

## **Error reduction of memory polynomial with binomial reduction in digital pre-distortion for wireless communication systems**

### **ABSTRACT**

The inherent character of the Power Amplifier (PA) on its non-linearity causes unwanted amplitude and phase distortions at the PA output signal. Faster information transmission speed together with the rapid changes in temperatures of electrical components incurs Memory Effects, the undesired spreading of the PA output signal. Digital Pre-distortion (DPD) is widely used to linearize the PA in order to reduce Memory Effects and the negative effects of non-linearity. In DPD, the Memory Polynomial Method (MP) is used commonly to model the PA with Memory Effects. To improve the performance of the MP in terms of resource optimization, the basis function of MP is binomially reduced in [4], where the Memory Polynomial with Binomial Reduction method (MPB-imag-2k) is developed. In this paper, MPB-imag-2k is shown to have unsatisfactory error deviation from the ideal output compared to MP. Therefore, MPB-imag-2k from [4] is further improved by increasing the effect of PA non-linearity order in the modeling equation, resulting in MPB. MPB is observed to have lesser error deviation from the ideal output, or lower Normalized Mean Square Error (NMSE) compared to MP and MPB-imag-2k. The simulation is performed using a modeled ZVE-8G Power Amplifier with sampled 4G (LTE) signals. MPB is capable of achieving similar linearizing performances with MPB-imag-2k within PA non-linearity order range of 1 to 4, preamplifier gain (PAG) of 2 to 4, with up to 28dB improvement in NMSE.

**Keyword:** 4G; Digital pre-distortion; Memory polynomial; PA linearization; Power amplifier