INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD ISSN: 2455-0620 Volume - 7, Issue - 8, Aug – 2021
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value: 86.87 Impact Factor: 6.719
Received Date: 04/08/2021 Acceptance Date: 20/08/2021 Publication Date: 31/08/2021

Image transmission and Reception using Carrier Wave Modulation

[1]Mr. Sandip R.Udawant , [2]Dr. Amit Jain,
[1, 2] Department of ECE& OPJS University, Churu, Rajasthan, India
Email - [1]udawant_etc@enggnagar.com , [2]dramitjain8171@rediffmail.com

Abstract: *Carrier wave modulation schemes have been used to enhance the performance of image transfer. The performance of digital modulation techniques were checked by transferring Image. BER &Eb/No these two parameters were considered during this investigation. This research article focused on various digital modulation schemes and their effect on bit error rate. CW modulation schemes were analyzed to compare bit error rates to study the effect of varying signal energy per bit to Noise ratio (E_b/N_o) on the error rate of various digital modulation schemes. MATLAB/SIMULINK has been used for model-based design methodology. The comparative study of different modulation schemes in normal AWGN channel was done. From the graphical illustration of E_b/N_o vs BER the suitable method of CW modulation has been found. An increase in the error rate with different values of M. Long distance communication lower level should be used and vice versa. For high data rate High level modulation techniques are always preferred. An images through CW modulation and Demodulation communication system has been sent and error probability for this particular transmission and reception has been calculated. The parameters like PSNR, MSE, Standard deviation and Varience has been obtained from this investigation.*

Key Words: *Carrier wave modulation, Image Transmission, BER, AWGN, PSNR.*

1. INTRODUCTION:

Now a days digital communication is most powerful area used in telecommunication sector in which the information is coded in the form of bits. There are many techniques that are implemented for modulation in digital communication some of them are BPSK, QPSK, M-ary PSK, QAM, GMSK. At the time of transmitting an image there is always a challenge to retain the quality of an image. By using these digital modulation techniques we can achieve it by more concentrating on BER & PSNR. The proposed system gives better results.[3,4]

In this paper carrier wave modulation techniques are used for transmitting an image. CW modulation technique carries the information with high data rate and this is very important for image transmission. There are various modulation techniques in communication system and we are transmitting images though the CW modulation. [25-27]

To achieve better results of Bit Error Rate, Signal to noise ratio & Bandwidth we are developing proposed methodology. For transmitting image though the digital modulation schemes, we are converting images into digital data and sending over the CW modulation. The CW methods we are using are M-ary PSK .M-ary FSK and M-ary QAM. [1-13].

In this research we have also concentrated on the Quality parameters and achieved the results for the image which we have considered for transmission and reception using CW modulation techniques.

2. METHODOLOGY & DESIGNL:

Here for calculating BER we have used Mathematical Formulae of Various CW Modulation Schemes. In order to do comparative analysis of carrier wave modulation techniques we can implement the image processing by using CW modulation techniques.

The application can be updated using key parameters such as BER & PSNR. In case the image is processed again the BER should be low and the SNR should be high. The proposed methodologies basically develop CW Modulation schemes.

We decided to design the application architecture and built and demonstrated a prototype system using MATLAB platform for image transmission. Proposed system not only demonstrates the image transmission but also implements secure data transmission with high speed. Bit-shifting encryption method is successfully implemented for secure data transmission.

M-ary modulator shows its effectiveness in image transmission. By varying M size, it's clear that image quality gets degraded.

The M size must be selected such that it will form media between image quality and message extraction capability. The system found to be cost effective and efficient for data transmission. [3,4,6,11,15]

