

Determining the Number of J/Psi by Dimuon Channel

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- Data & Method
- Selection of dimuon
- comparison of MC and Data
- Lum. by $ee \rightarrow 2(3)\gamma$
- Result and Error

Abstract

Here the J/ψ number from run13800 to run15500 is determined by J/ψ 's decay to dimuon channel, where the BG from e^+e^- decaying to dimuon is subtracted by the luminosity and its cross section.

Although there are still inconsistency between the $\cos\theta$ distributions of data and MC, the resolution of the results should be less than 10%, which is much more precise than the number of before BES J/ψ data.

Data & Method

- Data: Run 13800-15500
- Method:

$$N_{J/\psi} = \frac{N_{\mu\mu} - N_{bg}^{ee \rightarrow \mu\mu} - N_{bg}^{had}}{BR(J/\psi \rightarrow \mu\mu) \cdot \epsilon_{trg} \cdot \epsilon_1}$$

$$1. N_{bg}^{ee \rightarrow \mu\mu} = L \times \sigma(ee \rightarrow \mu\mu) \times \epsilon_2$$

$$2. N_{bg}^{ee \rightarrow \mu\mu} = N_{3..0}^{ee \rightarrow \mu\mu} \times \frac{L\sigma}{L_{3.0}\sigma_{3.0}}$$

Here using method 1. L is determined by $ee \rightarrow 2(3)$ photons

Selection of Dimuon

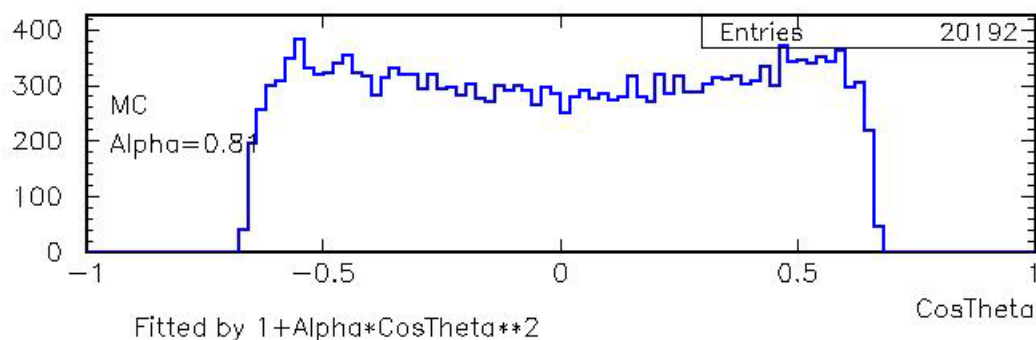
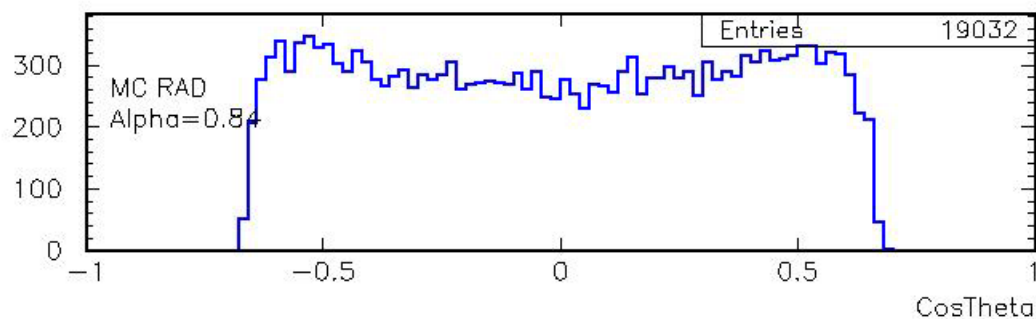
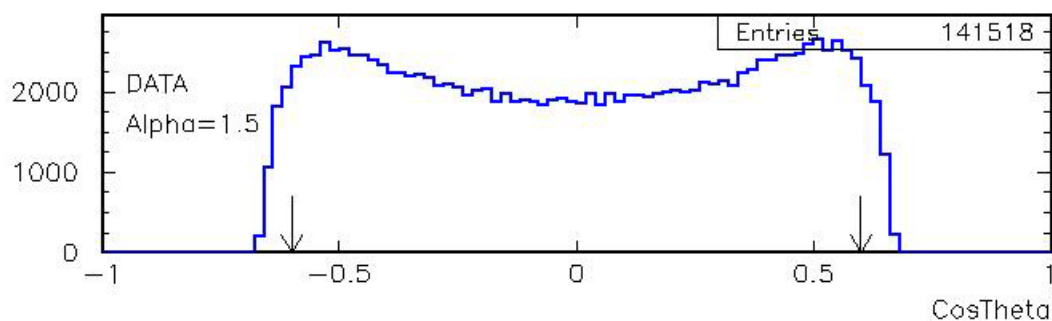
- Mfit=2, Nchrg=2, vertex limit
- Polar angel: $|\cos\theta| < 0.6$
- Back-to-back:

$$|\theta_1 + \theta_2 - 180| < 2.2$$

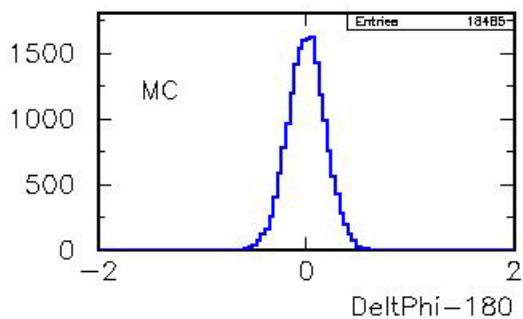
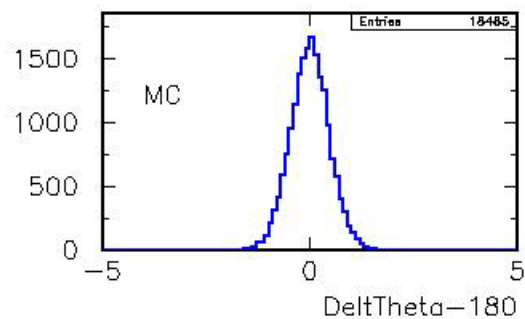
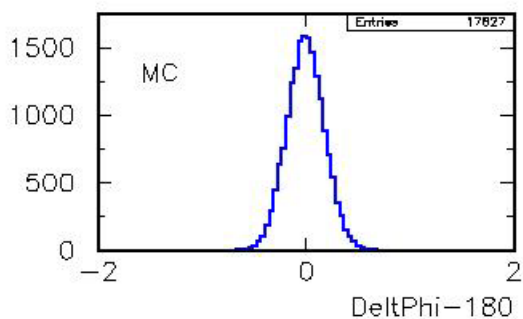
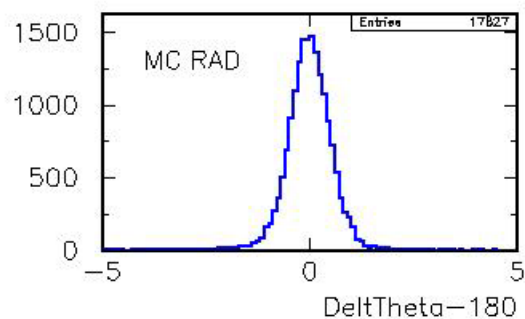
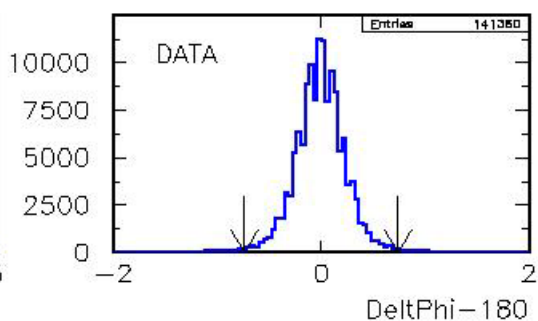
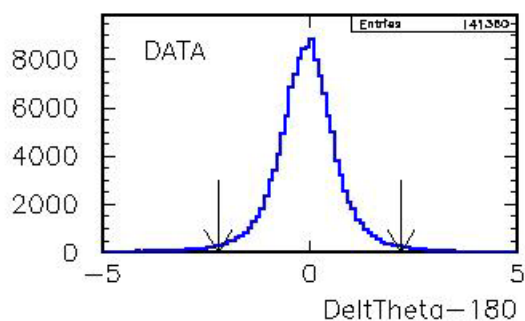
$$||\varphi_1 - \varphi_2| - 180| < 0.74$$

- Momentum: [1.38, 1.71] GeV
- $|\text{Thit} - \text{Texp}| < 0.74$
 $|\text{T1} - \text{T2}| < 0.91$
- Muid:
 $|\text{mustat1} + \text{mustat2}| > 3$

