



# COLIBRI

## - Status -



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# A transient sky follow-up telescope

**COLIBRI is an important element of the SVOM system:**

- To observe the early optical afterglow during the slew of the satellite.
- To provide fast accurate positions of faint and dark GRBs.
- To provide a fast redshift estimator to trigger instantly the largest facilities (VLT and NTT in particular).
- To complement the photometric follow-up of sources observed by SVOM during the General Program (between GRBs).

***But it will be also interested in all the scientific questions addressed by the transient sky: identification of the GWs and neutrinos alerts, the study of the TDEs and the AGNs, etc.***

# Motivation of the project

COLIBRI is born from the desire of France and Mexico to jointly develop and operate a new telescope dedicated to the transient sky, SVOM in particular, from an excellent astronomical site.

**But the ambition goes far beyond by:**

- Offering a modern and efficient telescope to the french and mexican scientific communities.
- Strengthening the historical links between France and Mexico.
- Training the youngest researchers in scientific themes at the forefront, and on modern observation and analysis methods.

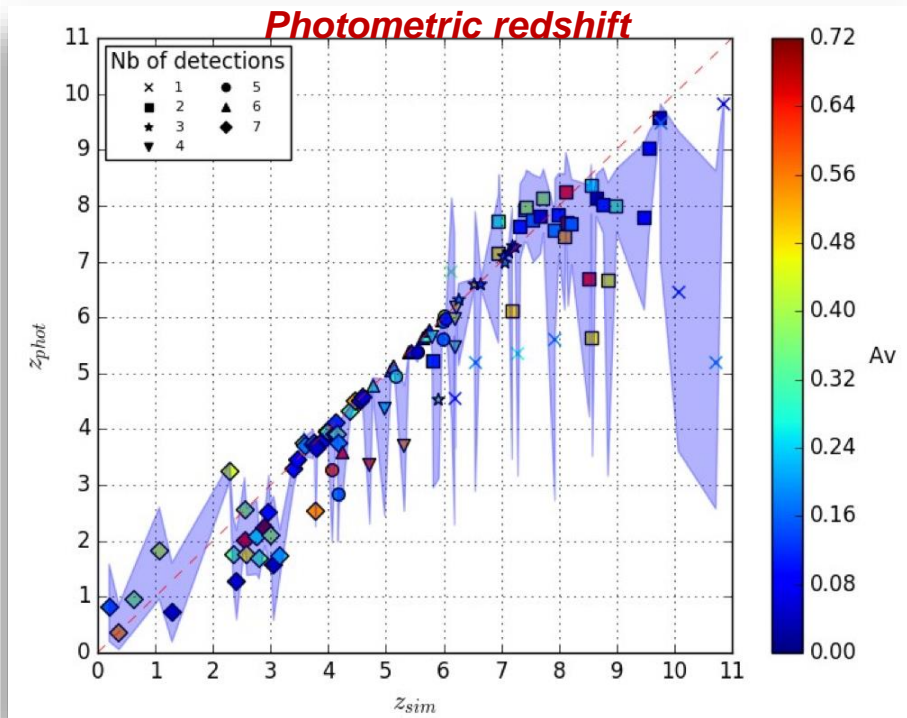
***All this is done in a very strong collaborative spirit.***

# Main requirements

Diameter of the primary mirror	1.3 m
Field of View (diameter)	26'
Number of simultaneous arms	<ul style="list-style-type: none"><li>• Minimum : 2 arms (1 in the visible et 1 in the NIR).</li><li>• Goal : 3 arms (2 in the visible et 1 in the NIR).</li></ul>
Sensitivity (300 sec, 5 sigma, AB system)	<ul style="list-style-type: none"><li>• <math>r = 22.0</math></li><li>• <math>J = 20.0</math></li></ul>
Spectral band	Each arm has its own filter wheel : <ul style="list-style-type: none"><li>• Visible : B, g, r, i, z and y.</li><li>• IR : J et H.</li></ul>
Delay between receiving the alert and beginning an observation	<30 seconds (goal: <20 seconds)
Deadlines to send information to the SVOM Burst Advocate	<b><i>First information delivered to the FSC about 5 minutes after the alert reception</i></b>

