

RPC ECOGAS

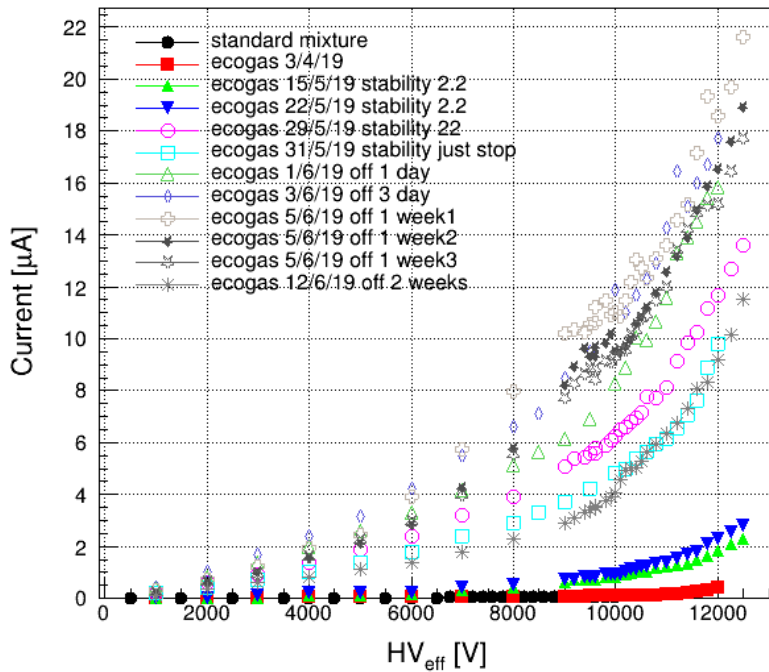
longevity & rate study

Ecogas meeting
14/06/2019

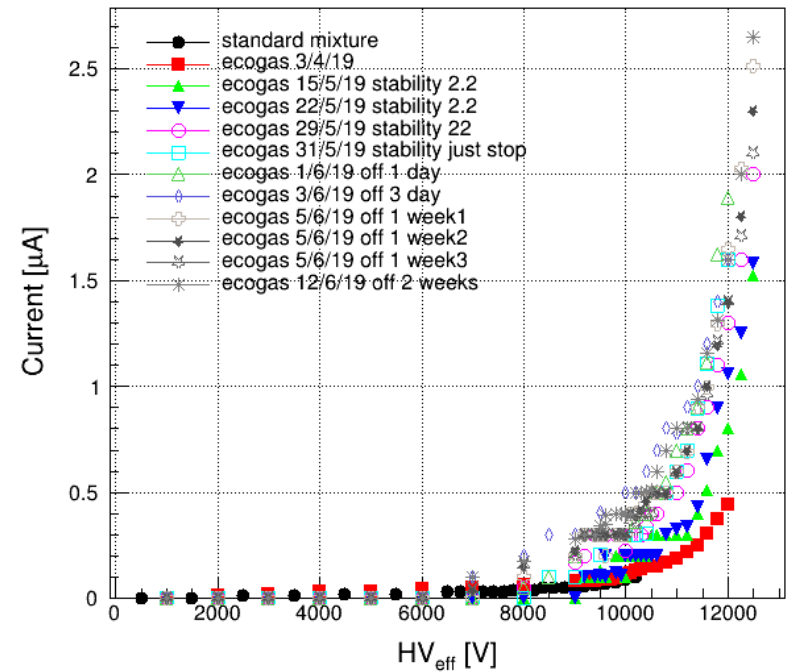
LONGEVITY STUDY & DARK CURRENT MONITORING

Dark current monitoring 2mm

CMS-GT-2-0-BOT



CMS-GT-2-0-TOP



BOT gap significant dark current increase

TOP gap small increase → 1st connected in the gas line

General dark current increase for all the tested chambers →

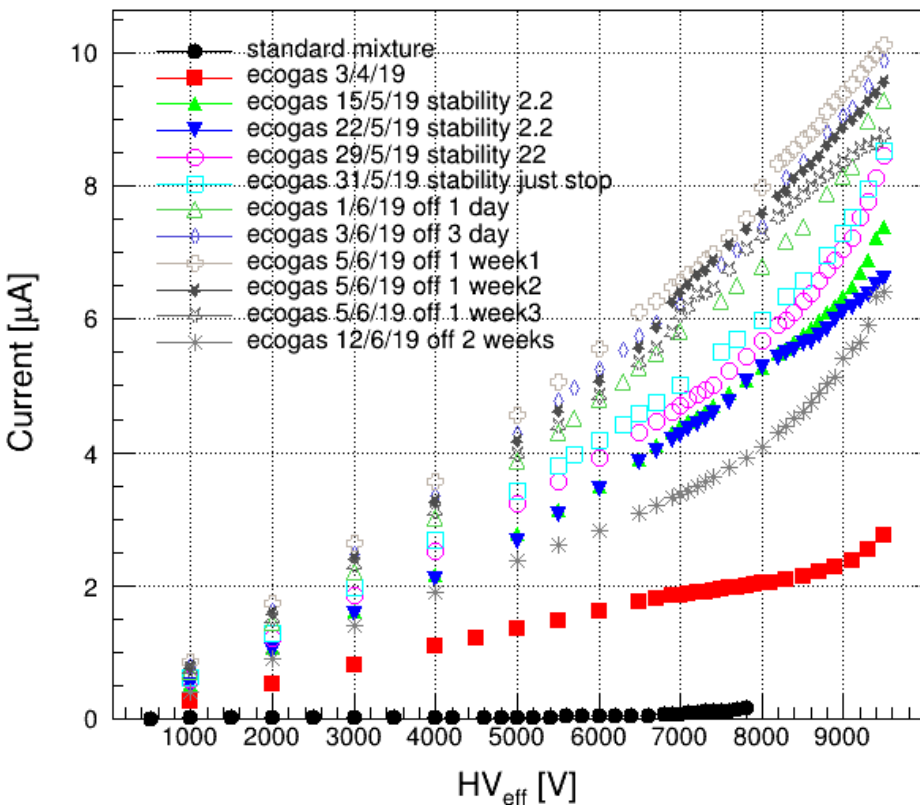
due to the radiation effect and 1 gas vol/h not enough?

