TB results: CGEM electronics

Alberto Bortone

for the Integration Working Group

BESIII ITALIA

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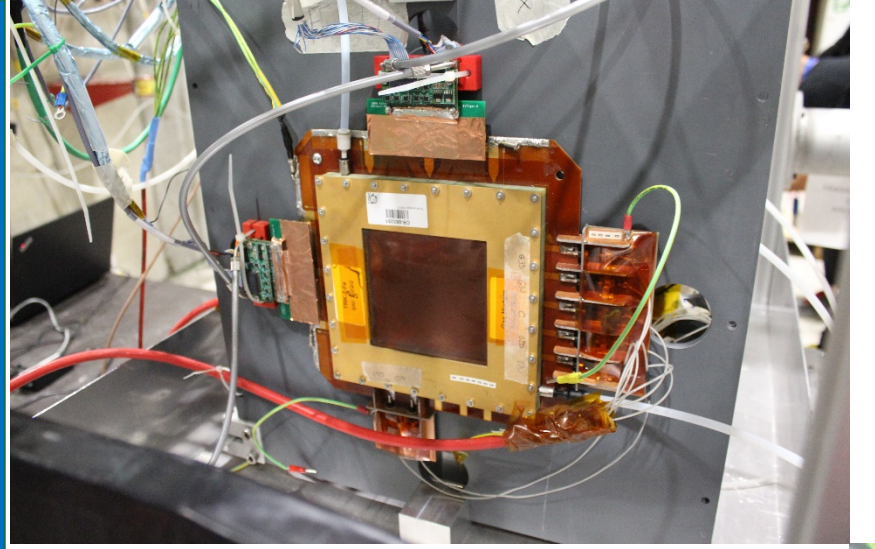
Original slides by Michela

TIGER-GEMROC Setup



ph@PiFE

~4 planar detectors:
8x8 cm^2 2D anode segmentation
-simplified HV distribution system (with RCR filters)

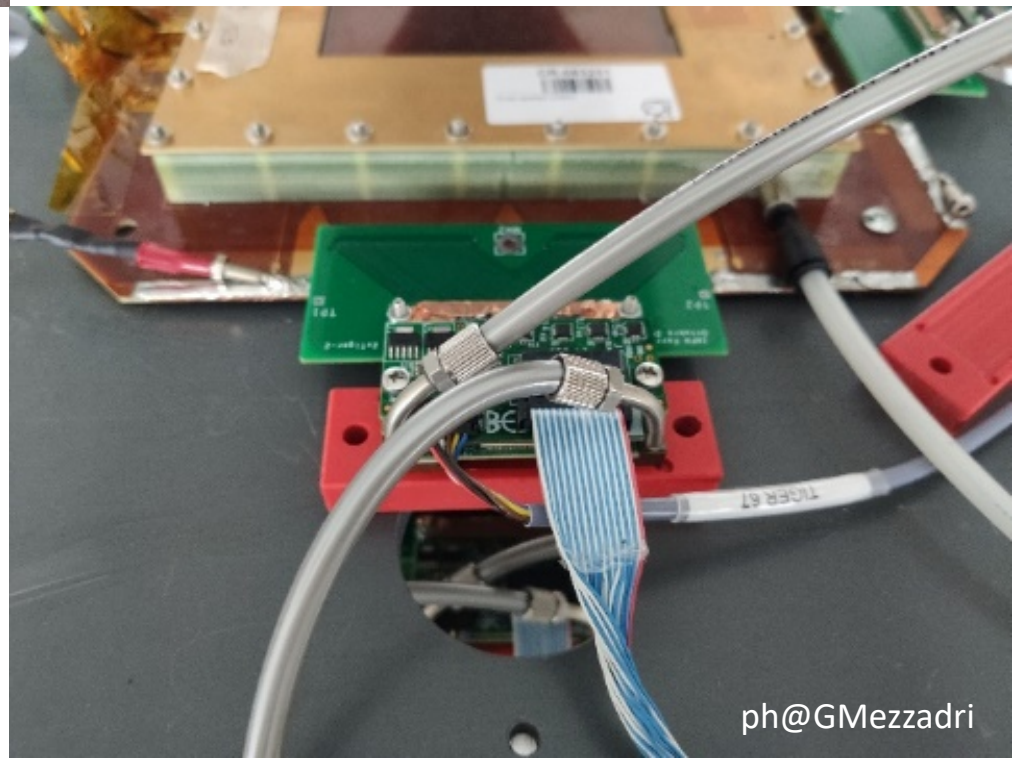
2 GEMROCs,

16 TIGERs,

1 local fanout+

1 system fanout module

@A. Cotta Ramusino



ph@GMezzadri

2 FEBs+

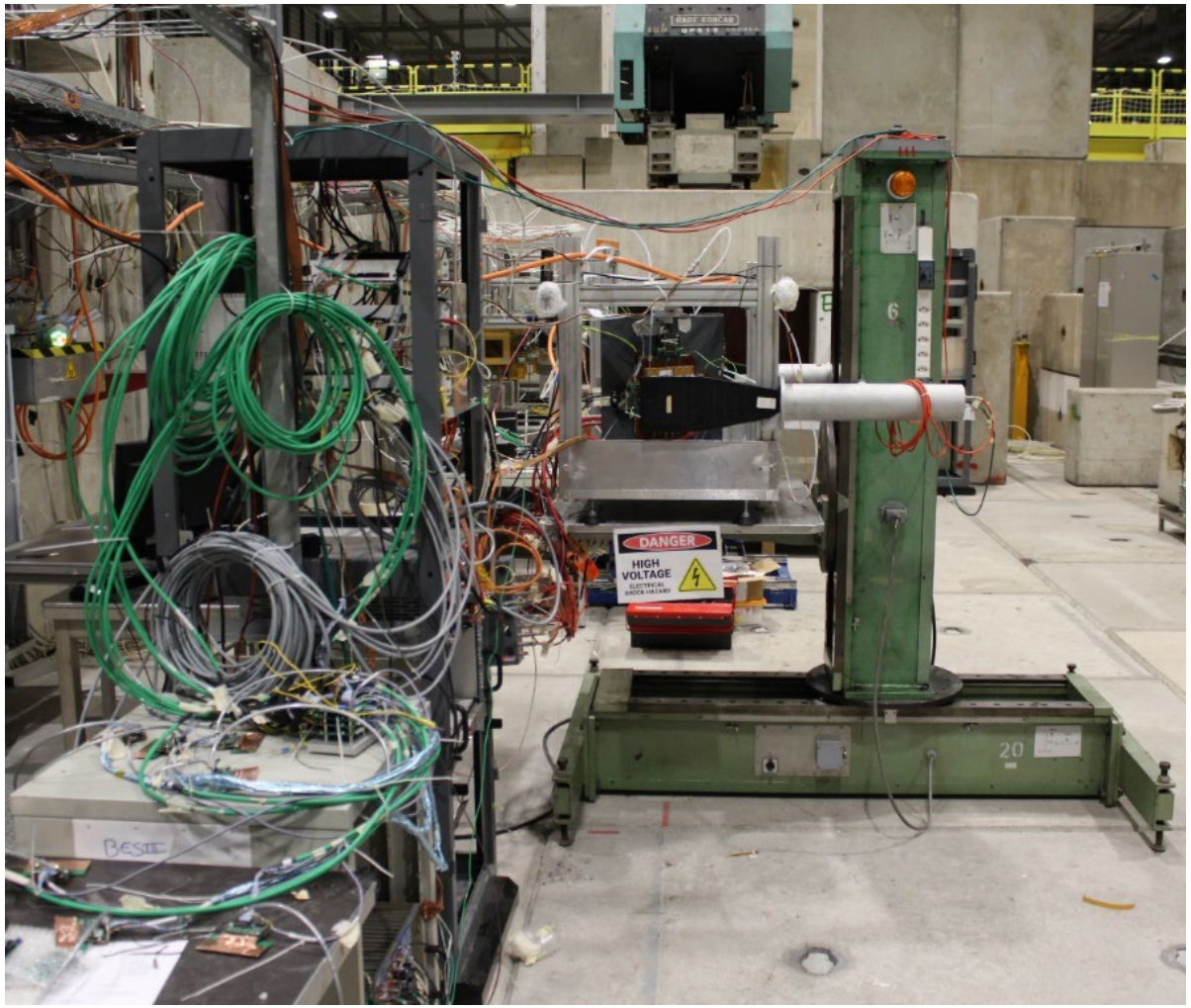
2 TRANSITION BOARDs

per planar detector

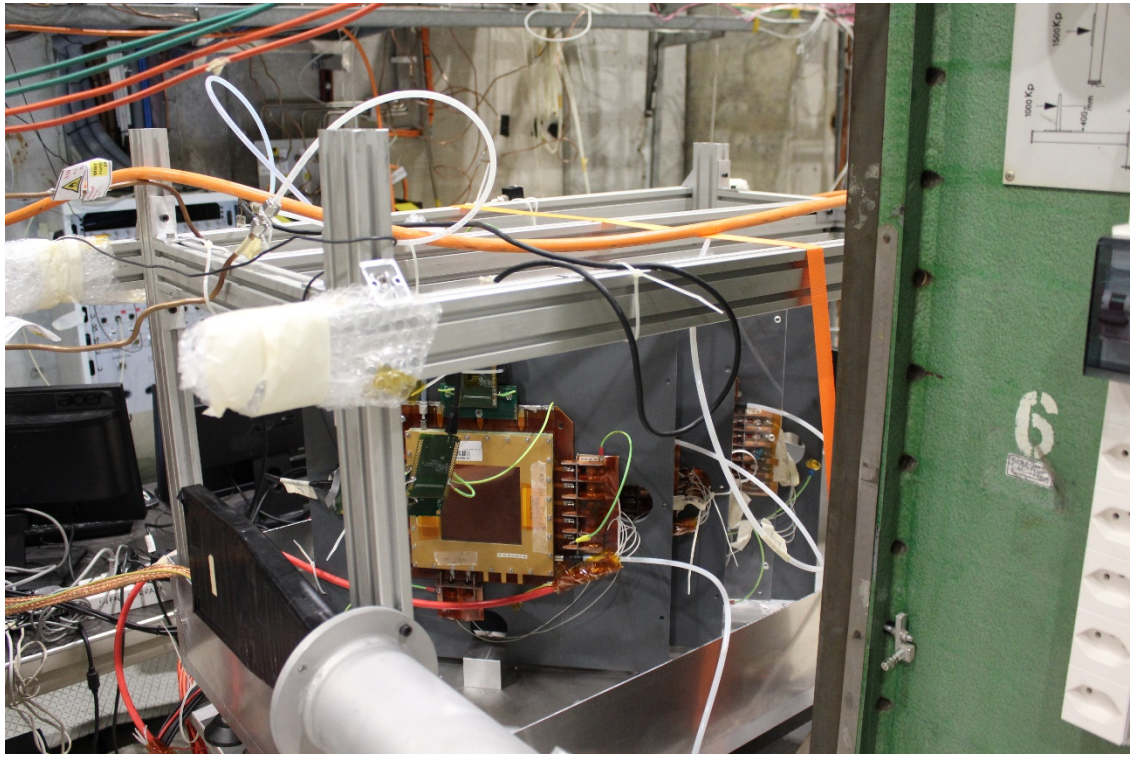
Transition boards do not match all channels for layer 3 FEBs:

5 strips missing per view

TIGER-GEMROC DAQ at TB



Muons @80 GeV/c
Pions @150 GeV/c
Ar:iC_4H_{10} 90:10



ph@PiFE

July 15-20, 2021:
#runs:~540
500k-1M triggers per run (duration: 5 minutes)
250 million triggers