2.1. Flow Diagram

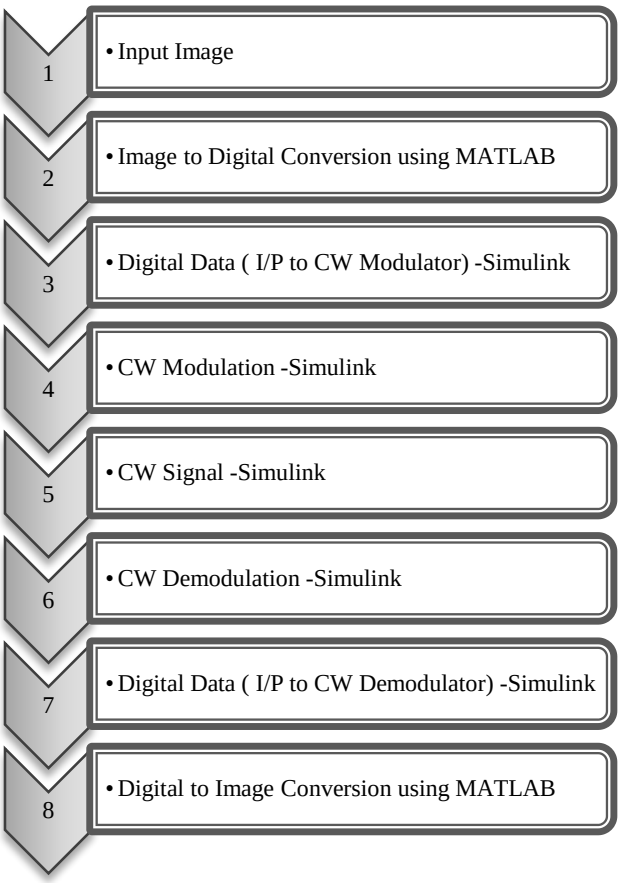

Figure 1: System Flow Diagram

As flowchart indicating the proposed methodology, input to the system is an image which will be converted into digital data using MATLAB. This digital information we will going to use as input signal to GMSK modulator. [8,16]

2.2. Image processing Flow:

In this research we are using image as an input entity. When we want to send image through CW modulations system it becomes difficult to send, hence we are converting image into hex i.e digital data. (Image to digital signal).

This digital signal we are sending and receiving though CW modulation scheme. And again we are converting that received digital data into image. [18, 23]

When we are using image as input entity then it becomes very essential to check quality parameters of an image. Here we are using various CW modulation schemes for the transmission and reception hence we are measuring the quality parameter for all CW modulation schemes.[17]

3. DESIGN STEPS:

Design Step for BPSK

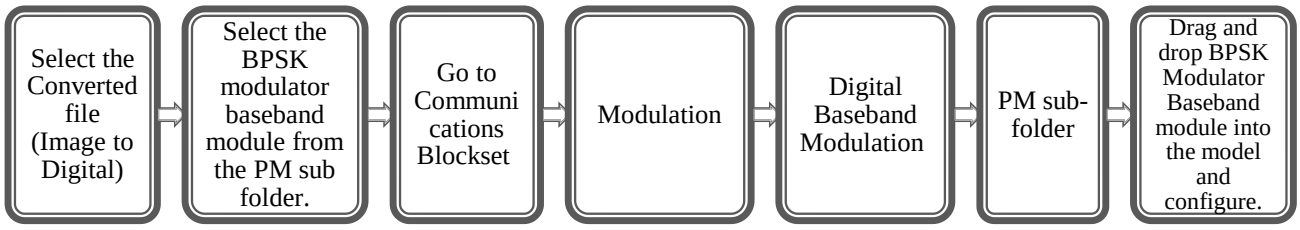

Figure 2: Basic Model of Image transmission using BPSK

In Figure 2, we have elaborated the working flow of image transmission using BPSK. Here we are selecting input file as Digital signal which we have already got from Image to digital Conversion.

Design steps for QPSK

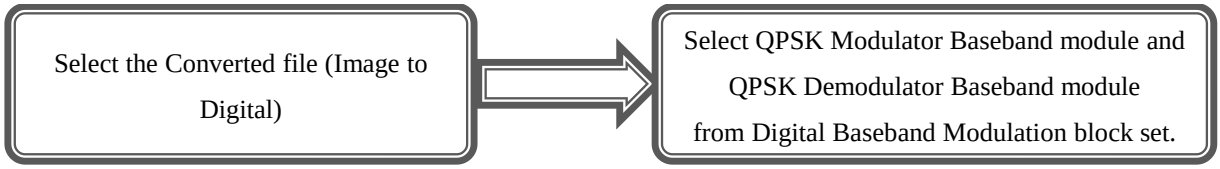

Figure 3: Basic Model of Image transmission using QPSK

In Figure 3, we have elaborated the working flow of image transmission using QPSK. Here we are selecting input file as Digital signal which we have already got from Image to digital Conversion.

