NEUTRINO-ELECTRON ELASTIC SCATTERING
RECO VS TRUE VARIABLES

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Introduction

- Update since last meeting: figured out how to obtain best estimate of true E.M. shower energy
  - Will refer to as "best-match"
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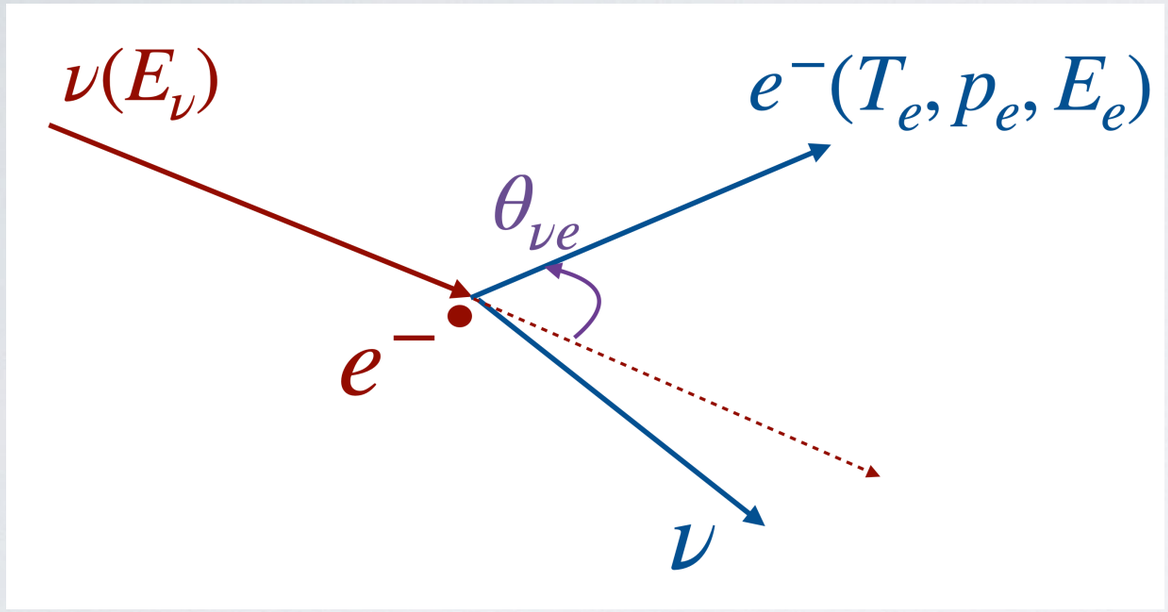
Introduction

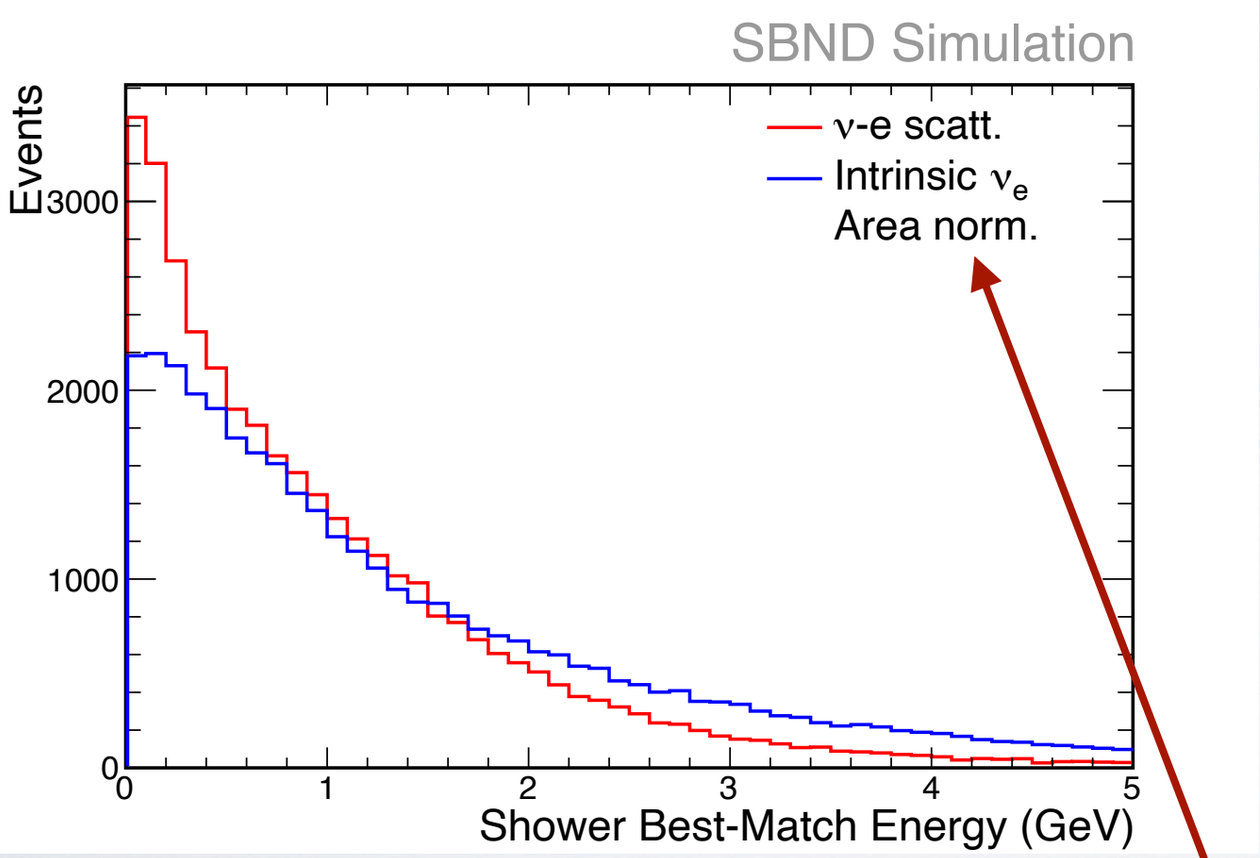


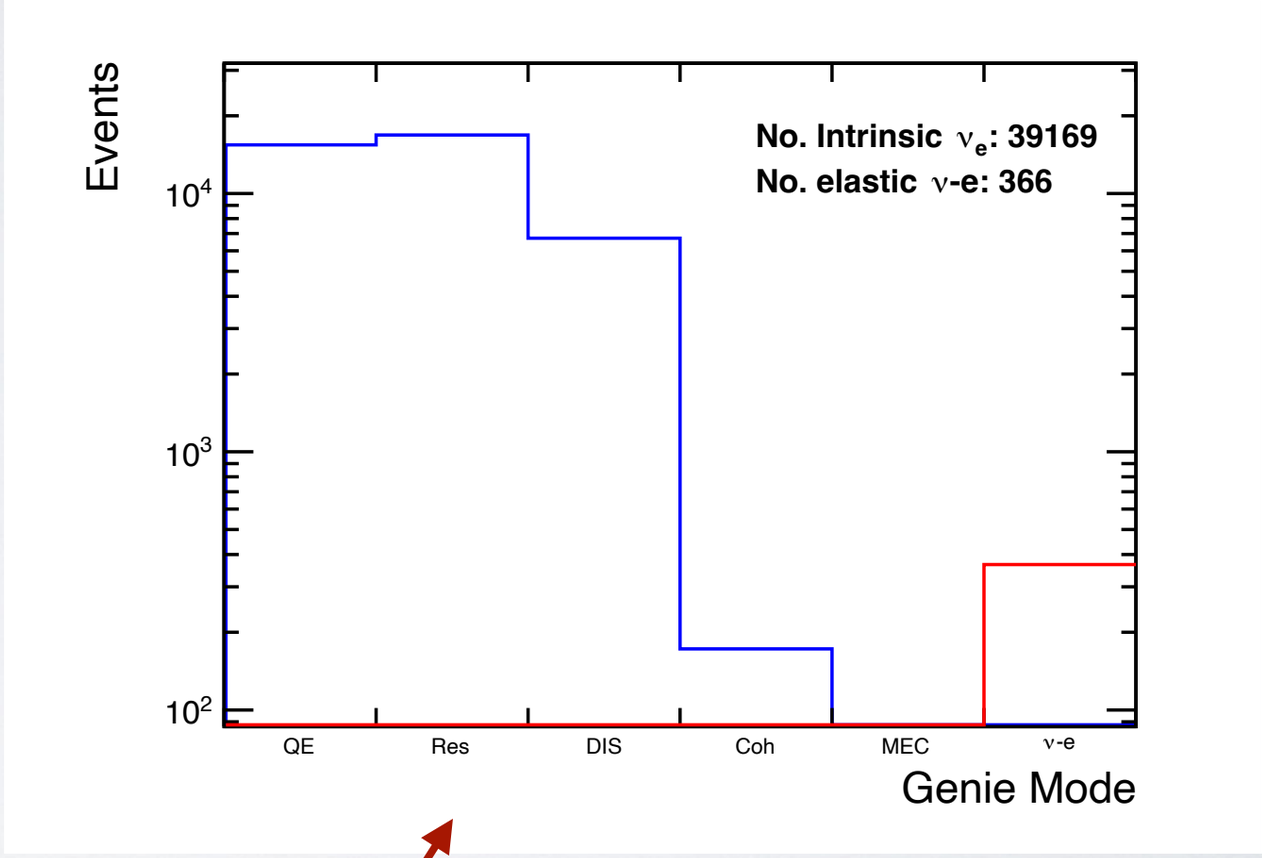
$$E_\nu = \frac{m_e T_e}{p_e \cos\theta_{\nu e} - T_e}$$

