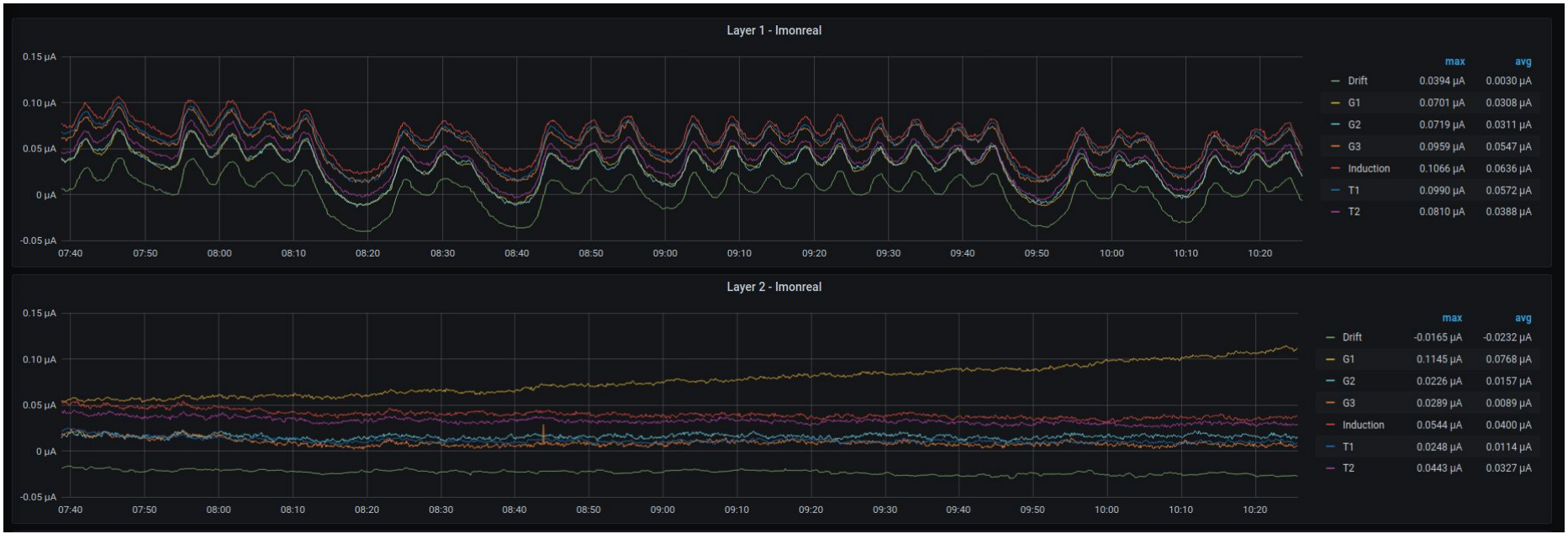
Layer 2 current drift

Alberto Bortone on behalf of the integration team
BESIII Italia - 6/11/2020

The crime

Before summer stop (1/7/2020)



Tests after summer stop (1/10/2020)

