



pt LUT assignment for CSCTF with 7 TeV data

By Anna Kropivnitskaya

- selection
- check PtLUTs at Point 5 with 7 TeV collision data
- Conclusion and Plans

Collision Data Selection

Analyze ntuples which produce Gian Piero based on old format of Prompt Analysis:

- ✓ Followed the prescriptions reported on <https://twiki.cern.ch/twiki/bin/viewauth/CMS/Collisions2010Recipes>
- ✓ Dataset used: Commissioning10/MinimumBias/RECO/ and the latest April ReReco, whenever available
- ✓ Used Runs: 132440, 132442, 132476, 132477, 132478, 132569, 132572, 132601, 132605, 132606, 132646, 132647, 132648, 132651, 132652, 132653, 132654, 132960, 132961, 132965, 132966, 132968, 132982, 132986, 132992, 133029, 133034, 133035
- ✓ Basic selections (DPGAnalysis/Skims/python/MinBiasPDSkim_cfg.py):
 - CSC minimal activity (1 segment, 1 hit chamber)
 - "Good Collision":
 - select on bits '0 AND (40 OR 41) AND NOT (36 OR 37 OR 38 OR 39) AND NOT ((42 AND NOT 43) OR (43 AND NOT 42))')
 - Good Vertex Selector
 - Scraping Removal Filter
- ✓ Analyze only global muons which have matching with csctf tracks, so-called **N_glob** (it was selected 5596 such golden muons)

Threshold efficiency = {N_glob with csctf_Pt > Pt threshold}/N_glob

Global Muons Selection

✓ Analyze only global muons which have

- matching with csctf tracks with:

$$dr = \sqrt{d\eta^2 + d\phi^2} < 0.2$$

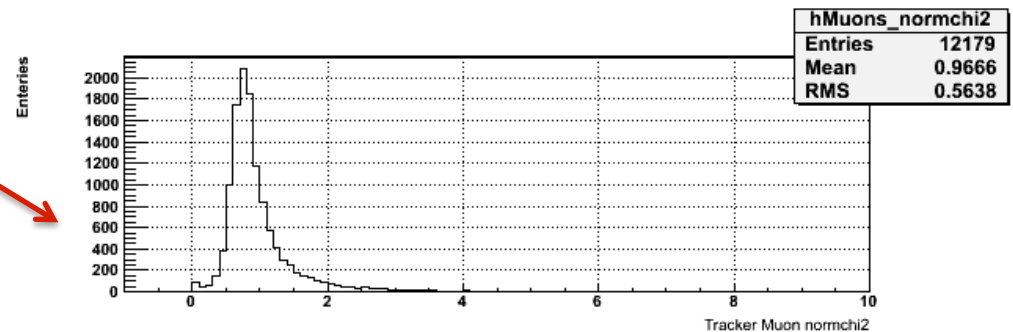
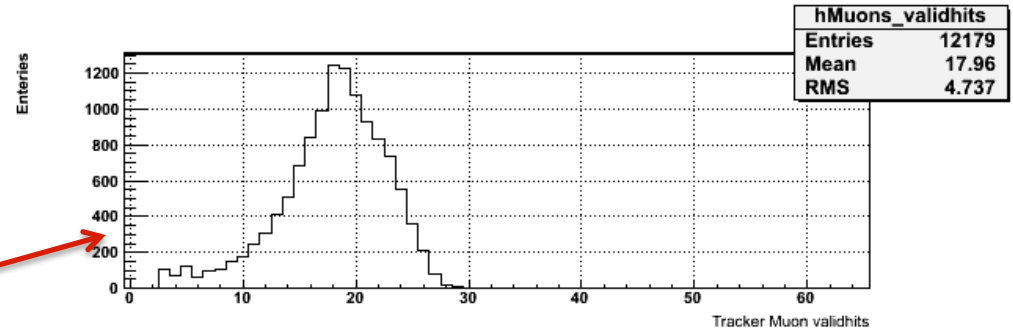
$$d\eta = \eta(\text{best global}) - \eta(\text{csctf}),$$

