Training A

Oscilloscope , Coaxial Cable

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Outline

1. What we learned

1.1 basic usage for oscilloscope;

1.2 basic property of coaxial cable.

2. What we did

2.1 Measure the reflection;

2.2 Measure the cable length by Oscilloscope;

2.3 Delay the signal;

2.4 Divide single signal to two signals.

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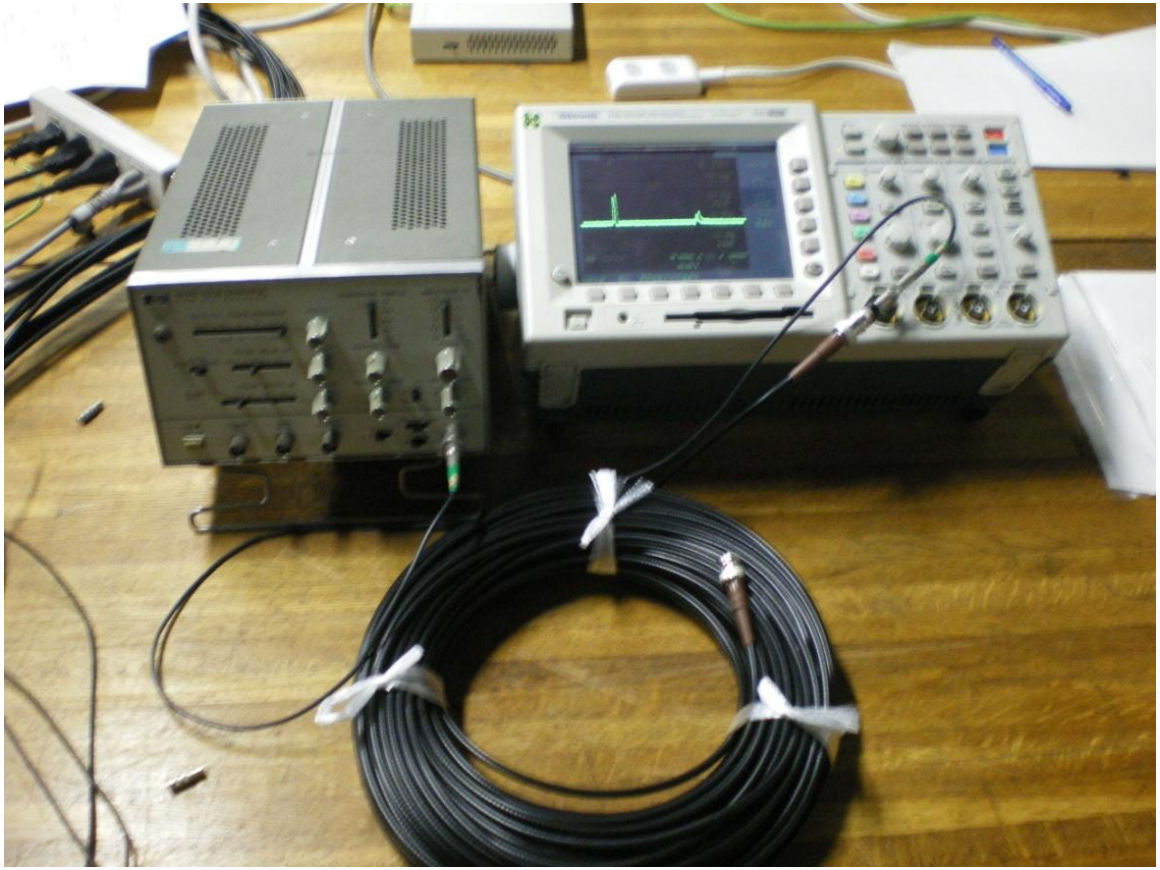
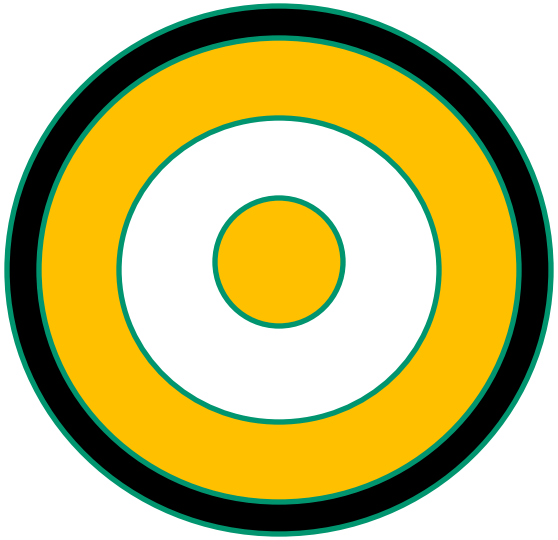
1.1 The basic usage of the Oscilloscope.



