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Review paper on different Receivers in IR-UWB Communication System

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Abstract: The increasing demand for portable, high data rate communications has focused much attention on wireless technology. Ultra Wide Band (UWB) waveforms have the ability to deliver megabits of information while maintaining low average power consumption within a short range.. This paper studies the performance of non-coherent impulse-radio ultra wideband (IR-UWB) correlation receivers over different channel models.

Keywords: impulse-radio, Ultra Wideband

I. INTRODUCTION

Wireless communications have become popular because they address growing demands. Portable wireless devices permit high data rates at low cost and, with improved semiconductor technology, low power consumption. The increase in high- speed, wired access to the Internet has increased the demand for high-speed communications within the home. The need forrobust forms of transmission that do not interfere with other users, even inside relatively small areas, such as a single room in a building, is a pressing requirement. Ultra wide band (UWB) technology is a form of wireless communications and is becoming a popular choice for addressing these types of issues. UWB communication is a radio technology, used for short range and high bandwidth communication because its transmitted power is of low level . Impulse Radio (IR) UWB systems convey information using ultra short (short duration typically sub nanosecond) baseband pulses having low power density, high time resolution, rich multipath diversity. UWB devices are operational in the frequency bands 3.1-10.6 GHz and also above 10.6 GHz, thereby allowing 7500 MHz of spectrum for unlicensed use. However, there are still great design challenges in realizing its potentials. In order to make a large number of resolvable multipath components, correlation receivers or rake receivers are mostly used. But combing many paths using a Rake receiver significantly increases the complexity of implementation, also the channel estimation is difficult completed for high rate sampling. To overcome these difficulties, Transmitted Reference (TR) technique is applied to UWB systems with demonstrated demodulation capability in unknown multipath channel.

II. PROBLEM DEFINITION

UWB signals are essentially transmitted using wirelesstransmission medium. When transmitted in the non-line of sight transmission mode, the phenomena of multipath propagation comes into effect, hence the transmitted signalhas to be recovered somehow. Another goal is to achieve a minimum bit error rate (BER) and improve the performance of the system.

III. SCOPE AND OBJECTIVES

UWB signal spreads over a large bandwidth of several gigahertz and hence coexists with other narrowband systems. Thus it may cope with the narrowband interference (NBI) using their high processing gain. However, due to low transmission. power, it is anticipated that even this large processing gain is not sufficient to suppress high levels of NBI. In many cases, the power of NBI is a few tens of dBs higher than both the signal and noise power. Hence, if such interference is not suppressed properly, the UWB receiver may be jammed and the system performance degrades. Investigation of UWB system using realistic channel models is to be carried out of performance improvement through interference suppression. Due to the above mentioned problem with rake receiver, traditional rake may not work. Another approach, namely transmitted reference (TR), initially proposed for spread spectrum communication has regained popularity. The TR schemes used along with correlation-based receivers does not require channel estimation. TR scheme, proposed by Hoctor and Tomilson transmits two pulses per frame wherein the first pulse is an unmodulated reference pulse followed by a data modulated pulse.

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The only difference between a TR scheme and ATR scheme is in the receiver structure. The receiver section in ATR scheme averages all the previous reference signals. A modified version of the TR scheme, DTR scheme, sends a single data pulse over the current frame by differentially modulating it with the data sent over the previous frame.

The objective of this project is to better understand the performance of receivers via simulations and try to improve the performance of the existing receivers and performance at higher data rates in case of multipath rich channels.

IV. RESEARCH METHODOLOGY

This paper studies the bit error rate (BER) performance of impulse-radio ultra wideband (IR-UWB) correlation receivers.A short summary of each part can be given as:

Part I: Performance Evaluation of RAKE Receiver for IR-UWB Systems using Multipath Channels:-

In this Part, the performance of RAKE receivers is evaluated in terms of BER using the measured channel responses in an industrial environment. The standard channel model proposed by IEEE 802.15.4a for non line-of-sight (NLOS) industrial environments is also used for comparison.

Part II: Transmitted Reference Receivers for ImpulseRadio UWB Systems:-

In this Part, the Transmitted Reference (TR), Averaged Transmitted reference (ATR) and Differential Transmitted Reference (DTR) schemes of the transmitted referencereceiver structure to improve the BER performance of IR- UWB signals are proposed.

V. OUTCOME ANDRESULT

Performance of receivers for high data rate UWB system is investigated through MATLAB simulation. In the evaluation of SRAKE receiver performance, high multipath UWB propagation channel models, i.e. CM3 and CM4 are considered.

