A Study in Progress :

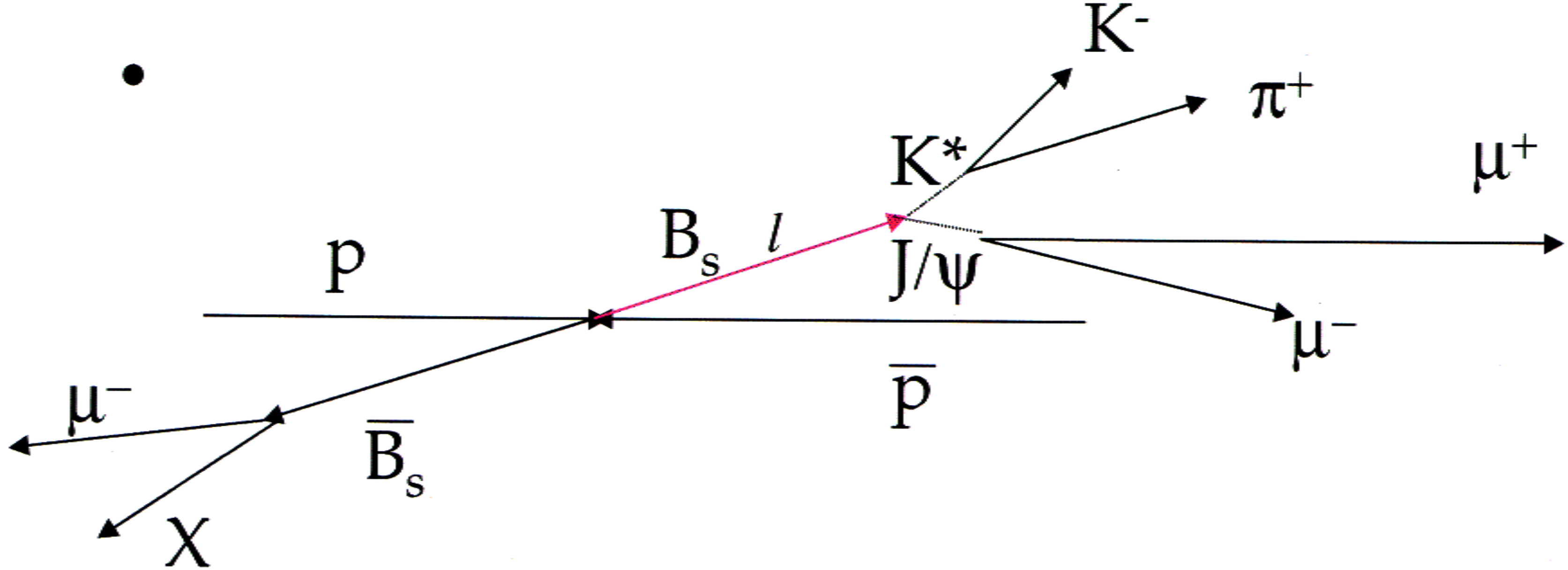
D0 Measurement of

ΔM_{B_s}

Using $B_s \rightarrow J/\Psi\ K^*$

$$B_s \to J/\psi K^*(890) \to \mu^+\mu^-(\gamma)K^\pm\pi^\mp$$

•



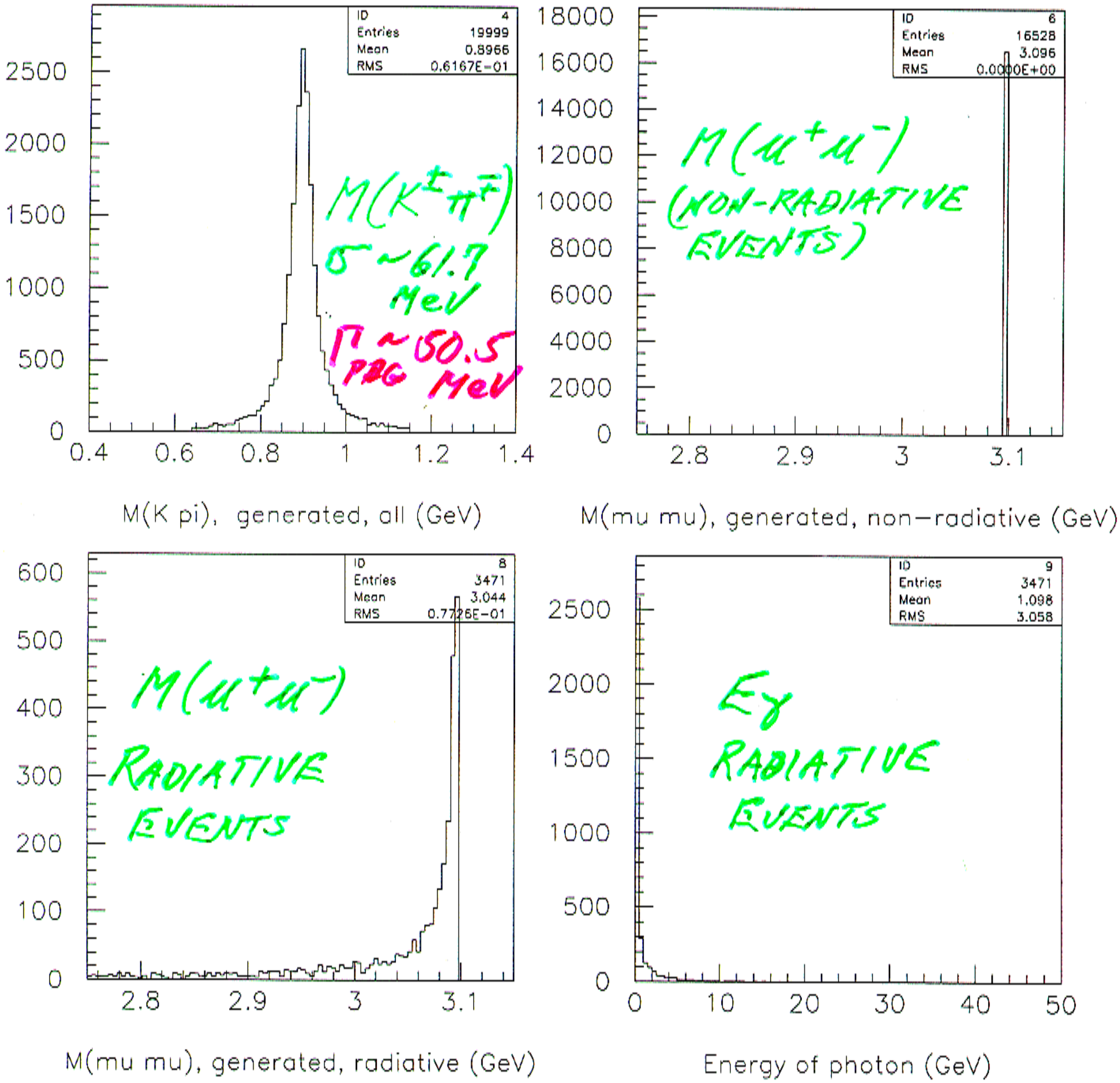
MC FAST

Event Generation

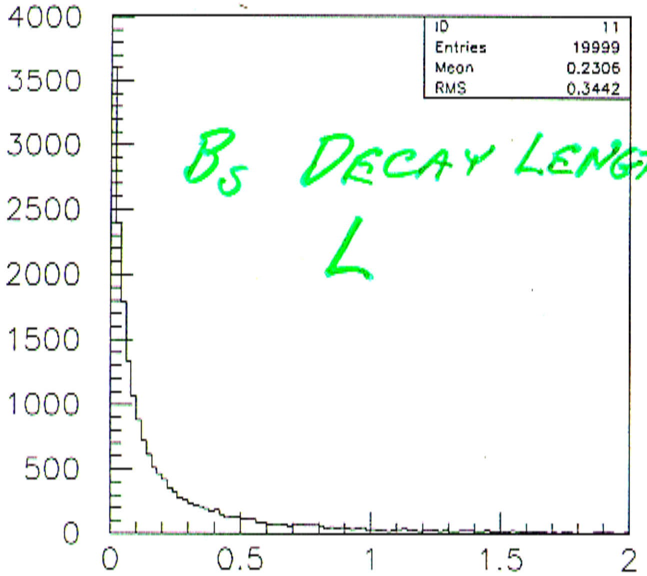
