Update on momentum resolution measurement

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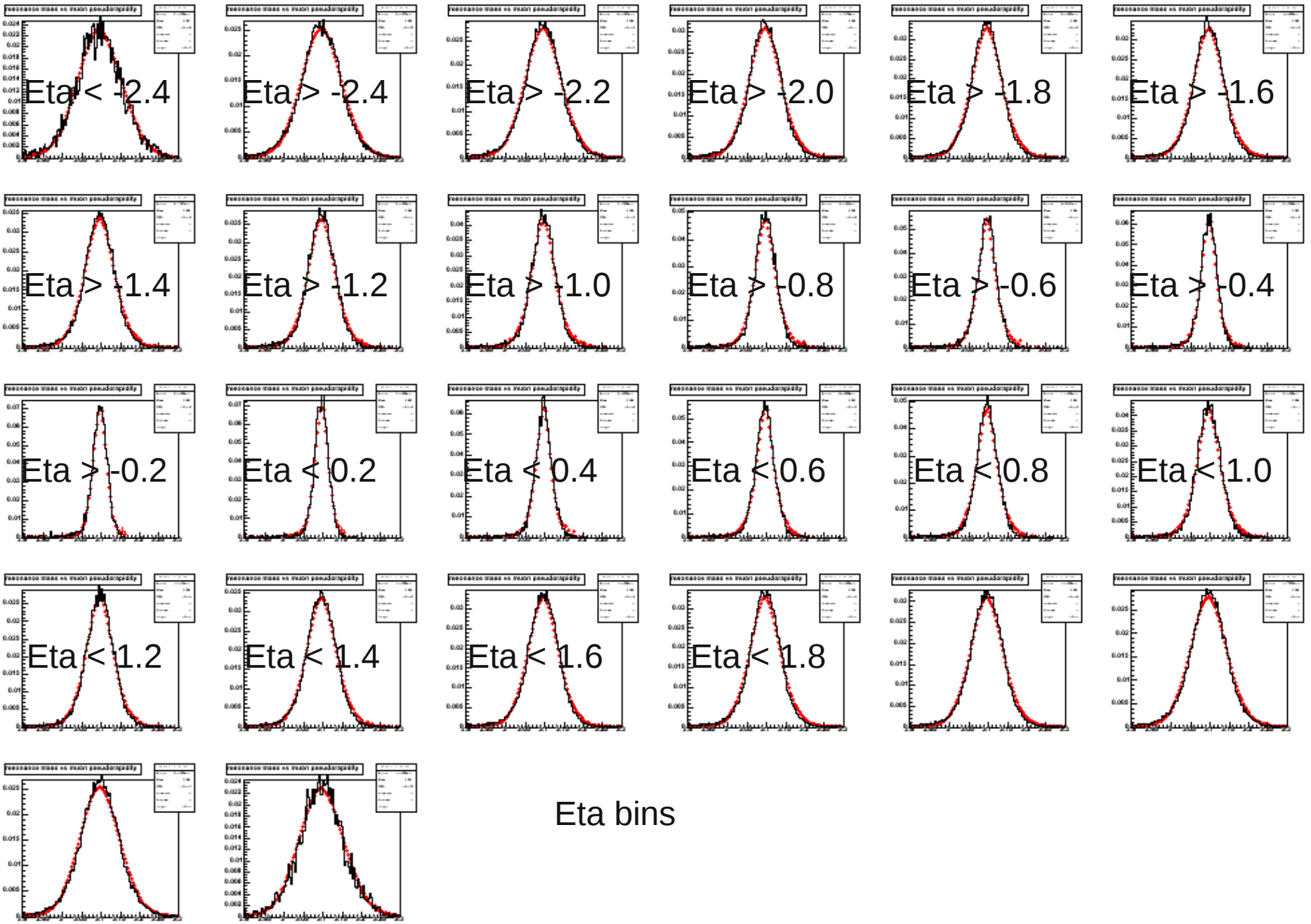
Introduction

- The old resolution fit suffered from a coarse background model
- The new detailed model allows to improve significantly the results of the fit
- How the background error is propagated in the resolution and scale fit errors is explained
- Finally, the updated results with 19/pb are shown for all the other plots of the paper

Resolution Fit

- The resolution fit was done after a background fit
- The background function used was a single exponential dependent only on the mass value
- This description can be improved taking into account the eta dependencies of the background shape

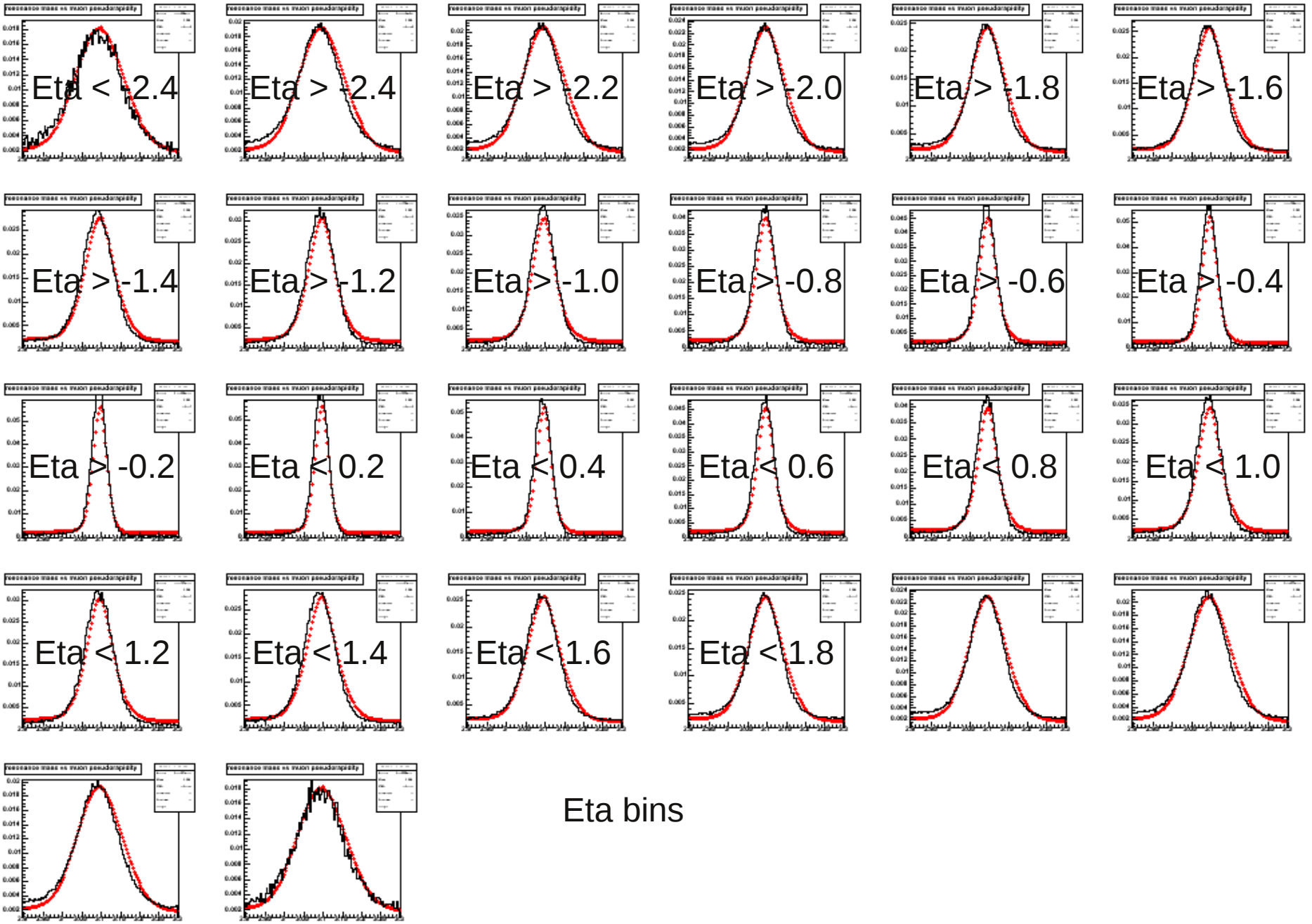
Fit on MC (J/Psi signal only)



