

## ABSTRACT

Optical code division multiple-access (CDMA) is an advantageous system that offers vast bandwidth and extra-high optical signal processing speed and also it allows multiple users to access transmission channel simultaneously that leads to an efficient use of the channel. Optical CDMA is based on the employment of orthogonal codes as signature code to each user. Pulse position modulation (PPM) is a modulation technique commonly used for intensity modulated/direct detection (IM/DD) optical communications that has a simple implementation and efficient use of the available source of energy.

In optical CDMA, multi-user interference is one of the most serious problems. To improve system performance in the presence of multi-user interference, an error correction codes can be applied. Turbo code (also known as parallel concatenated convolutional code) has good error-correction performance that makes turbo coding ideal for many communication applications with power and energy constraint.

In this final project, the performance of turbo coded optical CDMA system with Pulse Position Modulation (PPM) scheme is analyzed by doing a numerical calculation to the system bit error probability with the aid of MATLAB program and also referring to data from references. Optical Orthogonal Codes are used as the signature code of the system. Bit error probability is derived using Gaussian approximation on the output of APD photodetector and taking into account the APD noise, thermal noise, background noise, and multi-user interference.

Numerical calculation result on the bit error probability of turbo coded optical PPM-CDMA system shows that the system has a coding gain of 4.34 dB when using Turbo Code of rate 1/3 and operating at BER of  $10^{-9}$ . Furthermore, it shows that system with PPM is more energy efficient and has a better performance than the system with on-off keying (OOK) modulation. OOC code weight, numbers of users to accommodate, and the PPM order also have contribution to effect the system performance.