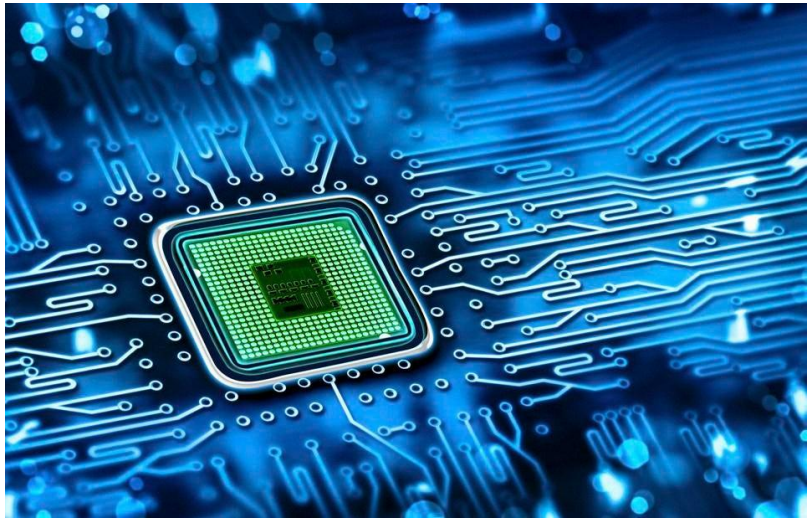
DIRECTIONAL COUPLER



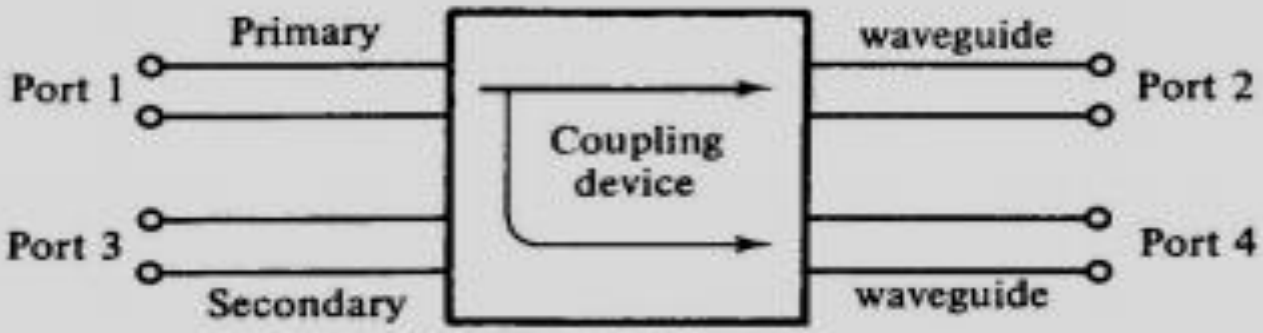
DIRECTIONAL COUPLER

- A directional coupler is a four-port waveguide junction as shown below.
- It Consists of a primary waveguide 1-2 and a secondary waveguide 3-4. When all Ports are terminated in their characteristic impedances, there is free transmission of the waves without reflection, between port 1 and port 2, and there is no transmission of power between port I and port 3 or between port 2 and port 4 because no coupling exists between these two pairs of ports.
- The degree of coupling between port 1 an d port4 and between port 2 and port 3 depends on the structure of the coupler.

DIRECTIONAL COUPLER

- The characteristics of a directional coupler can be expressed in terms of its Coupling factor and its directivity.
- Assuming that the wave is propagating from port to port2 in the primary line, the coupling factor and the directivity are defined ,
- It should be noted that port 2, port 3, and port 4 are terminated in their characteristic impedances. The coupling factor is a measure of the ratio of power levels in the primary and secondary lines. Hence if the coupling factor is known, a fraction of power measured at port 4 may be used to determine the power input at port 1 .

DIRECTIONAL COUPLER



where P1 = power input to port 1

P3 = power output from port 3

P4 = power output from port 4

$$\text{Coupling factor (dB)} = 10 \log_{10} \frac{P_1}{P_4}$$

$$\text{Directivity (dB)} = 10 \log_{10} \frac{P_4}{P_3}$$

DIRECTIONAL COUPLER

The directivity is a measure of how well the forward travelling wave in the primary waveguide couples only to a specific port of the secondary waveguide ideal directional coupler should have infinite directivity.

In other words, the power at port 3 must be zero because port 2 and port A are perfectly matched.

Actually well-designed directional couplers have a directivity of only 30 to 35 .

DIRECTIONAL COUPLER

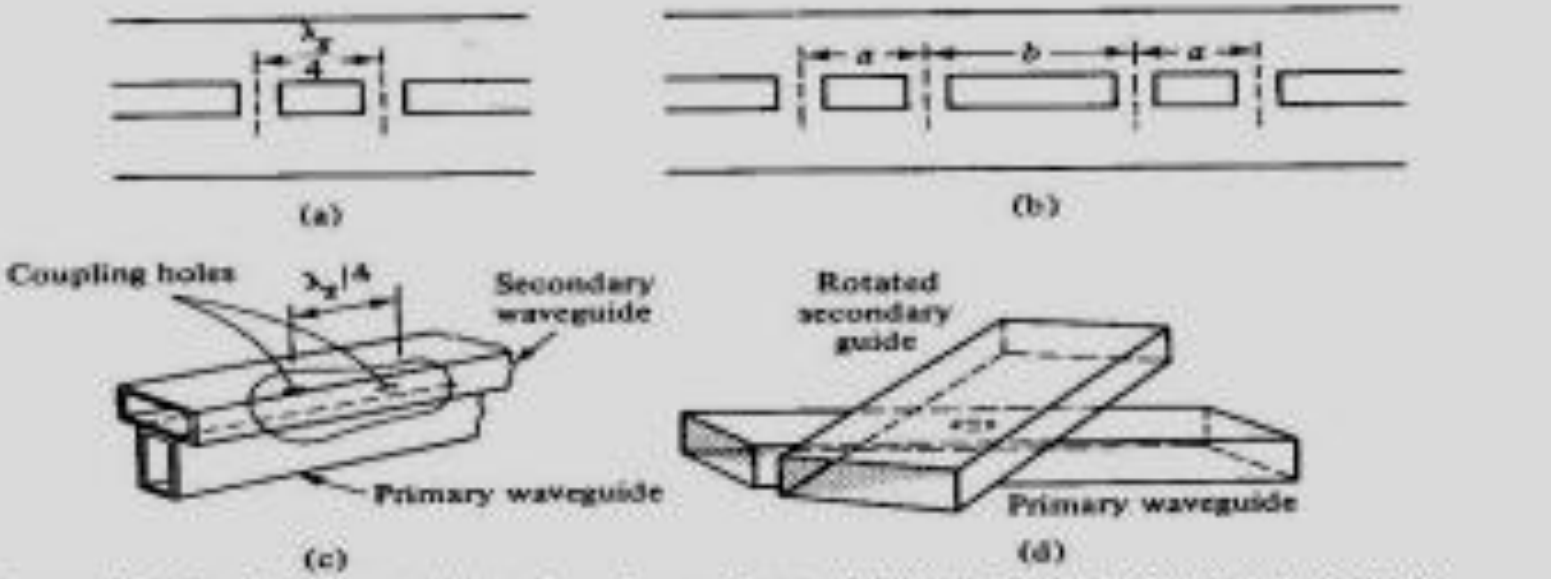


Figure 4-5-2 Different directional couplers. (a) Two-hole directional coupler. (b) Four-hole directional coupler. (c) Schwinger coupler. (d) Bethe-hole directional coupler.


Thank
you