

GTC Science Operations Status

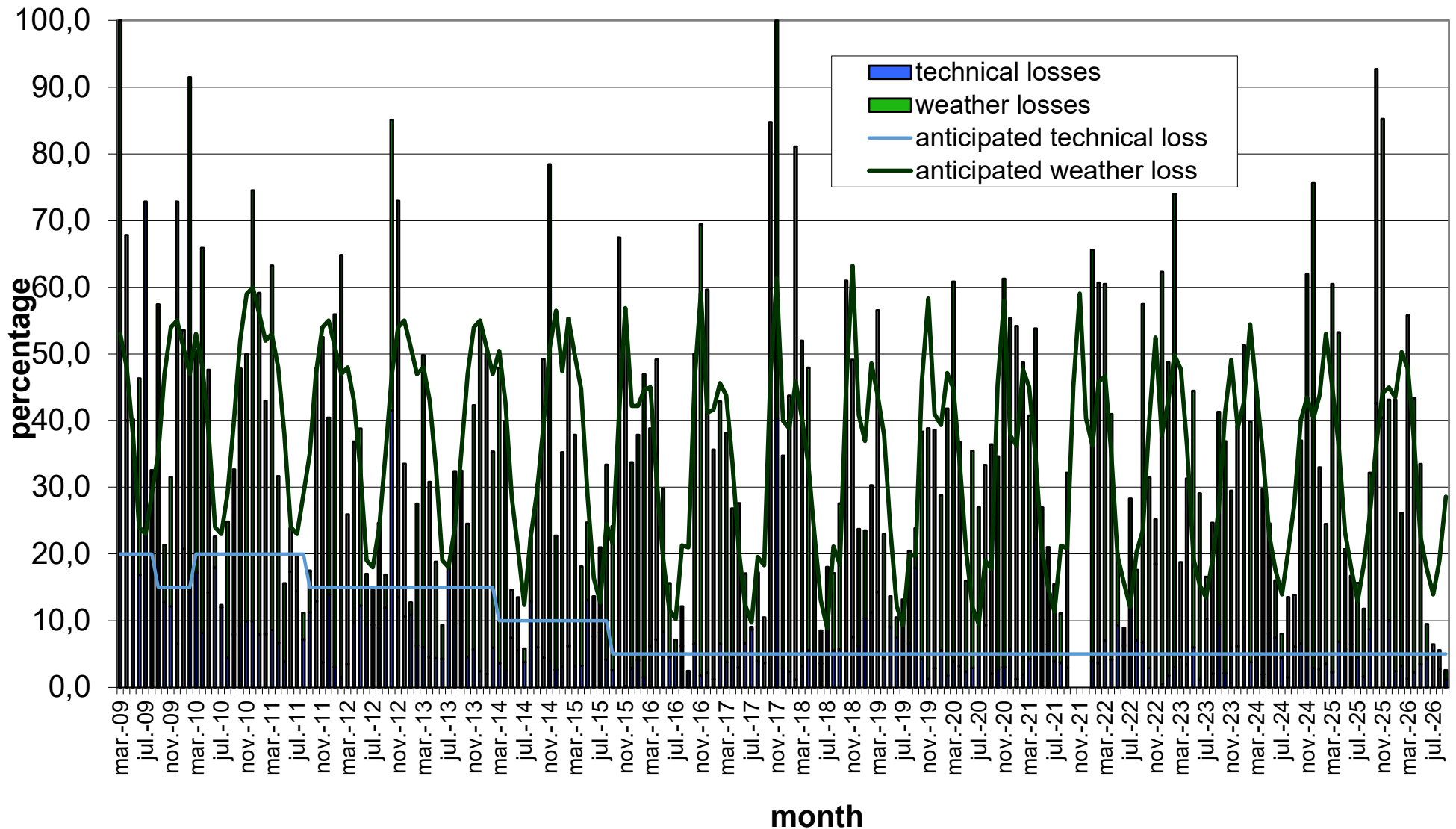
A. Cabrera-Lavers

GRANTECAN



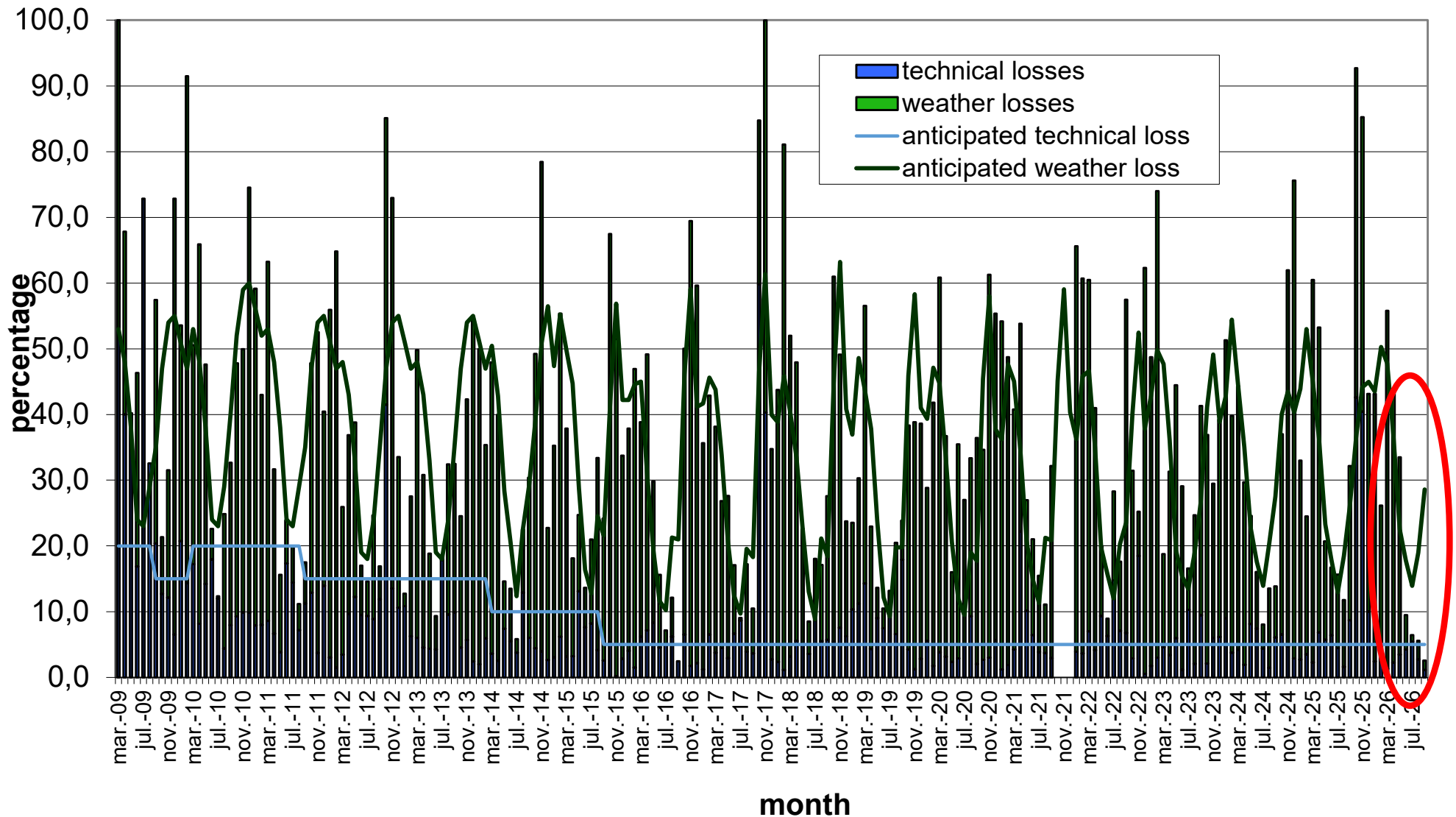
Operation statistics: down time

GTC science time losses



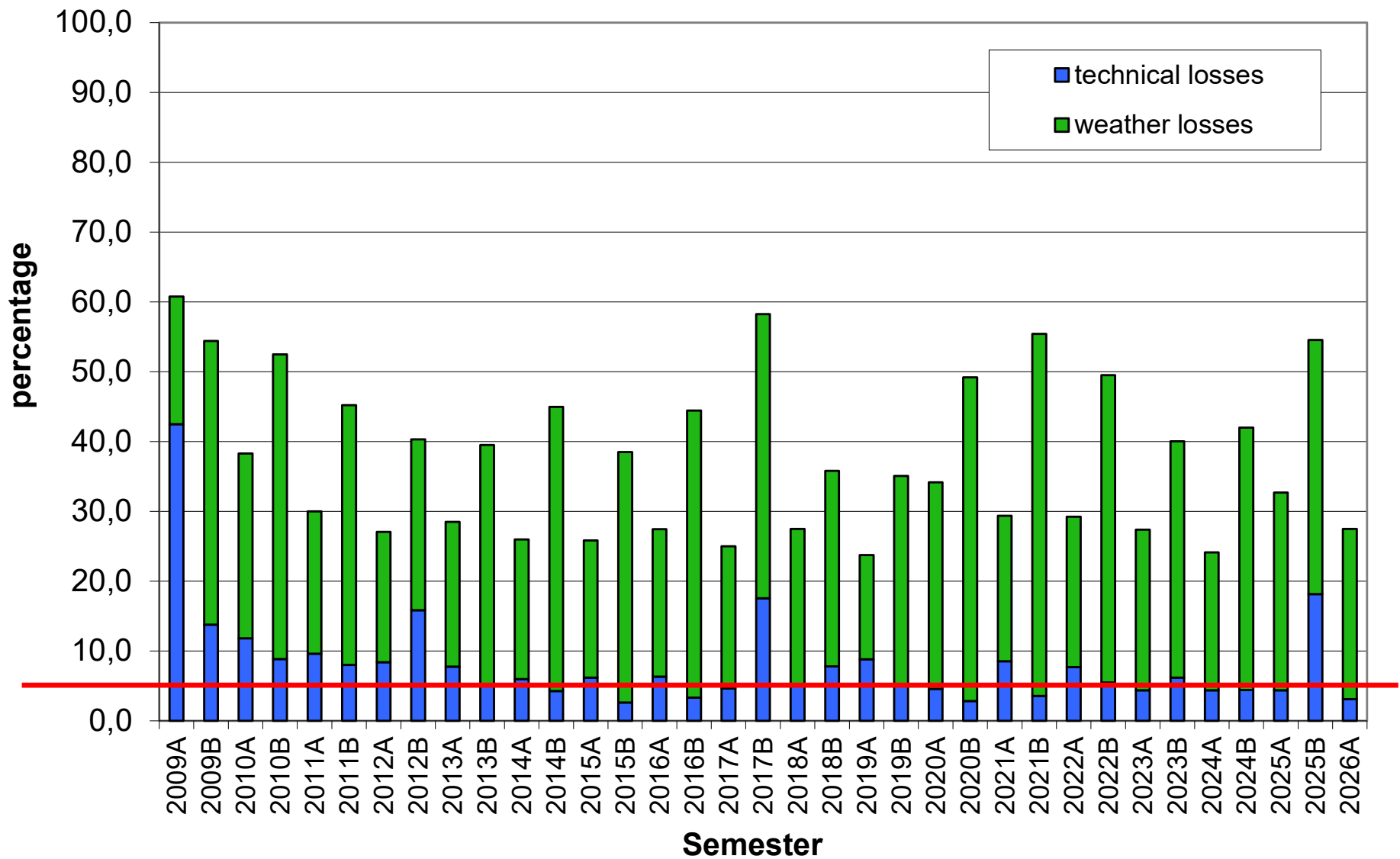
Operation statistics: down time

GTC science time losses



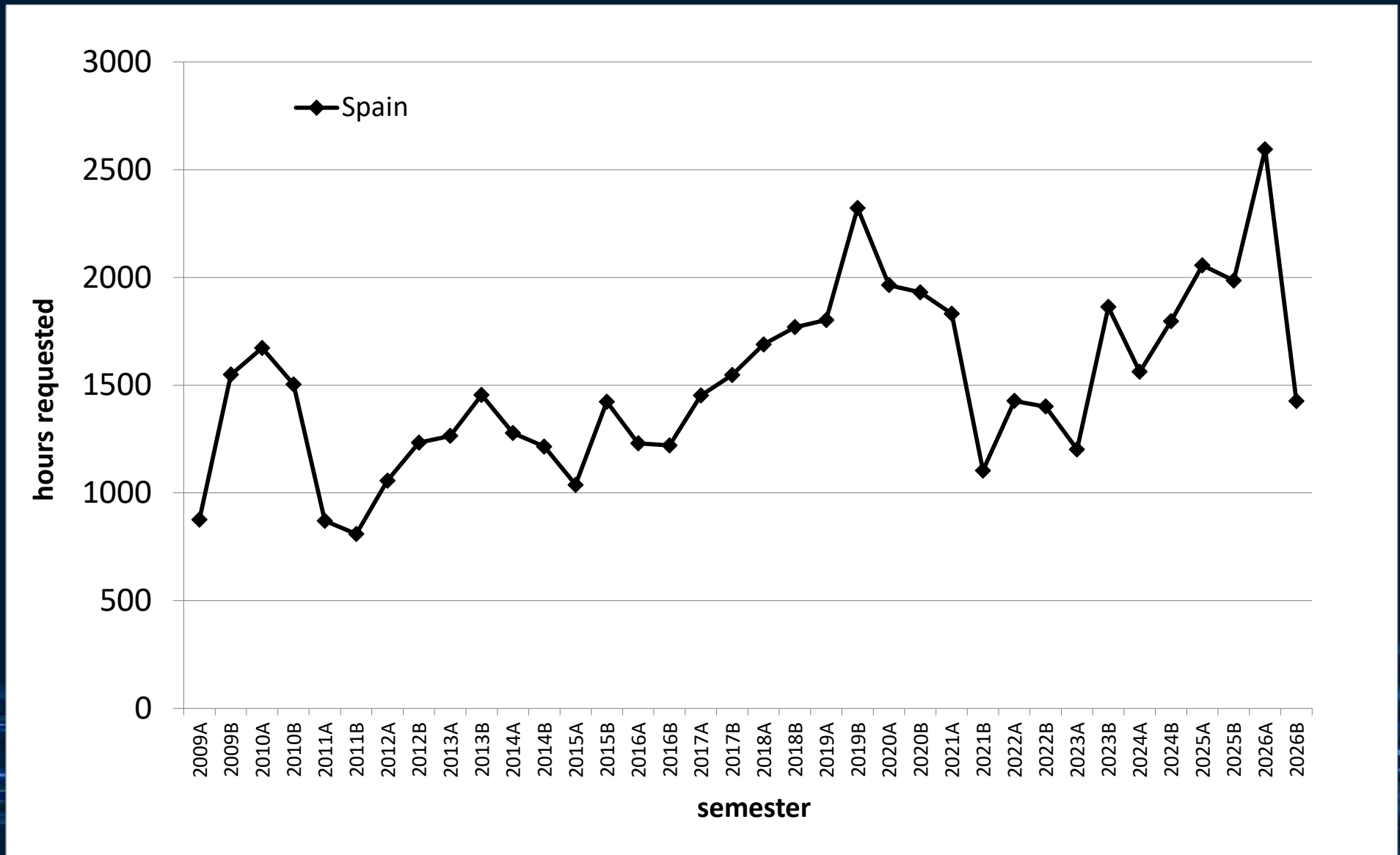
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GTC science time losses

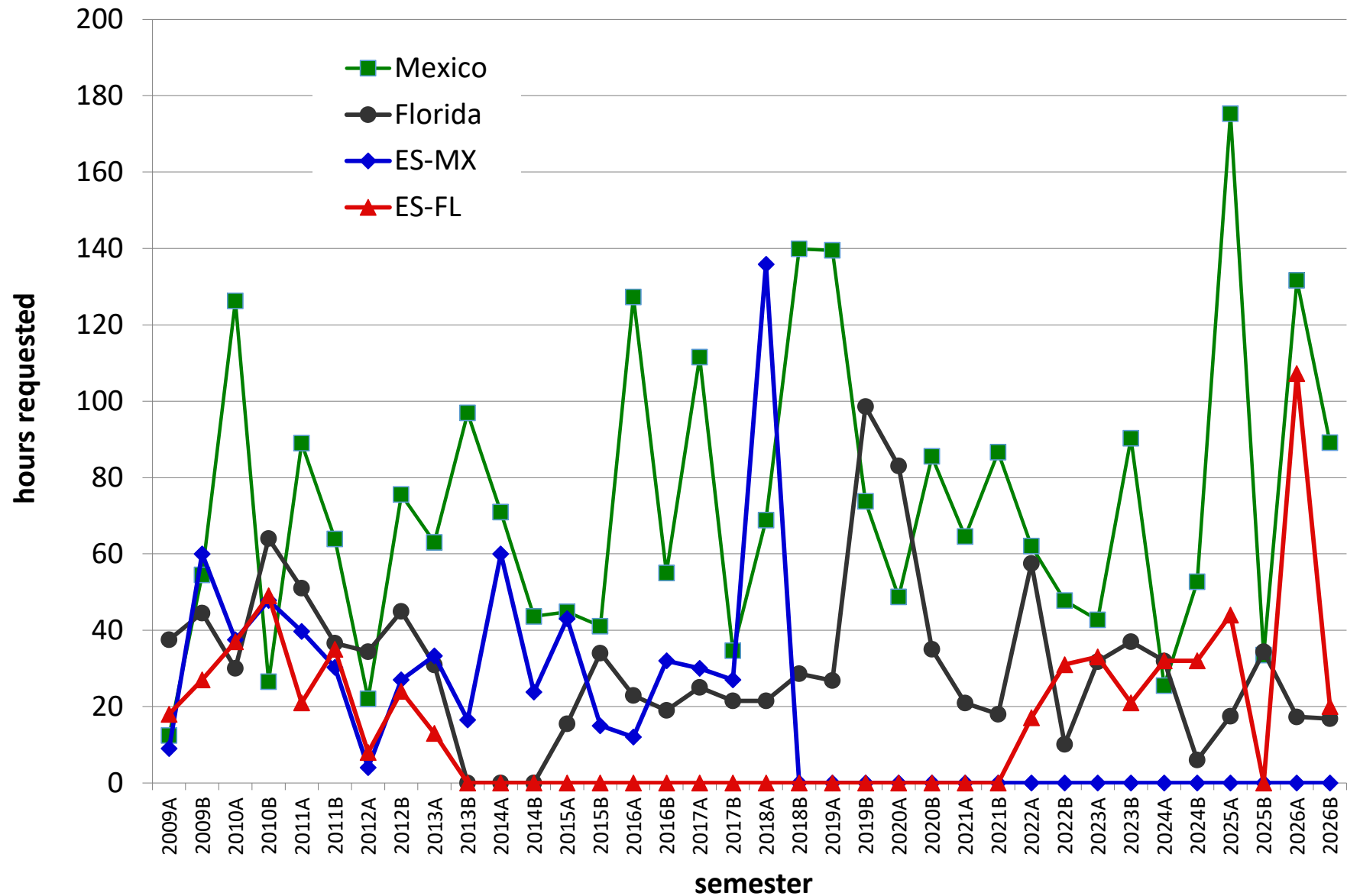


Operation statistics: Time demand

4 instruments offered for S26B

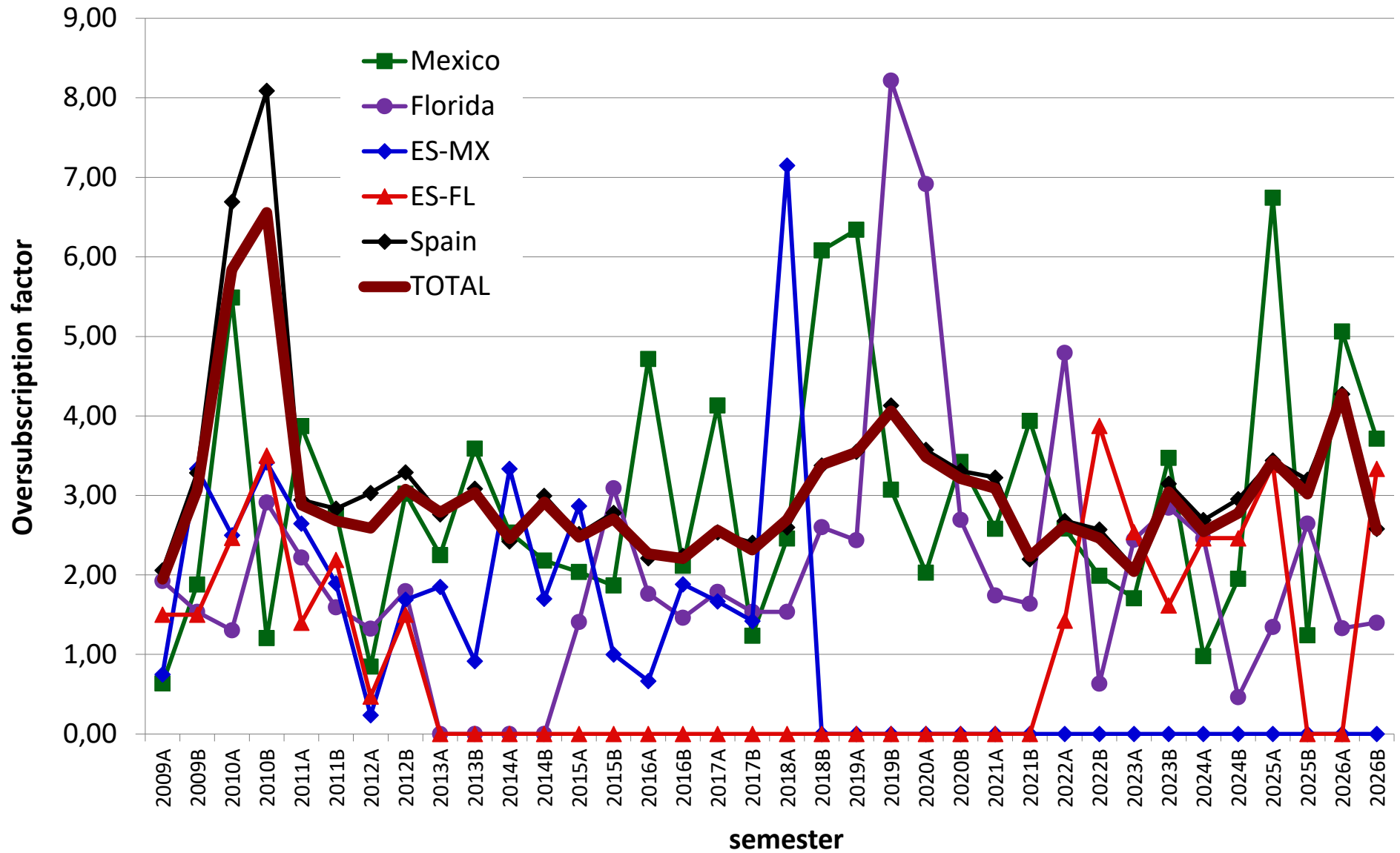


Operation statistics: Time demand



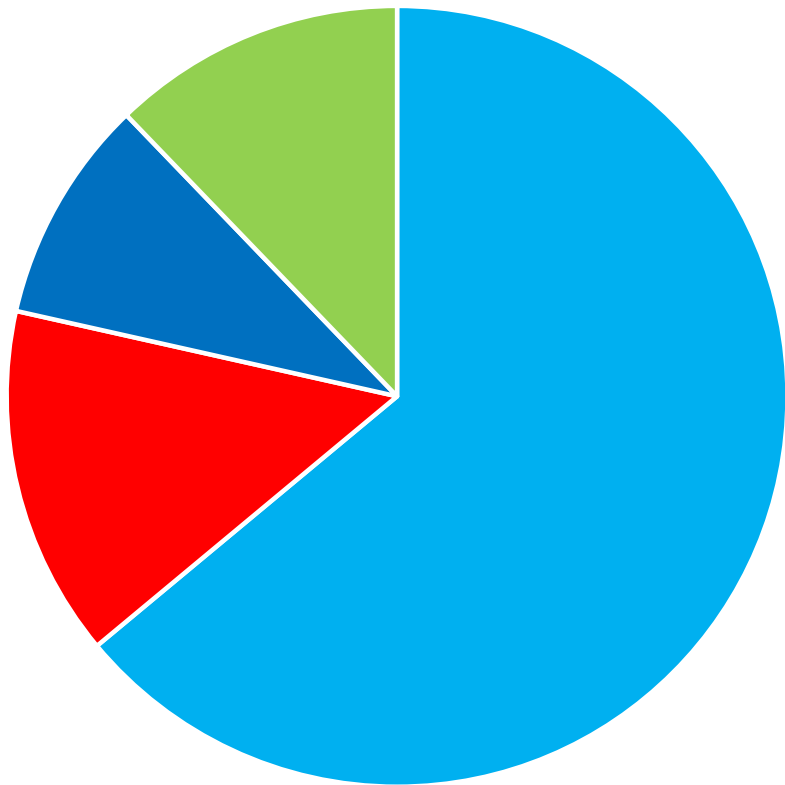
Observing proposals

Oversubscription factor 2.6



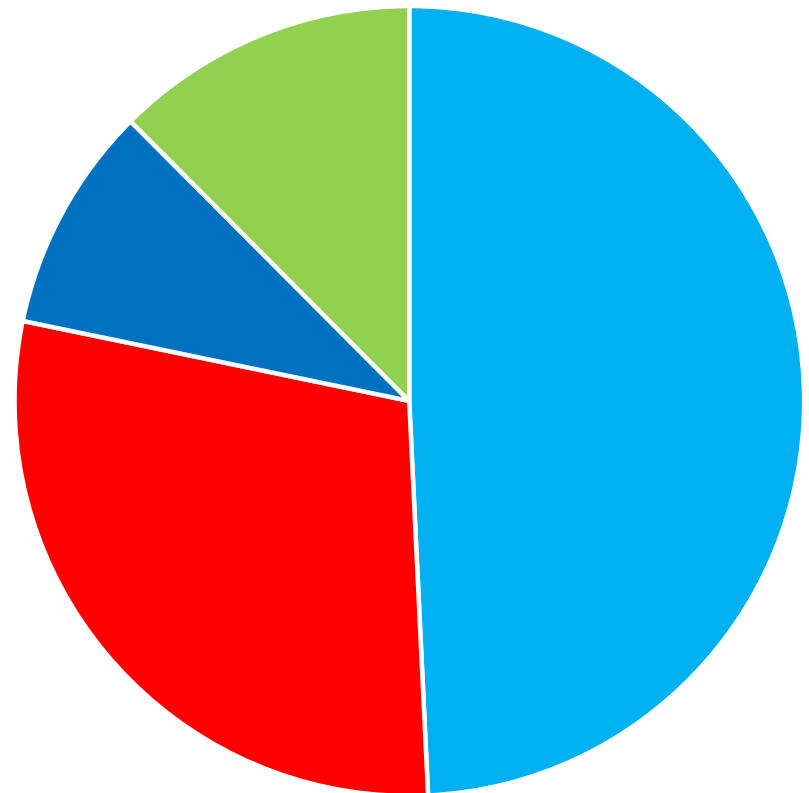
Science time requested per instrument

S26A TAC requested time



■ OSIRIS+ ■ EMIR ■ MEGARA ■ HIPERCAM

S26B TAC requested time

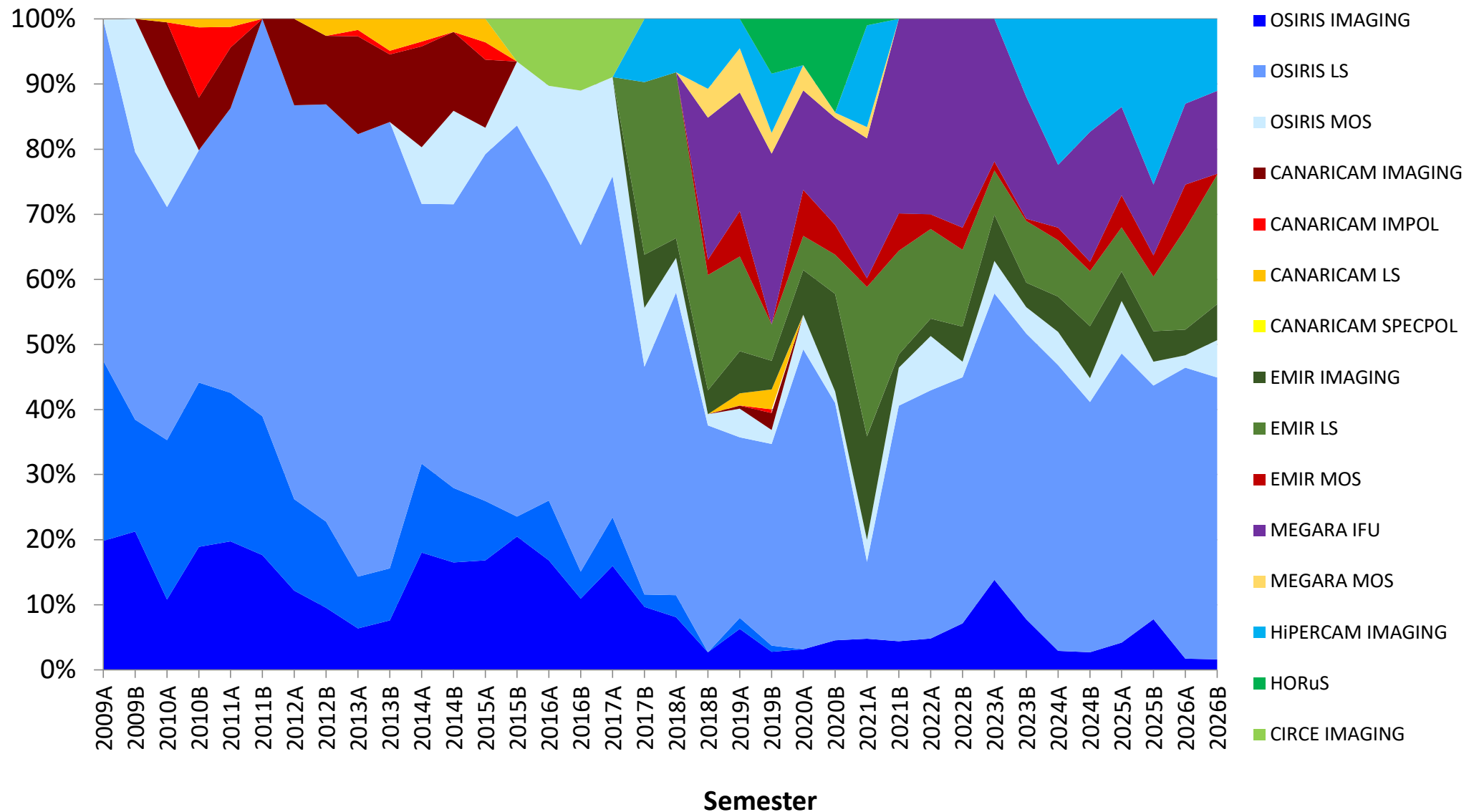


■ OSIRIS+ ■ EMIR ■ MEGARA ■ HIPERCAM

Science time allocated per instrument



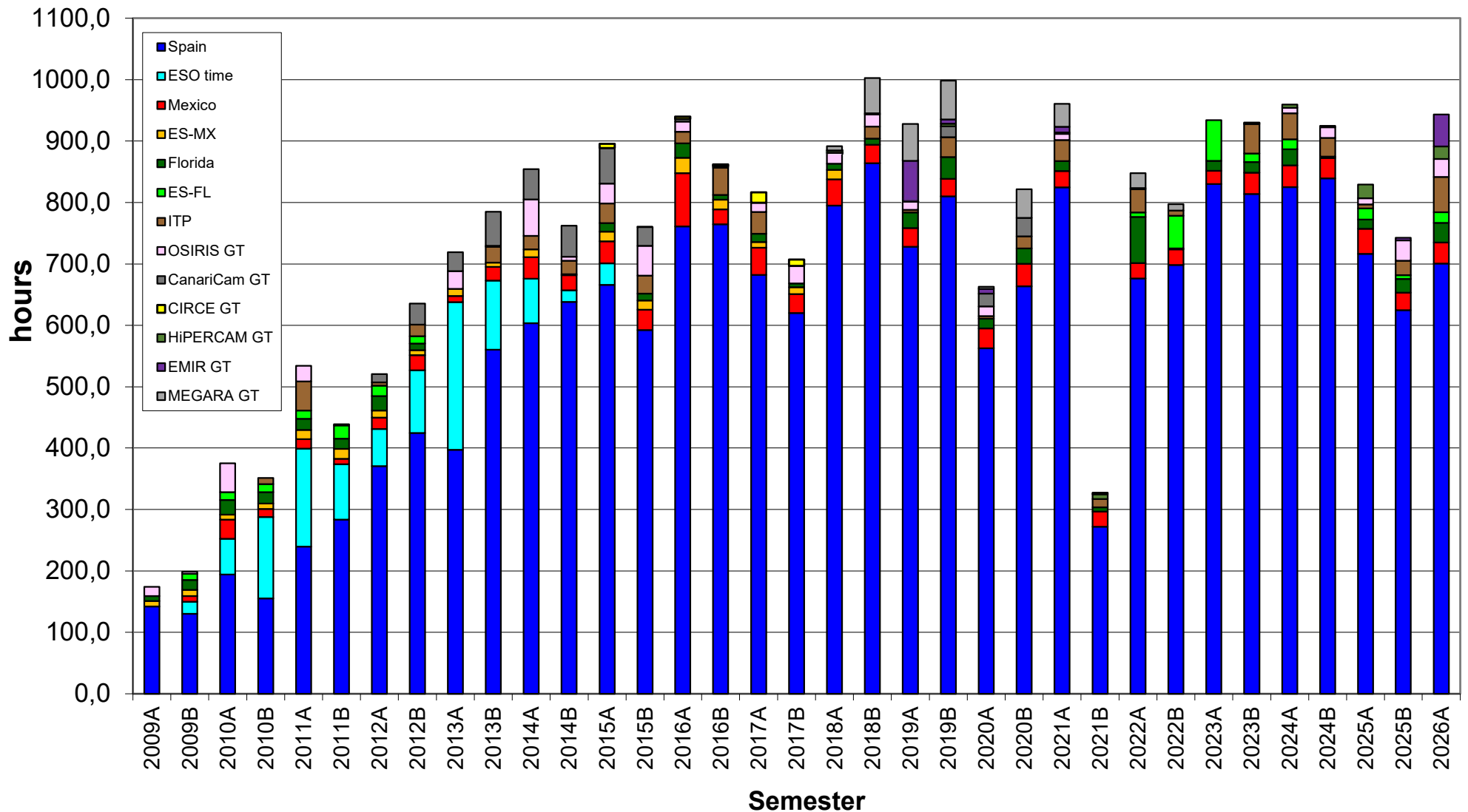
TAC time allocated by instrument mode



Science time delivered

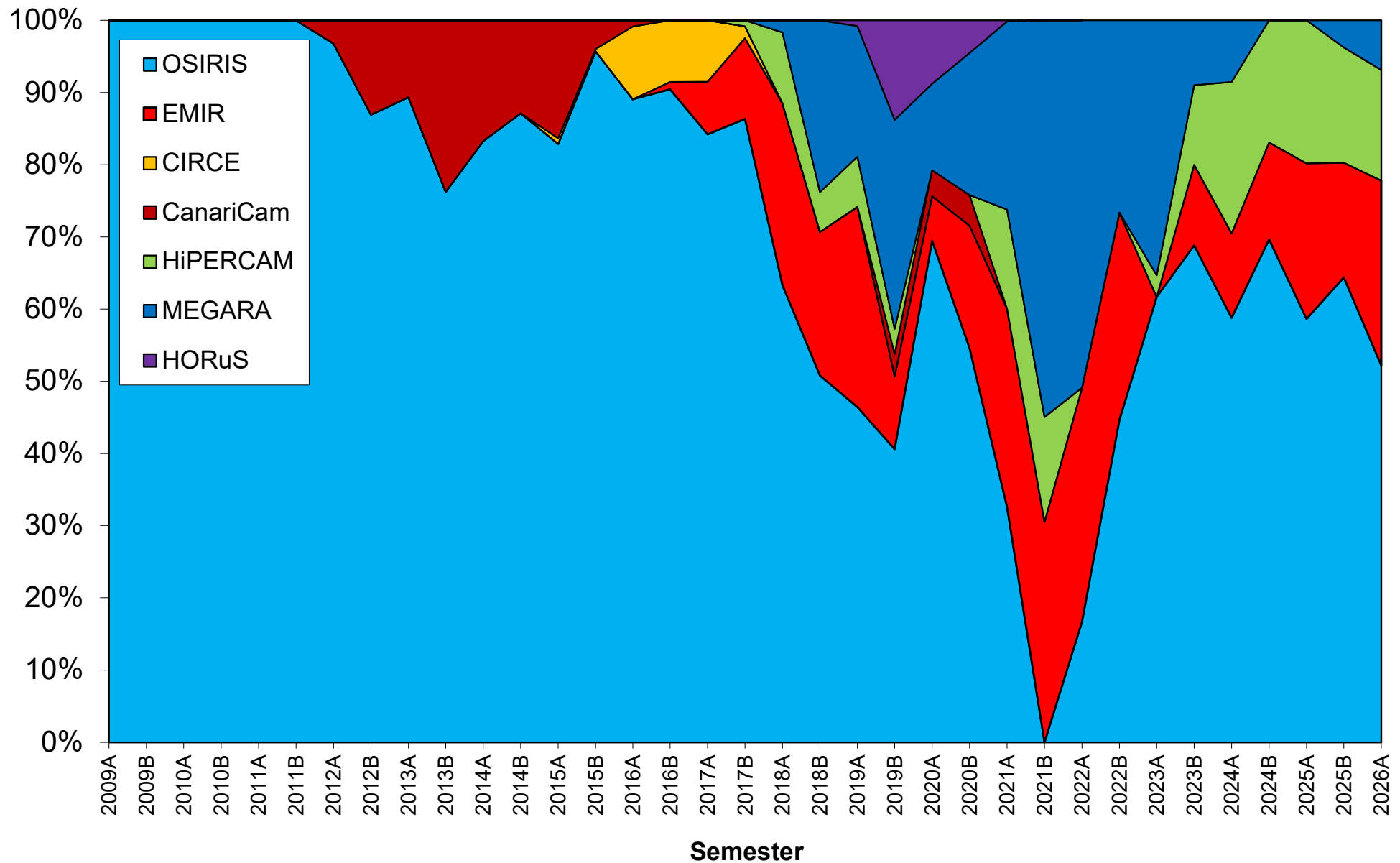
Night time available in 1 yr (within twilights) is 3285 hours.

