

Design of Implantable Antenna for Wireless Bio-Medical applications

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ABSTRACT - Presently, the medical technology involving in the reduction of complexity in the medical treatment process. Implantable antenna is a miniature sized antenna and It is low cost. The implantable antenna is a type of an antenna of implantable device that it is put in the human body. We are going to use the software application computer simulation tool (CST). CST is an 3D plot which is used for low and medium frequency range. Implantable antenna can be used in two ways and they are sensor antenna and simple antenna. When an implantable antenna is placed in human body, based on the permittivity of muscles, the radiation pattern of an antenna will be changed, it act as an sensor antenna and the permittivity varies for each and every person. failure, cancer, diabetes, etc. It is very much useful to diagnose the medical condition of the patient. Implantable antenna can also plays a vital role in Bio medical applications. This paper mainly aims to summarize the recent implantable antenna technologies.

Keywords: Computer Simulation Tool(CST), Industrial, Implantable Antenna, ISM band, Skin Specter.

I. INTRODUCTION

Implantable antenna technology is one of the current biomedical applications. Implantation is being used in both Biotelemetry and Biomedical therapy. The trend of implantation started in the year of 1960's with implantable pace makers and is emerging with improving the size and efficiency of implantable devices. Biomedical applications cover Biotelemetry and also Biomedical therapy. Realization of implantable antennas demands for work in different areas.

Radiation pattern also varies, by comparing the defect person's variation pattern with this standard radiation pattern. This medical device is used to detect the various parameters like

glucose level, temperature, heartrate, and patientsafety. Implantable antennas are mandatory to transfer data from implants to the external world by wirelessly.

It was the easiest communication between doctor and a patient. The implantable device has brought unimaginable success in the entire medical sector, which saved millions of people from life threatening diseases such as congestive cardiac failure, cancer, diabetes, etc. It is very much useful to diagnose the medical condition of the patient. Implantable antenna can also plays a vital role in Bio medical applications. This paper mainly aims to summarize the recent implantable antenna technologies.

This work can be categorized as many types (a) Choosing different antenna configurations which is suitable for lossy media, (b) minimizing the size of antennas and also improving the efficiency, (c) packaging of antennas with a proper insulating layers (d) testing the entire performance to enhance the range of Biomedical applications. This paper gives a review on the work in all the above mentioned area. At the end of 19th century, The Electromagnetic waves started their way in the form biomedical applications. These implanted devices collect the Since the, EM waves are emerging with new challenges in the medical field. EM waves are providing major contributions to Biotelemetry, Biomedical therapy and also diagnosis. Biomedical applications uses Electromagnetic waves require implantation of antennas inside the human body. The implanted device inside the human body is aimed at collecting the patient's entire information and also to send it to the base station through wireless communication. The trend of implantable devices started in the year of 1960's in the form of pacemakers and pills with sensing capability.

The trend of implantable devices is emerging with a new challenges in patient's information and also provide wireless

communication to the base station. The research interest is to enhance the Bio medical applications for monitoring patient.



Fig - 1: An Implantable antenna placed on the human body.

1.2 RELATED WORK

1. Bappaditya Mandal, Laya Joseph, Jaad Ebrahimzadeh, Mauricio D. Perez¹, Debasis Mitra, Robin Augustine: Low Profile Implantable Antenna for Fat Intra-Body Communication Quantum. In this paper, A study has been carried out to show the performance of the inside the human fat layer as a de for the intra body communication system, IEEE 2021.
2. Lukas Berklemann, Dirk Manteuffel: Antenna Parameters for On-Body Communications with Wearable and Implantable Antennas. In this paper, The author developed a method that enables a universal characterization of the on-body radiation characteristics of wearable and implantable antennas, IEEE, 2021.
3. SaifeShuhaib Md. Enan, ArifIstiaque, Md. Azad Hossain: Design and Characterization of Miniaturized Implantable PIFA Antenna for MICS Band Application. In this paper, The objective of this work was to design a miniaturized antenna able to resonate between 402-405 MHz band that has a moderate return loss, IEEE,2021
4. Nabeel Ahmed Malik, Paul Sant, Tahmina

Ajmal, Masood Ur-Rehman: A Compact Size Implantable Antenna for Bio-medical applications. In this paper, the Shorting pin is used to lower the antenna frequency and the superstrate layer is also used for human body tissue safety purposes, IEEE, 2020

5. F. Faisal, M. Zada, A. Ejaz, Y. Amin, S. Ullah, and H. Yoo: A Compact dual band implantable antenna system for medical applications. In this paper, the biotelemetry implantable system is used for scalp, IEEE, 2019

II. ANTENNA DESIGNING

A patch antenna is an antenna that is created by etching a patch of conductive material onto a dielectric surface. The dielectric material is connected to just a ground plane, it serves to support device. Furthermore, feed lines connected through the patch provide excitation to the antenna. It's also known as a Micro strip antenna or printed antenna since it's created using a micro strip technique then manufactured on a printed circuit board. Patch antenna which are typically used for microwave frequency uses at frequency uses at frequency greater than 100MHz.

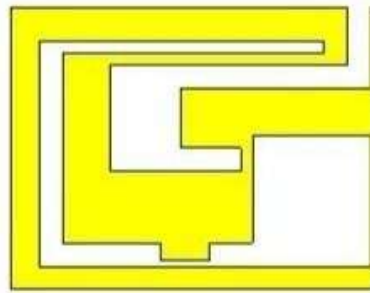


Fig-2: Structure of Implantable Antenna

The material used for ground is copper is a good conducting material, so we are used this method. Substrate and ground has the same dimension. The material used for substrate is FR-4 lossy. It is a electric insulator with high dielectric strength. The matrial used for patch is copper annealed. Patch is also a conducting plane. Then achieve the ISM band is 2.4GHz and also we created slots and loops to give a better antenna design. After that Input is given to the patch. The feeding techniqueis microstrip feeding and it is one of the most popular types of printed antenna. It plays a very significant role in todays world of wireless communication technology. The antenna

is very simpleusing convention fabrication techniques.

