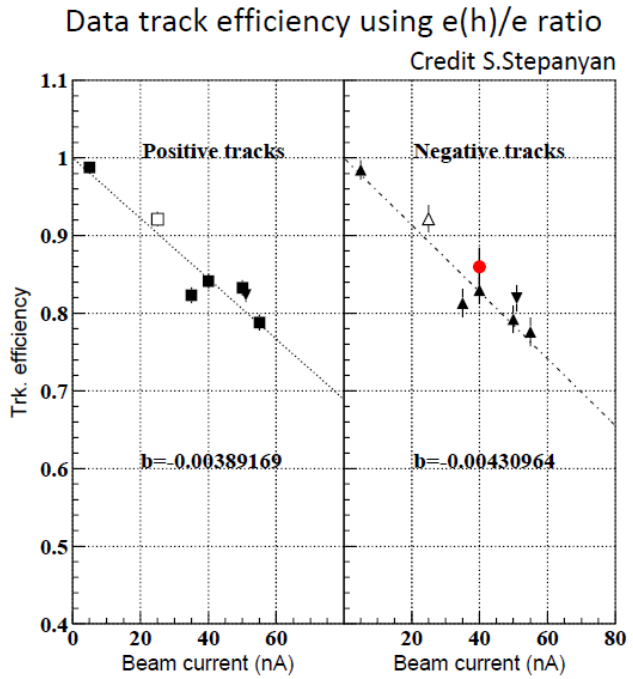
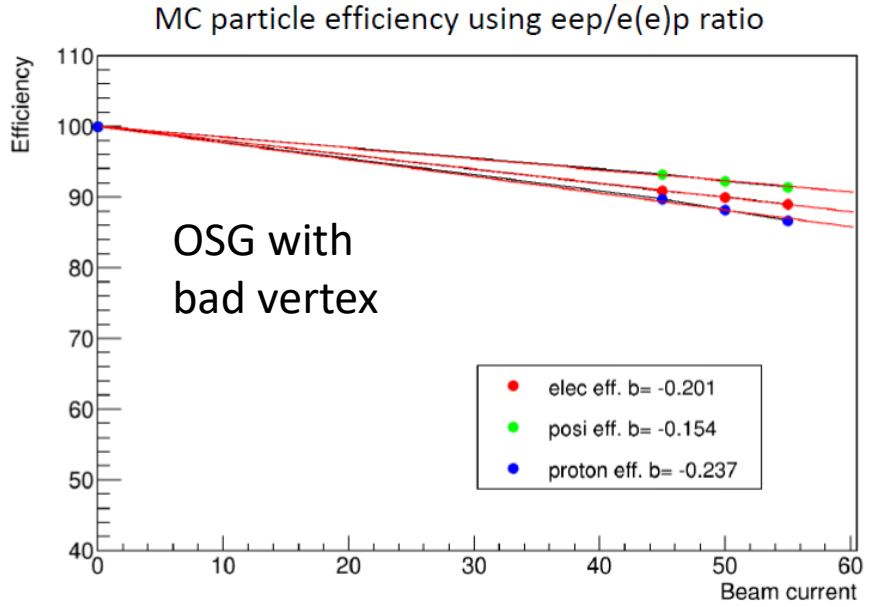
Background merging and particle efficiency study

State of this study:

- Large discrepancy seen in the single particle efficiency from TCS MC events and Data
- This study is done with OSG
- Need to investigate this behavior with latest GEMC and coatjava

