

# pXp analysis

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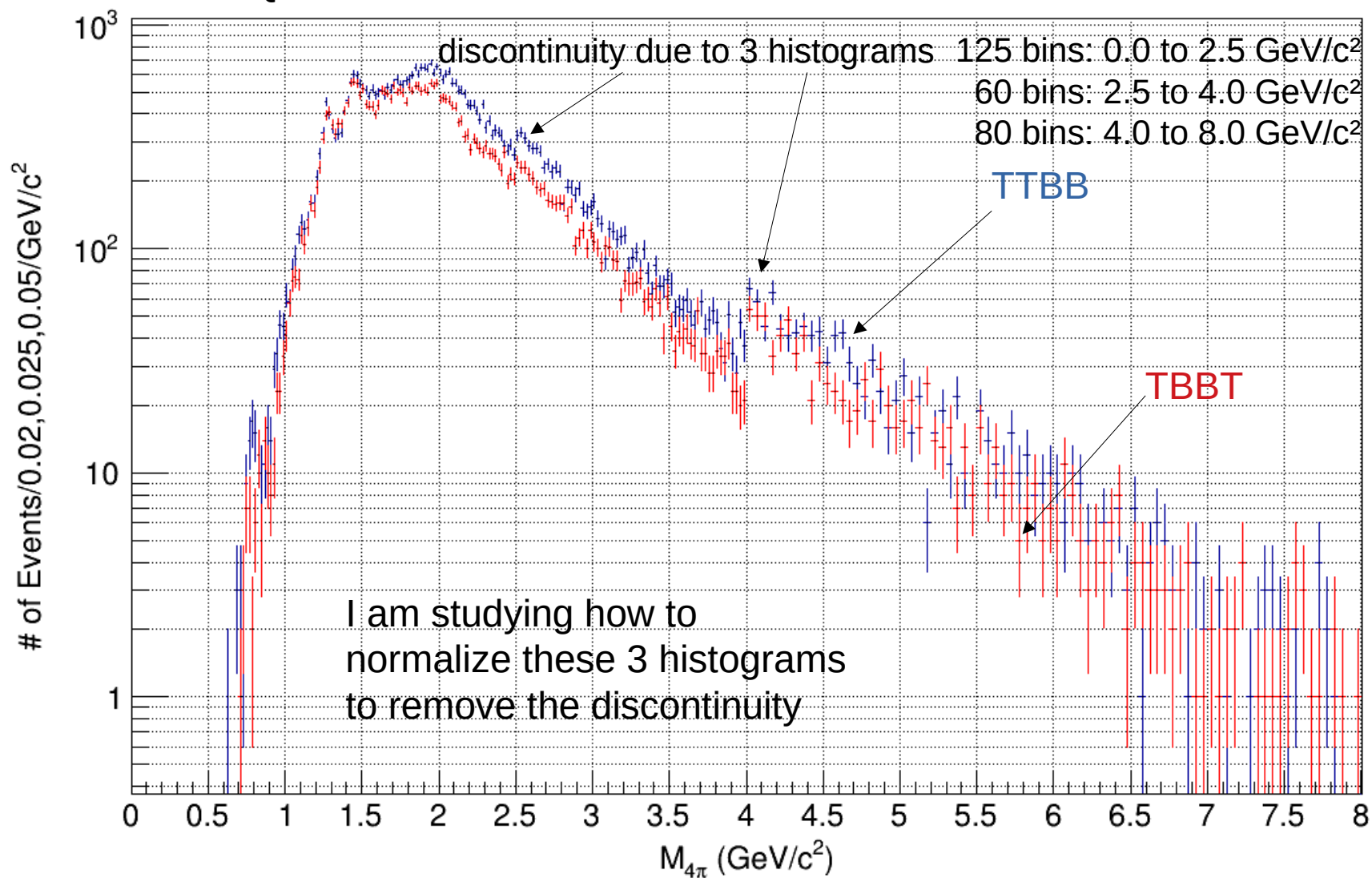
Mike Albrow (FNAL)