GUFI+CIVETTA

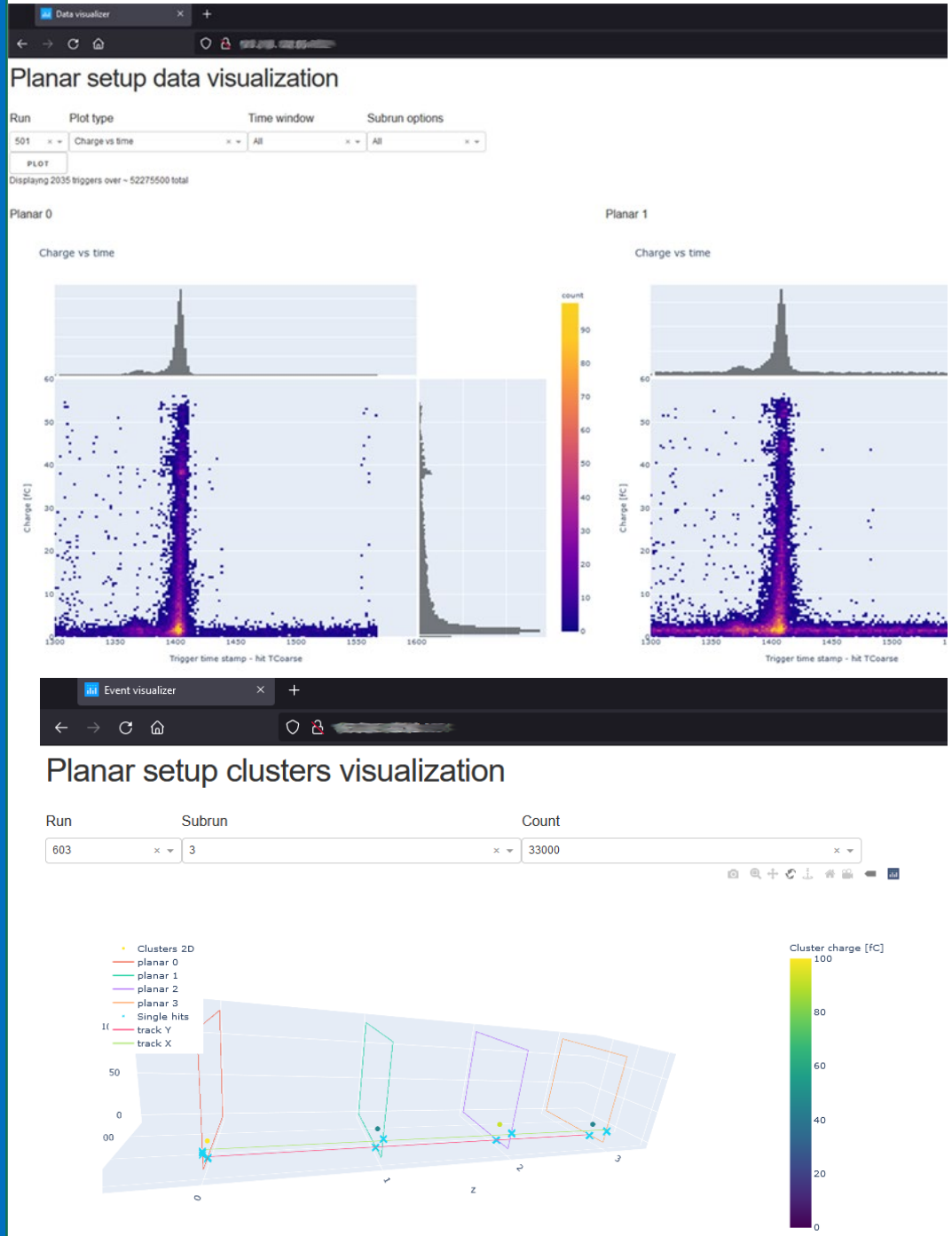
GUFI
DAQ

CIVETTA
Complete Interactive VErsatile Test Tool
Analysis

Decode
Calibration
Clusterization
Tracking
Cluster Selection
~~Alignment~~

GUFI monitoring

TIGER-GEMROC DAQ at TB



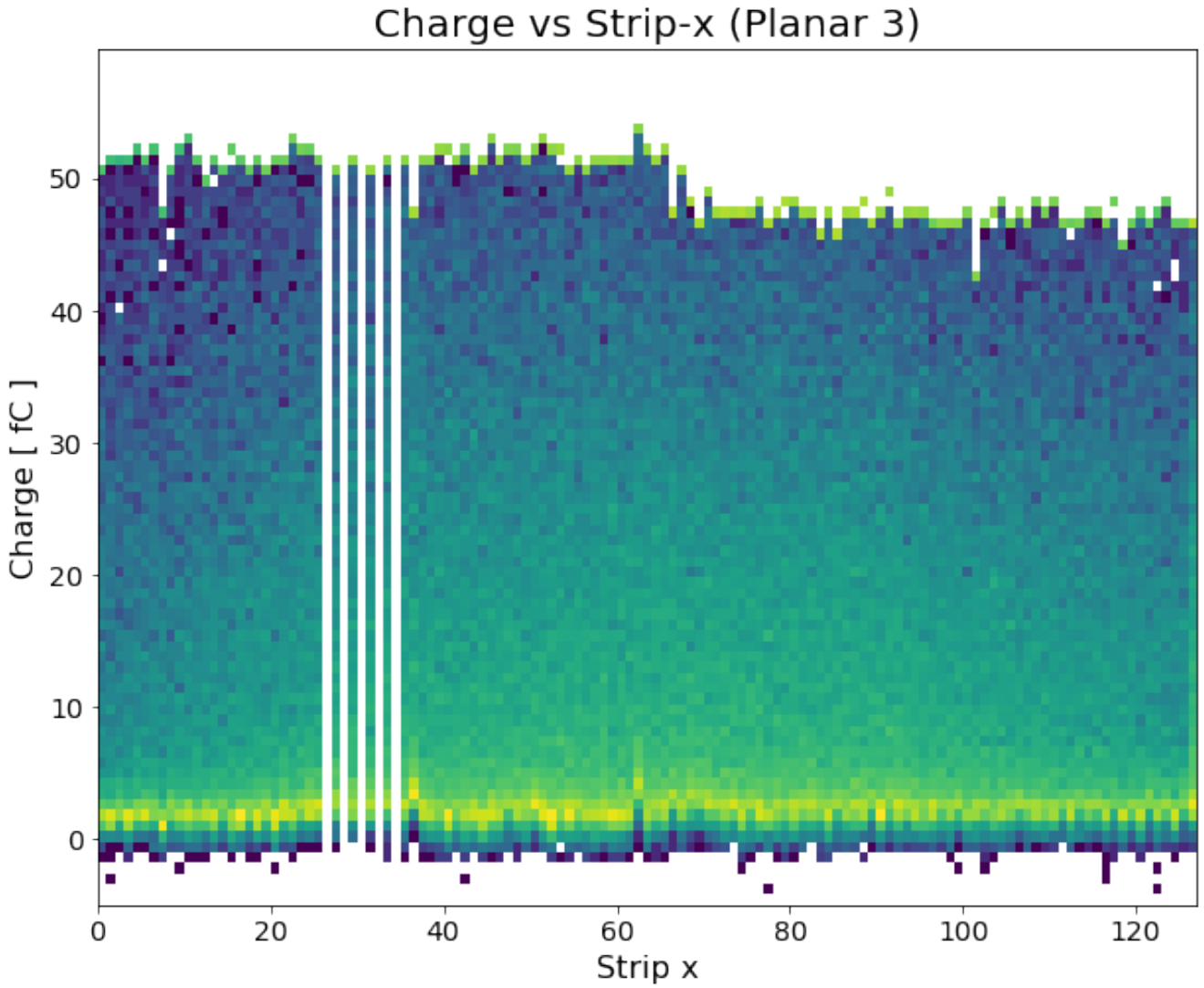
Online metrics and events visualization via web browser using Plotly-Dash

Immediately after run end on a subsample to check goodness

- ✓ HV scan (gain scan)
- ✓ Angle scan
- ✓ Drift field scan
- ✓ Threshold scan
- ✓ Integration time

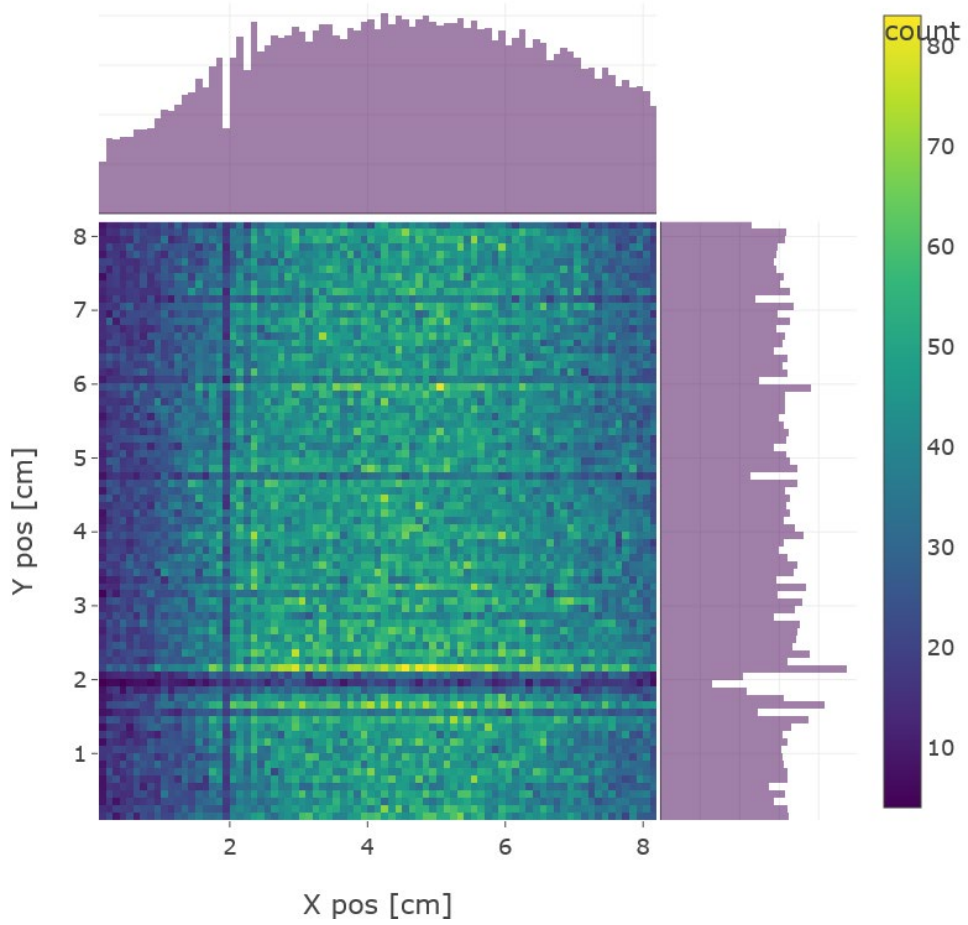
DAQ sw at TB:
STRESS –TEST!