$$d\phi = \phi(\text{best global}) - \phi(\text{csctf})$$

best global - best coincidence
with CSCTF

- Muons_validhits > 10

&& Muons_normchi2 < 3,
so-called **N_glob**



Global muons + with csctf tracks + Muons_validhits > 10 + Pt_track_muon > 2 GeV

&& Muons_normchi2 < 3

12.179

→ 5.596

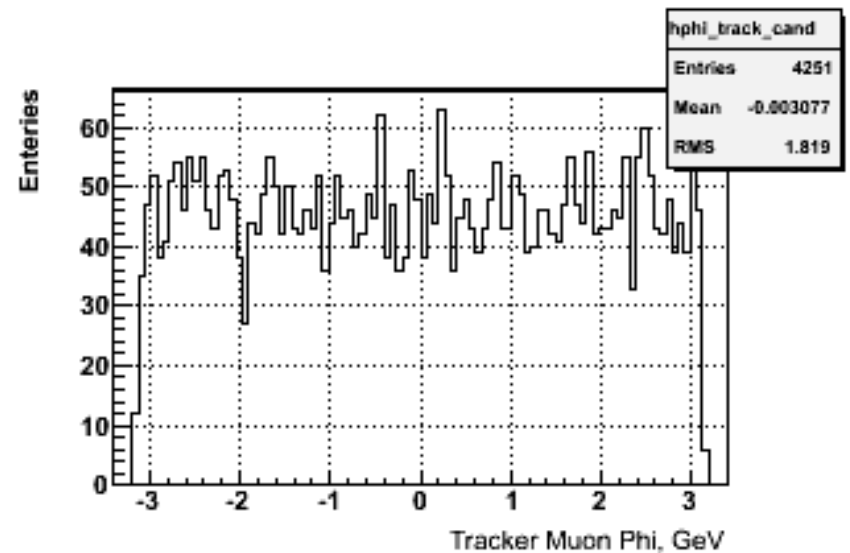
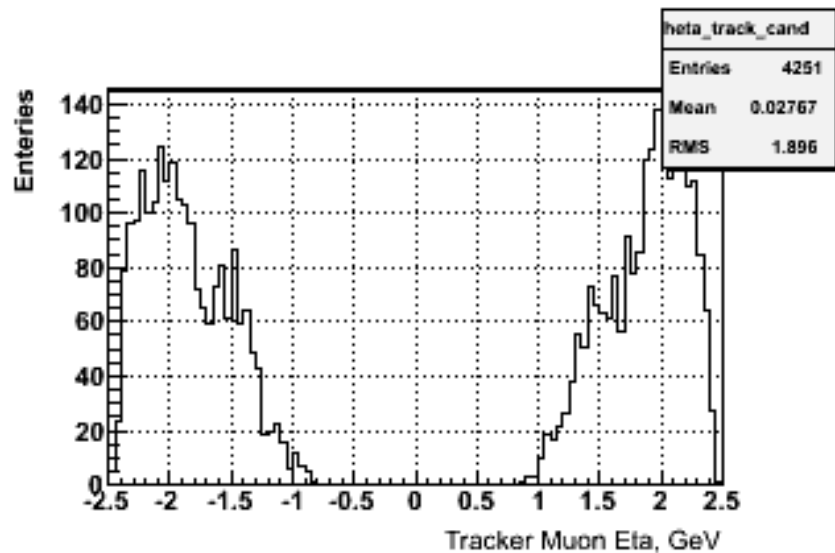
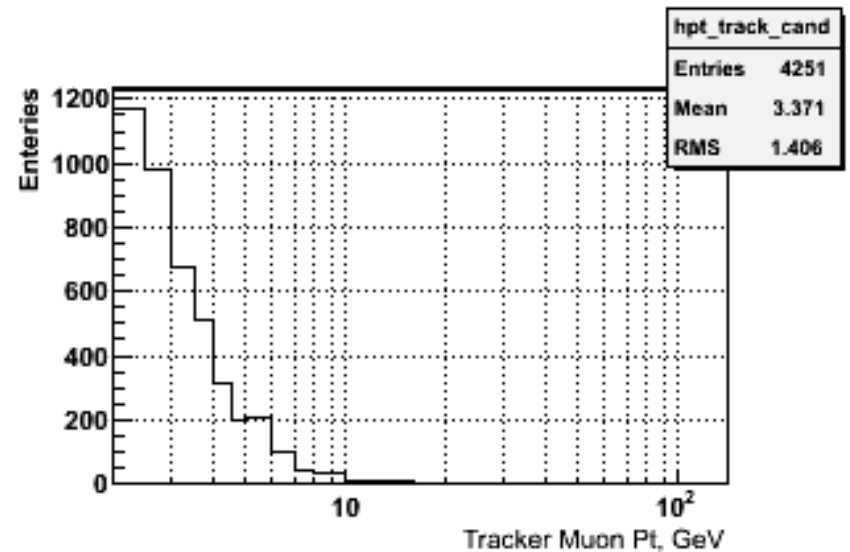
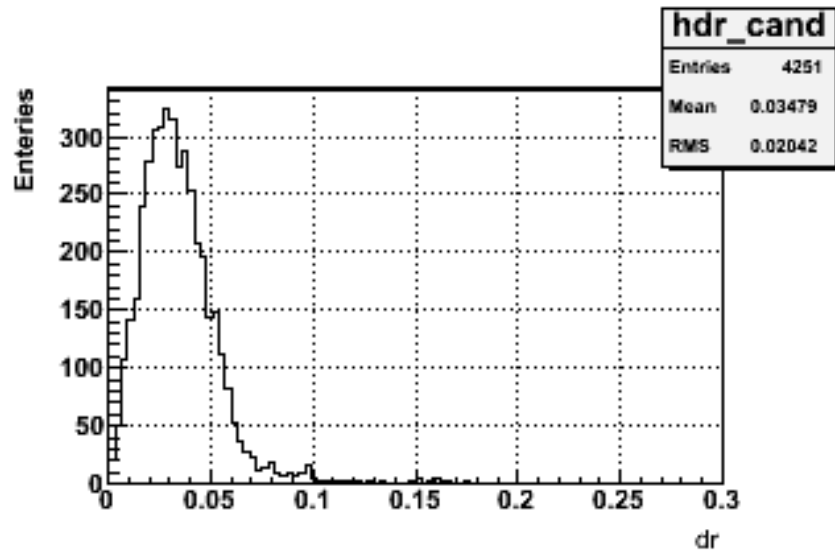
→ 5.163

