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A Modified H-shaped Microstrip Patch Antenna with Periodic Ground Structure

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Abstract: *A novel design of modified H-shaped microstrippatch antenna with periodic ground structure for broadband hasbeen proposed. Simulated result shows that the proposedgeometry offers bandwidth of 52.43 % (2.4GHz wide bandwidth)ranging from 3.165-5.565 GHz. The proposed antenna has stableradiation pattern and gain of more than 2 dB over the entireoperating bandwidth.*
Keywords: *bandwidth, gain, periodic structure.*

I. Introduction

Nowadays rapid enhancement in modern communication systems, the more research is going on compact antenna with various feeding technique, polarization, radiation pattern and radiating elements that attracts more and more researcher around the world towards this segment [1]. Among all of this designing of microstrip patch antenna becomes more popular to achieve stable gain, more bandwidth that covers bands and for particular application like Bluetooth, Wi-Fi, Wi-Max, WLAN etc. Broadband antenna has quite a few good qualities, such as high data transmission rates, low power consumption, small size, non-dispersive and simple hardware configuration in communication applications, etc [2]. As a result, a number of researches have been allocate their efforts to the development of wideband antenna recently for various application and this letter we are also looking for WLAN and WiMAX application. To adapt the designs for WiMAX and WLAN several antenna have been proposed in [3-6].

II. Antenna Geometry

The initial antenna geometry is compact with dimension of 15mm×15mm×1.66 mm. The patch is mounted on FR-4 lossy substrate of 1.59mm thickness while length and width are same. Geometry of the antenna is shown in figure-1.

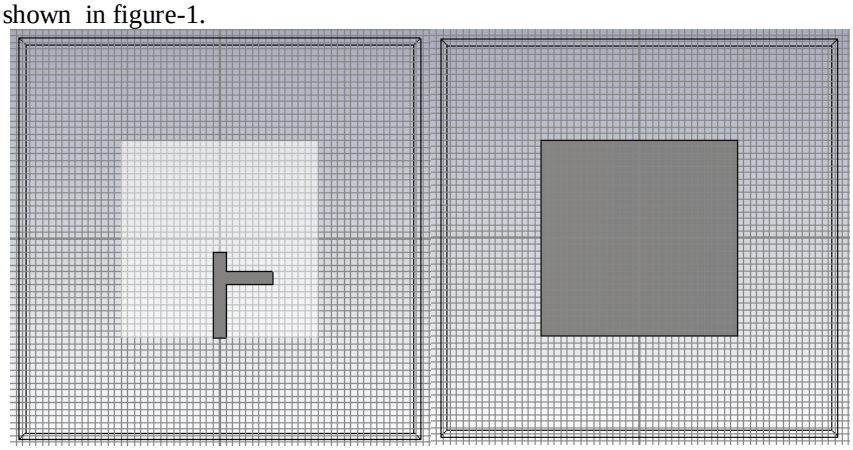

Figure-1: Initial Structure.

For our requirements we have optimized final geometry shown in figure-2 shown in below has optimized length in patch is L1=13mm and L2=14mm to obtained best radiation performance.

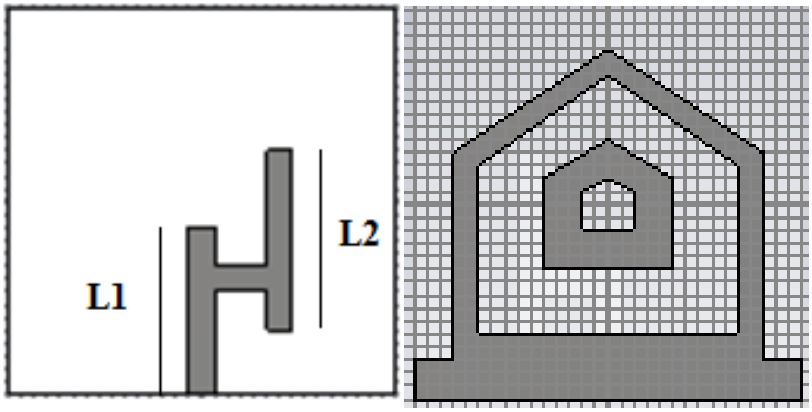

Figure: 2 Proposed antenna as front and back side view.

