Λ^0 analysis in argon run

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Analysis meeting

October 4, 2021

Outline:

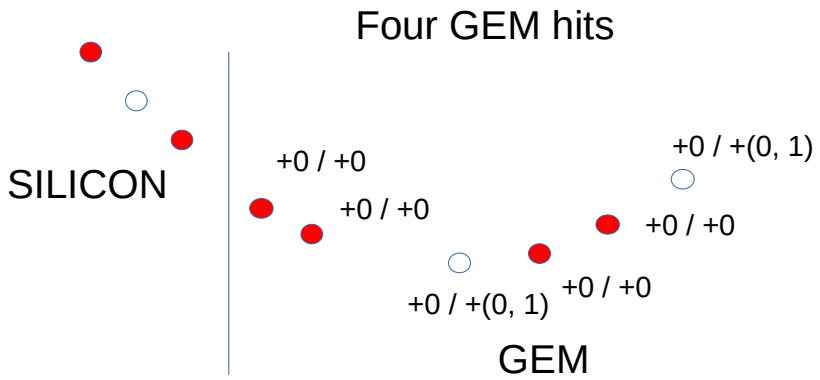
- **Towards realistic Monte Carlo simulation of BM@N Central Tracker**
- **Efficiencies of tracking procedure calculated for silicon and GEM part of BM@N Central tracker**
- **Preparations to get Λ^0 yields ...**

Calculation scheme:

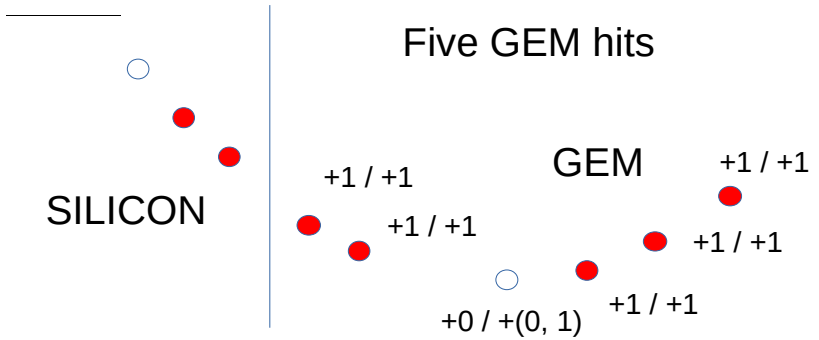
NGemHits > 3

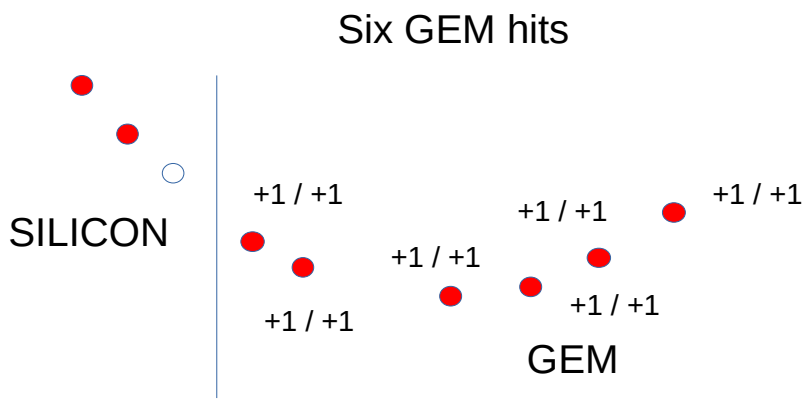
NSilHits > 1

$$Efficiency\ per\ each\ element\ of\ the\ tracker = \frac{Numerator}{Denominator}$$

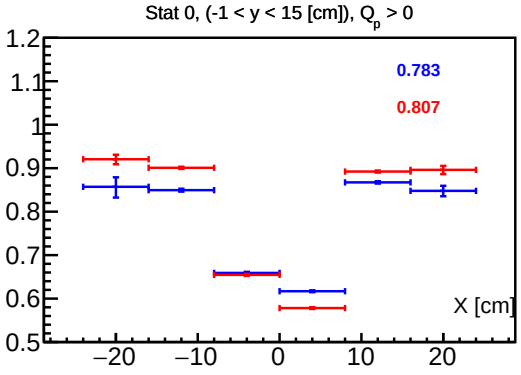


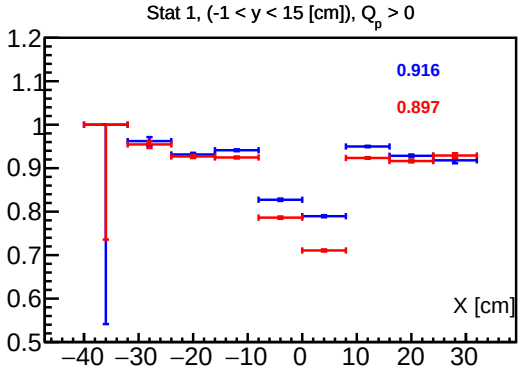
Acceptance: +(0 - outside, 1 - inside)

