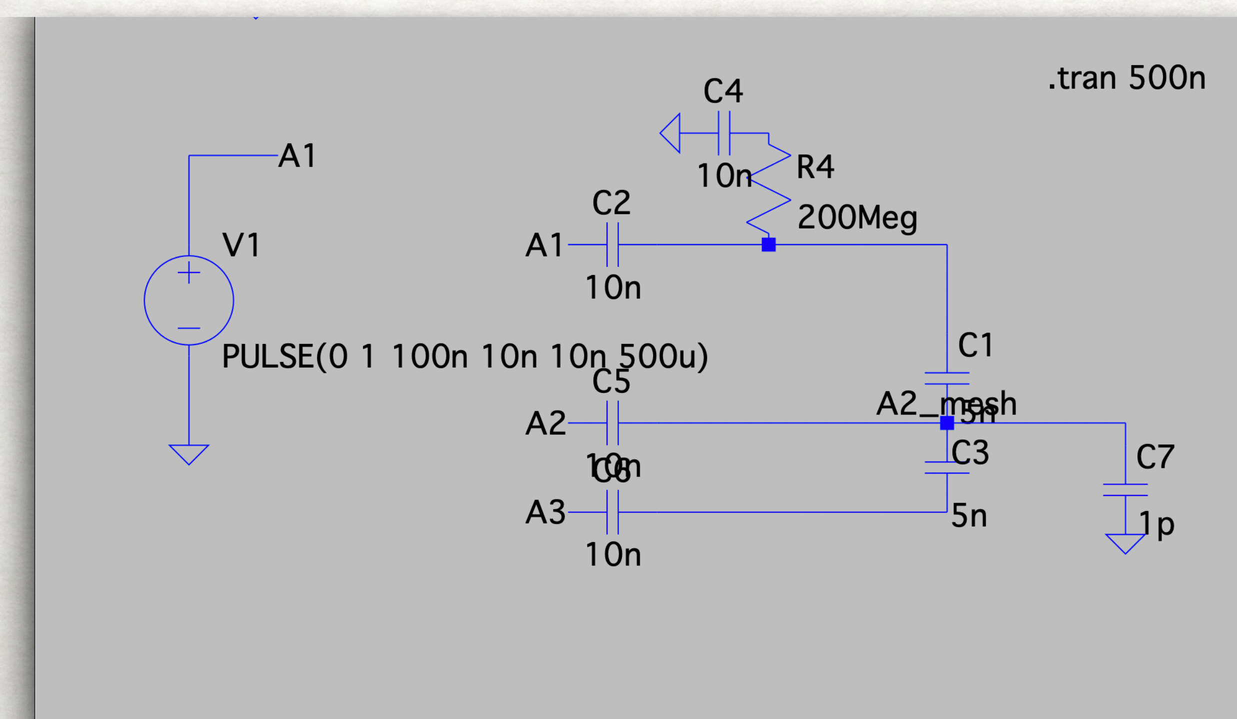
06/01/20 CAPACITANCE AND FINAL RESULTS ABOUT ATTENUATION

Adam Tarrant

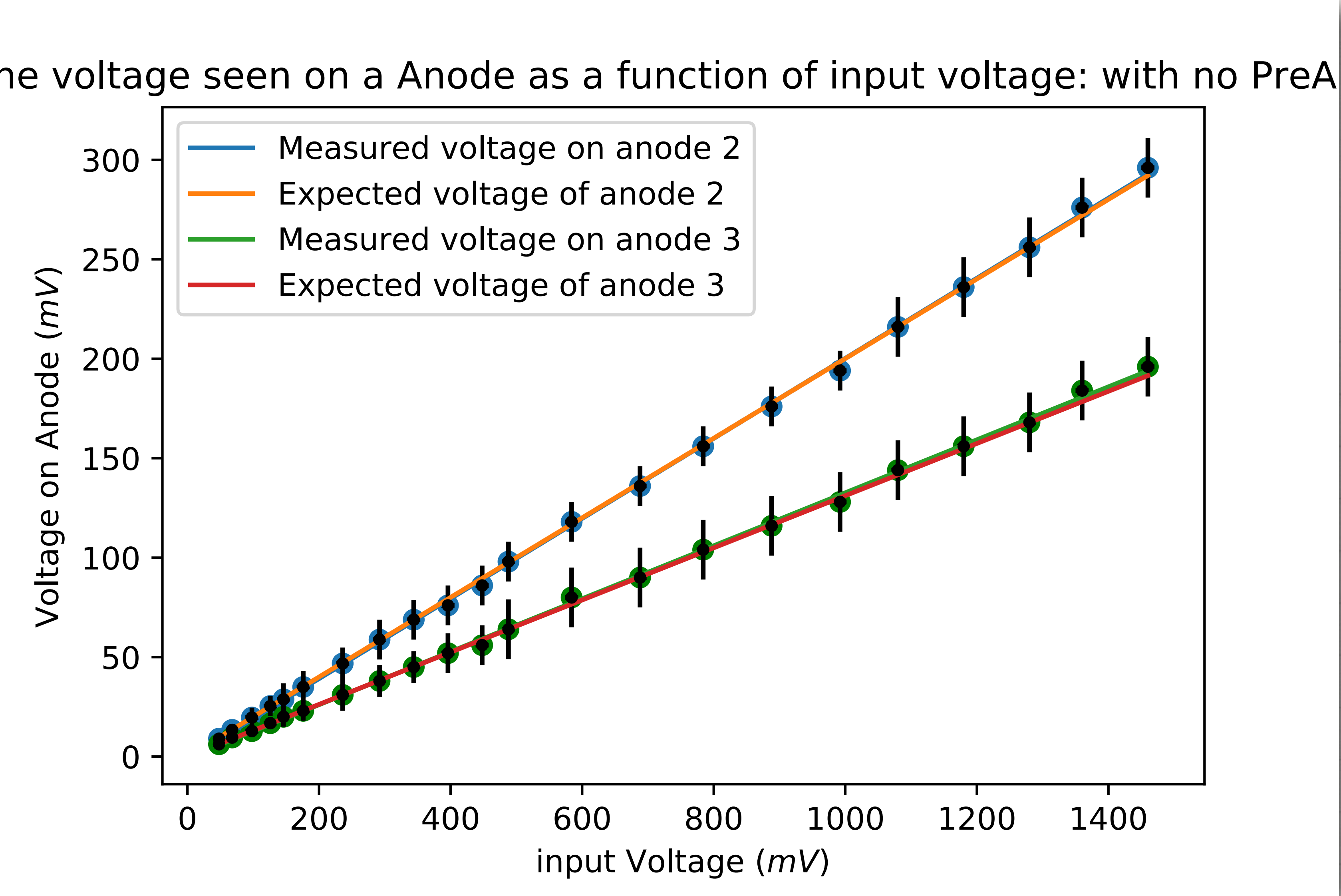
THE EXPERIMENTAL SETUP

- Into anode 1 (or needed anode) a signal generator is plugged in to the bias box which goes to the detector.
- A signal at a range of voltage is then produced which induces a signal on the other anodes.
- The other anodes amplitude are then read, with and without preamps



$$C = \frac{1}{\frac{1}{C_{couple}} + \frac{1}{C_{mesh}}}$$

$$Q = \frac{V_{input}}{C[pF]} \rightarrow V_{out} = \frac{Q}{C_{couple}}$$



Measurment taken	Anode 1/2 (nF)	Anode 2/3(nF)	Anode 1/3 (nF)
Graph calculated value	6.7	3.7	2.55
At detector feedthrough	5.32	3.41	2.16
At the Bias box	6.06	3.72	2.45

HPTPC CALIBRATION

SIGNAL ON ANODE 1 WITH NO PREAMP

Gradient of anode 2:

