Au+Au 200 GeV
Run-7 upsilon -1S embedding

Debasish Das, UC Davis

--- Checking the MC distributions for embedding upsilons

--- Opening Angle comparisons for pp and Au+Au embedding

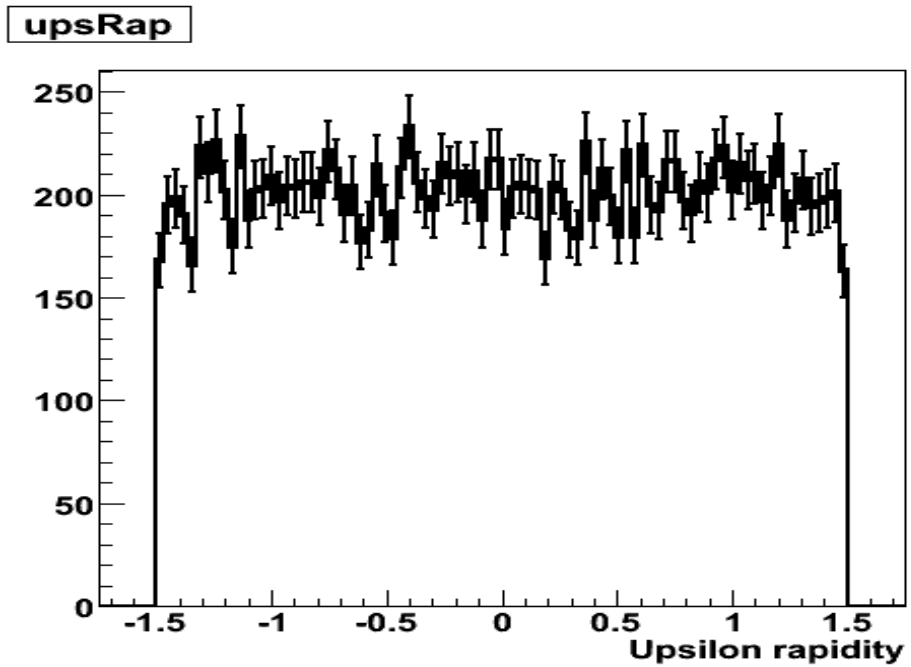
--- Vertex issues for Au+Au embedding

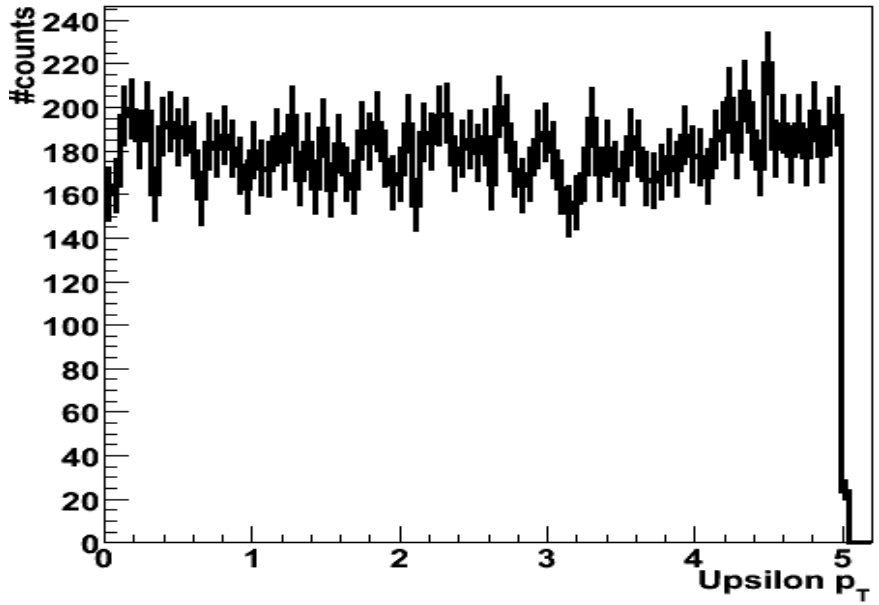
--- Issues with the Eta distribution of reconstructed daughters

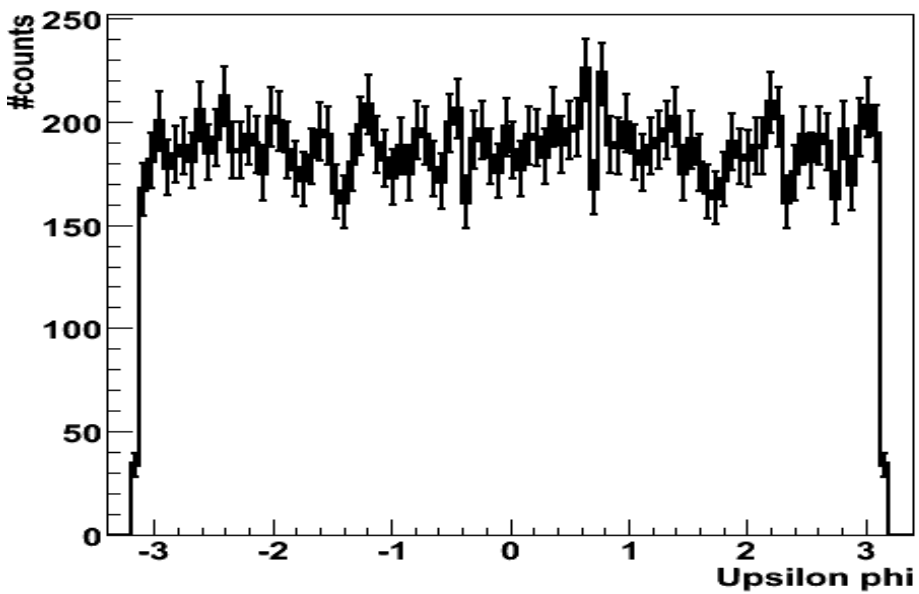
--- Fit with Crystal Ball parameters “used for pp”

