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PERFORMANCE EVALUATION OF DUAL POLARIZED MIMO ULTRA-MULTILEVEL OFDM USING NU-QAM UNDER MOBILE RECEPTION

T.Rama Swamy[1], V.Srinivas[2]
Assistant Professor[1,2]
Department of ECE
Malla Reddy Engineering College

Abstract

The combination of dual-polarized MIMO and ultramultilevel OFDM is considered in the next-generation digital terrestrial broadcasting. Also, the use of Non-Uniform QAM(NUQAM) as a new sub-carrier modulation scheme has been proposed. In the mobile reception of OFDM signal, inter-carrier interference(ICI) is generated by Doppler-spread. DP-MIMO-ICI canceller using iterative detection can improve the reception characteristics with complexity reduction. In this paper, the reception characteristics are evaluated for dual-polarized MIMO ultra-multilevel OFDM using NU-QAM under mobile reception.

INTRODUCTION

In 8K Super Hi-Vision(SHV) broadcasting system, a combination of dual-polarized DP-MIMO(Multi-Input MultiOutput) and ultra-multilevel UM-OFDM technologies to improve the transmission capacity has been proposed[1]. Also, the use of Non-Uniform QAM(NU-QAM) as a new sub-carrier modulation scheme is considered[2]. In the mobile reception of the dual-polarized DP-MIMO-UM-OFDM signal, horizontally and vertically waves of UM-OFDM signal are affected by Doppler-shift and received. Orthogonality between sub-carriers is distorted by Doppler-shift and inter-carrier interference(ICI) is generated. The reception characteristics are deteriorated by ICI. The DP-MIMO-ICI canceller can improve the reception characteristics under the mobile reception of dualpolarized DP-MIMO[3]. However, reception characteristics using NU-QAM are not considered. Thus, it is necessary to evaluate the reception characteristics using NU-QAM. In this paper, the reception characteristics of dual-polarized DP-MIMO ultra-multilevel UM-OFDM using NU-QAM are evaluated under the mobile reception. As the results of computer simulations, NU-QAM can improve the reception characteristics compared with the conventional modulation scheme under mobile reception of UM-OFDM

LITERATURE SURVEY

Beixiong Zheng et al."Multiple-Input Multiple-Output OFDM with Index Modulation: Low-Complexity Detector Design", in this paper proposed two low-complexity detectors derived from the SMC theory for the MIMO-OFDMIM system. The first proposed subblock-wise detector draws samples at the subblock level, exhibiting near-optimal performance for the MIMO-OFDMIM system. The second proposed subcarrier-wise detector draws samples at the subcarrier level, exhibiting substantially reduced complexity with a marginal performance loss. An effective legality examination method has been also developed to couple with the subcarrier wise detector. Computer simulation and numerical results have validated the outstanding performance and the low complexity of both proposed detectors. ErtugrulBasar et al."Multiple-Input Multiple-Output OFDM with Index Modulation", A novel scheme called MIMO-OFDM with index modulation has been proposed as an alternative multicarrier transmission technique for 5G networks. It has been shown via extensive computer simulations that the proposed scheme can provide significant BER performance improvements over classical MIMO-OFDM for several different configurations.

The following points remain unsolved in this study:

i) performance analysis, ii) the selection of optimal N and K values, iii) diversity techniques for MIMO-OFDM-IM

DUAL-POLARIZED MULTI INPUT-MULTI OUTPUT

The demand of high bit rate has increased in recent wireless communication networks. Theories by various engineers have proven that the Multiple Input Multiple Output (MIMO) technology has the ability to improve the problem of traffic capacity in the wireless networks. MIMO systems can be defined as the use of multiple antennas at both the transmitting and receiving ends of a wireless communication network. The systems take advantage of multipath transmission paths. Although various efforts have been made by engineers to improve the data rate, the capacity is never enough for users. Users of mobile wireless devices like to be able to use their devices in streaming live programs, playing more online games and streaming an online movie which involves a high data rates. Telecommunication companies and Internet Service Providers (ISPs) as example in Africa find it difficult to provide high data rate Internet services to their network users, especially mobile users, due to environmental factors. The only option to most of these companies is to provide Internet with a high data rate wirelessly. With the limited bandwidth in space, MIMO technology will be of great benefit to these companies in providing high data rate Internet services to their customers. Currently cellular systems, such as the third generation (3G) cellular system, satellite communication systems and video broadcasting systems have experienced a great increase in capacity in the implementation of MIMO channel technology. Access point devices such as wireless local area networks (WLAN) routers have also experienced a great change in transmission techniques, with a few using MIMO technology. The main goal of this project is to explain and illustrate the operation of MIMO channel technology.

