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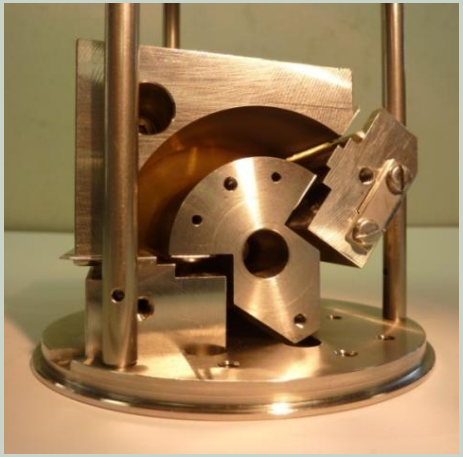
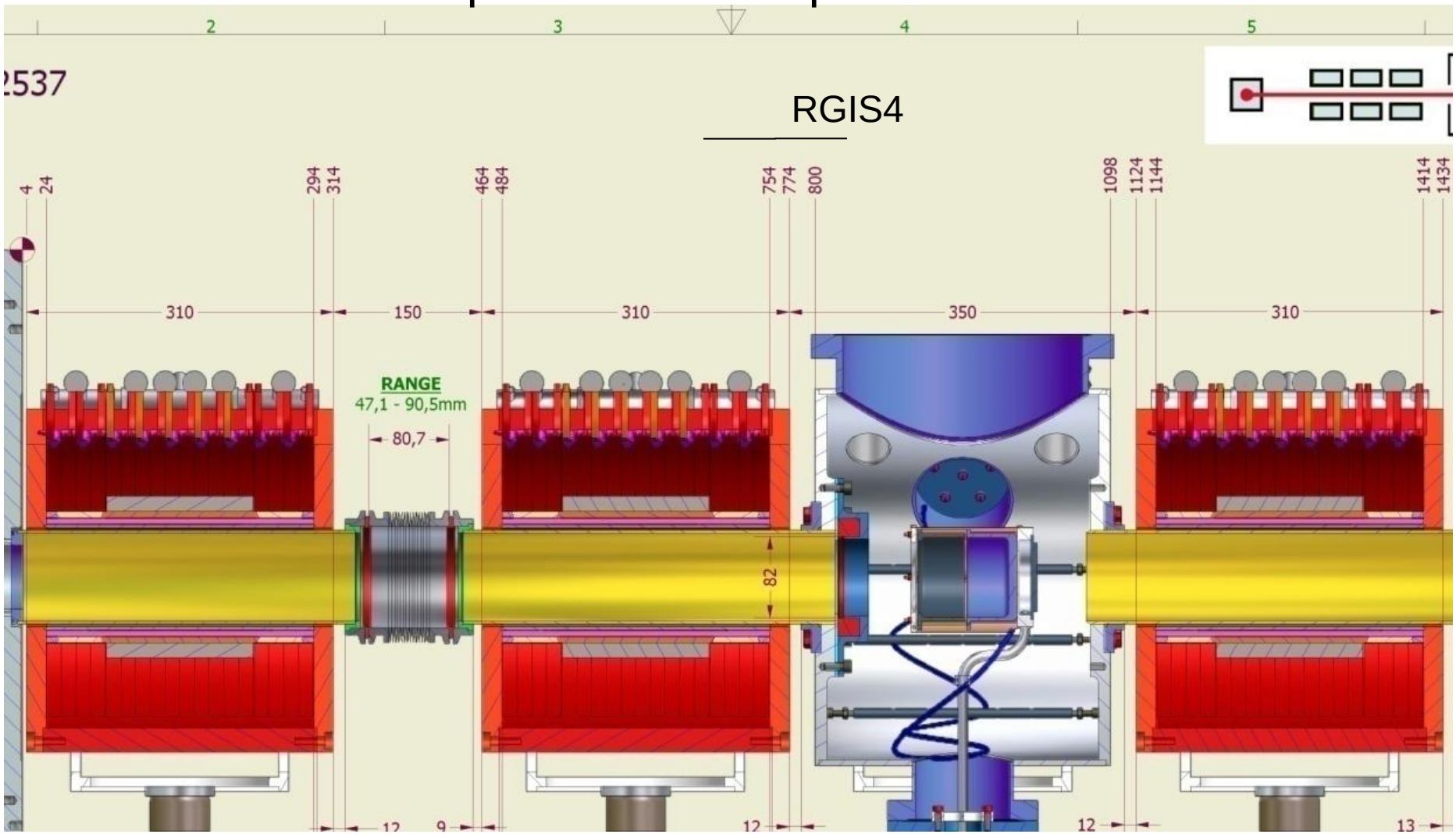
Residual Gas Ion Spectrometer v4 update

October 2012

by J. Pozimski, P. Savage, I. Clark & S. Alsari



Experimental setup in LEBT

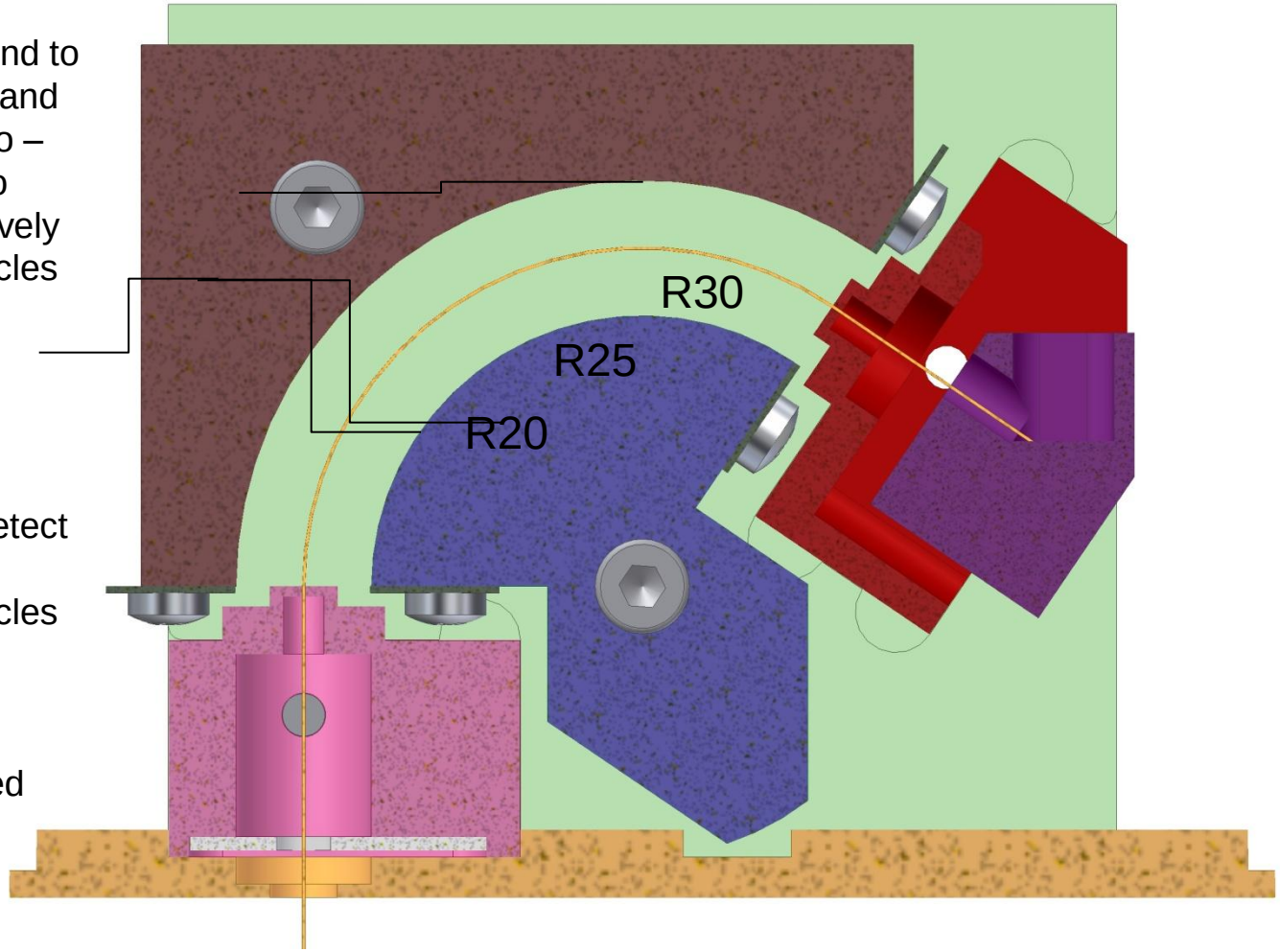


Residual Gas Ion Spectrometer v4 (RGIS4)

