LAr TPC

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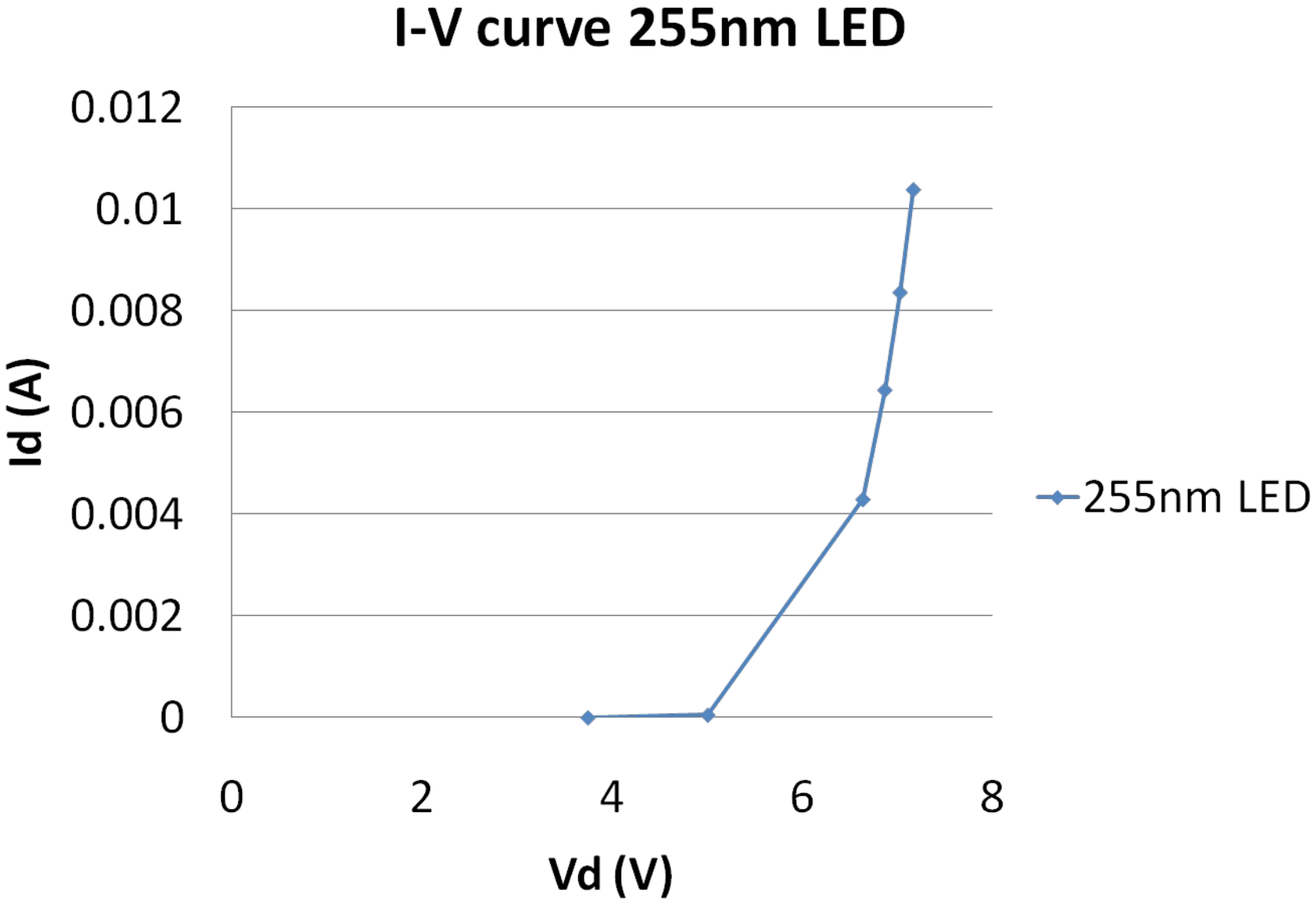
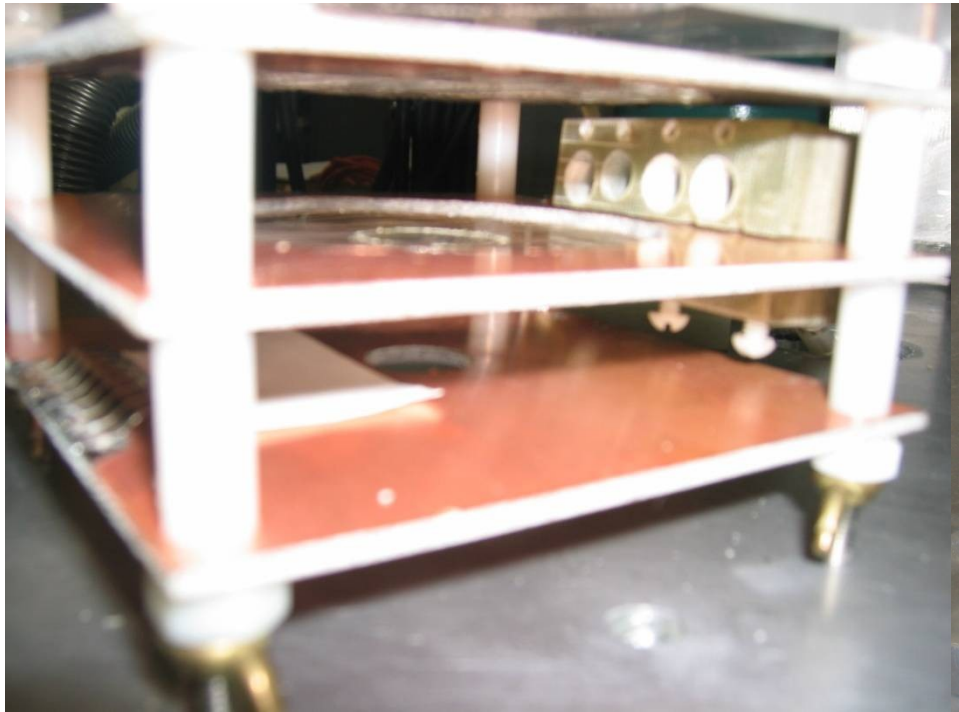
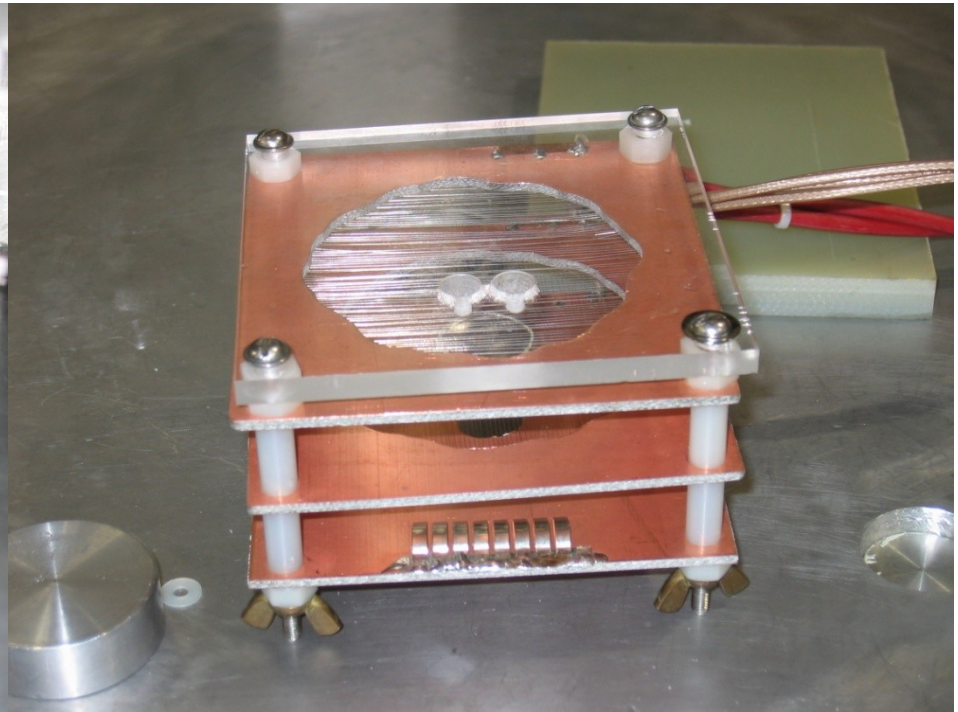
LEDs

