BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

Avalahalli, Yelahanka, Bengaluru-560064

Department of Electronics and Telecommunication Engineering

Internship Presentation

on

" Industrial Experience on RF Systems and Design of Patch Antenna "

Carried out at

TECHNILAB INSTRUMENT
Innovative Technology

Presented by:

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1BY20ET048

Under the guidance of:

Internal Guide

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Assistant Professor, Dept of ETE,

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External Guide

Mr. J Ravi Kumar

Chief Executive Officer

Technilab Instrument

CONTENTS

ABOUT THE COMPANY

- Technilab Instrument is a supplier of Laboratory Instruments and equipment to Institutions, Research and Development Centers, Engineering colleges, Universities and Government Organizations. Technilab Instrument was incorporated in the year 2004 by J Ravi Kumar.
- Technilab Instrument is a reputed organization having 25 years experience in the field of Electronics, RF and Microwave, Test and Measuring engaged in design, manufacture ,distribute and service provider of Test and Measuring Instruments and RF and microwave components.
- Technilab being a OEM (Original Equipment Manufacturer) offers high quality products and reputable service. Their products are used widely in academic institutions and universities , commercial, industrial, cellular wireless, aerospace, satellite, Broadband, RFID, test instrumentation and military applications

OBJECTIVES

- To understand the fundamental concepts of microwave engineering
- To gain hands-on experience in the design of Patch Antenna using HFSS tool
- To obtain industrial exposure through participation in the soldering of PCB boards and experimental testing of antennas

WEEKLY OVERVIEW

Date	Topic
11/08/2023 – 17/08/2023	Introduction to Microwave Signal Source
18/08/2023 – 24/08/2023	Introduction to High Frequency Electromagnetic Simulation Tool & Design of Patch Antenna
25/08/2023 – 31/08/2023	Understanding Types of Antenna & Experimental Testing of Antennas
01/09/2023 – 07/09/2023	Learning of Soldering Techniques
8/09/2023 – 11/09/2023	Understanding types of cables and connectors related to microwave engineering

