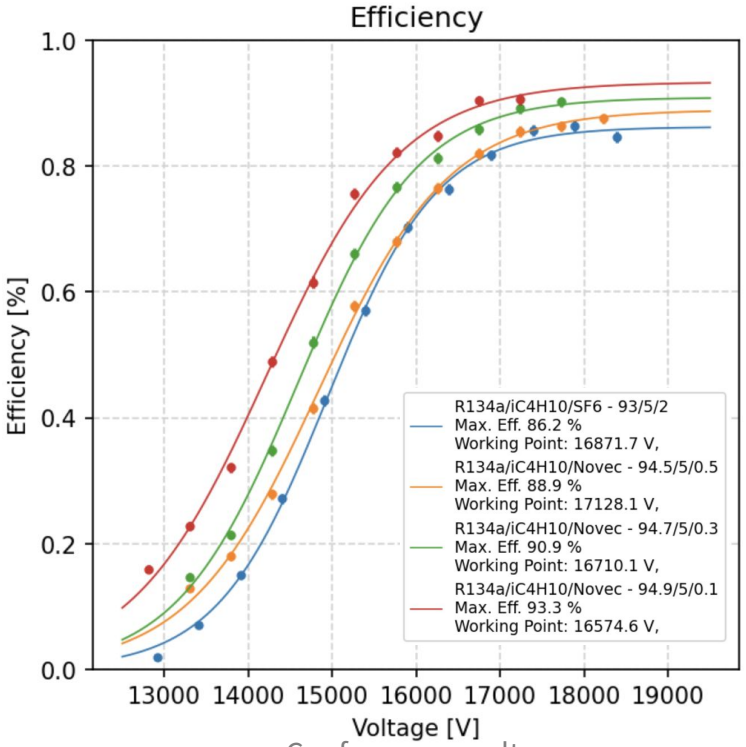
Update GRPC - week 39 - 2024

Mattia Verzeroli

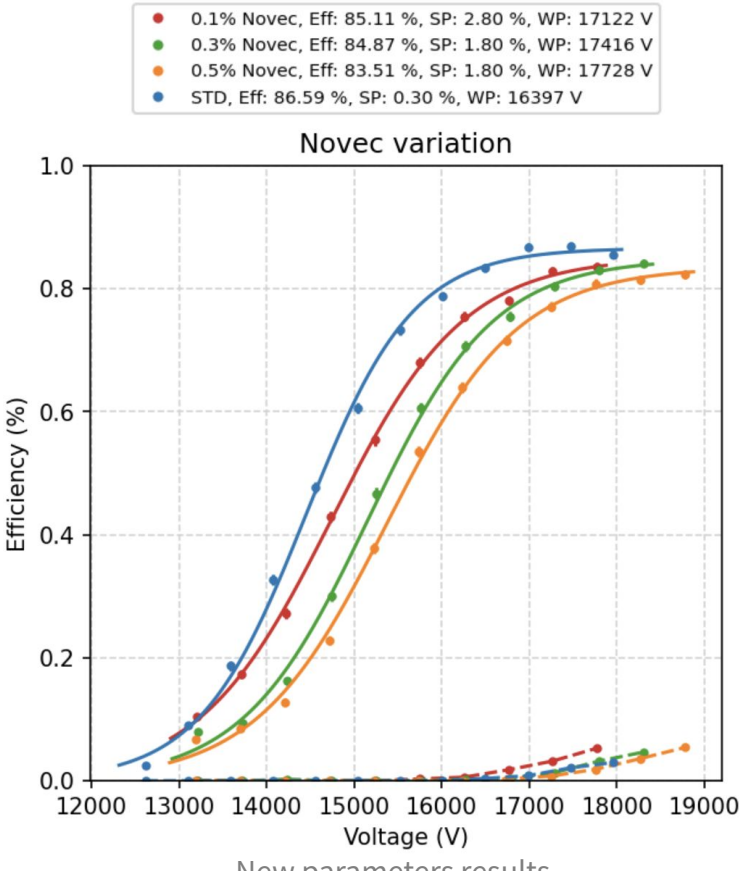
EP-DT
Detector Technologies

Re-analysis of conference data: Novec 4710

New params: Novec4710



Conference results



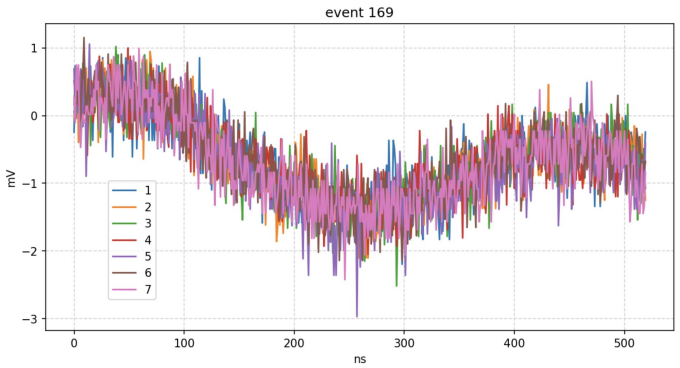
New parameters results

Looking the single signal, noticed noise that could be detected as signal:

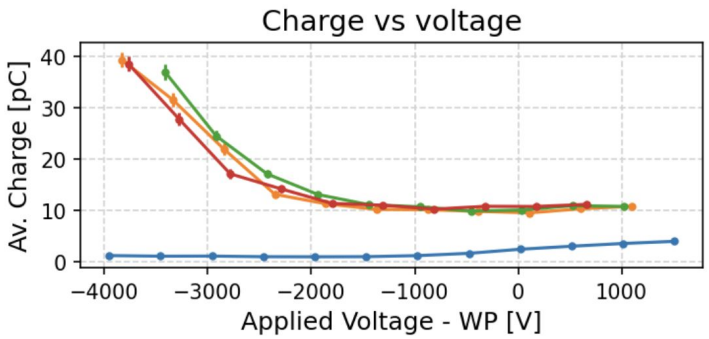
- Reduced the time windows strictly on the time arrivals
-

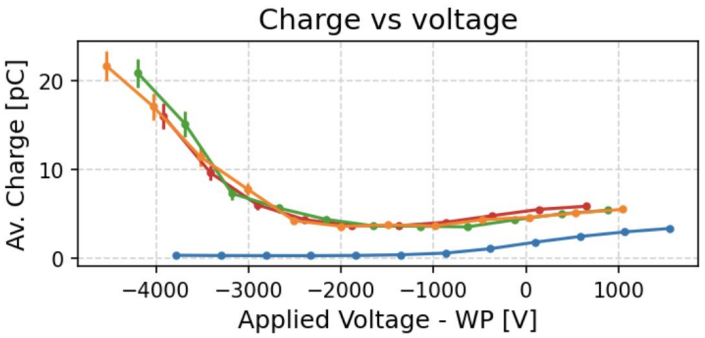
The data makes now more sense: higher WP for Novec gas mixture (+300 V for 0.2%), similar Maximum Efficiency for the scans.

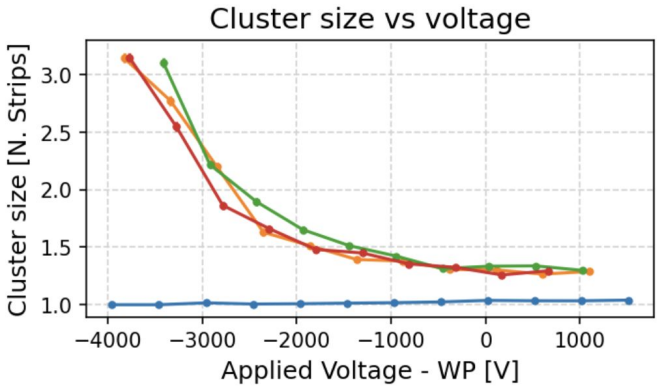
Still to understand if the low efficiency only due to geometry
-> Question at the conference

