Eta mass resolution in BCAL

Jefferson Lab

Introduction

E/P resolution in J/psi studies significantly worse in data than MC. Investigate whether BCAL resolution model in mcsmear through eta production.

$$\gamma p \to p\pi^+\pi^-(\eta \to \gamma\gamma)$$

Kinematic fit excluding eta mass (pimpipeta_resolution plugin)

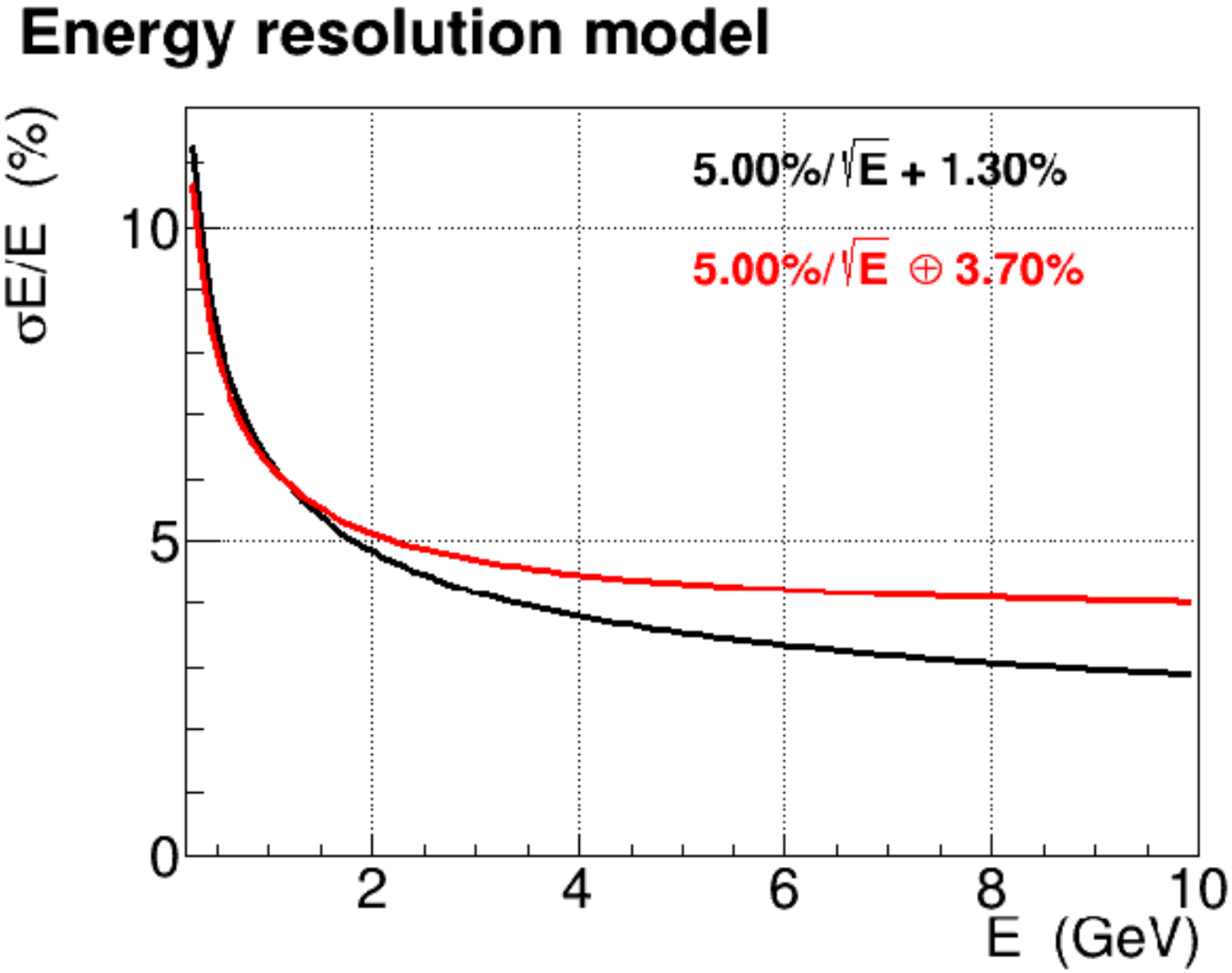
Data	**Simulation**
	Signal only genr8, t slope -1
8 GeV < E < 10 GeV	E = 9 GeV
New analysis library Built in timing and PID cuts	Old analysis library no cuts
No accidental subtraction No combo-aware filling	No combo-aware filling

Modification of mcsmear

It was discovered that mcsmear was combining smearing terms in BCAL linearly instead of in quadrature. The was corrected and new constants obtained.

