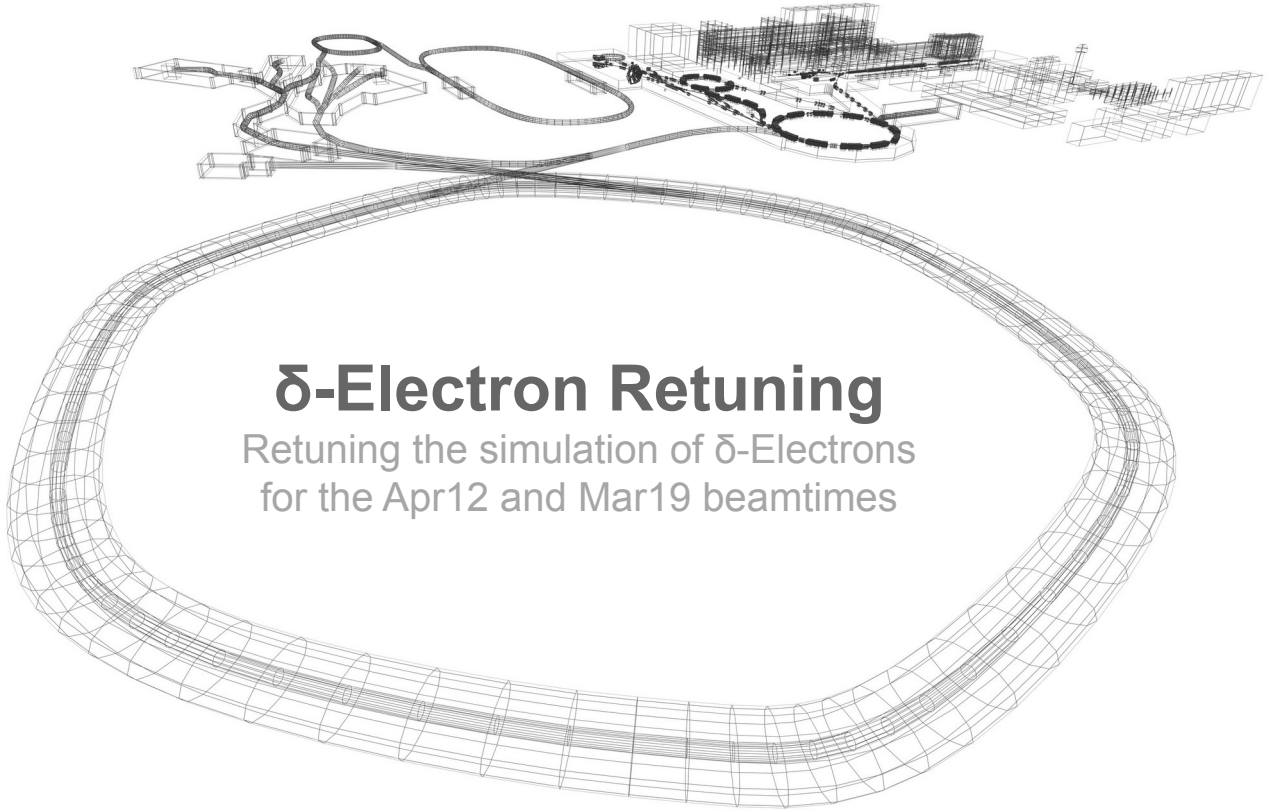


δ-Electron Retuning

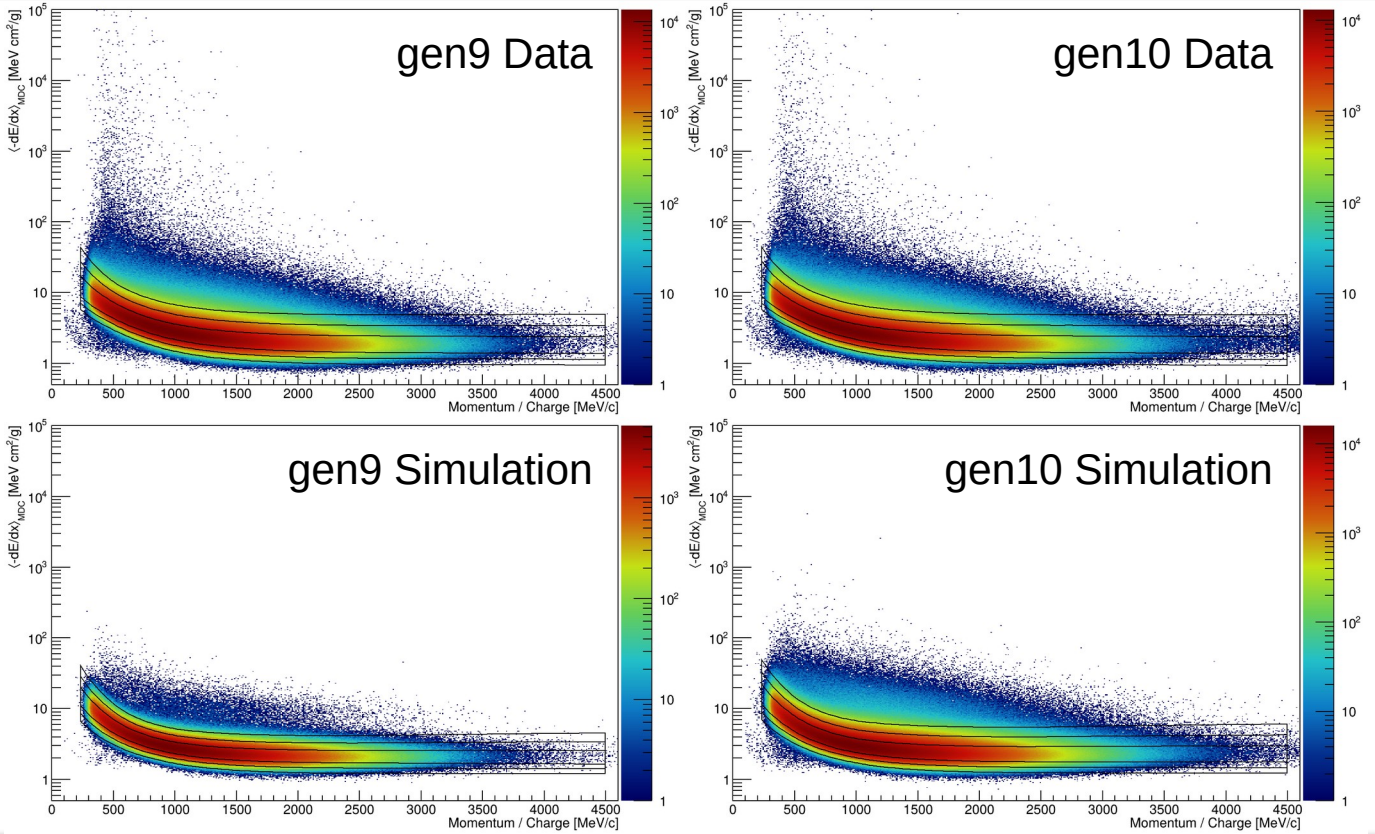
Retuning the simulation of δ-Electrons
for the Apr12 and Mar19 beamtimes

