

# Agreement with MC of the 2006 OT sample

Konrad Klimaszewski

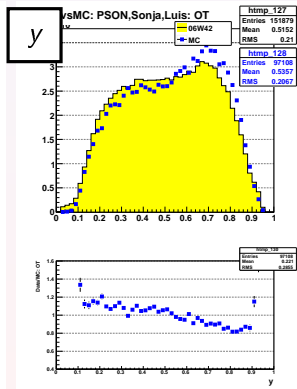
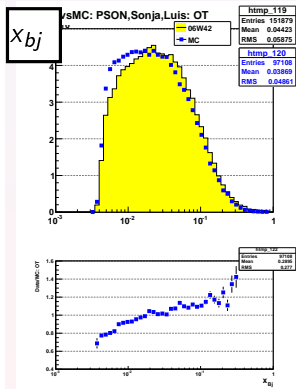
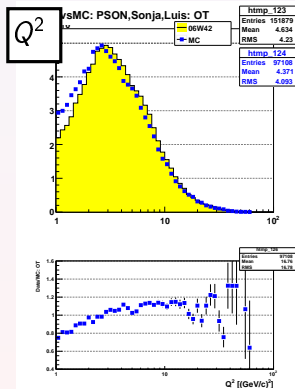
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CERN 16.06.2009

# The problem

- For extraction of  $\Delta G/G$  in the high  $p_T$  analysis we are using two MC samples:
  - High  $p_T$  - corresponding to our data sample
  - Inclusive - to take into account the contribution of PGF and QCDC to the  $A_1$
- Both samples should describe the data correctly
- Currently the description of the 2006 OT subsample is not satisfactory for both Inclusive and High  $p_T$  case.

# The problem ('06 high $p_T$ , OT)

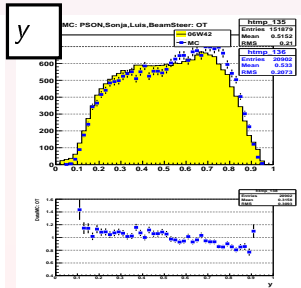
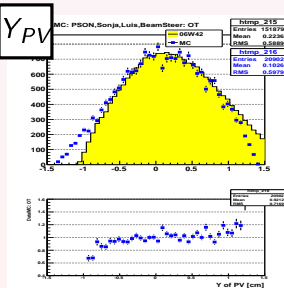
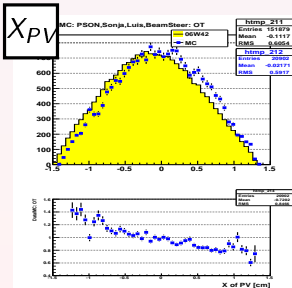
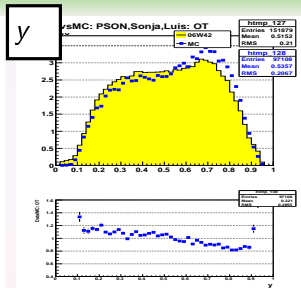
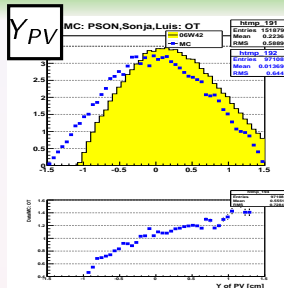
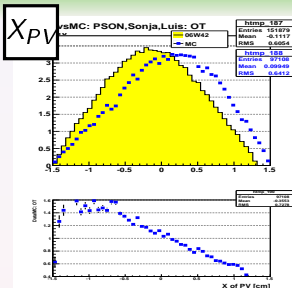


## $\mu$ and $\mu'$ description

- OT is an inclusive trigger so the basic assumption is that the problem should be in the description of the beam or the scattered muons.
- The beam file used comes from 2004 data.
  - A test MC was prepared with beam shifted according to mean values of position and slopes in the All triggers 2006 data sample.
- Is there a difference in  $\mu'$  description?
  - Various configurations tested  
(some results presented on next slides)