Chamber off to verify a possible dark current recovery:

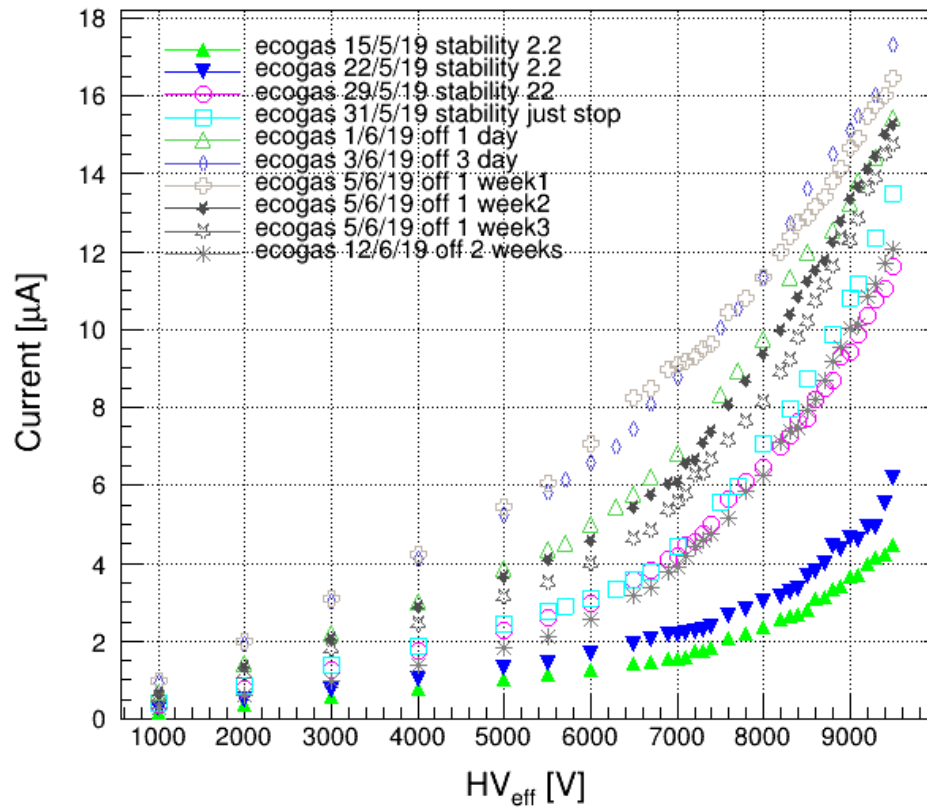
- Dark current monitored, but continued to increase for ~ 1 week even with the chambers off
- After ~ 1 week the dark current stabilize/decrease

Dark current monitoring 1.4mm

CMS-KODEL_1-4-BOT



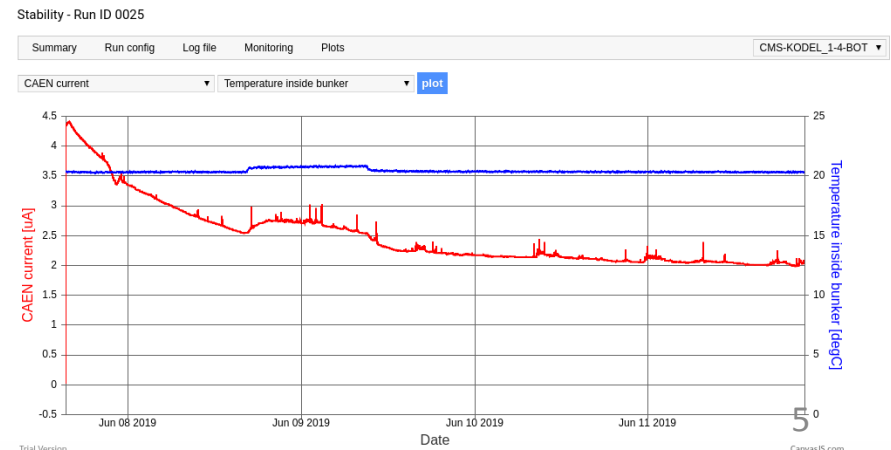
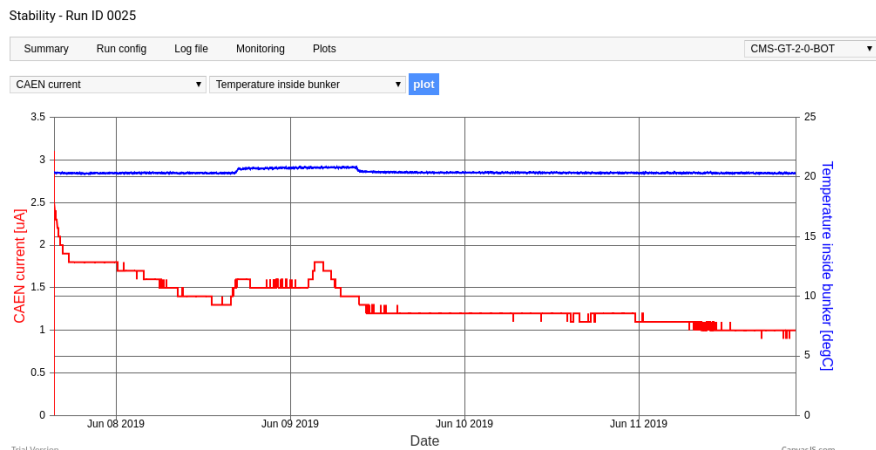
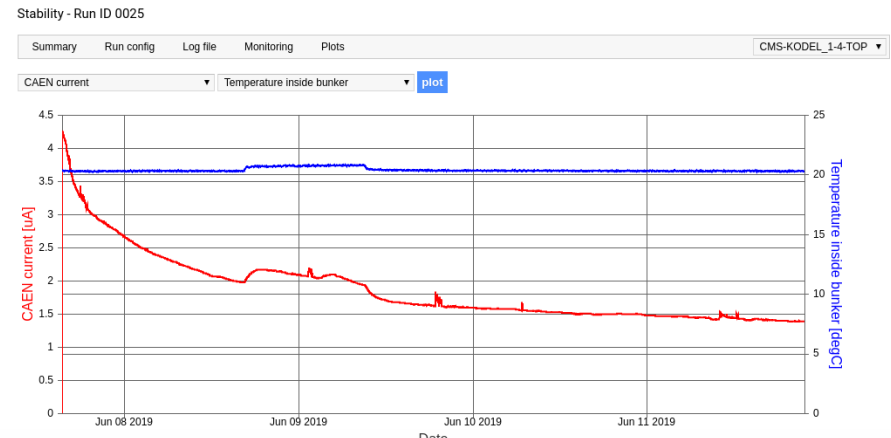
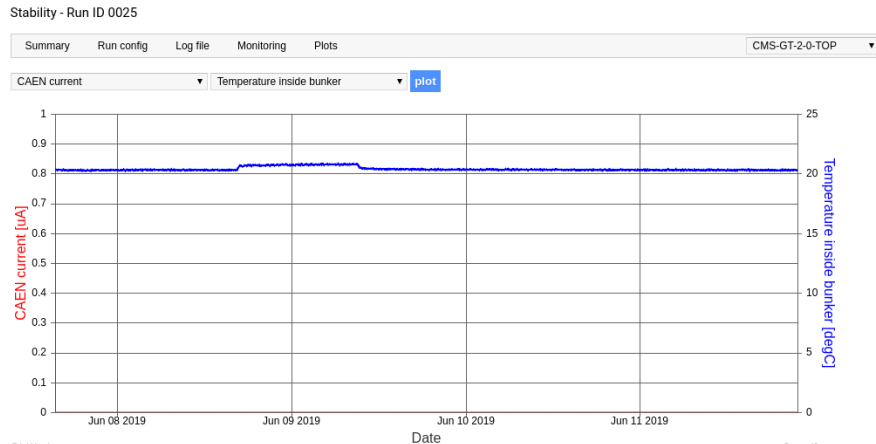
CMS-KODEL_1-4-TOP



