

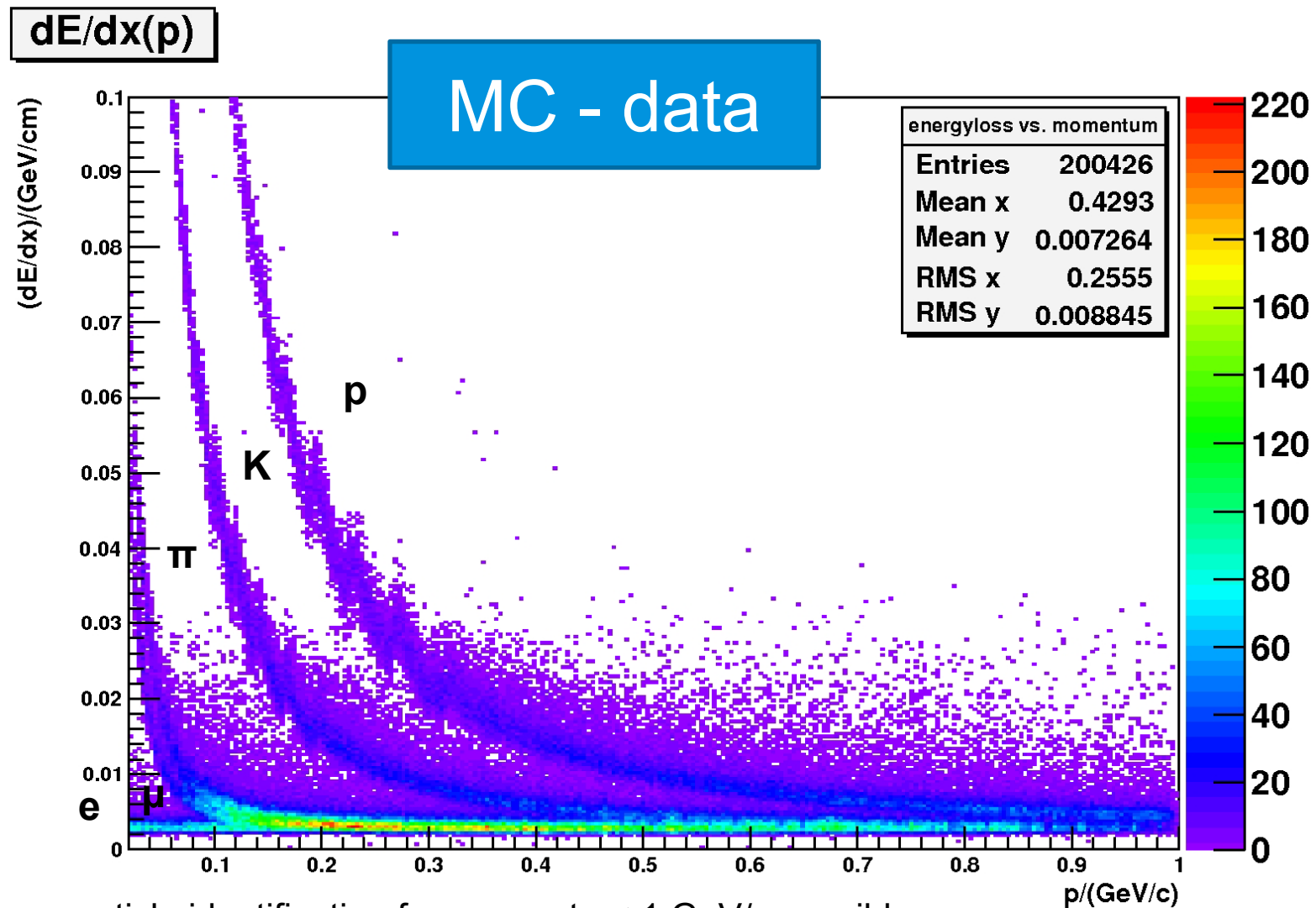


PID: dE/dx with the MVD

Content

- introduction
- dE resolution of MVD
- dx resolution
- track reconstruction
 - momentum resolution and reconstruction efficiency
 - comparison with former data

Energy loss for different particles

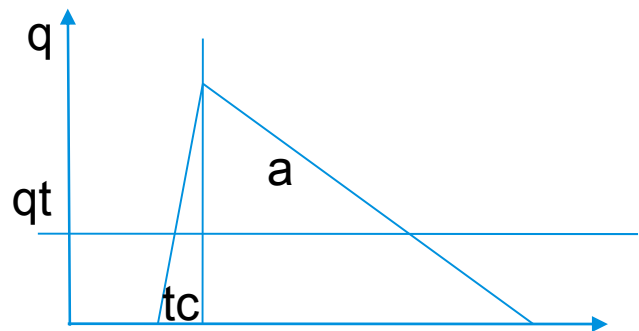


- particle identification for momenta < 1 GeV/c possible
- here: MC data, GEANT 4, $\Phi = [0..90]$, $\Theta = [0..360]$, one p, K, π , μ , e per event

