15.11.2000
D. Kuznetsov

# $J/\psi \to e^+e^-$ ($\Upsilon(1S) \to e^+e^-$) reconstruction using EMreco (SEMreco).

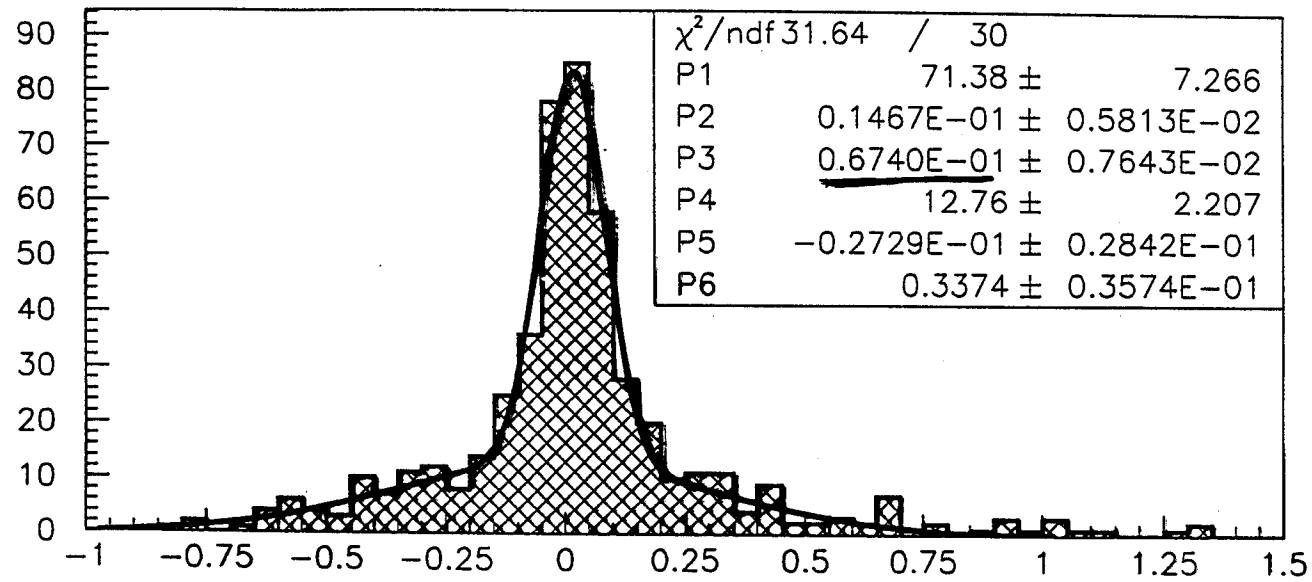
## MC SAMPLES

- $pmc02.pythia.1.1mb$; $B$'s from unforced $b\bar{b}$ events: $B \to J/\psi X$ ($J/\psi \to e^+e^-$ or $\mu^+\mu^-$ )
- $pmc03.pythia.0.0mb$; Dedicated MC: $B_d \to J/\psi K_s^0$ ($J/\psi \to e^+e^-$)

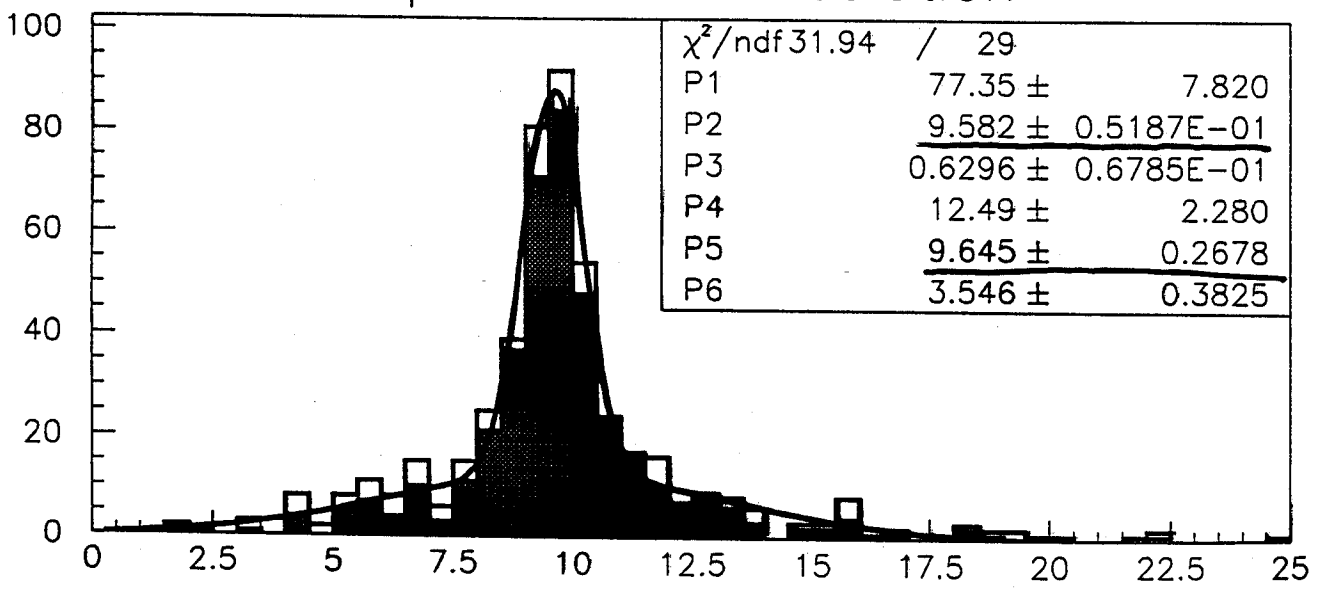
- $pmc02.pythia.1.1mb$; Prompt production: $\Upsilon(1S) \to e^+e^-$

