# Measurement of $\phi$(1020) elliptic flow in MPD with enhanced production

# Dataset

- UrQMD Bi+Bi at $\sqrt{s_{NN}}$ = 9.2 GeV ~100k event
- Centrality determination: **evCentrality** wagon
- Particle identification: **evPID** wagon
- Event plane measurements: **evPlane** wagon
- $\phi$ meson flow measurements: **flowEpPairKK**

- 50 additional $\phi$-meson within an event
- Reparametrized $\phi$-meson kinematics
- For reconstruction **UniGen** generator was used
- Collider mode

# PID cuts

**Event selection:**

- cut on vertex z coordinate: *130*

**PID cuts:**

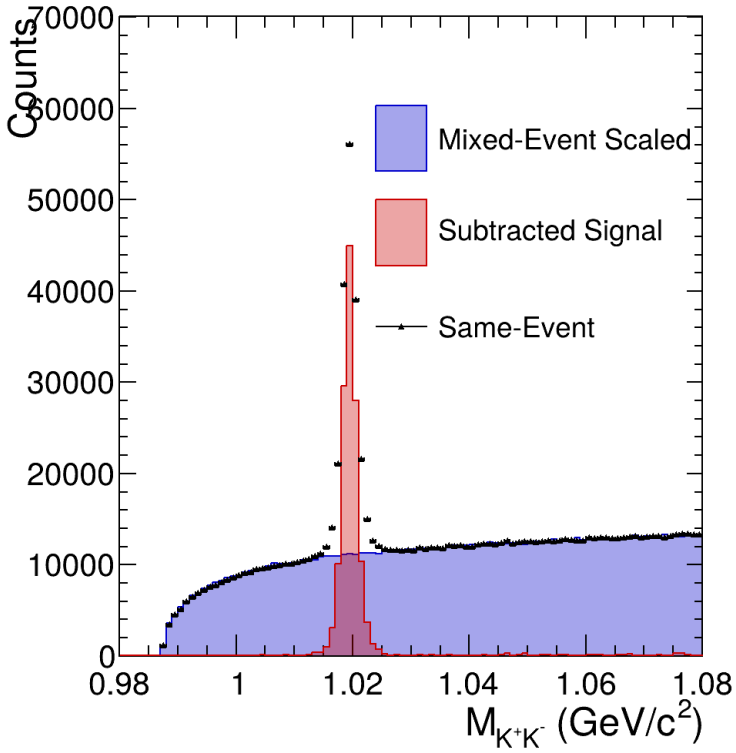
- dE/dx PID parameters: *2*
- Beta PID parameters: *2*

**Track cuts:**

- minimal number for a track: *24*
- maximal pseudorapidity for a track: *1*
- minimal pt for a track: *0.1*
- maximum DCA for a track: *2*

**Pair cuts:**

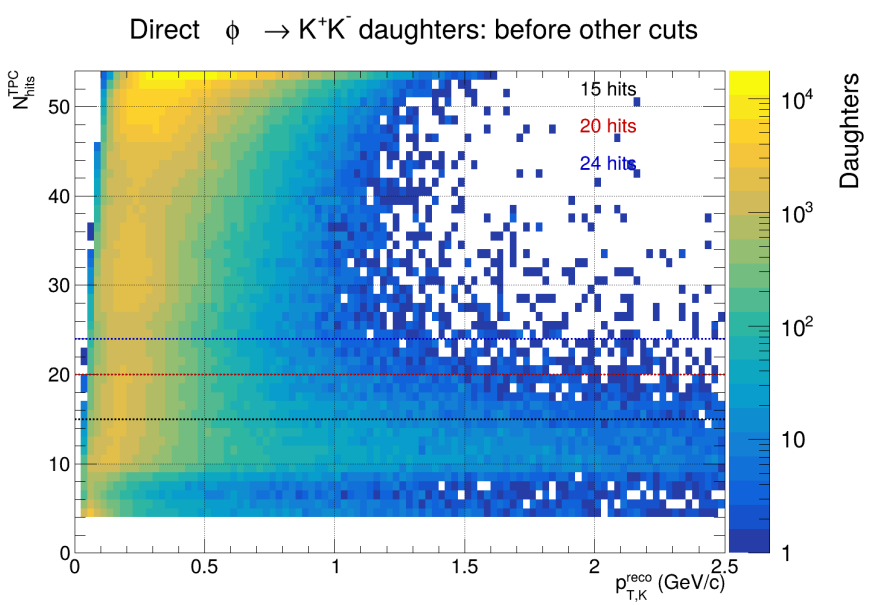
- pair cut: *1*

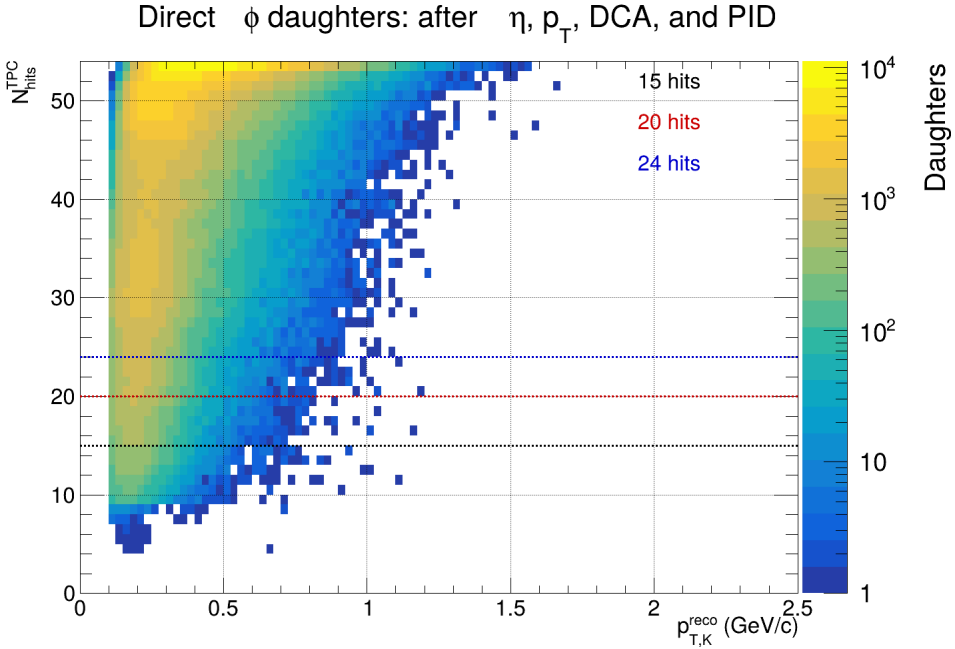


# Selection criteria for true reco signal

- ***Same parent***
- Mother *PDG* = *333* (ϕ-meson)
- Daughter reco tracks $K^{+}K^{-}$ *PDG* = +-*321*
- Mother (ϕ-meson) has enhancement flag (-*9* and -*15*)

# TPC $N_{hits}$ for $\phi \rightarrow K^+K^-$ daughters

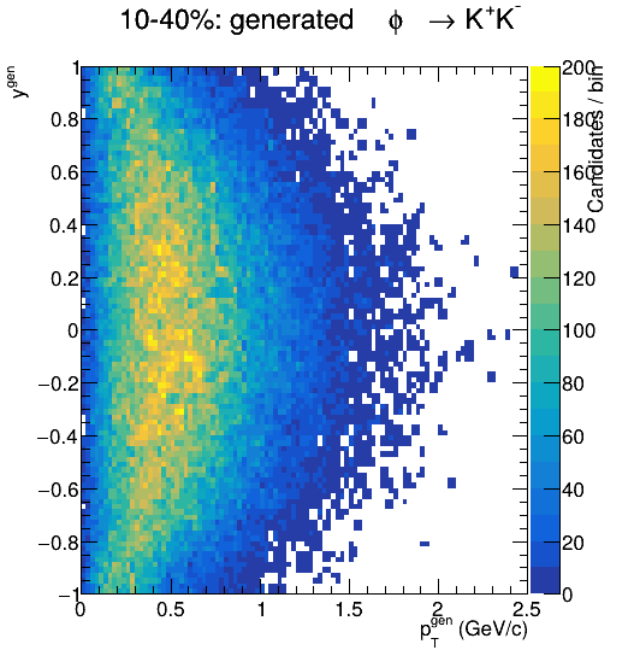


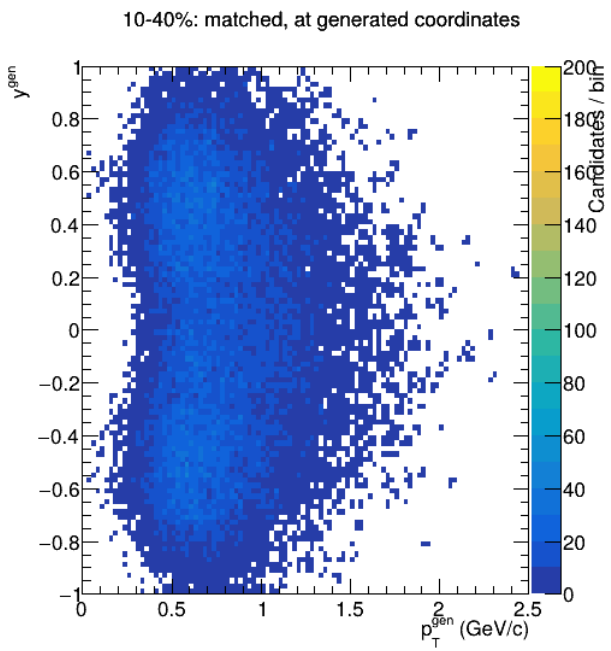



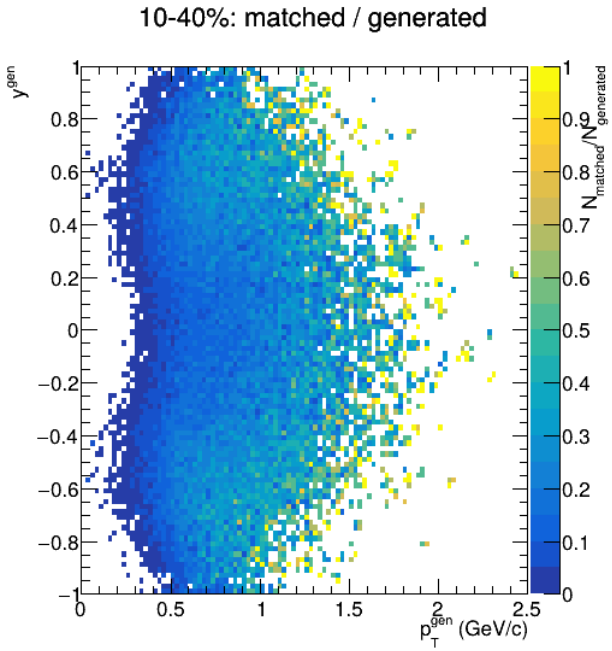

- Strict $N_{hits}$ criteria reduce statistics of low-$p_T$ $K$
- For $\phi$ reconstruction both of the $K^+K^-$ must be presented