Eta bins

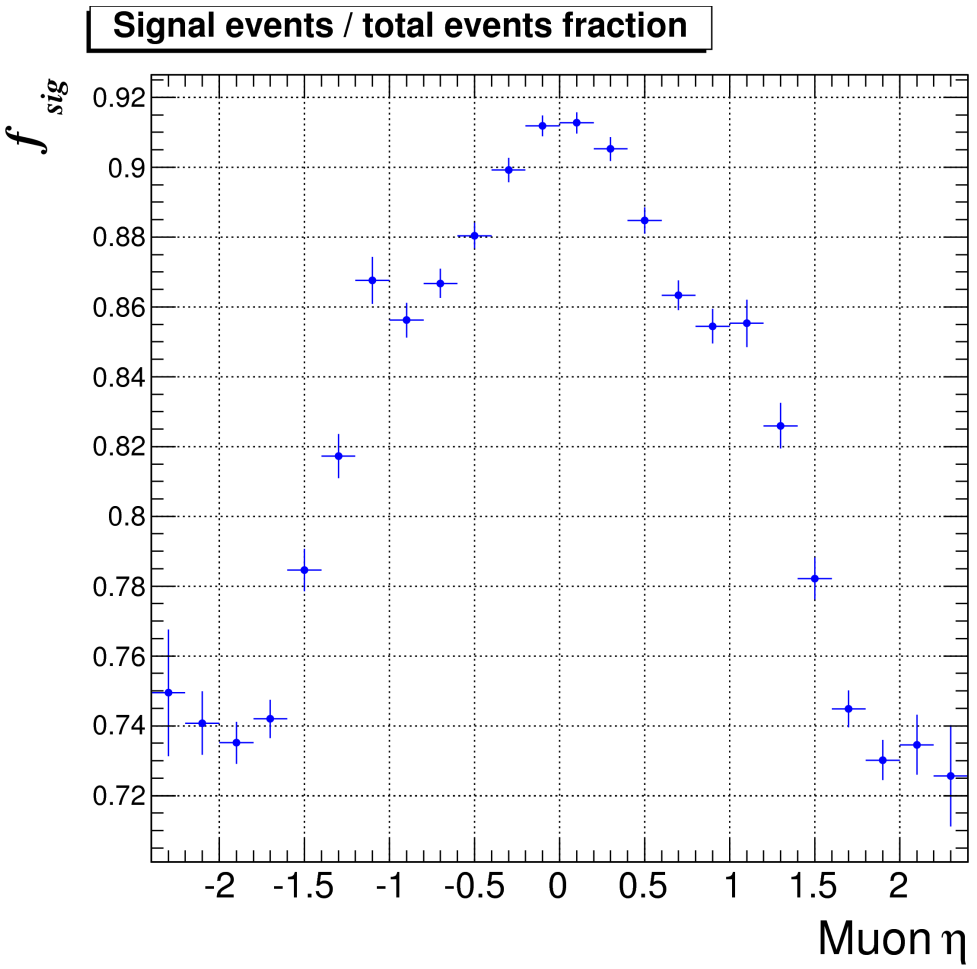
Calibration with old background fit

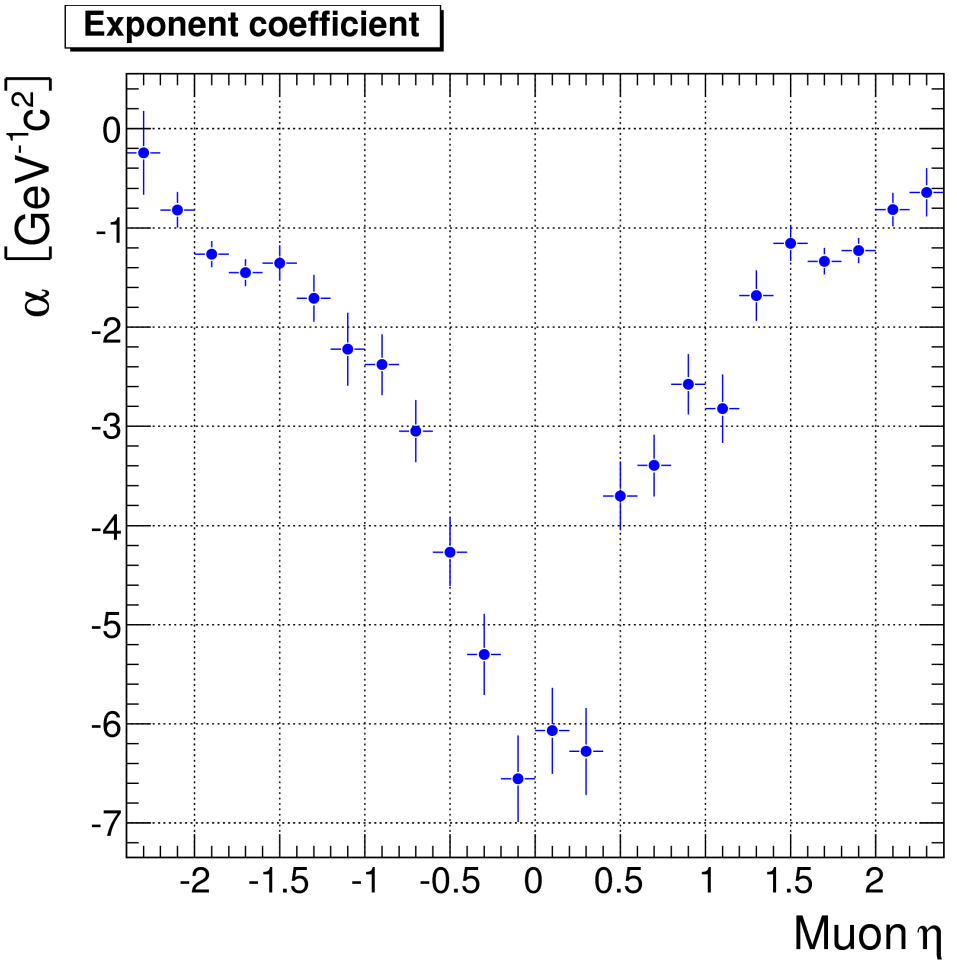
- Single exponential function fit and resolution fit: The exponential depends only on the mass



The Background

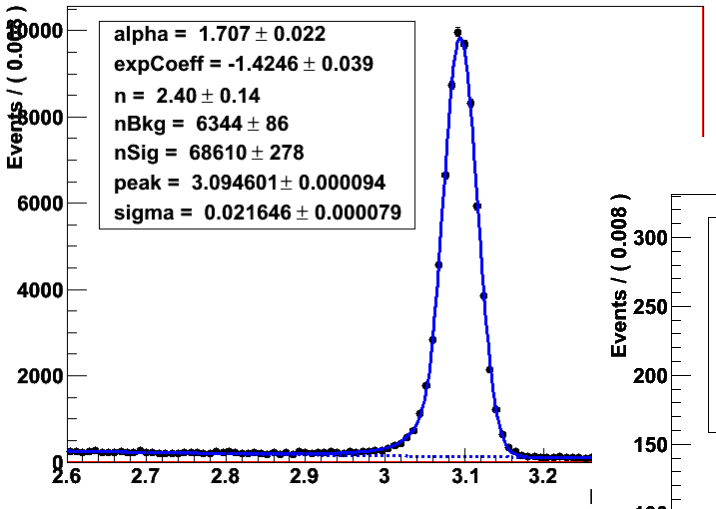
- The background changes dramatically as a function of (eta1, eta2)





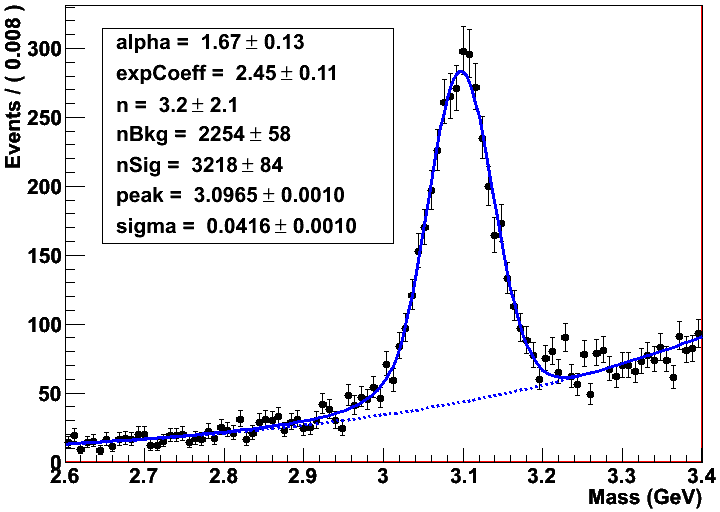
Improved background model

- The background is fit in bins of (eta1,eta2) and the results are used in MuScleFit