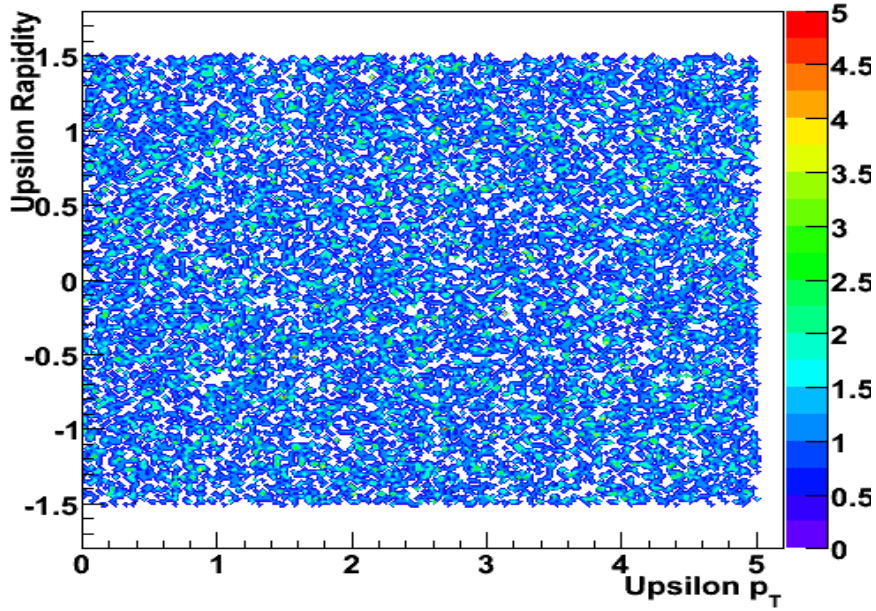
---- Summary and To-Do’s

MC-information in Au+Au 200 GeV upsilons



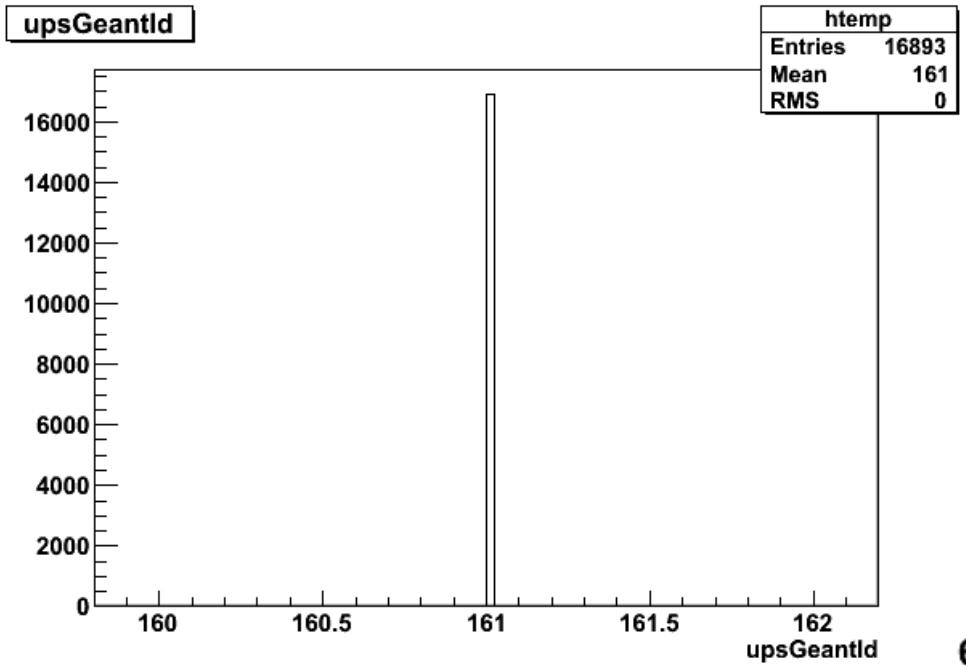






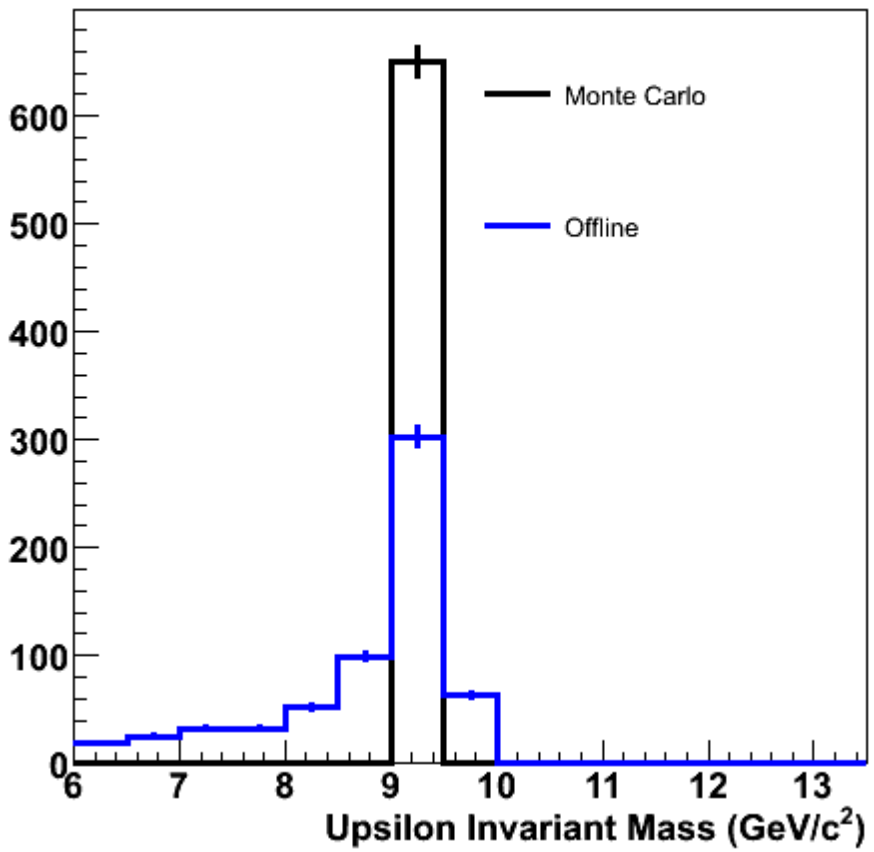
The plots show that the Monte Carlo information of Upsilons are consistent.

