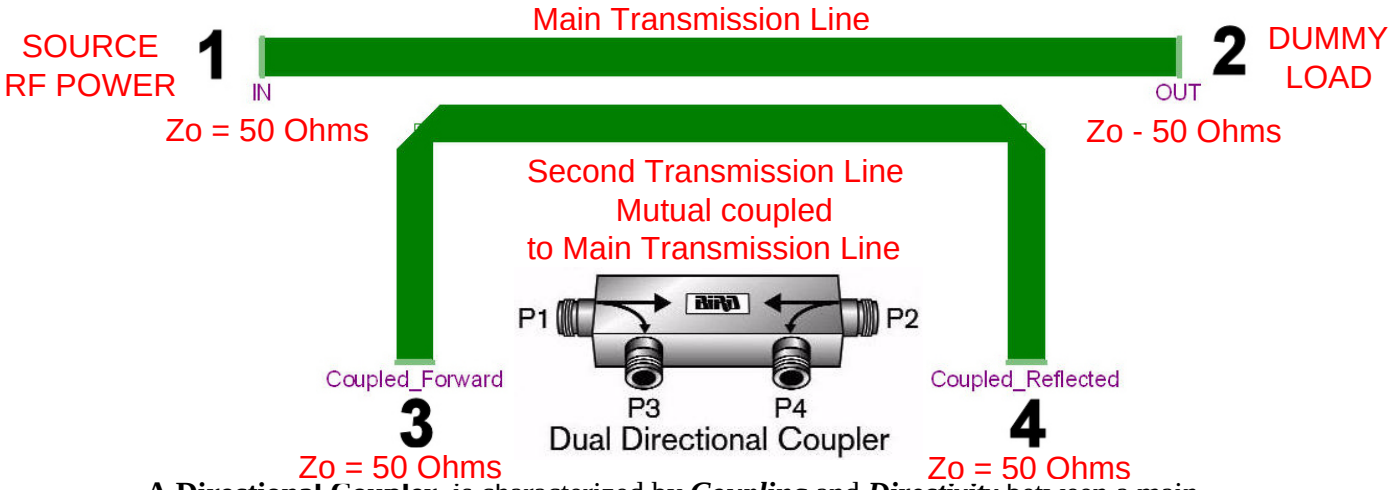
A Directional Coupler



A Directional Coupler, is characterized by ***Coupling*** and ***Directivity*** between a main transmission line (Port 1 to Port 2), and a second transmission line (Port 3 to Port 4), coupled to the main transmission line.

Coupling is the ratio of forward power, going in to Port 1 (RF Source) and coming out Port 2 (Load), to coupled power at Port 3 (Coupled Forward), measured in dB.

- Coupling varies with frequency.

Directivity is a measure of how well the coupler separates the two directions, and is the ratio of power out at Port 3 (Coupled Forward) to power out at Port 4 (Coupled Reflected), when RF Power on the main transmission line is flowing from Port 1 (Source RF), into a perfect termination at Port 2 (Load).

- Leakage from poor directivity limits the return loss (or VSWR) that we can measure. As an example, a directional coupler with only 20 dB of directivity would indicate a return loss of 20 dB, or VSWR = 1.22, for a perfect load.
    - Unwanted coupled power due to low directivity would add to the coupled reflected power.
    - Depending on the phases of the reflected and leakage power, the total could be twice as much as the reflected power.
    - Higher directivity is needed to measure low VSWR accurately.
- Low directivity can also affect power measurements, again at unknown phase, so that measured power varies with VSWR.
    - Leakage from reflected power adds to the coupled forward power, again at unknown phase, so that measured power varies with VSWR.