

Study of continuous electron identification

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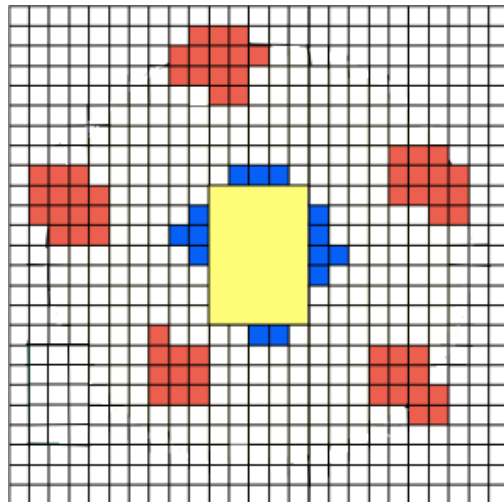
ATLAS Group, supervisor: Kristin Lohwasser
Zeuthen, 08/09/2015

Electron identification

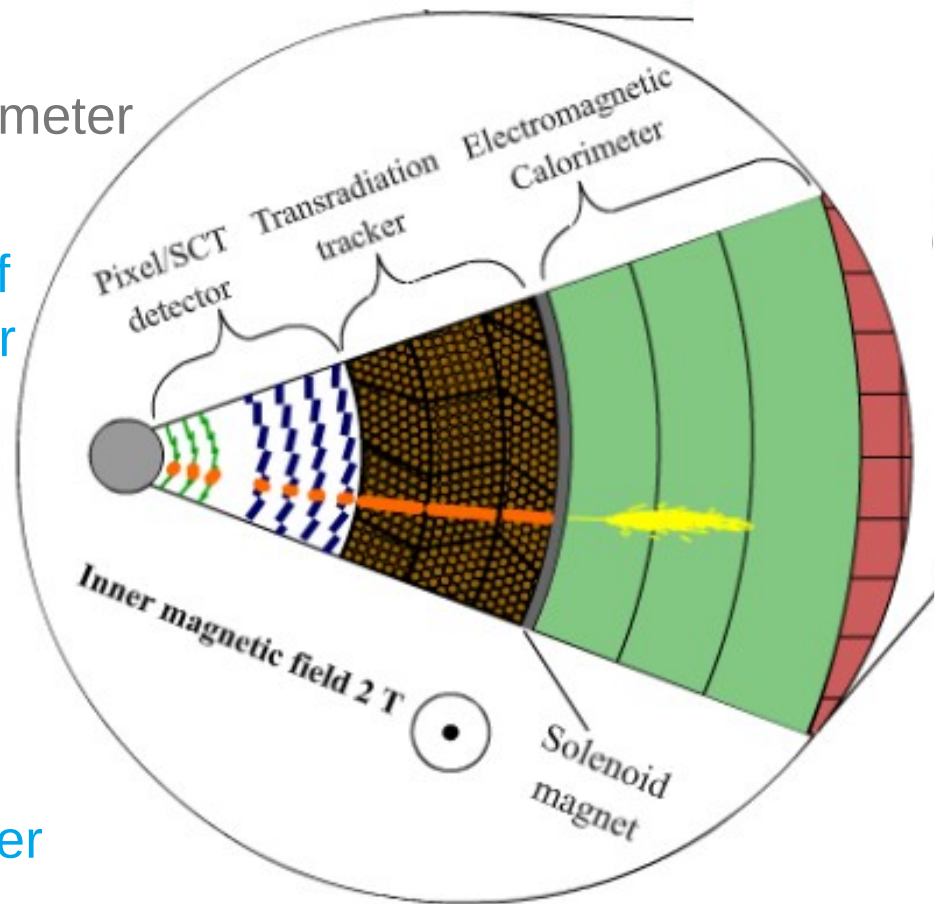
> Reconstruction of electrons in the ATLAS detector:

