COLLABORATION IN OBSERVING AND FINANCIAL PROGRAMMES
Observing with National Radio Facilities

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Scientific Directorate

V.N. Karazin Kharkiv National University – INAF
Bilateral Workshop on Astrophysics

22-23 March 2018 (Roma)

COLLABORATION IN OBSERVING AND FINANCIAL PROGRAMMES
Observing with National Radio Facilities

MEDICINA, 32 m

SRT, 64 m

NOTO, 32 m

SRT

Gregorian optical configuration
Diameter: 64 m
Frequency range: 0.3 – 116 GHz
Elevation range: 5°-90°
Azimuth range: ± 270°
Azimuth slewing speed: 51°/min
Elevation slewing speed: 30°/min

TIMELINE

June 2012 – October 2013: Techincal commissioning (Bolli et al. 2015)

September 2013: Opening Cerimony

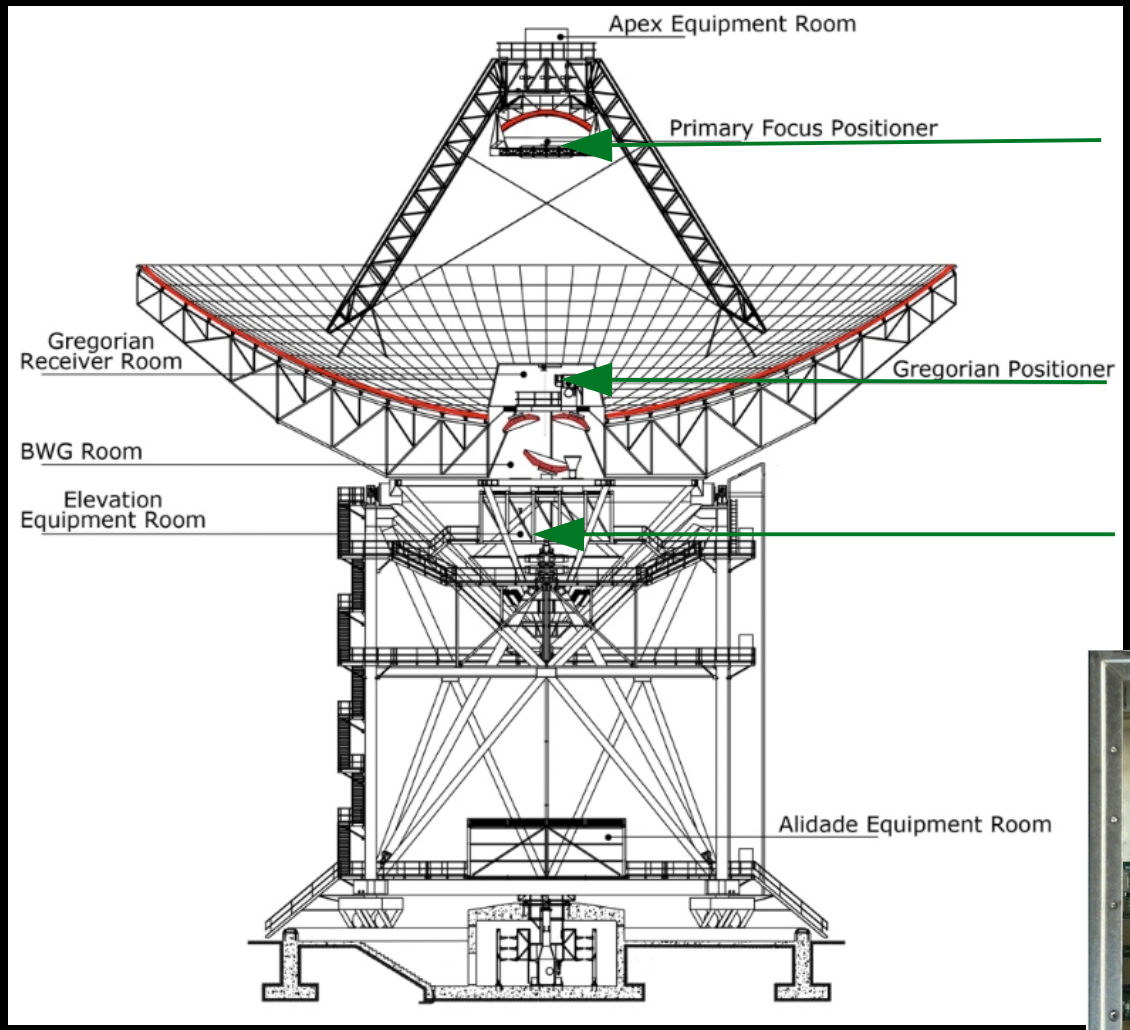
February 2012 - January 2016: Astronomical Validation (Prandoni et al. 2017)

February - August 2016: Early Science Program (accepted proposals: 15)

2017 months of stop due to the refurbishment of active surface (6 months)

2018 re-commissioning

SRT

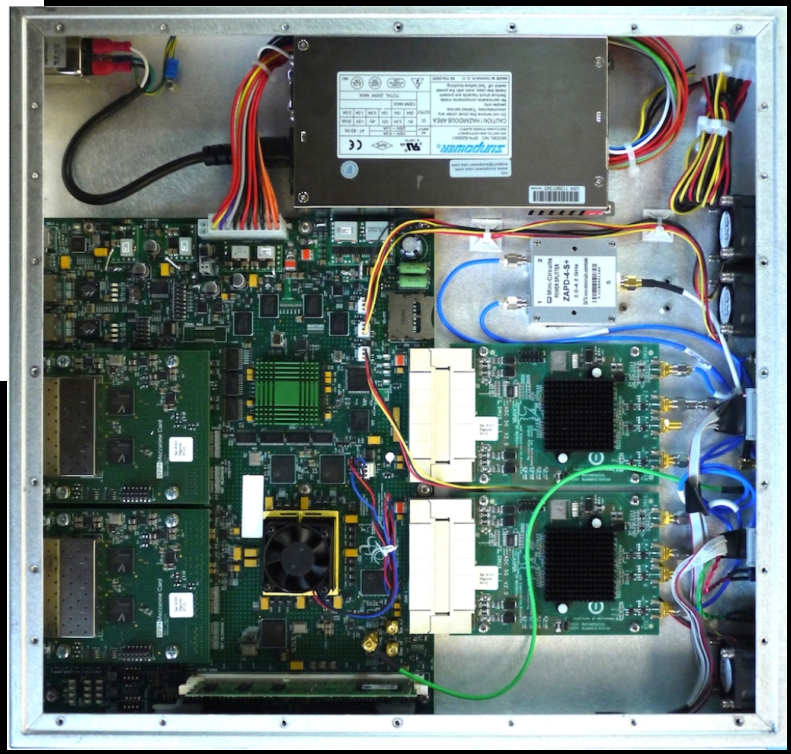


Receivers

Dual **L-band** (1.3-1.8 GHz) and **P-band** (305-425 MHz) coaxial

K-band multibeam (18-26 GHz)

C-band (5.7-7.7 GHz)



