

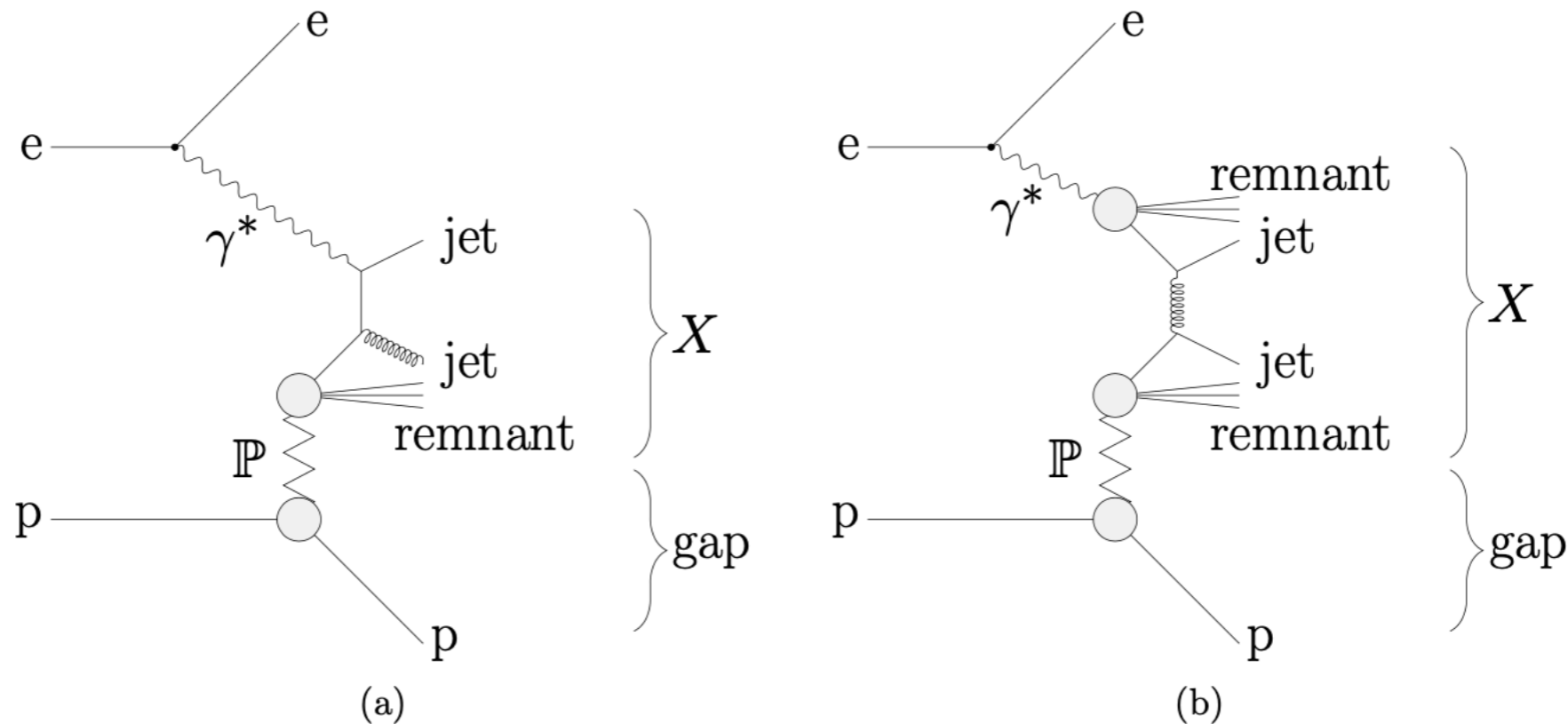
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# **Jet smearing for diffractive dijet photoproduction in ep**

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# Diffraction dijet photoproduction in ep



- Leading-order Feynman graphs for diffractive dijet production with photons in ep collisions;
- Left part is from direct photon contribution;
- Right part is from resolved photon contribution;
- Using Pythia8301 for our simulation;

