



# Ampère

Unité Mixte de Recherche du CNRS - UMR 5005

Génie Électrique, Automatique et Bio-Ingénierie

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## PhD Thesis advertisement (Laboratoire Ampère - Lyon)

**Thesis topics:** Structural and traps defect on new and aging GaN power devices

### Scientific Context:

In the framework of the ICPEI/Nano 2025 GaN4reliability project, Ampere laboratory will recruit a postdoctoral position to achieve advanced characterization of GaN power devices.

Wide-bandgap power components, such as gallium nitride (GaN), are particularly promising for the design of innovative power converters, with high efficiency and small footprint, for example for automotive applications. GaN offers a higher switching speed than SiC, making it potentially highly suitable for applications such as on-board charging, or DC/DC converter capable of operating at higher switching frequencies. However, GaN power components such as GaN HEMTs, have some reliability problems, with drifts observed in on-state resistance (dynamic), current collapse, threshold voltage and even leakage currents.

### Goals / Purpose:

Coupling aging studies with physical characterization (physically characterizing components as they age) will enable us to trace the role of the material. Physical characterization of components will be based on 3 methods: RAMAN, DLTS and OBIC.

The main target corresponds to lateral diodes on GaN (with a 2DEG channel) but some test could be applied to HEMT devices depending on the availability.

The targets are:

- Identification of structural defects (e.g dislocations, doping inhomogeneity...) in GaN by Raman spectroscopy
- Identification of electrically active defects (traps) in GaN devices by DLTS
- Characterization of the efficiency of periphery protection by optical setup (Optical Beam Induced Current)

During each test, some electrical characterization will be achieved to follow the possible aging.

### Research planning and Scientific approach:

At the beginning of the thesis, bibliography researches on GaN existing devices (properties, defects and limitation...) will be performed and pursued during the entire thesis. After an initial formation of the different characterization technics (RAMAN, DLTS and OBIC), GaN devices coming from ST Microelectronics will be physically characterized. After electrical stress, performed by a post-doc on the same GaN devices, these devices will be physically characterized once again at the same locations and some TCAD simulation will be done.



**Candidates' Background:**

Last year of Engineering school or Master 2 in Electronic, Semi-conductor Material, Micro-Nano Technology  
Interesting, Stringent and Self-Contained.  
Ability to summarize

**Required Knowledge:**

Physics of Semi-conductor, device-physics, Electronic

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**Thesis location:** Laboratoire Ampère, INSA de Lyon, Villeurbanne, France

**Start Date:** February 1<sup>st</sup> 2024, Oral hearing December 2024.

**Provided documents by the candidate:**

- CV
- Motivation Letter
- Academic Transcript

Send your candidature to: [camille.sonneville@insa-lyon.fr](mailto:camille.sonneville@insa-lyon.fr)