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Performance Evaluation of RoF-WDM System Using DPSK Modulation and Optical DSB-SC for Long-Haul Communications

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ABSTRACT

This paper aims to investigate the impact of DPSK modulation using ODBS-SC on RoF-WDM system performance. The injected laser power will be optimized to extend the transmission distance. Performance evaluation of the proposed system is carried on with the Optisystem .

1. INTRODUCTION

The accelerated growth in the demand for high-speed wireless services by users and the limitation of bandwidth has naturally led to the transition to the millimeter band centered around 60 GHz, providing very wide bandwidth at very high speed. Radio over Fiber (RoF) is dedicated to the optical transmission of microwave signals. As a result, the RoF link exploits the efficiency of the optical fiber for distributing radio signals to wireless access points that offer the benefit of mobility.

2. PROPOSED SYSTEM

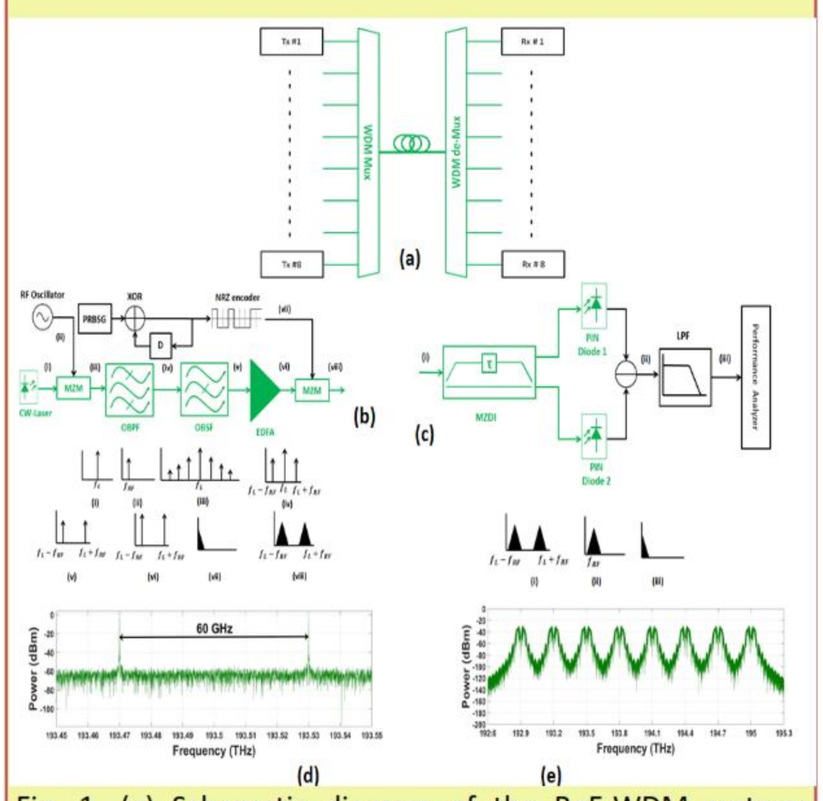

Fig. 1. (a) Schematic diagram of the RoF-WDM system; (b) the transmission part and(c)the reception part for each channel,(d)the ODSB-SC spectrum of the third channel and (e) WDM multiplexer output spectrum.

Spacing between channels	$0.3\ THz$
Bit rate of each channel	$30\ Gbps$
Attenuation of SSMF	$0.2\ dB/Km$
Attenuation of DCF	$0.5\ dB/Km$
Dispersion of the SSMF	$17\ ps/nm/Km$
Dispersion of theDCF	$-85\ ps/nm/Km$
MZDI Delay	$33.33 \times 10^{-12} s$
Cutoff frequency	$22.5\ GHz$

Table. 1. Simulation Setup

3. MAIN RESULTS

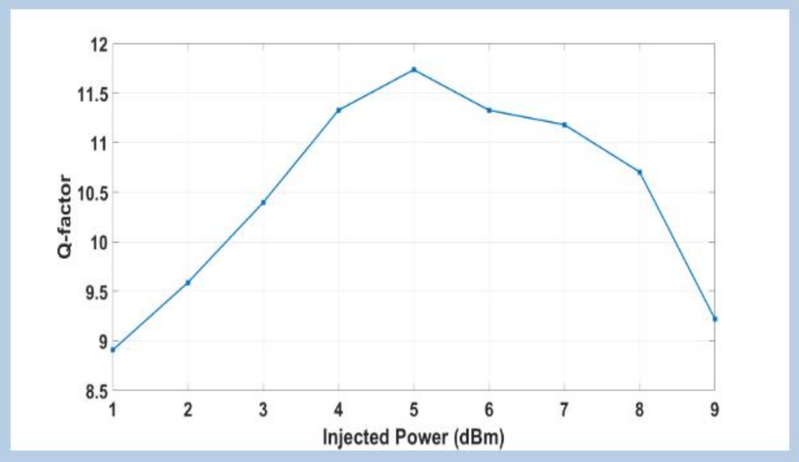

Fig. 2. Q-factor versus injected laser power for a distance of 1020Km.

