Wavelength Optimization in Dense Wavelength Division Multiplexing (D.W.D.M) to Enhance Free-space Optical Communication (F.S.O)

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Abstract. Optical tuning is the manipulation of the output wavelength of an optical device, such as a laser source, or in other word, an optical source whose wavelength of operation can be altered in a controlled manner. There are many applications which depend mainly on tunable laser such as in spectroscopy, photochemistry, and optical communication. We will conduct a study in the field of Dense Wavelength Division Multiplexing (D.W.D.M) which is very successful in Optical Communication. For example of (D.W.D.M) “Euro Rings” network spans over 15,000 km and connect 41 cities, consists of 96 fiber, 80 wavelength per fiber at 10 Gbit/sec per wavelength, so its total transmission capacity is almost 80 Tbit/sec. To have the same success in free-space optical communications we concern in our work to examine the interaction between multiple monochromatic optical wavelengths with water vapour which is the most major attenuation source in the air. We got a controllable wavelengths scanning by using a monochromator then we use a temperature controlled optical chamber to confine the interaction medium and varying the water vapour contents. At the end of the chamber we detect the number of photons for each wavelength by using interface module and software code. We compare our experimental results with the results of a theoretical module to conclude the optimum wavelengths in different atmospheric conditions. We can use the resulted data to give a reasonable feedback depend on the number of photons measurements to drive which wavelength is suitable to increase the signal to noise ratio, and also increase the number of wavelengths used in one (F.S.O) link which will be a large step in the modern communication systems.