

# Summary Thresholds Scan

Fixed thresholds:

O\_DAC=47 O\_LADDER\_INPUTBIAS=22 O\_LADDER\_ICOMP=49

Variable thresholds:

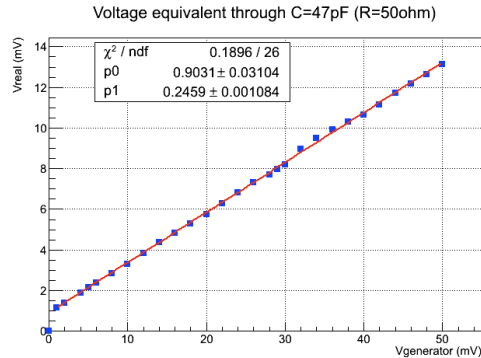
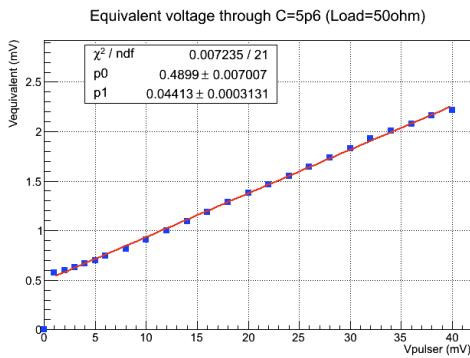
O\_LADDER\_DAC, TBIAS, TTHRESHOLD

Don't care thresholds:

EBIAS, ETHRESHOLD

## CONDITIONS

Charge injection with two capacitors: 5.6pF (plots in red) and 47pF (plots in green), using the analog channel, so that the energy thresholds do not have any influence on the measurements. The voltage shown is already the equivalent voltage obtained injecting the pulse from the frequency generator through the capacitor into a 50 ohm resistor, according to the following fits:

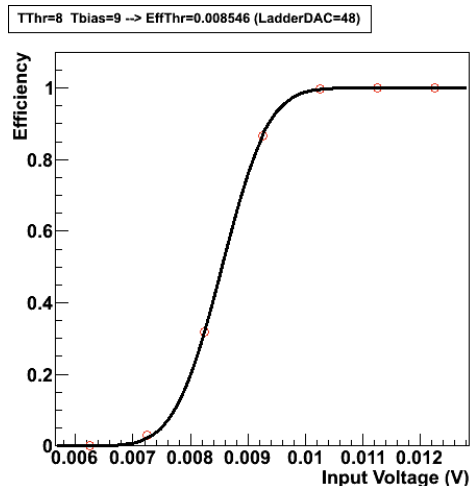
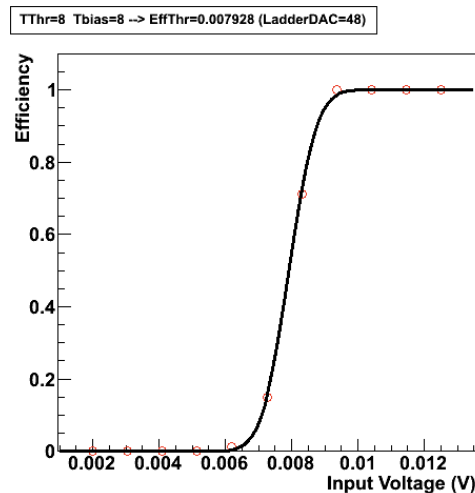


Pulse Generator Settings: 1us frequency, 5ns rise time, 2mV to 100mV input range.

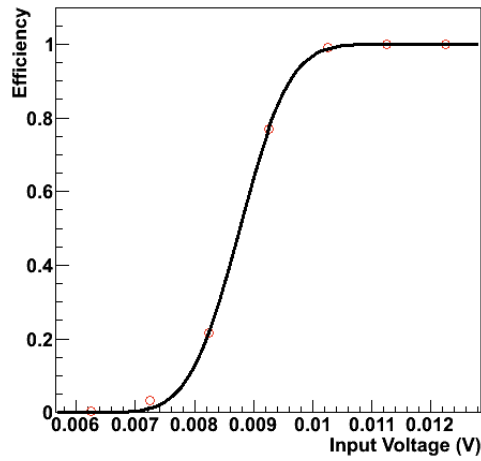
## C=5.6pF

S-Curves

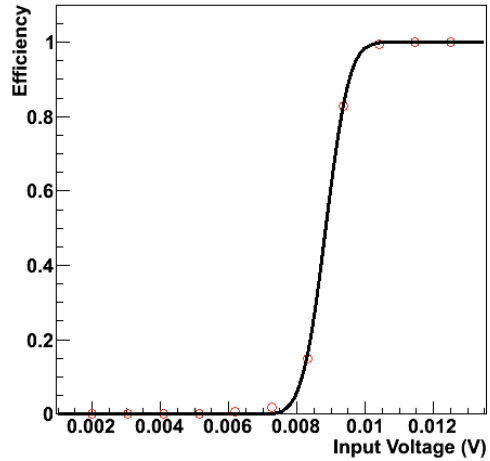
Fitted to the function:  $F(x) = 0.5 + 0.5 * (\text{TMath::Erf}((\text{par}[1] * x[0] - \text{par}[0])))$



TThr=8 Tbias=10 -> EffThr=0.008764 (LadderDAC=48)

