Chapter 7

Conclusion and Future work

7.1 Conclusion

Through this thesis, an approach has been established for planar vs conformal antenna. Fundamentally, the application of conformal antennas is suggested where a broad-beam radiation patterns and adaptability of surface are required. Aerodynamic design of aircraft imposed surfaces many restrictions. A mathematical relation has developed for the effect of curvature on the resonant frequency and S- parameter have been demonstrated in chapter 6. The cylindrical conformal array have been simulated together for an aircraft footprint and the simulation results show that the radiation parameter and polarization are affected by the footprint. To reduce this effect, an absorber may be incorporated below the antennas. Hence, the integration of the cylindrical array antennas on aircraft is advisable with the trade of broader beams than their counterparts by considering limited back radiation to keep polarization characteristics unaffected.

Here, few conformal antenna designs for planner surface and conformal surface are implemented, compared and studied in this work. The multiband and wideband signals are obtained by creating a slot at center of the patch of array. This Multiband operation can achieved by incorporating guard line section in +u,-u and +v plane. Operating frequency for Single element microstrip antenna is 9.2 GHz. These Guard lines 1, 2&3 resonating in X band at frequency 8.7GHZ and 11.8GHz for planner surface and resonating in Ku band at 15.38 GHz for non-planner surface (cylindrical surface). Array of two elements and
four elements is introduced for conformal applications which needed large bandwidth operated at separated transmitter receiver frequency. Meandering in feed act as phase shifter component and provide to revert back radiation pattern in original form as in planar form. Here, we achieved 70-80% similar radiation characteristics. The radiation beam is broader with directivity of 10.14dBi, 9.8dBi, 10.08dBi at 8.02, 9.2, 10.4GHz for slotted conformal array and 10.7dBi, 9.85dBi at 8.3GHz, 10.95GHz for conformal MLA respectively which are useful for X-band / Military application. The gain has been slightly decreases in comparison of planar array.

7.2 Future Work

The problem of directed radiation pattern is still there which we improved by meandered line but a phase shifter may be employ in the feed network. When the array antenna is integrated on the surface aircraft, its radiation characteristics are considerably affected. Therefore, a signal processing circuitry or phase shifter network may employ externally. No. of array element can be increase as per the requirement of size of aircraft or redome and antenna gain. For example- Indian aircraft LCA Tajas have Wing Span= 8.20 meter, Length= 13.20 meter and Height = 4.40 meter so might be large array antenna is required with cylindrical, toroidal, spherical, concave and convex in shape. As an aircraft required more than 70 types of antenna for different communication. The broader beam is achieved in conformal application for a nearly large hemispherical coverage. More realistic results will be establish by providing the user details of antenna geometry and other parameter then we will get a possible solution for communication and navigation applications. In addition of, array configurations further modified for beam forming array, digital beam
forming, steering application, and feeding techniques, multilayered and for antenna performance improvement.

A deeper investigation would be to study the theoretical methods of analysis and design on this type of antenna. Array configurations of conformal antennas would be the next step for the general conformal antenna study. Further investigation on conformal antenna arrays might reveal additional advantages over planar ones.