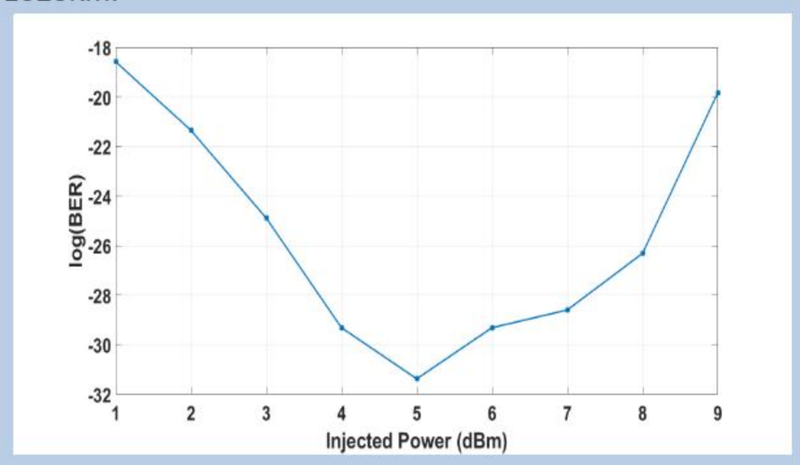

Fig. 3. Bit Error Rate logarithm versus injected laser power for a distance of 1020Km.

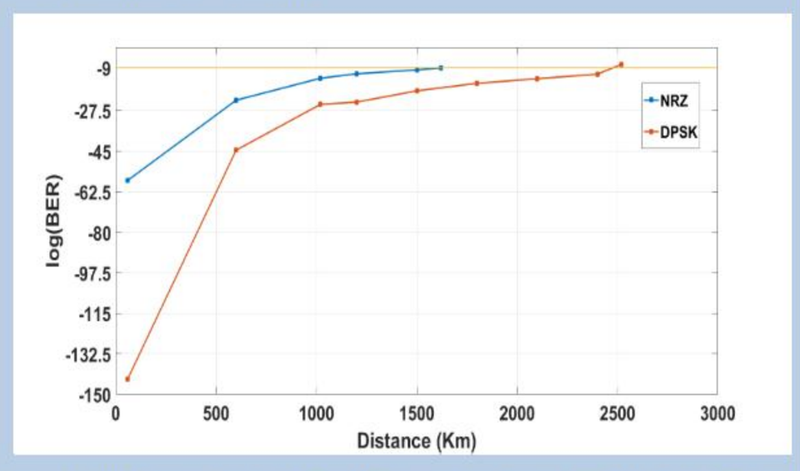

Fig. 4. Bit Error Rate logarithm versus transmission distance of the 6th channel for the NRZ and DPSK systems.

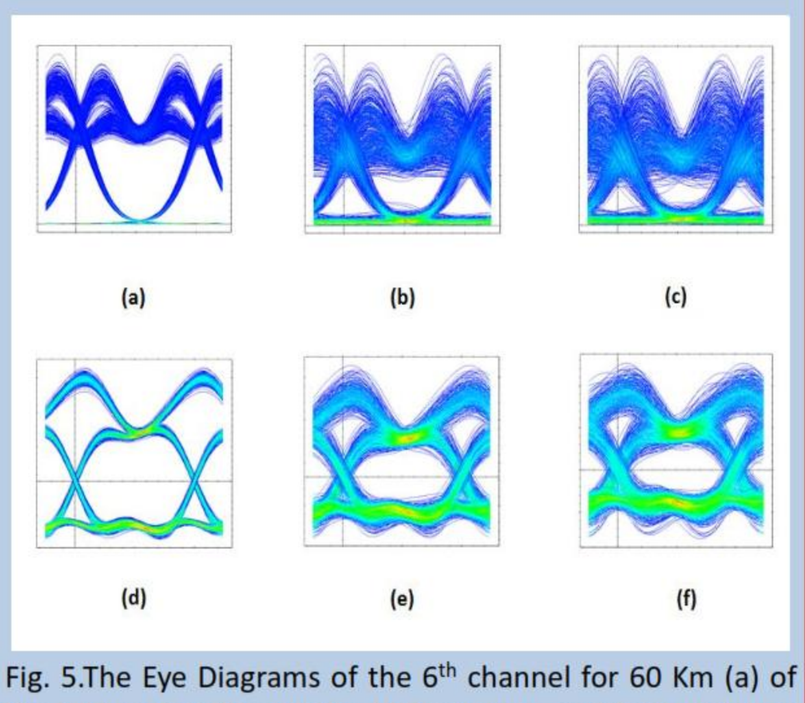

Fig. 5.The Eye Diagrams of the 6th channel for 60 Km (a) of the NRZ system(b) and the DPSK system, and for a distance of 1620 Km (c) of the NRZ system (d) and the DPSK system, and for a distance of 2520 Km of (e) of the NRZ system(f) and the DPSK system.

4. CONCLUSION

The simulation results obtained indicate that the laser's power of 5 dBm allows the propagation over a distance of 2520 Km. According these results, this proposed system can be a performant application for Multiservice networks because of the possibility of transmitting data for Wireless operators without the limitation imposed by the electrical noises. According to the results obtained, to optimize this system it is necessary to use the Error Correction Codes (ECC) which they allow the modulated signals to reach long distances.

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