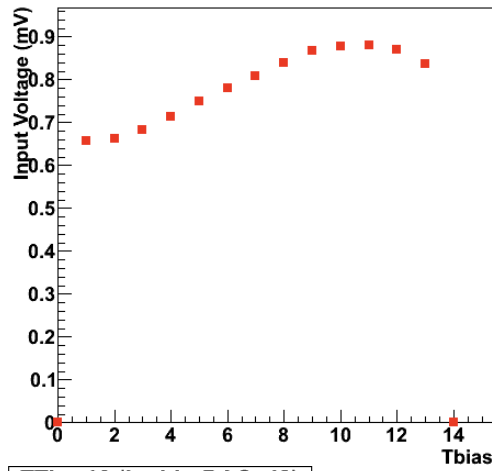


TThr=8 Tbias=11 -> EffThr=0.008847 (LadderDAC=48)

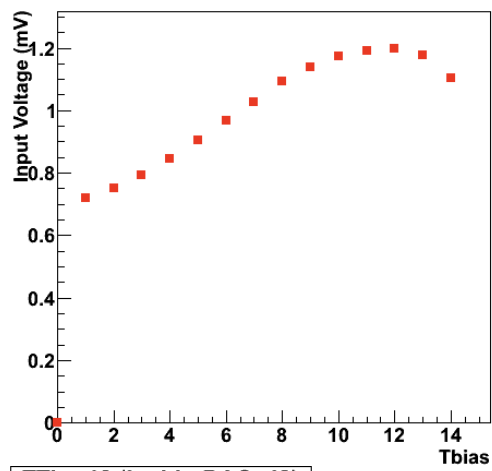


The input voltage for 50% of efficiency is obtained from each S-Curve, and the value obtained is represented for different TBias DAC values:

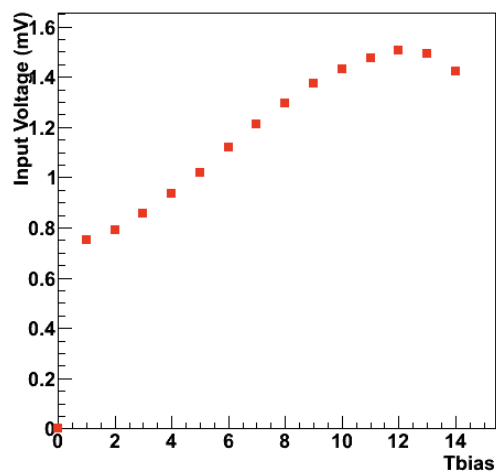
TThr=8 (LadderDAC=48)



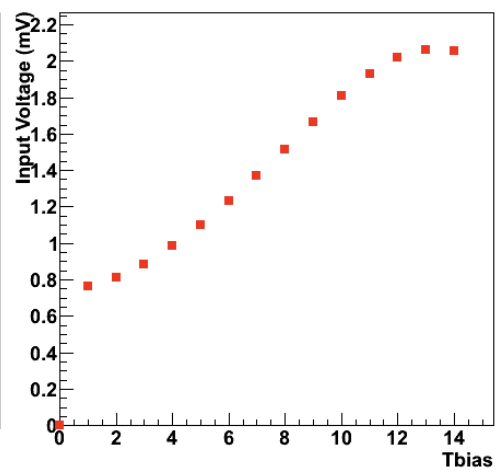
TThr=9 (LadderDAC=48)



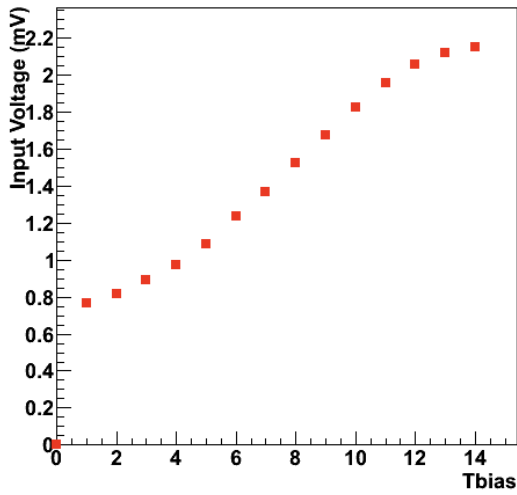
TThr=10 (LadderDAC=48)



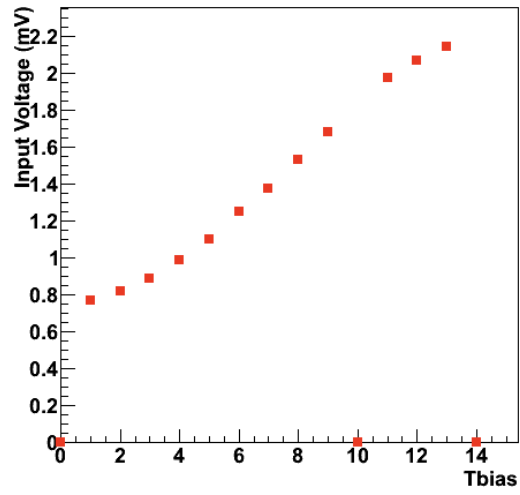
TThr=13 (LadderDAC=48)



TThr=14 (LadderDAC=48)