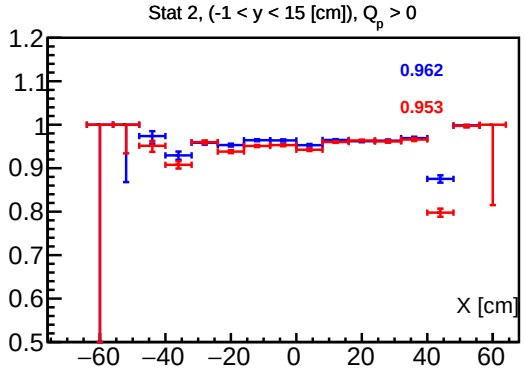


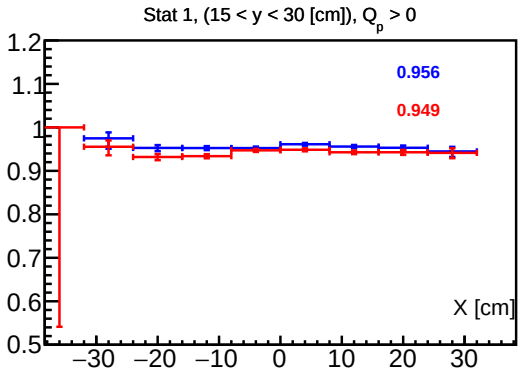


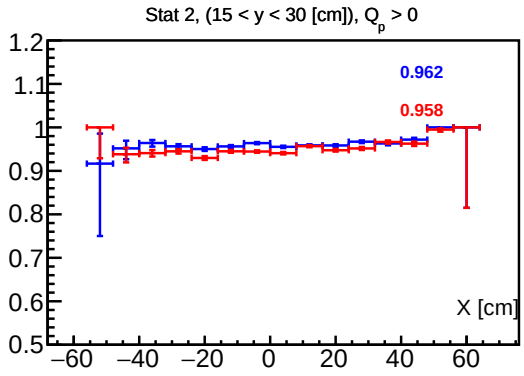
GEM efficiencies for Monte Carlo and data

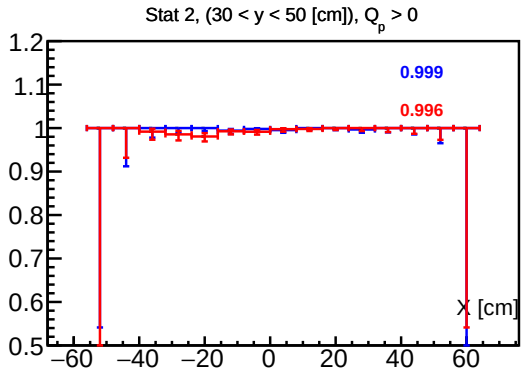












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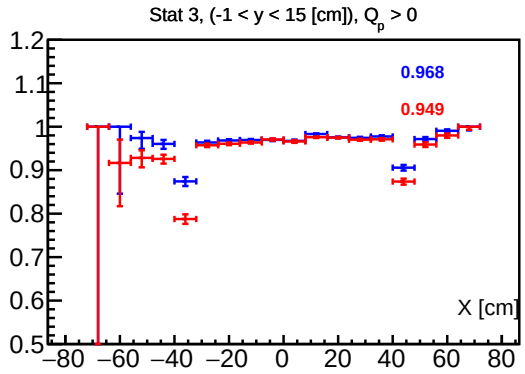
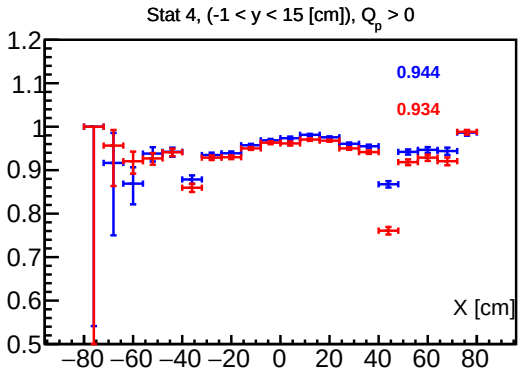
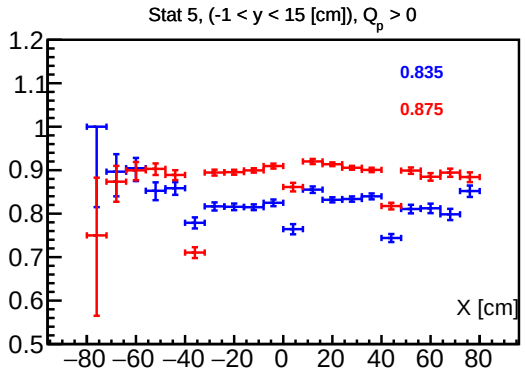
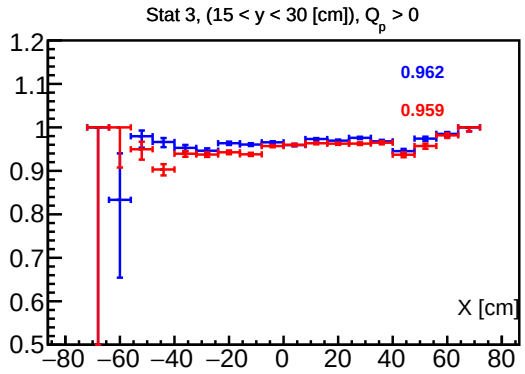
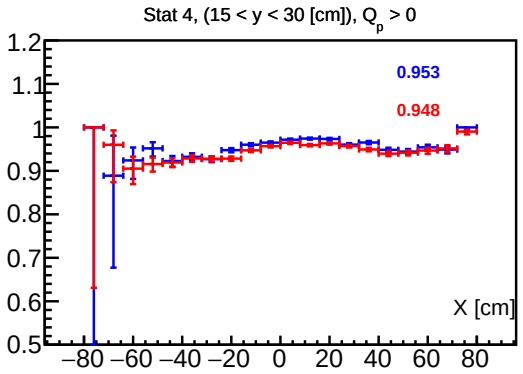
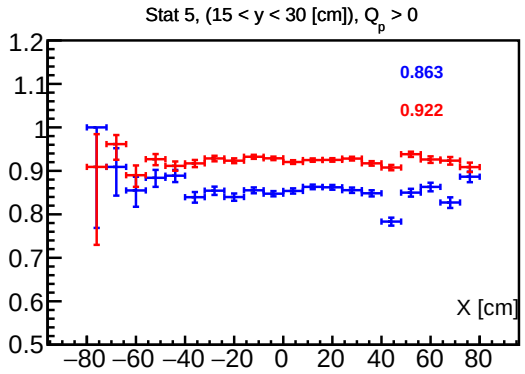


