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碩士論文

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National Taiwan University

Master Thesis

在Belle作質子鑑別的研析

The Study of proton identification

At Belle

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中文摘要

我們使用Λ樣本，來研究Belle實驗室中系統有能力鑑別出來的質子百分比，和與此相關的系統誤差，在論文中使用的Λ樣本數量是由π粒子和p粒子重組並選取適合的質量範圍而來，我們比較在各種不同的質子動量下，取不同的粒子鑑別限制（PID）時，Data和MC之間Λ樣本降低的百分比有何不同，來自Ks和γ的背景已經使用一些動量限制來適當的排除，在這份論文中，我們使用實驗7到實驗49中的on-resonance數據來源，在此數據中所累積的粒子數目（luminosity）492fb^{-1}，研究結果顯示在Belle實驗中對於質子的鑑別是穩定的，其系統誤差大概在2%以內。

Study of the Proton Identification at Belle

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Abstract

Proton Identification

Inclusive Λ sample are used to determine the Proton Identification efficiency and related systematic uncertainty for the Belle experiment. The number of tagged Λ's can be estimated from the reconstructed mass spectrum of proton and π^- from Λ decays. We compare momentum-dependent efficiency between Data and MC with various proton identification criteria. Background events from K_S and γ's are rejected properly using kinematical information. In the study, we used on-resonance data from EXP7 to EXP49, corresponding to an integrated luminosity of 492 fb^{-1}. The results indicate that the performance of proton identification at Belle is quite stable and the associated systematic uncertainty is within 2%.

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Chapter 1

Particle physics

1.1 Standard model

Since 1897 J. J .Thomson discovered the electron, people know all matter in the world consists of fundamental particles. For explaining the interaction force in a nucleus, many people threw themselves into the study of fundamental particles. After decades' efforts, the Standard Model of particle physics, which consists of both quantum mechanics and special relativity, was formulated in the 1970's. Standard Model, aka SM, tells us all matter is made out of three kinds of elementary particles: 6 kinds of leptons, 6 quarks in different flavors, and 4 mediators to form 4 basic forces between particles.

Every lepton and quark is spin 1/2 particle and gets its own anti-particle, which has all the same properties expect for the opposite charge and flavor number. Leptons are classified according to their charge and fall naturally into 3 families (or generations). Quarks are similarly classified according to charge, but besides that, they get 6 flavors. Table. 1.1 shows the elementary particles. The anti-particles, or antimatter, are outnumbered by matter, and we will discuss this in *CP* violation section.

Table. 1.2 shows 4 mediators for interacted forces: photons (γ), which are exchanged between charged particles to create electromagnetic force; W and

Z, which are exchanged between particles to create the weak force; gluons (g), which are exchanged between colored particles to create the strong force; and gravitons, which are exchanged between particles to create the gravity. The discovery of graviton is still proceeding, so the SM is not complete yet.

quarks				Mass(speculative)		
Spin:1/2				Bare	Effective	
	Generation	Flavor	charge		In baryons	In mesons
	1	d	- 1/3	7.5	363	310
		u	2/3	4.2	363	310
	2	s	- 1/3	150	538	483
		c	2/3	100	1500	1500
	3	b	- 1/3	4200	4700	4700
		t	2/3	> 23000	> 23000	> 23000
leptons						
Spin:1/2						
	Generation	symbol	charge	mass	Lifetime	
	1	e	-1	0.511003	∞	
		ν_e	0	< 0.0000022	∞	
	2	μ	-1	105.659	2.197×10^{-6}	
		ν_μ	0	< 0.17	∞	
	3	τ	-1	1784	3.3×10^{-13}	
		ν_τ	0	< 15.5	∞	

Table 1.1: Properities of quarks and leptons, mass in MeV/c^2, charge in unit of proton charge, lifetime in second

Force	Mediator	Spin/Parity	Mass	Lifetime	Charge
strong	gluon	1^-	0	∞	0
electromagnetic	photon(γ)	1^-	0	∞	0
weak	$W^\pm$,Z^0	1^-,1^+	81800,92600	-	$\pm$1,0
gravity	graviton	2^+	-	-	-

Table 1.2: The properties of mediatons, mass in MeV/c^2, charge in unit of proton charge, lifetime in second

1.2 CKM matrix

Unlike the electric charge carries the electromagnetic force or the color particle carries the strong force, There is no such particular name to let people know which particle can produce the weak force [6]. So far we know all quarks and leptons participate in exchanging $W^{\pm}$ or Z^0 and create the weak force, e.g. β decay. The lepton weak vertices involve only the leptons of the same generation. Similar with the lepton weak vertices, the quark weak vertices are allowed to operate only within its' own generation. But unlike the lepton weak vertices, when weak force happens, the definition of quark generation is not the same as what we originally introduced in the previous section. Concerning with the weak force, there will be a little skewed of the generation of quarks. Instead of

$$\begin{pmatrix} u \\ d \end{pmatrix}, \begin{pmatrix} c \\ s \end{pmatrix}, \begin{pmatrix} t \\ b \end{pmatrix} \tag{1.1}$$

now the weak force couple quarks as

$$\begin{pmatrix} u \\ d' \end{pmatrix}, \begin{pmatrix} c \\ s' \end{pmatrix}, \begin{pmatrix} t \\ b' \end{pmatrix} \tag{1.2}$$

where the *d'*, *s'*, *b'*, are linear combinations in this formula:

$$\begin{pmatrix} d' \\ s' \\ b' \end{pmatrix} = \mathbf{V_{CKM}} \begin{pmatrix} d \\ s \\ b \end{pmatrix} \tag{1.3}$$

$$\mathbf{V_{CKM}} = \begin{pmatrix} V_{ud} & V_{us} & V_{ub} \\ V_{cd} & V_{cs} & V_{cb} \\ V_{td} & V_{ts} & V_{tb} \end{pmatrix} \tag{1.4}$$

The Cabibbo-Kobayashi-Maskawa(CKM) matrix, which was first introduced by N.Cabibbo, M.Kobayashi, and T.Maskawa in 1973, is a 3×3 matrix.

CKM matrix shows us how quarks change their flavors via weak force. It's a unitary matrix, in which each element is the coupling strength between quarks and W or Z bosons. Wolfenstein introduced us a way to substitute $\lambda \equiv \sin\theta_C$ into CKM matrix:

$$\mathbf{V_{CKM}} = \begin{pmatrix} 1-(\lambda^2/2) & \lambda & A\lambda(\rho - i\eta) \\ -\lambda & 1-\lambda^2/2 & A\lambda^2 \\ A\lambda^3(1-\rho-i\eta) & -A\lambda^2 & 1 \end{pmatrix} + O(\lambda^4) \qquad (1.5)$$

For CKM matrix is unitary, we can get:

$$\sum_i V_{ij}^* V_{ik} = \delta_{jk}$$

$$V_{ud}V_{ub}^* + V_{cd}V_{cb}^* + V_{td}V_{tb}^* = 0$$

Fig 1.1 [5] shows the geometric relationship between the elements in CKM matrix.

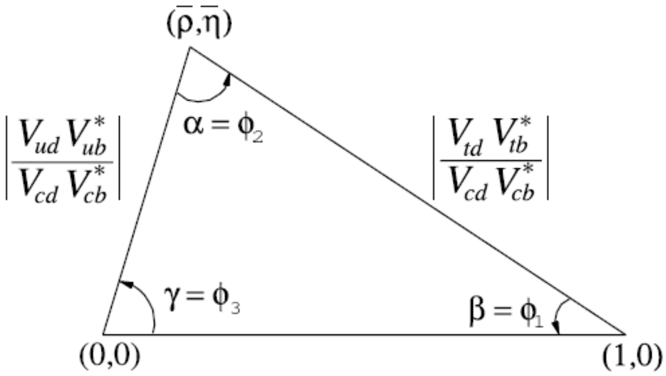


Figure 1.1: The unitary triangle

1.3 *CP* violation

When an operator H acts on a system and causes no change, we'll call it has H "symmetry". A parity operator (P) can turn a right hand system into an upside-down and backward left hand one. So far we know all neutrinos are left-handed particles, and all anti-neutrinos are right-handed particles.

For quarks we know they all have positive intrinsic parity, and anti-quarks have negative parity.

Charged conjugation (C), is an operator which can change the sign of charge. In other words, C can convert a particle into its anti-particle. CP operator is a combination of these two operators. For example, CP turns the left-handed anti-μ into a right-handed μ. Although we knew the weak interaction violates the C or P symmetry, but scientists still believe the CP symmetry until Christenson discovered the K_L decays into two π. Nowadays we know the electromagnetic and strong interactions remain invariant in CP conjugation, but there will be a slightly violation in some weak decays. We call this the CP violation. CP violation means the universe treats particles and anti-particle unequal and causes different life time of them. Perhaps it is a solution for us to explain why matter dominates the world and why anti-matter is almost gone?

1.4 B meson and Baryonic B decays

Mesons are particles with quark and anti-quark. B is a meson with one $\bar{b}$ anti-quark in it. The other quark in B is called spectator quark, which have much fewer mass than its companion. Since 1977 the new Υ resonance, $\Upsilon(4S)$, was discovered, scientists obtained plenty of $B\overline{B}$ pairs from it to do further study of CP violation. Measurement of spatial decay distances of B and $\overline{B}$ can tells us the time (lifetime) difference between them, and let us get more information of CP violation. Nowadays particle accelerator collides electron and positron to create $\Upsilon(4S)$ and obtain $B\overline{B}$ pairs ($e^+e^- \rightarrow \Upsilon(4S) \rightarrow B\overline{B}$).

$\Upsilon(4S)$ resonance is above the threshold of $B\overline{B}$ pair, in which we got B mesons with mass of 5.28 GeV/c^2. B meson decays are always described by the b quark decay, for example, $b \to c$ or $b \to s\gamma$.

$b \to c$ transitions or other charmless transitions are detected usually in B mesonic decays or B semi-leptonic decays. According to mesonic B decays scientists can determine CKM unitary triangles. In comparison with them, the baryonic B decays are not of so much interest by people. In 1987, there were only two B charmless baryonic decays $B^- \to p\overline{p}\pi^-$ and $\overline{B}^0 \to p\overline{p}\pi^+\pi^-$ were measured by Argus, but soon ruled out by CLEO, also nobody have ever seen two-body charmless baryonic B decays, which are important for understanding the CP violation more. All experimental and theoretical activities of charmless baryonic B decays faded away after 1992, until 2001 W.-S Hou and A. Soni present a explanation of why we can't detect them. In 2002, the first charmless three-body baryonic B decay $B^+ \to p\overline{p}K^+$ was detected and confirmed the conjecture. Up to now many other three-body charmless baryonic B decays are observed and there is still lots of unknown to discover.

Chapter 2

KEK B-Factory

2.1 KEK accelerator

The Belle Collaboration is an international collaboration with more than 400 physicists and engineers. Since 1999 the KEK B-Factory, aka KEKB, the energy-asymmetry collider in Tsukuba has been colliding 8 GeV electron and 3.5 GeV positron and creating $\Upsilon(4S)$ to decay into $B\overline{B}$ pairs until today. The goal of accelerator's design is getting the luminosity at the order of $10^{34}cm^{-2}s^{-1}$. This kind of order can give us about 0.8 million $B\overline{B}$ pairs a day. But after some improvements, KEK can achieve the luminosity of $1.5 \times 10^{34}cm^{-2}s^{-1}$ and produce about 1 million $B\overline{B}$ pairs a day.

Fig. 2.1 show a schematic plot of how the electron and positron collide. It a 3-km-long storage ring synchrotron using magnet to bend beam and making them only cross at the interaction point (IP) in the Tsukuba experiment hall. There is an cross angle of ± 11 millirads between electron and positron for getting higher luminosity. Low-energy beam line is aligned with the z axis because the bending effect of low-energy particle is larger than high-energy particle. You can get more detail in the homepage of Belle [7] and KEK [8].

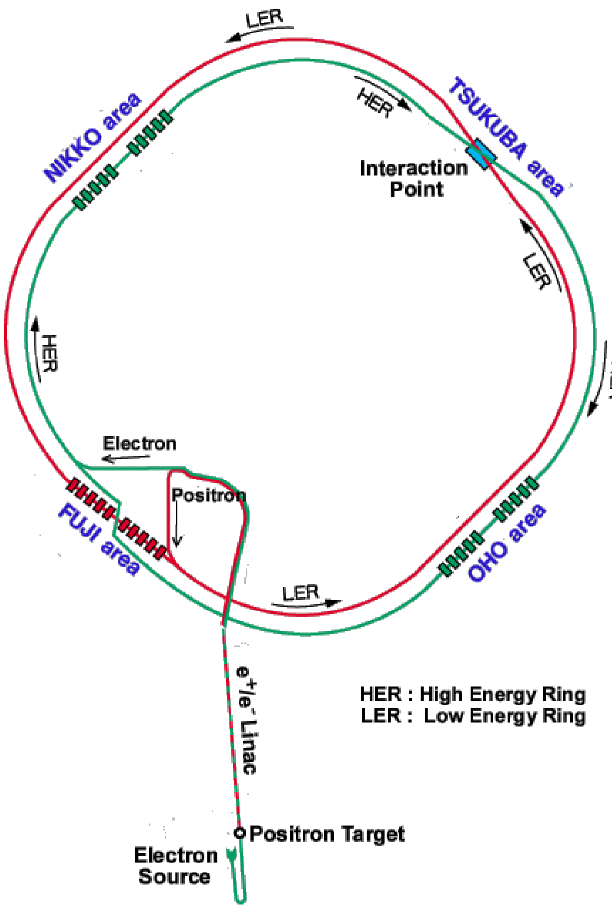


Figure 2.1: The schrmatic plot of KEKB synchrotron

2.2 Belle Detector

The Belle detector is a large particle detector constructed around a 1.5 T superconductor solenoid and iron structure surrounding the KEKB beams at the Tsukuba interaction region. It consists of several sub-detectors, which are in charge of different tasks. From the inner part to the outer part, we will introduce these sub-detector one by one. B meson vertices are measured by a silicon vertex detector (SVD) situated just outside of a cylindrical beryllium beam pipe. A 50-layer central drift chamber (CDC) provides the tracking of charged particles. Outside the CDC, aerogel Cherenkov counters (ACC) and the time-of-flight (TOF) are equipped radially. Electromagnetic showers are detected by electromagnetic calorimeter (ECL), which is an array of CsI(Tl) crystals. K_L and Muon detection system (KLM) in the iron return yoke takes the responsibility for detecting μ and K_L particles. As for the small angle forward and backward particles, we arrange the extreme forward calorimeter (EFC) to catch them. Table. 2.1 is the performance parameters expected for all the Belle sub-detectors. Fig. 2.2 and Fig 2.3 show the structure of the Belle detector in 3-D and in side view. You can get more detail in the Belle detector introduction web. [9]

Detector	Type	Configuration	Readout	Performance
Beam pipe	Beryllium double wall	Cylindrical r =20 mm $0.5/2.5/0.5(mm) = Be/He/Be$		He gas cooled
EFC	BGO	Photodiode readout segmentation 32 in ϕ; 5 in θ	160×2	RMS energy resolution 7.3 % at 8 GeV 5.8% at 3.5 GeV
SVD	Double-sided Si strip	Chip size: $57.5 \times 33.5mm^2$ Strip pitch: 25 (p)/50 (n) micro m 3 layers: 8/10/14 ladders	ϕ:40.96k z:40:96k	80 μm
CDC	Small cell drift chamber	Anode: 50 layers Cathode: 3 layers $r = 8.3 - 86.3cm$ $-77 \leq z \leq 160cm$	A:8.4k C:1.8k	$\sigma_{r\phi} = 130\mu m$ $\sigma_z = 200 - 1400\mu m$ $\sigma_{P_t}/P_t = 0.3\%\sqrt{p_t^2+1}$ $\delta_{dE/dx} = 6\%$
ACC	Silica aerogel	960 barrel/228 end-cap FM-PMTreadout		$N_{pe} > 6$ K/pi separation:$1.2 < p < 3.5$ GeV/c
TOF TSC	Scintillator	128 phi segmentation r=120 cm,3-m long 64 ϕ segmentation	128×2 64	=100 ps K/p separation ; up to 1:2 GeV/C
ECL	CsI (towered structure)	Barrel:$r = 125 - 62cm$ End-cap:z=-102cm and +196cm	6624 1152(F) 960 (B)	$\sigma_E/E = 1.3\%/\sqrt{E}$ $\sigma_{pos} = 0.5cm/\sqrt{E}$ (E in GeV)
KLM	Resistive plate counters	14 layers (5cm Fe and 4cm gap) 2 RPCs in each gap	$\vartheta : 16k$ $\phi : 16k$	dphi= dsida=30 mr for K_L 1% hadron fake
Magnet	Supercon.	Inner radius=170cm		B=1.5 T

Table 2.1: Performance parameters expected (or achieved) for the Belle detector

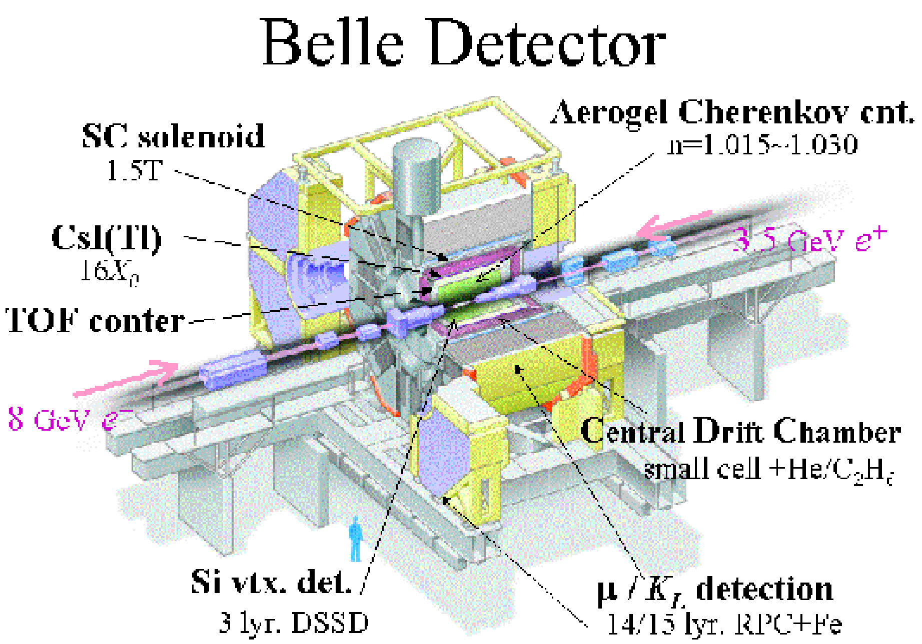


Figure 2.2: The schrmatic plot of KEKB synchrotron

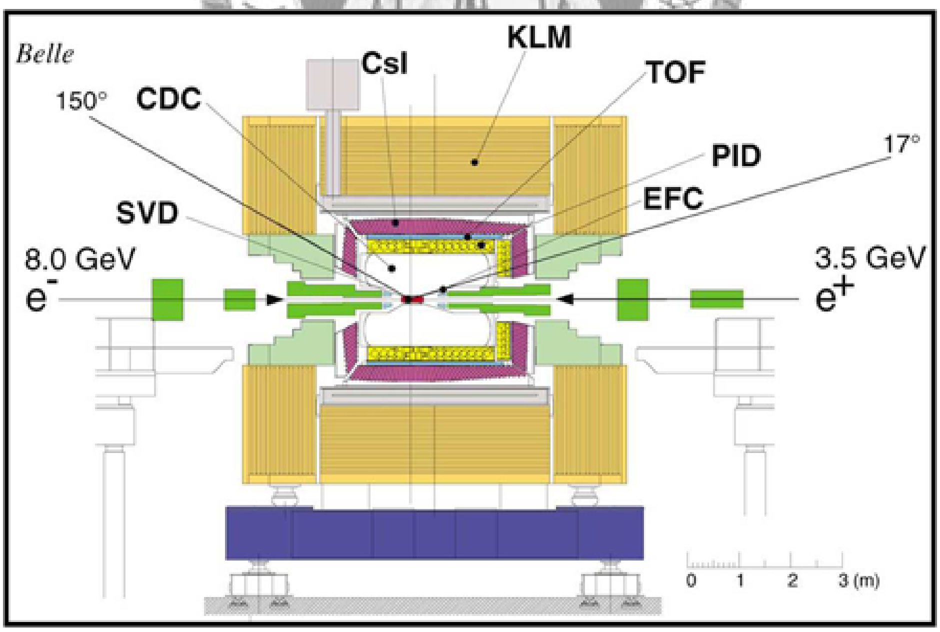


Figure 2.3: The schrmatic plot of KEKB synchrotron

2.2.1 Beam Pipe

Beam pipe is the place where beams collide and create plenty of particles of high luminosity. For getting a precise measurement of decay vertices, we should make beam pipe thin to let the vertex detector close to IP point. The central part of beam pipe is a double-wall beryllium cylinder with an inner diameter 40 mm and a 2mm gap between inner and outer walls. There is Helium gas filled in the gap for cooling the beam-induced heating at level as high as a few hundred watts. The 0.5mm-thickness inner wall supports the machine vacuum. There is a 20mm-thickness goal sheet attached outside the outer wall to reduce the low-energy X-ray background. Fig 2.4 shows the cross-section of the beam pipe in the IP point. Moreover, there are some masks in the outer part to shielding particle background from the direct hitting by the beams with the beam pipe. You can get the structure of those masks in Fig 2.5.

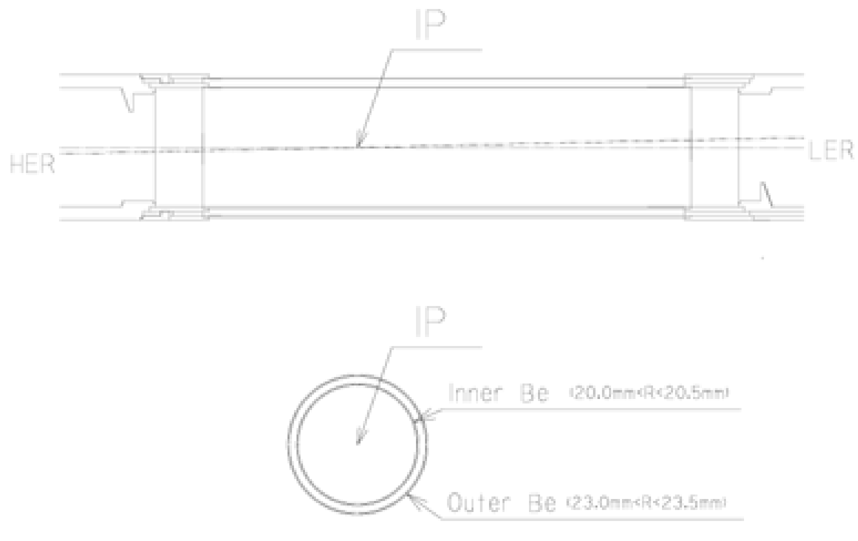


Figure 2.4: The cross-section of the beryllium beam pipe at the IP

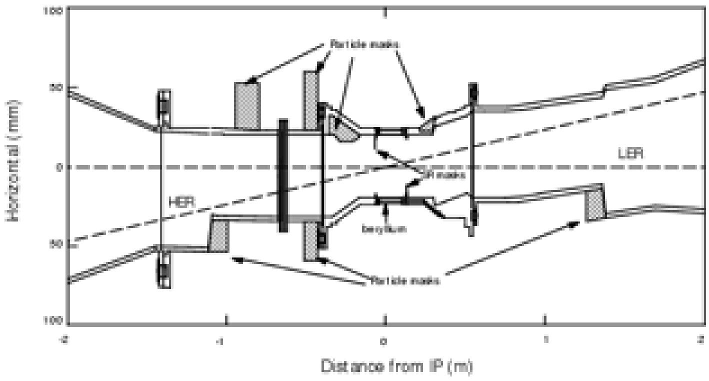


Figure 2.5: The arrangement of the beam pipe and horizontal masks

2.2.2 Silicon Vertex Detector (SVD)

SVD sub-detector uses Double-sided Silicon Strip Detectors (DSSD) with a Double-Metal-Layer (DML) readout structure as the detector's element. There are 32 ladders which contains a few DSSDs in each one of them. The KEK engineers have ever improved the SVD in 2003 and used 2 types of DSSDs in different layers. Old version SVD1 contains 3 layers of DSSDs and covers 86% of full solid angle ($23° < \theta < 139°$), but the new version SVD2 contains 4 layers of DSSDs and the angular range $17° < \theta < 150°$ with better efficiency. For precise measurement of proper-time-difference distribution of B Meson, we require the SVD gets position resolution of $100\mu m$. SVD strip will get high yields and good S/N ratio, than match the tracks detected by CDC. A matching track is defined as a CDC track can be matched with at least 2 SVD hits. SVD is equipped close to the IP point, which means SVD gets more radiation. But tracks-matching efficiency is also better than 98.7% after one year operation. Fig. 2.6 shows the configuration of SVD.