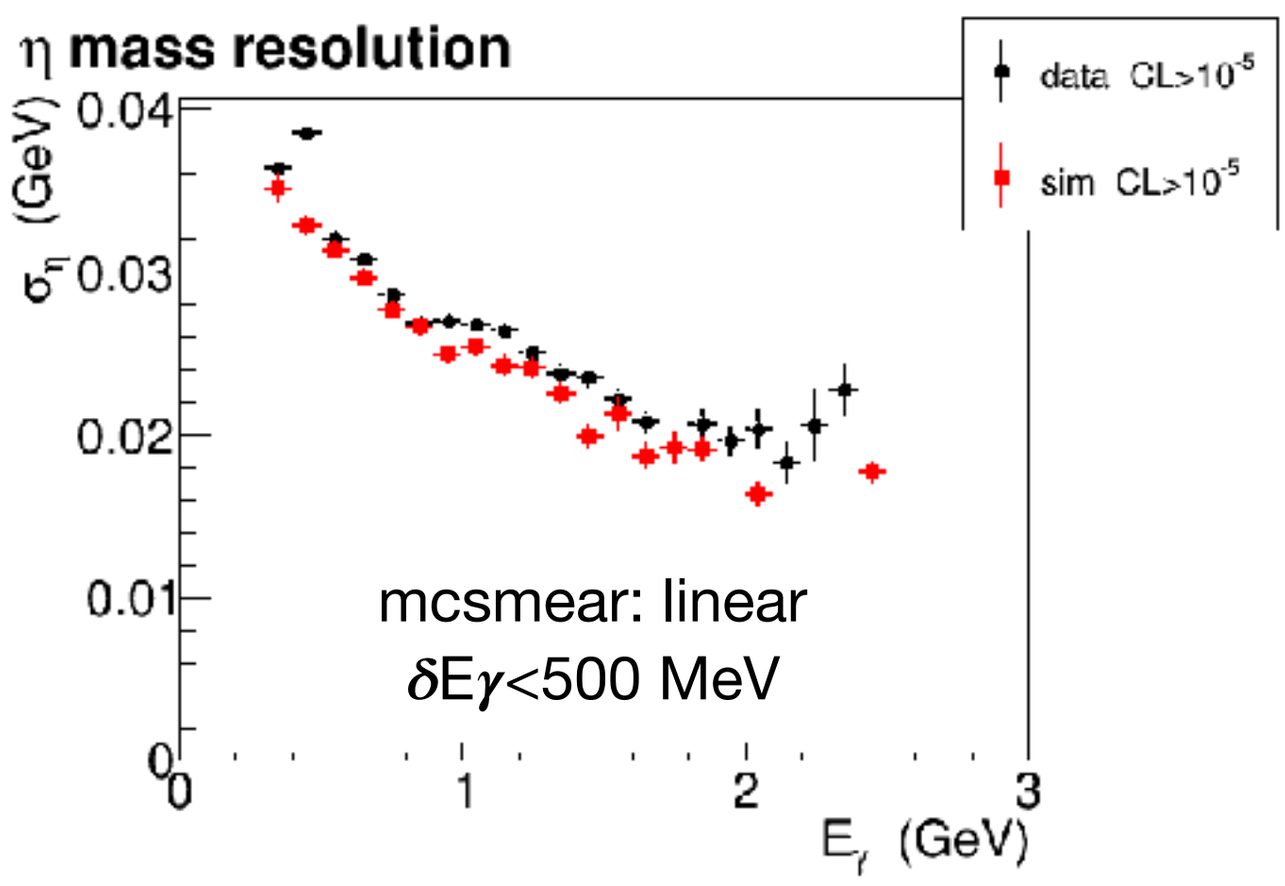
$$\frac{a}{\sqrt{E}} + b$$

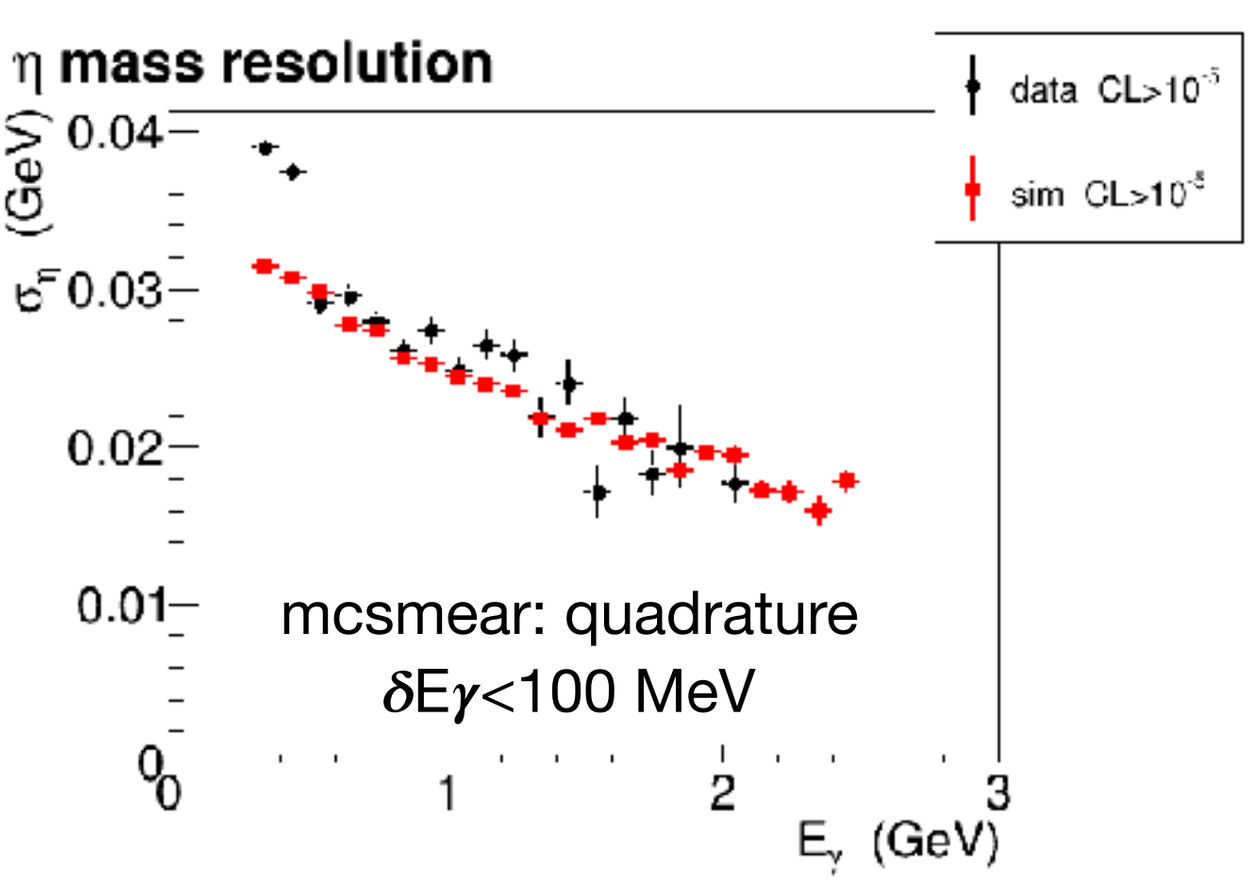
$$\sqrt{\left(\frac{a}{\sqrt{E}}\right)^2 + b^2}$$