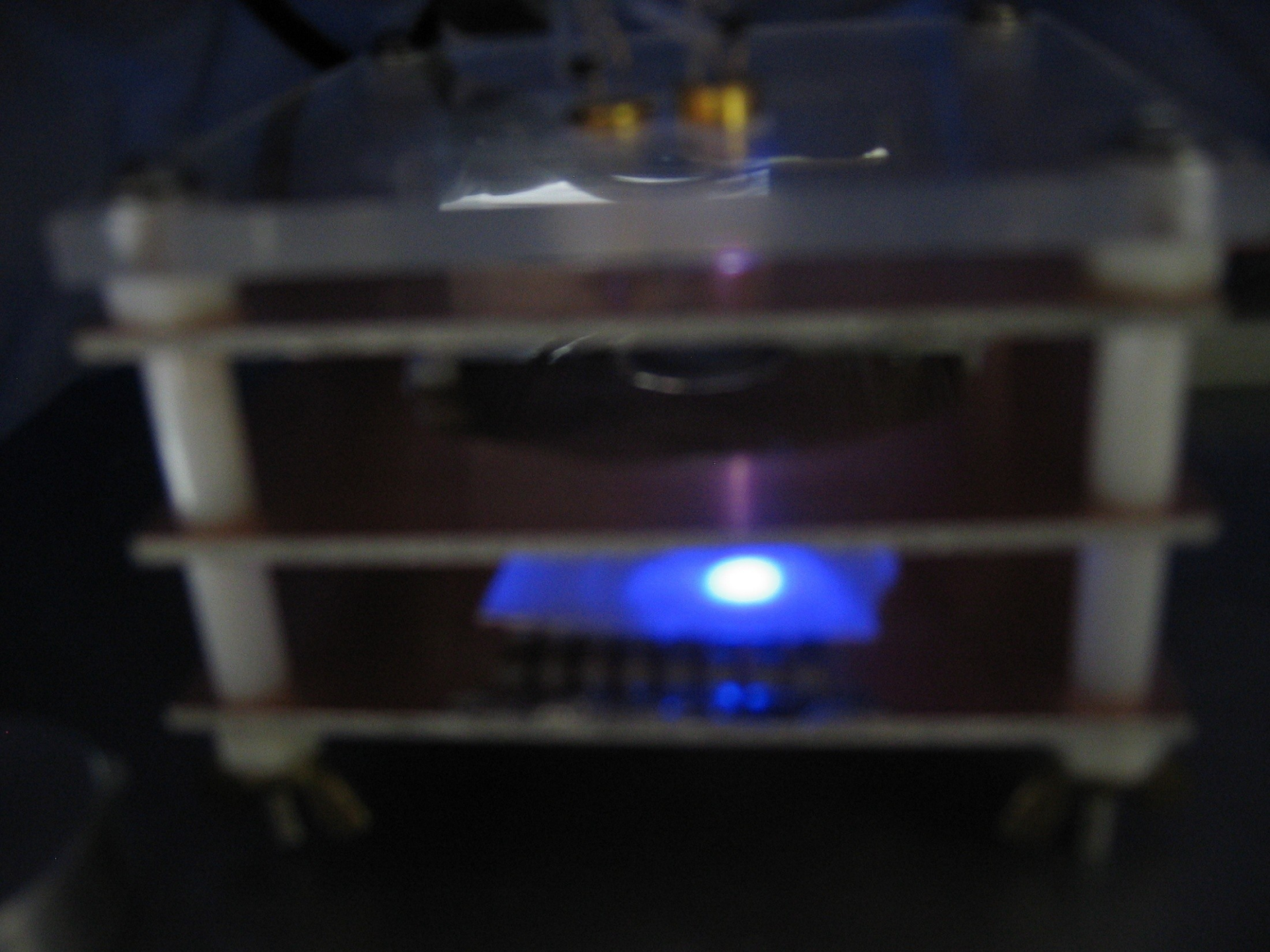
- 2 LEDs: 255nm and 355nm
- Plastic scintillator
- Phototube
- I-V curve
- 355 nm is more intense than the 255 nm


I-V curve 255nm LED
0.012
0.01
0.008
0.006
0.004
0.002
0
Id (A)
0
2
4
6
8
Vd (V)
255nm LED

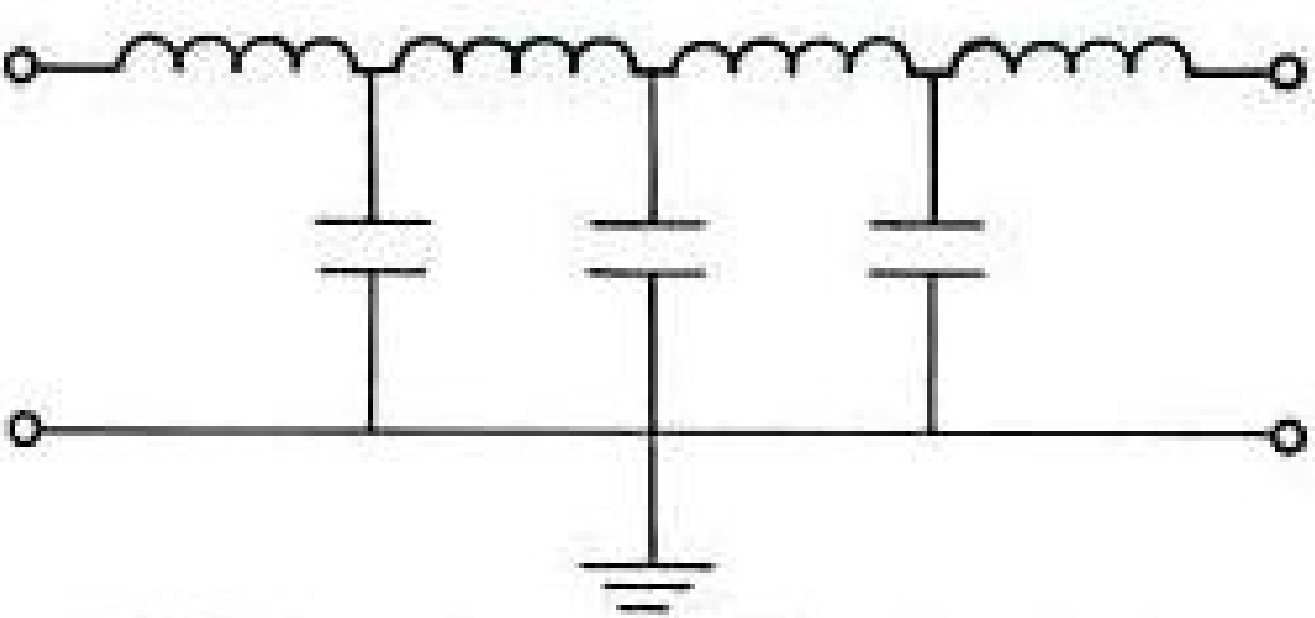
- Quantum efficiency = 0.21 e^-/photon
- Bell jar - pico-ammeter
- . NOISE – signal
- Improvements



