SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

OPTICAL AND MICROWAVE ENGINEERING

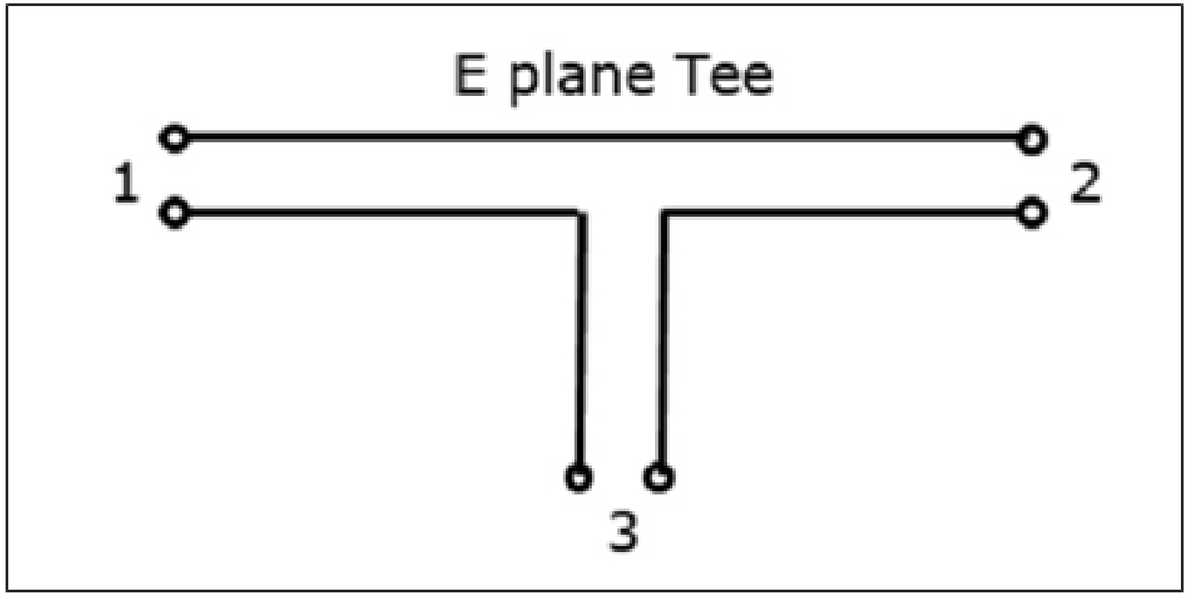
III YEAR/ VI SEMESTER

UNIT 1 – MICROWAVE PASSIVE ELEMENTS

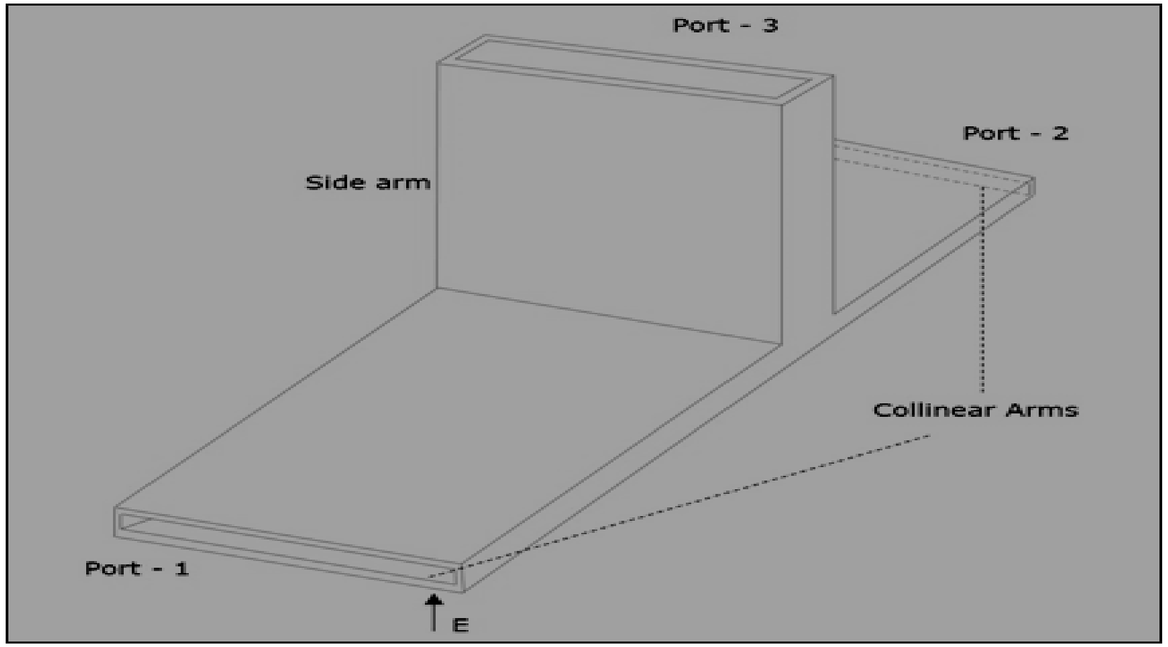
TOPIC– E & H PLANE TEE

E Plane Tee

An E-Plane Tee junction is formed by attaching a simple waveguide