



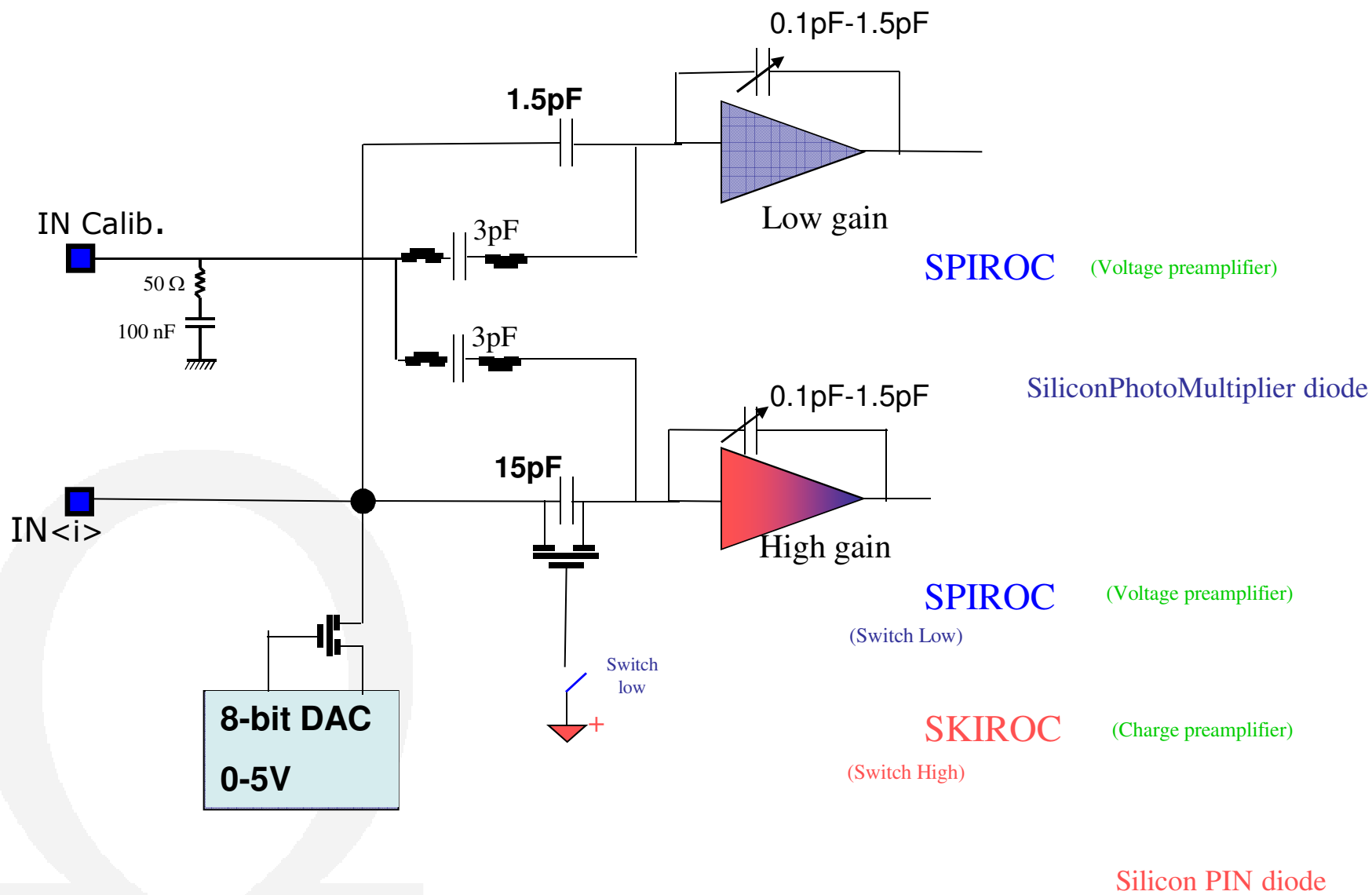
ECAL EUDET

Measurements of SKIROC

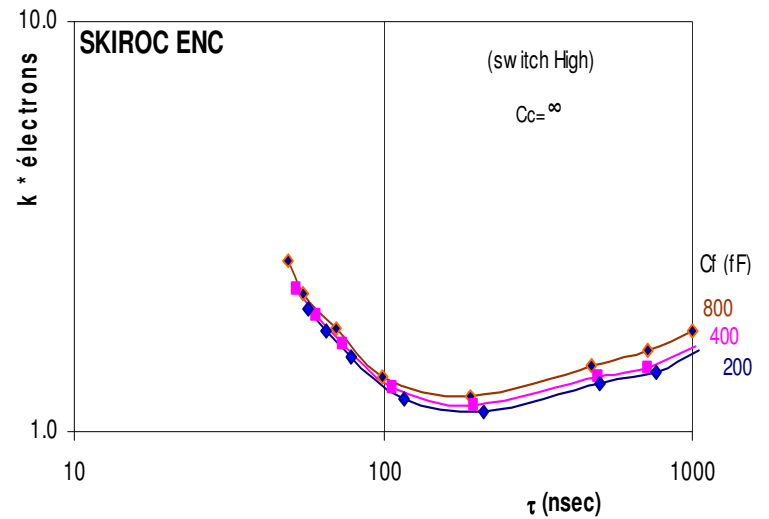
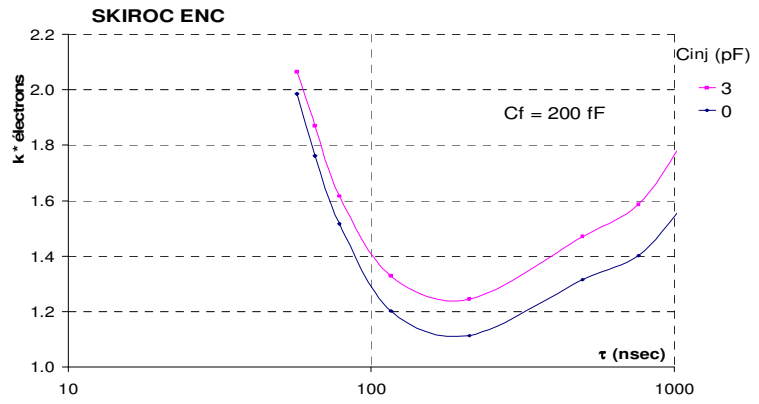
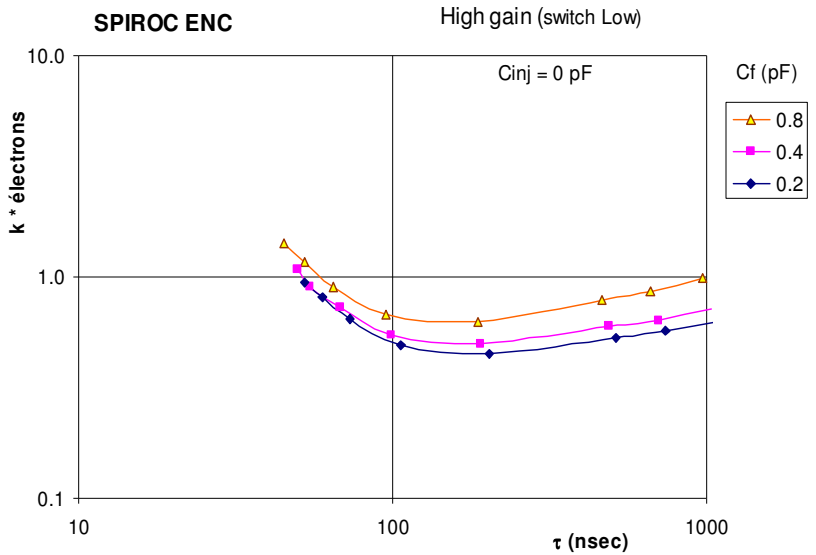
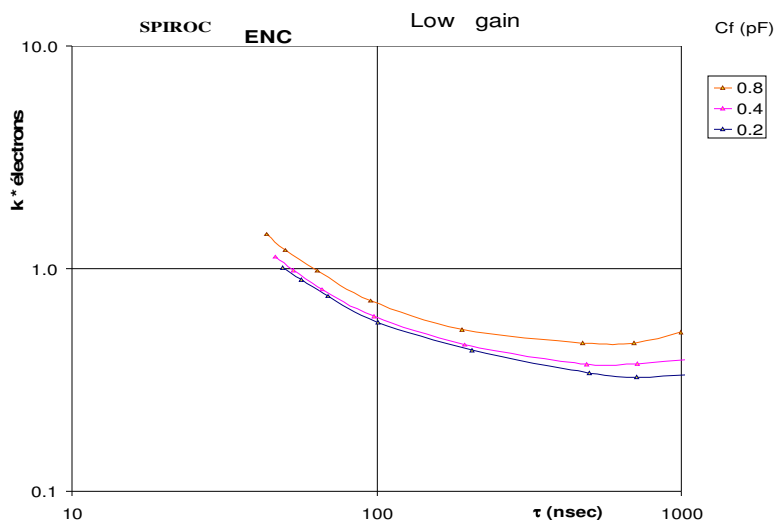


Maurice Cohen-Solal

SPIROC / SKIROC Schematic



Parallel noise ?