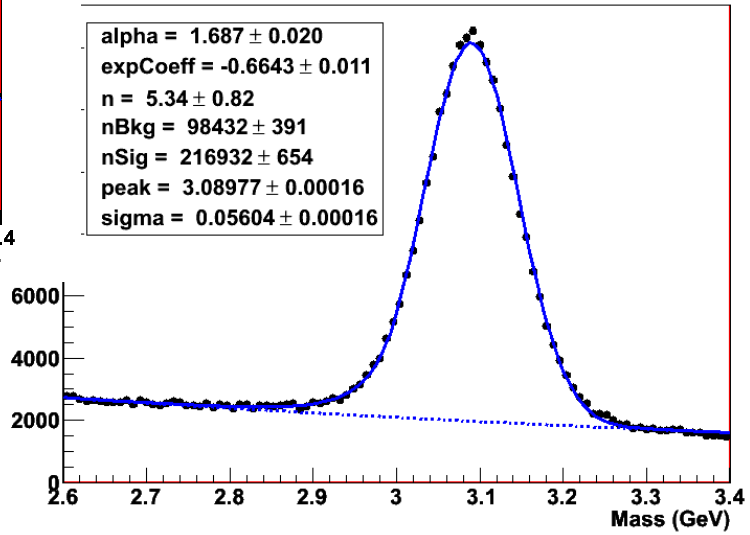


|eta| < 0.9

|eta_1| < 0.9 && |eta_2| > 2.0



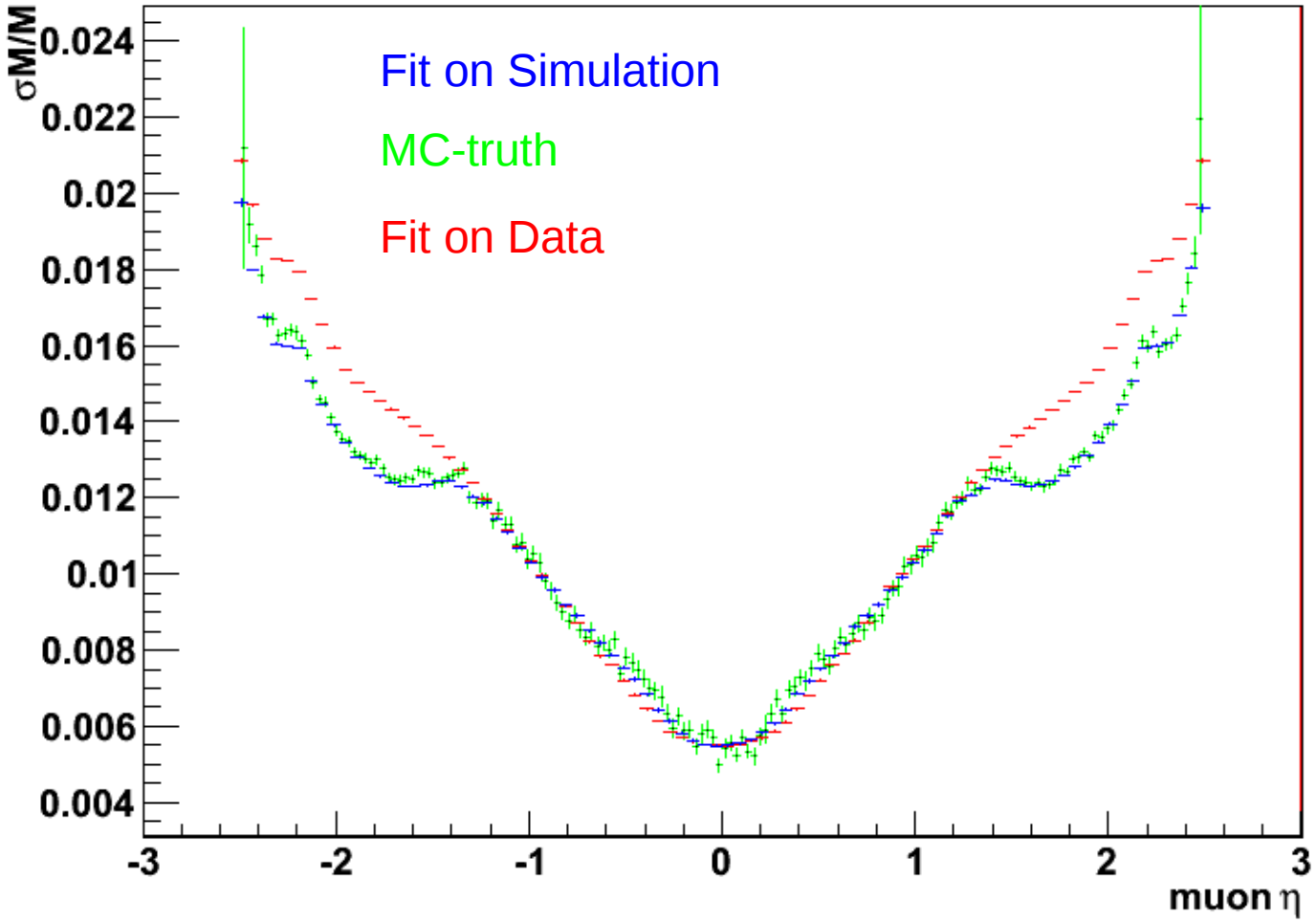
|eta| > 2.0



Results of the new fit

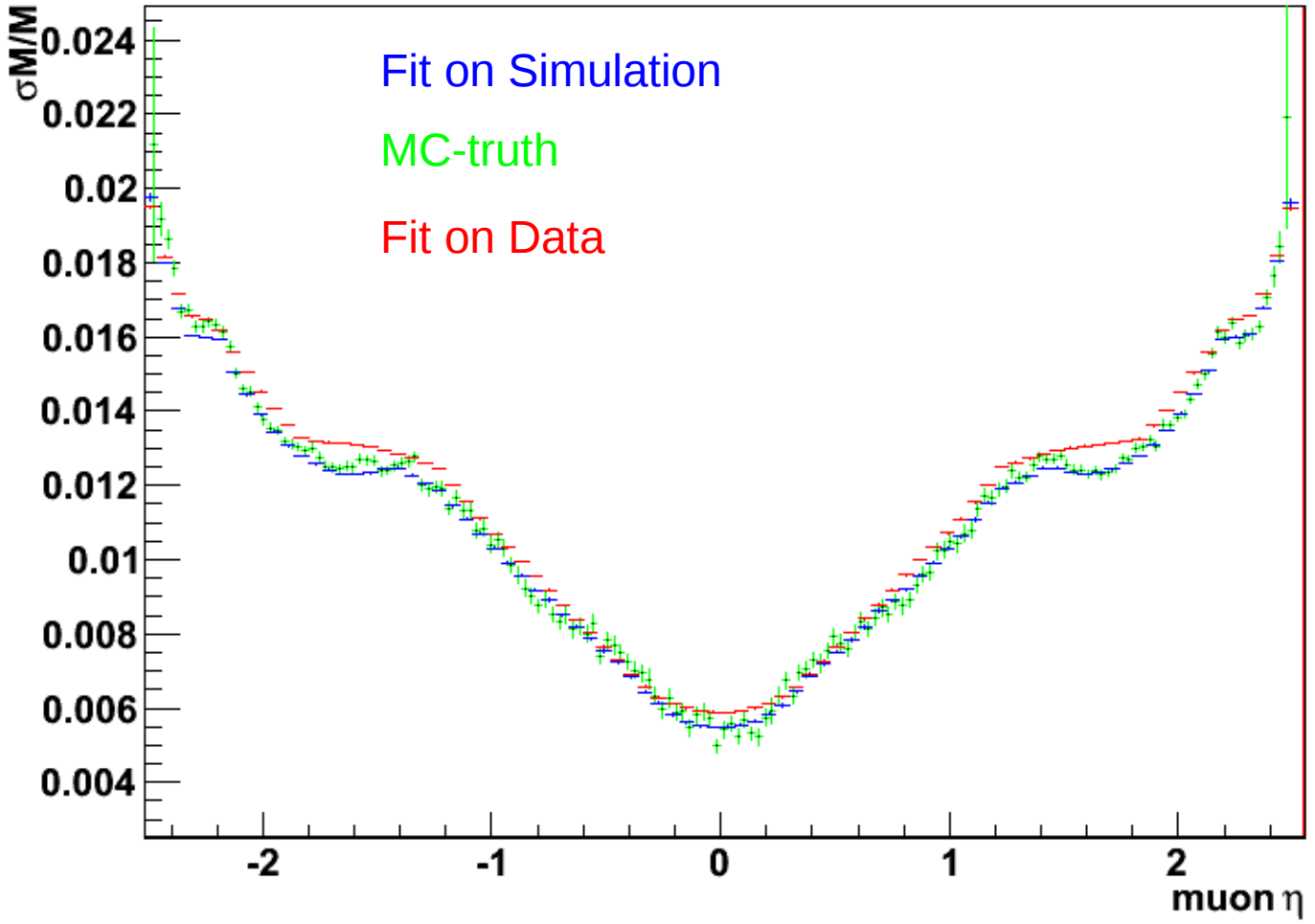
- Fit strategy:
  - Keep the background fixed
  - Fit order: resolution, scale, resolution
- Further refits of scale or resolution do not produce any improvement

Mass resolution data vs MC (OLD FIT)



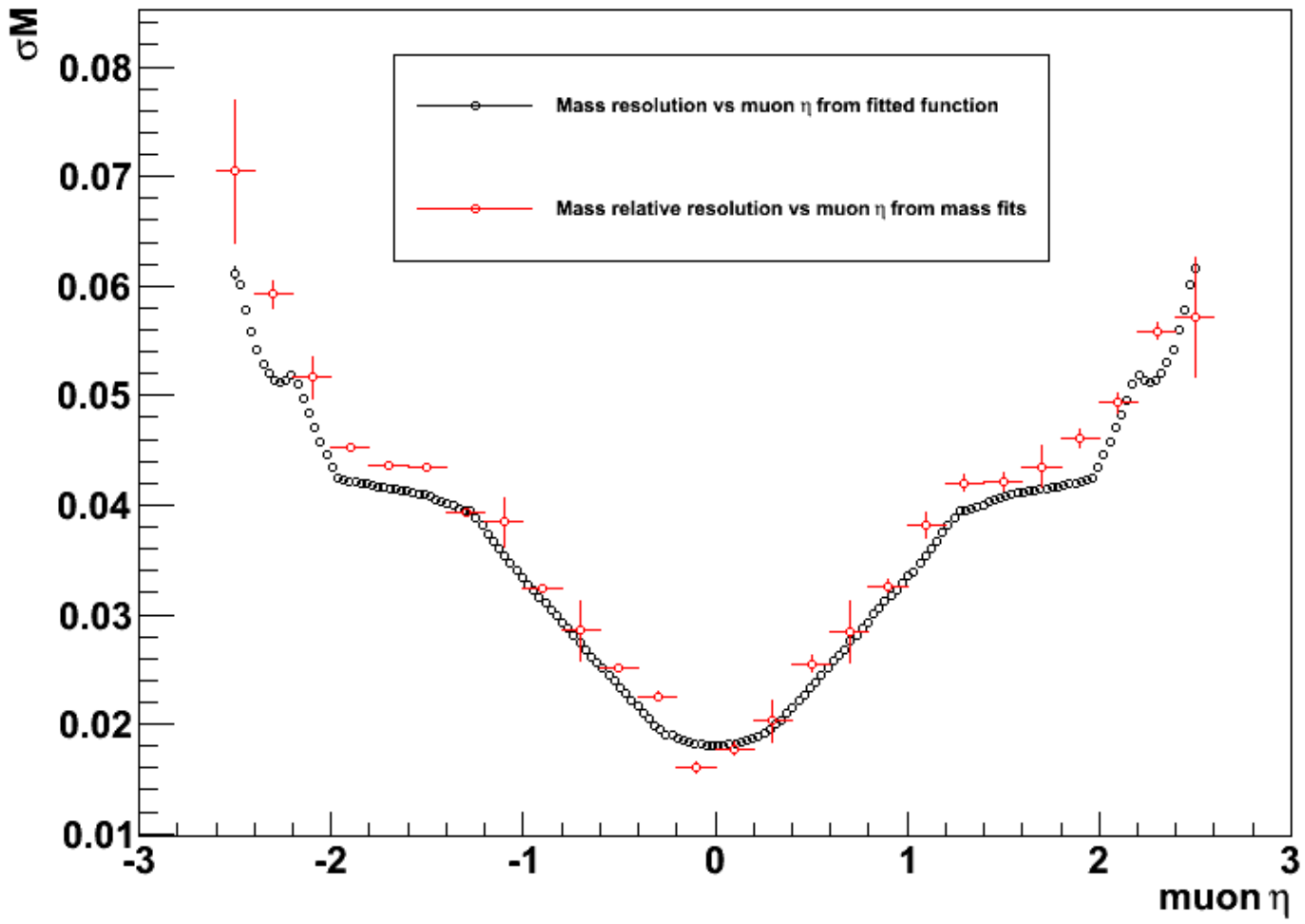
Resolution refit after scale fit

- The agreement improves in the forward region
  - Still residual discrepancy in 1.4 < |eta| < 1.8

