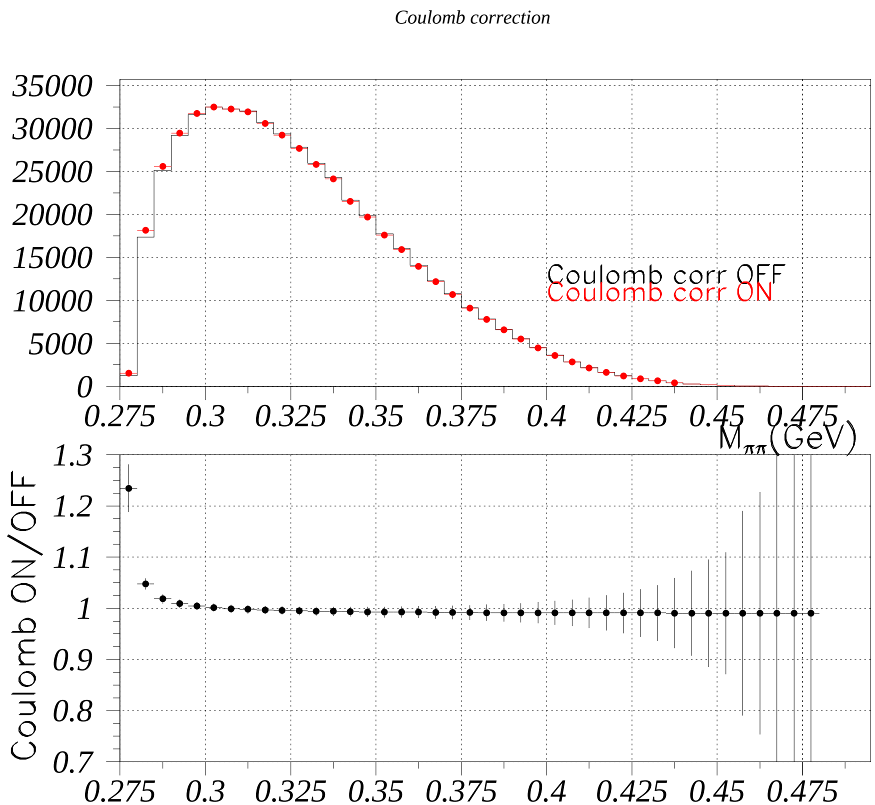
Extra slides -Ke4 analysis

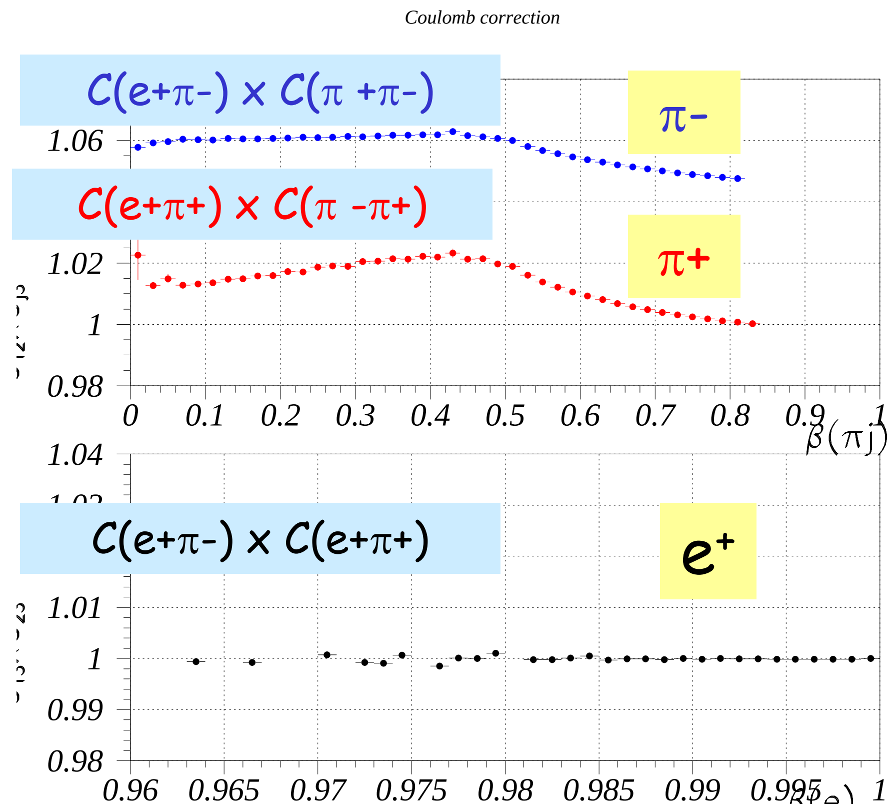
Classical Coulomb corrections

attraction/repulsion between opposite/same charge particles in the final state is implemented as a weight for each generated event : $C = C12*C13*C23$

