muon RECO efficiency
53X vs 73X

Emilien, Songkyo, Geonhee, Prashant, Vineet

dilepton meeting
14th January 2015

muon RECO service work

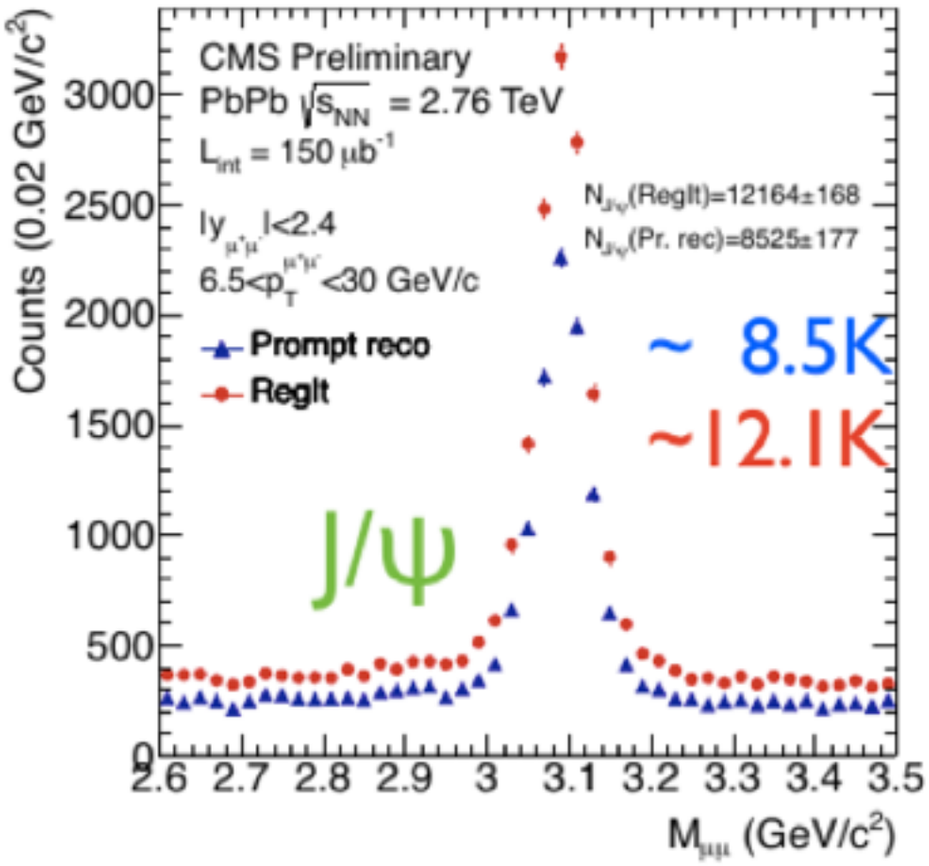
- **muon RECO for 2015 heavy ion run**
  - contact person : Emilien
  - manpower : Songkyo, Geonhee, Vineet, Prashant
  - main task

    1) REGIT (Regional iterative tracking) development

    2) reconstruct J/psi to lower p_T in PbPb

Regit

from Emilien

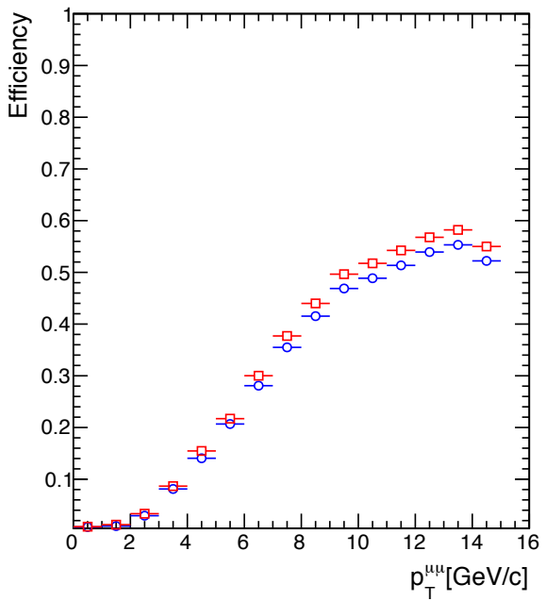


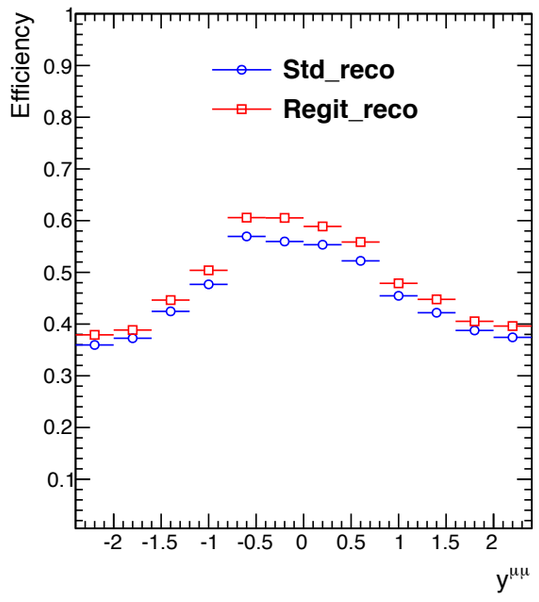
- PbPb
  - HI reco: HI tracking + STA
  - RegIt: HI tracking + (pp-iterative-tracking in region around STA) + STA
  - $\sim$ 40% increase in dimuon efficiency for prompt J/ψ: RegIt re-reco in 4.4
- pPb
  - pp reco

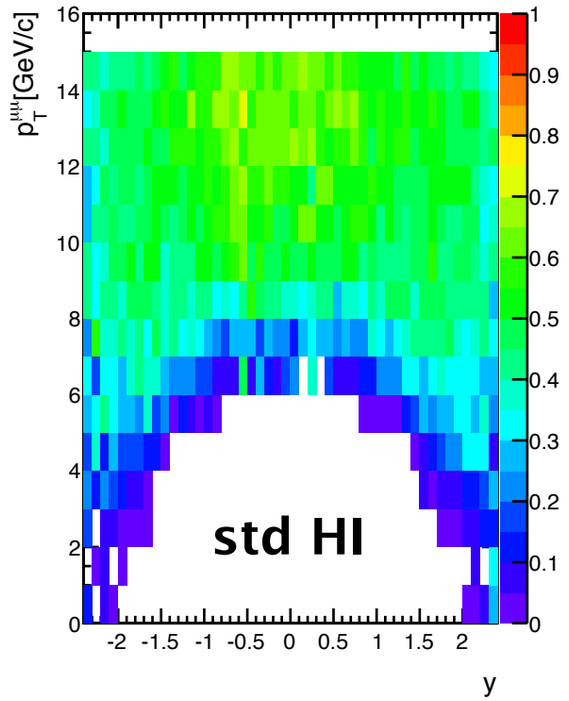
pp / std HI / Regit

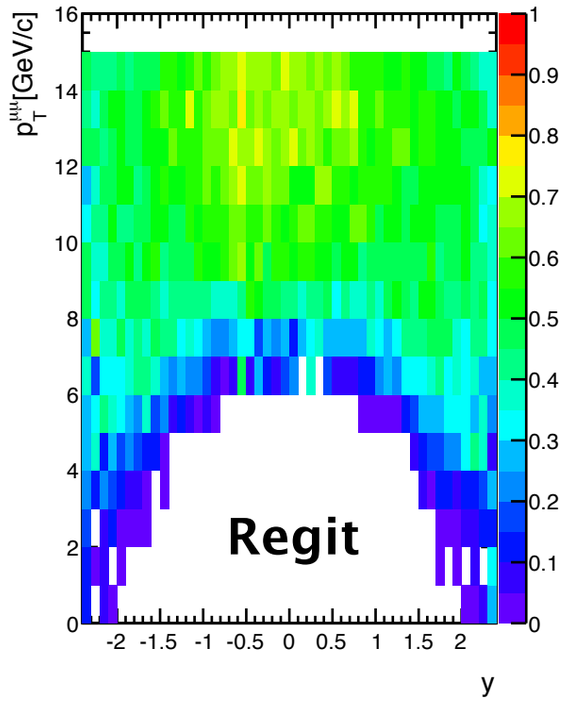
efficiency in 73X

- **Prompt J/psi**
  - dimuon pair

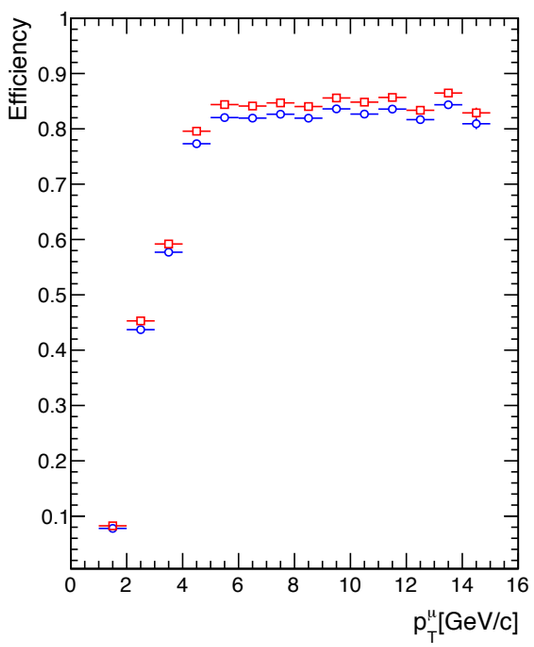


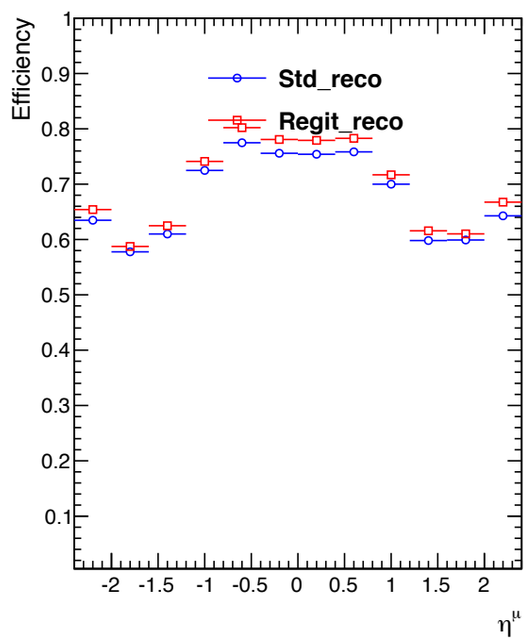


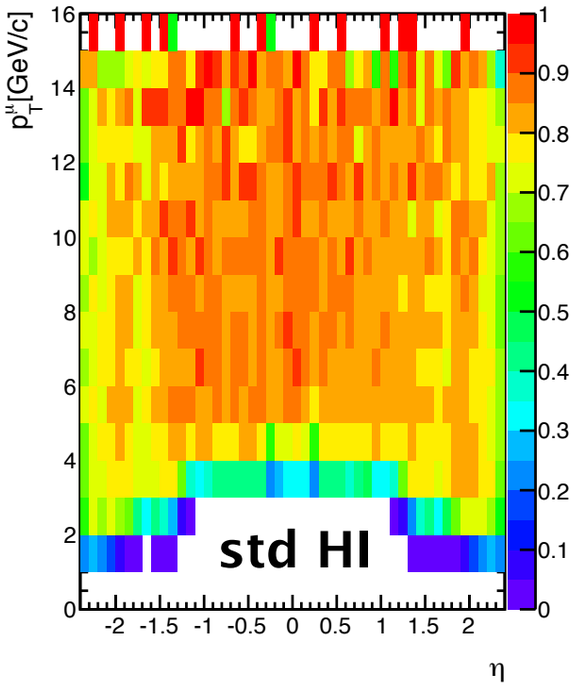


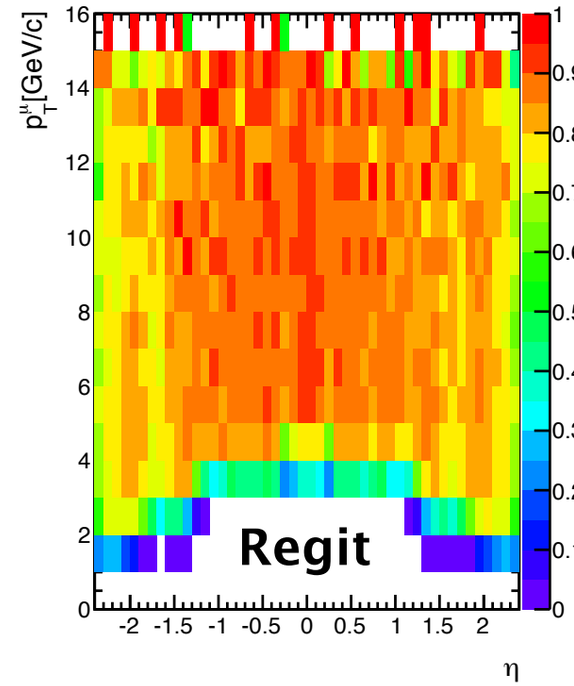


  - tracks (single muons)