1.2 The basic property of coaxial cable.

Impedance

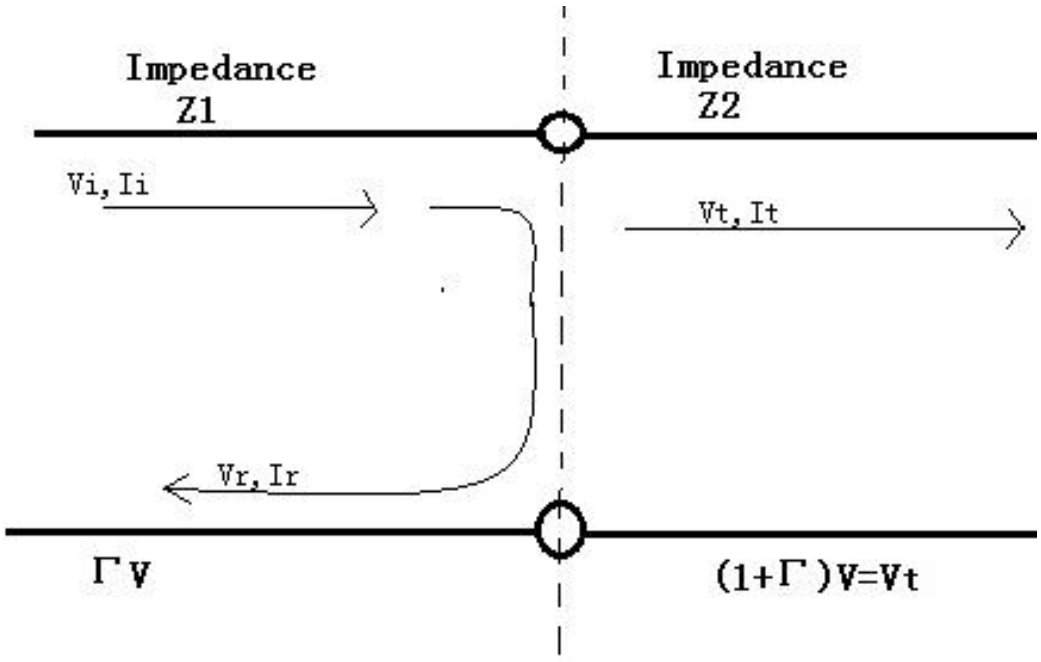


$$Z = \sqrt{\frac{1}{\xi_r}}\, 60 \ln \frac{b}{a}$$

a: diameter of inner conductor

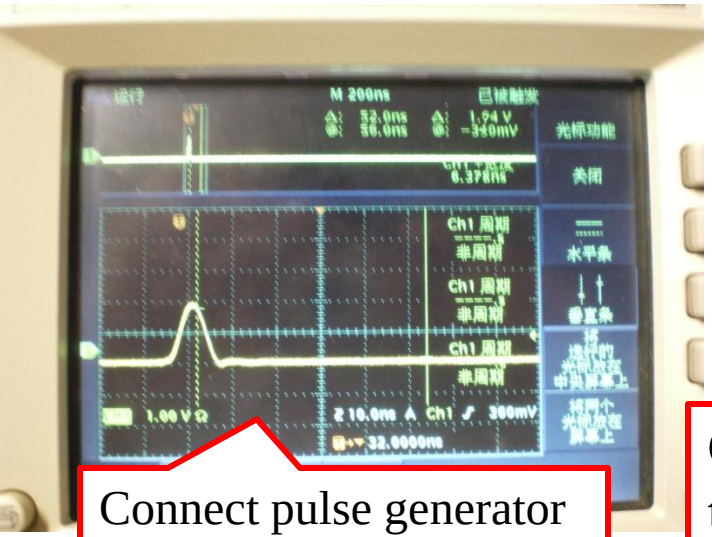
b: inner diameter of outer conductor

Impedance matching