Charge histogram signal region

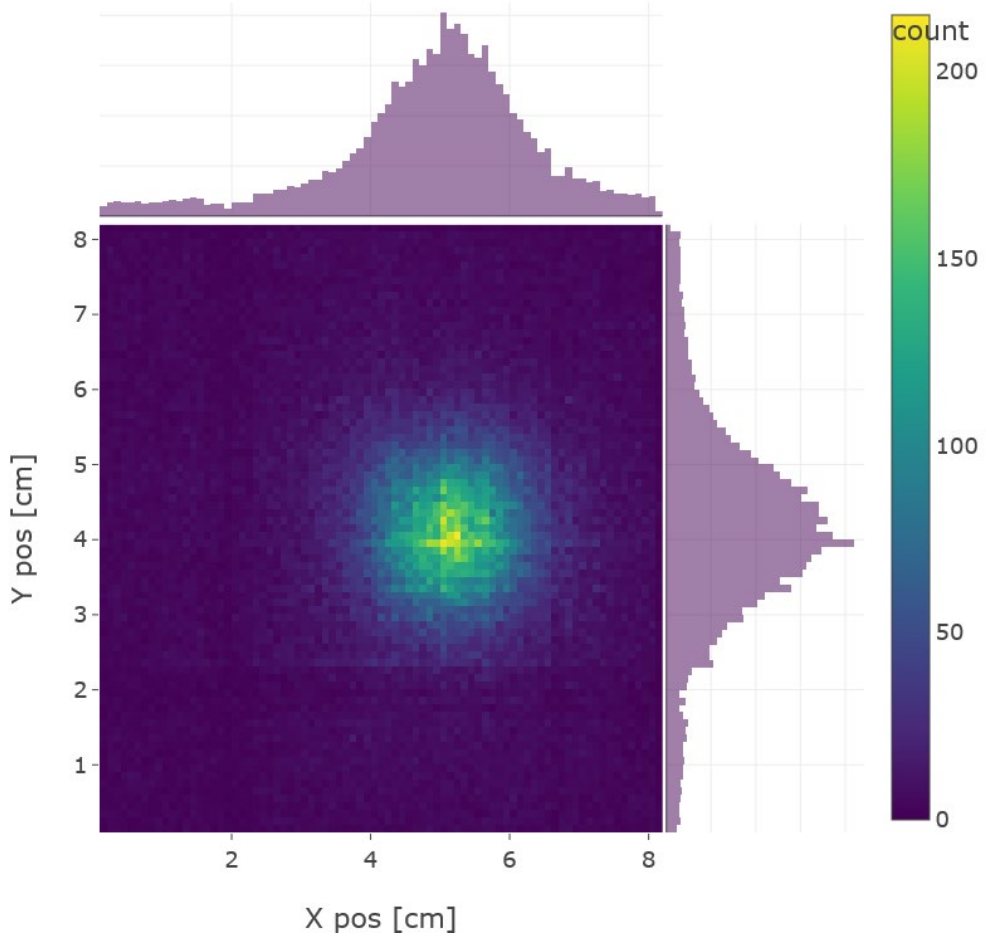


Beam profile

Muons

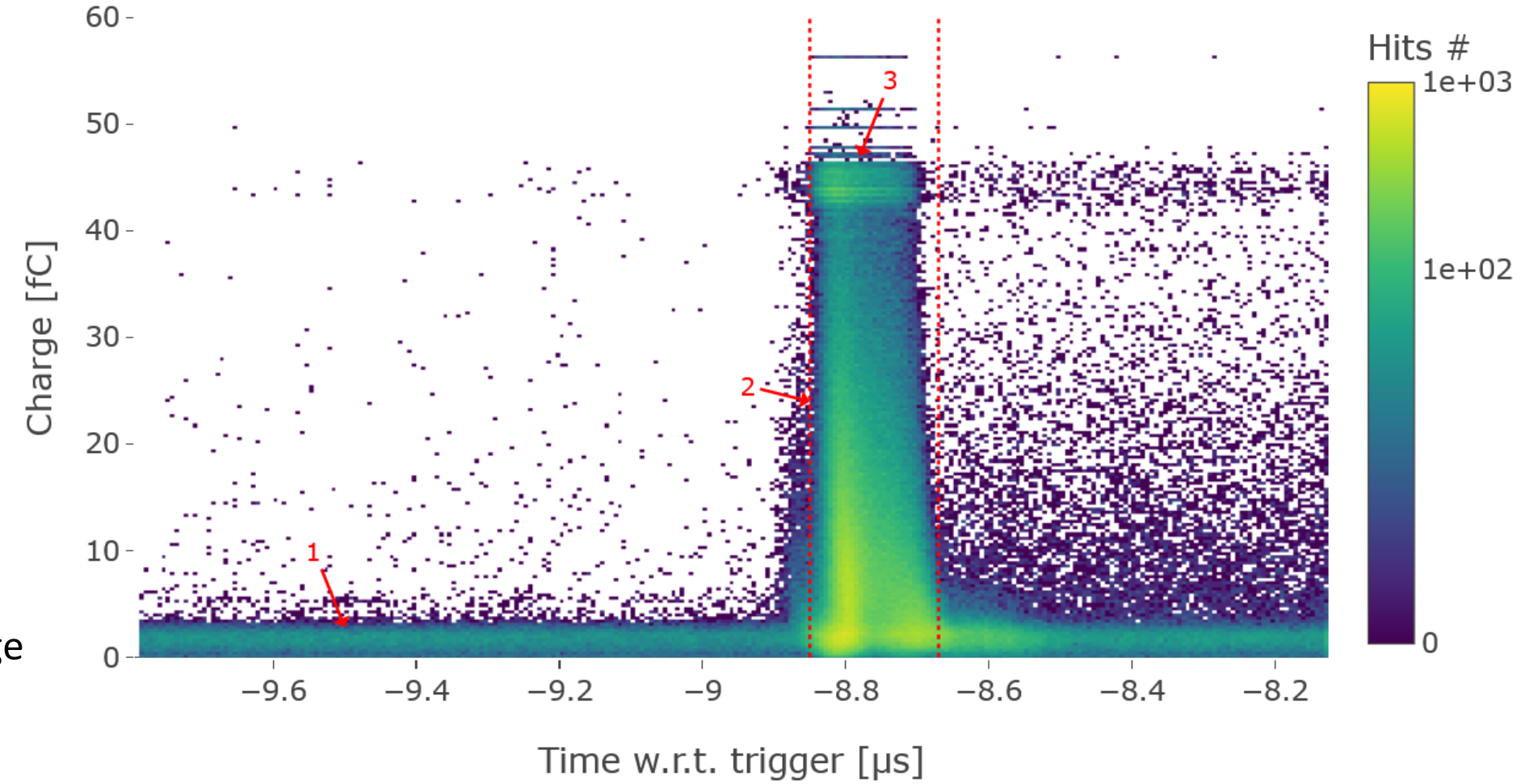


Pions



Hit: charge versus time

Planar detector #1
X view

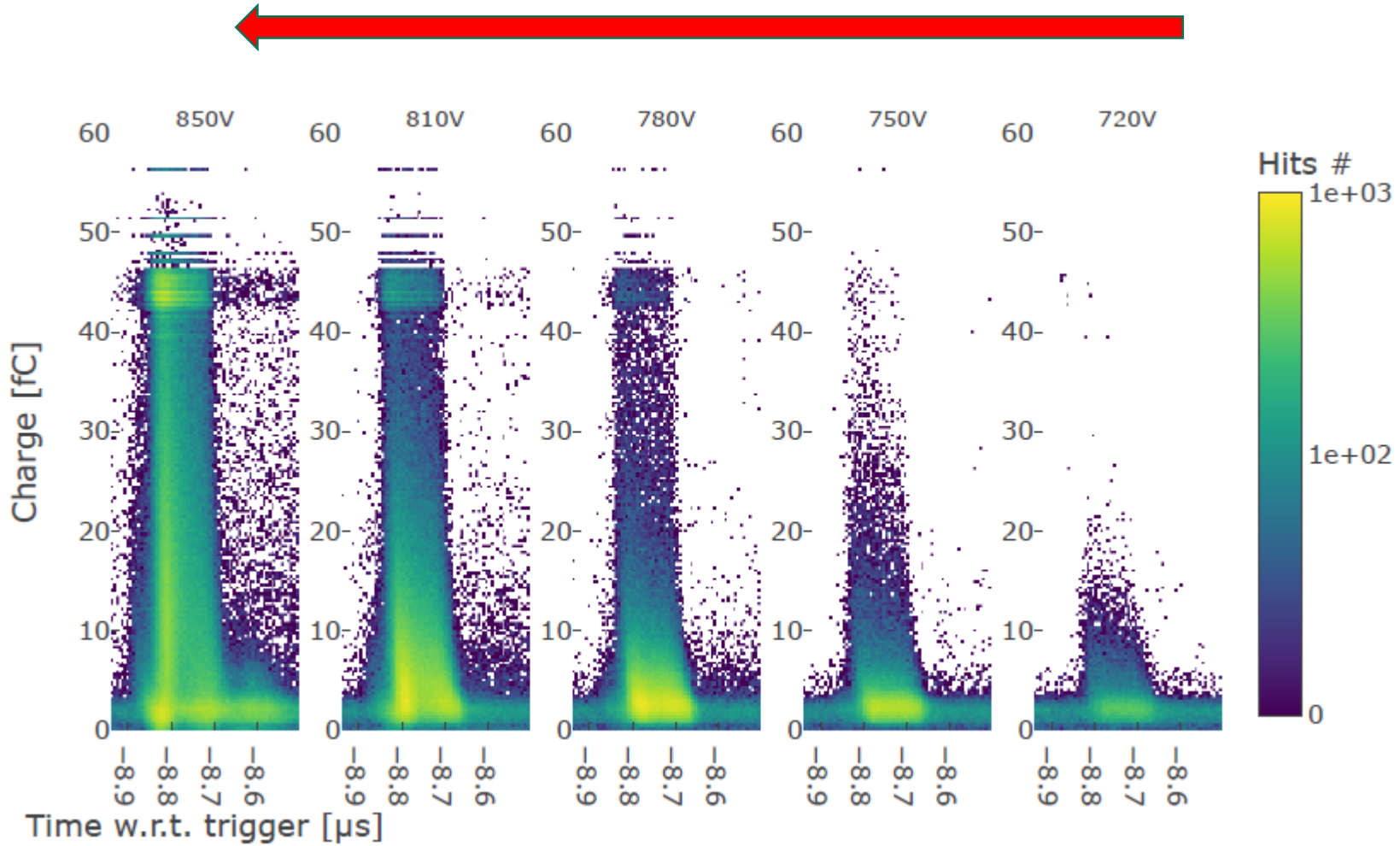


1. Noise band
2. Signal time range
3. Saturation

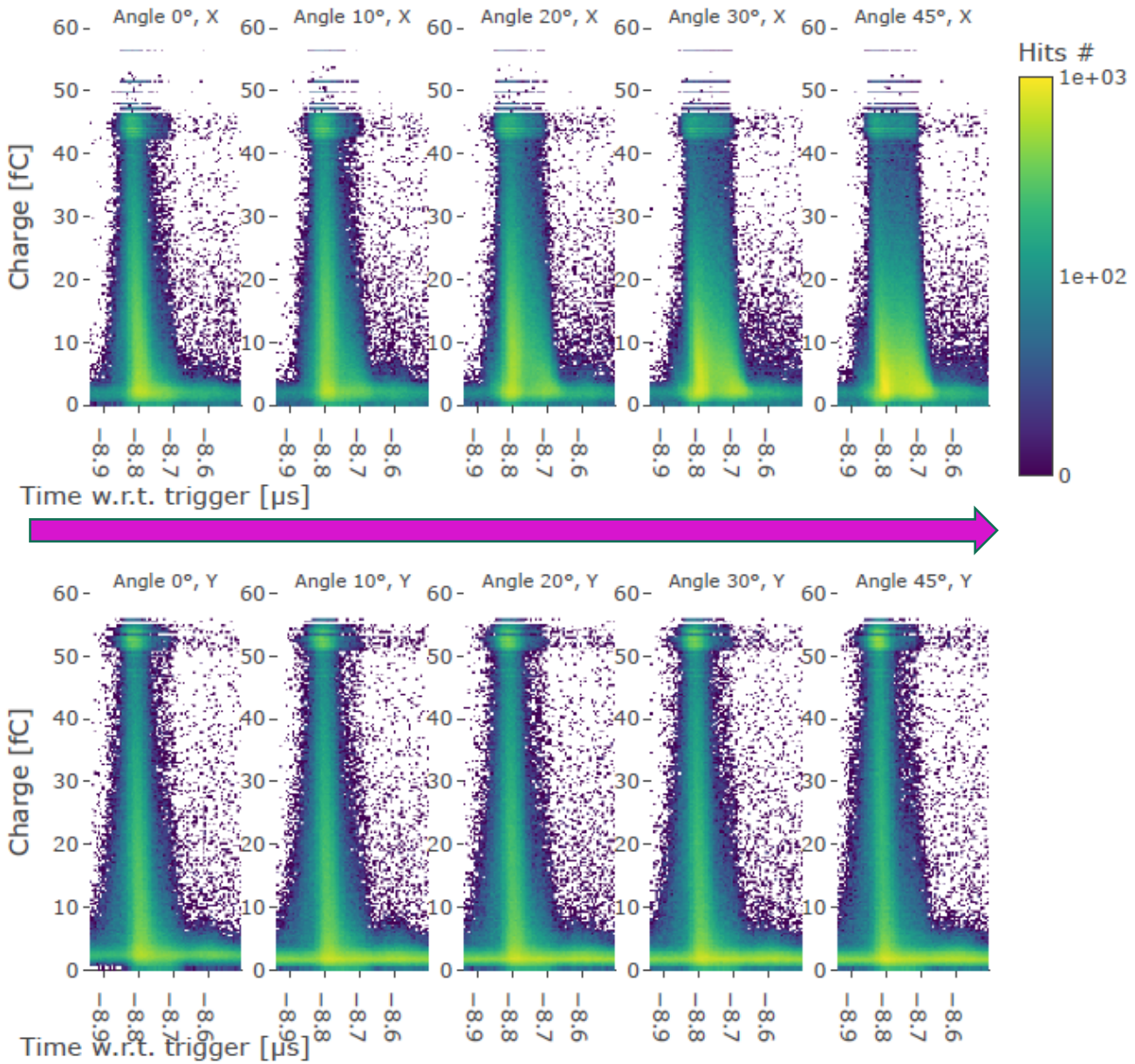
Hit: charge versus time wrt gain

Gain>
G1+G2+G3

X view
Drift field:1500 V/cm
beam angle: 30°



Hit: charge versus time wrt angle