0.2012951±0.0000008

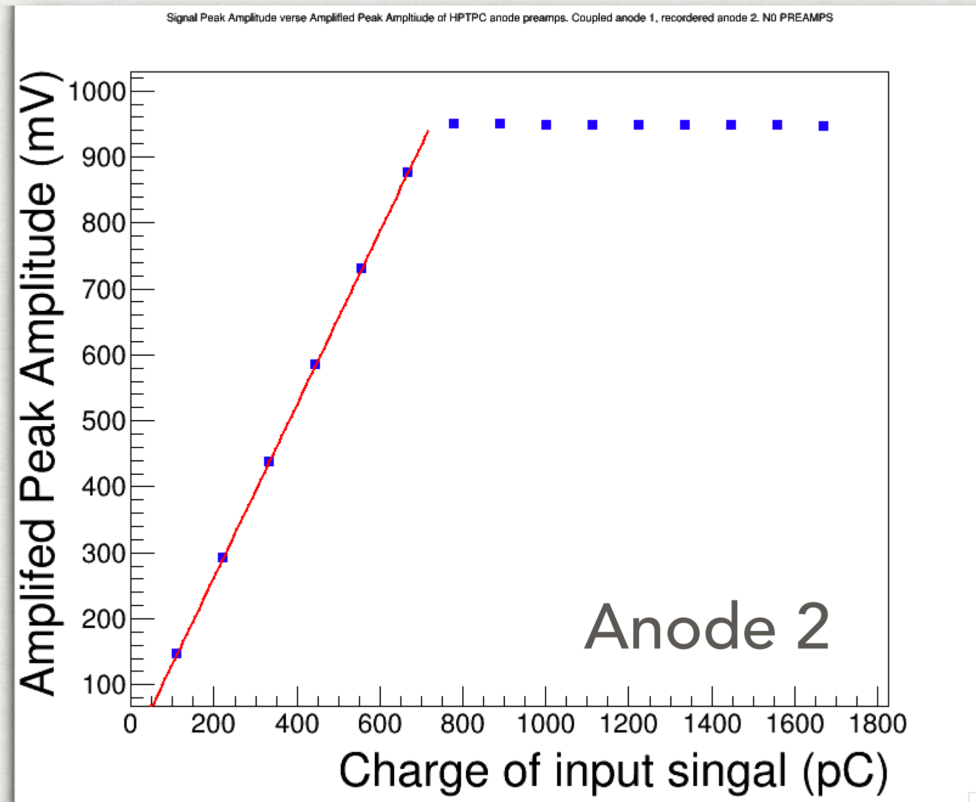
Gradient of anode 3:

0.1331882±0.0000007

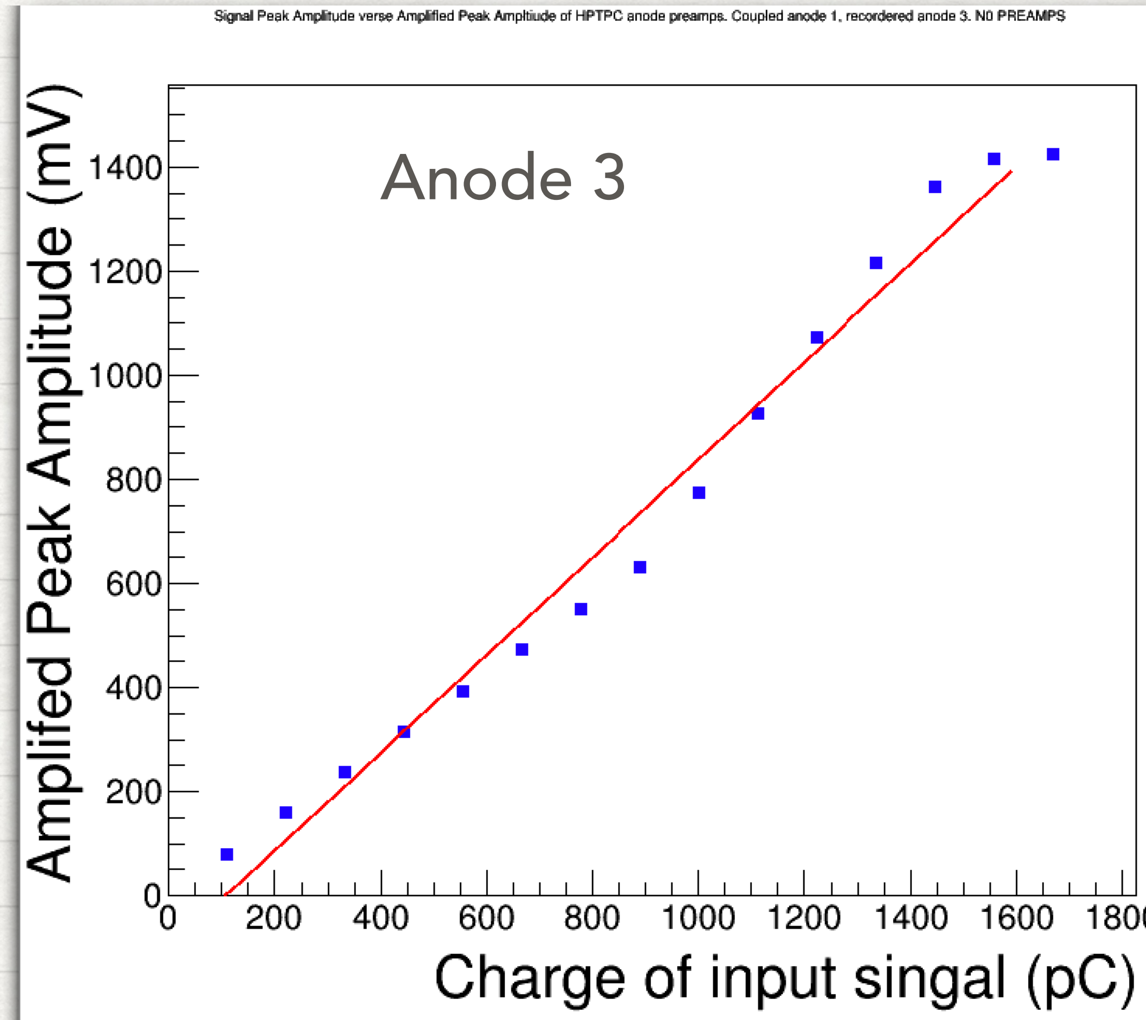
I have used this information to find a value for the capacitance to improve apon the estimates. By making a numerical calculation from the signal voltage and then converting this to a charge and then recalculate the expected output voltage.

