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Wide Bandwidth Reconfigurable Microstrip Antenna for Modern Wireless Applications

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ABSTRACT

In the present scenario of modern wireless communication Multiband communication works efficiently in interfering environment as needed. For this, multiband slot patch antennas are very useful because of their small size, low cost, and ease of integration on planar and non-planar surfaces. Here a multiband double inverted L-slot patch antenna is presented with five resonating modes and a gain of 4db with reconfigurability .The surface current distribution of this antenna alters radiating fields and achieves wideband of 1.2 GHz within the range of 15.3-16.5 GHz.

Keywords:- **Multiband, Patch, Reconfigurability**

1. INTRODUCTION

From the very early days, communication between human beings was made using sound and light signals. With the advancement in the technology and with the invention of antenna and utilization of electromagnetic spectrum, comes the idea of wireless communication. Different modes of wireless communication are radio frequency communication, microwave communication, infrared short range communication etc.

Need for Antennas: - According to IEEE standard definition, antenna is a means of transmitting and receiving radio waves. Antenna is required by any radio receiver or transmitter to couple its electrical connection to the electromagnetic field.

Types of Antennas: - 1. On the basis of radiation

A) Omni directional Antenna which radiate or receive in all directions
B) Directional Antenna which radiate or receive in a particular direction.

2. On the basis of aperture

A) Wire antenna -used in automobiles, buildings, ships etc.
B) Aperture antenna –used in spacecraft and aircraft applications.
C) Micro strip antenna[29](MSA) –used in space applications, government and commercial applications.
D) Array antennas-used to get required radiation characteristics which are not possible with the single antenna.

3. On the basis of polarization

A) Linearly polarized (Horizontal, Vertical) antennas
B) Circularly polarized antenna

From the above mentioned, on consideration of WLAN[4][5], MSA[1] is the most optimum choice. As they help in miniaturization of device because of their small size, low cost etc. On the other hand MSA also need modification as they have narrow bandwidth, poor efficiency and spurious feed radiation. Thus we design a multiband[3] micro strip antenna to increase the bandwidth along with reconfigurability using capacitors.

2. MULTIBAND MICRO STRIP ANTENNA

A multiband antenna can simultaneously operate on multiple frequencies, thus eliminating the need of separate antenna for each application. By using a slotted structure of the patch element , multiple resonances are obtained as multiple current paths with different lengths are created.

3. DESIGN CONSIDERATIONS

The multiband antenna consists of a coaxial feed, a substrate and a ground plane on which inverted L-slots are embedded. These L-slots are able to achieve multiple frequency bands and provide an operation at high frequency. It also shows reconfigurability and compactness. This antenna shows a good multiband characteristic to satisfy the requirement of slightly covers Ku/X band within range 11-24 GHz.

