Scrambling and Decoding Experiments in Fiber Optic Communication



Overview

The proposed scheme is implemented and tested in a real-time FPGA-based optical communication system using hollow-core fiber.

Key Takeaways

Scrambling and decoding in fiber optic communication involve techniques like optical code hopping, polarization scrambling, and space-time coding to enhance security, mitigate impairments, and improve data transmission performance. Optical Code Scrambling and DecodingBit-by-bit optical code scrambling uses time-domain spectral phase encoding/decoding (SPE/SPD) to securely transmit data over fiber. In experiments, 2.

5-Gb/s DPSK data was scrambled using multiple 8-chip, 20-Gchip/s Gold codes and transmitted over 34 km, demonstrating robust security against conventional energy detection and DPSK demodulation attacks. This method allows rapid reconfiguration of the optical code hopping sequence, enabling potential unconditional transmission security similar to a one-time pad system (Wang et al.),.

Polarization Scrambling

Polarization scramblers are employed to mitigate polarization-dependent impairments such as polarization mode dispersion (PMD) and polarization-dependent loss. All-optical polarization scramblers can operate in a chaotic regime using fiber loops and beam splitting, achieving scrambling speeds up to 42 Mrad/s with a low degree of polarization (

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Article Content

Experimental demonstration of integrated encryption and

Here we propose an integrated encryption and communication (IEAC) framework, designed to maximize mutual information (MI) for legal users while minimizing it for potential

Bit-by-bit optical code scrambling technique for secure optical ...

Abstract: We propose and demonstrate a novel bit-by-bit code scrambling technique based on time domain spectral phase encoding/decoding (SPE/SPD) scheme using only a single phase modulator

Experimental Investigation of Information Bit Scrambling for Physical ...

Compared to our previous experimental investigations of special punctured LDPC codes (targeting both, reliability and security), the combination of conventional LDPC codes with information bit scrambling

Real-time hollow-core fiber transmission system based ...

The proposed scheme is implemented and tested in a real-time FPGA-based optical communication system using hollow-core fiber. Experimental results show that the BER of the

A secure scheme based on polar-coded and 3D mixed domain

With the development of 6G network, the issue of physical layer security in optical fiber communication is becoming more and more significant. In this paper, a polar-coded encryption and

Guided scrambling: a new line coding technique for high bit rate fiber ...

Abstract: The technique introduced has relatively simple encoding and decoding procedures which can be implemented at the high bit rates used in optical fiber communication

Design and simulation of secure fiber optic communication system ...

In this work, a secure fiber optic communication system utilizing Hill cipher algorithm is demonstrated and investigated via integrated the MATLAB with OptiSystem software. The MATLAB

[2312.13693] Optical decoder learning for fiber communication at the ...

We showcase our method with coherent-state codes for the pure-loss bosonic channel, modelling optical-fiber and space communication, with a circuit architecture comprising linear optics,

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Space-Time Coding and Optimal Scrambling for Mode Multiplexed

We show that a combination of ST coding at the transmitter and an optimal distribution of mode scramblers in the optical link can completely absorb the penalties induced by important levels of MDL

Guided scrambling: a new line coding technique for optical fiber ...

Abstract: A line coding technique is introduced for binary signals which due to its simple encoding and decoding procedures is applicable to high-bit-rate optical fiber transmission systems.

(PDF) High Speed All-Optical Polarization Scrambler Based on ...

Here we report the first experimental demonstration of perpetual temporal spying and blinding process of optical data in fibre-optic transmission line based on polarization bypass.

Passive Scrambling and Unscrambling for Secure Fiber Optic ...

We propose an all-fiber based approach to scramble and un-scramble optical signal for secure fiber optic communications. A scrambler and un-scrambler pair with an operation range from 0.8 Gb/s to

Polarization Scramblers to Solve Practical Limitations of Frequency ...

Polarization variations in optical fibers are complex and would severely affect the performances of polarization-sensitive signal distribution systems. Owing to advances in

Polarization Scramblers

Polarization scramblers work by temporal polarization modulation, which can be done with various methods. They are vital for applications in fiber communications and other fields.

PMD mitigation through interleaving LDPC codes with polarization ...

1. Introduction In high-speed long-haul optical fiber transmission system, polarization mode dispersion (PMD) is a key factor that influences bit-error-rate (BER) performance , . The

Time scrambling and decoy-state quantum key distribution for optical ...

The real-time optical signal processing is operating with an array of tunable Fabry-Perot cavities by using the updating and synchronization keys. Based on this scheme, an experimental

Polarization Scramblers to Solve Practical Limitations of Frequency ...

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Owing to advances in experimental techniques and theoretical tools, we observe the effect of polarization variations in the optical fibers and we demon-strate that polarization mode dispersion

Design and simulation of secure fiber optic communication system ...

The security is crucial in modern communications systems for preserving the transferred data. In this work, a secure fiber optic communication system utilizing Hill cipher algorithm is

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