HV Status Report

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CERN
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Amplitude Methods

HV Current signal:

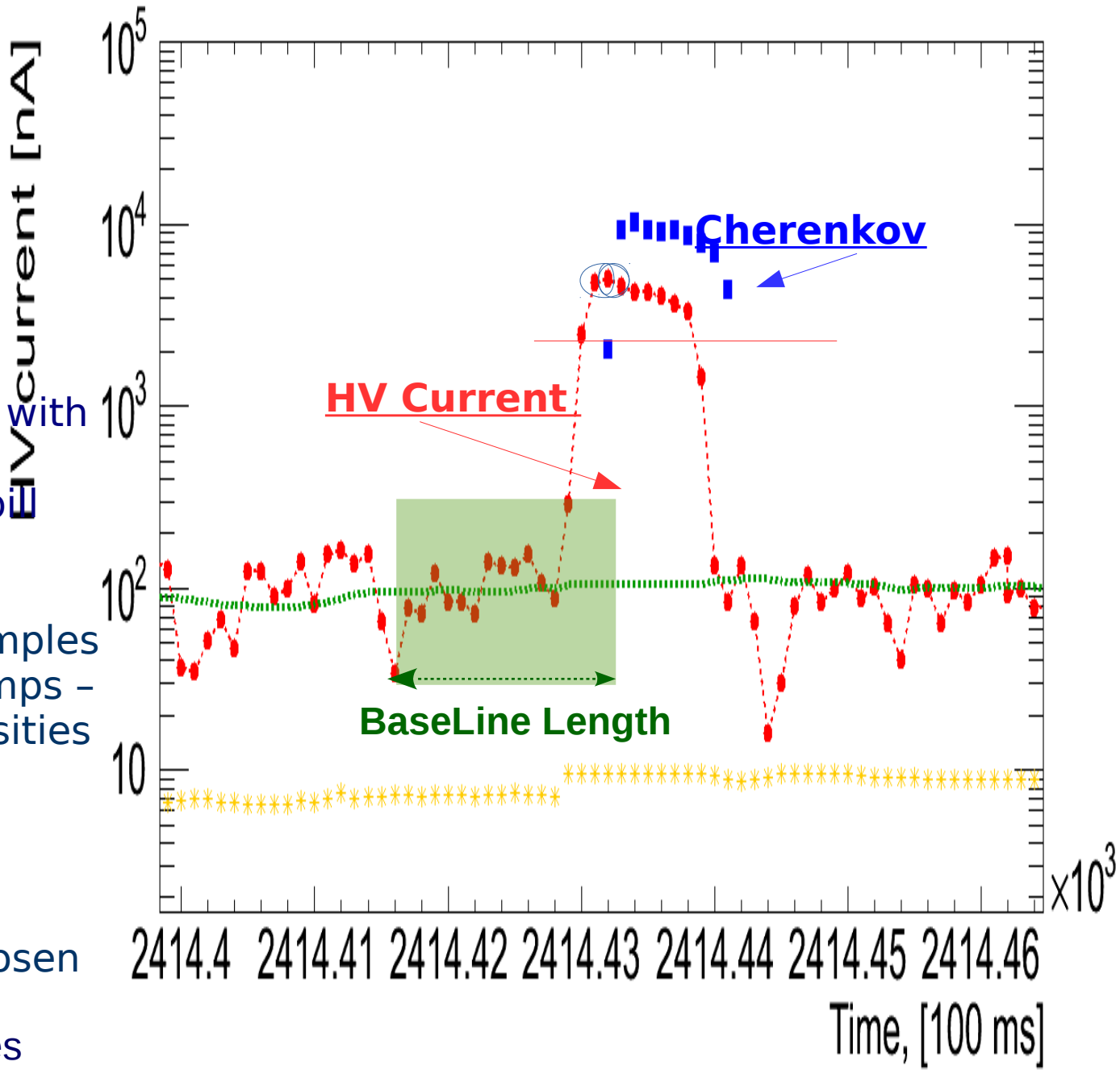
- Sliding average
- Threshold of 5 sigma
- HV signal
  →HV Current – average
- Signal length > 0.4 s

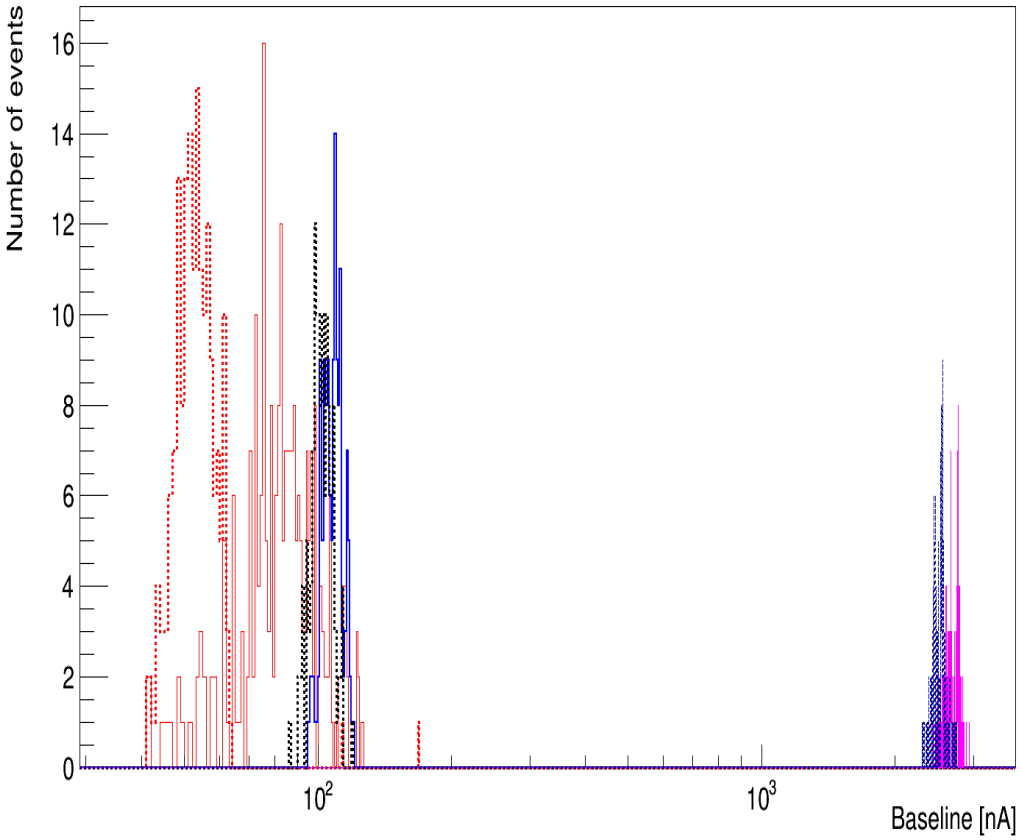
Cherenkov signal:

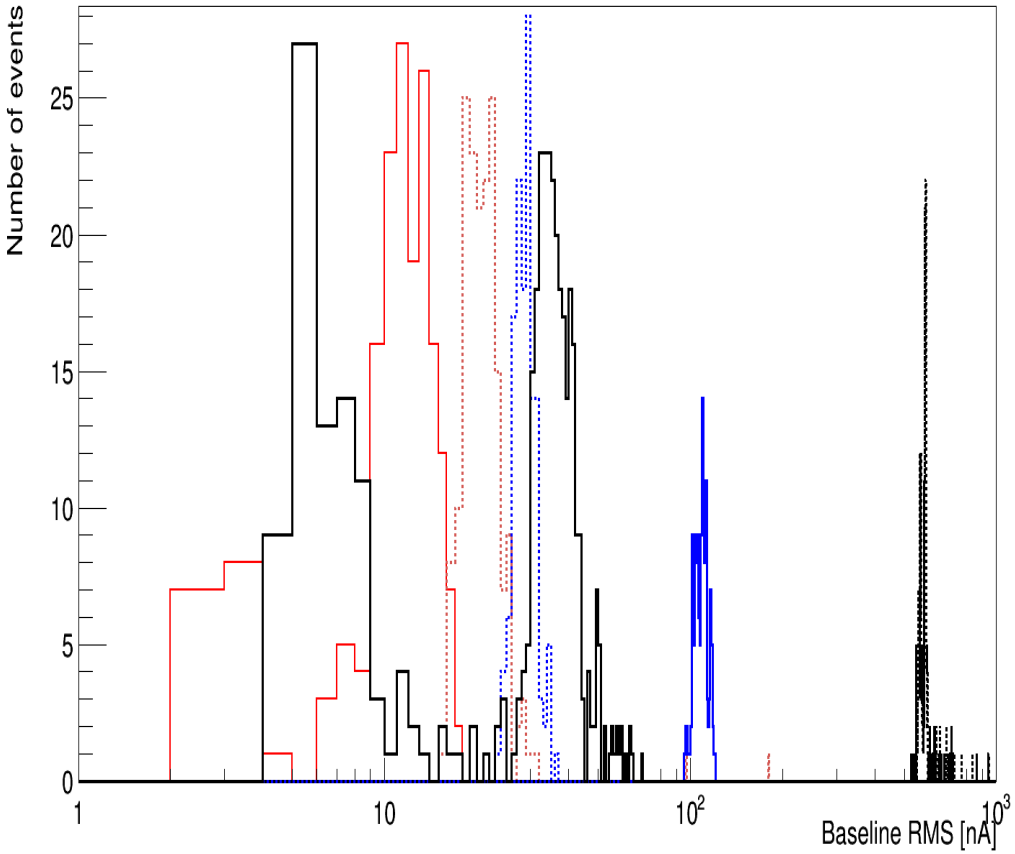
- Synchronization within 3 s with HV current
- Intensity → Ch Integral / spill length

- **BaseLine** variation 30 samples
- To protect from sudden jumps – (HV-BL)<200 for low intensities otherwise < 1000 for high intensities

- **Amplitude Methods:**
  - 3 Max samples was chosen
  - Errors were checked and updated for 3 max samples