**The cut should be optimized**

# Reconstruction efficiency: $\phi \rightarrow K^+K^-$, 10-40 %



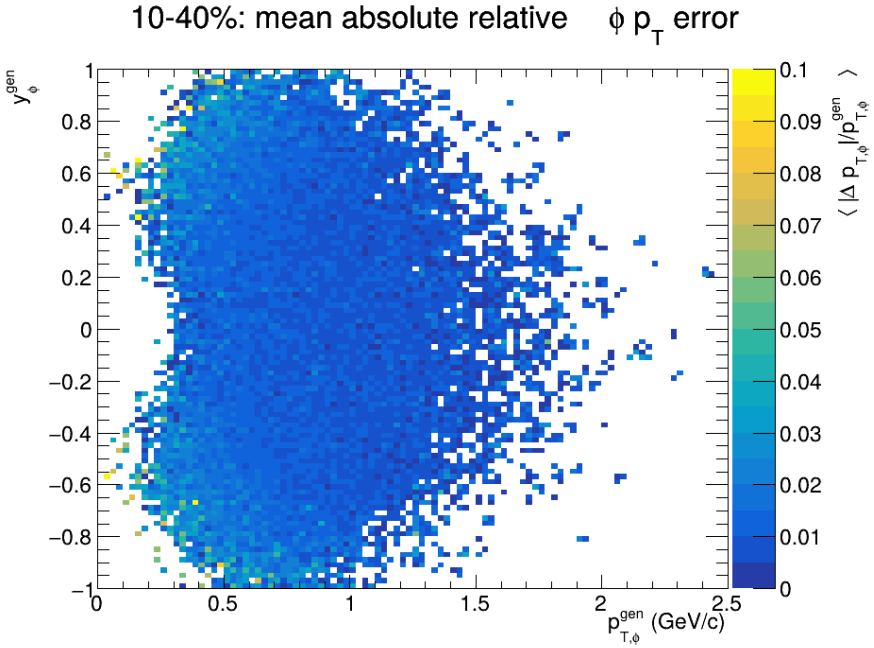



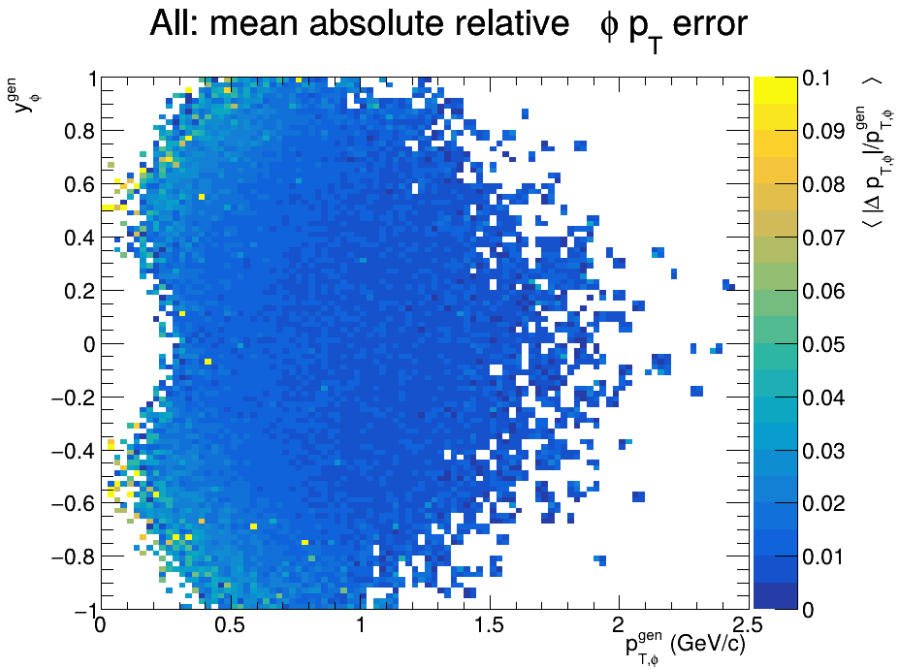




- The reconstructed matched $\phi$ yield doesn't reproduce the MC distribution (pT,y);
- Reconstruction remove a part of statistics

Reconstructed results should be corrected on efficiency (especially important for low-pT tracks)

# $p_T^{\phi}$ resolution ($\delta p_T$) for reconstrued tracks



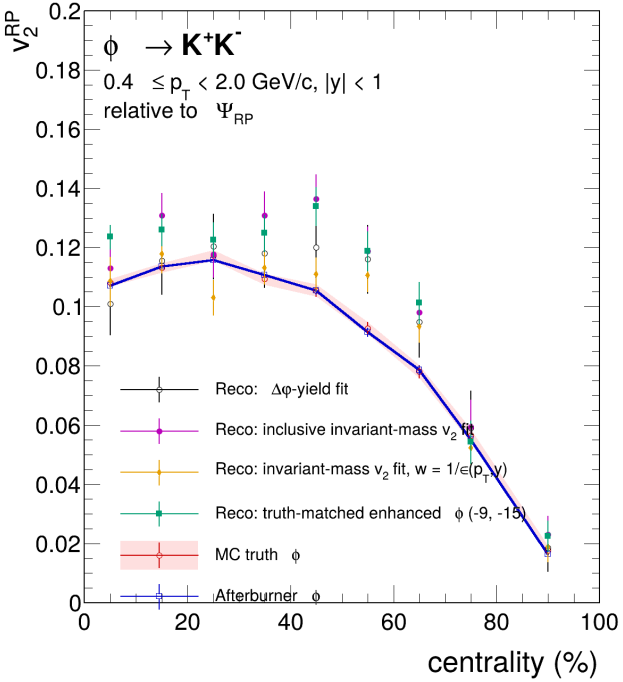



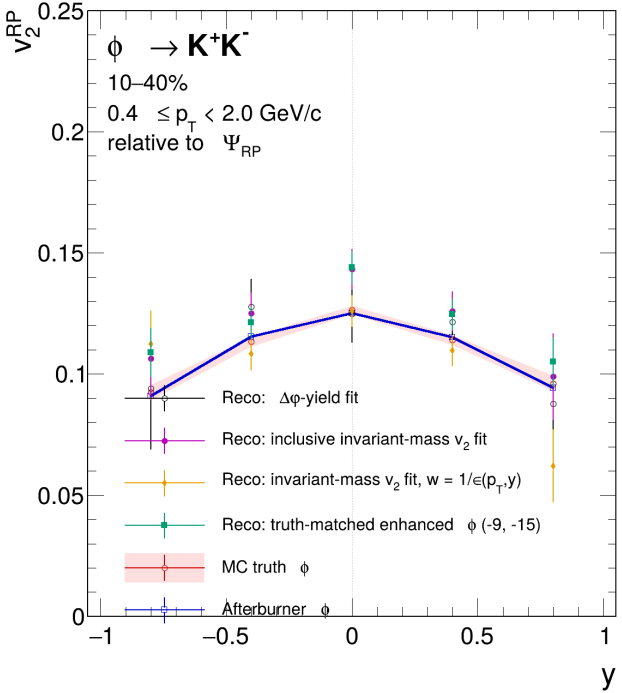

The $p_T$ difference is **largest** at **low** $p_T^{\phi}$ and becomes smaller at higher $p_T^{\phi}$

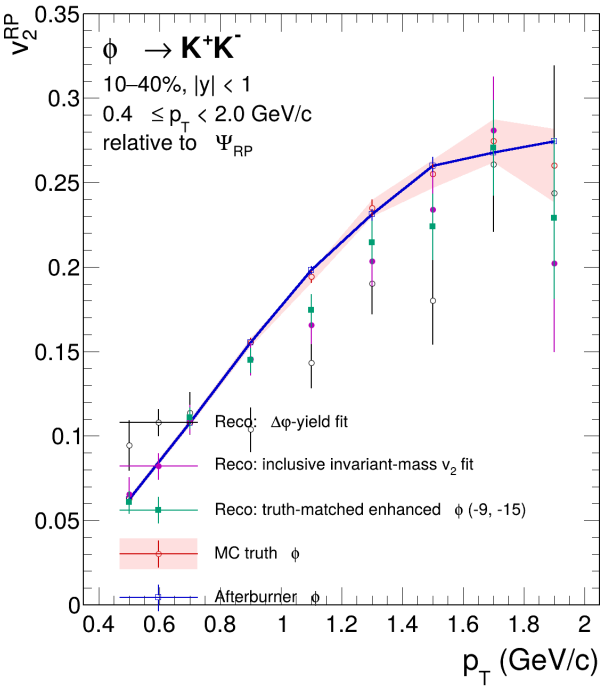
reconstructed $\phi$ momentum agrees more closely with MC truth at higher $p_T^{\phi}$