Ultra-Multilevel OFDM

OFDM has several significant benefits over single carrier QAM modulation which has lead to its adoption in many of the modern wireless standards, including ADSL, European Digital Video Broadcast, IEEE 802.11a/g/n (WiFi), WiMax, and 3GPP Long Term Evolution (LTE). First of all, OFDM enables easy equalization, solving many of the equalization complexity issues we encountered for single carrier QAM by working instead in the frequency domain. Second of all, the ability to control the size of the constellation on each subcarrier in OFDM also allows it to mimic the “waterfilling” construction which maximizes the amount of information which can be reliably transmitted over the channel: subcarriers (frequencies) with better channel gains can utilize higher order modulations and coding rates. A final significant benefit that we will encounter later in the course is that OFDM allows for an especially easy to implement and understand multiple access strategy OFDMA, in which different subcarriers (frequencies) are allocated to different users at different times. To understand how OFDM modems work, we must first revisit several properties of the discrete Fourier Transform, and its efficient implementation the Fast Fourier Transform. The circular convolution between two length N signals x1[n] and x2[n], $n \in \{0, 1, \ldots, N-1\}$, is defined as x1[n] * x2[n] = N X−1 =0 x1*x2[((n −1))N] where ((n))N = N − n n< 0 n n ≥ 0 Circularly convolving two length N signals x1[n] and x2[n] is the same thing as multiplying their discrete Fourier transforms x1[n]* x2[n] DF T ←→ X1[k]X2[k] .The underlying principle of OFDM is based on this property of the DFT

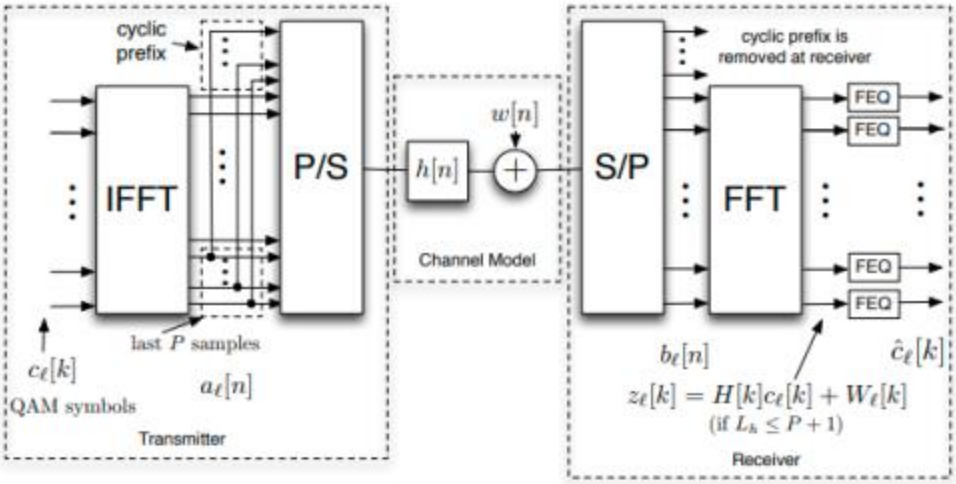

Figure 1: An OFDM transmitter, channel model, and receiver.

The performance of any communication system can be measured in terms of its power efficiency and bandwidth efficiency. The power efficiency describes the ability of communication system .

S.No.	Transmission Type	M in M-QAM	No. of Subcarriers	Bit rate	Fiber length	Power at the receiver (at BER of 10^{-9})	Bandwidth efficiency
1.	single carrier	64	1	10 Gbit/s	20 km	-37.3 dBm	6.0000
2.	multicarrier	64	128	10 Gbit/s	20 km	-36.3 dBm	10.6022

PROPOSED SYSTEM MODEL

In bit-interleaved coded modulation(BICM) that is bit interleaving after channel coding, the reception characteristics can be improved by using the constellation non-uniformed constellation[2]. The BICM capacity, is shown by following formula

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$$C_B = M - \sum_{i=1}^{M} E_{b,y}\left[\log_2 \frac{\sum_{x\in X} p(y|x)}{\sum_{x\in x_b^i} p(y|x)}\right],$$

where, ڔ denotes the number of bits per symbol(bits/symbol) and denotes the subset of all the points whose label has b = {0,1} in bit. Also, ٻ denotes the received symbol (denotes the conditional probability density function when the symbol, ٻ , is received when the symbol, ڽ , is transmitted. ے denotes expectation with respect to b and y. In this paper, QAM(Quadrature Amplitude Modulation) with uniform constellation is called as U-QAM(Uniform QAM) and QAM with non-uniform constellation is called as NUQAM(NonUniform QAM). The NU-QAM constellation is determined when the value of the BICM capacity becomes maximum. In this Project, constellations based on ATSC3.0 are considered[5].