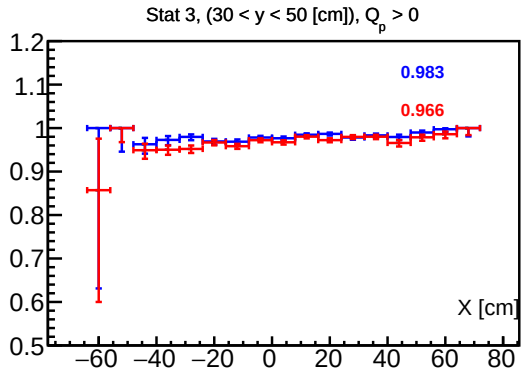


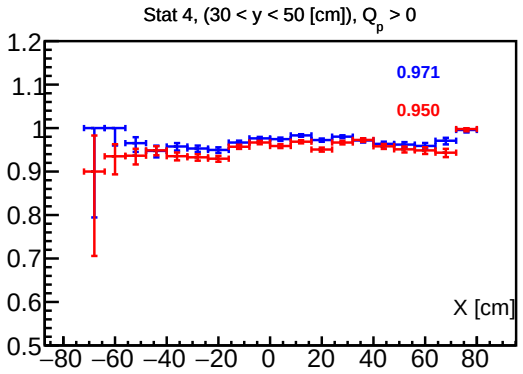


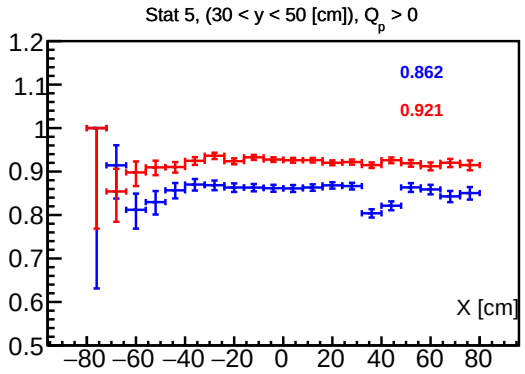




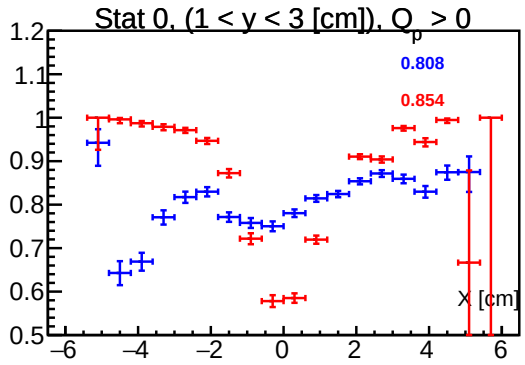


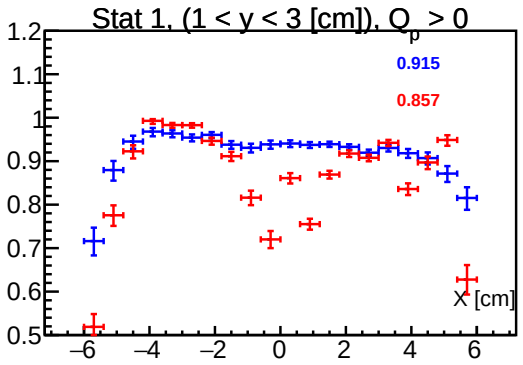


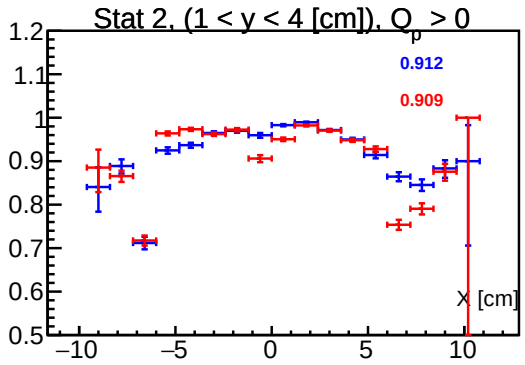


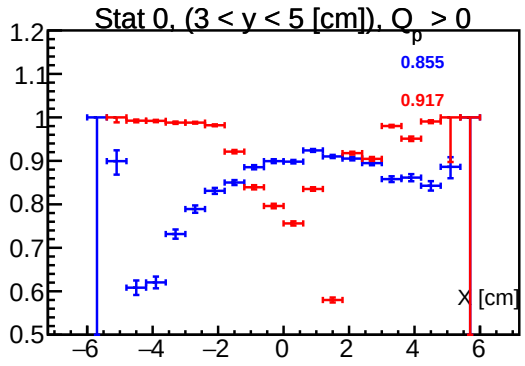


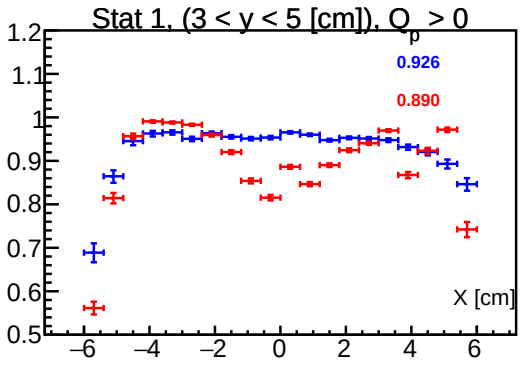
SILICON efficiencies for Monte Carlo and data

