



Digitization & Tuning update

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Status in March (reminder)

FULLY IMPLEMENTED

in standalone code (based on planar GEM)

- Shockley-Ramo theorem

instantaneous current induced by a charge in motion on an electrode

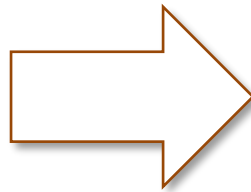
$$\dot{i}(t) = q_{e^-} \times v_{drift} \times W_{loc}$$

- APV25 simulation

RC circuit ($\tau = 50$ ns) + charge threshold

Parameters **we can tune**

- noise (ADC)
- ~~transparency (%)~~
- APV-25 threshold (ADC)
- conversion factor



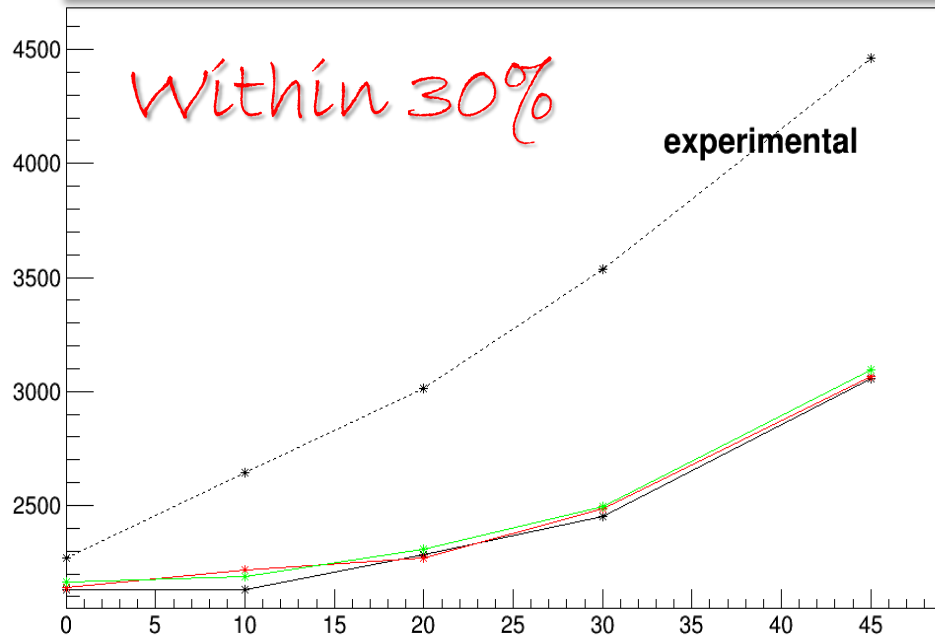
Variables **we must monitor**

- cluster size
- cluster charge
- CC position resolution
- uTPC position resolution
- uTPC angle

Tuning @ March 1st, 2018

(already “old story”)

Charge (ADC) vs angle (deg)

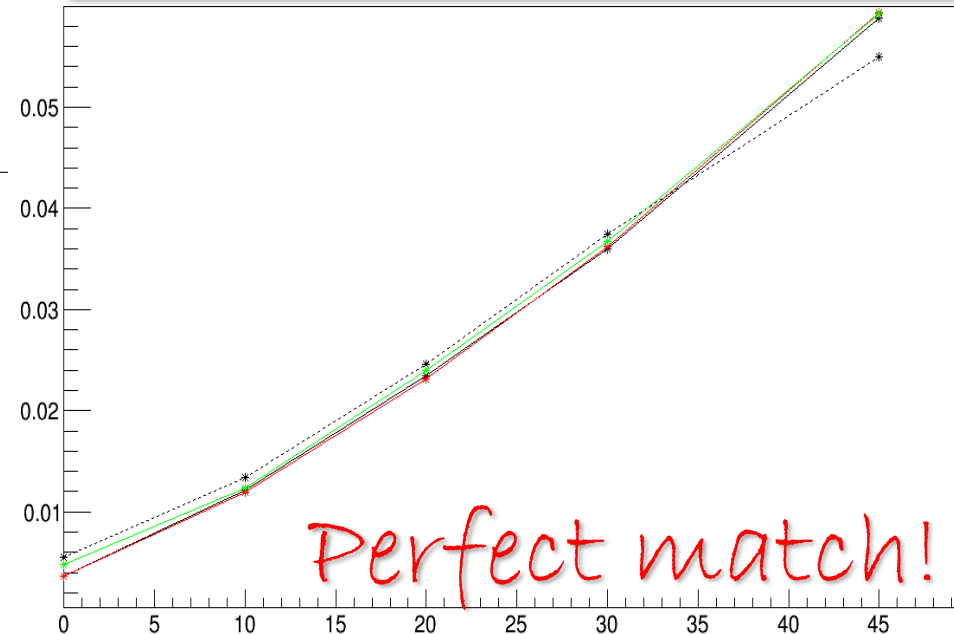


- Noise level = 0, 1, 5 ADC
- APV threshold = 45 ADC
- Conversion Factor = 30 ADC = 1fCc