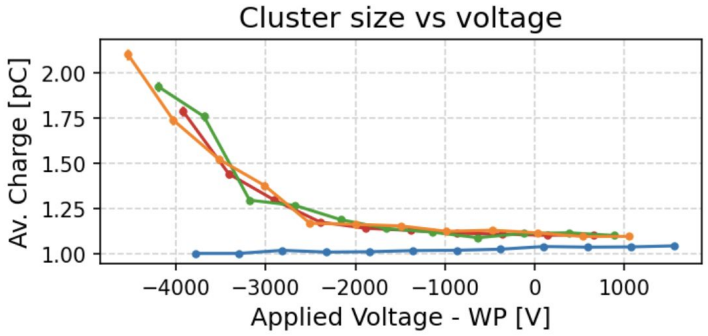


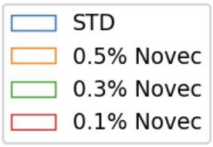
New params: Novec4710











Conference results

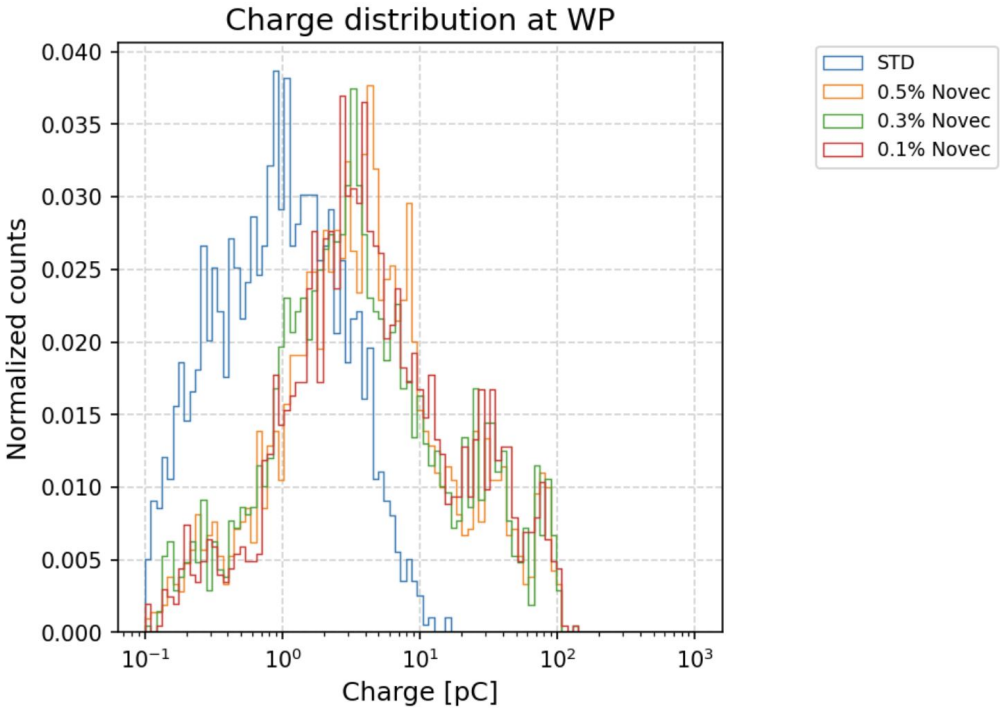
New parameters results

Considering the detected signal, I've see that the charge was computed by the sum of all the strips when one is detected:

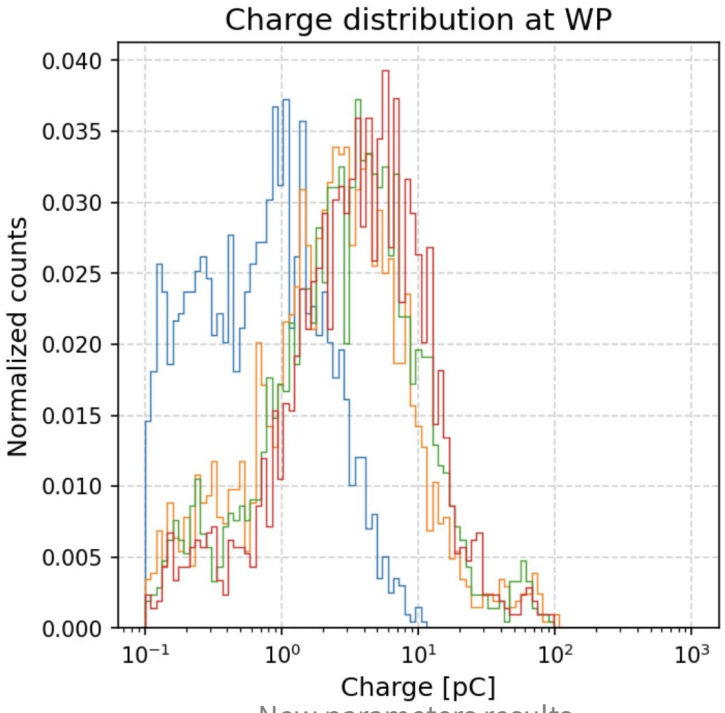
- This increments the values due to the noise
- Changed the code to have added the charge only from the detected strips

Better results: Lower values and increase with the increase of the HV

New params: Novec4710



Conference results



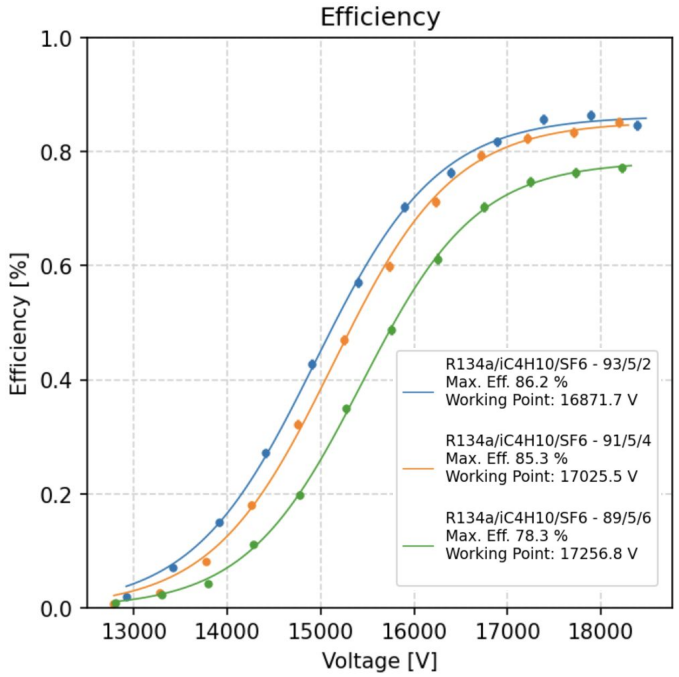
New parameters results

Better Charge Distribution after the correction:

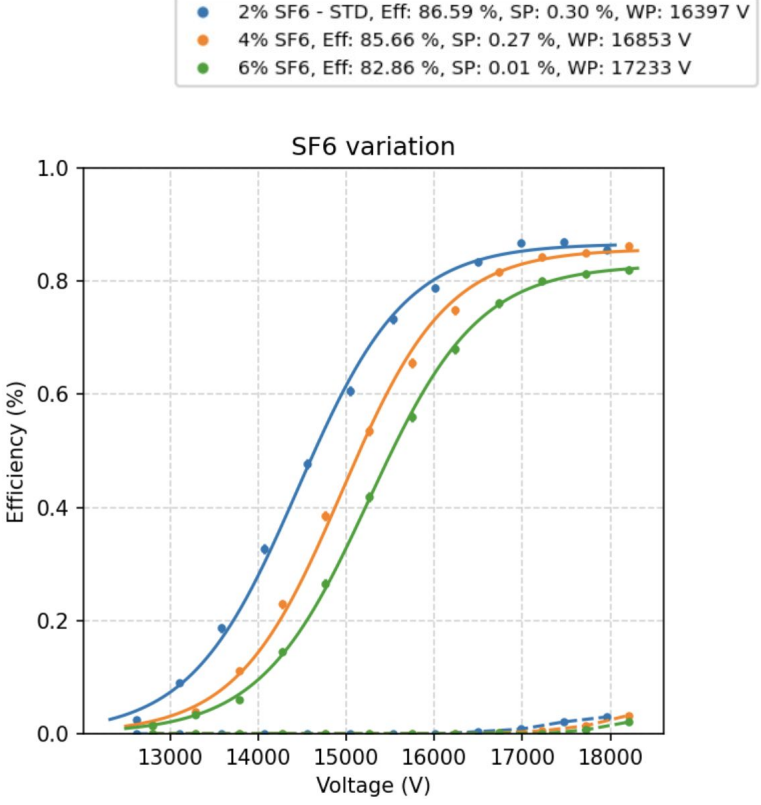
- Still visible the shift WRT STD gas mixture
- Almost disappeared the high charge region at WP