Introduction / Reminder

- δ-Electrons reduce reconstruction efficiency by blocking MDC cells from measuring particles of actual interest
- Strongly depending on short term beam intensity
- Sophisticated procedure to reproduce effects in simulation / embedding
- Open question: Layer efficiencies determined by Jochen included losses due to δ-Electrons partially → Risk of overcorrecting!
- Solution: Determine layer efficiencies from events with as few δ-Electrons as possible (NStartCluster 1 events) and retune simulations
- Updated layer efficiencies available since 30.04. (Mar19) and 12.05. (Apr12)

Simulated dE/dx in MDCs

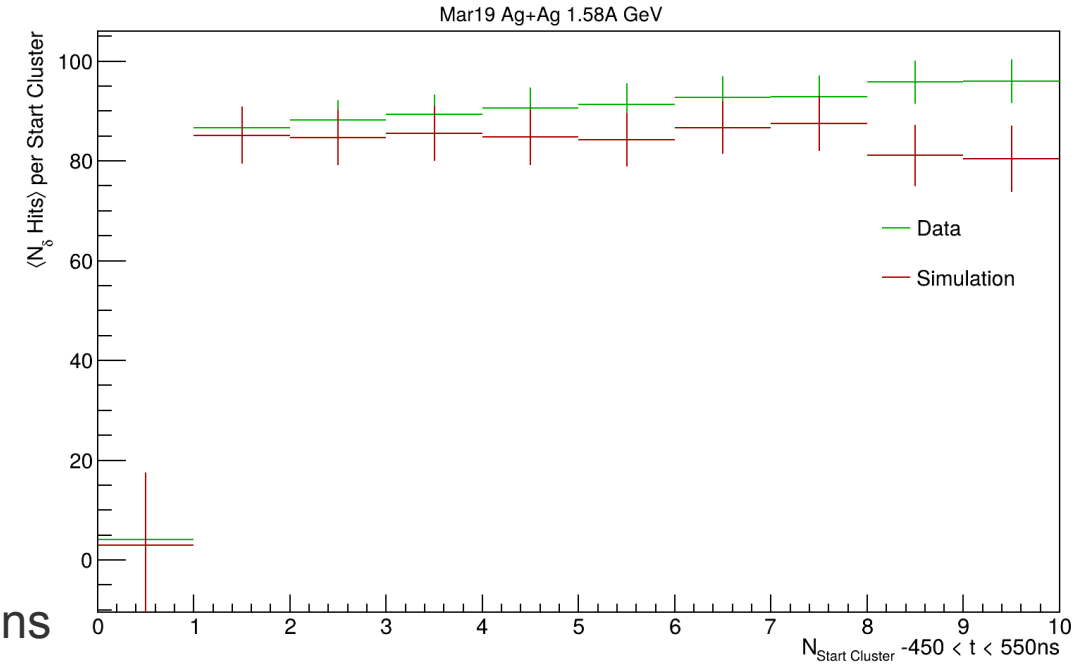
- Apr12 Au+Au
- dE/dx(MDC) vs. p
- Protons in RPC
- gen9 Simulation more narrow than data
- gen10 Simulation significantly closer to data



Mar19 Ag+Ag 1.58A GeV

Fine tuning: The amount of δ-Electrons per Beam Ion

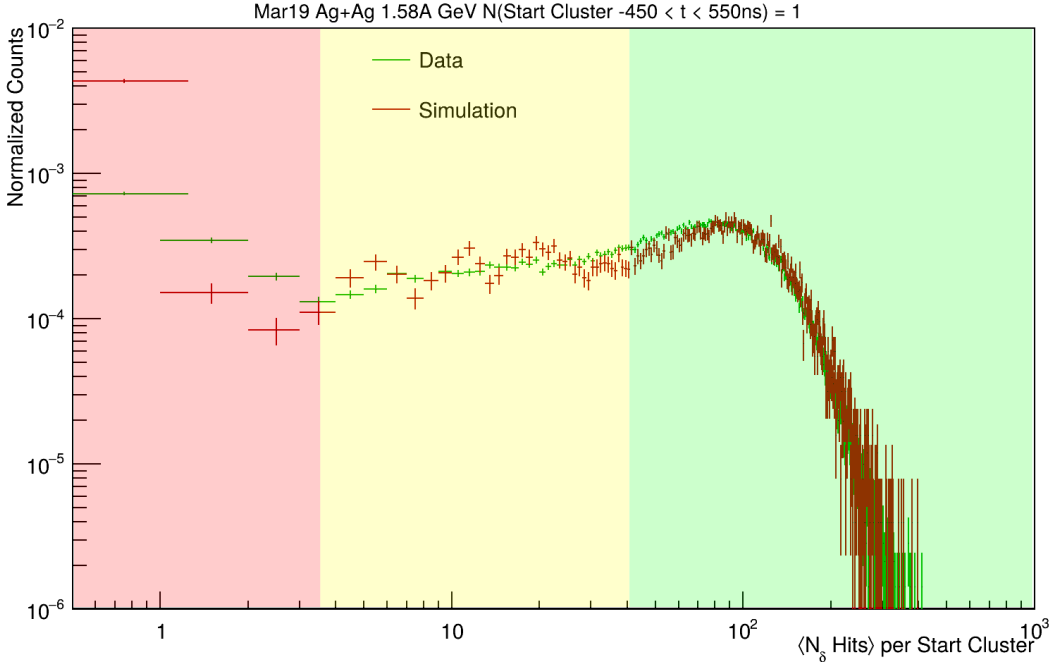
- Searching for Start Cluster from the time range -170 < t < -120ns without further Start Cluster ±100ns
- Counting the amount of MDC plane 1 and 2 hits up to 100ns after Start
- Special case 0 Start Cluster: Uncorrelated MDC hits observed between -120 and -20ns