TASKS PERFORMED

1.Design of Patch Antenna

1.Antenna Design

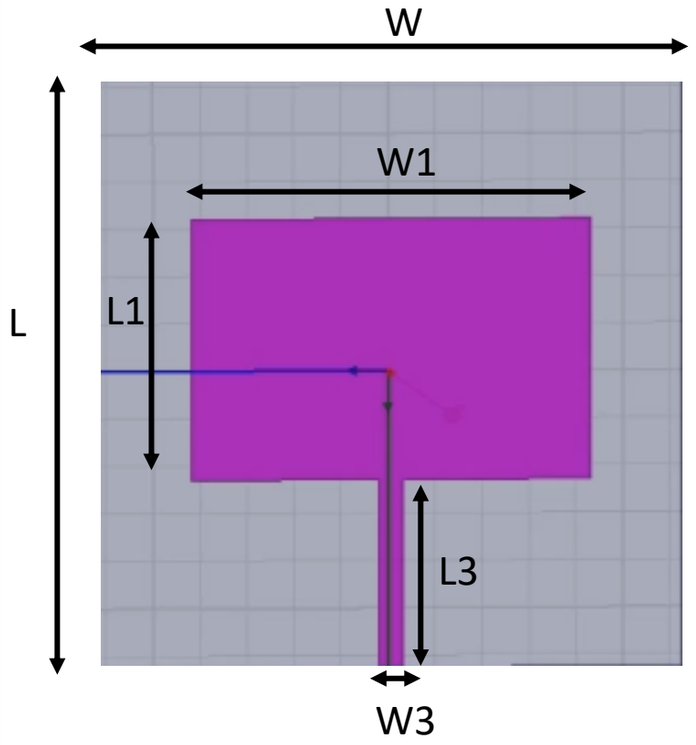

Figure 1 Antenna Front View

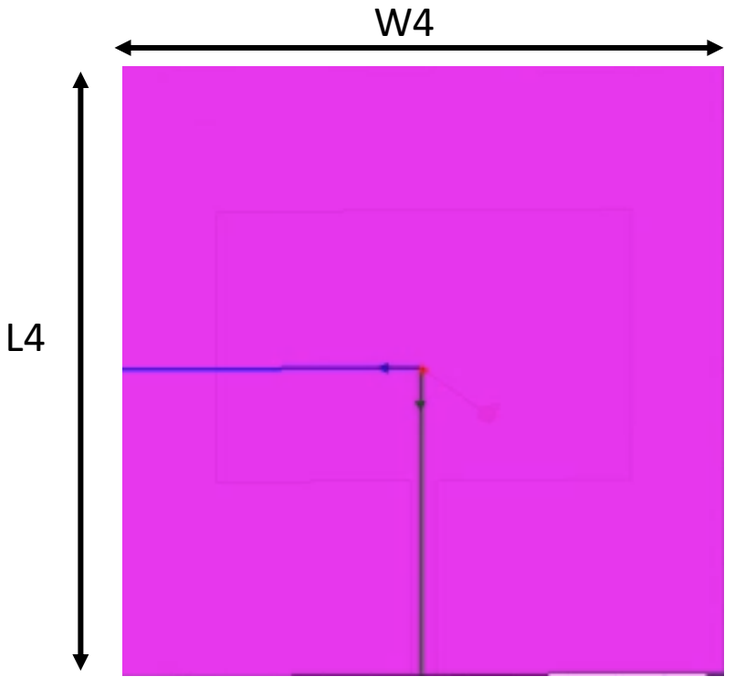

Figure 2 Antenna Back View

	Size in mm
Substrate	L=25, W=25
Patch	L1= 16, W1=28
Feed	L3= 11, W3=2
Ground	L4=25, W4=25