$$B_s \rightarrow J/\psi K^*(890) \rightarrow \mu^+\mu^-(\gamma)K^\pm\pi^\mp$$

- 20,000 events generated.
- 3,471 have radiative decay.
- 16,529 have no photon.

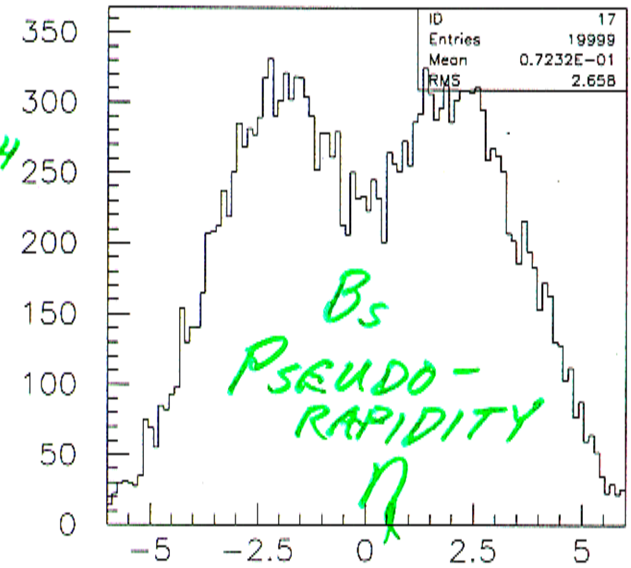
DISTRIBUTIONS FOR THE GENERATED EVENTS (PYTHIA)



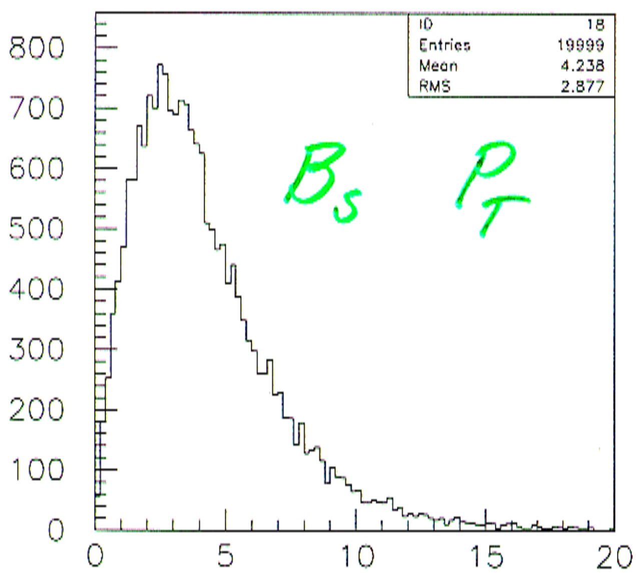
DISTRIBUTIONS FOR THE GENERATE EVENTS (PYTHIA)