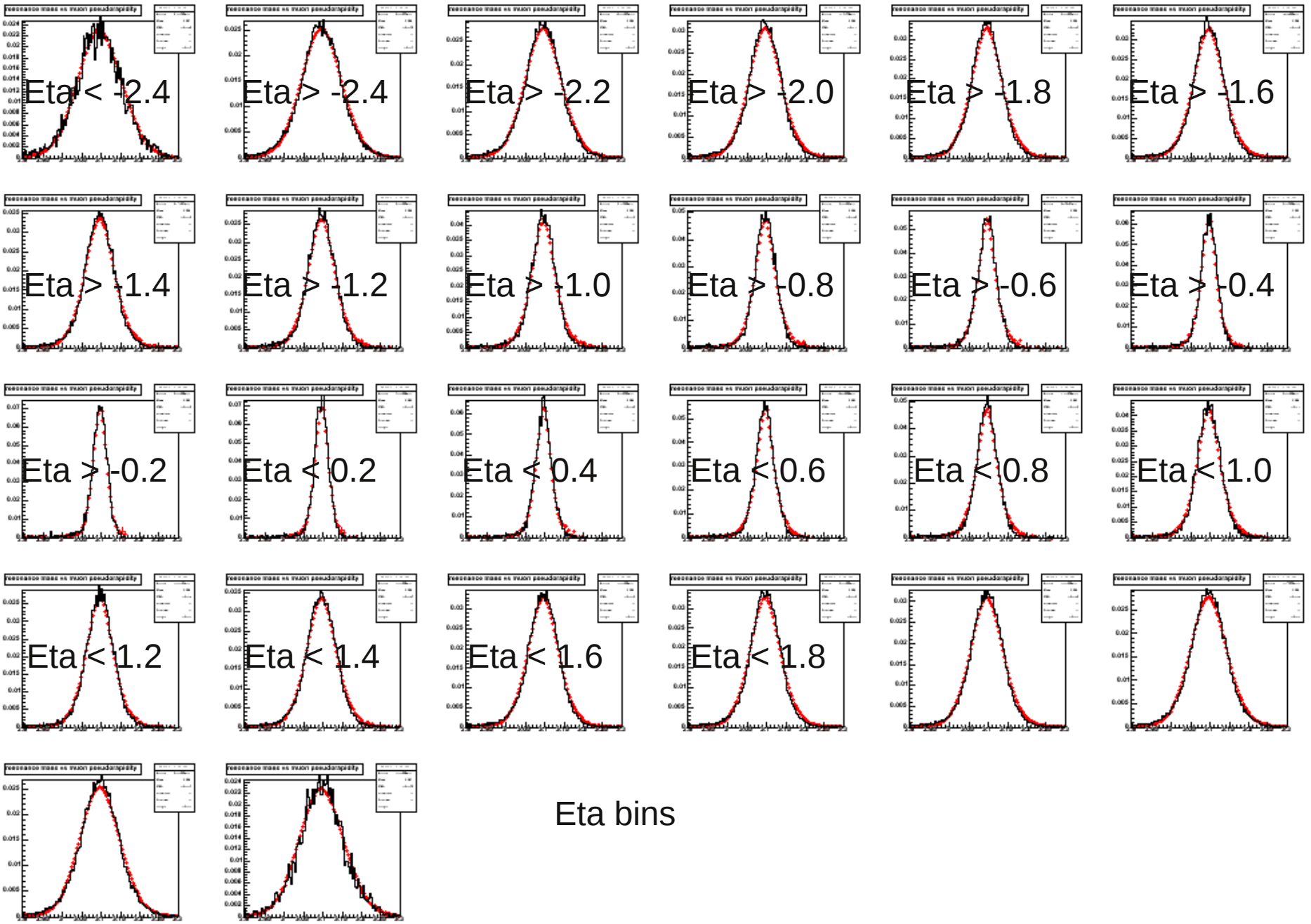


Comparison of the Fit with the result of direct mass fits in eta bins

- Note: the mass fits are done using CrystalBall + exponential

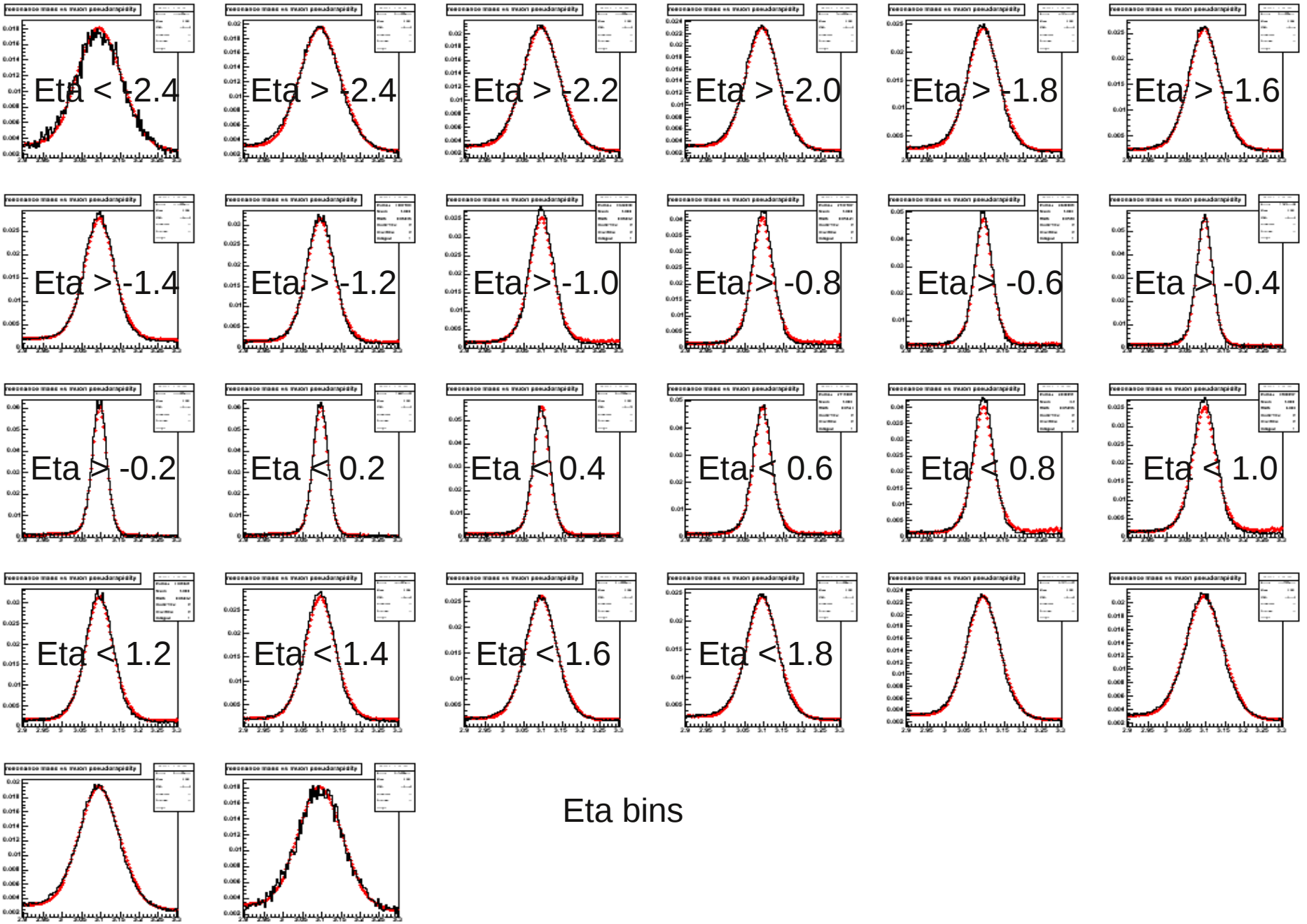


Fit on MC



Eta bins

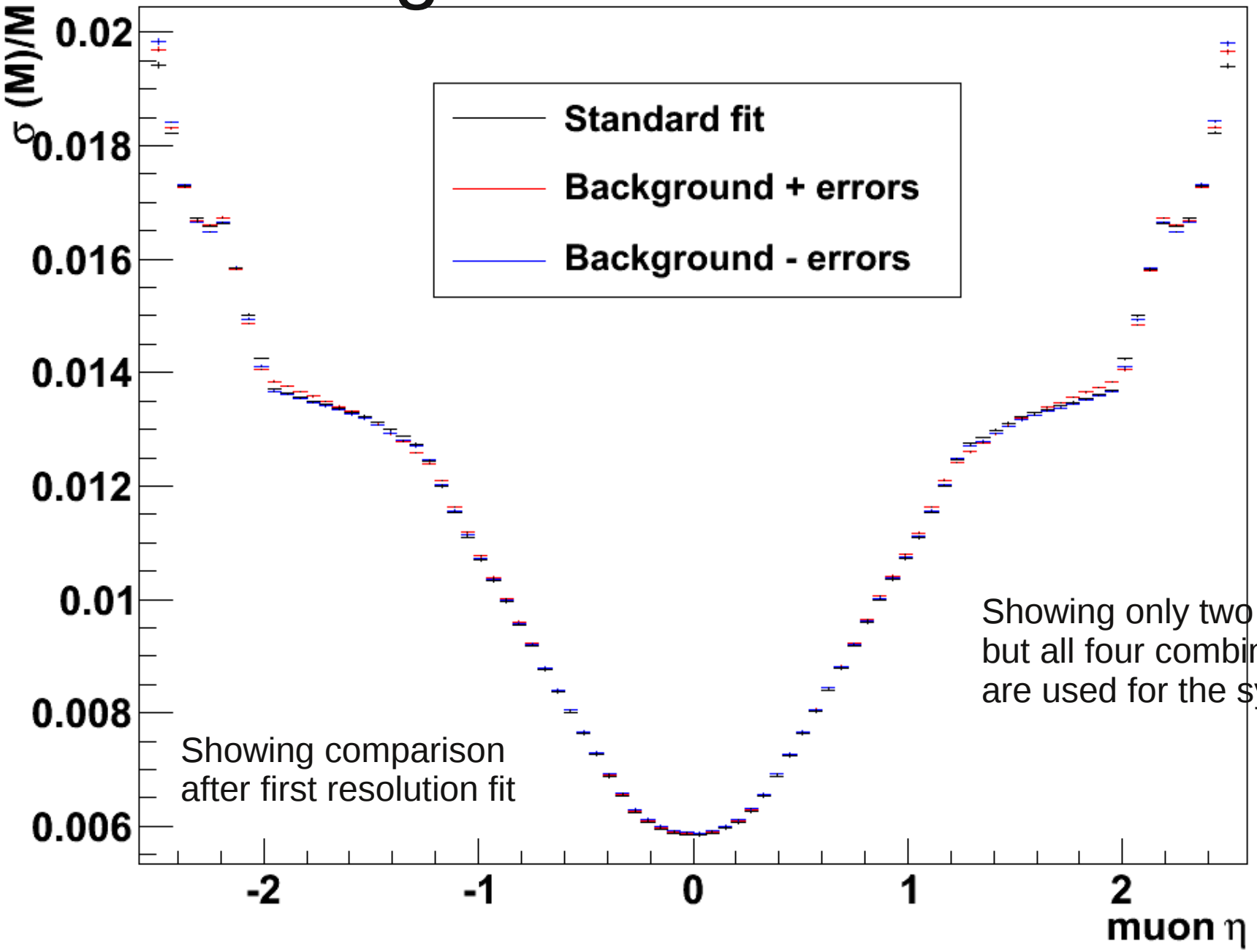
Fit on Data


Eta < -2.4
Eta > -2.4
Eta > -2.2
Eta > -2.0
Eta > -1.8
Eta > -1.6
Eta > -1.4
Eta > -1.2
Eta > -1.0
Eta > -0.8
Eta > -0.6
Eta > -0.4
Eta > -0.2
Eta < 0.2
Eta < 0.4
Eta < 0.6
Eta < 0.8
Eta < 1.0
Eta < 1.2
Eta < 1.4
Eta < 1.6
Eta < 1.8
Eta bins

Systematics from background model

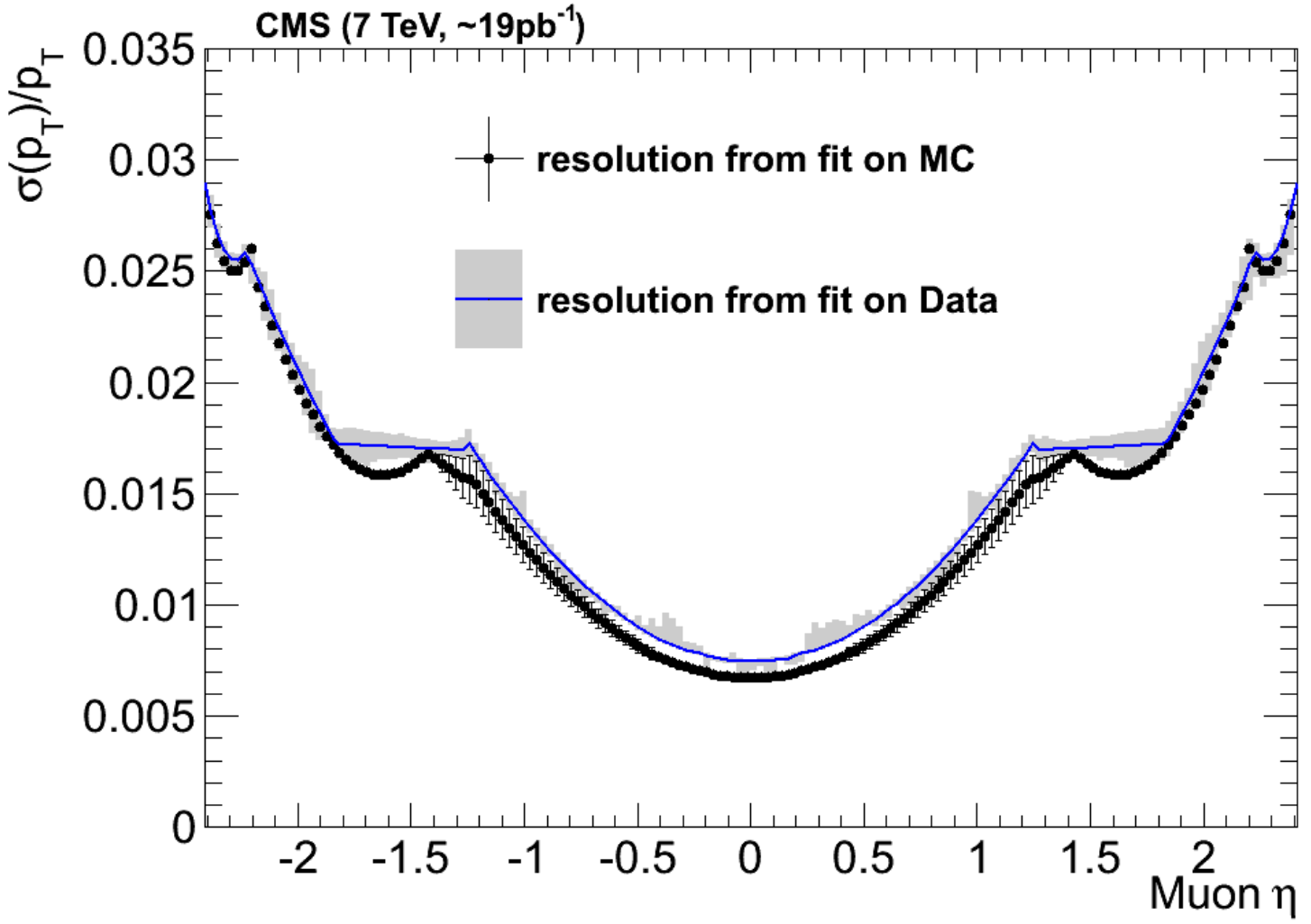
- Refit using the background parameters +- error
  - 2 parameters: exponential shape and S/N fraction = 4 combinations
- The variation in the resolution and scale fit parameters is taken as the propagation of the background statistical uncertainty
- Variations in the resolution fit are mostly in the endcaps, see next slide
- In addition, shift the eta bins for the background fits in both directions of 0.05 (the smallest bins have a width of 0.1) and repeat the resolution fit with the new models
- Take the biggest variations between all the six cases above as systematic error from the background model

