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Phi asymmetries in the MPF Method

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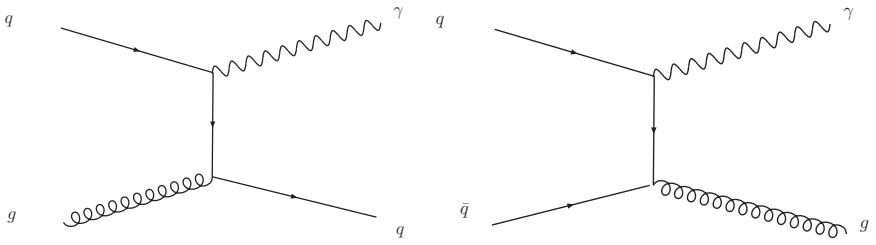
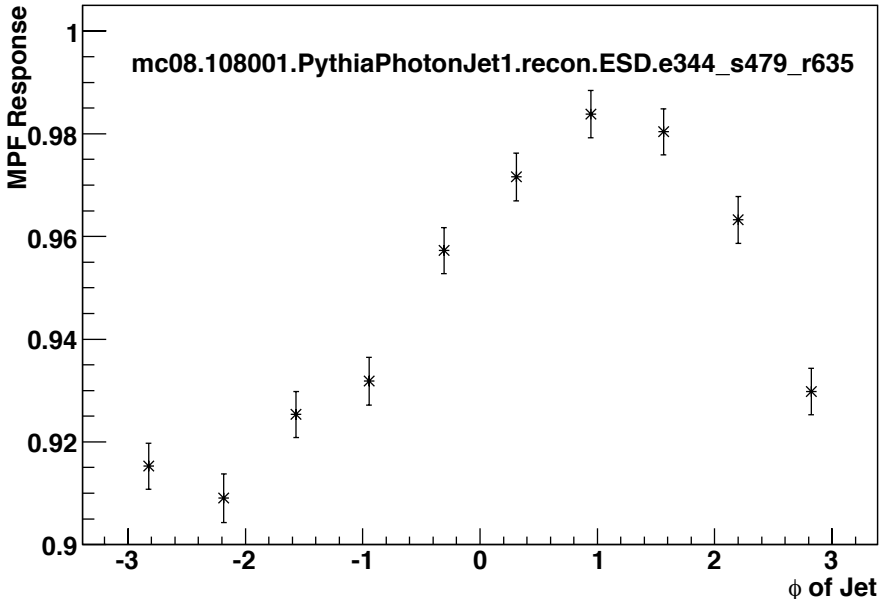
MPF Method and Phi Asymmetry





• The MPF (Missing Et Projection Fraction) defines the response,

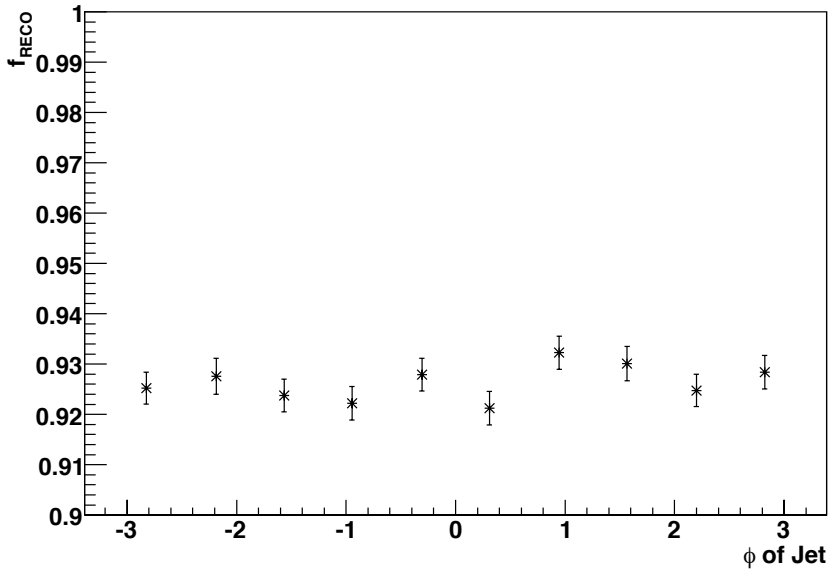
$$j = -\frac{\sum \vec{E}_T \bullet \hat{n}_\gamma^T}{\vec{E}_T^\gamma}$$

using the photon energy, $\vec{E}_T^\gamma$, direction of the photon, $\hat{n}_\gamma^T$, and a sum over the energy deposits in the calorimeter

