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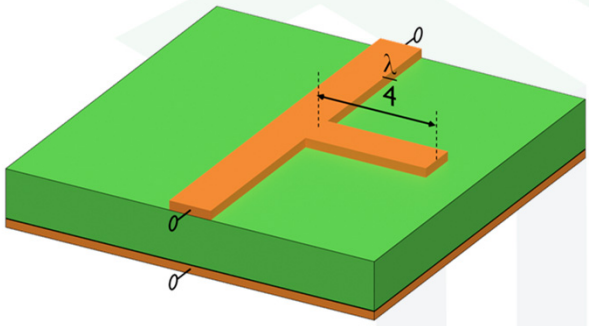
Electromagnetics:
Microwave Engineering

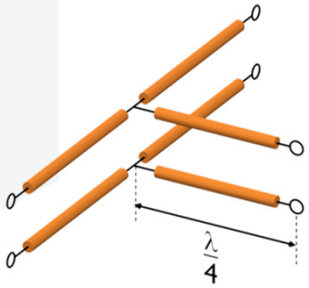
Radial Stubs

Basic Quarter-Wave Stub

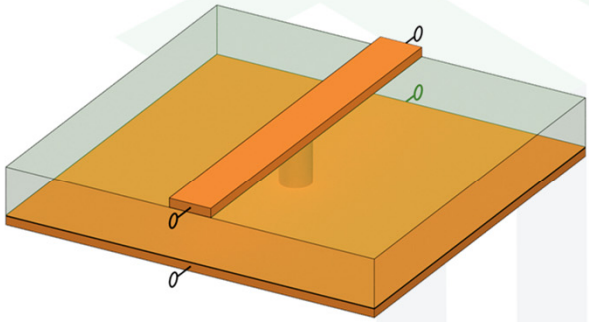


Microstrip circuit with
a quarter-wave stub.

Equivalent circuit with
a quarter-wave stub.

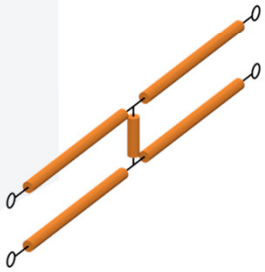


Basic Quarter-Wave Stub



Equivalent microstrip circuit at λ.

Equivalent circuit at λ.



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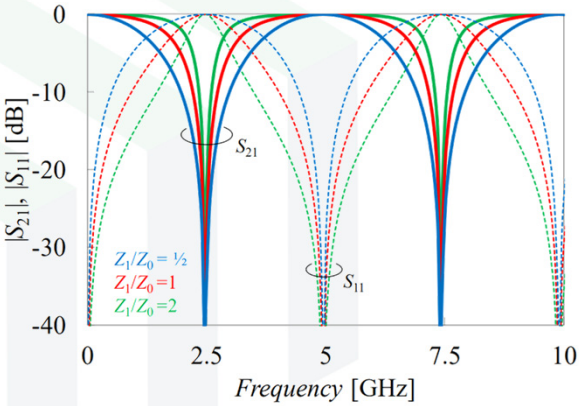
Frequency Response of the Basic Quarter-Wave Stub

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.

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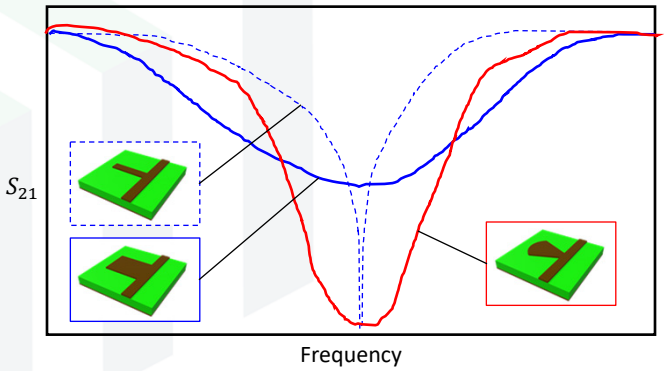
The Radial Stub

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.



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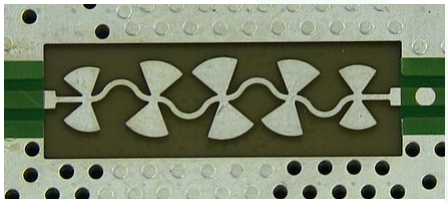
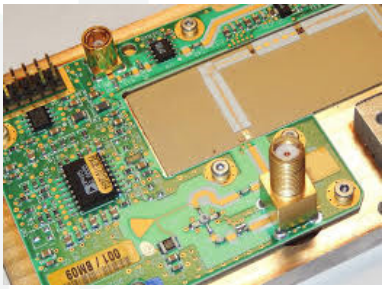
Microwave Circuits With Radio Stubs



https://www.wikiwand.com/en/Stub_(electronics)



Steer, Michael. *Microwave and RF design*. NC State University, 2019.

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