I can then compare this to the a multimeter reading of the capacitance

OLD GAIN MEASUREMENT WITH PREAMP



Gain: 1.3107±0.0001 mV/pC



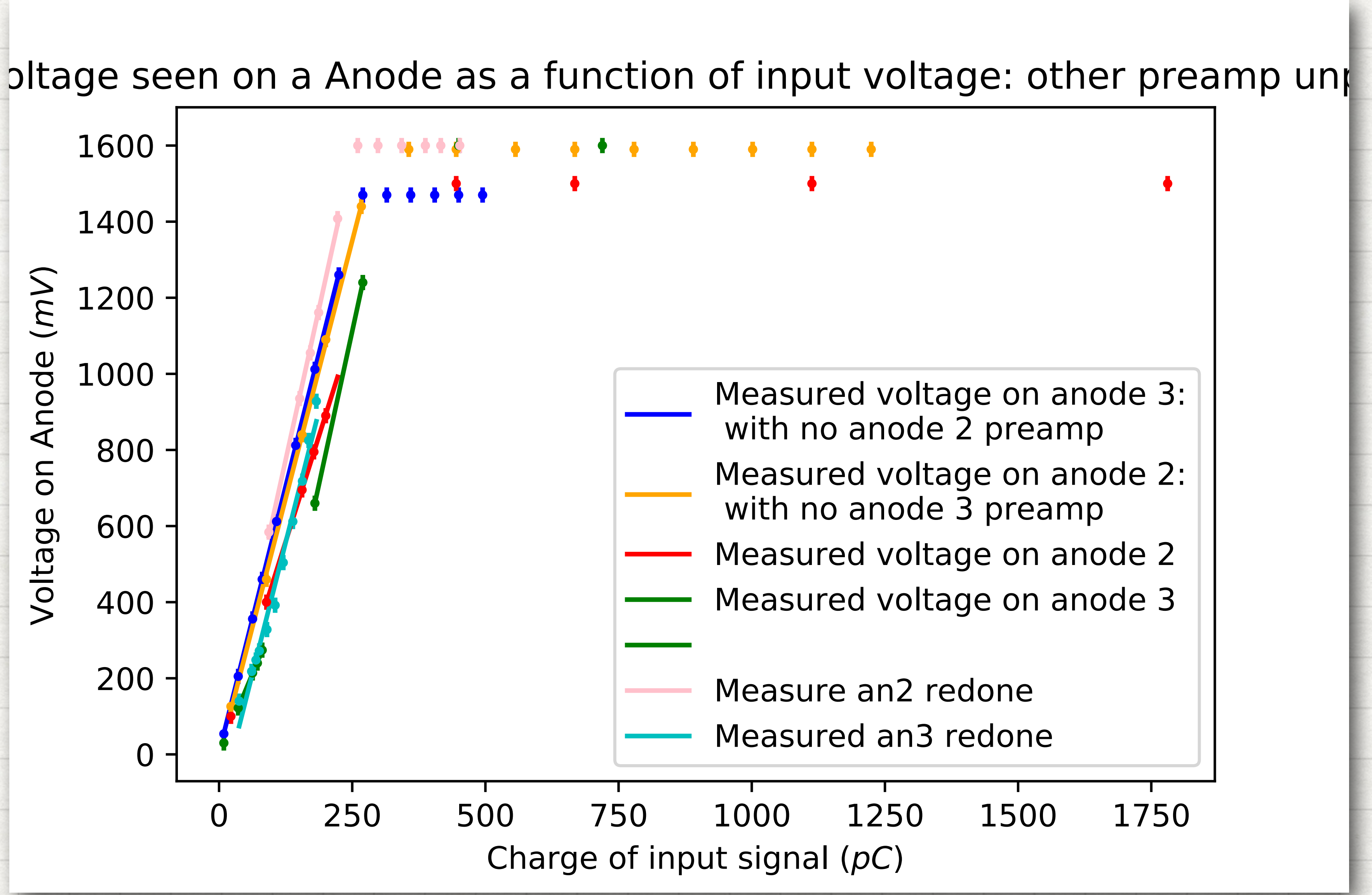
Gain: 0.93872±0.00003 mV/pC

Before the Holiday there was concern about measurements taken for anode 3 which didn't follow a straight line and then saturate. Further investigation was required