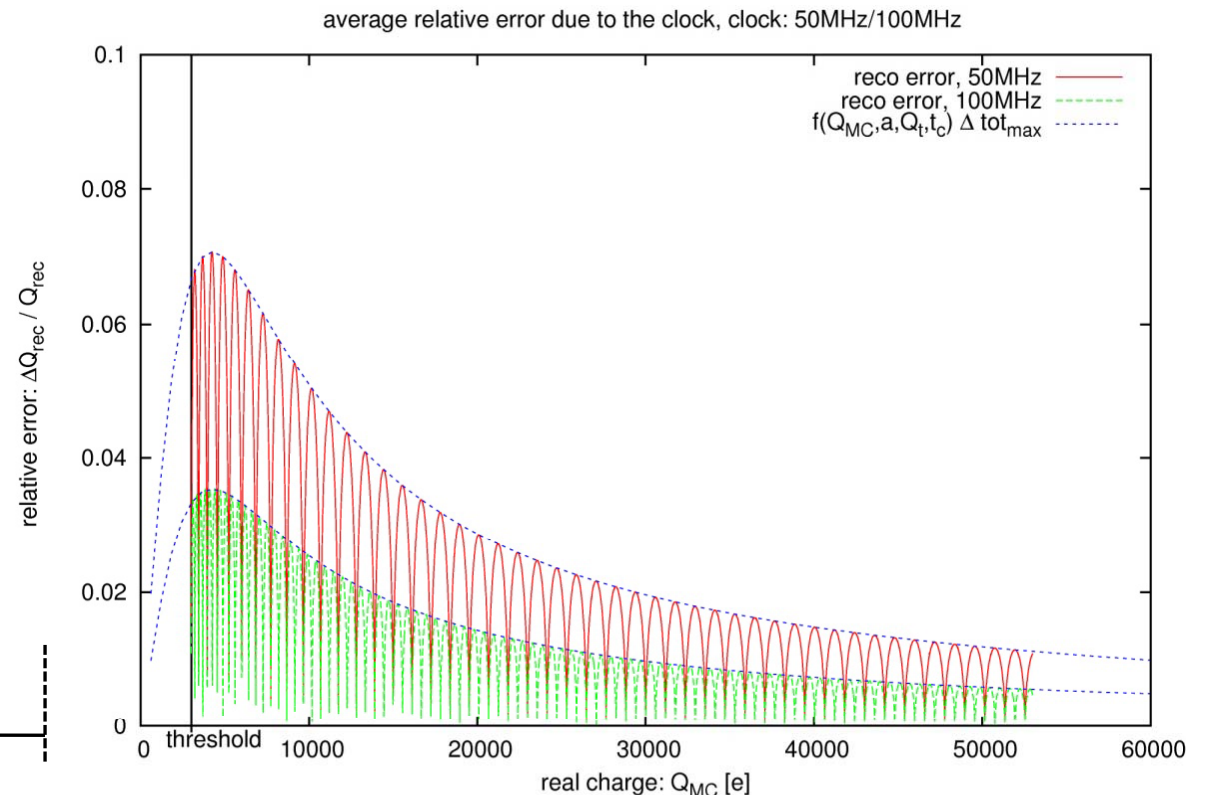
Effects on energy resolution

- chip frequency \rightarrow quantized TOT \rightarrow quantized rec. energy
 - reco error and clockfrequency are inversely proportional

model:

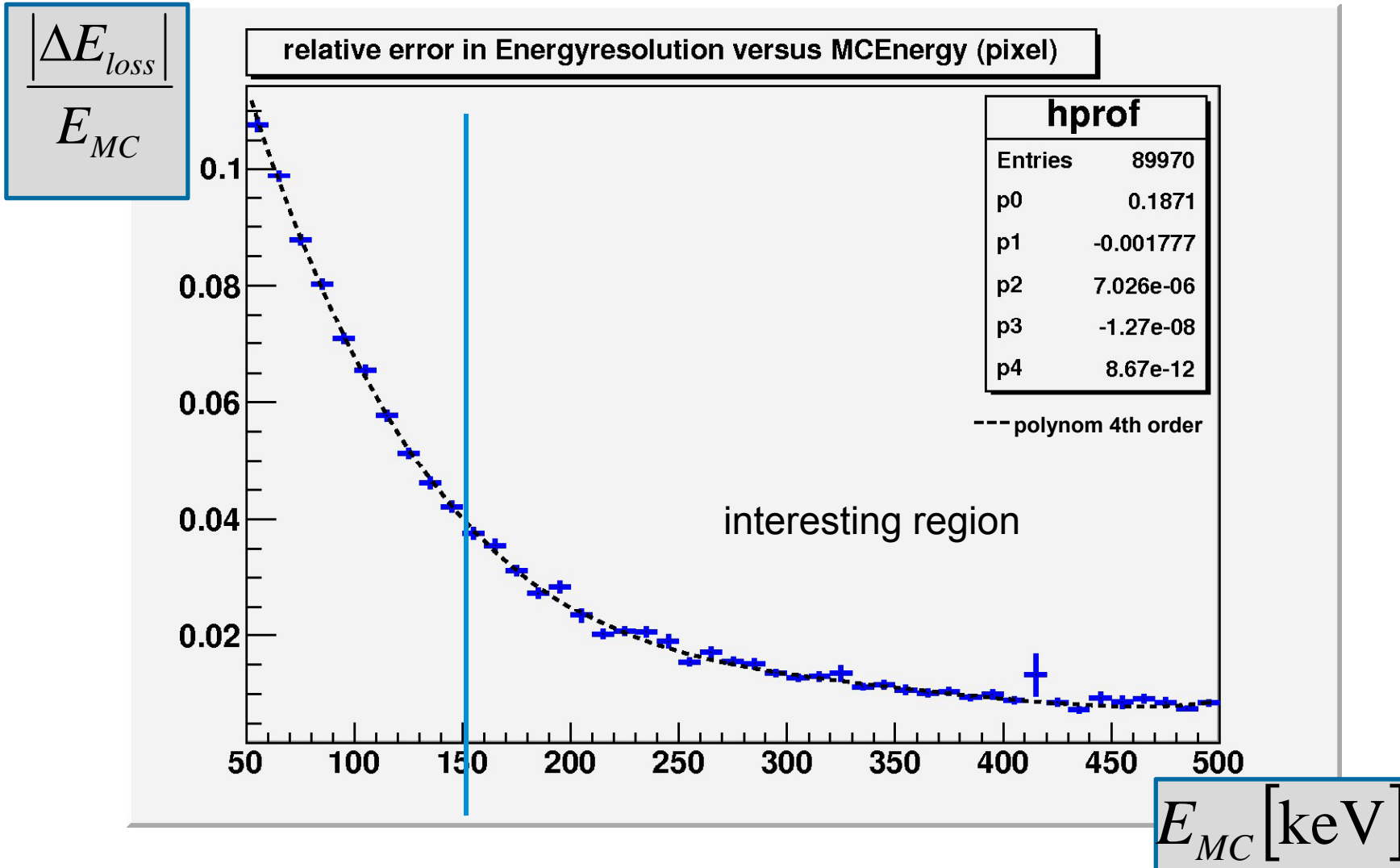


charging time t_c : 100ns
 const. current a : 60e/ns
 threshold q_t : 3000e



- production of secondaries
- noise of a digi and number of digis per reco hit

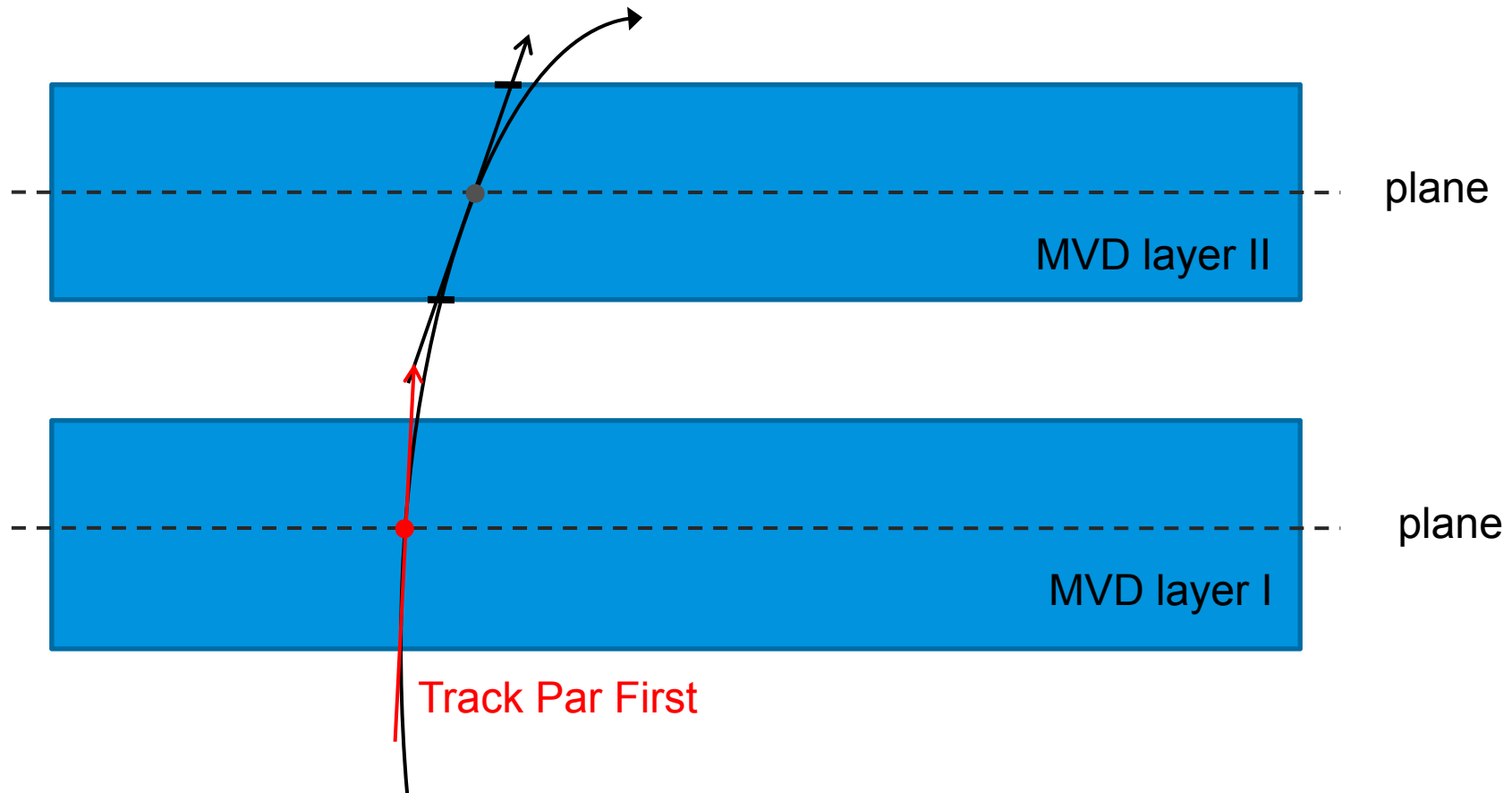
Energy Resolution



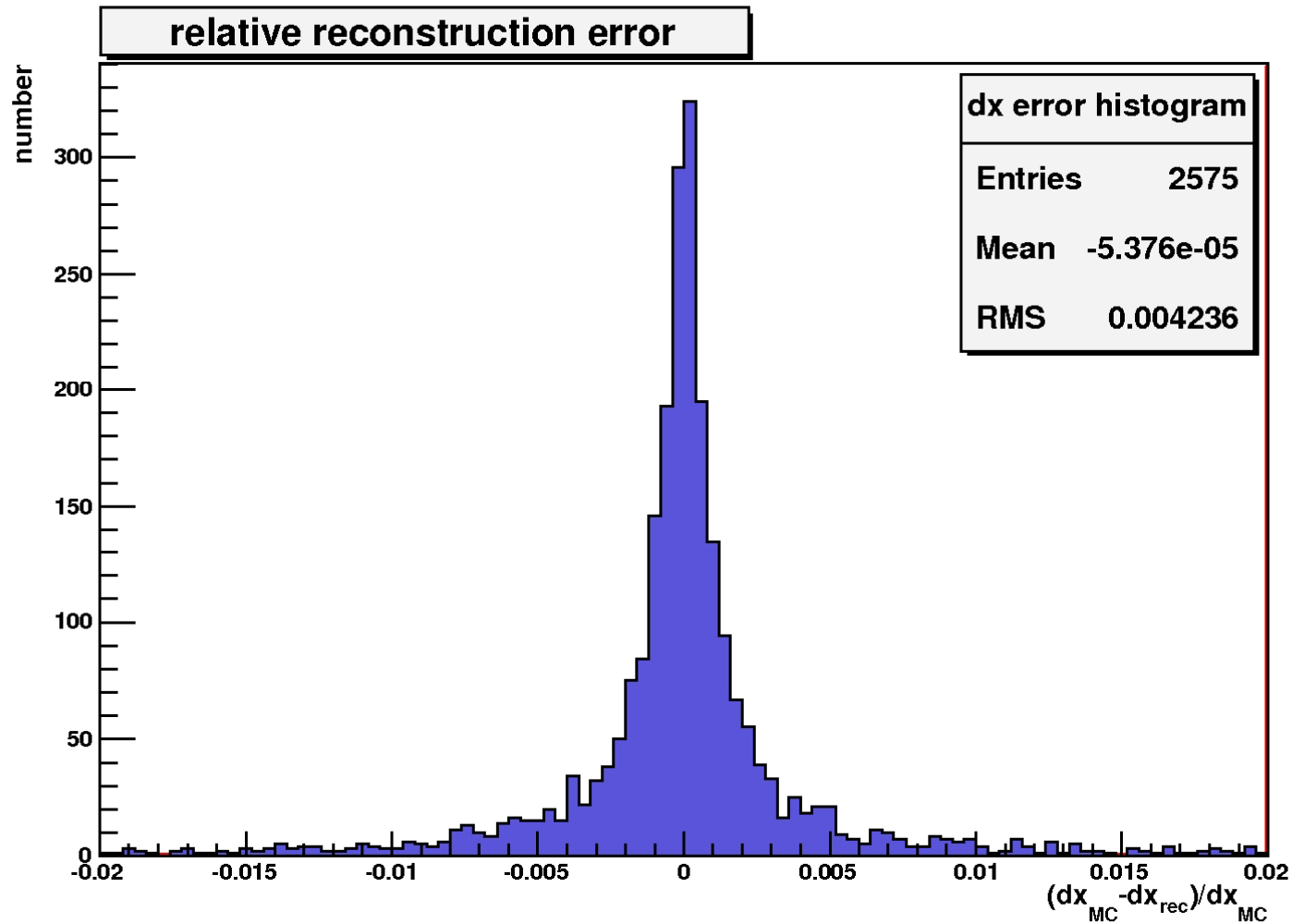
- here: GEANT 3, $\Phi = [0..90^\circ]$, $\Theta = [0..360^\circ]$, p, K, π , μ , e @ 0 .. 1 GeV/c, clock 50 Mhz
threshold,: 3000e , noise: 200e

dx resolution

- method:
 - propagation of TrackParFirst from reconstructed PndTrack through the MVD layers
 - dx: length of momentum vector in detector layer