G1 @ 280 V

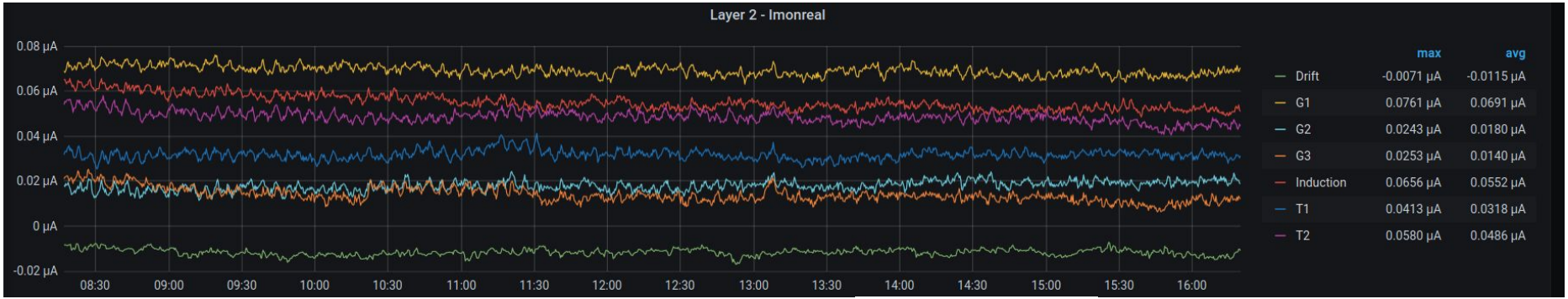
G1 @ 270 V

All GEMs @ 200 V

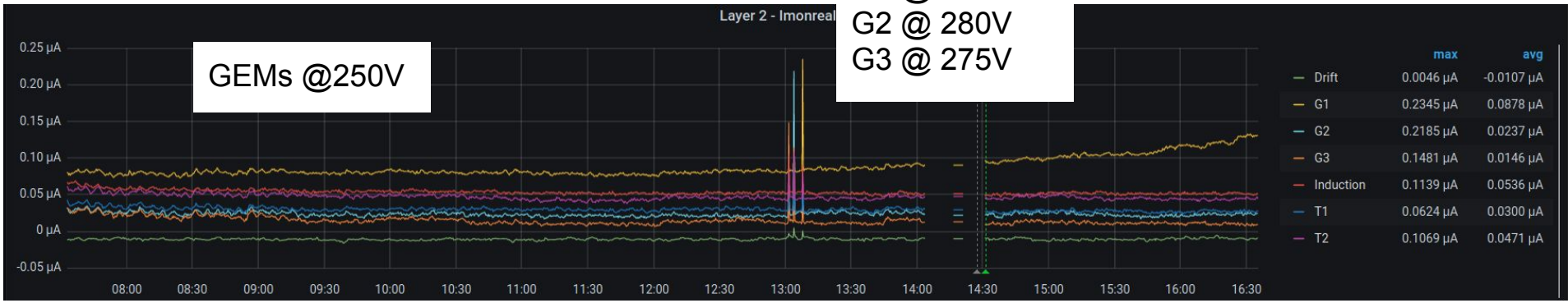
Power off

Looking at the previous days

28/09 GEMs @250V



29/09



Our investigation

HV tests

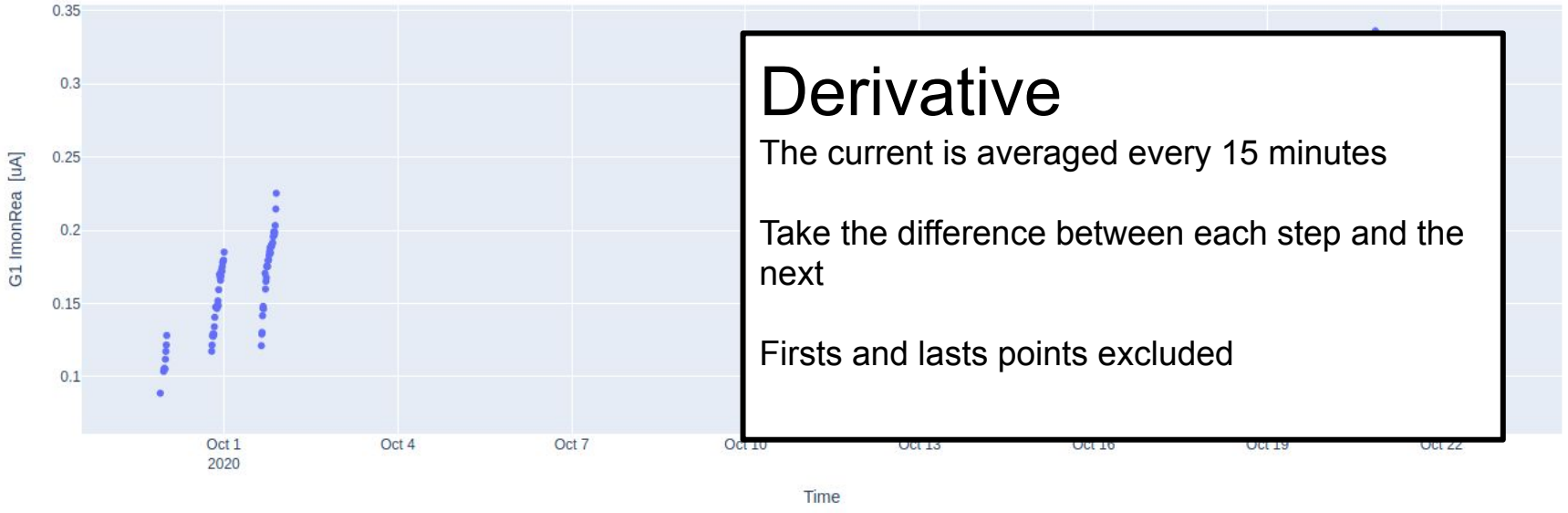
10/10 - solo G1 accesa fino a 300V -> ok
12/10 - Accesi elettrodi prima di G1 + 300V -> correnti inferiori a 50nA per 90'
13/10- solo T1 e G1 valori nominali -> corrente di G1 variata fra 60 nA e 86 nA in 100 minuti;(H<30%)
14 /10 - Acceso valori nominali + acq -> assorbimento corrente G1 tra gli 80 e 100nA
15-21/10 - Valori nominali -> drift crescente day by day
22/190 - Valori nominali -> drift fino a 300nA
- G1 fino a 280V da solo -> drift fino a 400nA
- T1 nominale G1 fino a 270V -> drift osservato da 200V, spento a 270nA
23/10 - Accesi elettrodi prima di G1 + 200V -> ok
- Drift spento, G1 280V, resto nominale -> DRIFT
- Drift spento, G1 200V, resto nominale -> NO effetti
- Drift 750V, G1 200V, resto nominale -> No effetti
- Drift 750V, G1 200V, resto nominale + 200V "sotto" -> no effetti
- Drift 750V, G1 240V, resto nominale + 200V "sotto" -> effetti
- G1 sola 240V -> effetti
dal 26/10 -> Nominale con G1 a 150V -> 190V -> 220V -> OK
26/10
G1 280V da sola -> drift
Acceso tutto con G1 a 200V -> spento quando supera 100nA

