## 4.4 CONCLUSION.

The work described in this thesis is an attempt to study for the first time a thick film electromagnetically coupled patch antenna. The feedline and the patch are on two different substrates. This antenna provides freedom of feed position. From literature survey it was seen that the use of ferrite was mainly as a substrate for the antenna. All these reports are mostly for in plane direct fed (microstrip feeding) or coaxial feed antennas. There are no reports available even of ferrite substrate being used for EMC antenna. To the authors knowledge the use of ferrite loading (as overlay) on EMC antenna has been studied for the first time. In this thesis the effect due to feed position changes, ferrite overlay thickness changes, ferrite overlay composition changes has been described. The use of ferrite as overlay instead of substrate gives more flexibility to the system.

The ferrite has been prepared by co-precipitation method and their properties have been found to be comparable with those prepared by ceramic method.

The electromagnetically coupled antenna offers three dimensional flexibility for antenna feeding. In this antenna no physical connection is made between the feedline and the element. Match of patch to the feedline is simple and is achieved by selecting appropriate line patch overlap. Flexibility and adjustment of the patch above the feedline to find the best match point causes high radiated power. Our results show that by changing the feed position (LSF, SSF and DF) one can obtain radiated power at three different frequencies keeping the antenna dimension same. This is a great advantage as only once designing and delineation has to be done.

Ferrite loading provides additional resonance frequencies of the same antenna. It was found that the antenna properties are controlled by its application environment and also by mode of feeding. Though all the overlay experimentation was done in the absence of external DC magnetic field, one would expect pure dielectric overlay like behavior of the antenna. The antenna did not show effects as expected due to dielectric loading indicating that the

intrinsic magnetization of the ferrite was also responsible for the properties observed.

These types of results are very interesting from technological aspects, since use of external magnetic field involves use of magnets which has to be added on the antenna circuits. This defeats the very idea of having miniaturised components, which are very light and easy to use. It is felt that ferrite overlaid EMC antennas can be very useful for multi frequency applications.

The fact that the radiated power increases at non resonance frequencies due to overlay indicates that smaller size antenna can be used for lower frequencies, where otherwise large size will be required if used without overlay. With proper combination of feed position, overlay composition and thickness we can tailor the antenna properties to suit the applications.

Our results also indicate possibility of obtaining different polarized beams from the same antenna by merely designing the feed positions or using ferrite overlay. This aspect needs to be investigated in a more systematic way to emphatically state about polarization properties.