# **INCREASED by factor of 4**: after efficiency correction

~ 50k events



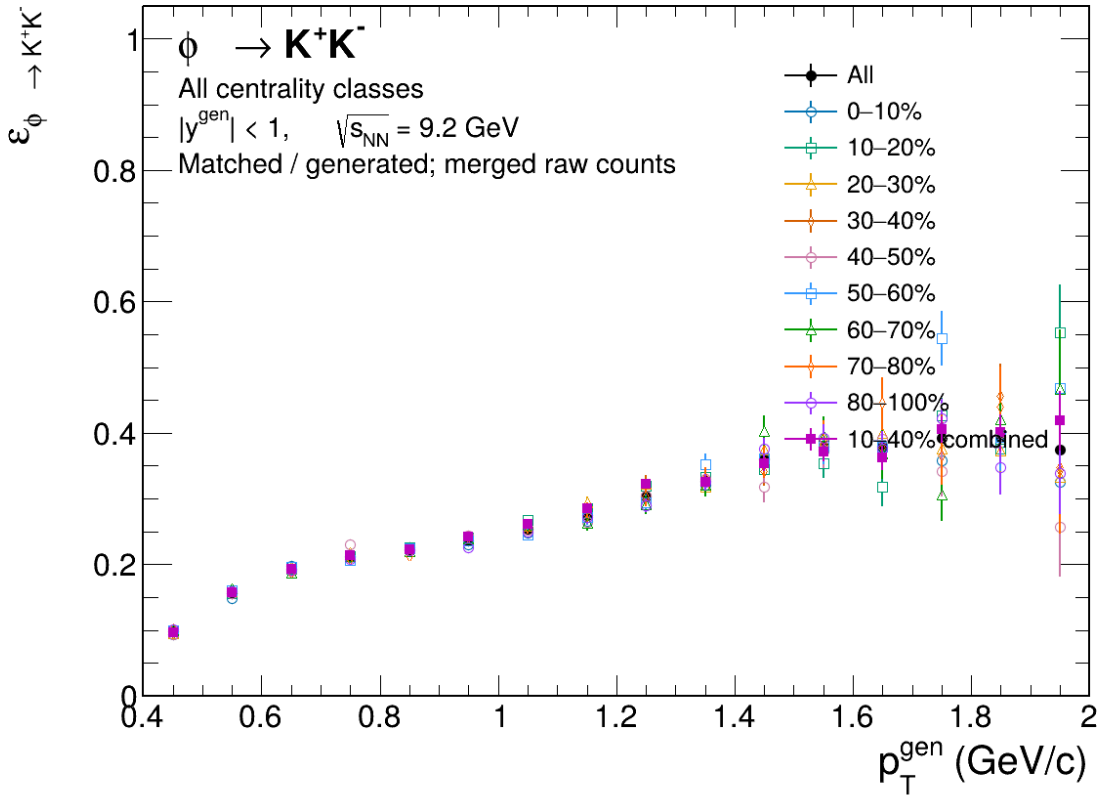




were corrected with $\phi$-meson $\epsilon(p_T, y, centrality)$

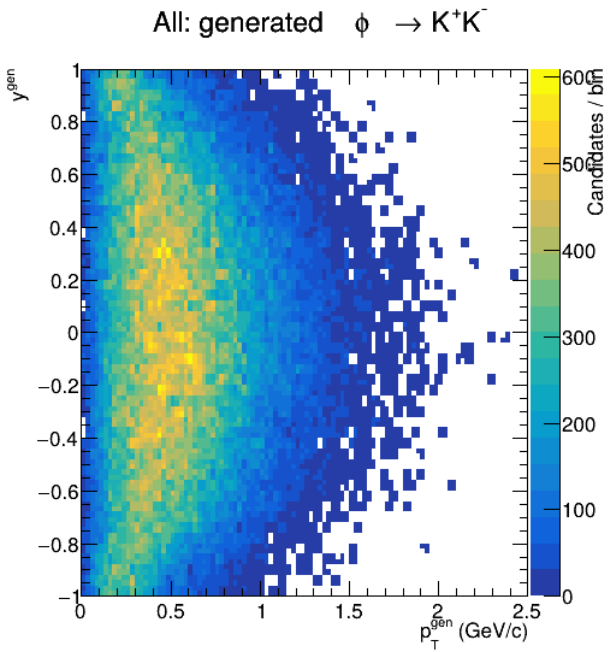
correction improves agreement of the reconstructed invariant-mass $v_2$ with the MC-truth

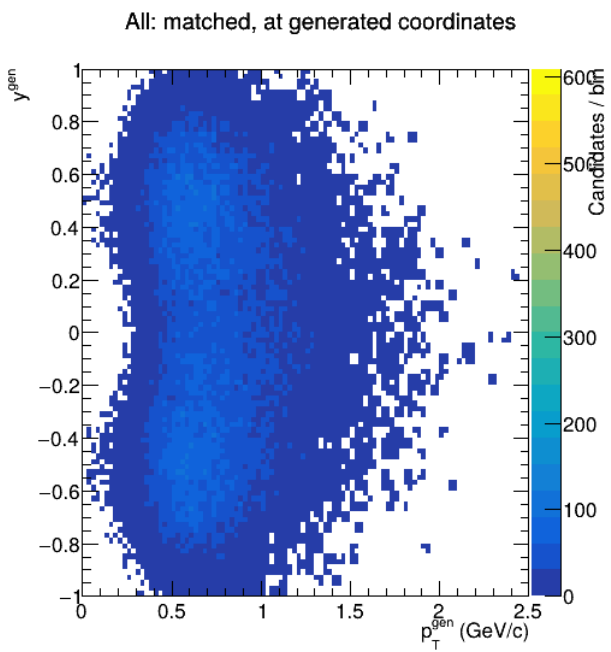
# BACKUP SLIDES

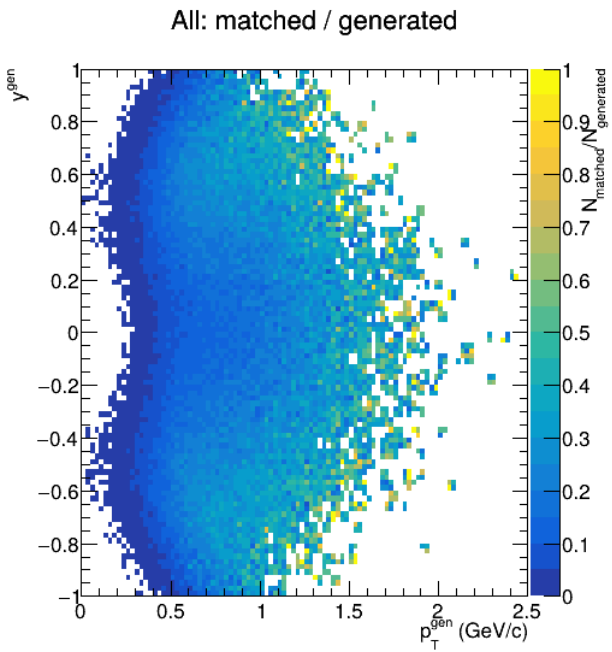
# eff(pT,y) for matched and generated tracks



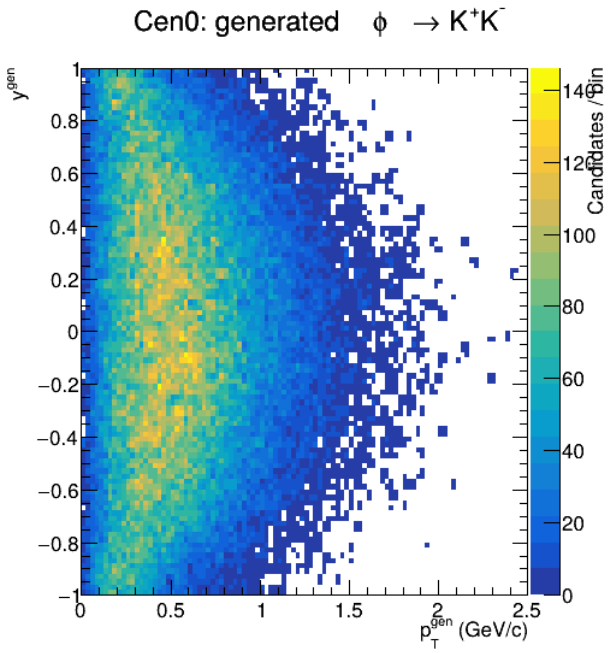
# (0-100)% (pT,y) for matched and generated tracks

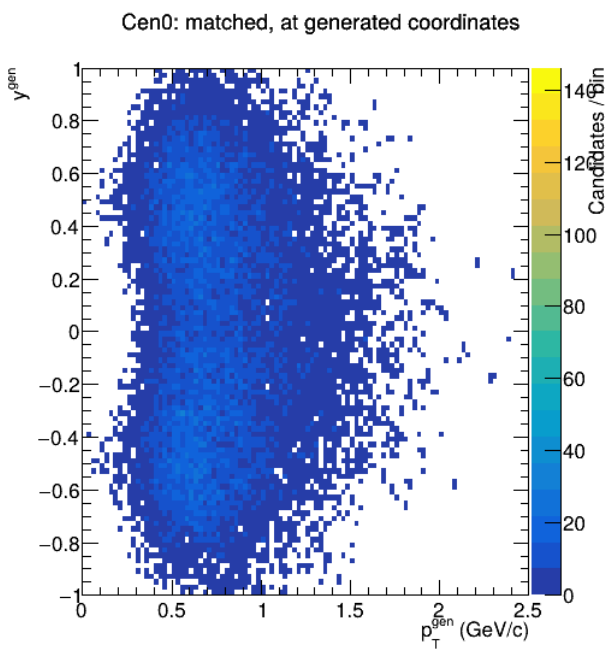


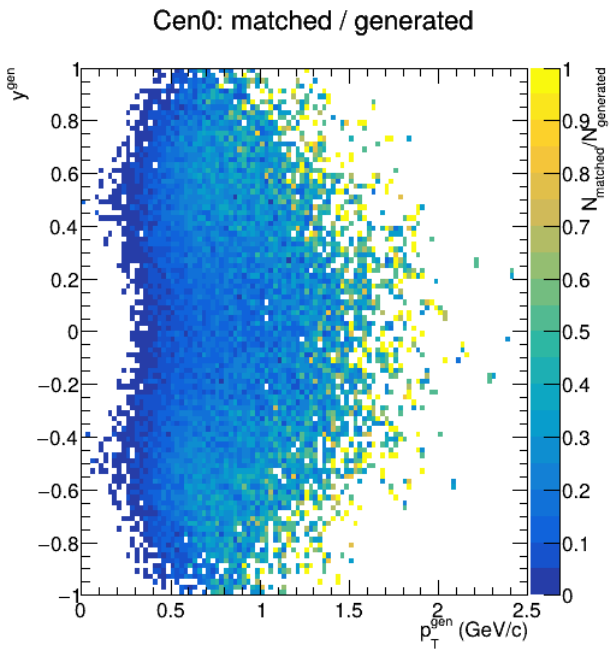



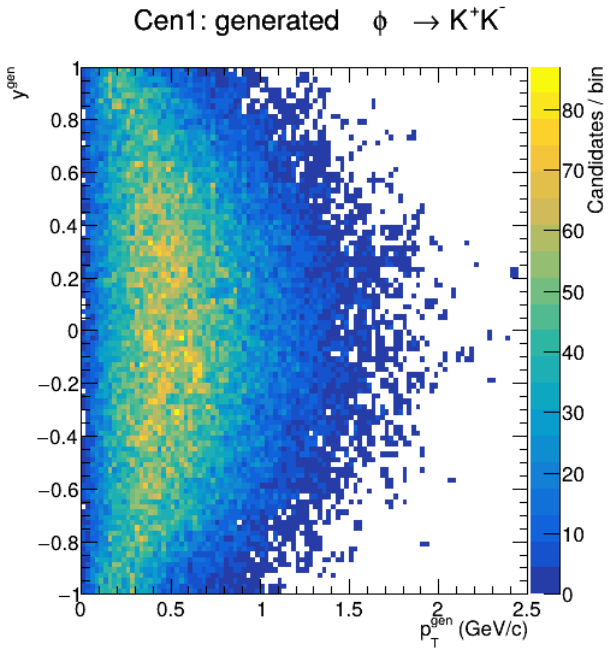
# (0-10)% (pT,y) for matched and generated tracks

