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Research Article

Evaluation Fiber Optic Communication Network Performance through Manchester Code

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ABSTRACT

There has been, and will continue to be, discussion over how to monitor wireline communications with increased data rates. In order to meet bandwidth requirements while keeping complexity at an acceptable level, engineers have dealt with many data formats over the years. Manchester encoding is a popular choice among the current solutions for various applications. Another benefit in high-speed input-output lines when the power budget is limited is the Manchester coding transceiver, which can be realized in a reasonably simple fashion. For inexpensive digital data optical transmission, the Manchester data format can be utilised as a modulation mechanism. The performance of the related transceivers under different conditions can be estimated by doing a comprehensive analysis of the Manchester data format and comparing it with other line coding types. System developed and fine-tuned for performance and feasibility evaluation. We used Opti system 2014 to test the system.

1. INTRODUCTION

A crucial component of the telecommunications network is fibre optics. It is perfect for gigabit transmission and beyond because to its high bandwidth capacity and low attenuation properties. Light pulses sent across an optical fibre can convey information from one location to another, a process known as communication. Light is modulated to generate an electromagnetic carrier wave, which carries information. The development of fiber-optic communication systems in the 1970s was a watershed moment in the history of the telecommunications sector, which in turn ushered in the Information Age [1]. Optical fibres have mostly supplanted copper wire communications in core networks across the industrialised world due to its many benefits over electrical transmission. Many telecommunications firms rely on optical fibre to transport signals for things like cable TV, the Internet, and telephone calls. The following are the main procedures involved in communicating using fiber-optics: Step one is to generate an optical signal using a transmitter. Step two is to send the signal down the fibre while keeping it from becoming too faint or distorted. Step three is to receive the signal and turn it into an electrical signal. For high data rate and long-distance applications, optical fibre significantly outperforms copper wire because of its far reduced attenuation and interference [2]. Despite the presence of utility lines, power lines, and railroad tracks, fibre can be installed in locations with low levels of electromagnetic interference (EMI). Also, places prone to lightning strikes should use nonmetallic all-dielectric wires [3]. Concerning the nonlinear impacts starting to pose a significant problem in the fibre [4]. Unipolar, polar, bipolar, and Manchester encoding are the most frequent types of line encoding. The signal is then passed through a "physical channel," which can be a "transmission medium" or a "data storage medium," after line coding. A transmission line can be used to directly transmit the line-coded signal, which is often expressed as voltage or current fluctuations (via differential signalling).In order to transform the line-coded signal, also known as the "baseband signal," into a "RF signal" suitable for transmission in open space, it is first pulse-shaped to decrease its frequency bandwidth and

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subsequently modulated to change its frequency. In free-space optical communication, the line-coded signal can activate and deactivate a light source; this is a typical application for infrared remote controls [5]. shows the linear losses that were computed using the formula.

$$Loss\ dB = 10 \log \frac{p\ out}{p\ in} \qquad (1)$$

$$Loss\ dB/km = \frac{Loss\ dB}{Length\ Fiber} \qquad (2)$$

$$Pout = Pin * 10^{Loss\ dB/10} \qquad (3)$$

2. MANCHESTER CODING – DECODING SYSTEM WITH FIBER LINK

Although Manchester coding (also known as bi-phase coding) necessitates twice as much bandwidth as non-return-zero (NRZ) coding, it offers a number of benefits, including the ability to perform a straightforward clock extraction operation. Its differential detection system also shows a high level of tolerance for intensity fluctuations, which makes it a potential code for burst mode transmission lines at high speeds [3]. The Manchester code facilitates clock recovery by ensuring frequent line voltage shifts that are directly proportional to the clock rate. Media that typically do not transmit a DC component can conveniently convey the encoded signal since the DC component is not data dependent and hence does not carry any information [4]. With the additional benefit of not requiring optical-electrical-optical conversion, all-optical Manchester encoding is quite appealing [7]. Figure (1) shows the intended system.

