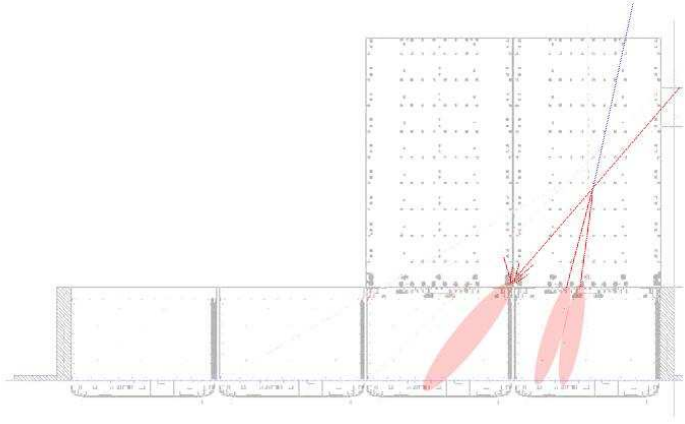
GLAST CERN 2006 Beamtest



Tkr Hits for PS proton runs

Johan Bregeon (INFN-Pisa)

October 12th, 2006

Runs

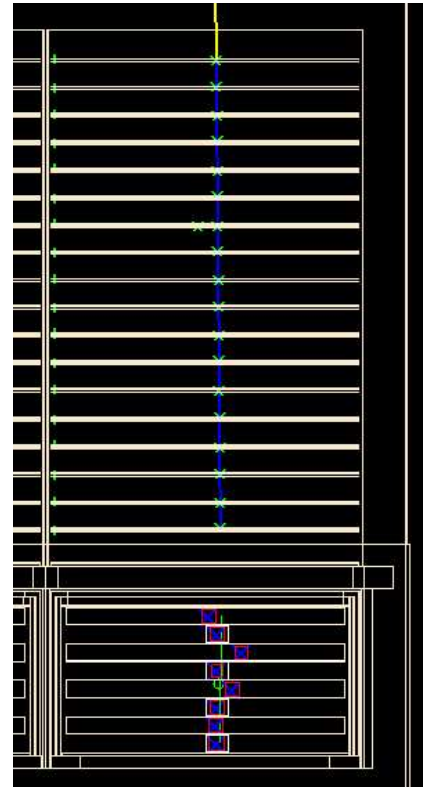
- 6GeV protons : data run 700001423
- MC run 156 LHEP hadronic model
- MC Custom run 1423 : LHEP - better beam spot
- MC run 181 Bertini hadronic model
- Center of Tower 3 : [561, 13, 0] at 0 degree

Which events ?

Ionizing Only particles

- First and Last TKR layer have only 1 hit per plane : no hadronic interaction in the TKR
- $TkrTotalHits \geq 36$: avoid gaps
- 8 logs hit in the CAL and $CalEnergyRaw < 150MeV$: no backsplash

