

## Design, Simulation and Construction of 2.4GHz Microstrip Patch Antenna for Improved Wi-Fi Reception

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**Abstract :** This project seeks to improve Wi-Fi reception by utilizing the properties of directional microstrip patch antennae. Where there is a dense population of Wi-Fi signal, several signal sources transmitting on the same frequency band and indeed channel constitutes interference to each other. The time it takes for request to be received, resolved and response given between a user and the resource provider is increased considerably. By deploying a directional patch antenna with a narrow bandwidth, the range of frequency received is reduced and should help in limiting the reception of signal from unwanted sources. A rectangular microstrip patch antenna (RMPA) is designed to operate at the Industrial Scientific and Medical (ISM) band (2.4GHz) commonly used in Wi-Fi network deployment. The dimensions of the antenna are calculated and these dimensions are used to generate a model on Advanced Design System (ADS), a microwave simulator. Simulation results are then analyzed and necessary optimization is carried out to further enhance the radiation quality so as to achieve desired results. Impedance matching at  $50\Omega$  is also obtained by using the inset feed method. Final antenna dimensions obtained after simulation and optimization are then used to implement practical construction on an FR-4 double sided copper clad printed circuit board (PCB) through a chemical etching process using ferric chloride ( $Fe_2Cl$ ). Simulation results show an RMPA operating at a centre frequency of 2.4GHz with a bandwidth of 40MHz. A voltage standing wave ratio (VSWR) of 1.0725 is recorded on a return loss of -29.112dB at input port showing an appreciable match in impedance to a source of  $50\Omega$ . In addition, a gain of 3.23dBi and directivity of 6.4dBi is observed during far-field analysis. On deployment, signal reception from wireless devices is improved due to antenna gain. A test source with a received signal strength indication (RSSI) of -80dBm without antenna installed on the receiver was improved to an RSSI of -61dBm. In addition, the directional radiation property of the RMPA prioritizes signals by pointing in the direction of a preferred signal source thus, reducing interference from undesired signal sources. This was observed during testing as rotation of the antenna on its axis resulted to the gain of signal in-front of the patch and fading of signals away from the front.

**Keywords :** advanced design system (ADS), inset feed, received signal strength indicator (RSSI), rectangular microstrip patch antenna (RMPA), voltage standing wave ratio (VSWR), wireless fidelity (Wi-Fi)

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