Re-analysis of conference data: SF6

New params: SF6



Conference results



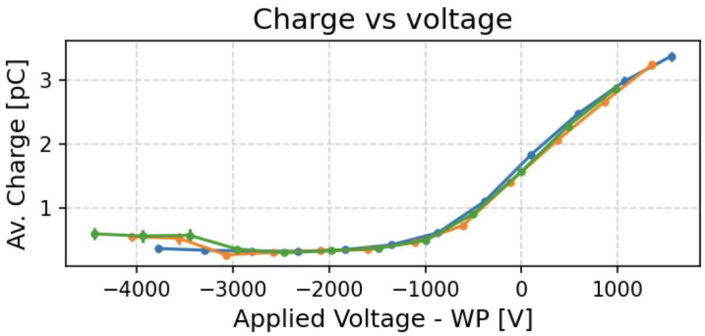
New parameters results

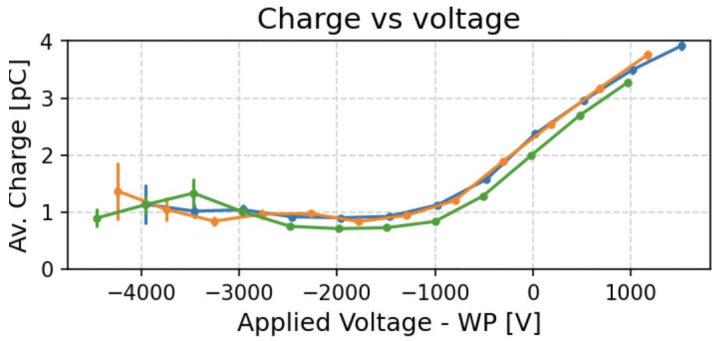
After the reduction of the time window:

- higher efficiency wrt conference results
- Lower WP (400 V increase for 2% increase)

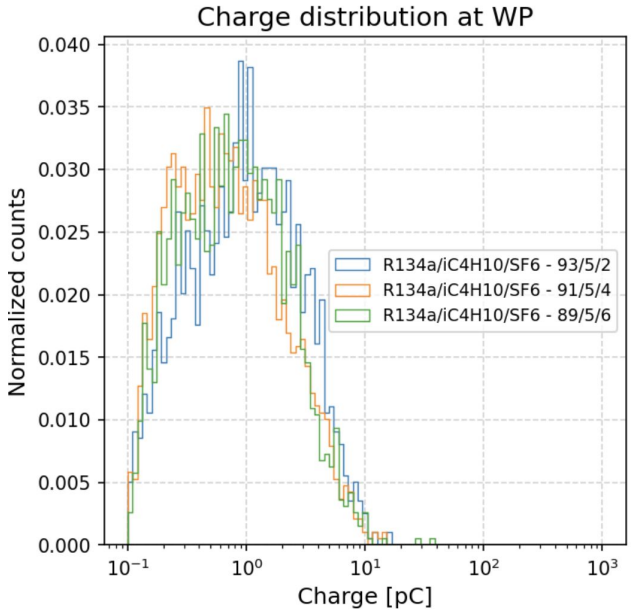
Lower amount of noise for these scans in the raw waveforms