Typical event

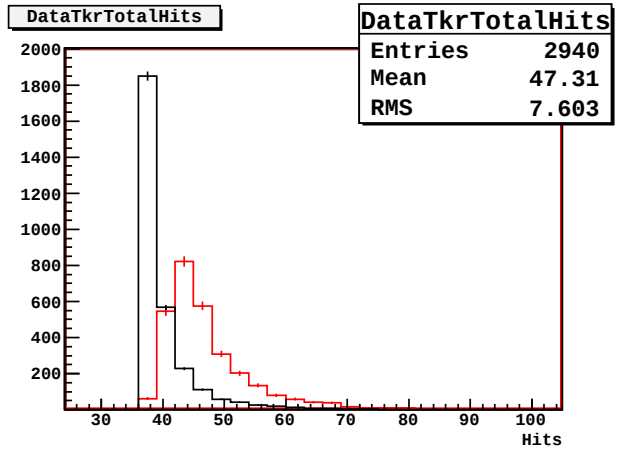


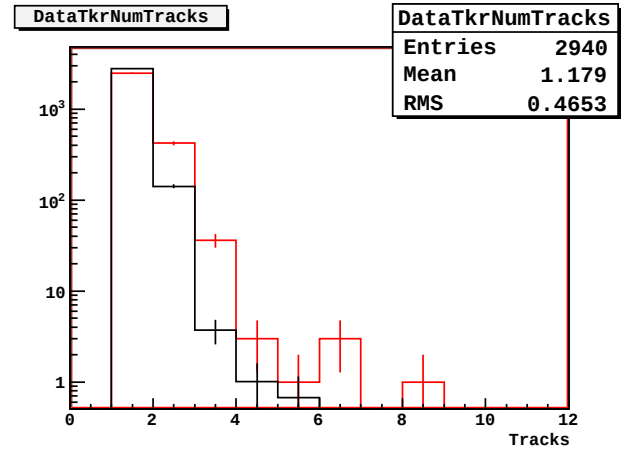
Basic Tracker Variables

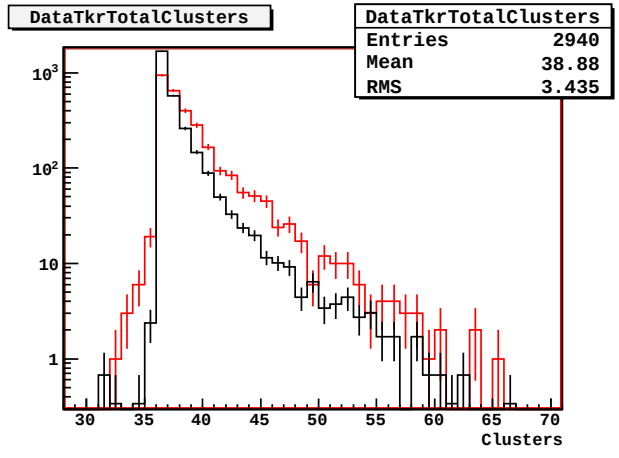
Data-1423 and MC-156

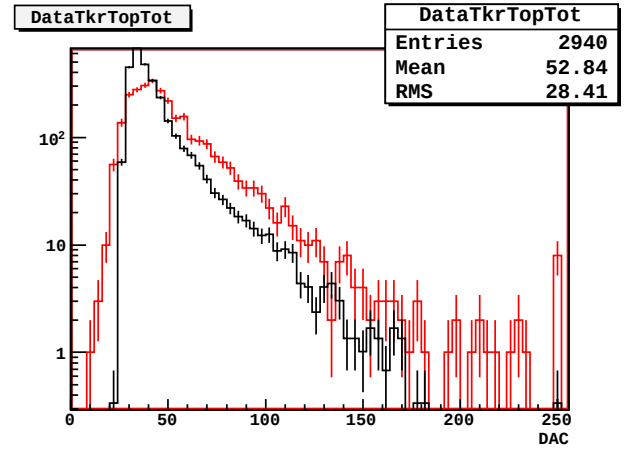
Data show

- more Hits
- more Tracks
- more Clusters
- more ToT



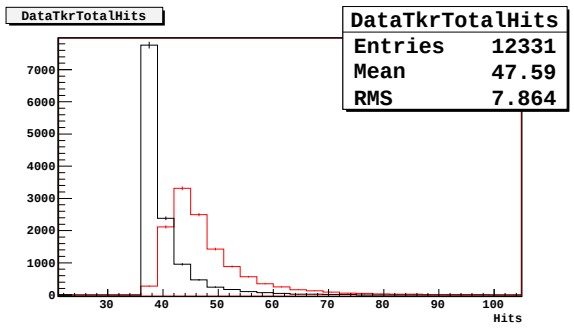


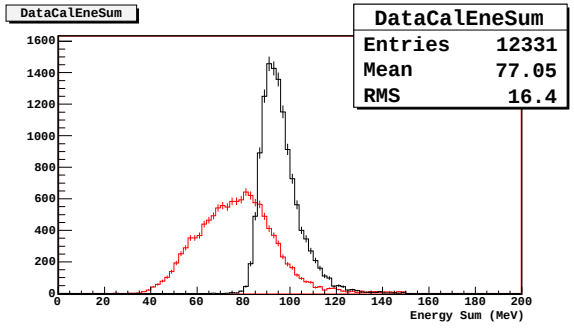




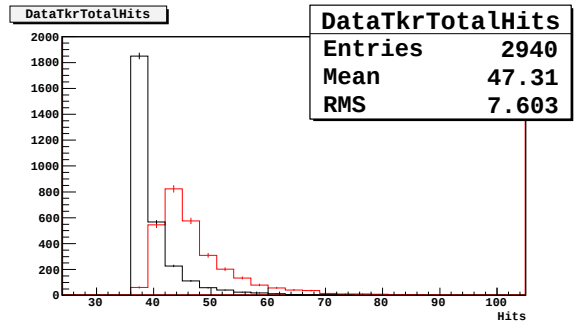
Delta Event Time

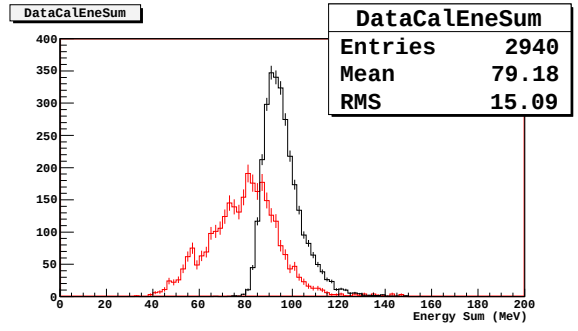
All MIPS



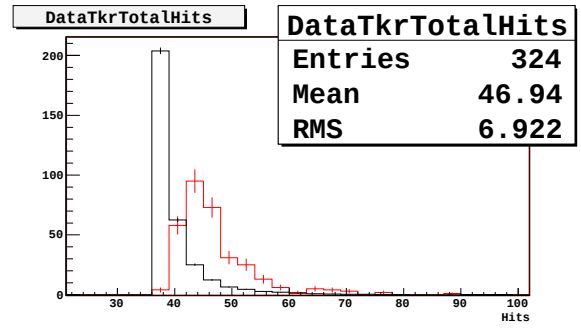


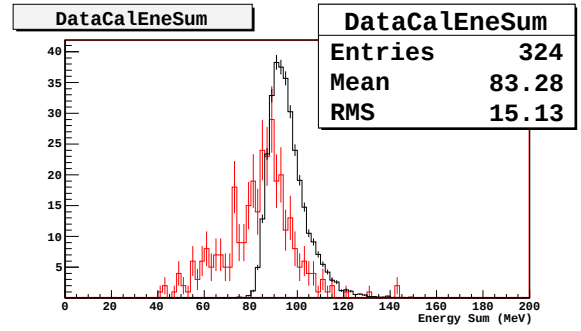
DeltaTime>1ms





DeltaTime>3ms

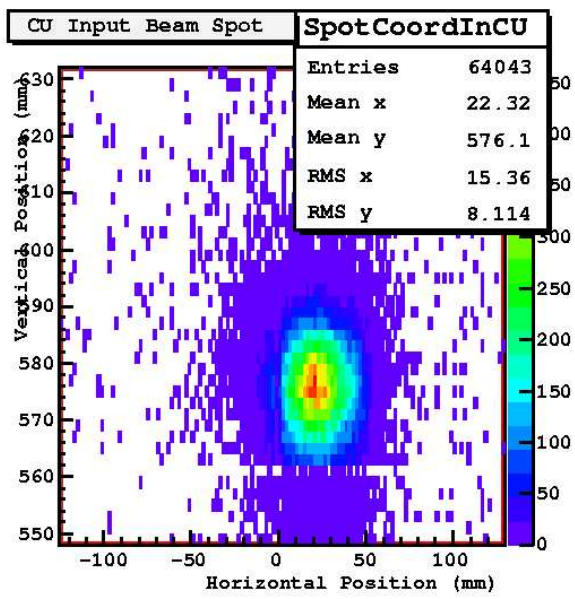




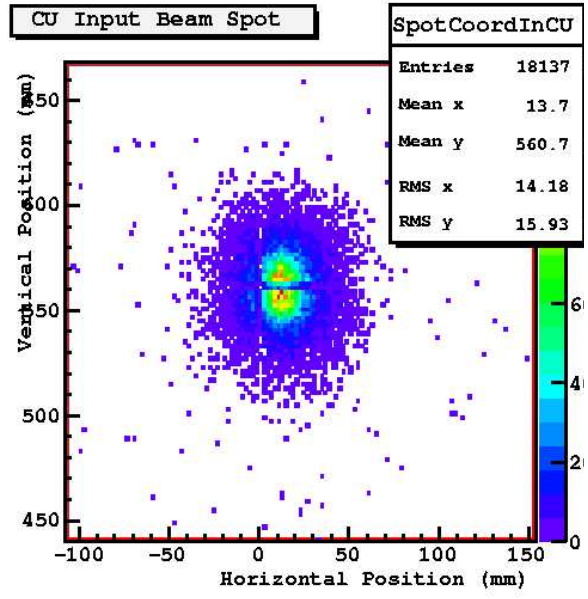
- strong impact on CalEnergyRaw, but it's not a problem for events we want to select : $CalEnergyRaw < 150MeV$
- no impact on TkrTotalHits, we'll use $dtime > 1ms$

Beam Spot

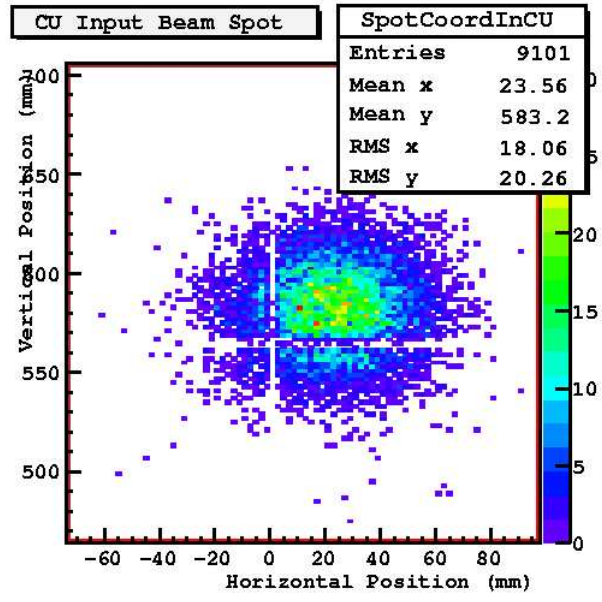
DATA



MC-156



Custom MC



- Custom MC Beam Spot is in better agreement with data.
- Beam divergence is slightly bigger in Monte-Carlo
- Table/Beam angle is [H,V]=[$0.5°$,$0.5°$] in data, but is [$0.°$, $0.°$] in MC-156 and [$0.5°$,$0.°$] in Custom MC.

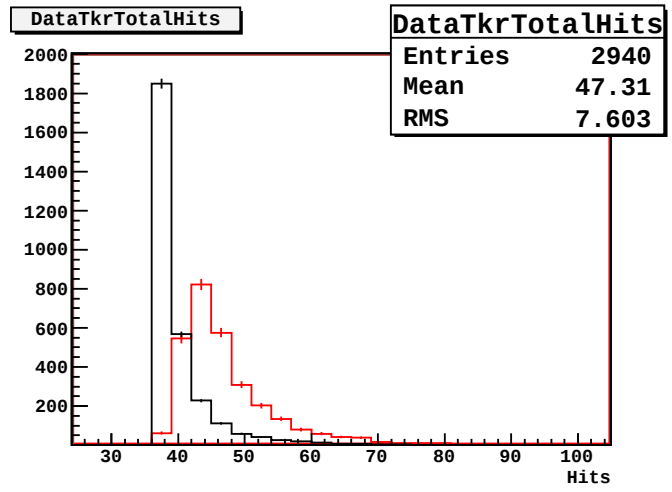
$\Rightarrow$ Custom MC Beam Spot is not too bad...but that makes no differences

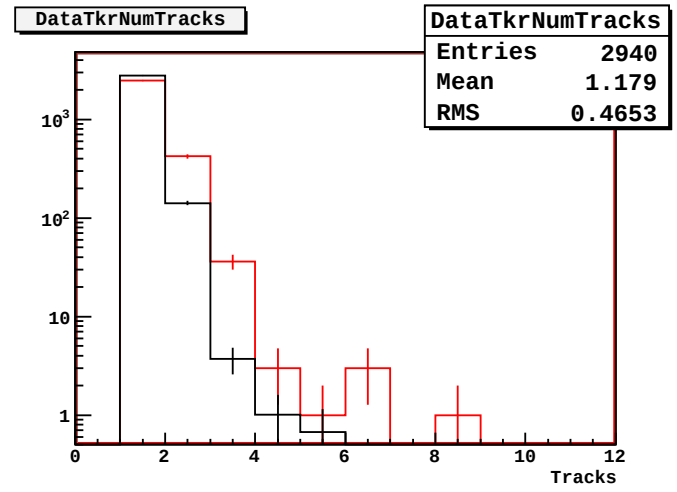
Data-1423 vs Custom MC (1)