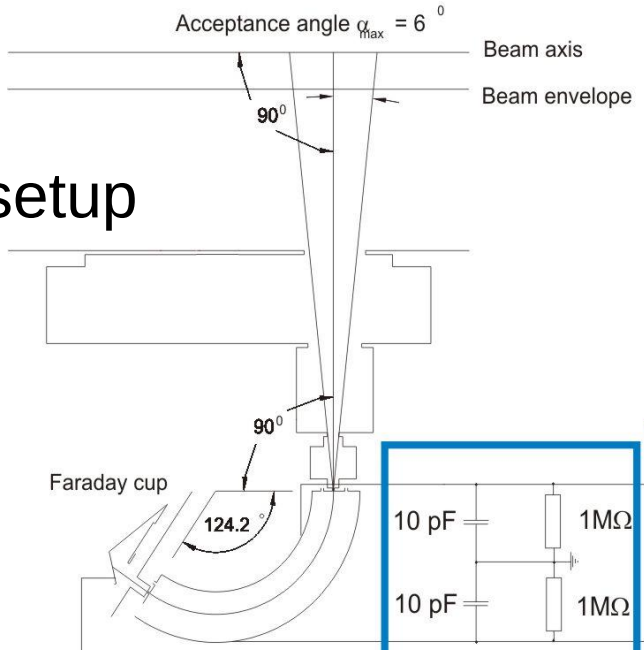
Set outer bend to +ve voltage and inner bend to –ve voltage to detect positively charge particles (in our case, residual gas ions)

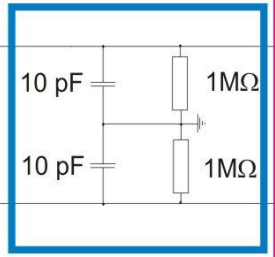
Reverse the polarity to detect negatively charge particles (in our case, electrons)

