

Lecture 13

niceguy

February 10, 2024

1 Smith Chart on a Network Analyzer

2 Smith Chart as Admittance Chart

Example 2.1. Find the input admittance of an open-circuited TL of characteristic impedance 300 Ohms and length 0.04λ .

At open circuit, conductance is 0, which is the leftmost point on the smith chart. Rotate by 0.04 towards the generator (clockwise).

$$Y_i = j0.26 \times Y_0 = \frac{j0.26}{300} = j0.87\text{mS}$$

3 Impedance Matching

We want to match a line. On a Smith chart, this is equivalent to moving an arbitrary point and moving it to the origin. There are 2 simple cases for this.

3.1 Case 1

$$z_L = 1 + jx$$

where a capacitor/inductor can be put in series to reduce z_L to 1, or an open/closed circuit transmission line with suitable length. Usually open circuits are easier.

3.2 Case 2

$$y_L = 1 + jb$$

If we connect in parallel a reactive load with susceptance $-b$, admittance becomes 1 (recall resistance in parallel). Similarly, this can be implemented with suitable short/open circuits.

3.3 Arbitrary Case

With $z_L = r + jx$, on a Smith chart, we can always rotate this about the origin until it intersects the $r = 1$ circle. Let this distance be Δd , then at $d = \Delta d$, we have reduced the problem to our first case. We attach a purely reactive load at this point, and we are done.