Avinashilingam Institute for Home Science and Higher Education for Women

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Account Type	:**Conference A/c**
Towards	:**Other Regn Fees**
Description	:Seven Day National Workshop : Post NAAC Quality Enhancement in Higher Education Institutions as on 22-29 August 2022
Mode of Payment	:**Online RTGS**
Amount	:**₹ 1500.00/-**

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Towards	:**Other Regn Fees**
Description	:Seven Day National Workshop : Post NAAC Quality Enhancement in Higher Education Institutions as on 22-29 August 2022
Mode of Payment	:**Online RTGS**
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Expenses towards Registration fee for seven Day National workshop: POST NAAC Quality Enhancement in Higher Education Institutions as on 22-29 August 2022.

Judith 27/9/22
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From
Mrs K.Thamaraiselvi
Assistant Professor
Department of Computer Science and Engineering
School of Engineering

To
The Vice Chancellor
Avinashilingam Institute for Home Science and Higher Education for Women
Through
The Registrar
The Finance officer (i/c),
The Dean (i/c), School of Engineering

R/FO/Dean Engg/HoD-CSE
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Respected Madam,

Sub: Requesting permission and on-duty to attend Red Hat global certification exam -reg.,

I would like to bring to your kind notice that Red Hat Academy is organizing "Training on Red Hat Enterprise cloud lab @ Sri Krishna Arts and Science College Coimbatore".

Training: 04.03.2023 - Saturday, 05.03.2023 - Sunday, 10.03.2023 -Friday, 11.03.2023 Saturday & 12.03.2023 –Sunday (5 Days) – Online mode.
Mock practice test: 13.03.2023 - Monday, 14.03.2023 – Tuesday, 15.03.2023 - Wednesday & 16.03.2023 – Thursday (4 Days) – Offline mode.
Final certification exam: 17.03.2023 - Friday (1 Day) – Offline mode.

In this regard, I kindly request you to grant me permission and on-duty to attend the same.

Also, I kindly request you to permit me to claim the examination fee amount of Rs.4868/- under the head fieldwork / Participation in conferences, Seminar, Workshops, FDP etc., from the sanctioned budget of Department of CSE for the academic year 2022-2023.

Yours Truly, 22/02/2023
(K.Thamaraiselvi)

Submitted to Dean.
22/2/2023
HoD-CSE

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23/2/23
(Dean i/c)

Sub to VC Madam
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Design and Implementaion of Weighted FIR Filter for Chromatic Dispersion using Frog Leap Algorithm

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Abstract— **An optimized approach for coherent optical fiber communication is to use a finite impulse response (FIR) filter to equalize chromatic dispersion (CD). The impulse response of the chromatic dispersion transfer function is used to determine the complex weights of the FIR filter taps. The complex weight's modulus is constant. A weighted finite FIR filter is proposed to improve the Chromatic Dispersion equalization performance by considering the restricted bandwidth of a single channel signal. This paper examines the Gaussian FIR filter and the raised cosine FIR filter. Optimum error vector magnitude (EVM) and normalized Godard's error of the coherent detection signal are calculated for the raised cosine and Gaussian FIR filters. The results have been intended to illustrate the improved features of the weighted filters, that remain unaffected by the transmission fiber's length, symbol rate, and modulation format. Since the results proved the indepency of the above parameters due to accepting wide range of frequency responses. As a result of these optimized weighted FIR filters, the EVM of the CD equalization signal is reduced. A comparison is then made between the proposed work and the literature work to show its effectiveness.From the results the amplitude normalization (0 to 1) is achieved by equalizing CD over the tap weights of the weighted filter. Also, the roll-off factor and the full width at half maximum, is compared for the proposed work with the existing methods with the rate of equalized dispersion.**

Index Terms— Normalized Godard's error, Error vector magnitude, finite impulse response filter, chromatic dispersion, CD equalization, Optical fibre, Gaussian FIR Filter.

I. Introduction

Information is transferred from one end to the other via the fiberoptic method of communication using light [1]. The electromagnetic carrier wave created from this light is then modulated to transmit the data. The fundamental steps makes the communication process that uses fiber optics is shown in Figure 1. The optical signals are initially produced using a transmitter. They checked to see if they are distorted or not then received and converted into electrical signals [2]. The features of dispersion in the optical fiber are determined by employingthe utmost speed of transmission [3]. The optical signals of various wavelengths are propelled through an optical fiber. Then these pulses move at multiplespeeds because of the refractive index variation along with the wavelength.When the light waves have been transferred a certain distance in an optical fiber, the spread out would be calculated at the specified time [4].This is continuously carried through the fiber length. The broadening phenomenon of the pulse width is usually termed dispersion. If the pulse width progressively increases, the impulse peak power decreases, leading to distortion in the transmitted analog and digital optical signal.Every pulse expands and overlays along with the neighbour's at the receiver input, ultimately fetching the misty.

