

# Yebes RT40m: a radiotelescope in a village of La Mancha (or almost)

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The Yebes 40-meter radiotelescope is operated by the Yebes Observatory (Yebes, Guadalajara), a Singular Scientific-Technical Infrastructure (ICTS) belonging to the Instituto Geográfico Nacional (IGN). Its observing frequencies range from 2 to 90 GHz, and it routinely operates both in single-dish mode, and as part of Very Large Baseline Interferometry (VLBI) networks such as the European VLBI Network (EVN) and the Global Millimeter VLBA Array (GMVA). Competitive access to the radiotelescope is offered to the whole scientific community through semestral Call for Proposals, as well as through Director's Discretionary Time proposals. This presentation covers the current characteristics of the 40m radiotelescope, focusing on almost unexploited niches, the scientific return it has already provided, and how to access observing time with this facility.

# The RT40m, an overview

The RT40m is a 40m diameter radiotelescope located in Yebes, Guadalajara (Spain), at 40°31'31"N 3°05'19"O, 931m above sea level.

It routinely performs VLBI observations under the European VLBI Network (EVN) and Global Millimeter VLBI Array (GMVA), as well as other VLBI and single-dish observations open to the scientific community.



## Currently available observing frequencies and bandwidths

Band	Frequency range	Single-dish Bandwidth	Spectral Resolution	Spatial resolution
C	4.9-5.4 & 6.1-6.6 GHz	500 MHz	30 KHz	~260''
X	8.1 - 8.9 GHz	500 MHz	30 KHz	~180''
K	21 - 25 GHz	500 MHz	30 KHz	~80''
Q	31.3 - 50.6 GHz	18.5 GHz	38 KHz	~40''
W	72 - 90 GHz	18.5 GHz	38 KHz	~20''

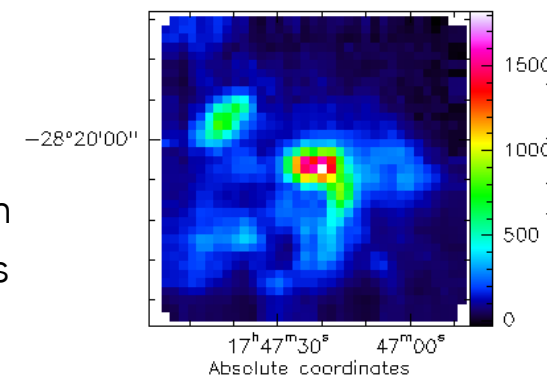
**Receptors from NANOCOSMOS ERC project, (almost) unique features in telescopes of this kind!**

# The RT40m, an overview



## Currently available observing modes

- Position switching
- Frequency switching
- On-the-fly mapping in Q (31.3 - 50.6 GHz) and W (72 - 90 GHz), in
  - Total power continuum mode across up to 8x2.5 GHz windows
  - Spectral mode across 2.5 GHz



# Many already published results

~90 refereed papers and non-refereed contributions published in the period 2017-2020 June

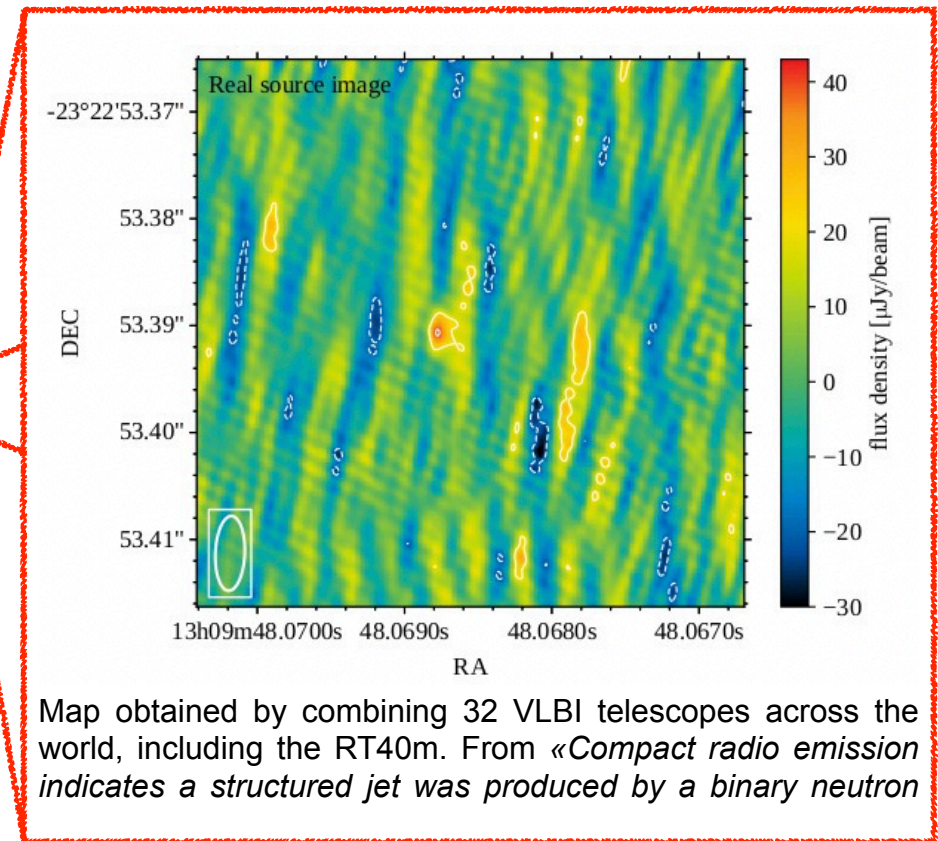
- Proposals
- EVN proposals
- GMVA proposals
- 40m radiotelescope
- Observations
- Time estimator
- RAYO
- Approved proposals
- Publications