GTC science time use (queue + visitor mode) by stake holder



Science time delivered per instrument

GTC science time use (queue + visitor mode) by instrument



Balance of time use by stakeholder group

	Spain	Mex	UF	ES-MX	ES-FL	ESO	ITP	Science Ver.	Guaranteed Time						TOTAL
									OSIRIS	CanariC	CIRCE	EMIR	HiPERCAM	MEGARA	
2009A	142,1	0,0	8,0	9,0	0,0	0,0		7,3	15,1						181,5
2009B	130,3	9,3	16,2	10,0	10,1	19,4			3,5						198,8
2010A	194,1	31,4	24,0	7,9	12,6	58,1			47,0						375,1
2010B	155,0	13,2	18,7	8,7	12,9	132,6	10,3		0,0						351,4
2011A	239,6	15,4	18,0	15,3	13,8	159,3	47,4		25,4						534,2
2011B	283,4	8,7	16,4	16,3	21,5	90,3	1,9		0,0						438,5
2012A	370,5	19,0	23,6	11,5	16,6	60,5	5,5		0,0	13,6					520,8
2012B	424,3	24,5	10,7	8,2	12,1	102,7	18,7		0,0	34,3					635,5
2013A	397,0	10,0		11,5		240,8	0,0		28,9	31,1					719,3
2013B	560,6	22,3		6,8		112,3	26,1		1,5	55,4					785,0
2014A	603,6	35,1		13,0		72,2	21,9		59,1	49,6					854,5
2014B	638,1	24,8		1,4		19,0	22,1		6,2	50,7					762,3
2015A	666,0	35,8	13,6	15,9		35,1	32,3		32,1	57,8	7,0				895,5
2015B	592,4	33,1	11,2	15,0			29,1		48,8	30,2	1,1				760,9
2016A	761,3	86,5	23,8	24,9			18,7		16,7	4,1	3,8				939,8
2016B	764,6	24,4	7,6	15,8			44,1		3,0		2,6				862,1
2017A	682,2	44,4	13,8	9,0			35,5		15,0		16,6				816,4
2017B	620,2	30,6	6,0	11,4					28,6		10,6				707,3

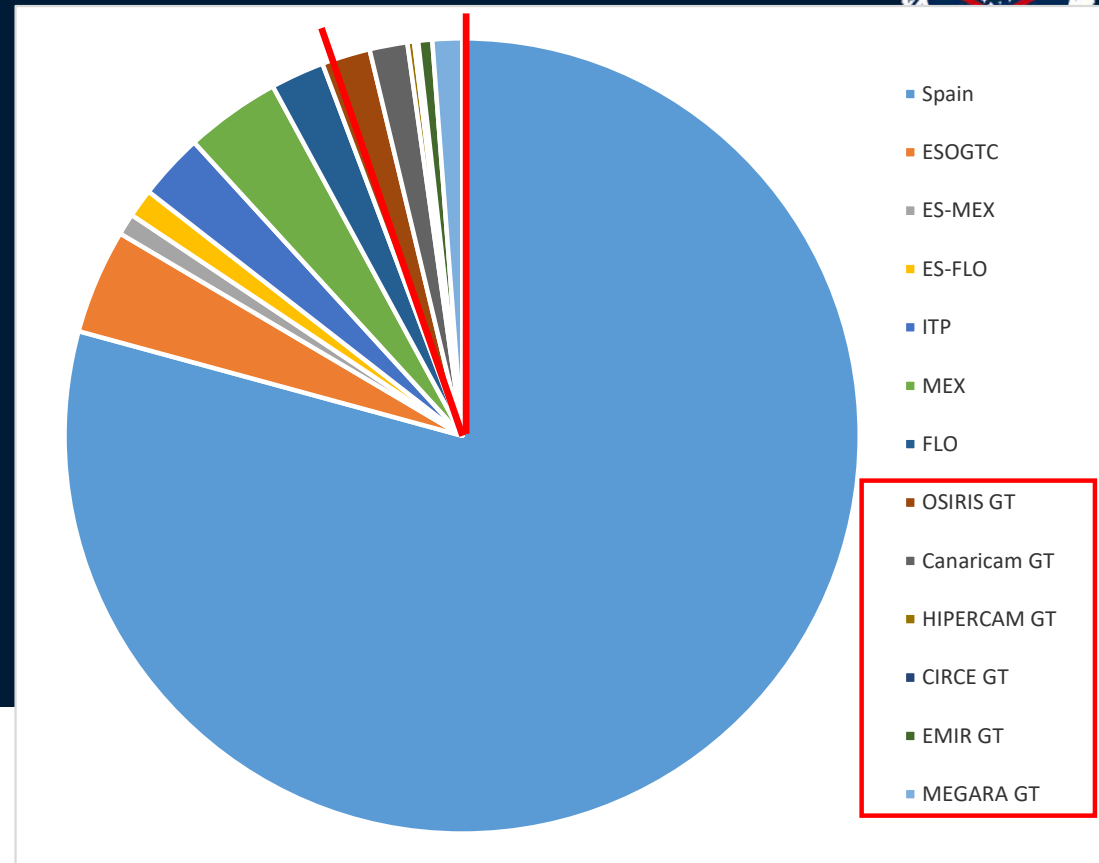
9

Balance of time use by stakeholder group

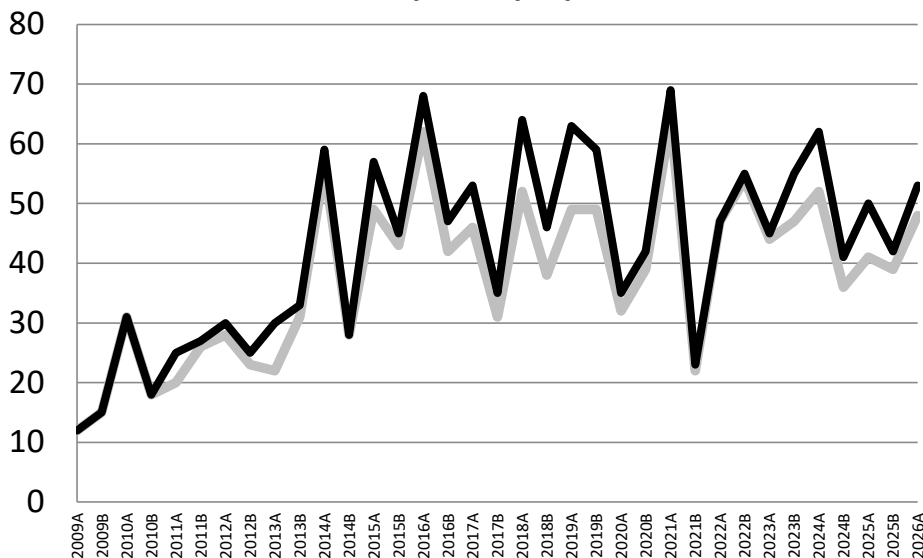
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									OSIRIS	CanariC	CIRCE	EMIR	HIPERCAM	MEGARA	
2018A	795,0	42,8	10,3	15,3					17,6				3,8	7,1	891,8
2018B	864,1	29,8	10,1				19,6		19,7				2,0	57,4	1002,7
2019A	727,8	30,5	25,6				4,1		13,9			65,3	0,8	60,0	928,0
2019B	810,2	28,5	35,3				32,5			17,6		6,9	4,0	63,4	998,4
2020A	562,6	32,4	16,0				4,1		15,9	21,0		7,7	0,0	3,5	663,0
2020B	663,5	36,7	25,1				19,6			30,3		0,0	0,0	46,5	821,7
2021A	824,8	26,2	16,1				34,4		9,8			9,0	2,5	37,3	960,5
2021B	271,8	24,6	7,0				13,7					1,5	7,5	1,2	327,2
2022A	676,4	25,1	74,9		7,4		3,9		2,0					24,3	848,0
2022B	698,3	25,3	1,7		53,1		8,4							10,5	797,3
2023A	830,1	21,7	16,0		66,1		0,0								933,9
2023B	814,1	34,5	17,2		14,0		47,7		1,8				1		930,3
2024A	825,1	35,5	25,9		16,2		42,7		8,6						959,5
2024B	839,4	33,1	2,2				30,6		17,3				2,3		924,9
2025A	716,5	41,0	14,7		18,3		6,5		9,9				22,4		829,3
2025B	624,9	28,4	22,2		6,4		23,2		33,4			4,0			742,5
2026A	700,5	34,6	31,9		17,1		57,4		29,4			52,1	20,5		943,5
% TOTAL	88,9	4,0	2,2	(1,0)	(1,2)		2,7								
TARGET	86,5625	3,75	1,875	1,875	0,9375		5,0								

GTC time delivery

- 79 % total data delivered to Spanish TAC proposals.
- 6 % total data provided for GT programs.
- 68 % OSIRIS / 11 % EMIR / 10 % MEGARA / 5 % HIPERCAM / 4 % CC / 1 % CIRCE / 1 % HORuS



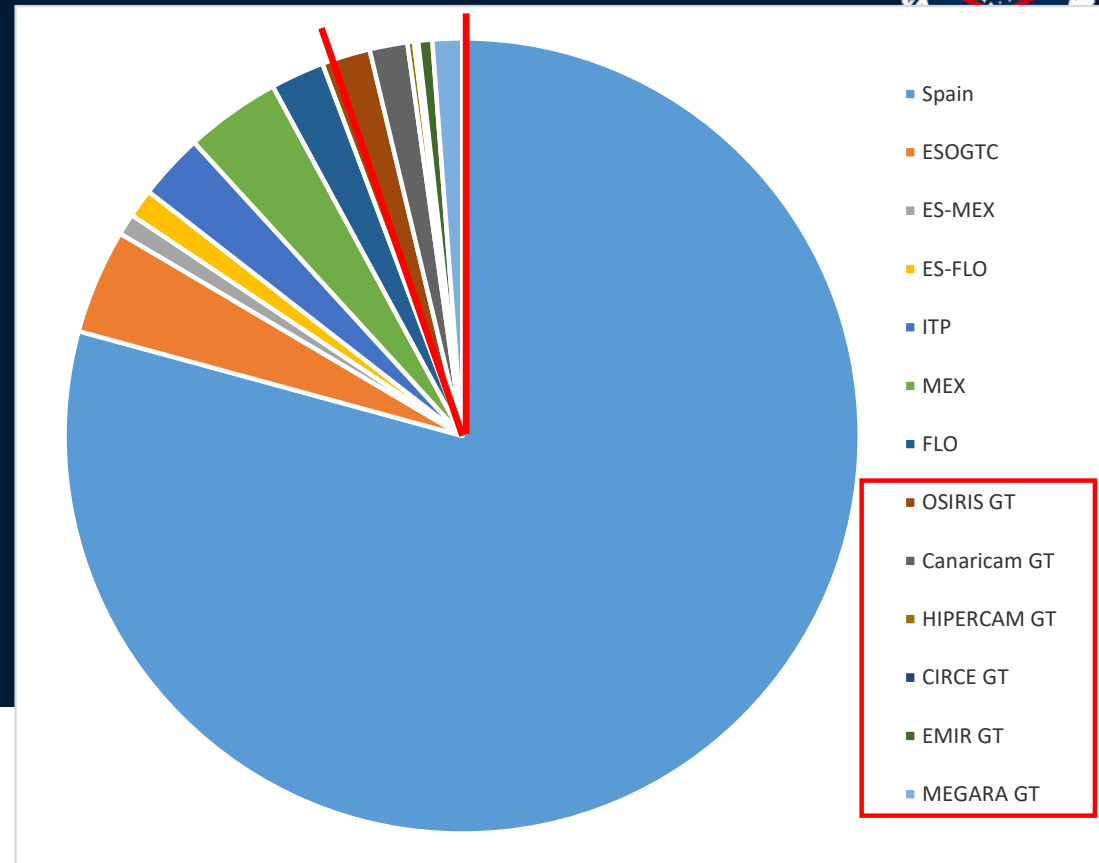
GTC completed proposals



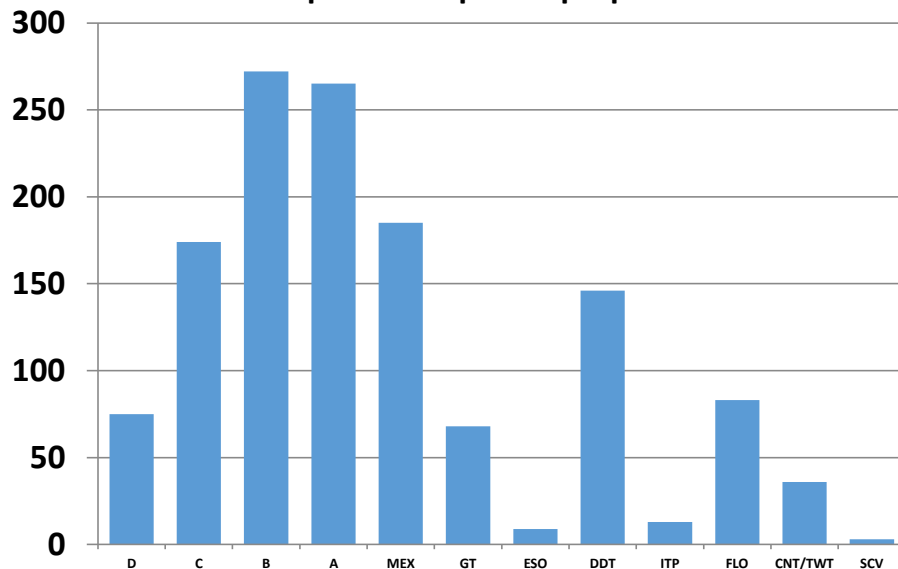
- Queue execution follows strictly TAC priorities (numbers for 2014-2025 period):
 - 75 % of the proposals in queue get data.
 - 83 % A / 40 % B / 30 % C / 43 % D band programs completed.

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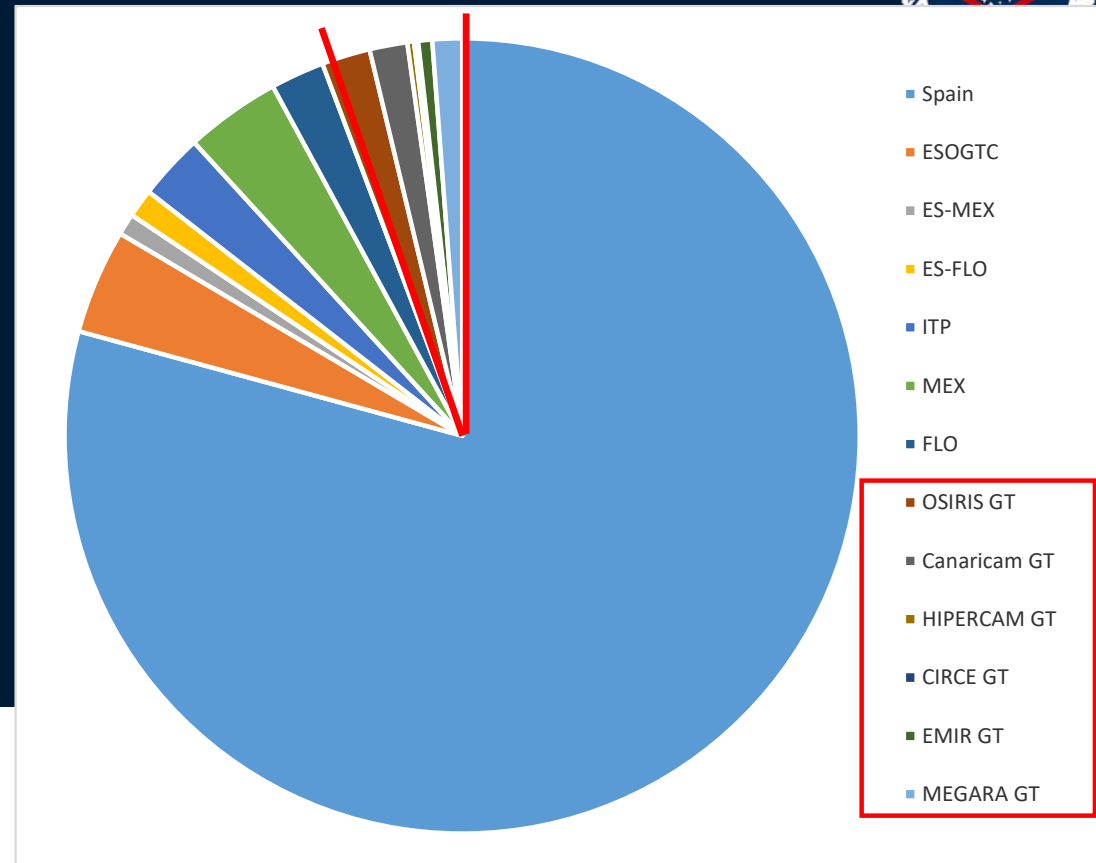
GTC queue completed proposals



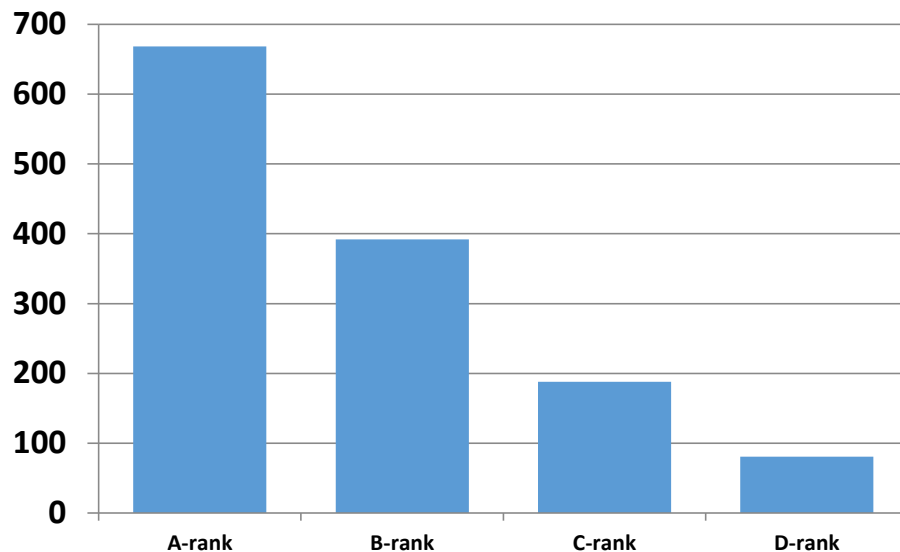
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GTC queue completed proposals

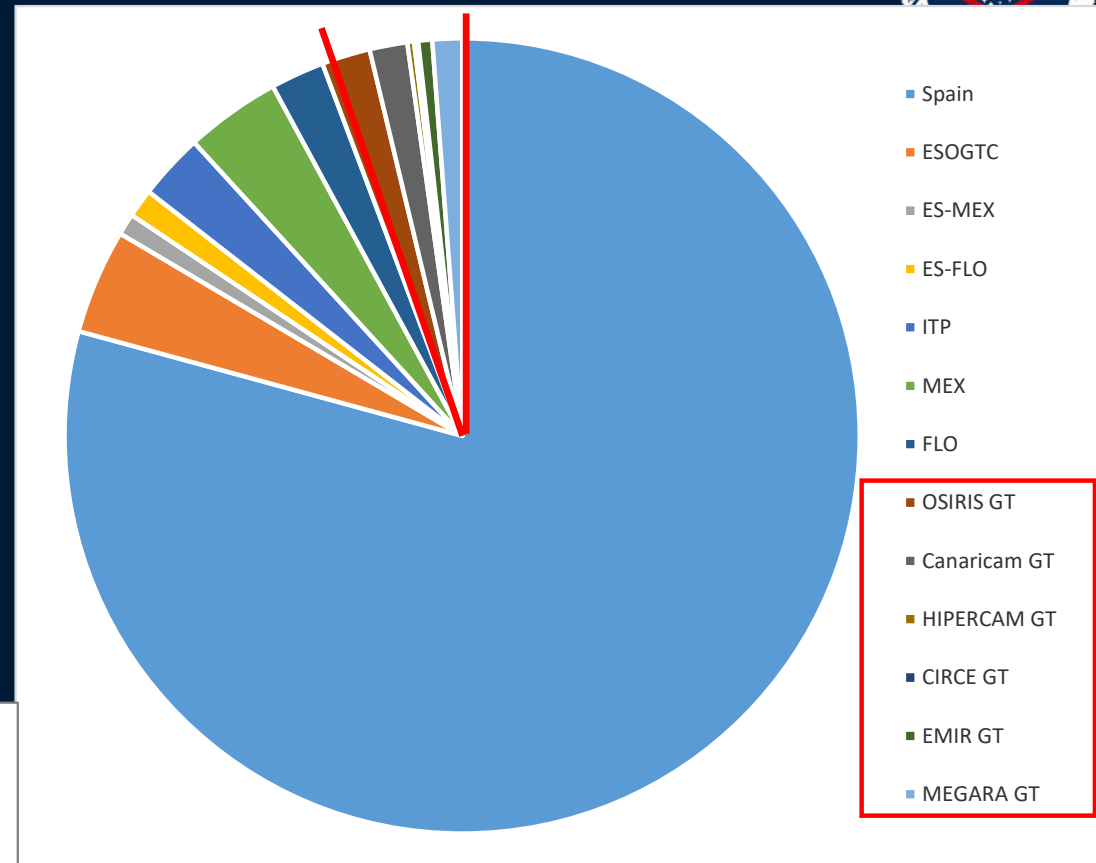
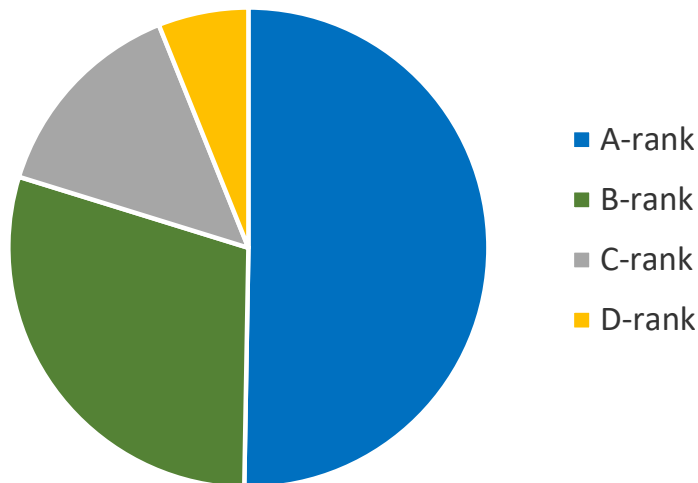


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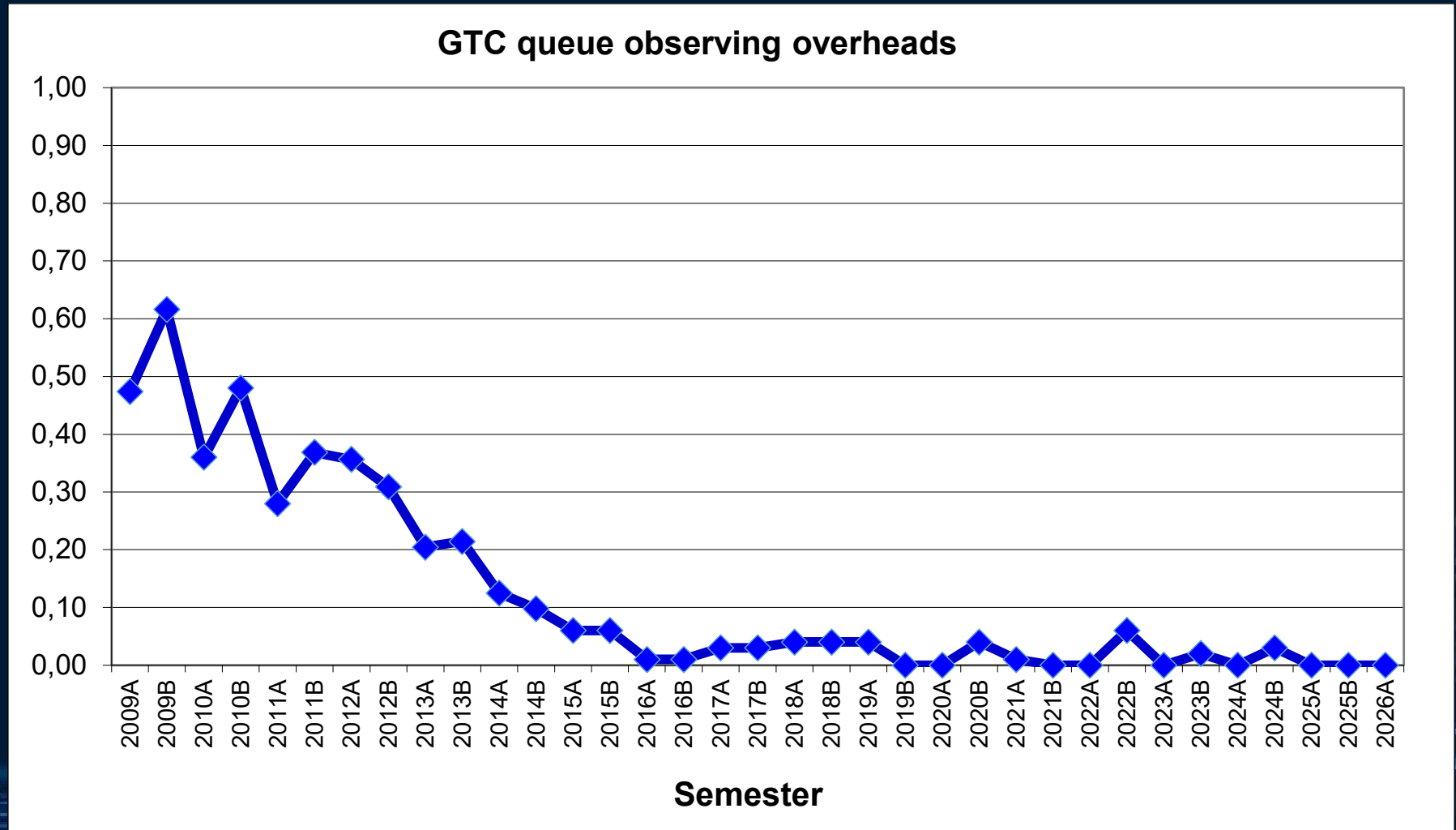
GTC queue completed proposals



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GTC operational efficacy

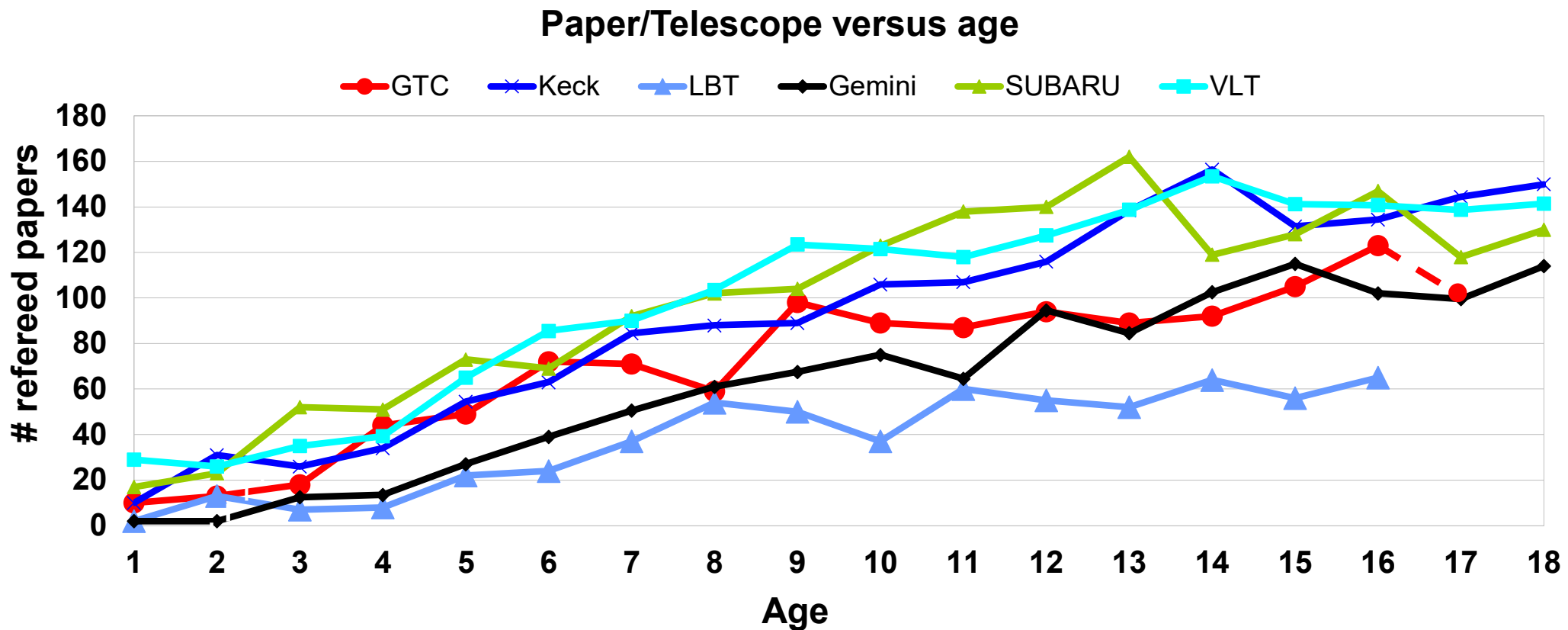
Comparing *real* time available (corrected for weather and technical losses) to hours delivered:



Efficacy metric includes *all* factors; human, environmental changes, scheduling but not intrinsic OB assumed overheads.

GTC science productivity

- 1195 papers published by 1 Sep 2026.
- 431 from Spain / 64 from MEX / 26 from UF (1st author).
- 963 OSIRIS / 81 HIPERCAM / 72 EMIR / 57 CC / 56 MEGARA / 16 CIRCE / 12 HORuS data.
- DDT/TOO proposals: 1 paper / 5 h - ESO-GTC: 1 paper / 10 h - regular TACs: 1 paper / 20 h.

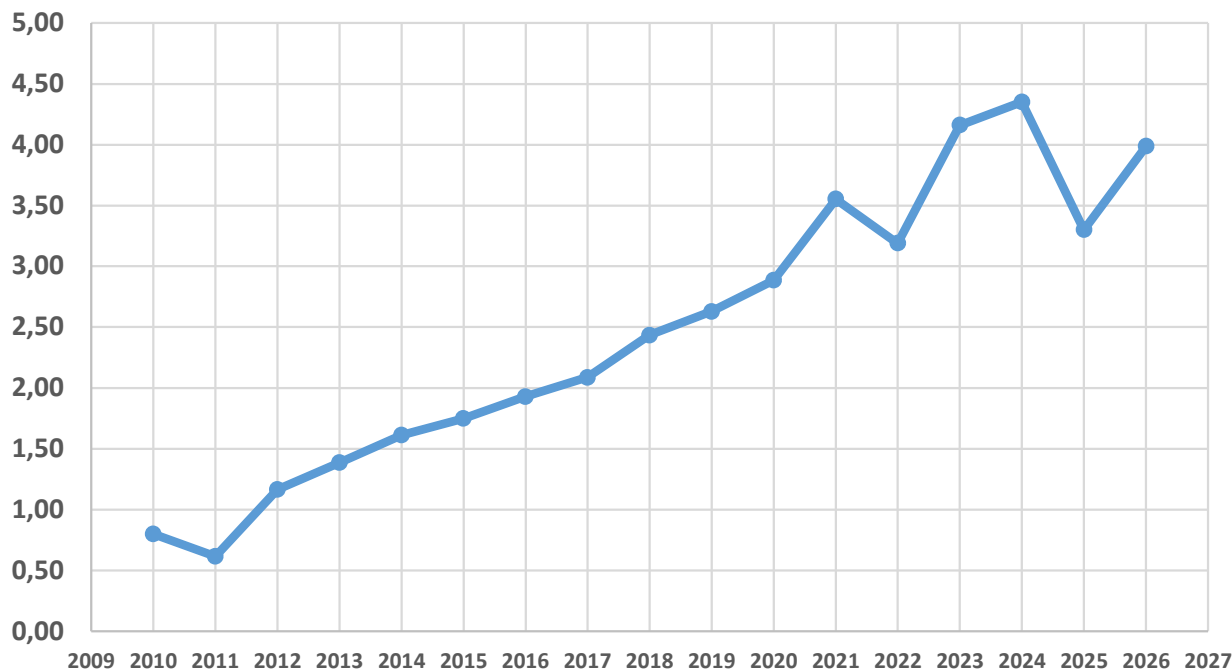


<http://gtc-phase2.gtc.iac.es/science/publications/publications.php>

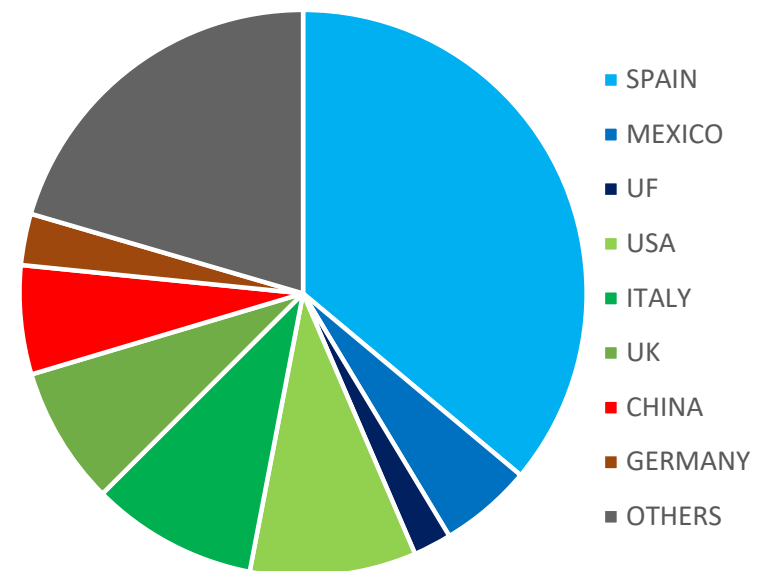
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GTC publications time delay



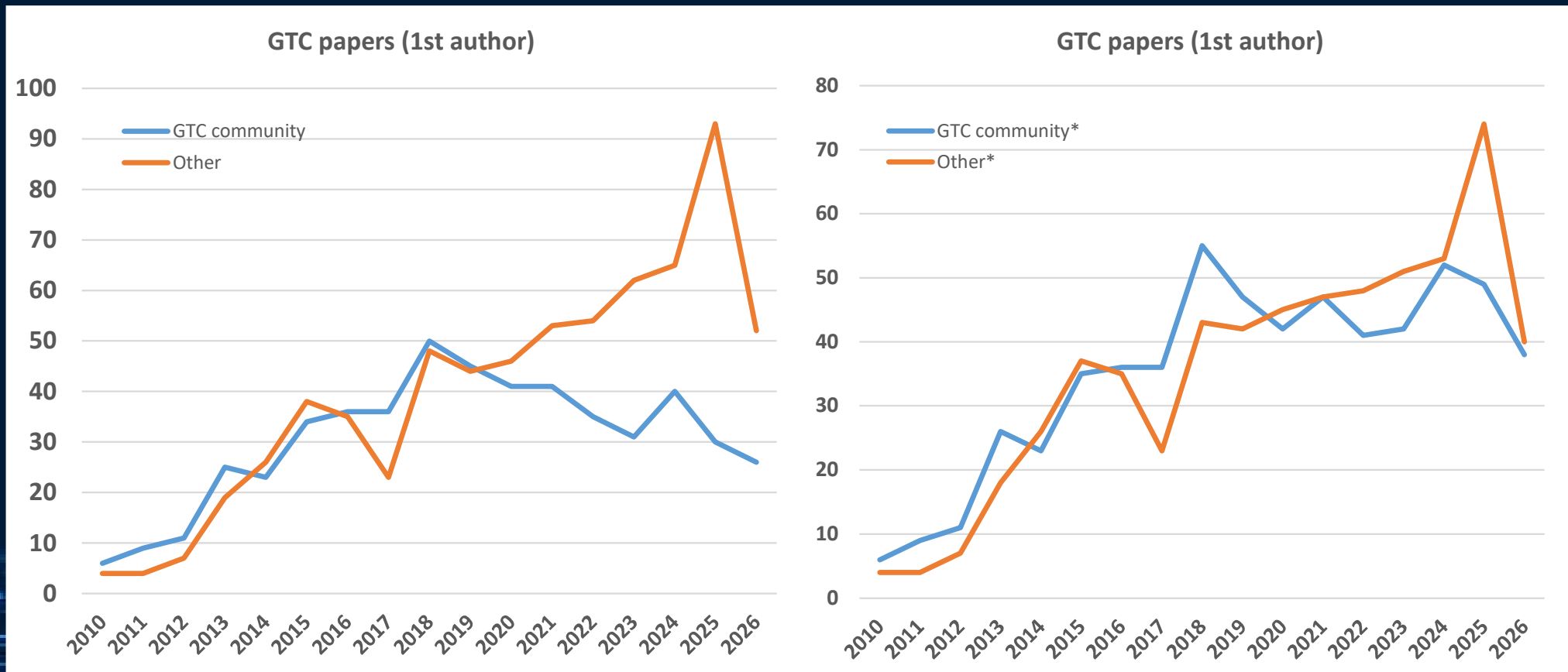
GTC publications (first author)



<http://gtc-phase2.gtc.iac.es/science/publications/publications.php>

GTC science productivity

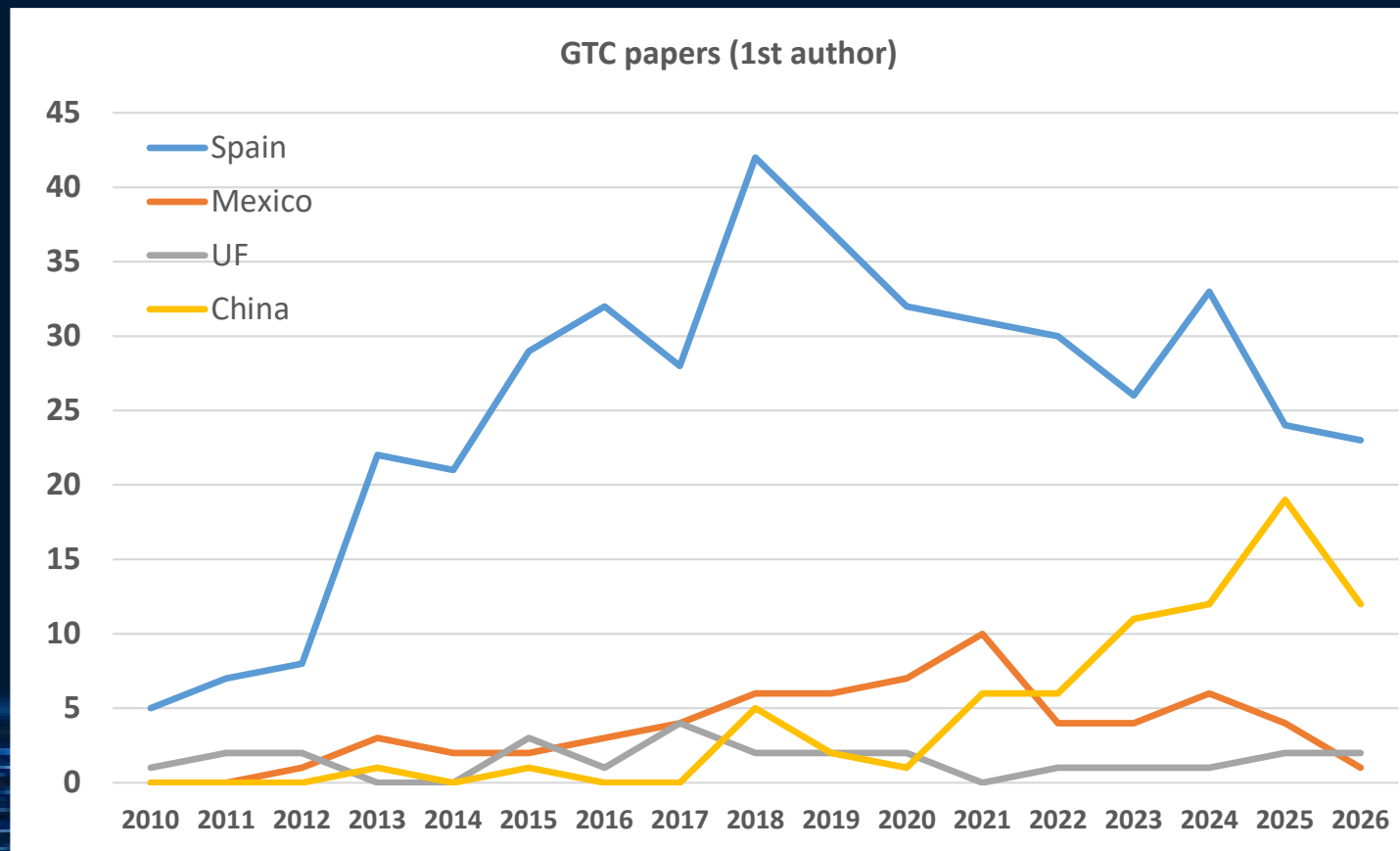
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- Requirements for a **future automatic scheduler** under definition, with a **higher priority w.r.t other developments. A first beta-tool already being tested!**

The screenshot displays the 'GTC Operations / Technical Evaluations' dashboard. The left sidebar contains navigation links for Overview, Admin Dashboard, PI Portal, Programs & Evaluation, and Operations. The main content area shows a summary of technical evaluations with the following data:

Category	Count	Percentage
TOTAL	224	
PENDING	104	46% of total
SUBMITTED	0	0% of total
COMPLETED	120	54% of total
APPROVAL RATE	54%	

Below the summary, there are filters for 'Call' (All calls), 'Pending' (104), 'Submitted' (0), 'Completed' (120), and 'All' (224). A search bar for 'Search ID, PI, title...' is also present. The 'Evaluations requiring attention' section shows a list of proposals, including one titled 'The missing population of hypervelocity subdwarfs: Leveraging theoretical models for...' by Roberto Raddi.

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● CLÁSICA

Phase 2 Legacy

La herramienta histórica de preparación de Fase 2. Interfaz original, flujo conocido: programas, OBs, finding charts y README como siempre.

.....

<http://scidrm-test2:8080/science/F2/> →

● NUEVA

Phase 2^{v2}

La nueva plataforma web del GTC: misma información, experiencia moderna, validación en línea y sincronización con CATIAC.

.....

<https://scidrm-test2:5177/> →

 **Sincronización automática:** los programas y Observing Blocks creados o modificados en cualquiera de las dos aplicaciones se replican en la otra en pocos minutos. Puede cambiar de herramienta cuando quiera.

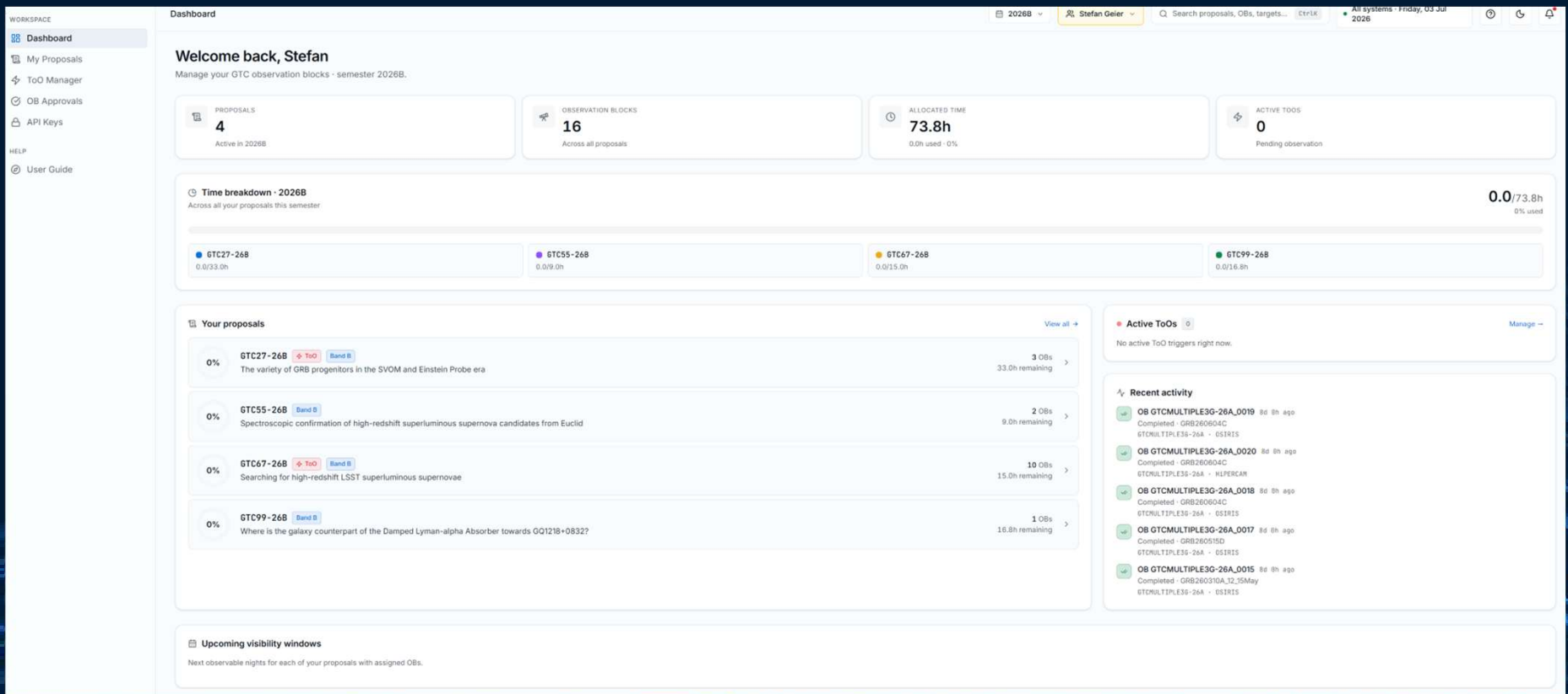
SEMESTRE ACTIVO • 2026B

UTC 2026-07-07 11:28:14

GTC SCIENCE OPERATIONS

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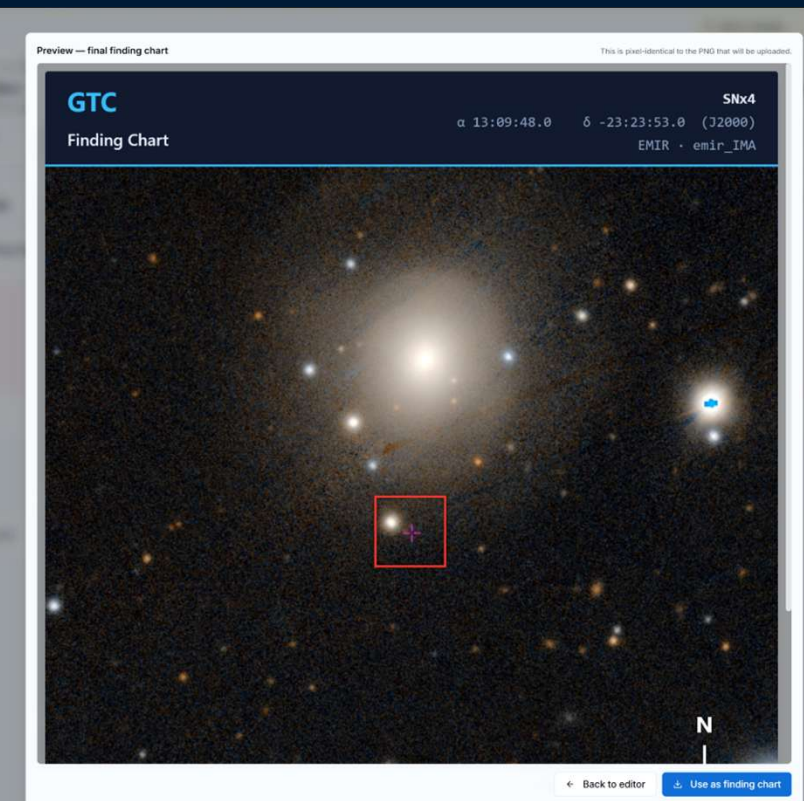
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The screenshot shows the GTC proposal management interface. At the top, there's a header with a 65% progress indicator, a 'GRB' label, and a 'Draft' status. Below this, a 'Create container' dialog box is open. The dialog has a title bar with a close button. Inside, it says 'Group observation blocks so they execute together or follow a cadence.' There are fields for 'Name' (with a placeholder 'e.g., Kilonova alpha trigger') and 'Container type' (a dropdown menu with options: 'Group — execute any/all OBs', 'Concatenation — execute sequentially', and 'Time-Link — execute at intervals'). There's also a 'Description (optional)' field. At the bottom, there's a 'Completion strategy' dropdown set to 'All OBs' and a 'Minimum executions' field set to '1'. There are 'Cancel' and 'Create container' buttons.



