Sardinia Radio Telescope

Federica Govoni
INAF - Osservatorio Astronomico di Cagliari

EXPO Osaka (Japan) - 25 June 2025

UNIONE EUROPEA
Fondo Sociale Europeo
Fondo Europeo di Sviluppo Regionale
Ministero dell'Istruzione, dell'Università e della Ricerca
PON RICERCA E INNOVAZIONE 2014 - 2020
INAF ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS

INAF ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS

OAC

Osservatorio Astronomico di Cagliari

SRT Sardinia Radio Telescope

SRT - Technical Specifications

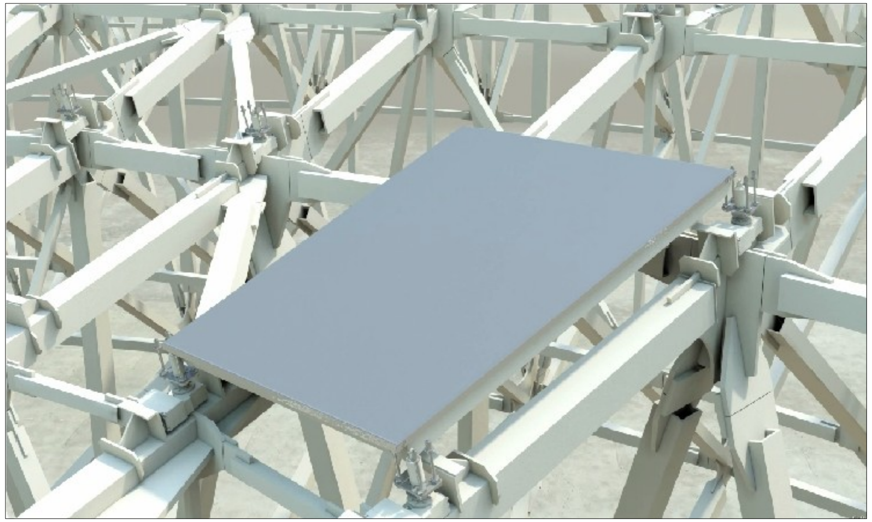
SRT is one of Europe's most innovative and high-herformance radio telescopes:

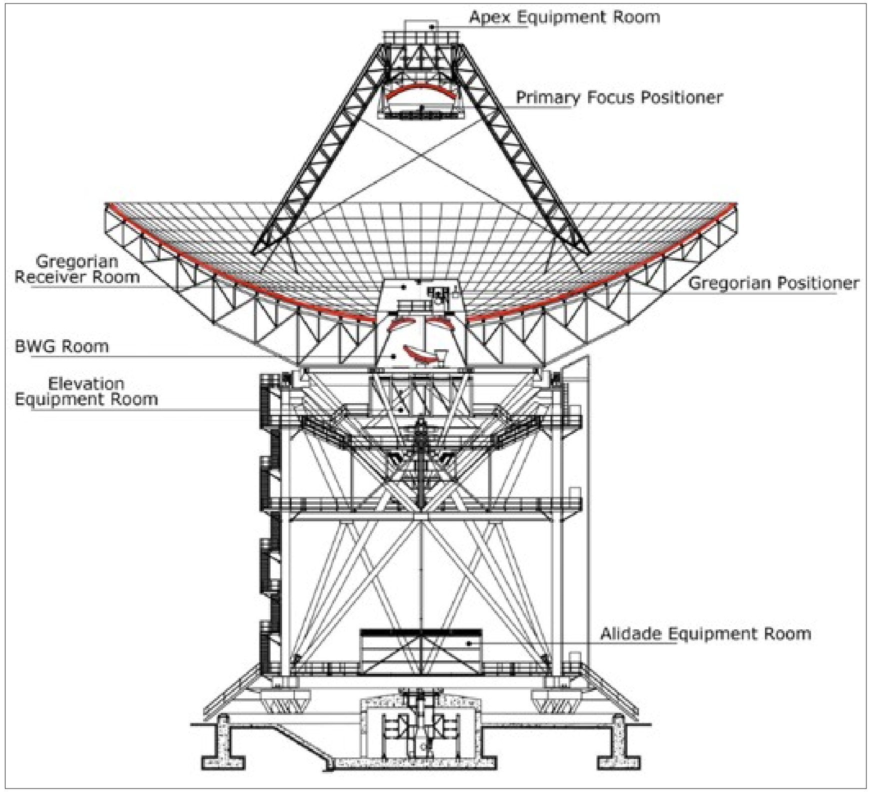
LARGE COLLECTING AREA (64m of diameter)

FREQUENCY AGILITY

ACTIVE SURFACE

The primary mirror's surface is built from a mosaic of over 1000 aluminum panels. Each panel rests on four movable supports, known as "actuators."





Focal Position	Min. Frequency	Max. Frequency	F/D ratio
Primary focus (F1)	300 MHz	20 GHz	0.33
Gregorian Focus (F2)	7.5 GHz	116 GHz	2.35
BWG focus (F3 and F4)	1.4 GHz	35 GHz	1.37 for F3 2.81 for F4