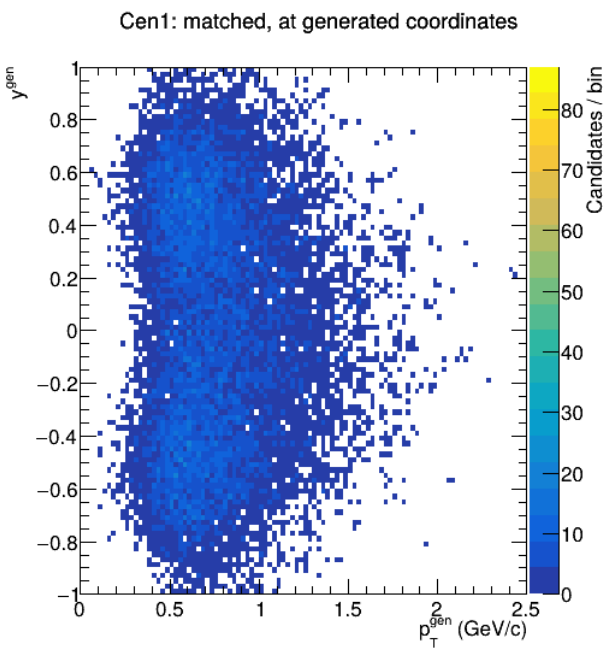


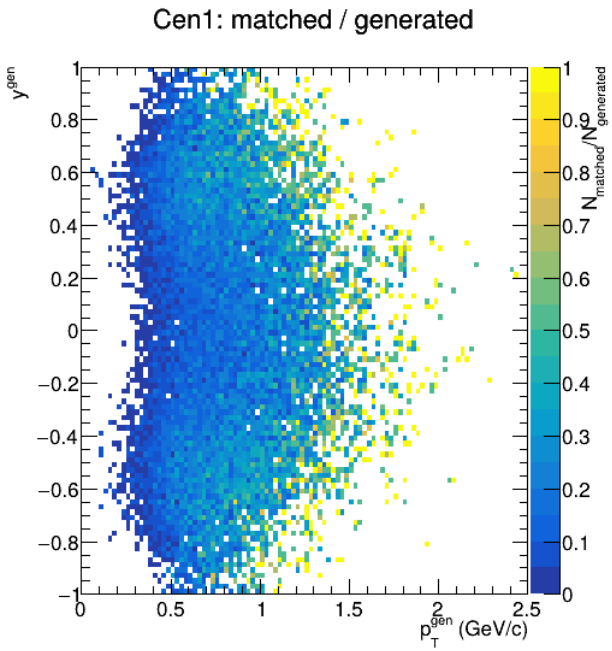



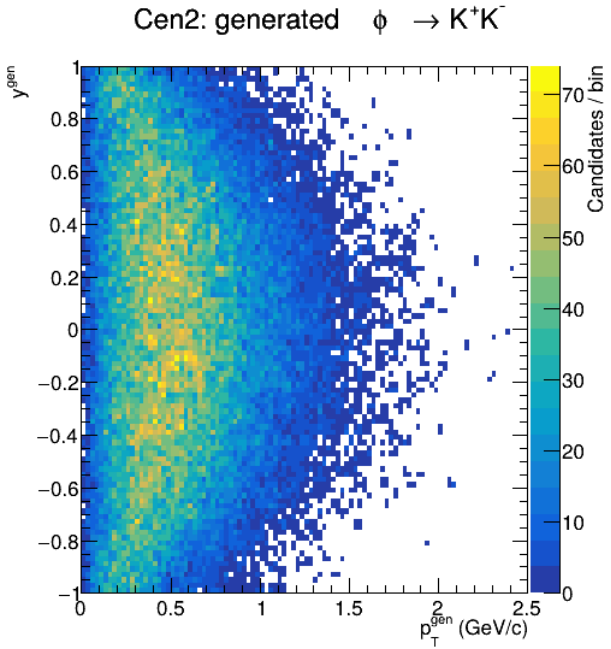
# (10-20)% (pT,y) for matched and generated tracks

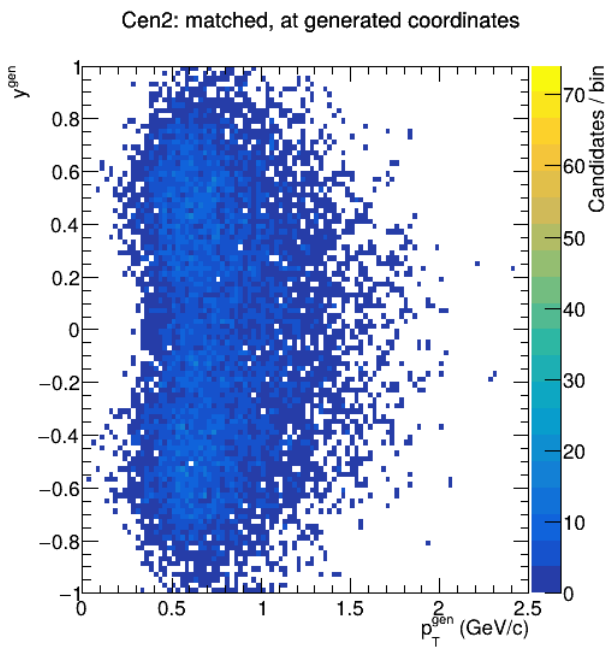


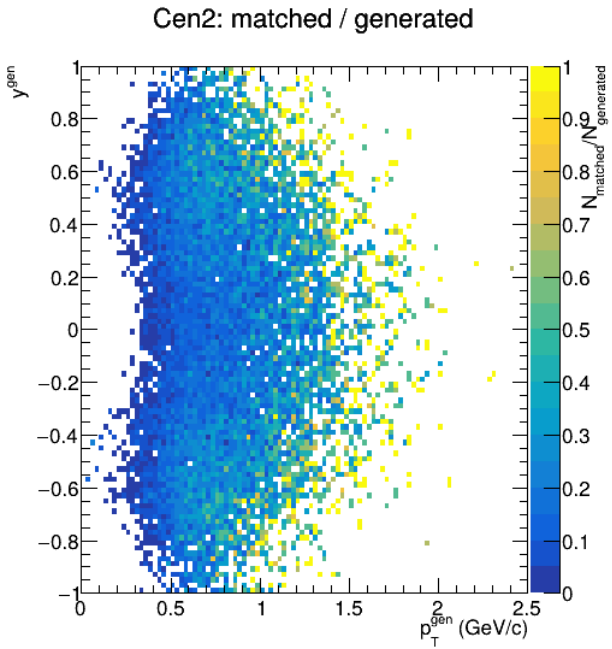



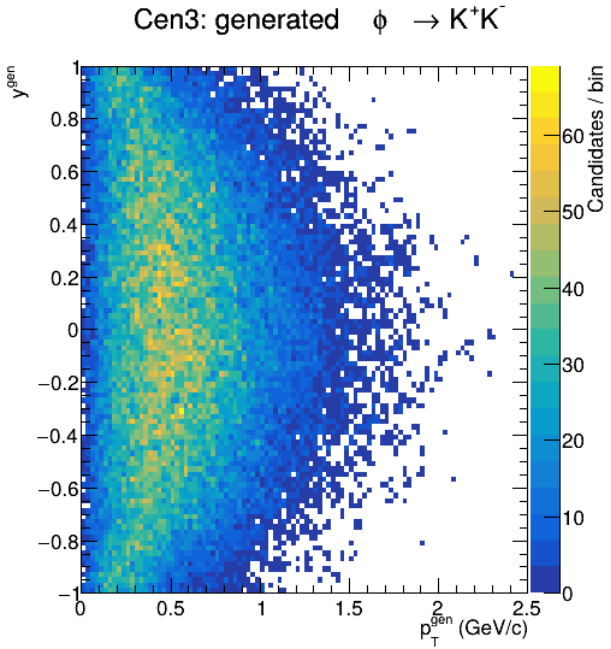
# (20-30)% (pT,y) for matched and generated tracks