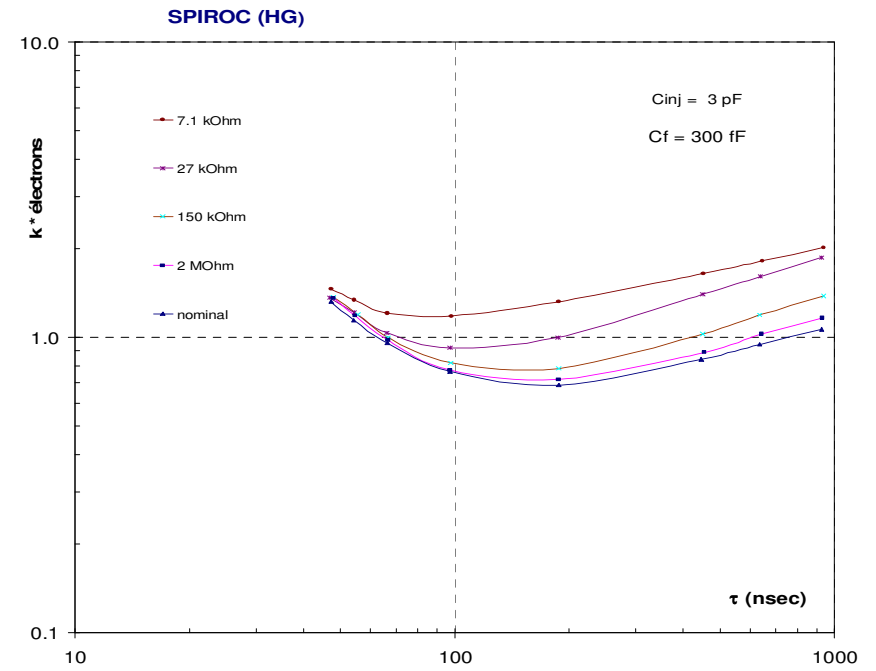
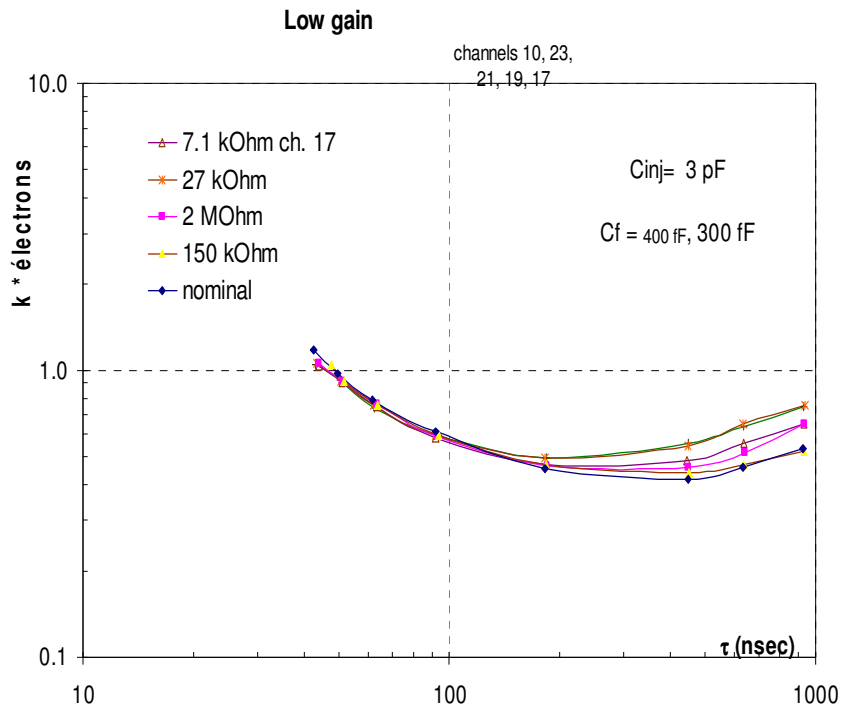
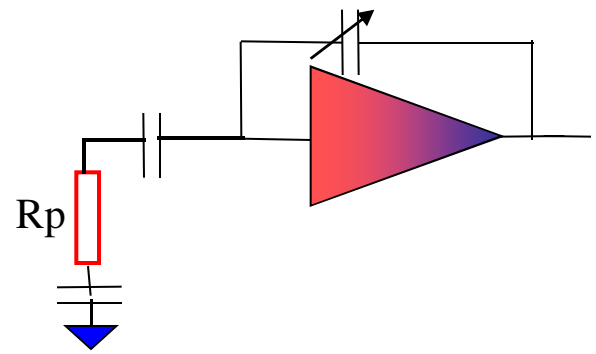


unexpected « parallel » noise

Dependance with C_f , C_c , C_{in} & no constant with τ ?

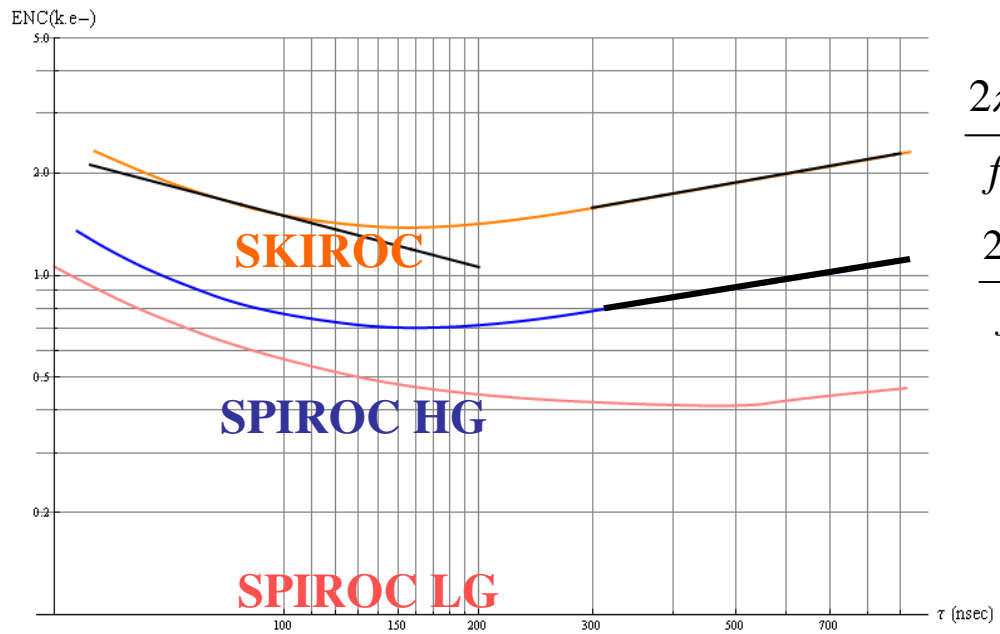
R equivalent = 160 k Ω !

noise vs Rp



ENC measurements & simulation

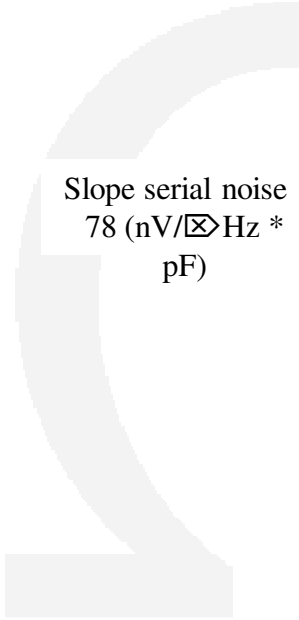
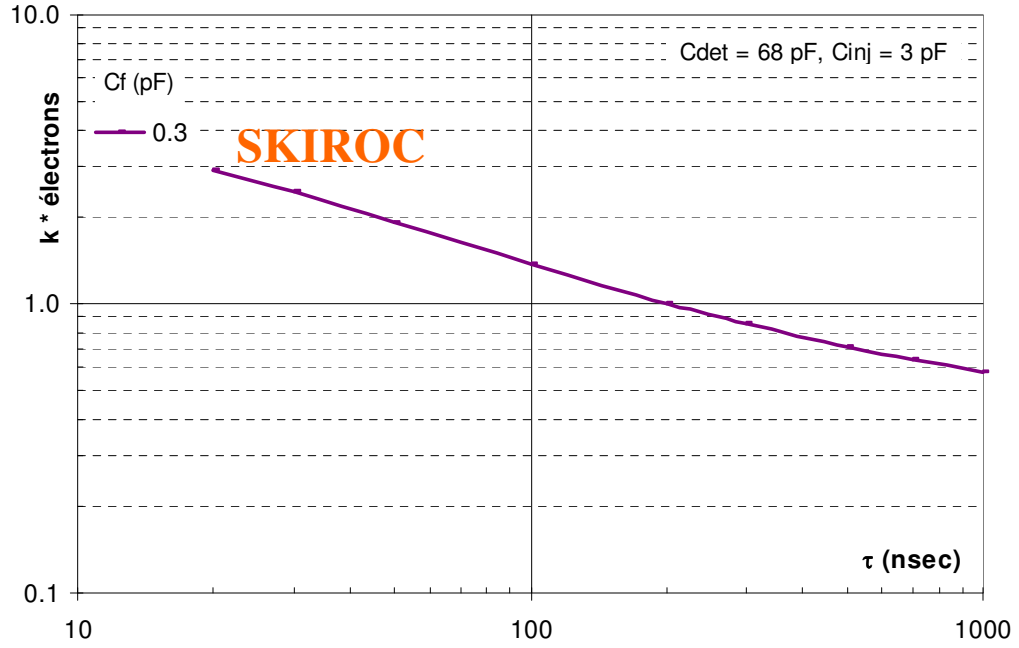
Slope serial noise:
64 (nV/√Hz * pF)