→ 4.252

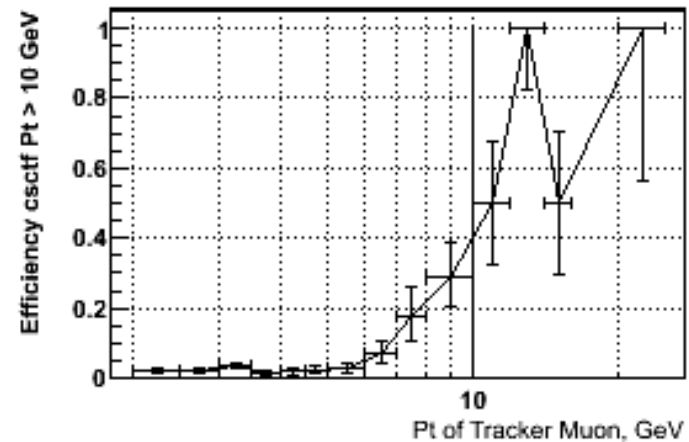
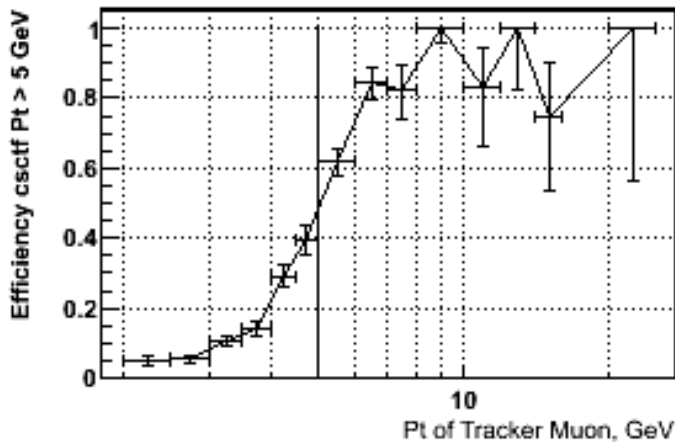
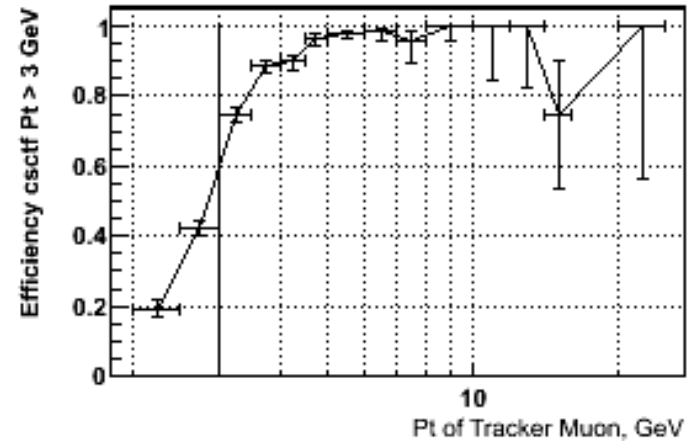
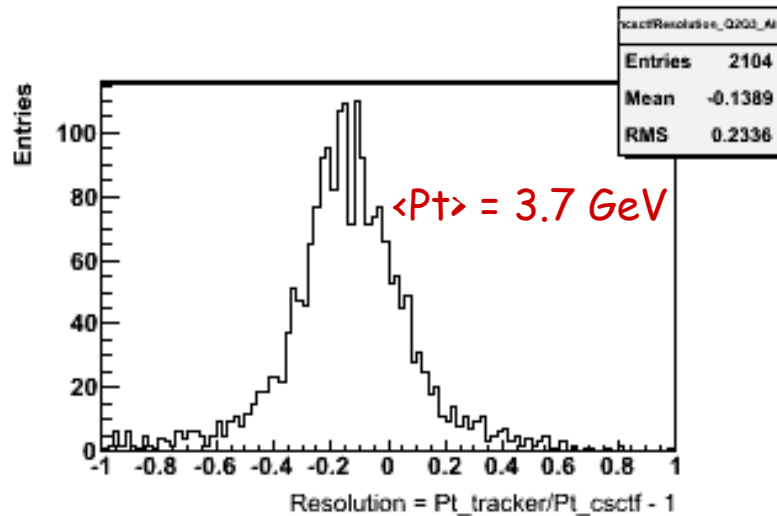
(it was selected 4252 such N_glob)