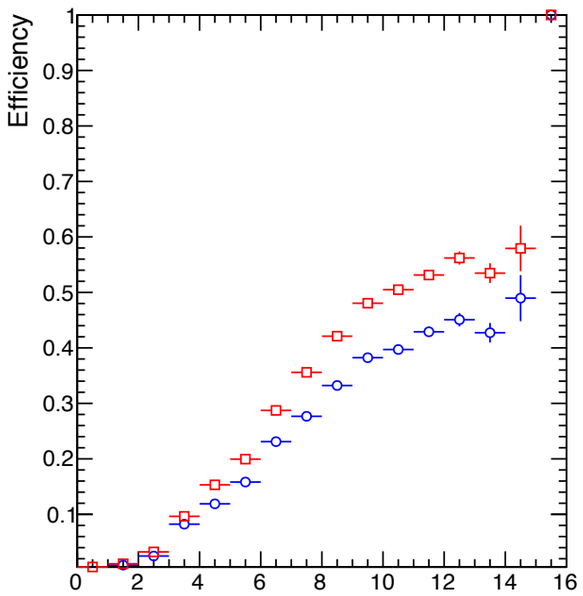


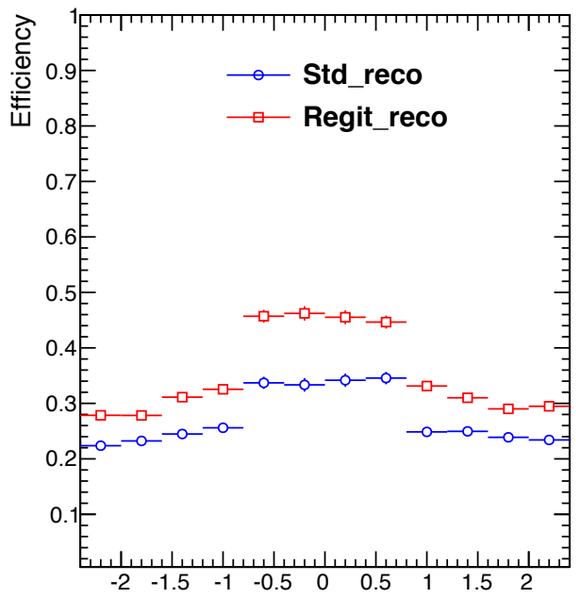


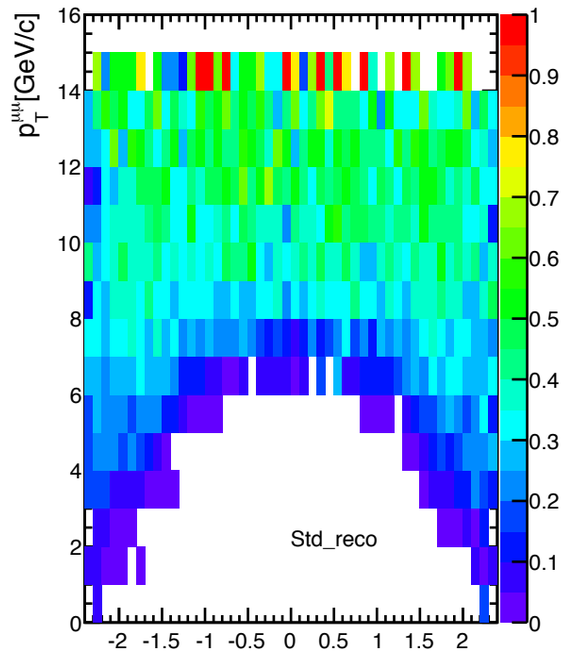
efficiency in 73X

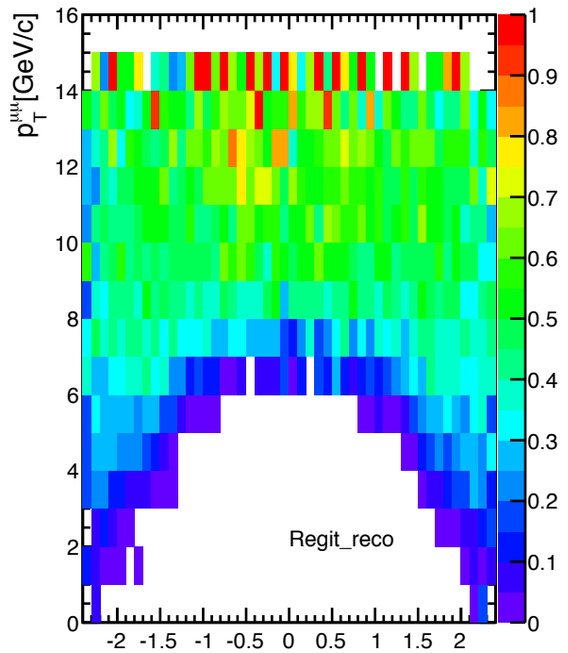
Non-prompt J/psi

- dimuon pair

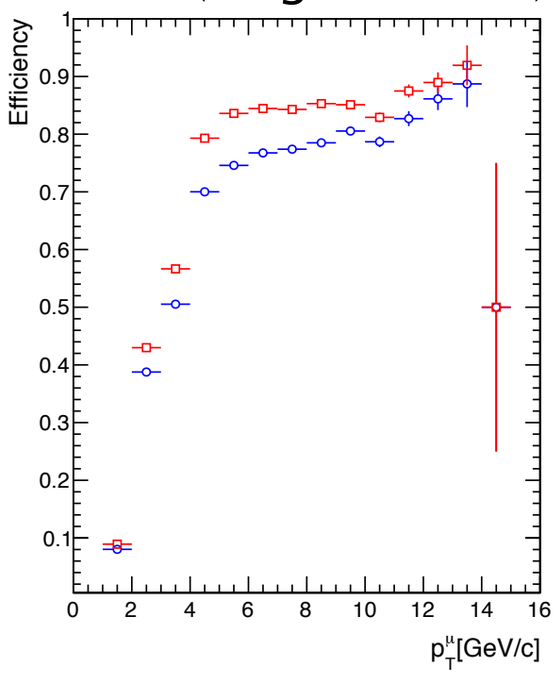


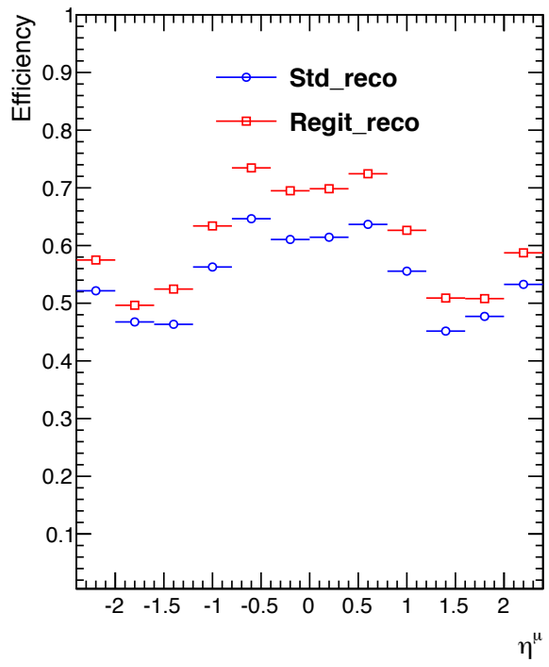


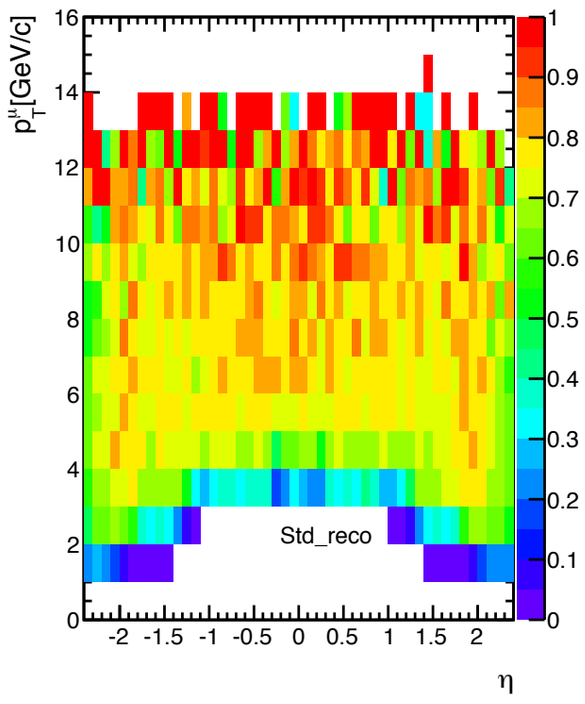


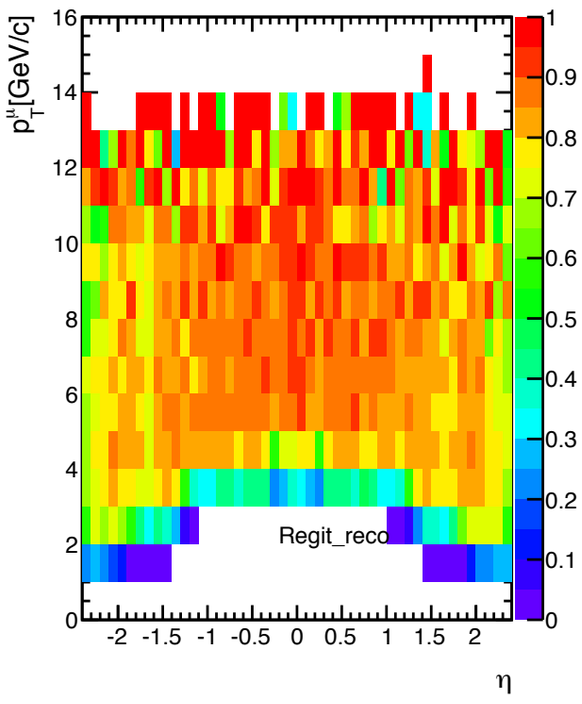


- tracks (single muons)





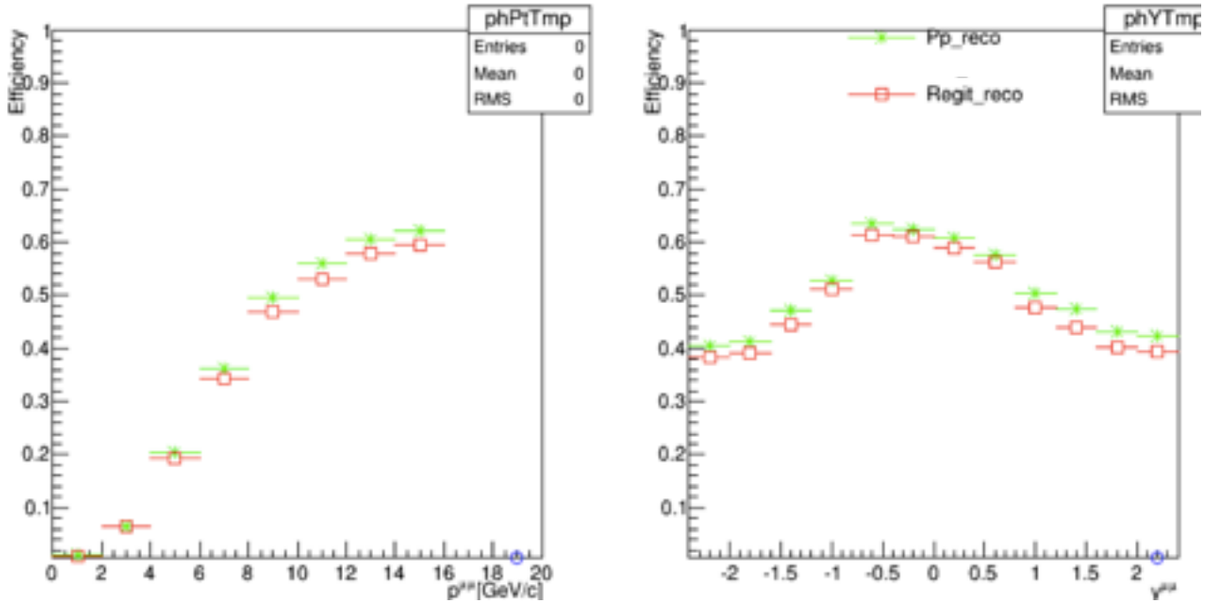




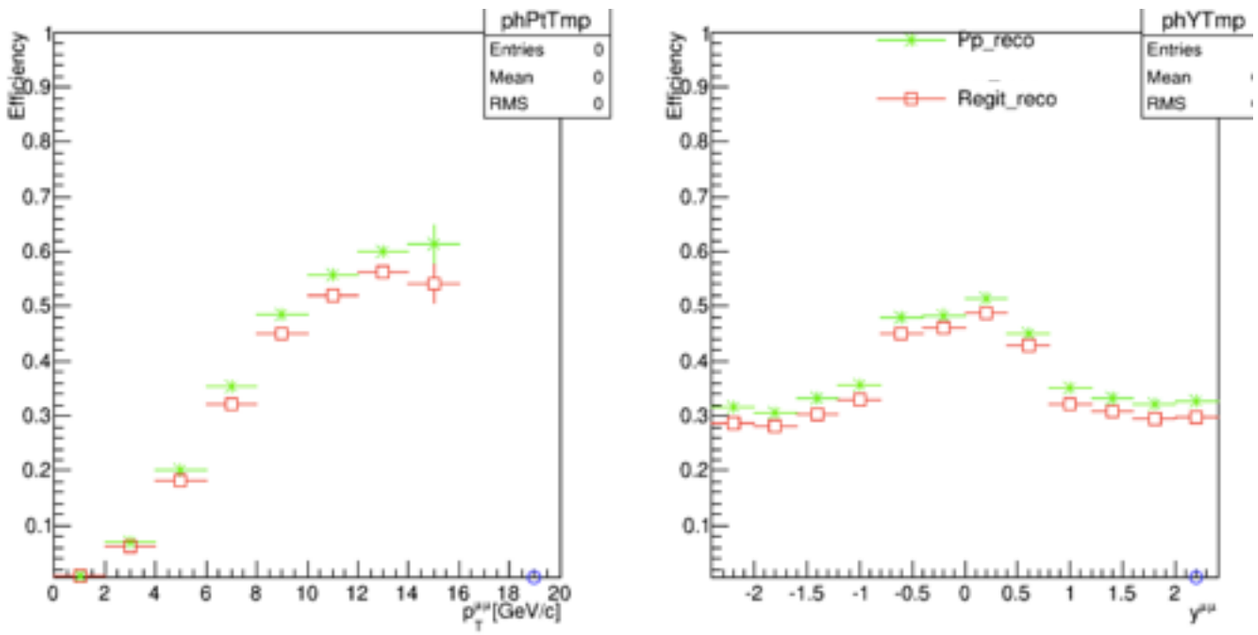
efficiency in 73X

from Geonhee

- **Prompt J/psi**
  - dimuon pair



- **Non-prompt J/psi**
  - dimuon pair



- Regit show higher Efficiency close to pp
- For prompt, pp ≈ Regit ≈ std HI
- For non-prompt, pp ≈ Regit > std HI

old Regit vs new Regit

MC & cut criteria

- **MC sample : non-embedded pythia gun**
  - CMSSW 53X : J/psi p_T < 20 GeV/c, 200k events
    - prompt MC : /pythiagun_jpsi_Pt020_STARTHI53_V27_gen_20140506/echapon-pythiagun_jpsi_Pt020_STARTHI53_V27_gen_20140506-b44ce38d6b7a7d0deaf18cccd16453b6/USER
    - non-prompt MC : /pythiagun_bJpsi_Pt020_STARTHI53_V27_gen_20140504/echapon-pythiagun_bJpsi_Pt020_STARTHI53_V27_gen_20140504-92a2ccf910317b195b8656f4a7d0d72d/USER
  - CMSSW 73X : J/psi p_T < 15 GeV/c, 30k events
    - prompt MC : /pythiagun_jpsi_Pt015_auto_starthi_HIon_gen_20141118/echapon-pythiagun_jpsi_Pt015_auto_starthi_HIon_gen_20141118-3427cf5935deeedcc1fba281d4dc8bb2/USER
    - non-prompt MC : /pythiagun_bjpsi_Pt015_auto_starthi_HIon_gen_20141120/echapon-pythiagun_bjpsi_Pt015_auto_starthi_HIon_gen_20141120-0a668b8241c4381607180a06c42370c2/USER

- **acceptance cut**

$$
\begin{aligned}
|\eta^{\mu}| < 1.3 &\rightarrow p_T^{\mu} > 3.3\ GeV/c \\
1.3 < |\eta^{\mu}| < 2.2 &\rightarrow p^{\mu} > 2.9\ GeV/c \\
2.2 < |\eta^{\mu}| < 2.4 &\rightarrow p_T^{\mu} > 0.8\ GeV/c
\end{aligned}
$$