About 2000 $J/\psi$ and 2000 $\Upsilon(1S)$ events were analyzed

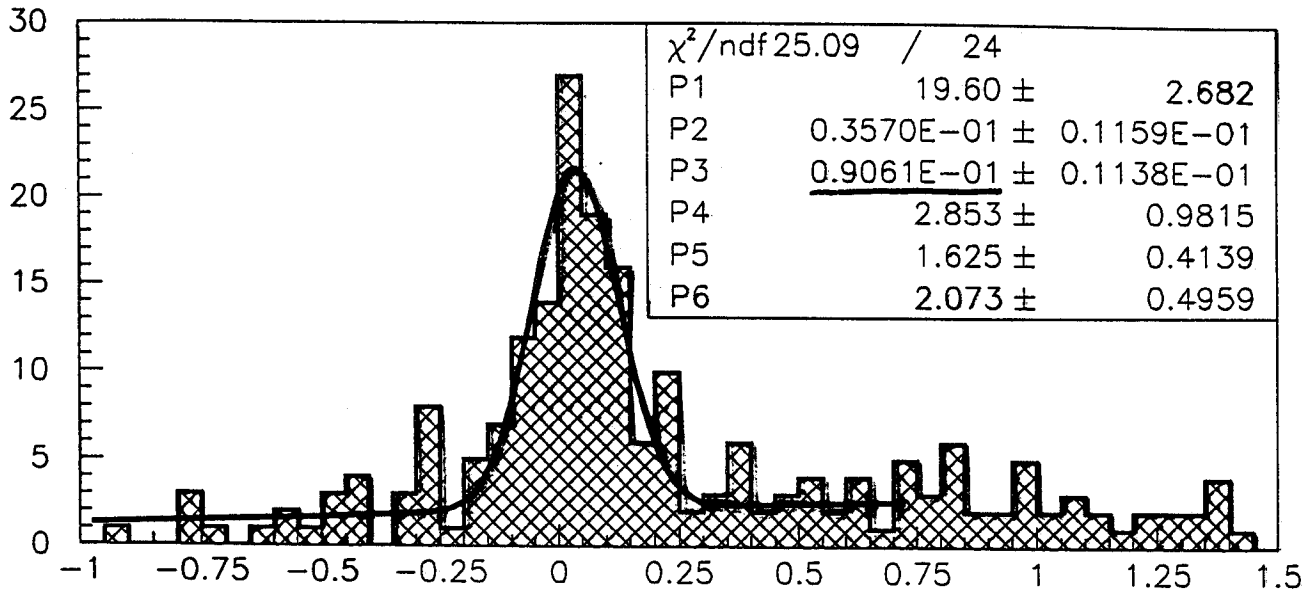
| Res. | PDG M | Mass | Mass res. | Rec eff. |
|---|---|---|---|---|
| $J/\psi$ | 3.097 | $3.18 \pm 0.04$ | $\sim 9\%$ | $\sim 7\%$ |
| $\Upsilon(1S)$ | 9.460 | $9.58 \pm 0.05$ | $\sim 6\%$ | $\sim 20\%$ |