Threshold efficiency = {N_glob with csctf_Pt > Pt threshold}/N_glob

Global Muons with CScTF track

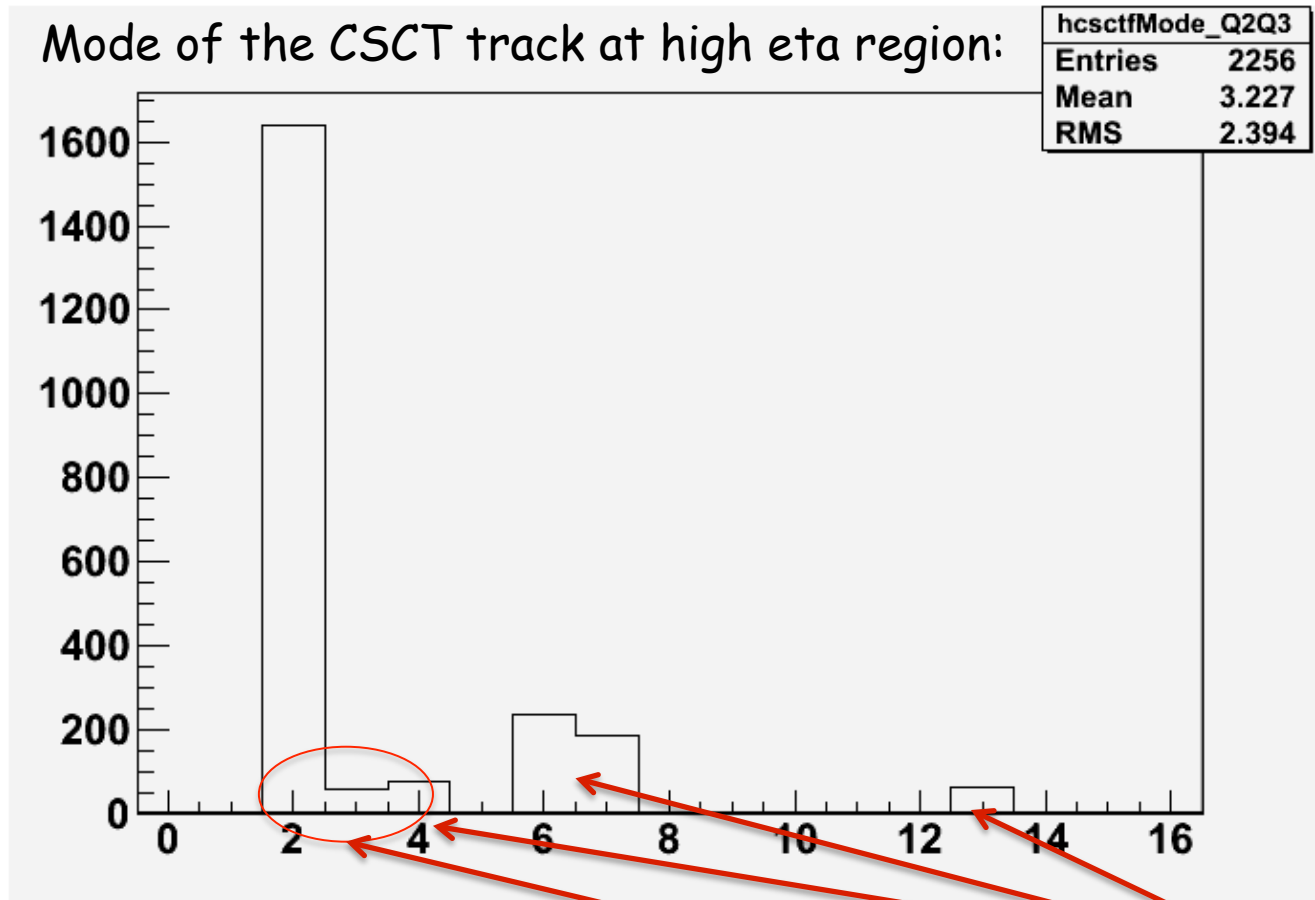


PtLUTs at Point 5: Q2&Q3, $1.2 < |\eta| < 2.1$



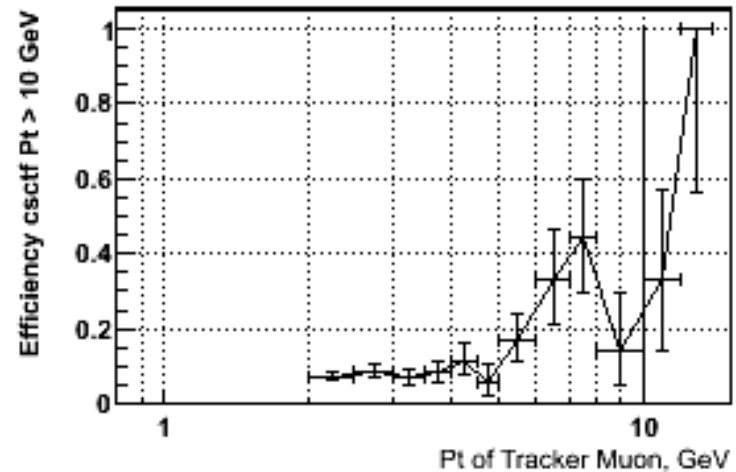
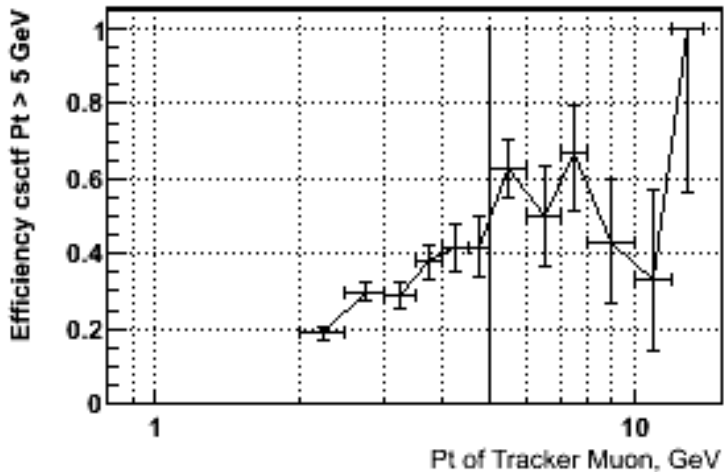
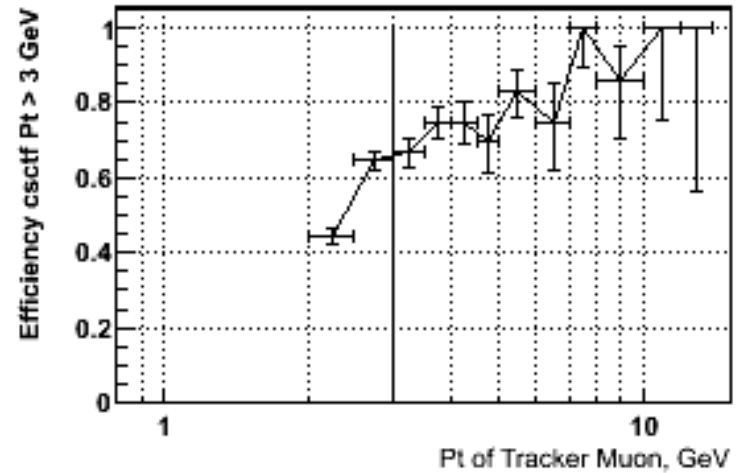
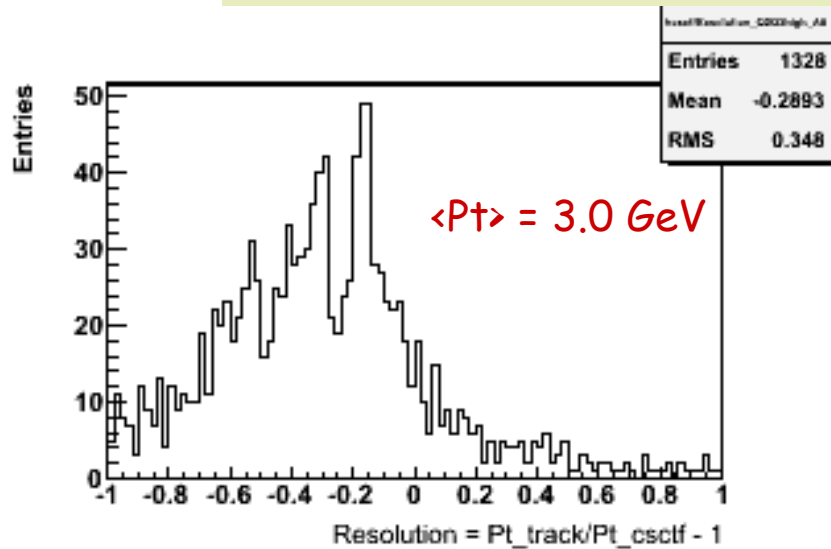
- + Good resolution ($\sim 23\%$) and threshold efficiency for golden region of eta
- Threshold efficiency start for the threshold Pt cut less then 0.9 (should be investigated)

