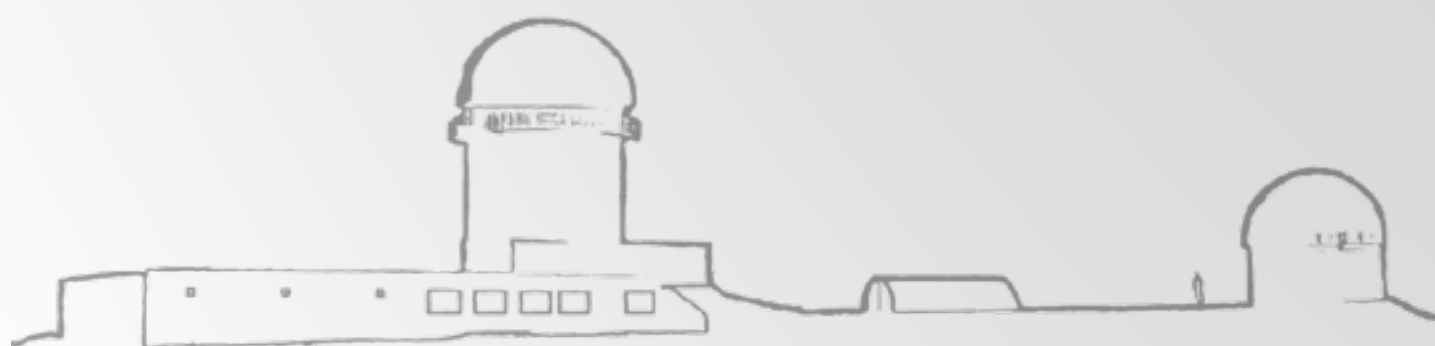


LA2: Development of cutting edge astronomical instrumentation for ICTS, ESFRI projects in astronomy and space missions

LA2.A1: Completion of JPCam and consolidation of its scientific operation on the JST250 telescope — Beginning of J-PAS

Antonio Marín-Franch

Deputy Director CEFCOA-OAJ



GOAL LA2.A1: The aim is to boost the completion of the JPCam, the 1.2Gpix panoramic camera integrated on the JST250 telescope at the ICTS Observatorio Astrofísico de Javalambre (OAJ) and start scientific operation → [The J-PAS Survey](#).

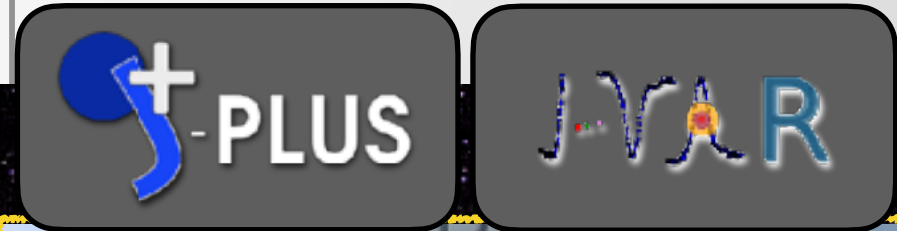
PRESENTATION OUTLINE:

- * OAJ, JST250, JPCam
- * Completion of JPCam Commissioning
- * J-PAS Survey Verification: **J-PAS starts!**
- * Renewal of the UPAD data center

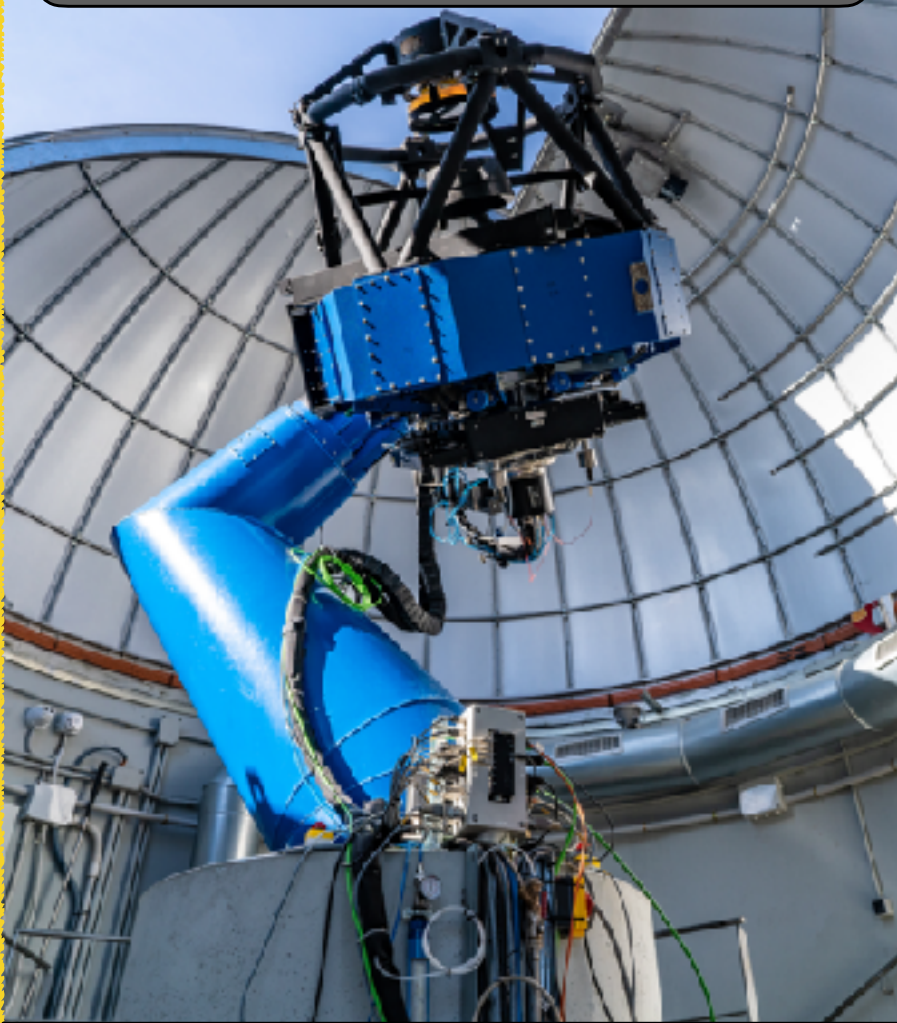


Observatorio Astrofísico de Javalambre


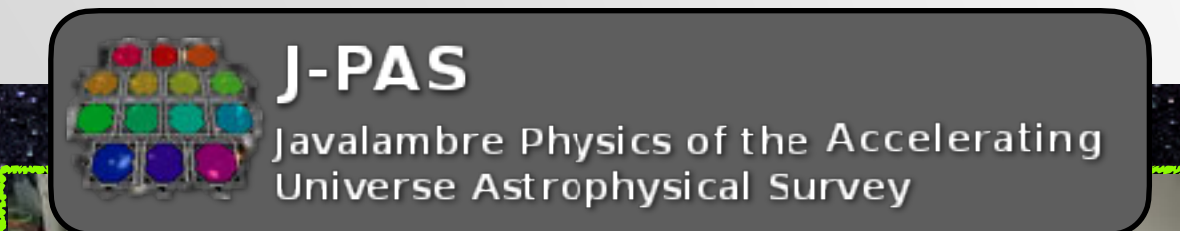
The OAJ is conceived to carry out large astronomical surveys, starting with the **J-PAS** and **J-PLUS**. To this purpose, the OAJ has two unique telescopes and instrumentation of unusually large FoV and a data center.



+ open time (LS)



JAST80
 Ritchey-Chrétien plus Field Corrector
 Diameter = 83 cm
 FoV = 2 deg \emptyset
 F/4,5
 M2 hexapod

+ open time (2025)




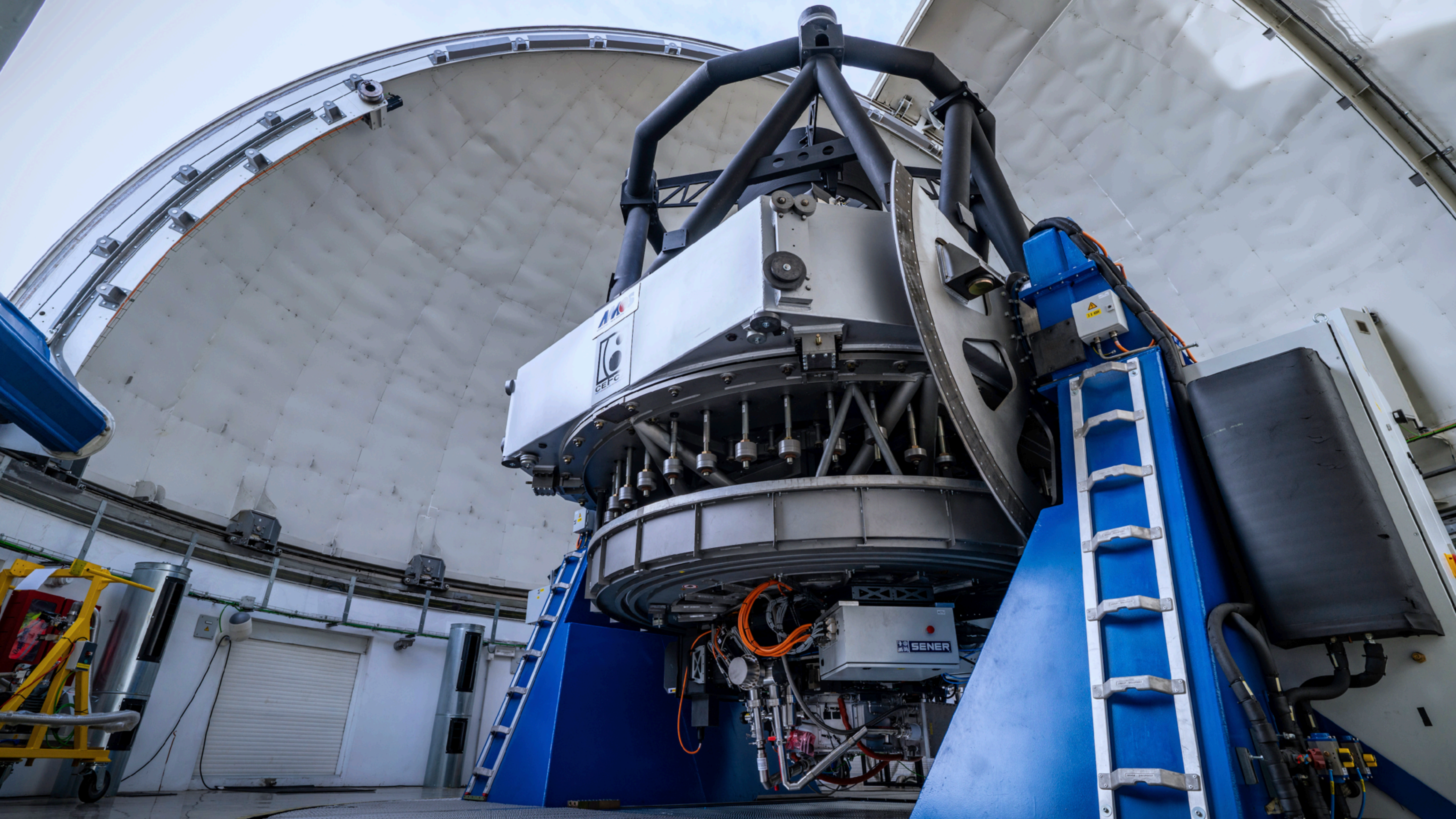
JST250
 Ritchey-Chrétien plus Field Corrector
 Diameter = 2,55 m
 FoV = 3 deg \emptyset
 F/3,5
 M2 hexapod



UPAD

- Main **storage**: 1.1 PB of disk storage + 4 PB in a robotic tape library
- Data **processing**: 21 nodes with more that 450 cores
- External **Data Access** System: Redundant web-servers (> 30 TB of storage)

