# Orthogonal Polynomials Based Complex Gaussian Processes of Nonlinear Power Amplifier for 5G Wireless Communication Systems

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***Abstract*— In this paper, an orthogonal polynomial based complex Gaussian process of nonlinear power amplifier for the filter bank multicarrier modulation (FBMC) systems is proposed. One of the most challenging problems for the FBMC systems is a non-linear distortion caused by a high power amplifier (HPA). Due to the signals for the FBMC communication scenario are modeled as a complex-Gaussian distribution, an analytical expression of the HPA characteristic based on an orthogonal polynomial method by using an upper triangle solution for complex-Gaussian process is derived in this paper. To ensure the robustness of the proposed orthogonal polynomials, the different input distribution such as an exponential and Rayleigh distribution is investigated. In the simulation, a normalized mean squared error (NMSE) and the probability of error performances (BER) in the additive white Gaussian noise (AWGN) channel and the frequency-selective Rayleigh fading channel of the proposed orthogonal polynomial method is determined. Simulation results show that the proposed orthogonal polynomial method significantly outperforms the conventional polynomial method. Furthermore, the proposed orthogonal polynomial based complex-Gaussian input distribution is superior to the exponential, and Rayleigh input distribution in terms of both NMSE and BER performance.**

***Keyword*— Orthogonal Polynomial, Nonlinear Distortion, FBMC, HPA, BER**

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