RG-A Inbending

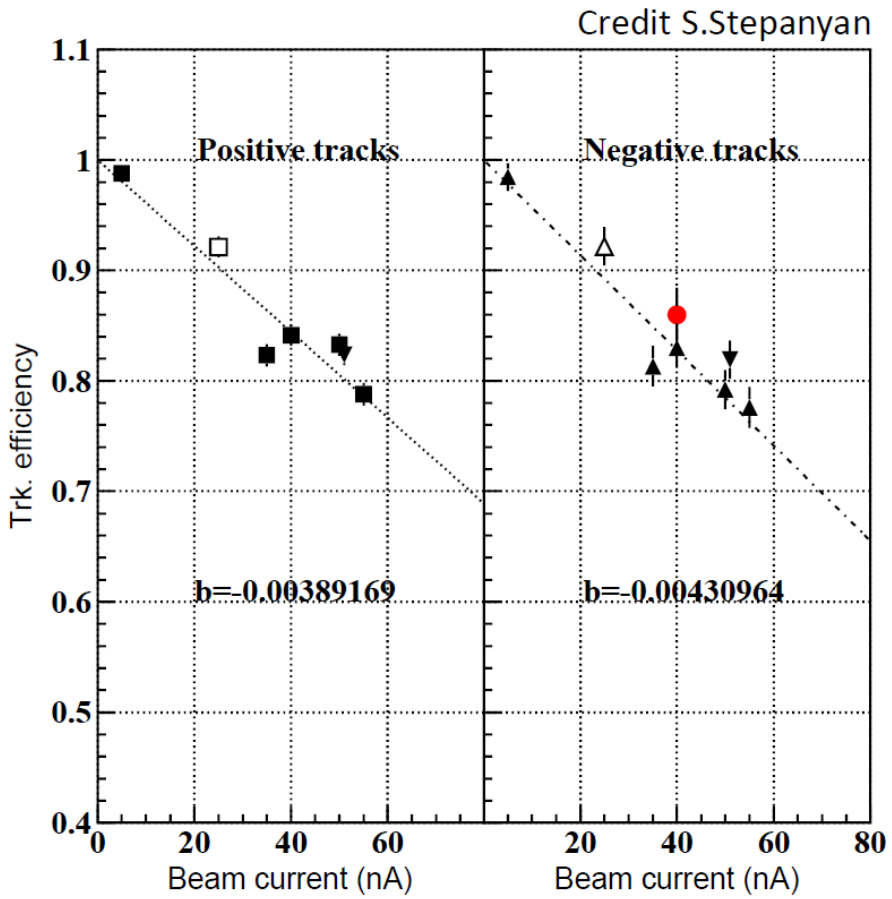




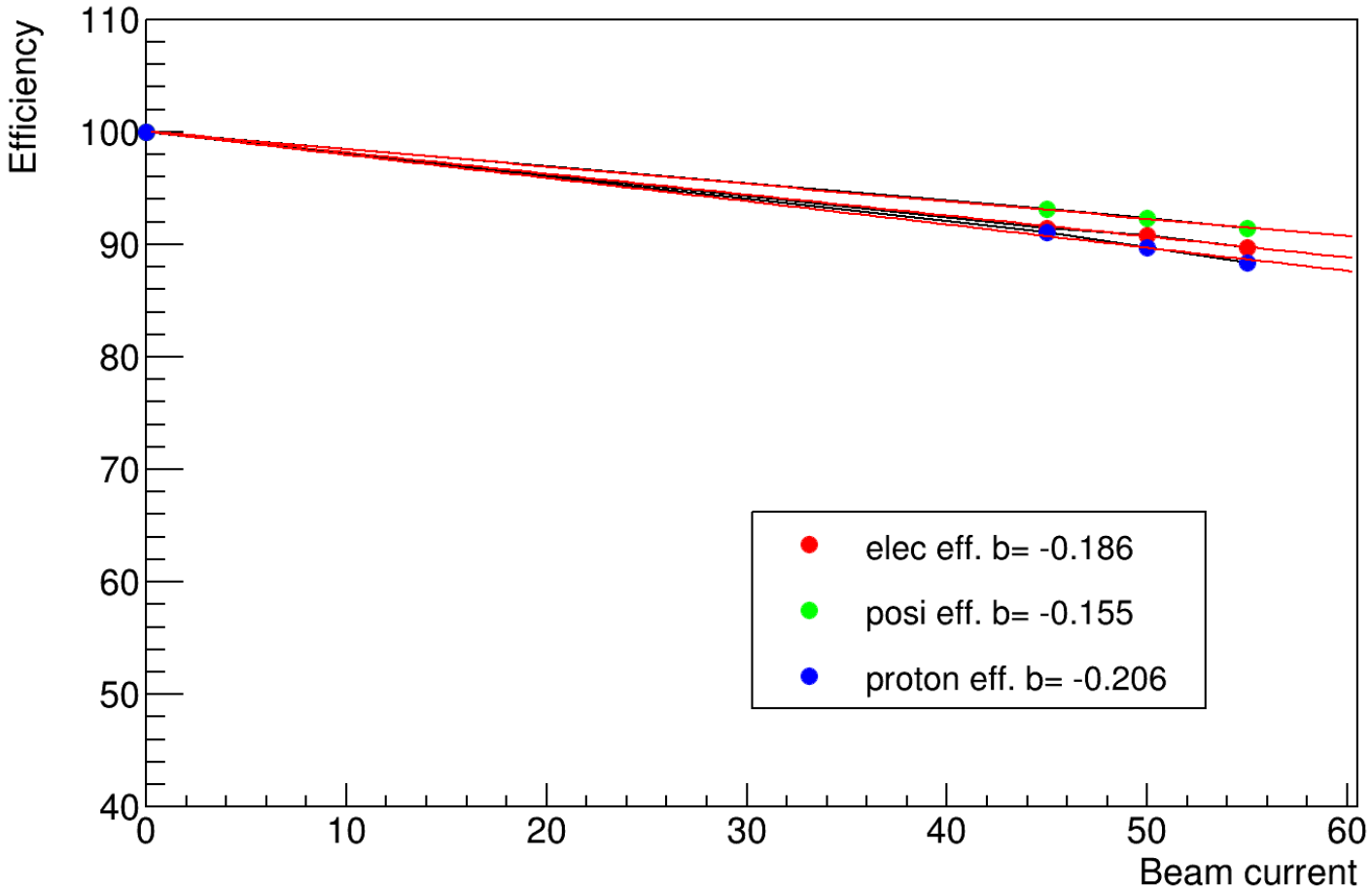
Method:

- Use GRAPE lund file
- Count the number of events with 2 final state particles detected and with 3 detected particles and compute ratio
- Normalize to “No Background” ratio, show efficiencies are relative to No BG case