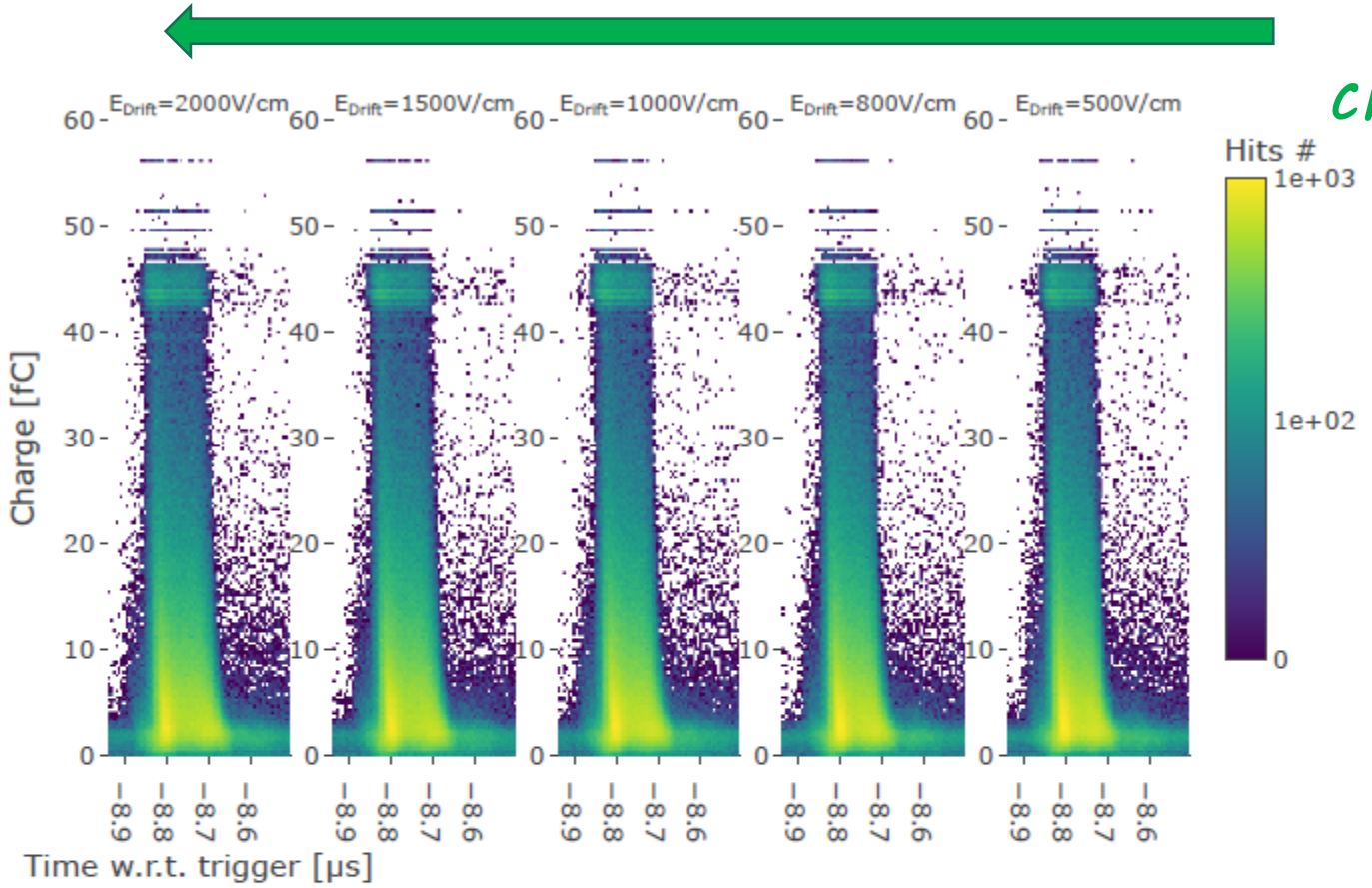
X view

Y view

Drift field:1500 V/cm

G1+G2+G3=825 V

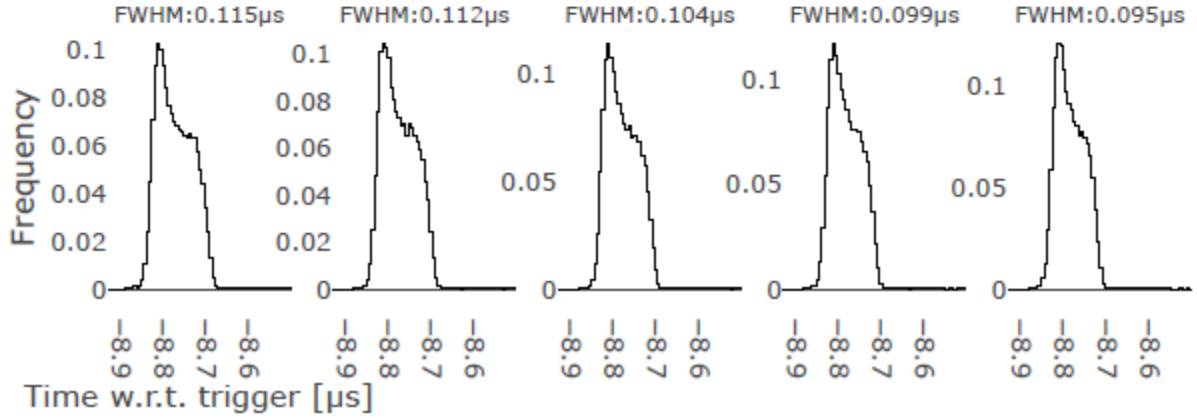
Hit: charge versus time wrt drift field



X view

G1+G2+G3=825 V

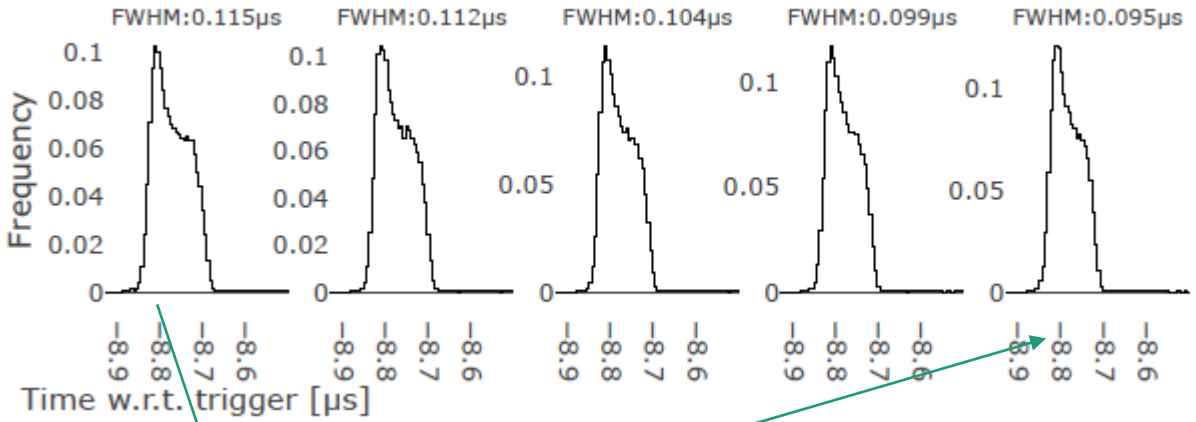
beam angle: 45°



Q>10 fC

Drift velocity

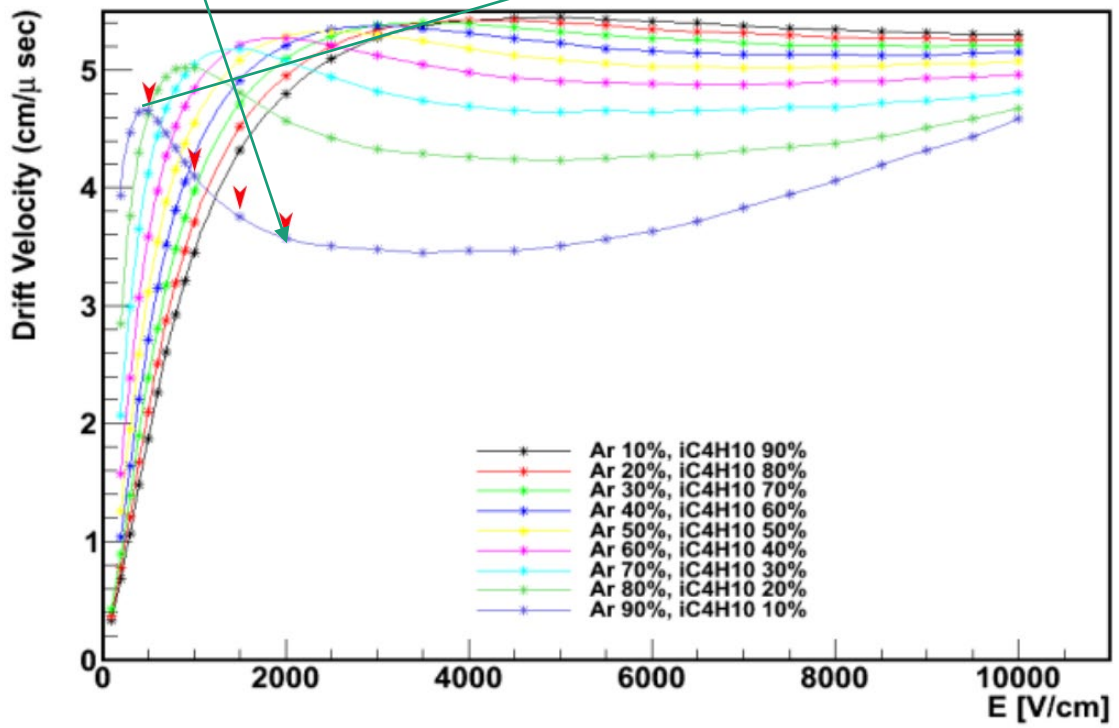
Q>10 fC



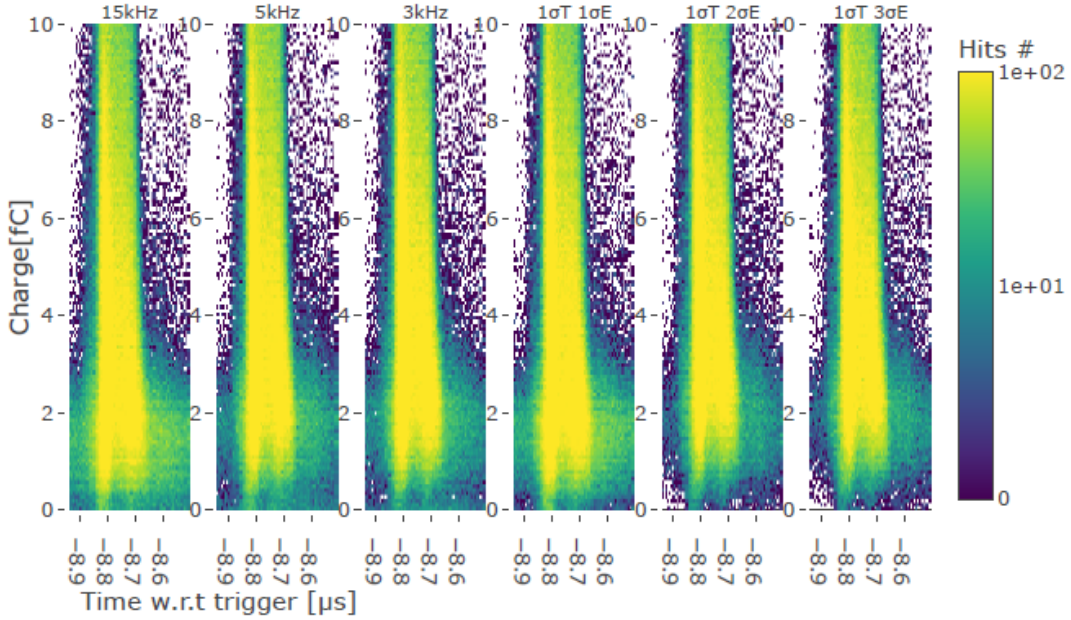
X view

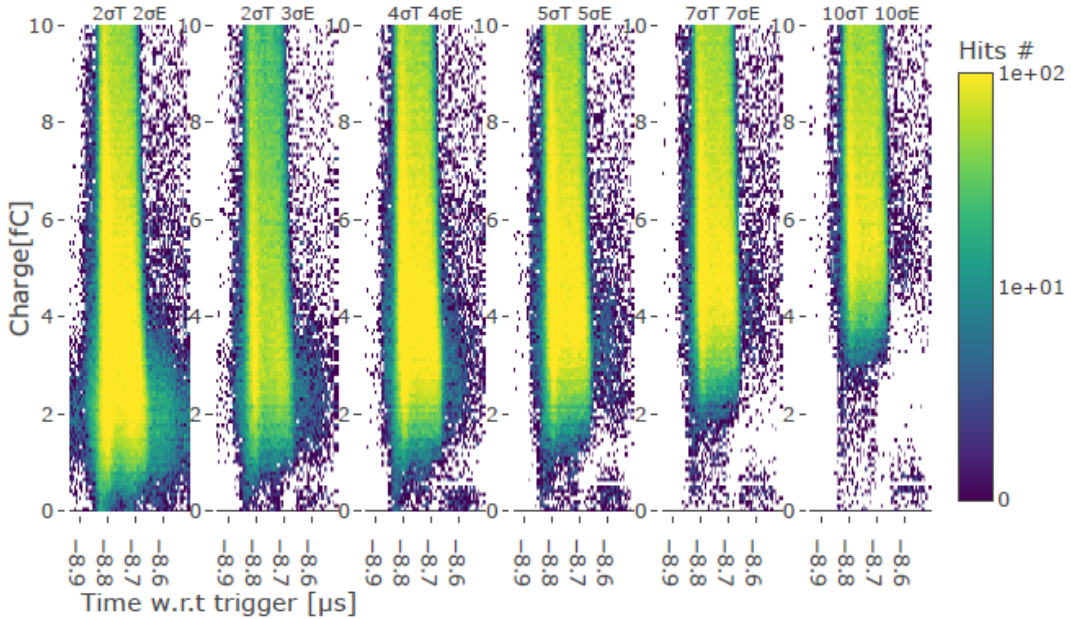
G1+G2+G3=825 V

