

# ECE 124d

## Homework 2

Due: Wed Jan 30, 2008

Reading: DSE chapter 3 to sec 3.6:

- a. lossless transmission lines
- b. termination, reflection, standing waves
- c. attenuation

Problems: p. 143: 3.7, 3.9, 3.10

3. Classical 10Mb Ethernet interconnections traverse a coaxial cable with an impedance of  $50\Omega$  and  $\epsilon_0=3.5$ . The basic data rate of an ethernet is 10MHz with rise and fall times of 25nS. (Higher frequencies are filtered out at the transceiver). Ethernet taps (stubs) have non-zero capacitance and inductance. (In fact they have a round trip response delay of 50nS max). A proper cable has markings every 2.5m. Please explain what the markings are for and why they are at 2.5 meter spacings. Hint: consider the effects of passing from a region of no taps to one in which many taps are spaced very closely along the cable.

4. TI introduced a new series of high speed TTL circuits in standard packaging using identical circuit dice as their older series which they claimed had significantly better noise performance. Assuming they made no electrical changes to the chip or 16-pin dip packaging (i.e. same package) -- how could they make this (True!) claim?

5. Consider a new chip you have built with output pad drivers that switch in 500pS. If these chips are placed on an (epoxy) circuit board using PGA packages, what is the maximum length of a wire w/o termination in the circuit board? If the board has a ground plane? (Use the default figures in the notes for parameters). For a 2.5V signaling swing, what level of voltage noise is created by the intrinsic inductance of the package?