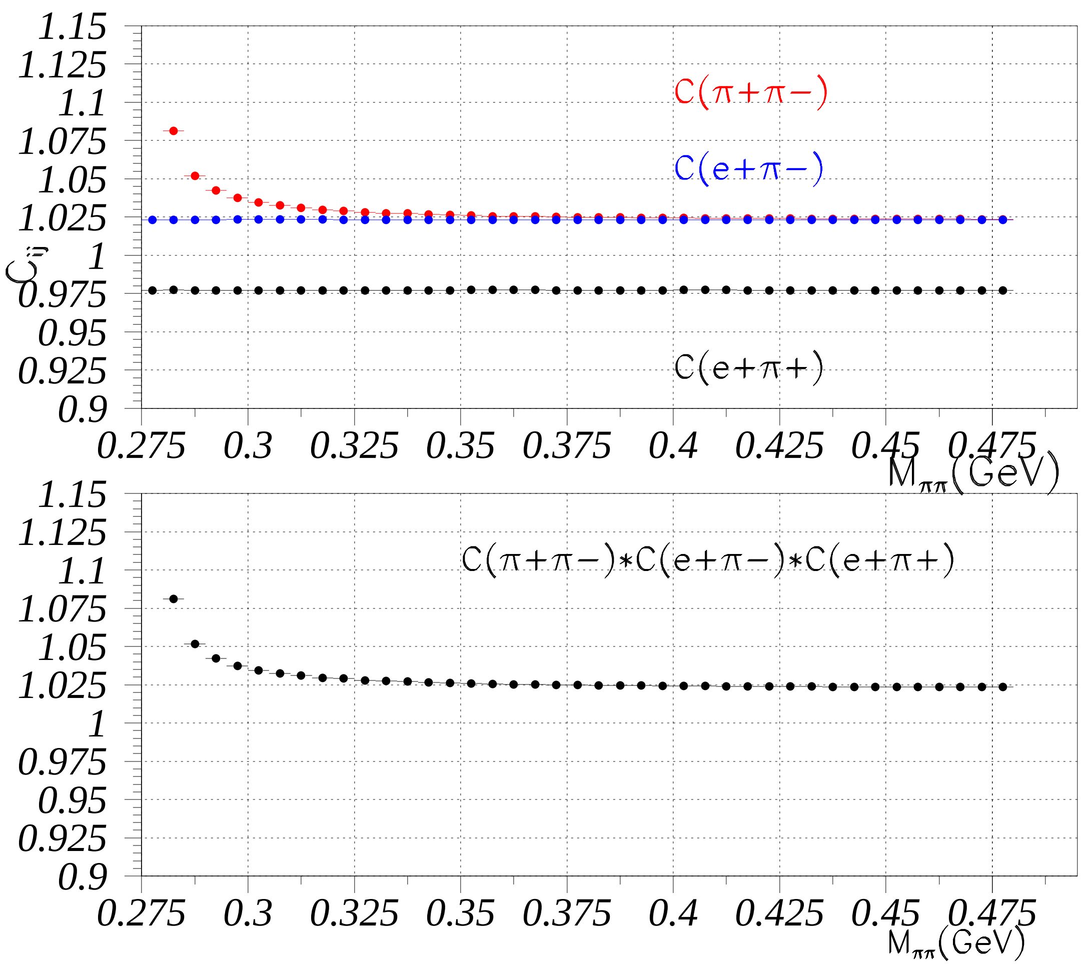
Where $Cij = nij/(e^{nij}-1)$ with $nij = 2\pi\alpha qiqj/vij$ and vij= relative velocity

