

The METIS Project in ASIAA

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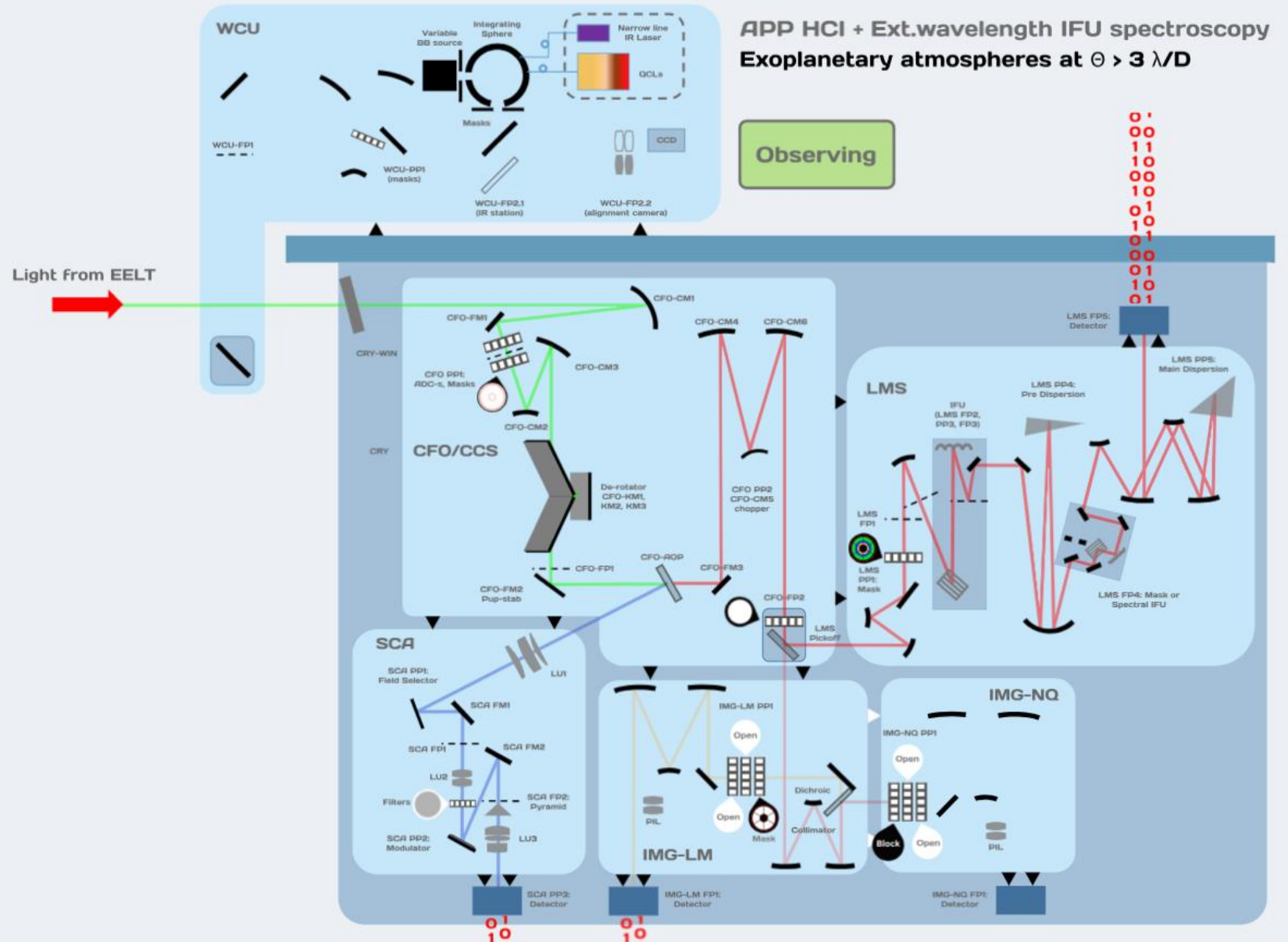
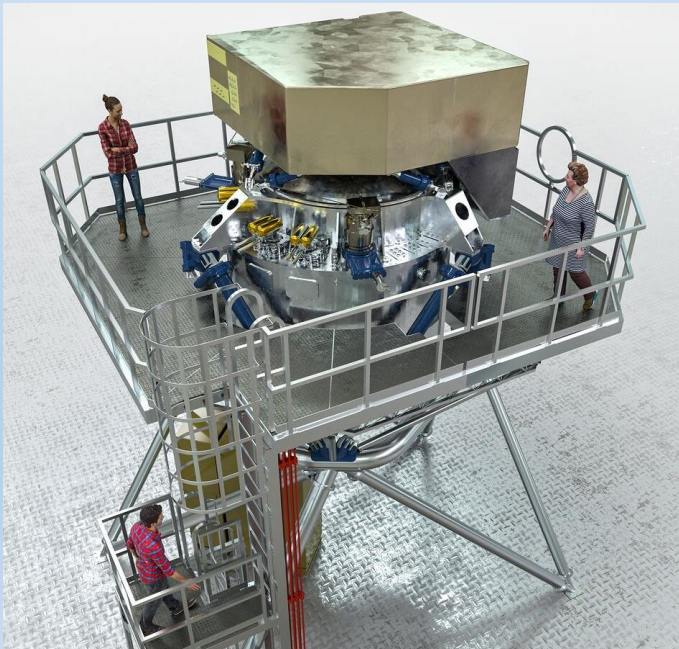
METIS Overview

