Sujet de thèse : année 2016-2017

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**Title:**

Metrology for advanced energy-saving technology , Power Consumption measurement of systems (wireless devices)

in next-generation electronics applications

**Overview**

The roll-out of 5th Generation (5G) telecommunications across Europe, by the year 2020, and the emergence of the Internet of Things (IoT) with 50 billion connected devices, will strongly increase the energy demand due to the continuous power consumption of the electronic devices needed to deliver these technologies. This project establishes the metrology required for this transformational objective for Europe by providing traceable measurements of power, losses and emerging electronic materials properties. Thus this project will enable European industries to optimise device and systems design for 5G an IoT applications requiring ultra-low power, more energy efficient operation.

**Need:**

The ongoing IoT and the future 5G radio access network will have a fundamental impact on the daily life of all European citizens. Sensors (the cornerstone of IoT) will be found everywhere (car, house, industrial health monitoring, etc.) and 5G communication systems will provide greater connectivity (Machine-to-Machine, high data rates with low latency). The high data-rate aspect of 5G at mmWave frequencies makes the power consumption and thermal issues very challenging in the wireless devices. In H2020, the Information and Communications Technology (ICT) sector is expected to contribute about 2 % of global CO2 emissions instead of 1.3 % in 2007 (Ericsson report, 2010). In this estimation, 20 % of the footprint may be accounted by the personal mobile networks and mobile devices. Phones and tablets will produce the strongest percentage increase in the ICT’s footprint: recent estimations forecast 50 billion devices enhancing the footprint by a factor of 4.

Improvement of energy efficiency of devices and processes are key components for a sustainable development of European products

**Objectives:**

Develop embedded sensors and the associated calibration and measurement techniques to accurately measure power consumption of wireless systems (mobile phones, tablets) and to improve the effectiveness of analog and RF tests of components and systems. For all that, the design and fabricate low cost BiCMOS (ST microelectronics) embedded sensors capable of measuring RF power consumption with high sensitivity and accuracy, up to the millimetre range will be designed, measured and integrated. Then, calibration techniques and systems which be studied in collaboration with the LNE (Laboratoire National de Métrologie et d’Etalonnage) allowing the traceable calibration of silicon embedded power sensors (uncertainty target of 10 µW).