The overall effect is a distortion of the $M\pi\pi$ mass





Coulomb correction

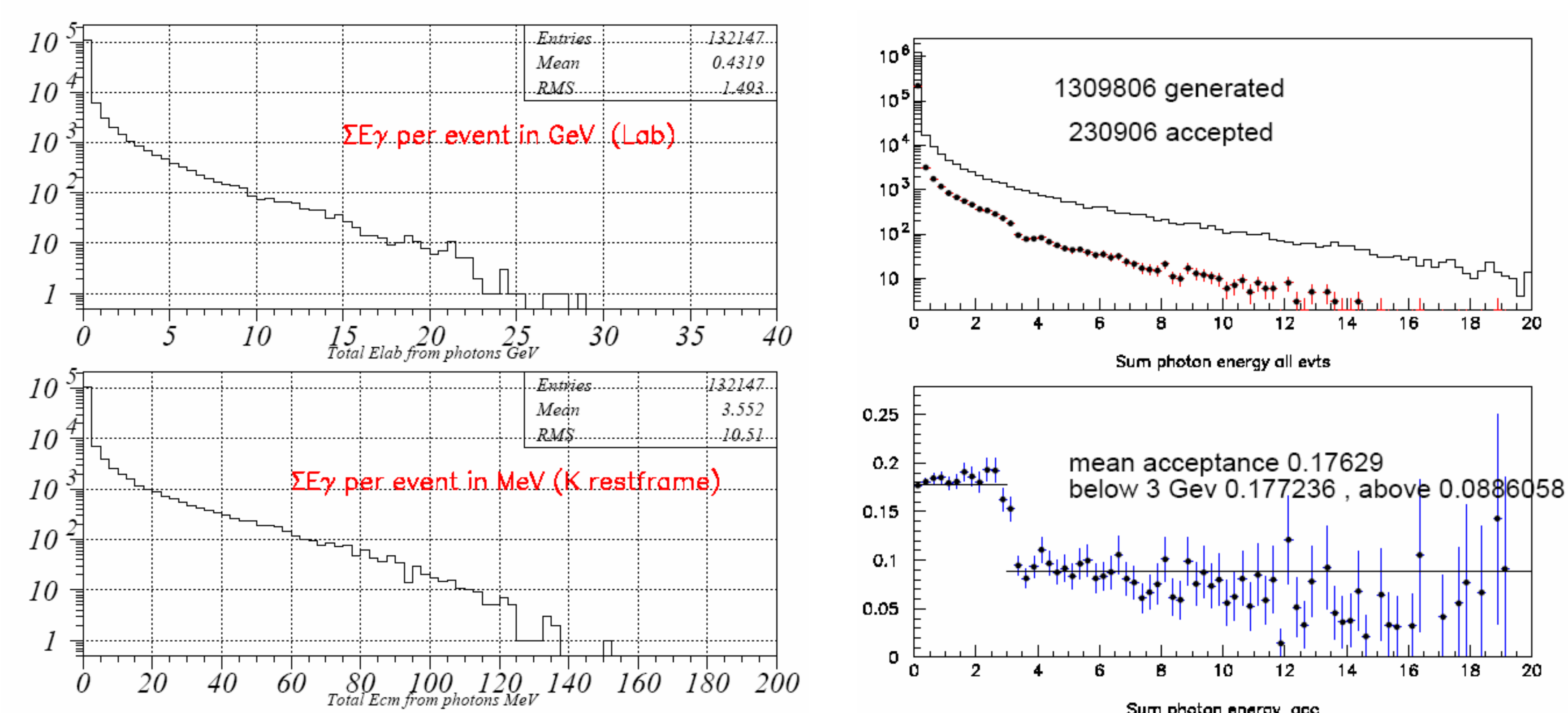


Radiative corrections

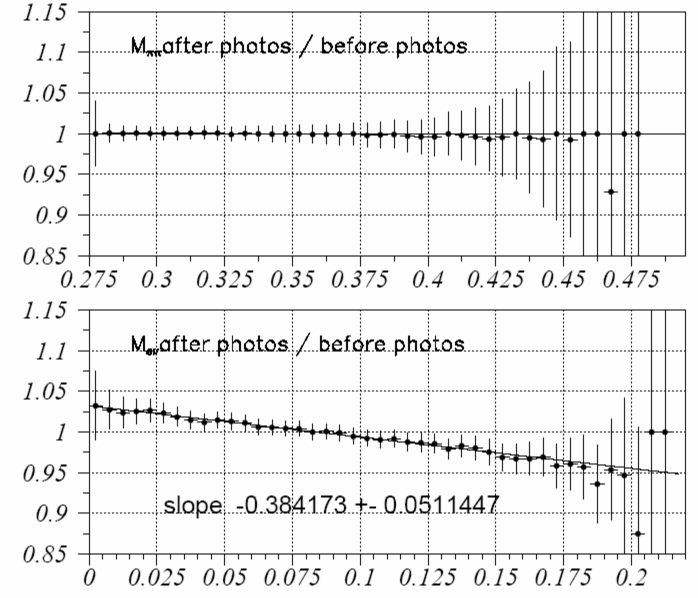
Simulation using PHOTOS version 2.15 from Z. Was et al.

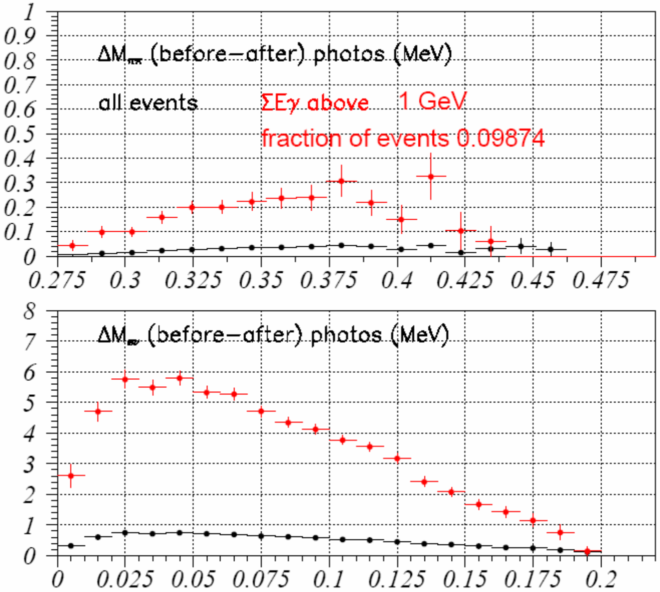
At high $M\pi\pi$ mass, there is room for photon emission (and thus at low $Me\nu$ mass)

~26% of events have "some" radiated photon energy (>0 GeV) but less than 10% have more than 1 GeV radiated. Above 3GeV radiated energy, the acceptance is even lower (cut at 3GeV non associated energy)