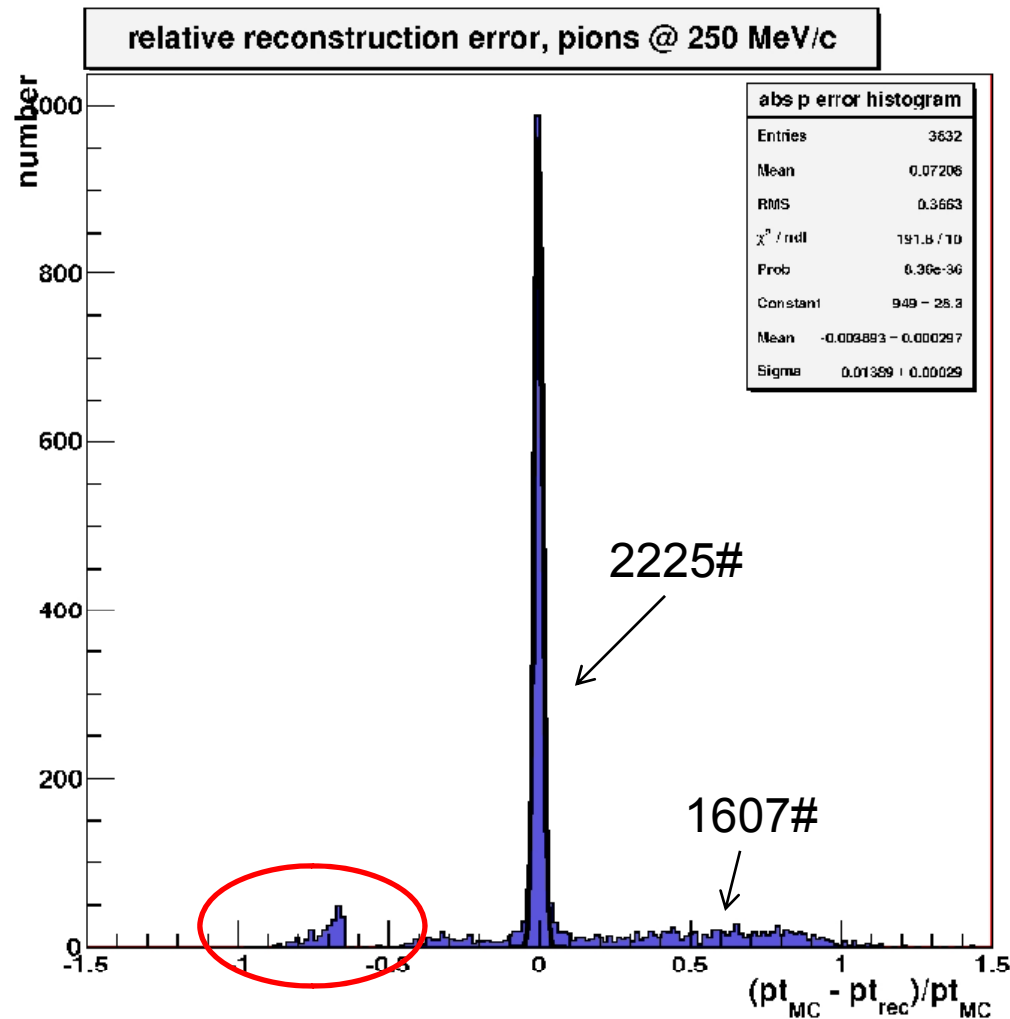
dx resolution



- here: Kaons, only primaries
- resolution better 0.5%

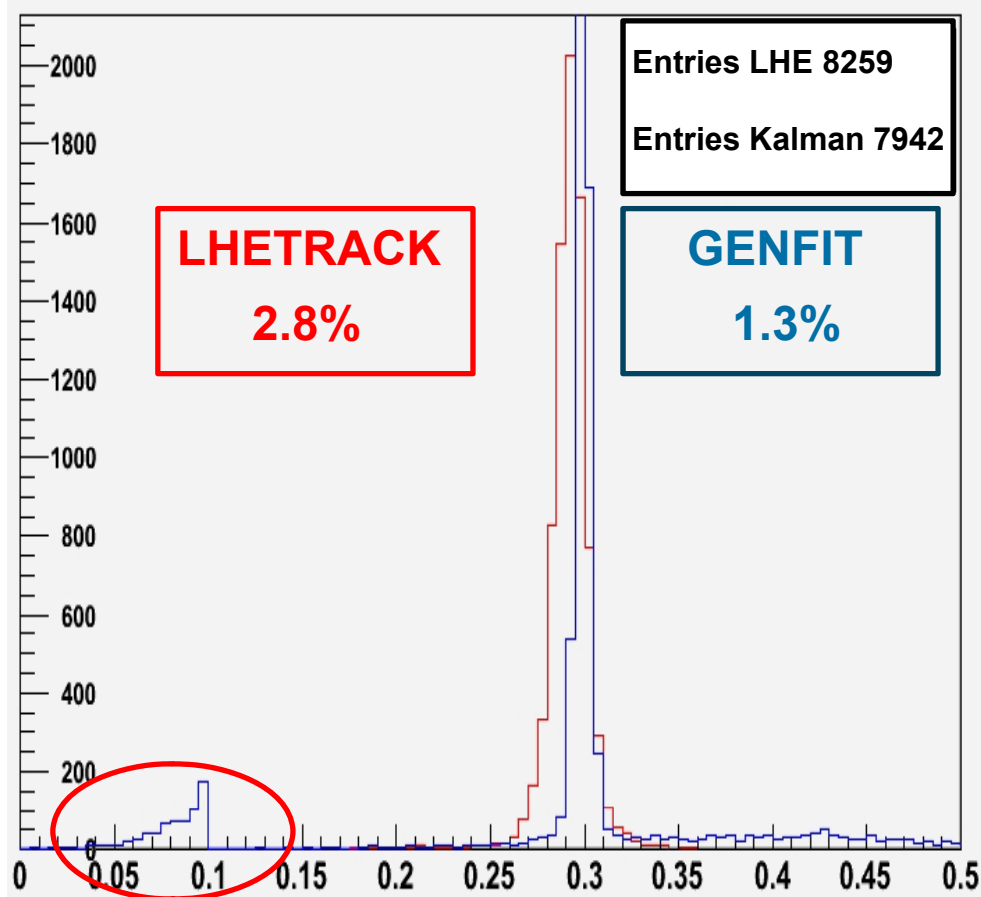
Momentum resolution (here: Pions @ 250 MeV/c pt)