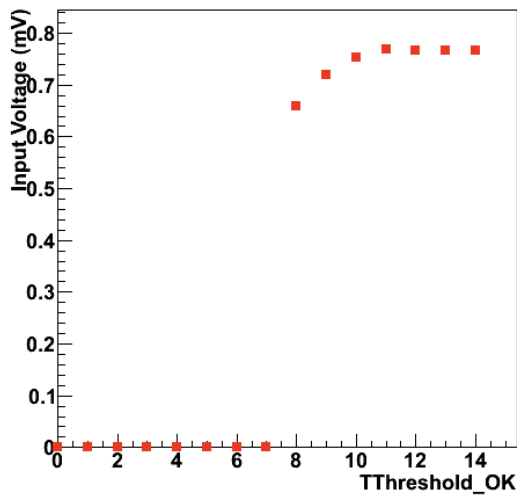


TThr=15 (LadderDAC=48)

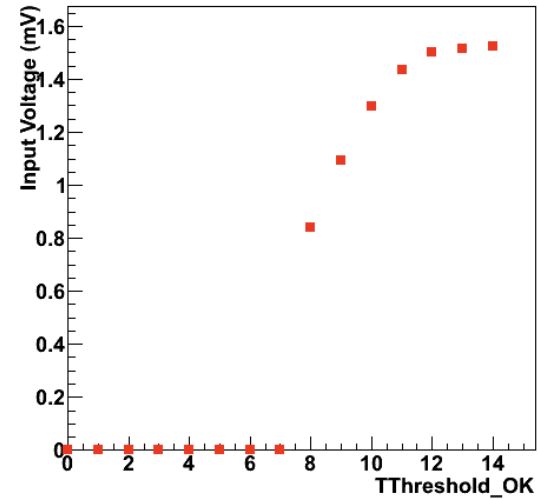


The same for different TThreshold DAC values:

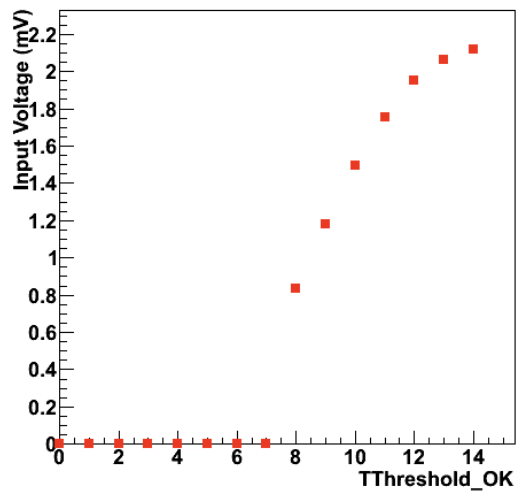
TBias\_OK=1 (LadderDAC=48)



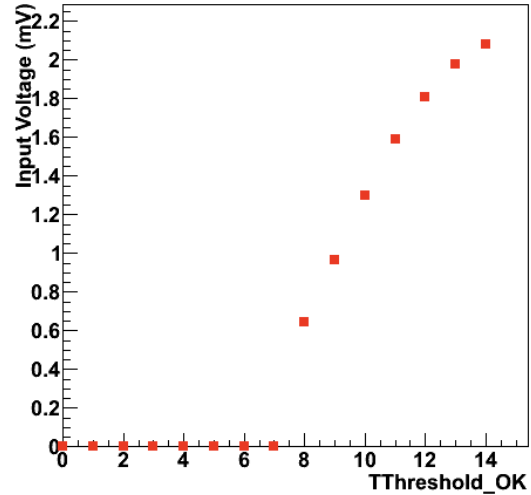
TBias\_OK=8 (LadderDAC=48)



TBias\_OK=13 (LadderDAC=48)

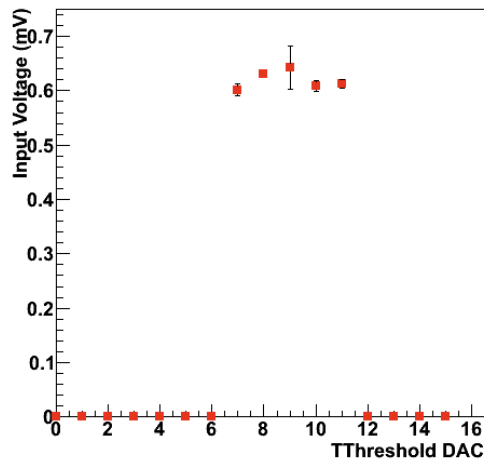


TBias\_OK=15 (LadderDAC=48)

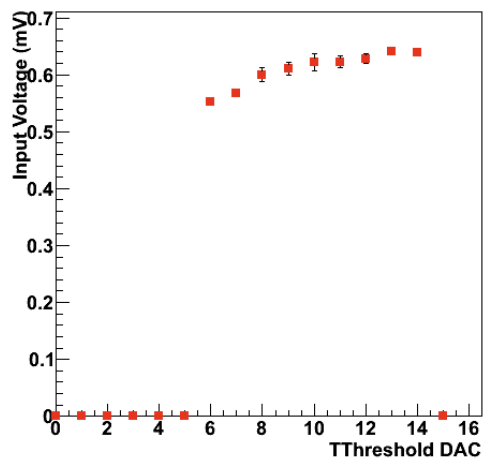


From the plots above the mean value, maximum and minimum value of the Input Voltage is taken, representing the mean value as a function of the TThreshold DAC. The error bars, do not indicate error, but indicate the maximum variation of the Input Voltage with TBias for every TThreshold DAC. This have been done for several Ladder DAC values:

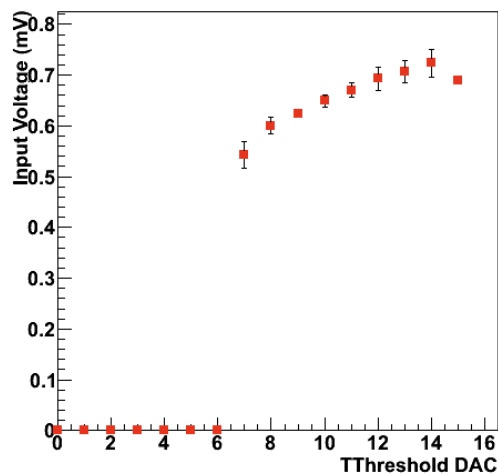
LADDER\_DAC=1



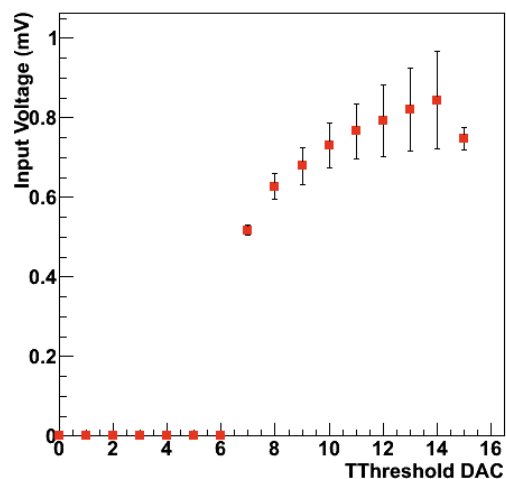
LADDER\_DAC=8



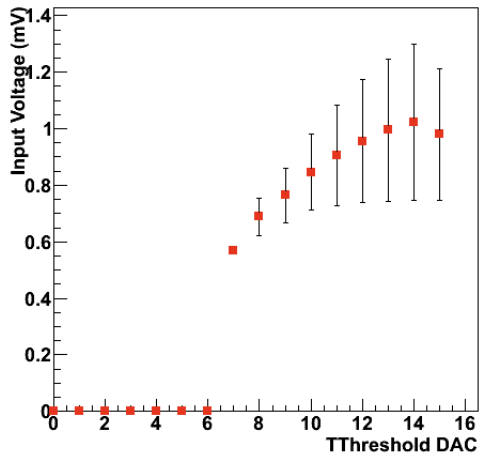
LADDER\_DAC=16



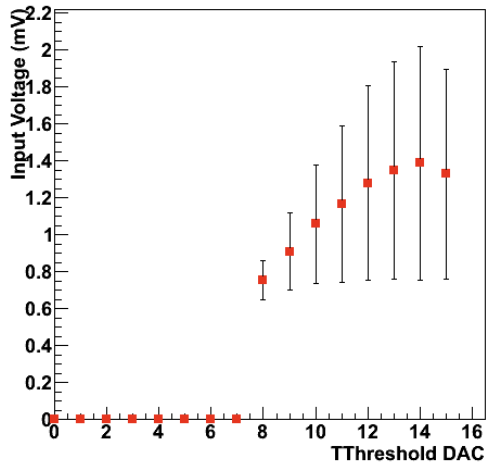
LADDER\_DAC=24



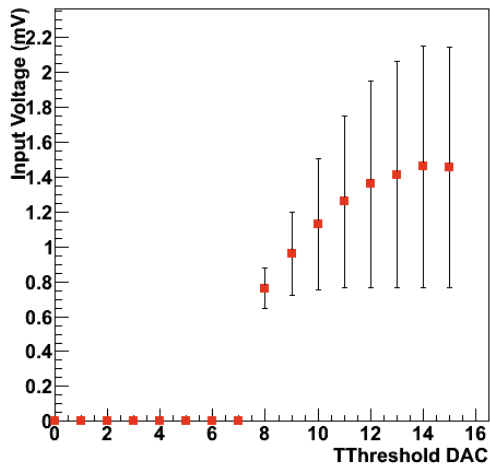
LADDER\_DAC=31



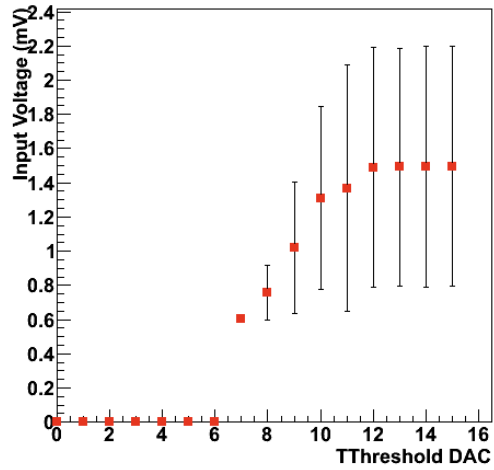
LADDER\_DAC=43



LADDER\_DAC=48

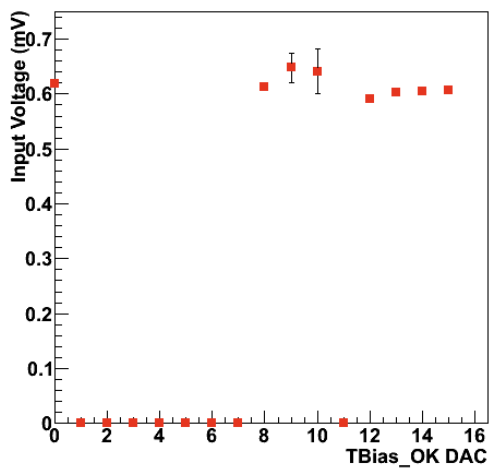


LADDER\_DAC=63

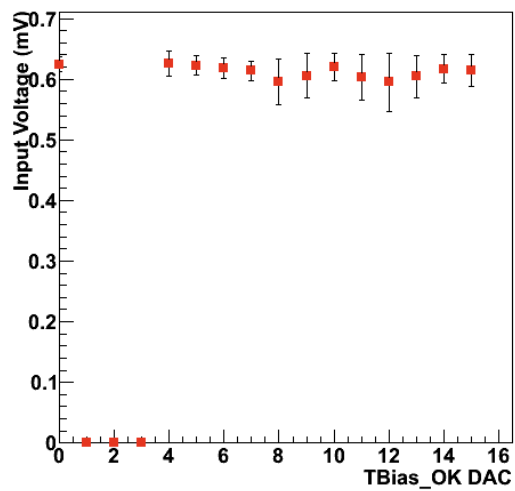


The same is done for different TBias DAC values:

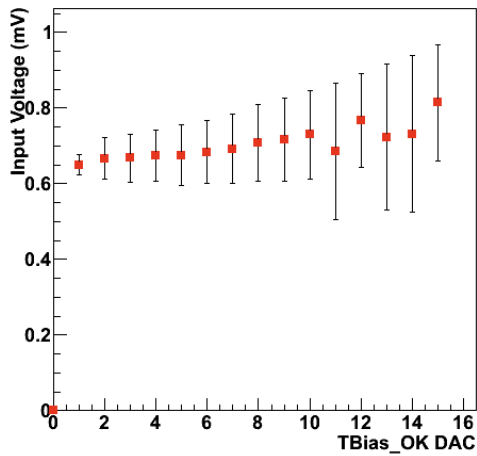
LADDER\_DAC=1



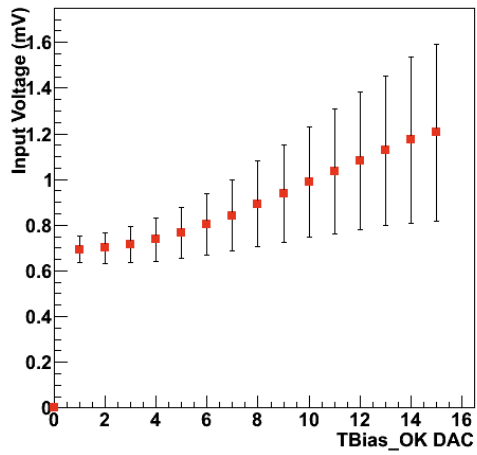
LADDER\_DAC=8



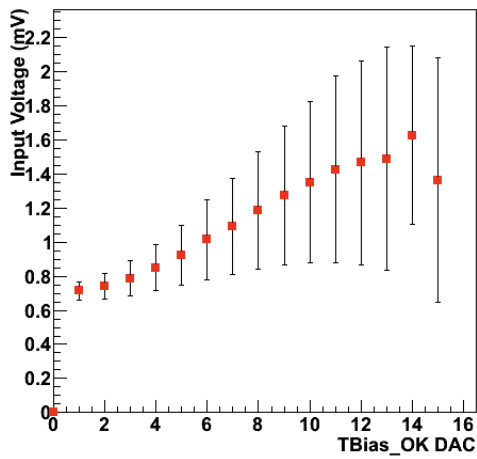
LADDER\_DAC=24



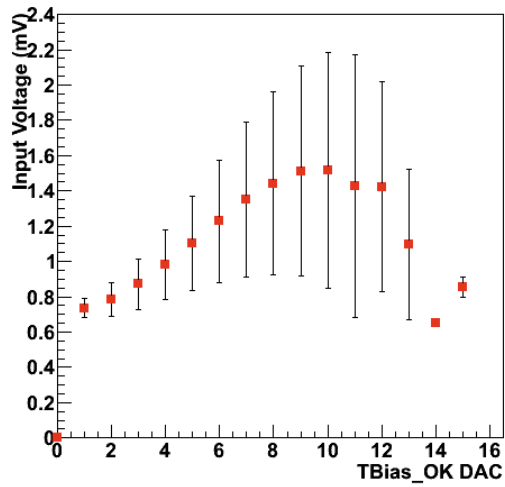
LADDER\_DAC=36



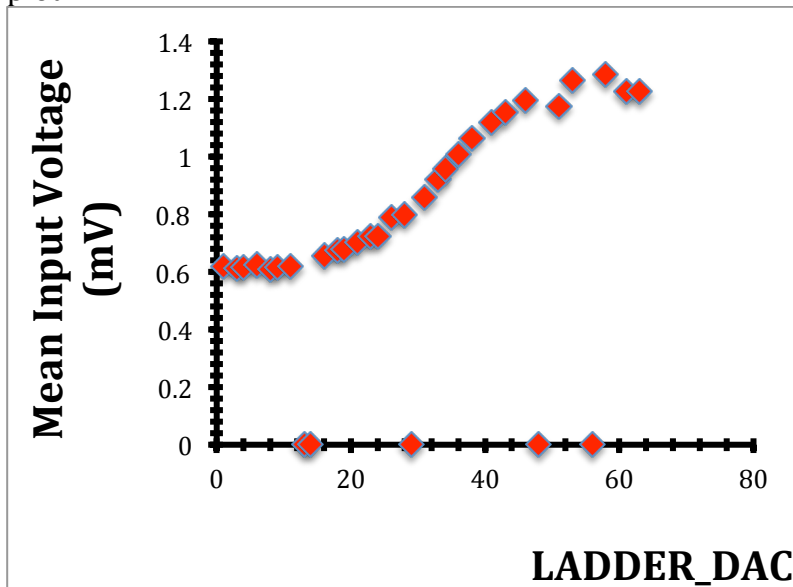
LADDER\_DAC=48



LADDER\_DAC=58



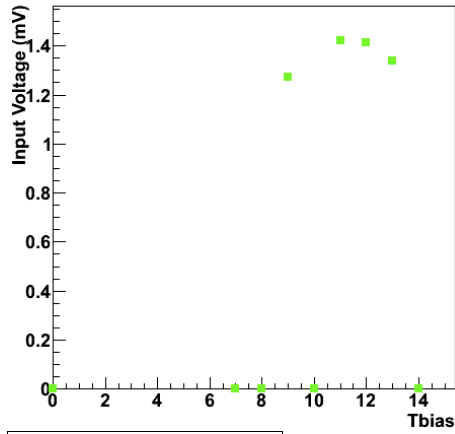
Finally the mean value of the plots shown above are represented in the following plot:



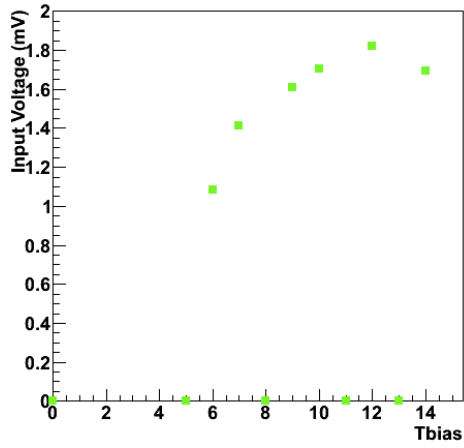
**C=47pF**

The same analysis as before.