- Rising trend with NStartCluster difficult to explain (Falling or Constant expected)

Fine tuning: The amount of δ-Electrons per Beam Ion

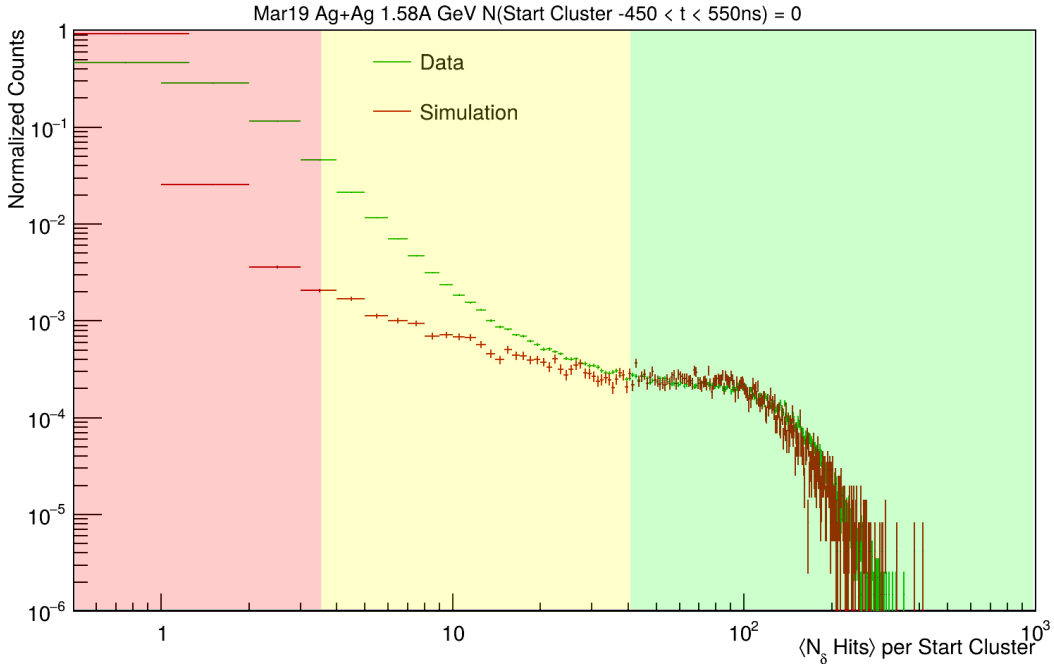
- Three regimes:
  - Beam Ions that hit the full target (Green Region)
  - Beam Ions that miss the target and hit e.g. Carbon (Yellow Region) – Only Z(C) / Z(Ag) = 12.8% hits
  - Beam Ions that miss the target and show just uncor elated hits (Red Region)



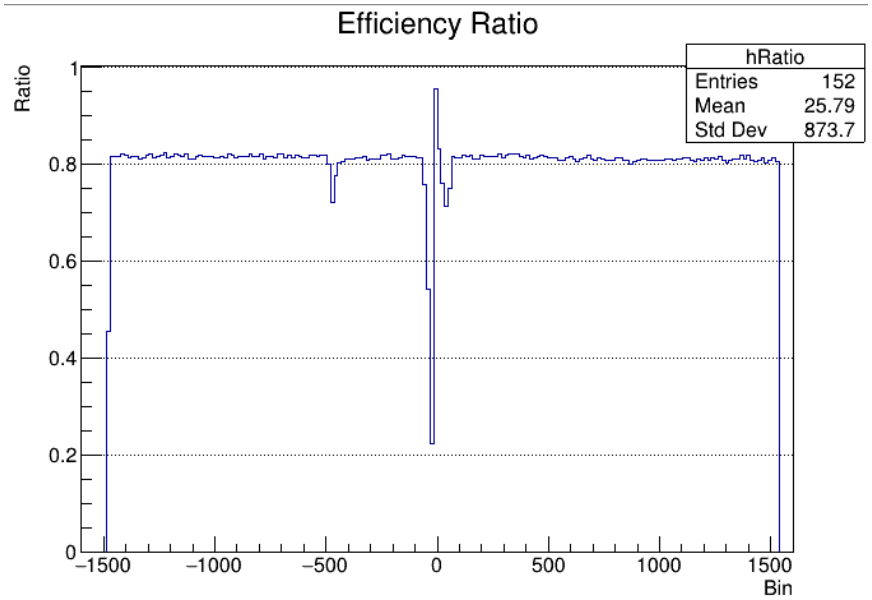
- Data show more uncorrelated hits in the red region (more dirt in data)

Fine tuning: The amount of δ-Electrons per Beam Ion

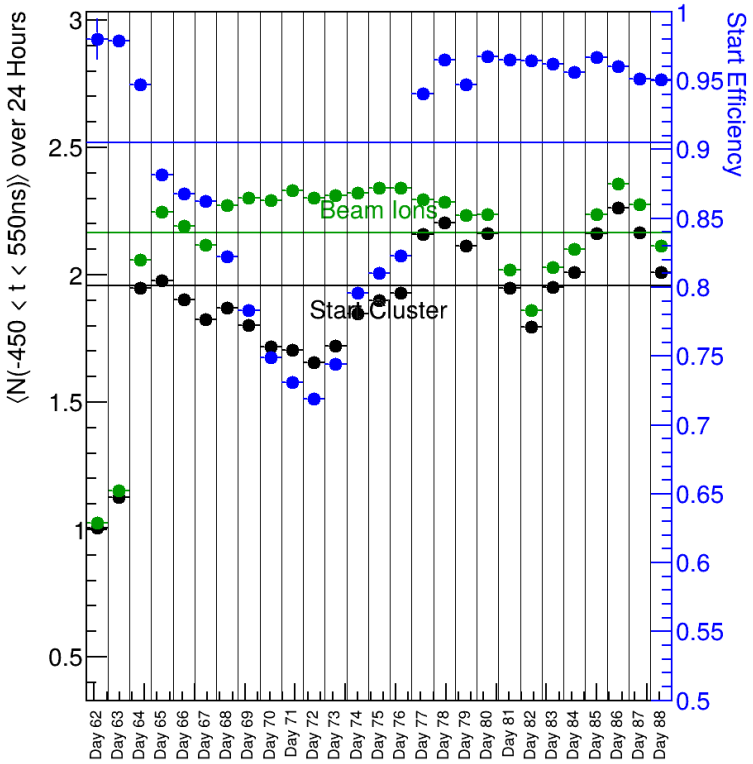
- Uncorrelated δ-Electron hits show significant structure in the green region
- δ-Electron showers like from a full beam ion traversing the target without a corresponding Start Cluster
- Significant Start detector inefficiency (ε ≈ 80%) could explain this as well as the rising slope from two slides before – How likely is it?



