Level-1 Global Muon Trigger status in ORCA

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Introduction

- This exercise serves two purposes:
  - Learn to work with CMS data, CMS software and learn GMT (after departure of Hannes)
  - Check the performance of GMT and local L1 muon triggers and prepare for PTDR
- Contents:
  - Reproduce standard efficiency plots of Hannes and compare to his last set of plots
  - Look in more detail into local inefficiencies discussed recently by Alexander Lanyov and co.

Data samples

- Data used in this presentation:
  - 100k single μ^- with:
    - **5** < p_T <100 GeV/c
    - -2.4 < η < 2.4
  - Generated with OSCAR 3.6.0
  - Processed with ORCA 8.8.0

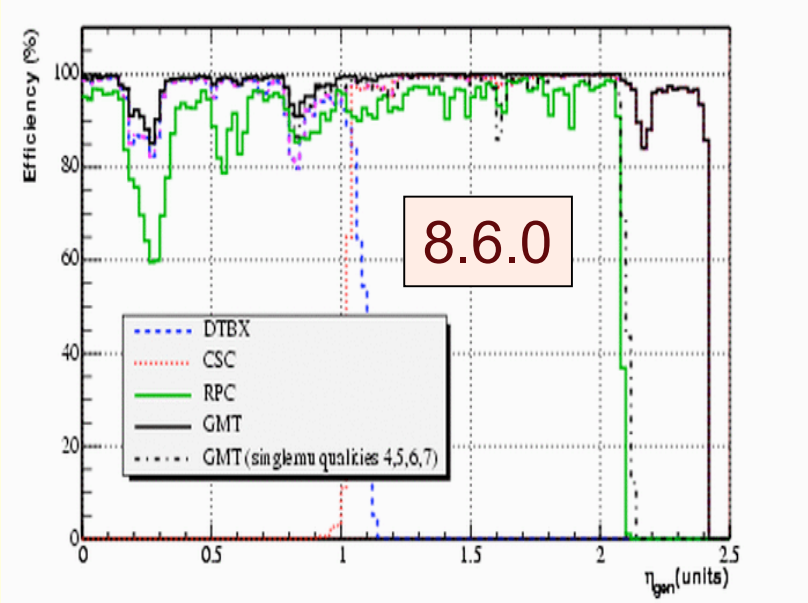
mu_Hit360_2_3_4_g133/
mu03_mu_pt5_100

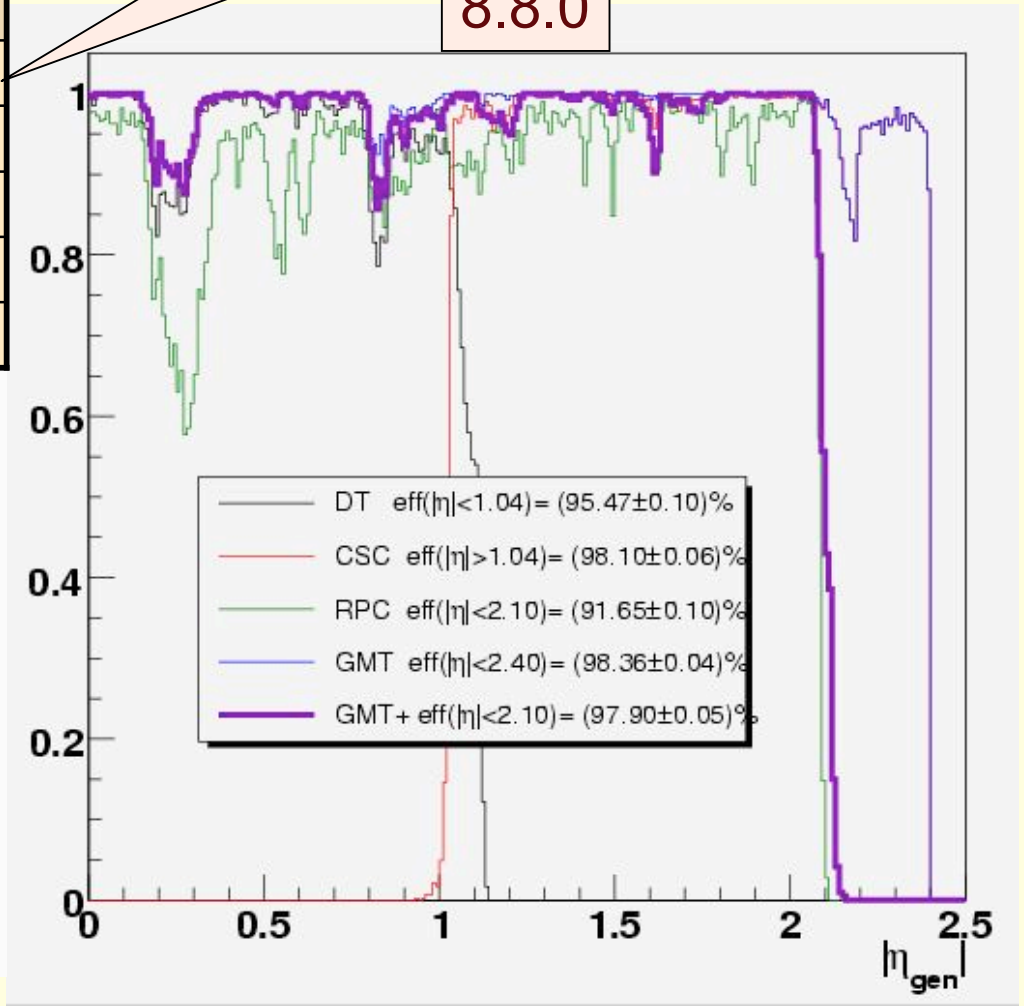
- Last data from Hannes:
  - 100k single $\mu^\pm$ with:
    - **2.5** < p_T <100 GeV/c
    - -2.4 < η < 2.4
  - Processed with ORCA 8.6.0

Efficiency vs. |η|

Slight increase in DT and RPC eff.
(maybe due to higher p_T cutoff in the sample)

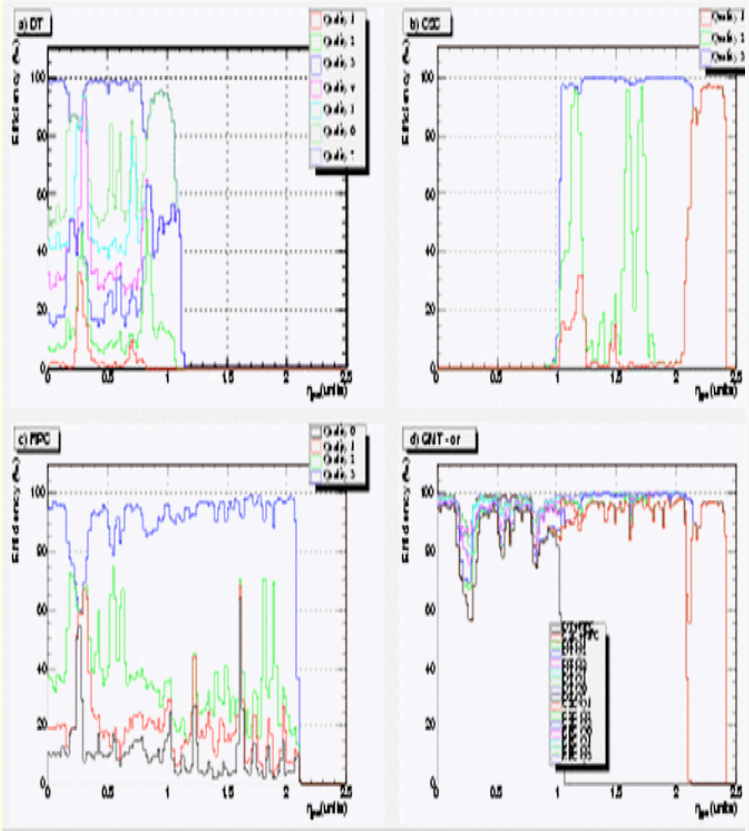
%	8.6.0	8.8.0
DT (0-1.04)	94.66±0.11	95.47±0.10
CSC (1.04-2.4)	97.98±0.06	98.10±0.08
RPC (0-2.1)	91.14±0.10	91.65±0.10
GMT (0-2.1)	98.49±0.04	98.93±0.04
GMT+ (0-2.1)		97.90±0.05





