

Highlights from the 1st BELLE beam runs

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Beauty99 @ Bled, Slovenia

Outline

- **Run condition**
- **Quality check of classified events**
- **Analysis of hadronic events**
- **Summary**

KEKB/BELLE physics run

- May 1 BELLE roll in
- May 24 KEBB operation resumed
- June 1~2 1st run for 18.5 hours
1st collision events
- June 9~10 2nd run for 24 hours
"1000 hadronic events" run

Run Condition

1st run (June 1, 14:30 ~ June 2, 9:00)

- Best beam current: 28mA (LER) + 16mA (HER)
- 128 bunch collision
- $\langle L \rangle = 1.7 \times 10^{30} \text{ cm}^{-2} \text{ s}^{-1}$
- $\int L dt = 21.8 \text{ nb}^{-1}$
- Trigger rate: 30Hz, dead time ~0.5%

2nd run (June 9, 9:00 ~ June 10, 9:00)

- Best beam current: 44mA (LER) + 17mA (HER)
- 128 bunch collision
- $\langle L \rangle = 10.4 \times 10^{30} \text{ cm}^{-2} \text{ s}^{-1}$
- $\int L dt = 505.4 \text{ nb}^{-1}$
- Trigger rate: 60Hz, dead time ~1%

Run Statistics

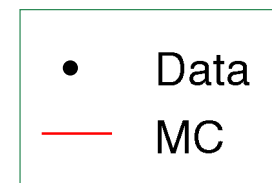
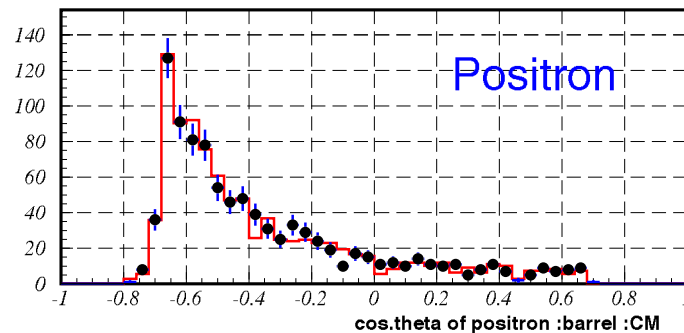
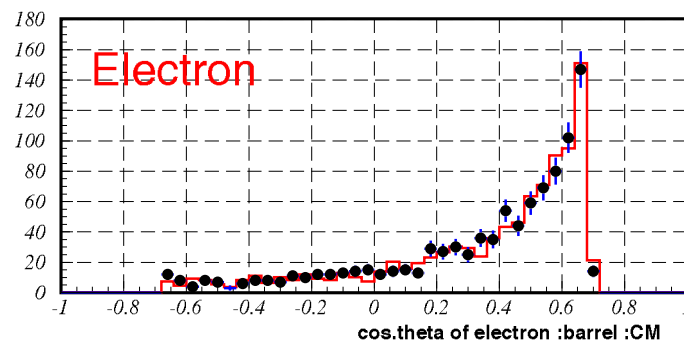
Run statistics			
	1st run	2nd run	Total
Barrel Bhabha	149	3457	3606
Hadronic Events	61	1269	1330
μ -pair events	11	234	245
γ -pair events	61	881	942
Integrated L (nb ⁻¹)	21.8	505.4	527.2

- **Note: Results shown here are preliminary.**
 - Numbers must be corrected by trigger and tracking efficiencies
 - Calibration for some sub-detectors are still in progress.

Review of beam data analysis

- **Detector performance (\Rightarrow talk by E.Prebys)**
- **Quality check of classified events.**
- **Analysis of hadronic events.**
 - Reconstruction performance (π^0 , K_s , K_L)
 - KID, EID, MUID
 - Event shape study
 - Observation of J/ψ events
- **Results shown below are preliminary.**
 - Calibration for sub-detectors are still in progress.
 - Tracking performance is not verified yet.
 - DST production is still repeated with updated constants.

Bhabha angular distribution (Barrel)



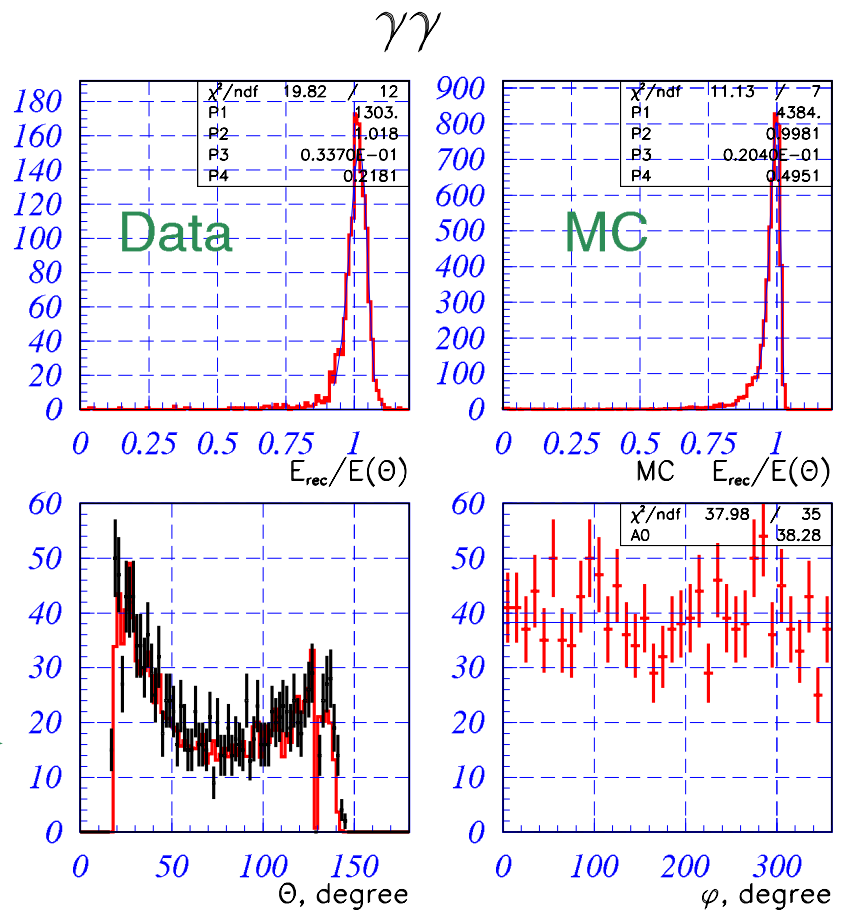
$\cos \theta$

- Histo's are normalized by number of "barrel bhabha" events.
- Luminosity is estimated based on this barrel Bhabha events presently.