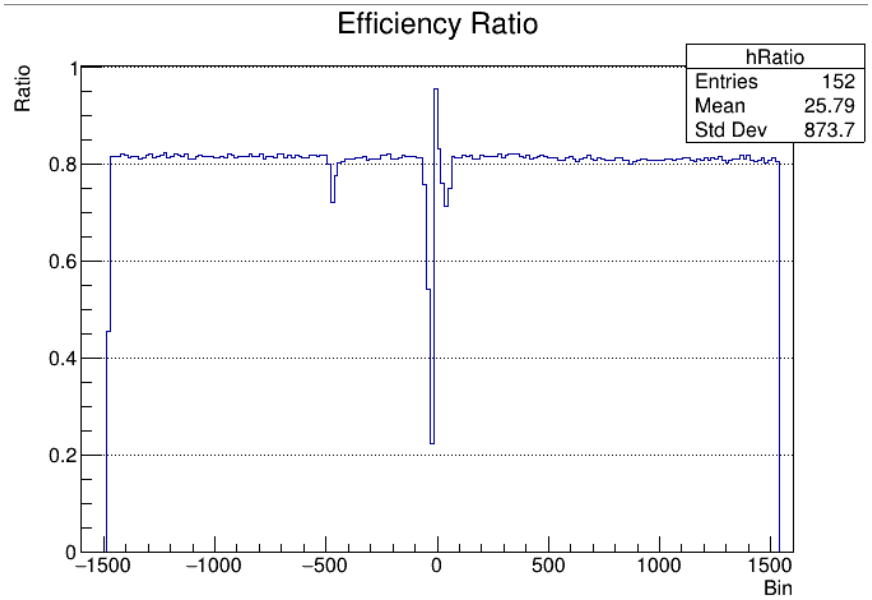
Start Detector Efficiency



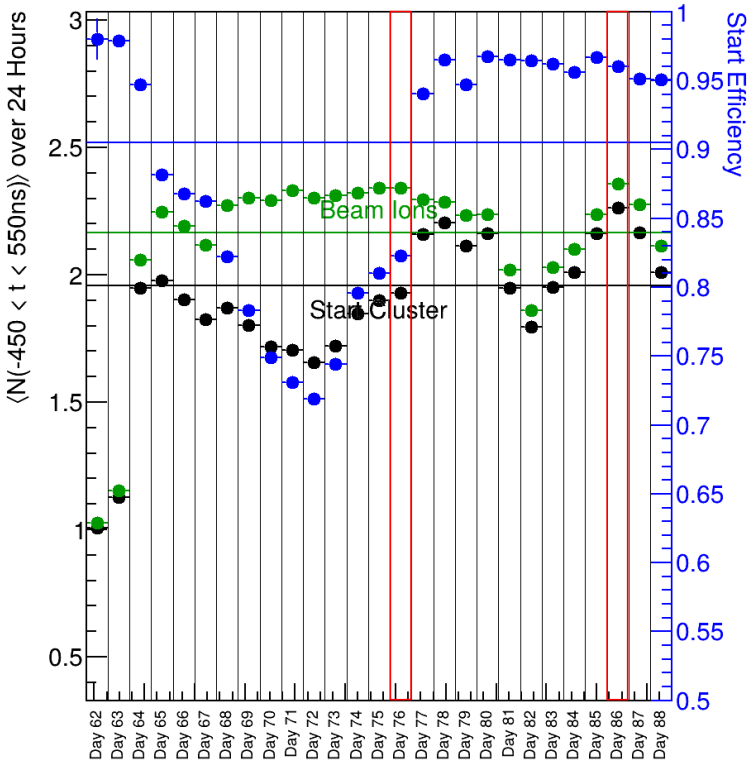
- Start Efficiency determined by Jurek for Day 076



