# ESAIRPL

## Infrared Payload De-risk activities summary report

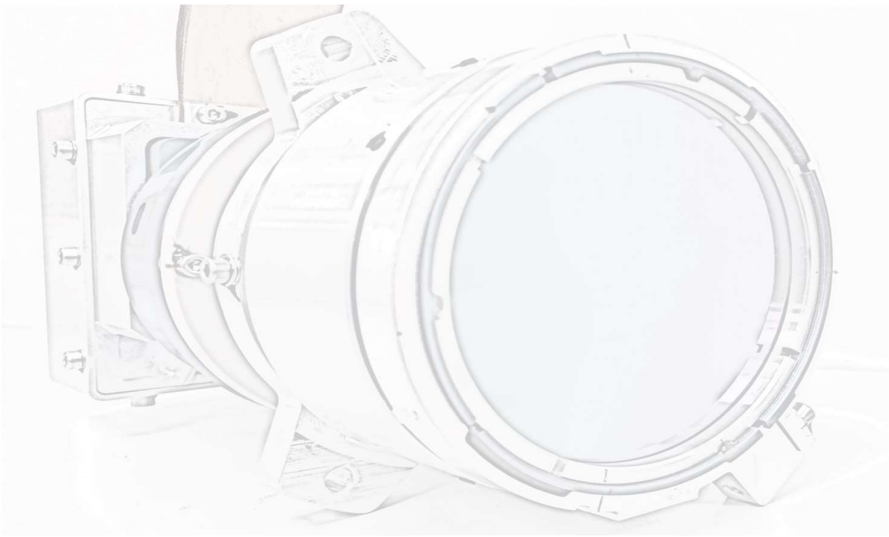
REFERENCE : ESAIRPL-ESR-LX-01

ISSUE : A

REVISION : 1

DATE : 15-05-2023

PAGES **6**



**APPROVAL**

| | NAME | COMPANY | SIGNATURE | DATE |
|---|---|---|---|---|
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| CHANGE RECORDS | | | | | |
|---|---|---|---|---|---|
| **Issue** | **Revision** | **Date** | **Author** | **Pages** | **Changes** |
| A | 0 | 14-03-2023 | D. BEGHUIN | ALL | INITIAL |
| A | 1 | 15-05-2023 | D. BEGHUIN /JH LECAT | ALL | REVISED ACCORDING TO ESA REMARKS |
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# 1 INTRODUCTION OR SCOPE

This document provides an executive summary of the ESA Contract No. 4000137342/21/NL/GLC/rk.

# 2 APPLICABLE AND REFERENCE DOCUMENTS

## 2.1 APPLICABLE DOCUMENTS

| AD## | Doc. Reference | Doc. identification |
|---|---|---|
| AD01 | ESA Contract No. 4000137342/21/NL/GLC/rk | Assessments to Prepare and De-Risk Technology Developments<br>"High Resolution Infrared Imagery for Small Platforms" |

## 2.2 REFERENCE DOCUMENTS

| RD## | Doc. Reference | Doc. identification |
|---|---|---|
| 01 | ESAIRPL-RP-LX-01 | Focusing mechanism design report |
| 02 | ESAIRPL-RP-LX-02 | Focusing mechanism test report |
| 03 | ESAIRPL-RP-LX-03 | Sensor TID test report |
| 04 | ESAIRPL-TN-LX-01 | Mission Definition |
| 05 | ESAIRPL-TN-LX-02 | Optical design |
| 06 | ESAIRPL-TN-LX-03 | Hybrid Architecture Analysis |
| 07 | ID3272_TSH_2022-22-28_v1 | Vibration test Report Lambda-X Camera |
| 08 | DOC_29378_830_1.1-Issue1.1 | TID TEST PLAN_830 - LAMBDAX_TIR_ROE |
| 09 | DOC_29763_830_1.0-Issue1.0 | RAPPORT TID TEST - MEASUREMENTS_830 - LAMBDAX_TIR_ROE |

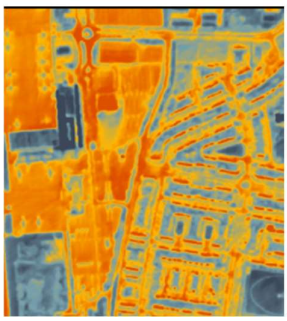
# 3 OVERVIEW OF THE ACTIVITIES

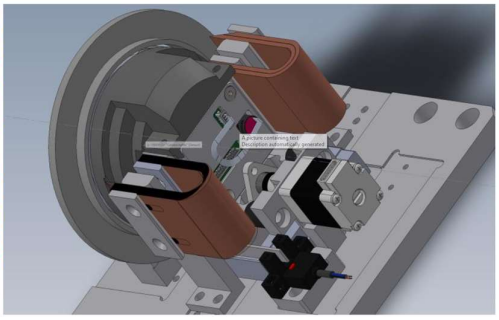
This project is part of the technological development of infrared imagery, both for Earth Observation and On-Orbit Services applications.

The part covered by this contract is the de-risking activity. This activity is split into design and analysis tasks as well as HW testing campaigns.

The target payload includes high-resolution optics and a bolometer sensor array with its read-out electronics. In this program we have addressed:

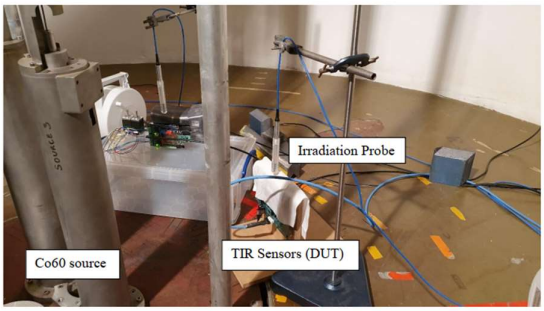
**A. The mission definition**

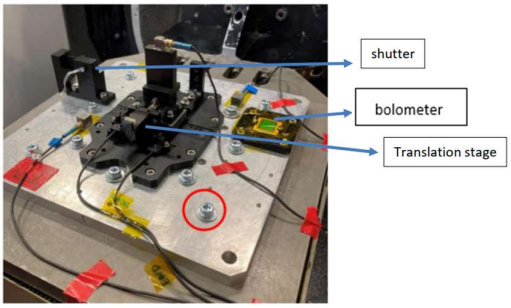




**B. The design and analyses activities**

- Read-out architecture for radiation-tolerant payload
- Optical design
- Focusing mechanism design




**C. The test activities**

- TID radiation test of the bolometer arrays
- Vibration test of the bolometer arrays
- Vibration test of the focusing mechanism

# 4 MAIN CONCLUSIONS OF THE ACTIVITIES

In this program, we have managed to develop a motorized focusing mechanism for infrared bolometer cameras. The translation system has been proven to be accurate enough for the application. The translation mechanism has resisted vibration launches up to a ceiling level. The weak elements have been identified and improvements are easily conceivable for heavy load.

We have demonstrated on one bolometer sensor that the vibrations up to a limited vibration load do not affect the performance significantly, as the NETD, or number of dead pixels, is not significantly modified.

We have also demonstrated that the shutter of the camera resists vibrations up to a limited vibration load.

The TID irradiation tests have demonstrated that the bolometer sensor is not affected by TID, as the sensors have not lost either function or performance due to the radiation dose.

The program has also proved the feasibility of radiation-tolerant read-out electronics for the bolometer sensor, as well as the feasibility of F#1 optics with good optical performances.

So, many of the risks identified for bringing this technology to space applications have been covered by analyses or by tests. The next step is an in-orbit demonstrator.