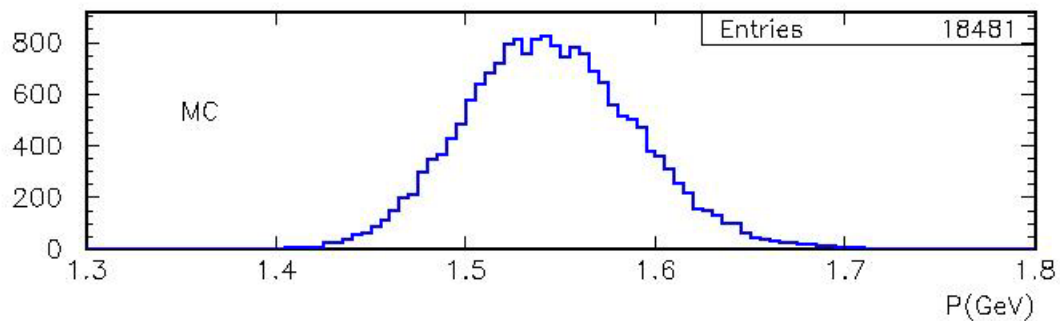
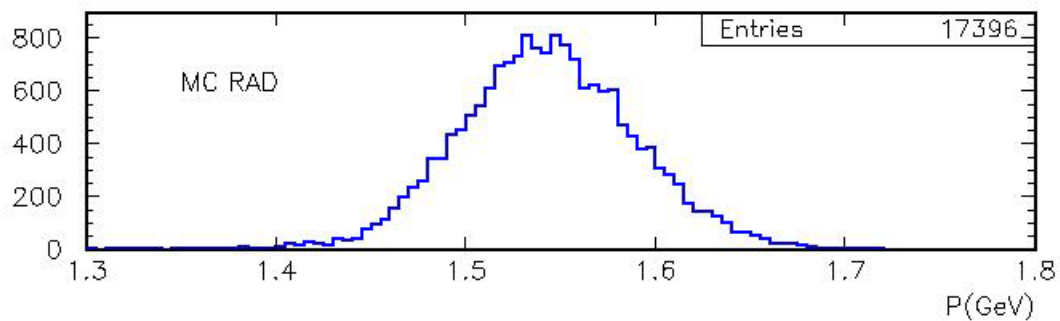
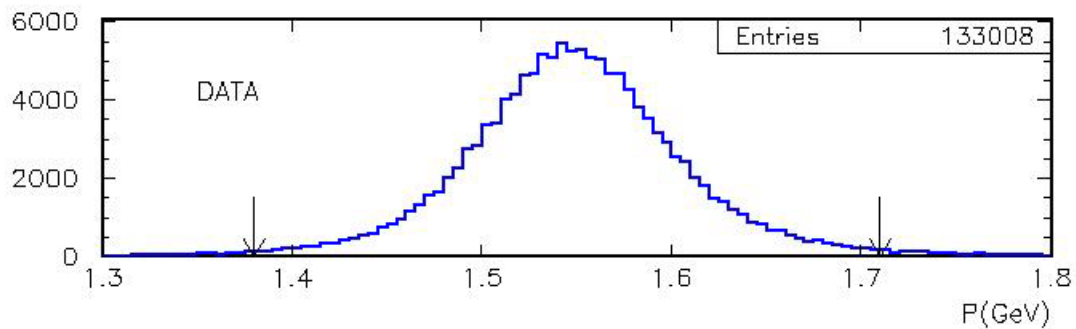
COMPARISON OF COSTHETA