Resolution fit variation for background uncertainties



sigma(Pt)/Pt

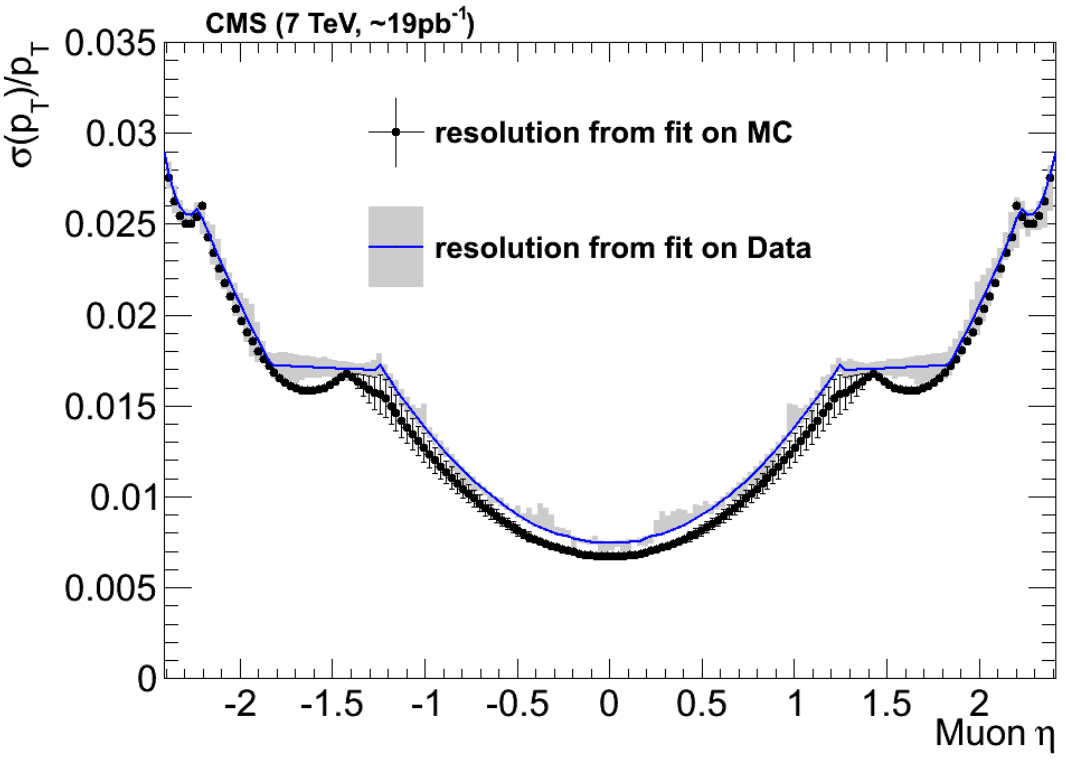
- Includes: stat + syst(background) + syst(MC)



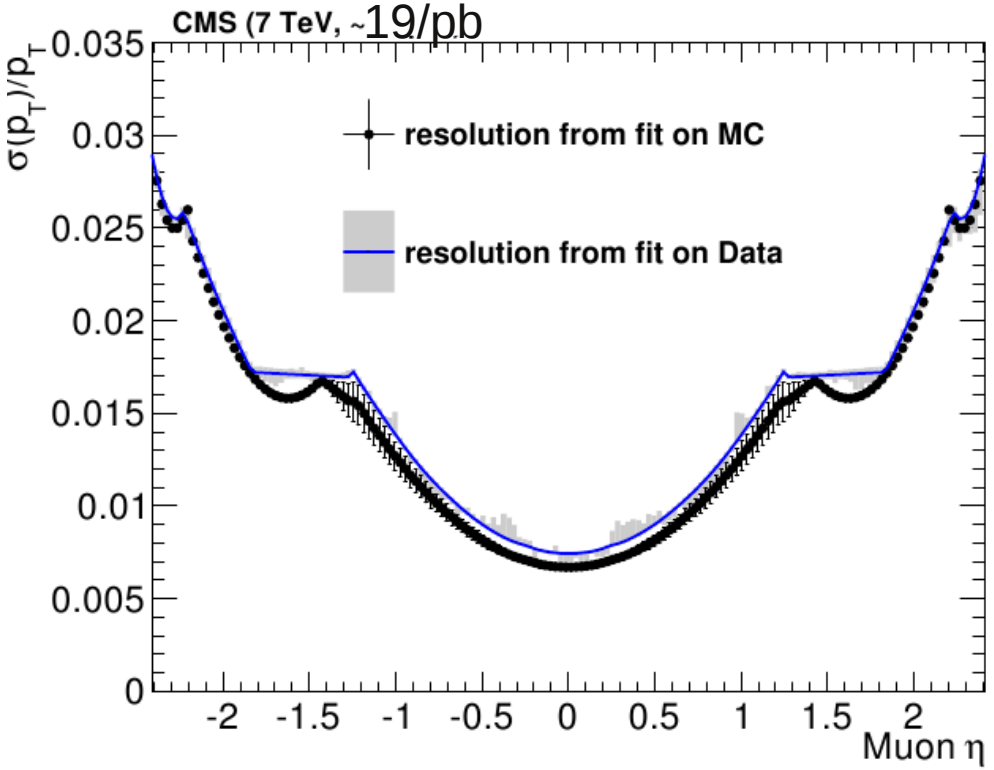
Background errors comparison

- Become important at high eta, where the background fraction increases.

With Background systematics

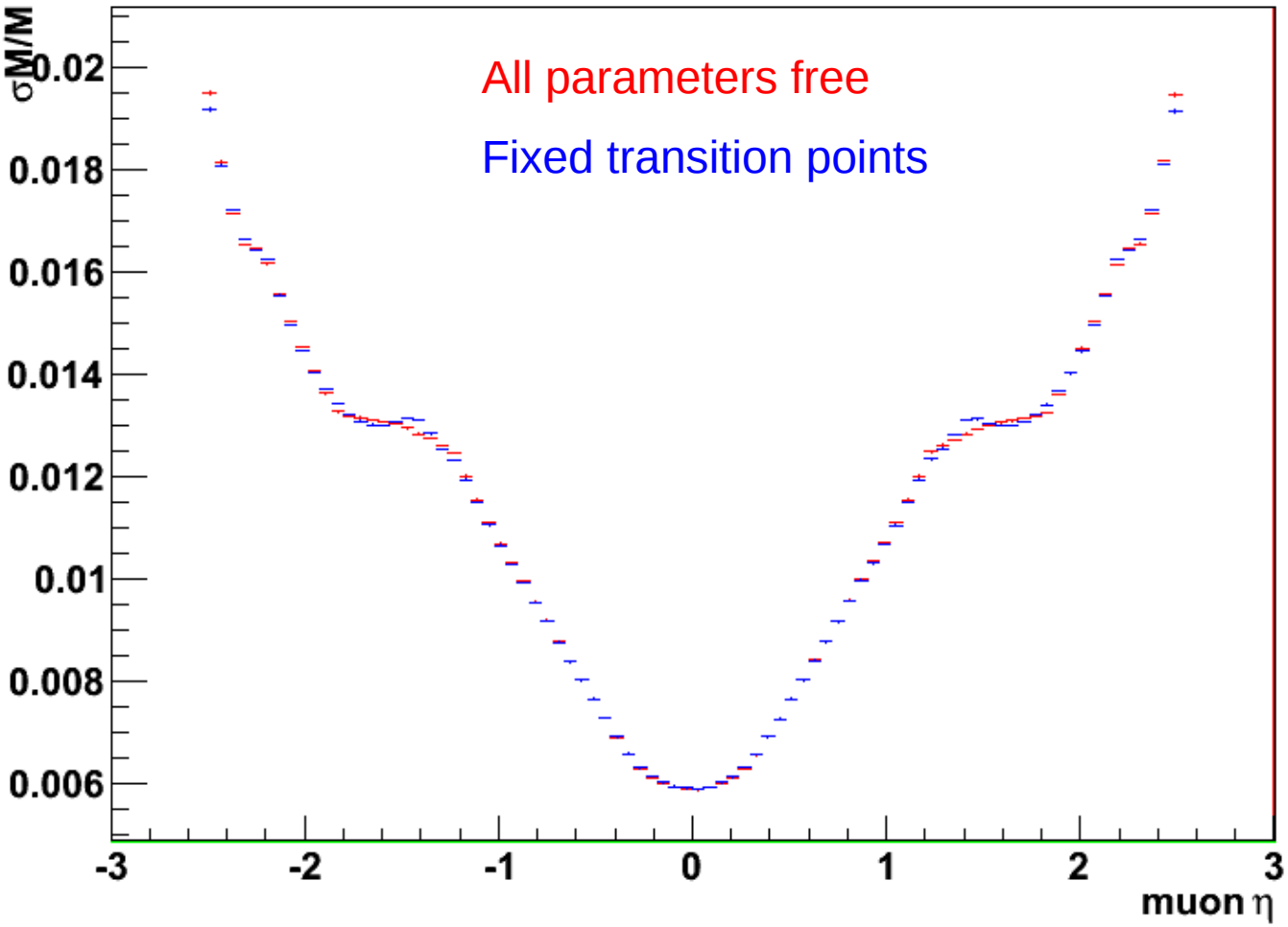


Without background systematics



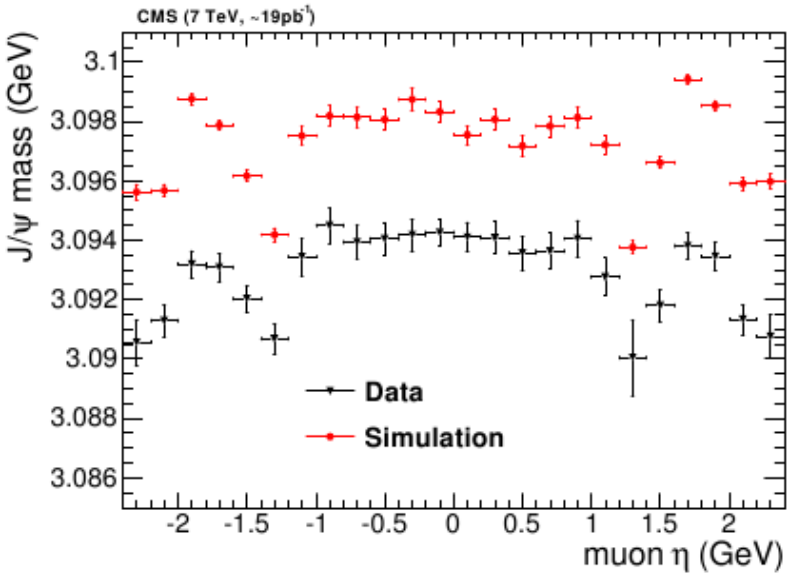
Additional Test

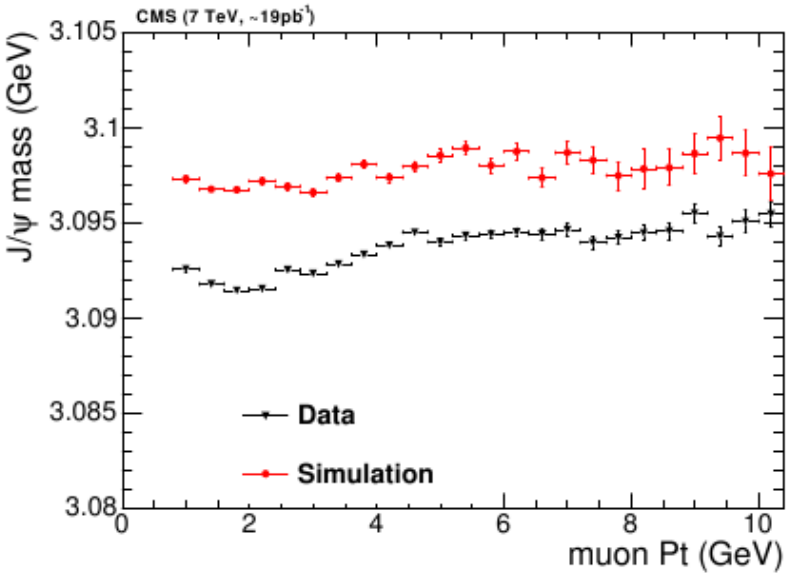
- Fix the transition parameters to the values found in the MC and repeat the fit
  - The fit seems to go in the same direction...