PtLUTs at Point 5: Q2&Q3, $1.2 < |\eta| < 2.1$



- Most tracks in the golden modes (3 stations) and have ME1 station

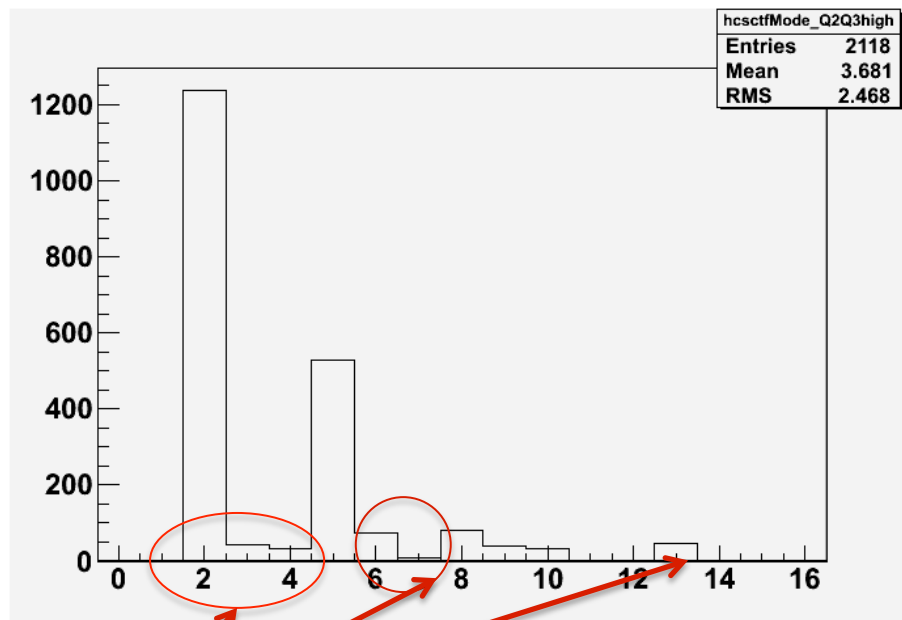
PtLUTs at Point 5: Q2&Q3, high $|\eta| > 2.1$



Low resolution ($\sim 35\%$) and low threshold efficiency in high η region

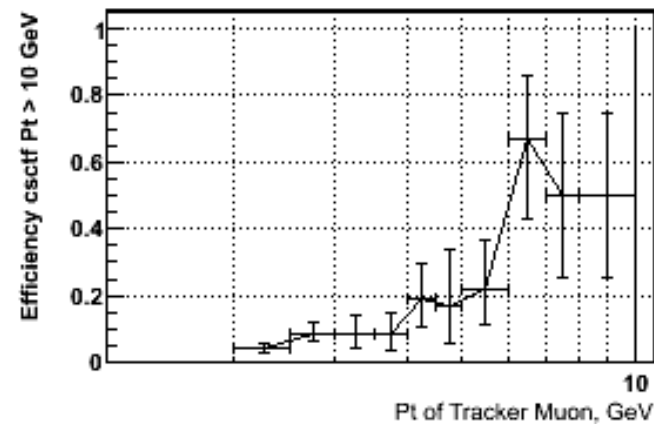
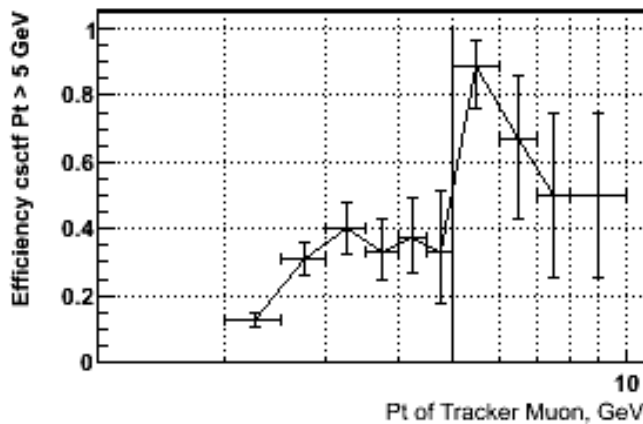
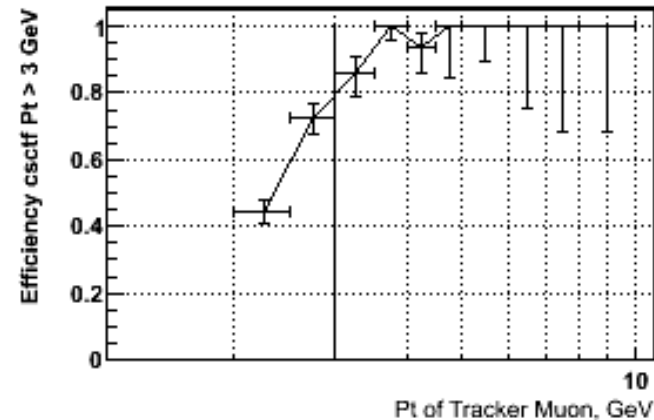
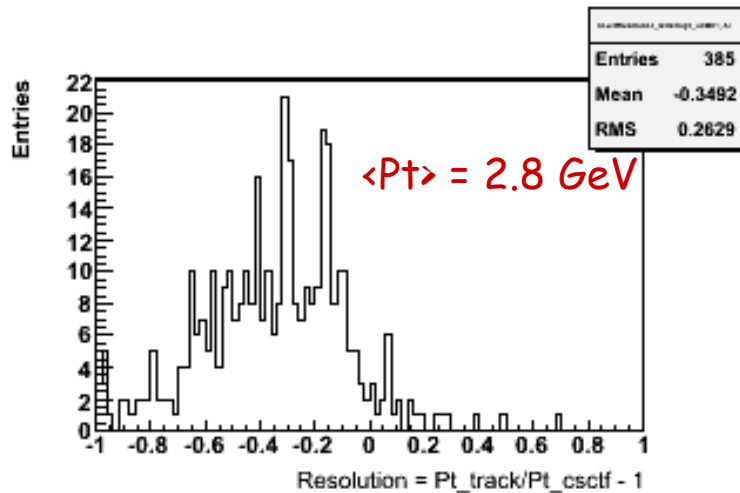
PtLUTs at Point 5: Q2&Q3, high $|\eta| > 2.1$

