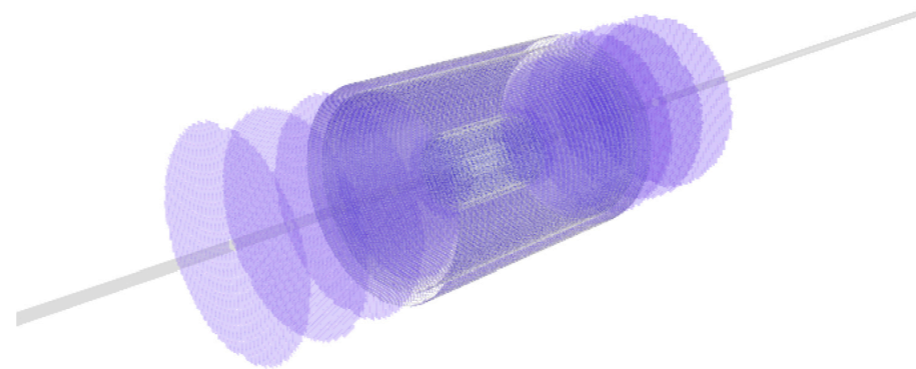

All-Si Tracker studies in Fun4All



Rey Cruz-Torres
06/23/2020

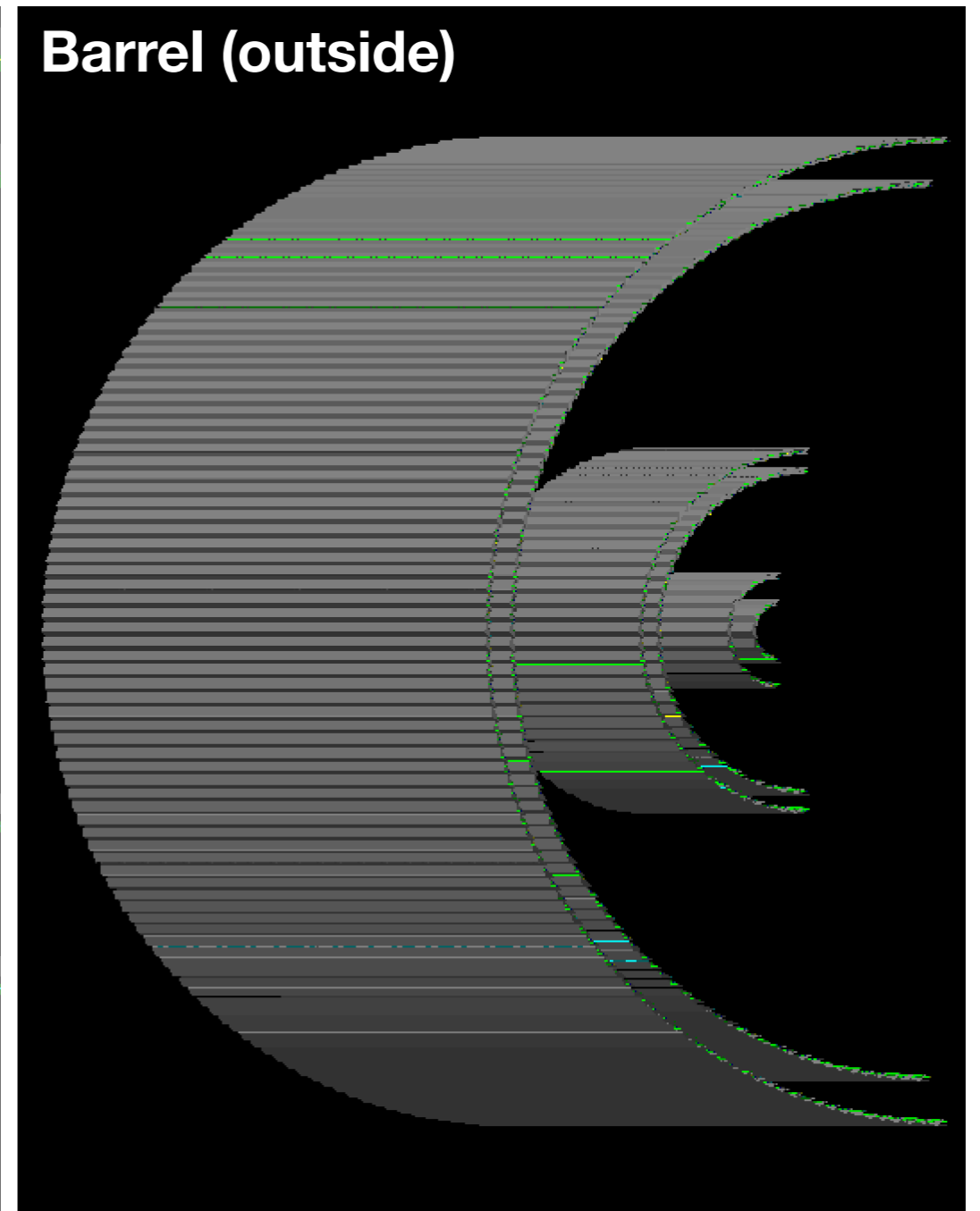
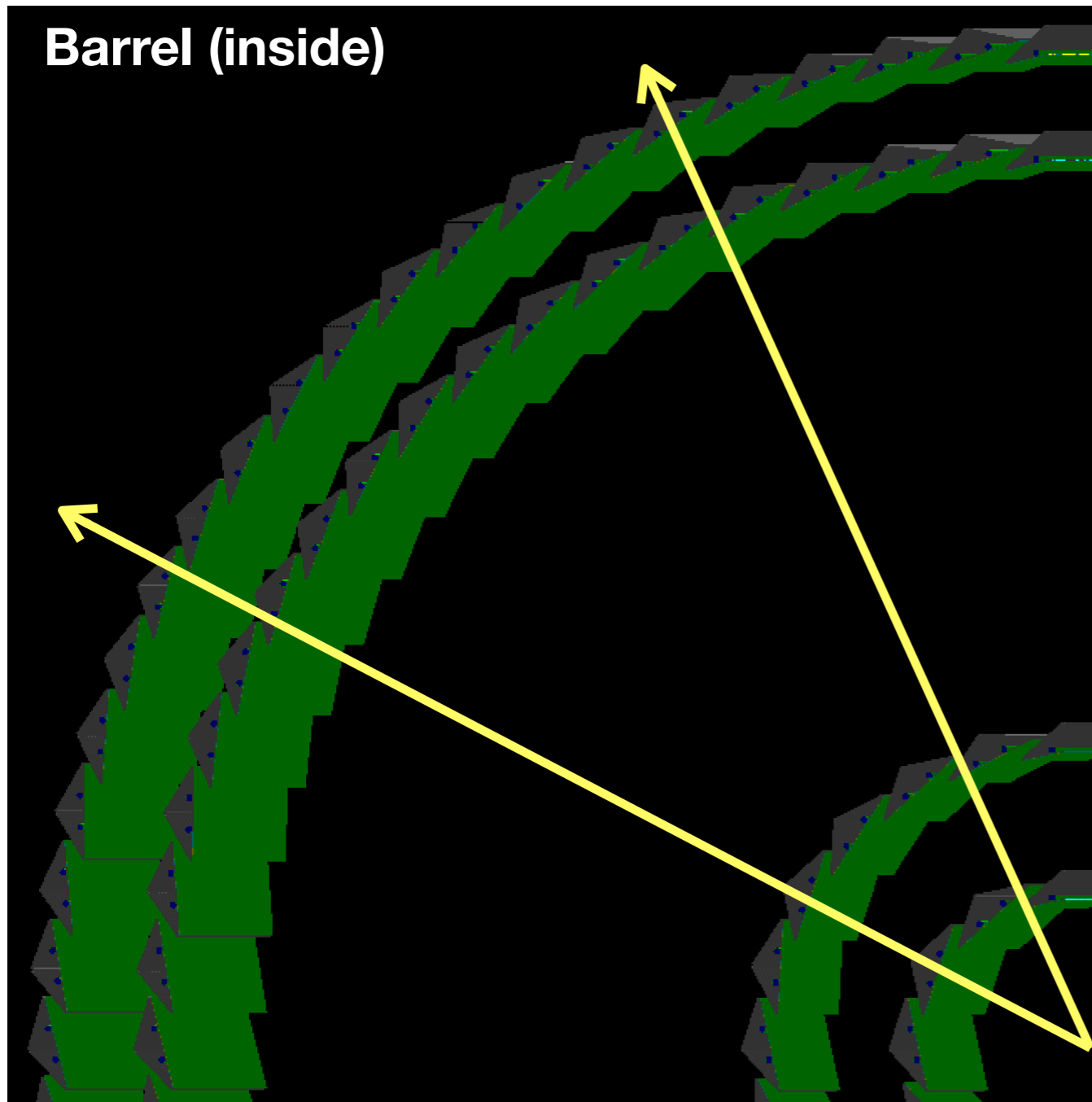
Outline