Geant Id and Invariant Mass – Au+Au 200

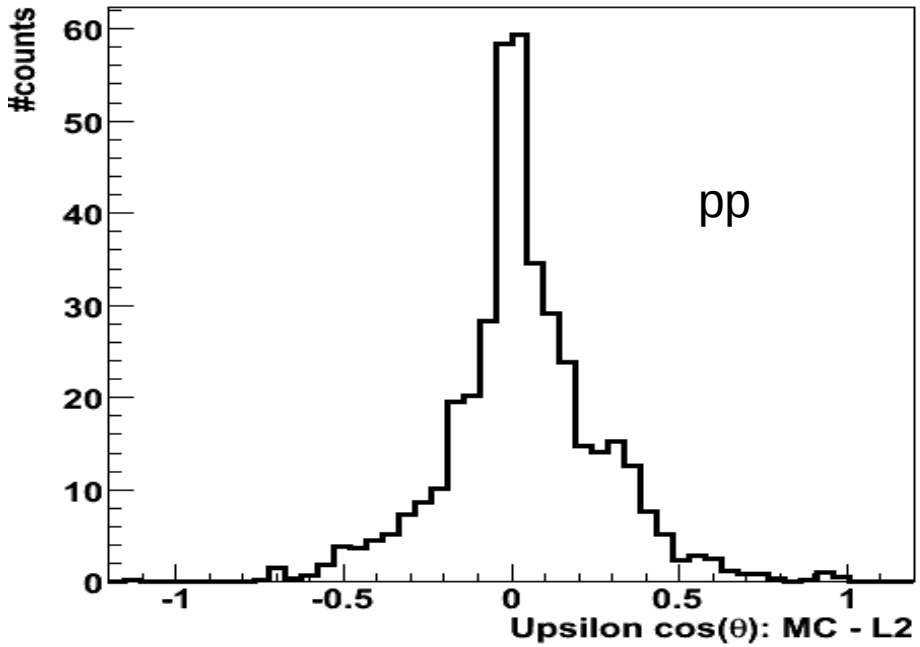


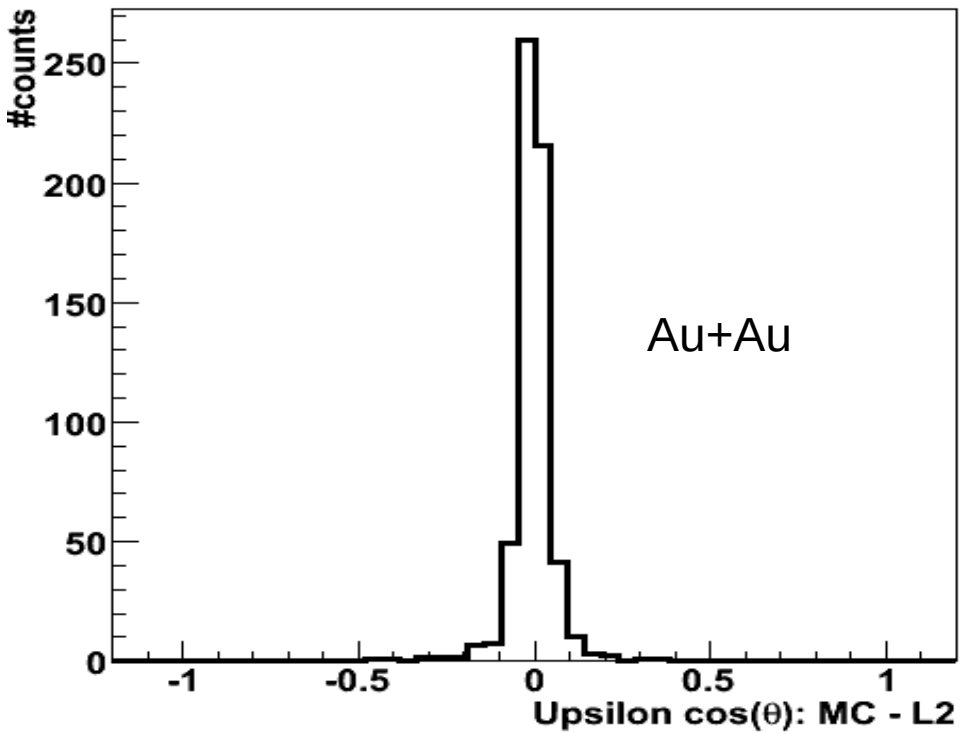
For 1S Upsilon Geant Id=161

The MC Upsilon Invariant mass peak value is consistent with reconstructed (offline) distribution



