ijecs open access www.ijecs.in
International Journal Of Engineering And Computer Science ISSN: 2319-7242
Volume 4 Issue 8 Aug 2015, Page No. 13772-13776

Papr Reduction In Ofdm System By Using Clipping And Filtering And Weighted Method

S. Murali Krishna[1] R. Sudheer Babu[2]

Department Of Ece[1] Assistant Professort[2]

G.Pulla Reddy Engineering College (Autonomous), Kurnool, A.P., India

Abstract: In this paper, a peak-to-average-ratio (PAPR) reduction scheme supported a weighted orthogonal frequency-division multiplexing (OFDM) signal is projected to cut back the PAPR while not distortion in removing the burden at the receiver aspect. within the projected theme, a weight is obligatory on every separate OFDM signal via a definite reasonably a band limited signal, associate degreed an OFDM signal fashioned with the weighted separate data is then thought of before a high power electronic equipment (HPA), whereas the original signal are often recovered fully at the receiver aspect. Meanwhile, the time period required to transmit the weighted OFDM signal is that the same because the time period for the first OFDM signal. The performance of the proposed scheme is estimated with Mat lab Simulator. With respect to the theoretical analysis, the weighted OFDM signal PAPR is smaller than that of the clipping and filtering (C&F) methodology, and also the bit-error-rate (BER) performance of the weighted OFDM system is improved compared with the C&F methodology. Here, the projected methodology is easier than the C&F method.

I. INTRODUCTION

Orthogonal frequency-division multiplexing (OFDM) can be a transmission technique that modulates multiple carriers at constant time. That transmitted multiple carriers can be demodulated orthogonally, on condition that correct time windowing is used at the receiver. So the OFDM-based system consists high spectral efficiency and is powerful against inter symbol interference and frequency-selective attenuation channels, it is widely chosen for broadcasting of European digital audio/video and wireless local/ metropolitan area network standards, and now, it\'s utilized in most broadband wireless communication systems. However, one altogether the key problems with OFDM-based systems is the high peak-to-average-power magnitude relation (PAPR) of a transmitted signal, which causes a distortion of an emblem at the nonlinear high-energy amplifier (HPA) of a transmitter. So, the ability efficiency of the HPA is must be avoid nonlinear distortion; or else, the high PAPR finishes up in necessary performance degradation. owing to the practical importance of this disadvantage, style of algorithms for reducing the high PAPR ar developed, like clipping and filtering (C&F) [1]–[3]; secret writing [4]–[7]; In this paper, a PAPR reduction theme supported a weighted OFDM signal is planned to chop back the PAPR whereas not distortion in removing the weight at the receiver facet. This technique is driven by a circular convolution method, i.e., the modulated OFDM signal is convoluted with an exact quite signal Φ for smoothing the height of the OFDMsignal before the HPA. Here, we decide the signal to satisfy that the Fourier rework ϕ of Φ has no zero on the important line. The convoluted signal will be written as an easy weighted OFDM signal. When the distinct dataN−1k=0is given, we tend to think about weighted knowledgeN−1k=0and kind Associate in Nursing OFDM signal with this weighted distinct data. Then, this weighted OFDM signal is that the same because the given convoluted signal.Since weightϕis heterogeneous, the bit-error-rate (BER) performance could be degraded. The PAPR of the weighted OFDM signal with the modified weight is smaller than that of the C&F technique, and the BER performance is improved compared with the C&F technique. The effectiveness of the planned theme is evaluated with pcsimulations.In this weighted OFDM technique with changed weight, the time duration required to transmit the weighted OFDM signal is that the same as the time length for the initial OFDM signal. Moreover, the initial discrete knowledge will be recovered fully at the receiver facet with additional 2Ncomplex multiplications of machine complexness without additional value in transmission. The weighted OFDM theme was introduced in [17], where the

Gaussian perform, {sine|sin|trigonometric perform circular function} function, and a few alternative functions were used as weighted functions. In [17], once the noise isn\'t gift, thePAPR of the weighted OFDM system with mathematician weight is reduced remarkably. As mentioned within the conclusion, however, the noise wasn't additionally thought of for BER performance. If the additive mathematician noise is taken into account, the BER performance of the weighted OFDMsystem with mathematician weight is going to be even degraded. during this paper, we suggest the weighted OFDM system with changed weight to enhance the BER performance, and that we additionally offer the condition for a perform to be a weight perform and a mathematical reason for the benefit of the weighted OFDM system derived from a circular convolution system.