- Angle scan 0, 10, 20, 30, 45 deg
- HV = 820 V
- Fields = 1.5/3/3/5 kV/cm

With induction

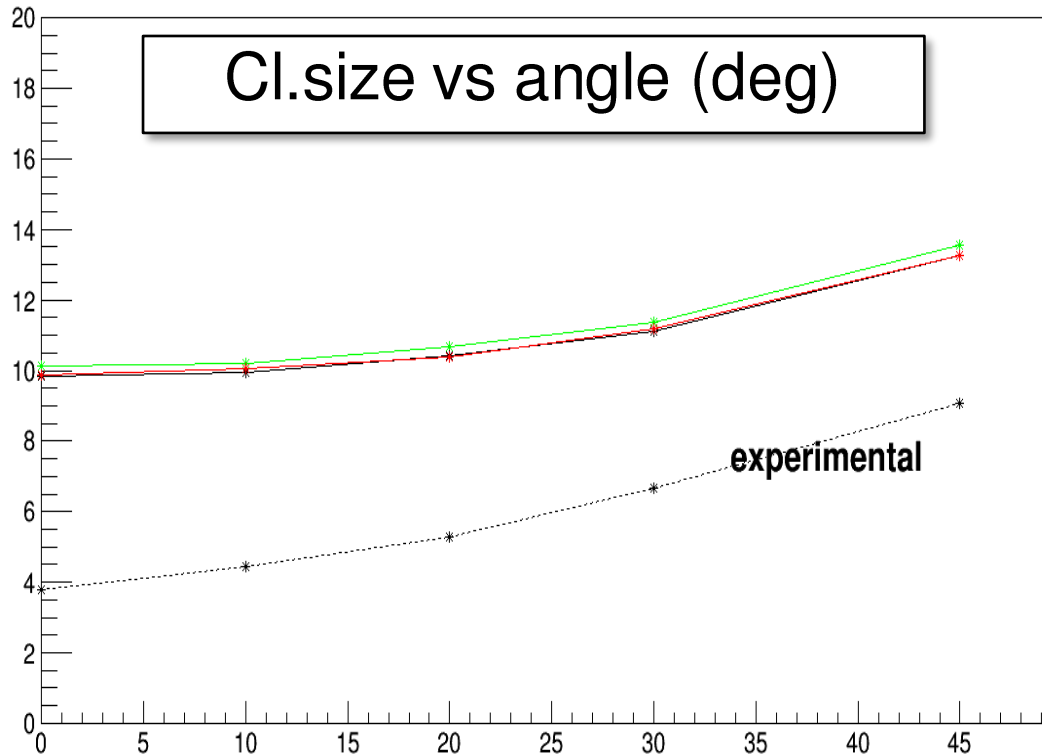
CC resolution vs angle (deg)



Tuning @ March 1st, 2018

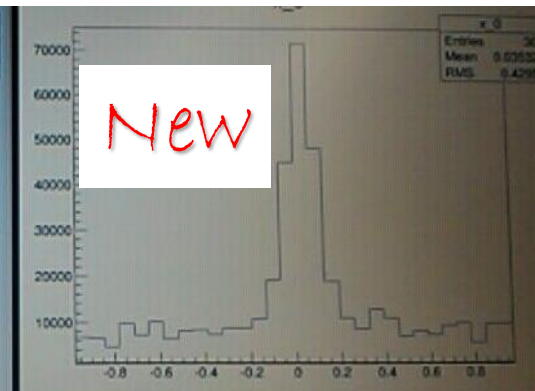
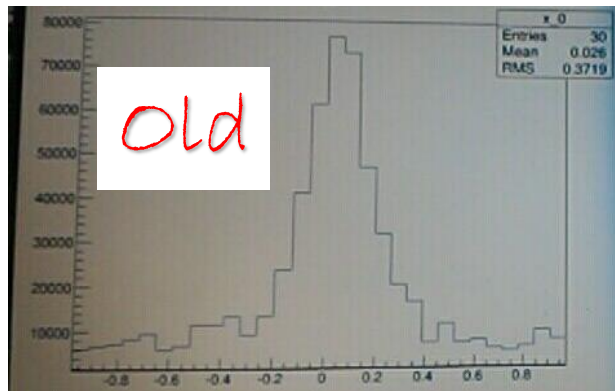
(already “old story”)