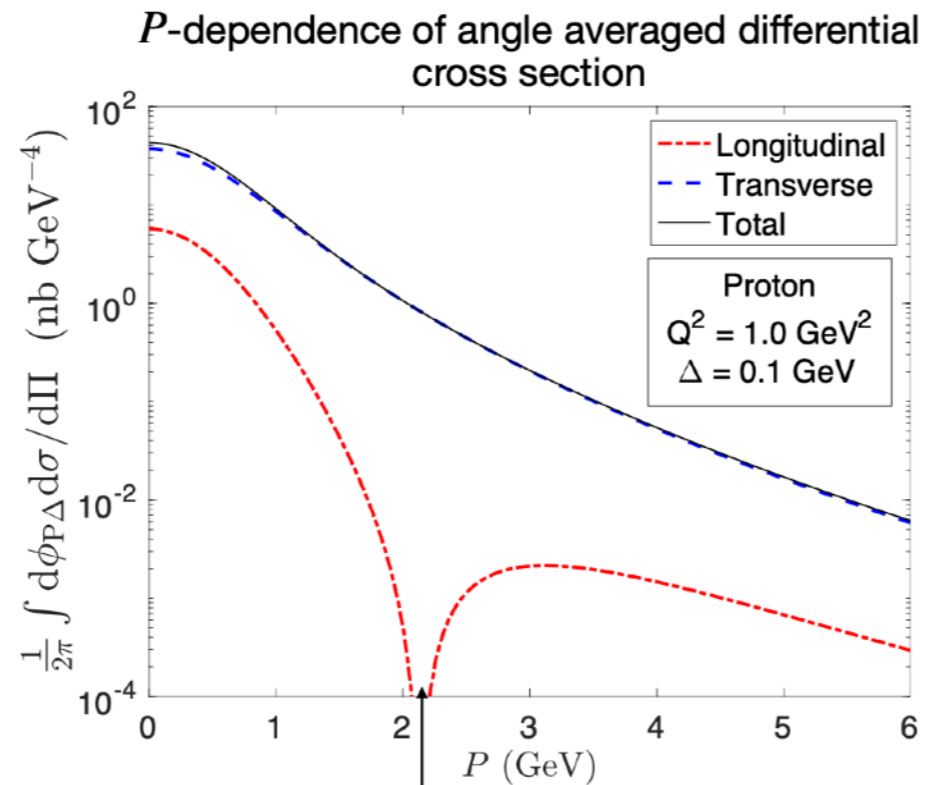
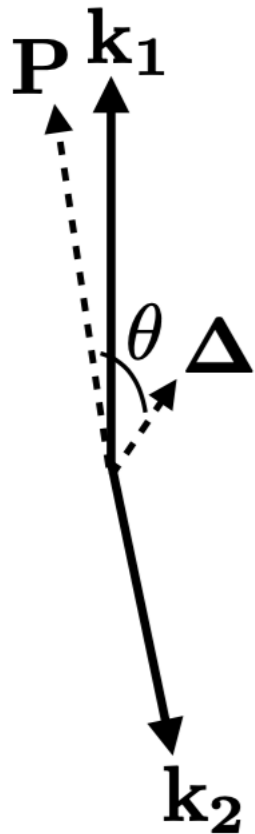
One technique to tag on diffraction is to require a "rapidity gap" in the detector. This means that there is a region in the detector from the hadron beam towards the center of the detector in which there is no activity from the hadronic final state. The efficiency for detecting, and the purity of, diffractive events therefore depends strongly on the rapidity coverage of the detector.

