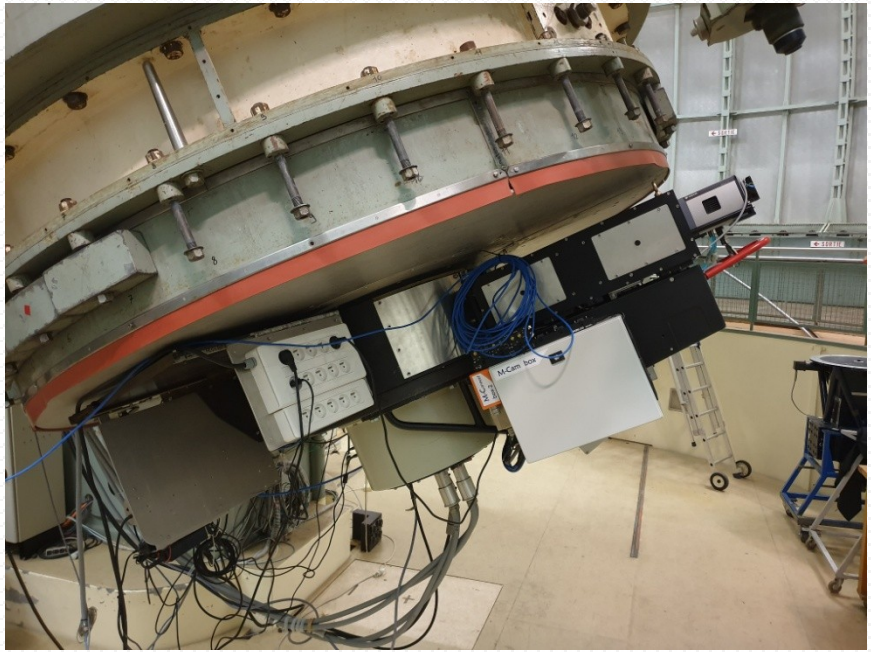
Mistral

Multi-purpose InSTRument for Astronomy at Low-resolution



C. Adami, J. Schmitt, S. Basa, M. Dennefeld

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Multi-purpose InSTRument for Astronomy at Low-resolution

Wavelength range	4200-8200A (blue setting) or 5800-9950A (red setting)
Spectral resolution	R=750 @ 6000A
Fixed Slit width	1.9 arcsec
Optical efficiency (Telescope+spectro)	Estimated at 0.3 @ 6000A (assuming seeing + slit of 2'')
Imaging FOV	5.1 arcminutes full light (9' in total)
Filter wheel	G', r', i', z', Y, Hα, OIII, SII, Hβ, red and blue order separation filter
CCD	Andor serie iKon-L 936, 27,6 x 27,6 mm / 2048 x 2048 pixels of 13.5 µ each, Deep Depletion CCD
Spectral calibration	Ar/Hg/Xe lamps for wavelength, Tungsten for Flat Field
Sampling	0.48 arcsec for 13.5 microns pixels
Grism	Blue:Two prism 19,8° with VPHG 600 tr/mm @600nm d=50mm Red: Two prism 25,6° with VPHG 600 tr/mm @900nm d=50mm
Camera lens	Blue: Nikon AF-S 100 mmF/1,4 Red: Objectif XENON-EMERALD 2.9/100-L

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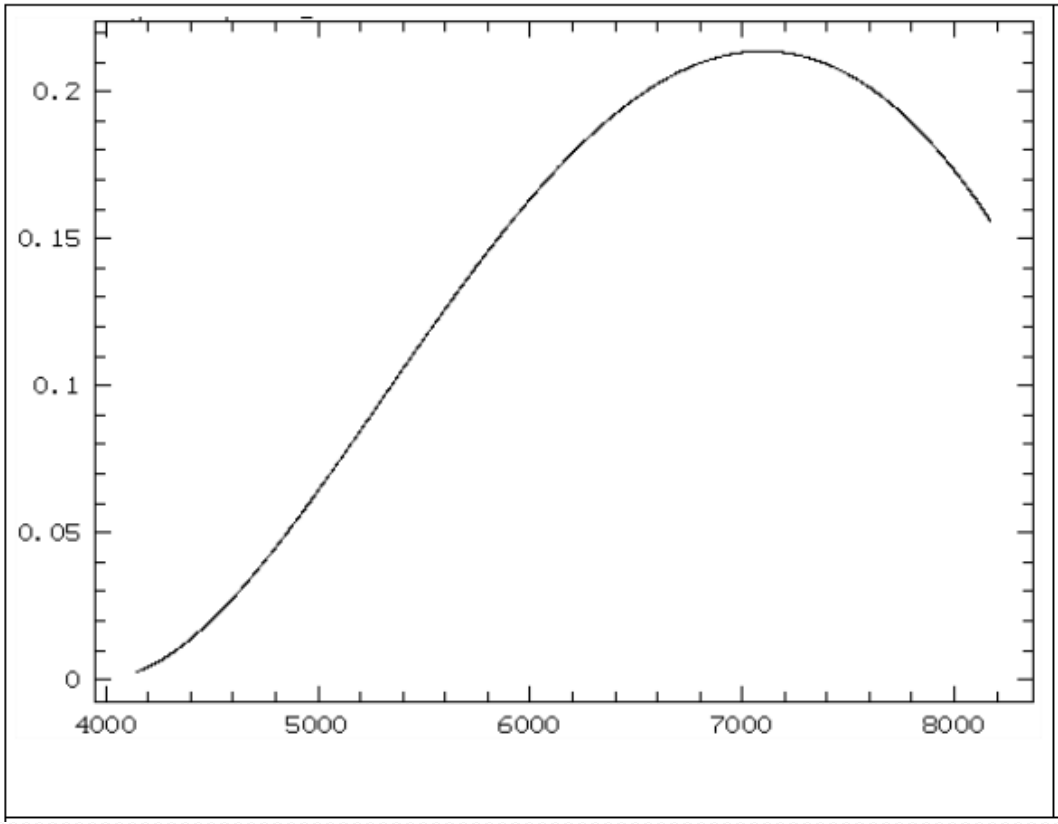