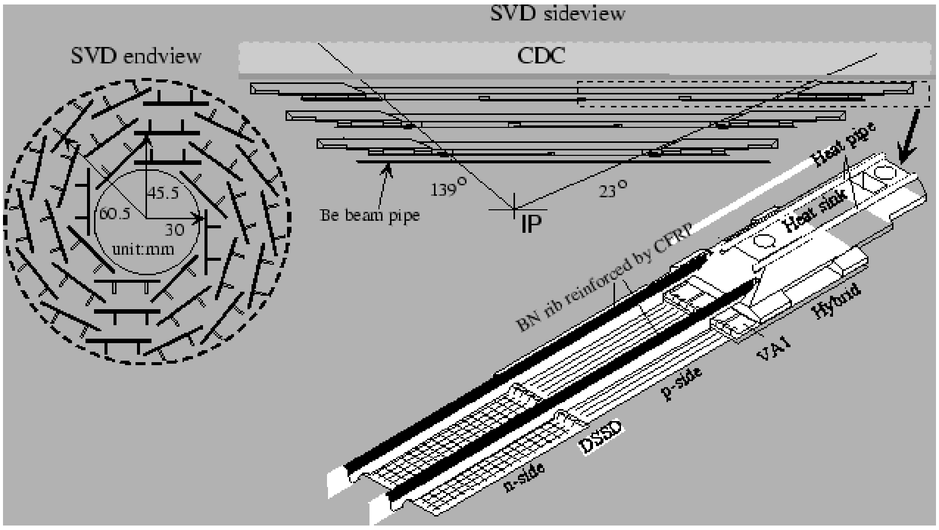
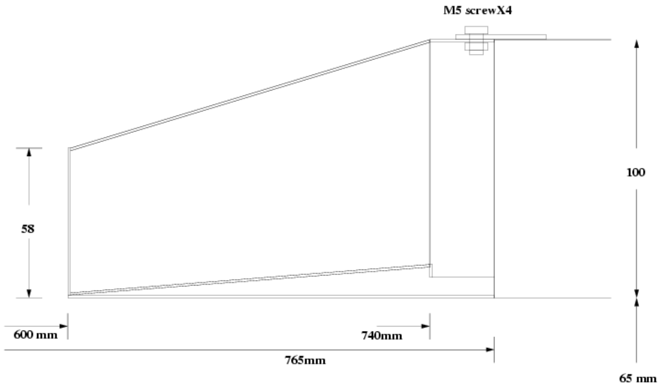


Figure 2.6: The configuration of SVD



EFC Forward Side-View

Figure 2.7: The side view of forward EFC

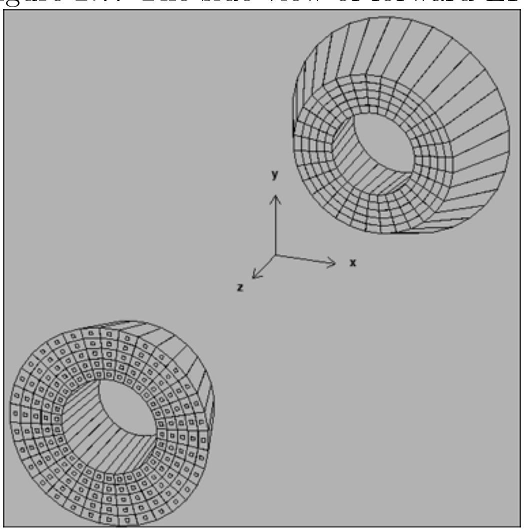


Figure 2.8: The 3-D view of the forward and backward EFC detector

2.2.3 Extreme Forward Calorimeter (EFC)

EFC sub-detector mainly detects electromagnetic showers of photon and electron in the small polar-angle region. It can detect the beam, monitor the luminosity, and tag for 2-photon physics and tag for B decays. The covering range of EFC is forward $6.4° < \theta < 11.5°$, and backward $163.3° < \theta < 171.2°$. The measurement of EFC is important for $B \rightarrow \tau\nu$ or 2-photon physics. For the highly exposure of radiation, we use the Bismuch Germanate crystal calorimeter (BGO,$Bi_4Ge_3O_{12}$) to construct EFC. BGO crystals are shaped in trapezoid , and arranged 32 ones in ϕ direction, 5 in θ direction. They construct the cone-like EFC which is show in Fig. 2.7 and Fig. 2.8.

2.2.4 Central Drift Chamber (CDC)

CDC sub-detector can reconstruct charged particles, for that reason it can provide us two primary measurements: The transverse momentum Pt from the curvatures, and the dE/dx distribution for particle identification. Fig 2.9 shows the overview of CDC structure. The inner radius is 103.5mm and the outer radius is 874mm. The CDC chamber contains 52 cylindrical layers organized in 13 super-layers. Each super-layer contains either stereo or axial layer. Those layers are placed in a way to let the whole CDC contains 8400 drift cells which are nearly square. Fig. 2.10 shows the cell structure and how they distribute in the cathode sector. In the chamber we fill the low-Z gas, which is 50% helium-50% ethane here, to reduce the Coulomb scattering.

We require CDC to have spatial resolution range from $120 - 150\mu m$, and the momentum resolution better $\sigma_{Pt}/Pt \cong 0.5\% \cdot \sqrt{1 + Pt^2}$ for all charged particle with $Pt \geq 100MeV/C$ in the polar-angle region $17° \leq \theta \leq 150°$. The de/dx measurement result of CDC is shown in Fig **??** and provides a tool for $K - \pi$ separation in the momentum range below 0.5 GeV/C.

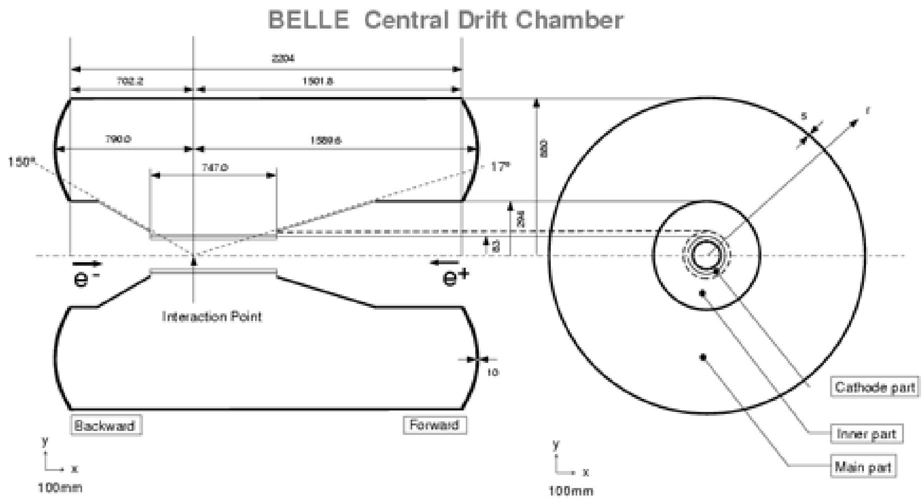


Figure 2.9: The CDC configuration

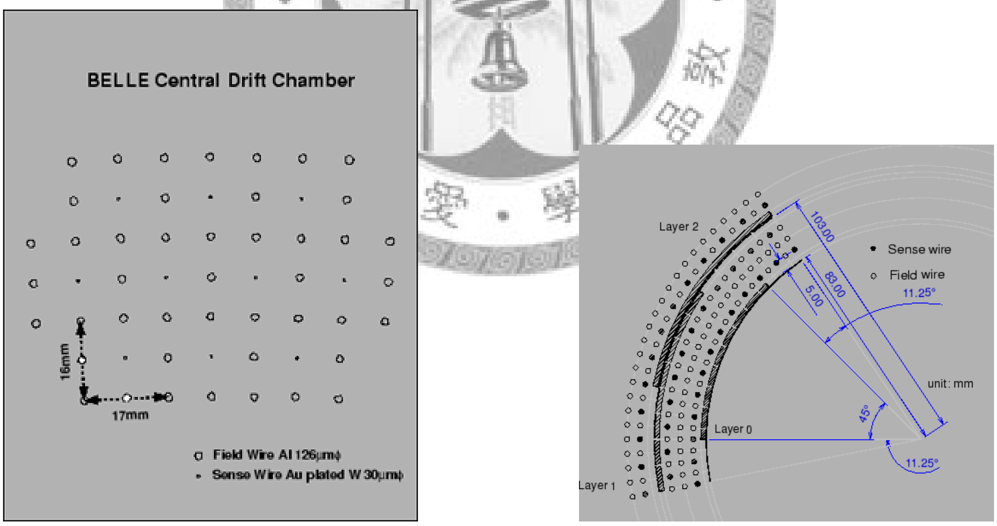


Figure 2.10: The CDC cell structure and the CDC cathode sector configuration

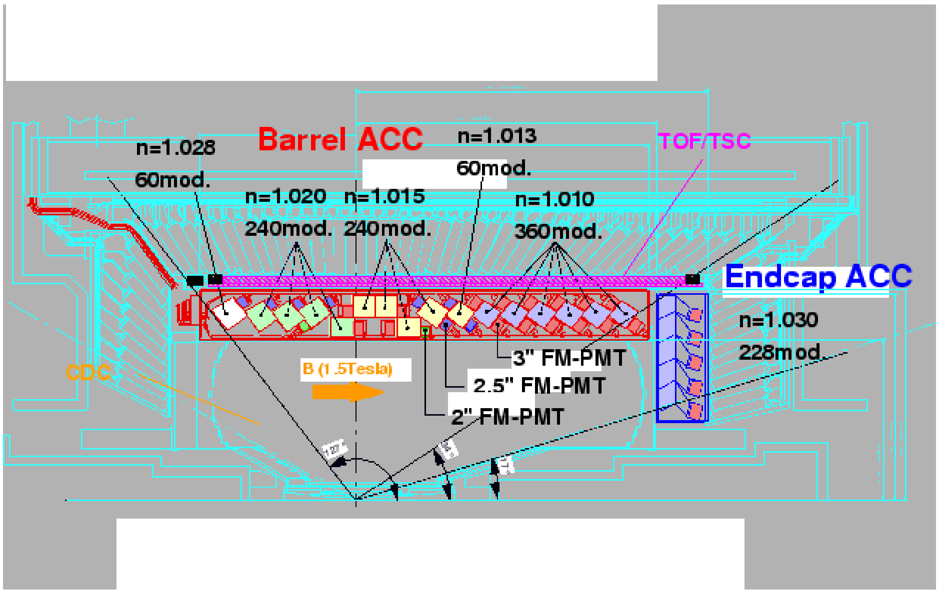


Figure 2.11: The arrangment of ACC in the Belle detector

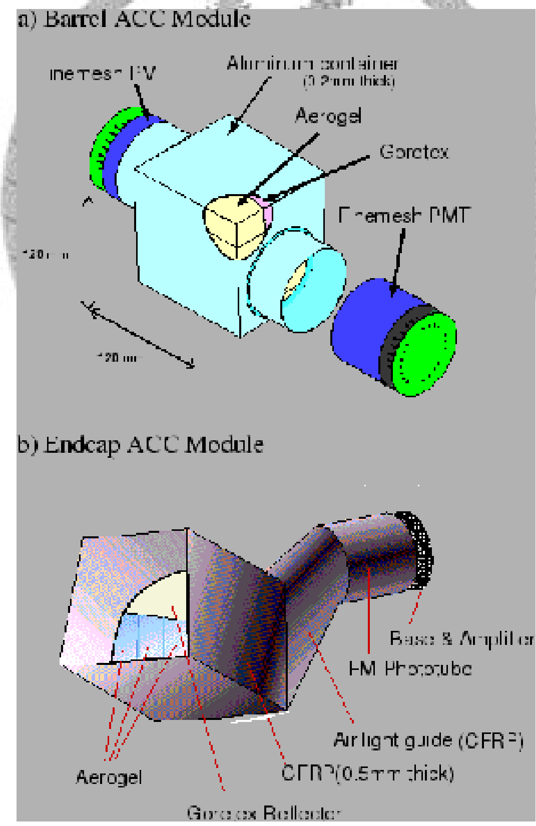


Figure 2.12: Schematic drawing of a typical ACC counter modules of barrel and endcap parts

2.2.5 Aerogel Cherenkov Counter (ACC)

The primary goal of ACC is to separate π and K particles from $1.2GeV/C$ up to around $4GeV/C$ by Cherenkov light. Cherenkov light occurs when the particle moves with a higher speed than speed of light in material, like the aerogel in ACC counters. For that reason in our ACC counters we chose the aerogel have index of refraction such as $n > 1/\beta = \sqrt{1+(m/p)^2}$, where m is the mass and p is the momentum of the particle. The indexes of refraction are different dependent on the counter's spatial position. Fig . 2.11 shows the arrangement of ACC in our detector. ACC contains 960 counters modules in barrel part, and 228 counters modules in endcap part, which cover polar angle $17° - 127°$. Fig. 2.12 shows the ACC counter in the barrel part and endcap part. Each counter contains 5 or 6 sheets of 2cm aerogel, and 2 FM-PMTs for barrel part, 3 FM-PMTs for endcap part.

2.2.6 Time of Flight (TOF)

The TOF got 2 tasks: to identify the charged particles with momentum below about $1.2GeV/C$, and do the trigger system. For trigger we require TOF to have time resolution of 100 ps, which means a 1.2m flight path. TOF can gets time resolution in this level and cover almost 90% of particles produced from $Upsolon(4S)$ decays. TOF contains 128 TOF counters and 64 TSC (trigger scintillation counter, which avoid pile-up) and covering range $17° < \theta < 127°$. Fig. 2.13 shows a module with 2 TOF and 1 TSC. For particle identification TOF use the formula below to calculate the mass of every track:

$$M^2_{track} = (\frac{1}{\beta^2} - 1) = (\frac{cT^t wc_o bs}{L_{path}}^2 - 1)P^2$$

Where P and L_{path} are momentum and path length of particle determined by CDC track fit assuming the μ mass, and T^{twc}_{obs} is time walk correction to get a precise observed time. Fig. 2.14 shows the mass distribution from TOF measurement of particles with momentum below $1.2GeV/C$.

2.2.7 Electromagnetic CaLorimeter (ECL)

ECL is designed for detecting energy and position of photons up to in the low momentum range, especially for those with momentum below $500MeV$ or up to $4GeV$. With the dE/dx results of CDC and light yield of ACC, ECL is useful for electron identification too, which is dependent on a comparison of charged particle tracks momentum and the energy it deposits in the electromagnetic calorimeter. ECL contains CsI(Tl) crystals with sizes in a range from $44.5 \times 44.5mm^2$ to $70.8 \times 70.8mm^2$ for the front faces, and from $54 \times 54mm^2$ to $82 \times 82mm^2$ for the rare faces. The size range of crystal is considering with the position resolution, the cost, and the energy resolution. We arrange CsI crystals in a way just like Fig. 2.15 shows. The whole calorimeter is comprised of a 3m long, 1.25m inner radius barrel section. Polar angle covering range is $17° < \theta < 150°$, and total solid-angle coverage of 91% of 4 π. We list some parameters of ECL in Table. 2.2.

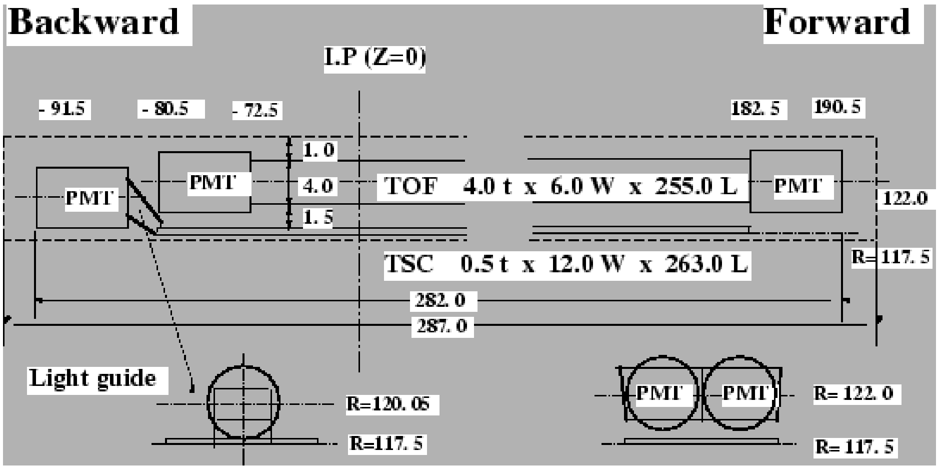


Figure 2.13: The dimension of a TOF/TSC module

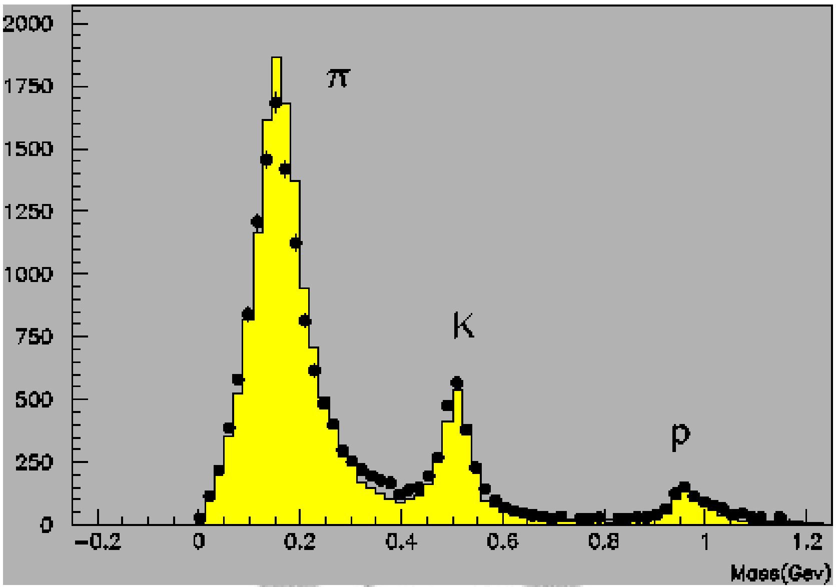


Figure 2.14: The mass distrubition from TOF measurement for particle momentum below 1.2GeV/C

2.2.8 K_L and Moun detection system (KLM)

KLM is designed for identifying K_L^0 and $\mu^{\pm}$ in the momentum range of $p > 600MeV/C$. It covers polar angle in a range of $17° < 155°$, and contains 15 layers of RPCs (glass-electrode-resistive plate counters) and 14 layers of 4.7cm thickness iron plates arranged alternately in the octagonal barrel region. (in the forward and backward endcap region we arrange 15 RPCs and

Item	θ coverage	θ seg.	ϕ seg.	No. of crystals
Forward end-cap	$12.4° - 31.4°$	13	48-144	1152
Barrel	$32.2° - 128.7°$	46	144	6624
Backward end-cap	$130.7° - 155.1°$	10	64-144	960

Table 2.2: Parameters of ECL

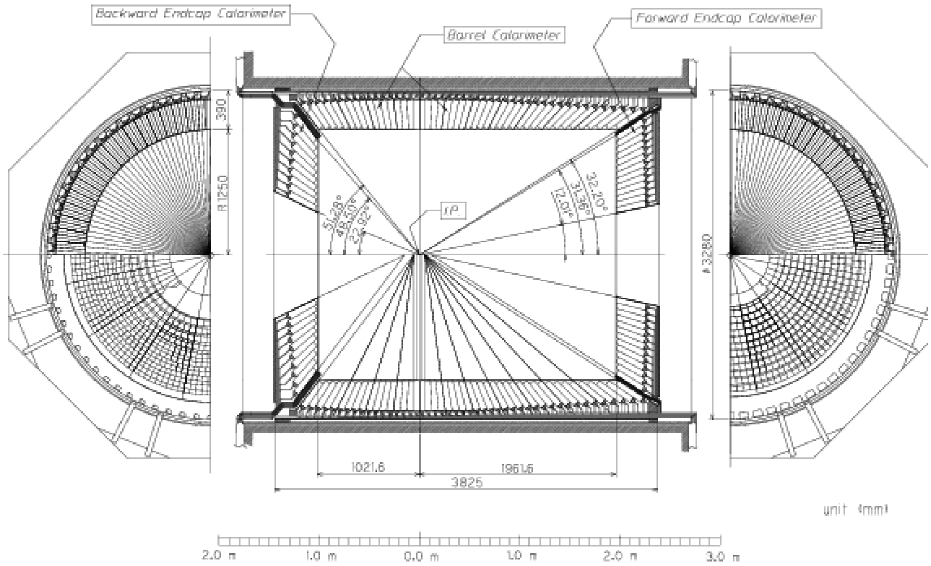


Figure 2.15: Configuration of ECL

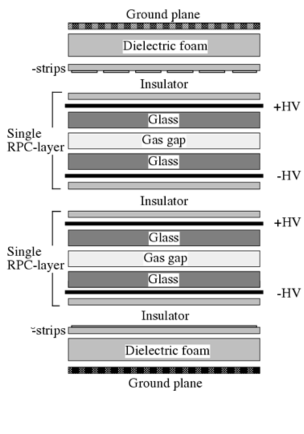


Figure 2.16: The cross-section of KLM superlayer

14 layers of iron plates in it). Fig. 2.16 shows the cross-section of a KLM super-layer. KLM gets the position resolution of 1.2cm and angular resolution better than 10 mrad. Actually KLM can't detect energy of K_L, so we get the K_L energy information from comparing CDC tracks with KLM clusters. KLM is also useful for μ identification, for it can be penetrated by them easily.

Chapter 3

Introduction

There is a very unique feature about B meson decays due to the large mass of B meson, namely, decays containing a baryon anti-baryon pair in the final state. In Belle experiments, we have large amount of $B\overline{B}$ pairs and have observed many new B decay modes containing baryons. Most of those baryonic decay chains end up with protons, so the detector performance of proton identification is very important.

In this study we use kinematically tagged Λ sample with $\Lambda \to p\pi^-$ for both data and Monte Carlo (MC) in order to check the performance of proton identification. The data sets used are from EXP7 to EXP49, corresponding to an integrated luminosity of 492 fb^-1. The MC samples consist of charged B^+B^-, mixed $B^0\overline{B^0}$, continuum charm and uds events in the ratio of 0.5 : 0.5 : 1 : 1.6. The MC events are generated according to different background files for runs of real data. The MC data size is about the same as the real data. The Belle library version b20060529_2127 is used for our result (we only used libray version b20090127_0910 in the region of forwards endcap to check the disagreement between MC and Data around proton momentum 2.0GeV)

Likelihood ratio method is applied using products of probability functions obtained from CDC, TOF and ACC with different particle hypothesis, i.e., charged pion, kaon, or proton. The definition of different likelihood ratios and the input values for the particle identification function called are listed below:

- $L_{p/k} = L_p/(L_p + L_k)$: atc_pid(3,1,5,4,3)
- $L_{p/\pi} = L_p/(L_p + L_\pi)$: atc_pid(3,1,5,4,2)

We use the information from Mdst_vee2 panther bank, with kind()=2 to select for Λ ($\Lambda \rightarrow p\pi^-$ candidates , and kind()=3 for $\overline{\Lambda}$ ($\overline{\Lambda} \rightarrow \bar{p}\pi^+$). This panther data bank is filled by kinematic fitting using two opposite charged tracks with vertex away from the interaction point (IP) and mass consistent with Λ.

The momentum and the polar angle distributions of Λ heavy daughters are shown in Fig. 3.1. This indicates that our samples can provide proton identification with momentum from very low region up to ~4GeV. Note that the statistics at high momentum regions are low.

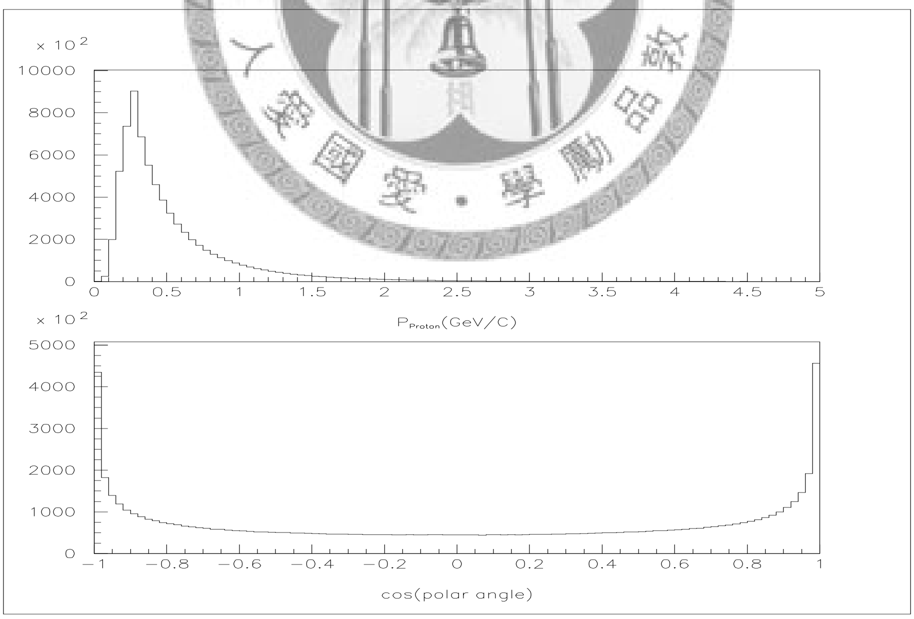


Figure 3.1: Distribution of candidate pronton momentum and polar angle in the Lab frame.

Invariant mass distribution of Λ with or without proton identification criteria (good Λ selection with $L_p\pi > 0.1, 0.9$) are shown in Fig. 3.2. The Λ signal peak is narrow. The mean value is 1.1157 GeV which is consistent with the official Λ mass from particle data group [1]. Its mass resolution is within the range of 0.5-0.8 MeV. Without proton criteria, the background shape is nonlinear and quite different from those with identification criteria. After PID cut the background is about flat even the PID cut is just the loosest one (> 0.1).