beam angle: 0°



Hit: charge versus time wrt threshold rate



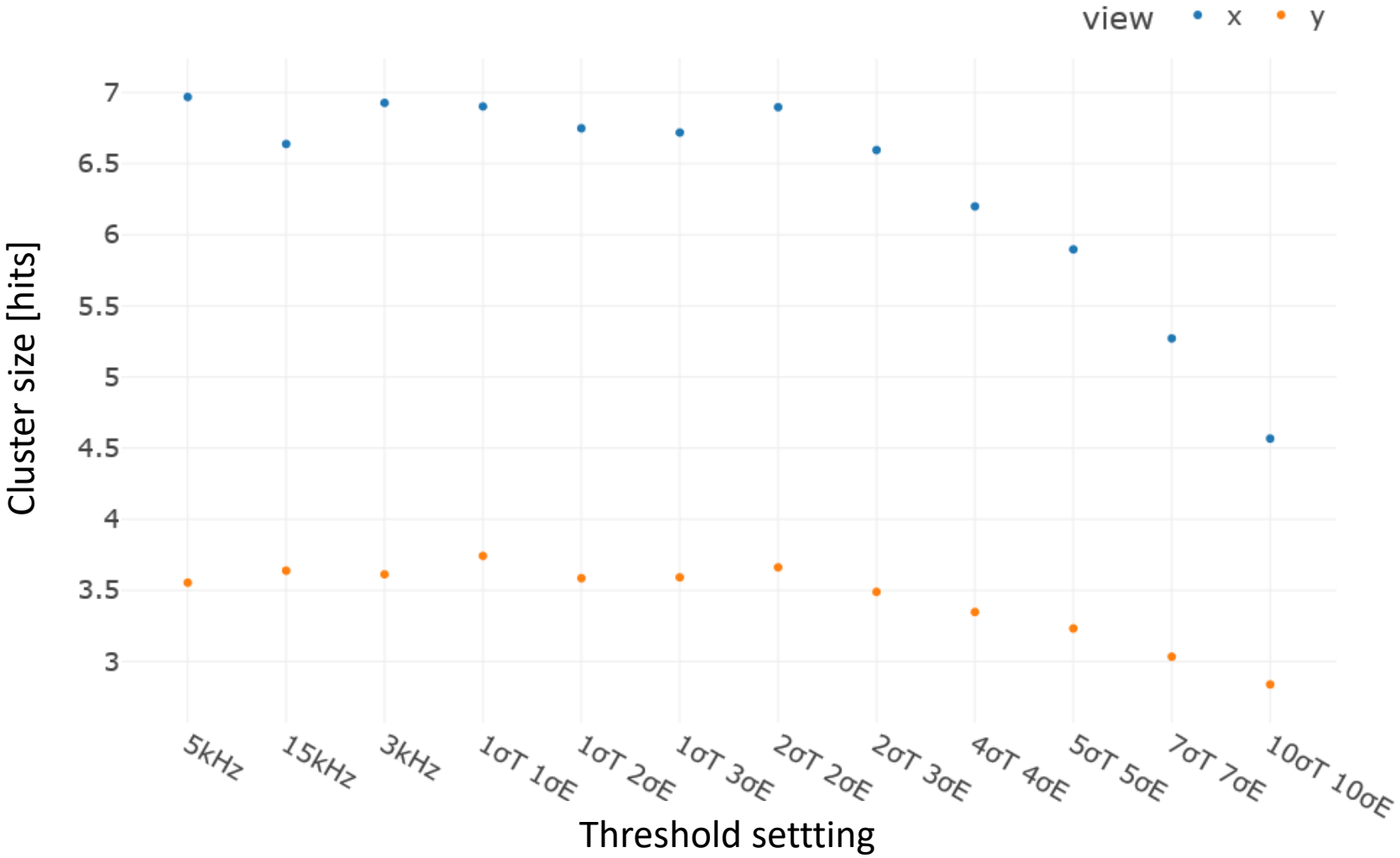


X view

G1+G2+G3=825 V

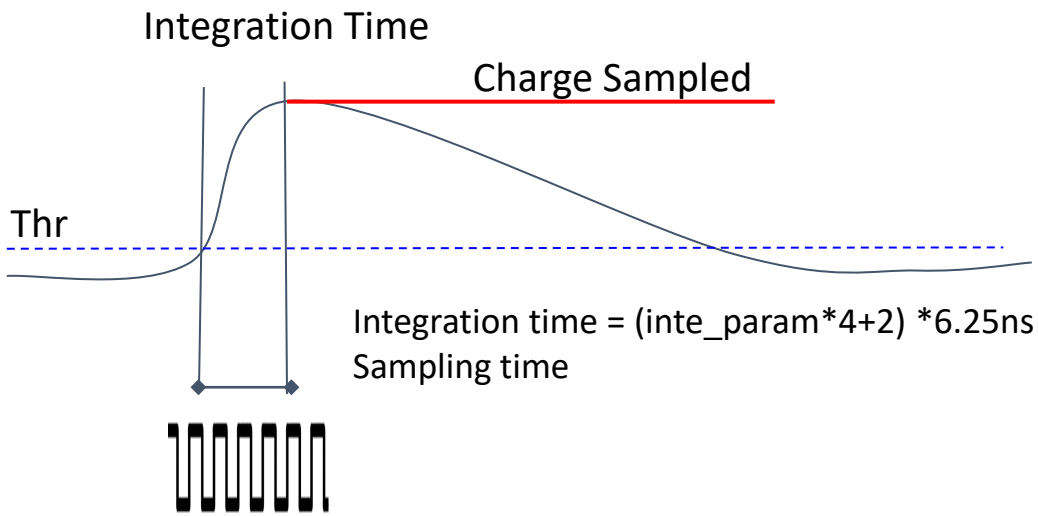
beam angle: 45°

Cluster size wrt threshold rate



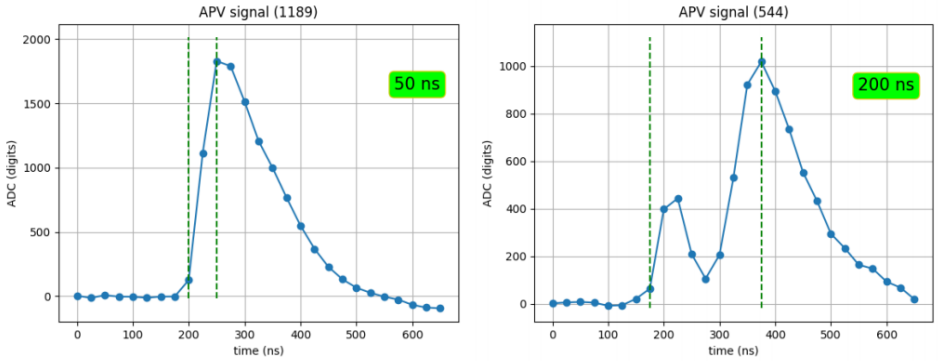
Cluster charge

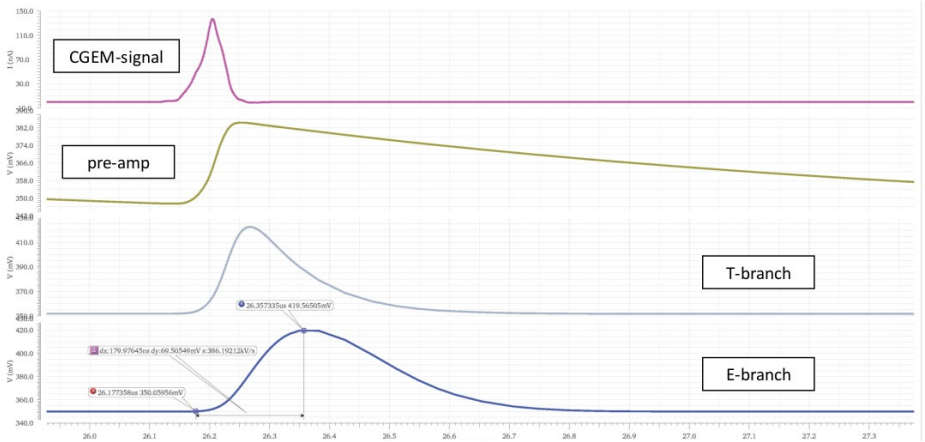
APV samples the signal 27 times and the charge maximum value is recorded
TIGER uses a fixed (but settable) integration time.