# Beam description ('06 high $p_T$ , OT)

Standard high  $p_T$  MC  
Adjusted beam file

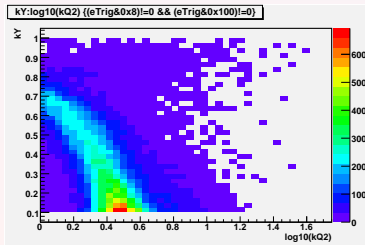
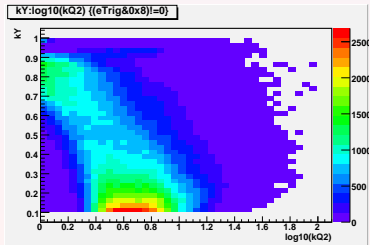


## $\mu'$ description

- The analysis was performed on the inclusive data sample - no interference with fragmentation tuning, hadron selection etc.
- Some discrepancies between Data and MC description of  $\mu'$  were identified.
- They are presented on next slides together with some of the tests that were done to identify their origin
  - Comparison with incMT which is described correctly
  - Effect of inefficiencies of VeryLargeAngleTrackers (VLATs) was tested by looking on events where  $\mu'$  is in acceptance of two last MWPC stations before the ECAL2 / HCAL2 (PA06 and PA11)
  - Effect of  $\mu'$  going in different directions was tested (up, down, left, right)

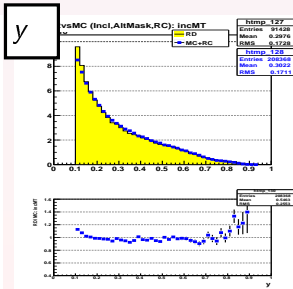
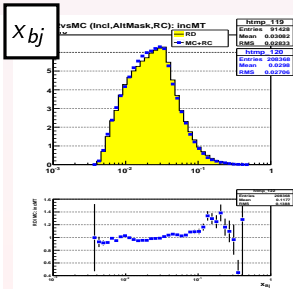
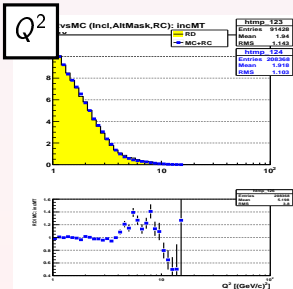
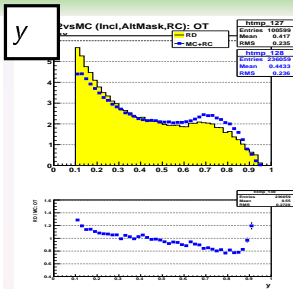
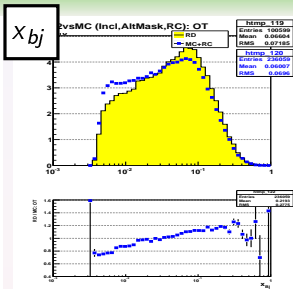
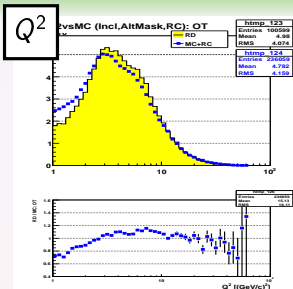
## Inclusive sample OT vs incMT

- As selection of two hadrons makes matters more complicated in the high  $p_T$  case we go back to the inclusive sample
- We compare the description of  $\mu'$  for OT sample with incMT
- In both cases radiative corrections are applied using the Radiative Weights Tables for inclusive case.