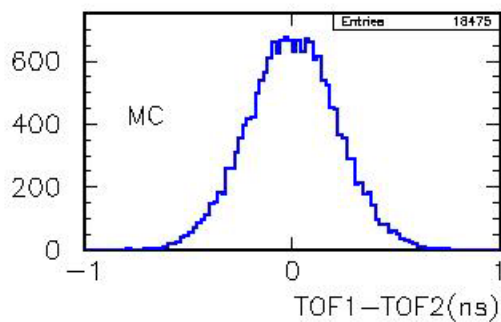
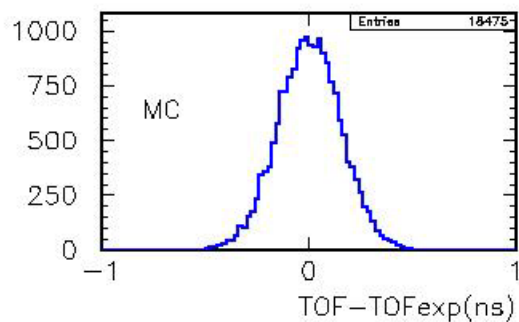
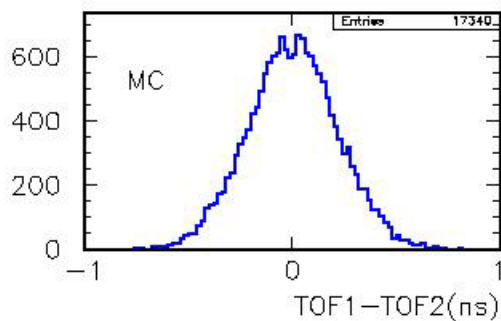
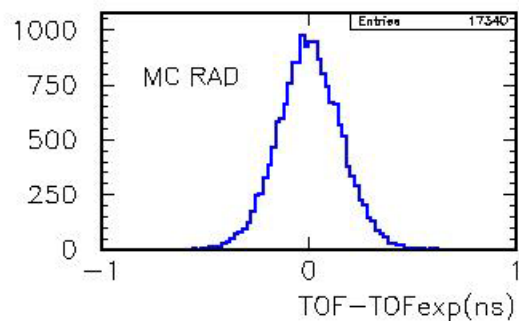
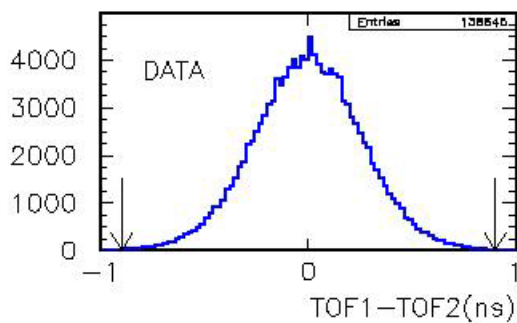
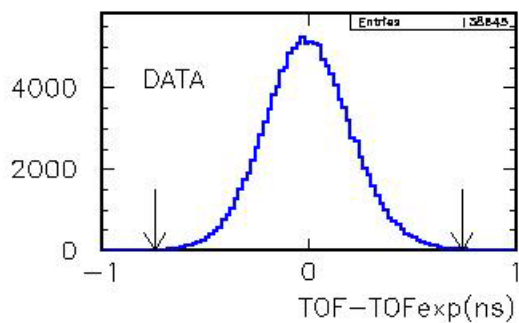
COMPARISON OF BACK-TO-BACK



COMPARISON OF MOMENTUM



COMPARISON OF TOF



Muon ID

NhitP	Gdhit	DBhit	Mustat
1	1	0	1
	1	1	2
2	1	0	1
	1	1	2
	2	0	2
	2	1	3
	1&2		3
3	1	1	1
	2	1	2
	3	1	2
	1 & 2		3
	2&3		3
	1&3		3

