Comparison Between Full Simulation and SGV in Light Higgsino Scenarios

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Light Higgsino Scenario

Motivated by naturalness which requires μ at the electroweak scale

Scenario contains

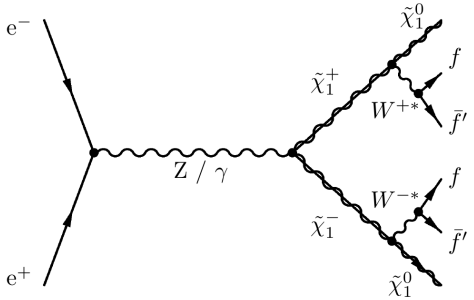
- 3 light higgsinos: $\tilde{\chi}_1^{\pm}$ & $\tilde{\chi}_1^0$ & $\tilde{\chi}_2^0$
- Almost mass degenerate: $\Delta M(\tilde{\chi}_1^{\pm}, \tilde{\chi}_1^0)$ & $\Delta M(\tilde{\chi}_2^0, \tilde{\chi}_1^0)$ $\sim$ a (sub) GeV
- All other supersymmetric particles are heavy up to a few TeV

Production Processes:

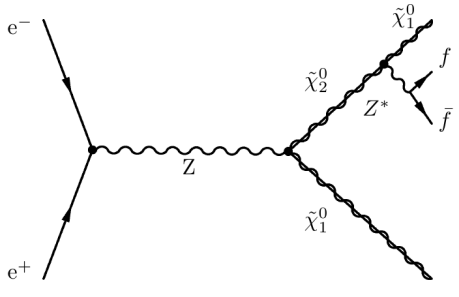
$$e^+e^- \rightarrow \tilde{\chi}_1^+\tilde{\chi}_1^-\gamma$$

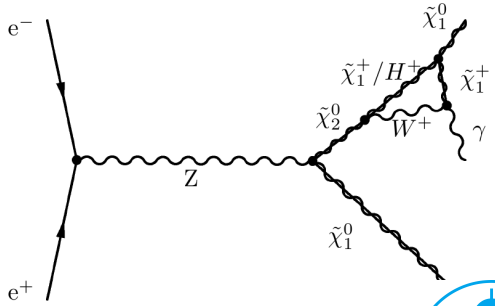
$$e^+e^- \rightarrow \tilde{\chi}_1^0\tilde{\chi}_2^0\gamma$$

Chargino



Neutralino

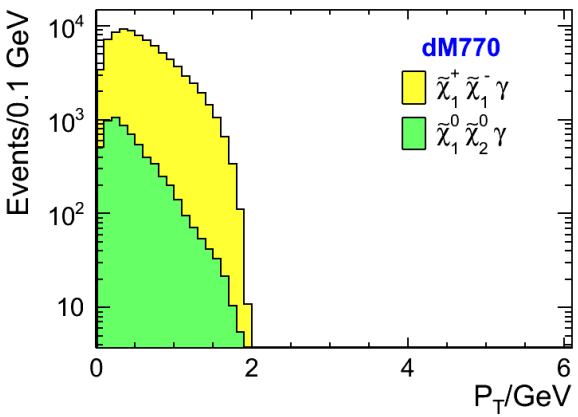




Higgsino Signatures

In the Final State

- A few soft visible particles
- A lot of missing energy (2 $\tilde{\chi}_1^0$)



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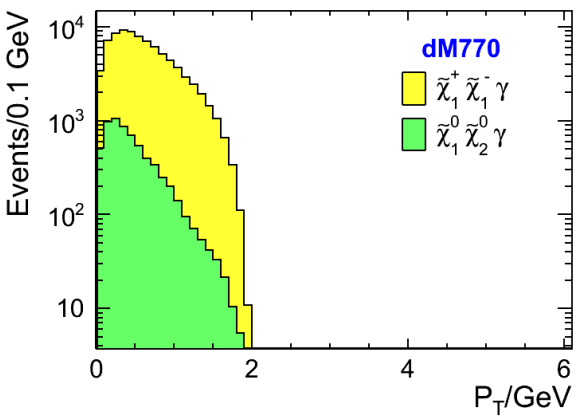
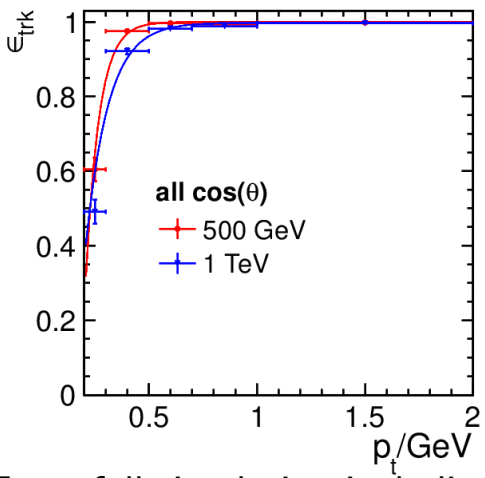


