

## Chapter 5

### Conclusion

One of the major challenges faced by wireless communications is channel estimation since the transmitted signals are reflected, scattered, and travel through multipath before reaching the receiver. Out of these multipaths, depending on the delay, they add either constructively or destructively, that results in fading. Nowadays due to the requirements and needs of higher data rates, wider coverage, spectral efficiency, capacity and reduced latency, evolution of new standards in wireless technology is must. The work carried out in this thesis, focus on the importance of channel estimation in MIMO OFDM systems.

In the first objective, the channel estimation is performed for conventional  $2 \times 2$  MIMO and Massive MIMO. Training based Channel Estimation is implemented using MMSE estimator at the receiver and Blind Channel Estimation using Zero Forcing. 16-QAM and QPSK modulation techniques are used to modulate the symbols. Since there is a greater distance between message points in a QPSK scheme than in a 16-QAM scheme, BER is better for a QPSK modulation approach than for 16-QAM. As per the simulation results, BCE outperforms when compared to the performance of TBCE. In the second objective, compressed sensing (CS) method based on priority where the channel with few dominant taps is used. Using the sparse nature of the channel, users with higher needs are given priority. As per the simulation, proposed compressed sensing due to the insertion of pilot sub carriers periodically and fixed cyclic prefix, significantly outperforms the traditional Least square and Minimum mean square, and BER is drastically reduced.

From third to fifth objective, the performance of MIMO OFDM in combination with Non-Orthogonal Multiple Access (NOMA) is analysed. In the third problem statement, followed by the fading channels (i.e.) both AWGN and Rayleigh behavioral analysis is studied using Non-Orthogonal Multiple Access. In addition hamming code is implemented to ensure error free transmission in channels. In the fourth objective Iterative algorithm implementation for both OFDM and NOMA is performed and channel estimation is done with and without the presence of NOMA. This clearly exhibits that signal transmission can be improved when combining MIMO OFDM with NOMA. In the last objective, LMMSE for multi-user NOMA with Iterative algorithm is proposed. By

using 64 QAM modulation and with appropriate number of iterations, it is evident from the simulation that NOMA when combined with MIMO performs better especially at high SNR values. From the above summary, Channel estimation is better when MIMO OFDM system is combined with Non-Orthogonal Multiple Access (NOMA) and due to which it is one of the promising aspect of the future wireless generations.