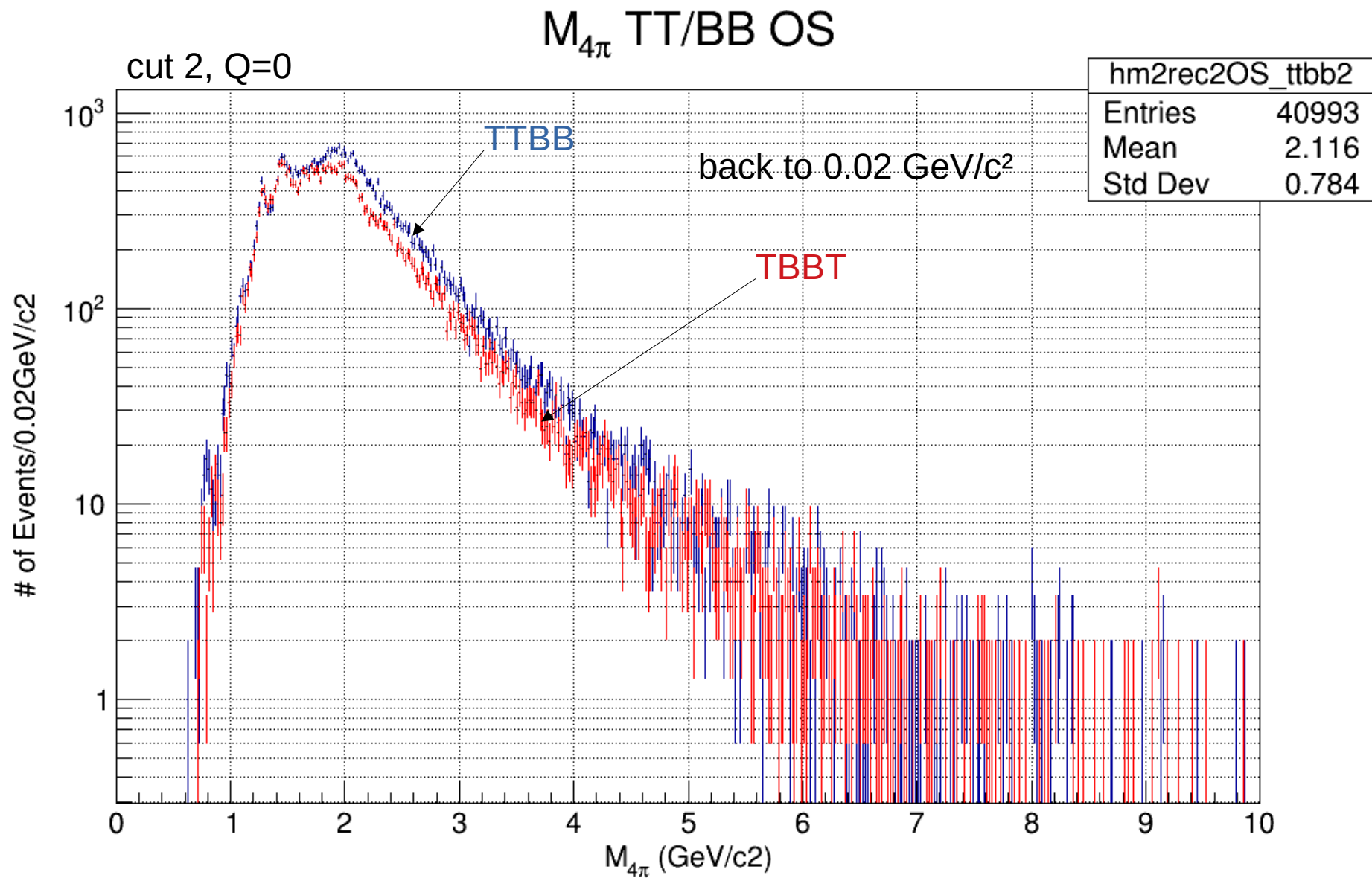
# Overview

- 4 pions mass distributions  
pion-pair mass distributions
- 4-track 2015 sample