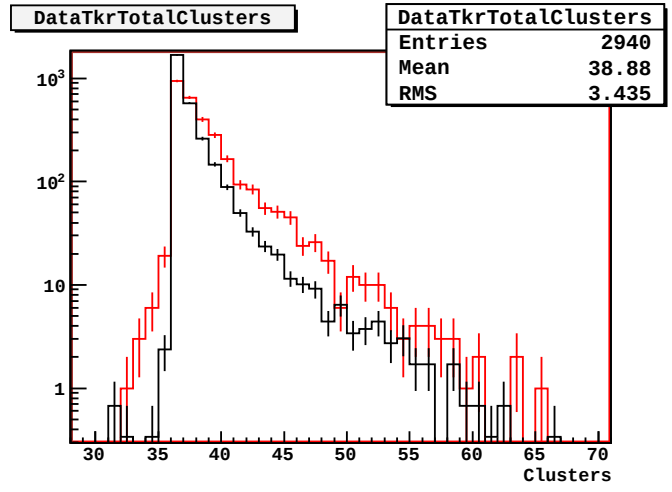
Custom MC

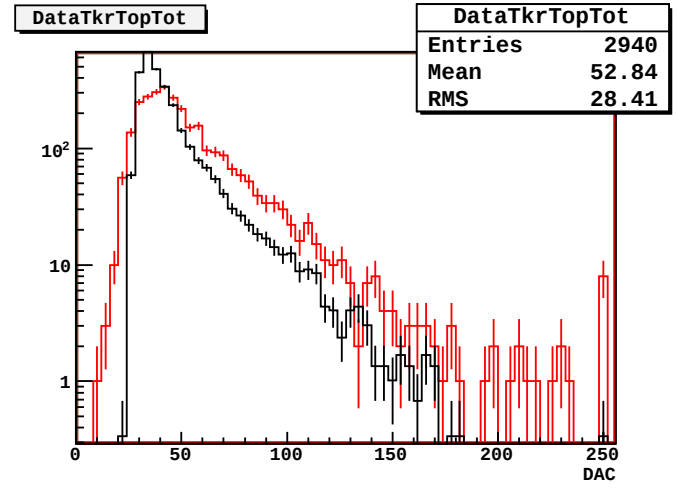
- BTR-v4r0909p11
- macro file MC-156
- correct CU position
- correct beam width
- correct beam divergence
- Noise Occupancy = $5.e-6$

$\Rightarrow$ no big differences







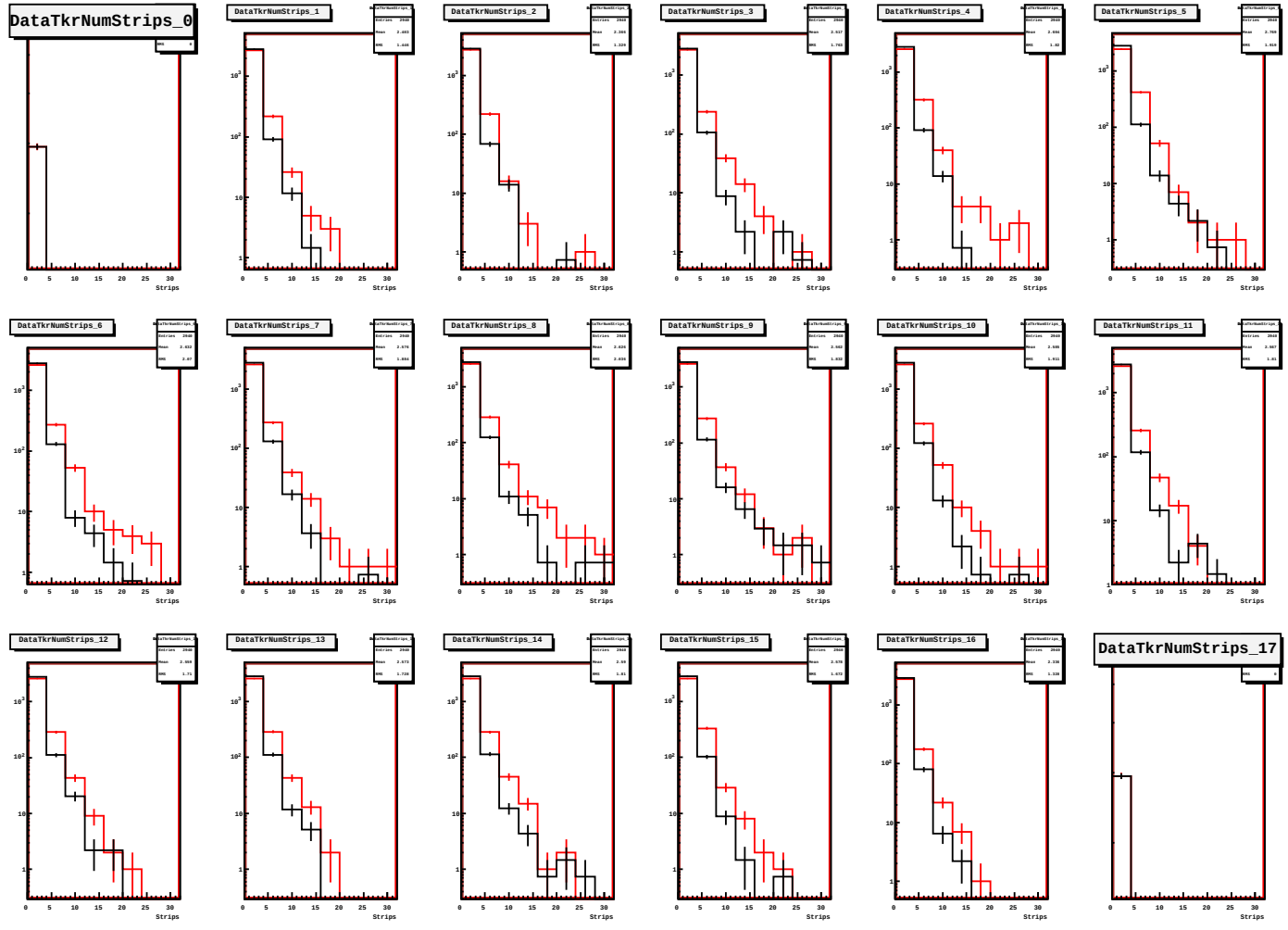


Data-1423 vs Custom MC (2)

Hits per Layer

- See the cut L0-L17
- All layers identical
- more hits in data

⇒ same effect on all layers

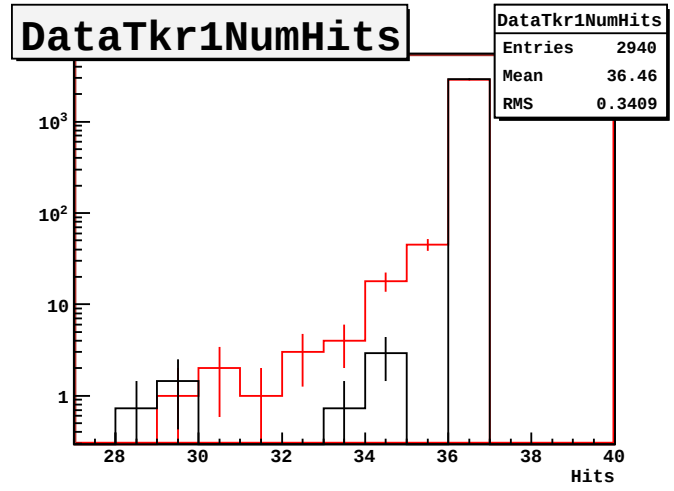


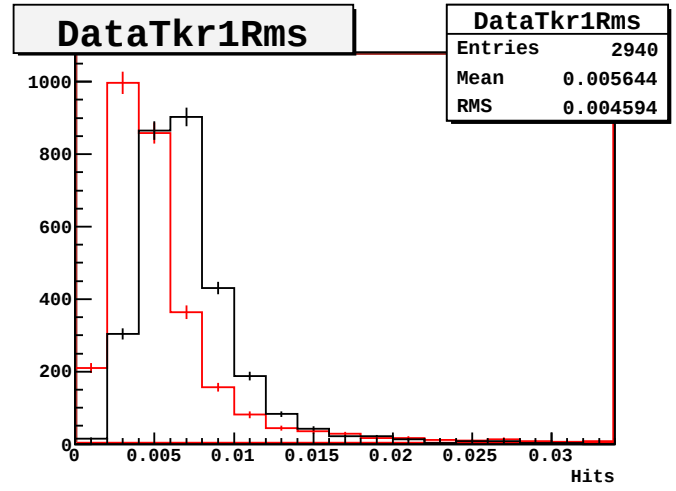
Data-1423 vs Custom MC (3)

