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Human Shaped Microstrip Patch Antenna for WLAN Application

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Abstract— **Due to low profile conformability, low weight, easy and cheap realization, the microstrip patch antenna has been widely used in real time applications. In this paper, an attempt has been made to design a human shaped microstrip patch antenna using High Frequency Structure Simulator (HFSS). Our aim is to analyze the radiation pattern and XY plot for different positions of proposed antenna. The proposed antenna is suitable particular for wireless communication application such as WLAN.**

***Index Terms*— HFSS, Microstrip Patch antenna, Radiation pattern, WLAN, XY plot.**

I. INTRODUCTION

Wireless networks, which have experienced an explosive growth in recent years, must support the rapidly increasing demand for high data rates due to the increasing popularity of smart phones, tablets, net books, cloud computing, etc. In this regard, a reliable wireless network with self-organizing and self-optimizing properties provides the required high data rates in a spectrally efficient manner becomes an attractive solution.

One of the most important modules of such a network is antenna. Antennas are necessary and critical component in these systems, but sometimes their inability to adapt to changing operating environments can limit their performance. The antennas design should have adaptability for the system change in the future or for the system based on the change of requirements on time. So the antenna design is the main component which must have additional functions to support the existence of the system.

The next generation wireless communication system requires supporting multi-mode and multi-band applications, the number of antenna elements on these platforms increases.

This, in turn, causes problem associated with co-site interference, cost, maintainability reliability, and increasing weight.

One approach to alleviate to challenges is to use a multi-function reconfigurable antenna which can replace multiple of single function legacy antennas. In this paper, human shaped microstrip patch antenna is analyzed.

II. MICROSTRIP PATCH ANTENNA

Microstrip antennas are rather economical to construct and design because of its simple 2D physical geometry. They are usually employed at Ultra High Frequency and higher frequencies because the size of the antenna is directly coupled with the wavelength at the resonant frequency.

A single patch antenna can provide a directive gain of about 6-9 dB. An individual microstrip antenna consists of a patch of metal foil of various shapes (a patch antenna) on the surface of a PCB, with a metal foil ground plane on the other side of the board. Most microstrips consist of multiple patches in a two-dimensional array. Some of common types are shown in Figure1.

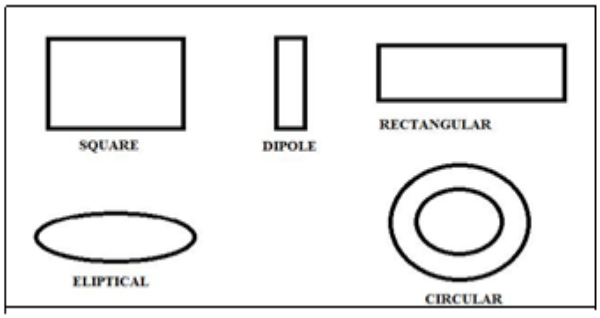

Figure 1 Different Shapes of Microstrip Patch Antenna

III. PROPOSED HUMAN SHAPED MICROSTRIP PATCH ANTENNA

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The structure of the proposed co-axial probe feed of the Human shaped microstrip patch antenna is shown in the Figure 2. In order to have better performance, the dielectric substrate must be chosen with a very low dielectric constant. This design will provide a required radiation, larger bandwidth and the maximum efficiency of the antenna.

Hence, the substrate selected for the design of the proposed antenna is air of thickness 3.2 mm and with low permittivity (r = 1.0006). The dimensions of the Microstrip patch antenna can be fed by variety of methods. These methods are contacting and non-contacting.

The four most popular feeding technique used are microstrip feed, co-axial probe feed, aperture coupled and proximity coupled feeding. The system is given with the source of a coaxial probe having approximately thickness of radius 2 mm.

The outer conductor of the co-axial cable is connected to the ground plane and the centre conductor is extended up to the patch. The simulation part of the proposed antenna is designed using HFSS software..

HFSS is a electromagnetic (EM) field high performance system for simulating any arbitrary 3D volumetric passive device with graphical user interface.

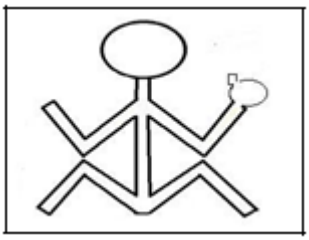

Figure 2 Human shaped microstrip patch antenna

The Human shaped microstrip patch antenna is analyzed with the help of radiation pattern of the antenna. The radiation or antenna pattern describes the relative strength of the radiated field in various directions from the antenna, at a constant distance.

The radiation pattern can be analyzed by simulator in three-dimensional, but the usual measurement of radiation patterns are two dimensional which was obtained from the sliced three-dimensional pattern.

The vertical and horizontal plane pattern measurements are analyzed by polar or rectangular format. In the polar coordinate system according to the voltage values of the signal the concentric grid lines are spaced logarithmically. Diverse values might be used for the logarithmic constant of periodicity. This value will enclose an effect on the manifestation of the plotted patterns. The 0 dB reference will be chosen as the outer edge generally in the chart.

The radiation pattern will not have the same pattern at large distances and the near field of the antenna. The near-field refers to the field pattern with maximum and uniform field strength that exists close to the antenna, while the field pattern at large distances will have minimum field strength.