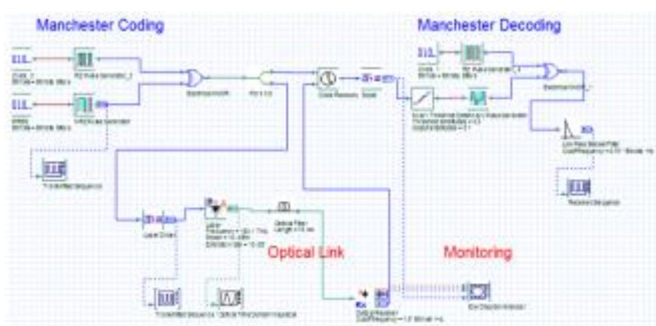

Fig. 1. Manchester coding – decoding system with fiber link

3. RESULTS AND DISCUSSION

For a common distance of 500 km SMF (10 loops x 50 km) and periodic amplification after each fibre, Figure (2: a, b) shows the results obtained with high-dispersion fibres 40 Gbps in SMF RZ modulation format transmission. In the graph, we can see that the maximum Q is a function of the input power. The ideal point, as seen in the BER Analyzer eye diagram, is input power 4 mW, as indicated by the graph. With a common distance of 250 km SMF (5 loops x 50 km) and periodic amplification after each fibre, Figure (3: a, b) shows the results obtained with high-dispersion fibres 40 Gbps in SMF NRZ modulation format transmission. In the graph, we can see that the maximum Q is a function of the input power. The ideal point, as shown by the graph of the BER Analyzer eye diagram, is input power 1.25 mW. You can see the parameters and fibre types utilised in Table (1). As a result of its 0.2 dB/km linear losses, the LSMF is superior.

TABLE I. SHOWS PARAMETER USED AND TYPES LENGTH OF THE FIBER

Parameter	Value
Linear losses	a = 0.2 dB/km
Fiber length	LSMF = 50km
Linear losses	a = 0.2 dB/km
Fiber length	LDCF = 10km

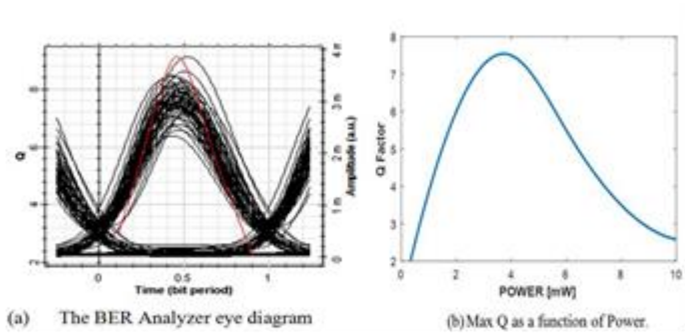

Fig.2. (BER analyzar and max Q factor)

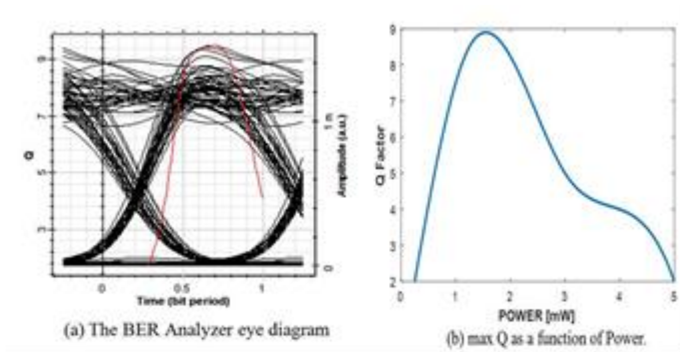

Fig. 3. (BER analyzer and max Q factor)

4. CONCLUSION

In these simulations Q factor of received signal versus transmitted signal power are presented. Eye diagrams for sys-tems performance are also presented. Oscilloscope visualizer is used to tracking the signals in time domain for 10 bit sequence from the transmitter to receiver in all components. The results show for Manchester coding the BER Analyzer eye diagram represents the optimal point, which according to the graph. next generation of optical communication systems require high capacity, better spectrum efficiency and more system flexibilities. According to the enormous increasing of data rate demand for the optical fiber transmission systems, this work has covered important technique. However, there are some limitations, which can be solved by using more advanced coding techniques like differential Manchester coding.

Conflicts Of Interest

None

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None

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