University of Stuttgart

Institute of Robust Power Semiconductor Systems

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Research or Master's Thesis

ILH RF-group

Design and Evaluation of a Reduced-Bandwidth Sampling System for Predistorting Broadband Communication Links

Motivation:

Signal linearity in communication systems RF front-ends is strongly influenced by Power Amplifiers. To compensate, PAs have to be limited in their output power (backed-off), to avoid operation in nonlinear amplification regions. This results in a reduction of output power thus the PA's efficiency degrades. Today's most promising linearization method is digital predistortion (DPD). A DPD system requires ADCs for sampling both the PA's input and output signal. ADC sampling bandwidth can be a limiting factor in processing broadband signals because ADC sampling bandwidth typically scales with ADC cost.

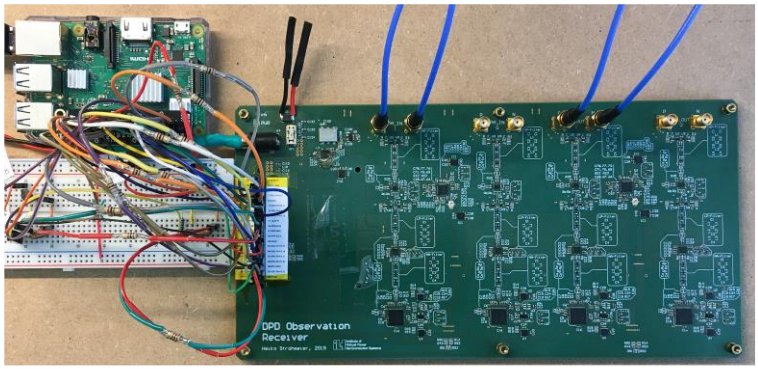

Fig.1 Photo of the observation receiver PCB with a Raspberry Pi for controlling the observation receiver via SPI.

Goals:

Redesign of a developed observation receiver (OR) for sampling a 2.5 GHz signal bandwidth based on COTS components. The OR claims to mitigate the trade-off between broadband and low-cost. The sampling of broadband input signals is achieved by downconverting the signal into multiple narrowband (reduced-bandwidth) frequency windows that are sampled individually by low-cost ADCs. This allows for broadband DP without expensive ADCs.

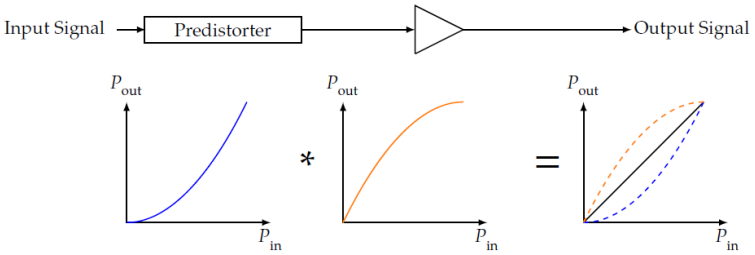

Fig.2 illustrates the predistortion principle.

Your Tasks:

- Evaluate existing concepts using system simulation
- Redesign of the DPD PCB
- Demonstrating the concept in simulation and measurements
- Apply DPD algorithms and test the performance on i.e. E-band amplifiers

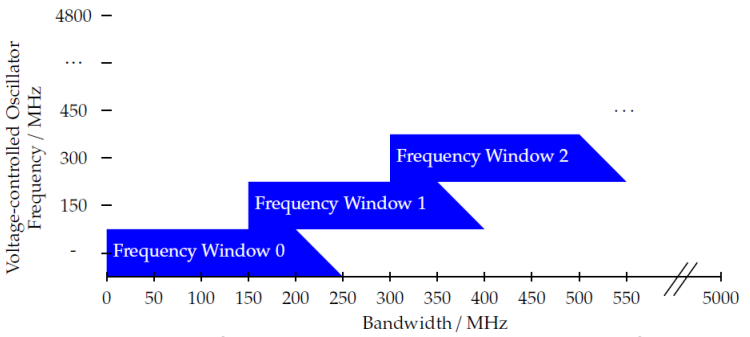

Fig.3 shows the first three observation receivers frequency windows.