Spectro-polarimetric Back-end

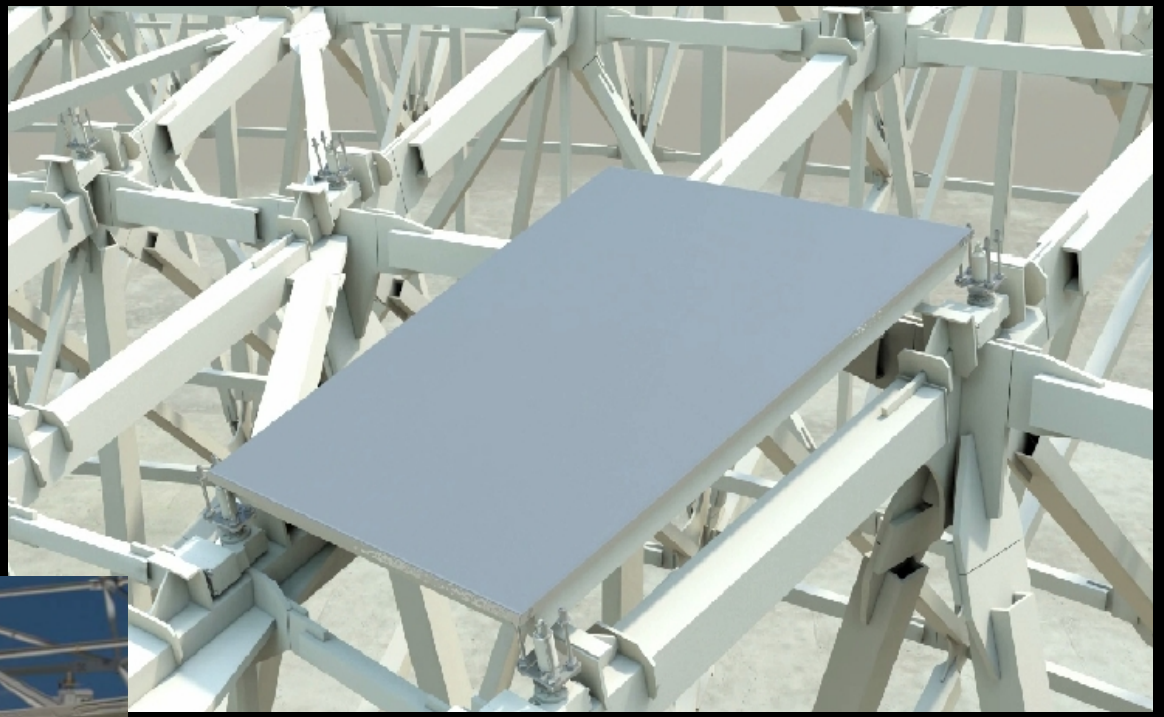
SARDARA
SArdinia **R**oach2-based **D**igital **A**rchitecture for **R**adio **A**stronomy
up to 2500 MHz and 16k-channels, seven beams

ACTIVE SURFACE

Active Surface System

1008 alluminium panels
1116 actuators

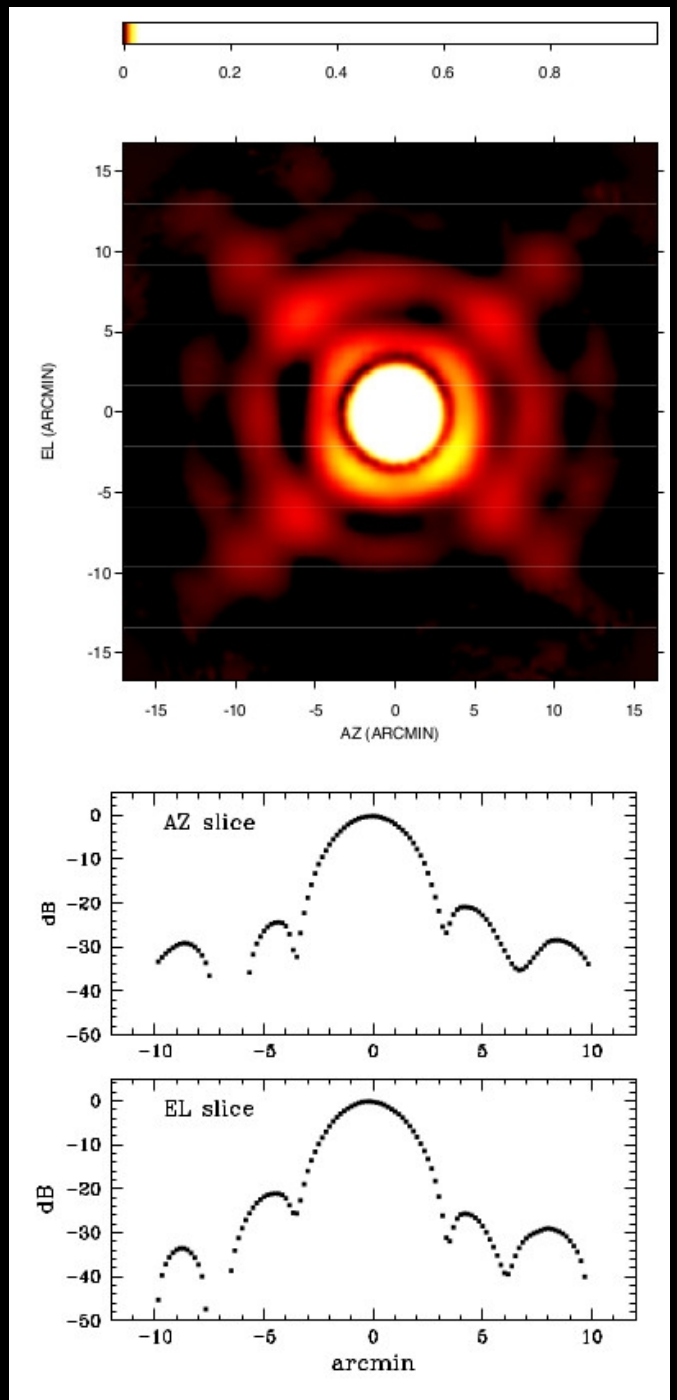
Examples of other telescopes:
- GBT
- Noto
- Tian Ma



