Charge Amplifiers Noise Analysis Report

Matteo Polo

December 14, 2023

Contents

1 Cremat Cr-110 + Cr-150

- Test input: Used Agilent pulse generator. Square wave with amplitude $V_{pp} = [140\text{-}180]$mV. Frequency 1kHz. $Q_{in} = V_{pp} * C2 = V_{pp} * 1$pF.

- Parameters set on CAEN 5780:

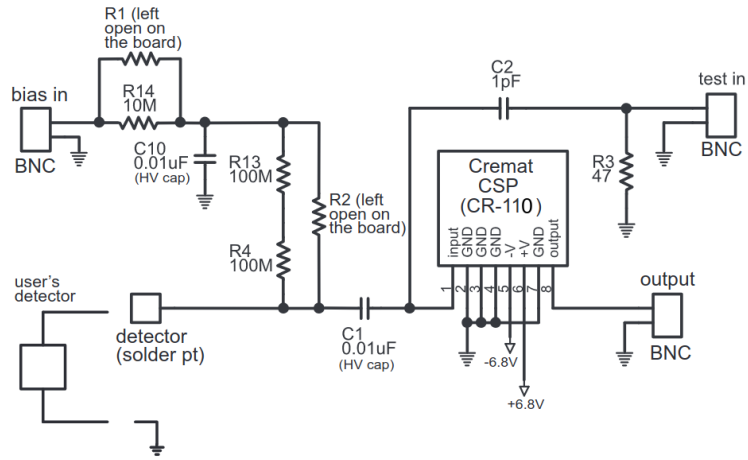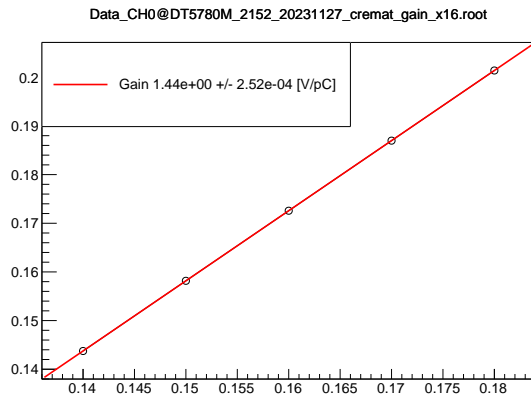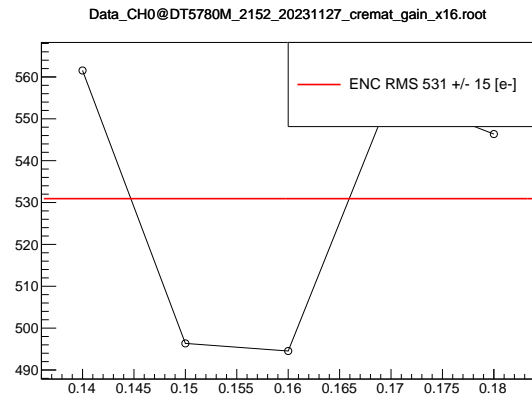| Record length	$40\mu s$
Polarity	neg
Coarse gain	x16
Trap raise time	$5\ \mu s$
Trap flat top	$5\ \mu s$
Trap pole zero	$130\ \mu s$
Peaking time	$50\ \%$
N sample peak	64

Figure 1: Cr-110 + Cr-150 Circuit

(a) Gain

(b) Noise

Figure 2: Figure

2 Amptek A250

- Test input: Used Agilent pulse generator. Square wave with amplitude $V_{pp} = [140\text{-}180]$mV. Frequency 1kHz. $Q_{in} = V_{pp} * C2 = V_{pp} * 1$pF.

