Chapter 6 Summary

The goal of this chapter is to utilize key concepts from Chapter 1 through Chapter 5 to show how theory and practice come together to complete a specific goal. This entire chapter is one big design problem. This is where the reader will go from theory to practice.

One Big Design Problem

In practical RF design, one of the most common challenges is matching an antenna's impedance to the system impedance to ensure maximum power transfer. WiFi devices, for example, typically operate around 2.4 GHz, a relatively narrow ISM band. Antennas rarely present a perfect 50 Ω impedance, so designing a matching network is critical in order for the antenna to work.

In this example, we will walk through the design of a microstrip single-stub matching network for a WiFi antenna operating at 2.4 GHz, using an open-circuit stub.

At 2.4 GHz, the measured input impedance of the antenna is $(25 - j50)\,\Omega$. The height of the circuit is 1.6mm and the substrate is FR-4 ($\epsilon_r = 4.4$). Simulate the design in MATLAB and sweep the simulated LogMag(S11) response from 1.4-3.4 GHz. Ensure the match at 2.4GHz is below -15dB for LogMag(S11). Using port expansion, determine the number of S-Parameters of the matching network and draw the corresponding circuit diagram with the proper incident and power waves.