



## Genetic Algorithm Based Tone-Reservation for PAPR Reduction in Wavelet-OFDM Systems

Esam A. A. Hagra<sup>1</sup>, Sameh A. Fathy<sup>2</sup>, Mohamed S. El-Mahallawy<sup>3</sup>

<sup>1</sup>Technical Research Center, Cairo, Egypt, esamhagra\_2006@yahoo.com

<sup>2</sup>The Higher Institute of Engineering, El-Shorouk Academy, Cairo, Egypt, sameh.fathy.eg@ieee.org

<sup>3</sup>College of Engineering and Technology, AASTMT, Cairo, Egypt, mahallawy@aast.edu

### ABSTRACT

High peak-to-average power ratio (PAPR) is one of the main problems that faces the orthogonal frequency division multiplexing (OFDM) system. Tone reservation (TR) technique is used to reduce this problem without introducing any new distortion. Moreover, TR technique can be used with wavelet-OFDM (WOFDM) system to enhance the PAPR performance, while maintaining most of the advantages of the OFDM system. A TR-WOFDM system that employed genetic algorithm (GA) is proposed in this paper to achieve a high PAPR reduction performance. GA is introduced to TR-WOFDM system to search the optimal positions of reserved tones. A comparative study is done to evaluate the proposed GA-TR-WOFDM system compared to GA-TR-OFDM, TR-WOFDM, and TR-OFDM systems in the sense of CCDF. The systems evaluation shows that the proposed technique outperforms the other studied techniques in achieving better PAPR reduction.

**Keywords:** GA, PAPR, TR, wavelet transform (WT).