

Experiment No 2: H-Plane Structure Using HFSS

Aim

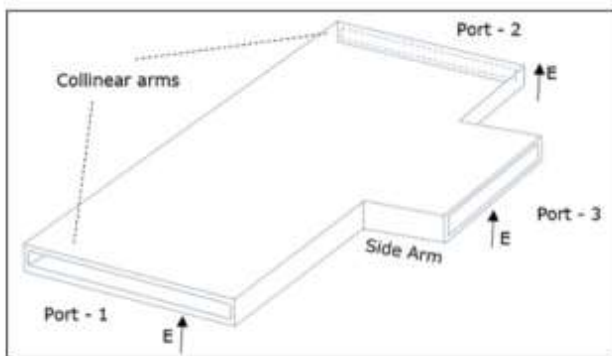
To design and model an H-plane structure using ANSYS HFSS by creating and modifying 3D geometry

Software Required

ANSYS Electronics Desktop (HFSS)

Theory

An H-plane tee junction is formed by attaching a simply waveguide to a rectangular waveguide which already has two parts. The arms of rectangular waveguide make two parts called collinear parts i.e., part1 and part2 while the new part is called as side arm or H-arm. This H-plane tee is also called Shunt tee. As the axis of the side arm is parallel to the magnetic field, this function is called H-plane tee junction. This is also called as current junction or the magnetic field divide itself into arms.



Procedure

1. Create Base Box

- Open **HFSS** and start a new 3D model.
- Go to **Draw** → **Box** to create a rectangular box.
- Enter the following dimensions:
 - **X-dimension:** 22.86 mm

- **Y-dimension:** 10.16 mm
 - **Z-dimension:** 60 mm
- Specify the position of the box as:
 - **X = -11.43 mm**
 - **Y = -5.08 mm**
 - **Z = 0 mm**
 - Click **OK** to create the box.
 - Press **Ctrl + D** to zoom out and view the model properly.

2. Rotate/Duplicate for H-Plane Structure

- Right-click the created box → **Edit** → **Duplicate** → **Around Axis**
- select Y-axis and set rotation = $+90^\circ$ → Click OK.
- Repeat: Duplicate around Y-axis with -90° → Click OK.

3. Uniting the Model

- Select **all three boxes** created.
- Right-click on the selection.
- Choose **Edit** → **Boolean** → **Unite**

4. Assigning Wave Ports

- Select **one face** at the open end of the plane.
- Right-click on the selected face and choose: **Excitations** → **Wave Port** → **Next**
- In the dialog box, change **Name** if required → click **New Line**.
- Click **New Line** and drag to draw the **integration line**.
- Click **Next** → **Finish**.
- Repeat to assign the second wave port.

5. Assigning Perfect E Boundary

- Select all the faces of the plane except the two end faces.
- Right-click and choose: **Assign Boundary** → **Perfect E** → OK.

6. Creating Solution Setup

- a. Go to **Analysis** → **Add Solution Setup**.
- b. set Solution Frequency = 10 GHz.
- c. Set Maximum Number of Passes = 6 → OK.

7. Adding Frequency Sweep

- a. Go to Analysis → Setup 1 → Add Frequency Sweep.
- b. Start = 5 GHz, Stop = 15 GHz
- c. Click **OK**.
- d. Right-click on **Analysis** and select **Analyze All**.
- e. Save the project. The simulation will now run.

8. Plotting Electric Field Vectors

- a. Select the plane and right-click.
- b. Choose **Plot Fields** → **E** → **Vector E**.
- c. A dialog box appears → click **Done**.

- d. Electric field vectors will be displayed.
- e. Animate the field distribution if required.

9. Plotting Magnetic Field (One Side of Plane)

- a. Select one side of the plane and right-click.
- b. Choose **Plot Fields** → **H** → **Mag H**.
- c. Click **Animate** to observe the magnetic field variation.

10. Plotting Magnetic Field on Remaining Faces

- a. Select all the other faces and right-click.
- b. Choose **Plot Fields** → **H** → **Mag H**.
- c. When the dialog box appears, click **Done**.
- d. Animate if required.

Result

The E-plane structure was successfully created, simulated, and field distributions were observed in HFSS