

$\Psi(4040)$ studies for the FTS

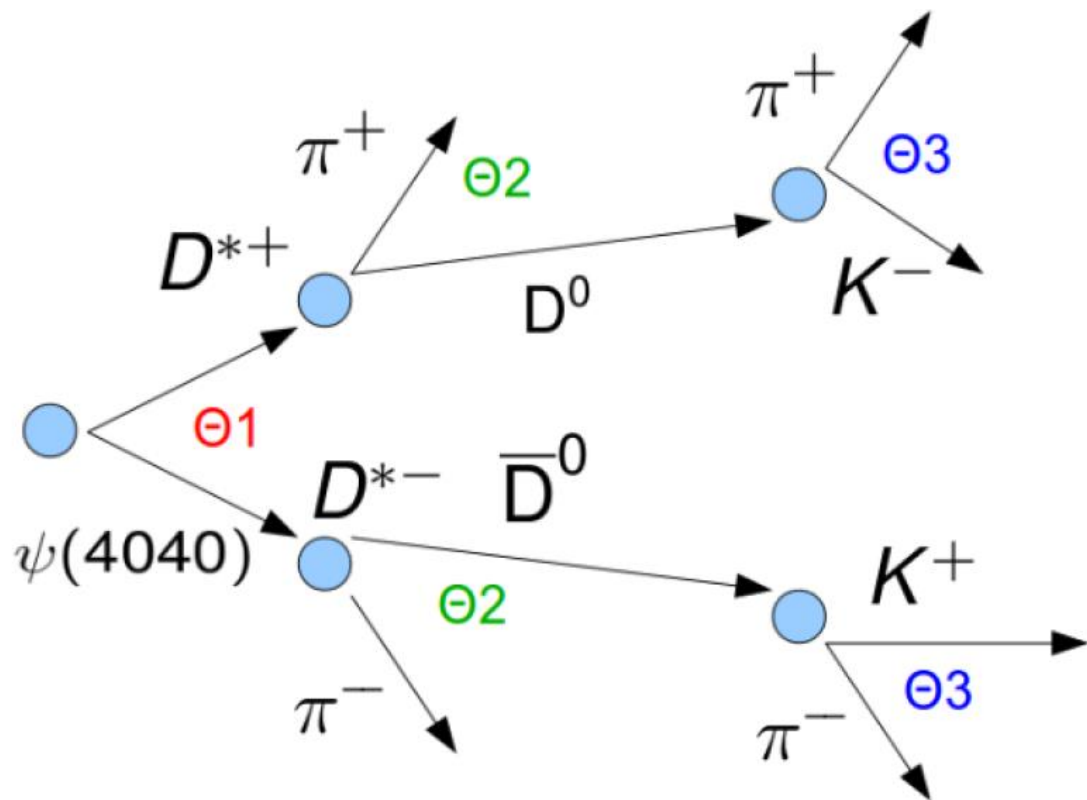
Jacek Biernat



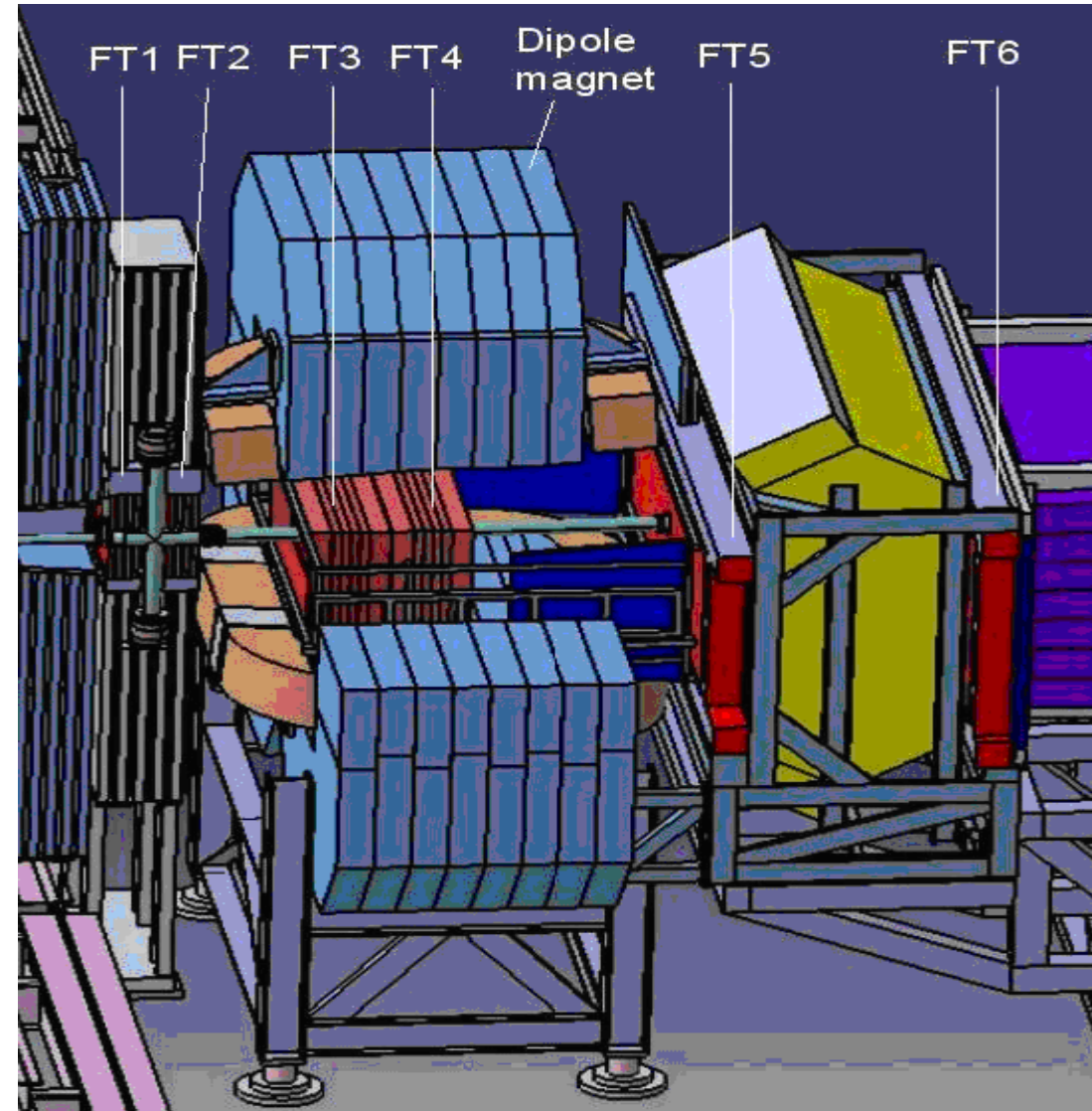
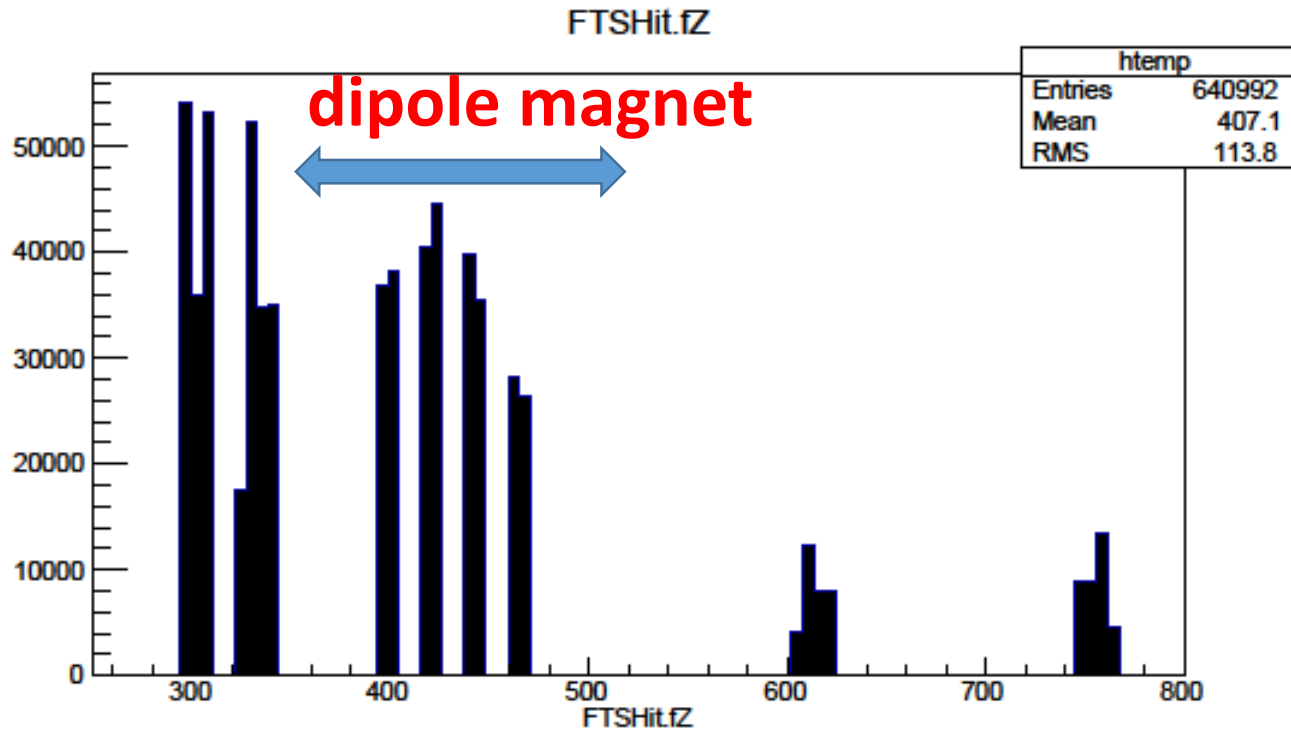
The Setup