III. SIMULATION SETUP

A large number of implanted antennas have been presented the literature. The simulation results give the calculated parameters such as, radiation pattern, and farfield, VSWR. Implanted antennas for Biomedical Application. In this section, antennas are reviewed in term of bandwidth, and size. Inaddition, capsules antennas minimum gain and radiation pattern directionality arereviewed and compared.

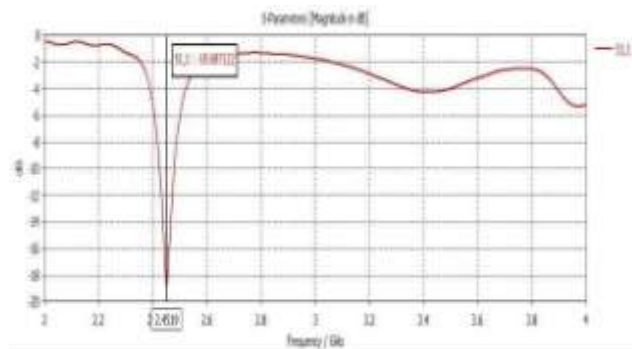


Fig-3: Return Loss for Implantable antenna

The proposed antenna is implanted using cst and thereturn loss -18.68. We have obtain the better results.

VSWR

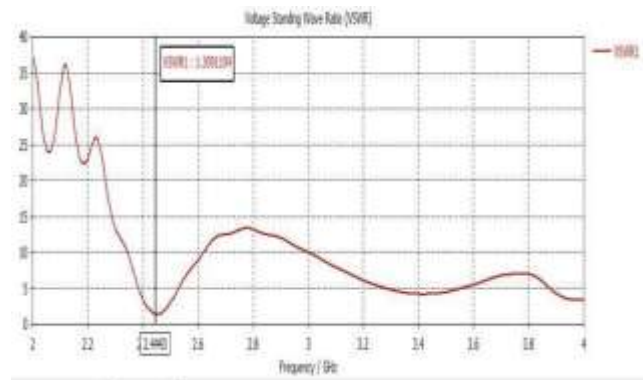


Fig-3.1: VSWR

The VSWR is always a real and positive number for antenna. The smaller the VSWR is, the better the antenna is matched to the transmission line and the more power is delivered to the antenna. In our design we have 1.39.

3.2 RADIATION PATTERN

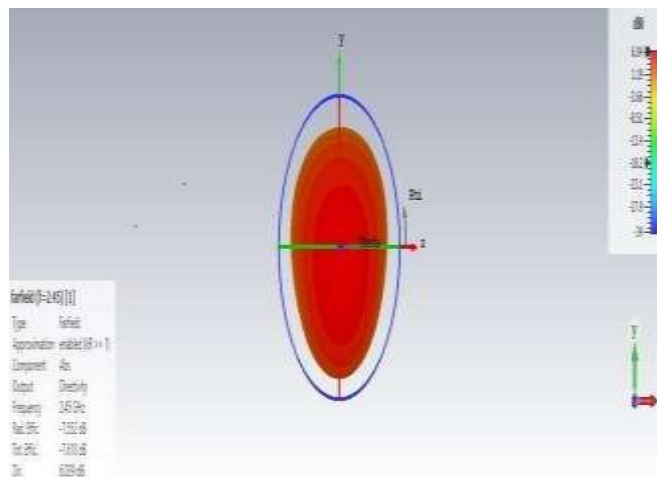


Fig -3.2: Radiation pattern for Implantable antenna
 The material used for ground is copper is a good conducting material, so we are used this method. Substrate and ground has the same dimension. The material used for substrate is FR-4 lossy. It is an electric insulator with high dielectric strength. The material used for patch is copper annealed. Patch is also a conducting plane. Then achieve the ISM band is 2.4GHz and also we created slots and loops to give a better antenna design.

After that Input is given to the patch. The

feeding technique is microstrip feeding and it is one of the most popular types of printed antenna. It plays a very significant role in today's world of wireless communication technology. The antenna is very simple using conventional fabrication techniques.

In this paper, a square patch single band antenna is proposed. In this design, ground and patch formed by rectangular slots, the proposed antenna of via is to tune the resonant frequency. The substrate has a thickness of 1.6 mm.

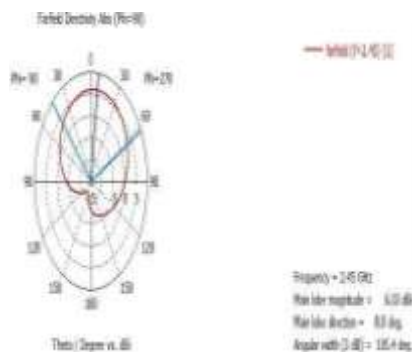


Fig-3.2(ii): Polar Graph

IV. CONCLUSIONS

In this paper, a square patch single band antenna is proposed. In this design, ground and patch formed by rectangular slots, the proposed antenna of via is tune the resonant frequency. The substrate have a thickness of 1.6 mm. The designed antenna has 300MHz Bandwidth with dimension of 30*23*1.6. It operates at Industrial, scientific, Medical (ISM) Band of 2.45GHz and having sufficient gain, Computer Simulation Tool is used to design and simulate the implantable antenna.

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