Mode of the CSCT track at high eta region:



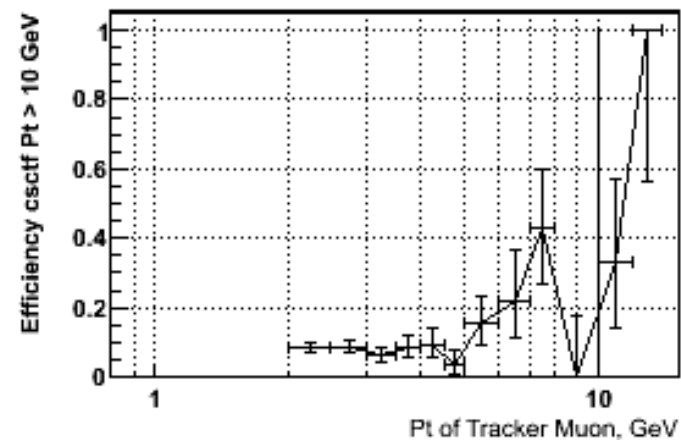
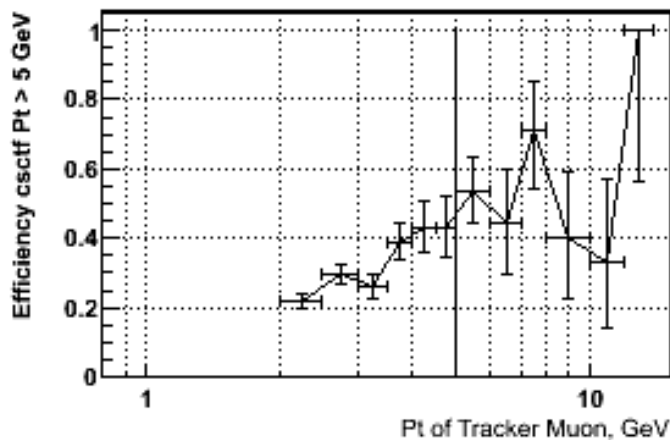
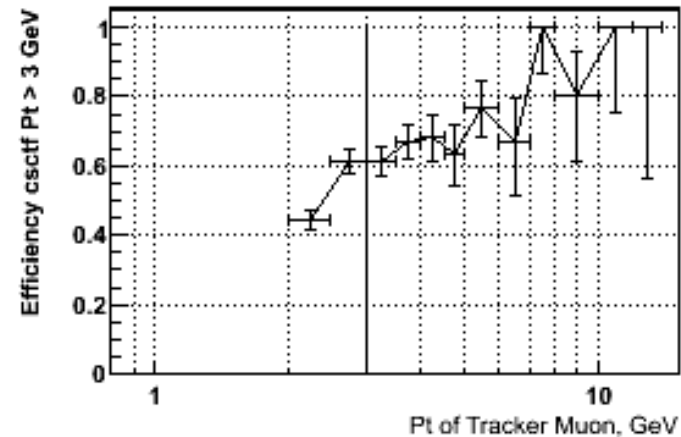
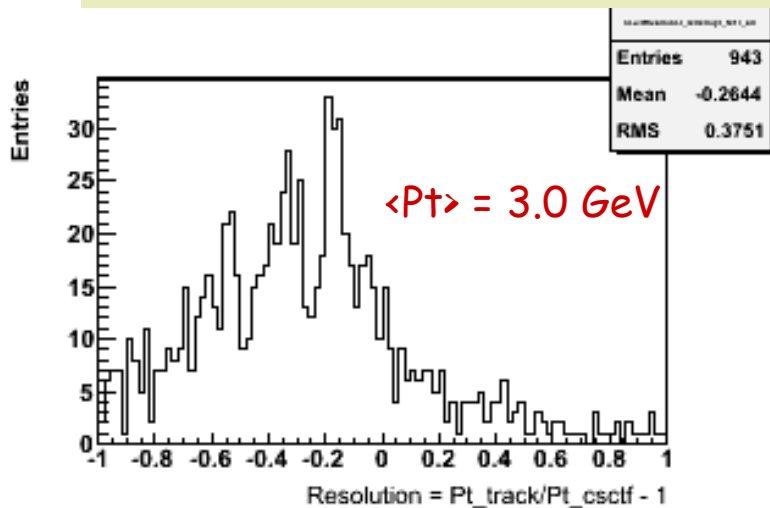
- Most tracks have ME1 station
- ME1 station has problem with phi assignment at high eta
- Analyze high eta region without tracks with ME1 (see next slide)

