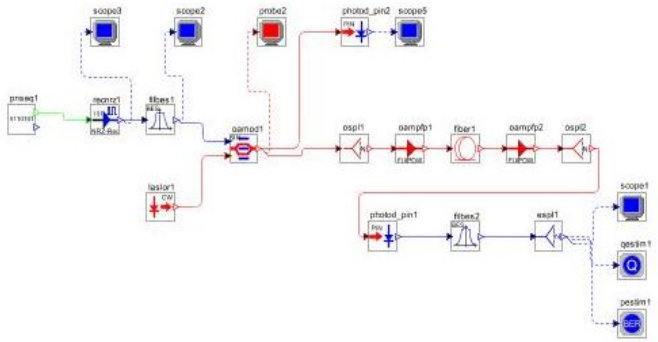

Figure 2:.Duobinary transmission system based on single arm MZM.

Here, the Pseudo Random Bit sequence generated by the data source is encoded by using NRZ electrical generator. Three level electrical signal is produced by passing this signal through a Bessel Thomson low pass filter. It is then modulated by using a single arm MZM with $\sin^2$ electrical shaped input-output characteristics to produce three level optical signal. This transfer function is typical for a Mach-Zehnder external modulator based on the electro-optic effects in the Lithium Niobate (LiNbO3) devices. Transmitting channel and the detector are same as that of dual arm MZM based system.

Compared to dual arm MZM, the transmitter section based on single arm MZM is less complex and also it avoids symmetric requirements [2,3].

3. Results and Discussions

3.1 Variation of Q Factor with Distance for Various Bit rates

Figure 3 and Figure 4 shows the variation of Q factor with distance for dual arm MZM and single arm MZM at bit rates 10, 20 and 30 Gbps respectively.

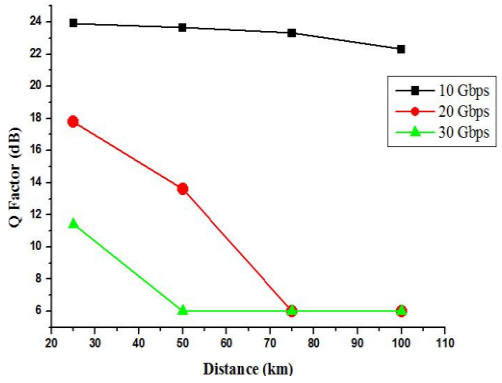

Figure 3:.Variation of Q Factor with distance for dual arm MZM

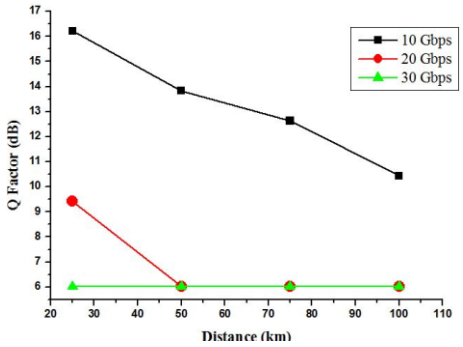

Figure 4: Variation of Q Factor with distance for single arm MZM

Dual arm MZM based duobinary transmission system provide better Q Factor than single arm MZM based transmission system. At lower bit rates single arm MZM based system can be used since it provide considerable value of Q Factor and low circuit complexity. But at higher bit rates and longer distances, dual arm MZM is better.

3.2 Variation of BER with Distance for Various Bit rates

Variation of BER with distance for dual arm MZM and single arm MZM at bit rates 10, 20 and 30 Gbps are shown in Figure 5 and Figure 6 respectively.

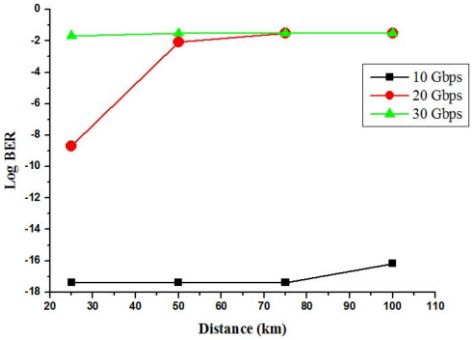

Figure 5: Variation of Log BER with distance for dual arm MZM

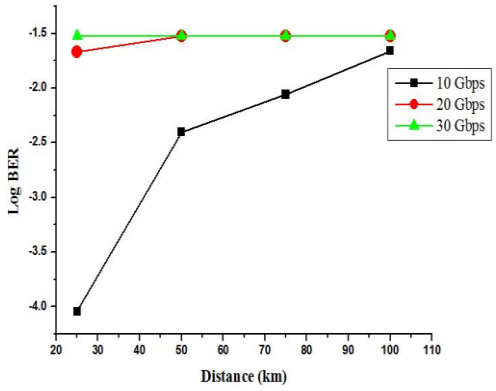

Figure 6: Variation of Log BER with distance for single arm MZM

In duobinary transmission system, dual arm MZM provides low BER values compared to single arm MZM. Also from the graphs it is clear that, as the distance increases Q Factor decreases and BER increases.