Design steps for M-PSK

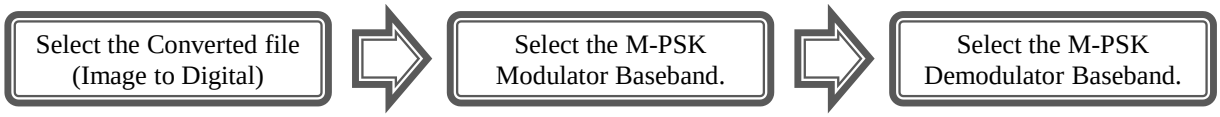

Figure 4: Simulink Model for M-PSK

In Figure 4, we have elaborated the working flow of image transmission using M-PSK. Here we are selecting input file as Digital signal which we have already got from Image to digital Conversion. Simulate again after changing value of M (4, 8, 16, 32 and 64). [19-21]

Design steps for Mary-QAM

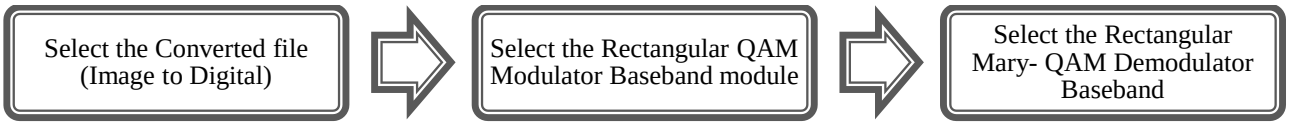

Figure 5: Simulink Model for Mary-QAM

In Figure 5, we have elaborated the working flow of image transmission using Mary-QAM. Here we are selecting input file as Digital signal which we have already got from Image to digital Conversion.

4. RESULTS AND DISCUSSION:

4.1. Results of Image Transmission & Reception:

For the analysis of an image for the transmission, eight images have been taken as test images. The results show that the best PSNR is obtained using the MATLAB simulation. When CW modulation is used for image processing, it actually is preserving the quality of image.

All parameters obtained the same values as the 8 images analyzed by imitation. For this we were found the results for various quality parameters.

BER values of M-ary PSK:

Table 1: BER Values of MPSK

Value of M M-ary	Eb/No = 2dB	Eb/No = 3dB	Eb/No = 4 dB	Eb/No = 5dB	Eb/No = 10dB	Eb/No = 15dB	Eb/No = 20dB	Eb/No = 25dB	Eb/No = 30dB
	BER								
2(BPSK)	0.1495	0.0812	0.08044	0.08027	0	0	0	0	0
4(QPSK)	0.2188	0.0822	0.0807	0.0804	0	0	0	0	0
8-Ary PSK	0.2639	0.1753	0.1401	0.1233	0.0958	0.0887	0.0860	0.0843	0.0834
16-Ary PSK	0.5597	0.4764	0.4164	0.3821	0.2988	0.2593	0.2375	0.2256	0.2141
32-Ary PSK	0.8145	0.8145	0.7108	0.6810	0.6139	0.5774	0.5597	0.5423	0.5338
64-Ary PSK	0.7933	0.7515	0.9774	0.9887	0.6139	1.0689	1.0689	0.9887	1.0689