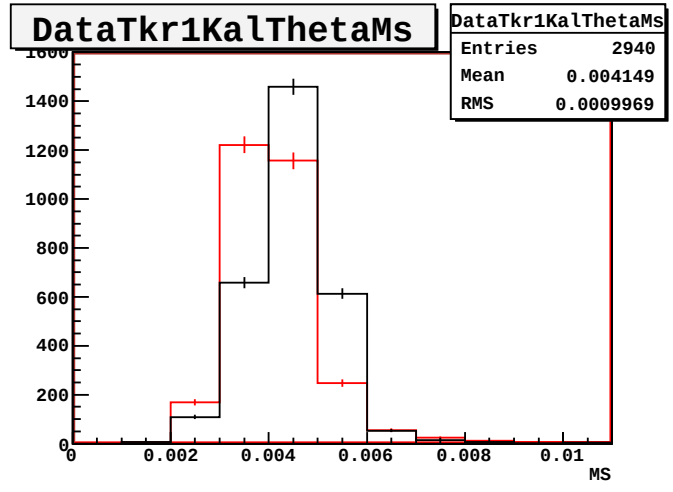
First Track

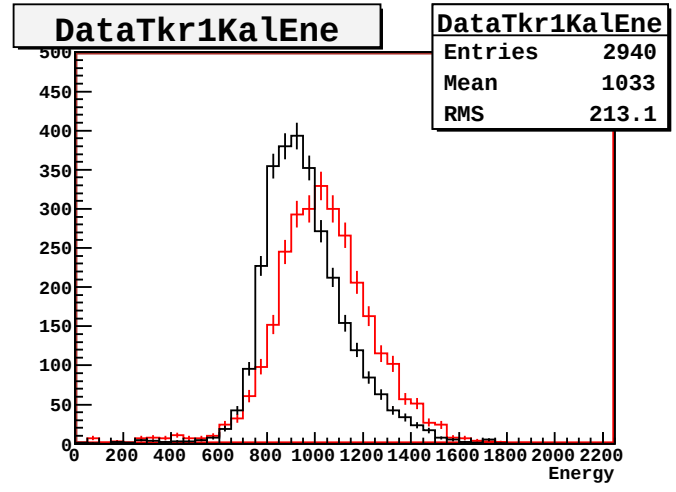
- 36 hits
- bigger RMS
- bigger Theta M.S.
- less Kal. Energy

⇒ does not explain TkrTotalHits issue...







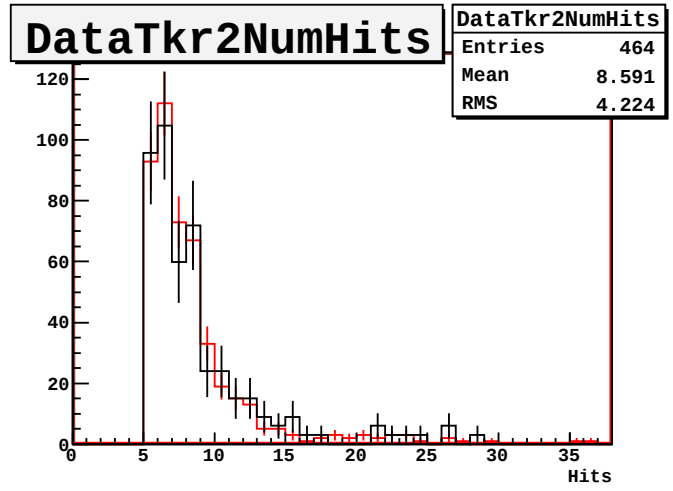


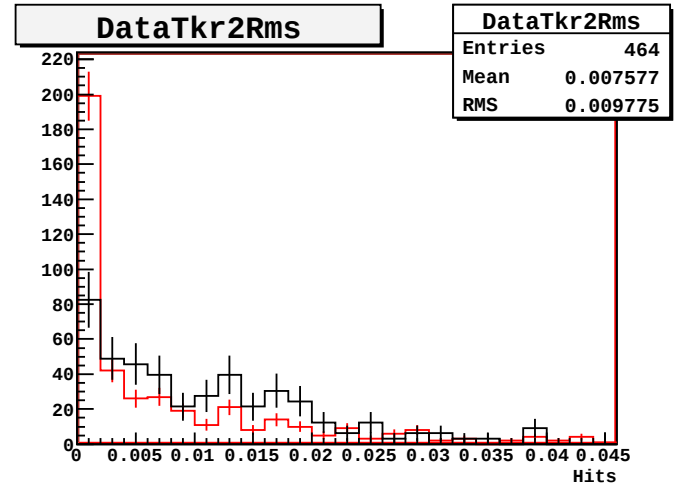
Data-1423 vs Custom MC (4)

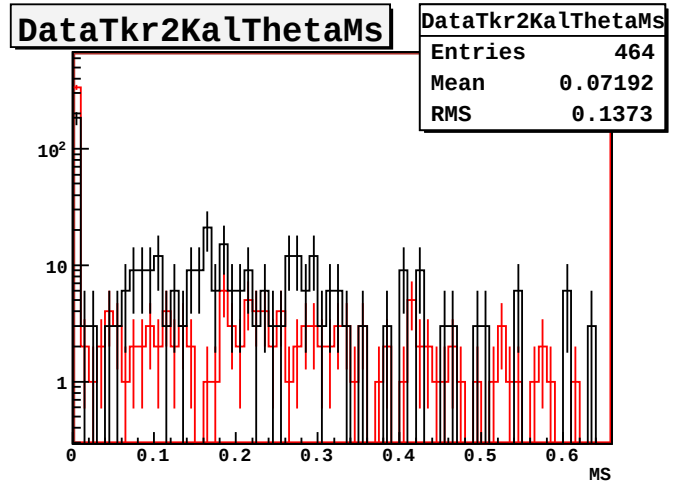
Second Track

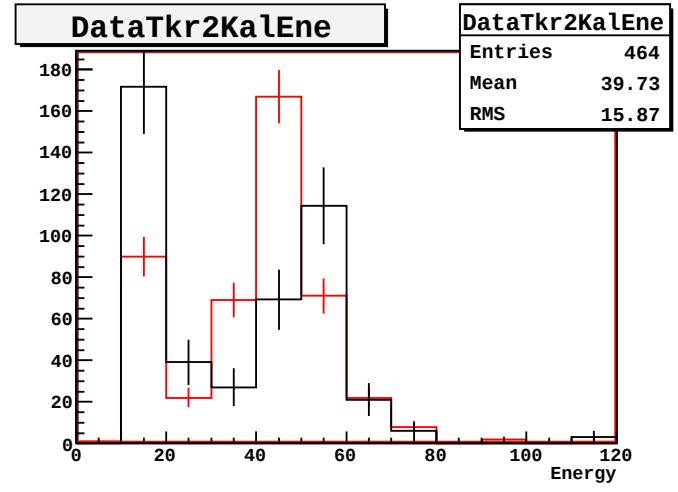
- few events
- but hit distribution is good

⇒ Quite Good overall !









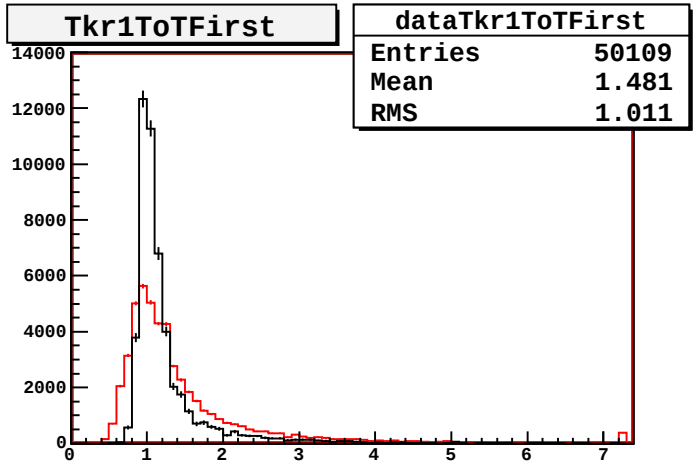
Data-1423 vs Custom MC (5)