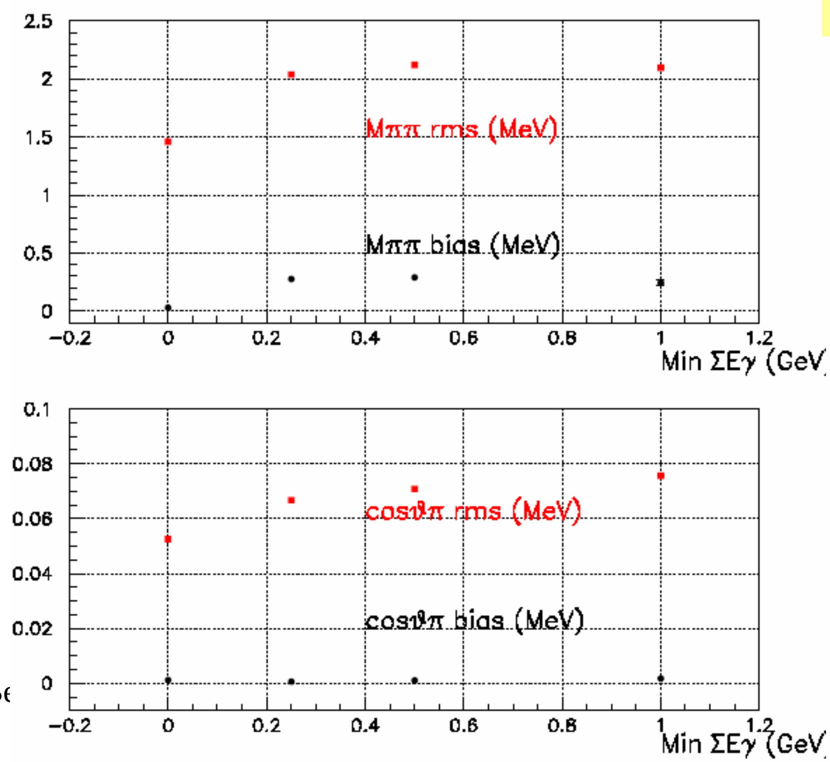
Generation level

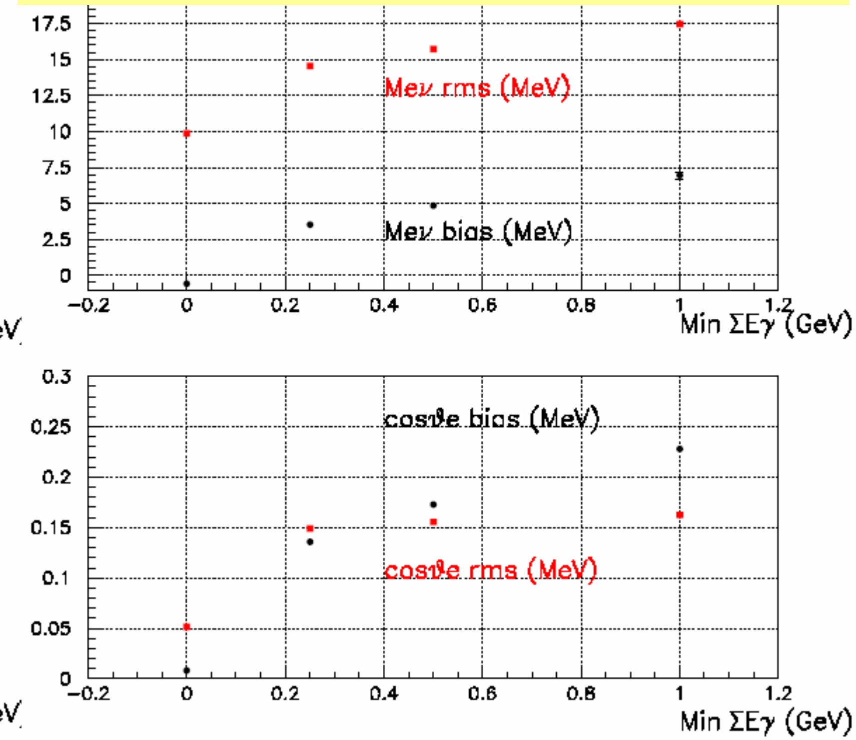




Largest effect on Meν and cosθe variables

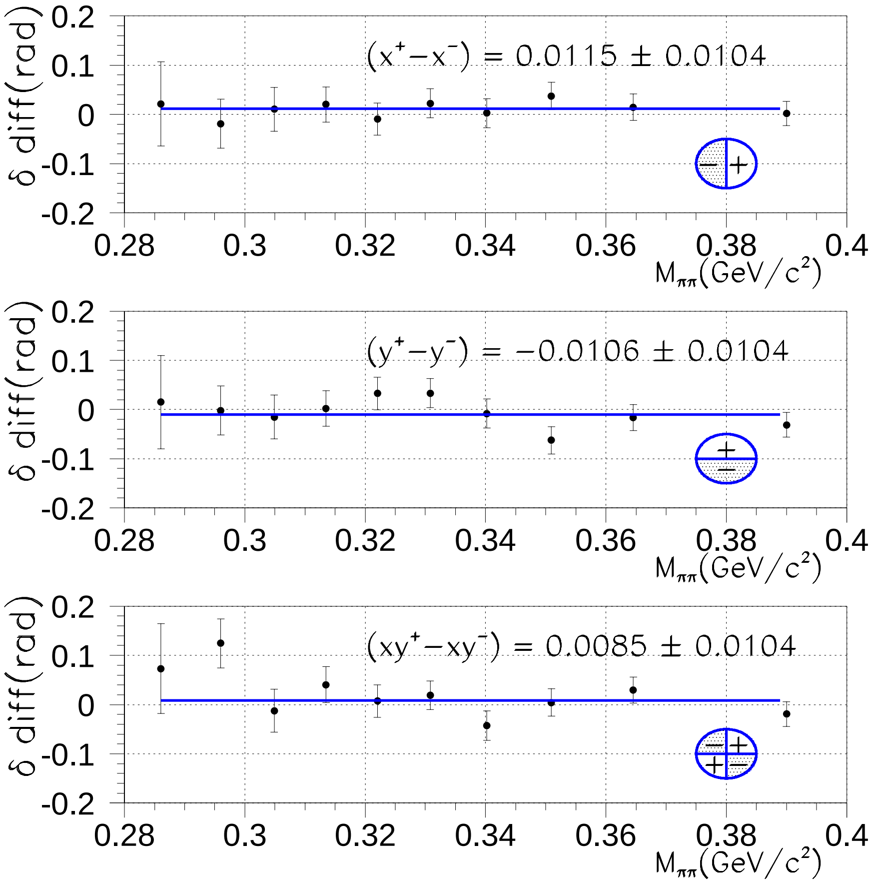
After acceptance and selection

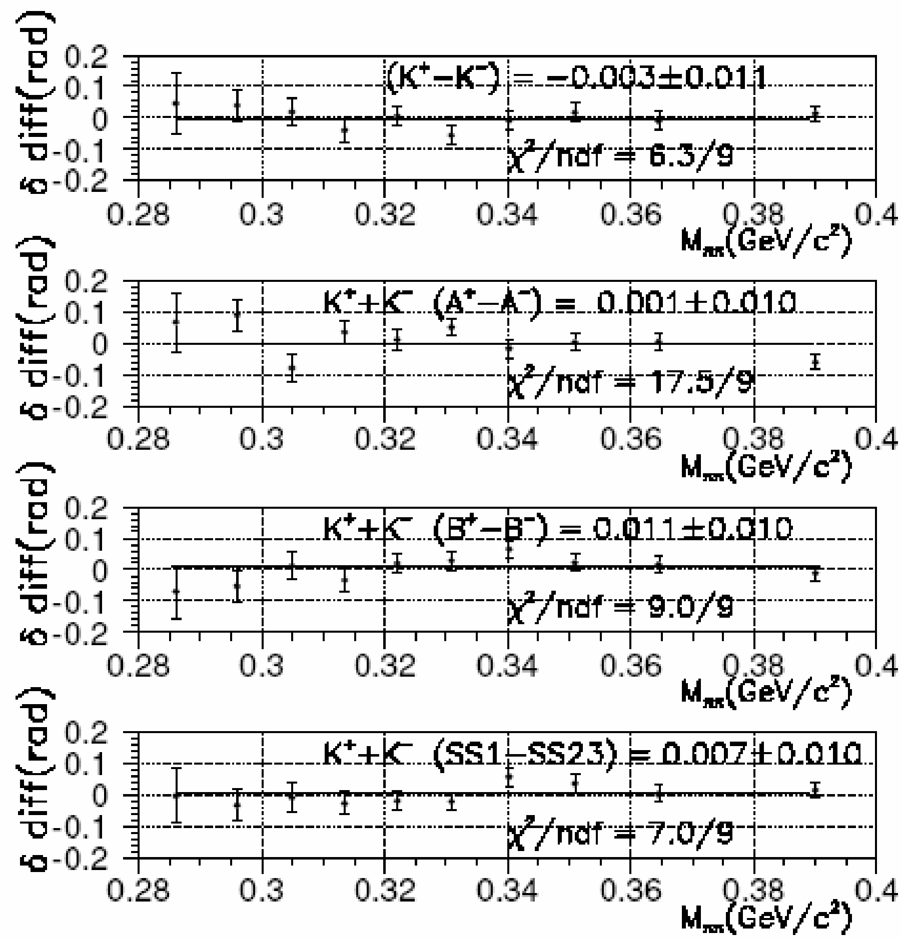




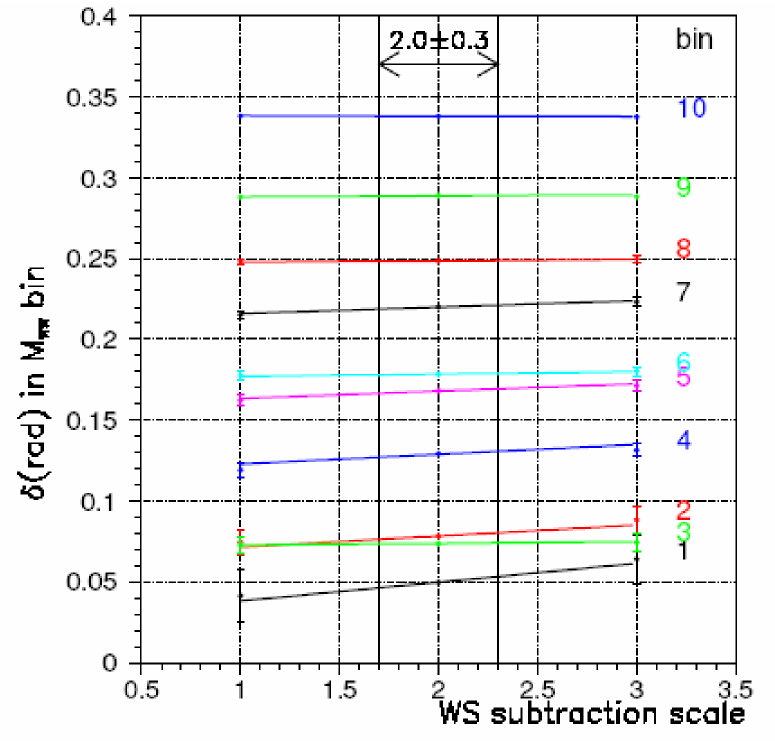
Stability checks = acceptance control quality

Electron impact in LKr calo, Kaon charge, Achromat and Magnet polarity, time …





Background level control (1)



Method:

- subtract 1*WS,2*WS,3*WS
- Measure slope Dδ/Dbkg for each δ point