to the broader dimension of a rectangular waveguide, which already has two ports.



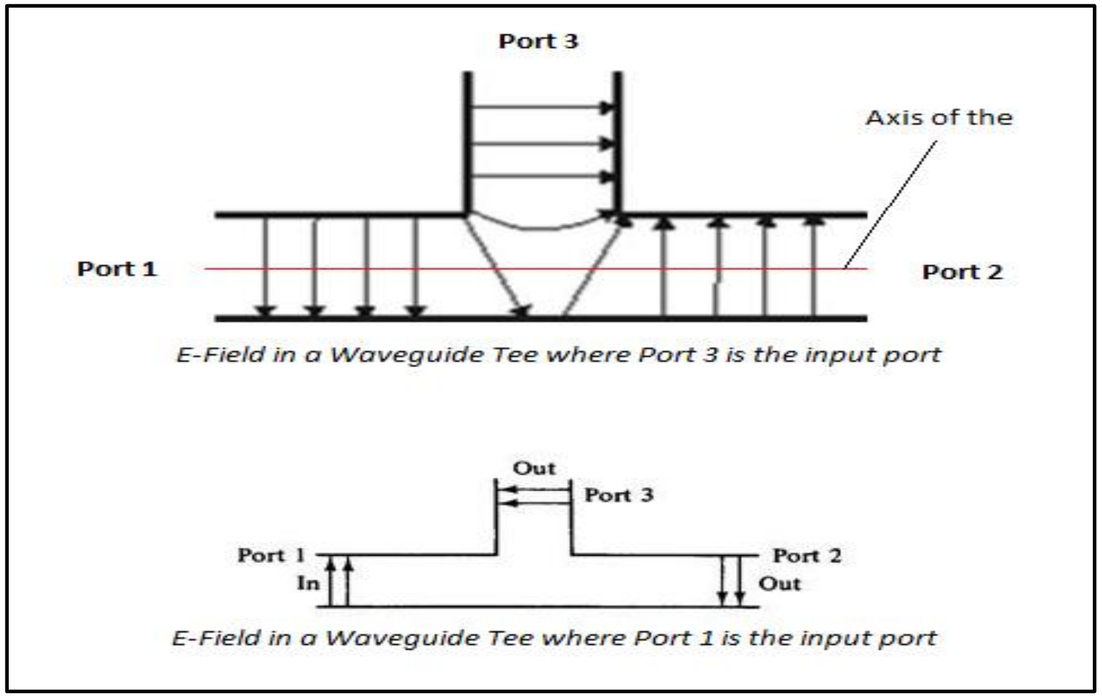
The arms of rectangular waveguides make two ports called collinear ports i.e., Port1 and Port2, while the new one, Port3 is called as Side arm or E-arm. T his E-plane Tee is also called as Series Tee.