- In SGV, track efficiency is used



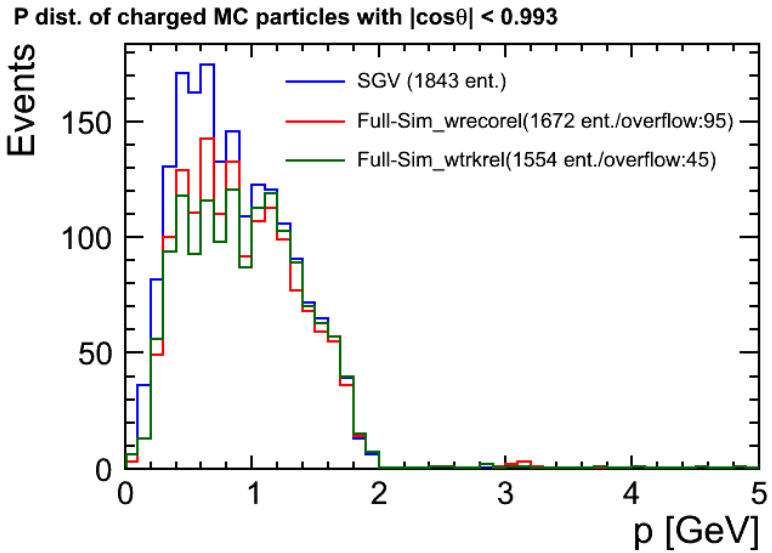
From full simulation including $t\bar{t}$ events and pair background

Used Sample

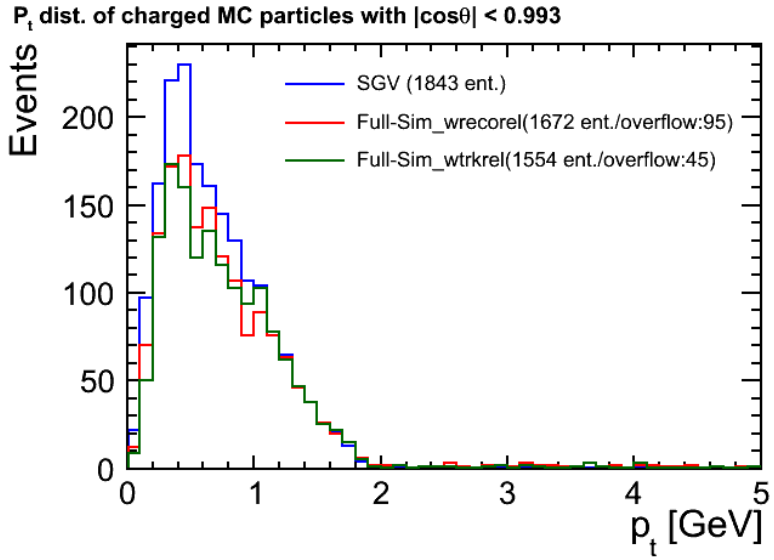
- $e^+e^- \rightarrow \tilde{\chi}_1^+ \tilde{\chi}_1^- \gamma$
- Polarisation: $P(e^+, e^-) = (-30\%, +80\%)$
- Simulate & Recontruct 1000 event
  - SGV
  - Full-Simulation

Comparison between SGV(recorel) & Full-sim(recorel & trkrel)