- Full FTS geometry
- pbar-p@ 7,71 GeV/c
- 10000 events simulated
- Simulated channel:
 - $\psi(4040) \rightarrow D^{*+}D^{*-} \rightarrow D^0\overline{D^0}\pi^+\pi^- \rightarrow K^-K^+\pi^+\pi^-\pi^+\pi^-$
- Two cases studied for reconstruction:
 - Full PANDA geometry
 - Without the FTS

Psi (4040) decay

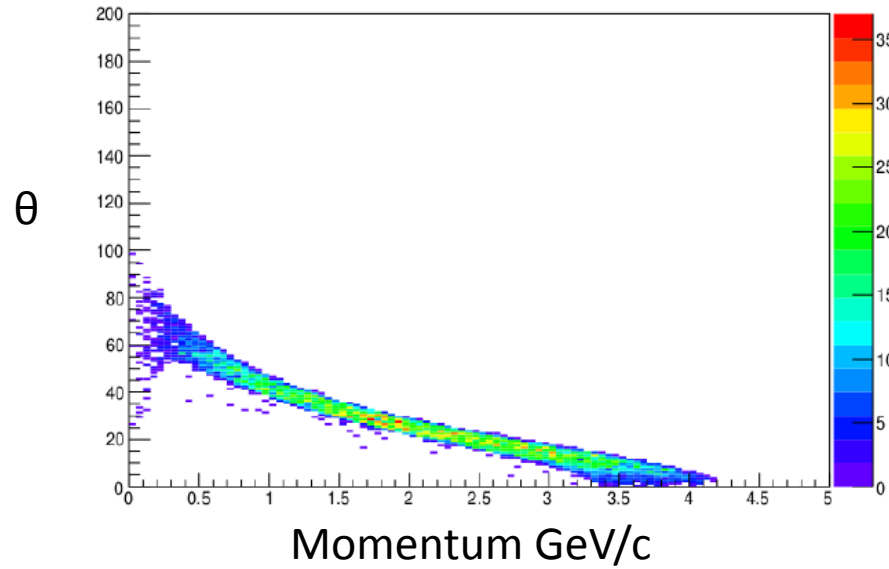


Hits in the Forward Tracking System



Theta vs momentum for Kaons (MC and reconstructed)