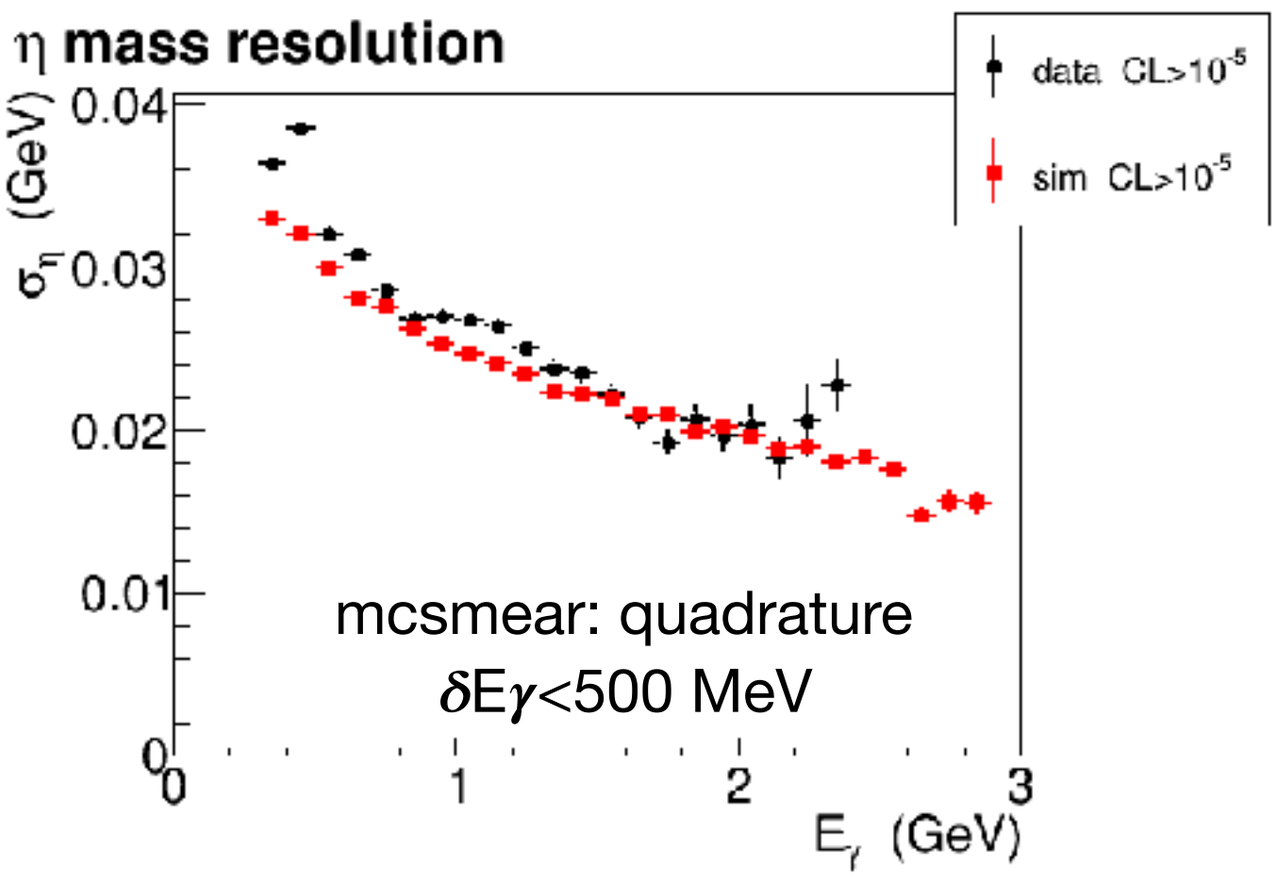


Eta mass resolution

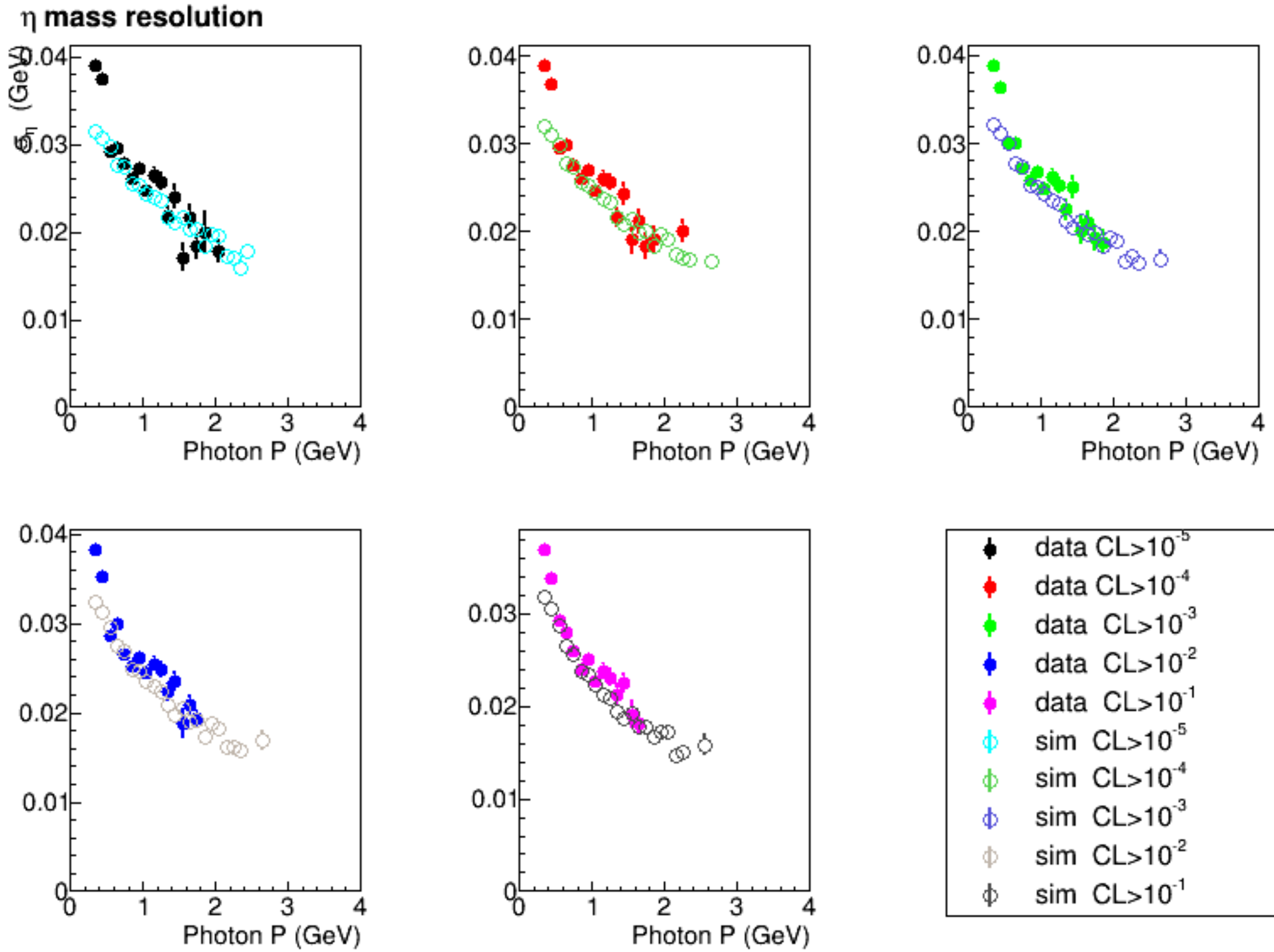
Symmetric photon cut



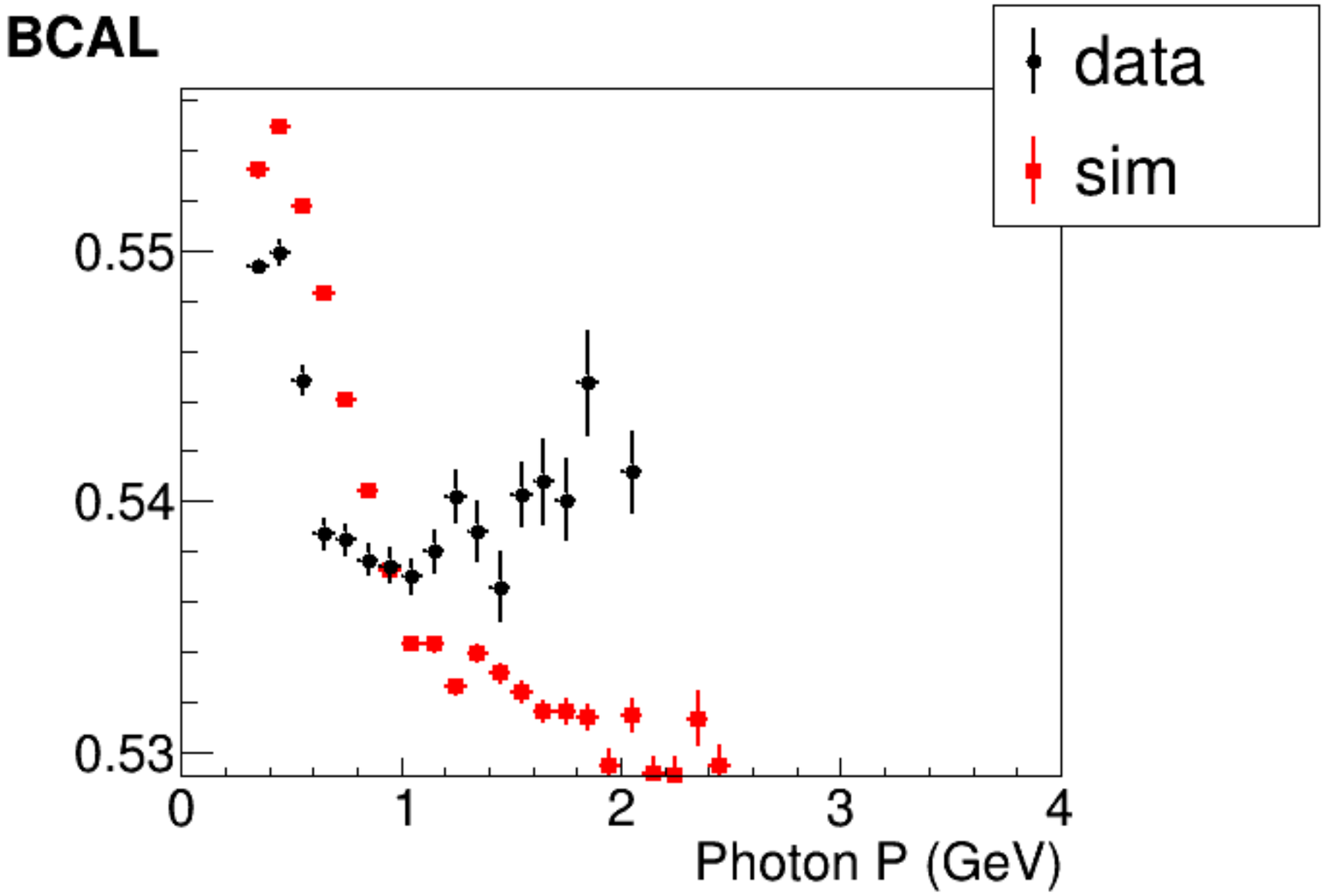