$$\Gamma = \frac{Vt}{Vi} = \frac{Z2-Z1}{Z2+Z1}$$

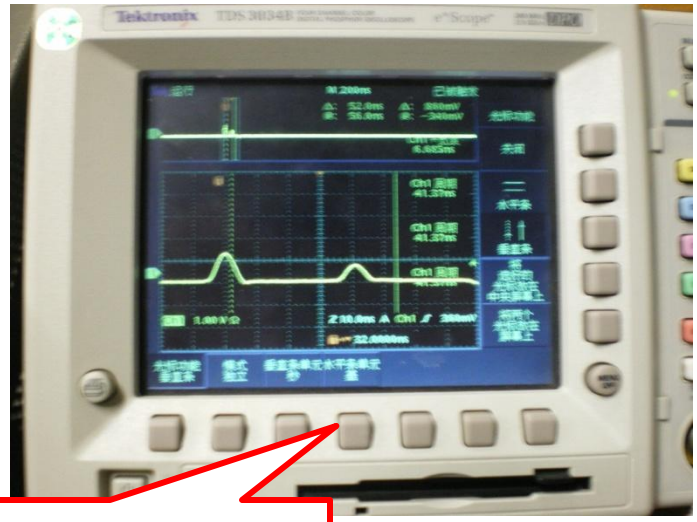
2.1 Measure the reflection



Connect pulse generator to oscilloscope with “T” connector

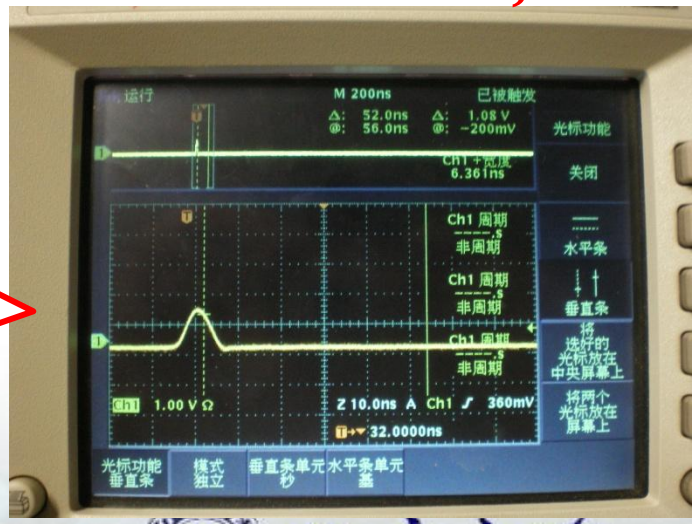
$$\Gamma = \frac{Vt}{Vi} = \frac{Z2-Z1}{Z2+Z1}$$