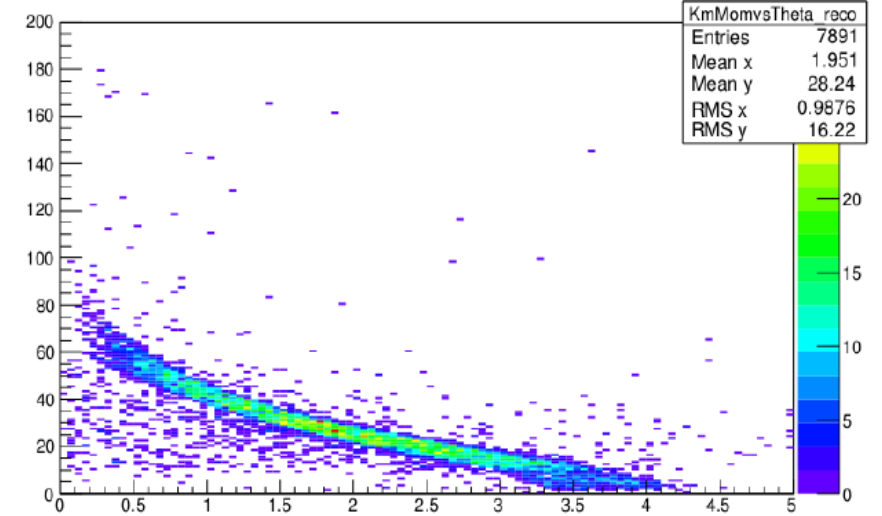
Mom vs Theta for K^-



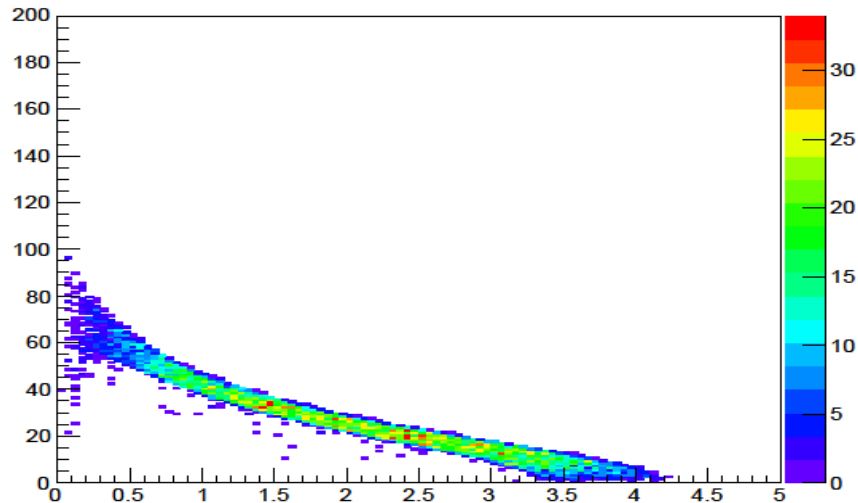
Reconstructed

78% reconstructed

Mom vs Theta for K^- reconstructed



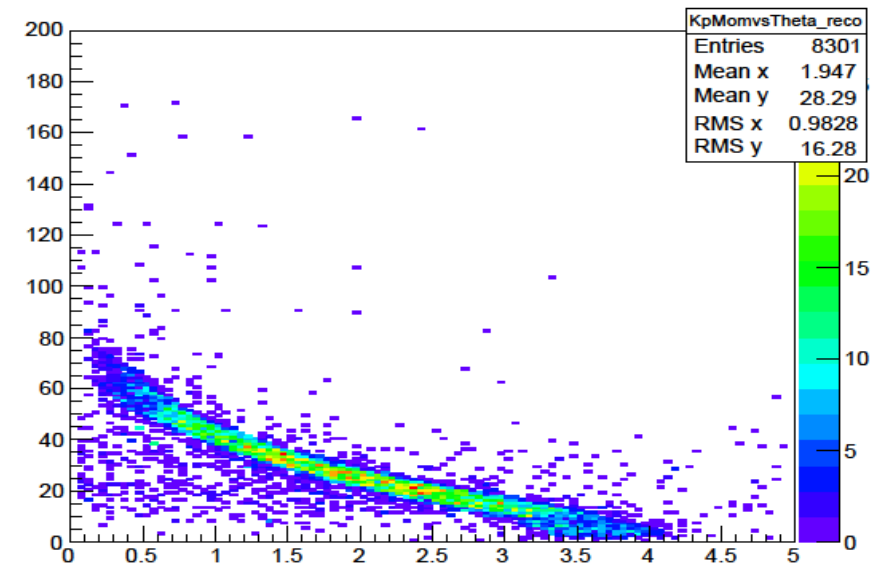
Mom vs Theta for K^+



Reconstructed

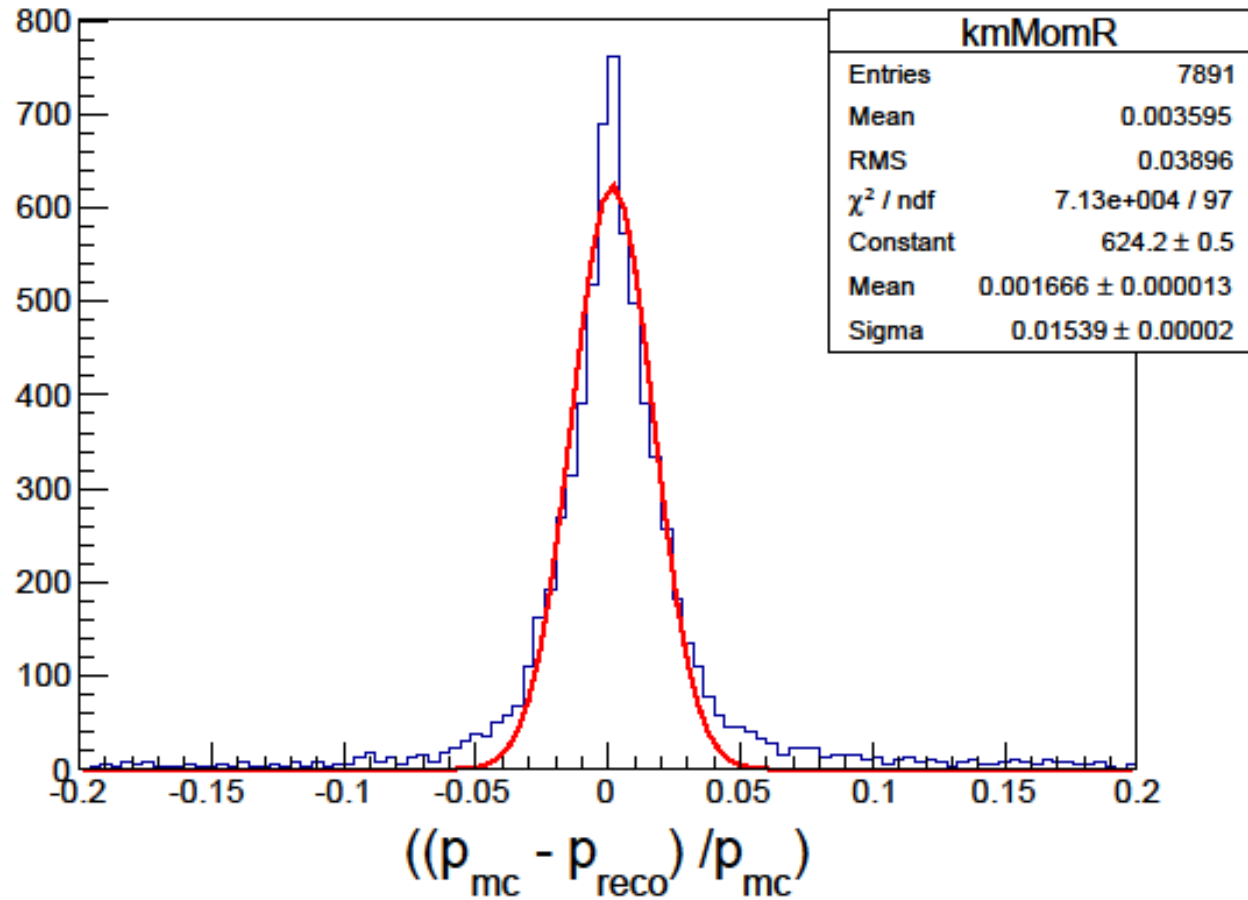
83% reconstructed

Mom vs Theta for K^+ reconstructed