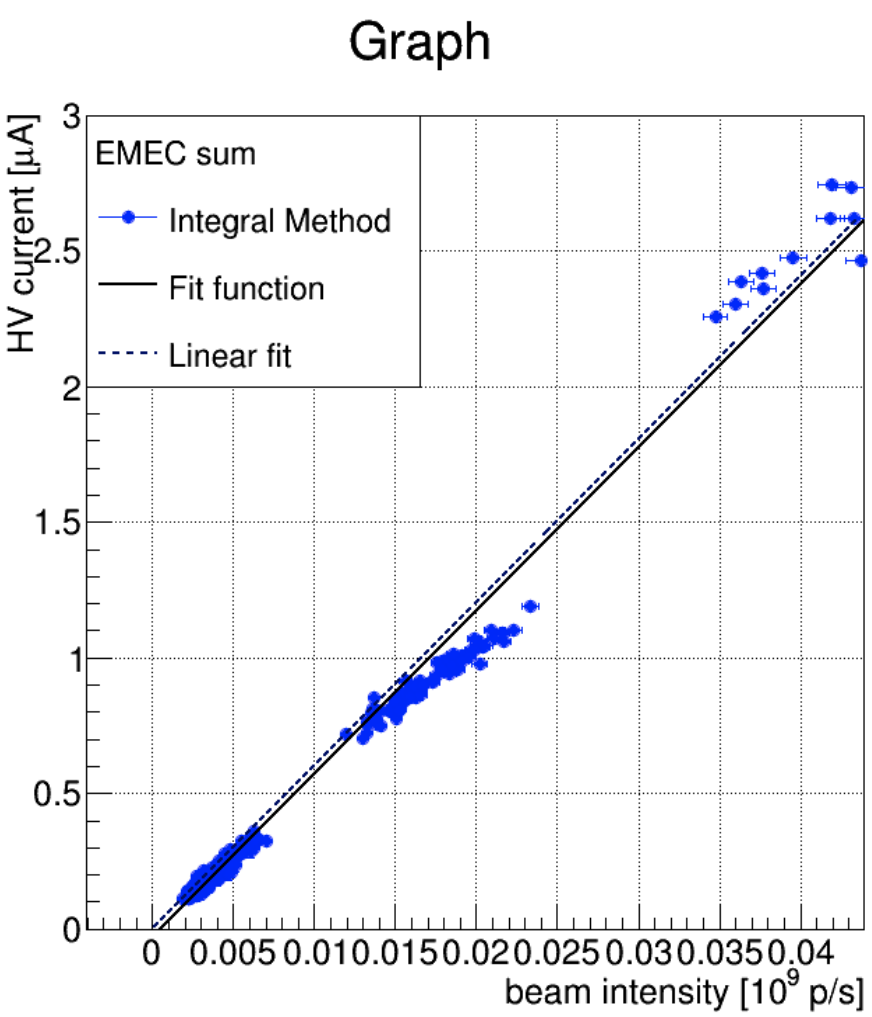


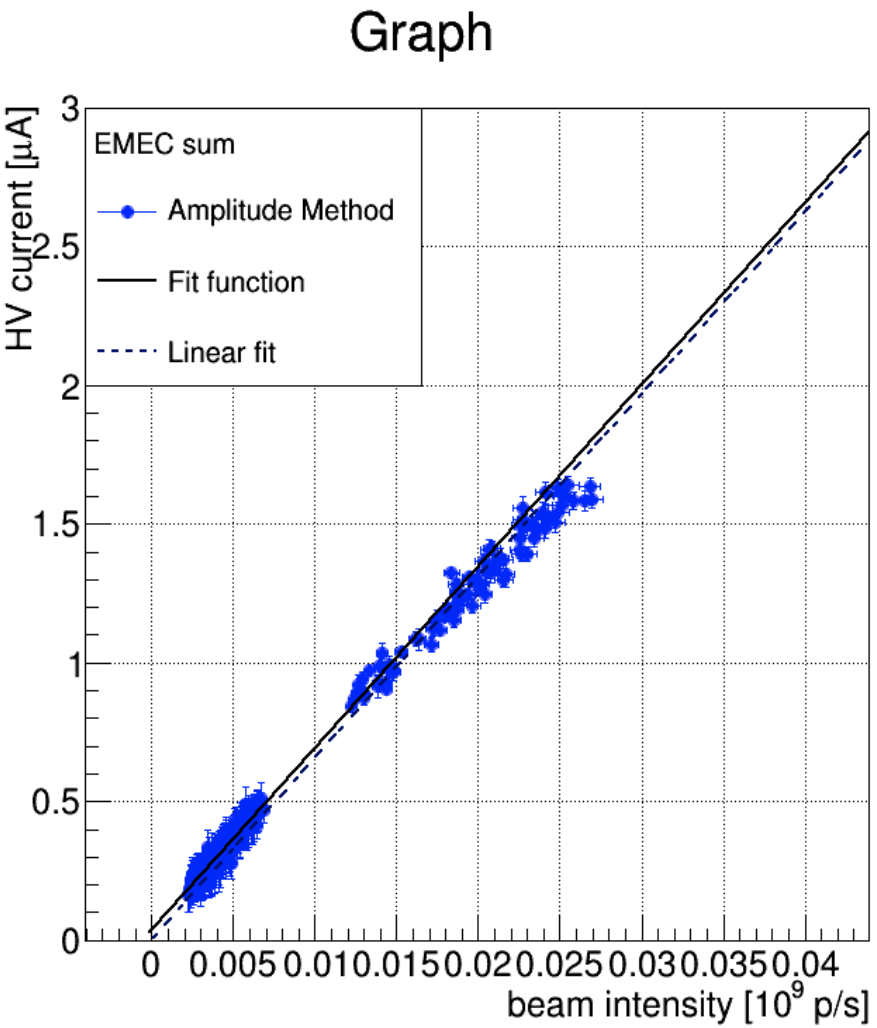




- Effect of the baseline calculation restriction
- Dashed lines – recalculation of the last 20 samples for the found signal (not 30 samples)
- Baseline is a bit smaller, RMS is different for different intensities.
- Restriction of 200nA was chosen to get optimal amount of low intensity signals reconstructed