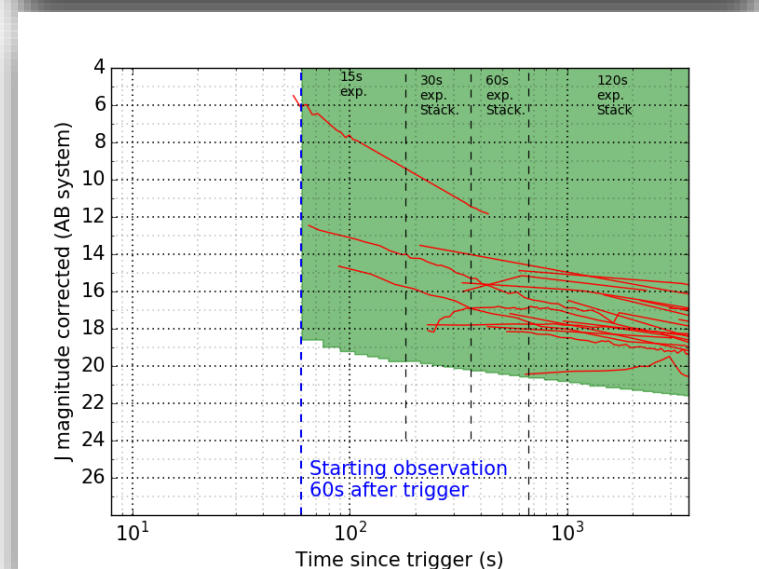
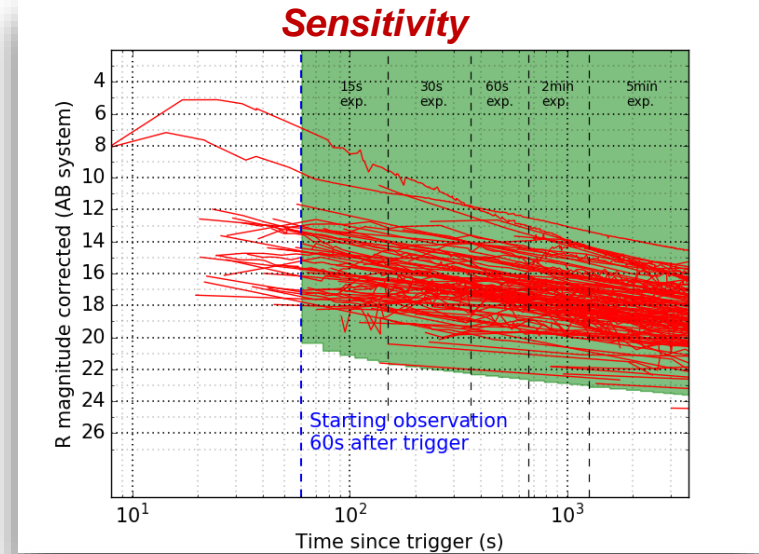


# GFT scientific performances



- Follow close to 100% of the GRBs detected so far.
- Good redshift precision for  $3 < z < 7.5$ .

From D. Corre PhD.



# Institutional partners

## France:

- **CNES** funds the developments on the near-infrared camera (CAGIRE).
- **FOCUS/UGA** provides an ALFA near-infrared sensor for CAGIRE (joined FOCUS/ESA development).
- **IPhU (replacing now OCEVU)/AMU** plays a key role in this project by funding the telescope.
- **INSU/CNRS** identified the project as one of its *P0* at the two latest Colloque de Prospective. It funds part of the developments (through CSAA).

## Mexico:

- **UNAM** funds a part of the developments (infrastructure at OAN).
- **CONACyT** funds a part of the developments (optical camera and beam splitter).

# MoU

**A MoU has been officially signed in November 2018.**

## **Time allocation as defined in the MoU:**

- 10% to the observatory for the hosting of COLIBRI.
- 45% to the French and Mexican scientific communities (equally divided).
- 45% to the consortium (time SVOM including here).

## **Time sharing must be respected over a six-month period:**

- Over shorter time periods, there may be temporary imbalances in the time allocated to Parties.