Caveat:

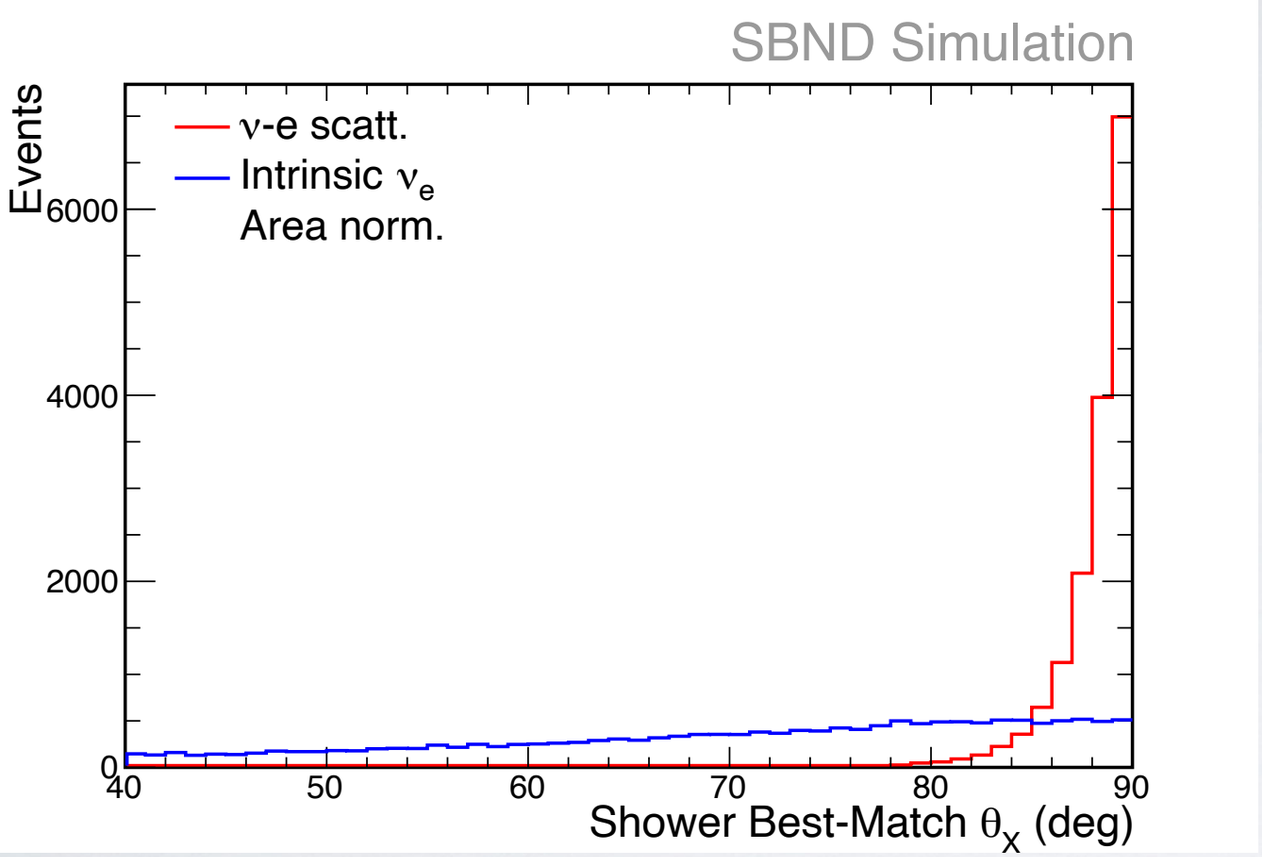
Measuring the incoming neutrino energy requires an **excellent** precision measuring both the energy and direction of the electron shower