# Dijet kinematics in EIC

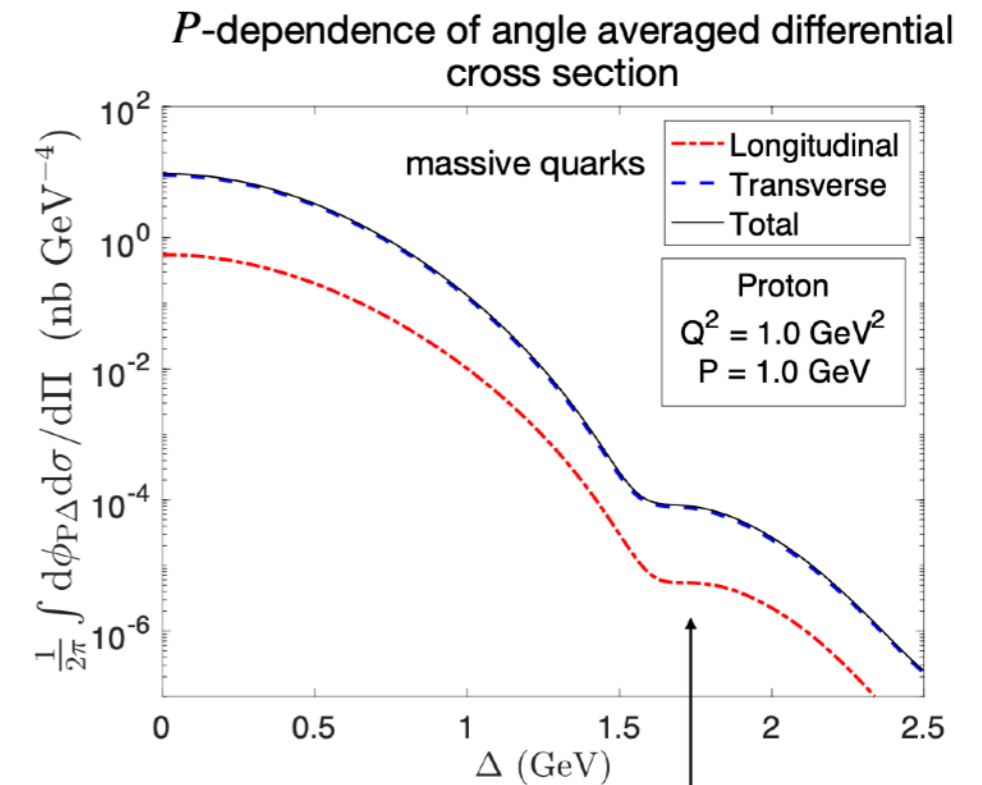
$$\gamma^* + p \rightarrow \text{jet}_1 + \text{jet}_2 + p$$

$(k_1) \quad (k_2)$

- $\mathbf{P} = 0.5(\mathbf{k}_1 - \mathbf{k}_2)$ ; “mean jet Pt”
- $\Delta = \mathbf{k}_1 + \mathbf{k}_2$ ; recoil momentum



Dip structure due to the behavior of the photon-dipole splitting function (longitudinal)



Dip-like structures due to saturation (otherwise Gaussian).

H. Mäntysaari, N. Mueller, B. Schenke. **Phys. Rev. D** 99, 074004 (2019)

FS, B. Schenke. **Phys. Rev. D** 100, 034007 (2019)

# The Procedure For The Jet Smearing

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Using Pythia8301 to produce diffractive photoproduction in ep

HepMC format events (DiffractiveEvents.txt)

```
root [] gSystem->Load("libeicsmear");  
root [] BuildTree ("DiffractiveEvents.txt",".",-1, "");
```

Generate EicTree (DiffractiveEvents.root)

```
root [] gSystem->Load("libeicsmear")  
root [] .L smearHandBook.cxx // Assuming you copied this here  
root [] SmearTree(BuildHandBookDetector(), "DiffractiveEvents.root", "smear.root",-1)
```

Smear the tree (smear.root)

Analyze the Tree

# Steps to Setup the Eic-smear

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cmake, root6, and hepmc3 required

setenv mytestdir /star/u/qiao/1/testeicsmear (or something like that)

mkdir -p \$mytestdir/install

setenv LD\_LIBRARY\_PATH \${mytestdir}/install/lib:\${LD\_LIBRARY\_PATH}

cd \$mytestdir

git clone <https://github.com/eic/eic-smear>

cd eic-smear

git checkout addhepmc

mkdir build

cd build

cmake -DCMAKE\_INSTALL\_PREFIX=\$mytestdir/install -DBUILD\_TESTS=ON ..