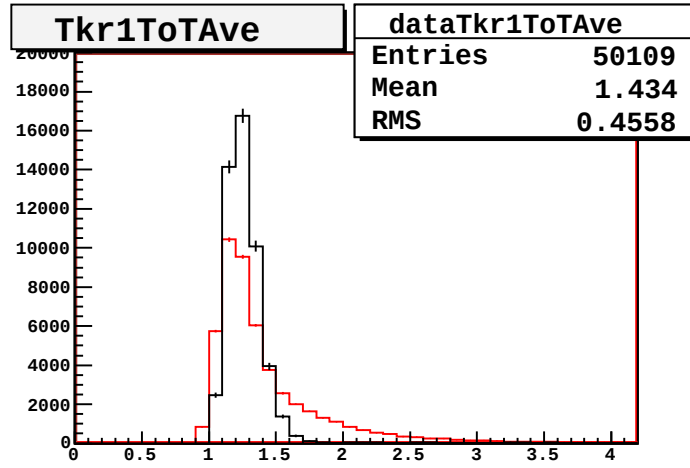
meritTuple

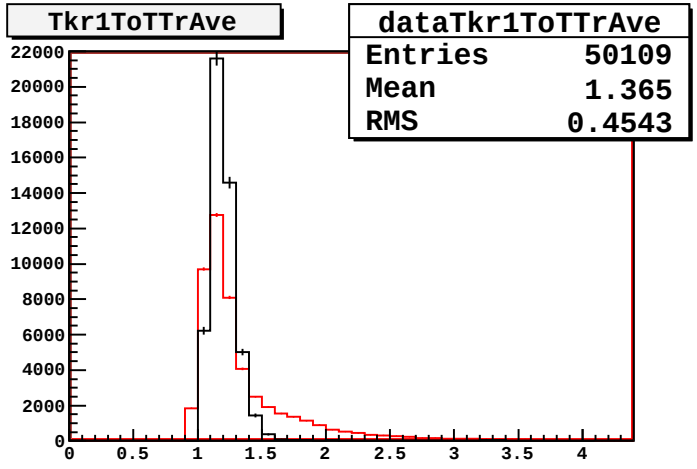
Tkr1ToT

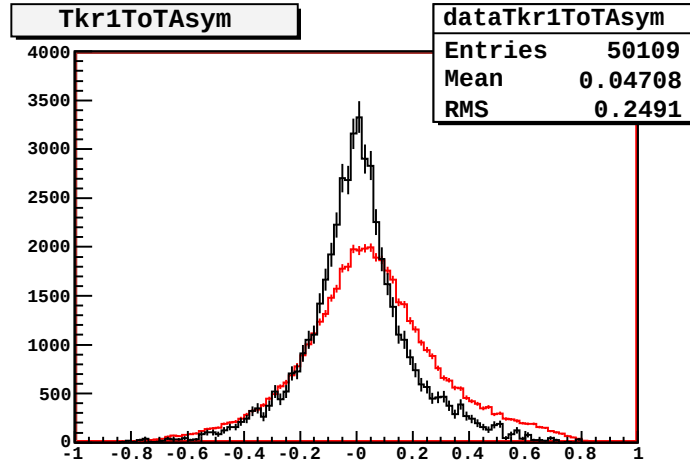
- almost same cuts
- sligthly larger distributions
- but means are fine

⇒ Apart from the tails : good agreement









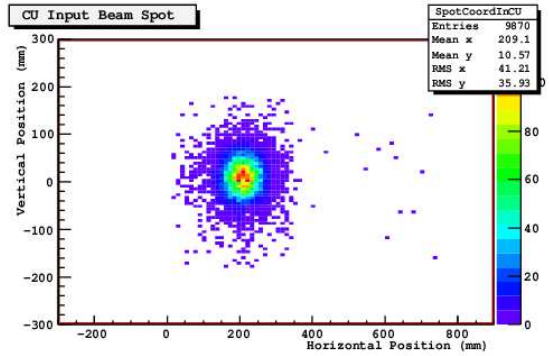
(Tails may be due to the CAL cut on MIPS not beeing effective b/c of CAL pedestal drift)

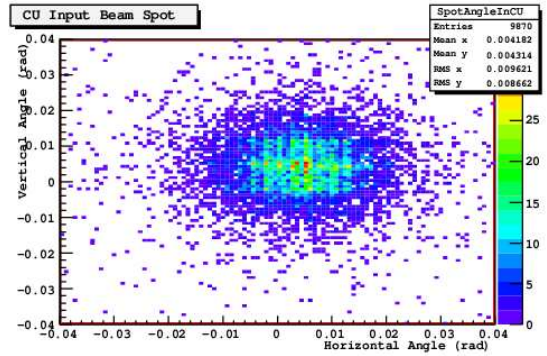
Conclusions for 6GeV protons

- Data show more Hits, Tracks, Clusters, ToT
- Cut on Δtime has no impact.
- Beam spot has no impact.
- Increasing noise in MC has no impact.
- Same effect in all Layers : probably not a Tkr geometty (X0) issue in MC
- Cut on Ionizing only particles : no hadronic model issue.
- First and Second Track parameters are reproduced better : Additional Hits are not associated to First track.
- FRED Event Display : no obvious difference with MC, hits close the main track ?
- Quick look to 10GeV protons : same conclusions