Some contradictory results, no answers

Relationship between drift and ambient parameters

G1 @ 280V
G2 @ 280V
G3 @ 275V

G1 current data during acquisition



Derivative

The current is averaged every 15 minutes

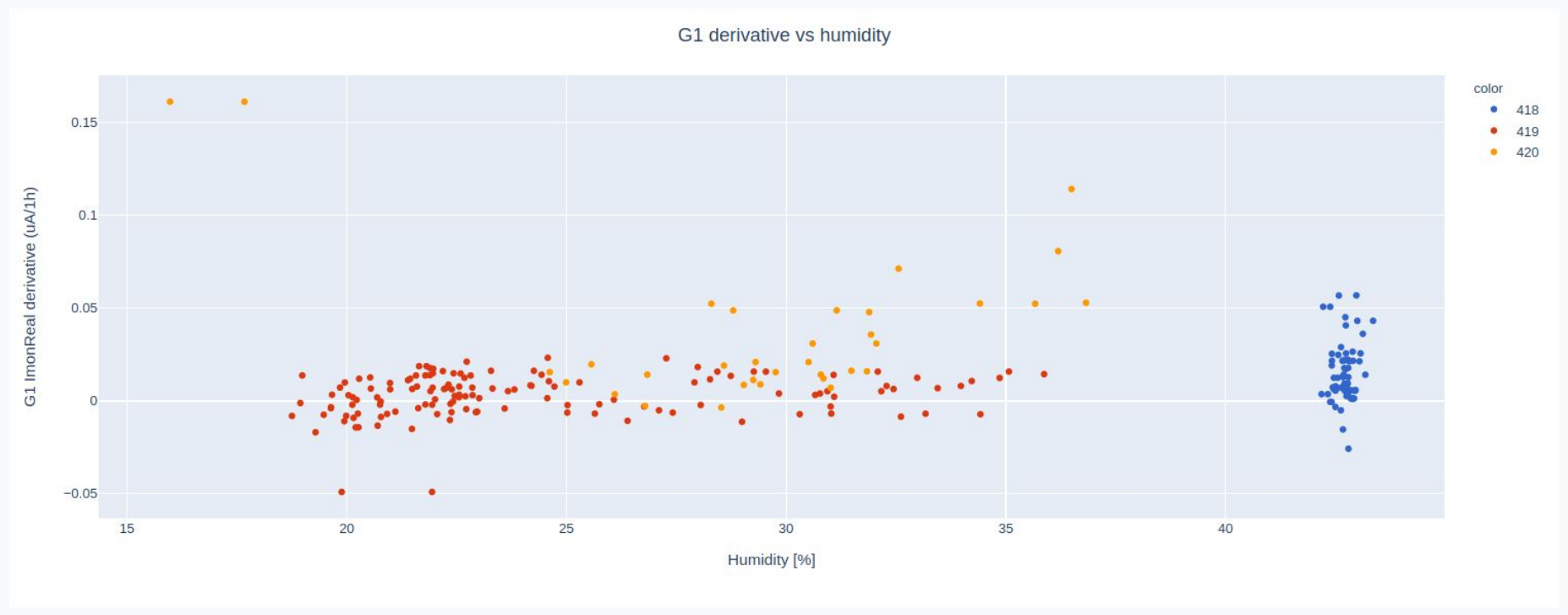
Take the difference between each step and the next

Firsts and lasts points excluded

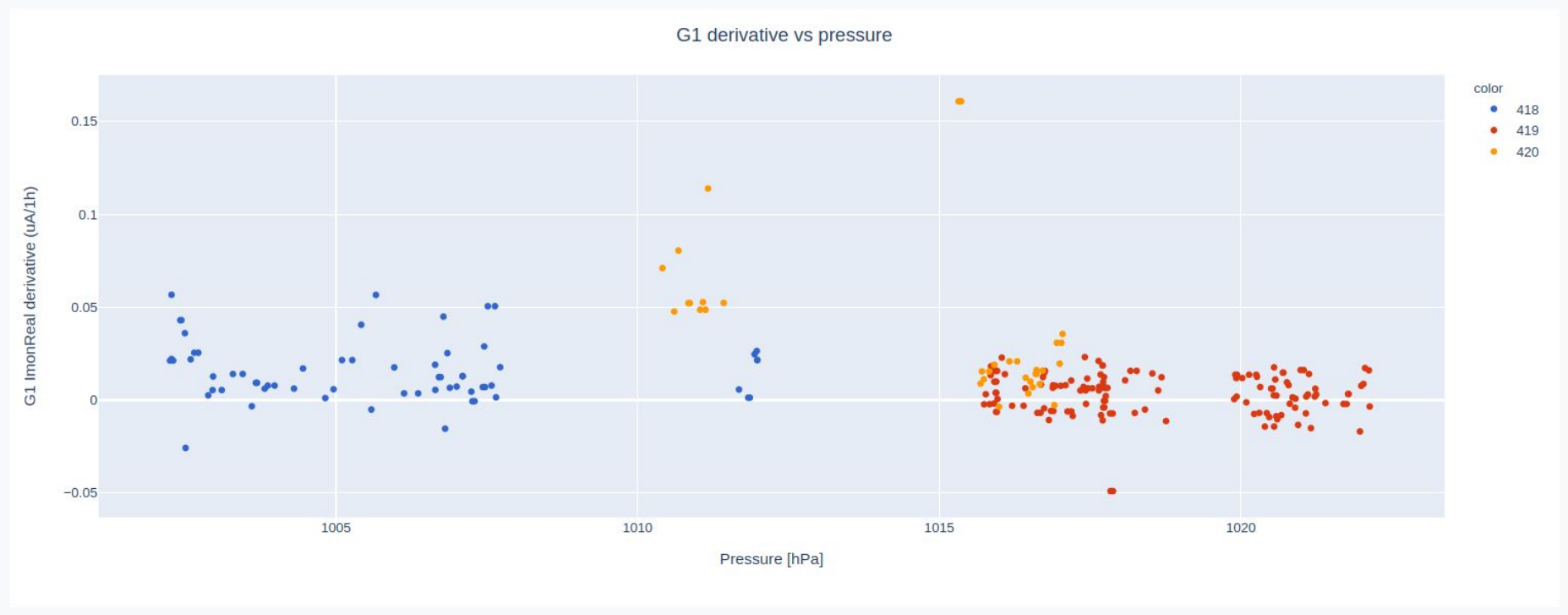
Relationship between drift and ambient parameters

