

ATLAS Calorimeter Commissioning

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1 Recap

- Missing ET
- Missing ET Performance Package

2 Progress

- Minimum Bias Events
- Resolution Curve

3 Future Work

Analyze the performance of the ATLAS calorimeter through the creation of a resolution curve that models the Missing Transverse Energy over different sets of data samples including: Minimum Bias events, DiJet Samples, and Cosmic Ray Data

Transverse energy that is not detected by the detector but known to exist because of Conservation of Momentum

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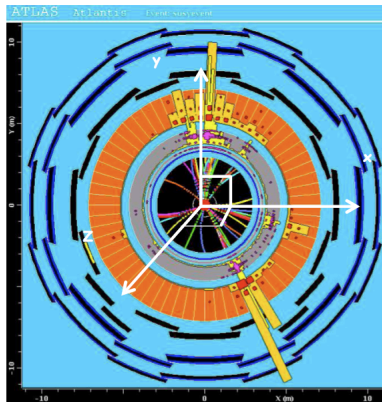
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 - Dead Material
 - Cracks in Detector

Transverse energy that is not detected by the detector but known to exist because of Conservation of Momentum

- Signifies possible new particles or Physics
- Fake Missing ET can be created from many areas
 - Dead Material
 - Cracks in Detector
 - Noise from electronics

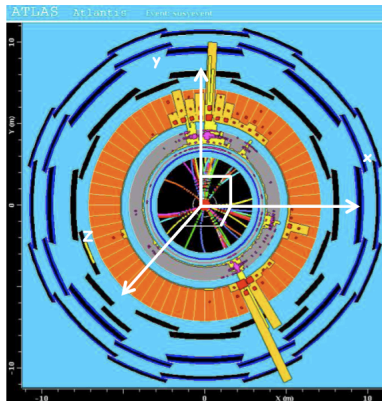
Missing ET Performance Package

- E_x - The "x" component of the Missing Transverse Energy



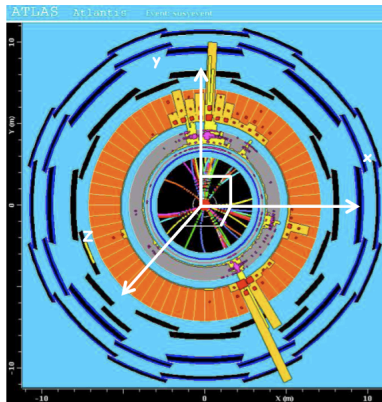
Missing ET Performance Package

- E_x - The “x” component of the Missing Transverse Energy
- E_y - The “y” component of the Missing Transverse Energy



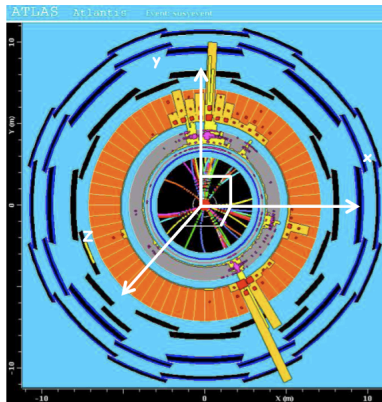
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- E_x - The “x” component of the Missing Transverse Energy
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- E_ϕ - The “ ϕ ” component of the Missing Transverse Energy



Missing ET Performance Package

- E_x - The “x” component of the Missing Transverse Energy
- E_y - The “y” component of the Missing Transverse Energy
- E_ϕ - The “ ϕ ” component of the Missing Transverse Energy
- $SumE_T$ - The sum of the Missing Transverse Energy over all of the calorimeter cells



Minimum Bias Events

- Run the Missing ET Performance package on three different sets of Minimum Bias Event samples

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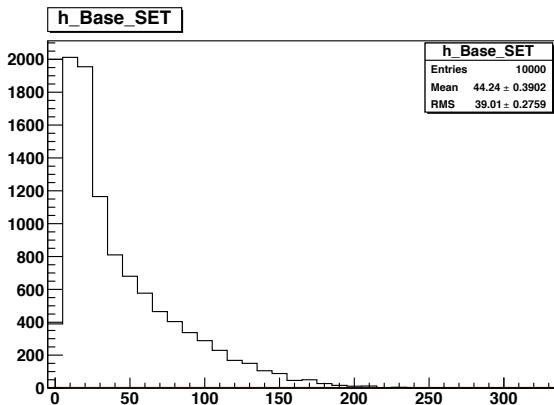
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 - Makes graphs that plot the Missing ET with respect to Eta