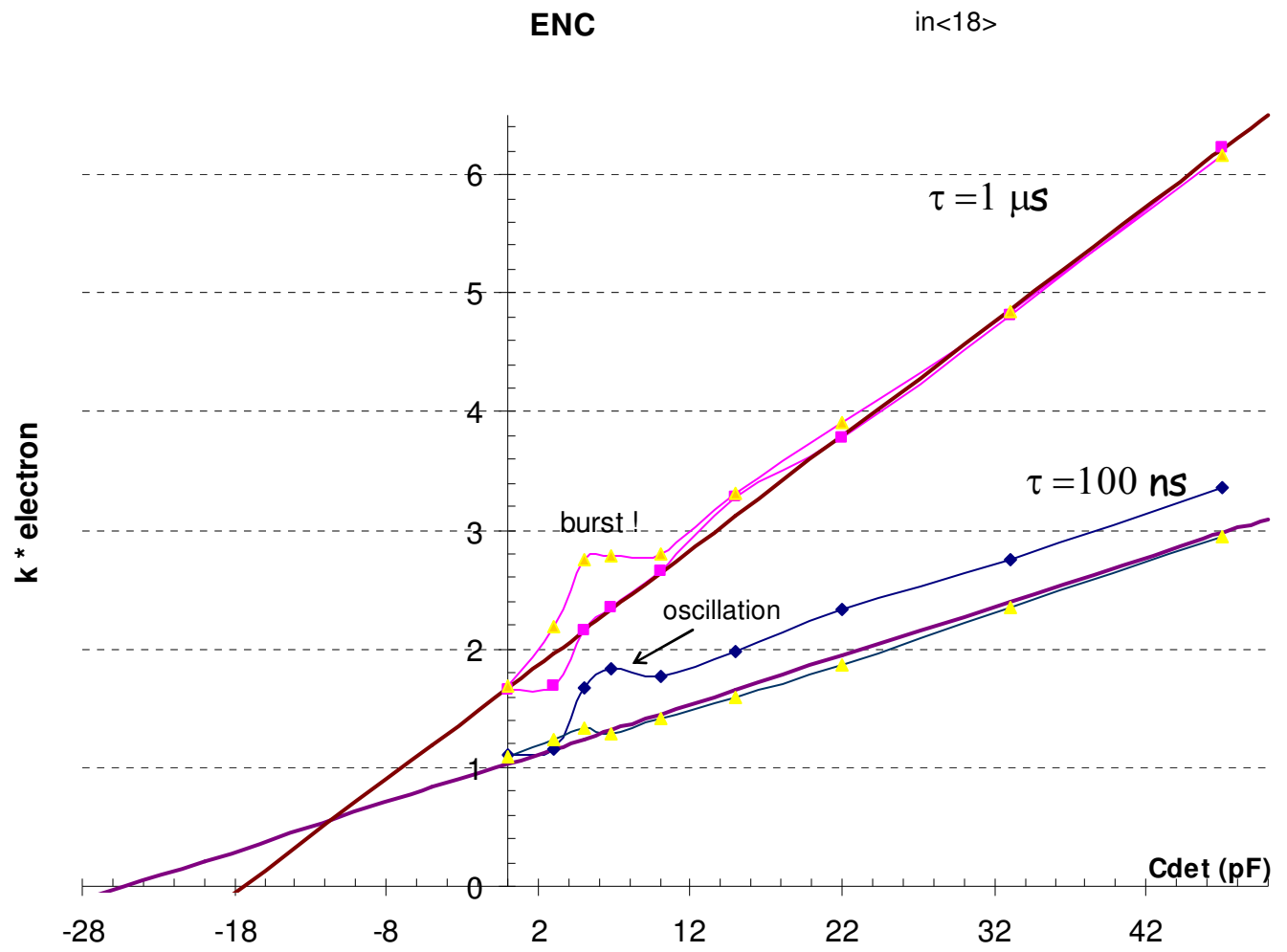


$$\frac{2\pi A_f}{f^{1.6}} \quad [V^2/Hz]$$

$$\frac{2\pi A_f}{f^{1.4}} \quad [V^2/Hz]$$

Slope serial noise :
78 (nV/√Hz * pF)





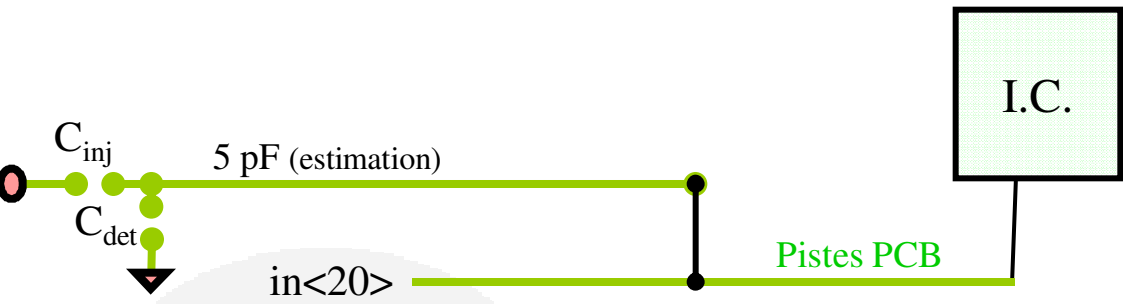
Cdet = 25 pF

Cdet = 17 pF

($e_n = 3 \text{ nV}/\sqrt{\text{Hz}}$)

ENC (effect of connexions)

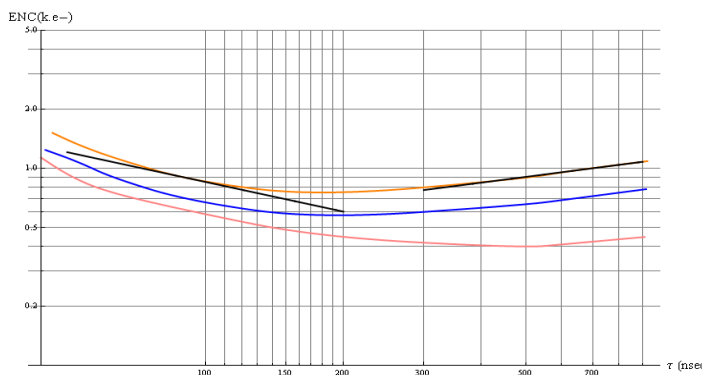
SKIROC



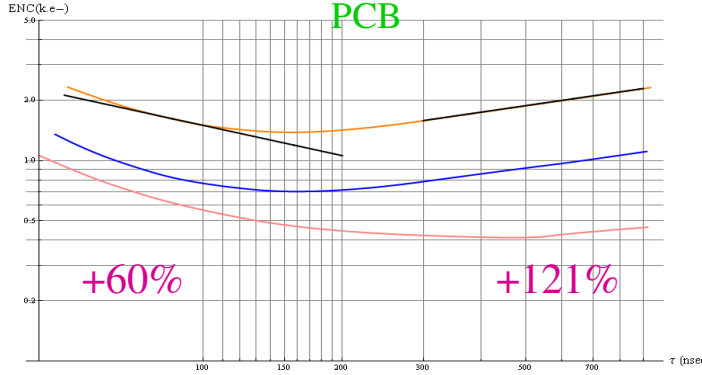
$$\text{ENC in<20> + piste} / \text{ENC in<20>}$$

+26 % soit 6.4 pF at 70 nsec

+55 % soit 17 pF at 1 μsec



PCB

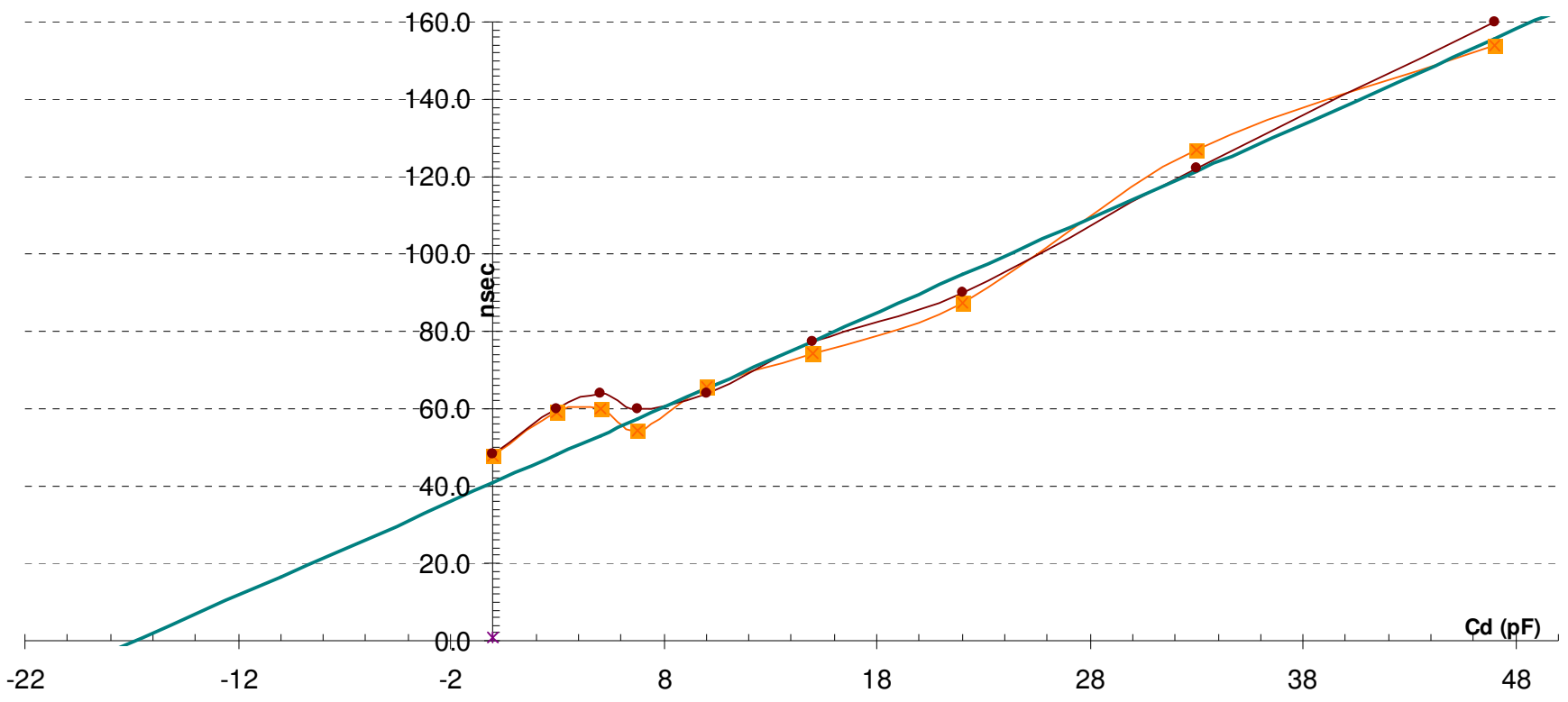


PCB

SKIROC

in<20>

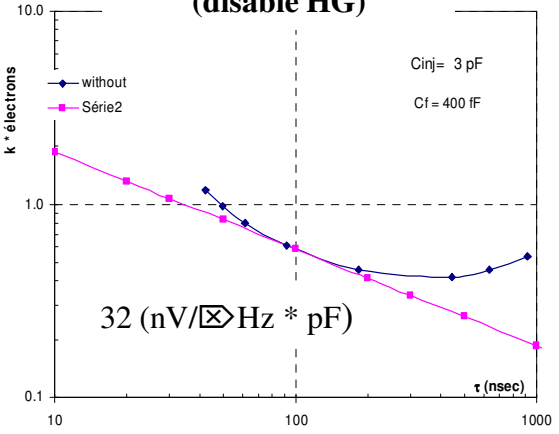
rise time



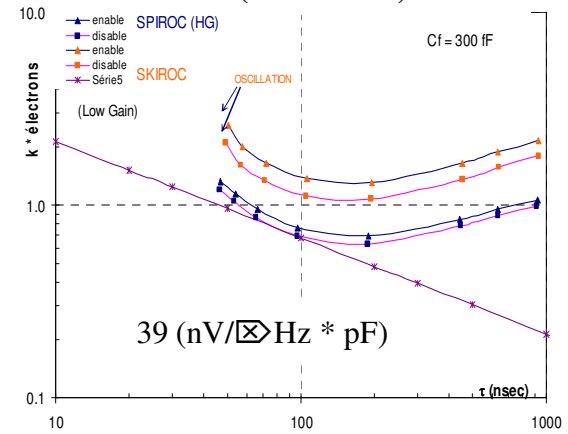
$$C_{det} = 16 - 3 = 13 \text{ pF}$$

Serial noise "fit"

