

ECO2 gas mixture current trends

Datasets

- HV scans performed with source OFF using the ECO2 gas mixture (60% CO₂, 35% HFO, 4% i-C₄H₁₀ and 1% SF₆) from WebDCS
- Integrated (accumulated) charge obtained by integrating the currents from Grafana (<https://epdt-rd-monitoring.web.cern.ch/d/pqvITZRWz/global>)
- Data from 6/11/2019 to 20/03/2020

Key dates

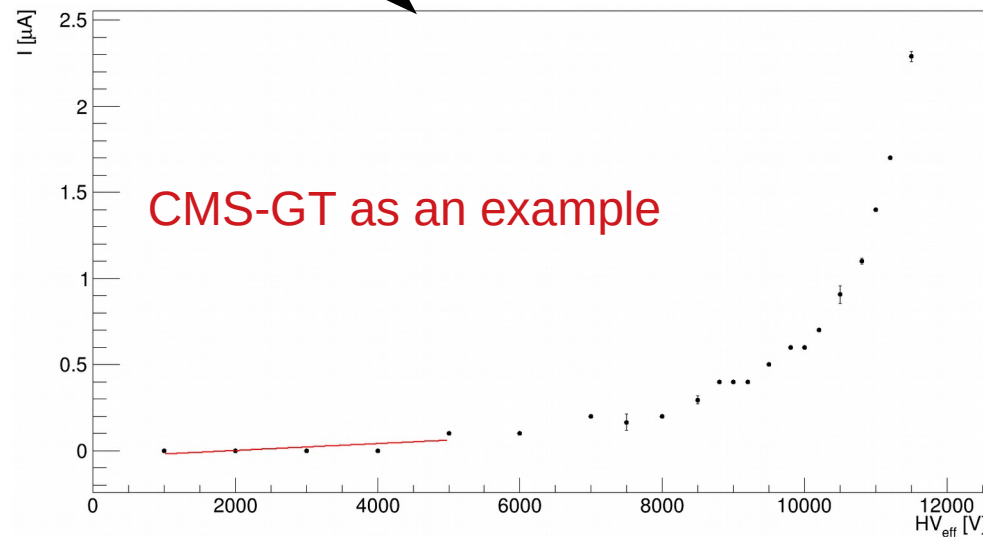
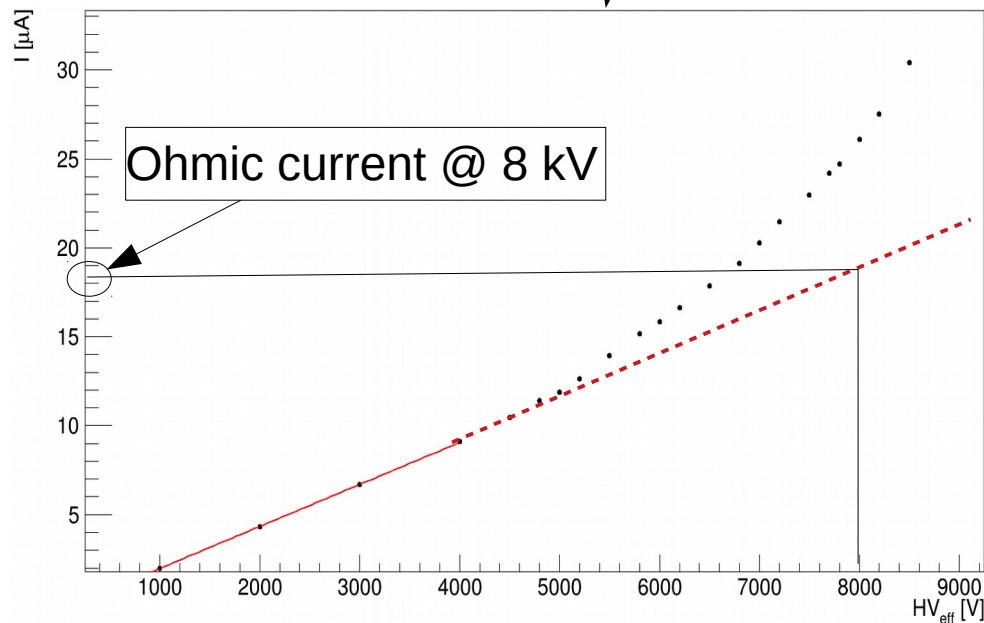
- 6/11/2019: start ECO2 flushing
- 20/12/2019 - 11/01/2020: Christmas break
- 15/01/2020: Ar scan for resistivity
- 22/01/2020: flushing chambers with ECO2 after break
- 19/02/2020: EP-DT RPC3 removed from GIF++
- 27/02/2020: bypass of humidifier wet gas line (dew point ≈ -40 °C)
- 17/03/2020: stop of activity due to lockdown

