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ADAPTIVE LINEARIZATION SCHEME FOR POWER AMPLIFIERS IN OFDM COMMUNICATION SYSTEMS

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Abstract. *An adaptive linearization scheme based on the exact model-matching (EMM) approach is proposed to compensate nonlinearity of high power amplifiers (HPAs). It is illustrated that the input-output property of the broadband amplifier system can be approximated by a memory polynomial model (MPM). Then, the compensation of HPA input is determined from the MPM in a real-time manner, and consequently, the linearization from the nonlinearity compensator (predistorter) input to the HPA output can be attained even though the nonlinear dynamics of HPA has uncertainty and is time-varying. The effectiveness of the proposed adaptive linearization scheme is validated in numerical simulation in a 64QAM-OFDM communication system.*
Keywords: Adaptive linearization, Predistortion, High power amplifiers (HPAs)

1. **Introduction.** Orthogonal frequency division multiplexing (OFDM) modulation has excellent performance in multi-path communication environments. Therefore, it has been used in wireless LAN, terrestrial digital television in European, Japan [1]. To attain high power in OFDM communication systems, a high power amplifier (HPA) in the transmitter often operates near saturation regions. It implies that the input-output relation of HPA involves nonlinearity, which deteriorates not only the performance of the communication channel itself, but also the adjacent channels due to the out-of-band spectral leakage. Consequently, the OFDM communication system requires linearization of HPA.

The digital predistortion is one widely used method to compensate the distortions caused by HPA, or obtain HPA linearization. The concept of the predistortion method is to generate the input signals to HPA with an inverse HPA model and offer linear amplification at the HPA output. Some ordinary predistortion schemes apply look-up tables (LUT) on low cost electronics [2], but they are restricted to low dimensional mappings and suffer from floor noise due to discontinuity of the table-based mapping. The inverse modeling approach based on Volterra series analysis is proposed for predistortion of the static HPA nonlinearity [3]. Furthermore, learning-based approaches of neural networks have also been utilized to compensate HPA nonlinearity [4, 5]. However, these previous approaches have not considered the dynamics (memory effects) in HPA.