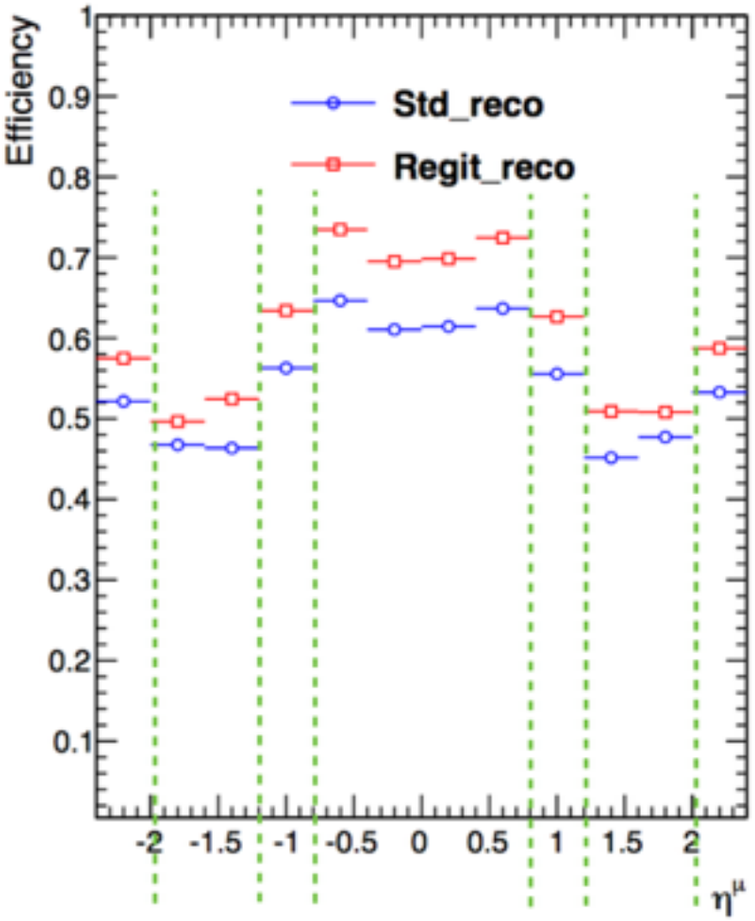
- **muon ID cut**
  - nValidPixelHits > 2
  - nValidMuonHits > 0
  - nmatch > 0
  - chi2/ndof < 4
  - 2.6 < $M_{\mu\mu}$ < 3.5 GeV

- **p_T cut**
  - pair : p_T < 15 GeV
  - track : 1 < p_T < 15 GeV

weighting

p_T-|y| weighting (pT-|η|)

- e.g.) non-prompt, single tracks



[η or y ranges]

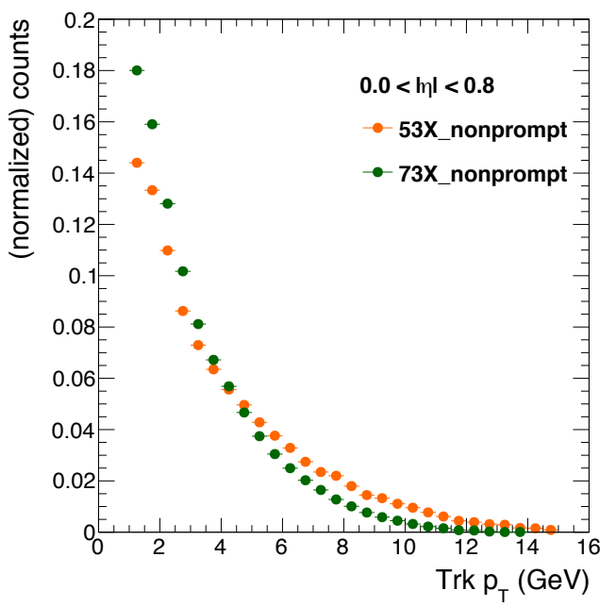
0 < |eta| < 0.8

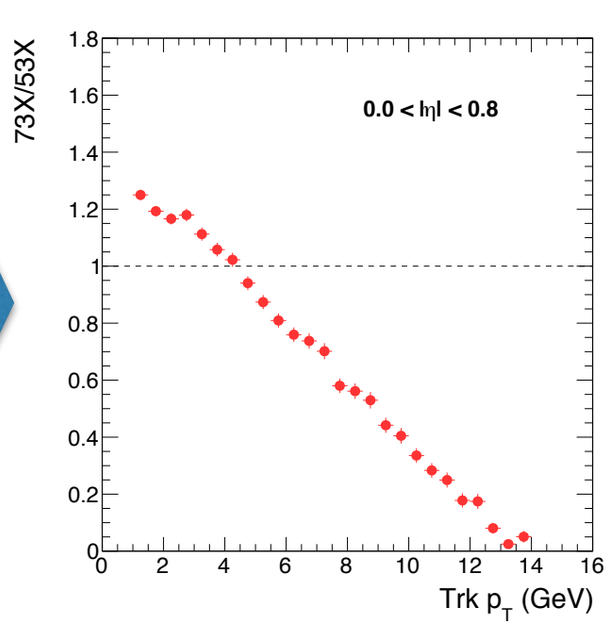
0.8< |eta| < 1.2

1.2 < |eta| < 2.

2. < |eta| < 2.4

- According to efficiency plots, divide 4 rapidity ranges
- For each regions, get pT distributions
- use their ratio 73X/53X as a weighting factor

