

Fiber Optic Communication Line Code Experiment Report



Overview

Fiber Optics Communication Lab Manual This experiment involves setting up a fiber optic analog link to transmit an audio signal. [1] A fiber optic transmit.

Key Takeaways

A Fiber Optic Communication Line Code Experiment Report documents the design, simulation, and performance analysis of optical links using NRZ and RZ line coding schemes, including BER, Q-factor, Eye Diagram, and received power measurements. Objective

The main objectives of the experiment are to:

- Design and simulate optical fiber links using NRZ and RZ line coding schemes.
- Analyze how the choice of line coding affects Bit Error Rate (BER), Q-factor, Eye Diagram, and Received Power.
- Compare system performance across different fiber lengths (e.g., 10 km, 25 km, 75 km, 100 km) to study the impact of attenuation, dispersion, and inter-symbol interference (ISI) .

Apparatus and Software

- Optical Fiber Trainer Kit or simulation software (e.g., OptiSystem 21)
- CW Laser Source

- PRBS Generator (Pseudo-Random Bit Sequence)
- Line Encoder (NRZ or RZ)
- Mach-Zehnder Modulator (MZM)
- Optical Fiber Channel
- EDFA (Erbium-Doped Fiber Amplifier) and Optical Attenuator
- PIN Photodiode and Low-Pass Filter
- BER Analyzer, Eye Diagram Analyzer, Optical Power Meter

Experimental Procedure

- Simulation Setup:
 - Open OptiSystem and create a new project.
 - Connect the PRBS Generator to the Line Encoder (NRZ or RZ).
 - Connect the Line Encoder output to the electrical input of the MZM.
 - Connect the CW Laser to the optical input of the MZM.
- Channel Configuration:
 - Connect the MZM output to the optical fiber.
 - Insert EDFA and Optical Attenuator after the fiber.
 - Vary fiber lengths (10 km, 25 km, 75 km, 100 km) to study performance.
- Receiver Setup:
 - Connect fiber output to PIN Photodiode → Low-Pass Filter.
 - Connect filter output to BER Analyzer and Eye Diagram Analyzer.
 - Connect PRBS output to BER Analyzer as reference.
 - Place Optical Power Meter before the receiver.
- Simulation Execution:
 - Run simulations at a bit rate of 10 Gb/s with 64 samples per bit.
 - Repeat for both NRZ and RZ coding formats at each fiber length.
- Data Recording:
 - Record Q-factor, BER, Received Power, and Eye Diagram for each configuration .

Observations and Analysis

- BER (Bit Error Rate): Lower BER indicates better system performance.
- Q-factor: Higher Q-factor corresponds to better signal separation and lower BER.

- Eye Diagram: A wide-open eye indicates low ISI and minimal distortion; a closed eye indicates signal degradation.
 - Received Power: Monitors optical attenuation through the fiber; decreases with increasing fiber length.
 - Comparison: NRZ coding is more bandwidth-efficient but less tolerant to noise and dispersion, while RZ coding requires more bandwidth but offers better synchronization and noise tolerance .
- Report Format

A professional lab report should include:

- Title and Objective
- Theory: Brief explanation of NRZ and RZ coding, optical link components, and performance metrics.
- Apparatus/Software
- Experimental Procedure
- Results: Tables and graphs for BER, Q-factor, Eye Diagrams, and Received Power.
- Discussion: Analyze trends, compare NRZ vs RZ, and explain the impact of fiber length.
- Conclusion: Summarize findings and practical implications.
- References: Cite textbooks, lab manuals, and software documentation . This structure ensures clarity, reproducibility, and professional presentation of the fiber optic line coding experiment.

Article Content

Fiber Optics Communication Lab Manual

This experiment involves setting up a fiber optic analog link to transmit an audio signal. A fiber optic transmitter converts an

Fiber Optic Communication Lab Report

The lab report details an experiment on fiber optic communication using the KL-900D kit, aiming to understand its functionality and

ECE4333 Lab Manual: Experiment 2

Preview text Experiment 2: Simulation Study of Different Optical Line Coding Formats (NRZ and RZ) in an Optical Fiber

EET 252W Fiber Optic Transmission Lab Report: PWM Analysis

Explore the principles of fiber optic communication and pulse width modulation in this detailed lab experiment report.

Optical Fiber Communication ECE Practical File.pdf

This document summarizes 10 experiments on optical fiber communication: 1. Studying a 650nm fiber optic analog link and the

LABORATORY MANUAL COMMUNICATION SYSTEMS LAB

The most significant features of LEDs, which are used for optical communication, include high modulation rate capability, high

Optical Communication Lab Manual

Lab manual for optical communication experiments: fiber optic links, propagation loss, numerical aperture. College/university level.

Novel Device Lab

Because this is a new and rapidly expanding technology, the education of most engineers does not include courses in fiber optics.

Optical Communication Lab Manual | PDF | Optical Fiber | Dispersion ...

This document is the laboratory manual for the Optical Communication course. It contains 13 experiments related to optical

How Deep Does Spectrum Bury Their Cable? A Fiber Engineer's

Disclosure: Glory Optical Communication manufactures direct-burial and armored fiber optic cable. Where this guide

Fiber Optic Digital Link Experiment | PDF

This document describes an experiment to study a digital fiber optic link using 660nm and 950nm fiber optic cables. A TTL signal

Handbook Optical fibres, cables and systems

The simultaneous availability of compact sources and of low-loss optical fibres led to a worldwide effort for developing optical fibre

MergedFile

In telecommunication, an optical time domain reflectometer (OTDR) is an optoelectronic instrument used to characterize an optical

Line Code for Optical Fiber Communication Systems

Abstract In this paper, different types of line coding techniques used for digital optical fiber communication have been

(PDF) Lab Report Fiber Optics

This laboratory report will discuss the characteristics of optical fibers, specifically, the single-mode fiber (S MF) and the multi-mode

Optical fiber Communication training report | PDF

This document provides a table of contents and index for a report on optical fiber cables. It includes 8 chapters that cover topics such

Fiber Optics Lab: Power Measurements

This laboratory report discusses fiber optic measurements and characteristics. It describes the basic structure of optical fibers

Optical Fiber Communication | Report | DOCX

This document is a project report submitted by Vanhishikha Bhargava to fulfill requirements for a Bachelor of Technology degree.

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