- tracks in inner detector
- Electromagnetic (EM) calorimeter

profile of
ATLAS-detector

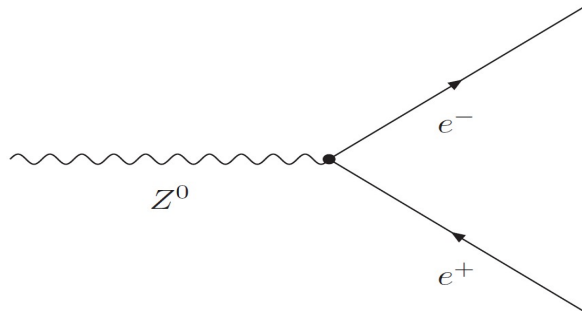


cluster in
EM calorimeter



Electron identification

> Signal process

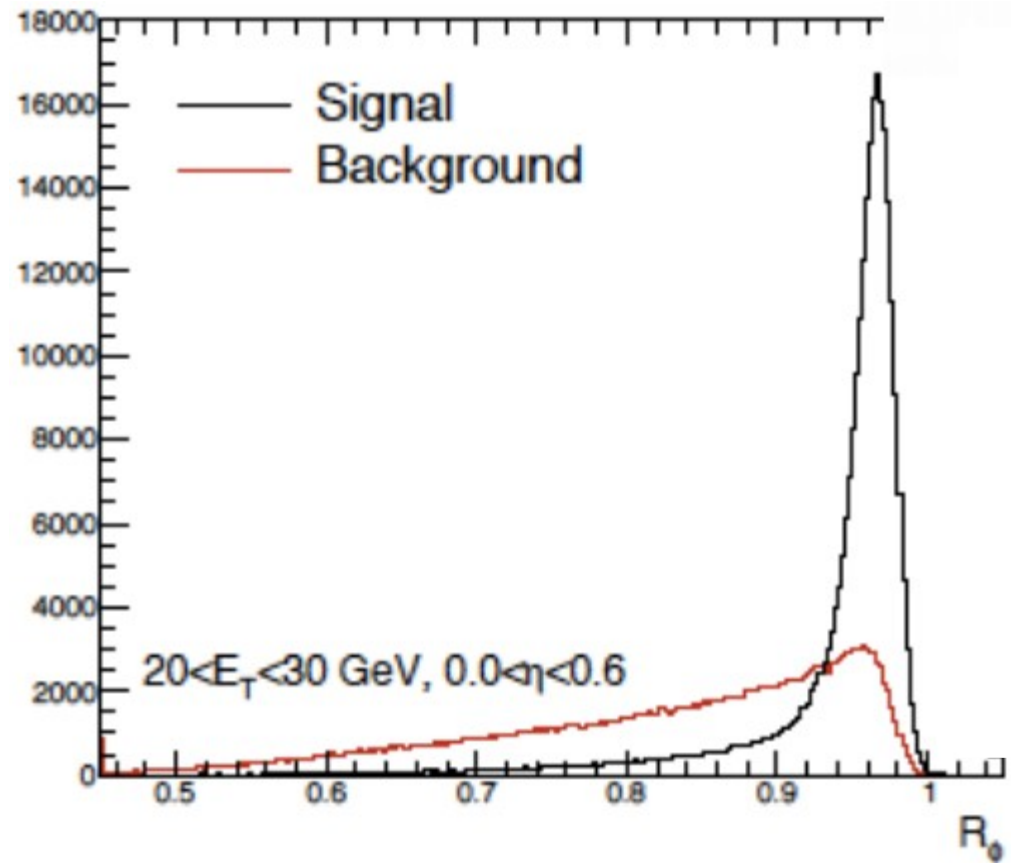


> Background processes

- Photon conversion
- B decay
- 2 Jets

> Cuts to optimise identification

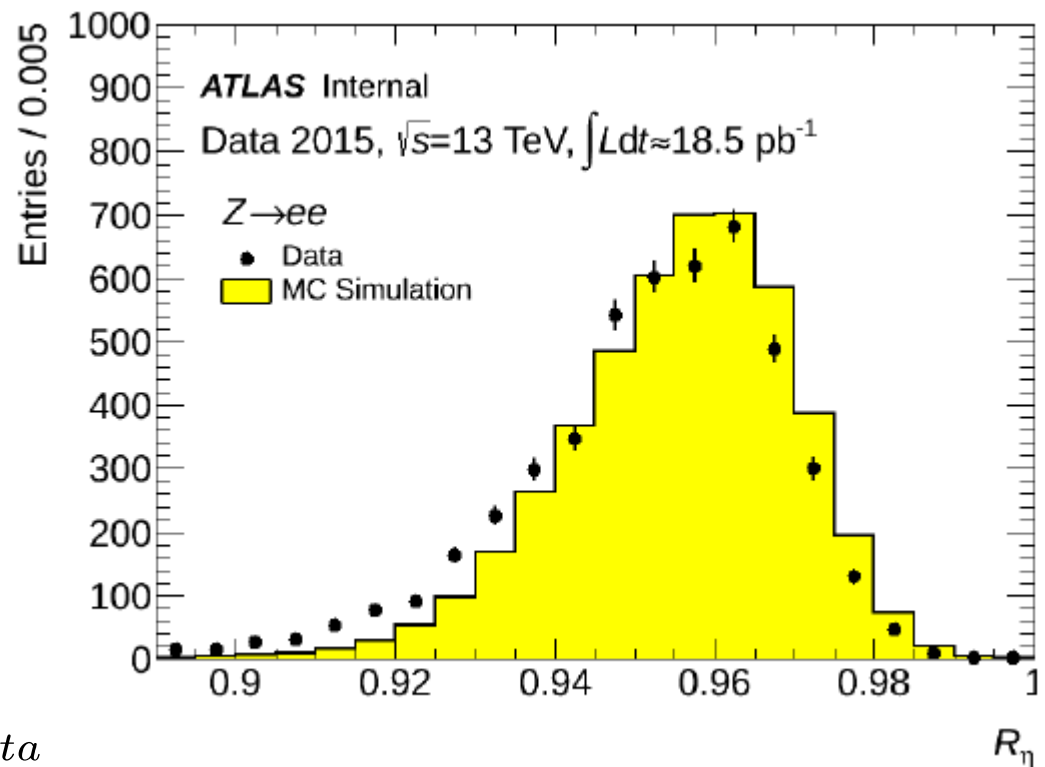
- On track
- Cluster-properties in EM calorimeter