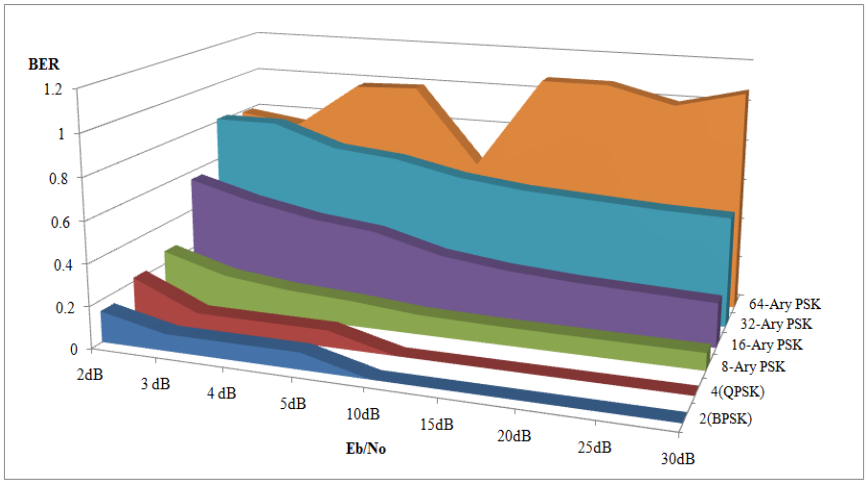

Figure 6: Graphical Representation of BER of M-ary PSK

Table 2. Simulation Results of Quality Parameters for M-ary PSK

Scheme	PSNR	MSE	Std Deviation	Variance
2(BPSK)	51.3521	153.7325	44.5955	1988.7586
4(QPSK)	47.6648	143.2275	44.1289	1947.3598
8-Ary PSK	47.775	118.8069	42.3073	1789.9076
16-Ary PSK	48.1424	123.2526	41.7317	1741.5348
32-Ary PSK	49.0974	111.0237	41.0457	1684.7495
64-Ary PSK	49.5682	131.7159	40.8534	1669.0003

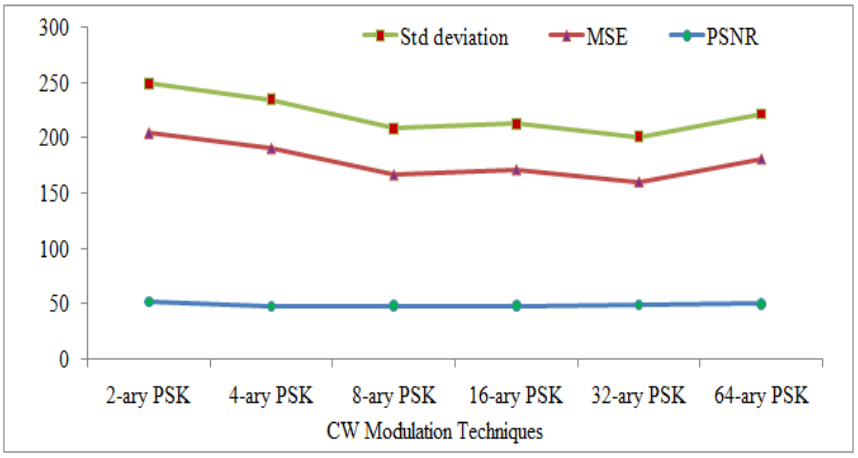

Figure 7: CW Schemes(MPSK) vs Quality Parameters (Std. Dev , MSE & PSNR)

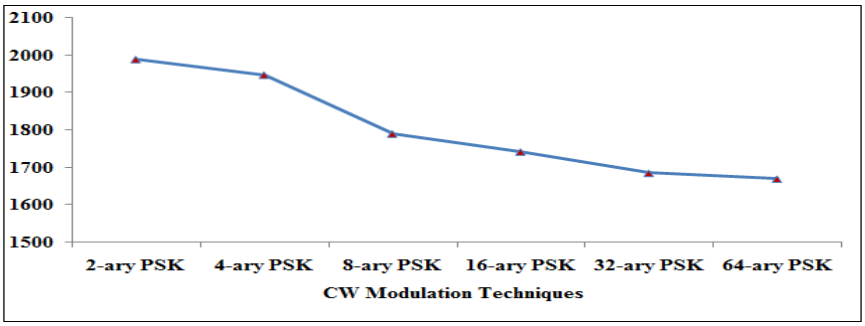

Figure 8. CW Schemes (MPSK) vs Quality Parameters (Variance)