Quote 0.3*Dδ/Dbkg since we control the background subtraction as (2. ± 0.3)*WS

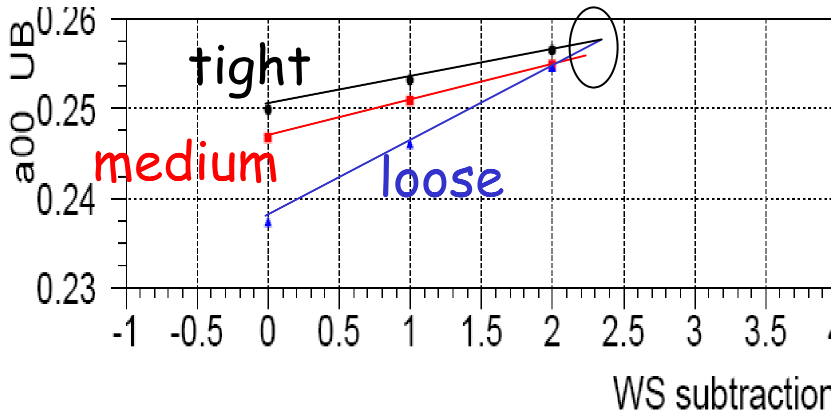
Slopes are all positive, bin to bin correlated

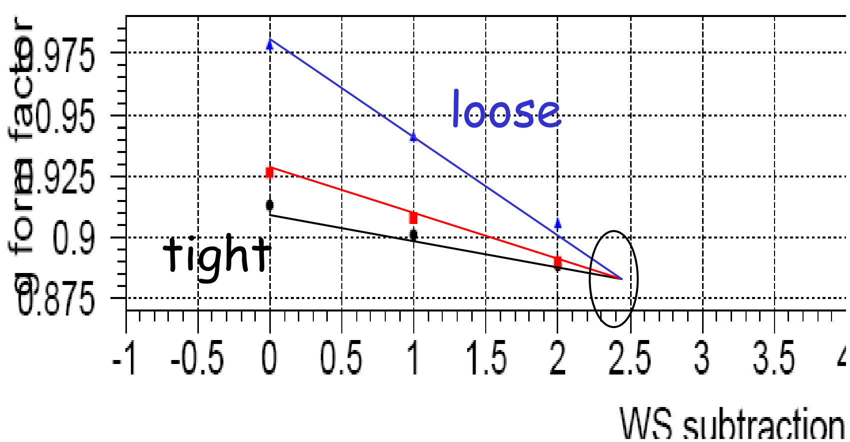
Background level control (2)

•Repeat for 3 ellipse cuts : the FF vary with the level of bkg subtracted but with different slopes

•The 3 lines focus to the same FF value when the true level is reached = ~ 2.3 x Wrong Sign events

•This factor 2.3 confirmed by summing all background processes contributing to signal with corresponding acceptance and branching fractions.