cut 2, Q=0

$M_{4\pi}$  TTBB, TBBT

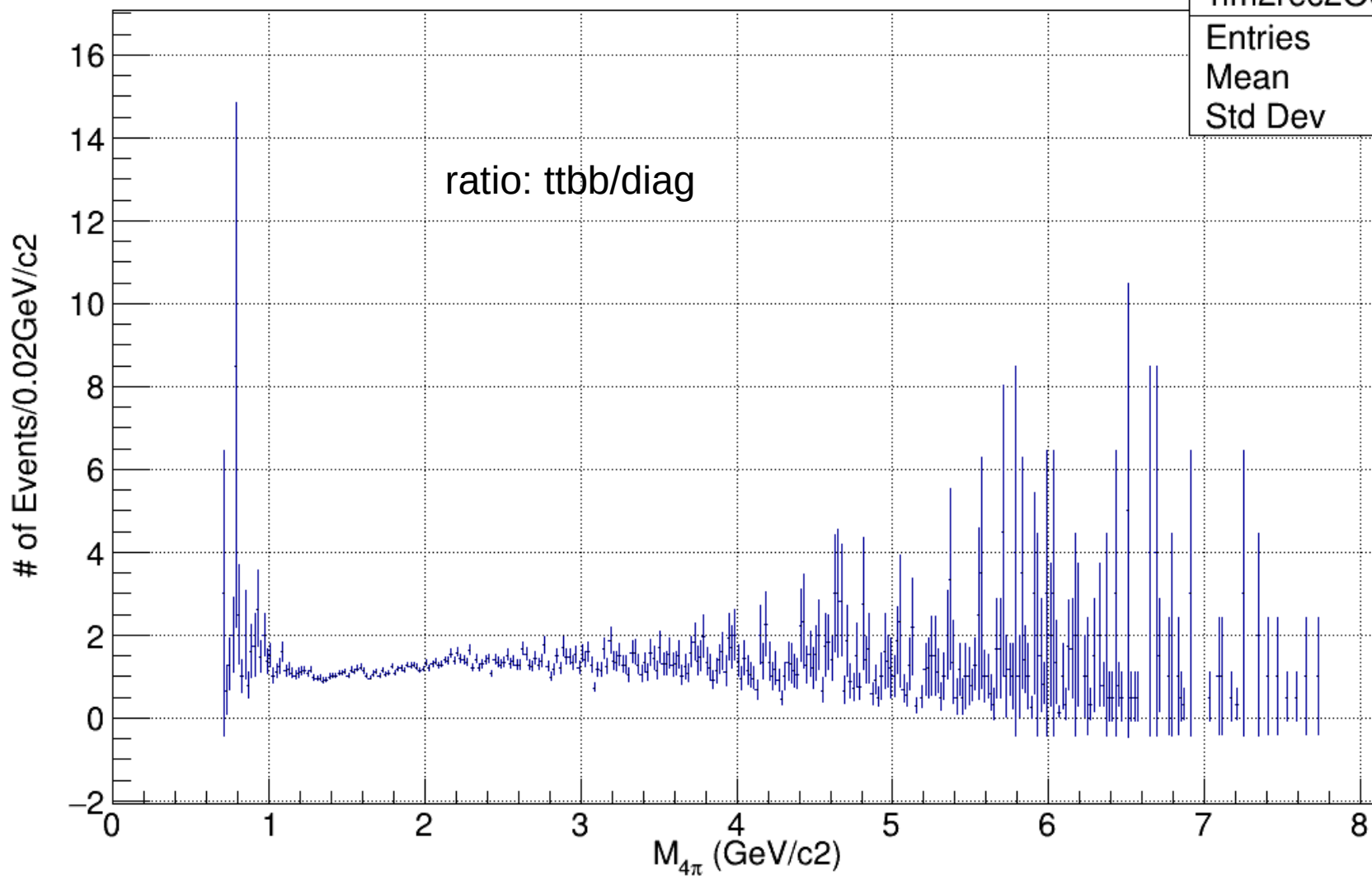




cut 2, Q=0

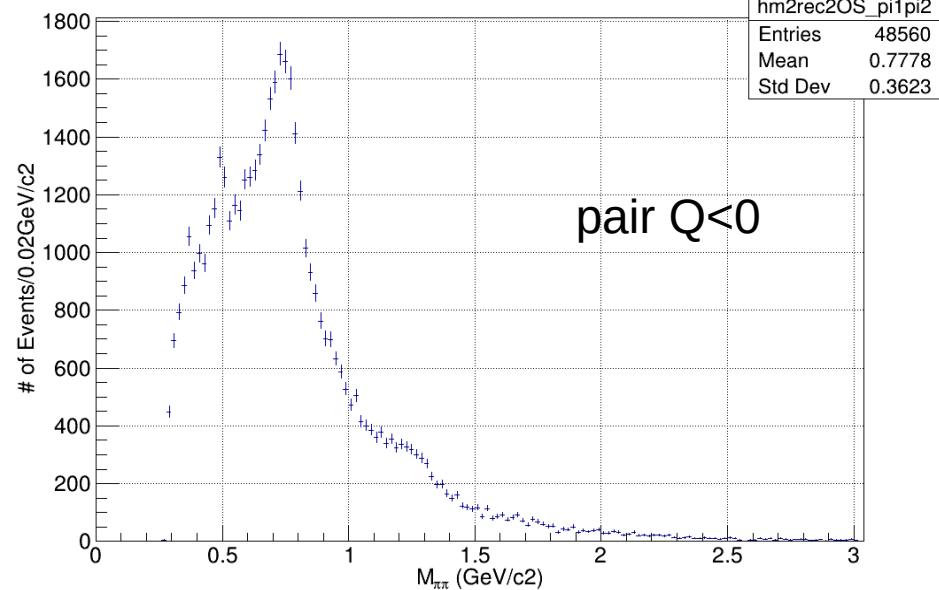
$M_{4\pi}$  TTBB/TBBT OS

hm2rec2OS_ttbb2	
Entries	502
Mean	3.87
Std Dev	1.872

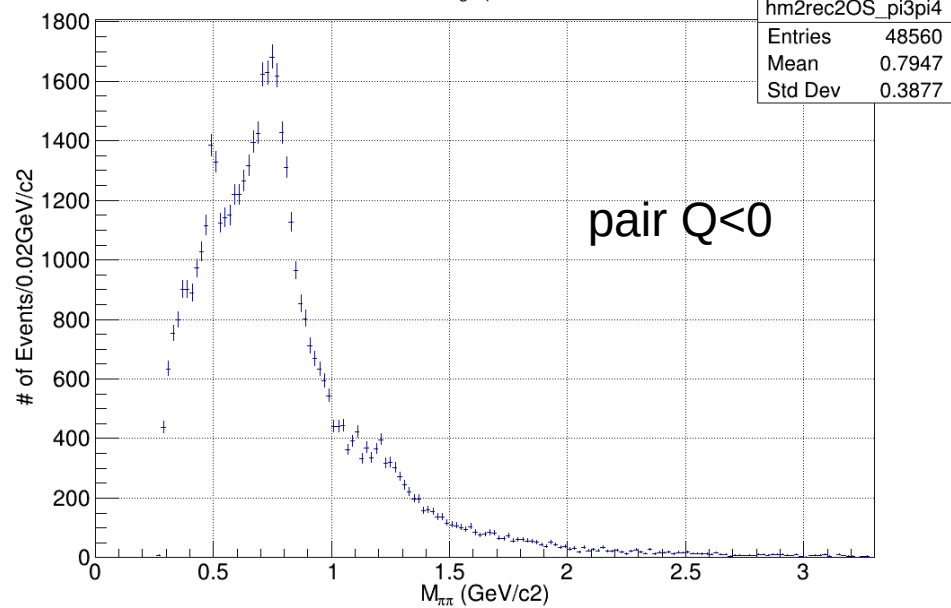