Efficiency vs. |η| by Quality

8.6.0



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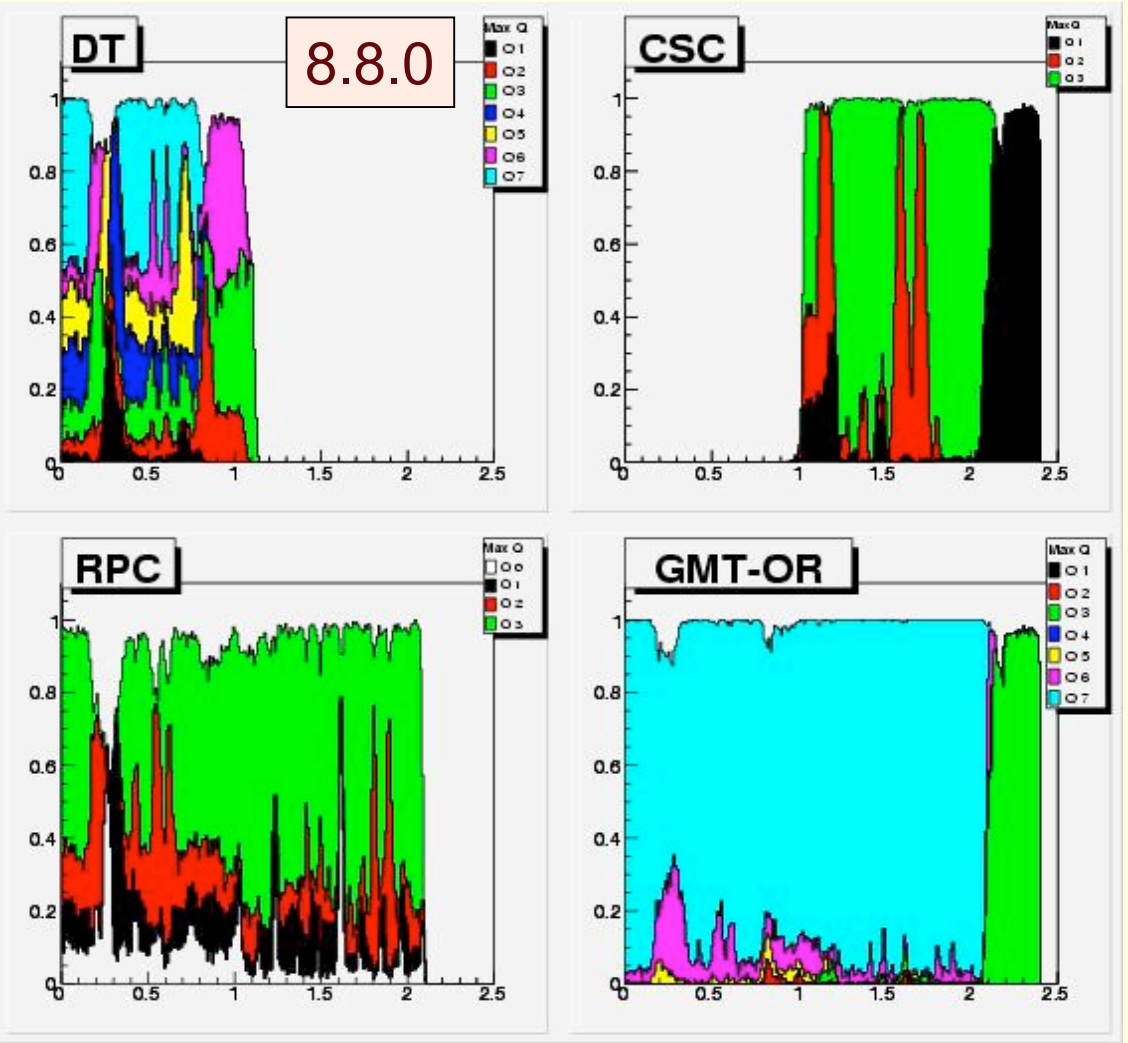
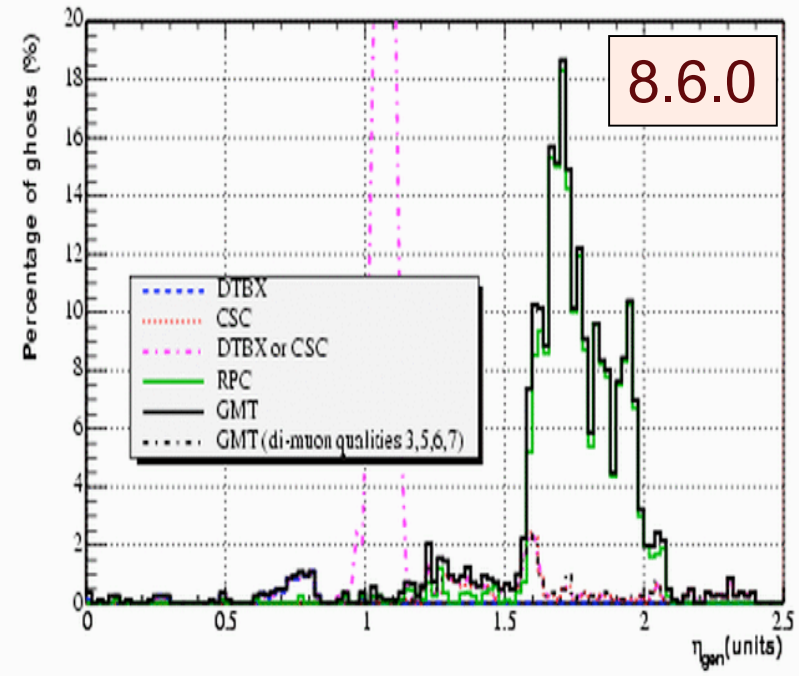
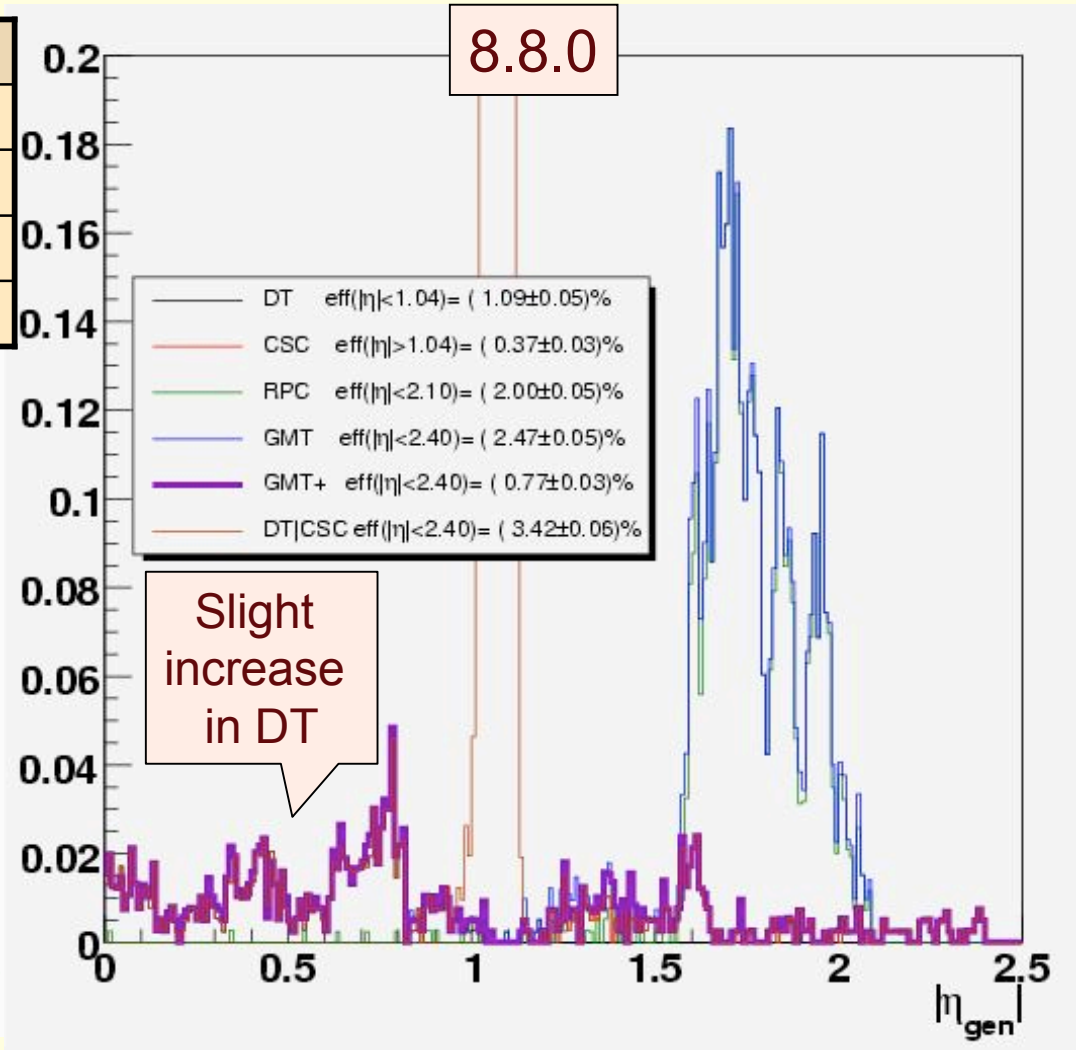