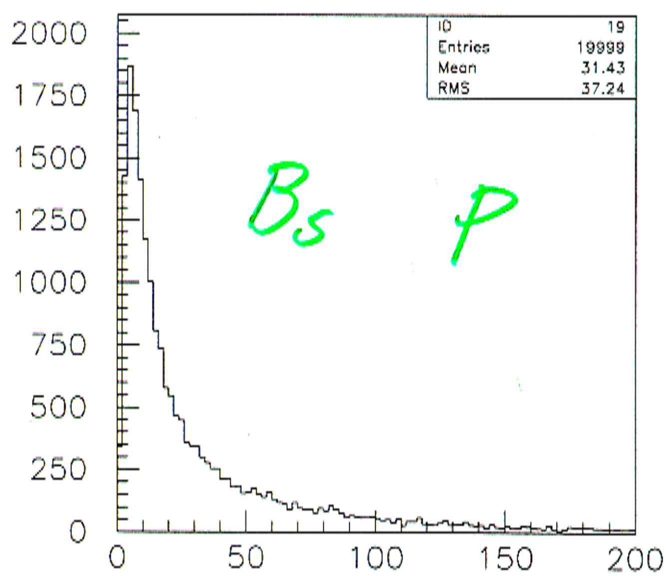
Lab Frame decay length of Bs (cm)



generated η of the Bzs



generated pT of the Bzs



generated p of the Bzs

Event Reconstruction

$$B_s \to J/\psi K^*(890) \to \mu^+\mu^-(\gamma)K^\pm\pi^\mp$$

- Fully reconstructed” means geometrically accepted in the silicon and the fiber tracker.

Event Reconstruction

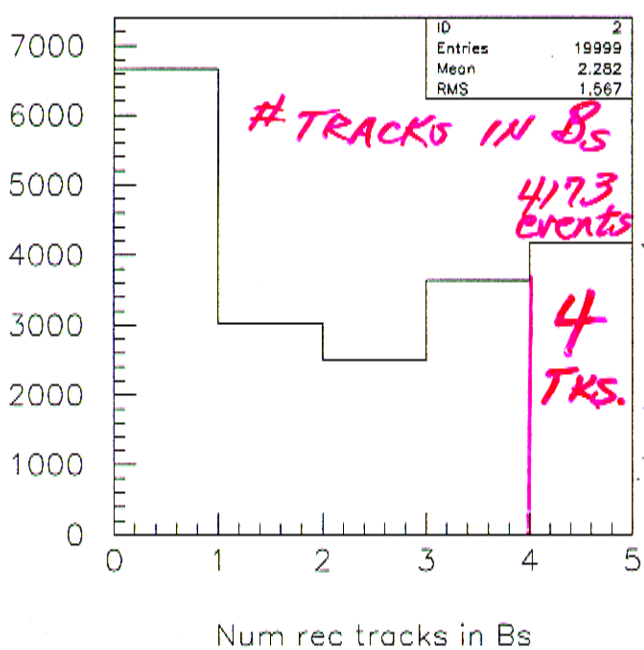
$$B_s \rightarrow J/\psi K^*(890) \rightarrow \mu^+\mu^-(\gamma)K^\pm\pi^\mp$$

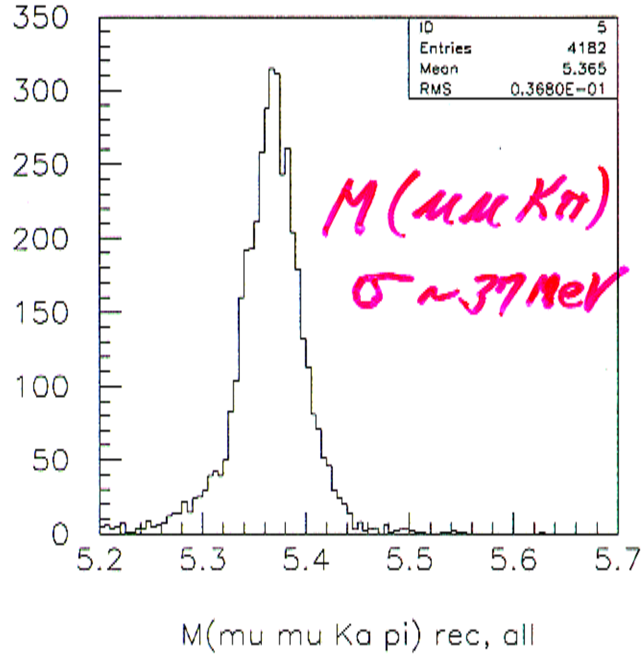
- 6,584/20,000 have dimuon reconstruction.
- 6,534/20,000 have K and π reconstruction.
- 4,173 are fully reconstructed.