3.3 Eye Diagram Analysis

3.3.1 At 10 Gbps for 25 km

Figure 7 (a) and (b) shows the eye diagrams of duobinary transmission systems using dual arm MZM and single arm MZM respectively at 10 Gbps for 25 km.

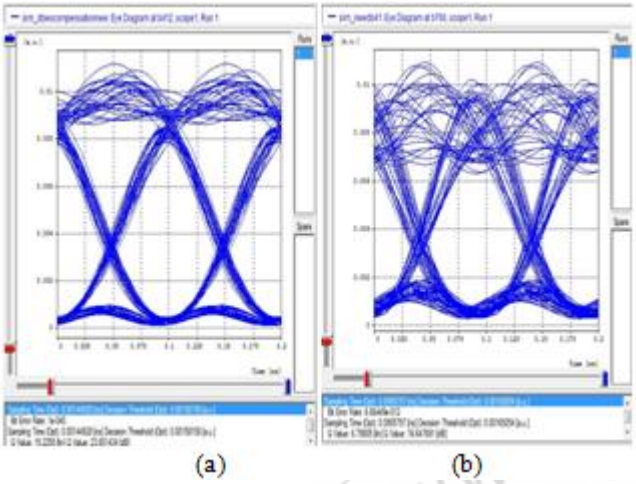

Figure 7: Eye diagrams of duobinary transmission systems based on (a) dual arm MZM (b) single arm MZM at 10 Gbps

3.3.2 At 20 Gbps for 25 km

Eye diagram of duobinary transmission systems using dual arm MZM and single arm MZM at 20 Gbps for 25 km are shown in Figure 8 (a) and (b) respectively.

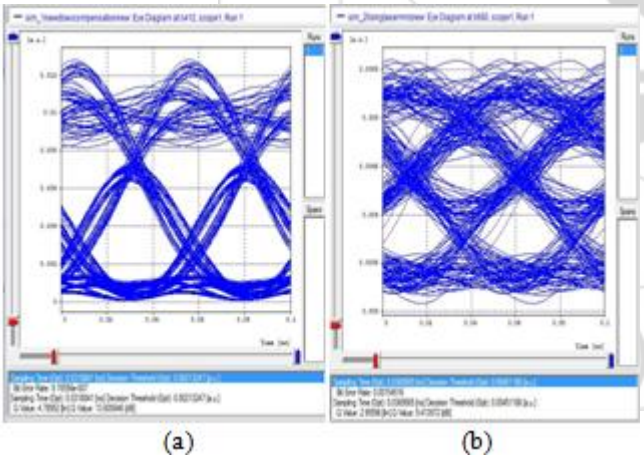

Figure 8: Eye diagrams of duobinary transmission systems based on (a) dual arm MZM (b) single arm MZM at 20 Gbps

3.3.3 At 30 Gbps for 25 km

Figure 9 (a) and (b) shows the eye diagrams of duobinary transmission systems using dual arm MZM and single arm MZM respectively at 30 Gbps for 25 km.

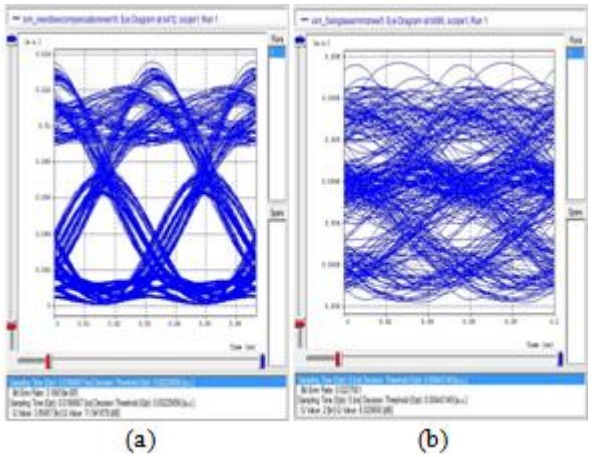

Figure 9: Eye diagrams of duobinary transmission systems based on (a) dual arm MZM (b) single arm MZM at 30 Gbps

From the above eye diagrams it is clear that the eye openings of duobinary transmission systems based on dual arm MZM is higher than that of single arm MZM based transmission systems.

4. Conclusion

Optical duobinary signal can be generated by using either a dual arm MZM or a single arm MZM. From the analysis ,it is observed that the transmission setup based on single arm MZM is less complex and it avoids all symmetry requirements. But it is suitable only for low bit rates. At high bit rates and for long distances, dual arm MZM is preferred due to its high Q Factor, low BER and large eye openings.

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