Adaptive Non-linear Pre-distortion

bc009

The Binary Core Adaptive non-linear pre-distortion core bc009 corrects the time-varying non-linear characteristics of the power amplifier, by means of a polynomial correction. The core thus reduces out-of-band spectral emissions and in-band non-linear noise, by controlling 3rd and 5th order distortion.

Features

- Suitable for digital modulation (QAM, OFDM).
- 3rd and 5th order distortion correction.
- Iterative Minimum Mean Square Error algorithm.
- Complex 3rd and 5th order coefficient estimation and real-time application.
- Selectable iterative algorithm convergence speed.
- Automatic timing recovery on feedback signal.
- Automatic phase recovery on feedback signal.
- Automatic forward power control.
- Logic Elements $\approx 4500$
- $18x18$ Multipliers $\approx 65$

Functional overview

The distortion is evaluated by comparing feedback signal $z$ to the input $x$ (see Figure 1) and by iteratively updating the polynomial complex coefficients for 3rd and 5th
order correction. The DAC sampling frequency, for the feedback signal, must be at least 5 times the nominal bandwidth of the input signal.

In order to compare the feedback signal to forward signal, the first must be synchronized in time and phase. Phase, fixed step delay and fractional delay are estimated before starting the iterative coefficient calculation and are applied on the feedback signal. A fractional step interpolator is provided for high precision timing synchronization. The fractional step interpolator performs also low pass filtering on the feedback signal.

A power control mechanism is provided so that post pre-distortion average power is maintained to the pre-distortion output.

Many different approaches to complex coefficient calculation and update are available, depending on your system characteristics. Resources reduction and optimization are possible on request, based on sampling frequency, system clock, and system characteristics.

![Figure 1: Adaptive non-linear pre-distortion system block diagram](image)