- Mid-infrared **ELT** Imager and **S**pectrograph, one of the first light instrument of ELT.
- Wavelength range 3 - 14 μ m. It has High Contrast Imaging & IFU modes.
- Imaging at L, M and N band with the capability of low (N) to medium (L/M) spectral resolving power. FoV $\sim 10'' \times 10''$.
- IFU mode (3-5 μ m, R $\sim 100,000$), FoV $\sim 1.0'' \times 0.5''$, under ELT diffraction limited case.
- To achieve diffraction limited case, METIS will use a Single-Conjugate Adaptive Optics (SCAO). The wavefront will be measured inside METIS, and feedback to ELT M4 & M5.
- Cool down to ~ 60 K to achieve low background noise.

METIS Overview

METIS adopts modular design, it is composed of:

- Common Fore-Optics, CFO
- SCAO
- Imager (L/M, N/Q)
- LM IFU Spectrograph, LMS



METIS Consortium

The METIS consortium is mainly composed of 10 European institutes.

In addition, University of Michigan and ASIAA are partners outside of Europe.



Contribution from ASIAA

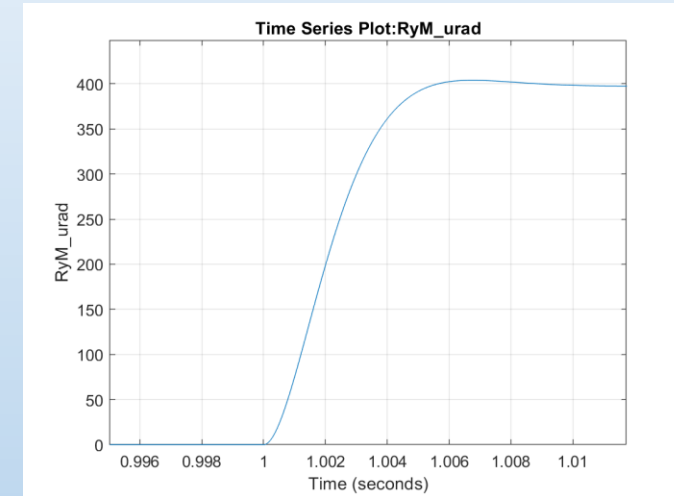
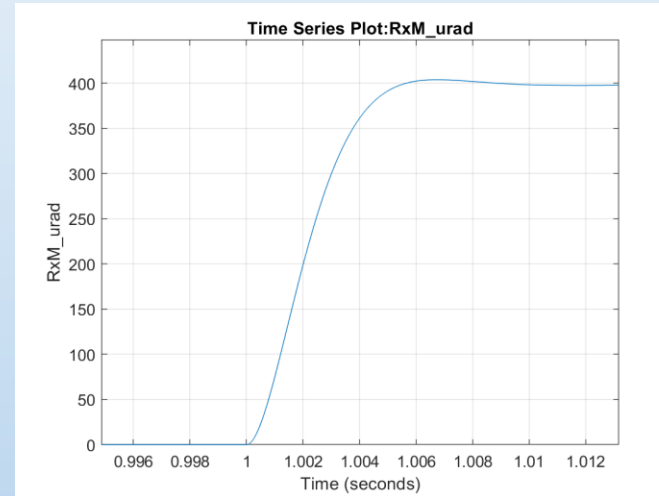
1. Development of chopper control system.
2. Development of optics wheels.
3. Develop the supporting equipment for the METIS system assembling, integration, and verification supporting equipment.
4. Development of data processing pipeline and simulation software with the Austria team.

