

# DESIGN AND PERFORMANCE INVESTIGATION OF INTER-SATELLITE OPTICAL WIRELESS COMMUNICATION SYSTEM EMPLOYING DIFFERENT MODULATION AND MULTIPLEXING TECHNIQUES

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Mode of Study : P. Time

## ABSTRACT

With the increasing concentration in digital age, it is required to set up an inter-satellite optical wireless communication (IsOWC) that can support ultra-high bit rate. Here the proposed IsOWC is implemented using Non-coherent Continuous Phase Frequency Shift Keying (CPFSK), Differential Quadrature phase shift keying (DQPSK), Coherent Medium shift keying (MSK) and Dual Polarization Quadrature phase shift keying (DP-QPSK) Modulation technique. The results of the proposed models is measured at a different power level and bit rate and compared. Finally it is concluded that DP-QPSK techniques gives the enhanced performance than the other techniques and can support up to 800Gbps for communication range of 5000 kilometres with only 3dBm input power. The detection of CPFSK and DQPSK are done by non-coherent receiver thus any phase or carrier recovery information is not required by the receiver to get the desired transmitted signal replica. Whereas in coherent modulation techniques one have to transmit additional phase recovery information along with the signal to get the desired transmitter signal replica. Here IsOWC using CPFSK and DQPSK works well beyond 30Gbps which is far better in comparison to PSK or FSK. The MSK and DP-QPSK designed using coherent technique. The MSK supports 300Gbps in comparison to CPFSK and can support 10 times more data rate. Where DP-QPSK can support up to 800Gbps as much as twice the data rate supported by conventional QPSK. There is almost 200% improvement over conventional QPSK if we design an IsOWC using DP-QPSK. The introduction of DSP in DP-QPSK can also supports the data rate beyond 800Gbps even. Thus Modulation techniques can be incorporated into existing IsOWC to enhance the data rate and even the security of the system improved to any hack of information by using these modulation techniques. The multiplexing techniques allows us to increase the capacity of existing systematic structure by accommodating more number of channel or user allowed to transmit. The multiplexing requires a multiplexer and can be done in space, time and frequency domain. Here two different type of multiplexing is proposed that are Dense Wavelength Division Multiplexing (DWDM) and Sub Carrier Multiplexing (SCM) that allows more no of users to transmit data over the single channel medium and thus increase the efficiency of the system. The advantages and disadvantages of both multiplexing techniques are discussed for implementation over existing IsOWC system and result shows how the use of multiplexing techniques can have benefits at different bit rate. It may be seen from the results that by using multiplexing techniques, the data rate can be enhanced in multiple of the no of channel used over single PSK channel. Thus with the use of optimum modulation technique and then multiplexing the user information, we can transmit ultra-high bit rate. That shows the enhancement of data transmitting capability of IsOWC is incorporated and impact of its implementation at different wavelength is discussed.