Solution for real power measurement in any high frequency integrated circuit

Researchers from the Spanish National Research Council at the Institute of Microelectronics of Barcelona (IMB-CNM) have recently developed a method that faces the challenge to measure the output real power delivered by a system or electronic device to another one in high frequency applications (RF-radio frequency, microwave, millimeter wave). This spatially-resolved, non-contact, and quantitative approach takes advantage that the device is under normal operation and also allows its analysis for specific electrical and thermal working conditions.

Industrial partners from semiconductor industry, complex electronic designers, and thermographic systems manufacturers and/or distributors are being sought to exploit the existing know-how through a licence or service agreement.

Non-invasive method to determine the real power delivered to the output load by active devices in RF systems

As it is well-known, heat generation is a major issue in any electronic systems or devices, and thermal management strategies trend to mitigate their consequences: efficiency decrease, system failure or breakdown, safety problems in several final applications. However, misbehaviors in electronic systems can lead to critical errors that should be analyzed in debugging stages. In this point, their analysis could be crucial to improving the final design or even detect when different stages are not properly supplied, particularly for high frequency applications, when they are part of more complex systems for signal conditioning, reception or transmission data (e.g., power amplifiers).

The determination of the real power delivered by the device to the output load is particularly difficult when the operating frequency increases. This is the case of RF applications (e.g., mobile phone communications or wifi 802.11), millimeter wave and (TeraHertz) THz frequencies (space communications) when the devices and systems are monolithically integrated being the access at local level or internal nodes highly difficult.

A local, easy-to-implement, and non-invasive solution based on lock-in thermography is used to capture thermal images which are post-processed to obtain temperature information pixel-by-pixel to finally determine how the power is delivered to the load by at least one of the active device, finally determining where the misbehavior occurs.

Fig.1) *Examples of application where high frequency devices are commonly used.*

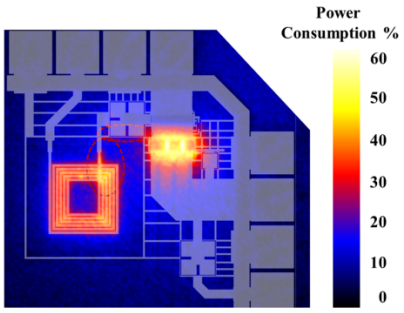

Fig.2) *Non-contact and Quantitative power consumption image of a RF electronic Device. The image has been obtained by an infrared thermography camera.*

Main advantages and applications

- Non-invasive and spatially-resolved electro-thermal technique applicable to any high frequency electronic system under operation.
- Flexible implementation with any other thermal imaging system.
- Quantitative indicator of power consumption, suitable as a quality control tool for design, debug and diagnostics of amplification, conditioning, transmission or reception signals systems useful in several final applications, e.g., mobile phone communications or wifi (802.11).

Patent Status

Priority Patent filed.

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