Cl.size vs angle (deg)



~~Twice!! □ work on it!~~

- Added missing clusterization
- Fixed induced current calculation



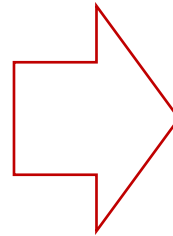
Now, June 2018

Conversion factor

remeasured in lab: 30 ADC = 1 fC

Threshold

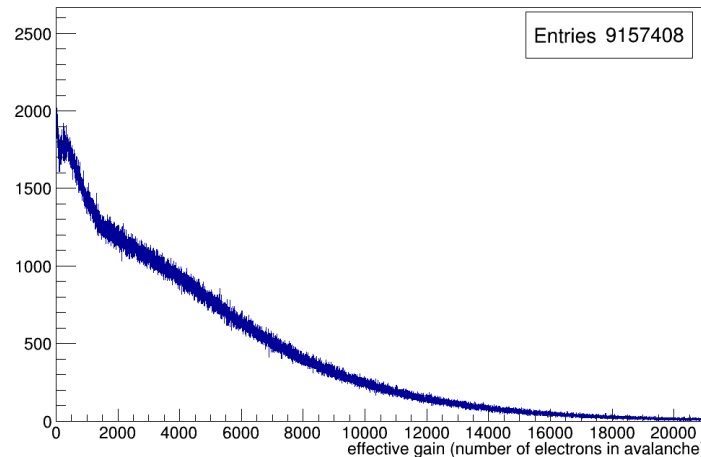
In testbeams was 45 ADC



Parameters **we can tune**

- noise (ADC)
- transparency (%)
- APV-25 threshold (ADC)
- ~~conversion factor~~

No more transparency + gain, but **effective gain** from histo

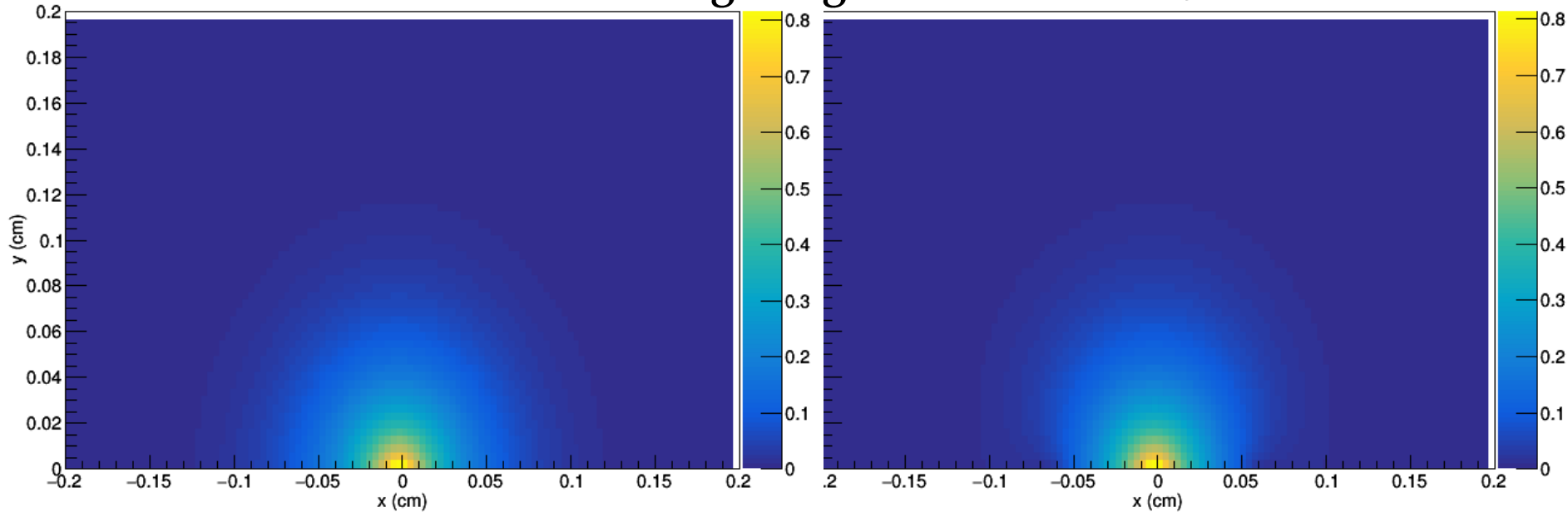


Now, June 2018

only with central strip @ 1V

Weighting field

with other strips @ 0V



GARFIELD computed WF, then not under control.