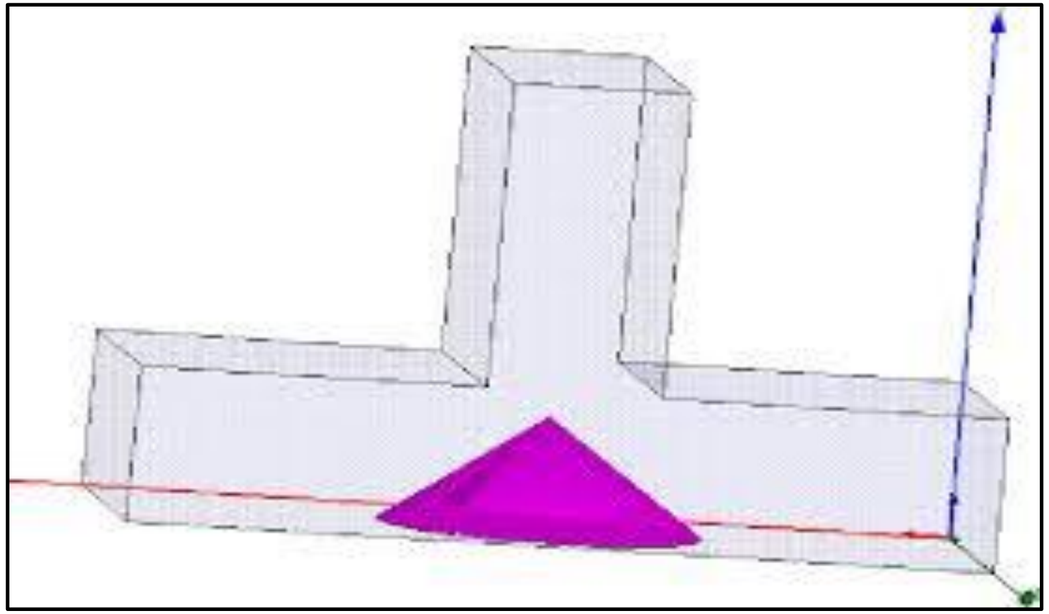
As the axis of the side arm is parallel to the electric field, this junction is called E-Plane Tee junction. This is also called as Voltage or Series junction.

The ports 1 and 2 are 180° out of phase with each other.

A waveguide tee is a 3 port device that is similar to a power divider. When the axis of the side arm is parallel to the Electric Field (E) of the collinear, then the tee is called a E-Plane Tee Junction.

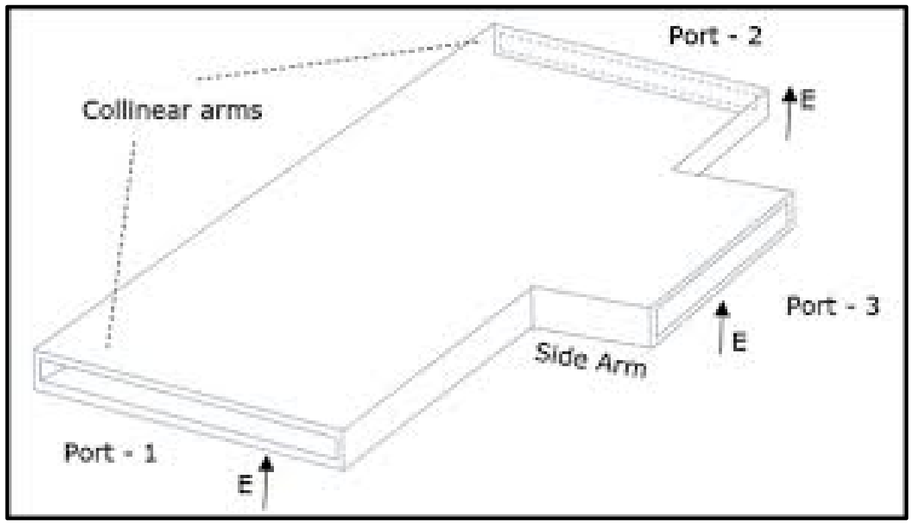


The outputs we get in this type of tee are 180° out of phase with each other, irrespective of from which port the input is fed.
The ports 1 and 2 are 180° out of phase with each other.

