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INTERNATIONAL JOURNAL OF ADVANCED PRODUCTION AND INDUSTRIAL ENGINEERING

IJAPIE-2018-04-225, Vol 3 (2), 22-24

IJAPIE
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BER Performance Evaluation for MIMO-OFDM for Underwater Channel

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Abstract : Aluminium based surface composites were fabricated by TIG arc process. B_4C mirco and nano particles were filled separately on the grooves of Aluminum substrate and modified the surfaces with different TIG arc speeds. The modified composite surface was characterized by optical microscope, Scanning Electron microscope and X-ray diffraction. The microhardness and wear properties of the composite surface were evaluated. The results of this study revealed that the newly formed nano composite surface enhances the hardness and wear characteristics. The wear worn-out surfaces of the composite surface were analyzed through SEM studies in order to understand the wear mechanisms.

Keywords: TIG arc surface, Aluminium, B_4C, Hardness, Wear resistance

I. INTRODUCTION

The concept of frequency-division multiplexing (FDD) has been used in OFDM, which is the method of transmitting multiple streams of data over a common broadband medium. That medium could be radio spectrum, coax cable, twisted pair, or fibre-optic cable. Orthogonal frequency division multiplexing is most efficient technique used in communication system. It has been used in latest many technologies like CDMA, 4G LTE etc.

Multiple Input Multiple Output (MIMO) is nothing but the use of multiple antennas at the entities of the transmitter and receiver to improvise the communication in the terms of performance and efficiency. Here the input is not the antennas having ends but the radio signal carrying channels. By the qualities of MIMO it is one of the promising and an accurate result producing technique by reducing the bit error rate not by just employing multiple antennas at transmitter and receiver sides, providing a new dimension that can be utilized in different ways to combat the impairments of wireless channels.

MIMO systems use arrays of multiple antennas at both transmitter and receiver, all operating at the same frequency at the same time. MIMO systems increase the spectral efficiency and/or reliability of the wireless system by exploiting multipath by using the rich scattering environment orthogonal frequency division multiplexing (OFDM) is widely employed to combat the effects of ISI, because OFDM obviates the need for complex equalization techniques. Orthogonal scheme is the basis of the Space Time Coding technique. Where Space-time block codes (STBC) are a generalized version of Orthogonal scheme, but have the same key features. Hence the specified codes are 90 degrees to each other and produces full transmit diversity given by the number of antennas. In other words, space-time block codes are a complex version of Orthogonal space-time code, where the encoding and decoding schemes are the same as there in the Orthogonal space-time code on both the transmitter and receiver sides to transmit the data they are arranged in rows and columns in which total number of antennas as columns and total time slots given as rows. But in the receiver end, Signals are combined together and applicable for the decision rule to be applied. Space-time block codes were designed to achieve the maximum diversity order for the given number of transmit and receive antennas subject to the constraint of having a simple linear decoding algorithm. Hence we can implement the time space block code easily which are feasible and user understandable.

In addition, OFDM can be called upon to deal with the effects of ISI in underwater communication. The use of MIMO systems and associated signalling approaches are critical for the future of high data rate, extremely reliable wireless communications.

II. METHODOLOGY

A.MIMO-OFDM System Model

The basic block diagram of MIMO-OFDM system with total of three input data is encoded using Forward Error Correction encoder that is used for removing the noisy content while transmitting. The main focus here is the encoding is achieved by error correction code from sender.