III. Simulation And Result Analysis

By simulating the initial structure with CST simulation tool we get reflection coefficient in terms of frequency in figure-3 given below is not desire for our requirement.

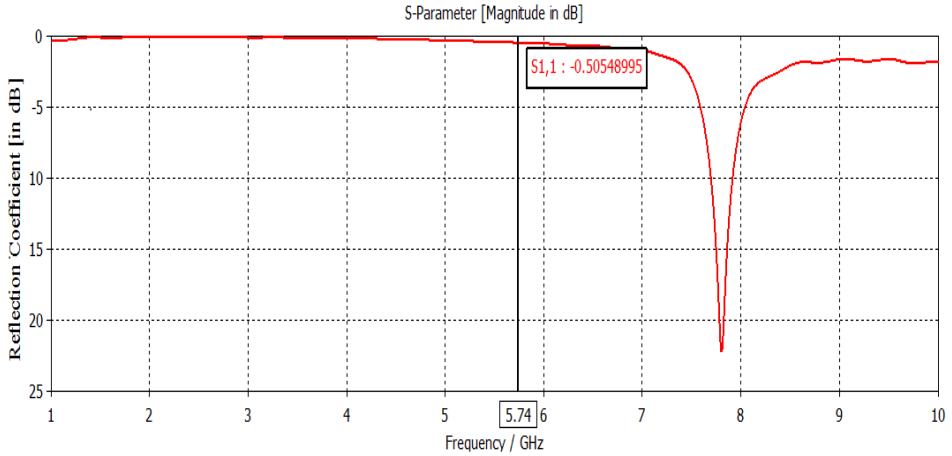

Figure: 3 Initial S-parameter.

To obtained desired requirement we are going to simulate the final structure with CST simulation tool, the proposed antenna has reflection coefficient(S11) in terms of frequency as shown in figure:4, by investigating the S11 parameter curve below -10dB it can be noticed that the simulated result of proposed antenna has two operating frequency of 3.725 GHz and 5.43 GHz and corresponding reflection coefficient (S11) are -24.33 dB and -42.53 dB respectively, the geometry has wide impedance bandwidth of 52.43% ranges from 3.165 GHz to 5.565GHz .

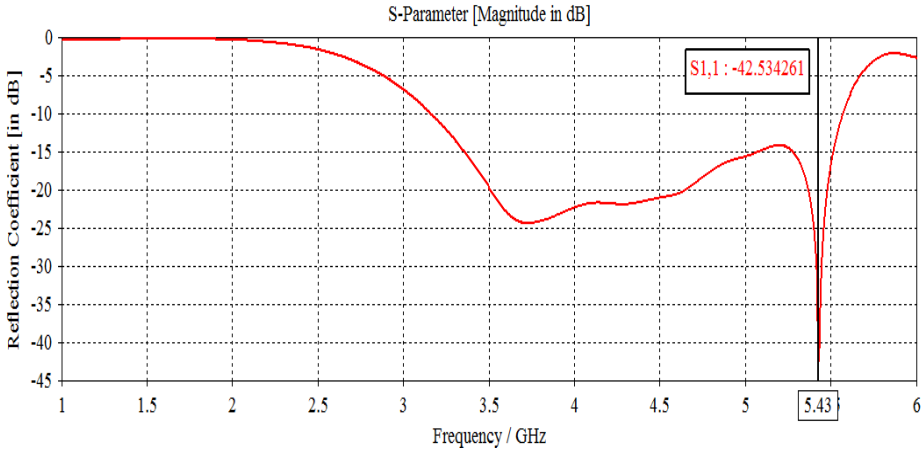

Figure: 4 Final S- parameter.

Variation in the ground geometry for parameter L1 and L2 according to table-1 as shown in below figure-5 in order to obtain desired result as shown in figure-4.

Figure: 5 Variation in Ground pale for L1 and L2 Parameter.