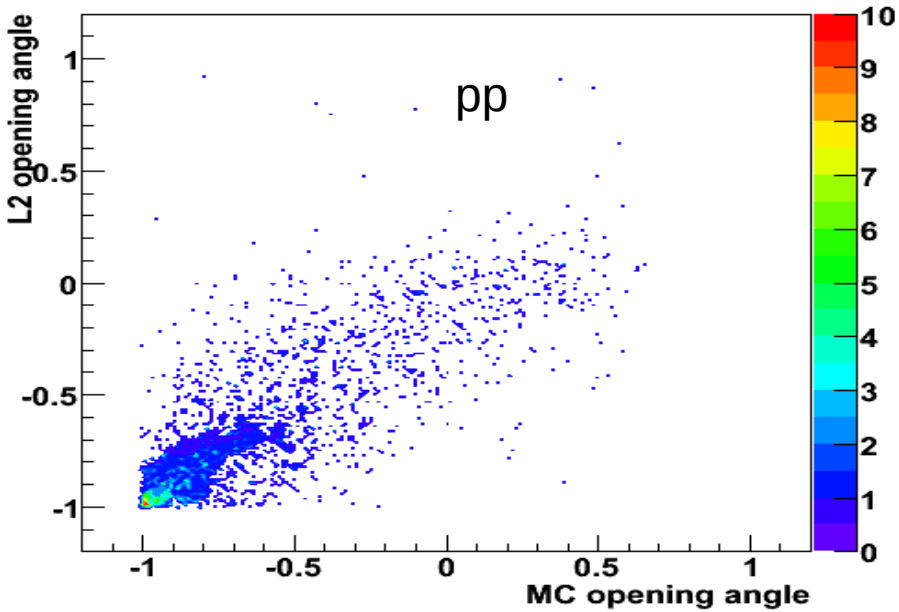
Opening angle – Au+Au 200 and pp 200

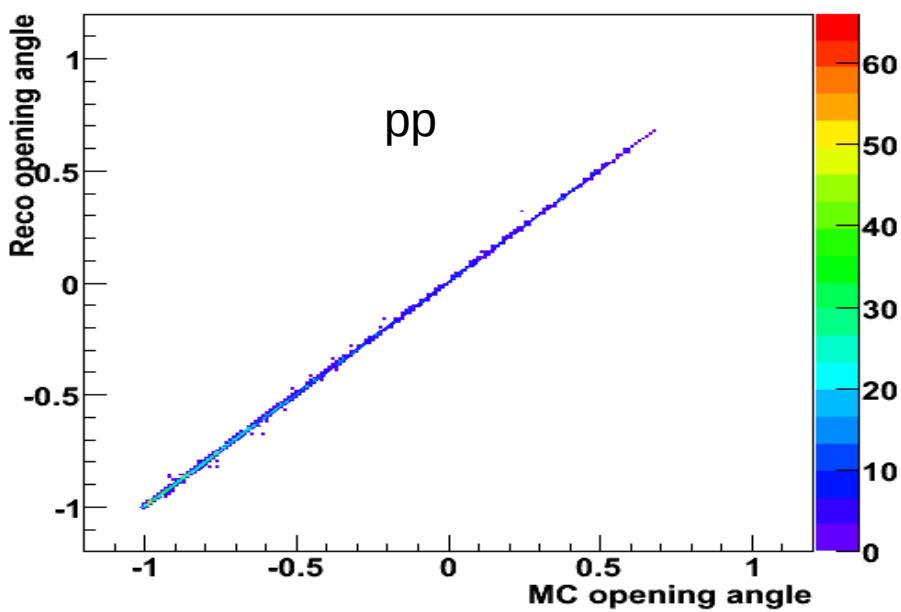


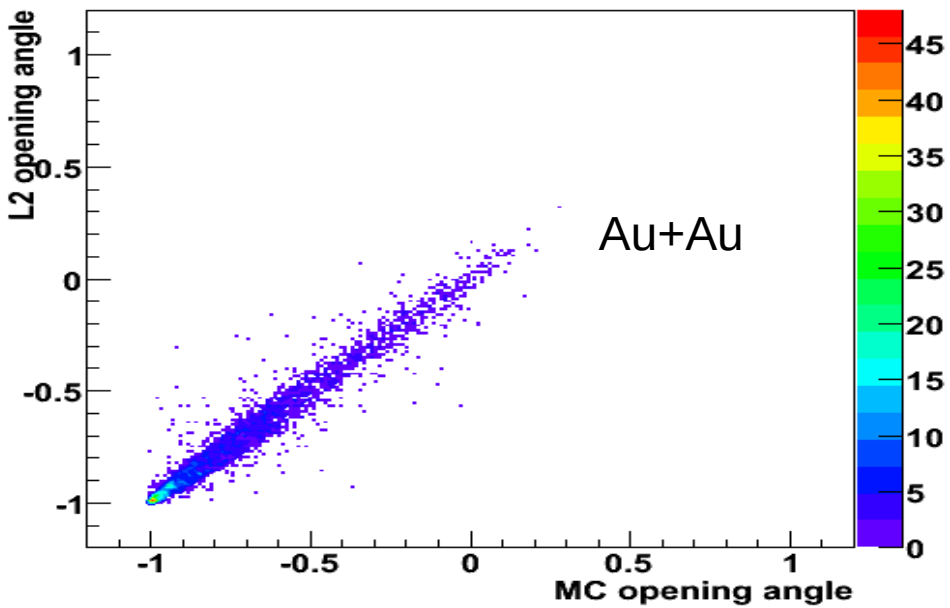


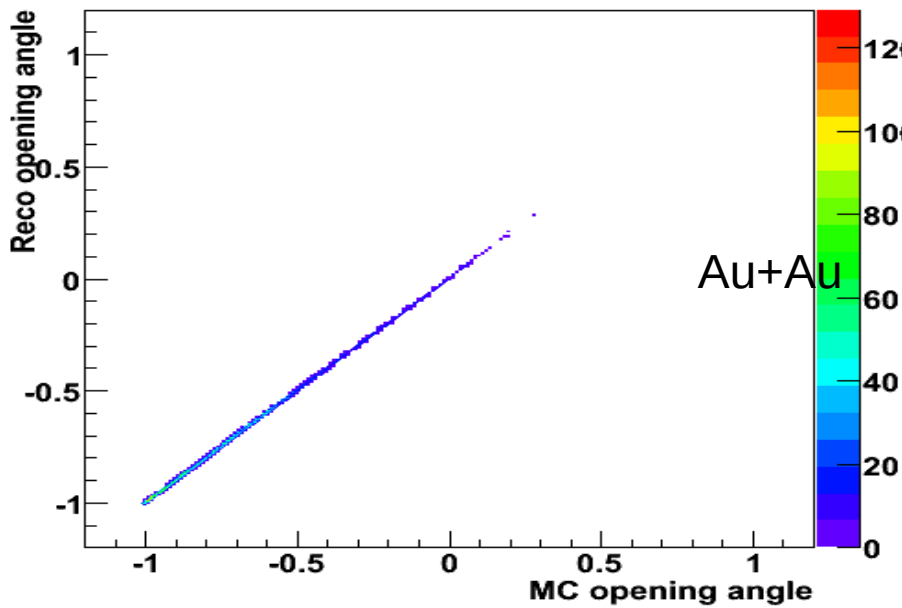
The width of the difference in opening angle between MC & L2 is more for p+p than for Au+Au.