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← Back to ToO Manager

Trigger Target of Opportunity • NORMAL • inline OB Cancel

GTC1-26A Search for kilonova counterparts associated with LIGO/Virgo BNS triggers...

STEP 1 Setup STEP 2 Target STEP 3 Instrument STEP 4 Templates STEP 5 Constraints STEP 6 Files STEP 7 Trigger info STEP 8 Review & fire

⚠ Triggering a ToO interrupts the night plan.
The operator on duty is paged within seconds. Even when you reuse an approved base OB, the full observation spec — target, instrument, templates, constraints and finding chart — must be locked before firing.

OVERWRITE PROGRAMME *

GTC1-26A ↔ ToO

Search for kilonova counterparts associated with LIGO/Virgo BNS triggers

🔍 6 of 12 triggers remaining

GTC18-26A ↔ ToO

Late-time spectroscopy of nearby Type Ia supernovae

🔍 1 of 4 triggers remaining

BASE OBSERVATION BLOCK
Pick an approved OB as a template — or start a brand-new OB inline for an event with no pre-approved slot.

🔗 **Inline trigger** — you will configure every step.
Use this when the event is too new for a pre-approved OB. You'll fill target, instrument, templates and constraints just like a normal OB. The support astronomer reviews everything before slewing.

URGENCY *

• **NORMAL** 🕒

Time-flexible. Observe within the validity window when conditions allow.

🕒 Staff acknowledges within a few hours · standard scheduling.

• **URGENT** 🕒

Time-critical. Should be observed tonight if observability and weather permit.

🕒 Staff acknowledges within 1 hour · current queue may be preempted.

• **CRITICAL** 🕒

GW-grade. Interrupt the running observation if necessary and re-plan the night.

🕒 Operator paged immediately · queue is interrupted.

← Previous Step 1 / 8 · 5% complete Next: Target →

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Dashboard / ToO Manager

ToO Manager

Trigger and follow your Targets of Opportunity. Triggers reach the operator on duty within seconds — only fire when you have a transient confirmation in hand.

[Trigger new ToO](#)

ACTIVE TRIGGERS

3

Pending observation

1 critical 1 urgent 1 normal

TRIGGER BUDGET - 26A

7

of 16 remaining

7 fired 2 scheduled

AVG TIME-TO-OBSERVE

41 min

From trigger to slew (historical)

SUCCESS RATE

67%

4 of 6 observed

Tonight at ORM 2026-05-15 • La Palma

now 20:07 UT

MOON

38% (waxing)

rise 12:14 • set 02:08

ASTRON. TWILIGHT

21:58 → 05:34

end 21:58 UT • start 05:34 UT

SEEING FORECAST

0.8" – 1.1"

ORM/TNG monitor (last hr)

SKY

Photometric

PWV ~ 4.1 mm

• Active triggers • 3

Sorted by urgency

CRITICAL ☒ Awaiting staff review

6 min ago expires in 9h 52m

AT2026bzz Created at trigger est. $r \approx 20.5$

RA 16:48:23.10 Dec +05:12:48.0

GTC1-26A • OSIRIS BB • no pre-existing OB — inline template • GCN 6CN 36058

Optical counterpart candidate for fast radio transient FRT 250515. Inside O5 LIGO localization 90%.

Message staff Re-trigger Abort trigger

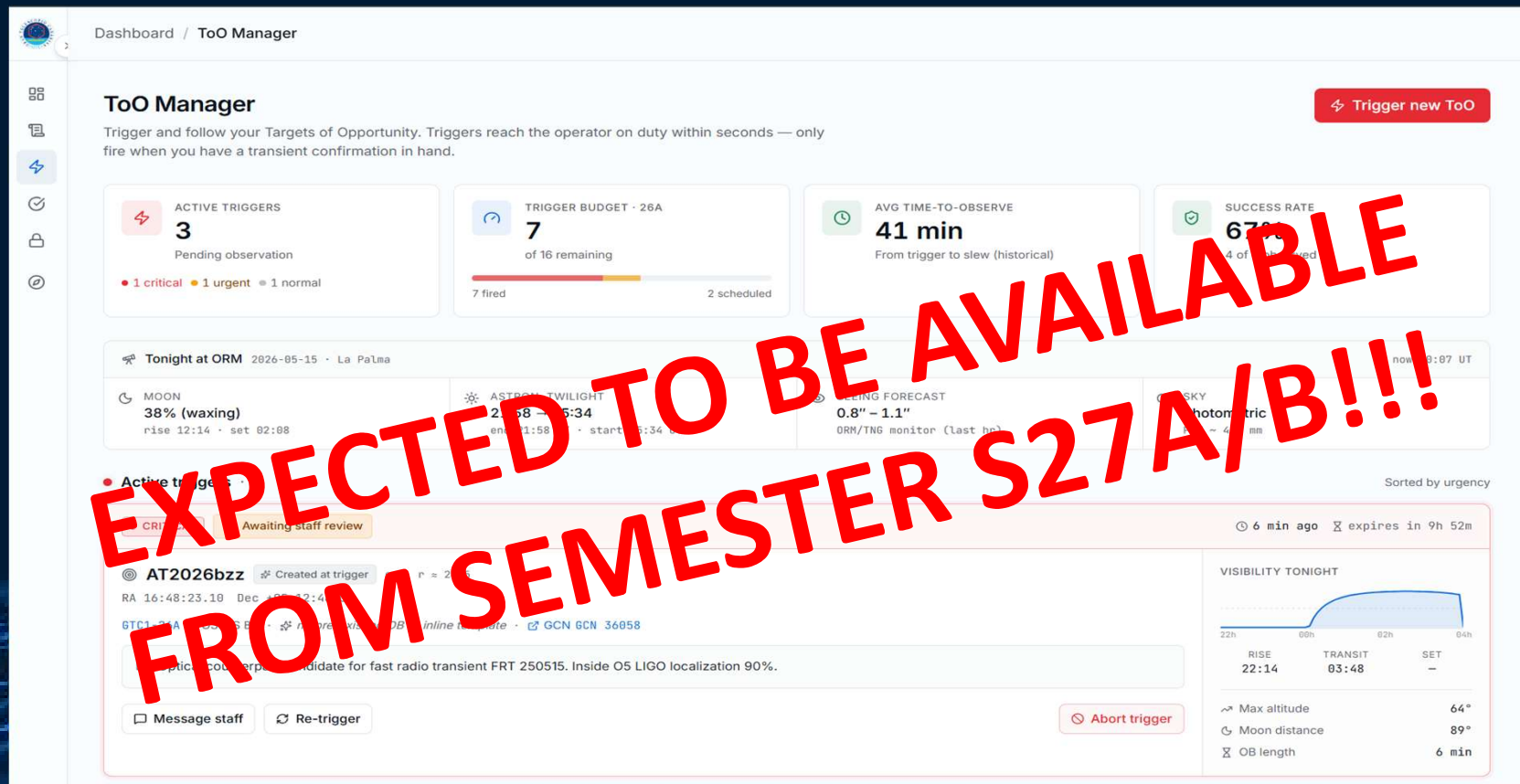
VISIBILITY TONIGHT

RISE 22:14 TRANSIT 03:48 SET —

Max altitude 64°
Moon distance 89°
OB length 6 min

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EXPECTED TO BE AVAILABLE FROM SEMESTER S27A/B!!!

GTC operation updates – GTC proposals/data management

- New **Technical Evaluation Tool completed**, compatible with **new Phase 1/new TAC tool**.
- New **GTC Phase 1 tool development in progress**, to be compliant with **new TAC tool**.
- New **GTC Phase 2 tool development in progress**, to be compliant with new Phase 1.
- Requirements for a **future automatic scheduler** under definition, with a **higher priority w.r.t other developments. A first beta-tool already being tested!**

The screenshot displays the GTC Operations Scheduler interface. The top navigation bar includes the GTC Operations logo, the current phase (PHASE 2 - ADMIN), a search bar for proposals, OBs, and targets, and the current date and time (All systems - Tuesday, 07 Jul 2026). The left sidebar contains a menu with sections: OVERVIEW (Admin Dashboard, PI Portal), PROGRAMS & EVALUATION (Programs, OB Approvals with 33 items, Technical Evaluation with 104 items), and OPERATIONS (Scheduler, Scheduler Playground, OB Parser, Night Log, Observing Calendar, Execution History, Instrumentation, Time Statistics). The main content area is titled 'GTC Operations / Scheduler' and features a 'Night Schedule Timeline' with a time axis from 21:00 to 06:15. Below the timeline is a legend for observation status (Done, Active) and instrument (OSIRIS, MEGARA, EMIR). A list of 'Scheduled Observations' is shown, including details like observation ID, instrument, target, and duration.

Order	Time Range	Instrument	Target	Duration	Priority
1	21:16 - 21:39	EMIR	GTCMULTIPLE4C-26A_0048 T22_H9.0_MILES_slit5.0	22m	10
2	21:46 - 22:00	OSIRIS	GTC29-26AMEX_0010 GD153-TelluricStandard	14m	14
3	22:00 - 22:15	OSIRIS	GTC29-26AMEX_0006 GD153-TelluricStandard_BAD	14m	18
4	22:15 - 22:29	OSIRIS	GTC29-26AMEX_0013 GD153-TelluricStandard	14m	16
5	22:29 - 22:45	OSIRIS	GTC101-26A_0012 SDSSJ1430+2303	15m	20

GTC operation updates – GTC data reduction system

- Ongoing Project to **provide automated reduced data to the users (ADPs)** with the aim of including reduced data for **OSIRIS+/EMIR/HIPERCAM/MEGARA** into the GTC archive:

<https://www.gtc.iac.es/observing/datareduction.php>

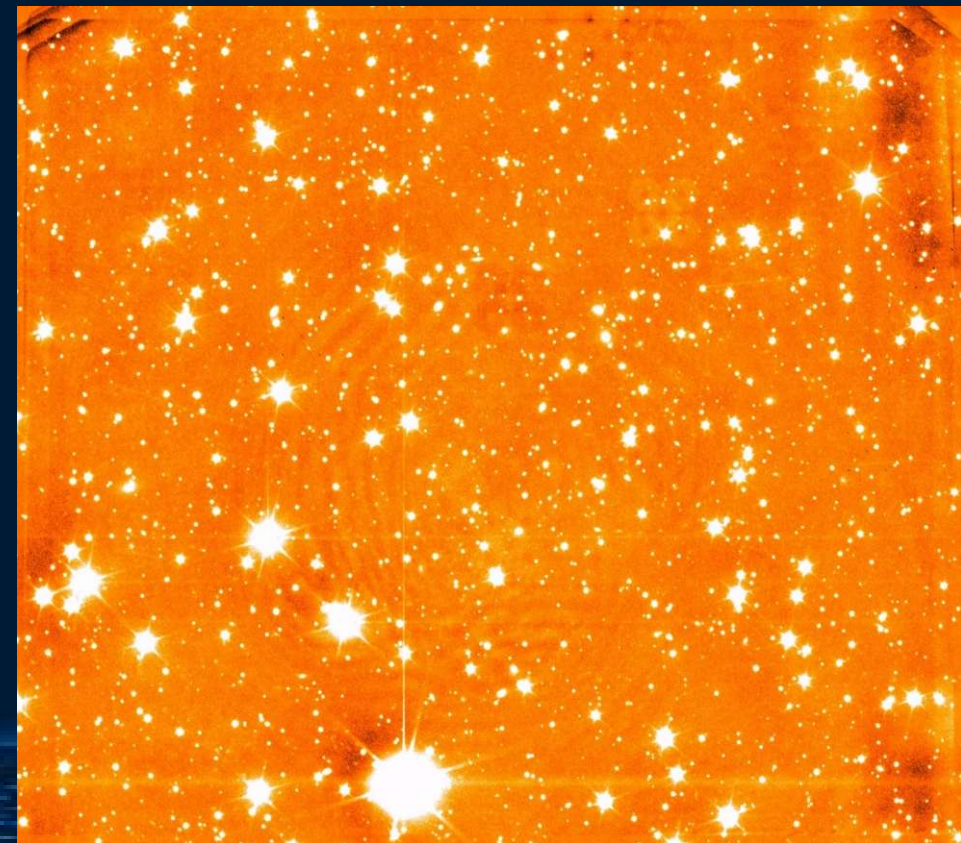
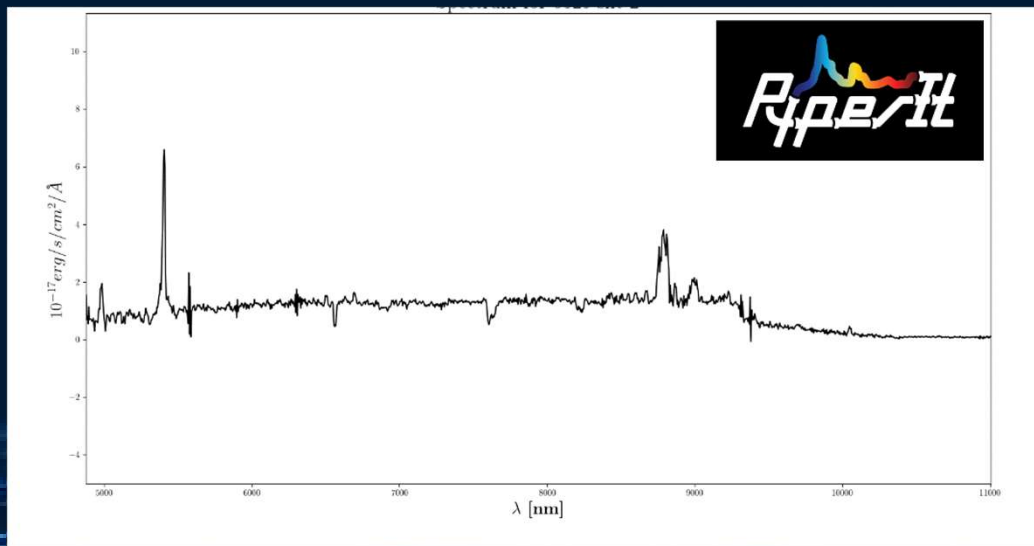
OSIRIS+: SAUSERO (imaging) / PyPeit (LSS/MOS)

SAUSERO: <https://ascl.net/2507.014>

MEGARA: MEGARA DRP

HIPERCAM: Ligthcurves (.log) / THILOS (imaging)

EMIR: SERRADERO (imaging) / TAGASASTE (LSS)



OSIRIS+ Data reduction tools: <https://www.gtc.iac.es/instruments/osiris+/osiris+.php#DataReduction>

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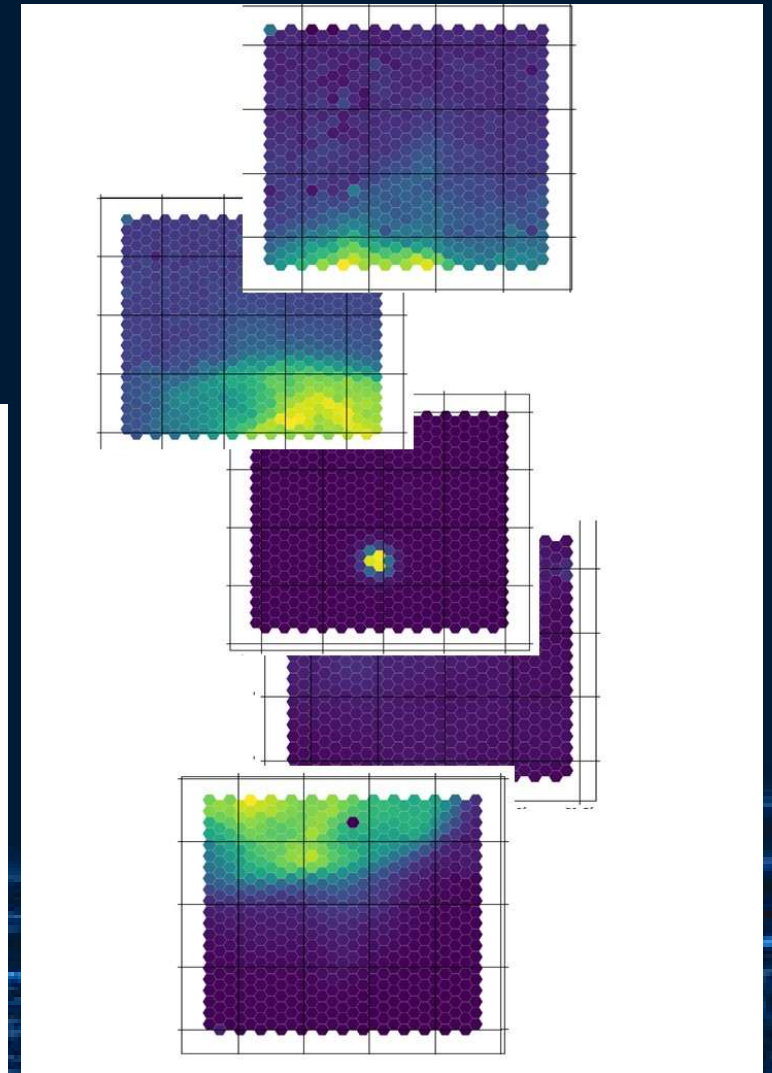
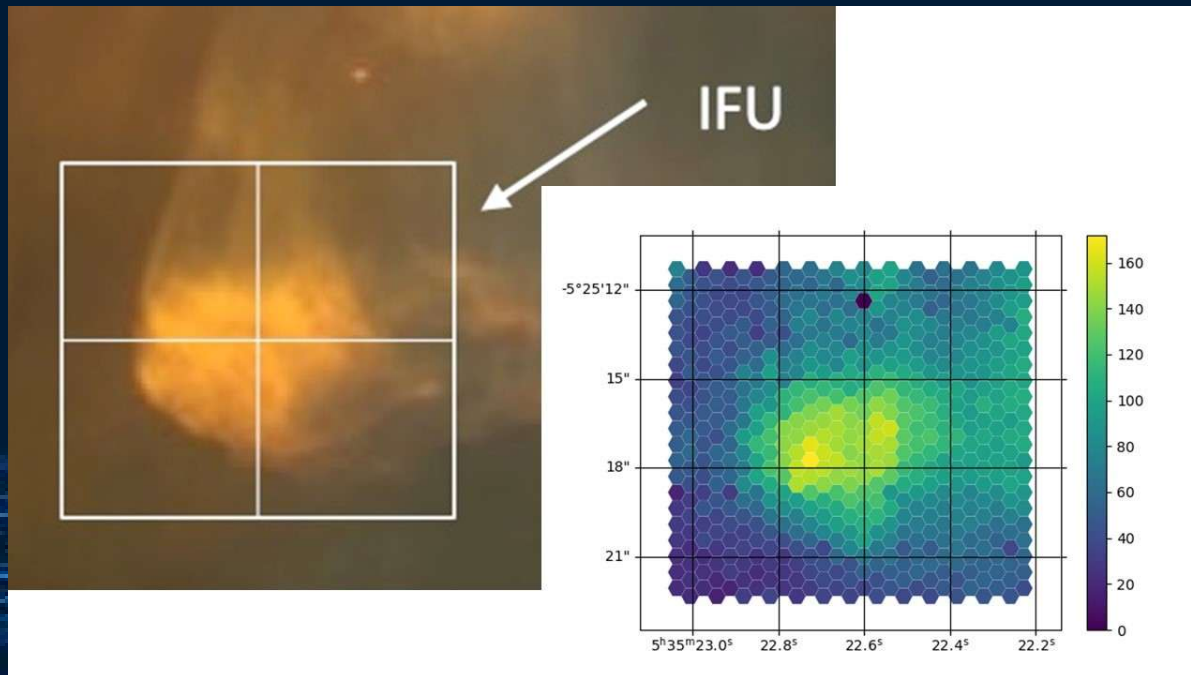
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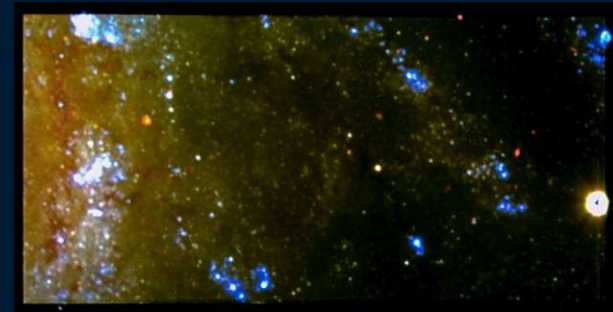
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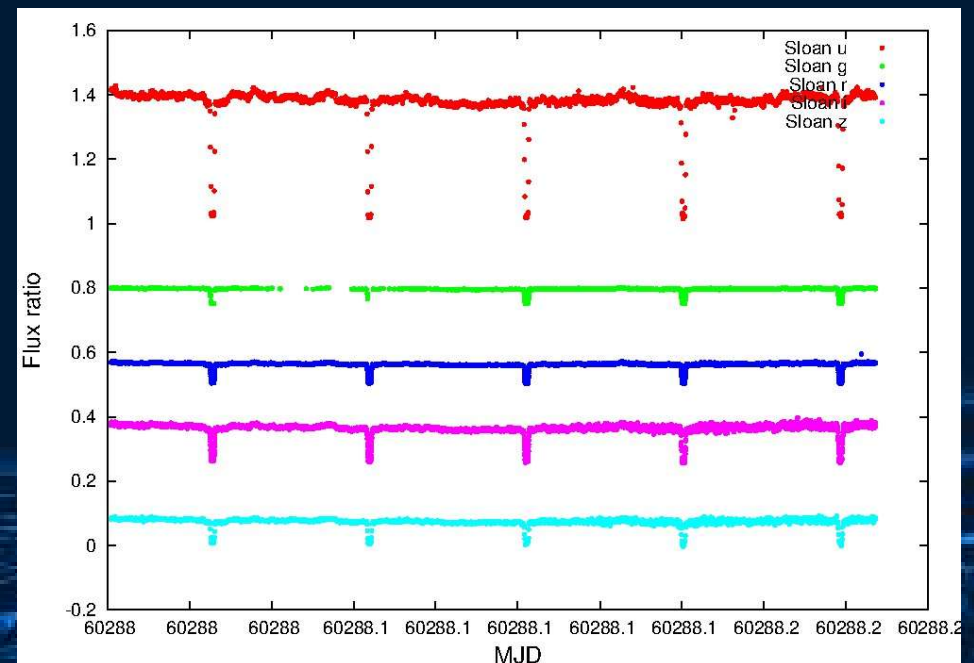
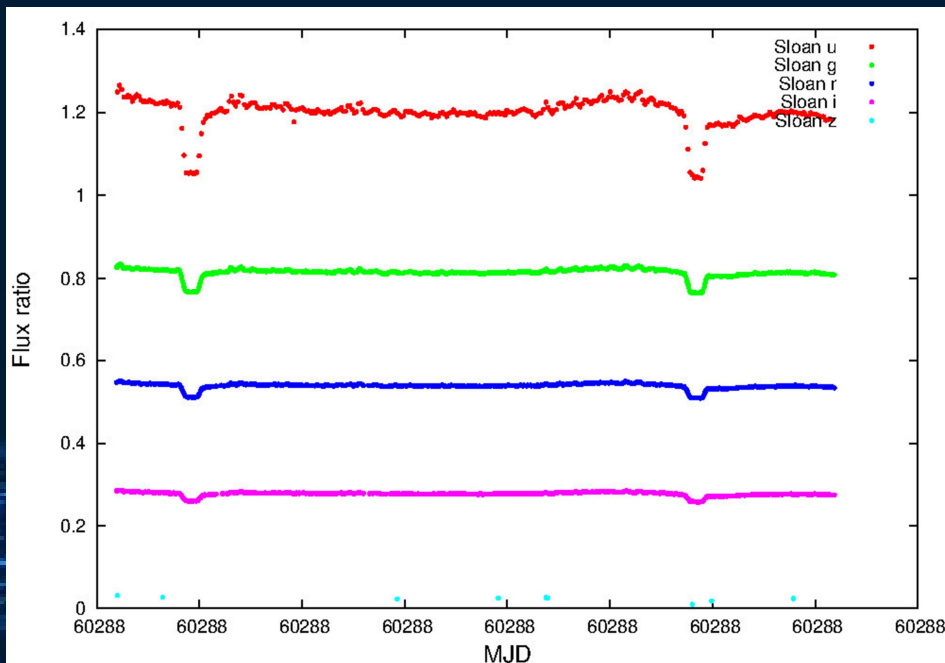
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THILOS: <https://github.com/Kennicutt/THILOS>



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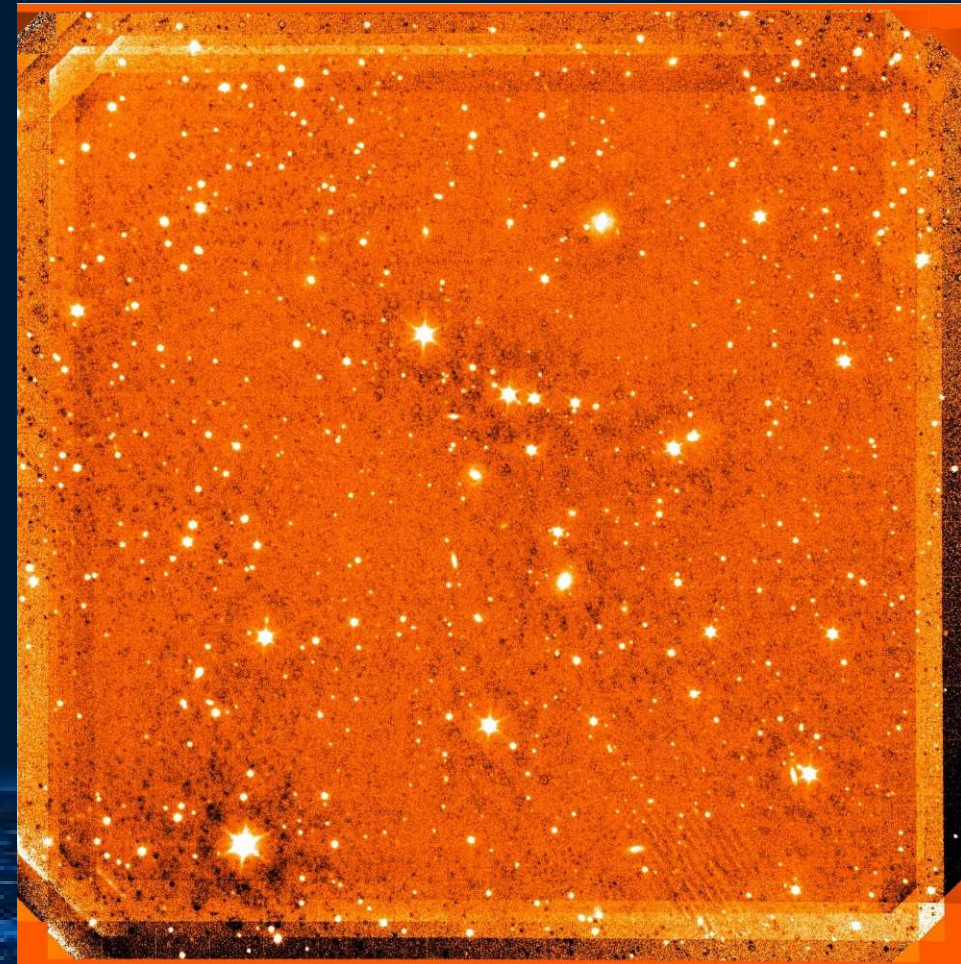
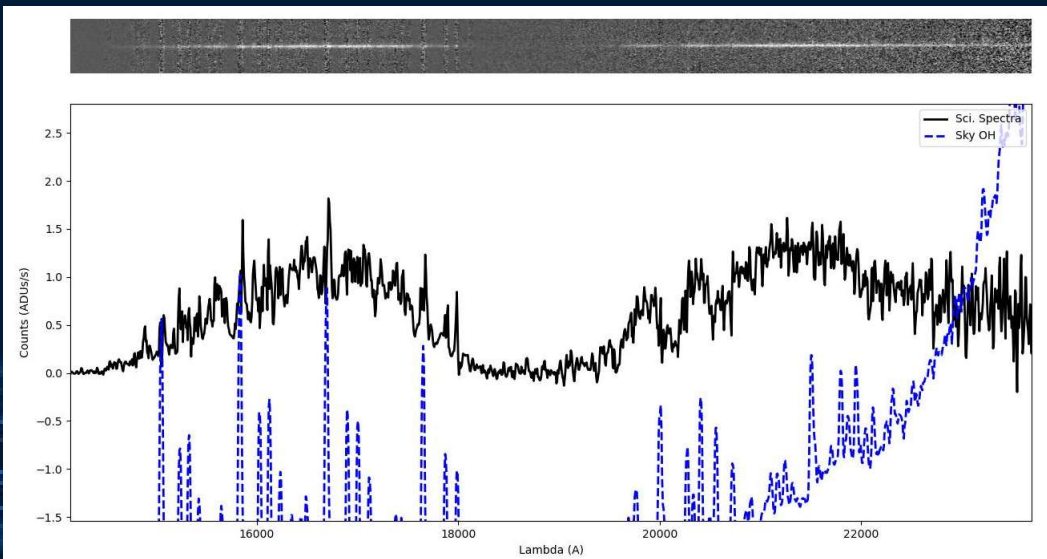
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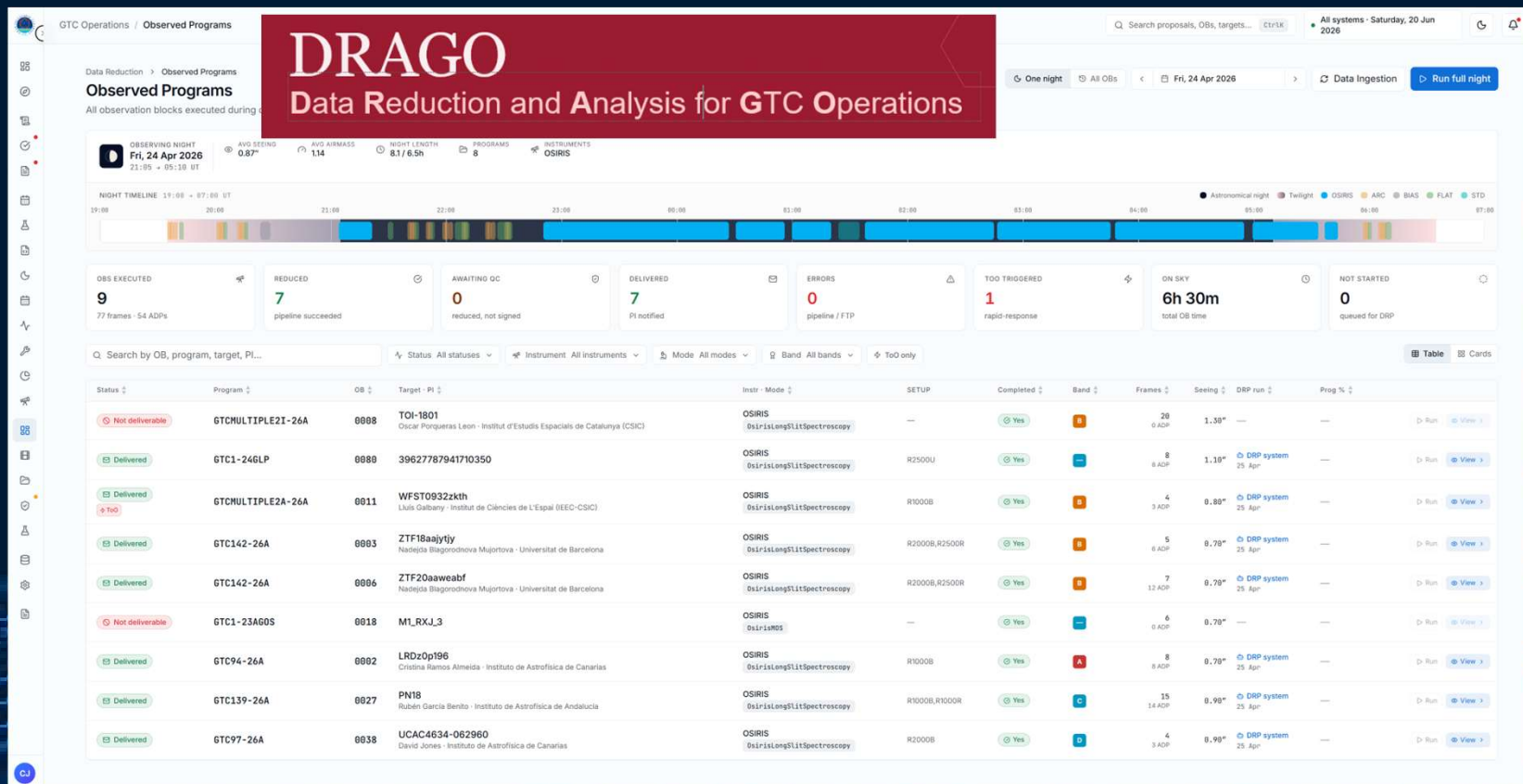
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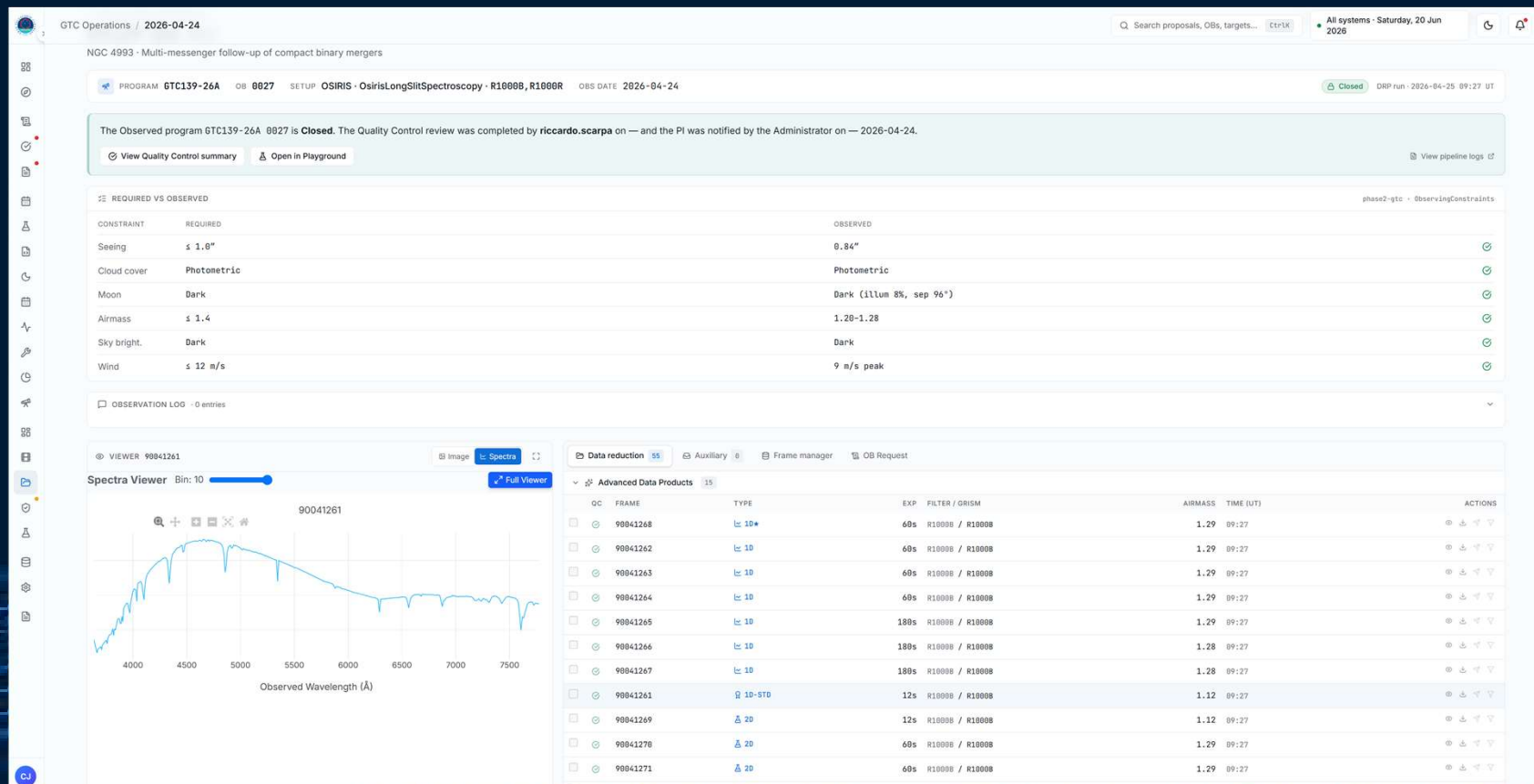
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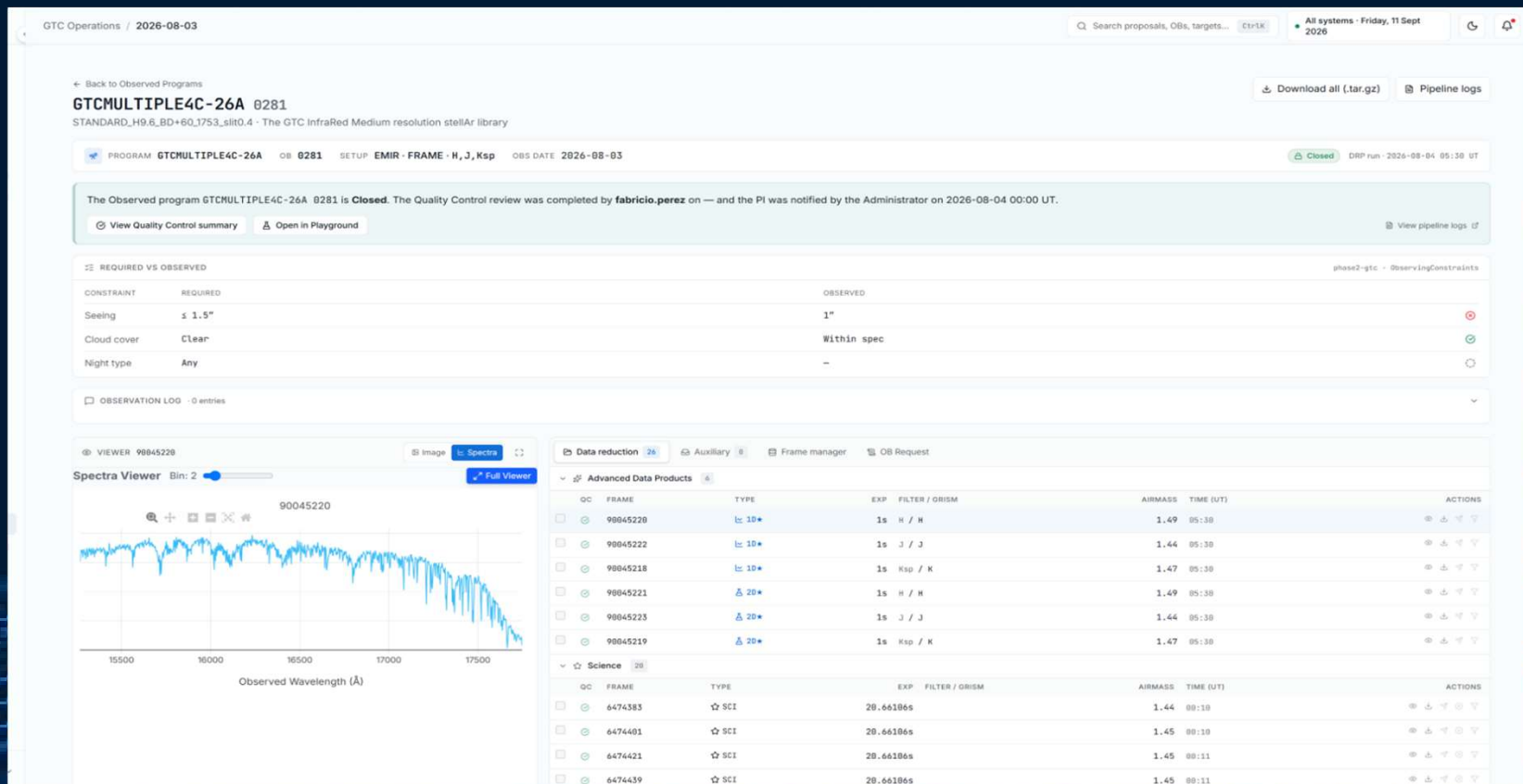
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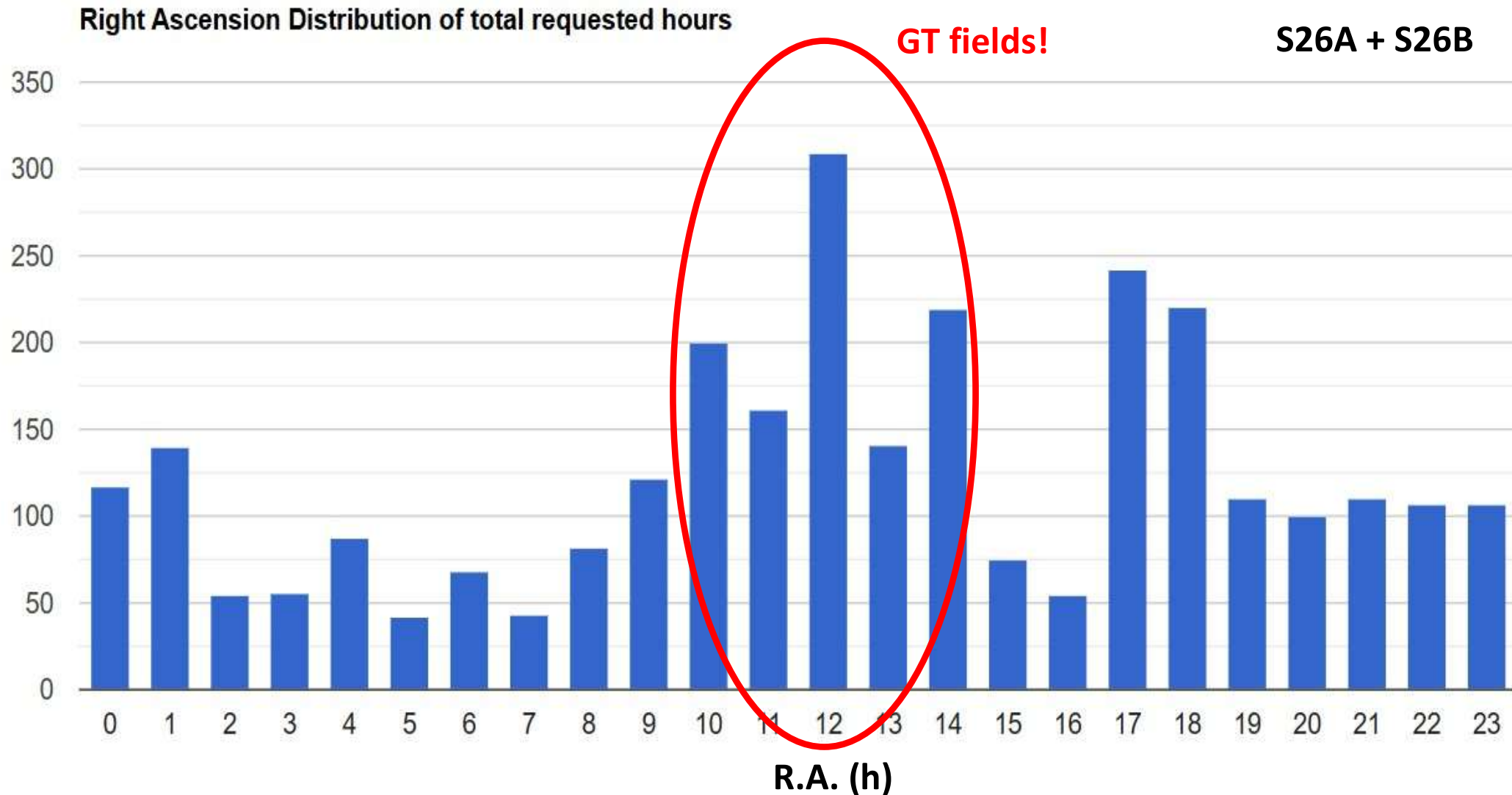