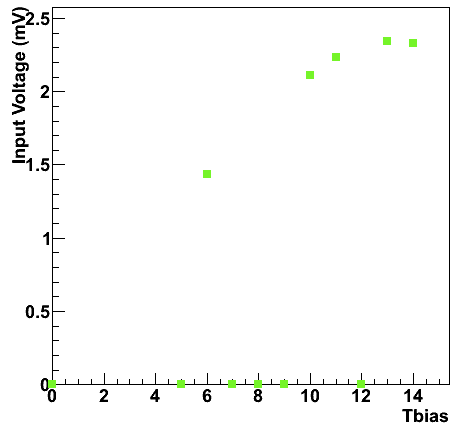
**TThr=9 (LadderDAC=48)**



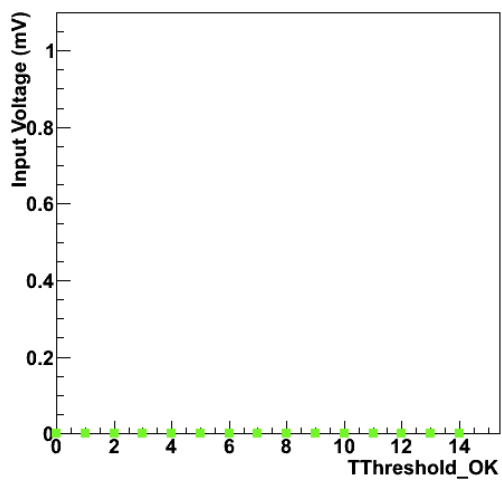
**TThr=10 (LadderDAC=48)**



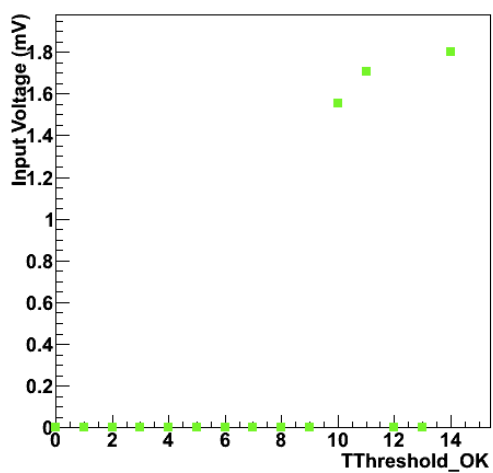
**TThr=12 (LadderDAC=48)**



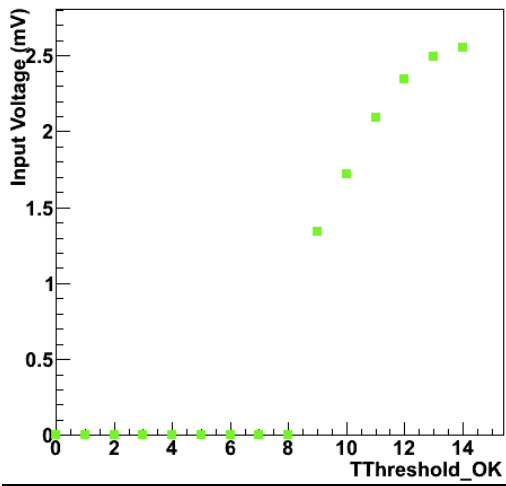
**TBias\_OK=1 (LadderDAC=48)**



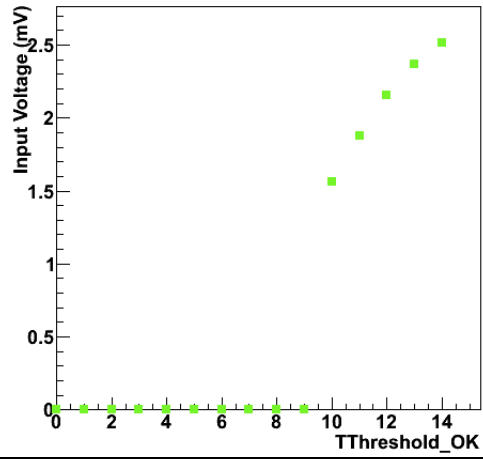
**TBias\_OK=8 (LadderDAC=48)**



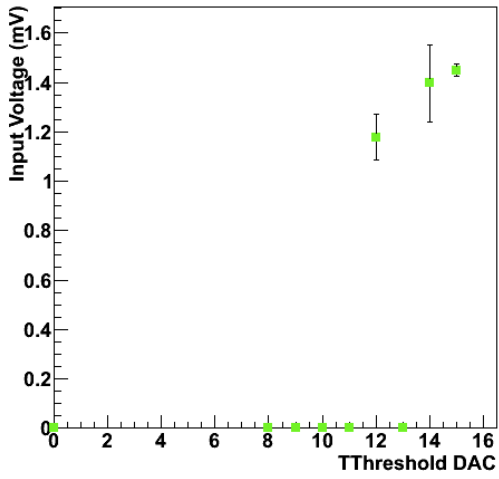
TBias\_OK=13 (LadderDAC=48)



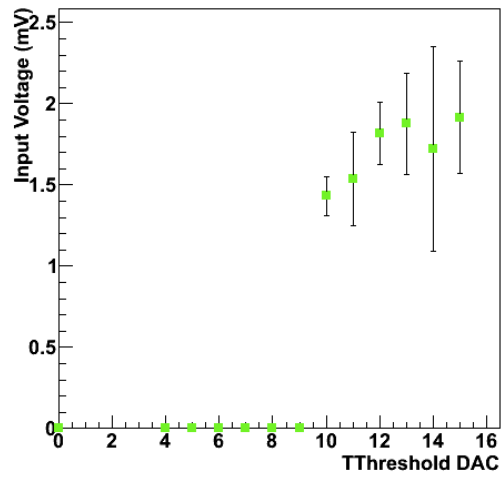
TBias\_OK=15 (LadderDAC=48)



