Performance Analysis of Different Combination of Mimo Antenna System using Digital Modulation

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ABSTRACT

The wireless communication system like MIMO-OFDM (Multiple Input Multiple Output - Orthogonal Frequency Division Multiplexing), the transmitter and the receiver have to be synchronized to each other in order to make efficient transmission. In this paper, OFDM based on the orthogonality are proposed for timing synchronization for Rayleigh channel using different combination of antenna system. This work simulate by Matlab R2013a tool by using communication block, and result shown between BER verses SNR.

KEYWORDS: MIMO-OFDM System, digital modulation, Rayleigh Channel

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I. INTRODUCTION

The growing demand for mobile Internet and wireless multimedia applications has motivated the development of broadband wireless access technologies in recent years. Mobile WiMAX has enabled convergence of mobile and fixed broadband networks through a common wide-area radio access technology and flexible network architecture. Worldwide Interoperability for Microwave Access (WiMAX) has been considered as one of the key technologies that are capable of addressing the increasing demand for high-speed data communication.

WiMAX is an IEEE 802.16 standard based technology responsible for bringing the Broadband Wireless Access (BWA) to the world as an alternative to wired broadband. WiMAX is expected to have an explosive growth, as well as the Wi-Fi, but compared with the Wi-Fi WiMAX provides broadband connections in greater areas, measured in square kilometers, even with links not in line of sight.

The WiMAX Forum collaborated on the IEEE Std 802.16c-2002 amendment to develop the system profiles for Wireless MAN-SC, it is forum helped developing IEEE Std 802.16-Conformance Jan-2005, IEEE Std 802.16-Conformance Feb-2005 and IEEE Std 802.16-Conformance Mar-2005 for a Protocol Implementation Conformance Statement (PICS) Performa, Test Suite Structure (TSS) and Test Purpose (TP) and Radio Conformance Test (RCT), respectively.

II. Methodology

Wireless MIMO channels have been recently attracting a great interest since they provide significant improvements in terms of spectral efficiency and reliability with respect to single input single-output (SISO) channels. The gains obtained by the deployment of multiple antennas at both sides of the link are the array gain, the diversity gain, and the multiplexing gain. The array gain is the improvement in signal-to-noise ratio (SNR) obtained by coherently
combining the signals on multiple-transmit or multiple-receive dimensions while the diversity gain is the improvement in link reliability obtained by receiving replicas of the information signal through independently fading dimensions.

III. Simulation Results
Alamouti performs Monte-Carlo simulation and estimates Bit Error Rate (BER) of Alamouti Scheme over communication channel. The scheme presumes 2 transmit (Tx) and arbitrary number of receive (Rx) elements. If Rx=1 (one receive element) the Alamouti is transformed to the order 2 transmit diversity scheme with Maximum Ratio Combining (MRC). The modulation format is MPSK with arbitrary order M which can be controlled by user.

In this work Matlab R2013a is used to simulate and models the different problems for analysis and results. The simulations parameters are entered using the built graphic user interface (GUI) and contain:

1. Number of pair symbols from both Transmitter elements to be transmitted: N. This number should be at least 10 times more that the expected 1/BER to provide low estimation error.
2. MPSK order M, must be a power of 2. Since for M=2 (BPSK), M=4 (QPSK), M=8 (8-PSK), M=16 (16-PSK).

IV. Simulation Results for (2T1R/2T2R and 2T3R) for BPSK Modulation

![Fig. 2: Simulation Results for MISO (2T1R) for BPSK Modulation](image)

![Fig. 3: Simulation Results for MIMO (2T2R) for BPSK Modulation](image)

![Fig. 4: Simulation Results for MIMO (2T3R) for BPSK Modulation](image)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>No. of Symbol</th>
<th>MPSK</th>
<th>TX-RX</th>
<th>BER</th>
<th>SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1000</td>
<td>2-PSK</td>
<td>2T1R</td>
<td>10²</td>
<td>7.2</td>
</tr>
<tr>
<td>2</td>
<td>1000</td>
<td>2-PSK</td>
<td>2T2R</td>
<td>10²</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1000</td>
<td>2-PSK</td>
<td>2T3R</td>
<td>10²</td>
<td>0.5</td>
</tr>
</tbody>
</table>

V. Conclusion
In the above results based on linear modulation schemes (MPSK) - 2 PSK, with consider number of symbols is 1000 for 2T1R, 2T2R and 2T3R for the calculate SNR is 7.2dB, 3dB and 0.5dB at 10⁻²BER respectively. The maximum SNR is 7.2dB for 2T1R at 10⁻² is better than 4.2dB as compared to 2T2R.

References