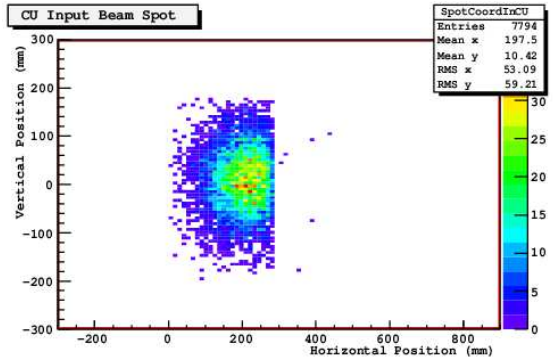
Electrons 1GeV Tower2 : run 1259

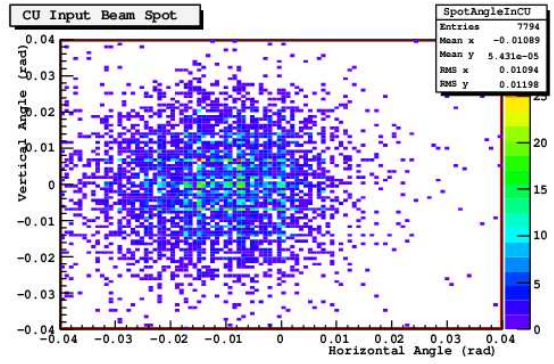
- Data



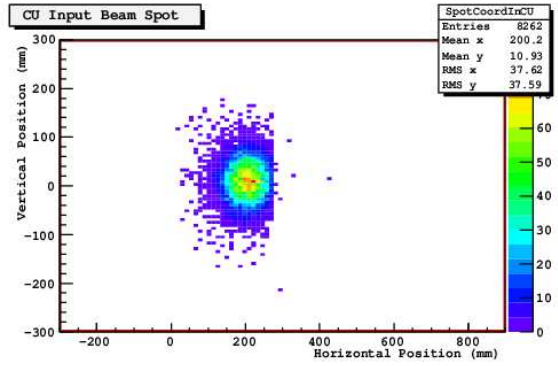


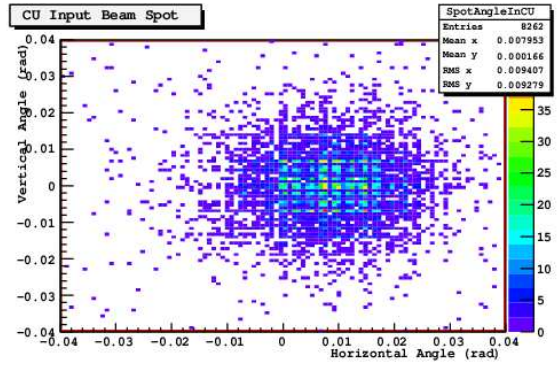
- First Custom MC





- Second Custom MC

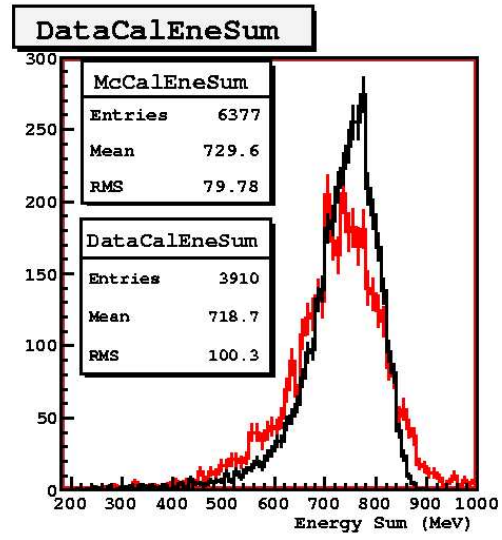


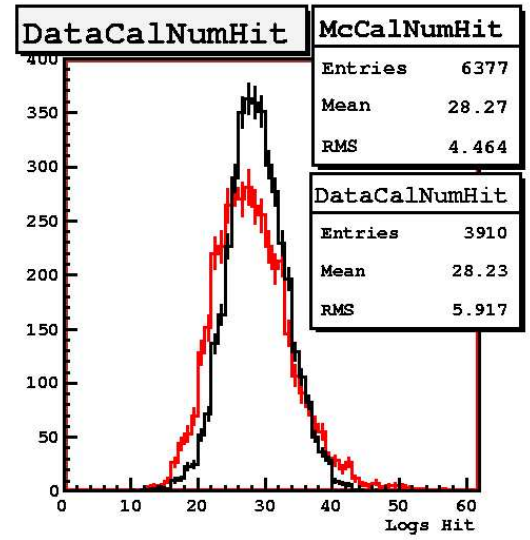


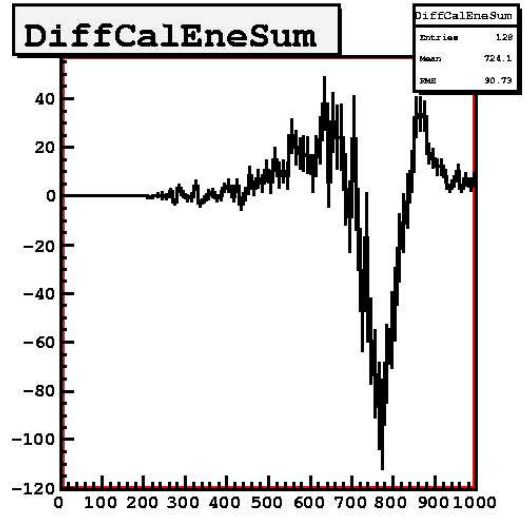
Data-1259 vs Custom MC (1)

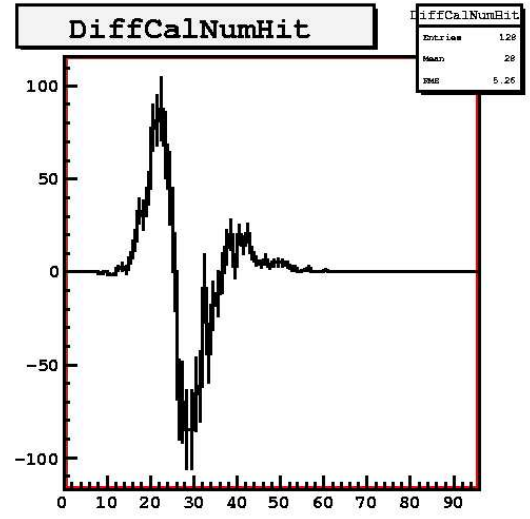
CAL

- DATA vs **MC**
- Not that bad with $\Delta_{time} > 1ms$
- Improves with bigger Δ_{time}
- Pedestal Drift compensates for Calibration error ?





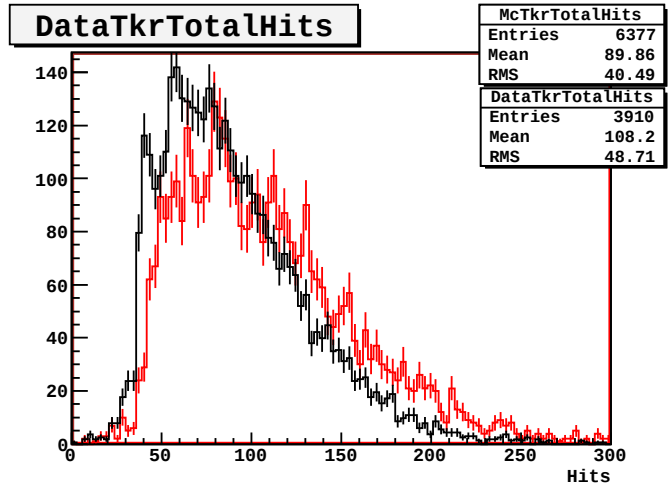


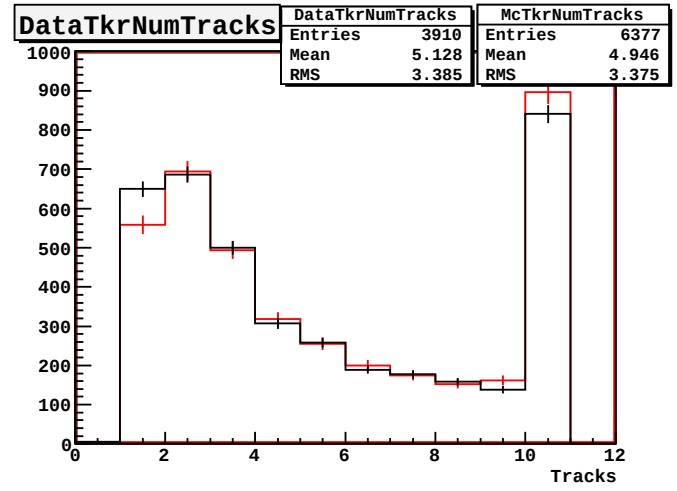


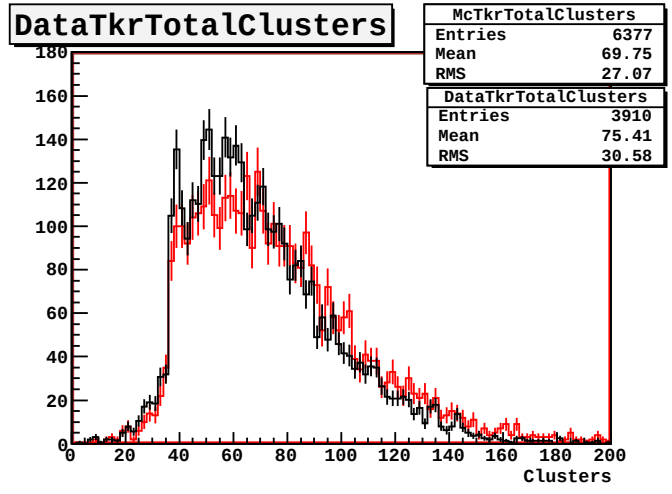
Data-1259 vs Custom MC (2)