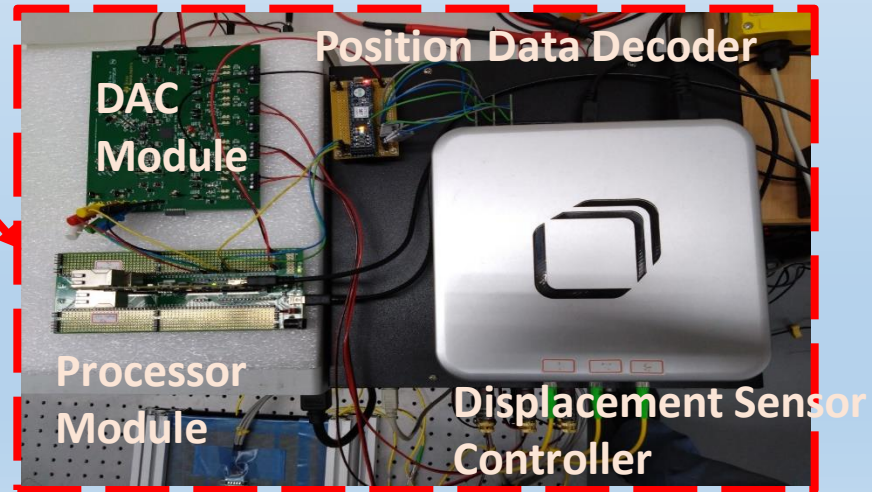
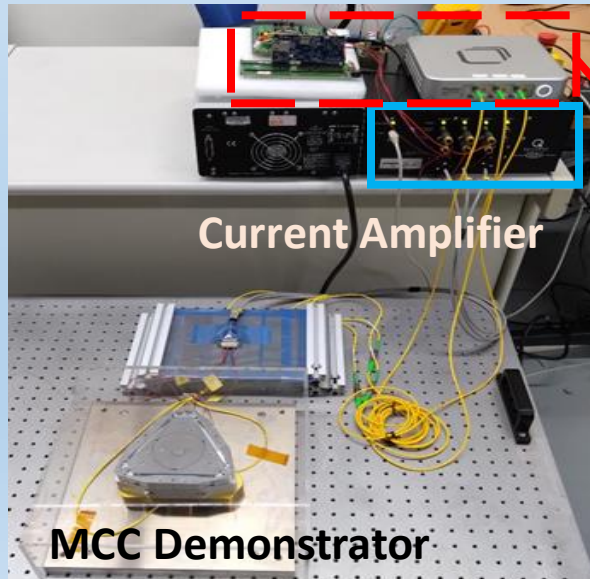
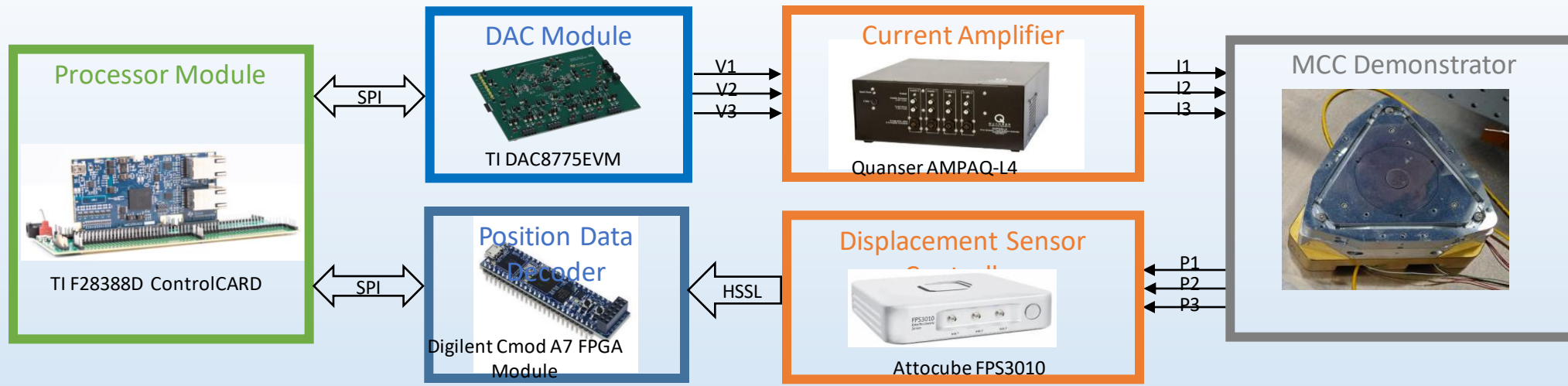
Development of Copper Control System