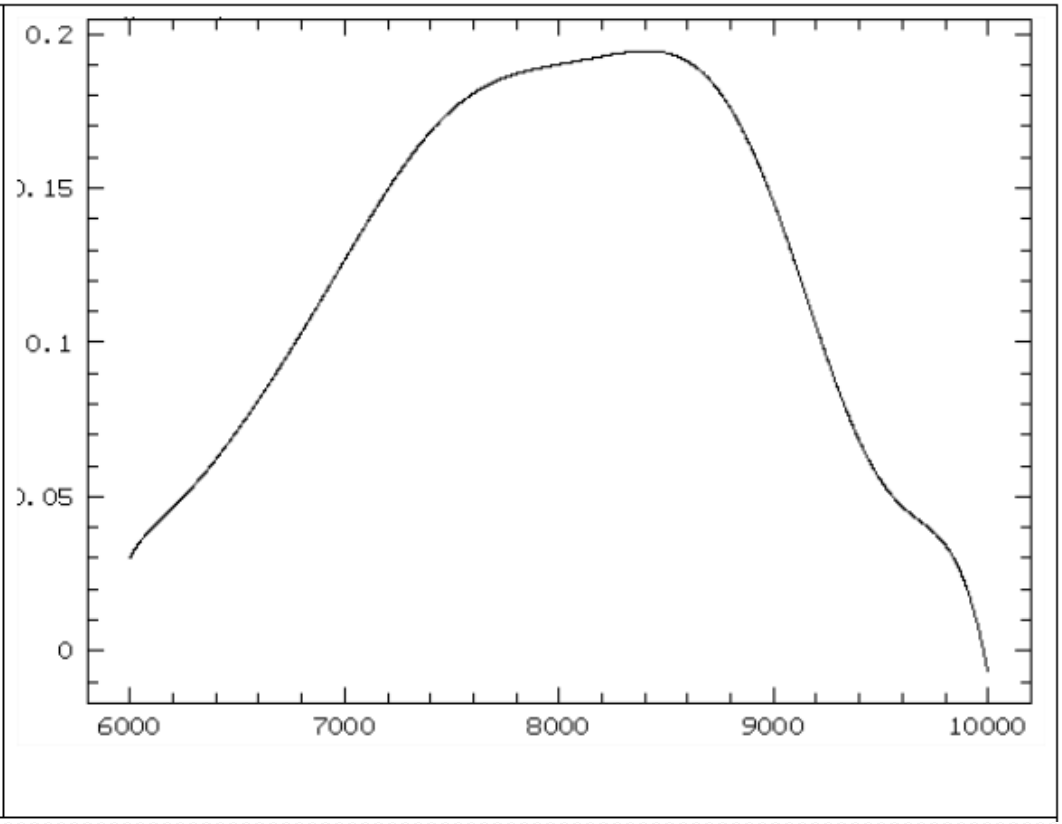

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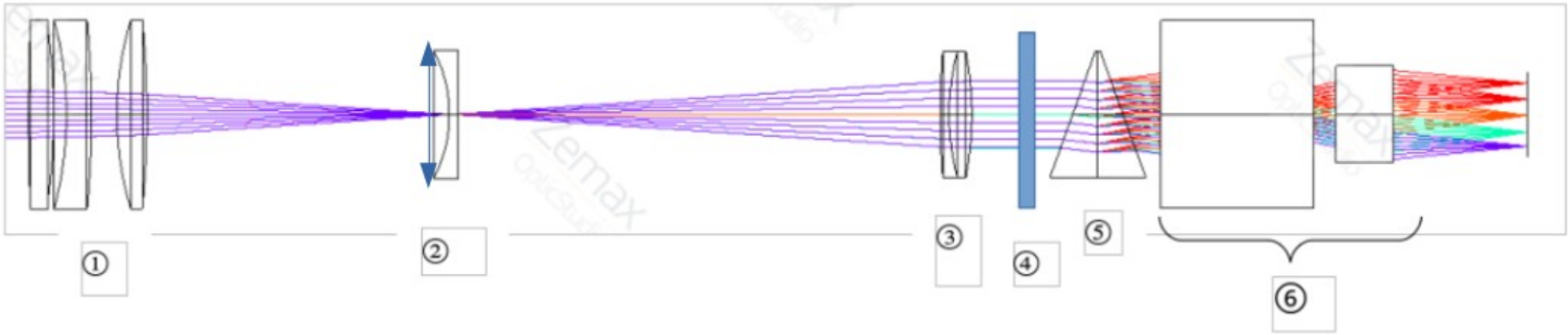
MISTRAL optical path

MISTRAL optical scheme: (1) focal reducer, (2) field lens -128 mm (with the slit a few mm before), (3) achromat collimator f=200mm, (4) filter wheel, (5) VPH 600 tr/mm with two prisms 19,8deg (blue)/25,6deg (red), (6) 100mm lens