Material Scan Update

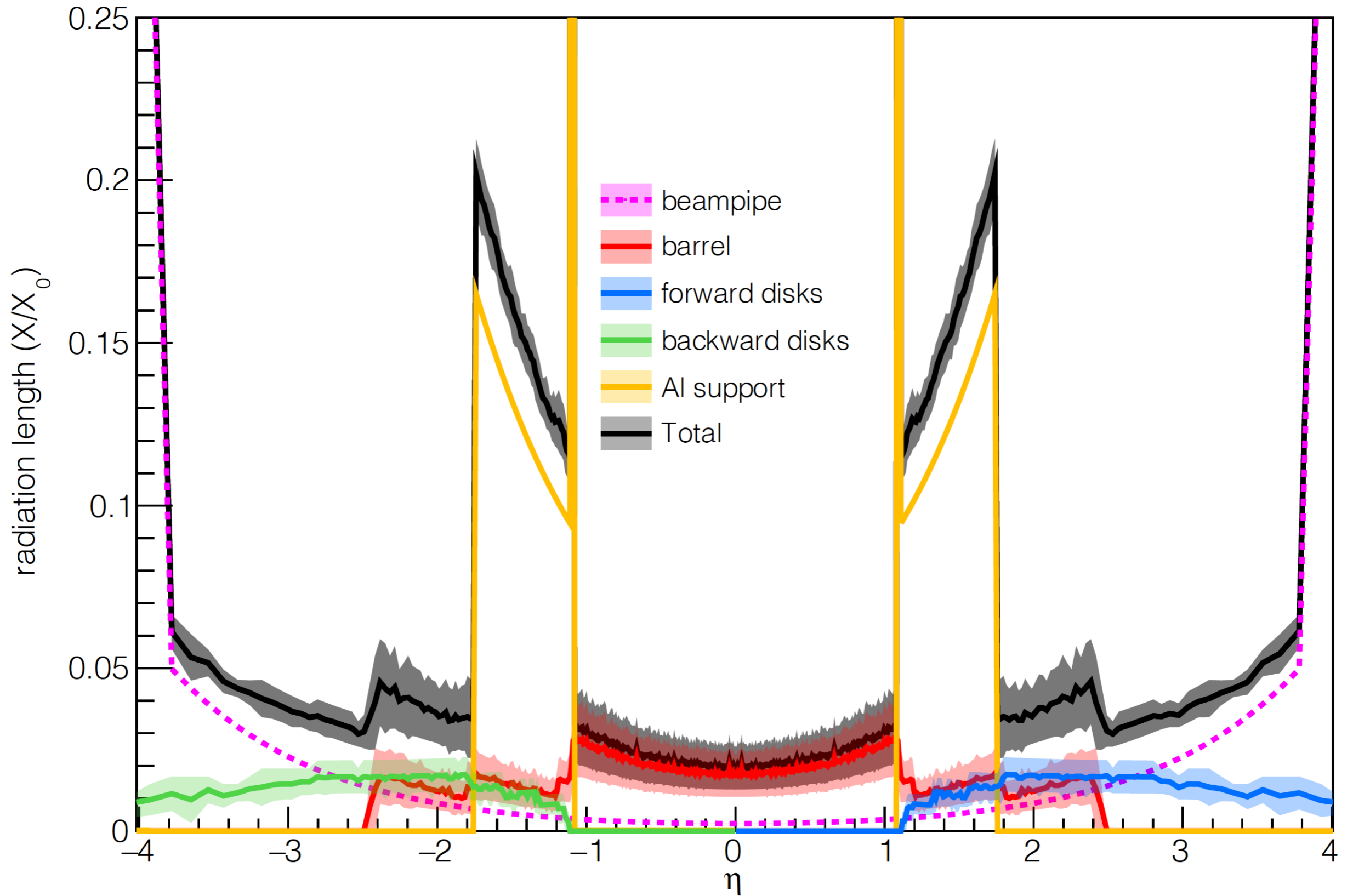
Jet Studies

Geometry Details

- Detector is not “smooth” in ϕ
- For a given η , did scan in ϕ
- error bar corresponds to max and min X/X_0



Material Scan



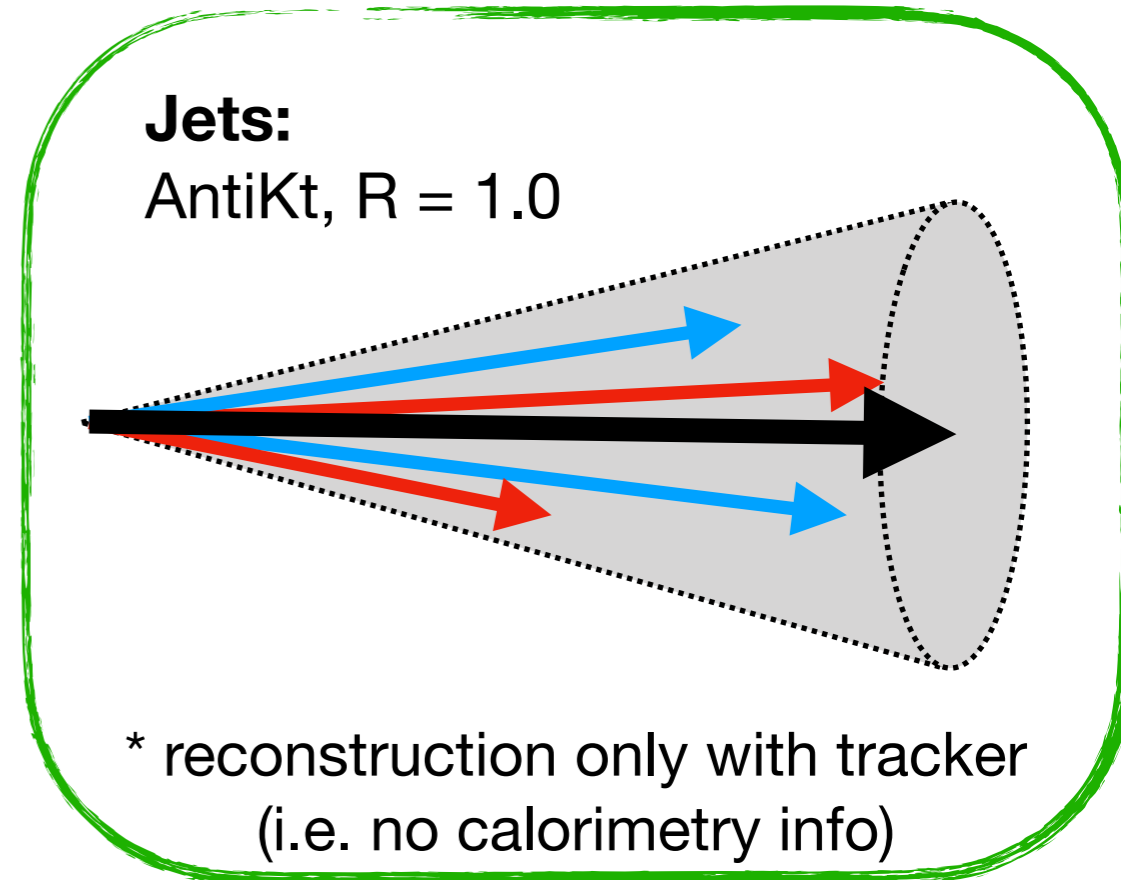
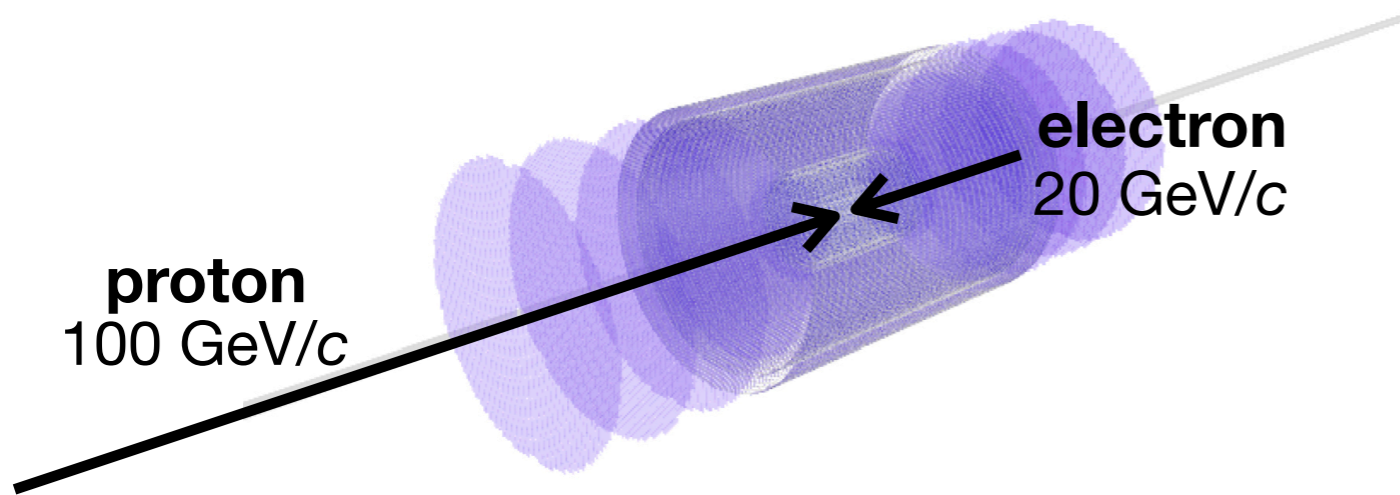
Outline

Material Scan Update

Jet Studies

Pythia 8 and jet configuration

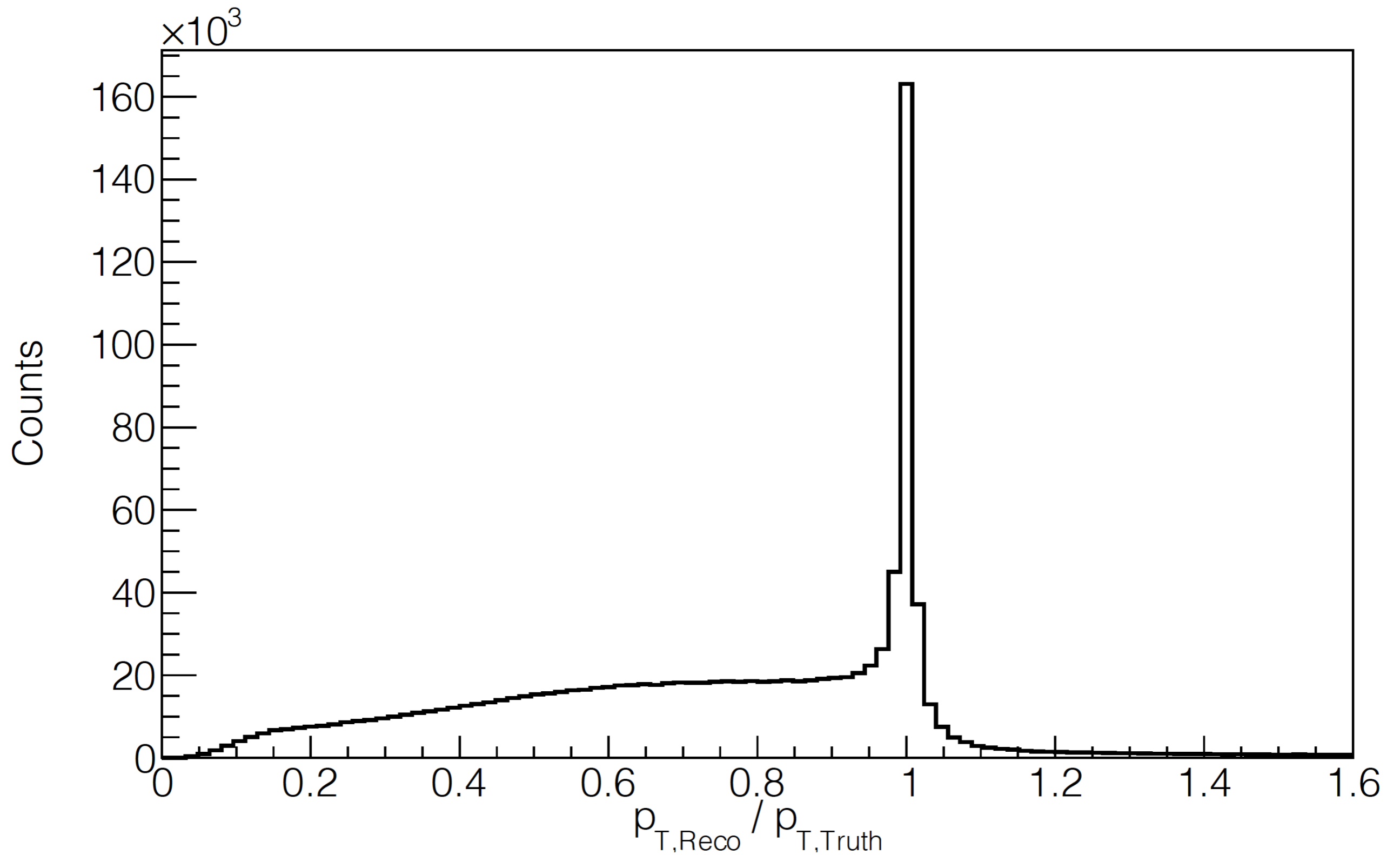
- Back-to-back beams with different energies:
 - `Beams:frameType=2`
 - details [here](#).



