

Training Opportunity for Portuguese Trainees

Reference	Title	Duty Station
PT-2019-TEC-EDC	MEMS & MEMS Advanced Manufacturing for space applications	ESTEC
<p>Overview of the unit's mission:</p> <p>The ESA Components Section covers Electrical, Electronic and Electromechanical (EEE) components Technology with focus on components development, reliability assessment, industrialisation and is responsible for the technical management of materials and components space evaluation & qualification. The work proposed by this trainee opportunity will offer involvement in the different tasks just afore mentioned and will typically involve activities such as:</p> <ul style="list-style-type: none"> • Technology trend analysis, literature surveys, specification development • Component test and test data analysis including environmental testing • Development of test hardware and/or software for electrical and functional characterisation • Reverse engineering and EEE parts physical analysis under adequate monitoring • Device modelling and simulation (failure modes, physic of failure) • Support to Radiation test of EEE Components on-site and at external test facilities; <p>The specific EEE technology domain covered by this opportunity supports the Miniaturisation of space systems and sub-systems and include the following component families:</p> <p>MEMS: RF, AOCS, MOEMS, micropropulsion, pressure sensors, etc but also MEMS packaging & stacking. Advanced manufacturing techniques such as for example 3D printing when applied to miniaturisation and MEMS prototyping are also covered by the section</p> <p>Nanotechnologies: CNTs and their application in space: thermal, mechanical, electrical and radiation; While also approaching:</p> <p>VLSI technologies: FPGA, ASIC, Memory devices, etc including Deep Sub Micron Technologies</p> <p>Hybrid circuit and technologies: thick and thin films and Packaging techniques</p>		
<p>Overview of the field of activity proposed:</p> <p>The Trainee opportunity will include 2 major tasks to be performed in parallel both in support to the Portuguese Industry:</p> <ol style="list-style-type: none"> 1) Space evaluation of MEMS Devices for space applications (Technology Pull) 2) Assessment of COTS (Component Off The Shelf: plastic packaged) magnetometer sensors for space applications <p>Task 1: Space evaluation of MEMS Devices for space applications</p> <p>The main MEMS device to be addressed in that task is a MEMS Magnetometer for coarse AOCS (Attitude and Orbit Control Systems) applications. Over the last couple of years, the Portuguese Company Lusospace based in Lisbon has initiated the development of a MEMS Magnetometer (MMG project) in collaboration with the university of Minho. The project is reaching maturity and the MEMS magnetometer chips have been validated and accepted with respect to their performance at room temperature.</p> <p>This milestone being achieved, it is now time to access the reliability of the MEMS Magnetometer in representative space environment.</p> <p>The trainee will therefore be in charge of:</p> <ul style="list-style-type: none"> • Define the functional and reliability testing to be performed to assess suitability of the MEMS chip magnetometer with respect to radiation (support the radiation testing of the MMG on-site and at external test facilities), temperature cycling, mechanical shocks and vibrations, temperature storage, long life operation (up to 17 years), outgassing, etc • Performance of physical analysis will also be required on a number of samples. • Performance of components space evaluation by executing the above defined test plans. • Performance of failure analysis of MEMS Magnetometer which degraded during the evaluation <p>Considering that the MEMS magnetometer has been validated using discrete electronic, ESA and Lusospace are planning to engage on the development of the associated ASIC development and the trainee will also support the design and prototyping of the command and control ASIC by industry once this activity is initiated.</p>		

For that Task 1, environmental test facilities present at ESA such as Thermal Cycling, mechanical shock and vibration, humidity as well as Co60 radiation facilities will be used by the Portuguese Trainee. The student will also perform the associated failure analysis of the MEMS that degraded during space evaluation testing; as part of that the student will become familiar with SEM, FIB, SAM, Profilometers, etc available at ESA. The Portuguese trainee may also be requested to perform similar activities as the above on different types of MEMS (for example pressure sensors or/and MEMS for Quantum Physics...)

This Task will be performed in full collaboration with Lusospace and Minho

Task 2: Assessment of COTS (Plastic encapsulated) Magnetometers for space application

Here again, the activity will be in full support of the Lusospace Company based in Lisbon. Their space qualified Magnetometer was based on Ceramic Packaged Sensors that the manufacturer has decided to declare obsolete and to propose them only as plastic (COTS Components Off The Shelf) encapsulated devices.

ESA together with the support of the Portuguese delegation have therefore engaged in a new programme aiming at supporting Lusospace to re-validate the new plastic sensor for space environment. The 2 nd task of the Portuguese trainee will therefore consist in supporting this new validation.

The validation programme will be based on ECSS-Q-ST-60-13 standard and will include, performance of Physical Analysis, Plastic encapsulation specific testing as well as the usual Electrical, Mechanical and environmental testing such as Mechanical Shocks and Vibrations, thermal Cycling, Outgassing, Life test and storage test etc...

Deliverables for Tasks 1 and 2;

Final report and Final presentation at completion of the training in presence of industry.

Required education:

Applicants should have completed their University course at Masters Level (or equivalent) in Electrical Engineering or Electronics with one or more of the following specialisations: Semiconductor Technology, Micro-electronics, MNT, Test Engineering, Process Engineering related to EEE. Ideally, applicants should also demonstrate a minimum of experience with laboratory activities in terms of device environmental as well as some knowledge of major failure mechanisms for MEMS components.

Applicants should have good interpersonal and communication skills and should be able to work in a multi-cultural environment, both independently and as part of a team.

Applicants must be fluent in English and/or French, the working languages of the Agency. A good proficiency in English is required.