

## ABSTRACT

One technology that can be used to increase the efficiency of bandwidth utilization is the Sub-carrier multiplexing (SCM). It is an old technology that has been studied and applied extensively in microwave and wireless communication systems. In optical domain, the most popular SCM application is the optical analog video transmission and distribution. SCM technology essentially uses a two step modulation. First, several low bandwidth RF channels carrying analog or digital signal are combined together and they are very close to each other in the frequency domain. Then this composite signal is further modulated onto a higher frequency microwave carrier or optical carrier and can be transmitted through different media. Because of its simple and low-cost implementation, high-speed optical data transmission using SCM technology attracted the attention of many researchers. The most significant advantage of SCM in optical communications is its ability to place different optical carriers together closely. This is because microwave and RF devices are much more mature than optical devices: the stability of a microwave oscillator is much better than an optical oscillator (laser diode) and the frequency selectivity of a microwave filter is much better than an optical filter. Therefore, the efficiency of bandwidth utilization of SCM is expected to be much better than conventional optical WDM.

One of the key factor to measure the performance of optical communication system is detection system of the receiver. There are 2 type detection technique are used in general optical communication system in receiver. Which is IM/DD (intensity Modulation with Direct Detection) and Coherent Detection. This final project is to study the sistem performance of coherent detection system in Sub Carrier Multiplexing, hopefully we will know how far the effect of SCM in Direct detection and Coherent the parameter defined.

From the research, we find that receiver sensitivity versus channel in coherent detection system ( using ASK, BPSK, and QPSK) have 2-10 dB better than IMDD. BER in homodyne coherent system is better than IMDD and I heterodyne is better.Total Bitrate for coherent heterodyne is 400% better than IMDD, last, SNR of heterodyne coherent detection system is 1.2 nW better than IMDD

Key Word: SCM (*SubCarrier Multiplexing*), coherent, IMDD