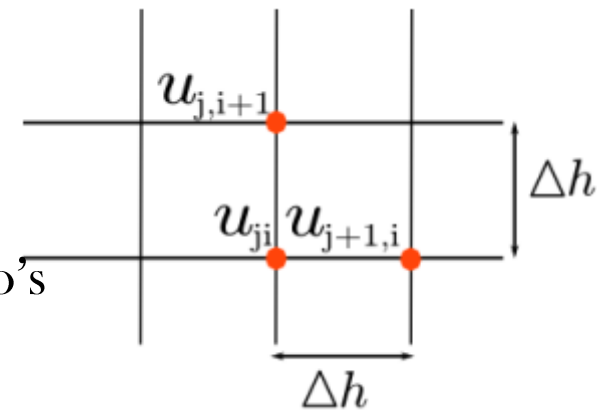
Let's compute it with finite elements calculation

- 1st version: just one strip @ 1V; I actually used the field

$$I_{\text{curr}} = \text{ele_ch} * \text{drift_velocity} * E_{\text{loc}}$$

- 2nd version: one strip @1V AND the others @0V (Ramo's theorem); I want to use the potential

$$Q_{\text{induced}} = \text{ele_ch} * \Delta V$$

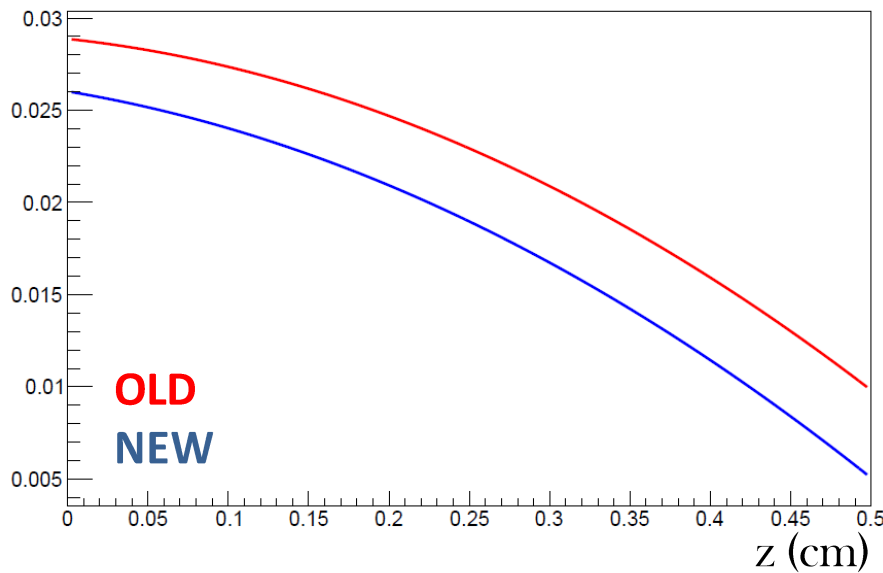


Now, June 2018

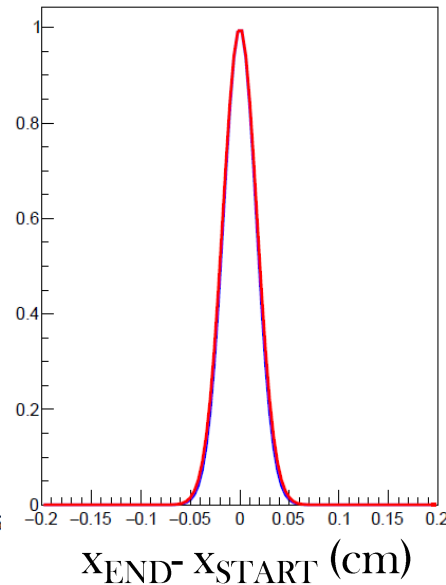
After bug fixing of the ANSYS field maps we did new diffusion studies [NO MAG FIELD]