This kind of effectisgenerally called inter-symbol interference. The dispersion usually restricts the capacity of the information at its maximum transmission speed [5]. It decreases the effectiveness of the bandwidth at the specified time and also worsens the rate of error because of the increased interference of the inter-symbol.By eliminating the spreading of optical pulses, the compensation of the dispersion is an essential feature that is mandatory for the communication system by the optical fiber. In optical communication, there is an enhancement in the effectiveness of the spectral and the capacity of the transmission are spontaneously needed[6]. Many issues such as dispersion, non-linear effectsand attenuation are present in fiber optic communication. The dispersion is the most critical parameter that affects the quality of service (QoS) of the communication systems [7]. Due to the nonlinearities of the optical fibers, the data transfer rate in the optical communication systems are limited[8]. By using optical networks, telecommunication[9], data communication systems, and cable television vast amounts of information can bequickly transmittedto remote points usingfeed-forwardWDM [10]optical signal.

The objective of this work is listed below:

- To optimize the innovative FIR Filter
  To optimize the roll-off factor and the full width at half maximum to reduce the dispersion.

The remaining sections in thisarticleare organized as follows: Section II investigates the traditional FIR Filter advancements. The description of the proposed FIR Filter is presented with its working flowin Section III. The experimental results of existing and proposed techniques are analyzed and evaluatedusing two parameters in Section IV. Finally, the article is concluded with its future work in Section V.

II. Literature Review

The section deliberates the existing work. The literature is briefly explained with the methodology, limitation,and future work. FIR filters were designed to compute and calculate the CD equalization performance[11].The restricted single channel signal bandwidth has been considered in this work. The improved cosine FIR filter and the Gaussian FIR filter have been inspected. The above said filters are optimized in terms of 16QAM, 32QAM, and EVM of the QPSKcoherent detection signal. The outcomes have been validated by the weighted filter parameters that are notdependent on the weighted filters, transmission fiber's length and the symbol rate. Along with the weighted FIR filters optimization, the equalization signalbelonging to the EVM of CDhas been reduced accordingly. The author proposed the future research towards the tap symmetric weighted functions FIR filter for better performance.

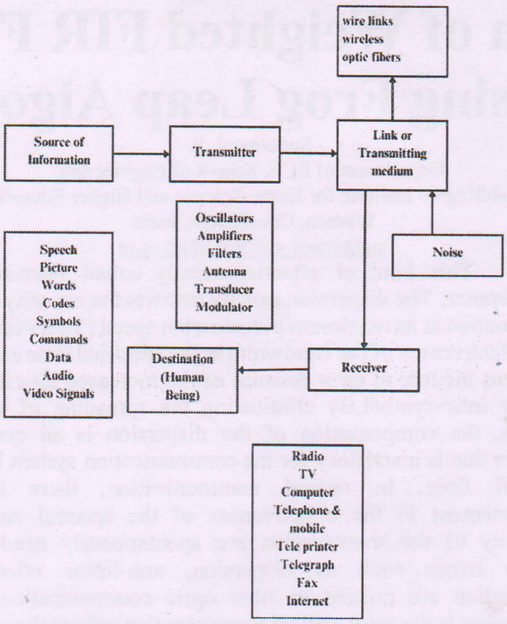

Fig. 1.Block Diagram of Communication System

In this paper [12], The authors examined the pointing errors and the orthogonal frequency-division multiplexing (OFDM) communication structure over the combined exponentiated Weibull (EW) fading channels using low-density parity-check (LDPC)-coded free space optical (FSO) OFDM.The outcomes have shown that the ABER performance belongs to the 16-QAM-OFDM was improved than the scheme of 16-PSK-OFDM above the compound fading channels of EW, irrespective of the strength of turbulence. The review has been demonstrated that the essential gain of the coding improvement has been attained by using the LDPC codes against the EW fading channels, particularly below the robust condition of the turbulence. Even when the jitter was increased or the width of the beam was decreased, along with the pointing errors, the additional coding gainhas been found.

F. Rottenberg at al., [13]reported many approaches for the compensation of the chromatic dispersion(CD) filter bank multicarrier (FBMC-OQAM) systems based on the optical fiber offset-QAM. The proposed various kind of equalization structures for wireless FBMC OQAM structuresare additionally applied for the optical FBMC-OQAM system to attain the CD's tolerance. The various compensation techniques for CD are verified mathematically and differentiated with the conventional one-tap equalizer. When compared with the frequency spreading method, the other CD compensation approaches have been provided a decreased tolerance of the CD. The proposed method requires a minimized complexity and thus made an excellentreplacement.