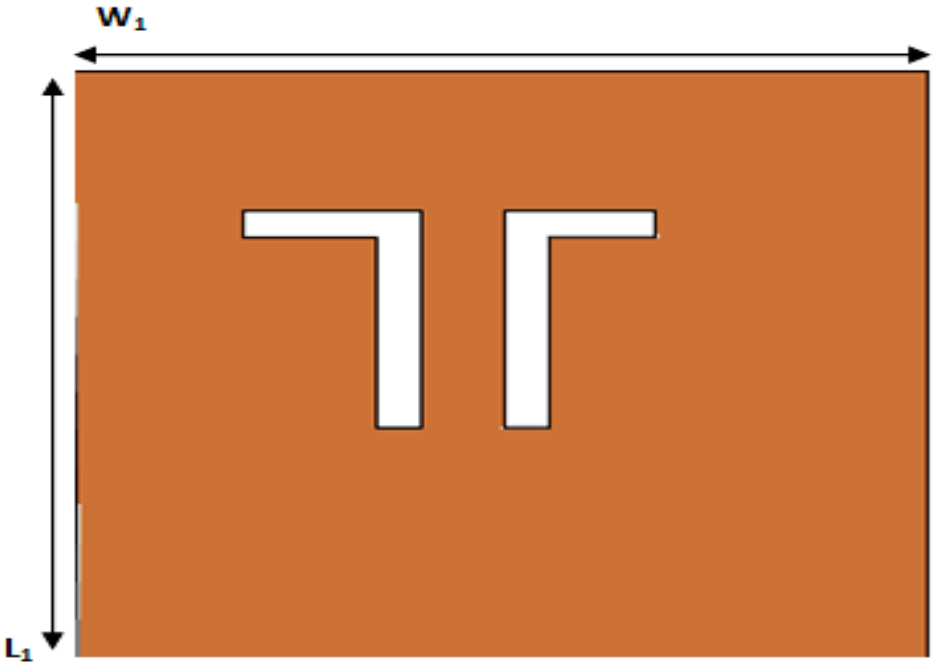

Figure 1 Geometry of Slotted Antenna

Table 1.Dimension of the Slotted Microstrip Patch Antenna

Dimensions	**Values**
Length of patch W1	60 mm
Width of patch L1	60 mm
Length of L-slot1	5.9 mm
Width of L-slot1	1.5 mm
Length of L-slot2	5.5 mm
Width of L-slot2	1.5 mm

4. SIMULATION TOOL DESCRIPTION

ADS is a high performance full-wave electromagnetic (EM) field simulator for arbitrary 3D volumetric passive device modeling that takes advantage of the familiar Microsoft Windows graphical user interface.