cut 2, Q = 0 4-tracks

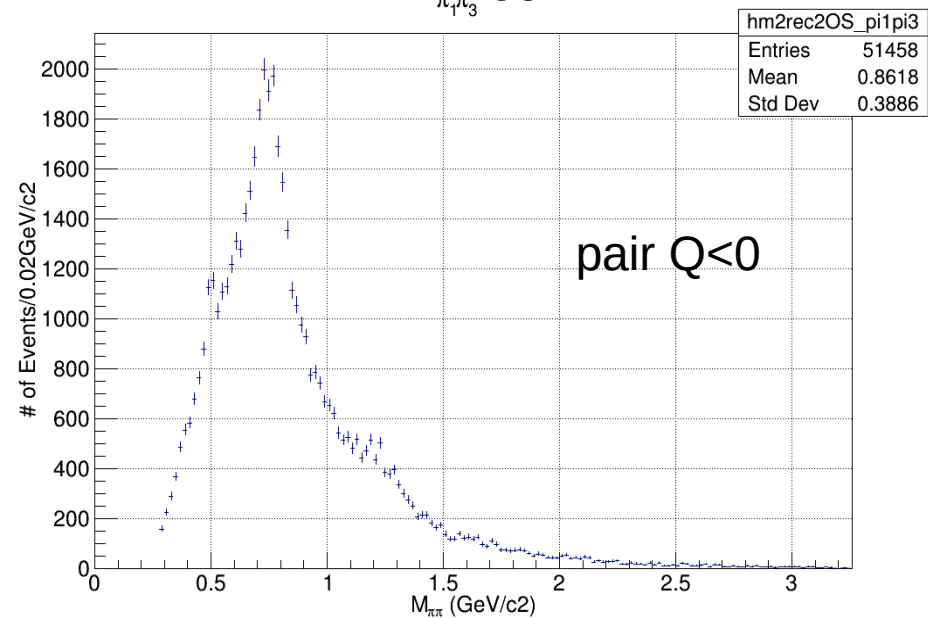
$M_{\pi_1\pi_2}$  OS



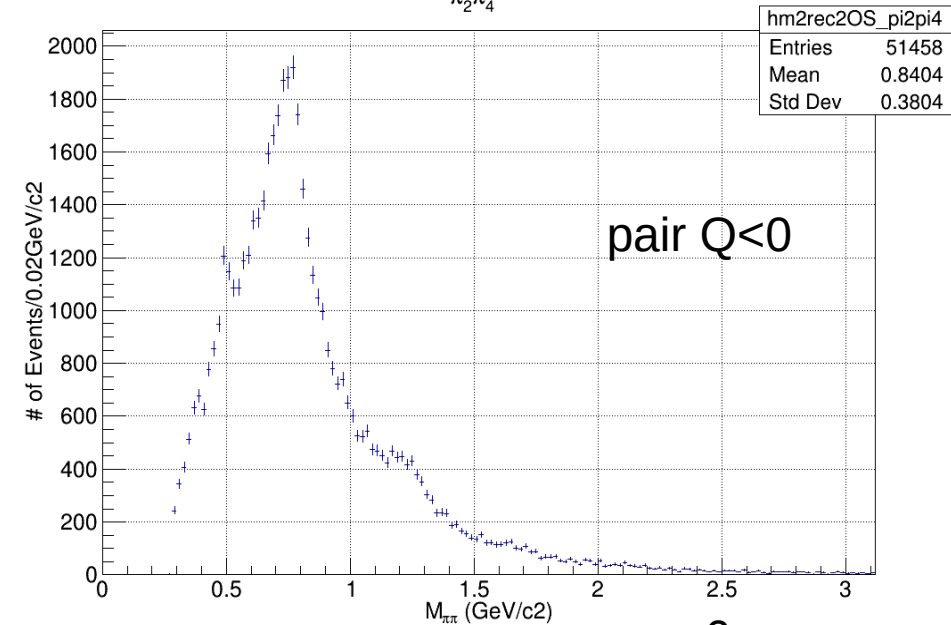
$M_{\pi_3\pi_4}$  OS



$M_{\pi_1\pi_3}$  OS



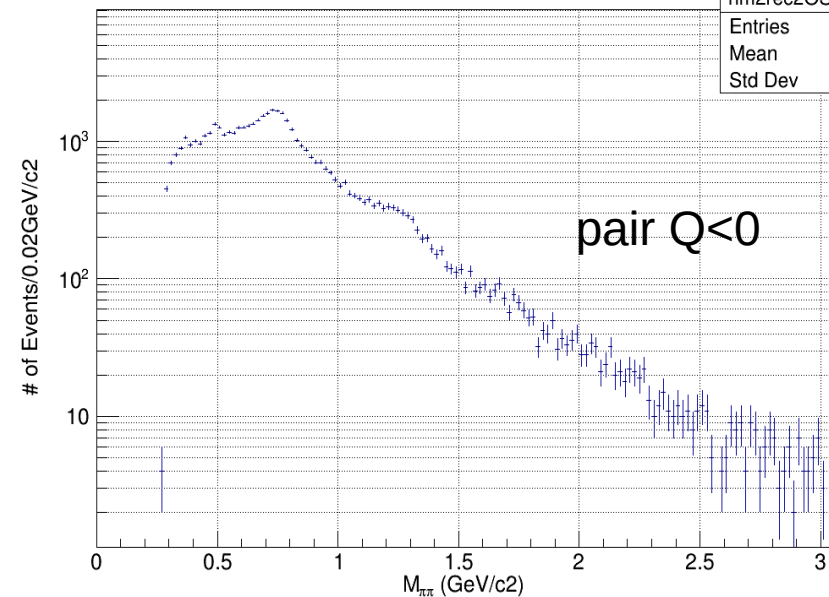
$M_{\pi_2\pi_4}$  OS