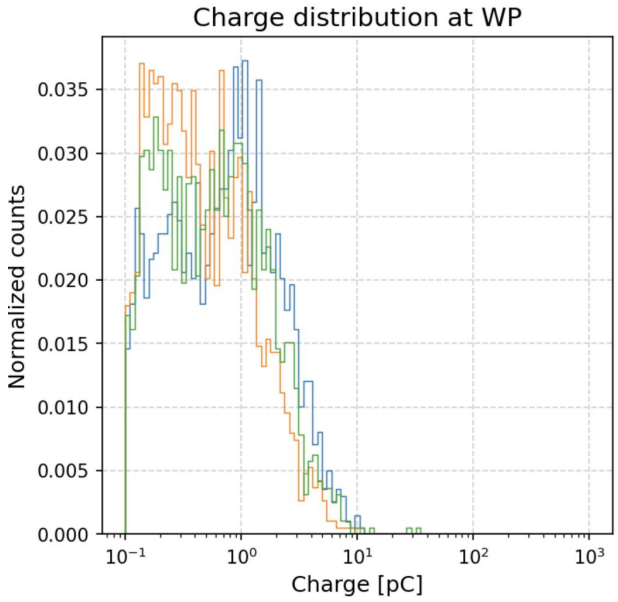
New params: SF6

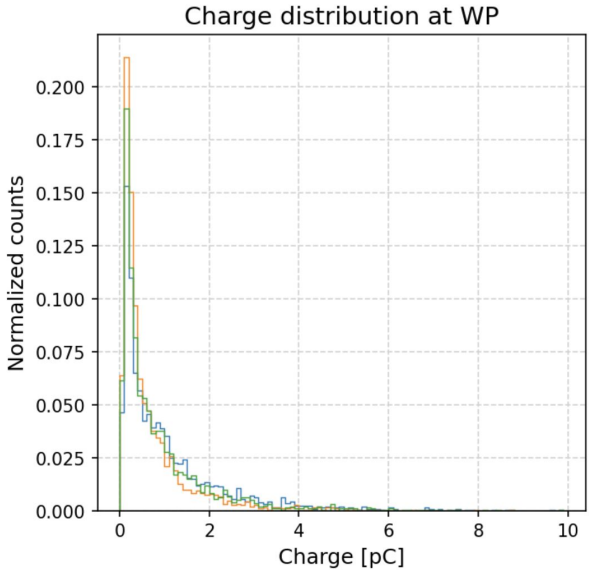




2% SF_6
4% SF_6
6% SF_6







Conference results

New parameters results

In this case, slightly higher avalanche charge values, but still with reasonable trend.
Increase of the low charge values -> not clear the increase in the avalanche charge

Issue with the change Novec - SF6

-> next thing that I will reconsider

What to do next? proposal

In parallel:

1. Flow again Novec gas mixture in the detector
2. Study the change in the charge distribution as a function of time
3. Analyse the surface of the detector to confirm the impurities formation

Possibility to have a new small scintillators?

1. Order the material and improve the detector construction:
   -> need help from CAD group user
2. Have a call with Imad to:
   - Understand better the goal
   - Try to start time res. measurements in Lyon
3. Construct at least 3 new detector in series (to be sure to have enough detector to do time resolution measurements