## Papers using data from the 40m Radiotelescope

Year:  When observations span several years, "Obs. Year" corresponds to the last one

### Refereed Papers

Proposal ID	Obs. Year	Pub. Year	Journal	Type	1st Author	Title
MB007	2017	2019	ApJ	VLBI (GMVA)	Issaoun	<a href="#">The Size, Shape, and Scattering of Sagittarius A* at 86 GHz: First VLBI with ALMA</a>
EY024A	2016	2019	MNRAS	VLBI (EVN)	Yang	<a href="#">A radio structure resolved at the decaparsec scale in the radio-quiet quasar PDS 456 with an extremely powerful X-ray outflow</a>
EC061	2017	2019	MNRAS	VLBI (EVN)	Cao	<a href="#">The loud and the quiet: searching for radio counterparts of two radio-weak BL Lac candidates with VLBI</a>
	2011	2019	A&A	VLBI (GMVA)	Nair	<a href="#">Global millimeter VLBI array survey of ultracompact extragalactic radio sources at 86 GHz</a>
	2017	2019	A&A	VLBI (GMVA)	Casadio	<a href="#">The magnetic field structure in CTA 102 from high-resolution mm-VLBI observations during the flaring state in 2016-2017</a>
	2015	2019	A&A	VLBI (GMVA)	Kim	<a href="#">Spatially resolved origin of millimeter-wave linear polarization in the nuclear region of 3C 84</a>
	2018	2019	Journal of the Korean Astronomical Society	VLBI	Zhao	<a href="#">Source-frequency phase-referencing observation of AGNs with KaVA using simultaneous dual-frequency receiving</a>
EP104	2017	2019	ApJ	VLBI (EVN)	Perger	<a href="#">Is There a Blazar Nested in the Core of the Radio Galaxy 3C 411?</a>
GG084 RG009 EP105	2018	2019	Science	VLBI (EVN)	Ghirlanda	<a href="#">Compact radio emission indicates a structured jet was produced by a binary neutron star merger</a>
18A010	2018	2019	A&A	SINGLE-DISH	Fuente	<a href="#">Gas phase Elemental abundances in Molecular clouds (GEMS)</a>
2016.1.01116.V 2016.1.00413.V 2016.1.01216.V 2016.1.01114.V 2016.1.01154.V 2016.1.01176.V 2016.1.01404.V 2016.1.01290.V 2016.1.01198.V	2017	2019	Publications of the Astronomical Society of the Pacific	VLBI (GMVA)	Goddi	<a href="#">Calibration of ALMA as a Phased Array. ALMA Observations During the 2017 VLBI Campaign</a>
EC047	2015	2019	A&A	VLBI (EVN)	Castangia	<a href="#">Water masers in Compton-thick AGN</a>
18A006 18B005	2018	2019	A&A	SINGLE-DISH	Cabezas	<a href="#">The millimeter-wave spectrum and astronomical search of succinonitrile and its vibrational excited states</a>
MB007	2017	2019	ApJ	VLBI (GMVA)	Blackburn	<a href="#">EHT-HOPS Pipeline for Millimeter VLBI Data Reduction</a>
RM010	2017	2019	MNRAS	VLBI (EVN)	Paice	<a href="#">Puzzling blue dips in the black hole candidate Swift J1357.2 - 0933, from ULTRACAM, SALT, ATCA, Swift, and NuSTAR</a>
19A010	2019	2019	A&A	SINGLE-DISH	Cernicharo	<a href="#">Discovery of two new magnesium-bearing species in IRC+10216: MgC3N and MgC4H</a>
EM101A EM101B EM101C EM101D EM101E	2013	2019	MNRAS	VLBI (EVN)	Atri	<a href="#">Potential kick velocity distribution of black hole X-ray binaries and implications for natal kicks</a>
GL015 GL021 GL026 GD017A GD017B GD021A GC028 GC031A GC031B GC031C	2014	2019	A&A	VLBI (EVN)	Varenius	<a href="#">The population of SNe/SNRs in the starburst galaxy Arp 220</a>





