



Electromagnetics:  
Microwave Engineering

## Radial Stubs



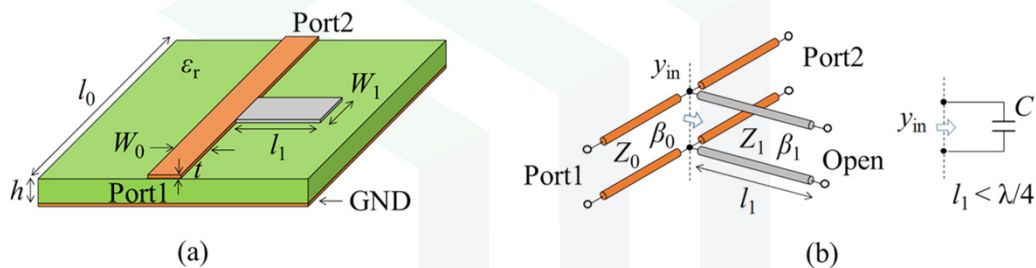
### Outline

- What is a radial stub?

# What is a Radial Stub?

Slide 3

## The Basic Quarter-Wave Stub

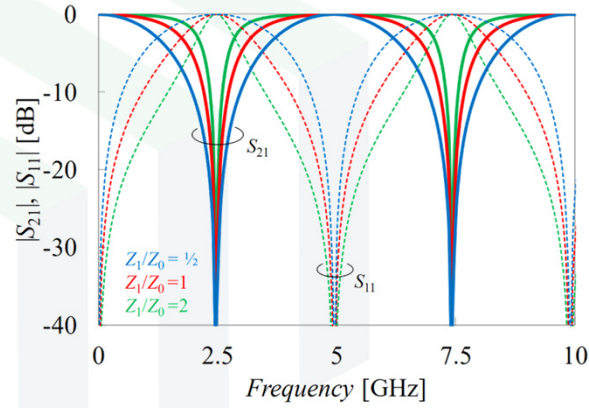


**Figure 1.** (a) Schematic view of a microstrip line (MSL) open-circuited stub. (b) Transmission line equivalent circuit of MSL open-circuited stub, and its input admittance when  $l_1 < \lambda/4$ .

## Frequency Response of the Basic Quarter-Wave Stub

A quarter-wave stub is a bandstop filter in transmission.

It presents an RF short circuit to the frequency corresponding to  $\lambda/4$ .



Kusama, Yusuke, and Ryota Isozaki.  
"Compact and Broadband Microstrip  
Band-Stop Filters with Single Rectangular  
Stubs." *Applied Sciences* 9.2 (2019): 248.

**Figure 2.** Calculated results of transmission coefficients  $|S_{21}|$  and reflection coefficients  $|S_{11}|$  for different characteristic impedance ratios between the stub line and the main transmission line ( $Z_1/Z_0$ ). Three patterns show  $Z_1/Z_0 = 1/2, 1,$  and  $2$ . The stop bandwidth widens if  $Z_1/Z_0$  is smaller. Smaller impedance ratio means that the stub line width  $W_1$  becomes wider.

## The Radial Stub

The basic quarter-wave stub is a bandstop filter in transmission at the frequency corresponding to  $\lambda/4$ .

Bandwidth of the stopband is increased by increasing the width of the stub. However, the RF short is introduced at a poorly defined point (i.e. spread out).

The radial stub increases bandwidth while still introducing the short at a concentrated point.