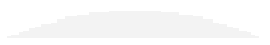
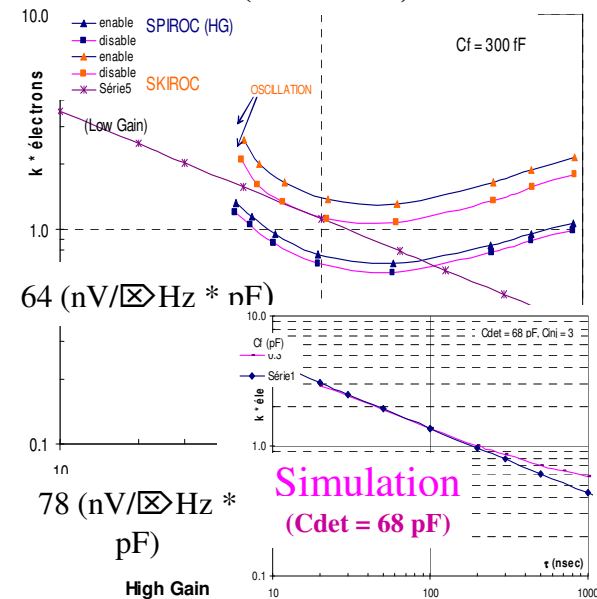
SPIROC LG (disable HG)



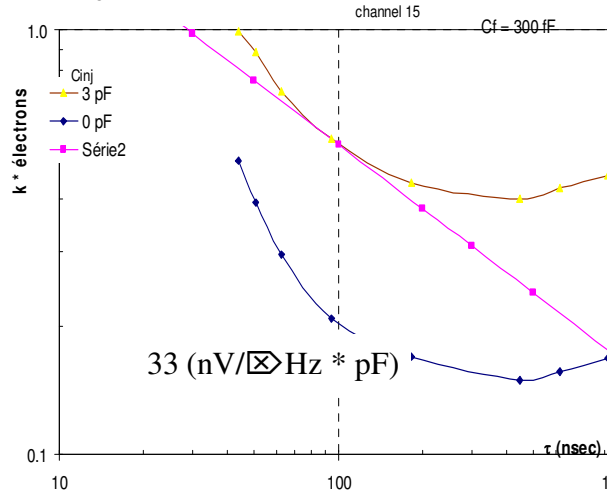
SPIROC HG (disable LG)



SKIROC (disable LG)

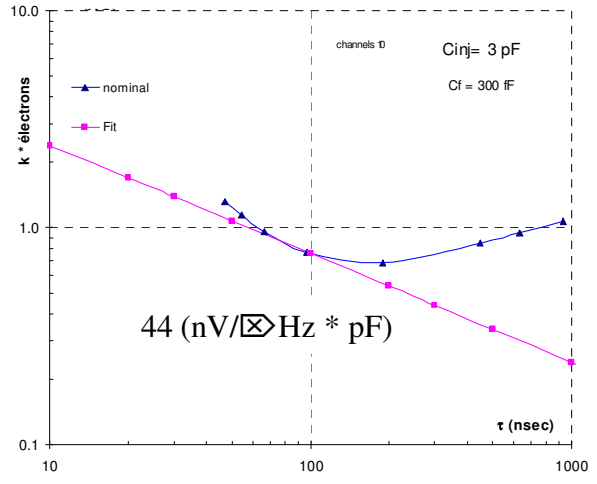


Low gain

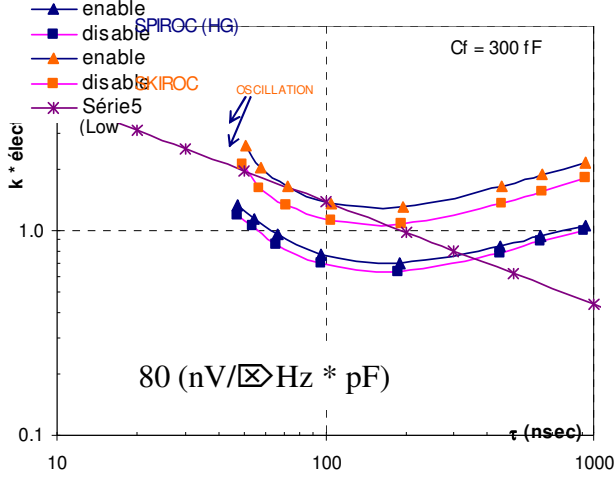


(enable HG)

SPIROC



(enable LG)



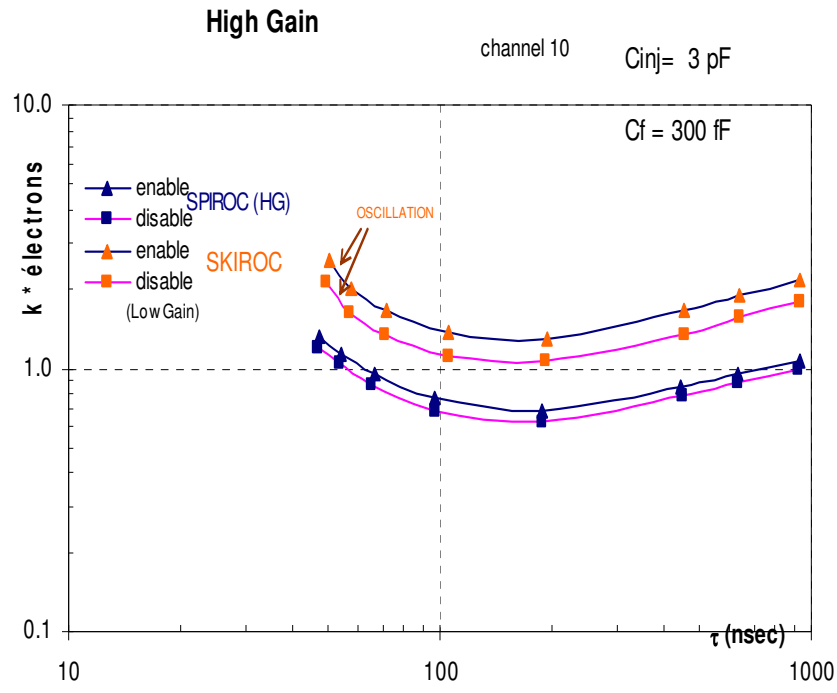
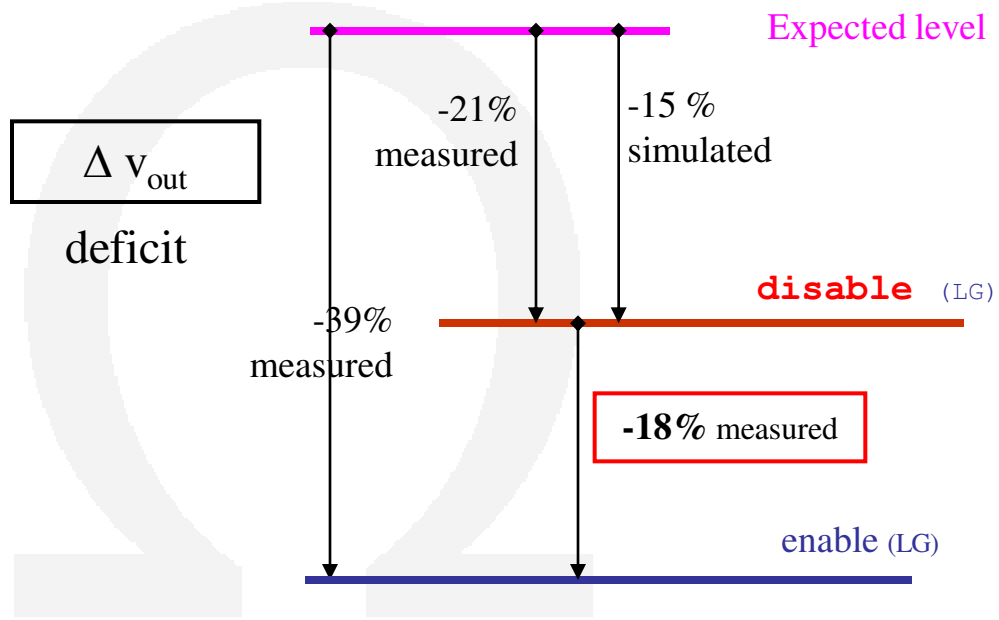
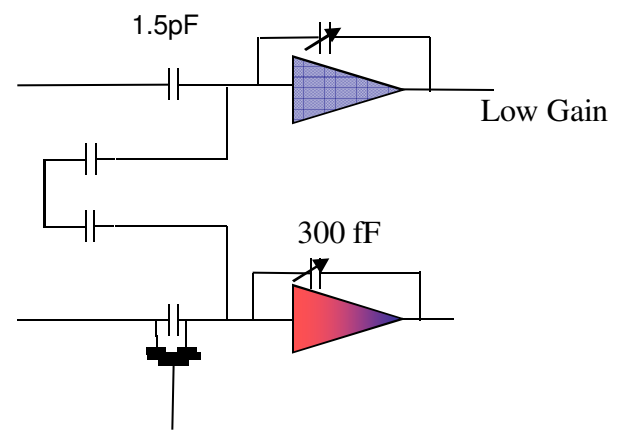
(enable LG)