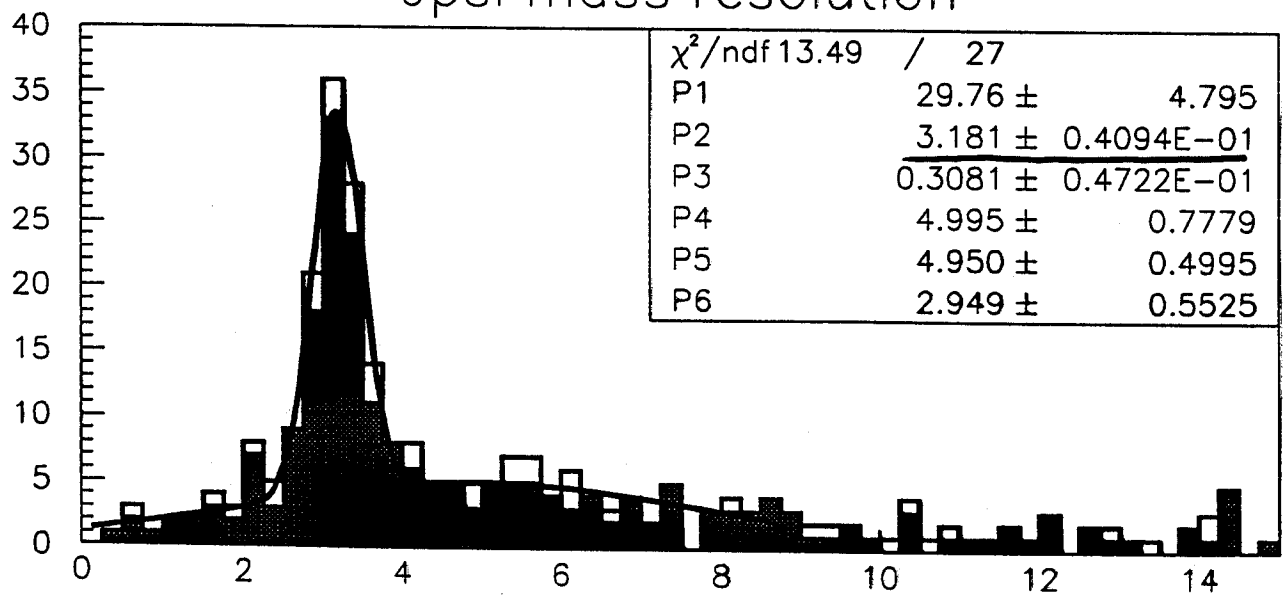

Upsilon mass resolution




Upsilon mass




Jpsi mass resolution

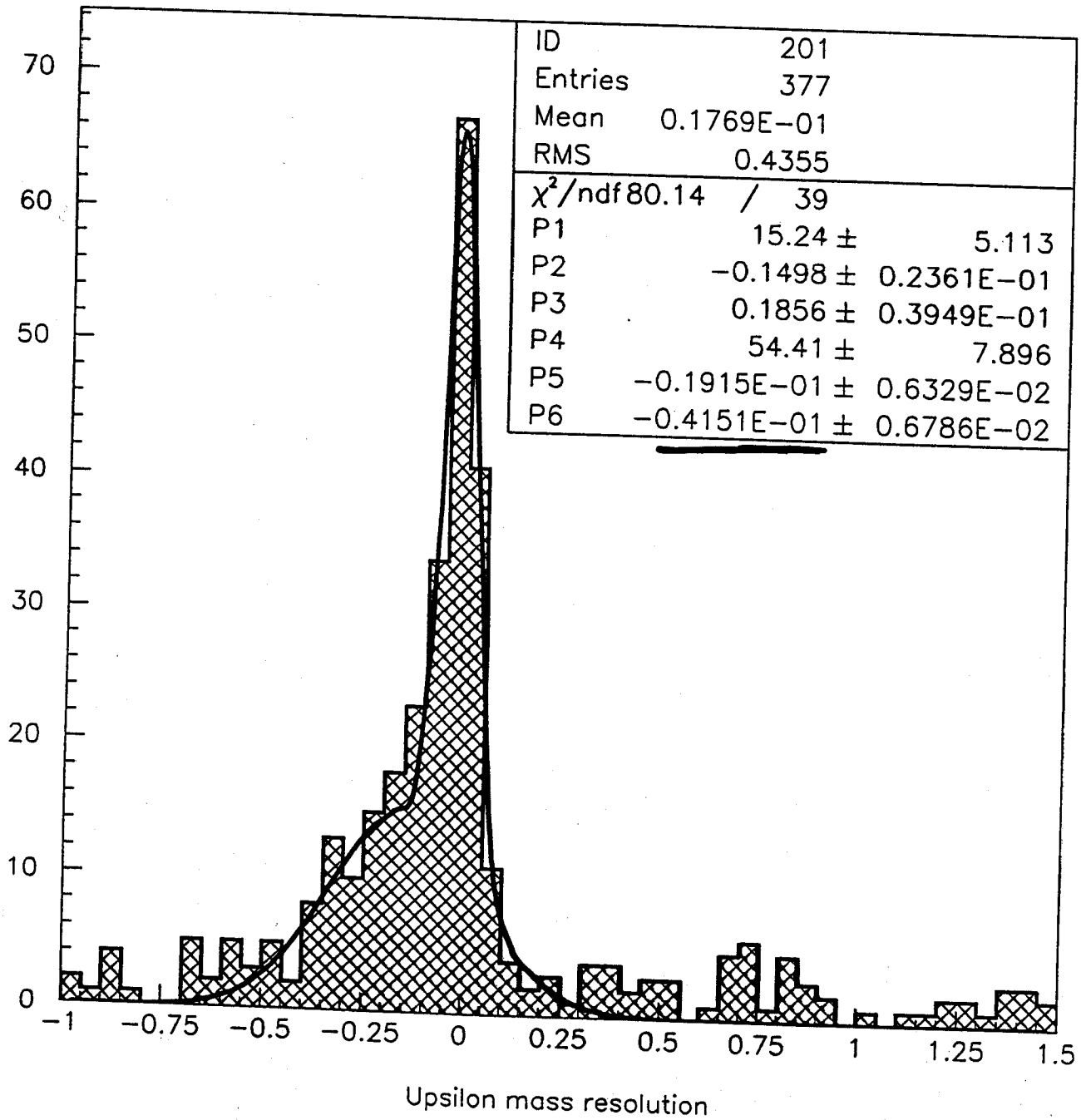



Jpsi mass

Υ(1S)

# SEM RECO (TRACKS!)

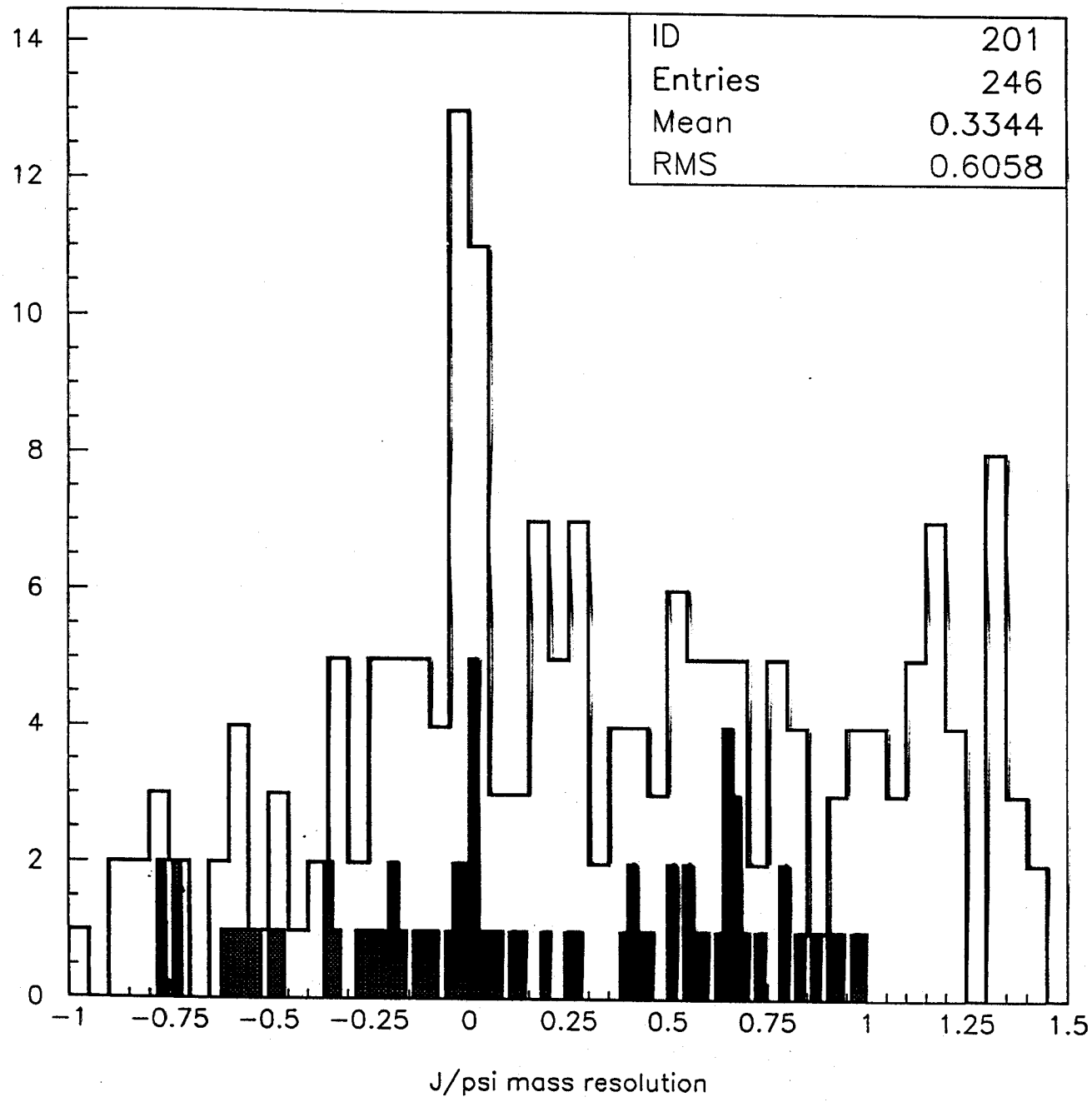
Full stat Υ(1S)



J/ψ

SEMreco (TRACKS!)