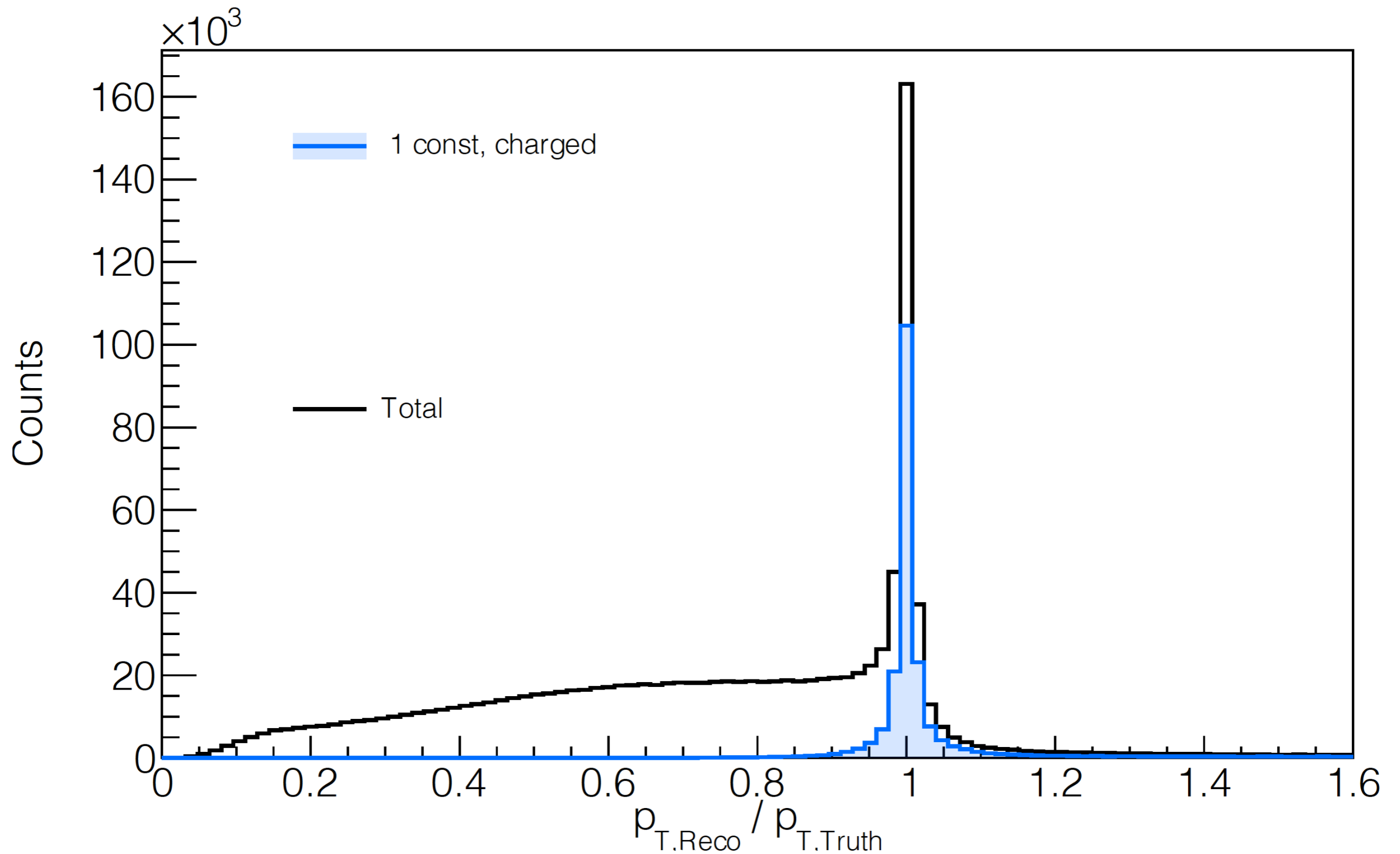
- Scattering $ff' \rightarrow ff'$ via γ^*/Z^0 t-channel exchange (full interference between the γ^* and γ^*Z^0):
 - `WeakBosonExchange:ff2ff(t:gmZ) = on`
 - details [here](#).
- All Hard QCD processes on:
 - `HardQCD:all = on`
 - details [here](#).

$$Q^2 > 16 (\text{GeV}/c^2)^2$$

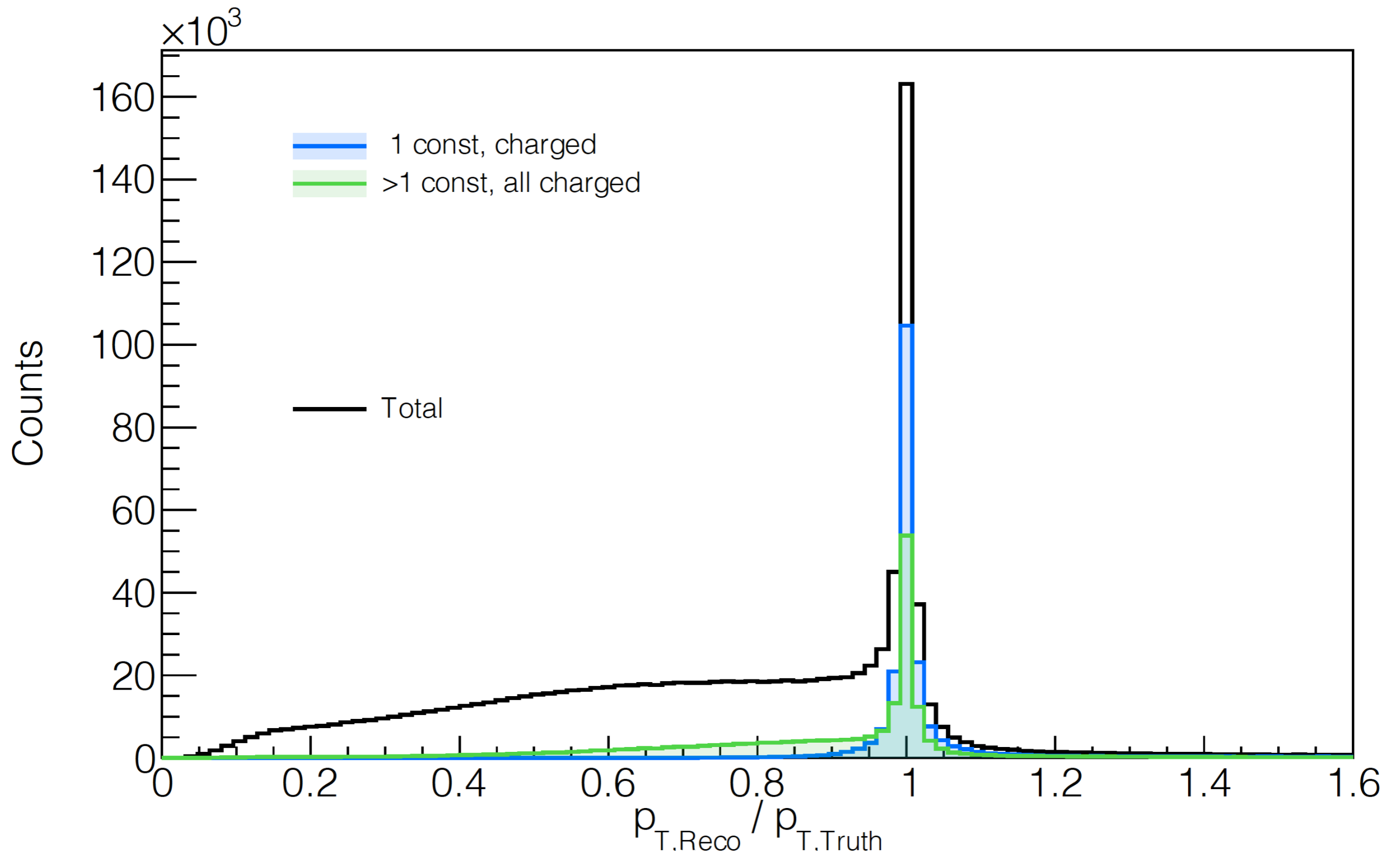
Jet $p_{T, \text{Reco}} / p_{T, \text{Truth}}$ distribution



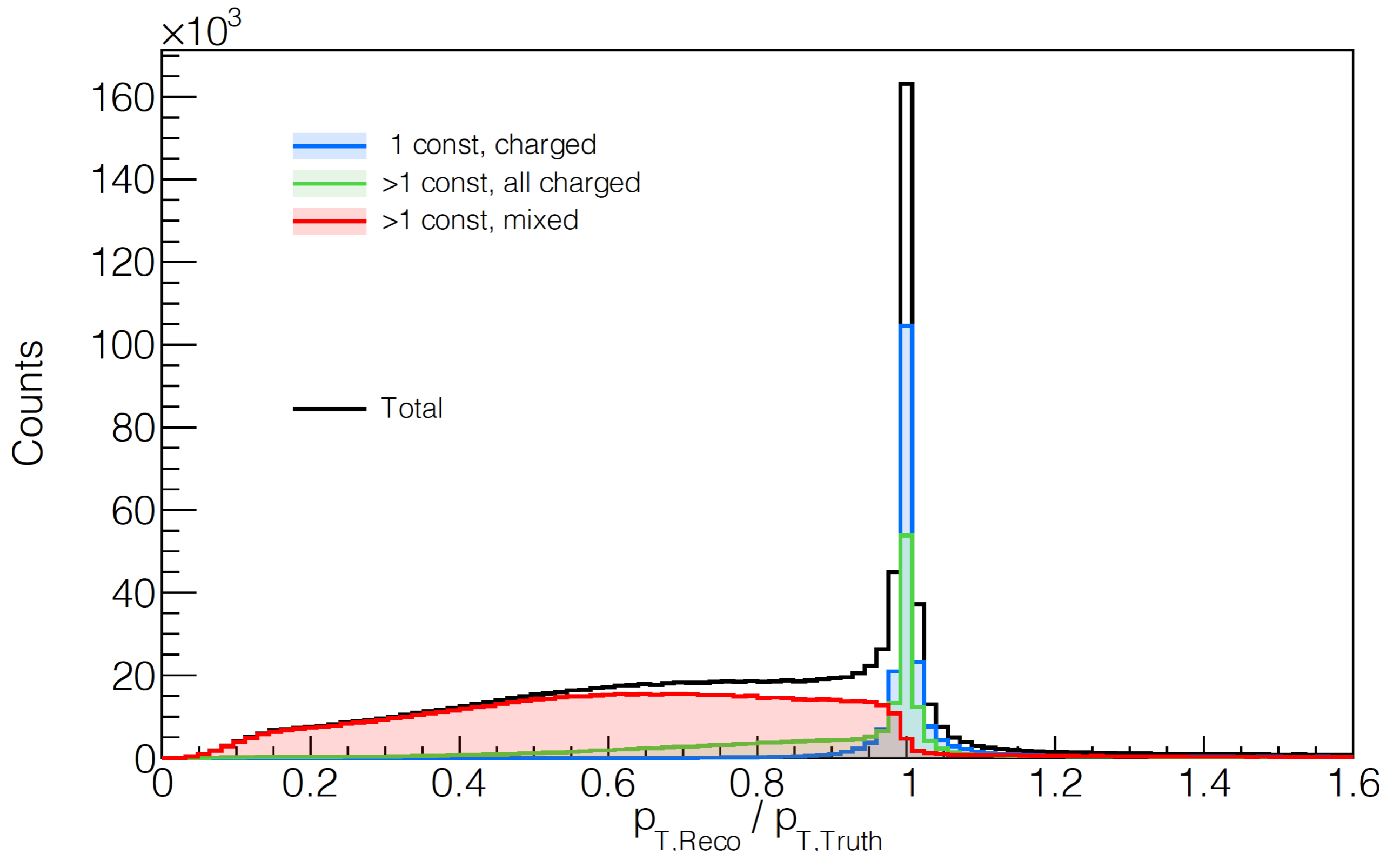
Jet $p_{T, \text{Reco}} / p_{T, \text{Truth}}$ distribution