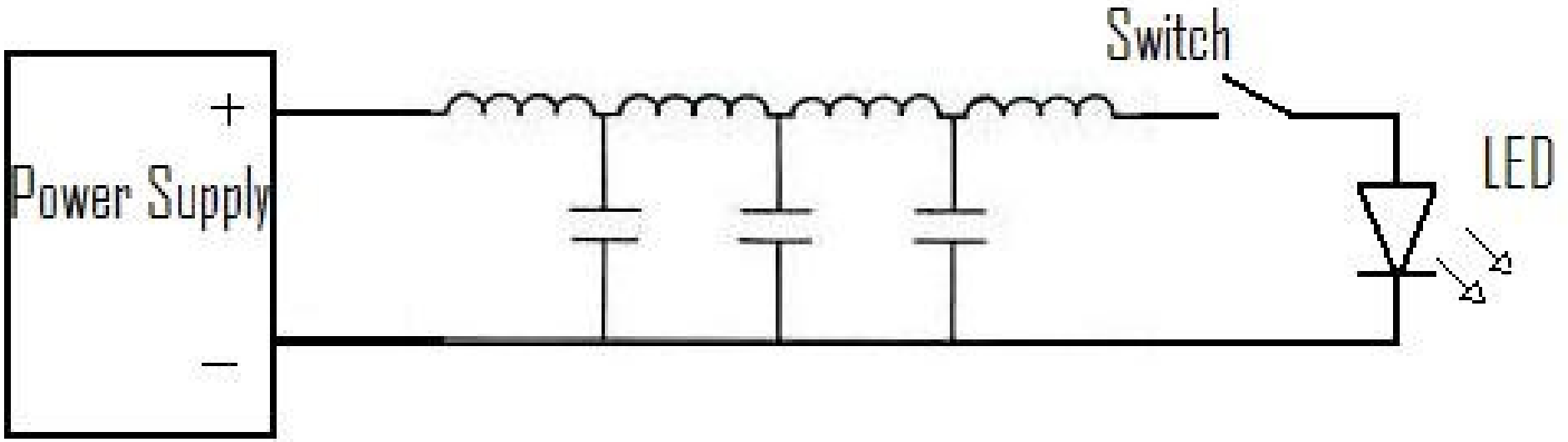


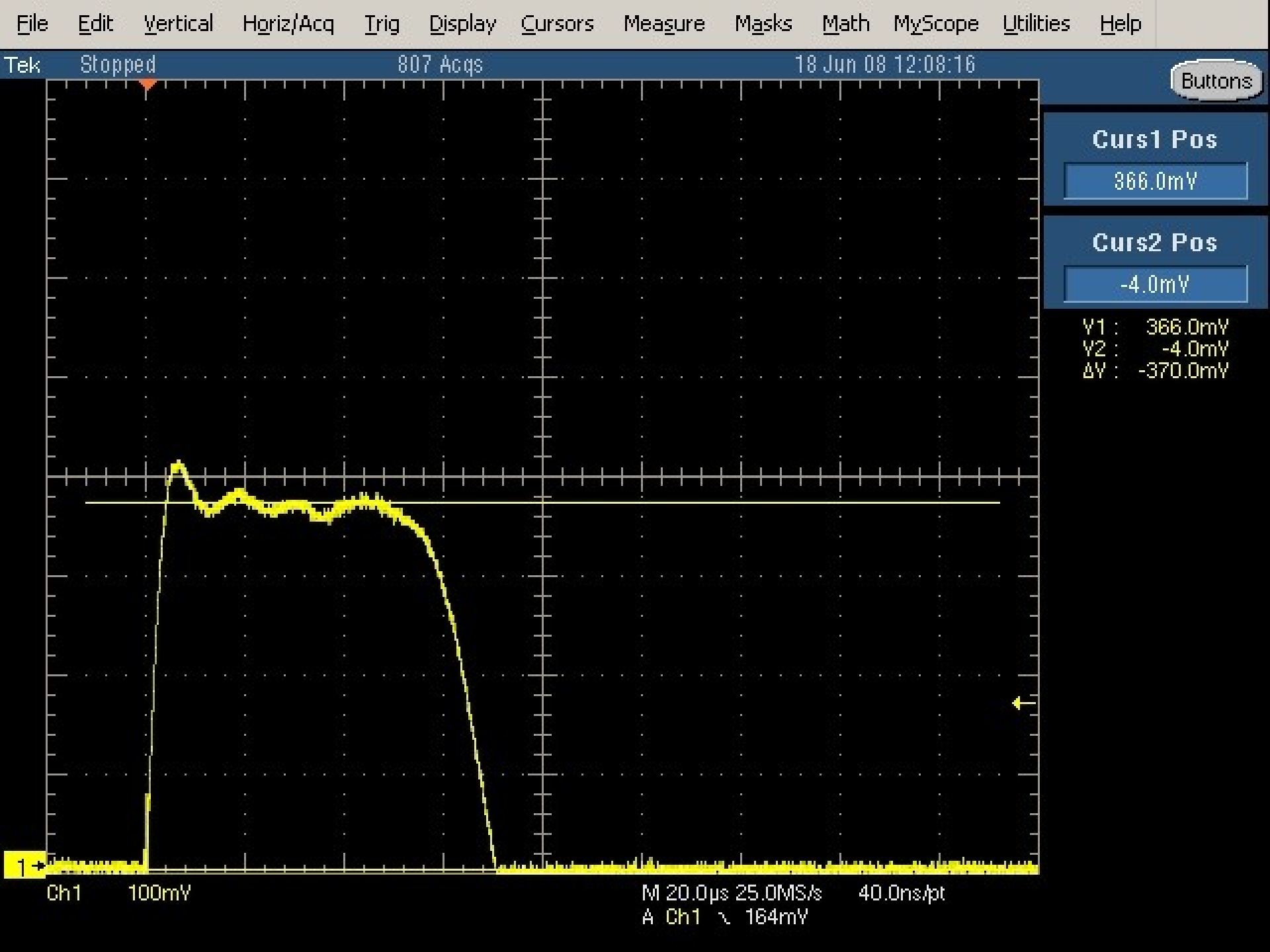


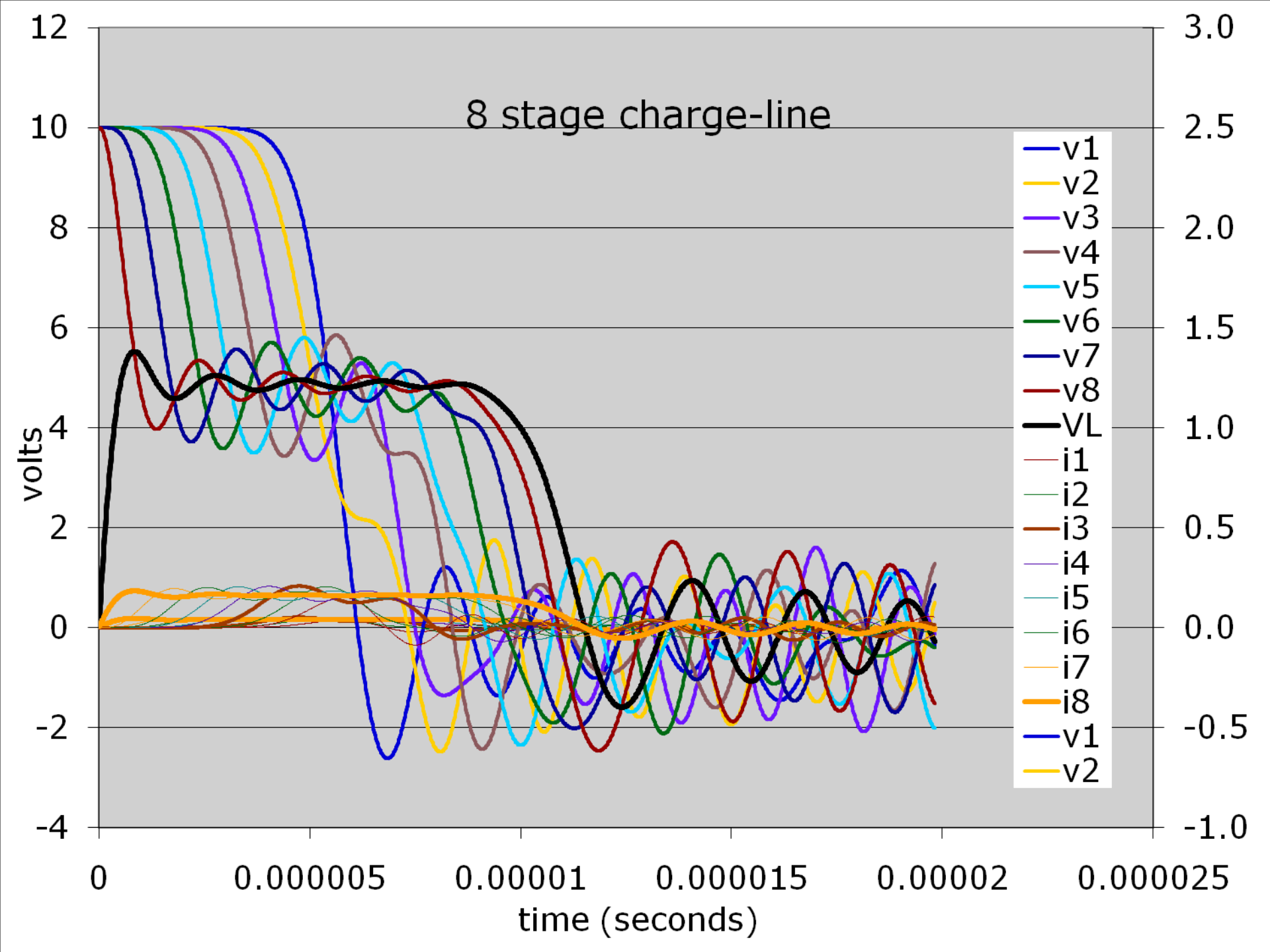
- Lot of current in a short period of time