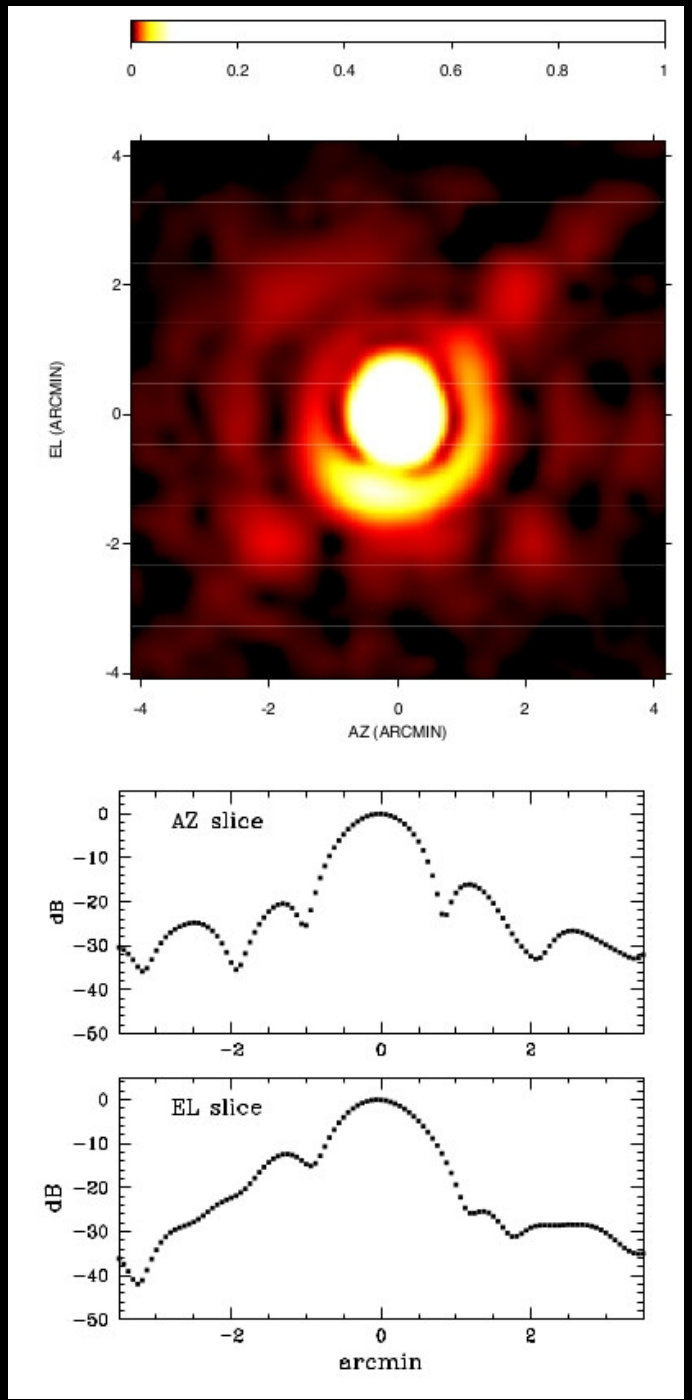
Active Surface System Refurbishment

BEAM PATTERN

C-BAND
7.24 GHz

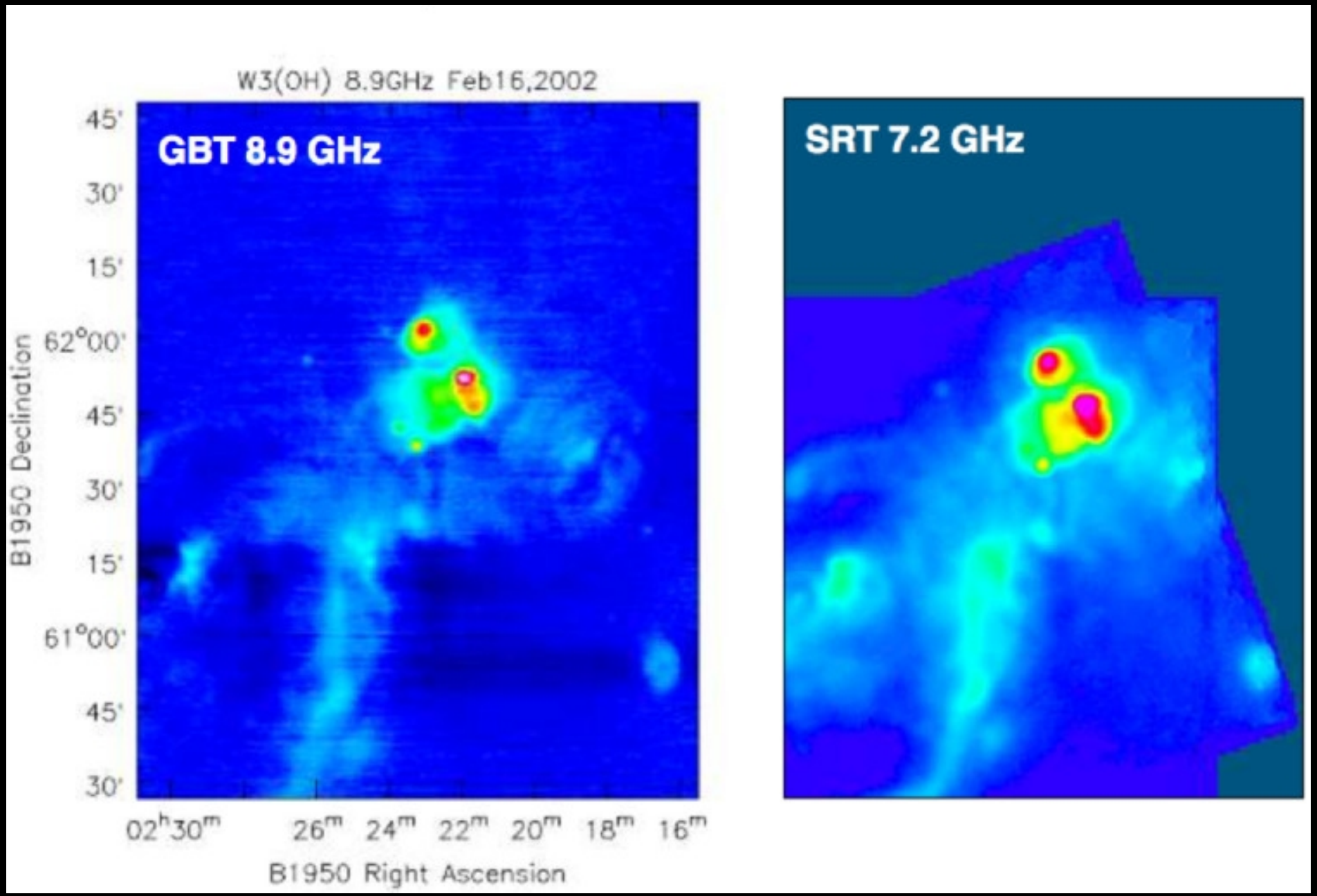


K-BAND
25.54 GHz



IMAGING CAPABILITIES

Extended Sources, C-BAND 7.24 GHz, 680 MHz of bandwidth

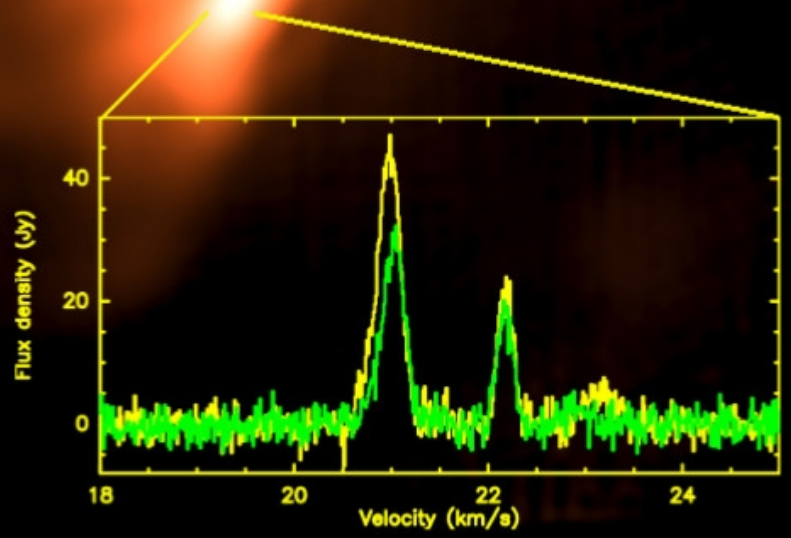


Prandoni et al. (2017)

SPECTROSCOPY

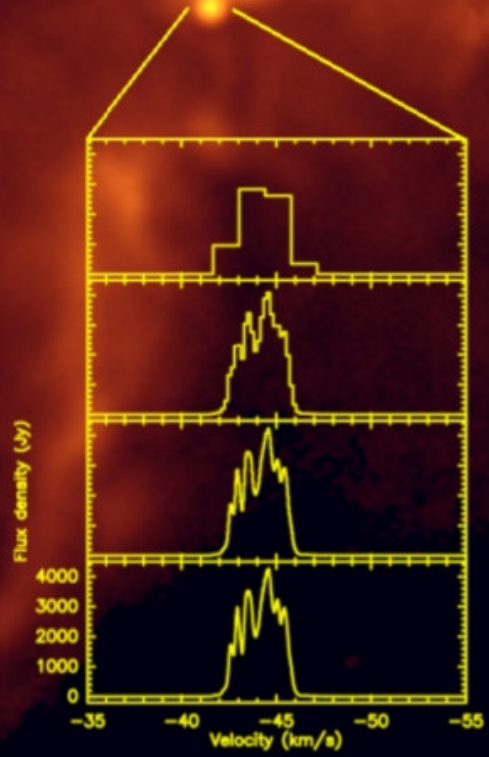
C-BAND 7.24 GHz, 680 MHz of bandwidth

Omega Nebula



62.5, 7.8, 2.0, 0.5 MHz
1.5, 0.2, 0.05, 0.01 km/s

W3(OH)



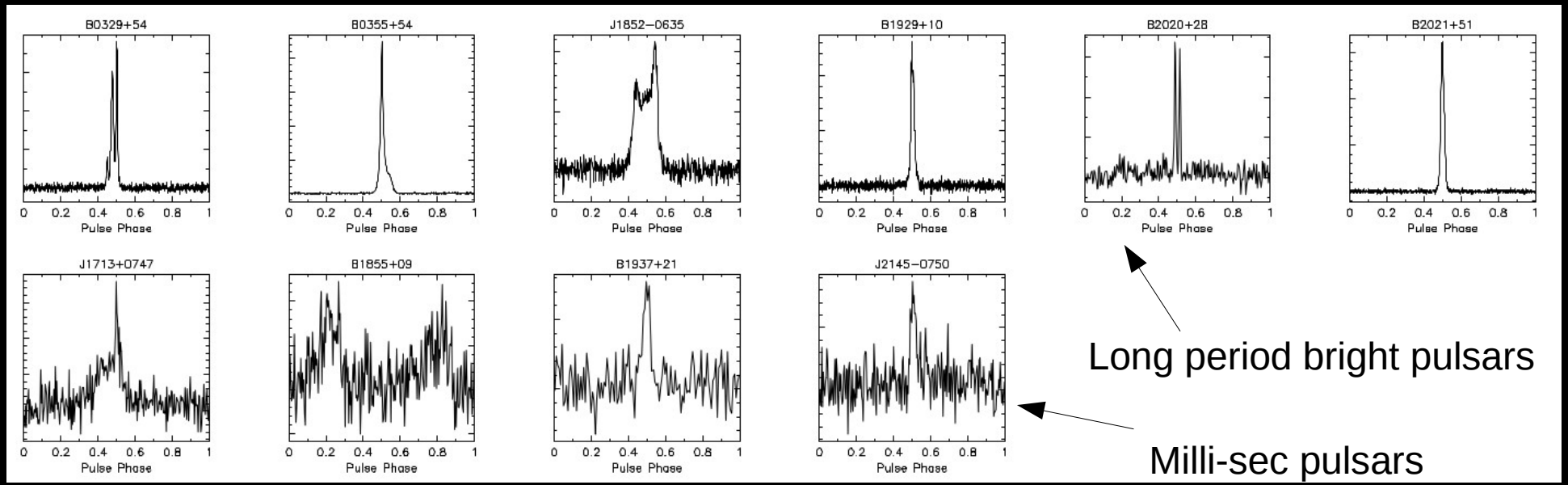
Prandoni et al. (2017)