PtLUTs at Point 5: Q2&Q3 without ME11a, high $|\eta| > 2.1$



- ✓ Good resolution ($\sim 26\%$) and high threshold efficiency (see threshold 3 GeV, for threshold 5 and 10 GeV no statistics) in high eta region for tracks without ME1
- ✓ CSCTF tracks with ME1 at high eta region are needed in separate study in future

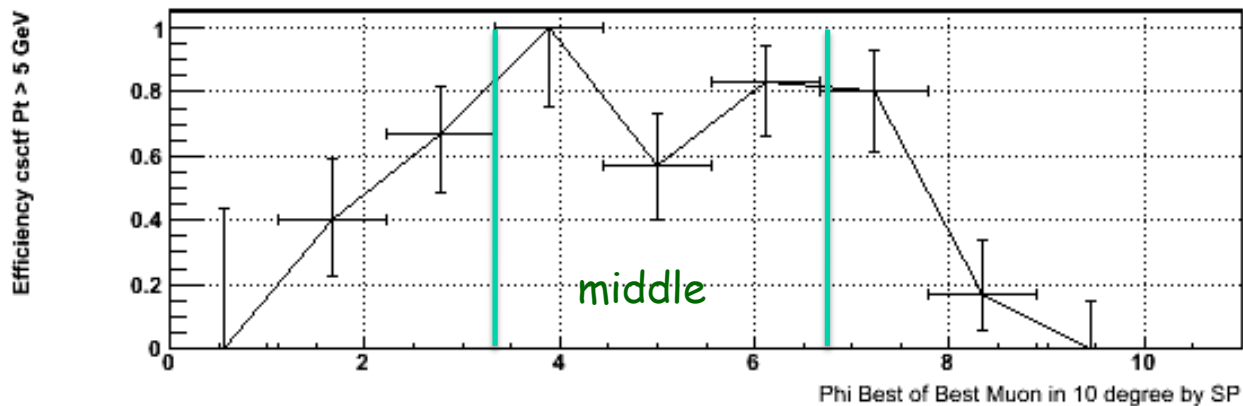
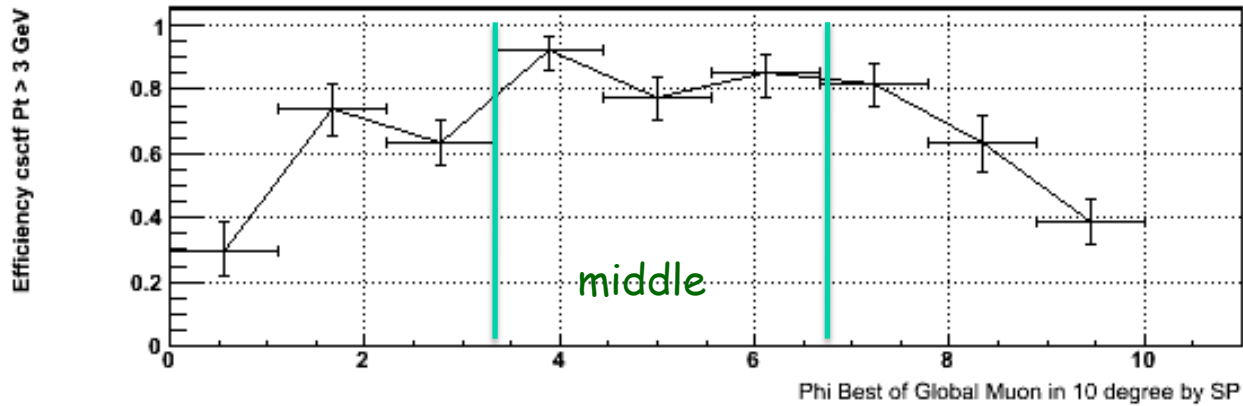
PtLUTs at Point 5: Q2&Q3 with ME1, high $|\eta| > 2.1$



- ✓ Low resolution ($\sim 38\%$) and low threshold efficiency (see threshold 3 GeV, for threshold 5 and 10 GeV no statistics) in high eta region for tracks with ME1
- ✓ CSCTF tracks with ME1 at high eta region are needed in separate study in future

PtLUTs at Point 5: Mode2 (1-2-3) with ME11a, high $|\eta| > 2.1$

$$\text{Phi} = \text{fmod}([\text{Phi_global}-15], 10)$$



- ✓ Threshold efficiency is significantly higher in the middle than at the ages what is expected from merger of 3 links to 1 for ME11a and assign to phi of middle link

Conclusion and Plans

- Rather good pt assignment at
 - golden eta region
 - high eta region for tracks without ME11a
- Threshold efficiency start for the threshold Pt cut less than 0.9 (should be investigated)
- bad pt assignment at
 - high eta region for tracks with ME11a
 - > possible solution:
 - most of such tracks are with Mode = 2 (ME1-M2-ME3)
 - use only dphi23 for pt assignment
 - use corrected dphi12 -> find minimum dphi12 using all 3 links for ME11a
- to do:
 - need to generate Monte Carlo in high eta region for ME11a study
 - migrate this analysis to the Prompt Analysis zone (use official ntuples)