2D distributions of Opening angle – Au+Au 200 and pp 200



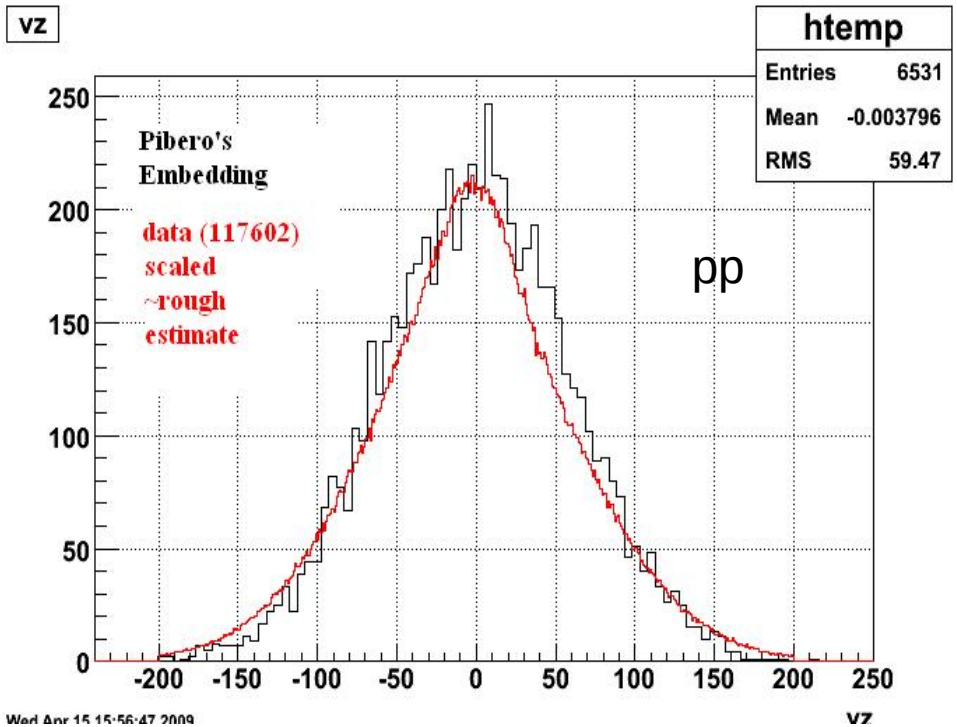






The 2D distributions also show that the case is “too good” for Au+Au

Vertex distributions
data & embedding – Au+Au 200 and pp 200



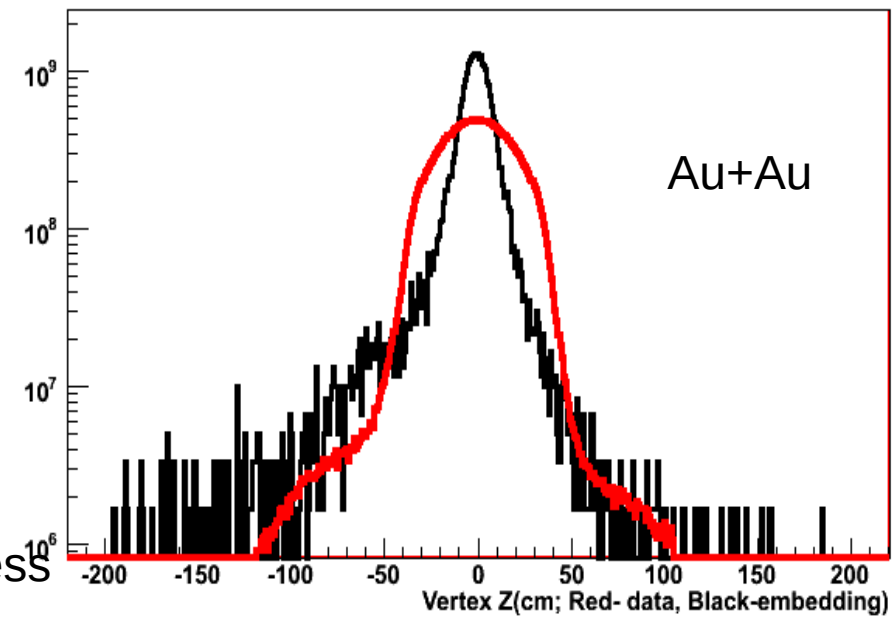
Upsilon Embedding in Au+Au 200 GeV :

NO "st_physics_adc" files in

Run-7 upsilon min-bias Dataset .

Hence a MC upsilon is decayed in "real" Minimum bias dataset.

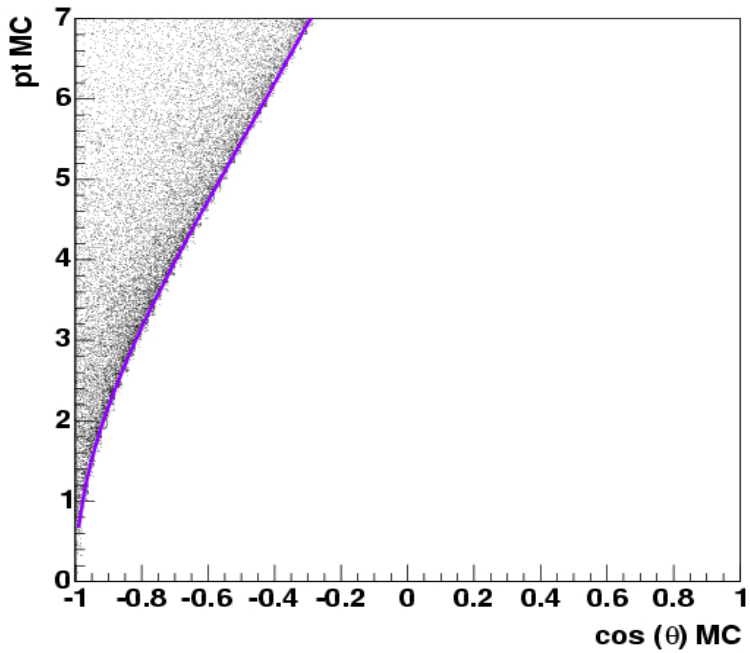
The min-bias dataset has VPD cut at 30 cm.



The Vz distribution is not matching between embedding and data for Au+Au, but it does match for pp.

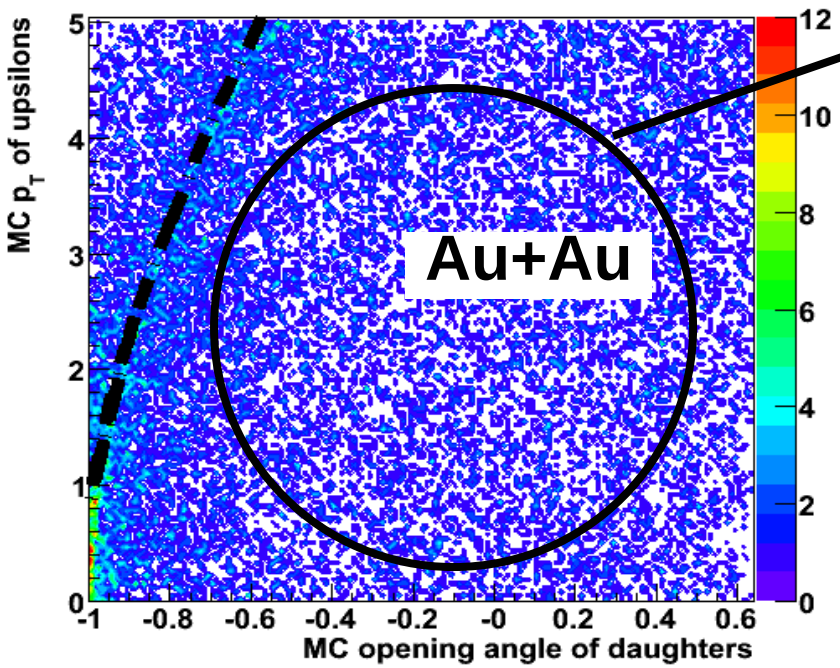
Reason: The tighter cut on Vz for minimum bias "real" dataset used for Au+Au embedding. Such Vz cut Absent for upsilon express stream data.