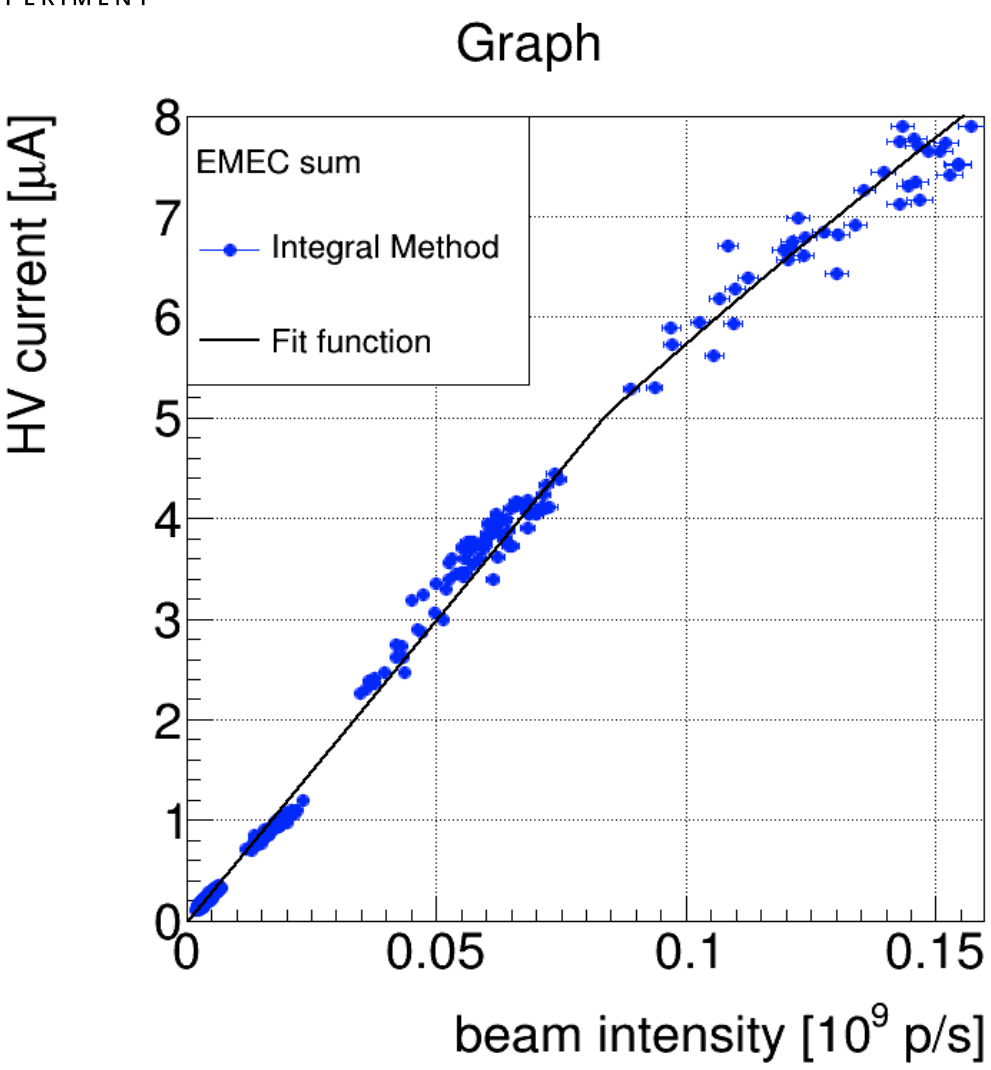
Offset

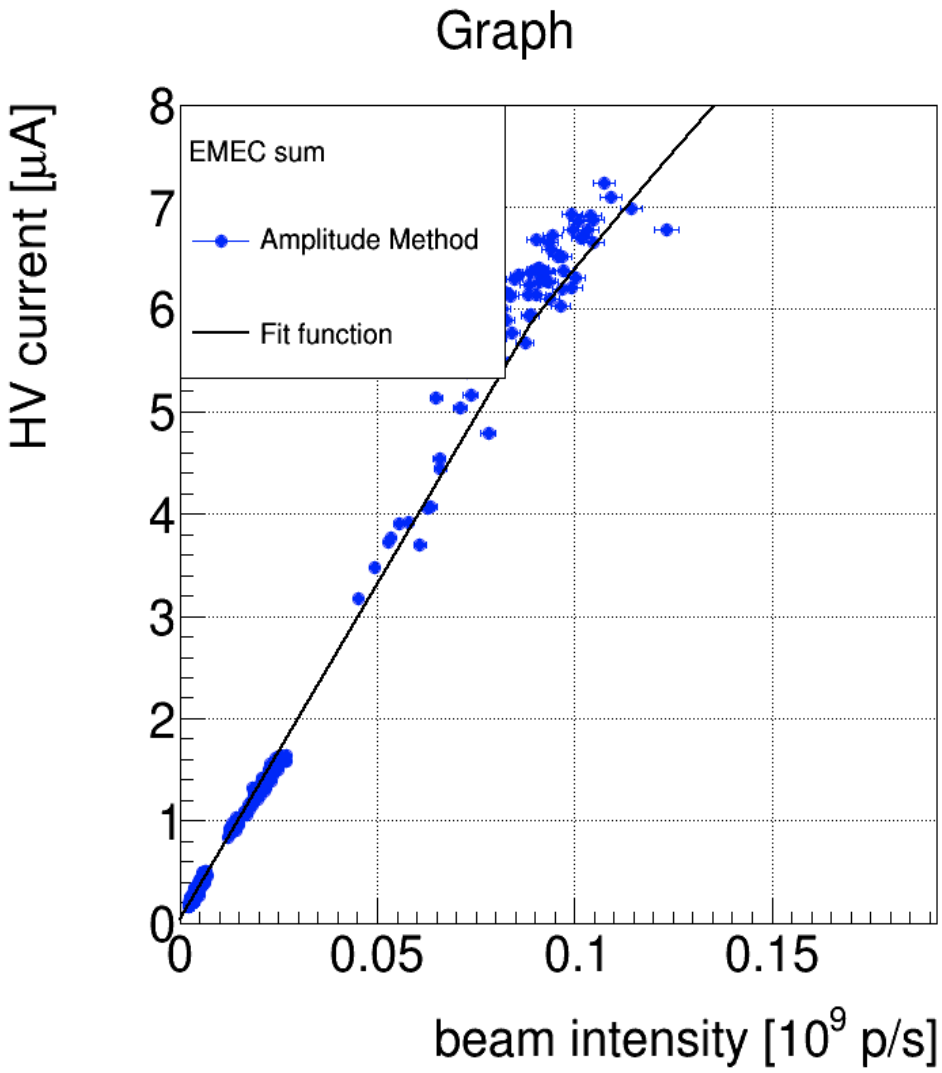




- Integral Method points to ~0 offset and Amplitude method to ~100nA While errors on the Amplitude method

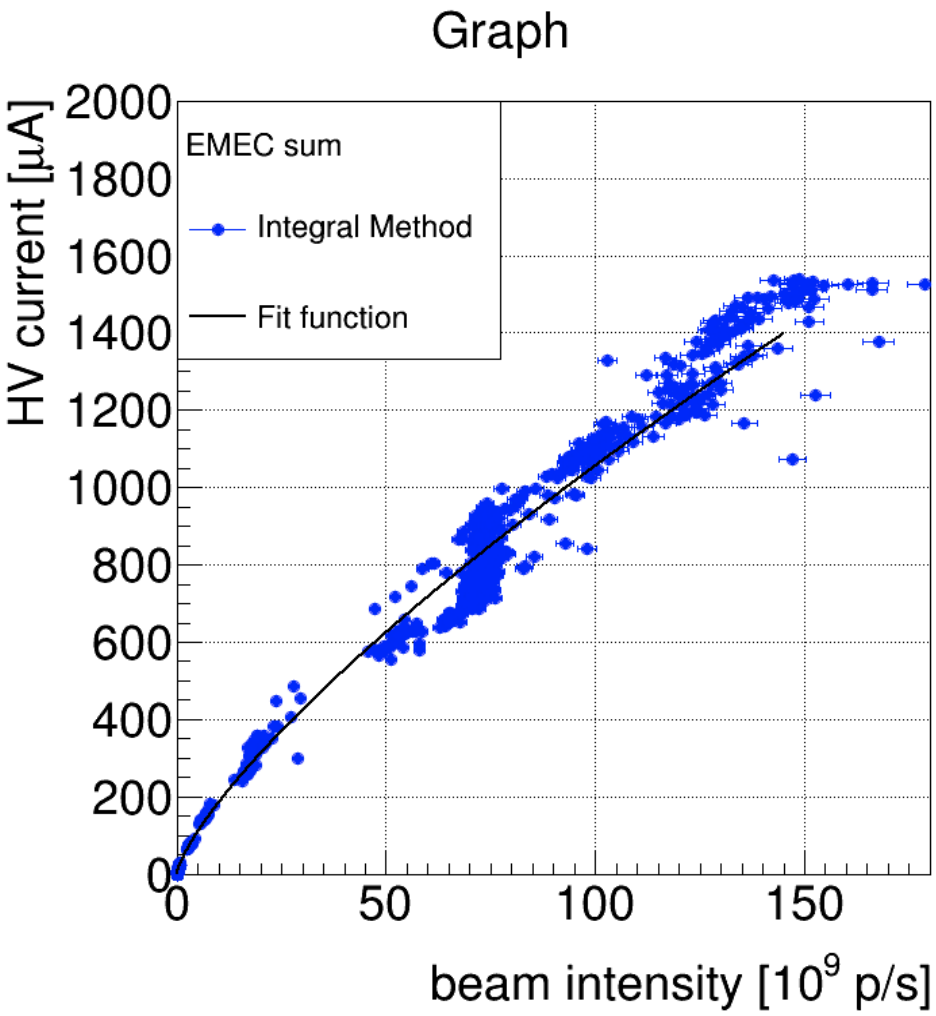
Knee plots

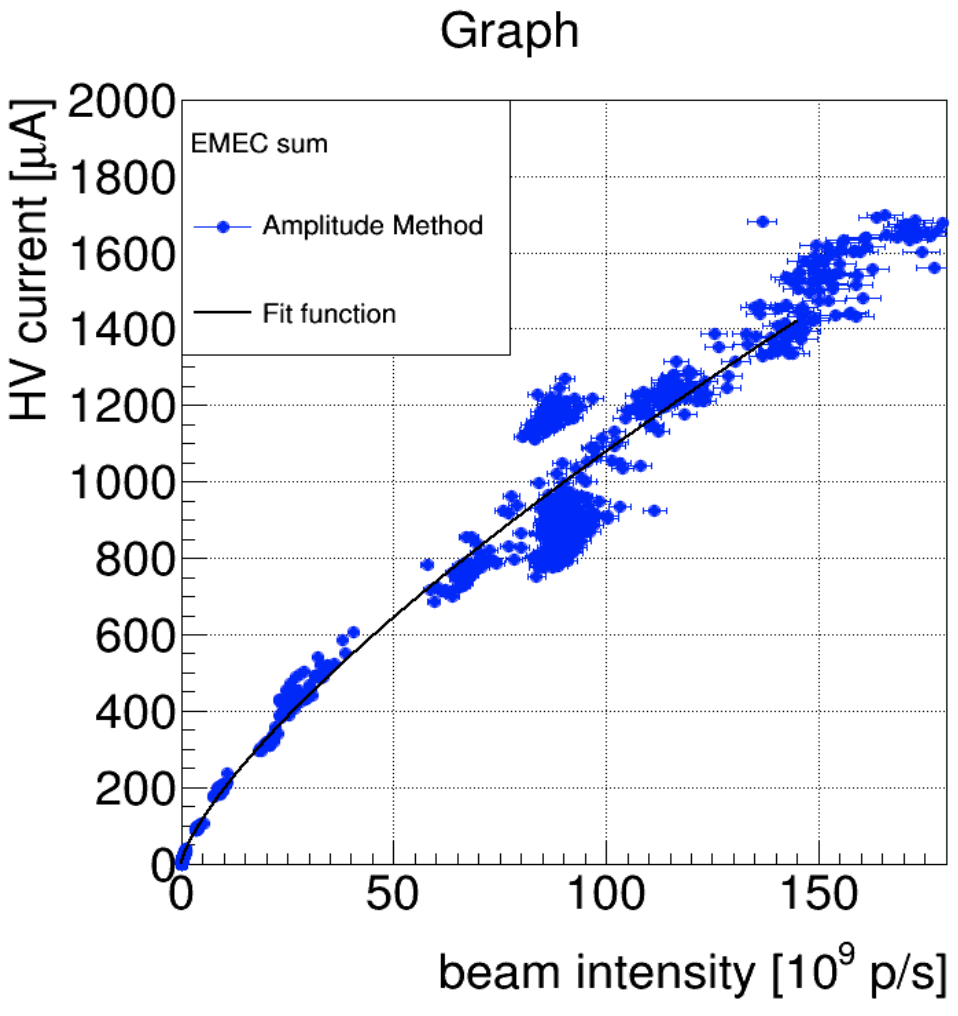




- There is a variations of the critical intensities observed and some times fits can fail at low ranges for fitting