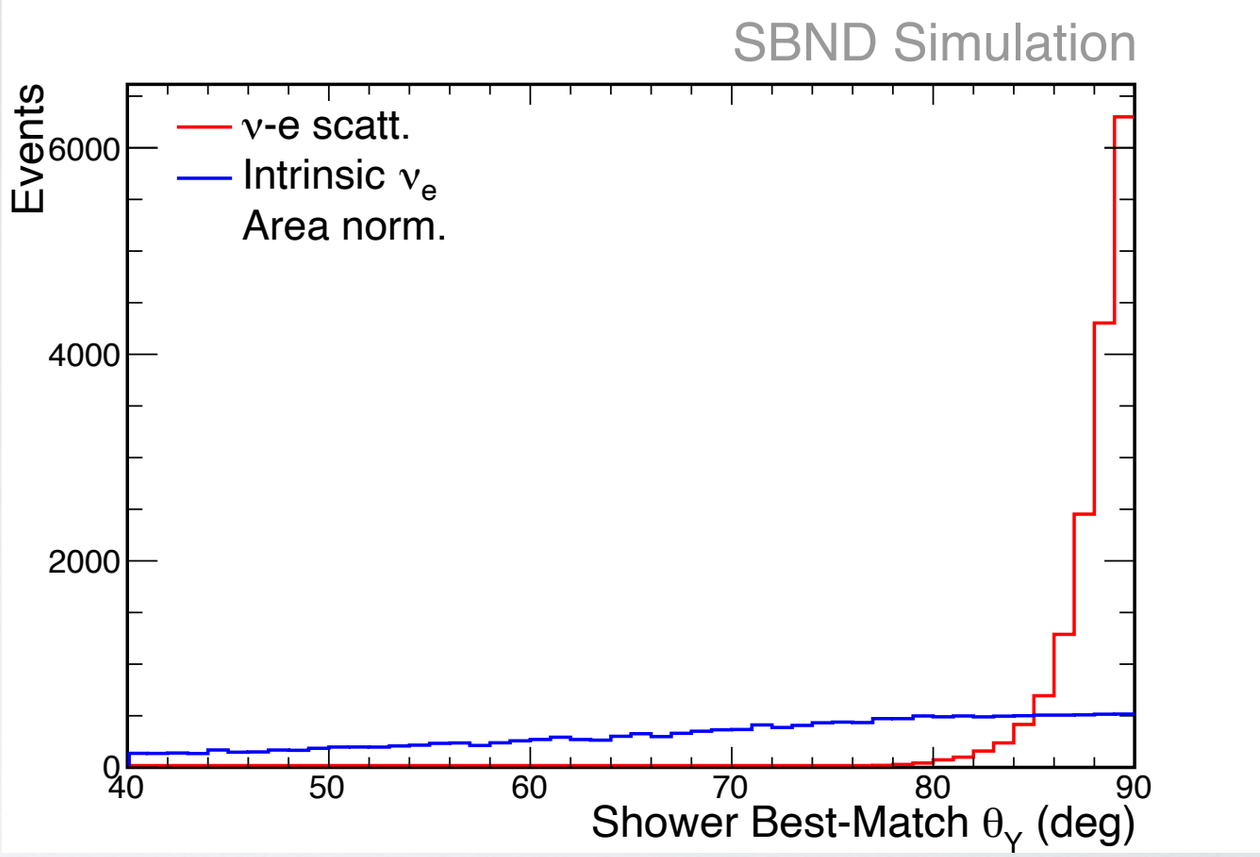
OVERVIEW OF THE MAIN TRUE VARIABLES

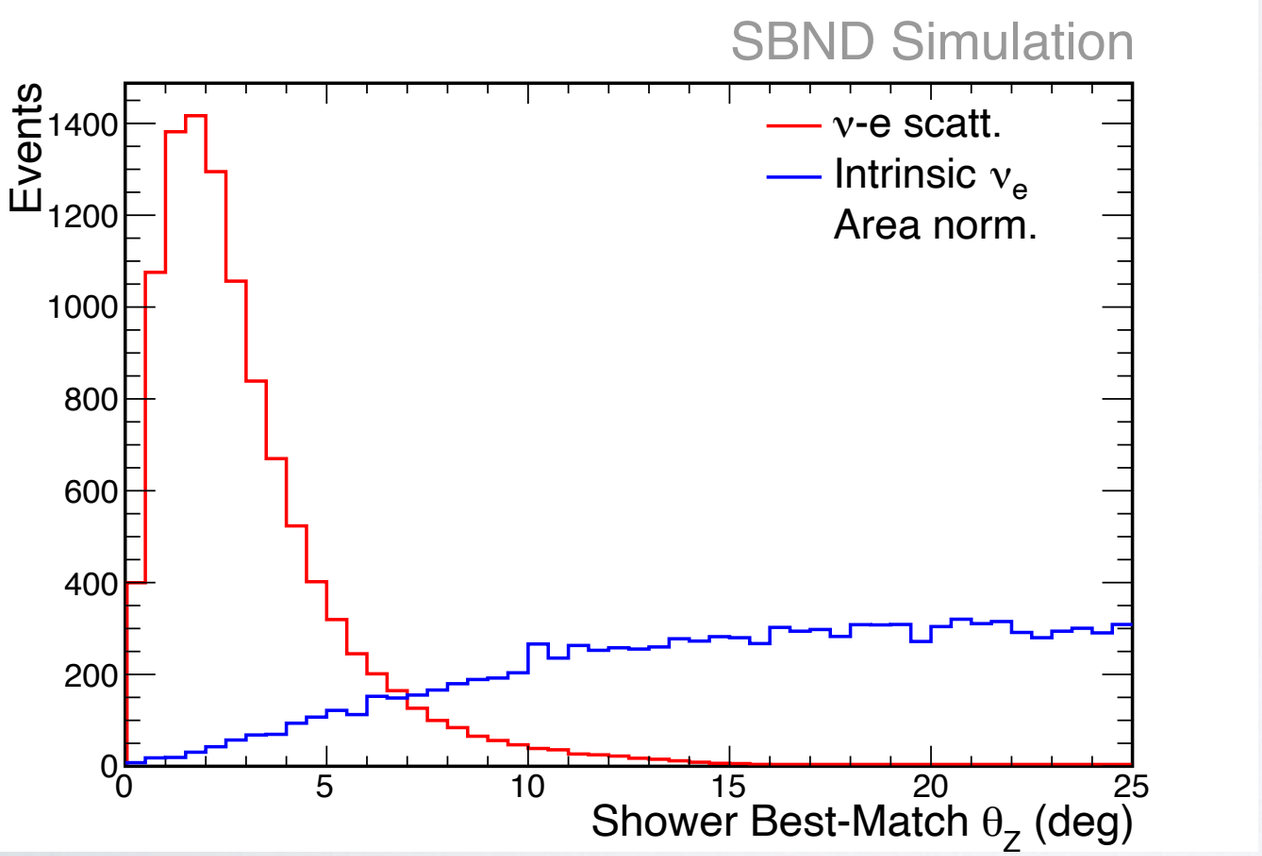




Reminder: most plots are area-normalised unless POT is shown





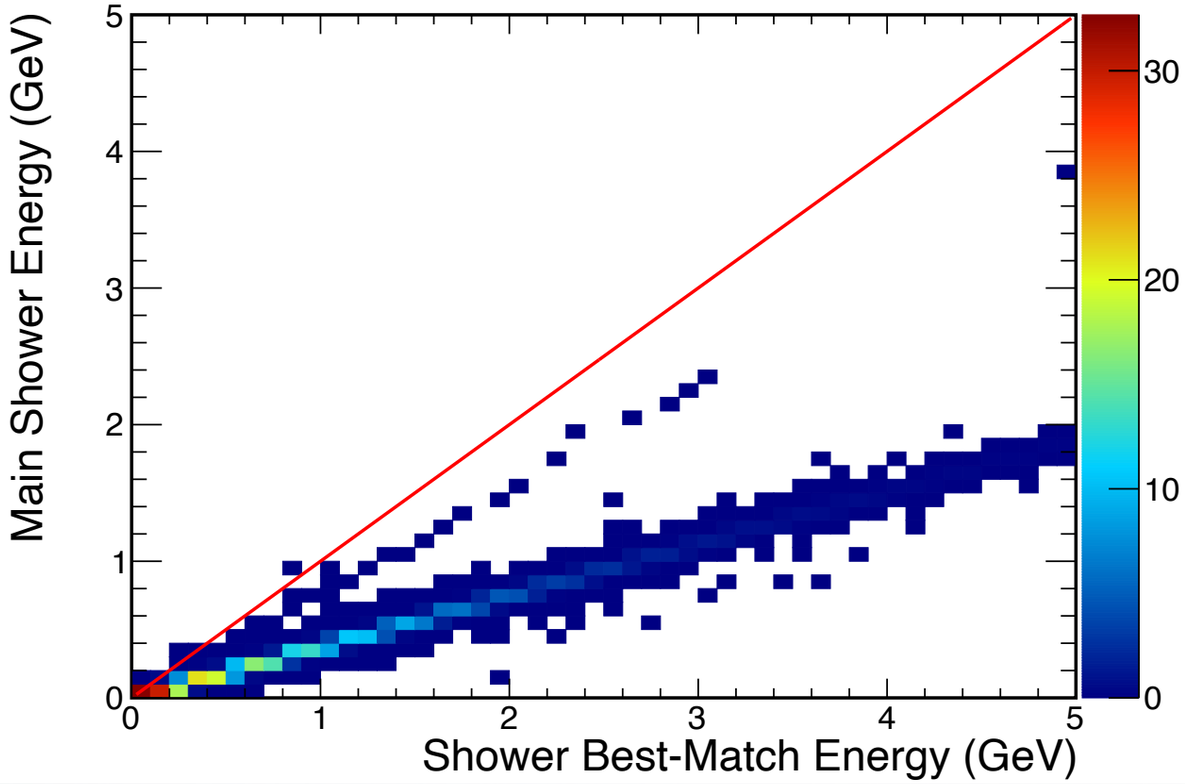


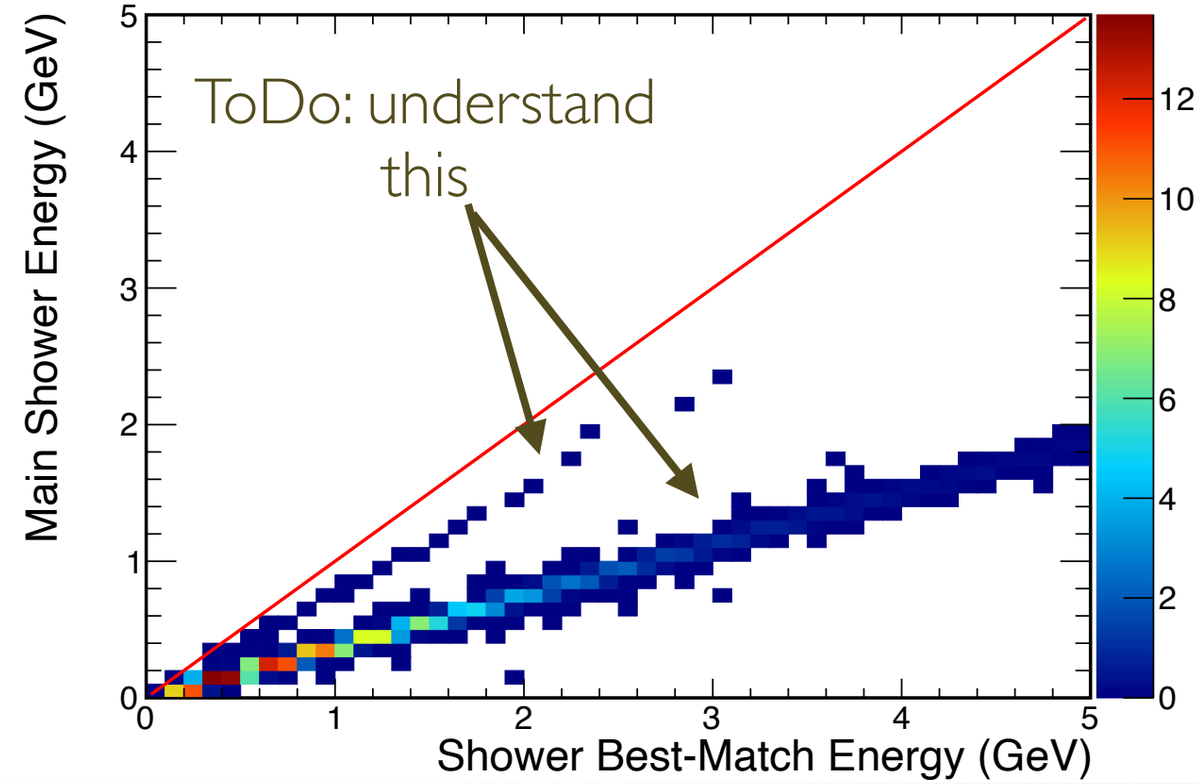
- As expected, E.M. showers from elastic scattering are much more forward, since there's no energy transfer to the nucleus

But how well do we reconstruct these quantities?

