QCD Background for $B^+ \rightarrow J/\psi K^+$

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Outline

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- Argumentation
- The sample of InclusivePPmux
- The number of events will sample
- The sample result

Motivation

1. The problem

the number of events for QCD Background is too small, when the cut added there are nearly no data left.

Actually when the p_t of k is small there are a lot of background.

2. The resolvent

Make a toy Monte Carlo sample.

Pick up the distribution of the mass and Pdl(proper decay length) for B+ from the existing sample of QCD

Suppose all the cut conditions are independent . And calculate the efficiency step by step, then multiply all the efficiency in a whole as the total efficiency.

Argumentation

1. Got the distribution of the mass and Pdl was in soft cut conditions, so maybe the distribution isn't correct.
2. The cut condition related between each other, so maybe the method of multiply all the efficiency in a whole isn't correct.
3. But take this result as the estimate of QCD background effect $B \rightarrow J/\psi$ k is effective. Especially to estimate the effect of pt for k^+ .

The sample of InclusivePPmux

/InclusivePPmuX/Summer08_IDEAL_V9_PAT_v1/USER

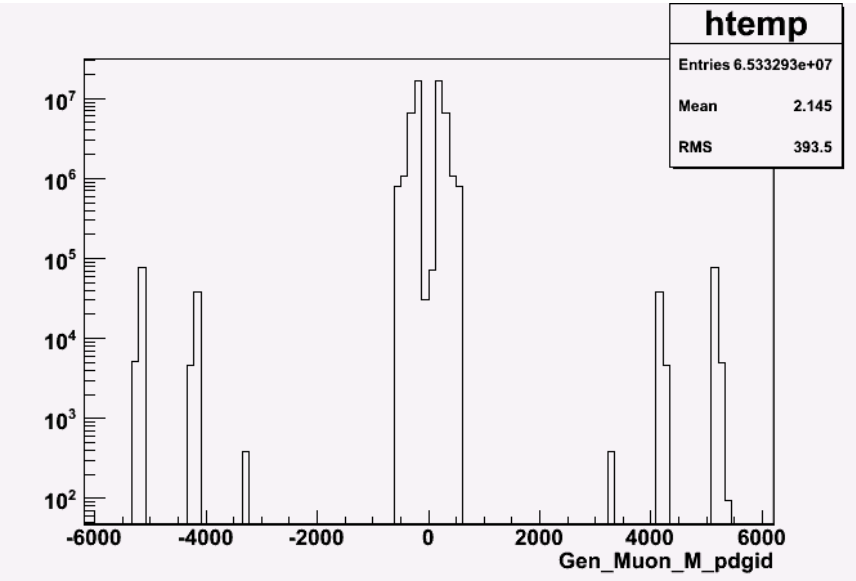
Created 22 Jan 2009 18:49:22 CET, ccntains 10345428 events, 312 files, 1 bl

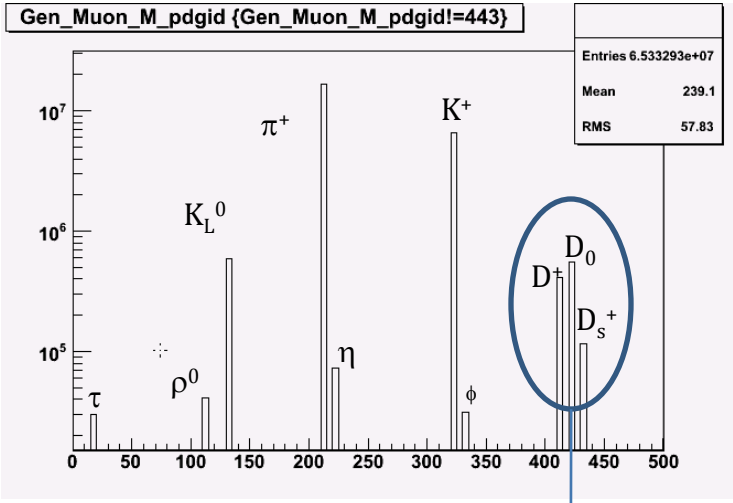
Release info , Block info , Run info , Ccnf. files , Parents , Children , Descriptio

Location	Events	Files	size	LFNs
T1_ES_PIC : srmcms.pic.es	10345428	312	304.5GB	cff plain
T2_IT_Legnaro : t2-srm-02.lnl.infn.it	10345428	312	304.5GB	cff plain
T2_US_UCSD : srm-3.t2.ucsd.edu	10345428	312	304.5GB	cff plain
T2_CN_Beijing : srm.ihep.ac.cn	10345428	312	304.5GB	cff plain

- $\varepsilon_{filter}=0.002305$
- $\sigma_{sample}=1.188458*10^{8}$ pb
- $N_{sample}=10345428$