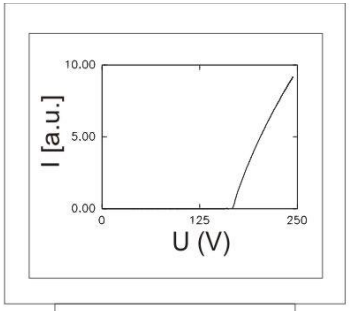
Fully shielded



Wiring of experimental setup







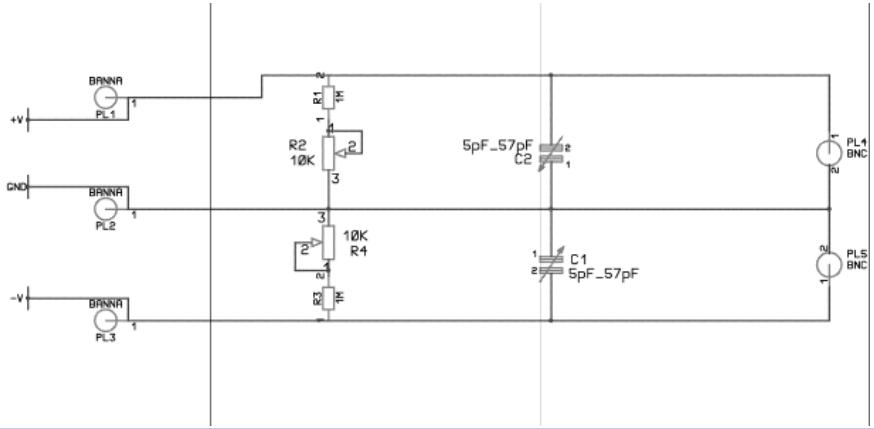
Data aquisation

electronically controled power supply

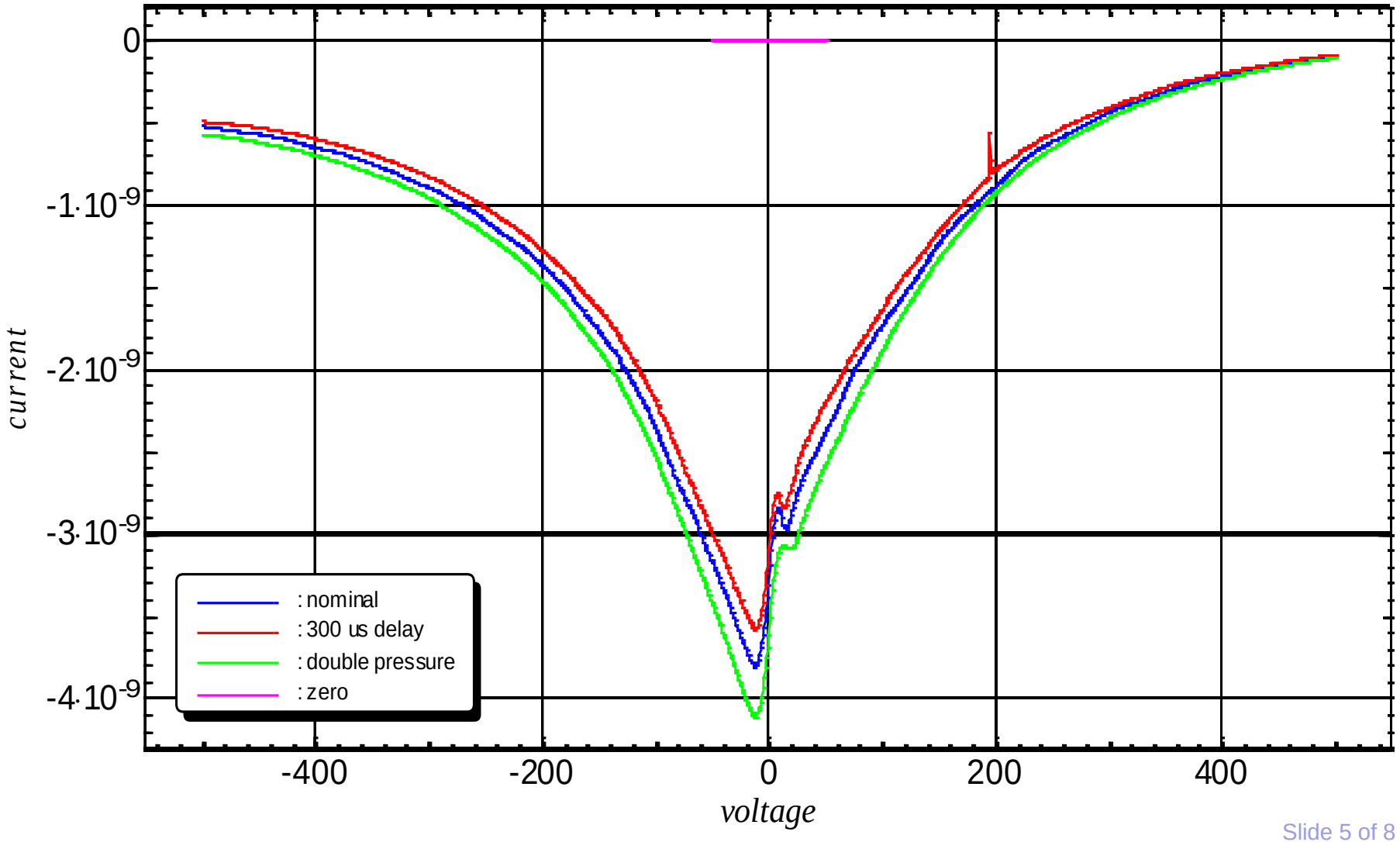
Keithley 6487

current amplifier

AD-Converter



Second set of measurements : 1st March 2012 – measurements 2

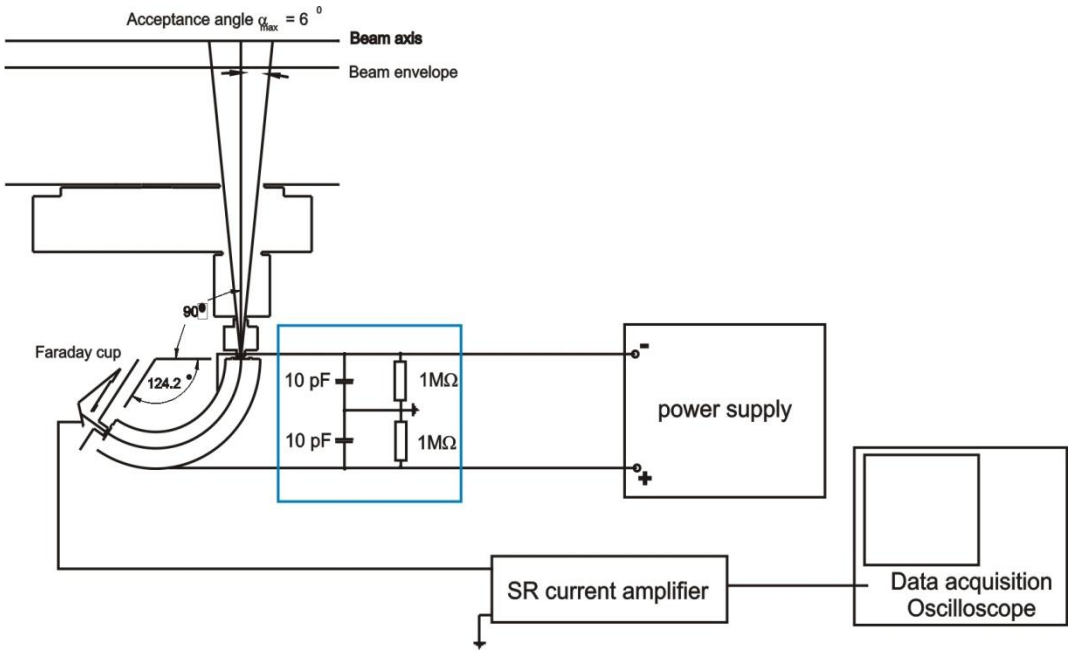


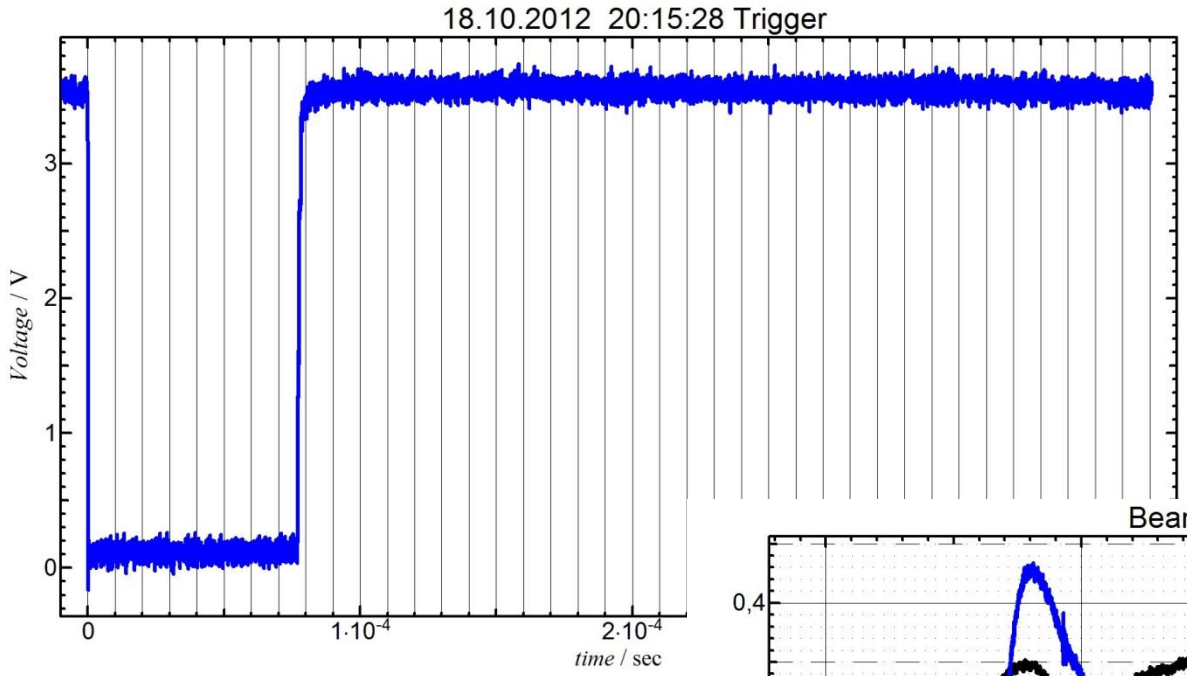
Due to persisting difficulties :

Change of experimental setup:

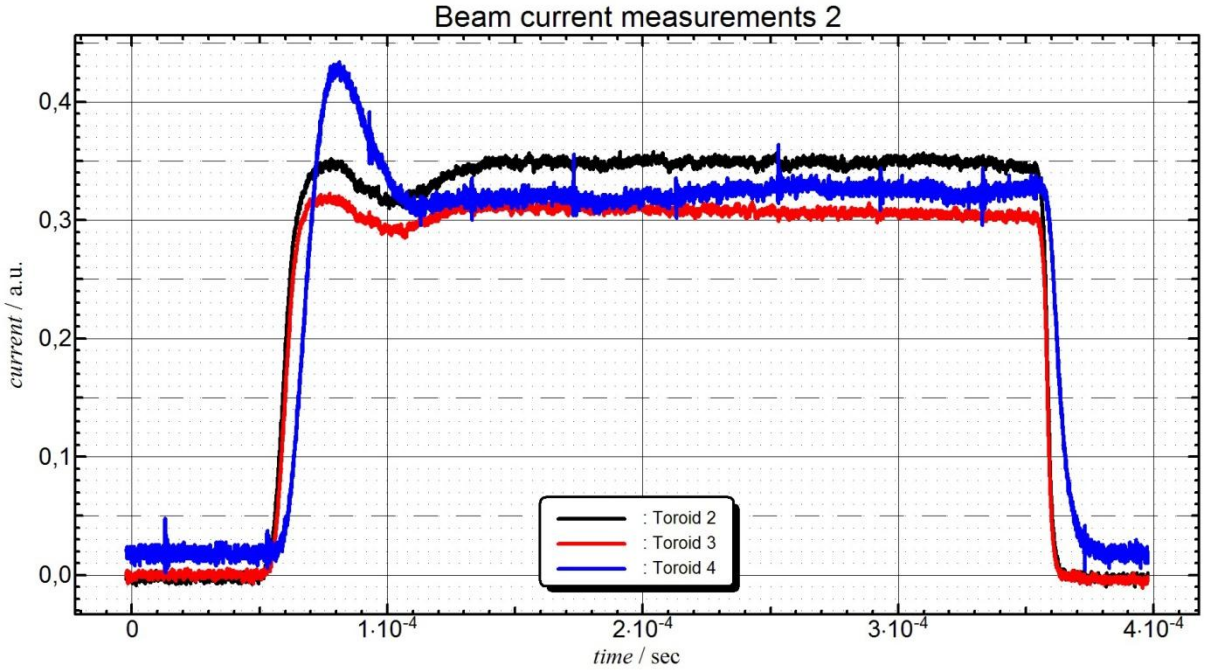
PS independent of data acquisition

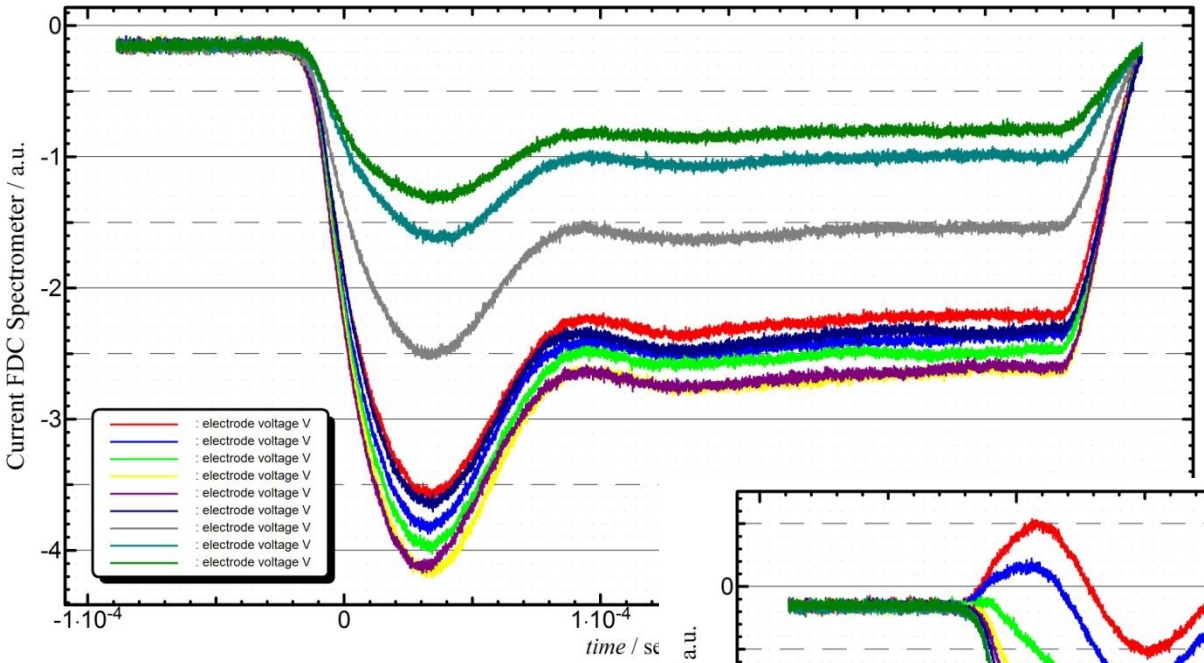
Data acquisition by Fast amplifier & Oscilloscope



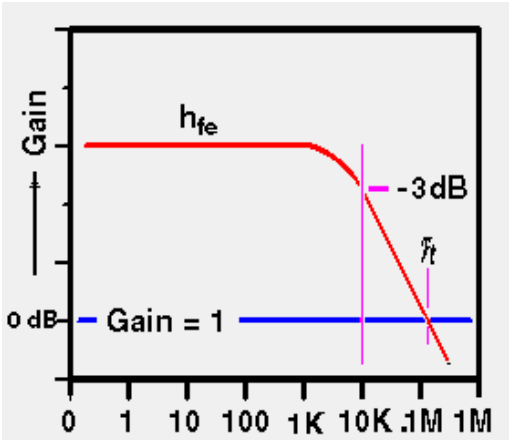


Currents observed by toroids at different positions in z. Toroid 4 has a different number of windings....