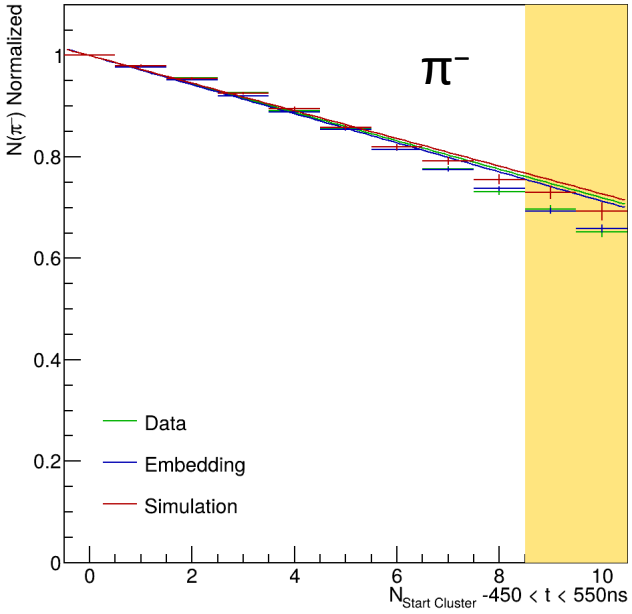
Start Detector Efficiency

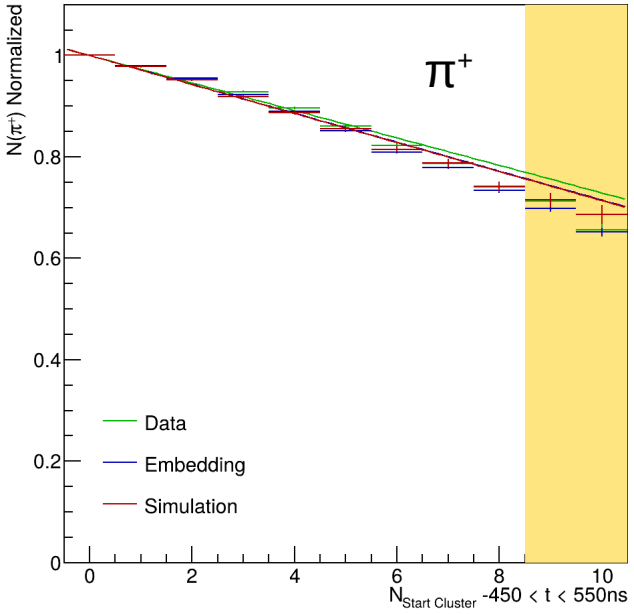


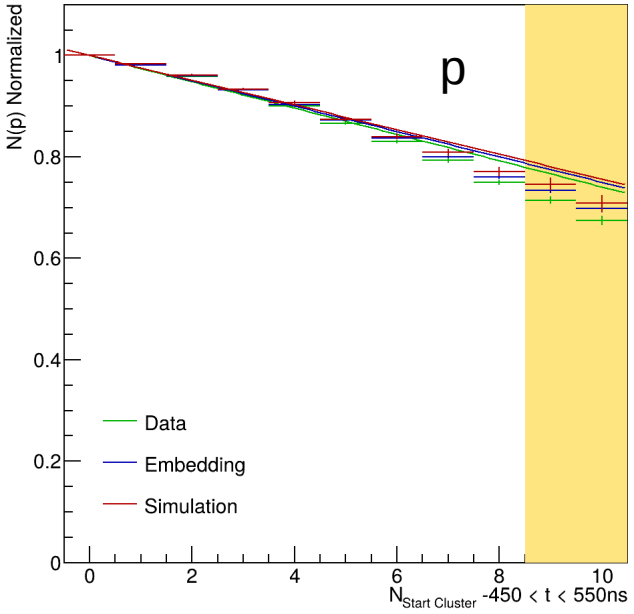
- Start Efficiency determined by Jurek for Day 076



Particle Scaling Day 076

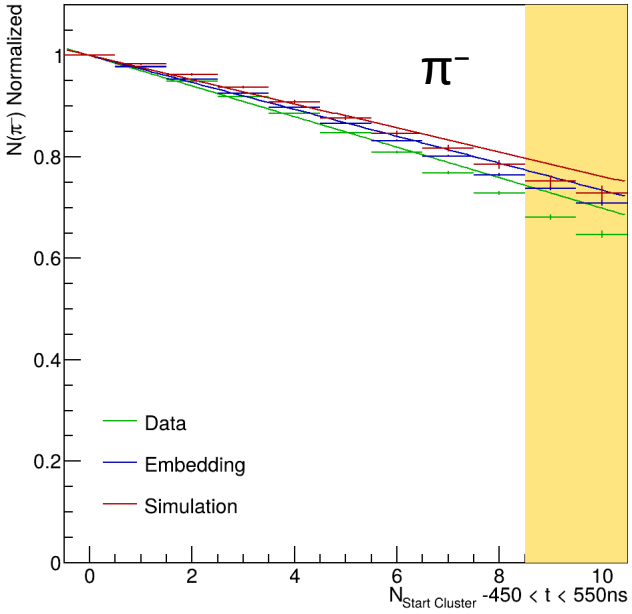


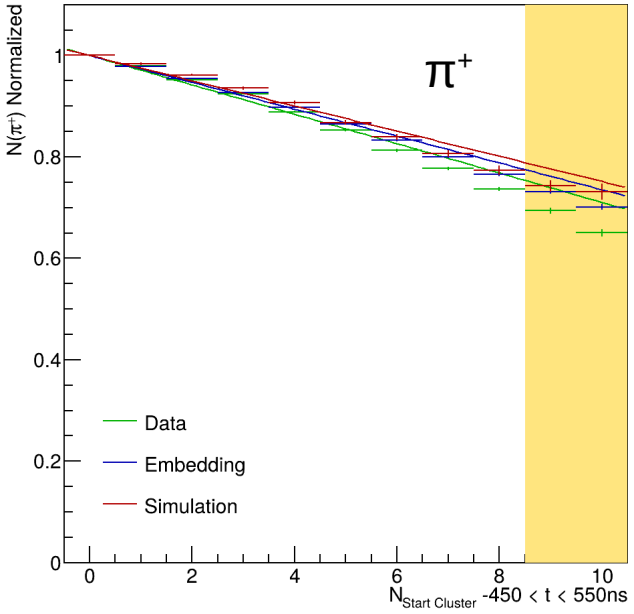


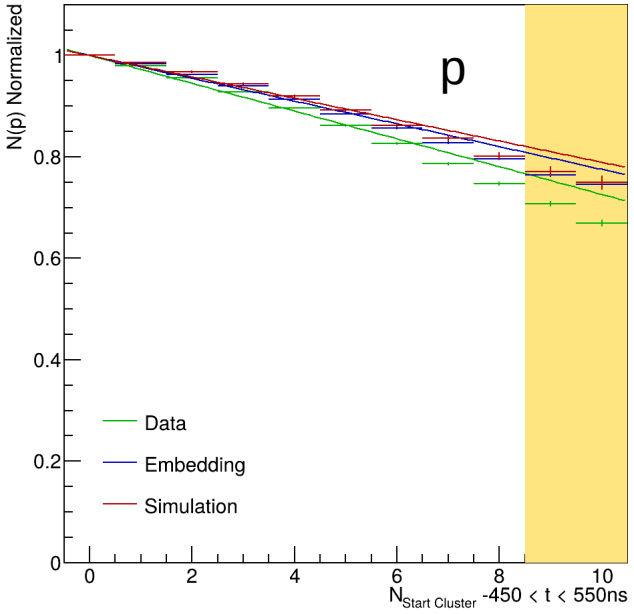


- Slopes are very well reproduced using newly determined Scaling Factors of 2.2 for fully simulated ranges and 0.8 for ranges covered by data!

