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Critical Analysis of PAPR Reduction for Better System Performance

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***Abstract*— Man has an insatiable desire of having more and more. This applies to his needs in communication field as well. Better connectivity and high speed data is becoming the new trend. OFDM is the transmission technique having the potential to support this increasing demand. It is a spectrally efficient version of multicarrier modulation. But the high power peaks of OFDM signal leads to high PAPR. This high PAPR increases BER and degrades the system performance. In this paper, a critical review of various PAPR reduction techniques is given. In this paper, various techniques , for example, clipping-filtering, companding, selective mapping technique are used to reduce the PAPR of simple OFDM signal. A hybrid concept is proposed in which combination of SLM technique and clipping-filtering technique is used to reduce PAPR. The obtained results have shown a significant decrease in PAPR.**

***Index Terms*: Cognitive Radio (CR), Orthogonal Frequency Division Multiplexing (OFDM), Peak to Average Power Ratio (PAPR), Partial Transmit Sequence (PTS), Selective Mapping (SLM)**

I. INTRODUCTION

With each passing day, higher speed data is becoming a common requirement. To supply high speed connectivity, better communication transmission techniques have been utilized. One of these advanced transmission techniques is OFDM, that is, Orthogonal frequency division multiplexing. Today, OFDM is used in many wireless applications, for example, WLAN standards, Wireless Metropolitan Area Networks (WMAN), Digital Video Broadcasting (DVB), 3GPP-LTE, Asymmetric Digital Subscriber Line (ADSL) etc. It is actually a multicarrier modulation technique having lower equalization complexity and better distortion mitigation capacity. OFDM is a transmission technique that divides the available spectrum into subcarriers, with each subcarrier containing a low rate data stream [1]. A large number of closely spaced orthogonal subcarriers are used to carry data. The main idea behind the OFDM is that since low-rate modulations are less sensitive to multipath, the better way is to send a number of low rate streams in parallel than sending one high rate waveform [2]. The orthogonality of the carriers means that each carrier has an integer number of cycles over a symbol period. Due to this integer number of cycles, the spectrum of each carrier has a null at the center frequency of each of the other carriers in the system that results in no interference between the carriers, allowing them to be spaced as close as possible [3]. This overlapping of the subcarriers reduces the required bandwidth and increases the spectral efficiency. Thus, it can be said OFDM increases wireless capacity without increasing bandwidth [4].

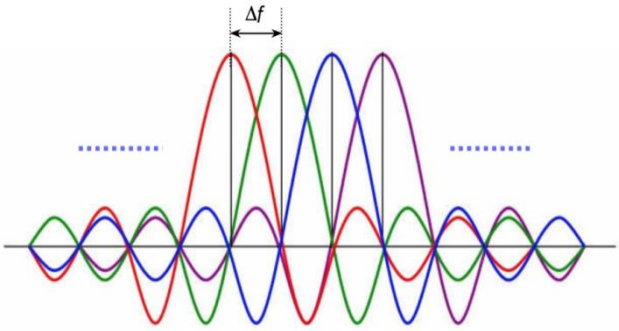

Figure1. Spectra of OFDM symbol

The literature is rich in the study of OFDM and its high PAPR. In [1], the authors have investigated many alternative modulation schemes which are actually variants of OFDM and have shown their potential to replace OFDM for radio systems. Considering their weak points, an improved FBMC/OQAM concept is proposed, which has proved to be able to maximize the benefits. In [2], the authors described CR systems and their requirements to have a flexible physical layer. The authors have investigated orthogonal frequency division multiplexing (OFDM) technique as a candidate transmission technology for CR. OFDM-based CR system block diagram is given and interaction among different layers is also discussed. Various challenges that arise from employing OFDM in CR systems are identified. The cognitive properties of some OFDM-based wireless standards are also discussed in this paper. In [3], the authors have presented a descriptive survey on OFDM for wireless communications with an intention to cover almost every aspect. The authors mentioned OFDM as a special form of multicarrier modulation (MCM) and gave a basic description of OFDM along with its use to deal with impairments in wireless systems, including channel estimation, timing-offset and frequency-offset estimation, ICI mitigation, and PAPR reduction. The authors also introduced related modulation and access schemes. The authors also summarized the MIMO techniques for OFDM and the wireless applications of OFDM. In [7], the authors have

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