Quality test of $\gamma\gamma$ events

$\frac{E(\text{measured})}{E(\text{calculated from } \theta)}$

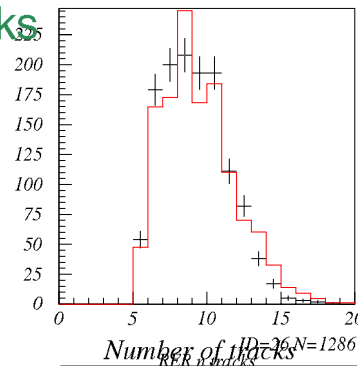
Angular distribution
compared to MC



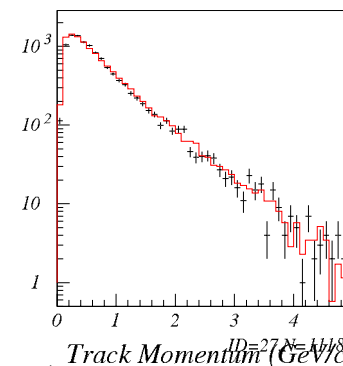
Quality test of hadronic events

- Distribution of various variables have been compared to MC
- Good agreement has been obtained.

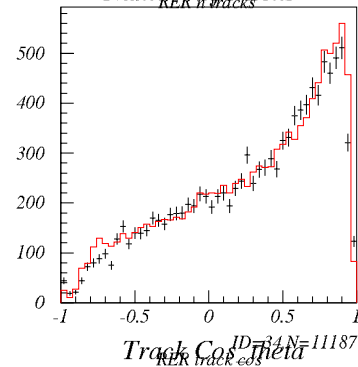
Number of tracks



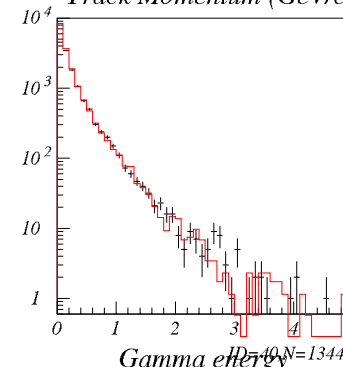
Track momentum



Track cos θ



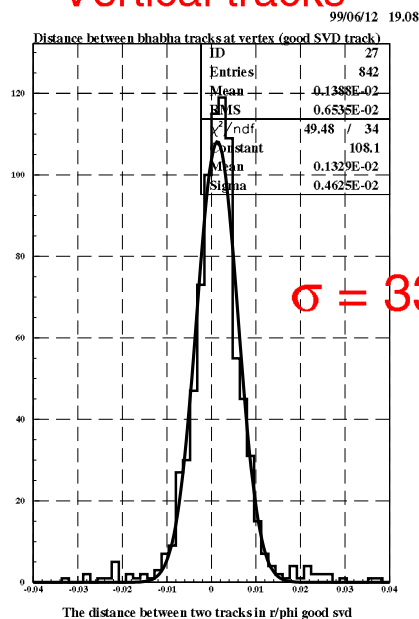
Gamma energy



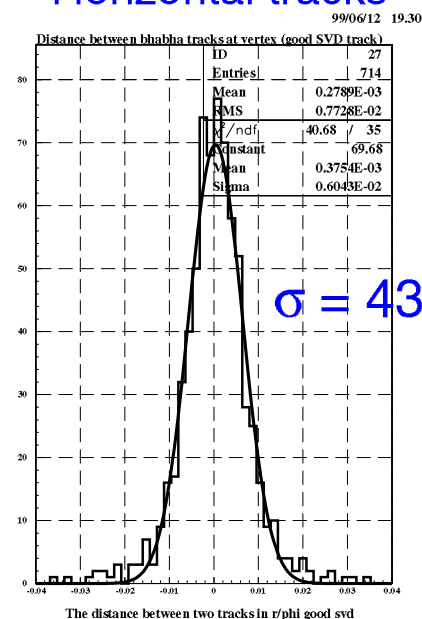
SVD: rphi vertex resolution

Closest approach (rphi) of two Bhabha tracks

Vertical tracks



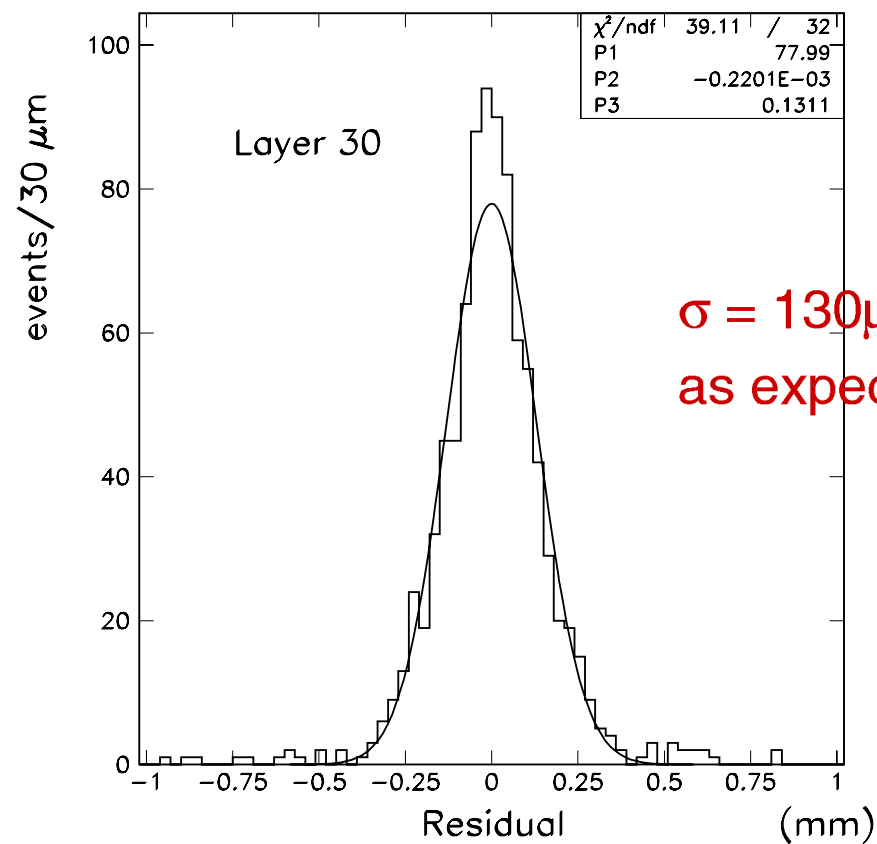
Horizontal tracks



SVD ladders in top-bottom are better alligned with cosmic rays than those in left-right.