Z2=∞,Γ=1

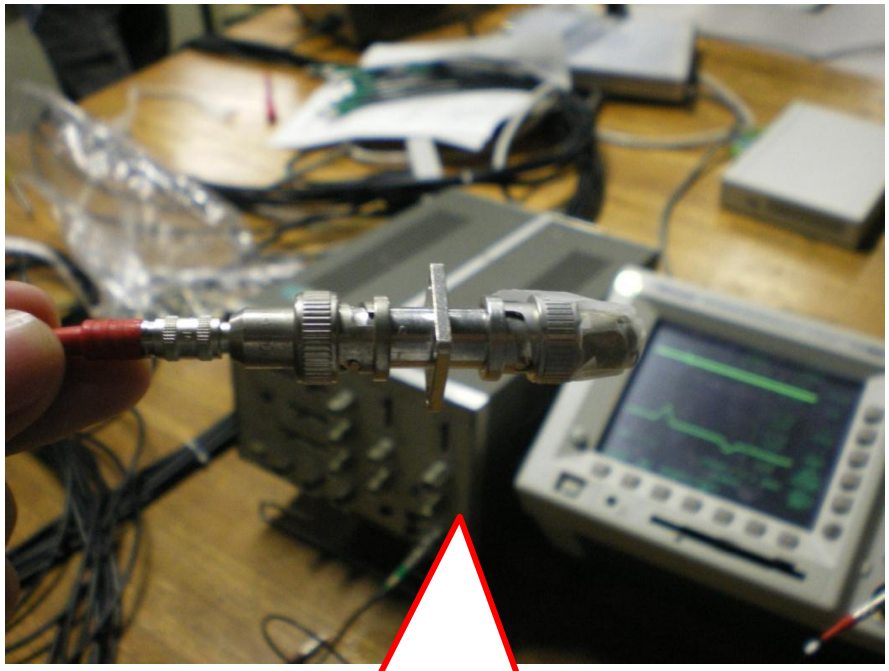


Connect a long cable to “T” connector and open the end of the long cable

Z2=Z1,Γ=0



Connect the end of the long cable with a 50 Ω termination

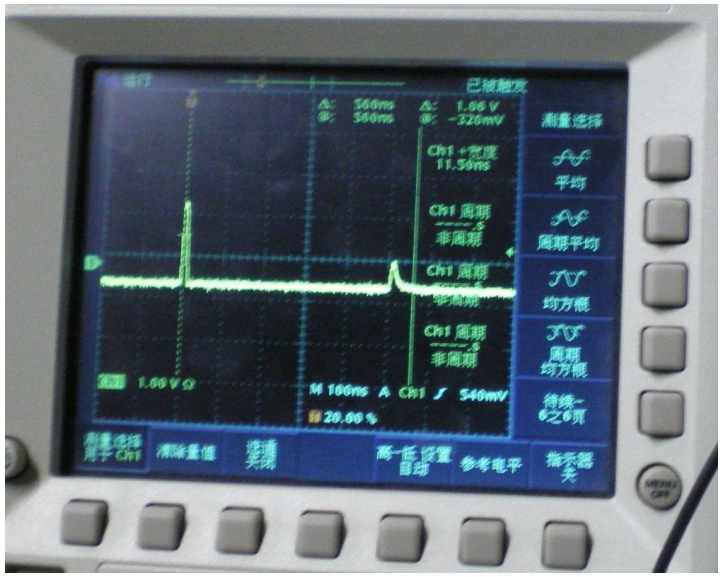


The inner conductor and outer conductor are connected directly.

Z2=0,Γ= -1

2.2 Measure the cable length by Oscilloscope

A 5m cable, Δt1=50ns



A long cable, Δt=500ns

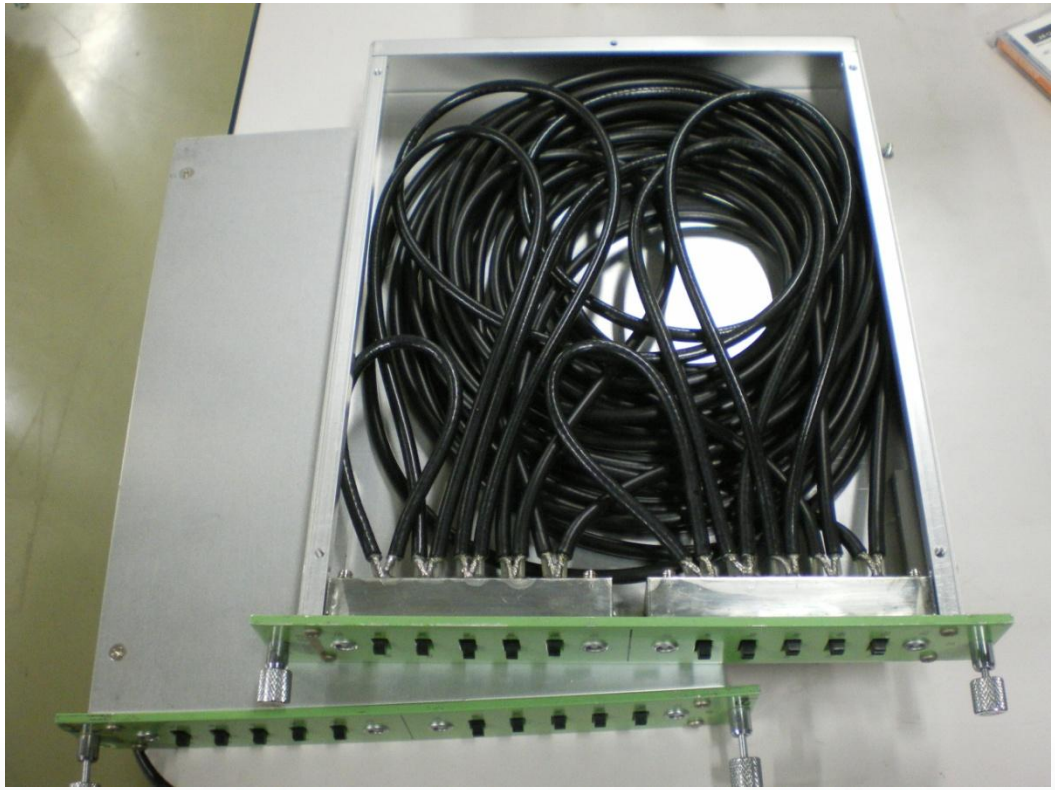
The velocity of signal in cable:

$$v = \frac{5m \times 2}{50ns} = 20cm/ns$$

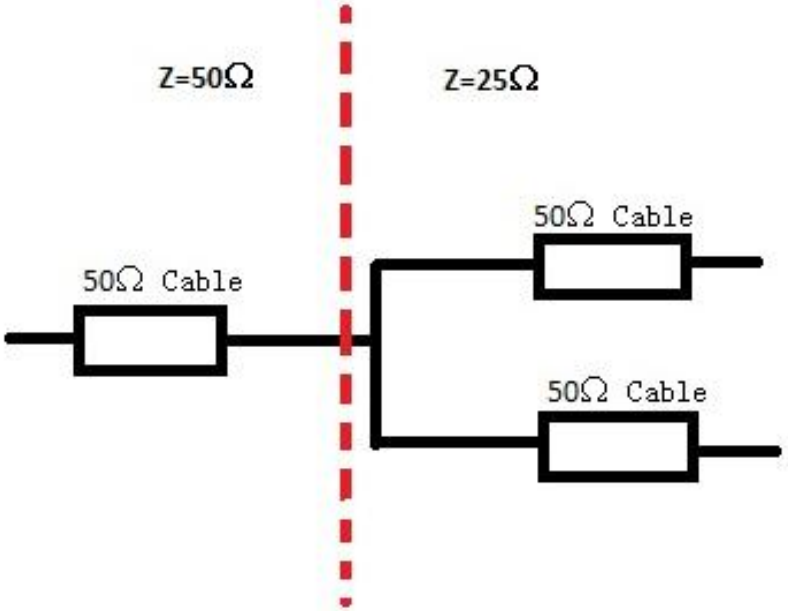
$$\frac{5m}{L} = \frac{50ns}{500ns}$$

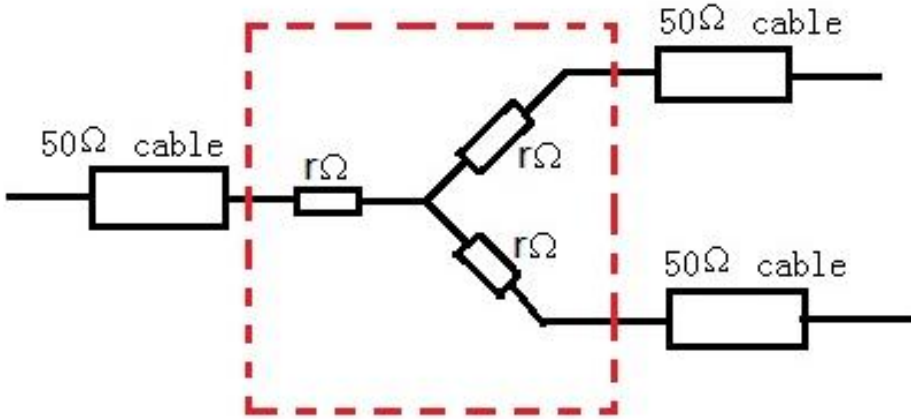
$$L = 50m$$

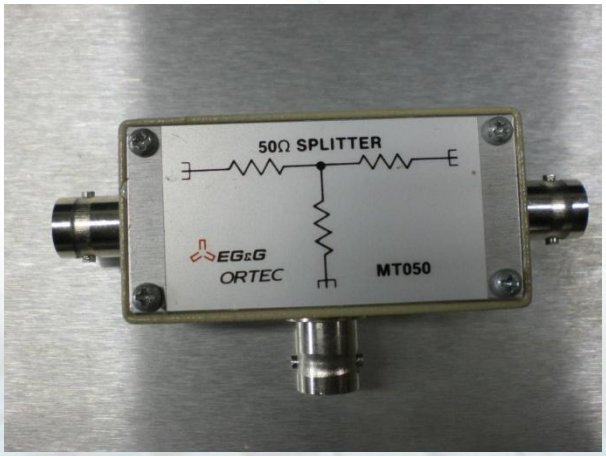
2.3 Delay the signal.



