Chapter 9

CONCLUSION AND FUTURE SCOPE

9.1 Conclusion

Wireless systems having MIMO antennas at transmitter and receiver increases the data rate, channel capacity and reliability of system. In current senario wireless systems possessing high gain, widebandwidth, high isolation are in great demand. Thus, applications like WLAN, WiMax, short range RADAR, satellite applications, UWB applications requires MIMO antennas for enhancing system capacity.

This thesis focuses on design, simulation, hardware measurement and applications of various configurations of MIMO antennas for wireless communication systems. The main aim of this research work is to design MIMO antennas to minimize mutual coupling between radiating antenna elements, achieving high gain with compact structure. MIMO antenna structures were designed using different techniques such as DGS, parasitic elements,slots which helps in reduction of mutual coupling between radiating elements.Use of partial ground plane with appropriate feeding methods improves the bandwidth of the MIMO antenna. The problem of mismatch in one of the structure is reduced by using stub technique.

Commercially available IE3D software is used for simulating antenna structures. All structures were fabricated on low cost, easily available FR4 substrate. Basic antenna parameters like return loss, isolation loss, VSWR, bandwidth were tested using vector network analyzer. Radiation pattern measurements and gain measurement done

in semi-anechoic chamber. The mutual coupling for MIMO antenna structures is found to be less than -12dB with very low envelope correlation coefficient. Simulated and measurement results were found to be in good agreement. Slight variation in simulated and measured results is due to SMA connector loss, cable loss and also due to fabrication errors. Practical testing of antenna was done with WiFi dongle for wireless internet connectivity and it has been observed that as the number of elements of the antenna increases the data rate of wireless data transfer increases.

In summary, various MIMO antenna configurations are designed, simulated, fabricated and tested. It is found that results of various structures are as per requirement of next generation wireless system applications.

9.2 Future scope

Design of MIMO antenna with enhanced isolation and high gain have a lot of scope in designing MIMO antenna for enhanced data rate. Based on the conclusions and inferences in the thesis, future work could be carried out in the following areas:

- The optimized configurations presented in this thesis could be further improved for isolation and miniaturized size.
- Different geometrical radiating structures can also be used for exciting higher order modes to improve the bandwidth performance.
- Polarization and pattern diversity concept can be used to reduce the fading effect and to improve the data rate of wireless systems.
- The impact of antenna characteristics on human body can also be studied.
- Massive MIMO antenna design is also challenging work in near future for 5G applications.