NEW GAIN WITH PREAMP

WITH PREAMP NOT MEASURED REMOVED

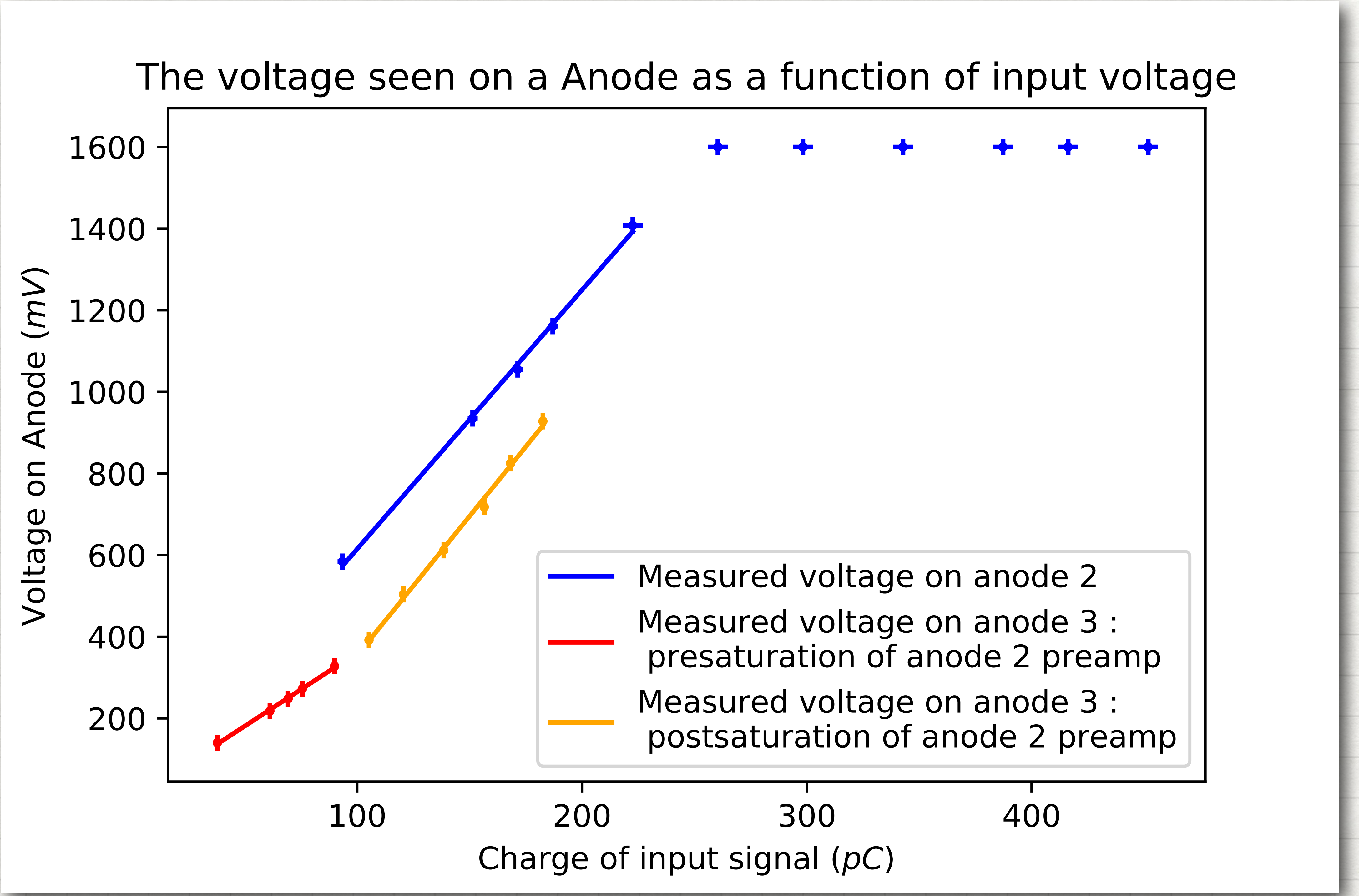
Repeating the experiment the kinks in anode 3 disappear when the preamp for anode 2 is removed. This is due to saturation in preamp 2 limiting the charge which affects anode 3



In this version the amplitude was measured using the oscilloscope instead of digitiser which removed issue with trigger and baseline threshold

NEW GAIN WITH PREAMP

GAIN CALCULATED



Gain anode 2 : 6.34±0.02 mV/pC

Gain anode 3 pre:3.593± 0.008mV/pC

Gain anode 3 post:6.81± 0.04mV/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 an input signal of 26mV

we have for anode 2

A=83±10mV, Q_e=22.5pC and $G_{preamp2}$= 6.32±0.02mV/pC

Which gives the value of f2=0.949±0.05

we have for anode 3 presaturation

A=83±10mV, Q_e=8.99pC and$G_{preamp3}$=3.593±0.008mV/pC

Which gives the value of f3=0.99±0.01

For an input signal of 174mV

we have for anode 3 presaturation

A=718±20mV, Q_e=156pC and$G_{preamp3}$=6.81±0.04mV/pC

Which gives the value of f3=0.68±0.01