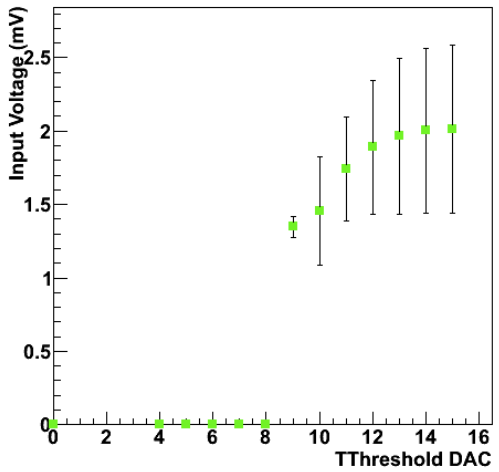
LADDER\_DAC=31



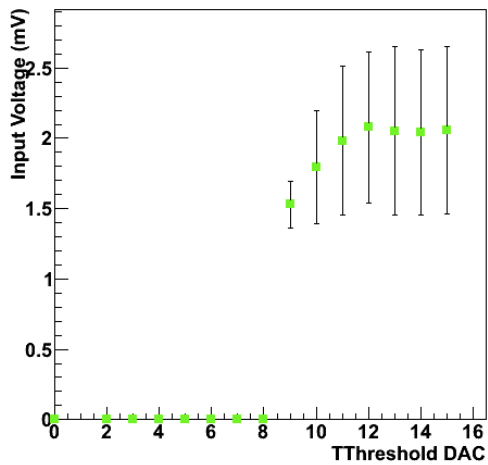
LADDER\_DAC=41



LADDER\_DAC=48

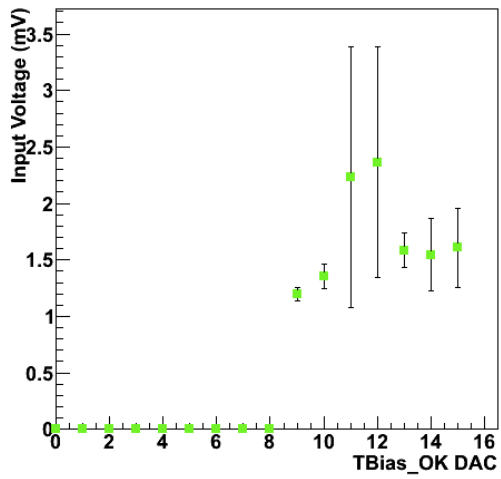


LADDER\_DAC=61

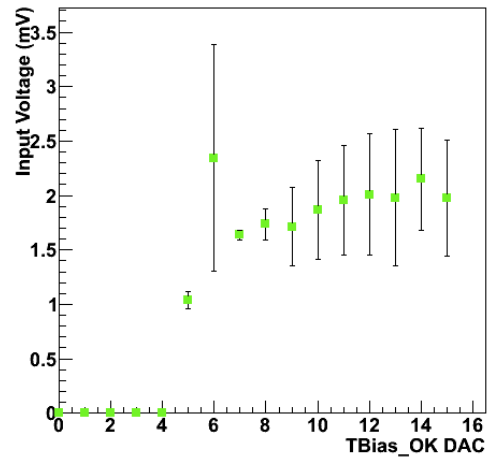




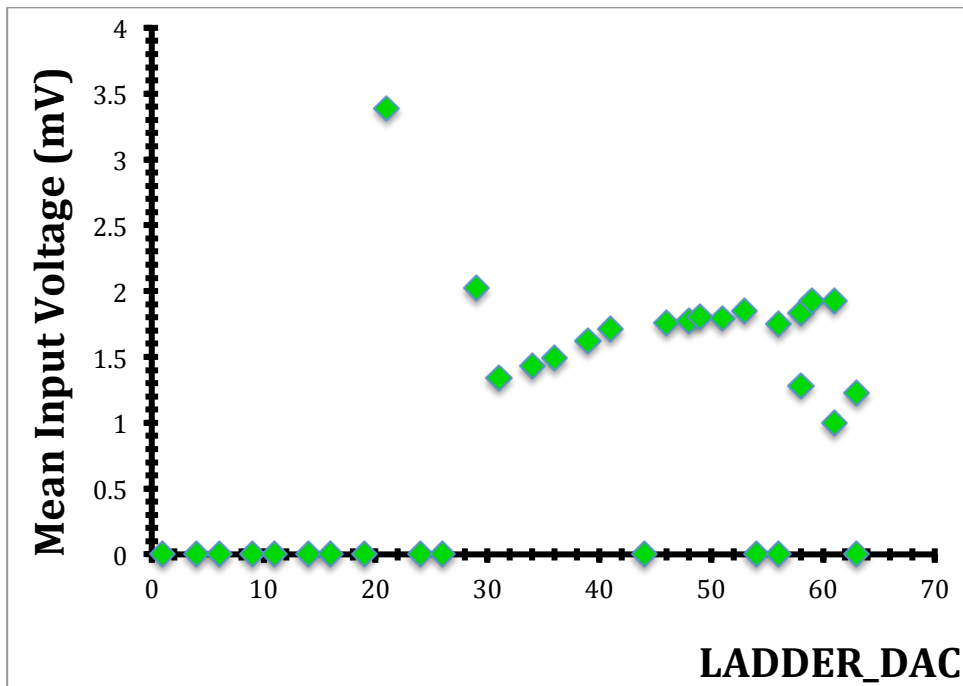
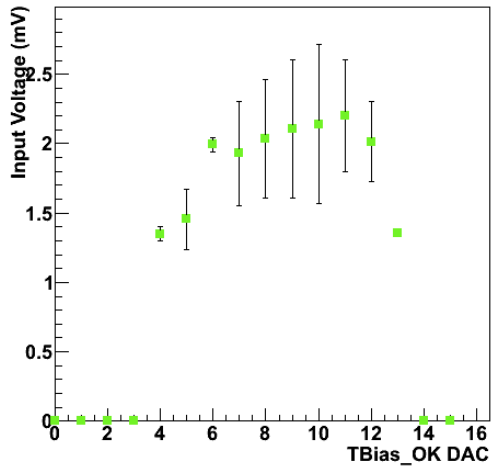