Dark current monitoring

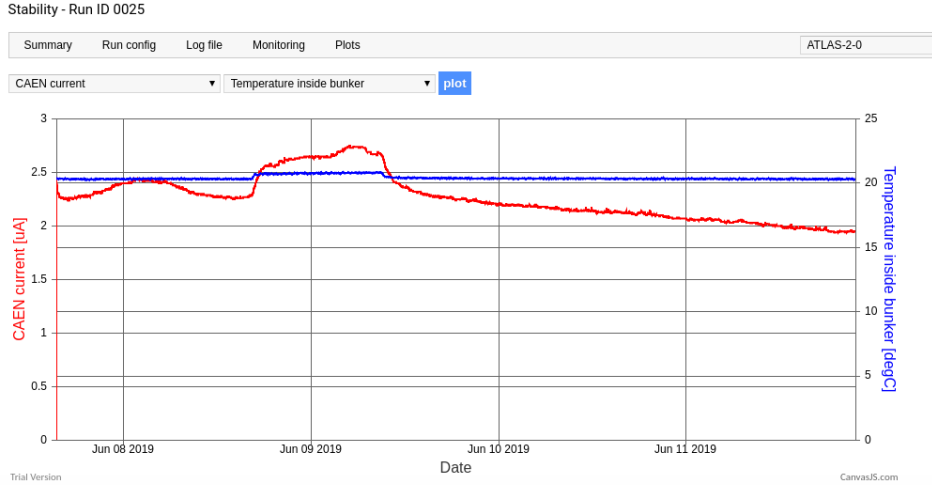
- STABILITY @ STBY (5kV) to continuously monitor the current
- ATLAS & ALICE chambers: gas flow increased to 4 and 2 gas vol/h to vary the gas flow effect

Source off dark current decay **AFTER TO PAUSE THE IRRADIATION**: 50% drop
CLEAR RADIATION DEPENDENCE



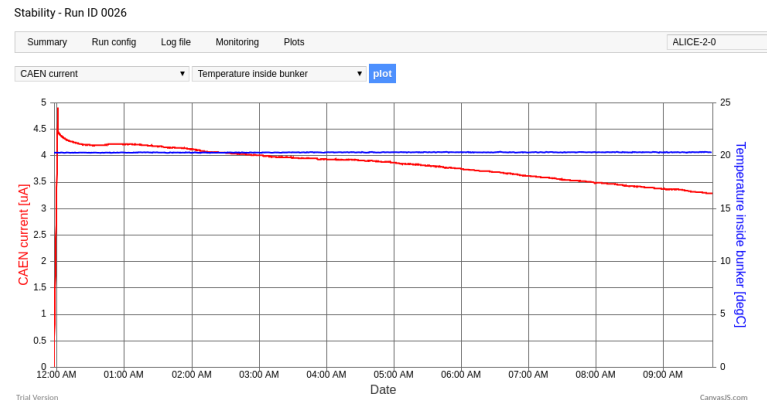
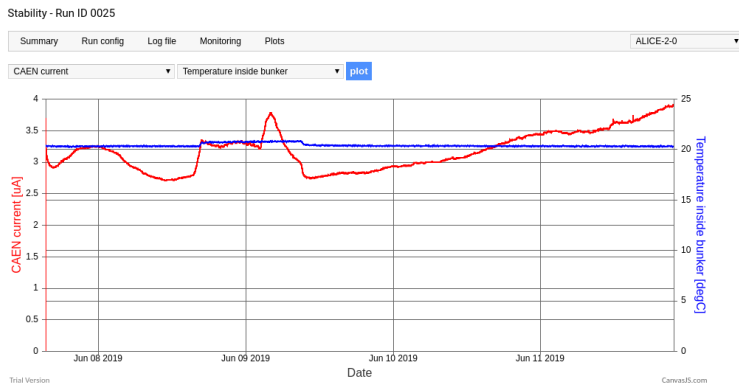
Dark current monitoring

Source off dark current decay AFTER TO PAUSE THE IRRADIATION FOR ATLAS (4 gas vol/h) & ALICE (2 gas vol/h)



ATLAS:
current DECREASE

ALICE: is the only chamber with the dark current increase, even after having with double the gas flow, up to Wednesday. After Wednesday the dark current decrease



RATE STUDY

SET UP

Chamber tested: **CMS-RPC GT**

Gas gap thickness: 2mm

Electrodes thickness: 2mm

Electronics: CMS-RPC

Threshold: 220mV → 150 fC

2 partition (left - right)

