Titre de la thèse – Fabien LEROY :

Design and realization of a 50-W DC/DC converter switching at 50 MHz. Application to spaceborne envelope-tracking radiofrequency transmitters

Résumé:
The present work comes in the framework of radiofrequency transmitters aboard telecommunication satellites. It targets the implementation of the Envelope-tracking technique, which aims at improving the trade-off between efficiency and linearity of such transmitters when dealing with modern envelope-modulated signals.

This thesis reports on the design of a dynamic DC/DC converter switching at 50 MHz and compatible with the bus voltages of 50 V or 100 V available on-board. Based on a single Gallium Nitride (GaN) transistor, it demonstrates high efficiency over a power range larger than 50 W, as required by on-board RF power amplifiers.

In addition, it describes a GaN-based pulse-width modulator designed to drive the gate of the switching device with a 50-MHz 10-V_{pp} pulse train. Moreover, it elaborates on a feedback control circuit, designed to constitute, together with the modulator and the converter, a closed-loop-controlled envelope amplifier in order to ensure the accuracy of the voltage supplied to the RF power amplifier according to the tracked modulation envelope.

Finally, it presents an envelope amplifier breadboard assembled and tested to demonstrate the simulated operation and show the first limits of the design.