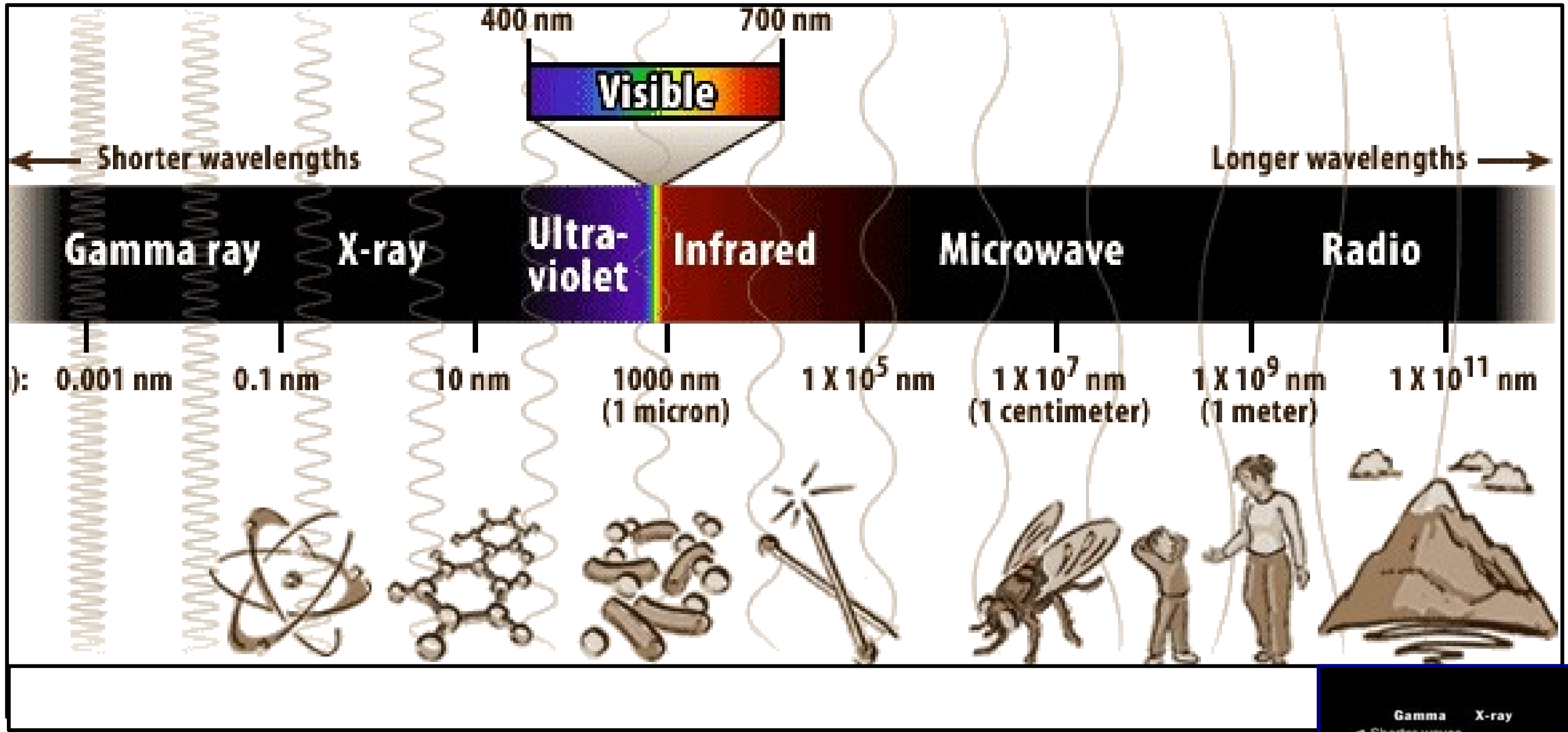
INAF – Sites in Sardinia

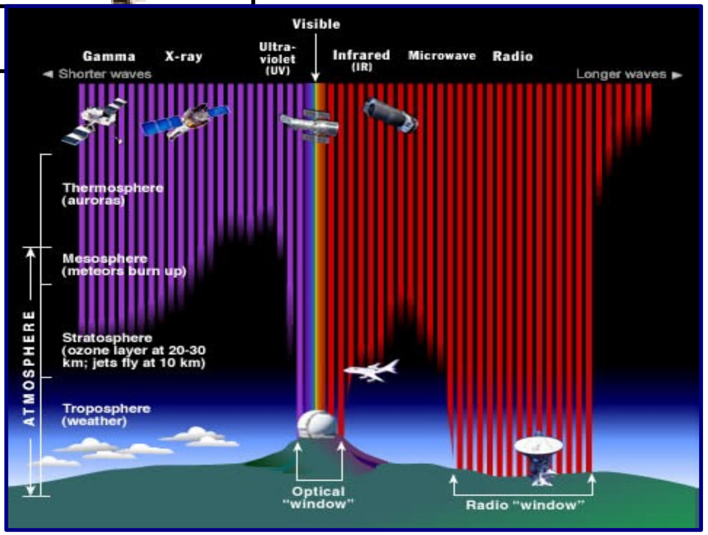
SAN BASILIO
Latitude 39°29’34” N
Longitude 9°14’42’’ E
Altitude - 600 m asl

SEDE INAF OA - CAGLIARI

Explore the Universe with Radio Waves

The more we manage to observe the Universe across the entire Electromagnetic Spectrum, the more physical information we can obtain about the cosmos.



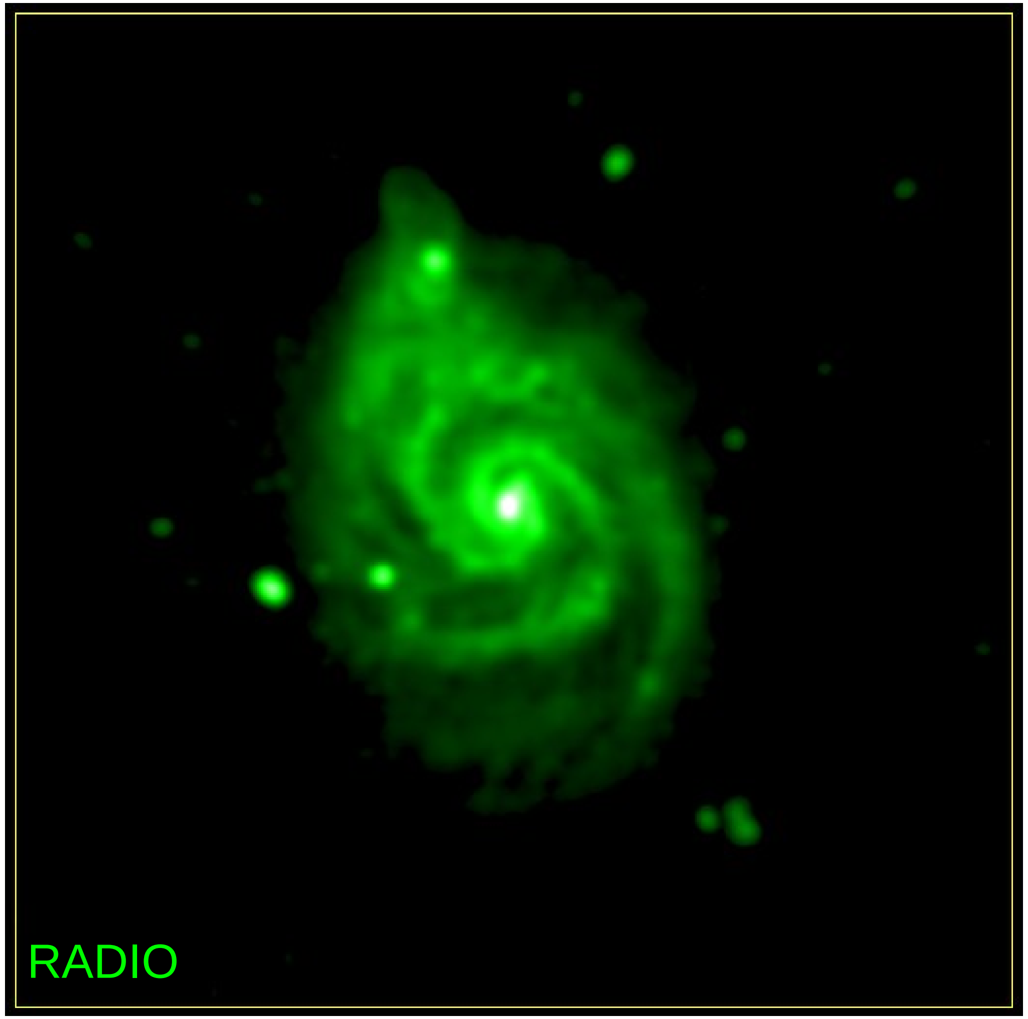


Radio observations using ground-based instruments

Radio observations even during the day

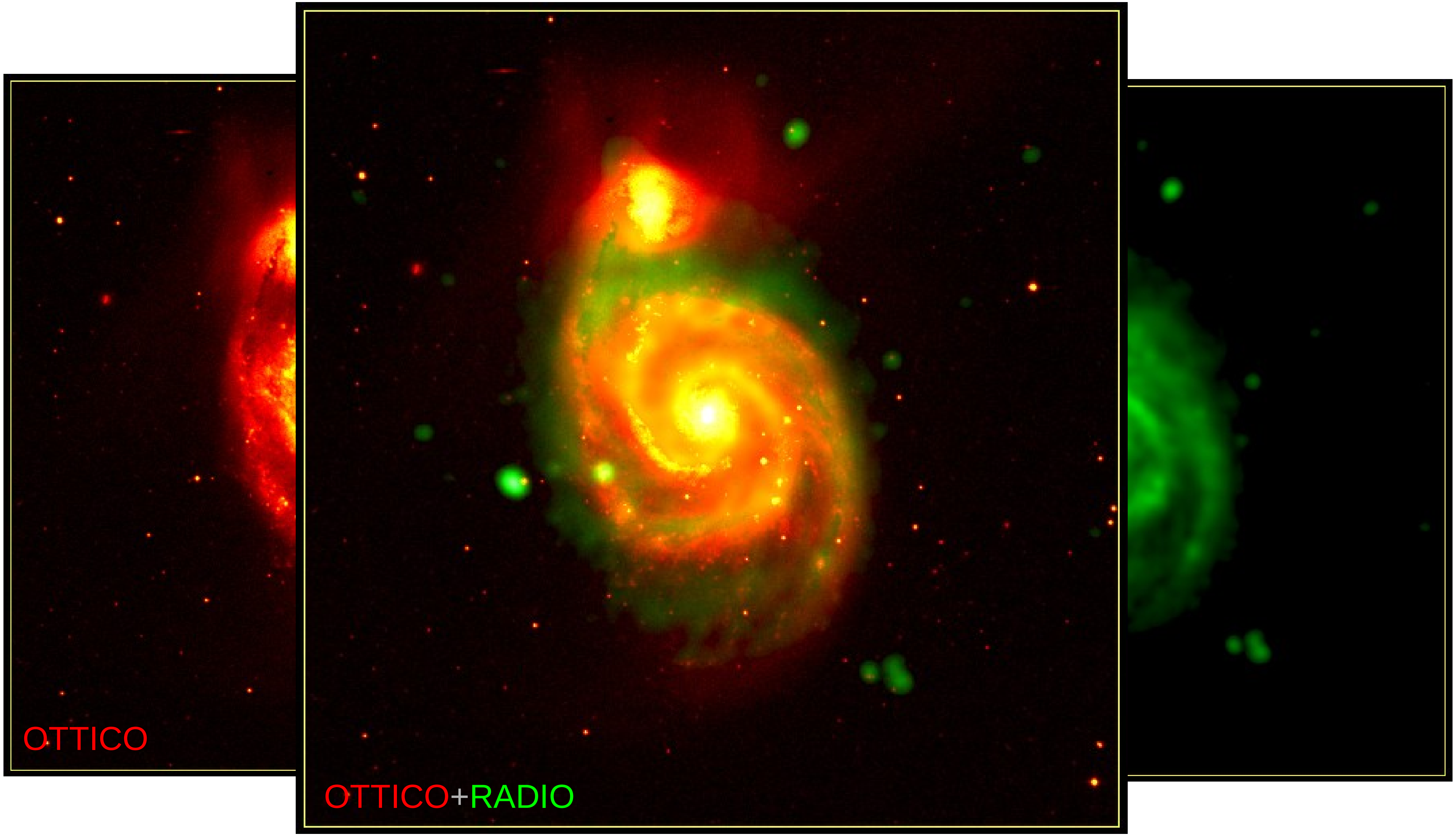
Radio observations even with cloudy skies
(depends on the observation frequency)