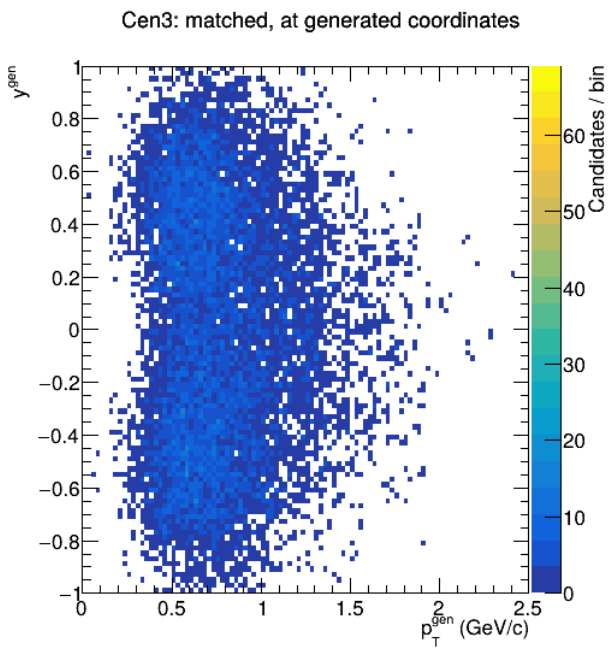


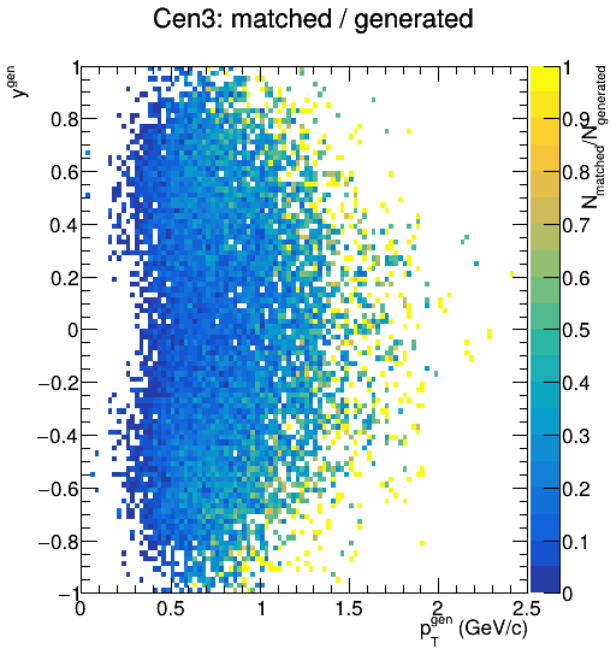



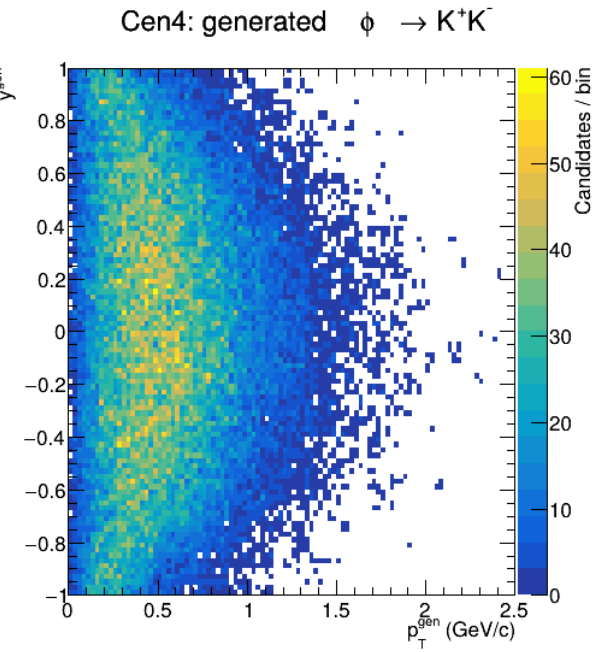
# (30-40)% (pT,y) for matched and generated tracks

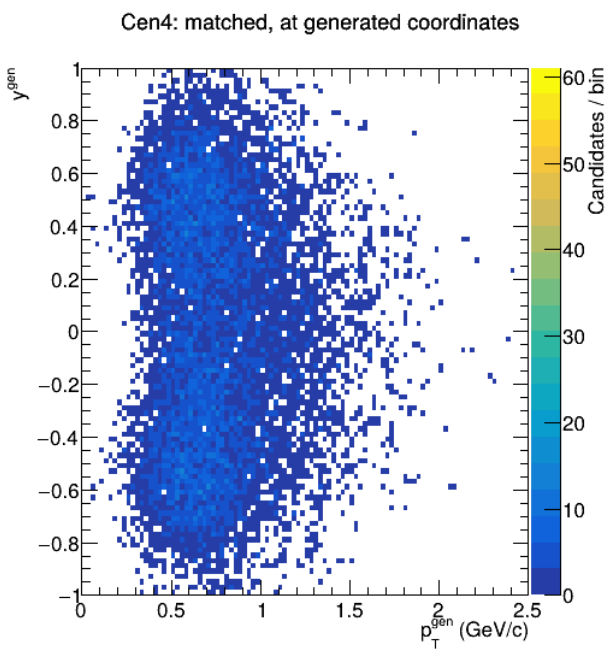


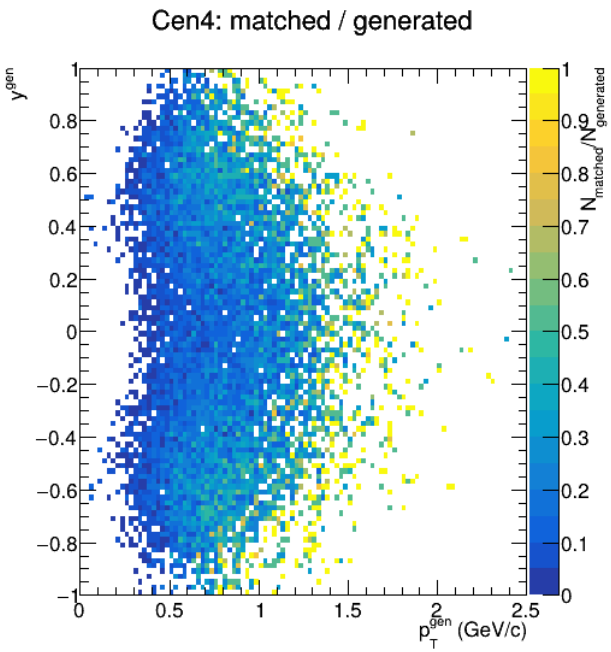



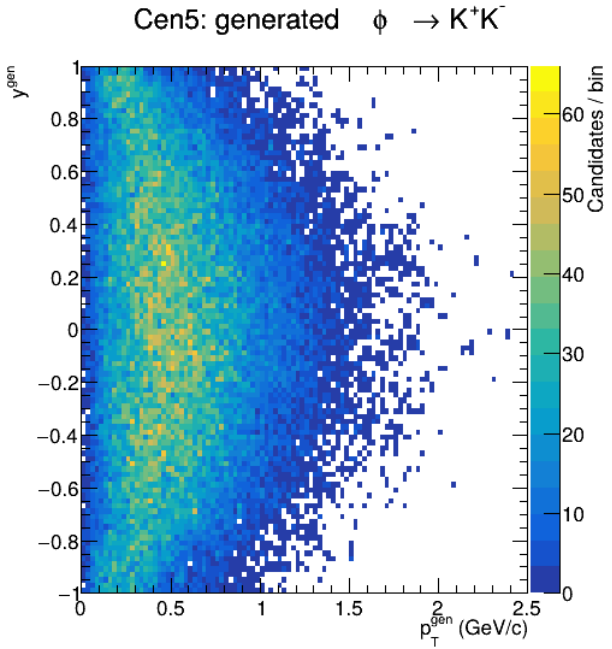
# (40-50)% (pT,y) for matched and generated tracks

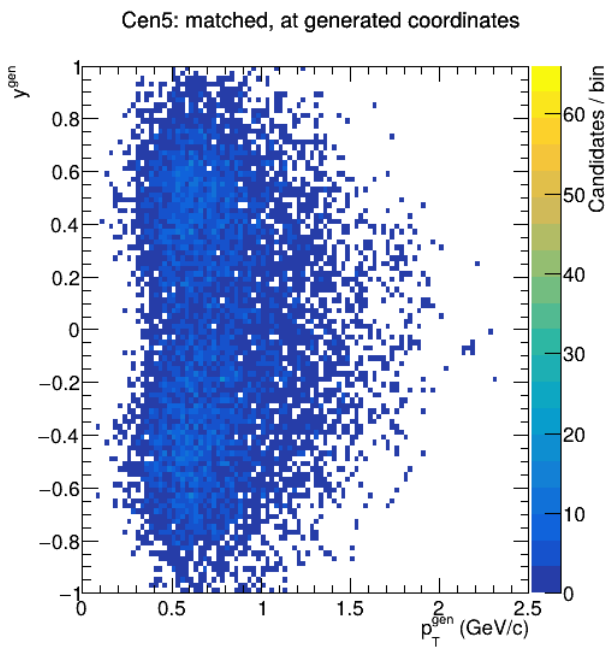


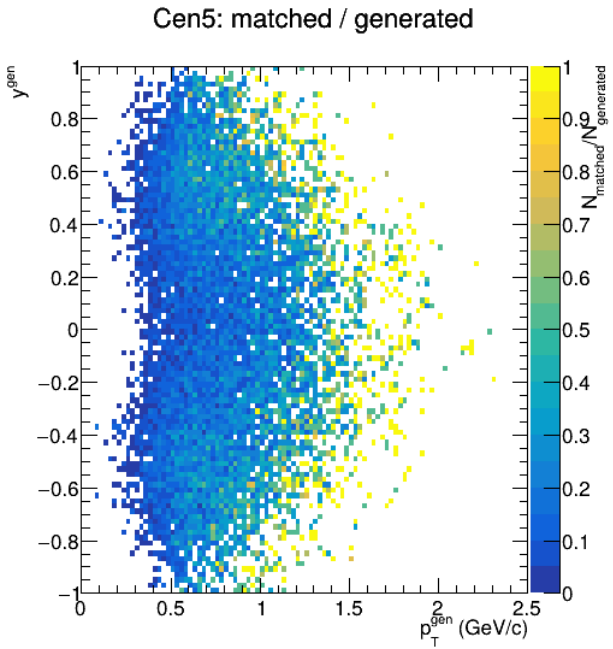



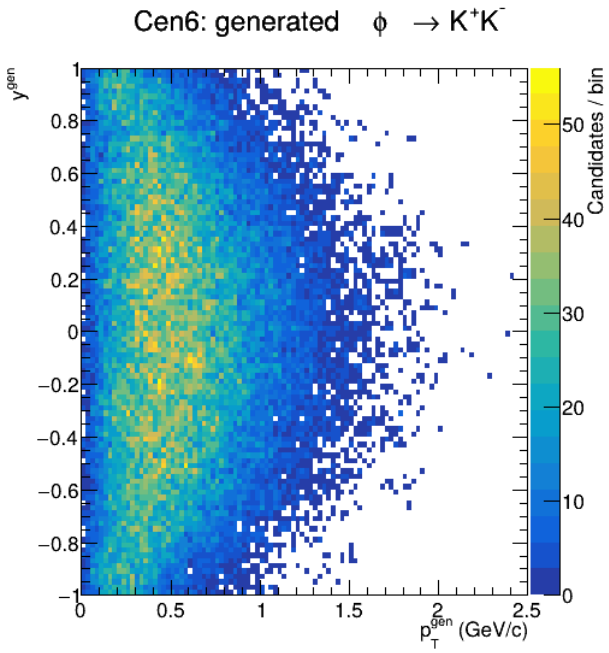
# (50-60)% (pT,y) for matched and generated tracks