L1	13mm	12mm	11mm	10mm
L2	7mm	6mm	5mm	4mm
Bandwidth	1.715GHz	2.1GHz	2.26GHz	2.4GHz
Gain	2.483 dB	2.484dB	2.48 dB	2.23 dB

The VSWR of the proposed antenna nearly approaches towards unity and shows good impedance matching as shown figure-6. The proposed antenna exhibits more directive and omnidirectionalpatternin H field, while the smith chart of the antenna also shown in figure-10.

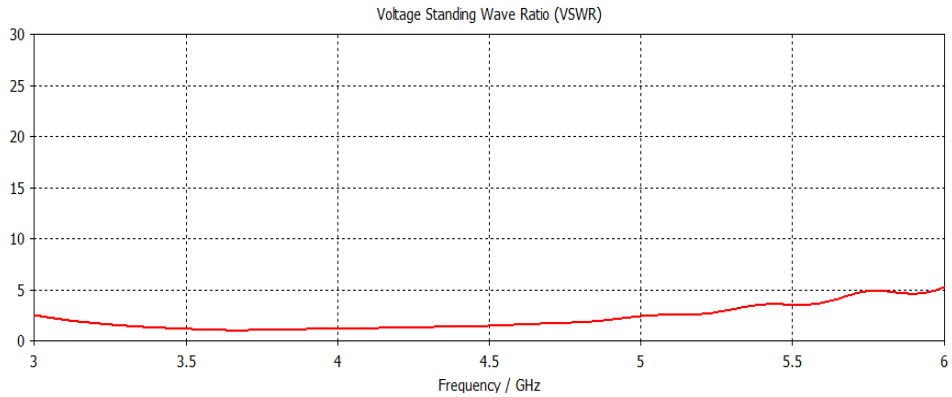

Figure: 6 VSWR Result

The proposed antenna has stable and constant gain more than 2 dB over entire range of bandwidth (i.e. 3.165-5.565GHz) is shown in figure-7.

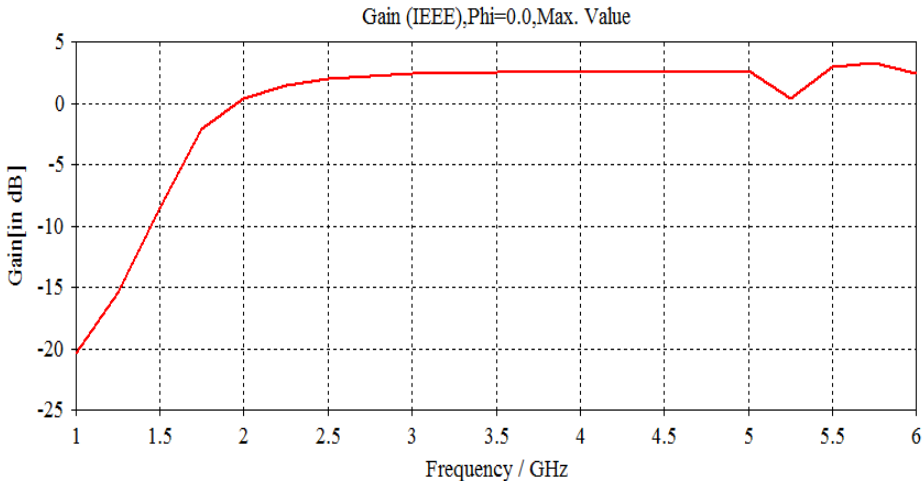

Figure: 7 Gain of proposed antenna.

The radiation pattern of E-field and H -field at both the operating frequency i.e. 3.725GHz and 5.43GHz is in figure-8 and figure-9 respectively.