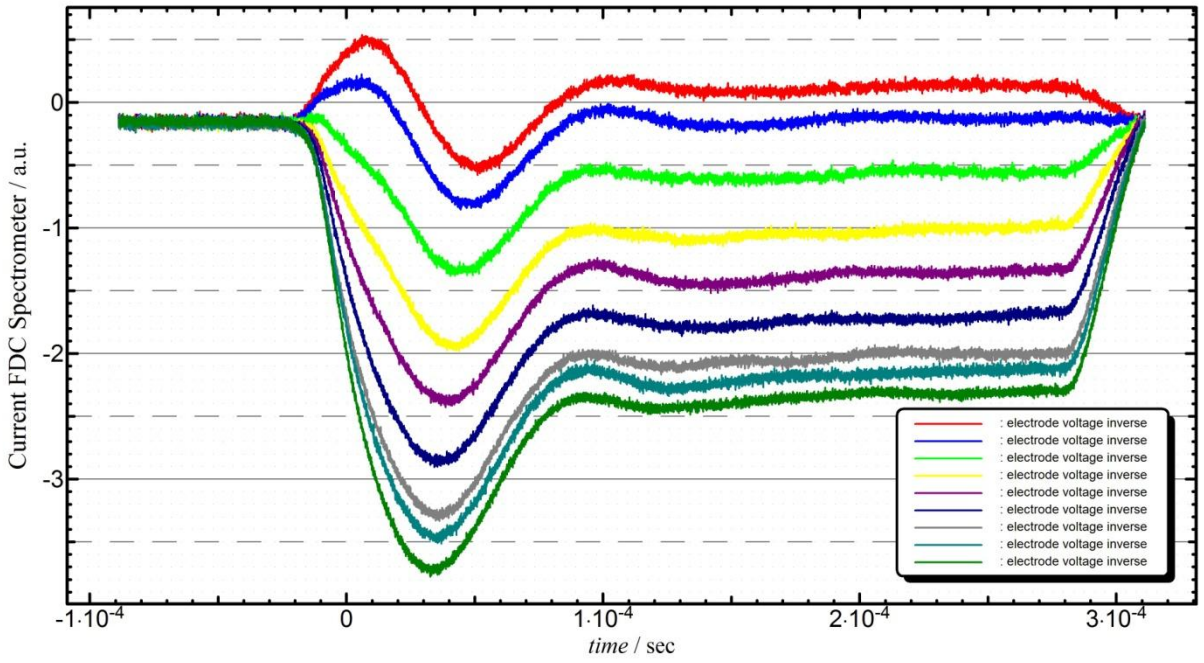


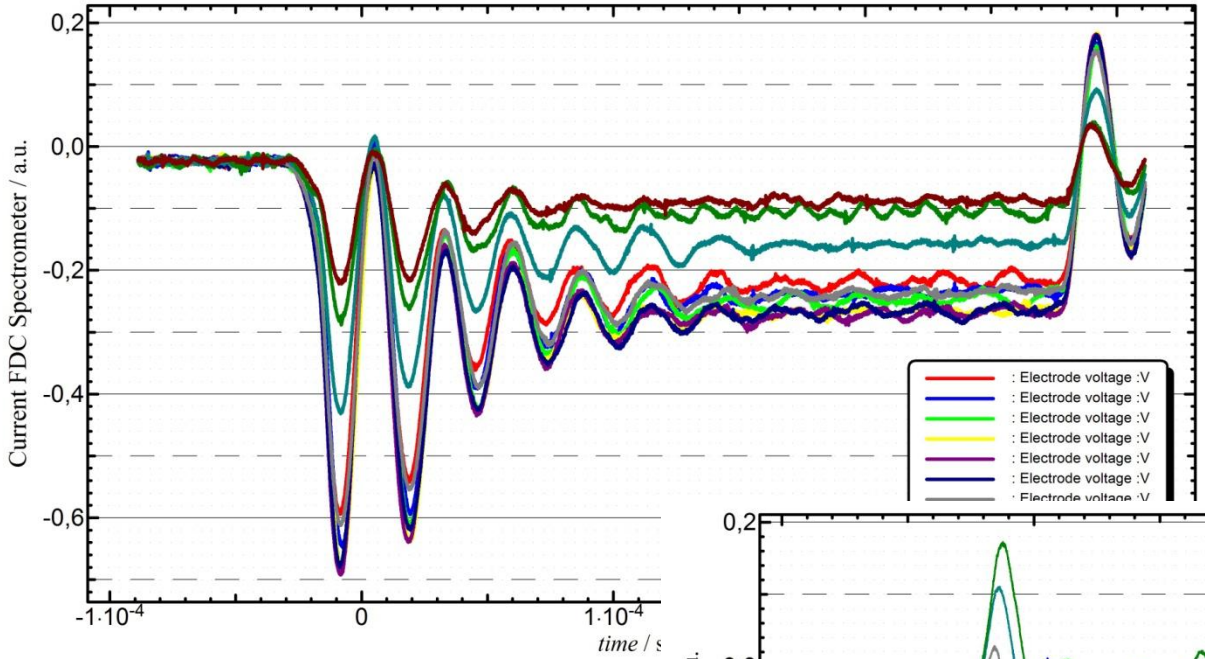


Bandwidth issue !



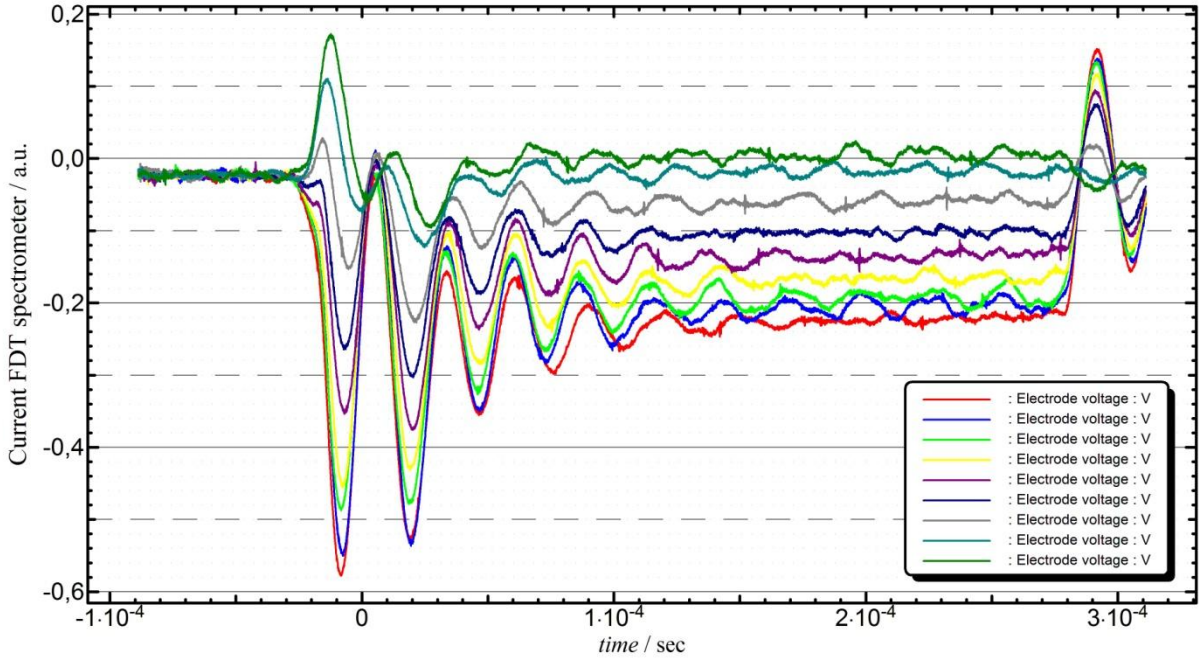
Currents observed by FDC for different deflection voltages with neg. (upper) and positive (right) polarity (range : 10nA/Volt)

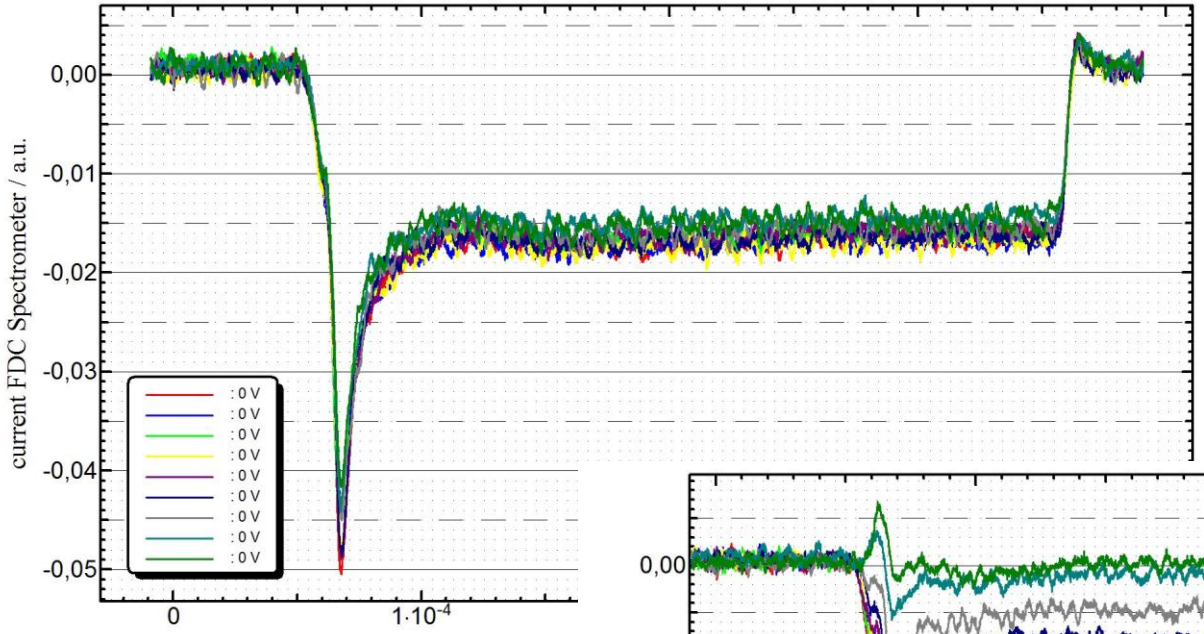




Bandwidth issue reduced but still persists !
Replaced amplifier..