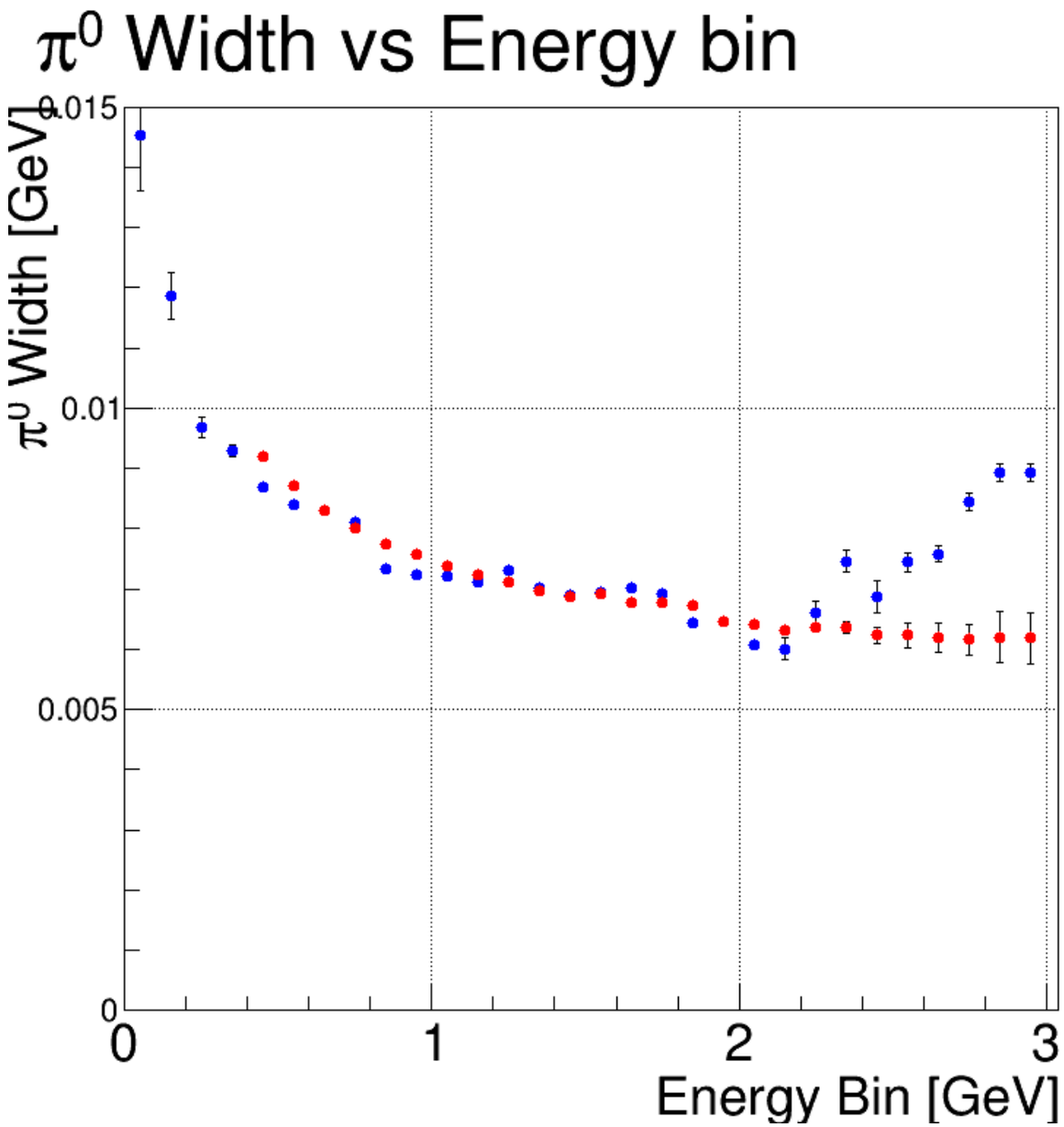
No Dependence on Confidence Level



Eta mass extraction



Pi0 width compare



Blue : MC
Red : data

After Mark's smearing fixes.