The article [14], the authors considered the Godard's error for the qualitymeasures of a signalto observe the chromatic dispersion(CD), modulation format of the coherent receiversin the DSPmodule and the nonlinear parameter. According to the Godard's error the review have been carried out on the CD monitoring which was having the capability to monitoraccurately. The random huge values of dispersion in thetransmission links which are uncompensated with the frequency domain equalizer combination. The earliernonlinear parameter monitoring approach have been extended according to the Godard's error via instinctively finding the values which are optimized to necessarily improve thecapability of adoption and presented the modest and the strong modulation format monitoring depending on the Godard'serror. At the same time, by experiments have been effectivelyconfirmed 192-Gb/s PDM-8QAM, 256-Gb/s PDM-16QAMand 128-Gb/s PDM-QPSK. C. Fougstedt et al., [15] investigated the implementation aspects, for example,area usageand power dissipation. That work also dealt with the frequency and timedomainCD compensation. This work also considered the design aspects of the fixed-point filter and the A/D-conversion quantization. In a 28-nm fully-depleted silicon-on-insulator(FD-SOI) progress methodology, the estimated filters have been executed to allow the precision analysis of the power consumptiom and area of the chip. The response of the filter optimizationhas been taken the shaping of the pulse was necessarily decrease the dissipation of the power and the area utilization of the implementations based on the time domain, which was made a feasible modification to the implementation based on the frequency domain.

S. Yin et al., [16] the authors designed and demonstrated an innovative Intra-PON Flow transmission along with the optical reroute by utilizing the Quasi-Passive Reconfigurable (QPAR) node. Adaptively the network has been reconfigured based on the status of the monitored traffic in the manner of defined software. The simulations have shown that the PON with rerouting architecture achieved superior network capability when compared with the PON without rerouting constrain along with similar traffic waiting time or the requirement of the blocking probability.Additionally, the adaptive Intra-PON architecture, along with the node of QPAR, enabled the effective multicast videotransmissionor the backup of files between the multipleserves, which are located in various kinds of address the networks that provided the minimum time for traffic waiting.

In this paper [17], the authors compared various kinds of measurements to the error rate prediction corresponding to the optical systems according to the non-binary forward error correction (FEC). The prediction accuracy has been proved as a whole, along with the formats of the multiple constellation and overheads of the FEC. It has been carried out in experiments and the simulation of the optical transmission against a recirculating loop. It has been shown that the FEC codes, which are employed worldwide, when the prediction performance was used according to the threshold computation from the transmission in optical metrics have been mentioned.

L. Yi, et al., [18]demonstrated the generation of phase chaos by deploying the module of the fine controllable dispersion along with the delayed feedback loop. The definite nonlinearity's effects have been studied. By carrying out the simulation and the experiment, the nonlinear dynamics evolution route has been demonstrated in terms of dispersion dependency and the gain parameters of feedback.The outcomes show that the proposed method concurrentlyshortens the phase chaos synchronization. It also enhanced the space of the key that could utilize the optical communicationsatmaximum speed chaotic. The authors Y. Li et al., [19]solved the issues corresponding to the long-standinginter-domain routing by proposed the internet exchange approach defined in software.The flexibility in the control has been enabled in the layer-3 networks. Also, the optical networks have introduced software-defined networking (SDN). The capability of optical network controlhas progressed to improve the optical network. The transparent software-defined exchange (tSDX)has been investigated along with the real-time deficiency alert aware service level agreement (SLA) assured for the multi-domain optical networks. The architecture of hierarchical control based on the SDN has been intended and developed.

I. T. Lima et al., [20]investigated the cost for the computational belongs to the nonlinear Fourier transform (NFT) according to the Zakharov–Shabat scattering issues by way of a nonlinear compensation method for the quadrature-phase-shift keyed (QPSK) signals along with elevated features of the cosine frequency in the systems of an optical fiber transmission along with the general dispersion fibers. This work also found the cost for the computation that was relatively high at a length of a data frame, and the quantity of power was tiny. Thus, it makes it more modest than the other typical approaches for transmission. Also, the physical reasons for the restrictions have been explained.

The authors presented [21] chromatic dispersion equalization for FIR filters using Fourier transform analysis, in which filter tabs were obtained from the pass band samples. The authors [22] incorporated the adaptive mutation particle swarm optimizer (AMPSO) algorithm into the chromatic dispersion equalization (CDE) filter and introduced the singular value decomposition least square (SVDLS) approach to determine the optimal tap weight of the CDE filter.

III. PROPOSED WORK

The Chromatic Dispersion (CD) is the major source of error in the optical fiber communication systems. Hence this has been taken into account for the further analysis of the system. With the development of the digital signal processing technology, the coherent optical receivers using the digital filterefficiently equalizes the CD in the optical fiber communication system.S. Tsukamoto presented a transversal filter [23]. S. J. Savory presents the proposed finite impulse response (FIR) filter to equalize the CD in time domain[24], especially for the long-haul optical fiber communication approaches. Thecomplex tap weights of a transversal filterare acquired in the transversal filter. This was attained from the truncated invertedfourier transform. By the single channel signal's bandwidth, the truncated window is found.

