Design of Small Integrated Antenna for Peer to Peer Network

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Abstract

In this paper, a small integrated antenna also called as micro strip patch antenna. This antenna has been designed to explore the outcome of diverse array combination of rectangular micro strip patches on the directivity and radiation pattern. The rationale of this work is to acquire a small, proficient and economical incorporated antenna that can work efficiently for peer to peer wireless communication such as for Bluetooth devices. Because, the operating frequency for such strategy lies between 2.4 GHz to 2.484 GHz and uses 80 channels with 1 MHz channel spacing, thus, the results were realistic for the frequency within its distribution. The results obtained had showed better perfection in the directivity and radiation pattern by mounting the number of combination for micro strip scrap arrays.

Keywords - *Rectangular micro strip patches, circularly polarized, directivity, radiation patterns.*

I. INTRODUCTION

An antenna is a component for wireless communication as it transmits or receives electromagnetic waves. All through a decade, numerous antenna designs have been residential and their relevance depends on the physical parameters of its output. Appropriate to recent trends of the communication system necessities in portable devices, it is compulsory to design a light, compact, transferable and a proficient antenna. Several researchers are still mounting optimum designs to reduce the size and weight of multiband antennas while maintenance good performance. An integrated antenna is among the one that is being favorite due to some practical applications, since of to its light weight, small size, easy and cheap consciousness. A small integrated antenna also called as micro strip antenna has significant applications in the area of wireless communication and is used for numerous microwave applications. Small integrated antenna technology came into continuation in the late 1970s but was well established in 1980s. The creation of micro strip antenna is easy as it requires a thin patch on one side of a dielectric substrate. The other side of substrate has a plane to the ground. The piece is normally made of conducting material like Copper or Gold and may be in any uninformed shapes like rectangular, circular, triangular and elliptical or some other shape.

For sensible applications, the most frequent used micro strip patches are rectangular and circular patch antennas. In wireless communication, small incorporated antennas are preferred than other radiating systems, due to their light weight, abridged size, low cost, conformability and ease of integration with communication devices. Electromagnetic waves are important as it radiates due to fringing fields between the edges of micro strip patch and the ground plane. The small integrated antenna can be mostly fed by either of the two methods, that is contacting and non-contacting methods. In contacting method, the RF power is fed honestly to the radiating element having another concerning element such as a micro strip line or probe feed. In the non-contacting method, there is no physical contact among the elements. An electromagnetic field pairing is done to transfer power between the micro strip line and the radiating pact that includes immediacy feeding and aperture feeding. According to the radiation pattern configurations, a well polarized micro strip antenna can be confidential as left-handed circularly polarized (LHCP) or right-handed circularly polarized (RHCP). In this paper, a micro strip based patch antenna has been planned to get the resulting parameters by unreliable to the arrays of micro strip patches to obtain the optimum output parameters. Lastly, the comparison has been done with the theoretical parameters of short range peer to peer wireless communication devices.

II. BLUETOOTH

Bluetooth is a low power wireless communication device and is used for relocate the data and voice signals. It is efficient for a short range communication of up to 100 meters only. It is a

wireless communication technique involving the two devices. Throughout the literature survey, it has been found that the Bluetooth device is named after Viking Kin Harald Bluetooth. It was made-up by Ericsson in 1994, in a hope that it would unite a world as Herald Bluetooth united Norway and Denmark and thus the device has named after Herald Bluetooth. Bluetooth technology provides a 10-meter special bubble that supports instantaneous transmission of both voice and data for multiple devices. Up to 8 data devices can be associated in a piconet, and up to 10 piconets can exist within the 10-meter bubble. Every piconet wires up to 3 simultaneous full duplex voice devices (CVSD). Tentatively, the data transfer rate is 1Mb/s, but the accessible data rates are 432 Kbps for full duplex transmission, 721/56 Kbps for asymmetric transmission, and 384 Kbps for TMS 2000 transmission.