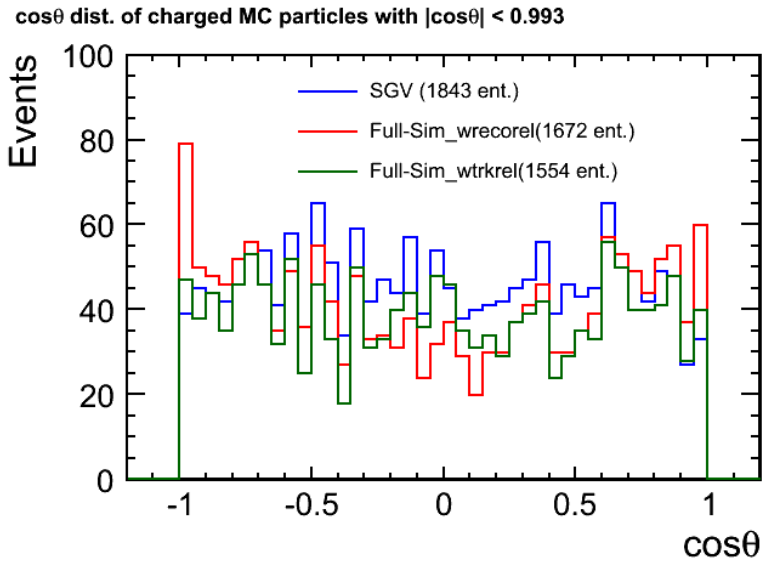
p dist. of `charged` true particles



p_t dist. of `charged` true particles

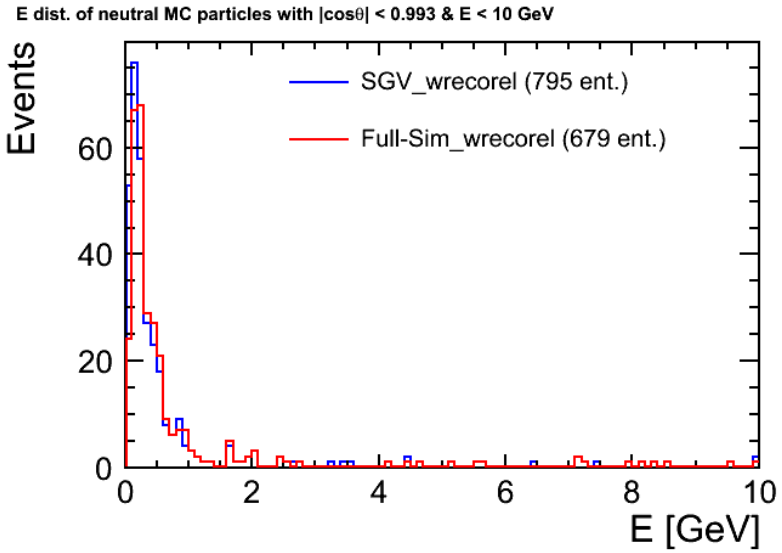


$cos\theta$ dist. of `charged` true particles

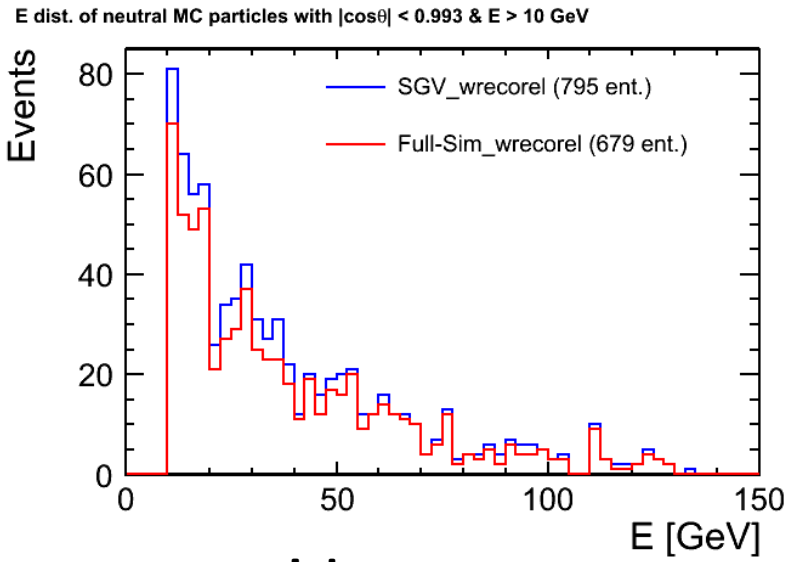


E dist. of `neutral` true particles

Low E Region

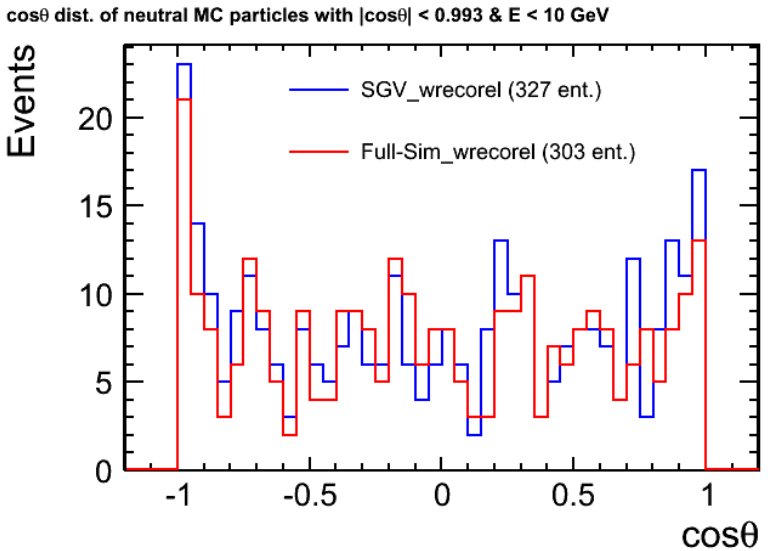


High E Region

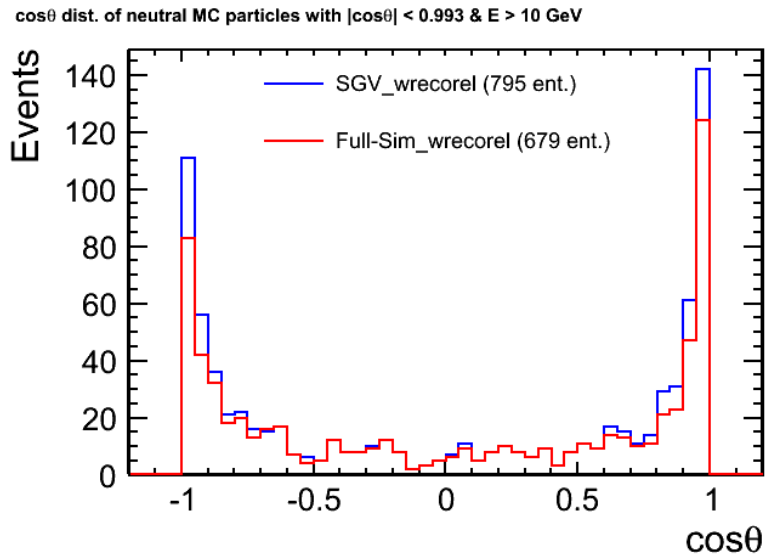