Data track efficiency using e(h)/e ratio



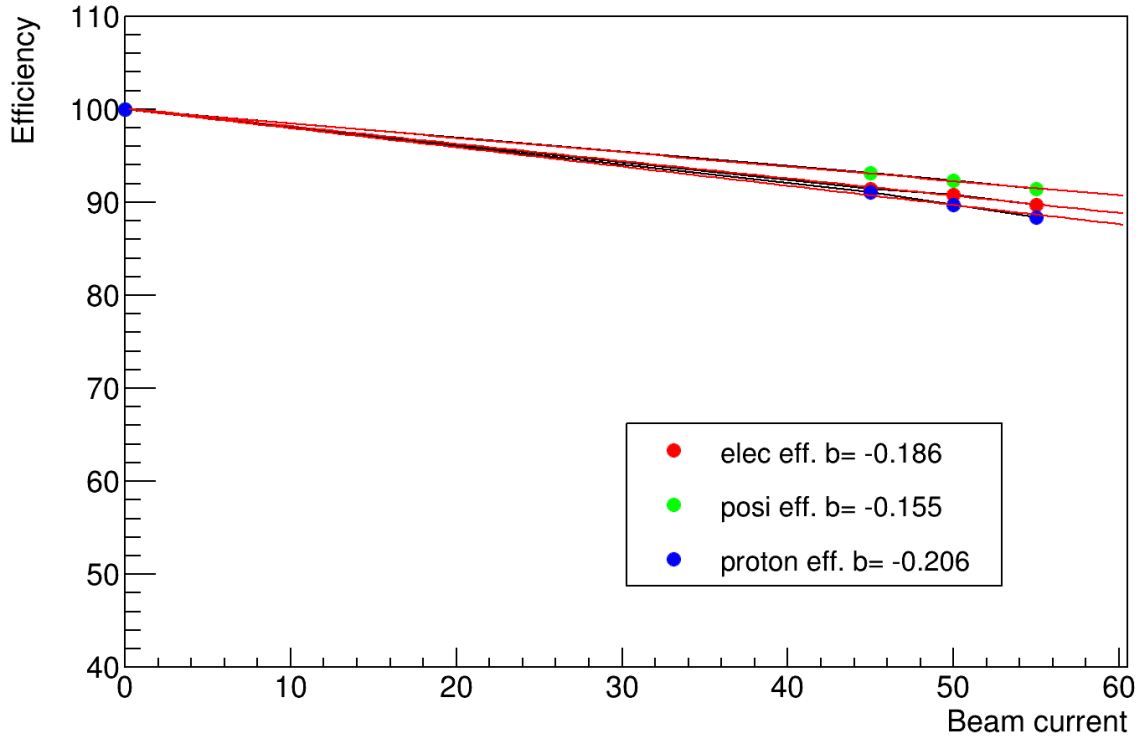
Inbending OSG (with good vertex)



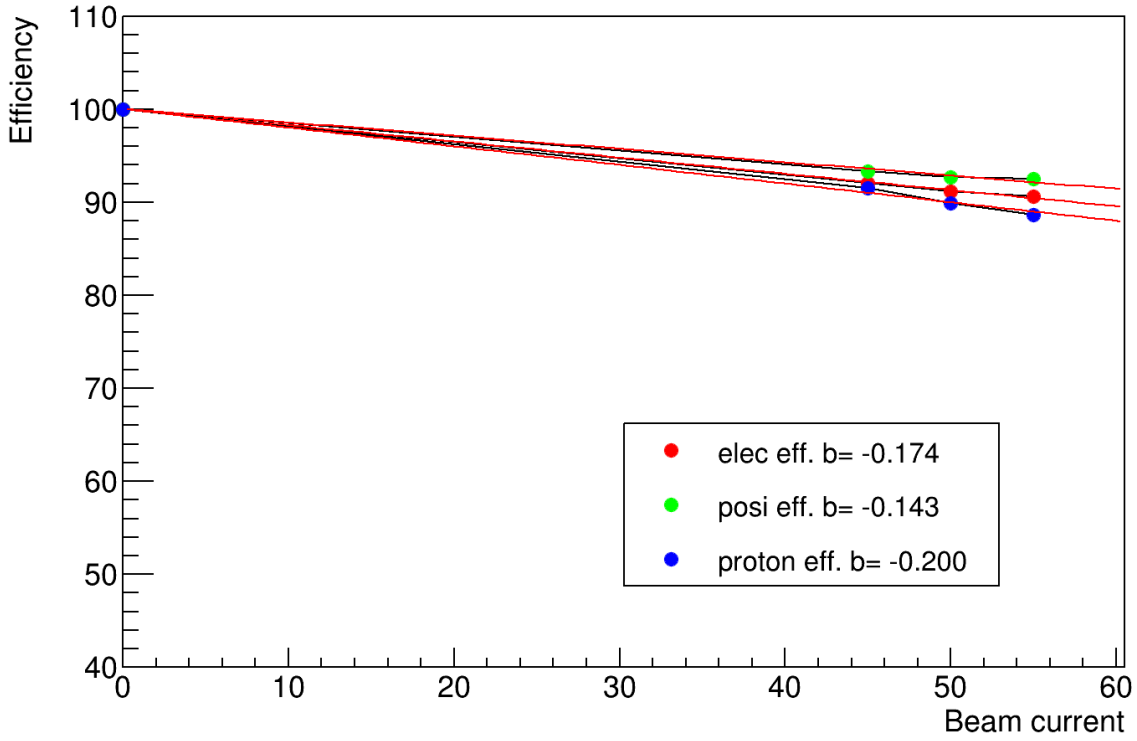
Discrepancy gets bigger with good vertex…