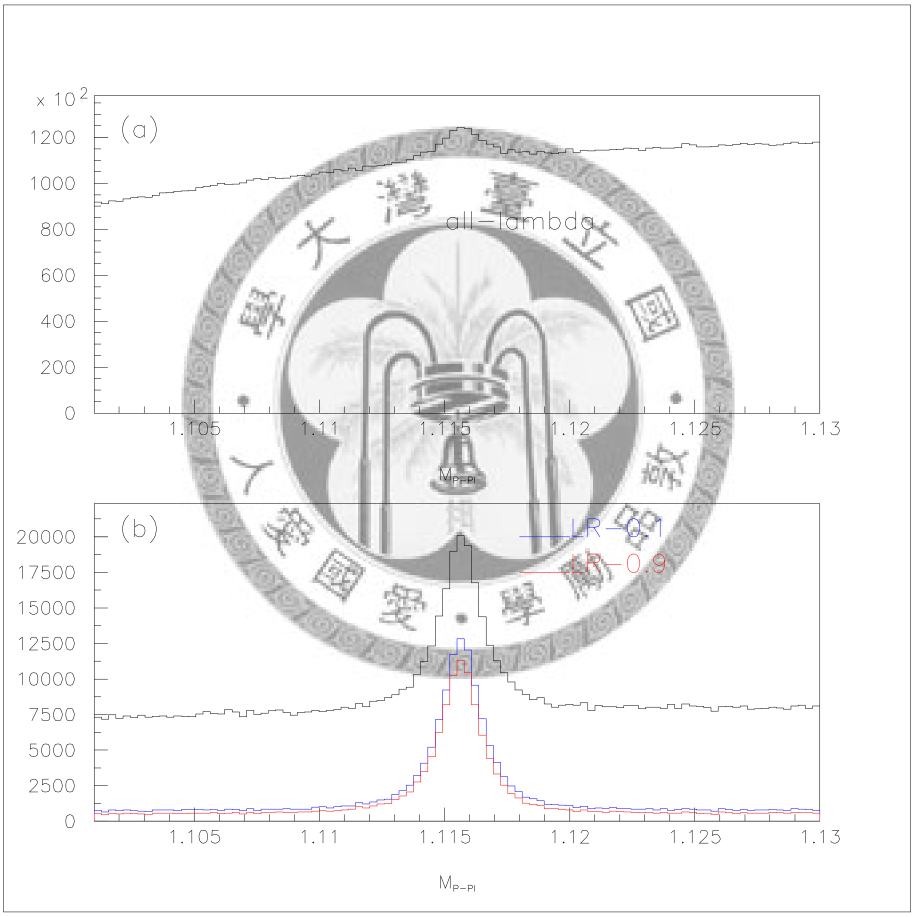


Figure 3.2: Reconstructed invariant mass distribution from proton and π. (a) Without any criteria; (b) With good Λ level 1 cut and likelihood ratio cut.

Chapter 4

Selection of Λ

From the Mdst_vee2 bank where vertex fit information was stored by using two oppositely charged tracks to reconstruct long lived particles like K_S, Λ, or $\overline{\Lambda}$, we obtain a Λ sample of 8.7×10^7. The corresponding luminosity is about 492 fb^{-1} which contains $(534.589 \pm 7.004) \times 10^6 B\bar{B}$ pairs. There are lots of fake Λ's in our sample. Some selection criteria are applied to reject fake Λ in order to reduce the file size and obtain cleaner Λ sample.

4.1 Selection criteria

The Λ finder use 4 kinematics variables for Λ quality cuts. We use the good Λ level 1 cuts [2] to get better signal to background ratio. Selection criteria are given in Table. 4.1, where zdist is the separation along z-axis of the two daughter tracks (presumably proton and π), dr is the minimum distance between the daughter tracks and the Interaction Point (IP) in the x-y plane, dphi is the angle between the vertex vector (from IP to Λ vertex) and the Λ momentum vector, and fl is the distance between IP and Λ vertex in the x-y plane.

Table 4.1: The good Λ level 1 cut

Λ Momentum (GeV)	zdist (cm)	dr (cm)	dphi (radian)	fl (cm)
> 1.5	< 12.9	> 0.008	< 0.09	> 0.22
0.5-1.5	< 9.8	> 0.010	< 0.18	> 0.16
< 0.5	< 2.4	> 0.027	< 1.20	> 0.11

To further purify our Λ sample, after the good Λ level 1 cut, we check the proper fly distance. Definition of proper fly distance is:

$$d_{proper} = dr_{Lab}/\gamma = dr_{Lab} \times (c/v_T) = dr_{Lab} \times (M_\Lambda/P_T) \times c$$

.

In the above equation, P_T is the transverse momentum of Λ, dr_{Lab} is fl as explained before, and γ is the Lorentz factor of Λ in the Lab frame. Fig. 4.1 is the distribution of Λ proper fly distance. Particles with proper distance longer than 400cm are rejected in our study.

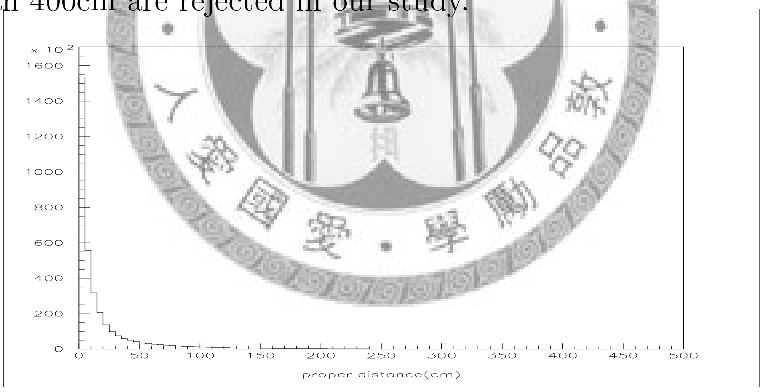


Figure 4.1: Proper fly distance of Λ event with good Λ level 1 cut

4.2 Nonlinear background

The nonlinearity of background shape shown in the Λ mass plot caused by K_S and γ are investigated in a previous proton identification study [3]. Fig. 4.2 shows background shapes for different track momentum. We can use some kinematical constraints to cut off those fake Λ.

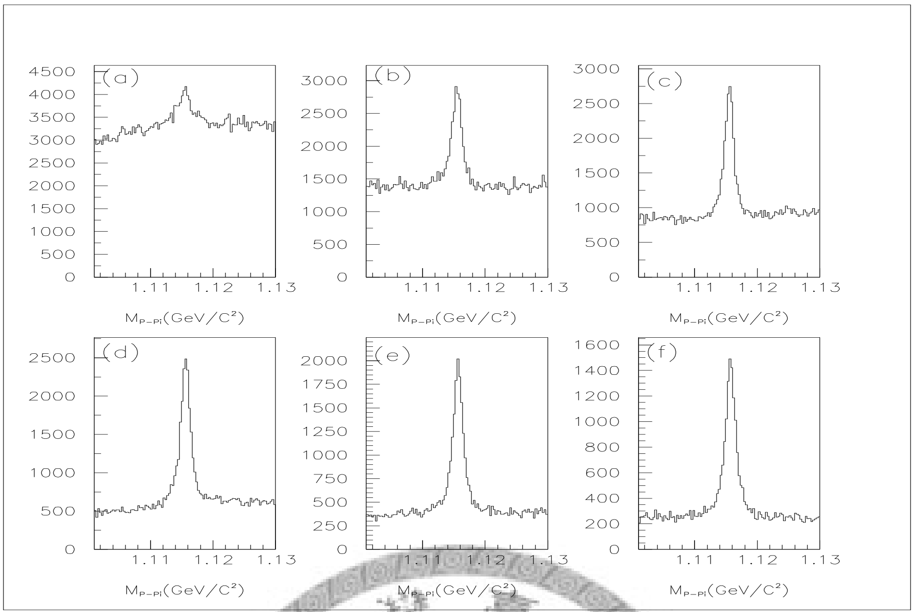


Figure 4.2: Nonlinearity of Λ mass background for different proton momentum range (a) P_p:0.2-0.4 GeV (b) P_p:0.4-0.6 GeV (c) P_p:0.6-0.8 GeV (d) P_p:1.8-1.0 GeV (e) P_p:1.0-1.2 GeV (f) P_p:1.2-1.4 GeV

4.2.1 rejection of K_S

Fig. 4.3 shows the K_S feeding into our Λ sample. This data sample is taken from Λ (Mdst_vee2 bank with good Λ level 1 cut) and proton mass is replaced by π mass.

Just like previous study, we also got a clear enhancement of $M_{(p \to \pi)\pi}$ near 0.497 GeV. We use a cut excluding particles with $0.485 < M_{\pi\pi} < 0.51$ GeV to reject K_S feeding into Λ. Fig. 4.4 shows effect of K_S rejection upon proton momentum with and without proton identification cut. Fig. 4.5 shows both the effect of K_S rejection upon background and upon signal in different proton momentum bins.

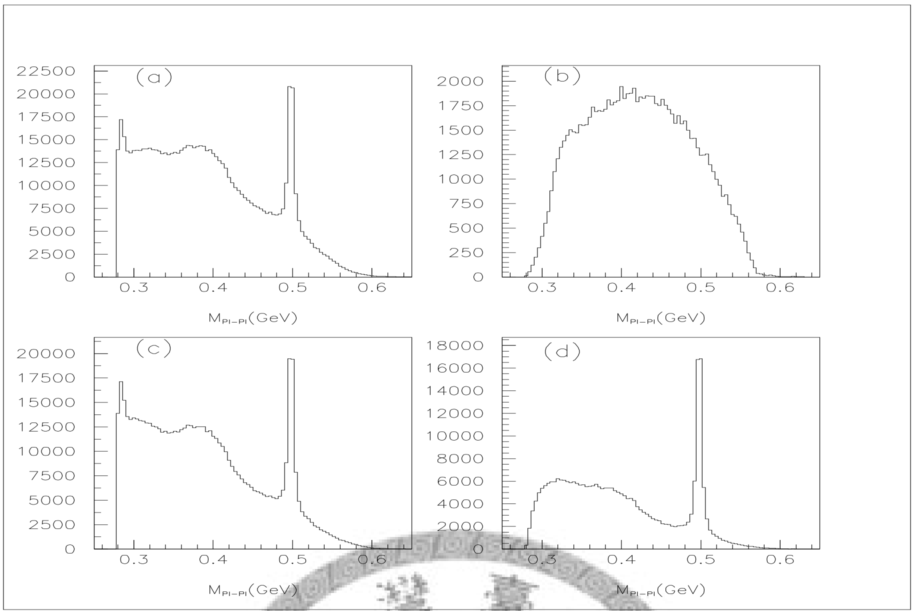


Figure 4.3: Invariant mass of $\pi\pi$ for Λ events with good Λ level 1 cut (a) all Λ events, (b) true Λ events with correct MC ID number, (c) fake Λ events with wrong ID number, (d) Λ events with criteria of daughters are π^+ and π^-

4.2.2 rejection of γ

Just like some K_S can feed into our Λ sample, some γ's can convert into e^+e^- pair in the detector and misidentified as proton and π^-. Fig. 4.6 shows the plot of $M_{(p\to e^+)(\pi^-\to e^-)}$ and we got a clear enhancement near 0 point. We cut off events with $M_{e^+e^-} < 0.05$ GeV to reject γ feeding into Λ. Fig. 4.7 and Fig. 4.8 show effects of γ rejection against proton momentum with and without proton identification cut, and against invariant mass of Λ in different proton momentum bins.

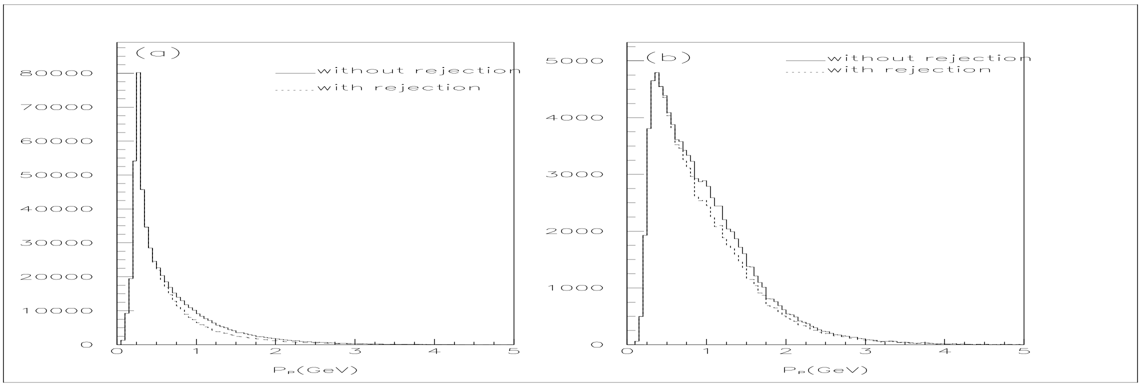


Figure 4.4: Effect of rejecting K_S against proton momentum; (a) without PID criteria, (b) with $L_{p-\pi} > 0.6$ and $L_{p-K} > 0.6$

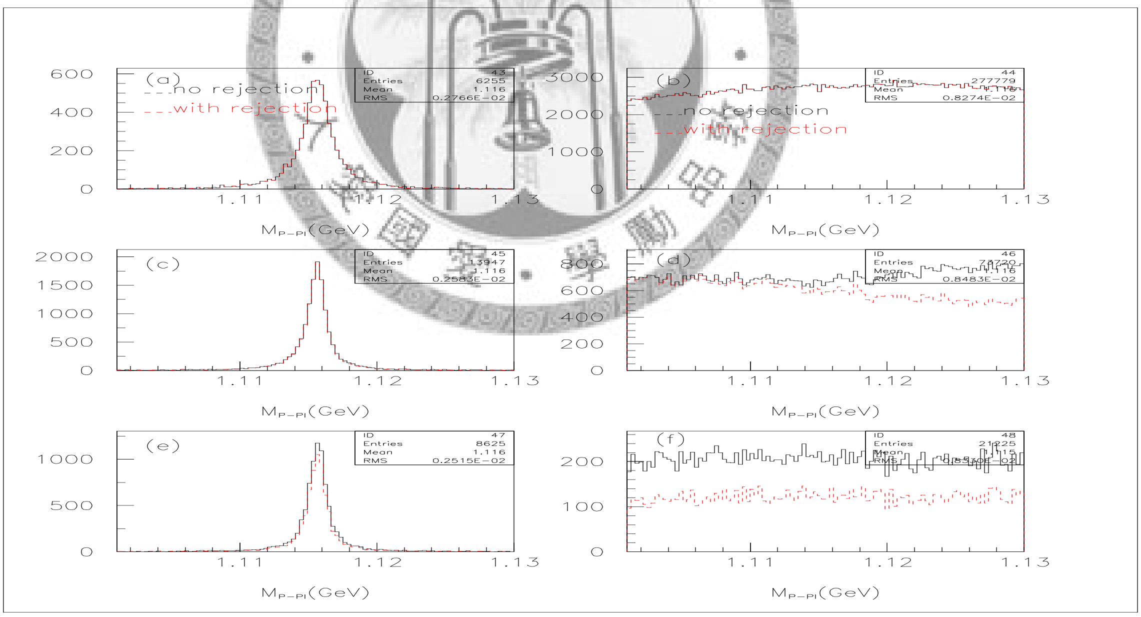


Figure 4.5: Effect of rejecting K_S against invariant masstrue for Λ (left hand side) and fake Λ (right hand side); (a)(b) P_p :0.2-0.4 GeV, (c)(d) P_p:0.6-0.8 GeV, (e)(f) P_p:1.2-1.4 GeV

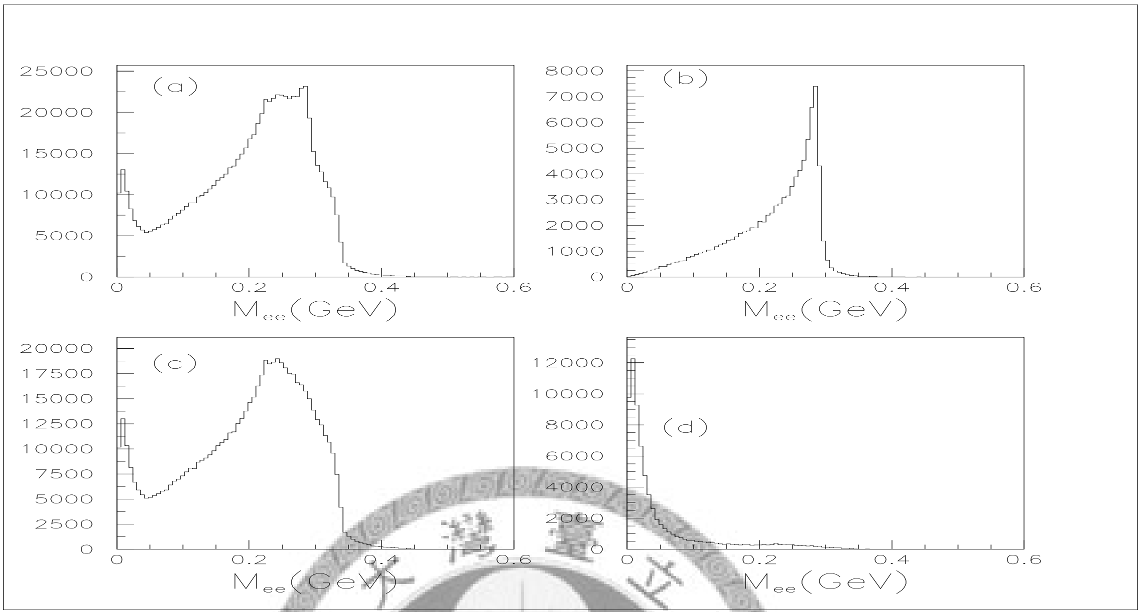


Figure 4.6: Invariant mass of ee for Λ events with good Λ level 1 cut (a) all Λ events, (b) true Λ events with correct MC ID, (c) fake Λ events with wrong ID, (d) $MC\Lambda$ cnadidates with criteria of daughters are e^+ and e^-

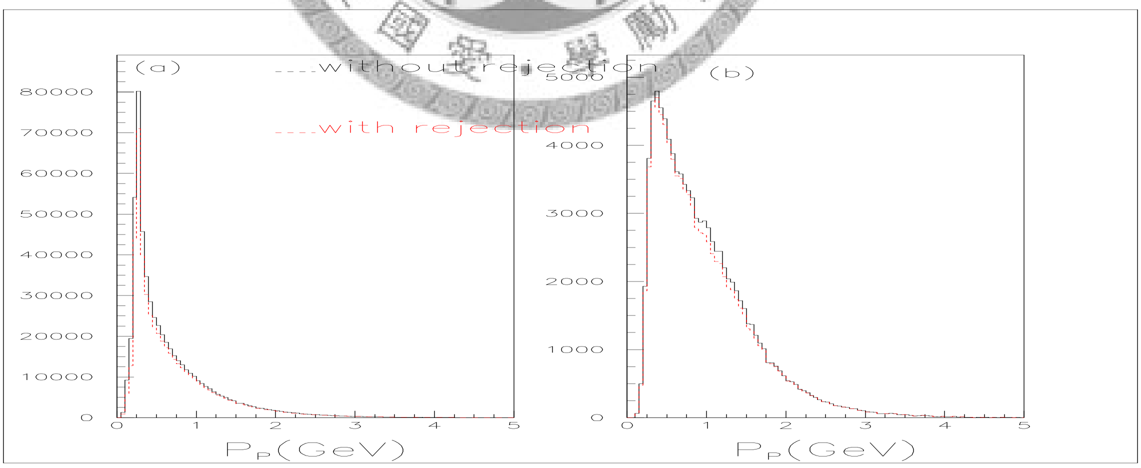


Figure 4.7: Effect of rejecting γ against proton momentum; (a) without PID criteria, (b) with $L_{p/\pi} > 0.6$ and $L_{p/K} > 0.6$

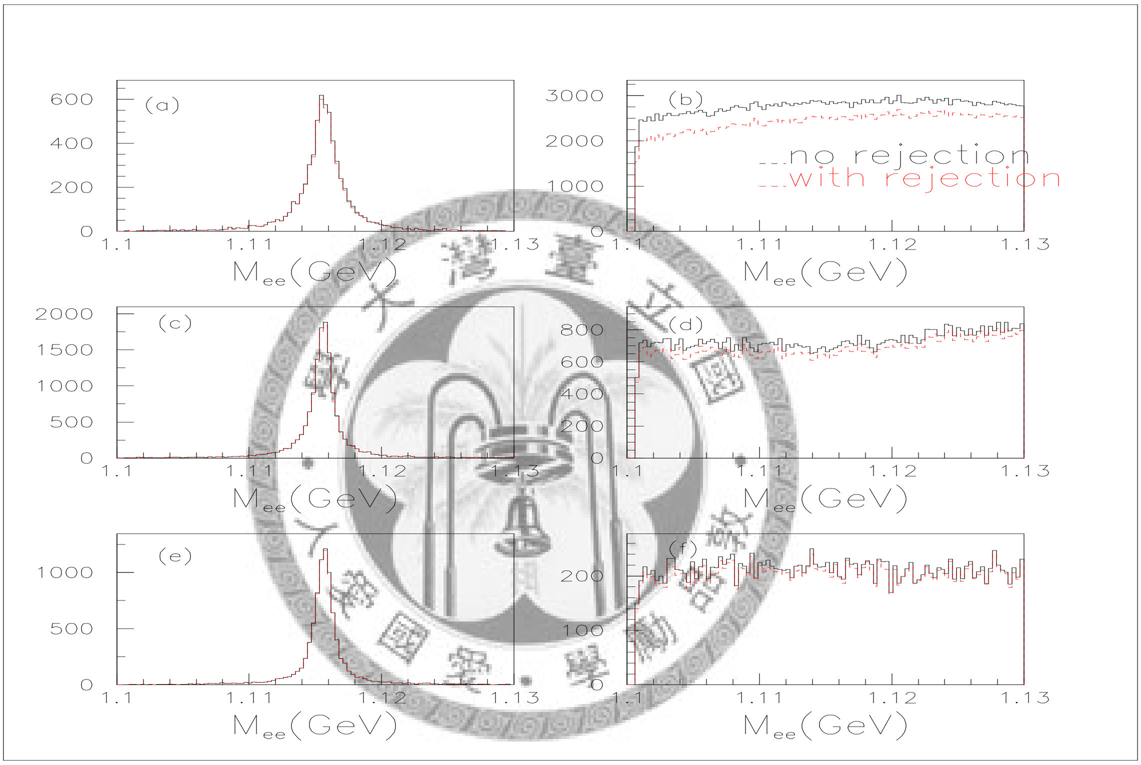


Figure 4.8: Effect of rejecting γ against invariant masstrue for Λ (left hand side) and fake Λ (right hand side); (a)(b) P_p :0.2-0.4 GeV, (c)(d) P_p:0.6-0.8 GeV, (e)(f) P_p:1.2-1.4 GeV

Chapter 5

Fit Λ Yields

To calculate the proton identification (PID) efficiency defined by Λ yield with PID criteria over Λ yield without PID criteria, we have to fit Λ invariant mass plot. The difference of the fitted yields between with and without loose PID criteria is usually very small. Since the background shapes without PID criteria are quite different from the ones with PID selection cuts, a small distortion dues to background shape can causes the resultant efficiency bigger than 100%. In order to avoid this kind of situations, we don't fit those plots without PID criteria. To obtain the total number of Λ's without PID criteria, we trust the MC true Λ efficiency of $L_P > 0.1$ and use the following equation to calculate it:

$$N_{DataSet-L_p>0} = N_{DataSet-L_p>0.1} \times (N_{True\Lambda-L_p>0}/N_{True\Lambda-L_p>0.1}),$$

where L_p stands for $L_{p\backslash\pi}$ for $p\pi$ separation and $L_{p\backslash K}$ for pK separation. In other words, the data and MC efficiency are actually fixed at L_p cut at 1.

The criteria to choose MC TrueΛ are :

1 ID number is Λ.

2 ID number of daughter with positive charge is proton.

3 ID number of daughter with negative charge is π.

5.1 Momentum binning and PDF in the fit

From Fig. 4.2 we know shapes of Λ mass resolution and background are dependent on track momentum. So we divide our sample into 11 bins of proton momentum for each EXP number. Table 5.1 shows the corresponding binning for different proton momentum ranges:

Table 5.1: Binning of proton momentum

Bin	momentum range (GeV)
1	$0.4 < p < 0.6$
2	$0.6 < p < 0.8$
3	$0.8 < p < 1.0$
4	$1.0 < p < 1.2$
5	$1.2 < p < 1.4$
6	$1.4 < p < 1.6$
7	$1.6 < p < 1.8$
8	$1.8 < p < 2.0$
9	$2.0 < p < 2.5$
10	$2.5 < p < 3.0$
11	$3.0 < p < 5.0$

The signal peak is fitted with two Gaussians of different mean values (near 1.1157 GeV) and different widths. First Gaussian function represented the Λ main signal. Second Gaussian function represented the tail part of signal peak. Background shape is described by a 3rd order polynomial. Both 2nd and 3rd order polynomial functions can fit background well, but we can get better χ^2/ndf when we used a 3rd polynomial function.

5.2 Fitting procedure

Just like the previous proton identification efficiency study [3], Λ mass resolution is independent of PID criteria. So we chose the following fitting procedure:

1 Fit the plot of tightest PID criteria ($L_p > 0.9$) in each proton momentum bin to get the signal and background shape function.

2 Fix the shape variables such as area ratio of two Gaussians, their means and widths. Float the total area variable of signal and allow the background shape to change part.

3 Fit all remaining plots of other PID selection cuts.

A typical example of fitting procedure/result is shown in Fig. 5.1.