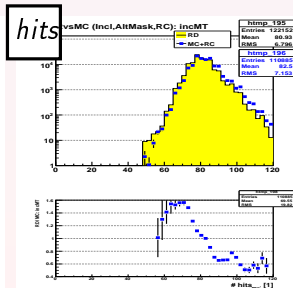
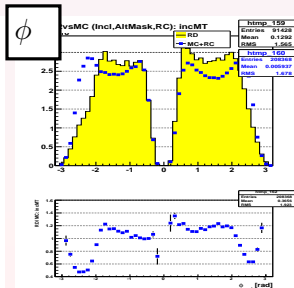
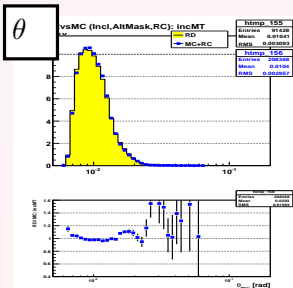
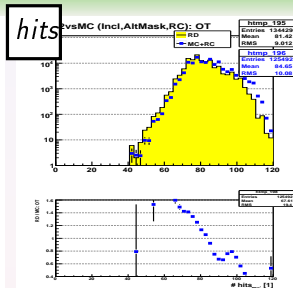
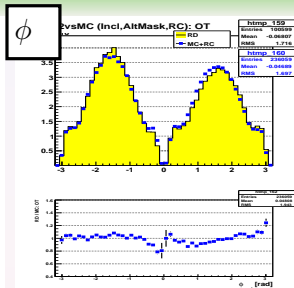
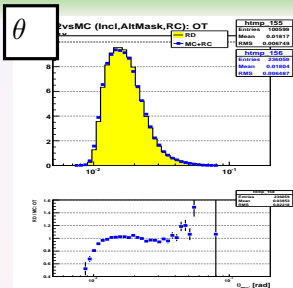
# OT vs incMT ('06 inclusive)

incMT OT



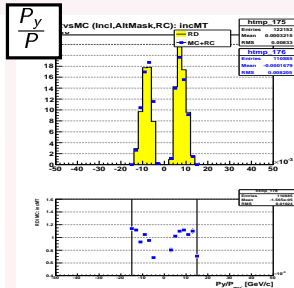
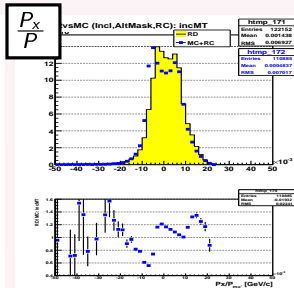
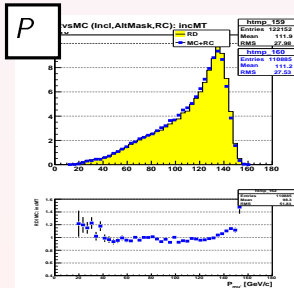
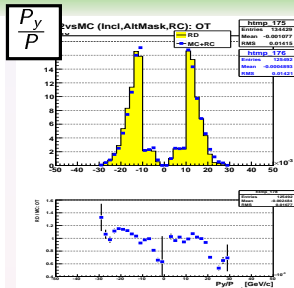
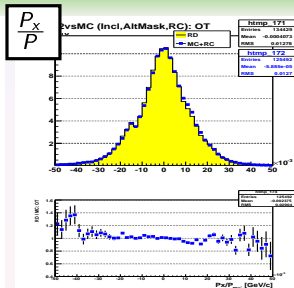
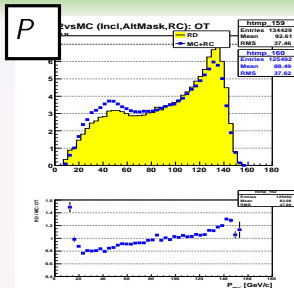
# $\mu'$ : OT vs incMT ('06 inclusive)