SKIROC déficit

DCOutput = 2.95 V (2.80V "measured")

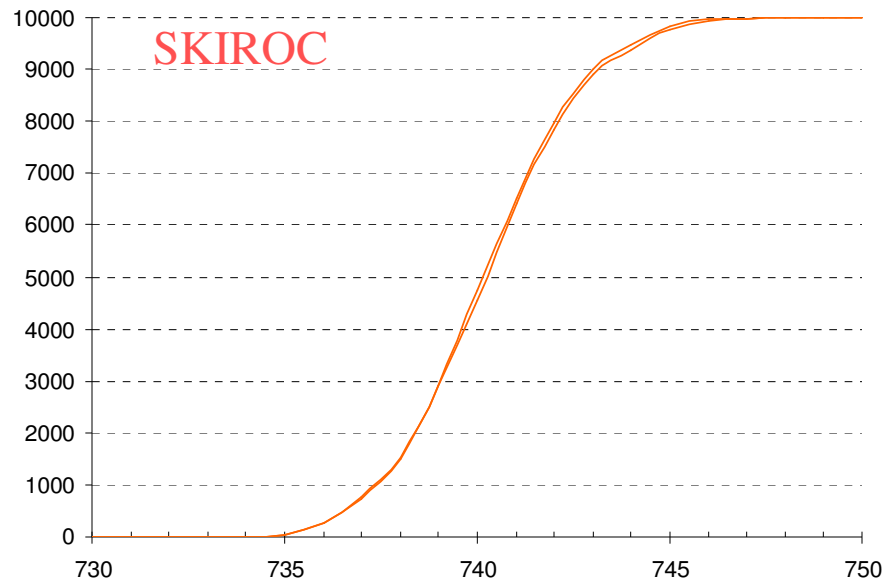
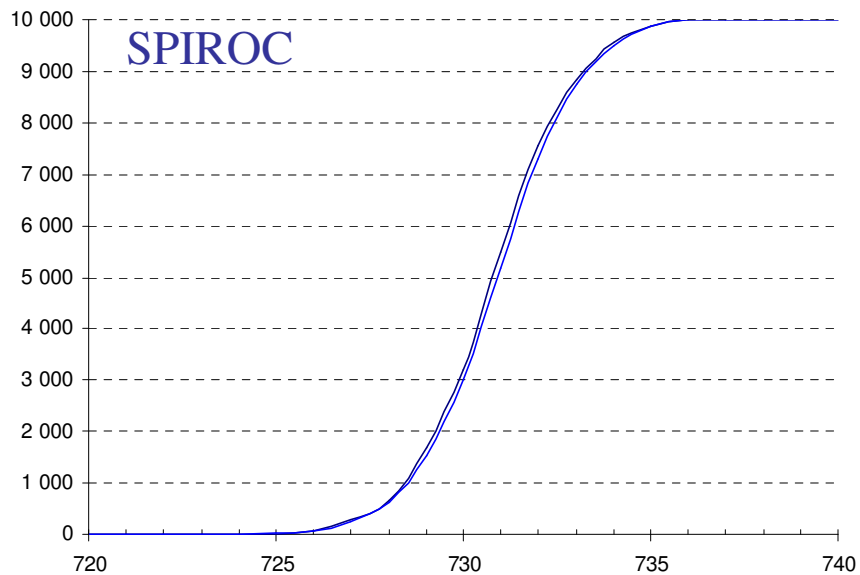
DCInput = 2.58 V

rise time
28 nsec simulation
 48 nsec measured (2 nsec generator)

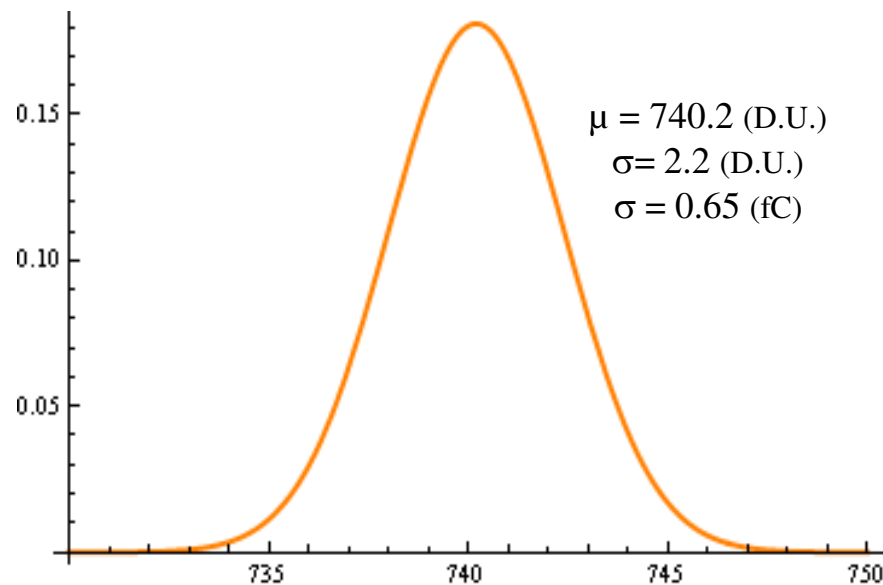
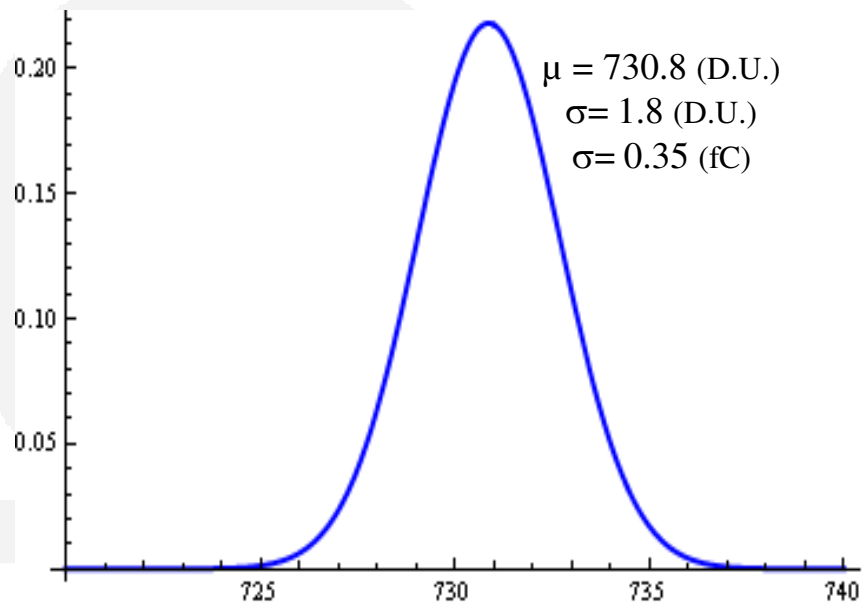


Counting vs DAC (Labview)

$Q_{inj} = 6.1 \text{ fC} = 38 \text{ ke}^-$ (In<23>)



1 DAC Unit = 1.28 mV

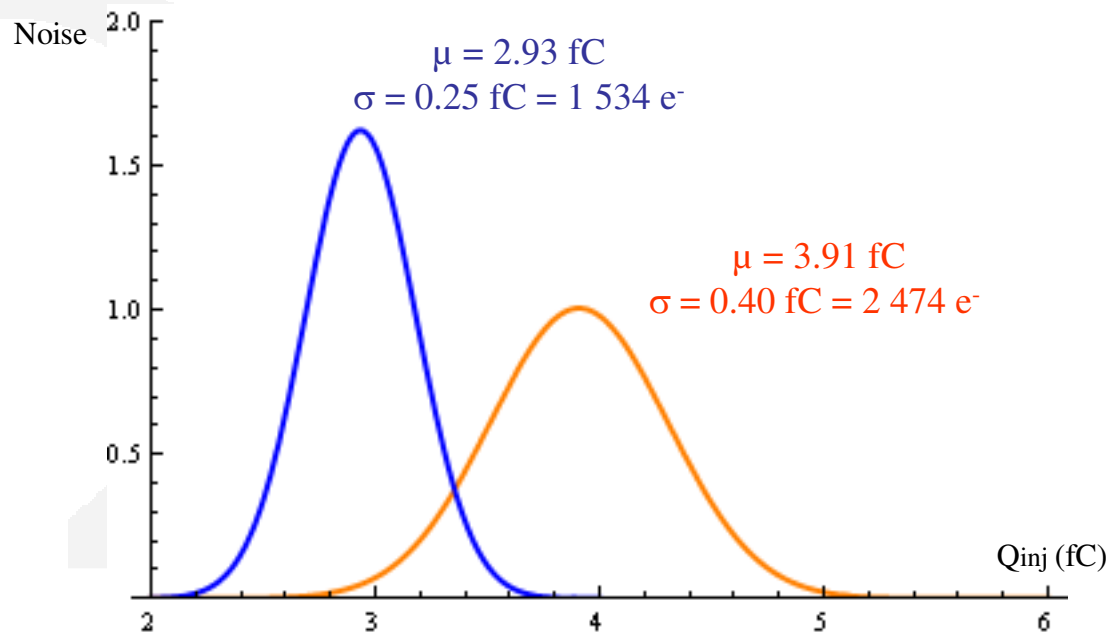
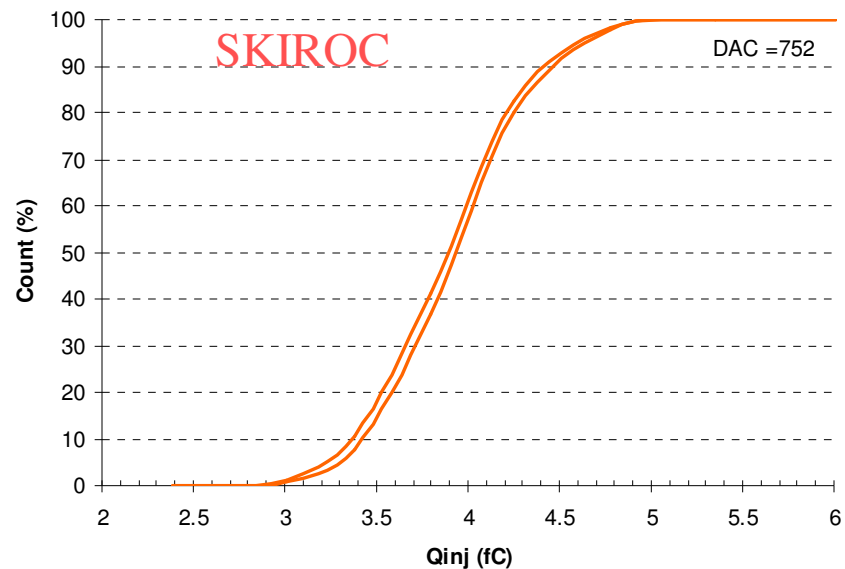
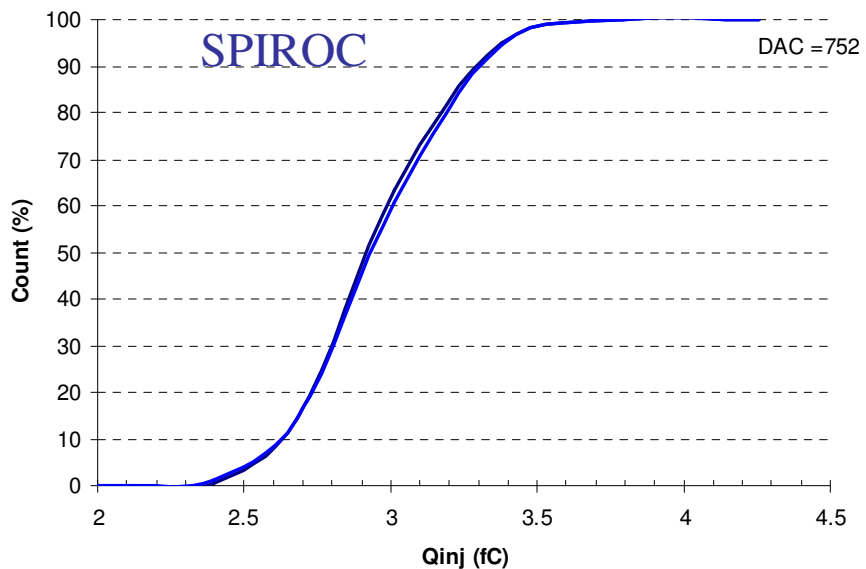