Table 1 Antenna Measurements

RESULTS

2.Antenna Results

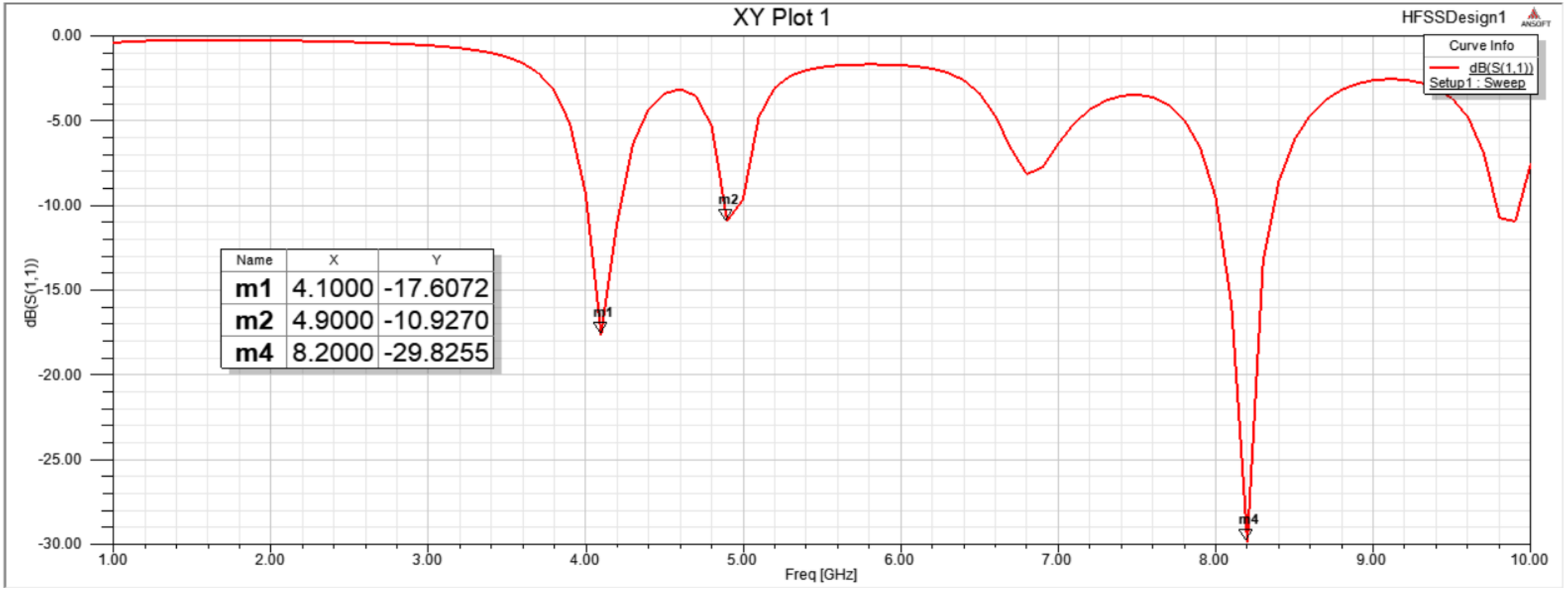

Figure 3 S11 parameter

RESULTS

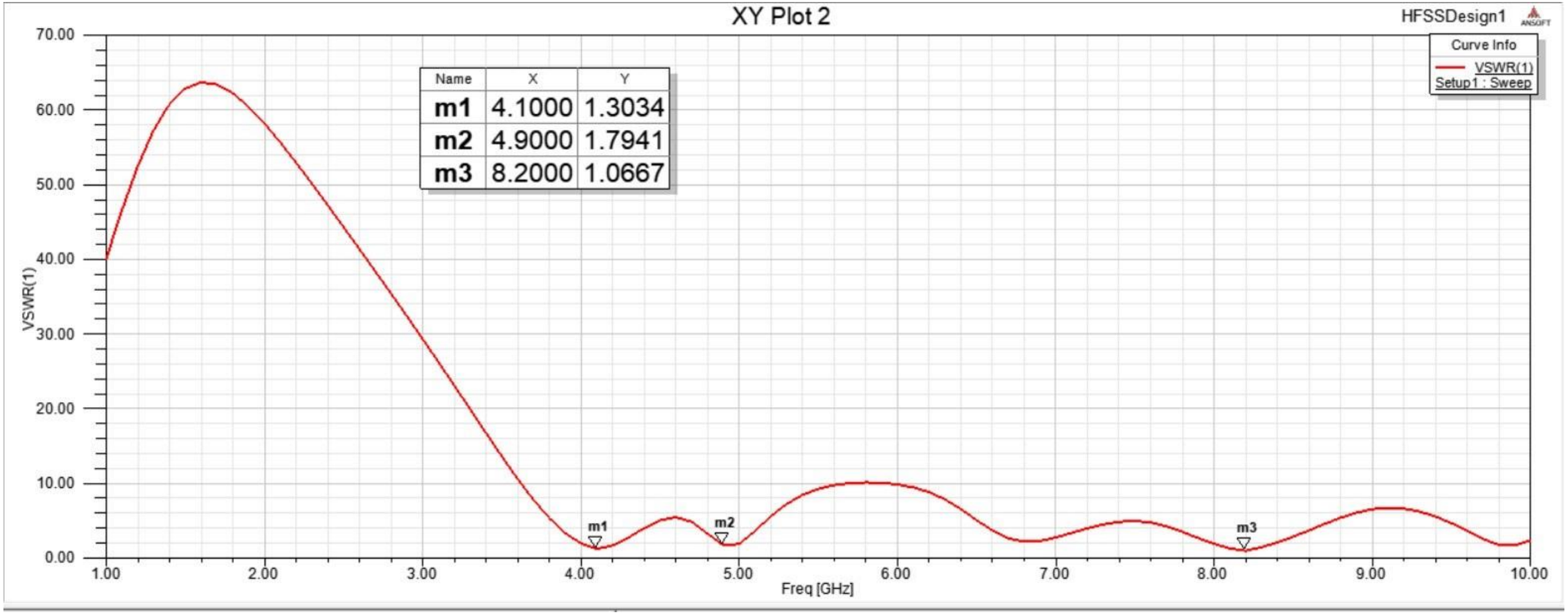

Figure 4 VSWR Graph

RESULTS