Spoiler: not that great

SHOWER ENERGY (SIGNAL)

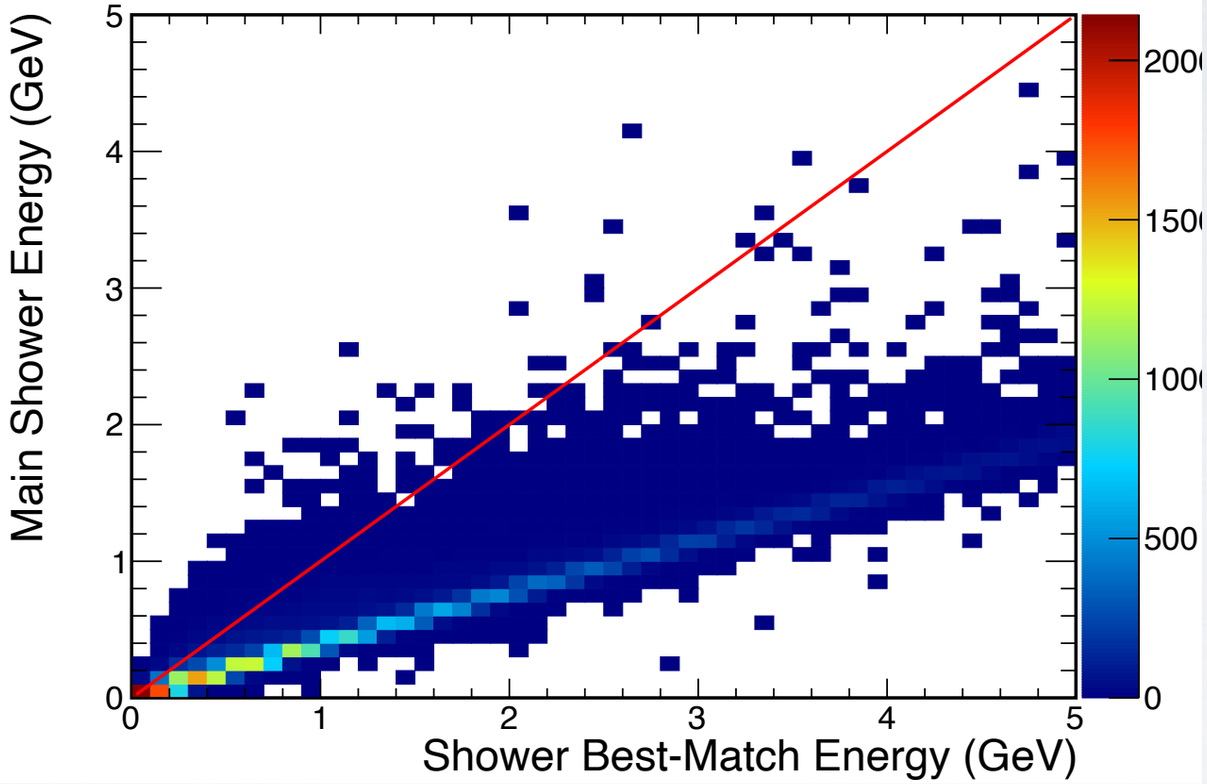


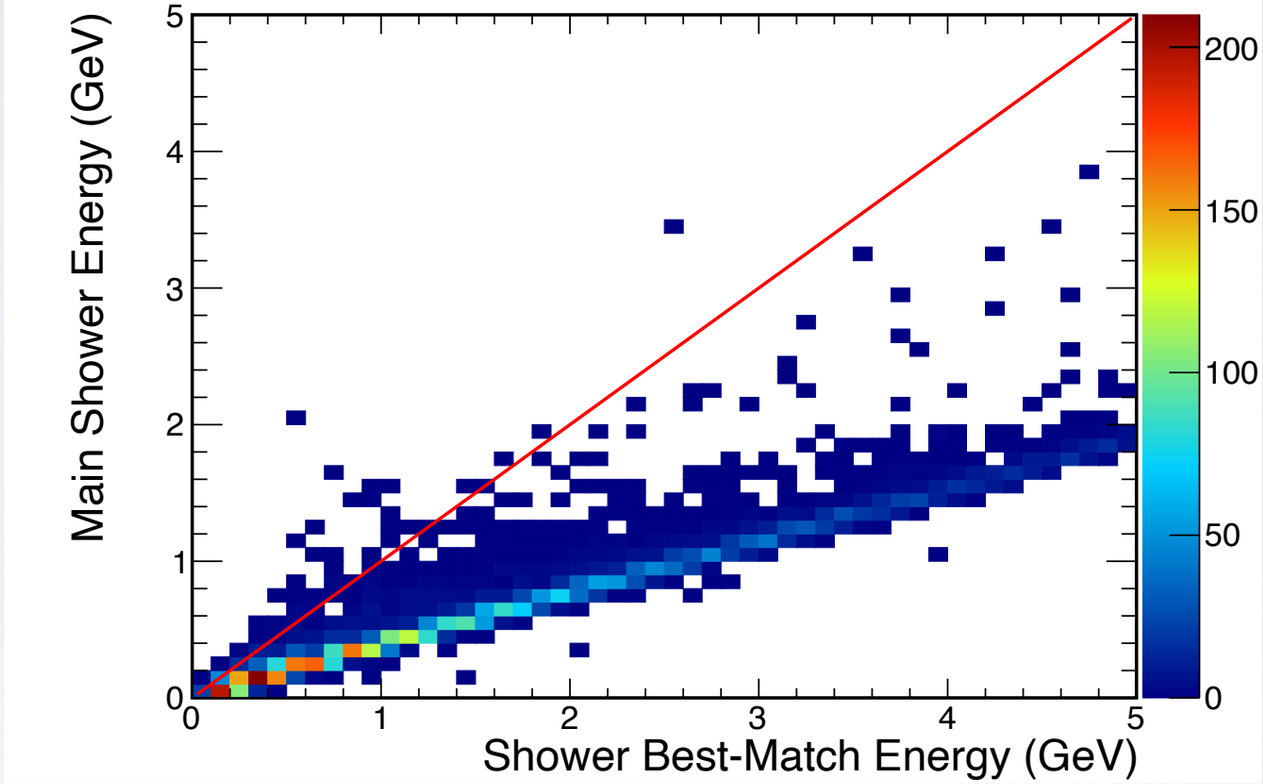


No cuts

One shower, no tracks

SHOWER ENERGY (BACKGROUND)