~1/3 J/ψ stat.



# Energy Scale Determination from Resonances

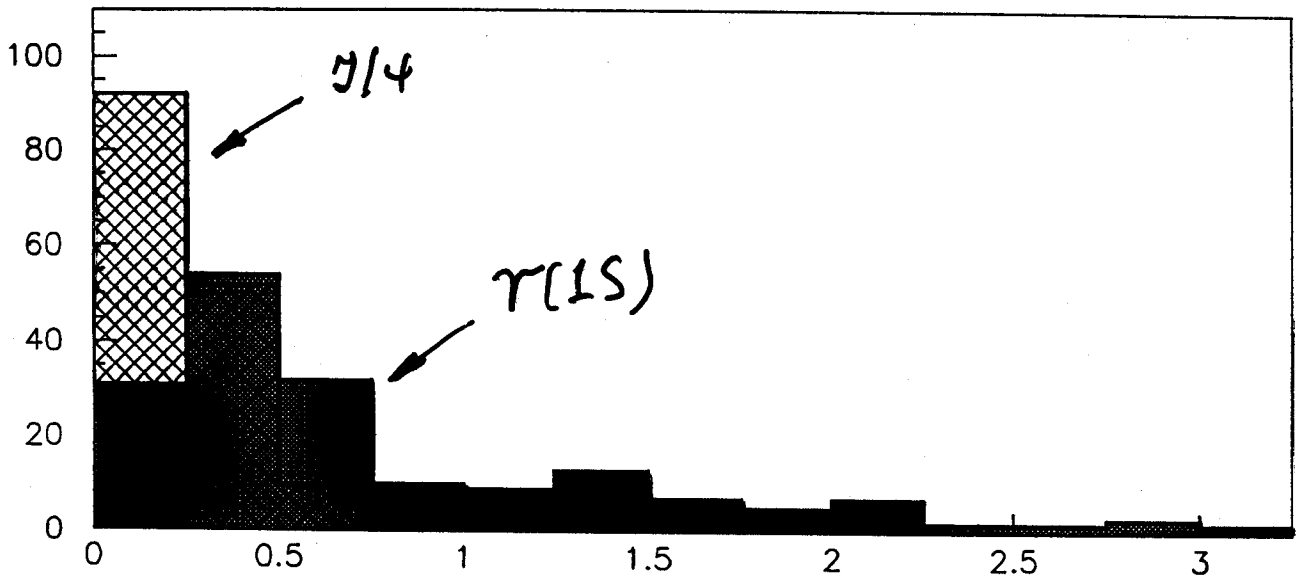
- $\mathbf{E = \alpha E_{meas} + \delta}$ $\Rightarrow$ determination of $\alpha$ and $\delta$ from Z, J/$\Psi$ and $\pi^0$
- $\mathbf{m = \sqrt{2}\, E_1 E_2 (1 - \cos\gamma)}$ $\Rightarrow$ E1, E2: electron energies, $\gamma$: opening angle

$\Rightarrow \mathbf{M_{true} \approx \alpha\, m + \delta\, f}$ with kinematic factor $\mathbf{f = (E_1 + E_2)(1 - \cos\gamma)/m}$

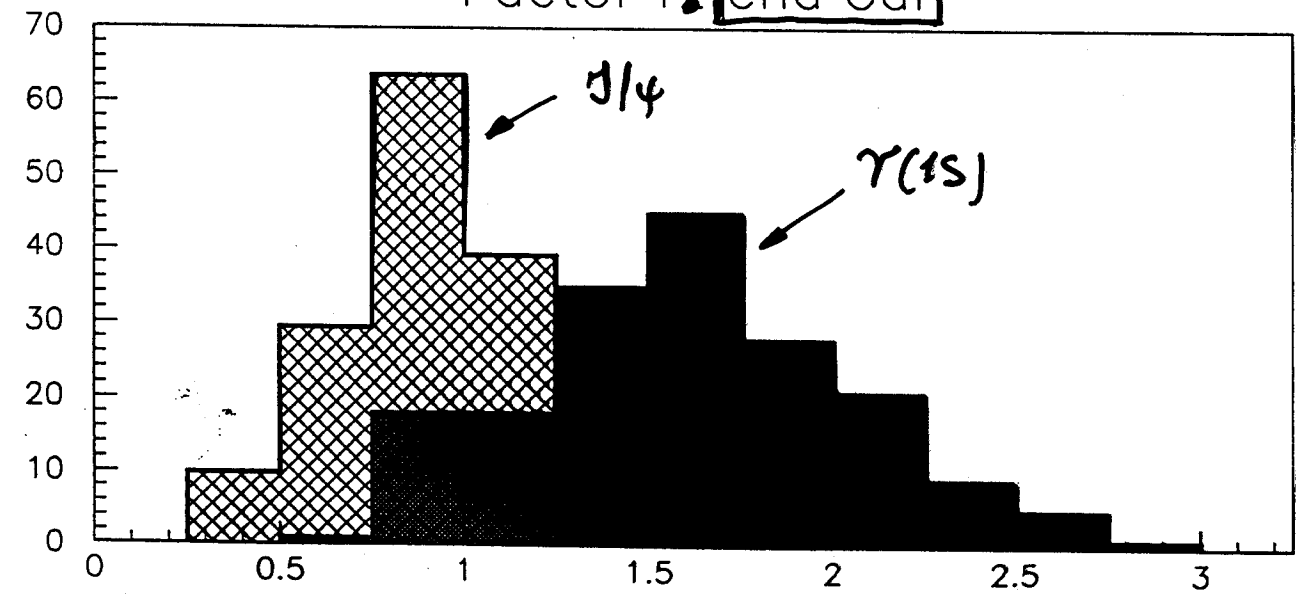
- $\mathbf{f_{max} = 2}$ for electrons back to back
- $\partial \mathbf{m}/\partial\, \delta = \mathbf{f} \Rightarrow$ sensitivity to an offset $\delta$ varies with f

