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H-Shaped Microstrip Patch Antenna Operating in ISM Band of Centre Frequency 2.45GHz

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ABSTRACT: In this paper a H shaped microstrip patch antenna is presented. This antenna resonates at2.45GHz. The proposed microstrip patch antenna has rectangular H shaped structure with microstrip feed. Roger having dielectric constant 10.2 is used as substrate material. The structure is simulated using HFSS. Simulation result shows that it covers the frequency band 2.42GHz to2.48GHz. Microstrip patch antenna is preferred as it is flexible in shape, conformal and miniaturization can be achieved to a great extent.

KEYWORDS: Antenna, ISM band, microstrip antenna, microstreep feed

I. INTRODUCTION

Microstrip patch antennas are more popularly used now a days due to its various advantages such as light weight, less volume, compatibility with integrated circuits, easy to install on the rigid surface and low cost. A simple microstrip patch antenna consists of a dielectric substrate having fixed dielectric constant. Radiating patch is present on one side of the dielectric substrate and a ground plane is present on other side of the substrate.
Common microstrip antennas are designed in shapes like square, rectangular, circular and elliptical, but any continuous shape is possible. Some patch antennas do not use a dielectric substrate, instead they are made of a metal patch mounted above a ground plane using dielectric spacers; the resulting structure is less rugged but has a wider bandwidth. The Industrial, Scientific and Medical (ISM) band is reserved for industrial scientific and medical purposes other than telecommunication.

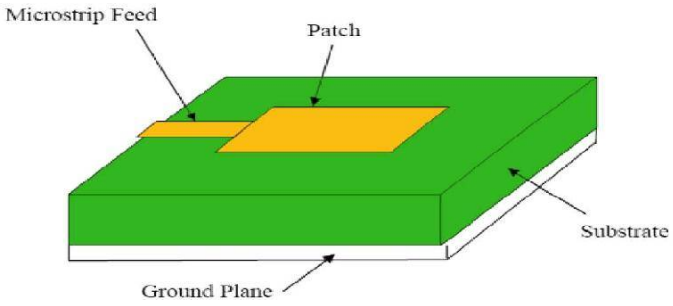

Fig 1.Microstrip patch antenna

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II. RELATED WORKS

The great interest of researchers in Wireless Body Area Networks (WBAN) and its applications have recently led to vast developments in wireless communication technologies. Wireless biotelemetry systems, such as implantable on-body and off-body medical antennas, have significantly enhanced the exchange of physiological data from the body to external monitoring devices compared to the traditional inductive coils [1]. Their higher data rates and longer communication range have been excessively exploited in applications such as hyperthermia treatments, microwave breast imaging, implantable brain computer interfaces, and wireless telemedicine. Successful use of medical devices requires effective communication of the critical microwave signal to the monitoring device [2]. This includes taking into consideration the multipath fading due to the movement of the body as well as the high dielectric constant of the tissues surrounding the radiated signal [3]. In addition, the wearable device should be low profile, small size, and light weight in order to facilitate its use in the human body [4][5].

Nowadays, many proposed wearable antenna have been introduced due to the invention of broaden applications in different fields such as telemedicine applications, Satellite applications, and GPS, to mention a few. The wearable antenna has several requirements must be considered during the design such antenna small size, light weight and conformal to devices and body shape. For these requirements and demands, many wearable antennas have been reported to get the aforementioned issues. A flexible and compact AMC based antenna for telemedicine applications is proposed for Wireless Body Area Network (WBAN) and telemedicine applications operating at 2.45 GHz [6]. A compact polyimide based antenna for flexible displays has been introduced [7]. A wearable circularly polarized antenna for personal satellite communication and navigation has been reported [8].

III. PROPOSED ANTENNA STRUCTURE AND SIMULATED RESULT

Medical devices can communicate wirelessly with an external device. Designing an antenna for medical devices is very critical. Size of antenna must be very small. Many research works is going on around the globe on the size reduction of the antenna at the ISM frequency band. Most of the available structures are complex (like spiral, helical, rectangular spiral, and fractal) and inherently very difficult to design and implement. Complex mathematical calculations are involved in analysing these structures. In this paper a H shaped microstrip rectangular patch antenna has been proposed. The structure has been simulated in HFSS. The substrate material used is Roger having dielectric constant of 10.2, with a substrate height of 1.6mm. In the proposed antenna ground plane used is $37.9\times47.6mm^2$ and the patch dimension is $28.3\times44mm^2$. The simulation result shows that the antenna covers ISM band of center frequency of 2.45 GHz.