incMT OT



# $\mu'$ : OT vs incMT ('06 inclusive)

incMT OT

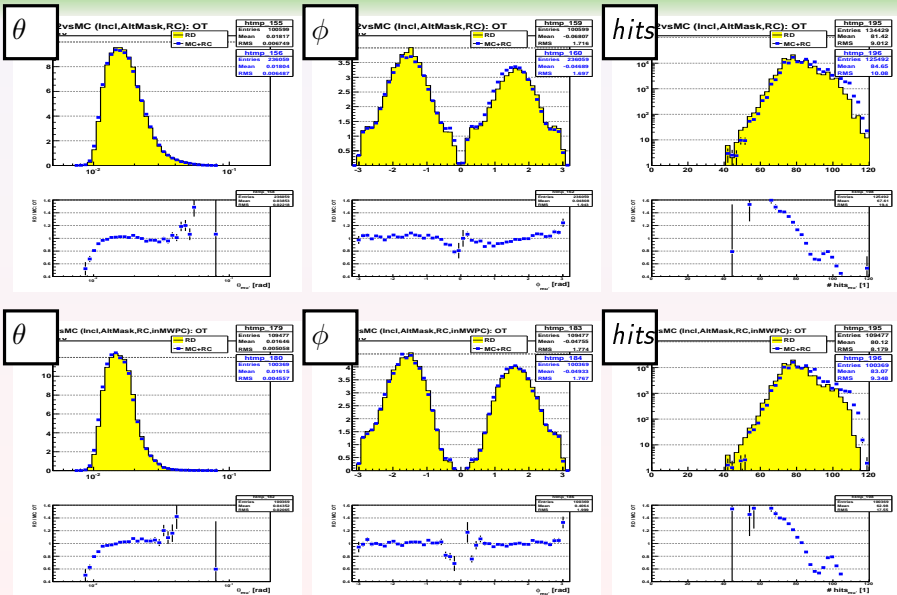


## VLAT effect

- The efficiency of the trackers is overestimated in the MC.
- This could be a big factor for e.g. W45 or MW2
- Estimate effect on the kinematic variables using data at hand:
  - Use standard inclusive MC
  - Select  $\mu'$  that point to the MWPC stations PA06 and PA11 (last MWPC before ECAL2/HCAL2 - thus in the region of W45)
  - Assuming that in region covered by MWPCs we have more redundancy and that MWPC efficiencies are better described in MC we would exclude the region that could be affected by overestimated efficiencies of W45

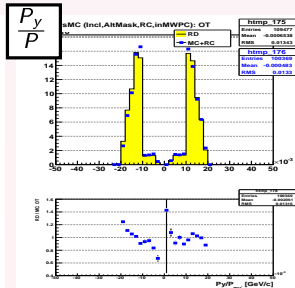
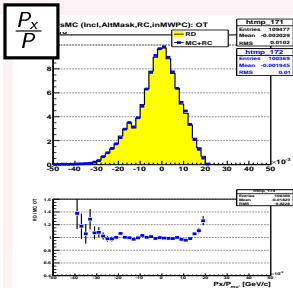
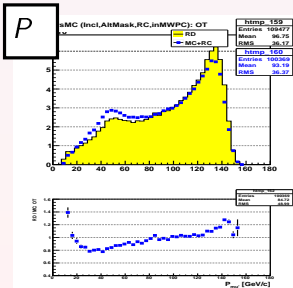
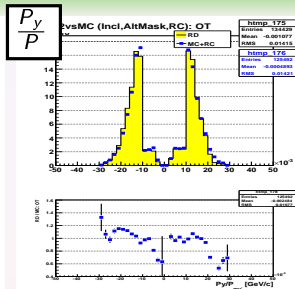
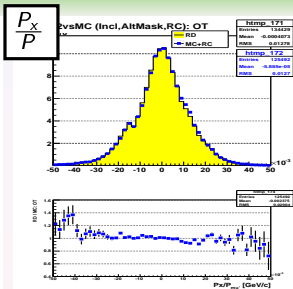
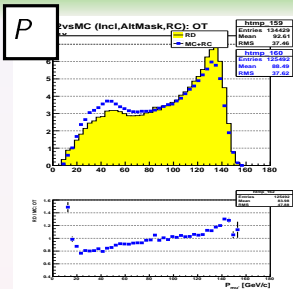
# $\mu'$ : VLAT effect ('06 Inclusive, OT)