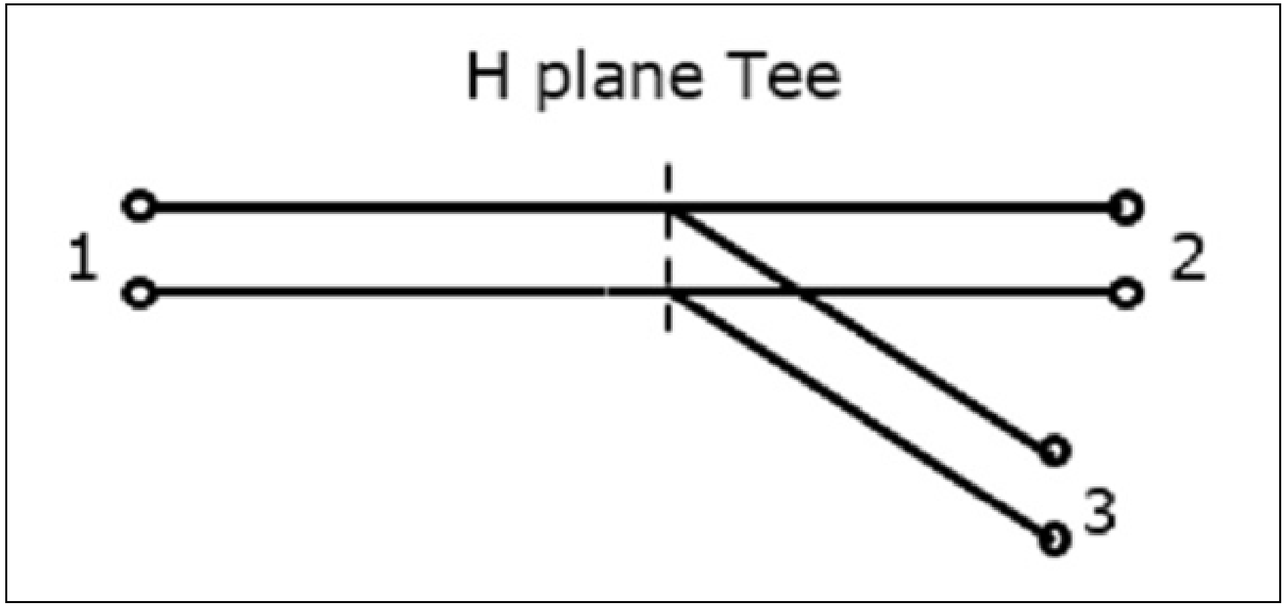


H Plane Tee

An H-Plane Tee junction is formed by attaching a simple waveguide to a rectangular waveguide which already has two ports.

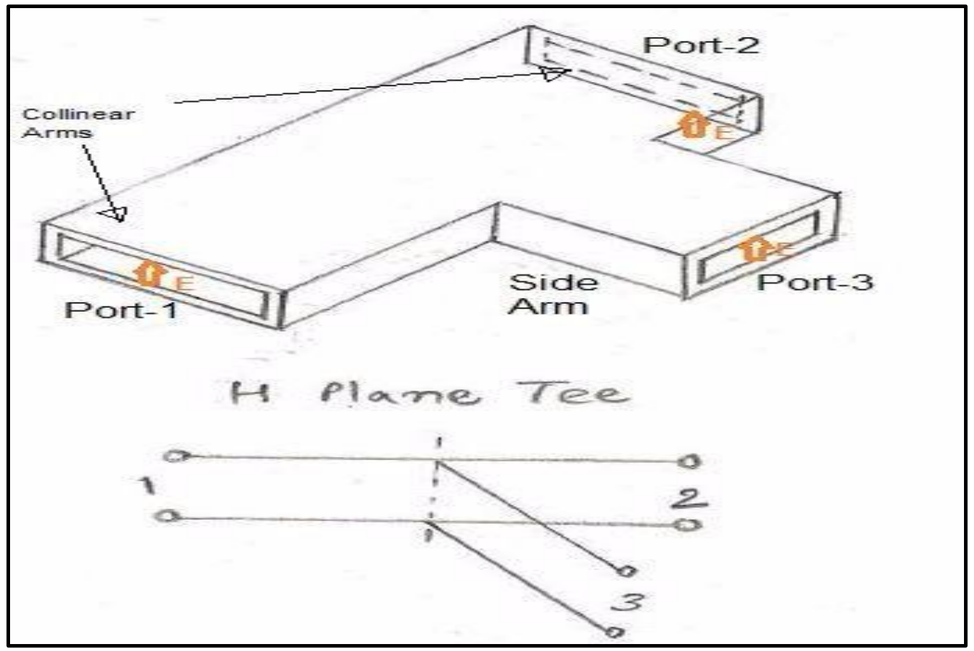


- **The arms of rectangular waveguides make two ports called collinear ports i.e.,**
- **Port1 and Port2, while the new one, Port3 is called as Side arm or H-arm. This H-plane Tee is also called as Shunt Tee**