- **In the InclusivePPmux sample We tack out all the muon from J/ψ, take the residual data as the QCD sample**


htemp
Entries 6.533293e+07
Mean 2.145
RMS 393.5
Gen_Muon_M_pdgid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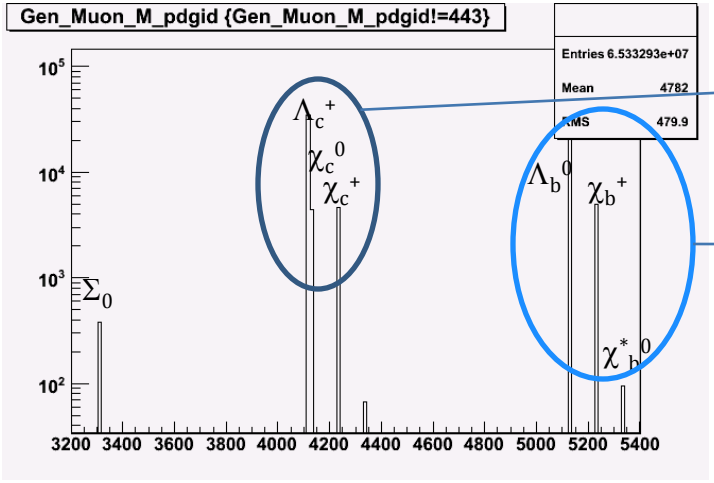
RMS 57.83
τ
ρ0
KL0
π+
η
K+
ϕ
D+
D0
Ds+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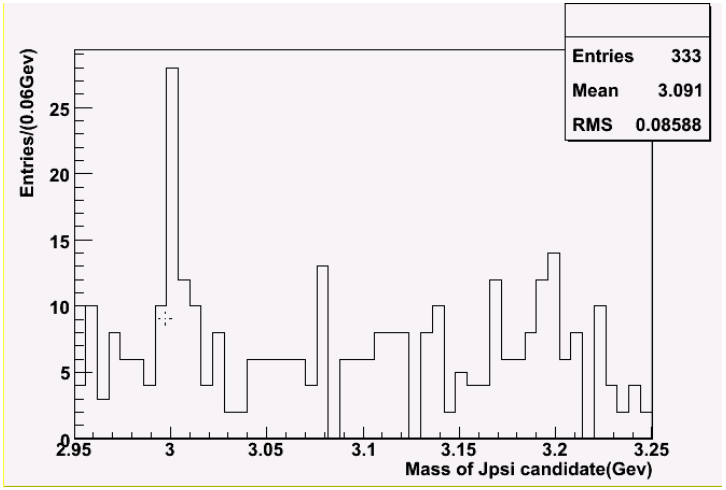
Entries 6.533293e+07
Mean 4782
RMS 479.9
Σ0
Λc+
χc0
χc+
Λb0
χb+
χ*b0

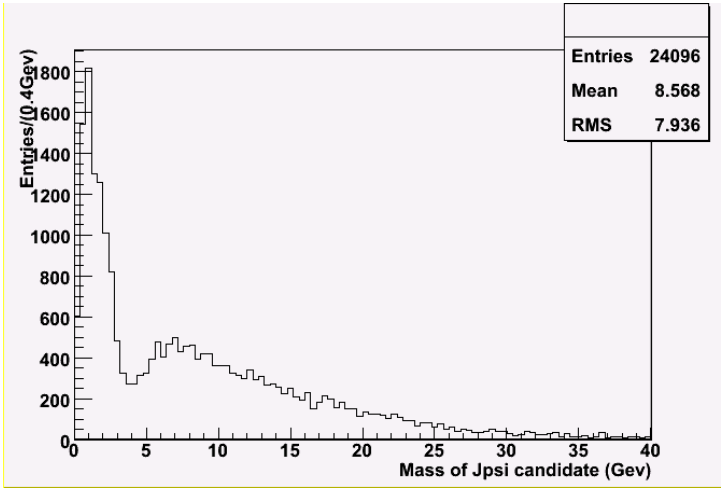
From c

From B

The distribution of sample



- Select condition:
- 1) two inverse charge dimuon,
- 2)single muon pt>2.5,
- 3)Jpsi mass window(2.95,3.25)