The chopper movement requirements are challenging:

- stable after 8ms, accuracy 6.5 arcsec
- chopping frequency of 0.1 - 2 Hz.

- Computer modeling first
- Matlab/Simulink to model the mirror movements
- discrete-time two-degree-of-freedom PID control method & feedback control algorithm

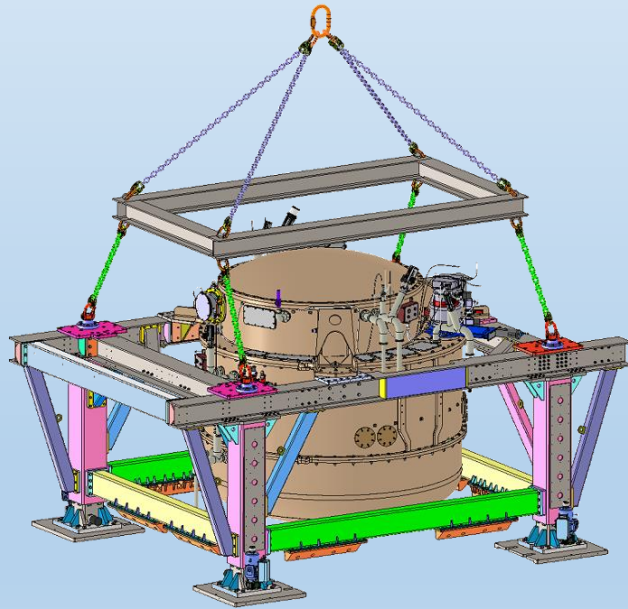




Development of Supporting Equipment

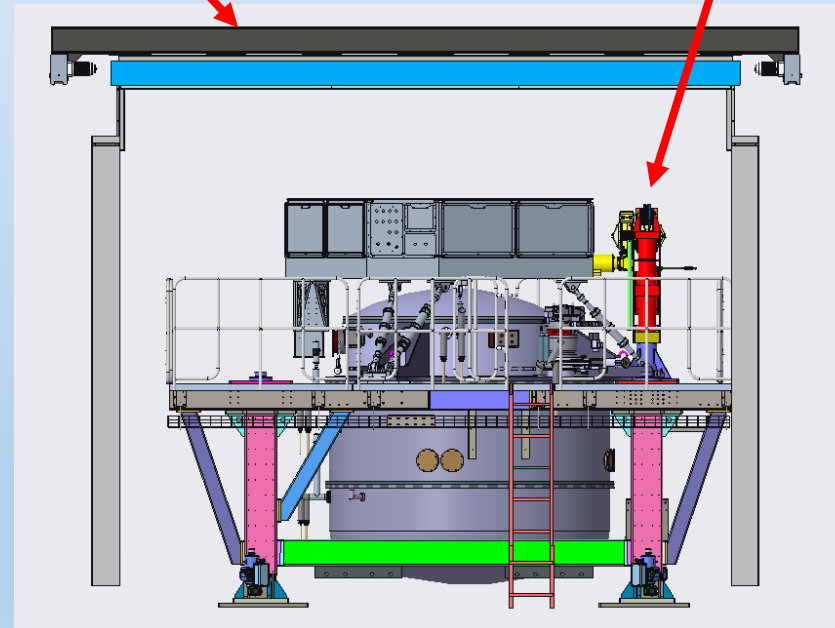
- Assembly Supporting Frame (ASF)
- Clean tent, shipping container
- Assembly Lifting Platform (ALP)