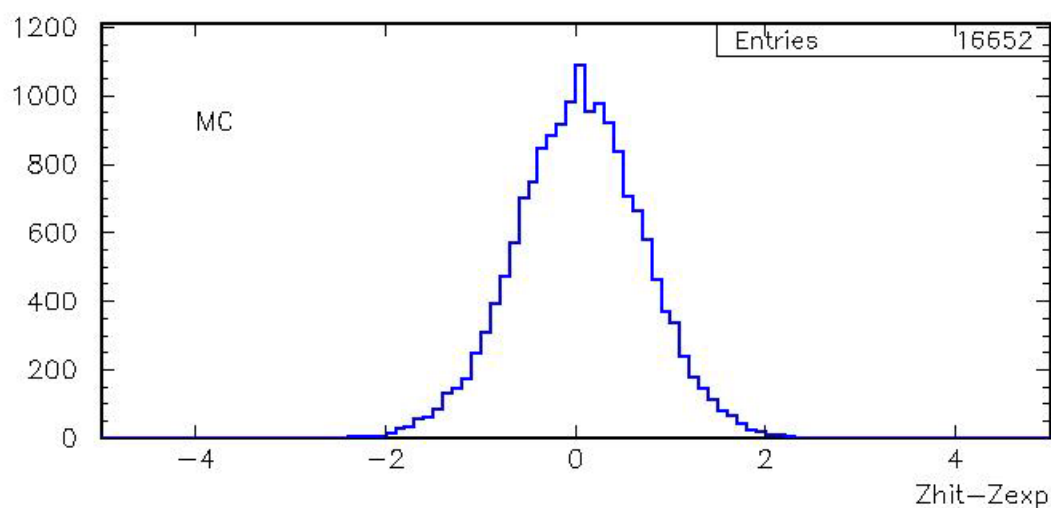
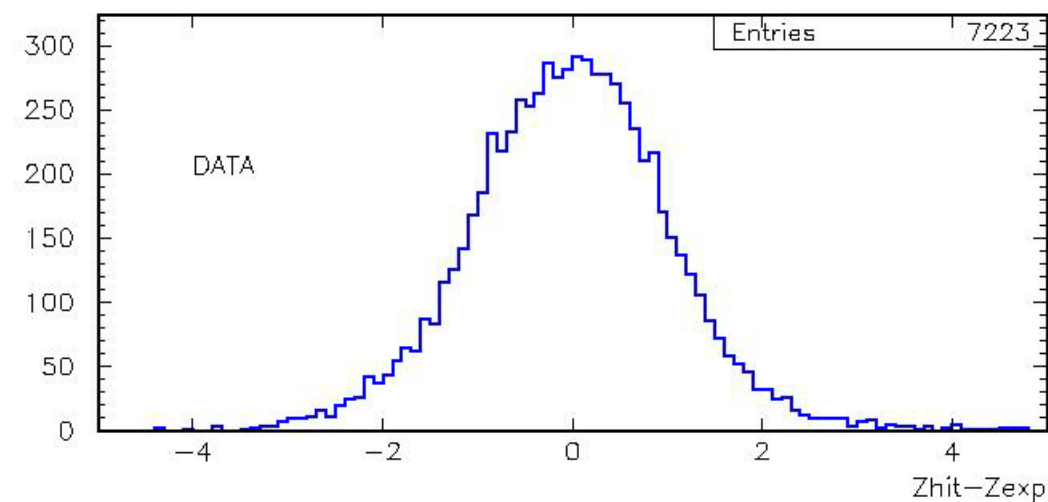
NhitP: Possible hit number from MDC info

Gdhit: Delta Z & Delta R inside 3sigma, the sigma and middle value are corrected according to data muon sample.

Dbhit: double tube hit in muon detector

Mustat: weight as muon

COMPARISON OF DETZ IN MU DETECTOR



Lum. By $ee \rightarrow gg$

- Selection of gg
 - Nchrg=0, Nneu \leq 3
 - Polar Angle: $|\cos\theta| < 0.70$
 - Avoid ribbon: 20cm, 25cm
 - Esc: [1.1, 1.87] GeV
 - Back-to-Back: $|\Delta\phi - 180^\circ| < 1.5^\circ$
- LUM:
$$L = \frac{N_{gg}}{\varepsilon \cdot \sigma_{gg}}$$
$$N_{gg} = 20.5K, \varepsilon = 2.03\%$$
$$\sigma_{gg} = 249.7nb, L = 4040nb^{-1}$$
- Sys.Err $<4\%$
BackGround: $<1\%$

Result

- No. of Jpsi: $N_{J/\psi} = (11.1 \pm_{0.8}^{0.5})M$

Ndimu	303.1 K
L	4040 nb-1
CS(ee->gg)	11.46 nb
Efficiencel	42.7 %
Efficiencel2	37.1 %
Njpii	11.1 M

- Error: <10%

1. Criteria are varied one sigma to get error.
2. In the dimuon sample ~5.7% is from ee-dimuon ,
L's error is ~4% from R group
3. Mid from hadron is negligible:
Only 0.2% with over one photon inside
the dimuon sample
4. In MC, the CosTheta distribution is not
consistent with data, which probably come from
the MDC trigger. So here efficiency should be
greater. More checks are needed.
5. The interference between ee->dimuon and Jpsi -
>dimuon have not been considered until now.

Error Analysis

SOURCE	ERROR(%)	
θ	+0.8	-2.2
ϕ	+0.8	-1.6
P	+2.6	-5.3
TOF	+0.2	-0.6
MUID	0.4	-1.4
MID from $ee \rightarrow uu$	+0.3	-0.3
MID from hadron	\sim	\sim
BR	+3.2	-3.2
ε	?	?
Interference	?	?
Total	+4.2	-7.0