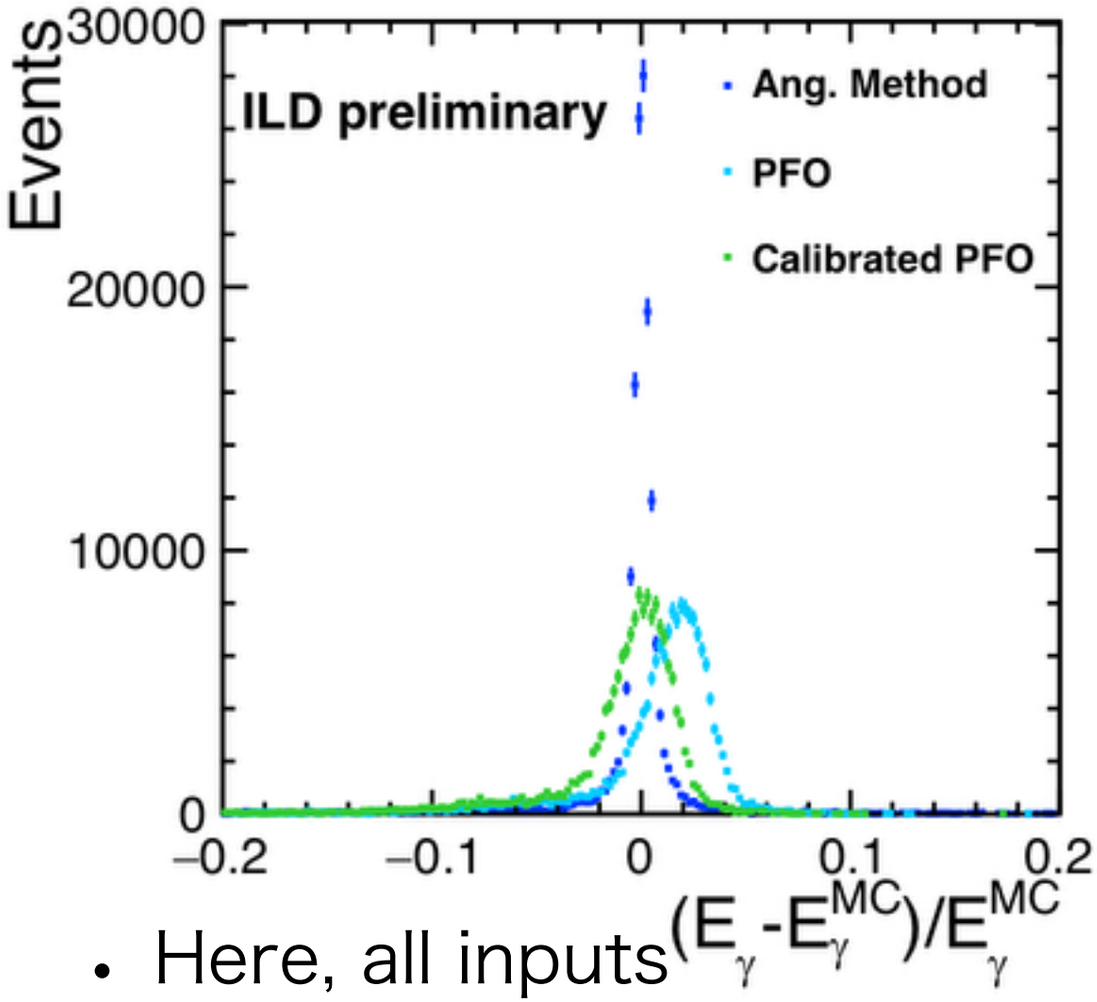
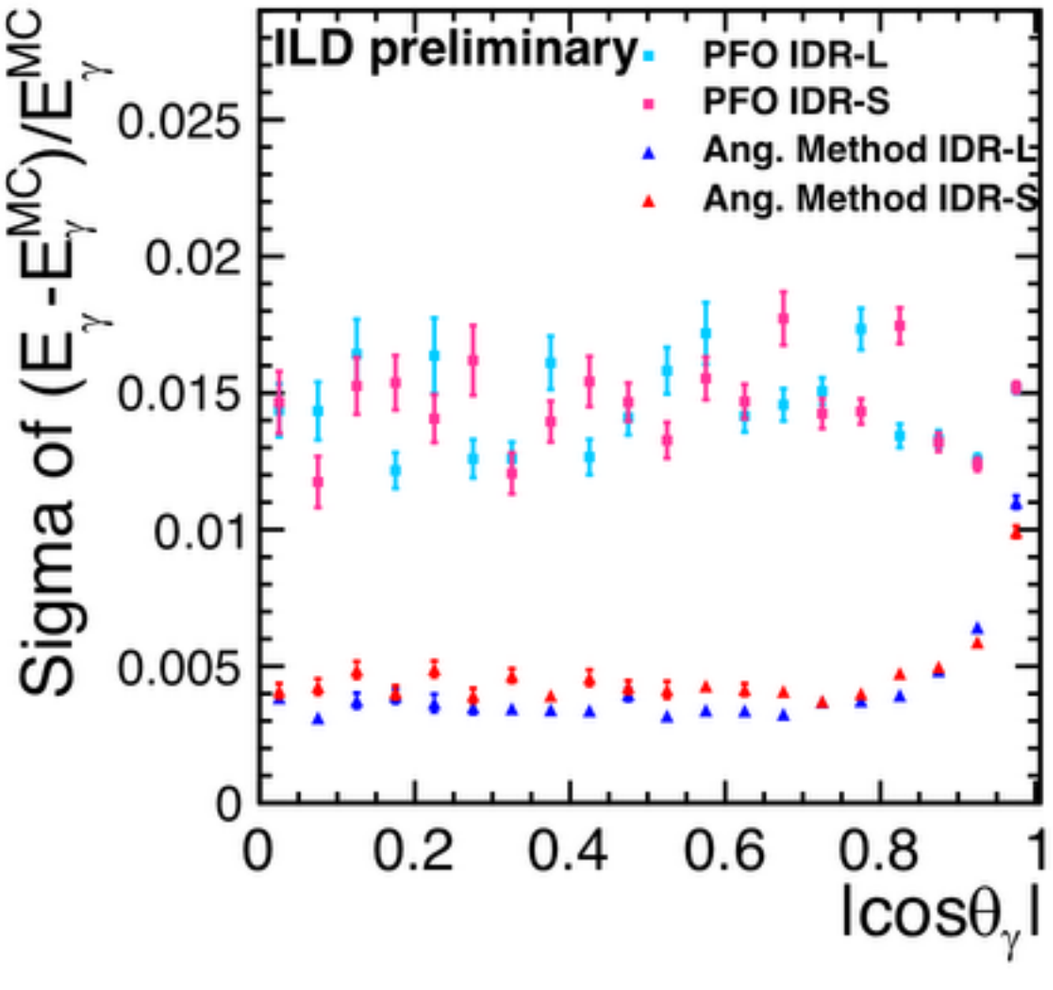
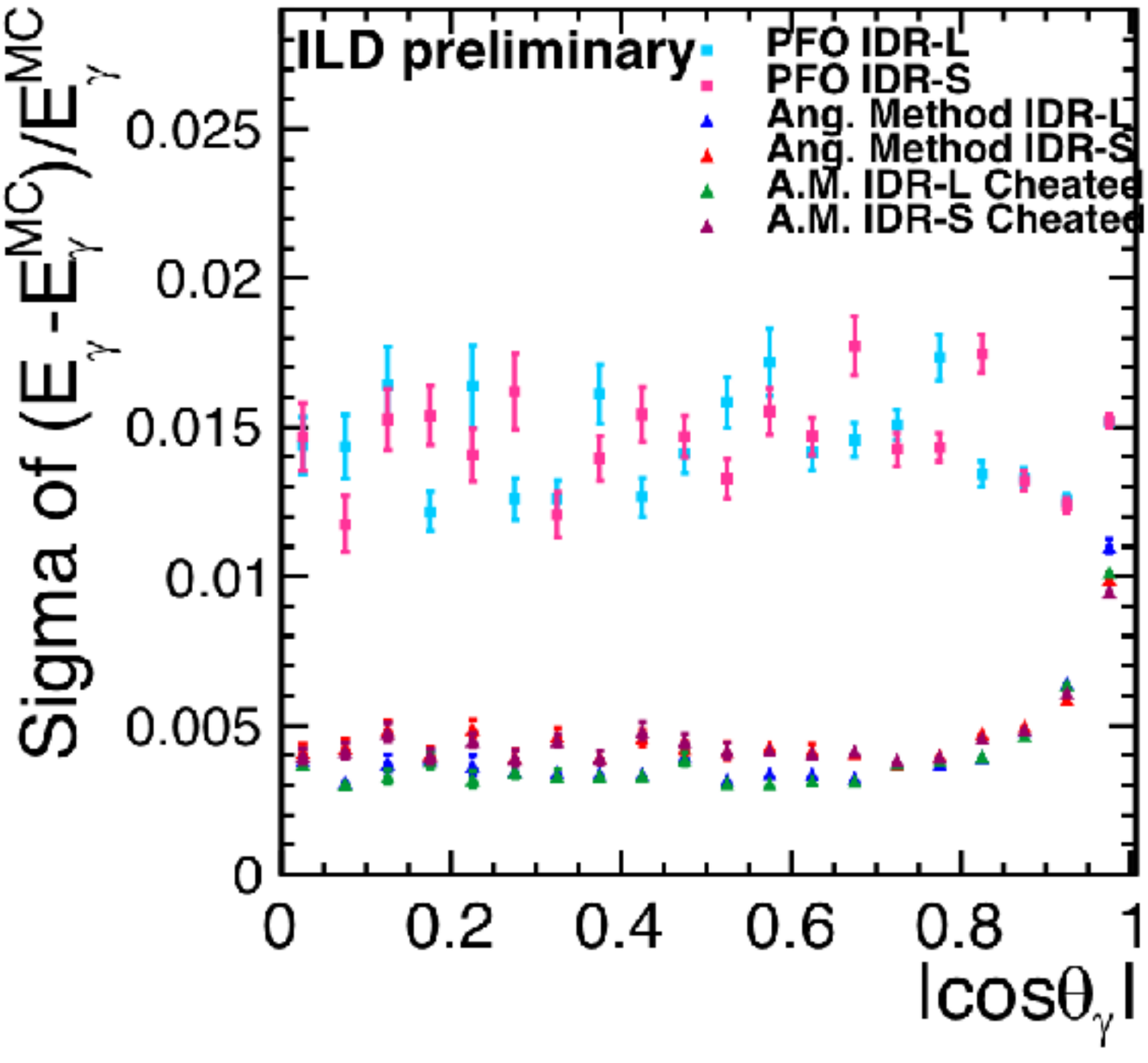
- e^+e^- -> γZ -> $\gamma \mu^+\mu^-$ process
  Photon energy reconstruction
  $\{\theta_{\mu^-}, \theta_{\mu^+}, \theta_{\gamma}, \phi_{\mu^-}, \phi_{\mu^+}, \phi_{\gamma}, E_{\mu^-}, E_{\mu^+}\}$ -> $\{E_{\gamma}, EISR\}$
  Defined as “Ang. Method”