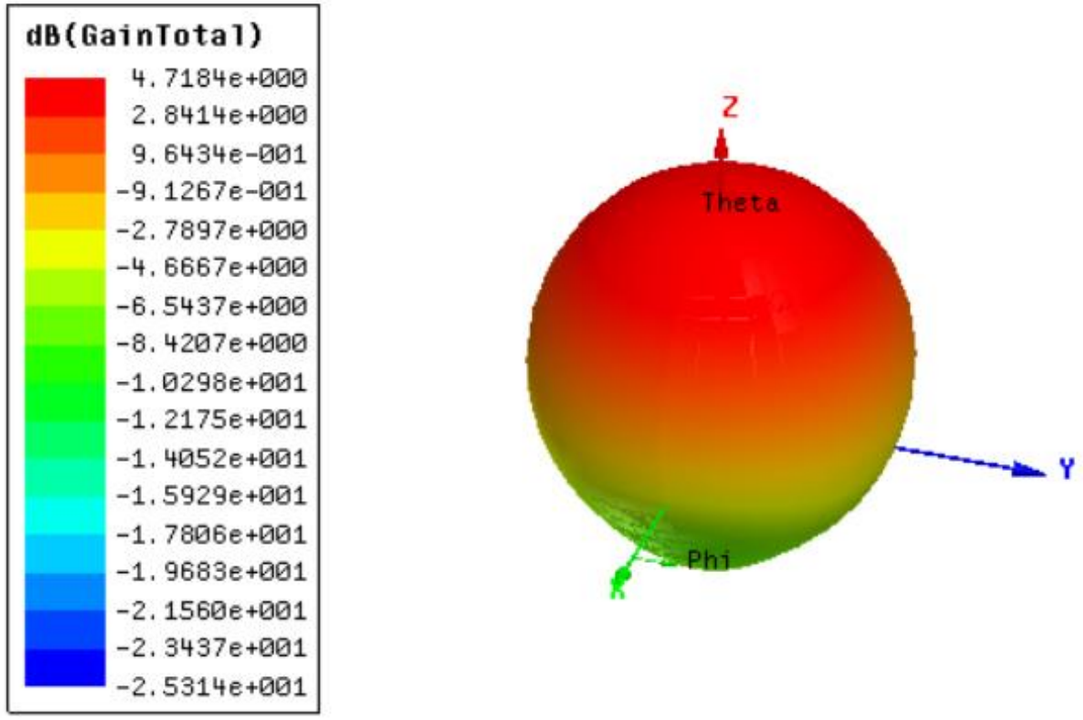

Figure 5 Gain Plot For 4.1 GHz Frequency

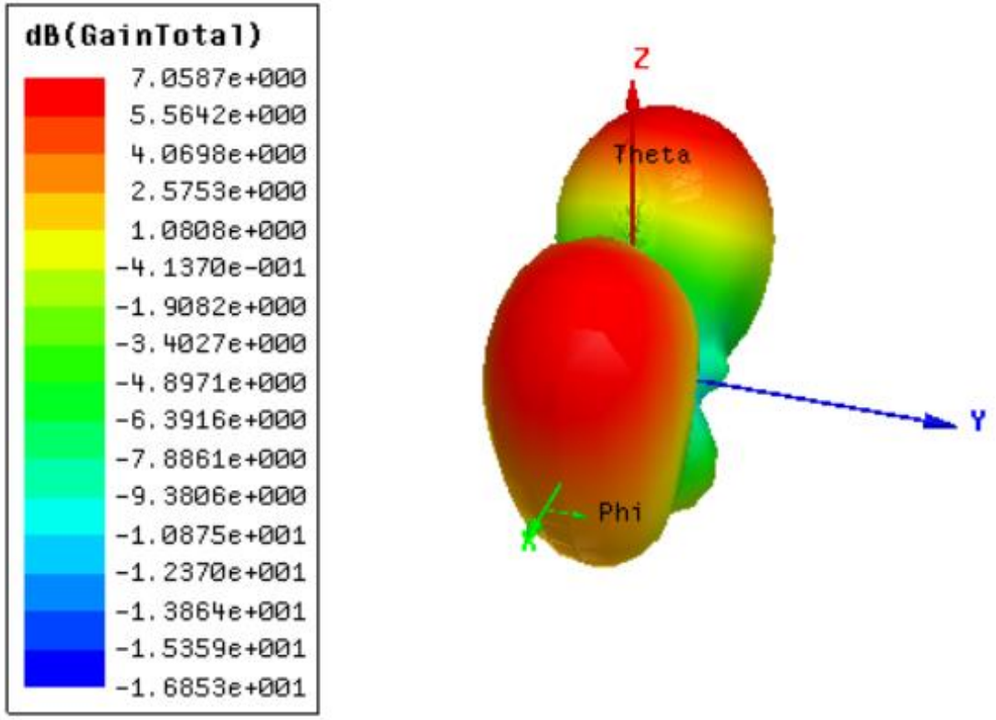

Figure 6 Gain Plot For 8.2 GHz Frequency

RESULTS

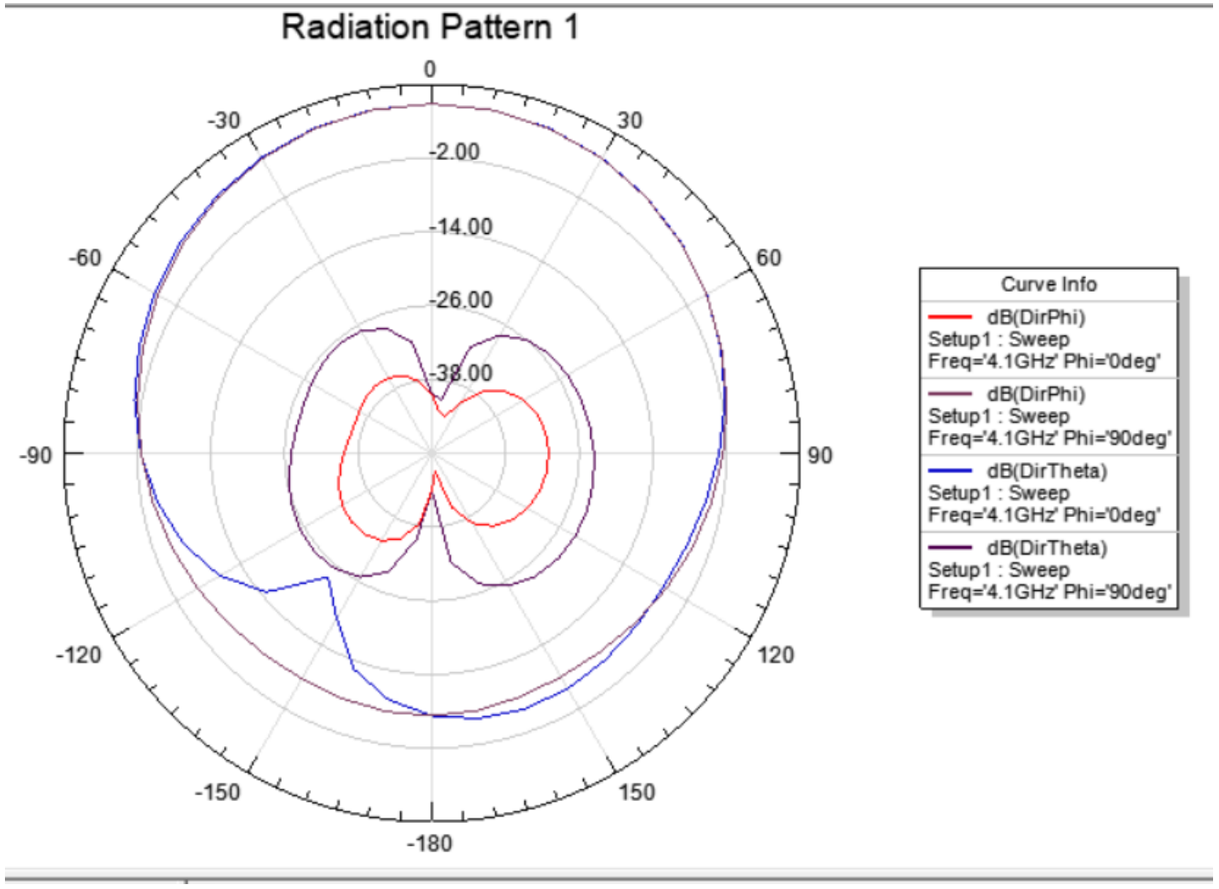