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- 1) two inverse charge dimuon,
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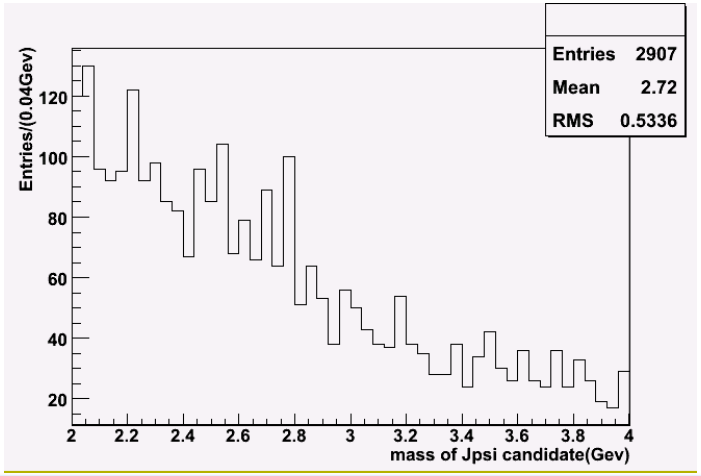
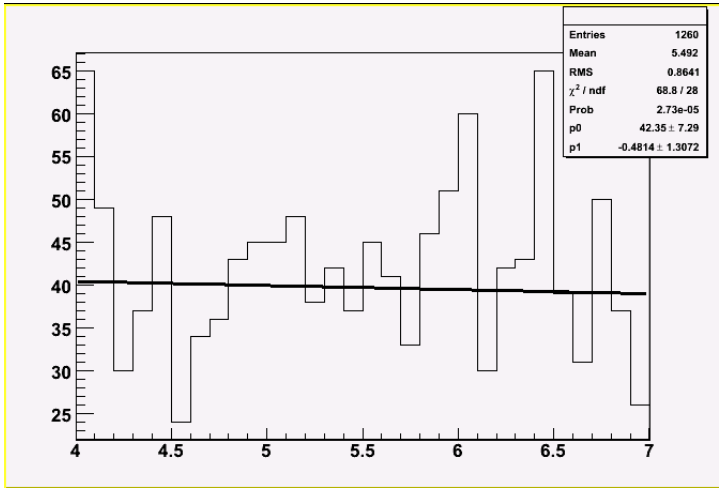
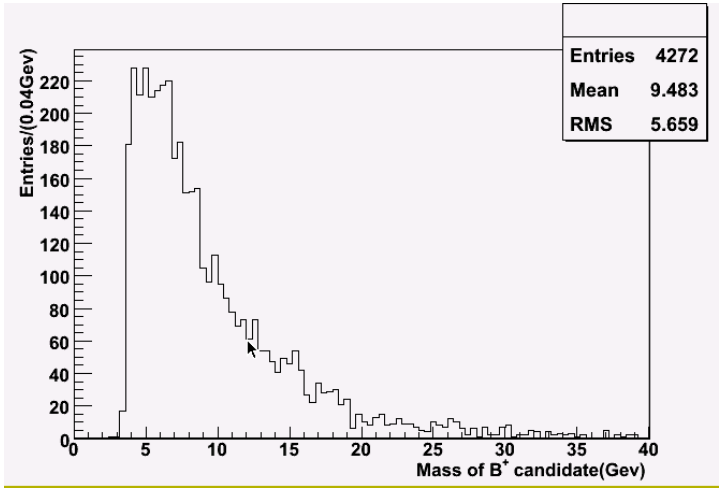
- Select condition:
- 1) two inverse charge dimuon,
- 2)single muon pt>2.5,
- 3)Jpsi mass window(2,4)