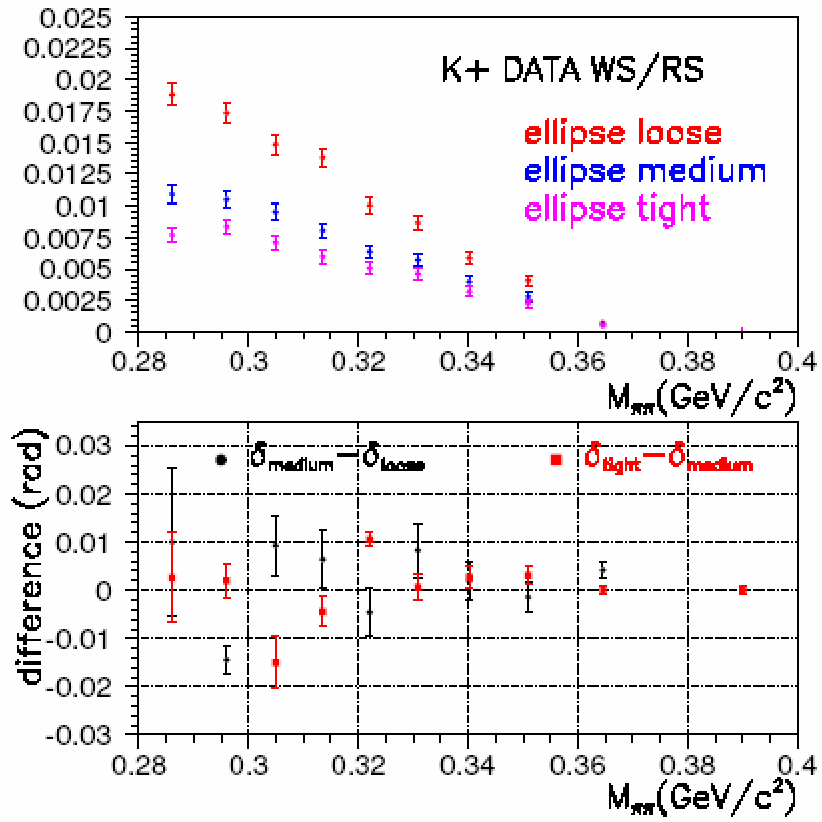


Background shape control

Method:

- Vary the ellipse cut in the plane [M3π-MK,pt] from loose to medium to tight
- Background shape distorted (not scaled)
- Quote 0.5*(Dδ1-Dδ2) as variations are similar and remove both ~2% events

No bin to bin correlation



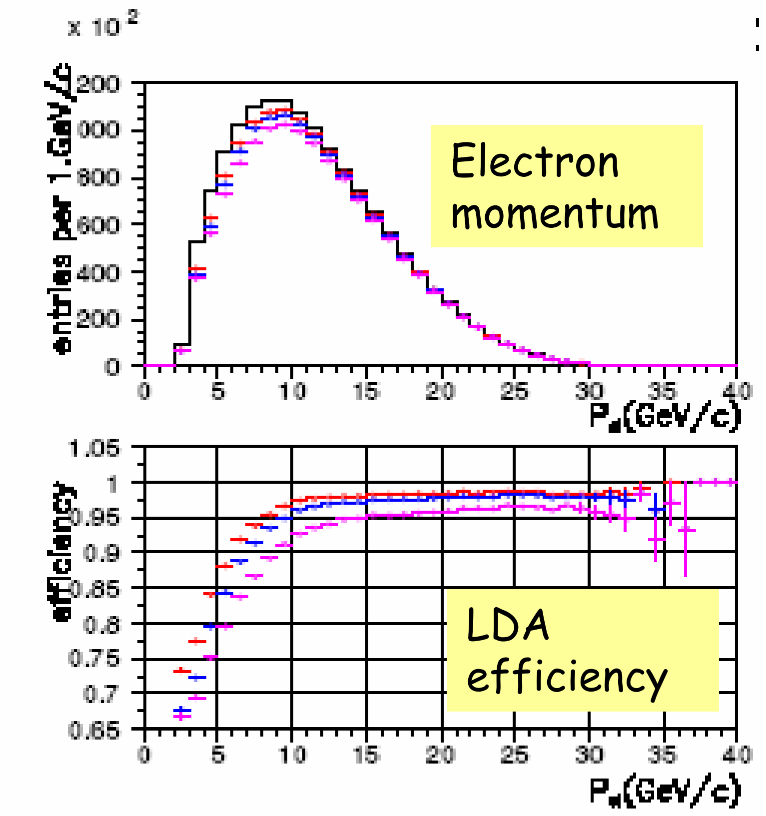
Electron identification control

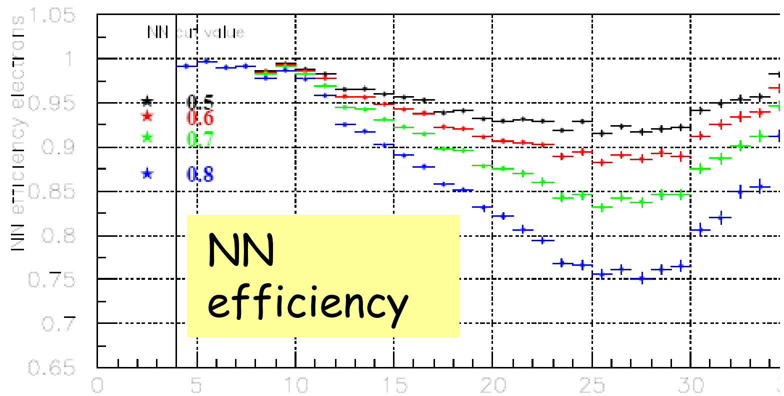
Method:

- Vary he LDA cut =(0.85, 0.90, 0.95) for Data and MC (applied to MC as a parametrized efficiency f(Pel)),

+ compare NN (0.80) and LDA(0.90) results

- Quote weighted rms of the three numbers as variations are similar and bin to bin uncorrelated





Trigger efficiency

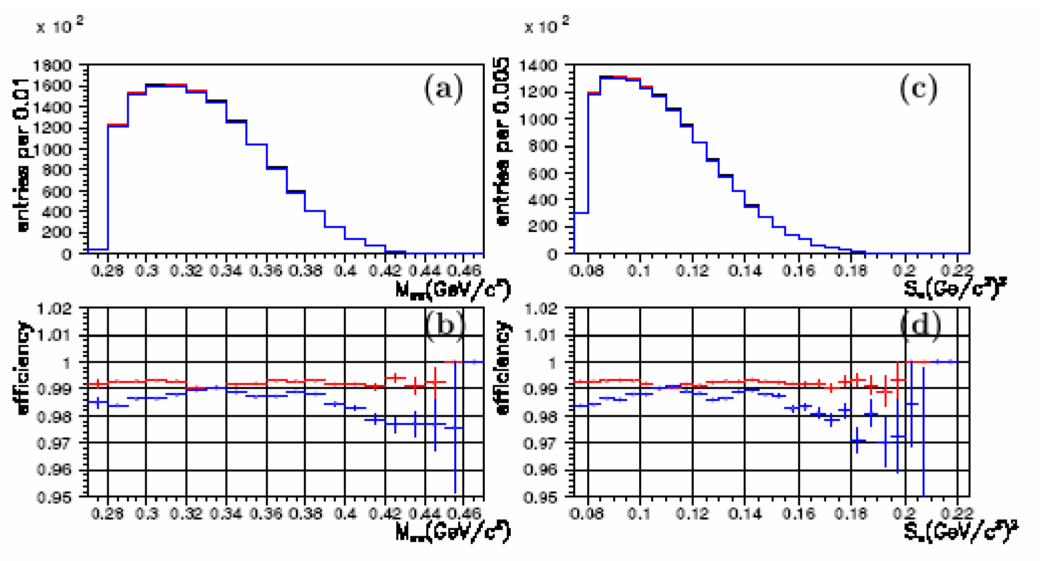
2 Methods:

- evaluation from Minimum Bias triggers in 2003:
  Efficiency = (99.3 ± 0.1)%, available as a matrix in the 5-dimension space of the C.M. variables.