LADDER\_DAC=36



LADDER\_DAC=49

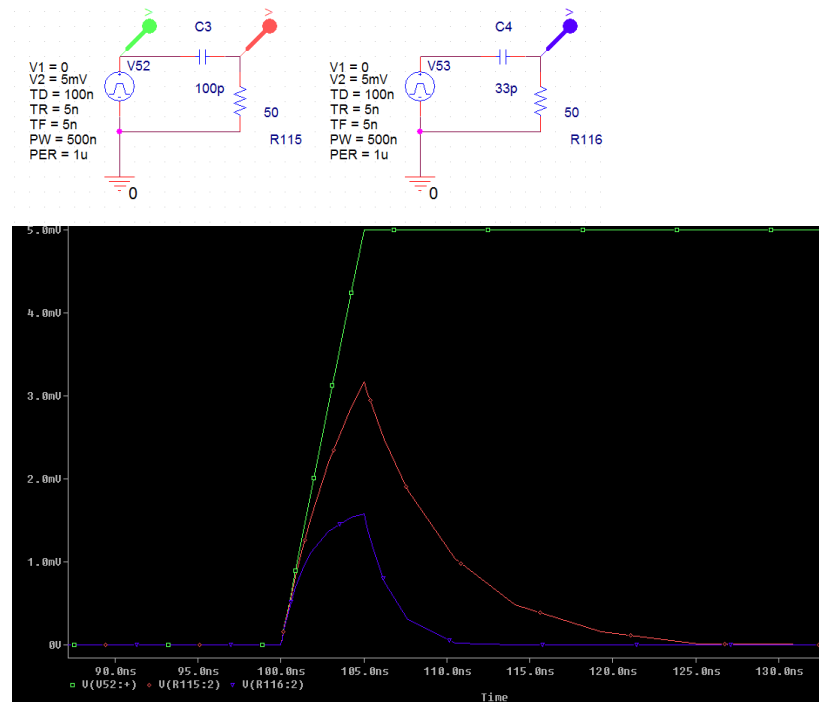


LADDER\_DAC=59



Here some simulations that may help to understand what signal we get with different capacitors and input charge.

**SAME INPUT CHARGE, DIFFERENT CAPACITORS:**



**SAME CAPACITOR, DIFFERENT INPUT CHARGE:**