$B^{\pm}$ Invariant mass distribution

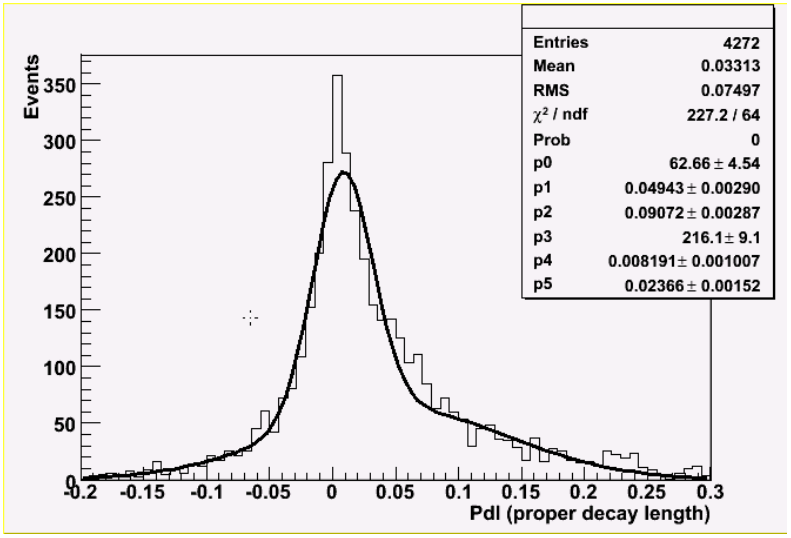


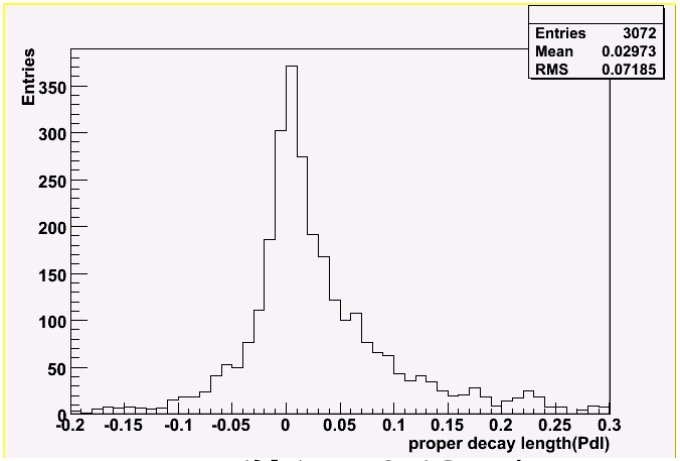


- Select condition:
- 1) two inverse charge dimuon,
- 2)single muon pt>2.5, Gev/c
- 3)Jpsi mass window(2Gev,4Gev)
- 4) Jpsi Pt >5.0Gev/c
- 5) kinematic constrained vertex fit
- 6)$k^{\pm}$ Pt>0.4Gev/c
- 7)$B^{\pm}$ mass window(4Gev,7Gev)

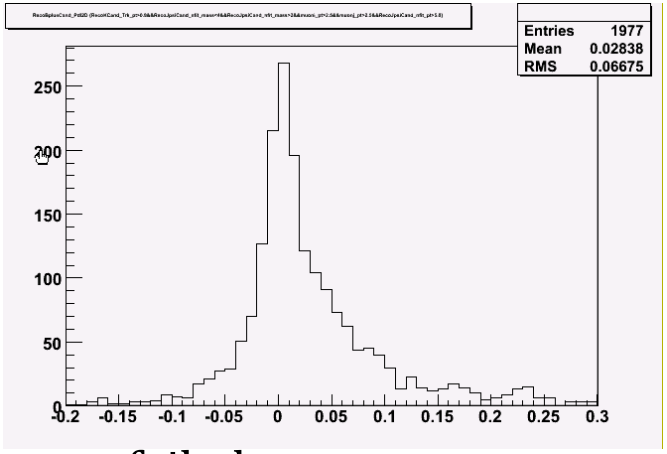
- Select condition:
- 1) two inverse charge dimuon,
- 2)single muon pt>2.5, Gev/c
- 3)Jpsi mass window(2Gev,4Gev)
- 4) Jpsi Pt >5.0Gev/c
- 5) kinematic constrained vertex fit
- 6)$k^{\pm}$Pt>0.4Gev/c

$B^{\pm}$ Proper decay length distribution





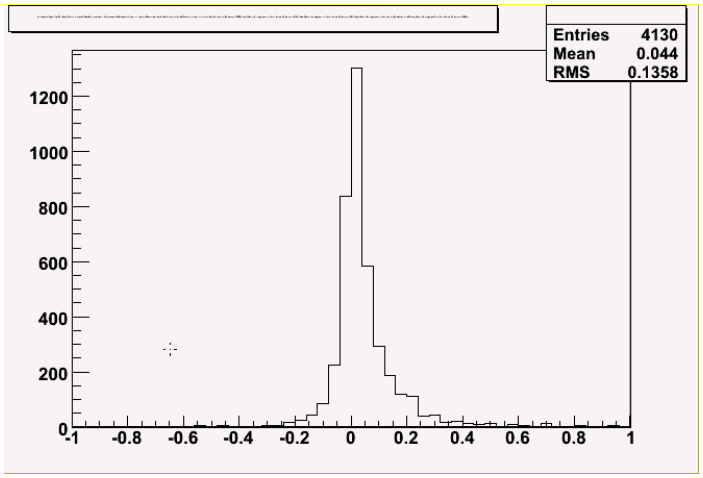
- 6)$k^{\pm}$ Pt>0.6Gev/c



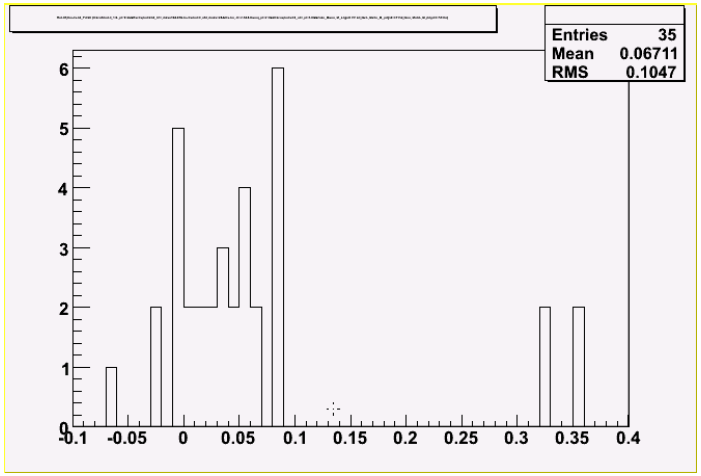
- Select condition:
- 1) two inverse charge dimuon,
- 2)single muon pt>2.5, Gev/c
- 3)Jpsi mass window(2Gev,4Gev)
- 4) Jpsi Pt >5.0Gev/c
- 5) kinematic constrained vertex fit
- 6)$k^{\pm}$ Pt>0.4Gev/c