• Compare to

$$f_{RECO} = \frac{E_T^{jet}(measured)}{E_T^{jet}(truth)}$$

•ϕ asymmetry present in MPF response, look for sources…



Beam Spot Displacement

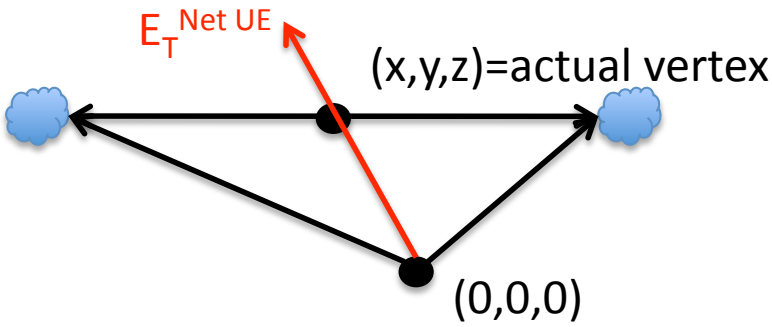
- Reconstruction version (r635) has a beam spot displacement of (x,y,z)=(1.5,2.5,-9)mm.
- This results in a net E_T from underlying event (UE)
- Contribution from this net E_T to the response

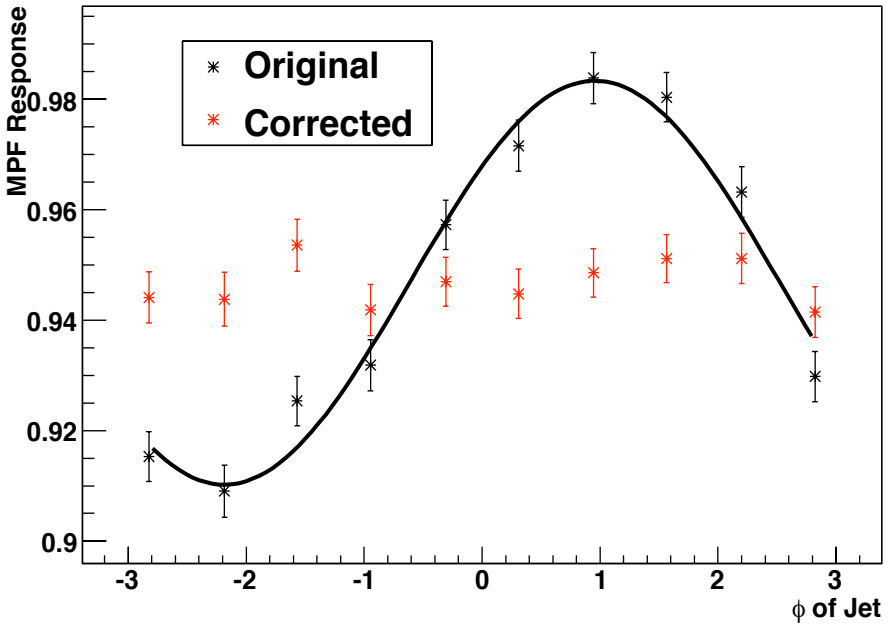
$j = j_{RECO} + j_{UE}$ ← $\frac{\vec{E}_T^{net,UE} \cdot \hat{n}_\gamma^T}{\vec{E}_T^{\gamma}}$

- Beam spot displacement should not affect the ϕ-averaged response
- Could correct this with two approaches:

1. Model by cosine function (right)
   - Good fit (χ^2/dof≈1.2)
   - ϕ distribution is flat if model is used to correct the response
   - ϕ average response is probably fine
2. Correct individual topoclusters to real primary vertex, preferred method, work in progress