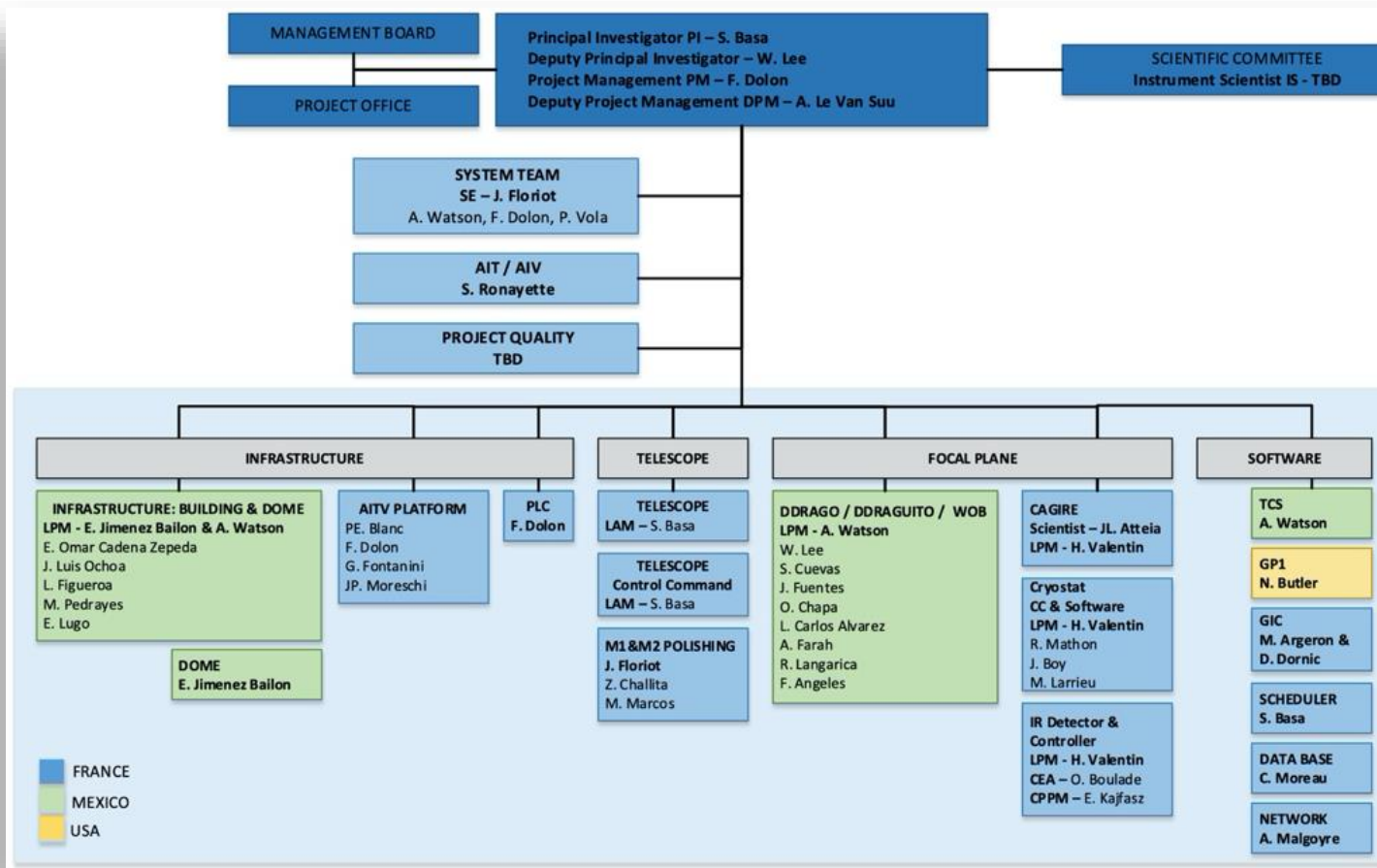
# Some general rules

**The MoU also defines the main rules for conducting the observations:**

- All the observations are performed in robotic mode (i.e., observers can never directly control the telescope).
- Time lost due to weather or technical problems, as well as for routine calibrations are not accounted for against the allocation of either country.
- Observations of alerts delivered by the SVOM mission have the highest priority and may interrupt any observation in progress. *The interrupted observation program shall be re-scheduled as early as possible according to its assigned priority.*
- Observations of other programs are managed in a way that shares the remaining time and other resources (for example, alerts and priorities) between France and Mexico according to the time-sharing defined in the MoU.