The protocol split that bandwidth to hold up both voice & data communication. Bluetooth can carry an asynchronous data channel, up to three instantaneous synchronous voice channels, or a channel, which concurrently ropes asynchronous data & synchronous voice. Every voice channel supports a 64 Kbps synchronous link. The asynchronous data channel can carry an asymmetric link of up to 721 Kbps in either direction, while permit the 57.6 Kbps in revisit direction or a symmetric link up to 432.6 Kbps. A piconet is a set of devices that is coupled through Bluetooth technology for temporary phase. A piconet starts with two coupled devices, such as a portable PC and cellular phone, and may cultivate up to eight connected devices. All Bluetooth devices are peer units and have indistinguishable implementations. Though, while establishing a piconet, one unit will act as a master and the other(s) as slave(s) for the length of the piconet connection. Bluetooth technology has no line-of- sight necessities for making it a potential substitution for infrared ports. Portable PCs can be related wirelessly to printers, transfer data to desktop PCs or PDAs or interface with cellular phones for wireless WAN access to corporate networks or the Internet.

III. ANTENNA DESIGN

The essential design of the micro strip patch antenna is shown in Fig. 1. 'L' signifies the length of the diffusion line between the slots, 'W' is the width of the patch and 'h' is the patch height.

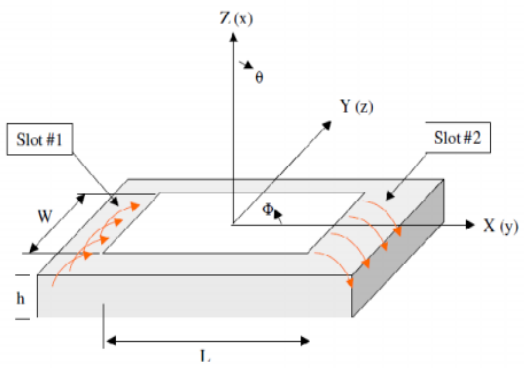

Fig. 1 Geometry of Rectangular Micro Strip Patch

A careful inference is obligatory for the antenna design to realize the optimum results. In order to design a small integrated antenna for peer to peer communication devices, the ringing frequency of 2.45 GHz is preferred which is very well inside the frequency range of Bluetooth, that is 2.4 GHz to 2.5 GHz. In this paper, the reverberating frequency used is 2.45 GHz. The dielectric material of the substrate (*Er*) selected is N4000-13 with a value of dielectric constant 3.430. The scrupulous use of a dielectric material is an imperative design parameter. Low dielectric stable is engaged in the prototype design as it gives better competence and higher bandwidth, and low quality factor Q. The low value of dielectric invariable helps in rising the fringing field at the patch border and thus increases the radiated power. In this proposed design, patch size is independent of dielectric constant. Substrate thickness is also an imperative design parameter. Thick substrate increases the fringing field at the patch periphery like low dielectric constant that increases the radiated power. The height of dielectric material (*h*) of the micro strip patch antenna with coaxial nourish is to be used. In this design, the elevation of dielectric material engaged is 1.6 mm.

IV. PHYSICAL PARAMETERS OF ANTENNA

These are the following parameters,

A. Width of the Patch
B. Length of the Patch
C. Input Impedance
D. Ground Dimension

Results:

The presentation of the antenna has been investigated by untrustworthy the number of micro strip rudiments in the antenna array. In this paper, has been shown the results for a single, 2 x 2 antenna array essentials and the effect on the directivity and diffusion pattern is pragmatic. Fig. 2 shows the 3D geometry for a single antenna element. Correspondingly, the 3D radiation pattern is shown in Fig 6.