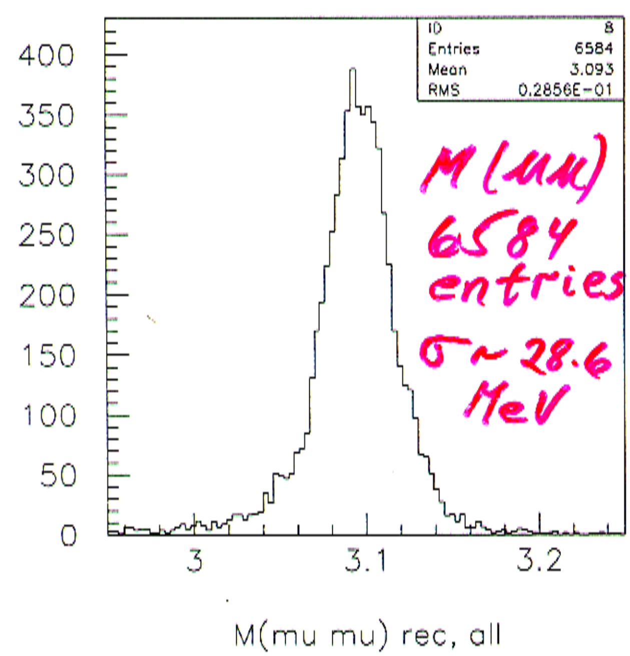
Further Cuts

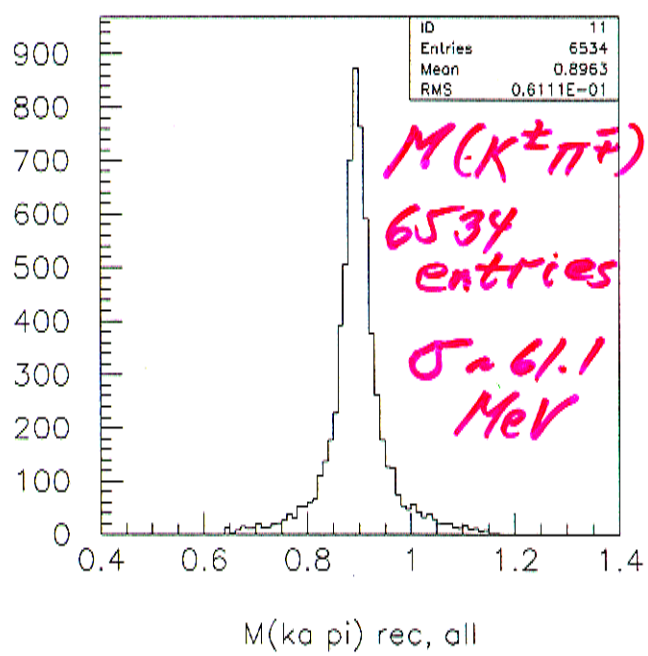
- 20.9 % are "fully reconstructed".
- 26.7 % of the fully-reconstructed events have p_T of both muons > 1.5 $(GeV/c)^2$.
- 89.6 % of the fully-reconstructed events have $|\eta| < 2$.
- 51.7 % of the fully-reconstructed events pass a vertex separation cut of $L/\sigma > 3$, K* mass and J/ψ mass cuts.
- ALL CUTS: 3.26 %.

RESULTS OF RECONSTRUCTION
(BEFORE FITTING)







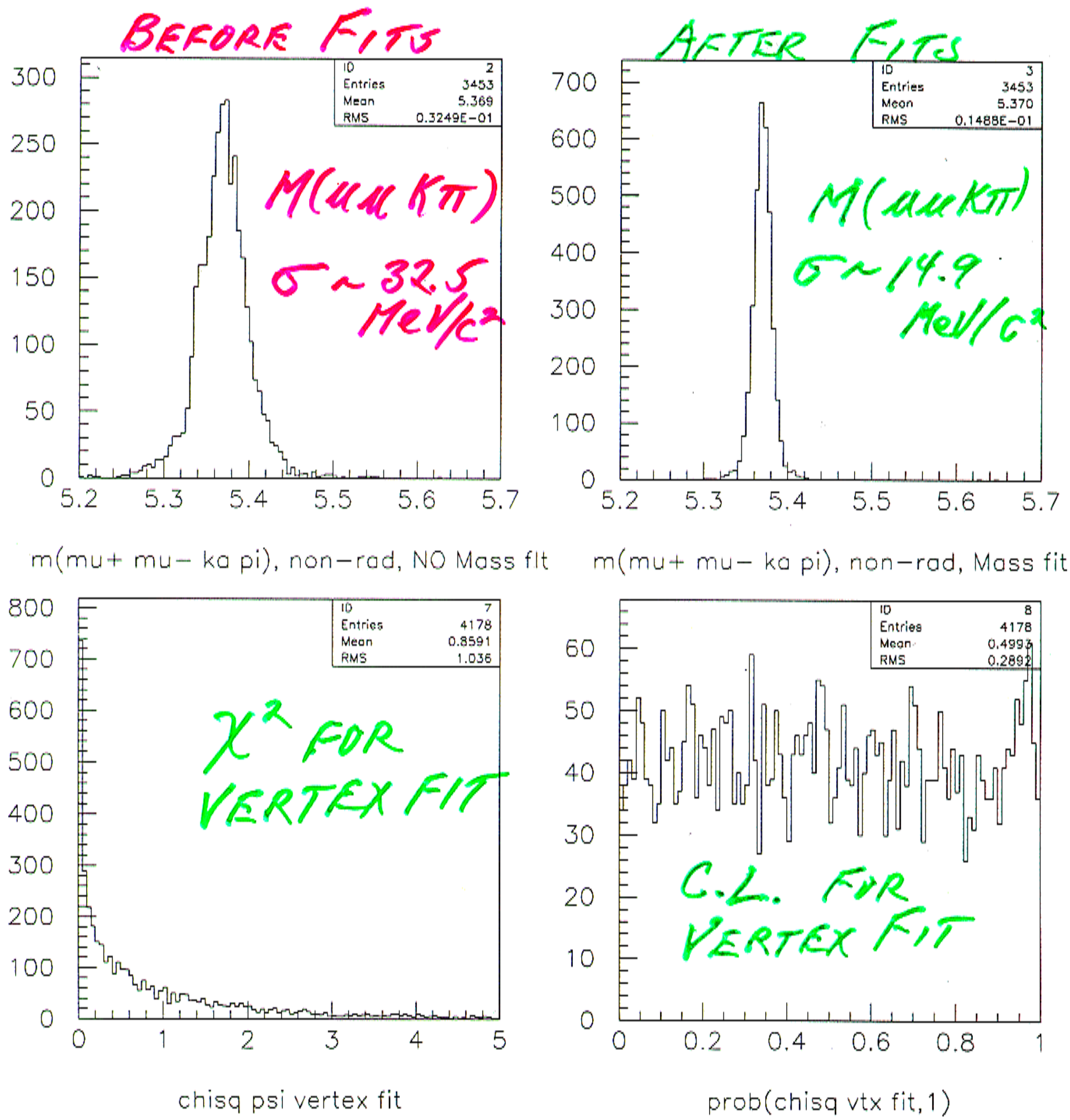


Event Fitting

$$B_s \to J/\psi K^*(890) \to \mu^+\mu^-(\gamma)K^\pm\pi^\mp$$

- J/ψ mass fit.
- J/ψ vertex fit.
- B_s vertex fit.
- Production vertex fit.