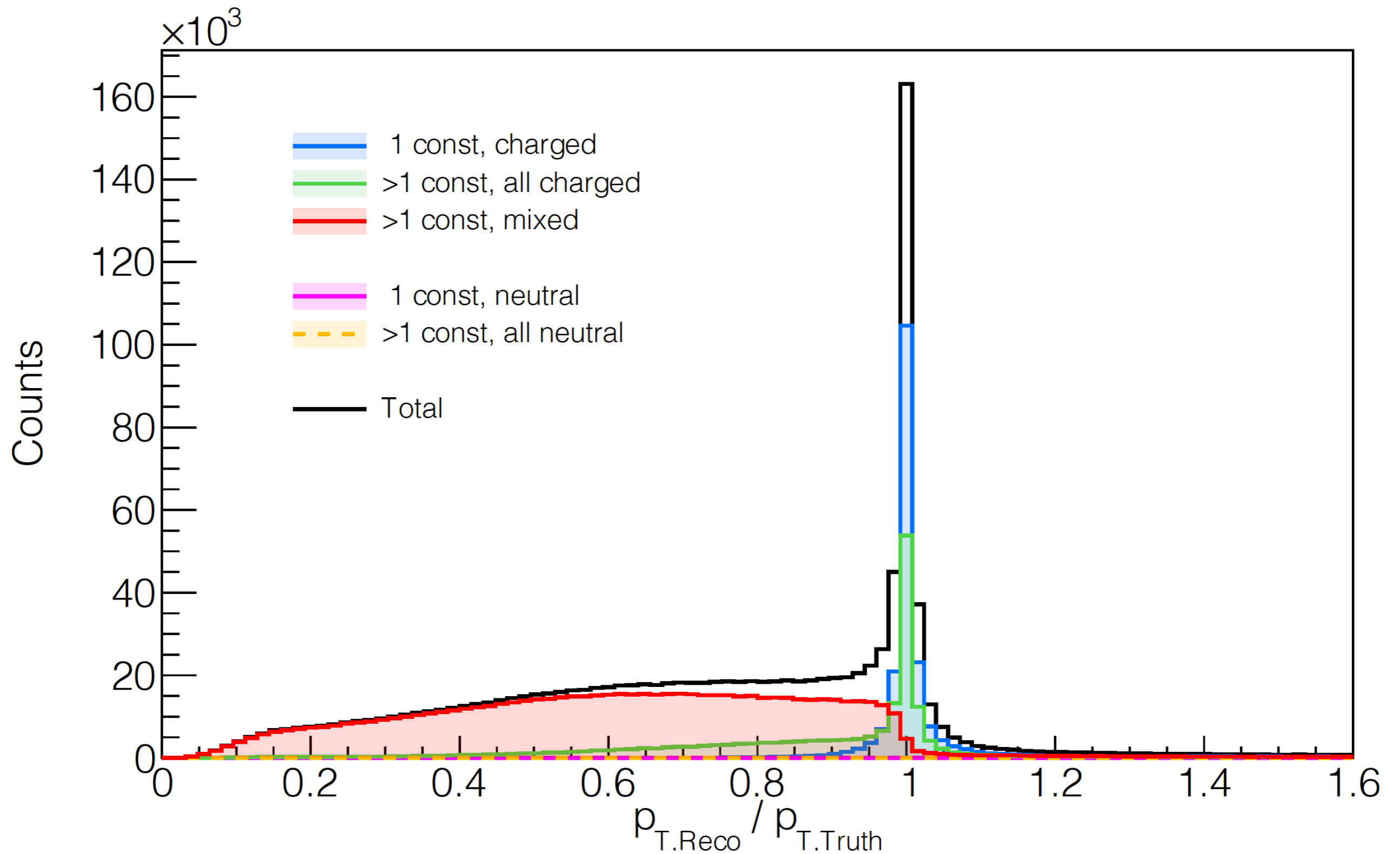
Jet $p_{T, \text{Reco}} / p_{T, \text{Truth}}$ distribution



Jet $p_{T, \text{Reco}} / p_{T, \text{Truth}}$ distribution



Jet $p_{T, \text{Reco}} / p_{T, \text{Truth}}$ distribution



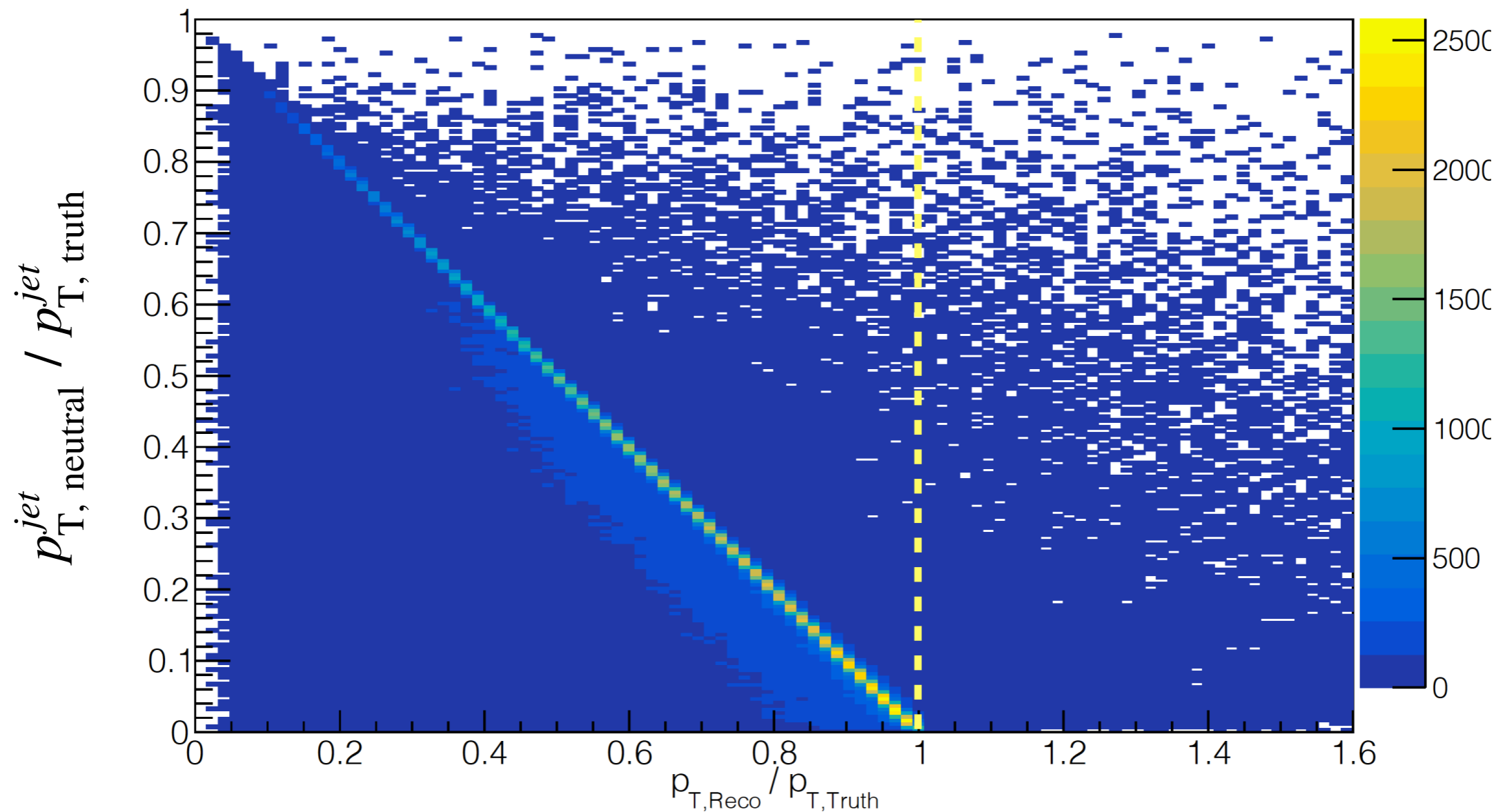
Jet p_T fraction carried by neutrals

$$p_{\text{truth}}^{\text{jet}, \mu} = p_{\text{charged}}^{\text{jet}, \mu} + p_{\text{neutral}}^{\text{jet}, \mu}$$