Analysis (1)

- Plots as a function of **time** and **integrated charge**
- Plot of the dark current (source OFF) at different HV values (for KODEL: 5, 6.5, 7.5 and 8.5 kV while for the others: 8, 9, 10 and 11 kV)
- Plot of the Ohmic component of the dark current at different HV values (for KODEL: 6.5, 7.5 and 8.5 kV while for the others: 9, 10 and 11 kV)
- **All plotted quantities are without irradiation**

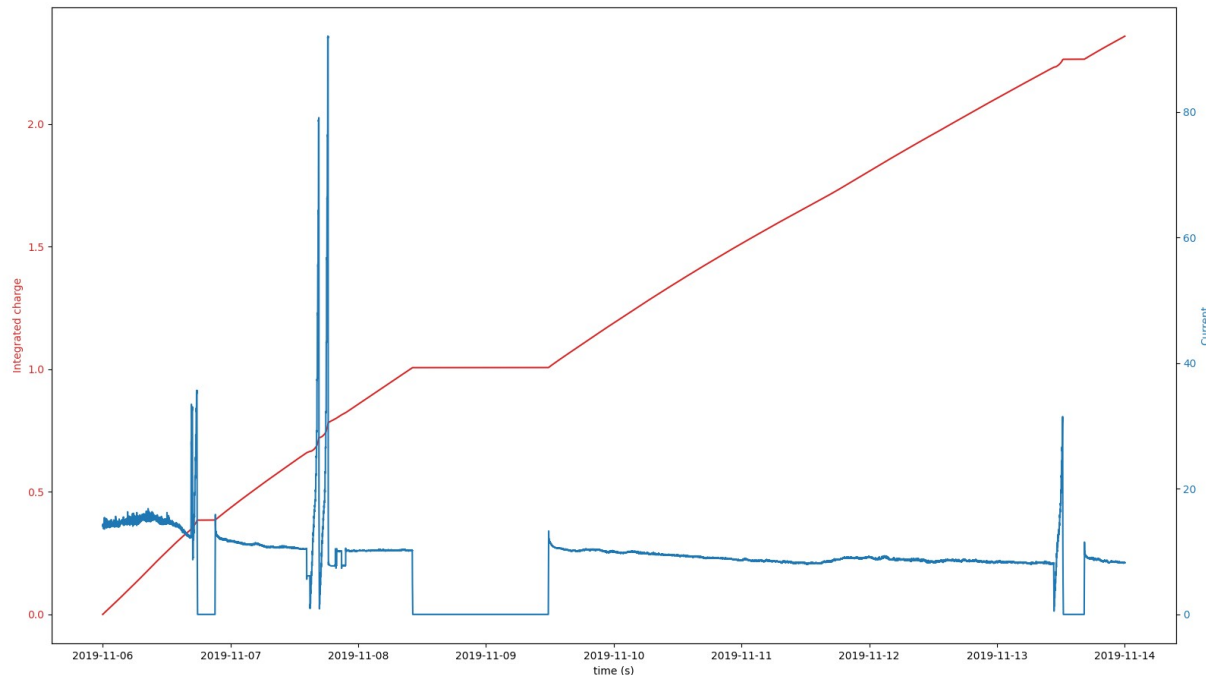
Analysis (2)

- Dark current obtained from the various $I(HV)$ scans
- For the Ohmic component: linear fit to the various $I(HV)$ curves (for **KODEL** 0-4 kV, for the **others** 1-5 kV) evaluated at different HV values



Analysis (3)

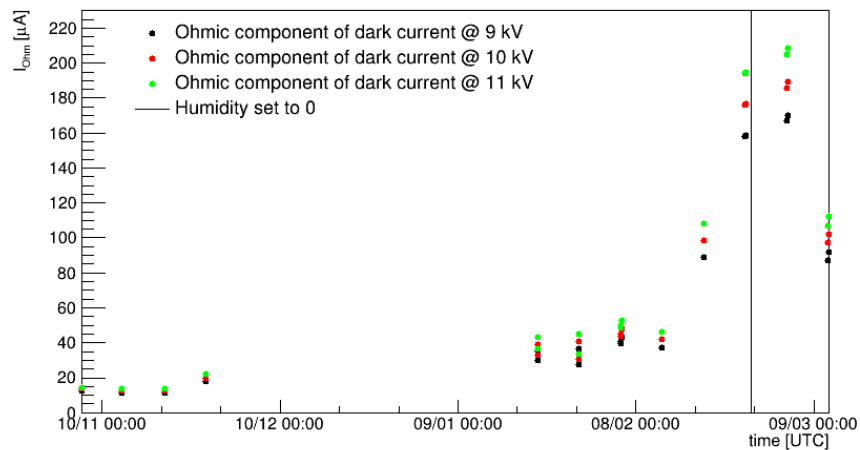
- Datapoints corresponding to the different I(HV) scans
- Integrated charge values correspond to the different I(HV) scans