PULSARS

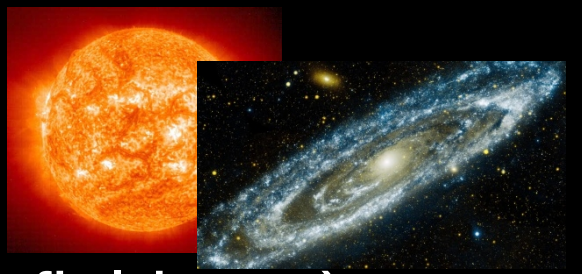
C-BAND

PSR name	N_{obs}	t_{obs} (s)	S/N	S_{6000} (mJy)
B0329+54	21	304	124	2.5
B0355+54	6	666	281	5.2
J1852-0635	2	115	65	6.7
B1929+10	3	164	122	4.6
B2020+28	1	510	30	0.7
B2021+51	6	303	244	4.2
J1713+0747	1	1830	22	0.2
B1855+09	1	930	13	0.4
B1937+21	1	630	12	0.2
J2145-0750	2	1365	10	0.1

Prandoni et al. (2017)

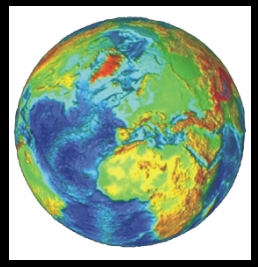


AREAS OF APPLICATION

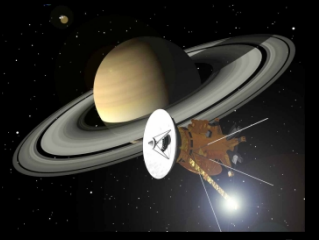


Single Dish Radio Astronomy & VLBI
(star formation, pulsars, galaxies, magnetic fields, …)

Geodesy



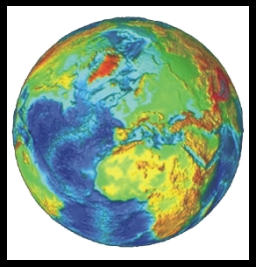
Space science
(monitoring of space debris)



Deep Space Network
(communication and control of probes in the Solar System)

AREAS OF APPLICATION

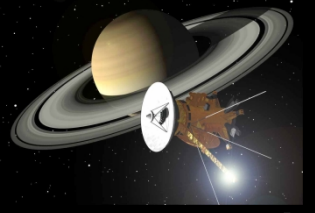

Single Dish Radio Astronomy & VLBI
(star formation, pulsars, galaxies, magnetic fields, …)



Geodesy

20%

Space science
(monitoring of space debris)



Deep Space Network
(communication and control of probes in the Solar System)

SCIENCE

Areas where INAF antennas can play a major role in the next future:

1. VLBI science
2. Gravitational wave detection experiments
3. Pulsars
4. The transient sky
5. Fast radio transients
6. Electromagnetic counterparts of gravitational waves
7. X-ray binaries
8. High-frequency Galactic and extragalactic surveys
9. Supernova remnants
10. Radio galaxies and diffuse emission in galaxy clusters
11. High-resolution spectroscopy
12. SETI

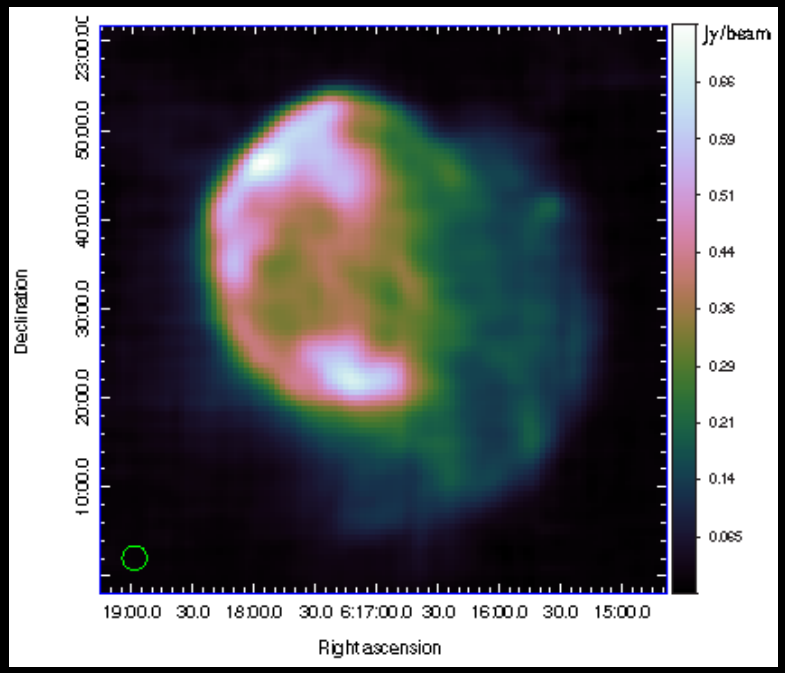
HIGH-FREQUENCY OBSERVATIONS

Future applications at 30-100 GHz with the SRT

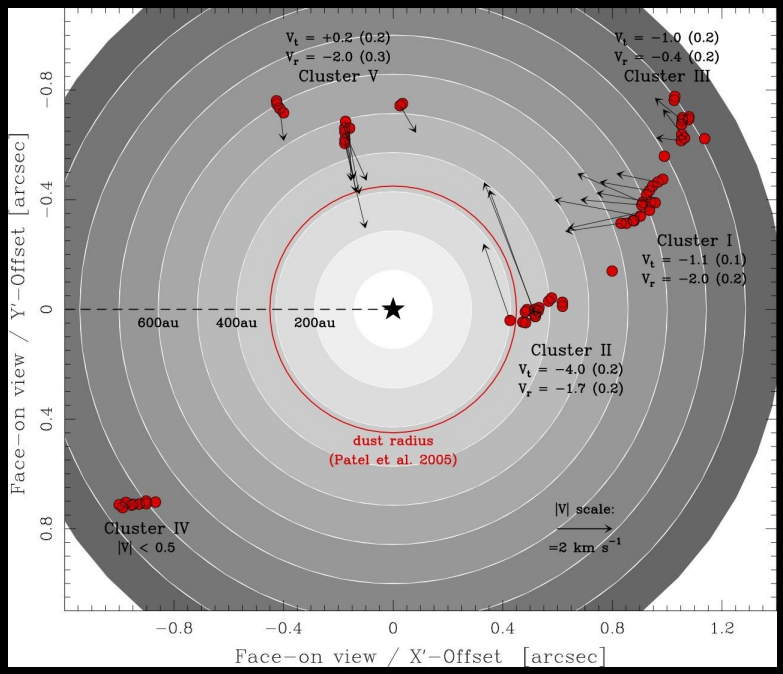
- Mapping Galactic filaments
- Survey of Complex Organic Molecules
- Galactic maser surveys and study of methanol megamasers
- CO and SiO transitions and dense gas tracers
- Sunyaev-Zeldovich effect in galaxy clusters
- Electron energy distribution cut-off/breaks
- Solar Physics-Space Weather applications