No cuts

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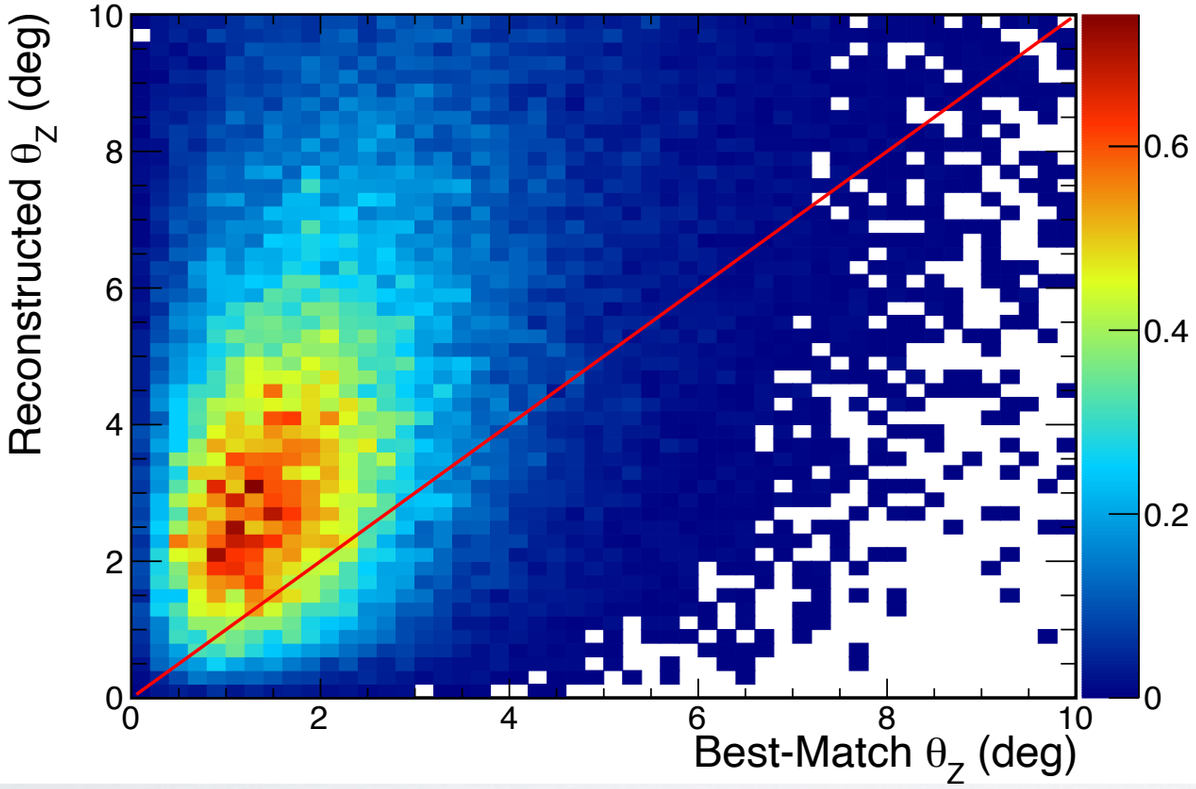
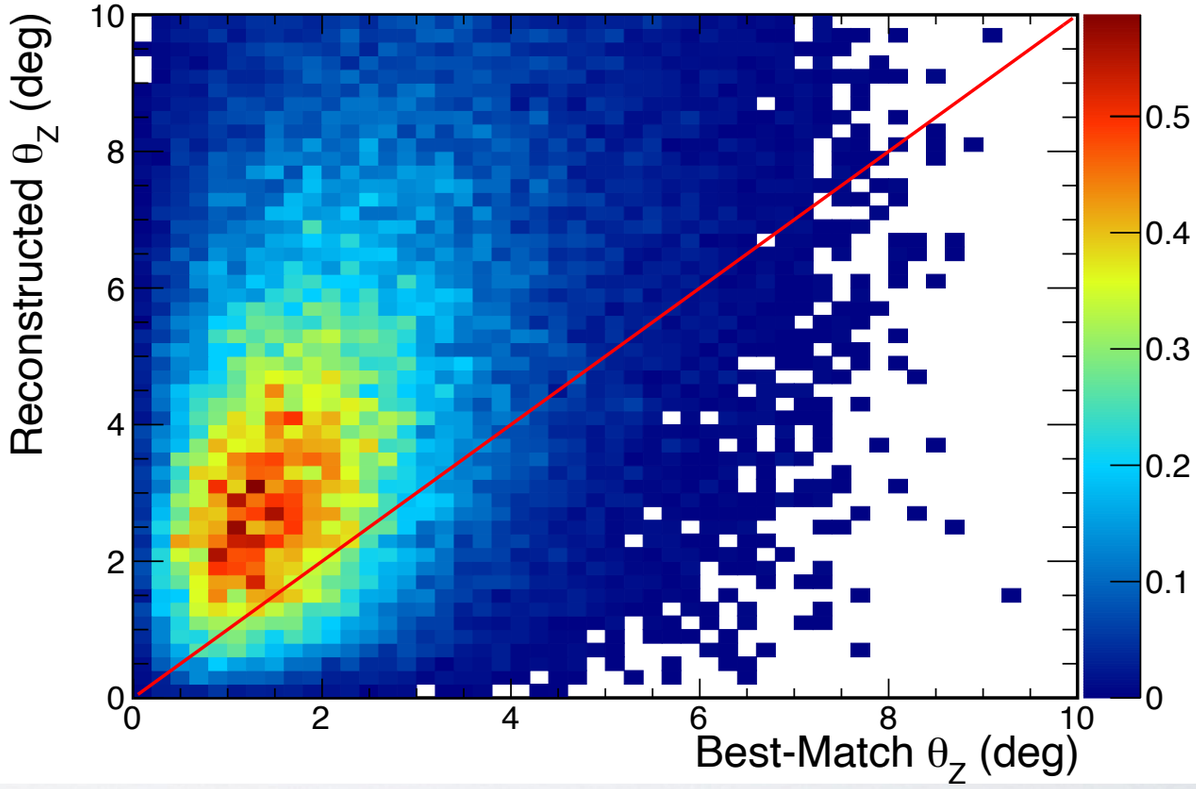
SHOWER DIRECTION (SIGNAL, ZOOM)



No cuts



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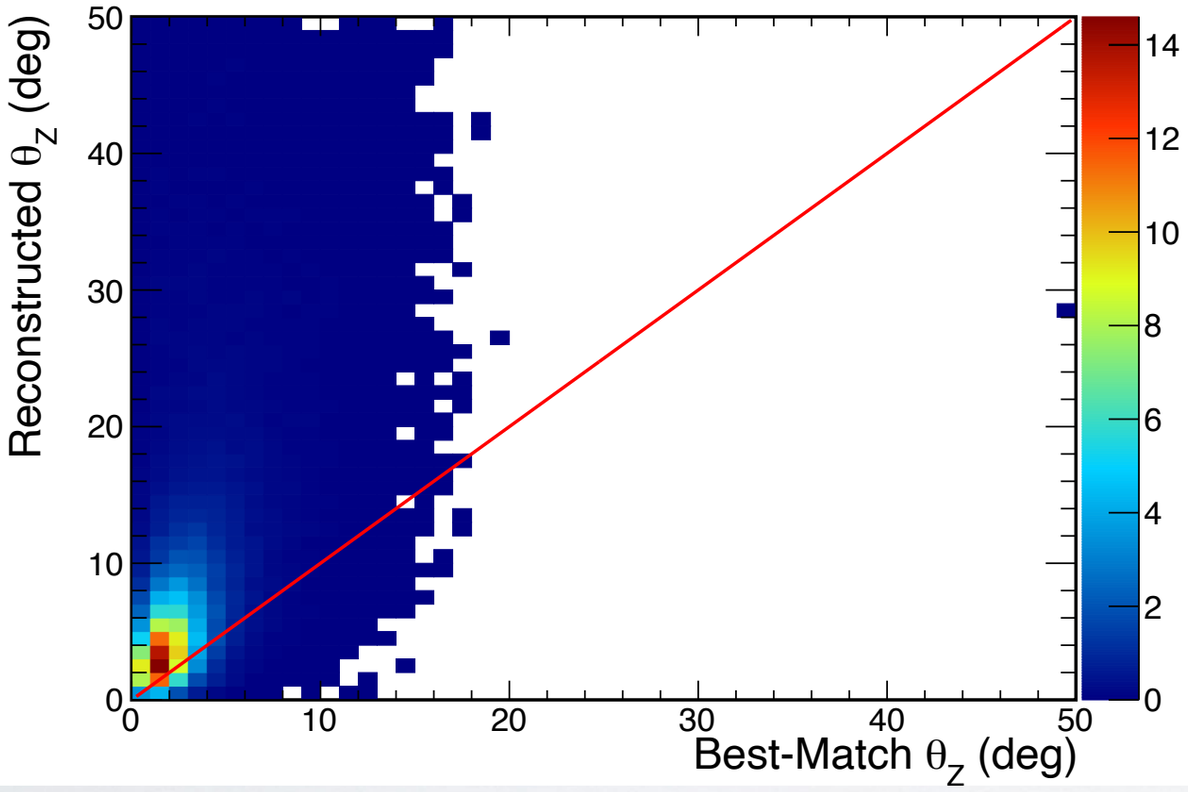
SHOWER DIRECTION (SIGNAL)



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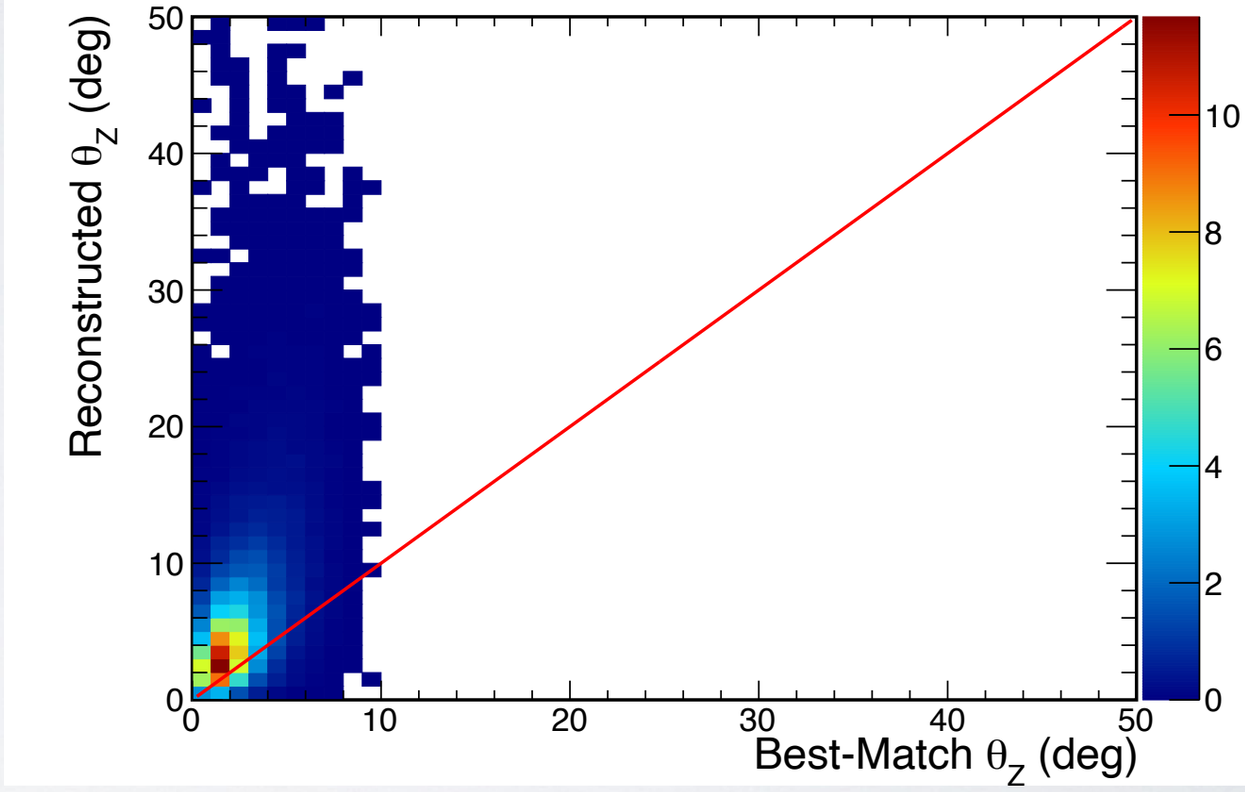