Explore the Universe with Radio Waves



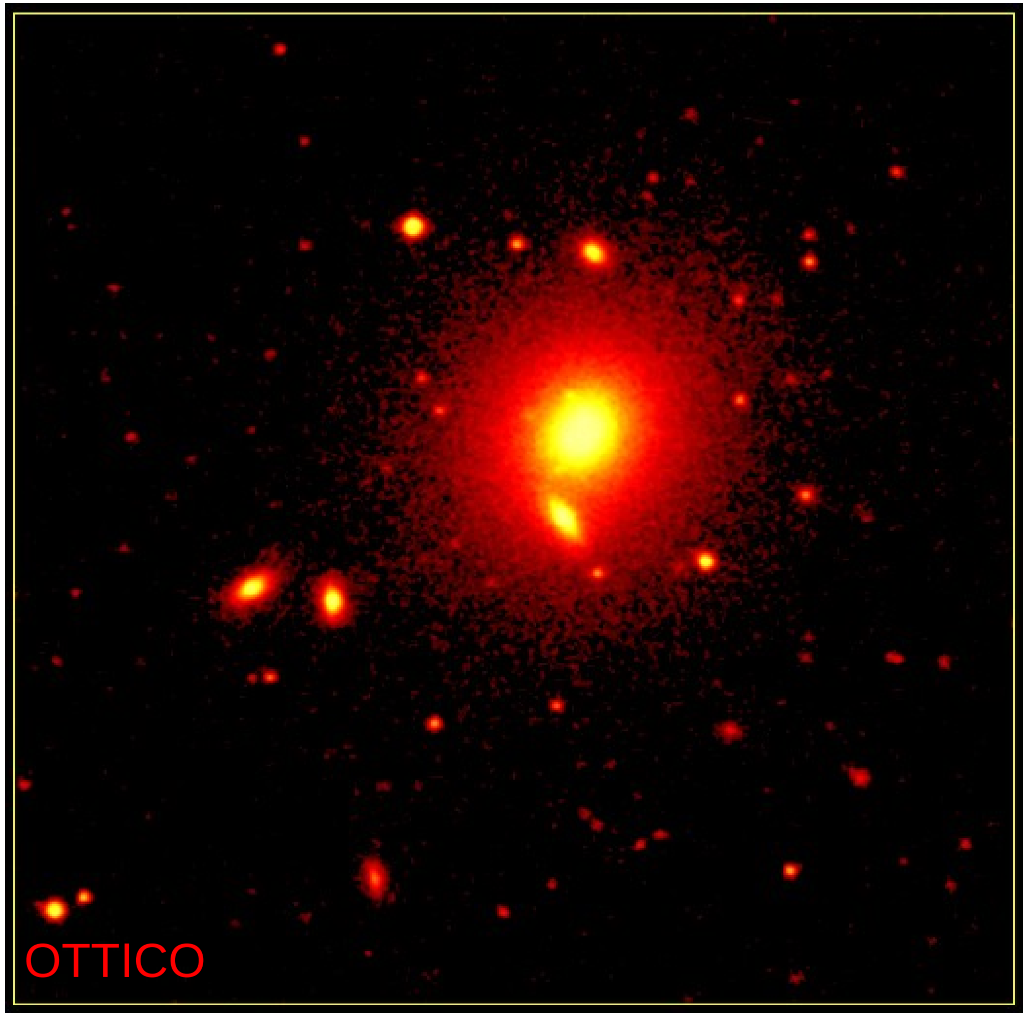
Spiral Galaxy

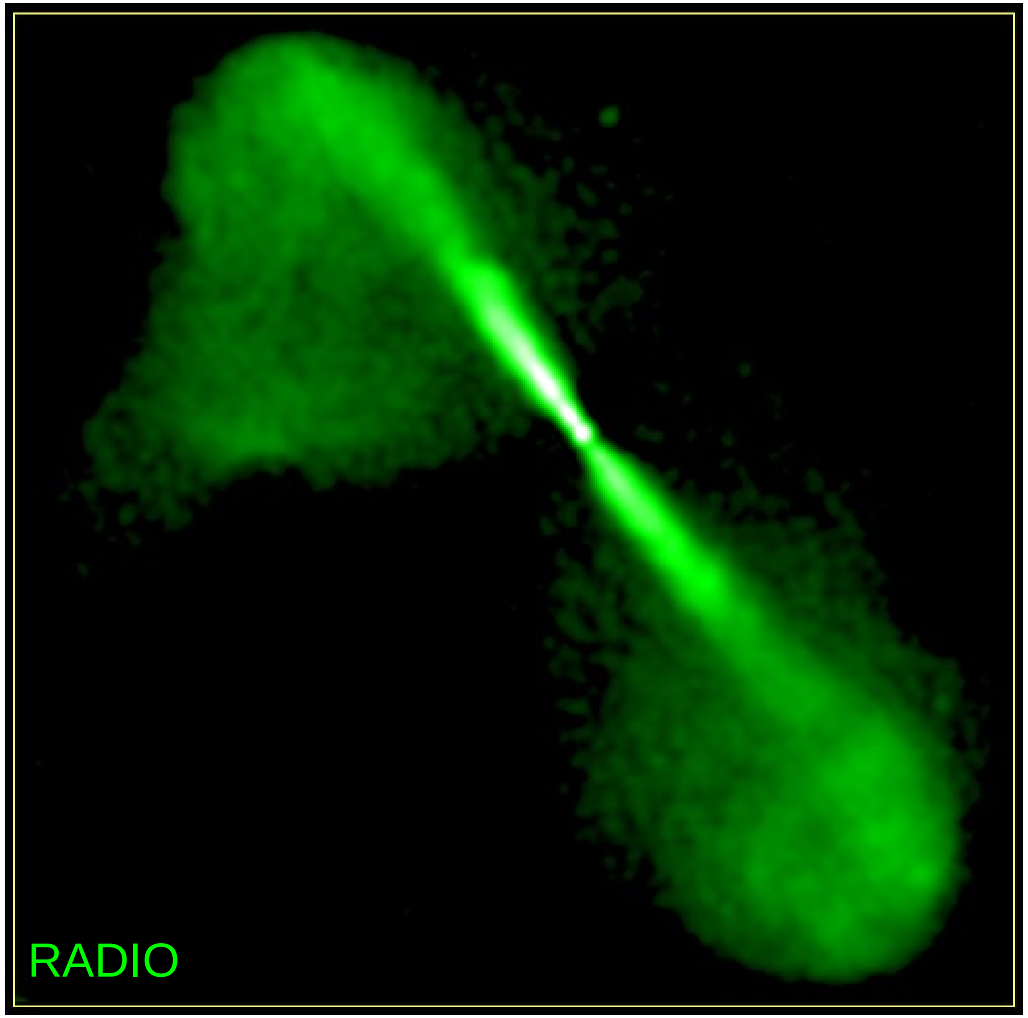
Explore the Universe with Radio Waves



Spiral Galaxy

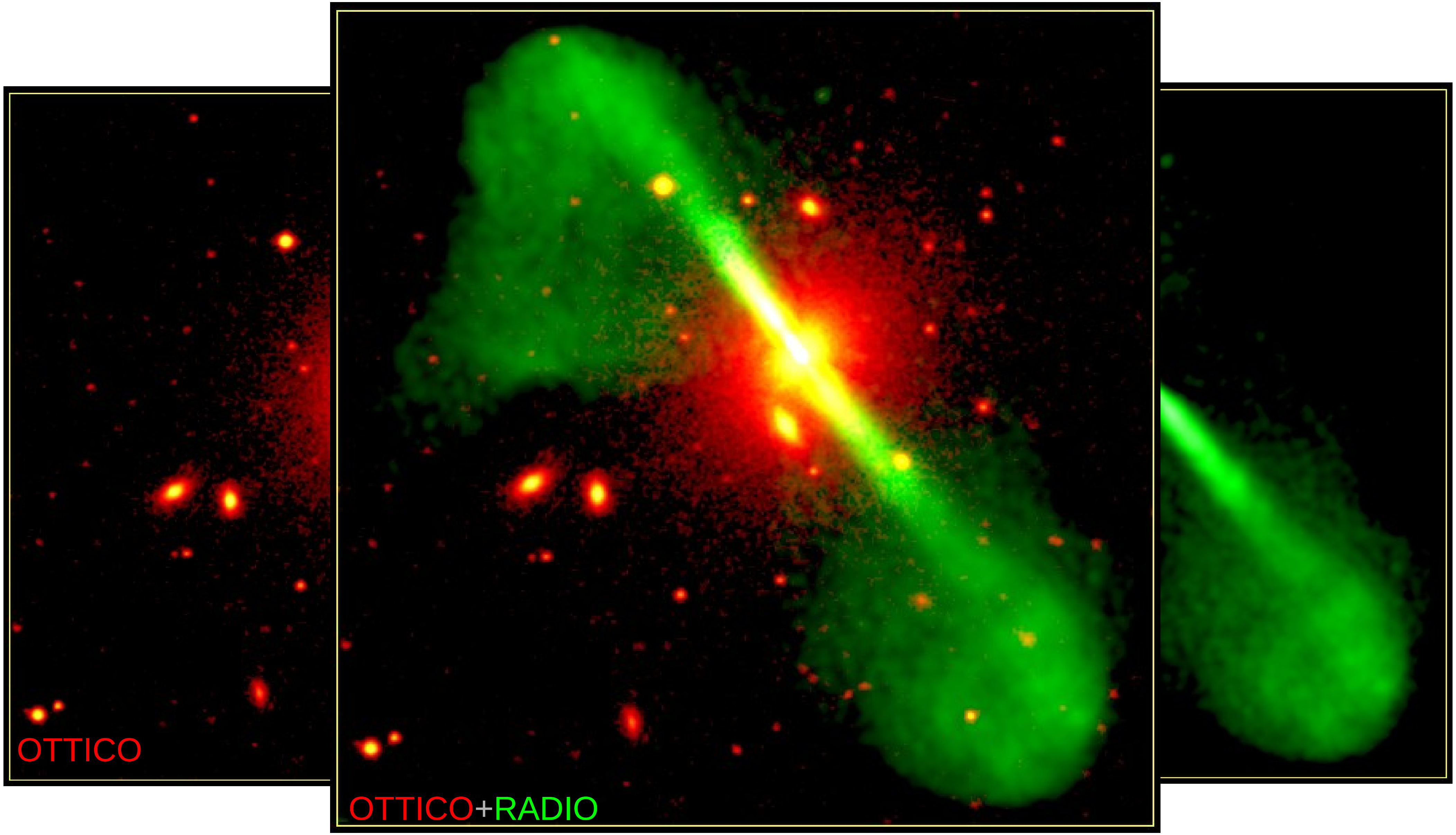
Explore the Universe with Radio Waves





Elliptical Galaxy

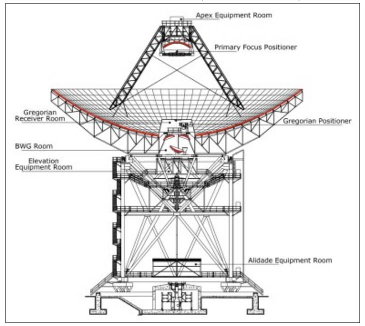
Explore the Universe with Radio Waves



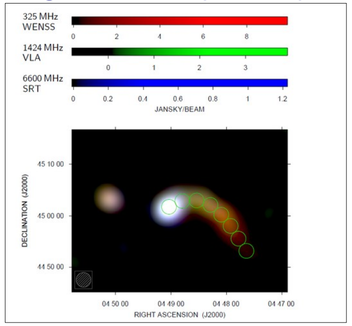
Elliptical Galaxy

SRT - Timeline

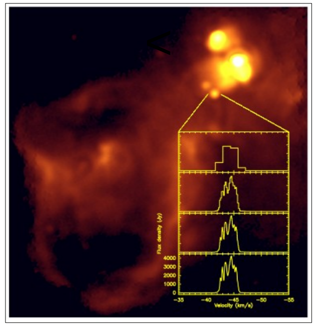
Bolli et al. (2015)



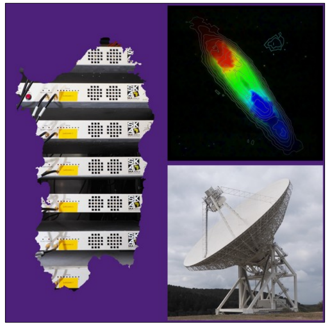
Murgia et al. (2016)



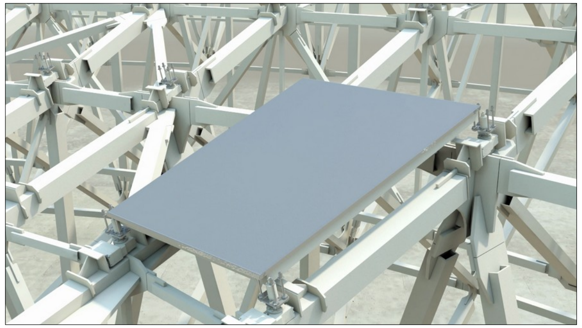
Prandoni et al. (2017)



Melis et al. (2018)



