



3.2 WiMAX System

WiMAX is a communication technology used to deliver high-speed internet service to large geographical areas, wirelessly. The demo assumes that the fading parameters are identical for the two links. The Space-Time Diversity Combiner block uses the channel estimates for each link and combines the received signals as per [15].

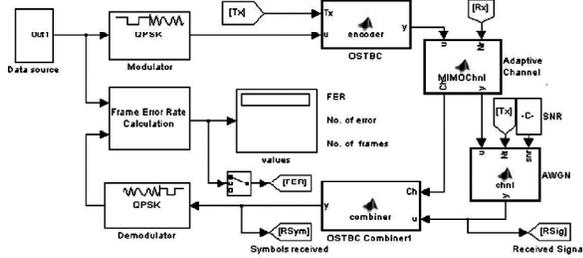


Figure 2: WiMAX System Model

The System is explored with the 2x1 MISO channel i.e. 2 transmitter and 1 receiver and assuming that the fading parameters are identical for both the links. Space-time block codes try to exploit the presence of independent multipath propagation to improve the reliability of transmission [16].

3.3 MIMAX System

MIMO is the use of multiple transmitters and receivers (multiple antennas) on both WiMAX base stations and subscriber devices to achieve improved performance in terms of bandwidth and distances. With MIMO, two simultaneous data streams can be sent, which doubles the bandwidth.

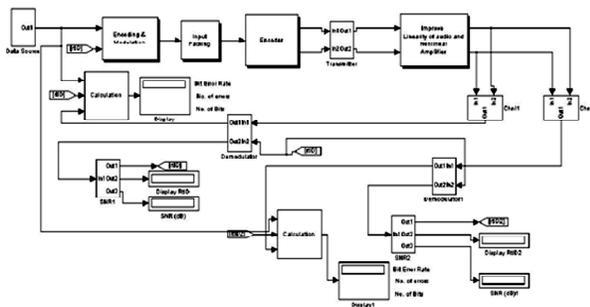


Figure 3: MIMAX - Block Diagram

The MIMAX is implemented with two channels and achieved with the same Bit Error Rate (BER) values for both the channels. The implementation of the MIMAX on WiMAX helps to take the integrated advantage of both the techniques MIMAX and WiMAX which mainly provides a supporting hand of the aim at covering a large geographical area of up to nearly 35 miles which is a very big advantage for the communicating vehicles of the vehicular network on the Intelligent Transportation System.

4. SIMULATION RESULTS

4.1 WiMAX System Simulation

The WiMAX system, displays the calculation of the Bit Error Rate (BER), with the number of error count and number of bits along with the compatible rate ID and the Estimation of SNR (Signal to Noise Ratio). It also displays the Spectrum scope of the transmitter to antenna respectively i.e. (2x1).

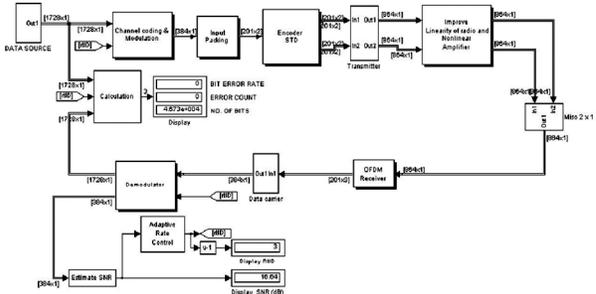


Figure 4: WiMAX System – Running Simulation - Screen Shot

4.2 MIMAX System Simulation

The simulation results of the MIMAX on WiMAX is shown which is aimed for two channel and achieved with the goal of an approximately coequal Bit Error Rate (BER). The MIMAX model is designed with two channels with different data values with different properties and the simulation result is achieved with the almost same Bit error rate for both the channels designed. The simulation also displays the spectrum scope graphs to confirm that the same bandwidth is achieved. Recent research on MIMO systems shows that STBC is effective to reduce the fading effect in the wireless channel by providing diversity [17], [18] and this improves BER performance in receiver.

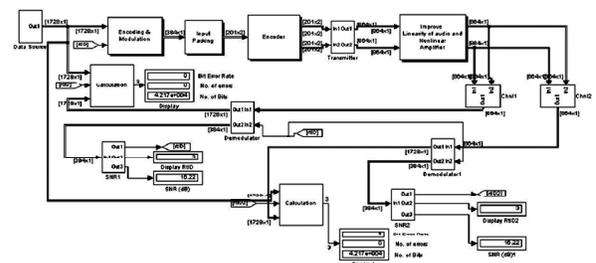


Figure 5: MIMAX - Running Simulation - Screen Shot

The spectrum scope of the subsystems is shown below. It shows the transmitted data point's constellation, with the axes of in-phase amplitude and quadrature amplitude. The constellation diagram reveals that the system is maintaining equally similar performance in each channel while the system is increased with the number of channels.

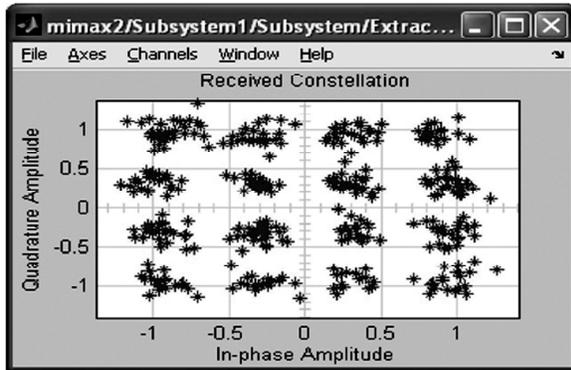


Figure 6: MIMAX - Constellation - Data Carrier

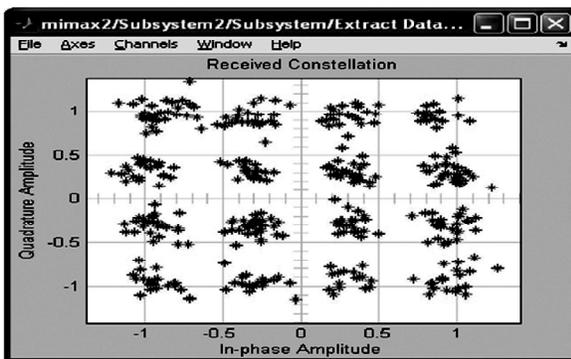


Figure 7: MIMAX - Constellation - Data Carrier 1

## 5. CONCLUSION

The demanding needs of the ITS (Intelligent Transportation System) is fulfilled to a maximum extent. The coverage of data transmission is improved for a larger geographical area by converging the technologies of communication. Communication and RADAR technology will be converged in ITS using DSRC channels.

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