ASF overview



Clean tent

ALP



Shipping container



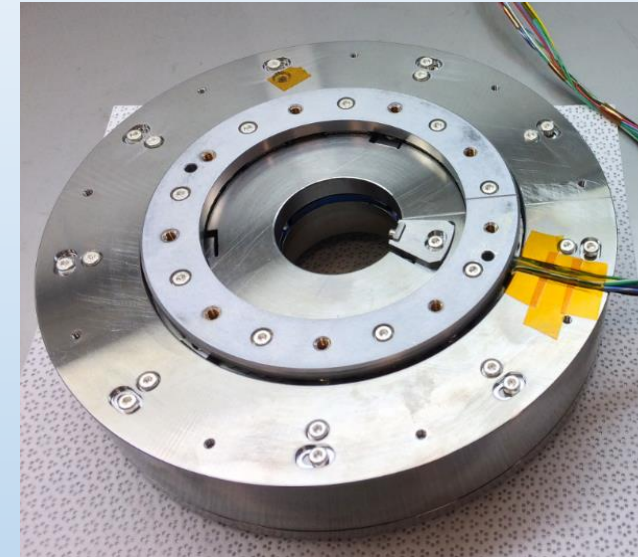
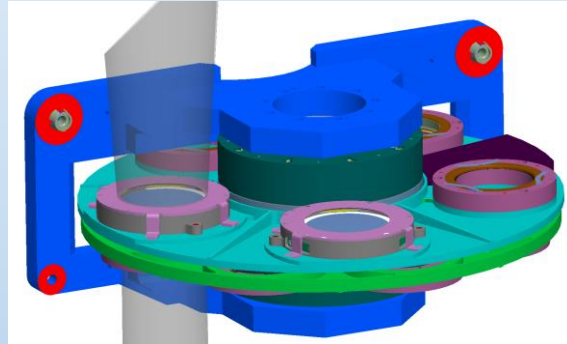
Currently the clean tent has been delivered to ETH (shall arrive in Jan. 2024). The ASF has passed the manufacturing review and will be fabricated soon.

Development of Optics Wheels

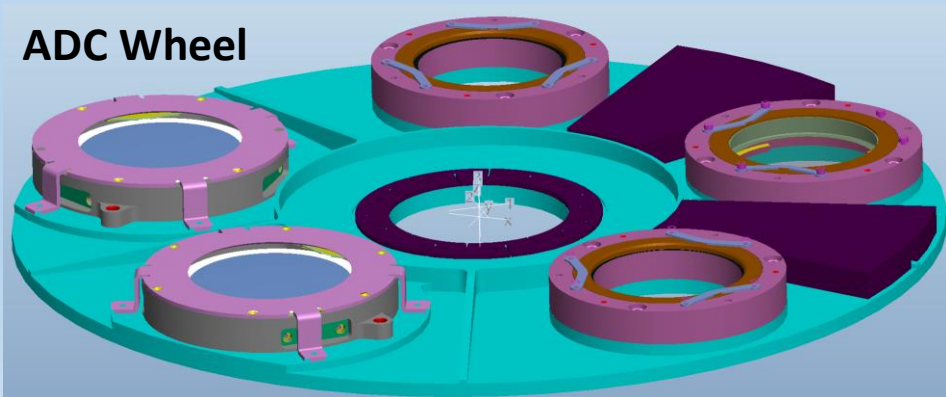
ASIAA is in charge 4 wheels in METIS supported by 4 ICARs:

- PP1 wheel and ADC wheel at 1st pupil plane
- FP2 wheel and LMS pick-off wheel at focal plane 2