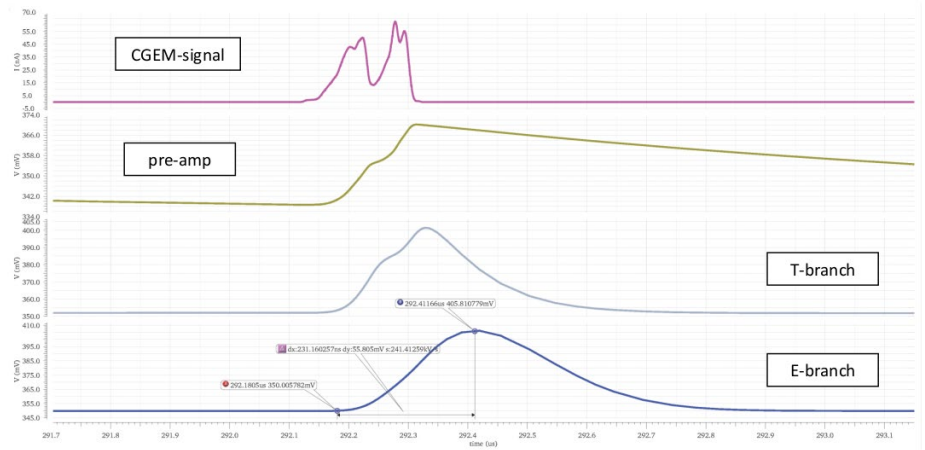


Saturation levels are different of about 5-10 fC and this has an effect on the charge measured at 0°.