FITTING IMPROVES RESOLUTION



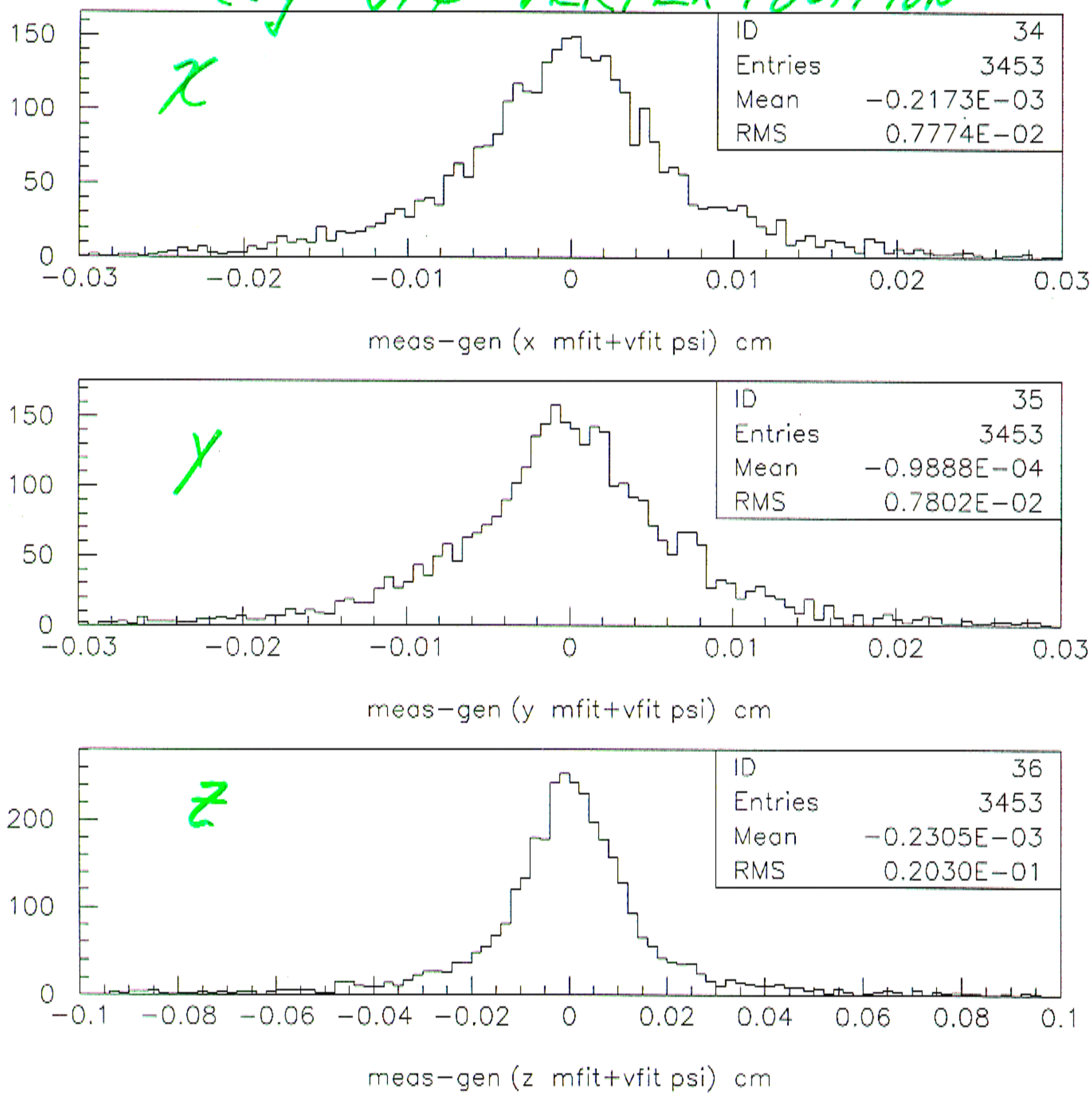
Resolutions

- Effective mass resolutions.