Ghost probability vs. |η|

%	8.6.0	8.8.0
DT|CSC (0-2.4)		3.42±0.06
GMT (0-2.1)	2.34(±0.06)	2.78±0.06
GMT (0-2.4)		2.47±0.05
GMT+ (0-2.4)		0.77±0.03

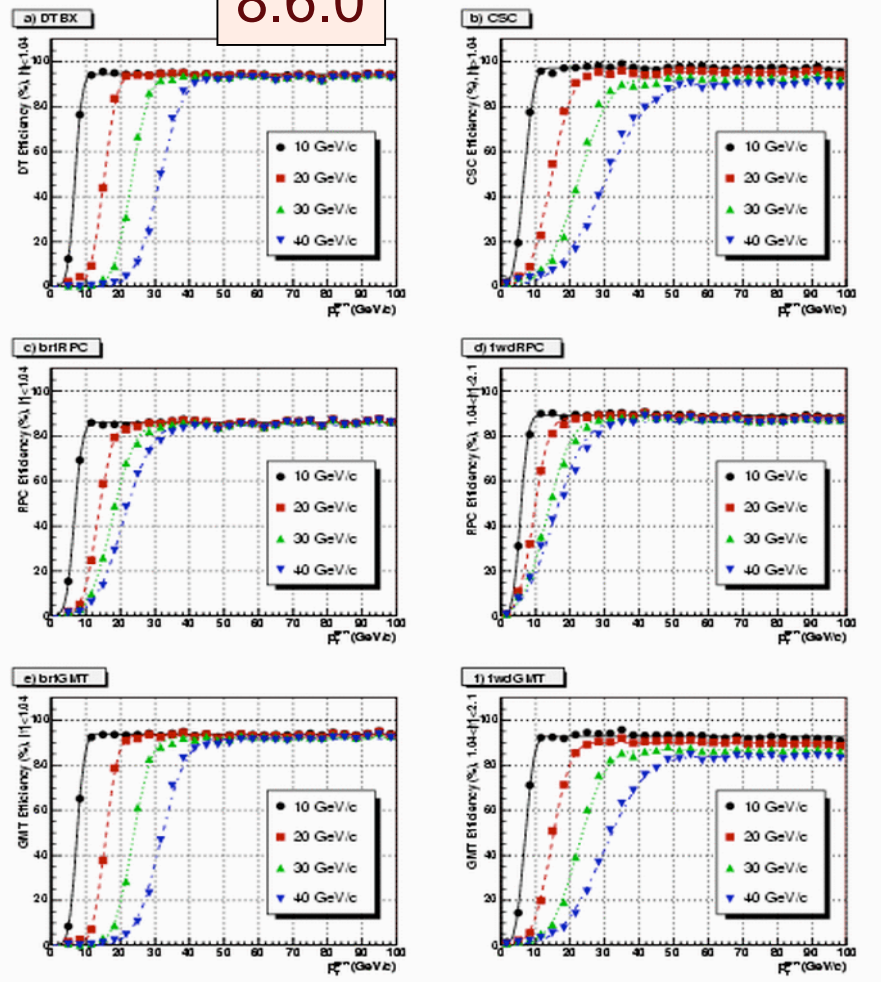




Turn-on curves

CSC p_T performs well only up to $|\eta|<2.1$

8.6.0