BER values of M-ary QAM

Table 3. BER Values of M-Ary QAM

M	Eb/No = 2dB	Eb/No = 3 dB	Eb/No= 4 dB	Eb/No = 5dB	Eb/No = 10dB	Eb/No = 15dB	Eb/No =20dB	Eb/No =25dB	Eb/No = 30dB
	BER								
2-Ary QAM	0.1257	0.0945	0.1257	0.0818	0	0	0	0	0
4-Ary QAM	0.1484	0.1016	0.1484	0.0825	0	0	0	0	0
8-Ary QAM	0.1598	0.1052	0.1598	0.0829	0	0	0	0	0
16-Ary QAM	0.1655	0.1070	0.1655	0.0831	0	0	0	0	0
32-Ary QAM	0.1683	0.1079	0.1683	0.0832	0	0	0	0	0
64-Ary QAM	0.1698	0.1083	0.1697	0.0833	0	0	0	0	0

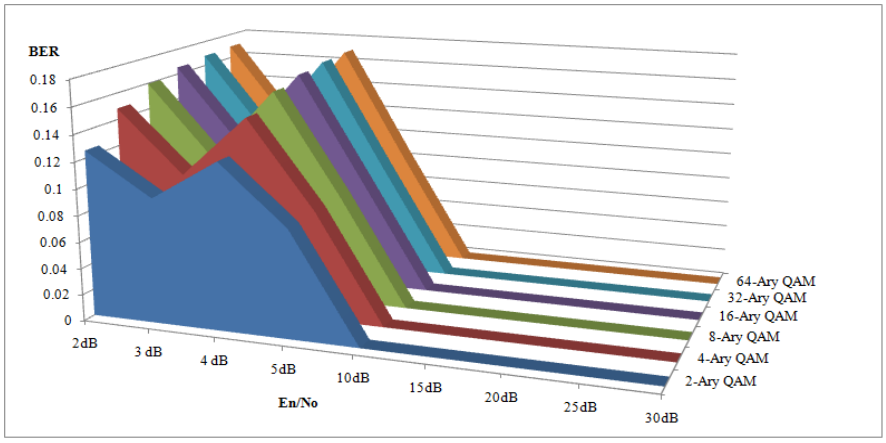

Figure 9. Graphical Representation of BER of M-ary QAM

Table 3. Simulation Results of Quality Parameters for M-ary PSK

Scheme	PSNR	MSE	Std Deviation	Variance
2-Ary QAM	45.7147	106.8546	44.5588	1985.49
4-Ary QAM	46.0043	99.5266	44.7054	1998.57
8-Ary QAM	46.0974	111.0237	44.0457	1940.02
16-Ary QAM	46.5682	33.7159	44.8534	2011.83
32-Ary QAM	47.8750	119.8069	44.0073	1936.64
64-Ary QAM	48.1424	123.2526	44.7317	2000.92