Quantity	Level	σ
$M(B_s)$	Recon.	37 MeV
$M(B_s)$	Recon., no γ	32 MeV
$M(B_s)$	J/ψ mass fit	15 MeV
$M(B_s)$	B_s vertex only	35 MeV
$M(\mu\mu)$	Recon.	29 MeV

DISTRIBUTIONS OF (FITTED - GENERATED) QUANTITIES

e.g J/ψ VERTEX POSITION

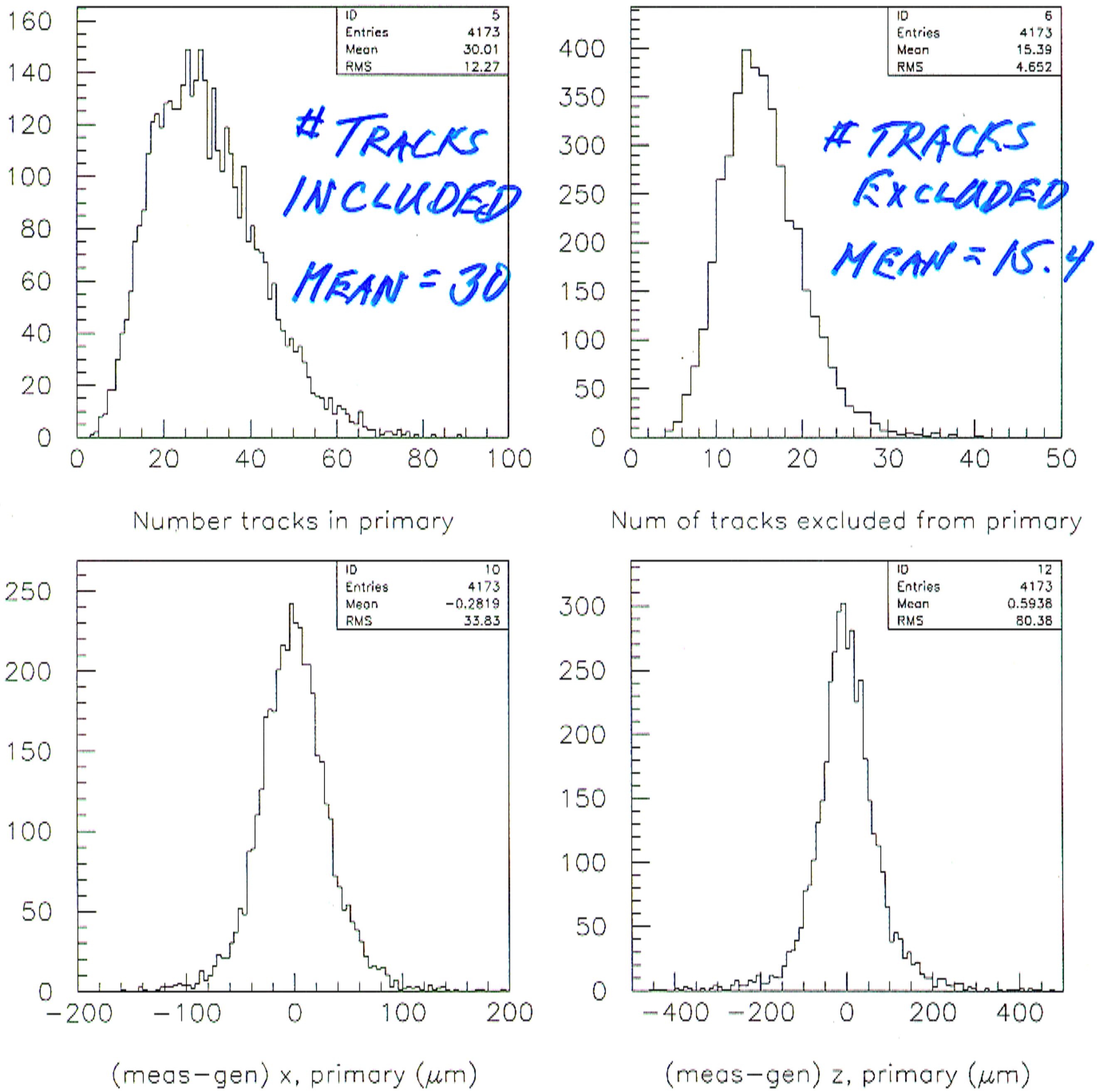


σ[(Fitted - Generated) Distrib.]