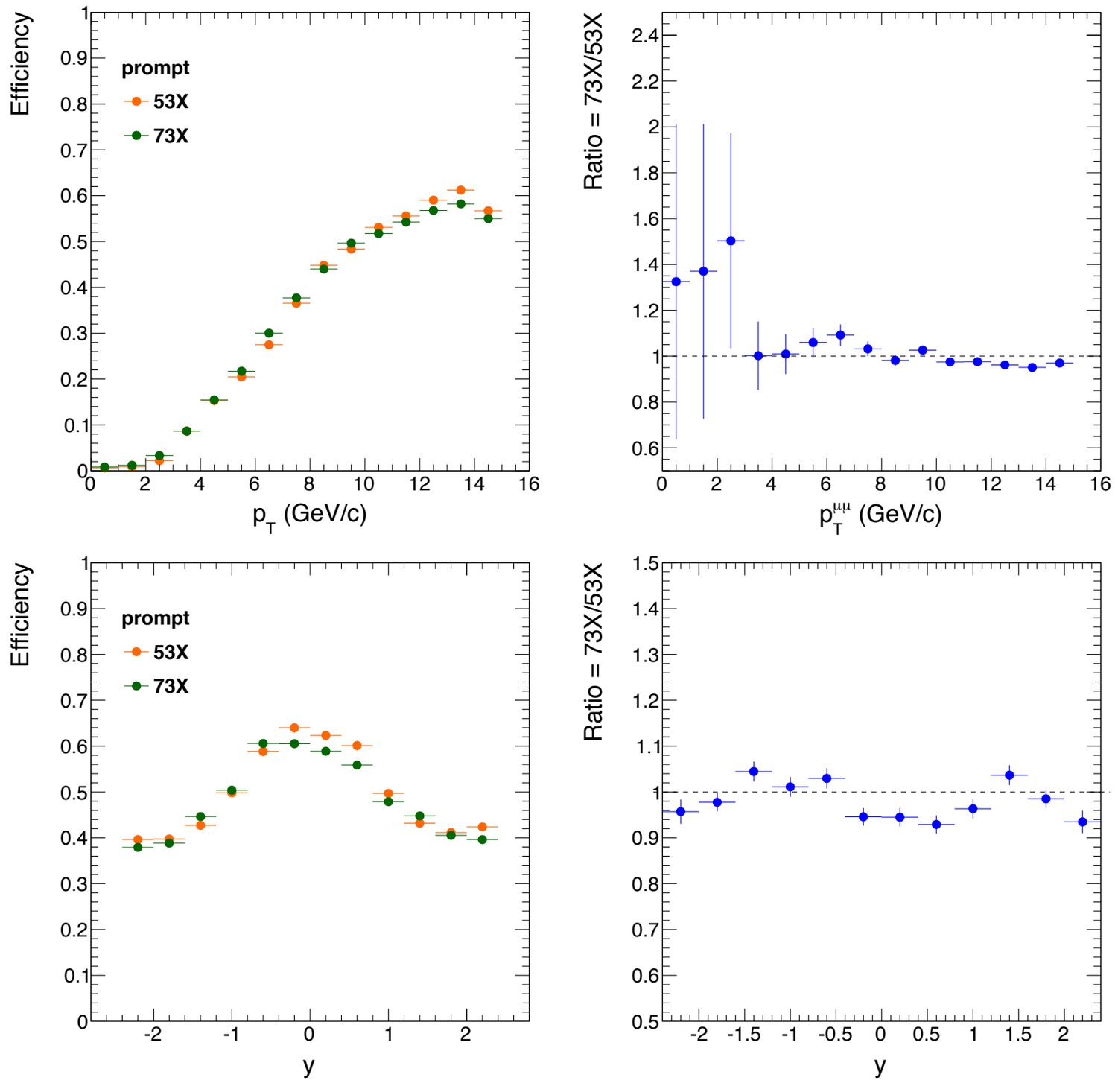




more details on back-up

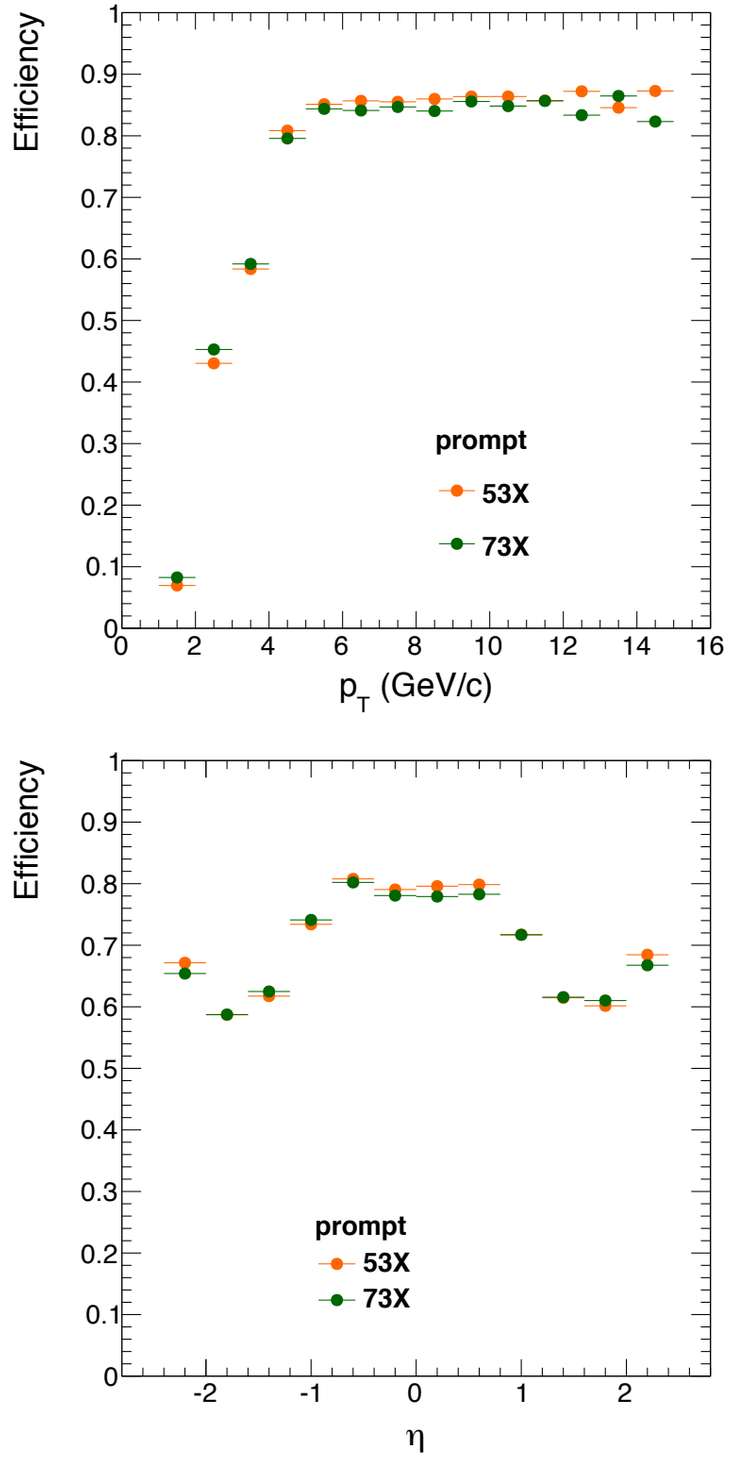
Efficiency : 53X vs 73X

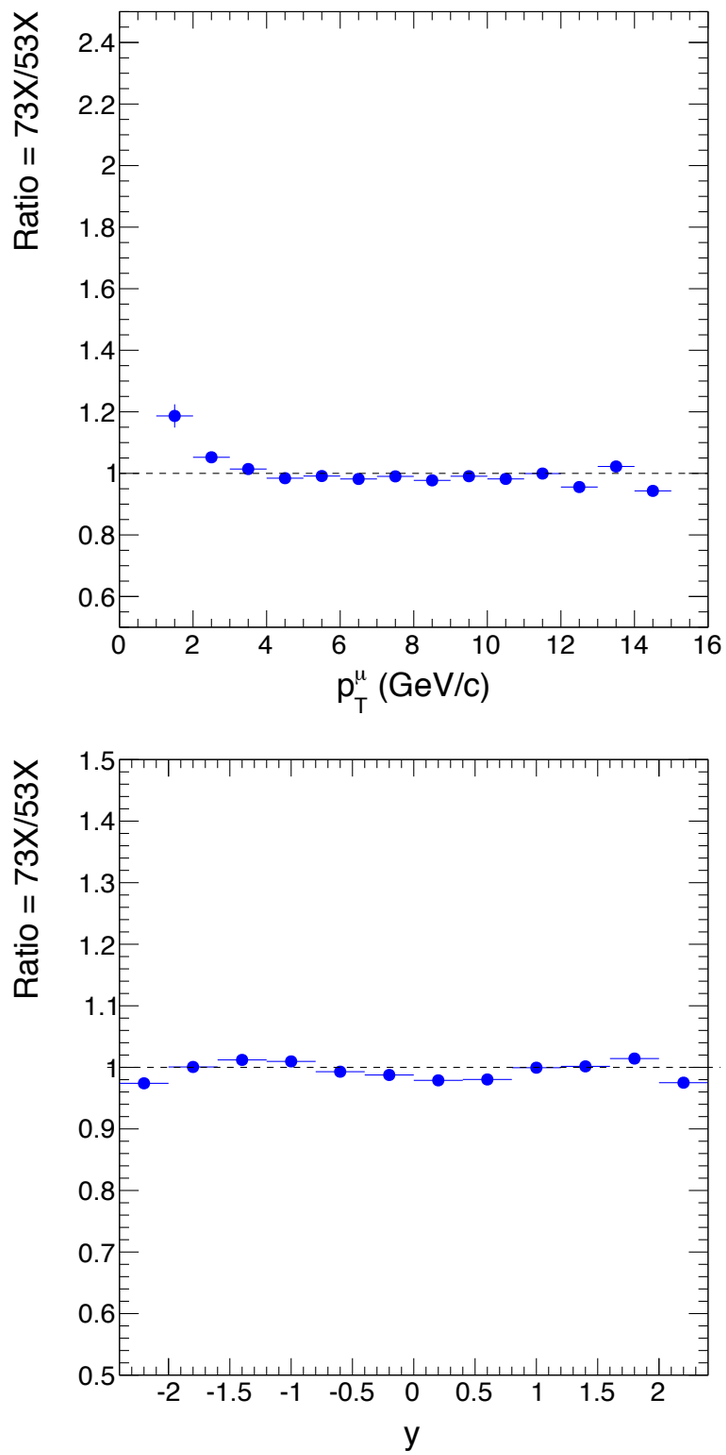
- **Prompt J/psi**
  - dimuon pair



Efficiency : 53X vs 73X

- **Prompt J/psi**
  - single tracks

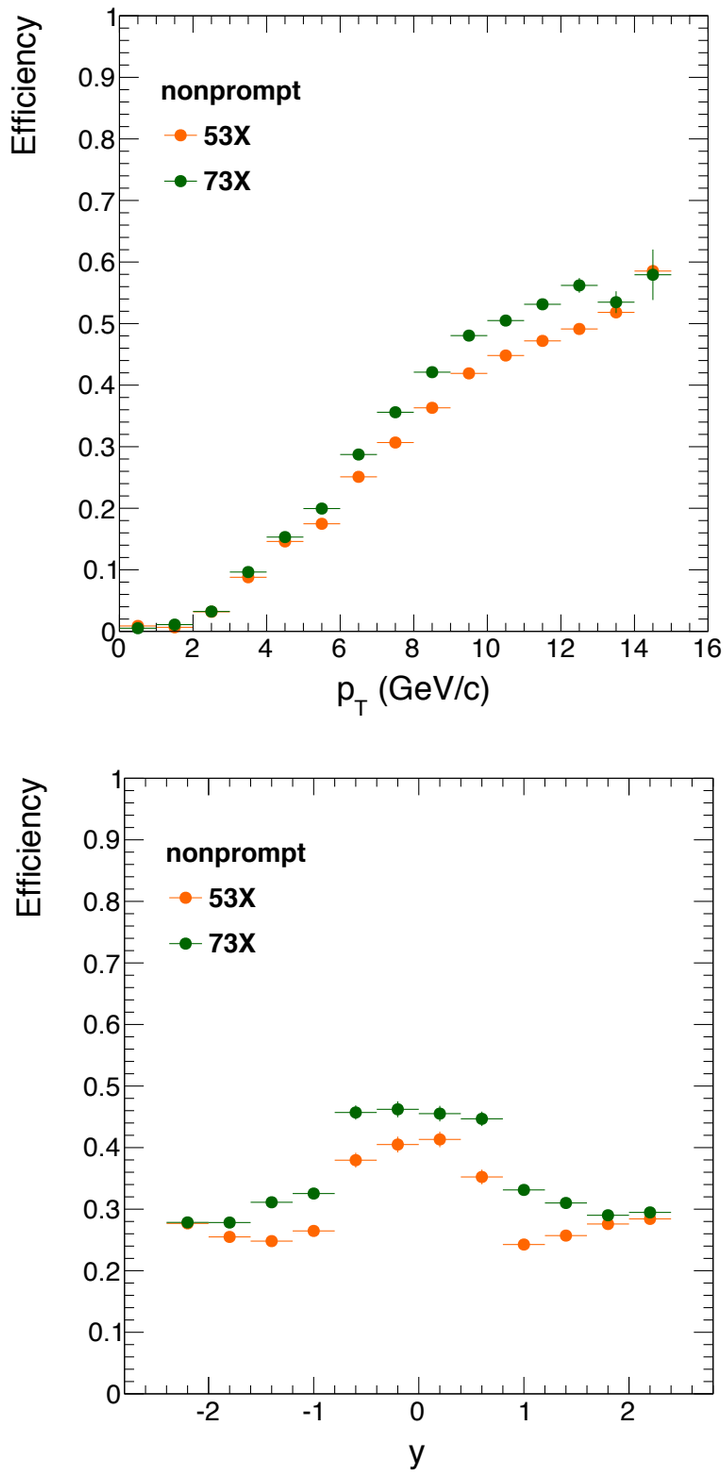


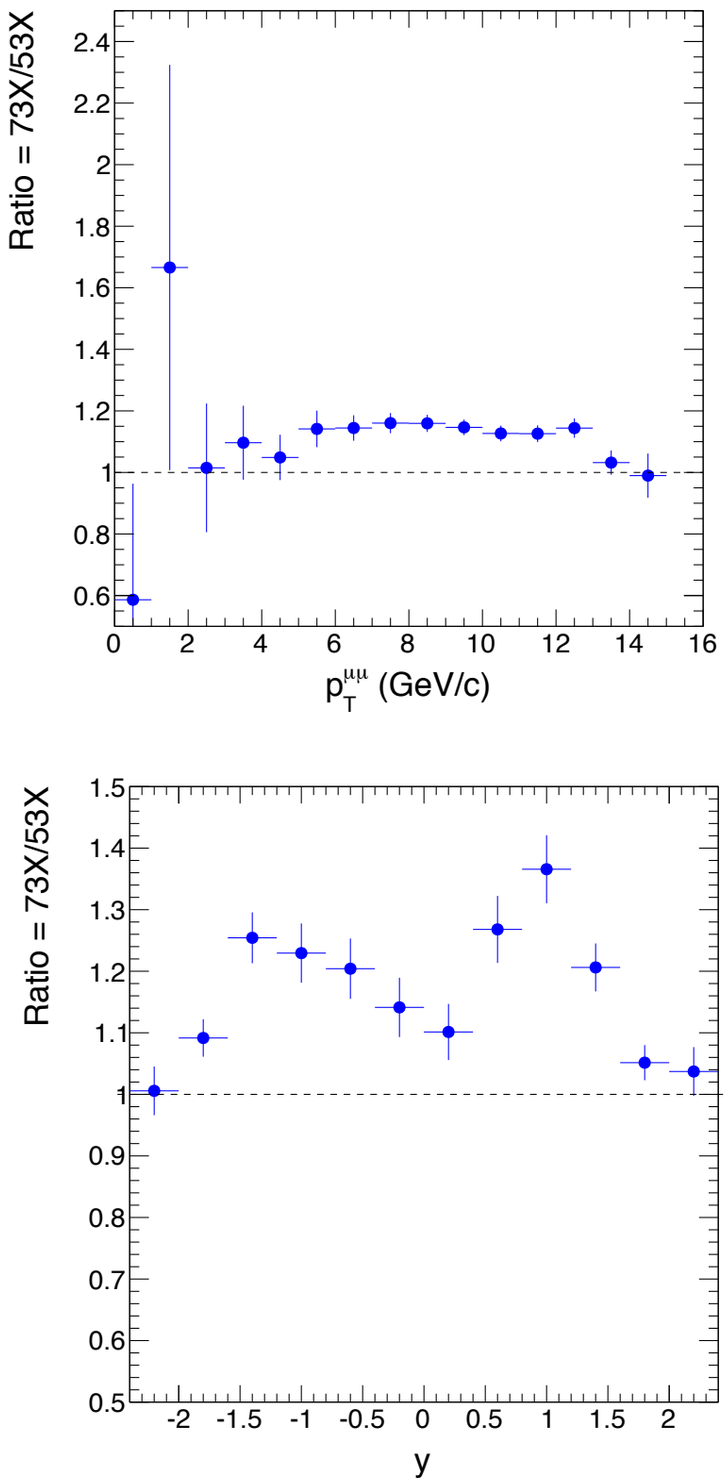


- 73X more efficient at low pT regions
- 73X vs 53X similar for prompt J/psi

Efficiency : 53X vs 73X

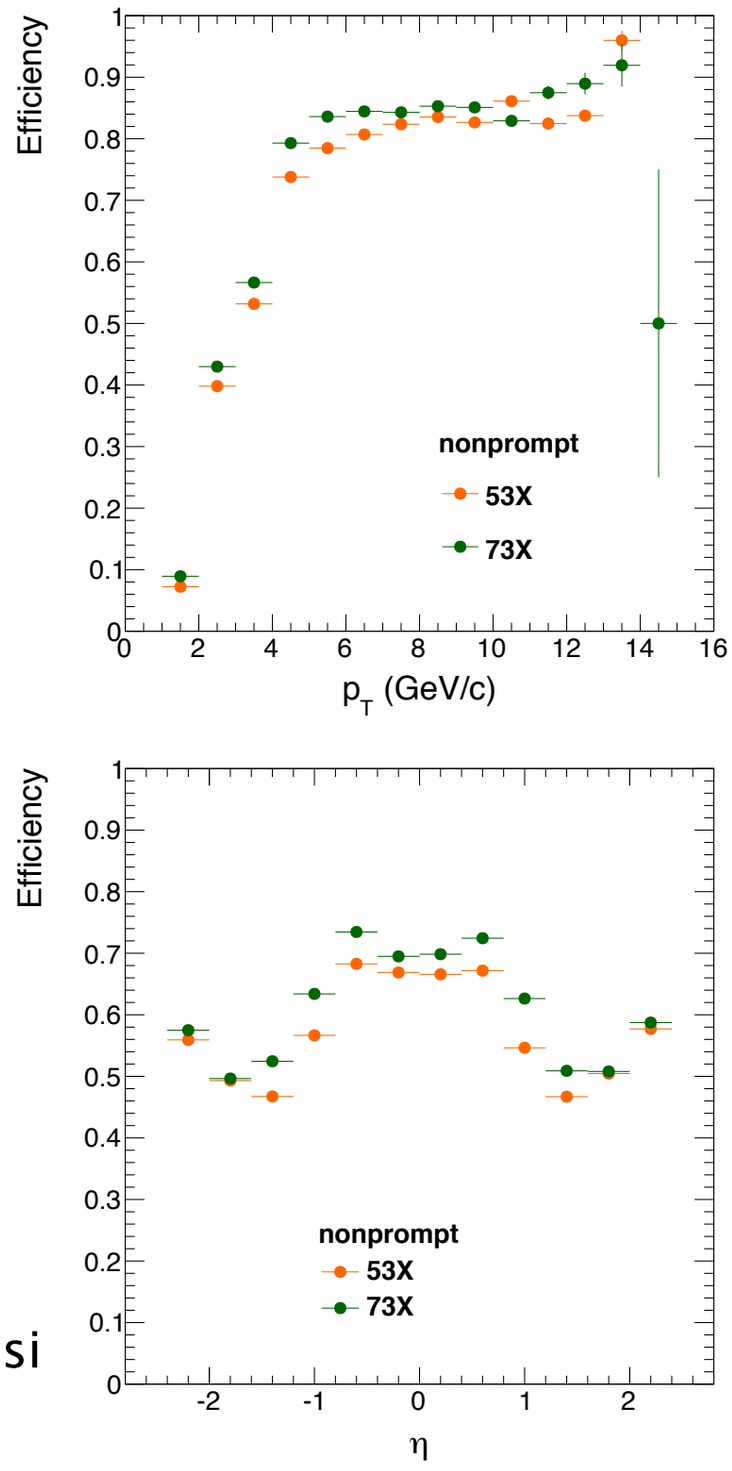
- **Non-prompt J/psi**
  - dimuon pair

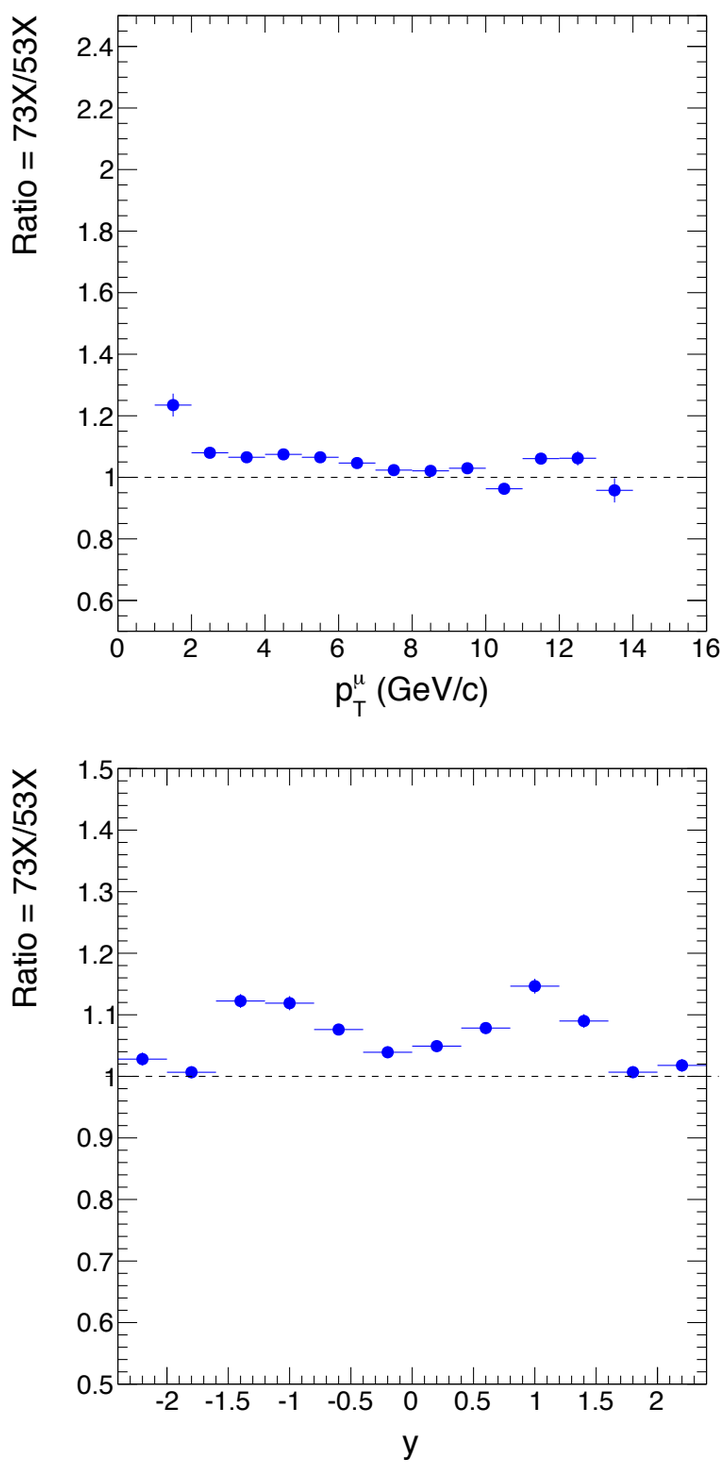




Efficiency : 53X vs 73X

- **Non-prompt J/psi**
  - single tracks



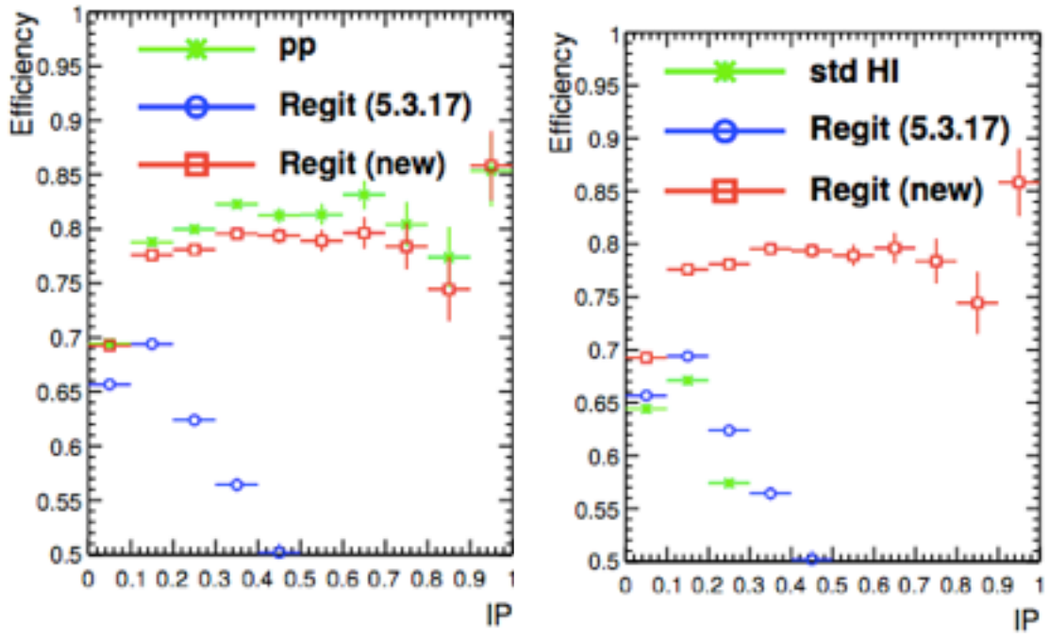


- 73X more efficient at low pT regions
- 73X more efficient for non-prompt J/psi

to-do

[For myself]

- check l_{xy} dependence
- tune acceptance & muID cut criteria
- work with embedded samples



[For overall]

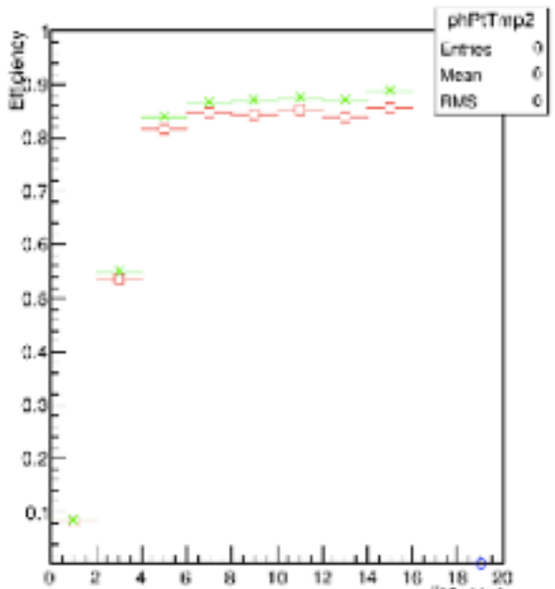
- timing study (next deadline 3rd Feb.)