$cos\theta$ dist. of `neutral` true particles

Low E Region

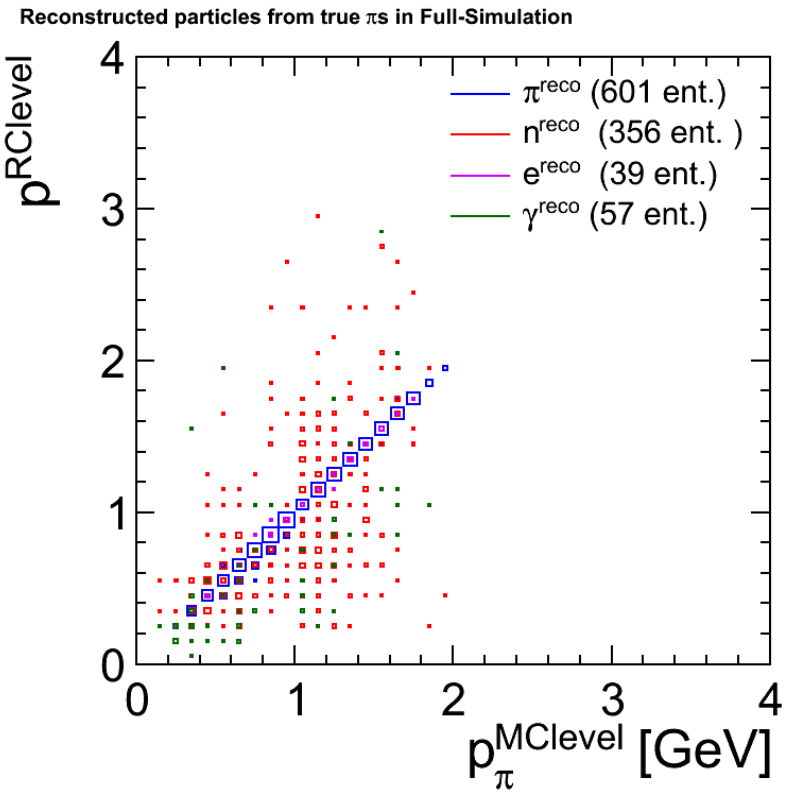


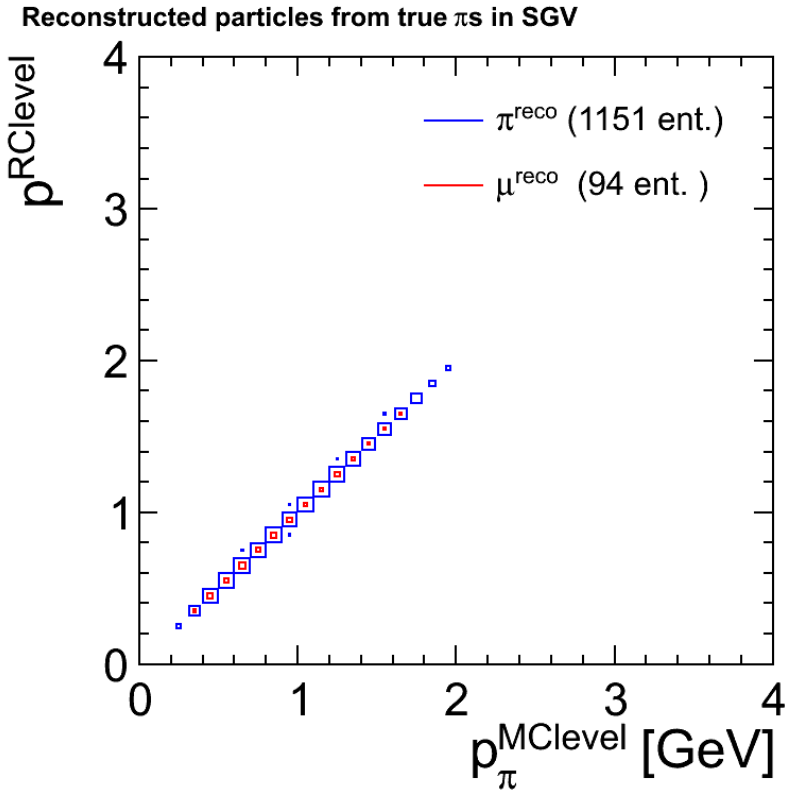
High E Region



Relation between true and reconstructed particles

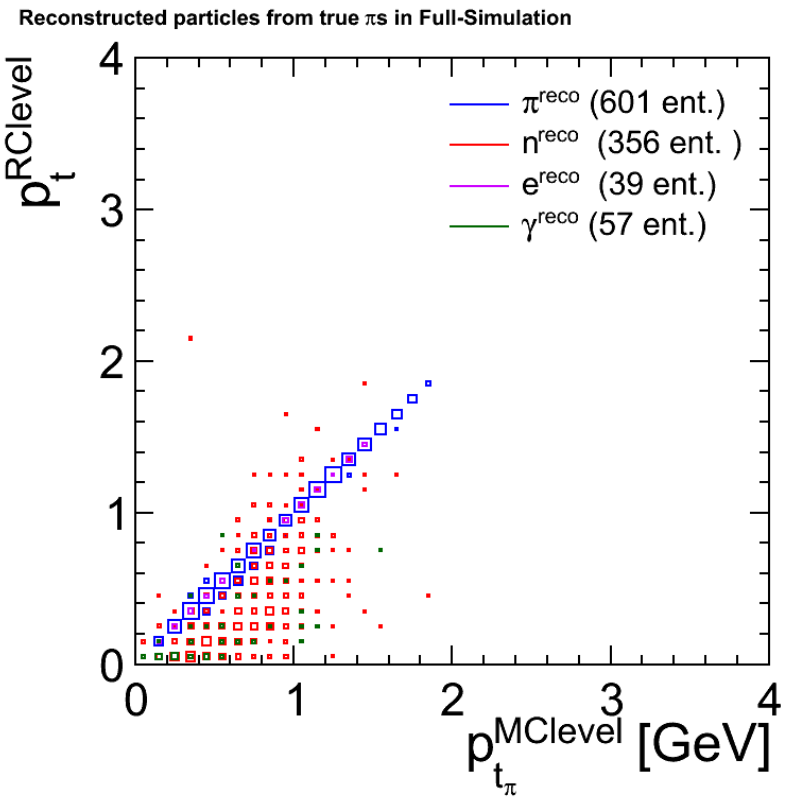
- Choose true πs
- x-axis $\longrightarrow$ momentum of true pions
- y-axis $\longrightarrow$ momentum of reconstructed particles related to true πs