In the FIR filter, the complex tap weightscorresponding to anFIR filteris acquired from the truncated impulse response. By the gathered dispersion and the sampling interval, a higher bound on the taps numbers is determined to neglect the frequency aliasing. In this work, a single channel signal's restricted bandwidth is considered to determin the optimal length of the FIR filter taps for CD equalization and also to neglect the frequency aliasing. Additionally, the CD equalization performance also increased. For this research two weighted FIR filtersare investigated: raised cosine typeand the gaussian type. The proposed filter flow diagram is shown in Figure 2.

For the calculation of the tap values of the weighted FIR filter,the equation for the raised cosine function and the Gaussian function is mentioned below, where the modulus complex weights are calculated for CD equalization.

Raised cosine function:

The raised cosine function is denoted as $f_{RaisedCosine}(t)$

$f_{RaisedCosine}(t)$ is defined as,

$$f_{RaisedCosine}(t) = \begin{cases} 1 \\ 0 \leq |t| < \frac{1-R_o}{2} \cdot Z \\ \frac{1}{2}\left\{1 + cos\left[\frac{\pi}{R_o \cdot Z}\left(|t| - \frac{1-R_o}{2} \cdot Z\right)\right]\right\} \\ \frac{1-R_o}{2} \cdot Z \leq |t| \leq \frac{1+R_o}{2} \cdot Z \\ 0 \\ |t| > \frac{1+R_o}{2} \cdot Z \end{cases} \quad [1]$$

Where, R_o - is the roll-off factor.

Z - is the full width at half maximum (FWHM) of$f_{RaisedCosine}(t)$.

The,$R_o$and the Z values are tuned with the help of the Frog-Leap Algorithm. At a particular tuned values, the dispersion is equalized.

The full width at half maximum is mentioned in the below equation,

$$Z = X_{RaisedCosine} \cdot Z_{window} \quad [2]$$

Z_{window} – is the time length of the truncation window of an FIR filter to avoid frequency aliasing

$X_{RaisedCosine}$ – is the window coefficient

Gaussian function:

The raised cosine is mentioned here as, $f_{gaussian}(t)$

$f_{gaussian}(t)$ is defined as,

$$f_{gaussian}(t) = \exp\left(-\frac{t^2}{2 \cdot Z_o{}^2}\right) \quad [3]$$

Where,

Z_o – is the half-width at 1/e-intensity point.

In this Gaussian function, theZ_o is tuned with the help of the frog-leap algorithm. This optimized

The full width at half maximum (FWHM) of $f_{gaussian}(t)$.

$$Z = 2(\ln 2)^{1/2} Z_o [4]$$

The output of the weighted FIR filter is,

$$W_{FIR} = \sum_{m=0}^{N-1} w_m \cdot Y(n-m) [5]$$

Where,w_m – is the tap weights and Y – is the input signal

Frog Leap Algorithm

Input: Input signalS_i, Chromatic dispersed signalC_i

Output: roll-off factorR_o And full width at half maximum (FWHM) Z

Procedure:

Step 1: Initialize the population,

$$P = length(S_i)$$

Step 2: Evaluate fitness function,

$$y_i = h_i^H \cdot S_i$$

Where, y_i – received signal

h_i^H - filter coefficients of the entire samples of the signal

$$e_i = C_i - y_i$$

e_i- Error of the signal

$$R_o = r_1, \quad for \ \frac{\sum e}{length(e)} < pos_i$$

$$Z = r_2, \quad for \ \frac{\sum e}{length(e)} < pos_i$$

Step 3: partition the population into memeplexes, P

$$= shuffle(S_i, 'ascend') \qquad if \ R_o < R_{o_{prev}}$$

$R_{o_{prev}}$ – is the roll-off factor at the previous iteration/

Step 4: Perform the same process for various iterations,
Max_{iter} – is the maximum number of iterations = 100
While $it < Max_{iter}$
Evaluate fitness function,

$$y_i = h_i^H \cdot S_i$$

Where, y_i – received signal
h_i^H - filter coefficients of the entire samples of the signal

$$e_i = C_i - y_i$$

e_i- Error of the signal

$$R_o = r_1, \quad for \ \frac{\sum e}{length(e)} < pos_i$$

$$Z = r_2, \quad for \ \frac{\sum e}{length(e)} < pos_i$$

Update the memeplexes

$$P = shuffle(S_i, 'ascend') \qquad if \ R_o < R_{o_{prev}}$$

End while
Returned the roll-off factor and full width at half maximum (FWHM)

Algorithm Description:

In this algorithm, the LMS filter is considered for the fitness function. The error value is used to the roll-off factor R_o and full width at half maximum (FWHM) Z. Based on the results, the signals are shuffled. The best value is finally optimized after many iterations. The frog leap algorithm is used to tune the roll of factor R_o and full width at half maximum.

