3/02/20 CAPACITANCE INVESTIGATION OF DIGITISER AND INPUT SIGNAL

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HIGH LOW INPUT VOLTAGE

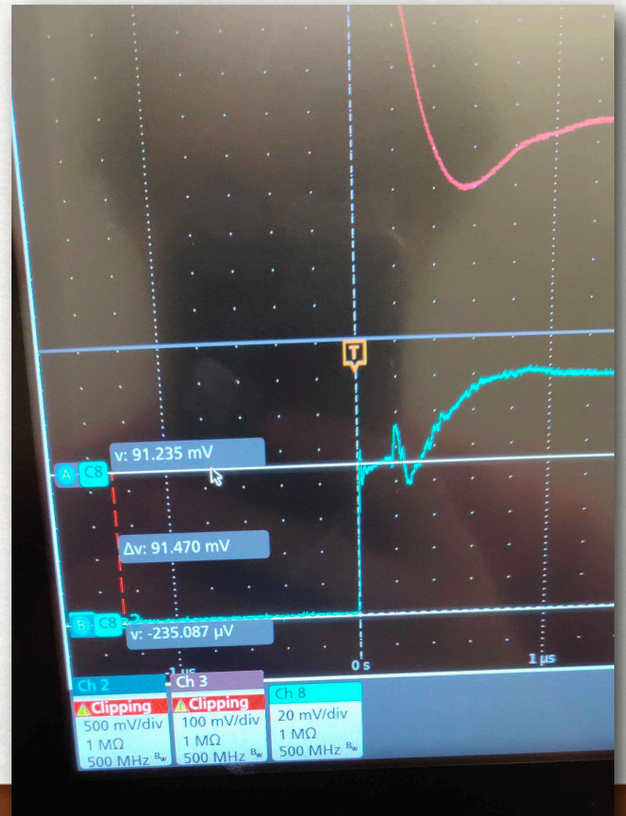
I was investigating the effect of the digitiser on the capacitance

At the same time I decided to investigate what pluses hight was correct to use when calculating the capacitance

This is because the selected voltage is slightly different to the voltage seen in the detector