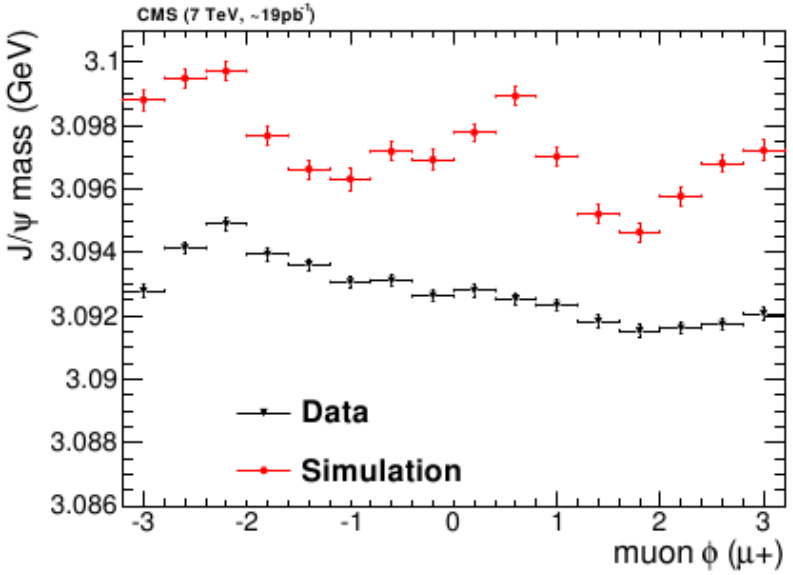


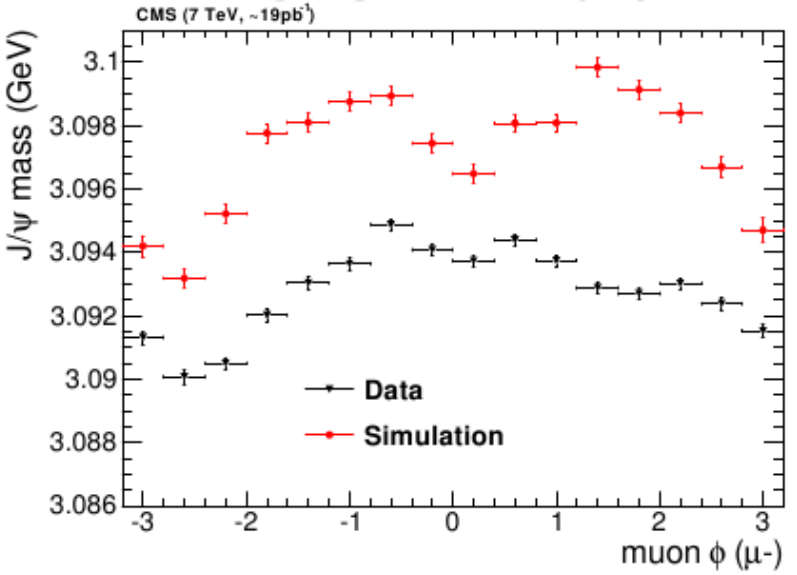
Update of the results with 19/pb

Mass: Data vs Simulation

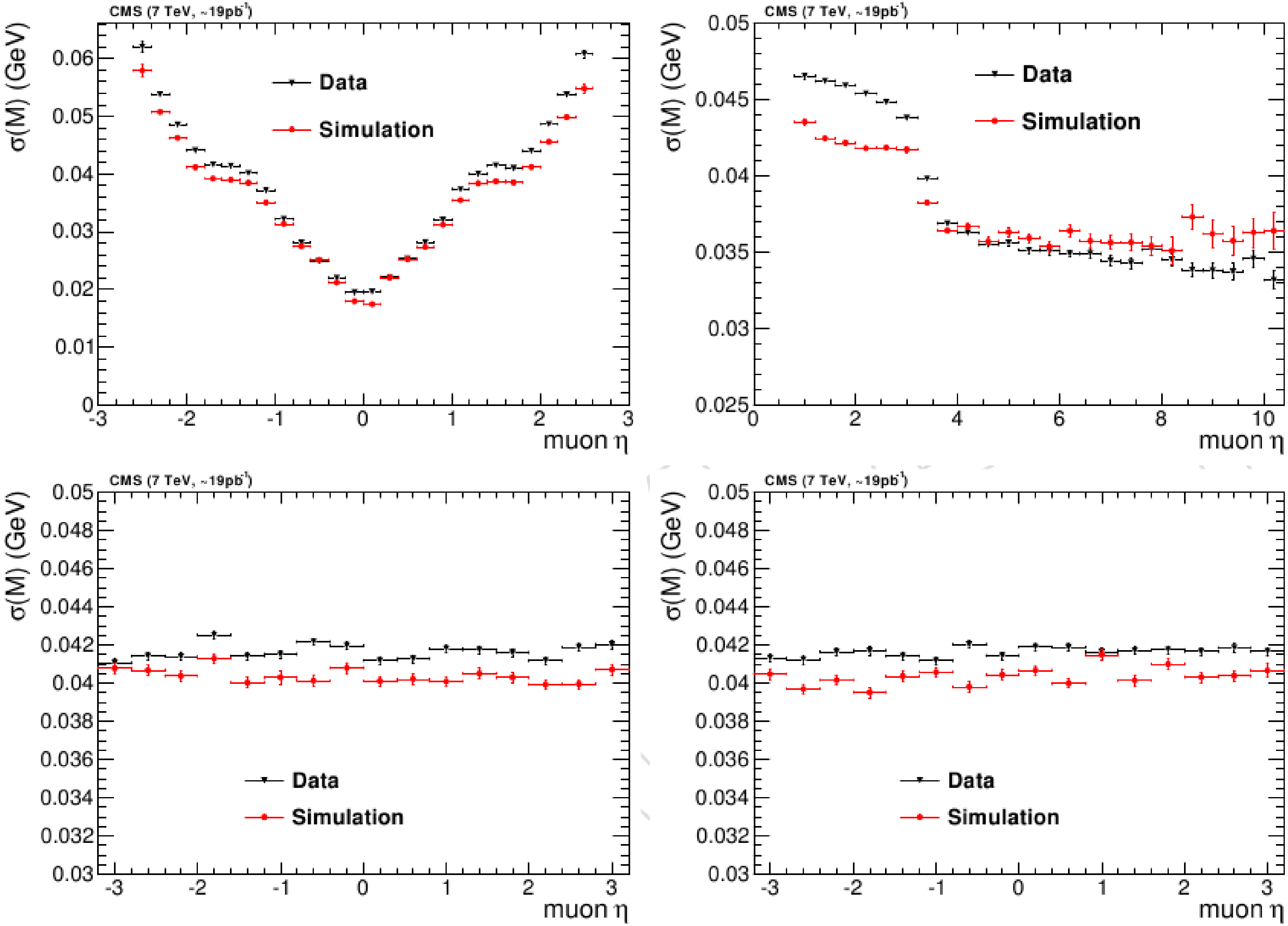






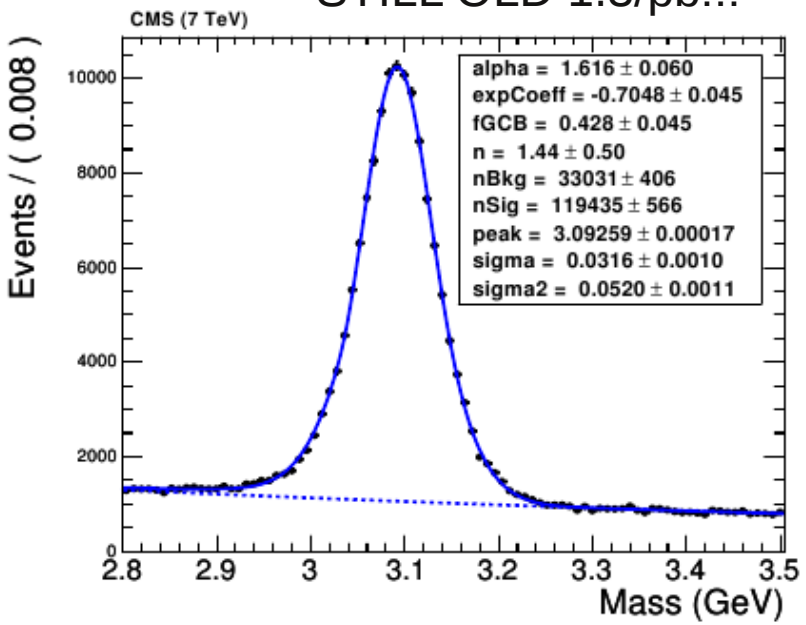


Mass Resolution: Data vs Simulation

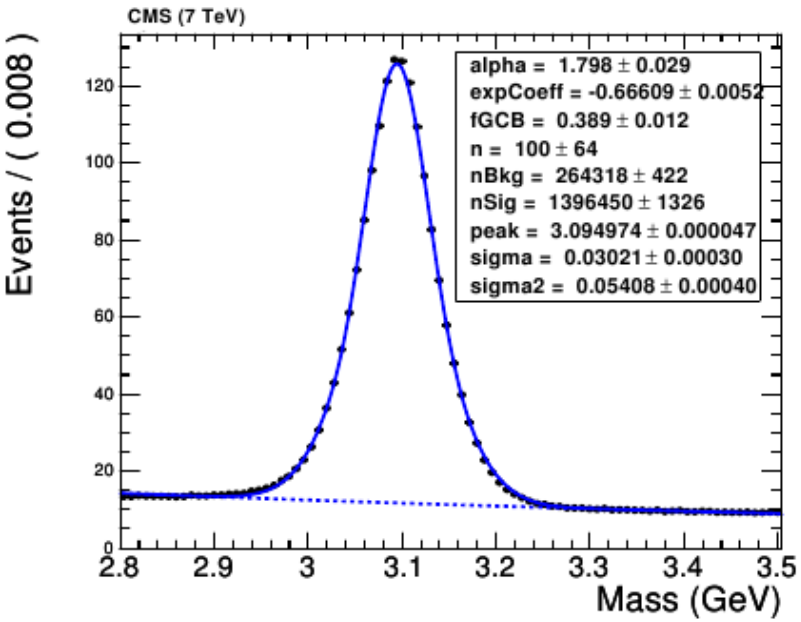


Integrated mass fit

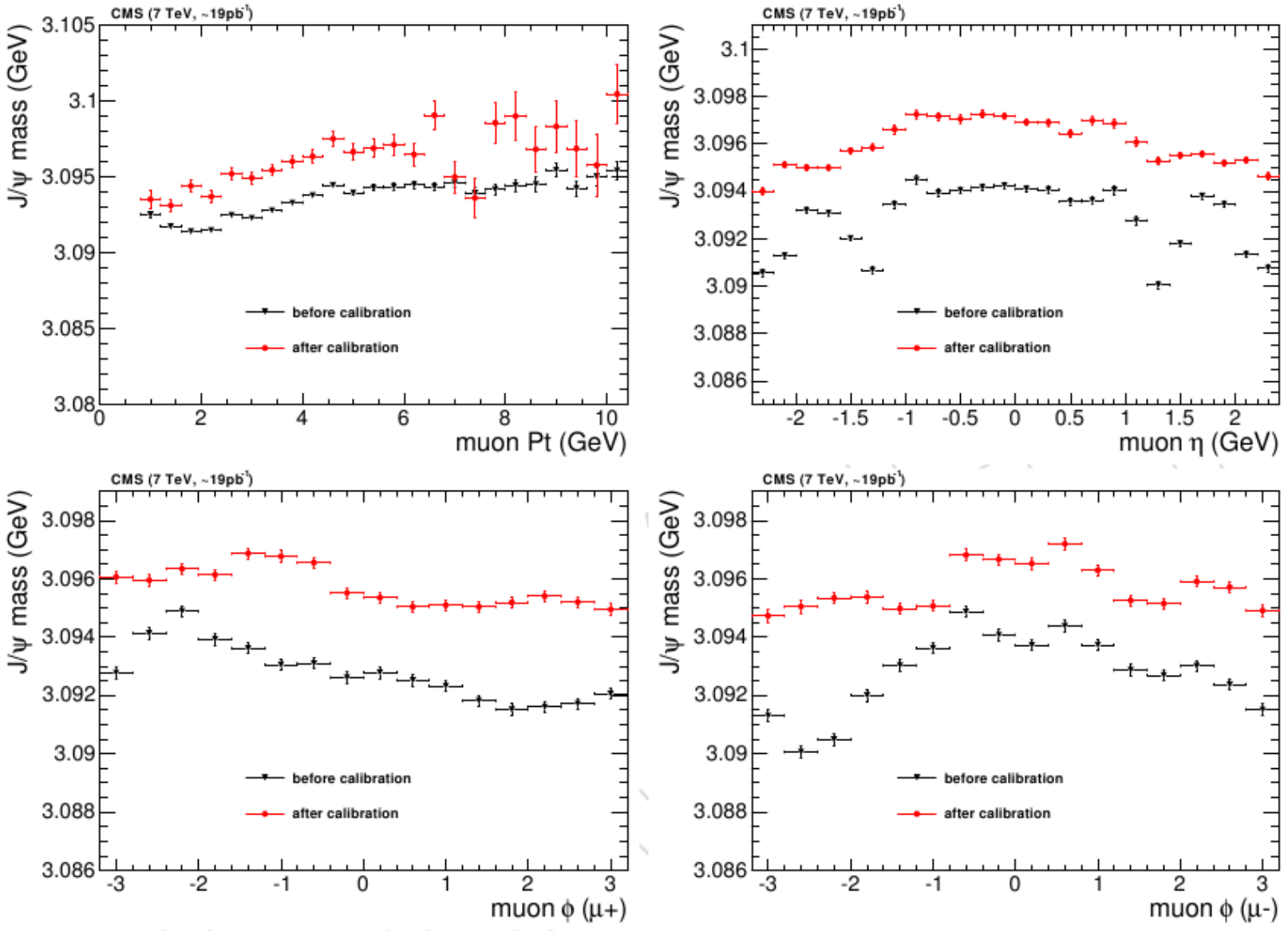
STILL OLD 1.3/pb!!!



