E157 Lecture 4 Day Plan

Any questions before quiz

Quiz + Team Quiz + Talk through solution

Lab review –

- Assumptions, DC=no caps, AC=linear, Transient=mostly honest
- Axes, DC=V vs. V, AC= V vs. f, Transient=V vs. t
- S parameter experience
- Length calibration: how was this? Practical/theory? Keep me posted on lab 2

Complex number visualizations for VSWR, refer to sketch below –

- Phasor notation, everything spins at omega
- Let phi=0 be at load, let source be at -S
- Accrue negative phase as fwd wave propagates forward: V(x,t)=V(-S,t)*exp(-jkx)
- Accrue positive phase as rev wave propagates backward: V(x,t)=V(0,t)*exp(-jkx)
- Results in counterspinning vectors,
  → constant phase relationship between fwd and rev wave vs. time
  → amplitude at x is fixed by phase relationship
- _Also_ can accrue phase from the load. Just adds phase to relationship.
- VSWR has a Spinning Gamma plus one vector at 2jkx, twice as fast

Where are max/min in a standing wave for real Gamma? – for real Gamma, max/min at termination

Falling edges for square waves (has been 1V forever and falls to 0V) can be modeled as a superposition of a negative step propagating down the line + DC volts

Sketch

- we're omitting exp(wt) everywhere, per phasors)
- this line is less than lambda/2 long.
  - The up/down minima is at lambda/4 (half a VSWR pattern).
  - Fwd wave would be at an angle of pi at lambda/2 (1 VSWR pattern), and the up-left angle is less than that
  - A full wave would be two VSWR patterns, bringing fwd in a full circle

Label	src+Z0 (at x=-S)	line	line	line	line	load (at x=0)
fwd	Vi*exp(kS)	Vi/2*exp(kS)	up-left	up	up-right	Vi/2*exp(0)
rev	term	Γ*Vi/2*exp(+kS)	down-left	down	down-right	Γ*Vi/2*exp(0)
sum	… show both vectors, constant angle relation					