Experiment No. – 3

Aim- Design and Simulate Power Divider

Software Required- CST Studio

Theory

A power divider in milli-meterwave (mm-Wave) technology is a passive microwave component used to split an input signal into multiple output signals with equal or predetermined power ratios. These devices are commonly used in mm-Wave and high-frequency applications, such as radar systems, wireless communication, and various types of sensors. The key characteristics and considerations for power dividers in mm-Wave technology are as follows:

Frequency Range: Power dividers designed for mm-Wave applications typically operate in frequency ranges above 30 GHz, with some applications extending into the terahertz (THz) range. They are designed to handle the high-frequency signals used in these systems.

Miniaturization: Due to the high operating frequencies, mm-Wave power dividers are often compact and must be designed with tight tolerances to ensure proper signal splitting and minimal loss. Miniaturization techniques, such as planar transmission line structures and microstrip technology, are commonly employed.
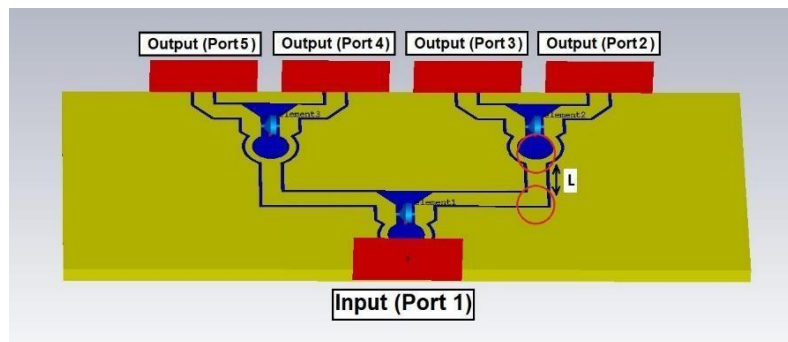
Types of Dividers

Wilkinson Power Divider: This is a commonly used power divider design that provides equal power splitting and isolation between output ports. It consists of resistors and quarter-wave transmission lines

T-Junction Power Divider: This type of divider uses a T-shaped junction to split the signal into two equal parts. It is relatively simple and cost effective
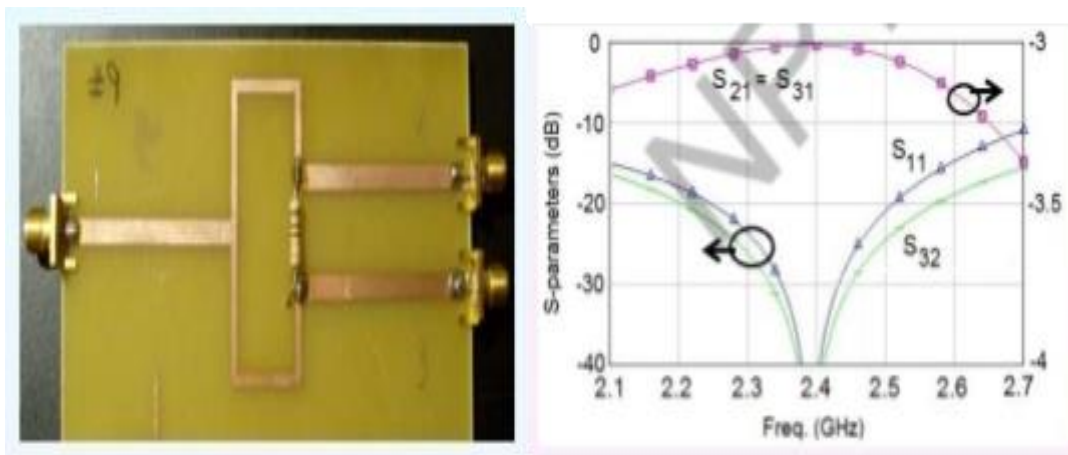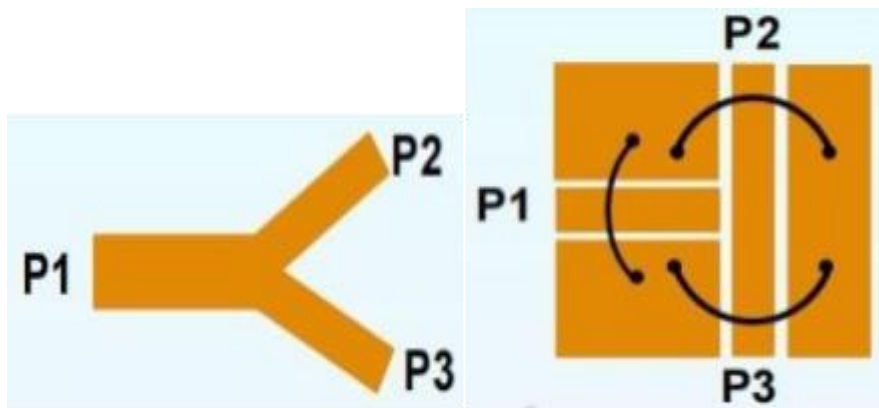
.
Procedure

Designing a Power Divider using CST Microwave Studio (CST MWS) involves several

steps. Below is a general procedure for designing Power Divider, along with measurements you can perform in CST:

Step 1: Define Specifications

Determine the operating frequency (f0) is 2 GHz of the Power Divider .