D0-note 1819 - Ulrich Heintz
D0-note 2209 - Ulrich Heintz
D0-note 2298 - I. Adam et al.
PRD 58-12002 - W-mass Run 1a
PRD 58-92003 - W-mass Run 1b

$$f = \left(E_1^{meas} + E_2^{meas}\right)(1-\cos\gamma)/M_{max}$$




Factor f2 end Cal



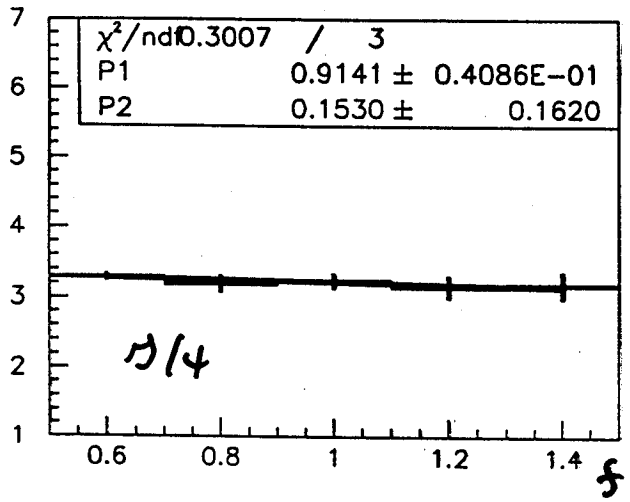

Factor f2 central Cal

# Electromagnetic energy scale.

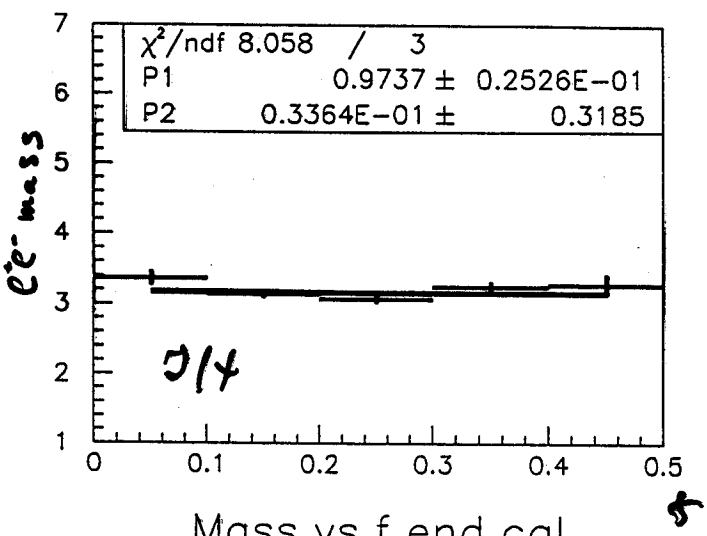
$$M_{meas} = \frac{1}{\alpha} M_{true} - \frac{\delta}{\alpha} f.$$

$P1 \equiv \alpha \quad P2 \equiv \delta$

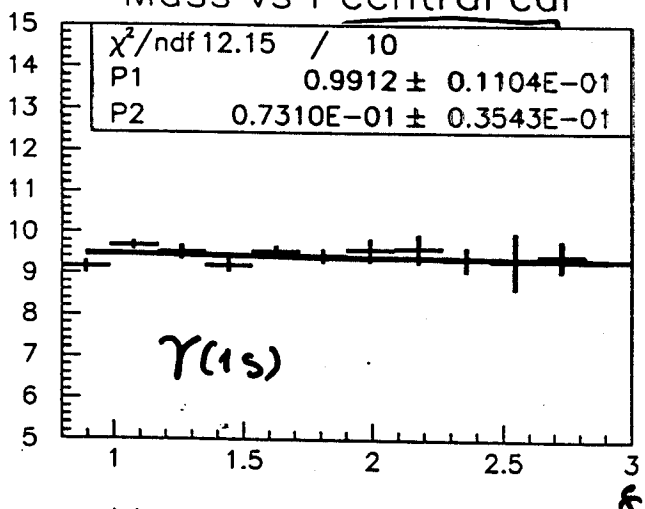
energy scale $\alpha \sim 1$
offset $B \sim 0$ (excluding END cal for $\Upsilon(1S)$?)