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Cluster of galaxies

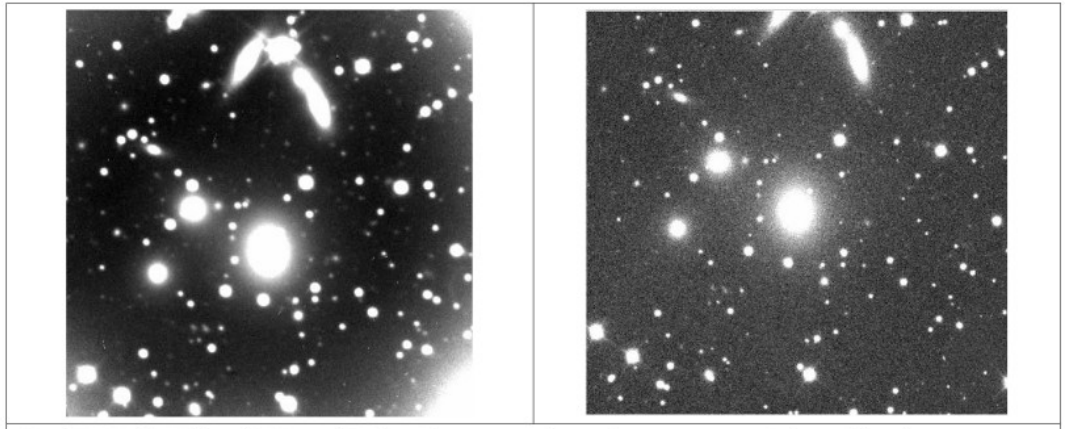
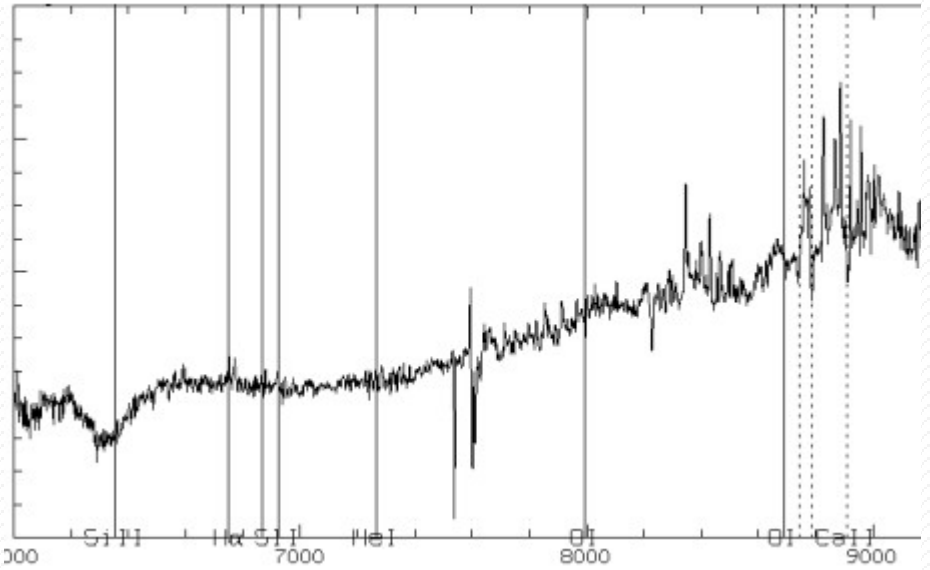


Fig. A7 : Left: g'-band MISTRAL (50min exposure), seeing~3 arcsec, Right : g'-band SDSS.

At2020abfa, V=18.6, 1 hour



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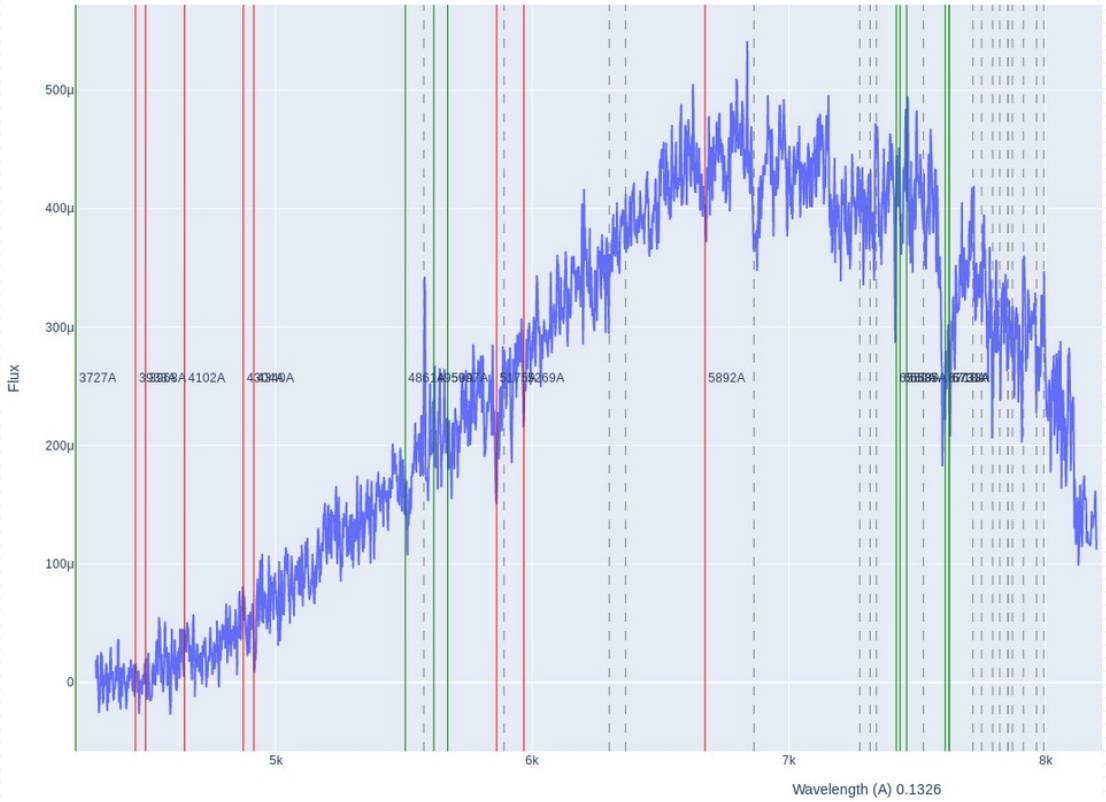
Multi-purpose InSTRument for Astronomy at Low-resolution