Sum of charged
constituent 4-momenta

Sum of neutral
constituent 4-momenta

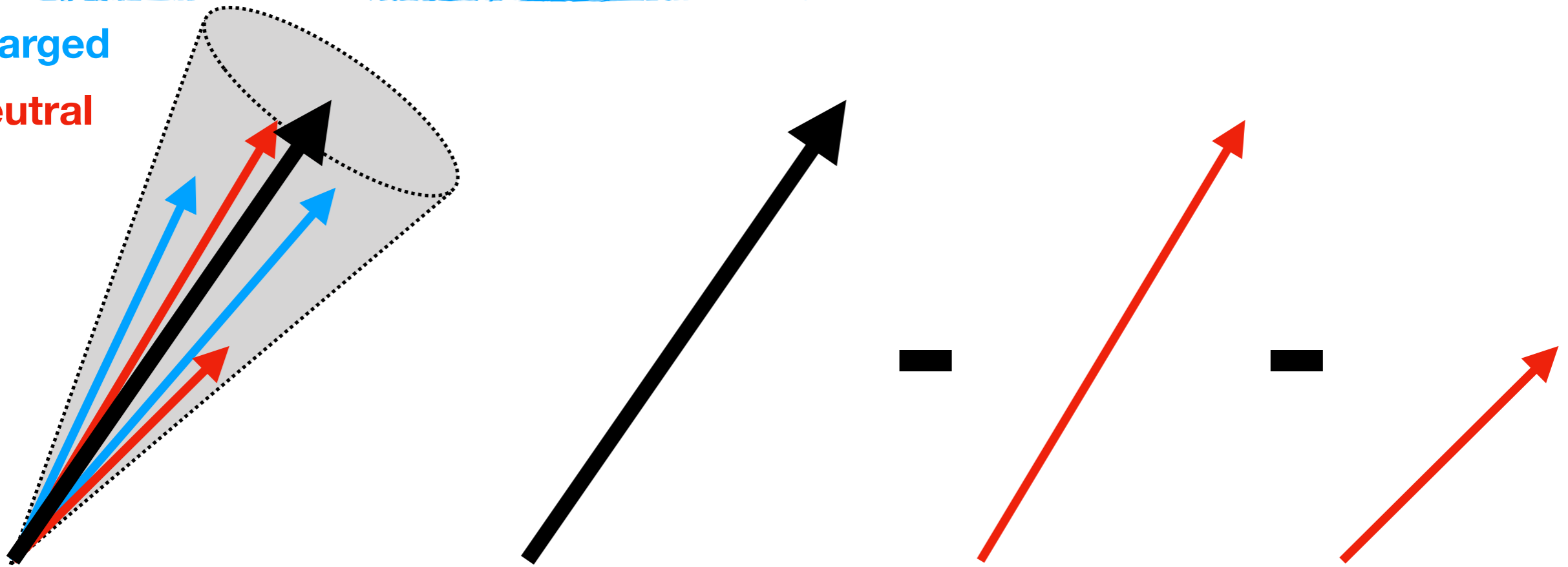
>1 constituent, mixed jet



Subtracting neutral contribution from truth jet

Charged

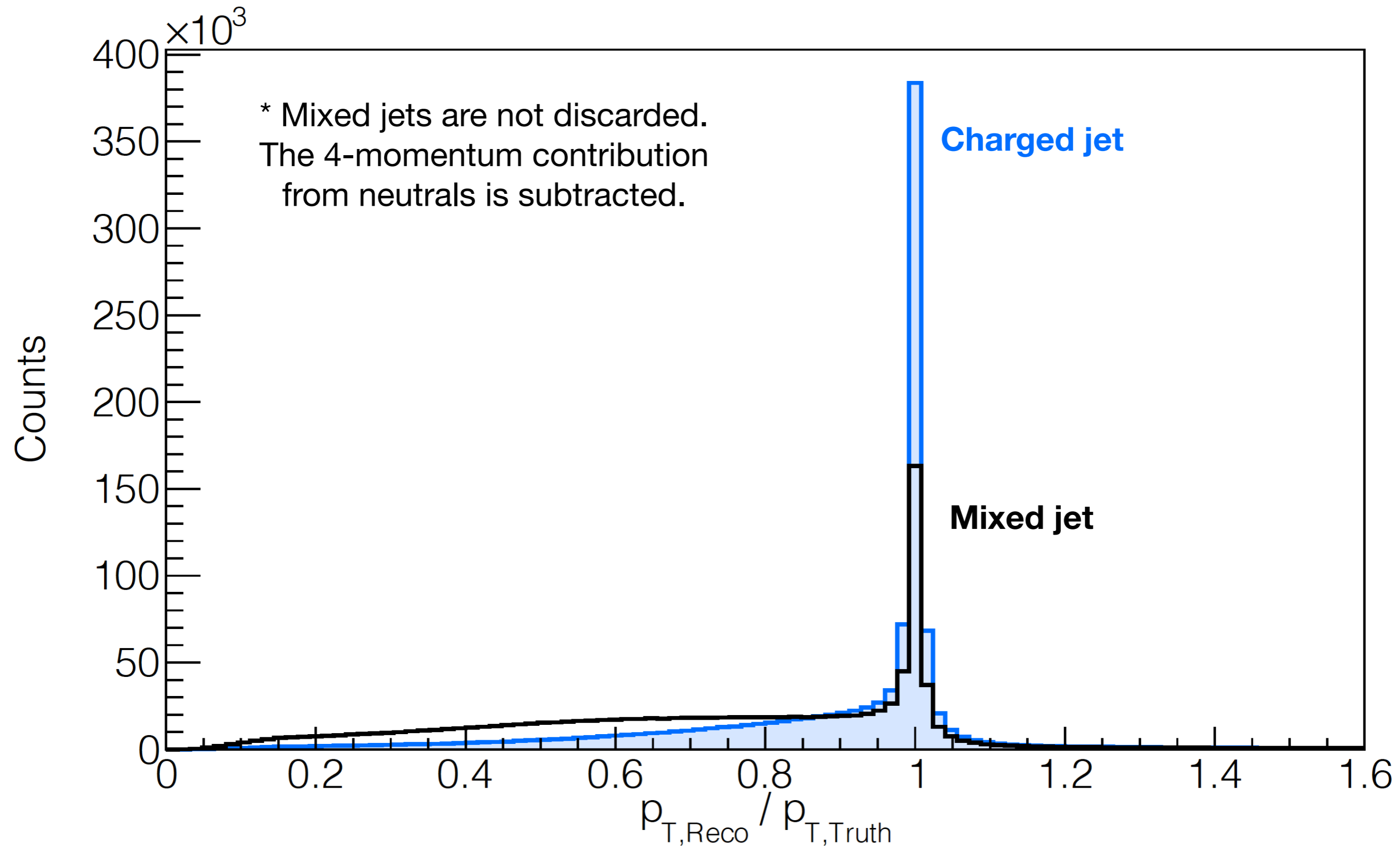
Neutral



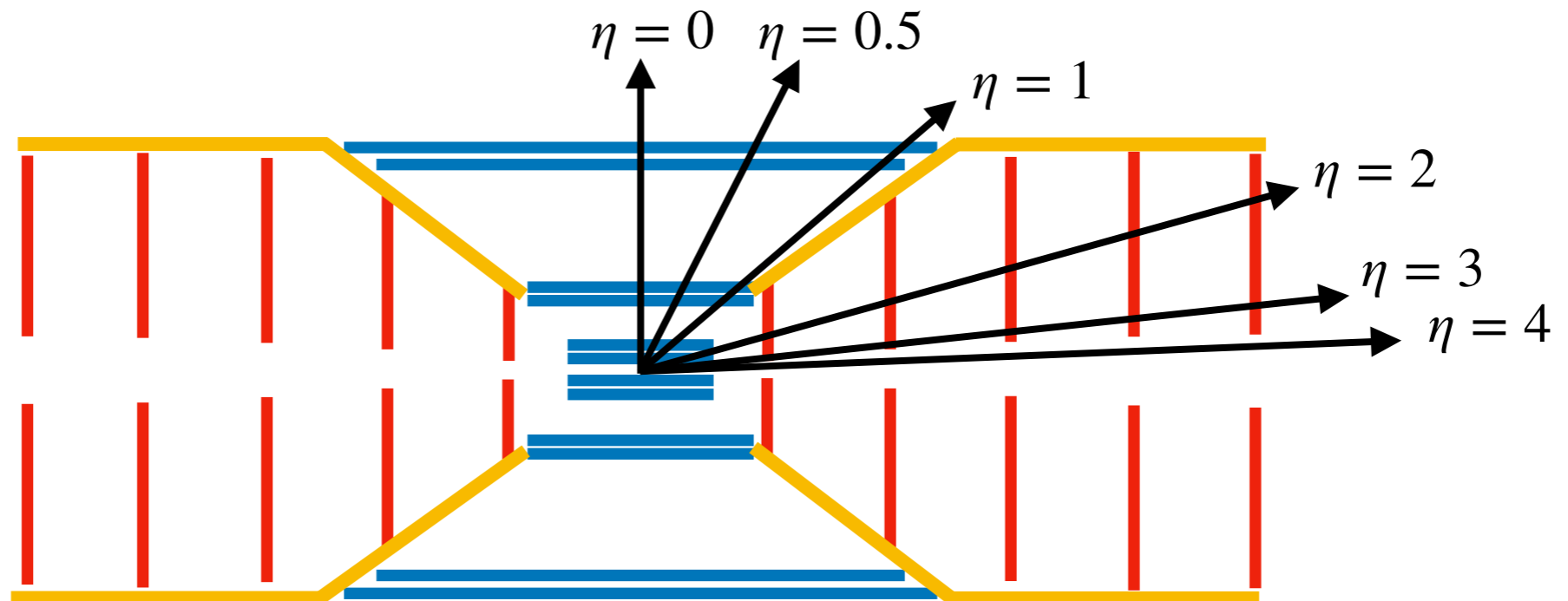
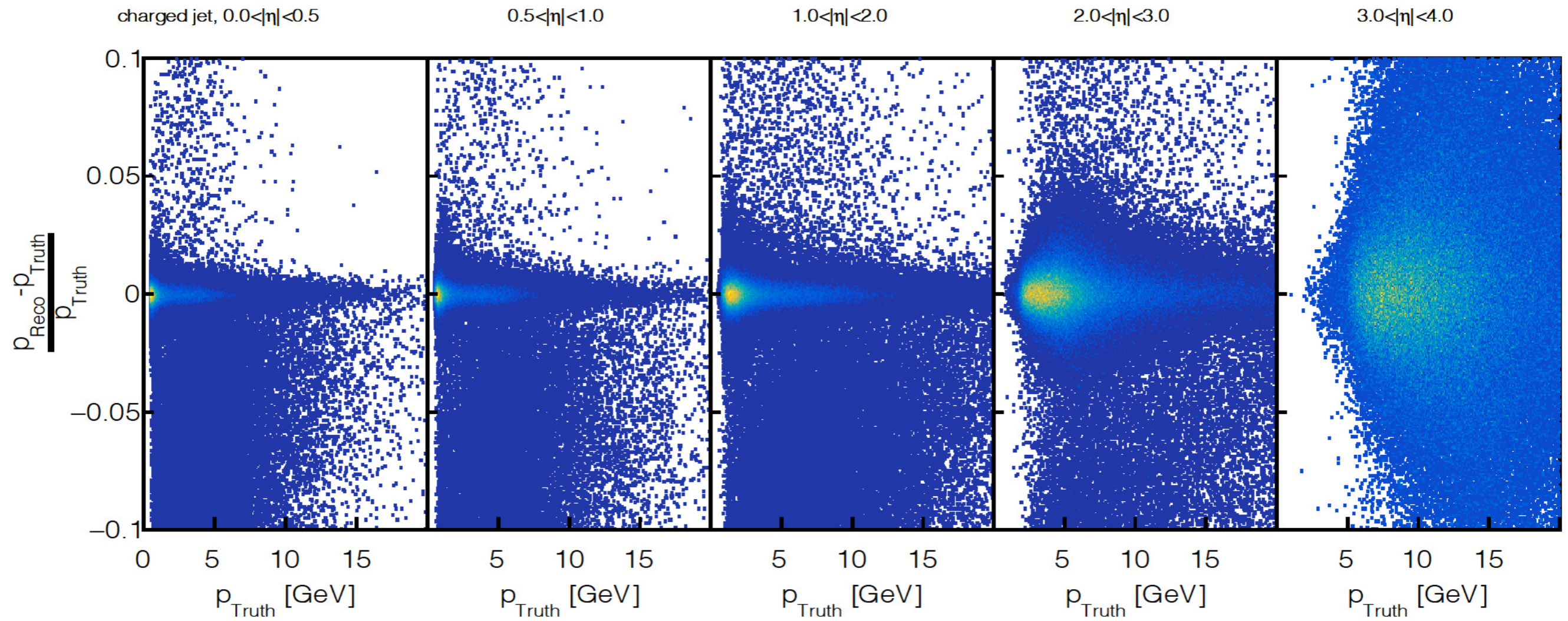
```
for ( each truth_jet ){  
  neutral_truth_jet = truth_jet  
  for ( constituent in truth_jet ){  
    if( constituent is neutral )  
      neutral_truth_jet -= constituent  
  }  
}
```