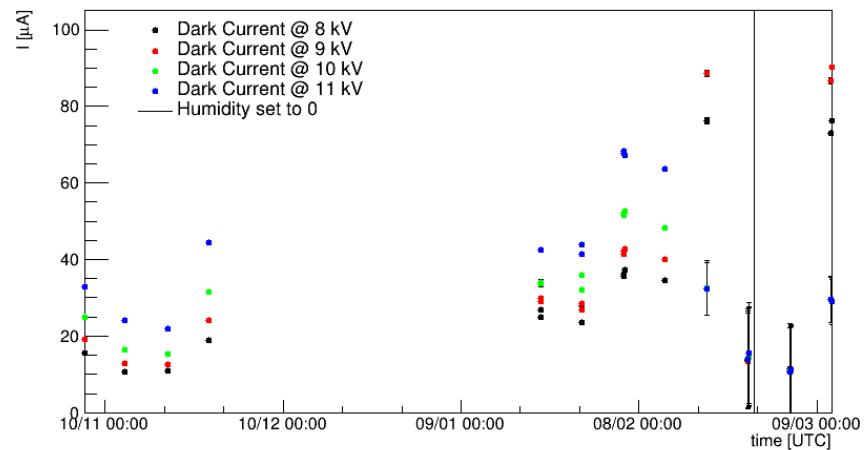
- Example: ALICE detector (short time period of 1 week)
- In blue: current (μA)
- In red: integrated charge (mC/cm^2)

ALICE and EP-DT (time)

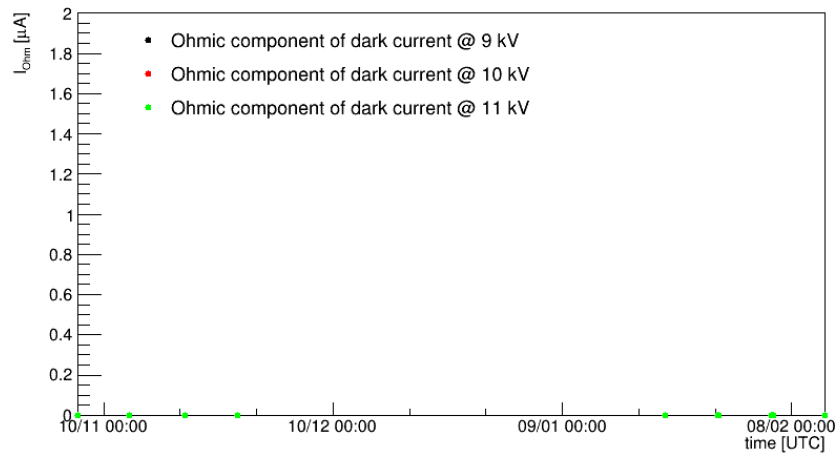
Ohmic component of the dark current of ALICE-2-0