Ell. galaxy, r'=17.2,
z=0.1326, 1 hour



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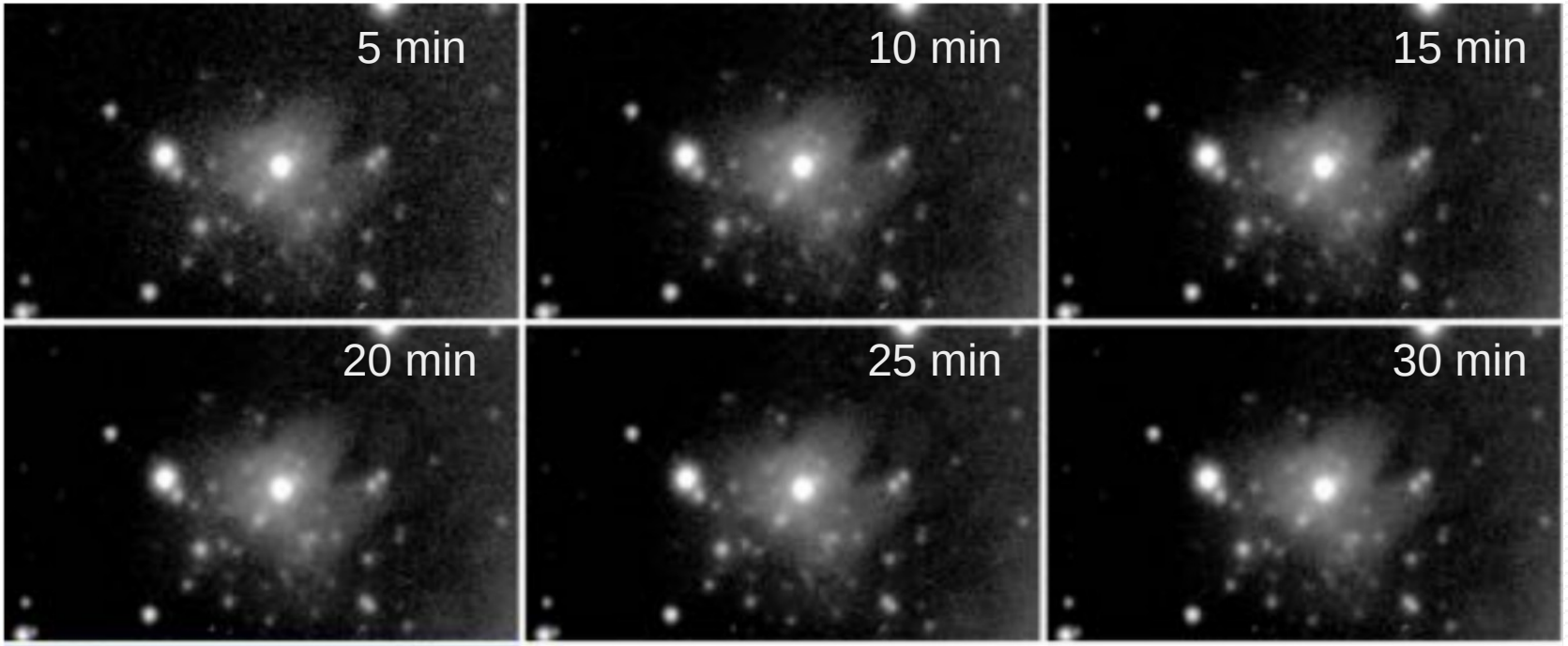
Multi-purpose InSTRument for Astronomy at Low-resolution

Diffuse objects inside diffuse objects : Y band



Mistral

Multi-purpose **I**n**STR**ument for **A**stronomy at **L**ow-resolution

Status

- **September 2021** (2021B)
  - Open to community, visitor mode (pressure 1.4)
  - First observations OK
- **March 2022** (2022 A)
  - Open to community visitor (pressure 1.5) +ToO (pressure 2.2) mode

Visitor mode

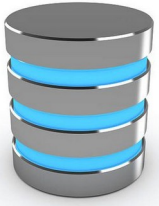
Mode	status	
Sky tests	validé	
Control command	validé	http://www.obs-hp.fr/guide/mistral/MISTRAL_spectrograph_camera.shtml
On site data reduction	validé	Mode Quick look imagerie + spectro / λ response of instrument
Cookbook/Web/Etc	validé	http://www.obs-hp.fr/guide/mistral/MISTRAL_spectrograph_camera.shtml
DataBases	validé	https://cesamsi.lam.fr/instance/mistral/home

DataBase online

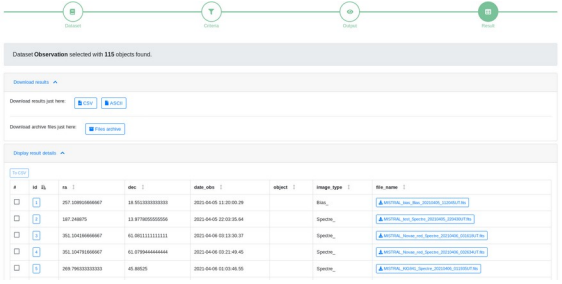
PC mistraltube

VM NAS SAS
osupythéas

Base de données
MISTRAL



Interface de mise a dispo
CeSAM



PC mistralburo

Valeur ajoutée
données finales
observateur

Sur requête

ASPIC

ToO mode

Mode	Status	Comments	Goal
New guiding*	ongoing	Better stability, tested beginning of December	Observation upgrade
Mistral/SOPHIE commutation mirror	validated	Typical time < 1 min	SOPHIE/MISTRAL commutation
Mistral/SOPHIE FOCUS commutation	ongoing	<2021 : 12 min + physical cable connexion >2022 : ~7 min, no cable connexion required Expected : end 2021 / beginning 2022	
Night assistants formation	ongoing	Done : Day-time formation Ongoing : Visitor mode night-time observations 4 assistants will be ready mid-february	Night time ToO operations
ToO procedures for night assistant**	ongoing	Procedure defined, material available (ongoing mounting), VOEvent software installed in the observing room Expected : February 2022	
End-to-end procedure test on real alerts	scheduled	2021B: 4 technical alerts 12/2021 - 02/2022	Final tests

* Mirror, camera, plate structure : done
Camera structure, installation : ongoing

** ICRON communication,
AuDela/guiding camera tests : done

Two ToO modes

- ToO/Alerts: night-time occurence, requires immediate reaction : if « go », observation must start ASAP (i.e. < 20-30 min).

