

# Design optimization of aluminum-made secondary mirror in space telescopes

Minigrant – 2022 INAF funds

Status summary

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# Project status

- Milestone M1 - Ready to start M2 CAD design: 100%

Inputs to start the project have been identified: space telescope as reference, input loads (static, dynamic, thermal, screw preload), performance in term of surface error deformation.

- Milestone M2 - Ready to start M2 simulation: 100%

Three options for possible 'cuts' at screws interface have been considered to reduce the surface deformation induced by screw preload. The most effective option in term of deformation and manufacturability is selected and implemented in a final CAD model for this milestone.

- Milestone M3 - Ready to start manufacturing: 50%

Some FEM analyses on m2 component have been completed to have a first feedback on the interface design: modal analysis, static analysis with loads at launch, static analysis with planarity error at m2/telescope interface surface, static analysis with screw preload. This last analysis was a priority as preload was considered one of the worst offenders for surface deformation. On the basis of these first results, no updates on the CAD model has been introduced.

Thermoelastic analysis and dynamic analysis are under assessment.

A first mirror mechanical drawing has been prepared, as template to start interaction with manufacturer.

The definition of GSE, test plan, test set-up have not started, as the achievement of prototype manufacturing is an optional final goal.

*Note:* From 06/2023 I am an associate member of INAF institute (OA-Arcetri). In 06/2023 I ended my INAF job contract and I started a new position in private sector.

- Milestone M4 - Ready to test: 0%
- Milestone M5- End of the project: 0%

# Reached objectives and criticalities

## REACHED OBJECTIVES

- Definition of the study case is accomplished. A first CAD model is developed and some FEM analysis has been performed.
  
- Training on CAD and FEM softwares
  - > Training to learn new softwares:  
Hyperworks - Altair suite as FEM preprocessor and post processor;  
MSC Nastran as FEM solver;  
CATIA V5, 3D cad modelling software.
  - > Training on already known softwares: Autodesk inventor, Femap, Sigfit.
  
- Optomechanics school
  - > SOIDT 2023 – Space Optics Instrument Design and Technology, ESA school. <http://soidt.org/course2023/>
  
- Conference attendance on the reference telescope study case  
ARIEL consortium meeting – June 6-9 2023

# Reached objectives and criticalities

## **BUDGET**

- Available budget: 19500 €
- Expenses at 01/11/2023:

SOIDT 2023 – Space Optics Instrument Design and Technology, ESA school: 4181.1 €

ARIEL consortium meeting – June 6-9 2023 : 1057.4 €

High performance Laptop : 3080.2€

TOT: 8318.7€

## **CRITICALITIES**

- Time constraint on analyses: currently limited time resources are available to accomplish the missing FEM analyses
- Time and budget constraint on prototype: due to limited time and budget resources, It is likely that the project is de-scoped by dismissing the goal of prototype manufacturing and testing.