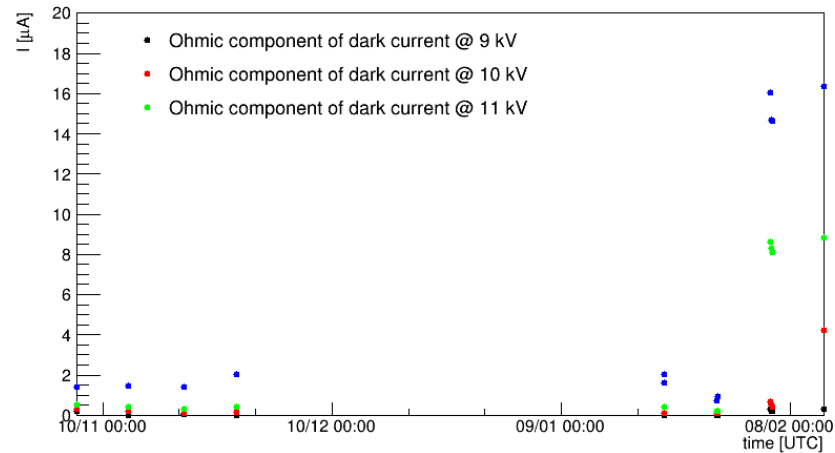
Dark current of ALICE-2-0



Ohmic component of the dark current of EPDT-RPC3

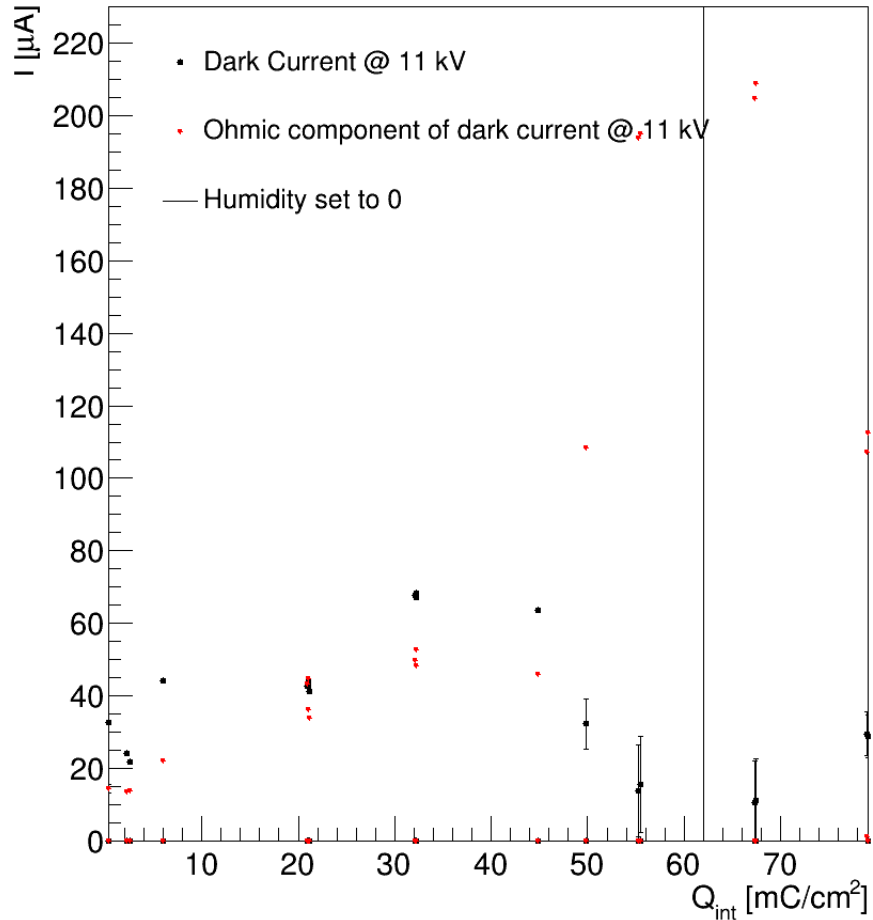


Dark current of EPDT-RPC3

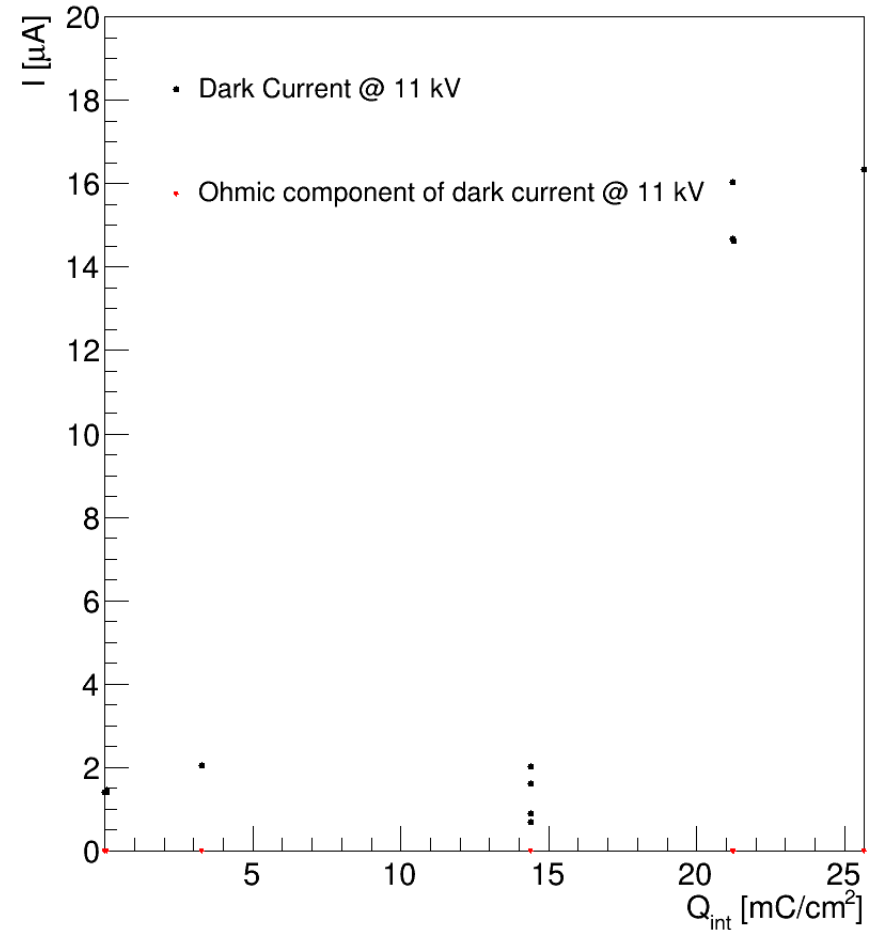


ALICE and EP-DT (int. charge)

