



Validation and experimental verification of ESA MEMS qualification methodology

Activity Summary

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1 Company Presentation

Lusospace, Lda.

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Lusospace was founded in 2002 and since then it has been increasingly involved in the space sector through numerous innovative and diverse programs. The AMR magnetometer being the first space hardware internally developed intended to fly in AEOLUS ESA satellite in 2007.

Along these years, extensive know-how in critical areas has been fostered and consolidated which together with a strong team-work culture has allowed Lusospace to acquire the necessary capabilities to successfully tackle ambitious and technologically challenging projects.

LusoSpace is a privately held company, covering the following main fields of activities:

- Attitude and Orbit Control System (AOCS)
- Laser systems and optoelectronics
- Electric Propulsion
- MEMS / MOEMS

Previous activities in MEMS included the projects “Procedures for MEMS Qualification” and “Optical MEMS for Earth Observation”. Current projects include “Connectivity and Packaging of Systems-of-Microsystems” and “Miniaturization of a Magnetometer based on Micro Technology”. Previous and current activities in MEMS field provide important knowledge in the development and packaging of MEMS for space applications.

Lusospace vision is founded in two main cornerstones. The first is to lead the space sector in the Portuguese market and the second is to develop and sell terrestrial applications which result from our space experience and its success.

Lusospace in this project is supported by the institutions that are part of Heterogeneous Technology Alliance: CEA-LETI (France), Commissariat à l’Energie Atomique - Laboratoire d’Electronique et de Technologie de l’Information; CSEM (Switzerland), Centre Suisse d’Electronique et de Microtechnique; Fraunhofer-Gesellschaft (Germany), and VTT (Finland), Valtion Teknillisestä Tutkimuslaitoksesta.

2 Overview / Scope of Activity

This activity is part of the ESA Basic Technology Research Programme (TRP). Micro Electro Mechanical Systems (MEMS) have proven themselves in Earth-based applications such as automotive, medical, displays..., by showing outstanding performance and reliability figures. In space,

MEMS have a large potential in applications like communication, navigation, Earth observation and scientific mission by:

- Fostering new types of scientific missions and instruments
- Reducing cost, size, mass and time from mission conception to launch
- Increasing performances, reliability and redundancy

Today, only a few MEMS components have been or are planned to be used in space applications. Despite the growing interest for this new technology for space and the great reliability figures shown by earth-based sensors for application, specific space MEMS components have a low TRL. One important reason for this low TRL is the lack of appropriate standards for qualification of MEMS components on which the industry could base themselves for future development and space usage.

This project aims at changing this situation by continuing the efforts made during the activity: Procedures for MEMS Qualification, contract #42000021272.

The final objective of this activity is to draft an ECSS Technical Memorandum (TM) addressing space MEMS qualification methodology. This Technical Memorandum shall regroup the qualification methodology (MEMS classification and associated test plans) developed in this activity.

For doing that, Lusospace and its partners will start by reviewing the work performed under the activity: Procedures for MEMS Qualification, contract #42000021272, and propose a revised qualification methodology with the goal of having a clear and distinct procedure for the classification and qualification test of various MEMS components. This methodology will then be verified by using existing MEMS components and qualify them following the proposed test plans.

In this context, primary achievements in this activity shall be:

- Develop a MEMS classification system based on common failures
- Design a test plan to be applied to the MEMS classification system
- Draft an ECSS Technical Memorandum for space qualification of MEMS.