DESIGN AND ANALYSIS OF STACKED MICROSTRIPPATCH ANTENNA FOR WLAN APPLICATION

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ABSTRACT:
In this paper, a stacked microstrip patch antenna is designed for WLAN applications. The proposed antenna resonates at 5.2GHz with a low return loss of -35dB. The proposed stack offers wide bandwidth from 4.9GHz to 5.3GHz. The other important parameters like VSWR are less than 2 and gain is 6 dB The performance, such as gain, bandwidth, VSWR, and return loss, has been improved by positioning two identical dielectric FR-4 substrates, one on top of another. The feed is provided using proximity coupling for good impedance matching. The simulation results were obtained using CSTMW 2018 software. As a result, the proposed stack antenna is suitable for WLAN applications.

Keywords: Stacked patch antenna, WLAN, gain, bandwidth, VSWR and return loss.

I. INTRODUCTION:

The demand for wireless communication services is at an all-time high in today's materialistic atmosphere. As the demand for high data transmission rates develops, an antenna is needed with the ability to work over a wideband and broad beam range. The researchers are having difficulty in constructing an antenna that meets all of the requirements, such as small height and width, simple shape, large bandwidth, broad beam-width, tightly packed and tiny size, in wireless data communication systems. Microstrip patch antennas (MPAs) have been the best alternative for achieving all of the parameters listed above [1]. The tremendous growth of wireless communications has an impact on demand for microstrip patch antennas, which have superiority over small height and width, simple shape, feather weight, unadorned and cost-effective manufacturing using the latest printed circuit technology, ease of integration with feed networks, and so on. Microstrip patch antennas are used in high- performance spacecraft, mobile radio, and wireless communications [2]. Microstrip patch antennas, on the other hand, suffer from a variety of operational faults, including low throughput, inadequate power, lack of polarisation purity, factitious feed radiation, poor output gain, and a narrow frequency spectrum. The problems of the microstrip patch antenna have been solved in a variety of ways. Using a low dielectric substrate, implementing different impedance matching and feeding procedures, increasing substrate thickness, using multiple resonators, and stacking are some of these methods.

The antenna for WLAN applications has been investigated in several studies. There is a linear relationship between impedance bandwidth and antenna volume in microstrip patch antennas [3]. Using two multi-layered patches, higher impedance bandwidth can be achieved [4]. In WLAN applications, the layered structure is used to increase bandwidth [4–9]. A two-substrate stacked patch antenna with proximity coupling for the feed is suggested.

This paper is categorized into four sections: Section I gives a brief overview of microstrip antennas and their shortcomings. The antenna design is covered in Section II. Section III presents the simulation and findings. In Section IV, the paper was completed.

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II. ANTENNA DESIGN:

Two substrates are stacked horizontally and constructed like a multilayer printed circuit board in this antenna. For designing antenna, firstly frequency need to be selected and then selection of substrates with height and dielectric constant should be done. And also consider the type of feed. This proposed antenna operating frequency range is 5.2GHz. The parameters of the designed antenna are listed below:

- Ground :(Copper-lossy) L= 26.05 mm, W= 24.00 mm
- Lower substrate: (Rogers RT5880 (Lossy)) L=26.05mm, W=24.00mm,H= 1.60mm
- Upper substrate: (FR-4 (Lossy)) L=20.00mm, W=24.00mm, H=1.60mm.
- Feed :(Copper-lossy) L= 11.90 mm, W= 3.00 mm.
- Patch: (Copper-lossy) L= 17.50 mm, W= 13. 20 mm.

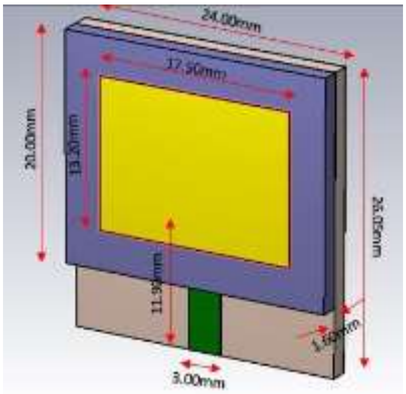

Fig1: Designed antenna’s front view

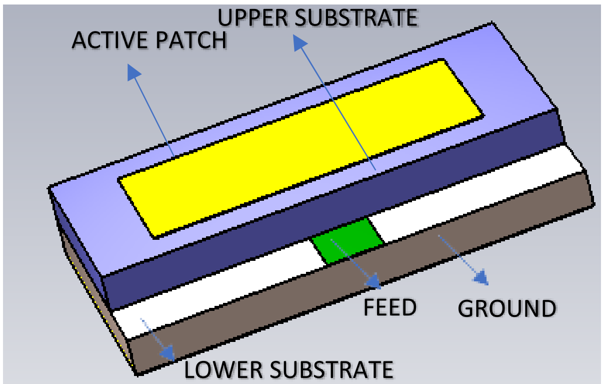

Fig2: Designed antenna’s top view

III. SIMULATION AND RESULTS:

By using CST microwave software studio, the proposed antenna is simulated and corresponding s-parameters are shown in figure3. The S1,1 of antenna is less than -35dB.