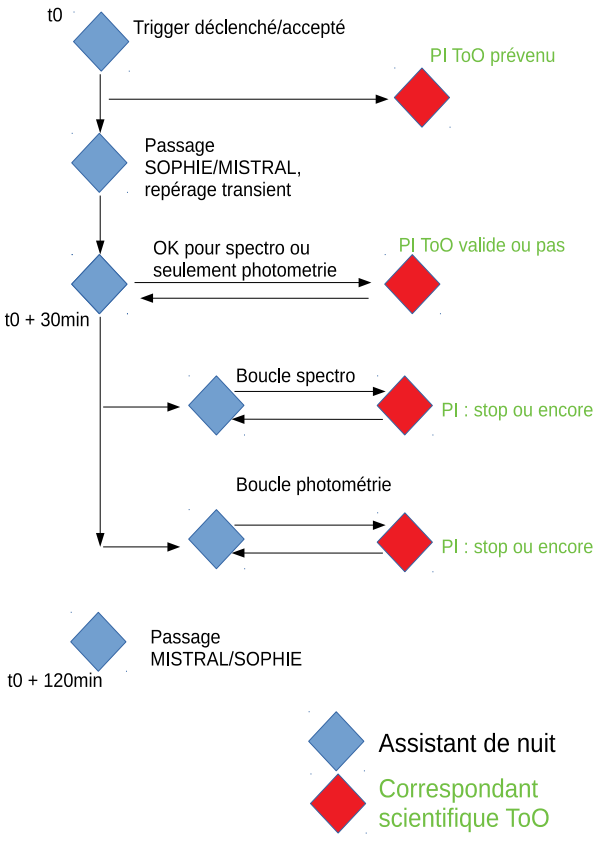
- Standard ToO: day-time trigger, enough time for OHP direction to give «go/no go » before the night

GRB proposed strategy

- Initial photometric loop with predefined filters and exposure times
- When collected/reduced, PI decision to go for secondary photometric loop or spectroscopic loop

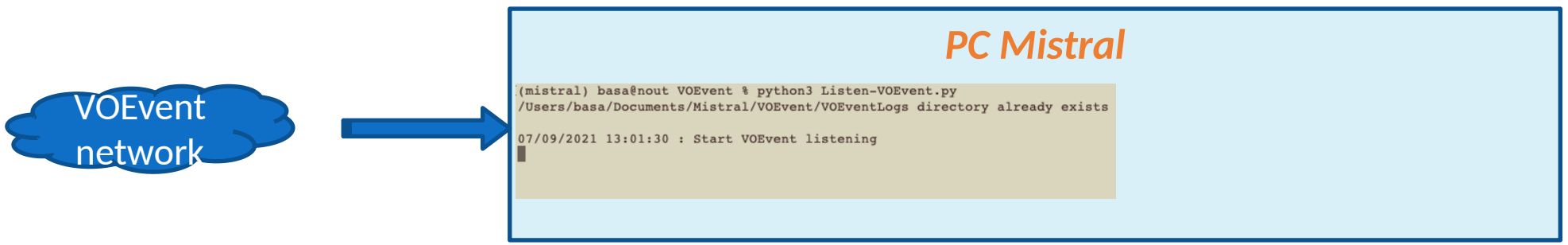
Processus

- Slack communication operator-observator
- Alert reception and automatic filtering
- Data to observator through real time LAM-cloud hosting



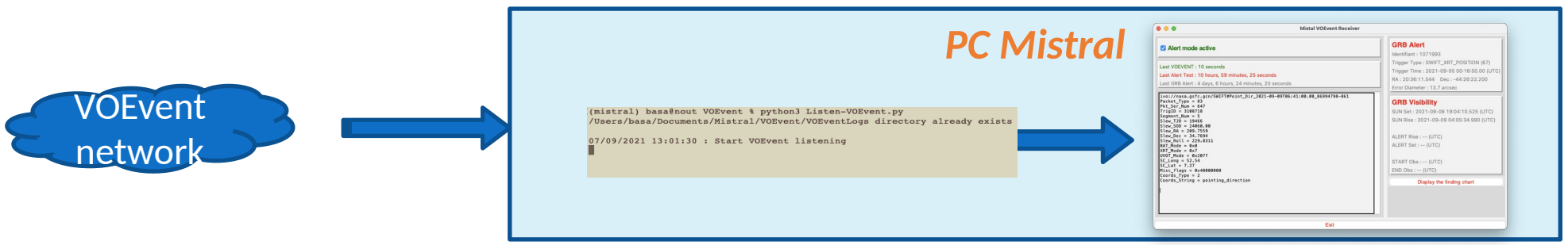
Alert reception and automatic filtering

- ***Listen-VOEvent:***
  - Listen and filter VOEvents:
    - For now, only SWIFT (MISTRAL-compatible error box).
  - Possibility to add other surveys (ZTF, IceCube, ..etc...)



Alert visualization

- ***VOEvent-Mistral:***
  - Visualize the last alert and useful informations:
    - Visibility
    - Worthwhile alert ? (localization precision, too old, etc.).
    - Finding chart.
    - Etc.