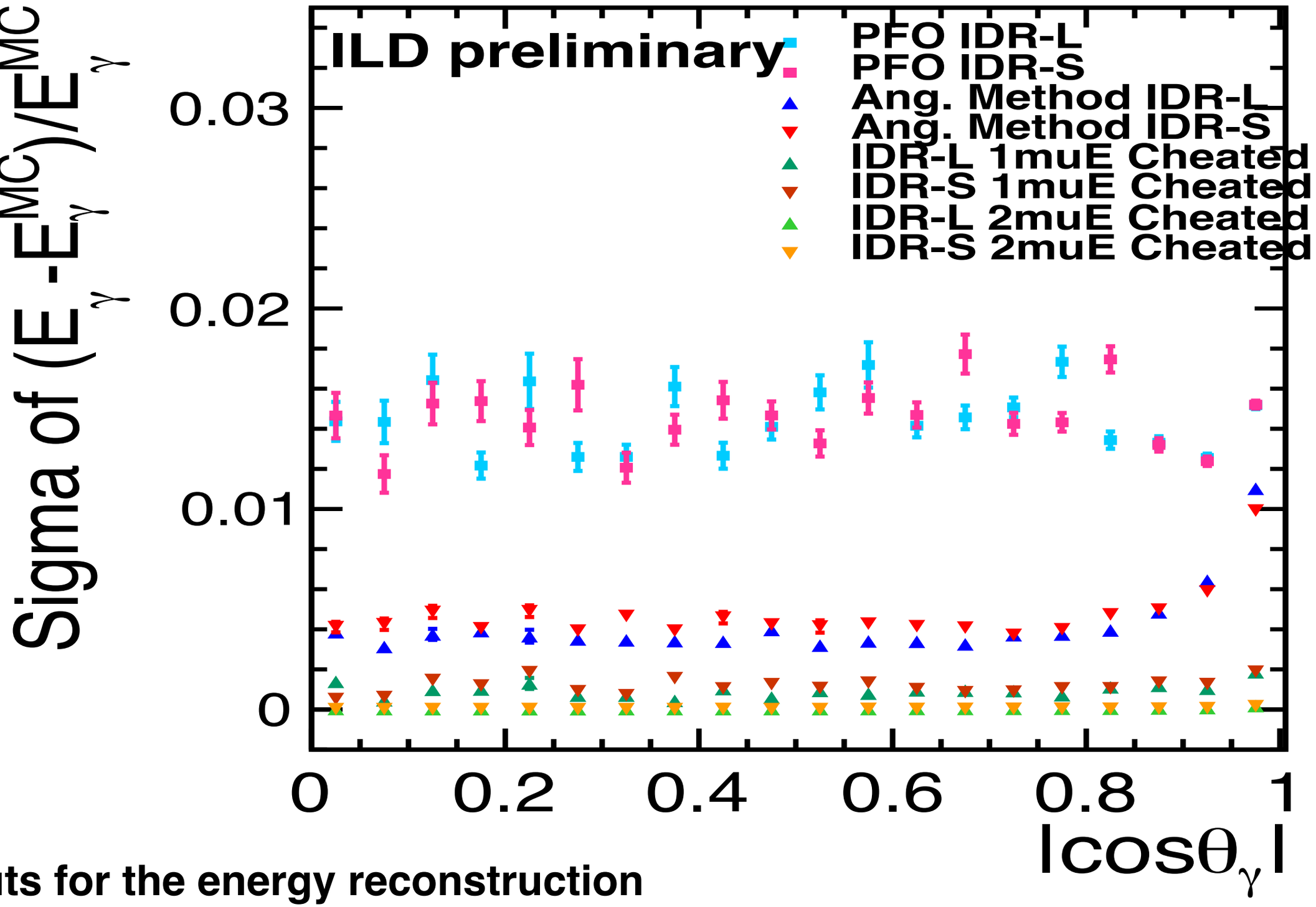


- Here, all inputs $\{\theta_{\mu^-}, \theta_{\mu^+}, \theta_{\gamma}, \phi_{\mu^-}, \phi_{\mu^+}, \phi_{\gamma}, E_{\mu^-}, E_{\mu^+}\}$: PFO
  Relationship with the detector performance aspects is checked.

Phi and theta of photon are slightly biased.
Comparison between resolution using MCtruth angles of photon and resolution using PFO angles of photon is made.



<Resolution>
the highest |cosθγ| bin
-> changed
Other bins
-> No difference



Inputs for the energy reconstruction

"Ang. Method": PFO (θμ-,θμ+,φμ-,φμ+,Eμ-,Eμ+) + MCtrue (θγ,φγ)

"1muE Cheated": PFO (θμ-,θμ+,φμ-,φμ+,Eμ+) + MCtrue (θγ,φγ,**Eμ-**)

"2muE Cheated": PFO (θμ-,θμ+,φμ-,φμ+) + MCtrue (θγ,φγ,**Eμ-**,**Eμ+**)

DIFFERENT from the definition in the IDR

Photon energy resolution is largely affected by momentum resolution of muons.

$$\begin{cases} E_\mu + E_{\mu^+} + E_\gamma + |P_{ISR}| = 500 \\ E_\mu sin\theta_\mu sin\phi_\mu + E_{\mu^+} sin\theta_{\mu^+} sin\phi_{\mu^+} + E_\gamma sin\theta_\gamma sin\phi_\gamma = 0 \end{cases}$$

Using propagation of errors in the second equation,

$$\frac{\sigma(E_\gamma)}{E_\gamma} = \frac{a\sqrt{E_\mu^4 sin^4\theta_\mu sin^2\phi_\mu + E_{\mu^+}^4 sin^4\theta_{\mu^+} sin^2\phi_{\mu^+}}}{E_\mu sin\theta_\mu sin\phi_\mu + E_{\mu^+} sin\theta_{\mu^+} sin\phi_{\mu^+}}$$

,where "a" is $a = \frac{\Delta P_T}{P_T^2} = 2 \times 10^{-5}$

Assuming Eμ = 250 GeV, Eμ+ = 0 GeV, and sin* =1,
the resolution would be 2*10-5*250 =0.005,
which is consistent with the result of Ang. Method.
Photon energy resolution is largely affected by momentum resolution of muons.