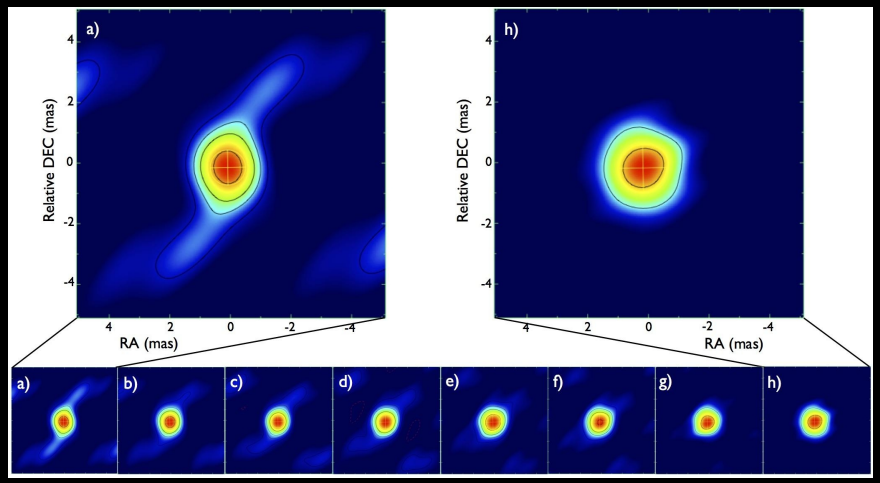
FIRST SCIENTIFIC RESULTS

First 7 GHz images of large Supernova Remnants (Egron et al., 2017a)



EVN observations of methanol maser spost (Sanna et., 2017)

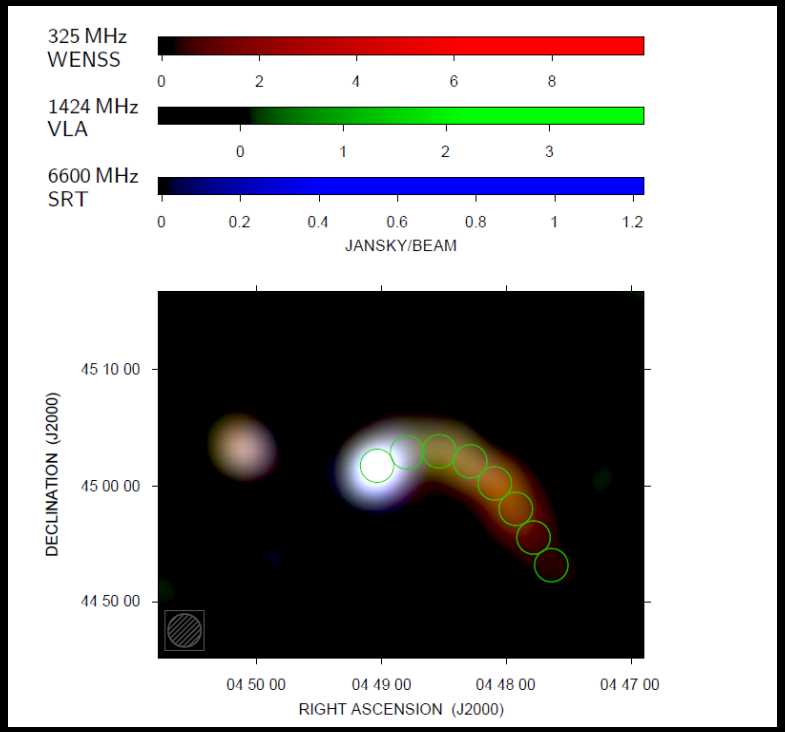




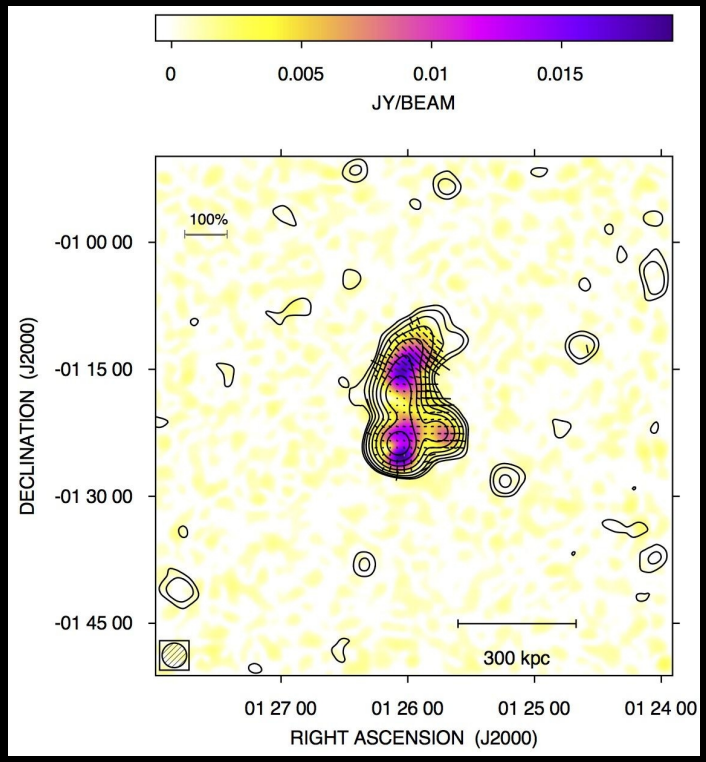
Single-dish and I-VLBI monitoring of Galactic binaries (Egron et al., 2017b)

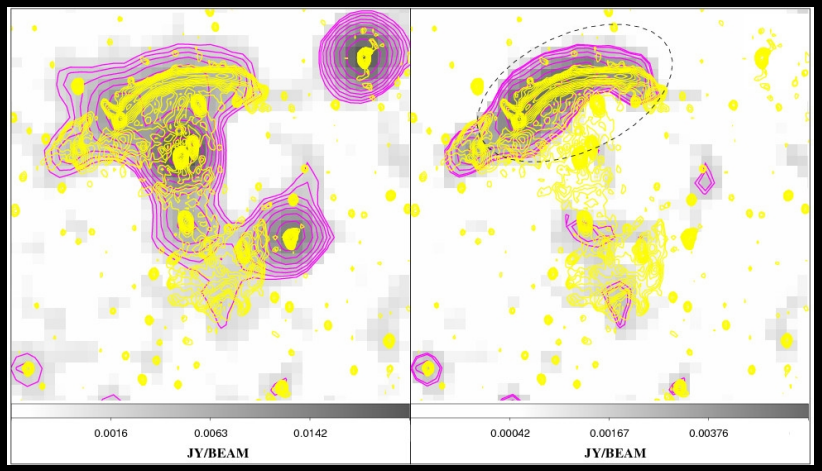
FIRST SCIENTIFIC RESULTS

Wide-band spectral-polarimetric observation of galaxy cluster (Murgia et al., 2016)



Intra-cluster magnetic field power spectra (Govoni et al., 2017)