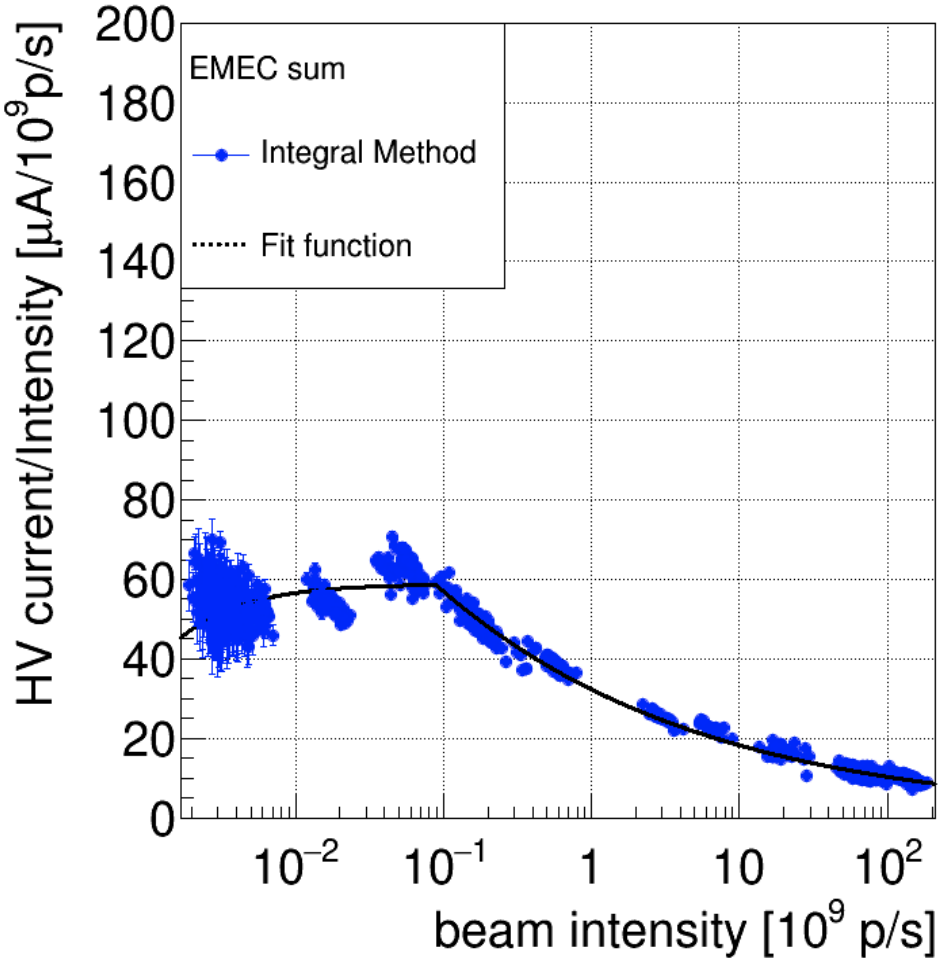
Normal fit examples

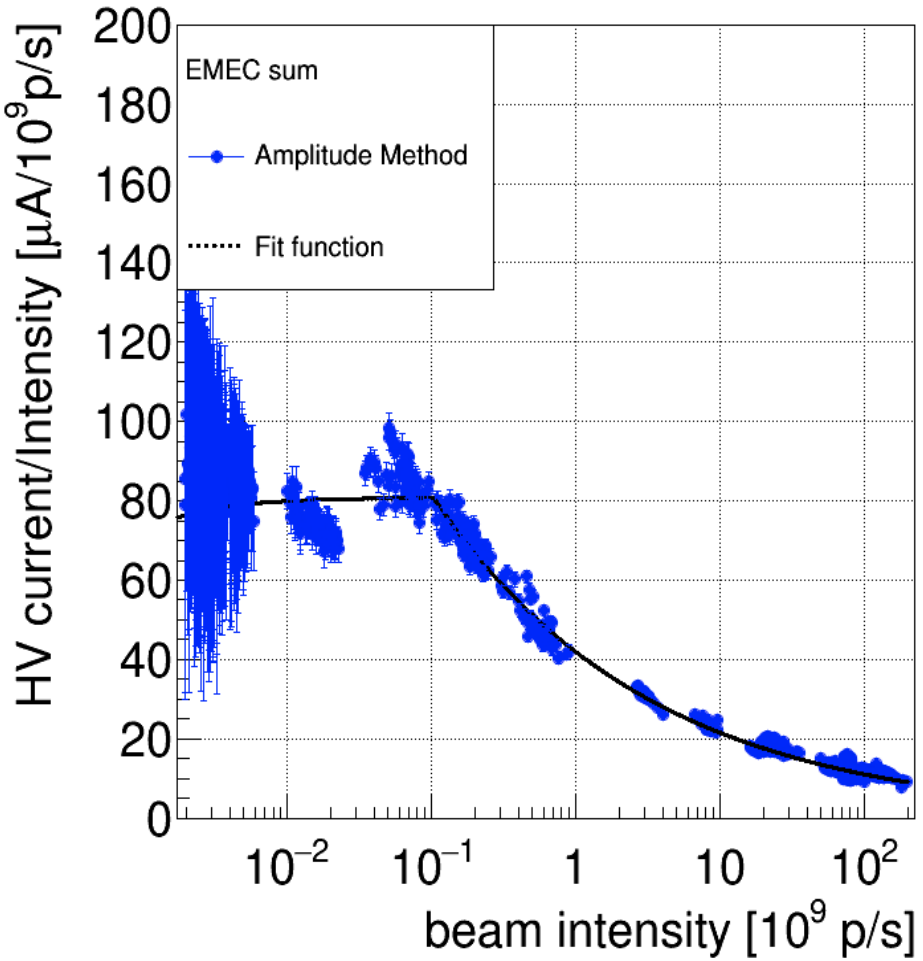




- After adding the variation for the baseline calculations for different intensities, larger intensities are better reconstructed

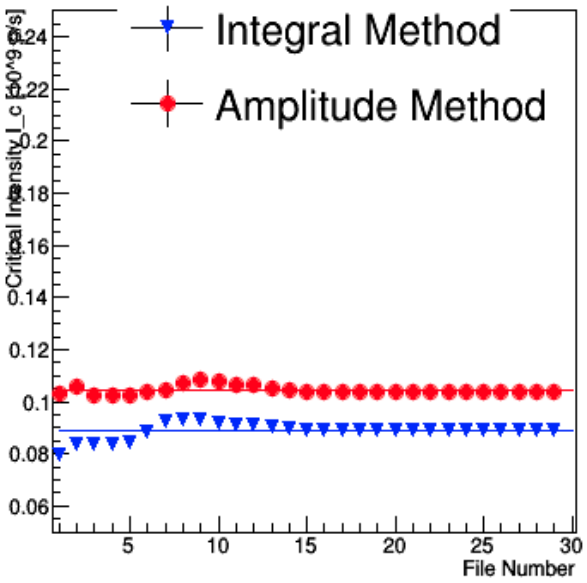
Ratio fits

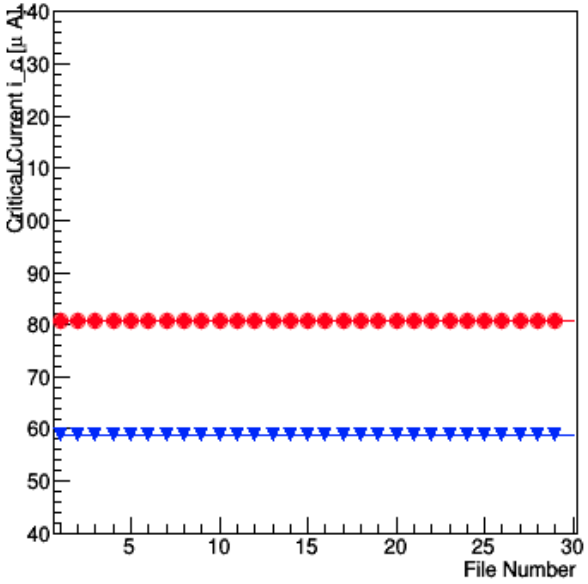


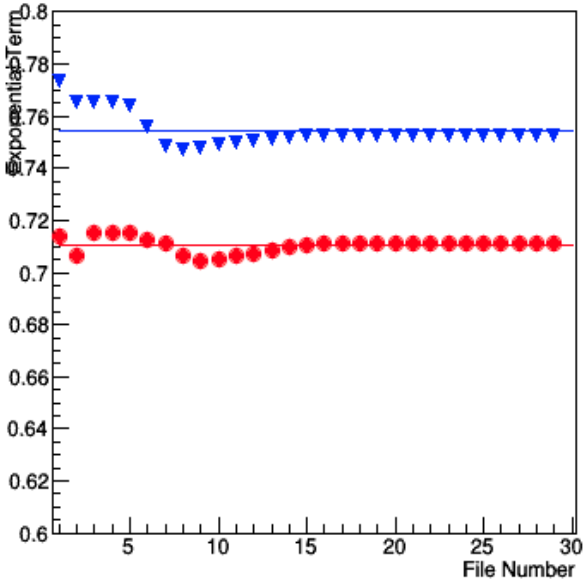


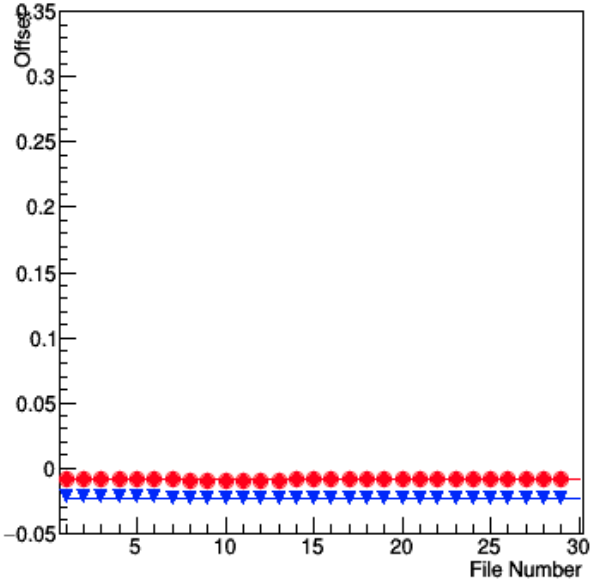
- Ratio fits show small offset now as well.
- Fit can be done also without offset.
- Critical intensities become closer between the methods.