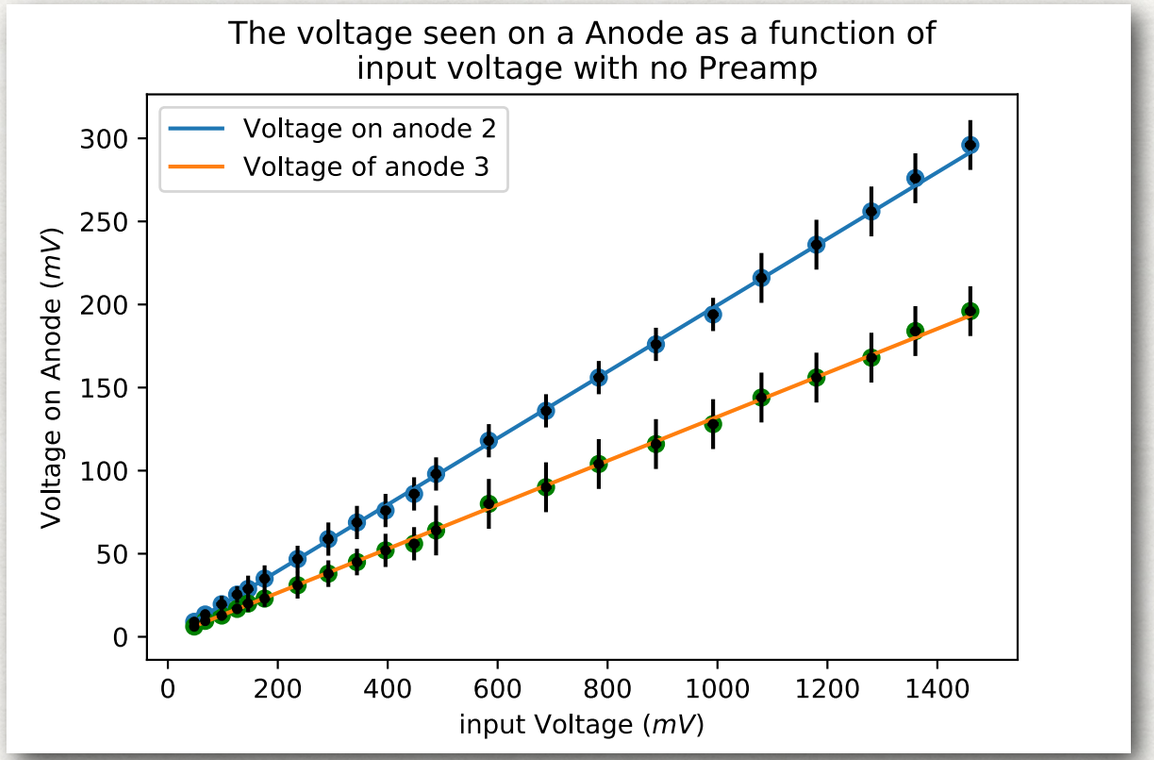
140mV input signal on pulse generator

Low peak voltage:
Only 91mV initial

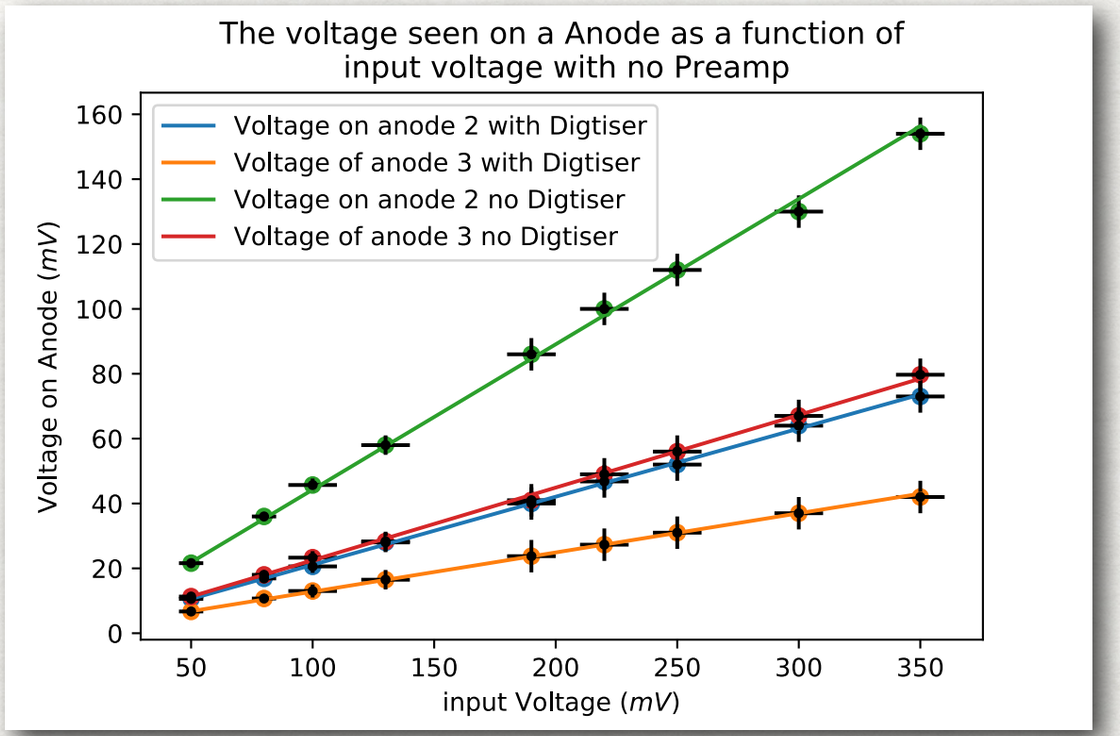


High peak voltage:
