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Pre-Equalization of Signal in an Optical OFDM System Exploiting Silicon Photo Multiplier

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ABSTRACT: The performance of a brand-new time domain signal pre-equalization methodology victimization optical orthogonal frequency division multiplexing (OFDM) and a silicon photomultiplier (SiPM) based mostly receiver is studied. The SiPM contains an outsized array of microcells and each microcell detects single photons. It's wont arguably the foremost sensitive optical receiver, that detects intensity level signals by reckoning the quantity of inward photons inside every signal sampling amount. Non-linear distortions and interference occur within the received signal once the OFDM sampling amount is brief. The amplitude of the time domain signal sample is pre-adjusted based on the predicted fraction of microcells that are active. Using this approach, the negative impacts of the recovery time of the microcells are significantly reduced. The results that are presented show that when this new form of pre-equalization is used the bit error rate (BER) performance of the system is improved for a wide range of irradiance levels.

KEYWORDS: OFDM, Silicon Photomultiplier, ADC, Bit error rate, pre-equalization, microcells.

I. INTRODUCTION

Orthogonal frequency division multiplexing (OFDM) is employed extensively in broadband wired and wireless communication systems as a result of it's a good answer to intersymbol interference (ISI) caused by a dispersive channel. This becomes more and more vital as information rates increase to the purpose wherever, once typical serial modulation schemes like construction AM (QAM) or NRZ square measure used, the received signal at any time depends on multiple transmitted symbols. during this case the quality of effort in serial schemes that use time domain effort rises quickly. In distinction, the quality of OFDM, and of systems victimization serial modulation and frequency domain effort, scale well as information rates and dispersion increase. A second major advantage of OFDM is that it transfers the quality of transmitters and receivers from the analog to the digital domain. The precise style of analog filters will have a serious impact on the performance of serial modulation systems. In OFDM any part variation with frequency will be corrected at very little or no value within the digital components of the receiver. Despite these vital benefits of OFDM, it's solely recently that it's been thought of for optical communications.

II. RELATED WORK

[1] Statistical Modeling of Single-Photon Avalanche Diode Receivers for Optical Wireless Communications' & Elham Sarbaz et al [2018] IEEE. OOK- On-off Keying. BPPM- Binary Pulse Position Modulation. Low BER [Bit Error Rate] Low accuracy. [2] EML-based Multi-Path Self-Interference Cancellation with Adaptive Frequency-Domain Pre-Equalization' & Yunhao Zhang et al [2018] IEEE. AFDPE- Adaptive Frequency-domain Pre-equalization. Improved performance is achieved. The recovery of SOI [Signal Of Interest] is not good. [3] 'Investigation of DC-Biased Optical OFDM with Precoding Matrix for Visible Light Communications: Theory, Simulations and Experiments', & Tao Jiang et al [2018] IEEE. Precoding Matrix Techniques Improved BER [Bit Error Rate] performance. BER performance is poor for low transmitting power. [4] Clipping-Enhanced Optical OFDM for Visible Light Communication Systems' & Jie Lian et al [2019] IEEE. CEO-OFDM- Clipping-enhanced Optical Orthogonal Frequency Division Multiplexing. Better



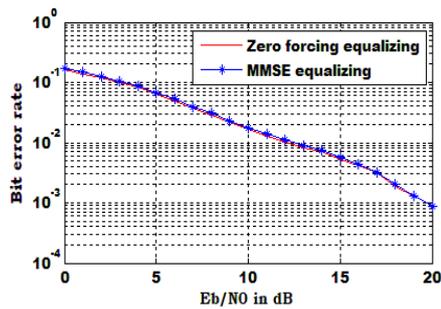
illumination performance. The performance of bit error rate is poor. [5] 'Pre-Equalization and Bandwidth Limitation for a 100-G-Baud 32 QAM All-Silicon Transmitter' & Likai Zhu et al [2019] IEEE. Pre equalization method. Windowing method is used for filter design. Improved system performance. Effective number of bits in DAC are limited.