After calibration
19/pb

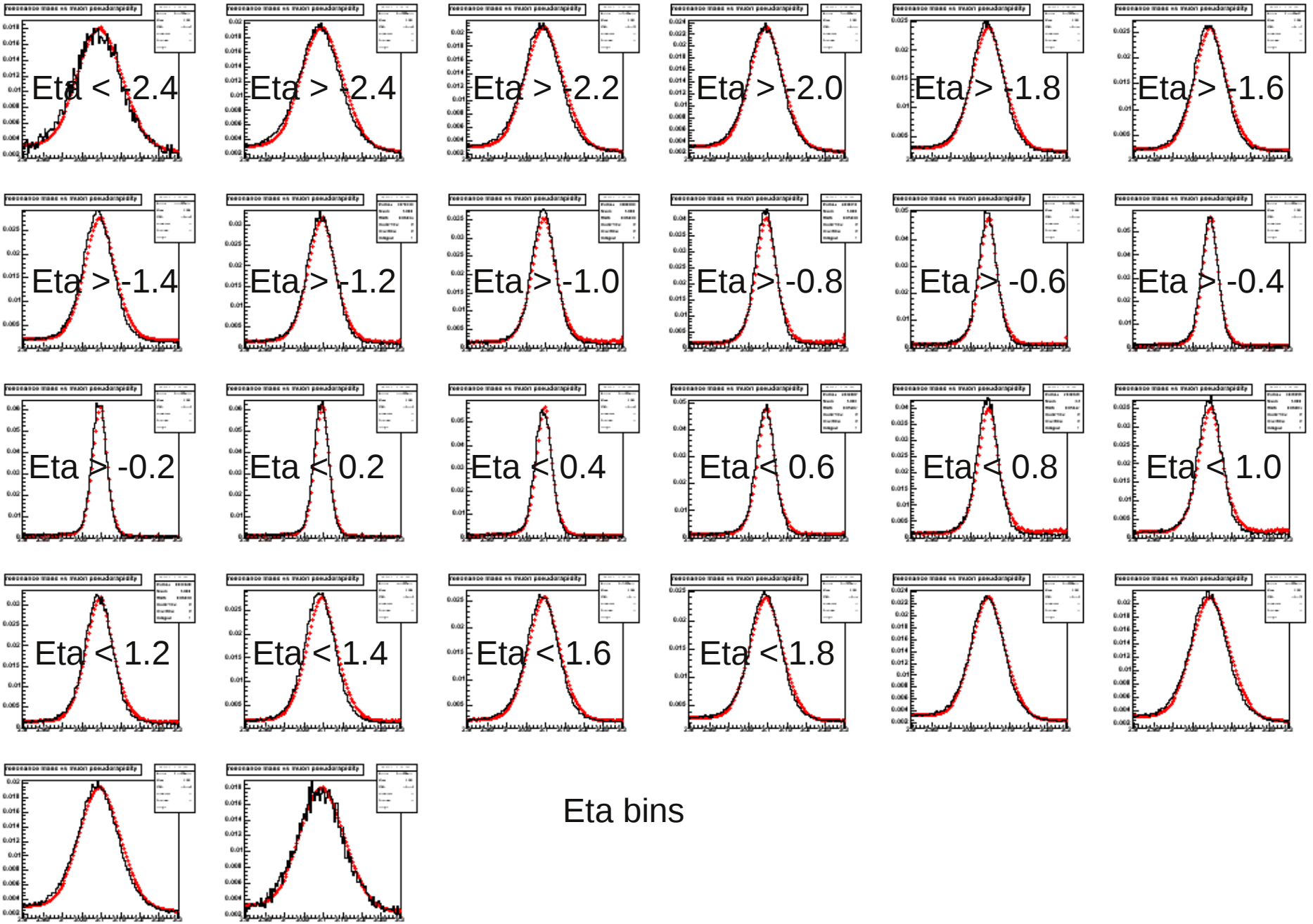


Scale correction on Data

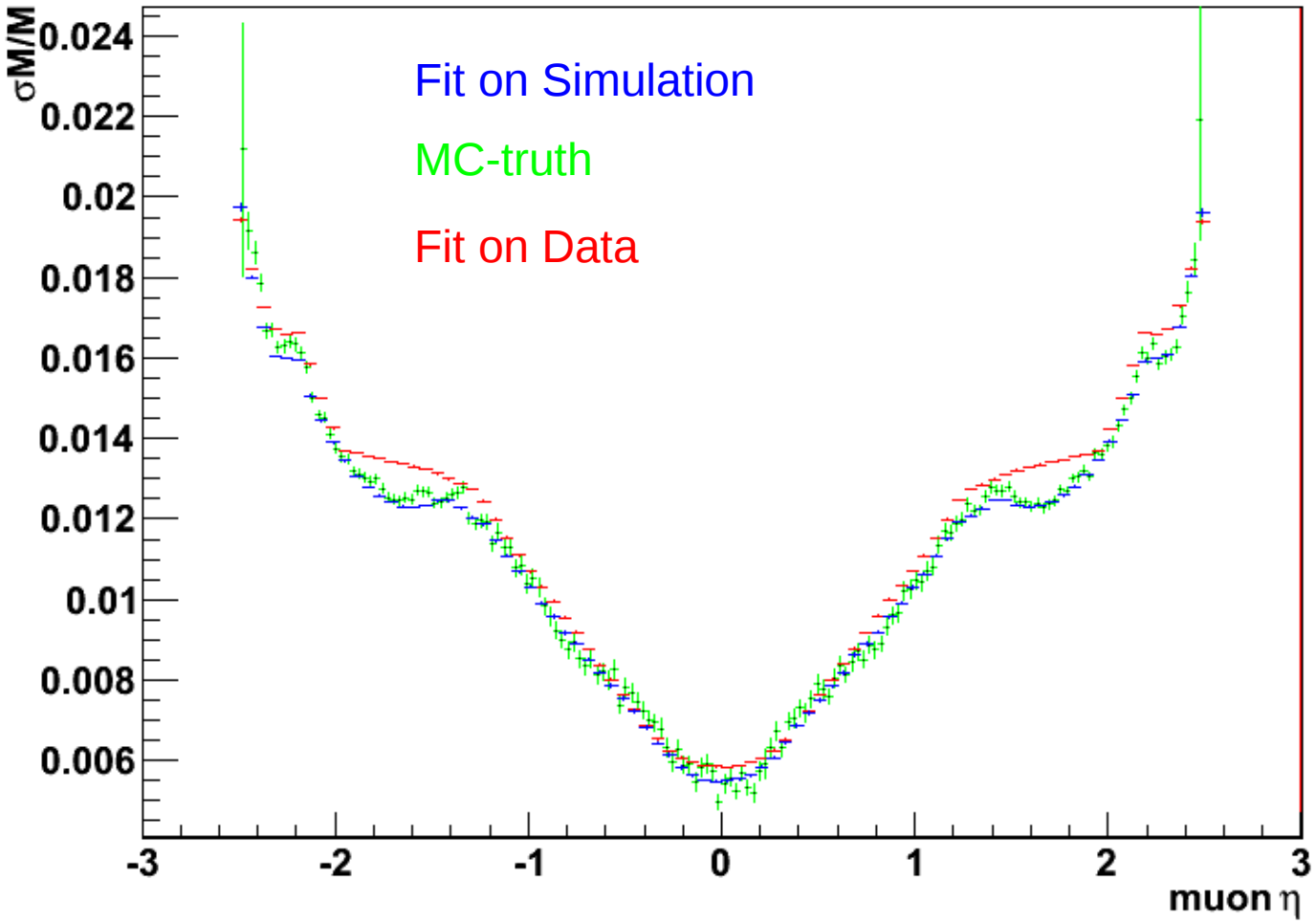


Backup

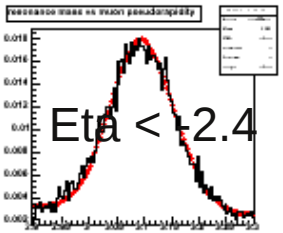
Calibration with new background fit

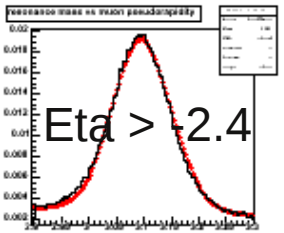


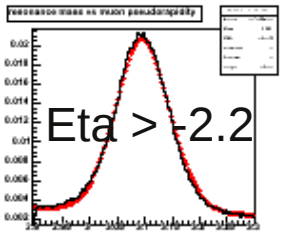
Mass resolution data vs MC

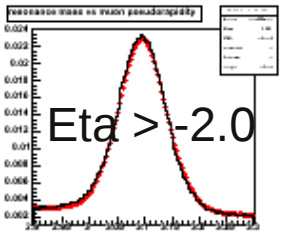


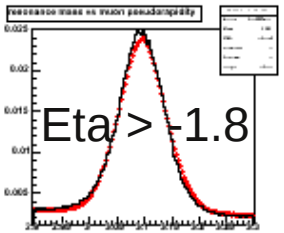
After the scale fit

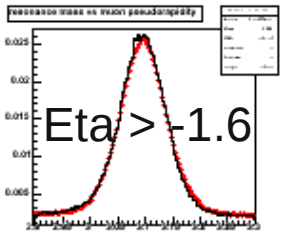


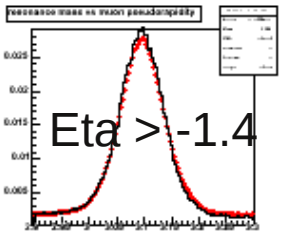


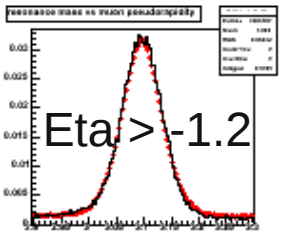


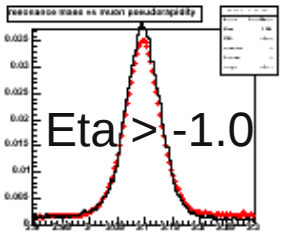


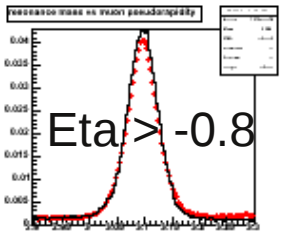


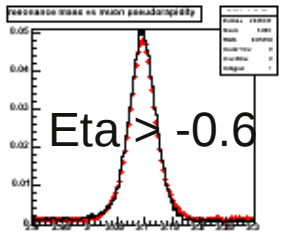


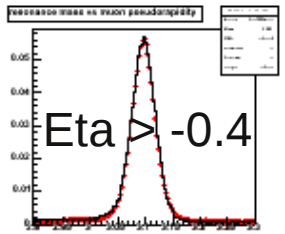


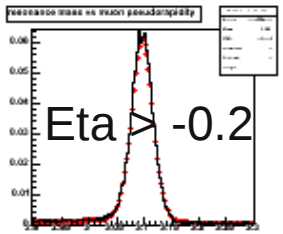


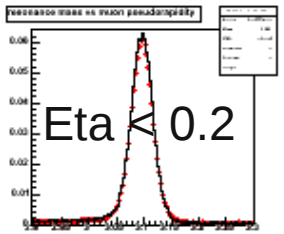


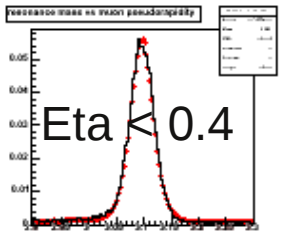


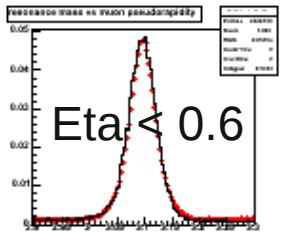


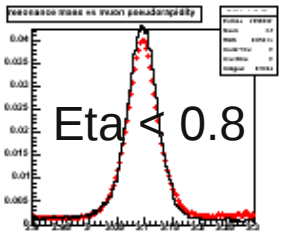