Relationship between drift and ambient parameters

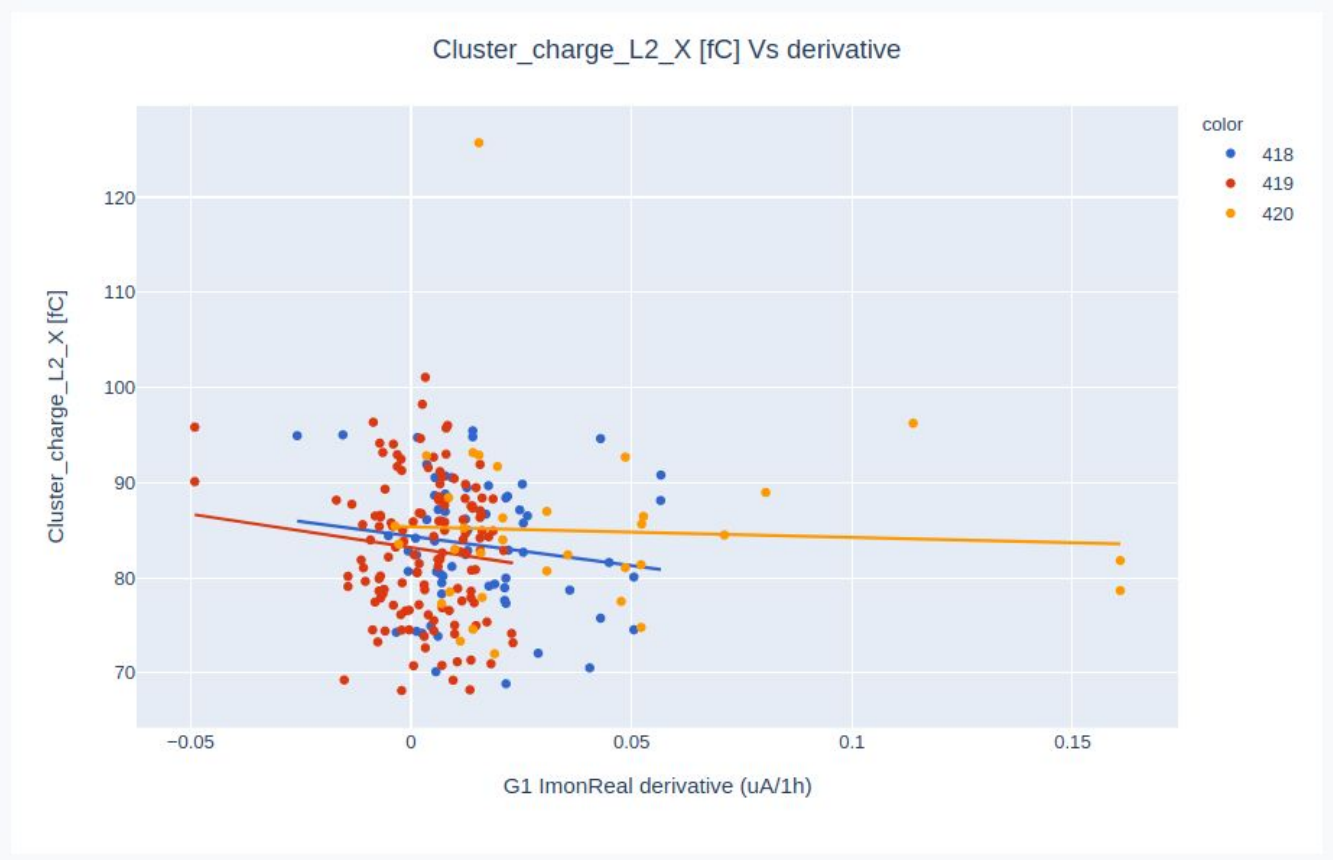
Relationship between drift and ambient parameters