Comparison of the BER performances, is observed on different UWB NLOS channel models (CM3 & CM4).

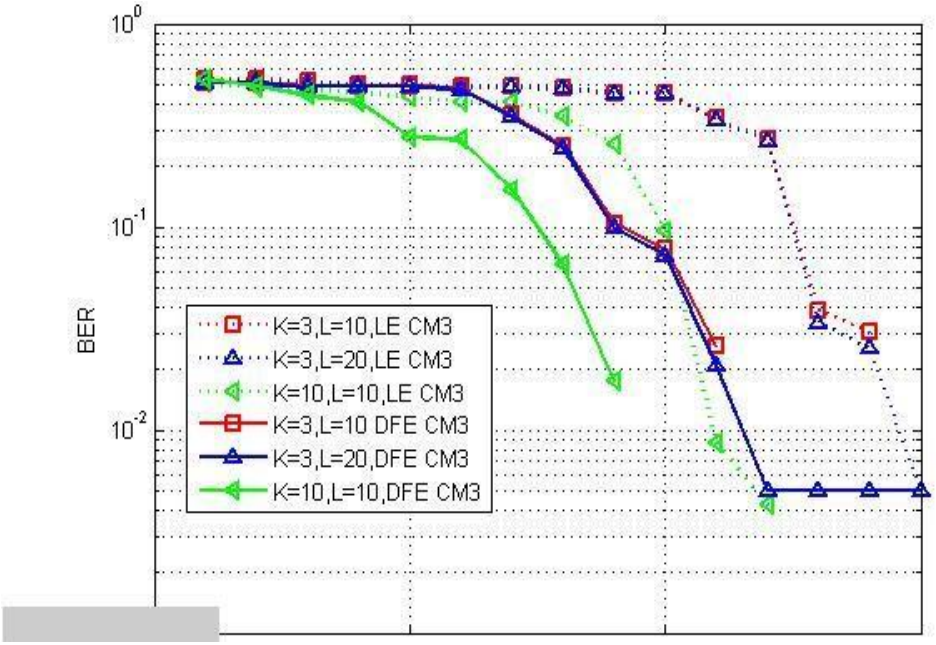

Fig 1 : Performance of UWB SRAKE receiver fordifferent rake fingers for CM3 channel model

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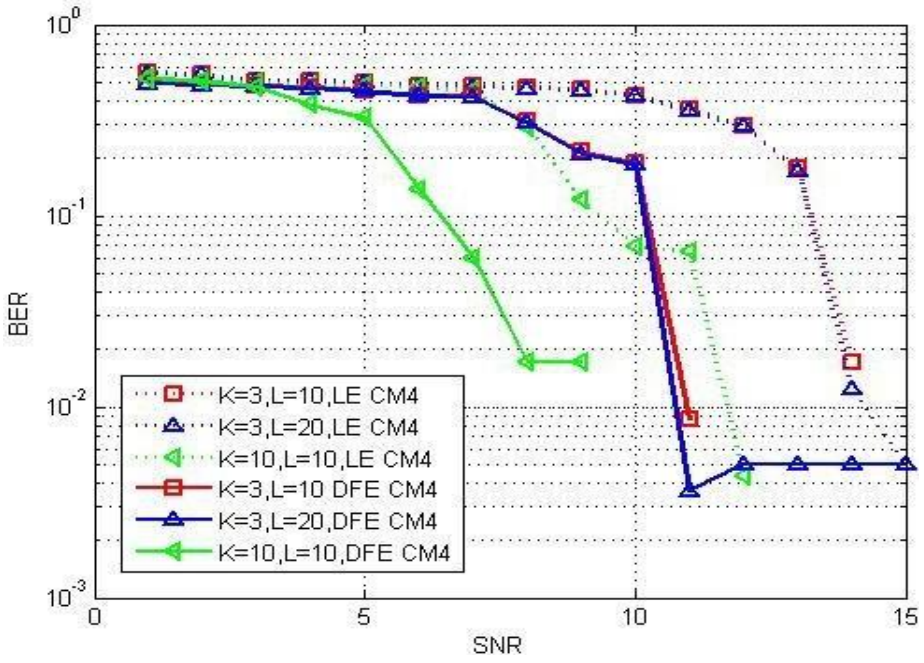

Fig 2 : Performance of UWB SRAKE receiver fordifferent rake fingers for CM4 channel model

VI. FUTURE WORK

The BER comparison for the various non-coherent IR-UWB receivers such as TR, ATR and DTR in different channel models can be observed.

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