→Cluster charge as function of integration time

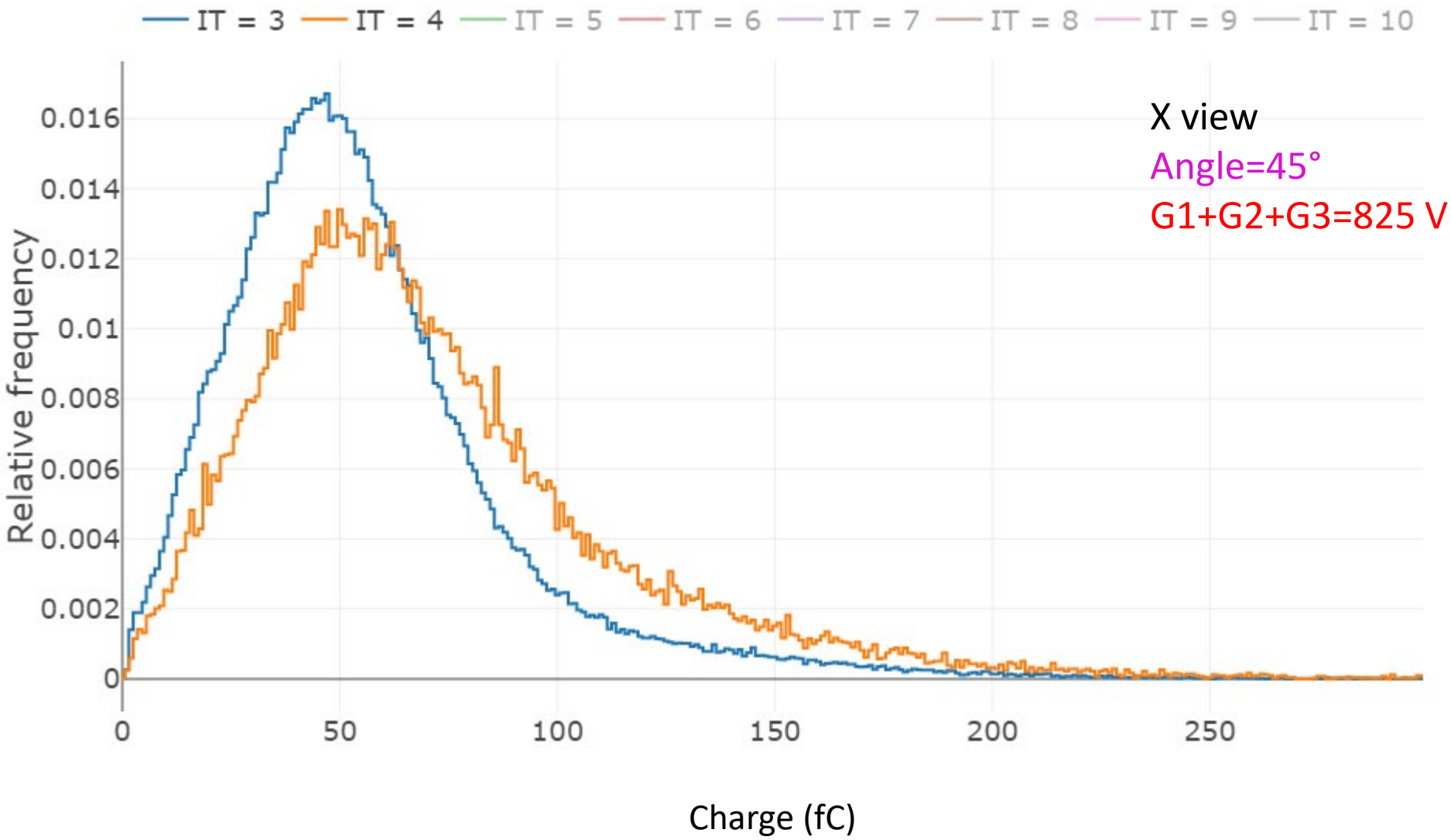






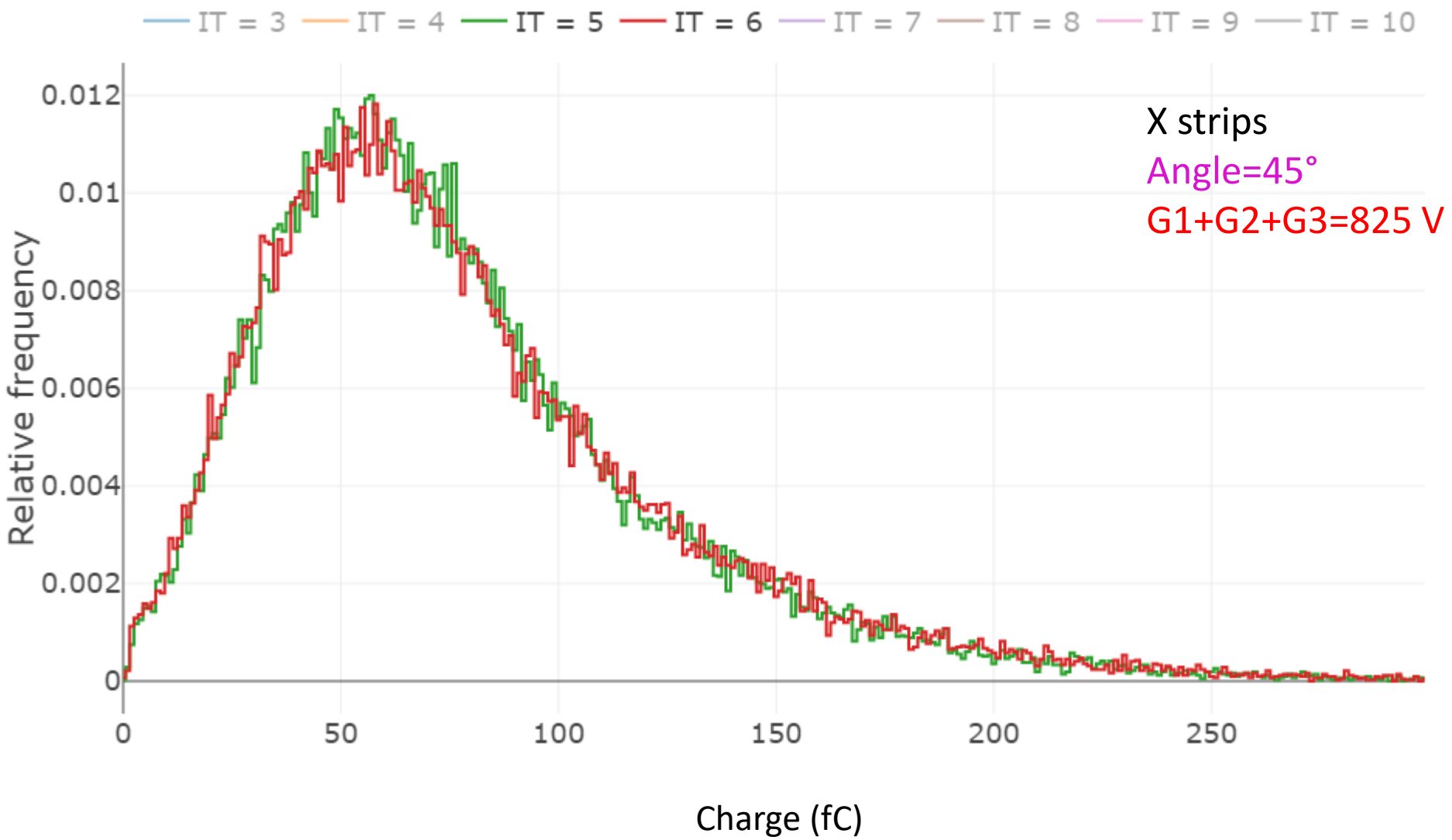
@F. Cossio

Cluster Charge versus Integration Time

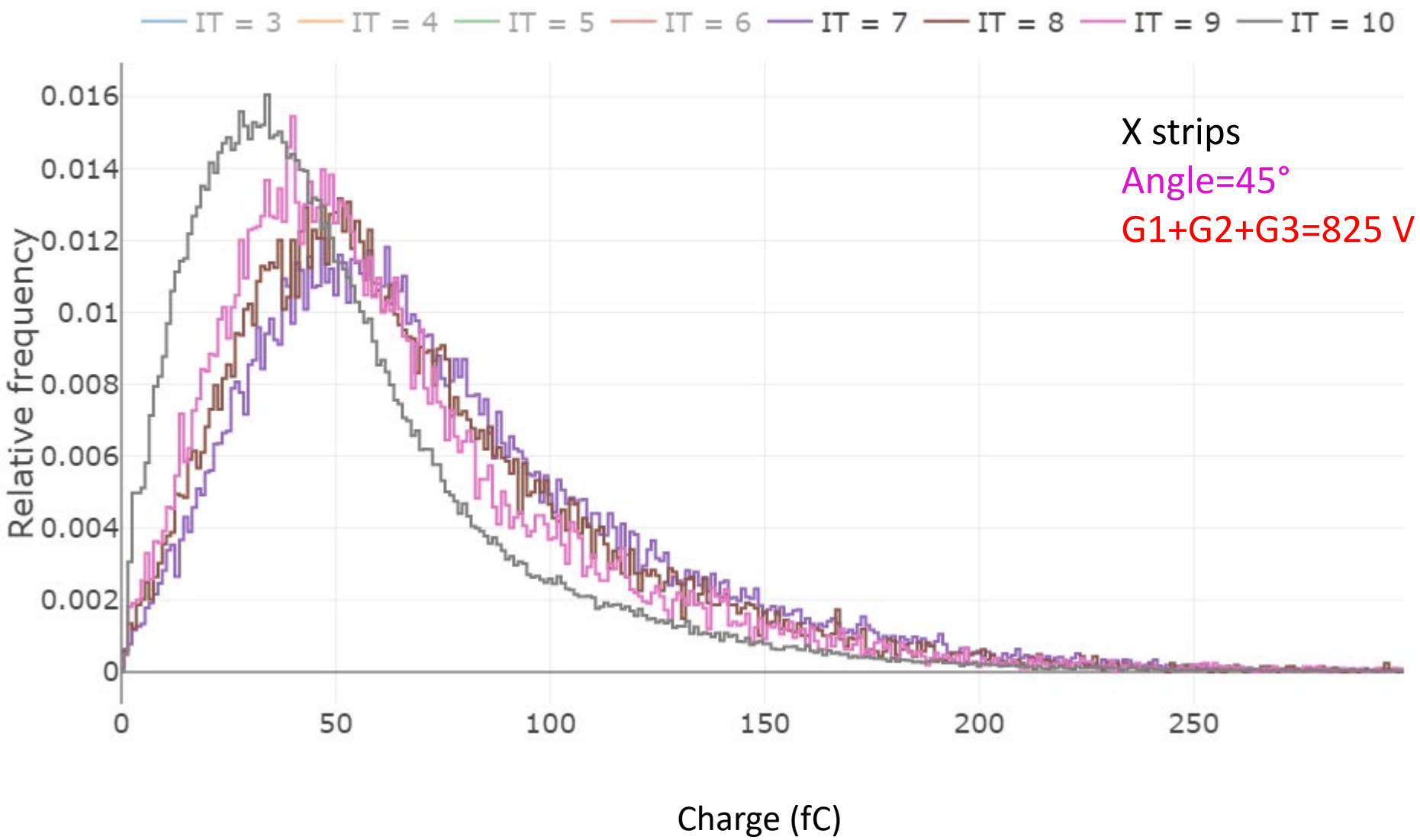


X view
Angle=45°
G1+G2+G3=825 V

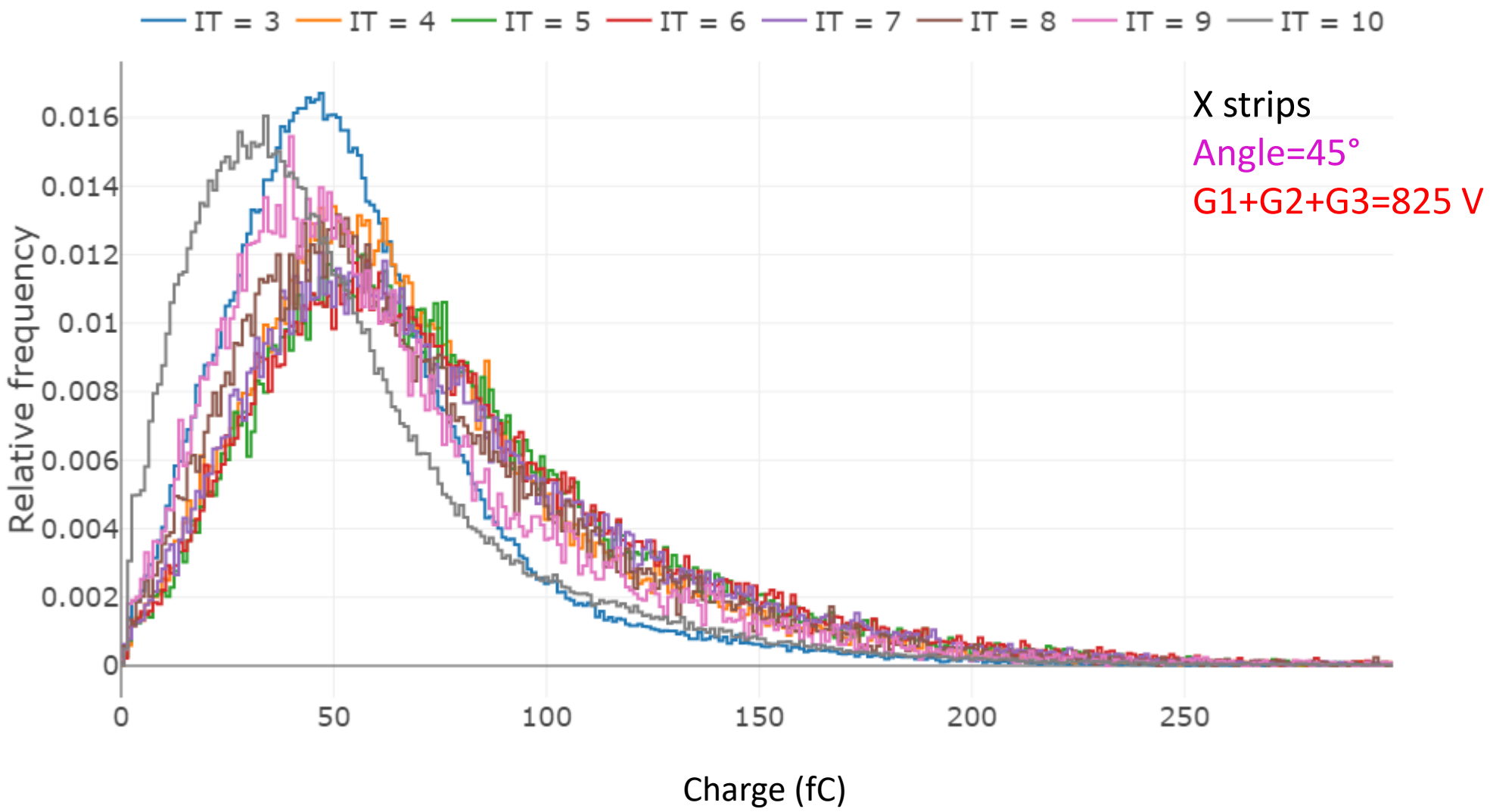
Cluster Charge versus Integration Time



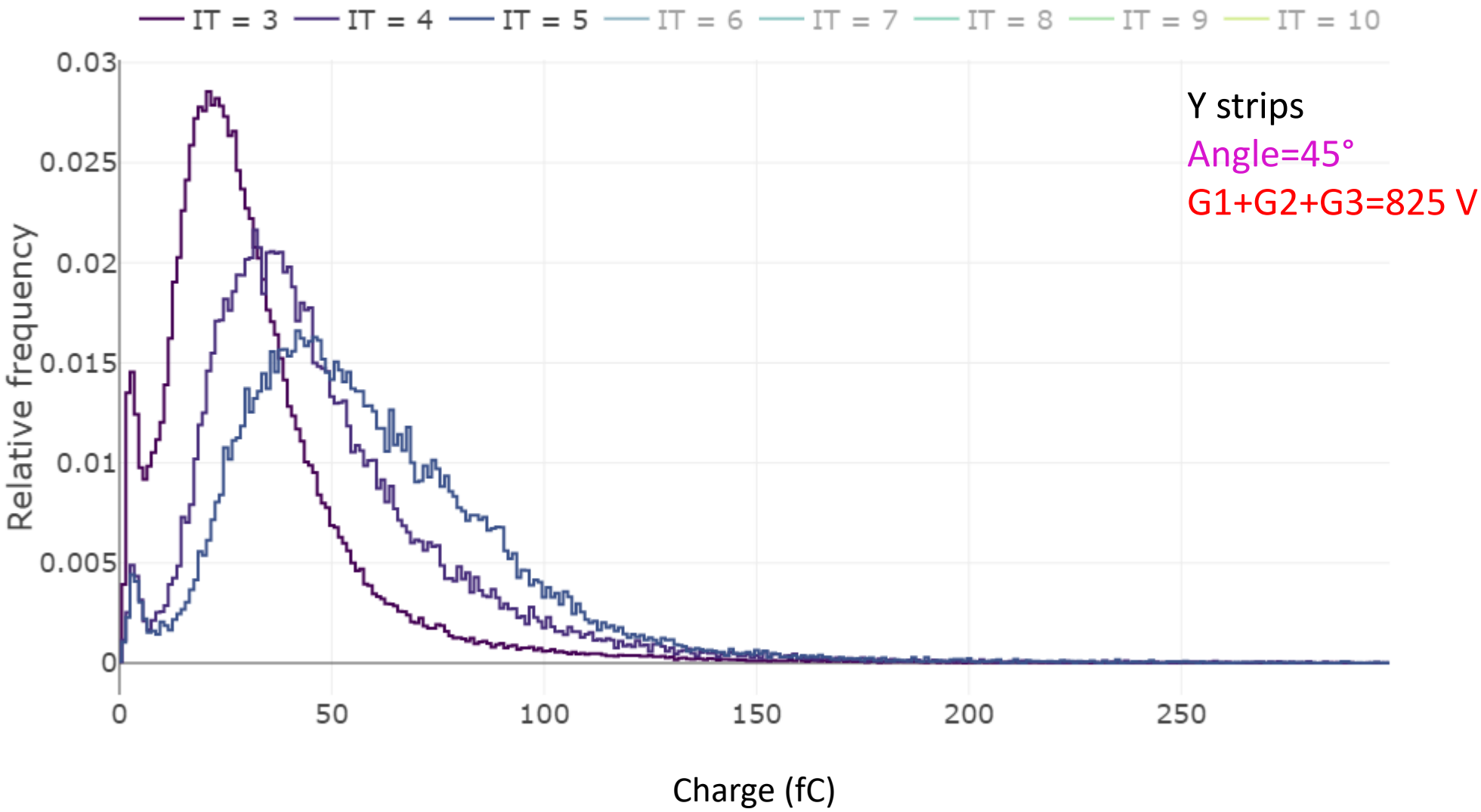
Cluster Charge versus Integration Time



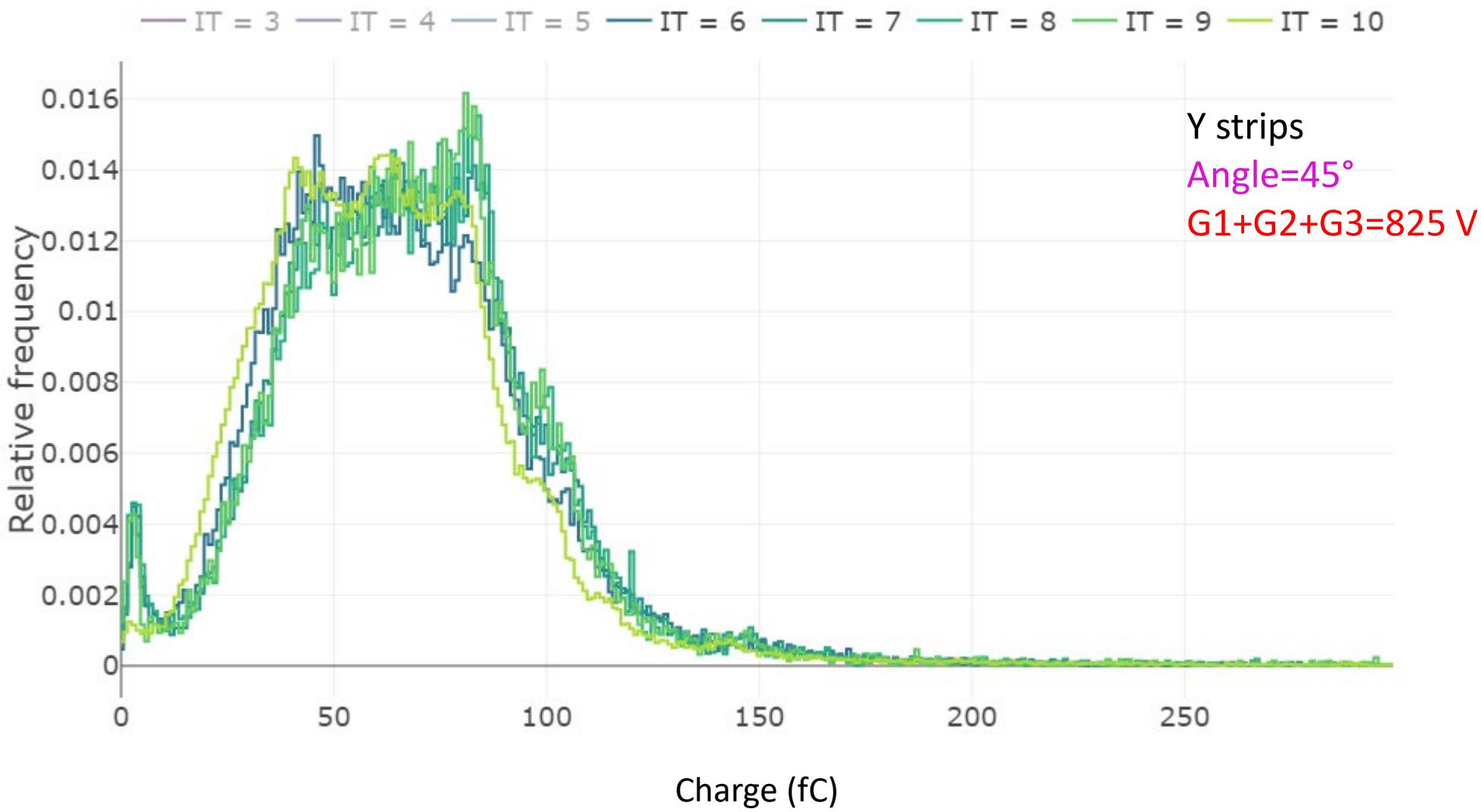
Cluster Charge versus Integration Time



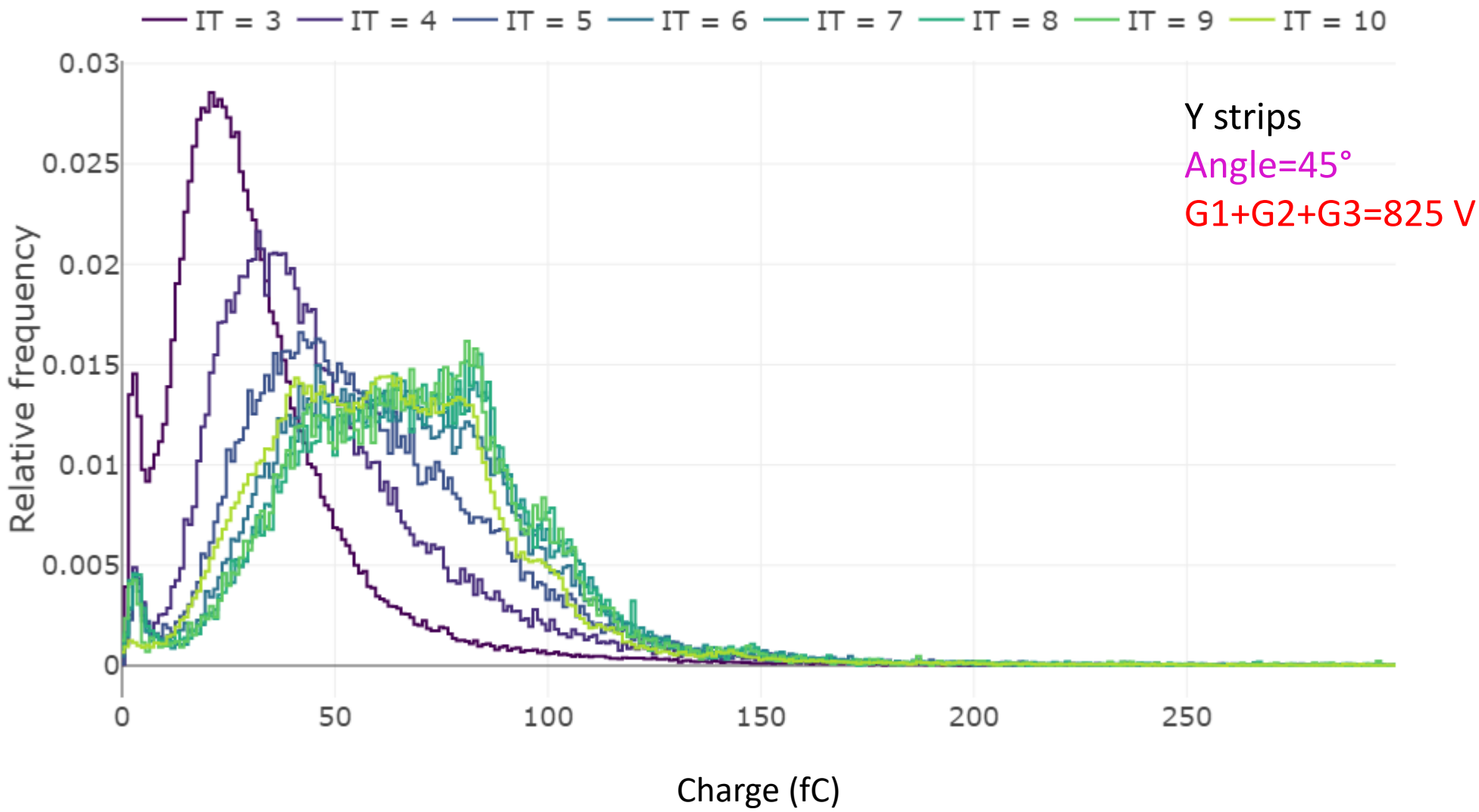
Cluster Charge versus Integration Time



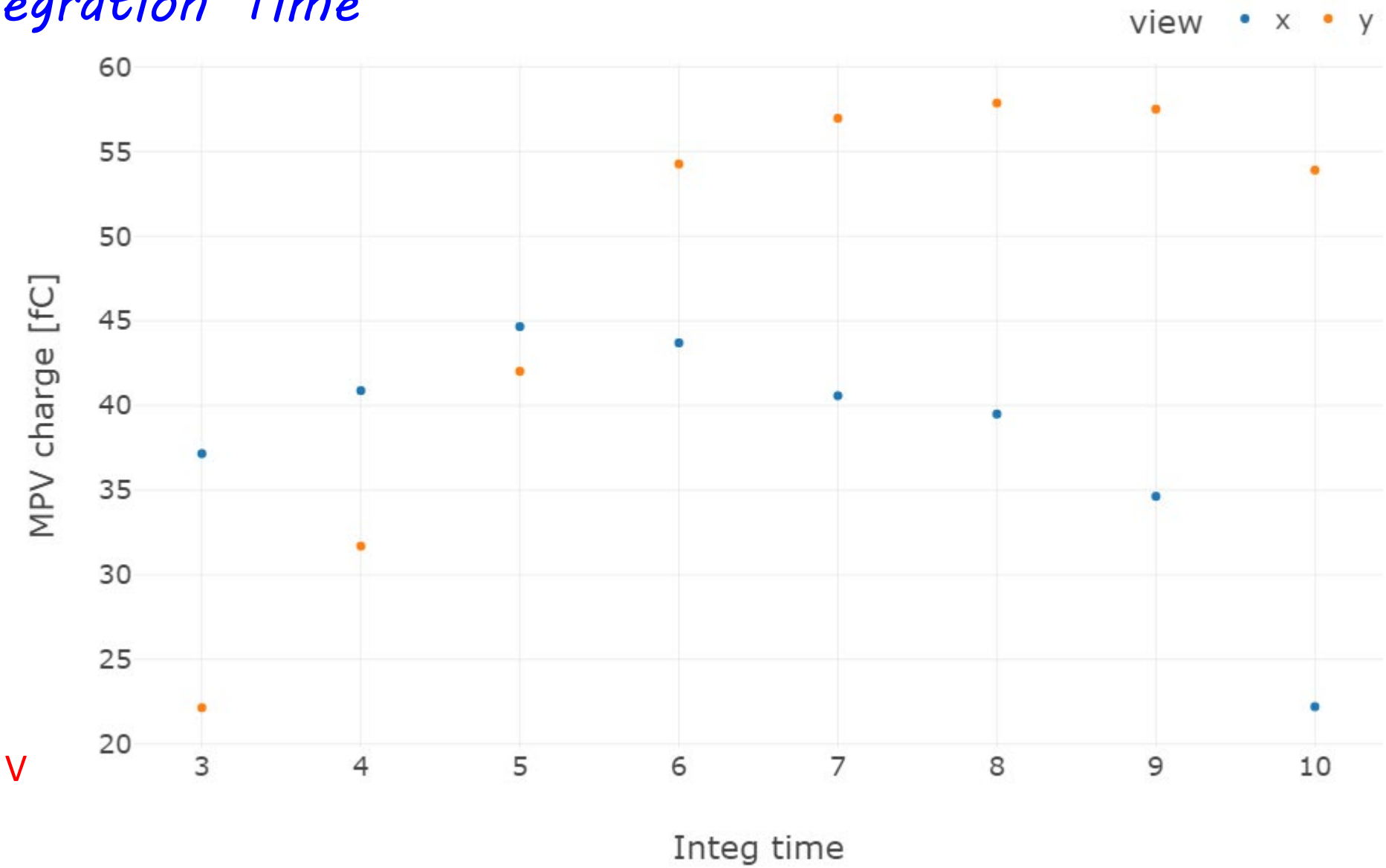
Cluster Charge versus Integration Time



Cluster Charge versus Integration Time