Method to check how well identification work:

> Efficiency $\epsilon = \frac{\text{electrons which pass cuts}}{\text{all electrons}}$

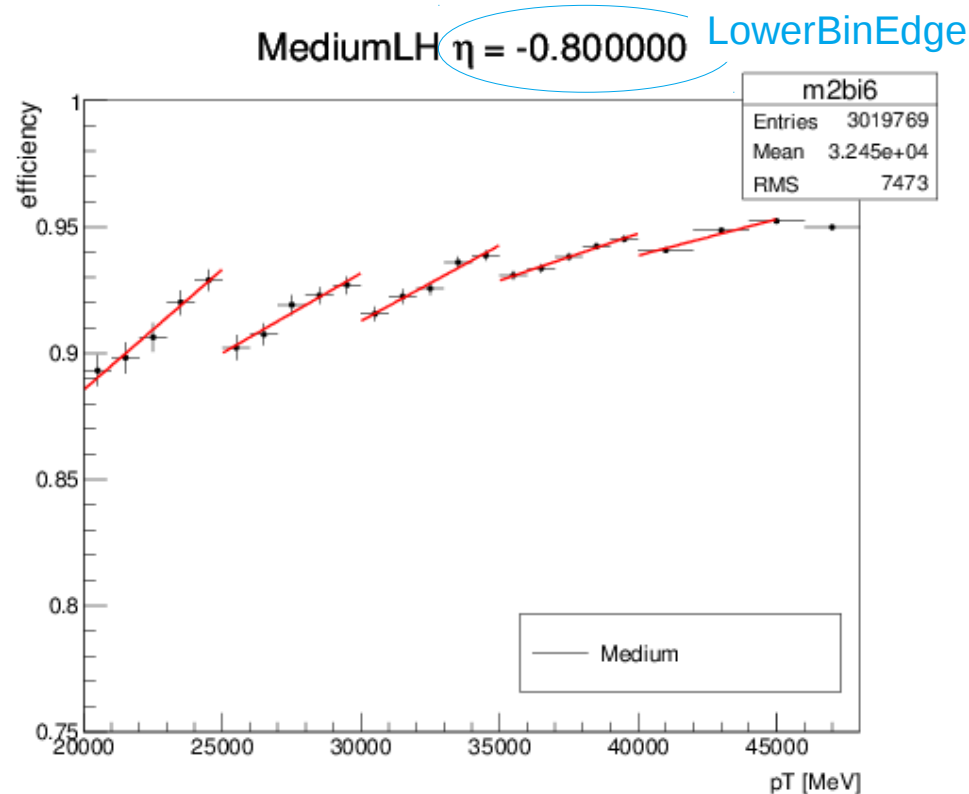
- Shift in shapes for MC Simulation and Data



> Scale factor $SF = \frac{\epsilon_{Data}}{\epsilon_{MC}}$

Problem

- > Discontinuities in identification binning causes discontinuities in data, MC, efficiency, scale factors, ...



used pT Bins [GeV]: {20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 44, (45), 46, 48, 50, 55, 60, 65, 70, 75, 80, 90, 1000};