Particle Scaling Day 086



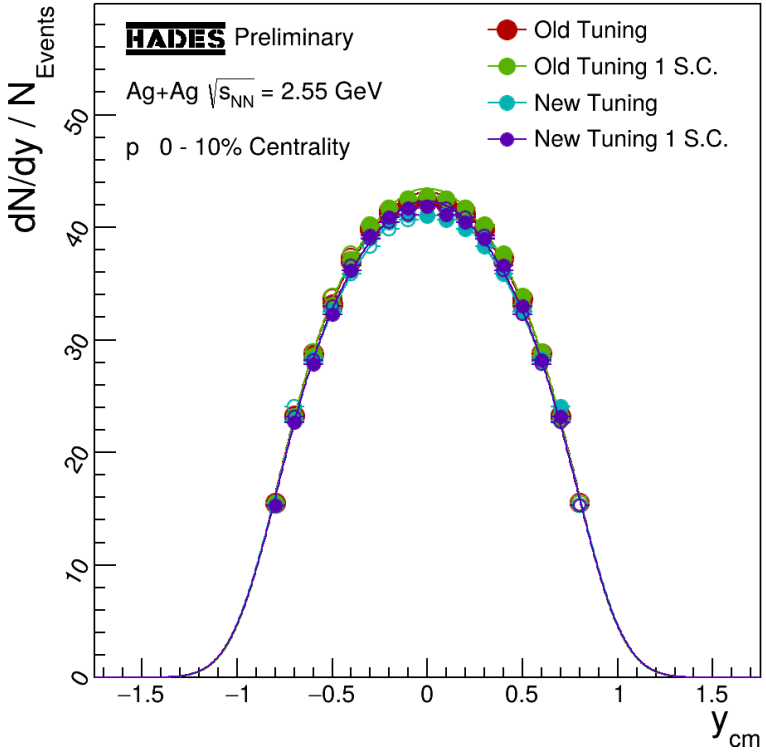




- Reasonable well agreement on cross-check Day 086 without dedicated tuning aside from Start Efficiency and Start Cluster Probability Distribution

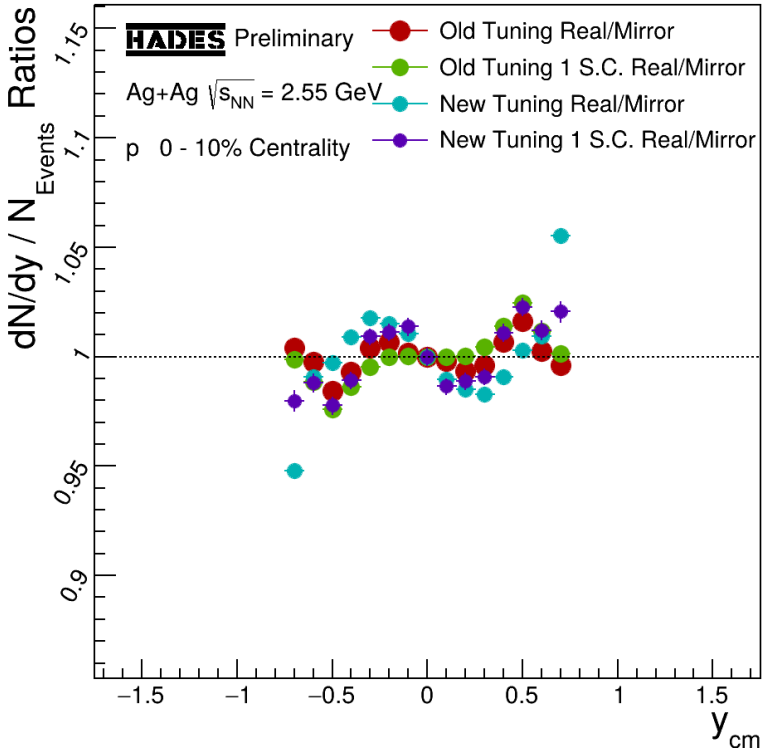
Proton dN/dy distributions

- Proton yield very slightly reduced (Within systematical uncertainties)
- Within uncertainties symmetric around mid-rapidity
- Cross-checks using only 1 Start Cluster (S.C.) events consistent



Proton dN/dy distributions

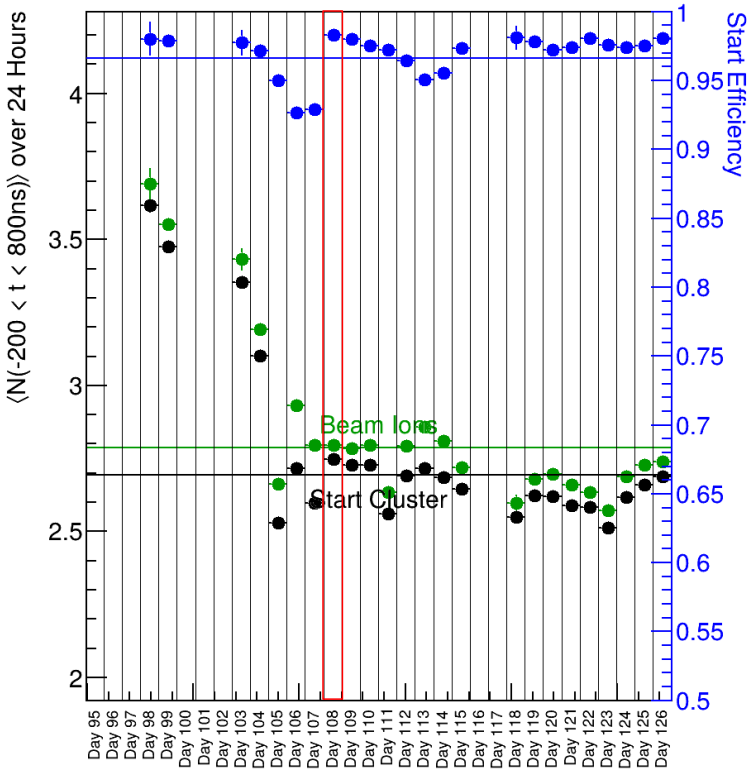
- Proton yield very slightly reduced (Within systematical uncertainties)
- Within uncertainties symmetric around mid-rapidity
- Cross-checks using only 1 Start Cluster (S.C.) events consistent