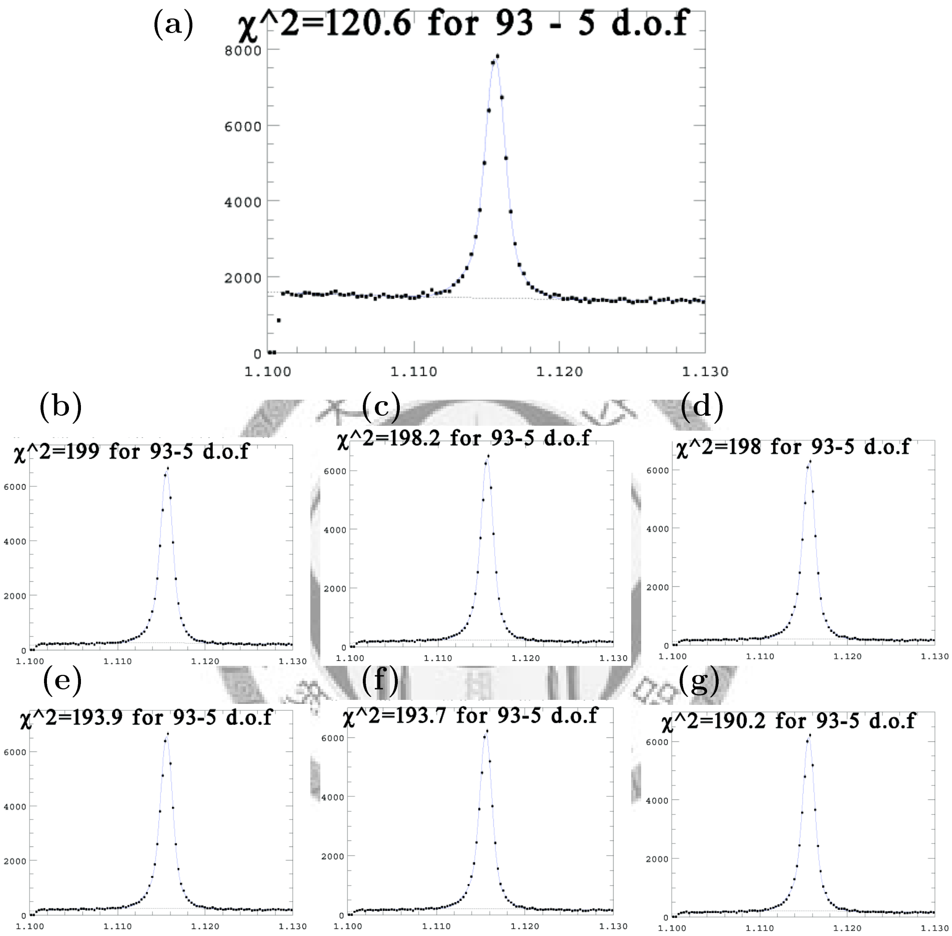


Figure 5.1: Fitting result of Λ sample in proton momentum range 0.8-1.0 GeV; (a) without any PID criteria, (b) with $L_{p/\pi} > 0.1$, (c) with $L_{p/\pi} > 0.6$, (d) with $L_{p/\pi} > 0.9$, (e) with $L_{p/K} > 0.1$, (f) with $L_{p/K} > 0.6$, (g) with $L_{p/K} > 0.9$.

Chapter 6

Result for Different Exp Numbers

6.1 Efficiency calculation

We calculate the PID criteria efficiency defined as:

$$\epsilon = \frac{N_{withPIDcriteria}}{N_{withoutPIDcriteria}}$$

And we compare the MC efficiency and Data efficiency with the same PID criteria by calculate the double ratio, which is defined as:

$$R = \frac{\epsilon_{Data}}{\epsilon_{MC}}$$

Efficiencies of Data and MC with different PID criteria are listed in Chapter Table1 (we take Exp7-11 and EXP33-37 for example and list the result of $L_{p-\pi} or L_{p-K} > 0.2, 0.4, 0.6, 0.9$). The statistic error will be described in the following section. Fig. 6.1 to Fig. 6.7 show effieiencies and Data-MC double ratios of the $L_{p-\pi}$ criteria part of Chapter Table1. Fig. 6.8 to Fig. 6.14 show the L_{p-k} criteria part. From these plots we can find the efficiency tendency for momentum bins of different Exp numbers are quite similar. The double ratio values are within 1-2%, which means PID criteria performance of different Exp numbers behavior almost the same. We'll calculate the experiment dependent error value in the following section, too.

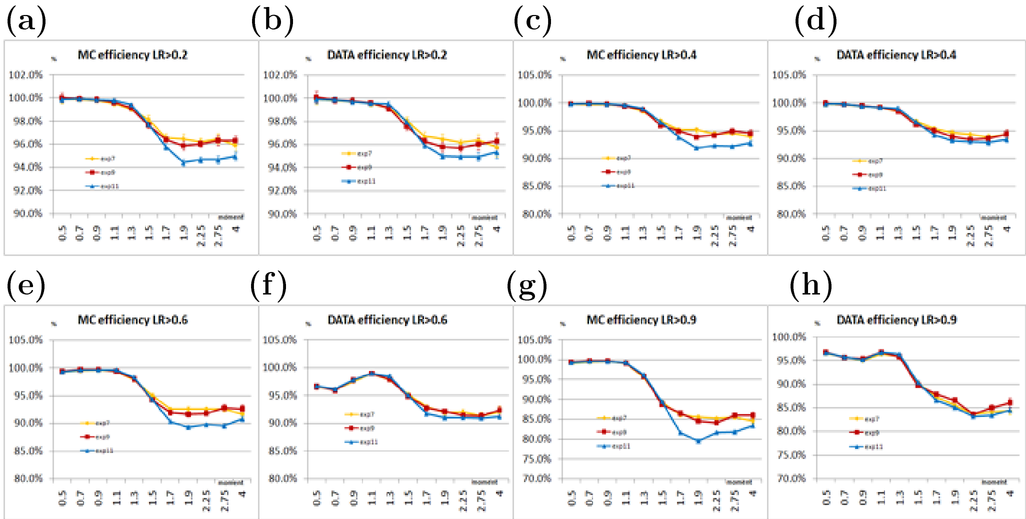


Figure 6.1: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp7 to 11,:Yellow Exp7, Red Exp9, Blue Exp11;(a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

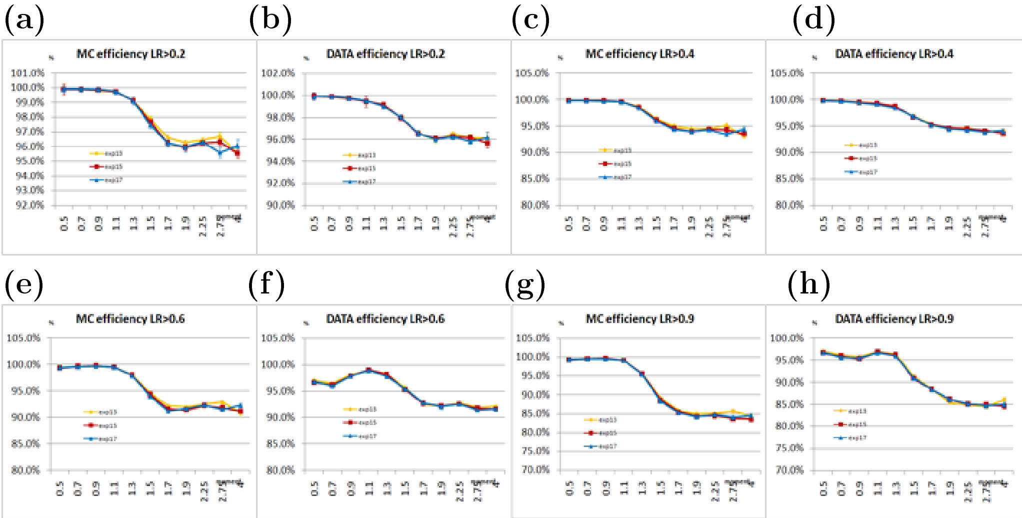


Figure 6.2: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp13 to 17:Yellow Exp13, Red Exp15, Blue Exp17;(a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

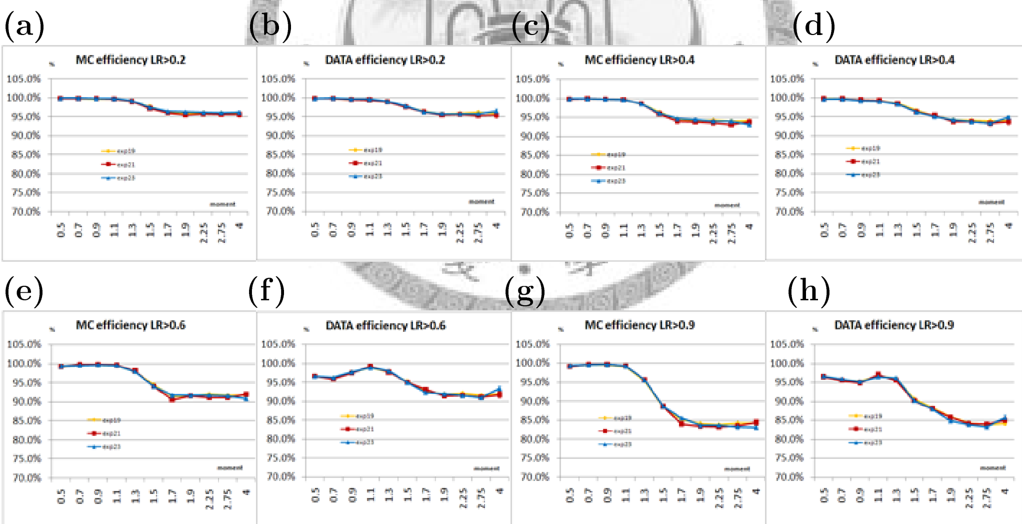


Figure 6.3: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp19 to 23:Yellow Exp19, Red Exp21, Blue Exp23; (a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

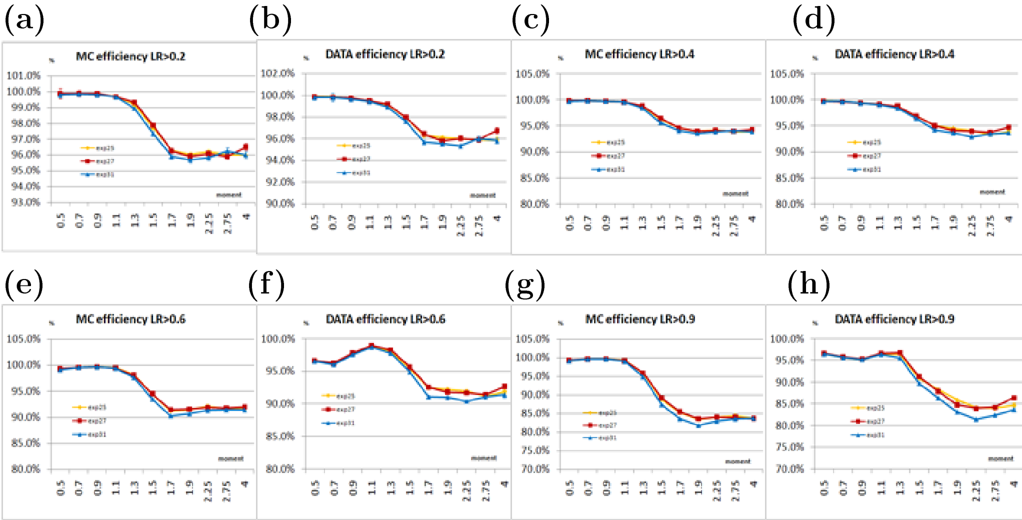


Figure 6.4: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp25 to 31:Yellow Exp25, Red Exp27, Blue Exp31; (a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

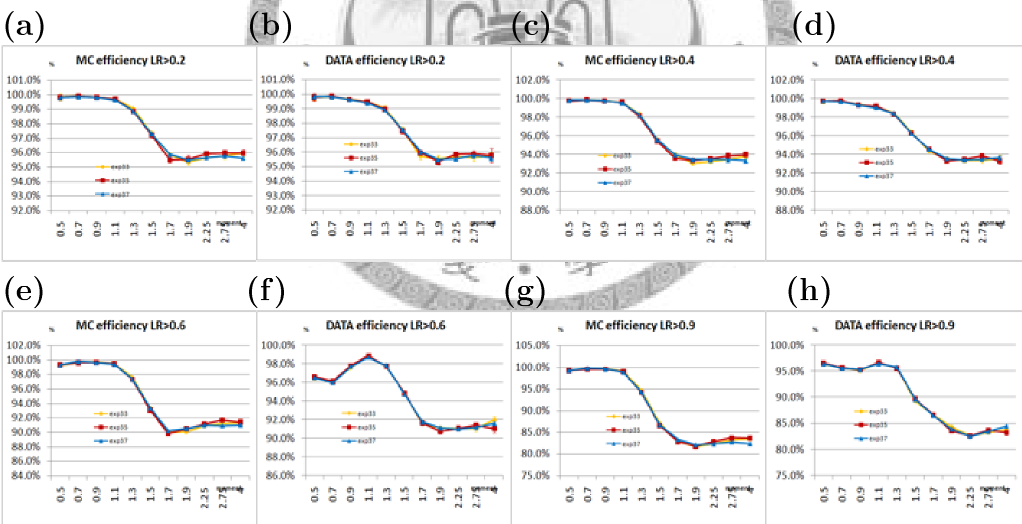


Figure 6.5: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp33 to 37:Yellow Exp33, Red Exp35, Blue Exp37;(a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

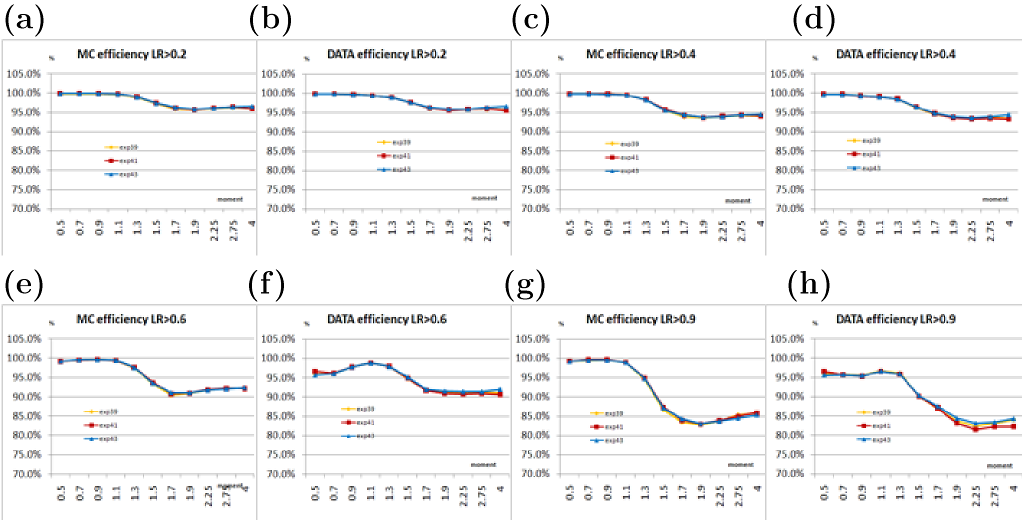


Figure 6.6: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp39 to 43:Yellow Exp39, Red Exp41, Blue Exp43;(a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

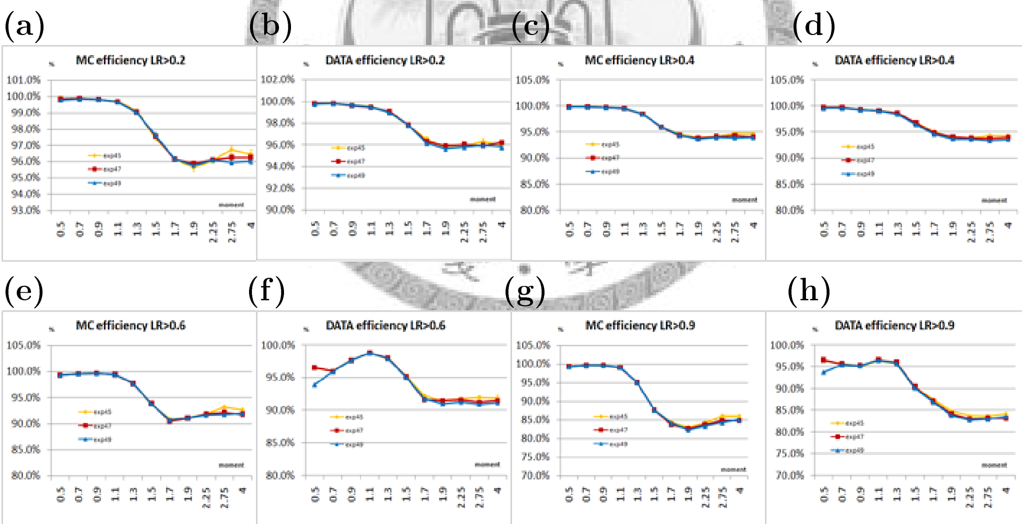
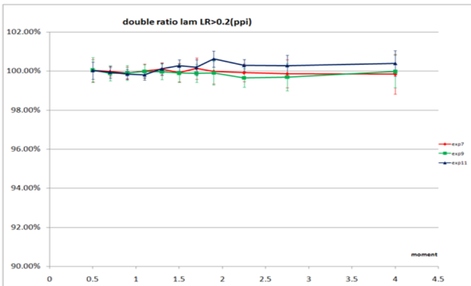
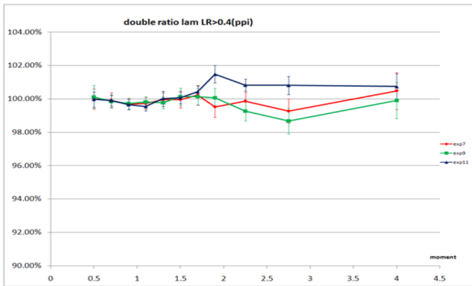


Figure 6.7: Efficiencies of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp45 to 49:Yellow Exp45, Red Exp47, Blue Exp49;(a)MC $L_{p-\pi} > 0.2$, (b)Data $L_{p-\pi} > 0.2$, (c)MC $L_{p-\pi} > 0.4$, (d)Data $L_{p-\pi} > 0.4$, (e)MC $L_{p-\pi} > 0.6$, (f)Data $L_{p-\pi} > 0.6$, (g)MC $L_{p-\pi} > 0.9$, (h)Data $L_{p-\pi} > 0.9$

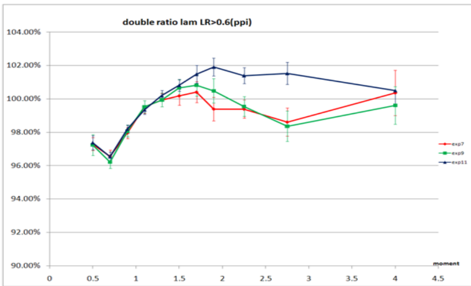
(a)



(b)



(c)



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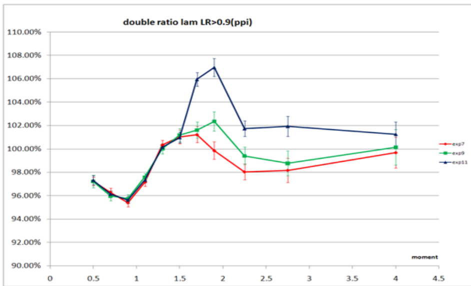
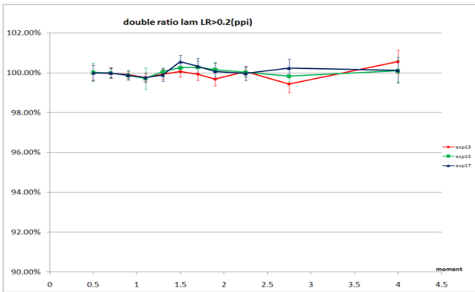


Figure 6.8: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp7 to 11:Red Exp7, Green Exp9, Blue Exp11;(a)$L_{p-\pi} > 0.2$, (b)$L_{p-\pi} > 0.4$, (c)$L_{p-\pi} > 0.6$, (d)$L_{p-\pi} > 0.9$

(a)



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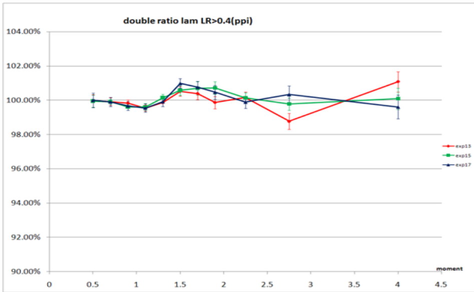
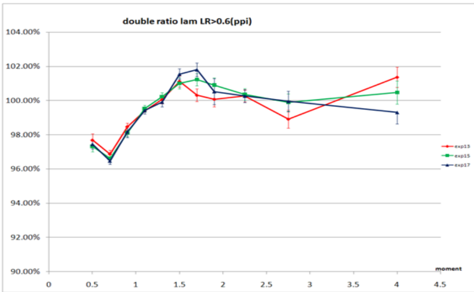


(c)



(d)

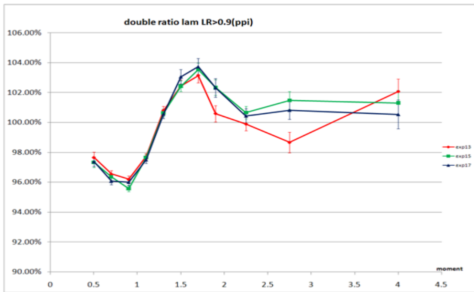


Figure 6.9: Data-MC double ratio of $p - \pi$ cut for proton momentum range 0.4-5 GeV from Exp13 to 17:Red Exp13, Green Exp15, Blue Exp17;(a)$L_{p-\pi} > 0.2$, (b)$L_{p-\pi} > 0.4$, (c)$L_{p-\pi} > 0.6$, (d)$L_{p-\pi} > 0.9$

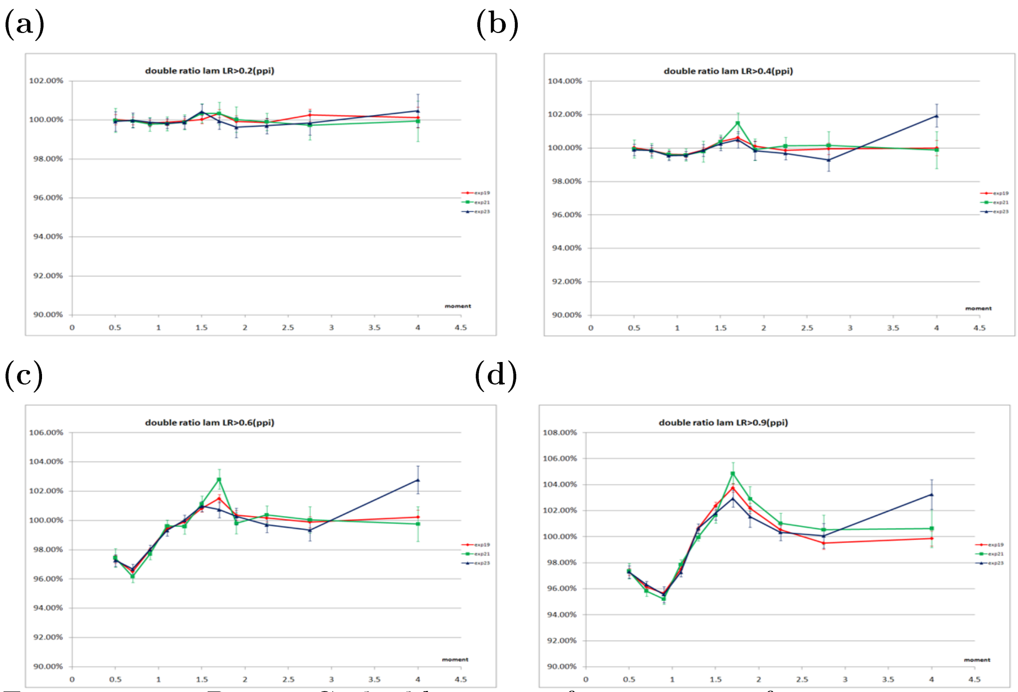


Figure 6.10: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp19 to 23:Red Exp19, Green Exp21, Blue Exp23;(a)$L_{p-\pi} > 0.2$, (b)$L_{p-\pi} > 0.4$, (c)$L_{p-\pi} > 0.6$, (d)$L_{p-\pi} > 0.9$

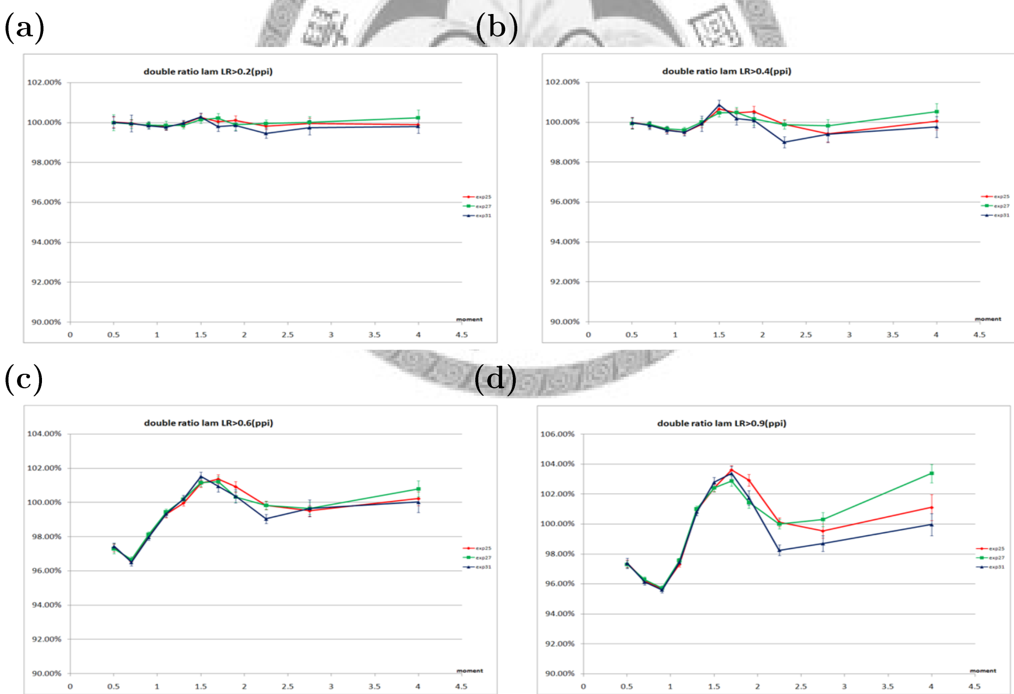


Figure 6.11: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp25 to 31:Red Exp25, Green Exp27, Blue Exp31;(a)$L_{p-\pi} > 0.2$, (b)$L_{p-\pi} > 0.4$, (c)$L_{p-\pi} > 0.6$, (d)$L_{p-\pi} > 0.9$