II.SCHEMATIC ILLUSTRATION

Orthogonal multicarrier modulation is Associate in nursing economical methodology of information transmission over channels with frequency-selective weakening. This method includes a comparatively straightforward implementation supported the inverse fast Fourier remodel (IFFT). The simplified block diagrams for Associate in Nursing OFDM system with the convolution theme and also the projected weighted theme as shown in Fig. 1. As delineated in Fig. 1(a), the modulated information stream is carried on the multicarriers by the IFFT, and also the convolution block reduces the PAPR of signal, that is love the load block of the proposed theme, as shown in Fig. 1(b). within the following block, the cyclic prefix is another before the HPA For a discrete data $\{a_k\}_{k=0}^{N-1}$ multicarrier modulated signal $x_N(t)$ on [0,NT] is represented by

$$x_N^{(t)} = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} a_k e^{j2\pi f_{kt}} \quad (1)$$

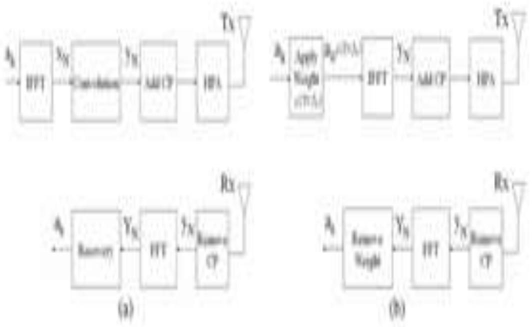

Fig. 1. Simplified block diagrams for an OFDM system with (a) convolution scheme and (b) proposed weighting scheme.

Where N is the number of subcarriers, T is the original symbol period, $\Delta f = 1/NT$ and $f_k = k\Delta f,\ k = 0, \ldots, N-1$. The PAPR of x_N over the time interval [0,NT] is defined by

$$APR(x_N) = \frac{max0 \le t \le N_T |x_N(t)|^2}{E(|x_N(t)|2)} \quad (2)$$

Where E(·)denotes the expectation operator.

III.A WEIGHTED OFDM SYSTEM

First, we consider the convolution method and then derive the corresponding weighted OFDM signal

A. Convolution Method

The Fourier transform

$$f|f|(\xi) = \int f(x) e^{-j\xi x}\, dx \quad (3)$$

If the integral exists. The inverse Fourier transform $f^{-1}[F]$ of f defined by

$$f^{-1}[F](x) = \frac{1}{2\pi} \int F(\xi)\, e^{j\xi x} dx \quad (4)$$

Provided that the integral exists. Then $f^{-1}[F](f) = f$, when f and F[f] are integrable, and

$$F\big[f[f]\big] = 2\pi f \quad (5)$$

whereˇ

f(x)=f(−x).

We consider signal ϕ as

$$\varphi(x) = \frac{1 - sinc(x)}{\pi^2 x^2} \quad (6)$$

Where

$$sinc\ x = \begin{cases} \frac{sin\pi x}{\pi x}, & x \ne 0 \\ 1, & x = 0 \end{cases}$$

By direct computation, the Fourier transform Φ:=F[ϕ]of ϕ is given by

$$\varphi(\xi) = \begin{cases} \frac{1}{2} \left(1 - \frac{|\xi|}{\pi}\right)^2, & |\xi| \le \pi \\ 0, & otherwise \end{cases}$$

The signal is a band limited signal with band width π, has no zero on the real line, and

$$\varphi = \varphi \quad (7)$$

For more information about ϕ, see the Appendix at the end of this paper. Consider the circular convoluted signal as follows:

DOI: 10.18535/ijecs/v4i8.26

$$y_N = \frac{1}{2\pi} x_N * \varphi(t) = \int_{-\pi}^{\pi} x_N(t-\xi)\phi(\xi)\, dx \qquad (8)$$

Taking the Fourier transform in (8), we have by (5) and (7) that

$$F|y_N| = \frac{1}{2\pi} F|x_N|f|\phi| = F[x_N]\varphi \qquad (9)$$

Where

$$a_k = \frac{\sqrt{N}\;\; F[x_N](2\pi f_k)}{2\pi} = \frac{\sqrt{N}\;\; F[x_N](2\pi f_k)}{2\pi\varphi(2\pi f_k)} \qquad (10)$$