Only 140.48mV

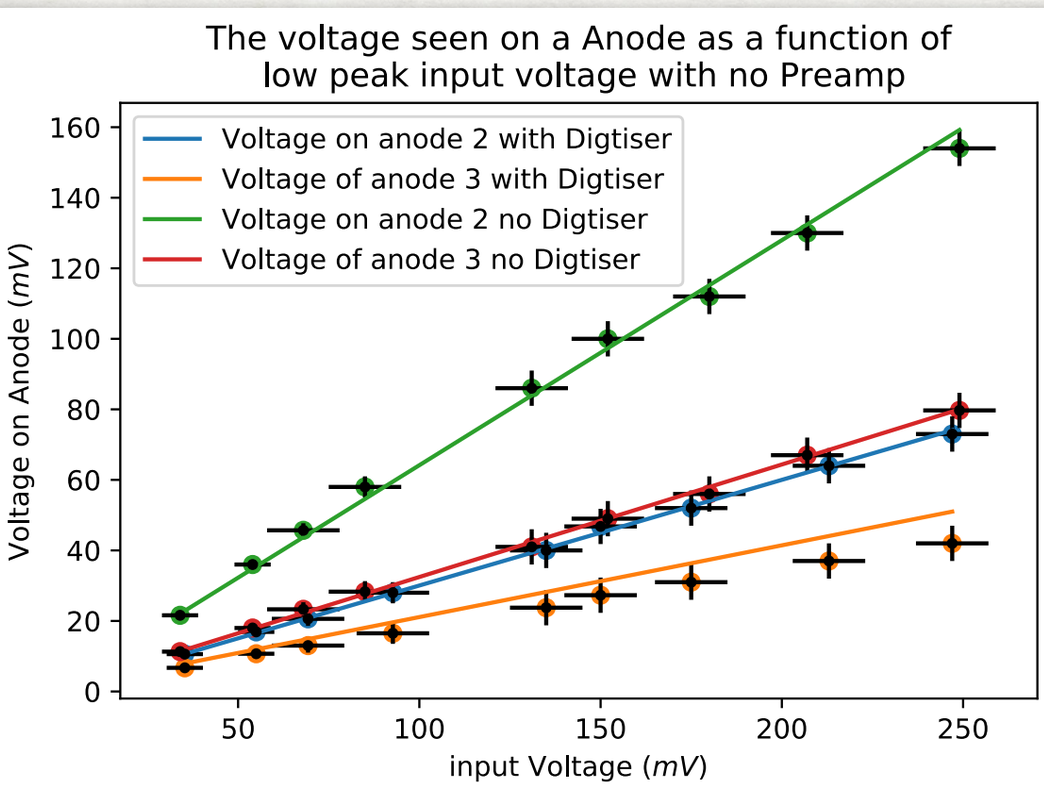
Previous result



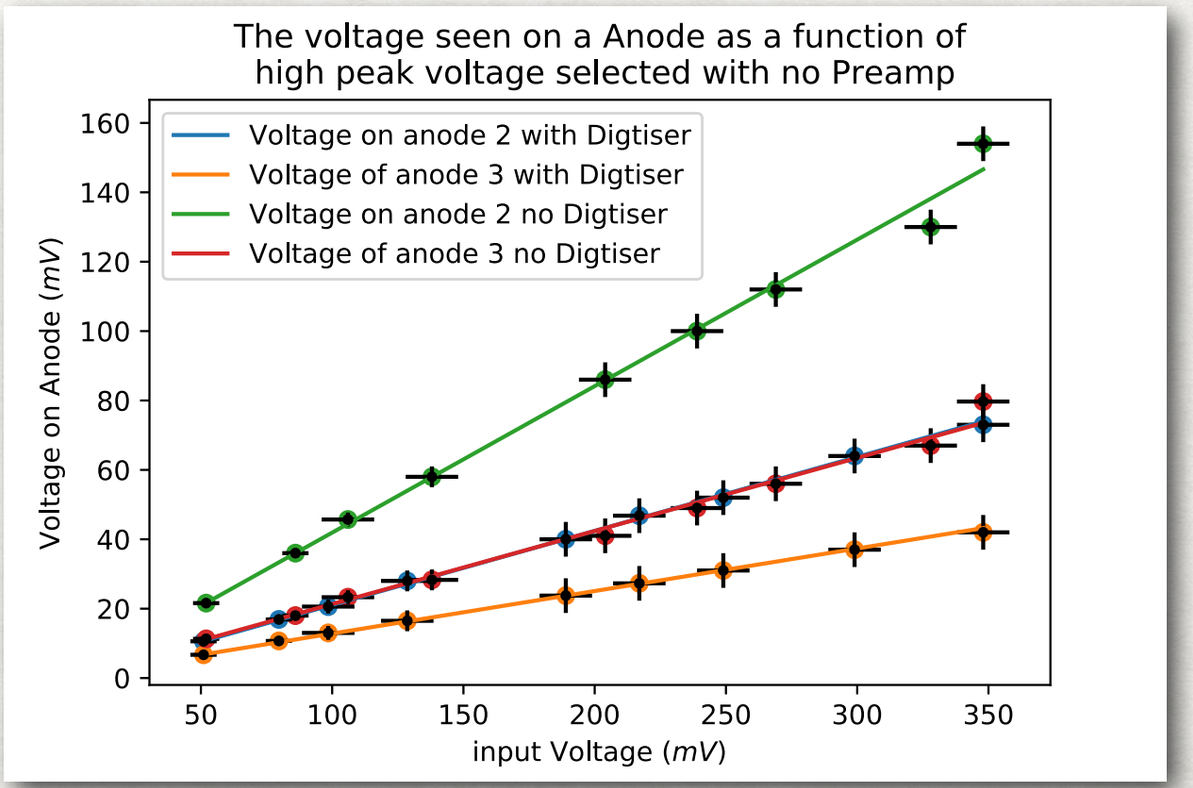
Result if input voltage is the one inputted into the signal generator