Relationship between drift and ambient parameters

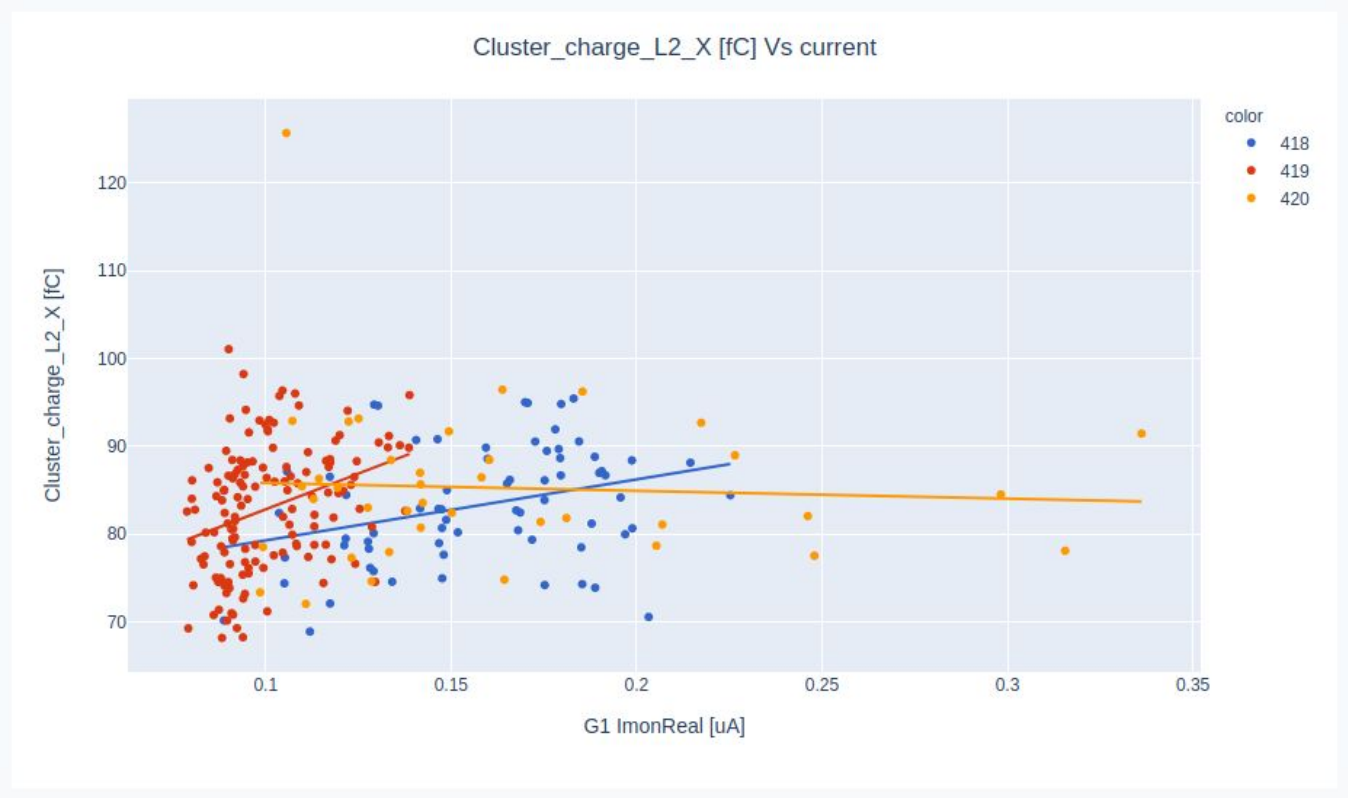


Drift and cluster stats - preliminary studies



No correlation between cluster charge and current derivative

Drift and cluster stats - preliminary studies

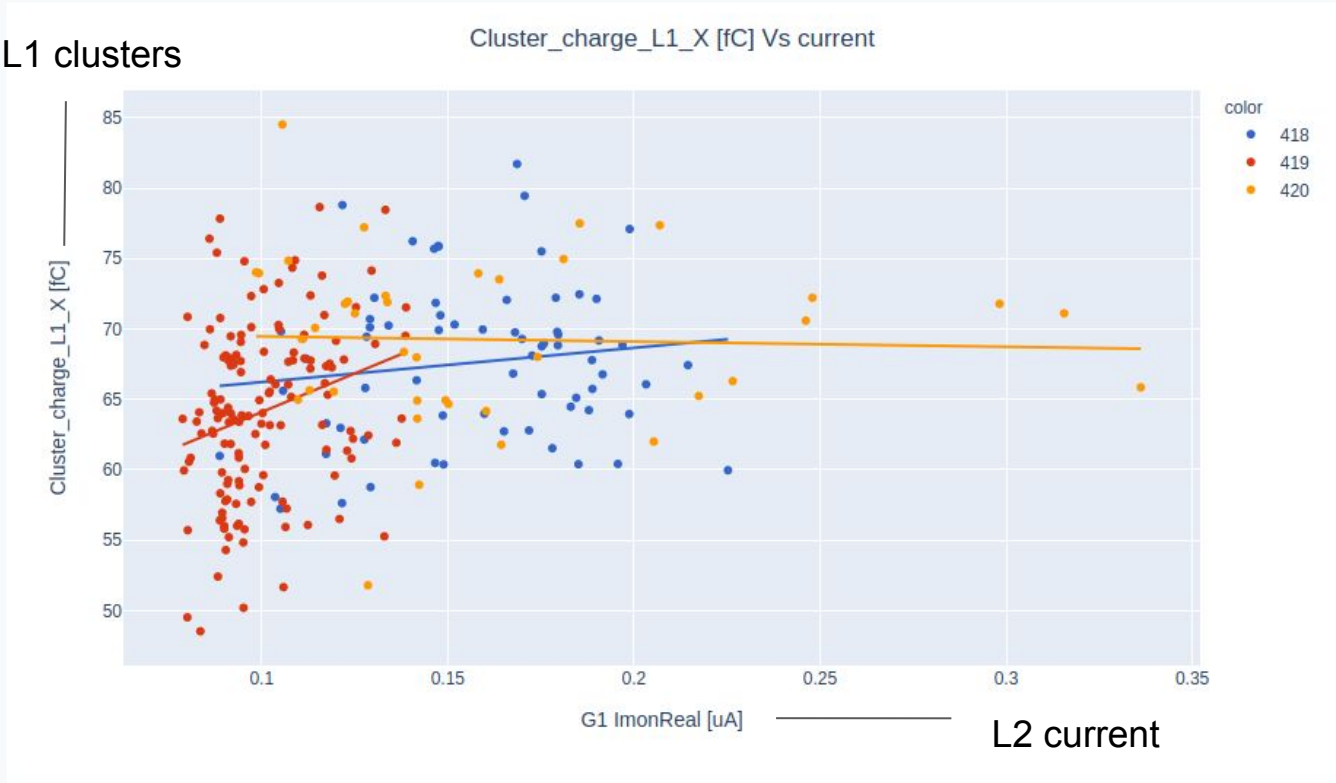


Maybe there is a correlation in 2/3 runs

But...

Drift and cluster stats - preliminary studies

L1 clusters



