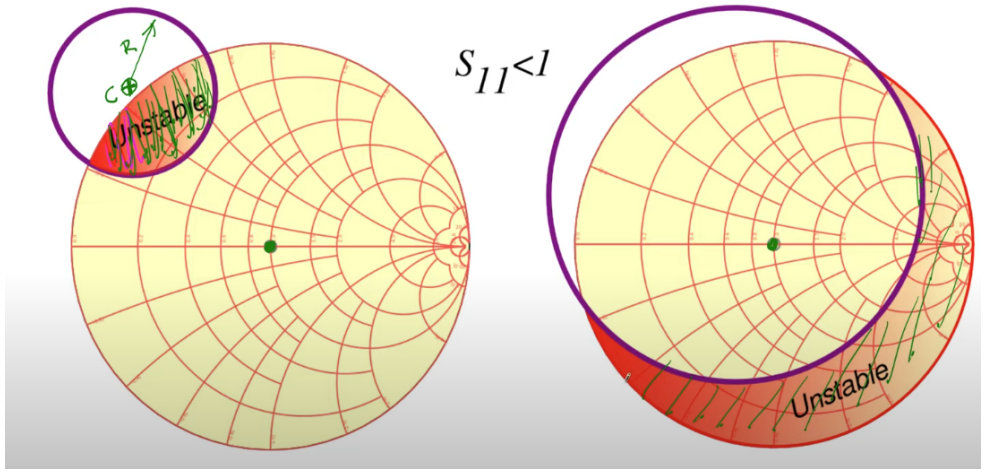
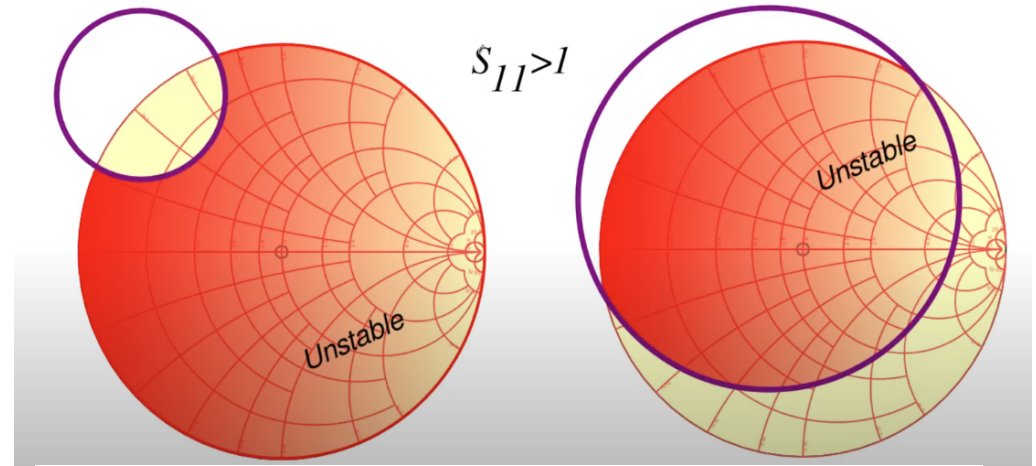
Stability Circles when $S_{11} < 1$



Stability Circles when $S_{11} > 1$



Necessary and sufficient conditions for amplifier stability are:

$$K = \frac{1 - |S_{11}|^2 - |S_{22}|^2 + |\Delta|^2}{2|S_{12}S_{21}|} > 1,$$

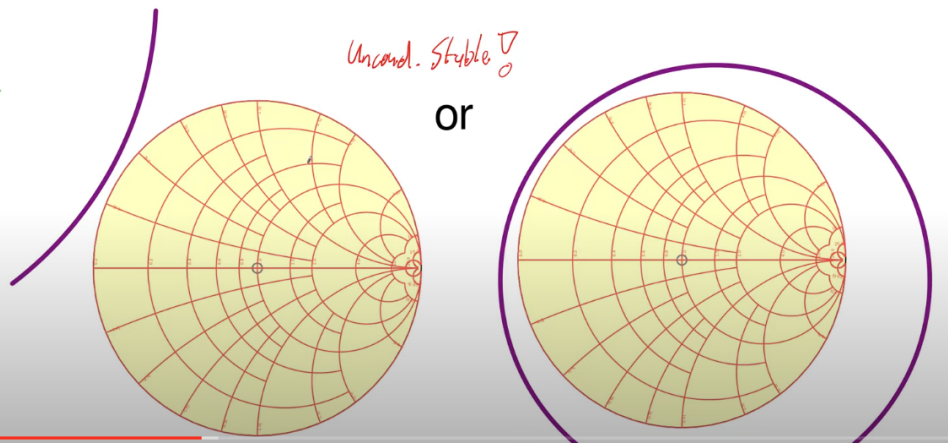
and

$$|\Delta| < 1.$$

$S_{11}S_{22} - S_{12} \cdot S_{21}$

Unconditionally Stable

For an unconditionally stable device, the stability circles are outside (or totally enclose) the Smith chart.



A new test involving one parameter only is the μ-Test with

$$\mu = \frac{1 - |S_{11}|^2}{|S_{22} - \Delta S_{11}^*| + |S_{12}S_{21}|} > 1$$

The μ is the distance of the closed point of the stability circle to the center of the Smith chart

Similar for the Load Circle:

$$\mu = \frac{1 - |S_{22}|^2}{|S_{11} - \Delta S_{22}^*| + |S_{12}S_{21}|} > 1$$