CONSTRUCTION	TECHNICAL COMMISSIONING	SCIENTIFIC VALIDATION
2006	2011	2013 – 2016



UNIONE EUROPEA
Fondo Sociale Europeo
Fondo Europeo di Sviluppo Regionale

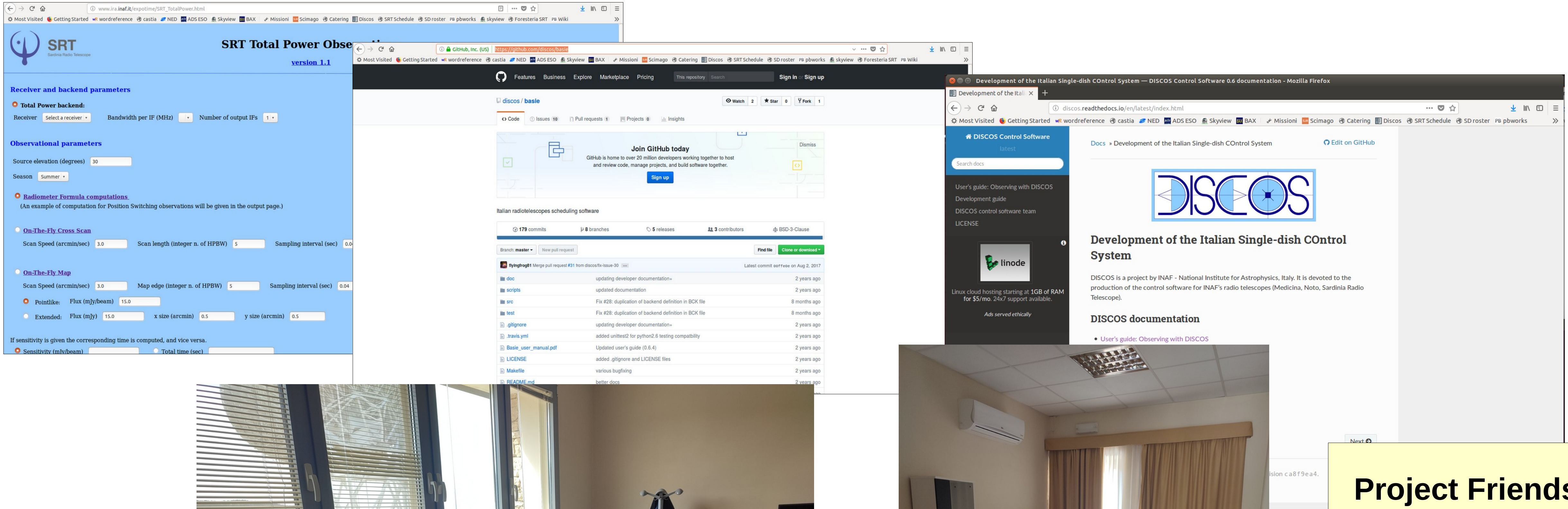
Ministero dell'Istruzione, dell'Università e della Ricerca

PON RICERCA E INNOVAZIONE

INAF ISTITUTO NAZIONALE DI ASTROFISICA
NATIONAL INSTITUTE FOR ASTROPHYSICS

EARLY SCIENCE	ACTIVE SURFACE NEW BUILDINGS	SCIENCE	PON-SRT UPGRADE	SCIENCE
2016	2017 – 2018	2019 – 2020 – 2021	2022 – 2023	2024 – 2025

SRT - Site



Project Friends Team

SRT Control Room

SRT Guest House

SRT Science (VLBI and Single-dish mode)

Gravitational Wave detection

Electromagnetic counterpart of Gravitational Waves

Star forming regions

Pulsars and Compact Objects

Fast Radio Burst and the Transient Sky

X-ray binaries

Supernova Remnants

Radio Galaxies and Active Galactic Nuclei

Spiral Galaxies (Spectral Energy Distribution, AME)

Diffuse emission in galaxy clusters and in the Cosmic Web

Maser emission (galactic and extragalactic)

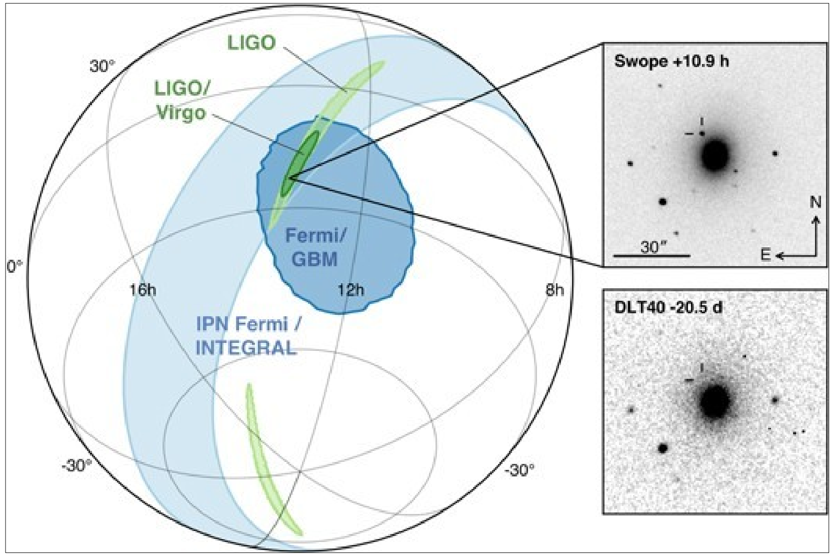
Solar Weather

Microquasars

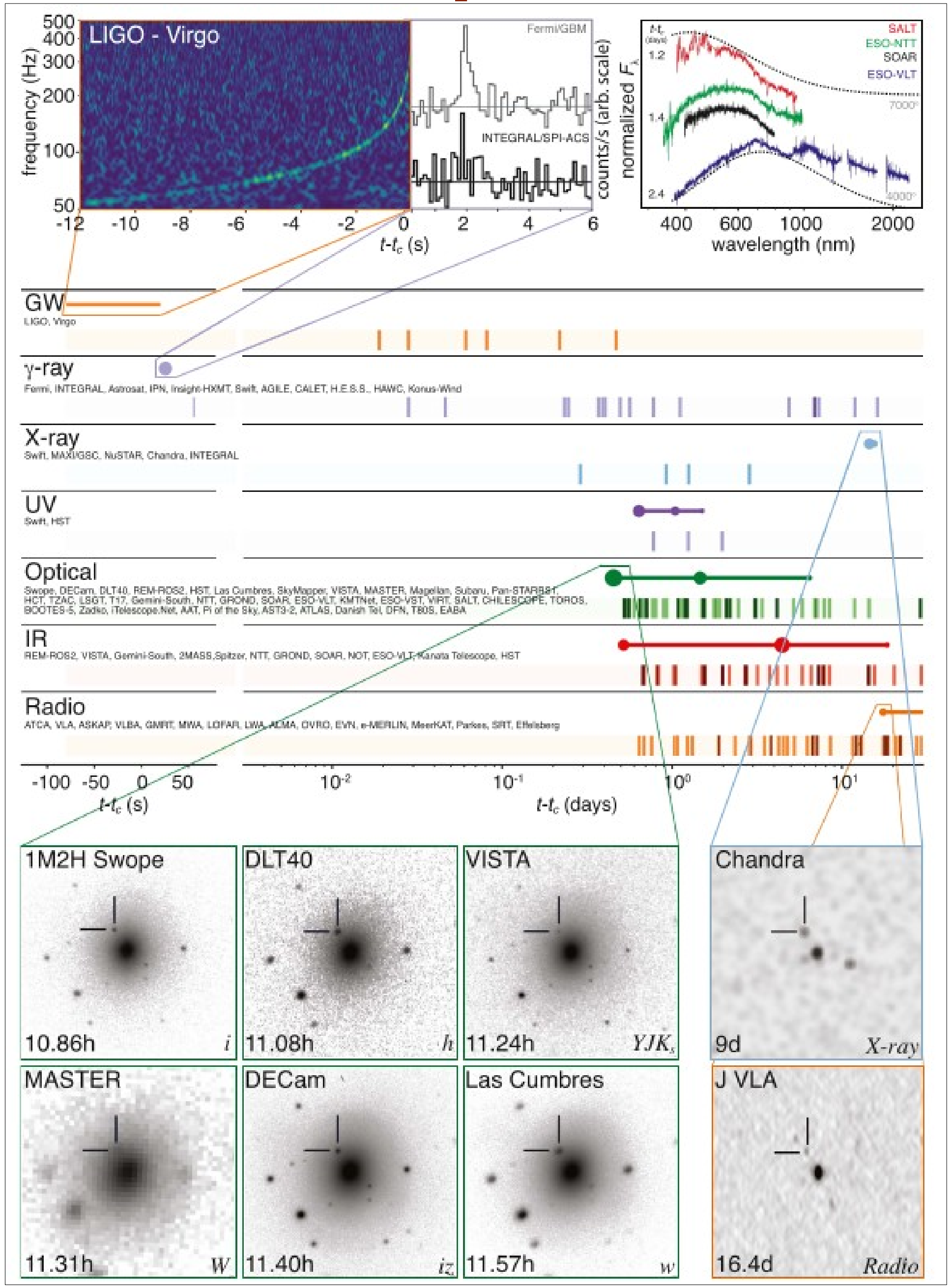
SETI

SRT in Synergy with the Einstein Telescope

Electromagnetic counterpart of Gravitational Waves



SRT Follow-up observations
(7-19 Sept. 2017)
Frequency **7.2 GHz**
Flux < 1.2 - 1.8 mJy