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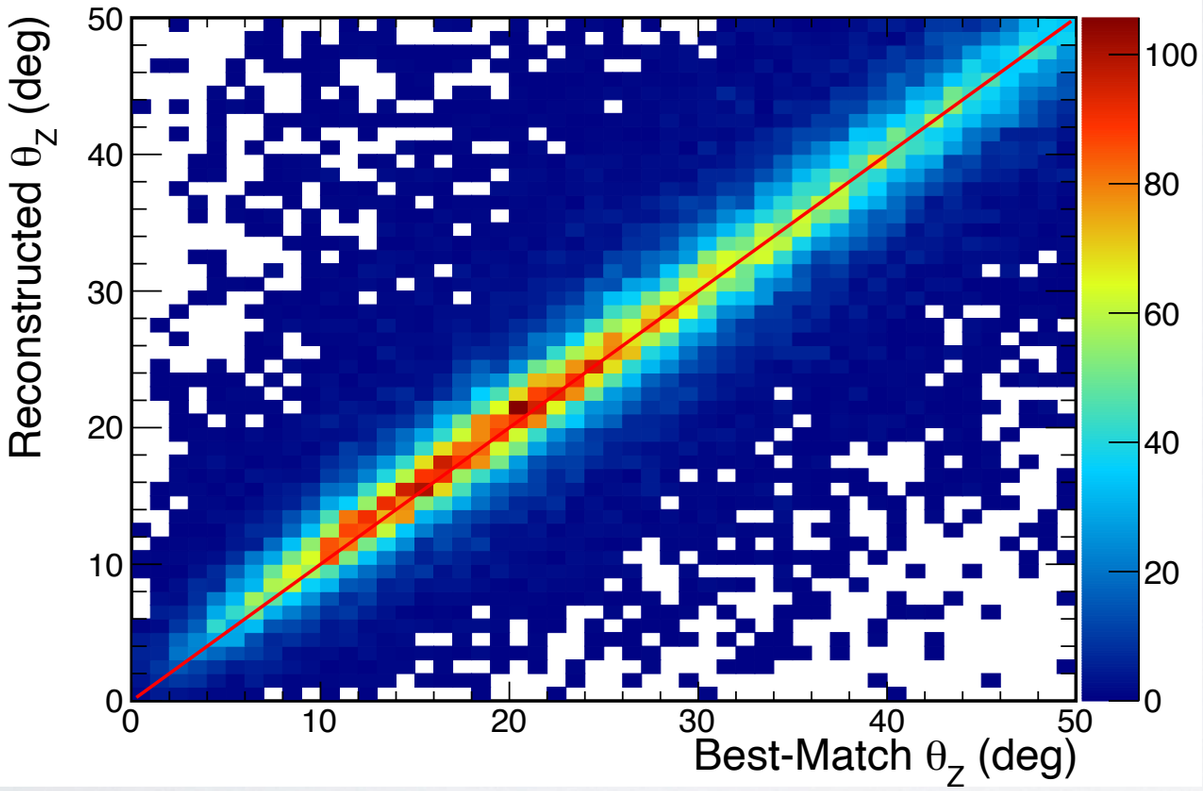
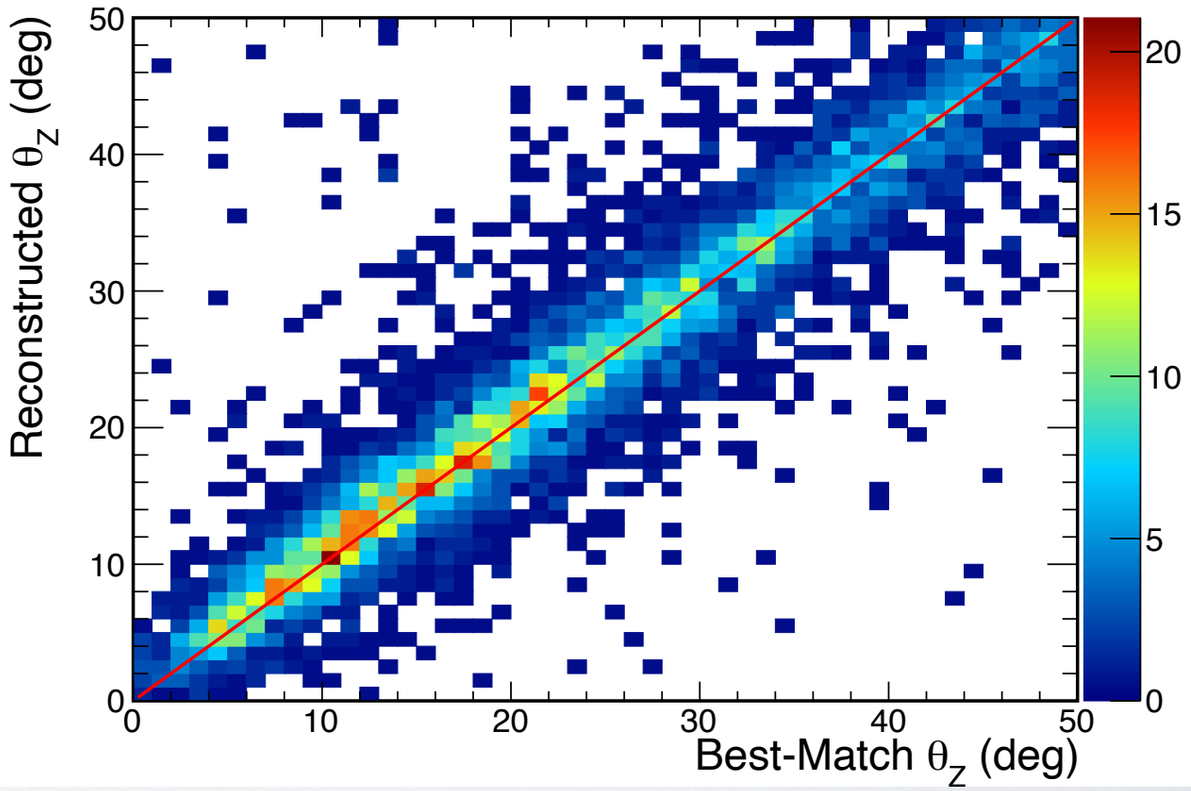
SHOWER DIRECTION (BACKGROUND)