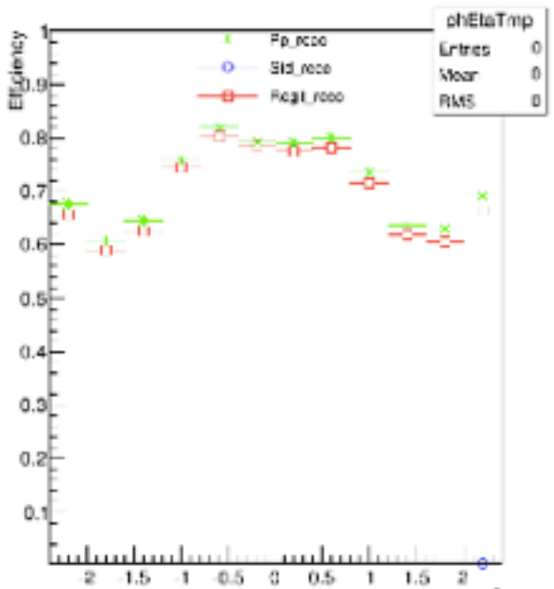
Back up

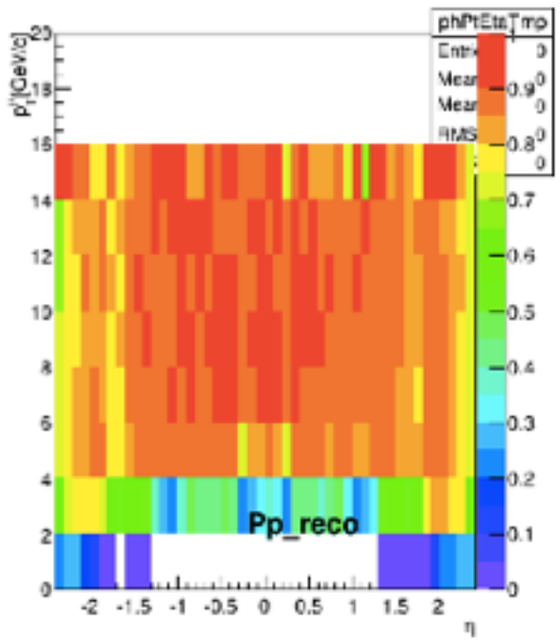
efficiency in 73X

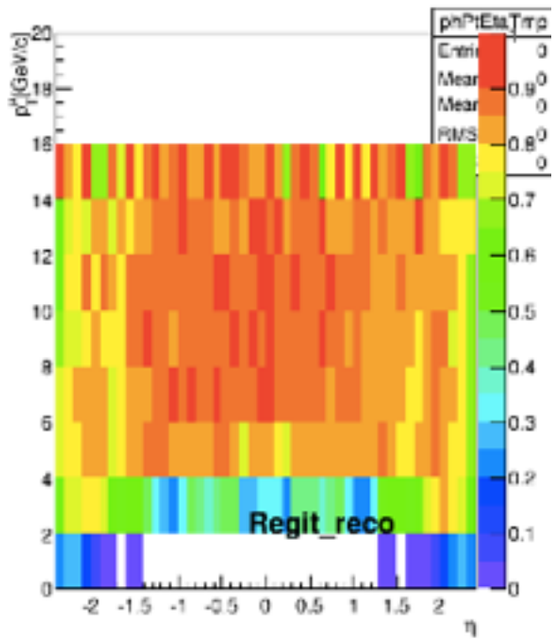
from Geonhee

- **Prompt J/psi (non-embedded)**
  - Efficiency _single

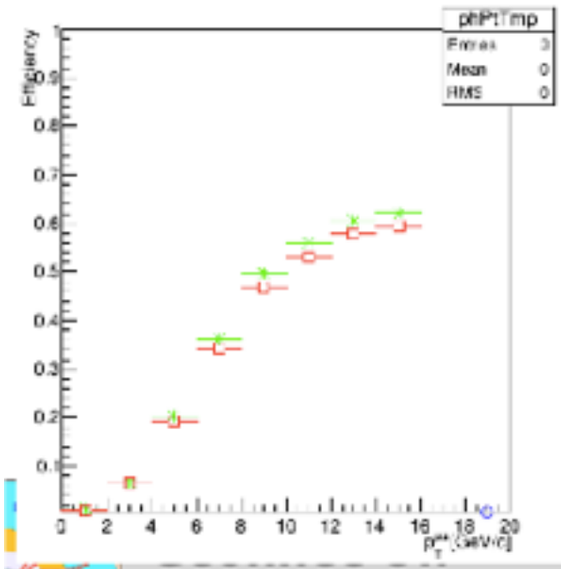


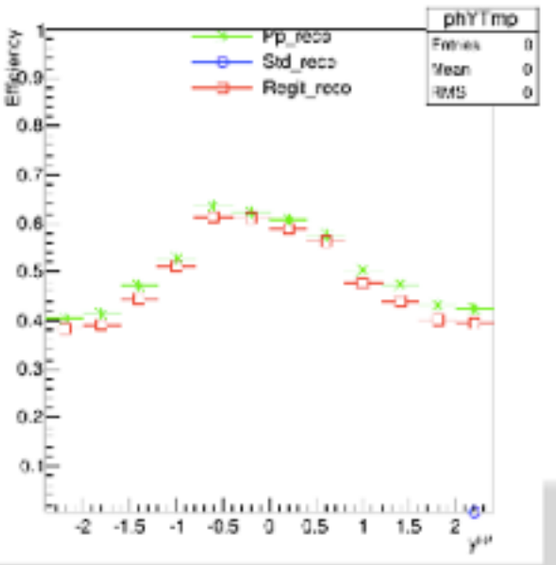


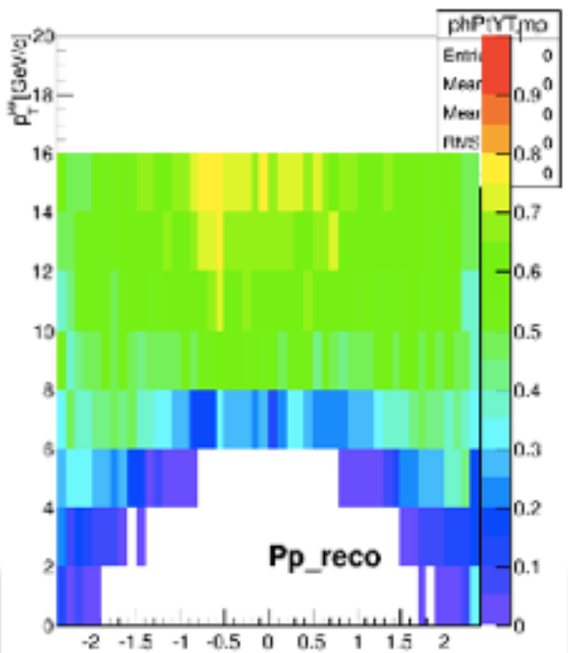


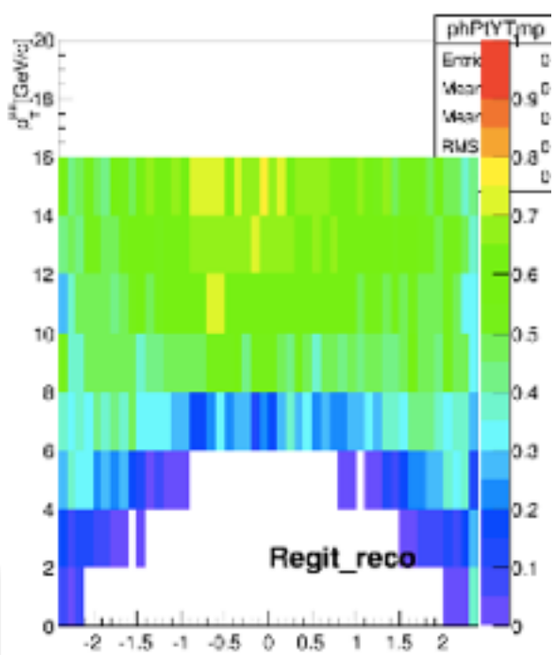


  - Efficiency _pair





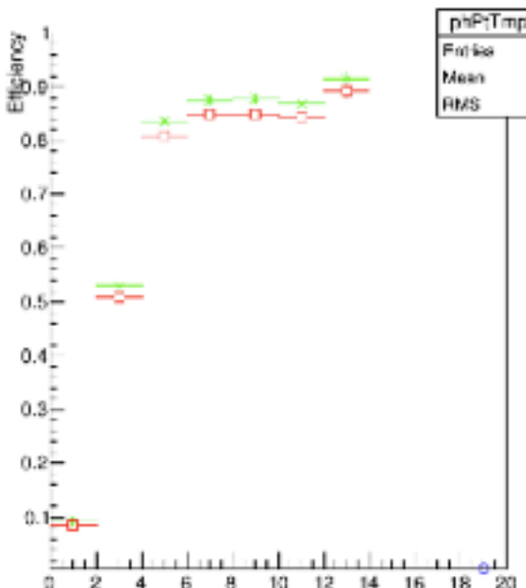


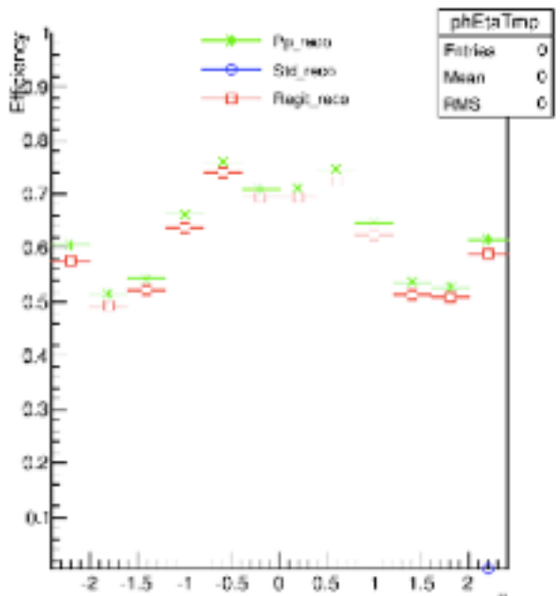


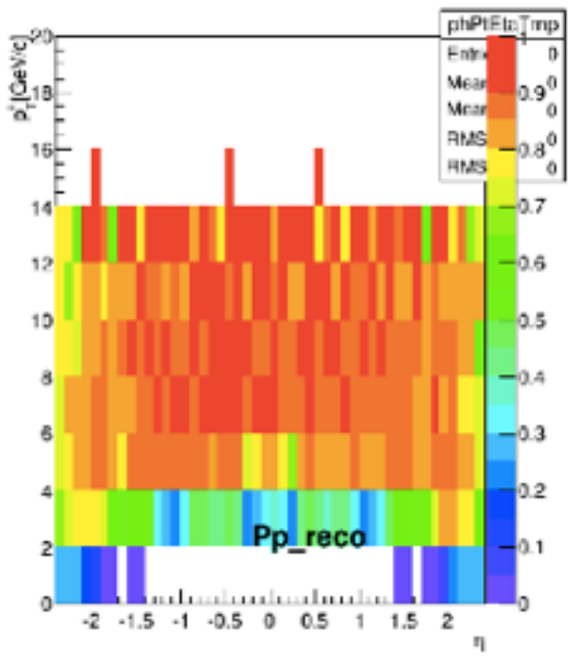
efficiency in 73X

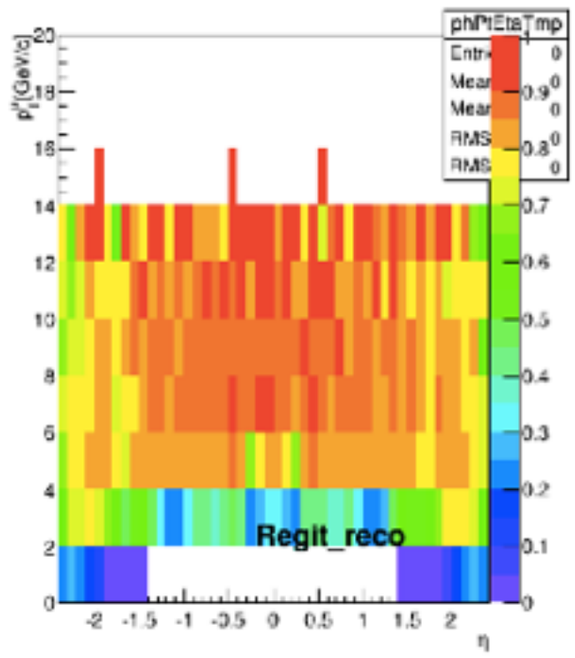
from Geonhee

- **Non-prompt J/psi (non-embedded)**
  - Efficiency – single

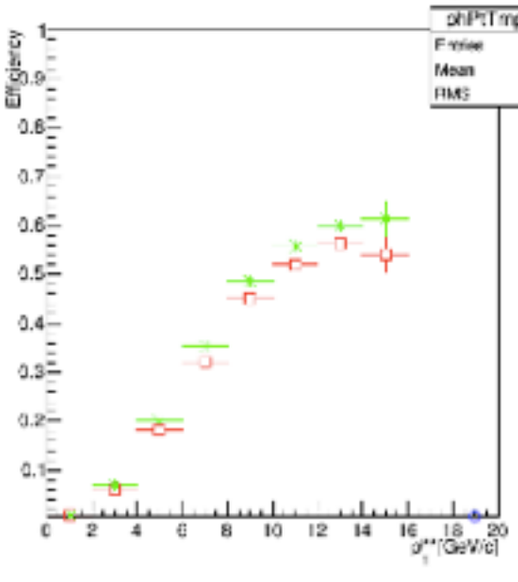


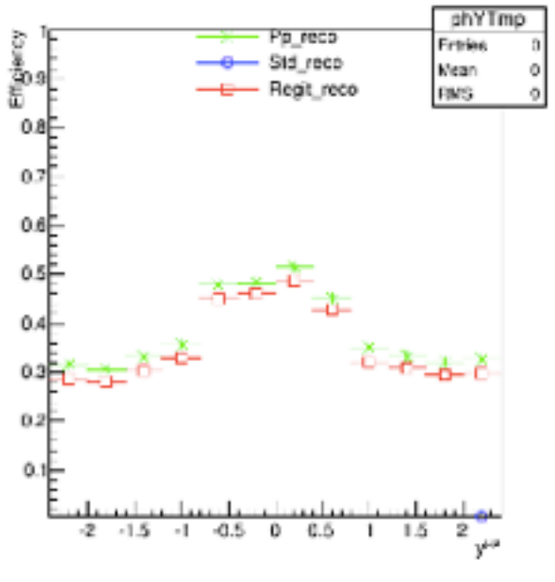


