The 48th European Microwave Conference

Duration: 08:30 – 17:50
Room: N109

WM-01
Digital Calibration and Nonlinear Compensation Techniques for MIMO Wireless Transmitters in 5G and Beyond

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Abstract
In the existing cellular base stations, to guarantee linearity, digital predistortion (DPD) is widely used to compensate for the nonlinear distortion generated by RF power amplifiers (PAs). In 5G, particularly in wideband millimetre wave transmitters, the conventional DPD is no longer workable. With increasing demands for higher data rates, the signal bandwidth will continue to increase. At millimetre bands, the modulation signal bandwidths can reach hundreds of MHz or even multi-GHz and the peak to average power ratio of the signal may well exceed 10 dB. This requires not only very high sampling rates for digital signal processing but also sophisticated DPD models to compensate the nonlinearity, that leads to high power consumption and high cost. To increase power efficiency and meet the demands for high capacity, dense networks of base stations will be deployed and transmitters with multiple antennas (e.g., with massive MIMO architectures) and multiple power amplifiers will be used. In these transmitters, the output power of each PA will be significantly reduced compared to that in the existing high power base stations, which leaves limited headroom for digital predistortion in terms of power and cost budget. New digital compensation solutions for linear and nonlinear distortion compensation of ultra-wideband or multi-band 5G systems will be required. In addition, due to multiple antennas and PAs are used in MIMO transceivers, characterization and compensation of coupling effects between the antenna array and the PAs must be addressed.
In this workshop, we will discuss the future trends of 5G wireless transmitters and the related modelling and system design challenges that we are facing in developing digital calibration and nonlinear compensation techniques for such systems. Particular emphasis will be given to MIMO system architectures, digital compensation model selection, feedback loop data acquisition, model extraction algorithms and various system architectures. System characterisation, theoretical analysis, experimental test and hardware/software system implementation issues will be discussed.

Programme

On the Calibration of Multi-Antenna Arrays
Thomas Eriksson[1]
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Prediction and Compensation of PA Linearity and Efficiency in MIMO Scenarios
Filipe M. Barradas[1]
[1]University of Aveiro / Instituto de Telecomunicações

Low Complexity DPD for 5G Massive MIMO
Wenhua Chen[1]
[1]Tsinghua University

Linearization Technique in 5G Massive MIMO Array
Chao Yu[1]
[1]Southeast University

Model Order Reduction Techniques for Digital Predistortion Linearization of NR-5G Amplification Architectures
Pere L. Gilabert[1]
[1]Universitat Politècnica de Catalunya

Re-development of DPD for 5G Wireless Transmitters
Anding Zhu[1]
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Stochastic Modeling to Understand Dirty MIMO Transmitters
Daniel Rönnow[1], Peter Händel[2]
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