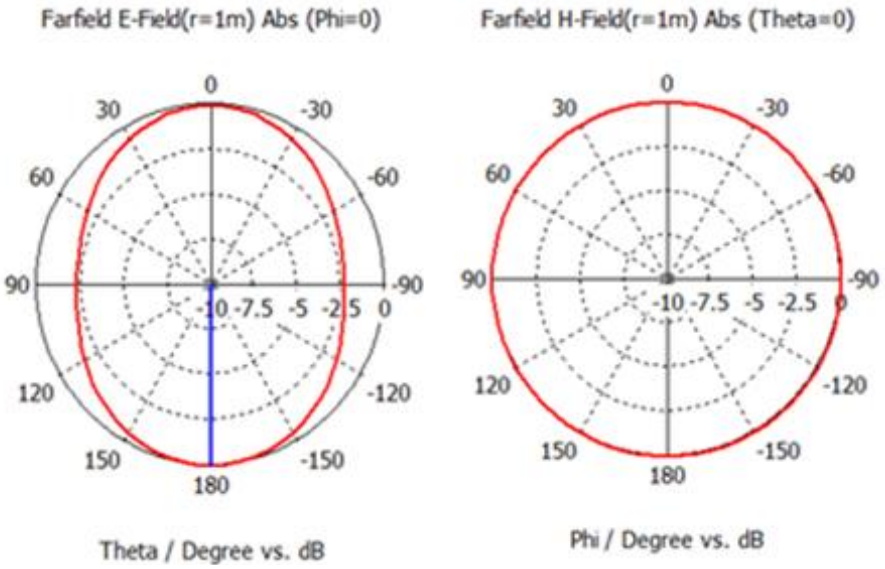

Figure: 8 Radiation pattern at 3.725GHz

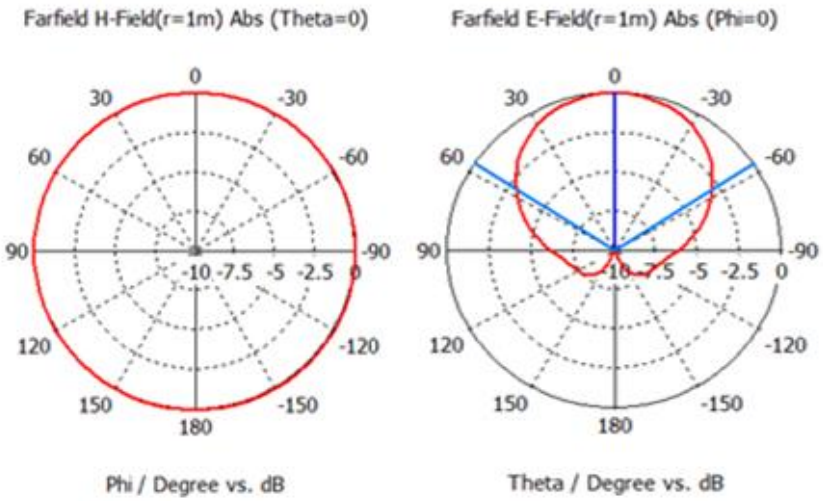

Figure: 9 Radiation pattern at 5.43GHz.

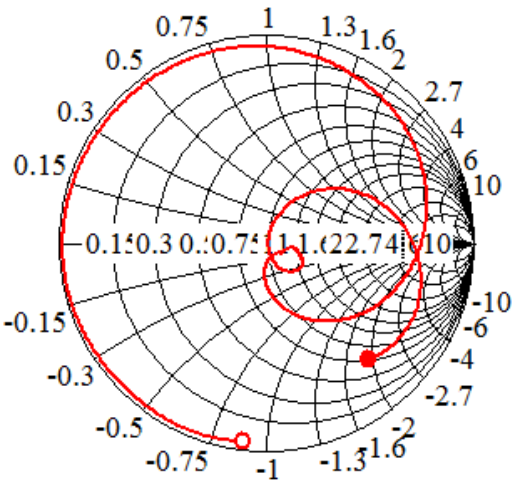

Figure: 10 Smitch chart of proposed antenna.

IV. Conclusion

The the proposed antenna is very well suitable for IEEE 802.11 WLAN standards which consist of 5.2-GHz (5.15–5.35 GHz) frequency band and WiMAX standards consist of 3.5-GHz (3.3–3.6 GHz) and 5.5-GHz (5.25–5.85 GHz) frequency band application. The proposed antenna has a good wide bandwidth of 52.43 % (2.4GHz wide bandwidth) ranging from 3.165-5.565 GHz and stable radiation pattern.

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