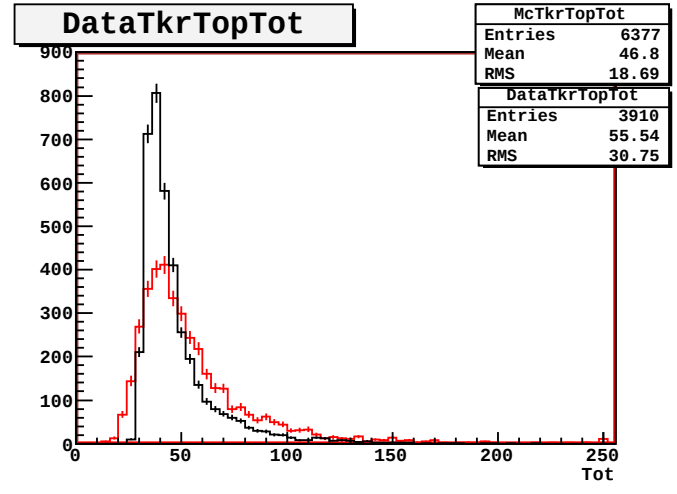
TKR

- Looks Better
- still a shift







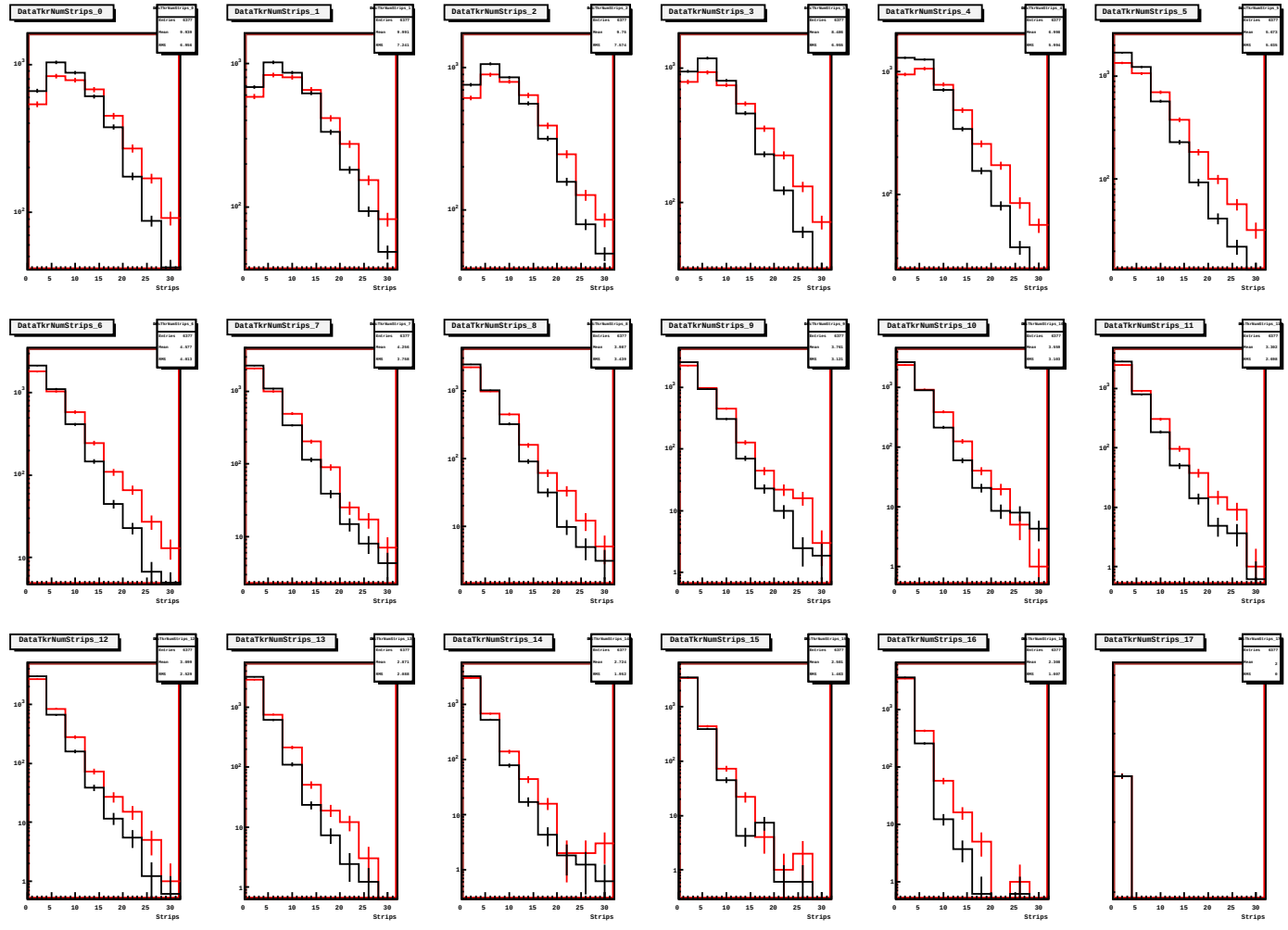


Data-1259 vs Custom MC (3)

Hits per Layer

- See the cut L17
- All layers show more hits in data

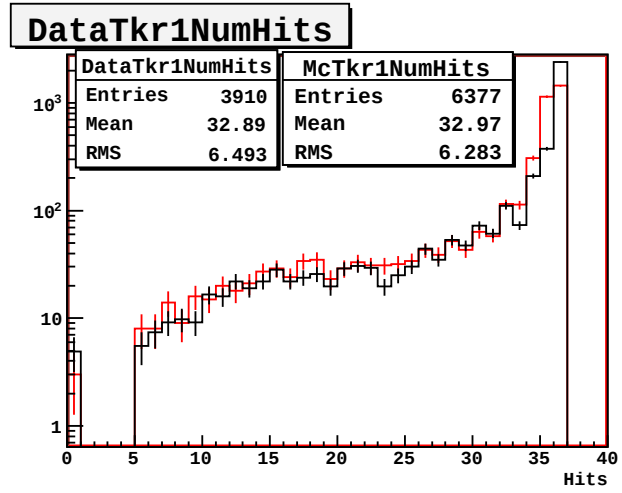
⇒ same effect on all layers

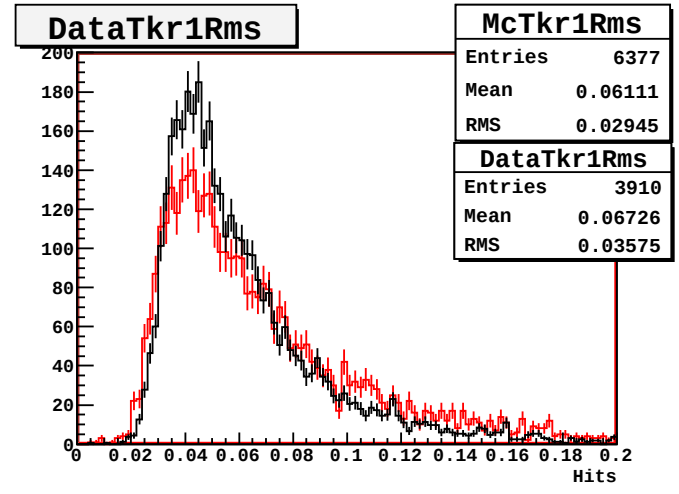


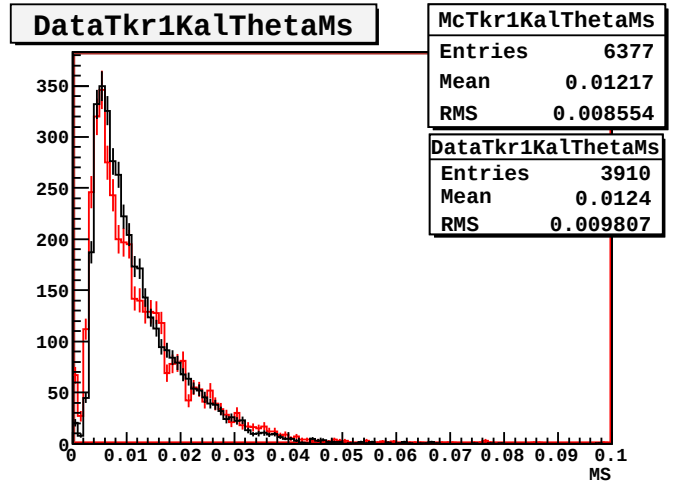
Data-1259 vs Custom MC (4)

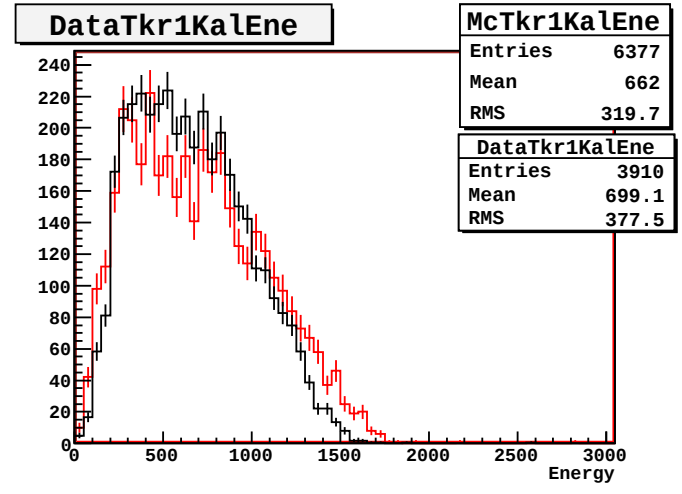
First Track

⇒ That's fairly good !