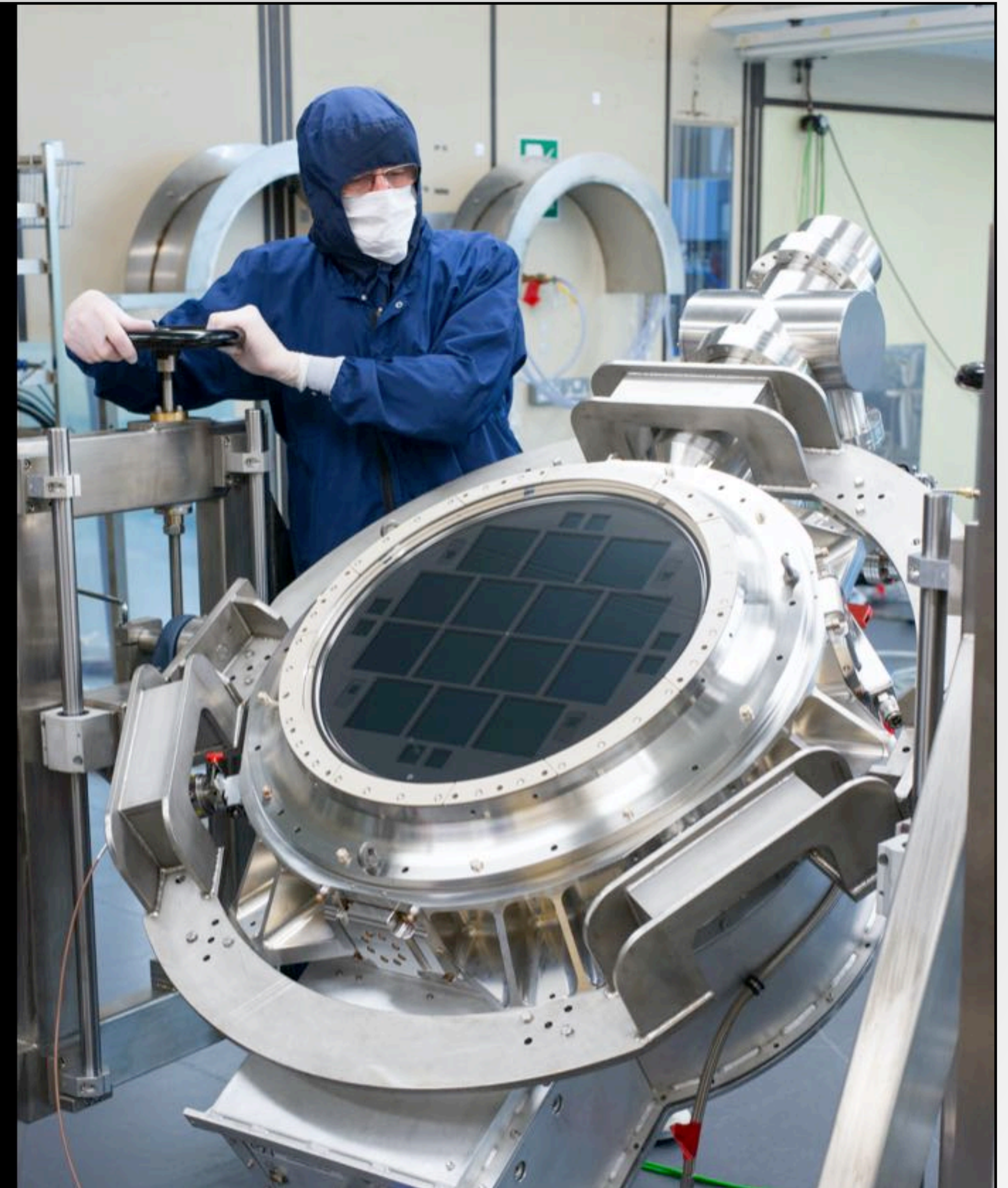
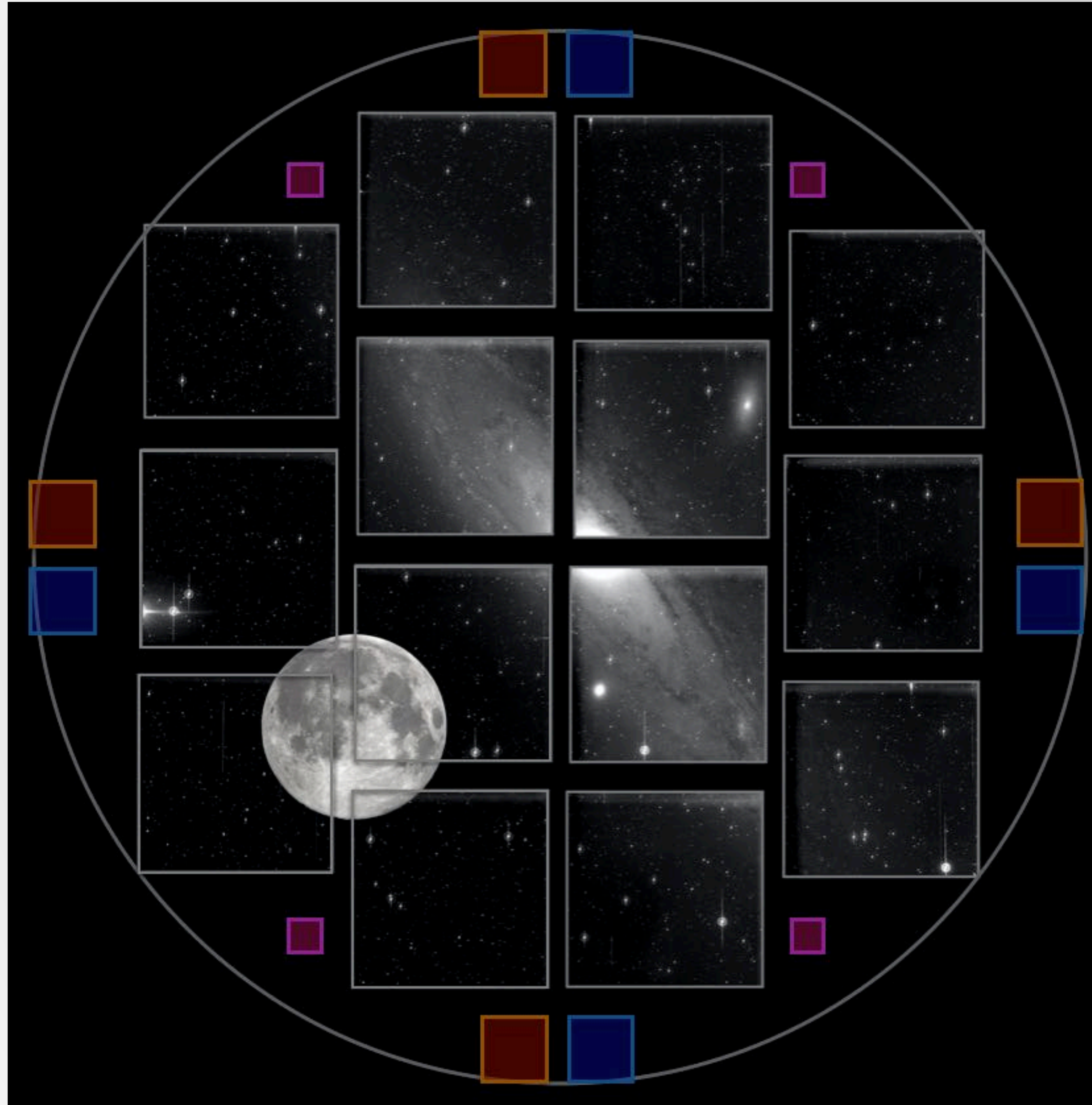