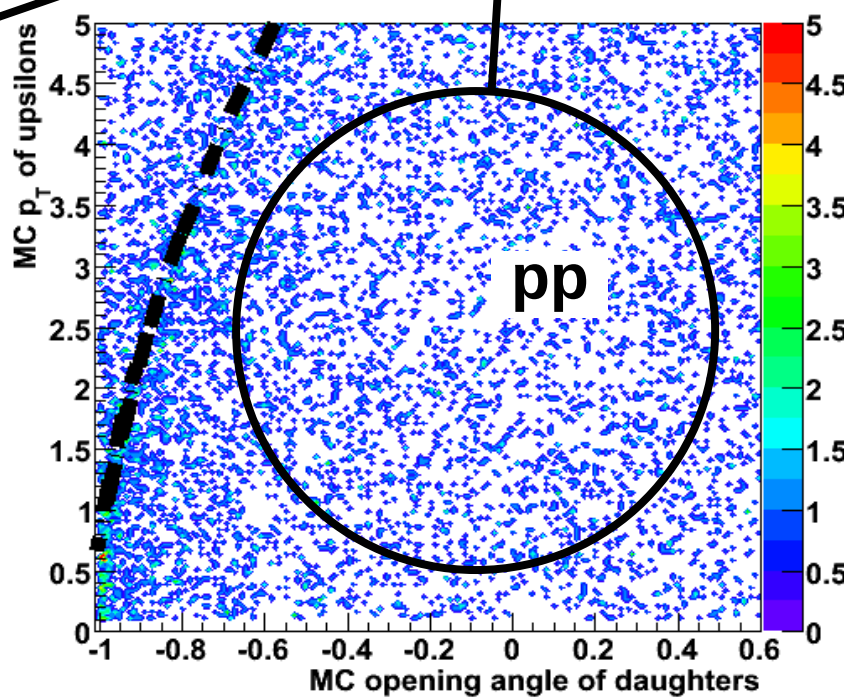
Opening Angle Kinematics– Upsilon MC p_T vs Opening Angle



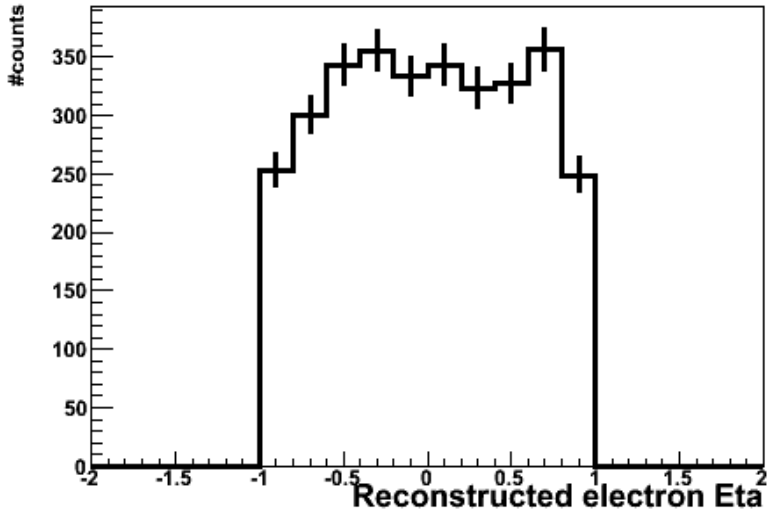
This is an issue for both the pp and Au+Au embedding and still not understood.