Only done on inbending so far

OSG: GEMC 4.4.2 + Coatjava 6.5.6.1
8M events

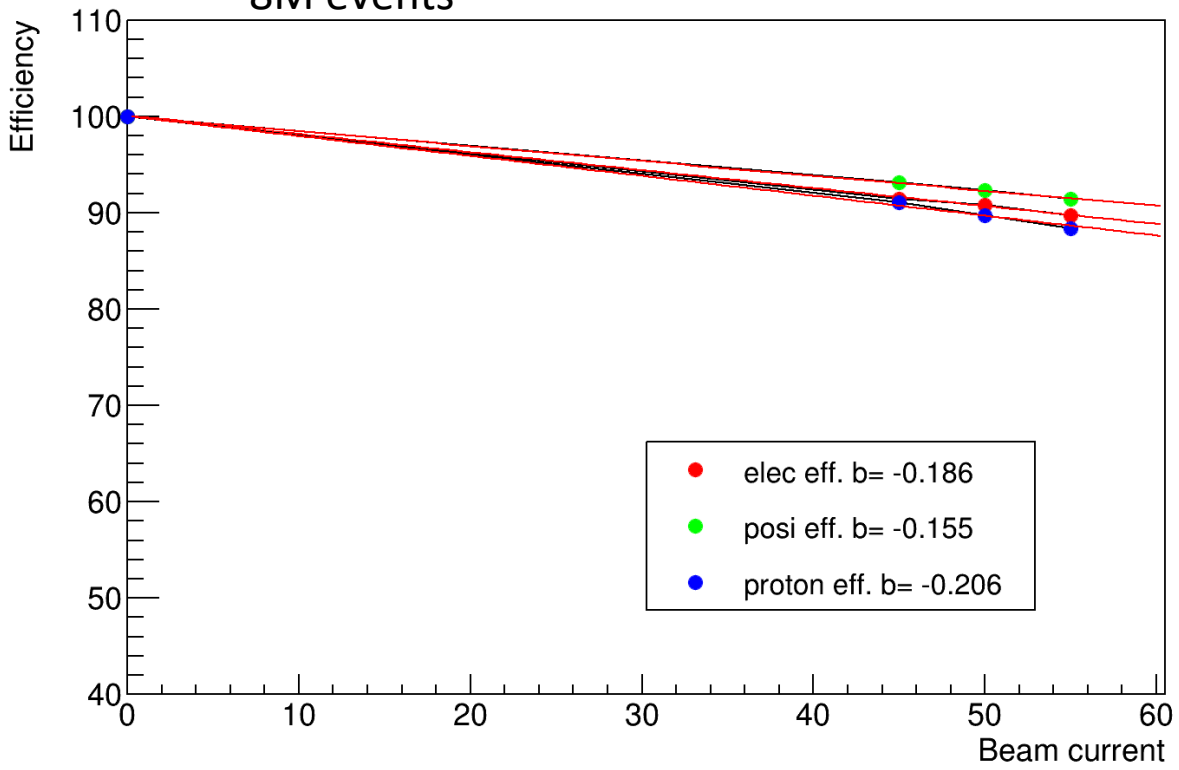


GEMC 4.4.2 + Coatjava 6.5.6.2
1 M events

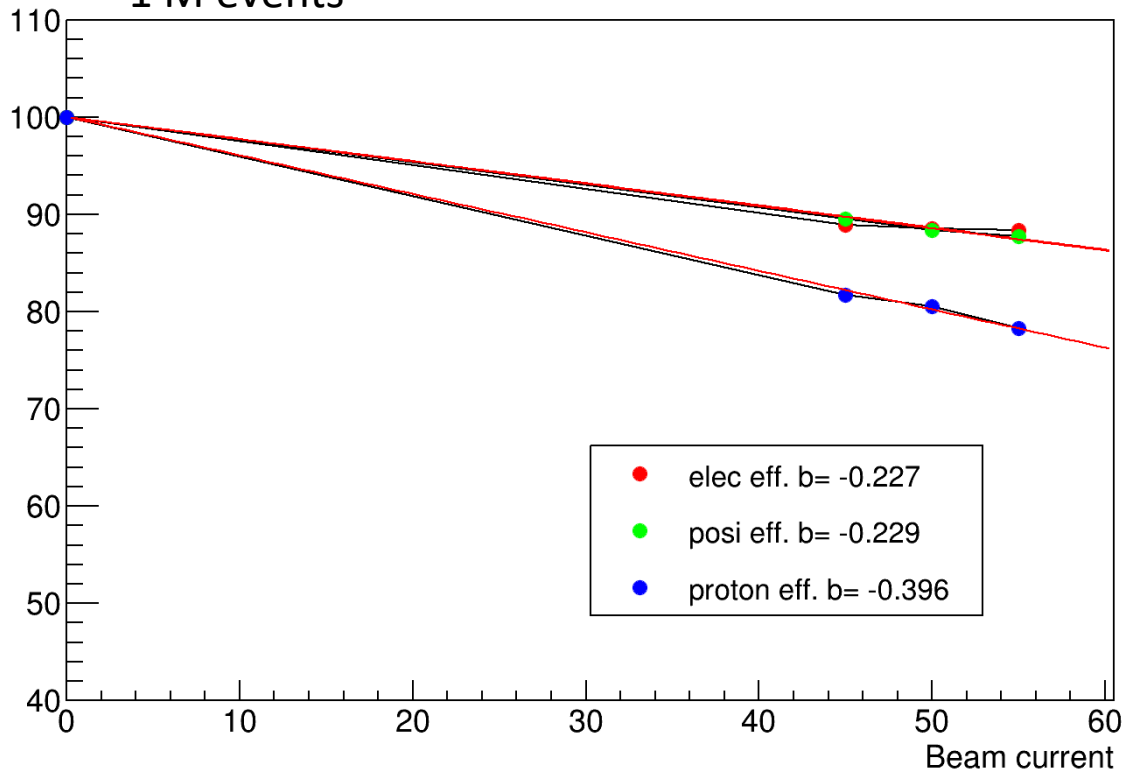


Expected same results between OSG and GEMC 4.4.2 + Coatjava 6.5.6.2