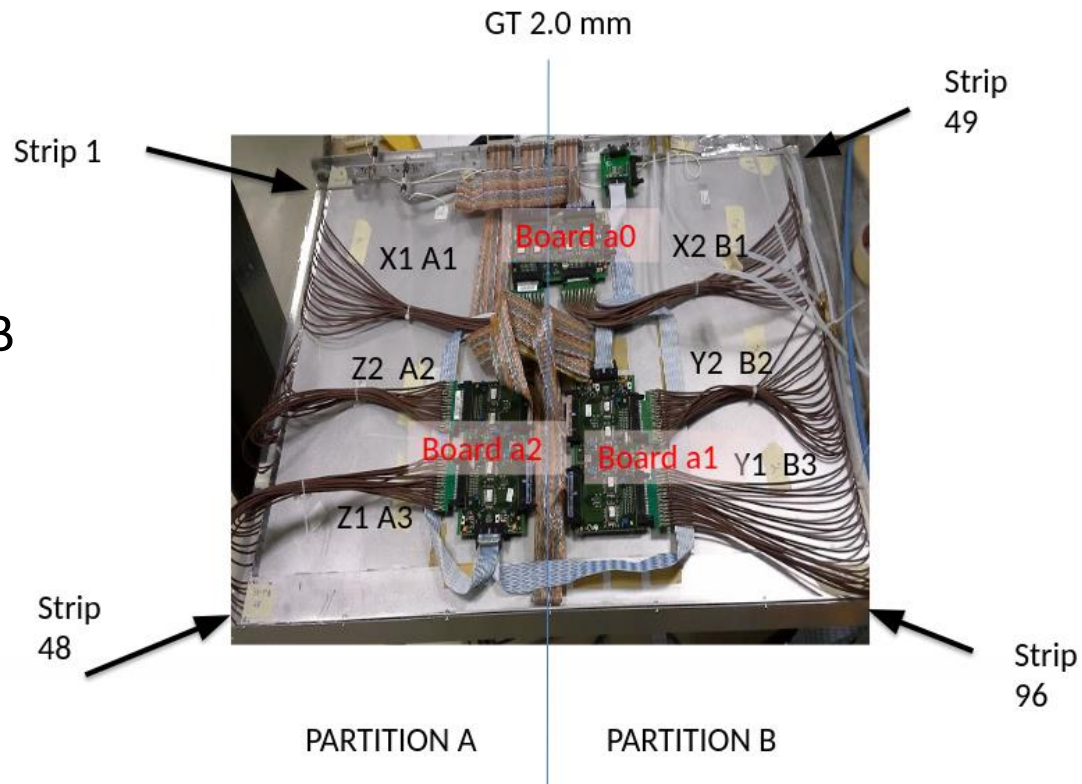
3 CMS feb

96 strips → 32 channels each FEB

Strip pitch 1.5 cm

5 ABS rate scans:

- 69
- 22
- 15
- 10
- 6.9



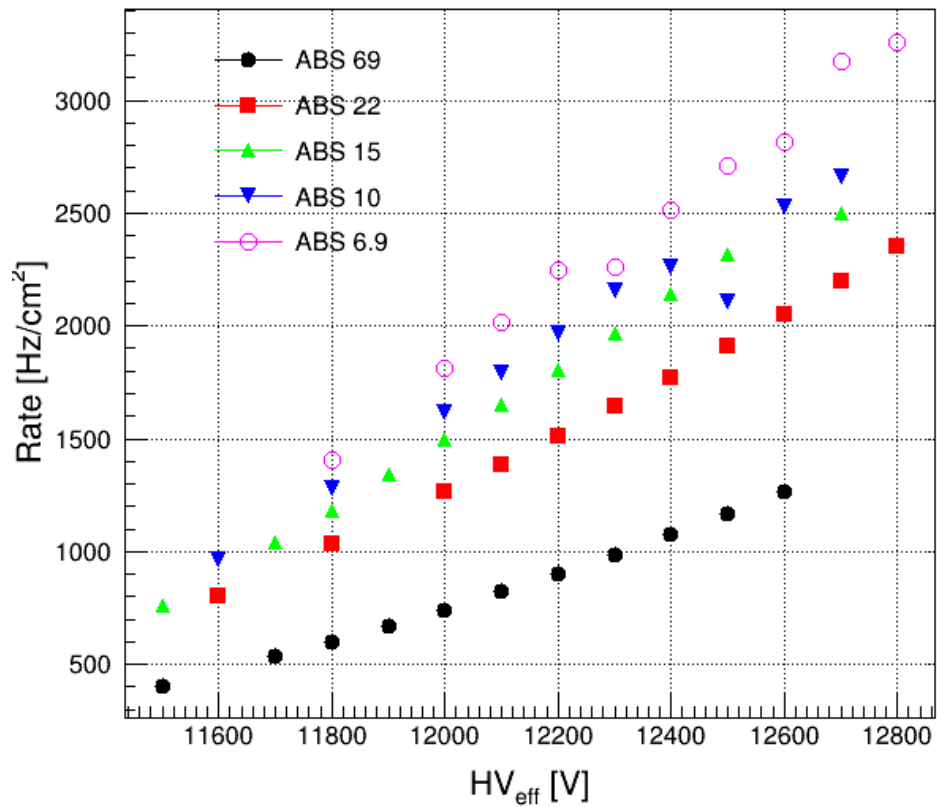
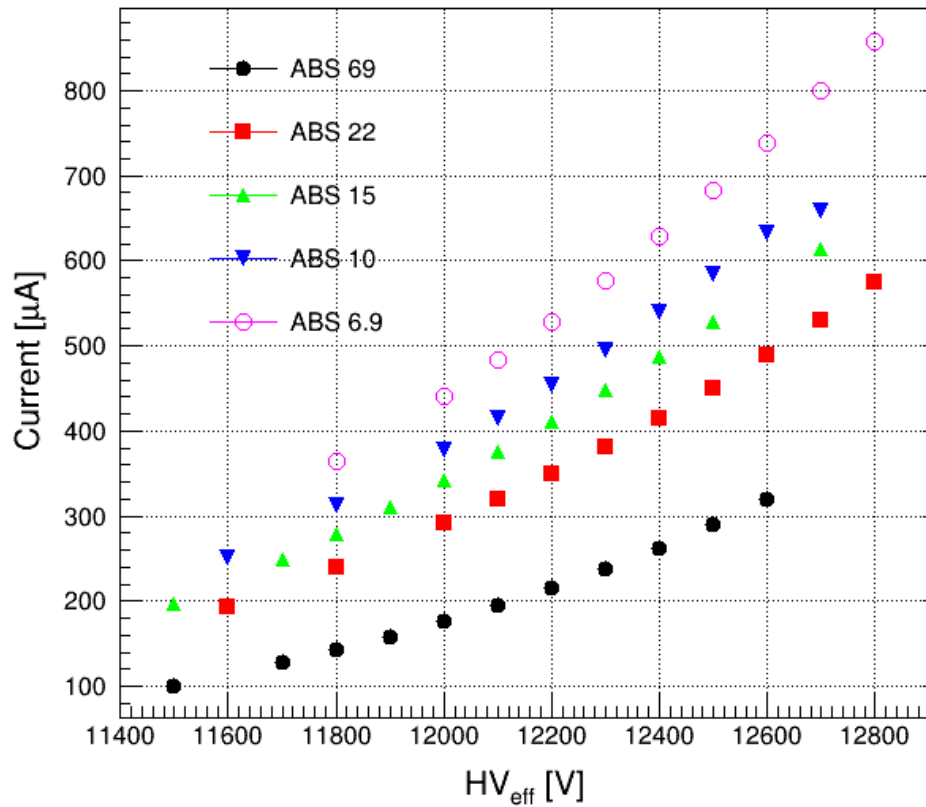
CURRENT & RATE VS HV