* green in this slide indicates a four-momentum vector

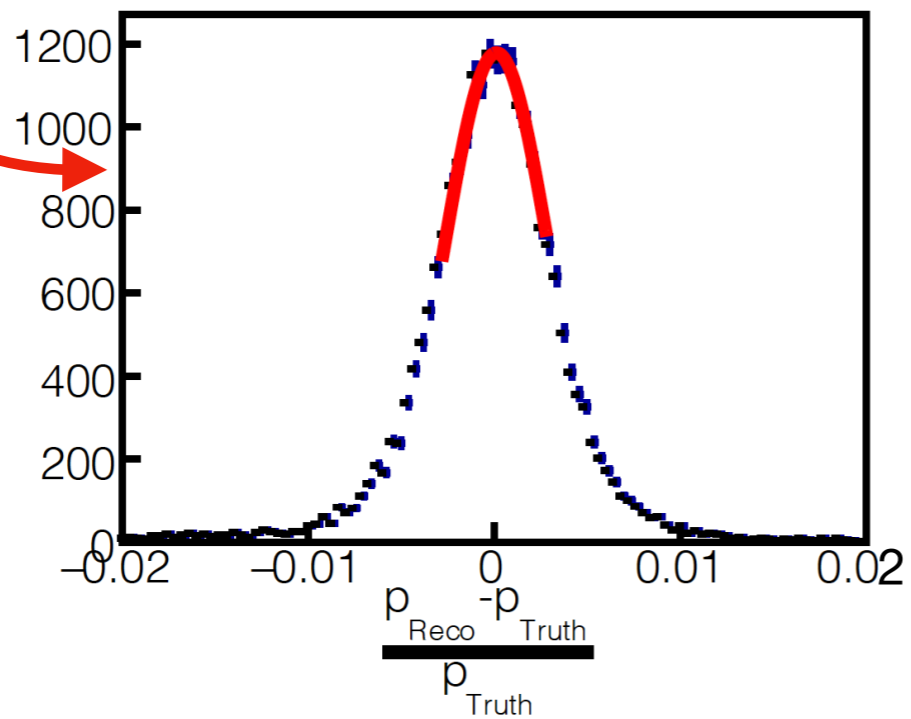
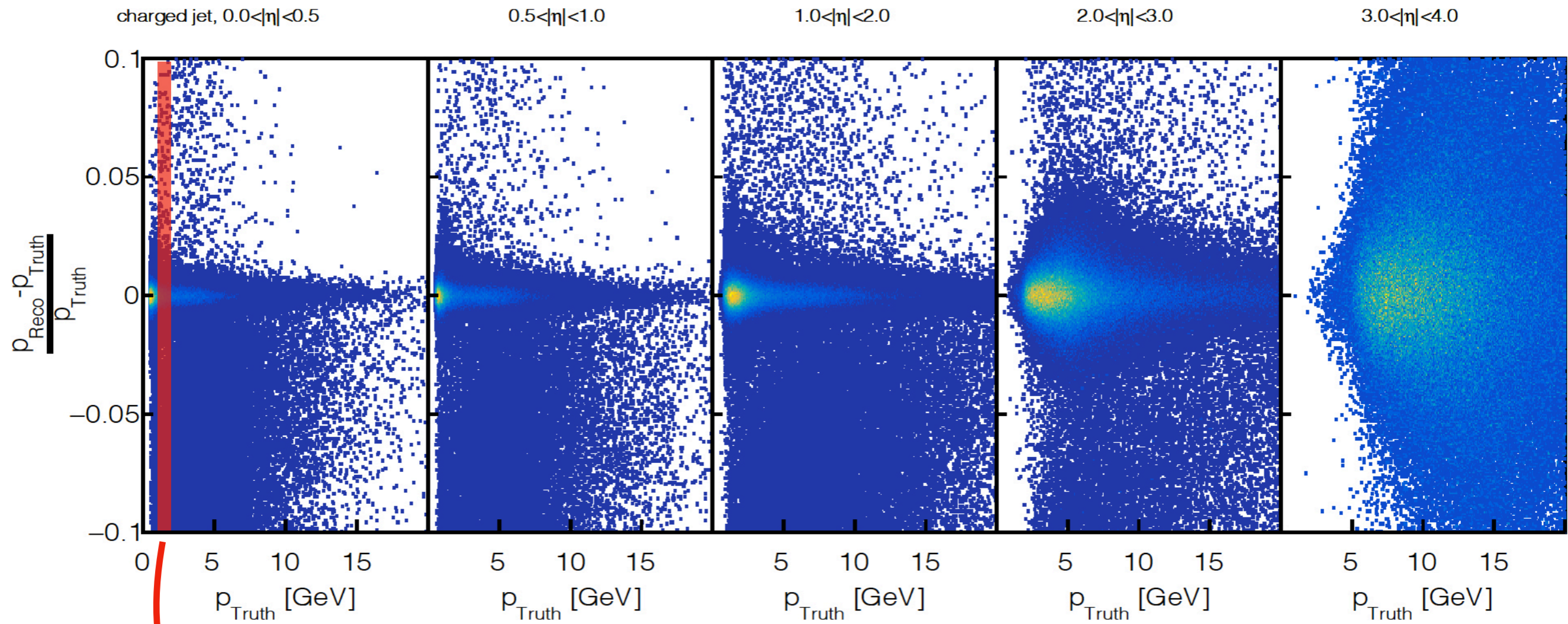
$p_{T, \text{Reco}} / p_{T, \text{Truth}}$ dist. after neutral subtraction