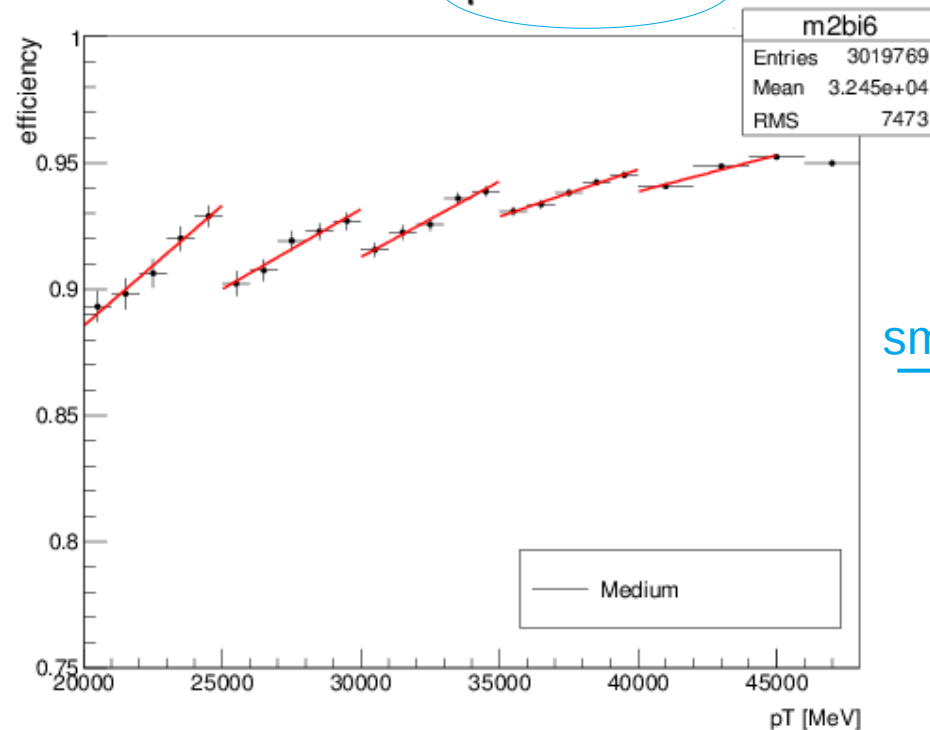
used eta Bins: {-2.47,-2.37, -2.01, -1.52, -1.37, -0.8, -0.1, 0.1, 0.8, 1.37, 1.52, 2.01, 2.37, 2.47};



Problem → Solution

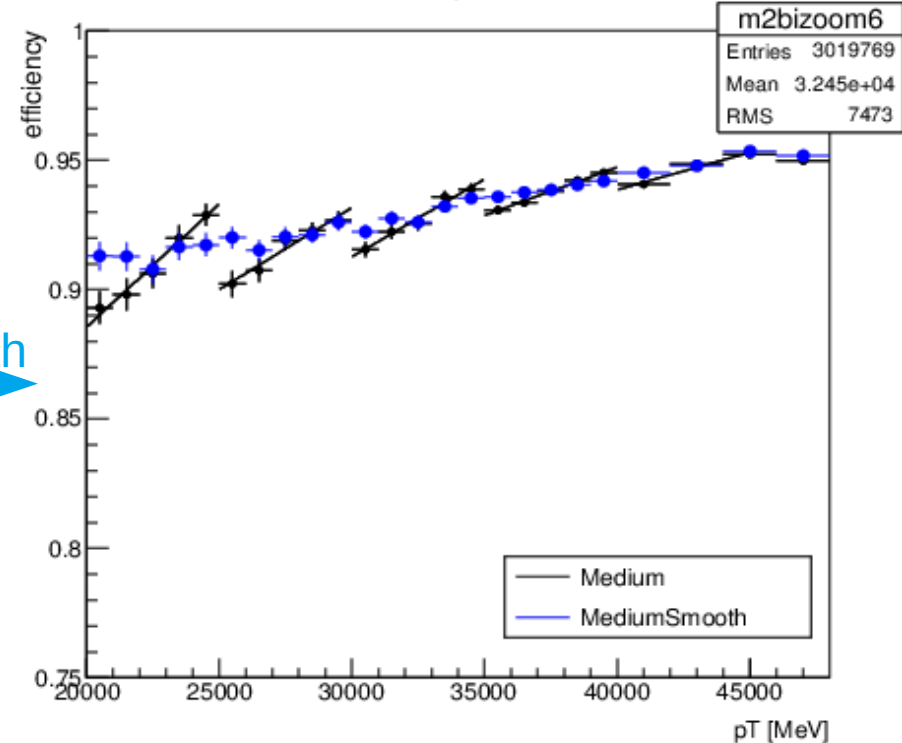
- > Discontinuities in identification binning causes discontinuities in data, MC, efficiency, scale factors, ...
- > Looking for continuous MC efficiency

MediumLH $\eta = -0.800000$ LowerBinEdge



smooth →

MediumLH $\eta = -0.800000$



used pT Bins [GeV]: {20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 44, (45), 46, 48, 50, 55, 60, 65, 70, 75, 80, 90, 1000};