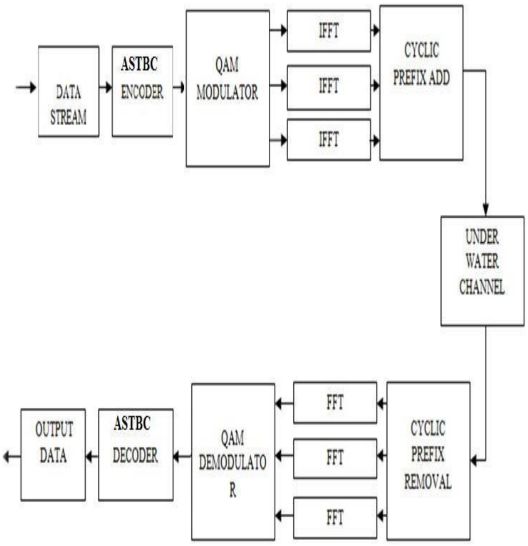

Fig 1: Overall System Block Diagram

The basic block diagram of MIMO-OFDM system with total of three input data is encoded using FEC (Forward Error Correction) encoder. Forward error correction (FEC) is a technique used for controlling errors in data transmission over unreliable or noisy communication channels. The objective over here is the sender encoding a message in a repetitive way. The encoded data is given as input to the interleaver block. Interleaver is a technique that is used for making forward error correction more robust with respect to burst errors. The output of the interleaver block is then given as input to modulator, where data is modulated using QAM (Quadrature Amplitude Modulation) Quadrature amplitude modulation (QAM) is both an analog and a digital modulation scheme. Quadrature components which are out of phase by 90 degrees with which are of same factor called to frequency. The modulated signal is then given as input to IFFT (Inverse Fast Fourier Transform). FFT algorithm is used to modulate via sender and also to demodulate by receiver which is implemented in orthogonally divided frequency multiplexing model.

The output of IFFT is given to cyclic prefix added sent through underwater channel to the cyclic prefix removal block and later to the FFT block. Then output of FFT is sent to the QAM demodulator block where the signal is demodulated and sent to De-Interleaver block. Then signal is sent to the FEC decoder where the signal is decoded and outputs the resulting signal.

III. SIMULATION AND RESULTS

A. Simulation Requirements

For the purpose of experimental setup, MATLAB version above 2009 is required along with providing Simulink library which is an excellent tool where it is an interactive system whose basic data element is an array that does not require mentioning its structure.

B. Simulation Script for computing BER

In the imitation of real system, here the observations are made by undertaking the output of three different values. For all these samples, graphic information has been collected for analysis and qualitative information, as explained before in the scheme presentation. In Fig.2 showing the graphs related to the sample number 2.

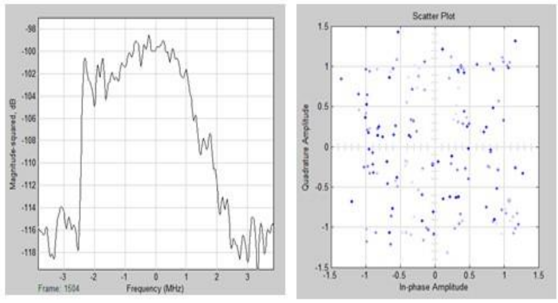

Fig. 2: Graphic information from sample number 2 in OFDM system simulation.

By observing the graphs in Fig.2 here we say that symbol detections are probabilistic because the signal spectrum is very scattered. This can induce to the conclusion that the error rate may be high for this system. the symbol errors are registered to produce values in quantitative manner and it is showed in the Fig.3.

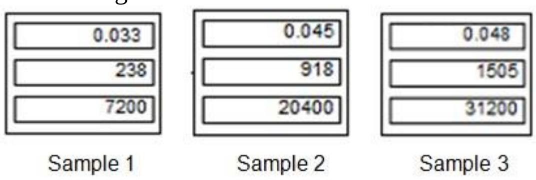

Fig. 3: Error information from three samples

Each sample's error value is accumulated when it is gathered initially. The next value is error count detected by the system. The last value is the total amount of symbols transmitted by the system. Graph indicating the raise by 4.8% of error in the last sample taken. These errors are caused because the system cannot recover many of the symbols affected by noise and channel attenuation, which are very strong factors in undersea channel.