Result if input voltage is the low initial peak



Result if input voltage is the high peak



MEASURING THE CAPACITANCE

SIGNAL ON ANODE 1 WITH NO PREAMP

Using this form to fit a straight line with C_{mesh} as the free parameter

$$V_{output} = \frac{V_{input} C_{couple}}{\frac{1}{C_{couple}} + \frac{1}{C_{mesh}}}$$

Measurment taken	Anode 1/2 (nF)	An1/2 Chi^2/n	Anode 2/3(nF)	An1/3 Chi^2/n	Anode 1/3 (nF)
Previous result	2.50±0.06	0.03	3.9±0.04	0.02	-
Fit Value: input signal: Digtiser plugged in	2.7±0.1	0.02	1.7±0.2	0.02	-
Fit Value: input signal: Digtiser unplugged	8.1±0.3	0.3	4.5±0.4	0.06	-
Fit Value: low voltage read:Digtiser plugged in	4.2±0.2	0.04	2.3±0.3	0.05	-
Fit Value: low voltage read:Digtiser unplugged	17±1	0.9	6.3±0.5	0.09	-
Fit Value: high voltage Read: Digitiser plugged in	2.7±0.1	0.02	2.0 ±0.1	0.02	-
Fit Value: high voltage Read: Digitiser unplugged	7.3±0.3	0.76	4.4±0.4	0.35	BEST?
At detector feedthrough	5.32±0.05	-	3.41±0.05	-	2.16±0.05
At the Bias box	6.06±0.05	-	3.72±0.05	-	2.45±0.05

CONCLUSION

The digitiser resistor is halving the signal seen which is what resulted in the capacitance being different from the measured values.