- evaluation from $\pi\pi^0_D$ decays treated as Ke4 (S_π up to 0.225)
  Efficiency = (98.15± 0.06)%, available as function of S_π

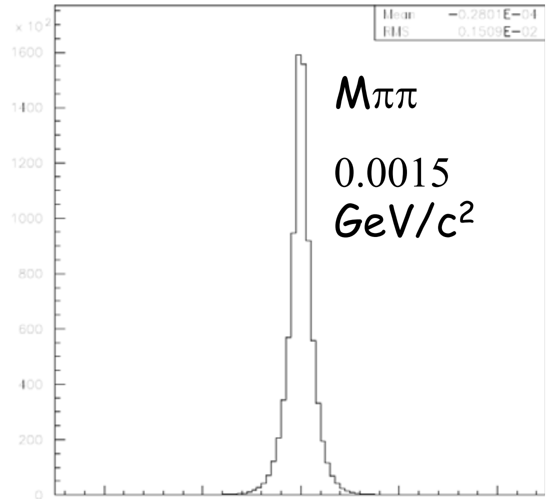
Difference within 1% for significant acceptance regions

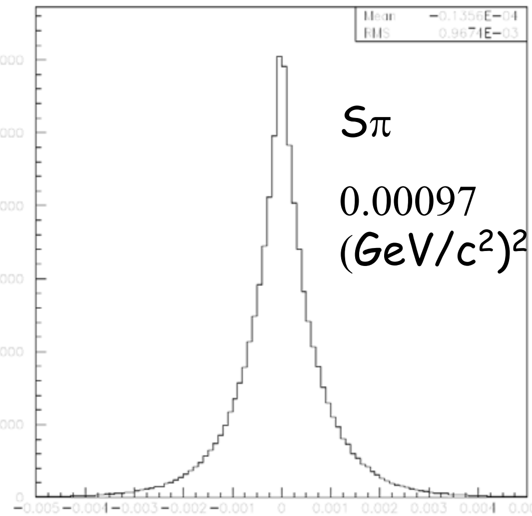
Effect on data is similar when efficiency applied to MC, →average values, bin to bin uncorrelated

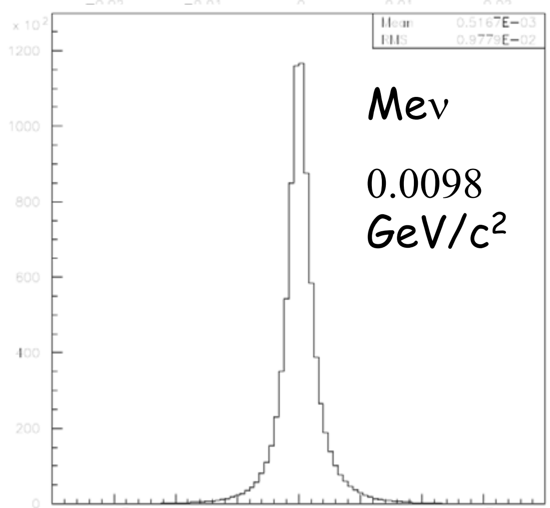


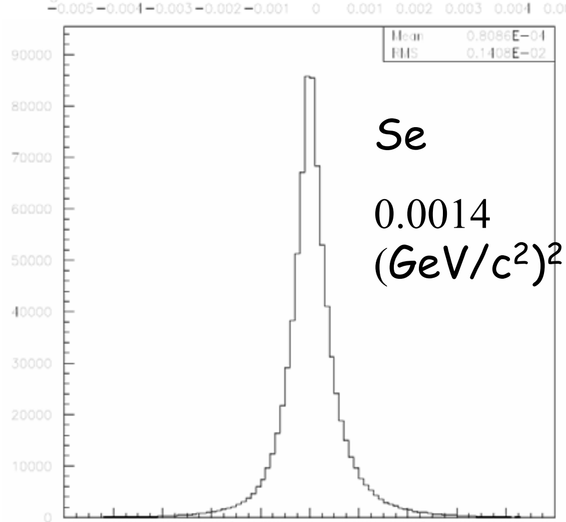
NA48 resolutions

Resolution for C.M. variables : masses









BNL for comparison :

Sπ 0.00133 $(GeV/c^2)^2$

Se 0.00361 $(GeV/c^2)^2$

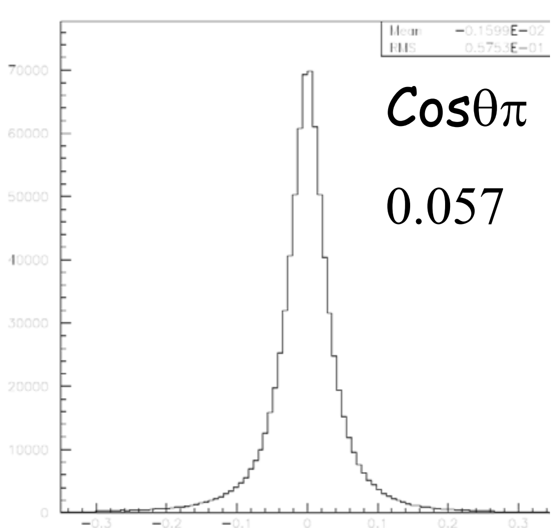
θπ 0.147 (rad)