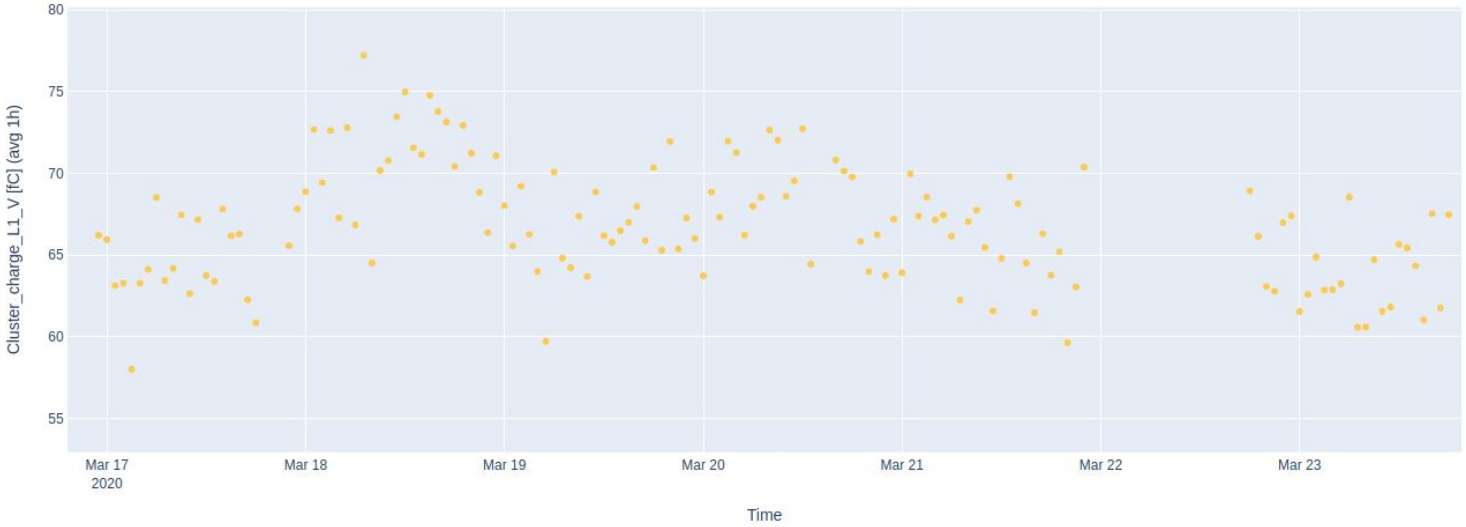
L2 current

Similar correlation between L1 clusters and L2 current

Maybe there is an external factor influencing both L2 G1 current and the cluster stats

Cluster metrics stability

EX : RUN 376



We are investigating the performance oscillation.
Stay tuned for updates in the next months.

Conclusions

- There is an important drift in the current to the Layer 2 Gem 1 electrode
- We are still not able to localize the problem inside or outside the detector with HV test. The problem is new and doesn’t resemble any know internal problem of the detectors.
- The correlation of this drift with ambient parameters and cluster stats is not clear
- To understand the origin of this problem we need to perform hardware tests on the setup

Thank you for your attention

Drift and cluster stats - preliminary studies