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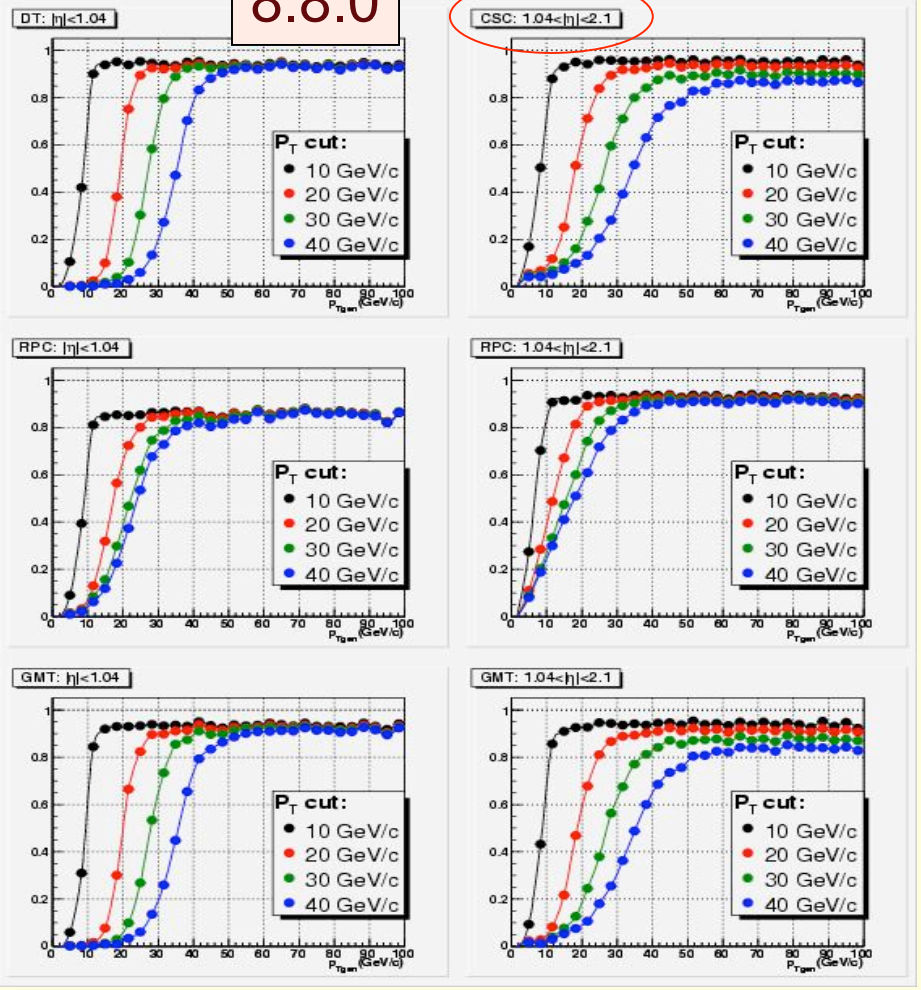
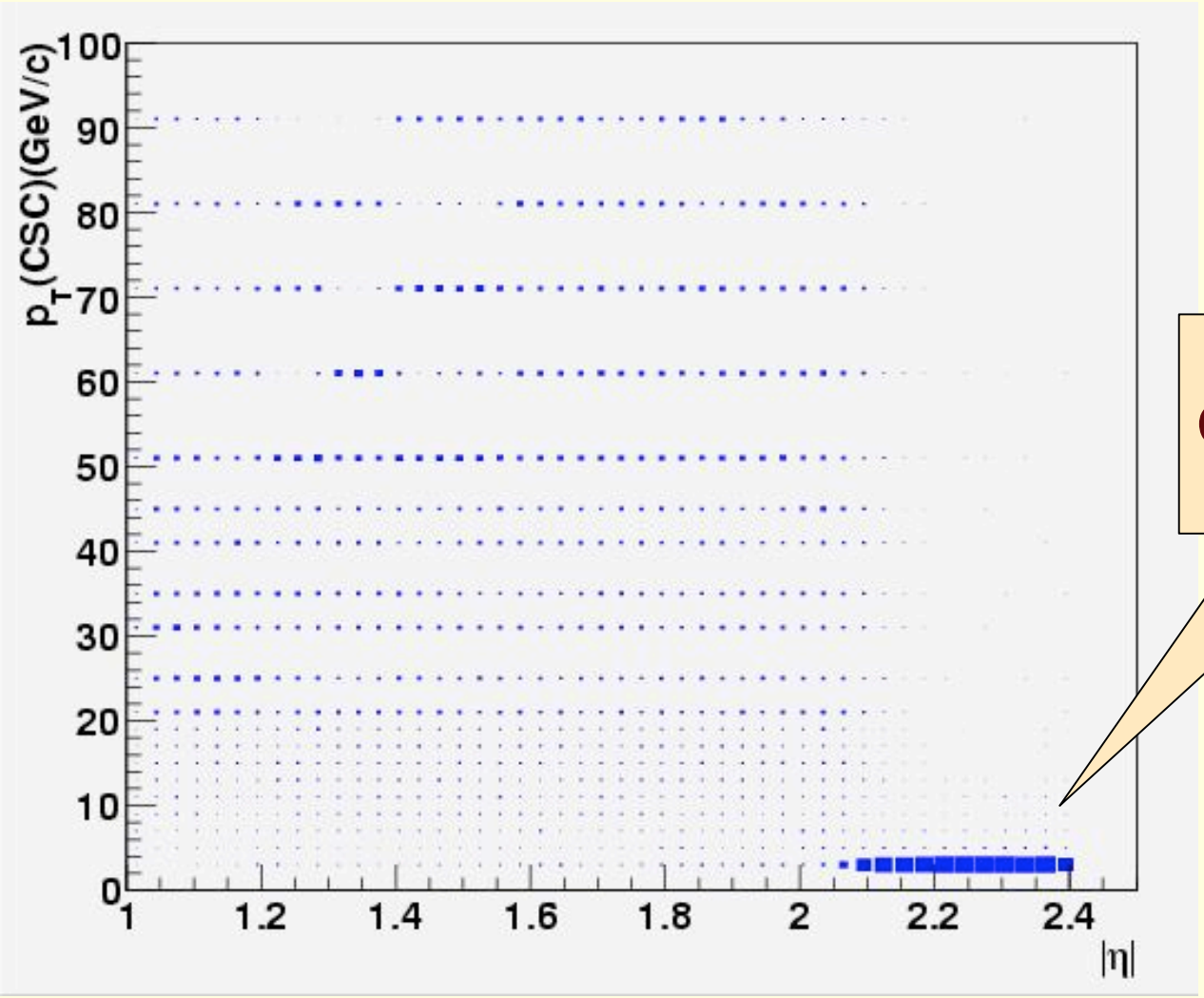


pT measurement at |η|>2.1



Above |η|≈2.05
CSC measures
p_T = 3 GeV/c

p_T resolution

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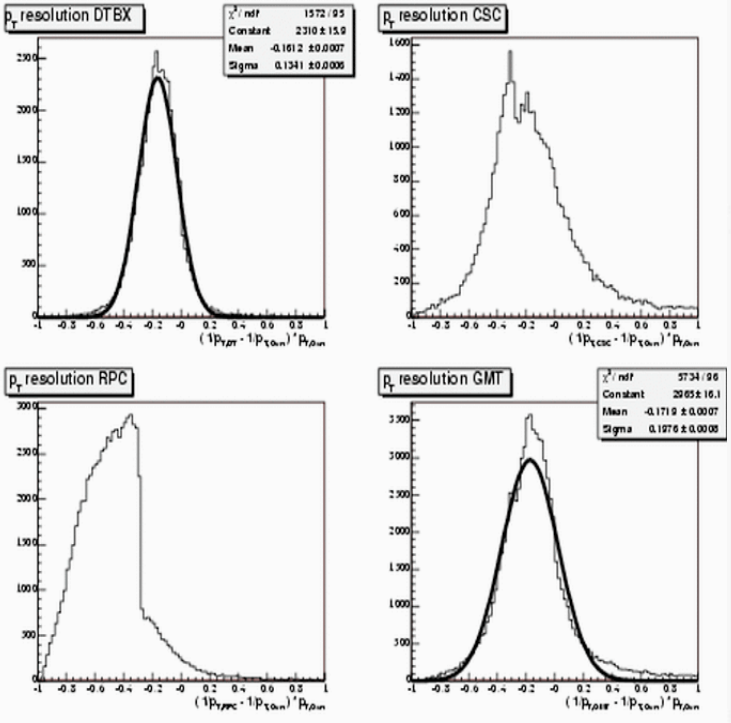