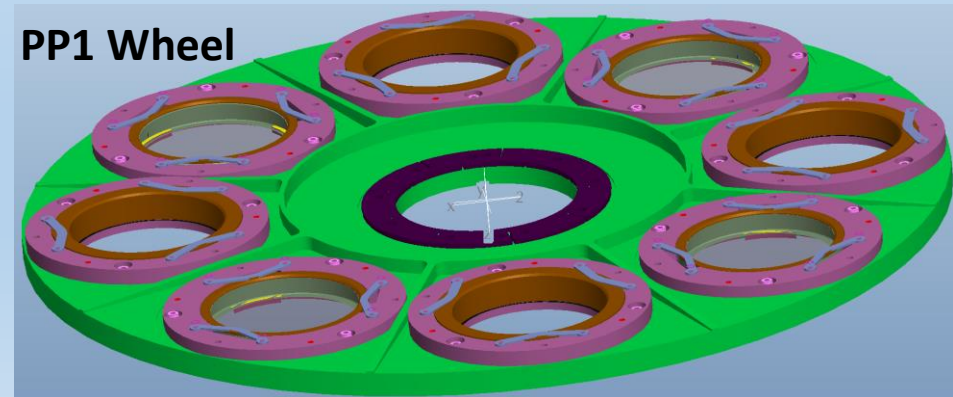
**PP1 + ADC Wheel
Overview**



ADC Wheel

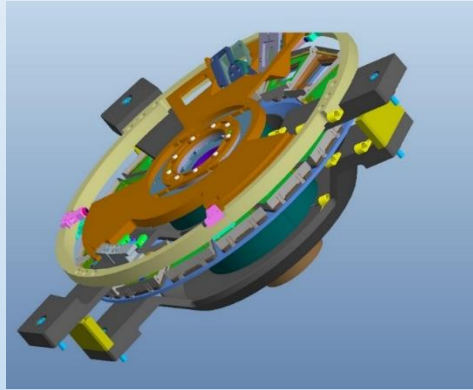


PP1 Wheel

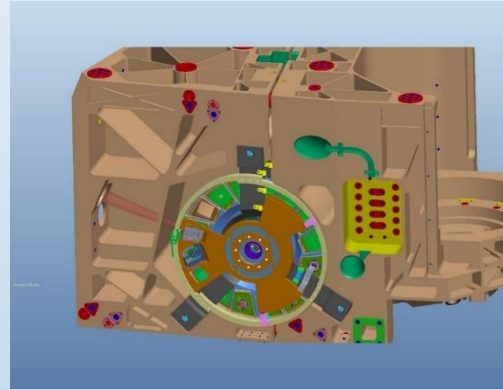


Development of Optics Wheels

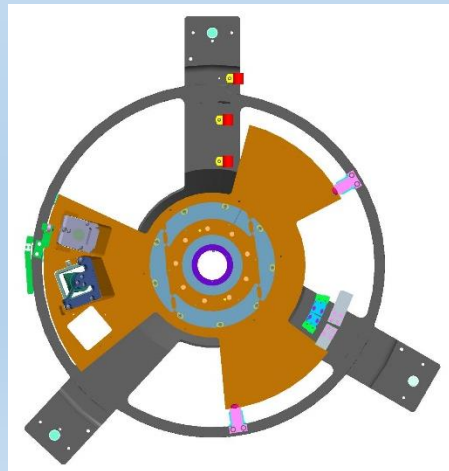
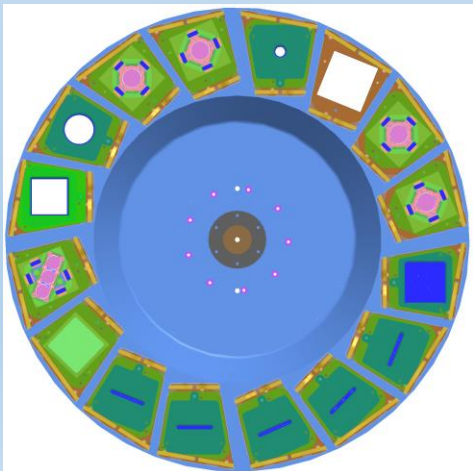
FP2 + LMS pick-off Wheel Overview



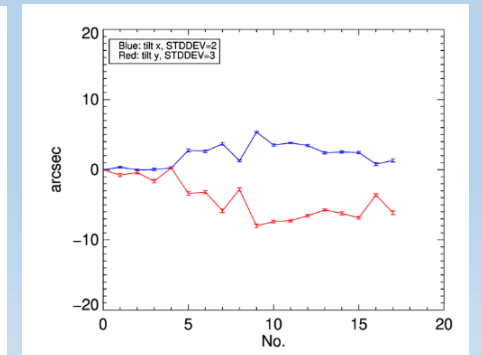
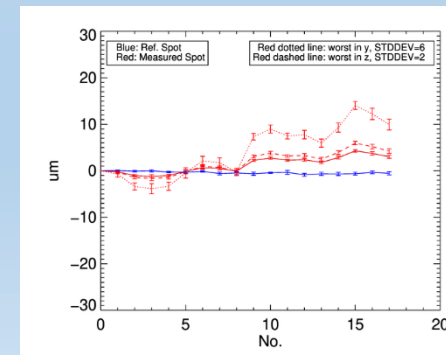
FP2 Wheel



LMS pick-off wheel



Proto-type of LMS pick-off wheel in cryo. chamber



Current Status

- Passed FDR in mid 2022
- METIS now is in parts fabrication phase and will enter AIV phase next year
- Expect to have on site commissioning in 2029