

$$\pi_{msc} = \pi_{mL} - \frac{\alpha}{1+r'}$$

$$\pi_{moc} = \pi_{mL} + \frac{\alpha}{1-r'}$$

$$\Rightarrow \alpha = (\pi_{mL} - \pi_{msc})(1+r')$$

$$\Rightarrow \pi_{moc} - \pi_{mL} = (\pi_{mL} - \pi_{msc}) \frac{(1+r')}{(1-r')}$$

$$\frac{1+r'}{1-r'} = \frac{\pi_{moc} - \pi_{mL}}{\pi_{mL} - \pi_{msc}} = \beta$$

$$1+r' = \beta(1-r')$$

$$r'(1+\beta) = \beta - 1 \Rightarrow r' = \frac{\beta - 1}{\beta + 1}$$

$$\Rightarrow \alpha = (\pi_{mL} - \pi_{msc}) \left(1 + \frac{\beta - 1}{\beta + 1} \right)$$

$$\frac{2\beta}{\beta + 1} = \frac{2 \left(\frac{\pi_{moc} - \pi_{mL}}{\pi_{mL} - \pi_{msc}} \right)}{\beta + 1}$$

$$\beta + 1 = \frac{\cancel{\Gamma_{ML}} - \Gamma_{MSC} + \Gamma_{MOC} - \cancel{\Gamma_{ML}}}{\Gamma_{ML} - \Gamma_{MSC}}$$

$$\frac{2\beta}{\beta + 1} = \frac{2(\Gamma_{MOC} - \Gamma_{ML})}{\Gamma_{MOC} - \Gamma_{MSC}}$$

$$\alpha = \frac{(\Gamma_{ML} - \Gamma_{MSC}) 2(\Gamma_{MOC} - \Gamma_{ML})}{\Gamma_{MOC} - \Gamma_{MSC}}$$

$$r' = \frac{\beta - 1}{\beta + 1} = \frac{\beta - 1}{\frac{\Gamma_{MOC} - \Gamma_{MSC}}{\Gamma_{ML} - \Gamma_{MSC}}}$$

$$\beta - 1 = \frac{\Gamma_{MOC} - \Gamma_{ML} + \Gamma_{MSC} - \Gamma_{ML}}{\Gamma_{ML} - \Gamma_{MSC}}$$

$$= \frac{\Gamma_{MOC} + \Gamma_{MSC} - 2\Gamma_{ML}}{\Gamma_{ML} - \Gamma_{MSC}}$$

$$r' = \frac{\Gamma_{moc} + \Gamma_{msc} - 2\Gamma_{mL}}{\Gamma_{moc} - \Gamma_{msc}}$$

$$\Gamma_{mu} = \Gamma_{mL} + \frac{\alpha \Gamma_{uL}}{1 - r' \Gamma_{uL}}$$

$$(\Gamma_{mu} - \Gamma_{mL}) = \frac{\alpha \Gamma_{uL}}{1 - r' \Gamma_{uL}}$$

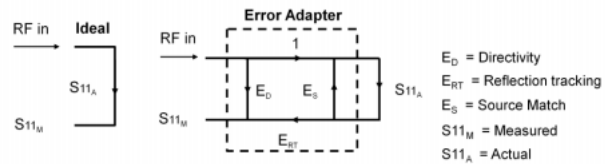
$$(\Gamma_{mu} - \Gamma_{mL})(1 - r' \Gamma_{uL}) = \alpha \Gamma_{uL}$$

$$\Gamma_{mu} - \Gamma_{mL} = \Gamma_{uL} (\alpha + (\Gamma_{mu} - \Gamma_{mL}) r')$$

$$\Gamma_{uL} = \frac{\Gamma_{mu} - \Gamma_{mL}}{(\Gamma_{mu} - \Gamma_{mL}) r' + \alpha}$$

In the literature, r' is known as source match, E_S , and α is known as reflection tracking, E_R . Γ_{mL} is known as E_D , directivity. Γ_{mu} is sometimes written as S_{11M} , or measured reflection.

Reflection: One-Port Model



To solve for error terms, we
measure 3 standards to generate
3 equations and 3 unknowns

$$S_{11M} = E_D + E_{RT} \left[\frac{S_{11A}}{1 - E_S S_{11A}} \right]$$

- Assumes good termination at port two if testing two-port devices
- If using port two of NA and DUT reverse isolation is low (e.g., filter passband):
 - Assumption of good termination is not valid
 - Two-port error correction yields better results

I verified with an octave script that this method is the same as correcting the impedance using the formula:

$$Z_u = Z_o \frac{(\Gamma_{m0} - \Gamma_{mL})(\Gamma_{mU} - \Gamma_{mS})}{(\Gamma_{mL} - \Gamma_{mS})(\Gamma_{m0} - \Gamma_{mU})}$$