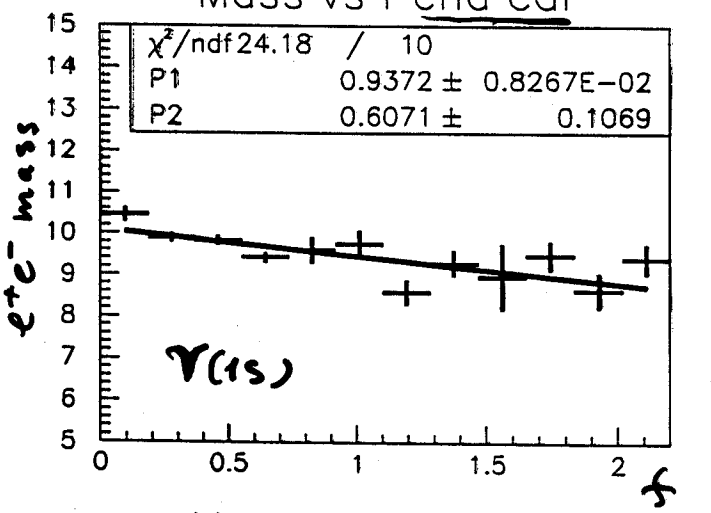

Mass vs f central cal




Mass vs f end cal

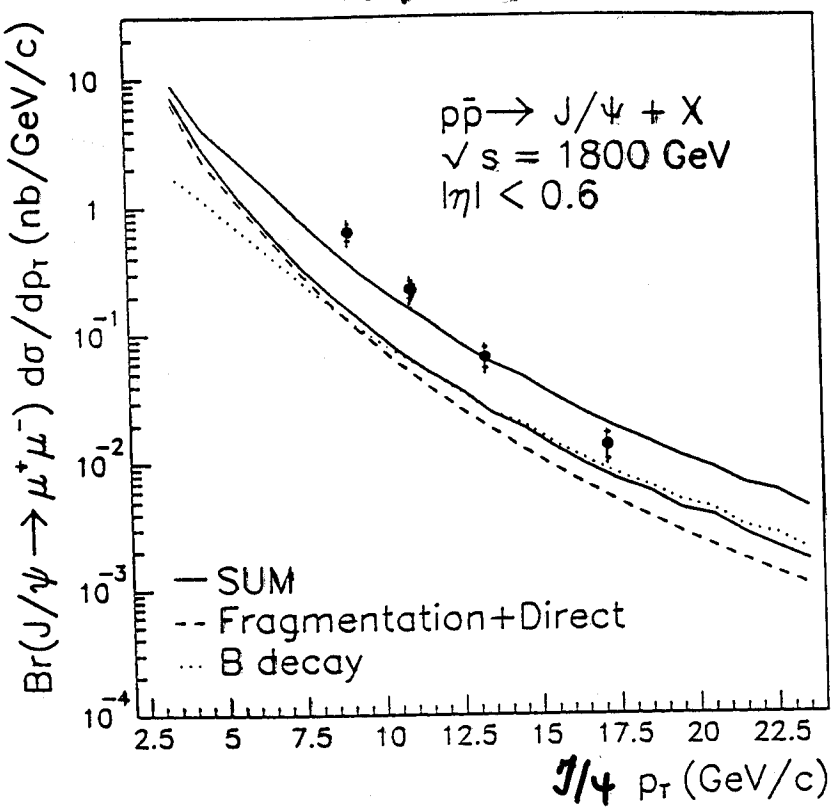


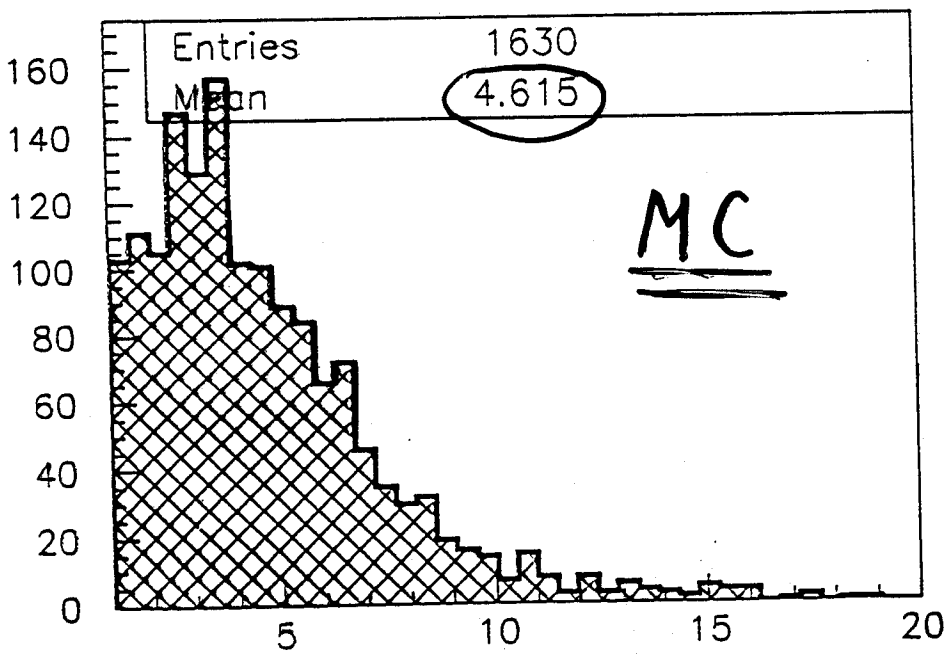

Mass vs f central cal



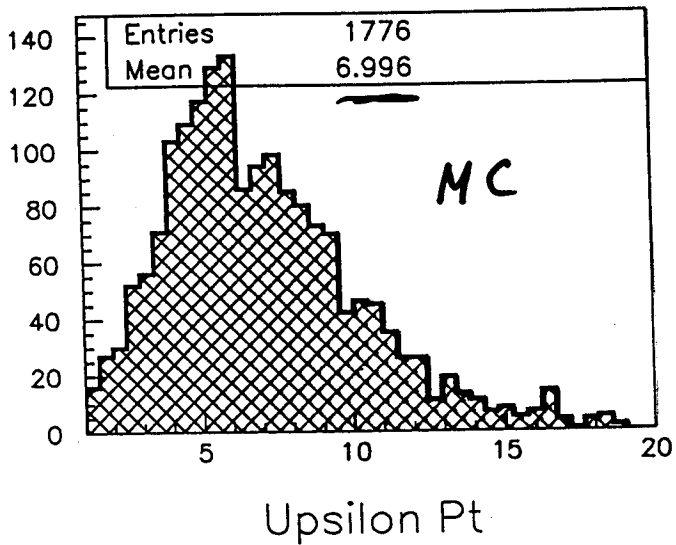

Mass vs f end cal

Run I

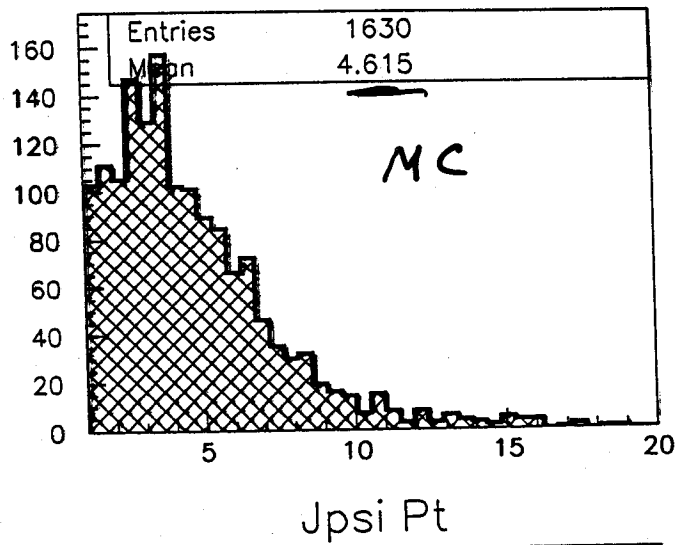

$p\bar{p} \rightarrow J/\psi + X$
$\sqrt{s} = 1800$ GeV
$|\eta| < 0.6$
— SUM
-- Fragmentation+Direct
··· B decay
$Br(J/\psi \rightarrow \mu^+\mu^-)\, d\sigma/dp_T$ (nb/GeV/c)
$J/\psi$ $p_T$ (GeV/c)