OSG: GEMC 4.4.2 + Coatjava 6.5.6.1
8M events



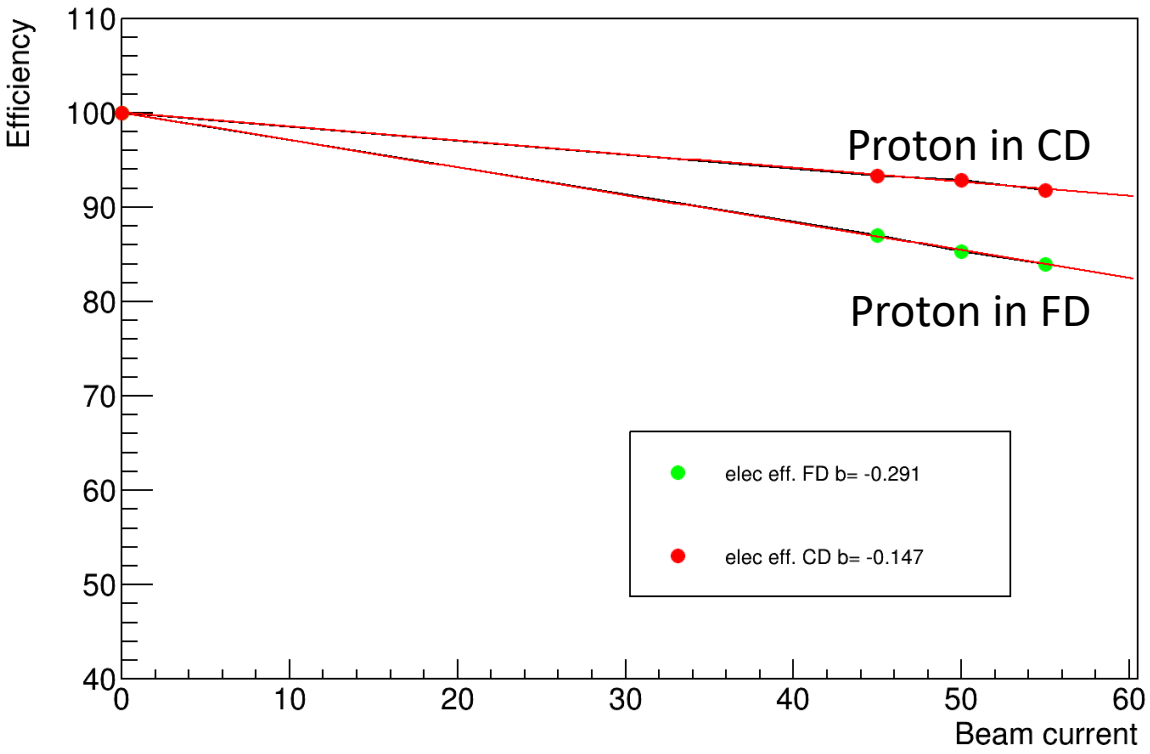
GEMC 5.1.0 + Coatjava 8.1.0
1 M events



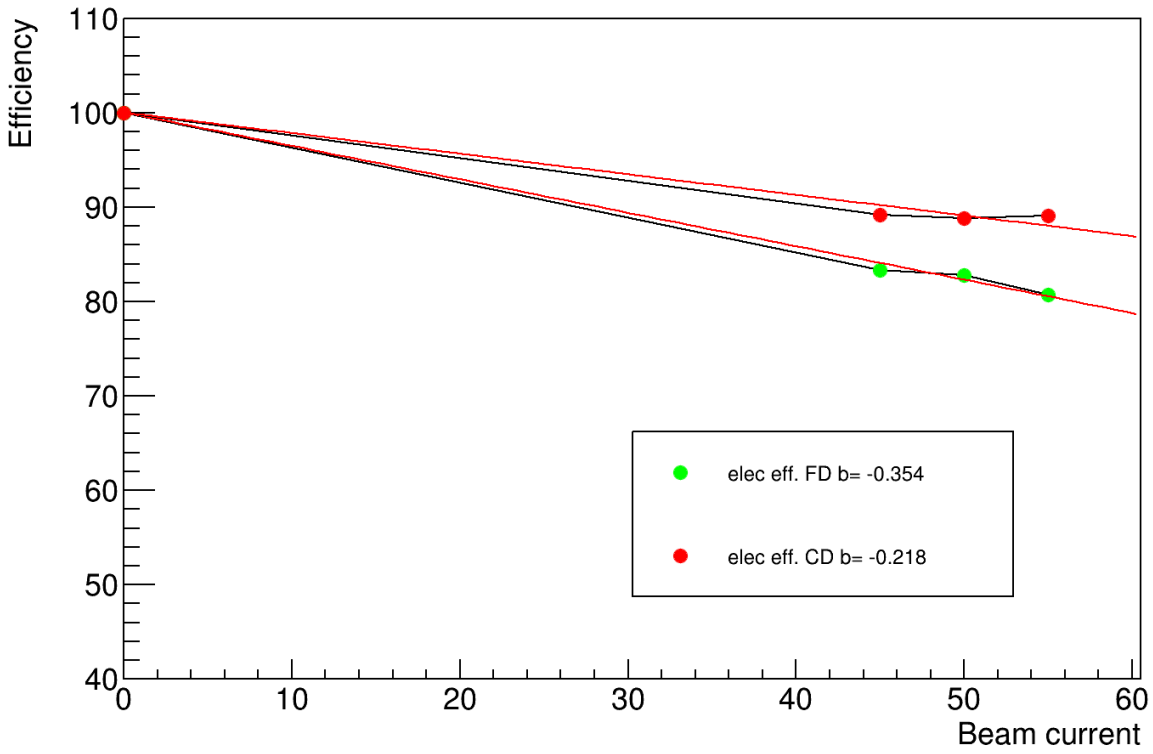
Efficiencies are significantly smaller in GEMC 5.1