Full sample



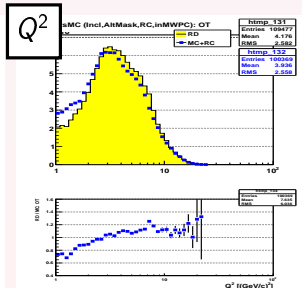
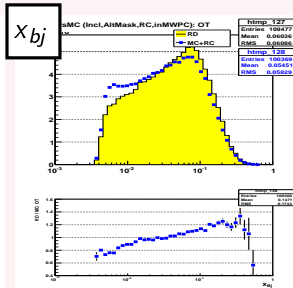
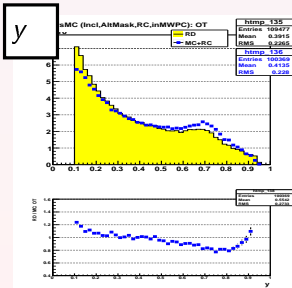
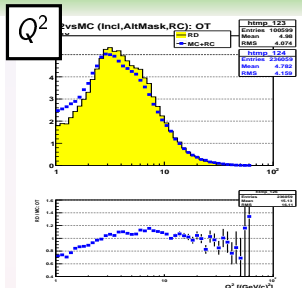
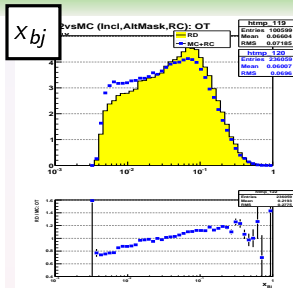
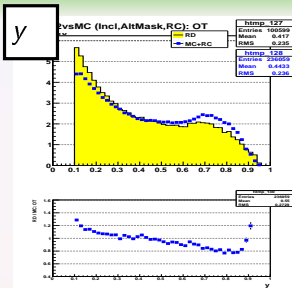
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Full sample



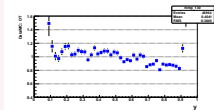
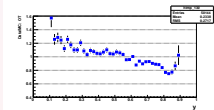
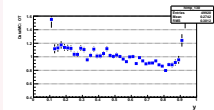
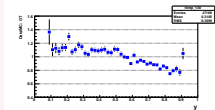
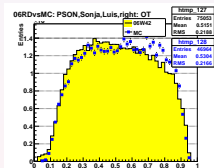
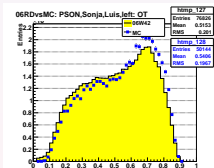
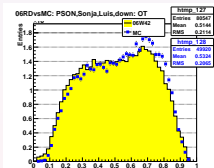
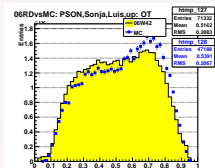
# VLAT effect ('06 Inclusive, OT)

