

Contributions to Greener Cellular Networks: From Device Physics to System Level

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FIGURES 1 AND 2

Prize attributed by Huawei Technologies to the “Wireless Circuits – Av” group.

Cellular networks waste huge amounts of energy in their base stations that connect to the surrounding phones and devices, being the power amplifier of each base station the main culprit for such an energy waste. Each of these amplifiers radiates tens or even hundreds of Watt, at the expense of an equivalent amount of power (or more) dissipated as heat, corresponding to an excess operation expenditure supported by the network operators. This fact led the telecommunications’ industry to invest in research for new amplifier architectures and techniques that provide a significant improvement on the overall energy efficiency of cellular network transmitters.

The research group “Wireless Circuits – Av” from the Instituto de Telecomunicações, Aveiro, has been working towards this goal, within a long-term collaboration project with the multinational company Huawei Technologies. The strategy is to first understand the physical behaviors of the core building block of the power amplifier circuit – the transistor – to then model such behaviors through mathematical formulations, enabling highly accurate circuit design level simulations. Moreover, the overall input-output behavior of complete amplifier circuits is also modeled, for an efficient analysis of the amplifier characteristics, from output signal fidelity to energy efficiency. This original holistic strategy of linking knowledge from intrinsic transistor behavior up to the overall amplifier system-level operation has produced relevant contributions to the improvement of cellular base station transmitters. These received the recognition from both our academic peers, through highly reputed publications, and from the industry, namely Huawei Technologies, which, in 2023, attributed to this collaboration the annual prize of “Excellent Technical Cooperation Project”, with the mention: “in Recognition of Outstanding Research Contributions from IT Aveiro”, referring to all the world-wide cooperations the company had in 2022.

