Review of Microstrip Array Antenna for various Applications

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***Abstract*- Various types of antennas are used in various application. Orientation and structure plays important role in performance parameters. In this paper various techniques are studied and better technique is quoted with output using simulation. HFSS software is used for results. Simulations of linear array with and without meander is shown in results. Different types of Array antenna performance is studied and observed for best suited applications.**

***Index terms*- Array, Directivity, Isolation and Metamaterials**

I.INTRODUCTION

Antennas are used to transmit and receive signals as it acts as transreceiver and hence selection of antenna based on its properties and characteristics is very important as well as crucial. Directivity of an antenna must be high in order to have less losses and for high performance. Total internal reflection should be more so that maximum signal reaches destination and return loss is minimum. Interference between two adjacent antennas are more and it should be minimized. So proper technique is required to reduce interference and increase isolation which improves efficiency of an antenna and overall system.[1]

Array of antenna is required for the system where communication throughput requirement is high and latency low. M*N array elements where M is elements across x axis and N is elements across y axis which forms an array. Based on lattice of formation array can be of rectangular, circular and square shape as antenna varies. Spacing of antenna should be half wavelength.[6]

Depending on placement of microstrip patch array, array can be linear array, rectangular array, circular array etc out of which few have been studied and simulated for characteristic performance.

II. METAMATERIALS

Microstrip patch antenna is preferred due to its small size, compatibility and easy to fabricate .Antenna has substrate and patch made up of copper. Metamaterial is material which doesn't exist in nature but can be achieved by configuration and structure changes in materials. Permittivity is considered to be negative and permeability to be negative in order to have maximum total internal reflection so that efficiency of an antenna increases as gain increases and S21 also increases. Different types of structures are available in order to incorporate to be metamaterial but meander structure has proved to be better among all.[7]

III. ARRAY ANTENNA

Antenna used in various combination results in huge amplification of signals which can be used in various applications. For example linear array antennas can be used for automotive car application, square array antenna 4*4/8*8 array can also be used for automotive vehicle, aero planes etc. Some application requires antenna to orient in 360 degree for aerial route, so circular array antenna plays important role and the design of circular antenna array with central element suitable for beam forming technique in wireless applications can be considered. A circular arrangement of eight circular sector microstrip antennas improves beam steering in all 360 degree. Also light weight feature should be considered so that substrate can be used with foam and aluminum. Numerous studies of smart antennas have already been conducted using linear or planar arrays, but performance of smart antennas with circular array and circular array with central element proves to be better solution. Comparison of all array will give clear idea of its usage in various applications[8]

IV. RESULTS

All simulations are done in HFSS Software where antenna is designed and boundary conditions are assigned and simulated