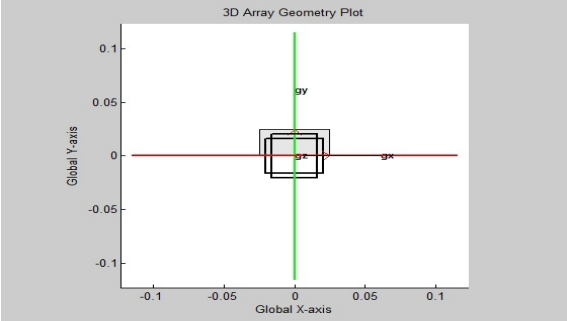

Fig. 2. 3D Geometry of a Single Micro Strip Antenna

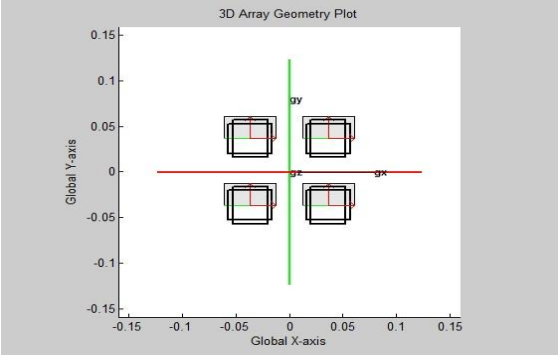

Fig. 3. 3D Geometry of A 2 X 2 Micro Strip Antenna

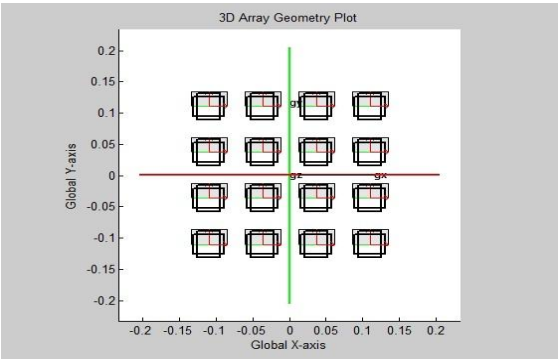

Fig. 4. 3D Geometry of a 4 X 4 Micro Strip Antenna

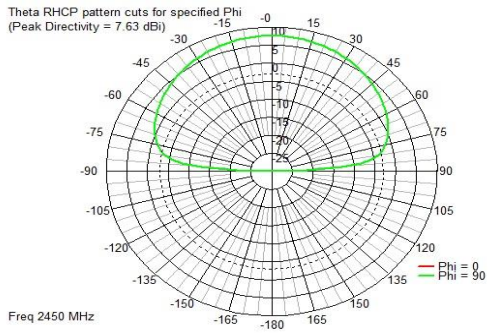

Fig. 5. Radiation Pattern For A Single Micro Strip Patch Antenna

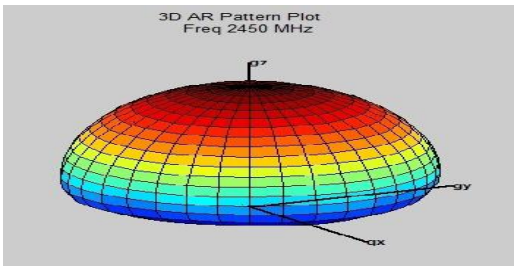

Fig.6. 3D Radiation Pattern of a Single Micro Strip Antenna

V. CONCLUSION

It intended 3 disparate configurations of micro strip based patch antennas by scenery the input operating frequency of Bluetooth devices that is 2.45 GHz. The coaching gain of a single, 2 x 2, and 4 x 4 antenna arrays is untried to be 7.63 dB, 13.12 dB and 18.62 dB. The results show that 4 x 4 rectangular micro strip antenna array can work as a skilled micro strip antenna as it shows improved dictate gain and radiation pattern. Furthermore the patch area is very small as compare to conformist antenna and the directivity is high 18.62 dB as compared to the conventional antenna. Hence the antenna can set off well at the frequency 2.45 GHz as is compulsory for in service the Bluetooth devices. It may be completed that this antenna shows high directivity with reduced size. Due to increase in the directivity, it may be probable that this antenna can work for Bluetooth devices up to 100 meters in a more capable method than the available conventional antennas.

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