E157 Lecture 10 Day Plan

Any questions before quiz

Quiz + Team Quiz + Talk through solution

Measuring Q from return loss! Lab 3 debug

- Log plots are tricky, what would $S_{21}$ be for the $S_{11}$ shown (show a filter)
- If lossless and terminated $1+S_{11}^2=S_{21}^2$
- Therefore, -3dB on $S_{11}$ plot corresponds to 3dB off peak in $S_{21}$ plot
- For very low $S_{11}$, less than -3dB, can use pseudo -3dB point based on $S_{11}$ min
  Effective $S_{21}$ peak, linear = $\sqrt{1-|S_{11},\text{min, linear}|^2}$
  Effective $S_{21}$ -3dB, linear = Effective $S_{21}/\sqrt{2}$
  Effective $S_{11}$ -3dB, linear = $\sqrt{1-\text{Effective } S_{21},-3\text{dB,linear}}|^2$
- Potentially discuss loaded and unloaded Q & weak coupling

What VNA to use for DP1

- Siglent $S_{11}$ with filter board input TG, output terminated $\Rightarrow$ easy export, easy calibration
- Siglent $S_{21}$ with filter board input TG output RF $\Rightarrow$ easy export, calibration harder
- Anechoic VNA $\Rightarrow$ Export is tricky (see Xavier plotter script), do full 2 port cal, watch cables

S-parameters of filters – insertion loss, return loss, Smith Charts

- Can class (1) sketch a Chebyshev II filter response function, (2) draw $S_{21}$ and $S_{11}$ for it.
- $|S_{21}|^2 = |H(j\omega)|^2$ roughly, both measure power flow
- $S_{21}$ in band is insertion loss
- $S_{21}$ out of band is stop-band rejection
- $S_{11}$ is high out of band, signals bounce off of filters. Transfer over at 3dB corners

Calculate Z parameters for quiz problems