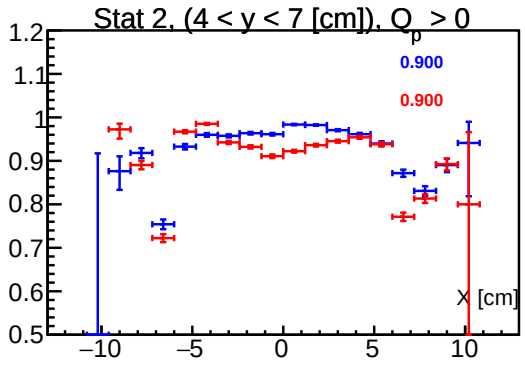


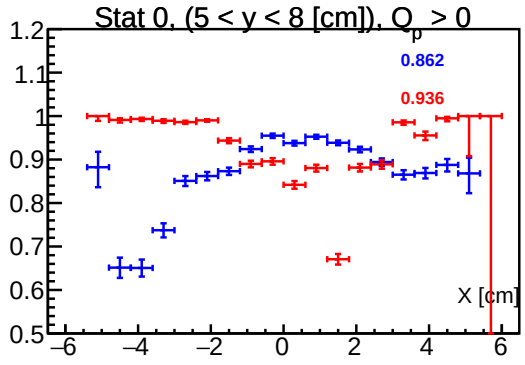


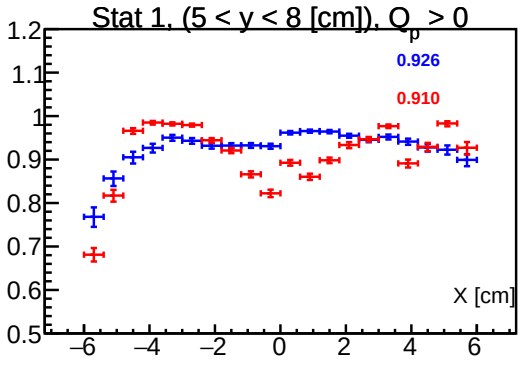


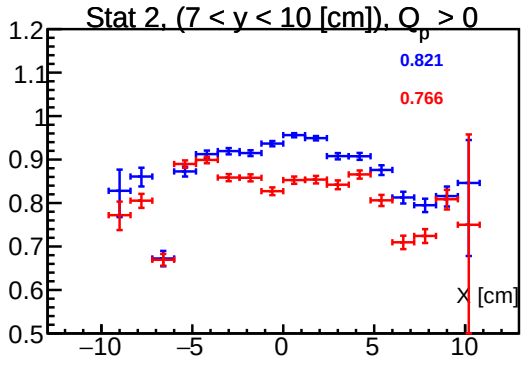






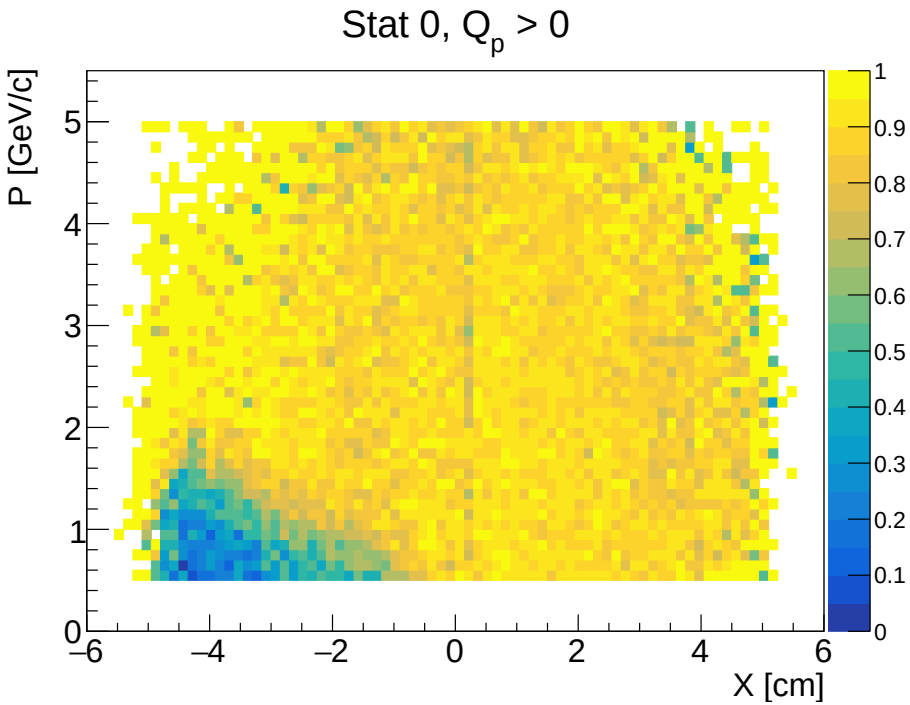


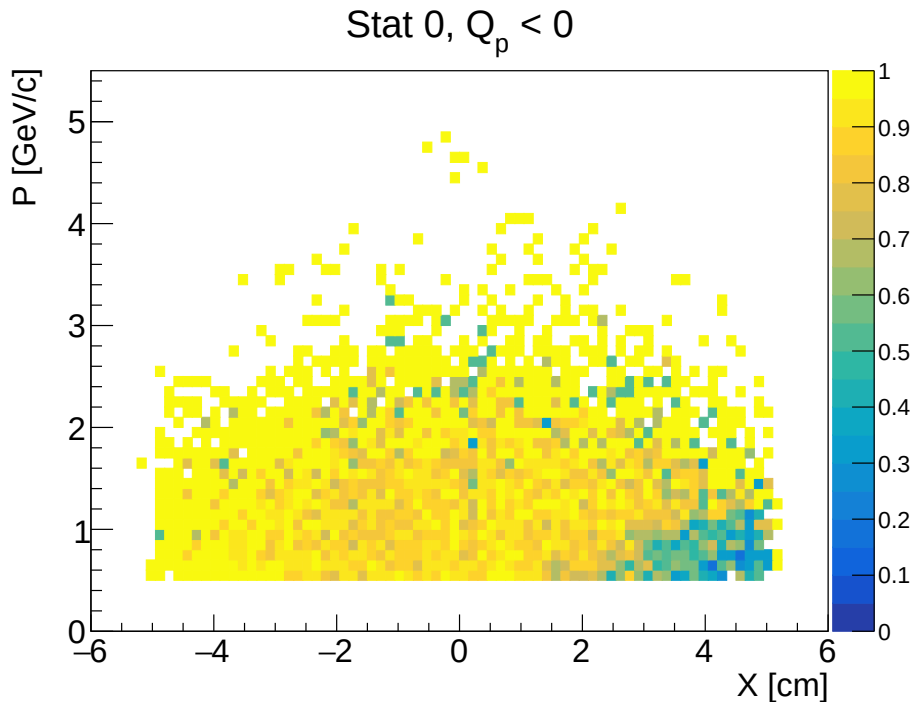




Area of low efficiency in Monte Carlo (SILICON)

- Big discrepancies in some ranges along X-axis
- Central area should be corrected more precisely