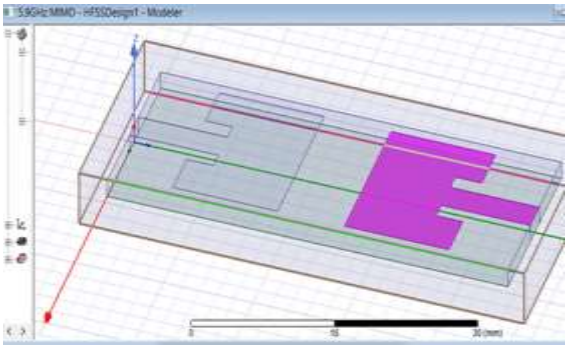

Fig 1.1 1*2 Linear Array Antenna

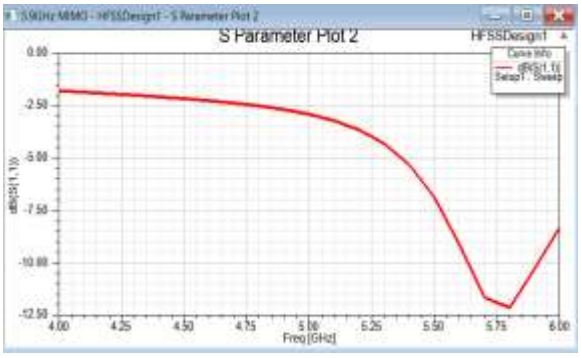

Fig 1.2 S11 Characteristic

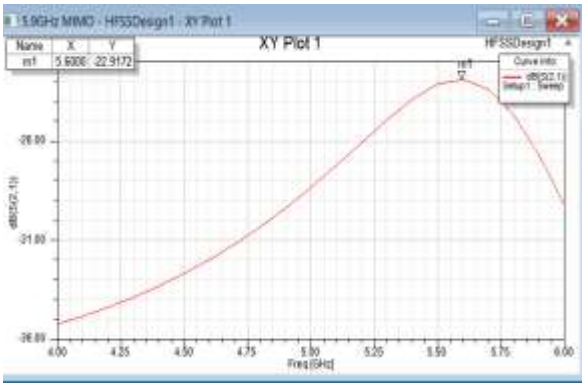

Fig 1.3 S21 Characteristic

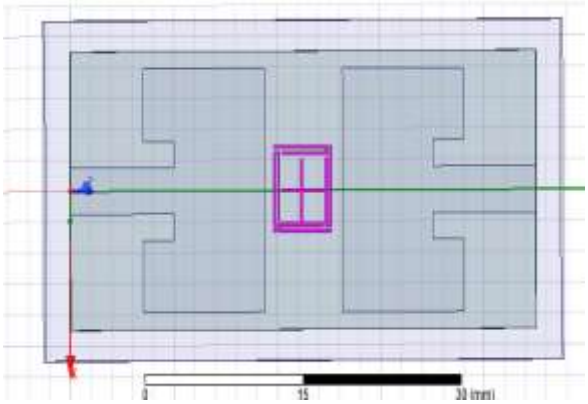

Fig 2.1 1*2 Meander Array Antenna

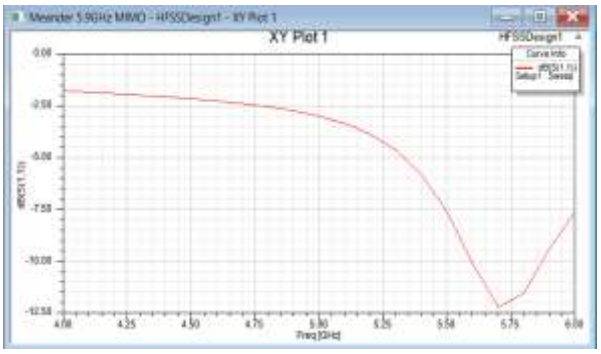

Fig 2.2 S 11Characteristic

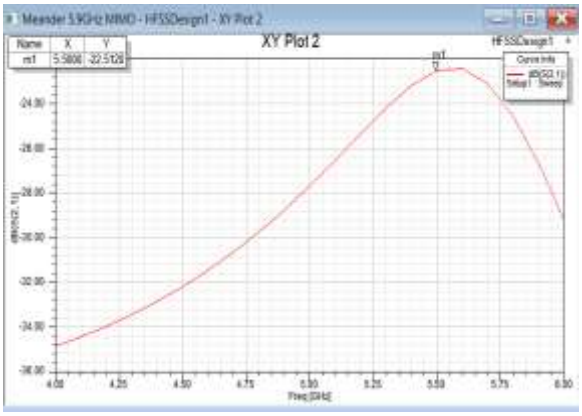

Fig 2.3 S21 Characteristic

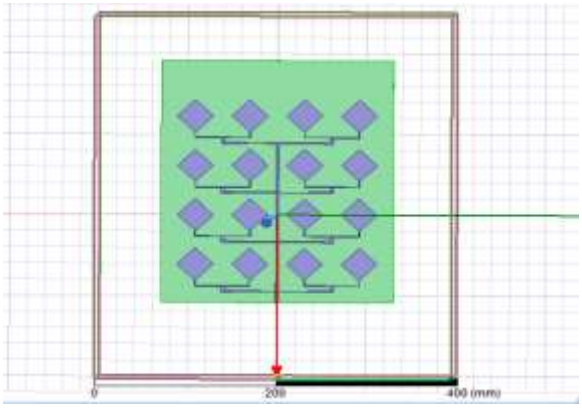

Fig 3.1 4*4 Array Antenna

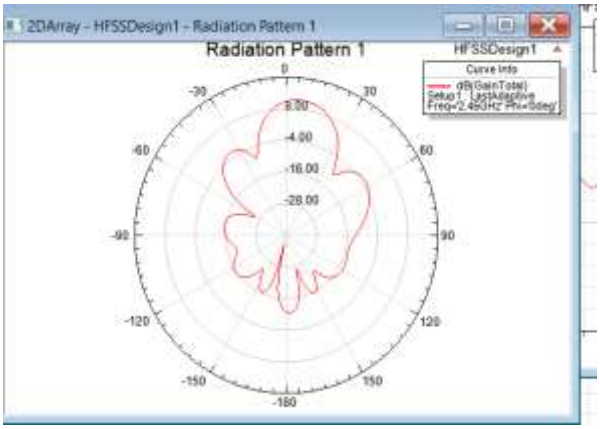

Fig 3.2 Radiation Pattern

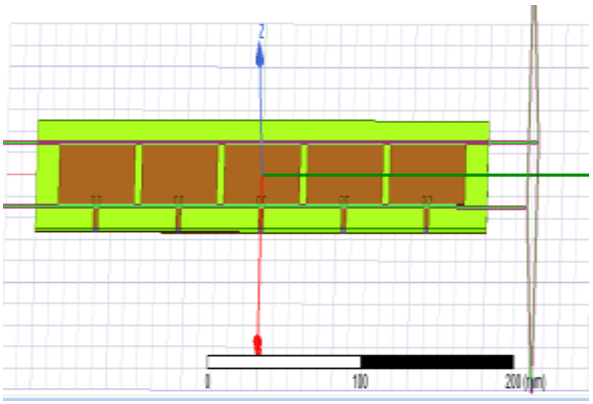

Fig 4.1 1*4 Linear Array Antenna

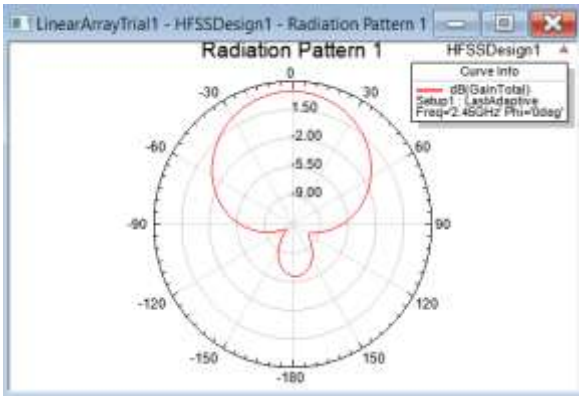

Fig 4.2 Radiation Pattern

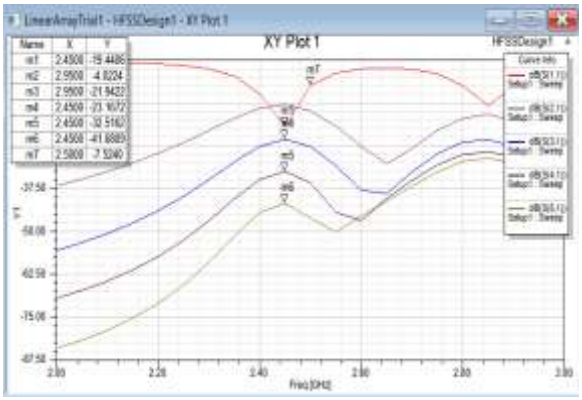

Fig 4.3 S Parameters

From the results we can observe that different array antenna have different performance parameters which can be used for various applications like automotive vehicle and Un manned aerial vehicles. S11, S21, S12, S22 all parameters are studied and it is prior required for any application.

V. CONCLUSION

Simulation Results Comparison [9]

Table shows comparison of various techniques used in antenna array. We can conclude that Array antenna has an edge over conventional microstrip antenna. Meander structure along with microstrip array shows great improvement in radiation intensity and gain. 1* 2 Menader array and 4*4 array can be used for automotive vehicle, 1*4 linear array can be used for automotive vehicle, Circular array can be simulated with meander array and light weight structure so that it can be used for Un manned aerial vehicle. Array can be used for efficient communication in various applications.

VI. FUTURE SCOPE

Further work can be done on circular array antenna spacing, orientation and coverage improvement in order to improve gain, directivity and radiation pattern so that it can be used for specific applications

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