Minimum Bias Events

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- Checked the plots versus the Geometry Packages, which tell what part of the detector was “turned off” during the simulation
 - Makes graphs that plot the Missing ET with respect to Eta
 - Each region has an associated pseudorapidity value

Minimum Bias Histograms

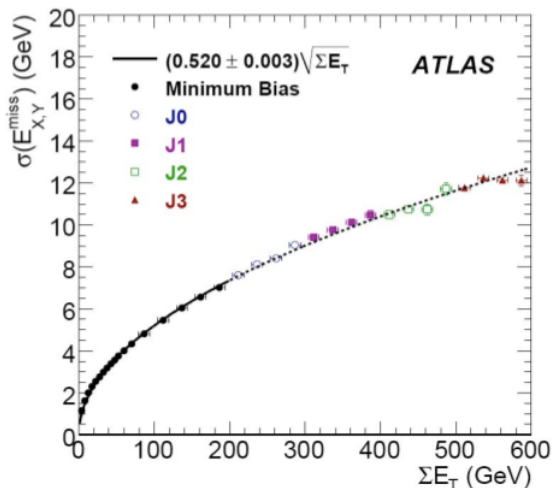
$$\text{Sum}E_T = \sum \sqrt{E_x^2 + E_y^2}$$



Uncalibrated ETMiss from all Cells above 2 sigma noise cell energy threshold

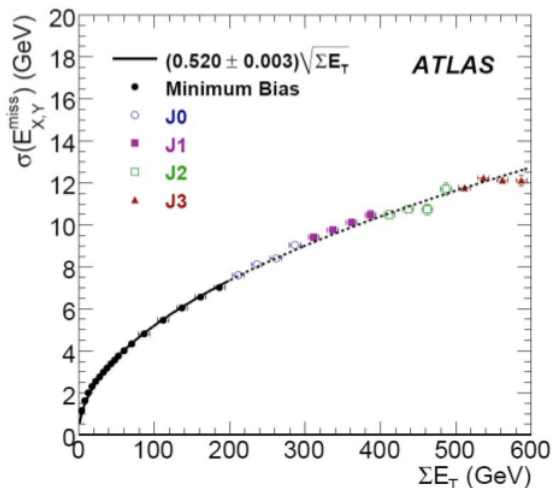
Resolution Curve

$$\sigma = a \cdot \sqrt{\sum E_T}$$

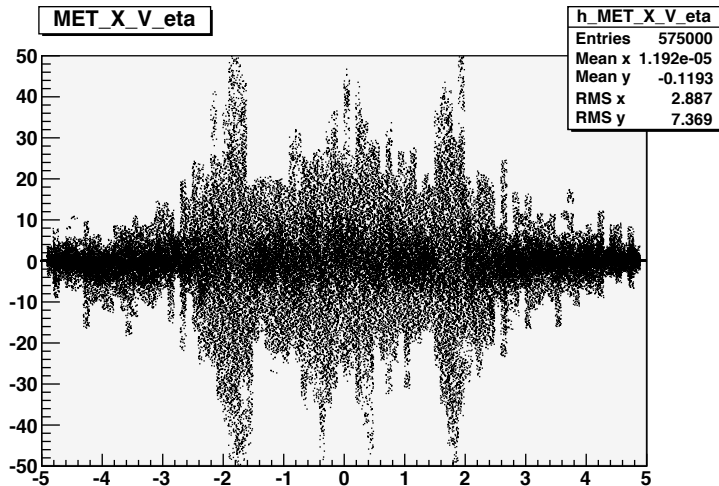


Resolution Curve

- $\sigma = a \cdot \sqrt{\sum E_T}$
- “a” - Quantifies the Missing E_T resolution (Varies between .53 and .57)



Minimum Bias Histograms



- Work with mentor on DiJet Event data samples

Future Work

- Work with mentor on DiJet Event data samples
- Run Missing ET Performance Package on Cosmic Ray Data

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- Run Missing ET Performance Package on Cosmic Ray Data
- Produce Resolution Curve modeling the ATLAS Calorimeter performance

Acknowledgements

- Dr. Richard Teuscher
- Mr. Travis Bain
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