CHAPTER FIVE

CONCLUSION

5.1   Summary

Optical Code Division Multiple Access (OCDMA) is a multiplexing/multiple access technique adapted from the successful implementation in wireless networks. In OCDMA systems, each user is assigned with a sequence code that serves as its address. An Optical CDMA user modulates its code (or address) with each data bit and asynchronously initiates transmission. Hence, this modifies its spectrum appearance, in a way recognizable only by the intended receiver. Otherwise, only noise-like bursts are observed. The advantages of OCDM technique over other multiplexing techniques such as TDM, FDM and WDM are numerous.

Throughout this project, the encoder and decoder modules which are constructed using parallel and serial configuration based on FBG's had been investigate. The objectives of this project have been successfully achieved which developed it by the simulation approaches (using OptiSystem software).

From the presented BER versus Input Power graphs, the parallel configuration provides a BER of 2.69×10^{-4} taking the average of Channel 1 and Channel 2 for 622Mbps of bit rate performance. As mention for this section in Chapter Four, the fiber length is

fixed to 10 km compared to the serial configuration which only has the maximum transmission input power of 18.75dBm with BER of 2.93×10^{-6} taking the average of Channel 1 and Channel 2 such as in parallel configuration. However, in hardware implementation the parallel configuration setup might not be the favorable design since it requires more circulators. It means that a single FBG will require a single circulator to build the parallel configuration. This can increase the cost for the implementation and also increasing the insertion loss due to the circulators. Besides that, the more circulators used will make the duration of simulation process became too long.

Meanwhile, the presented BER versus bit rate graph shows that the serial configuration supports higher bit rate of 1.5Gbps with the BER of 7.73×10^{-4} taking the average of Channel 1 and Channel 2 while the parallel configuration can support the bit rate of 1Gbps with the BER of 2.18×10^{-3} also taking the average of Channel 1 and Channel 2. However, the BER versus input power show that the parallel configuration can provide a better result compared to serial configuration. Hence, there were some conclusion can be made according to the results in this simulation project. In this system which requires in any communication system especially, OCDMA system which using the parallel configuration is suitable for a system which requires higher input power from the broadband sources. Meanwhile, for any communication requires higher bit rate, serial configuration is the better configuration compared to parallel configuration as shown in performance graphs of BER versus bit rate.

However, in general, the parallel configuration shows superior performance as it can support up to 18.75dBm of input power compared to serial configuration. This outshines the bit rate performance by the serial configuration which is just 0.5Gbps higher than the parallel configuration.

Overall after accomplished the project, we can conclude that in the OCDMA system the used of FBG as the main component in the encoder and decoder modules has becomes popular for the ability to select the wavelengths by slicing the broadband source to form the code sequences, the simplicity in designing the encoder and decoder modules and the cost

of a fixed uniform FBG is fairly reasonable [4-11]. However, since the Bragg wavelength value is unstable due to the influenced of the temperature and strain to the FBGs grating, the used of FBG may becomes less popular to the code sequences which are restricted to wavelength assigned for each of the code sequence.

5.2   Recommendation of Future Project

As mentioned earlier in the conclusion, this project is successfully achieved the objectives. Anyhow, there are still some improvement has to make over for make sure the system used will give a better performance. The designs of encoder and decoder modules which are constructed in parallel and serial configuration are one of method used in the OCDMA system's circuit. The function of encoder and decoder modules in this system is such as a filter. If in basic circuit, the encoder and decoder parts commonly use a Low Pass Filter.

However, the used of FBG's as the main component in this project did not give a big differs for the results. The results of BER for both configurations are nearly same but still can see the different. This problem occur because of the RAM used for simulation process is too small which is 512MB. Therefore, the simulation will not give an exactly results because these designs requires more circulators. Anyhow, the results are still correct and can show the increasing performance in the graphs.

To fix this problem, it can be solved with using the higher bit of RAM for the simulation used before. This means that if using RAM higher than 1GB (can be almost 1.5GB), the results of simulation can be smoother and the simulation process can be faster.

5.3   Commercialization Potential

Optical communication systems in the optical fiber play a main part of the digital communications in backbone networks, high speed LAN, MAN and etc. The main advantages of the optical fiber communications are the high speed, large capacity and high reliability by the use of the broadband of the optical fiber. Asynchronous multiple access methods where network access is random and collisions occur, such as token passing and carrier sense multiple-access, are well suited to LAN's with low traffic demand. However, these asynchronous access methods suffer from cumulative delay as the traffic intensity increases. Also, contention protocols generally proposed for low traffic demands are not suitable if traffic delay is a major issue, e.g., in networks where information must be transmitted simultaneously. On the other hand, synchronous accessing methods where transmissions are perfectly scheduled provide more successful transmissions than asynchronous methods.

The OCDMA is a suitable system which can apply for communication industry such as Telekom Malaysia (TM), TMNet and etc. Commonly, TM only uses the CDMA system as one of their communication system which provided for telephone fixed line. However, the application for CDMA is limited to certain area because of some requirements in CDMA setup. Therefore, this project which using OCDMA system can potentially to be commercial for TM's application in having better communication without having such limit areas of coverage.