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ECEN 360 Sec 1

Lab 3

Matlab T-Line

Part I

2)

Ref = 0

With a reflection coefficient of 0 the reverse propagating wave is zero, so the vswr is seen as a straight line at 1 V since the amplitude of the forward propagating wave is 1V and matches the red total waveform.

Ref = 1

The reflection of 1 causes the reverse propagating wave to be equivalent to the forward propagating wave with no phase shift. So as seen at the right side of the window, the blue (forward) and green (reverse) waves are equal, and the amplitude is the same as well but moving in opposite directions. The total waveform reflects this. As seen by the turquoise wave.

Ref = -1

With a reflection coefficient of -1 the forward and reverse propagating waves are equal and opposite at the right side of the window (at the load) but moving in opposite directions. The sum is similar to that of a reflections coefficient of 1, but looks like it is out of phase by 90 degrees, or offset 1/2 period.

Ref = .5

A reflection coefficient of .5 makes the green (reverse) propagating wave have an amplitude of .5 that of the blue (forward). This the standing wave has a maximum of 1.5 and a minimum of .5 (whereas the reflection coefficients of 1 and -1 went from 2V to 0V) as the red (total) wave goes from 1.5V to -1.5 V as it moves along.

Ref = .707 + j\*.707

A reflection coefficient of .707 + j\*.707 causes the green (reverse) propagating wave to have the same magnitude of as the forward wave, but makes the green wave 45 degrees out of phase with the blue (forward) one. This can be seen between the blue and green as well as in the difference between turquoise wave in the ref=1 waveform and this one.

3)

Ref = .707 + j\*.707

Alpha = .1 (non zero loss term)

The flaw is that the x-axis should go from -2 to 0 to show the proper reflection, so the total wave goes from about .3 to 2V instead of 0 to 2. First figure is the incorrect one, the second is the corrected one.

Ref = 1.5 (greater than 1)

Alpha = .1

The VSWF is increasing since the reverse propagating wave is also increasing. Which is odd since the forward propagating wave is staying constant.

Part II

I added the following to find the input impedance at each point on the T-Line. I must be missing something because it didn’t change at all. It just stayed at 31.8 ohms the whole time. This was assuming a 50 Ohm characteristic impedance. I am not sure what I did wrong here, but I felt that I understood everything else that was going on in part I.

Iz=(Vo\*(exp(-gamma\*z)-ref\*exp(gamma\*z))/50.\*conj(Vo\*(exp(-gamma\*z)-ref\*exp(gamma\*z))/50)).^.5;

Zin = Vswr/Iz;

Conclusion

I felt that the parameters in part I all made sense and that I understood why the changes in reflection coefficient changed the wave form. I had a hard time knowing what to do in Part II so I tried adding the input impedance along the T-line, but failed at it. Maybe the equation I used was wrong.