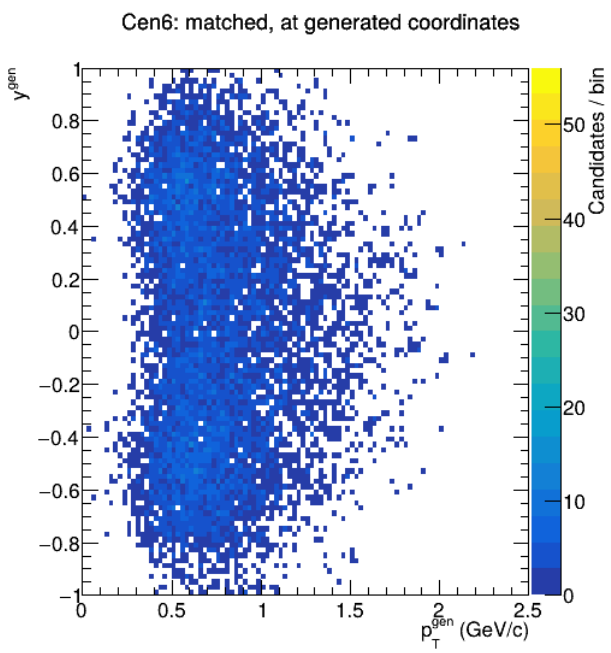


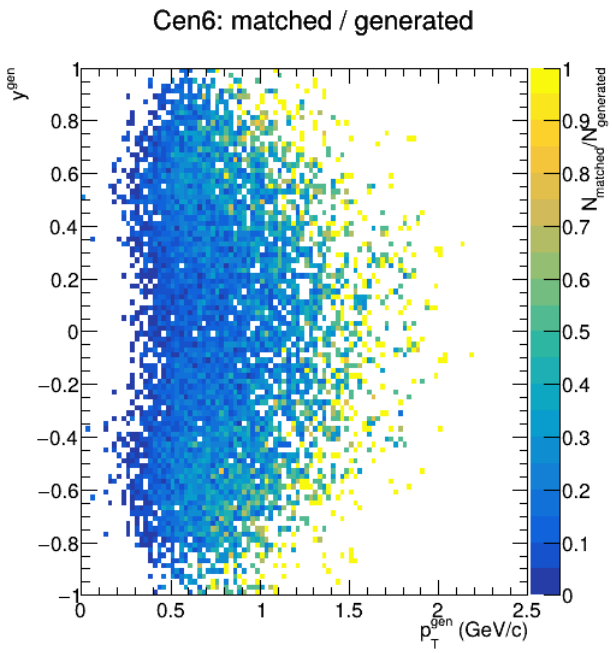



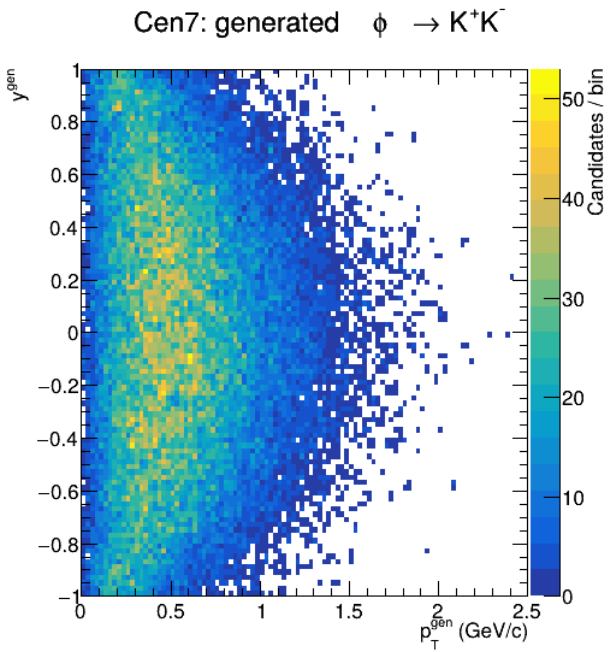
# (60-70)% (pT,y) for matched and generated tracks

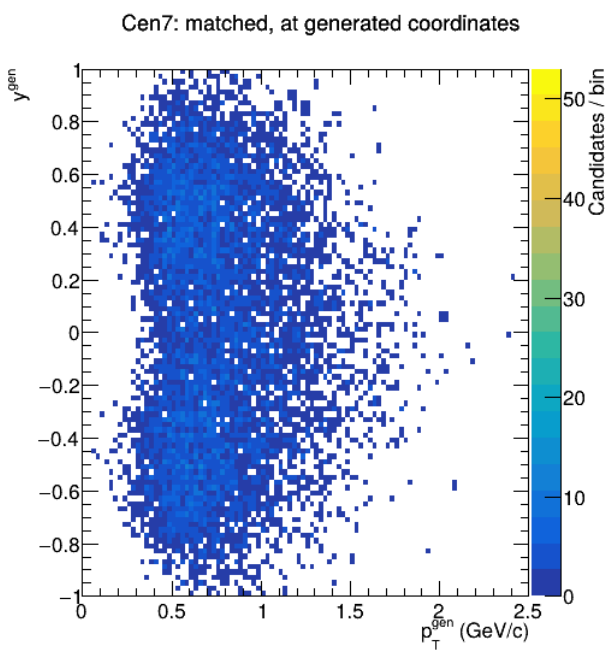


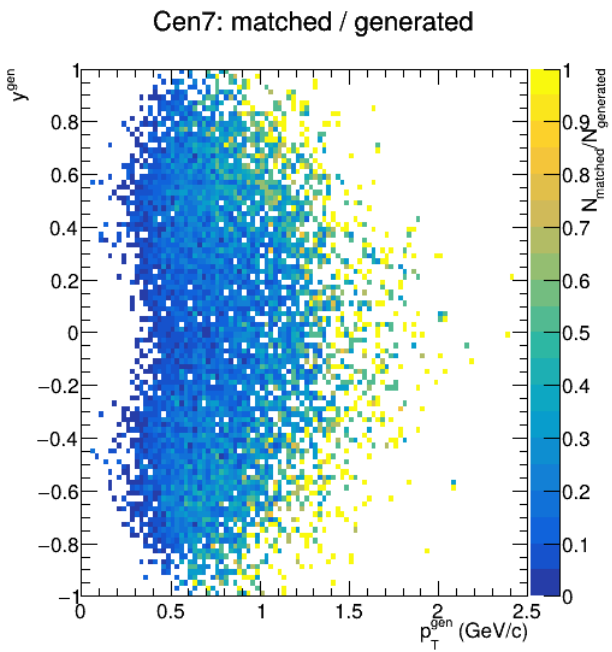



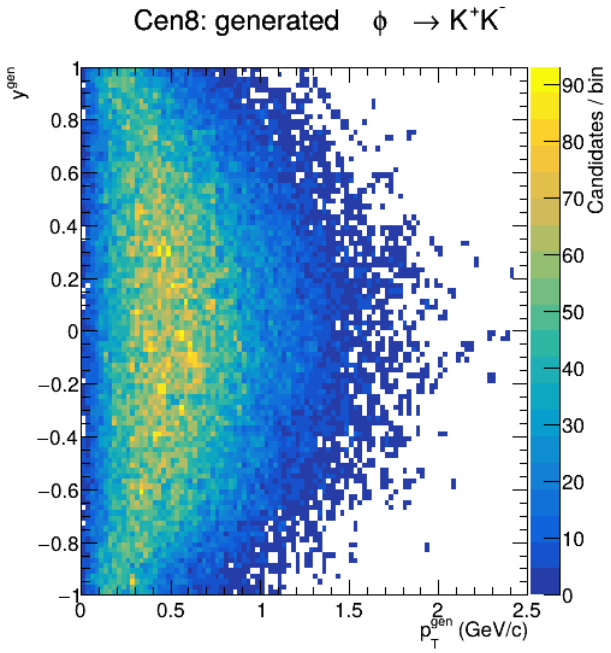
# (70-80)% (pT,y) for matched and generated tracks

