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Locate Agent Phase (LAP): A Selected Mapping Technique without Any Side Information, To Reduce PAPR of QPSK Modulated OFDM

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***Abstract*: A standout amongst real challenges of the orthogonal frequency division multiplexing (OFDM) system is high peak to average power ratio (PAPR) which causes the execution debasement because of distortion in the high power amplifier. Diverse strategy were presented for PAPR reduction but Selected mapping (SLM) is one of the significant method to lessen the PAPR in OFDM system .However the constraint of SLM is the need of transmit side information. In this paper we have proposed a new procedure, Locate Agent Phase (LAP), that permit us to reduce the PAPR of OFDM system based on SLM procedure without transmitting any side information and creating any distortion.**

Keywords:* *OFDM, PAPR, QPSK, SLM

I. INTRODUCTION

OFDM is one of most demandable plans for transmission process in present day communication system. It is a multi-carrier modulation technique that has demonstrated colossal potential for rapid remote communication system. By transmitting the signal all the while over different channels, one can enhance the heartiness of the communication system. Since the individual channel transfer speed is much littler than the system data transmission, the channel attributes are for all intents and purposes level, despite the fact that they may not be level over the system data transmission. Unfortunately, OFDM has a major issue of a high peak to average power ratio (PAPR) when various modulated subcarriers are included with the same stage. The high PAPR acquires on signal distortion in the nonlinear locale of high power amplifier (HPA) and corruption of bit error rate (BER) execution. Along these lines, it is essential to reduce the PAPR in the OFDM communication system. There are different techniques for reducing the PAPR [1].These are broadly examined and numerous diminishment procedures have been proposed for multicarrier system. These technique can be sorted into the accompanying, clipping and filtering [1], coding [2], phasing [3], scrambling[4], interleaving [5], and companding [6].

Clipping method is to cut the top over a specific level. The section system can without much of a stretch diminish PAPR. Be that as it may, the BER execution turns out to be more regrettable because of numerous absconded signals [7].Block coding is another technique for PAPR decrease. This method can reduce the PAPR internal 3 dB without any signal distortion. Nonetheless, the code rate turns out to be low and in addition the transfer speed productivity [7].

SLM [8-12] might be arranged into the stage control plan to get away from the high peak. One signal of the least PAPR is chosen in an arrangement of a few signals containing the same data information. Both procedures require much framework multifaceted nature and computational weight by utilizing many IFFT block. However, this is extremely flexible scheme and has a successful execution of the PAPR diminishment without any signal distortion. Different dummy sequences are incorporated into the same input data, and, a while later IFFT, the signal has a minimum PAPR is chosen for output signal [2]. In this paper, we propose and analyze a system for reducing high PAPR, in view of part of a strategy proposed in [7] and [8].We take QPSK modulated inputs to generate OFDM signal and there is no side information required for detecting the data at the receiver. The proposed algorithm is easy to actualize and preserves the great PAPR reduction capability of the original SLM method.

II. CONVENTIONAL SCHEME

A. *Review of OFDM and SLM*

An OFDM signal $o(n)$ is represented as

$$o(n) = \frac{1}{N}\sum_{k=1}^{N} M(k) e^{2j\pi\frac{(n-1)(k-1)}{N}} ; N \geq n \geq 1 \qquad (1)$$

Where N is the number of subcarriers, $M(k)$ the frequency domain of OFDM signal and k is the subcarrier index.

The PAPR of the OFDM signal is expressed as

$$papr = \frac{\max\left[o(n)\times o^*(n)\right]}{E\left[o(n)\times o^*(n)\right]} \qquad (2)$$

Fig.1 demonstrates the conventional SLM scheme. In the SLM technique, they make different data blocks with the same data and chooses the most good for transmission. Additionally, when they take this equation, transmitted side information is essential. This procedure cuts down the data rate and losing of side information obliterates the entire data. The proposed LAP system tackle these issues. This is one sort of blind SLM technique and has been discussed about in [11] and [12] by capitalizing on the finite alphabet nature of the information star grouping.

