RESEARCH ARTICLE OPEN ACCESS

Microstrip Patch Antenna for Wi-Fi and Bluetooth Application in the ISM Band

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Abstract:

An antenna with excellent precision is needed because wireless communication technology is developing quickly. Thisresearch study illustrates a 2.4GHz-resonant microstrip patch antenna that operates in the L band for satellite communication. Coaxial feeding is the mechanism employed for this antenna. For this antenna, variables such as bandwidth, gain, and return lossare analysed. Design andsimulation are performed using the CST STUDIO. Introduction to Microstrip Patch Antenna Design A rectangular microstrip patch antenna with an inset-fed microstripfeed lineistheorizedtobedesignedforWi-Fiat 2.4GHz. CST

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I. INTRODUCTION

The antenna is a crucial component in any field of wireless communication. Various types of antennas areavailable depending on the use and necessity. Today's electronics and communication advancements tend to reduce the size of communication devices, necessitating the use of small, portable antennas.

The most popular antennas are microstrip patch antennas because they are lightweight, quick to make,and simple to utilize in any system. The patch antennaalso offers great efficiency,and the efficiency of thepatch is dependent on the material's r. The effectivenessof the antenna grows as we choose materials for thepatch that have low values of r. Patch can be fed in a variety of ways.

II. FEEDING TECHNIQUES

Contactingfeed:

In this technique, the radiating element receives power directly. A coaxial wire or micro strip is used for this. There are so two varieties of touching feed:

MicrostripFeeding:

It is a conducting strip whose width is much smaller thanthe radiating element's width. The feed line allows forsimple etching on the substrate because the strip's dimensions are narrower. The structure's feed line may be placed in one of three locations: the centre, inset, oroffset.

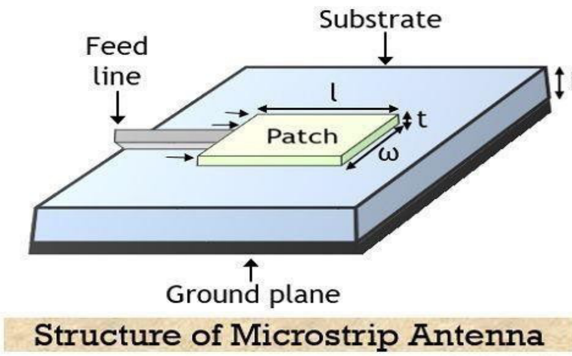

Fig. 1

Coaxialfeeding:
One of the of ten employed techniques for feeding the antenna is coaxial feed. The inner conductor is connected tothe patch when coaxial feeding is applied to the antenna. While the ground plane is connected to the outer conductor. The impedance varies along with the variation in the co axial feed's position. Because the feed line can be linked wherever on the patch, impedance matching is madeeasier. However, since this requires drilling a hole inthesubstrate, connecting the feed line with the ground plane is alittlechallenging.

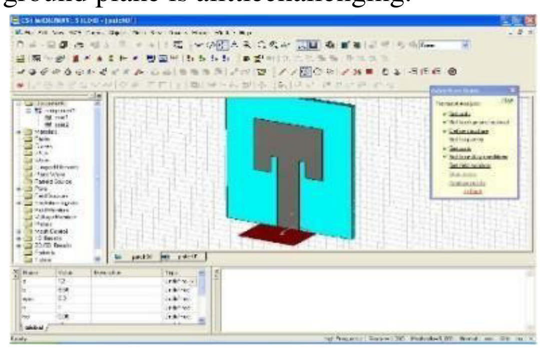

Fig 2. Simulated Patch Antenna

Non-Contactfeed:
(a) Aperture:

With this type of electromagnetic coupling, the radiating element can be excited without coming into touch with the other object.In this procedure, two dielectric substrates that are separated by a ground plane are takeninto consideration. The ground plane serves as the feedline's conduit. The upper dielectric substrate contains thepatch because there is no direct contact between the feedand the radiating patch. As a result, a slot forms on theconducting plane, allowing the feed line's energy to becoupled to the antenna.The feed line is separated from theradiating element by the ground plane. Control is possibledue to the slot's length and feed line’s width.The antennafeedmethodisthemostchallenging.

