4.4 Efforts of Hybrid configuration on Q Factor and BER

The Hybrid configuration I covers 120.036Km with Q factor of 32.2548 and 32.2729 for PIN and APD. The Q factor for APD is better than the BER for PIN which is shown in table 3.

Table 3:Q factor for Hybrid configuration I

Length(Km)	*Q factor(PIN)*	*Q factor (APD)*
40.012	227.683	227.748
80.024	222.063	222.24
120.036	32.2548	32.2729

The Hybrid configuration I covers 120.036Km with BER of 1.50492e-228 and 8.39614e-229 for PIN and APD. The BER for APD is better than the BER for PIN which is shown in table 4.

Table 4: BER for Hybrid configuration I

Distance (Km)	*BER (PIN)*	*BER(APD)*
40.012	0	0
80.024	0	0
120.036	1.50492e-228	8.39614e-229

The Hybrid configuration II covers 65.012Km with Q factor of 2.33563 and BER of 0.00955 shown in table 5.

Table 5:Q factor and BER for Hybrid configuration II

Length(Km)	*Q FACTOR*	*BER*
55.012	2.32715	0.00975
65.012	2.33563	0.00955

The Hybrid configuration III covers 65.012Km with Q factor of 2.6557 and BER of 0.003882 shown in table 6.

Table 6:Q factor and BER for Hybrid configuration III

Length (Km)	*Q Factor*	*BER*
65.012	2.6557	0.003882

4.5 Effect of attenuation on Q factor and Bit Error Rate (BER)

With attenuation of 0.9dB/Km the DWDM system is covered distance of 480.144Km compared to attenuation of 0.5dB/Km.Q factor and BER of attenuation 0.5dB/Km and 0.9dB/Km with different distance had shown in table 7 and 8.

Table 7:Q factor and BER of attenuation 0.5dB/Km

Distance(Km)	*Q factor*	*BER*
130.048	194.368	0
160.048	193.438	0
200.060	97.0358	0
240.072	25.3776	2.22811e^-142
280.084	5.37964	3.73083e^-008

Table 8: Q factor and BER of attenuation 0.9dB/Km

Distance (Km)	*Q factor*	*BER*
200.060	56.1871	0
240.072	50.1879	0
280.084	44.4455	0
320.096	38.4701	4.940e^-324
360.108	31.8866	2.0191e^-223
480.144	11.2515	1.1289e^-29

4.6 Effect of Channel Spacing on Q factor and Bit Error Rate (BER)

The performance of 64 channel DWDM systems with the channel spacing as 50GHz, 55 GHz at1550 nm window. It was observed that on increasing the frequency spacing; Q factor increases and the bit error rate decreases. Frequency spacing of 55 GHz gives better Q factor and BER; i.e. 7.37423 and 8.23996e^-14 respectively. DWDM system is covered 520.156Km with channel spacing 55 GHz.

Table 9:Q factor and BER of channel spacing

Channel spacing (GHz)	DISTANCE (Km)	Q factor	BER
50	520.156	6.65019	1.45943e^-11
55	520.156	7.37423	8.23996e^-14

5. Conclusion

In this paper various combinations of optical amplifiers (Hybrid configuration) for a dense wavelength division multiplexed system with different modulation formats was designed. MDRZ modulation format shows maximum Q factor, comparing to CSRZ and DRZ modulation format, and so it is said to be an optimized modulation format. EDFA-RAMAN, SMF+EDFA-RAMAN, SMF+EDFA-RAMAN +DCF are used instead of fiber link. EDFA-RAMAN is found to have the best performance among the three types in the terms of quality factor, BER.EDFA-RAMAN configuration with 55 GHz channel spacing, MDRZ modulation format, 0.9dB/Km attenuation, 16 MHz line width and 456mw, 600mw EDFA and Raman pump power gives optimum results in terms of Q factor and BER for a distance of 520.156km. The maximum

distance of 520.156 km is achieved by the EDFA-Raman at acceptable BER (8.23996-14), quality factor (7.37423dB) using avalanche photodiode (APD).The role of laser line-width is also investigated as it plays important role to minimize the nonlinearity and four wave mixing .The performance of proposed 64 X 20 high speed system with hybrid configuration I is evaluated in terms of Q factor, BER which clearly states that all the channels are transmitted up to long optical span of 520.156 Km with acceptable Q factor and BER.

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