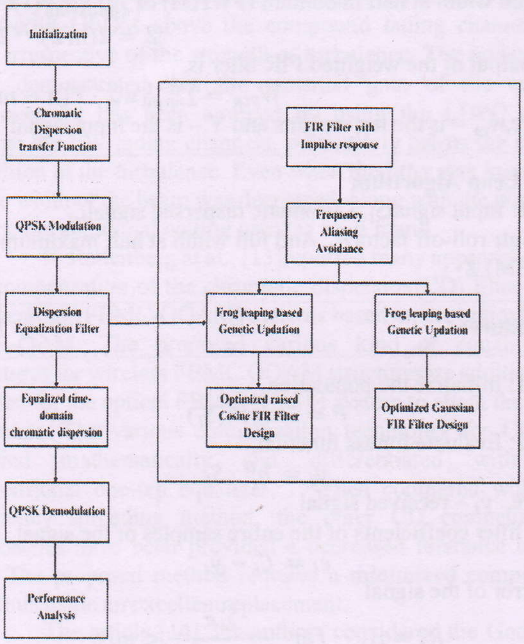

Fig.2. Proposed FIR filter flow diagram

IV. Performance Analysis

In this section the performance of the optimized raised cosine FIR filter and the Gaussian FIR filter in terms of Error vector magnitude (EVM) and the Normalized Godard's error of the coherent detection signal are analyzed. The simulation is carried out in MATLAB and the parameter considered under the study are measured and evaluated.

Error Vector Magnitude:

It is a vector whichlies between the ideal constellation point and the point which is received at the receiver end.It is also mentioned as the variation among the actual symbols which is received and the symbols in ideal mode. The error vector's average amplitude, is regularized to the maximum amplitude of the signal, is generally called the EVM. In terms ofpercentage value for EVM, the root means square (RMS) average is taken into consideration.

The error vector magnitude value is the same as the fraction between the error vector's amplitude and the root mean square (RMS) amplitude of the considered reference. This value is mentioned in decibel(dB).

$$EVM(dB) = 20\log_{10}\left(\frac{P_{error}}{P_{reference}}\right) \quad [6]$$

WhereP_{error} is mentioned as the error vector's RMS amplitude

Figure 3 shows the input signal considered with time on x-axisand amplitude ony-axis.

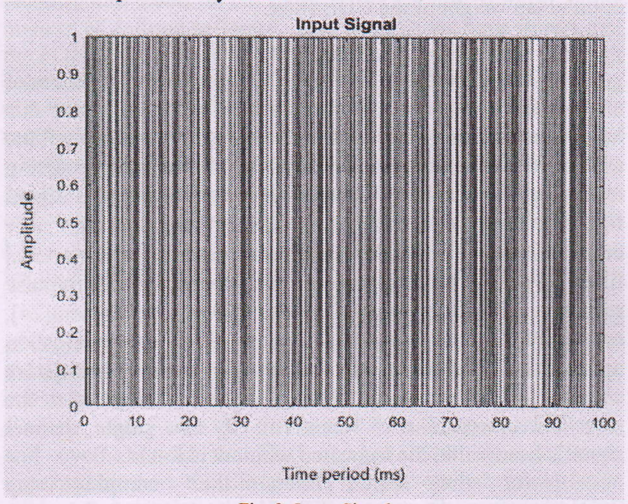

Fig. 3. Input Signal

At the initialization step, this signal is given as the input to find the chromatic dispersion transfer function. The input signal amplitude varies from 0 to 1.After this function, QPSK modulation is carried out. The resultant signals are shown in figure 4.

In the QPSK Modulated Signal, the x-axis is the time variation, and the y-axis is the amplitude variation of the signal. Figure 4 shows the QPSK Modulated Signal amplitude variations.The signal's amplitude is changed after the signal is modulated based on the QPSK. The amplitude varies from -0.8 to the 0.8.