CDC: tracking resolution

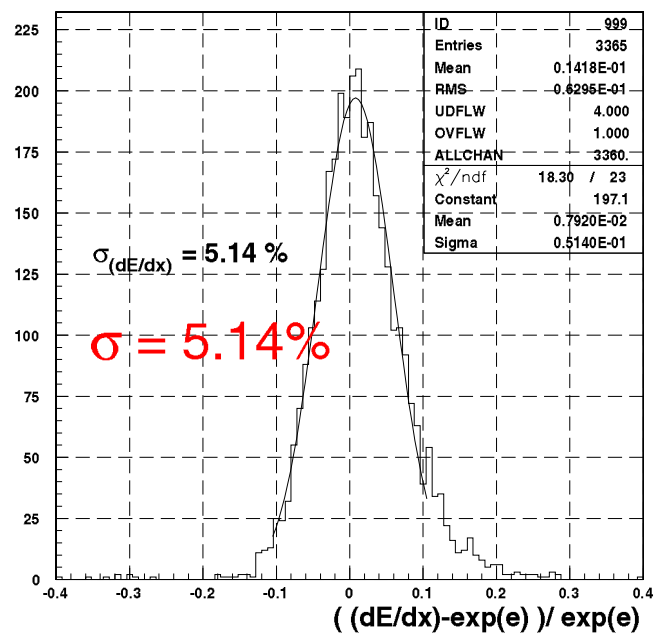
Residual distribution



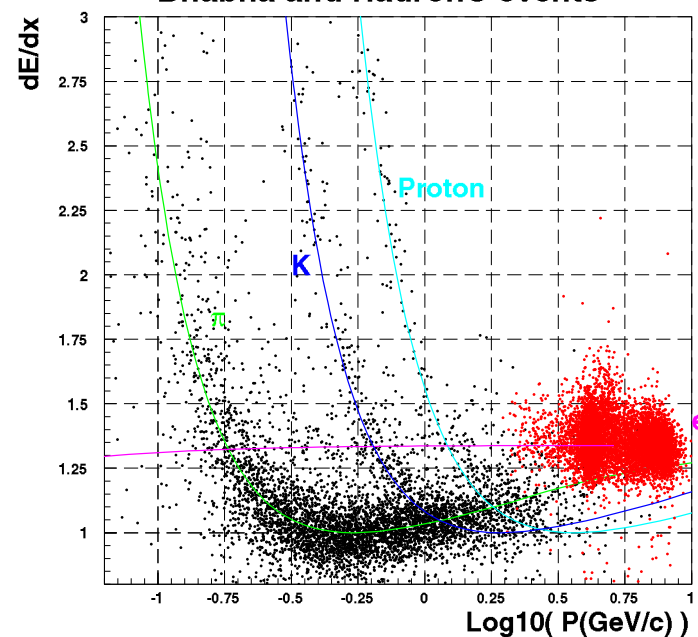
$\sigma = 130\mu\text{m}$
as expected from MC.