- Lumped delay line



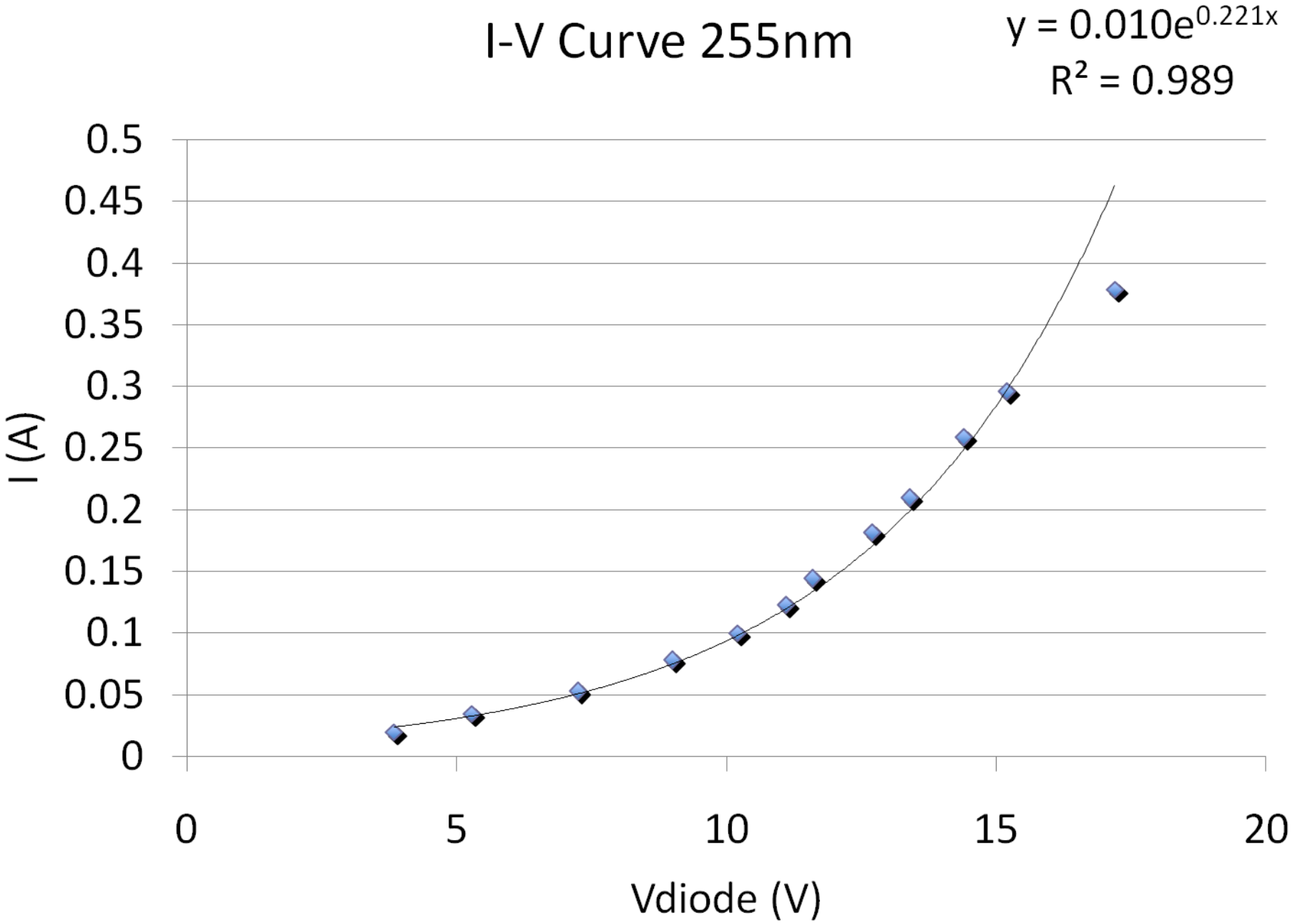
- $T=\sqrt{LC}= 34.64\ \mu s$
- The discharge time is the double of the time we calculated.