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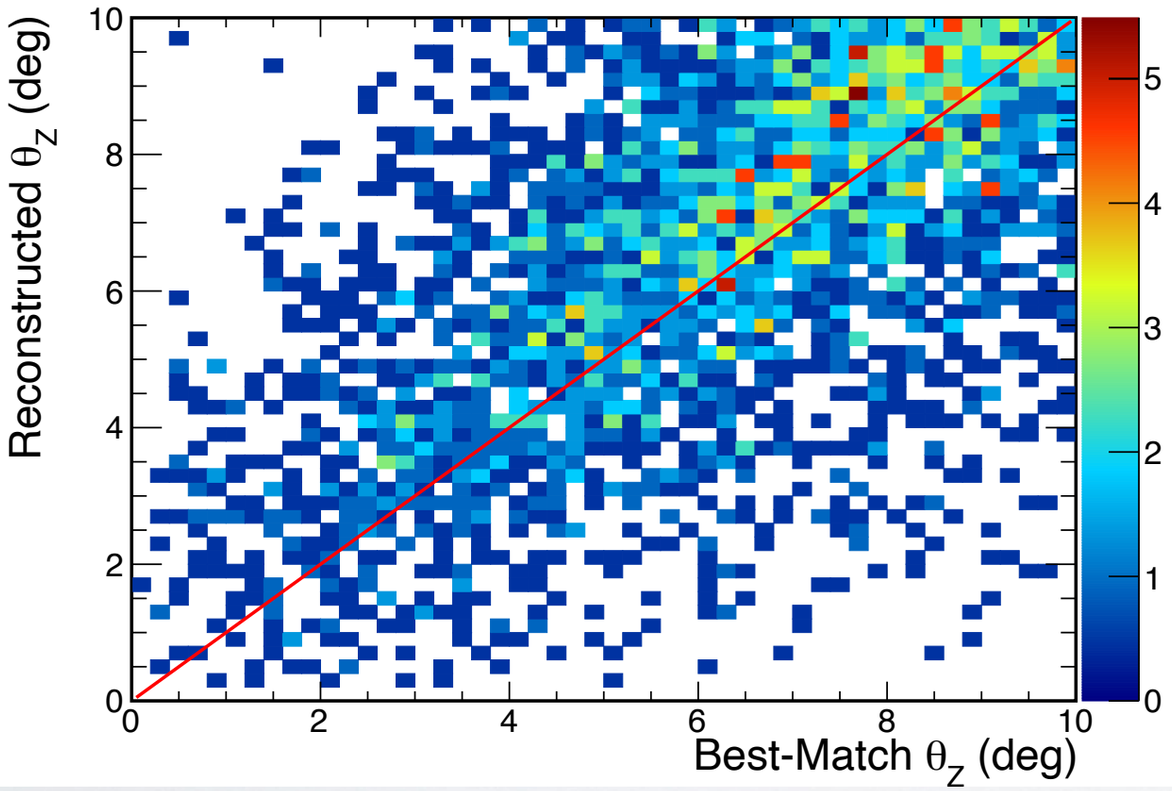
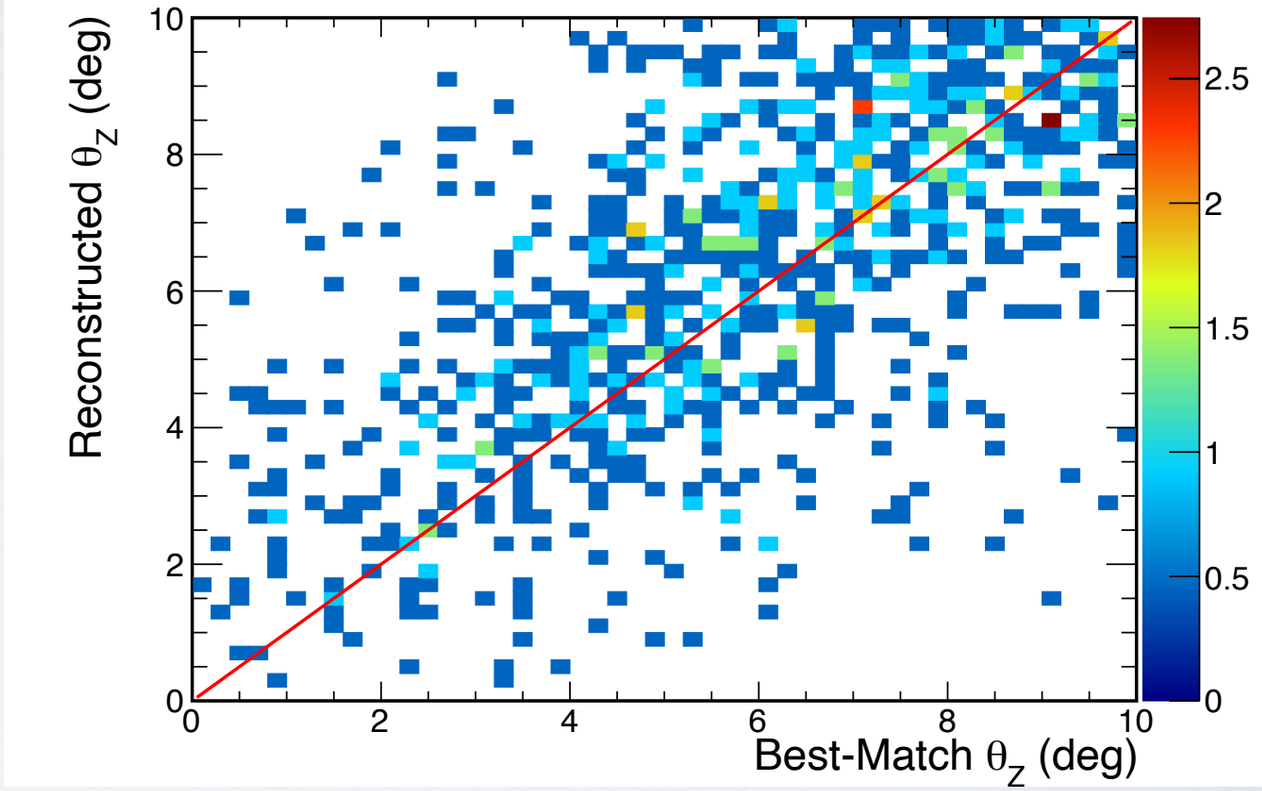
SHOWER DIRECTION (BACKGROUND, ZOOM)





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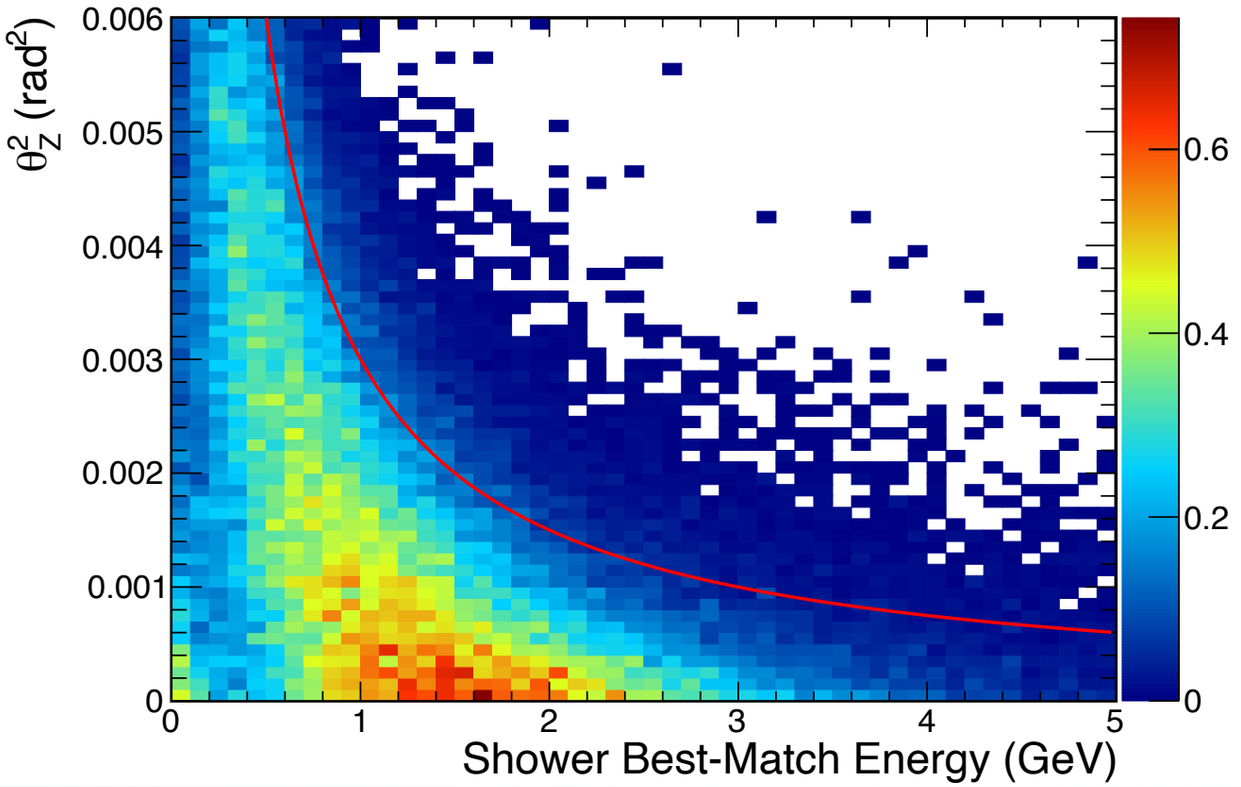
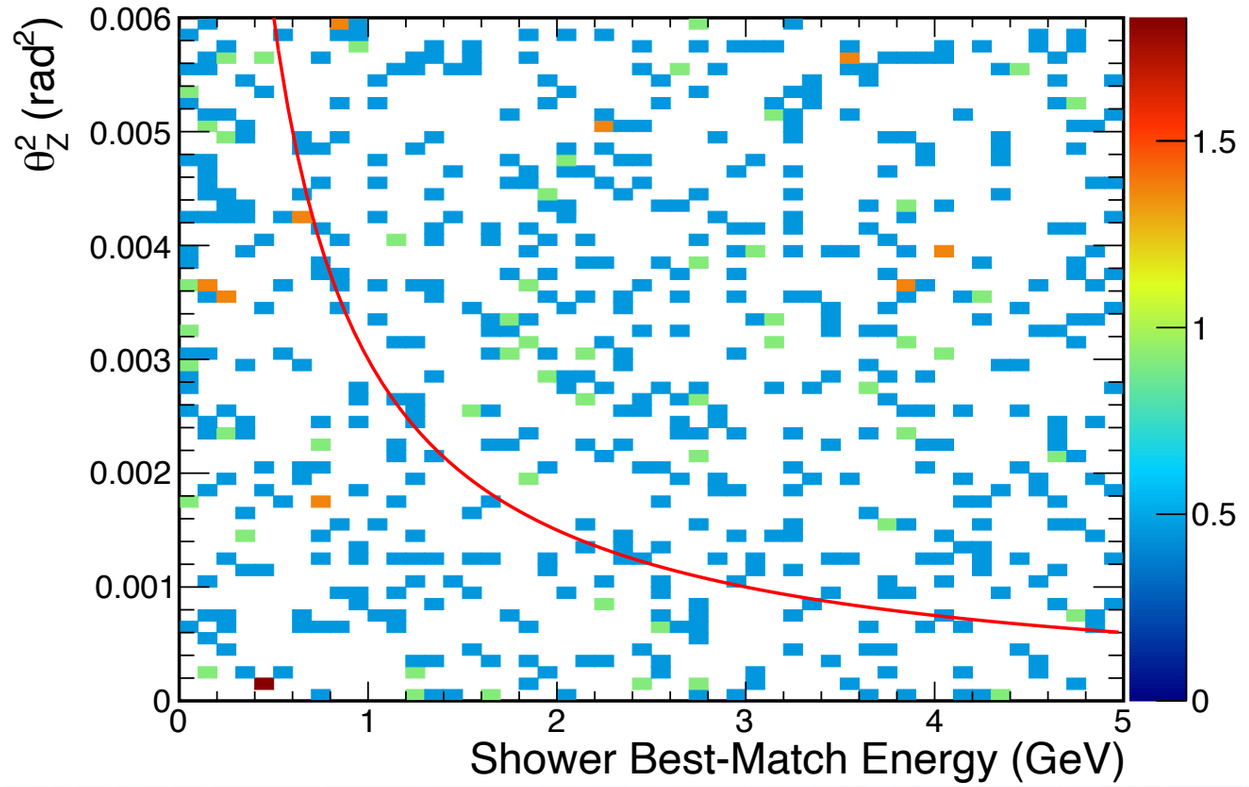
SELECTION (TRUE VARIABLES)