Alert visualization

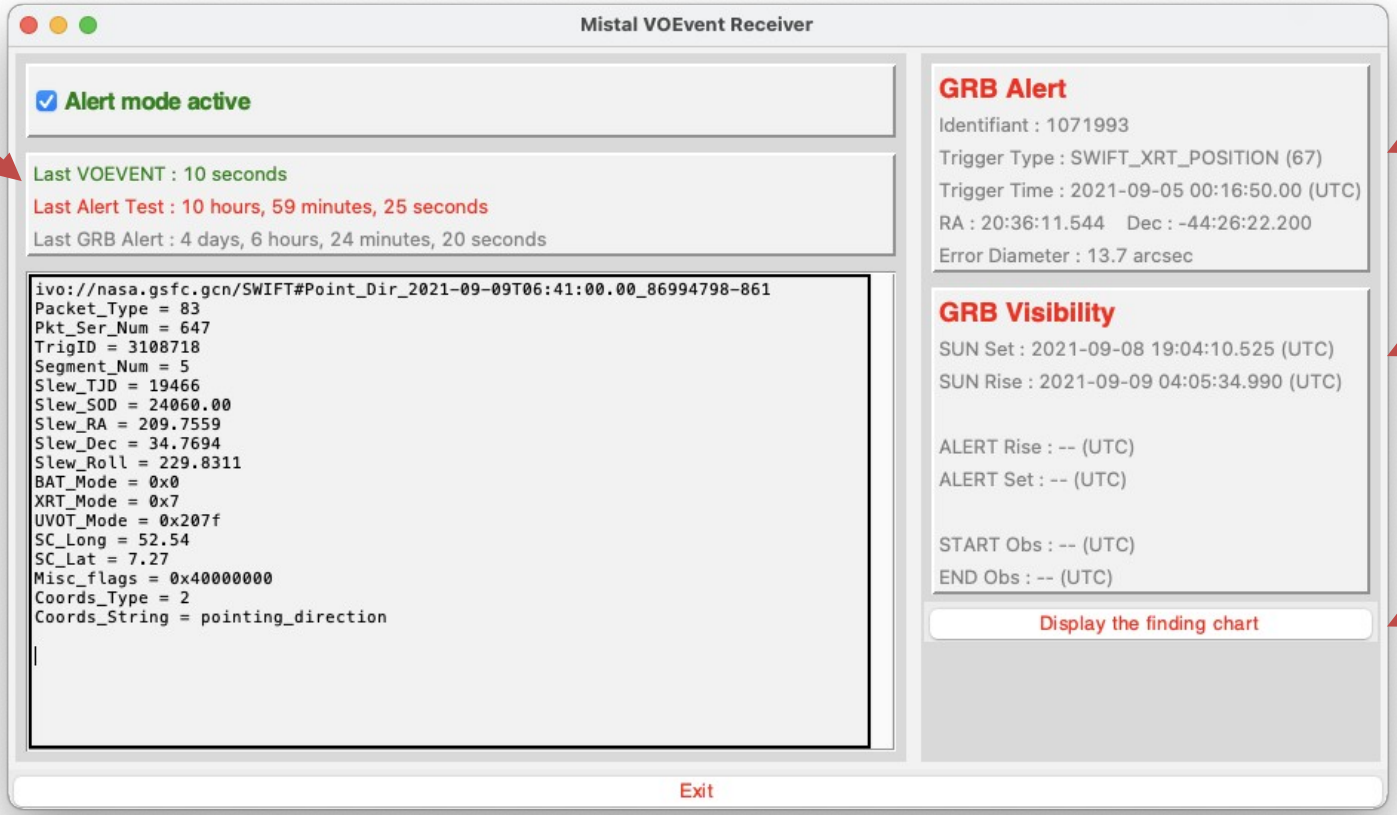
Surveillance du VOEvent

Logs

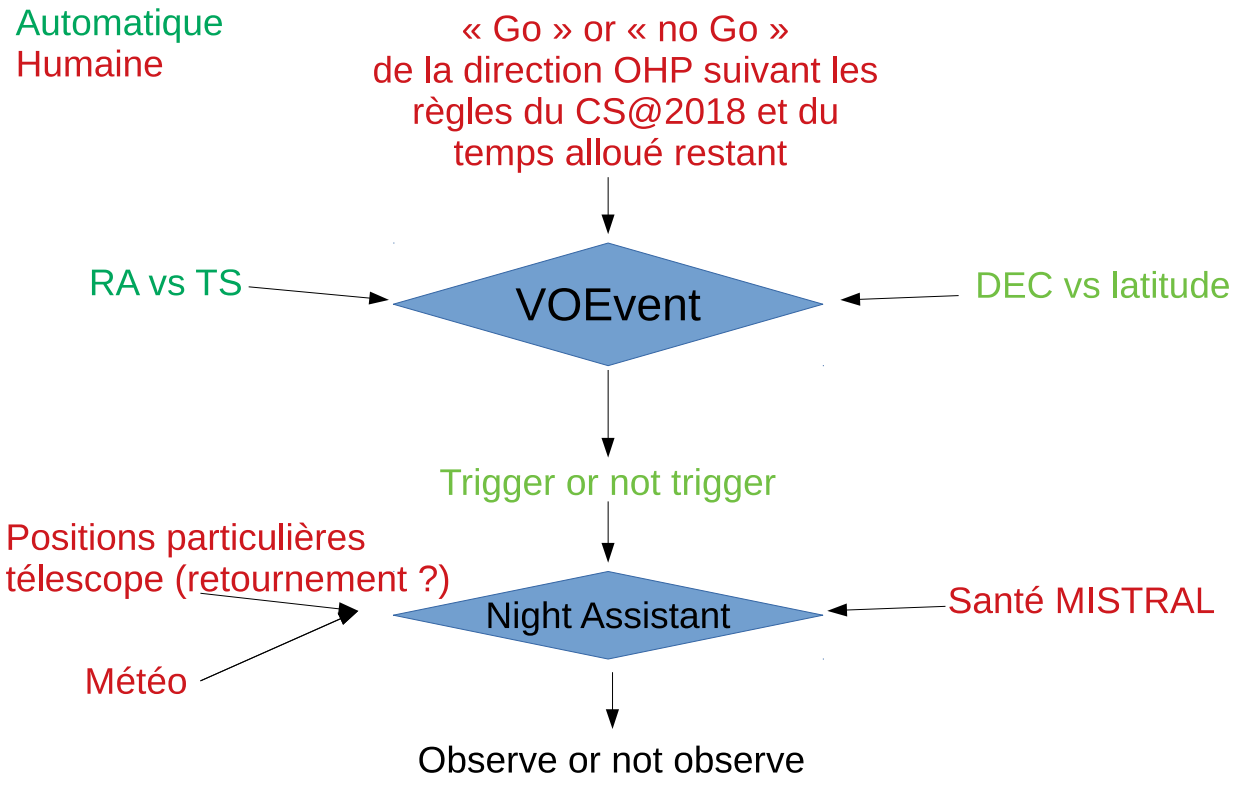
Dernière alerte GRB

Visibilité de l'alerte

FC avec Aladin

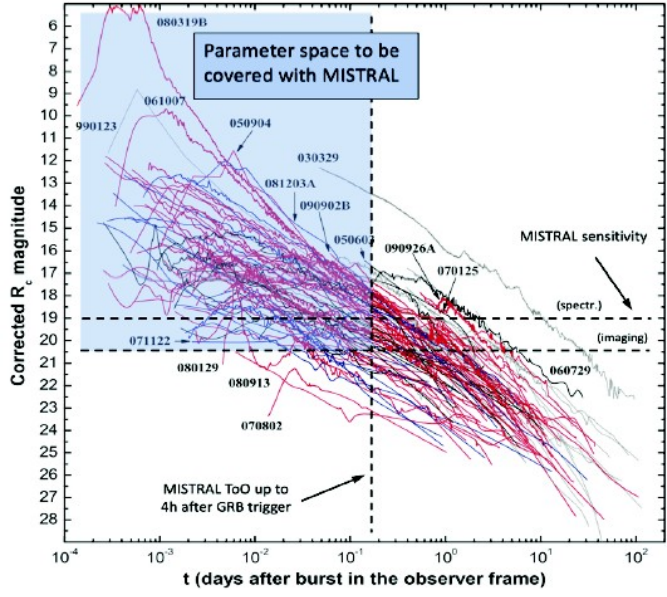


Night-time assistant decision tree



Training proposal 2022A

- LeFloch et al., 30 hours, 15x2h alerts
- SWIFT triggers
- Proposed strategy :
  - If « primo » night-time VOEvent : 8x2min r' band, fast readou Slack communication with telescope operator + real-time data reduction (if already detected afterglow by other teams: strategy adaptation)
  - If visible afterglow at r'<19 : 60min spectro integration, green setting
  - If r'>19 : 60min imaging mode (g' and/or r', slow reading mode, 5min indiv exposures)



planning 2021/2022

New guiding

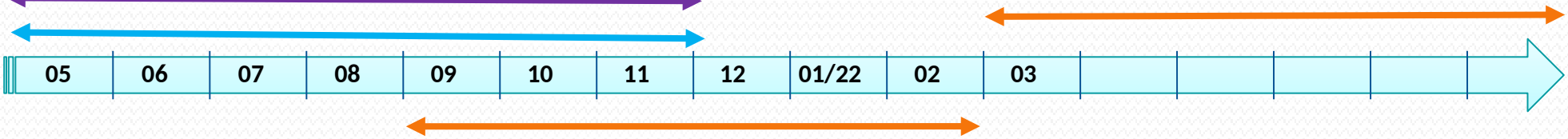
- Study : done
- Elements : July- October 2021
- Integration /test : November 2021
- Technical observing run : 6-8 December 2021

FOCUS M2

- Study : done, tests : done
- Integration end 2021 / beginning 2022

ToO mode available

March 2022



Technical test of ToO/alert

December 2021 - February 2022

Mistral

Multi-purpose **I**n**STR**ument for **A**stronomy at **L**ow-resolution

Points techniques

Table 4	**V~18.5**	**V~16.5**	**V~15**
(1) point + find guiding star	[5; 25] min	[5; 15] min	[5; 15] min
(2) place object at slit position	[5; 10] min	[5; 8] min	[1; 5] min
(3) verify that object light is passing through the slit	<2 min	<2 min	<2 min