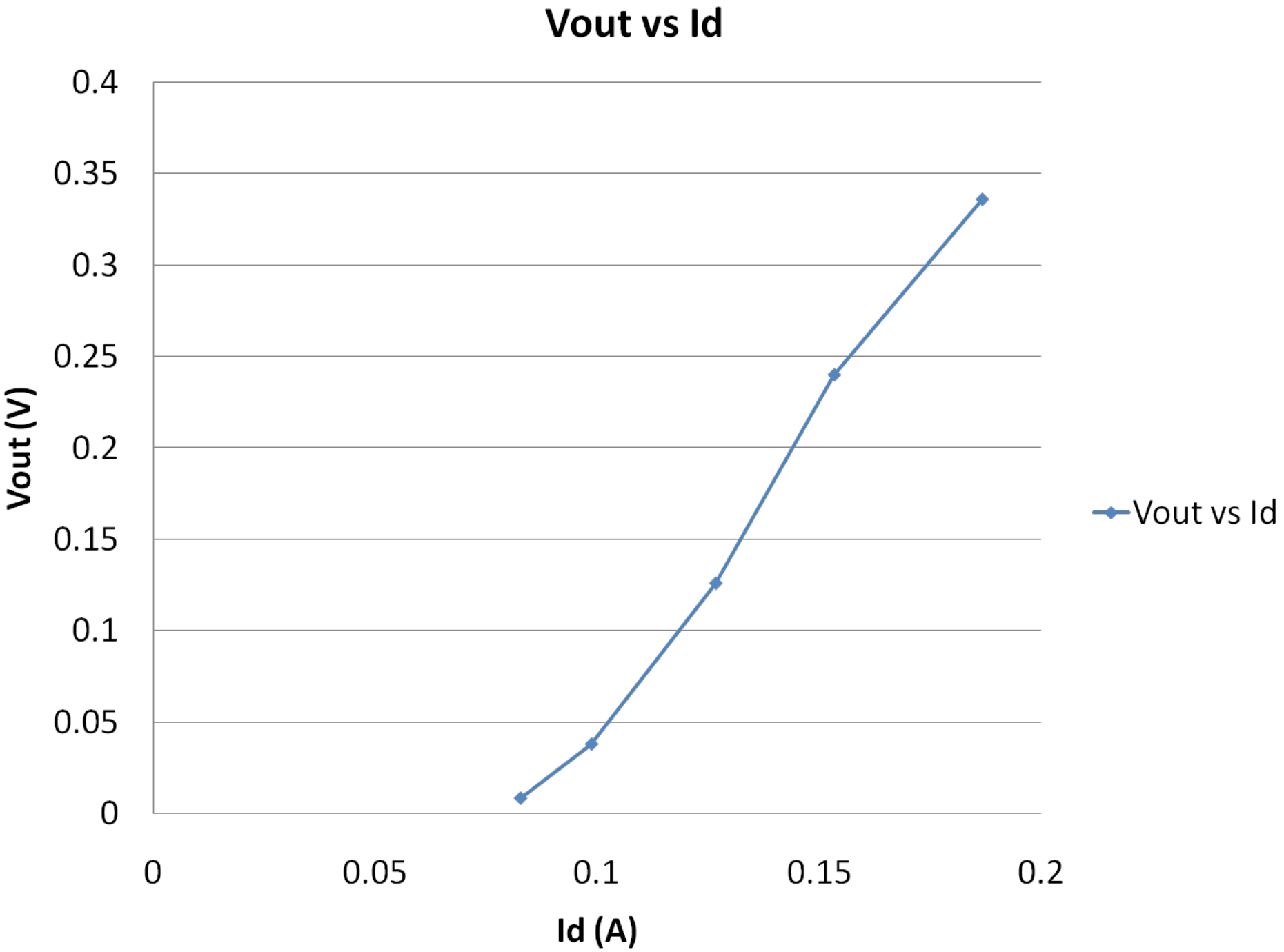

Switch
LED
+
Power Supply
–


File Edit Vertical Horiz/Acq Trig Display Cursors Measure Masks Math MyScope Utilities Help
Tek Stopped 807 Acqs 18 Jun 08 12:08:16
Buttons
Curs1 Pos
366.0mV
Curs2 Pos
-4.0mV
V1 : 366.0mV
V2 : -4.0mV
ΔV : -370.0mV
1→
Ch1 100mV
M 20.0µs 25.0MS/s 40.0ns/pt
A Ch1 ∿ 164mV

