

## Abstract

The modern generation of Optical Orthogonal Frequency Division Multiplexing (O-OFDM) is an enthusiastic topic of research today. Reach and capacity are the essential performance requirements. OFDM is a specific case of FDM technique which is a Multi Carrier Modulation (MCM). First of this study, the single polarization and dual polarization 16-QAM scheme coherent detection optical OFDM system will be designed and simulated with identifying the advantages for both systems. O-OFDM system is simulated by using Optisystem V14.0. The main objective of this thesis is to use different lengths of the cyclic prefix (CP), the prefix is a portion added to the beginning of the symbol containing a same portion at the end of the symbol. This portion confirms orthogonality between the subcarriers, and mitigate the effects of Inter Carrier Interference (ICI) and Inter Symbol Interference (ISI). The other factor which will be studied and tested in this research is using different values of effective area of the optical fiber and observing the effects of altering both CP and effective area on the overall performance of the system.