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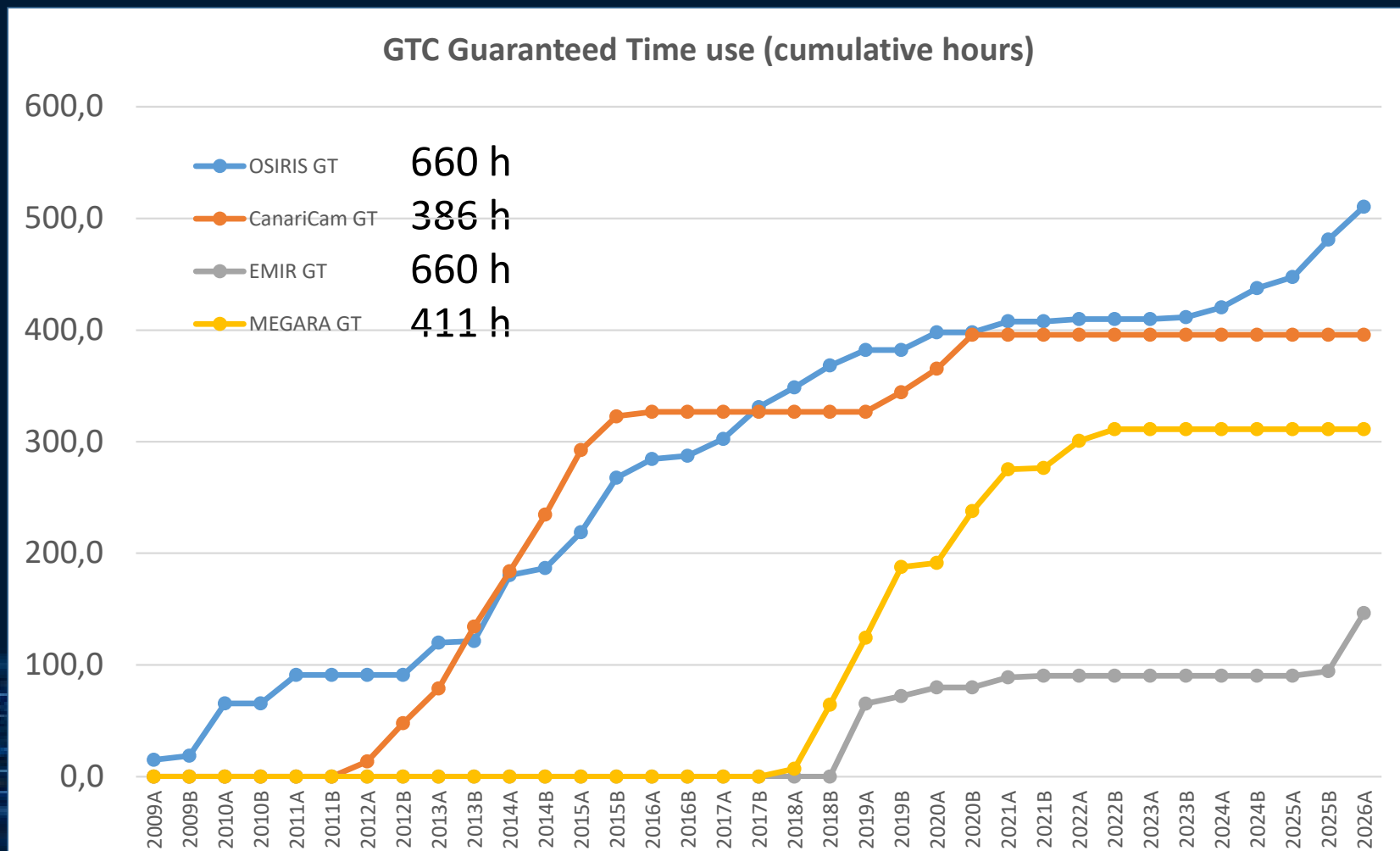
TAC related issues (I): RA 10-14h oversubscription



http://www.gtc.iac.es/observing/observing.php#The_time_allocation_process

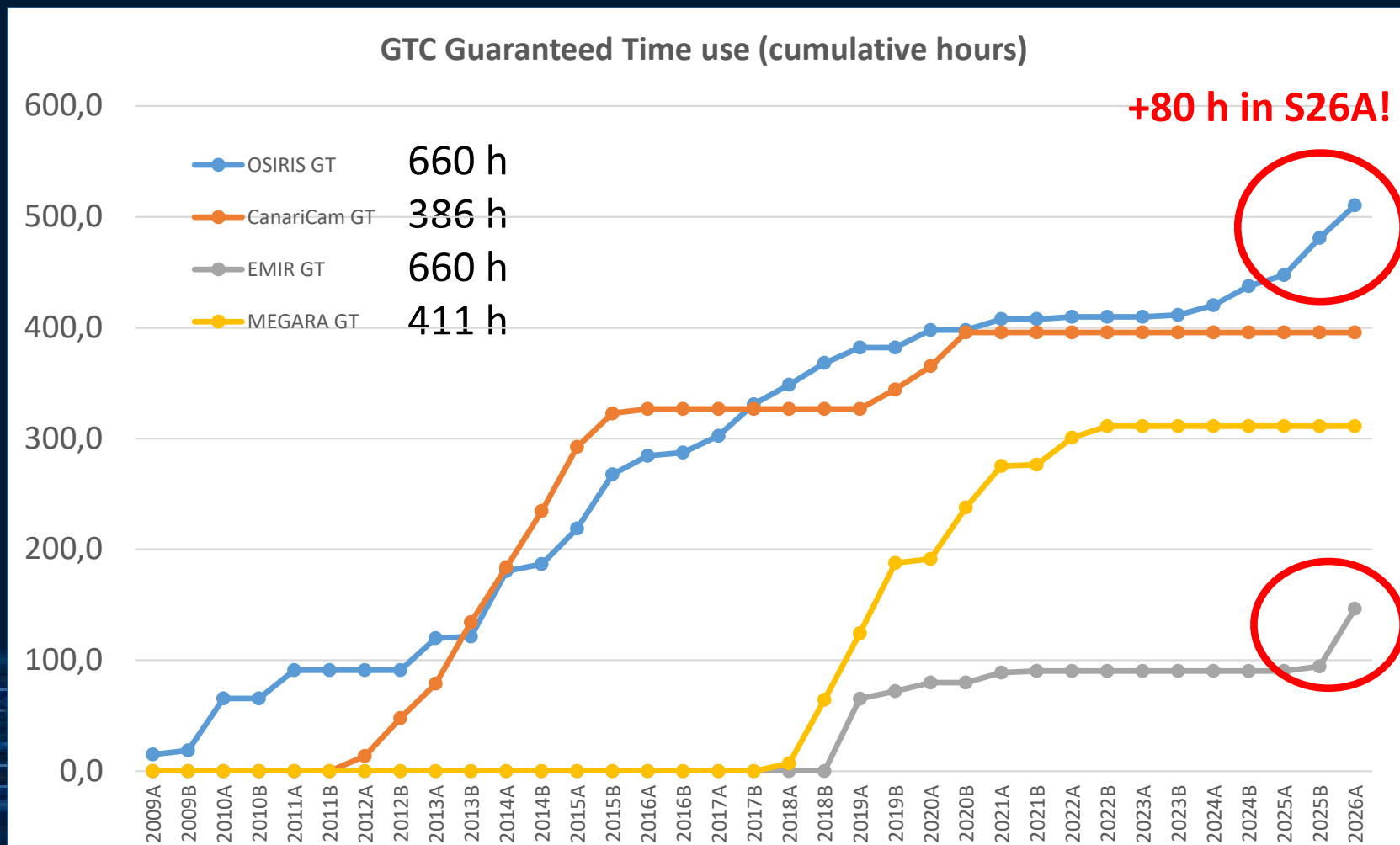
TAC related issues (II): Guaranteed time use

- **Canaricam GT COMPLETED / > 75 % MEGARA GT completed** (40 h IFU / 60 h MOS pending).
- **OSIRIS/EMIR GT resumed from S24A onwards** (OTELLO OSIRIS MOS + EMIR GOYA/GALEP projects) **with the aim to be completed in 2 years from S26A!**



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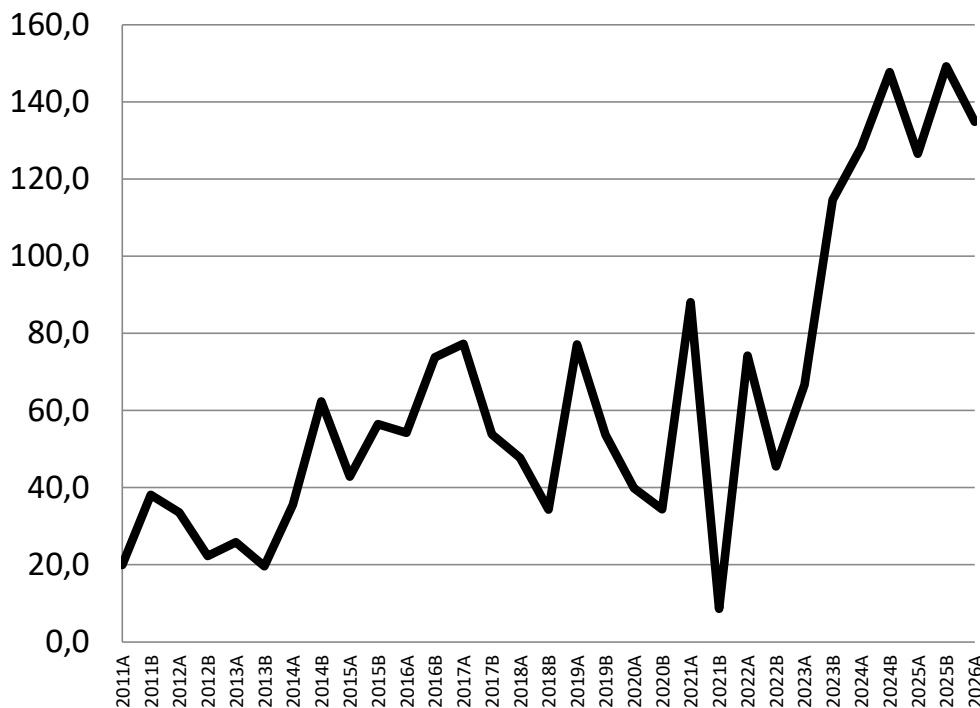
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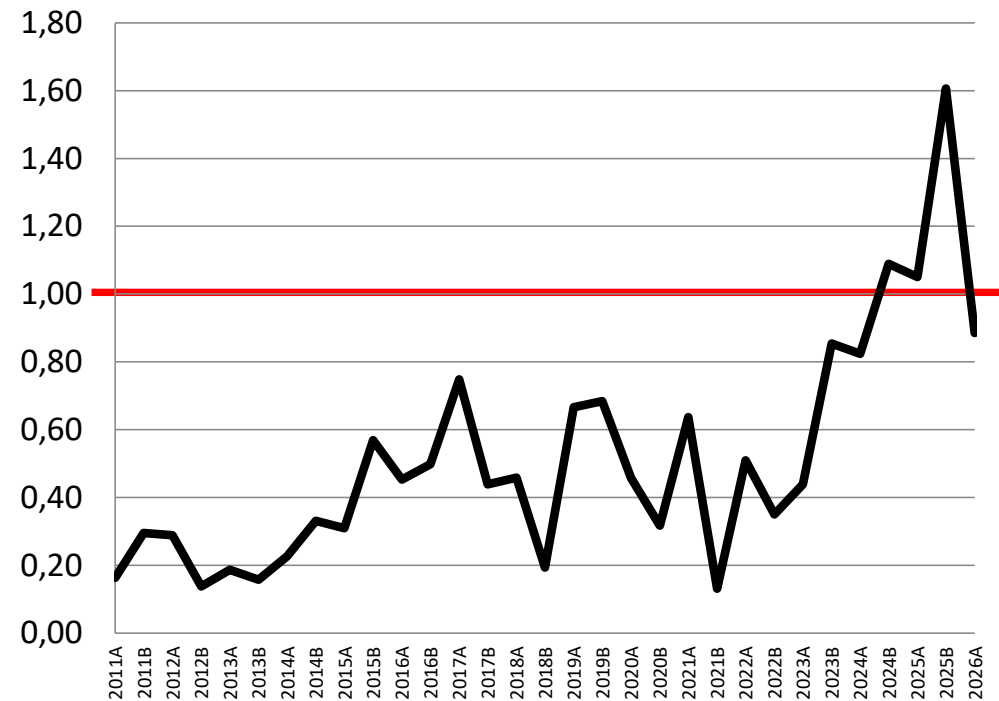
TAC related issues (III): ToOs management

- Notable increase of **the time demand for TOO**s in the last two years: > 120 h executed each semester with **more than a trigger per night** (275 - 300 h routinely allocated for ToOs).
- ToO proposals requesting **all the instruments** (OSIRIS, EMIR, MEGARA, HiPERCAM) and coming from **all the GTC communities yielding to priority conflicts!** => **TOOs are not accepted for GTC Large-Programmes.**

GTC TOO's executed hours



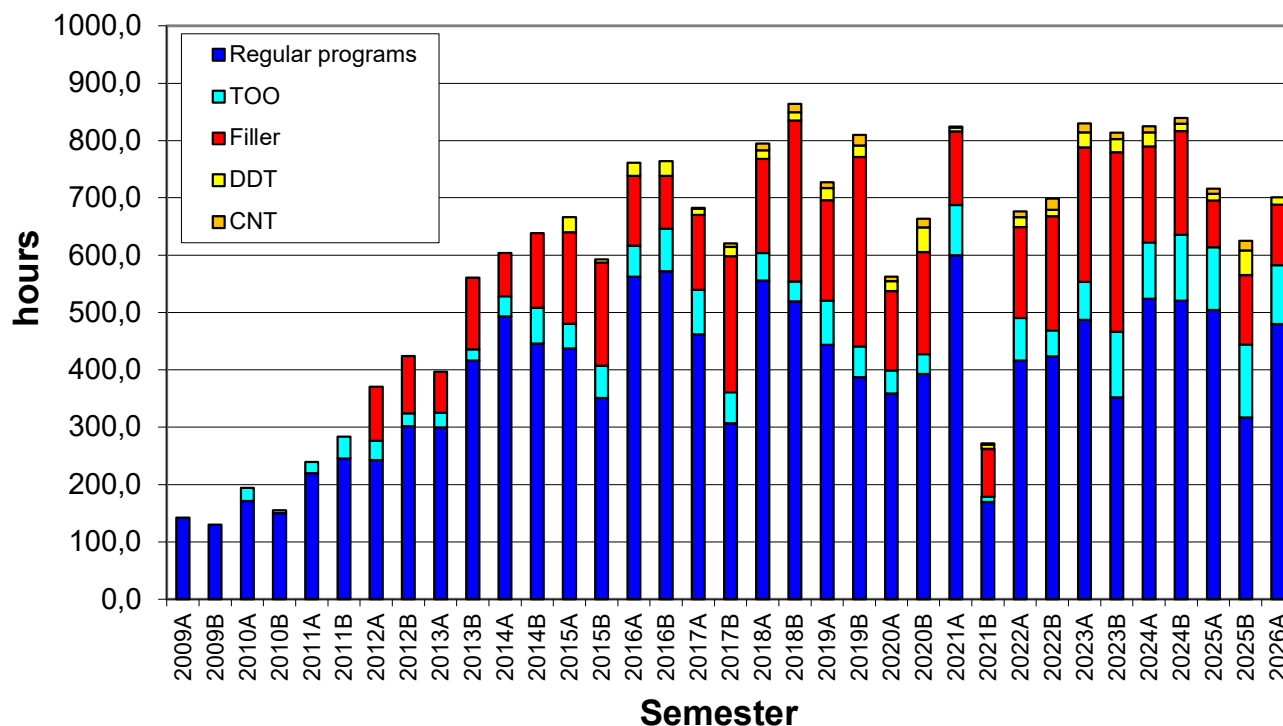
GTC TOO's triggers rate (triggers/science nights)



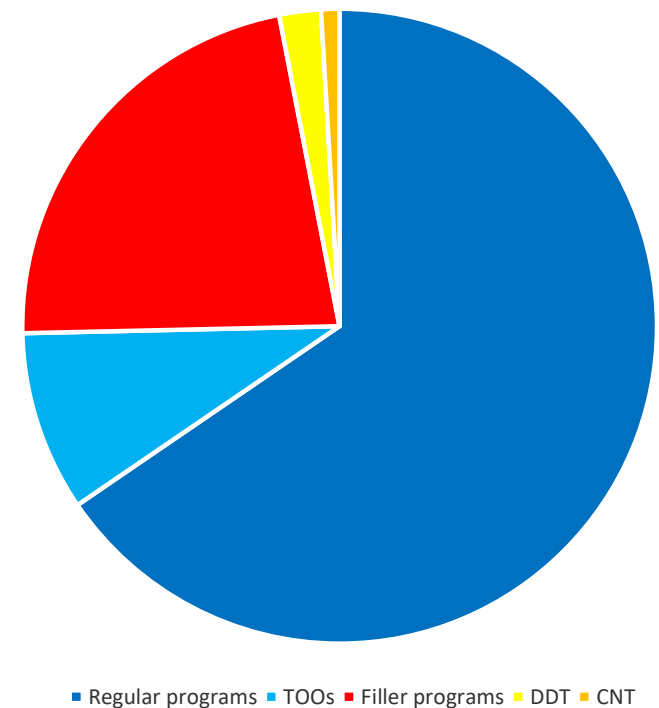
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GTC Spanish TAC science time use (queue + visitor mode)



GTC Spanish TAC science time use



Plan for Semester 2026B (time allocated by TACs)

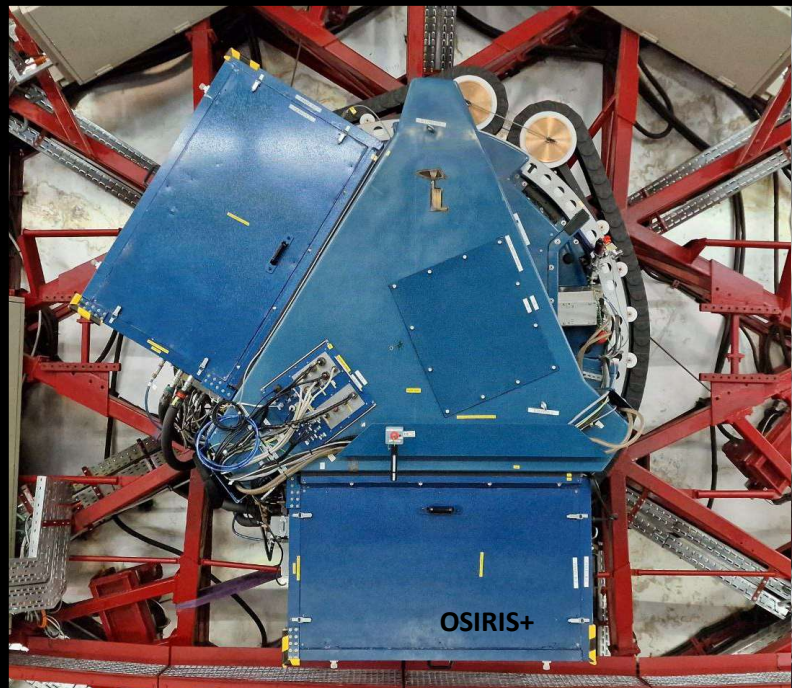
- Approximately 80 % of time for science.
 - + Technical telescope time / GTC OPTICS+GTCAO works
 - + FRIDA / MIRADAS commissioning (TBC).
- Offer **OSIRIS** imaging, longslit and MOS modes with the new blue sensitive monolithic detector (**OSIRIS+**).
- Offer **EMIR** imaging, longslit and MOS mode with the new higher sensitivity detector (**EMIR+**).
- Offer **MEGARA (IFU mode only).**
- Offer **HIPERCAM** including new COMPO component. **DIFFUSER/Narrowband filters for A-ranked proposals only.**
- **Large-Programs are offered in S26B for HiPERCAM, MEGARA (IFU mode), EMIR and OSIRIS (imaging and longslit spectroscopy modes).** TOO are not accepted due to scheduling issues. **100 h per semester are available in this call.**



Plan for Semester 2027A (call for proposals September 2026)

- Approximately 80 % of time for science.
 - + Technical telescope time / GTC OPTICS+GTCAO works
 - + FRIDA / MIRADAS commissioning (TBC).
- Offer **OSIRIS** imaging, longslit and MOS modes with the new blue sensitive monolithic detector (**OSIRIS+**).
- Offer **EMIR** imaging, longslit and MOS mode with the new higher sensitivity detector (**EMIR+**).
- Offer **MEGARA (IFU mode only).**
- Offer **HIPERCAM** including new COMPO component. **DIFFUSER/Narrowband filters for A-ranked proposals only.**
- **Large-Programs are offered in S27A for HiPERCAM, MEGARA (IFU mode), EMIR and OSIRIS (imaging and longslit spectroscopy modes).** TOO are not accepted due to scheduling issues. **50 h per semester are available in this call.**
- Monitoring/Long Term programmes are **accepted for A-band ranked proposals.**

GTC Current Instrumentation Status



OSIRIS+



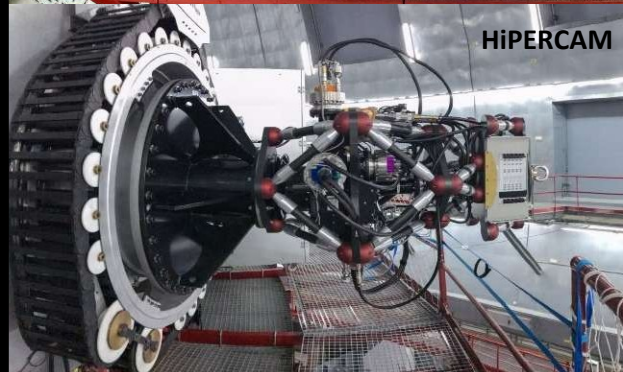
MEGARA



EMIR



MIRADAS



HiPERCAM

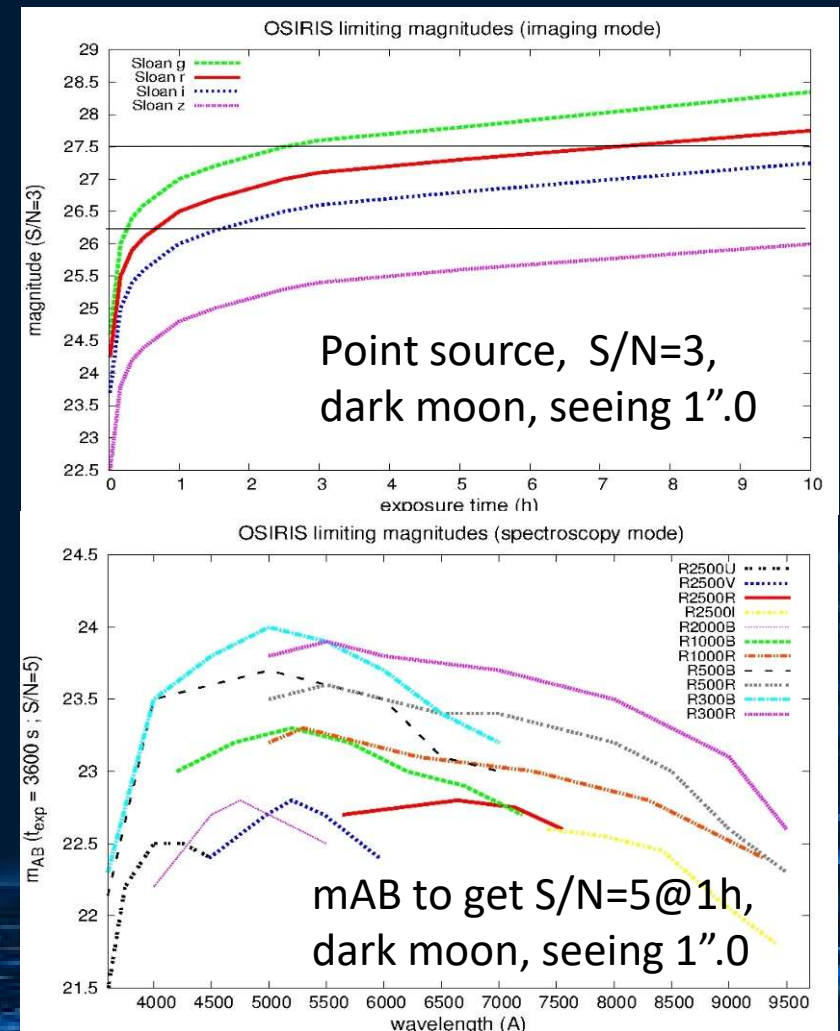


GTCAO

OSIRIS imager and multi-object spectrograph

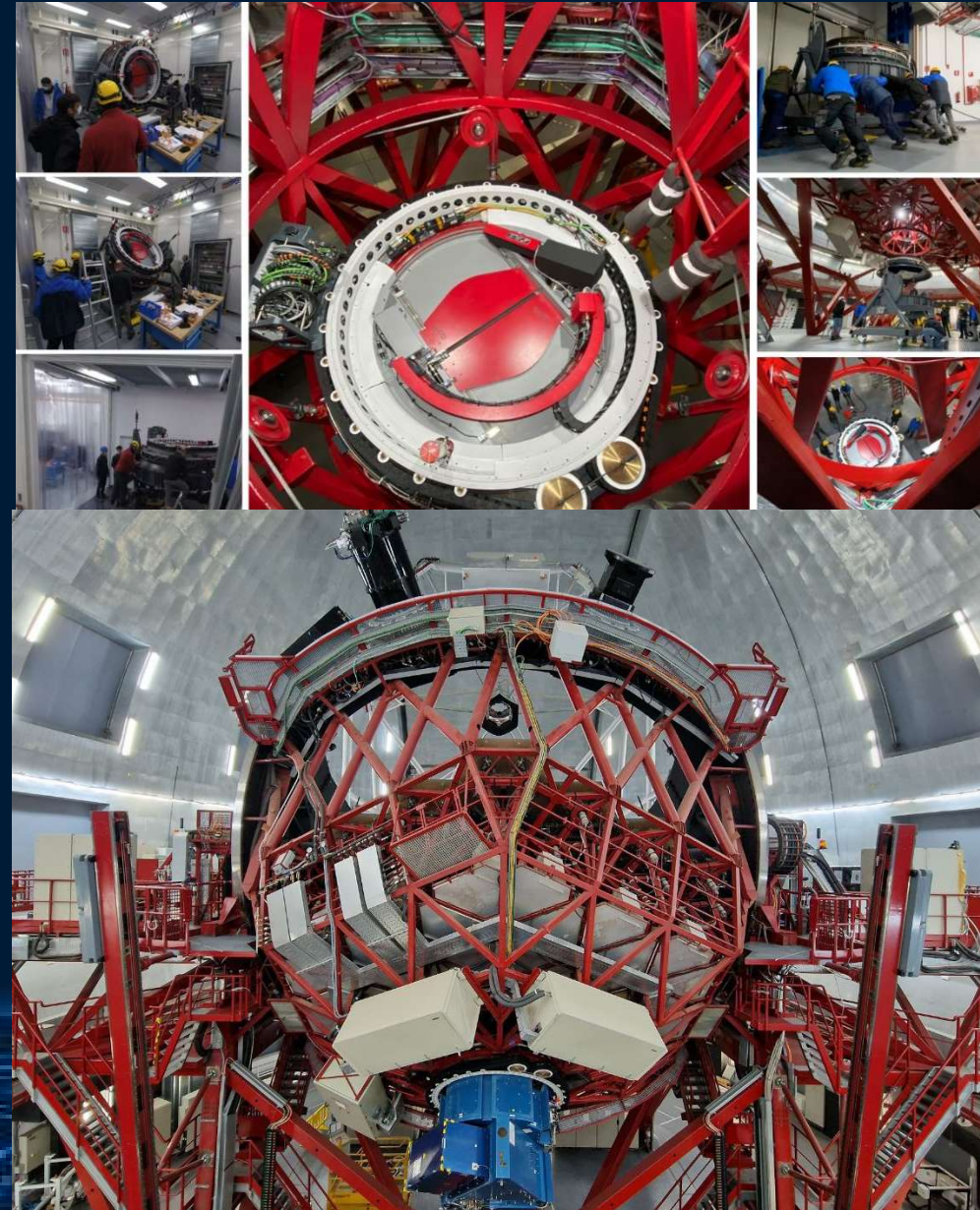
Common-user instrument since 2009 (Nasmyth B), moved to Cassegrain in 2022, upgraded to a new blue sensitive 4k x 4k monolithic CCD in December 2022 (**OSIRIS+**).

<i>Spectral Range</i>	0.36-1.00 μm
<i>Detector</i>	E2V CCD231-84-1-E74
<i>Plate Scale</i>	0.125 arcsec pix^{-1}
<i>Field of view</i>	7.8 x 7.8 arcmin ²
<i>Imaging modes</i>	Broad-band Medium band Tunable Filters Fast photometry
<i>Spectroscopic modes</i>	long-slit mask MOS
<i>Spectral resolution</i>	300 to 2500



OSIRIS upgrade timeline (OSIRIS+)

- **New Focal Station** (Cassegrain) installed in **December 2020**, operative in **November 2021**, and on sky commissioning **completed in February 2022** (including new HMP).
- **OSIRIS** was installed at the new focal station in **February 2022**. First on sky tests on **March 2022** were successful, but **different problems with Mask Loader**, affected to the planned observing runs (solved in **June 2022**).
- First **science observations** obtained on **late April 2022** (without ICM), and **routinely observations began in July 2022**.
- **OSIRIS new CCD** was installed and commissioned at the instrument in **December 2022**, **included in the scientific operations in late 2022B/2023A (IMAGING, LSS, MOS)**.



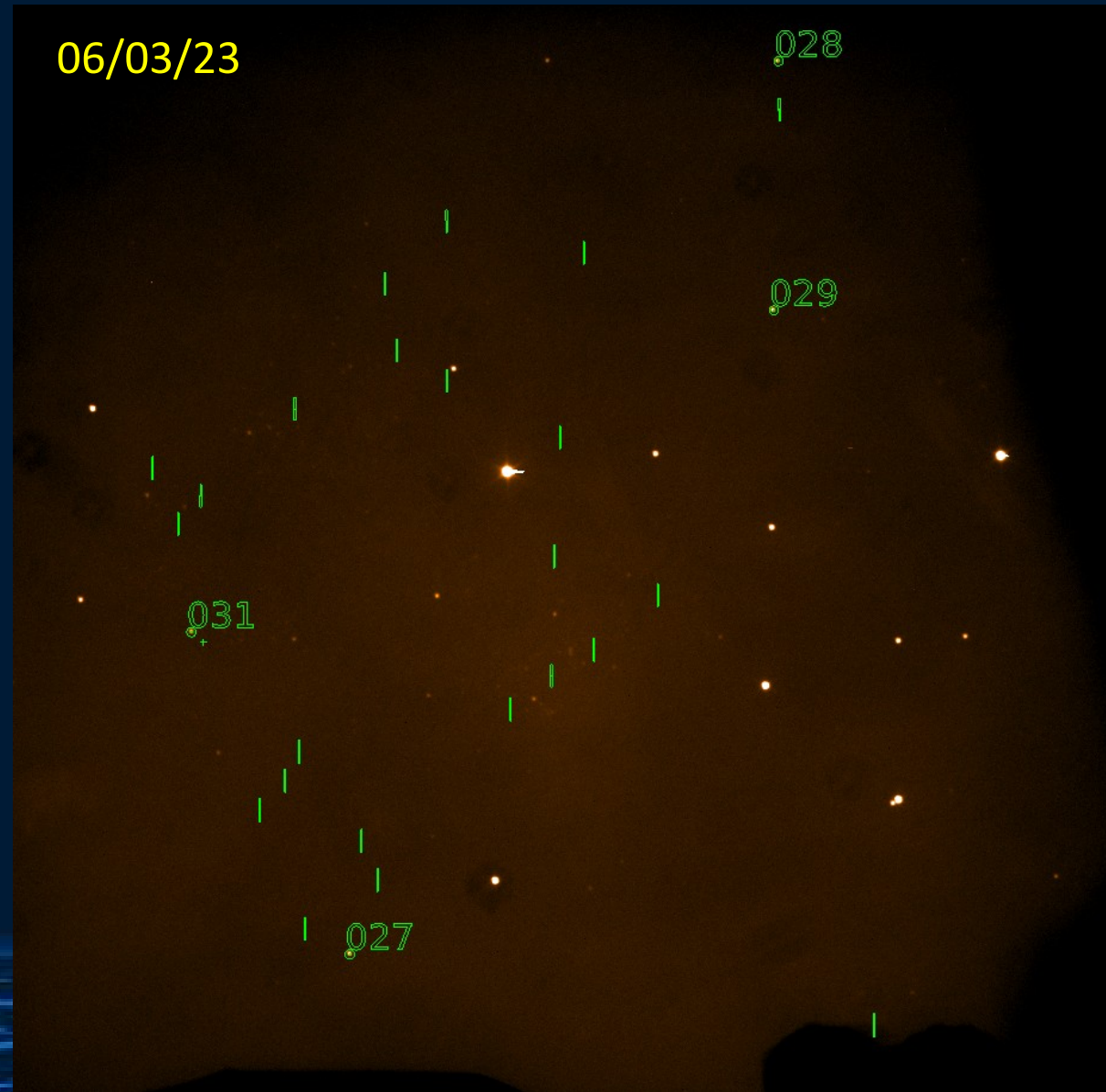
OSIRIS+ instrumental modes

- Broad Band imaging
- Medium Band imaging.
- Long Slit Spectroscopy.
- **Multi Object Spectroscopy**
(MD3.32, released April 2023).

(about 160 masks already
produced and executed!)

- **TFs and Fast Modes will not
be commissioned**

(new components and extensive
commissioning needed)



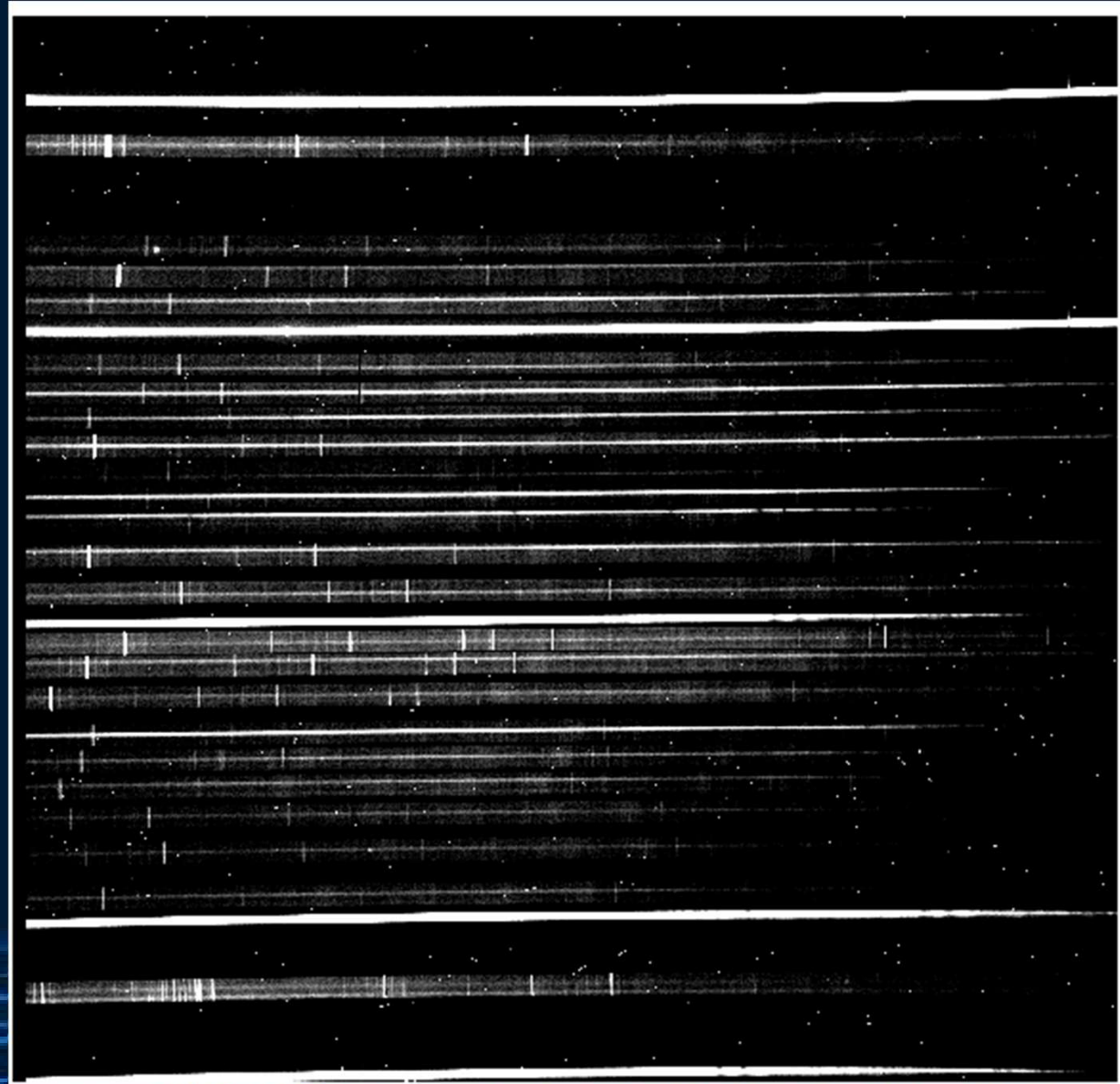
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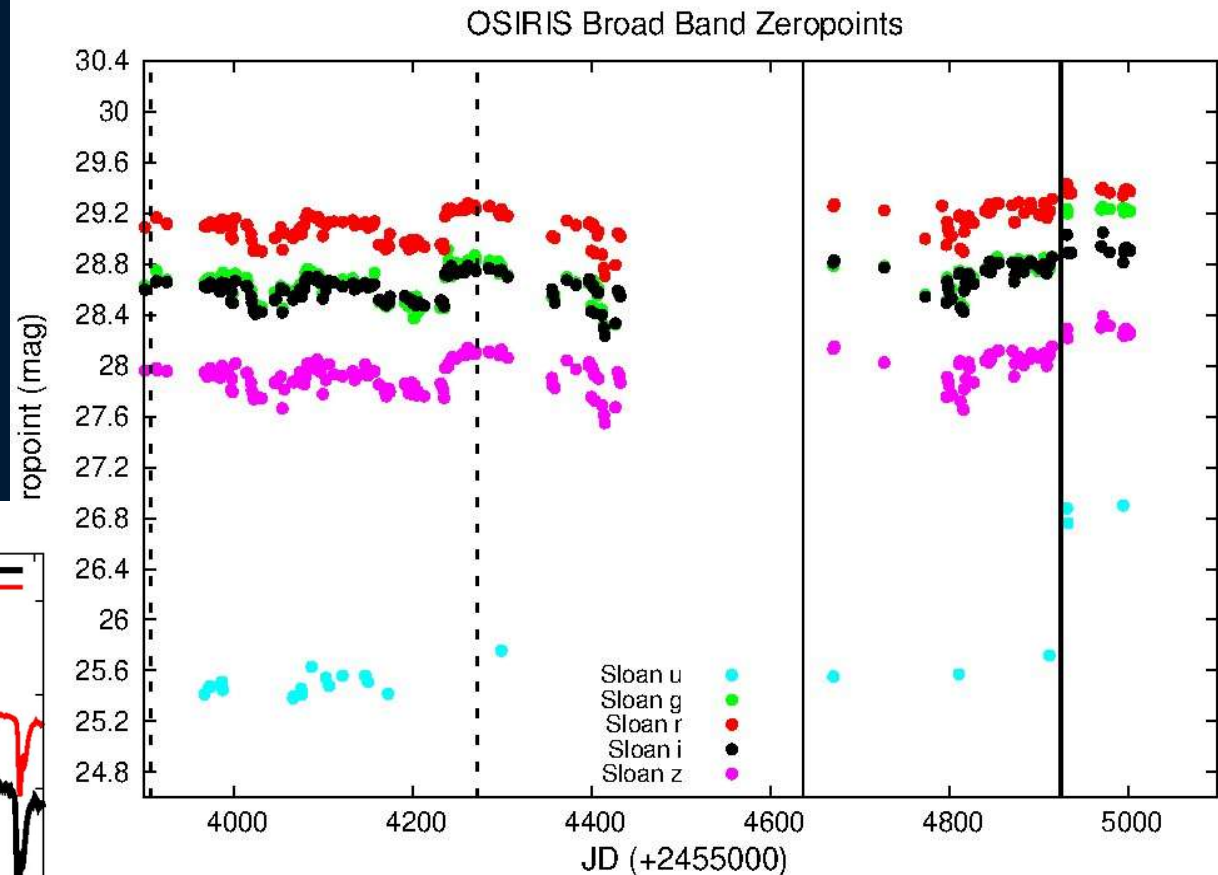
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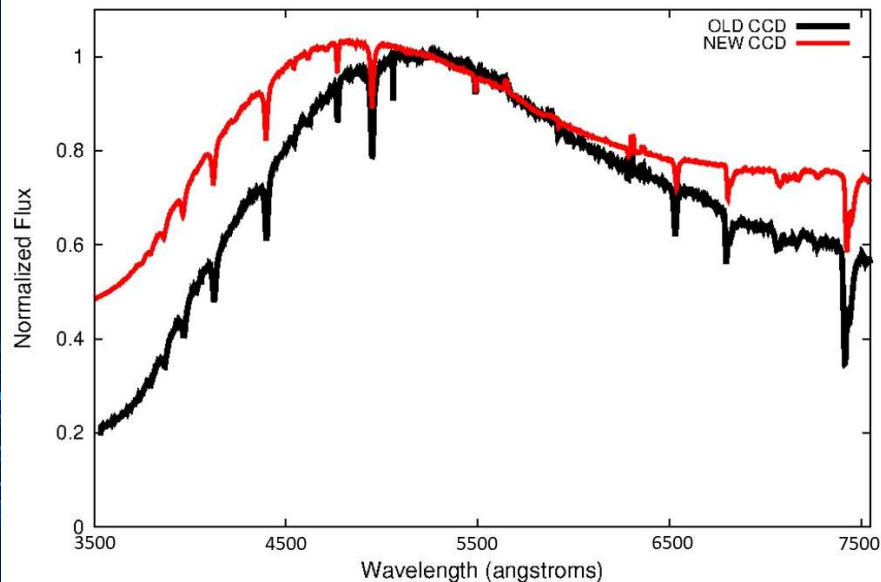
OSIRIS upgrade (New CCD) - Pros

• **Notable sensitivity gain** at bluer wavelengths (0.5-1.2 mags) but also some improvement in the red.