Slide 11

MCS7

Excelsis\siSKI.xls
Cohen-Solal, 10/1/2009

Counting vs signal (scope)



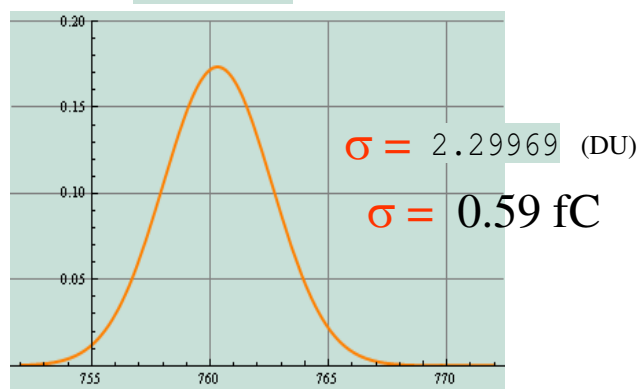
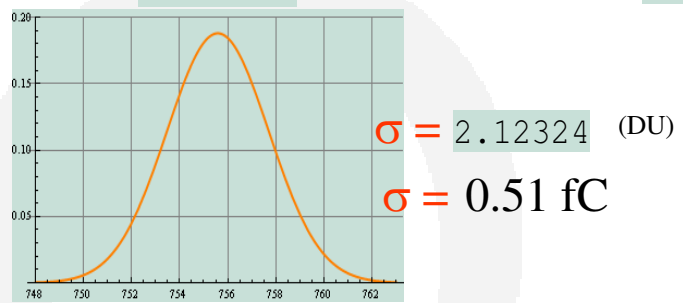
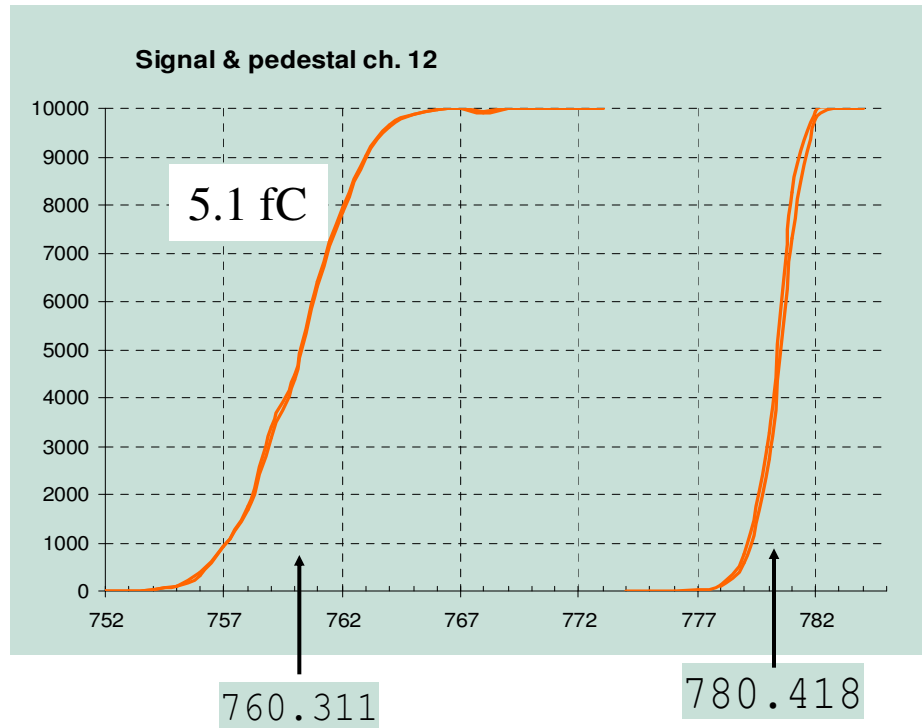
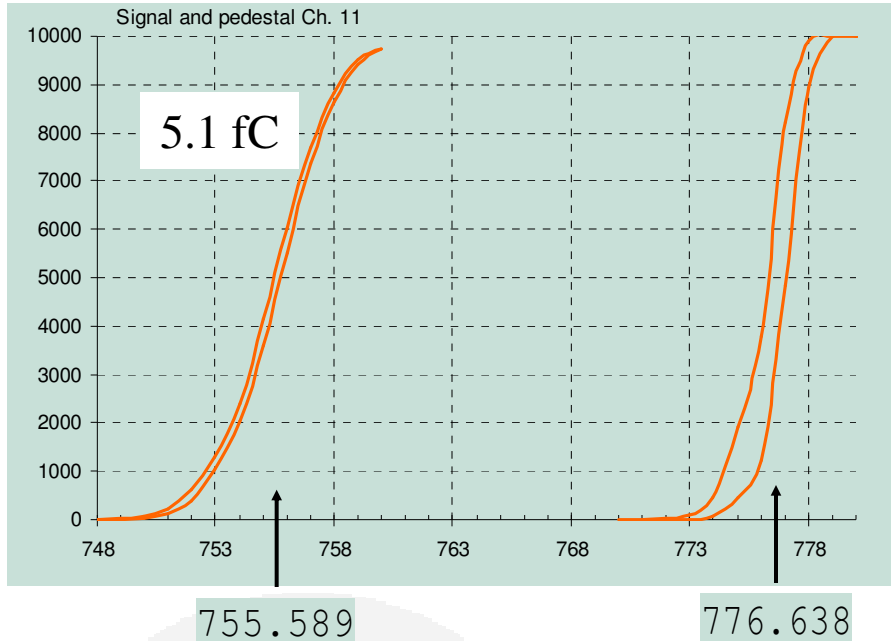
Slide 12