The far-field region is moreover called as the radiation field. Ordinarily, it is the radiated energy from the antenna that is of interest. Hence antenna patterns are regularly deliberate in the far-field area. In pattern measurement it is significant to decide a distance adequately great to be in the far-field than in the near-field.

The least permissible distance depends mainly on the antenna dimension in relation to the wavelength. The formula for calculating the permissible distance of radiation is

$$r_{min} = 2d^{2\lambda} \quad \text{---- (1)}$$

where r min is the minimum distance from the antenna, λ is the wavelength and d is the maximum dimension of the antenna.

The proposed human shaped microstrip patch antenna is suitable particular for wireless communication application such as WLAN.

IV. RESULTS

The Human shaped patched antenna is designed for WLAN application and its radiation pattern are analyzed with HFSS software in different position The simulated output of the patch antenna using HFSS is shown in Figure 3.The radiation pattern which is a sliced version of 3D image and the XY plots which is with respect to the Horizontal and the Vertical plane position.

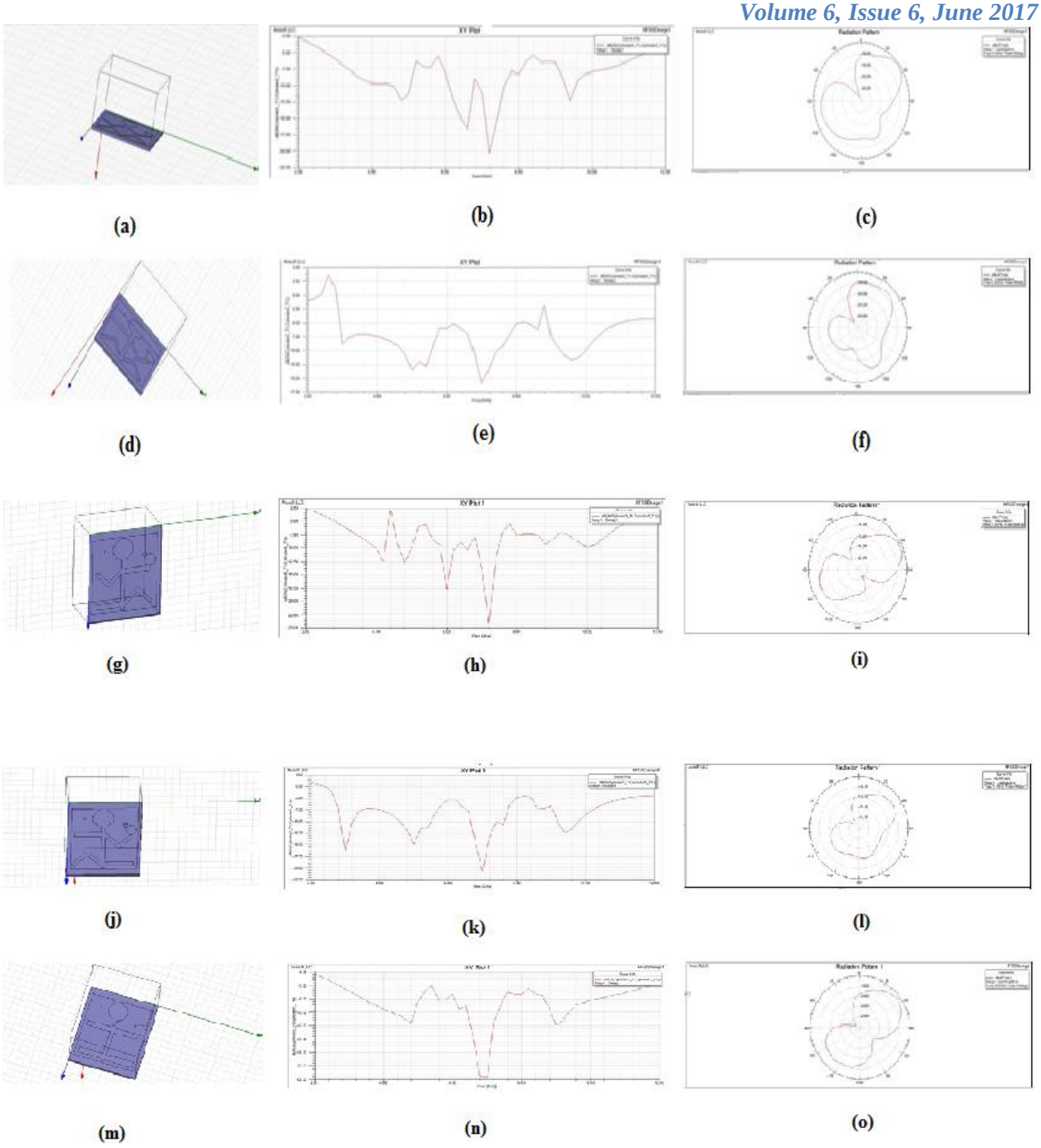

Figure 3 (a) – (o). Various positions of human shaped microstrip patch antenna and its XY plots & Radiation patterns

V. CONCLUSION

The simulation is carried out to demonstrate a patch antenna and the result confirms it has good performance in the far field. An advantage inherent to microstrip patch antennas is the ability to have polarization diversity. In human shaped microstrip patch antenna more radiation pattern is available than other because of various position changes of proposed antenna. For the future work, compare the human shaped microstrip patch antenna with other types of antenna in terms of radiation pattern and the XY plots to get an optimized result.

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