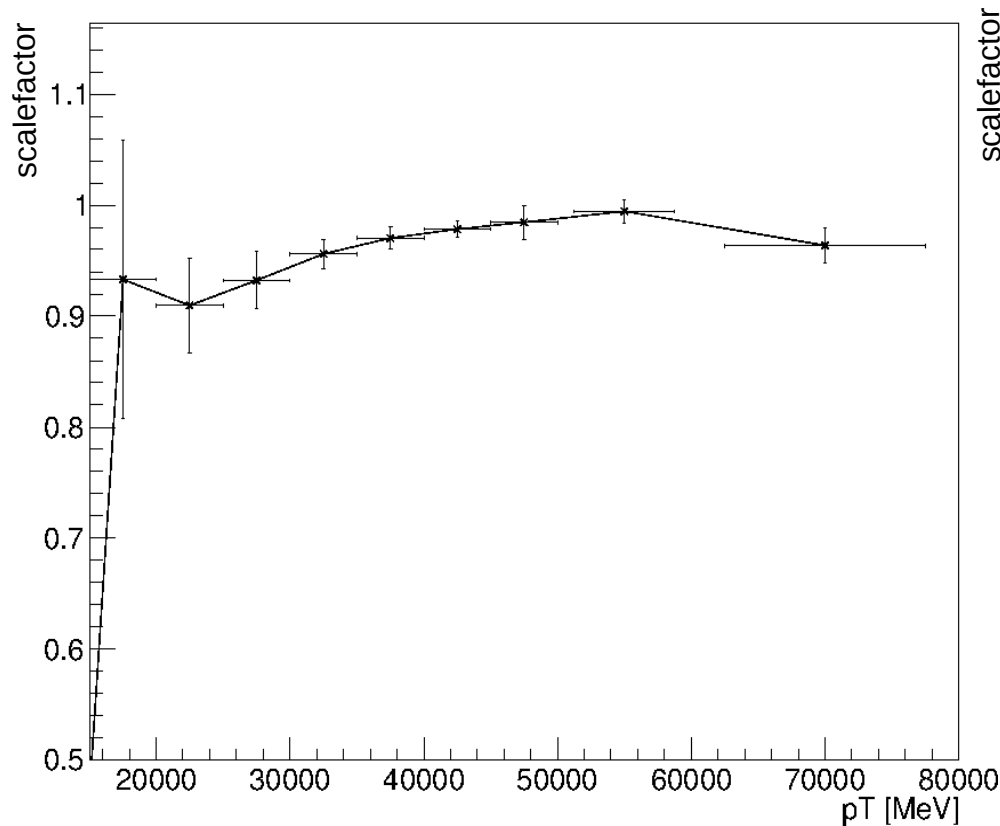
used eta Bins: {-2.47, -2.37, -2.01, -1.52, -1.37, -0.8, -0.1, 0.1, 0.8, 1.37, 1.52, 2.01, 2.37, 2.47};