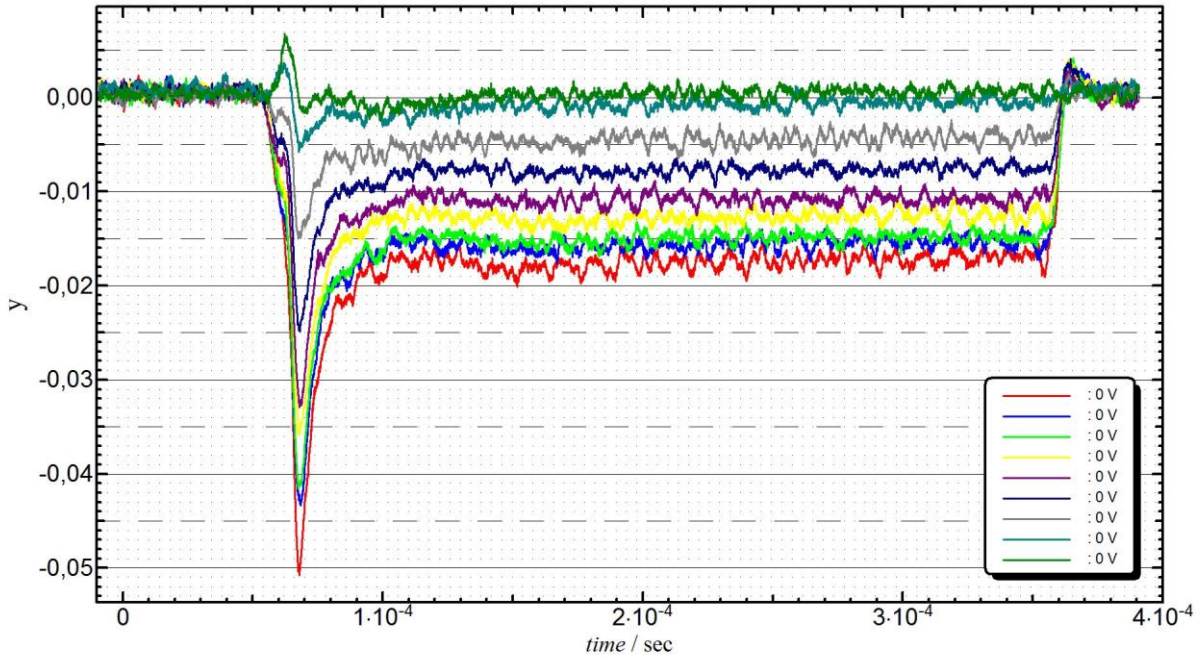
Currents observed for different deflection voltages with neg (upper) and positive (right) polarity (range : 100nA/Volt)



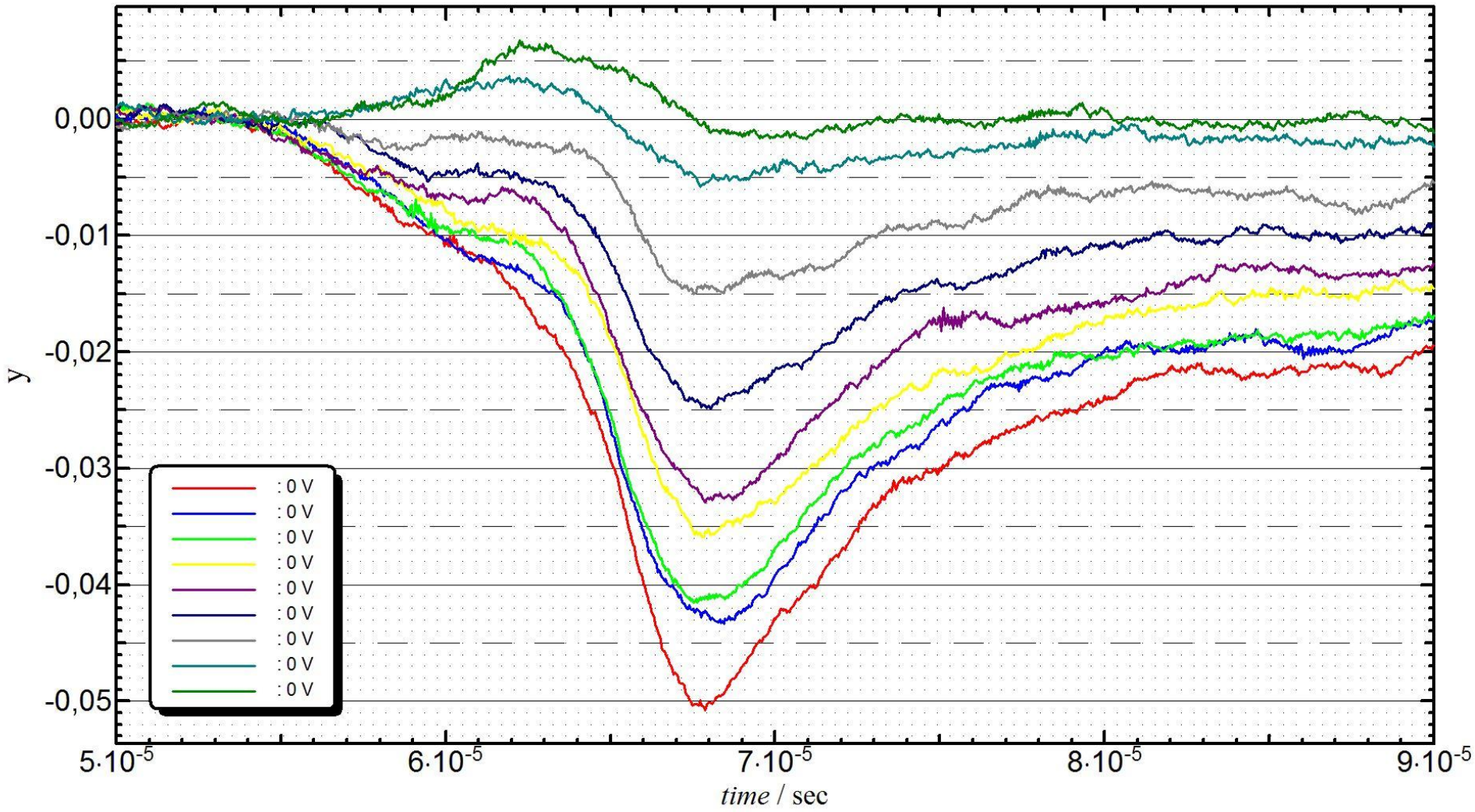


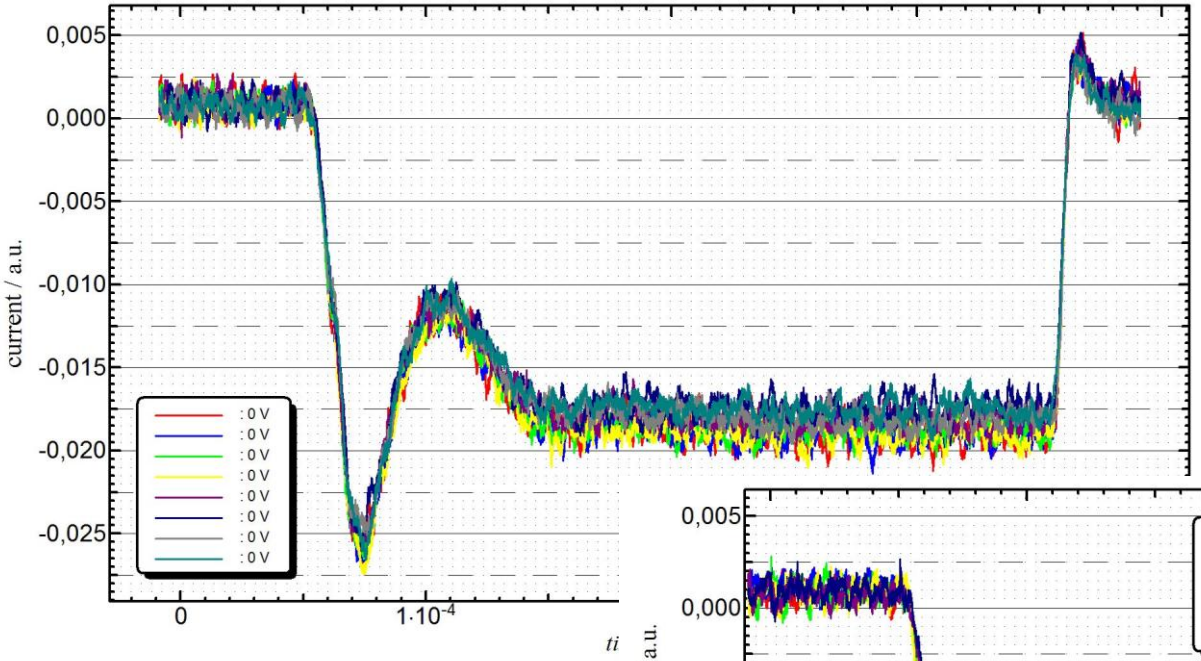
Bandwidth issue seems resolved!

