List of Figures

Figure 1.1: A) The frequency spectrum of eight channels shown utilizing frequency division multiplexing. Parallel transmitters are employed in which guard bands are placed between sub-carriers. ........................................ 4

Figure 1.1 B) The frequency spectrum of OFDM is shown where sub-channels are orthogonal to the adjacent channels. The percentage of bandwidth used to transmit the same data is reduced by 50%........................................ 4

Figure 1.2: A parallel transmission scheme utilizing FDM is implemented by the use of a serial-to-parallel converter and multiple narrowband transmitters....................... 5

Figure 1.3: The OFDM scheme, proposed by Chang........................................ 7

Figure 1.4: Modern day implementation for an OFDM system.......................... 8

Figure 3.1: Conventional non-overlapping multicarrier Technique.................. 37

Figure 3.2: Illustration of multicarrier modulation with Overlapping.............. 37

Figure 3.3: A baseband OFDM System............................................................. 42

Figure 4.1: Adaptive equalization....................................................................... 57

Figure 6.1: Illustration of an OFDM Signal......................................................... 75

Figure 6.2: An OFDM Signal simulated for distortion after HPA.................... 76

Figure 6.3: BER Compared with SNR for different levels of QAM.................. 77

Figure 6.4: BER compared with SNR Plot for BPSK over AWGN and Rayleigh... 79

Figure 6.5: OFDM BER Compared with SNR in Selective Rayleigh Fading Channel.......................................................... 81

Figure 6.6: BER sensitivity for CFO in an AWGN channel............................. 82

Figure 6.7: Capacity plot in comparison with SNR in a Rayleigh Fast Fading
Figure 6.8: Achievable capacity of different receiver structures in Rayleigh Fading MIMO

Figure 7.1: A 16 QAM Constellation under the effect of CFO

Figure 7.2: A 16 QAM Constellation under the effect of STO

Figure 7.3: Plot of Actual Channel

Figure 7.4: The Plot of Channel Estimated Using LS

Figure 7.5: The Plot of Channel Estimated Using MMSE

Figure 7.6: The Plot of SNR and Mean Squared Error for LS and MMSE based estimator

Figure 7.7: Blind Channel Estimation based on CMA Approach

Figure 7.8: Blind Channel Estimation based on Precoding Approach

Figure 8.1: MSE Performance versus SNR for ML and CRLB Estimators

Figure 8.2: MSE Performance versus SNR for Subspace and CRLB Blind Estimators

Figure 8.3: Online and offline BCRLB versus the number of observations for 2 * 2 MIMO systems with SNR = 5 dB using analytical approach

Figure 8.4: Online and offline BCRLB versus the number of observations for 2 * 2 MIMO systems with SNR = 5 dB using numerical approach

Figure 8.5: MSE Performance versus SNR for ML, CRLB Estimator and the Proposed Estimator
Figure 8.6: MSE Performance versus SNR for Subspace, CRLB Estimator and the Proposed Estimator

Figure 8.7: Standard Deviation plot of theoretical SNR and SNR calculated using the Proposed Method

Figure 8.8: Mean Square Error plot of theoretical SNR and SNR calculated using the Proposed Method

Figure 8.9: Plot of Normalised bias for theoretical SNR and SNR calculated using the Proposed Method

Figure 8.10: BER Performances for Subspace, CRLB Estimator and the Proposed Estimator