III. METHODOLOGY

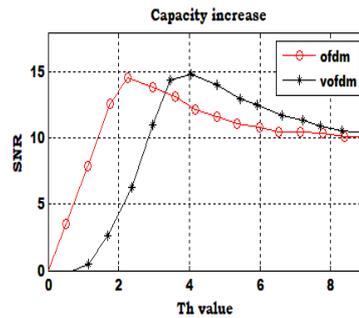
Initially, the data is assigned to the input. Hermitian Symmetry performs the complex conjugate equal to the original function with changed sign $X(f) = X^*(-f)$. After IFFT, the negative part of the signal is clipped with the addition of cyclic prefix (CP) and DC bias. Pre-equalization is performed to reduce the interference caused by recovery time. The digital signal is converted to analog form by DAC and the output is applied to SiPM for detecting the light intensity. The generated pulses are added together and fed to ADC. The obtained digital signal is converted to the number of detected photons and the added CP is removed. The output is subjected to FFT and finally a binary data sequence is generated.

IV. EXPERIMENTAL RESULTS

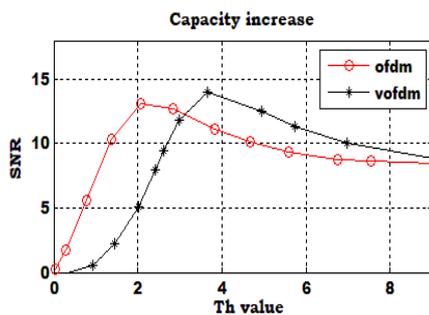
The proposed work is implemented in MATLAB simulation and the following results are obtained. Figs. (A) : Zero forcing (B) : Capacity Increase 1 (C) Capacity Increase 2 (D) SNR Performance ϵ SNR Performance of optimal output $p=0.1$ (E) SNR Performance $p=0.1$ (F) SNR Performance $p=1$ (G) Capacity Reforestation plot.



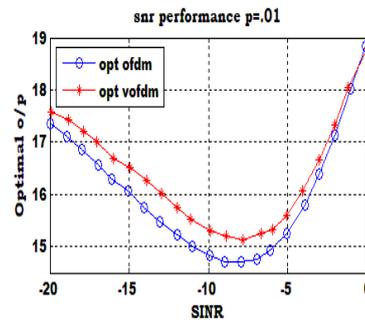
(A)



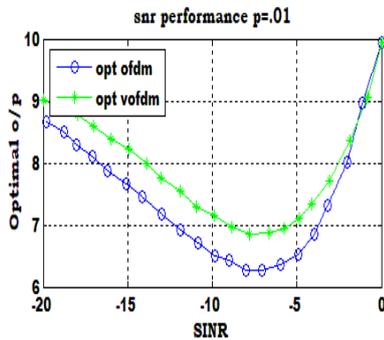
(B)



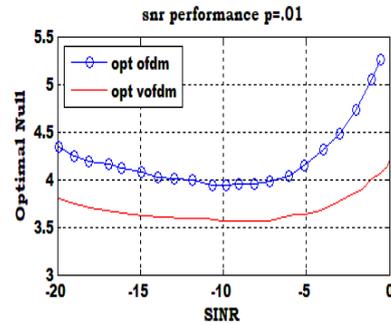
(C)



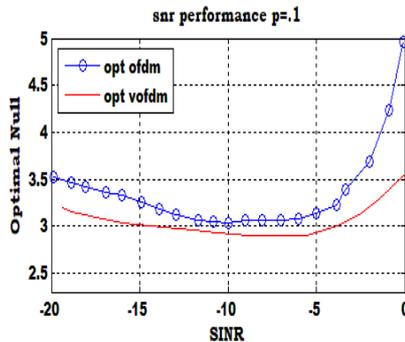
(D)



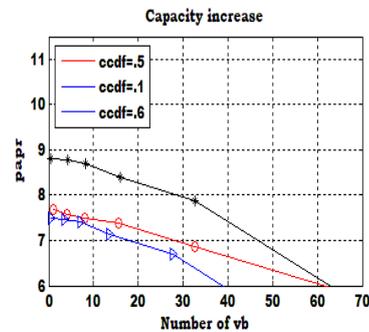
(E)



(F)



(G)



(H)

V. CONCLUSION

The finite recovery time of microcells in a SiPM is analyzed by using the Monte Carlo simulations. The impact of the recovery time is reduced with the assistance of new time domain-based pre-equalization method. The BER performance of the system is significantly improved by pre-adjusting the amplitudes of the transmitted signal samples on the basis of the estimated fraction of active microcells. The BER performance of both the SiPM 30035 and SiPM 60035 has been investigated.

