

PhD Position - WFE project

W-band FrontEnd modules in LTCC for Nano-satellites and Magnetometry

DESCRIPTION

Context

The W-band (75-110 GHz) is used for different applications such as 5G and 6G communications, high precision spatial observation or magnetometry to mention a few. For such systems an RF front-end is an important device which includes, as a minimum, an antenna and active circuits (MMICs) such as an amplifier and a mixer. Classically at high frequencies, a "split-block" solution is used where the MMICs are integrated in metallic waveguides. However, when the frequency tends towards 100 GHz, the dimensions and manufacturing tolerances become critical. In the case of Nano-satellites, constraints of size, weight and harsh environment are critical. It is in this perspective that we propose this thesis with the objective to realize an RF front-end in a single ceramic module based on LTCC (Low Temperature Cofired Ceramics).

Objectives

LTCC is a multilayer ceramic material that has already been proven in space systems for lower frequencies < 30 GHz. This technology is interesting in regards to its advantageous characteristics. However, there are several problematic aspects to overcome related to the millimeter wave frequency. The Ph.D. Student should work on the following problematics:

- 1) The MMICs interconnection method should be reviewed to minimize parasitic elements.
- 2) Power amplifiers dissipate heat that must be removed to increase its lifetime. Ceramic has a rather low thermal conductivity; therefore, more efficient solutions must be proposed.
- 4) LTCC technology allows for antenna elements, filters and power combiners/splitters to be directly integrated within the module. Different solutions can be proposed and evaluated in this thesis.
- 5) For a magnetometer system, the antenna is external to the frontend module. It is therefore necessary to work on the interconnection between these two elements for an optimal signal transfer.

PH D Environment

IMT Atlantique is a leading engineering school, internationally recognized for its research. It belongs to the Institut Mines-Télécom and depends on the ministry in charge of industry and digital technology. The Ph.D. student will integrate the Microwave department at IMT Atlantique and the DH team (Dispositifs Hyperfréquence) within the CNRS laboratory UMR 6285 Lab-STICC. The WFE project



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(partly funded by the Brittany Region) will include interaction with RF engineers of WAINVAM-E, a young startup specialized in magnetometry based in Lorient.

Applicant profile

The candidate should have a M.Sc. degree or equivalent, with basic knowledge in microwave electronics and analogue electronics. The candidate should also appreciate practical lab work with a capability of doing precision handcraft.

English or French speaking/writing skills are required.

How to apply

Applicants should send their complete application package by email to the contacts provided. This includes:

- Full CV with a list of projects and courses related to the subject of the PhD,
- Complete academic record (from bachelor to MSc),
- 1 or 2 reference contacts (former or current internship advisor, teacher, etc.).

Dates:

Last application date: July 15th 2022

Selection: August 15th 2022

Thesis start date: At the latest in November 2022

Contact

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