Apr12 Au+Au 1.23A GeV

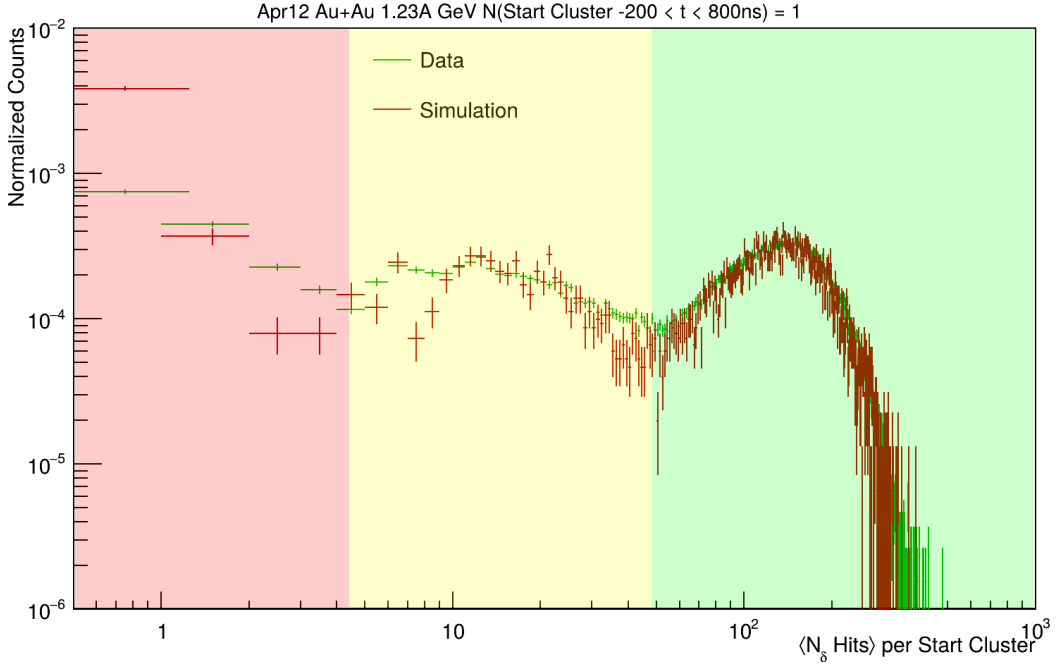
Start Detector Efficiency

- Start Detector significantly more stable in Apr12 beamtime than in Mar19 beamtime
- No need for any further changes to the δ-Electron procedure now established for Mar19



Fine tuning: The amount of δ-Electrons per Beam Ion

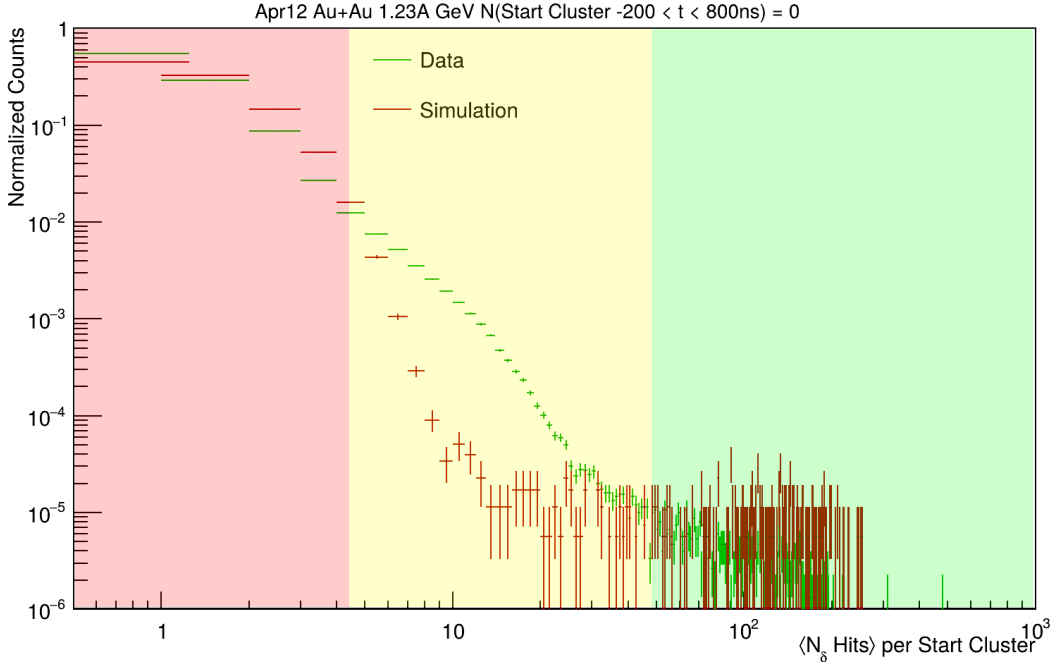
- Three regimes:
  - Beam Ions that hit the full target (Green Region)
  - Beam Ions that miss the target and hit e.g. Carbon (Yellow Region) – Only Z(C) / Z(Au) = 7.5% hits
  - Beam Ions that miss the target and show just uncorr-elated hits (Red Region)



- Data show more uncorrelated hits in the red region (more dirt in data)

