

# 10:1 HIGH IMPEDANCE OSCILLOSCOPE PROBE NEEDS LOSSY CABLE

Plot V(out\_a), V(out\_b) and V(out\_c)

.tran 0 1u 0 1n

.ac dec 500 0.1k 200MEG

.AC analysis can be used also to see the "flat" frequency response.

Some links:

[http://www.tek.com/site/ps/0,\\_60-15265-INTRO\\_EN,00.html](http://www.tek.com/site/ps/0,_60-15265-INTRO_EN,00.html)

<http://www.probemaster.com/helpful.htm>

We learn how useless a standard coaxial cable is for this purpose.

Probe cables need adapted high ohmic resistance of inner conductor.

Typical values are 100 Ohm/m to 200 Ohm/m depending on the cable's Z-impedance.

Z from dimensions:  $Z = 60/\sqrt{\epsilon_r} \log(D/d)$  [Ohm] , D/d = outer/inner diameter

Characteristic Impedance Z:  $Z = \sqrt{L/C}$

Delay:  $T_{pd} = \sqrt{L \cdot C} = 5 \text{ ns/m}$  or  $v = 1/\sqrt{L \cdot C} = 2/3 \cdot c_0$  choosen

Probe-a(selfmade): probe with 50 Ohm cable, l=2m, R'=0 (lossless, standard coax)

Probe-b(selfmade): probe with 50 Ohm cable, l=2m, R'=100 Ohm/m, special cable

Probe-c(HPIAg, Tek): their probes have typ. 100 Ohm cable, l=2m, R'=190 Ohm/m, special cable

R' is the ohmic resistance per 1m length of the inner conductor.

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