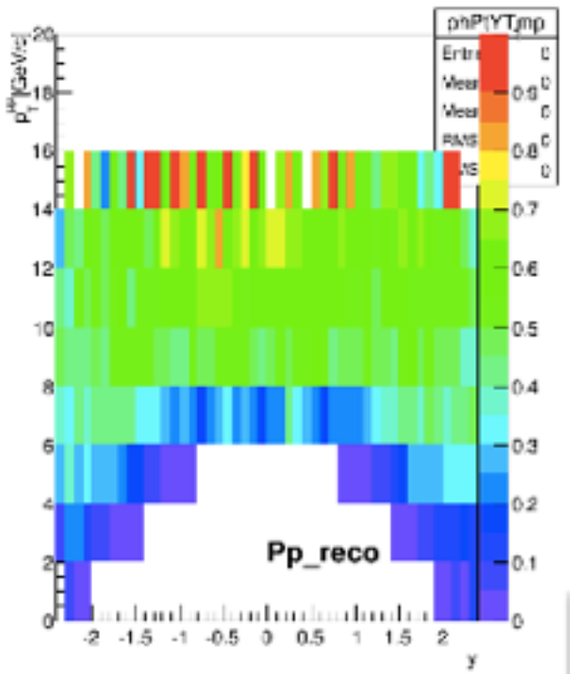


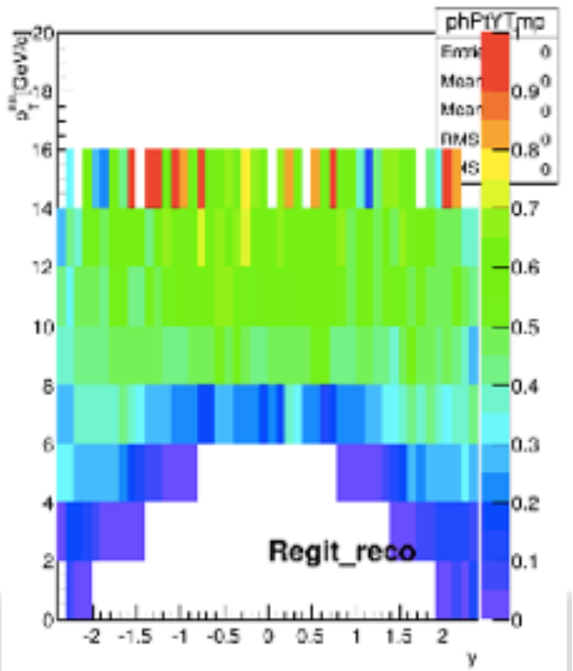


  - Efficiency - pair



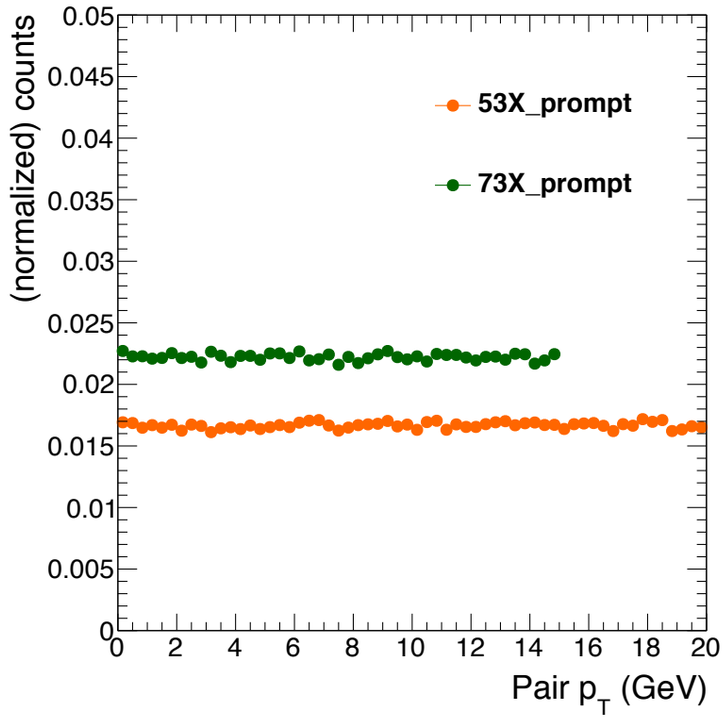




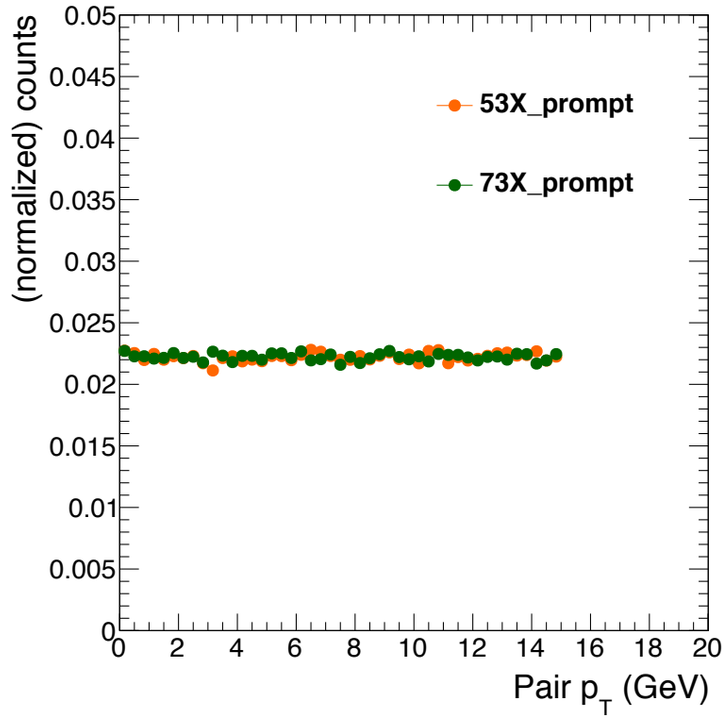


Efficiency : std vs regit

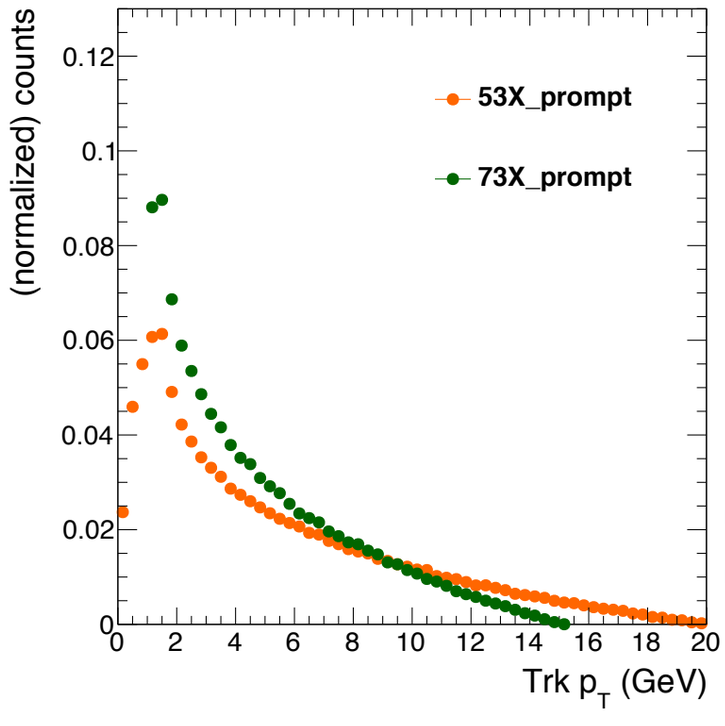
- **Prompt J/psi**
  - dimuon pair



- diMu p_T : 0-15 GeV
- sglMu p_T : 1-15 GeV



- tracks (single muons)



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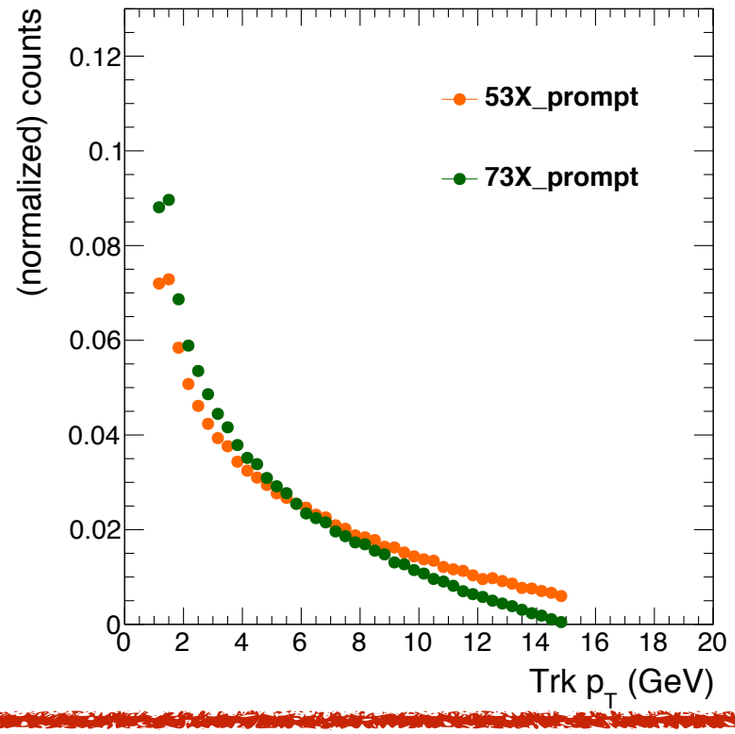
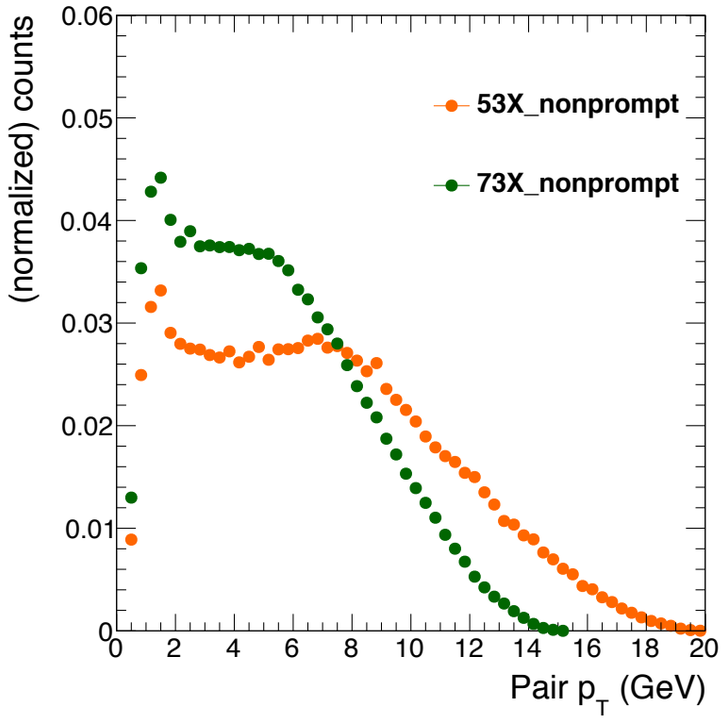
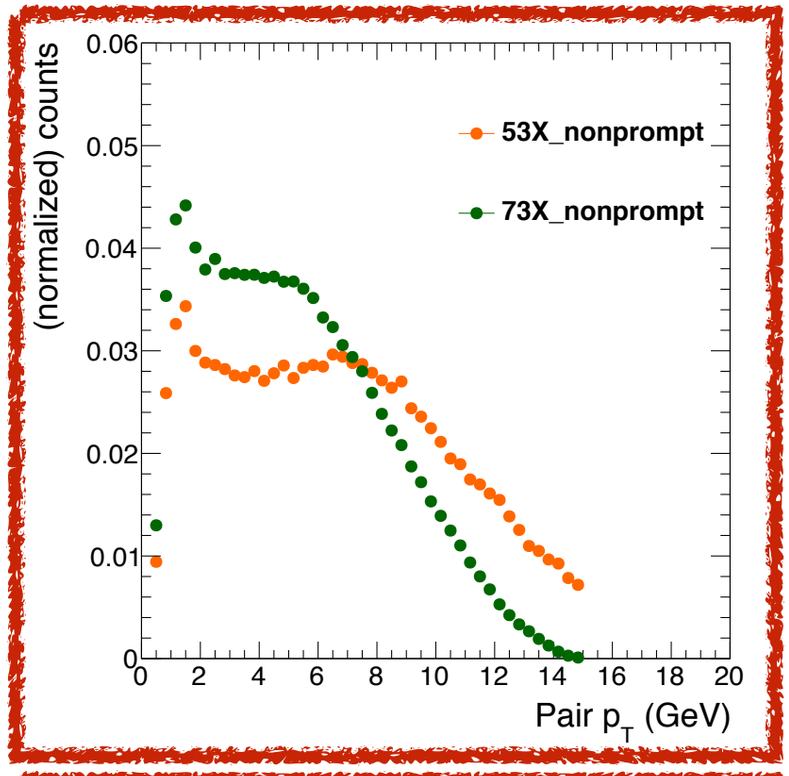


Efficiency : std vs regit

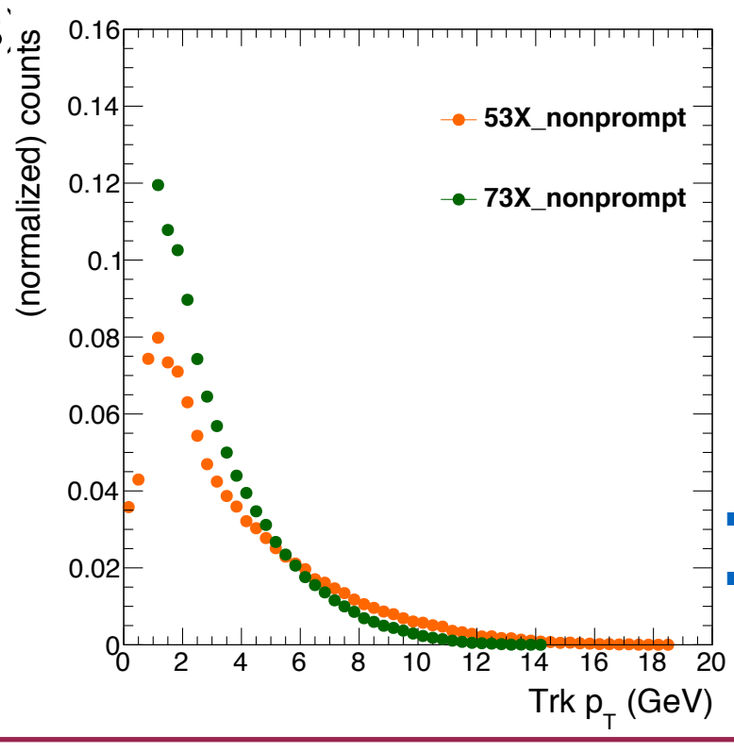
- **Non-prompt J/psi**
  - dimuon pair



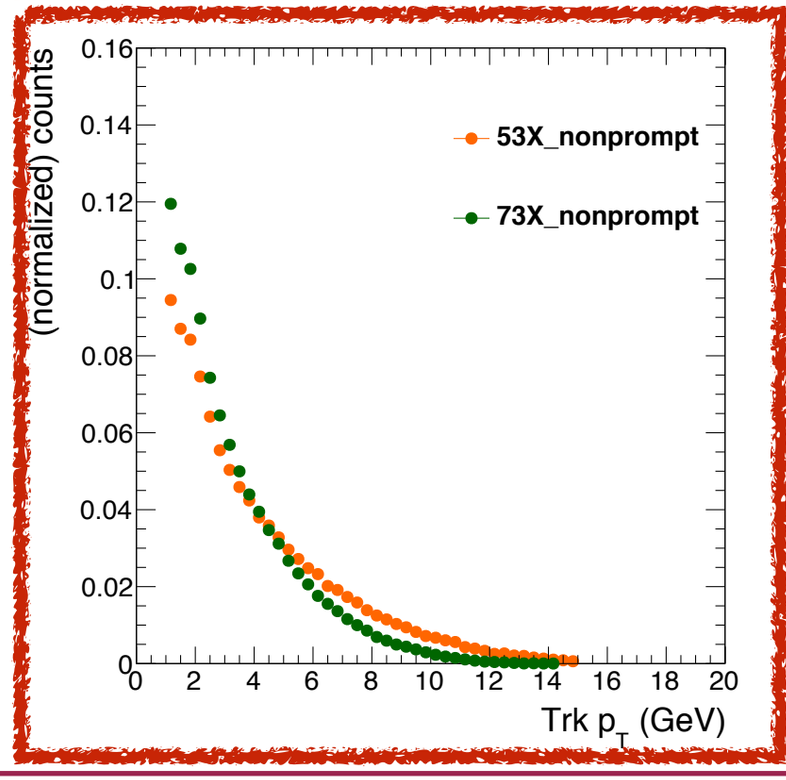
- diMu p_T : 0-15 GeV
- sglMu p_T : 1-15 GeV