CURRENT vs HV

RATE vs HV

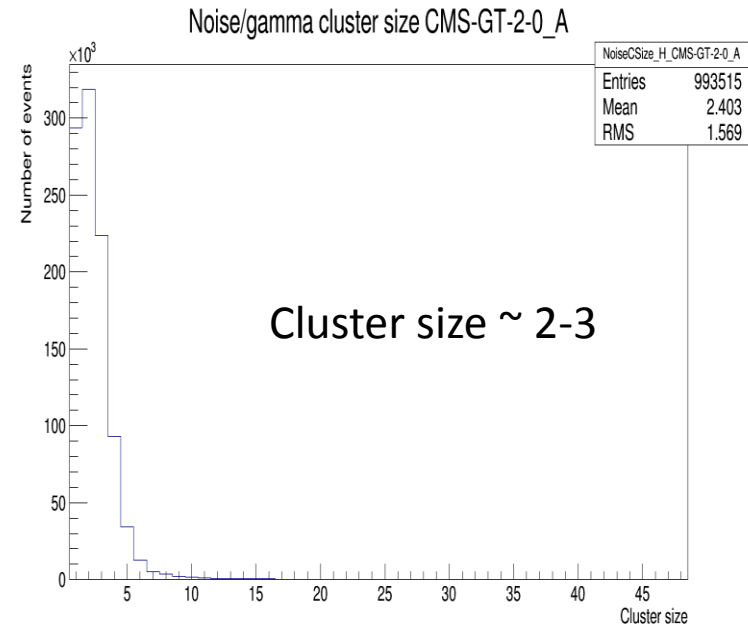
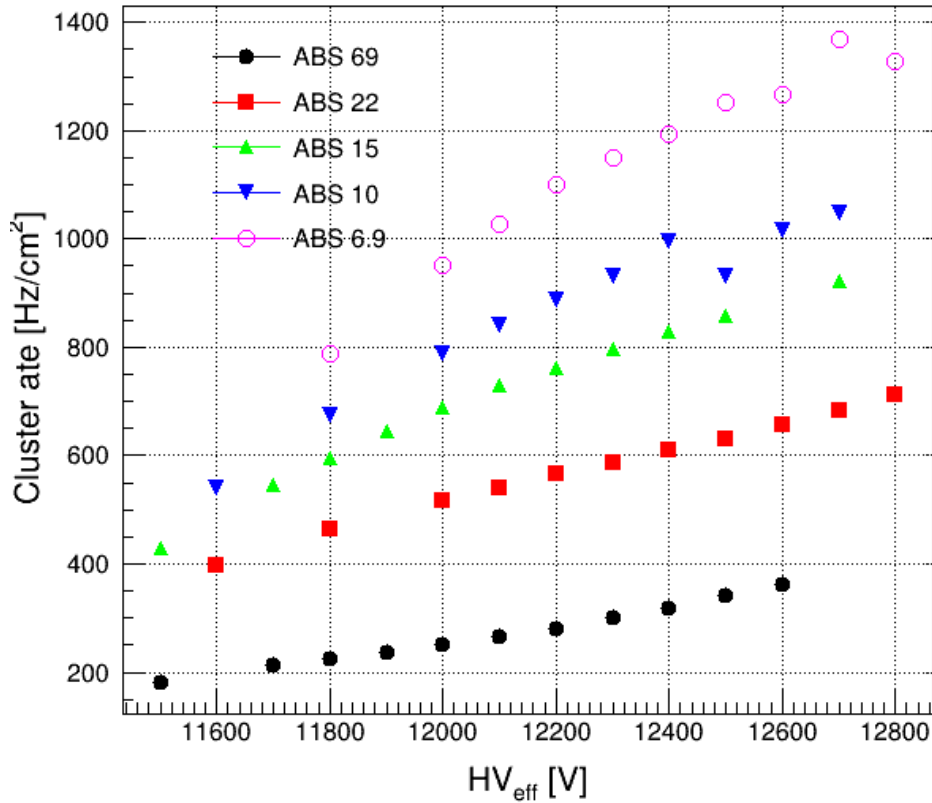
CMS-GT-2-0