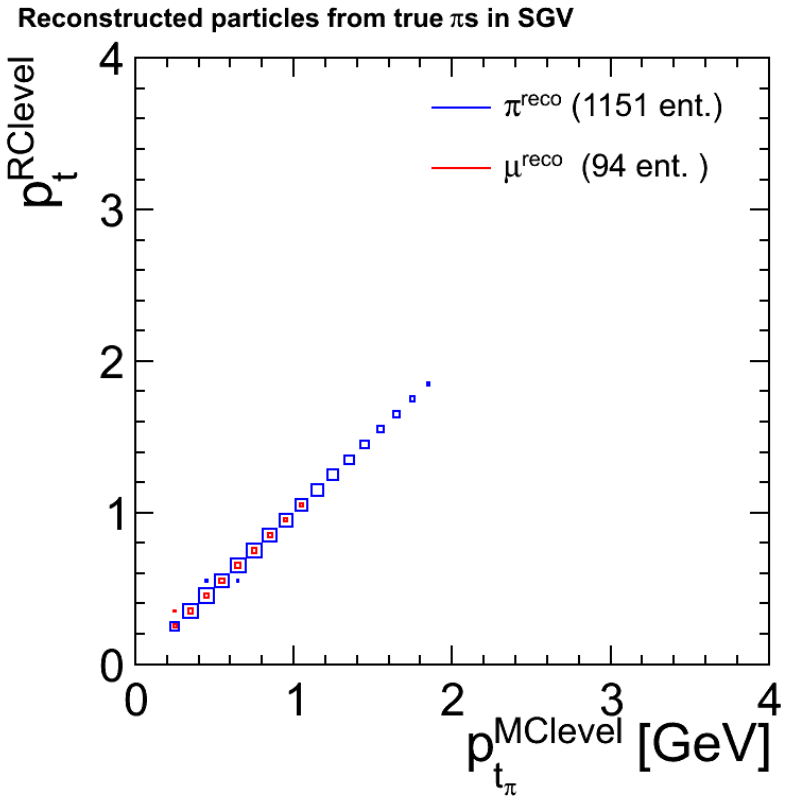




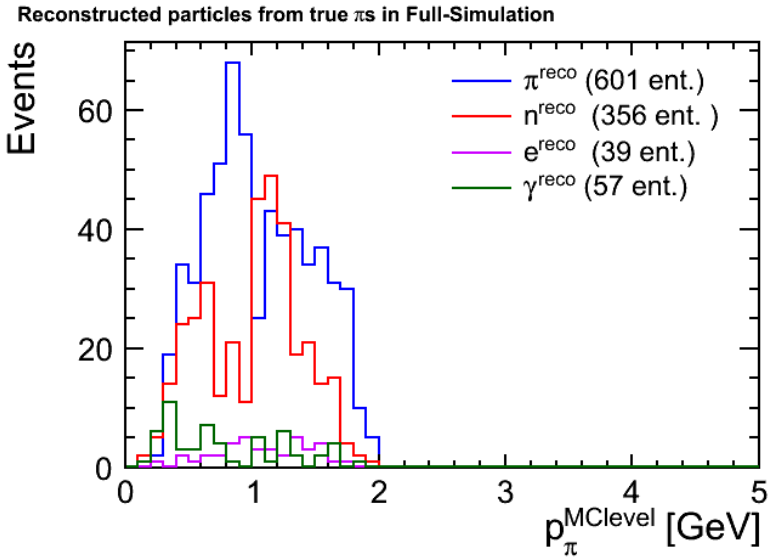
Relation between true and reconstructed particles

- x-axis $\longrightarrow$ p_t dist. of true pions
- y-axis $\longrightarrow$ p_t dist. of reconstructed particles related to true πs