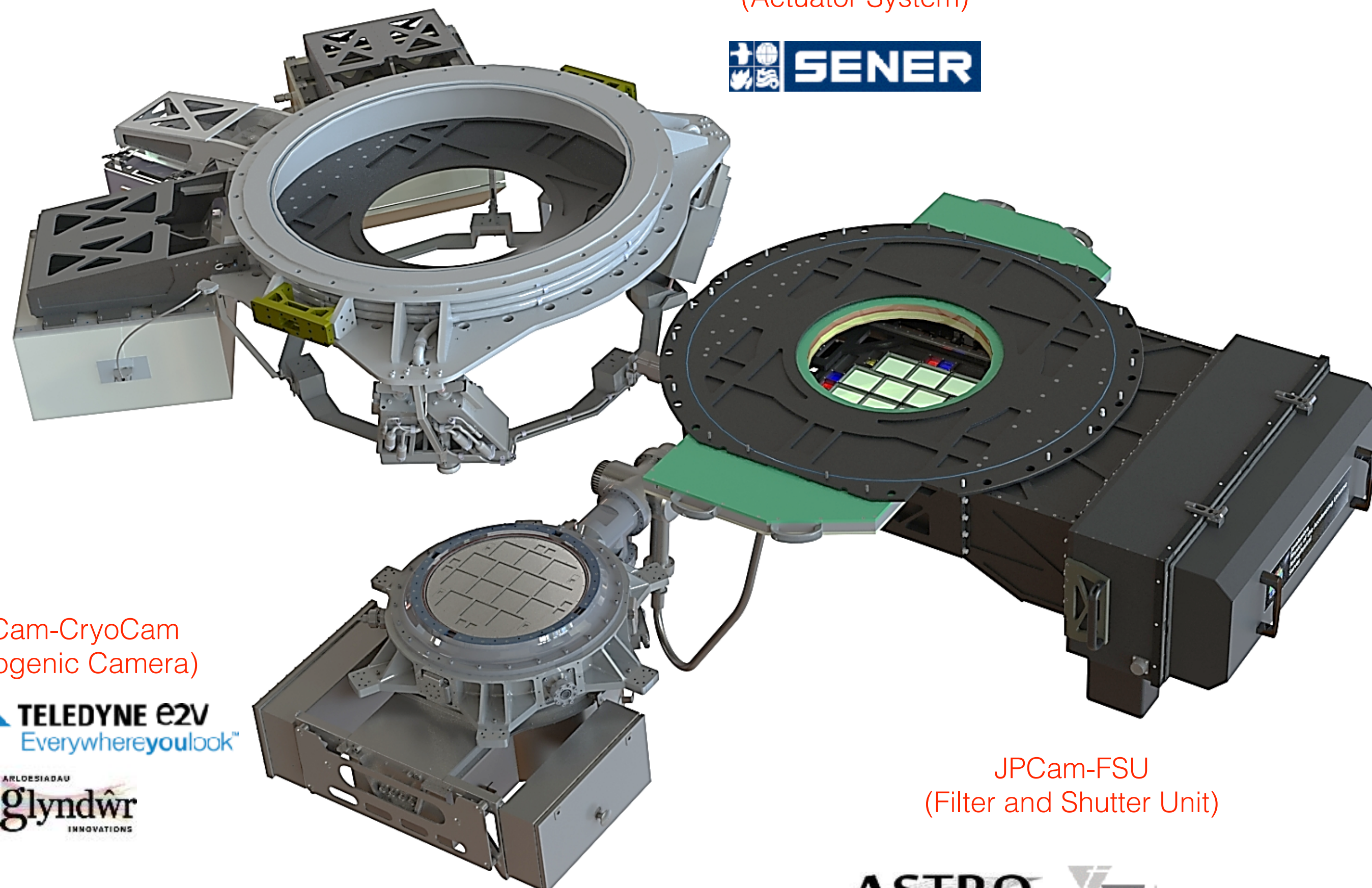
CEPC

SENER

Javalambre Panoramic Camera – JPCam



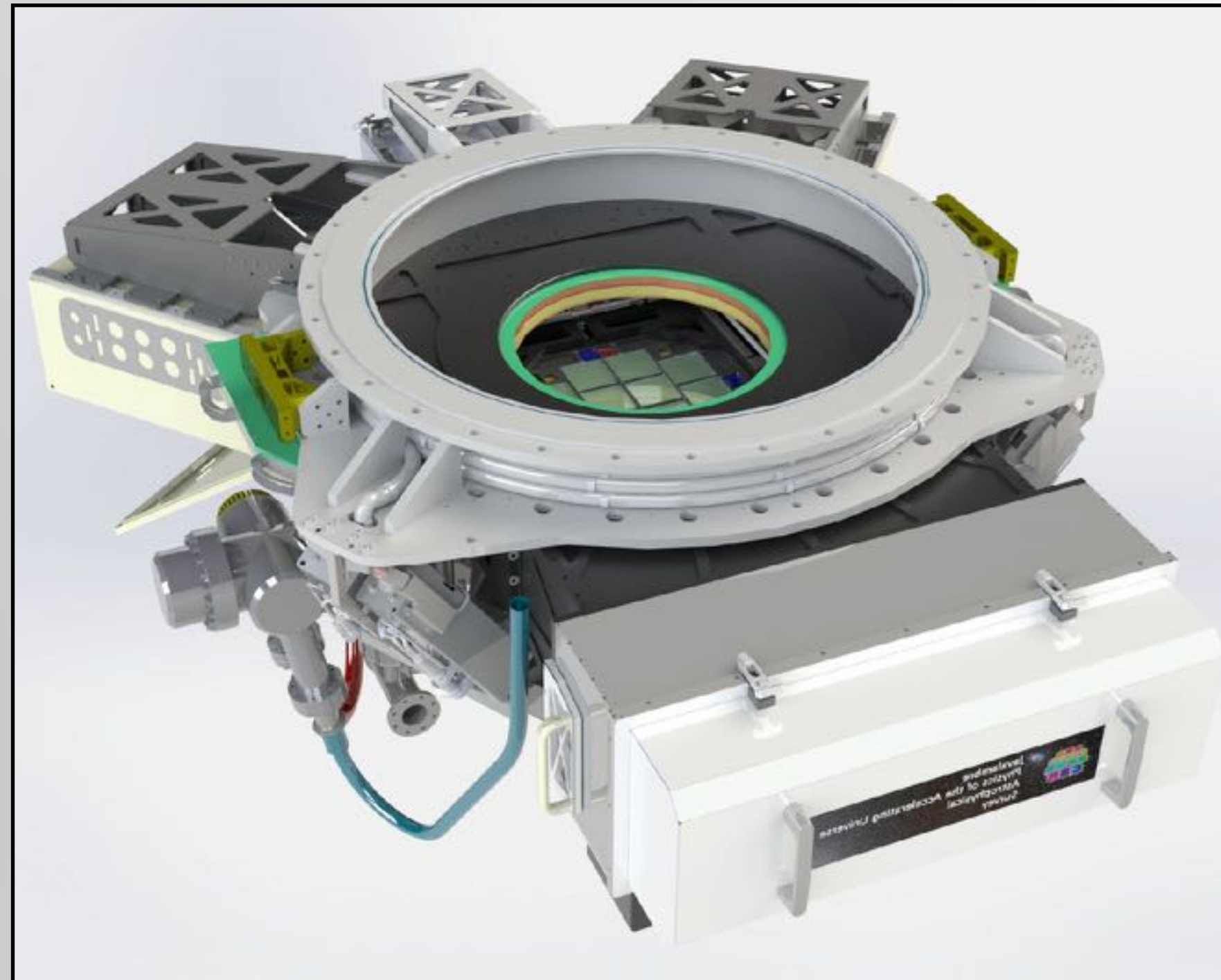
JPCam-AS
(Actuator System)



JPCam-CryoCam
(Cryogenic Camera)

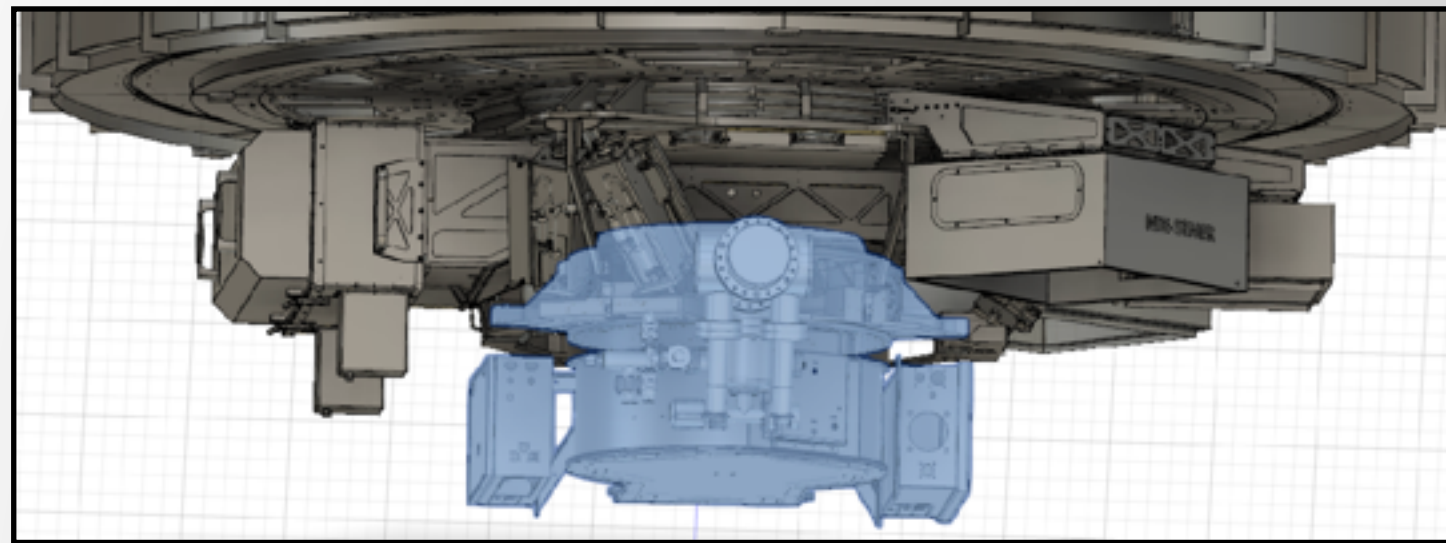


JPCam-FSU
(Filter and Shutter Unit)



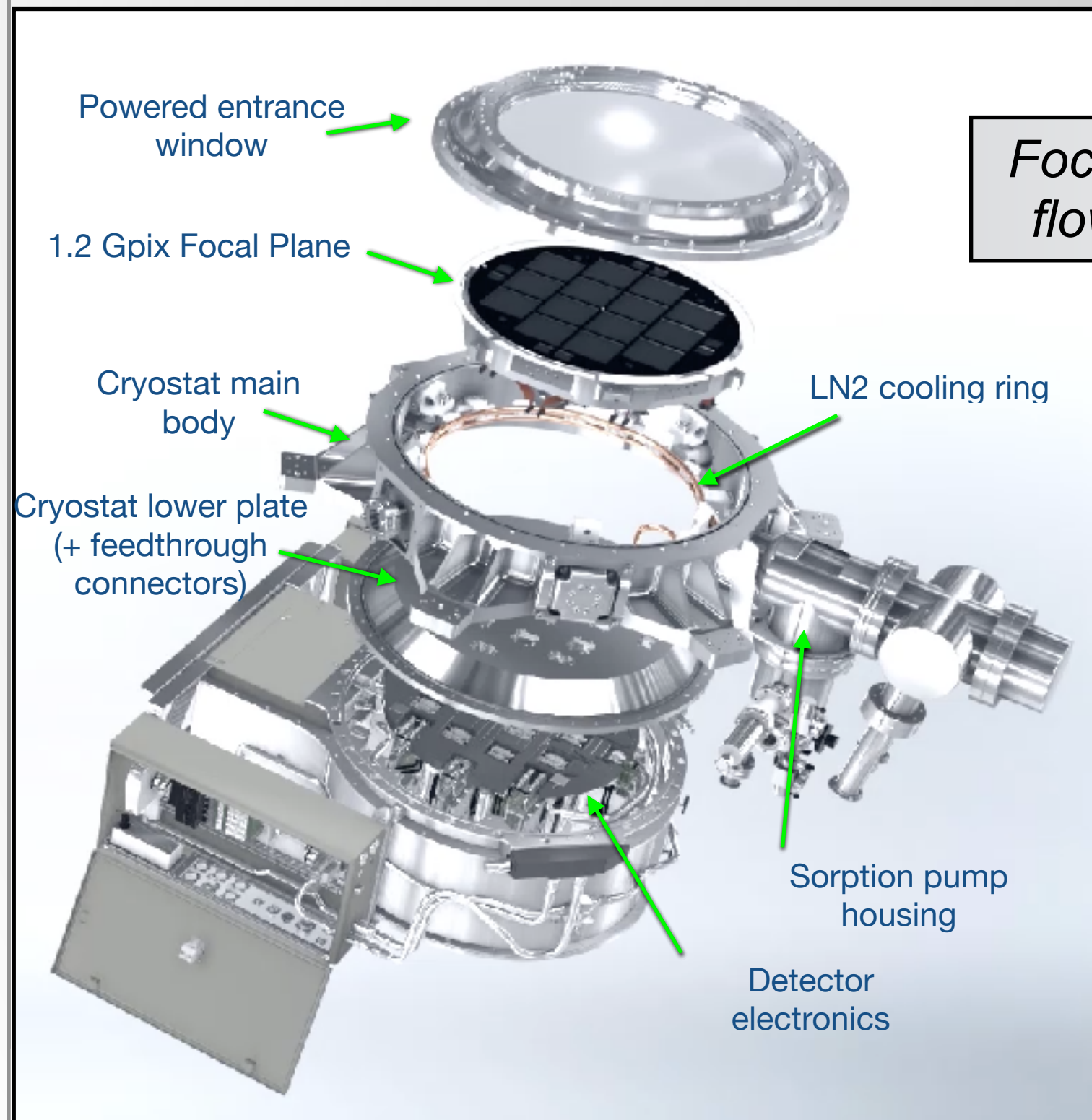
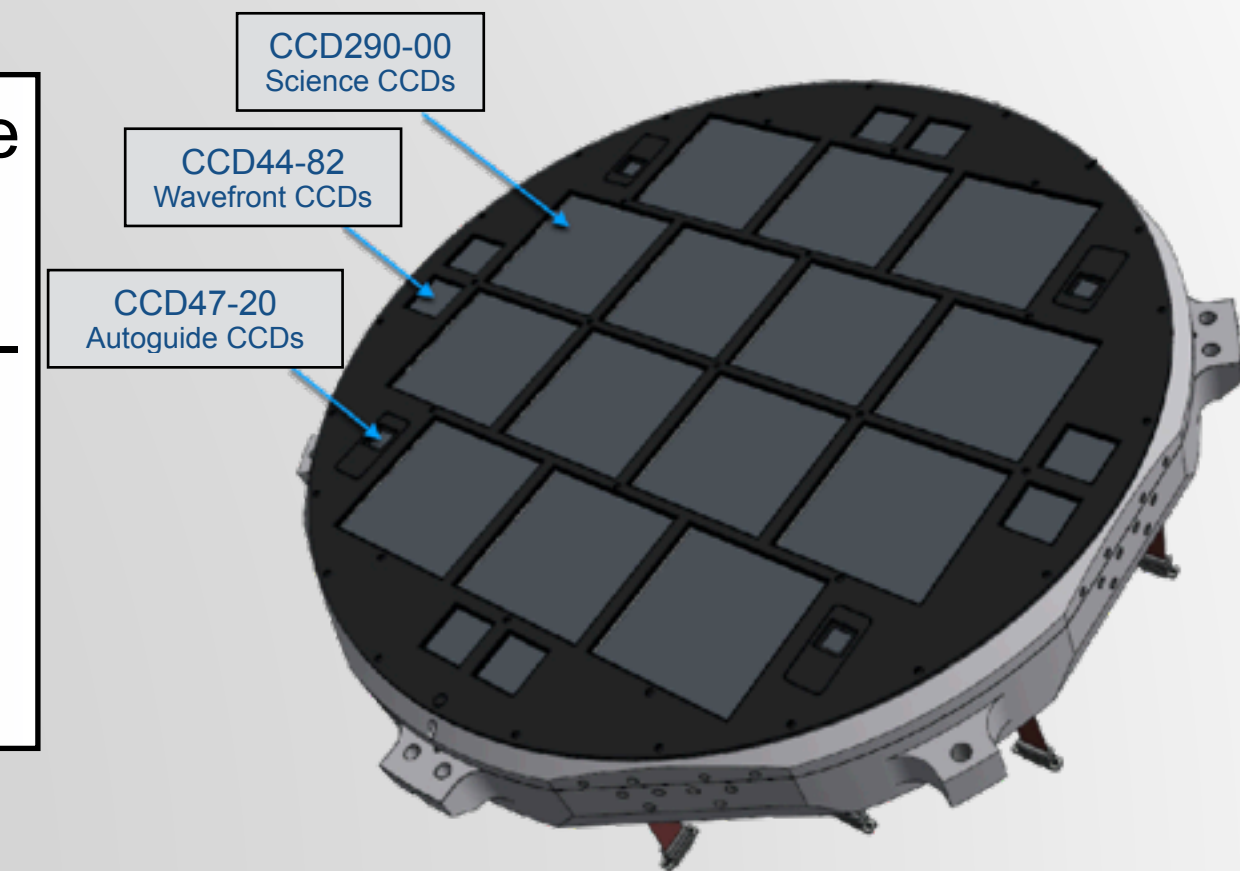
CCD format	14 × 9216 × 9232 pix, 10 μm pix ⁻¹ 1.2 Gpix camera
Pixel scale	0.2265" pix ⁻¹
Unvignetted FoV	3.4deg ² – (14×) 0.48deg × 0.51deg
Read out time (633kHz)	10.9 s (full frame) – 6.1 s (2x2 binning)
Read out noise (633kHz)	5.5 e ⁻ (RMS)
Read out time (400kHz)	16.4 s (full frame) – 8.9 s (2x2 binning)
Read out noise (400kHz)	4.3 e ⁻ (RMS)
Gain	2.274 e ⁻ ADU ⁻¹
Minimum exposure time	0.1 s
Exposure homogeneity	1 ms
Full well	> 125 000 e ⁻
Dark current	0.001 e ⁻ pix ⁻¹ s ⁻¹