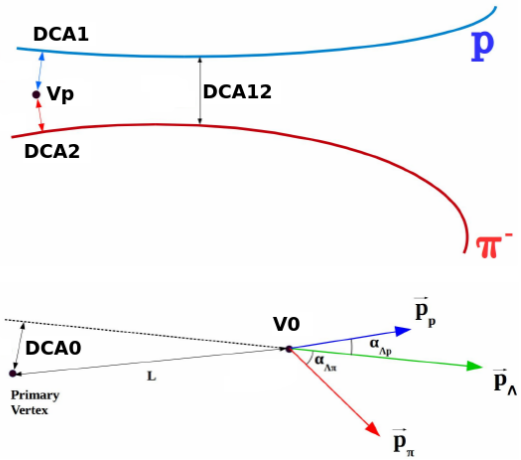




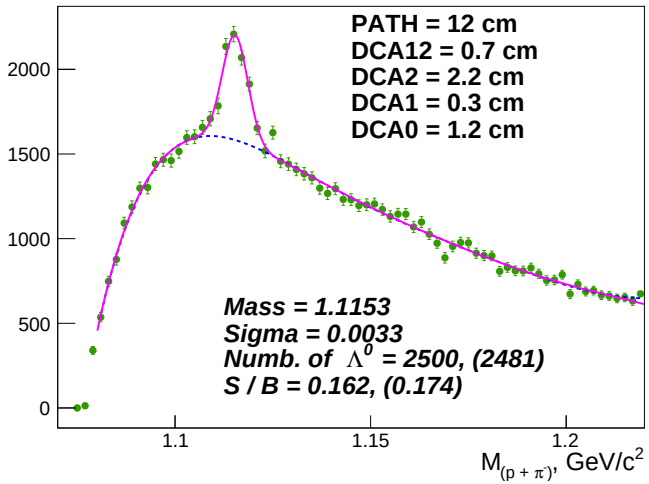
- Efficiency gap corresponds to area, where negligible part of tracks have first point ($<< 1\%$)

Looking at reconstructed Λ^0 in data and Monte Carlo

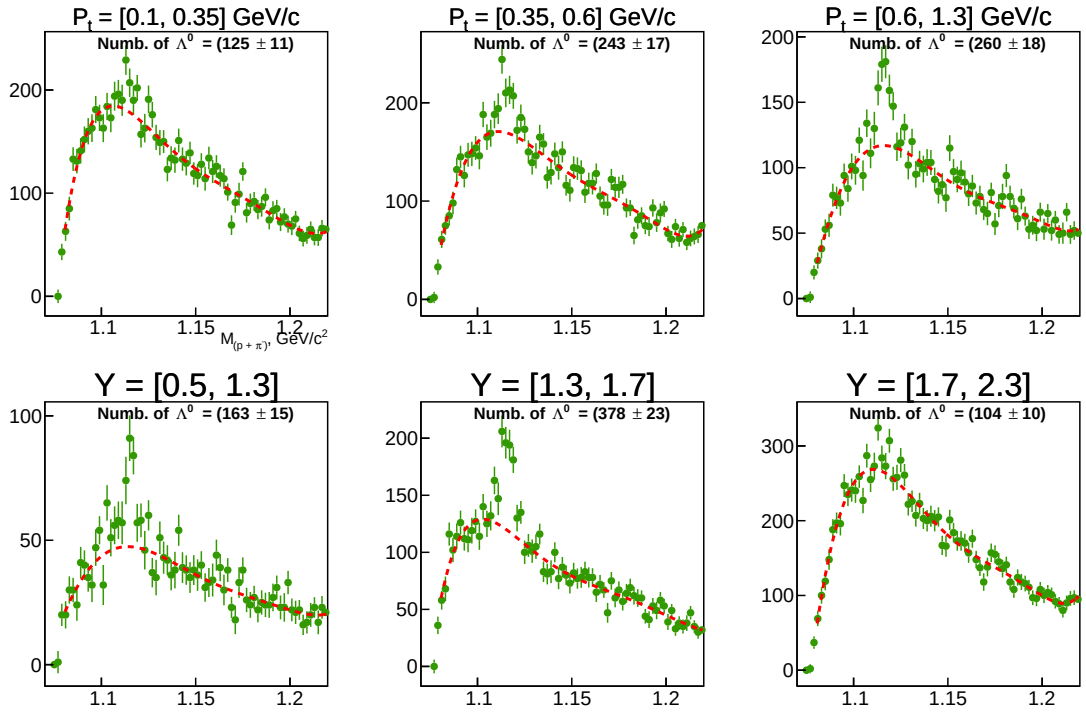
- Done for all targets
- Three chosen P_t bins: (0.1, 0.35), (0.35, 0.6) and (0.6, 1.3) GeV/c
- Three chosen Y bins: (0.5, 1.3), (1.3, 1.7) and (1.7, 2.3)
- Lower value of first bin and upper value of last bin were chosen not to suppress signal significantly (done when analyzing all targets)
- For each chosen bin $(S \pm \Delta S)$ is estimated