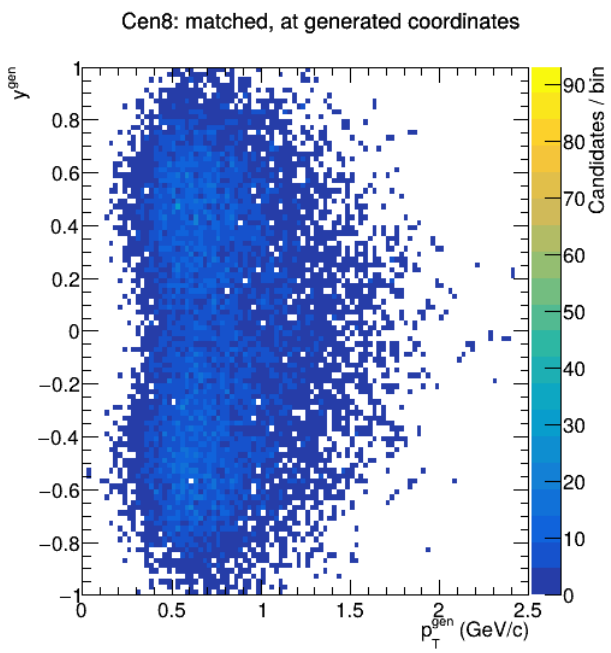


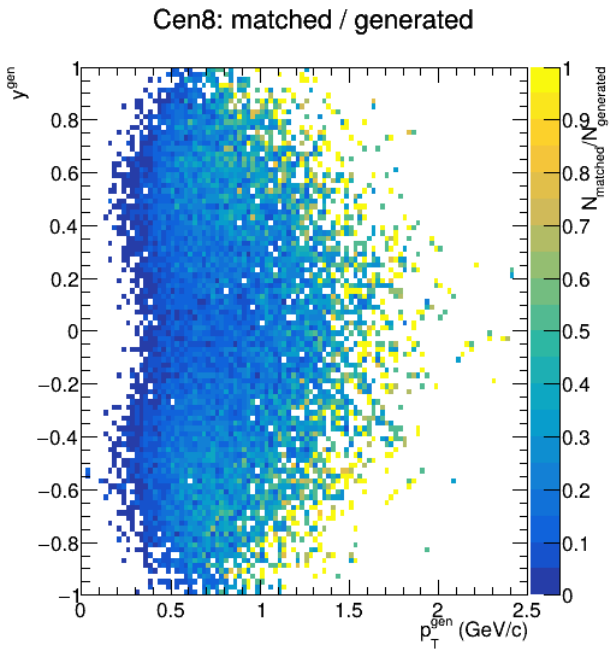



# (80-100)% (pT,y) for matched and generated tracks

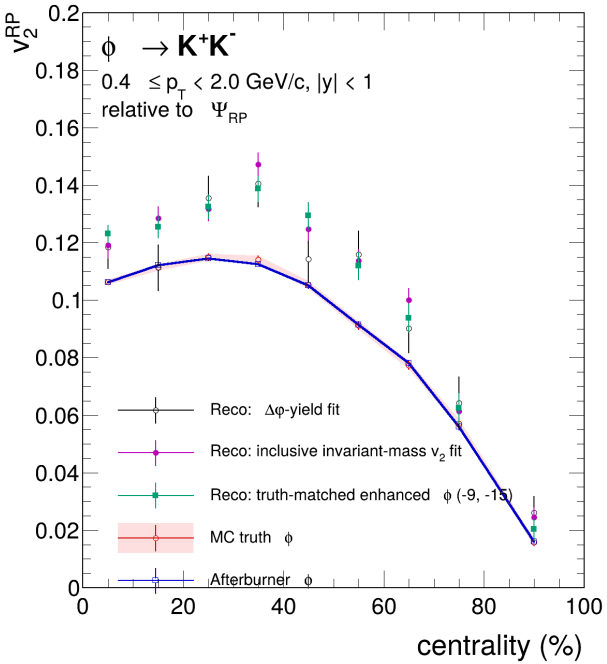


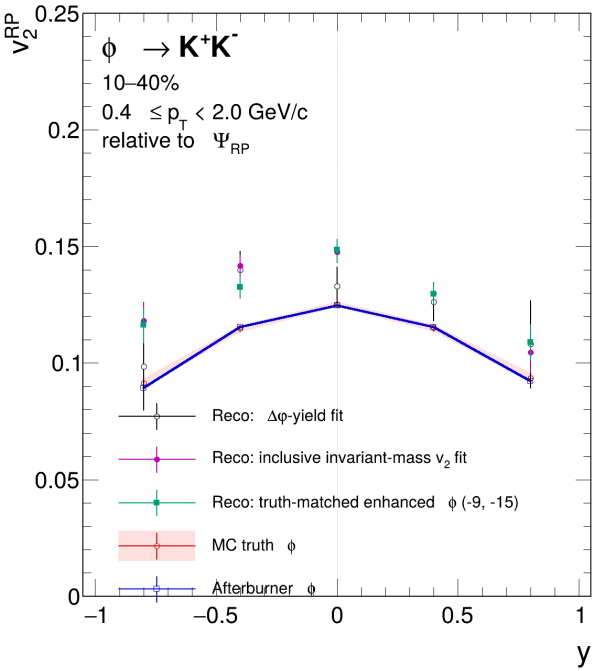



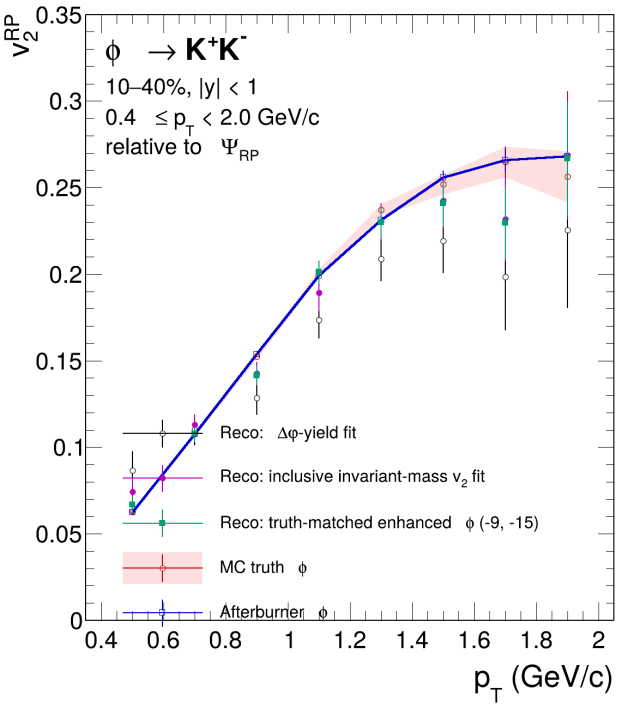



# OLD SLIDES

# **INCREASED by factor of 4**: true reco signal Nhits > 26

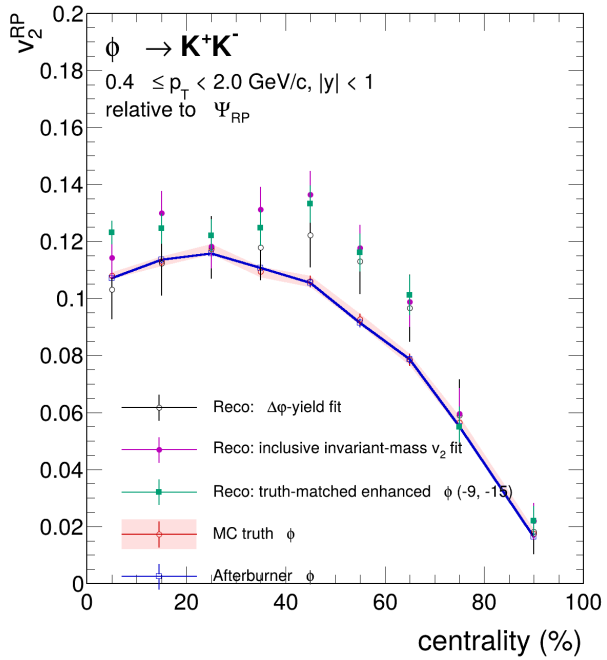


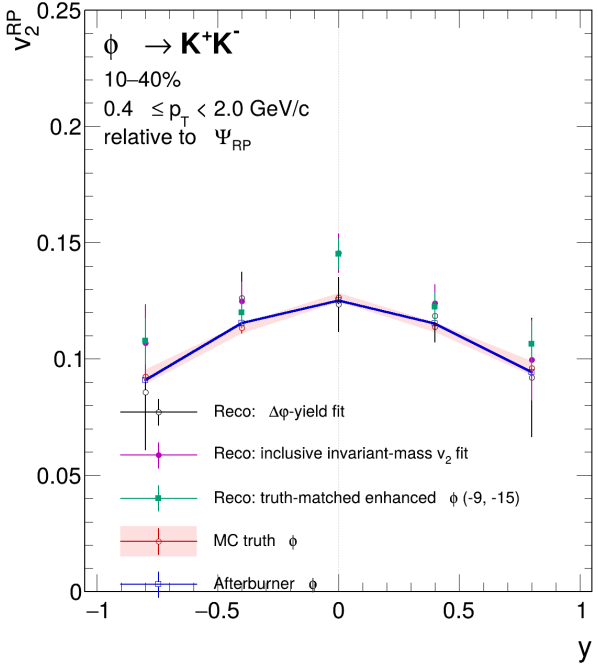



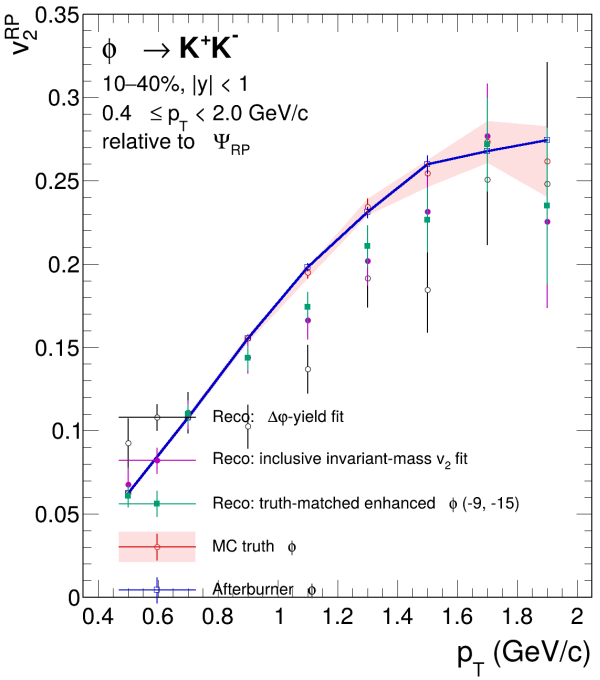




**~ 95k events**

# **INCREASED by factor of 4**: true reco signal Nhits > 15

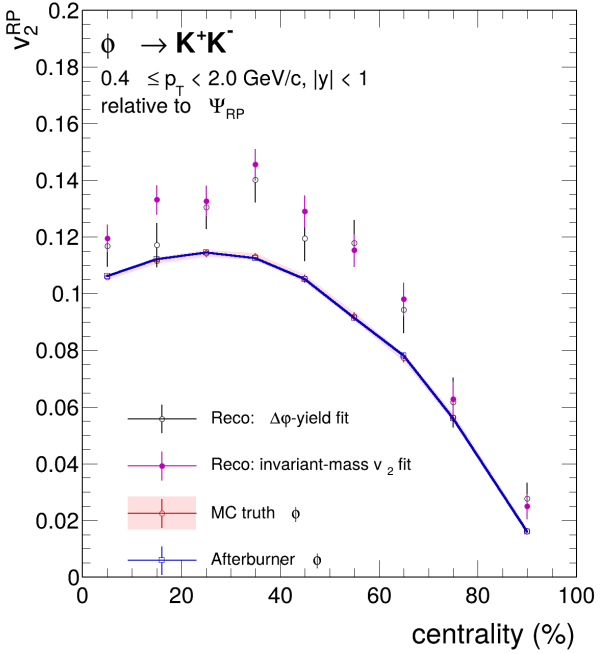


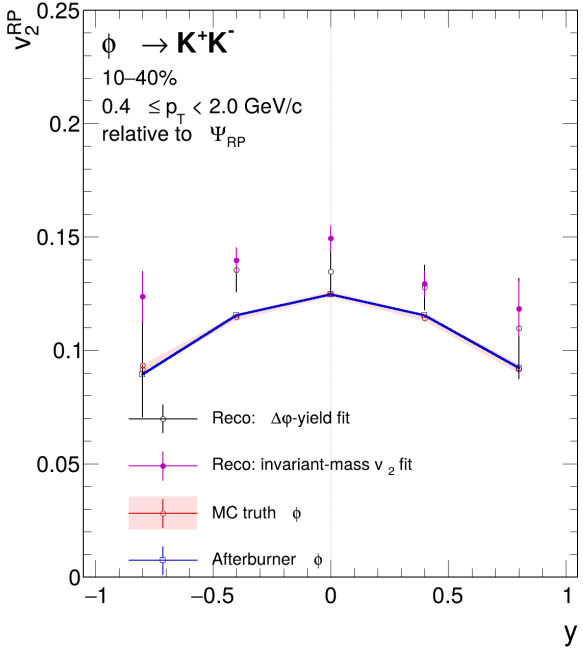



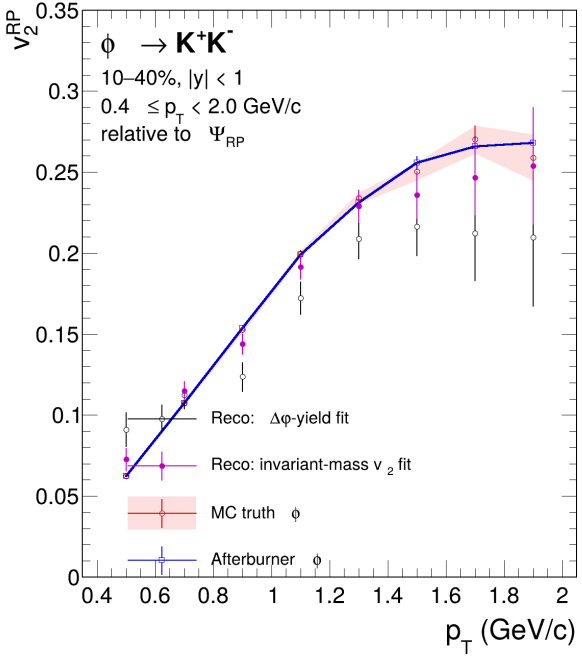




**~ 95k events**

# **INCREASED by factor of 4**: Elliptic flow relative to centrality rapidity, pT

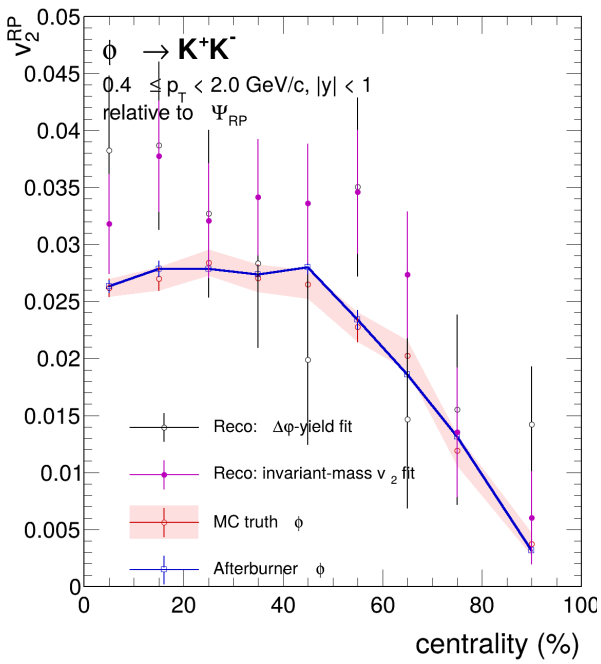


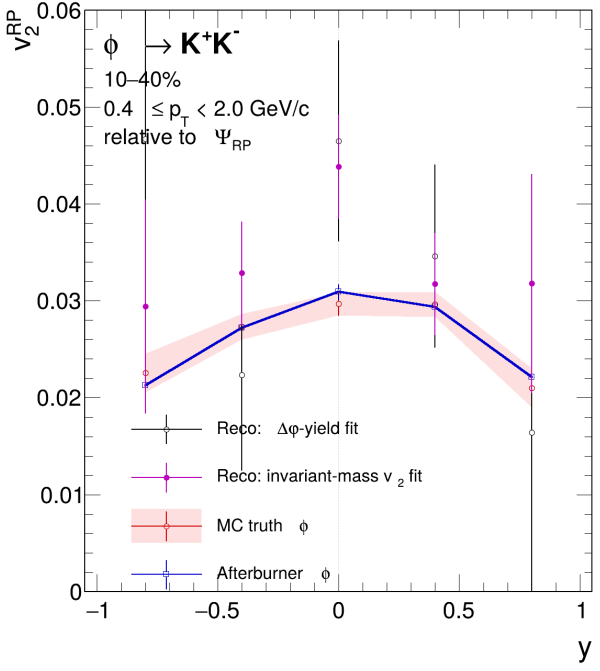



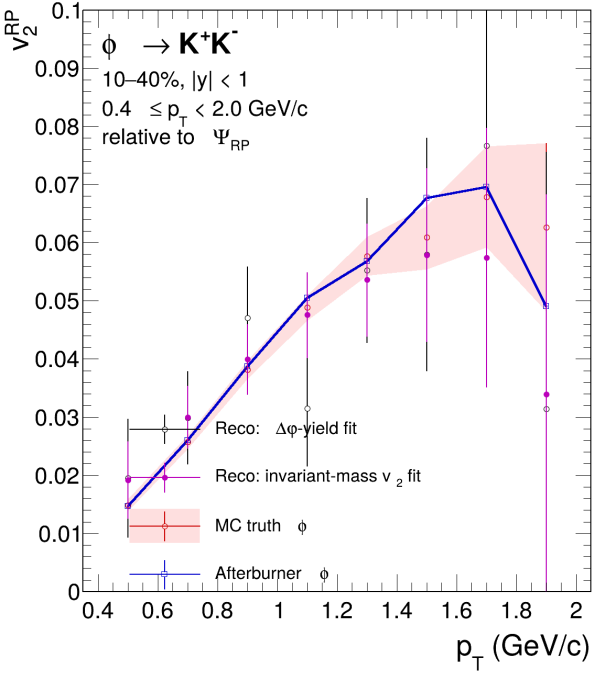




**~ 100k events**

# **REALISTIC**: Elliptic flow relative to centrality rapidity, pT



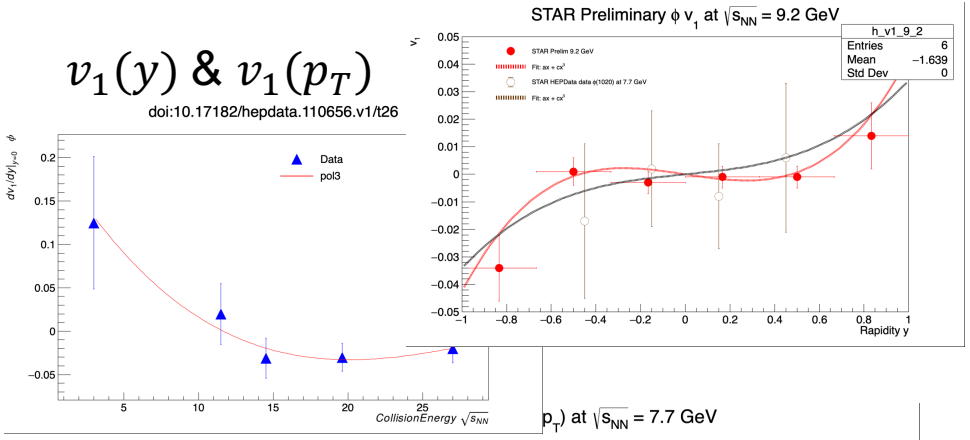



