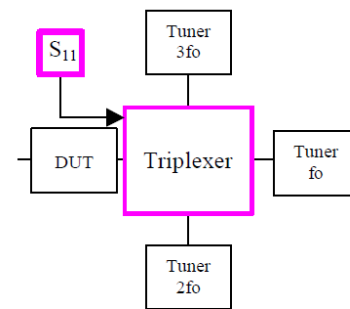


## Why do Triplexers cause spurious Oscillations?

### Why will Triplexers cause Spurious Oscillations In a Load Pull Setup!

Triplexer's wideband  $S_{11}$  frequency response will certainly create spurious oscillations when connected to potentially unstable power transistors (Stability Factor  $k < 1$ ). Spurious oscillations are created outside the test band when the setup reflection factor crosses the instability region of the transistor. The setup reflection factor is, in this case, the  $S_{11}$  of the Triplexer, shown in the plot below for a typical, low insertion loss, Triplexer unit. It is seen that  $|S_{11}|$  is higher than 0.94 (<0.5dB return loss) everywhere outside the test bands for  $f_0$ ,  $2f_0$  and  $3f_0$ . This is especially critical for low frequencies (left side in the plot) where the gain (and instability) of the transistors are typically very high.



Triplexer-based harmonic Load Pull setup (symmetrical for Source Pull)

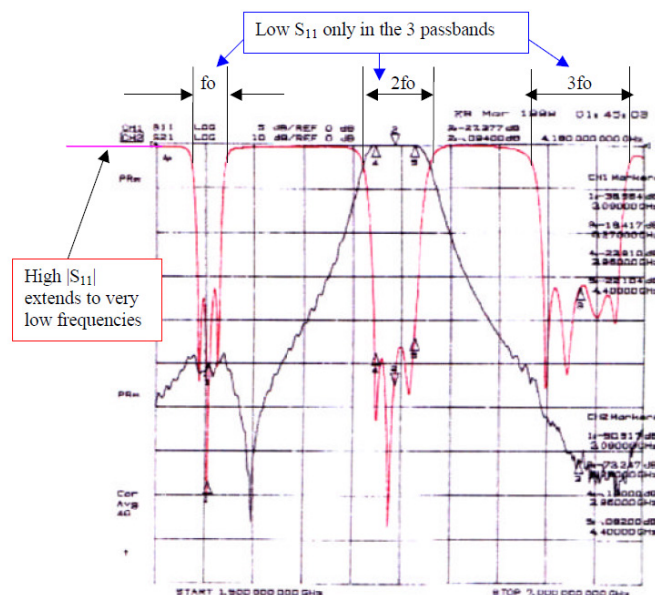


Figure 1: Typical wideband  $S_{11}$  and  $S_{21}$  frequency response of low loss Triplexer between DUT port and  $2f_0$  port.

Spurious oscillations will occur at low frequencies, where the  $S_{11}$  response of the Triplexer overlaps the Stability Circles of the transistor under test. This area is shown shadowed red in the figure below. Only around the harmonic frequencies  $f_0$ ,  $2f_0$  and  $3f_0$  the oscillation risk is negligible, because  $|S_{11}|$  is low; however high gain transistors will oscillate at any frequency satisfying the oscillation conditions. Oscillations may not occur if the Source side of the DUT is connected to 50 Ohm, but this condition is unlikely, since the DUT has to be matched on both sides to be tested properly.

The worst situation is when two Triplexers are used in the setup, in which case the spurious oscillation conditions are likely to be met both at the Source and the Load side of the DUT simultaneously.

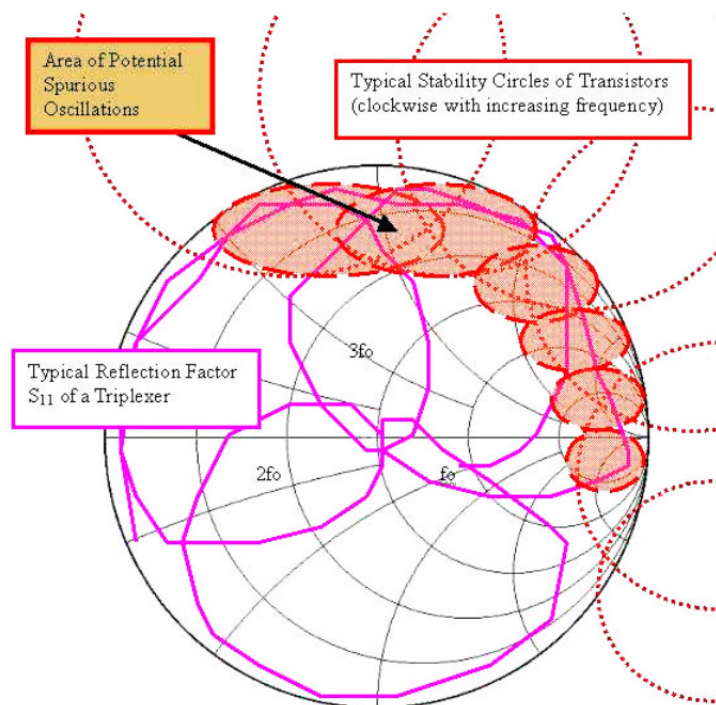


Figure 2: Stability Circles of a power transistor overlapping the reflection factor response of a low loss Triplexer.