Results



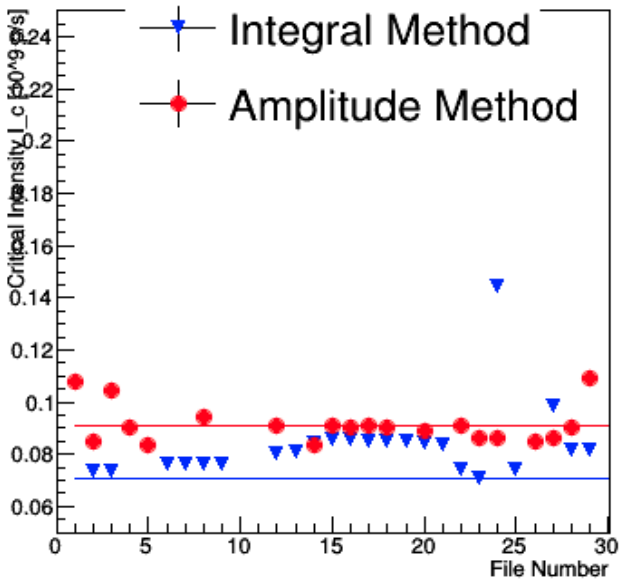


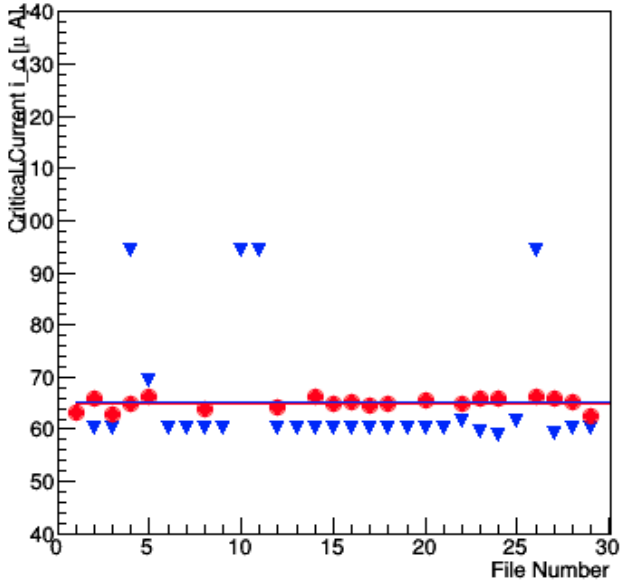


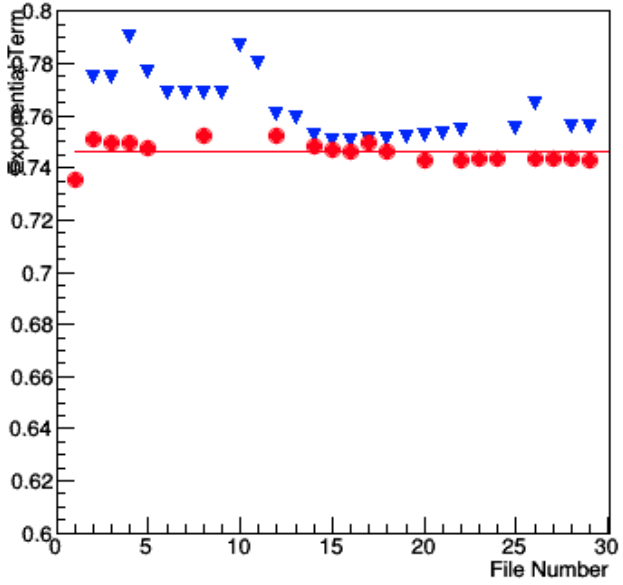


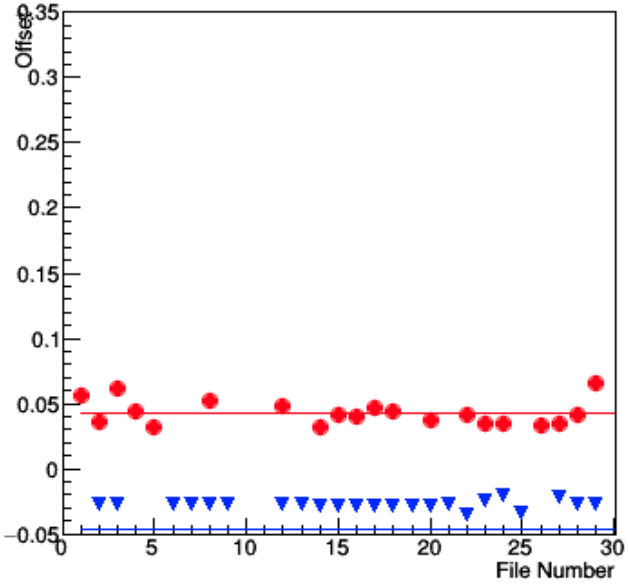
- After adding errors, all fits do not fail with offset, offsets are now very low.
- Normal view is disturbed, I need to rerun the baseline procedure to get the old plots back

Normal fit results









- Less stable
- Offset gets larger due to different fit

Conclusions

- Table with results:

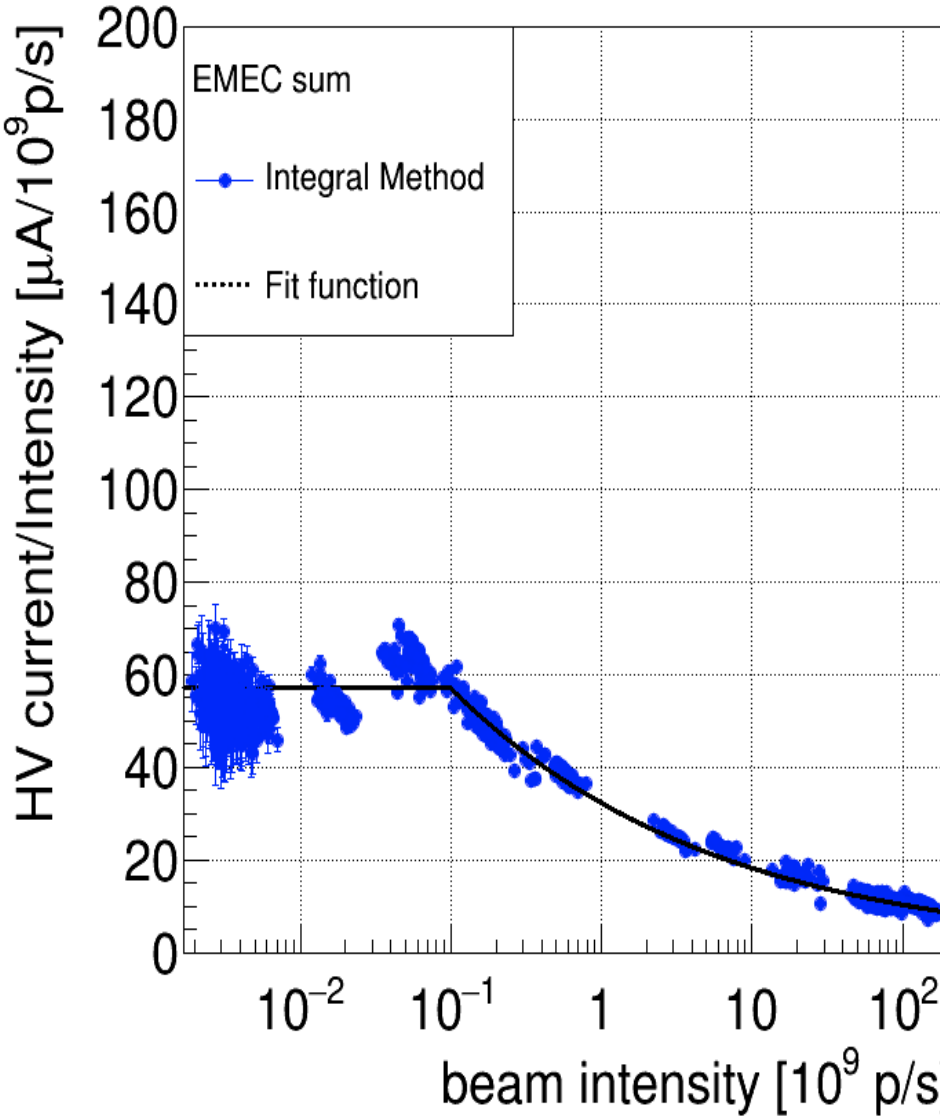
	Int Normal with Offset	Ampl Normal with Offset	Int Ratio with Offset	Ampl Ratio with Offset	Int Ratio noOffset	Ampl Ratio noOffset
Ic	0.071 +-0.03	0.09 +-0.01	0.089 +-0.003	0.104 +-0.002	0.09 +-0.01	0.106 +-0.002
ic/Ic	65.3 +-11.9	64.9 +-1.1	58.87 +-0.02	80.83 +-0.02	57.38 +-0.02	80.41 +-0.02
pow	1.63 +-3.4	0.746 +-0.01	0.754 +-0.006	0.71+-0.01	0.75 +-0.01	0.71+-0.01
offs	-0.05 +-0.04	0.043 +-0.01	-0.0227 +-0.001	-0.009+-0.001		

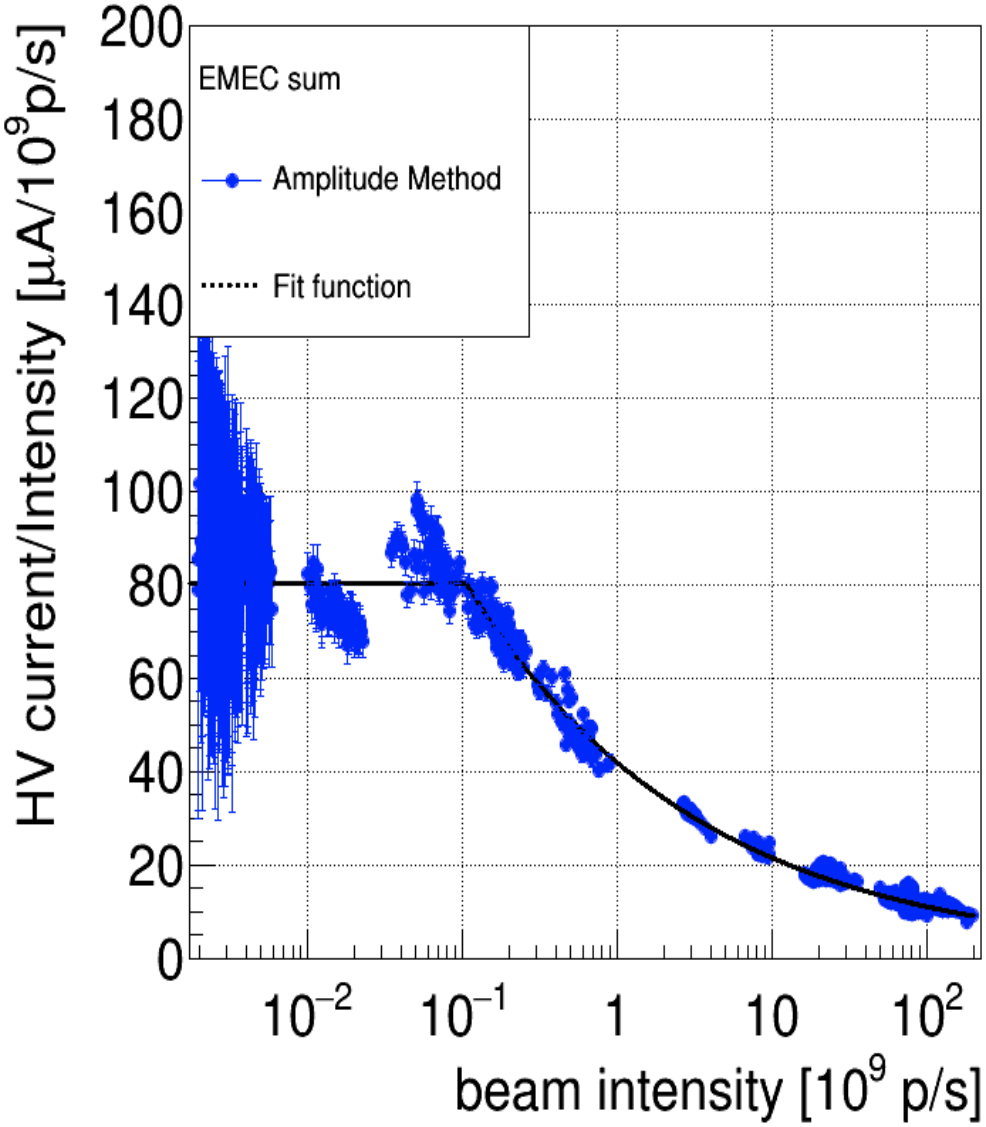
Back up slides

- Thank you for your attention!