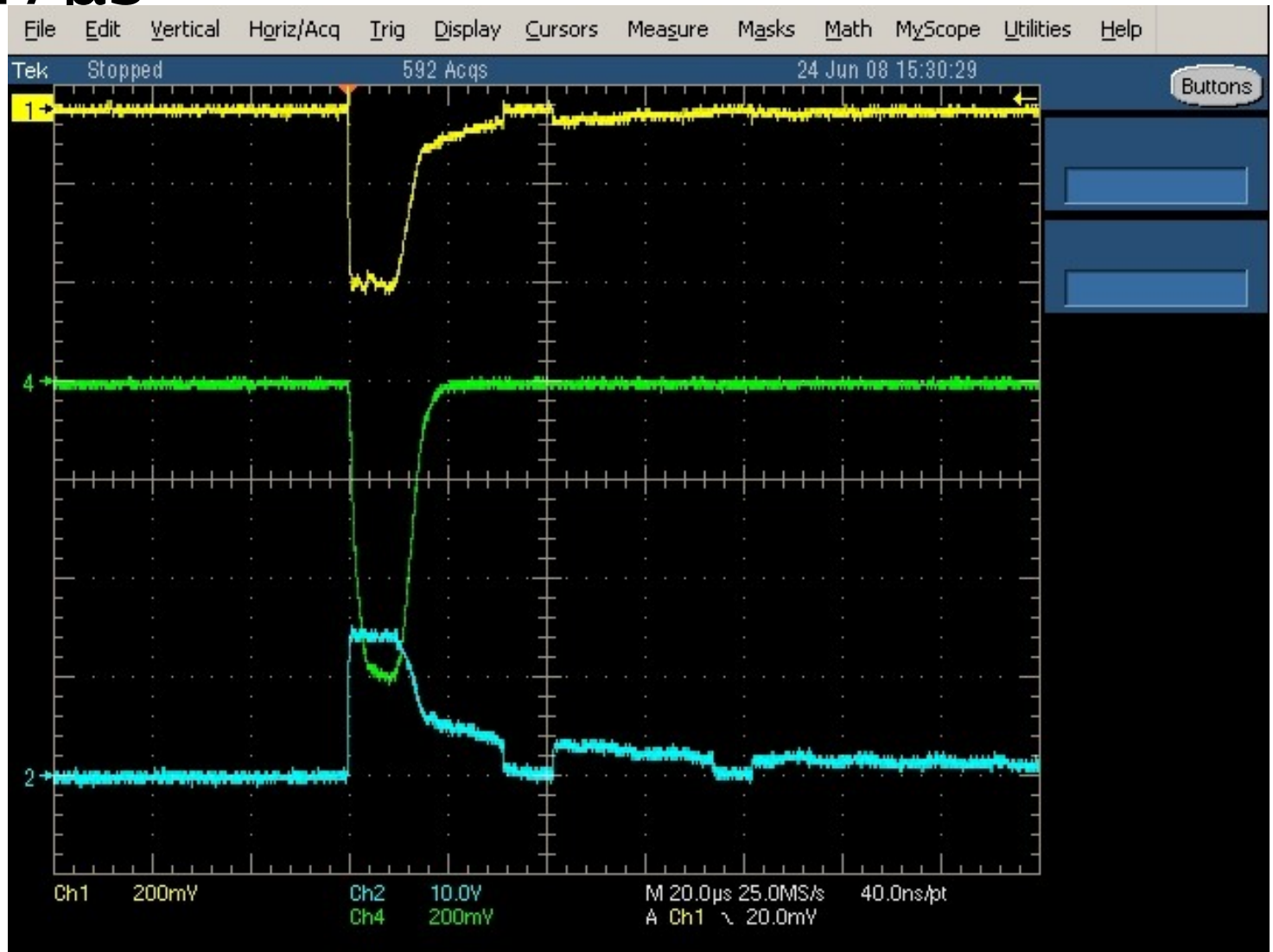

8 stage charge-line
volts
time (seconds)
12
10
8
6
4
2
0
-2
-4
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
0
0.000005
0.00001
0.000015
0.00002
0.000025
v1
v2
v3
v4
v5
v6
v7
v8
VL
i1
i2
i3
i4
i5
i6
i7
i8
v1
v2

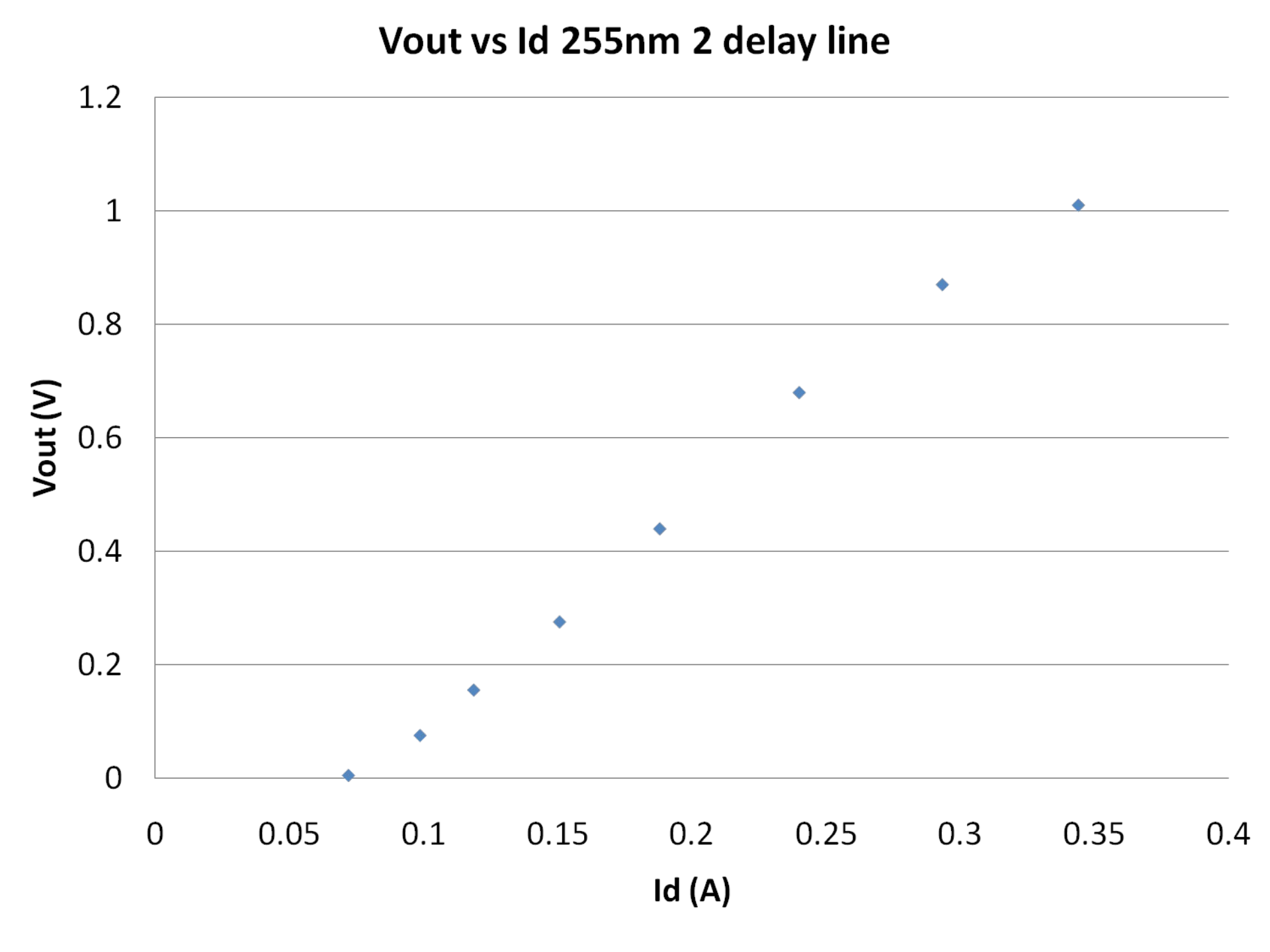
Results


I-V Curve 255nm
y = 0.010e^0.221x
R² = 0.989
I (A)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15
20
Vdiode (V)


Vout vs Id
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Vout (V)
0
0.05
0.1
0.15
0.2
Id (A)
Vout vs Id