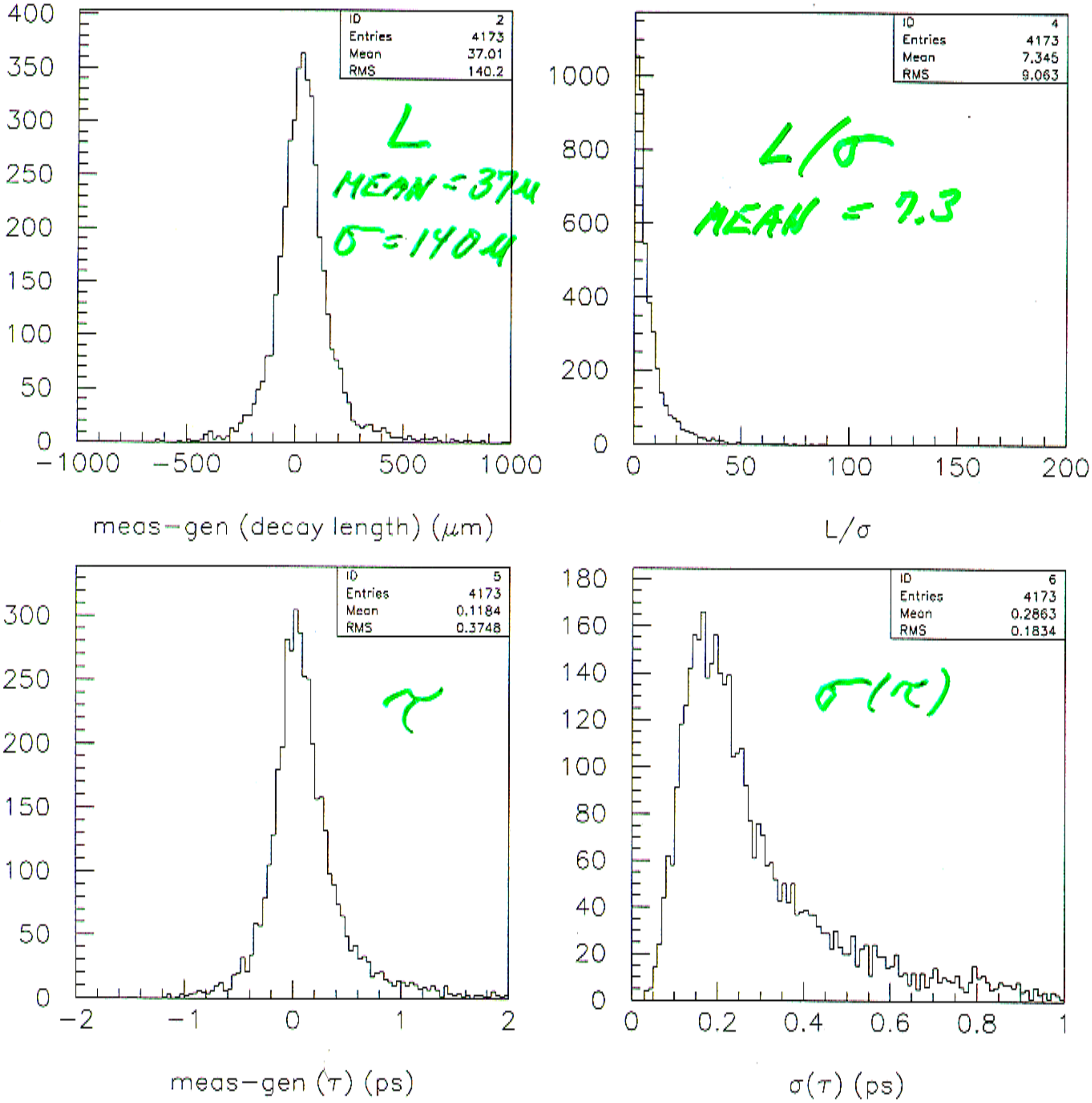
Resolutions

Quantity	σ (x, y, z)
Production Vertex (μ)	34 , 34 , 80
B_s Vertex (μ)	48 , 47 , 139
J/ψ Vertex (μ)	78 , 78 , 203
J/ψ Momentum (MeV/c)	18.3 , 17.9, 33.6
B_s Decay length	140 μ
Proper time	0.37 ps

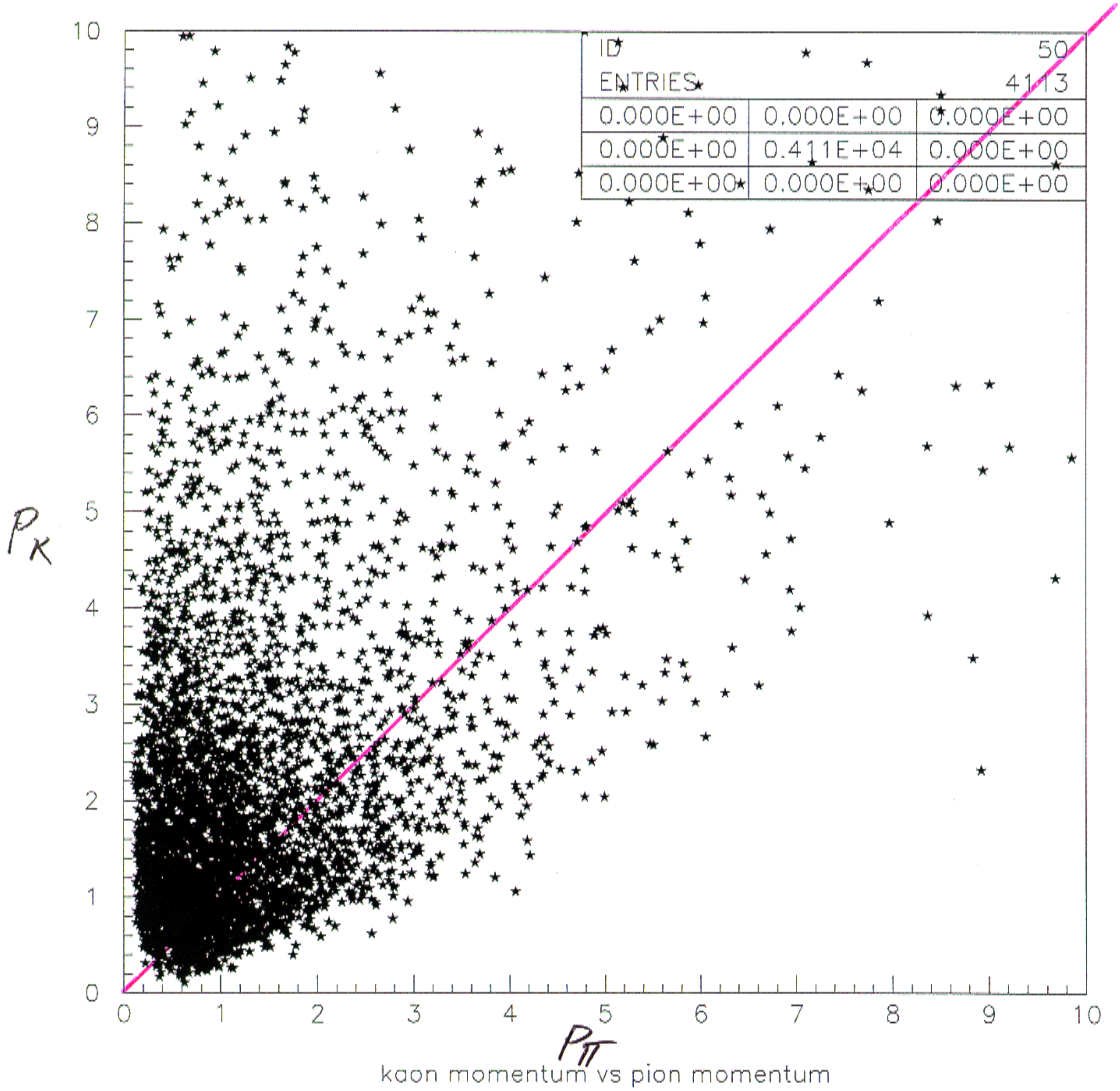
PRIMARY VERTEX FIT



(FITTED - GENERATED)