- reco. Mom. by: PndTrack → TrackParFirst → momentum
- MC Mom. by: PndTrack → PndCandidate → GetSortedHits → Index of first MVD Hit

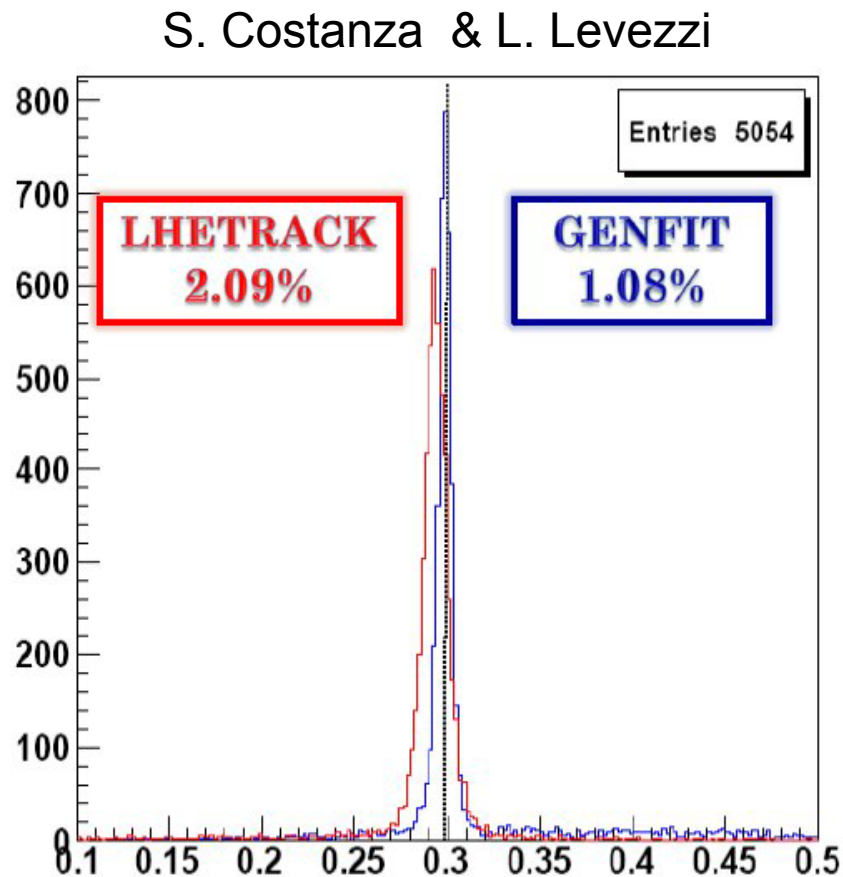


- simulation parameter:
 - GEANT 3, boxgen.
 - $\Phi = 60^\circ$, $\Theta = [0..360^\circ]$
 - Lhe tutorial macros + ideal track finder
 - Kalman task
 - MVD + STT
- observation:
 - **strange region**
 - a lot of background:
 - 1-2% resolution for < 60% events
 - error up to 300%