  - tracks (single muons)

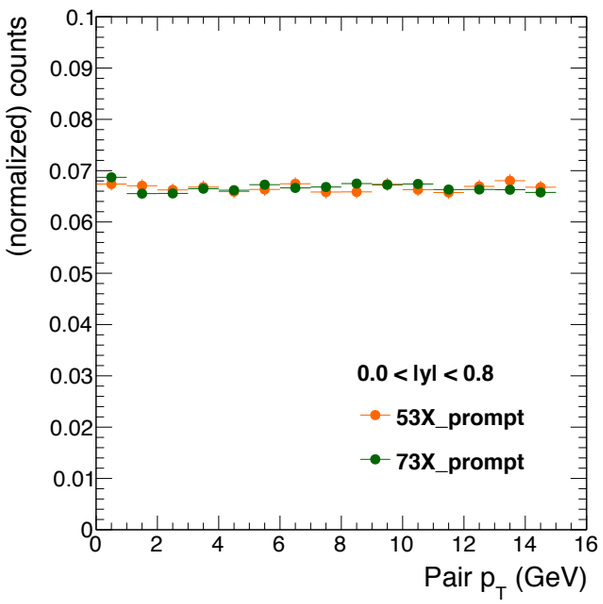


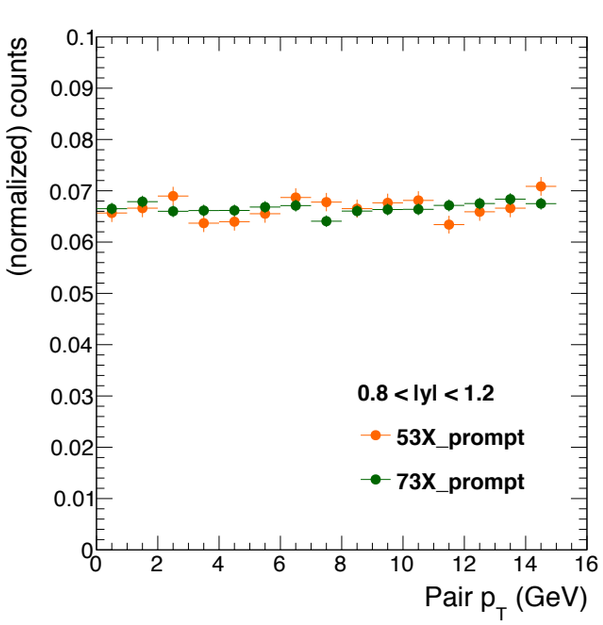
- diMu p_T : 0-15 GeV
- sglMu p_T : 1-15 GeV

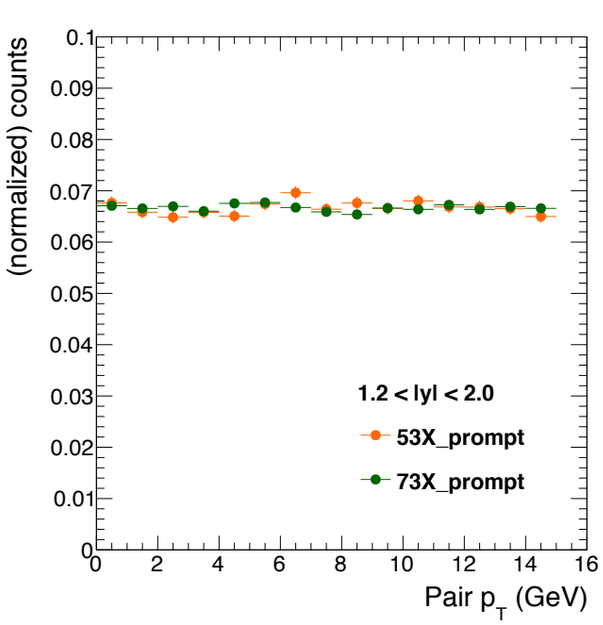


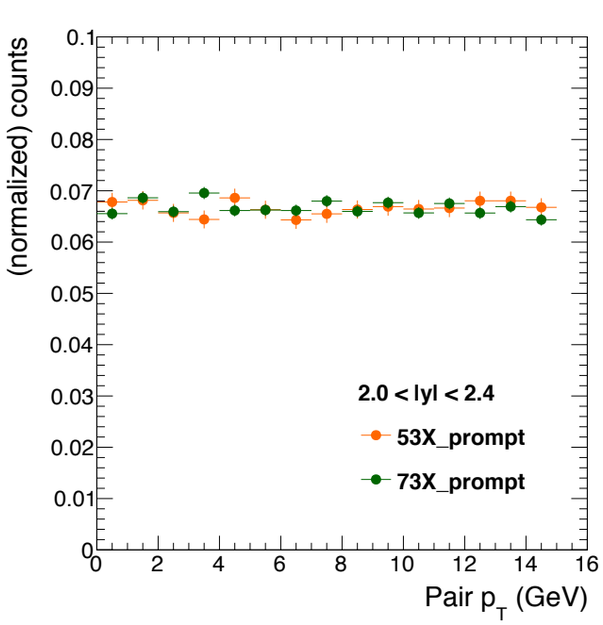
53X vs 73X

- **prompt J/psi**
  - dimuon pair

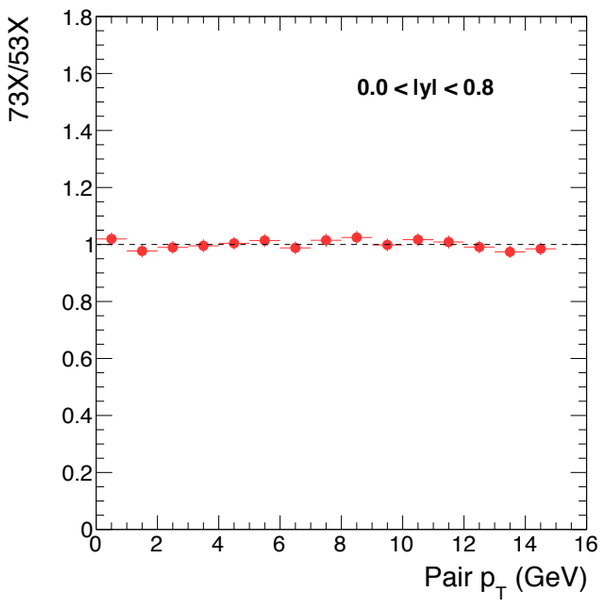


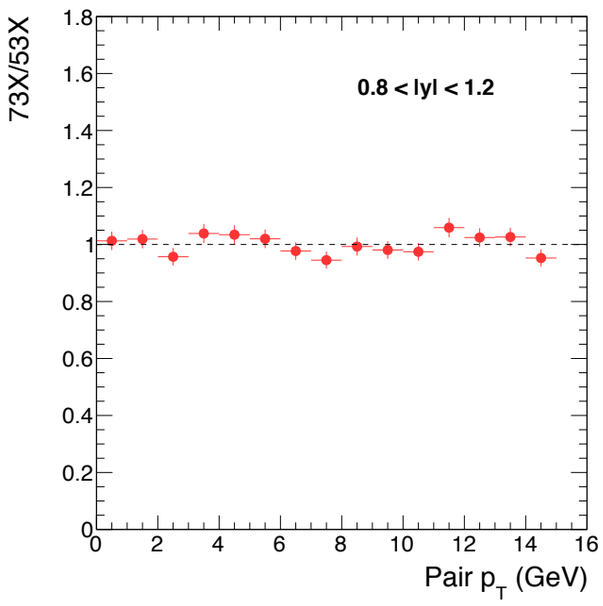


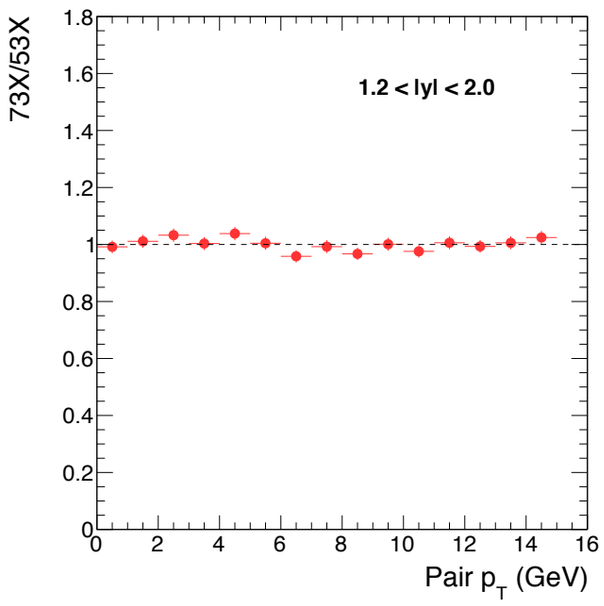


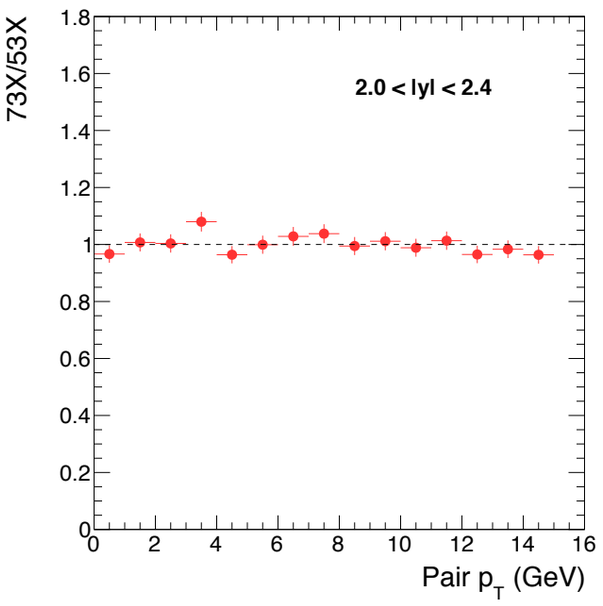


  - Ratio -> used as a weight factor for 53X



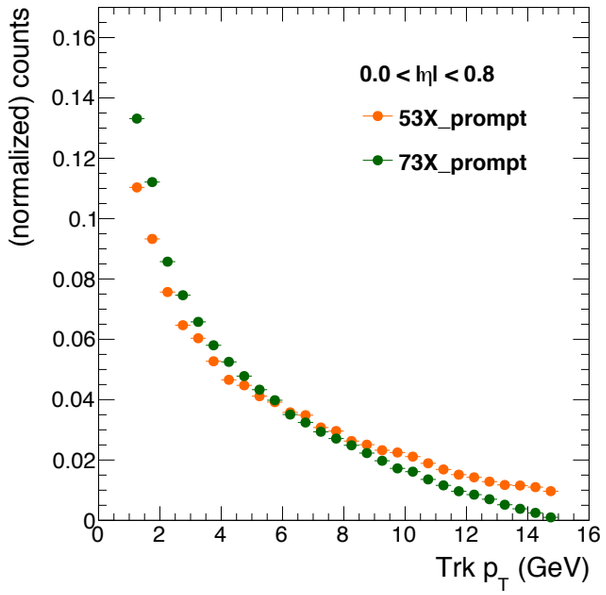


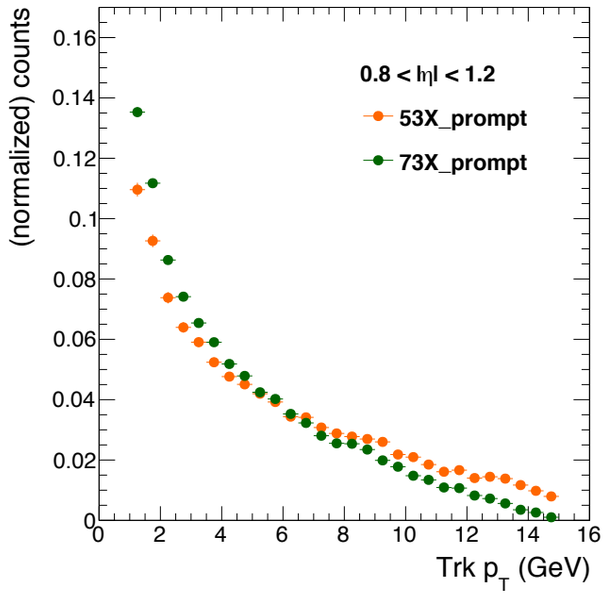


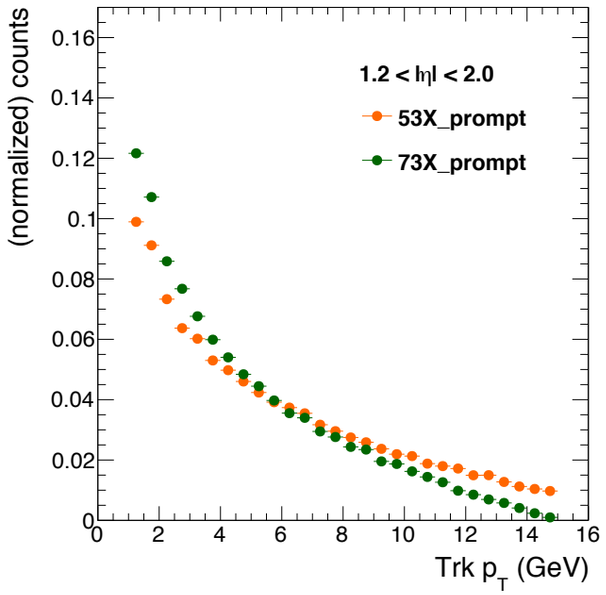


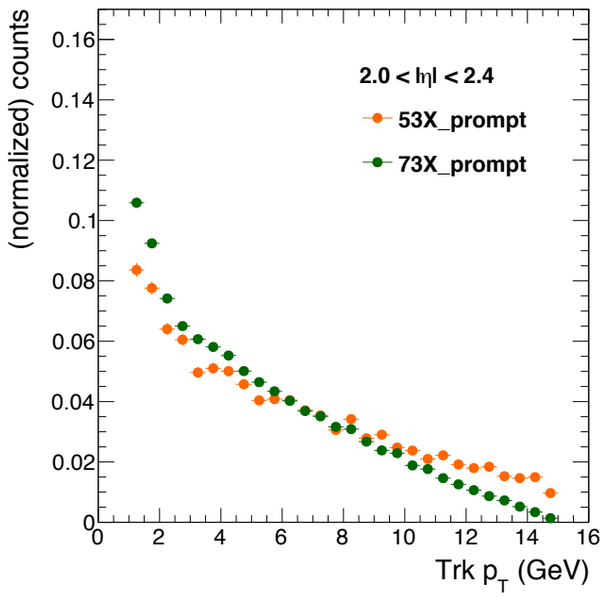
53X vs 73X

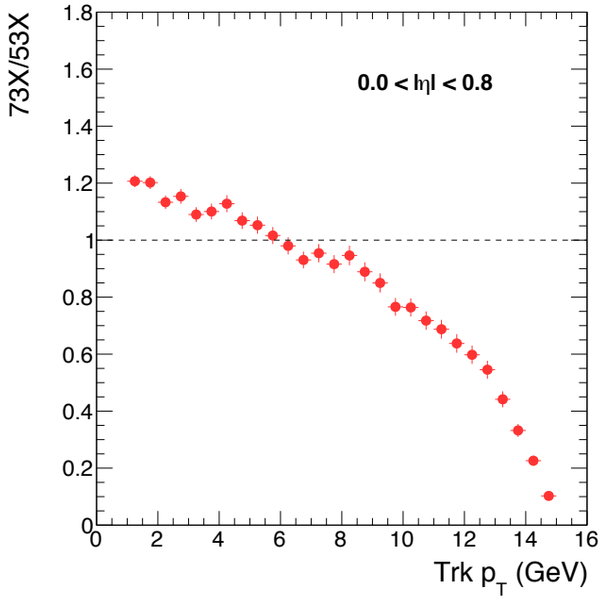
- **prompt J/psi**
  - tracks (single muons)

