# UNIVERSITY OF GRENOBLE

**Academic year 2012/2013**

## NOTICE OF DEFENSE

### BURDIN François Tuesday, July 16, 2013 at 10 :00

defense of a doctoral thesis for the University of Grenoble, specialty Nanoelectronics and NanoTechnlologies (NEET) entitled :

**New topologies of power dividers, baluns and phase shifters in RF and millimetre-wave bands, based on microstrip lines and slow-wave coplanar waveguides technologies.**

**Place : Amphi 001, Grenoble INP – Minatec, 3 Parvis Louis Néel, Grenoble**
Thesis prepared in the laboratory IMEP-LAHC supervised by M. Ferrari Philippe and Mrs Podevin Florence.

**ABSTRACT:**

The first purpose of this work was the use of slow-wave coplanar waveguides (S-CPW) to achieve various passive components with the aim to show their great potential and interest at millimetre-waves. Several CMOS or BiCMOS technologies were used: CMOS 65 nm and 28 nm, and BiCMOS 55 nm.
Two baluns, one based on a rat-race topology and the other based on a modified Wilkinson power divider, and a phase inverter, were achieved and measured in a 65 nm CMOS technology. State-ofthe-art results were achieved. A branch-line coupler and an in phase power divider without isolation were designed in a 28 nm CMOS technology. Really good performances are expected for these compact devices being yet under fabrication. Then, a new topology of in phase and isolated power divider was developed, leading to more flexibility and compactness, well suited to millimetre-wave frequencies. Two power dividers with different characteristics were realized in a PCB technology at 2.45 GHz by using microstrip lines, as a proof-of-concept. After that, a power divider was designed at the working frequency of 60 GHz in the 55 nm BiCMOS technology with S-CPWs. The simulation results showed a low loss, full-matched and isolated component, which is also under fabrication and will be characterized as soon as possible. Finally, two new topologies of reflection type phase shifters were presented, one for the RF band and one for the millimetre-wave one. For the one in RF band, the phase shift can reach more than 360° with a great figure-of-merit as compared to the state-ofthe-art. Concerning the phase shifter in the millimetre-wave band, the simulation results show a phase shift of 341° with also a high figure-of-merit.

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