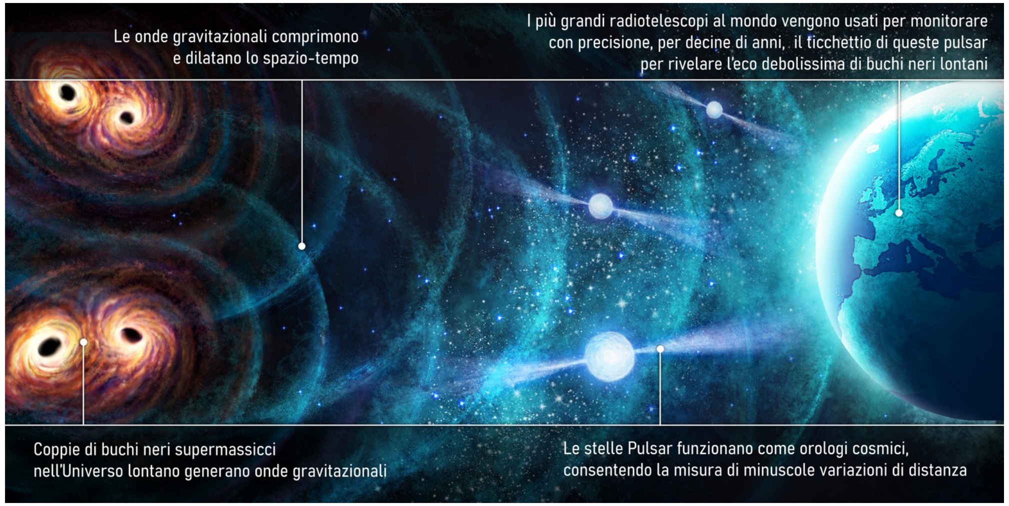


Multi-messenger observations of a binary neutron star merger
Abbott et al. (2017, ApJL)

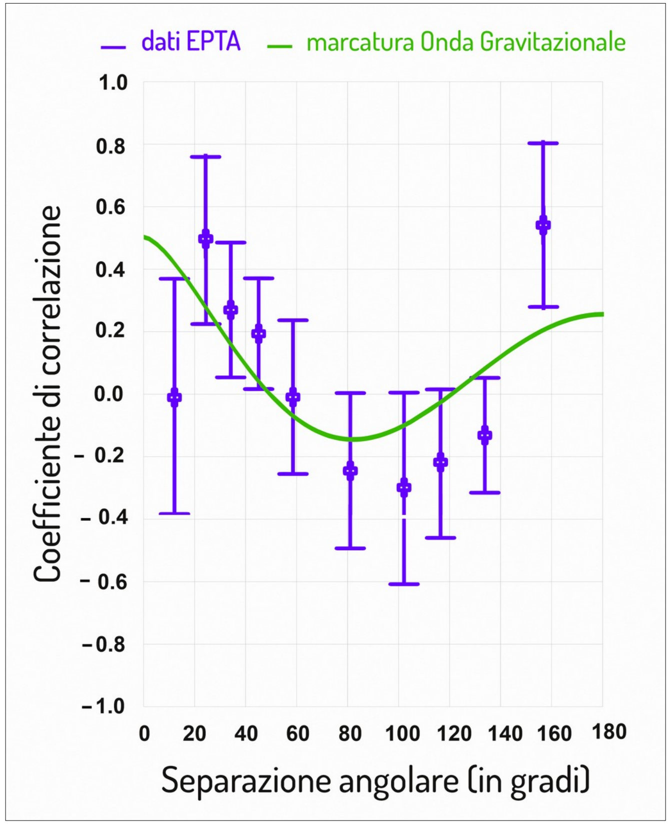
SRT in Complementarity with the Einstein Telescope

Gravitational Wave detection

The European Pulsar Timing Array (EPTA)

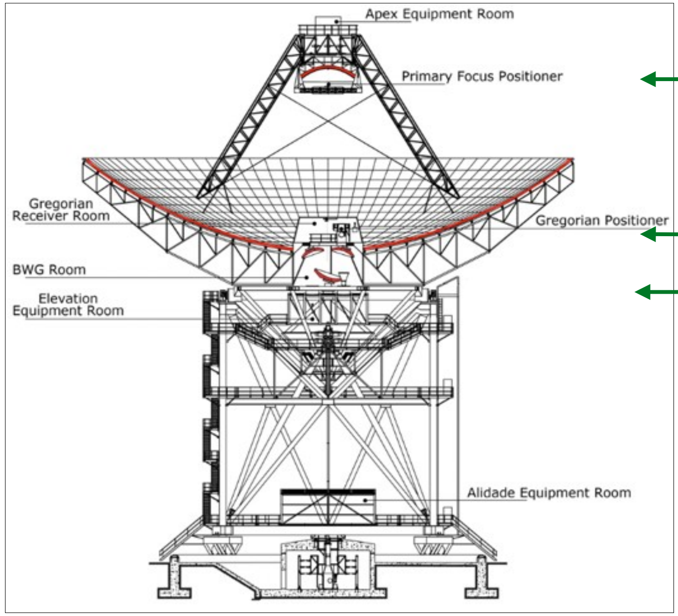


SRT
Effelsberg
Jodrell Bank
Nancay
WSRT



II data release from EPTA I. The dataset and timing analysis (**EPTA coll.; A&A 2023)**
II data release from EPTA II. Customised pulsar noise models for spatially correlated GW (**EPTA coll.; A&A 2023)**
II data release from EPTA III. Search for GW signals (**EPTA coll.; A&A 2023)**
II data release from EPTA: Search for continuous GW signals (**Falxa et al.; MNRAS 2023)**
II data release from EPTA: Challenging the ultralight dark matter paradigm **(Smarra et al. 2023; PhRevLet)**