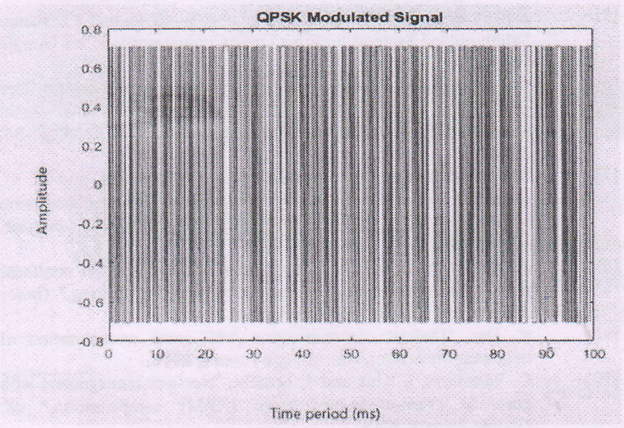

Fig. 4. QPSK Modulated Signal

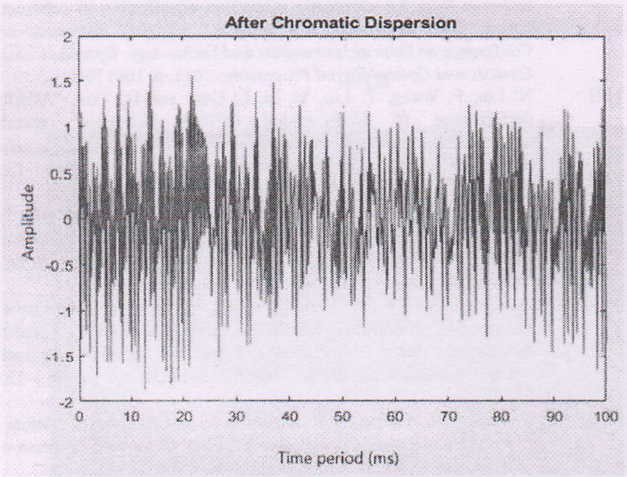

Fig.5.Signals after Chromatic Dispersion

Figure 5 illustrates the signals after the chromatic dispersion. This signal's amplitude varies from -2 to 2. Chromatic dispersed amplitude variations are depicted in figure 5. Figure 6 shows the output values, estimated by the raised cosine of the FIR filter. In this output signal's amplitude varies from 0 to 1.This applied CD is then equalized by the optimized values of the weighted FIR filter's tap weights.

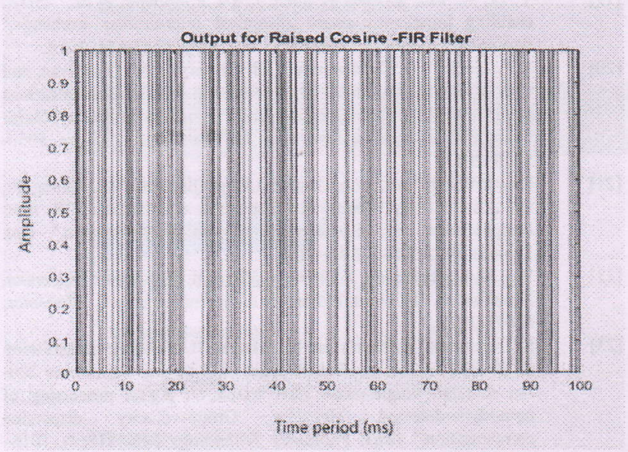

Fig. 6. Output signal from the Raised Cosine of FIR Filter.

From the n number of iterations of the roll-off factorR_o, and full width at half maximum (FWHM). For the particular tune values of the roll-off factor and the full width at half maximum, the entire dispersion is equalized.The Frog leap algorithm optimizes these two factors. For that particular tuning values, the raised cosine value is estimated.This raised cosine value is then applied to find the weighted FIR filter's tap weights.

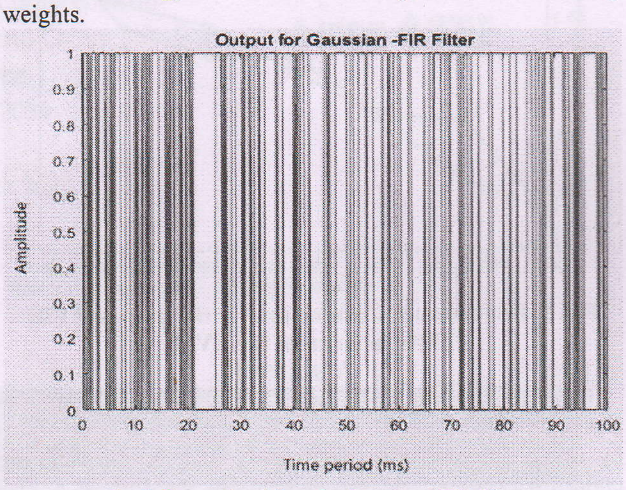

Fig. 7. Output signal from the Gaussian of FIR Filter

Figure 7 shows the output signal of the Gaussian-FIR Filter. In case of Gaussian, the Z_0 is optimized. The tuning is achieved by the Frog leap algorithm.The equalized dispersion values are used for tuning Z_0,which are taken for the calculation of the Gaussian Cosine function value. Then this value is applied to the calculation of the weighted FIR filter. In Figure 7 the amplitude values vary from 0 to 1. The CD equalization provides better result over the Gaussian filter compared to raised coine filter.