# Open for observing proposals!

The Yebes Observatory is a Singular Scientific-Technical Infrastructure (ICTS) and, as such, competitive access to the RT40m is offered to the whole scientific community through semestral Call for Proposals, as well as through Director's Discretionary Time (DDT) proposals.

Anyone can apply for either SINGLE-DISH or VLBI observing time.

## Regular Call for Proposals (SINGLE-DISH and non-EVN, non-GMVA VLBI)

- Twice a year, proposal submission open ~15 May/15 June, and ~15 November/15 December
- Observations carried out by observatory staff in semesters February-July and August-January

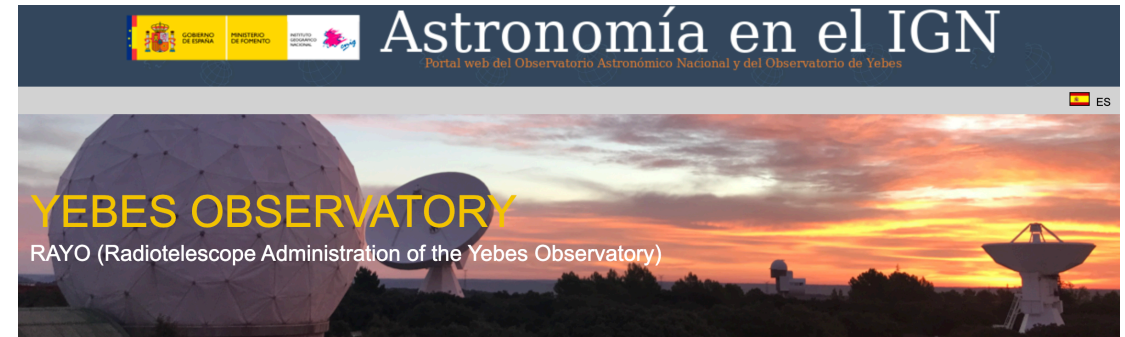
## Director's Discretionary Time Proposals

- Can be applied for at any time
- Reserved for high impact, potentially disruptive/innovative, urgent or Target-of-Opportunity projects

# How to apply for observing time

Proposal creation and data handling are coordinated through the RAYO platform

<http://rt40m.oan.es/rayo>



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**Proposal information**

Proposal ID: 20D011  
Changes are saved after pressing the "Save changes" button at the bottom-right corner.

General Information	Justification	Source Catalog	Observations	Schedules	Results	Support
<b>General information</b> Call: 20D PI: Dr. Miguel Santander García Email: m.santander@oan.es Institution: OAN Country: Spain Co-Is: Valentin Bujarrabal <v.bujarrabal@oan.es> Javier Alcolea <j.alcolea@oan.es> Dave Jones <djones@iac.es> Miguel Gomez-Garrido <m.gomezgarrido@oan.es> Title: The photodissociation region of post-common-envelope planetary nebulae Abstract (max. 1200 char): At least 20% planetary nebulae (PNe) arise from common envelope (CE) evolution, a very brief phase in which the Asymptotic Giant Branch (AGB) star engulfs a companion, whose orbit considerably shrinks, providing gravitational energy to eject the CE into an expanding PN. Although there is considerable observational proof of these events, there are no satisfactory theoretical models, as they fail to eject the large amount of mass in the envelope of the AGB star. CE evolution interrupts the AGB suddenly ejecting its envelope, therefore PNe from CE should be more massive than their single star counterparts. Telescope Total Time (h): 39.0 hours (automatically computed from the Science Goals after clicking on "Save changes") Overall scheduling constraints: Refer here any overall scheduling constraints, if any Proposal file: 20D011.pdf						

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**Create a new proposal**

PI: Dr. Miguel Santander García  
Email: m.santander@oan.es

☐ VLBI proposal (leave unchecked for single-dish)  
☐ Discretionary Director Time (DDT) (can be created at any time, if the [requirements of a DDT proposal](#) are met)

[Create new Proposal](#)

- RAYO is straightforward to use in order to make proposal submission as easy and time-saving as possible
- Several thousand hours available each year
- Oversubscription factor (still) not high, so feel free to apply if you have a good scientific project in mind!