JPCam Cryogenic Camera subsystem



1.2 Gpix focal plane mosaic composed by a total of 26 CCDs of three different types:

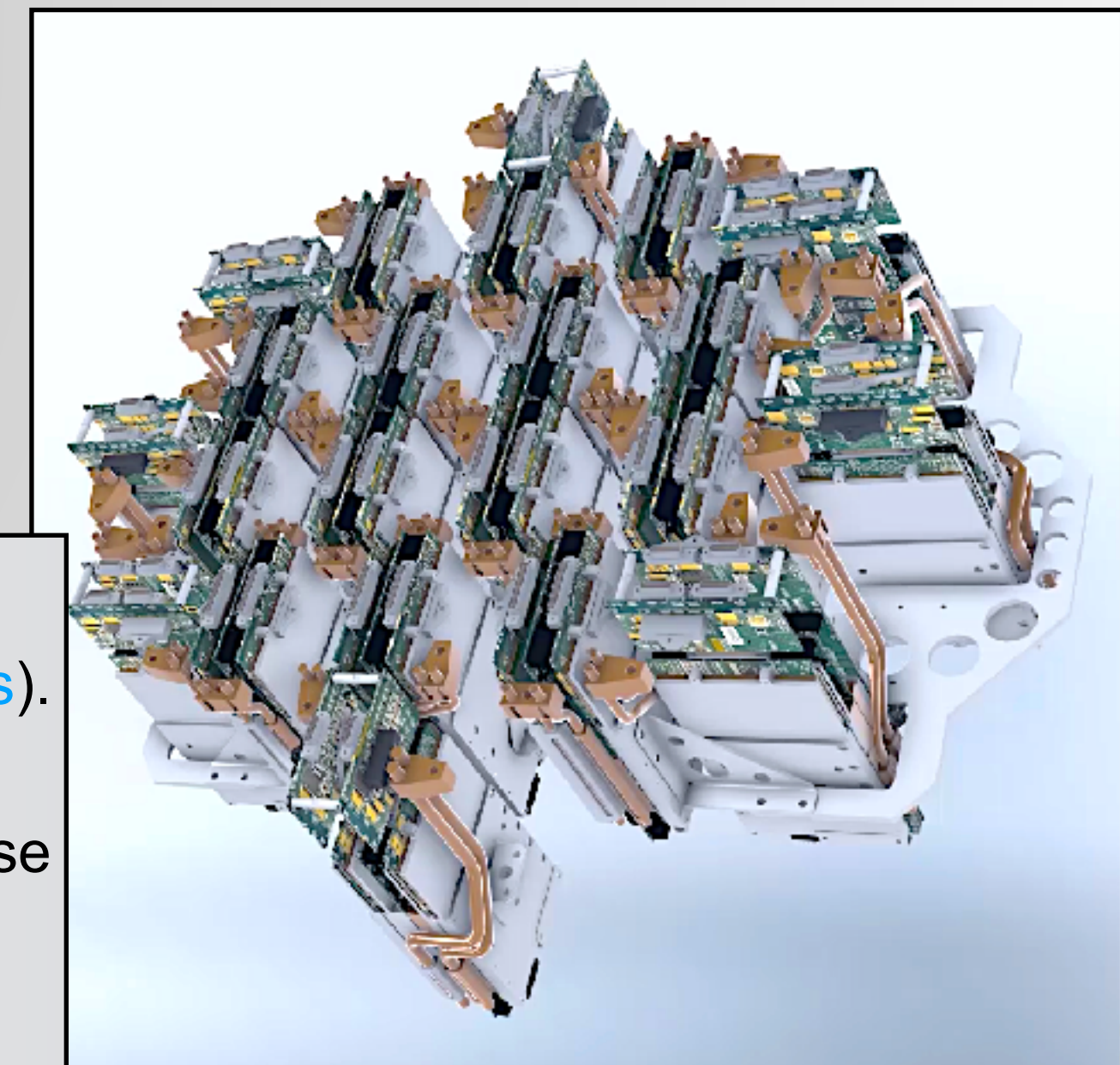
- **14 × CCD290–99 (Science CCDs)**. 9.216 x 9.232, 10µm pixel, non-inverted, full frame, deep depletion, astro multi-2 CCDs.
- **8 × CCD44–82 (Wavefront Sensors)**. 2048 X 2048 Frame-transfer.
- **4 × CCD47–20 (Autoguide CCDs)**. 1024 X 1024 Frame-transfer.



Focal Plane Array inside a continuous flow cryostat. LN2 cooled at -110°C.

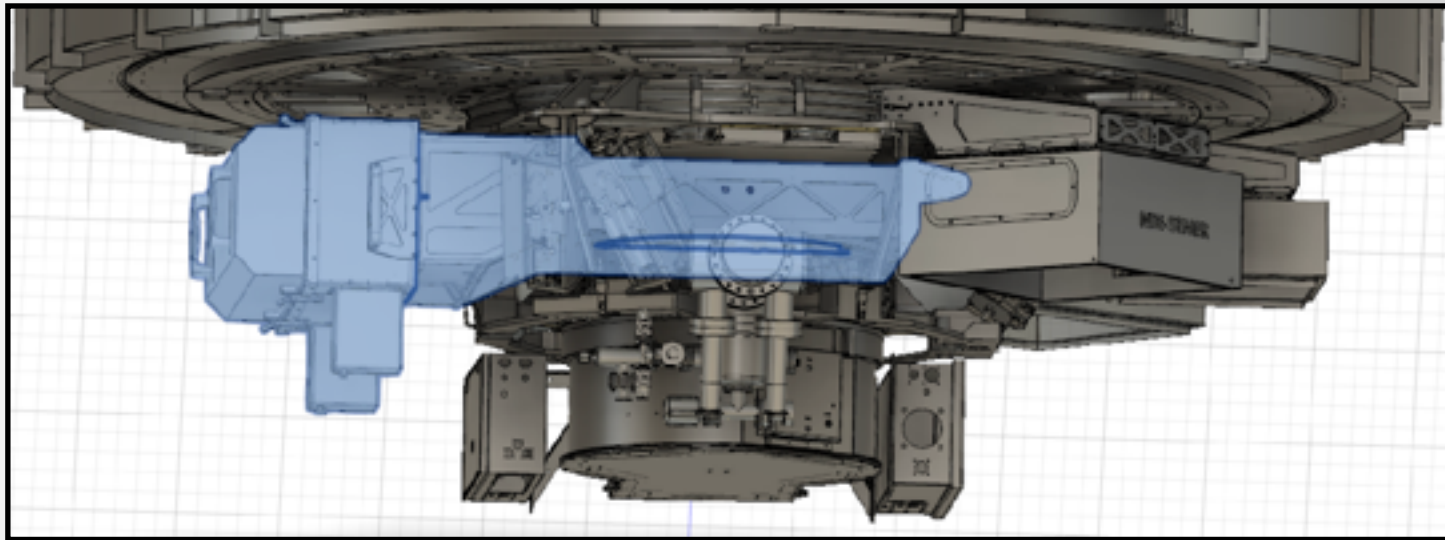
Includes **detector electronics** to control all CCDs:

- 22 CCD drive modules + interface module (**more than 70 PCBs**). Glycol water cooling system.
- Power and data handling electronics (**224-channel** low noise electronics)
- Over **50 FPGAs** to handle the 2.4 GBytes of data per frame
- Digital CDS (Correlated Double Sampling) readout