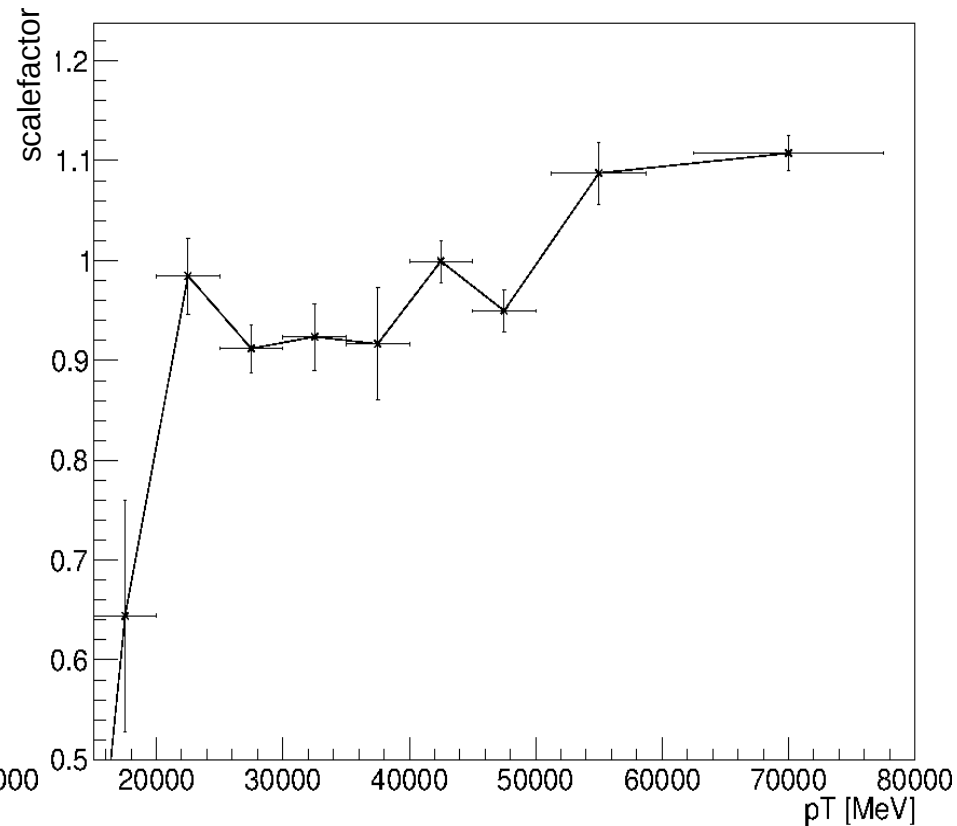
Scale factor

> Still not enough statistic

MediumLHSmooth $\eta = 0.800000$



MediumLHSmooth $\eta = 2.370000$

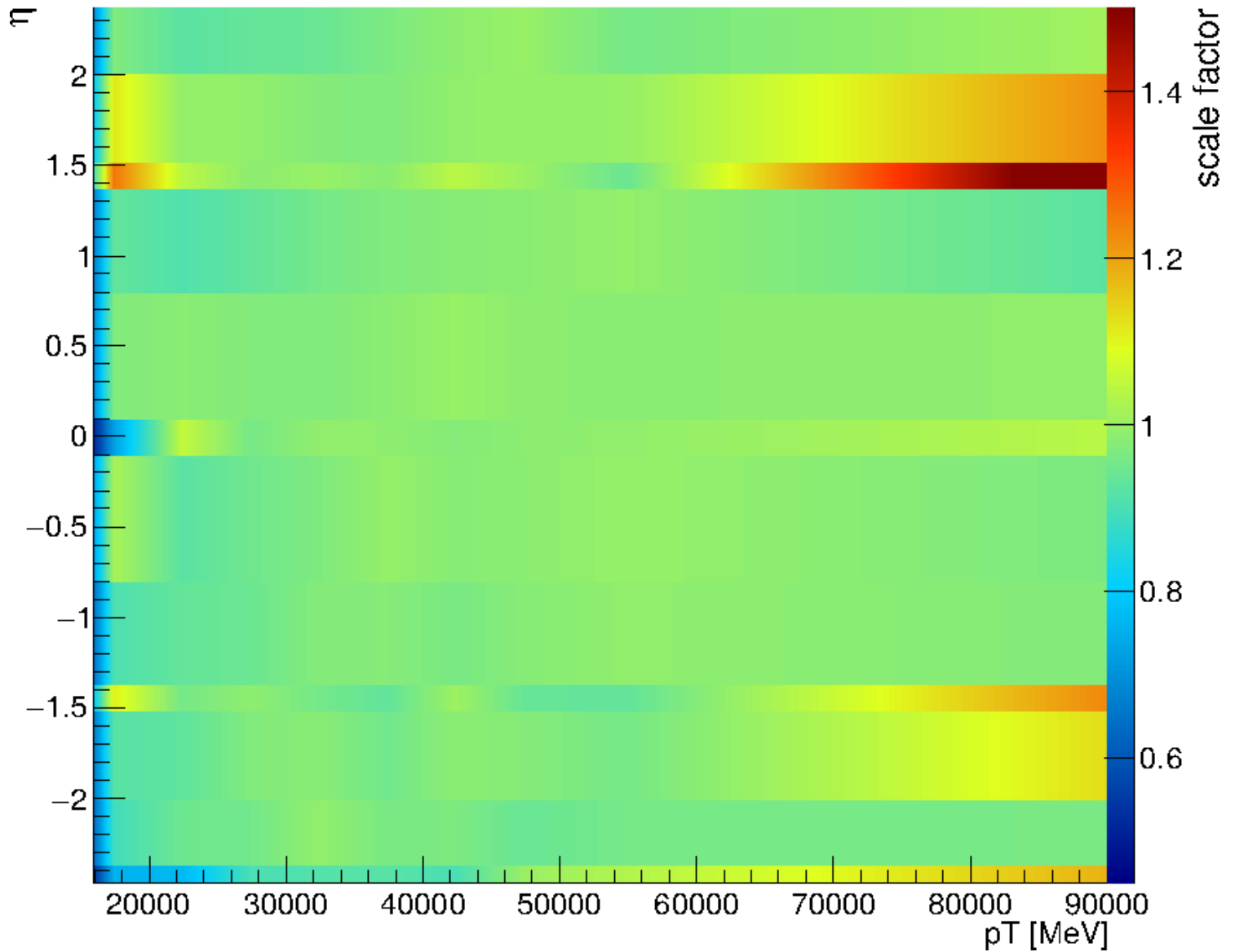


eta Bins: $\{-2.47, -2.37, -2.01, -1.52, -1.37, -0.8, -0.1, 0.1, 0.8, 1.37, 1.52, 2.01, 2.37, 2.47\}$;



Scale factors in 2D histogram (eta - pT)

MediumSmoothLH



MediumLH
Smooth

Conclusion

- > Compared normal LH and smooth LH efficiencies
- > Scale factors don't follow a smooth pattern in all eta bins, because the uncertainties are too large → waiting for more data
- > Saved scale factors in 2D histogram

To Do:

- > Integrate continuous scale factors in “ElectronEfficiencyCorrectionTool”