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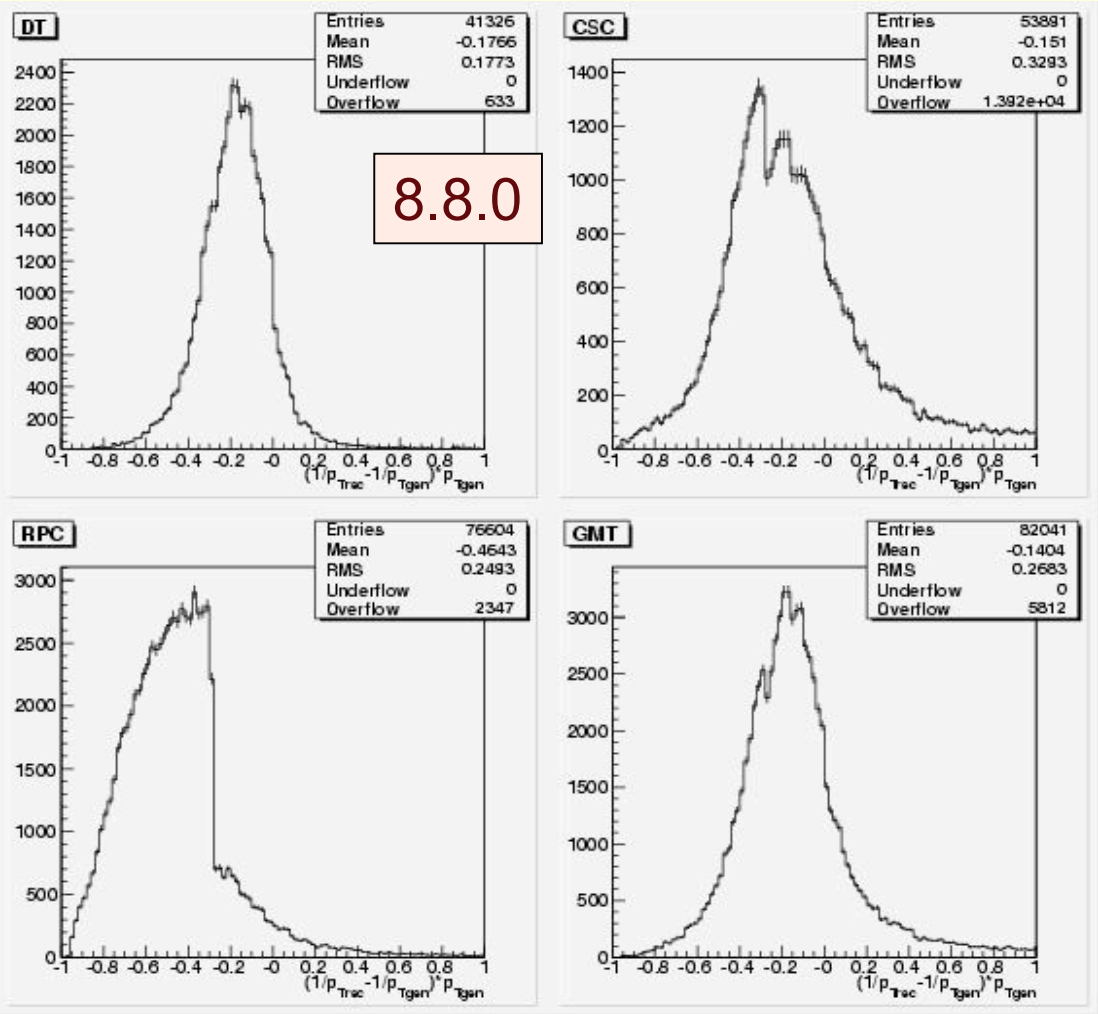
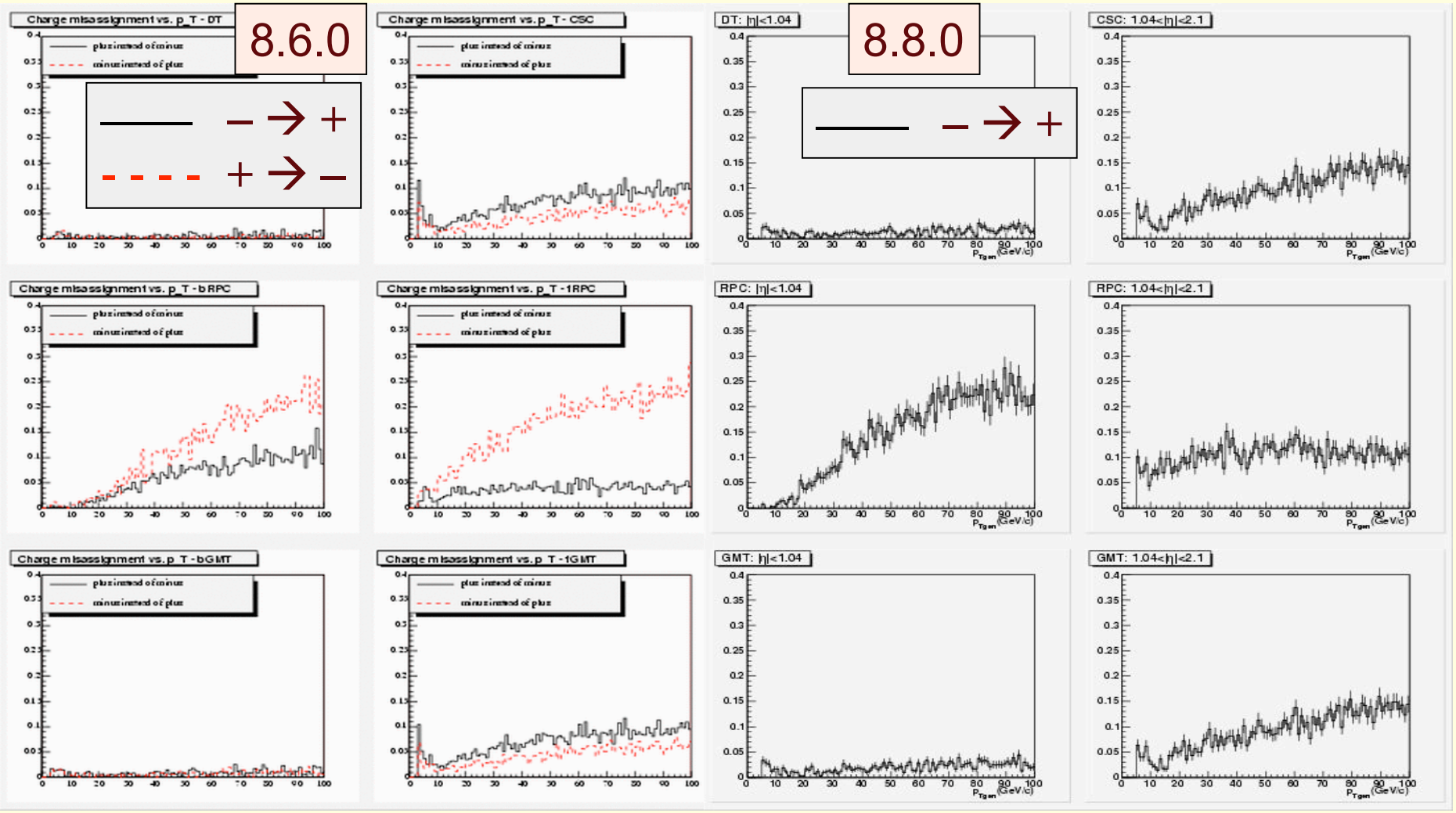
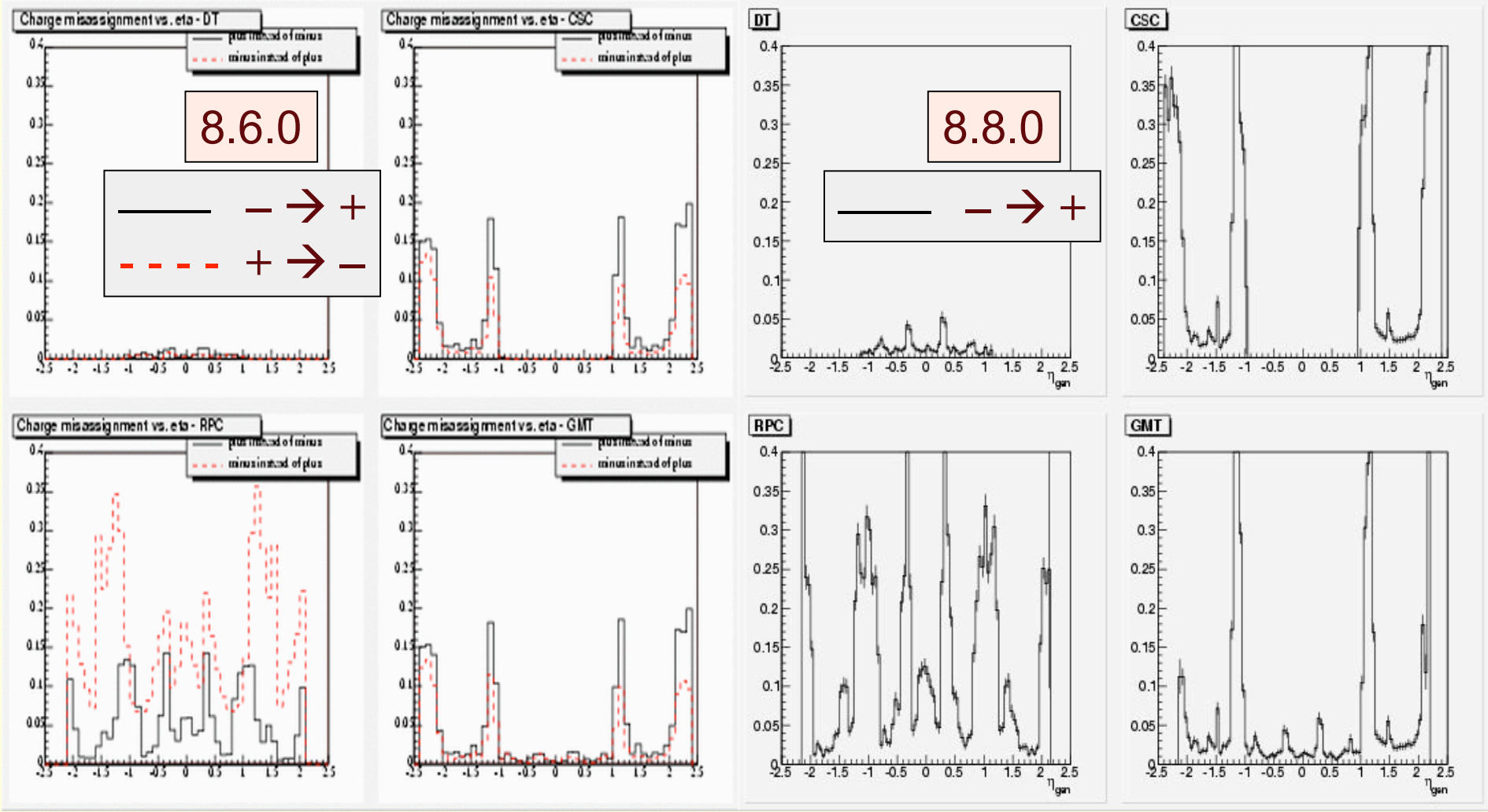