(b) Proximity:

It is also referred to as indirect feed because there is no ground plane involved. The conducting surface of the antenna has a slot, and a microstrip line is used to providecoupling. Compared to an aperture coupled feed antenna,it is simpler to fabricate. It provides the widest band width and little spurious emission.

III. METHODOLOGY

Object Identification:

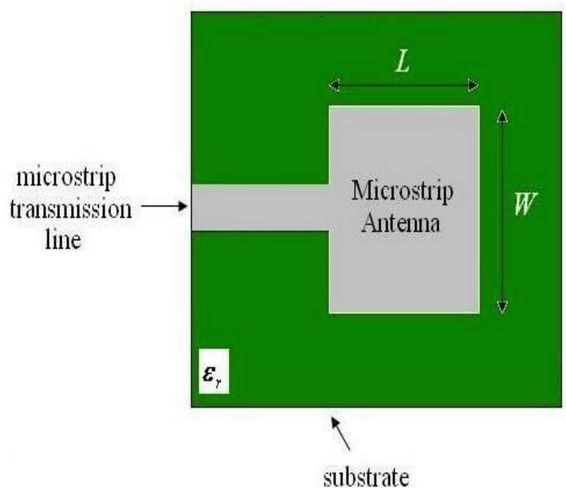

Fig 3. Top view of patch antenna

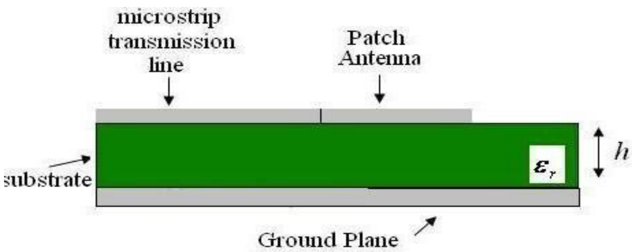

Fig 4. Side view of patch antenna

II. DESIGN OF MICROSTRIP ANTENNA

The ability to print microstrip or patch antennas directly on to a circuit board makes them more and more practical. Microstrip antennas are becoming more common in mobile phones very quickly. Patch antennas are inexpensive, have a small profile, and are simple to make. High conductivity metal is used to make the patch antenna, microstrip transmission line, and ground plane (typically copper). The patch has the following dimensions: L,W, and is supported by a substrate (adi electric circuit board) with the following thickness, h, and permittivity, Erordi electric constant. It is not crucially significant how thick the ground plane or microstripis. The heighth should not be much less than 0.025 wave lengths.

RT5880SUBSTRATE

High frequency/broadband applications are well suited for RT/duroid5880 laminates becausethey have a low dielectric constant (Dk) andminimal dielectric loss. The randomly aligned microfibers reinforcingthePTFEcompositesaidinpreserving THE Dk homogeny.