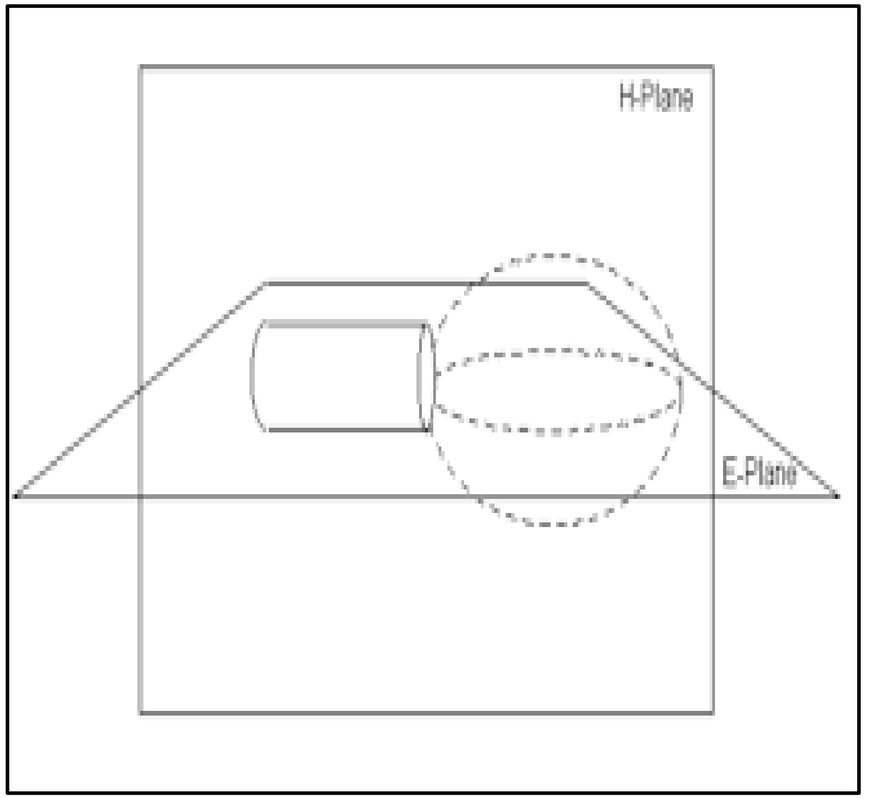
As the axis of the side arm is parallel to the magnetic field, this junction is called H-Plane Tee junction. This is also called as Current junction, as the magnetic field divides itself into arms.

In H plane tee, when two inputs are fed into port-1 and port-2 of the arms(collinear), output at port-3 will be in phase and also additive in nature.

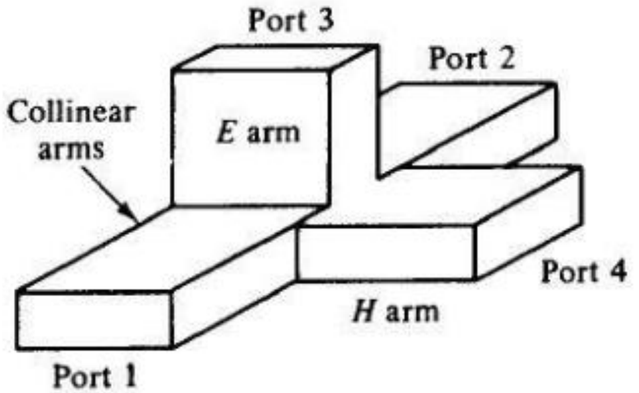


On the other side, if input is fed at port-3, the waves get split equally into port-1 and port-2 with in-phase and will have same magnitude.

These properties of H-plane tee is used in waveguide power combiner and power divider.



MAGIC TEE



Magic Tee (Hybrid Tees)

MAGIC TEE

A **magic tee** (or **magic T** or **hybrid tee**) is a hybrid or 3 dB coupler used in microwave systems. It is an alternative to the rat-race coupler.
In contrast to the rat-race, the three-dimensional structure of the magic tee makes it less readily constructed in planar technologies such as micro strip or strip line.

The magic tee is a combination of E and H plane tees.
Arm 3 forms an H-plane tee with arms 1 and 2.
Arm 4 forms an E-plane tee with arms 1 and 2.
Arms 1 and 2 are sometimes called the *side* or *collinear* arms.
Port 3 is called the *H-plane port*, and is also called the *Σ port*, *sum port* or the *P-port* (for "parallel").
Port 4 is the *E-plane port*, and is also called the *Δ port*, *difference port*, or *S-port* (for "series").
There is no one single established convention regarding the numbering of the ports.
the magic tee must incorporate an internal matching structure.

THANK YOU