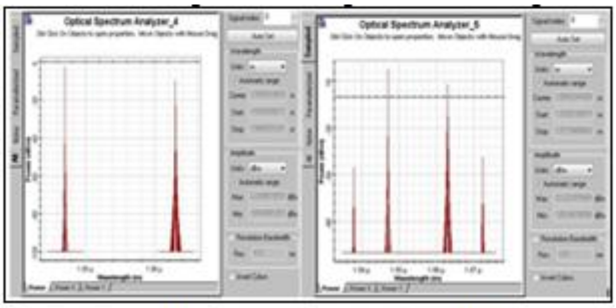
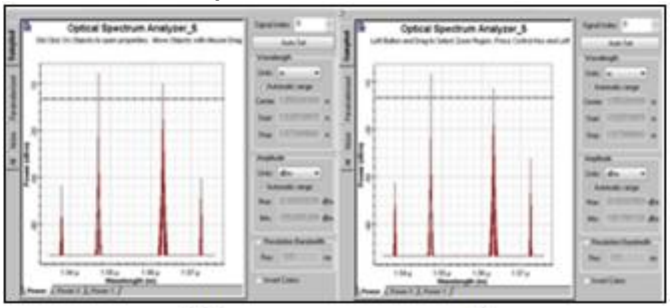


(a) (b)

Figure 4: Spectrum of (a) multiplexed signal (b) fiber output with converted wavelengths

4.1 Influence of Fiber Length

In FWM-based wavelength converter, the selected optical fiber is very important for achieving FWM effectively. In order to see the impact of link length in the wavelength conversion process, different fiber link lengths is applied for all type of fibers. The used fiber lengths are 1 km and 7 km and the power of the pump into the fiber was 0 dBm, while the power of the signal was -2 dBm. The output spectrum of the FWM phenomena when utilizing DCF fiber of 1 km and 7 km is shown in Figure 5.



(a) (b)

Figure 5: Spectrum of DCF fiber output for (a) 1km (b) 7km

As a result of FWM, two converted signals, down converted and up converted signals are generated at 1538 nm and 1572 nm respectively. The peak power of the converted signal 1572 nm, for 1 km and 7 km fiber length is -51 dBm and -40.4 dBm respectively. Similarly, the same procedure is done for SMF-28, LEAF and METRO fibers. The obtained results are summarized and compared in Table 1.

The results obtained indicate that, the peak optical powers of the two newly generated sidebands are higher when changing the fiber link length from 1 km to 7 km. That is, the nonlinear effects depend on the transmission length of the optical fiber. This is because the longer the optical fiber, the more the light interacts with the fiber material and more the nonlinear effects. On the other hand, it is obtained that the DCF fiber has the highest received peak power compared to the other three types of fibers even when changing the fiber length. This is due to the smallest effective area of the DCF fiber compared to the other optical fibers.

Table 1: Comparison between the different applied fibers and the effect of fiber length

Type of Optical Fiber	Optical power at 1572 nm in dBm	
	1 km fiber length	7 km fiber length
Dispersion compensating fiber (DCF)	-51	-40.4
Single mode fiber (SMF-28)	-54	-41.8
Positive dispersion non-zero dispersion-shifted fiber (LEAF)	-52.32	-45
Negative dispersion non-zero dispersion-shifted fiber (METRO)	-67.4	-53

4.2 Influence of probe power

In FWM wavelength converter, the probe power is varied from -20 dBm to -2 dBm inorder to find the influence of probe power on the converted signal power. The Figure 6 shows the obtained relation of probe power with the converted signal (1572 nm) power for DCF fiber of 7 km. The converted signal varies when changes the input signal power. From the figure its clear that the converted signal power increases with increase in input signal power and the highest value of power for converted signal is obtained at -2 dBm with -40.4 dBm.

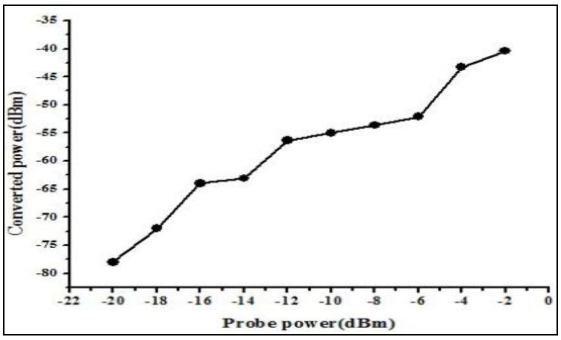


Figure 6: Probe power Vs Converted signal power

5. Conclusion

The FWM wavelength converters using different fibers has been simulated and the results obtained indicate that DCF is the best applied fiber among the four different fibers. This is because of the smaller cross sectional area of DCF. In FWM wavelength converters, it is obtained that the longest interaction length of optical fiber (7 km) lead to highest peak power at the converted wavelength. Also in FWM based wavelength conversion, wavelength conversion covering the entire C-band, can be achieved with different fiber types.

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