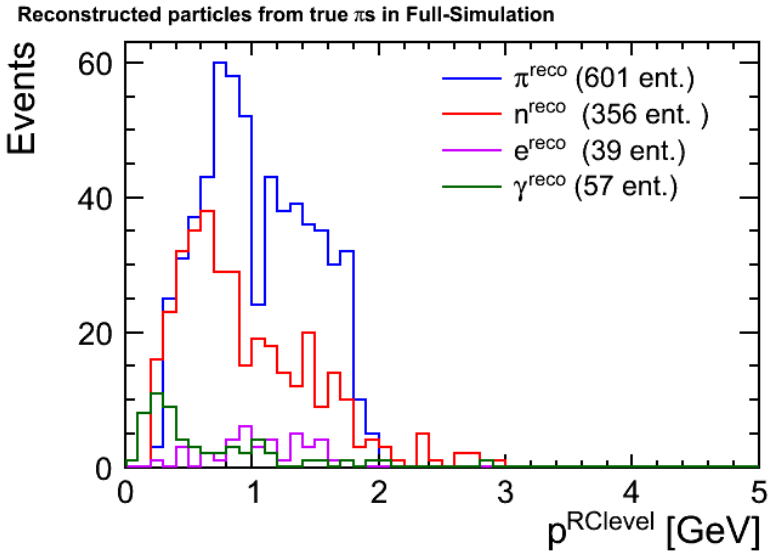




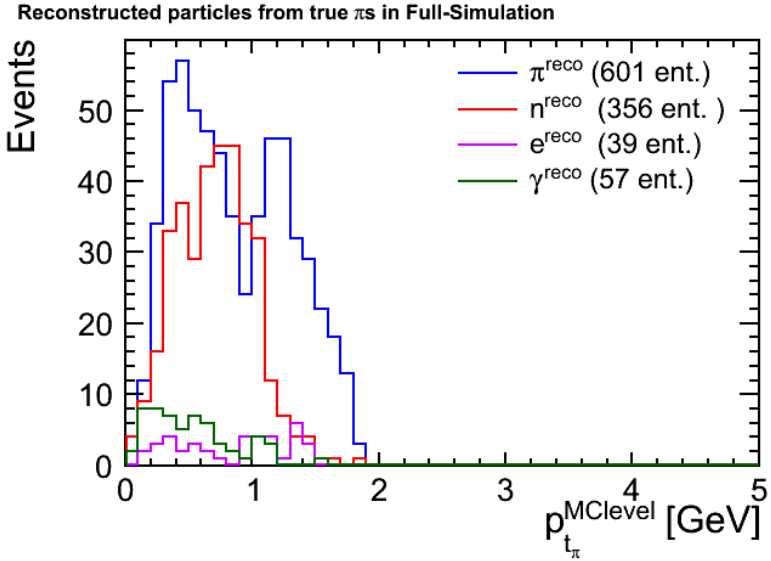
p dist. of true πs



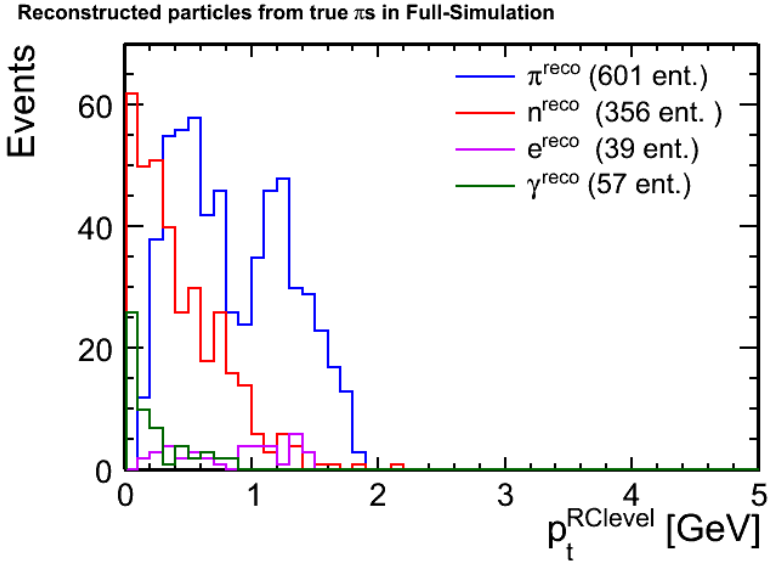
p dist. of reconstructed particles



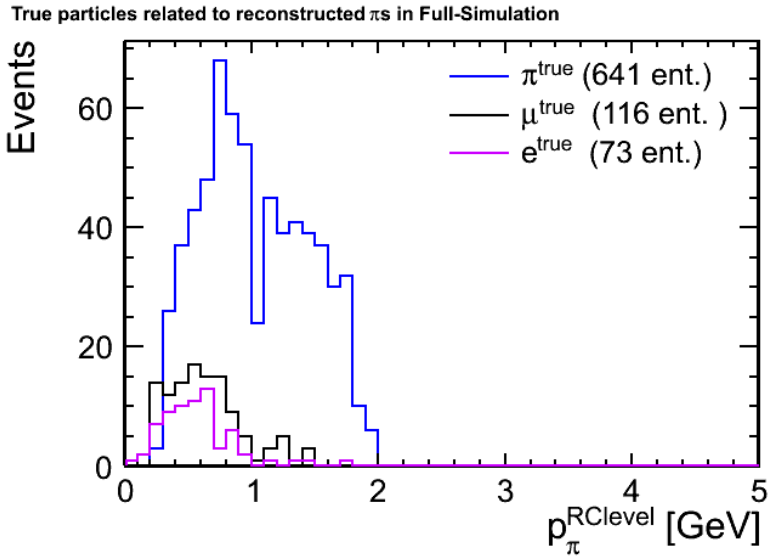
p_t dist. of true πs



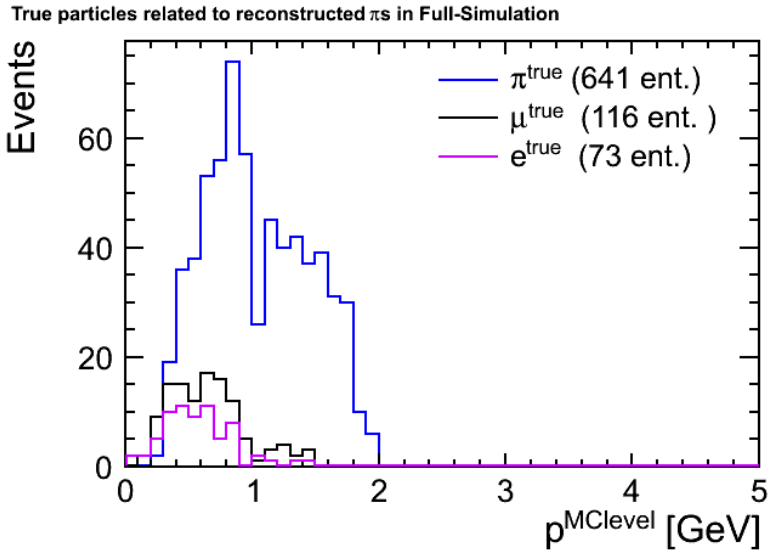
p_t dist. of reconstructed particles



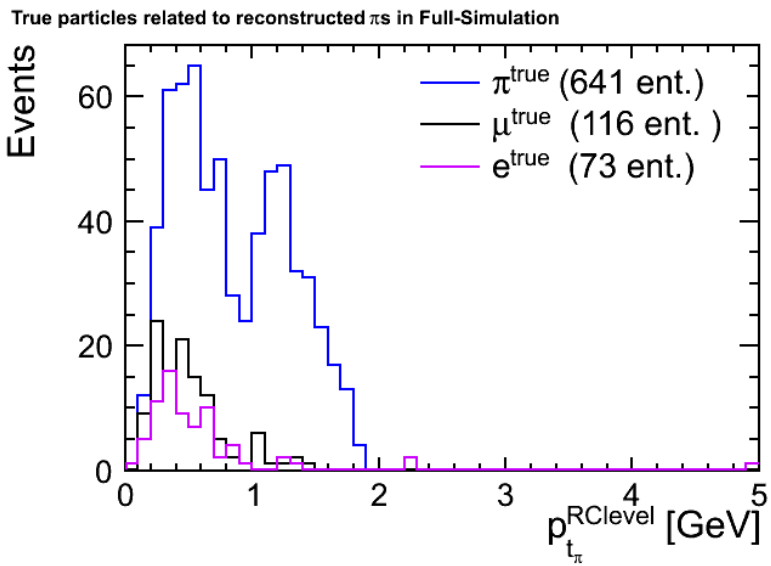