CONCLUSIONS

The simulated results of proposed antenna are as shown

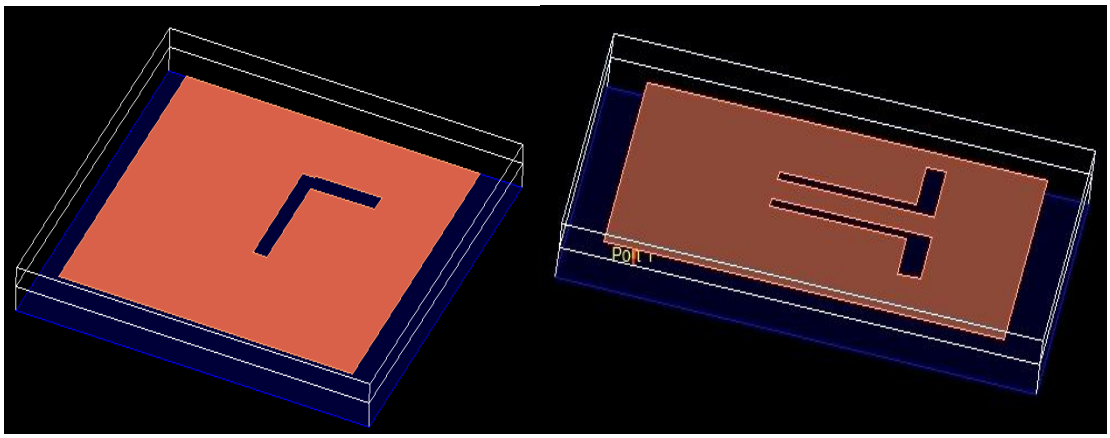

Figure 2 Schematic of the Single and double inverted L-slot antenna

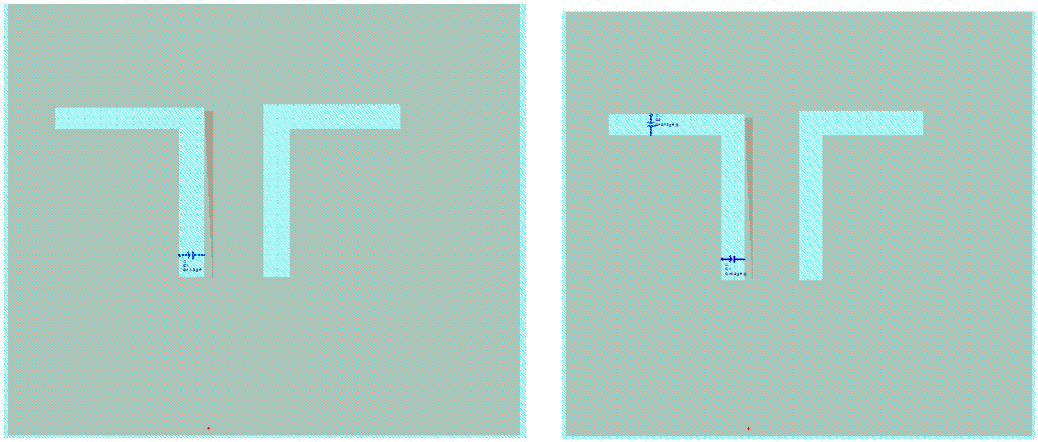

Figure 3 Schematic of the inverted L-slot with one and two capacitor antenna

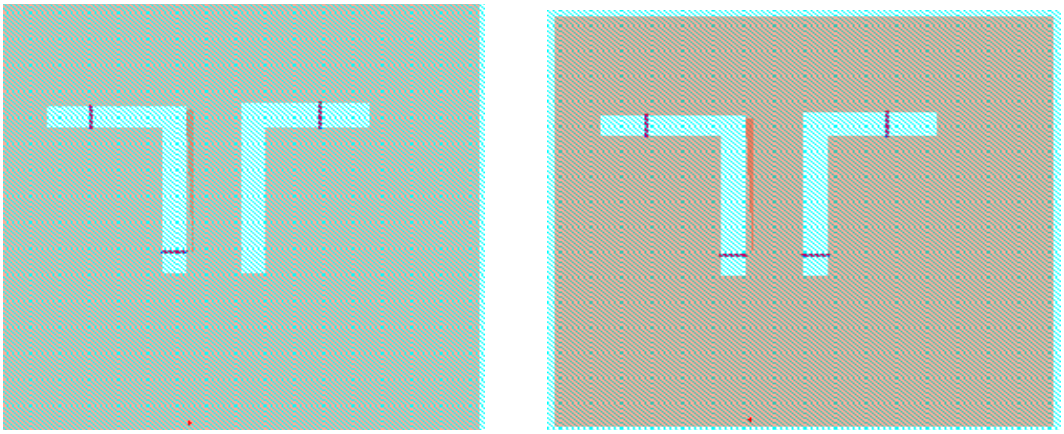

Figure 4Schematic of the inverted L-slot with three and four capacitor antenna