Figure 7 Radiation Pattern For 4.1 GHz Frequency

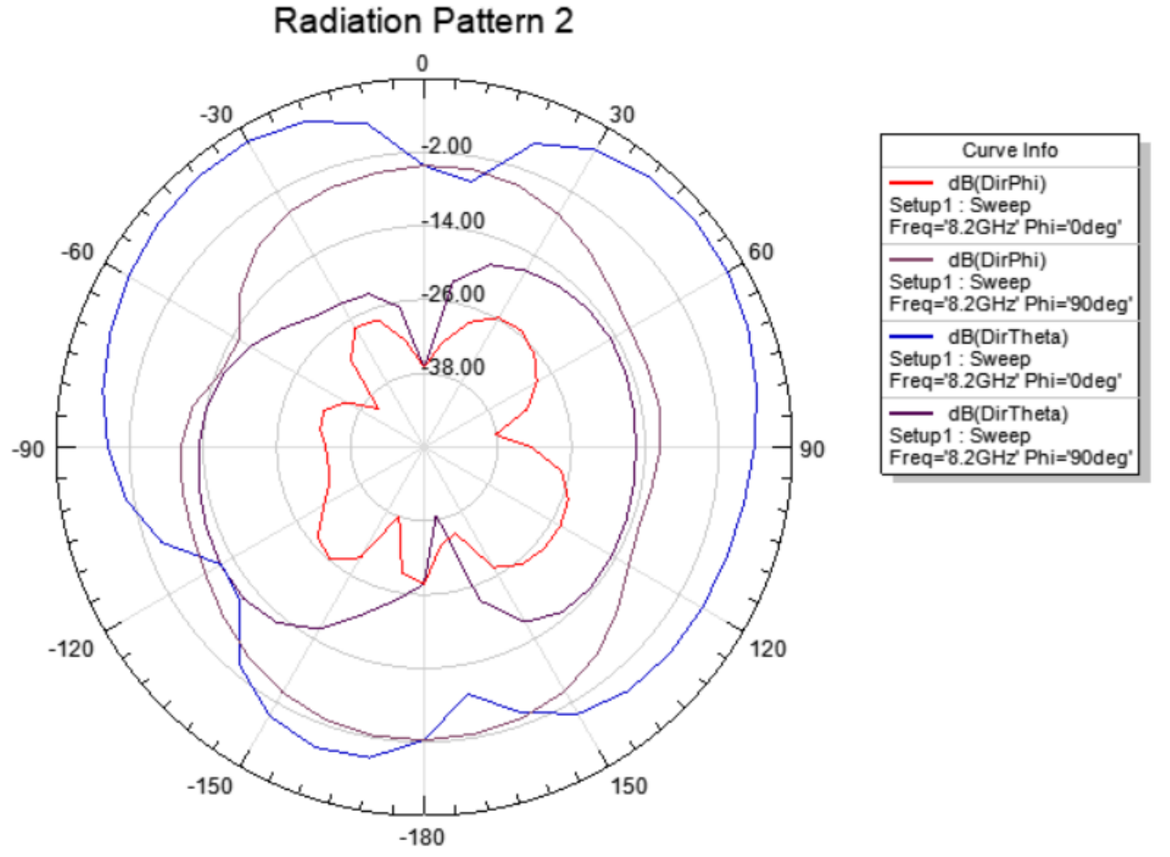

Figure 8 Radiation Pattern For 8.2GHz Frequency

TASKS PERFORMED

2. Soldering

- Soldering is a process used for joining metal parts to form a mechanical or electrical bond.
- It typically uses a low melting point metal alloy (solder) which is melted and applied to the metal parts to be joined and this bonds to the metal parts and forms a connection when the solder solidifies.