# Project organization





# COLIBRI STATUS

1. INTRODUCTION
2. AITV at OHP
3. DDRAGUITO & DDRAGO Status
4. CAGIRE Status
5. SOFTWARE Status
6. INFRASTRUCTURE Status
7. CONCLUSION

## COLIBRI – INTRODUCTION

- Since March 2020 – COVID-19: work at home, laboratory closed, several confinement.
- Weather condition very unstable @ OHP
- Late in the building design and construction
- Telescope shipping only when the building ready @ Mexico



## COLIBRI AITV AT OHP

*Telescope, OGSE, DDRAGUITO, balancing,  
software*

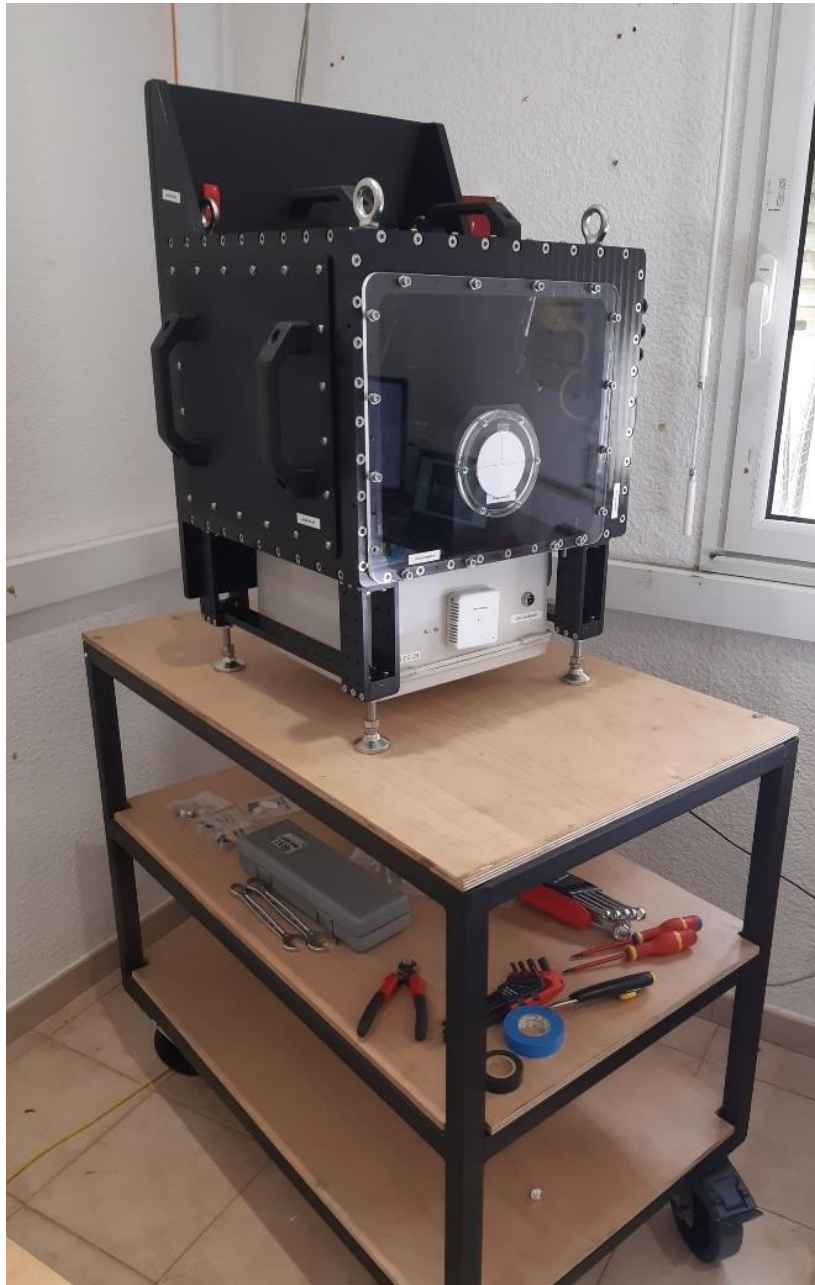
# COLIBRI AITV AT OHP – TIME LINE

This timeline shows the main steps of the AITV activities at OHP.