SRT Receivers



P-band
L-band

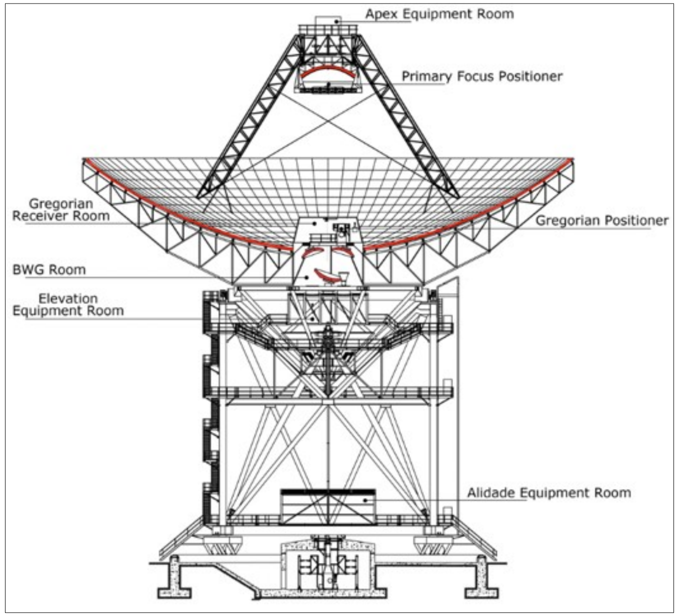
K-band

Chigh-band

AVAILABLE RECEIVERS (FIRST LIGHT)
UNDER CONSTRUCTION

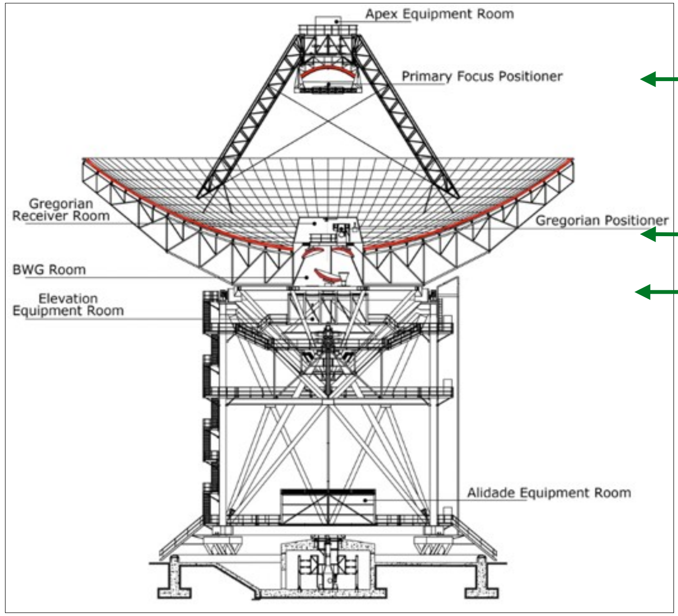
2016-2019

P-band 305-425 MHz	**L-band** 1.3-1.8 GHz			**Chigh-band** 5.7-7.7 GHz	**K-band** multibeam 18-26.5 GHz	**Frequency**
		S-band 3.0-4.5 GHz	**Clow-band** 4.2-5.6 GHz			


Apex Equipment Room
Primary Focus Positioner
Gregorian Receiver Room
Gregorian Positioner
BWG Room
Elevation Equipment Room
Alidade Equipment Room