Full sample  $\mu'$  in MWPC acceptance



# $\mu'$ direction ('06 high $p_T$ , OT)

y



up

down

left

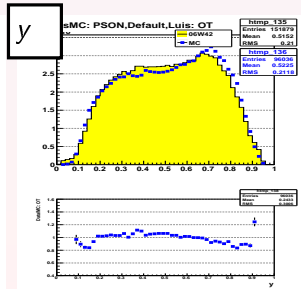
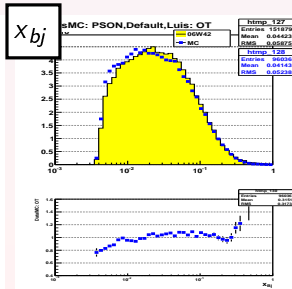
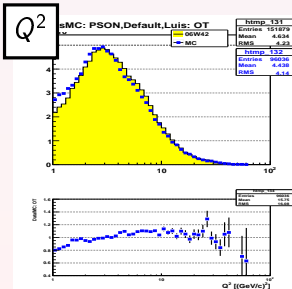
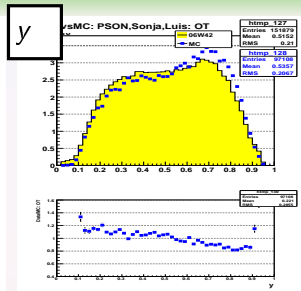
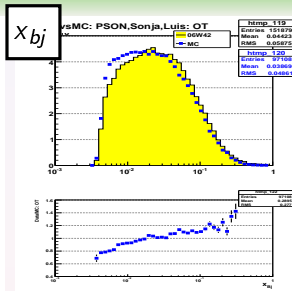
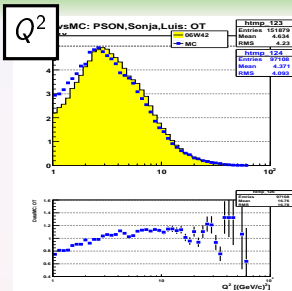
right

## Default vs COMPASS

- In the high  $p_T$  we are dealing with rather special sample: two hadrons with large  $p_T$  in the PV
- The fragmentation parameters were tuned to have a better description of hadronic variables
- What is the effect on muon kinematics?

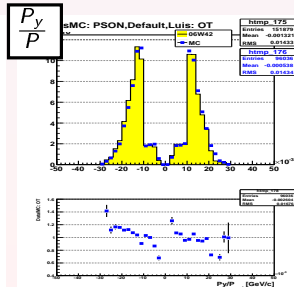
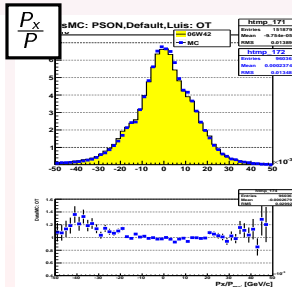
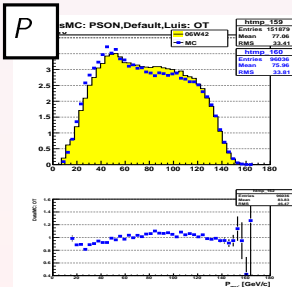
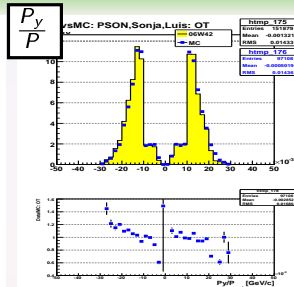
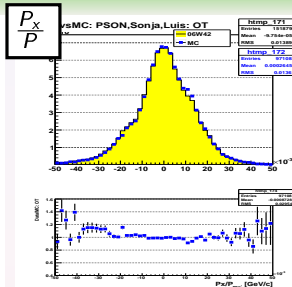
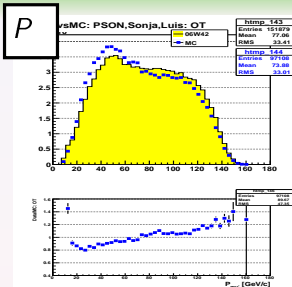
# Default vs COMPASS ('06 high $p_T$ , OT)

Default COMPASS



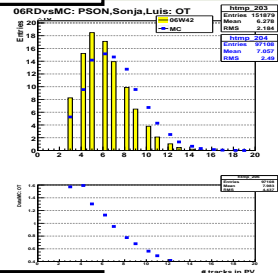
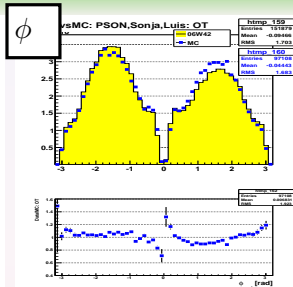
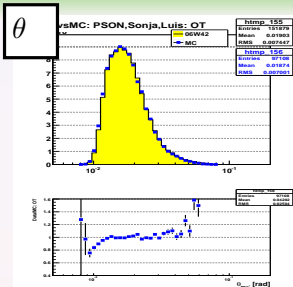
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Default COMPASS

