Performance Evaluation of symmetric 8×10 Gbps TWDM-PON incorporating Polarization Division Multiplexed Modulation Techniques under fiber-impairments

Meet Kumari (✉ meetkumari08@yahoo.in)

Punjabi University <https://orcid.org/0000-0001-9975-1557>

Reecha Sharma

Punjabi University

Anu Sheetal

Guru Nanak Dev University

Research Article

Keywords: TWDM-PON, PDM, MZM, EAM

Posted Date: March 24th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-342975/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Version of Record: A version of this preprint was published at Wireless Personal Communications on August 14th, 2021. See the published version at <https://doi.org/10.1007/s11277-021-08751-2>.

Abstract

Today's access networks are in high demand to fulfill the high bandwidth requirement because of extensive improvement in high transmission rate applications for cloud computing, big data analytics, and other next-generation 5G smart applications. This exponential growth of high capacity and broadband access technologies comprise an essential trend in the development of a passive optical network (PON) access network. In this paper, 80/80 Gbps time wavelength division multiplexing PON (TWDM-PON) incorporating polarization division multiplexing (PDM) based Mach-Zehnder modulator (MZM) and electroabsorption modulator (EAM) techniques have been proposed. The performance of the system consisting of different polarized multiplexed modulation techniques is investigated in both downstream and upstream data transmission for variable transmission distance and received optical power in terms of bit error rate (BER), eye diagrams, power budget (PB) and receiver sensitivity (RS). The results show that the 4×20/20 Gbps PDM-EAM modulated signals over 100 km fiber distance at -60 dBm RS and 70 dB PB are successfully transmitted under fiber non-linearities. The proposed TWDM-PON system provides a next-generation long-reach access network from urban to rural areas.

Full Text

This preprint is available for [download as a PDF](#).

Figures

Figure 1

Schematic of PDM based bidirectional 4×20/20 Gbps TWDM-PON incorporating MZM/EAM modulation techniques

(a)

(b)

Figure 2

Schematic of (a) Bidirectional TWDM-PON incorporating PDM-MZM/EAM modulation techniques and (b) upstream time switch section

Figure 3

Simulation setup for Bidirectional TWDM-PON incorporating PDM-MZM/EAM modulation techniques

Figure 4

The optical spectra of OFDM signals in (a) downstream and (b) upstream direction

Figure 5

BER vs length for (a) downstream channels, (b) upstream channels, BER vs ROP over 40 km distance for (c) downstream channels and (d) upstream channels employing MZM/EAM modulators. Insets: corresponding EAM modulation eye diagrams

Figure 6

Optical spectrum of (a) Transmitted signal, after 20 km for (b) EAM, (c) MZM; after 40 km for (d) EAM, (e) MZM; after 60 km for (f) EAM, (g) MZM, after 80 km for (h) EAM, (i) MZM; after 100 km for (j) EAM and (k) MZM