CDC: dEdx resolution

Bhabha events



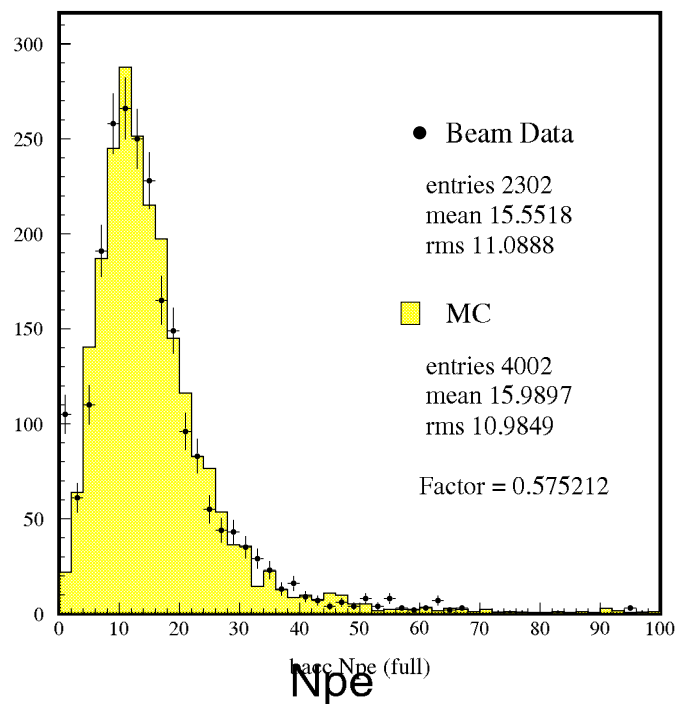
Bhabha and Hadronic events



ACC: pulse height spectrum

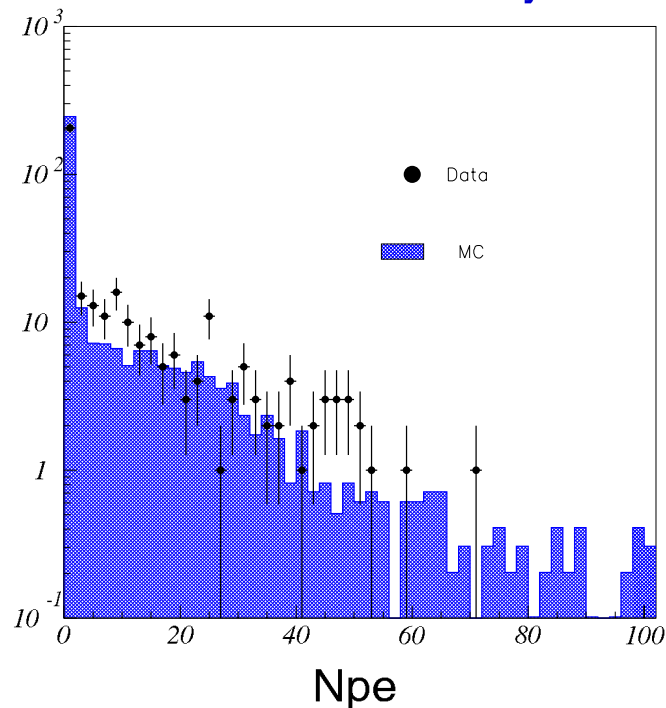
Bhabha events

99/06/10 11.37



Hadronic events

Proton track selected by TOF&dEdx



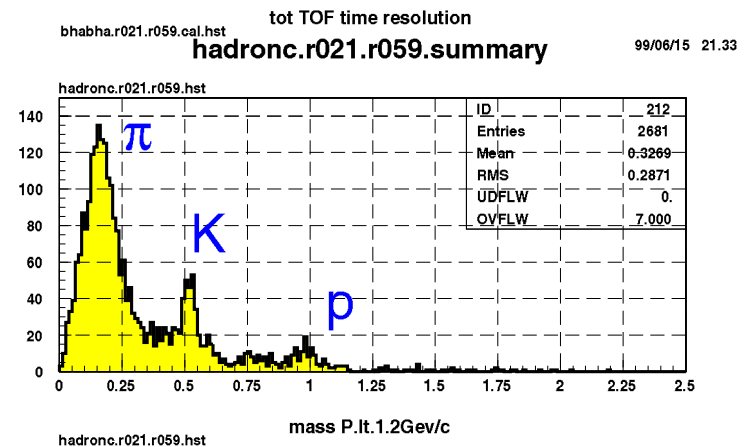
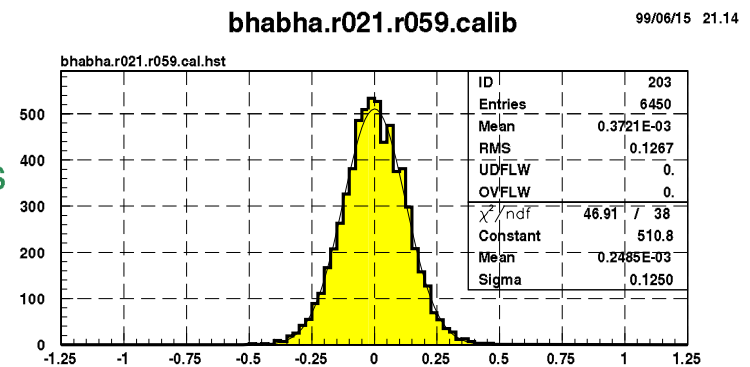
Response to light velocity and sub-threshold particles
are as expected from MC.

TOF: time-of-flight resolution

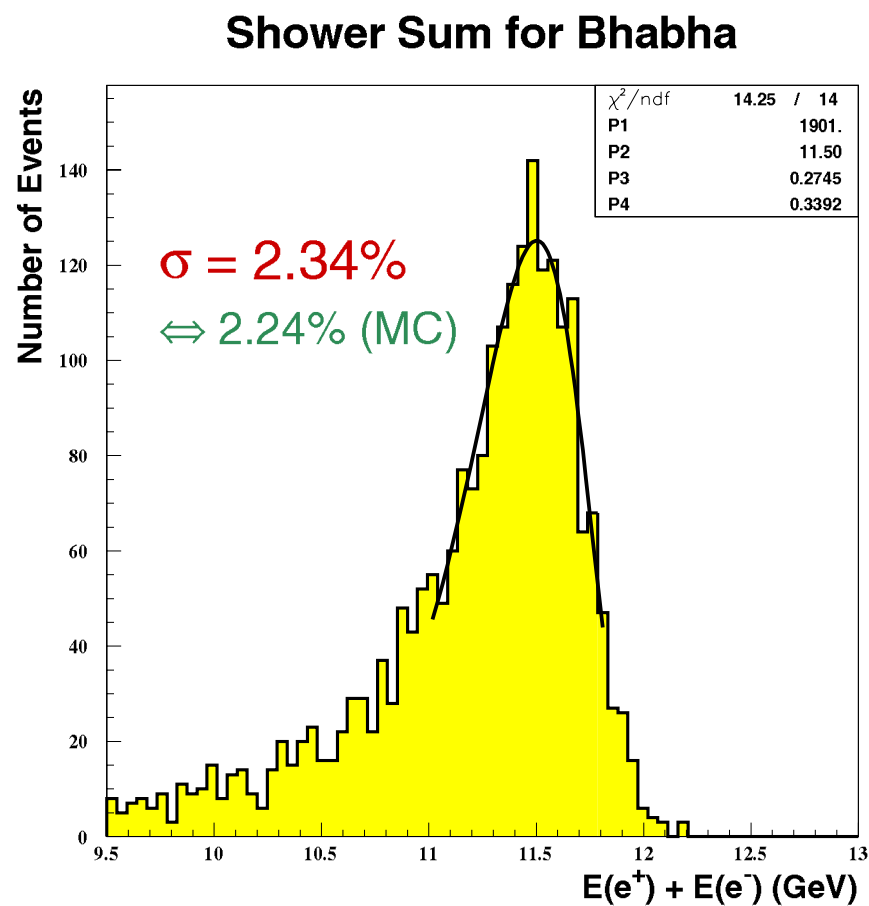
Time-of-flight resolution
measured with Bhabha tracks

$$\sigma = 125\text{ps}$$

Mass distribution of tracks
in hadronic events
($p < 1.2 \text{ GeV/c}$)



