

Partitioning Design Approach for the Reliable Design of Highly Efficient RF Power Amplifiers



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(Dr. Kayden Gerlach)

PARTITIONING DESIGN APPROACH FOR THE RELIABLE DESIGN OF HIGHLY EFFICIENT RF POWER AMPLIFIERS



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Kassel University Press Nov 2017, 2017. Taschenbuch. Condition: Neu. Neuware - The modern wireless communication systems require modulated signals with wide modulation bandwidth. This, in turns, requires signals with very high dynamic range and peak-to-average power ratio (PAPR). This means that the amplifier in the base-station has to work at a power back-off as large as the dynamic range of the signal, so that the amplifier has a high linearity in this region. For the standard single-stage amplifiers, this large power back-off reduces the efficiency dramatically. In this work, a three-way Doherty power amplifier (DPA) aiming at high power efficiency within a dynamic range of 9.5 dB, is designed and fabricated using partitioning design approach. The partitioning design approach decomposes a complex design task into small-sized, well-controllable, and verifiable subcircuits. This advanced straight forward method has shown very promising results. Using this design approach, a three-way DPA has been designed to demonstrate the advantages of this reliable design technique as well. Based on the design of a single-stage power amplifier and proposing a novel output power combiner, a 6 W three-way DPA has been designed which allows the mandatory load modulation principle in three-way DPA structures to be realized with simpler elements, whereas the design of a standard Doherty combiner would have been very challenging and not practical due to the extremely small value of its characteristic line impedance. The proposed combiner is calculated for a three-way DPA with 2-mm AlGaN/GaN-HEMTs. The simulation result shows a very good load modulation for the amplifier, which confirms the theoretical expectation for a three-way DPA. The efficiency of the designed 6 W three-way DPA at large back-off shows very promising values compared to recently reported amplifiers. The measured IMD3 products confirm the good linearity of the amplifier as well. Accordingly, the proposed power...



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