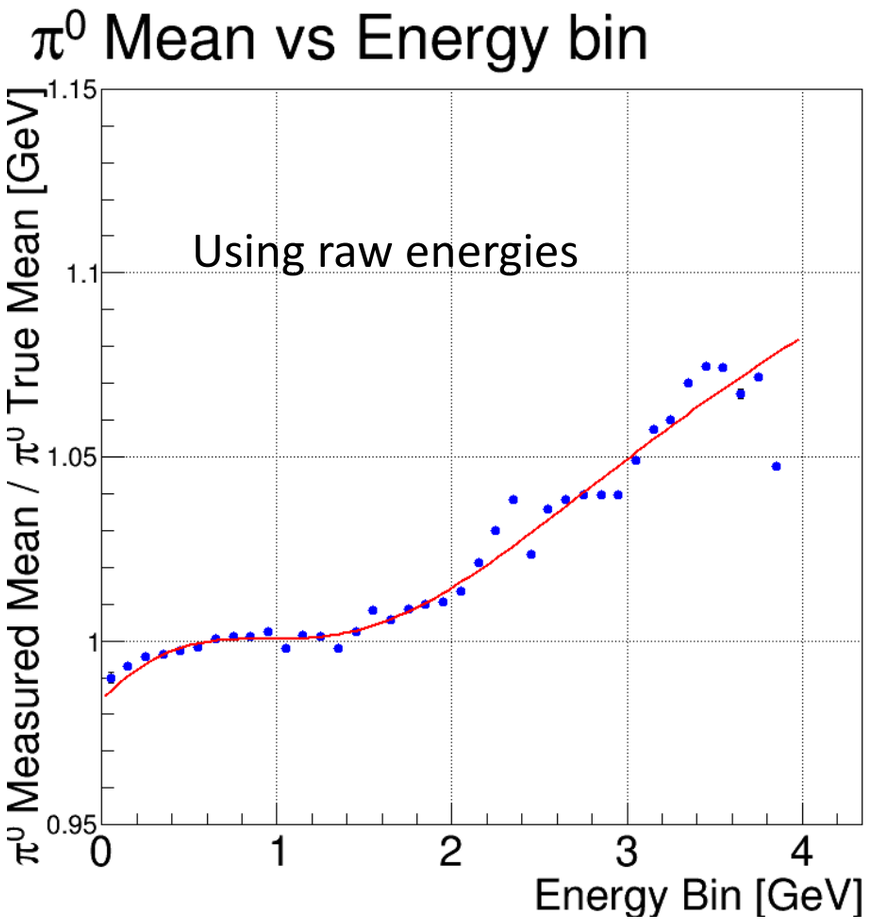
Will McGinley

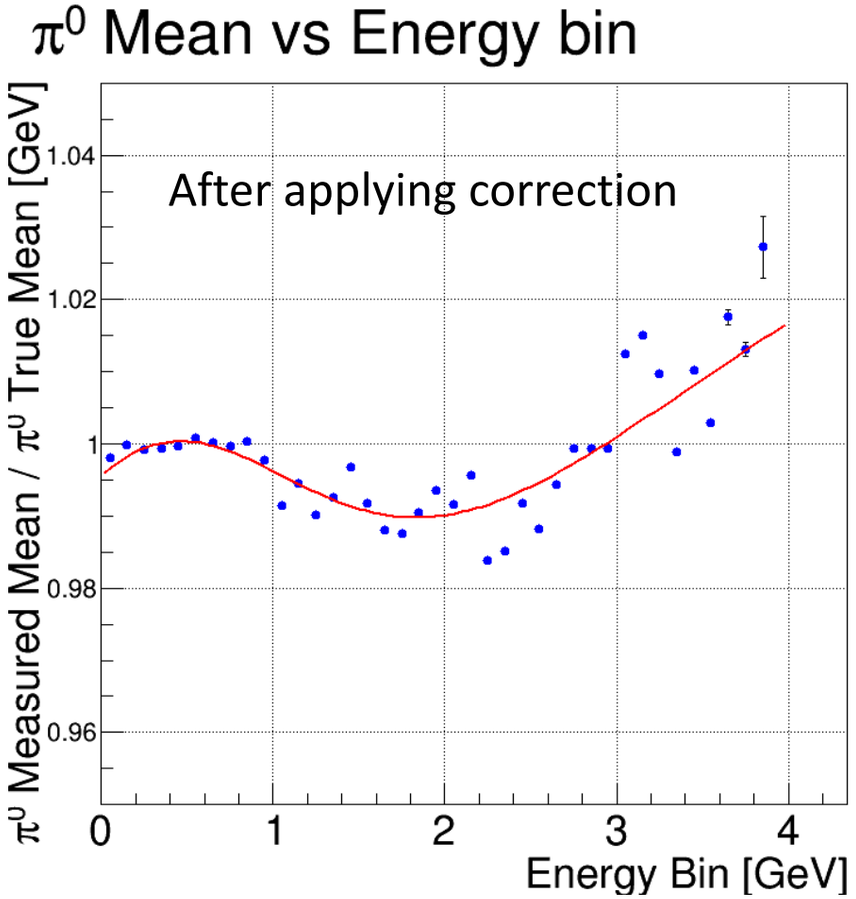
Geant3 Pi0 resolution

- Only looking after Mark's smearing fixes, but I have the data for the old stuff I can look at if interested.
- I applied a global scale factor to the gains of 1.033 to set the pi0 mass around the correct value before applying any corrections.
- Measured pi0 mean divided by the known pi0 mass (134.9MeV) vs energy symmetric bins

$$f(E) = p_0 - p_1 * exp^{(-p_2*E+p_3)} - \frac{p_4}{(p_5 + p_6 * exp^{(-E*p_7+p_8)})}$$