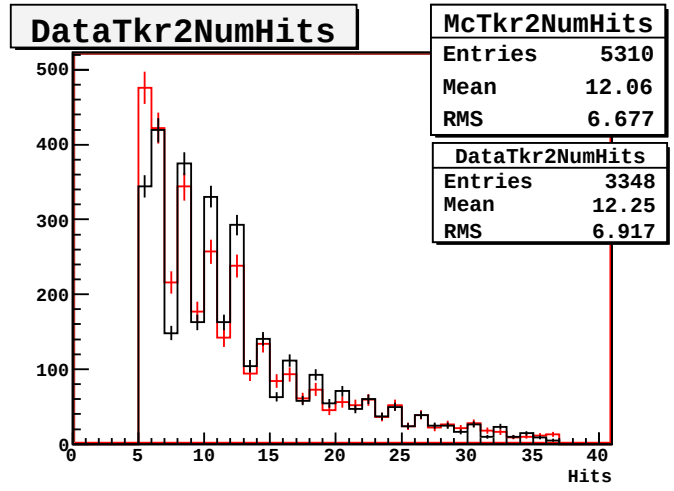


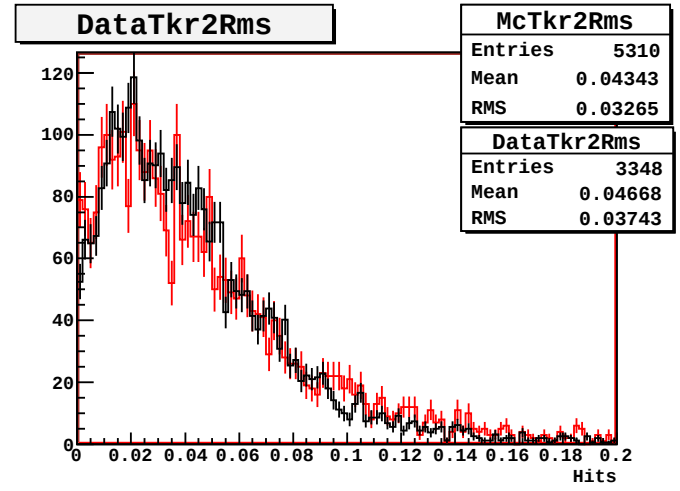


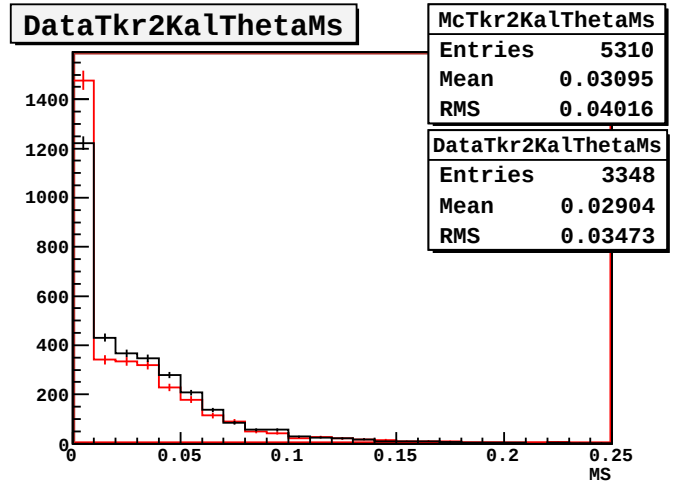
Data-1259 vs Custom MC (5)

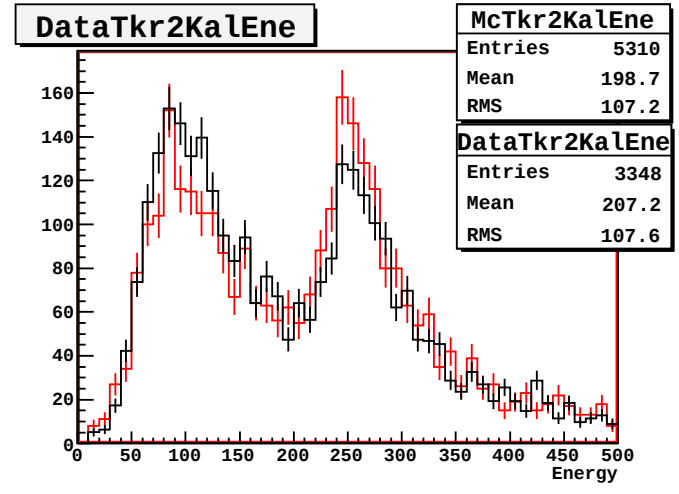
Second Track

⇒ nice agreement !









General Conclusions

- Tagged-γ : more hits in average in Data (**BARI**)
- Low energy electrons : more hits but everything else looks good !
- High energy electrons : more hits, more clusters, larger clusters (**Leon**)
- Protons *MIP* 6-10GeV : more hits, more tracks, more clusters, additional hits not associated to main track but not far away from it though.

Ideas ?

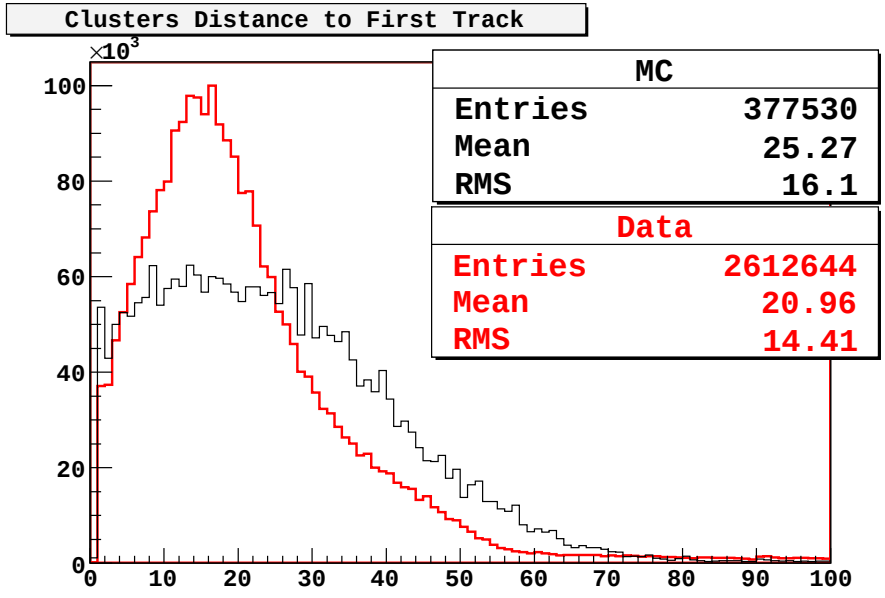
Possible explanations (see also Leon's talk)

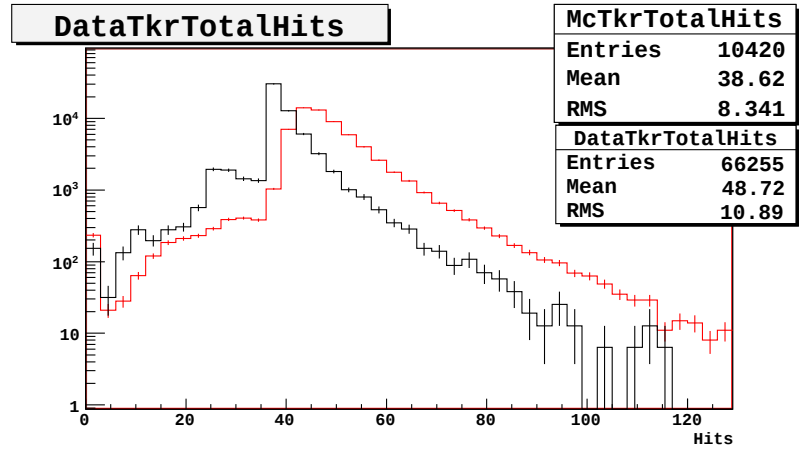
- $\Rightarrow$ δ-rays not well reproduced by MC ?
- $\Rightarrow$ Cut for low energy electrons in G4 : $100\mu m$
- $\Rightarrow$ crosstalk ?
- $\Rightarrow$ diffusion near strip edge ?

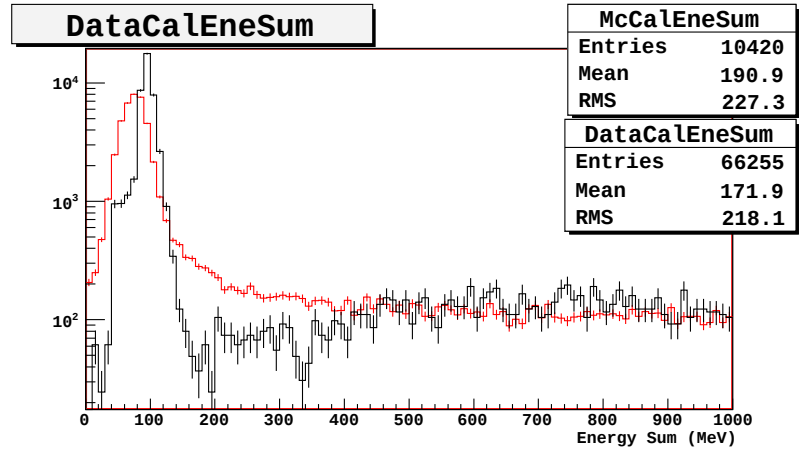
Data-1423 vs Custom MC - Addon

Where are the hits ?

- 15mm from the track !
- MC distribution is larger ???
- are these $\Delta - rays$?







+ Take events with one track and get track entry point
+ calculate the distance to the track for ALL clusters

Data-1423 vs NEW MC 184 - Addon (2)

Thanks Franz !

- Cut at $10\mu m$ in Tkr
- Cut at $70\mu m$ in Cal
- Good idea but no significant improvement...