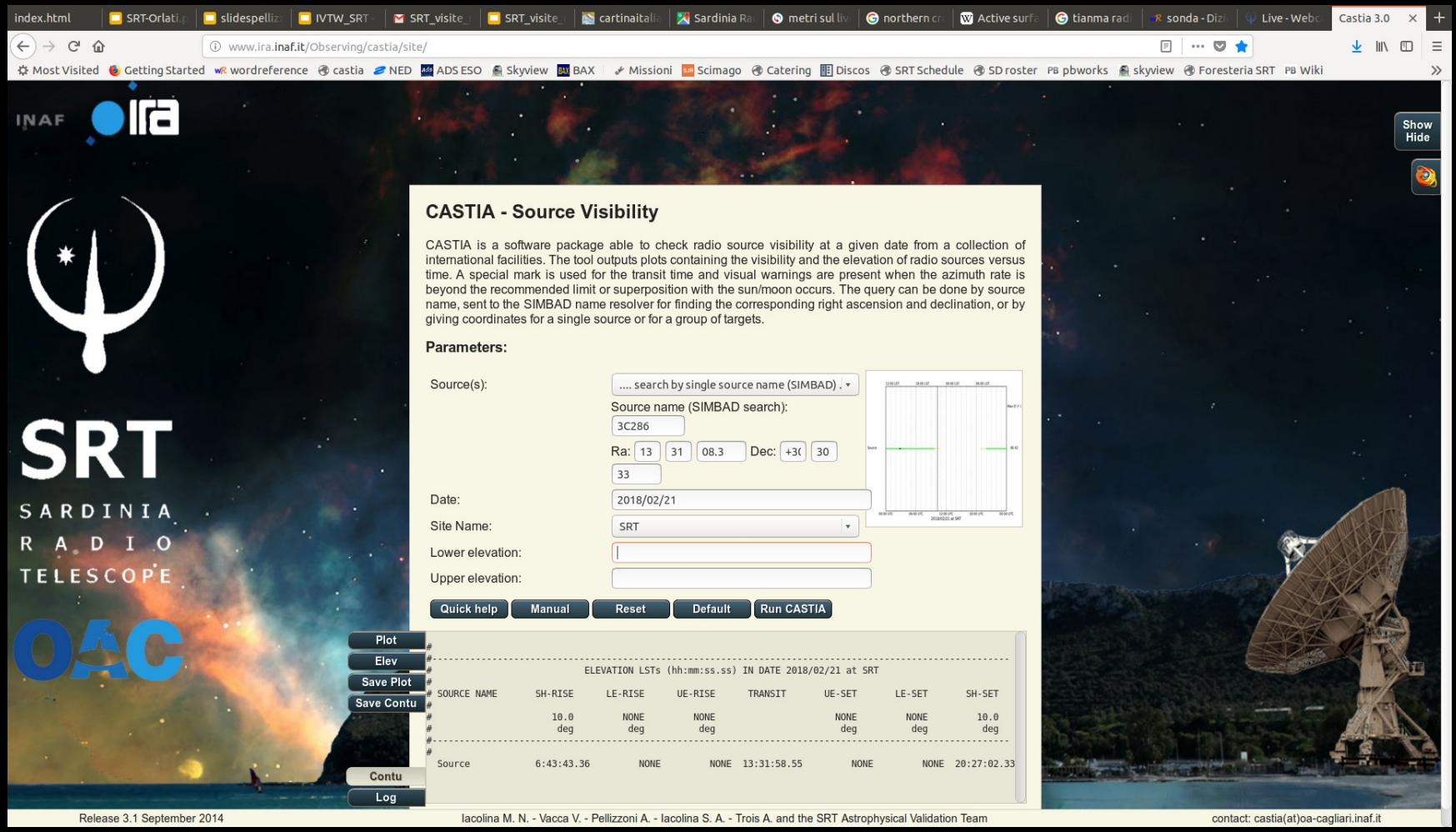




Relic radio emission from galaxy clusters (Loi et al., 2017)

PREPARING THE OBSERVATIONS

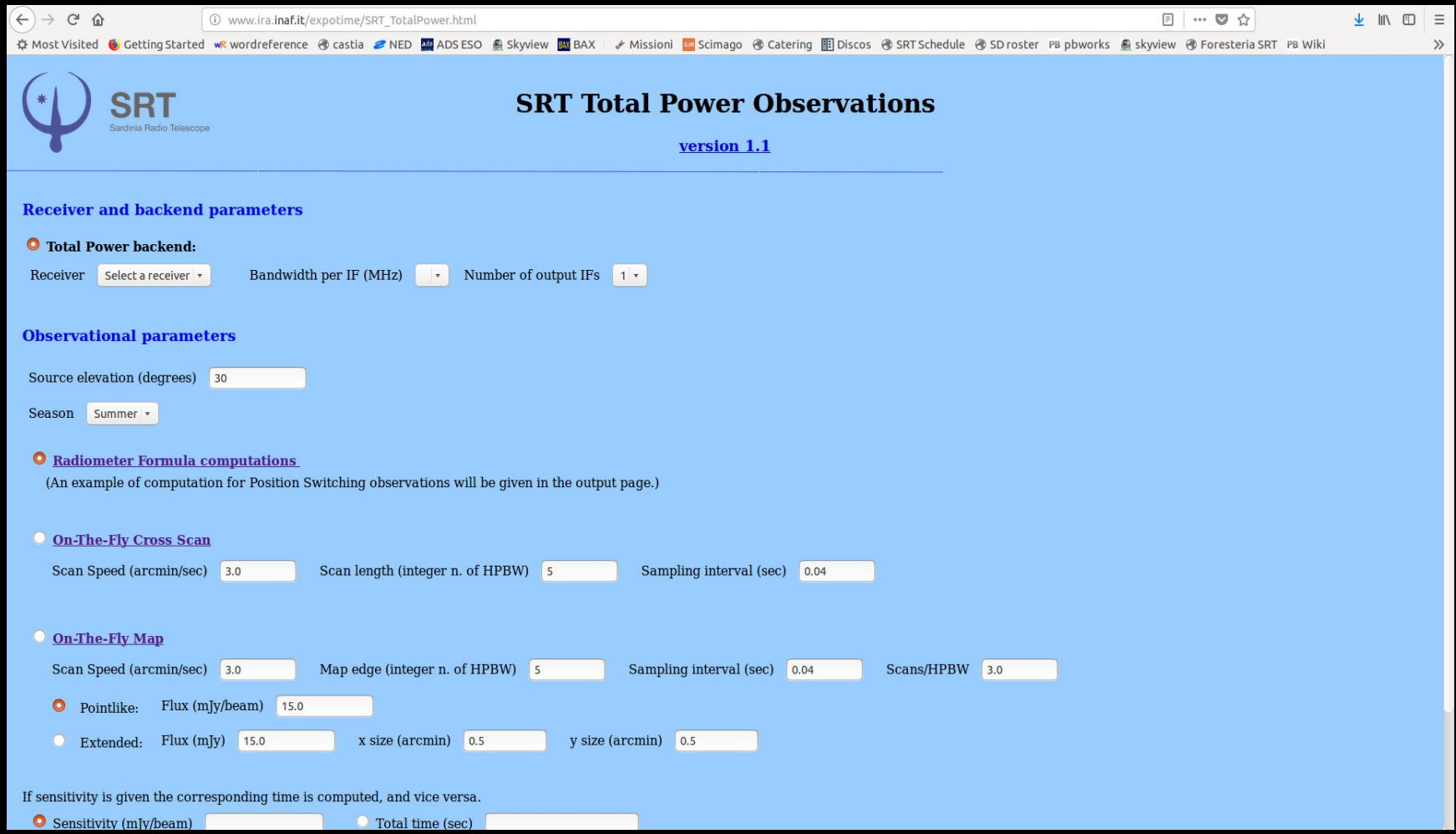
1. CASTIA: Source Visibility



Vacca et al. (2013)