p dist. of reconstructed πs



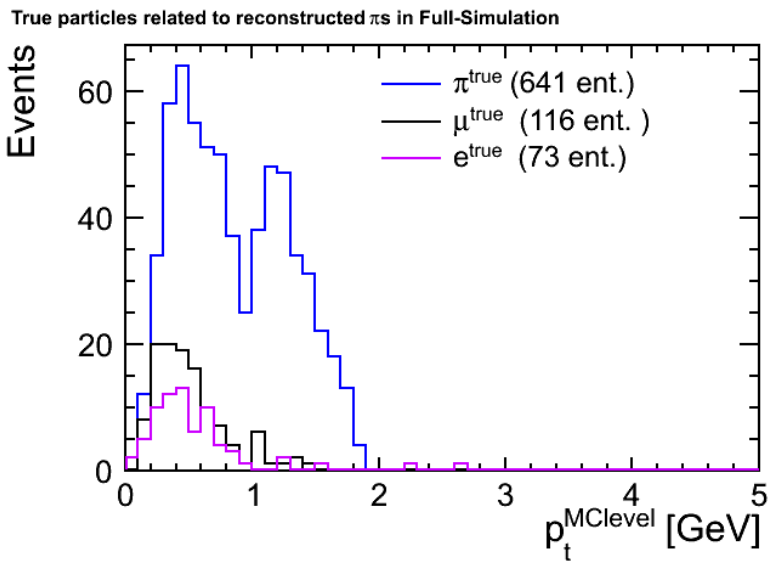
p dist. of true particles



p_t dist. of reconstructed πs

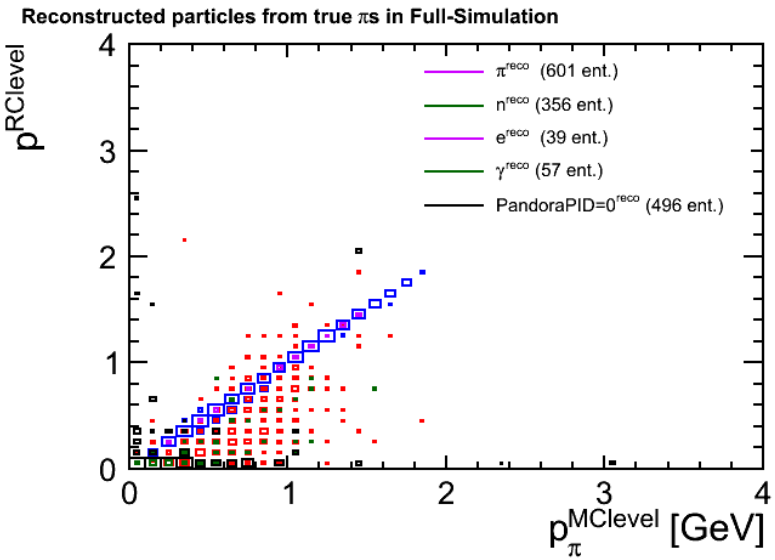


p_t dist. of true particles

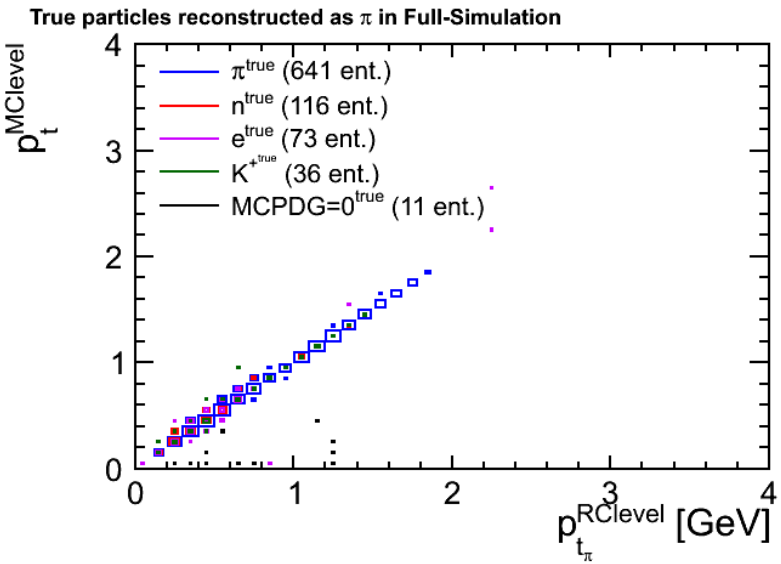


True and Reconstructed Pions

p_t dist. of RCpart. vs true π

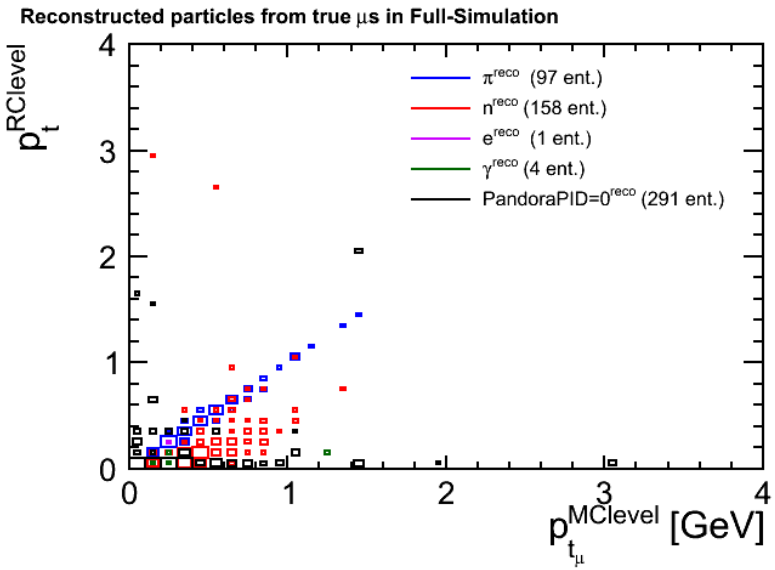


