Abstract: The main aim of this paper is to design a dual band MIMO antenna for WLAN & WI-MAX applications. The antenna consists of four square patches and the dimensions of the antenna are 55 mm x 30 mm. This antenna is designed using a low cost FR-4 lossy as a substrate with thickness of 2 mm whose relative permittivity is 2.65 and loss tangent is 0.02. The design and simulation of the antenna is performed in CST studio. Simulated result showed that the antenna operates at frequencies such as 2.6 GHz, 3.6 GHz. The radiation energy is relatively concentrated and gain reach 3.5dBi and 3.4dBi at center of operating frequencies. And also an Envelope Correlation Coefficient value of less than 0.01 is obtained. The value of diversity gain obtained is greater than 9.9. The antenna will have applications in S-band.

Keywords: Dual-band, MIMO, Loss tangent, ECC, Diversity gain

Introduction:

Wide development of wireless communication has high demands. Around the world interoperability Microwave, farther broadband communication benchmarks based on Inaccessible adjacent locate organize (WLAN) based or commonly called Wi-Fi, is broadly utilized in organize. Inside the fifth time (5G) flexible communication system inside the band 2.400GHz-2.9 GHz (2.4 G band) and Wi-3.5-3.7GHz. The low frequency band has small transmission debilitating and long transmission distance. Which satisfies the requirements of signal hail scope and capacity and stable organize speed. get The high frequency band has wide bandwidth. The hail capacity to point is concentrated. Radio wires utilized to transmit and get electromagnetic waves for inaccessible adapt are an important part to Wi-Fi system.
Antenna design:

The schematic representation of the proposed MIMO antenna is shown in fig-1. The proposed antenna has total dimensions of 90x52 mm\(^2\) and is designed on low cost 2mm thick substrate (FR4) having \(\varepsilon_r\) (relative permittivity) of 2.65 and tan \(\delta\) of 0.02.

![Proposed Antenna Structure](image1.png)

Results and discussion:

Scattering parameters

Fig. 2 illustrates the simulated S11 (dB) results. The antenna exhibits two working frequencies in this case those are 2.6 GHz and 3.6 GHz. In this case dual band response is achieved.

![S11 Results](image2.png)

Far field analysis

To demonstrate far field performance of the proposed antenna, far field radiation pattern was evaluated using simulator. Fig.3a shows the radiation pattern at 2.6GHz frequency and Fig.3b shows the radiation pattern at 3.6GHz frequency.

![Far Field Directivity](image3.png)

Table 1 Parameters of the proposed antenna

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (mm)</th>
<th>Parameter</th>
<th>Value (mm)</th>
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<tbody>
<tr>
<td>(S_x)</td>
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<td>(F)</td>
<td>1</td>
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<tr>
<td>(S_y)</td>
<td>52</td>
<td>(B_x)</td>
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<td>12</td>
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</tr>
<tr>
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<td>18</td>
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<td>(W_2)</td>
<td>2</td>
</tr>
<tr>
<td>(E)</td>
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</table>

![Far Field at 2.6 GHz](image4.png)
Envelope correlation coefficient

The ECC can measure field coupling between the MIMO antenna elements and is considered an essential performance standard for evaluating MIMO antennas. It tells us how independent two radiation patterns are. It is desirable to have ECC value between 0.3-0.4.

Diversity gain

The value of diversity gain for any acceptable MIMO antenna is around 10. Fig.5 shows the

References


