E157 Lecture 17 Day Plan

Any questions before quiz

Quiz + Team Quiz + Talk through solution

Design spec roundup

- Rrad(ω). [Ohms] TX can't tell difference between radiation and dissipation, so resistor.
- Xrad(ω) = Crad(ω) + Lrad(ω). [Ohms]
    - Crad and Lrad can be approximated const sometimes.
    - All second order systems appear capacitive below resonance, inductive above
- Rloss(ω). [Ohms] Frequency dependence is from skin effect.
- Efficiency(ω) = Rrad/Rloss (b/c share same current). [Dimensionless]
- Bandwidth. [Hz] -3dB _in frequency_. Measure w/ VNA (S21 off peak, S11 off 0dB.)
- Radiation Pattern
    - Displayed as 3x polar plots in each antenna plane (xy, xz, yz)
    - Directivity and Gain [dBi]. Max of radiation pattern. Directivity theoretical.
    - Beam Width. [degrees]. -3dB _in angle_ off rad pattern max.
    - Note that "broadside" is the direction that an antenna is pointing.
    - Azimuth and
- Polarization [degrees].
    - Which way E field comes out of antenna
    - Note that superposition allows diagonal and circular polarizations
- Area / Dimension [m]. Matters for near/far field.

Discuss phased array beamforming and radiation patterns

Chu limit – Q >= (1/(ka)^3+1/ka) for linear polarized, where a radius of containing sphere & k is wave #

Why is path loss frequency dependent? → isotropic antenna gets smaller. So does yours probably.

Review receive antenna in a circuit and LC model for Xrad