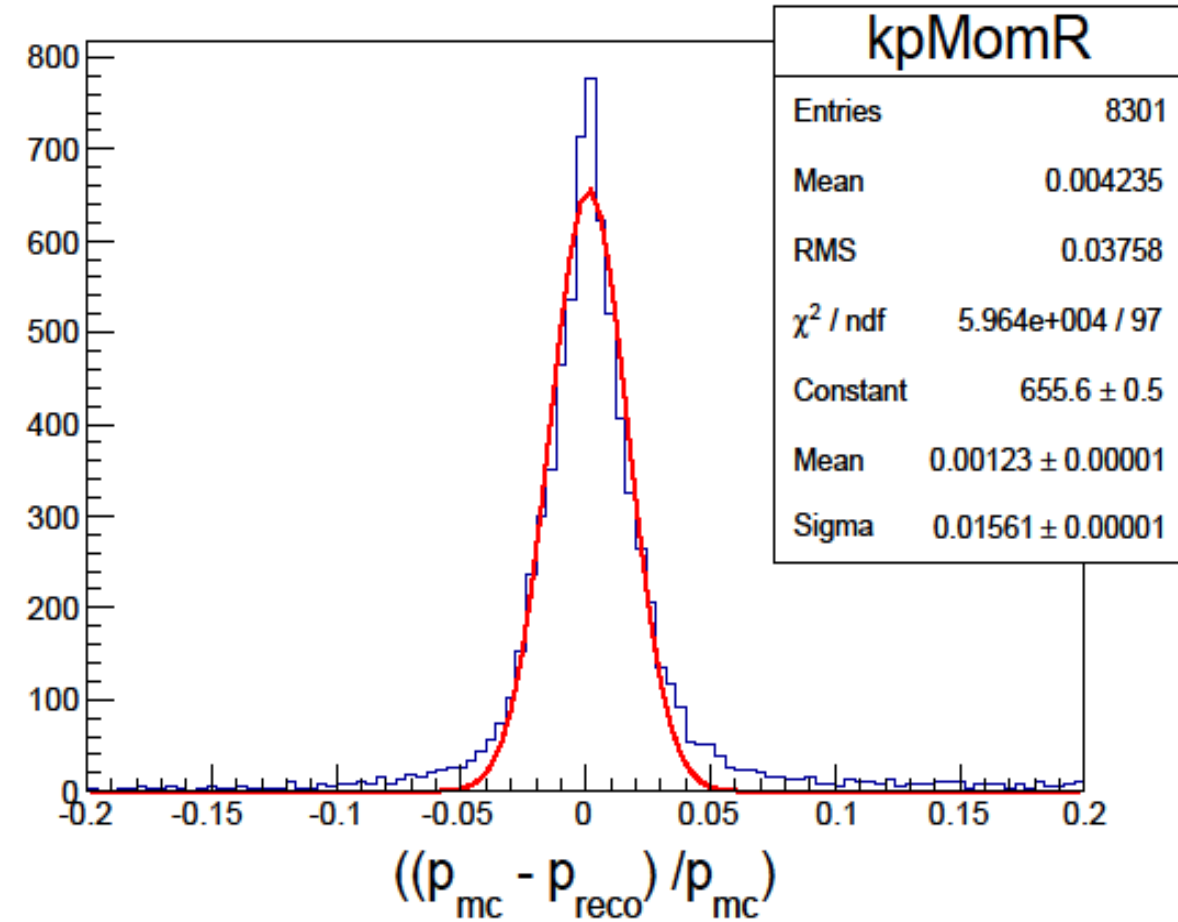


Momentum resolution study for Kaons

Momentum resolution for K^-

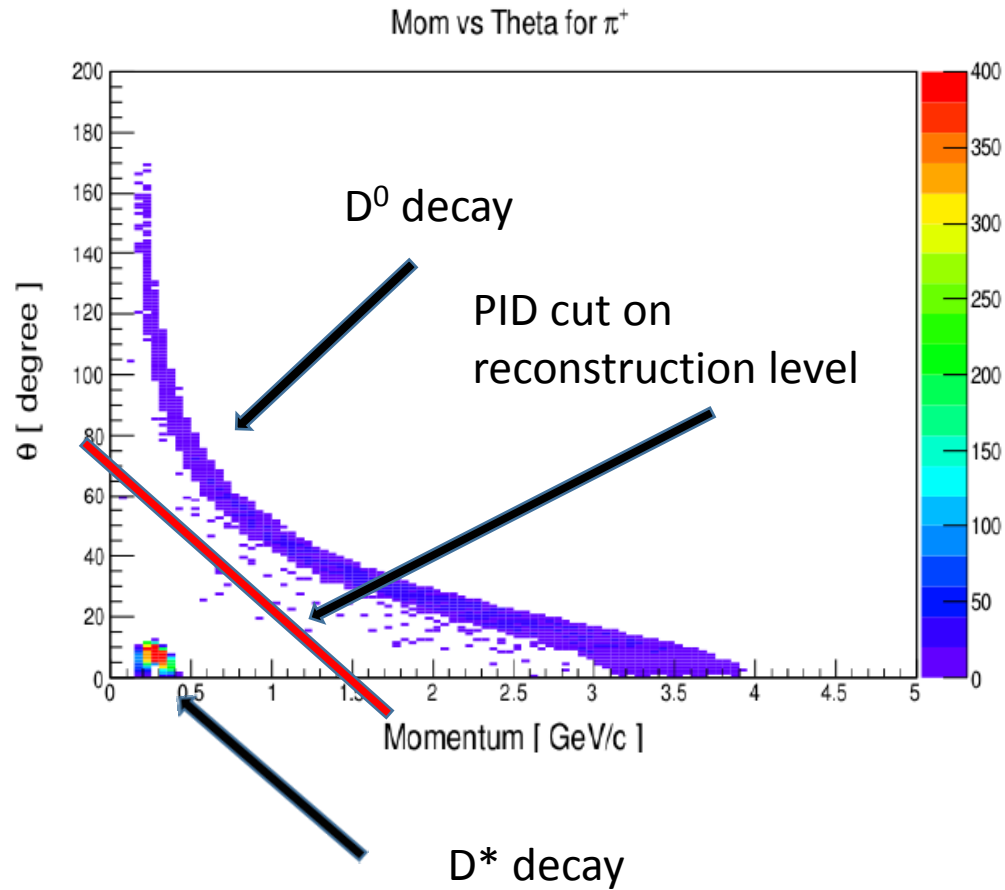


Momentum resolution for K^+



SIGMA = 1.561 %

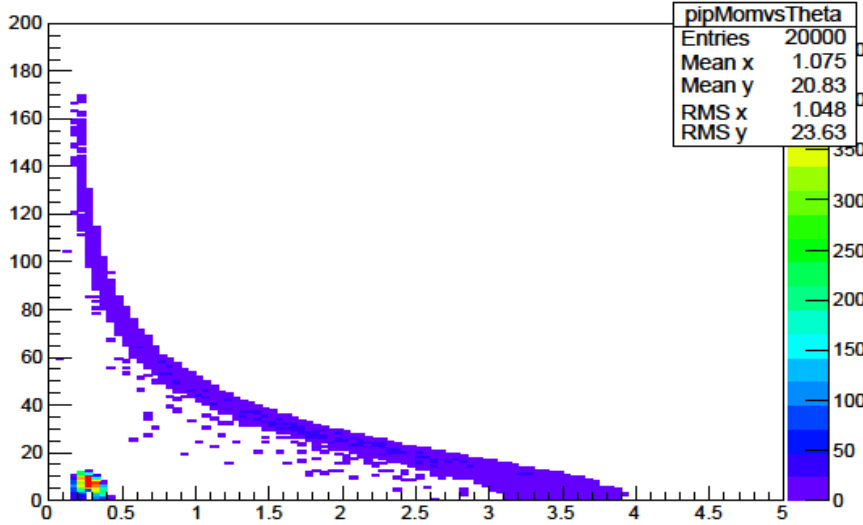
Theta vs momentum for pions



D^0 carries most of the boost coming from D^* decay!

Theta vs momentum for π^+ (MC and reconstructed)