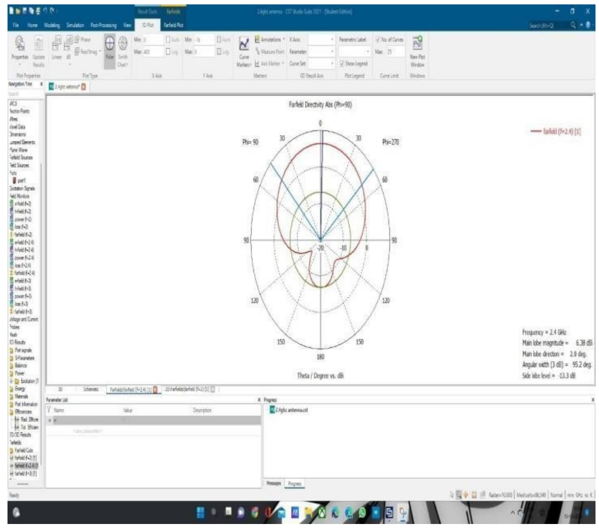

Fig 5. Farfield of Patch Antenna

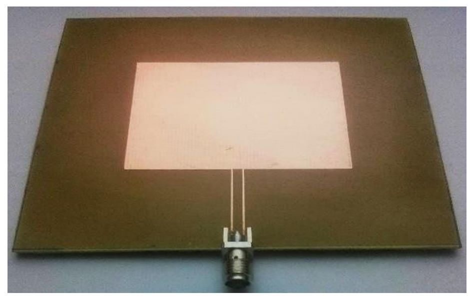

Fig 6. 3d View of Farfield

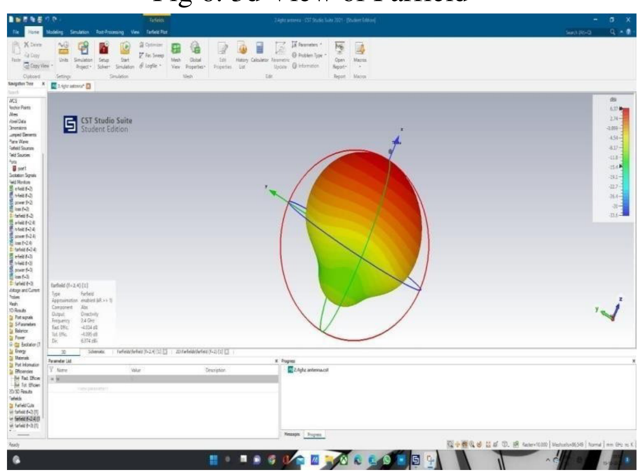

Fig7. 2d View of Farfield

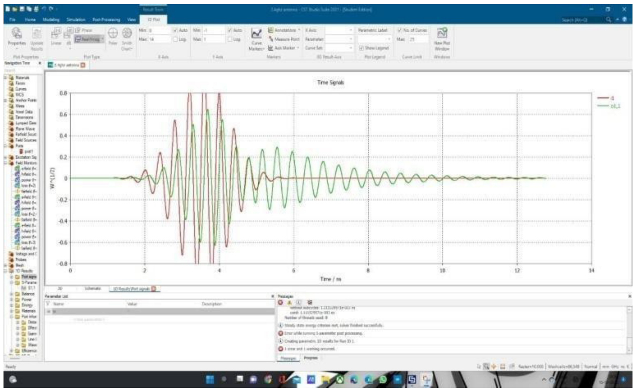

Fig 8. Emission Pattern

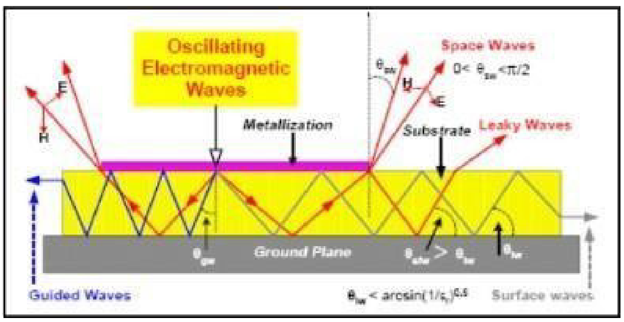

Fig 9. Copper Clad

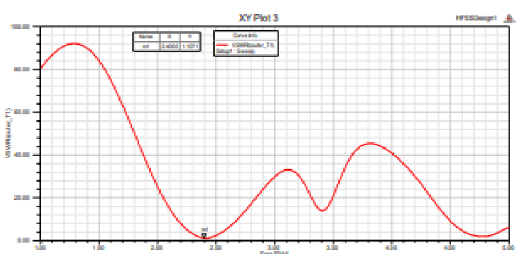

Fig 10. Patch Antenna Gain

Conclusion:

This article presents the simulation of a microstrip patchantenna designed for ISM band applications. Wehavedesignedthemicrostrippatchantennawhichisresonatingatthecenterfrequencyof2.4GHzthatisISM band frequency. Voltage standing wave ratio forthis antenna is 1.1 and bandwidth is 5% of the centrefrequency.ThesimulationresultsindicateseamlessintegrationpotentialoftheantennawiththeexistingISMbandapplicationcircuitry.

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Resonant Frequency	2.4GHz
Return Loss	-44.721dB
Gain	0.645
VSWR	1.1
Bandwidth	5%