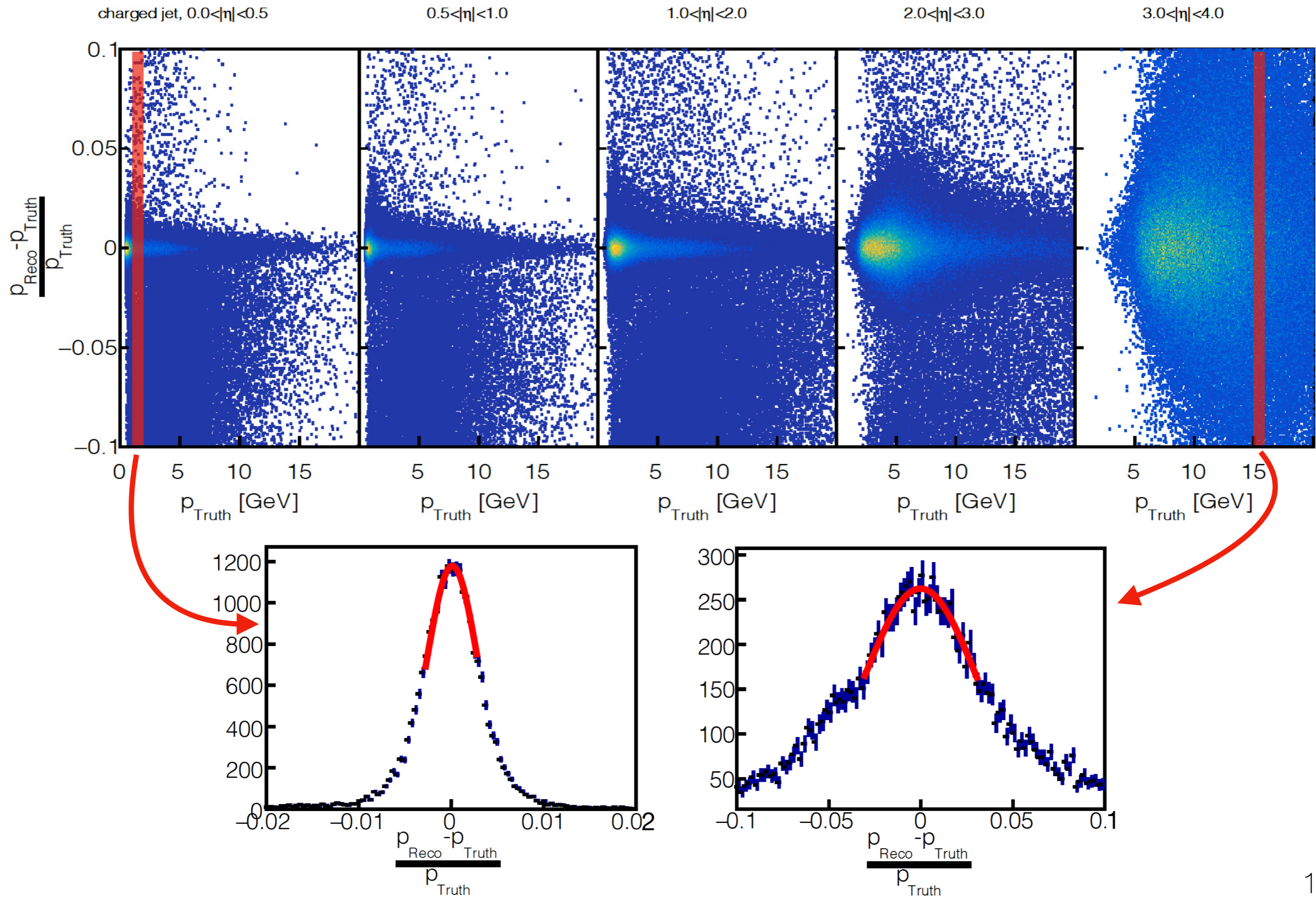
Jet momentum resolution



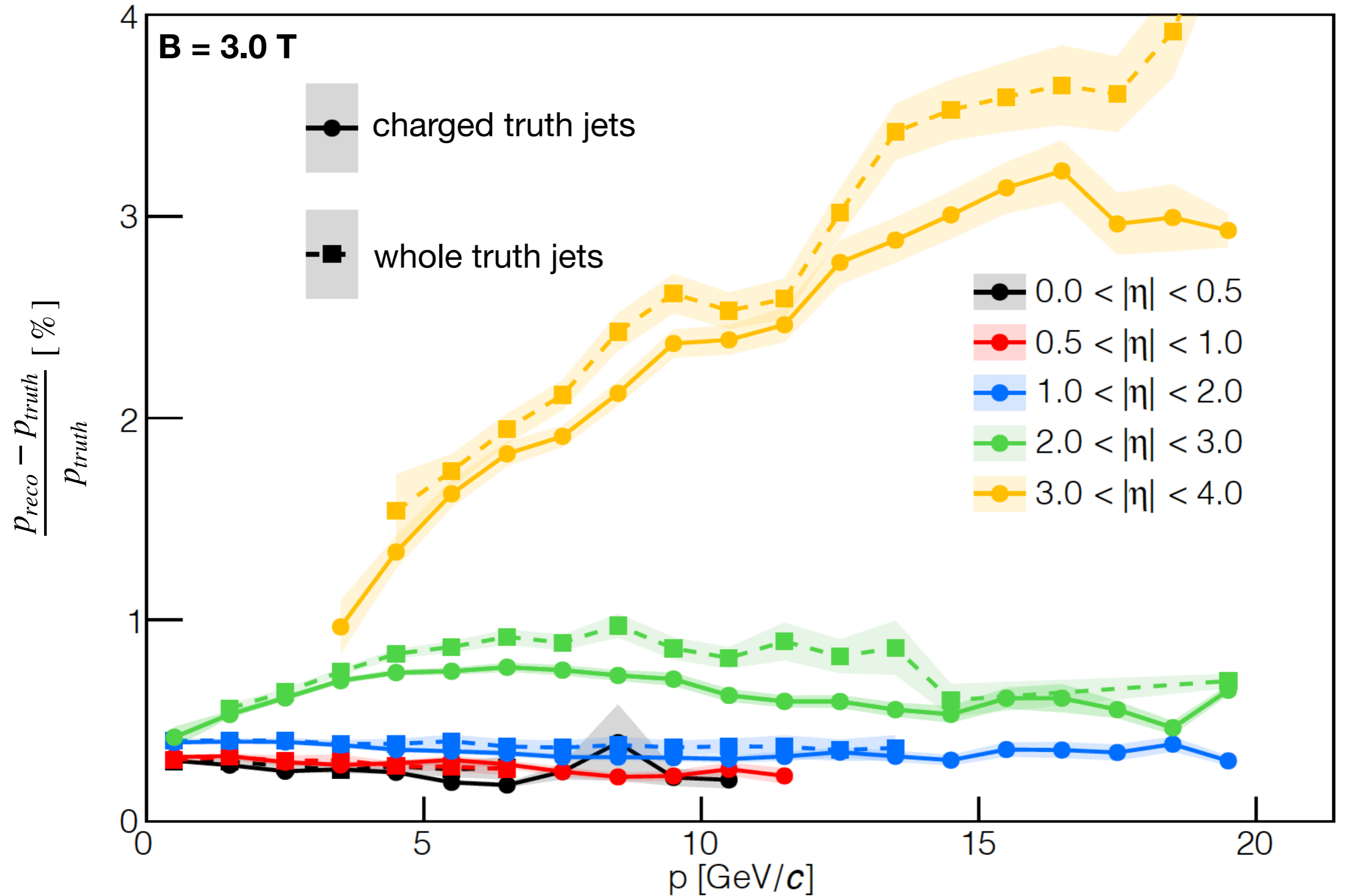
Jet momentum resolution



Jet momentum resolution



Jet momentum resolution

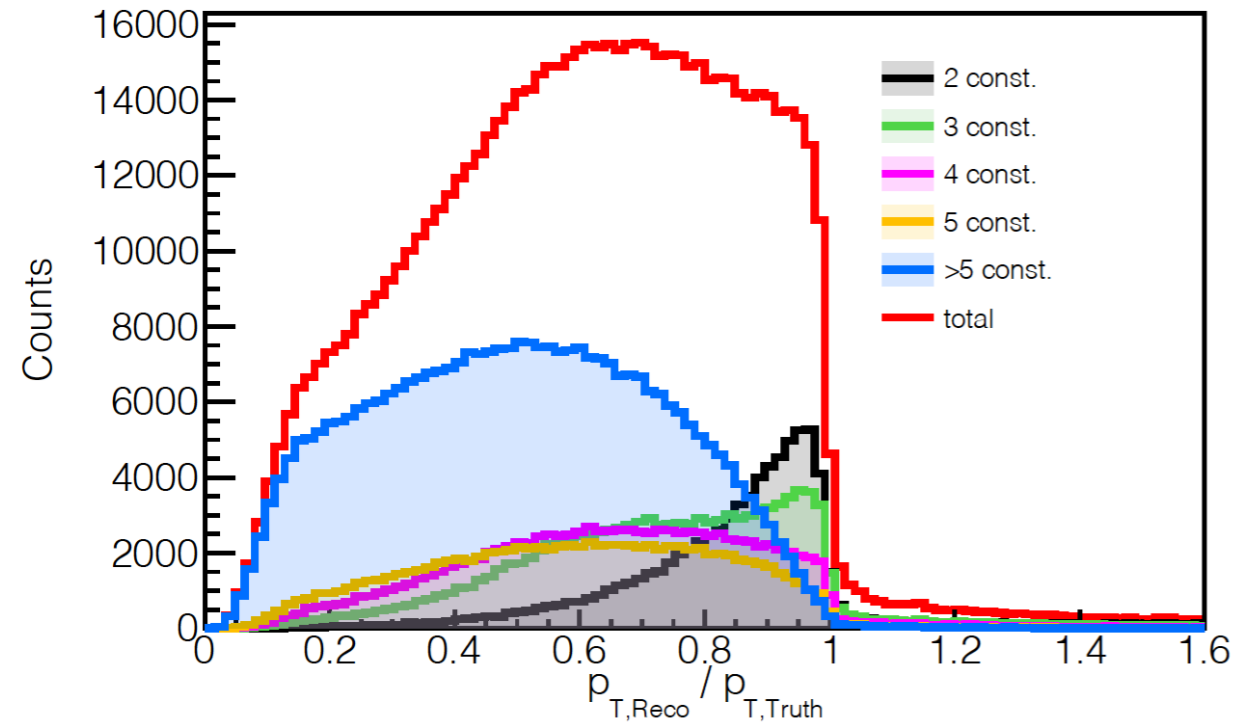


Next Steps:

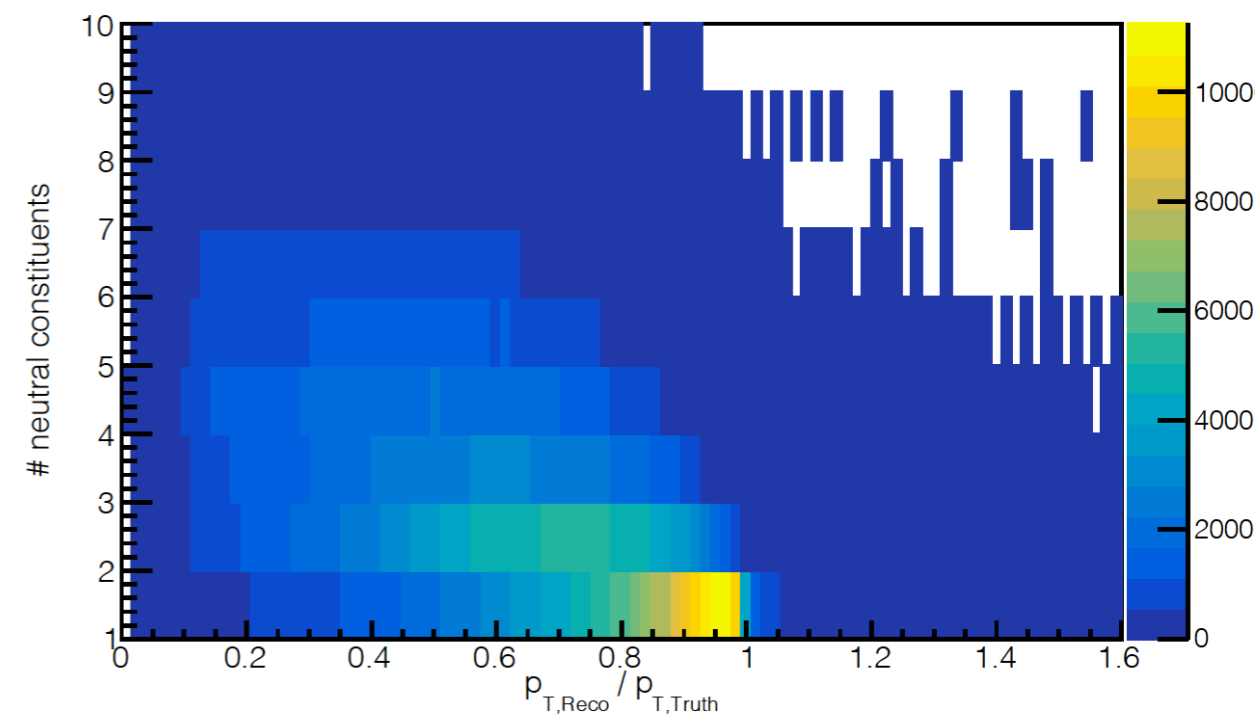
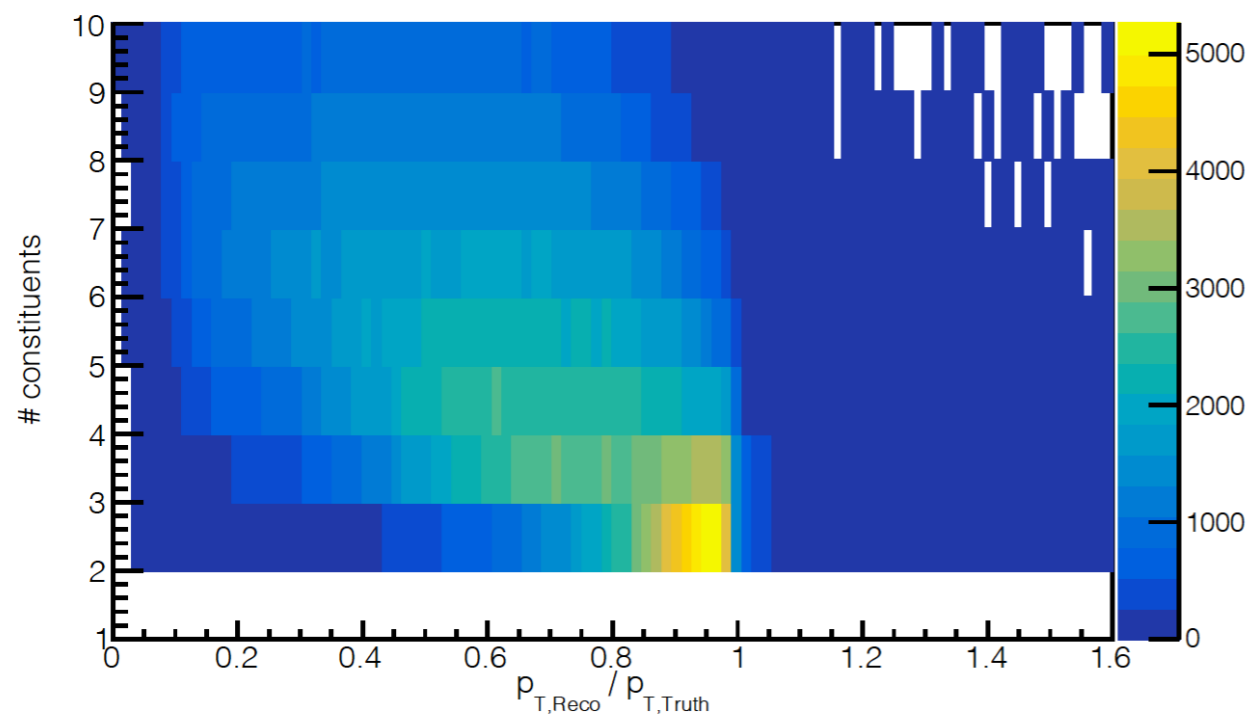
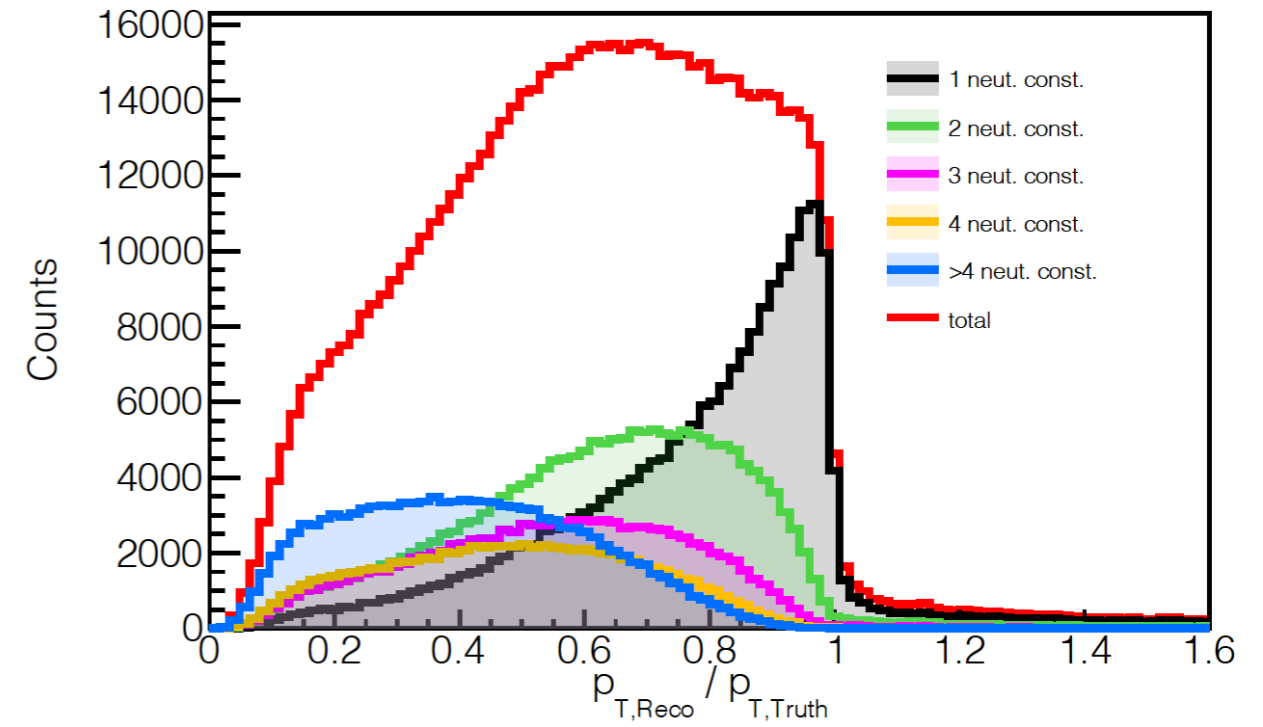
- Repeat study with other B-field configurations
- Study angular resolutions
- Edit source code to include constituent info
- Look at smaller-radii jets
- Efficiency studies