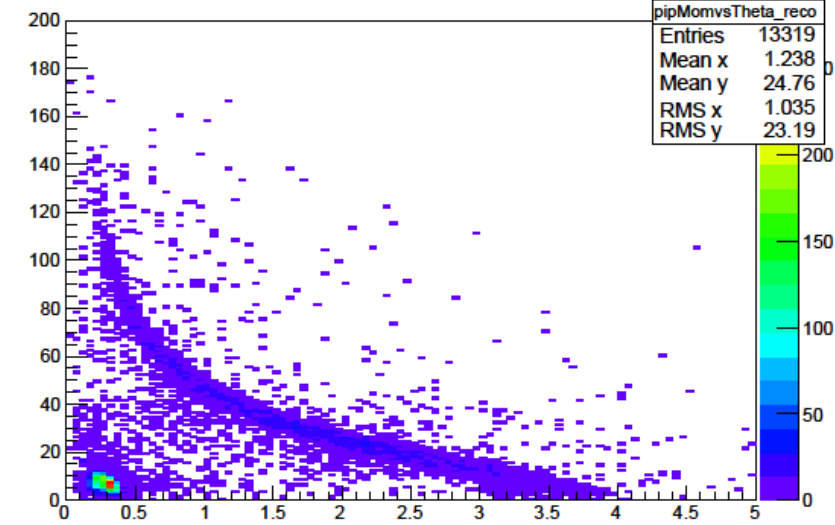
Mom vs Theta for π^+



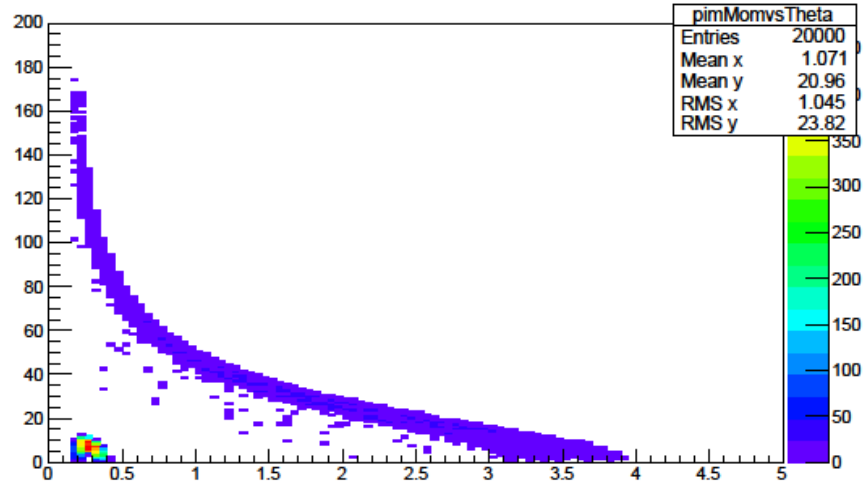
Reconstructed

→ 80% reconstructed

Mom vs Theta for π^+ reconstructed

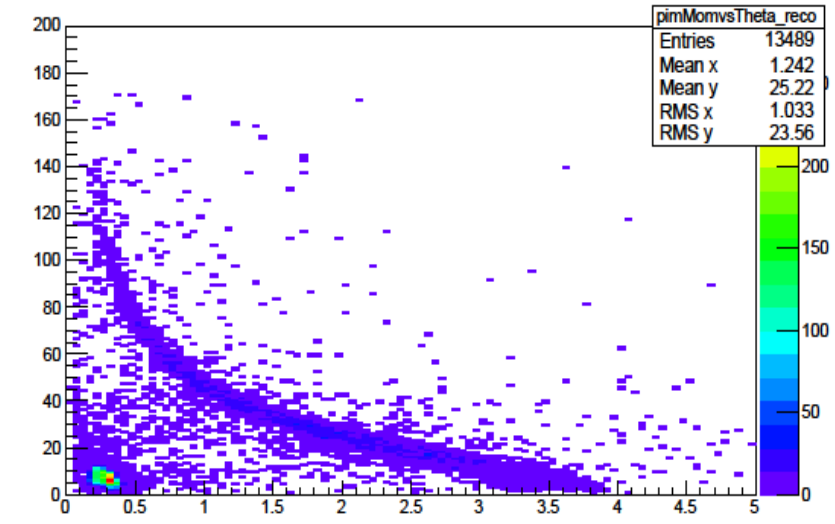


Mom vs Theta for π^-



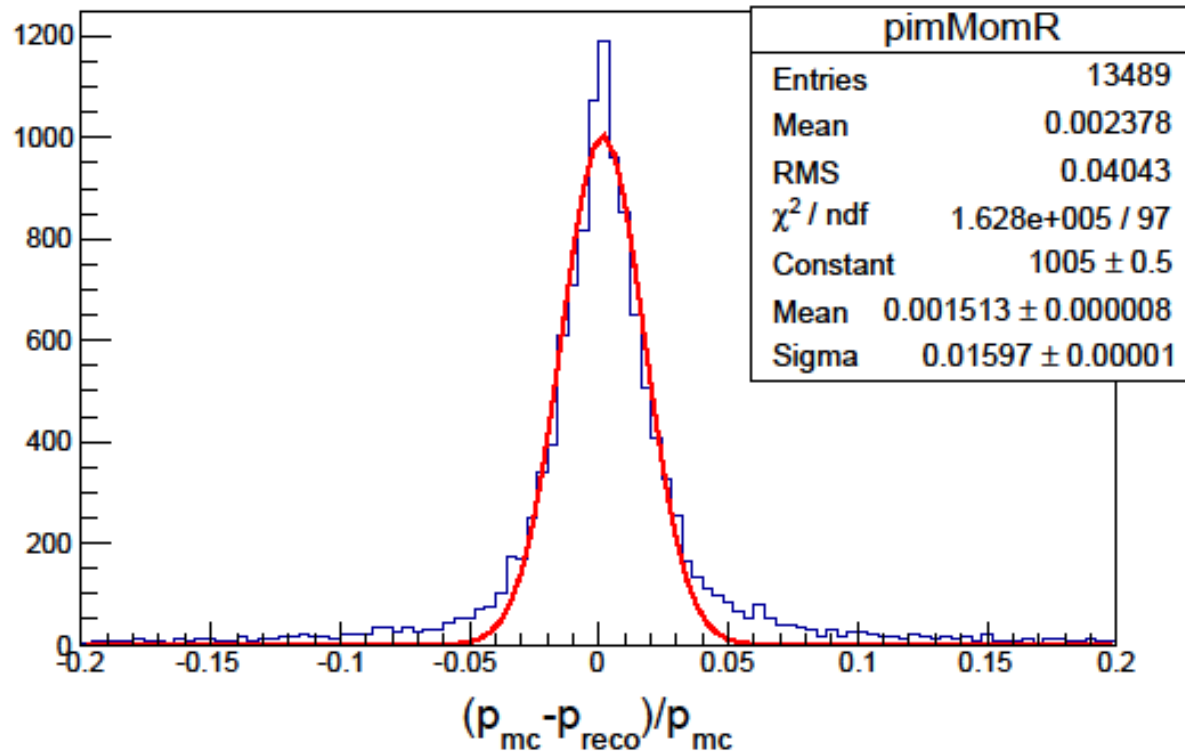
Reconstructed

Mom vs Theta for π^- reconstructed

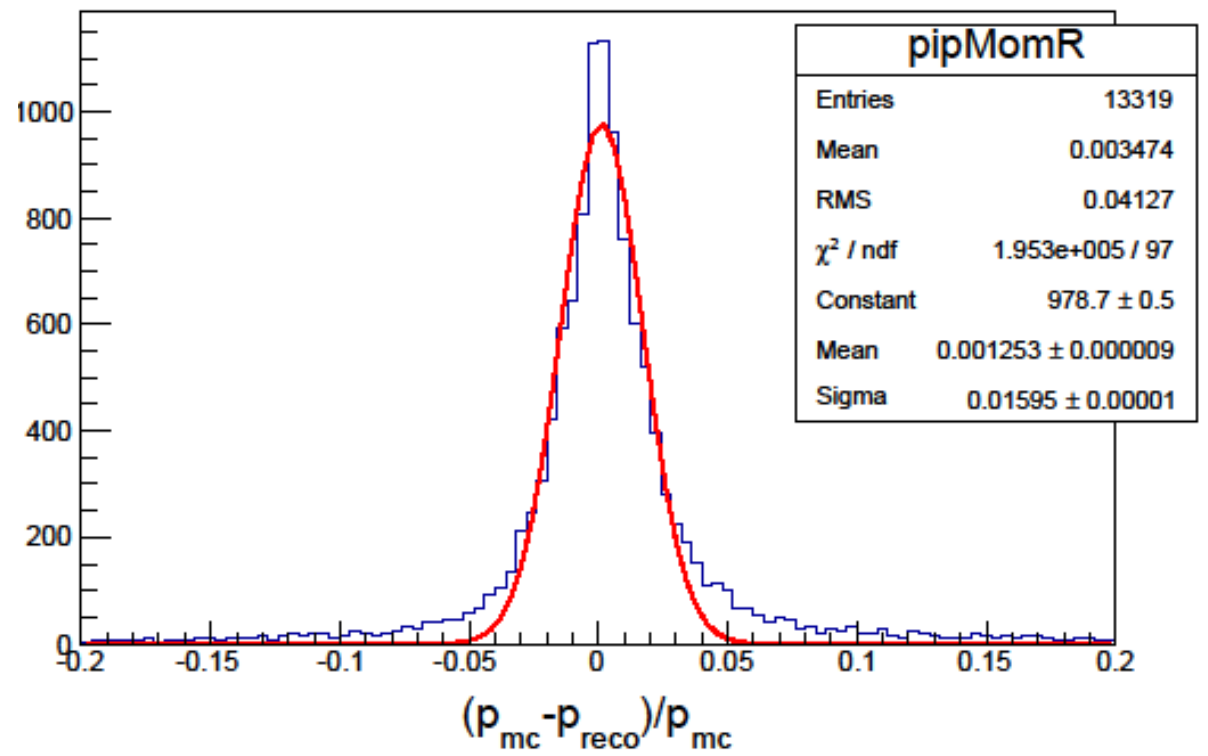


Momentum resolution study for $\pi^{-/+}$

Momentum resolution for π^{-}



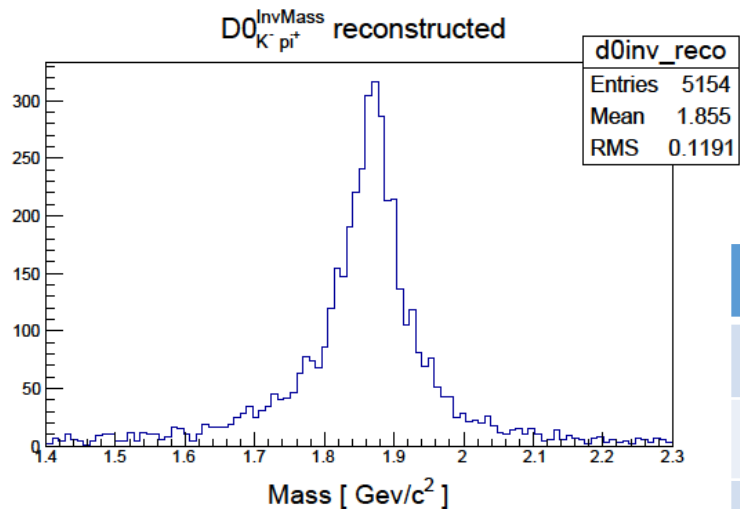
Momentum resolution for π^{+}



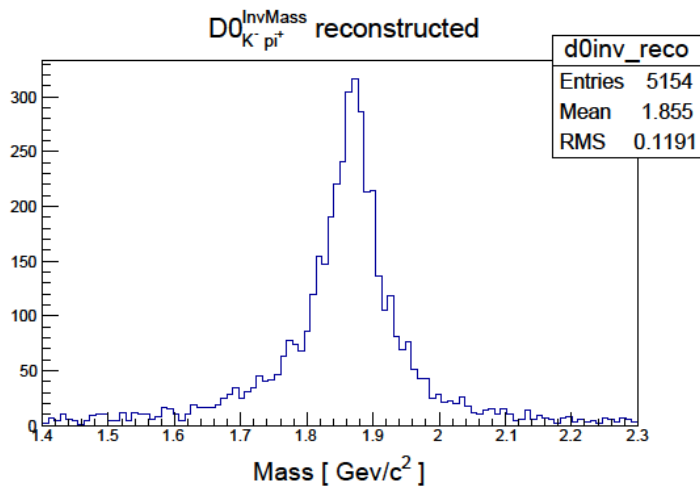
SIGMA = 1.595 %

Invariant mass calculations

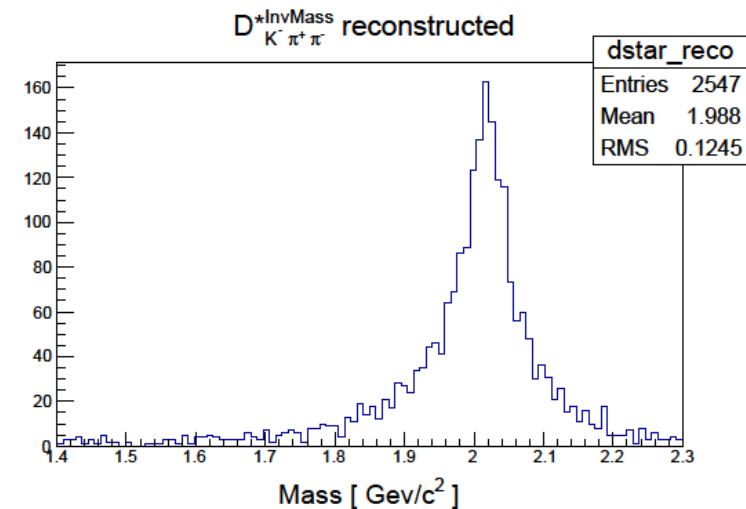
D^0 (1864)



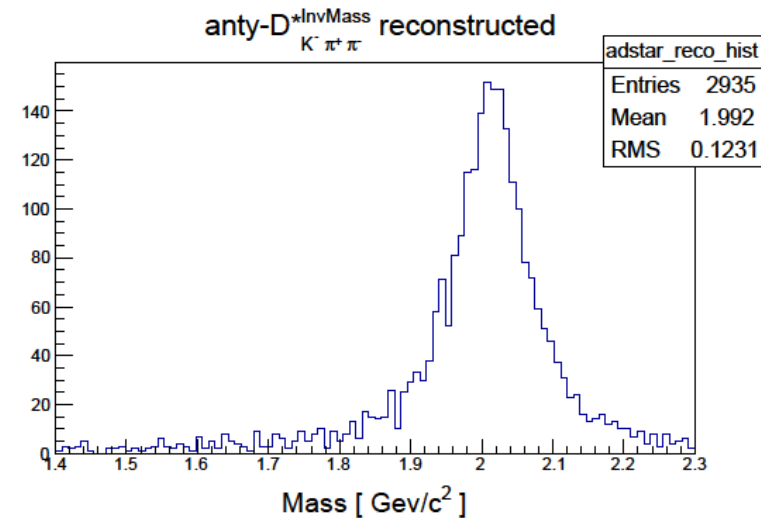
anty- D^0 (1864)



D^{*+} (2010)



