Linear Power Amplifier Design for Mobile Communication

As wireless communication systems evolve, the newer systems deliver higher data rate signals using wider bandwidths. To efficiently utilize precious spectrum resources, the systems employ complex modulation schemes which produce signals with large peak-to-average power ratios (PAPR’s). To amplify those signals without any distortion, the power amplifiers are required to be highly linear as well as efficient. To introduce amplifier design techniques for such systems basic design methods for linear amplifiers will be discussed. However, the efficiencies of conventional linear amplifiers are low due to the backed-off operation used to amplify the high PAPR signals. To meet current needs the amplifiers should maintain high efficiencies in low power regions so that they can deliver high efficiencies even for the amplification of signals with large PAPR’s. The most popular technique for base station applications is the Doherty amplifier which will be fully described. This will include basic design concepts as well as advanced design techniques such as multi-way and multi-stage designs. Highly efficient switching/saturated PAs become very important techniques as unit PA elements for advanced transmitters. Such architectures can deliver the required linearity, in some cases with the help of digital pre-distortion (DPD), while preserving the efficiency at low power. Those switching PA design methods and the transmitter architectures are also discussed. The amplifier techniques will cover Class D, E, F, and the saturated amplifier. For advanced architectures, envelope tracking operation, class-S and LINC (linear amplifier with nonlinear components) PA’s will also be introduced.

Bumman Kim – Biography

Bumman Kim is currently POSTECH Fellow and Professor in the Department of Electrical Engineering at POSTECH. He started to work on GaAs MMIC and Microwave power amplifiers at the Central Research Labs. of Texas Instruments Inc. in 1981 and has been in this field since then. He developed the first MMIC at millimeter-wave frequencies and the first power operation of GaAs HBT at microwave frequencies. Recently, he is applying MMIC techniques to power amplifiers for mobile communications. He successfully operated the first fully functional Doherty power amplifiers at microwave frequencies. Such amplifiers have become the most favored ones for base-station applications. Currently, he is heavily involved in envelope tracking techniques, DPD techniques, etc. for base-station applications. He is also expanding such PA technologies to handset applications. He has authored more than 300 papers in international journals and conferences with an additional 200 papers within Korea and has 70 patents registered. Prof. Kim is a Fellow of the IEEE and IET and has served as an AdCom member, IEEE Distinguished Microwave Lecturer and member of MTT Committee 5 (High Power Amplifiers) and 17 (UHF and VHF Technologies).

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