Muons @ 300 MeV/c total momentum comparison with former results, STT+MVD



with Lhe ideal track finder

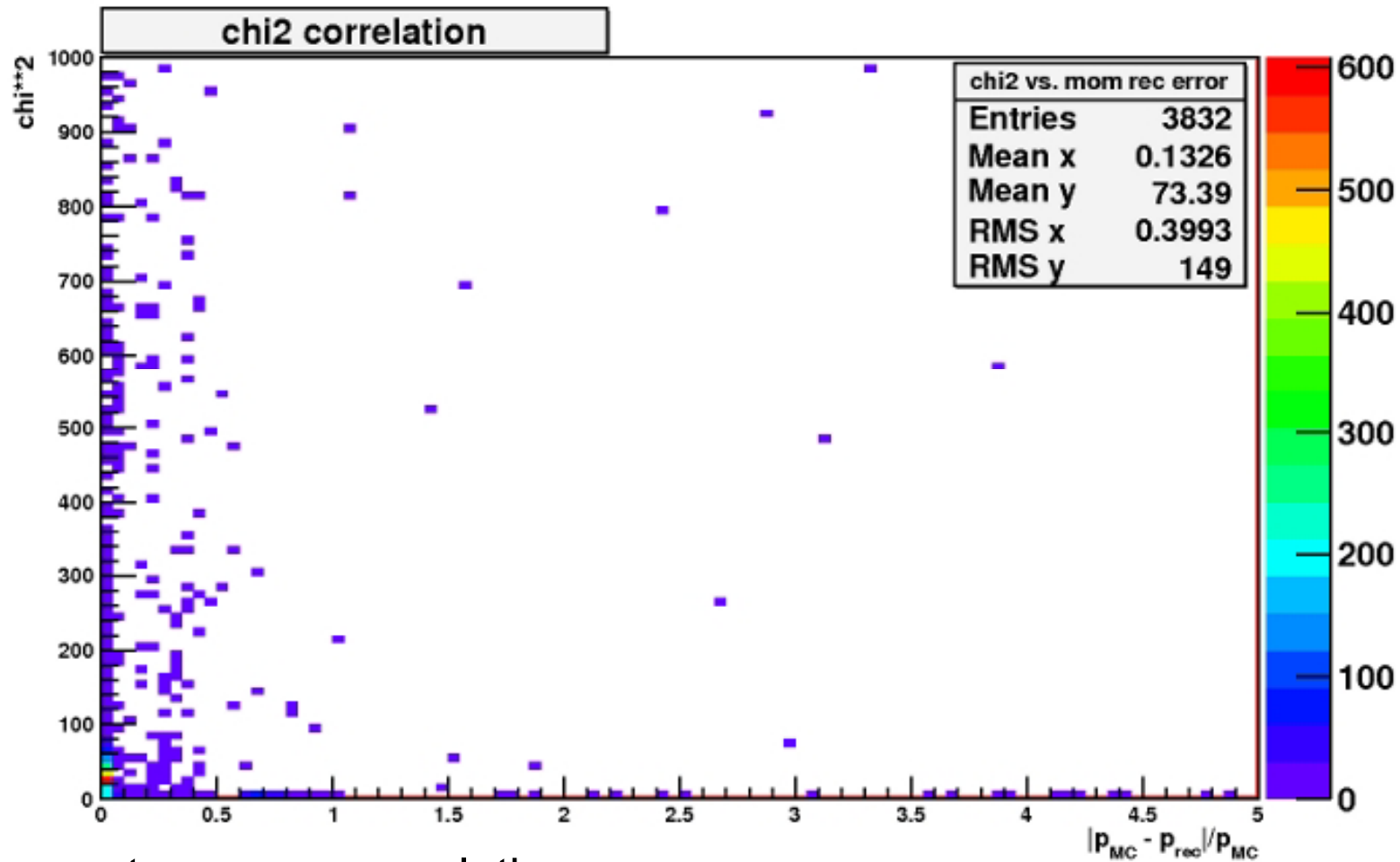


without ideal track finder

Kalman task improves the mom. resolution and enlarges background...

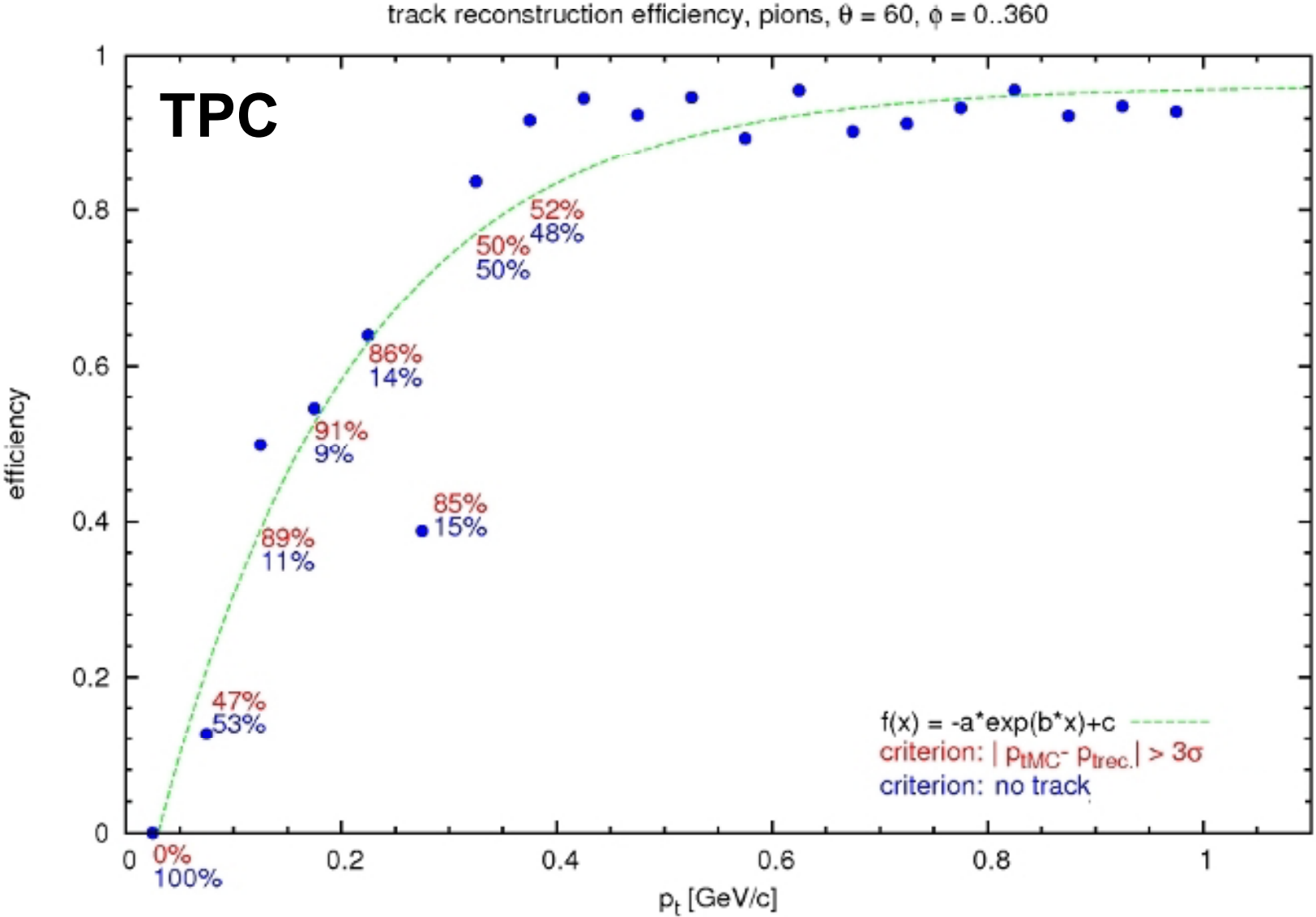
How to identify a „bad“ fit for mom. reco.?