POSITION

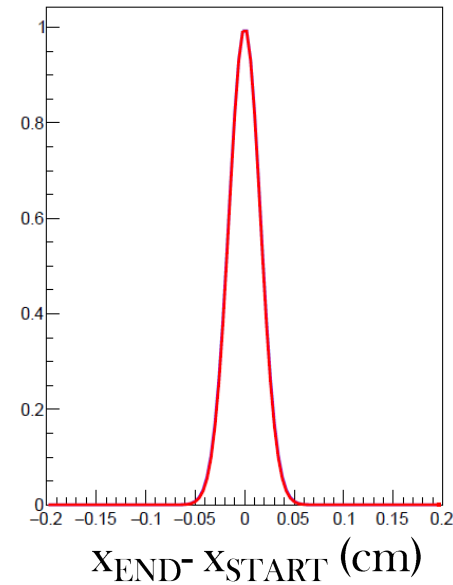
DRIFT, position sigma



TRANSFER, position



INDUCTION, position



- less diffusion in drift gap
- same in the other gaps

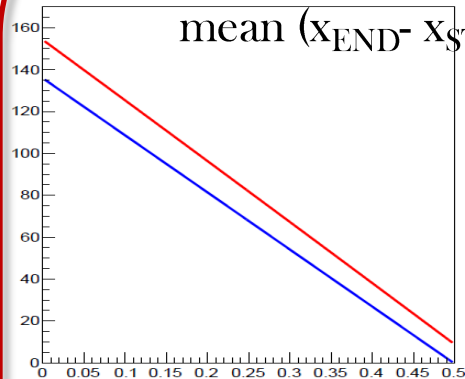
Now, June 2018

After bug fixing of the ANSYS field maps we did new diffusion studies [NO MAG FIELD]