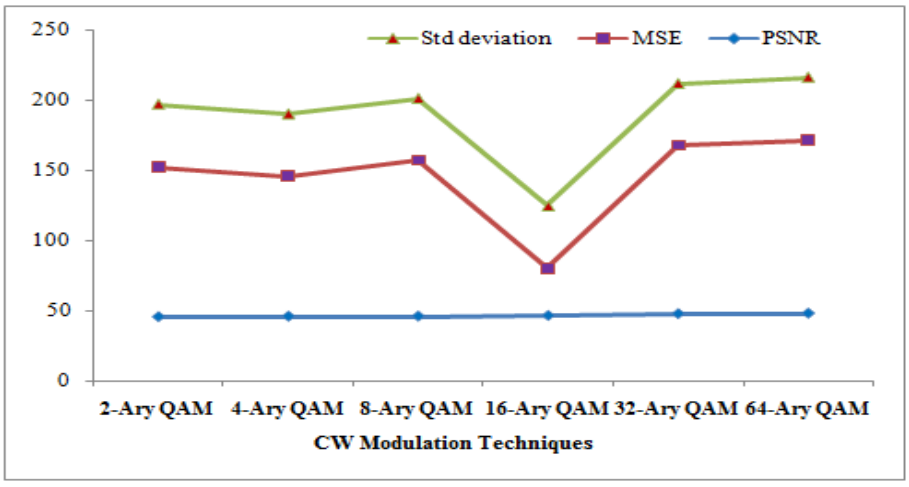

***Figure 10*:** CW Schemes (MQAM) vs Quality Parameters (Std. Dev , MSE & PSNR)

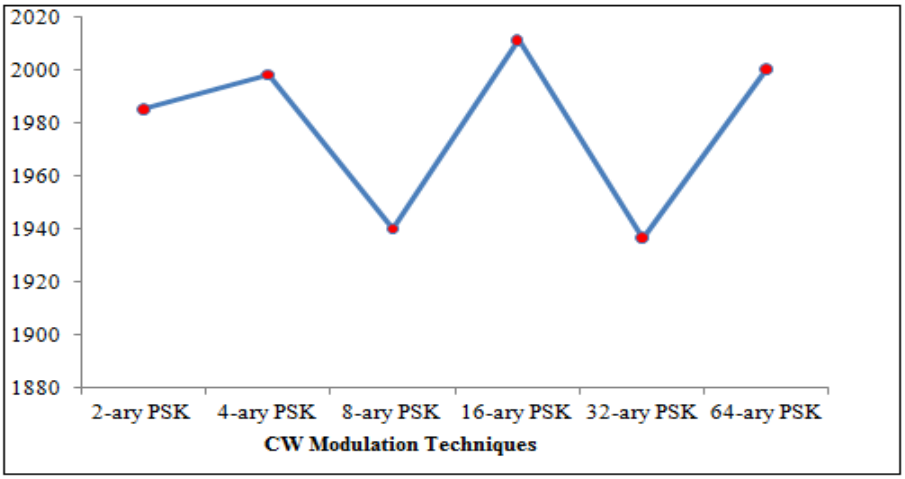

***Figure 11*:** CW Schemes (MQAM) vs Quality Parameters (Variance)

5. CONCLUSIONS:

We have calculated BER by using various CW modulation techniques. We were compared BER using various M-ary Modulation schemes. We have analyzed the effect of varying signal energy per bit to Noise ratio (E_b/N_o) on the error rate of various CW modulation techniques. We have found that 2-ary PSK (BPSK) & M-ary PAM offering better BER while transmitting image through AWGN channel. From Figure 6 & 9 we can conclude that the BPSK & M-ary QAM having negligible probability of error while transmitting & receiving the image through CW modulation Schemes.

Hence, in this paper the modulation and demodulation has done using image processing. The application can be analyzed using parameters such as MSE, Std. Deviation, variance & PSNR. By using BPSK & Mary-QAM modulation and demodulation processing of images gives good Peak Signal to Noise Ratio (PSNR) i.e. 51.3521. & 48.1424 respectively.

Conclusively we can write, by using CW modulation scheme we can transmit and receive an image with very negligible BER and can achieve better values of quality parameters.

REFERENCES:

1. B. O. Omijeh, IfiokabasiEyo,(2016) " Comparative study of Bit Error Rate of Different M-ary Modulation Techniques in AWGN channel", American Journal of Networks and Communications, Vol5, Issue 5,Pp 82-90.
2. Neda Fatima, Salman Ahmad Siddiqui, Anwar Ahmad(2020) , Comparative Performance Analysis of Digital Modulation Schemes with Digital Audio Transmission through AWGN Channel, IEEE Xplore,
3. Sandip R Udawant, Satyawati S Magar(2016) ,Digital image processing by using GMSK, International Conference on Automatic Control and Dynamic Optimization Techniques (ICACDOT),IEEE Xplore,695-698.
4. Sandip R Udawant, Satyawati S Magar(2018) ,Modulation and Demodulation of Image Processing by Using GMSK, International Journal of Engineering & Technology, Volume 7, Issue 3.27, Pages 233-235.
5. Rajesh M N, B K Shrisha, Nishith Rao, H.V. Kumaraswamy, (2016)An analysis of BER comparison of various digital modulation schemes used for adaptive modulation, IEEE International Conference On RTEICT, India, 241-245.
6. Satyawati Magar, BhavaniS,(2018) "Comparative analysis of biomedical image compression using oscillation concept and existing methods" , Computational Vision and Bio Inspired Computing, Springer,205-214.
7. D Buda,(1996) "A Comparison of Two Digital Modulation Techniques," IEEE Transaction on Communications, Vol.1, pp 429-335.
8. Shadbhawana Jain and Shailendra Yadav,(2015) "Image Transmission Using 64-QAM Modulation Technique in Digital Communication System", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 12.
9. Jondral, F., Machauer, R., and Wiesler, A., (1998) "Comparison of GMSK and inear approximated GMSK for use in Software Radio." IEEE, pp. 557-559.
10. Satyawati Magar, Bhavani Sridharan,(2016) "Innovative approach to biomedical image compression using oscillation concept", International Conference on Automotive Control and Dynamic Optimization Techniques (ICACDOT),Pages 124-128,IEEE Conference Publications-IEEE Xplore.