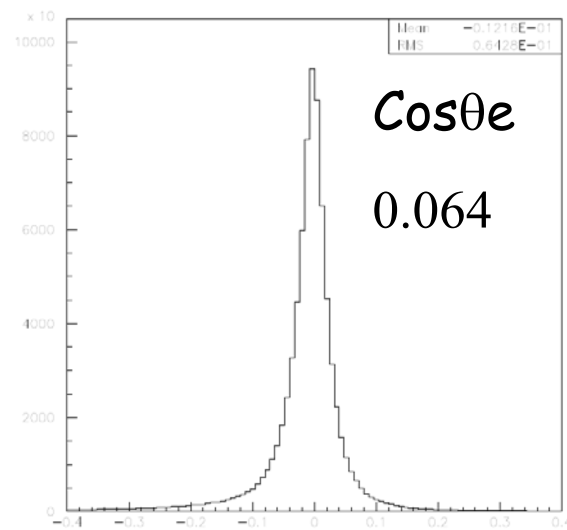
θe 0.111 (rad)

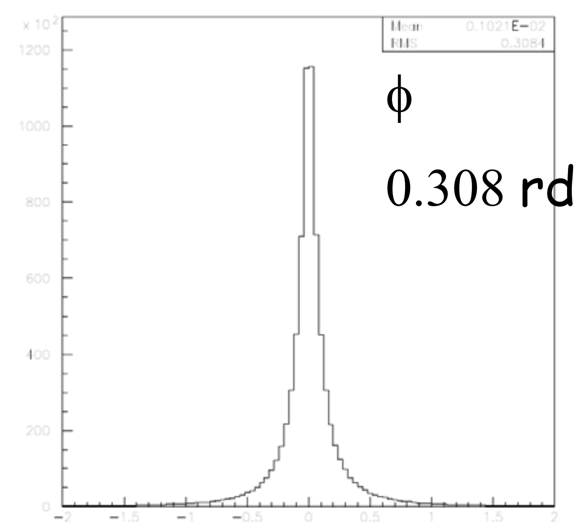
ϕ 0.404 (rad)

NA48 resolutions

Resolution for C.M. variables : rms (angles)

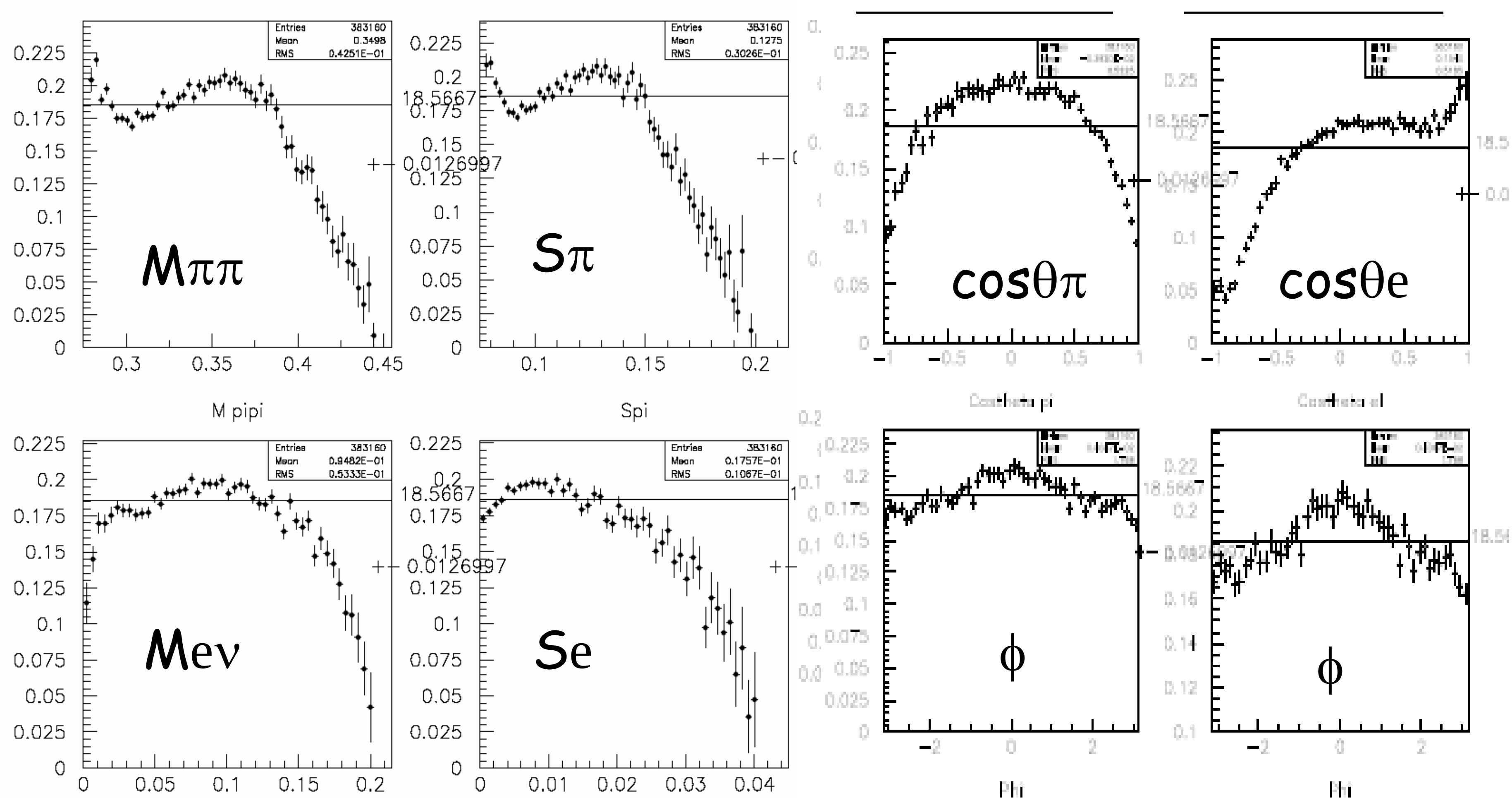






Acceptance

Typically 18.57 +- 0.01 %



The "Dalitz" plot ($M\pi\pi$,$Me\nu$) bins