Pre-Lab 2

**Introduction:**

The objective of this pre-lab was to matching networks with different substrate material. In addition to the design process, the pre-lab called for simulations with Z0lver. This pre-lab was designed to become familiar with this new software tool. Lastly, the pre-lab required to learn the basic operation of the portable network analyzer, Keysight FieldFox, which is used in the lab.

**Part 1: Quarter-Wave Matching Network**

The first part of the pre-lab required to find the widths for a 50Ω input line and a 200Ω output line on a 62 mil thick Duroid 5880 substrate. After the widths were found, the length, characteristic impedance, and the width of a single quarter-wave matching network had to be calculated. Once all parameters were accounted for, the design was implemented in Z0lover.

**Part 2: Double-Stub Matching Network**

Part two of the pre-lab used a Smith Chart to design a double-stub matching network that matches a load of ZL = 100-j50Ω to a 50Ω feed line. This design is implemented on a 31 mil thick FR4 substrate and then simulated in Z0lver.

Process for Double-Stub:

1 Convert the load to a normalized admittance: yL=g+jb

2) Transform yL along constant Γ towards generator by distance dA to reach yA = gA + jbA

3) Draw auxillary circle (pivot of g=1 circle by distance dB)

4) Add susceptance (b) to yA to get to yIN,A on auxillary circle. The amount of susceptance added is equal to -bSA, the input susceptance of stub A.

5) Find ySA = -jbSA Determine LA by transforming ySA along constant Γ towards load until we reach PSC (for short-circuit stub) or POC (for open-circuit stub).

6) Transform yIN,A along constant Γ towards generator by distance dB to reach yB on auxillary circle. The susceptance of yB (bB) is equal to -bSB, the input susceptance of stub B.

7) Find ySB = -jbSB Determine LB by transforming ySB along constant Γ towards load until we reach PSC (for short-circuit stub) or POC (for open-circuit stub).. <https://courses.engr.illinois.edu/ece329/impedance_matching.pdf>

**Part 3: Keysight FieldFox Network Analyzer**

The last part of the pre-lab was to become familiar with the portable network analyzer that will be used in future labs. Some of the main areas of focus were frequency sweeping, calibration, taking measurements, and exporting data.