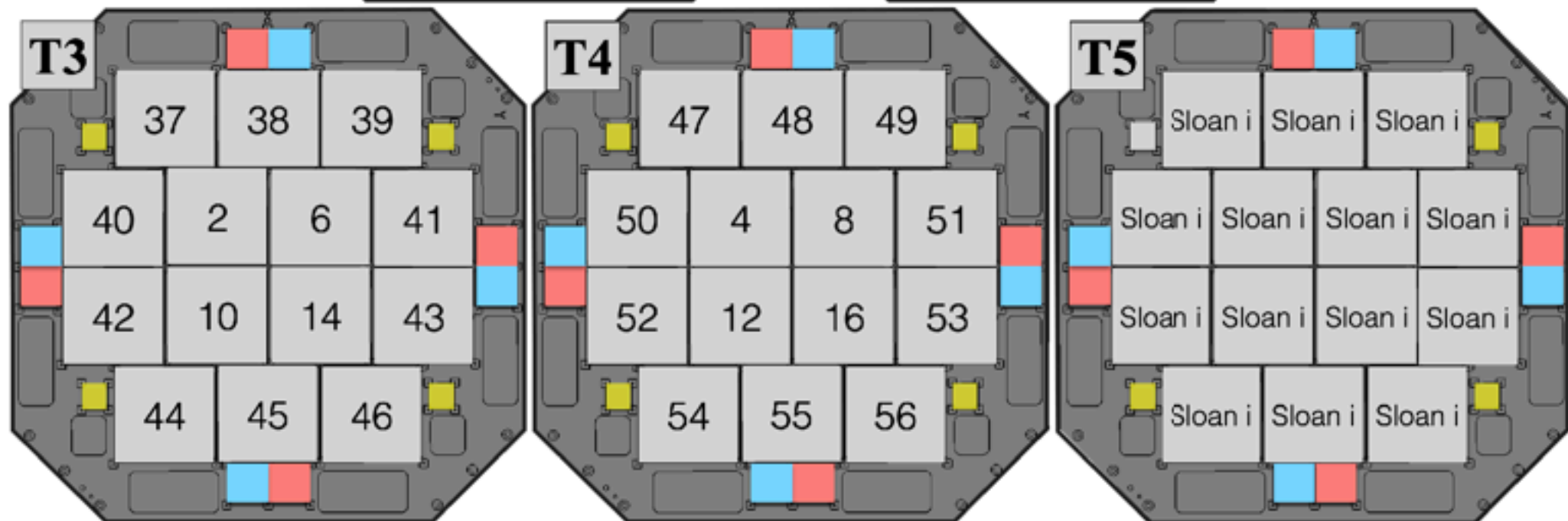
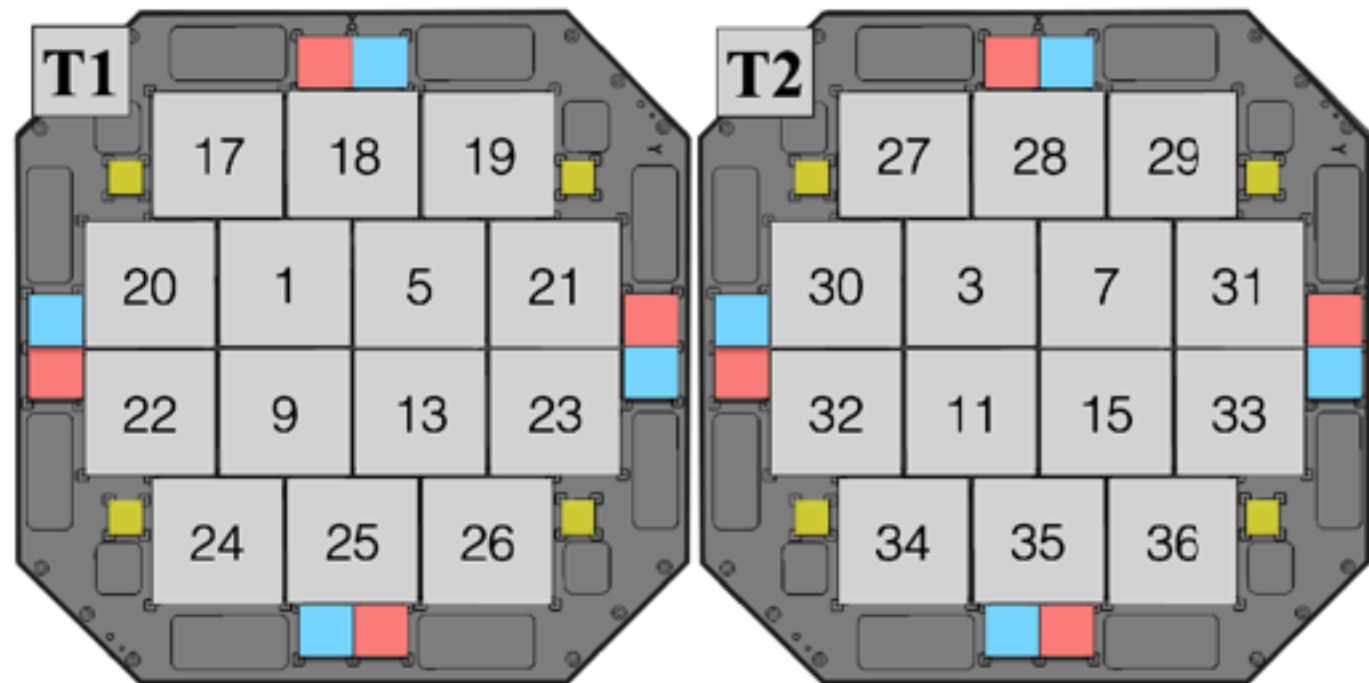
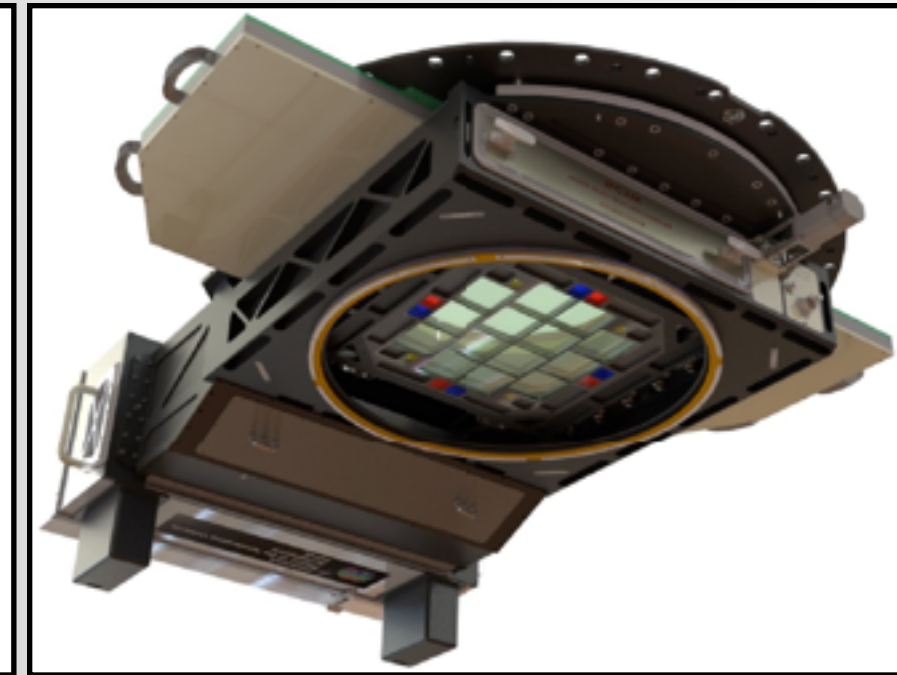
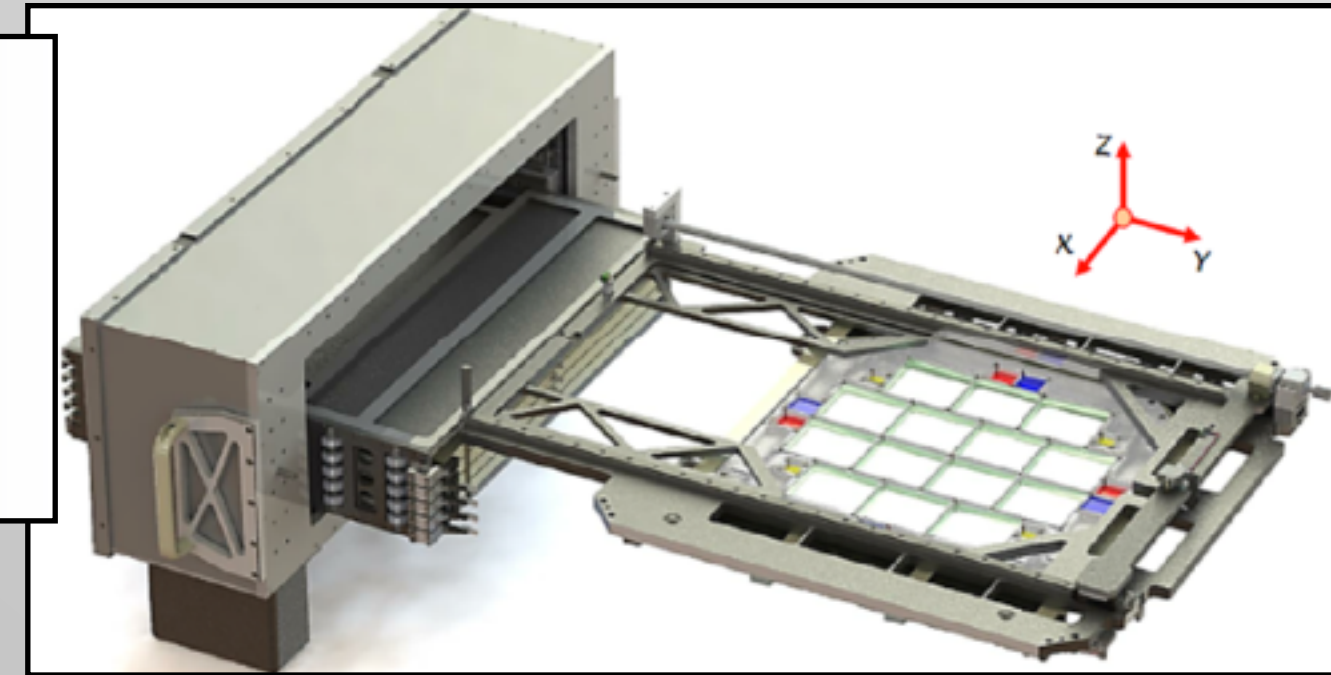


Javalambre Panoramic Camera – JPCam

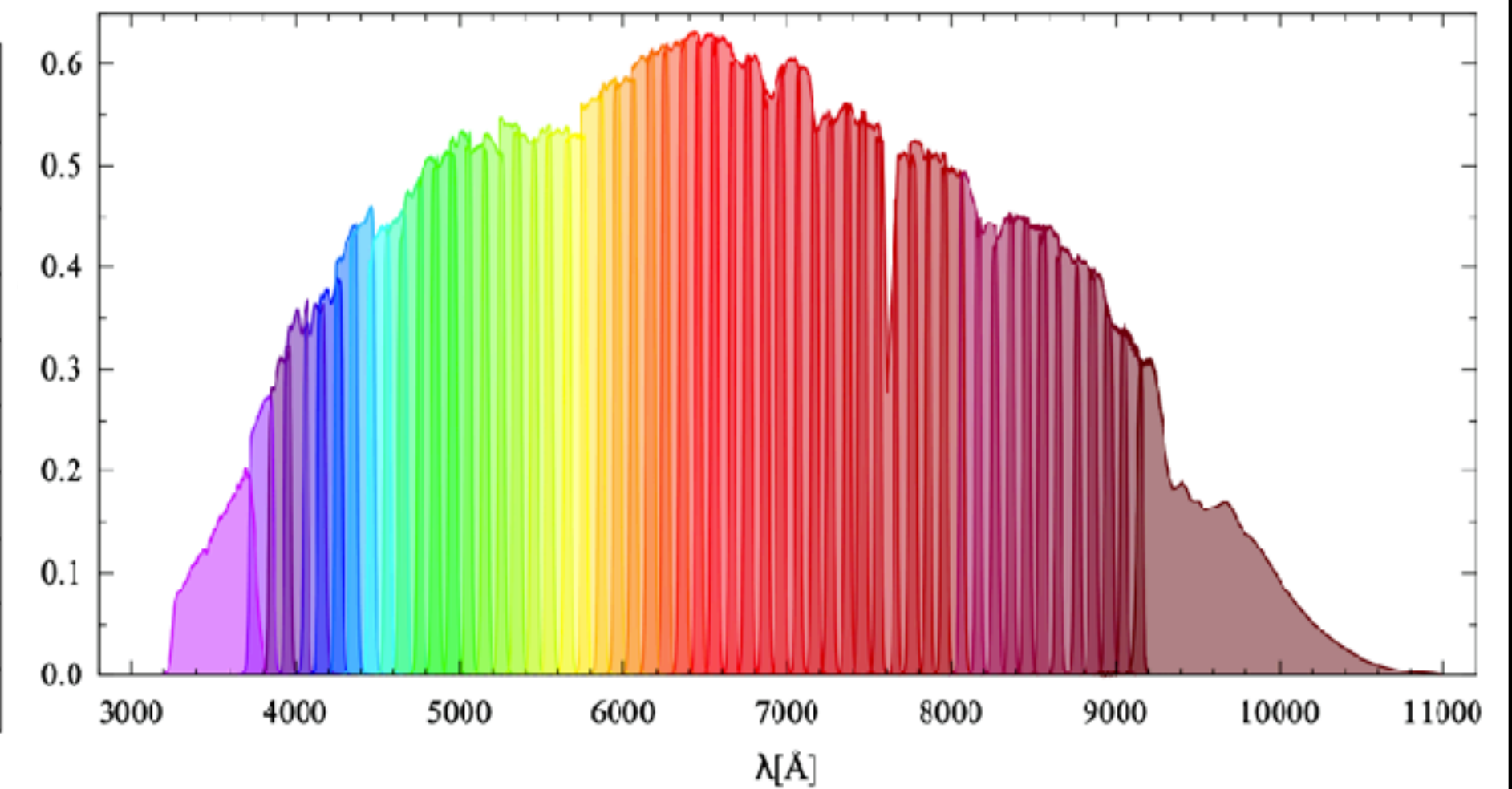
Filter and Shutter Unit



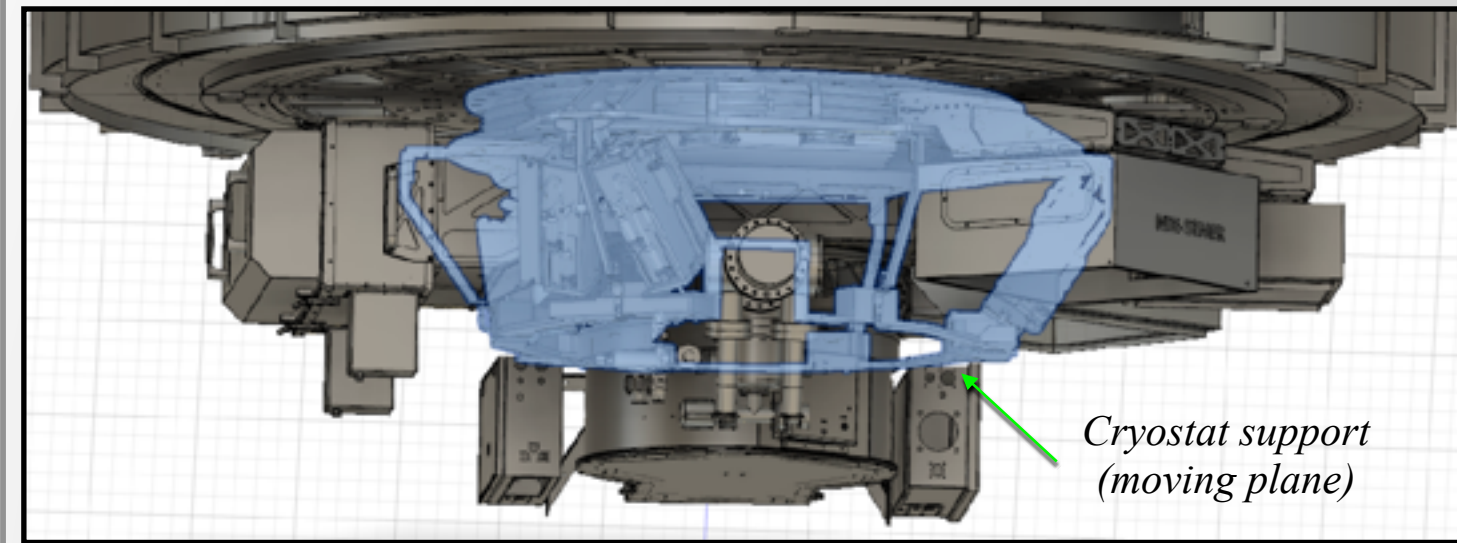
- Sealed to maintain a GN2 atm.
- “Two-curtain” 515mm shutter
- Admit 5 filter tray assemblies
- Filter tray change in <40s.