- f(0) = 0.984103, f(8GeV) = 1.12238

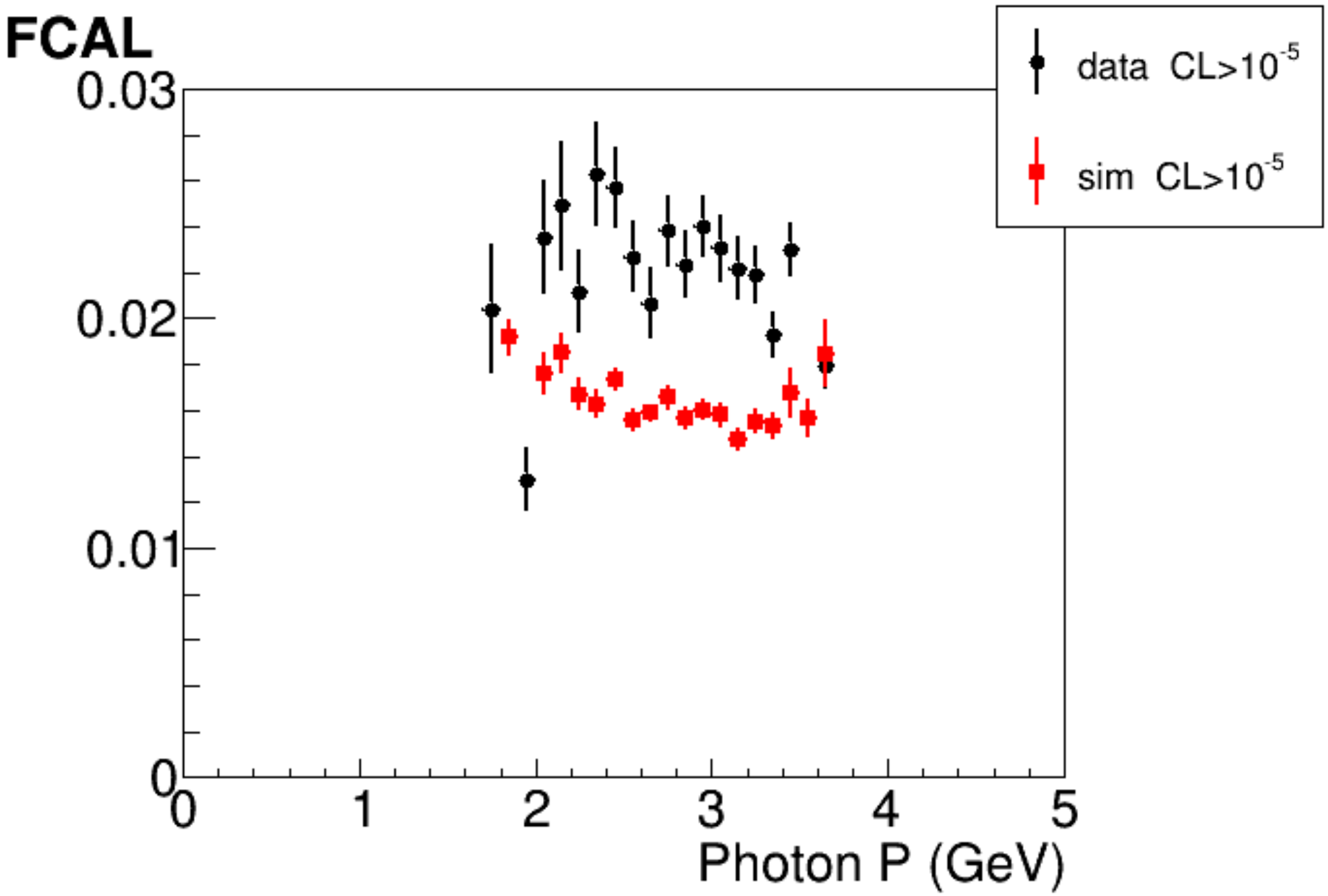




ıot too pretty but nostly better

FCAL

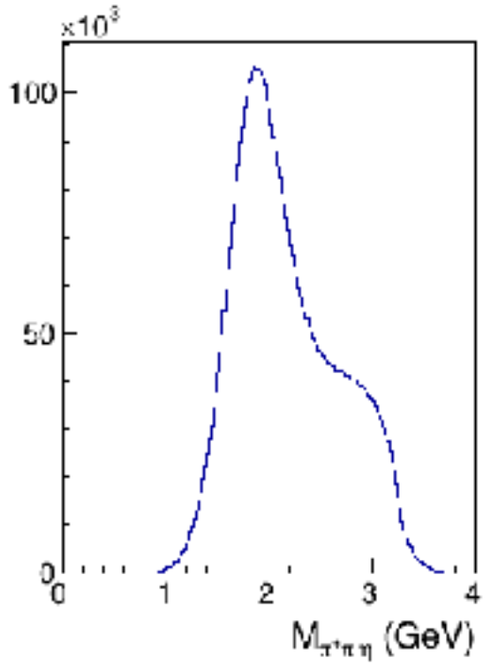
FCAL appears to be under-smeared

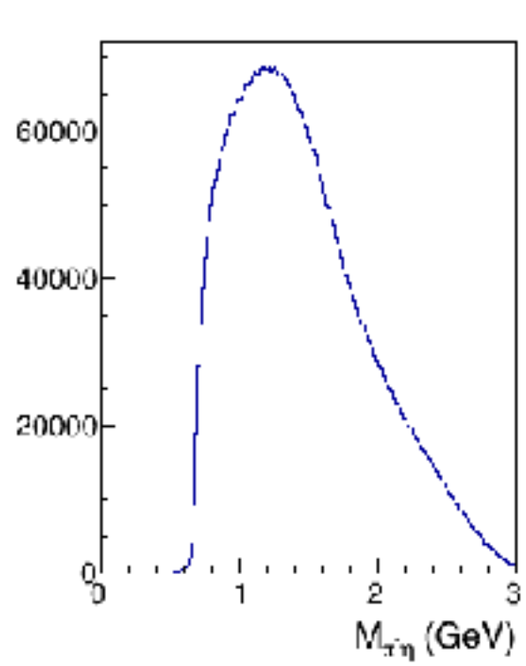


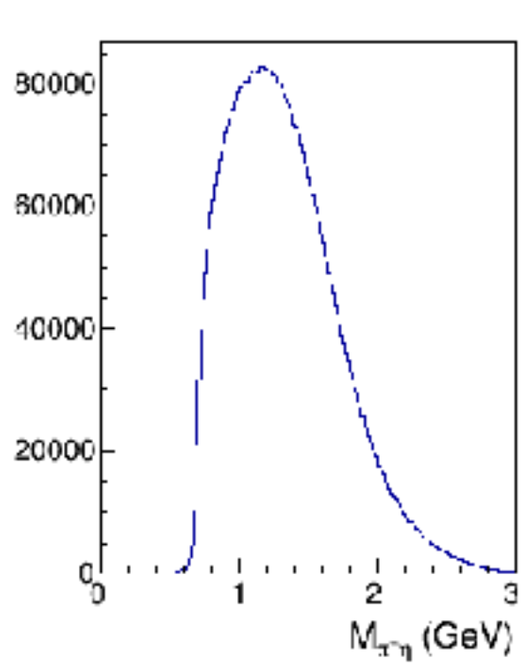
Comparison of distributions

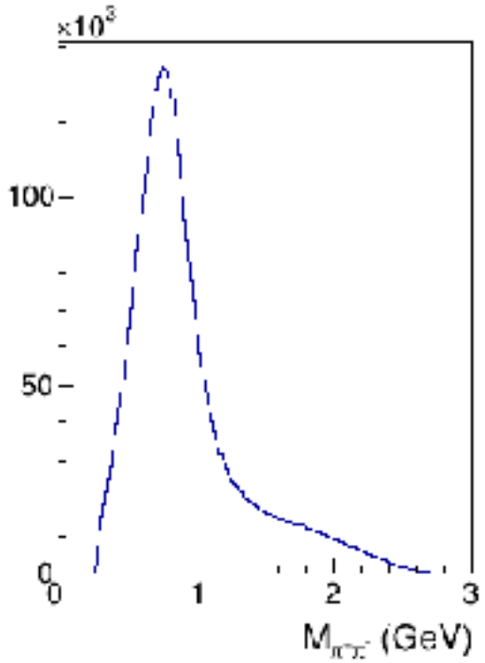
$CL > 10^{-6}$

Simulation