- Gauss +exp fit was failed.
- Two Gauss fit succeed

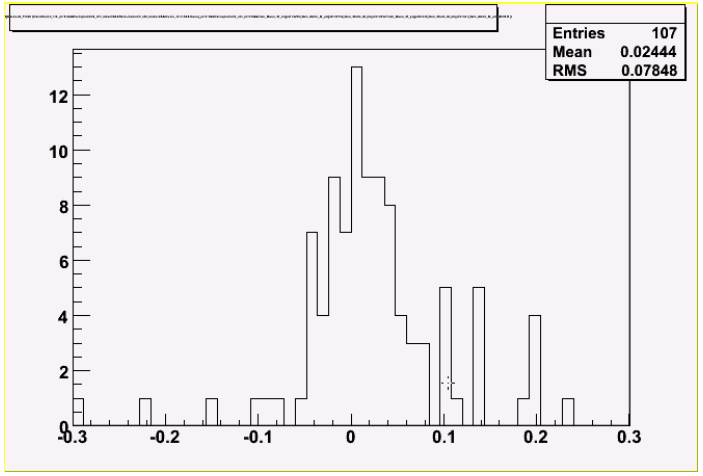
- 6)$k^{\pm}$ Pt>0.8Gev/c



- Not from B and c



- From B



- From C

- Select condition:
- 1) two inverse charge dimuon,
- 2)single muon pt>2.5, Gev/c
- 3)Jpsi mass window(2Gev,4Gev)
- 4) Jpsi Pt >5.0Gev/c
- 5) kinematic constrained vertex fit
- 6)$k^{\pm}$ Pt>0.4Gev/c

The number of events will sample

After select two inverse charge dimuon, single muon pt>2.5, dimuon mass window(2.95,3.25), and dimuon pt >5.0, and after vertex fit and k pt cut, we get the total efficiency of Reconstructed $B^{\pm}$.

$\varepsilon_{Total}=\varepsilon_{\mathbf{dimuon}} *\varepsilon_{\mathbf{charge\ select}} *\varepsilon_{singmupt} * \varepsilon_{Jpsimass} *\varepsilon_{Jpsipt} *\varepsilon_{kpt} *\varepsilon_{B+mass}$

K^+ Pt (Gev/c)	0.4	0.6	0.8	1.2	1.6	1.8	2.0
$\varepsilon_{TonBmw}\times10^{-6}$	25	15	9.76	4.61	2.2	1.6	1.1
$\varepsilon_{Total}\times10^{-6}$	21.76	8.7	3.22	0.63	0.17	0.09	0.05

- ε_{dimuon} select dimuon
- $\varepsilon_{charge\ select}$ select inverse charge dimuon
- $\varepsilon_{singmupt}$ single muon pt cut(>2.5Gev/c)
- $\varepsilon_{Jpsimass}$ Jpsi mass window constrain(2.95Gev,3.25Gev)
- ε_{Jpsipt} Jpsi Pt cut(>5.0Gev/c)
- ε_{kpt} $k^{\pm}$Pt cut
- ε_{B+mass} $B^{\pm}$ mass window constraint(4Gev,7Gev)
- ε_{TonBmw} The total efficiency except no $B^{\pm}$ mass window constraint

- The Integrated luminosity of the sampleInclusivePPmux is
- $10345428/(1.188458*10^{8})=0.087\ pb^{-1}$

- So we got in 10 pb^{-1} Integrated luminosity
- The B background events number should be :
- Pdl Events number $=N_{sample}* \varepsilon_{TonBmw} *10\ pb^{-1}/\ 0.087\ pb^{-1}$
- Invmass Events number $=N_{sample}* \varepsilon_{Total} *10\ pb^{-1}/\ 0.087\ pb^{-1}$

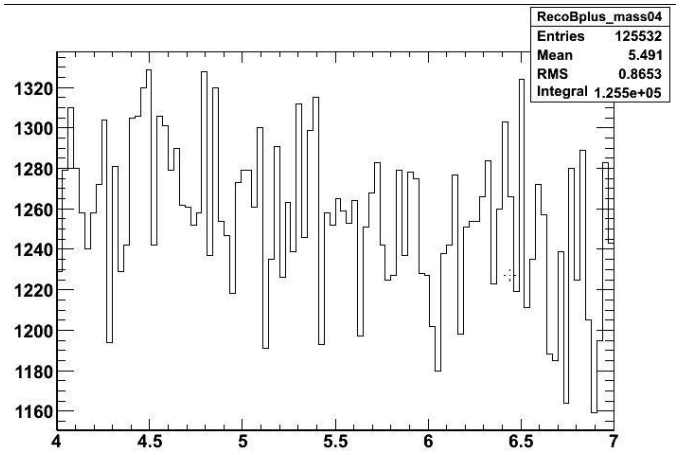
Pt	0.4	0.6	0.8	1.2	1.6	1.8	2.0
Pdl Events	114290	18060	11610	5282	2580	1935	1290
Invmass Events	125532	10475	3831	746	201	108	63