B. Weighted OFDM System

We show that the convoluted signal in (8) can be written as a simple weighted OFDM signal in. Observing by (5), (7) and (8) that

$$\int_{-\pi}^{\pi} e^{j2\pi f_k (t-\xi)\phi(\xi)}\, d\xi = 2\pi\phi(2\pi f_k) e^{j2\pi f_k t}$$

$$y_N(t) = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} a_k \varphi(2\pi f_k)\, e^{j2\pi f_k t} \qquad 0 \le t \le Nt \; (11)$$

the convoluted signal in (8) can be expressed as the following weighted OFDM signal:

$$\varphi_\alpha^{(x)} = \varphi(x) + \frac{\alpha}{\log N} \qquad (12)$$

C. Weighted OFDM System With Modified Weight

The demerit of the weighted OFDM signal in (11) is the degradation of BER performance since the weightϕis nonuniform. To overcome this obstacle, we consider the modified weight with a positive constant α as follows:

$$z_N(t) = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} a_k \varphi(2\pi f_k)\, e^{j2\pi f_k t} \qquad 0 \le t \le NT \quad (13)$$

whereαis a shift parameter, and logN obtained by experiment. Then,ϕ=ϕ0. In the weighted OFDM signal in (11), we replace weight ϕ with ϕα for a suitable positive constantαto get the weighted OFDM signal, i.e.,

$$z_N(t) = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} a_k \varphi(2\pi f_k)\, e^{j2\pi f_k t} \qquad 0 \le t \le NT$$

as a transmitted signal instead of xN in (1)

The PAPR of the weighted OFDM signalzNis given by

$$PAPR(z_N) = \frac{max0{\le}t{\le}N_T|z_N(t)|2}{E(z_N(t)^2)} \qquad (14)$$

In the following, we provide the simulation results showing that the PAPR of the weighted OFDM signal with modified weight ϕαis smaller than that of the C&F method (see Fig. 2), and the BER performance of the weighted OFDM system with modified weightϕαis improved compared with the C&F method (Fig. 3). We note that as increases, due to the modification of weight, the BER performances improved, whereas the complementary cumulative distribution function (CCDF) grows slightly. In (13), we can recover discrete data {ak ϕα (2πfk)}N−1k=0 by the conventional method of the OFDM system. Since by dividing the given discrete data by (2πfk) we can obtain the original discrete data, the weighted OFDM system is not expected to cause any computational complexity in recovering the original discrete data. In fact, 2Ncomplex multiplications are additionally needed compared with the original OFDM method. We note that a sufficient condition for a signal˜ ϕto be a proper weight is that˜ ϕ(2πfk)=0foranyk=0,...,N−1. We expect that the performance of the weighted OFDM system corresponding to ˜ depends on the smoothness of the Fourier transform of˜ ϕ.

IV. SIMULATIONRESULTS

The performance of this proposed scheme is analyzed through the simulations. In the simulations, 10^3quadratic-phase-shift-keying (QPSK)-modulated OFDM symbols were randomly generated. It is shown that the PAPR of this weighted OFDM method is smaller than that of the C&F method, and the BER performance is improved compared with the C&F method.

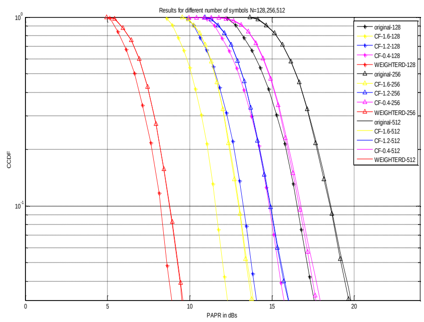

Figure 4.1: Results for different number of symbols N=128,256,512

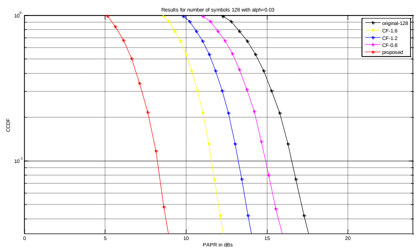

Figure 4.2: N=128, alpha=0.03

DOI: 10.18535/ijecs/v4i8.26

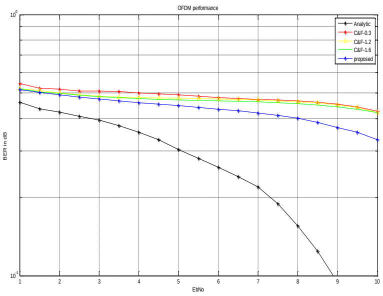

Figure 4.3: Ofdm performance in terms of BER

CONCLUSION

A PAPR reduction theme supported a weighted OFDM signal has been projected to cut back the PAPR while not information distortion in removing the burden at the receiver facet within the mathematical read. To reduce the height of the OFDM signal, a band limited signal ϕ, which is not zero on the set N−1k=0, is introduced, and that we kind weight ϕα=ϕ+α/logN for an acceptable positive constant α. we tend to contemplate a weighted separate information to make a weighted OFDM signal, before the HPA, wherever the weights area unit obligatory by mistreatment signal ϕα It is shown that the PAPR of this weighted OFDM methodology is smaller than that of the C&F methodology, and also the performance of BER also improved compared with the C& amp; F methodology Which is outlined on an equivalent interval because the original OFDM signal, before the HPA, wherever the weights area unit obligatory by mistreatment signals ϕα? It is shown that the PAPR of this weighted OFDM methodology is smaller than that of the C&F methodology, and also the performance of BER also improved compared with the C& amp; F methodology.

