

## **Time and Wavelength Division Multiplexing Passive Optical Network Comparative Analysis: Modulation Formats and Channel Spacings**

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**Abstract :** In light of the substantial increase in end-user requirements and the incessant need of network operators to upgrade the capabilities of access networks, in this paper, the performance of the different modulation formats on eight-channels Time and Wavelength Division Multiplexing Passive Optical Network (TWDM-PON) transmission system has been examined and compared. Limitations and features of modulation formats have been determined to outline the most suitable design to enhance the data rate and transmission reach to obtain the best performance of the network. The considered modulation formats are On-Off Keying Non-Return-to-Zero (NRZ-OOK), Carrier Suppressed Return to Zero (CSRZ), Duo Binary (DB), Modified Duo Binary (MODB), Quadrature Phase Shift Keying (QPSK), and Differential Quadrature Phase Shift Keying (DQPSK). The performance has been analyzed by varying transmission distances and bit rates under different channel spacing. Furthermore, the system is evaluated in terms of minimum Bit Error Rate (BER) and Quality factor (Qf) without applying any dispersion compensation technique, or any optical amplifier. Optisystem software was used for simulation purposes.

**Keywords :** BER, DuoBinary, NRZ-OOK, TWDM-PON

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