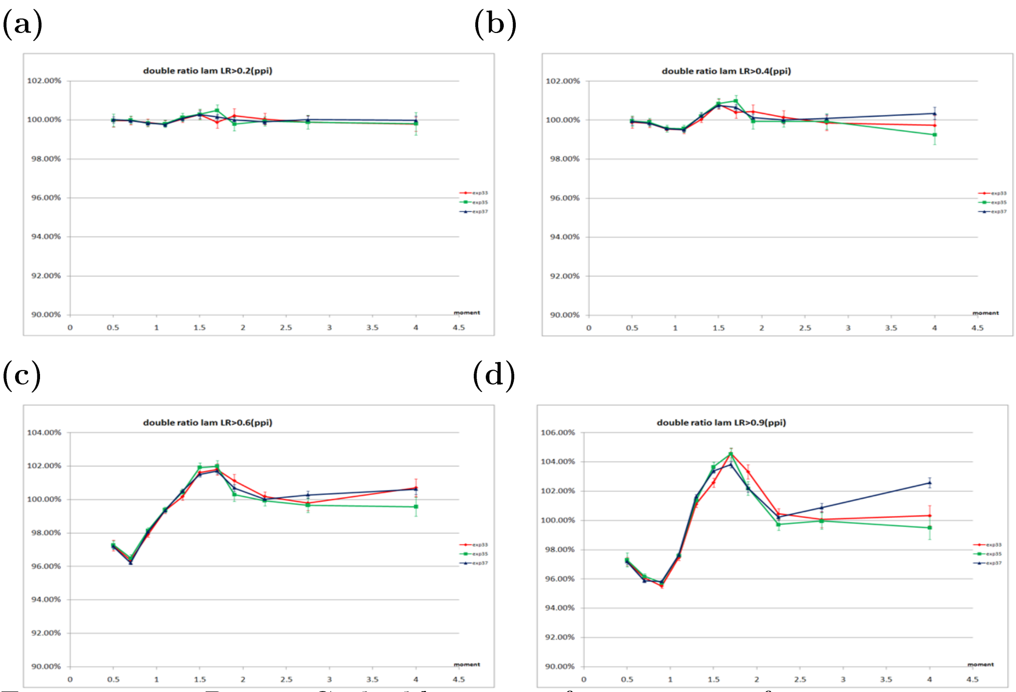


Figure 6.12: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp33 to 37:Red Exp33, Green Exp35, Blue Exp37;(a)$L_{p-\pi}>0.2$, (b)$L_{p-\pi}>0.4$, (c)$L_{p-\pi}>0.6$, (d)$L_{p-\pi}>0.9$

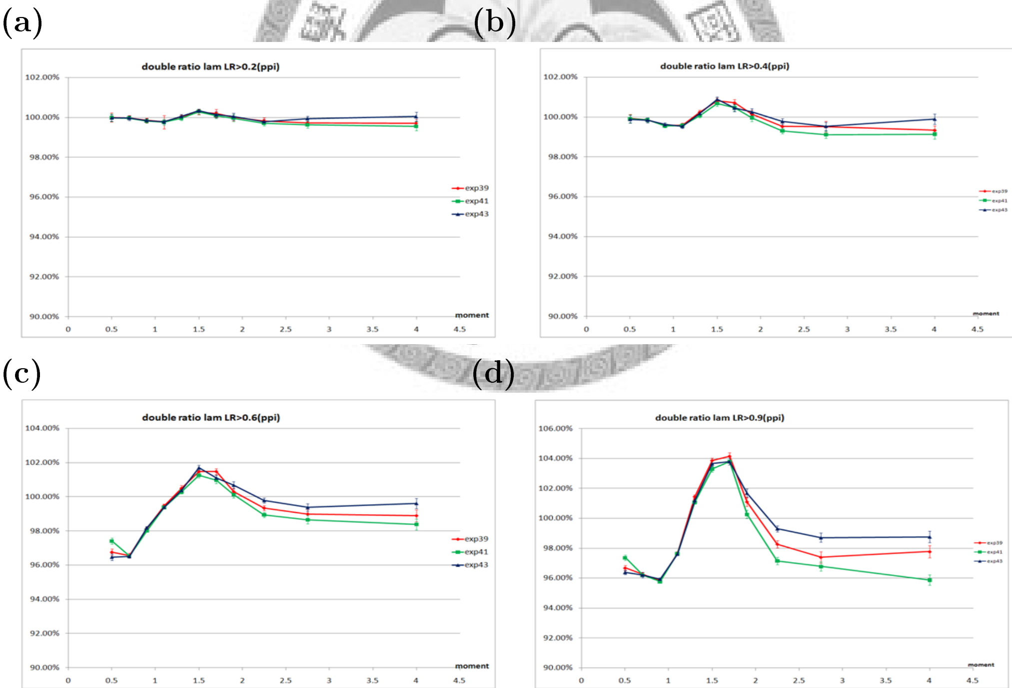


Figure 6.13: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp39 to 43:Red Exp39, Green Exp41, Blue Exp43;(a)$L_{p-\pi}>0.2$, (b)$L_{p-\pi}>0.4$, (c)$L_{p-\pi}>0.6$, (d)$L_{p-\pi}>0.9$

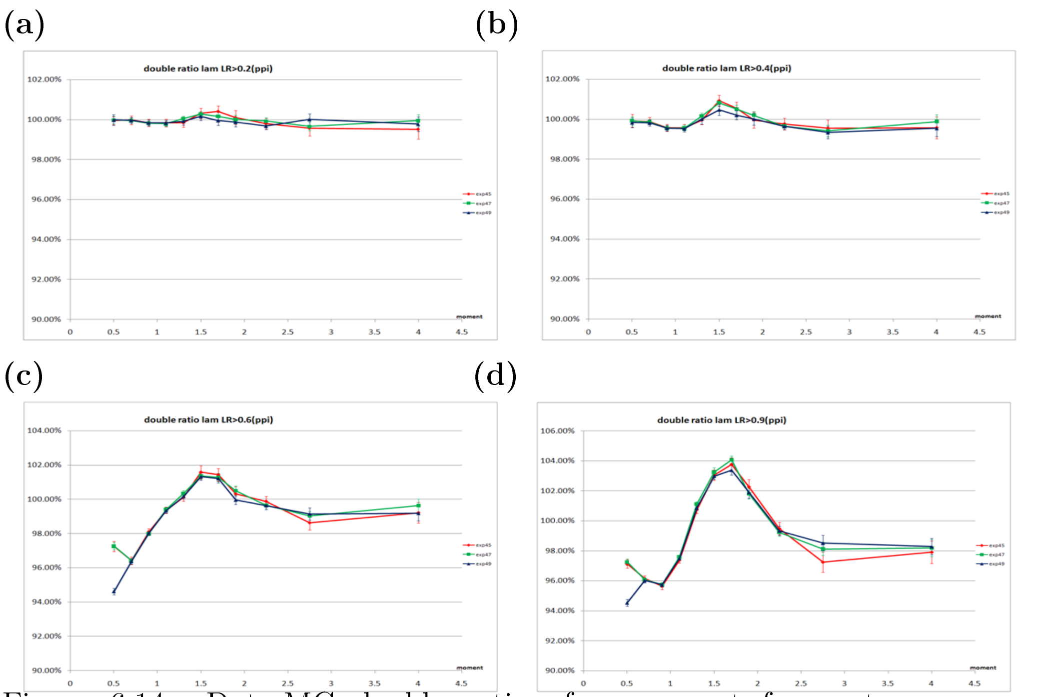


Figure 6.14: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp45 to 49:Red Exp45, Green Exp47, Blue Exp43;(a)$L_{p-\pi}>0.2$, (b)$L_{p-\pi}>0.4$, (c)$L_{p-\pi}>0.6$, (d)$L_{p-\pi}>0.9$

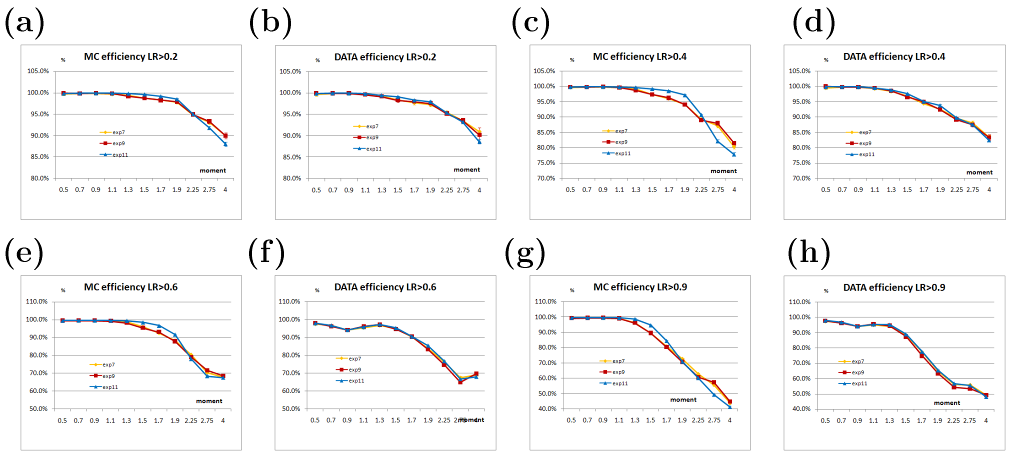


Figure 6.15: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp7 to 11,:Yellow Exp7, Red Exp9, Blue Exp11;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

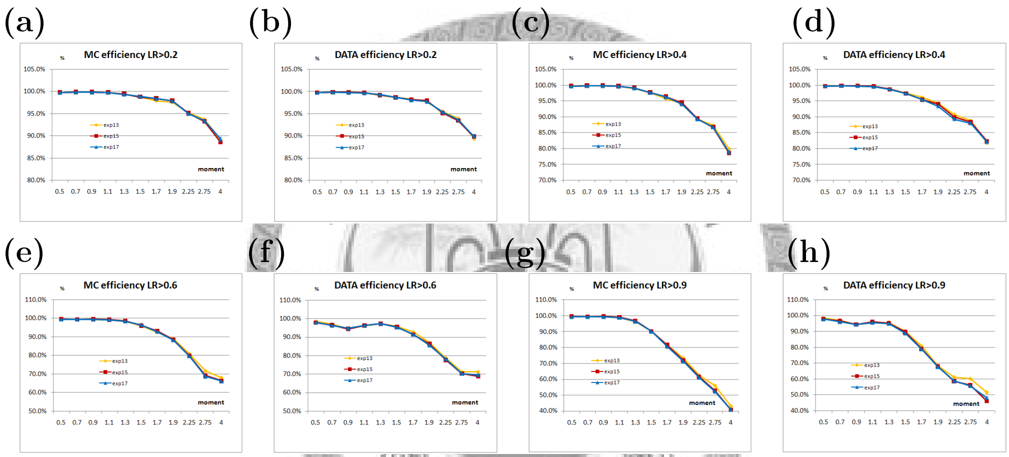


Figure 6.16: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp13 to 17:Yellow Exp13, Red Exp15, Blue Exp17;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

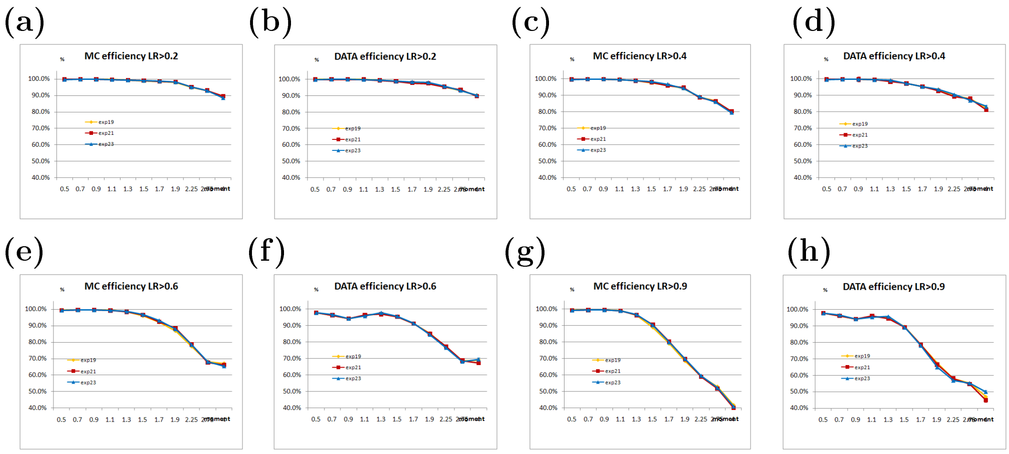


Figure 6.17: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp19 to 23,:Yellow Exp19, Red Exp21, Blue Exp23;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

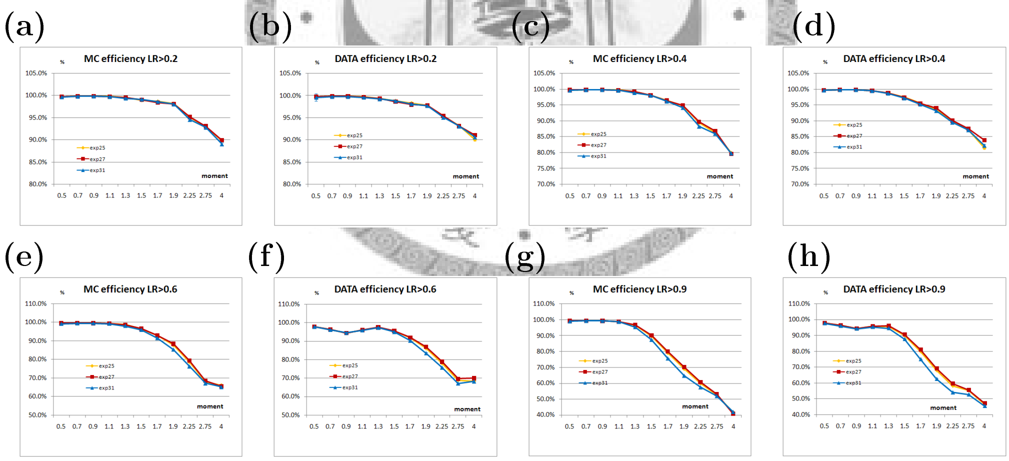


Figure 6.18: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp25 to 31:Yellow Exp25, Red Exp27, Blue Exp31;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

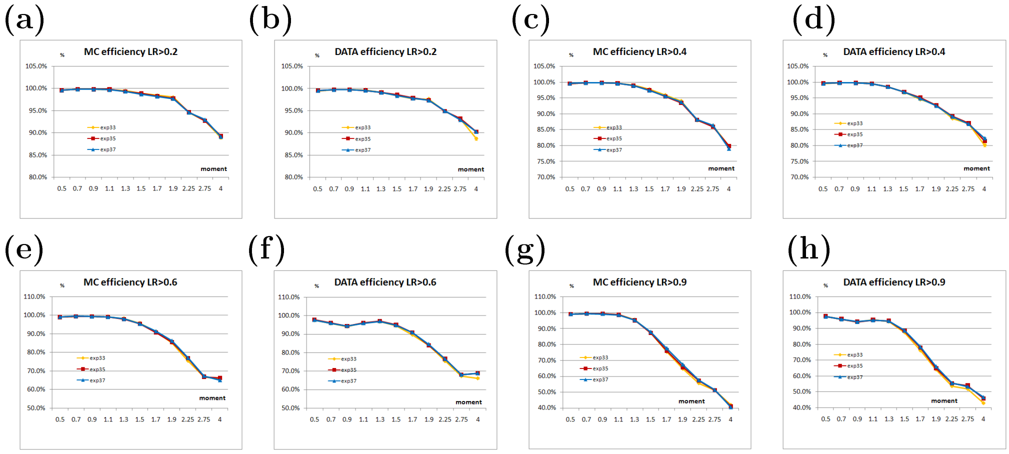


Figure 6.19: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp33 to 37,:Yellow Exp33, Red Exp35, Blue Exp37;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

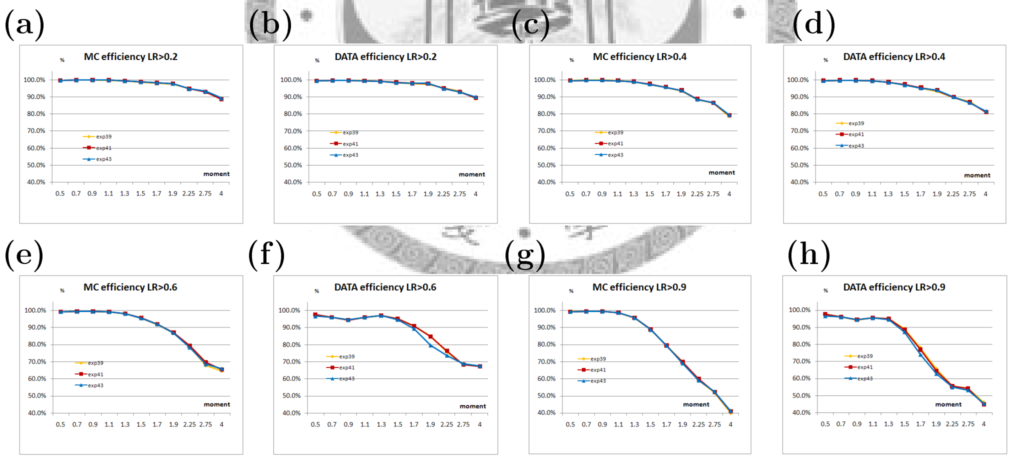


Figure 6.20: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp39 to 43:Yellow Exp39, Red Exp41, Blue Exp43;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

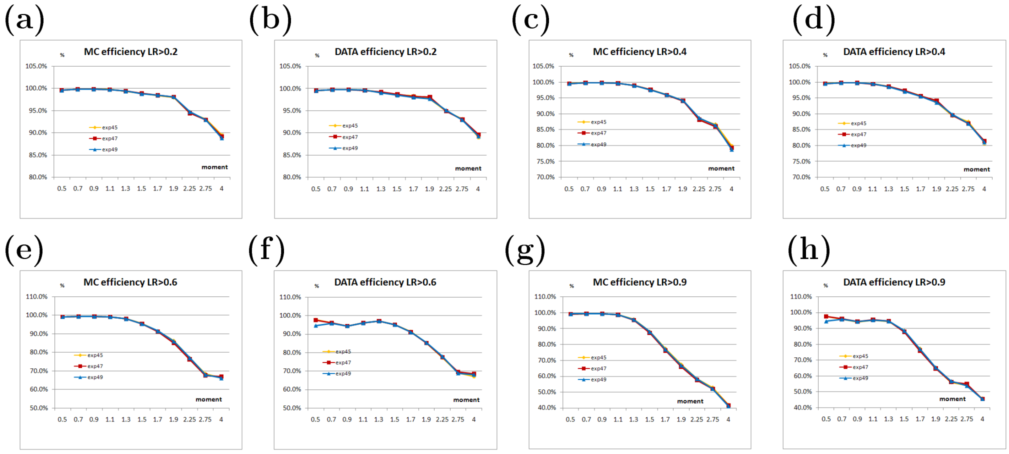


Figure 6.21: Efficiencies of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp45 to 49,;Yellow Exp45, Red Exp47, Blue Exp49;(a)MC $L_{p-K} > 0.2$, (b)Data $L_{p-K} > 0.2$, (c)MC $L_{p-K} > 0.4$, (d)Data $L_{p-K} > 0.4$, (e)MC $L_{p-K} > 0.6$, (f)Data $L_{p-K} > 0.6$, (g)MC $L_{p-K} > 0.9$, (h)Data $L_{p-K} > 0.9$

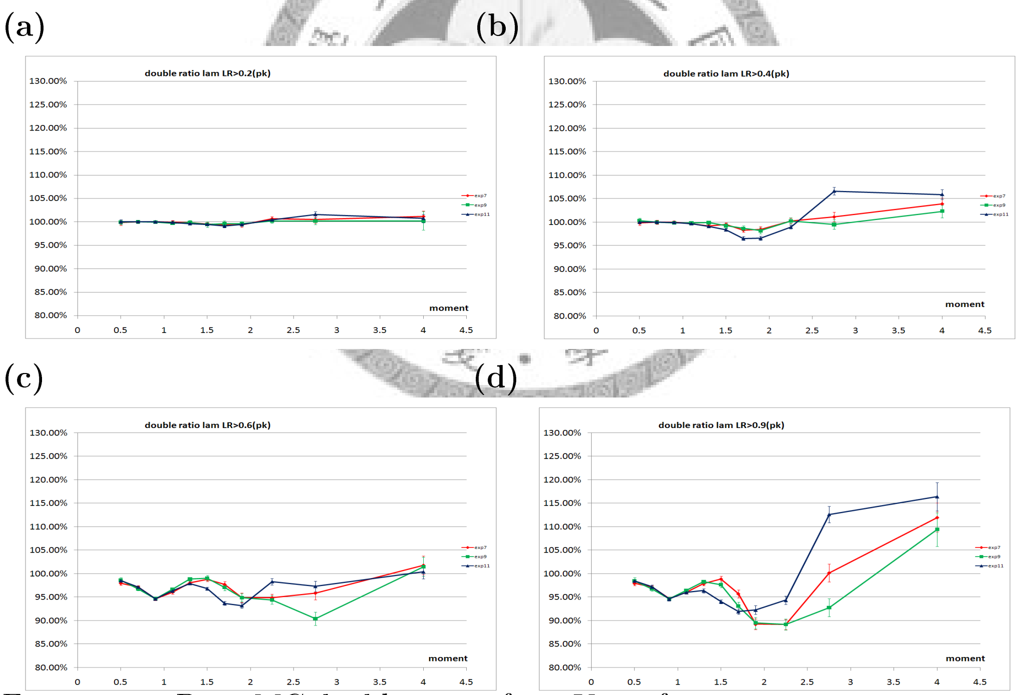


Figure 6.22: Data-MC double ratio of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp7 to 11:Red Exp7, Green Exp9, Blue Exp11;(a)$L_{p-K} > 0.2$, (b)$L_{p-K} > 0.4$, (c)$L_{p-K} > 0.6$, (d)$L_{p-K} > 0.9$

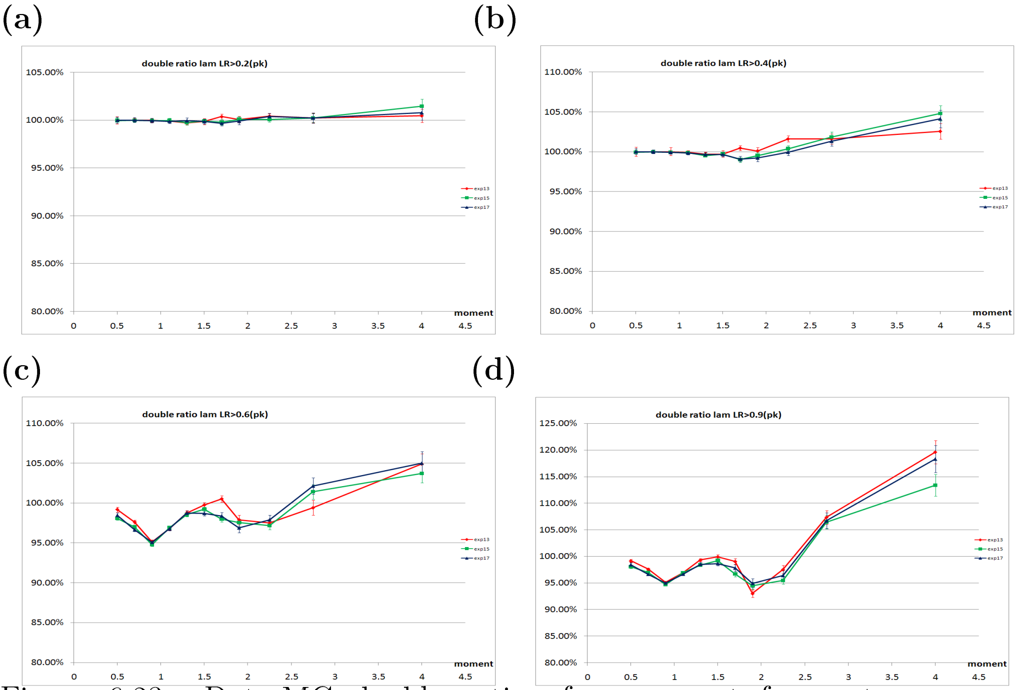


Figure 6.23: Data-MC double ratio of $p - \pi$ cut for proton momentum range 0.4-5 GeV from Exp13 to 17:Red Exp13, Green Exp15, Blue Exp17;(a)$L_{p-K} > 0.2$, (b)$L_{p-K} > 0.4$, (c)$L_{p-K} > 0.6$, (d)$L_{p-K} > 0.9$