There are two types of components to be assembled on the PCB:

1. Through-Hole Components
    - The leads of the component are passed through holes in the PCB and then soldered to a “pad” on the reverse side of the PCB.
    - Soldering is accomplished by heating the component lead and PCB pad with a soldering iron and melting solder wire into the joint.
    - Examples of these components are resistors, capacitors, inductors, crystal oscillators, diodes.

TASKS PERFORMED

2. Soldering

. 2. Surface Mount Components

- For surface mount construction the component's pads are on the same side of the PCB as the component and the component connections sit onto these pads.
- Soldering is accomplished by applying solder paste onto component pads on the PCB, placing the component onto the paste and then heating the entire assembly to melt the solder.

Figure 9 Surface Mount

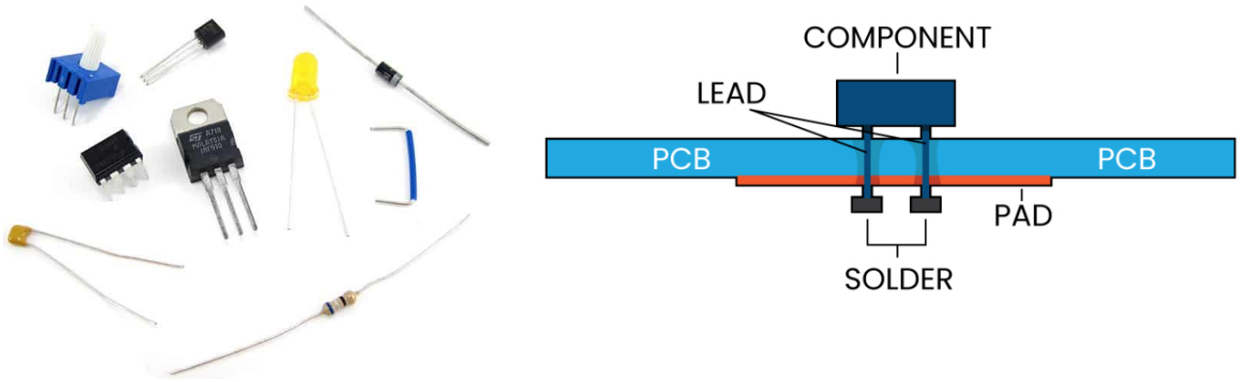

Figure 10 Through Hole

TECHNICAL CONCEPTS LEARNT

TYPES OF ANTENNAS

1. Wire Antennas

- A wire antenna is a type of radio antenna that includes a long wire suspended over the ground.
- The wire in the antenna picks up the signals & radiates them further.
- The wire is simply connected to the transmitter or the receiver through the tuner of an antenna to transmit or receive the signals.

Figure 11 Dipole Antenna

2. Aperture Antennas

- An antenna including an aperture at the ending is known as an aperture antenna.
- Antenna aperture is the area around an antenna where power can be derived from electromagnetic field effects.

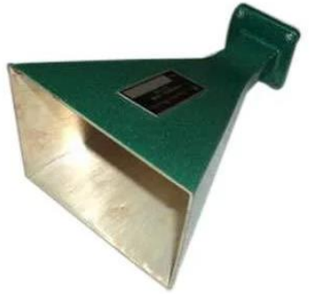

Figure 12 Horn Antenna

TECHNICAL CONCEPTS LEARNT

TYPES OF ANTENNAS

3. Microstrip Antennas

- An antenna that is shaped by simply etching out a piece of conductive material above a dielectric surface is called a microstrip antenna or a patch antenna.
- On the ground plane of this microstrip antenna, the dielectric material is mounted, where this plane supports the entire structure.
- In addition, the excitation to this antenna can be provided with feed lines that are connected to the patch.

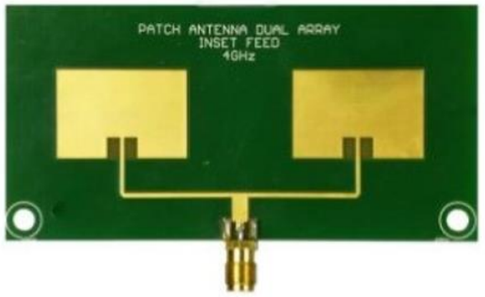

Figure 13 Microstrip Patch Antenna

4. Reflector Antennas

- An antenna that is designed for reflecting the incident electromagnetic signals originating from a separate source.
- This antenna is mainly designed to function at high microwave frequencies.
- It is most popular within spacecraft antenna systems due to its lightweight & simple structure.