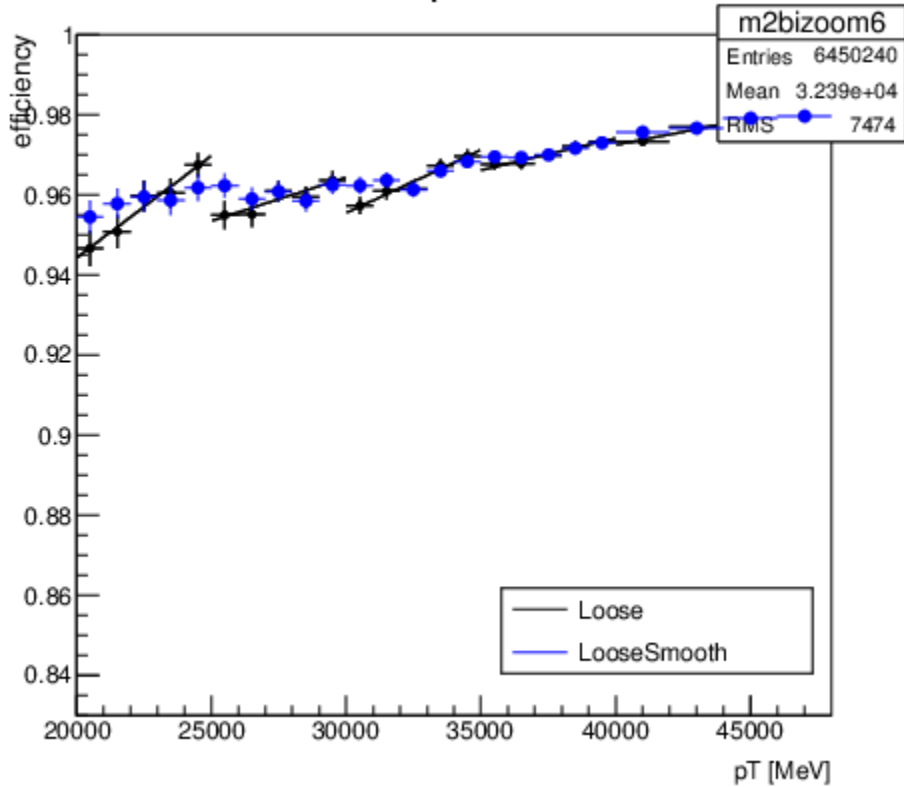
Thank you!

Questions?