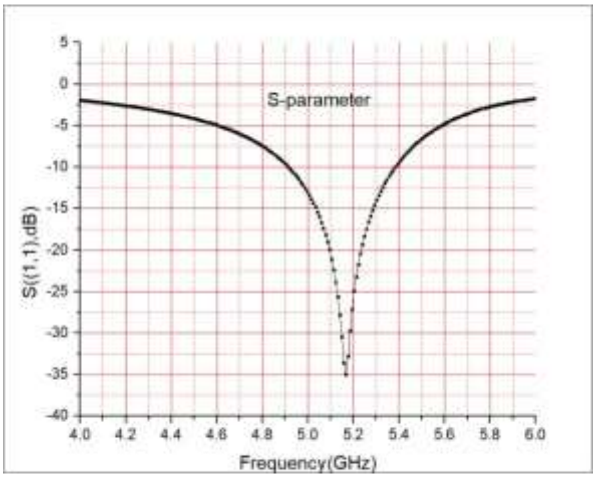

Fig3: Proposed antenna's return loss after simulation

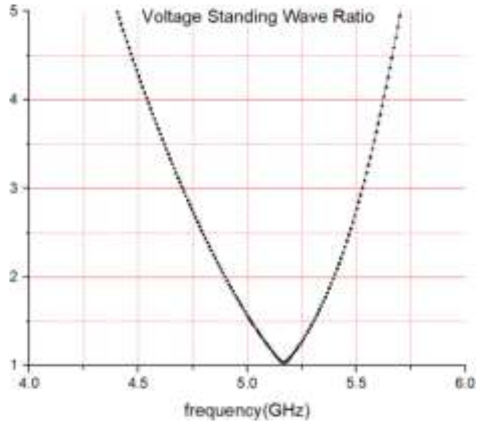

Fig4: VSWR Voltage Standing Wave Ratio

A VSWR value under 2 is considered for most applications, because it is highly accepted for impedance mismatch. For our proposed antenna, as shown in figure4, the VSWR value is less than 2. So, the power will efficientlytransmit from source.

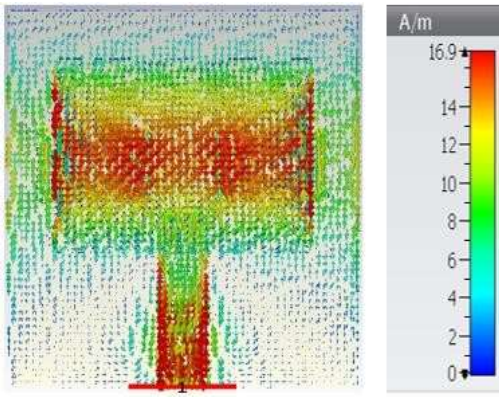

Fig5: Surface Current Distribution

The proposed antenna's surface current distribution at 5.2GHz is shown in the figure5. Current distribution is maximum at the feed and active patch. And it is minimum at the ends of the patch. In addition, 3D gain polar plot at the frequency 5.2GHz is shown figure6. At this frequency 6dB maximum gain has been obtained.

IV. CONCLUSION:

An antenna which is suitable for WLAN applications has been designed using stacking and simulated. Many designs parametric tests have been done to

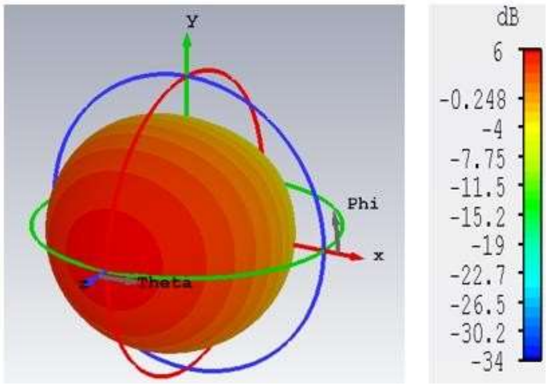

Fig6: 3D gain polar plot

improve the antenna's performance. The simulated antenna has a 5.2GHz resonance frequency and a 35dB return loss. The suggested antenna has a bandwidth of 4.9GHz to 5.3GHz and a peak gain of 6dB, which is suitable for WLAN.

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