



Institut Supérieur de l'Aéronautique et de l'Espace

Instrumentation engineer for planetary seismometers, mechanical and thermal expert

In order to prepare the next generation of planetary seismometers, the Institut Supérieur de l'Aéronautique et de l'Espace (ISAE-Supaero), University of Toulouse, France, is looking for a talented instrumentation engineer, specialized in mechanical and thermal design, modeling and testing. The position is to be filled within the Space Systems for Planetary Applications team.

The activities will be performed within the PIONEERS project funded by European Commission. This 4-year project is aiming to develop the next generation of planetary seismometers sensing both translations and rotations of planetary surfaces and relying on sensors using optical interferometry. The consortium involved include the laboratory and industrial partners that are european leaders in their field. ISAE-SUPAERO will be in charge of the overall design, systems engineering and space qualification of the instruments integrating the sensors. A high-performance instrument at low TRL level and a flight model of a compact instrument at CubeSat format will be produced.

The engineer activities will be focused on the design, modeling, testing and space qualification of the instruments. It includes the numerical modeling of mechanical, thermal and thermo-elastic properties.

The candidate must demonstrate a previous experience of mechanical design and thermal modeling in the framework of space projects.

He has an engineering degree (and/or PhD) in mechanical and thermal fields, or in space instrumentation. Previous experience of the use of CAD modeling tools (CATIA, Solidworks...) , mechanical modelling software and/or thermal modelling software (IDEAS, NASTRAN/PATRAN ...) is required. A background in space systems will be appreciated but is not mandatory for candidate with a strong expertise in mechanical and thermal design and modeling.

The proposed position is proposed for one year with a possible extension to four, starting 1st January 2019. Net income will be in the range of 2200-2500€/months depending on experience.

Proposal must be sent through E-mail to raphael.garcia@isae.fr and david.mimoun@isae.fr with email subject: '**Instrumentation engineer for planetary seismometers**

Proposal must contain:

- Motivation letter with availability
- CV with indication of citizenship
- One reference letter plus a list of 2 possible additional references with name, address, emails and professional relations, if any.

Additional informations :

ISAE-SUPAERO web site : <http://www.isae.fr>

DEOS web site : <http://recherche.isae.fr/en/departments/deos.html>

Description of the PIONEERS partners and project:



Title of Proposal: Planetary Instruments based on Optical technologies for an iNnovative European Exploration using Rotational Seismology

Acronym of Proposal: PIONEERS

List of participants:

Participant No*	Participant organisation name	Participant short name	Country
1	Institut Supérieur de l'Aéronautique et de l'Espace	ISAE-SUPAERO	France
2	ETH Zurich	ETHZ	Switzerland
3	Institut de Physique du Globe de Paris	IPGP	France
4	Royal Observatory of Belgium	ROB	Belgium
5	Ludwig-Maximilians-University	LMU	Germany
6	iXblue	IXBLUE	France

Work programme topics addressed: SPACE-20-SCI-2018

Name of the coordinating person: Raphaël Garcia

Coordinator email: raphael.garcia@isae-supero.fr

EXECUTIVE SUMMARY

PIONEERS will allow Europe to enter a new realm of planetary exploration with an innovative ground motion instrumentation concept relying on high precision sensors based on optical interferometry.

Willing to keep the European leadership in planetary seismology and high precision measurements of ground deformations, we will develop two innovative 6 degrees of freedom (6 DoF, with 3 translations and 3 rotations) instruments for measuring ground deformation on planetary objects. The first instrument is a prototype of very low noise 6 DoF sensor dedicated to internal structure imaging of terrestrial planets. The second one is a high TRL CubeSat version of the same instrument concept for exploration of small bodies.

For single to sparse networks, 6 DoF measurements provide substantial more science return compared to classic 3 DoF measurements. Only currently emerging for terrestrial applications, 6 DoF measurements target fundamental science objectives from the formation of planetary systems to the characterization of habitable worlds, and will support planetary defense and asteroid resources applications.

Instruments will be designed based on scientific requirements, and re-using planetary seismology expertise and space qualified, high performance optical technologies provided by the PIONEERS partners. The science case of 6 DoF planetary exploration will be demonstrated through simulations, application of innovative data analysis methods, and testing in Earth analogue and laboratory environments.

An improvement of instrument noise of two orders of magnitude is expected for the planetary prototype by using optical sensing technologies. Cost optimization, ITAR free strategy and adaptation to CubeSat standards will drive other technological developments that will open new markets for high precision scientific instrumentation.

Instruments developed by our consortium members are demonstrating their leadership this year (SEIS on board INSIGHT, blueSeis commercial rotational seismometer release, ROMY laser interferometer). It is the right time to keep European leadership by innovating both on instrument concept and technology.