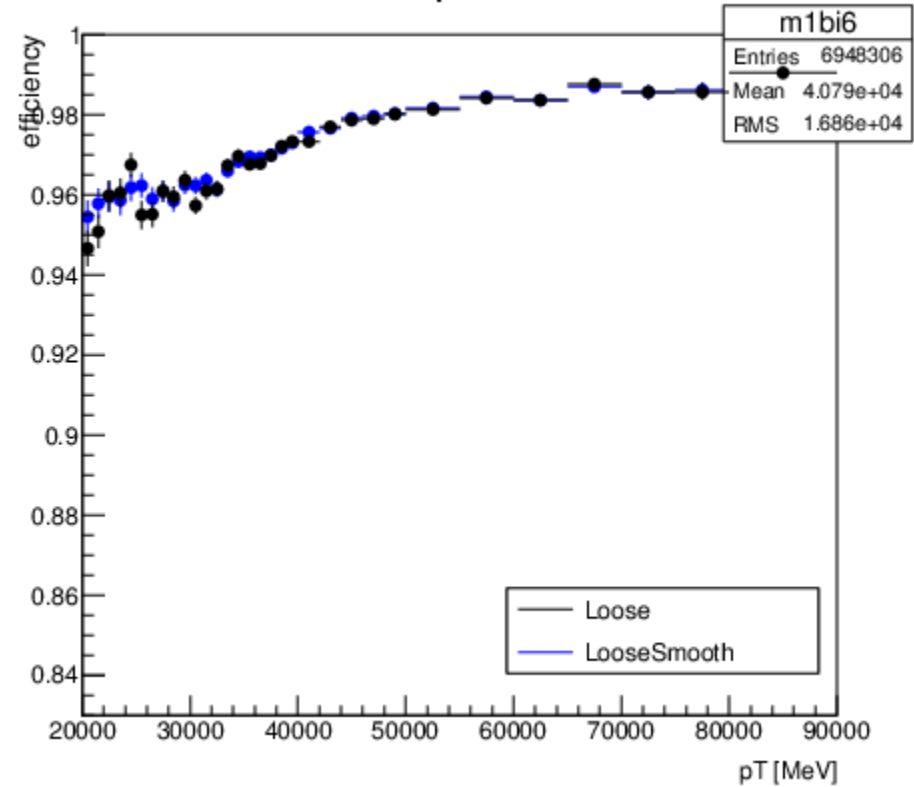


Back up

LooseLH $\eta = -0.800000$



LooseLH $\eta = -0.800000$

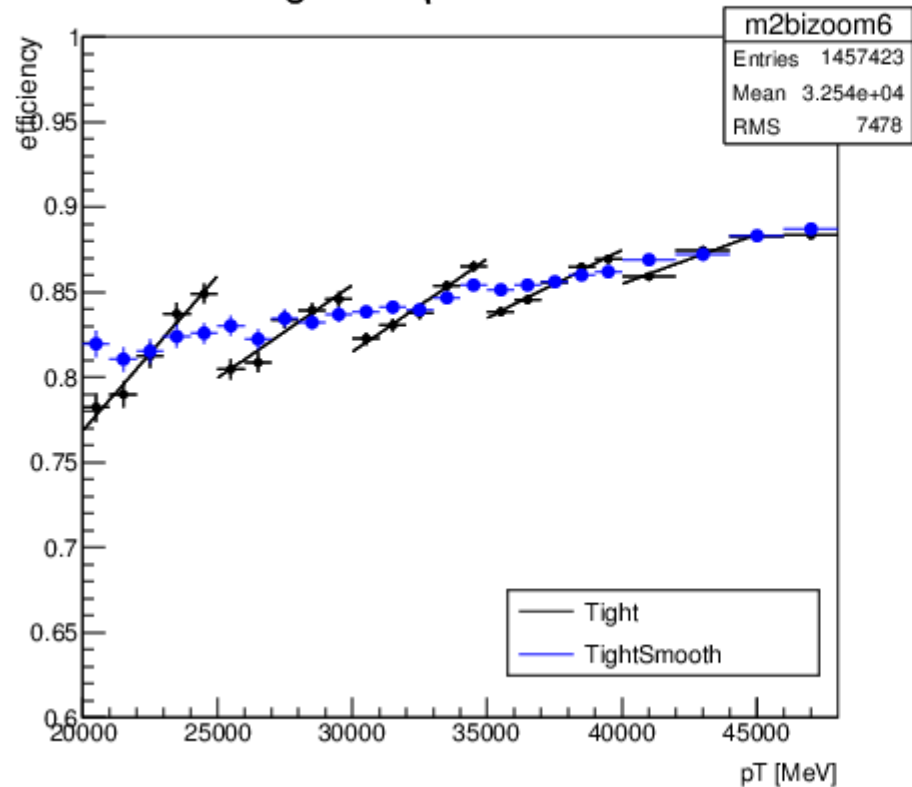


eta Bins: $\{-2.47, -2.37, -2.01, -1.52, -1.37, -0.8, -0.1, 0.1, 0.8, 1.37, 1.52, 2.01, 2.37, 2.47\}$;

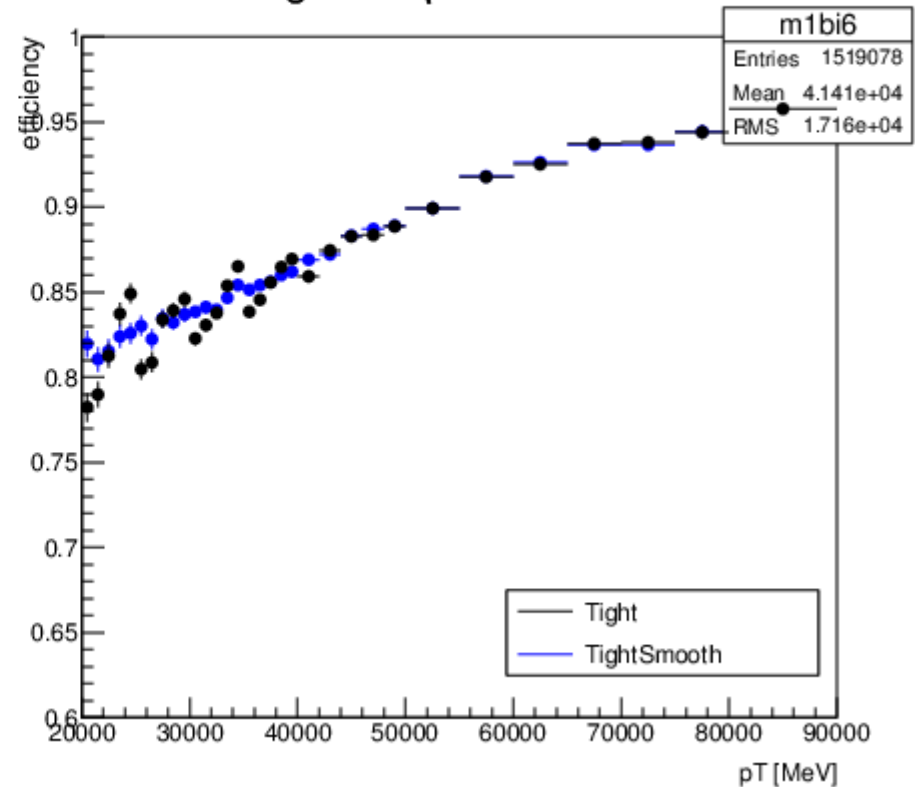


Back up

TightLH $\eta = -0.800000$



TightLH $\eta = -0.800000$



eta Bins: $\{-2.47, -2.37, -2.01, -1.52, -1.37, -0.8, -0.1, 0.1, 0.8, 1.37, 1.52, 2.01, 2.37, 2.47\}$;