REFERENCES

- [1] Mingmin Zhao, FadelAdib, Dina Katabi, "Emotion Recognition using Wireless Signals", Massachusetts Institute of Technology, 4th International Conference on Signal Processing and Integrated Networks (SPIN),2017.
- [2] ShivamGupta,"Facial emotion recognition in real-time and static images", Proceedings of the Second International Conference on Inventive Systems and Control (ICISC 2018) IEEE Xplore Compliant - Part Number: CFP18J06-ART, ISBN:978-1-5386-0807-4; DVD Part Number: CFP18J06DVD, ISBN:978-1-5386-0806-7.
- [3] S.Padmapiya& Esther AnnlinKalaJames, Government College of Technology, "Real Time Smart Car Lock Security System Using Face Detection and Recognition",2012 International Conference on Computer Communication and Informatics (ICCCI -), Jan. 10 – 12, 2019, Coimbatore, INDIA.
- [4] Alejandro Jaimes,NicuSebeb, an IDIAP, Switzerland b University of Amsterdam, The Netherlands, Multimodal human-computer interaction: A survey. Received 21 September 2005; accepted 30 October 2106, available online 31 January 2016, communicated by Mathias Kolsch.



- [5] Alejandro JaimesA, NicuSebe, an IDIAP, “Computer Vision and Image Understanding Multimodal human-computer interaction”: A survey. The Switzerland b University of Amsterdam, The Netherlands, Received 21 September 2017; accepted 30 October 2017.
- [6] Adrian RhesaSeptianSiswanto, AntoSatriyoNugroho, MaulahikmahGalinium, Information Technology, Swiss German University, Indonesia. “Implementation of Face Recognition Algorithm for Biometrics Based Time Attendance System”. Center for Information & Communication Technology.
- [7] KrutiGoyal, KartikeyAgarwal, Rishi Kumar CSE, Amity, University Noida, India. “Face Detection and Tracking Using OpenCV”. International Conference on Electronics, Communication, and Aerospace Technology ICECA 2017.
- [8] Hyeon-Jung Lee, Sungkyunkwan Hong College of Information and Communication Engineering University Suwon, 440-746, South Korea, “A Study on Emotion Recognition Method and Its Application using Face Image”.
- [9] LehLuoh, Chih-Chang Huang and Hsueh-Yen Liu, Chung-Hua University, 2010 International Conference on System Science and Engineering Image processing based emotion recognition, 2010 International Conference on System Science and Engineering.
- [10] A. Kumaravel, S. Sivasubramanian, “Identifying images on moving objects to enhance the recognition”, International Journal of Engineering & Technology.
- [11] SSivasubramanian, A Kumaravel, “Improved image compression using effective lossless compression technique”, Cluster Computing, March 2018.
- [12] C. Nalini, K Rajendra Prasad, C Raghavendra, “Comparative Observation and Performance Analysis of Multiple Algorithms on Iris Data”, International Journal of Pure and Applied Mathematics.
- [13] C. Raghavendra, K. Rajendra Prasad, PadakandlaVyshnav, “Intelligent System For Visualized Data Analytics A Review”, International Journal of Pure and Applied Mathematics.
- [14] “Facial Recognition Application”Animetrics. Retrieved 2008-09-04
- [15] Bonsor, K. “How Facial Recognition Systems Work” Retrieved 2008-05-02
- [16] Crawford, Mark. “Better Face Recognition Software”.
- [17] Image Compression in Face Recognition-a LiteratureSurveyKresimirDelac, Sonja Grgic and MislavGrgic.University of Zagreb, Faculty of Electrical Engineering and Computing Croatia
- [18] Patil, J. V., &Bailke, P. “Real time facial expression recognition using RealSense camera and ANN”. International Conference on Inventive Computation Technologies (ICICT).



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