

Position title: Internship "CHM IGBT"

Ref. Budget : #STAGIAIRE 2019 P03.13.04

Contract type: Internship

Duration: 5-6 months

Start date: September 2019

Qualification required: Electrical engineering

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SuperGrid Institute recruits Intern F/M

« Power Semiconductor Junction Temperature Direct Measurement and Estimation by Temperature Sensitive Electrical Parameters »

The Institute for Energy Transition (ITE) Supergrid is a collaborative research platform in the field of low-carbon energy, bringing together the expertise of industry and public research in the logic of public-private co-investment and close cooperation between all stakeholders of the sector.

The institute aims to develop technologies and services for the Supergrid that is the future electricity transmission network, using direct current and alternating current at very high voltages (in the order of one million volts), designed to transport large-scale energy from renewable sources remote from load centers, a significant portion of which are offshore, which will be in connection with flexible storage resources; to manage the intermittent nature of renewable energy; and also, to ensure the stability and security of the network.

General context

Power semiconductors are arguably the most important enabling technology of power converters. Trends in power converter design for high voltage applications are requiring the use of many semiconductors, either/ or connected in series to reach high voltage withstand values and/ or in parallel to reach high values of current withstand.

Semiconductors are at the same time, unfortunately, prone to failure, which can lead to increased costs associated with power converter downtime and maintenance, component

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replacement, etc. Monitoring the condition of these components can allow some of those important problems to be mitigated.

A central aspect of IGBT condition monitoring is related to monitoring of the semiconductor junction temperature, due to the stress that its variation places on the packaging elements of the semiconductor. Outside of laboratory conditions it is difficult to measure directly the junction temperature and so junction temperature estimation techniques are currently receiving much attention in the literature.

Objectives / Missions

- Develop personal understanding of power semiconductor condition monitoring and junction temperature estimation/ measurement from state-of-the-art documentation (already written)
- Specify and set-up current and voltage measurement for temperature sensitive electrical parameter observation
- Specify and set –up temperature measurement equipment (as optic fiber, infra-red camera, on-chip temperature measurement, thermocouple, etc...) in order to measure the junction temperature
- Conduct tests on high-tech laboratory test bench on a selection of medium voltage (MV) IGBT power modules to make accurate measurement of their junction temperature - supported by technical staff, engineers, and academics
- Investigation of a number of junction temperature estimation techniques and their validation on the test bench
- Reporting of results to project team and members of the power electronics program in the form of presentations and a technical report.

Note:

There may be the possibility to publish results as a co-author in a scientific paper

The internship will be realised in R&D program Power Electronics & Converters (research group of around 30 people).

Profile of the candidate

Field: Electrical Engineering, semiconductor physics (applied and experimental)

Education level: Masters, last year of engineering school, gap year

Sound knowledge in either/ all of the following: MV power semiconductors, power converters, experimental measurements

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Autonomy and self-discipline
Fluency in English is welcome.

Other informations

- **Workplace:** ITE SuperGrid Institute, Villeurbanne (69)
- **Internship period:** September 2019, for a duration of 6 months
- **Salary :** The salary depends on the year of studies and the internship duration. It can reach 1100€ gross/month for a 6 months last year master studies internship.
- **Contact:** to apply, please send CV, cover letter and most recent marks to:
francois.wallart@supergrid-institute.com

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