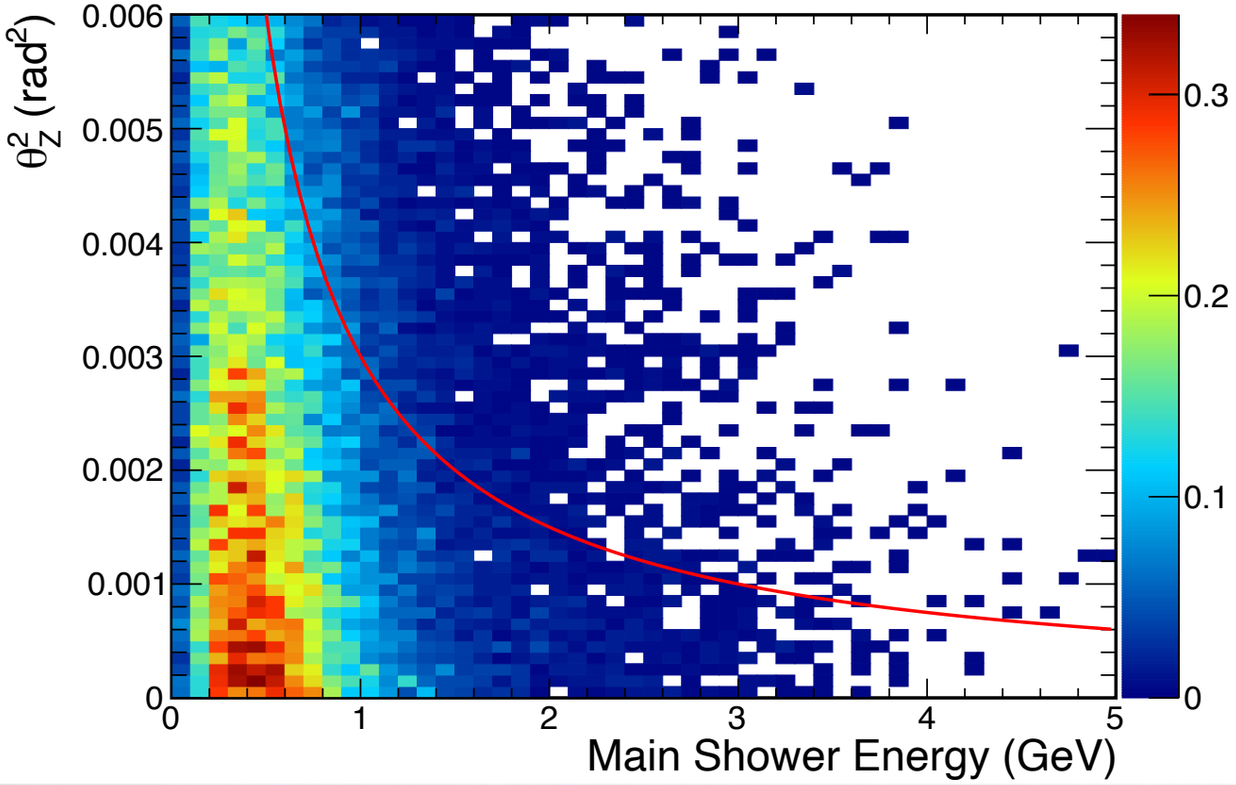


Signal

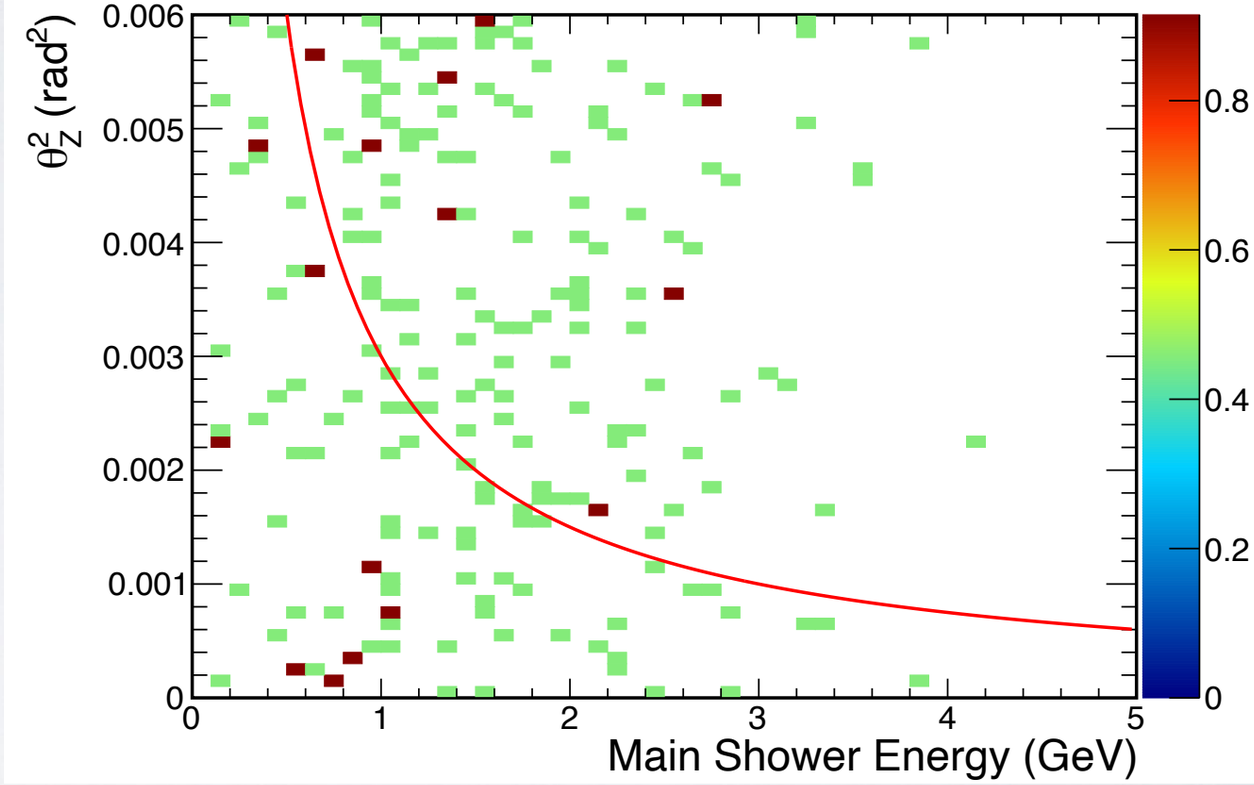


Background

Selection (Reco variables)



Signal



Background

Conclusions

- There's a significant shift both in the reconstruction of the energy and the direction of the electromagnetic shower
    - There appears to be a group of showers for which the reconstruction os significantly closer: understand
- The shift in the direction shows for the signal, but not so much for the background
    - To be understood