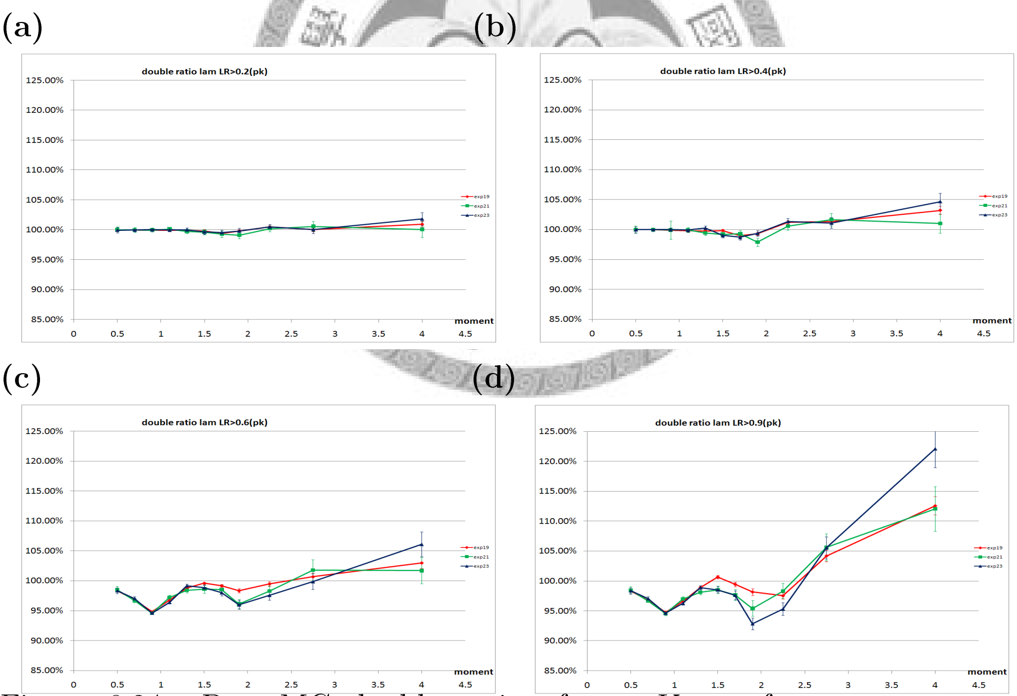


Figure 6.24: Data-MC double ratio of $p - K$ cut for proton momentum range 0.4-5 GeV from Exp19 to 23:Red Exp19, Green Exp21, Blue Exp23;(a)$L_{p-K} > 0.2$, (b)$L_{p-K} > 0.4$, (c)$L_{p-K} > 0.6$, (d)$L_{p-K} > 0.9$

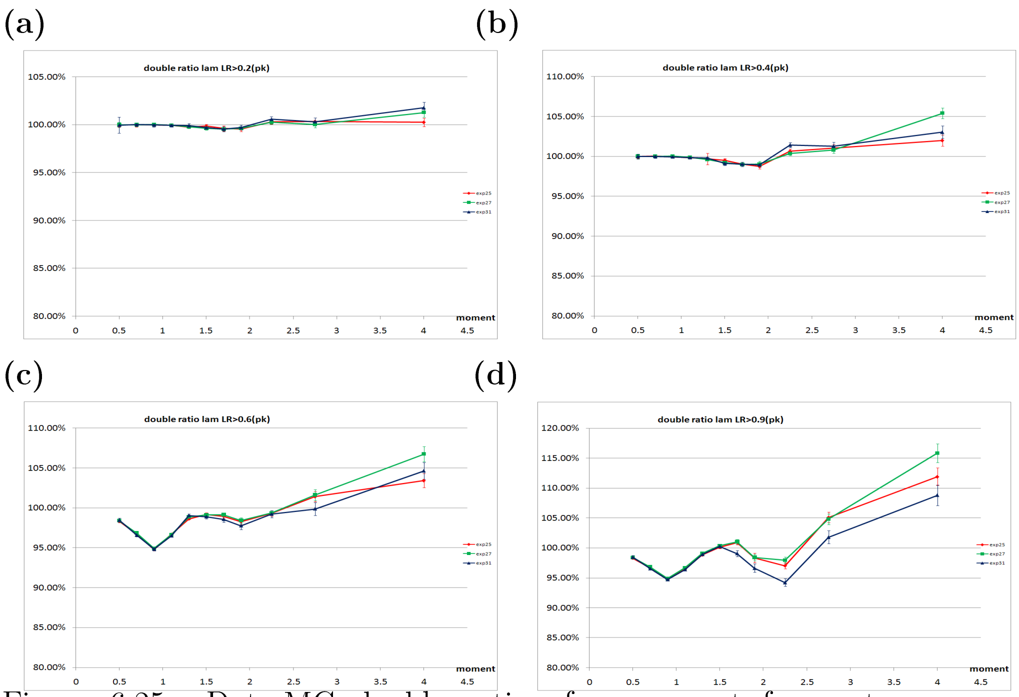


Figure 6.25: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp25 to 31:Red Exp25, Green Exp27, Blue Exp31;(a)$L_{p-K}>0.2$, (b)$L_{p-K}>0.4$, (c)$L_{p-K}>0.6$, (d)$L_{p-K}>0.9$

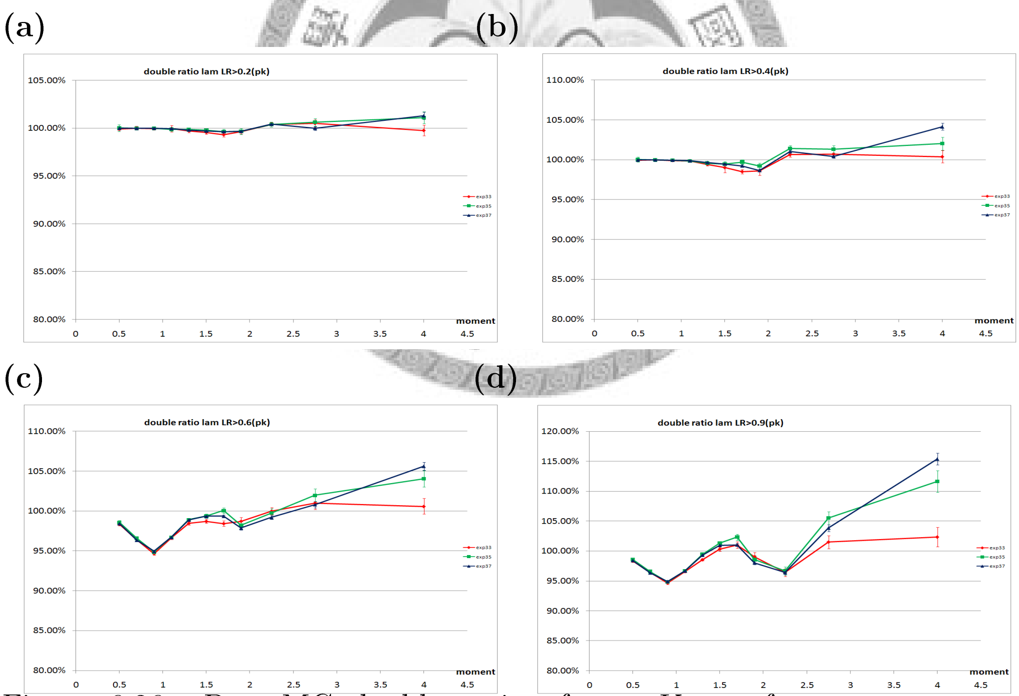


Figure 6.26: Data-MC double ratio of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp33 to 37:Red Exp33, Green Exp35, Blue Exp37;(a)$L_{p-K}>0.2$, (b)$L_{p-K}>0.4$, (c)$L_{p-K}>0.6$, (d)$L_{p-K}>0.9$

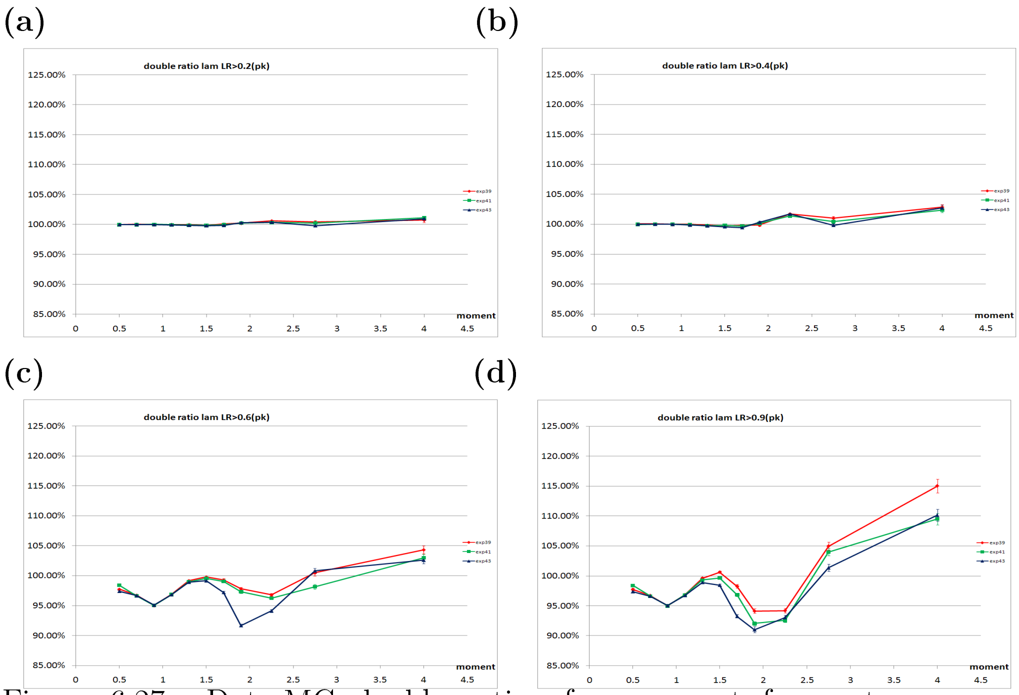


Figure 6.27: Data-MC double ratio of $p-\pi$ cut for proton momentum range 0.4-5 GeV from Exp39 to 43:Red Exp39, Green Exp41, Blue Exp43;(a)$L_{p-K}>0.2$, (b)$L_{p-K}>0.4$, (c)$L_{p-K}>0.6$, (d)$L_{p-K}>0.9$

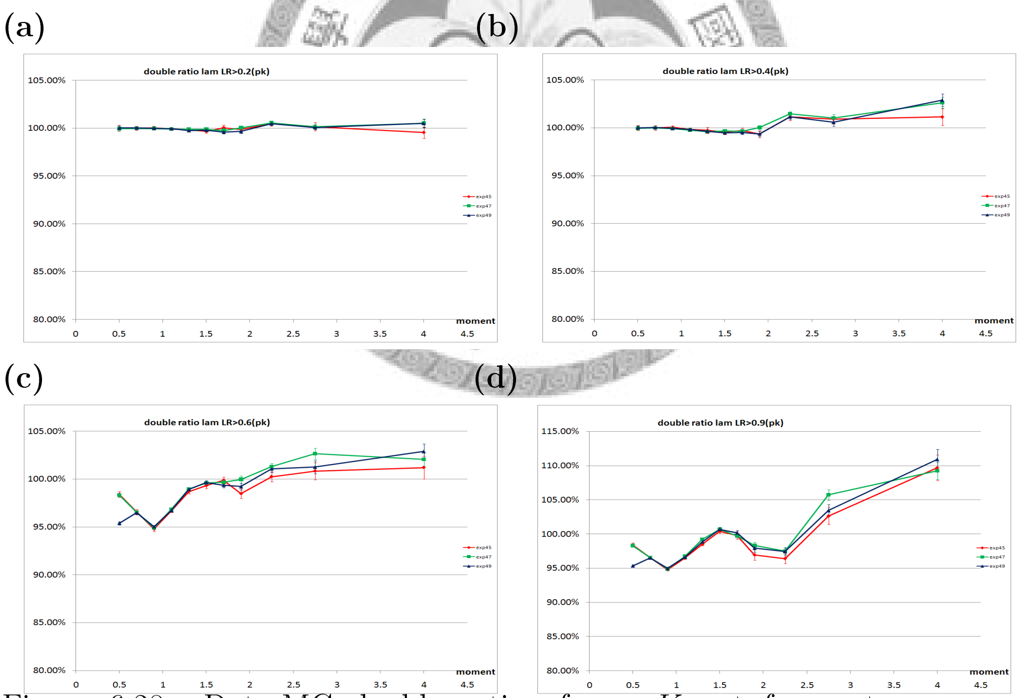


Figure 6.28: Data-MC double ratio of $p-K$ cut for proton momentum range 0.4-5 GeV from Exp45 to 49:Red Exp45, Green Exp47, Blue Exp49;(a)$L_{p-K}>0.2$, (b)$L_{p-K}>0.4$, (c)$L_{p-K}>0.6$, (d)$L_{p-K}>0.9$

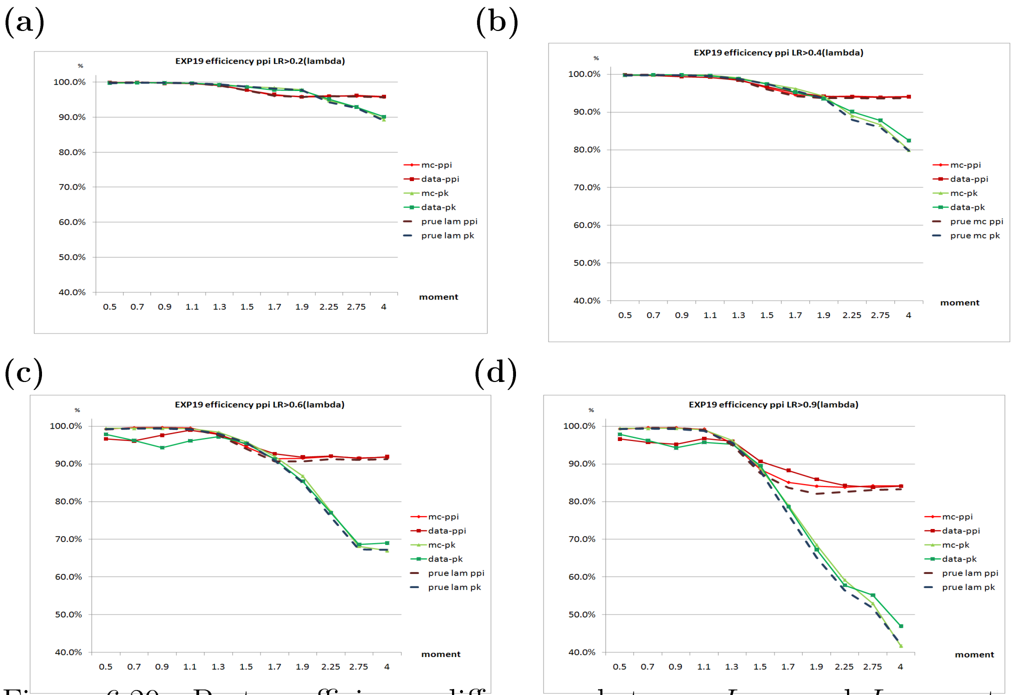
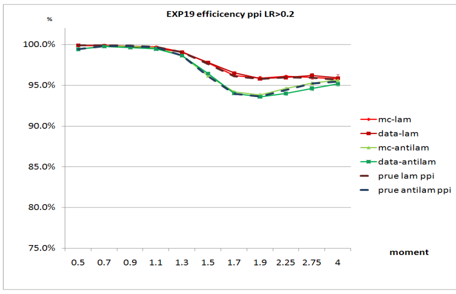


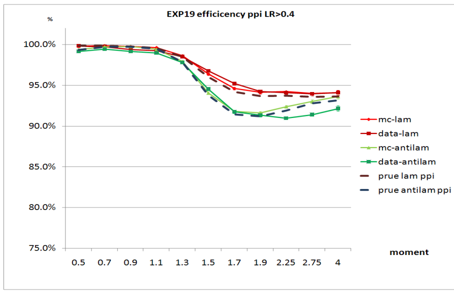
Figure 6.29: Proton efficiency differences between $L_{p-\pi}$ and L_{p-K} cut of Exp19 ;(a)$PID > 0.2$, (b)$PID > 0.4$, (c)$PID > 0.6$, (d)$PID > 0.9$

Figure 6.30: Proton Data-MC double ratio differences between $L_{p-\pi}$ and L_{p-K} cut of Exp19 ;(a)$PID > 0.2$, (b)$PID > 0.4$, (c)$PID > 0.6$, (d)$PID > 0.9$

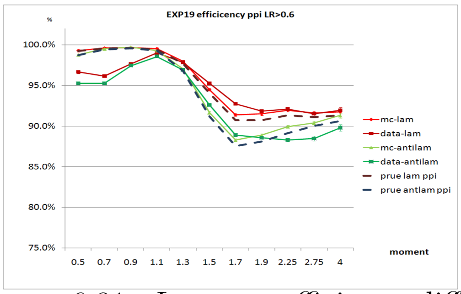
(a)



(b)



(c)



(d)

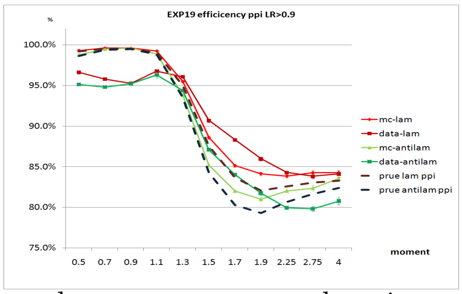
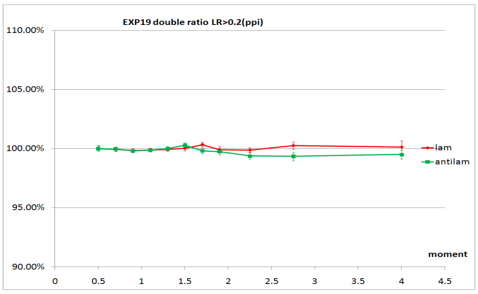
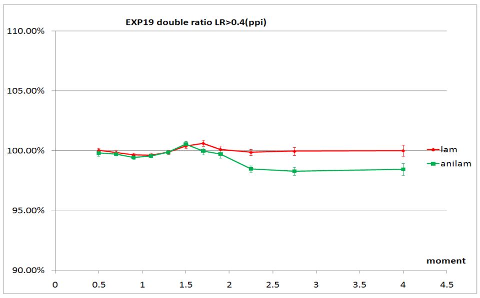


Figure 6.31: $L_{p-\pi}$ cut efficiency differences between proton and anti-proton of Exp19; (a)$PID > 0.2$, (b)$PID > 0.4$, (c)$PID > 0.6$, (d)$PID > 0.9$

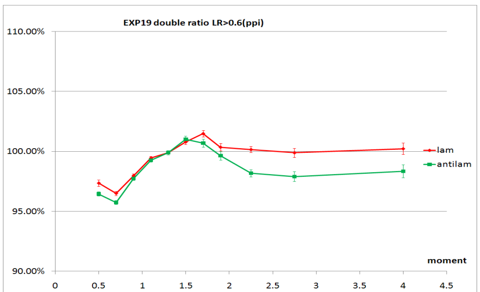
(a)



(b)



(c)



(d)

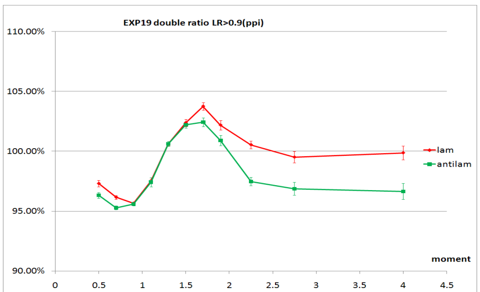


Figure 6.32: $L_{p-\pi}$ cut Data-MC double ratio differences between proton and anti-proton of Exp19; (a)$PID > 0.2$, (b)$PID > 0.4$, (c)$PID > 0.6$, (d)$PID > 0.9$

The efficiencies and double ratio difference between $L_{p-\pi}$ cut and L_{p-K} cut are listed in the Fig. 6.29 and Fig. 6.30 (take Exp19 for example), in which we can find efficiencies with two different PID cuts got more difference with tighter PID cut. Dash lines are efficiencies of pure Λ selected with the same particle number criteria from MC. With the same PID cut the L_{p-K} efficiency usually decrease more than $L_{p-\pi}$ cut, especially in the high momentum range. The double ratio, in the same way, fluctuates more with the L_{p-K} cut in high momentum range, which means MC disagrees Data most when we take the tightest cut in the high momentum region. Besides the high momentum region, double ratio with L_{p-K} cut are usually within 4%. For $L_{p-\pi}$ cut, double ratios are mostly within 5% even with the tightest cut (> 0.9).

The difference between proton and anti-proton is shown in Fig. 6.31 and Fig. 6.32 (still take Exp19 for example). From these plots we find efficiencies of anti-proton decrease more than of proton, especially when we take the tightest PID cut (> 0.9) in high momentum range. The proton's and anti-proton's double ratios fluctuates similarly. Mostly the double ratios of proton or anti-proton are within 5%.

Chapter 7

Polar Angle Study

7.1 Polar angle division

Considering the requirement of PID package user, we merged $L_{p-\pi}$ and L_{p-K} into one $L_{p(Proton)}$ cut, which means in the following part if we took $L_p > 0.6$, we would take $L_{p-\pi} > 0.6$ and $L_{p-K} > 0.6$ at the same time. In the result of the PID criteria performance difference from different polar angle, we study data sample not only dividing them into 11 momentum bins, but also dividing them into 4 polar angle bins according to the counter types of ACC sub-detector. The polar angle binning is shown in Fig. 7.1, and the angle ranges for each bin are listed in Table. 7.1. Event distribution in 4 angle bins is shown in Fig. 7.1.

Table 7.1: The polar angle binning

Bin number	Angle
Bin1(back-endcap)	127°-180°
Bin2(back-barrel)	57°-127°
Bin3(forwards-barrel)	34°-57°
Bin4((forwards-endcap)	0°-34°

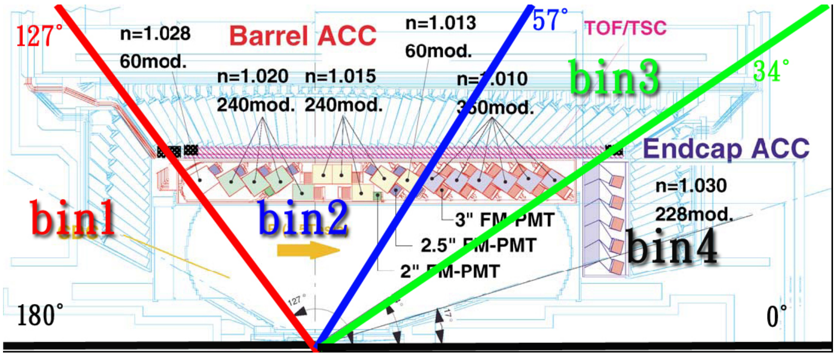


Figure 7.1: Polar angle bins division according to ACC counter types; Bin1 backward endcap 127°-180°, Bin2 backward barrel 57°-127°, Bin3 forwards barrel 34°-57°, Bin4 forwards endcap 34°-0°

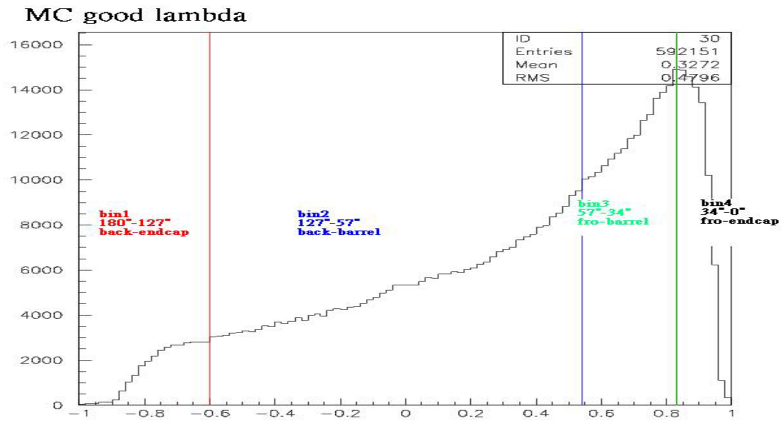


Figure 7.2: Event distribution in 4 polar angle bins

Thinking about the event number ratio of SVD1 to SVD2, as well as the PID criteria perform and similarly in different Exp number, we took Exp11 and Exp25 in SVD1, and took Exp31, Exp37, Exp47 in SVD2, to study the following polar angle division part. Efficiencies and Data-MC double ratio are listed in Chpater Table2 and Table3, as well as their statistic errors. Fig. 7.3 to Fig. 7.12 show the plots of proton efficiencies and double ratios in Chapter Table2 and Table3. Due to the statistic of backward endcap bin (bin1) is not enough, so we would adjust the range of horizontal axis in those plots.

We don't have enough statistics in Bin1. From Fig. 7.11 to Fig. 7.12 we find there is a double ratio structure around momentum 2.0GeV no matter in SVD1 or SVD2, especially when we take the tight PID cut, which we'll discuss in the next chapter. Except for bin4, the double ratio are mostly within 5%.