Charge misID vs. p_T



Charge misID vs. p_T



Efficiency vs. ϕ

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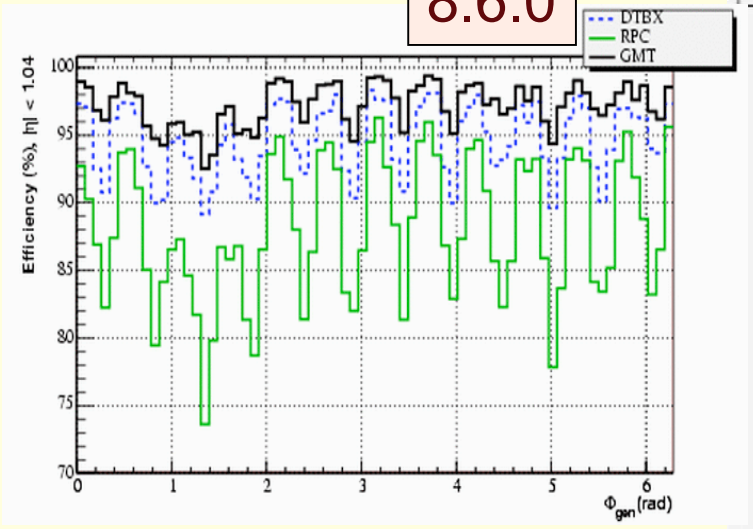

