

Internship Proposal – 4/6 months

Title: Development of IonSat flight software: Payload and SPINO board

Context of the internship

The Space Center of École Polytechnique (CSEP), created in 2010, proposes and supervises space projects for École Polytechnique students. CSEP coordinates and brings together, through its projects, students, teacher-researchers, industrialists and French and European space agencies. It is financially and operationally supported by the education patronage program *Espace, Science et Défis du Spatial* led by Professor Pascal Chabert.

IonSat is a 6U nanosatellite project equipped with an electric propulsion engine, dedicated to demonstrating the feasibility of nanosatellite missions in Very Low Earth Orbit. With a strong educational vocation, the project is currently led by several students and supported by numerous space actors: start-up (ThrustMe), industries (Thalès Alenia Space), agencies (CNES, Onera).

Internship description

The objective of this internship is to participate in the development of the IonSat Flight Software (FS). This software is responsible for managing all the IonSat satellite platform subsystems and contributes to guarantee the proper functioning of the associated payload.

In concrete terms, the intern will work on the part of the FS concerning the payloads and the SPINO communication board. The CSEP has a flight software of a working cubesat platform. At the state of the art, such software is not compatible with some of IonSat subsystems, such as IonSat payloads and SPINO communication board. The intern will first perform communication tests between the onboard computer and both the payload subsystems and SPINO board. Then, the intern will implement on the FS the functions that enable the use of such subsystems, according to the different operating modes of the satellite. Particular attention will be paid to documentation, testing and validation.

Notions of software development and space systems engineering are appreciated.

The mission will focus on:

- The development, implementation, and validation of communications between the on-board computer (OBC) and both the Payload and the SPINO board.
- The development, implementation, and validation of those functions that enable the use of the Payload and the SPINO board.
- Specify the data constraints, responsiveness with each component and functionality. Thus, precisely define the performance of the system (reactivity, throughput, data, etc.).



- Use the payload development kit to prepare the FS for the use of IonSat Payload.
- Manage system errors and failures effectively with well-established scenarios and intelligent safety protocols.

The intern will work with one full time engineer of the CSEP, and can use the help of the space team of the Laboratory of Plasmas Physics, specialized in conception of space-ready magnetometers and on-board electronics. There are also frequent contacts with experts from the French aerospace agencies (CNES, ONERA) and companies (Thalès Alenia Space, ThrustMe) partners of the IonSat Project.

Technical Requirements

- M1 or M2 level in informatics and programming, electrical engineering, or related domains.
- Experience in C/C++ programming.
- Knowledge in UNIX like systems.
- Knowledge in aerospace systems is a plus.
- Knowledge of communication buses (I2C, CAN, RS422, etc.).
- Experience on the Zynq Zybo Z7-10 target is a plus.
- Experience on the XtratuM hypervisor is a big plus.

Behavioural Requirements

- Self Motivation and autonomy.
- Communication and teamwork.

Internship duration: 4-6 months, from April/May 2024

If you are interested, send your CV and a cover letter, clearly indicating your motivation and availability dates.

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