REFERENCES

[1] X. Li and L. J. Cimini, Jr., "Effects of clipping and filtering on the performance of OFDM,"IEEE Commun. Lett. vol. 2, no. 5, pp. 131–133,May 1998.

[2] J. Armstrong, "Peak-to-average power reduction for OFDM by repeated clipping and frequency domain filters,"Electron. Lett. vol. 38, no. 5,pp. 246–247, Feb. 2002.

[3] Y.-C. Wang and Z.-Q. Luo, "Optimized iterative clipping and filtering forPAPR reduction of OFDM signals,"IEEE Trans. Commun., vol. 59, no. 1,pp. 33–37, Jan. 2011.

[4] X. Li and J. A. Ritcey, "M-sequences for OFDM peak-to-average power ratio reduction ''.

[5] V. Tarokh and H. Jafarkhani, "On the computation and reduction ofthe peak-to-average power ratio in multicarrier communications," IEEETrans. Commun., vol. 48, no. 1, pp. 37–44, Jan. 2000.

[6] J. A. Davis and J. Jedwab, "Peak-to-mean power control in OFDM,Golay complementary sequences, and reed-muller codes,"IEEE Trans.Inf. Theory, vol. 45, no. 7, pp. 2397–2417, Nov. 1999.

[7] K. G. Paterson and V. Tarokh, "On the existence and construction of goodcodes with low peak-to-average power ratios,"IEEE Trans. Inf. Theory,vol. 46, no. 6, pp. 1974–1987, Sep. 2000.

[8] R. W. Bauml, R. F. H. Fischer, and J. B. Huber, "Reducing the peakto-average power ratio of multicarrier modulation by selected mapping,"Electron. Lett., vol. 32, no. 22, pp. 2056–2057, Oct. 1996.

[9] S. H. Muller and H. B. Huber, "OFDM with reduced peak-to-mean powerratio by optimum combination of partial transmit sequences," Electron.Lett., vol. 33, no. 5, pp. 368–369, Feb. 1997

[10] A. D. S. Jayalath and C. Tellambura, "Reducing the peak-to-average power ratio of orthogonal frequency division multiplexing signal through bit or symbol interleaving,"Electron. Lett., vol. 36, no. 13, pp. 1161–1163, Jun. 2000.

[11] J. Tellado, "Peak to average power reduction for multicarrier modulation,"Ph.D. dissertation, Stanford Univ., Stanford, CA, Sep. 1999.

[12] S. Yoo, S. Yoon, S. Y. Kim, and I. Song, "A novel PAPR reduction scheme for OFDM systems: Selective mapping of partial tones (SMOPT),"IEEETrans. Consum. Electron., vol. 52, no. 1, pp. 40–43, Feb. 2006.

[13] B. S. Korngold and D. L. Jones, "PAR reduction in OFDM via active constellation extension,"IEEE Trans. Broadcast., vol. 49, no. 3, pp. 258–268, Sep. 2003

[14] X. Huang, J. Lu, J. Zheng, K. B. Letaief, and J. Gu, "Compandingtransform for reduction in peak-to-average power ratio of OFDM signals,"IEEE Trans. Wireless Comuun., vol. 3, no. 6, pp. 2030–2039,Nov. 2004

[15] T. Jiang, Y. Yang, and Y. H. Song, "Exponential companding technique for PAPR reduction in OFDM systems,"IEEE Trans. Broadcast., vol. 51,no. 2, pp. 244–248, Jun. 2005.

DOI: 10.18535/ijecs/v4i8.26

[16] X. Wang, T. T. Tjhung, and Y. Wu, “On the SER and spectral analyses of A-law companded multicarrier modulation,”IEEE Trans. Veh. Technol.,vol. 52, no. 5, pp. 1408–1412, Sep. 2003.

[17] H. Nikookar and R. Prasad, “Weighted OFDM for wireless multipathchannels,”IEICE Trans. Commun., vol. E83B, no. 8, pp. 1864–1872,Aug. 2000.

[18] G. B. Folland,Real Analysis. Hoboken, NJ: Wiley-Interscience, 1999.