ZPs	OSIRIS	OSIRIS+*
u'	25.7	26.9
g'	28.85	29.3
r'	29.3	29.4
i'	28.85	29.0
z'	28.15	28.3



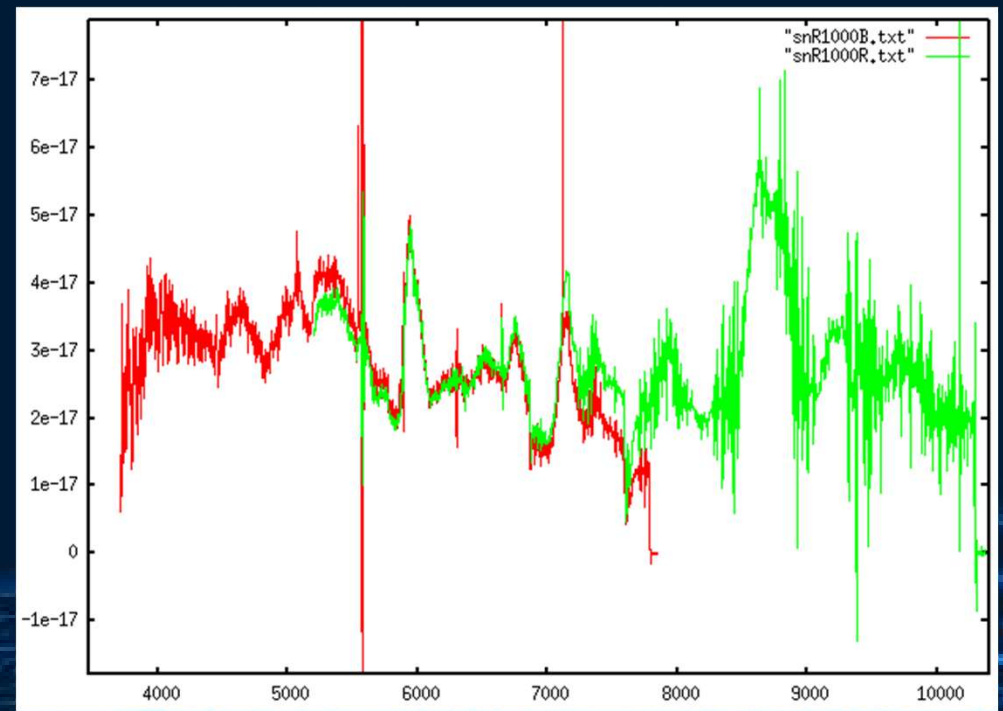
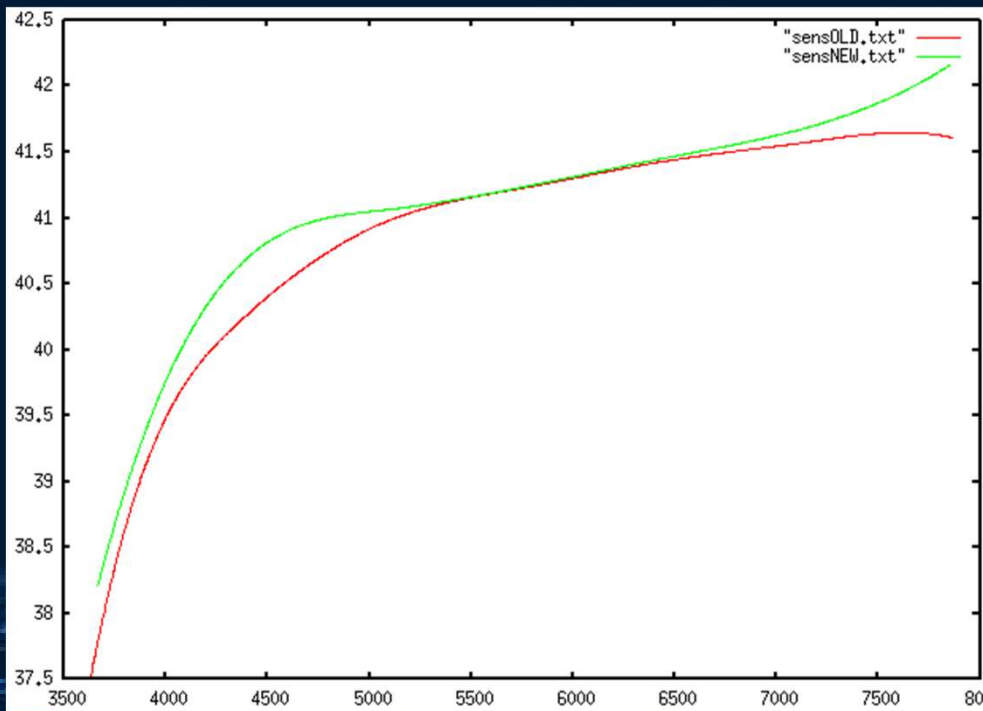
Feige110 spectrophotometric standard



* Converted to 'old' CCD gain (equivalent ZPs in ADU/s are 0.7 mags lower).

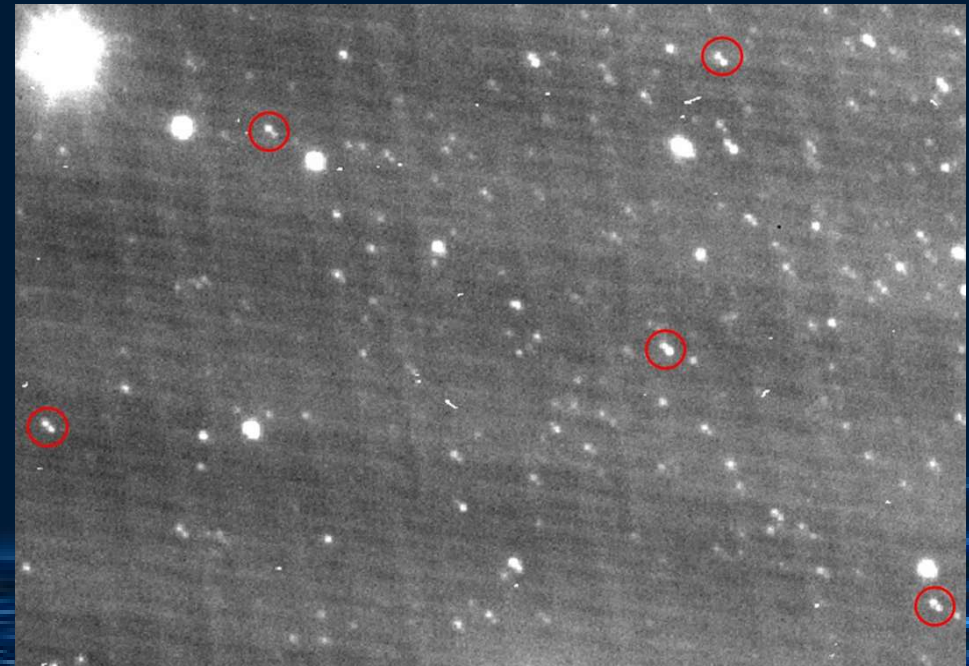
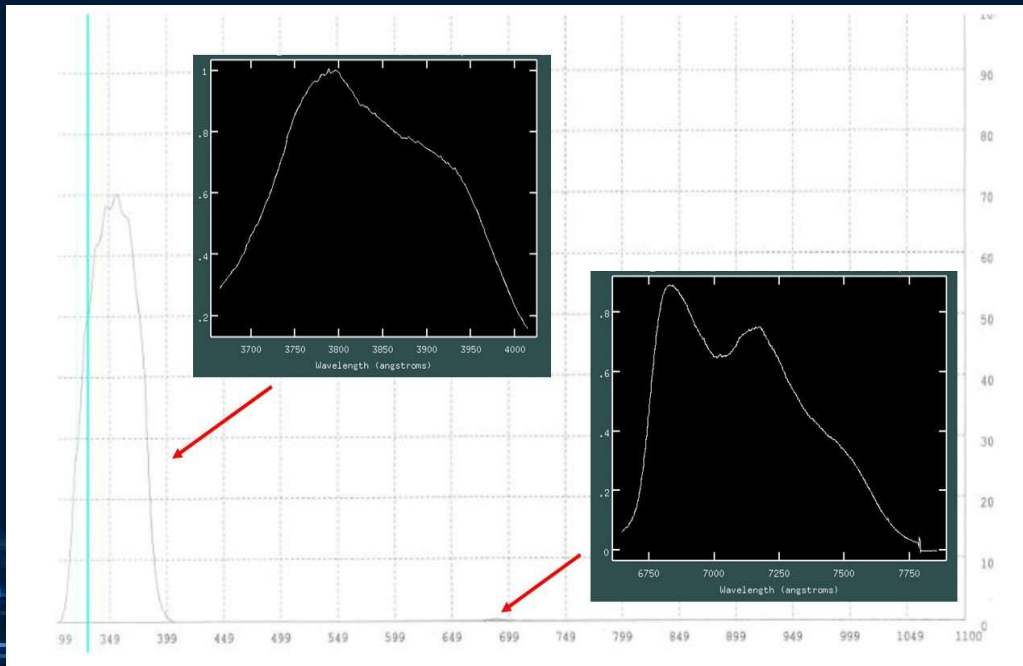
OSIRIS upgrade (New CCD) - Cons

- **Second order contamination in OSIRIS+ blue grisms:** R300B, R500B, R1000B show some contamination at wavelengths larger than 650 nm (7% at 700 nm, but 25% at 750 nm!).
- **Sloan u' filter leakage** at approximately 670-750 nm produces that contamination coming from these wavelengths would affect the photometry obtained in u' band (use HIPERCAM if required!). => **A new Super SDSS filter set under procurement.**



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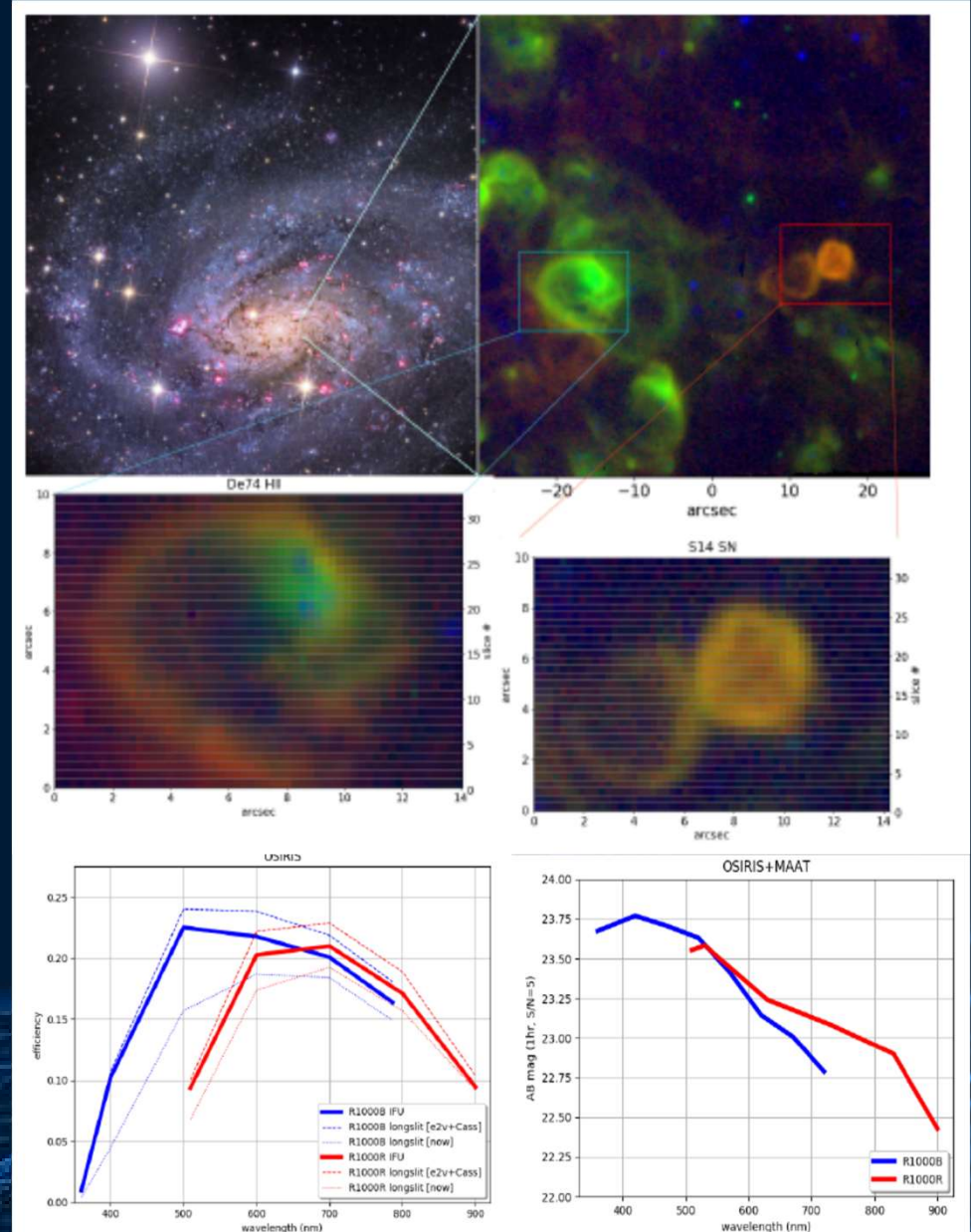
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MAAT@OSIRIS

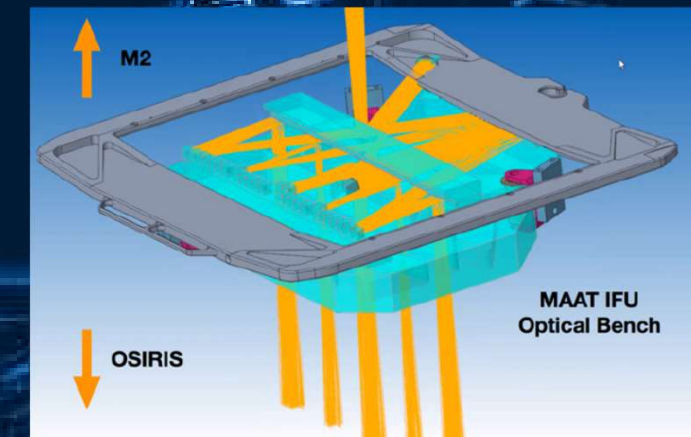
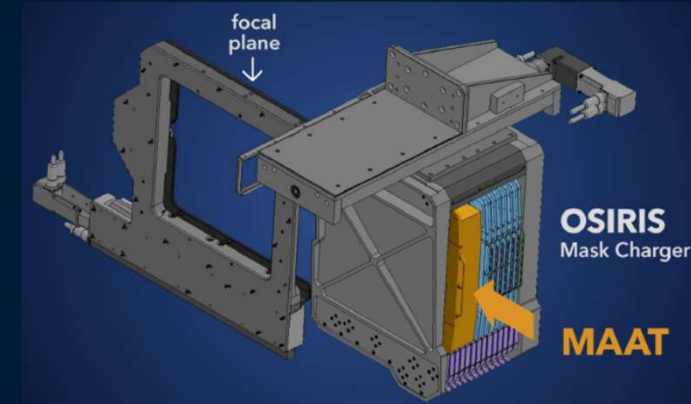
IFU based on image slicers to be integrated in OSIRIS (expected by late 2026).

<i>Spectral Range</i>	0.36-1.00 μm
<i>Detector</i>	E2V 4k x 4k
<i>Plate Scale</i>	0.127 arcsec pix ⁻¹
<i>Field of view</i>	12" x 8.5"
<i>Module</i>	Integral Field Unit
<i>Spatial Sampling</i>	0.303" x 0.127"
<i>Spectral resolution</i>	600 to 4100



MAAT@OSIRIS

- MAAT Equipment (construction) approved in November 2021 (funding secured, 1.9 M€ as of April 2024). MAAT PDR passed in April 2022. FDR completed in May 2023.
- Feasibility study of the new OSIRIS Mask Charger completed in July 2022 by MAAT team. Works started in early-2024.
- The MAAT Construction Phase started in May 2023 (final Opto-mechanical design completed by Bertin Winlight in June 2023). Some delays in the procurement and construction issues => MAAT will be accepted at GTC in April 2026.
- MAAT's first on-sky tests in May 2026.



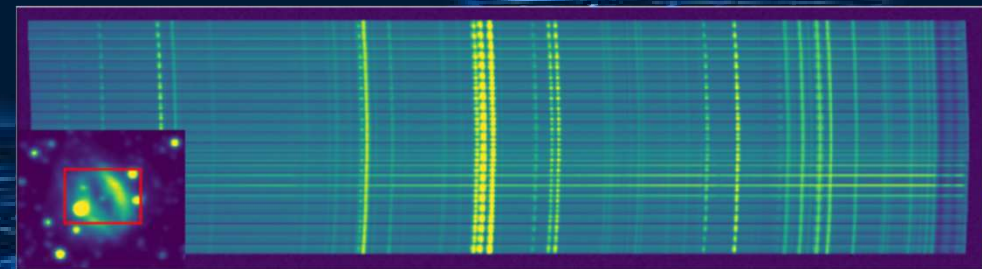
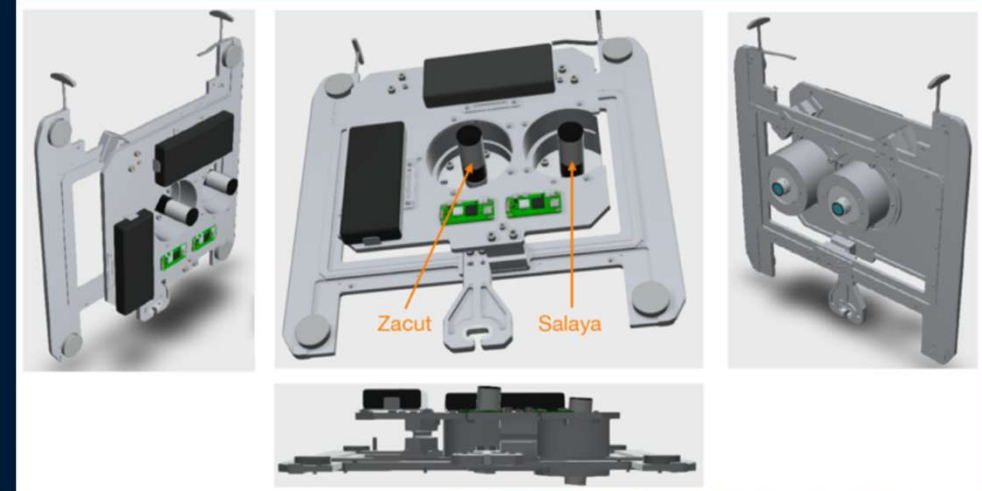
GTC GUC Meeting



CALP, La Palma, 17-18 September 2026

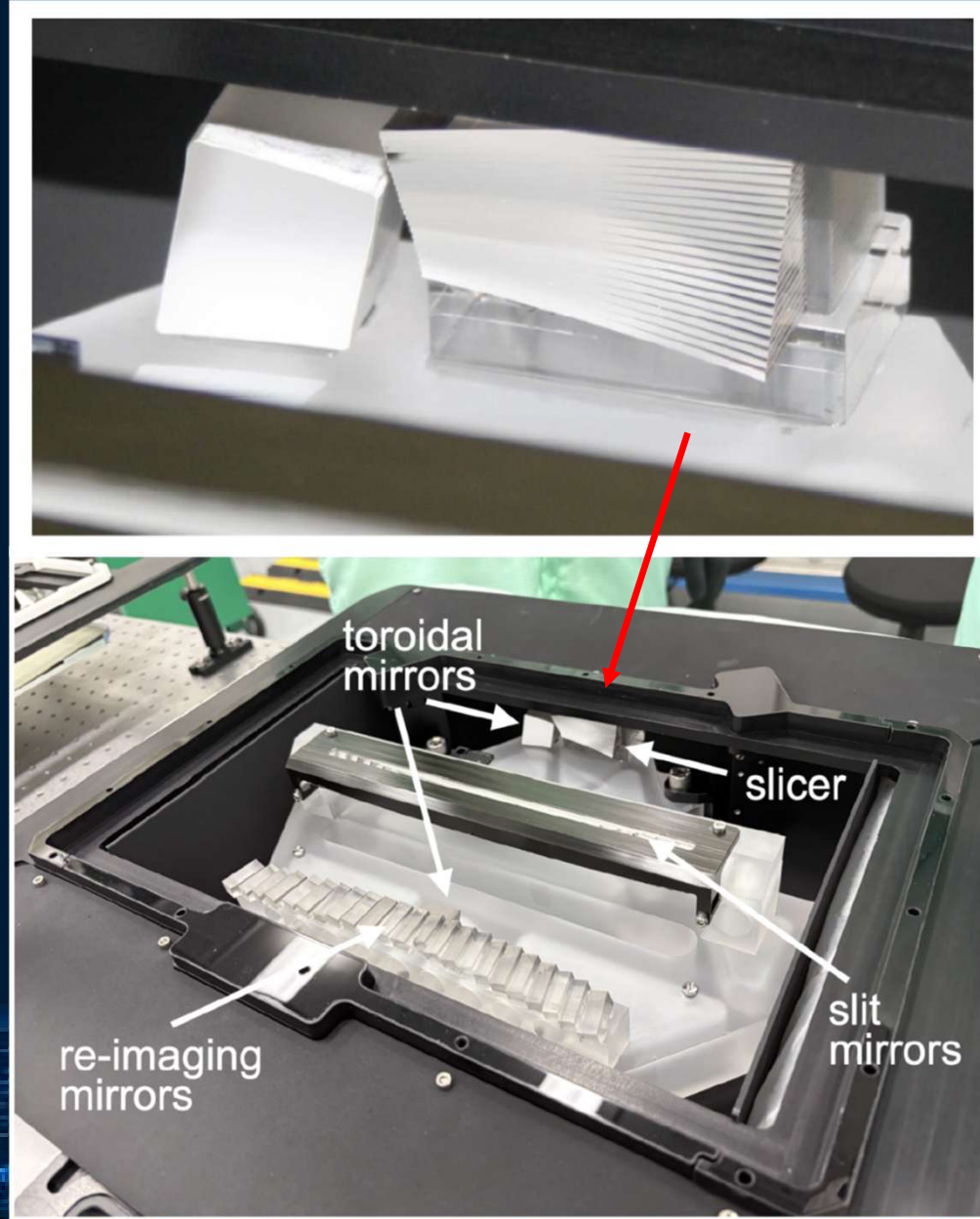
MAAT@OSIRIS

- Upgrade of the OSIRIS Mask Charger completed in May 2024.
- Functionality of the positioning system for MAAT using the MAAT-Dummy tested in July 2024. Full verification completed in late August 2024.
- Initial software / MAAT-Dummy tests started in August 2025.
- MAAT IFU optical system constructed at Bertin Winlight (Marseille), some design problems delayed its procurement to GTC to April 2026.
- **First light obtained in 23-24 May 2026**
- MAAT data reduction pipeline has been implemented using the PyPeit software package (developed using simulated data).
- MAAT ETC is publicly available at: <https://maat.iaa.es/etc/>



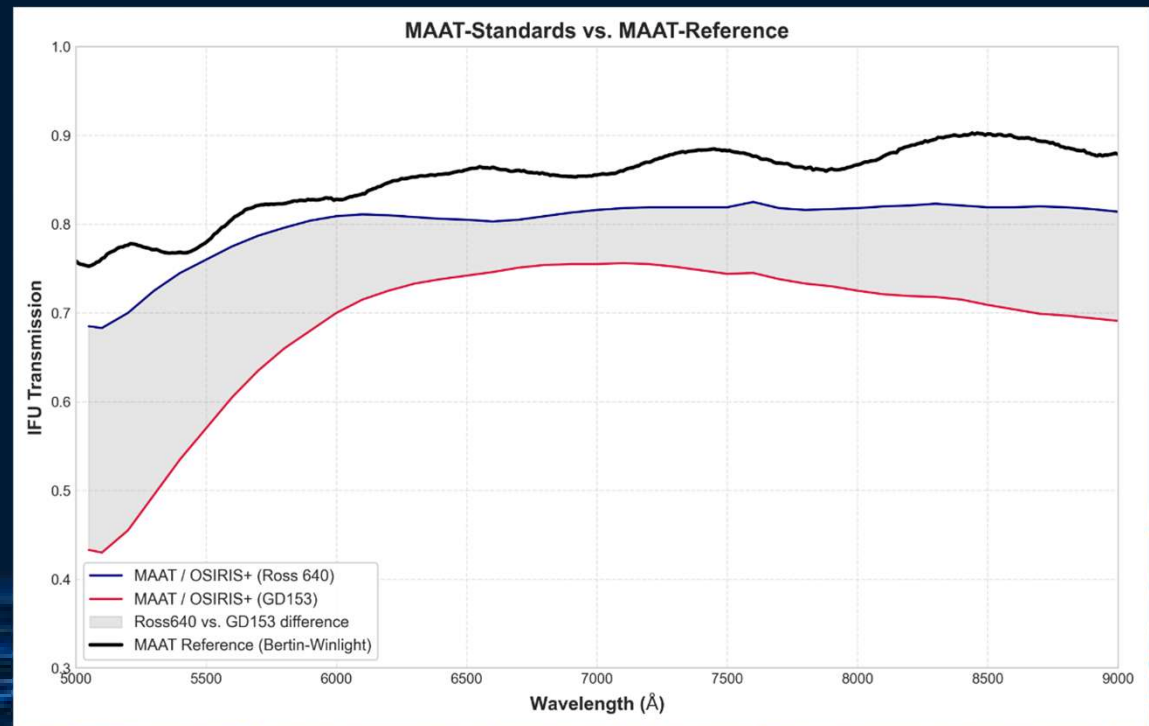
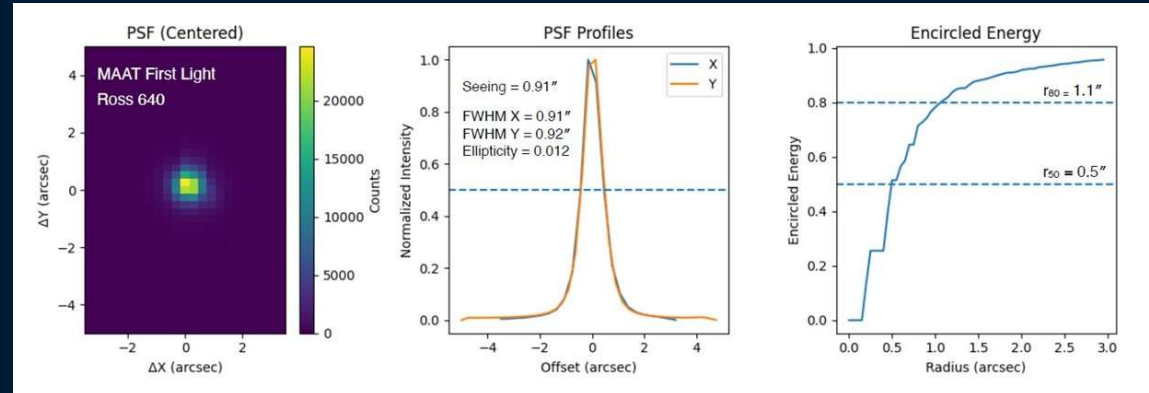
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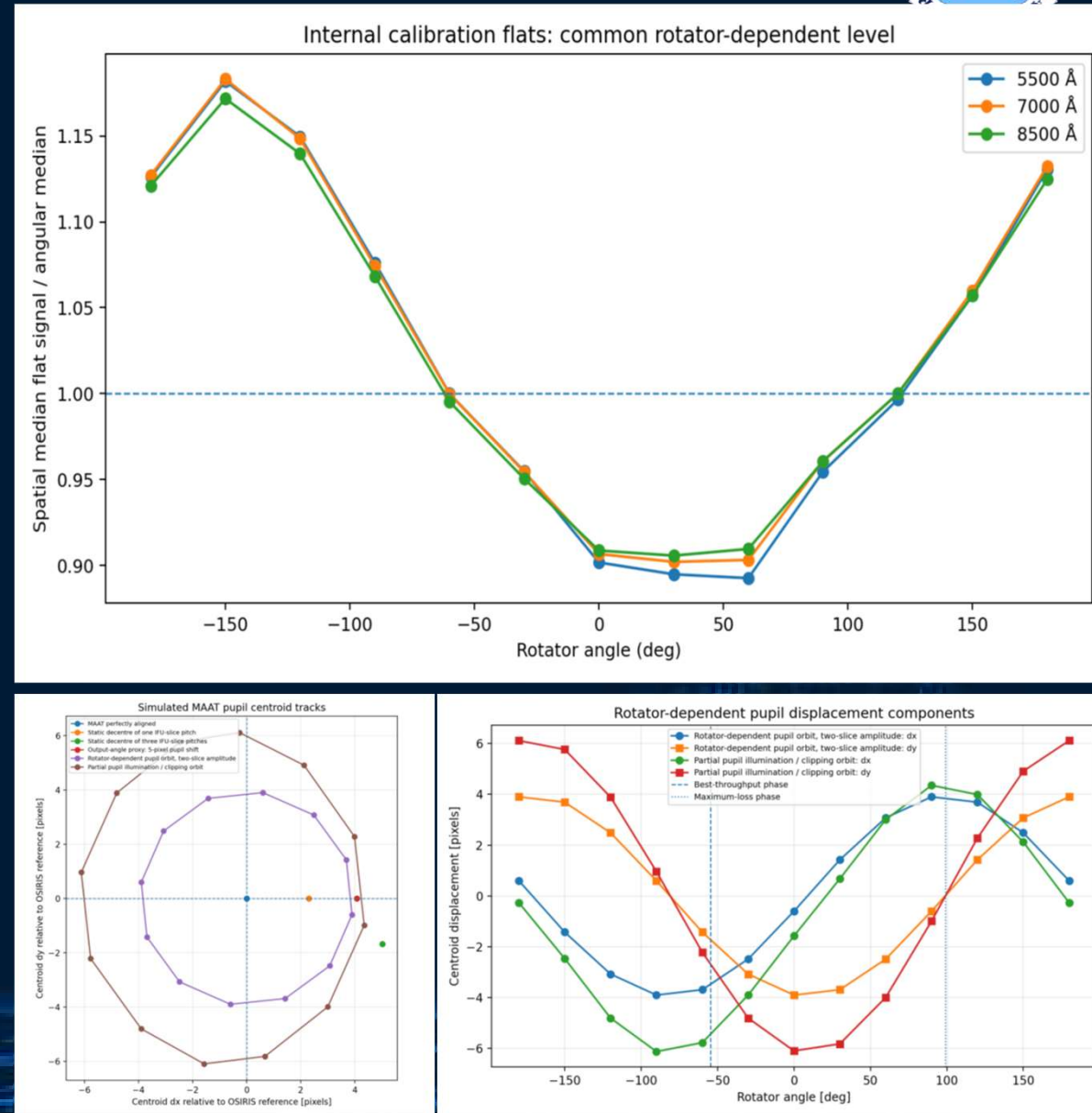
MAAT First Light (May 2026)

- First light for MAAT obtained on May 24th 2026.
- Excelent image quality and promising throughput obtained.
- Some issues need to be solved:
 - Insertion process still to be consolidated.
 - Throughput dependence with rotation:
 - => MAAT/OSIRIS+ pupil missalignment?
 - Straylight contamination
 - => M3 tower baffling?
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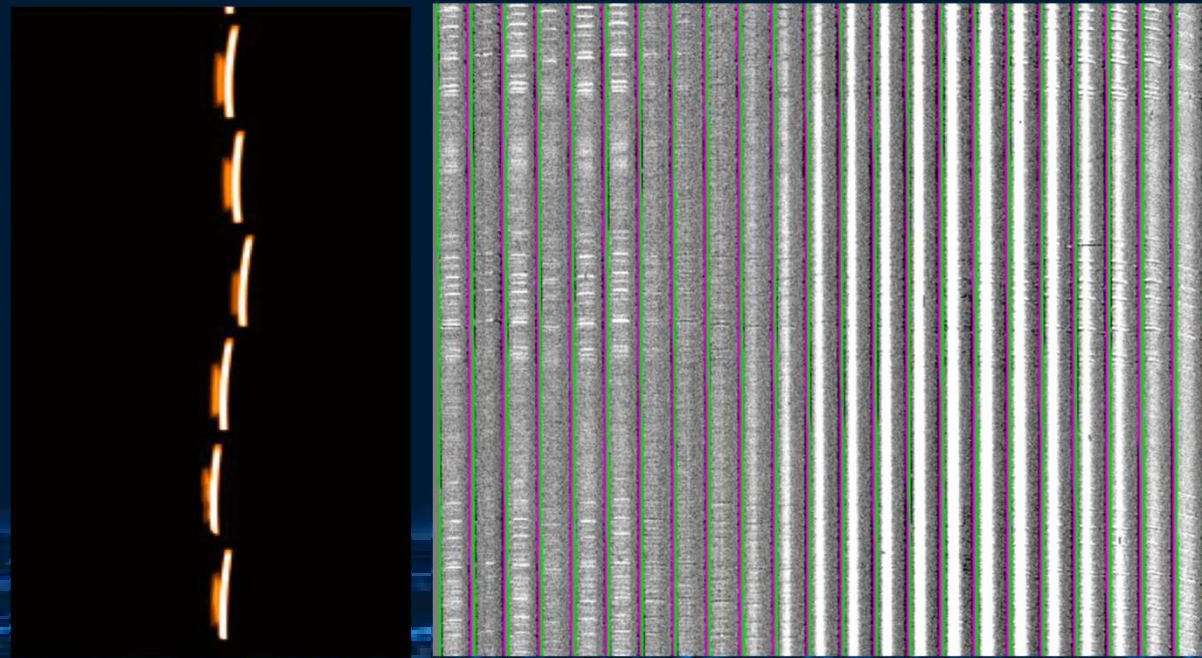
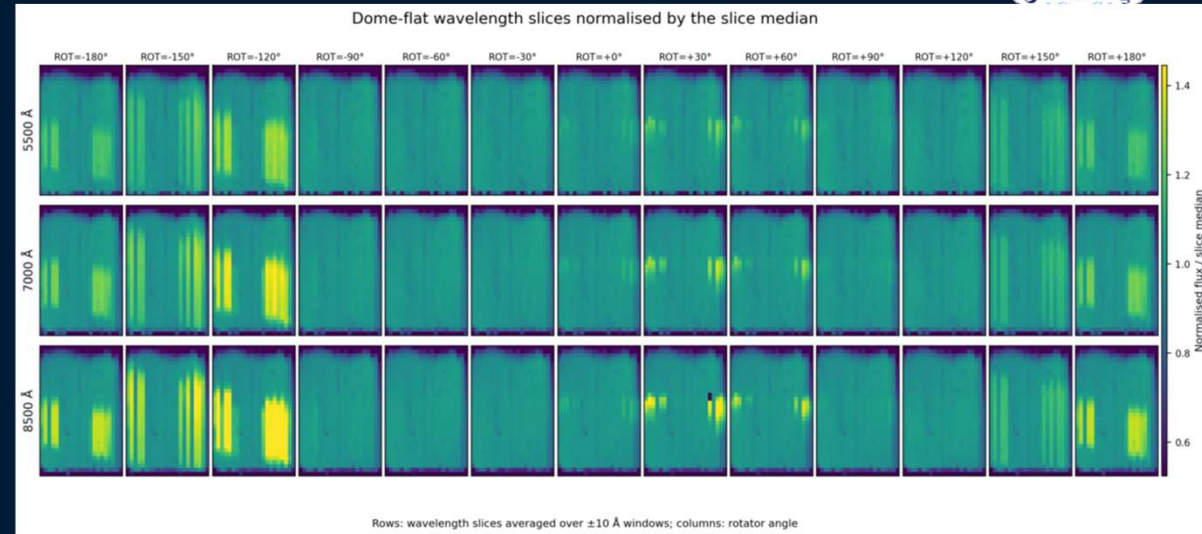
MAAT First Light (May 2026)