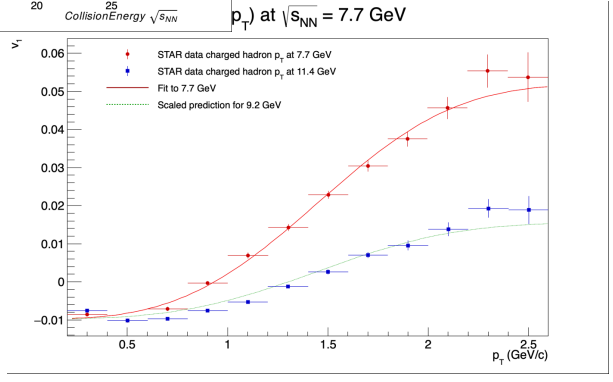




**~ 120k events**

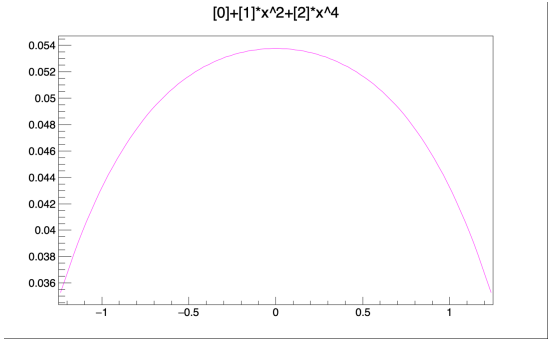
# $\phi$-meson $v_1$ and $v_2$ parameterization

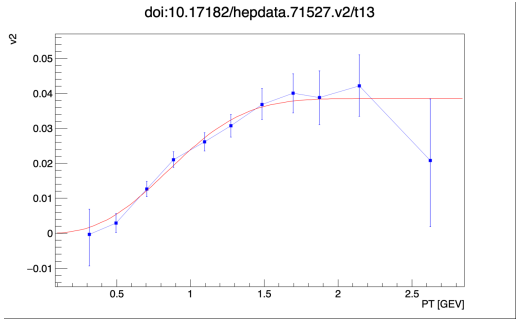
$v_1(y)$ & $v_1(p_T)$




$v_2(\eta)$ and $v_2(p_T)$ parametrized by data [3][4]




[3] arXiv:1206.5528 (Fig.8)
[4] arXiv:1509.08397v2

# Previous measurement at the prod. 25

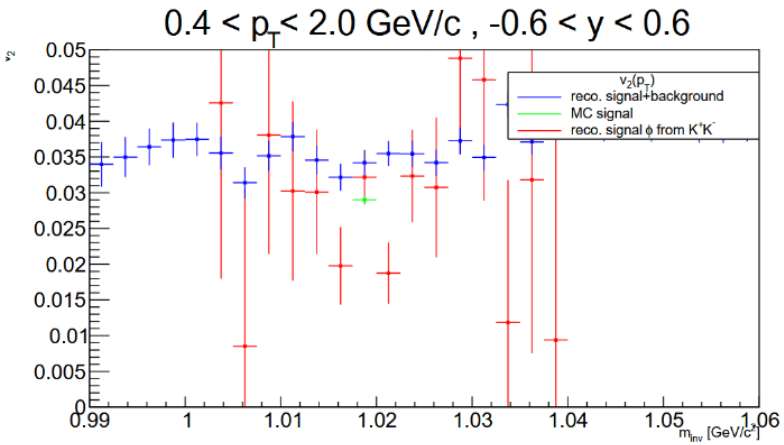
**Used cuts:**

Event selection: vertex z coordinate < *130*

Track selection:

- Kaons identification within $2\sigma$
- $N_{hits} > 24$
- $p_T > 0.1$ GeV/c
- |DCA| < $2\sigma$
- Kaon pair $|y_{K^+K^-}| < -0.6$

Signal $v_2$ and background $v_2$ are similar – *can not distinguish between them very well*.



# Previous measurement at the prod. 25

- (Reco full) reconstructed data (with background subtraction);
- (Reco signal)
  Δ$\phi$ method for reconstructed data:
  pdg = 321(K+) and -321(K-)
  mother particle pdg = 333 (phi meson);
- **(True)** Monte Carlo data;
  mother particle pdg = 333 (phi meson);