- The pulse is long
- Build another. T= 8 µs.
- ≈17µs

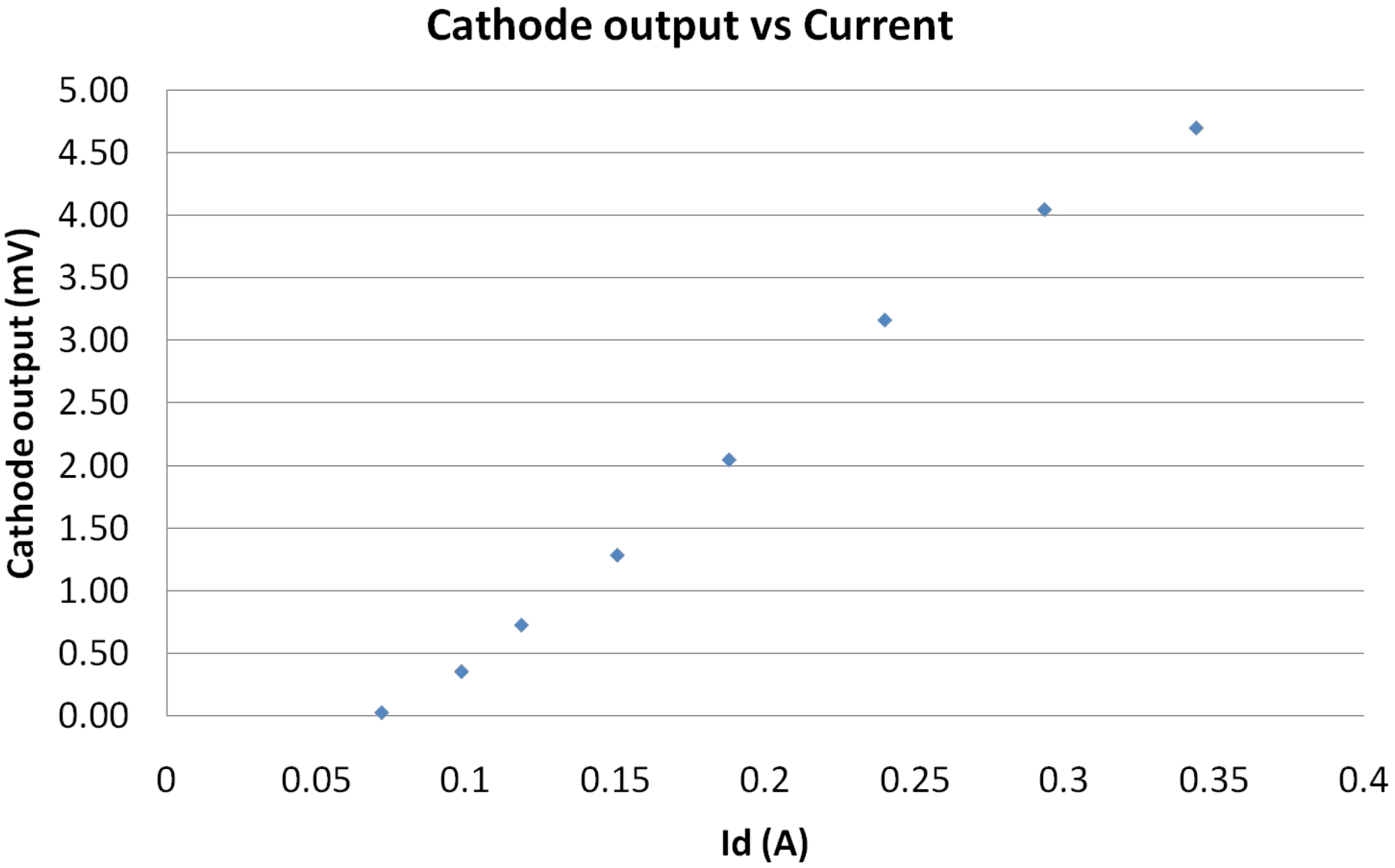



Vout vs Id 255nm 2 delay line
1.2
1
0.8
0.6
0.4
0.2
0
Vout (V)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Id (A)

- Broken LED.
- These tests were made with the phototube, to be sure that we had a good signal, and after that we tried with the bell jar but we never saw anything.
- LED vs Fiber.

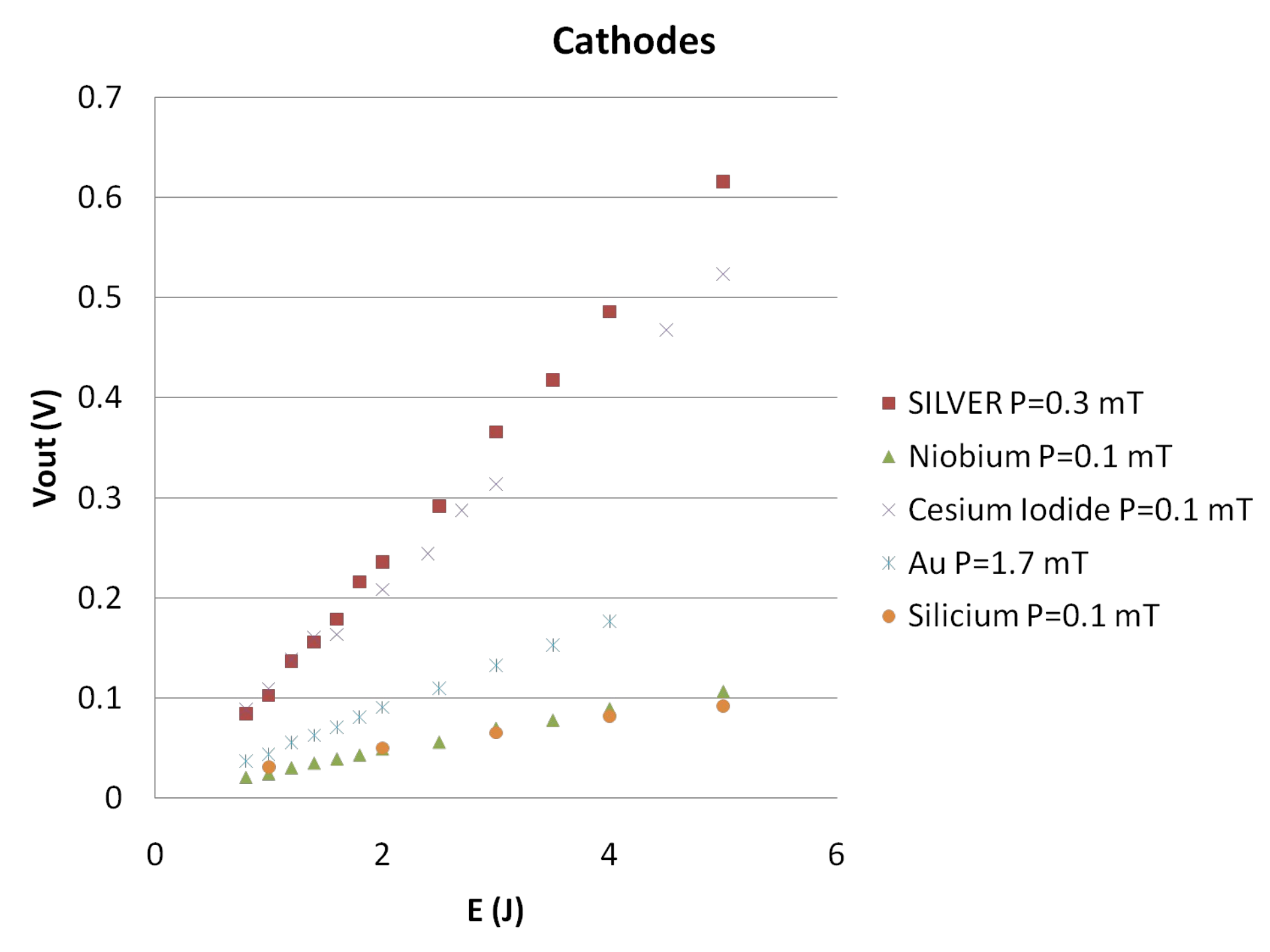
- Omnipresent problem in the bell jar: NOISE
- Changed some components
- Integrator
- Grounds
- Signal from the flash lamp
- Noise is 20 mV