Didn't concern mass window of $B^{\pm}$

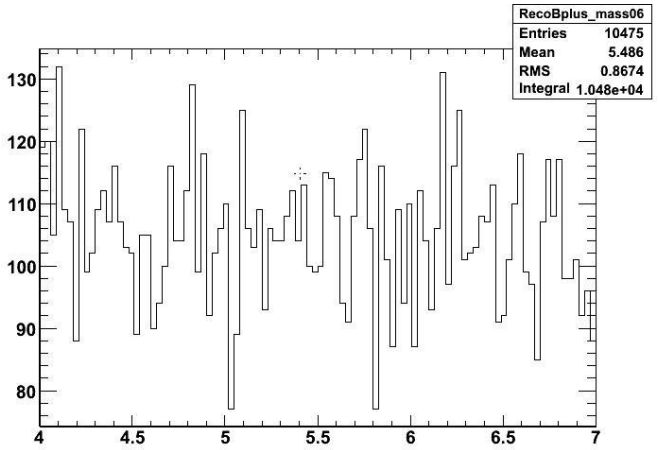
Concern mass window of $B^{\pm}(4,7)$

The sample result

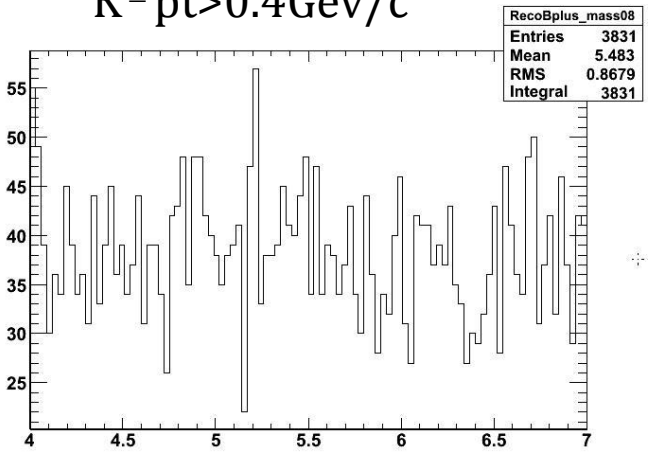
B^+ Invariant mass distribution



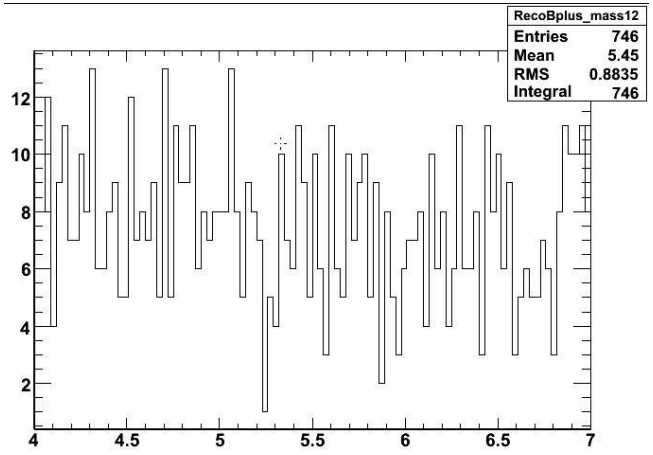
$K^{\pm}$ pt>0.4Gev/c



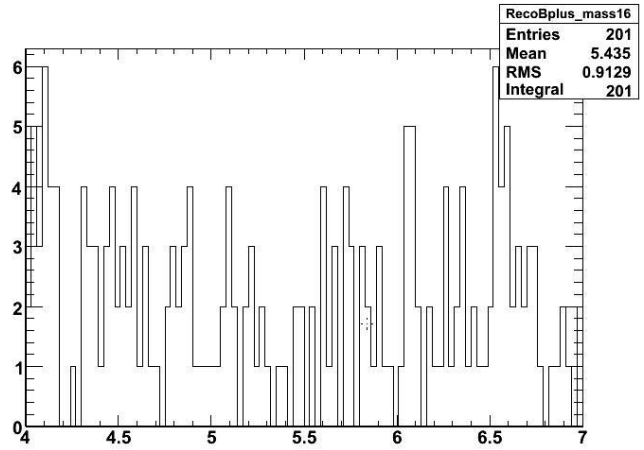
$K^{\pm}$ pt>0.6Gev/c