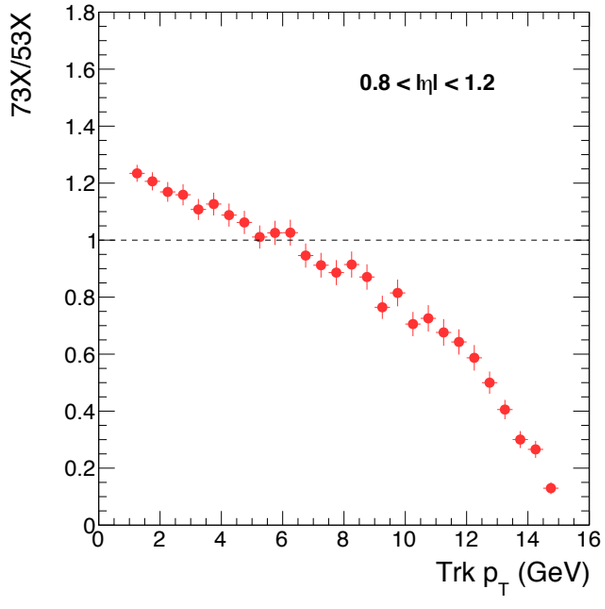


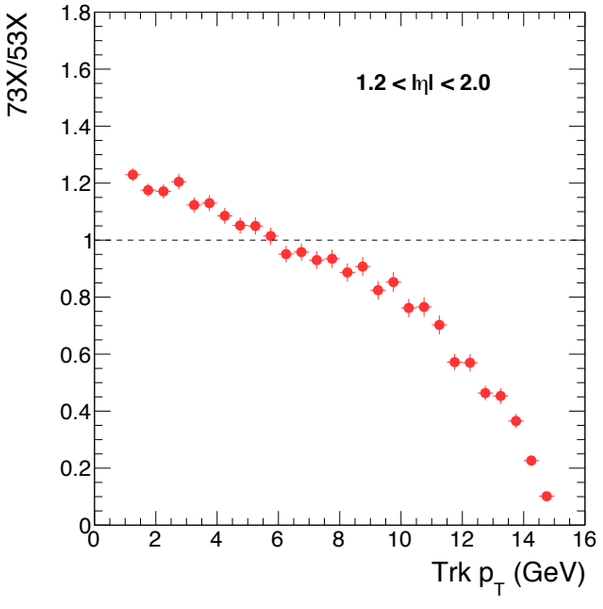


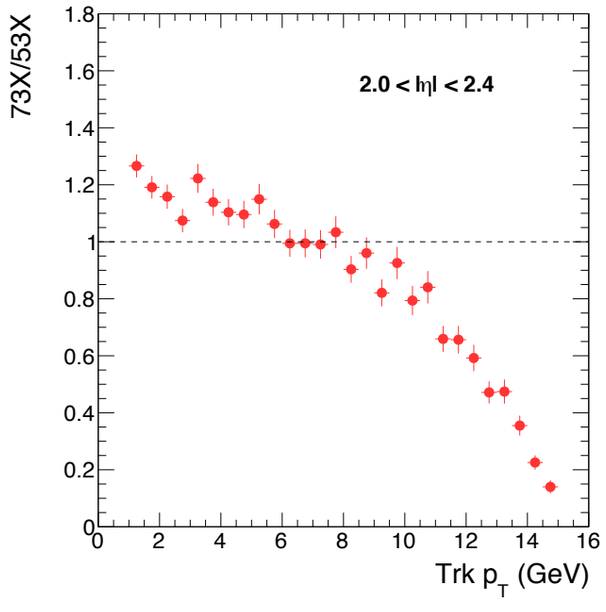






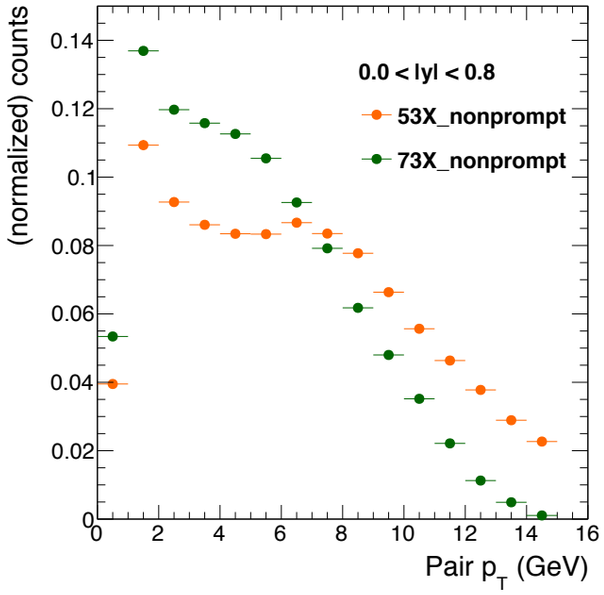


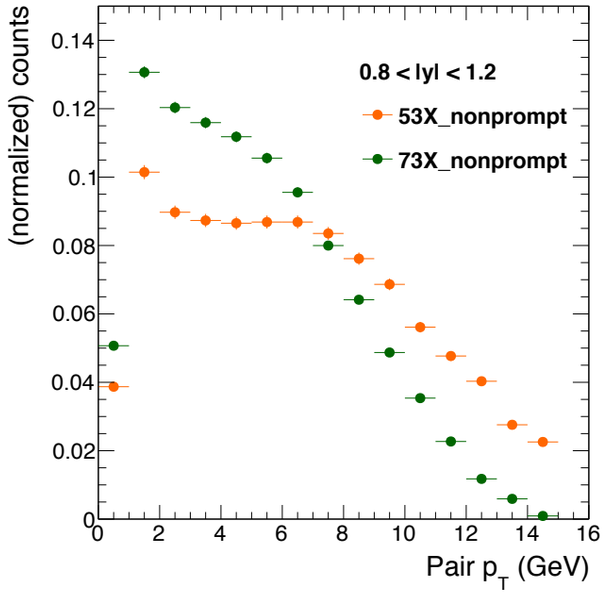


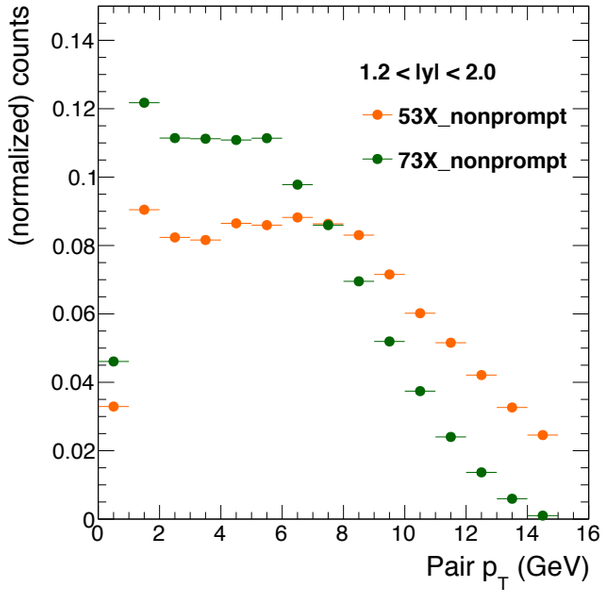


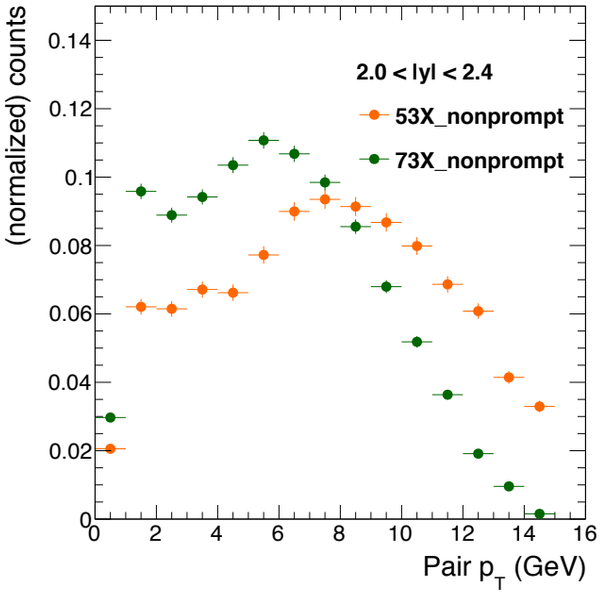
53X vs 73X

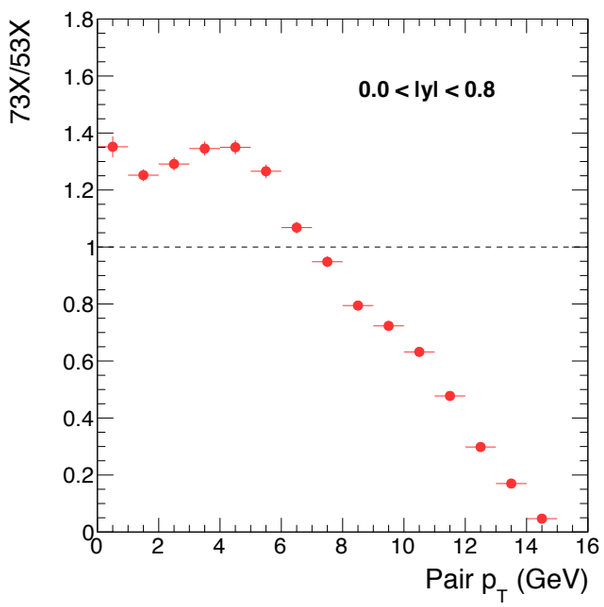
- **non-prompt J/psi**
  - dimuon pair

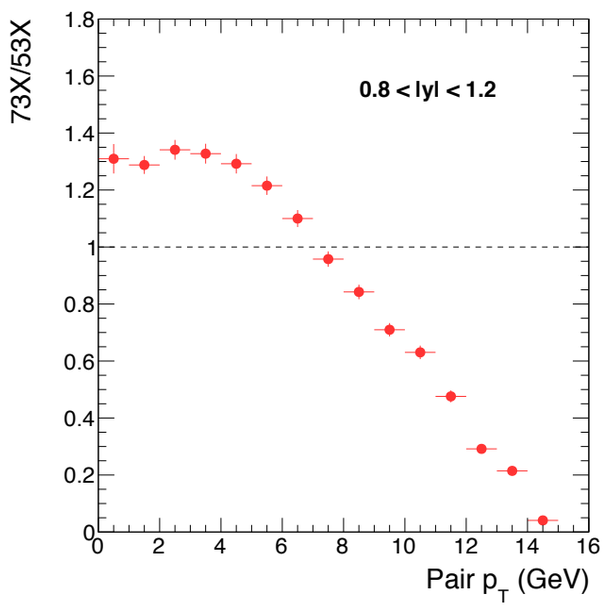


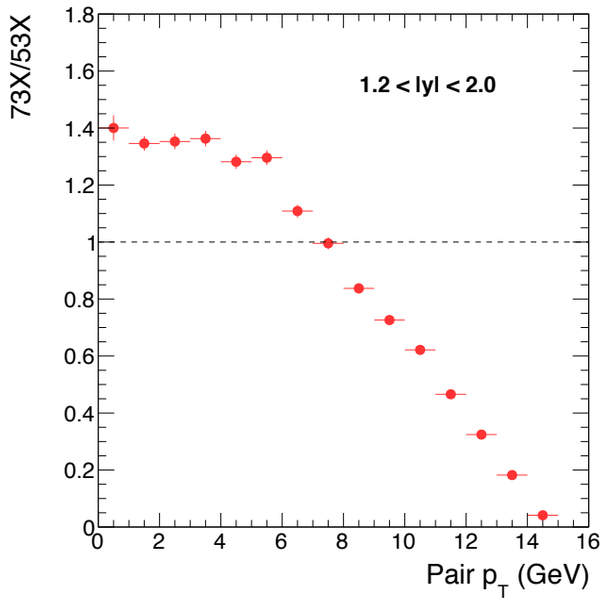


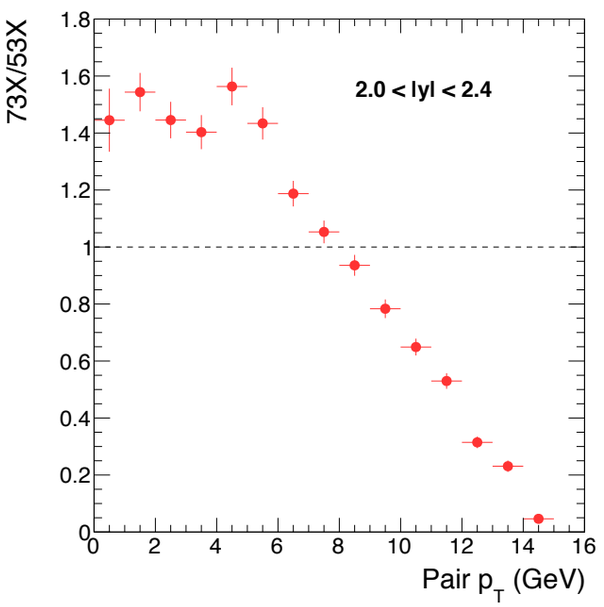












53X vs 73X

- **non-prompt J/psi**
  - tracks (single muons)