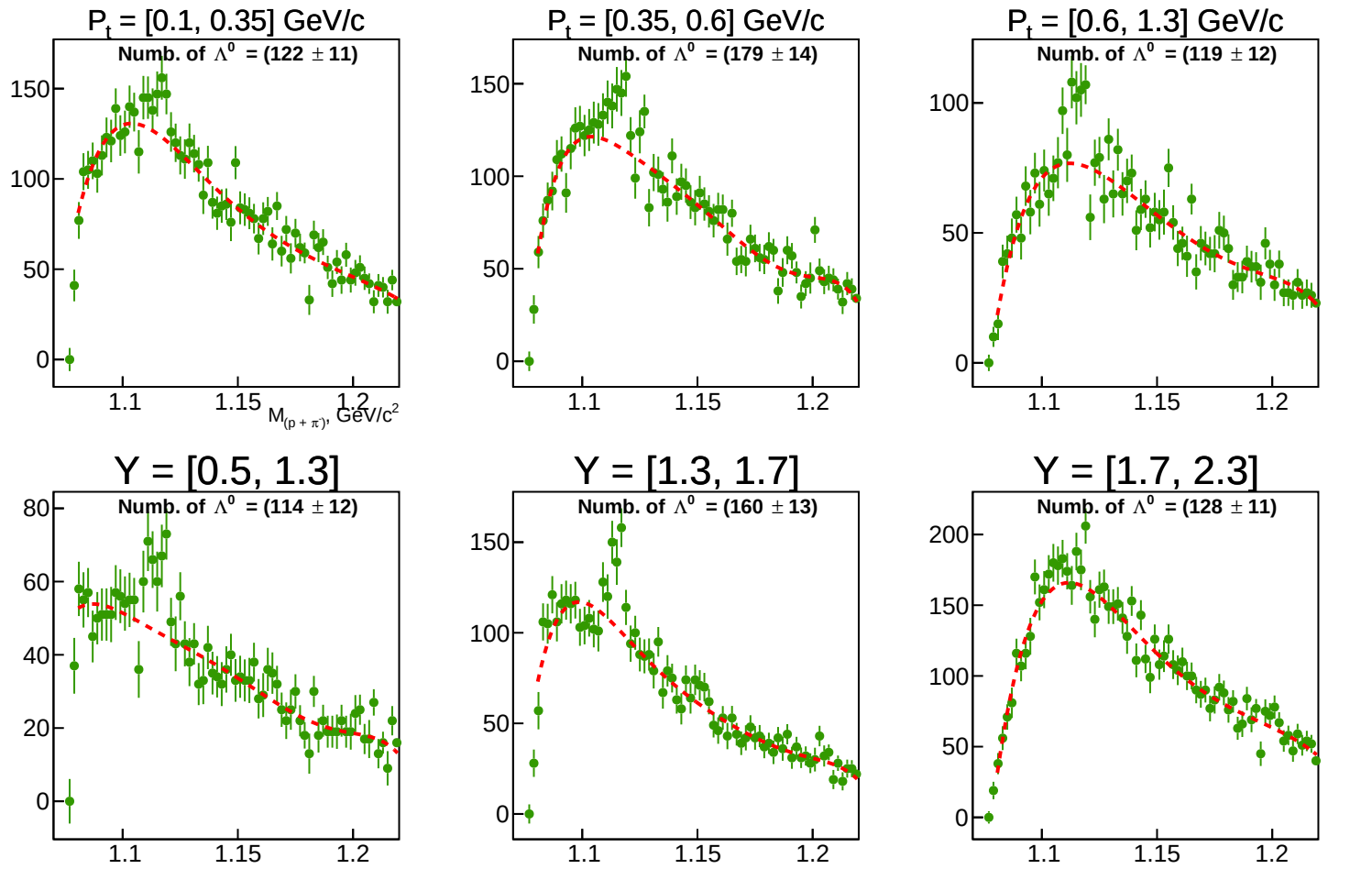
Invariant mass: $\Lambda^0 \rightarrow \pi^- + p$ (Al Cu Pb Sn)