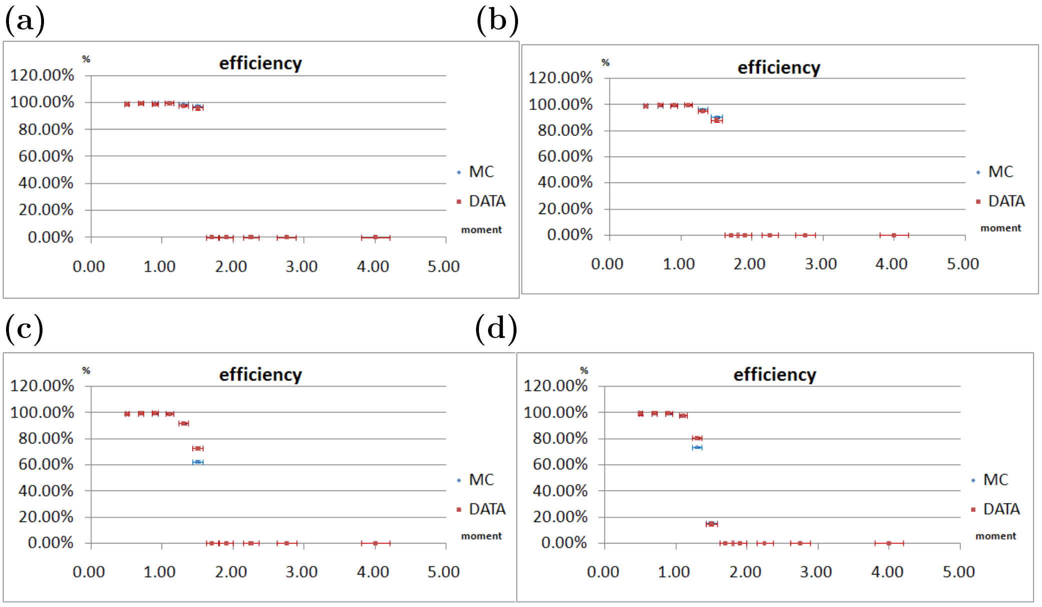


Figure 7.3: Proton efficiencies of MC and Data of SVD1 in bin1(backward endcap):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

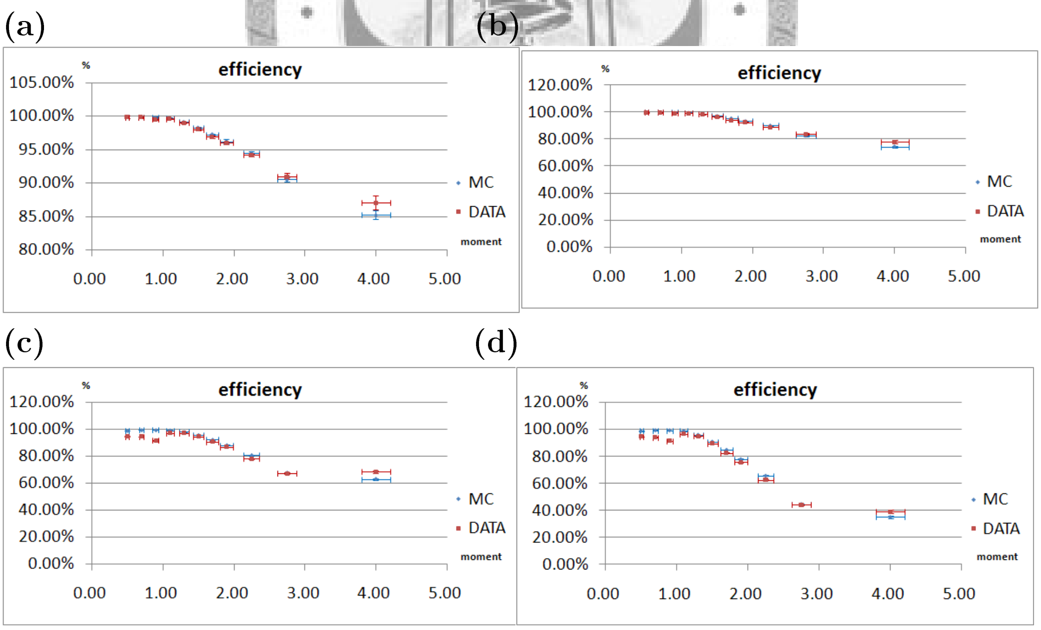


Figure 7.4: Proton efficiencies of MC and Data of SVD1 in bin2(backward barrel):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

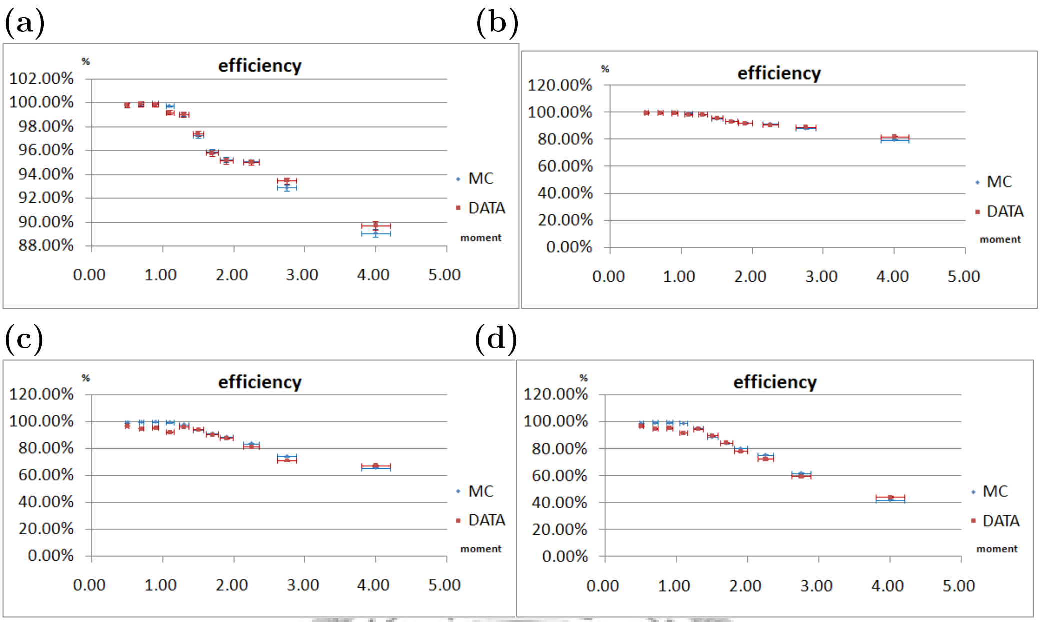


Figure 7.5: Proton efficiencies of MC and Data of SVD1 in bin3(forwards barrel):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

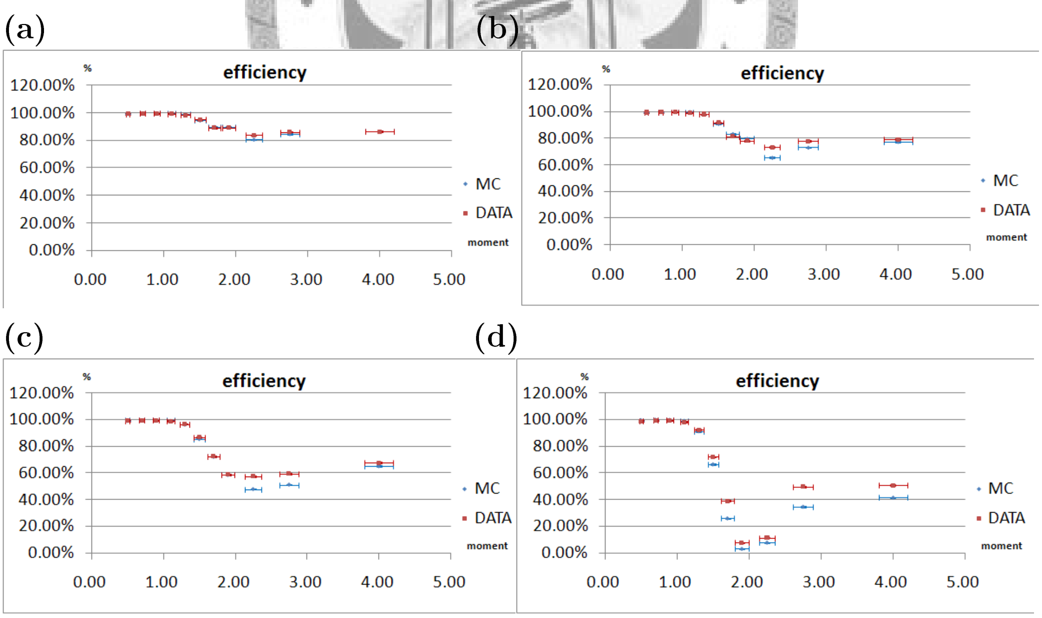


Figure 7.6: Proton efficiencies of MC and Data of SVD1 in bin4(forwards endcap):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

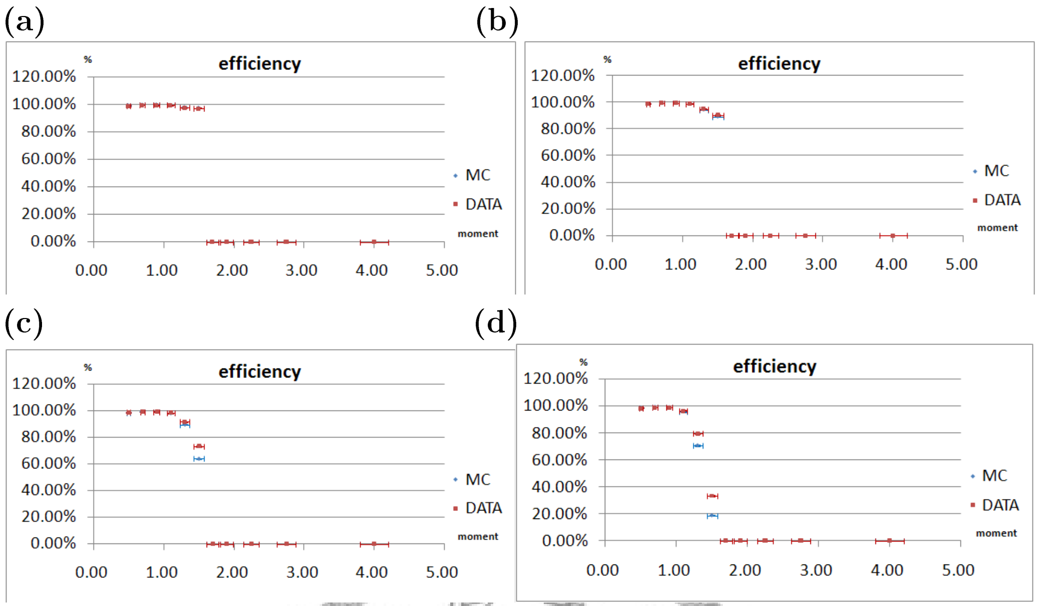


Figure 7.7: Proton efficiencies of MC and Data of SVD2 in bin1(backward endcap):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

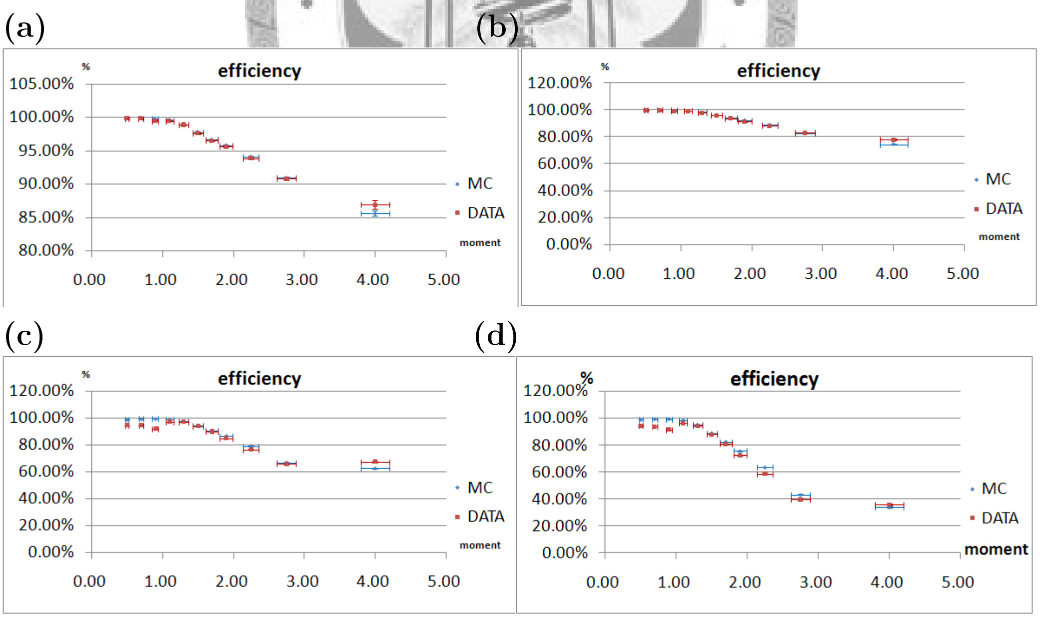


Figure 7.8: Proton efficiencies of MC and Data of SVD2 in bin2(backward barrel):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

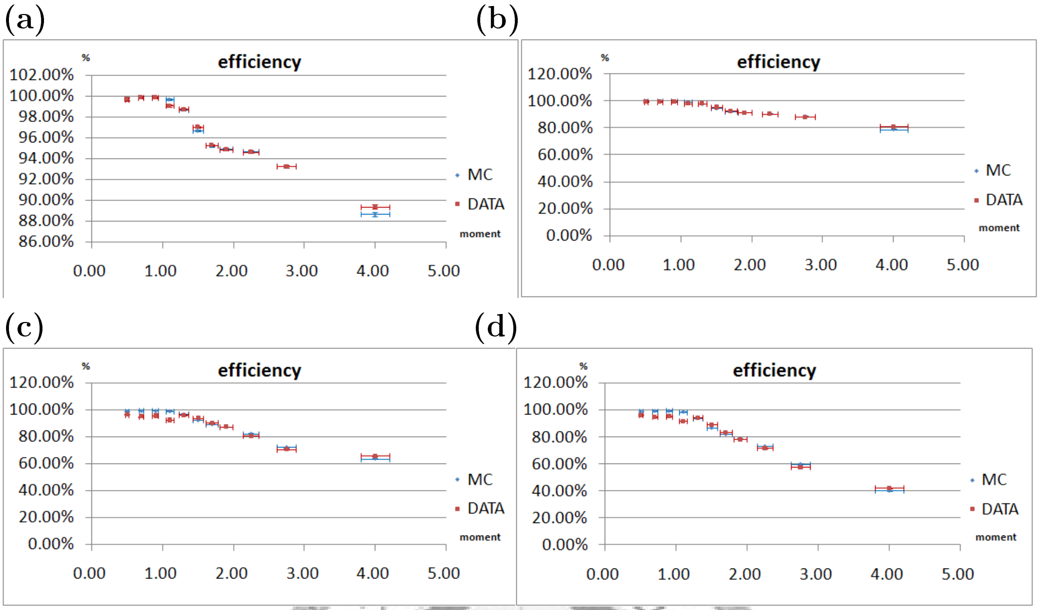


Figure 7.9: Proton efficiencies of MC and Data of SVD2 in bin3(forwards barrel):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

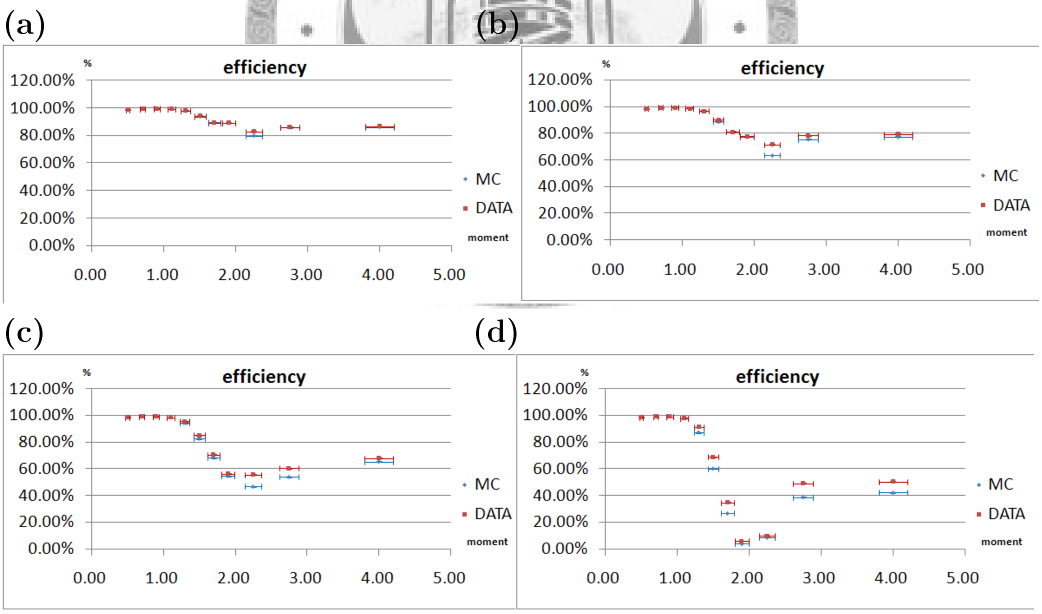


Figure 7.10: Proton efficiencies of MC and Data of SVD2 in bin4(forwards endcap):Blue MC, Red Data;(a)$L_p > 0.2$, (b)$L_p > 0.4$, (c)$L_p > 0.6$, (d)$L_p > 0.9$

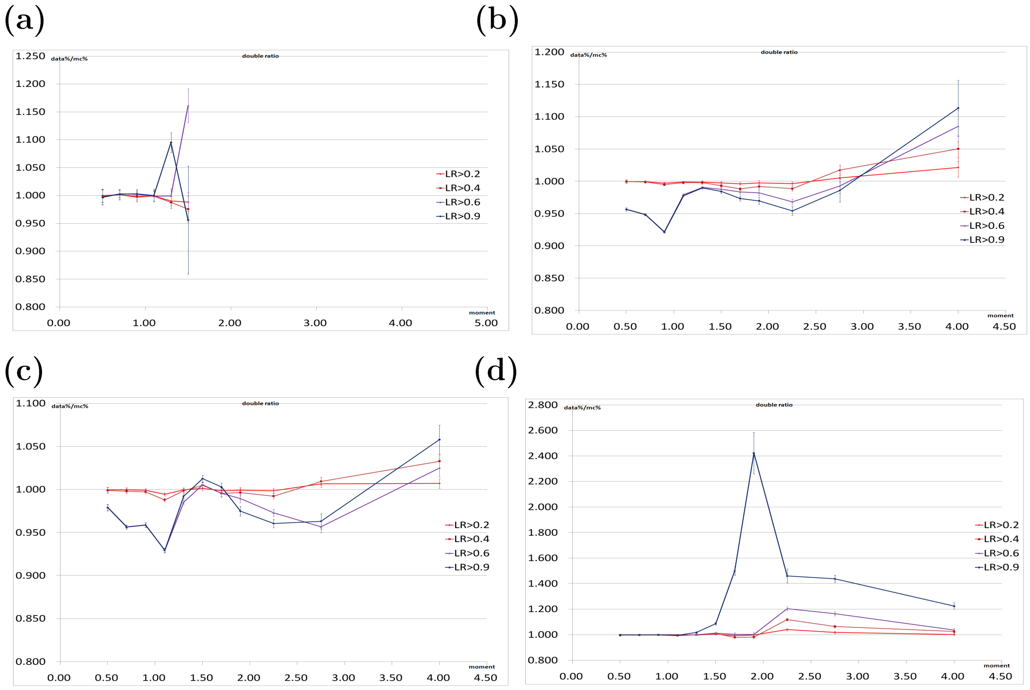


Figure 7.11: Proton Data-MC double ratio of SVD1 in 4 polar bins with different PID criteria; lightRed: $L_p > 0.2$,darkRed:$L_p > 0.4$, Purple:$L_p > 0.6$, Blue:$L_p > 0.9$;(a)Bin1, (b)Bin2, (c)Bin3, (d)Bin4

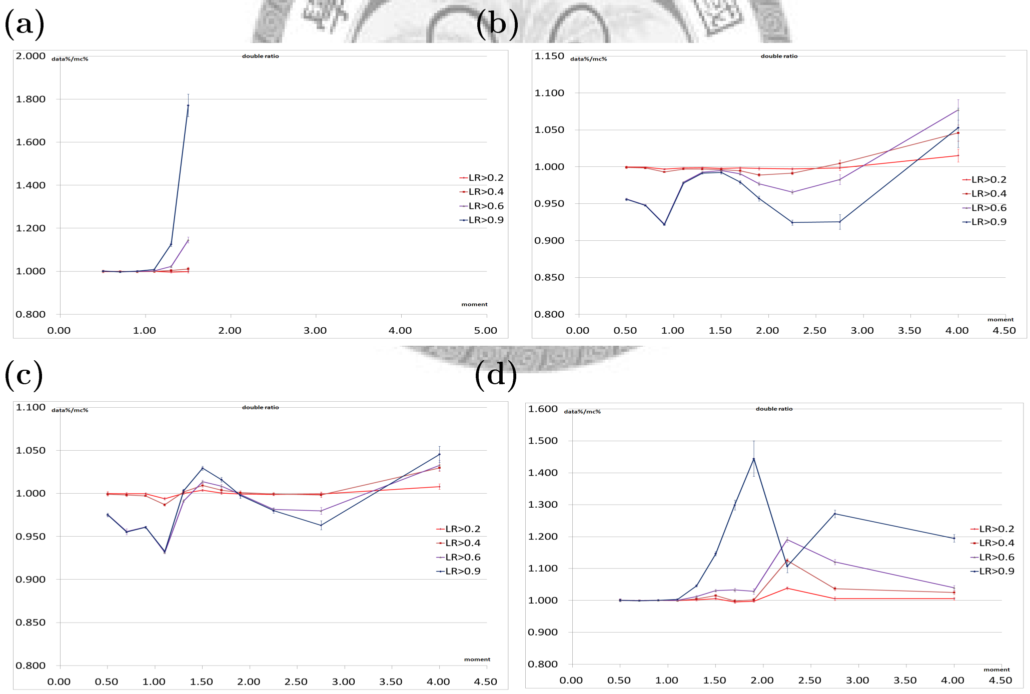


Figure 7.12: Proton Data-MC double ratio of SVD2 in 4 polar bins with different PID criteria; lightRed: $L_p > 0.2$,darkRed:$L_p > 0.4$, Purple:$L_p > 0.6$, Blue:$L_p > 0.9$;(a)Bin1, (b)Bin2, (c)Bin3, (d)Bin4

7.2 Error

7.2.1 statistic error

In Chapter Table1, Chapter Table2, and Chapter Table3 we list the statistics errors of MC efficiencies, Data efficiencies, and Data-MC double ratios. For the MC and Data efficiencies, we calculated their statistic error with the formula:

$$\delta\epsilon \;=\; \frac{1}{n} \times \left[\sqrt{m(1-\frac{n}{m})} \oplus \sqrt{((\delta n)^2 - n) \times (1 - \frac{(\delta n)^2 - n}{(\delta m)^2 - m})} \right]$$

Where n and m are the event numbers with and without PID criteria, δm and δn are the statistic errors of event numbers with and without PID criteria, we can get these error information from fitting results with PAW package. $\oplus$ is quadratic sum, which means we square those numbers, add them, and take the square root value as a result. In Chapter Table1 we can find the statistic error of MC and Data efficiencies are in a range of about 0.2-0.8%.

For the Data-MC double ratio, we calculate their statistic error with the formula:

$$\delta R \;=\; \frac{\epsilon_{DATA}}{\epsilon_{MC}} \times \left[\sqrt{(\frac{\delta\epsilon_{MC}}{\epsilon_{MC}})^2 + (\frac{\delta\epsilon_{DATA}}{\epsilon_{DATA}})^2} \right]$$

Where $\delta\epsilon_{MC}$ and $\delta\epsilon_{DATA}$ are statics error of MC and Data efficiencies calculated from the formula above.

7.2.2 systematic error

The systematic errors for efficiencies and double ratio are the quadratic sum of shape dependence error and expermiment dependence error:

$$\delta\epsilon_{sys} \;=\; \sqrt{(\delta\epsilon_{Shape})^2 + (\delta\epsilon_{Exp})^2}$$
$$\delta R_{sys} \;=\; \sqrt{(\delta R_{Shape})^2 + (\delta R_{Exp})^2}$$

For the shape dependence error, for simplification and considering the tendency of efficiency, we chose two momentum bins, 0.6-0.8GeV and 1.6-1.8GeV, to calculate the shape dependence errors. We got new efficiencies by varying the values of each fixed shape parameter by $\pm 1\sigma$, [4] and calculate the efficiency shape dependence errors with the formula:

$$\delta\epsilon_{Shape} \quad = \quad \frac{\Delta\epsilon}{\epsilon_{Original}}$$

After we have MC and Data new efficiencies we can calculate the shape dependence error of double ratio, with the same formula which we calculate the statistic double ratio error. The result is listed in the following Table 7.2.

For the experiment dependent error, we took the formula of root-mean-square error to calculate the difference between different Exp numbers. Exp dependent error is up to the momentum of particle and the PID criteria, but not up to the particle type. So we only calculate it in 11 momentum bins with four PID cuts of SVD1 and SVD2. The result is listed in Table. 7.3.