Effect of proton detection on electron eff.

OSG



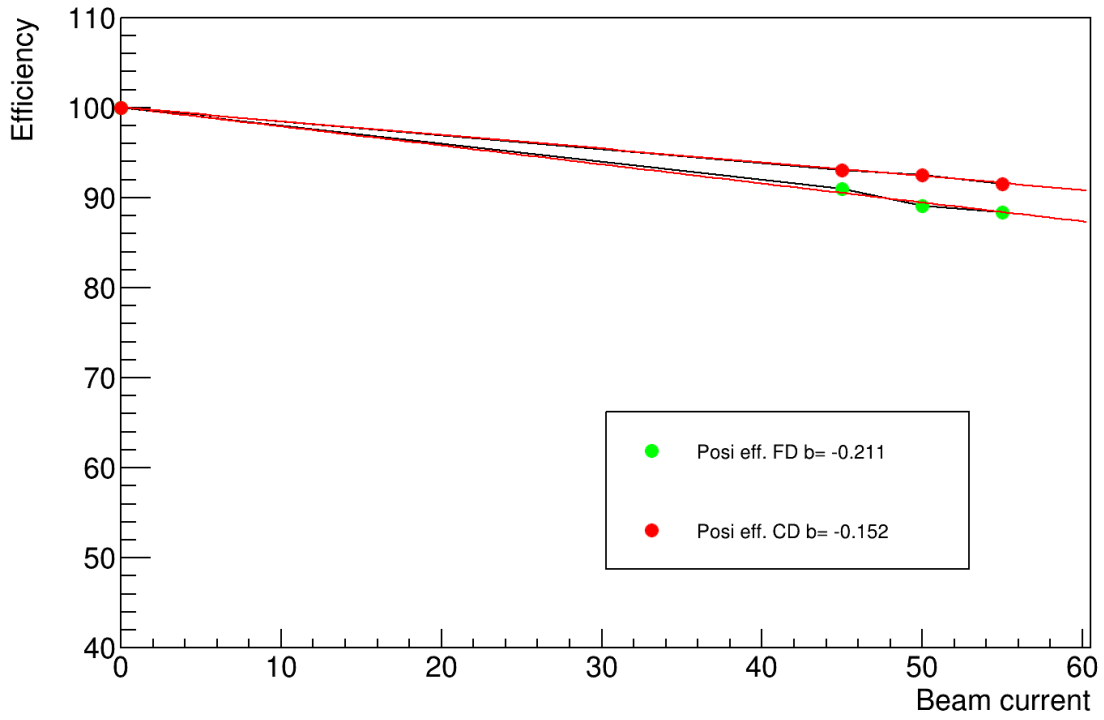
GEMC 5.1.0 + Coatjava 8.1.0



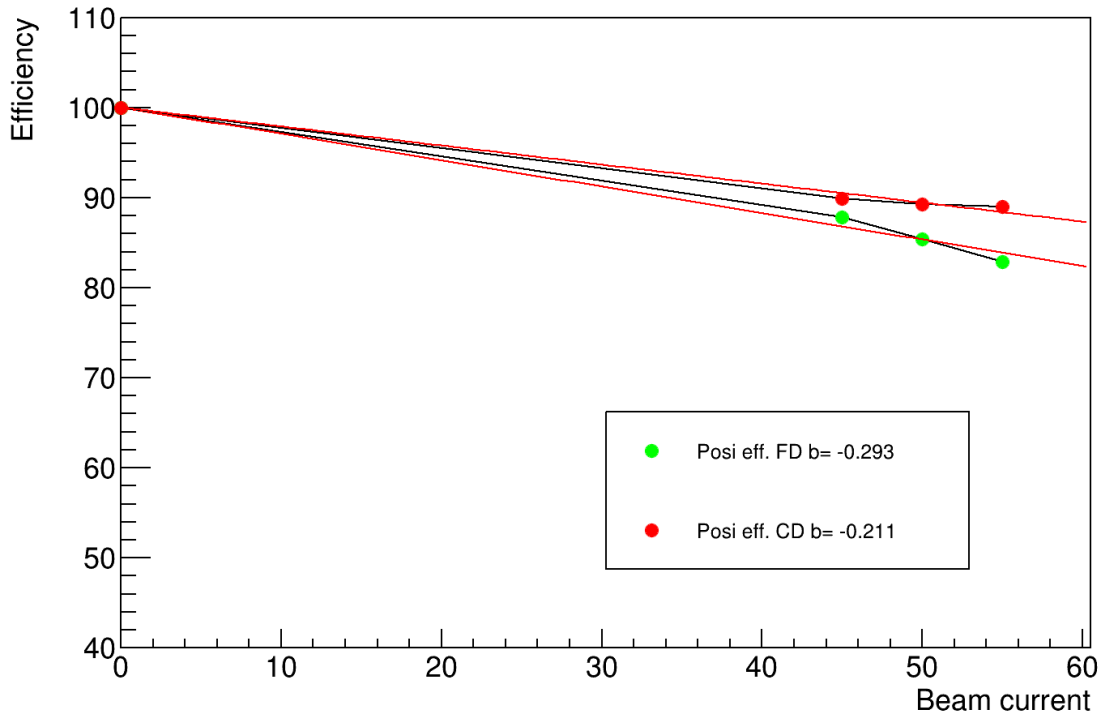
- Efficiency is consistent with proton detection location
- GEMC 5.1 produce lower efficiencies