TIME

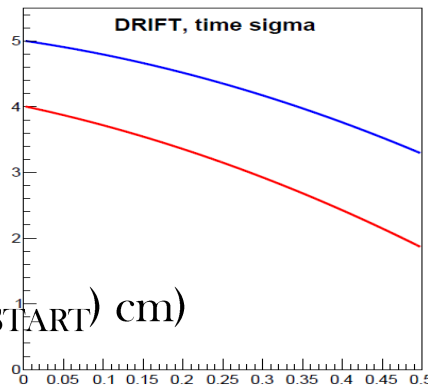
DRIFT, time mean

mean ($x_{END} - x_{START}$) cm

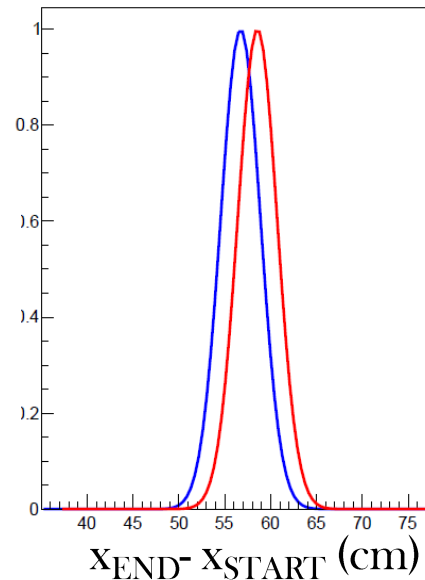


DRIFT, time sigma

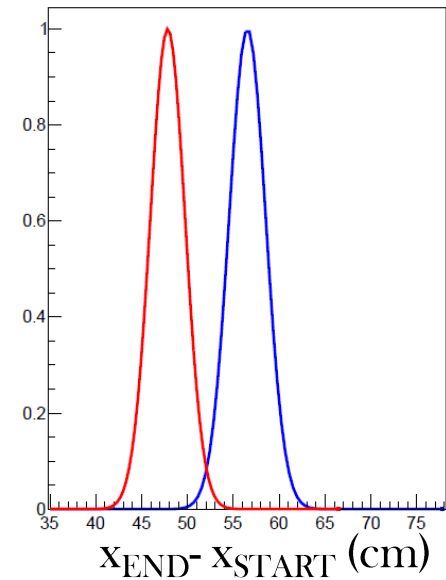
sigma ($x_{END} - x_{START}$) cm



TRANSFER, time



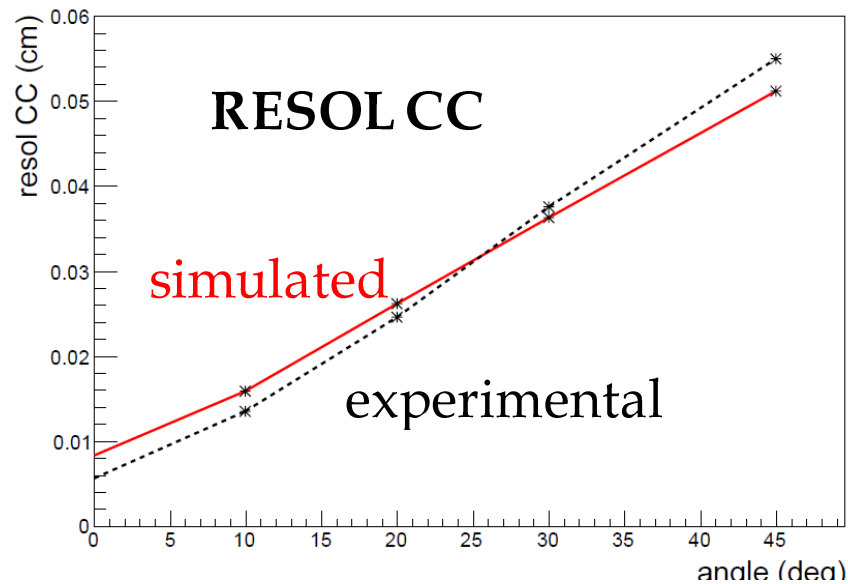
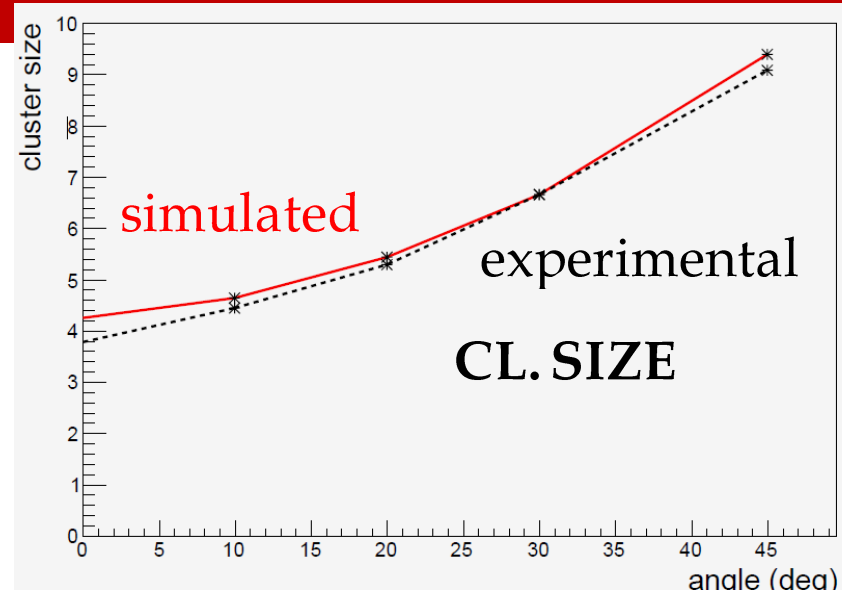
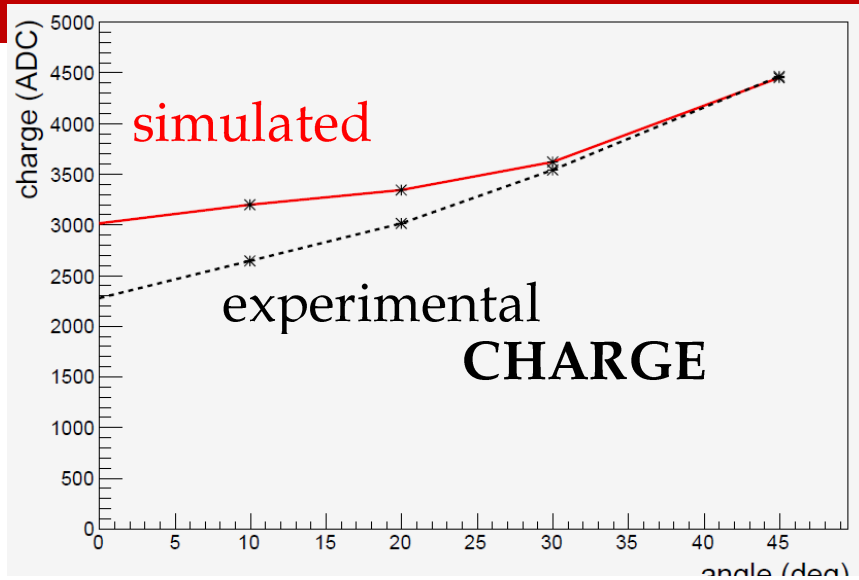
INDUCTION, time