(4) get spectra of the object	Observer's choice	Observer's choice	Observer's choice
(5) get spectral calibrations	4 min	4 min	4 min
Total overheads + calibrations	**~[15; 40] min**	**~[15; 30] min**	**~[10; 25] min**

Mistral

Environnement informatique des assistants de nuit

La gestion du mode d'alerte Mistral demande un environnement informatique additionnel du poste des assistants de nuit.

- Report des écrans Mistral
- Logiciel de pilotage du moteur de la caméra de guidage
- Logiciel d'évènement VOEvent
- Logiciel de communication Slack
- Logiciel de commutation du miroir Mistral

→ Utilisation du PC guidage ou **installation d'un nouveau PC au poste de travail**

Mistral

Manpower

Rôle	Nom	Laboratoire	ETP (2021)	ETP restant
Gestion projet	J. Schmitt	OHP	0.2	0.1
Informatique commande contrôle	J. Schmitt	OHP	0.25	0.05
Informatique réduction de données	C. Adami Stagiaire J. Schmitt	LAM/OHP	0.4 0.3 0.05	0.05
Bureau d'étude/Mécanique	J.C. Brunel	OHP	0.3	
Intégration mécanique/électronique guidage	F. Huppert J.C. Brunel J. Schmitt	OHP	0.3 0.3 0.1	0.1 0.2 0.1
Codage M2 télescope 193	F.Moreau/ L.Moreau/ F. Dolon/ stagiaire/J.C. Brunel	OHP	0.4	0.05
Tests sur le ciel	C. Adami J. Schmitt M. Dennefeld	LAM/OHP/ IAP	0.1 0.1 0.05	0.05 0.05
Documents/Web/Etc/VOEvent	C. Adami J. Schmitt S. Basa G Castagnoli M. dennefeld C. Moreau	LAM/OHP IAP	0.2 0.1 0.05 0.05 0.05 0.05	0.05
		Total :	3.35	0.7

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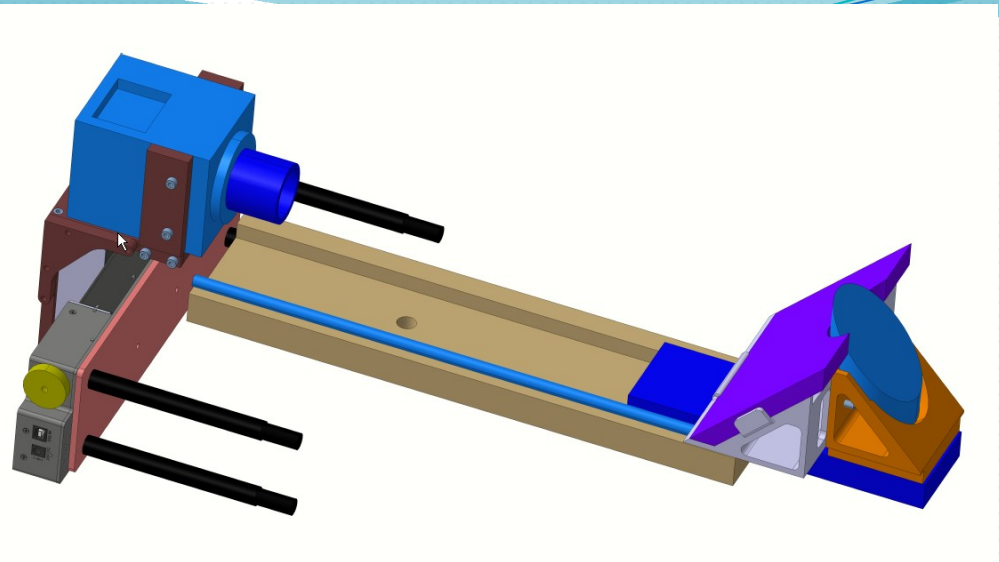
Nouveau guidage

mécanique:

Etude terminée.