2016-2019

SRT Receivers



P-band
L-band

K-band

Chigh-band

AVAILABLE RECEIVERS
UNDER CONSTRUCTION
PON RECEIVERS AVAILABLE
UNDER COMMISSIONING

TODAY

Tri-band K/Q/W
VLBI (SRT, Medicina, Noto)
18-26, 35-50, 86-116 GHz

Millimeter Camera
80-116 GHz

Frequency

P-band
305-425 MHz

L-band
1.3-1.8 GHz

S-band
3.0-4.5 GHz

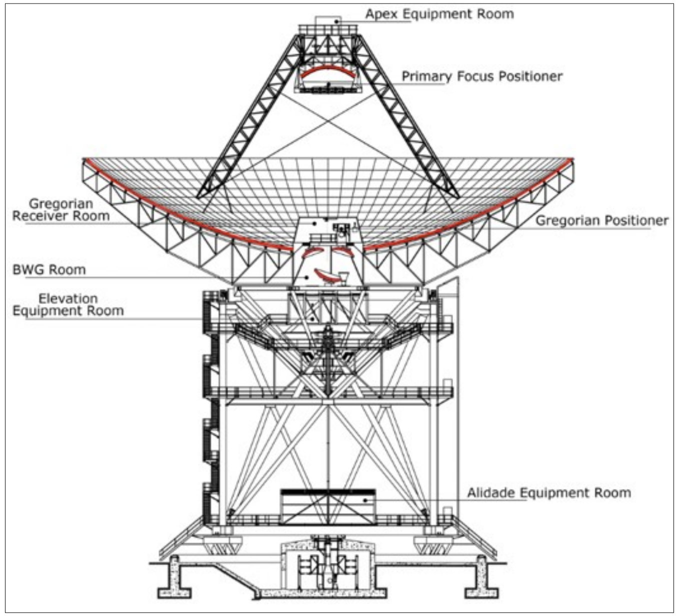
Clow-band
4.2-5.6 GHz

Chigh-band
5.7-7.7 GHz

K-band multibeam
18-26.5 GHz

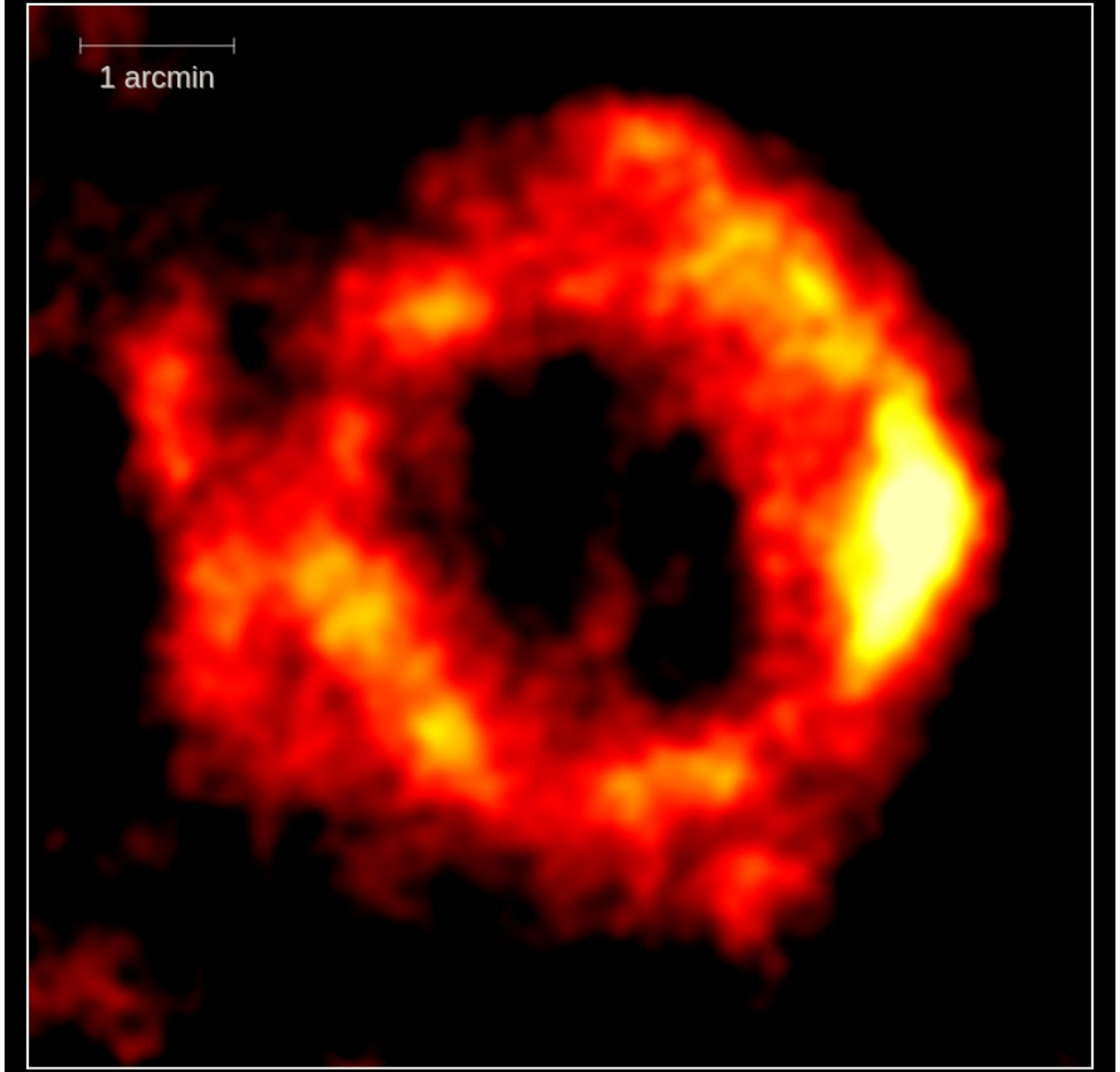
Q-band
multibeam
33-50 GHz

W-band
multibeam
75-116 GHz

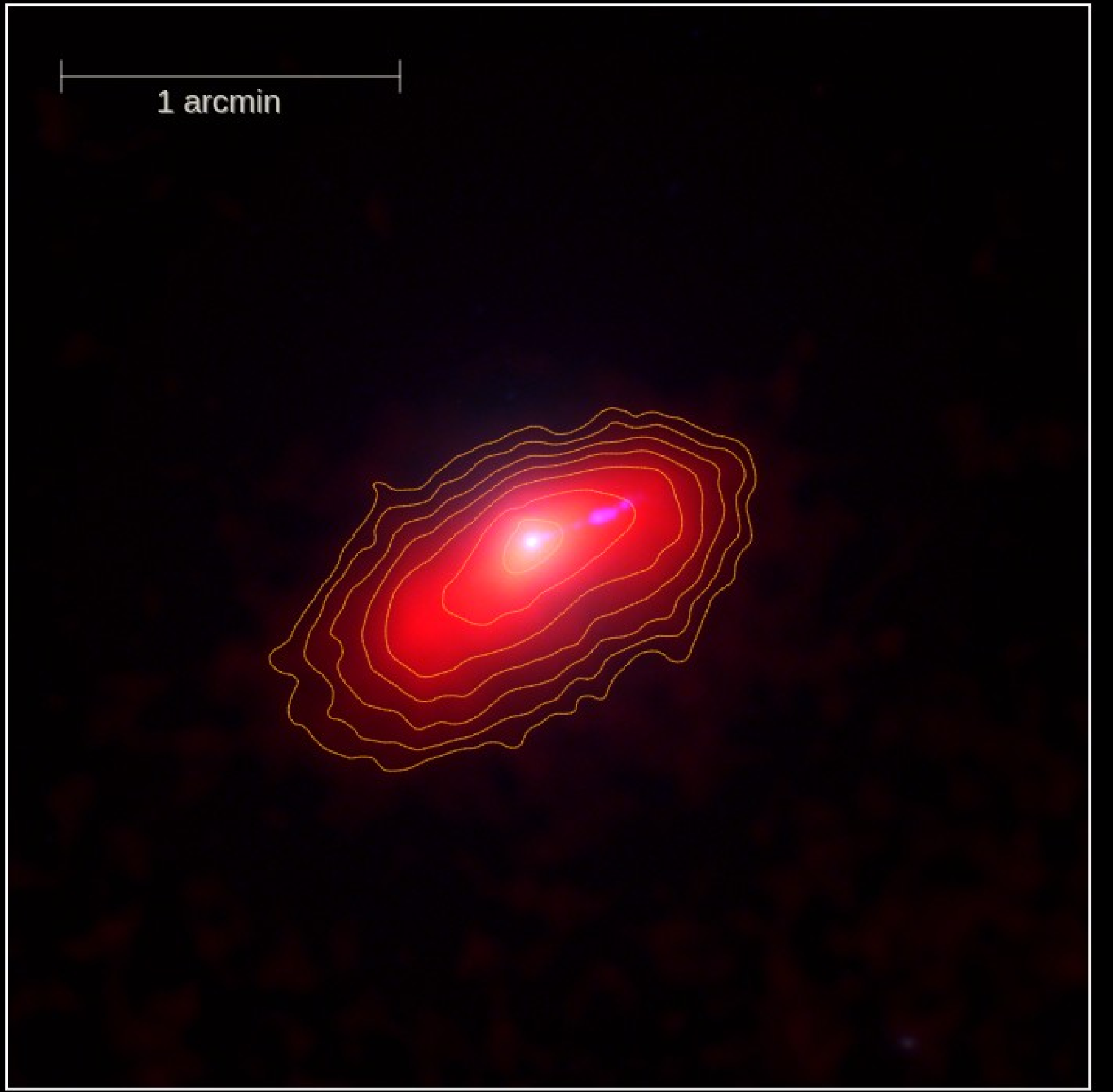