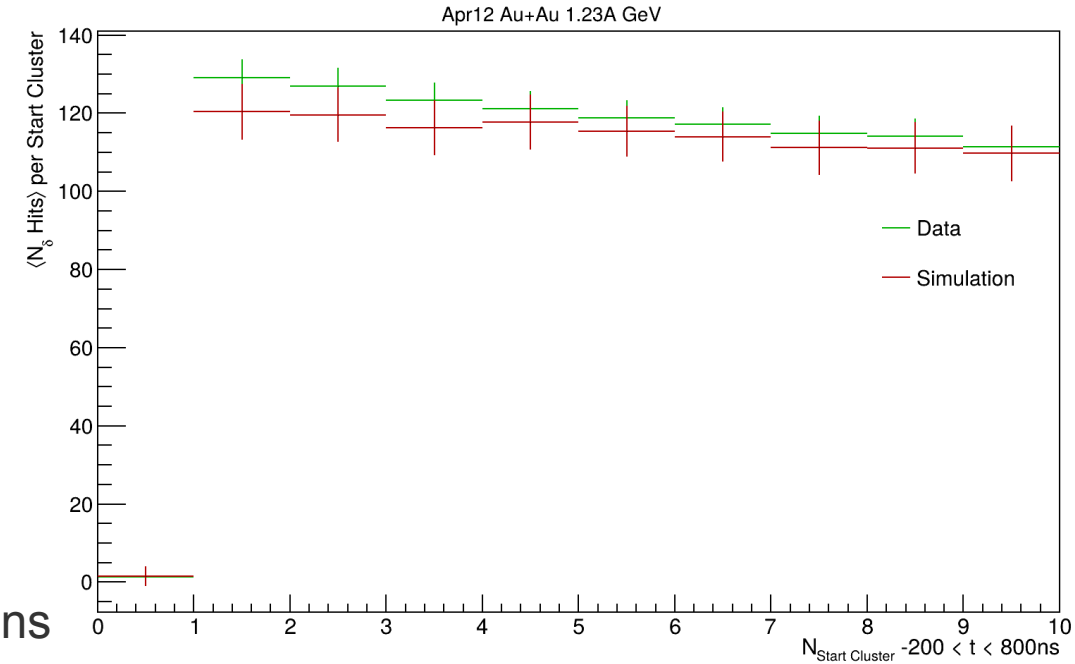
Fine tuning: The amount of δ-Electrons per Beam Ion

- Uncorrelated δ-Electron hits show almost no entries in the green region
- Expected because of the significantly higher Start Detector efficiency



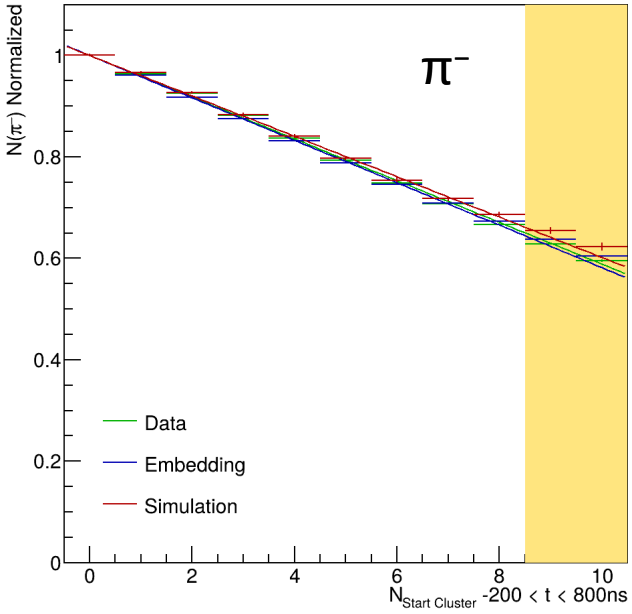
Fine tuning: The amount of δ-Electrons per Beam Ion

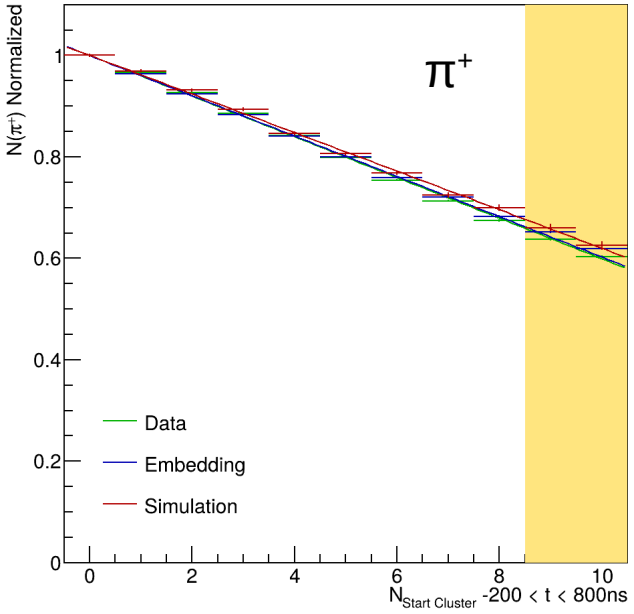
- Searching for Start Cluster from the time range -170 < t < -120ns without further Start Cluster ±100ns
- Counting the amount of MDC plane 1 and 2 hits up to 100ns after Start
- Special case 0 Start Cluster: Uncorrelated MDC hits observed between -120 and -20ns

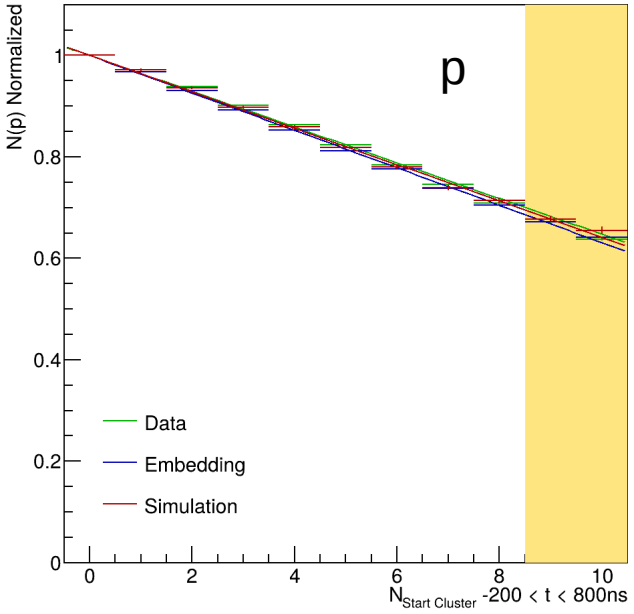


- Falling trend with NStartCluster (Not rising because of better Start efficiency)

Particle Scaling Day 108







- Slopes are very well reproduced using newly determined Scaling Factors of 1.8 for fully simulated ranges and 0.8 for ranges covered by data!


Thank you
for your
Attention!
1500
1000
500
0
−500
−1000
−1500
−2000
−1500
−1000
−500
0
500
1000
1500
2000