Qint of ALICE-2-0

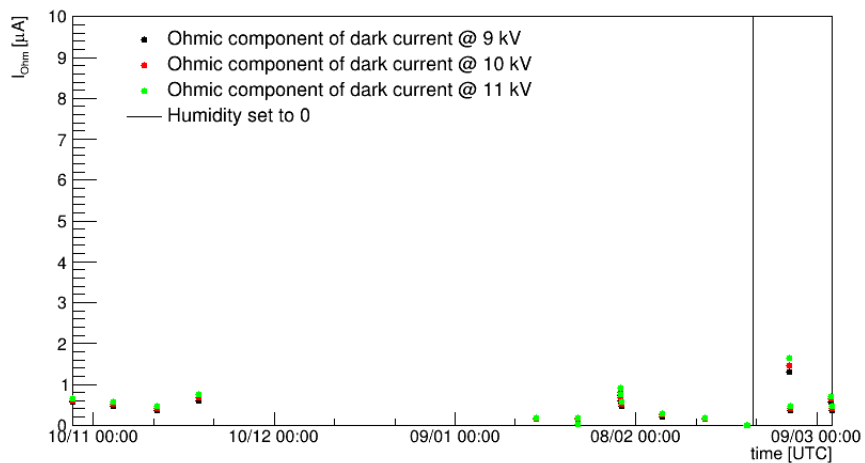


Qint of EPDT-RPC3

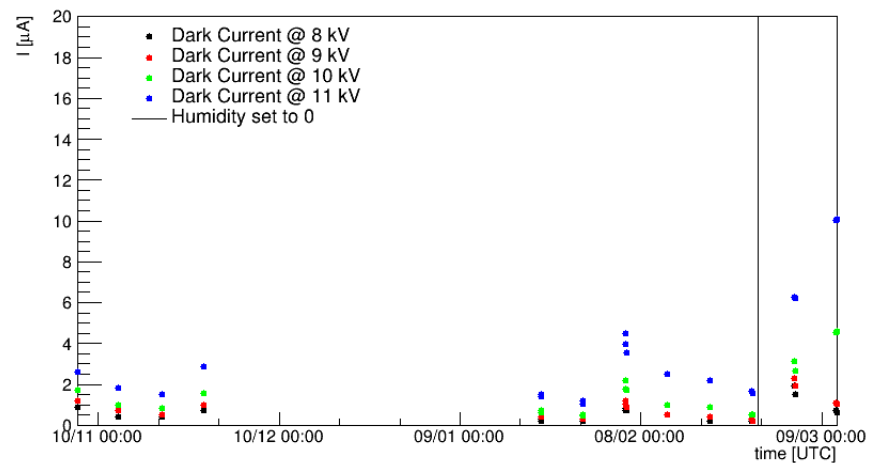


CMS-GT (time)

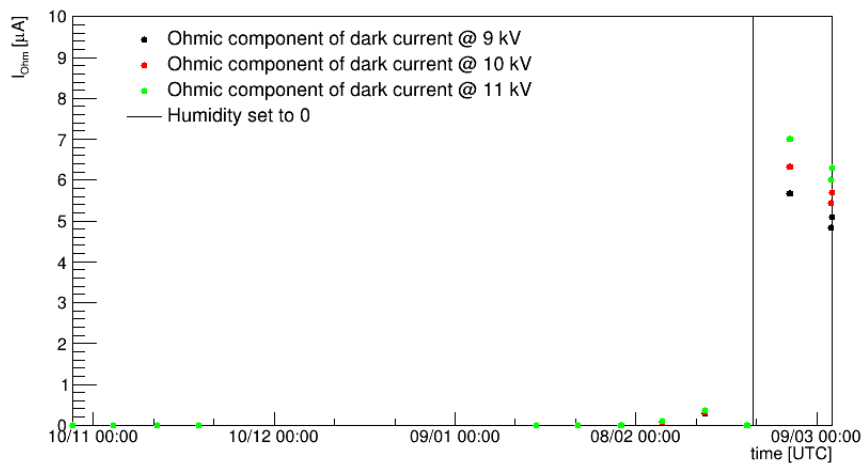
Ohmic component of the dark current of CMS-GT-2-0-BOT