Mixed jets, >1 constituents

all constituents



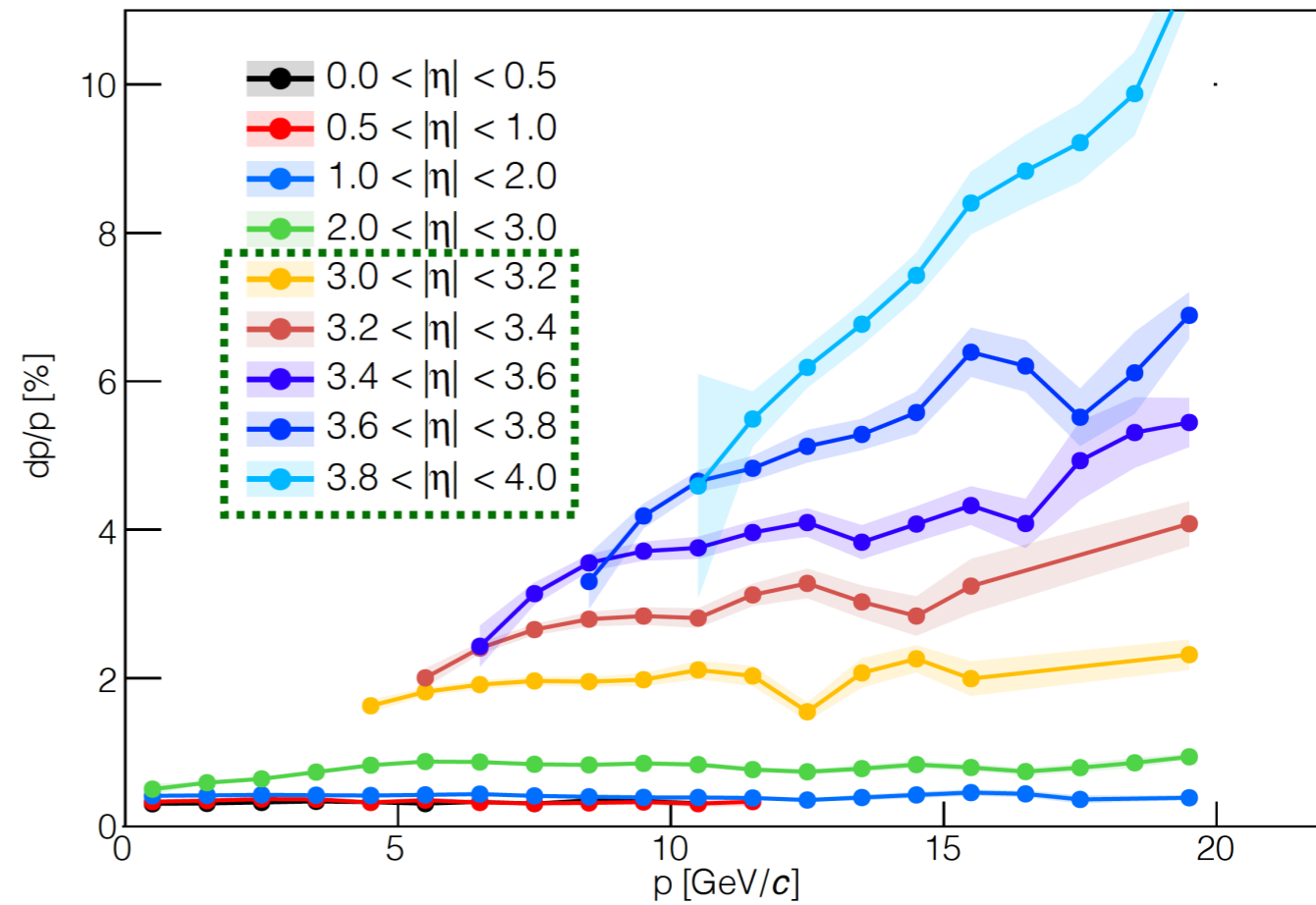
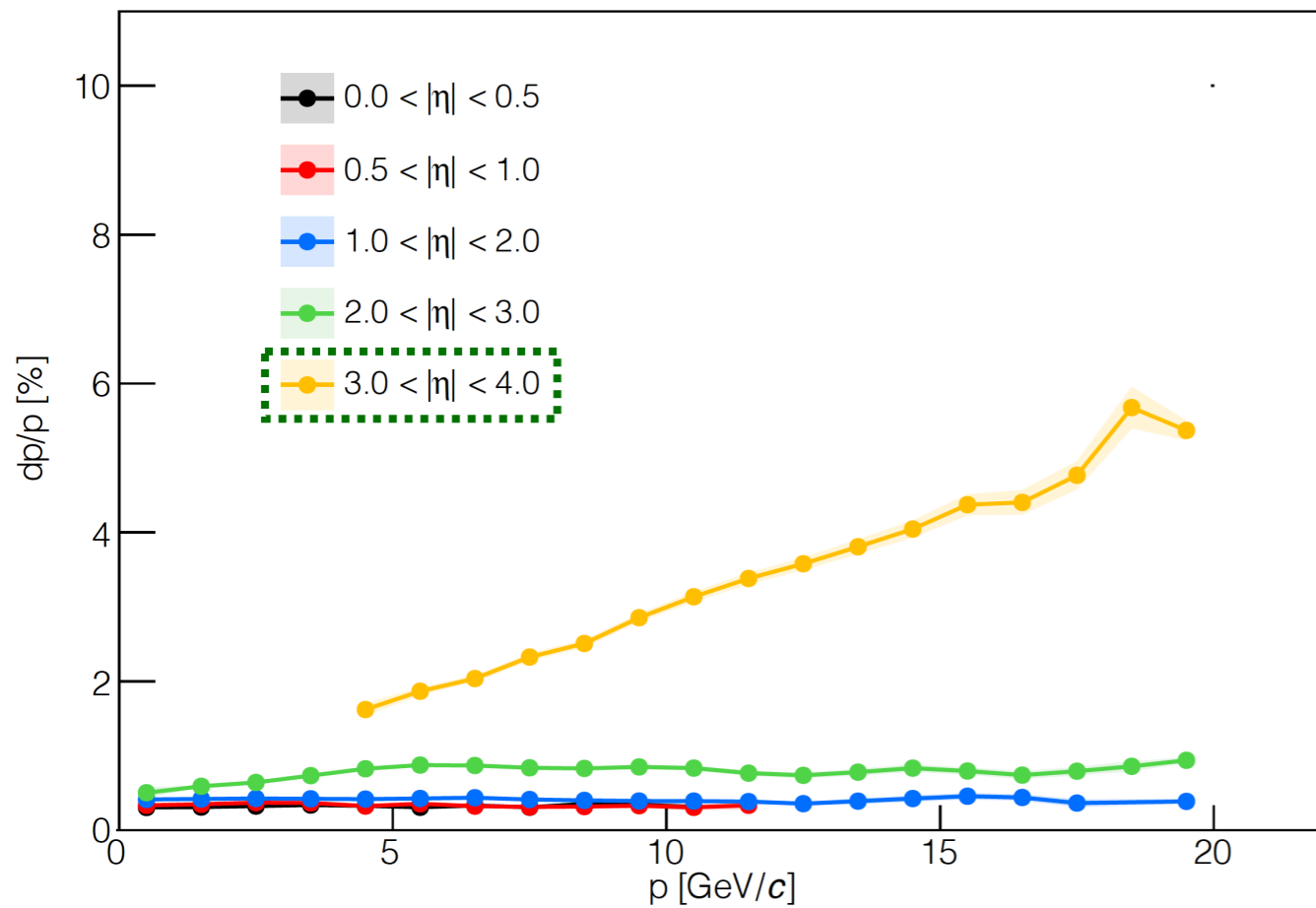
neutral constituents



Smaller jet radii and smaller eta bins

R = 0.2

B = 3.0 T



Pythia config file

```
Beams:idA = 2212  ! first beam, p = 2212, pbar = -2212
Beams:idB = 11    ! second beam, e = 11, ebar = -11
Beams:eA = 100   ! proton beam 100 GeV/c
Beams:eB = 20    ! electron beam 20 GeV/c
Beams:frameType=2 ! beams are back-to-back, but with different energies
! Settings related to output in init(), next() and stat()
Init:showChangedSettings = on
Main:timesAllowErrors=900000
Next:numberShowInfo = 1          ! print event information n times
! PDF
#PDF:pSet = 7 ! CTEQ6L, NLO alpha_s(M_Z) = 0.1180.
PDF:lepton=off
TimeShower:QEDshowerByL=off
#PDF:useHardNPFA=on
#PDF:nPDFSetA=3
#PDF:pSet=LHAPDF6:EPPS16nlo_CT14nlo_Pb208

! Process
WeakBosonExchange:ff2ff(t:gmZ)=on
HardQCD:all = on

! PhaseSpace
PhaseSpace:Q2Min=16
SpaceShower:pTmaxMatch=2
! Seed
Random:setSeed = on
Random:seed = 0
```