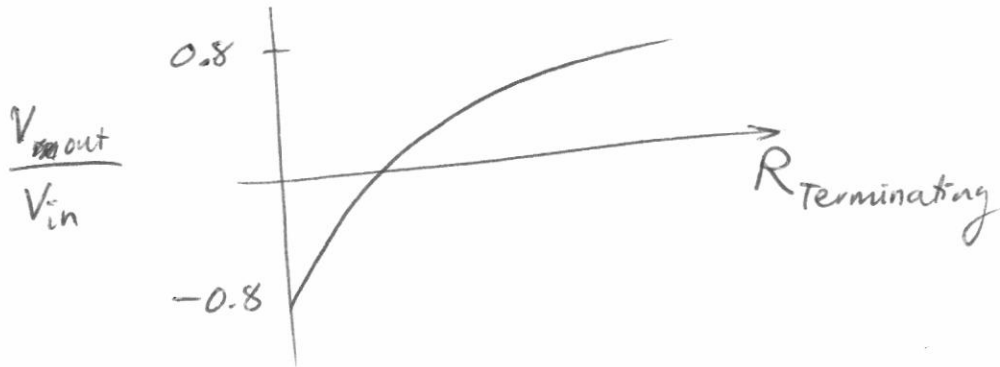


PH 424

DAY 5



One of my favorite parts of physics.
 Good experimental data is telling us some
 fundamental aspects of the system.

* Qualitative surprises

① $\frac{V_{out}}{V_{in}}$ does not reach ± 1 .

② Small impedance $R_{terminal}$ flips
 the sign of the voltage
 pulse

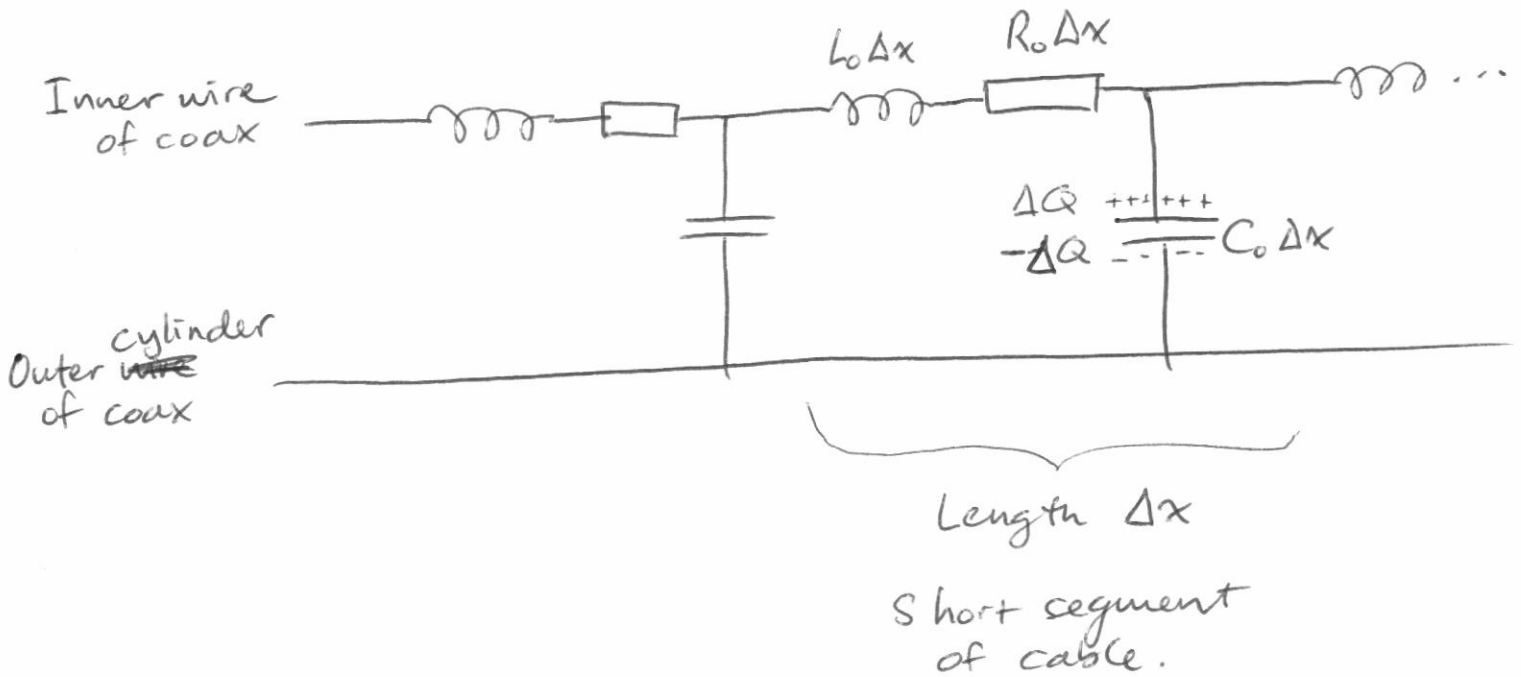
* Quantitative puzzles

- What is the mathematical
 relationship between
 $\frac{V_{out}}{V_{in}}$ and $R_{terminal}$?

CIRCUIT MODEL

(2)

- $L_0 \equiv$ Inductance per unit length
- $R_0 \equiv$ Resistance per unit length.
- $C_0 \equiv$ Capacitance per unit length.



See Main 10.3 and links on class website Day 5.

Charge ~~on~~ build up in a short segment ~~is~~

$$\Delta Q = V(x,t) C_0 \Delta x$$

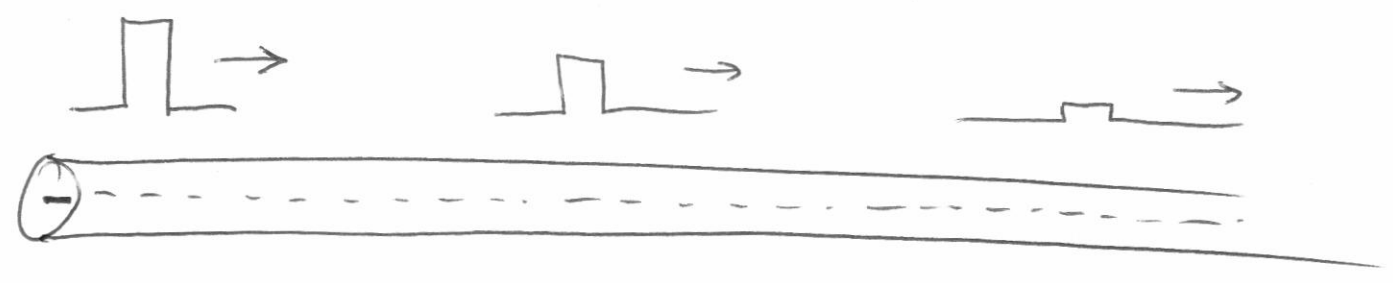
local voltage diff between inside wire and outside cylinder.

Wave eqn for V

$$\frac{\partial^2 V(x,t)}{\partial x^2} = L_0 C_0 \frac{\partial^2 V(x,t)}{\partial t^2} \quad [\text{neglecting } R_0]$$

(3)

R_0 leads to attenuation.
(Need to add R_0 into the wave eqⁿ).



(this is different from dispersion).

To make analogies with waves on stretched strings, we'll have to show that $V(x,t)$ in a coax cable wave behaves like $\frac{\partial \psi}{\partial x}$ in a stretched string wave.

See HW #3.