PREPARING THE OBSERVATIONS

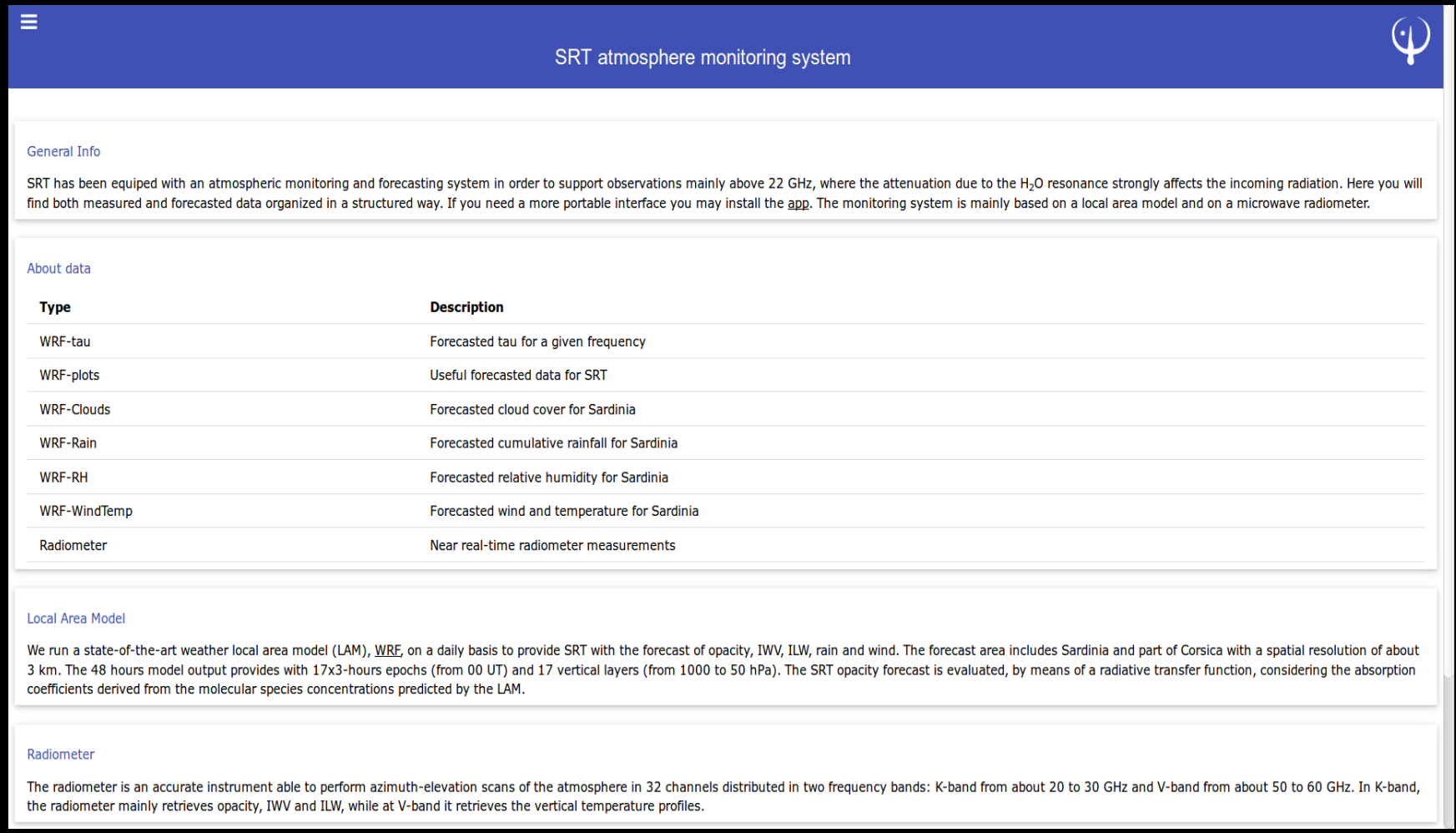
2. ETC: Exposure Time Calculator



Zanichelli et al. (2015)

PREPARING THE OBSERVATIONS

3. Meteo Forcasting: numerical weather prediction model on timescales of 36 h to allow for dynamic scheduling



SRT atmosphere monitoring system

General Info

SRT has been equiped with an atmospheric monitoring and forecasting system in order to support observations mainly above 22 GHz, where the attenuation due to the H_2O resonance strongly affects the incoming radiation. Here you will find both measured and forecasted data organized in a structured way. If you need a more portable interface you may install the app. The monitoring system is mainly based on a local area model and on a microwave radiometer.

About data

Type	Description
WRF-tau	Forecasted tau for a given frequency
WRF-plots	Useful forecasted data for SRT
WRF-Clouds	Forecasted cloud cover for Sardinia
WRF-Rain	Forecasted cumulative rainfall for Sardinia
WRF-RH	Forecasted relative humidity for Sardinia
WRF-WindTemp	Forecasted wind and temperature for Sardinia
Radiometer	Near real-time radiometer measurements

Local Area Model

We run a state-of-the-art weather local area model (LAM), WRF, on a daily basis to provide SRT with the forecast of opacity, IWV, ILW, rain and wind. The forecast area includes Sardinia and part of Corsica with a spatial resolution of about 3 km. The 48 hours model output provides with 17x3-hours epochs (from 00 UT) and 17 vertical layers (from 1000 to 50 hPa). The SRT opacity forecast is evaluated, by means of a radiative transfer function, considering the absorption coefficients derived from the molecular species concentrations predicted by the LAM.

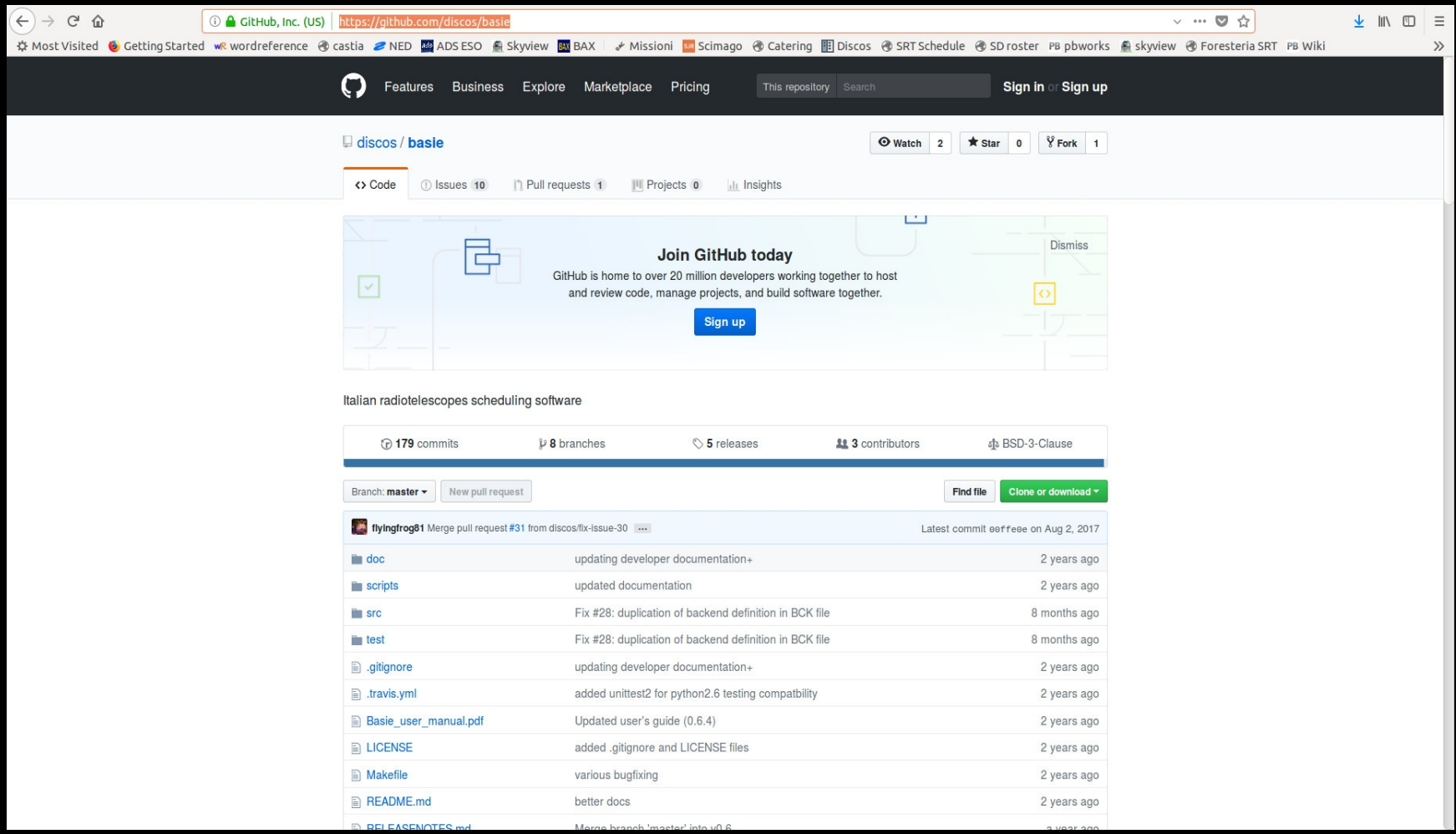
Radiometer

The radiometer is an accurate instrument able to perform azimuth-elevation scans of the atmosphere in 32 channels distributed in two frequency bands: K-band from about 20 to 30 GHz and V-band from about 50 to 60 GHz. In K-band, the radiometer mainly retrieves opacity, IWV and ILW, while at V-band it retrieves the vertical temperature profiles.

Nasir et al. (2013), Buffa et al. (2016)