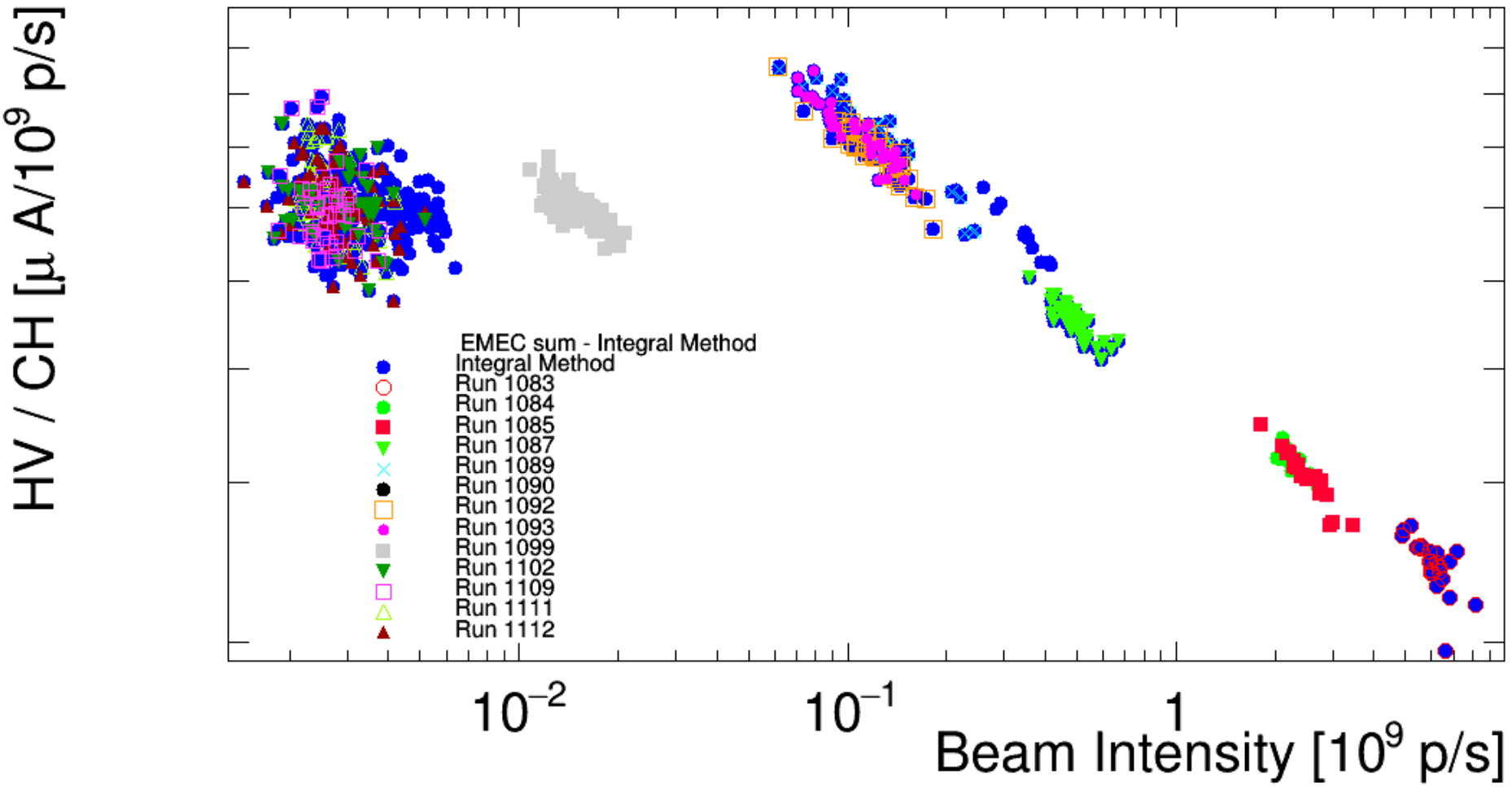
- Back up slides:

No Offset


EMEC sum
Integral Method
Fit function
HV current/Intensity [μA/10^9p/s]
beam intensity [10^9 p/s]

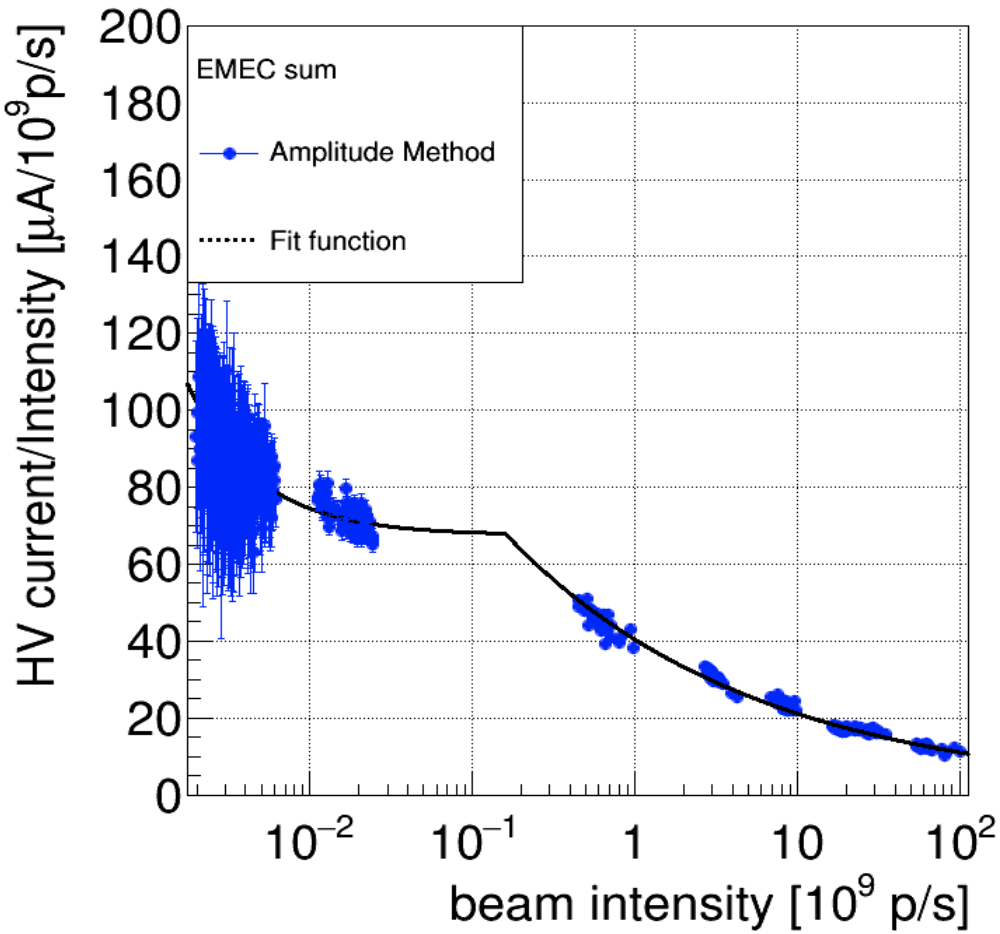

EMEC sum
Amplitude Method
Fit function
HV current/Intensity [μA/10^9p/s]
beam intensity [10^9 p/s]

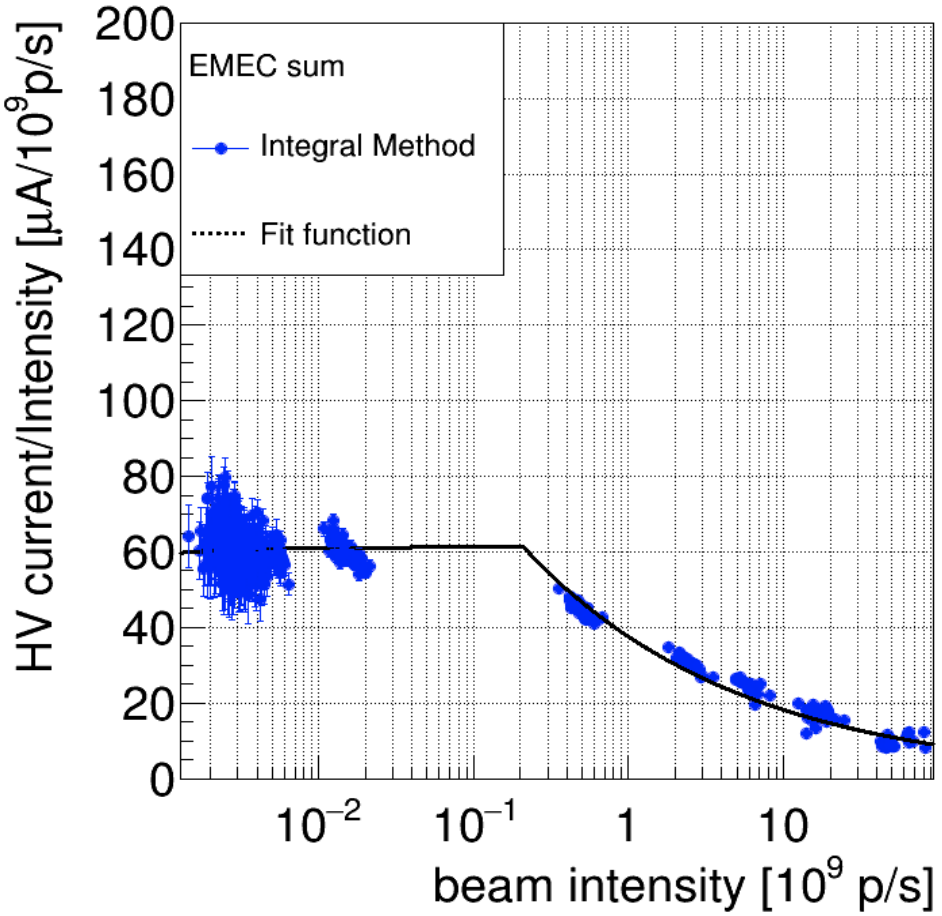
Run Positions



- Runs in the knee – 1089, 1092, 1093 – all are considered bad from the asymmetry values of EMEC, HEC, FCal analysis by A. Savin
- We can not get rid of them, we need or to use and remember they have asymmetry or to introduce some correction