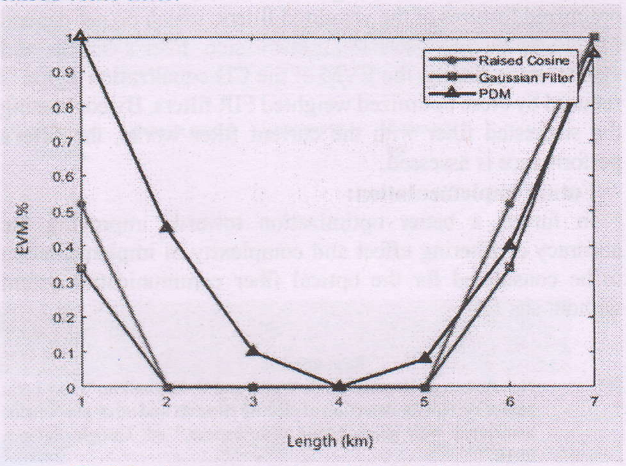

Fig. 8. Performance comparison with the existing techniques

In figure 8, the performanceof the proposed work is compared with the existing approach. The PDM is the existing approach. The figure 9 compares the raised cosine and the gaussian filter's performance in terms of EVM. This shows, that according to the length variation the EVM in percentage is increased in both the raised cosine and the gaussian filter. The gaussian cosine is risen linearly based on the variation in the length,which is represented in Km. But the raised filter is randomly varied according to the variation of the length.

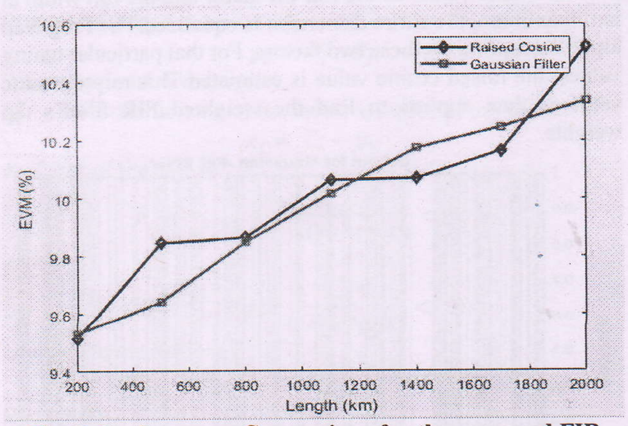

Fig. 9. Performance Comparison for the proposed FIR Filter in terms of the EVM

V. CONCLUSION

The finite impulse response (FIR) filter is an optimized chromatic dispersion (CD)where the equalization is achieved by using optimum error vector magnitudefor the coherent optical fiber communication system. In the FIR filter, the impulse response of the chromatic dispersion transfer function is determined using the complex weights of the FIR filter taps. The complex weight's modulus is constant. In this work, the limited bandwidth of a single channel signal is considered and the weighted FIR filters are proposed to improvise the CD equalization performances. This work examines the Gaussian FIR filter and the raised cosine FIR filter. The raised cosine FIR filter and the Gaussian FIR filter are optimized in terms of Error vector magnitude (EVM) and the Normalized Godard's error of the coherent detection signal. The results illustrate the optimized features of the weighted filters, which do not depend on the modulation format, transmission fiber's length and symbol rate. Finally, the EVM of the CD equalization signal is reduced by these optimized weighted FIR filters. By contrasting the suggested filter with the current filter works, the filter's performance is assessed.

Future implementation:

In future, a better optimization towards improving the accuracy of filtering effect and complexity of implementation to be considered for the optical fiber communicationsystem without any CD.

REFERENCES

[1] N. Lagakos, P. Hernandez, D. Wells, and V. Kaybulkin, "Fiber optic sensor system for detection of electric currents and other phenomena associated with geomagnetic disturbances," ed: Google Patents, 2018.

[2] M. De Jong, K. E. Elliott, C. R. Harrison, and C. A. Strause, "Fiber optic modules having a fiber tray, optical-to-optical fiber optic connectors, and methods thereof," ed: Google Patents, 2018.

[3] M. Smrha, M. D. Schroeder, M. Gunderson, and V. Loch, "Managed connectivity in fiber optic systems and methods thereof," ed: Google Patents, 2018.

[4] J. Gong, J. Huang, and J. Zhao, "Apparatus and method for reorganizing resources of optical fiber cabinet and optical fiber cabinet," ed: Google Patents, 2018.

[5] J. M. Castro, R. J. Pimpinella, B. Lane, B. Kose, and Y. Huang, "Methods and Systems for Fiber Optic Communication," ed: Google Patents, 2018.