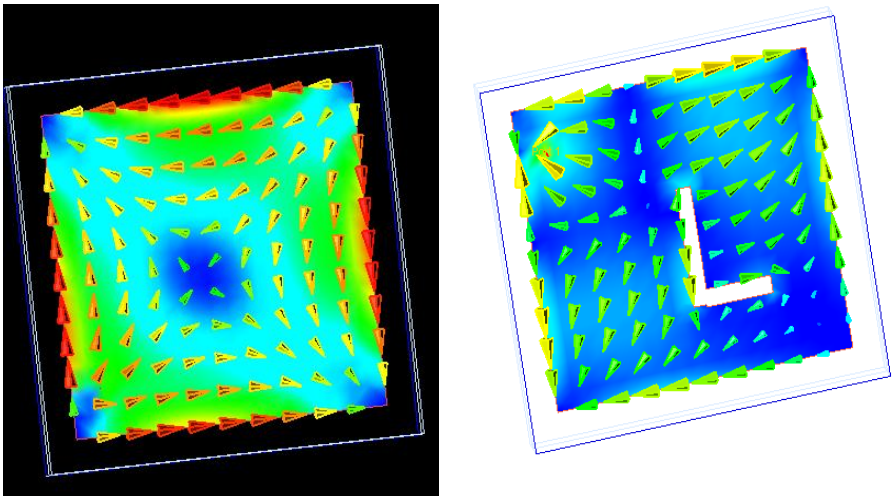

Figure5 Surface current distribution of rectangular and single L-slot antenna

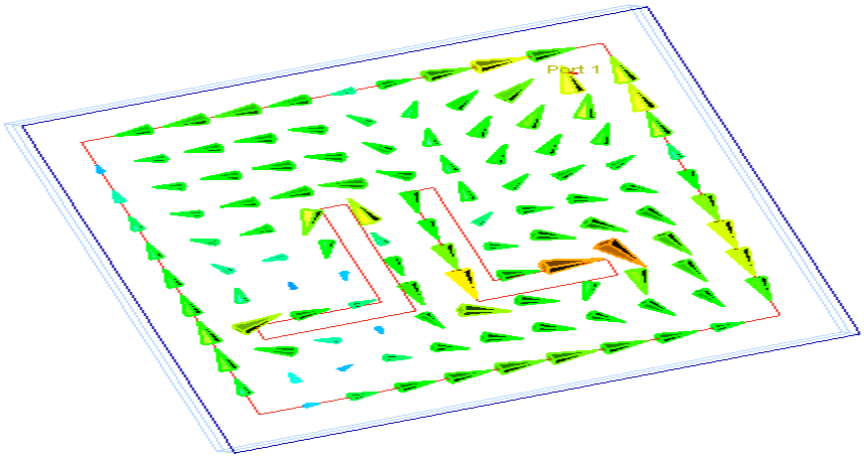

Figure 6Surface current distribution pattern of double L-slot

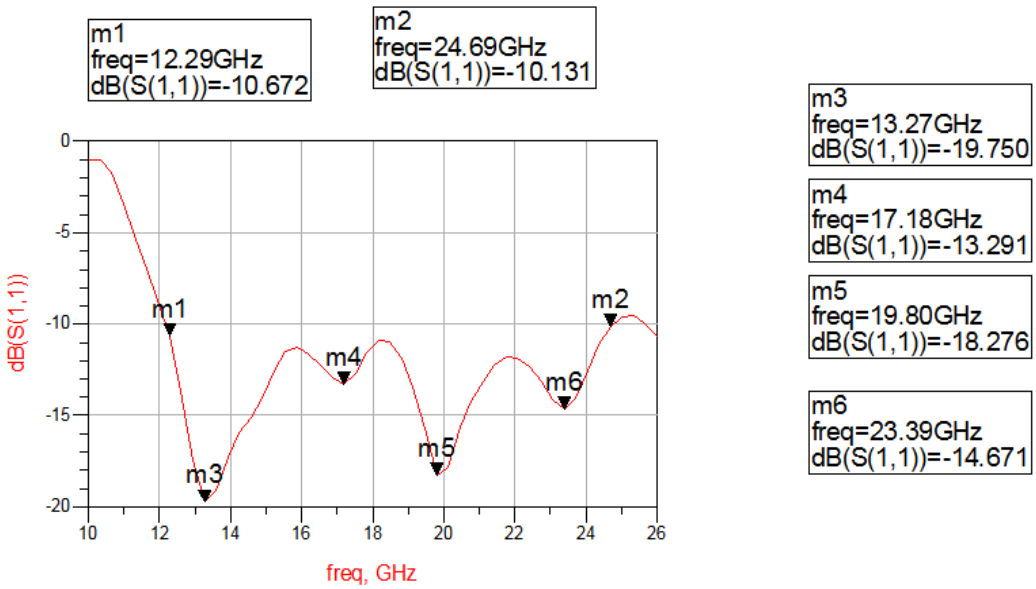

Figure 7 Return loss Vs Frequency (Proposed antenna2 with three capacitor)

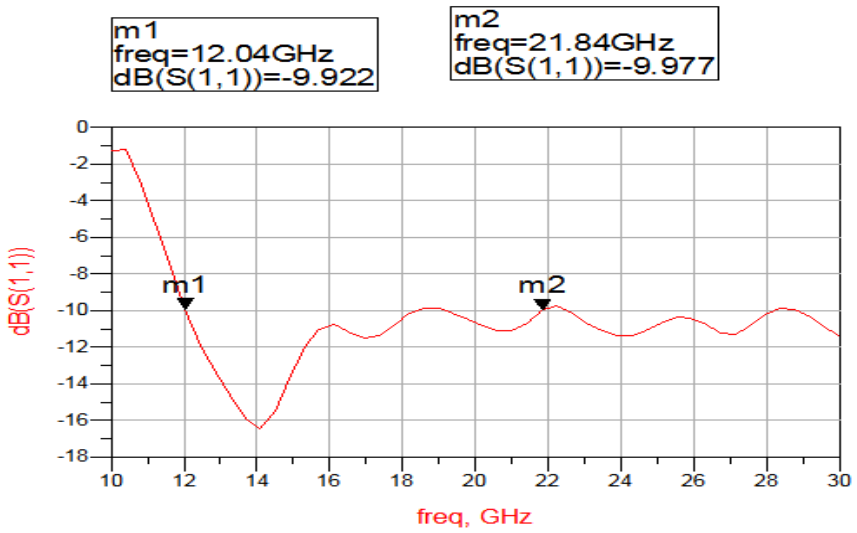

Figure 8 Return loss Vs Frequency (Proposed antenna1 with four capacitor)