If to remove runs

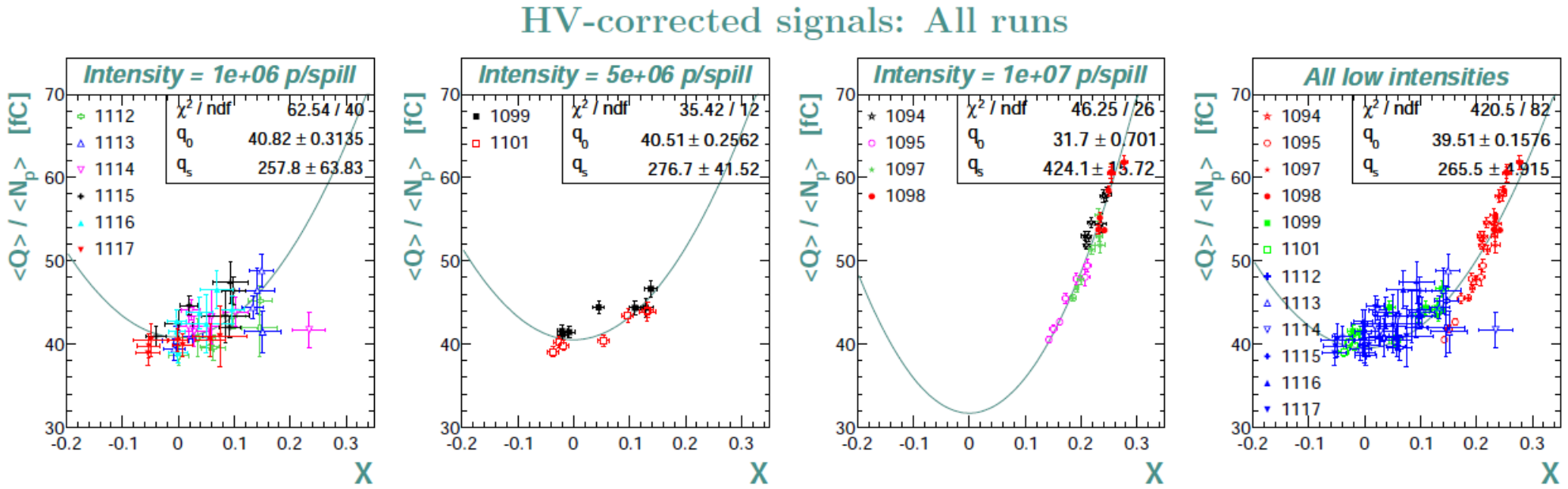




- Knee vanished, this runs have to be kept
- But treated
  - Or selecting good spills
  - Or corrected for the asymmetry
  -

Corrections

- Fit dependence Qn(X) = q0 + qs · X^2
- Take the fit parameters from “All low intensities” from A. Kiryunin
- Q0=39.51 ; qs=265.5
- Take the X parameter from S. Savin for runs 1083;1084;1085;1087;1089;1090;1092;1093;1098;1113;1141
- Recalculate CH intensity by multiplying with the correction factor
- Correction factor = Qn(X)/q0 → cherenkov values are getting larger – the ratio between HV/CH is getting smaller – the knee runs have to move right-down on the ratio plots.

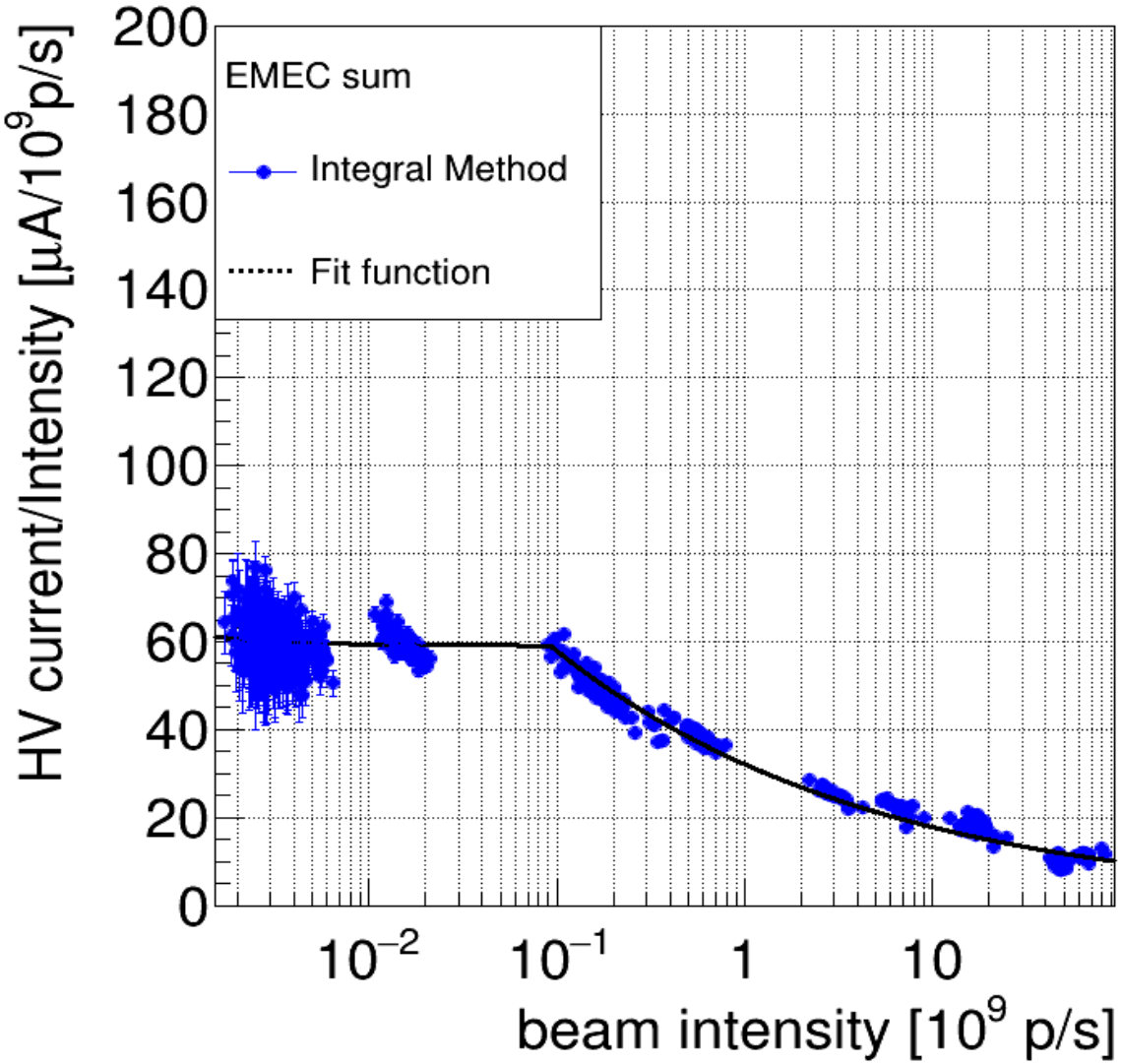


Reminder about used runs

1074, 1080, 1083, 1084, 1085,
1087, 1089, 1090, 1092, 1093,
1099, 1102, 1107, 1109, 1185,
1110, 1111, 1112, 1113, 1114,
1116, 1117, 1130, 1131, 1137,
1140, 1141, 1142, 1165, 1169,
1172, 1175, 1176, 1177, 1178,
1179, 1180, 1182, 1183, 1184,
1170, 1181

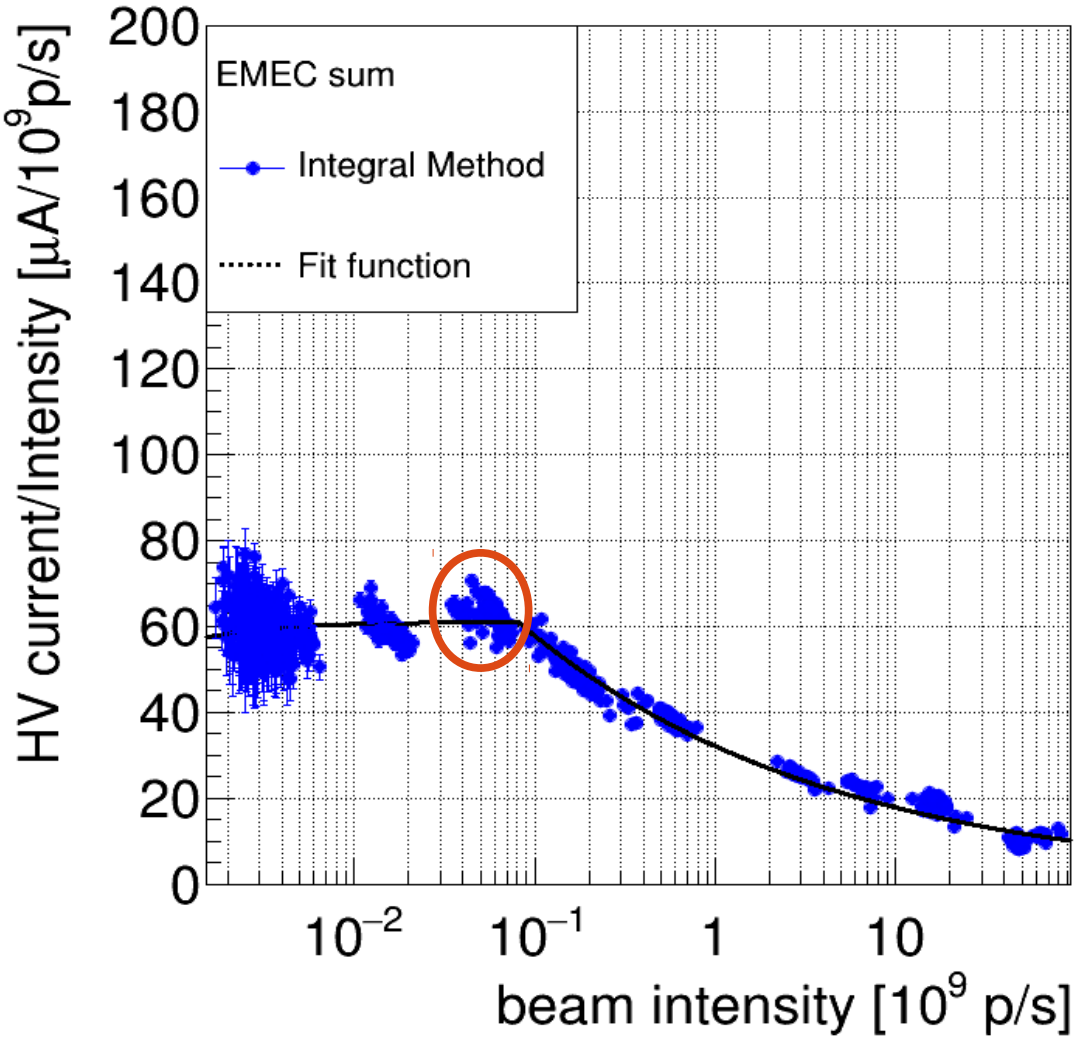
- Run 1098 can be included with corrections: x=0.175

Integral Method



- Knee runs moved right-down as expected
- Correction factors were 1.3-1.5
- Resulting fit has practically no offset
- The critical value moved to smaller values
- No real knee is observed, therefore the final error has to be determined by the low intensity fluctuations