STEP	DESCRIPTION	Description
1	What we need to start the integration process: <ul style="list-style-type: none"> <li>- The test platform</li> <li>- Telescope with its mirrors <b>aligned</b></li> <li>- Tools: OGSE, balancing tool, crane, test cameras...</li> </ul>	<b>DONE</b>
2	Telescope alone validation Data analysis	<b>DONE</b> , results conclude to a bad alignment of the telescope. Some tests will be redo after the 2 <sup>nd</sup> alignment
3-a	DDRAGUITO: <ul style="list-style-type: none"> <li>- AIT in France</li> <li>- Validation on sky</li> </ul>	At LAM: optical alignment check <b>DONE</b> At OHP: Assembly and check <b>DONE</b> AT OHP: tests with the telescope -> November
3-b	Software validation	Start with DDRAGUITO test
4	Telescope dismounting, packing and shipping to Mexico	May 2022





## DDRAGUITO AITV AT OHP

*Goal: reassembly, check in lab and tests on sky*

# COLIBRI – DDRAGO Status



## DDRAGUITO @ LAM:

- Check alignment at LAM: **OK** – 3 days in June 2021

## DDRAGUITO @ OHP:

In September 2021:

- Computer and network installation at OHP: **OK**
- Camera cooling at OHP: **OK**
- Functional tests (filter wheel, sensors...): **OK**
- Cables routing inside the telescope: **OK**



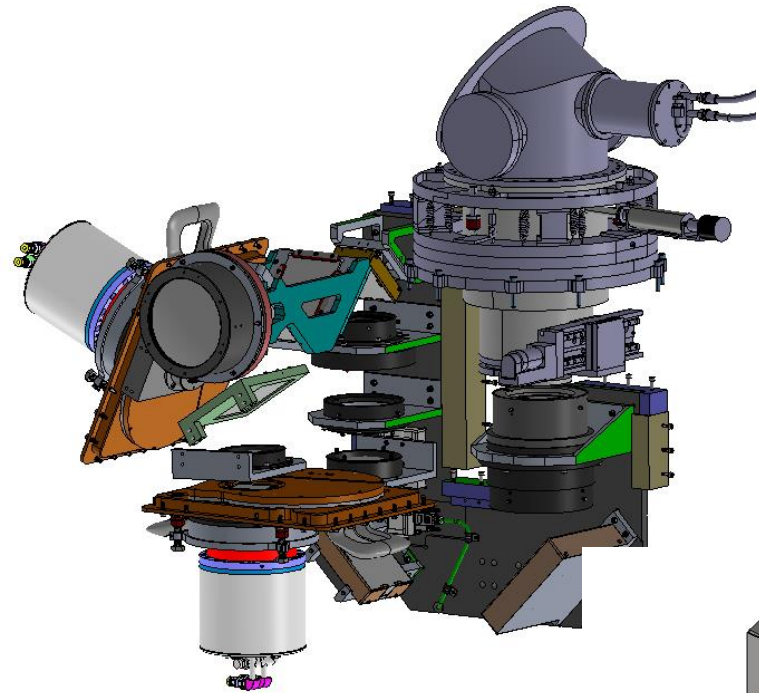
## Next step:

- Balancing
- Installation on the telescope derotator
- Tests on sky

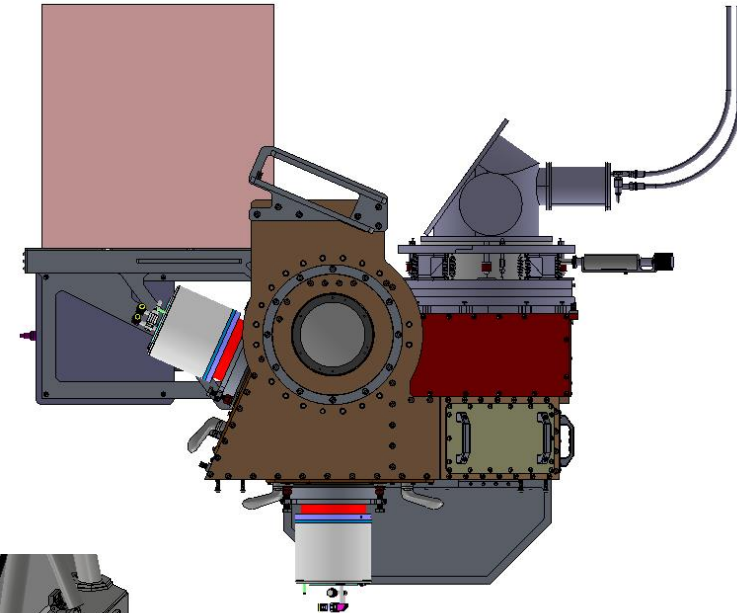
**ONLY AFTER THE FINAL ALIGNMENT OF THE TELESCOPE.  
TESTS FROM DECEMBER 2021 TO FEBRUARY 2021**

# DDRAGO STATUS AT OAN

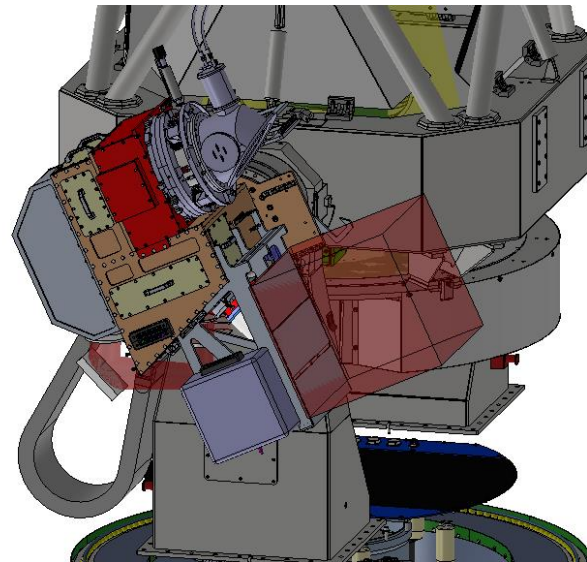
*CDR Phase*



*Complete instrument without covers*



*Complete instrument with covers*



*Complete instrument installed on the telescope*

## DDRAGO is in the final design phase.

DDRAGO is composed of:

- MSU: Mechanical Support Unit which carry DDRAGO, WOB and CAGIRE
- DDRAGO: Two visible channel camera: blue (band gri) and red(zy) with its close electronics
- WOB: Warm Optical Bench for CAGIRE CRYOSTAT
- CAGIRE: cryostat with Infrared detector and its close electronics

### Main point:

DDRAGO optical design: finished

Optical design of the WOB optics (L5 to L12): Last version of the design is validated with CAGIRE

Finalization of the interfaces with CAGIRE (cryostat and close electronics)

FEA analysis of the instrument (without CAGIRE) – results under analysis and check with optical tolerances

Instrument control: will be validated with DDRAGUITO

Order for 2<sup>nd</sup> CCD has been placed.

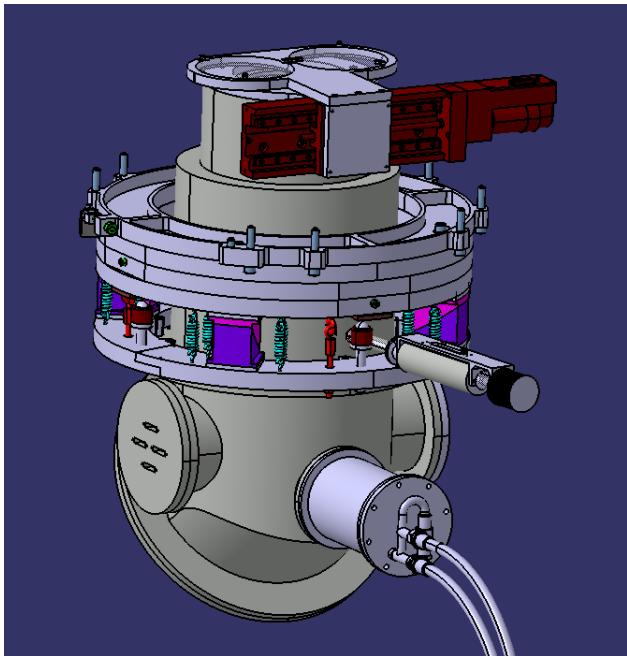
### MAIN KEY DATES:

- DDRAGO CDR: end 2021 / beginning 2022
- Manufacturing phase: January to June 2022
- Optics delivery at UNAM: June 2022
- AIT: June – October 2022
- **DDRAGO acceptance at UNAM: October 2022**
- **DDRAGO delivery at OAN – Mexico: October 2022**
- **WOB delivery at OAN – Mexico: February 2023**



# CAGIRE STATUS @ IRAP

*CDR phase*



*Cryostat 3D CAD model*



*Cryostat prototype 3D print*



*Cryostat prototype 3D print*



### **CAGIRE is in the final design phase. The CDR was led the 8 of July 2021.**

#### **Main point:**

Optical design: Last version of the design is validated with the DDRAGO team

Work with Epsilon for the thermal study, it helps for

- Cryostat design: design in progress and updates with the results of the analysis
- Cryostat manufacturing: material type ⇨ aluminum, manufacturer ⇨ SATIL
- To determine the thermal power to extract and in fine the cryocooler selection

Lynred Detector:

- 4 had been delivered to CEA by Lynred: 2 science and 2 engineering.
- 1 science is really better than the other.
- Discussion with ESA are led to decide which one is for CAGIRE.

AIT tools design in progress.

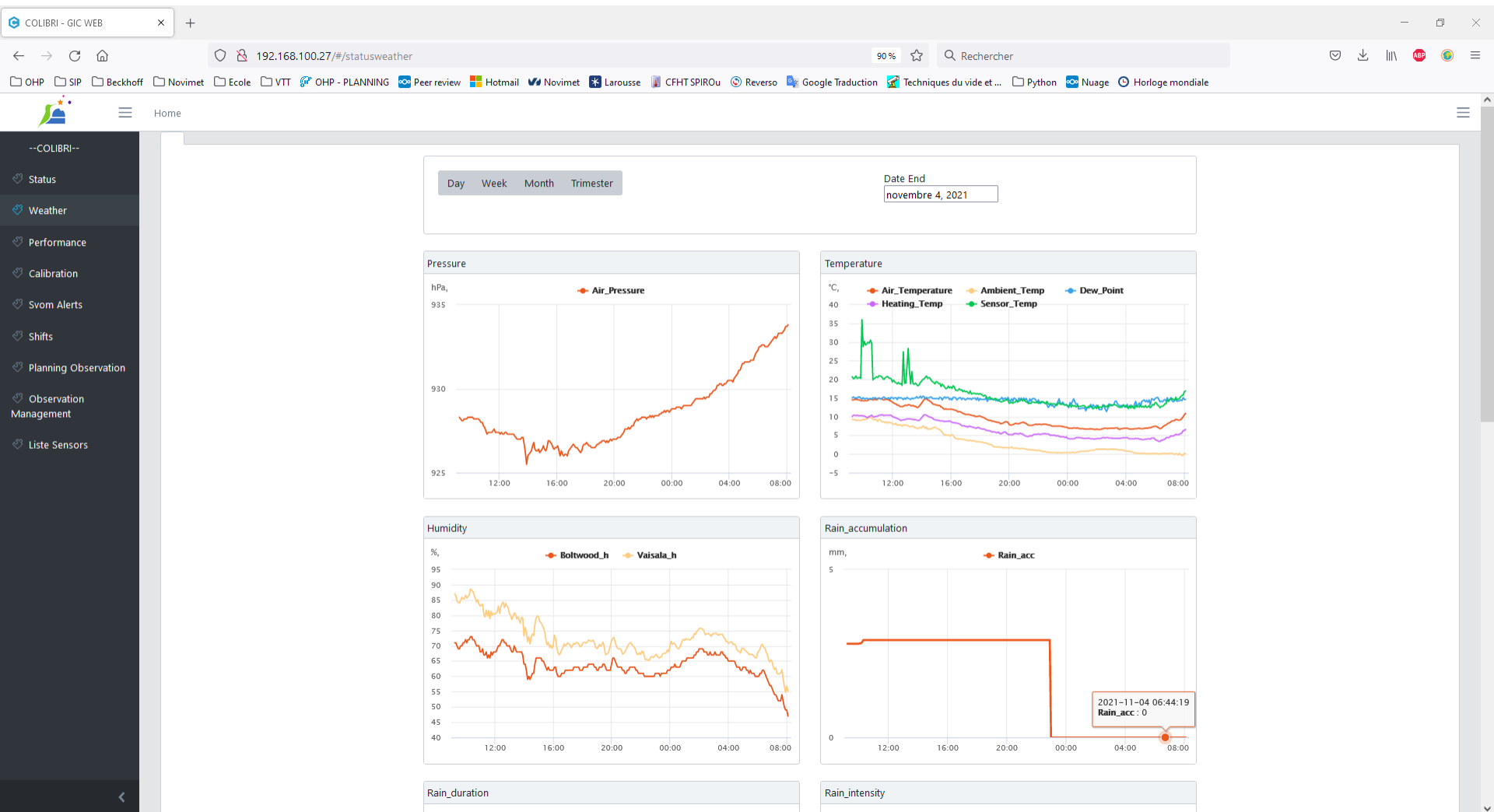
Close electronics: design and integration on DDRAGO finished.