# cut 2, Q = 0 4-tracks

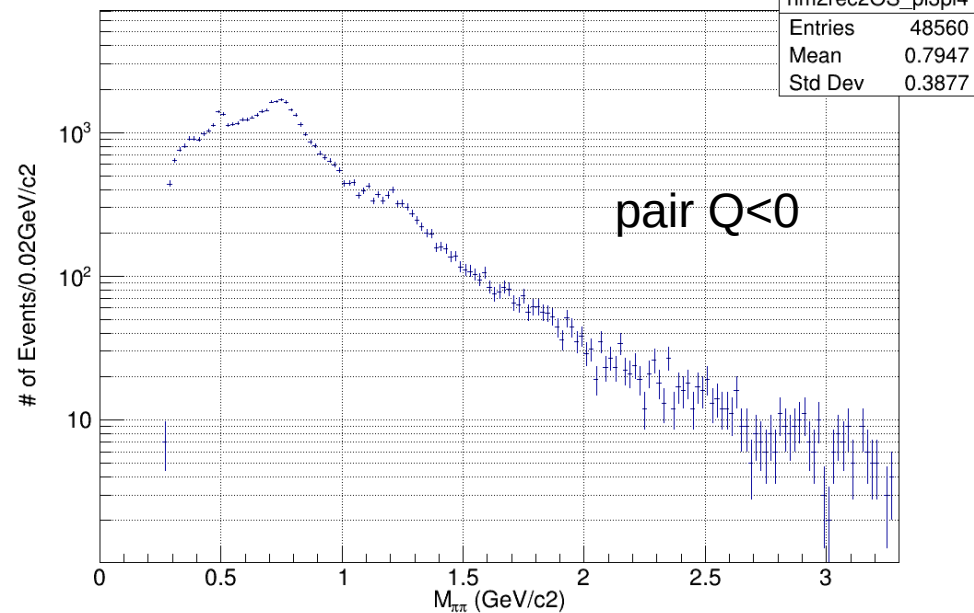
$M_{\pi_1\pi_2}$  OS

hm2rec2OS_pi1pi2	
Entries	48560
Mean	0.7778
Std Dev	0.3623



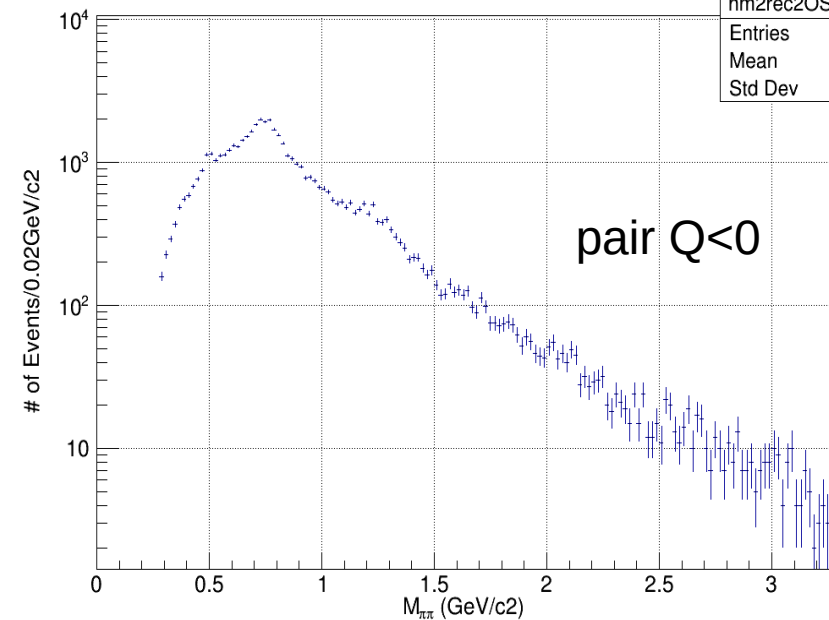
$M_{\pi_3\pi_4}$  OS

hm2rec2OS_pi3pi4	
Entries	48560