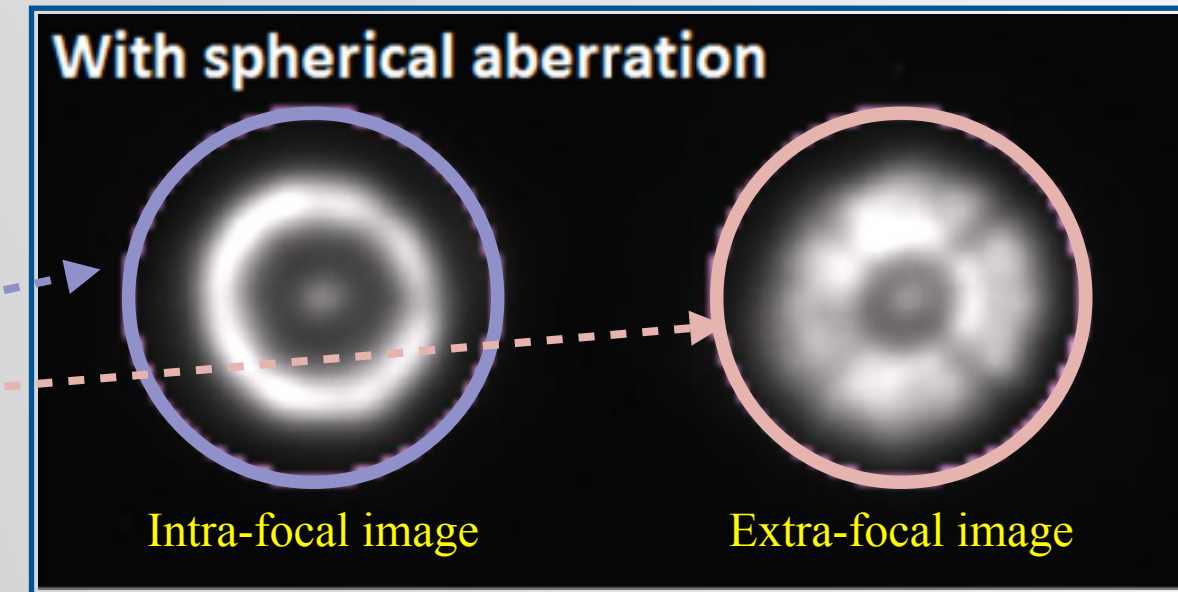
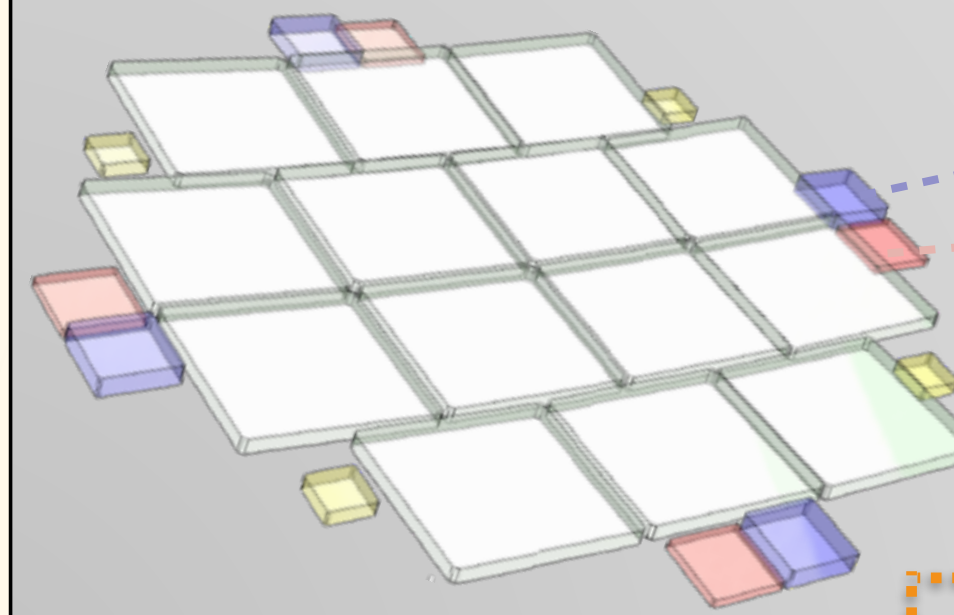
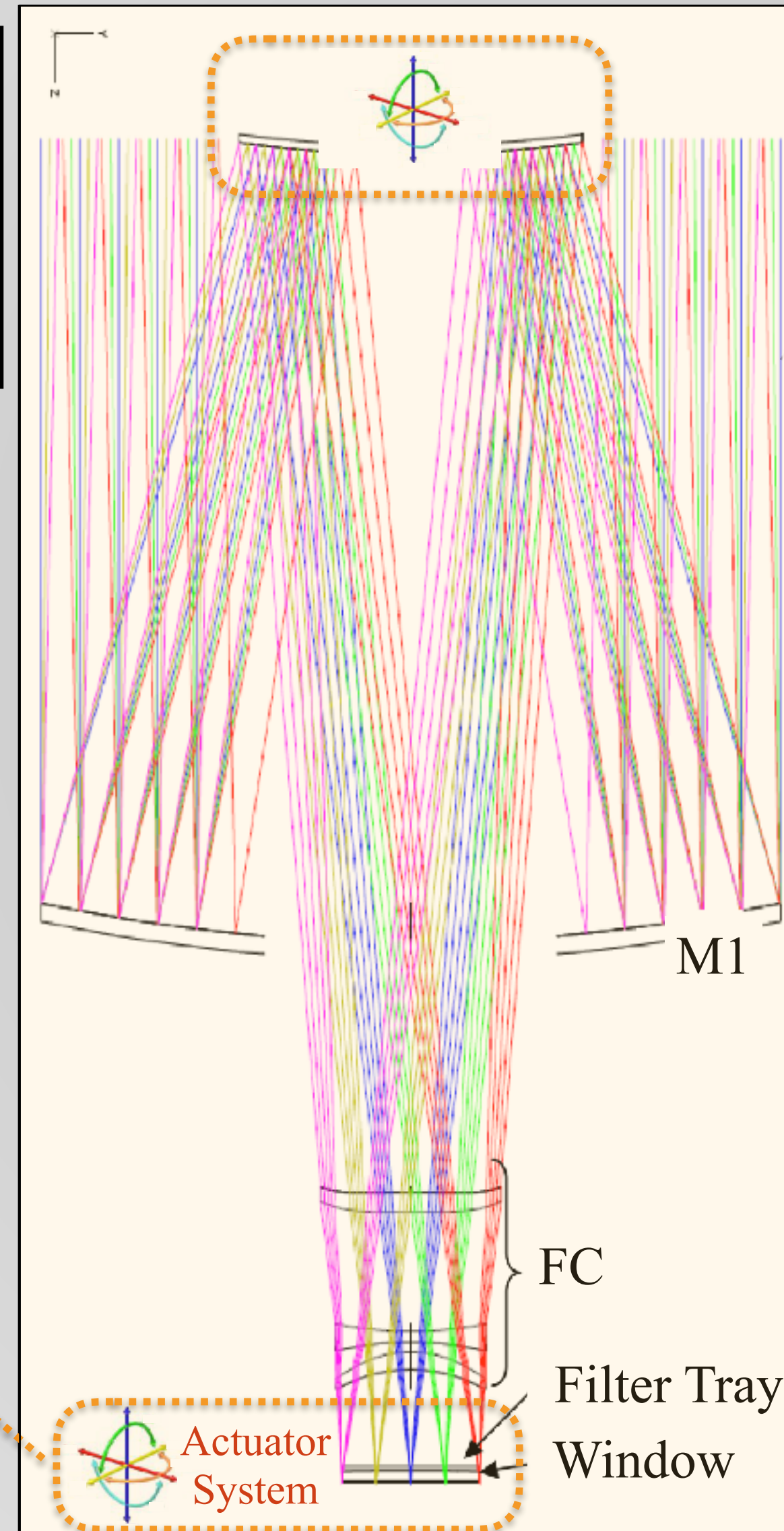
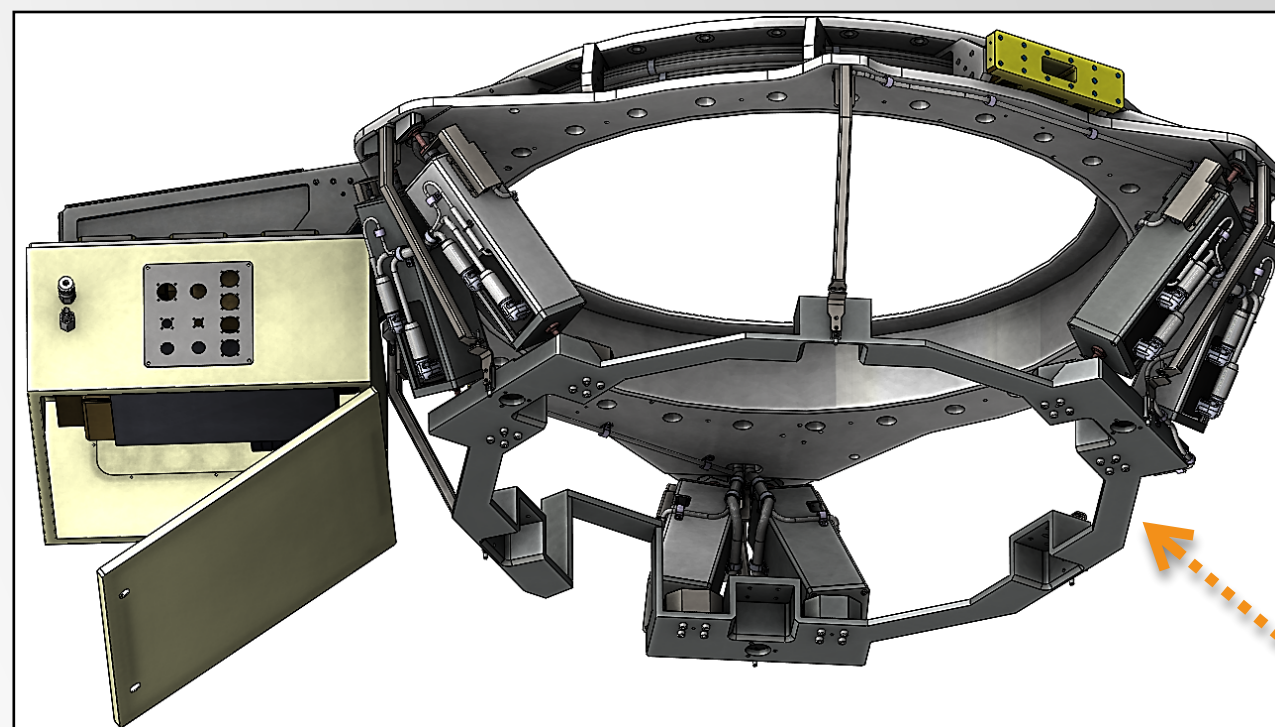
# Filter	CW (nm)	FWHM (nm)
1	348,5	49.5
2	378,5	15.5
3	390,0	14.5
4	400,0	14.5
5	410,0	14.5
...
54	900,0	14.5
55	910,0	14.5
56	1007,5	188.8



Actuator system and IQ control system

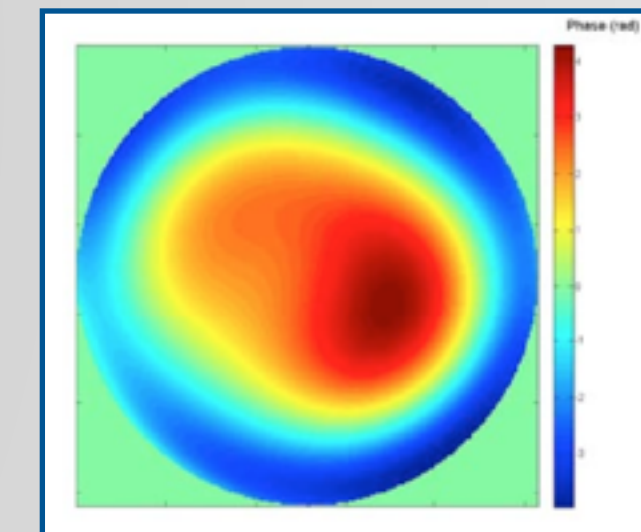


CryoCam weight	580 kg
Relative focus accuracy	$\pm 4 \mu\text{m}$
Relative tilt accuracy	$\pm 1 \text{ arcsec}$
Response time	$< 3 \text{ s}$