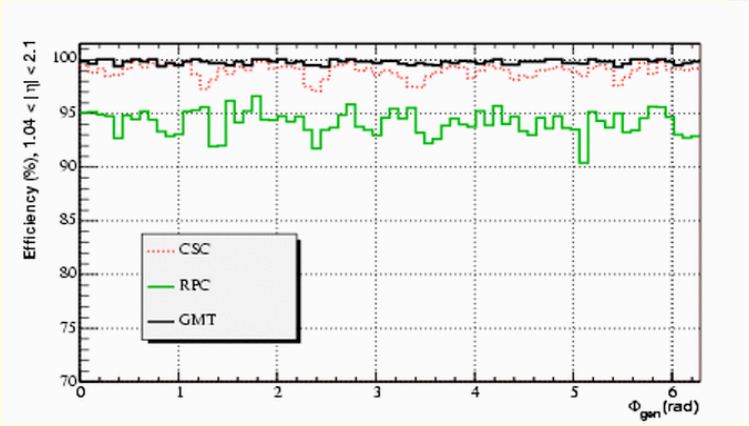

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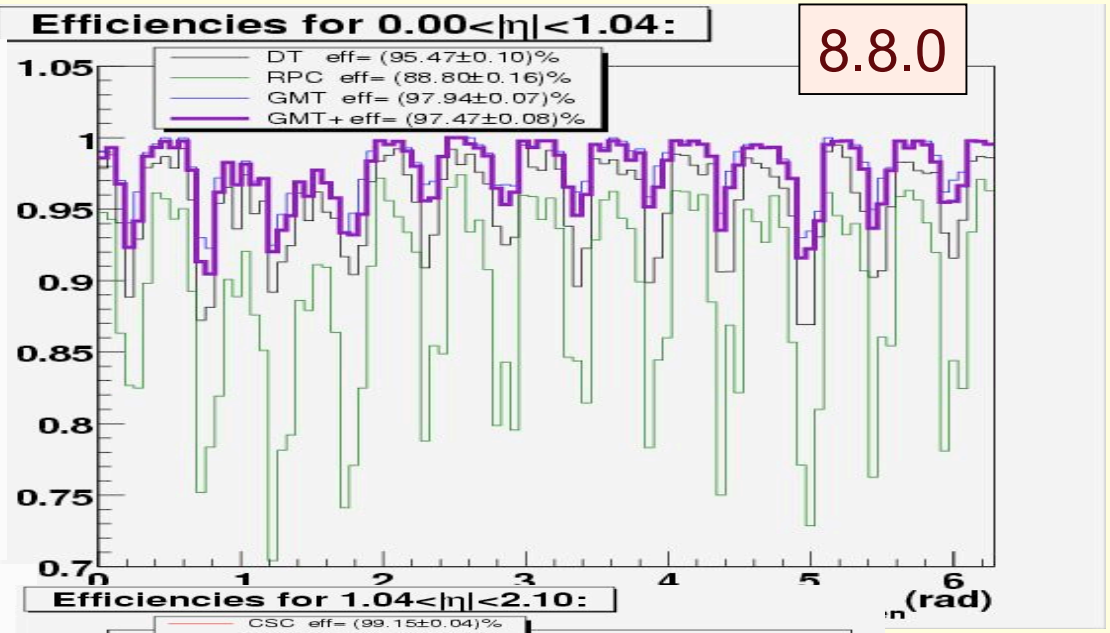
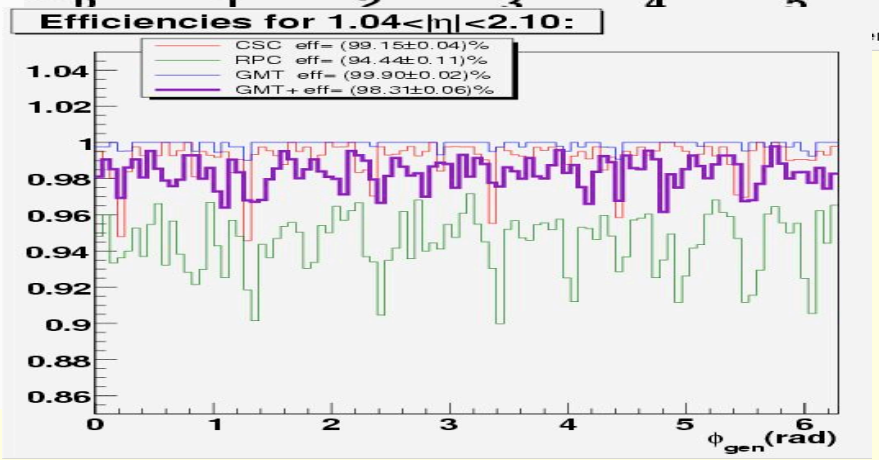
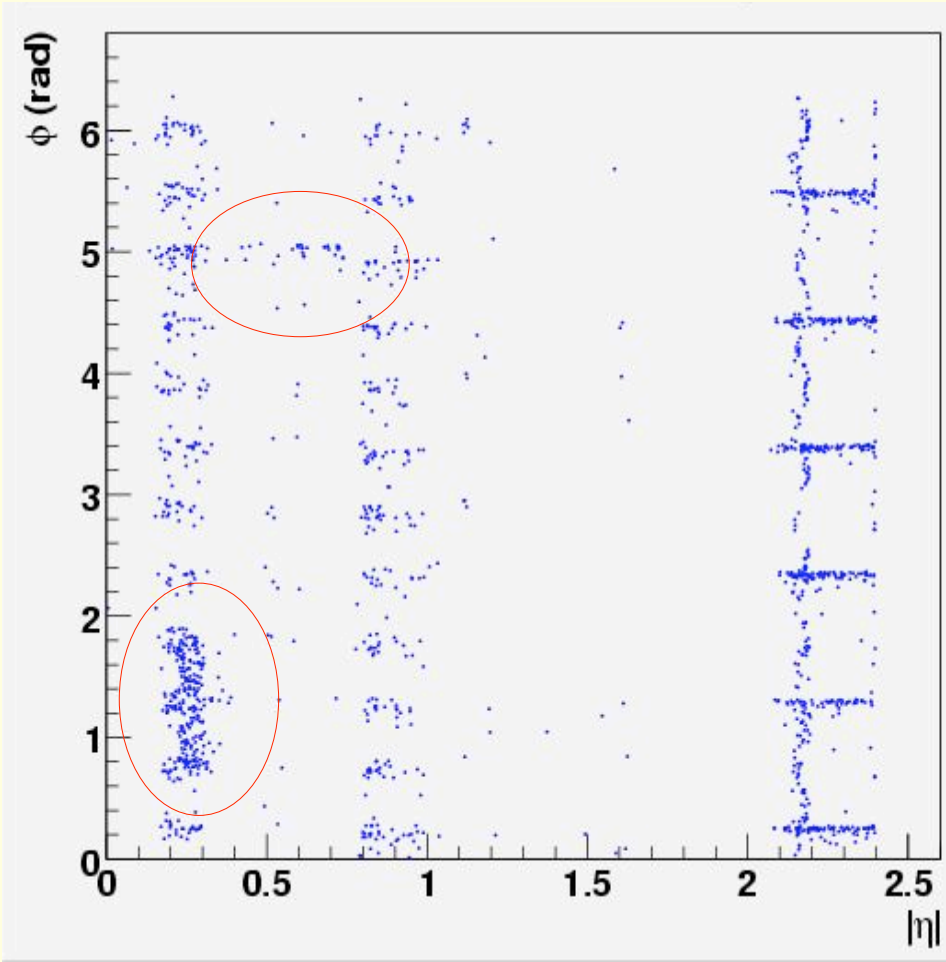
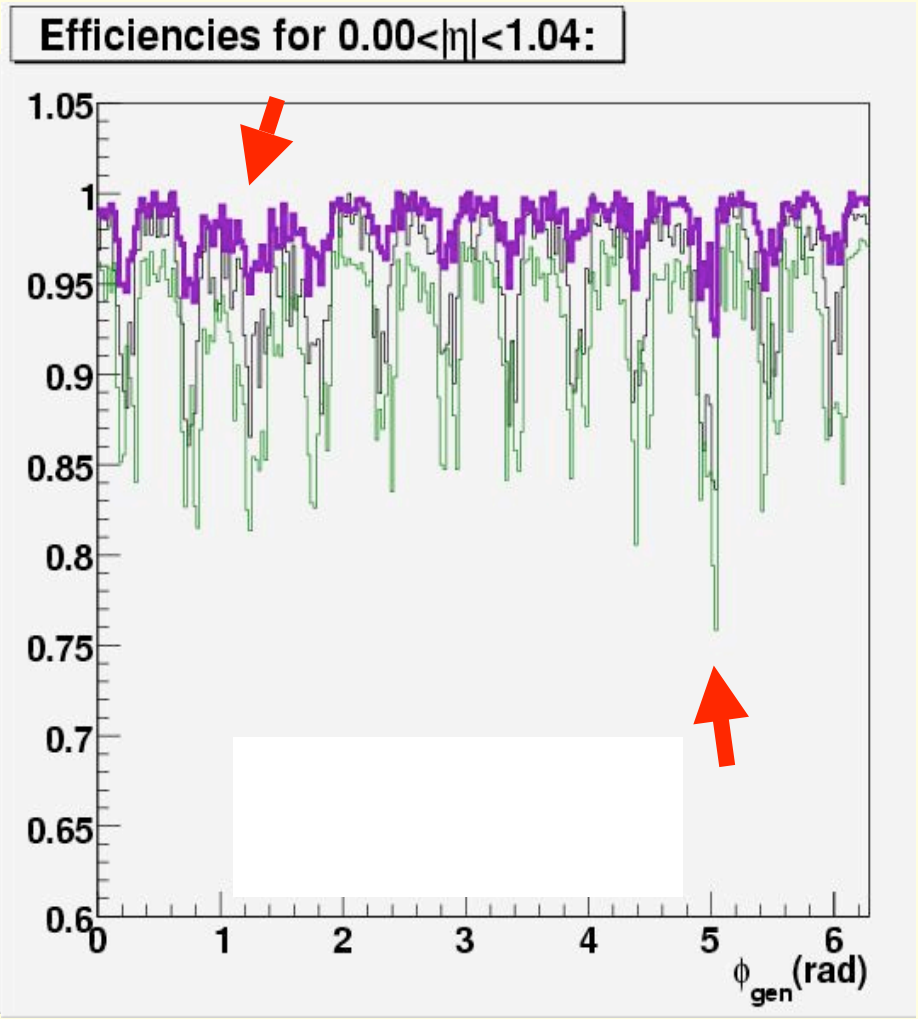