Apex Equipment Room
Primary Focus Positioner
Gregorian Receiver Room
Gregorian Positioner
BWG Room
Elevation Equipment Room
Alidade Equipment Room

TODAY

SRT at High Radio Frequencies

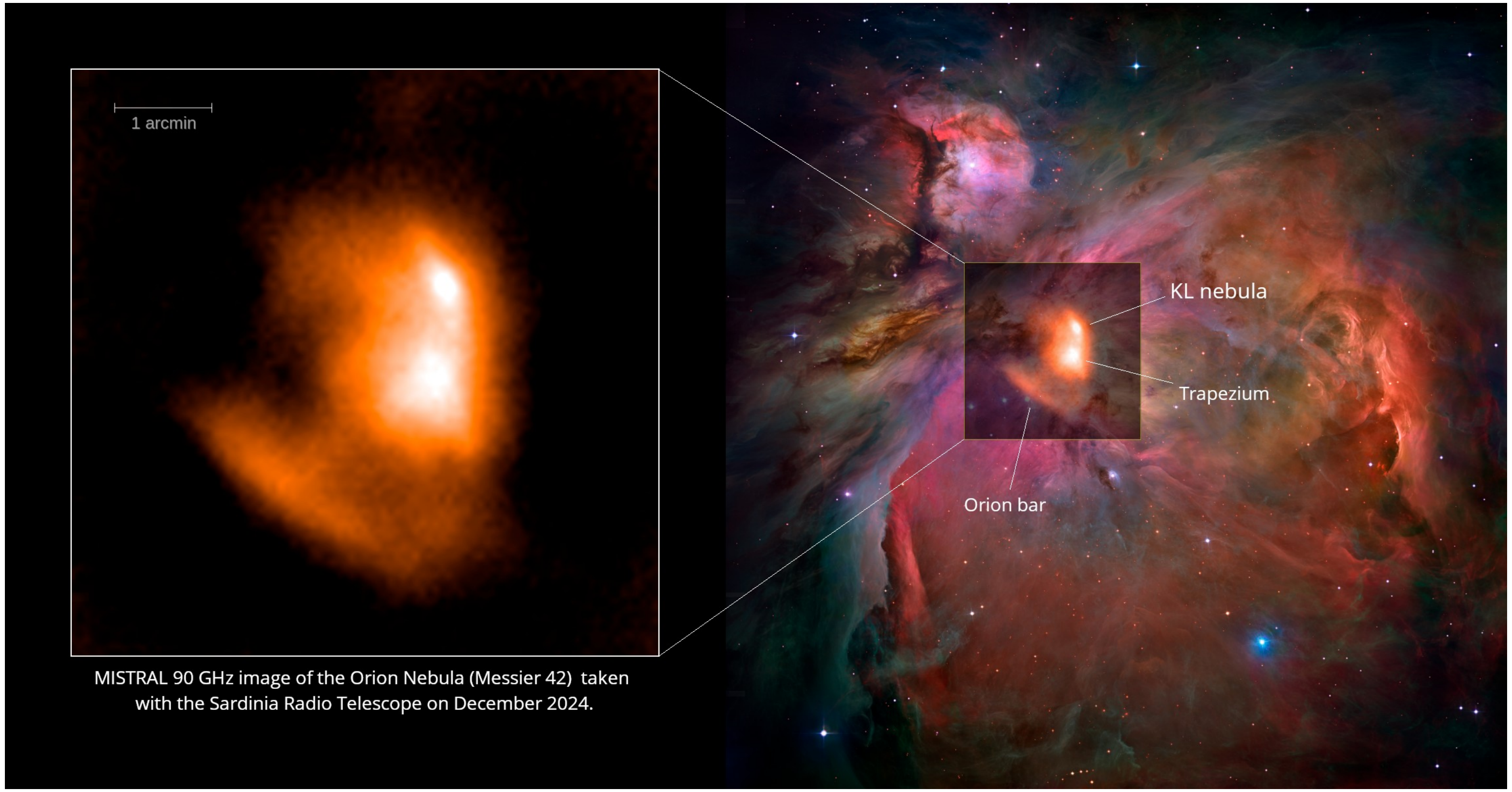


MISTRAL 90 GHz image of the supernova remnant Cas-A taken with the Sardinia Radio Telescope on April 2025.



MISTRAL 90 GHz image of Virgo-A (M87) taken with the Sardinia Radio Telescope on February 2025.

SRT at High Radio Frequencies



MISTRAL 90 GHz image of the Orion Nebula (Messier 42) taken with the Sardinia Radio Telescope on December 2024.