A Non-intrusive and low-cost approach to extract Figures of Merit in any part of a high-frequency electronic device

CSIC have developed a method to extract figures of merit (FoM) from high-frequency operating-devices (such as both low-noise and power amplifiers or mixers), with a local, non-intrusive, low-cost approach.
Industrial partners from semiconductor industry addressed to telecommunication and radar application sectors (particularly focused on amplifiers and mixer systems developers), as well as thermographic systems manufacturers and/or distributors, are being sought to exploit the existing know-how through a licence or service agreement.

Non-intrusive, local and low-cost method to extract figures of merit in high-frequency operating-devices

In the state-of-the-art, the temperature in the different points of a high-frequency electronic device is determined by an invasive way (i.e. external or internal sensors). The approach proposed bases on the post-processing of thermal images obtained when the device is under working conditions (electrically and thermally) by using a lock-in thermographic system and heterodynally driving the inspected device to down convert high frequency electrical information to a lower frequency thermal field.

In this regard, the developed non-intrusive procedure locally monitors the frequency response of any electrical parameter (i.e., current, voltage or power consumption) in any desired part of the electronic device. Thereby, a better knowledge of their behavior during operating conditions (both electrical and thermal) permits to optimize the design process and verify their fabrication process in a more reliable and robust manner.

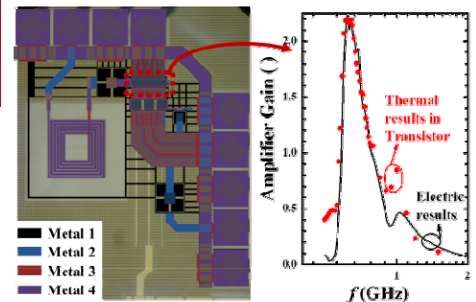

***Fig.1)** Frequency versus power gain of power amplifier*

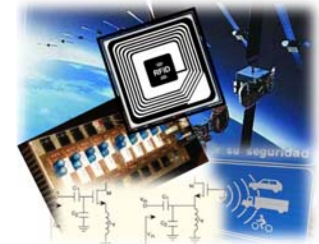

***Fig 2)** Potential applications of the technology*

Main innovations and advantages

- Non-invasive and non-destructive electro-thermal spatial resolved technique (6 microns spatial resolution).
- Local and quantitative monitoring of current, voltage or power consumption of any active or passive component contained within an Integrated Circuit (IC).
- Useful for debugging in complex IC's for RF microwave and millimeter applications.
- Very suitable as quality control system for diagnostics of Radio Frequency, microwave and millimeter wave devices, such as low-noise and power amplifiers or mixers.
- Of easy implementation in any other imaging temperature sensing system such as thermoreflectance, liquid-crystal thermography, among others.
- This method can be extended to power devices design and debugging.

Patent Status

Patent application filed

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