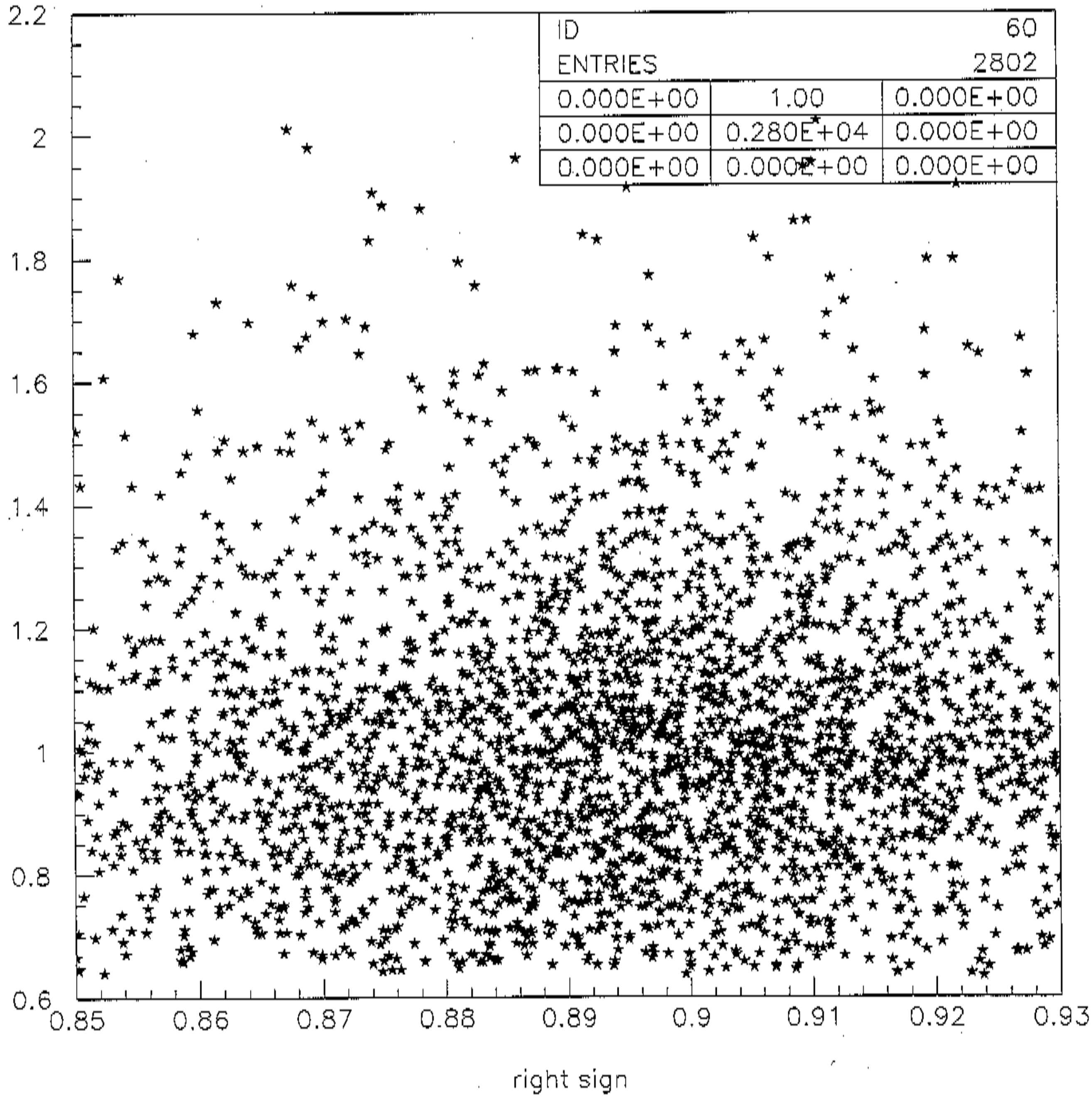


FLAVOR TAGGING BY $P_K > P_\pi$ ASSUMPTION.



Flavor Tagging (momentum)

- $p_K > p_\pi$
- Dilution = $(N_r-N_w)/(N_r+N_w) = .42$ (no cuts)
- Dilution = $(N_r-N_w)/(N_r+N_w) = .32$ (all cuts)



ID 60
ENTRIES 2802
0.000E+00 1.00 0.000E+00
0.000E+00 0.280E+04 0.000E+00
0.000E+00 0.000E+00 0.000E+00
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.85
0.86
0.87
0.88
0.89
0.9
0.91
0.92
0.93
right sign

Flavor Tagging (Kπ mass)

- Choose closest mass to K*
- Dilution = $(N_r-N_w)/(N_r+N_w)$ = .67 (no cuts)
- Dilution = $(N_r-N_w)/(N_r+N_w)$ = .68 (no cuts)

Next Steps:

- Flavor Tag the Production Vertex.

  (Concentrate on additional leptons and try to develop a tagging algorithm.)

- Make better estimates of the statistics we will have in this channel.

- Create a data sample to study the time evolution of the decays (Put in a ΔM and see if we can measure the oscillations.)

- Study MCFAST further or convert to new D0 Monte Carlo.