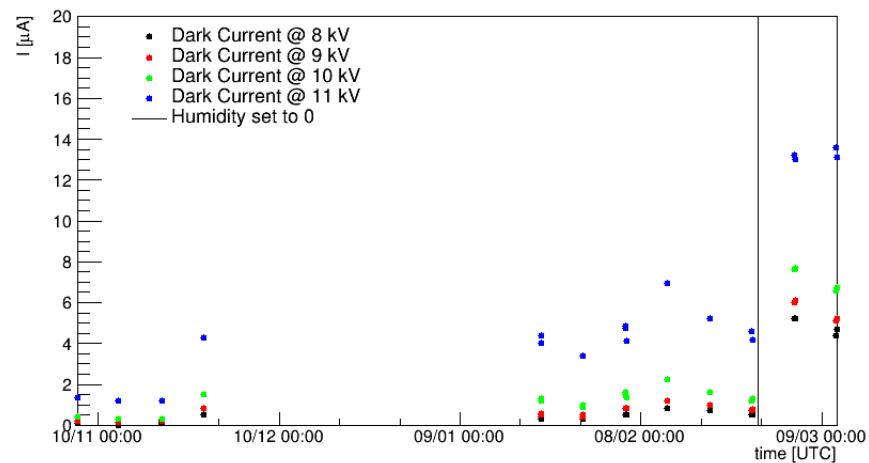
Dark current of CMS-GT-2-0-BOT



Ohmic component of the dark current of CMS-GT-2-0-TOP

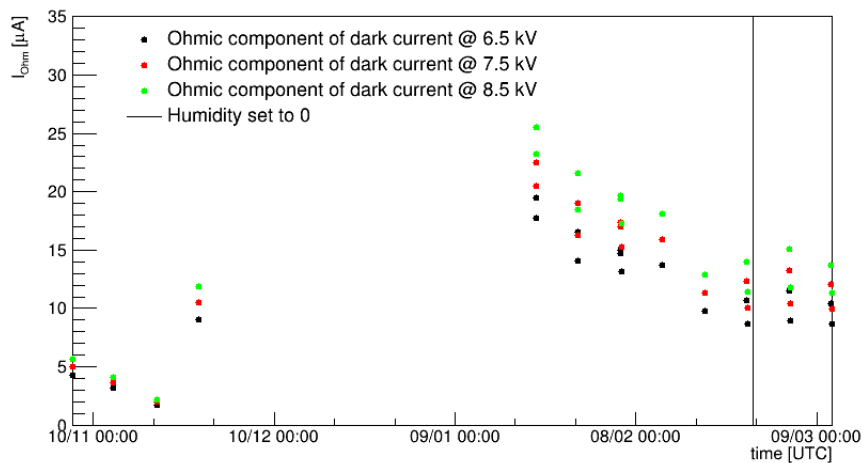


Dark current of CMS-GT-2-0-TOP

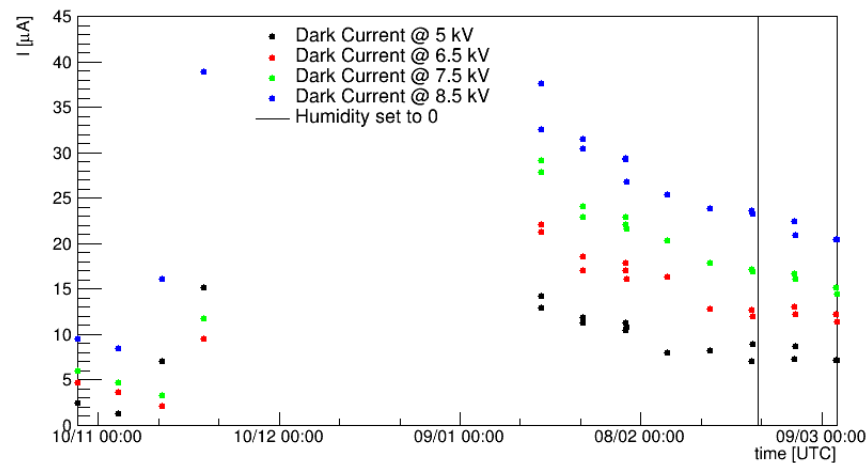


CMS-KODEL (time)