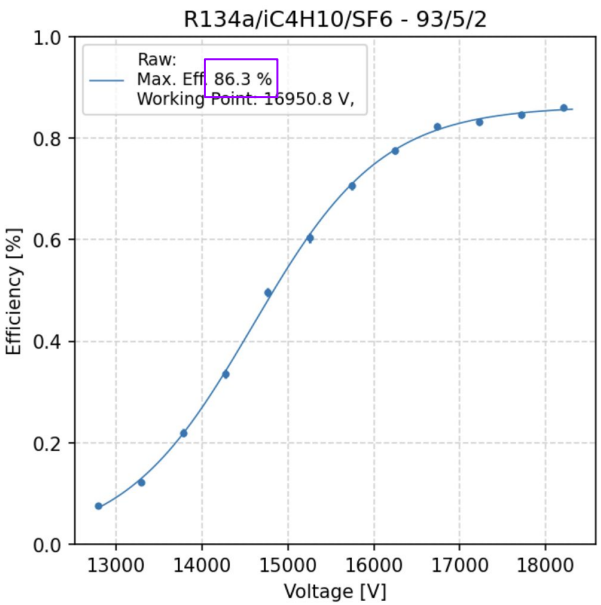
December 2024

After:

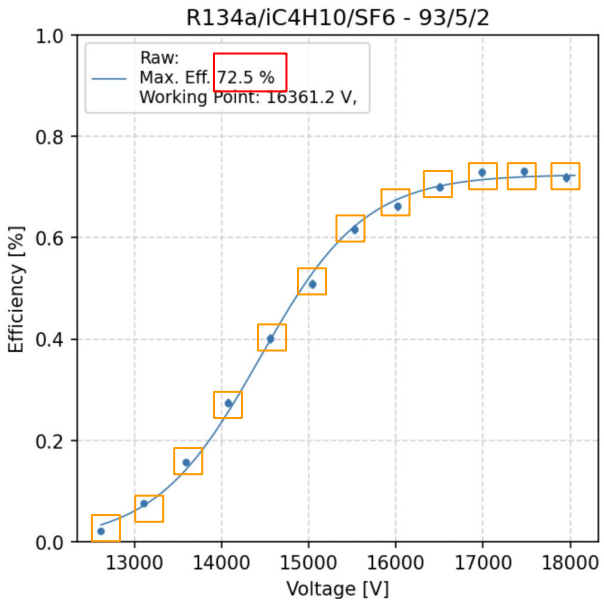
1. Test SF_6 variation to confirm previous data + to have time resolution measurements
2. Test with Giorgia's gas $[C_3H_2ClF_3]$ + to have time resolution measurements
3. Test with Amolea 1224yd(Z) $[C_3F_4HCl]$ + to have time resolution measurements

Backup

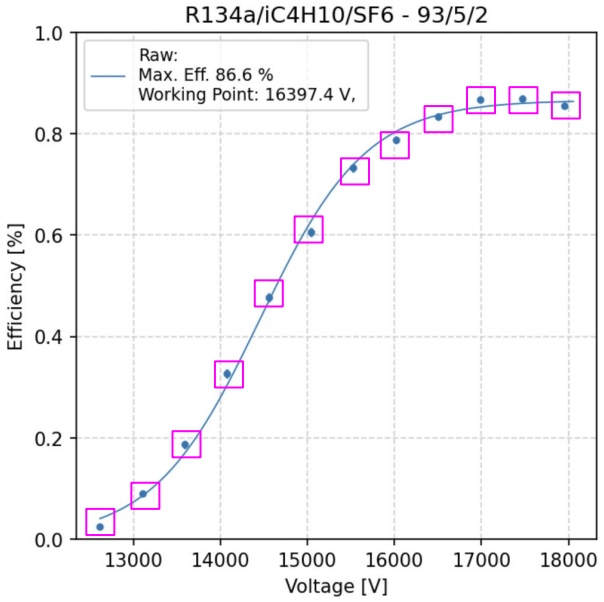
Check of data analysis: efficiency corrections



Scan with Katerina Scintillator



Scan with our scintillators



scan with our scintillators corrected

In case of the same gas mixture, eff_corr is from:

eff_wrong : eff_max_wrong = eff_corr : eff_max_corr

$$\text{eff\_corr} = \frac{\text{eff\_wrong} * \text{eff\_max\_corr}}{\text{eff\_max\_wrong}}$$

In case of a different gas mixture (d), eff_max_corr is substituted by eff_max_corr_d:

eff_max_wrong_d : eff_max_wrong = eff_max_corr_d : eff_max_corr