Figure14 Parabolic Reflector Antenna

TECHNICAL CONCEPTS LEARNT

TYPES OF ANTENNAS

5. Array Antennas

- An antenna array definition is a group of antennas that are arranged to form a single antenna to generate radiation patterns but not generated by individual antennas.
- So, a set of antennas will work together to transmit or receive radio signals.
- The designing and maintenance of this antenna is cost-effective as every antenna is smaller. For the antenna array, proper spacing & phase must be given while configuring.
- Although, a single antenna transmits with a good directivity, it fails to transmit a signal from transmitter to receiver without losses.

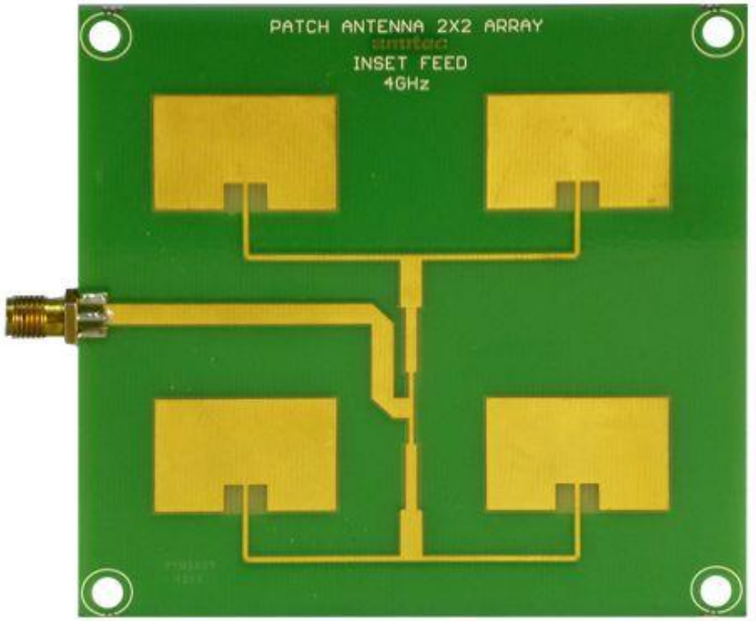

Figure 15 Array Antenna

LEARNING OUTCOMES

1. Acquired knowledge regarding the fundamentals of microwave Engineering.
2. Learned the usage of High Frequency Electromagnetic Simulation Tool.
3. Designed a Patch Antenna using this tool.
4. Gained an understanding of the different types of antennas and their uses.
5. Gained practical skills to solder components on a PCB.

INTERNSHIP CERTIFICATE

Technilab Instrument
Innovative Technology

TO WHOM IT MAY CONCERN

Ms. S Varsha

Has completed the

Internship on Design Micro-Strip Patch Antennas and Industrial Experience on Microwave System

From 11/08/2023-11/09/2023

The internship program was held under the auspices of Technilab instruments, Bengaluru, India.

The 4 Week duration internship covered the fundamental concepts of Microwave Signal Source, RF Power Meters, its applications, basics of RF/Microwave. The program included hands on experience on assembling antenna Turntable, RF Power Meter, Klystron Power Supply (KPS) and VCO Boards and High Frequency Electromagnetic Simulation Tool, testing and working of antenna.

The internship also provided the use of software skills & tools required as per industry standard. The topics covered in this program are transmission lines theory, types of antennas, industrial experience on production of microwave signal source, experimental testing of antennas, types of cables and connectors related to microwave engineering.

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CONCLUSION

The internship at Tehnilab Instrument for the duration of one month has provided practical insights into the microwave field of engineering. Throughout the internship, the tasks assigned enhanced my skills and knowledge related to the microwave field. Through a comprehensive exploration of microwave engineering, a solid foundation in its fundamentals has been acquired.

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THANK YOU!