2.4 Divide single signal to two signals.







$$50 = \frac{50 + r}{2} + r$$

$$r = 16.7\ \Omega$$

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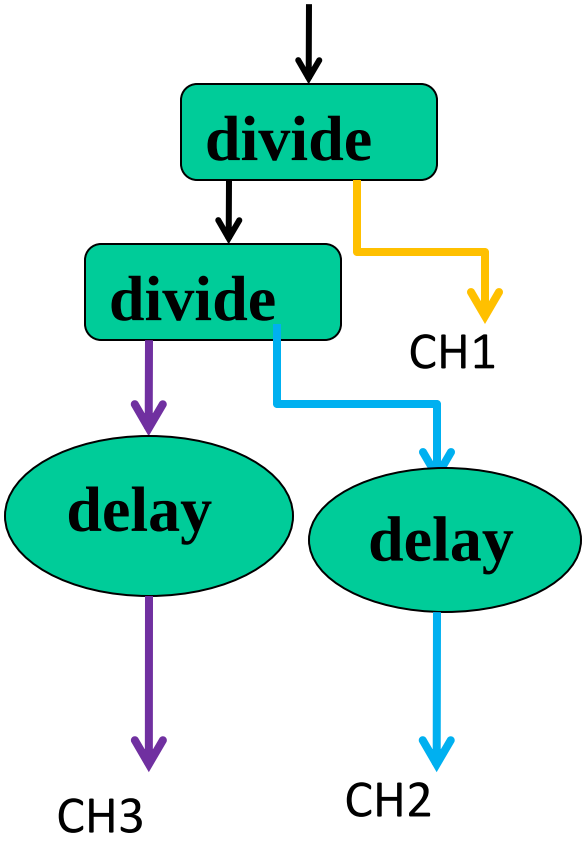
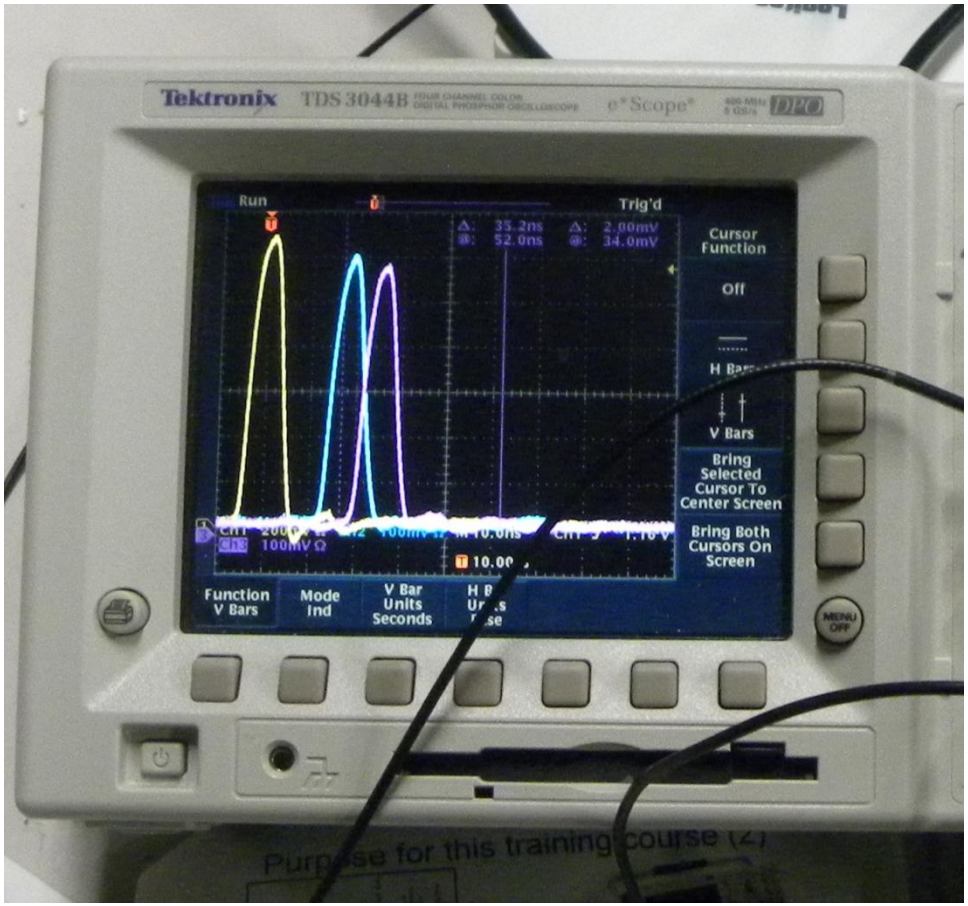

divide
divide
CH1
delay
delay
CH3
CH2


Tektronix
TDS 3044B
Run
Trig'd
Cursor Function
Off
V Bars
Bring Selected Cursor To Center Screen
Bring Both Cursors On Screen
Function V Bars
Mode Ind
V Bar Units Seconds

Thanks for your listening!

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