CsI: Bhabha energy sum



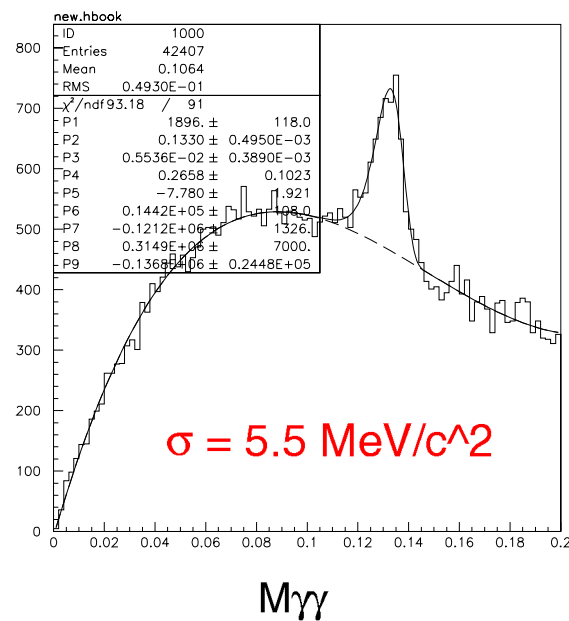
pi0 reconstruction

Two-gamma invariant mass distribution

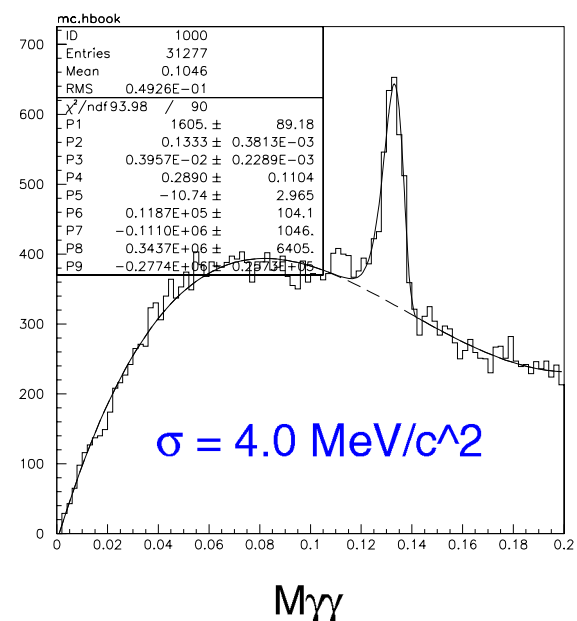
$E_\gamma > 20\text{MeV}$

All two-gamma combinations are plotted.

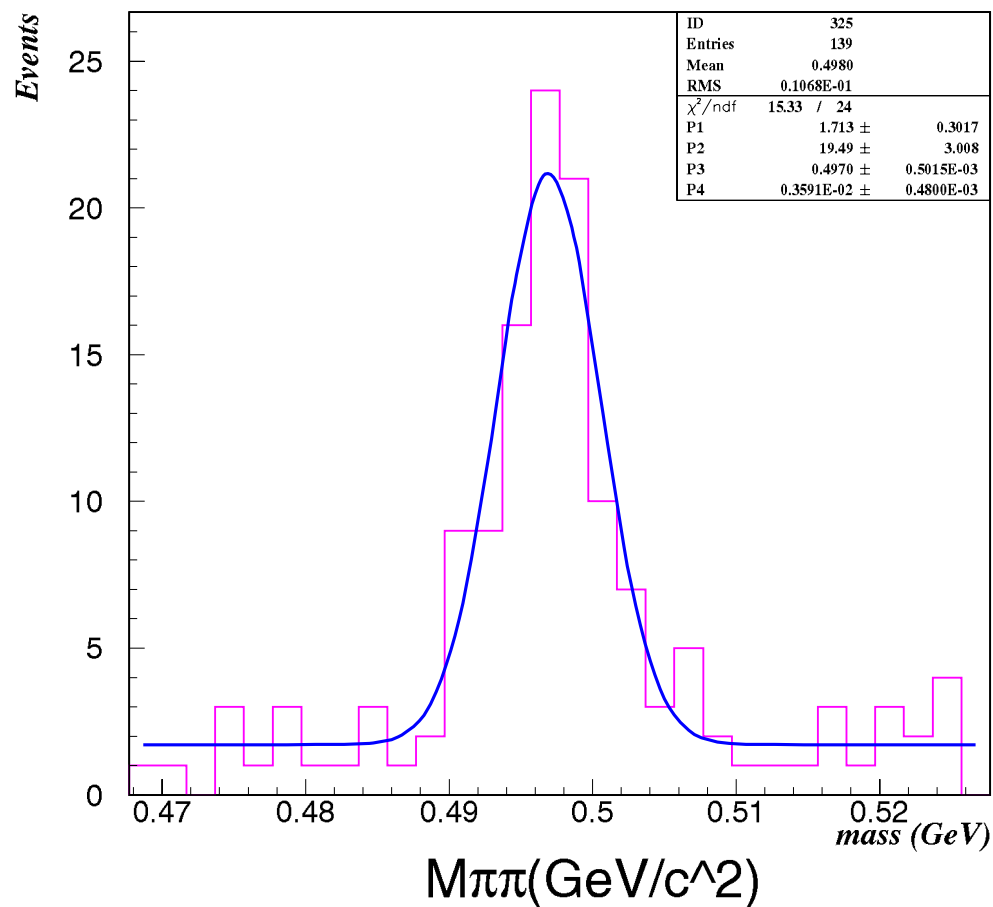
Data



Monte Carlo (continuum)