make

Make install

**Kolja Kauder has added a new Reader in eic-smear to read the HepMC format data.**

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# Smearred Jet Pt Uncertainty

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## ✓ Simulation

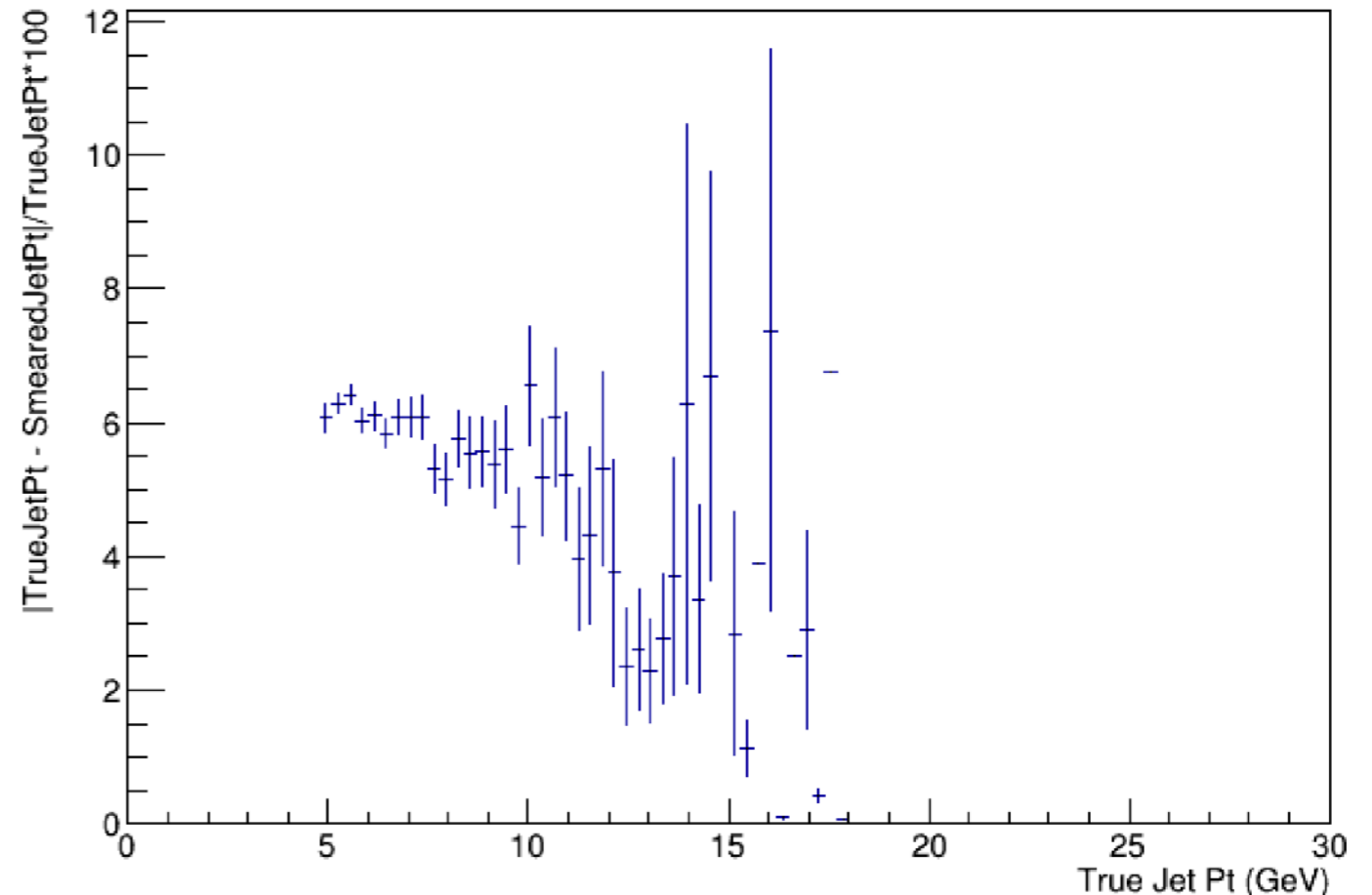
- Pythia8 (diffractive)
- $E_e = 18\text{GeV}$ ,  $E_p = 275\text{GeV}$
- $Q^2 < 1.0\text{ GeV}^2$

