T.7 C.K. ANANDAN–Compact broad band microstrip antennas using parasitic elements–1988–Dr. K.G. Nair

Recently use of microstrip antenna is becoming increasingly popular since they have been found to be light weight, simple and inexpensive to fabricate. The inherent disadvantage of microstrip antennas is their narrow impedance bandwidth. A large number of works have appeared on the problem of increasing the bandwidth of microstrip antennas. Additional resonators gap coupled to the driven patch antenna have been used for improving the impedance characteristics. However, these configurations increase the overall size of the antenna to a large extent together with the distortion of the radiation pattern. A compact antenna configuration which gives enhanced bandwidth and less distorted radiation pattern has been developed and is analyzed in detail. The system contains a number of parasitic elements which are gap-coupled to a driven patch. The methodology adopted is as follows:

The method adopted is the parasitic technique. In order to keep the overall size of the system a minimum, the driven patch and parasitics are made thin. Since the resonant frequency depends on the patch width, here the driven patch and the parasitics are made of unequal widths to achieve multiple resonances. The various parameters involved such as parasitic width, position of the parasite, number of parasities, the feed point location etc., are studied in detail in this thesis.

The effect of parasitic elements gap coupled to a driven patch antenna is studied and is found that the input impedance drastically changes due to the presence of parasites. This shows that the parasitic elements can be utilized to modify the impedance characteristics. When coupling gap is increased, it is observed that the two resonant frequencies come closer and a proper choice of gap-width gives desired upper and lower resonant frequencies.

The study of the change in impedance characteristics of the parasitic loaded antenna with feed location shows that as in the case of a single patch antenna, the impedance is also increased as the feed is moved towards the radiating edge.

In the designed broadband antenna, a number of parasites are gap-coupled to the non-radiating edge. Coupling due to each parasite is adjusted by varying the gap width experimentally. For the present system the bandwidth is increased to eight times that of an individual patch antenna. Extension of this in the case of a number of parasites of arbitrary width and coupling gap can be taken up for further study in this field.