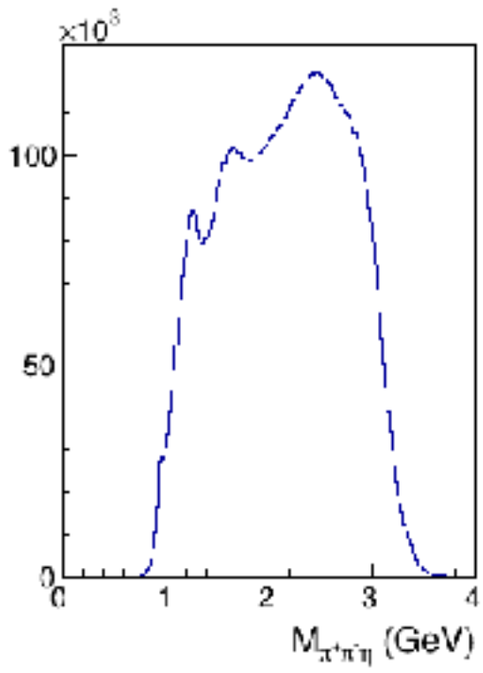


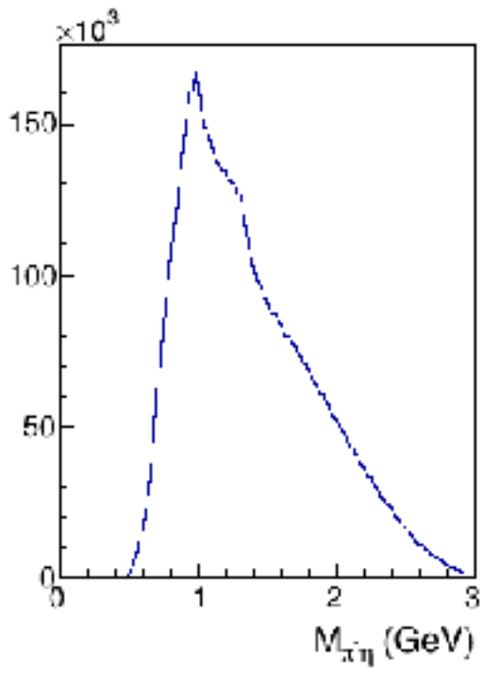


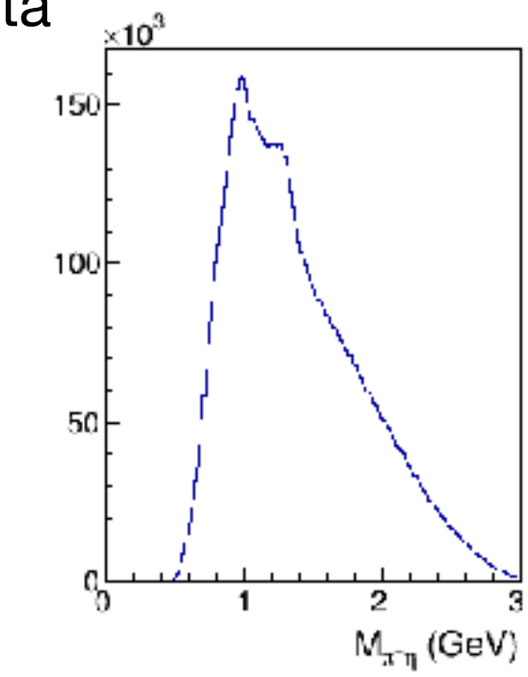


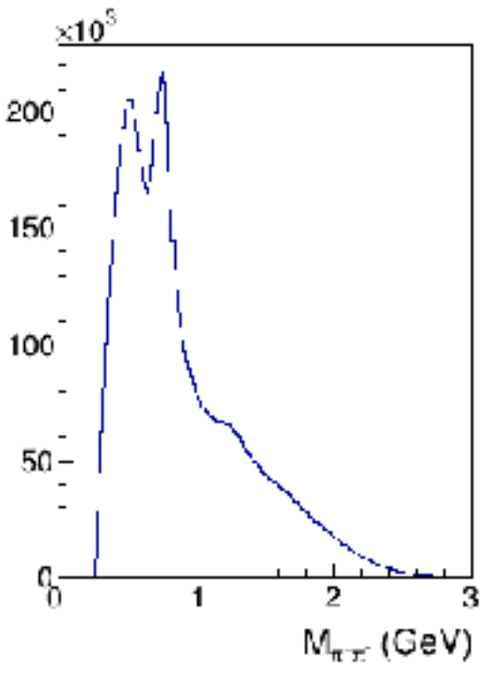


Data



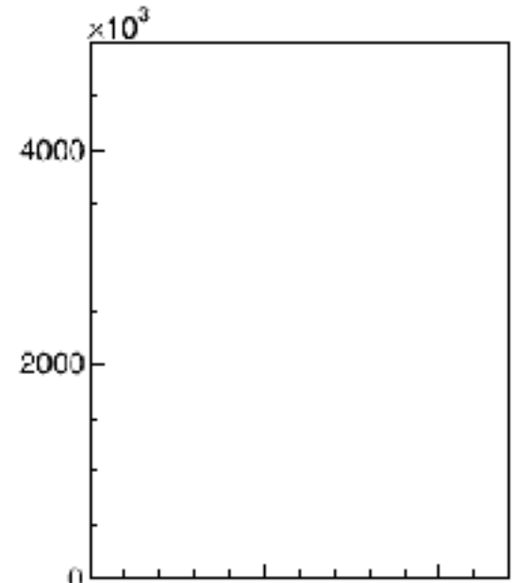


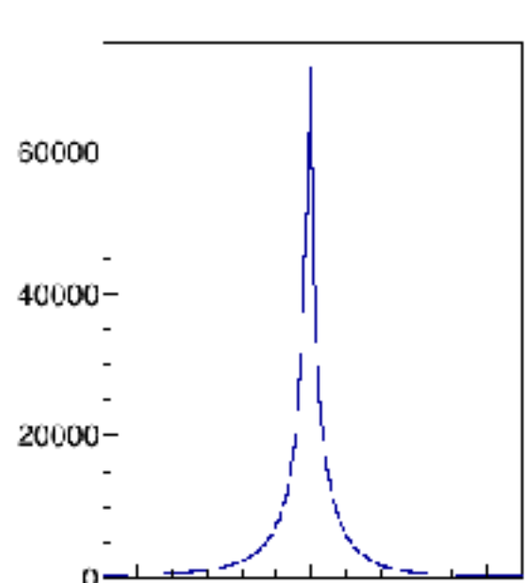


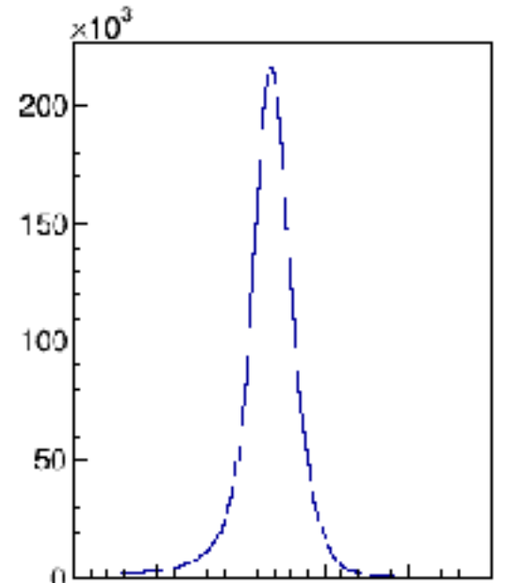


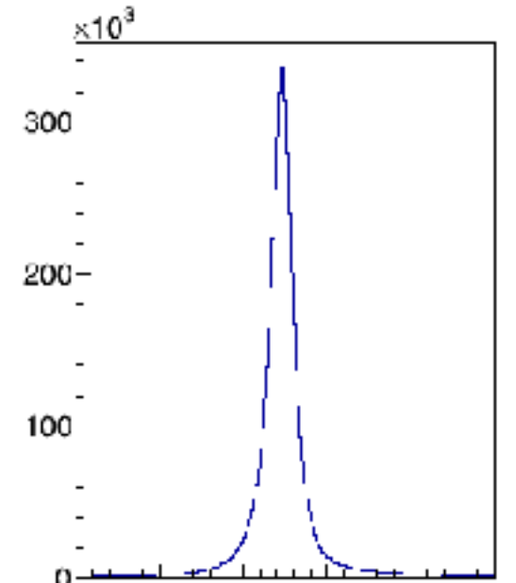
CL > 10^{-6}

Simulation