- First light for MAAT obtained on May 24th 2026.
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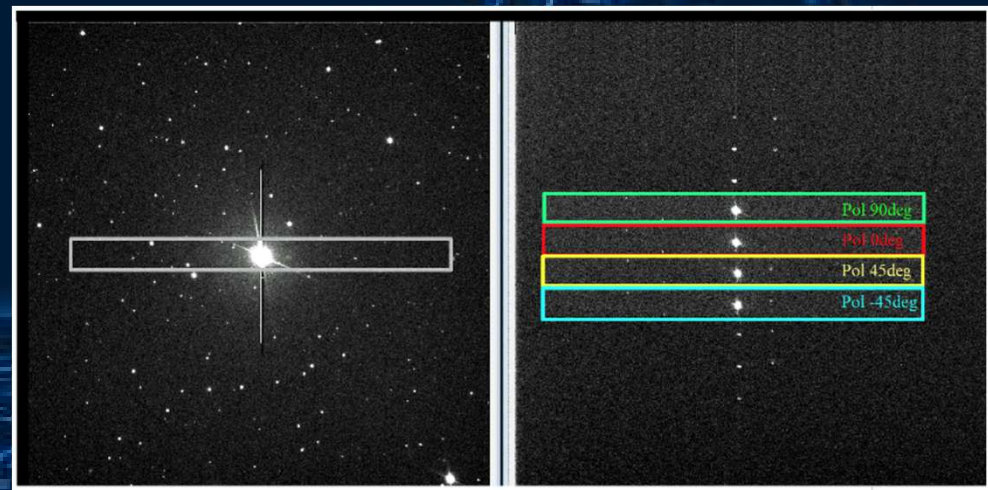
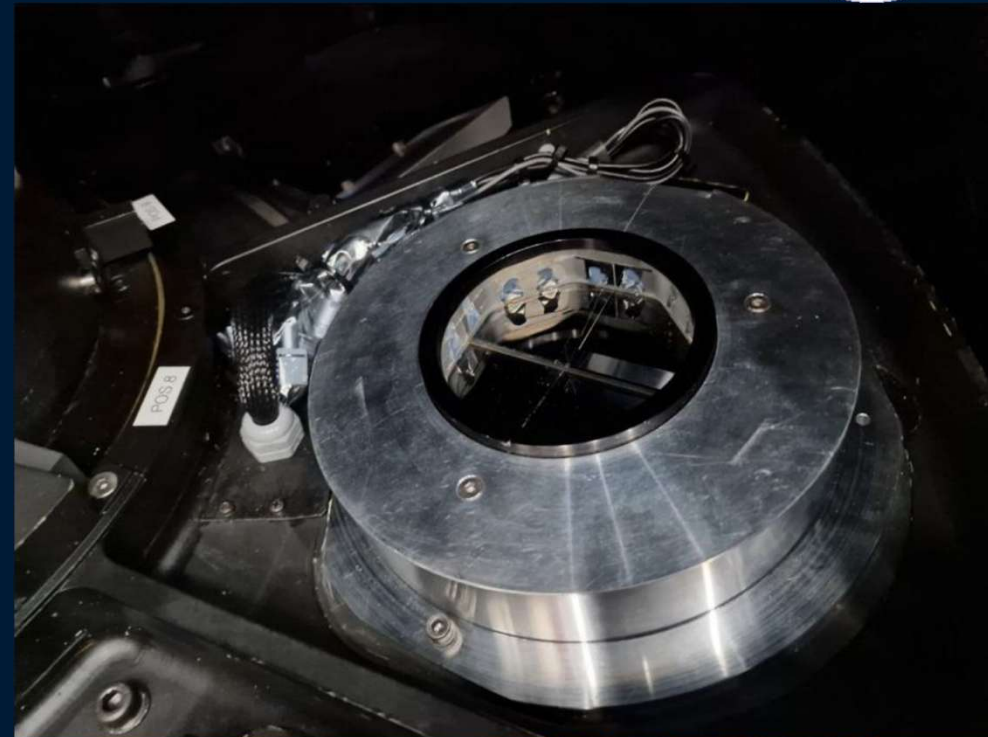
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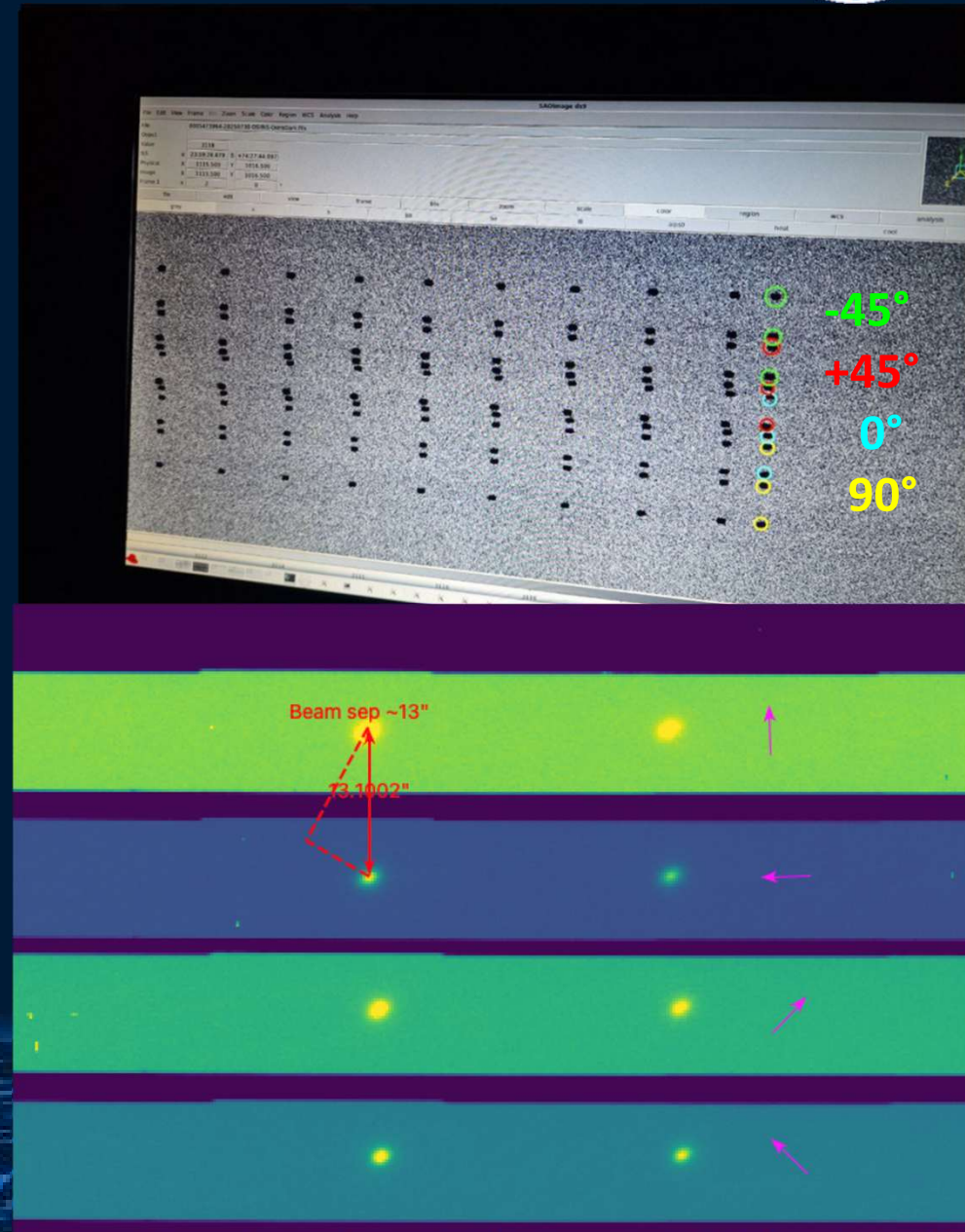
Optical Polarimetry with OSIRIS+

- **Linear polarimetry in OSIRIS by using the Double Wollaston (DW)** borrowed from the DOLORES@TNG spectrograph. PI: F. Prada (IAA-CSIC), coIP: A. Ghedina (TNG-INAf).
- DW installed in the slot of the BTF of the OSIRIS grism wheel.
- FOV of $516'' \times 13''$ to avoid overlapping FOVs of different polarization states (**four parallel strips** give the lineal polarization at 0° , 90° , $+45^\circ$, and -45°).
- Installation and alignment tests done in 30-31 July 2025. **Polarized and non-polarized stars** also observed to measure polarization / calibration parameters: instrumental polarization, zero-angle determination and dependence with position in FOV.
- **A scientific demonstration run completed in February 2026 (analysis ongoing).**



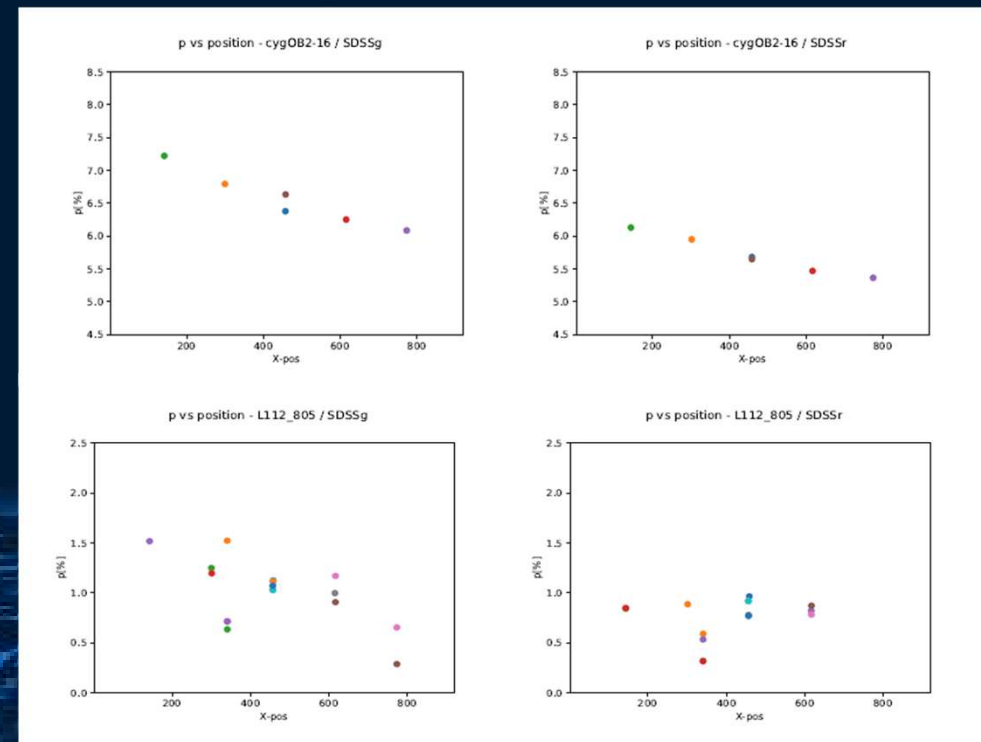
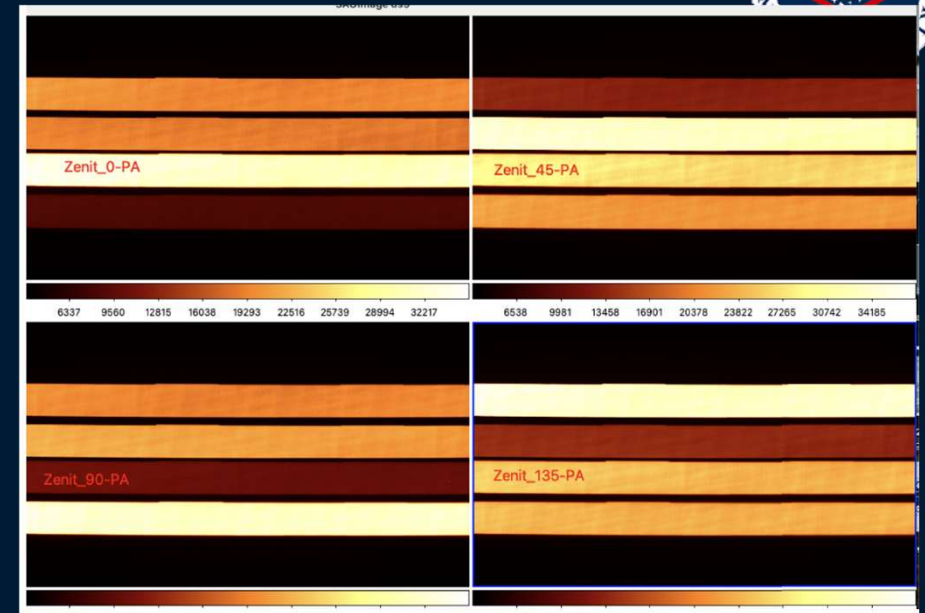
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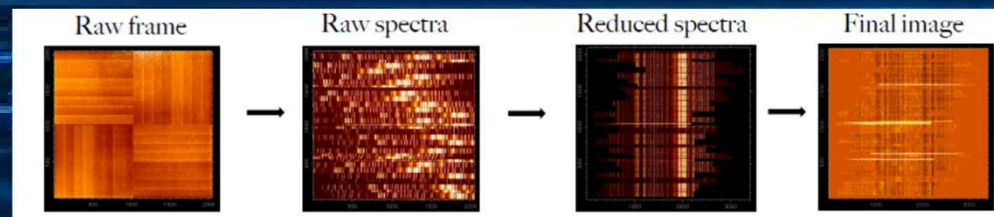


EMIR NIR imager and multi-object spectrograph

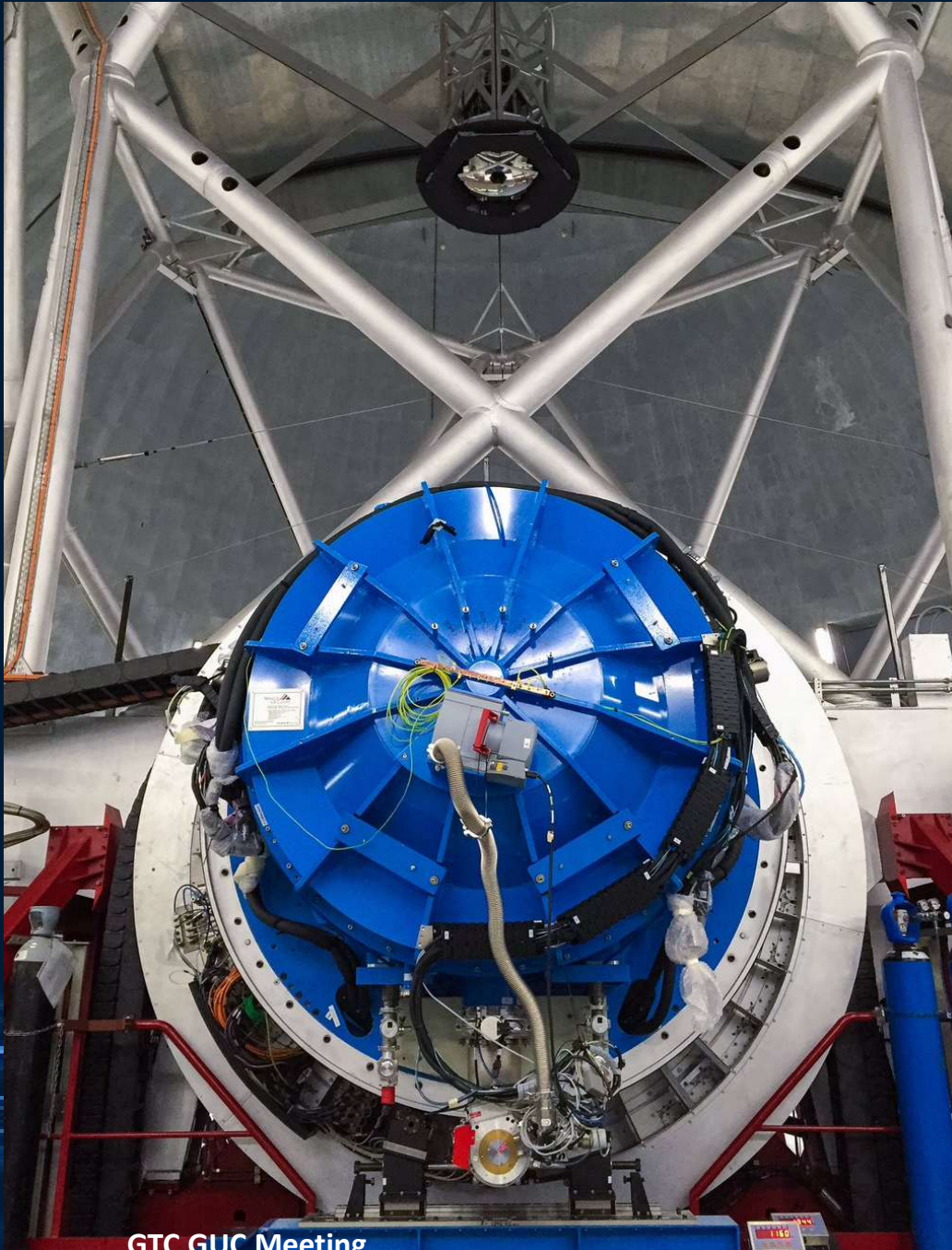
Common-user instrument since 2017 (Nasmyth A).

<i>Spectral Range</i>	0.9-2.5 μ m[1.1-2.5 μ m]	<i>MOS mode</i>	
<i>Detector</i>	HAWAII2 2048 ²	<i>F.O.V.</i>	6.7 x 4 arcmin ² (55 slitlets)
<i>Spectral resolution</i>	1000 (YJ, HK) 5000,4250,4000 (JHK)	<i>Sensitivity</i>	<u>K~20.0 in 3h @ S/N=3 (continuum)</u>
<i>Spectral coverage</i>	1 single window/exp.		1.4x10 ⁻¹⁸ erg/s/cm ² /Å @ S/N=6 (line)
<i>Imaging modes</i>	Broad/narrow band	<i>Imaging mode</i>	
<i>Plate Scale</i>	0.2 arcsec pix ⁻¹	<i>F.O.V.</i>	6.7 x 6.7 arcmin ²
<i>Image quality</i>	$\theta_{80} < 0.3$ arcsec	<i>Sensitivity</i>	<u>K~22.0 in 1h, for S/N=3 & 0.6 arcsec aperture</u>

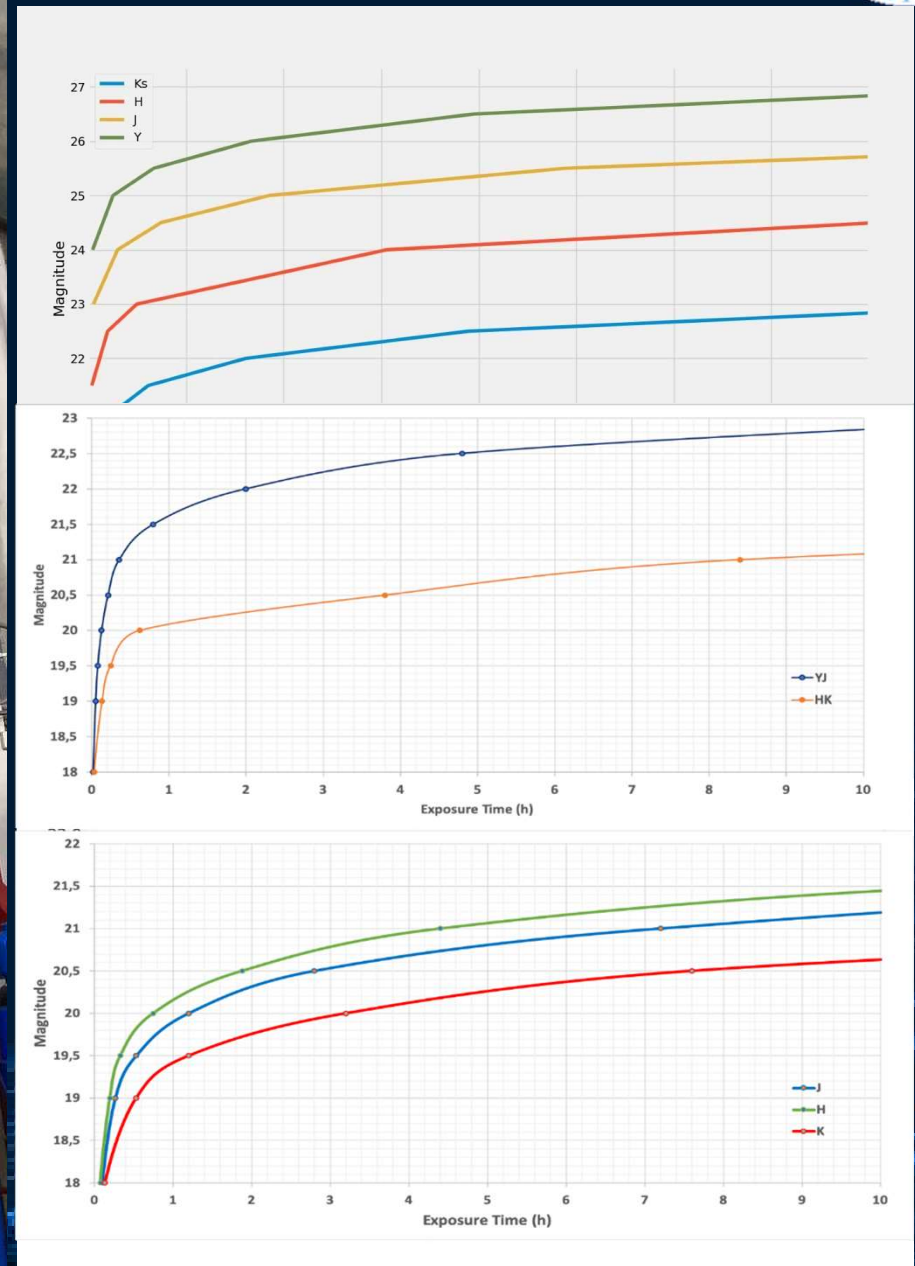
EMIR DRP: <http://research.iac.es/proyecto/emir/pages/observing-with-emir/observing-tools/drp.php>



EMIR NIR imager and multi-object spectrograph



GTC GUC Meeting

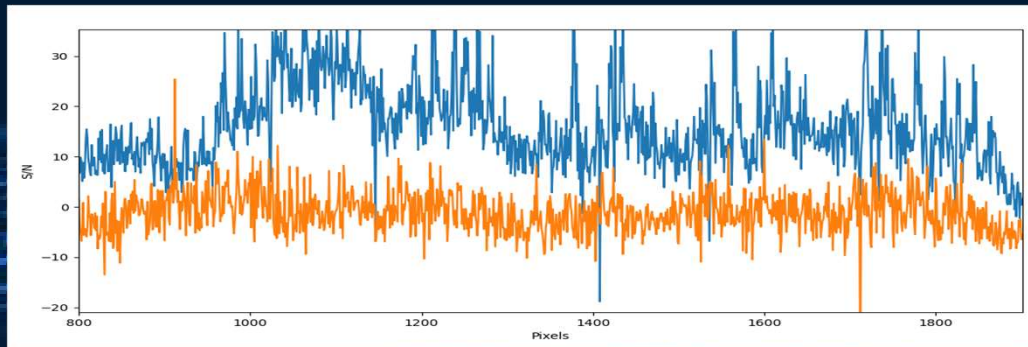
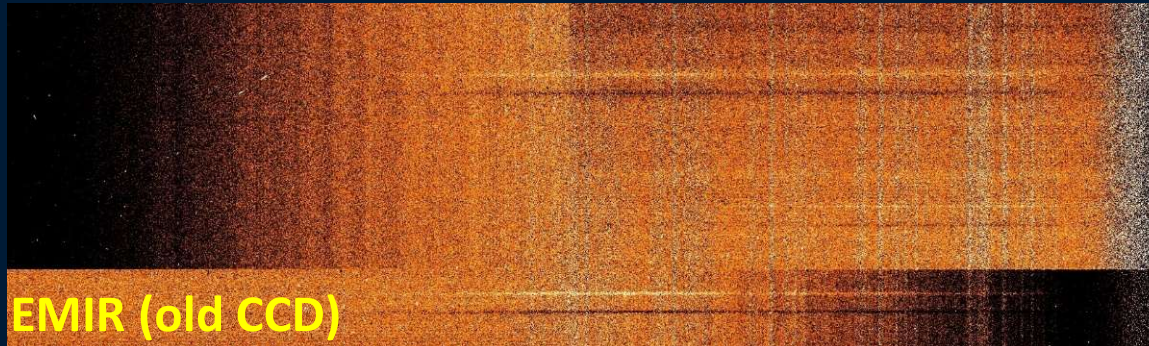


CALP, La Palma, 17-18 September 2026

EMIR upgrade (New H2RG)

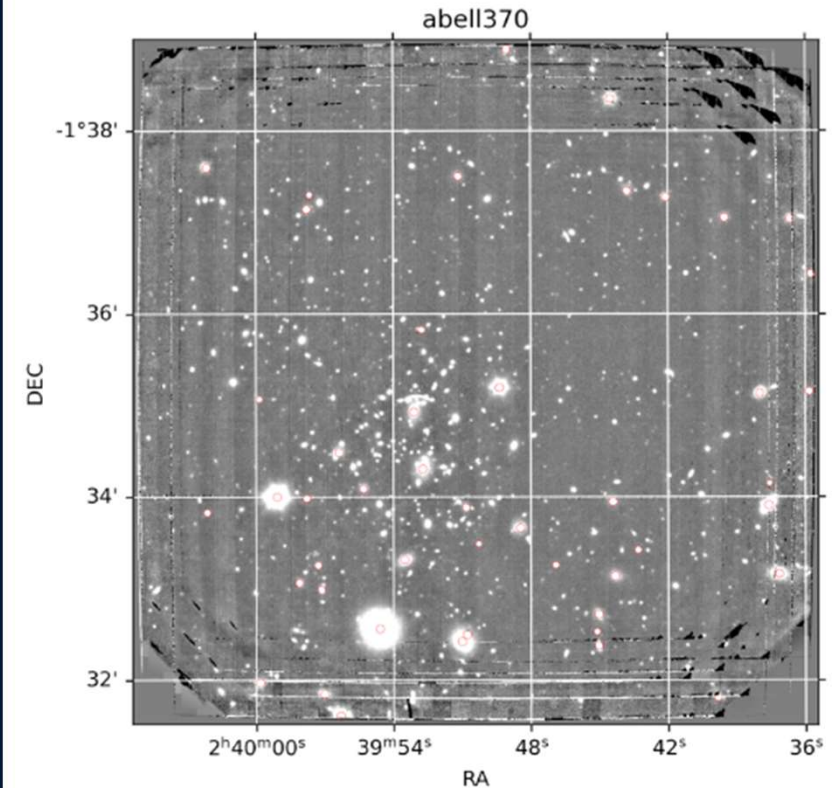
- Notable sensitivity gain with respect to previous EMIR data, now in better agreement with ETC predictions!

J=20.5 (YJ/t=2560 s)



ABELL 370

J: 6 iter x 7 dith x 10 exp x 10s = 4200s



```
****img nings, texp, mean, median, std : 420 10.0 0.049 0.000 0.267
***mlim(3sig): 25.038 mlim(5sig): 24.484
***Bckg_lim mean, median, std
```

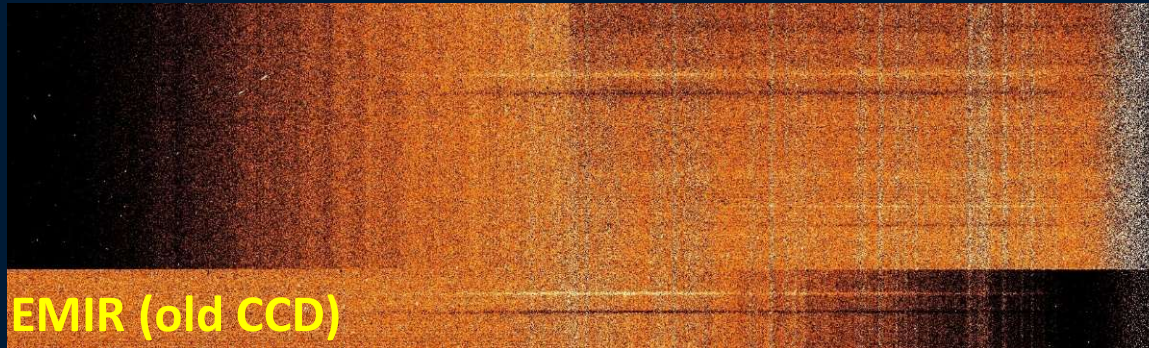
```
***mlim(3sig) mean, median, std
25.038 25.038 0.000
***mlim(5sig) mean, median, std
24.484 24.484 0.000
```

J = 25 mag

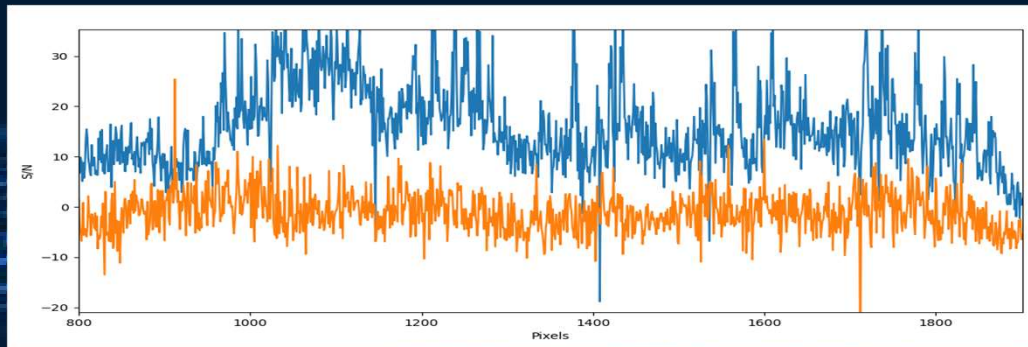
EMIR upgrade (New H2RG)

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$J=20.5$ ($YJ/t=2560$ s)

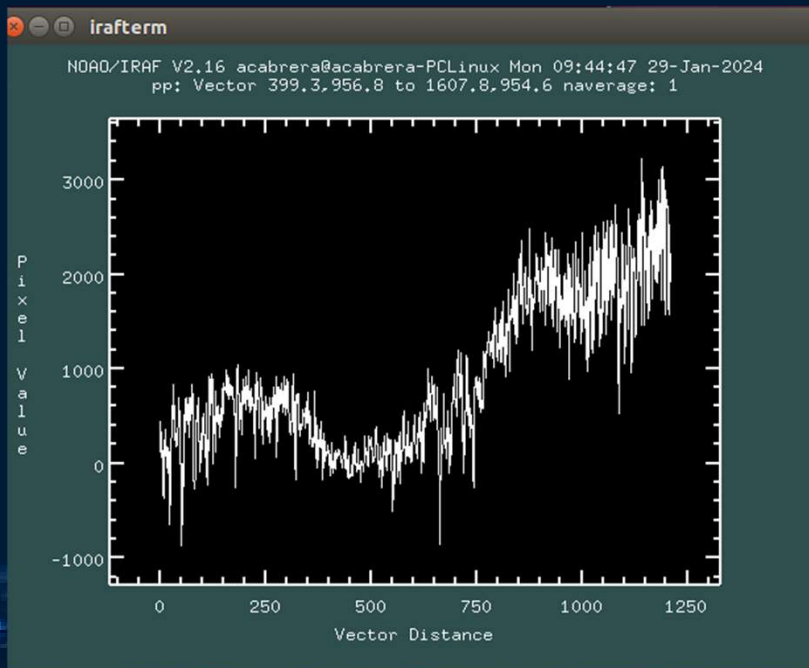
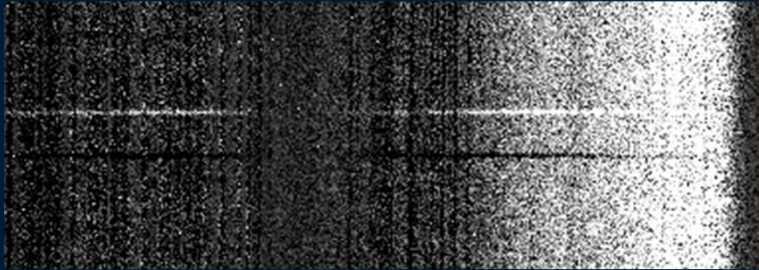


$K = 22.5$ mag ($t=3.5$ h)



EMIR upgrade (New H2RG)

- **Notable sensitivity gain with respect to previous EMIR data**, now in better agreement with ETC predictions!



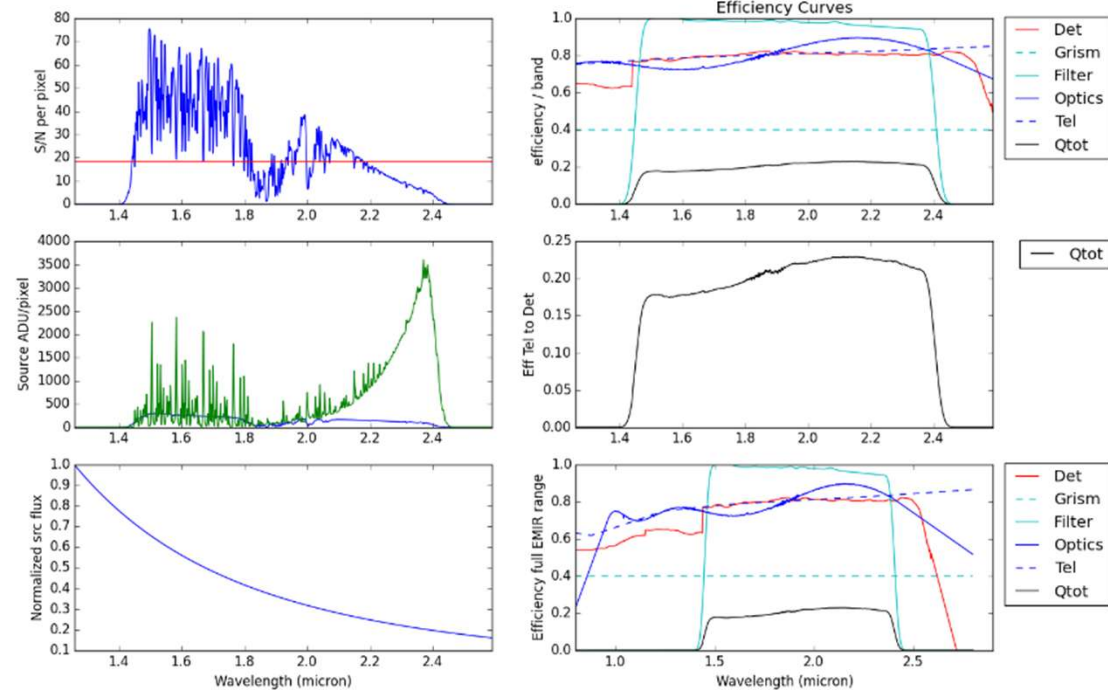
sky = 1122.6

Median S/N for ABBA from 56 frames of 200.0 s:

S/N per pixel = 18.5

S/N per res. element = 37.8

K=17.5 (HK/t=8000 s)

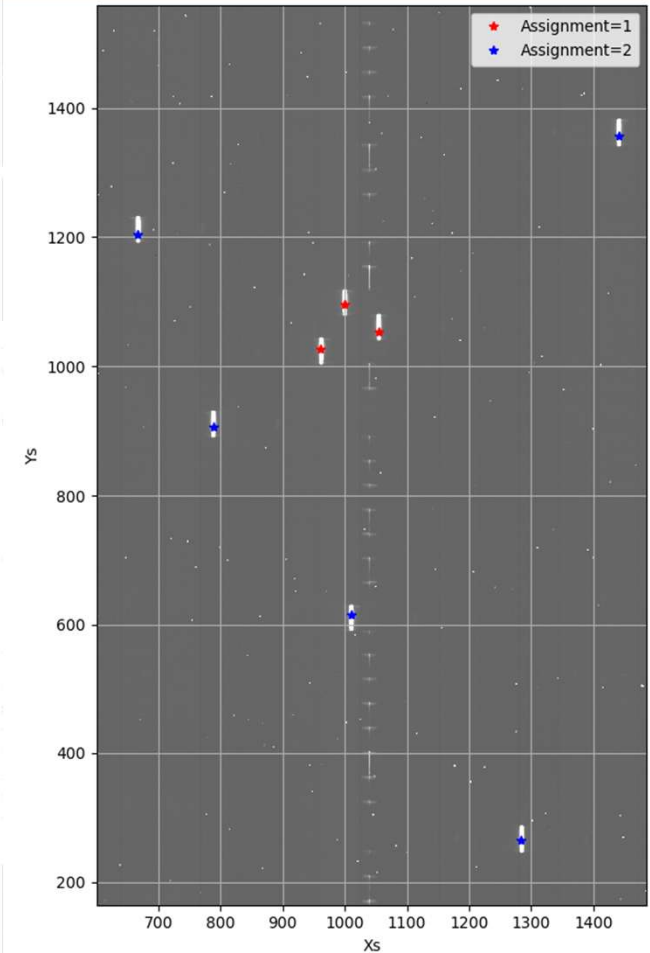
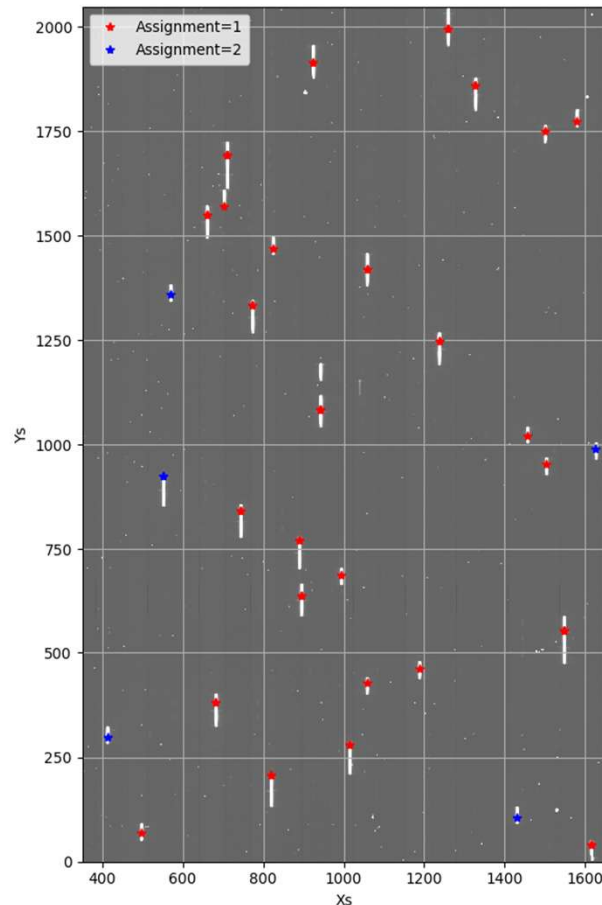
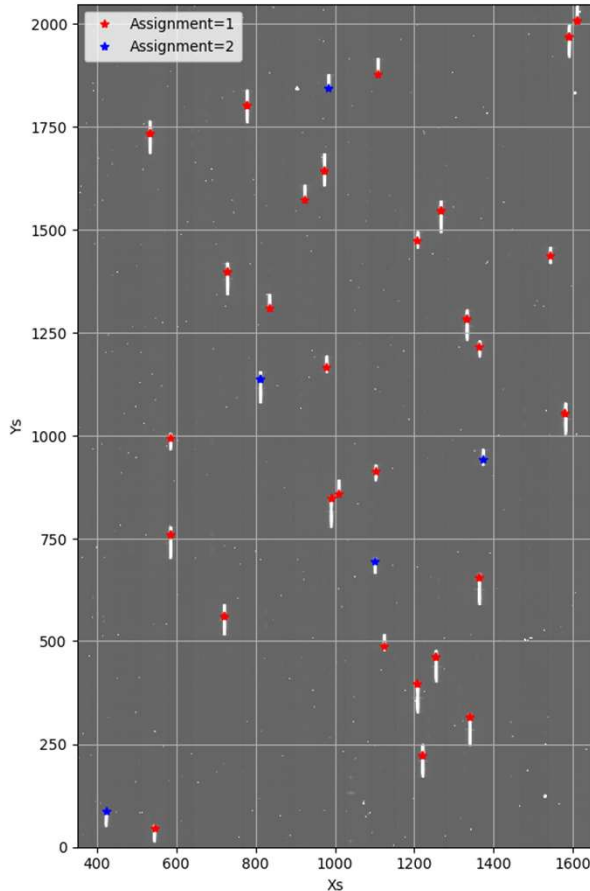


EMIR observational issues

● **CSU FAILED in mid-SEP 2023:** a electronic board died and replaced by the only spare available => CSU functional again with a **new fine-calibration for configig MOS MASKs (No problems experienced in the last 2 years).**



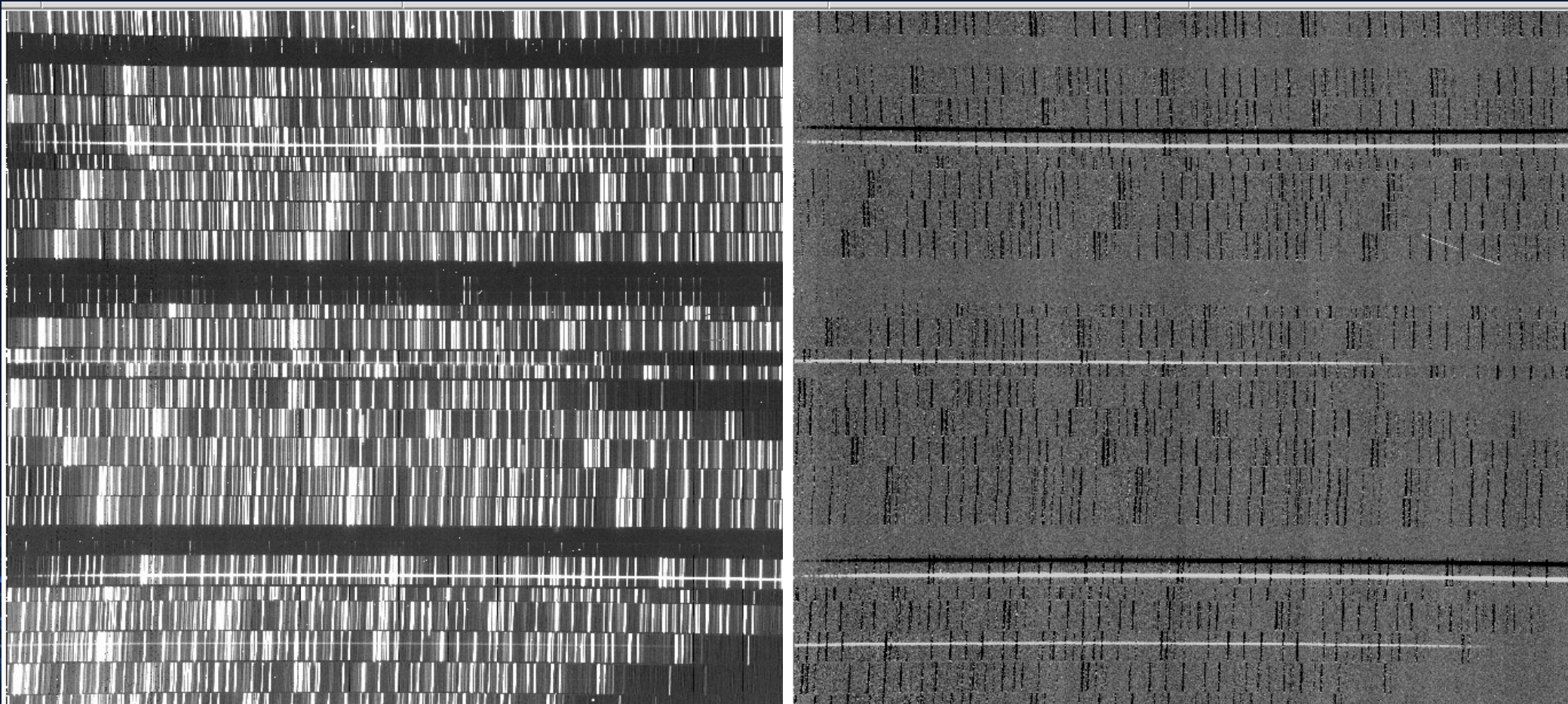
In the process of **repairing damaged board and fabricate new spares due to obsolescence.**



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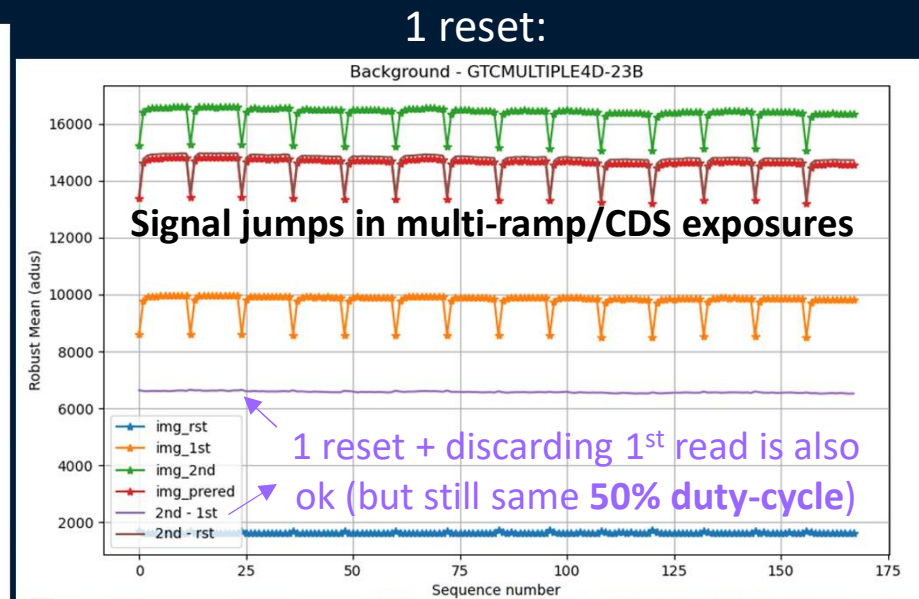
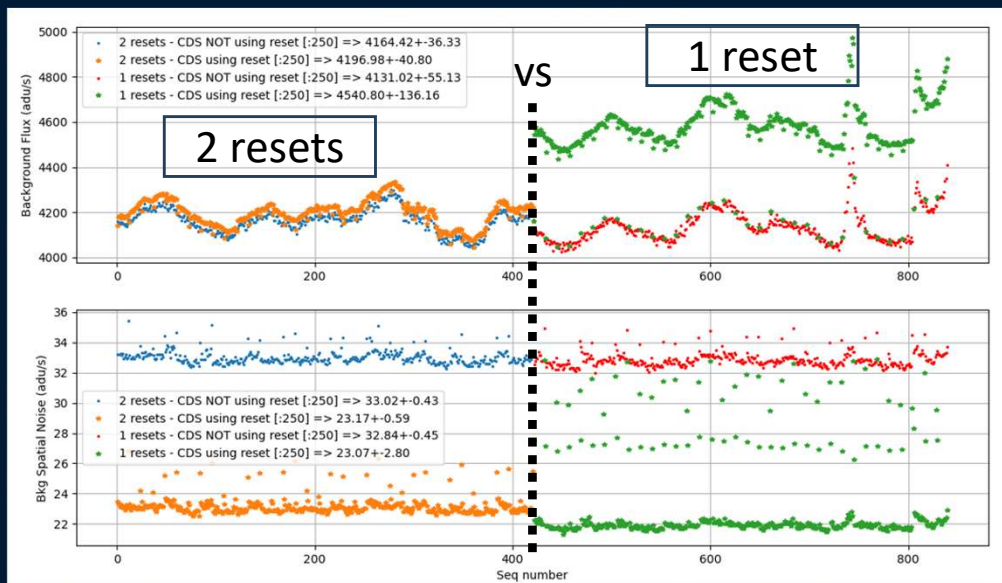
In the process of repairing damaged board and fabricate new spares due to obsolescence.