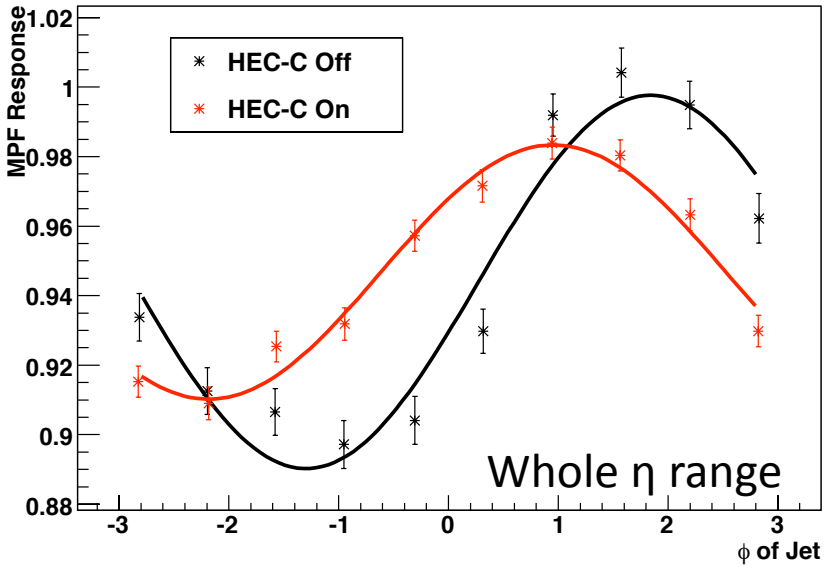
Net E_T direction due to extrapolation to assumed vertex (0,0,0)

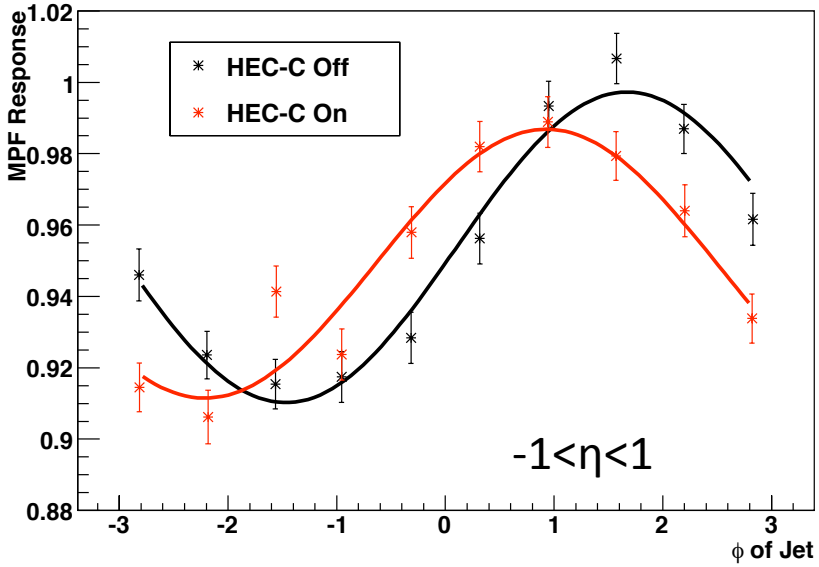




Detector “damage” on MPF method

- Examined PhotonJet e344_s456_r545
  - ➢ One HEC-C quadrant turned off ($-\pi/2<\Phi<0$) in reconstruction r545
  - ➢ Beam spot displacement
- Whole detector plot (top):
  - ➢ Huge dip at $\phi \approx -1$: Jet could be in the turned off HEC-C quadrant
  - ➢ Not well described by cosine function (because of jets in HEC-C quadrant)
- Part of detector away from the HEC-C (bottom):
  - ➢ Jets well measured, $E_T^{Net,UE}$ from HEC-C
  - ➢ Amplitude of asymmetry similar, distribution shifted
  - ➢ Mixture of $E_T^{Net,UE}$ from beam spot displacement and detector damage
- No observed effect from detector “damage” on ϕ-averaged MPF response (if jets are not in damaged region)





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Summary

- Phi asymmetry studied for MPF method
- Beam spot displacement understood to be due to net UE direction
  - Should correct topocluster (η,ϕ,E_T) using primary vertex
- Detector damage does not affect MPF method for jets in central “control” region
  - No observed phi-averaged difference between r545 and r635 samples