- idea: χ^2 from PndTrack a good indicator for the momentum resolution



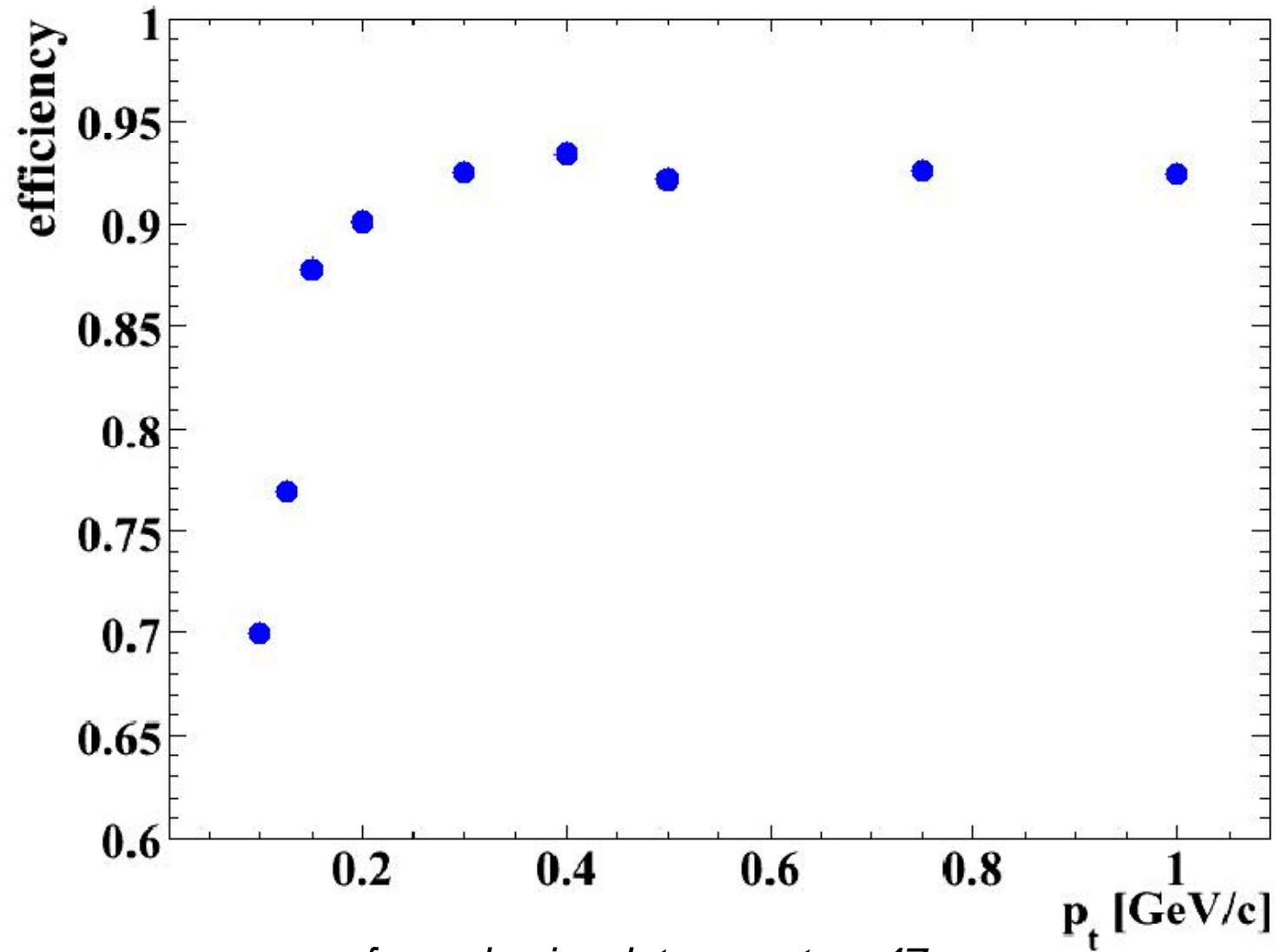
- easy to see: no correlation

Momentum reconstruction efficiency



Former data with Barbar framework

global track reconstruction performance, STT + MVD



from physics data report, p. 47

Summary and outlook:

- **energy resolution** (for pixel MVD): **< 4%**
- **dx resolution**: **<0,5%** (tested for Kaons)
- **mometum reconstruction**:
 - very dependend of the particle type
 - GenFit produces background? Bug?
- further studies have to be done for the five particles (P,K,pi,mu,e)

Thank you for your attention!

appendix: STT track reco efficiency

