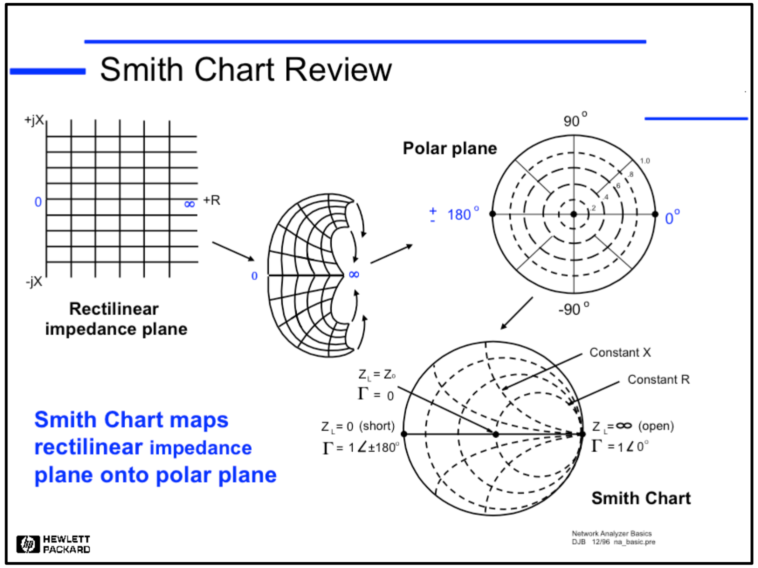
Smith Chart

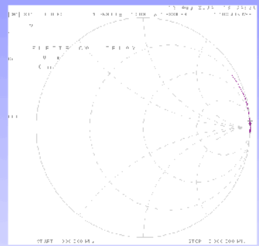


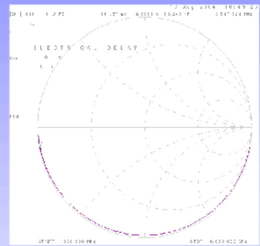
The amount of reflection that occurs when characterizing a device depends on the impedance the incident signal sees. Let's review how complex reflection and impedance values are displayed. Since any impedance can be represented as a real and imaginary part (R+jX or G+jB), we can easily see how these quantities can be plotted on a rectilinear grid known as the complex impedance plane. Unfortunately, the open circuit (quite a common impedance value) appears at infinity on the x-axis.

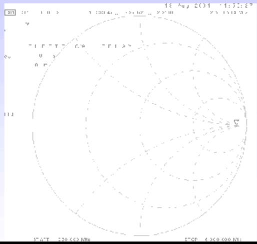
The polar plot is very useful since the entire impedance plane is covered. But instead of actually plotting impedance, we display the reflection coefficient in vector form. The magnitude of the vector is the distance from the center of the display, and phase is displayed as the angle of vector referenced to a flat line from the center to the rightmost edge. The drawback of polar plots is that impedance values cannot be read directly from the display.

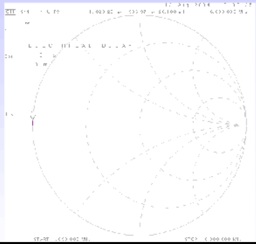
Since there is a one-to-one correspondence between complex impedance and reflection coefficient, we can map the positive real half of the complex impedance plane onto the polar display. The result is the Smith chart. All values of reactance and all positive values of resistance from 0 to ∞ fall within the outer circle of the Smith chart. Loci of constant resistance now appear as circles, and loci of constant reactance appear as arcs. Impedances on the Smith chart are always normalized to the characteristic impedance of the test system (Zo, which is usually 50 or 75 ohms). A perfect termination (Zo) appears in the center of the chart.

Circuits components

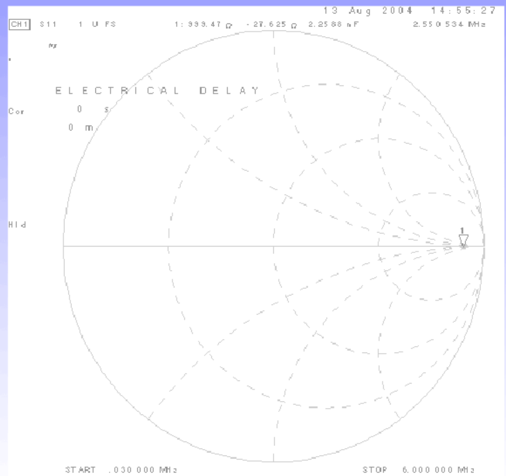






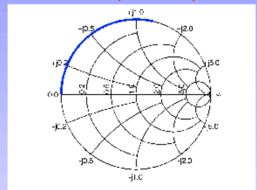


Smith Chart main points



Some circuit elements

1 mH (0-10kHz)



1 uF (0-10kHz)