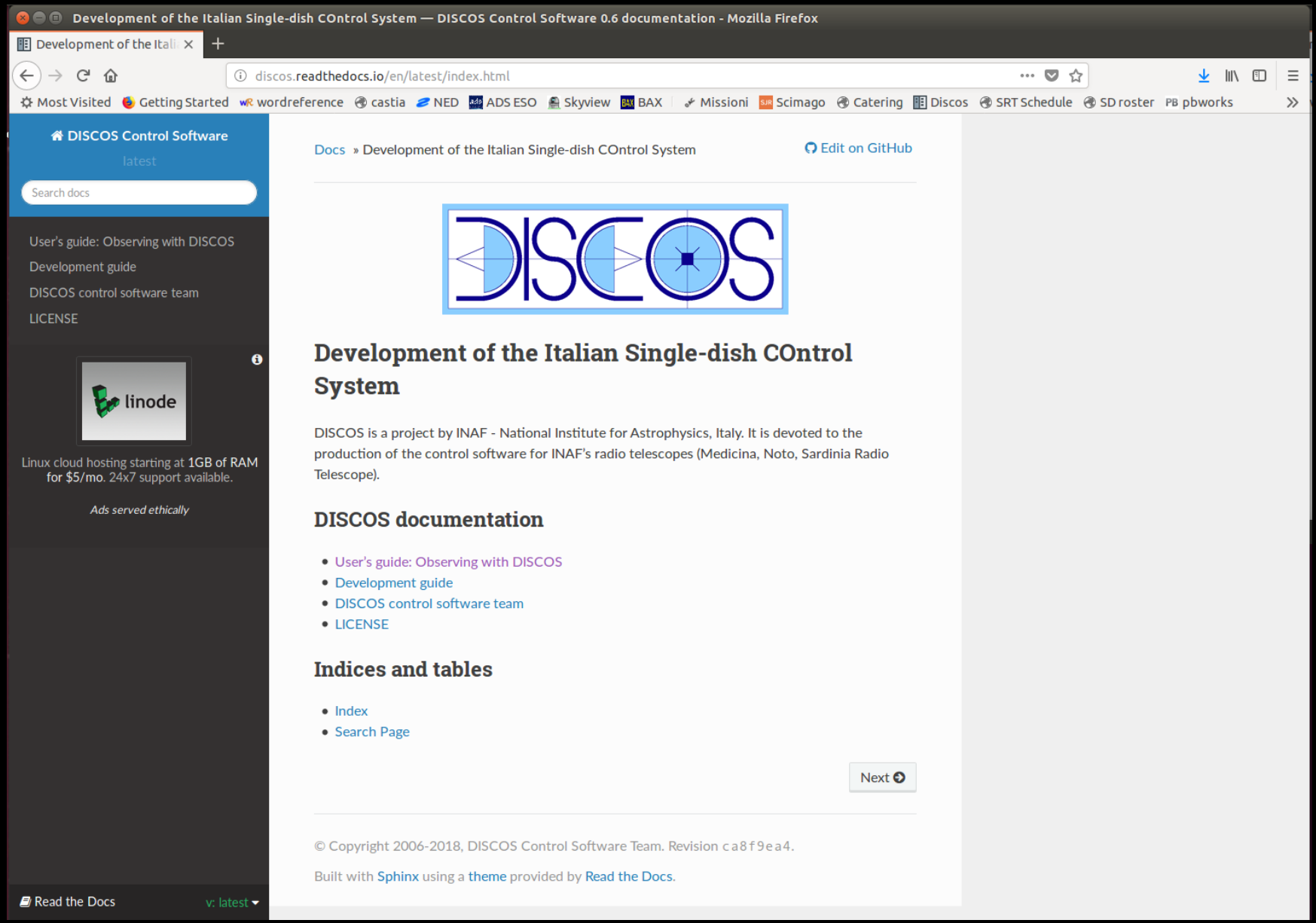
PREPARING THE OBSERVATIONS

4. Basie: Schedule Creator, Marco Bartolini



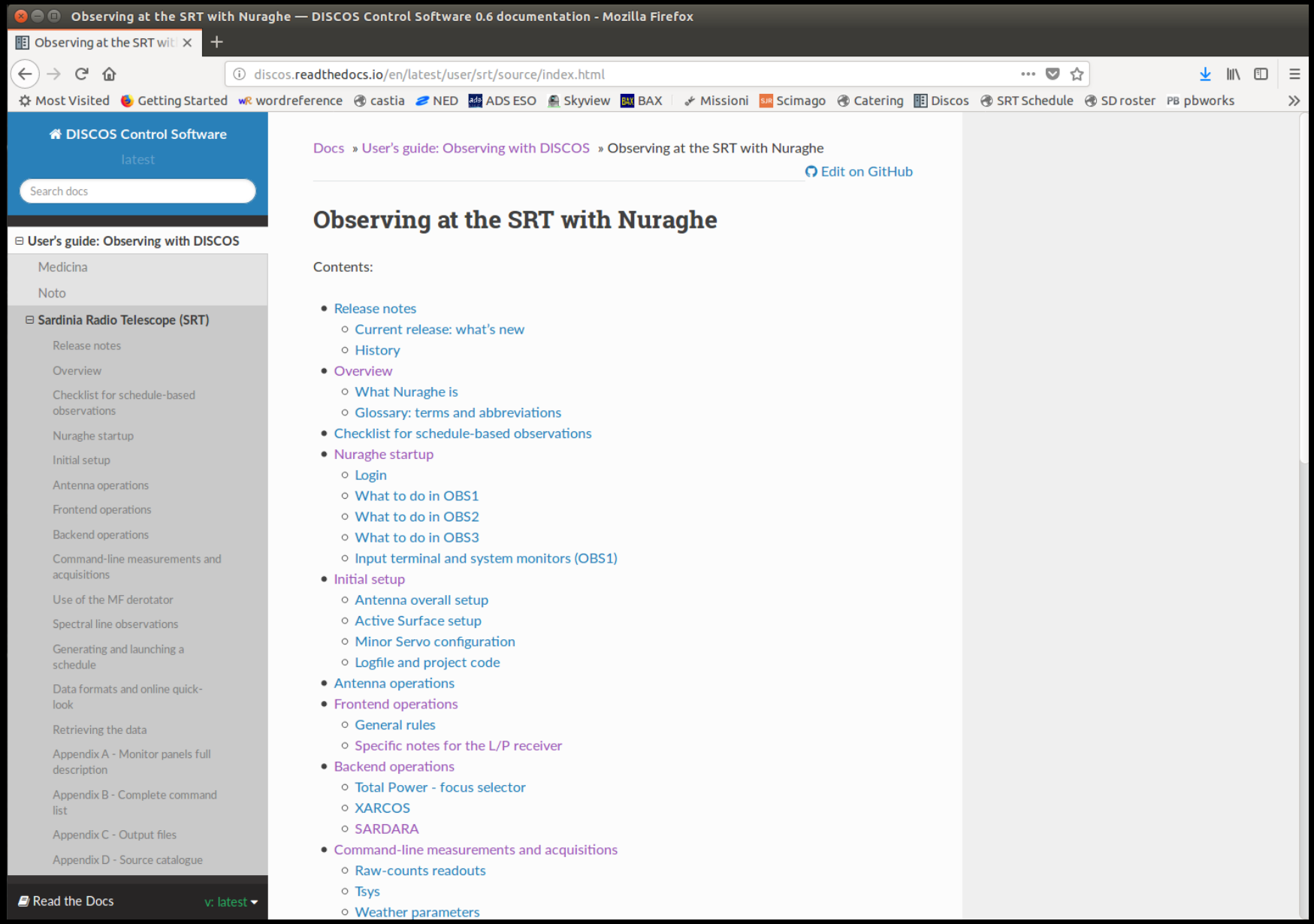
https://github.com/discos/basie

OBSERVING



People: Marco Bartolini, Marco Buttu, Carlo Migoni, Andrea Orlati, Sergio Poppi, Simona Righini, Antonietta Fara

OBSERVING


Observing at the SRT with Nuraghe — DISCOS Control Software 0.6 documentation - Mozilla Firefox
Observing at the SRT wit
discos.readthedocs.io/en/latest/user/srt/source/index.html
Most Visited
Getting Started
wordreference
castia
NED
ADS ESO
Skyview
BAX
Missioni
Scimago
Catering
Discos
SRT Schedule
SD roster
pbworks
DISCOS Control Software
latest
Search docs
User's guide: Observing with DISCOS
Medicina
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Read the Docs
v: latest
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OBSERVING


Mount
AntennaBoss
GenericBackend
Receivers
MinorServo
Scheduler
SRT
OperatorInput
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MANAGEMENT/CalibrationTool
Applications
Places
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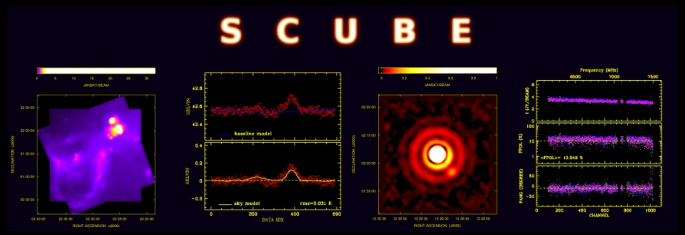
Tue Nov 28, 21:18:01

DATA REDUCTION TOOLS

1. SDI: SRT single-dish imager (Egron, Pellizzoni et al. 2017)

2. SCUBE: Single-dish Spectral-polarimetry Software (Murgia et al. 2016)



3. SRT single-dish Tools (Bachetti et al. 2016)


THANK YOU!
Sergio Poppi