MIMO-ICI CANCELLER USING ITERATIVE DETECTION

In MIMO-ICI canceller using iterative detection, the reception characteristics can be improved by removing remained influence of ICI. The reduction scheme of influence is explained in this section. The received vector, is temporary demodulated by MIMO-ICI canceller with complexity reduction and temporary demodulated vector, can be obtain. and channel matrix are used for the reduction of remained component. Reduction of remained component is operated by

$$\bar{d}_H(k,l') = \hat{d}_H(k,l') - \sum_{\substack{n=0 \\ n\le l-N_{AS}, \\ l+N_{AS}\le n}}^{N-1} H_{H,H}(k,l',n)\,\bar{d}_H(k,n) - \sum_{\substack{n=0 \\ n\le l-N_{AS}, \\ l+N_{AS}\le n}}^{N-1} H_{V,H}(k,l',n)\,\bar{d}_V(k,n). \quad (2)$$

The vertically-polarized wave components can be shown in the same way as It denotes limited number of subcarriers in MIMO-ICI canceller with complexity reduction.

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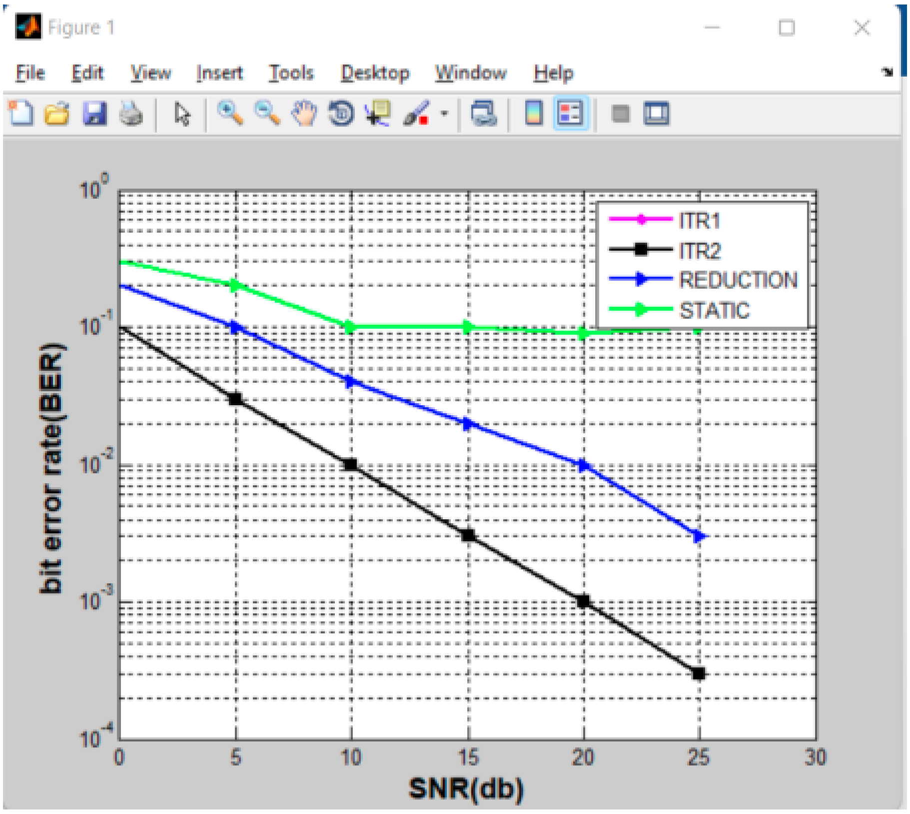
RESULT



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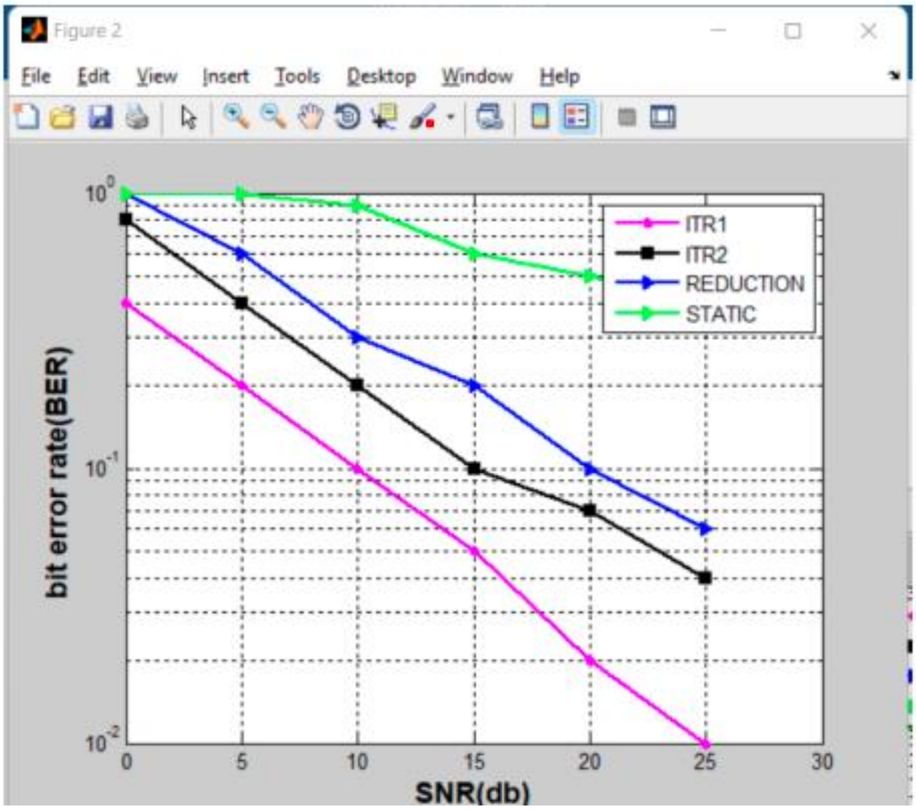