CMS-GT-2-0



CLUSTER RATE VS HV

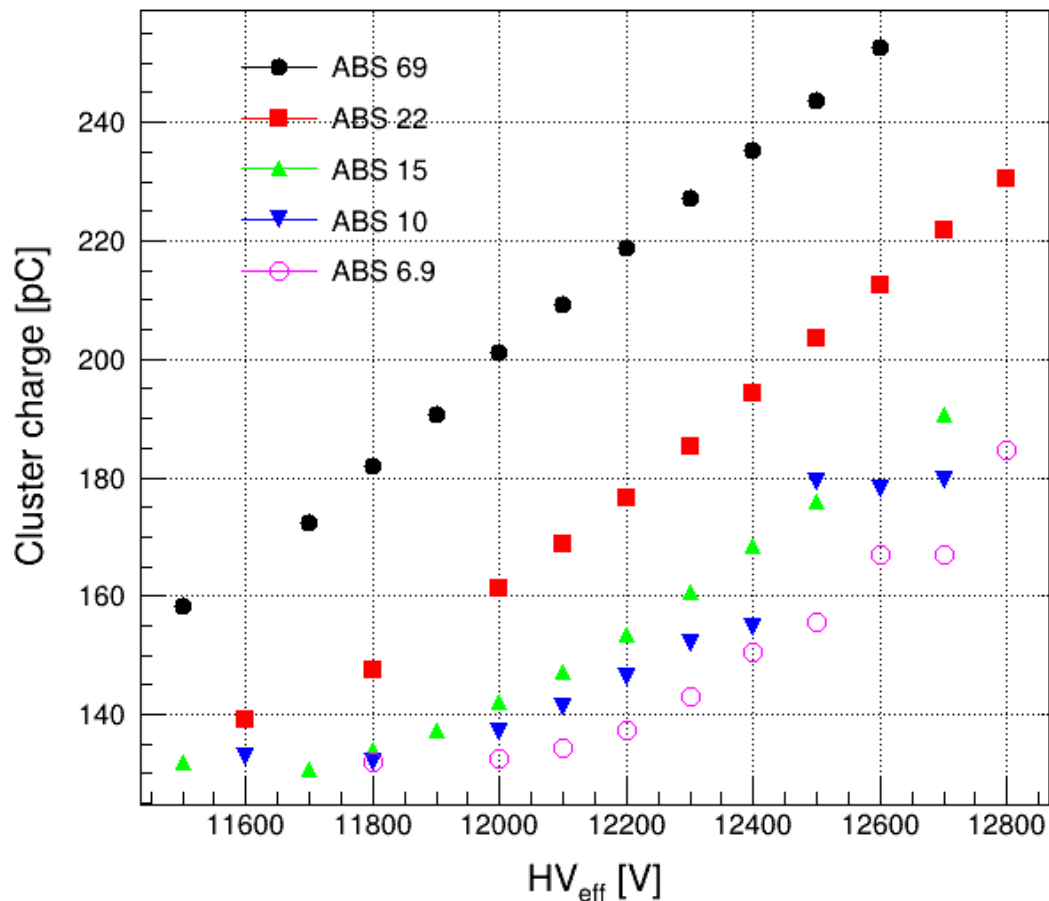
CMS-GT-2-0



$$\text{Cluster rate} = \frac{\text{Hit rate}}{\text{Cluster size}}$$

CLUSTER CHARGE VS HV

CMS-GT-2-0

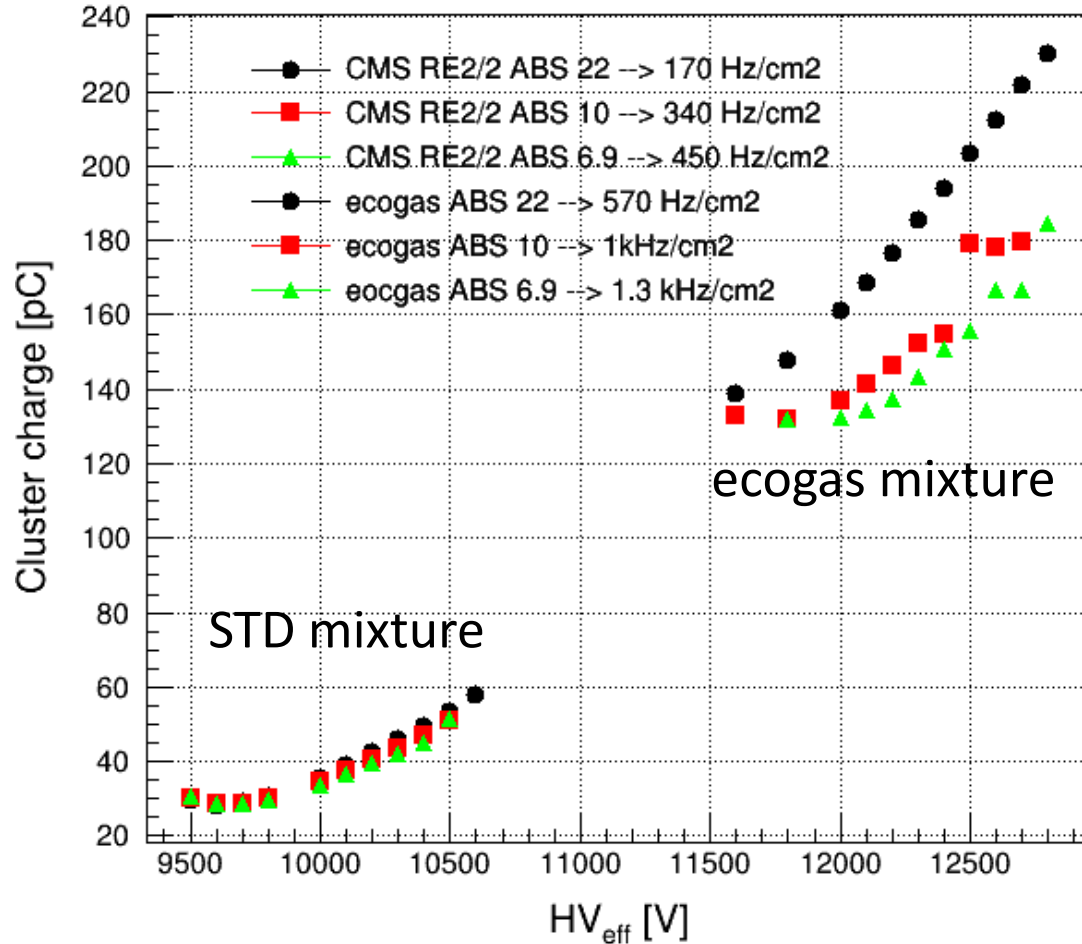


ABS	Cl_Rate	WP
69	225	11800
22	570	12200
15	877	12600
10	1050	12700
6.9	1290	12800

$$\text{Cluster charge} = \frac{\text{Current density}}{\text{Cluster rate}}$$

CLUSTER CHARGE VS HV

ECO VS STD MIX



Ecogas charge @ gamma WP
~ 180 pC

STD mix charge @ muon WP
~ 30 pC (*CMS-RE4-2 chamber)
(@ gamma WP the charge is
~ 37pC)

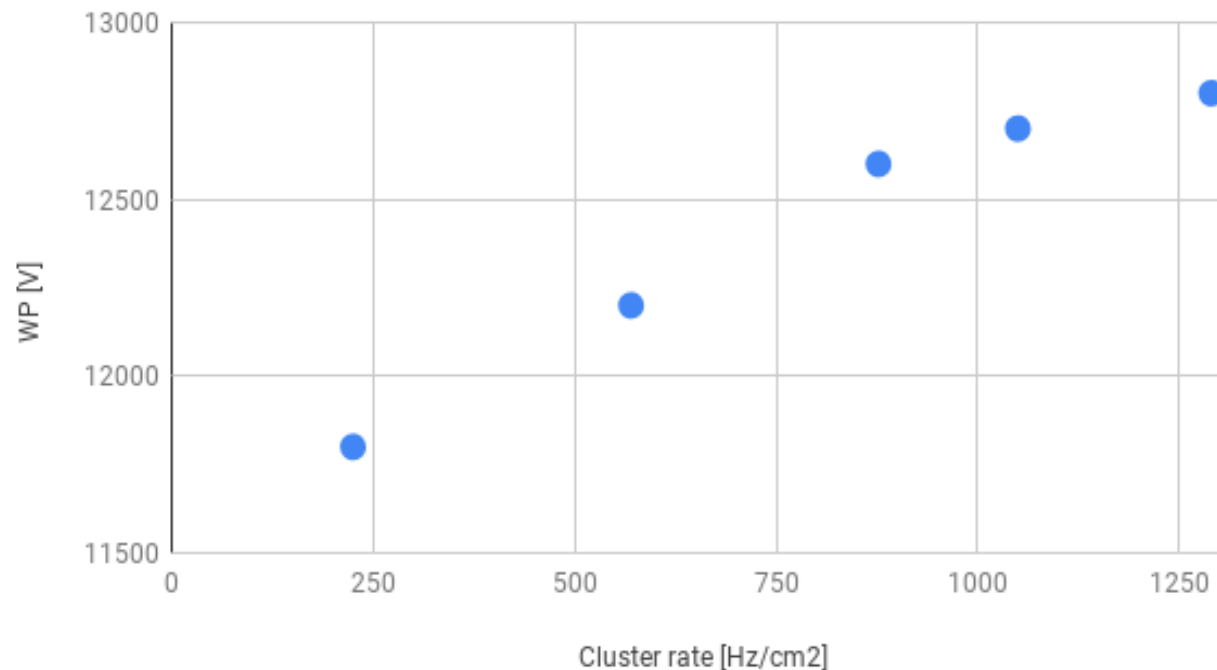
**Ecogas charge is 5-6 times
greater than STD mix charge**
(confirmed Frascati results)

Working point estimation from cluster rate curves

Working point: Voltage estimated at the rate plateau

Gammas WP \sim 400V higher than muon WP

WP vs rate



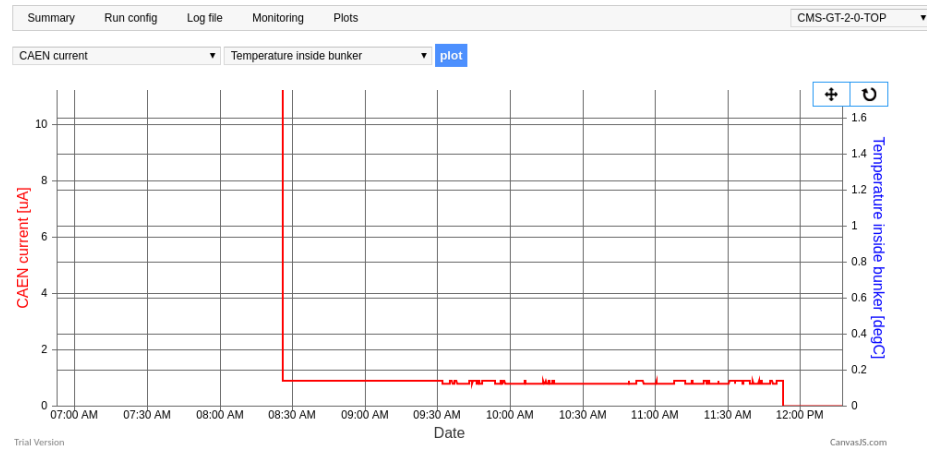
\sim 1kV shift going from 250 Hz/cm² to 1250 Hz/cm² (cluster rate)