Entries 1630
Mean 4.615
MC

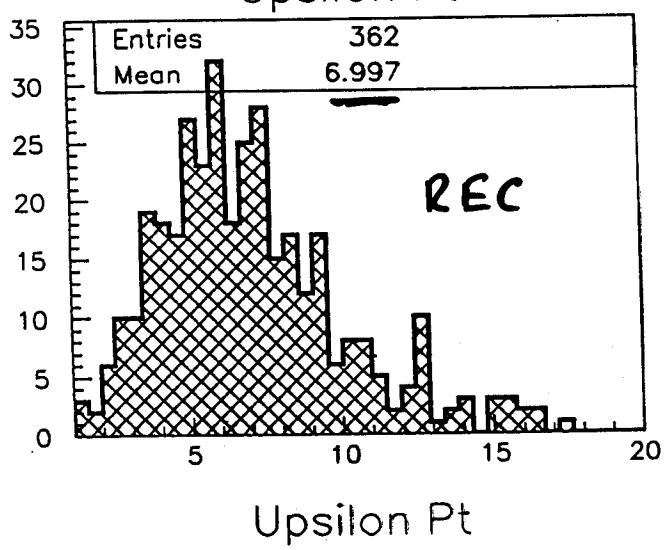
Jpsi Pt



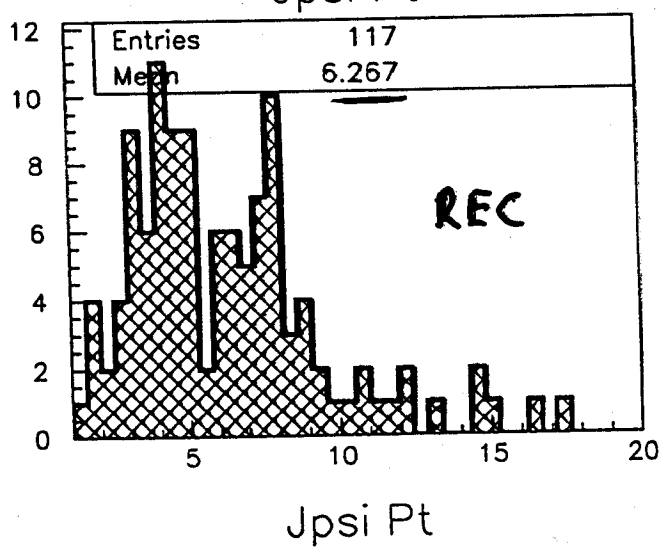

Upsilon Pt



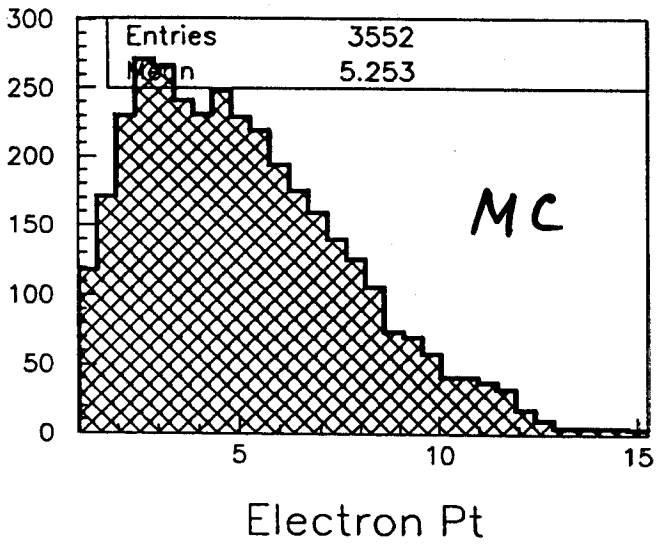

Jpsi Pt

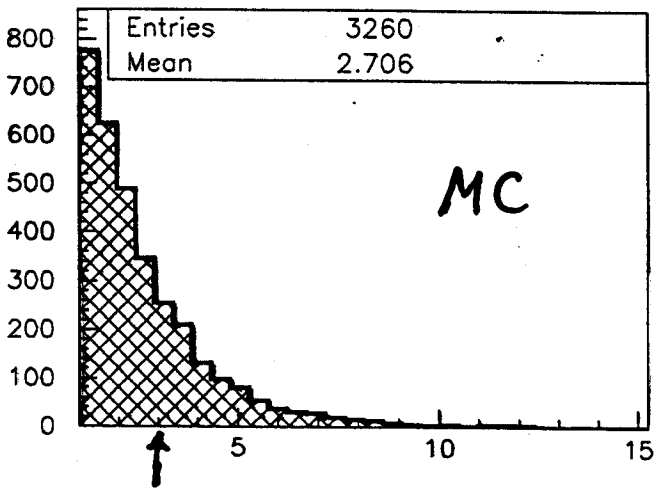


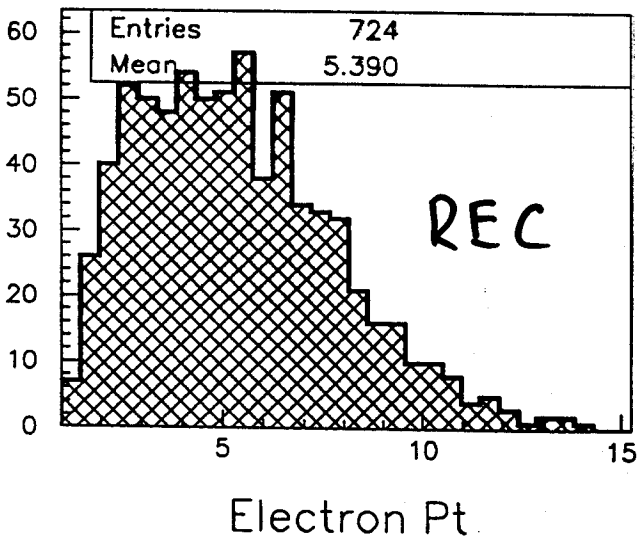

Upsilon Pt

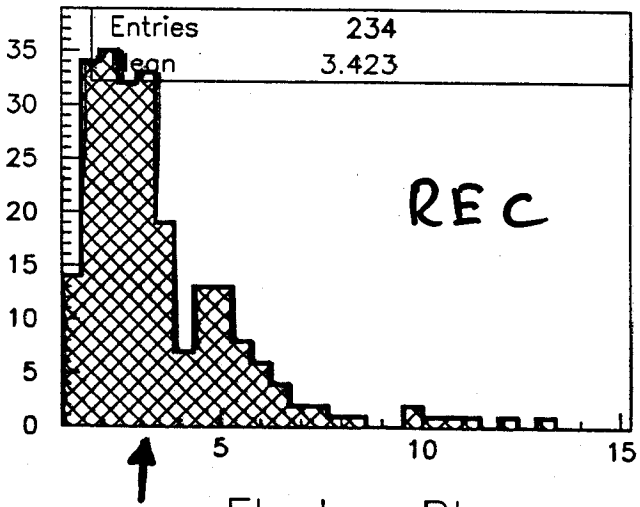



Jpsi Pt

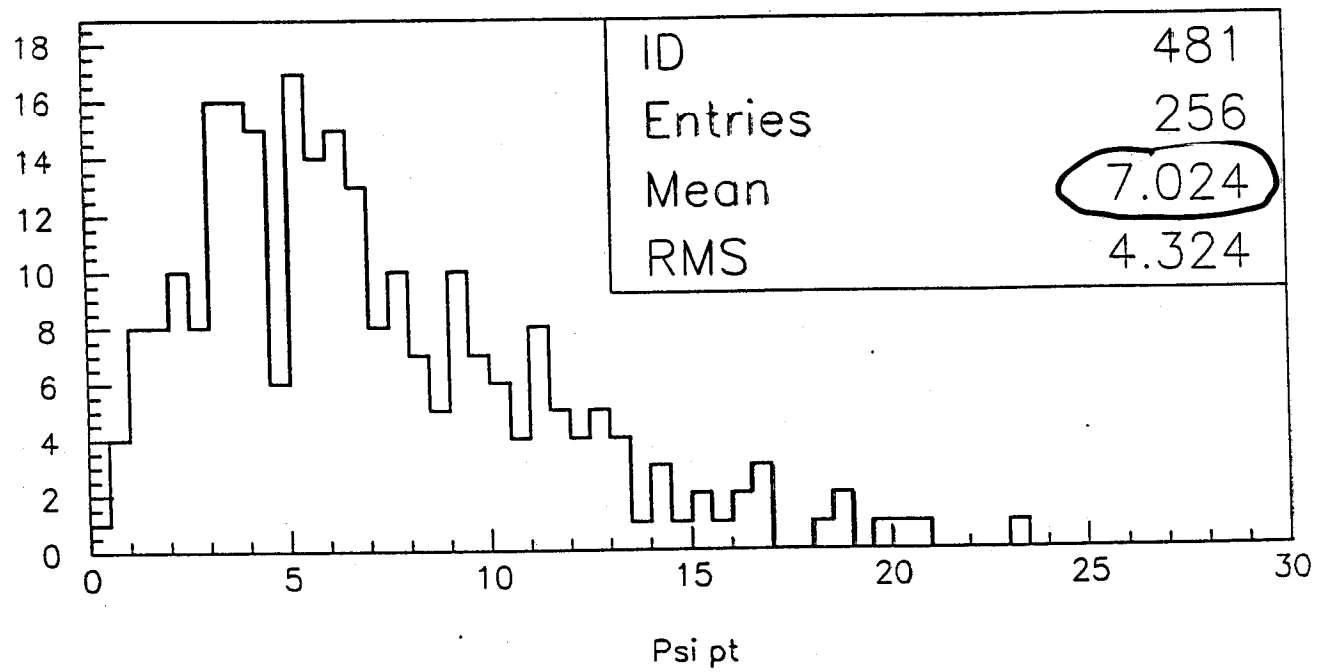