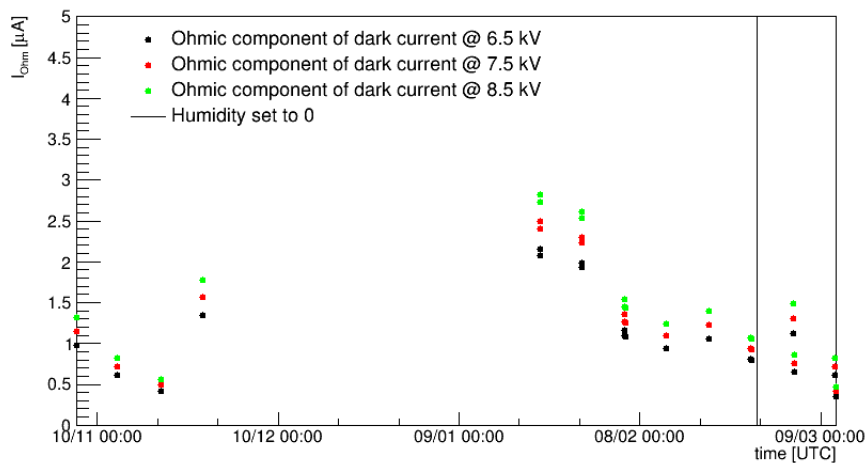
Ohmic component of the dark current of CMS-KODEL_1-4-BOT