## ✓ Jet Finder

- Anti- $k_T$
- Lab frame
- $R = 0.8$
- Min Jet  $p_T = 4\text{ GeV}$

## ✓ Smearing

- Eic-smear: Handbook detector
- Charge hadron  $p_T > 0.25\text{ GeV}$
- Photon energy  $> 0.2\text{ GeV}$

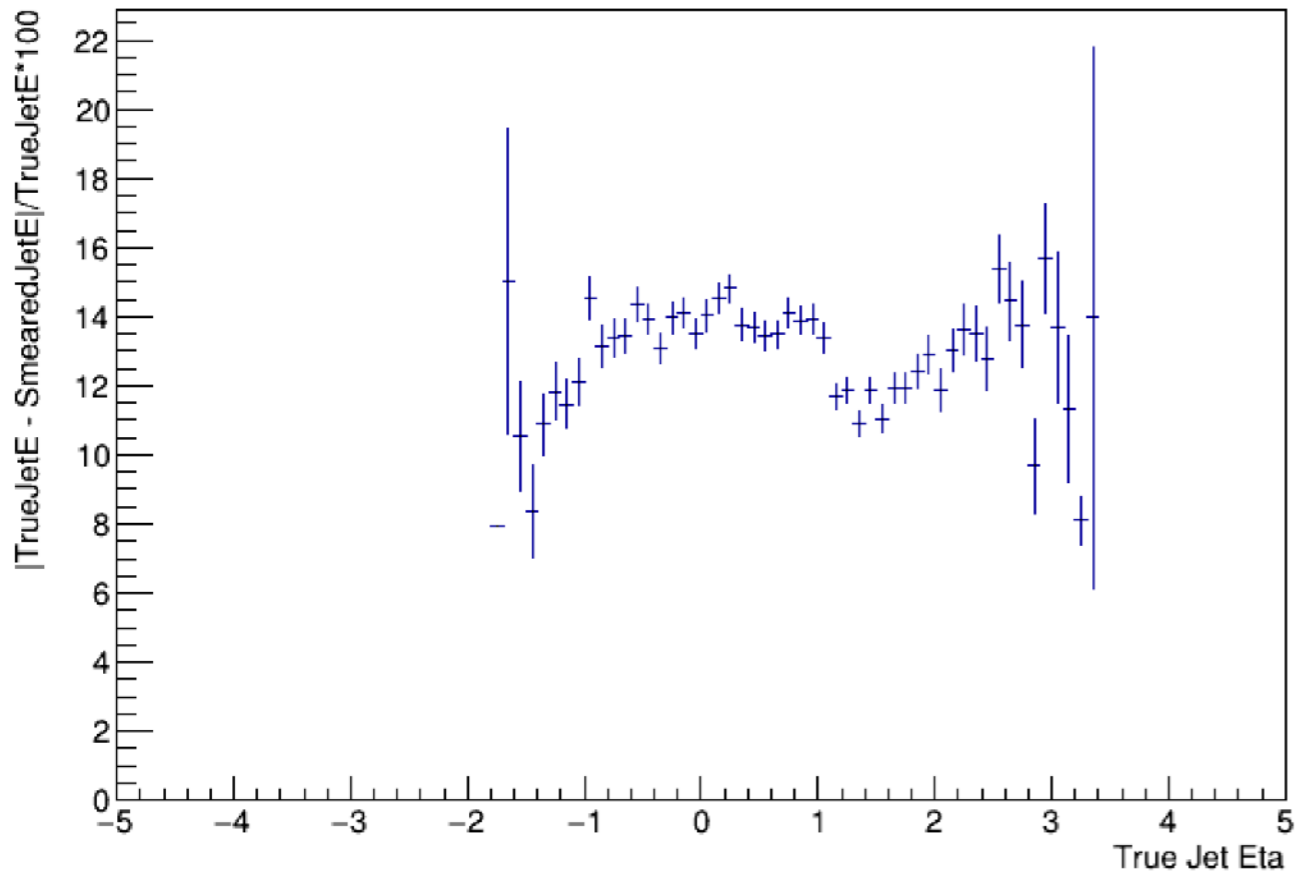


**Still working on producing more data.**

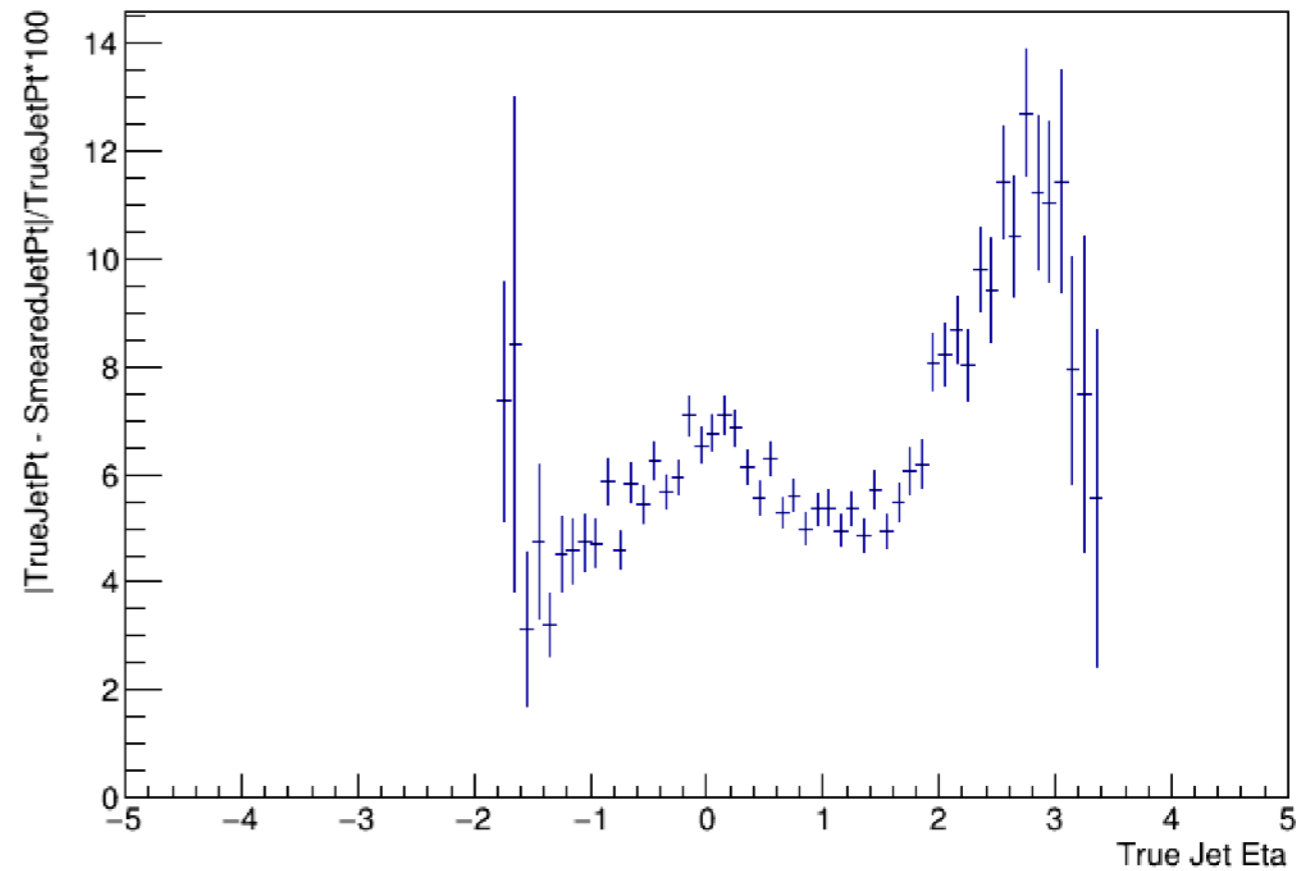
# Smearred Jet Eta Uncertainty

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## E vs Eta

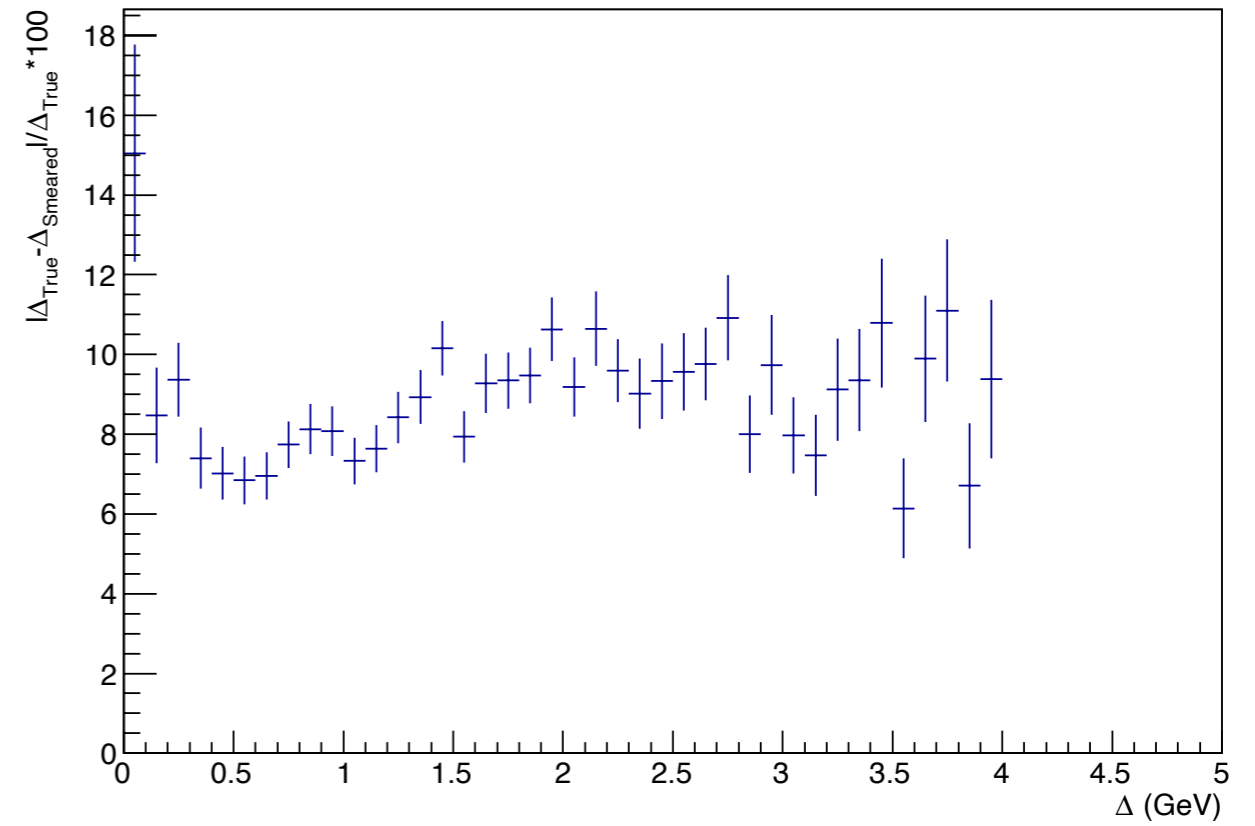