[6] S. Owaki and M. Nakamura, "XPM compensation in optical fiber transmission systems using neural-network-based digital signal processing," *IEICE Communications Express,* vol. 7, pp. 31-36, 2018.

[7] S. A. Mohammed, H. Abdullahi, M. M. Babangida, and M. G. Mustapha, "Analysis of Linear and Non-Linear Effect of Dispersion in A Single Mode Optical Fiber Transmission System," *Analysis,* vol. 4, 2018.

[8] J. Jignesh, A. Lowery, and B. Corcoran, "Inter-channel nonlinear phase noise compensation using optical injection locking," *Optics express,* vol. 26, pp. 5733-5746, 2018.

[9] R. Dar, "Optical communication with some compensation of nonlinear distortions," ed: Google Patents, 2018.

[10] O. Vassilieva, I. Kim, and T. Ikeuchi, "Network management with per-node cross-phase-modulation (XPM) compensation," ed: Google Patents, 2018.

[11] Z. Zeng, A. Yang, P. Guo, and L. Feng, "Weighted finite impulse response filter for chromatic dispersion equalization in coherent optical fiber communication systems," in *2017 International Conference on Optical Instruments and Technology: Optoelectronic Devices and Optical Signal Processing*, 2018, p. 106170U.

[12] X. Liu, P. Wang, T. Liu, Y. Li, L. Guo, and H. Tian, "ABER performance of LDPC-coded OFDM free-space optical communication system over exponentiated Weibull fading channels with pointing errors," *IEEE Photonics Journal,* vol. 9, pp. 1-13, 2017.

[13] F. Rottenberg, T.-H. Nguyen, S.-P. Gorza, F. Horlin, and J. Louveaux, "Advanced chromatic dispersion compensation in optical fiber FBMC-OQAM systems," *IEEE Photonics Journal,* vol. 9, pp. 1-10, 2017.

[14] L. Jiang, L. Yan, A. Yi, Y. Pan, M. Hao, W. Pan, *et al.*, "Chromatic Dispersion, Nonlinear Parameter, and Modulation Format Monitoring Based on Godard's Error for Coherent Optical Transmission Systems," *IEEE Photonics Journal,* vol. 10, pp. 1-12, 2018.

[15] C. Fougstedt, A. Sheikh, P. Johannisson, and P. Larsson-Edefors, "Filter Implementation for Power-Efficient Chromatic Dispersion Compensation," *IEEE Photonics Journal,* 2018.

[16] S. Yin, T. S. Shen, Y. Bi, J. Jin, T. Oyama, and L. G. Kazovsky, "A novel quasi-passive, software-defined, and energy efficient optical access network for adaptive intra-PON flow transmission," *Journal of Lightwave Technology,* vol. 33, pp. 4536-4546, 2015.

[17] L. Schmalen, A. Alvarado, and R. Rios-Müller, "Performance prediction of nonbinary forward error correction in optical transmission experiments," *Journal of Lightwave Technology,* vol. 35, pp. 1015-1027, 2017.

[18] L. Yi, J. Ke, G. Xia, and W. Hu, "Phase chaos generation and security enhancement by introducing fine-controllable dispersion," *Journal of Optics,* vol. 20, p. 024004, 2018.

[19] Y. Li, W. Mo, S. Zhu, Y. Shen, J. Yu, P. Samadi, *et al.*, "tSDX: enabling impairment-aware all-optical inter-domain exchange," *Journal of Lightwave Technology,* vol. 36, pp. 142-154, 2018.

[20] I. T. Lima, T. D. DeMenezes, V. S. Grigoryan, M. O'sullivan, and C. R. Menyuk, "Nonlinear compensation in optical communications systems with normal dispersion fibers using the nonlinear Fourier transform," *Journal of Lightwave Technology,* vol. 35, pp. 5056-5068, 2017.

[21] Dawei Wang, Hao Jiang, Guowei Liang, Qianxin Zhan, Zikang Su, and Zhaohui Li, "Chromatic dispersion equalization FIR filter design based on discrete least-squares approximation," *Opt. Express* 29, 20387-20394, 2021.

[22] Wu, Z.; Li, S.; Huang, Z.; Shen, F.; Zhao, Y. "Chromatic Dispersion Equalization FIR Digital Filter for Coherent Receiver", *Photonics,* 8, 478,2021.

[23] S. Tsukamoto, K. Katoh and K. Kikuchi, "Unrepeated transmission of 20-Gb/s optical quadrature phase-shift-keying signal over 200-km standard single-mode fiber based on digital processing of homodyne-detected signalfor Group-velocity dispersion compensation," *IEEE Photonics Technology Letters*18(9), 1016–1018, 2006.

[24] S. J. Savory, "Digital filters for coherent optical receivers," *Opt. Express* 16(2), 804–817, 2008.

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