Currents observed for different deflection voltages with neg (upper) and positive (right) polarity (Range : 500nA/Volt)

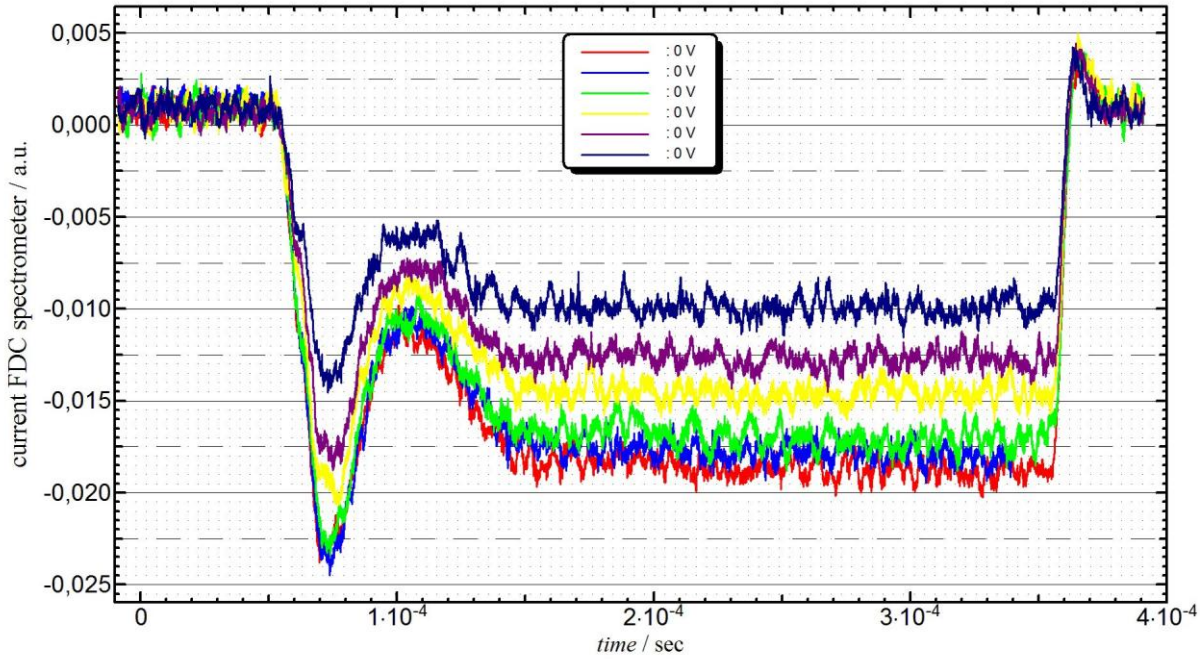


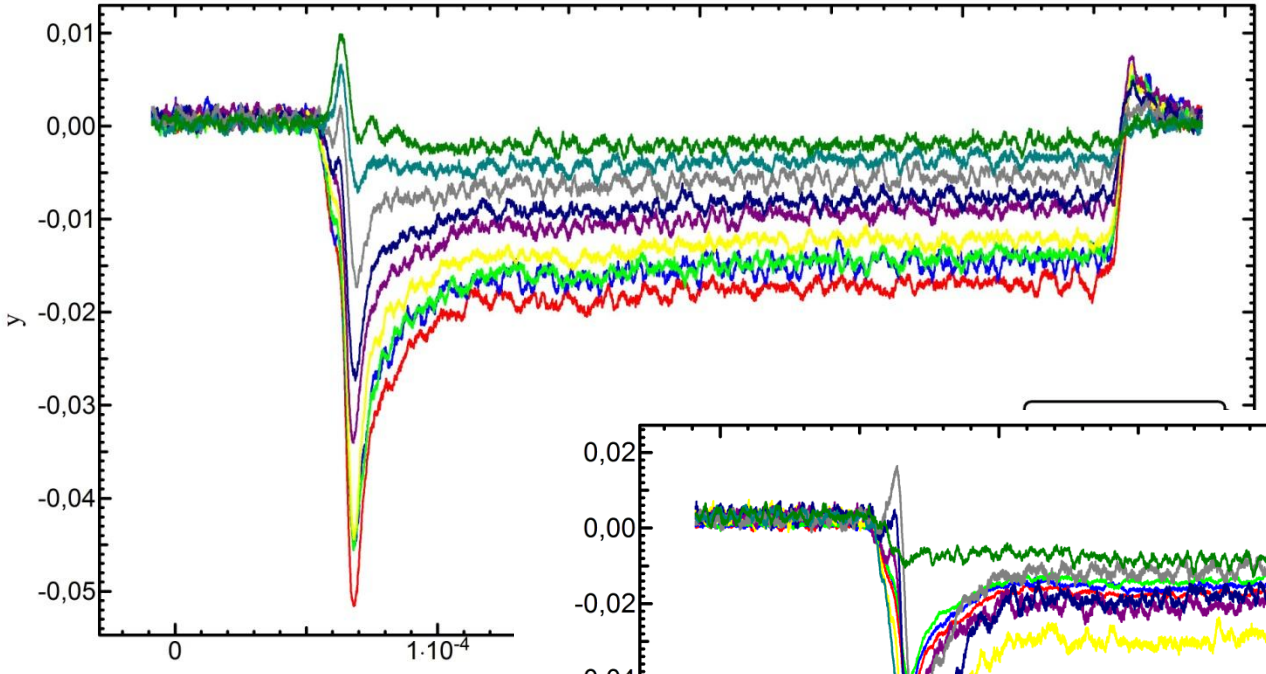
Detail of previous measurement – there is something...