Compute Zernike polynoms

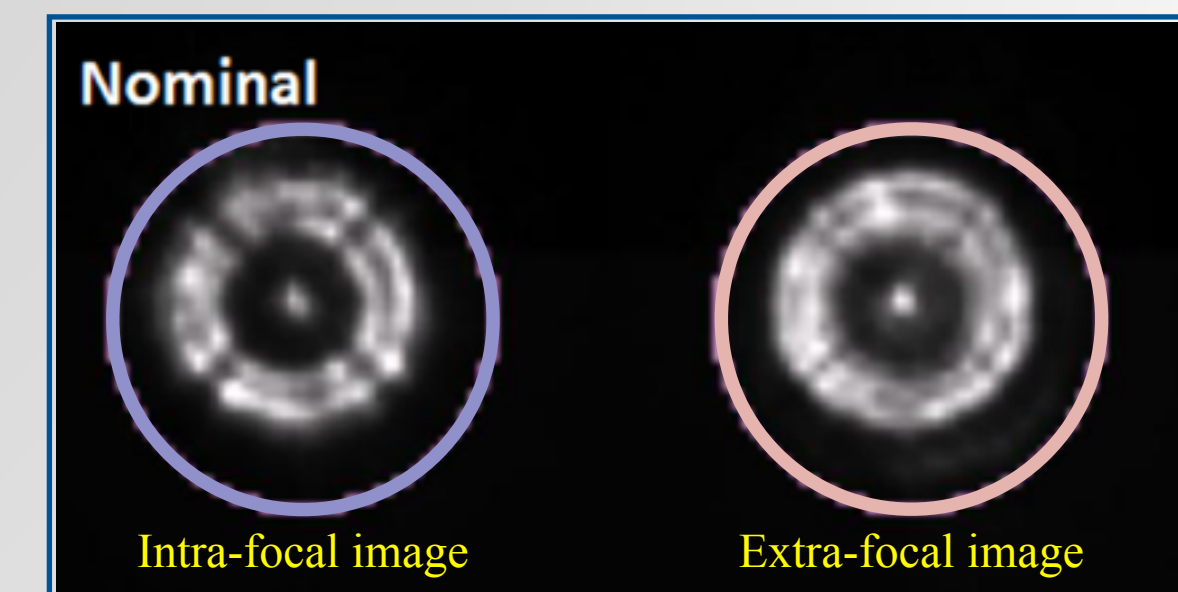
3

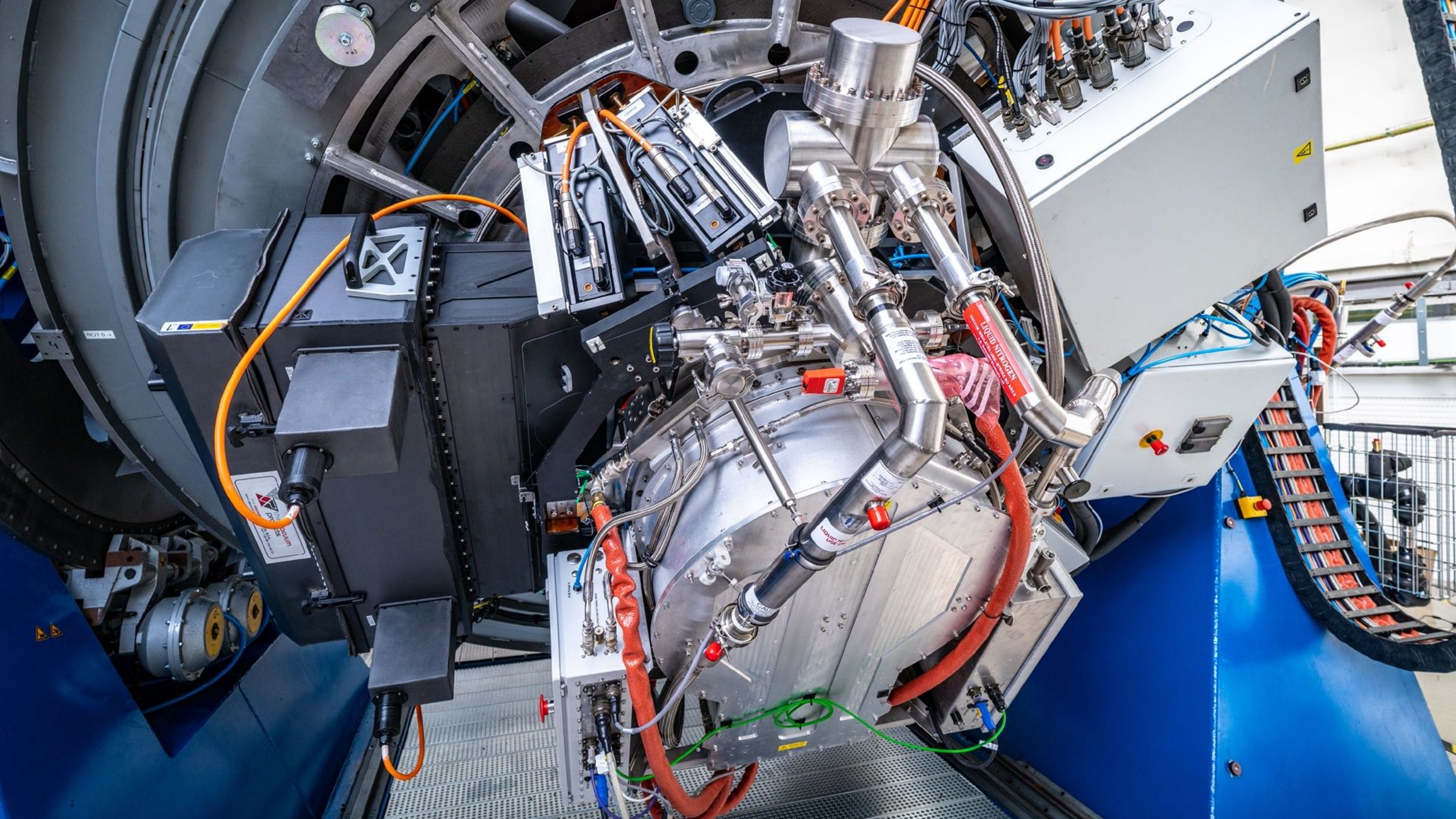


4

Apply M2 hexapod + Actuator System motions

5





H2.1.1 – Completion of JPCam commissioning → [Milestone achieved in Nov. 2023](#)



H2.1.1 – Completion of JPCam commissioning → Milestone achieved in Nov. 2023



H2.1.2 – Specialized technological assistance contract → Milestone achieved in Apr. 2023



To optimize JPCam performances: 2 year specialized technological assistance with the cryogenic camera manufacturer.

Contract's signature: 01/04/2023 – End of service: 31/3/2025

H2.1.1 – Completion of JPCam commissioning → Milestone achieved in Nov. 2023



H2.1.2 – Specialized technological assistance contract → Milestone achieved in Apr. 2023



To optimize JPCam performances: 2 year specialized technological assistance with the cryogenic camera manufacturer.

Contract's signature: 01/04/2023 – End of service: 31/3/2025

H2.1.3 – Acquisition of a set of auxiliary systems and equipment for JPCam and JST250



To maximize efficiency and availability during scientific operation: acquisition of a set of auxiliary systems and equipment for the operation of JPCam

Contract's signature: 28/12/2022 – End of supply: 30/8/2024

+ electronics engineer

Status of JPCam Commissioning and beginning of J-PAS

H2.1.1 – Completion of JPCam commissioning → Milestone achieved in Nov. 2023



H2.1.2 – Specialized technological assistance contract → Milestone achieved in Apr. 2023



To optimize JPCam performances: 2 year specialized technological assistance with the cryogenic camera manufacturer.

Contract's signature: 01/04/2023 – End of service: 31/3/2025

H2.1.3 – Acquisition of a set of auxiliary systems and equipment for JPCam and JST250



To maximize efficiency and availability during scientific operation: acquisition of a set of auxiliary systems and equipment for the operation of JPCam

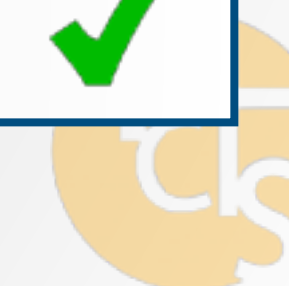
Contract's signature: 28/12/2022 – End of supply: 30/8/2024

+ electronics engineer

LA8-A1 – Renewal of the UPAD data center



Contract's signature: 03/11/2023 – End of renewal: 28/05/2024



Status of JPCam Commissioning and beginning of J-PAS

H2.1.1 – Completion of JPCam commissioning → Milestone achieved in Nov. 2023



H2.1.2 – Specialized technological assistance contract → Milestone achieved in Apr. 2023



To optimize JPCam performances: 2 year specialized technological assistance with the cryogenic camera manufacturer.

Contract's signature: 01/04/2023 – End of service: 31/3/2025

H2.1.3 – Acquisition of a set of auxiliary systems and equipment for JPCam and JST250



To maximize efficiency and availability during scientific operation: acquisition of a set of auxiliary systems and equipment for the operation of JPCam

Contract's signature: 28/12/2022 – End of supply: 30/8/2024

+ electronics engineer

LA8-A1 – Renewal of the UPAD data center



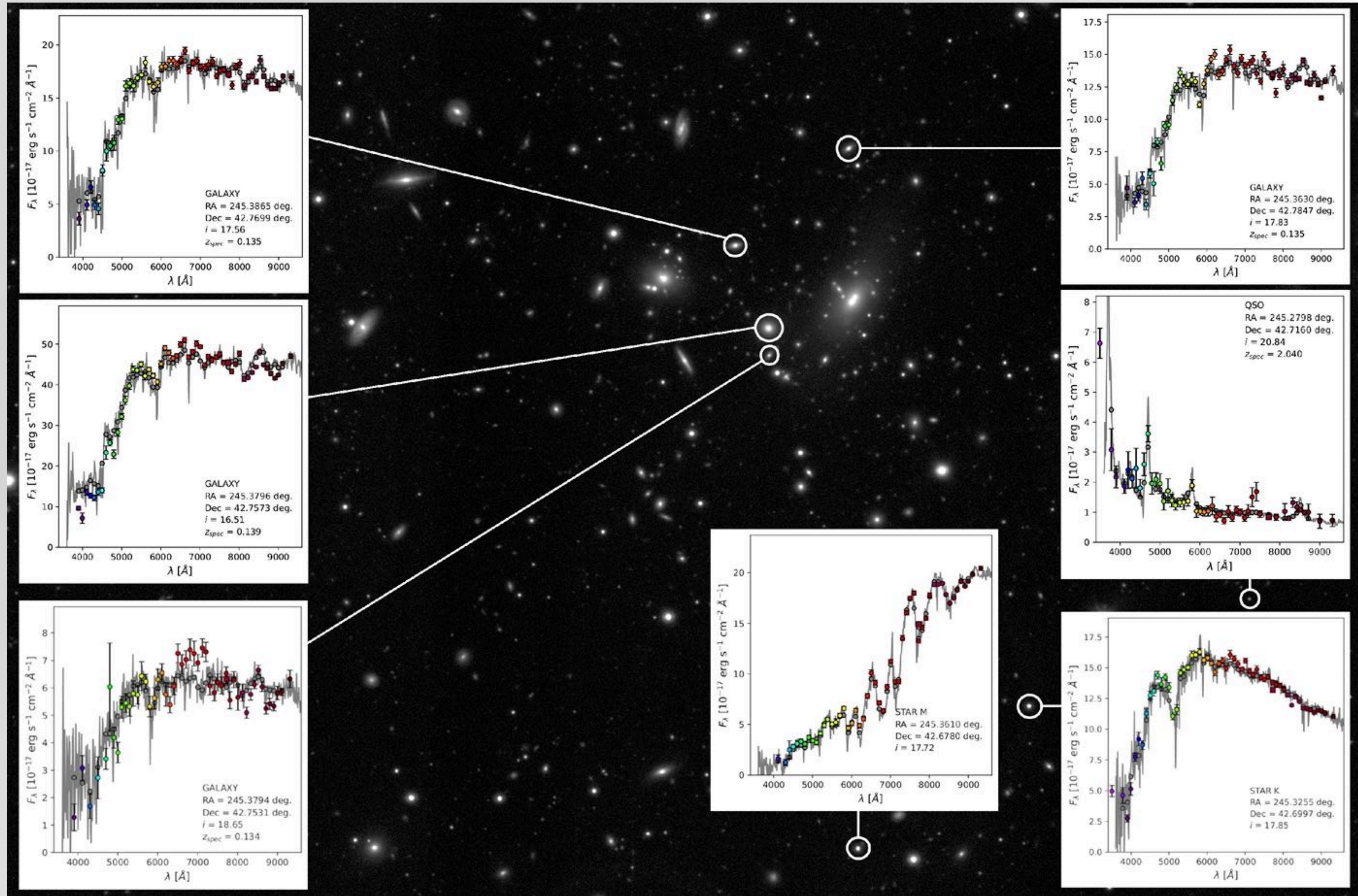
Contract's signature: 03/11/2023 – End of renewal: 28/05/2024