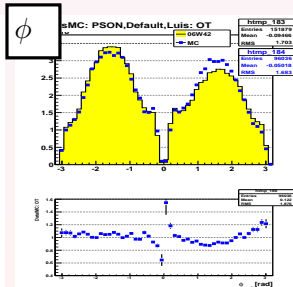
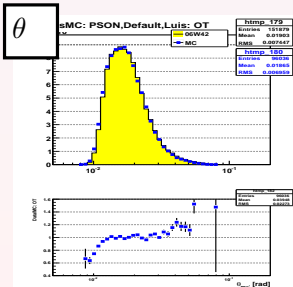


# Default vs COMPASS ('06 high $\sigma_T$ OT)

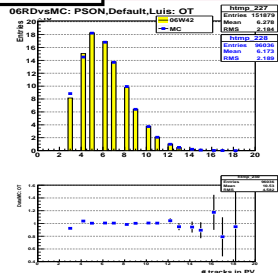
PVtracks



Default COMPASS

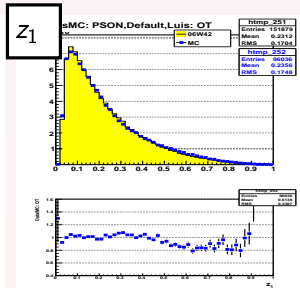
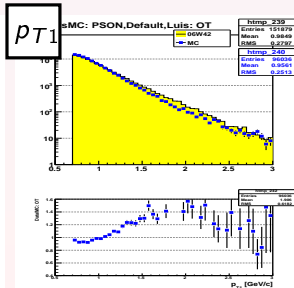
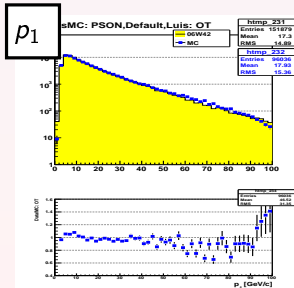
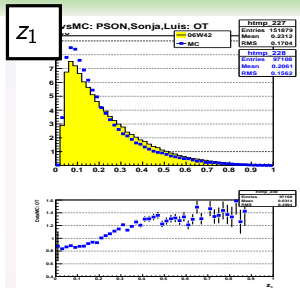
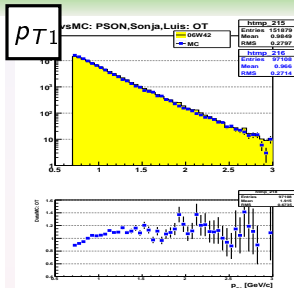
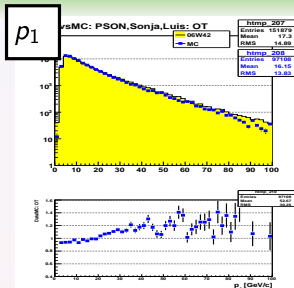