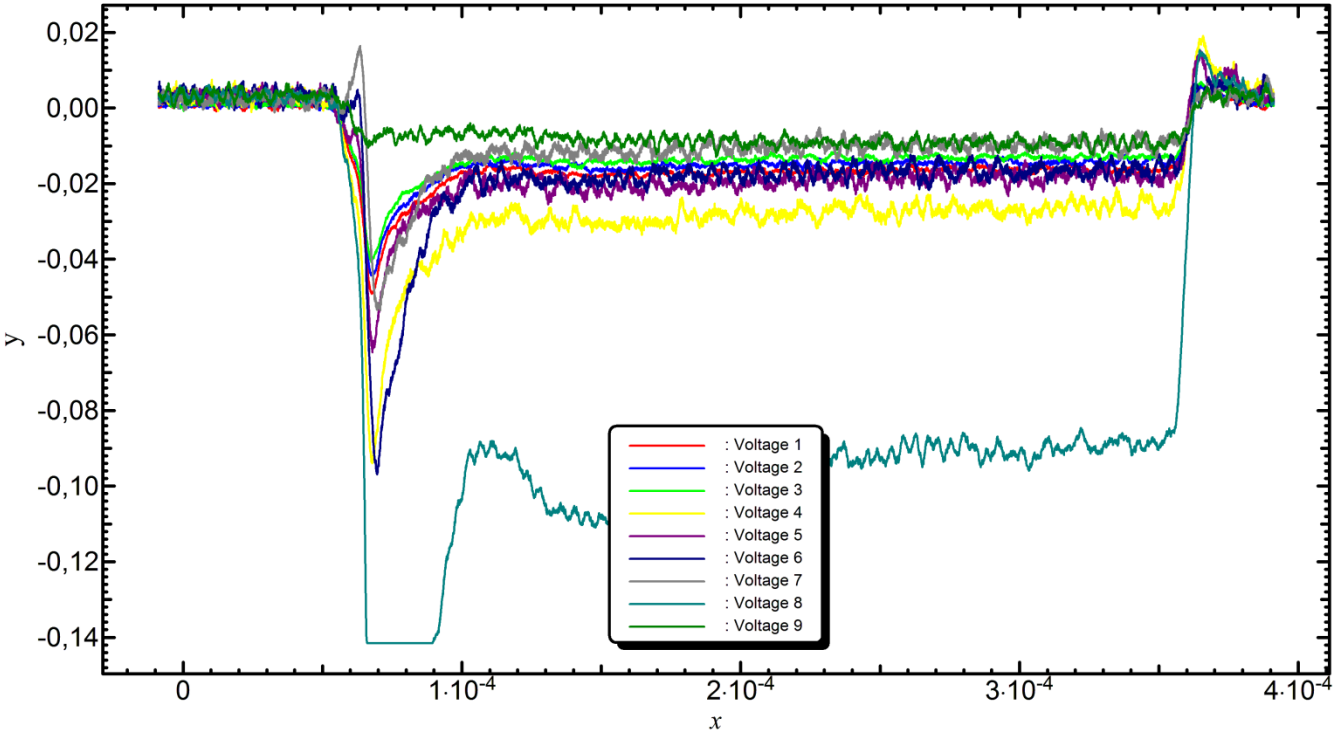




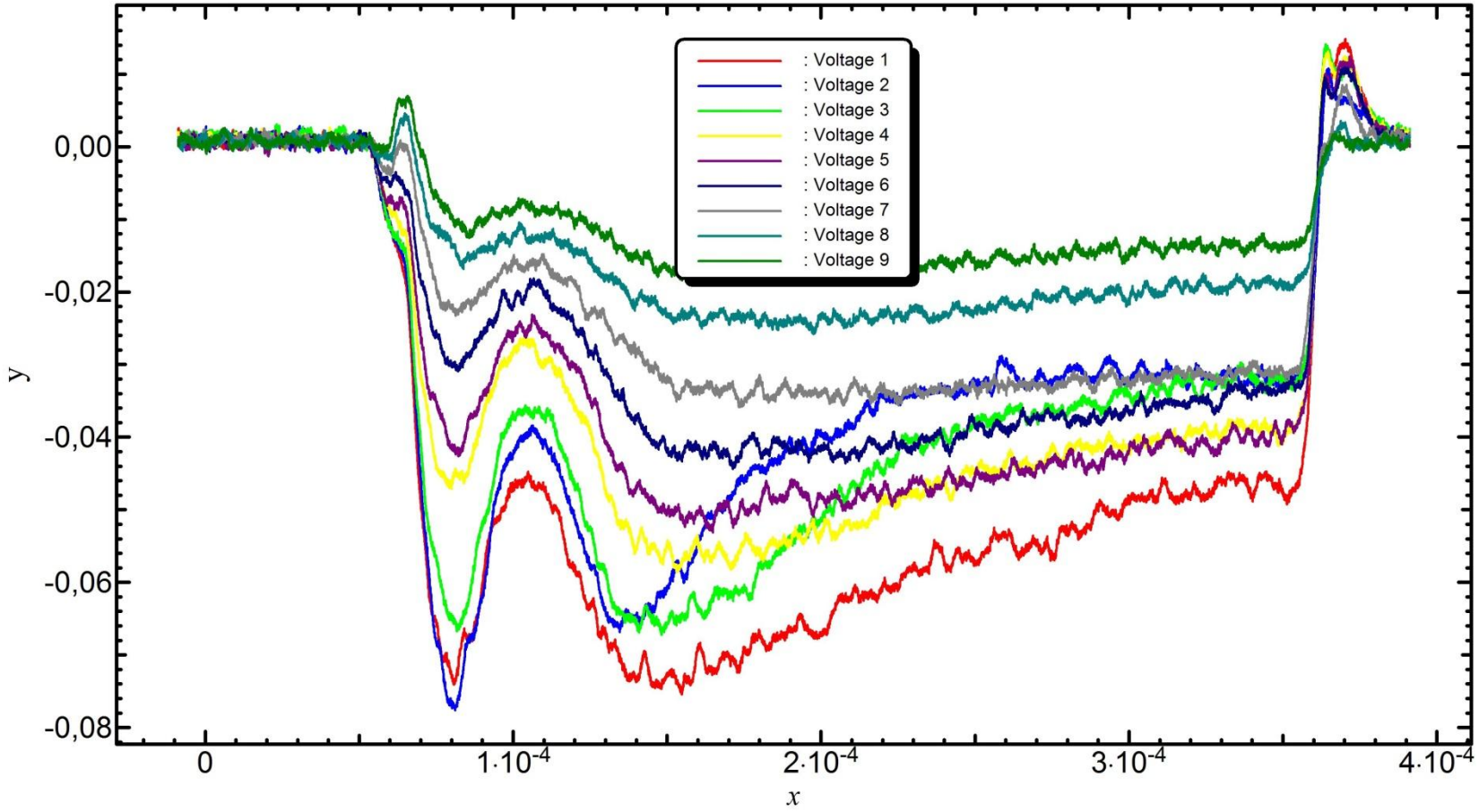
Solenoid settings change from 180 / 100 A to 200/120 A



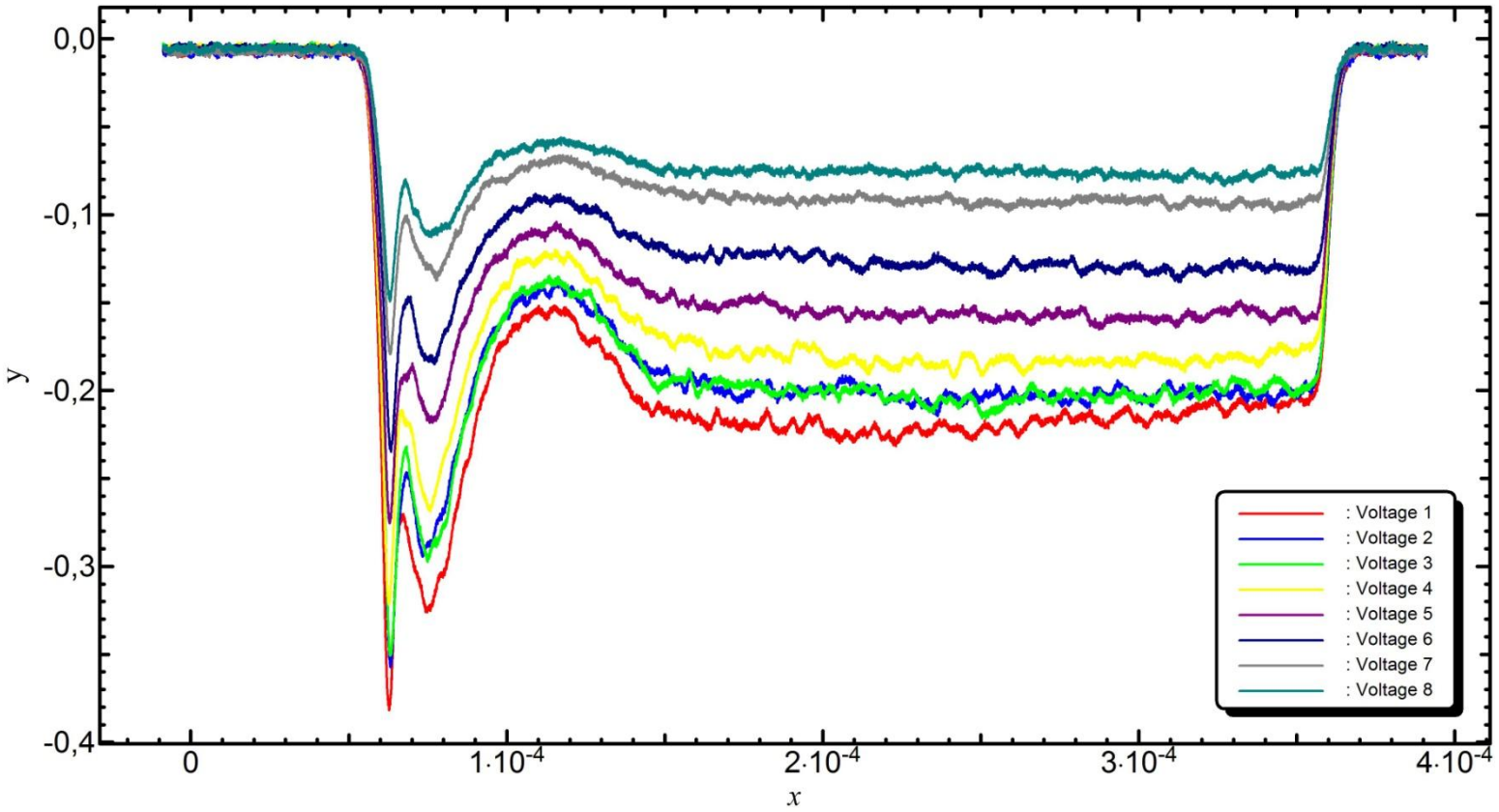




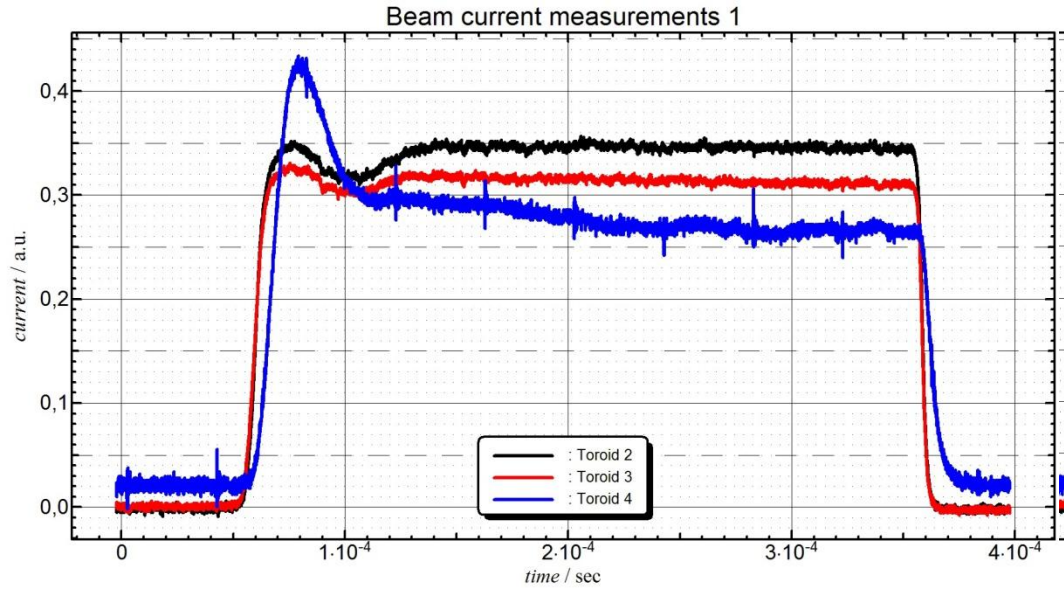
Gas pressure fr
1.05 to 1.17 an
1.27 10-5 hpa
Krypton
Solenoid settin
180 / 100 A

