PhD offer

Jointly at ***IETR UMR CNRS 6164****,* ***LERMA UMR CNRS 8112*** *and* ***C2N UMR CNRS 9001****, France*

FRONT-ENDS FOR TERAHERTZ HETERODYNE RECEIVERS IN CUBESAT PLATFORMS

Project context

CubeSats are a class of miniaturized satellites for space research, which number of launches is steadily increasing, with several initiatives in Europe. They are (relatively) low-cost and very modular; indeed they consist of several units (U) with dimensions 1U=10×10×10 cm^3. CubeSats fly as a secondary payload and they can be used to enhance the science objectives of the primary mission, to enable observations in new environments (potentially hazardous) or to serve as proof-of-concept for new technologies. For instance, the twin CubeSats of MarCO (https://mars.nasa.gov/insight/) were used to relay tracking data directly to Earth almost in real time during the critical phases of Entry, Descent, and Landing (EDL) for the mission Insight, which landed in Mars in November 2018. One of the main challenges for scientific instruments in CubeSats consist in devising new architectures at the same time compact (and well-suited to the CubeSat form factor) and with performances similar to those of the primary payload.

Objectives of the PhD offer

This thesis ambitions the development of a novel ultra-compact instrument (a receiver working around 600 GHz) to study Earth's radiation budget. The instrument will be sized so it can be accommodated in a CubeSat platform. The three main objectives are: 1) the development of high-gain flat antennas that can be easily integrated on the CubeSat's chassis, 2) the design high-sensitivity broadband circuits for the room-temperature receiver in space, and 3) the micro-fabrication of antennas and circuits so one can achieve a mass and volume reduction by a factor of 5 compared to competing solutions. This interdisciplinary project involves 3 CNRS laboratories, which wide expertise in antenna design (IETR), Schottky-based room-temperature receivers (LERMA) and nanotechnology (C2N) will be exploited to guarantee the success of this project, funded by CNRS's "Mission pour les initiatives transverses et interdisciplinaires" (MITI) under the 80Prime program.

The recruited student will first carry out a thorough literature review. His/her tasks will also include the analysis and design of the flat antenna (using ad-hoc tools or commercial software) and the study of the best configuration for the mixer (fundamental, sub-harmonic) as well as its efficient integration with the radiating part. Finally, the candidate will see through the fabrication and testing of the front-end. System aspects (thermal, calibration and power consumption) will be also accounted for in a holistic design approach.

Candidate

Required education level: Master or equivalent degree in electrical engineering or physics.
Duration: 36 months.
Required background: antenna theory, microwave engineering, electronic engineering, numerical modeling, periodic structures. Knowledge of French is not required.

Deadline to apply: as soon as possible, with firm deadline on September 30.

Contact persons

To apply please send your motivation letter, CV, and recommendation letters (optional) to:

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All the candidatures are evaluated. However, due to the large number of applications we receive, we will contact only the short-listed candidates.