PVtracks



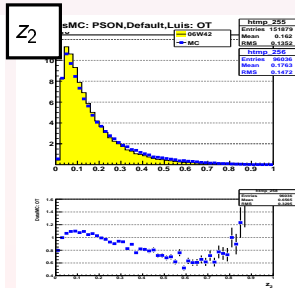
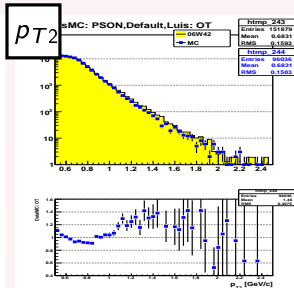
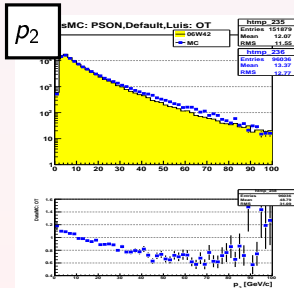
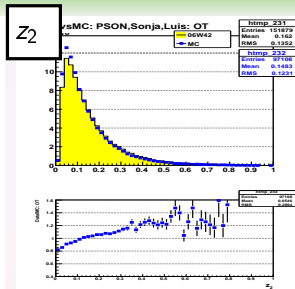
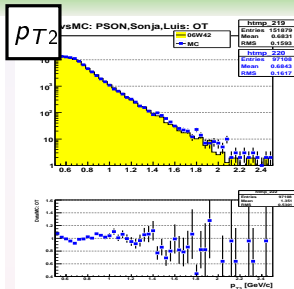
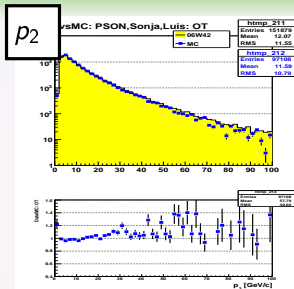
# Default vs COMPASS ('06 high $p_T$ , OT)

Default COMPASS



# Default vs COMPASS ('06 high $p_T$ , OT)

Default COMPASS



## Further tuning

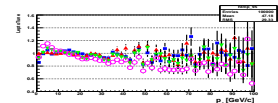
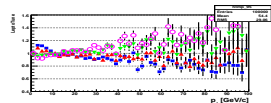
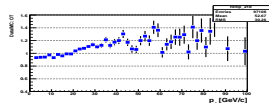
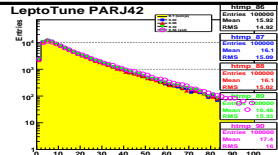
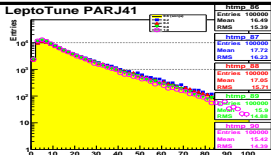
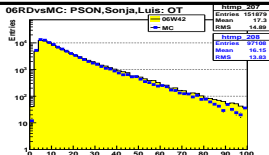
- Using bare LEPTO generator sensitivity of hadronic variables to parameters used in tuning of the fragmentation was tested
- The COMPASS tune has a satisfactory description of  $p_T$  of both hadrons and better description of second hadron momentum
- It seems that there could be found a set of parameters that would allow to improve description of longitudinal momentum without breaking the agreement for transverse one.

# Further tuning

Data/FullMC (COMPASS)

LEPTO : COMPASS/PARJ41

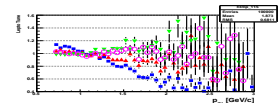
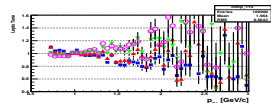
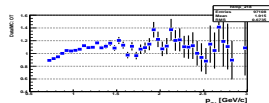
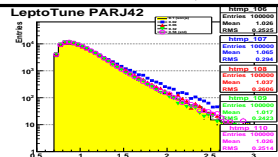
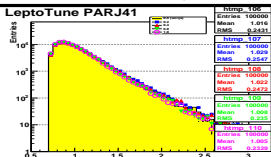
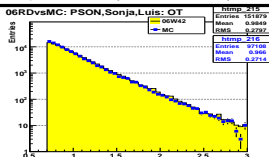
LEPTO : COMPASS/PARJ42



Data/FullMC (COMPASS)

LEPTO : COMPASS/PARJ41

LEPTO : COMPASS/PARJ42



pT1 p1

## Conclusions

- The problem with description of the 2006 data by MC lies in the region covered by OT or in the OT itself.
- Various tests were done - none points to an obvious error in description of OT by MC.
- The COMPASS tuning of the fragmentation seems to enhance the effect - still the problem is clearly visible in the inclusive case with Radiative Corrections taken into account.
- It was shown that the COMPASS tuning with looser cuts and enlarged acceptance is no longer optimal:
  - Bad description of track multiplicities in the PV
  - Worse description of the leading hadron compared to subleading yet the leading hadron carries most of the information
- A new tuning will be prepared that will be closer to the default.