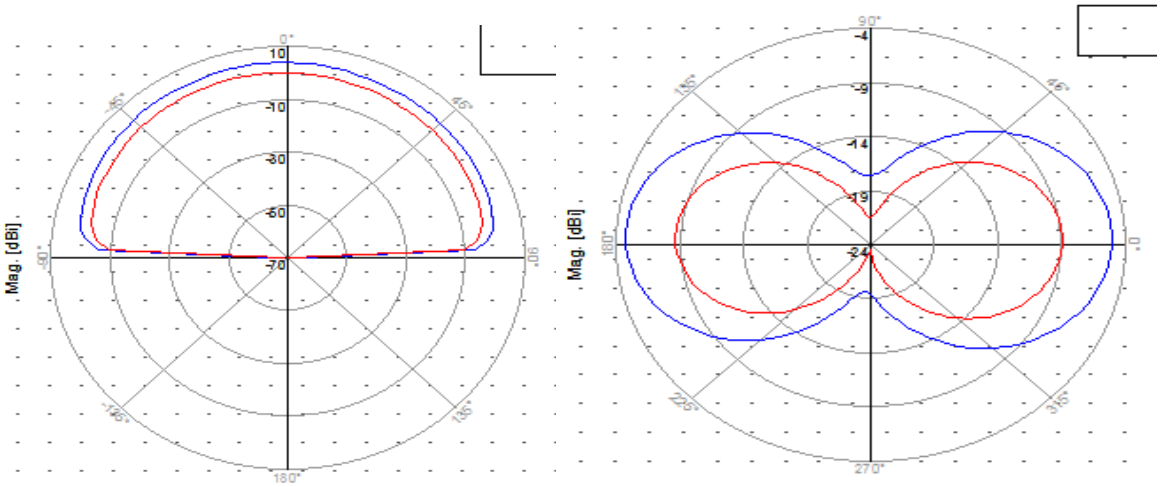

Figure 9 Radiation pattern at 11.2 and 12.1 GHz

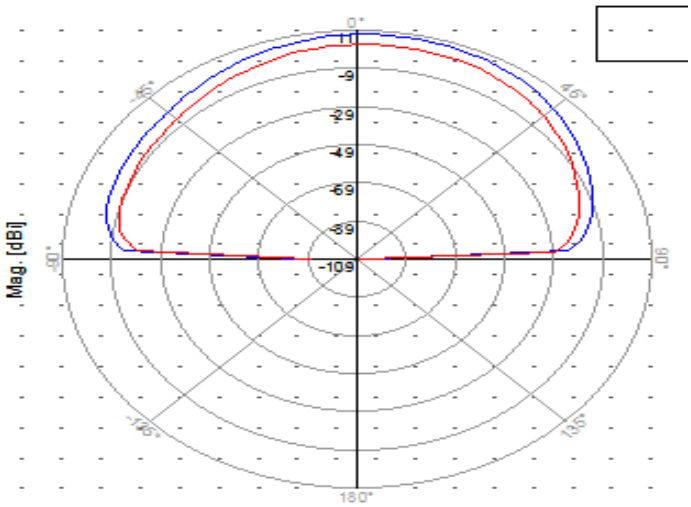

Figure 10 Radiation Pattern at 16.2 GHz

The above figures describe the simulation results of reconfigurable slotted patch antenna in ADS tool. The simulated return loss is obtained -15dB, -20.9 dB, -19 dB and -20.6 at 11 GHz, 12.1 GHz, 16.2GHz and 17.8 GHZ in scale from 13to 24 GHz.

FUTURE SCOPES

Minimizing electromagnetic energy absorption by the user's head can be another important area of study, since there may be health hazards, if the users head is surrounded by a strong electromagnetic energy for a long time. Another area of interest is examining the effect of the ground plane dimensions on the performance of the antenna element in order to increase system performance. By changing in the material of the patch physical parameter of the Microstrip Patch is changes, this will be help designer to determine the antenna performance and make necessary adjustment before simulation.

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