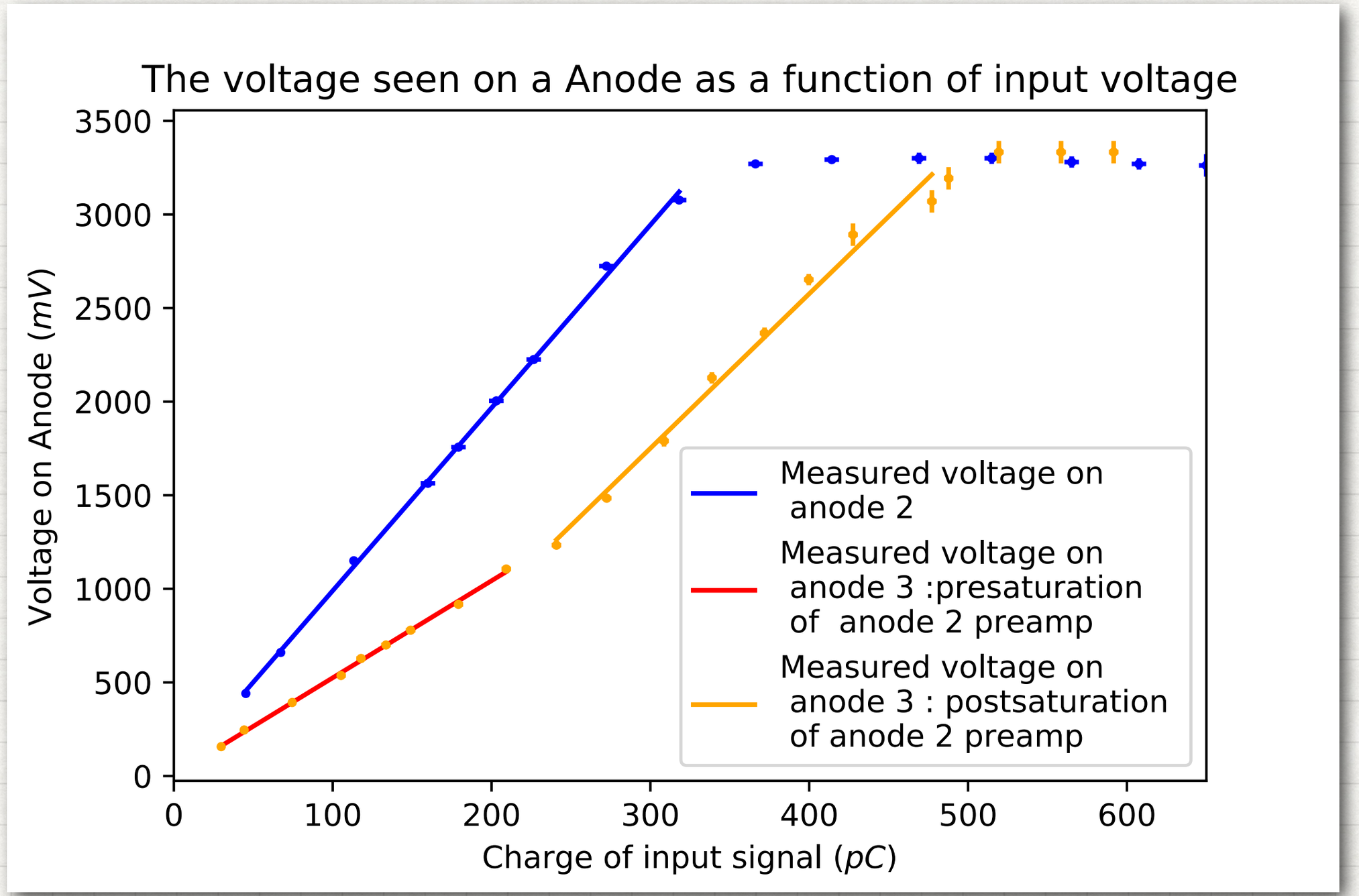
I concluded that the high peak unplugged digitiser results int the most correct calculation of the capacitance

This also allows me to calculate the distance between the mesh planes.

The distance between 1 and 2 is (1.20±0.05)mm and (2.0±0.2)mm between anode 2 and 3

NEW GAIN WITH PREAMP

GAIN CALCULATED USING THE MEASURED CAPACITANCE AT BIAS BOX



Gain anode 2 : (9.8± 0.1)mV/pC

Gain anode 3 pre: (5.18± 0.07)mV/pC

Gain anode 3 post: (8.3± 0.4)mV/pC

CAPACITANCE OF ANODES

$$A = fG_{mesh}G_{preamp}Q_e$$

G_{mesh} = 1 in this case as there is no gas amplification in this method

For Calculated Capacitance

For an input signal of (29±5)mV

we have for **anode 2**

A=(660±20)mV, Q_e=(64±1)pC and $G_{preamp2}$= (9.8±0.1)mV/pC

Which gives the value of f2=1.05±0.03

we have for **anode 3 presaturation**

A=(250±20)mV, Q_e=(42±7)pC and$G_{preamp3}$=(5.18±0.07)mV/pC

Which gives the value of f3=1.15±0.2

For an input signal of (270±10)mV

we have for **anode 3 postsaturation**

A=(2652±30)mV, Q_e=(390±30)pC and$G_{preamp3}$=(8.3±0.4)mV/pC

Which gives the value of f3=0.82±0.03