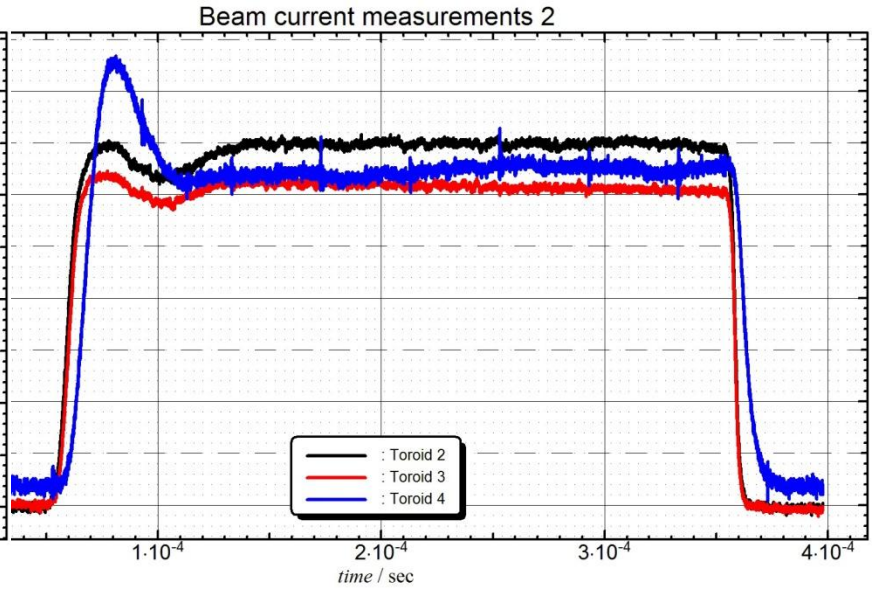


Gas pressure : 1.53 10-5 hpa H2 + Krypton
Solenoid settings 150 / 0 A

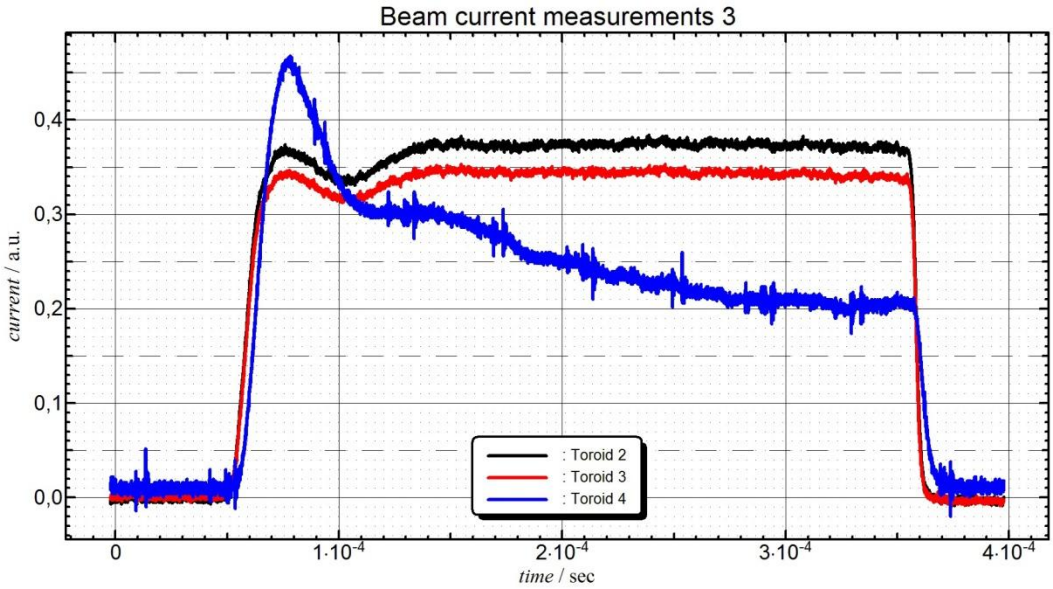


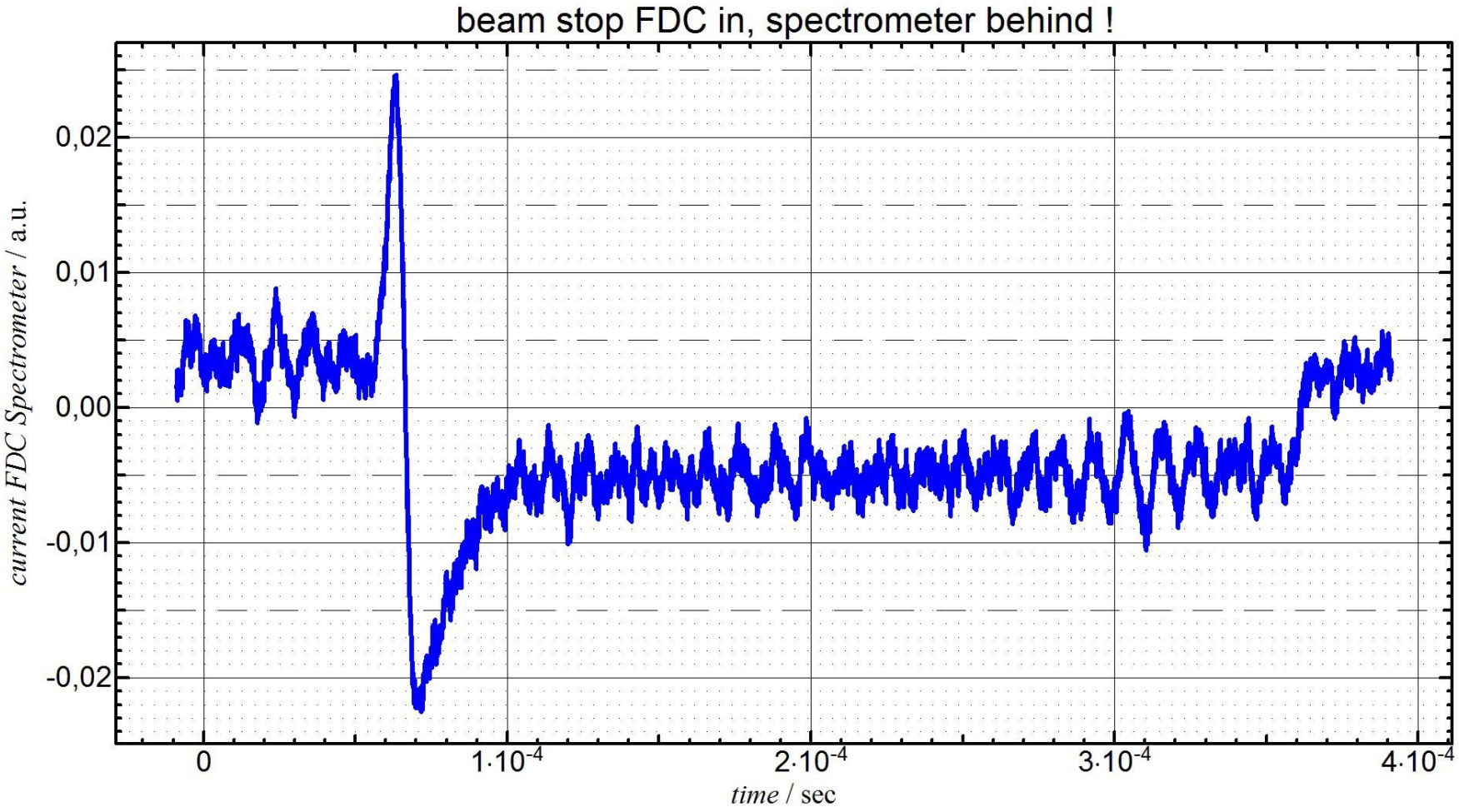
Gas pressure: 1.53 10-5 hpa H2 +Krypton
Solenoid settings : 150 / 0 A
decompensated (0-75 V)





Beam current measurements
For different settings of solenoids
1 : 150 / 0 A - gas & decomp
2: 150 / 0 A - gas
3: 180 / 100 - gas




beam stop FDC in, spectrometer behind !
current FDC Spectrometer / a.u.
0,02
0,01
0,00
-0,01
-0,02
0
1·10-4
2·10-4
3·10-4
4·10-4
time / sec

Summary

PS independent of data acquisition -> replace by Keithley (energy range & computer controlled PS)

Data acquisition by Fast amplifier & Oscilloscope -> might add pre amplifier to see if amplifier noise (oscilloscope) can be reduced.

Still some way to go, but already a major improvement !
Time resolved measurement allowed to identify “electron problem” – electron suppression possible ? (magnetic ?)

Require more measurements – solenoid settings, gas pressure, pulsed decomp. Electrode.
1 beam day for improvements – 3 days with emittance measurements for data taking.... If possible before Christmas...