- Parameters set on CAEN 5780:

Record length	$20\mu s$
Polarity	neg
Coarse gain	x16
Trap raise time	$0.5\ \mu s$
Trap flat top	$0.3\ \mu s$
Trap pole zero	$1\ \mu s$
Peaking time	50 %
N sample peak	16

- To reduce the output offset, which is 600mV, a capacitance of 100pF was added in parallel to a resistor of 3MΩ.
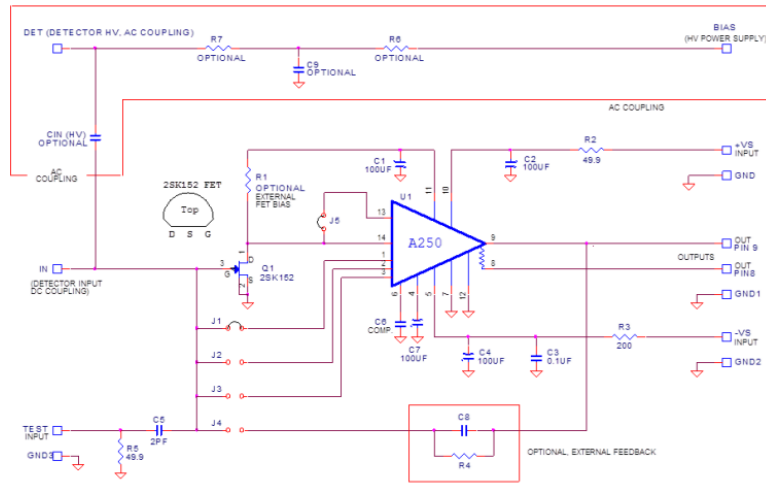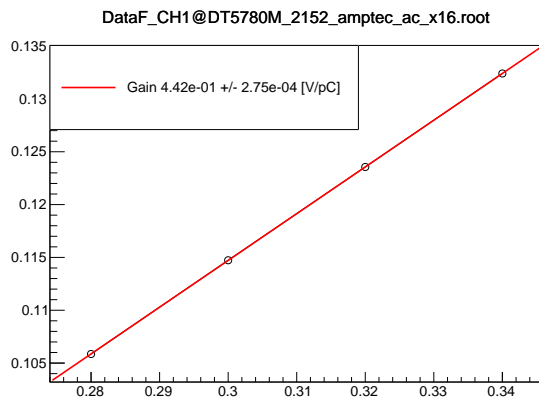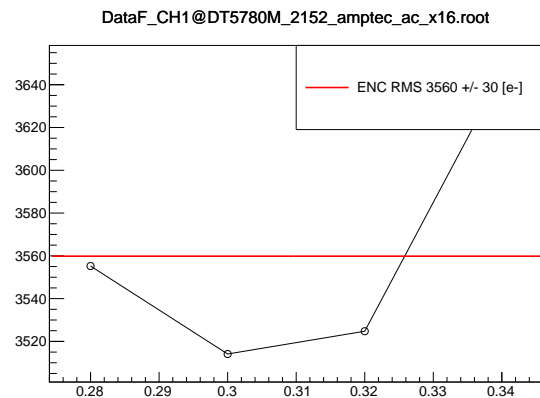

Figure 3: A250 + PC250 Circuit

(a) Gain

(b) Noise
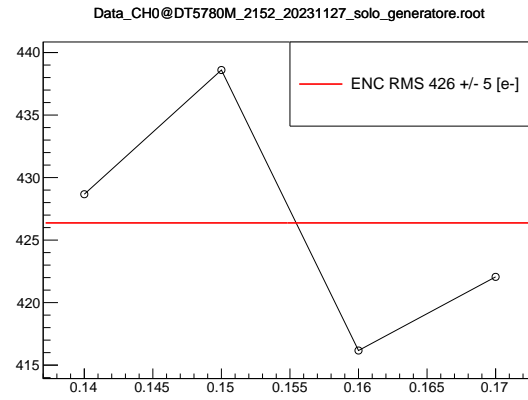
Figure 4: Figure

3 Pulse Generator Only

Figure 5: Noise

4 Conclusions

The following formula was used for noise calculation, to remove the noise contribution from the pulser in the amplifier + pulser system.

$$ENC_{amp} = \sqrt{ENC^2_{amp+pul} - ENC^2_{pul}} \tag{1}$$

Amplifier	Equivalent noise charge
Cremat Cr-110	316 ± 5 e$^-$
Amptek A250	3534 ± 5 e$^-$

Table 1: Final Results CR-150