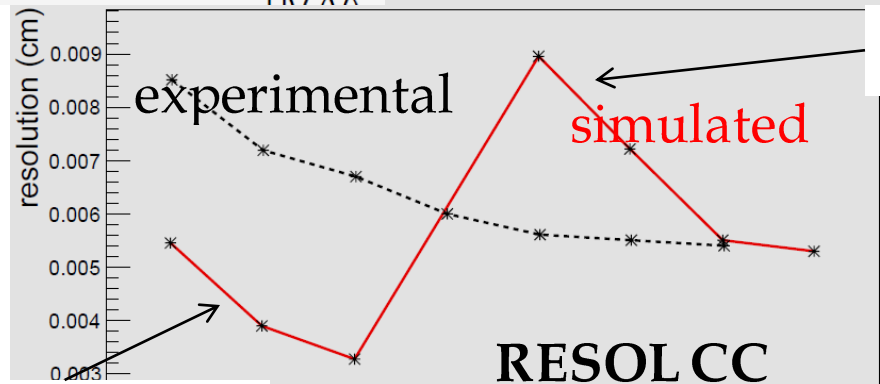
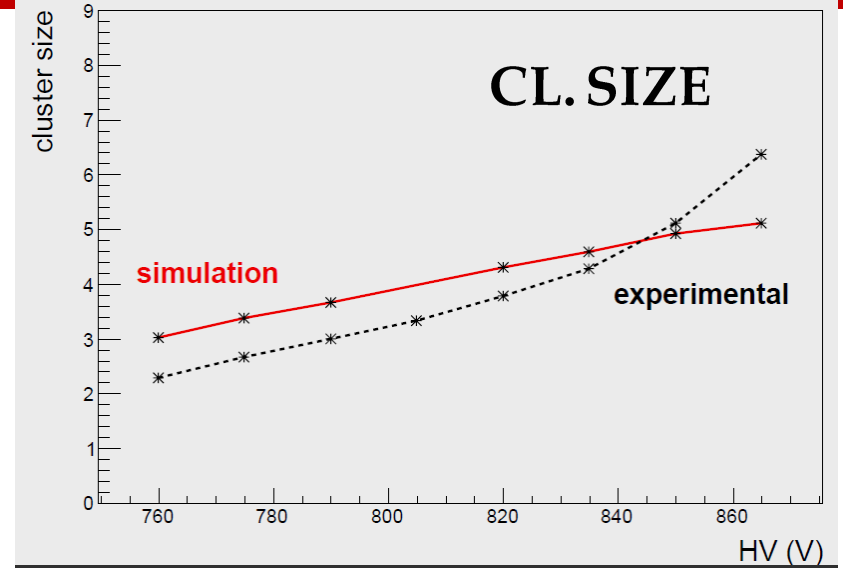
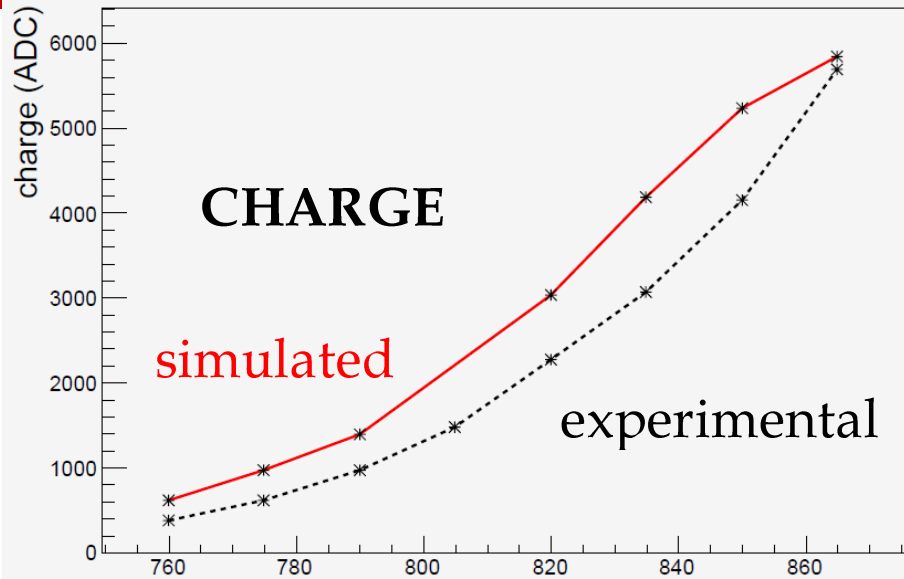
OLD
NEW

- shift in time smaller in drift gap BUT bigger smearing
- shift in transf & induct gaps agrees with $v_D = 35 \mu\text{m/ns}$