MCS2

Scope.xls

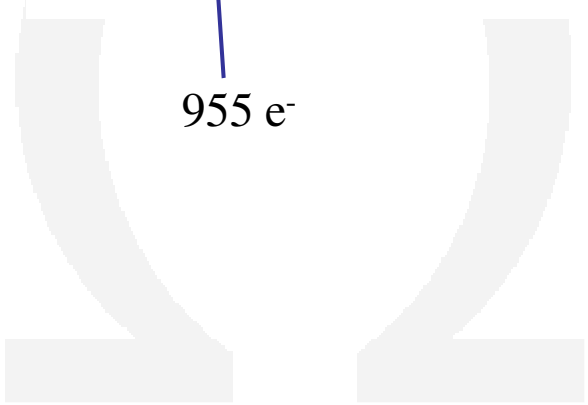
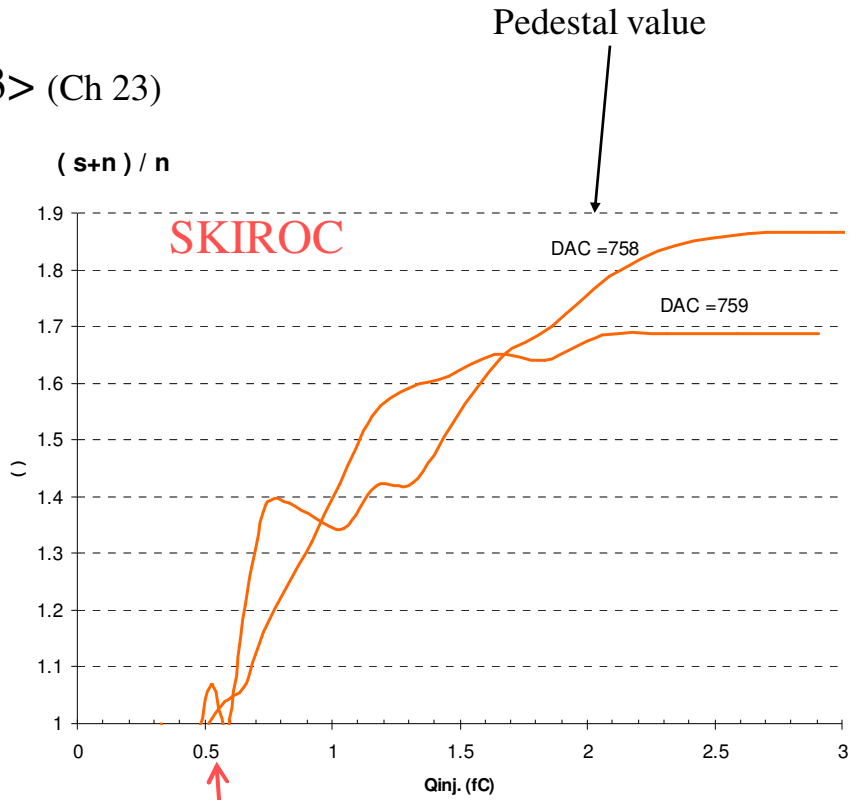
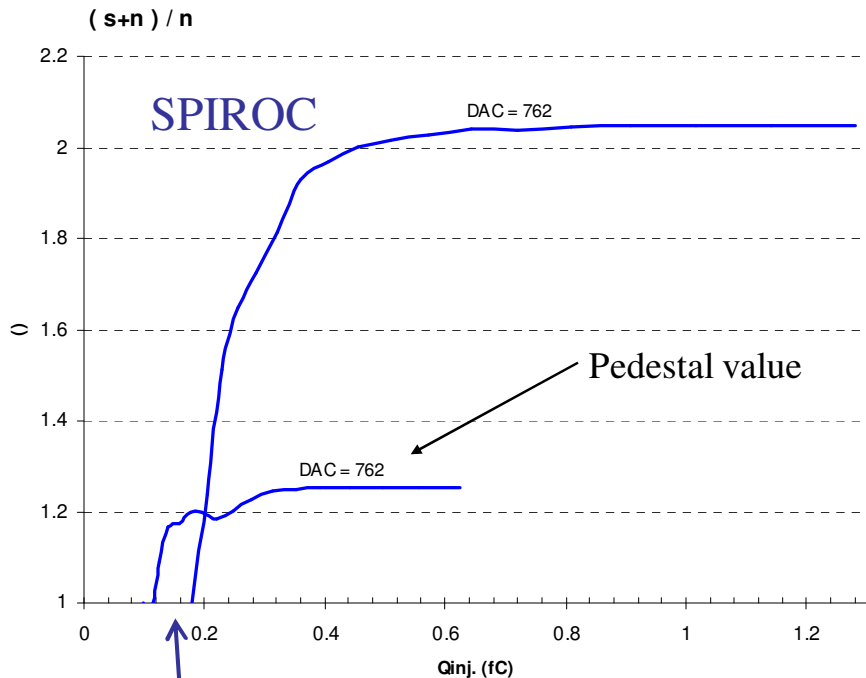
Cohen-Solal, 10/1/2009

Counting Pedestal (stable) & signal



Counting vs Q_{inj} (Labview)

In<23> (Ch 23)



Slide 14

MCS1

SB.xls

Cohen-Solal, 10/1/2009

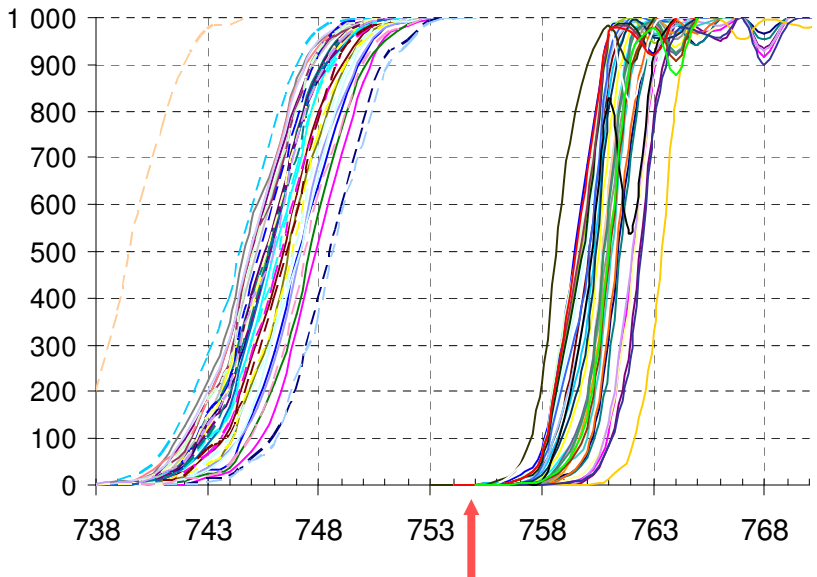
noise of the discriminator SKIROC (minimum possible signal) summary

| Qinj. (fC) | noise (fC) | |
|---------------|---------------|---|
| 6.1 | 0.65 | Labview counting vs DAC In<23> |
| 3.9 | 0.40 | Scope counting vs signal In<23> (no PC, no USB, no CLK) |
| 6.5 | 0.44 | Labview counting vs signal In<23> |
| ped | 0.59 | Labview (s+n) vs signal In<23> |
| ped | 0.61 | Labview (s+n) vs signal In<21> |
| 5.1 | 0.51 | Labview counting vs DAC In<11> (stable pedestal) |
| 5.1 | 0.59 | Labview counting vs DAC In<12> (stable pedestal) |

0.59 ($\sigma=0.08$) fC \equiv 3 700 ($\sigma=500$) electrons

(stable pedestal)

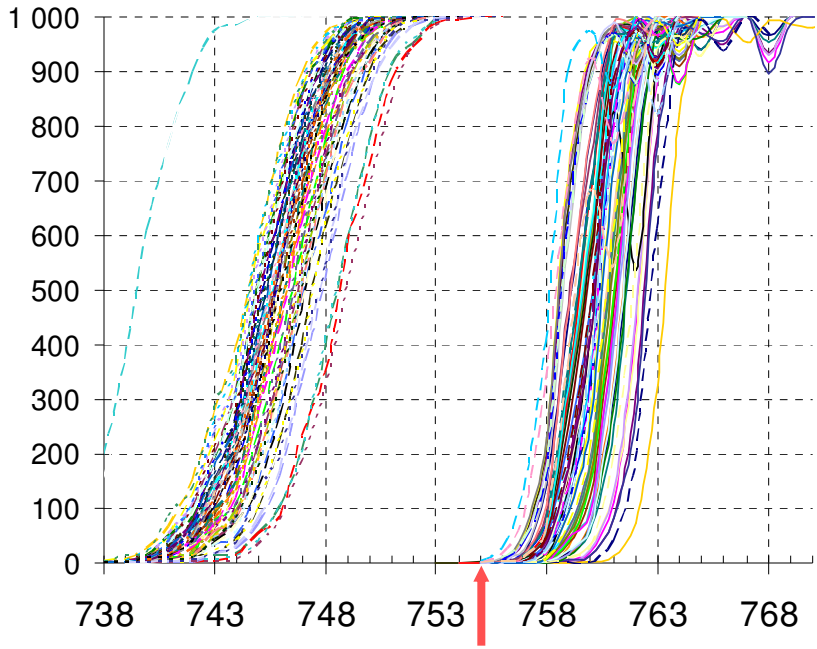
$Q_{inj} = 4.52 \text{ fC}$



Ped. (min -max)

- 4.7 DU
- 3.8 DU (~~Ch20~~)
- 3.0 DU (~~Ch20, Ch28~~)

$Q_{inj} = 4.52 \text{ fC}$
&
 $Q_{inj} = 4.57 \text{ fC}$



Ped. (min -max)

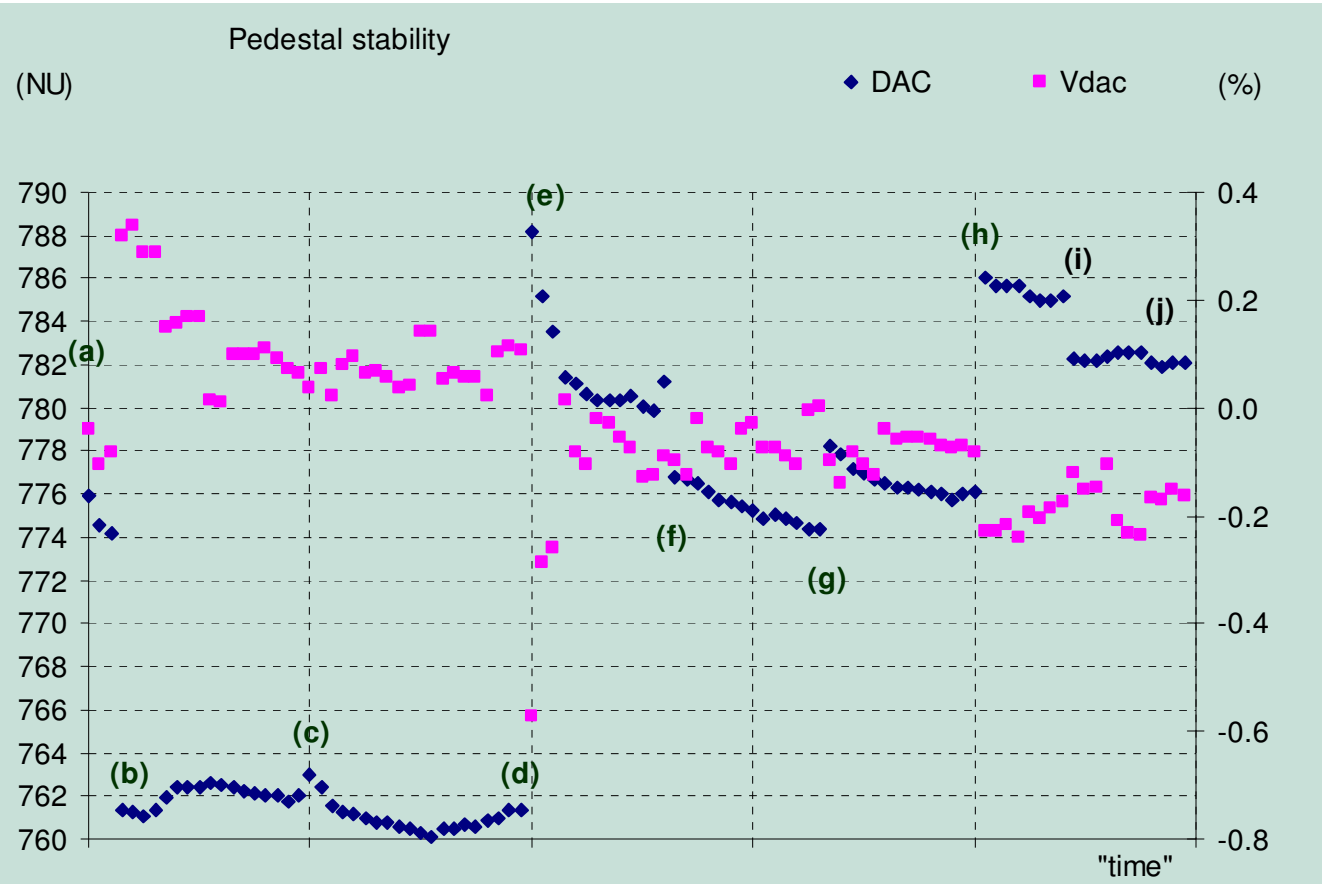
- 5.0 DU
- 4.3 DU (~~Ch20~~)
- 4.0 DU (~~Ch20, Ch28~~)

The threshold of the trigger (red arrow) could be set at **0.52 MIP** (2.1 fC).