Mean	0.7947
Std Dev	0.3877



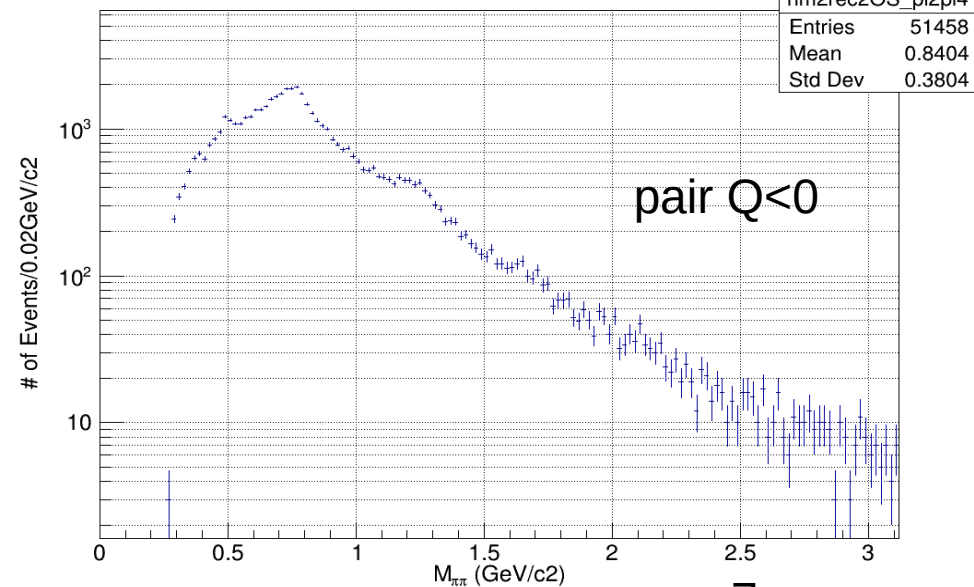
$M_{\pi_1\pi_3}$  OS

hm2rec2OS_pi1pi3	
Entries	51458
Mean	0.8618
Std Dev	0.3886



$M_{\pi_2\pi_4}$  OS

hm2rec2OS_pi2pi4	
Entries	51458
Mean	0.8404
Std Dev	0.3804



to do:

1. fits

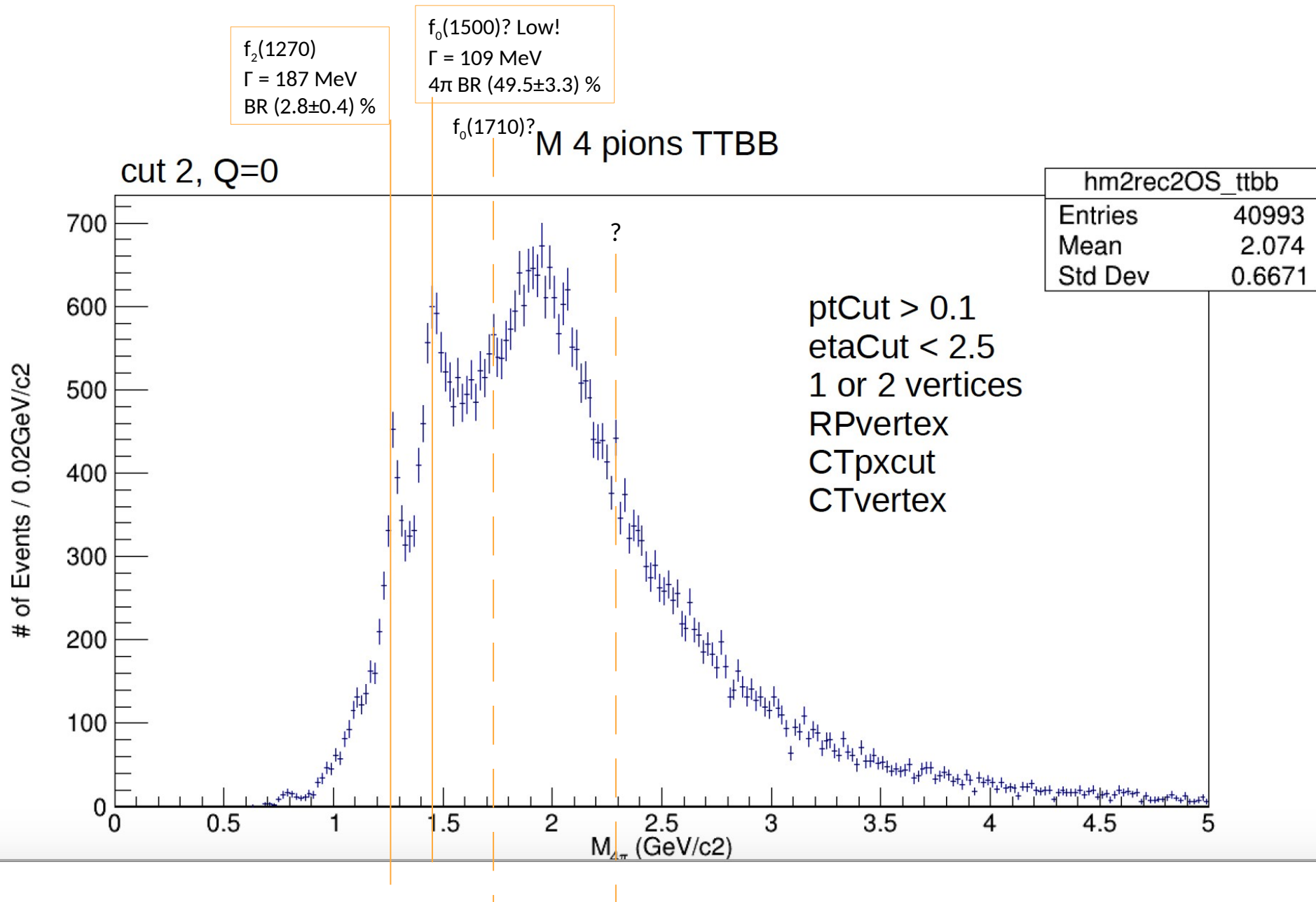
2. t1 and t2

3. slices of delta\_phi

4.  $pt = \sqrt{p_x^2 + p_y^2}$

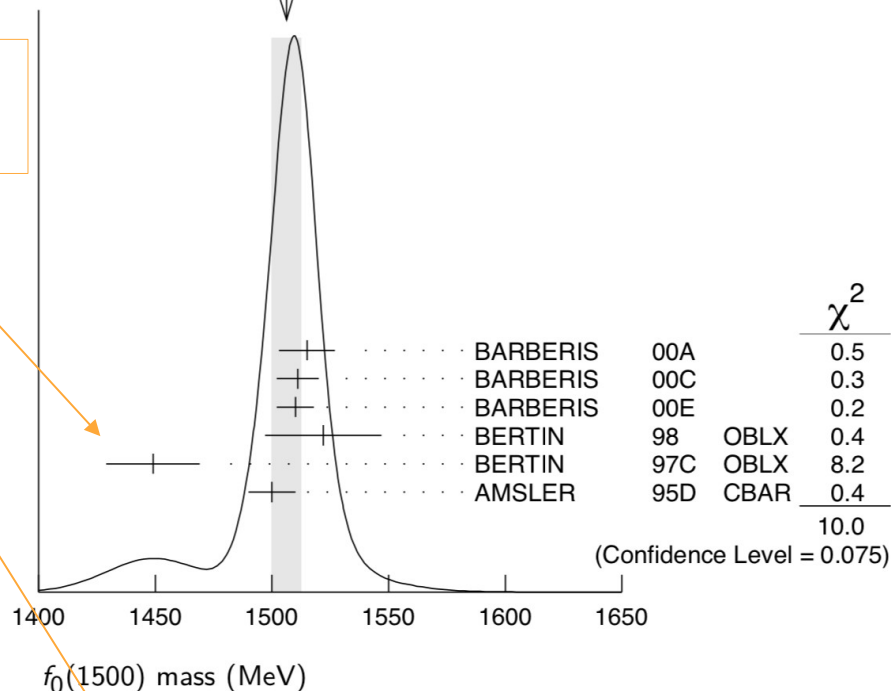


from here I will keep Mike's slides



# From PDG 2018 big book on $f_0(1500)$

WEIGHTED AVERAGE  
1506 $\pm$ 6 (Error scaled by 1.4)



1505  $\pm$  15

1445  $\pm$  5

1497  $\pm$  30

$\sim$  1505

1446  $\pm$  5

<sup>18</sup> AMSLER  
<sup>19</sup> ANTINORI

<sup>11</sup> ANTINORI  
BUGG

<sup>11</sup> ABATZIS

95C CBAR 0.0  $\bar{p}p \rightarrow \eta\eta\pi^0$

95 OMEG 300,450  $pp \rightarrow pp2(\pi^+\pi^-)$

95 OMEG 300,450  $pp \rightarrow pp\pi^+\pi^-$

95 MRK3  $J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$

94 OMEG 450  $pp \rightarrow pp2(\pi^+\pi^-)$

Superceded by Antinori's later paper



# A further study of the centrally produced $\pi^+ \pi^-$ and $\pi^+ \pi^- \pi^+ \pi^-$ channels in pp interactions at 300 and 450 GeV/c

WA91 Collaboration, F. Antinori<sup>d</sup>, D. Barberis<sup>d</sup>, A. Bayes<sup>c</sup>, W. Beusch<sup>d</sup>, J.N. Carney<sup>c</sup>, S. Clewer<sup>c</sup>, J.P. Davies<sup>c</sup>, D. Di Bari<sup>b</sup>, C.J. Dodenhoff<sup>c</sup>, D. Evans<sup>c</sup>, D. Elia<sup>b</sup>, R. Fini<sup>b</sup>, B.R. French<sup>d</sup>, B. Ghidini<sup>b</sup>, A. Jacholkowski<sup>d</sup>, J.B. Kinson<sup>c</sup>, A. I<sup>d</sup> ... M.F. Votruba<sup>c</sup>

## Abstract

An analysis of the centrally produced  $\pi^+ \pi^-$  and  $\pi^+ \pi^- \pi^+ \pi^-$  mass spectra from the WA76 and WA91 experiments is presented, which shows that in the  $\pi^+ \pi^- \pi^+ \pi^-$  channel there are two new states, the  $f_0(1450)$  and  $f_2(1900)$ . There is another new state in the  $\pi^+ \pi^-$  channel with  $M = 1497 \pm 30$  MeV and  $\Gamma = 199 \pm 30$  MeV, which is compatible with the  $f_0(1520)$  observed by the Crystal Barrel experiment. Another interpretation is discussed, where the 1450 and 1497 GeV structures are explained as being due to an interference effect between the  $f_0(1365)$  and  $f_0(1520)$ .

Thanks for your kind help and attention !