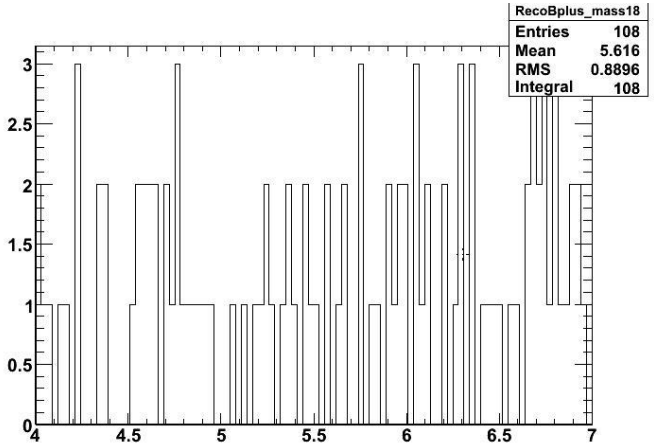
$K^{\pm}$ pt>0.8Gev/c



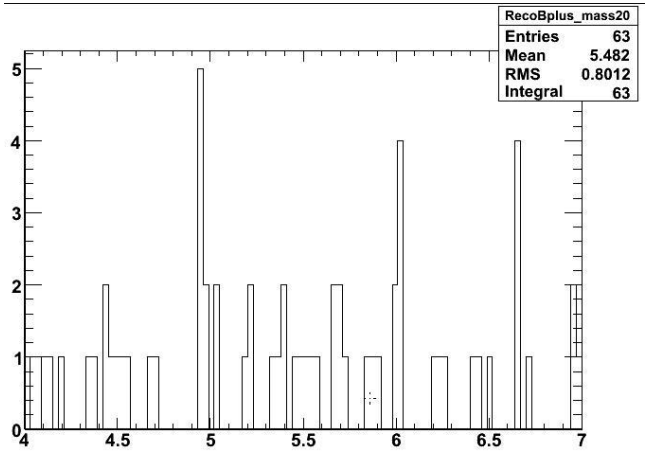
$K^{\pm}$ pt>1.2Gev/c



$K^{\pm}$ pt>1.6Gev/c

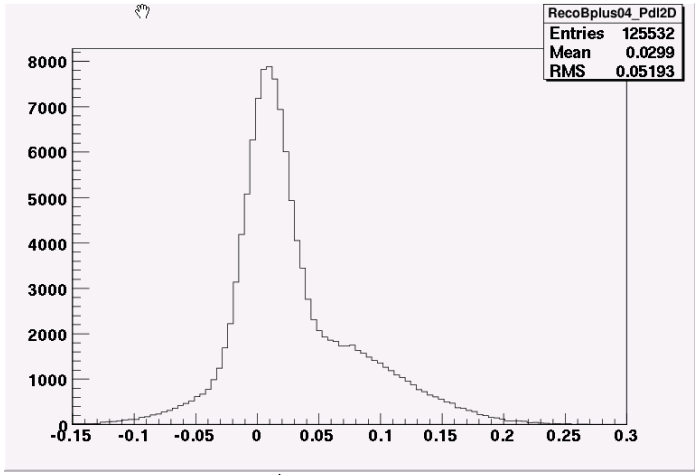


$K^{\pm}$ pt>1.8Gev/c

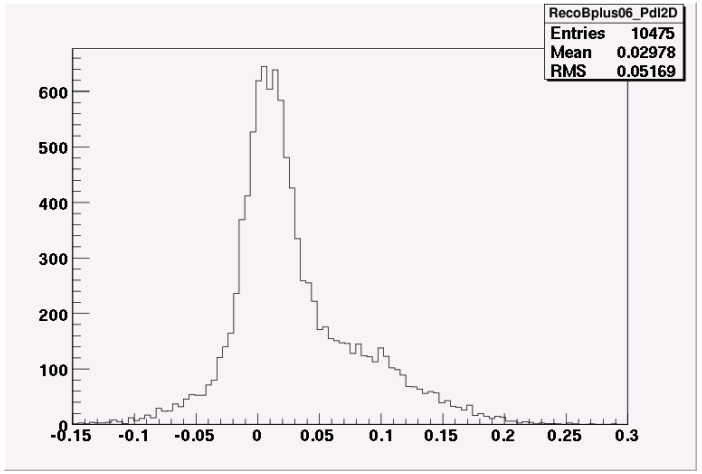


$K^{\pm}$ pt>2.0Gev/c

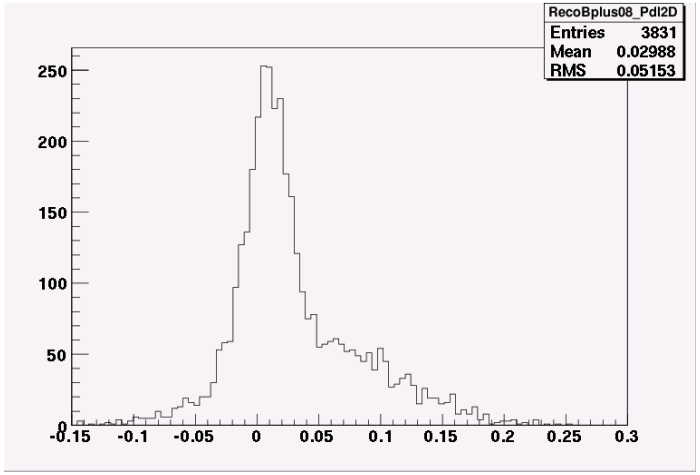
B^+ Proper decay length distribution



