Research Issues in Wireless

Communications and Networking

Farhat Anwar
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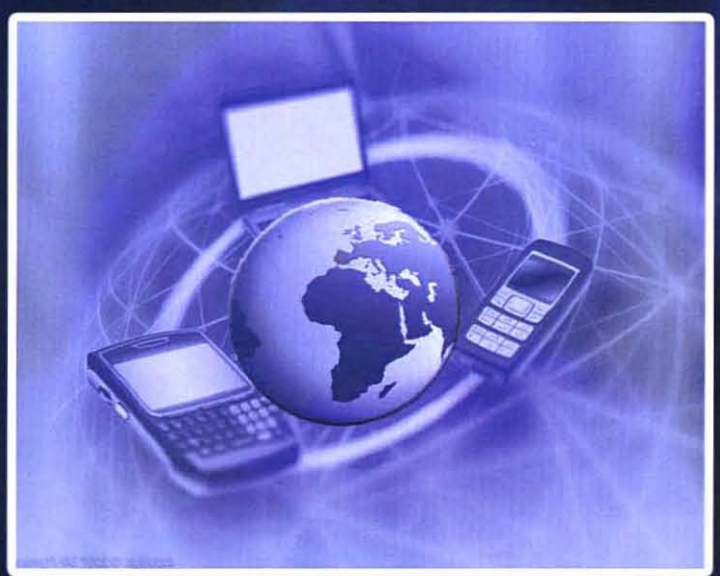

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CHAPTER 25

Design and Performance Analysis of Multiple Transmitters/Receivers on Free Space Optics (FSO) Link

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25.1 INTRODUCTION

Free Space Optics is the concept of transmitting very high bandwidth information using the optical beam from one point to another through the atmosphere. This technology offers various advantages to both telecommunication users and providers. It provides a high data rates up to several Gbps, has immunity to radio frequency interferences, requires no licensing, gives a highly secured communication link due to the usage of a very narrow beam angle, and offers an inexpensive, fast and easy deployment when compared to the fiber optic installation [1, 2].

As a terrestrial communication system, FSO link is deeply affected by climatic and atmospheric phenomena occurred in the free space. The atmospheric turbulences will cause the rapid fluctuation of received power and eventually will reduce the system quality [3]. Hence, there are many studies [4-9] proposed the alternatives to mitigate the shortcomings.

This work will make use the multiple TX/RX i.e. multiple laser beams within a FSO based unit to analyze its communication link performances. The effort here is to model the multiple TX/RX FSO link based on the commercial FSO equipment that are on the practical site. The performance analysis will be in terms of received power, eye diagram and BER. The drive to design the model is triggered by the fact that the BER tester practically does not provide the exact value of the BER. In nature, it only display either pass or fail and does not convey anything more than that. Therefore, it would be useful to know how much error the system can tolerate before the BER significantly increases based on the received power and the number of transmitters and receivers used. As for the eye diagram, it will serves as an additional parameter in determining the quality of the FSO link. The objectives are to design the multiple TX/RX FSO link and analyze its performances based on the theoretically calculated received power using the mathematical model developed by previous research and finally determine the BER for of each of the multiple TX/RX combinations. There would be a maximum of 16 combinations of multiple TX/RX FSO layouts to be designed and analyzed.

The remainder of the paper is organized as follows. Section 2 covers the overview of the system modeling which includes all the components from the software used to design the diverse system. Section 3 presents the result and analysis of the BER and the eye diagram for 16 combinations of transmitters and receivers. Finally, the last part is the conclusion of the overall work.

25.2 SYSTEM MODELING

Multiple TX/RX system of FSO link was designed and modeled for the performance analysis by using the OptiSystem Version 7.0 by Optiwave [10]. It serves to design the optical communication system. The lightwave system [11] in the software offers the FSO channel module which is the main subject of the design to be used in the FSO link