BACK UP

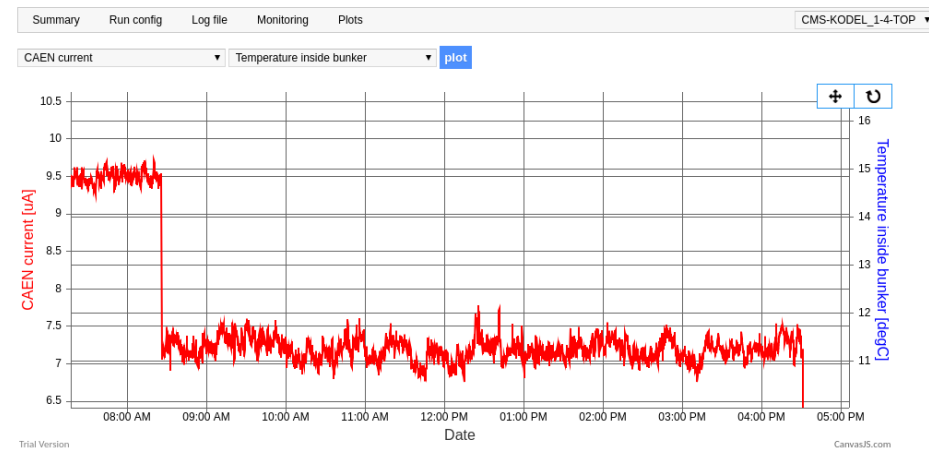
Dark current monitoring

Source off dark current decay **BEFORE TO PAUSE THE IRRADIATION:**
no evident and significant recover after 8h

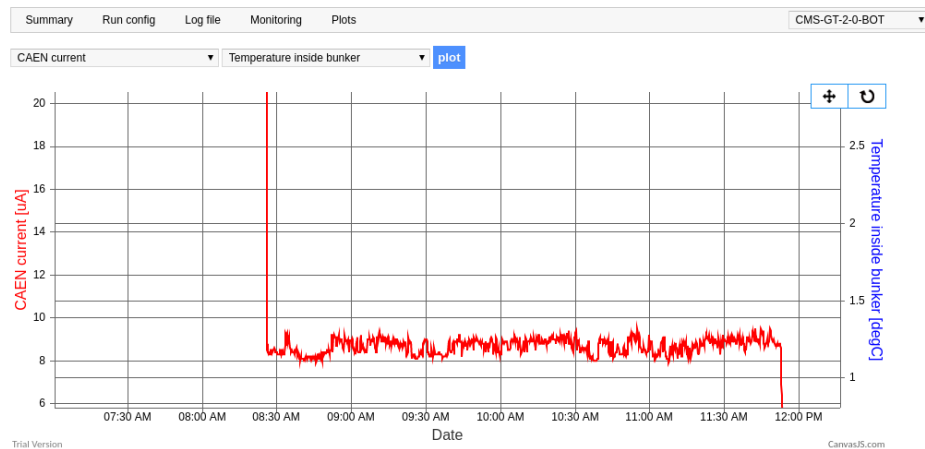
Stability - Run ID 0023



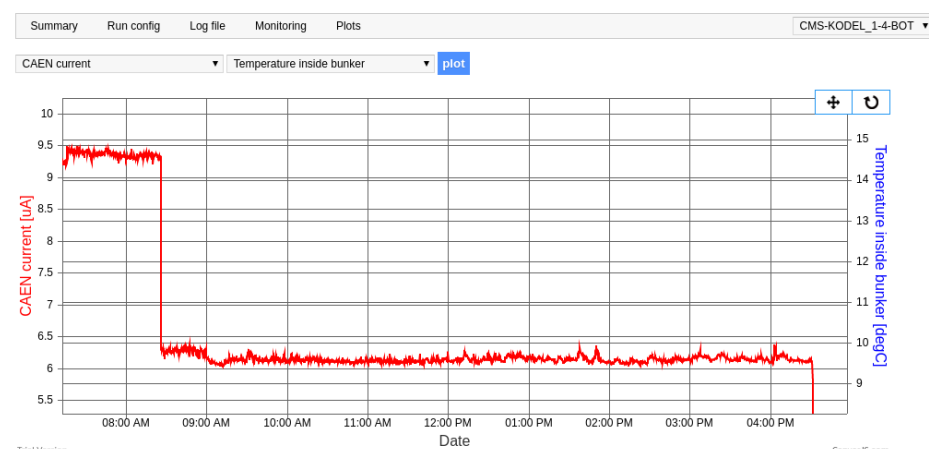
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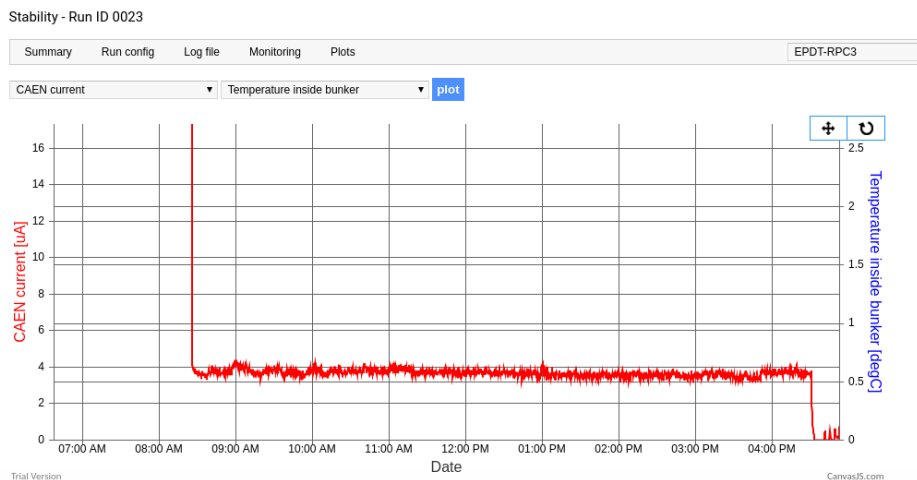
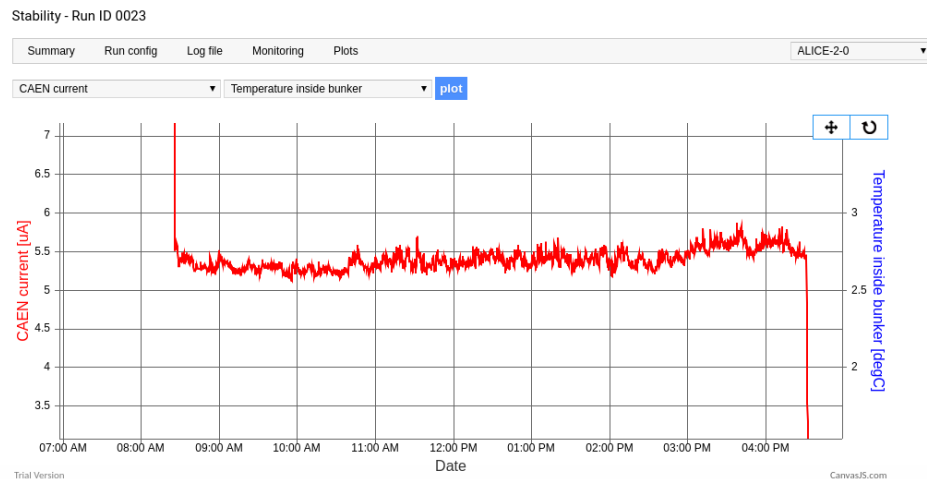
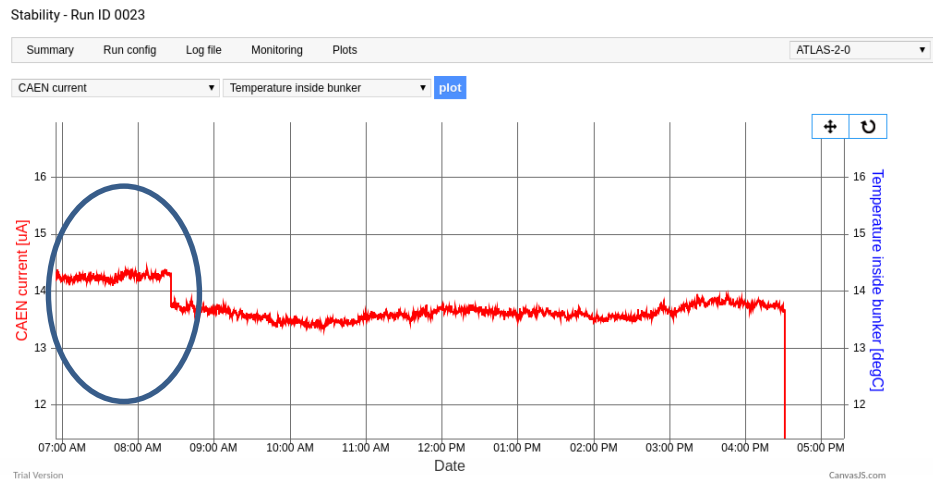