11. Ali Farzamnia, Ngu War Hlaing, Muralindran Mariappan, Manas Kumar Haldar,(2018) "BER Comparison of OFDM with M-QAM Modulation Scheme of AWGN an Rayleigh Fadig Chanels", 9th IEEE Control and System Graduate Research Colloquium (ICSGRC),3-4.
12. D. S. Chirov,(2018) "Application of the decision trees to recognize the types of digital modulation of radio signals in cognitive systems of HF communication" , Systems of Signal Synchronization, Generating and Processing in Telecommunications, pp. 1–6, Belaru.
13. B. Chirag, A. Lohith, and H. S. Prashantha, (2018) "Comparative performance analysis of various digital modulation schemes in AWGN channel," 2017 Innov. Power Adv. Comput. Technol. i-PACT 2017, vol. 2017-January, pp. 1–5.
14. P. Kumar and A. Kumari,(2016) "BER Analysis Of BPSK, QPSK, 16-QAM & 64-QAM Based OFDM System Over Rayleigh Fading Channel," IOSR J. Electron. Commun. Eng., vol. 11, no. 04, pp. 66–74.
15. K. D. Rao,(2015) "Channel coding techniques for wireless communications," Channel Coding Tech. Wireless Communication, pp. 1–394.
16. M. Barnela,(2015) "International Journal of Advanced Research in Computer Science and Software Engineering Performance Analysis of OSPF , RIP , IGRP and EIGRP Routing Protocols using OPNET 14 . 5 Simulator," vol. 5, no. 5, pp. 1335–1341.
17. K. Thakuria and A. Ghosh (2014), "Analysis of Bit Error Rate of different M-ary PSK Modulation Schemes in AWGN Channel," Int. J. Innov. Res. Electr., vol. 2, no. 5, pp. 2321–5526.
18. H. M. Aung, W. Z. Hein, and H. M. Tun,(2014) "Performance Evaluation of GSM Transmission over Different Modulation Schemes," Int. J. Sci. Res. Publ., vol. 4, no. 4, pp. 1–5.
19. H. Kaur, B. Jain, and A. Verma,(2011) "Comparative Performance Analysis of M-ary PSK Modulation Schemes using Simulink," Iject, vol. 7109, no. 3, pp. 204–209.
20. R. Suthar, S. Joshi, and N. Agrawal, (2011) "Performance Analysis of Different M-ARY Modulation Techniques in Cellular Mobile Communication," Int. J. Comput. Appl., vol. 1, pp. 25–29.
21. A. Hossain, A. H. Khandokar, G. Rashed, R. Yasmin, and A. F. M. Mirza,(2009) "Performance Comparison of M-Ary Modulation Schemes for an Efficient Wireless Communication System with Digital Color Image Transmission Performance Comparison of M-Ary Modulation Schemes for an Efficient Wireless Communication System with Digital Color Image Transmission," .
22. Rohan D Jahagirdar and Aditya Narendra Ukey, (2010) "Study of Digital Modulation Techniques," IEEE Transactions on Communications, vol. 8, pp. 312-322.
23. Mrs.J.A.Desai and Mrs.S.N.Kulkarni,(2015) "Effect of Noise on BER of BPSK, QPSK, DPSK, and QAM Modulation Techniques", IJRSI, vol 3, issue 7, pp. 71-74.
24. PratimaManhas and Dr M.K Soni, (2015) "Ber Analysis Of BPSK, QPSK & QAM Based OFDM System Using Simulink", IJEEE, vol 7, issue 2, pp. 54- 60.