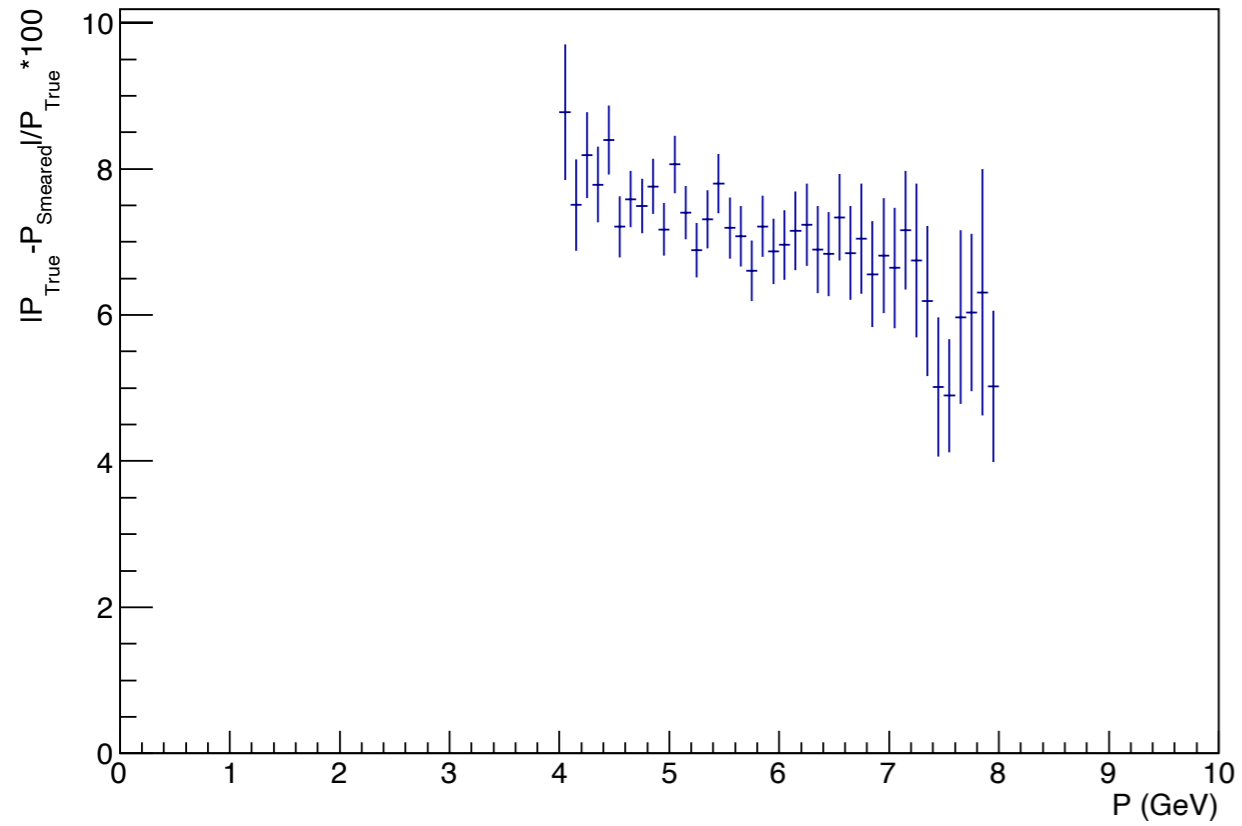


## Pt vs Eta



# Dijet P and $\Delta$ Uncertainty

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# Summary

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- Jet smearing for diffractive dijet photoproduction in ep is studied;
- Smeared Jet uncertainty vs Pt and eta is shown;
- Dijet P and  $\Delta$  uncertainty is shown;
- Please let me if there is other kinematical region that is interesting;