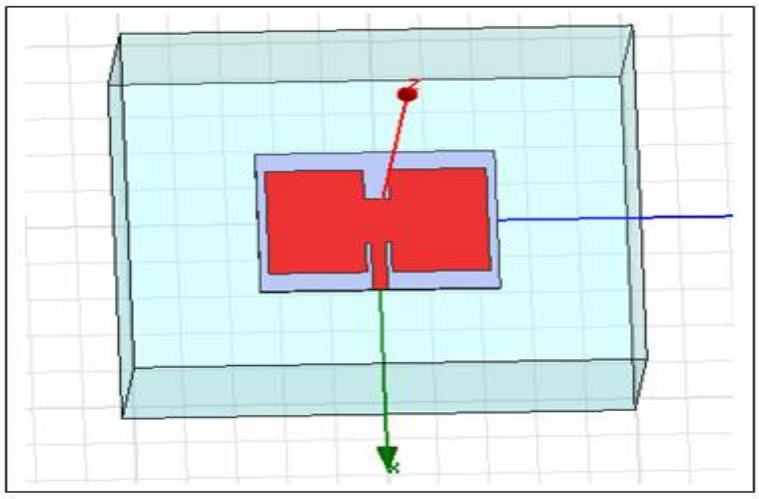

Fig1. Proposed H-shaped Microstrip patch antenna

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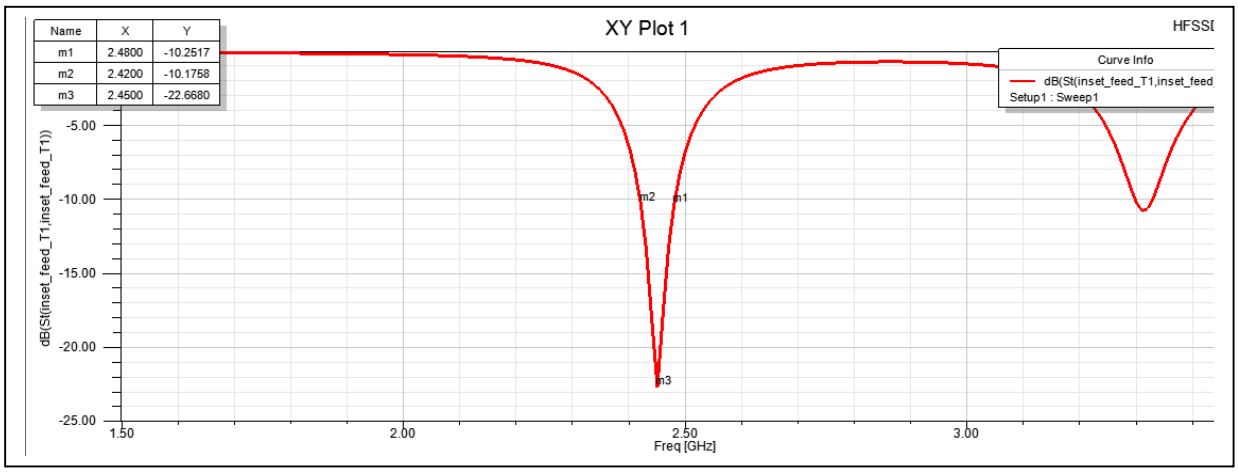

Fig2. The S parameter display

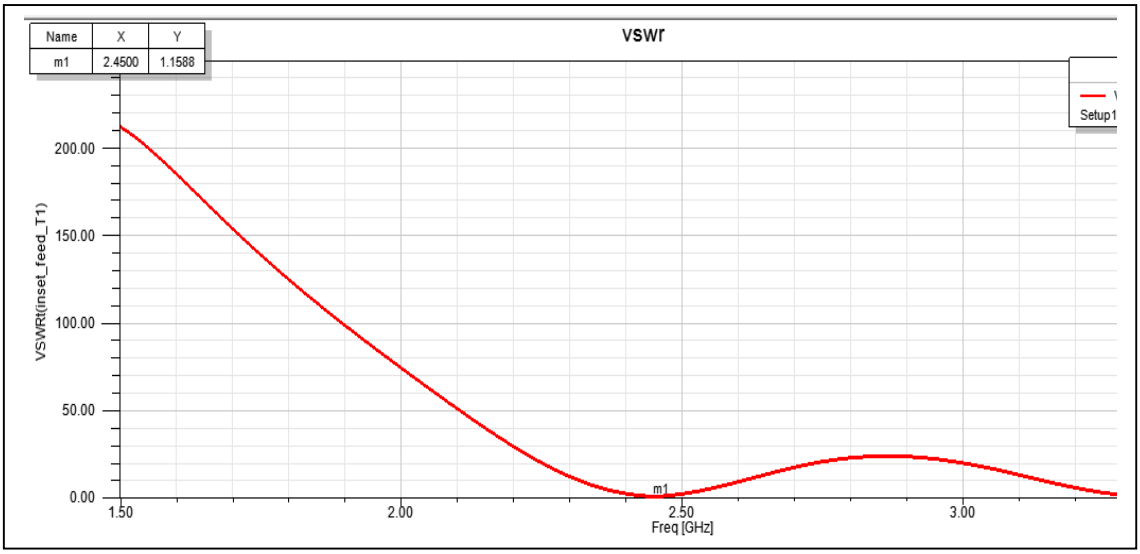

Fig. 3 VSWR Display

IV.CONCLUSION

Microstrip patch antenna is simple to design and implement due to its sensitivity at high gain but it is difficult to design it in ISM band. However, Microstrip patch antennas give high directivity, high gain and antenna efficiency. This antenna design can be very helpful in the communication system for many applications in fields such as biomedical example- pacemaker. The demand for narrowband antenna is increasing day by day. To meet with these increasing demands, more efficient antennas such as Microstrip patch antennas are required.

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