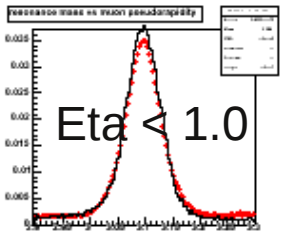


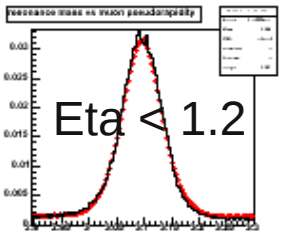


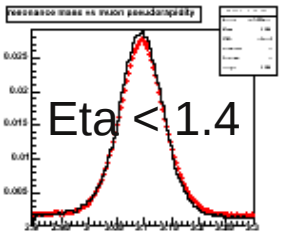


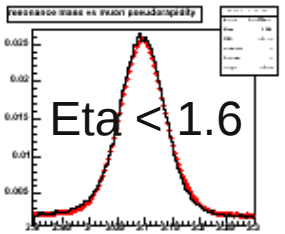


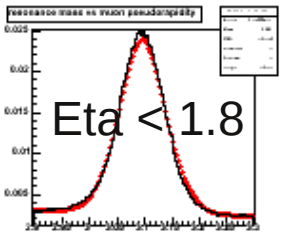


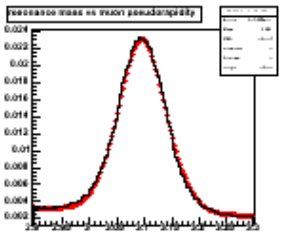


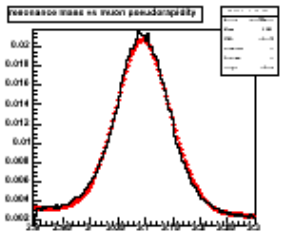


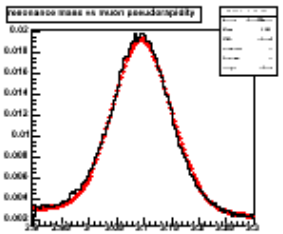


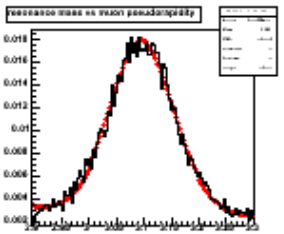






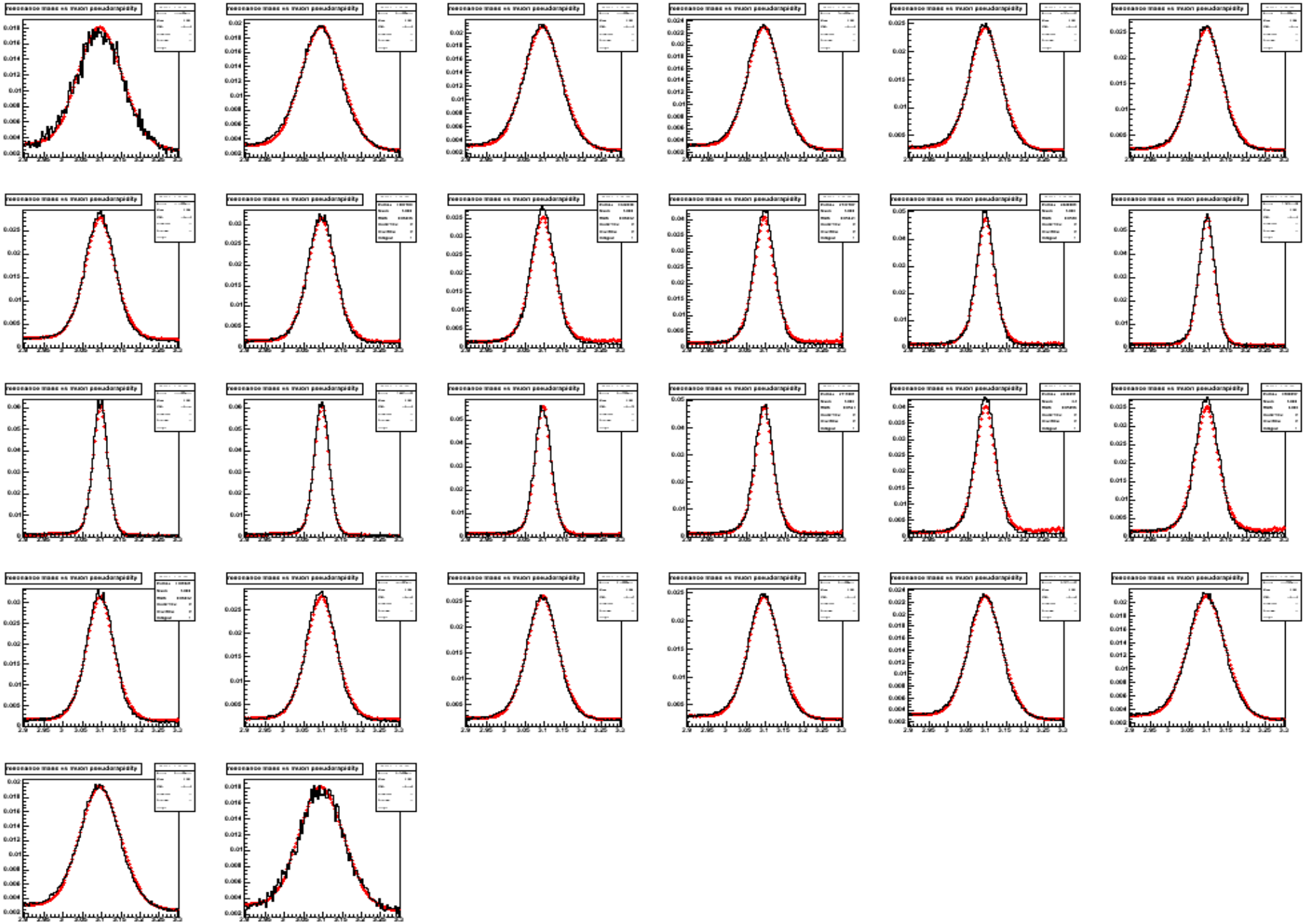






Eta bins

Probs after refit



Old Considerations

- The systematics do not cover the difference between data and simulation
- This difference appears to reduce when refitting after a scale fit, so it might be still artificial
- But, the fits in that region are not tremendously wrong...
  - Nevertheless the shape could appear not gaussian because of variations in the background shape
- Trying now to refit after additional scale corrections:
  - Resolution, scale, resolution, scale, resolution