Ks reconstruction



Flight length: $> 1.0\text{cm}$
closest apl. of two tracks
in Z: $< 0.5\text{cm}$

$$\sigma = 3.6 \text{ MeV}$$

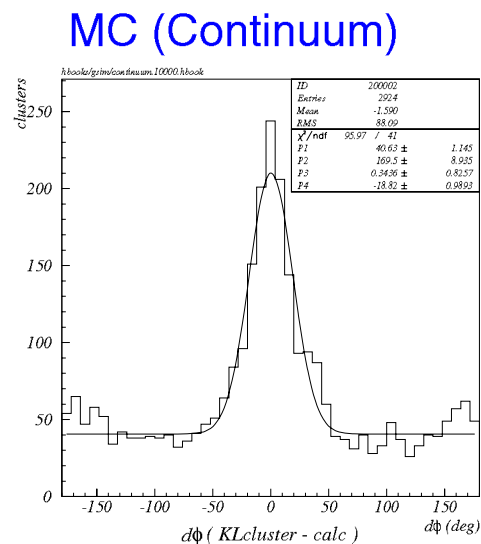
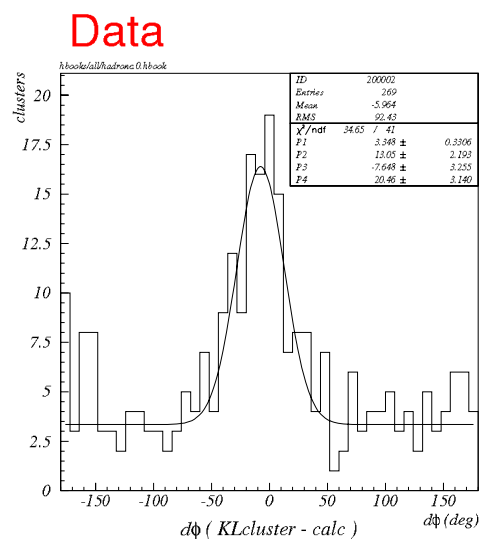
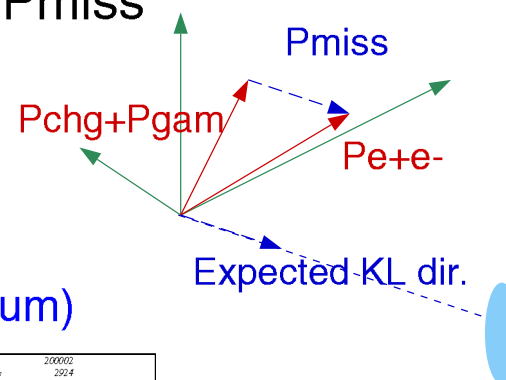
\Leftrightarrow MC prediction

3.0MeV (CDC only)

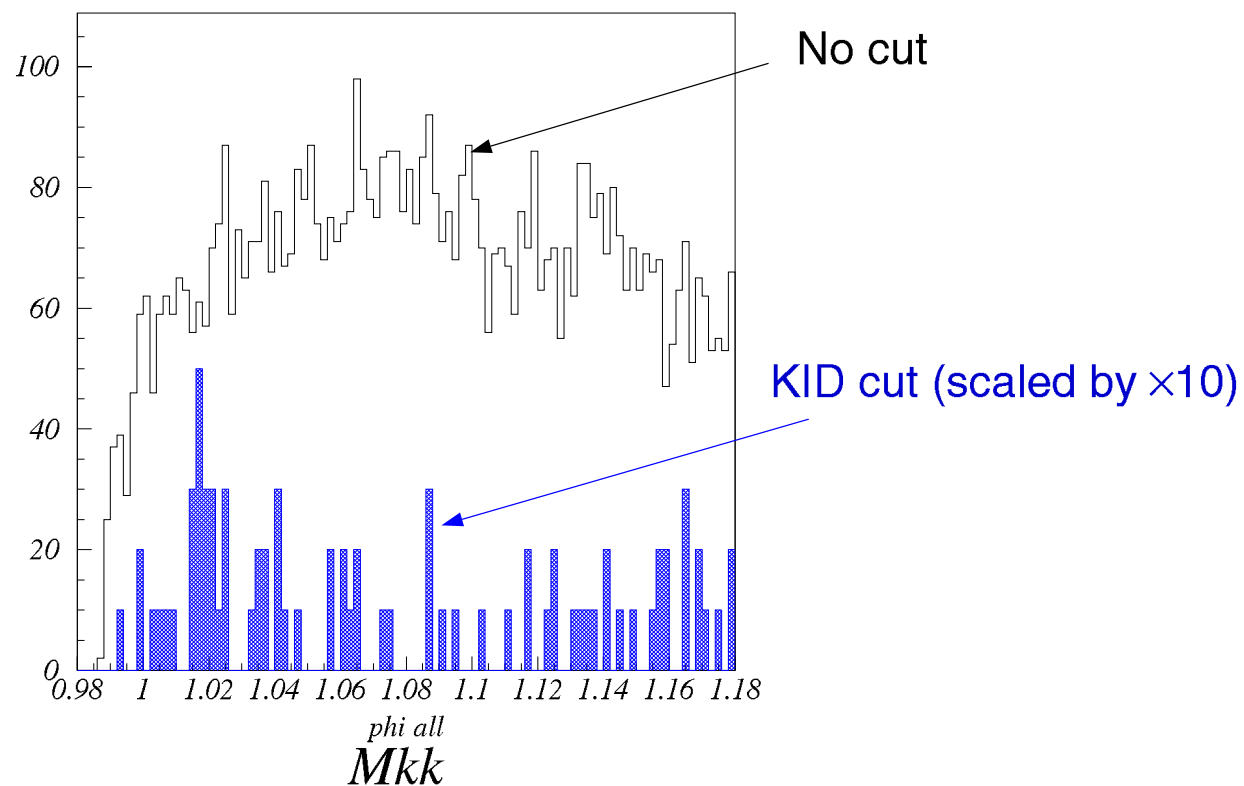
2.7MeV (CDC+SVD)