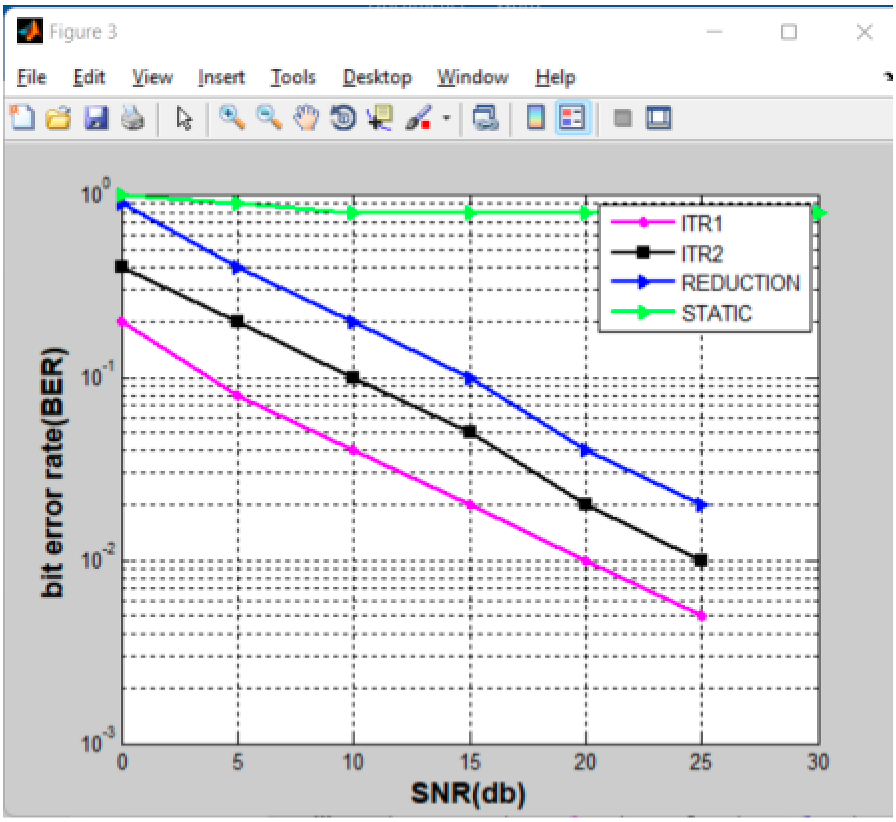

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CONCLUSION

In this project, dual-polarized MIMO ultra-multilevel OFDM under mobile reception using NU-QAM is evaluated. When NU-QAM is used for sub-carrier modulation, reception characteristics can be improved under the mobile reception of OFDM signals. Also, it is possible to reduce the number of iterations when U-QAM and NU-QAM modulation are compared

REFERENCE

[1] K. Murayama, "Large-capacity Transmission Technology for Nextgeneration Digital Terrestrial Broadcasting in Super Hi-Vision", NHK STRL R&D, No.134(Jul. 2012)

[2] T. Shitomi, S. Asakura, S. Saito, T. Saito and K. Shibuya, "Technology for the Next Generation of Digital Terrestrial Broadcasting -Improvement of Transmission Performance in Ultra Multi-level Signals Using NonUniform Mapping -", ITE Technical Report, Nol.38, No.5(Jan. 2014)

[3] H. Otsubo, A. Nakamura and M. Itami, "Improving Performance of DualPolarized MIMO UltraMultilevel OFDM Under Mobile Reception", ICCE2017(Jan. 2017)

[4] G. Caire, G. Taricco and E. Biglieri, "Capacity of bit-interleaved channels", IEE Electronics Letters, Vol.32, No.12(Jun.1996) [5] ATSC S32-230r56,Physical Layer Protocol(Jun.2016)