Back up slides

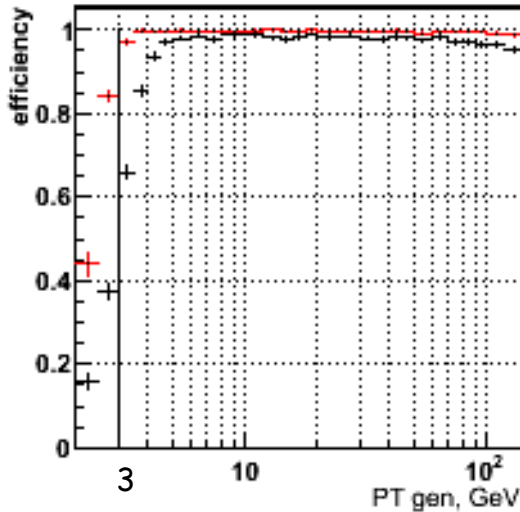
Monte Carlo: PtLUTs Likelihood Method

- ✓ We have generated a new PtLUT and test on
 - official MC from the L1 DPG
 - "Super Pointing" muons from CRAFT 09
- ✓ The new PtLUT shows improvements for (see next slide):
 - ✓ Quality 3 muons with low pT ($pT < 5 \text{ GeV}$)
 - ✓ Quality 1 muons in all η bins
 - ✓ Quality 2 muons in high η bins
 - ✓ muons in the overlap region (DT-ME) for Quality 1, 2 and 3
 - ✓ equivalent performances in the other regions
- ✓ PtLUTs based on Likelihood method
 - are uploaded at Point 5 (4 March 2010)
 - O2O is ready and will be implemented in CMSSW_3_6_X
 - check pt assignment with new collision data
- ✓ The latest PtLUTs information you could find at twiki page:

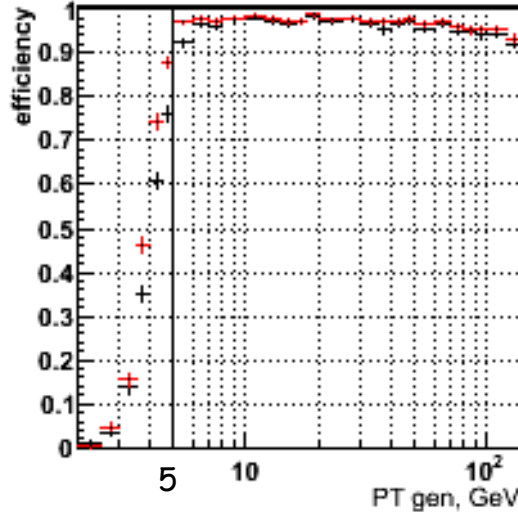
<https://twiki.cern.ch/twiki/bin/view/Main/PtLUTs>

Monte Carlo: PtLUTs Likelihood Method: Performance

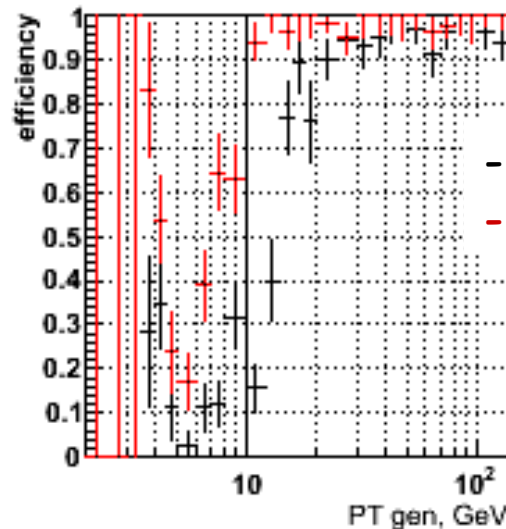
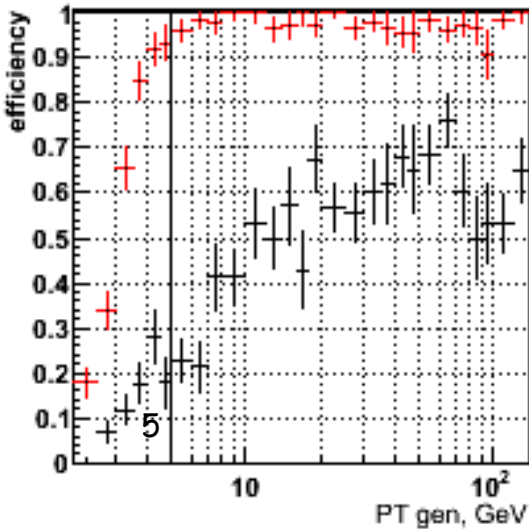
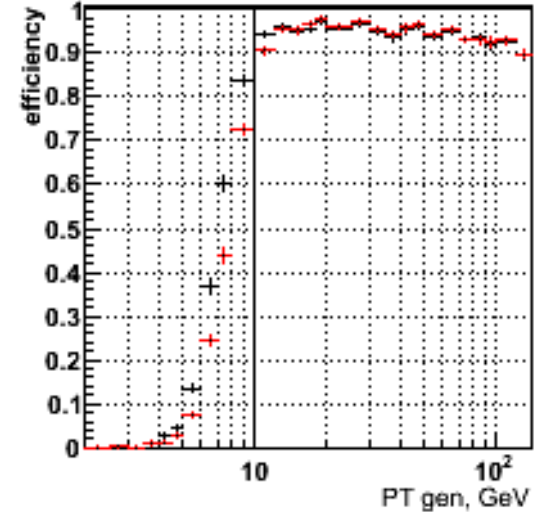
Quality 3 : 3 stations including ME1 for $1.2 < |\eta| < 2.1$



Quality 1: 2 stations without ME1 for $1.2 < |\eta| < 2.1$



Quality 3 in overlap region ME-DT



- old Likelihood method 2001
- new Likelihood method