Internship proposal - Fall 2017

Development of the Radio-occultation Payload for the IGOSat mission : operations preparation and optimization of the flight software

Skills, key-words : Scientific instrumentation, aerospace engineering, data treatment, functional tests, GPS occultation, embedded software, c language.

Study level: 4th Year/ Master Degree

Duration : 6 months

Stipend : 554 € / months

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Internship description :

The Laboratories of Excellence (LabEx) UnivEarthS [1], set up by AIM (Astrophysics, Instrumentation and Modelling [2]), APC (AstroParticle and Cosmology [3]) and IPGP (Institut de Physique du Globe de Paris [4]) of Paris Diderot University [4], allowed the emergence of cross-cutting projects in these three laboratories.
Taking advantage of the strong involvement of these laboratories in numerous experiments and space instruments, a nanosatellite project developed by student was initiated by the LabEx UnivEarthS in October 2012, with the technical and financial support of the CNES (French Space Agency) and the Paris Diderot Space Campus [6]. More specifically, it is a question of developing, by 2018, a 3-unit CubeSat satellite (i.e. with a size of 10x10x30 cm [7]). This satellite, called **IGOSat**, will carry 2 payloads (a dual frequency GPS to study the ionosphere and a scintillator for the study of radiation belts)

The purpose of the internship is to iterate the flight software design of a radio-occultation payload that will fly within a 3 units CubeSat. The student will study data transmission chain, from the antenna, through the on-board data processing, to the ground station. The quality of the scientific data will be investigated too. As every space project related work, some documentation will have to be produced, and review in front of experts from the French Space Agency (CNES) will have to be performed.
This payload includes an L-band GNSS antenna and a dual-frequencies GPS receiver operated through the on-board computer. Raw data recorded by the receiver have to be processed on-board to select the occultation data of interest for the mission.
A test bench is already in place, currently being integrated in a « flat-satellite ». The student will have to go one step further and work on the integration to the Engineering Model of the satellite (basically the flat-satellite integrated in a « flight-model » shape, with relevant functions and performance).
Within a team of students, engineers and scientists, the student need to be able to work autonomously as well as part of a team, have a sense of rigor especially in writing presentation, and already a global vision of information transmission.
This internship is a good opportunity to address numerous points of space engineering.

Bibliographie

[1] LabEx UnivEarthS : http://www.univearths.fr
[2] Laboratoire AIM : http://irfu.cea.fr/Sap/
[3] Laboratoire APC : http://www.apc.univ-paris7.fr
[4] Institut de Physique du Globe : http://www.ipgp.fr
[5] Université paris Diderot : http://www.univ-paris-diderot.fr
[6] Campus Spatial Paris Diderot : http://www.campusspatial-paris.fr
[7] CubeSats informations : http://www.cubesat.org
[8] IGOSat Project : http://www.igosat.fr
[9] Jakowski, N., V. Wilken, and C. Mayer (2007), Space weather monitoring by GPS measurements on board CHAMP, Space Weather, 5, S08006.