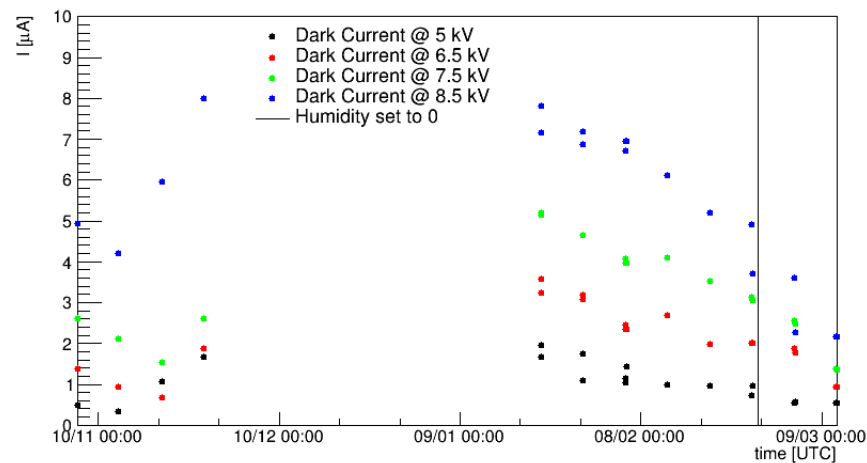
Dark current of CMS-KODEL_1-4-BOT



Ohmic component of the dark current of CMS-KODEL_1-4-TOP

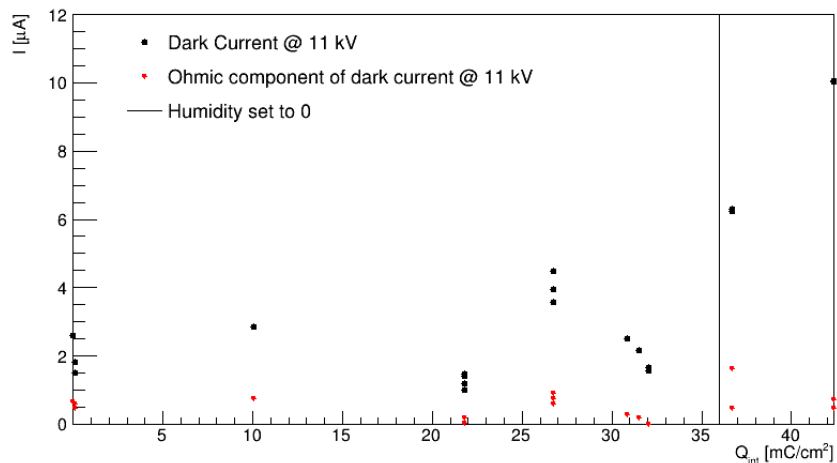


Dark current of CMS-KODEL_1-4-TOP

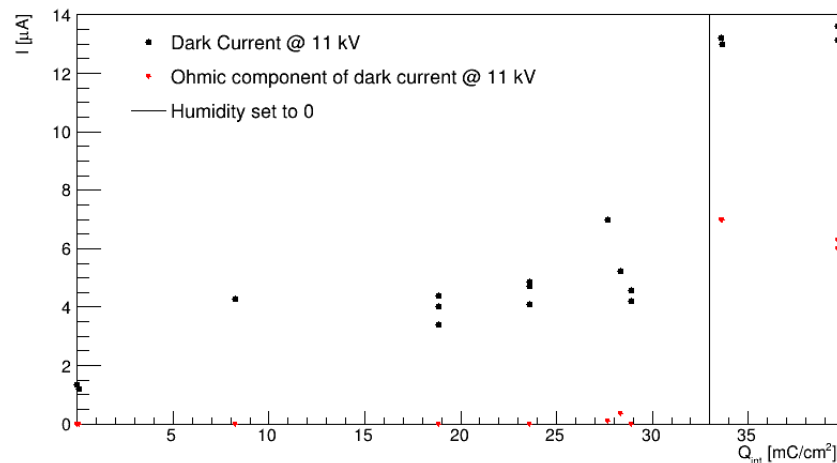


CMS (integrated charge)

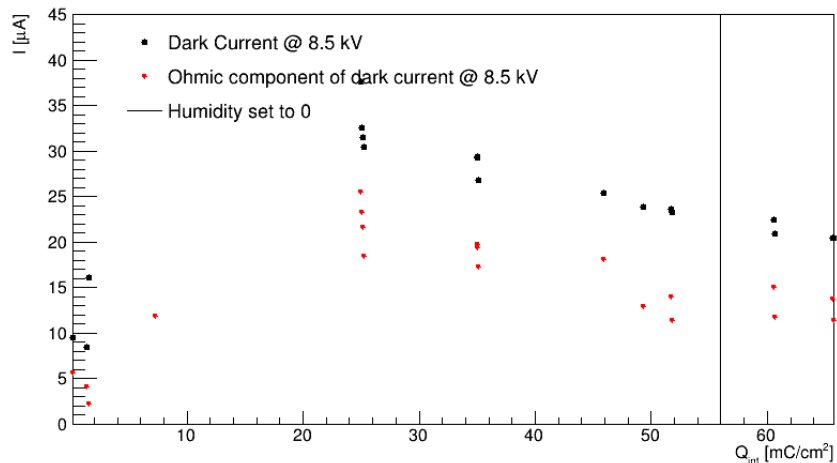
Qint of CMS-GT-2-0-BOT



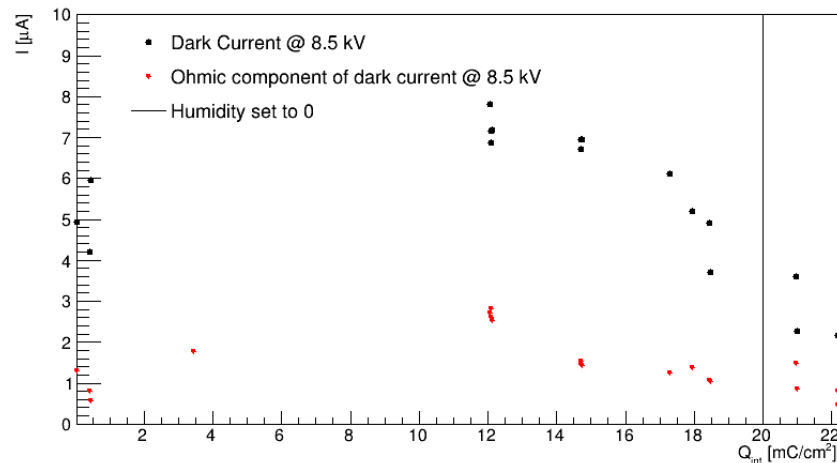
Qint of CMS-GT-2-0-TOP



Qint of CMS-KODEL_1-4-BOT



Qint of CMS-KODEL_1-4-TOP



Conclusions

- Last data points from ALICE show a great increase in the Ohmic component of the detector (probable leakage of current, to be checked out and replaced as soon as possible).
- It seems like the current is decreasing for ALICE →
not true because the chamber was always tripping and the saved current values are not the real ones
- EP-DT chamber removed on 19/2/2020 →
did not participate in the humidity tests
- CMS-GT shows an increase step after the humidity was lowered to 0
- CMS-KODEL showed a decrease, both in the ohmic component and total current, after Christmas break, even before the humidity was decreased