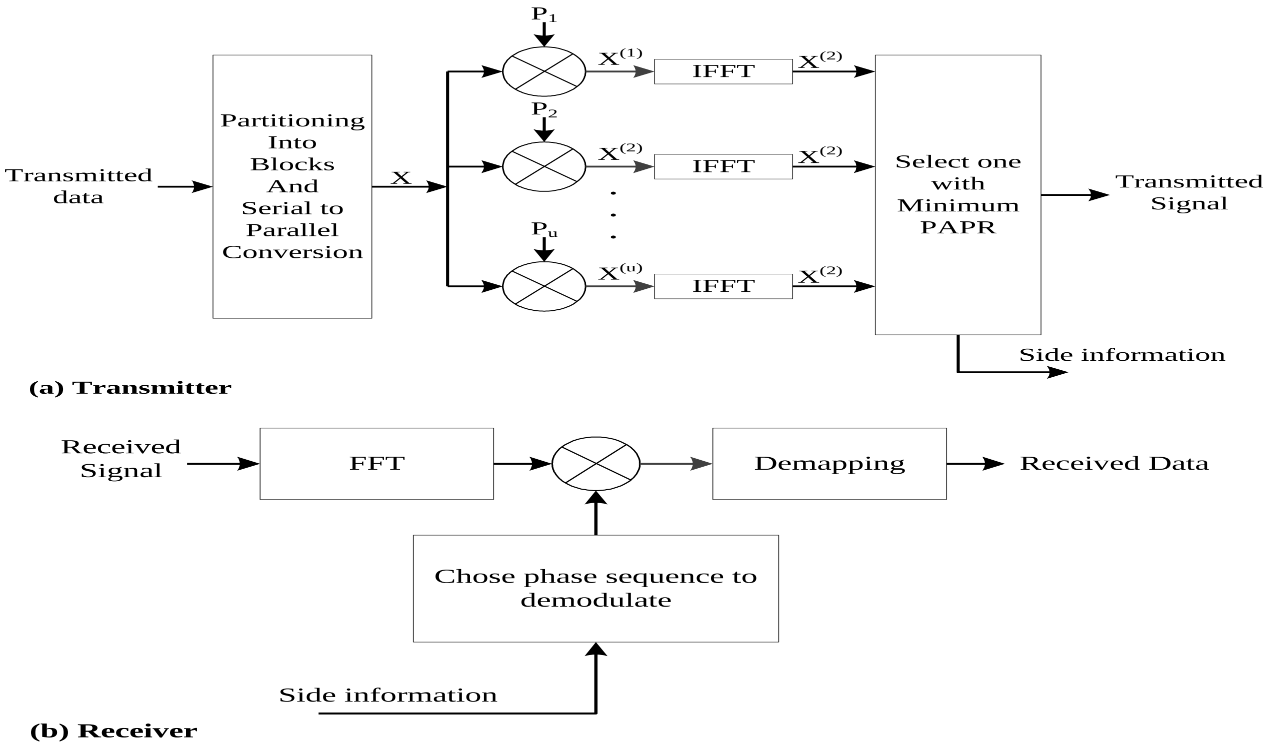

Fig. 1 Conventional SLM with side information

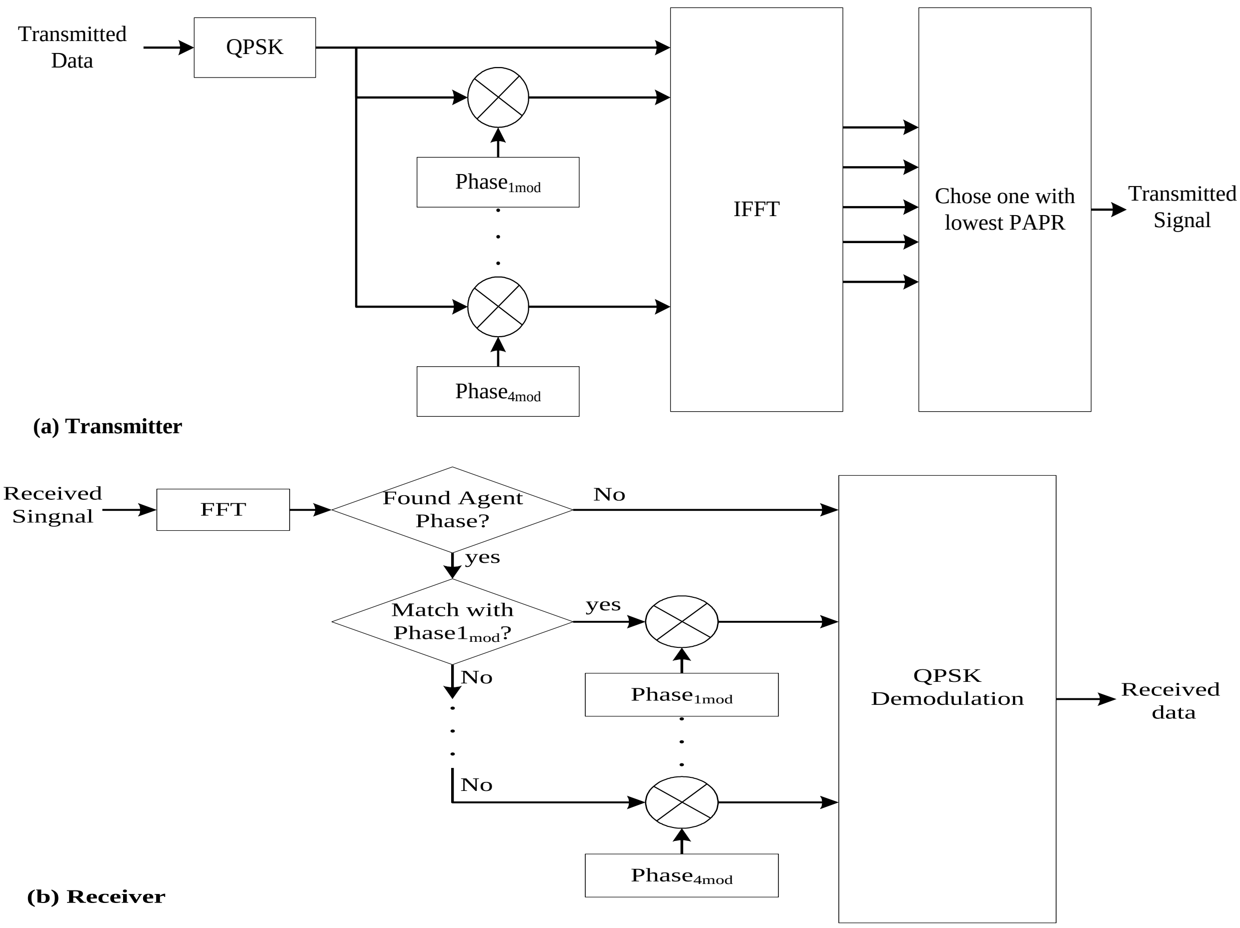

Fig. 2 Proposed SLM Model

In [10], blind SLM was carried out in conjunction with pilot symbol assisted with the modulation in OFDM. Our proposed method works on any QPSK modulated sequences. It is less complexes than the strategy in [11] and [12] and beats the blind SLM algorithm proposed in [10].We change the amplitude of the PSK modulated data which increase the signal power and LAP overcomes this issue.

III. PROPOSED SCHEME

A. *Locate Agent Phase*

Fig. 2 shows the proposed Locate Agent Phase (LAP) scheme.In LAP we use most popular and important modulation techniques QPSK, where we create different data block which represent the same information and transit the one with lowest PAPR. Here each phase sequence is different from each other. Those Phase sequences create Agent phases. The agent phase is the phase which is not present in conventional QPSK. At the receiver we detect the used phase sequence by determining the location of the Agent Phase. To make a signal's phase an agent phase we need to multiply the signal with $\Delta_m = e^{(j\times 45^0)}$

For example when we have N=8 subcarriers we have our phase sequences:

$$Phase1_{\mathrm{mod}} = \begin{cases} \Delta_m, \frac{N}{4} \\ -\Delta_m, \frac{N}{2}+1 \\ 1, Otherwise \end{cases} \quad (3)$$

$$Phase2_{\mathrm{mod}} = \begin{cases} -\Delta_m, \frac{N}{8} \\ -\Delta_m, \frac{3N}{4} \\ 1, Otherwise \end{cases} \quad (4)$$

$$Phase3_{\mathrm{mod}} = \begin{cases} \Delta_m, \frac{3N}{8} \\ -\Delta_m, \frac{N}{2} \\ 1, Otherwise \end{cases} \quad (5)$$

$$Phase4_{\mathrm{mod}} = \begin{cases} -\Delta_m, \frac{7N}{8} \\ \Delta_m, N \\ 1, Otherwise \end{cases} \quad (6)$$