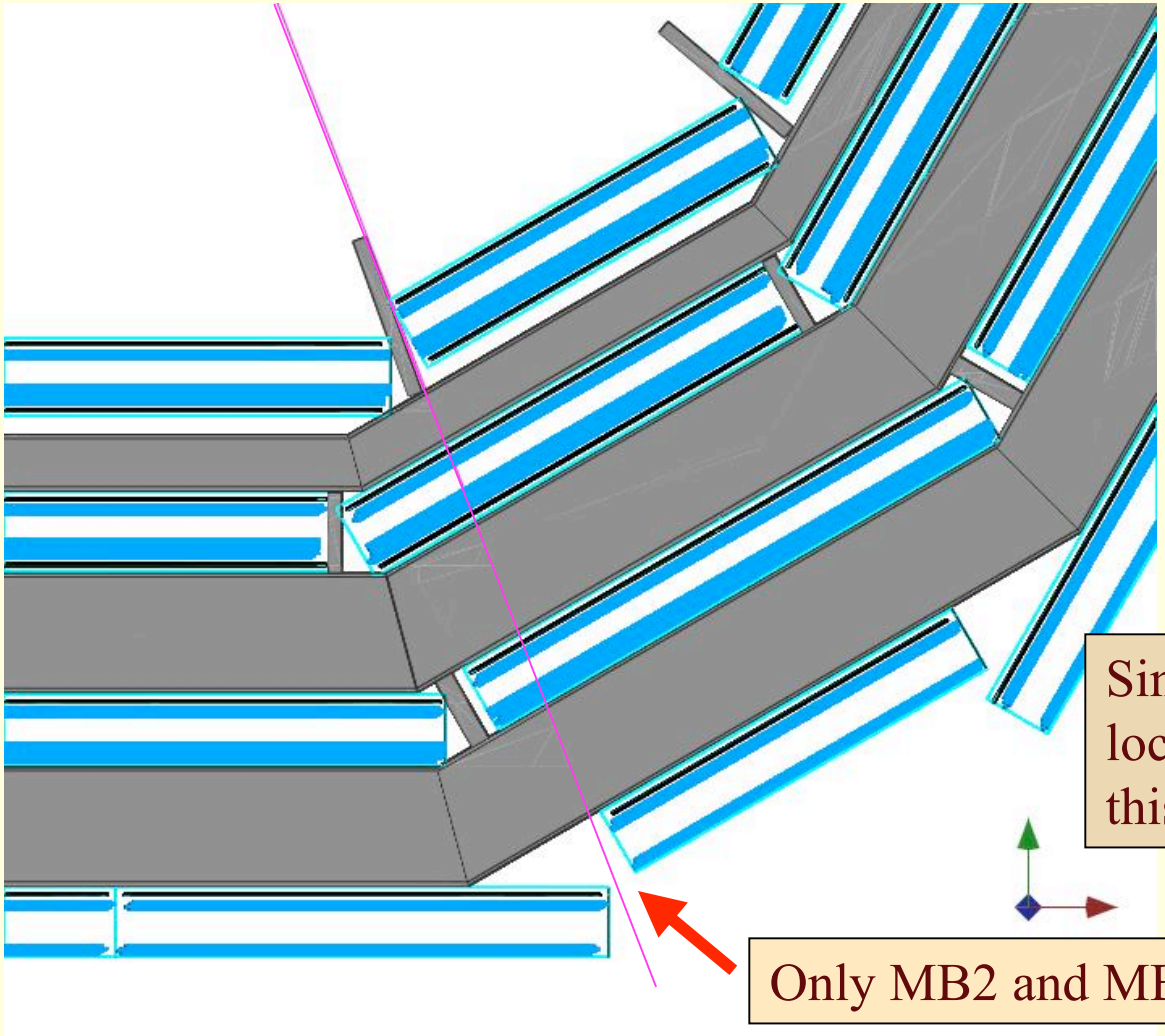


Local infficiencies in barrel





Example of an inefficient ϕ~5.05 event



Conclusions

- Efficiency and ghost probability of GMT and L1 local muon triggers in **ORCA 8.8.0** is practically unchanged wrt. last check with **ORCA 8.6.0**.
- Main difference is in charge misID (worse by factor two) – will check normalisation with Hannes…
- For a complete performance check - includes rate estimates: need minimum bias samples!
- Small local inefficiency structures in certain η-ϕ regions in the barrel, reported recently, could be reproduced (despite of low statistics). Origin of $\phi \sim 5.05$ inefficiency is probably purely geometrical.