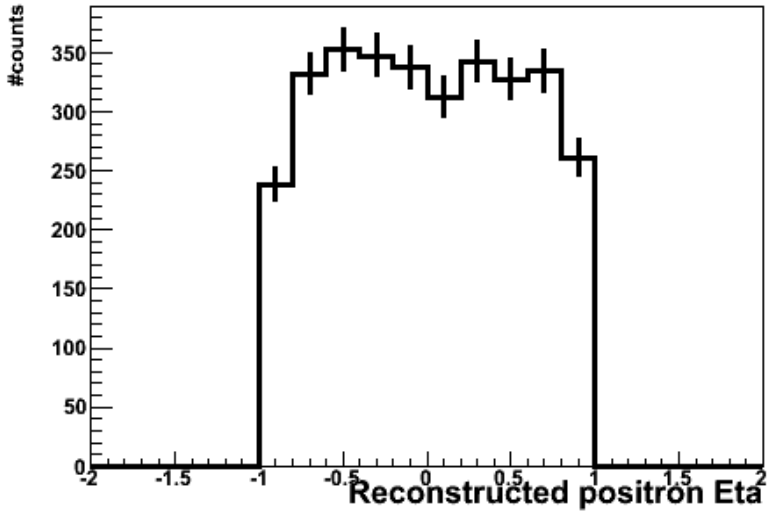
Entries outside the kinematic limit

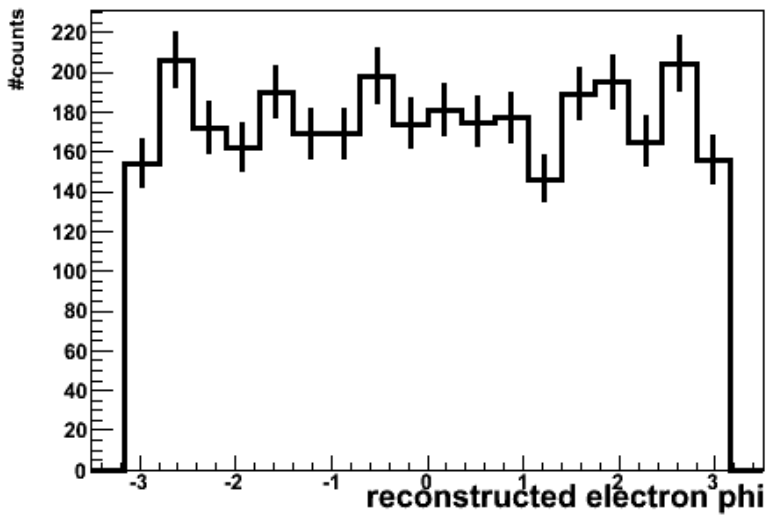


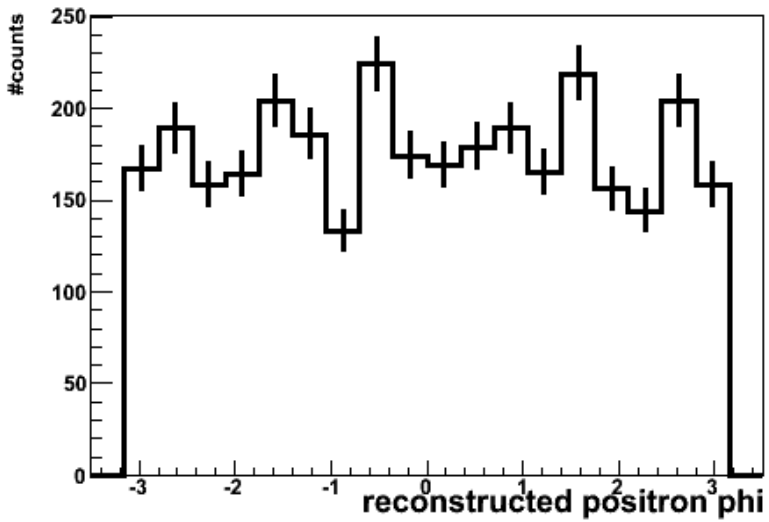


Au+Au 200 GeV, reconstructed electrons and positrons Eta and Phi



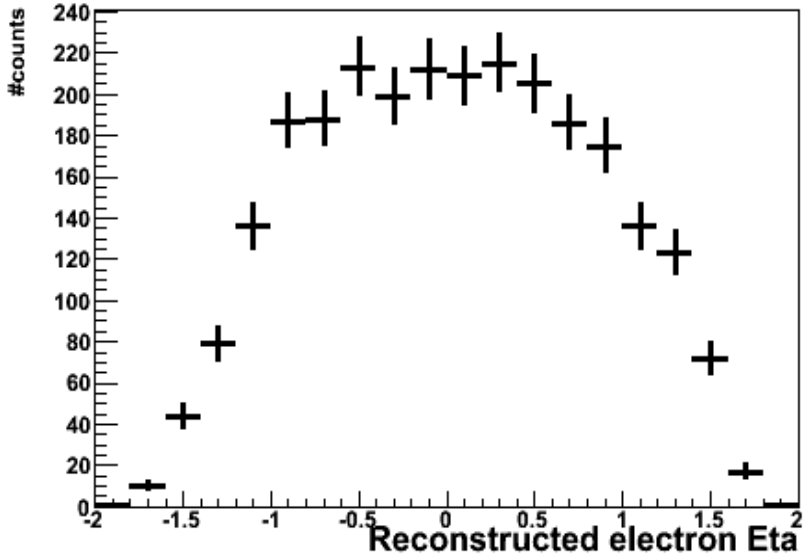


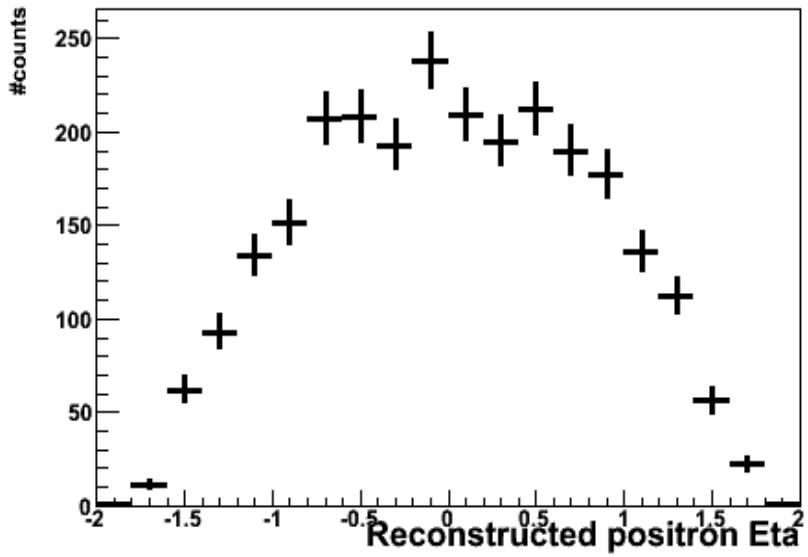


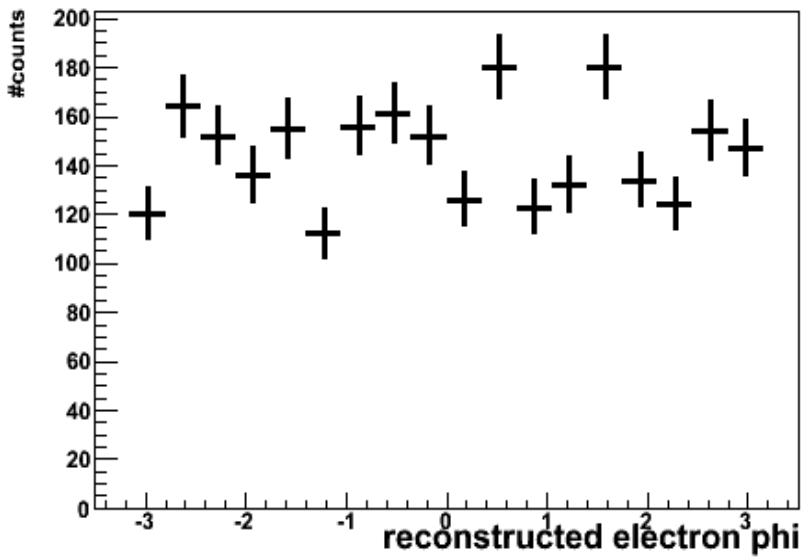


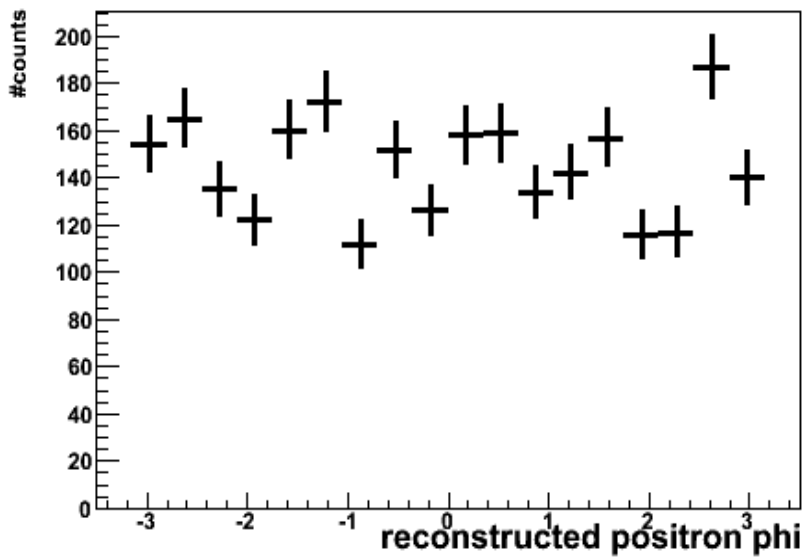
The eta distribution of daughters have a sharp “cut” which is not understood.

