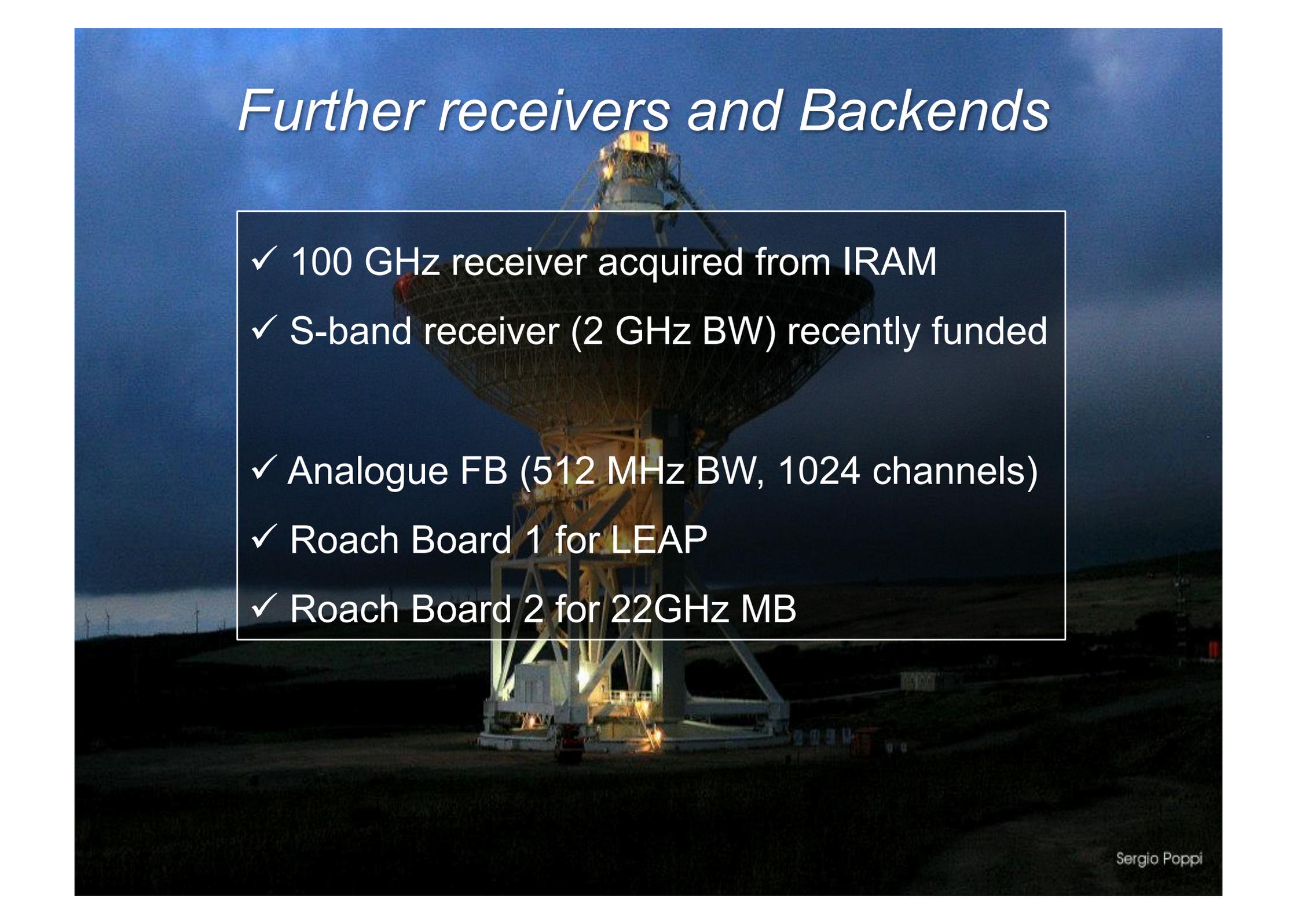
First light back-ends



Backend	Characteristics	Status
Multibeam digital spectrometer	2 GHz BW 16 ch x 125 MHz	Tested
DBBC system + MARK 5 C		Tested
Total power detector	14 IF - 2 GHz input Filters : 300, 700, 1200, 2000 MHz	Tested at SRT
Software Correlator	DiFX running on the HPC Cluster	
ATNF Pulsar Digital Filterbank	Dual Frequency mode 2 x 2 x 1 GHz BW	Tested at the Medicina 32m dish



Further receivers and Backends



- ✓ 100 GHz receiver acquired from IRAM
- ✓ S-band receiver (2 GHz BW) recently funded
- ✓ Analogue FB (512 MHz BW, 1024 channels)
- ✓ Roach Board 1 for LEAP
- ✓ Roach Board 2 for 22GHz MB

Milestones

2003: Signed the contract with MT-Mechatronics (MAN).
The construction of the SRT parts begins in Egypt



2003: Signed by INAF the contracts with the local companies Porru and CAP for the basement construction

2006: basement completed...

... and delivered to MT-Mechatronics
with a formal ceremony



2007 - 2010



The big event: May 22 2010



The first ever single big lift, 64m, 500t



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The first snow-test: 19/12/2010



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First tests on astronomical sources

*Starting august 2012
uncalibrated images of
astronomical sources
produced at 22 and 6.7 GHz*

[Plots under embargo]

Timeline



- ✧ now: technical commissioning ongoing...
- ✧ 1 april 2013: start of the scientific validation
- ✧ 1 november 2013: shared risk early science observations
- ✧ sometimes in 2014: fully operational



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Thanks and... see you soon in Pranu Sanguni

Sergio Poppi