Angle scan

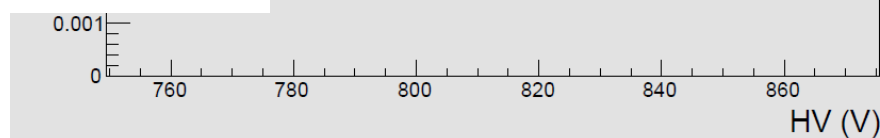


HV scan



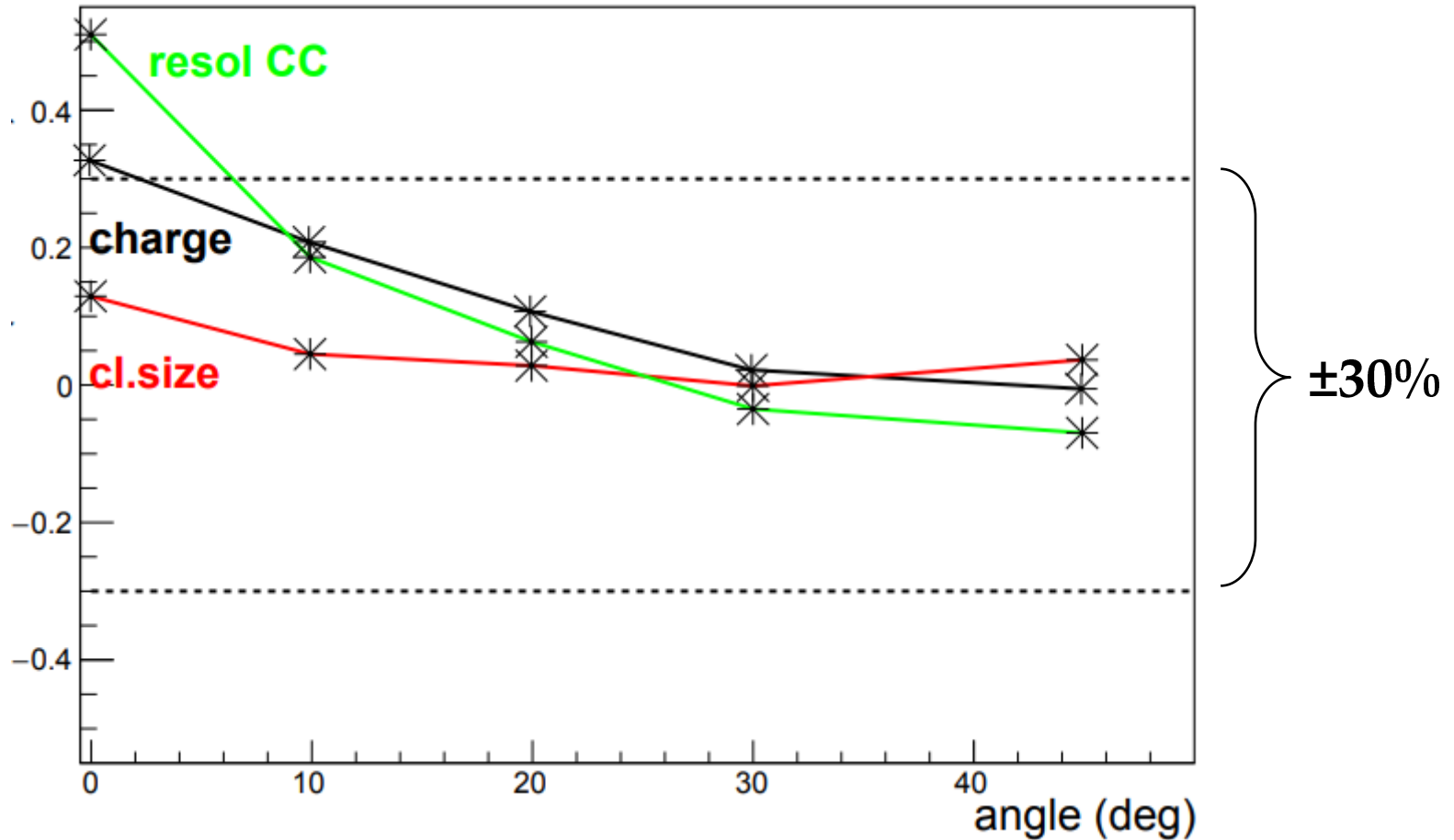
Fit with 1 Gaussian

Fit with 2 Gaussians



Now, June 2018

ANGLE SCAN



Now, June 2018

HV SCAN