Cluster Charge versus Integration Time



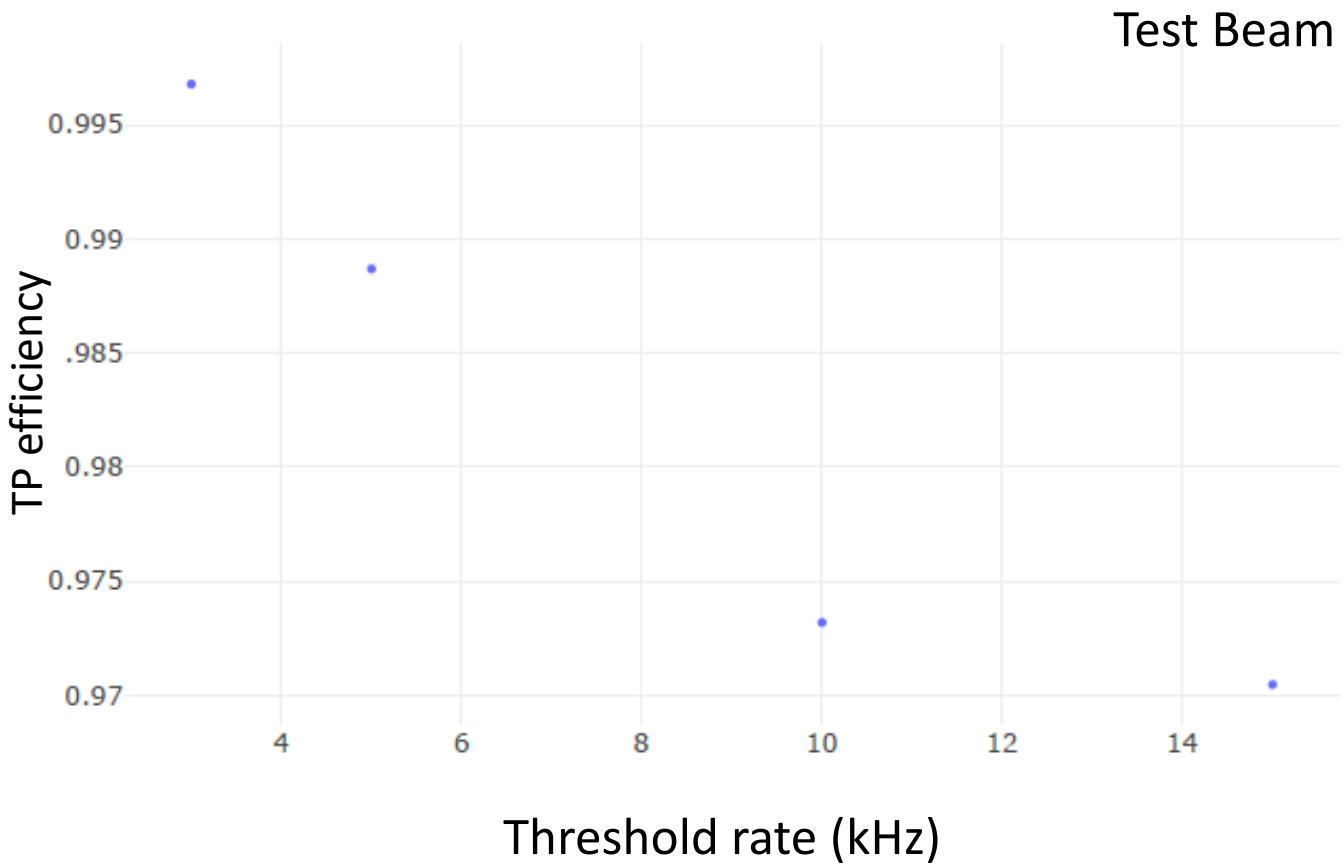
Angle=45°

G1+G2+G3=825 V

FW: trigger-matched packing efficiency

Only TP -> Eff 100 % (304805 trigger)

With cosmic data eff 0.99
(without fw patch was 0.92-0.96)



Summary and outlook

>TIGER-GEMROC DAQ and DAQ sw @TB:
Good quality runs: 1 M triggers in 5 minutes

>Interesting metrics can be extracted and examined
already at the level of hits as a function of time, gain, beam angle, integration time, drift field, etc.

>Data processing ongoing (see Stefano's presentation)

>The CIVETTA analysis will be completed with alignment and performance mapping on the detectors.

Grazie per l'attenzione!