Ryan Rogers

Dr. Baylis

RF uWave Lab

11/8/19

Post-lab Report #7

**Summary:** The purpose of this lab is to allow students to design a coupled-line coupler, ideal and realistic versions, then compare the simulations to a manufactured practical coupler to see if ideal behaviors can be reproduced practically. Results show than most behavioral characteristics in the practical coupler mirror those of the simulated ideal version with slight variations due to environmental and material influences.

**Discussion**: As coupling decreases between the two lines, the length and width of the traces change only slightly, with the length shrinking by a little less than 1mm and the width increasing by less than half a mm. The more dramatic change is the separation of the two lines, growing from 0.338mm for the -10dB coupled pair, to 2.074mm for the -20dB lines. Increasing the coupling between the lines from -20dB to -10dB has virtually no effect on the S-parameter of the isolated port (S4,1) while the input port’s S-parameter (S1,1) increases, indicating that more of the incident power is allowed to pass through the junction (Compare S(1,1) with S(5,5) and S(4,1) with S(8,5) in Figure 1). Figure 2 shows the original two couplers as well as a more practical version of the -20dB coupler, with transmission lines branching off from the coupled section. All S-parameters seem to shift upward, with the most noticeable difference appearing on the input line (S(9,9) in Figure 2). Figure 3 shows the results of measuring the practical coupler. However, because we only have two ports on the VNA, we opted to match two of the four lines with 50ohm ends.

A screenshot of a cell phone

Description automatically generated

Figure : Coupled-Line Couplers and Their Behavior

A close up of a map

Description automatically generated

Figure : S-parameters of Coupled Lines

A close up of a map

Description automatically generated

Figure : Measured S-Parameters for Practical Coupler