KL finding

KLM cluster dist. in the direction of Pmiss

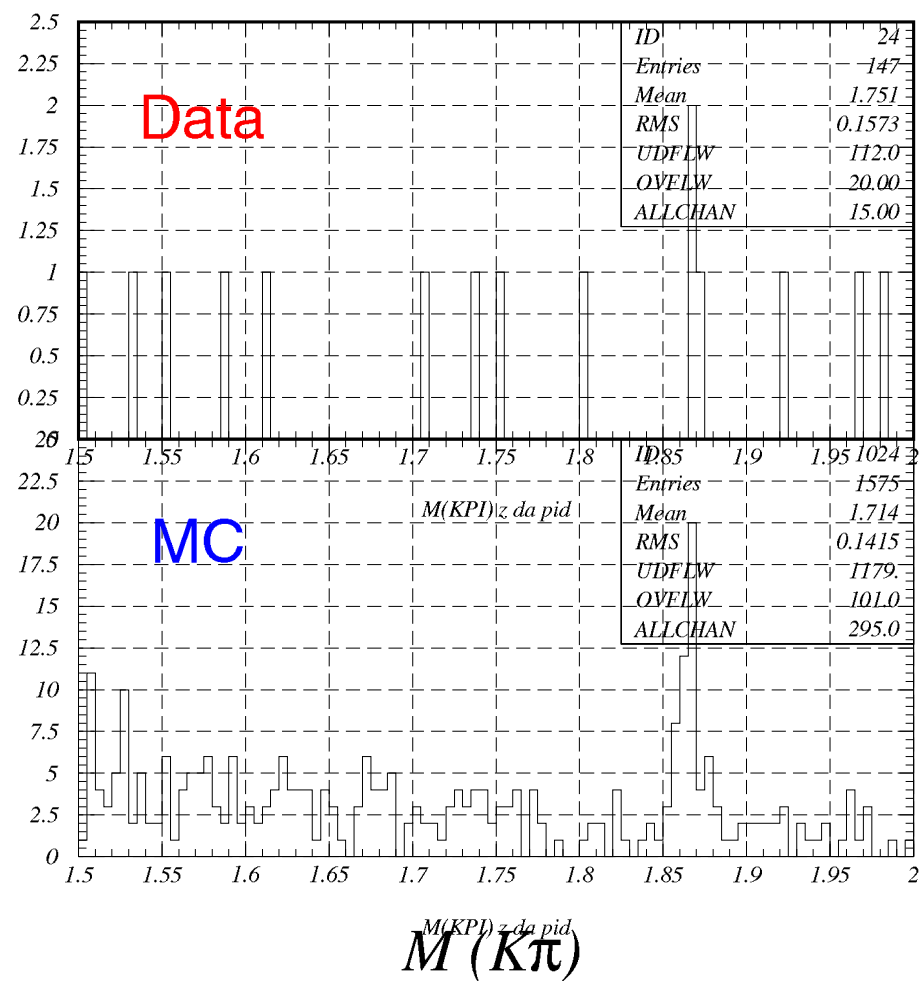


Kaon ID: $\phi \rightarrow K^+K^-$

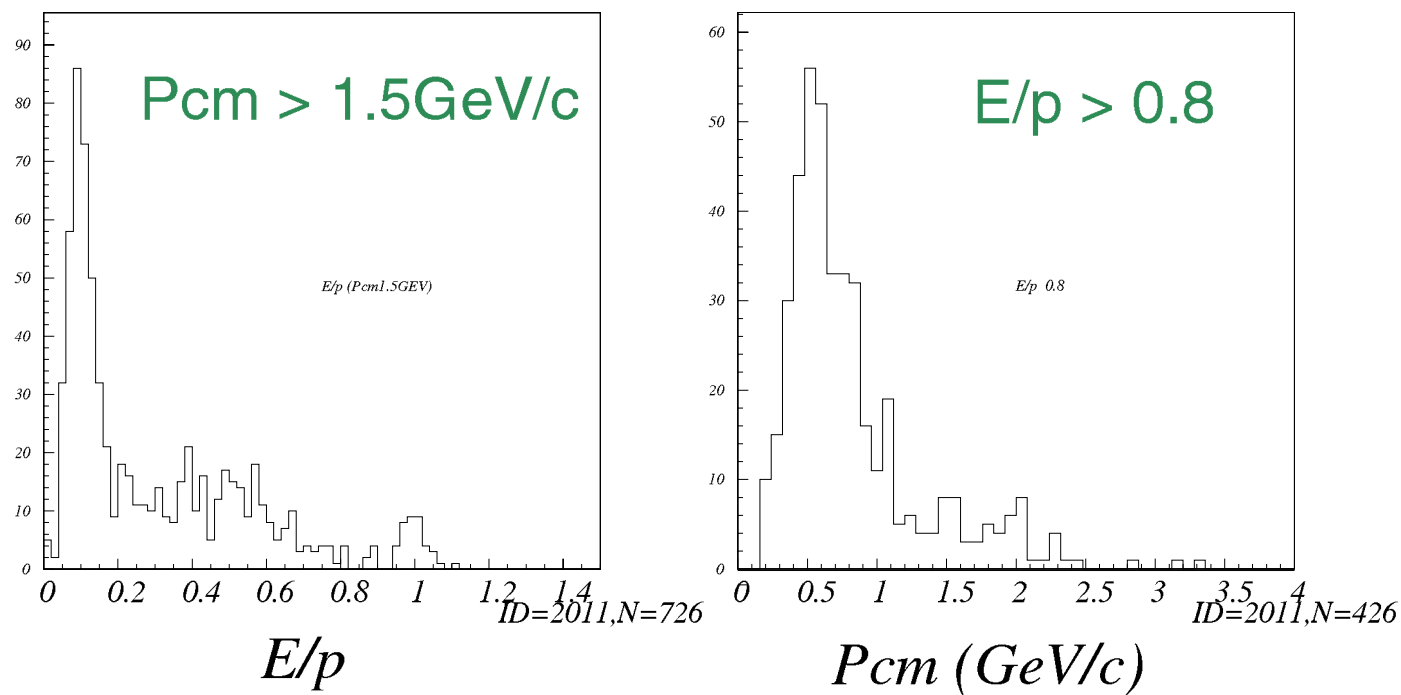


- Large suppression of background!