Slide 16

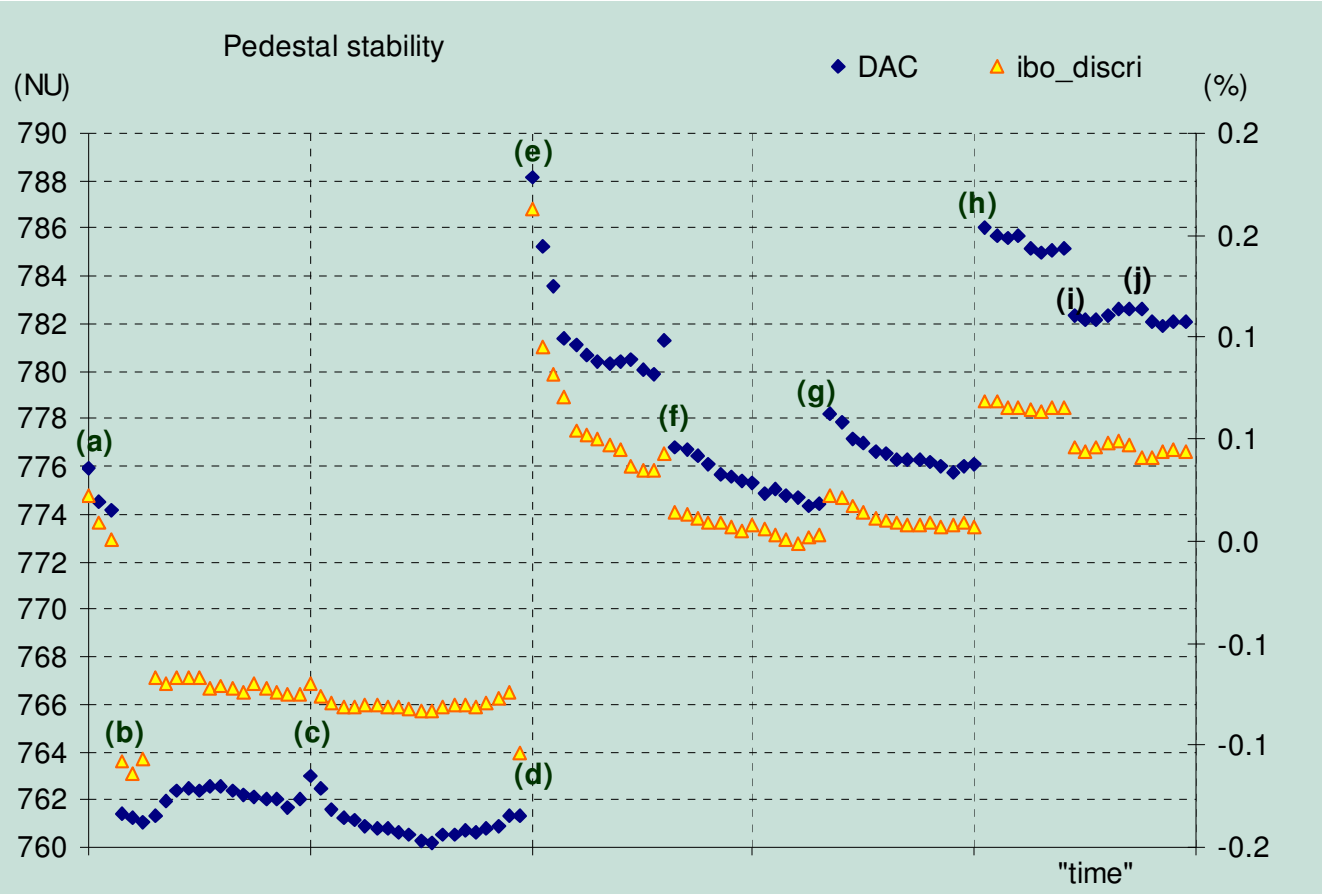
MCS12 scurves\Stable\syntheseBis
Cohen-Solal, 10/22/2009

SKIROC pedestal stability (DAC value, V_{DAC})



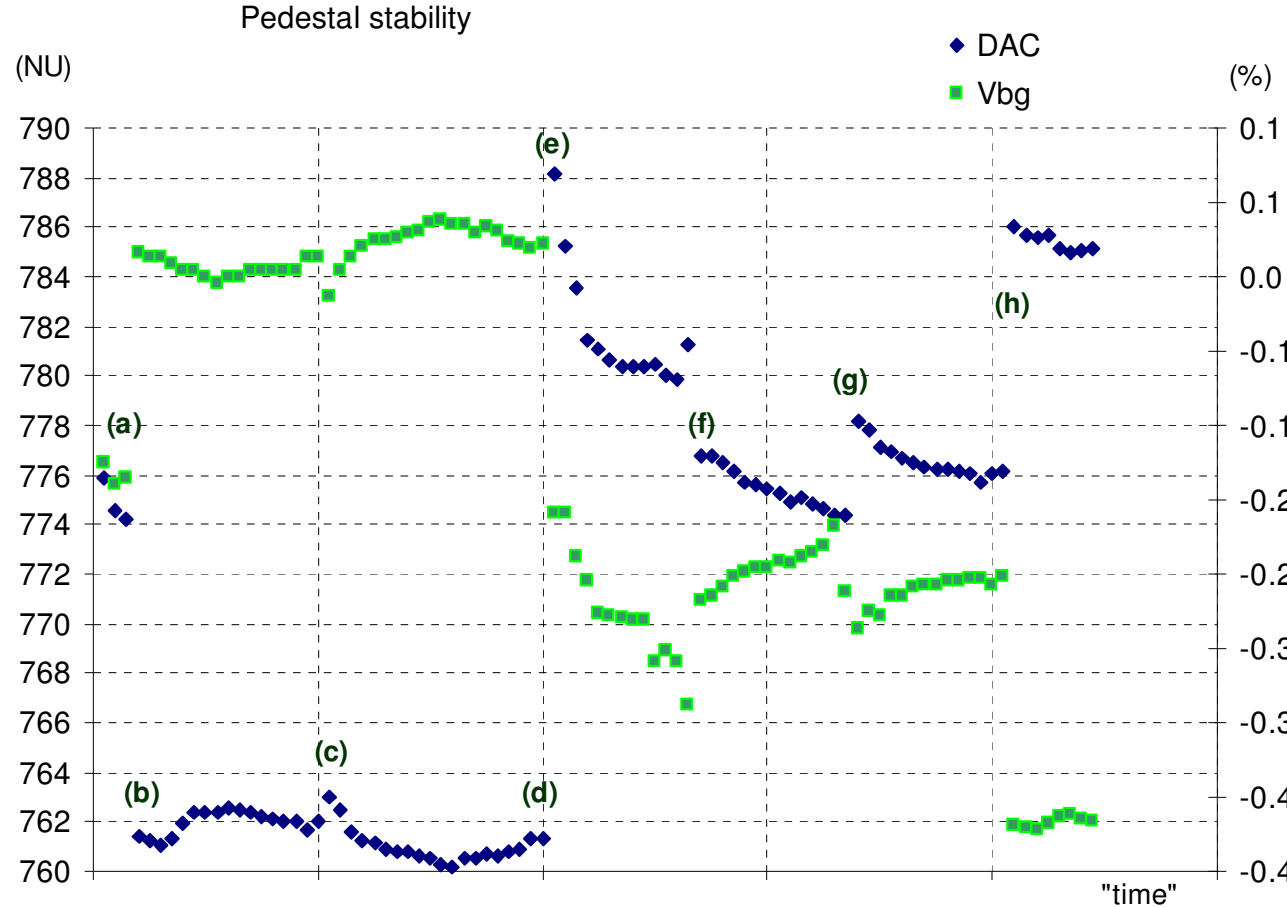
- (a) Power switch on
- (b) 38 mn after (a)
- (c) Other test
- (d) Switch off (week-end)
- (e) Switch on (Monday)
- (f) 5hrs 12mn after (e)
- (g) 1hrs 55 mn break
- (h) At morning (cold)
- (i) 3 hrs 39 mn break
- (j) 2 hrs 40 mn break

SKIROC pedestal stability (DAC, ibo_d_{iscri})



- (a) Power switch on
- (b) 38 mn after (a)
- (c) Other test
- (d) Switch off (week-end)
- (e) Switch on (Monday)
- (f) 5hrs 12mn after (e)
- (g) 1hrs 55 mn break
- (h) At morning (cold)
- (i) 3 hrs 39 mn break
- (j) 2 hrs 40 mn break

SKIROC pedestal stability (DAC, $V_{bandgap}$)



- a) Power switch on
- b) 38 mn after (a)
- c) Other test
- d) Switch off (week-end)
- e) Switch on (Monday)
- f) 5hrs 12mn after (e)
- g) 1hrs 55 mn break
- h) At morning (cold)
- i) 3 hrs 39 mn break
- j) 2 hrs 40 mn break

0.04 mV drift of the band gap shifts the pedestal value of 1 unit DAC.