Design Substrate taking material, Rogger 5870(Lossy).

Design Ground with Copper(annealed) Material.

Choose the size and shape of the cylindrical DRA.

Calculate Z0 for Feeding

Design Feed by calculate Line Impedance.

Design four bricks (Q1, Q2, Q3, Q4, Q5 & Q6).

Add All (Q1,Q2, Q3, Q4, Q5 & Q6) by Boolean Algebra.

Step 2: Initial Design

Create a new project in CST MWS.

Choose the Time Domain solver and set up the simulation environment.

Start with an initial design of the Power Divider based on given specifications.

After Completion of Design.

Pick face - Select macros solver, where we use port.

For Selection of Port, First calculate port Extension Coefficient.

Step 3: Simulation and Optimization

Simulate the initial design to obtain the antenna's radiation pattern, impedance matching, and other relevant characteristics.

Use the optimization tools in CST to fine-tune the Power Divider parameters (e.g., size, shape) to meet your specifications.

Iterate the optimization process until the desired performance is achieved.

Measurements

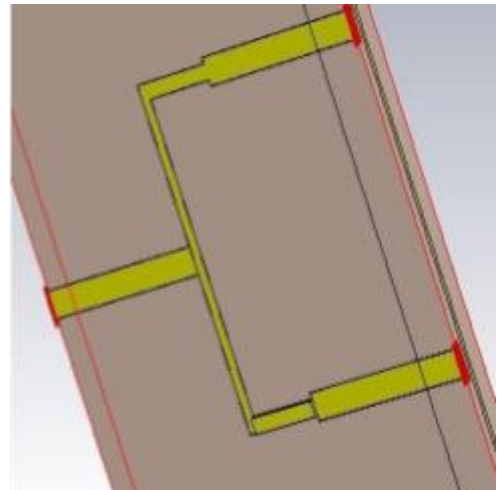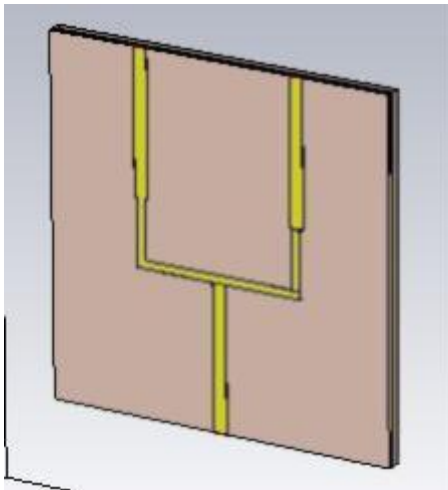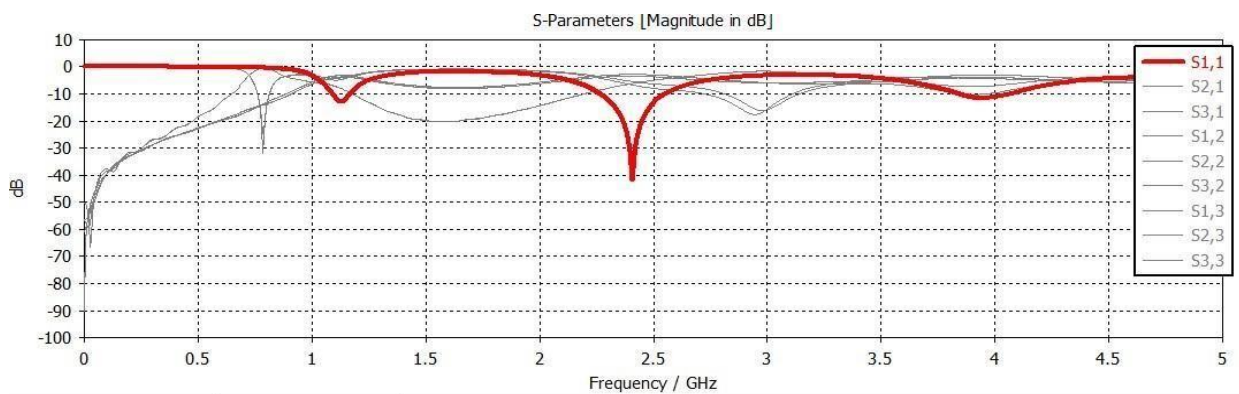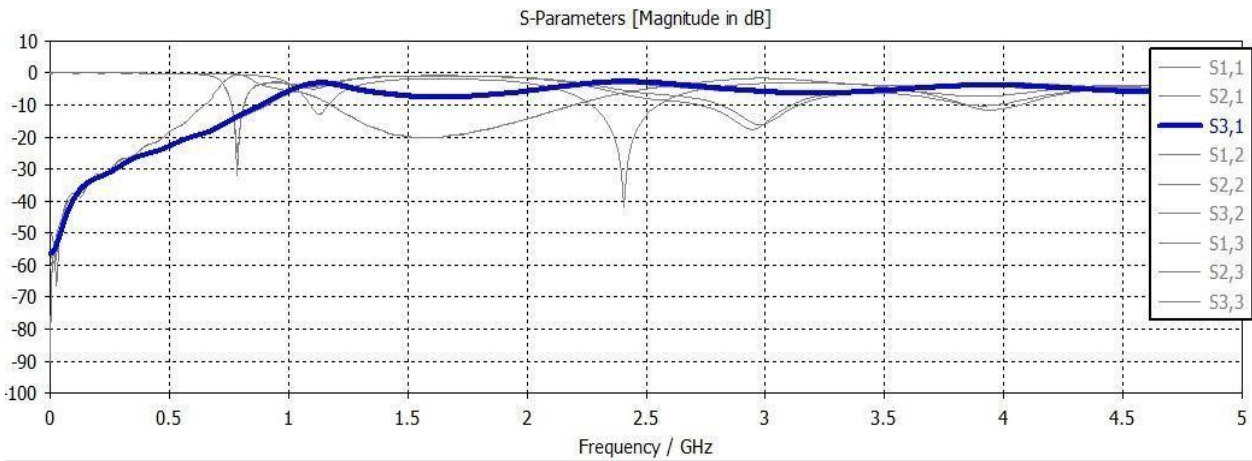| parameters	values
substrate	Width : 60mm Length :60mm Height :0.787mm
Ground	Width :60mm Length :60mm Height :0.035mm
Feed	Width :2.35mm Length :60mm Height :0.035mm