EMIR observational issues

• **DETECTOR OVERHEADS ARE LARGER THAN EXPECTED:** we need >1 resets to stabilize the signal. Each reset consumes 1 frame time ~ 1.5 s.

- **2 RESETS in IMAGING mode:** Operational efficiency is (unavoidably) low for short integrations (duty-cycle $\sim 50\%$ for 3s exposure time in Ks).



- **3 RESETS in SPECTROSCOPIC mode:** Not such an issue for long ramps.

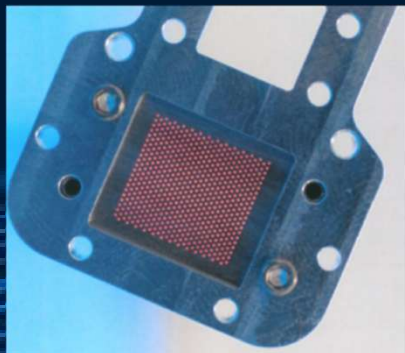
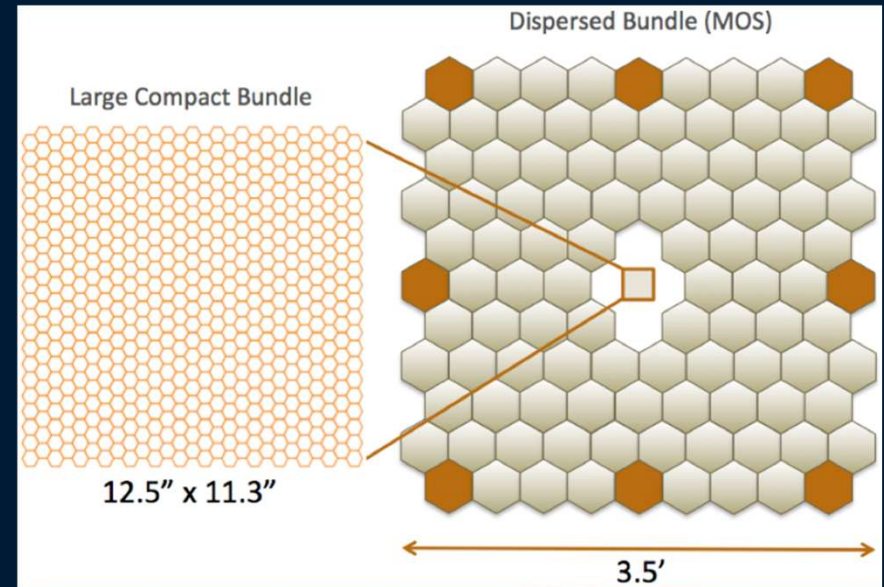
• **WORK IN PROGRESS:**

- Larger individual integration times offered (up to 1200 s). Available from S26A.
- High speed (20 MHz) readout + non used resets configuration to improve efficiency. Tests ongoing. **Some issues found, this possible upgrade is currently stalled!**

MEGARA optical medium-res multi-object spectrograph

Common-user instrument since 2018 (FCass-F).

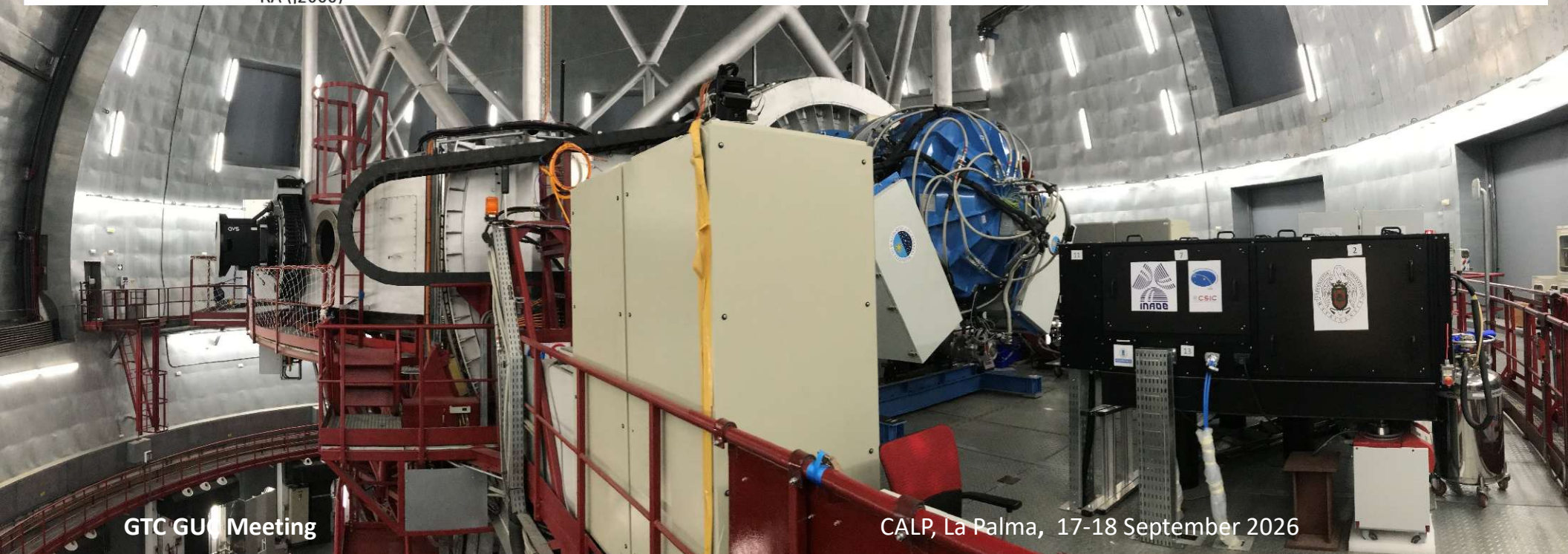
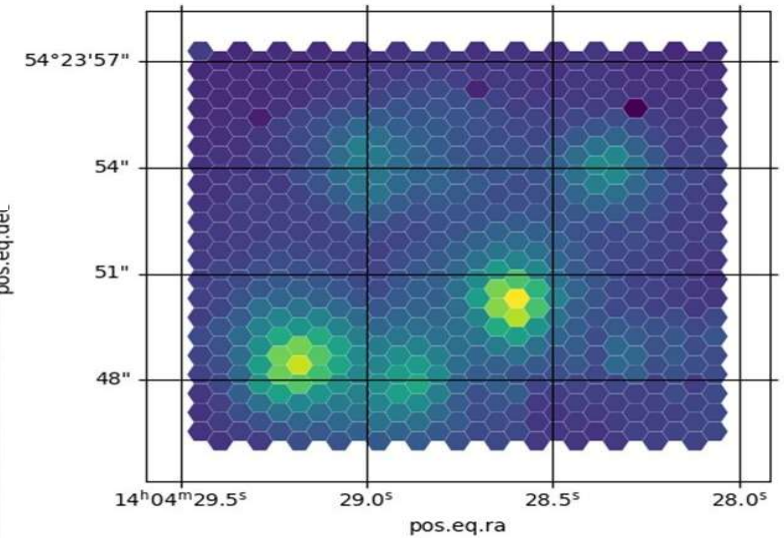
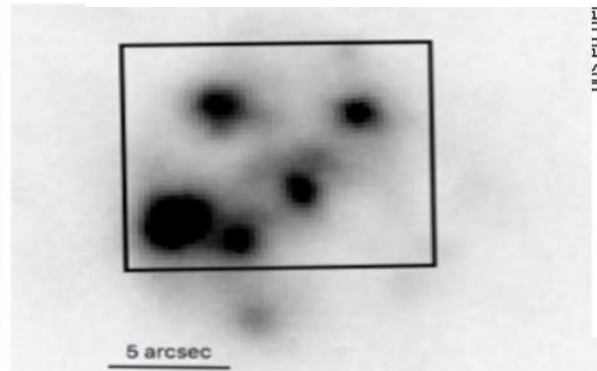
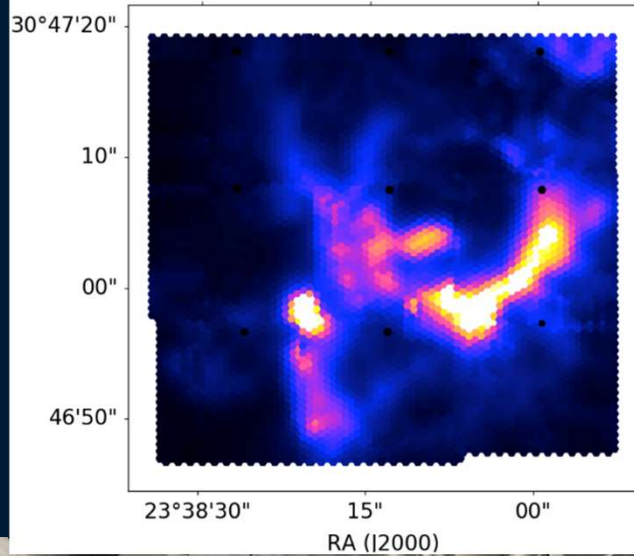
<i>Spectral range</i>	0.365-1.000 μm
<i>Detector</i>	E2V CCD231-84-1-E74
<i>IFU field of view</i>	12.5 x 11.3 arcsec ²
<i>IFU spaxel size</i>	0.62 arcsec
<i>MOS</i>	92 x 7-fiber mini-IFUs*
<i>MOS field of view</i>	3.5 x 3.5 arcmin ²
<i>Spectral resolution</i>	6000 to 20000
<i># of spectra</i>	650



* Currently not available

MEGARA DRP: <https://pypi.org/project/megaradrp/>

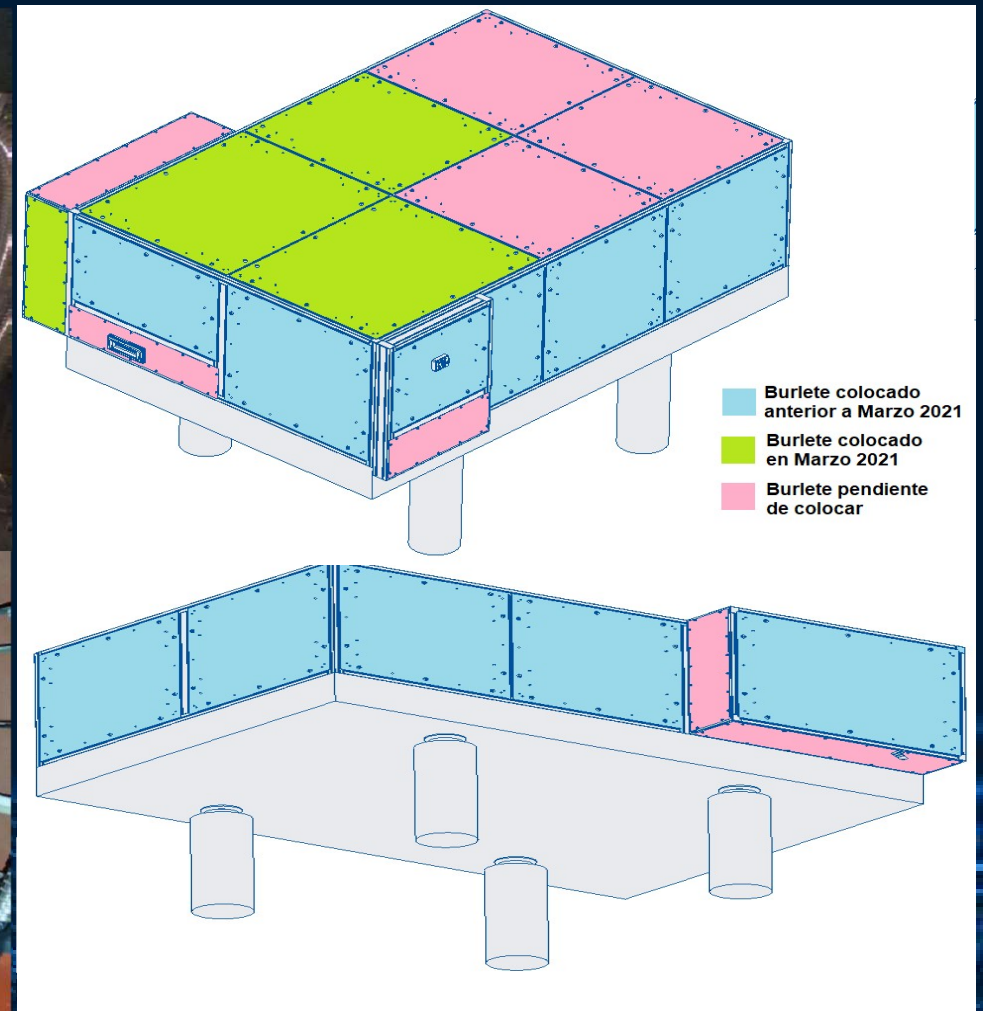
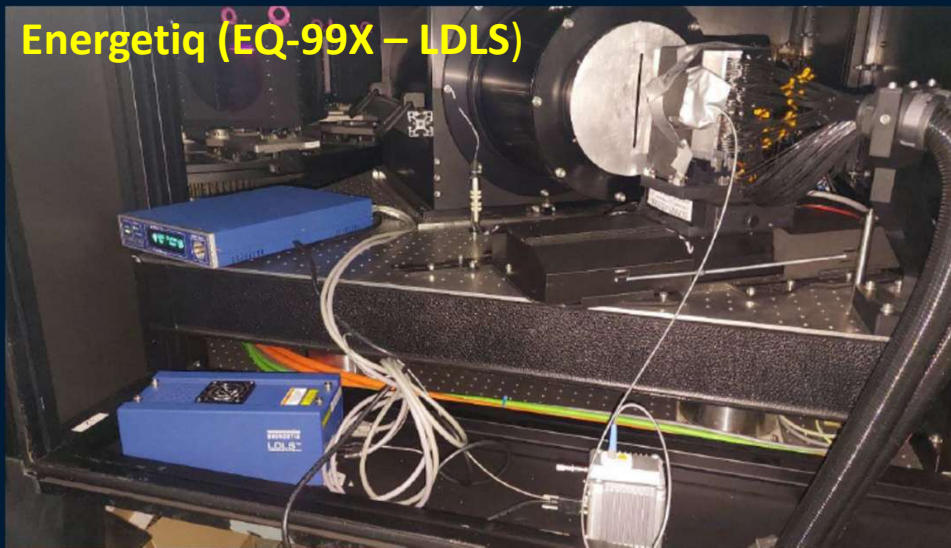
MEGARA optical medium-res multi-object spectrograph



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- Study about emissivity lamps completed for improving the use of bluer VPHs (a new 250W halogen lamp expected for October 2026).
- A thermal enclosure for the instrument is being studied for using MEGARA in Summer!!.

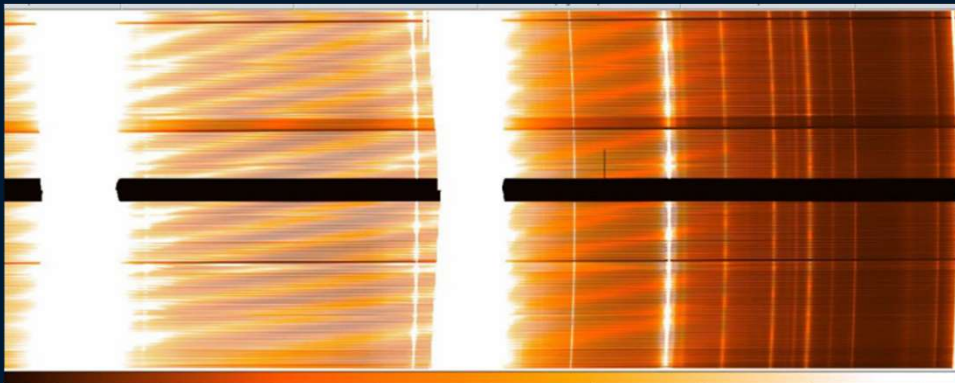
Energetiq (EQ-99X – LDLS)



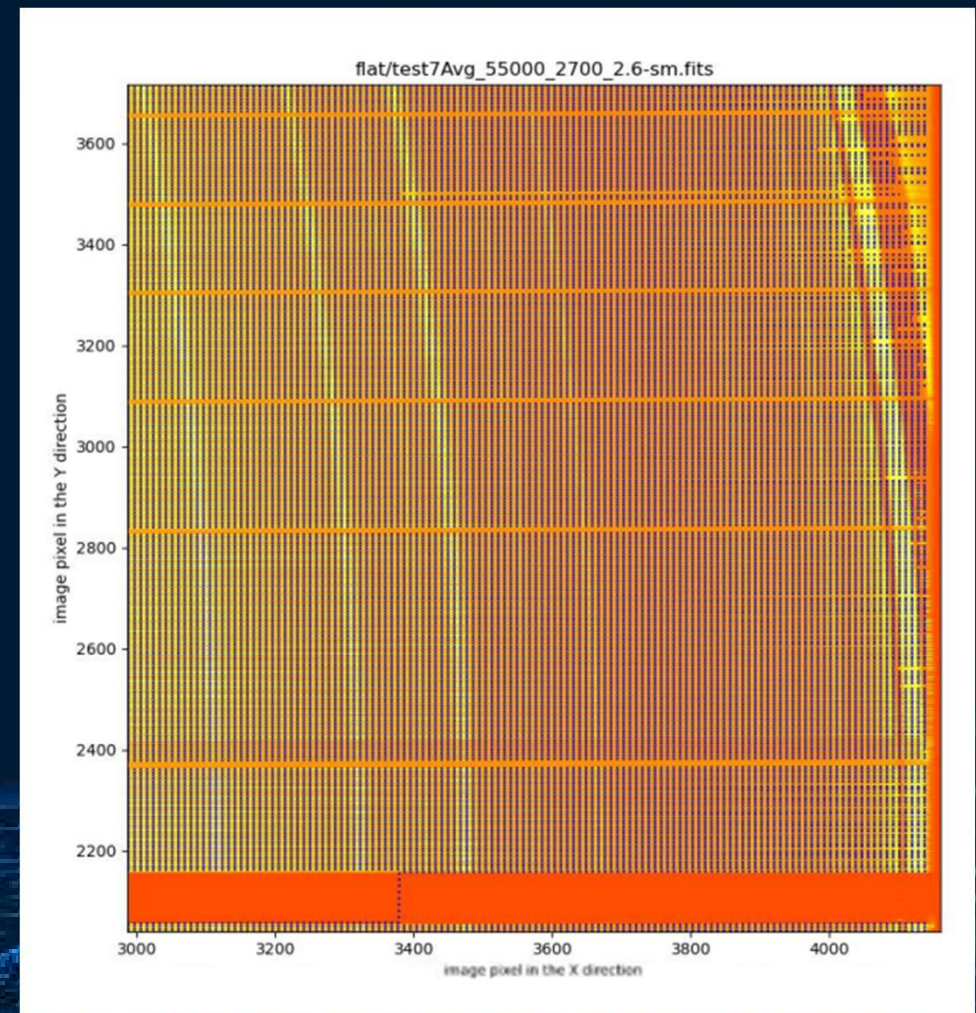
OSRAM ULTRA-VITALUX

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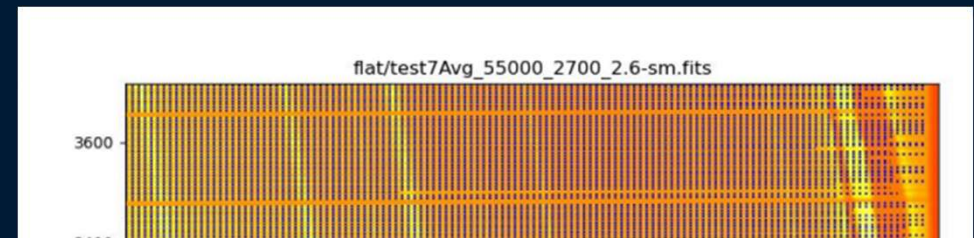


OSRAM ULTRA-VITALUX

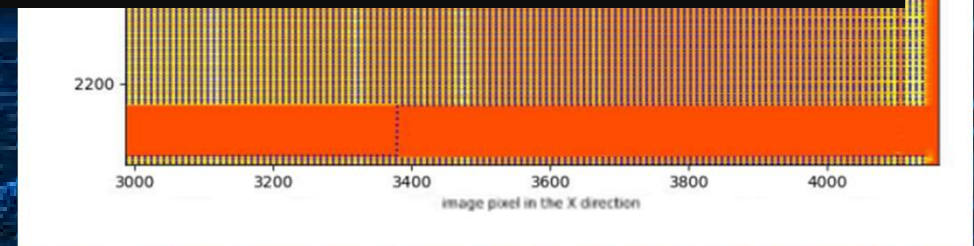


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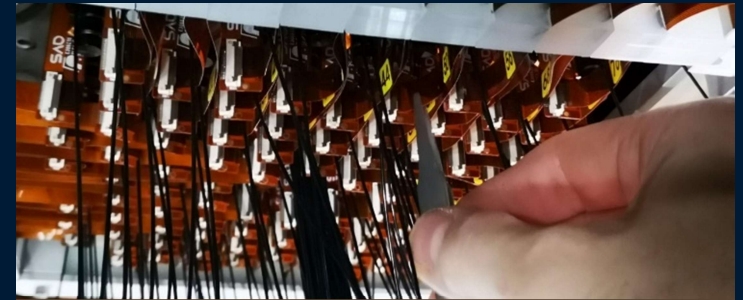
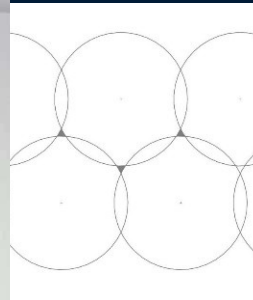
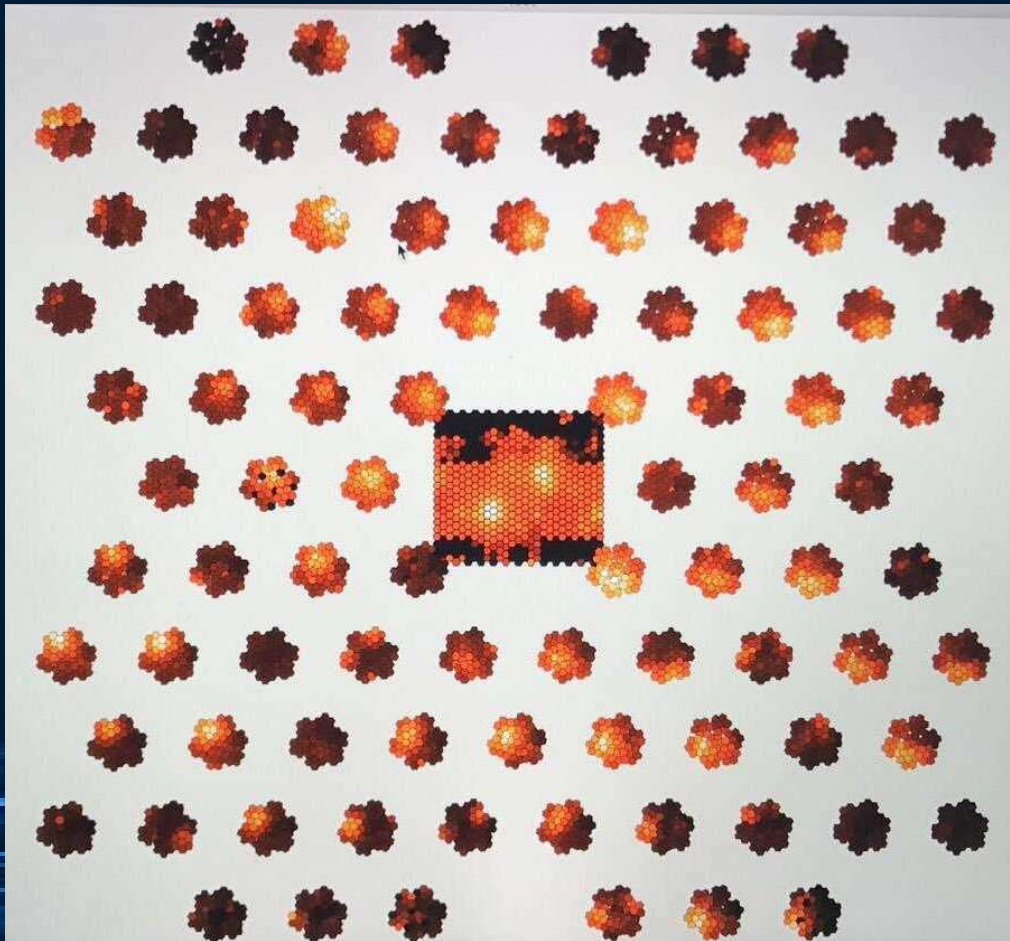
**New algorithms (IA based)
being tested to improve the
data reduction**



OSRAM ULTRA-VITALUX

MEGARA optical medium-res multi-object spectrograph

- MEGARA MOS positioners have been degraded with time. Currently, only 52 positioners are reaching the correct position when demanded.
- In the current situation, most of the MOS observing programs are affected. MEGARA MOS mode will not be offered to TACs until this situation is solved.



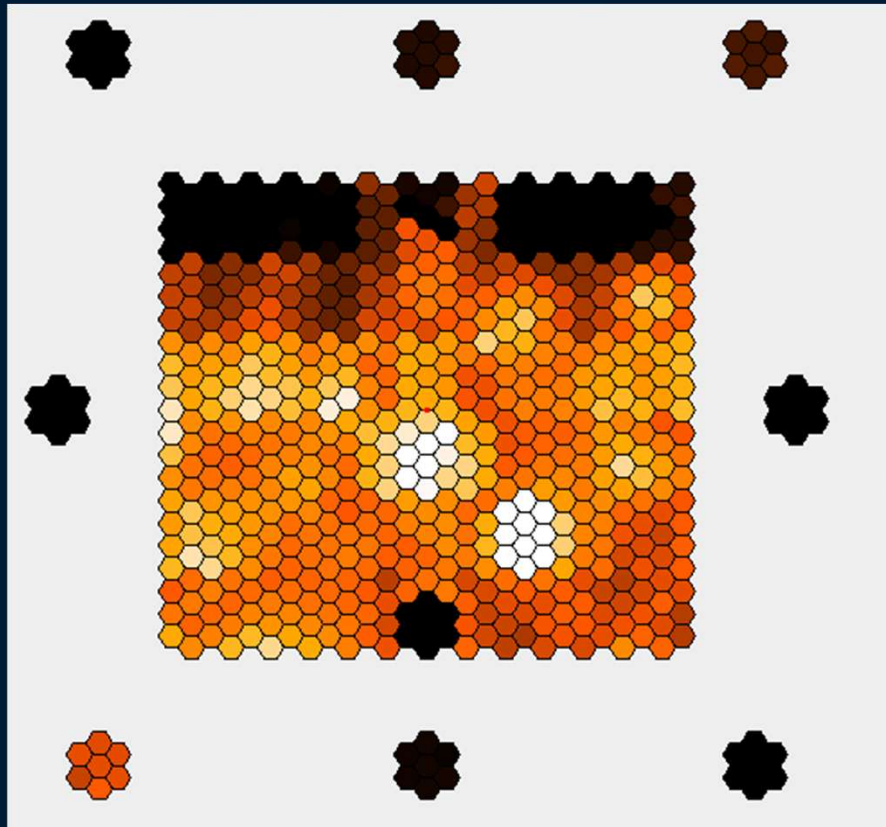
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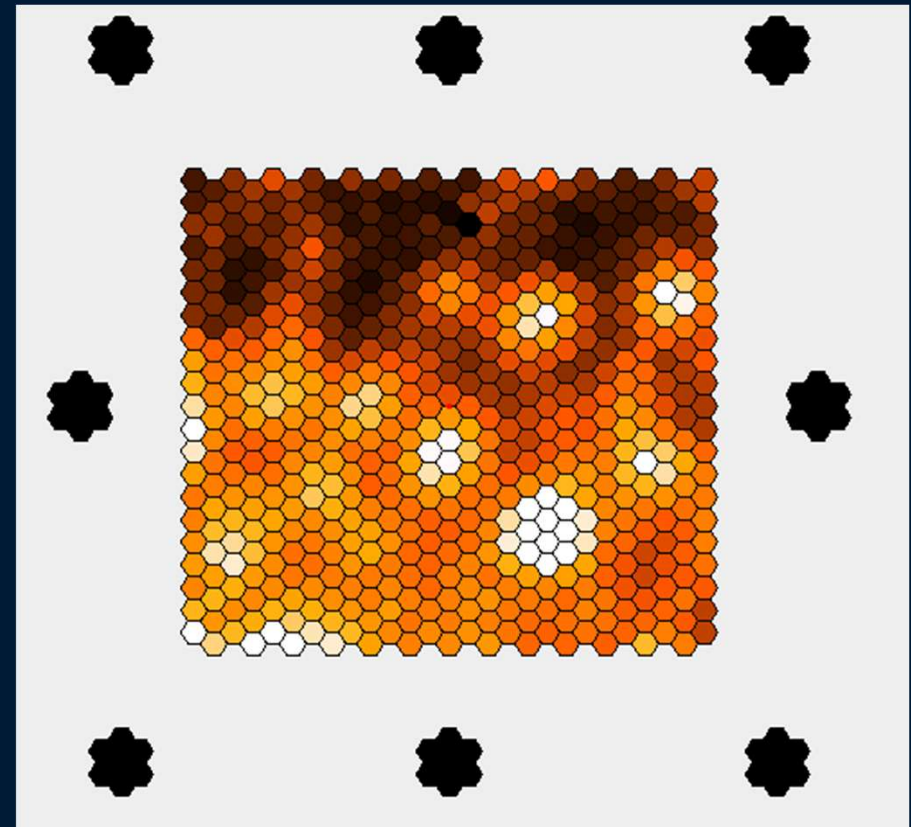
ACTIVITY STALLED DUE TO LACK OF RESOURCES!!!

MEGARA optical medium-res multi-object spectrograph

- **MEGARA DRP** in continuous development to improve the data reduction.



3x60s on M15 GC with HR-R
(MEGARA DRP ≤ 0.9)



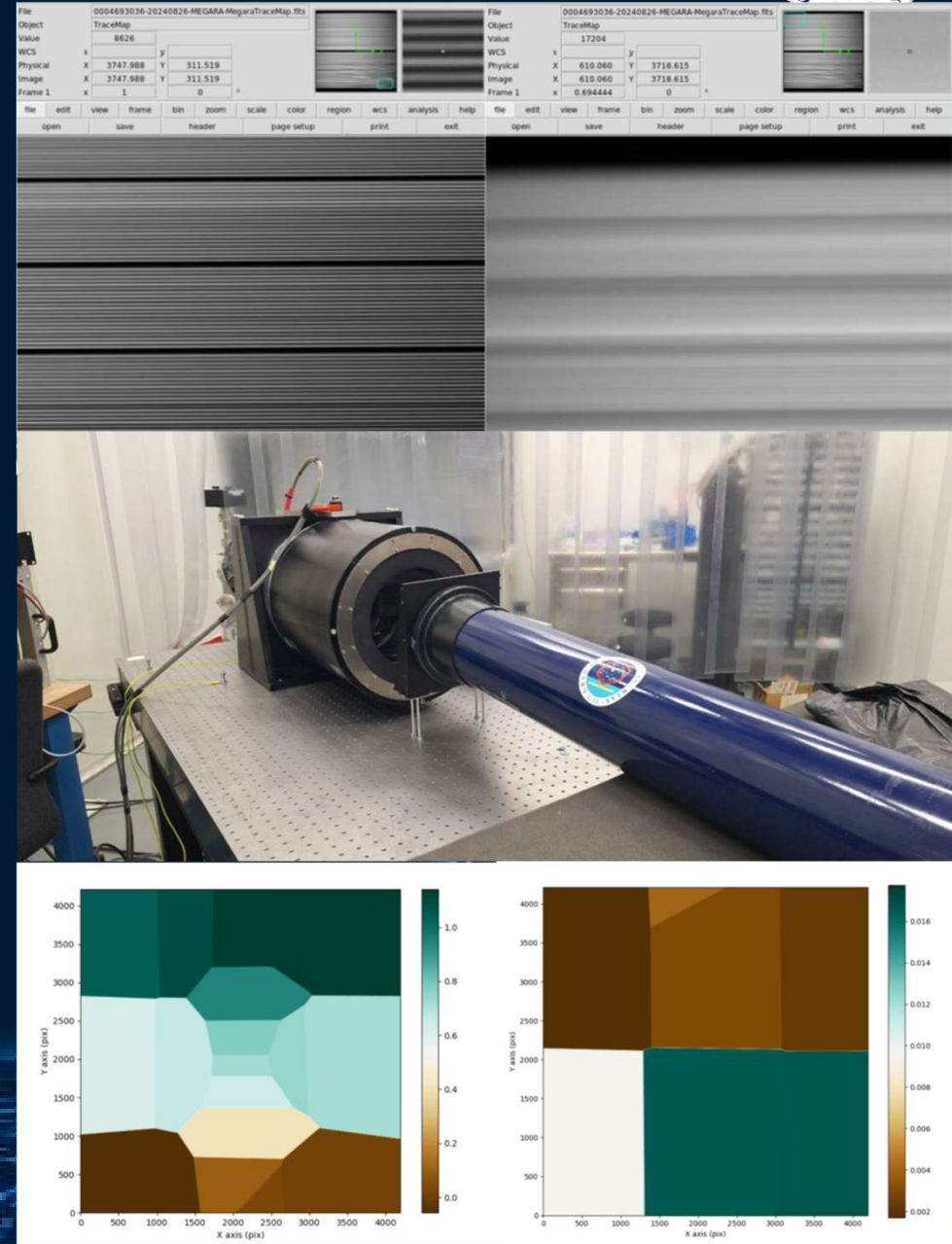
3x60s on M15 GC with HR-R
(MEGARA DRP 0.9.1)

MEGARA DRP (0.21) – March 2026: <https://github.com/guaix-ucm/megaradrp/>

http://www.gtc.iac.es/instruments/megara/megara.php#Data_Reduction_Package

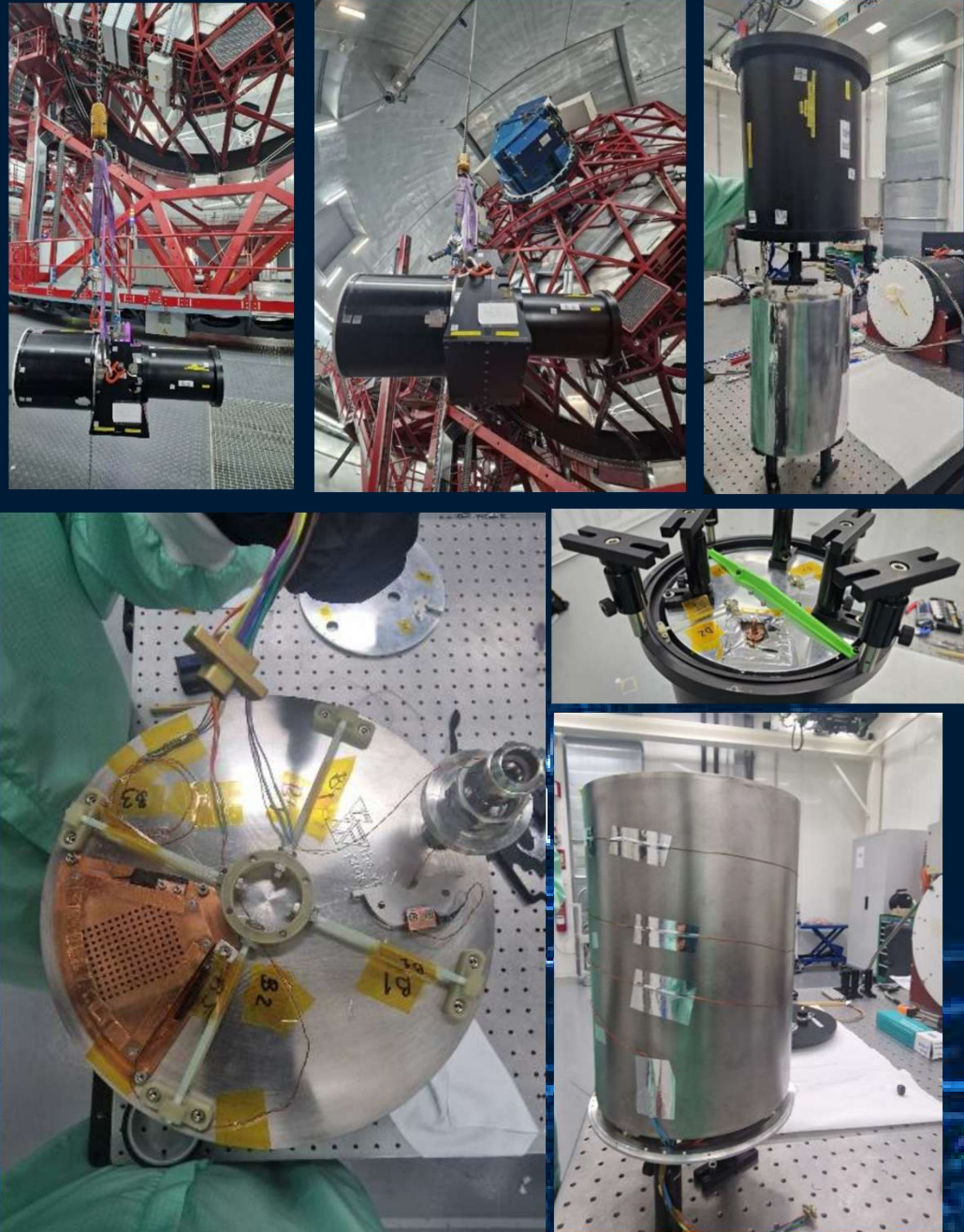
MEGARA optical medium-res multi-object spectrograph

- **MEGARA inoperative due to an internal problem found in September 2024.**
- Tests conducted by mapping the FOV with a laser beam shown **a 1mm tilt in the CCD in the vertical direction.**
- Works done in collaboration with IAC staff in July 2025 were able to solve this problem, with a 0.02 mm residual tilt.
- **MEGARA recovered science operations from December 2025.**
- MEGARA ETC updated with latest throughput estimates.
- LN2 supply consolidated during S26A.
- MEGARA internal sensors' maintenance in August 2026. **MEGARA back to operation from 16th September 2026.**