Beginning of J-PAS

High impact in other CCAA involved:

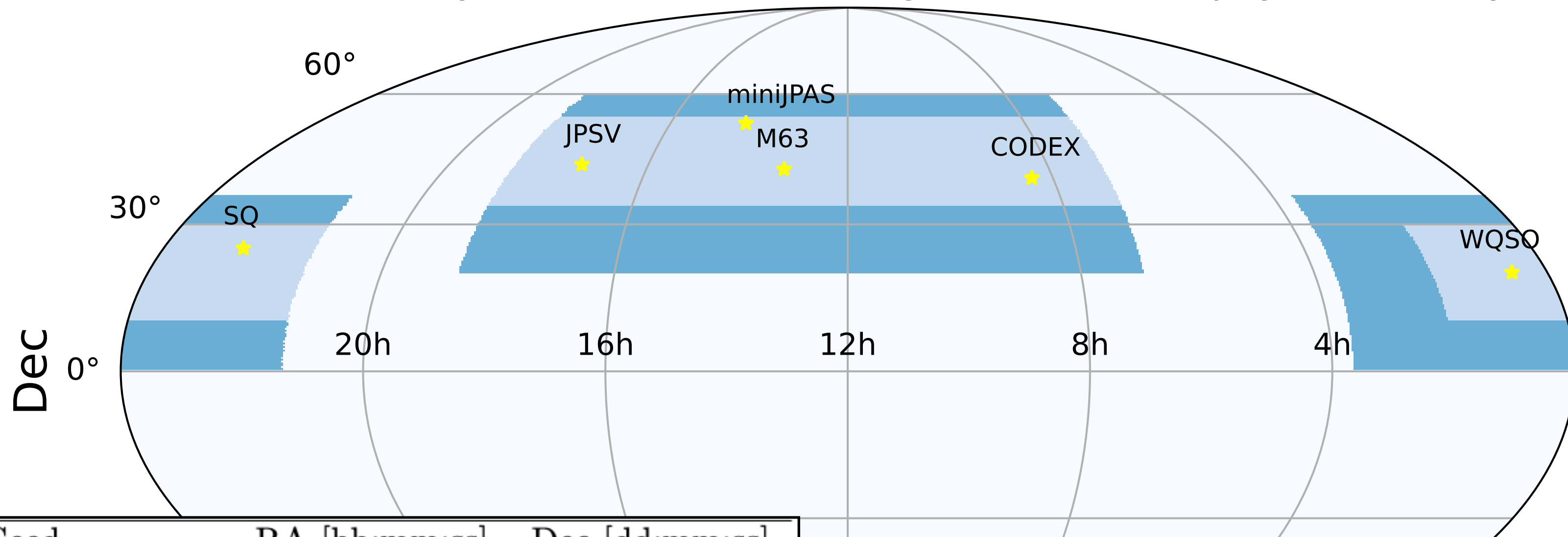
Andalucía, Aragón, Cantabria, Cataluña, Madrid, Valencia



J-PAS Survey Verification

J-PAS Observations started centered in 6 “seeds” chosen based on specific scientific interests and visibility.

Javalambre Physics of the Accelerating Universe Astrophysical Survey



Status

- 32 deg² with all filters
- 100-400 deg² with individual filters
- Internal DR expected at the end of June'24
- First **public data release** November'24.

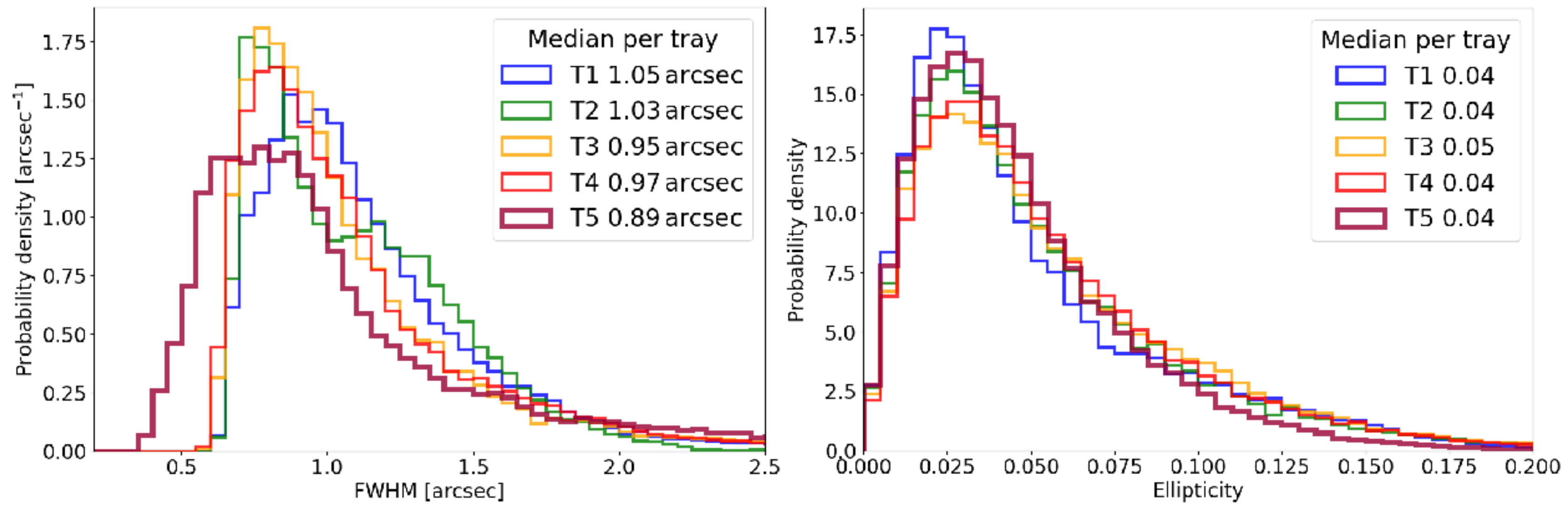
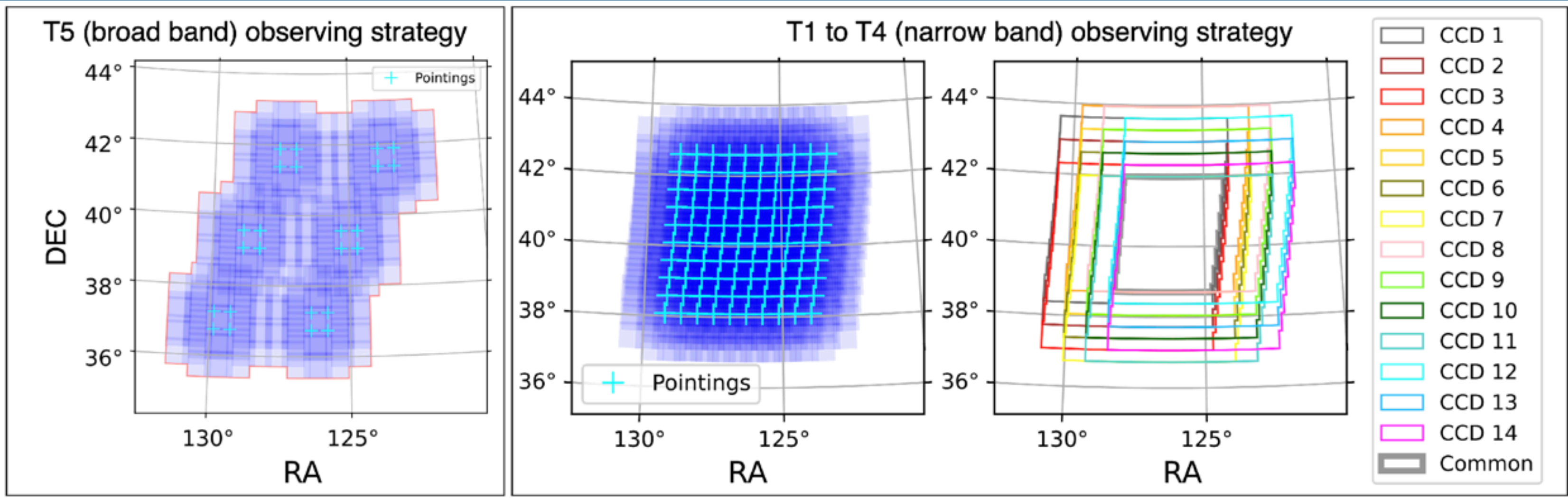
Seed	RA [hh:mm:ss]	Dec [dd:mm:ss]
WEAVE-QSO	00:36:14	20:00:00
CODEX	08:24:27	40:06:19
MESSIER063	13:15:49	42:01:46
miniJPAS	14:17:48	52:43:34
JPSV	16:16:00	43:00:00
StephQuint	22:36:00	22:30:00

RA

Tray	Read-out	Binning	Exp. time	Num. exp.	Num. pointings
T1	MODE 3	2 × 2	60 s	×1	39722
T2	MODE 3	2 × 2	60 s	×1	39722
T3	MODE 3	2 × 2	60 s	×1	39722
T4	MODE 3	2 × 2	60 s	×2	39722
T5	MODE 2	full frame	30 s	×4	5692

J-PAS Survey Verification

J-PAS Observations started centered in 6 “seeds” chosen based on specific scientific interests and visibility.

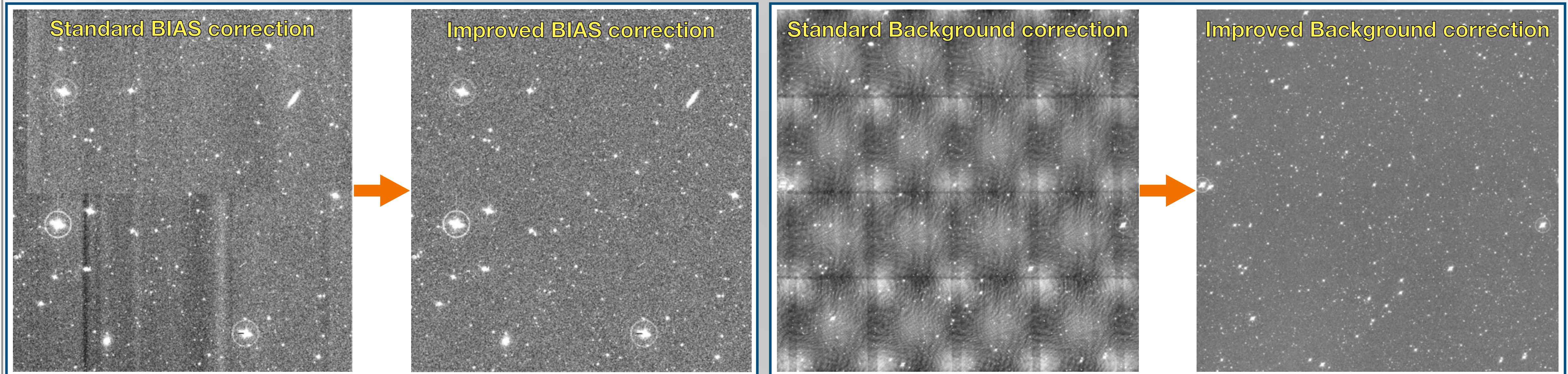


Status

- 32 deg² with all filters
- 100-400 deg² with individual filters
- Internal DR expected at the end of June'24
- First **public data release** November'24.

J-PAS Survey Verification

UPAD has developed special routines to optimize the pipeline to JPCam particularities, improving the scientific quality of delivered data.



H8.1.1- Renewal of EDAM-NG (distribution of OAJ data)

Status

- 1.1PiB @ 5000MB/s read/write
- The hardware was installed on 2023.
- Migration from the old EDAM to new EDAM-NG system in preparation.
- Last configuration phases in progress. Imminent start-up.



H8.1.2- Renewal of the UPAD main storage (high speed access storage)

Status

- 1.1PiB @ 5000MB/s read/write
- The hardware was installed on May 27 and 28, 2024.
- Existing data will be transferred to the upgraded system.



A4.1- J-PAS/J-PLUS. Cosmology, Galaxies, Structure, Sinergies. (Collaboration UV - OAJ)

Status

- 2x firewalls for UPAD + 2x tape libraries (back-up) + tape units + PDUs: Supply process in progress.

Thank you!

