Companding and clipped filtering based Hybrid Technique for PAPR reduction of FBMC-OQAM

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Abstract— **For transmitting QAM signals, a sensor subcarrier - quadrature amplitude modulated (FBMC-QAM) system using two sample filters is presented. Filtration for even post symbols and odd-numbered sub-carrier symbols is done separately in the proposed transmitter. Multicarrier transmission, which sends data over the channel in several frequency subcarriers at a lower data rate, has become popular in this situation.**
A potential waveform for 5G is the filter bank multicarrier system, which is an efficient multicarrier system. FBMC has a high Highest point Power Ratio (PAPR), similar to OFDM and other multicarrier systems, which necessitates the use of high-power amplification with a wide dynamic range. Precoding methods are employed to reduce PAPR at the cost of BER performance loss. A unique application of A-law and Mu-law companding methods for PAPR reduction of the FBMC-OQAM method is proposed in this work. Utilizing A-law and Mu-law companding algorithms, the paper also analyses the tradeoff between Parameter estimation and FBMC-OQAM Bit error efficiency. The PAPR of the system has decreased significantly as a result of the simulated results, but the BER has increased. Both companding strategies yielded mixed results, with Mu-law companding marginally outperforming A-law companding in terms of PAPR reduction. However, A-law companding has a higher BER than Mu-law companding.

Index Terms—High Power Amplifier (HPA), Filter Bank Multicarrier (FBMC), Bit Error Rate (BER), Peak to Average Power Ratio (PAPR)

I. INTRODUCTION

Despite the fact that wireless transmission and related technologies are thought to be nearing the end of their life cycles, the need for new technologies and better throughputs continues to grow. They are now extensively linked to the majority of infrastructural facilities and are inextricably linked to daily operations. Many interdisciplinary applications and cross-functionalities have been added to services and operations. Despite the fact that the last enormous boom has passed, experts and programmers are still searching for new technologies to better the present systems that have evolved through generations.
Mobile phones are no longer just devices for private contact. They've evolved into portable intelligent computers that can run multimedia apps and perform functions that can be controlled remotely. Communication capability is one of its features, albeit it is a required infrastructural resource.
Thru the network connection, several stationary and mobile devices are connected to systems in concurrently. These will be even more efficient, user-friendly, complex, and intelligent than they are now. They will be able to meet these demands by acquiring and/or utilising remote resources with the help of wireless communication. These resources are in high demand, and may include cloud-based computing and intelligence, as well as storing. In remote centralised or distributed systems, certain jobs can be processed much more quickly and intelligently.
Orthogonal Frequency Division Multiplexing (OFDM) [2] is a prominent multicarrier system that is utilised in Digital Audio Broadcast (DAB), Digital Video Broadcast (DVB), and other applications. OFDM is a spectrally efficient method that reduces ISI by using a cyclic prefix (CP). At the same hand, based on its height, this CP reduces spectral efficiency. Filter bank trade marks, a new multicarrier system, successfully overcomes this flaw (FBMC). The system can have strong stopband attenuate in an FBMC system cos of subcarrier filters, which limit frequency leaking between the subchannels and allow the prototype filtering ordering to be large. Sub channel filters can simplify equalisation at the receiver and eliminate the need for CP [3].
Because OFDM struggles from either a high peak to average power ratio (PAPR) due to the non of actual HPAs used to magnify the message data, FBMC suffers from the same problem, hence lowering the PAPR is the major requirement for achieving large data rates. Because of the high PAPR, high dynamic range amplifiers and ADC/DACs are used [1]. High PAPR is the primary issue in all multicarrier systems because it distorts the signal, resulting in poor BER efficiency
PTS [4], coding methods selection projection (SLM) [4], phase optimization, tone injection (TI), companding [5], tone reserve (TR), clipping and filtering, and active constellations elongation are some of the PAPR reduction strategies utilised in OFDM (ACE).
The simplest way to use is clipping and filtering [5]. Peaks that surpass the threshold value are clipped and then filtered to keep the peak value low. PTS and SLM are probabilistic algorithms that weight signal subcarriers with phase factors before transmitting signals with low PAPR [6][12]. Both of these strategies require the transmission of side information in addition to the signal, lowering the spectral efficiency. Because of their simplicity and flexibility, companding methods are commonly utilised for PAPR reduction [7].

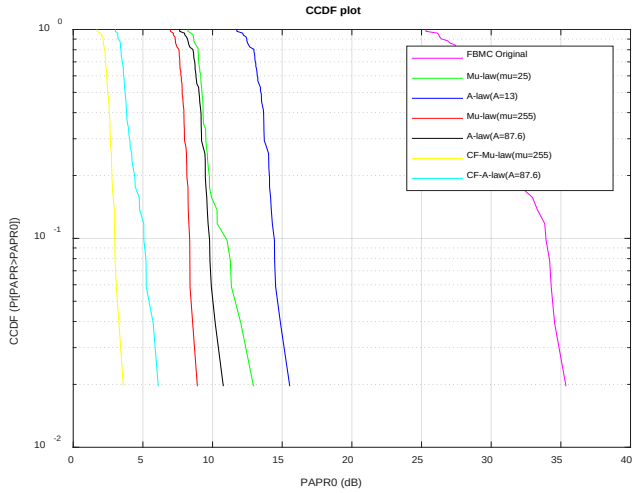

Figure 11: CCDF Plot

Figure 9 shows Figure 10 shows BER Plot in AWGN Channel and Figure 11 shows CCDF Plot for the FBMC-OQAM Prototype Filter. The BER of combined signals has increased dramatically. The BER of A-law companding is slightly higher than Mu-law companding.

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This work proposes a novel application of Mu-law and A-law companding techniques to reduce PAPR in the FBMCOQAM system. Companding strategies are effective at lowering PAPR, but they have a negative impact on overall system performance. The simulation findings show that when companding is used, the PAPR decreases significantly, albeit at the cost of a high BER. The lower the PAPR, the higher the system's BER will be.

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