MEGARA optical medium-res multi-object spectrograph

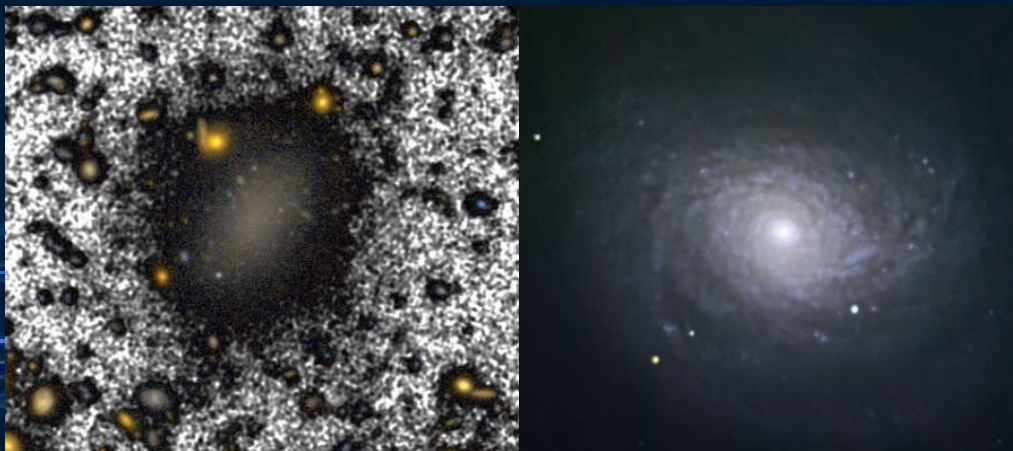
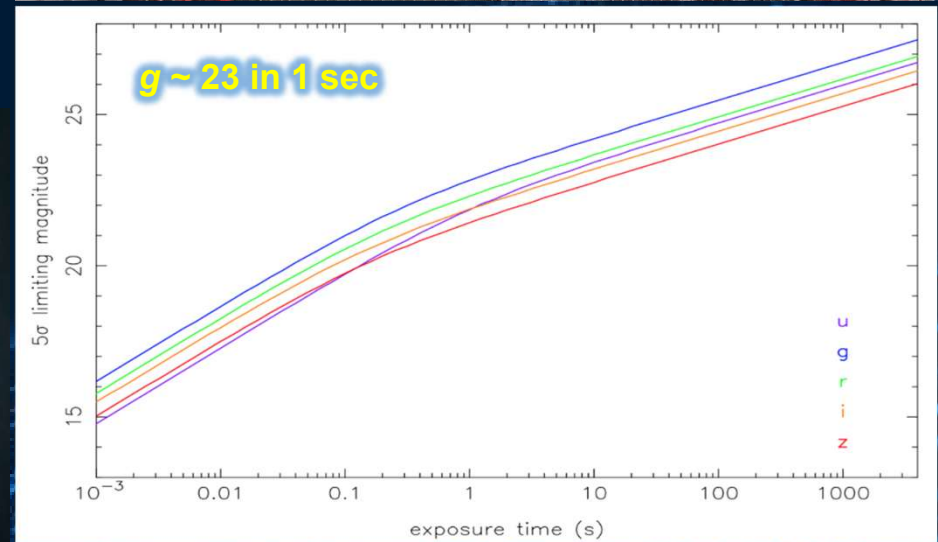
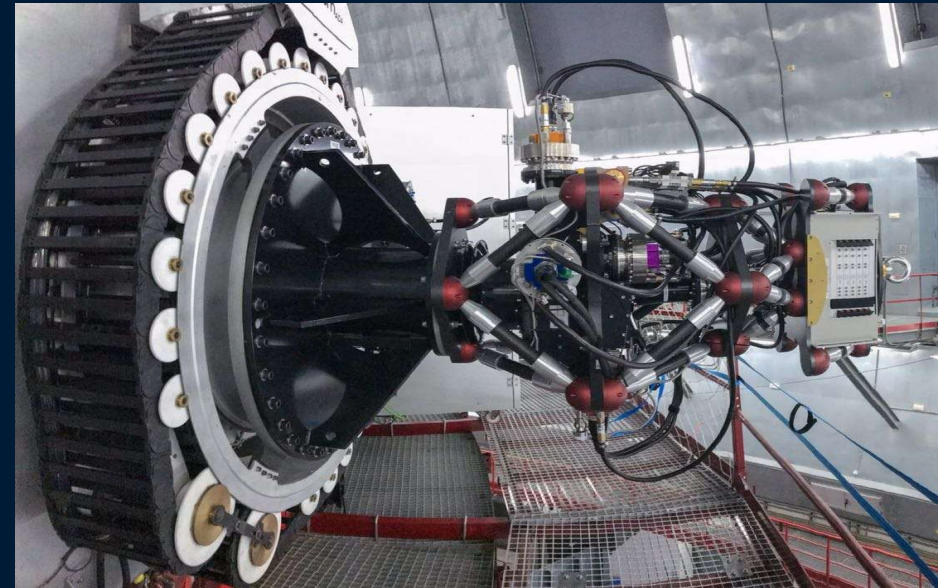
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HIPERCAM: High Speed, Multiband Imager on the GTC

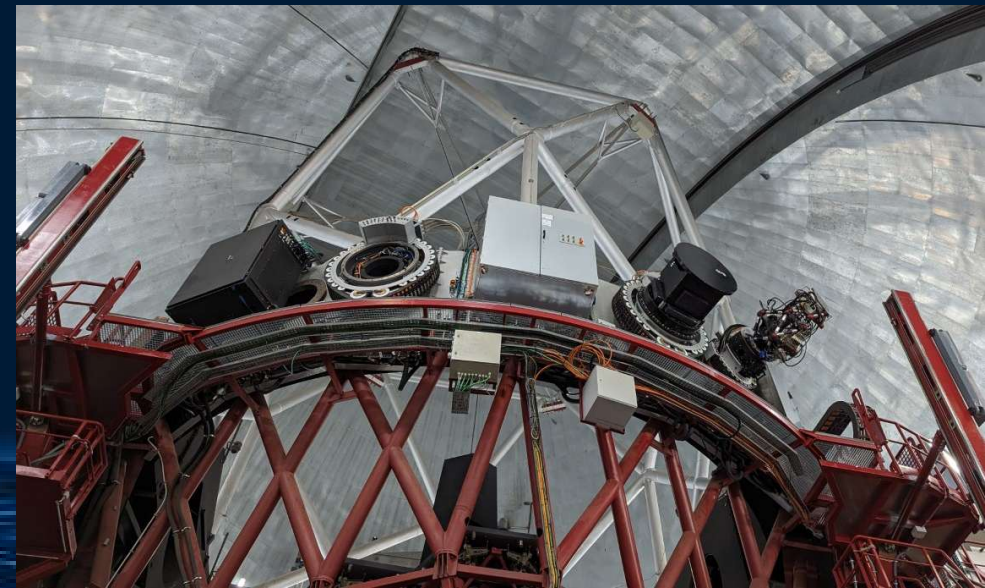
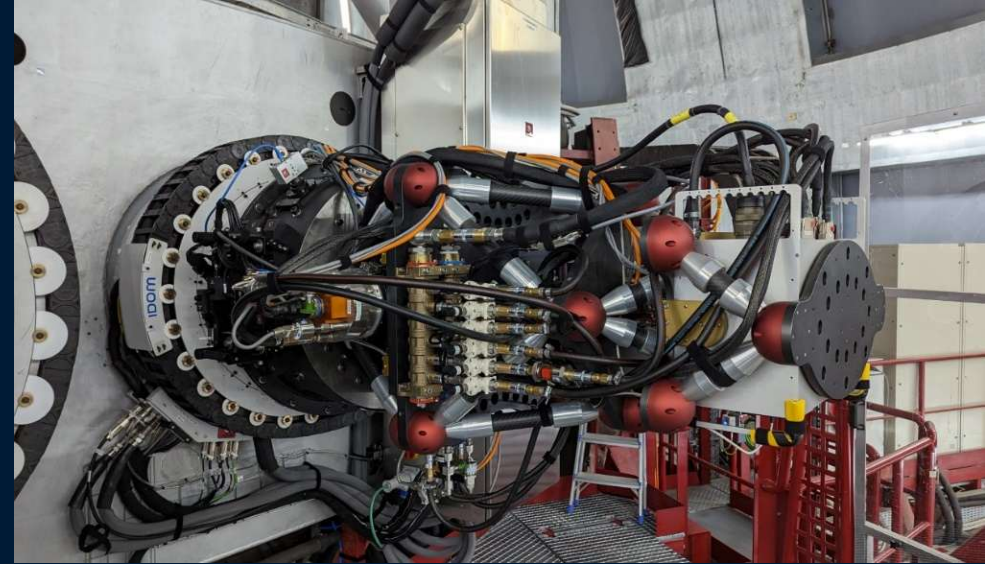
First light at GTC in Feb 2018, installed (not permanently) at FCass E until Sep 2019.
Installed permanently at FCass G from April 2023.

<i>Spectral Range</i>	0.36-1.00 μm
<i>Detector</i>	5 x E2V 47-20 frame-transfer devices
<i>Plate Scale</i>	0.081 arcsec pix^{-1}
<i>Field of view</i>	2.8 x 1.4 arcmin ²
<i>Imaging modes</i>	Fast photometry with broad band filters u'g'r'l'z' (simultaneous)



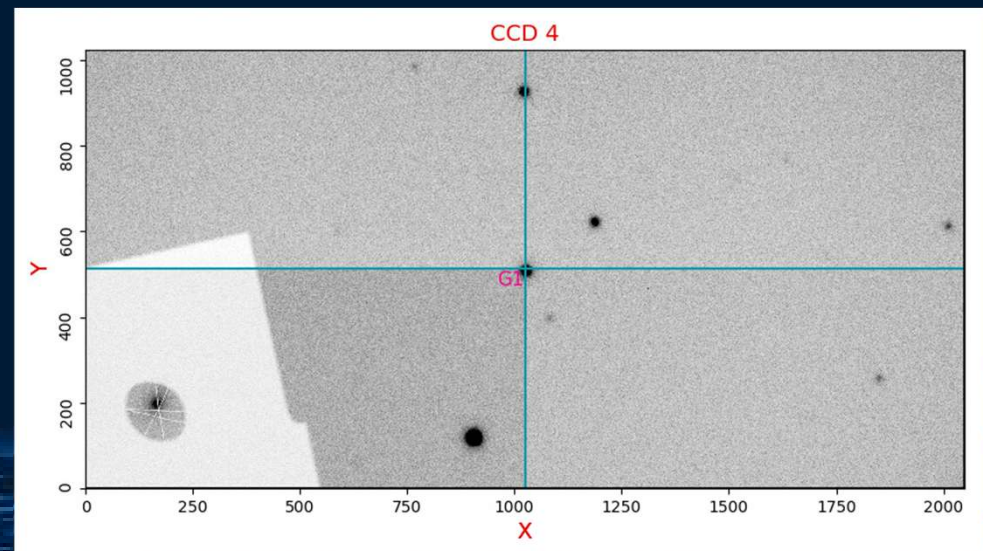
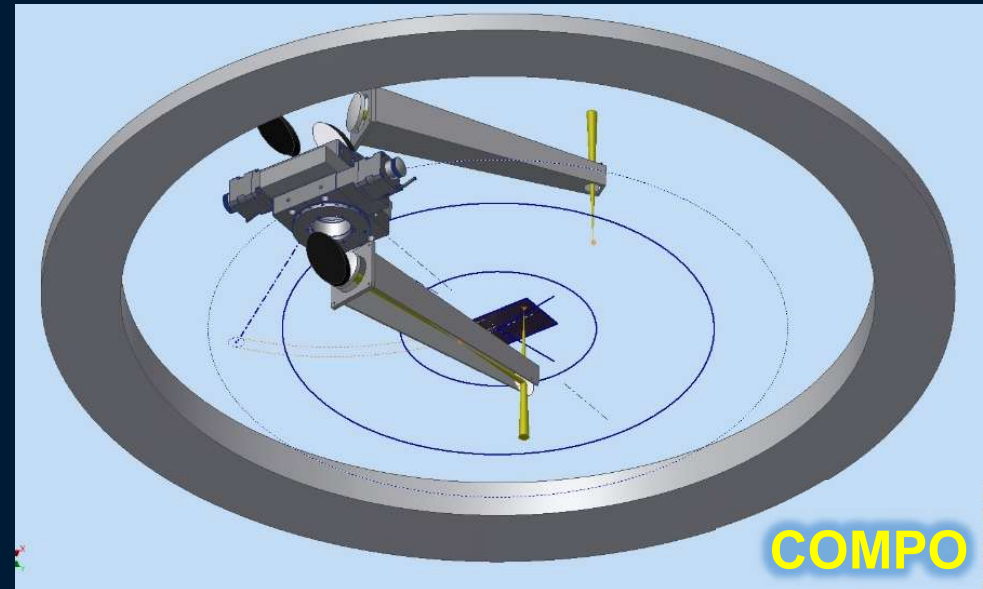
HIPERCAM@FCassG timeline

- FCass G rotator for HIPERCAM, installed and tested in 17-23 April 2023
- First on sky tests with HIPERCAM (including COMPO commissioning) completed successfully in May 2023.
- Hipercam was offered from S23B, being the second-most demanded instrument at GTC until S26A, and the second-most productive instrument in terms of scientific results (and the most efficient one).
- GTC staff trained to operate HIPERCAM (including non sidereal objects) External support only required in some specific configurations). Diffuser and narrow band filters are used on demand, but only for A-ranked programs!
- Maintenance works in FCass G rotator scheduled for 22-24 September 2026.



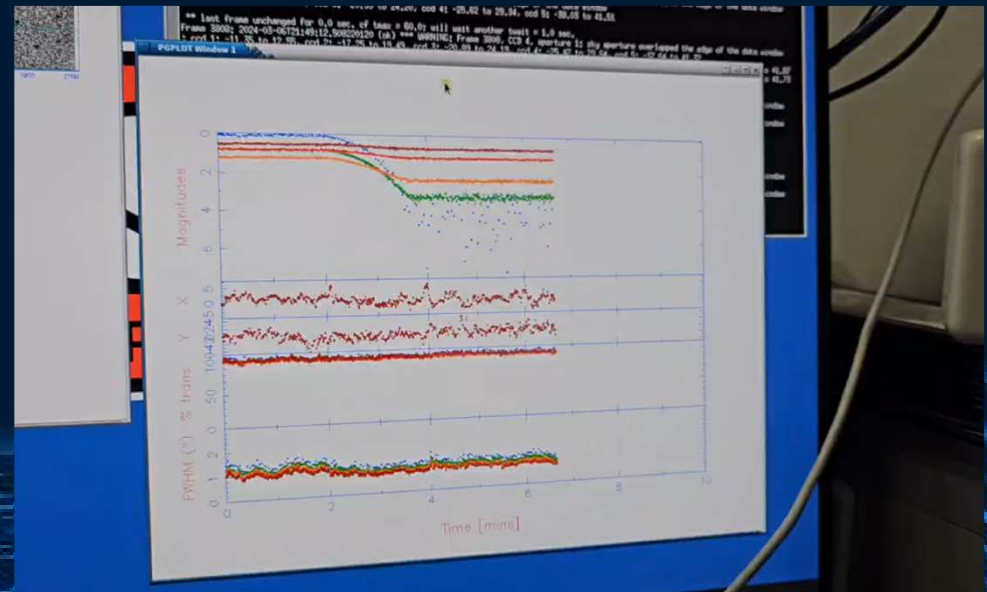
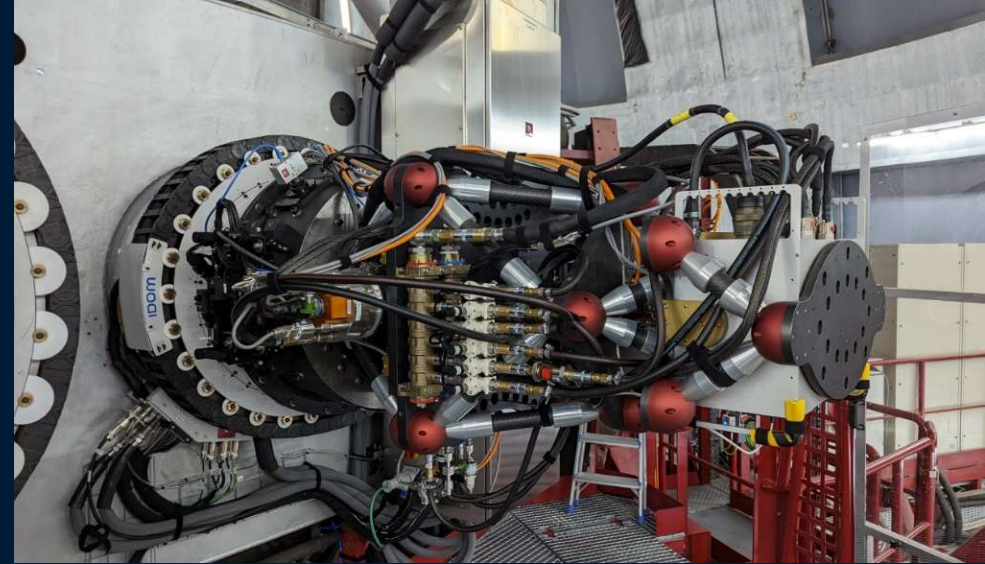
HIPERCAM@FCassG timeline

- FCass G rotator for HIPERCAM, installed and tested in 17-23 April 2023
- First on sky tests with HIPERCAM (including COMPO commissioning) completed successfully in May 2023.
- Hipercam was offered from S23B, being the second-most demanded instrument at GTC until S26A, and the second-most productive instrument in terms of scientific results (and the most efficient one).
- GTC staff trained to operate HIPERCAM (including non sidereal objects) External support only required in some specific configurations). Diffuser and narrow band filters are used on demand, but only for A-ranked programs!
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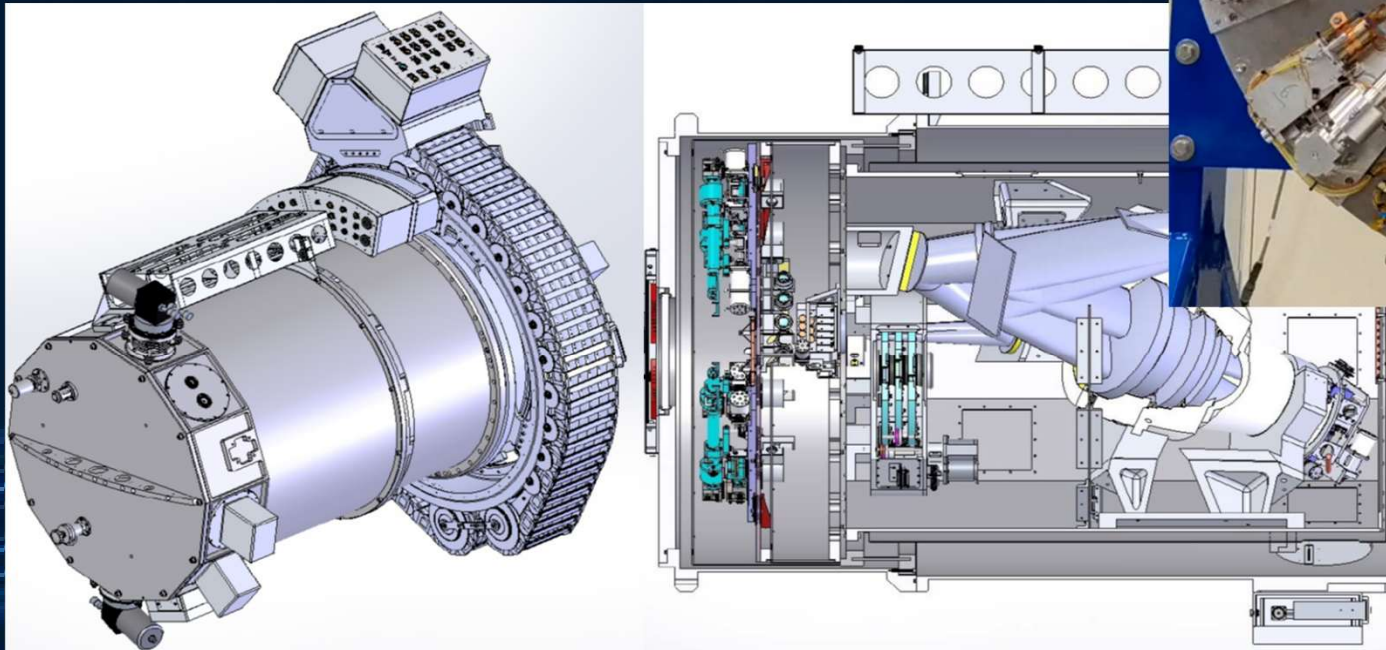
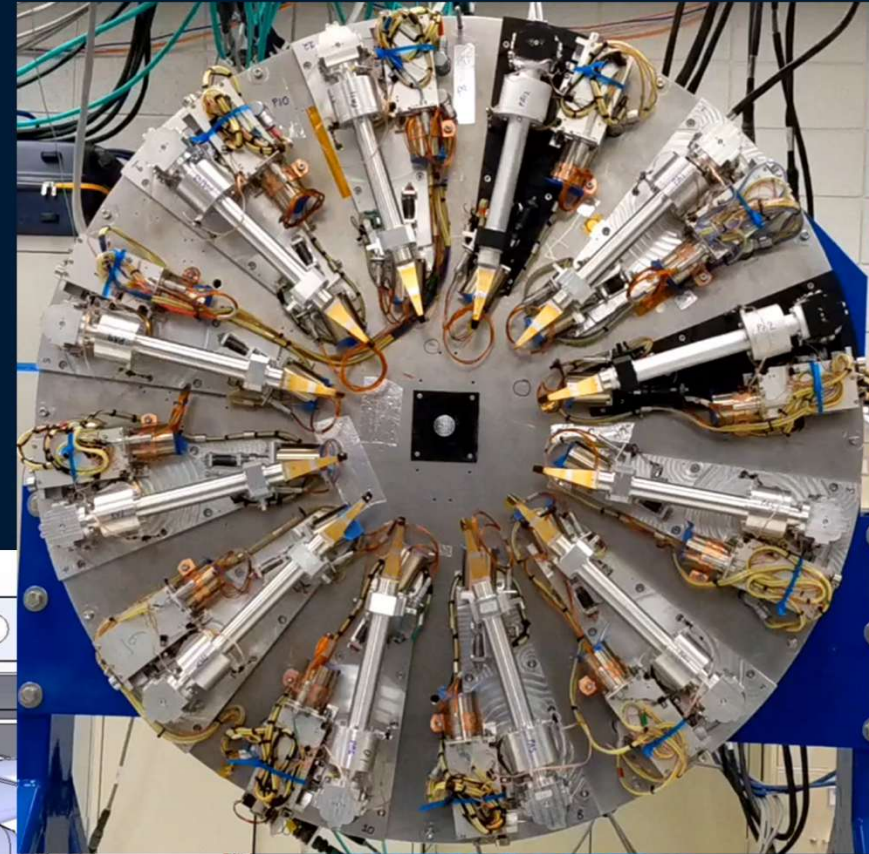
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MIRADAS NIR medium-resolution multi-object spectrograph

Common user instrument (FCass-E).

<i>Spectral Range</i>	1-2.5 μm
<i>Field of view</i>	5' x 5'
<i>Spectroscopic mode</i>	MOS up to 12 probe arms
<i>Spectropolarimetry</i>	WP in single-object mode
<i>Spectral resolution</i>	20000

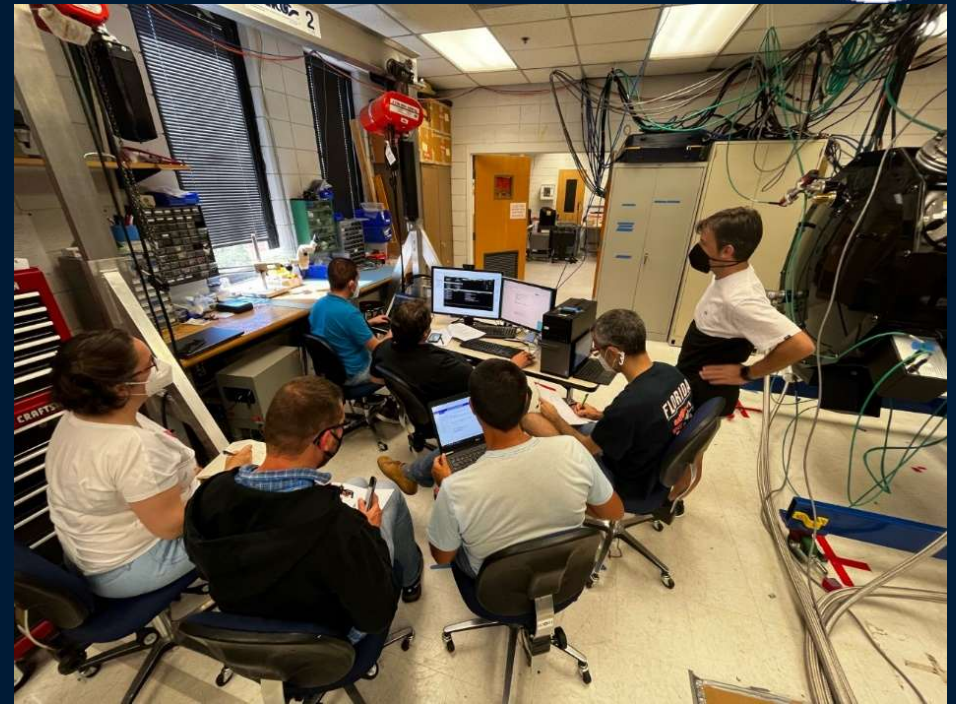


MIRADAS NIR medium-resolution multi-object spectrograph

- Acceptance tests completed at University of Florida (11-18 May 2022). Instrument received at GTC in June 2022.
- First on-sky tests (including technical first light) in July 2022. Problems noted in some components partially solved in 2024, offering an uncompleted version of the instrument with 6 operative channels (including SO/SPOL), enough to test overall on-sky instrument performance.



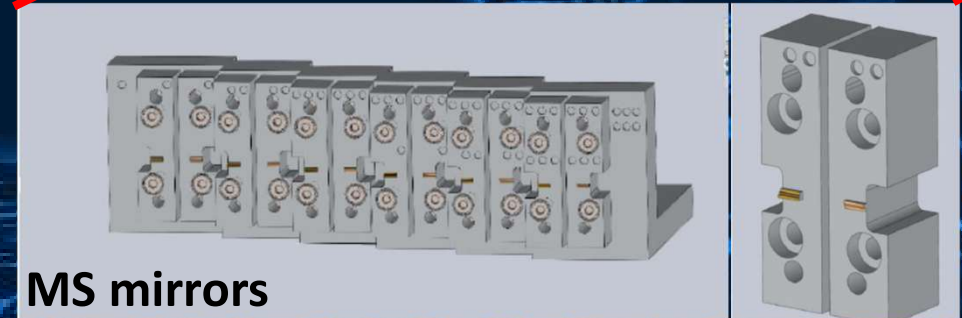
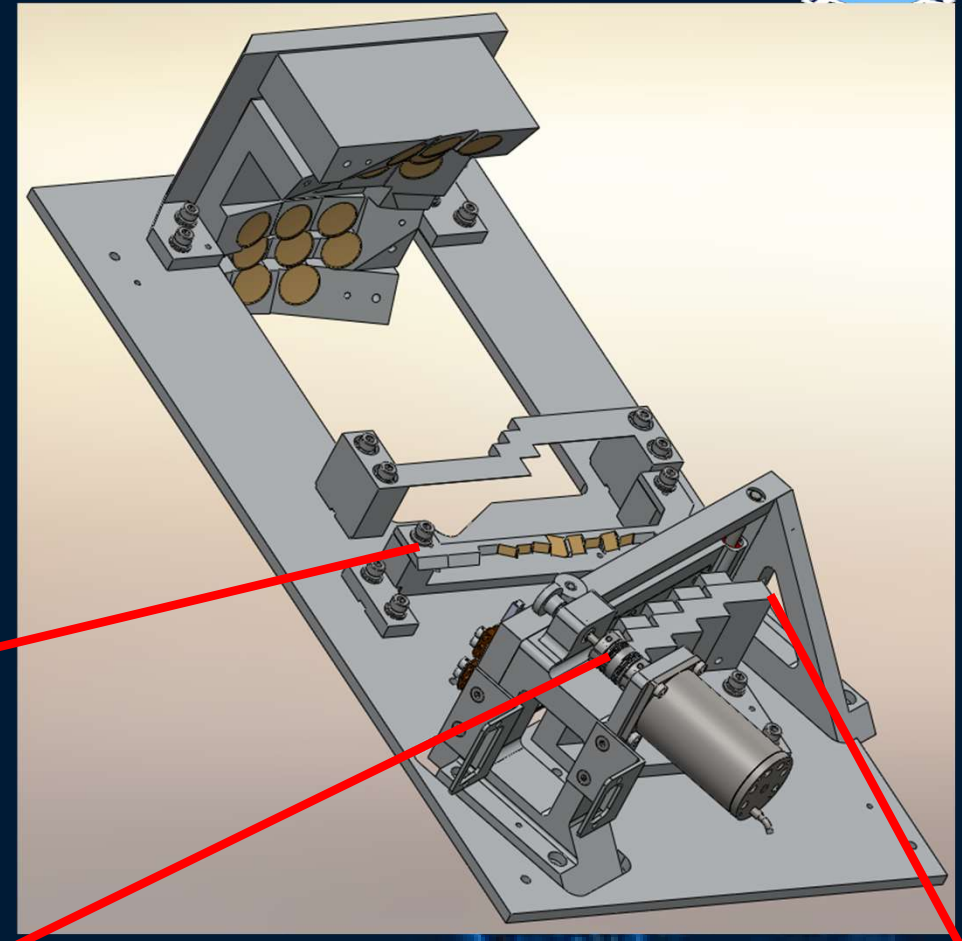
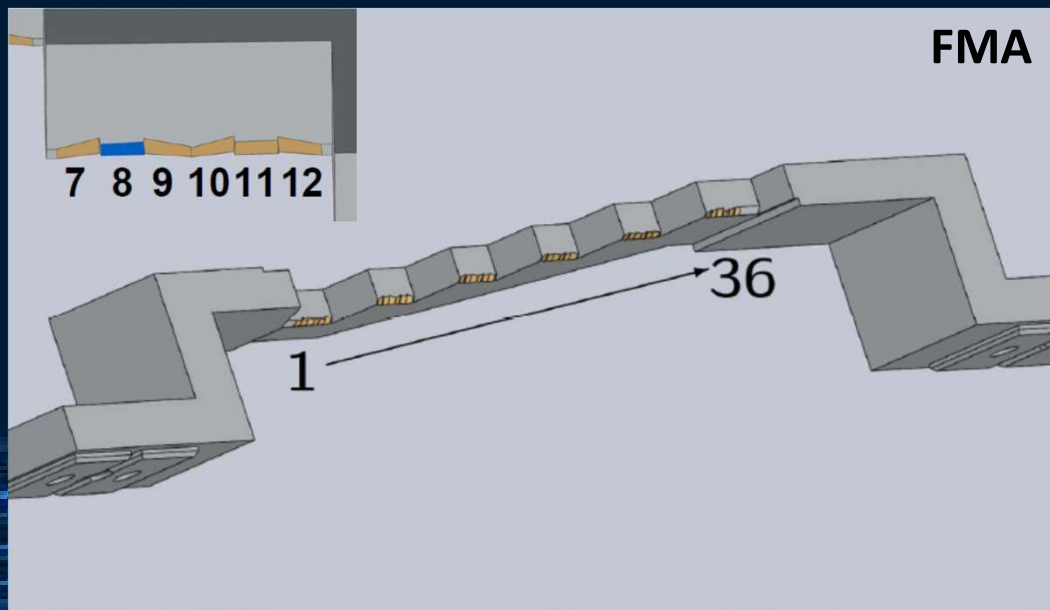
GTC GUC Meeting



CALP, La Palma, 17-18 September 2026

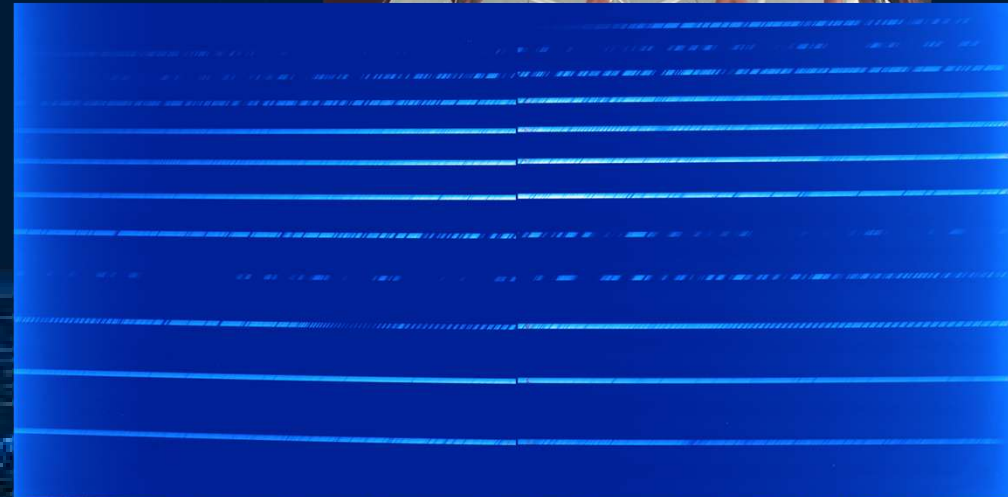
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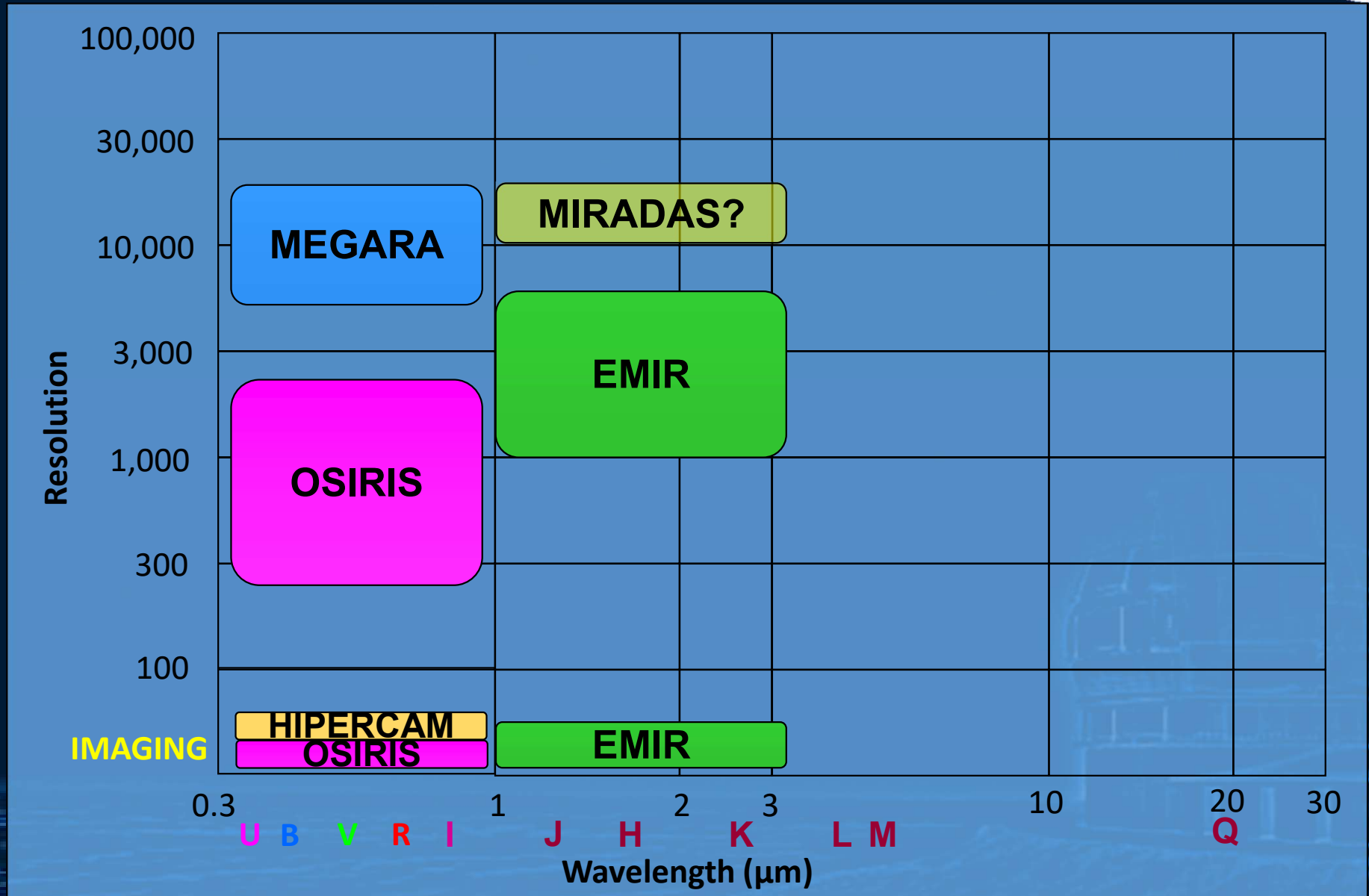


MIRADAS NIR medium-resolution multi-object spectrograph

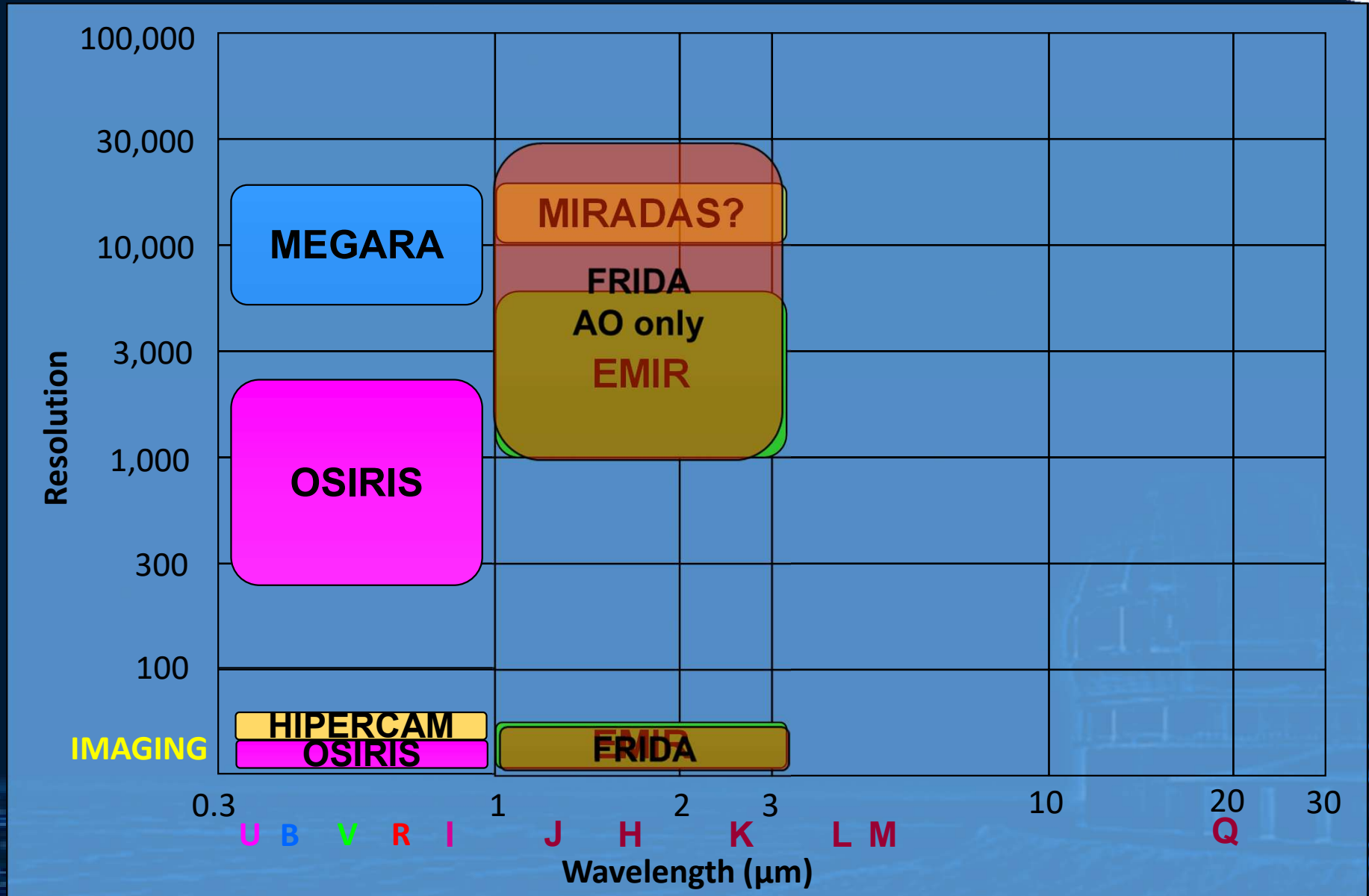
- **MIRADAS macroslicer** reinstalled in MIRADAS in July 2024.
- **Repairing of damaged components** and **optical alignment** of acquisitions arms completed.
- **Control software** of the instrument tested and updated to the current GCS release.
- **Preparation works** in FCassE focal station completed in **August 2024**.
- **Warm/cold tests** at GTC Lab began in **September 2024**. Lot of debugging needed. Remote testing in **Oct-Dec 2024**. On site **go/no-go testing** in **March 2025**.
- **On sky comissioning** during **April-Jul 2025**.
- Instrument was **warmed up** in late-July 2025 and **in stand-by mode until a strategic decision is made (Formal report produced for PI and UF to be discussed).**



GTC instrumentation for 2026-2027



GTC instrumentation for 2026-2027



GTC instruments (2009-2029)

2023 COALA (TECH)

2009-2022 OSIRIS
2019-2021 HORuS
2023 GTC AO
2027 FRIDA

2023 HiPERCAM

2012-2016 CanariCam
2017 EMIR
2023 EMIR+

2027 CHORUS (UV)

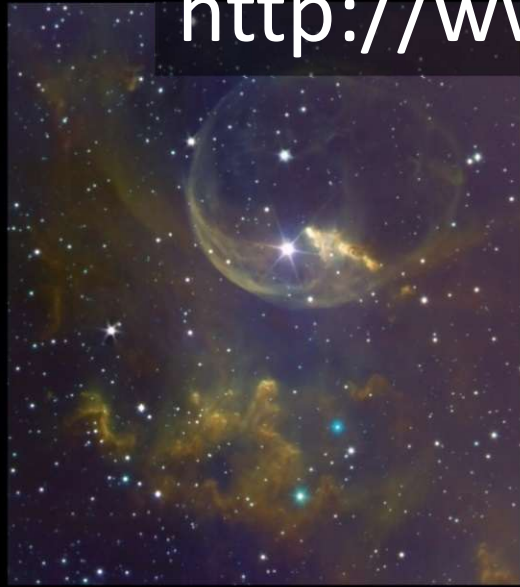
2015-2017 CIRCE
2018-2021 HiPERCAM
2019-2020 CanariCam
2026 MIRADAS

2018 MEGARA

2022 OSIRIS
2023 OSIRIS+
2026 MAAT

2030 CHORUS (VIS)

<http://www.gtc.iac.es/GTChome.php>



THANKS!!!!

antonio.cabrera@gtc.iac.es