p+p 200 GeV reconstructed electrons and positrons Eta and Phi



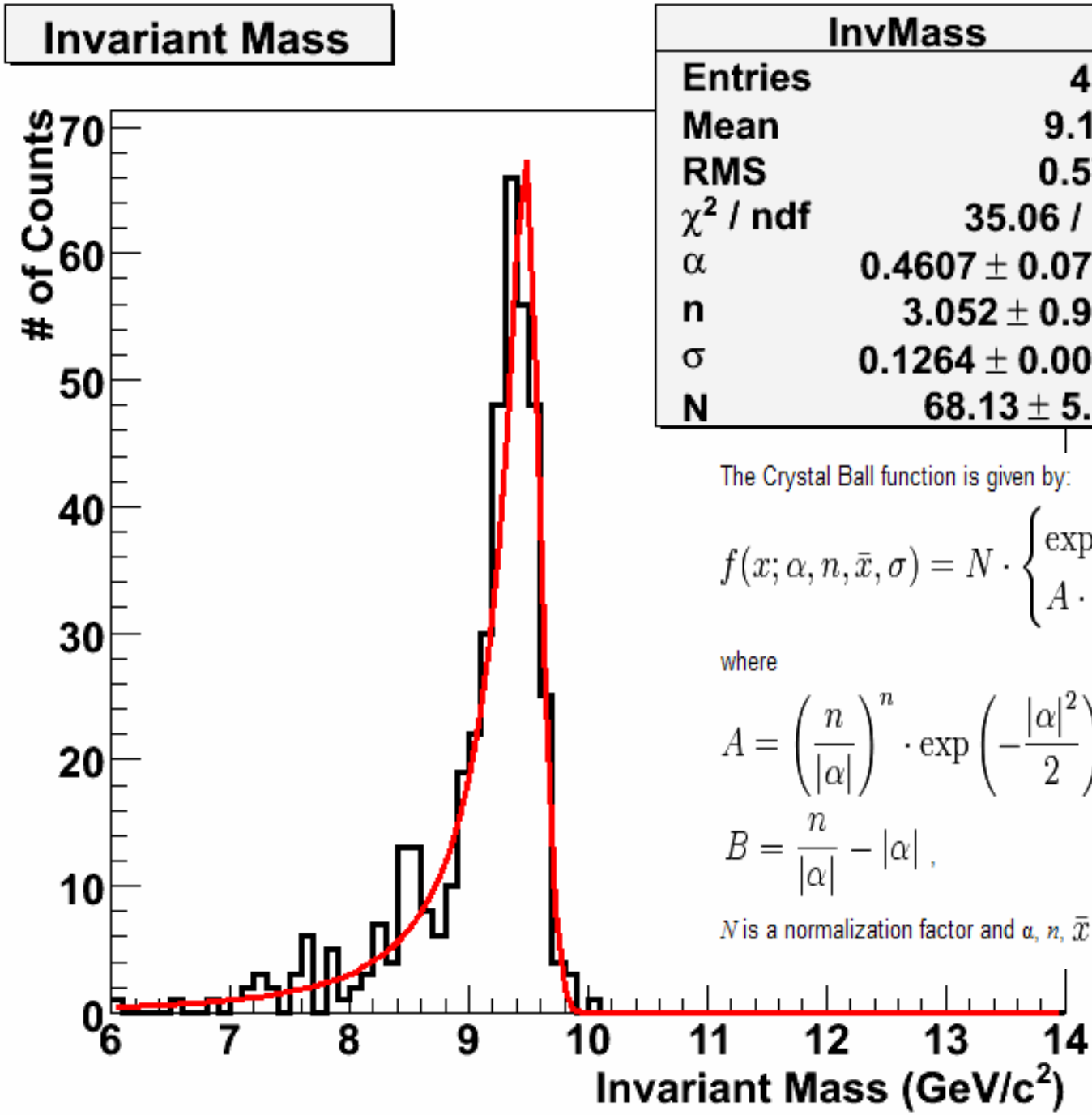






Such “sharp” eta cut is absent for pp 200 GeV embedding sample

Upsilon Line-Shape for 1S state in Au+Au 200 GeV (from TPC)



InvMass	
Entries	414
Mean	9.101
RMS	0.574
χ^2 / ndf	35.06 / 27
α	0.4607 ± 0.0739
n	3.052 ± 0.993
σ	0.1264 ± 0.0087
N	68.13 ± 5.39

The Crystal Ball function is given by:

$$f(x;\alpha,n,\bar{x},\sigma) = N \cdot \begin{cases} \exp(-\frac{(x-\bar{x})^2}{2\sigma^2}), & \text{for } \frac{x-\bar{x}}{\sigma} > -\alpha \\ A \cdot (B - \frac{x-\bar{x}}{\sigma})^{-n}, & \text{for } \frac{x-\bar{x}}{\sigma} \leqslant -\alpha \end{cases}$$

where

$$A = \left(\frac{n}{|\alpha|}\right)^n \cdot \exp\left(-\frac{|\alpha|^2}{2}\right),$$

$$B = \frac{n}{|\alpha|} - |\alpha|\ ,$$

N is a normalization factor and α, n, $\bar{x}$ and σ are parameters which are fitted with the data.

Summary and To-Do's

- The MC information is consistent with the embedding request.
- The vertex distribution needs to be fixed and a possibility will be to use events which do not have such an explicit cut on Vz.
- We see entries outside the kinematic limit for pp and Au+Au in MC pT vs opening angle plot. This is something we need to get fixed.
- The sharp cut in Eta for reconstructed electrons also needs to be understood for Au+Au which is absent for pp embedding.