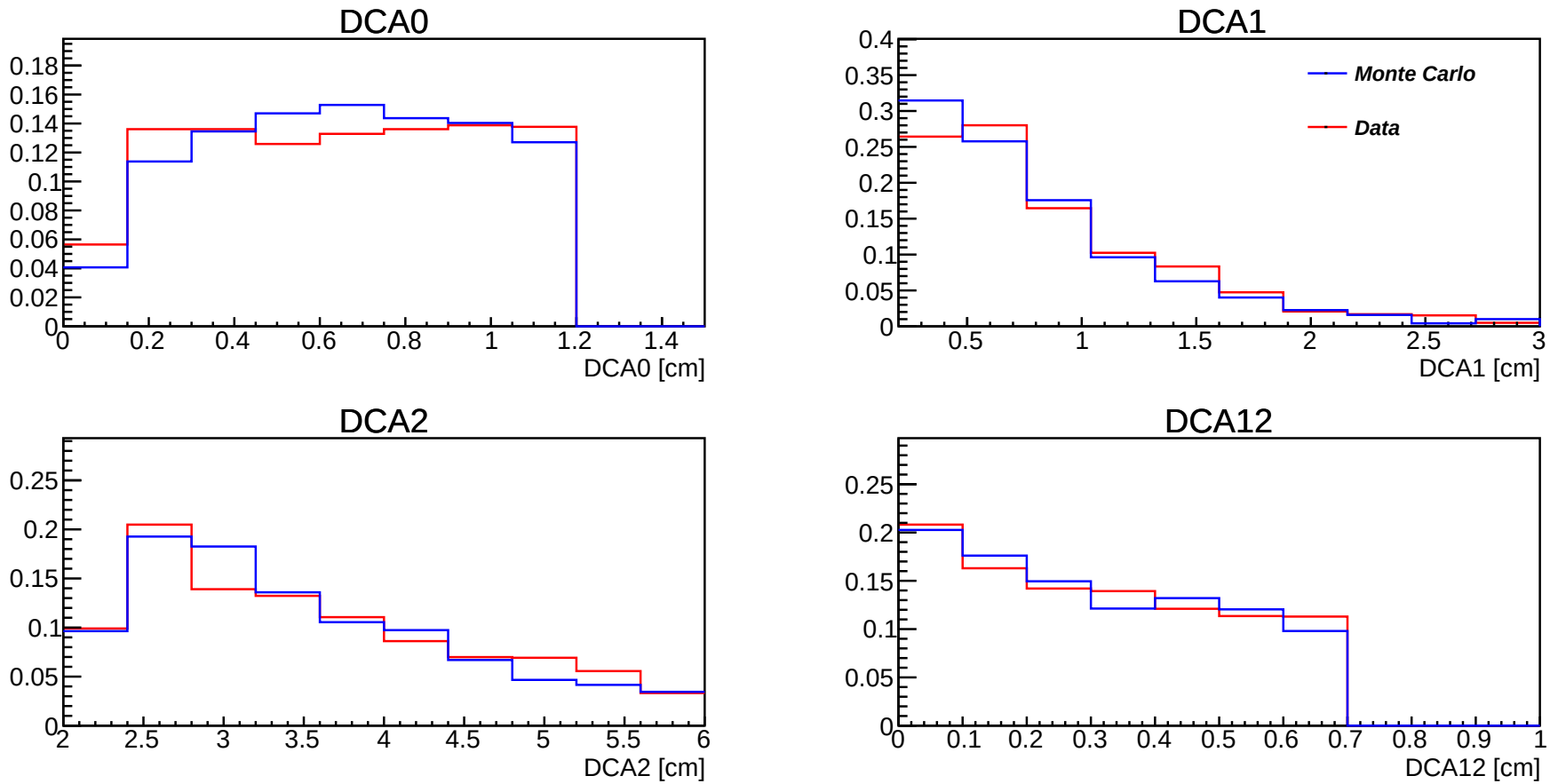
Target: Cu



Can we use this version of MC to get yields?

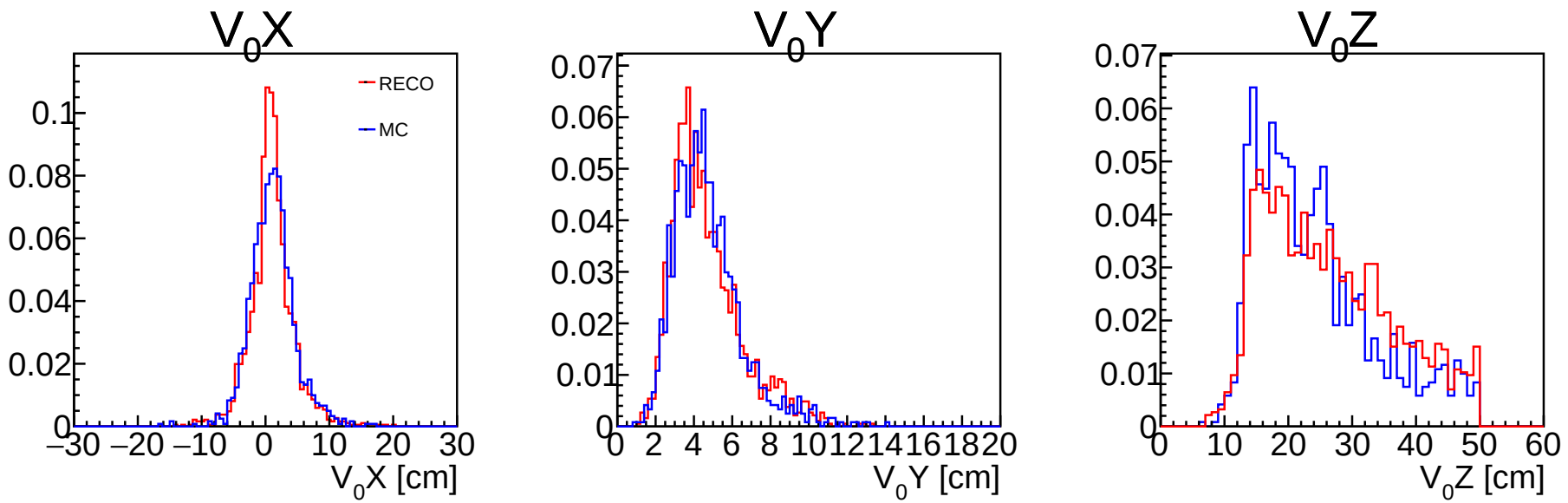


Geometrical cuts in data and Monte Carlo



- Achieved relatively good agreement between Monte Carlo and data by making use of the same set of geometrical cuts

Reconstructed V_0's in data and Monte Carlo



- **Found secondary vertices correspond to selected signal range ($\pm$ 3 MeV/c^2) in the mass spectrum**
- **Relatively good agreement in X- and Y- directions, some discrepancies are visible in Z.**

Conclusion:

- **Improved Monte Carlo of the BM@N Central Tracker seems to be almost "matured": some small fixes for silicon part of the tracker required**
- **Suppression of Λ^0 signal looks reasonable in Monte Carlo if compared with experimental data**
- **Next step of the work consists of getting Λ^0 yields for all targets**