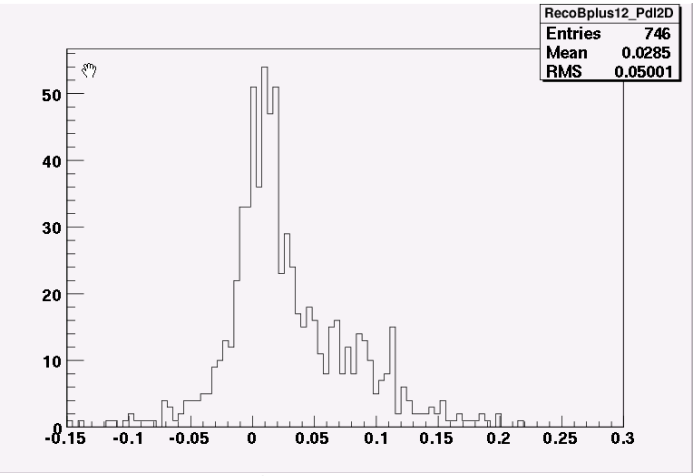
$K^\pm$ pt>0.4Gev/c



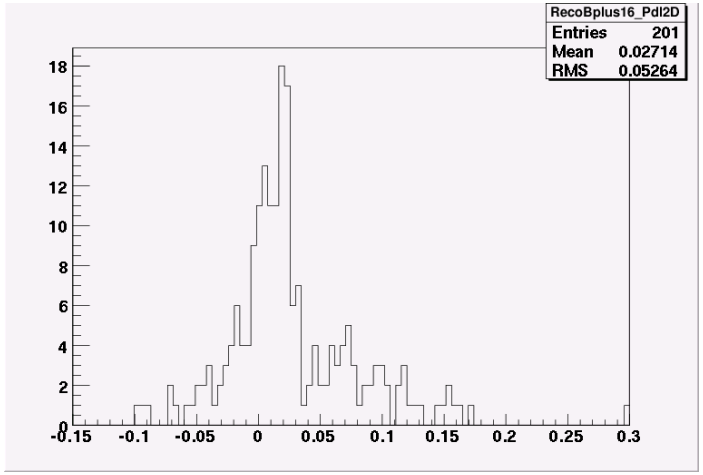
$K^\pm$ pt>0.6Gev/c



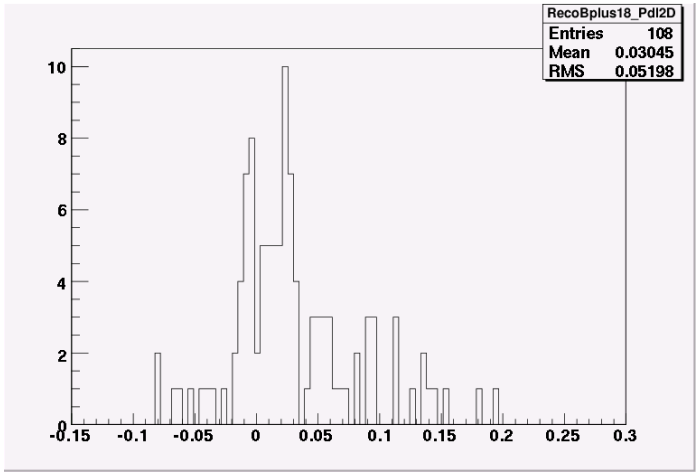
$K^\pm$ pt>0.8Gev/c



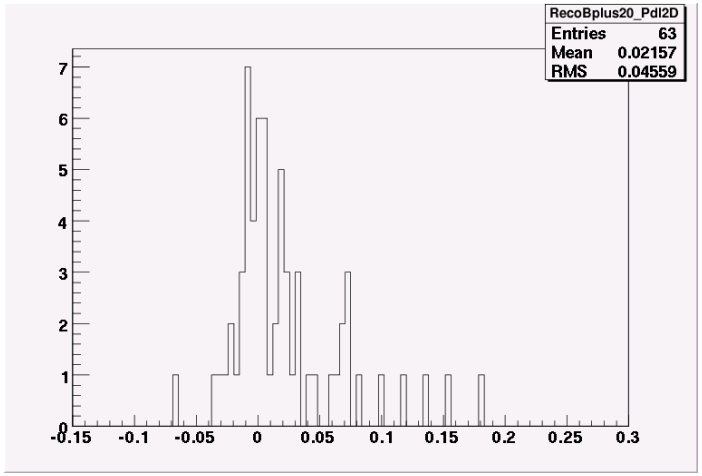
$K^\pm$ pt>1.2Gev/c



$K^{\pm}$ pt>1.6Gev/c



$K^{\pm}$ pt>1.8Gev/c



$K^{\pm}$ pt>2.0Gev/c

Thank you!