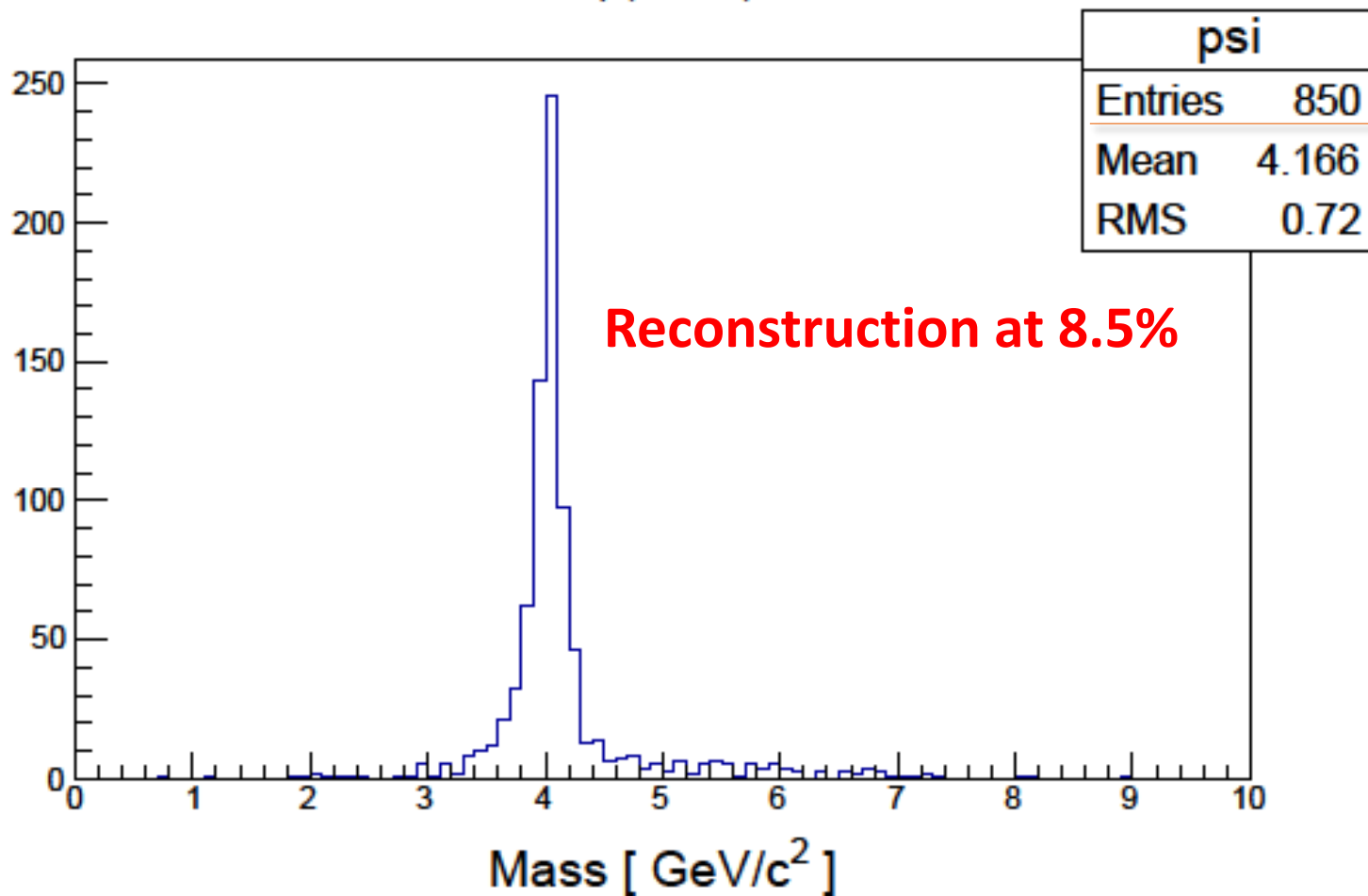
D^{*-} (2010)



	Reconstructed
D^0	5154
$\overline{D^0}$	5154
D^{*+}	2547
D^{*-}	2935

$\Psi(4040)$

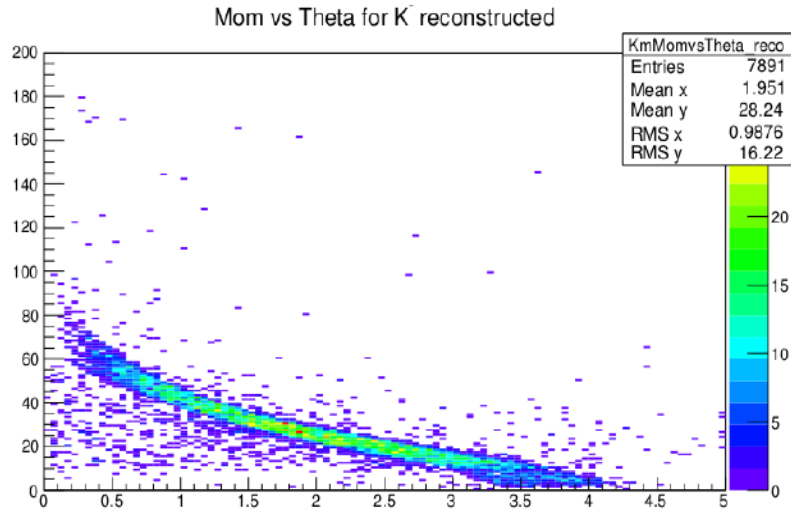
$\psi(4040)$



What happens when one switches off the FTS ?!

Kaons

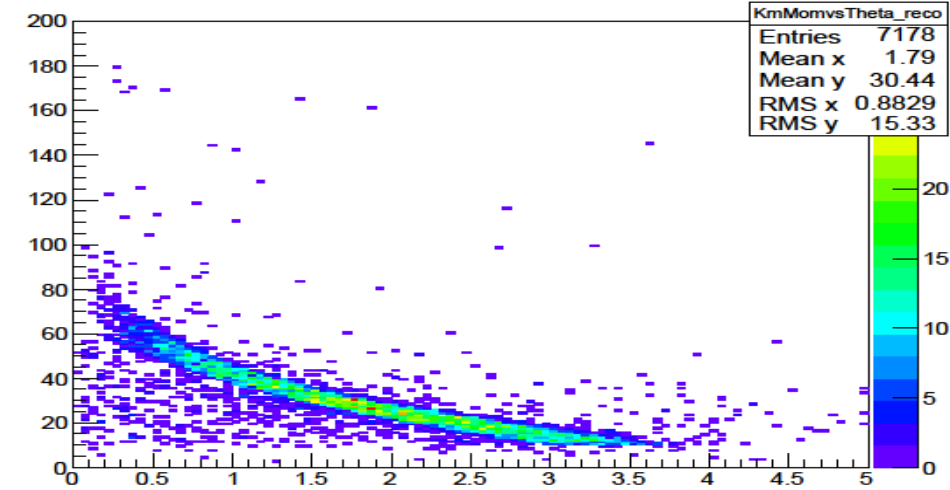
Full setup



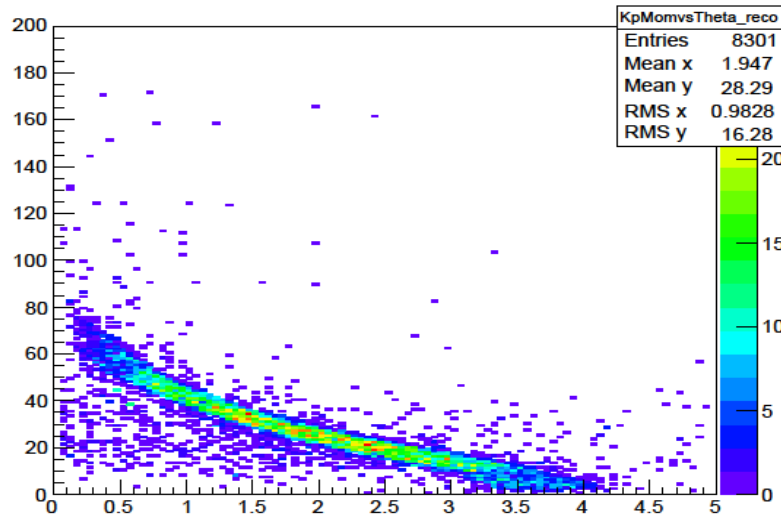
Some of the K's emitted at low theta are lost