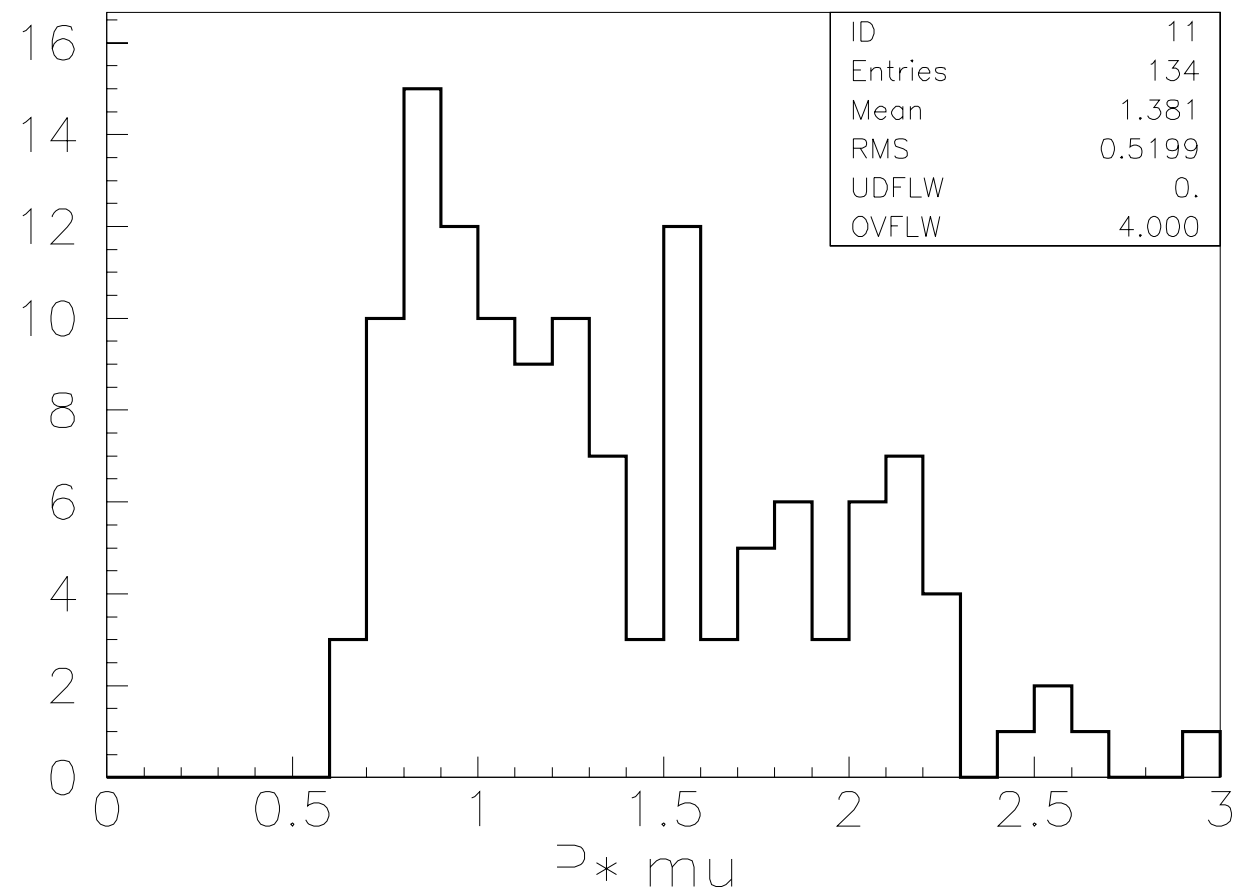
$D \rightarrow K\pi$



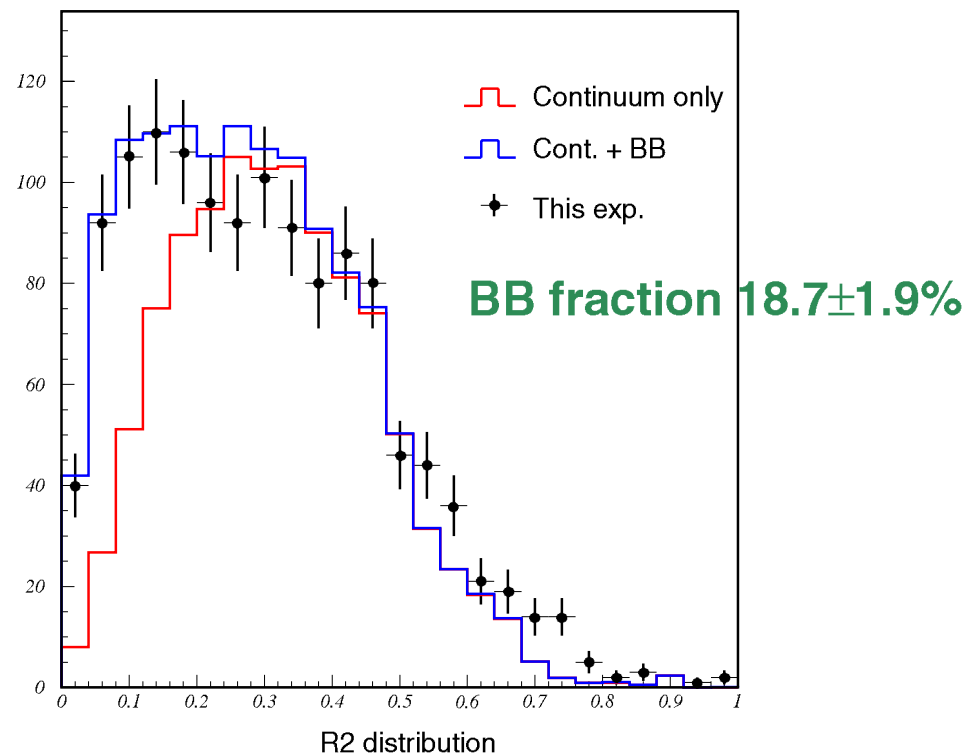
Eid in hadronic events



Muid in hadronic events



Shape of hadronic events



It is likely that...

We were on the shoulder of $\Upsilon(4S)$!!

J/ψ events

- **We have started to see B-Bbar events and have found two J/ψ production already !!**
- **J/ψ → e⁺e⁻**
- **J/ψ → μ⁺μ⁻**
 - This event is also a candidate of J/ψ KL
 - (⇒ talk by E.Prebys in the next session)
- **BELLE seems to be very lucky experiment !...**

Summary & Plan

- In June 1999, BELLE had physics runs in two periods.
- BELLE has acquired more than 1000 hadronic events.

BELLE experiment has started !

- All detectors worked well during the runs.
- The data have been analyzed.
 - The detector performance has been verified.
 - No major problem.
 - Many interesting results
 - We have started to see B-Bbar.

This is the great first step!

Plan

- **Beam will be back on June 28.**
- **Then we will try,**
 - Beam background study
 - Energy scan (5 points)
 - Continuous data acquisition by summer shutdown
- **By summer shutdown,**
 - Target $\langle L \rangle = 2\text{fb}^{-1}$
 - Possible extension of beam time: July 25 \Rightarrow Aug. 4
- **The real long run is anticipated from October.**

We'll enter into new era of B physics!