#### **MAIN KEY DATES:**

- New evaluation of some of the CAGIRE CDR documents during the DDRAGO CDR
- Manufacturing phase: December 2021 to September 2022
- Detector delivery at IRAP: April 2022
- AIT Cryostat: September – October 2022
- **CAGIRE acceptance at IRAP: February 2023**
- **CAGIRE delivery at OAN – Mexico: March 2023**

# SOFTWARE STATUS

CPPM, UNAM, LAM, OHP



## **GIC & GP1 Pipeline:** demonstration today by Damien

- GIC / GP1 computer is installed @ OHP
- GP1 will be tested (soon) with the first image of DDRAGUITO on sky
- Meanwhile TCS running, GIC is connected with PLC and the seeing monitor

**TCS:** will start in December 2021

**DATABASE:** will start in 2022

## **PLC:** in progress

- Installation on the AIT platform @ OHP in July 2021
- Communication with TCS – **To be tested** (testing with TCS not done)
- Weather monitoring - **Done**
- UPS monitoring - **Done**
- Observatory operating mode – **Done**
- Sensors monitoring – **Done**
- Telescope controller interconnection – **To be done and tested**
- Some functionalities will be only tested at OAN (Dome, louvers, anti-intrusion...)  
- **To be done and tested**

# COLIBRI BUILDING AT OAN – MEXICO

> JUNE 2022

*Building concept @ OAN - MEXICO*





# COLIBRI – Infrastructure status

## MAIN STEPS:

- Cliff Reinforcement: design is finished, the contract is passed. Wait for the **environmental permit** to start the work on site.
- Telescope pillar: construction is finished
- Building: design almost finished, need the work on cliff finished to start the construction process
- Service building and AC unit design: finished
- Weather mast & Seeing monitor: in operation @ OHP, design and location @ OAN is validated

## MAIN KEY DATES:

- Environmental permit for the cliff: end of October 2021
- Cliff reinforcement work on site: January 2022 (1 month)
- Contract for building and services: finished end of January 2022
- Building and service building construction: February to June 2022
- Dome installation: May 2022
- **Telescope Installation: September 2022**





# COLIBRI – NEXT MAIN KEY DATES

## Main work for the next 6 months

- Telescope final alignment
- Test on sky with DDRAGUITO
- Software validation at OHP
- DDRAGO & CAGIRE CDR
- Building construction
- Telescope shipping to Mexico