FTS off

Mom vs Theta for K⁻ reconstructed

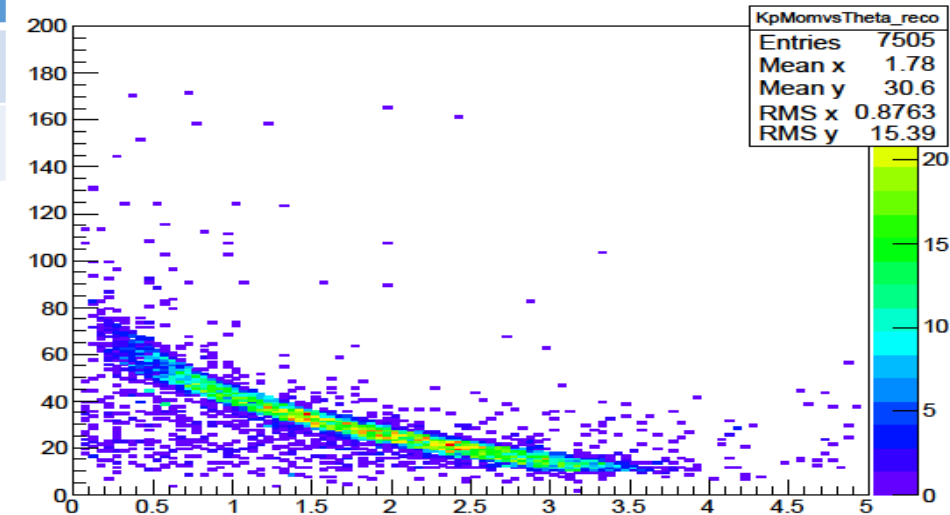


Mom vs Theta for K⁺ reconstructed

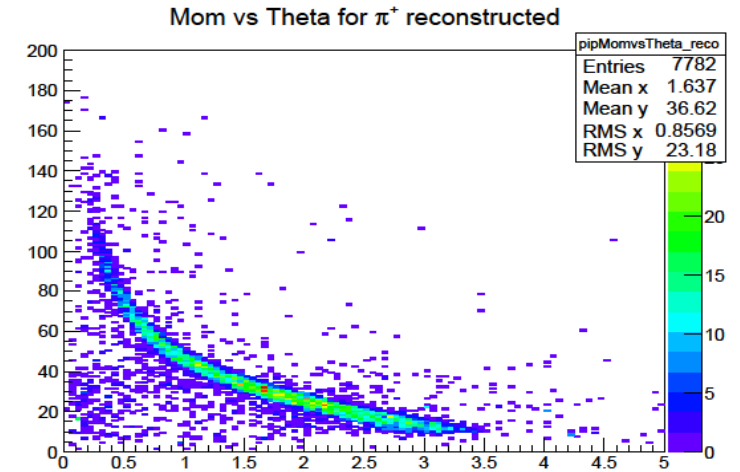
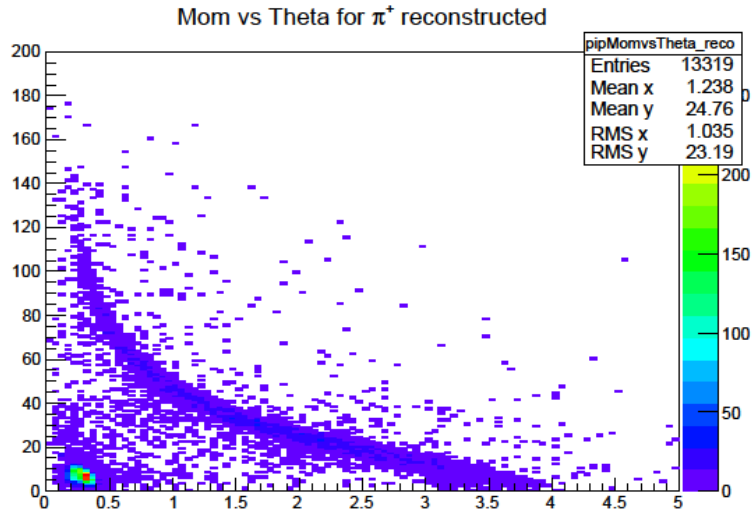


Full Setup		FTS OFF	
K ⁺	K ⁻	K ⁺	K ⁻
7891	8301	7178	7505

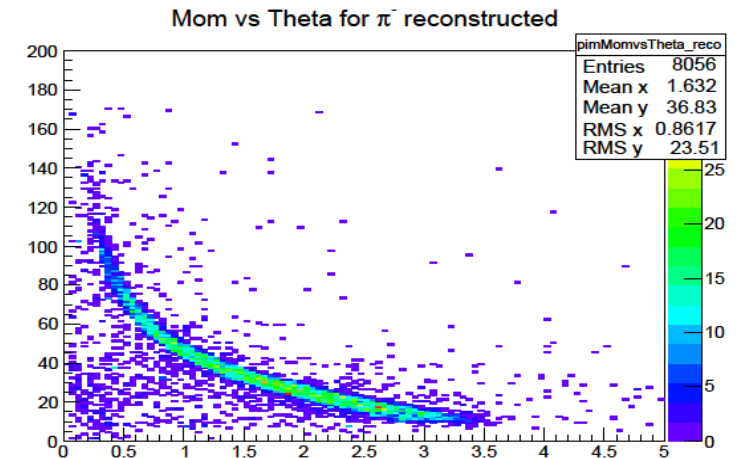
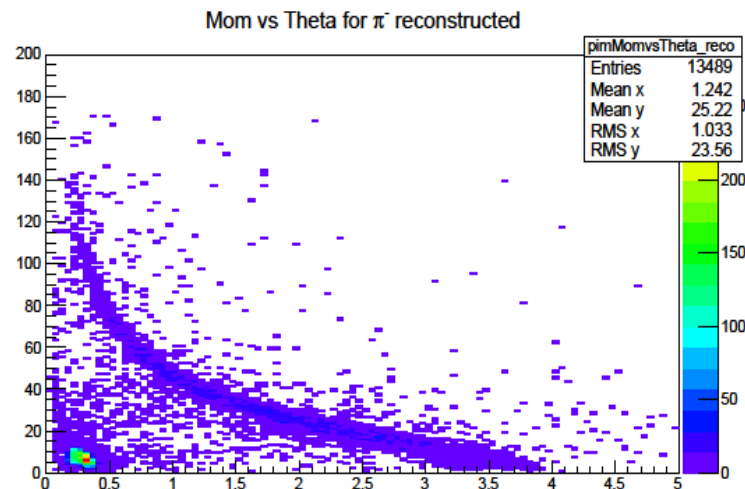
Mom vs Theta for K⁺ reconstructed



Theta vs momentum for $\pi^{-/+}$



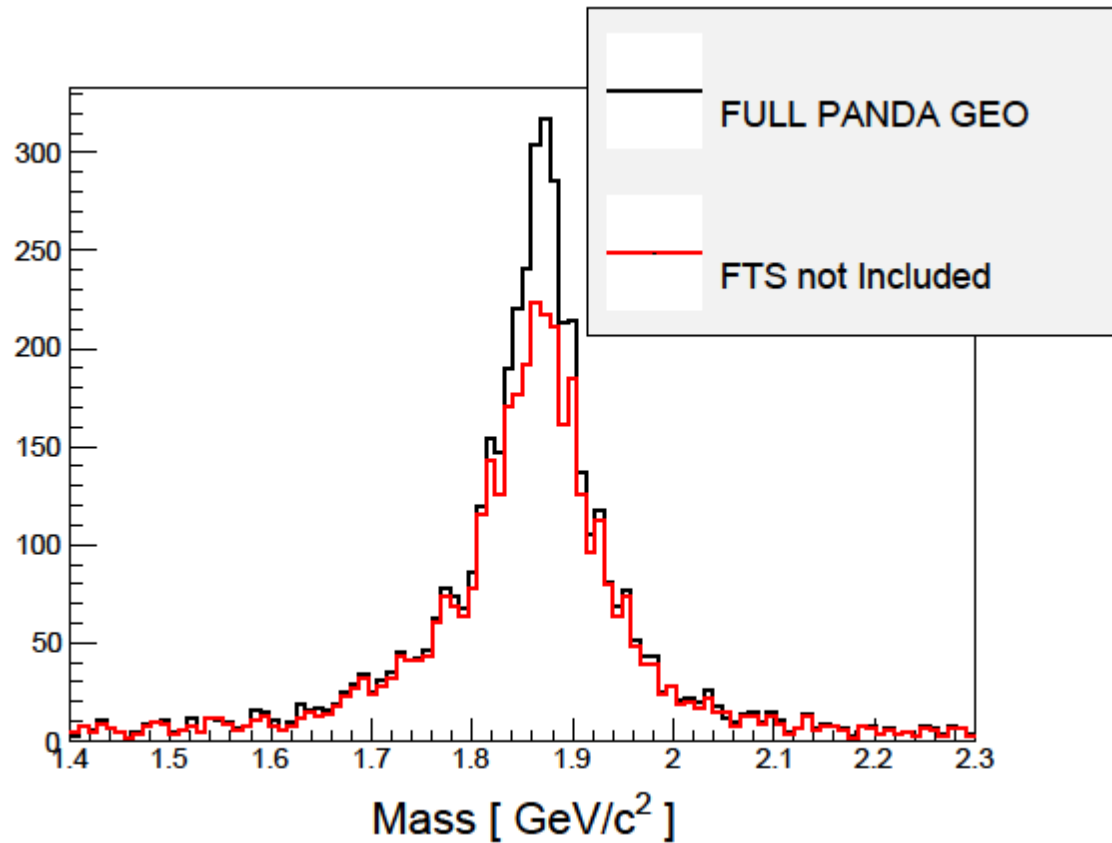
Full Setup		FTS OFF	
π^+	π^-	π^+	π^-
13319	13489	7782	8056