Design & Dimensions

Fig - power-divider   Fig- ports (1,2,3)

S-Parameters [Magnitude in dB]

S-Parameters [Magnitude in dB]
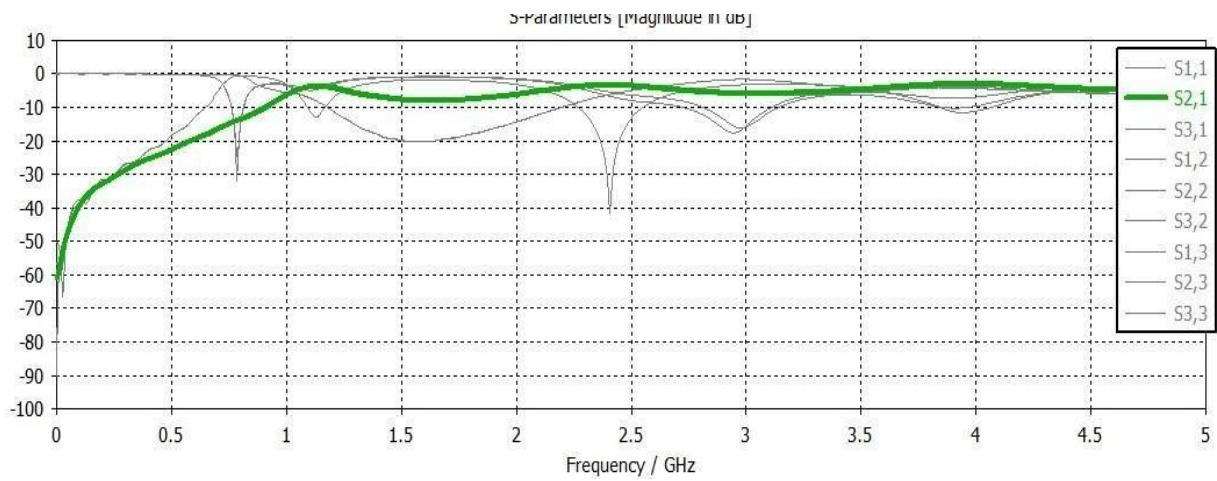
Conclusion

This Power Divider is Design and Simulate and Graph Shown that the power is equally transmitted to both Port as shown in S parameter S12 and S13 having Same Pattern that means Port 2 and port 3 receive the same signal