Performance Investigation of Coherent Detection OFDM WDM-RoF network with different modulation techniques and Dispersion Compensation using FBG

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ABSTRACT

The fiber capacity of 100 Tb/s poses new challenges to the optical communication community, requiring the innovation of novel schemes of optical amplification, modulation format, or fiber design. The convergence system of CO-OFDM WDM-RoF network which can improves the spectral efficiency of the wireless access system and also support the seamless integration between air and optical transmission. In this thesis, WDM-RoF based on the CO-OFDM format and dispersion compensation using FBG for different modulation techniques is to be proposed. With OFDM and coherent receiving technology, the access network achieves high bandwidth utility efficiency and excellent transporting properties. The performance of the system in terms of BER, Q-factor, OSNR, fiber length, and receiving constellation is evaluated and a network with an excellent access property is obtained. Dispersion management and modulation formats have been studied for single-channel and 8 Channel-WDM optical communication system with per channel bit rate of 1Tbit/s. The problems of dispersion and BER are also minimized by using FBG dispersion compensation technique. As a result, CO-OFDM WDM-RoF network without FBG is studied on BER analyzer it is observed that for 4-QAM, 8-QAM and DPSK modulation techniques, OSNR = 18 dB, 9 dB and 18 dB, Q-factor is 78, 5 and 28.03 and BER is 0, $1.737*10^{-32}$ and $1.016*10^{-173}$, respectively. But when CO-OFDM WDM-RoF network using FBG is studied on BER analyzer it is observed that for 4-QAM, 8-QAM and DPSK modulation techniques, OSNR = 63 dB, 55 dB and 58 dB, Q-factor is 81, 41 and 28.94 and BER is 0, $1.016*10^{-87}$ and $1.799*10^{-184}$, respectively. Hence, CO-OFDM in WDM-RoF network using 4-QAM has better performance at 220 km fiber length using FBG. Q-factor for 4-QAM is 3 times greater than DPSK and 2 times greater than 8-QAM using FBG. By comparing results of 4-QAM, 8-QAM and DPSK, it is found that 4-QAM performs better in terms of fiber length, OSNR, Q-factor and BER. Hopefully, the benefits of the advanced modulation formats demonstrated in this work will be sufficient to overcome the drawbacks of extra transmitter and receiver complexity. If so, these formats will allow for future ultra-high capacity spectrally efficient optical communication systems.