Integral Method + 1098 Run



Added run 1098 with correction due to asymmetry

X=0.174

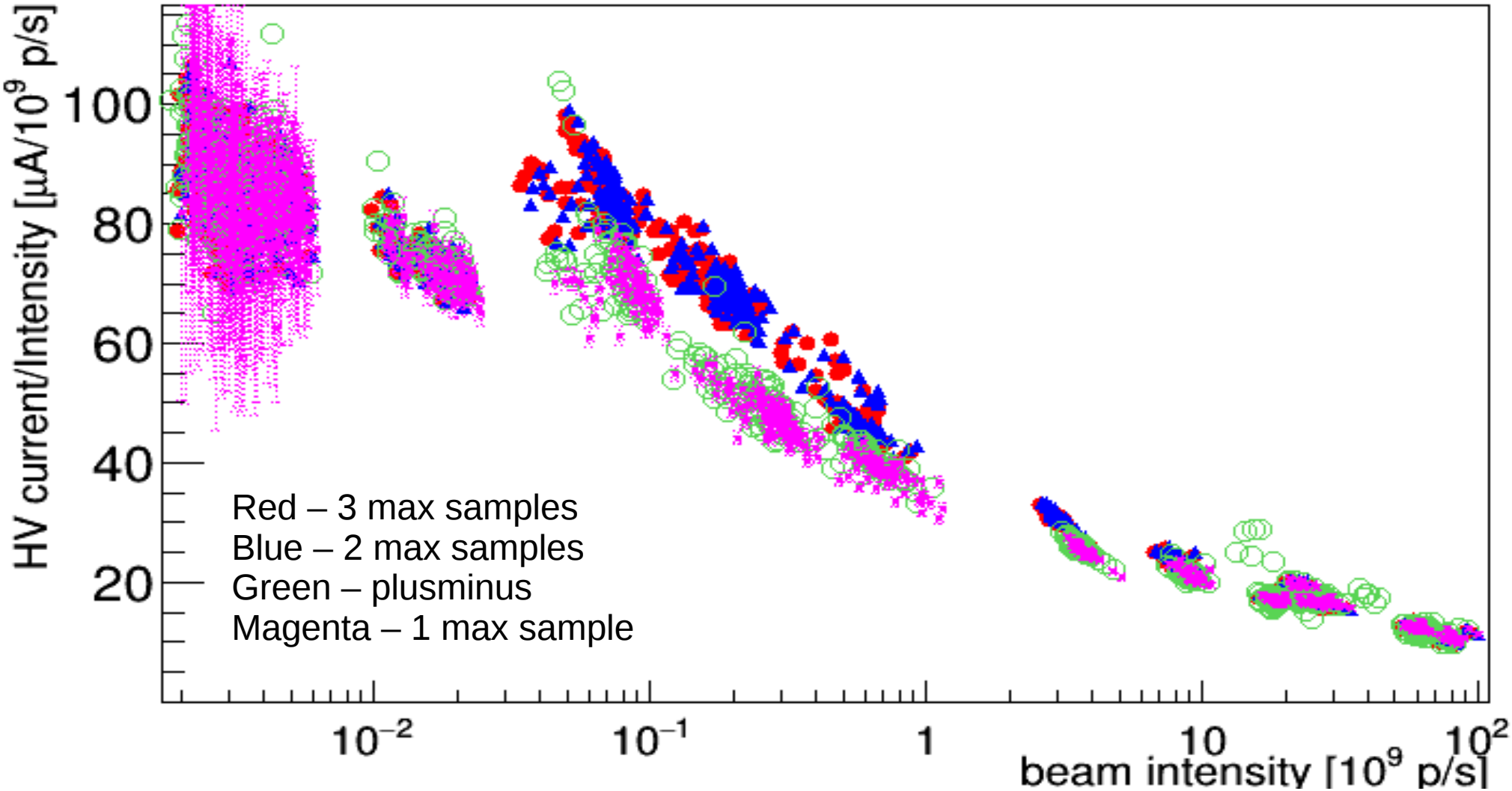
Appeared in the knee

Did not change a lot the integral method results

Critical value ~0.8 10^8 p/s

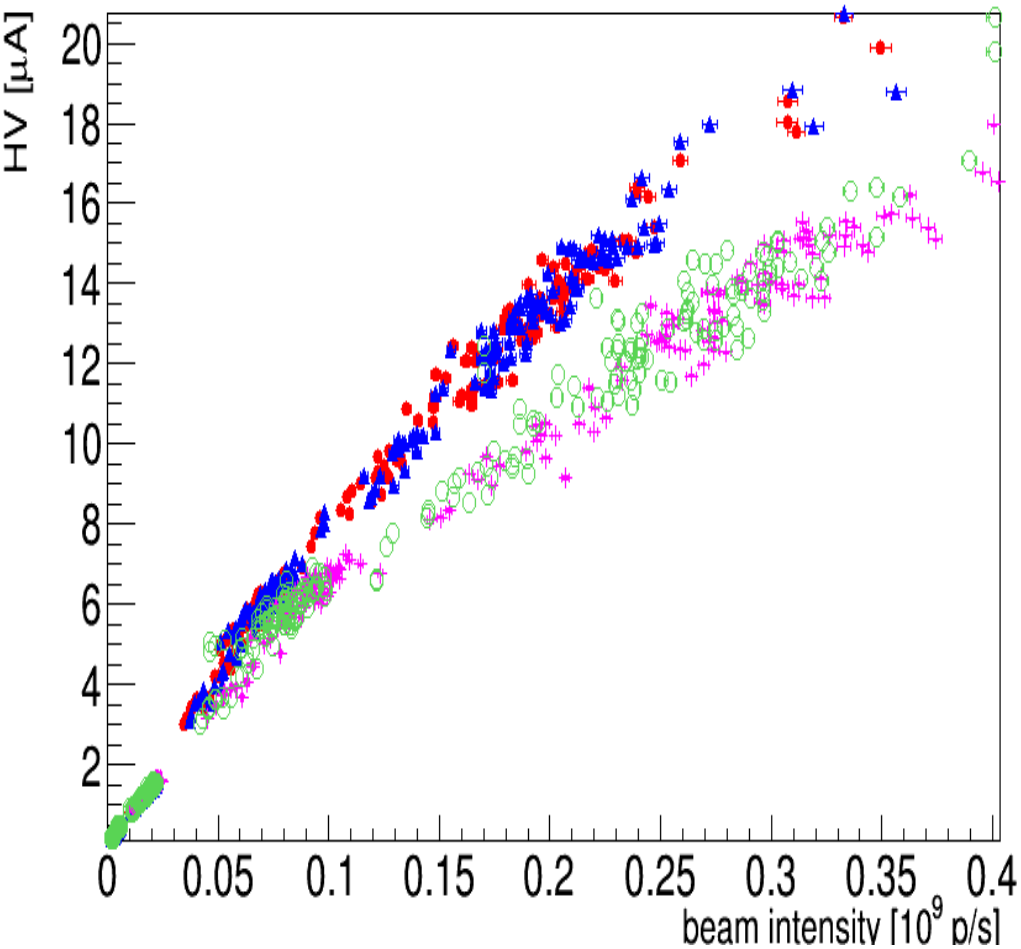
Offset is negligible (dominated by the lower intensities)

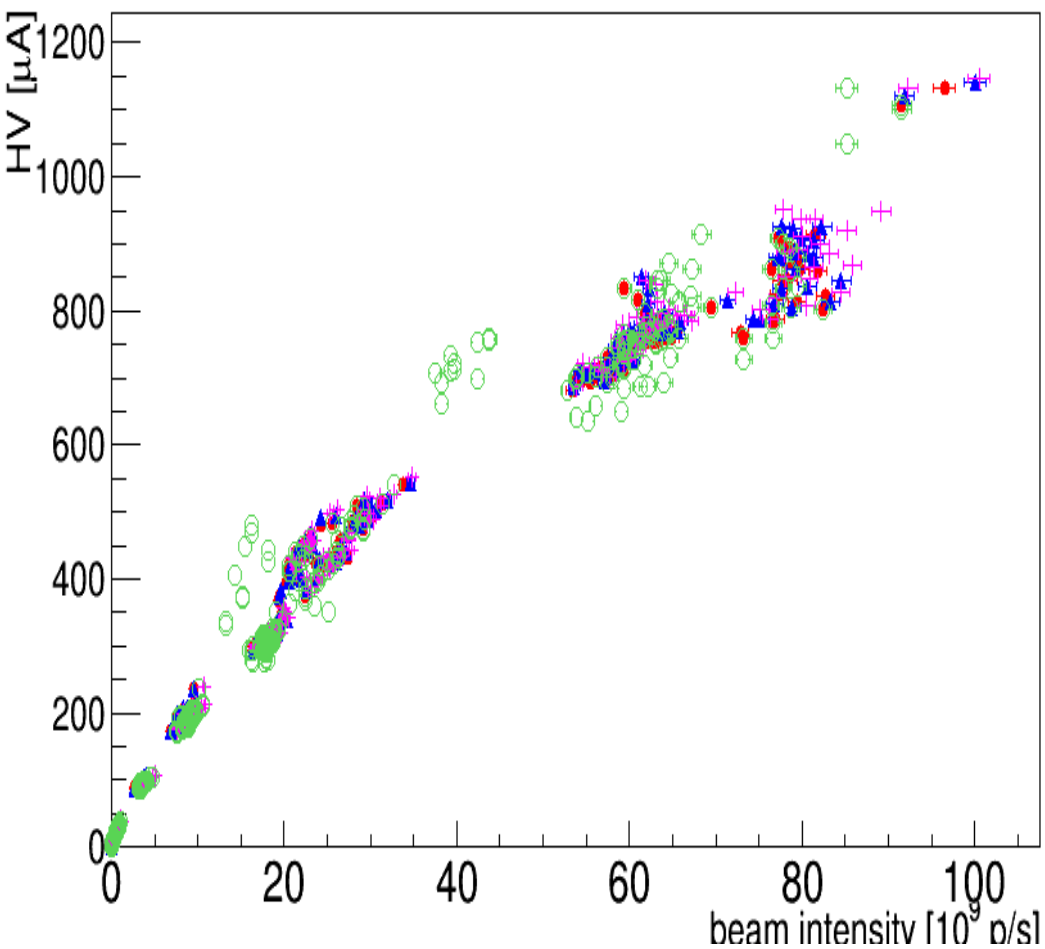
Different amplitude methods



- Cherenkov correction was applied
- 2, 3 samples maximum repeat the lowest intensities as other methods, but enlarge the knee
- Only available explanation is also pick up higher Cherenkov values by single maximum finder and by the 2 or tree maximum samples the ratio is lower as the Cherenkov is lower.
- Need to see the normal HV vs CH

Comparison





- Errors are not fully implemented
- Methods for large intensities look similar, but at knee area – effect of lower CH signal is larger
- Will affect final plots therefore and if to take 3 samples sum maximum for the amplitude method we will get more flat distribution for low intensities