Entries 3552
Mean 5.253
MC
Electron Pt


Entries 3260
Mean 2.706
MC
Electron Pt

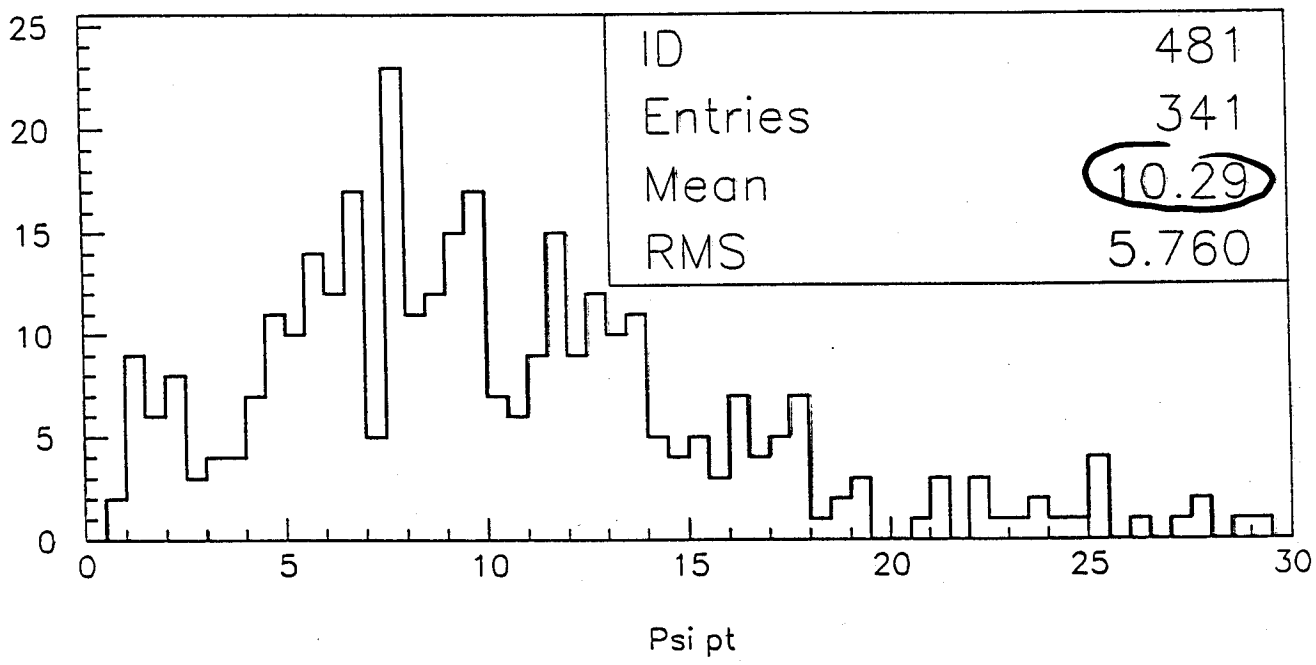

Entries 724
Mean 5.390
REC
Electron Pt


Entries 234
Mean 3.423
REC
Electron Pt

$\hat{P}_\perp = 10$ GeV




$\hat{P}_\perp = 15$ GeV




$\hat{P}_\perp$ for hard $2 \to 2$ process

defined in the Rest frame of the hard interaction

$B_s^0 \to J/\psi\,\phi$ MC