

# Nonlinearity Estimation and Spectral Regrowth Prediction of Power Amplifiers using Correlation Techniques

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## Extended Abstract

Nonlinearity estimation and spectral regrowth prediction are crucial to power amplifier linearization. The correlation techniques shown here can estimate amplifier nonlinearity and predict out-of-band power spectrum. In a multi-channel DS-CDMA system, the PA's baseband input signal is the sum of several uncorrelated PN (pseudorandom noise) digital binary sequences  $S_i$  ( $i$  is the channel number). A new binary test signal  $S_{test}$  is created by forming the product of  $S_i$  for several inputs. Both  $S_{test}$  and the output signal  $V_{out}$  are nonlinear functions of the input signal. We have shown that the nonlinearity of the power amplifier can be extracted by the maximal correlation values between  $V_{out}$  and  $S_{test}$ . The calculation of spectral regrowth and power correlation values based on amplifier nonlinearity coefficients is then described. Simulation and measurement show that both the out-of-band power and the maximal power correlation values have very similar dependence on the polynomial coefficients. Thus it is plausible that the correlation values are excellent indicators of the system nonlinearity. The technique is potentially applicable to the measurement of amplifier nonlinearity in real time during amplifier operation.