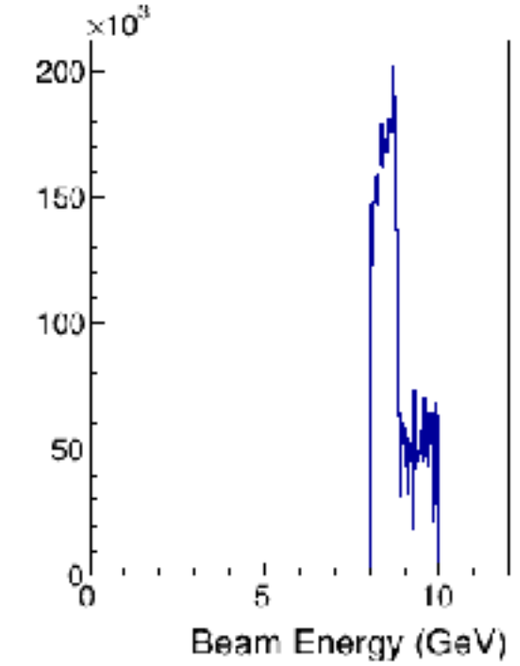


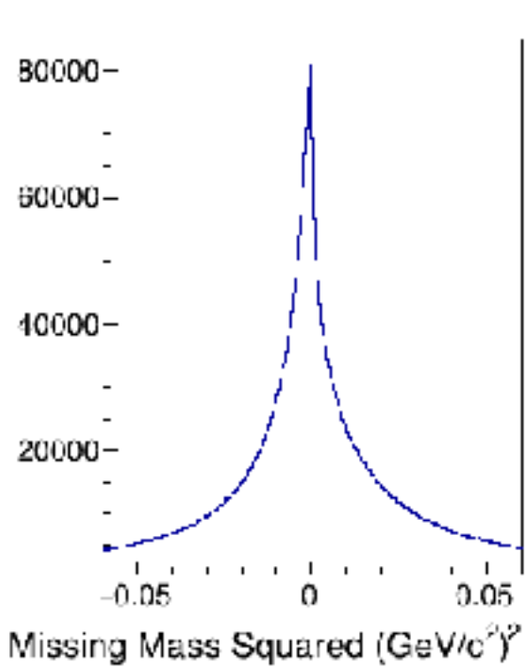


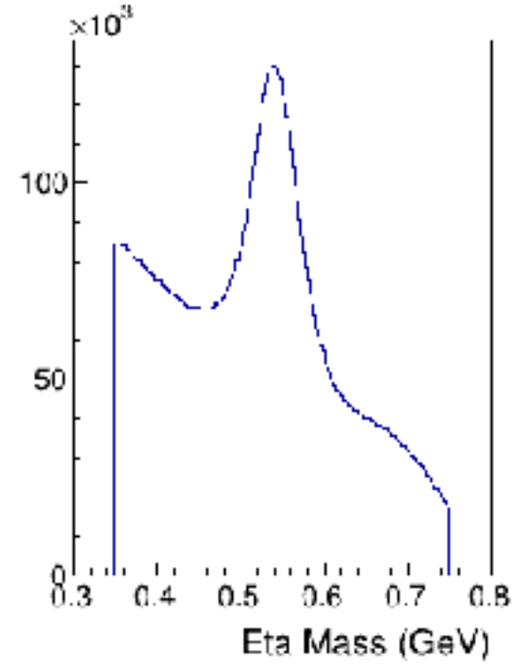


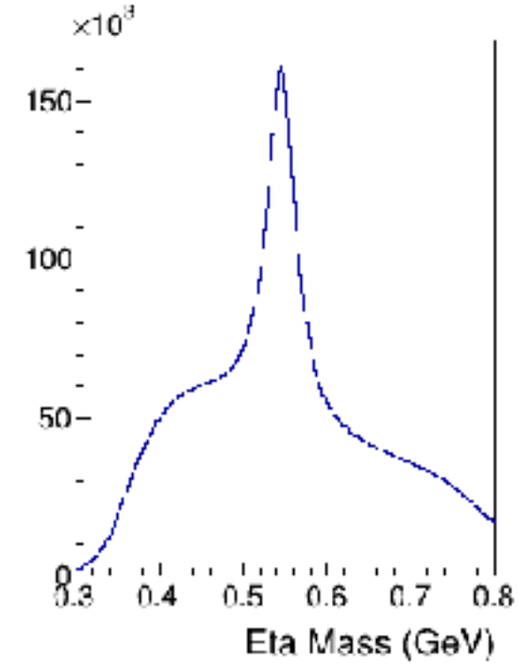


Data



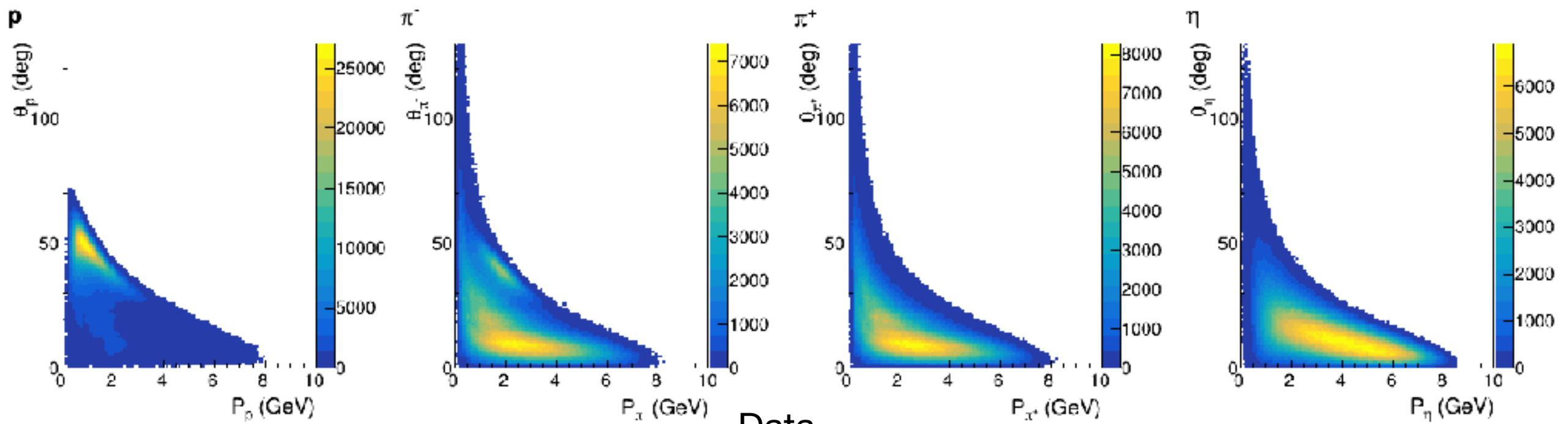




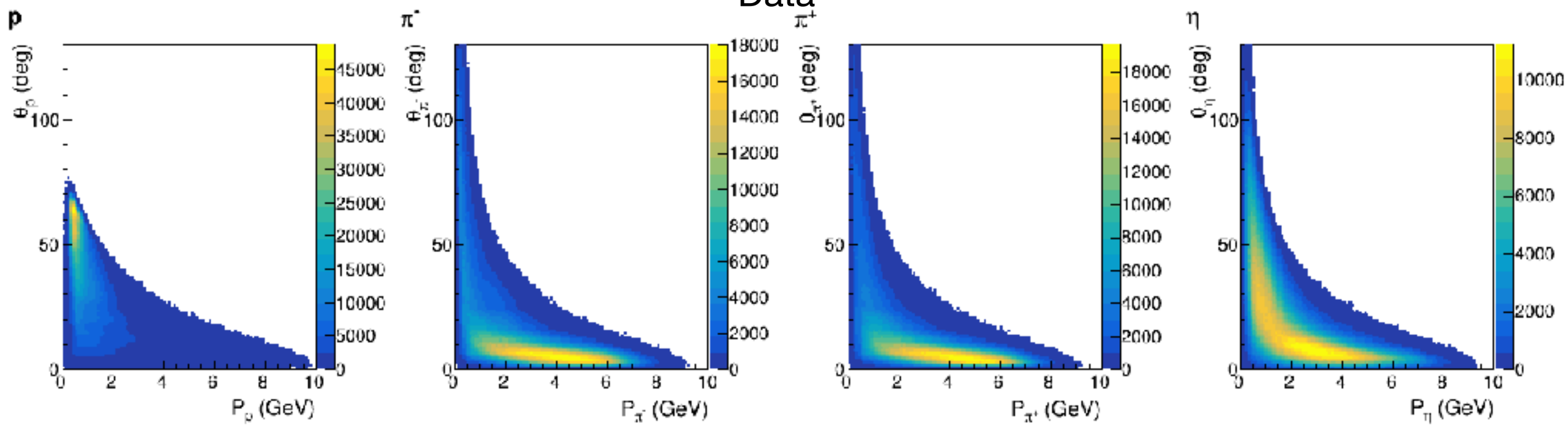


CL > 10^{-6}

Simulation

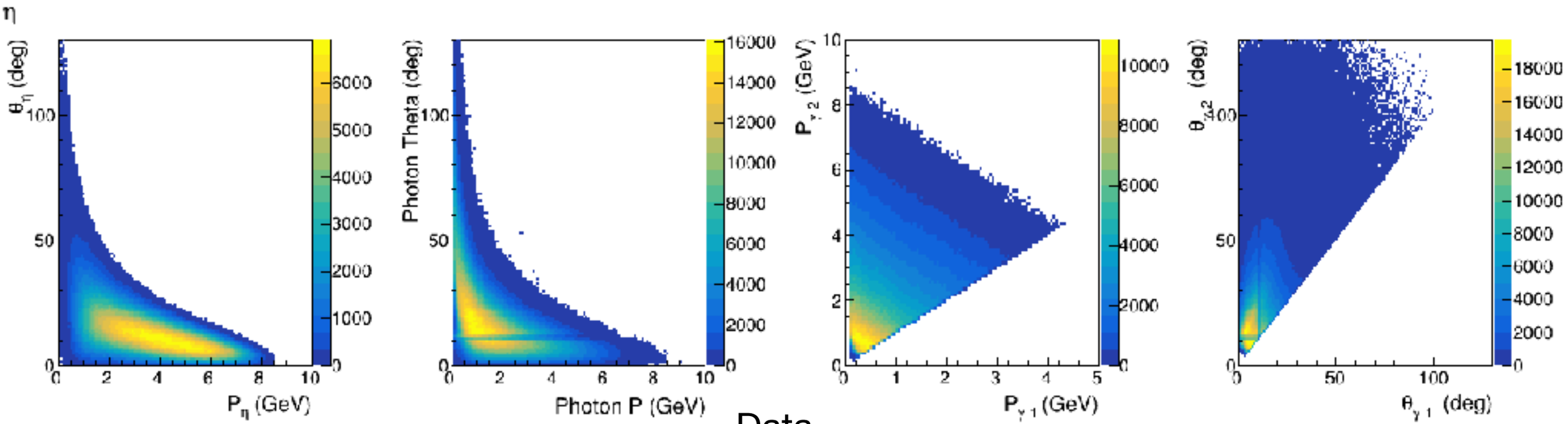


Data



CL > 10^{-6}

Simulation



Data