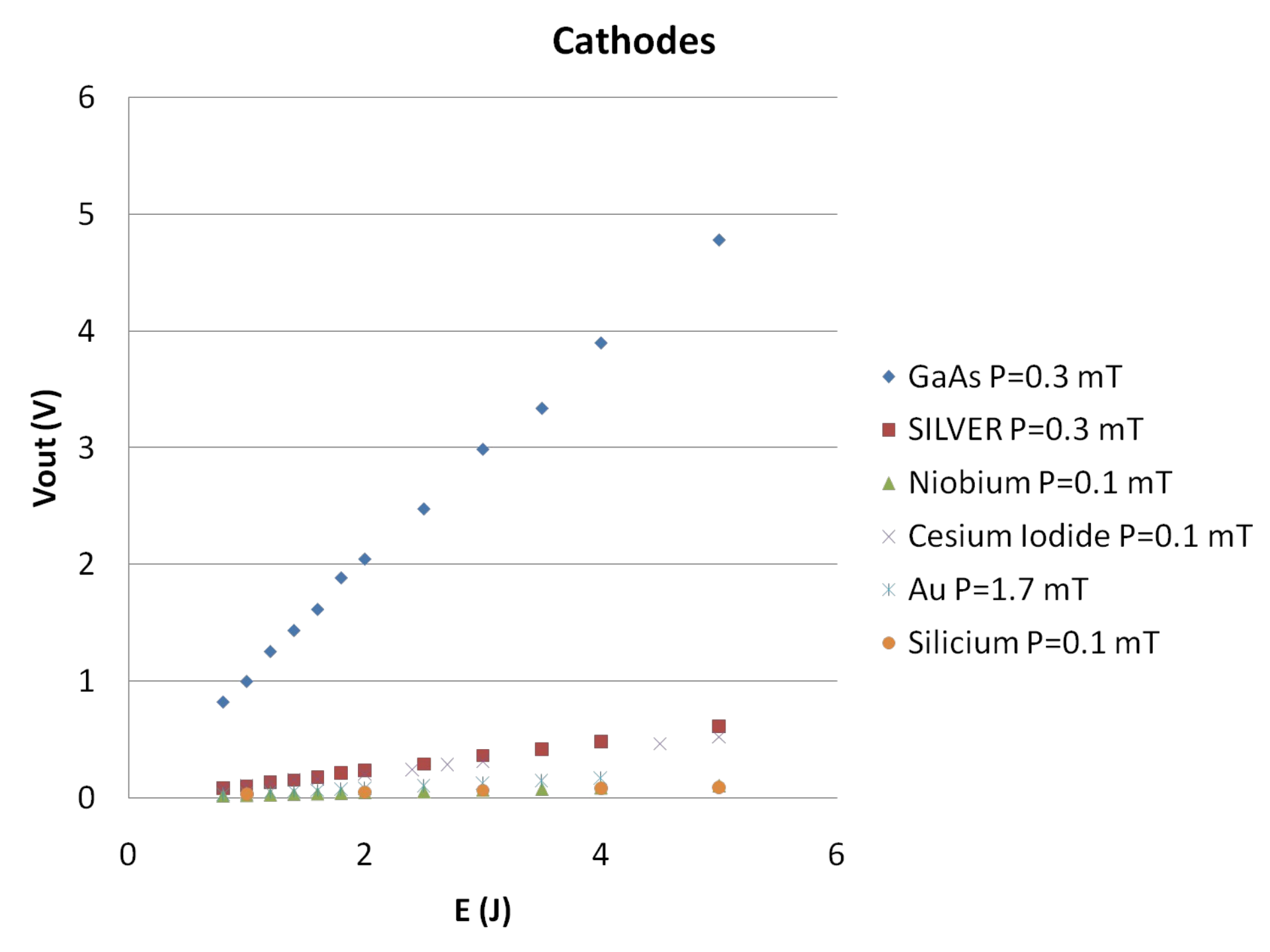
- Rough estimation of the quantum efficiency Au cathode: 0.001, hence



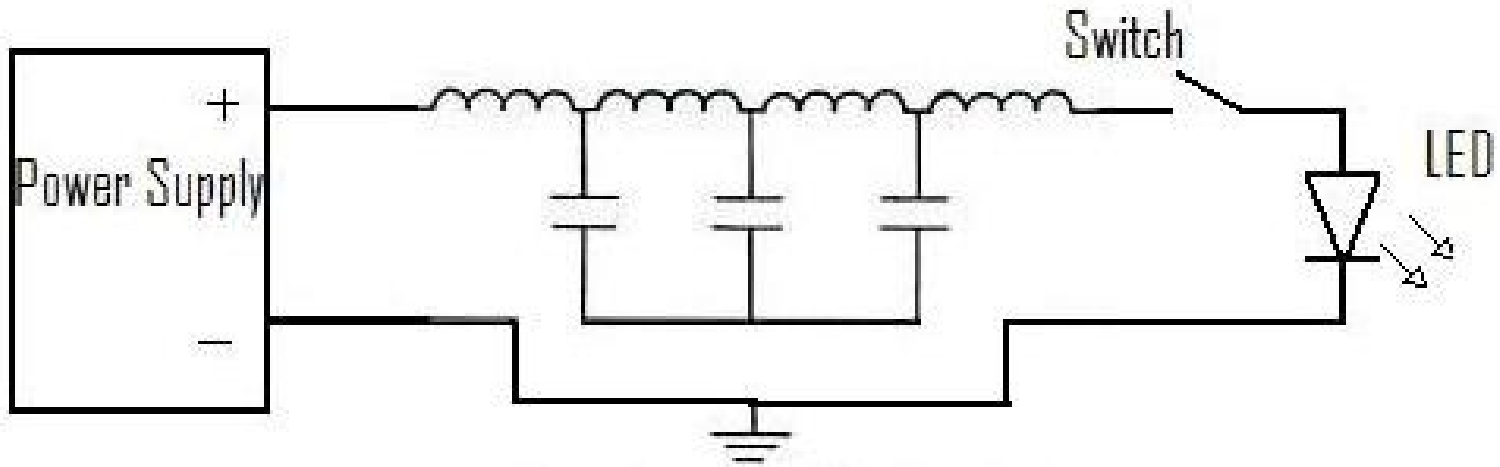
- PANIC = new cathodes
- The first option is cesium iodide (CsI), which is said to have a very good response with respect to gold.
- Make the cathode
- CsI absorbs a lot of moisture
- No difference
- Get rid of the noise
- Research about cathodes

- Cathodes tested
- Silver (Ag)
- Galium arsenide (GaAs)
- Zinc (Zn)
- Niobium (Nb)
- Silicium (Si)
- Gadolinium (Gd) (to be used)
- After a couple of tests, we realized that the output voltage is dependent of the pressure inside the bell jar. From this point we tried to make all the measurements at a constant pressure


Cathodes
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Vout (V)
0
2
4
6
E (J)
SILVER P=0.3 mT
Niobium P=0.1 mT
Cesium Iodide P=0.1 mT
Au P=1.7 mT
Silicium P=0.1 mT


Cathodes
Vout (V)
E (J)
0
1
2
3
4
5
6
0
2
4
6
GaAs P=0.3 mT
SILVER P=0.3 mT
Niobium P=0.1 mT
Cesium Iodide P=0.1 mT
Au P=1.7 mT
Silicium P=0.1 mT

- Tests made with the flash lamp
- BROKEN LED AGAIN!



CONCLUSION

- A LOT OF WORK TO DO!

Thank you