En cours de réalisation



Informatique/électronique:

Pas de développement nécessaire:

Camera FLI piloté par Audela

Pilotage de la platine de déplacement par liaison USB – ethernet (avec le logiciel Thorlabs)

Intégration/test:

Montage en octobre 2021

Tests de jour en novembre 2021

Tests de nuit du 6 au 8 décembre 2021

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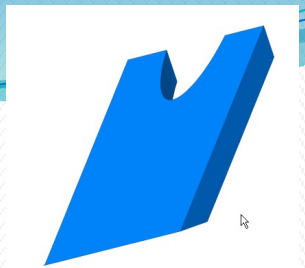
Etude nouveau guidage



Guidage actuel:

-Champ et performance insuffisante

-Câbles de connections du guidage trainant sur le sol.

-Changement Mistral/Sophie compliqué en pleine nuit.

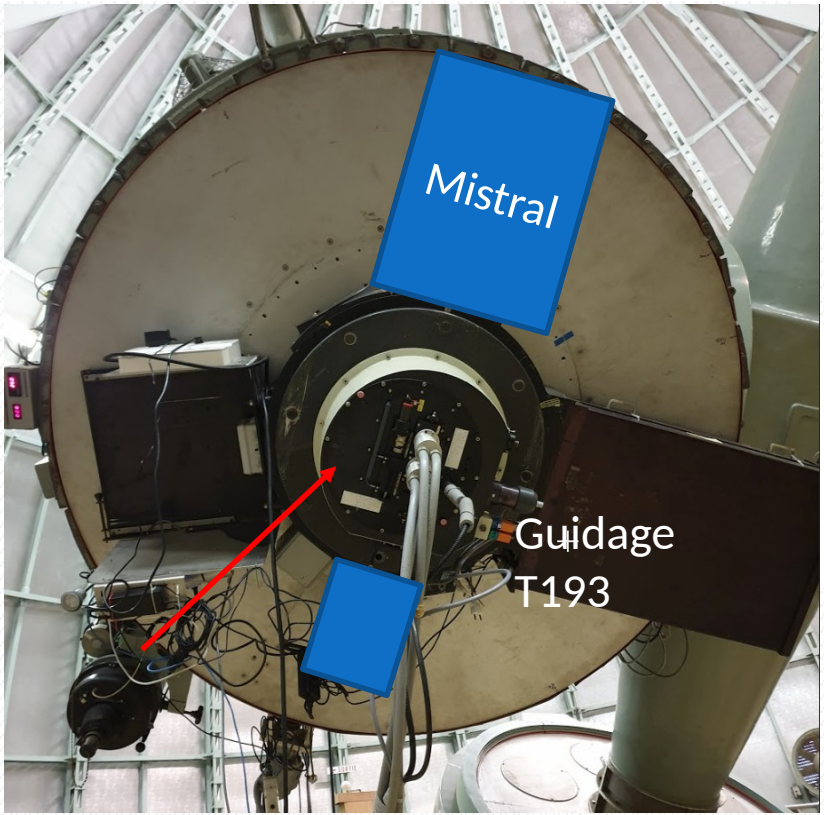
-Présente des dérives et limite les temps de poses individuels à 15/30 min

Nouveau guidage

- champ de 70 arcmin²: au moins une étoile guide quasiment partout.

-Camera plus performante. Meilleure stabilité

- Platine déplacement, Miroir de renvoi, Optique, Caméra de guidage FLI MLx695 (compatible guidage T193/Sophie) approvisionnés



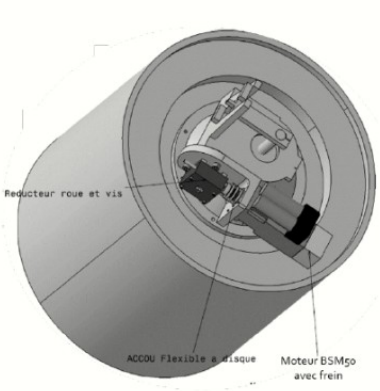
Nouveau guidage

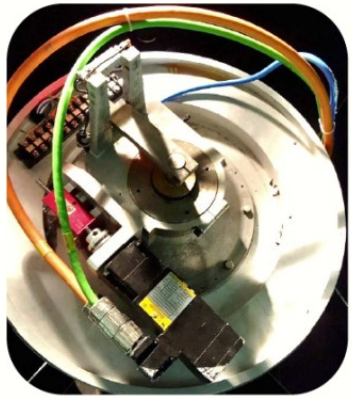
Mistral

Etude nouveau codage mise au point T193 (M2)

Contrainte :

Mistral (et les instruments visiteurs) demande de faire un **déplacement important de la mise au point** du T193.





Problème :

- Le codeur du miroir de mise au point du T193 (M2) ne code en absolu que 1 cm sur les 9 cm de plage de réglage.
- le **plantage régulier** de la commande de mise au point par Audela à chaque dépassement du codeur rend la phase de mise au point lente (10 minutes).

Nouveau système de Codage:

- Etude réalisée et testée par un stagiaire en juin dernier.
- Remplacement du réducteur du moteur
- Gain de temps important (temps de commutation < 1 minute)
- Modification mécanique (2 jours)
- Modification du code informatique (1 à 2 semaines)