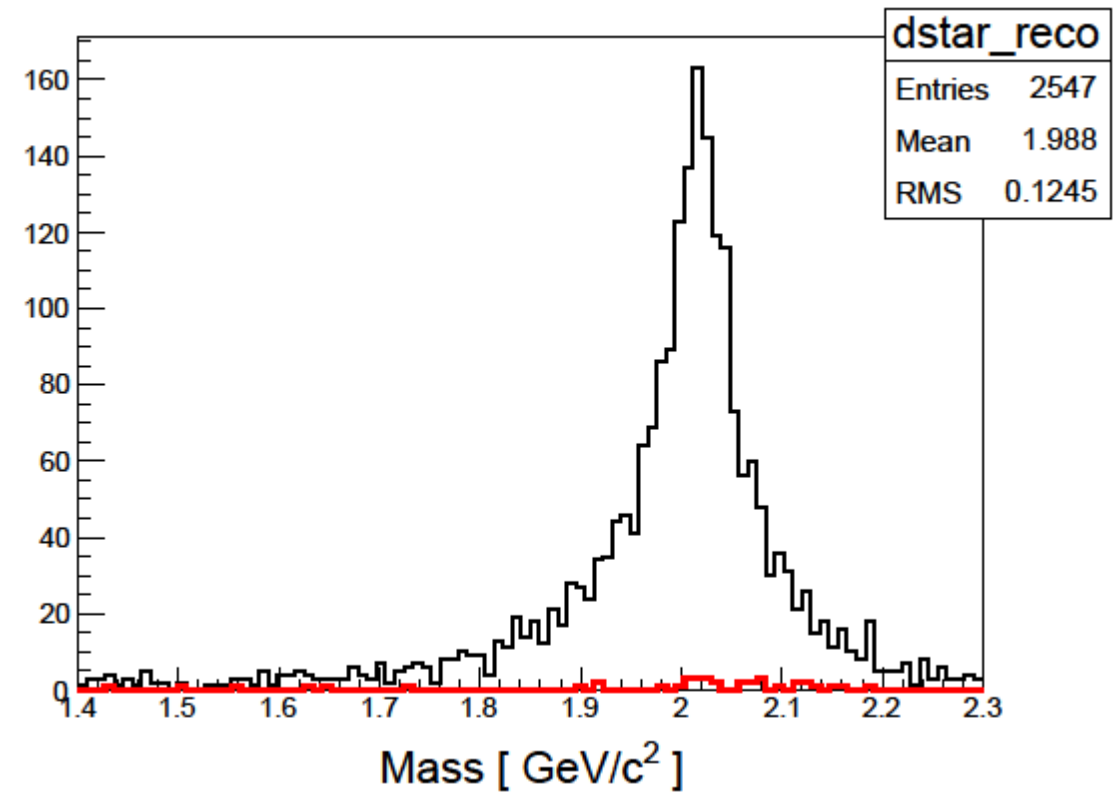
Pions coming from D^* decay are not visible ☹️
 Pions at low theta are lost

Invariant mass calculations

D^0 (1864)



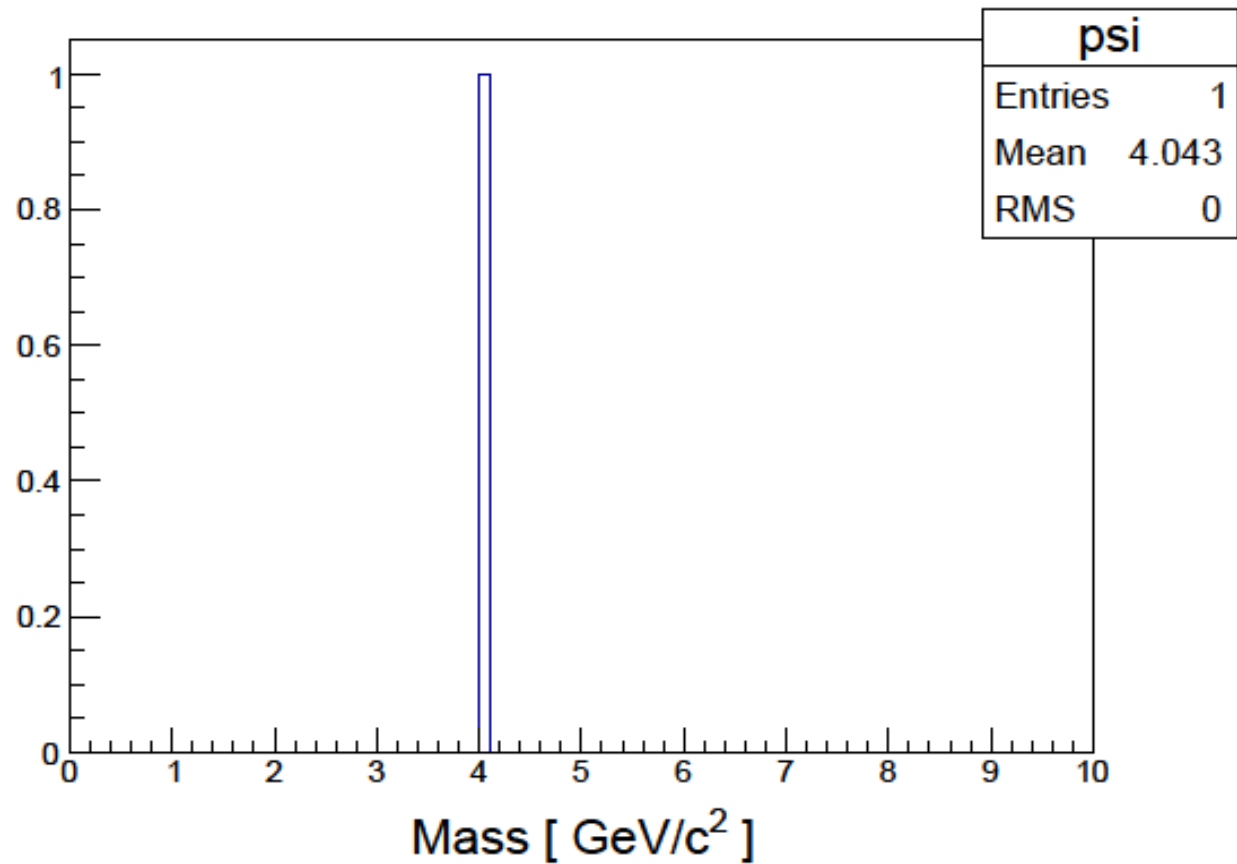
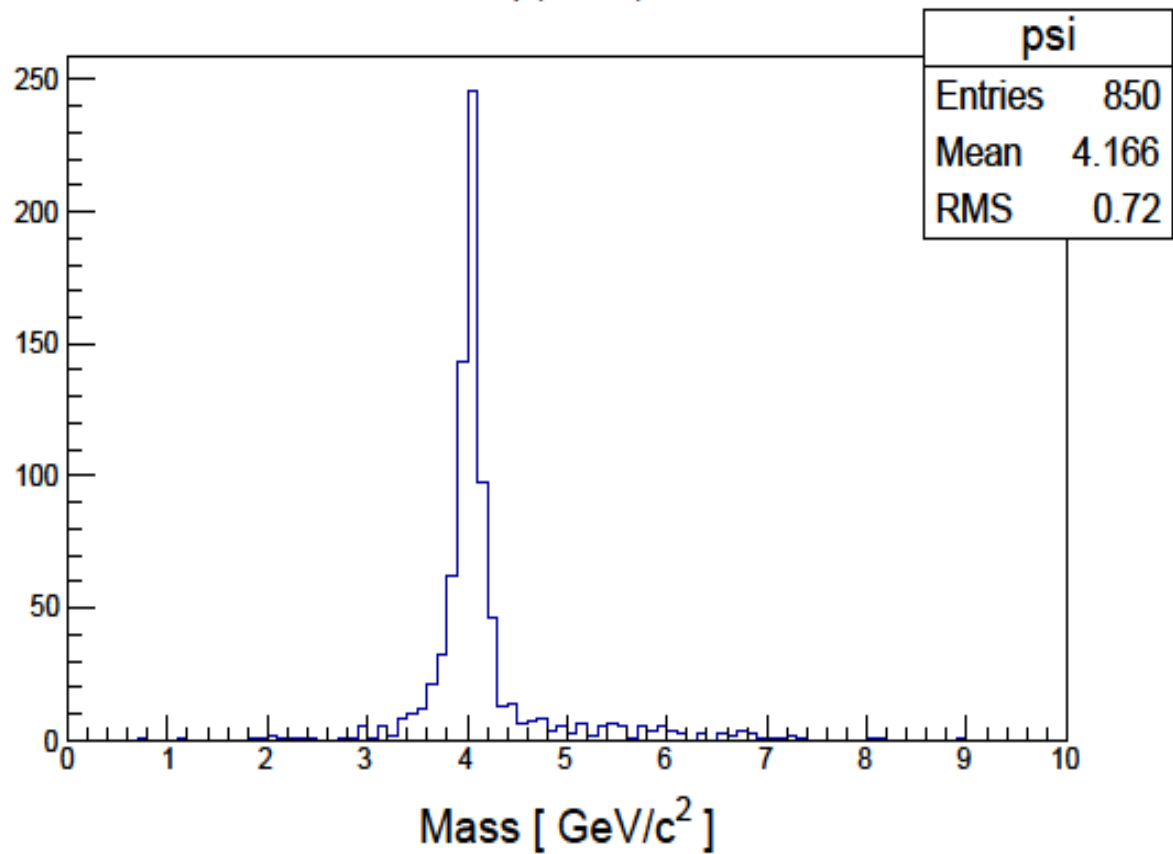
D^* (2010)



D^* not visible

$\Psi(4040)$

$\psi(4040)$



Conclusions

- Reconstruction efficiency for $\psi(4040)$ is 8.5 %
- FTS is necessary to reconstruct ψ (π 's coming from D^* decay are emitted at low theta angle)