Abstracts

A highly efficient linearized wide-band CDMA handset power amplifier based on predistortion under various bias conditions

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This paper investigates the use of amplifier linearization for performance improvement on a power amplifier developed for a wide-band CDMA (W-CDMA) system. A predistortion technique was chosen due to its compact size, which is suitable to implement in handsets. A predistorter (PD) monolithic-microwave integrated-circuit based on a heterojunction FET (HJFET) was designed and fabricated. Depending on the control voltage, the PD achieves both gain expansion and compression characteristics, which is shown to be important for compensating various amplifier nonlinearities. The power performances of an HJFET amplifier with and without a PD are compared. Due to the variation of the amplifier's responses under high and low quiescent current levels, the PD response required for optimum distortion cancellation in each case is examined. The linearized amplifier demonstrates a state-of-the-art power-added efficiency (PAE) of 57.4% under W-CDMA criteria, resulting from a 5-dB reduction in adjacent channel leakage power ratio. In addition, the use of power control in a W-CDMA system requires amplifiers with good efficiency over a wide range of output power. By combining a bias control scheme with predistortion, it is shown that a high PAE of over 40% can also be achieved for a 20 dB output power range. The improvements achieved are attributed to the alleviation of amplifier's nonlinearities after linearization.

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