p_t dist. of MCpart. vs reconstructed π

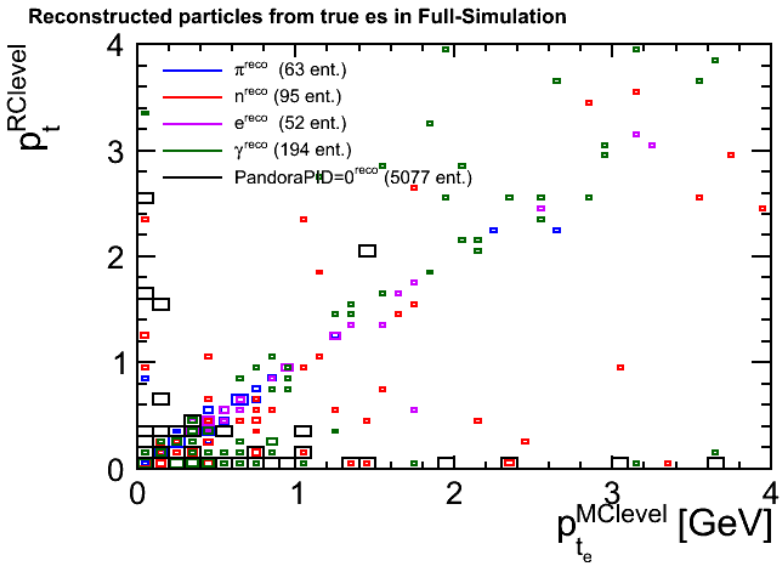


True Muons and Electrons

p_t dist. of RCpart. vs true μ



p_t dist. of RCpart. vs true e



Outlook

- Select particles efficiently
- Consider
  - fake tracks
  - $\gamma\gamma \longrightarrow$ hadrons overlay
- Perform the analysis
- Compare with the results obtained in SGV