At the receiver after determining the used phase sequence for modulation, we revert the signal to its original phase by multiplying it with $\Delta_d = e^{(-j\times 45^0)}$ in the appropriate positions. The phase sequences used for this process are:

$$Phase1_{demod} = \begin{cases} \Delta_d, \frac{N}{4} \\ -\Delta_d, \frac{N}{2}+1 \\ 1, Otherwise \end{cases} \quad (7)$$

$$Phase2_{demod} = \begin{cases} -\Delta_d, \frac{N}{8} \\ -\Delta_d, \frac{3N}{4} \\ 1, Otherwise \end{cases} \quad (8)$$

$$Phase3_{demod} = \begin{cases} \Delta_d, \frac{3N}{8} \\ -\Delta_d, \frac{N}{2} \\ 1, Otherwise \end{cases} \quad (9)$$

$$Phase4_{demod} = \begin{cases} -\Delta_d, \frac{7N}{8} \\ \Delta_d, N \\ 1, Otherwise \end{cases}$$

(10)

Fig. 2 shows the proposed scheme. For higher N number we just repeat this phase sequence of 8 Subcarrier.

IV. PERFORMANCE EVALUATION AND RESULT

To visualize our scheme we use MATLAB simulation tool and to show our PAPR reduction capability we use complementary cumulative distribution function distribution function (CCDF) graph [7] which signifies the likelihood of a data block surpasses a given threshold. We use 64 subcarriers, 640000 data and QPSK modulation technique. We multiply it with 4 phase sequences and bring one with most minimal PAPR. Fig.3 demonstrates the PAPR lessening capability of LAP compared with the conventional OFDM.

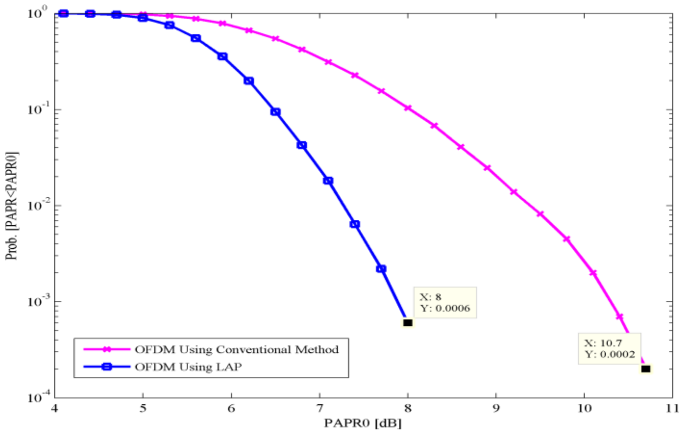

Fig. 3 CCDF curve of conventional OFDM vs. OFDM using LAP

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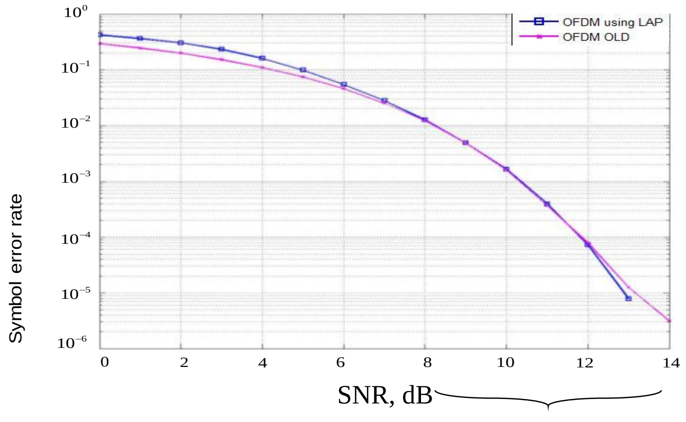

Fig. 4 Symbol error rate

Here we can see that the PAPR probability curve of conventional OFDM reaches 10.7dB whereas OFDM using LAP techniques highest PAPR is 8dB. From the above graph we can conclude that our scheme have 2.7dB less PAPR than the conventional OFDM but symbol error rate are same in Fig.4.

V. CONCLUSION

In this paper we recommended a method to decrease PAPR modified from those past SLM strategy. It is indicated that PAPR diminishment utilizing our method requiring low intricacy for an expansive number for subcarriers same time it supports the comparable PAPR diminishment execution compared with the tantamount customary SLM plan. Finally, our computer simulation demonstrates that recommended plan accomplishes an excellent execution to PAPR diminishment.

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