C. Simulation Script for computing BER

For an Example Script for computing the BER for BPSK modulation in a Rayleigh fading channel with Orthogonal Space Time Block Coding Two transmit antenna, 1 Receive antenna

The MATLAB/Octave script by following functions:

(a) Generate random binary sequence of +1′s and -1′s.
(b) Group them into pair of two symbols
(c) Code it per the Orthogonal Space Time code, multiply the symbols with the channel and then add white Gaussian noise.
(d) Equalize the received symbols

(e) Counting the bit error by doing hard decision decoding.
(f) Repeat for multiple values of and plot the simulation and theoretical results as in figure:4

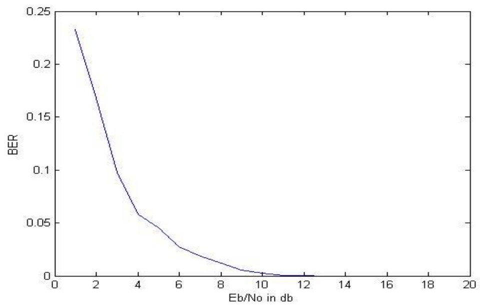

Fig 4: BER plot for BPSK in Rayleigh channel with 3 Transmit Antenna and 1 Receive Orthogonal STBC

From the Fig4 we can see the Orthogonal Space Time Block Coding has around 3dB poorer performance.

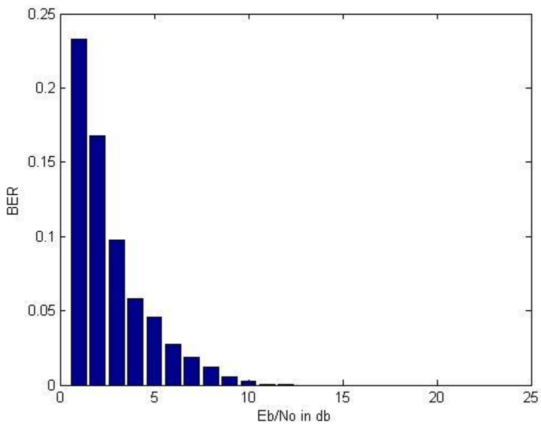

Fig 5: Graphical representation of BER vs Eb/No

IV. CONCLUSION

In this paper different MIMO detection techniques was analyzed and compared. We obtain an efficient OFDM model based on Orthogonal space time block codes for underwater communication with 3 input data stream. Can improvise it by more input data streams, further implemented on Field programmable gate array, an integrated circuit designed to be configured by a customer or a designer after manufacturing and also current proposed model can be utilised by underwater vehicle for further research. This paper will help us to do survey for further improvisation in efficiency or the performance factors.

REFERENCES

[1] Nelson Iruthayanathan, K.S. Vishvaksenan, V, Rajendran, SaisrinivasanMohankumar “Performance analysis of Alamouti space time block-coded MIMO–OFDM system for underwater communication”. Journal of Elsevier (2015): 0045-7906.

[2] Nelson Iruthayanathan, Kuttathati Srinivasan, Vishvaksenan1,VelayuthamRajendran “Performance of Spread Spectrum Based Multi-Carrier System in Underwater Communication Using Transmitter Pre-Processing”. IEEE access on (2016): 2169-3536.

[3] André Goalic, Nicolas Beuzelin, JoëlTrubuil, “Underwater Acoustic Communication using Reed Solomon Block Alamouti space time block Codes Channel Coding to transmit Images and Speech,” IEEE International Conference on Oceans, Page(s): 1 – 6, 2010.

[4] Yuri Labrador, Deng Pan, and Jerry Miller, “Modulation and Error Correction in the Underwater Acoustic Communication Channel,”International Journal of Computer Science and Network Security (IJCSNS), Vol.9 No.7, July 2009 th

[5] Goalic A, Trubuil J, BeuzelinN, “Long Range Real-time Underwater Acoustic Communications at Low Bit Rate withChannel coding Protection” IEEE Military Communication Conference, MILCOM, Page(s): 1-7, 2008.