Effect of proton detection on positron eff.

OSG



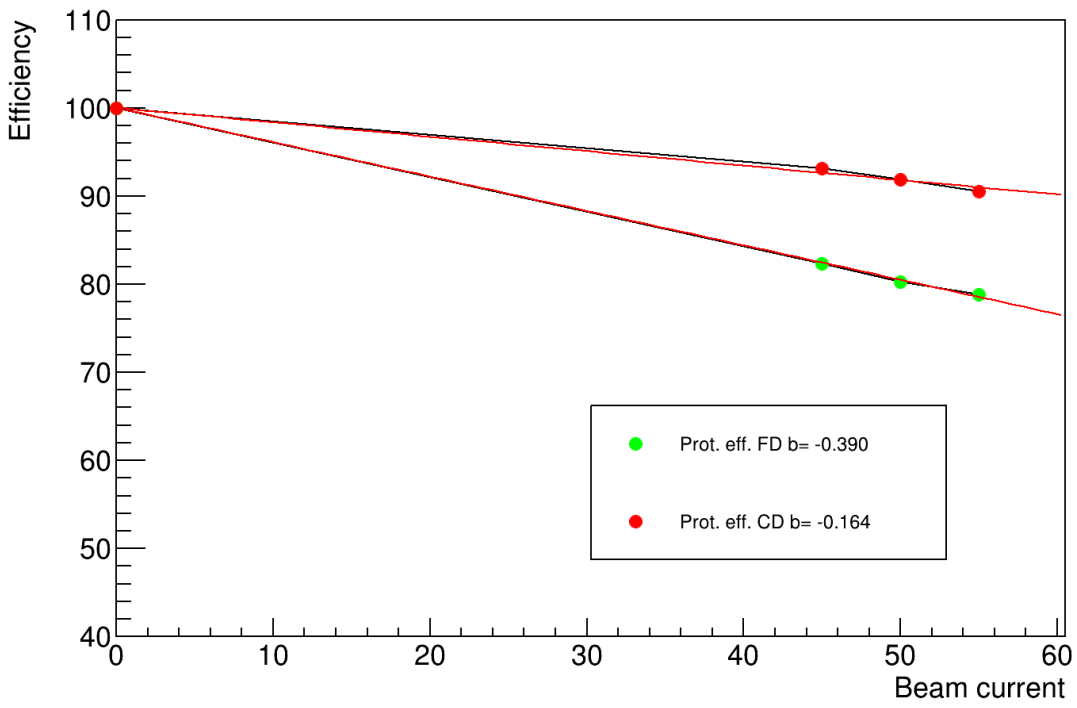
GEMC 5.1.0 + Coatjava 8.1.0



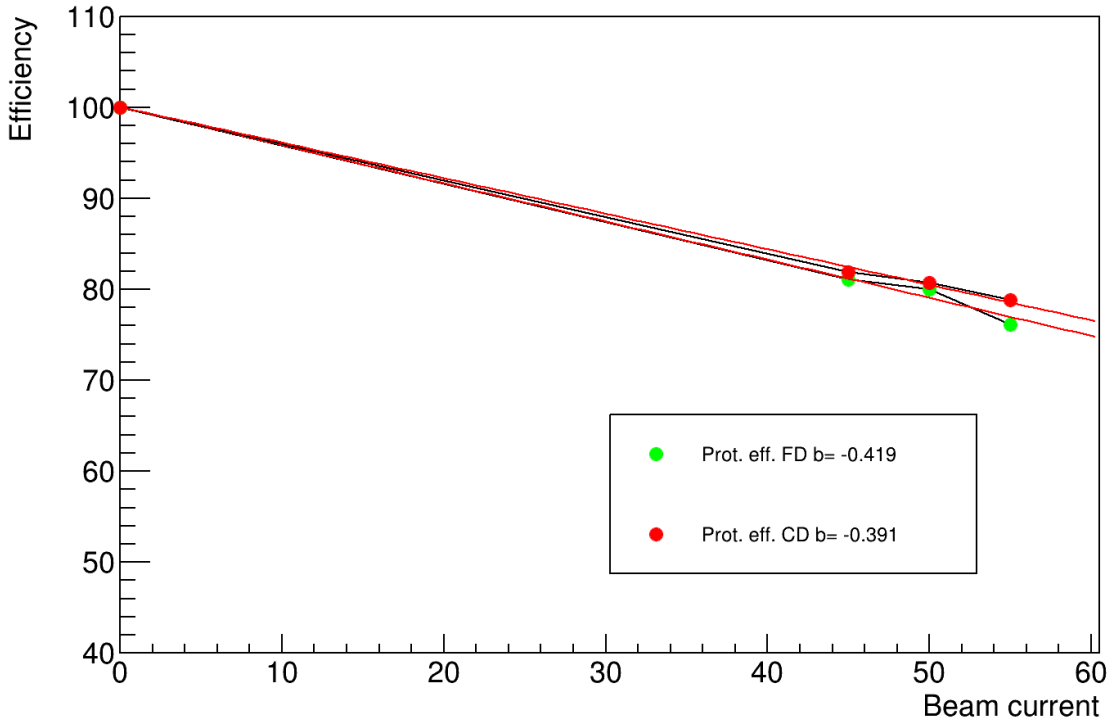
Similar behavior than electron

Effect of proton detector on proton eff.

OSG



GEMC 5.1.0 + Coatjava 8.1.0



- Efficiency of proton in the CD is drastically different between gemc 4.4.2 and 5.1
- FD efficiencies are smaller in Gemc 5.1, getting closer to data-extracted values

Take away

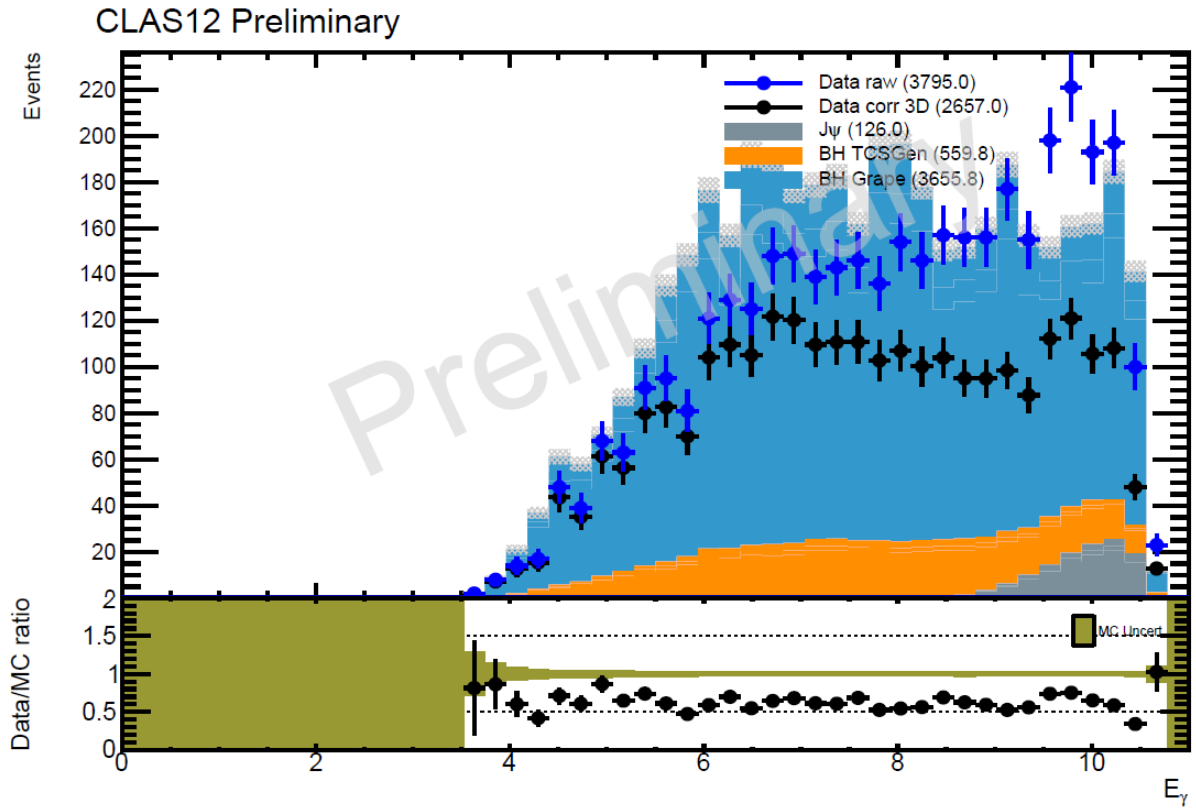
-Some change in GEMC/Coatjava have significantly changed the efficiencies in the MC
-Large effect on proton in CD
-Extracted value are still “better” than the efficiencies extracted from data

Further study

- Finish outbending study
- Remove one caveat : make sure electron/positron are in different sectors
- Redo study with GEMC 4.4.2 and coatjava 8.1.0

Lepton PID in progress:

- NN pid of leptons redone: using BDT. 4 BDT have been trained for each combination of field/charge
- Applied to data, MC, ee sample
- Need a bit more checks, more results next meeting



$|M^2_X|<0.4$ & $|Q^2|<0.1$ & M>1.5 GeV & P_Lepton > 1.7 GeV