Stability - Run ID 0023



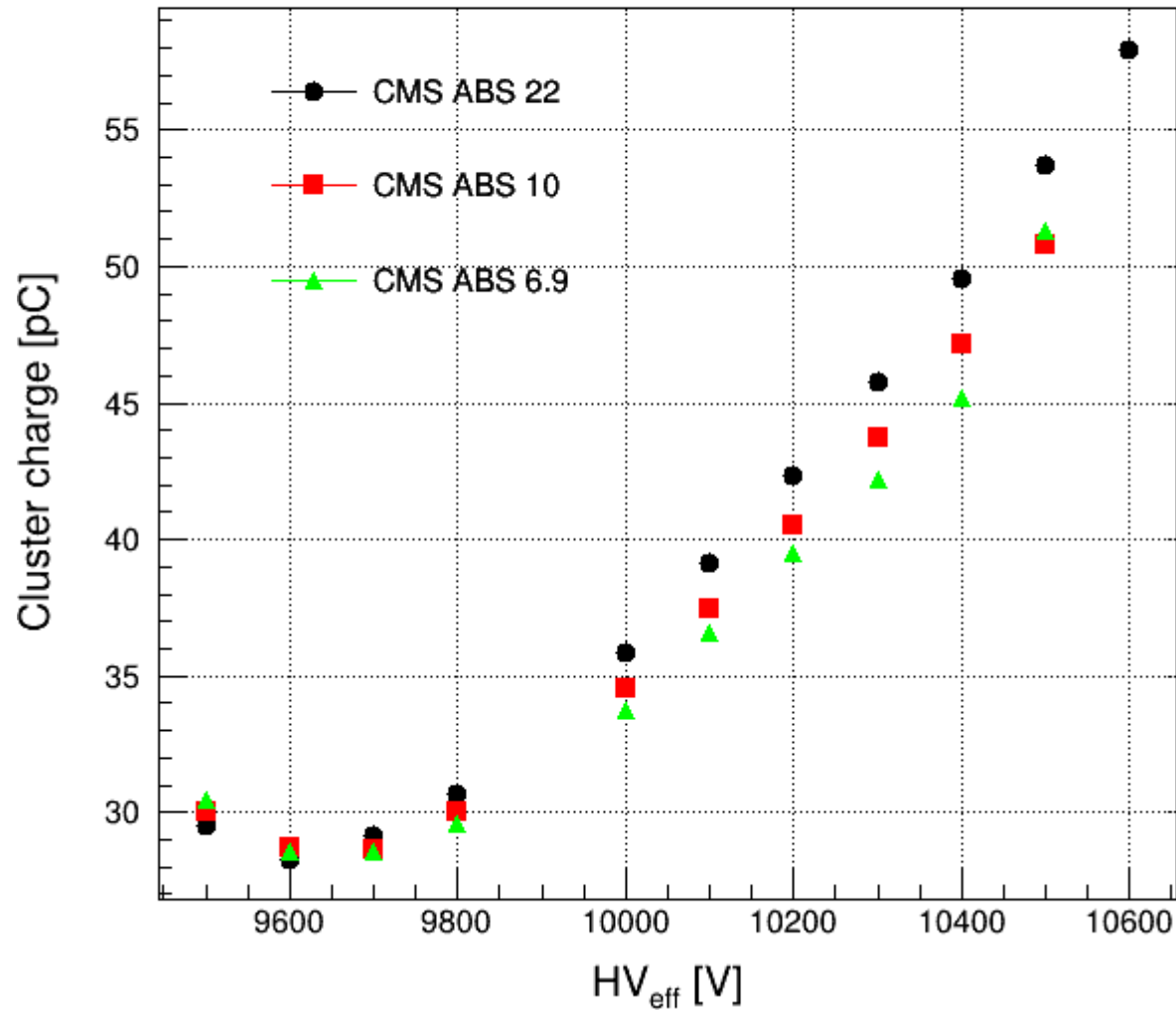
Dark current monitoring 2mm

Source off dark current decay: no evident and significant recover after 8h



CLUSTER CHARGE CMS-RPC

RE2-2-NPD-BARC-8



195 Hz/cm²
360 Hz/cm²
480 Hz/cm²