SVD1	momentum	MC		Data	
		Λ	$\overline{\Lambda}$	Λ	$\overline{\Lambda}$
effieicncy	0.6-0.8GeV	0.324%	0.201%	0.356%	0.217%
	1.6-1.8GeV	0.297%	0.417%	0.534%	0.817%
double ratio	0.6-0.8GeV	0.033%	0.021%		
	1.6-1.8GeV	0.240%	0.401%		
SVD2					
effieicncy	0.6-0.8GeV	0.118%	0.109%	0.157%	0.124%
	1.6-1.8GeV	0.256%	0.237%	0.267%	0.296%
double ratio	0.6-0.8GeV	0.039%	0.016%		
	1.6-1.8GeV	0.034%	0.069%		

Table 7.2: The shape dependent systematic error of efficiency and double ratio

	SVD1			SVD2		
LR	%		double ratio	%		double ratio
(> 0.2)	MC	DATA		MC	DATA	
	0.03%	0.05%	0.03%	0.02%	0.02%	0.02%
	0.01%	0.020%	0.010%	0.01%	0.01%	0.02%
	0.03%	0.030%	0.030%	0.01%	0.01%	0.01%
	0.05%	0.050%	0.060%	0.03%	0.03%	0.03%
	0.12%	0.080%	0.090%	0.04%	0.05%	0.07%
	0.19%	0.17%	0.16%	0.14%	0.14%	0.08%
	0.26%	0.210%	0.280%	0.21%	0.16%	0.20%
	0.21%	0.170%	0.240%	0.21%	0.25%	0.28%
	0.15%	0.120%	0.150%	0.11%	0.08%	0.09%
	0.39%	0.300%	0.360%	0.17%	0.17%	0.24%
	0.58%	0.63%	0.49%	0.32%	0.54%	0.51%
(> 0.4)						
	0.03%	0.08%	0.07%	0.02%	0.02%	0.02%
	0.02%	0.02%	0.02%	0.01%	0.01%	0.02%
	0.04%	0.03%	0.05%	0.02%	0.02%	0.03%
	0.06%	0.06%	0.06%	0.05%	0.04%	0.06%
	0.18%	0.17%	0.22%	0.06%	0.07%	0.10%
	0.40%	0.22%	0.37%	0.19%	0.18%	0.22%
	0.55%	0.34%	0.75%	0.21%	0.30%	0.32%
	0.67%	0.48%	0.77%	0.23%	0.63%	0.65%
	0.40%	0.39%	0.61%	0.25%	0.43%	0.30%
	1.08%	0.50%	1.28%	0.27%	0.24%	0.47%
	0.69%	0.85%	1.42%	0.42%	0.61%	0.93%
(> 0.6)						
	0.10%	0.23%	0.27%	0.04%	0.80%	0.84%
	0.03%	0.25%	0.25%	0.07%	0.08%	0.13%
	0.05%	0.15%	0.15%	0.03%	0.11%	0.12%
	0.07%	0.20%	0.21%	0.06%	0.07%	0.09%
	0.22%	0.23%	0.28%	0.10%	0.11%	0.15%
	0.58%	0.30%	0.65%	0.16%	0.24%	0.29%
	0.99%	0.68%	1.47%	0.34%	0.62%	0.85%
	1.08%	1.03%	1.65%	0.75%	1.86%	2.57%
	1.02%	1.07%	1.48%	1.20%	1.20%	2.53%
	1.18%	1.39%	2.54%	0.87%	0.63%	1.30%
	0.90%	0.93%	1.88%	0.70%	0.72%	1.43%
(> 0.8)						
	0.10%	0.22%	0.26%	0.05%	0.81%	0.85%
	0.03%	0.25%	0.25%	0.07%	0.08%	0.12%
	0.06%	0.14%	0.15%	0.03%	0.11%	0.12%
	0.09%	0.20%	0.22%	0.07%	0.08%	0.11%
	0.38%	0.33%	0.47%	0.12%	0.17%	0.24%
	0.94%	0.55%	1.17%	0.33%	0.41%	0.52%
	1.37%	1.20%	2.36%	1.04%	1.26%	2.01%
	1.47%	1.55%	2.73%	1.93%	1.86%	3.69%
	1.16%	1.43%	2.41%	1.31%	0.78%	2.02%
	1.22%	1.24%	2.47%	0.55%	0.59%	0.92%
	0.99%	1.35%	2.23%	0.62%	0.76%	2.08%

Table 7.3: The Experiment dependent systematic error of efficiency and double ratio

7.3 Study of sub-detector

From Fig. 7.11 and Fig. 7.12, we found there is a huge disagreement between MC and Date, which happens in the same way for anti-proton, around momentum of 2GeV. For checking which sub-detector causes the disagreement, we turn off the sub-detector one by one. Table. 7.4 are the particle identification functions we used in bin4 (forwards endcap) for checking sub-detector. The result is listed in Fig. 7.13 and Fig. 7.14.

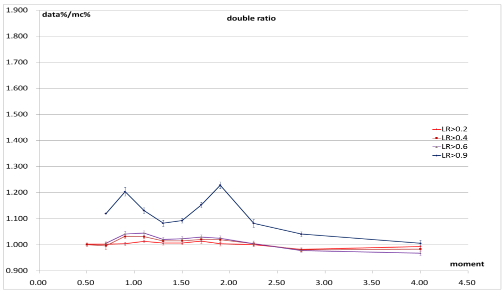
Fig. 7.13.(c) and Fig. 7.14.(c) tell us the TOF sub-detector is not working in the bin4 region. Among ACC ad CDC, ACC takes more responsibility of particle identification than CDC in forwards endcap region. But the ACC counter in the forwards endcap region are working on the flavor tagging. Depend on the different momentum working range of different sub-detector, we can tell the disagreement between MC and Data around 2.0 GeV is obvious. Fig. 7.15 shows the PID distribution measurement result of turning on different sub-detector, in which $L_p = 0.5$ means the system can't distinguish the type of this particle.

In the following part we divide Bin4 into two smaller angles, bin4-1 and bin4-2. Fig. 7.16 shows the divided ranges of bin4-1 and bin4-2. The measurement result of particle identification in bin4-1 and bin4-2 are listed in Fig. 7.17. From Fig 5.17 we know the most part of L_p cut's disagreement between MC and Data around 2.0 GeV is mainly caused by the L_{p-K} cut in the bin4-2, which is the region of about 0 polar angle.

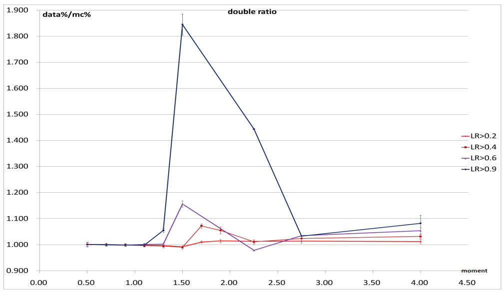
Sub-Detector	Probability function
Only ACC ON	$L_{p-\pi}$: atc_pid(-1,1,5,4,3)
	L_{p-K} : atc_pid(-1,1,5,4,2)
Only CDC ON	$L_{p-\pi}$: atc_pid(3,1,-1,4,3)
	L_{p-K} : atc_pid(3,1,-1,4,2)
Only TOF ON	$L_{p-\pi}$: atc_pid(3,-1,5,4,3)
	L_{p-K} : atc_pid(3,-1,5,4,2)

Table 7.4: The identification functions for turning down the sub-detectors

(a)



(b)



(c)

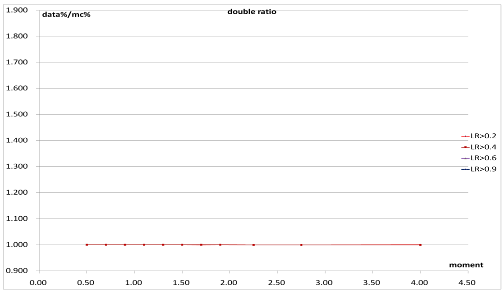
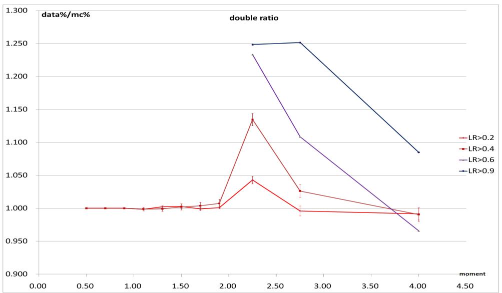
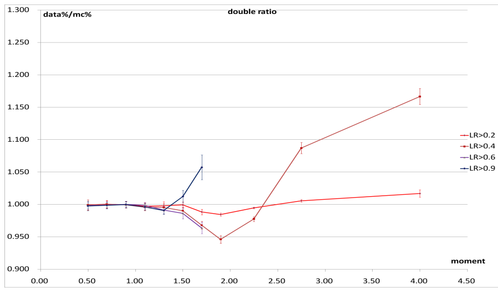


Figure 7.13: The proton double ratio with $L_{p-\pi}$ cut for turning on one sub-detector each time in bin4;(a)only ACC working ,(b)only CDC working ,(c)only TOF working

(a)



(b)



(c)

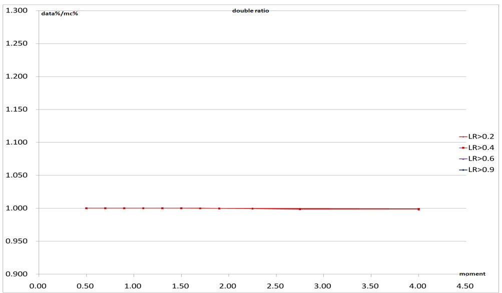


Figure 7.14: The proton double ratio with L_{p-K} cut for turning on one sub-detector each time in bin4;(a)only ACC working,(b)only CDC working,(c)only TOF working

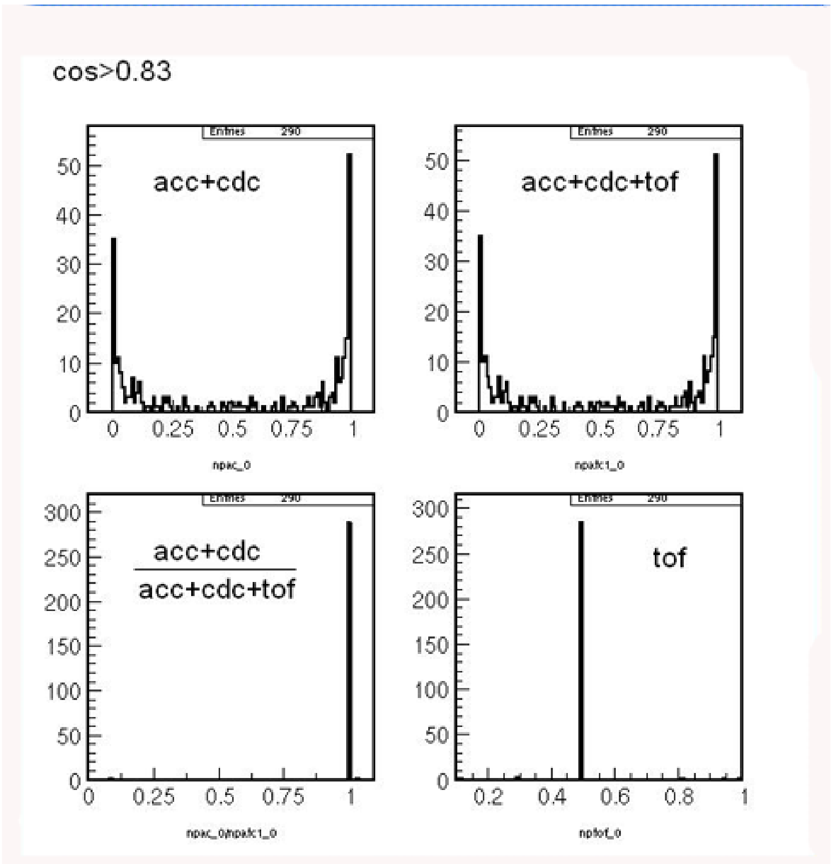


Figure 7.15: The PID distribution in bin4 when different sub-detector are working;(a)only ACC and CDC working,(b)all sub-detectors are working,(c)the PID distribution division of ACC+CDC over all sub-detector,(d)only TOF working

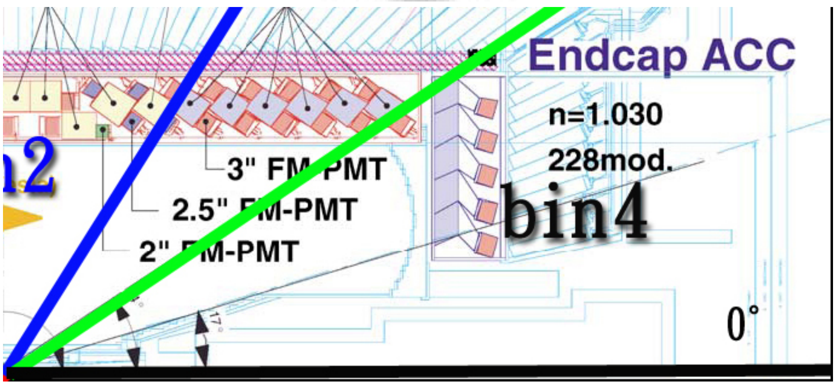


Figure 7.16: The angle ranges of bin4-1 and bin4-2

(a) (b)

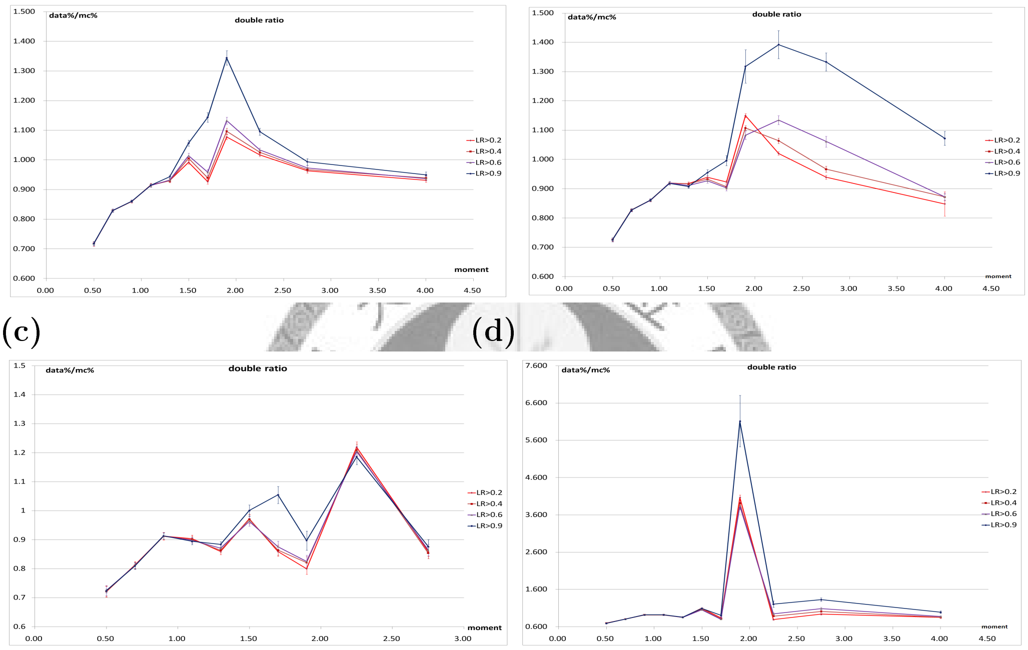


Figure 7.17: The proton Data-MC double ratio (a)in bin4-1 with $L_{p-\pi}$ cut,(b) in bin4-1 with L_{p-K} cut,(c)in bin4-2 with $L_{p-\pi}$ cut,(d)in bin4-2 with L_{p-K} cut

Chapter 8

Summary

Λ events are used to study the proton identification performance at Belle. First we used $L_{p-\pi}$ and L_{p-K} likelihood ratio to identify particles in every Exp. From the first part of result we know the PID performance in different Exp number behave similarly. We can calculate the Exp dependent error, which is dependent on proton momentum (11 bins), and is in a range of 0.2-3%. MC and Data disagrees more with L_{p-K} cut than with $L_{p-\pi}$ cut, especially in high momentum region and with tight PID cut. Besides that, most double ratio are within about 4%. With the same PID cut, efficiency decreases more of anti-proton than that of proton. However the double ratio value tendency doesn't have much difference.

Considering the usage of PID identification functions, study about merging $L_{p-\pi}$ and L_{p-K} cuts into one $L_{p(proton)}$ cut in different polar angle is performed. In the barrel region, double ratios are within about 4% even with the tightest PID cut (> 0.9). But in the forwards endcap region, we find apparent disagreement around momentum 2 GeV, which is caused by the different working area of 3 sub-detectors, ACC CDC and TOF. The disagreement is attributable to the L_{p-K} cut in the region of about 0 polar angle.

Chapter 9

Table1

$L_{p-\pi} > 0.2$							
exp7	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.90%**	0.38%	**99.93%**	0.429%	**100.03%**	0.58%
	0.6-0.8	**99.88%**	0.16%	**99.85%**	0.156%	**99.97%**	0.22%
	0.8-1.0	**99.81%**	0.20%	**99.71%**	0.230%	**99.90%**	0.30%
	1.0-1.2	**99.57%**	0.25%	**99.57%**	0.251%	**100.00%**	0.35%
	1.2-1.4	**99.06%**	0.15%	**99.15%**	0.273%	**100.10%**	0.32%
	1.4-1.6	**98.18%**	0.33%	**98.09%**	0.323%	**99.91%**	0.47%
	1.6-1.8	**96.60%**	0.36%	**96.73%**	0.380%	**100.13%**	0.54%
	1.8-2.0	**96.49%**	0.40%	**96.47%**	0.462%	**99.98%**	0.63%
	2.0-2.5	**96.25%**	0.31%	**96.17%**	0.305%	**99.91%**	0.45%
	2.5-3.0	**96.49%**	0.44%	**96.36%**	0.525%	**99.86%**	0.71%
	3.0-5.0	**95.94%**	0.60%	**95.78%**	0.777%	**99.83%**	1.02%
exp9	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**100.06%**	0.41%	**100.12%**	0.496%	**100.06%**	0.64%
	0.6-0.8	**99.98%**	0.25%	**99.86%**	0.292%	**99.88%**	0.38%
	0.8-1.0	**99.89%**	0.26%	**99.79%**	0.276%	**99.91%**	0.38%
	1.0-1.2	**99.65%**	0.24%	**99.63%**	0.225%	**99.99%**	0.33%
	1.2-1.4	**99.19%**	0.28%	**99.16%**	0.282%	**99.97%**	0.40%
	1.4-1.6	**97.70%**	0.31%	**97.60%**	0.336%	**99.89%**	0.47%
	1.6-1.8	**96.46%**	0.24%	**96.34%**	0.372%	**99.88%**	0.46%
	1.8-2.0	**95.91%**	0.39%	**95.81%**	0.429%	**99.90%**	0.61%
	2.0-2.5	**96.07%**	0.30%	**95.72%**	0.355%	**99.64%**	0.48%
	2.5-3.0	**96.37%**	0.44%	**96.06%**	0.508%	**99.68%**	0.70%
	3.0-5.0	**96.35%**	0.38%	**96.32%**	0.705%	**99.97%**	0.83%
exp11	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.89%**	0.277%	**99.91%**	0.344%	**100.02%**	0.44%
	0.6-0.8	**99.93%**	0.185%	**99.87%**	0.236%	**99.94%**	0.30%
	0.8-1.0	**99.85%**	0.174%	**99.69%**	0.183%	**99.83%**	0.25%
	1.0-1.2	**99.77%**	0.178%	**99.57%**	0.193%	**99.80%**	0.26%
	1.2-1.4	**99.41%**	0.165%	**99.51%**	0.243%	**100.10%**	0.30%
	1.4-1.6	**97.73%**	0.199%	**97.99%**	0.231%	**100.26%**	0.31%
	1.6-1.8	**95.79%**	0.270%	**95.96%**	0.267%	**100.18%**	0.40%
	1.8-2.0	**94.43%**	0.310%	**95.01%**	0.244%	**100.61%**	0.42%
	2.0-2.5	**94.68%**	0.241%	**94.96%**	0.176%	**100.29%**	0.32%
	2.5-3.0	**94.69%**	0.349%	**94.95%**	0.373%	**100.27%**	0.54%
	3.0-5.0	**94.99%**	0.374%	**95.35%**	0.495%	**100.39%**	0.65%
$L_{p-\pi} > 0.4$							
exp7	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.86%**	0.38%	**99.86%**	0.470%	**100.00%**	0.60%
	0.6-0.8	**99.81%**	0.26%	**99.73%**	0.362%	**99.92%**	0.45%
	0.8-1.0	**99.73%**	0.23%	**99.42%**	0.204%	**99.70%**	0.31%
	1.0-1.2	**99.55%**	0.24%	**99.28%**	0.250%	**99.73%**	0.35%
	1.2-1.4	**98.52%**	0.30%	**98.48%**	0.272%	**99.96%**	0.41%
	1.4-1.6	**96.77%**	0.37%	**96.73%**	0.319%	**99.96%**	0.50%
	1.6-1.8	**95.19%**	0.38%	**95.40%**	0.391%	**100.22%**	0.57%
	1.8-2.0	**95.18%**	0.41%	**94.73%**	0.454%	**99.53%**	0.64%
	2.0-2.5	**94.48%**	0.33%	**94.36%**	0.360%	**99.87%**	0.52%
	2.5-3.0	**94.58%**	0.39%	**93.89%**	0.563%	**99.28%**	0.72%
	3.0-5.0	**93.93%**	0.64%	**94.38%**	0.811%	**100.48%**	1.10%
exp9	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.85%**	0.41%	**99.96%**	0.549%	**100.11%**	0.68%
	0.6-0.8	**99.93%**	0.25%	**99.78%**	0.290%	**99.85%**	0.38%
	0.8-1.0	**99.80%**	0.23%	**99.53%**	0.250%	**99.72%**	0.34%
	1.0-1.2	**99.44%**	0.22%	**99.26%**	0.253%	**99.82%**	0.34%
	1.2-1.4	**98.81%**	0.14%	**98.58%**	0.318%	**99.77%**	0.35%
	1.4-1.6	**96.00%**	0.35%	**96.13%**	0.351%	**100.13%**	0.52%
	1.6-1.8	**94.95%**	0.38%	**95.08%**	0.303%	**100.13%**	0.52%
	1.8-2.0	**93.91%**	0.31%	**93.97%**	0.456%	**100.06%**	0.59%
	2.0-2.5	**94.18%**	0.39%	**93.48%**	0.383%	**99.26%**	0.58%
	2.5-3.0	**94.95%**	0.47%	**93.68%**	0.555%	**98.67%**	0.76%
	3.0-5.0	**94.52%**	0.69%	**94.43%**	0.756%	**99.91%**	1.08%
exp11	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.85%**	0.28%	**99.82%**	0.367%	**99.97%**	0.46%
	0.6-0.8	**99.91%**	0.18%	**99.81%**	0.259%	**99.90%**	0.32%
	0.8-1.0	**99.78%**	0.24%	**99.43%**	0.179%	**99.65%**	0.30%
	1.0-1.2	**99.65%**	0.17%	**99.19%**	0.183%	**99.53%**	0.25%
	1.2-1.4	**99.02%**	0.19%	**99.03%**	0.405%	**100.01%**	0.45%
	1.4-1.6	**96.58%**	0.24%	**96.64%**	0.240%	**100.06%**	0.35%
	1.6-1.8	**93.80%**	0.26%	**94.20%**	0.198%	**100.42%**	0.35%
	1.8-2.0	**91.88%**	0.34%	**93.24%**	0.334%	**101.48%**	0.52%
	2.0-2.5	**92.28%**	0.26%	**93.04%**	0.201%	**100.82%**	0.36%
	2.5-3.0	**92.15%**	0.30%	**92.90%**	0.400%	**100.81%**	0.55%
	3.0-5.0	**92.77%**	0.49%	**93.46%**	0.529%	**100.74%**	0.78%

Table 9.1: Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

			$L_{p-\pi} > 0.6$				
exp7	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.31%**	0.38%	**96.61%**	0.105%	**97.29%**	0.39%
	0.6-0.8	**99.51%**	0.25%	**96.08%**	0.281%	**96.55%**	0.37%
	0.8-1.0	**99.62%**	0.23%	**97.58%**	0.246%	**97.96%**	0.34%
	1.0-1.2	**99.46%**	0.24%	**98.99%**	0.283%	**99.52%**	0.37%
	1.2-1.4	**97.92%**	0.28%	**97.85%**	0.273%	**99.93%**	0.40%
	1.4-1.6	**95.07%**	0.33%	**95.24%**	0.406%	**100.18%**	0.55%
	1.6-1.8	**92.59%**	0.40%	**92.97%**	0.411%	**100.41%**	0.62%
	1.8-2.0	**92.58%**	0.44%	**92.01%**	0.480%	**99.39%**	0.70%
	2.0-2.5	**92.63%**	0.31%	**92.06%**	0.411%	**99.39%**	0.55%
	2.5-3.0	**92.65%**	0.51%	**91.36%**	0.594%	**98.61%**	0.84%
	3.0-5.0	**91.70%**	0.68%	**92.03%**	1.036%	**100.36%**	1.35%
exp9	momentum	**mc%**	%+-	**data%**	error	**double %**	error
	0.4-0.6	**99.39%**	0.39%	**96.65%**	0.494%	**97.24%**	0.63%
	0.6-0.8	**99.70%**	0.25%	**95.93%**	0.298%	**96.22%**	0.38%
	0.8-1.0	**99.72%**	0.23%	**97.79%**	0.259%	**98.07%**	0.34%
	1.0-1.2	**99.45%**	0.25%	**98.98%**	0.256%	**99.52%**	0.36%
	1.2-1.4	**98.04%**	0.27%	**97.98%**	0.296%	**99.94%**	0.41%
	1.4-1.6	**94.26%**	0.28%	**94.89%**	0.358%	**100.66%**	0.48%
	1.6-1.8	**91.97%**	0.43%	**92.72%**	0.413%	**100.82%**	0.65%
	1.8-2.0	**91.69%**	0.45%	**92.14%**	0.481%	**100.49%**	0.72%
	2.0-2.5	**91.84%**	0.36%	**91.43%**	0.403%	**99.55%**	0.59%
	2.5-3.0	**92.83%**	0.61%	**91.31%**	0.594%	**98.36%**	0.91%
	3.0-5.0	**92.67%**	0.68%	**92.31%**	0.796%	**99.61%**	1.12%
exp11	momentum	**mc%**	%+-	**data%**	erro	**double %**	erro
	0.4-0.6	**99.33%**	0.33%	**96.73%**	0.261%	**97.38%**	0.42%
	0.6-0.8	**99.64%**	0.18%	**96.19%**	0.214%	**96.54%**	0.28%
	0.8-1.0	**99.63%**	0.17%	**97.82%**	0.190%	**98.19%**	0.25%
	1.0-1.2	**99.66%**	0.21%	**99.01%**	0.182%	**99.34%**	0.28%
	1.2-1.4	**98.33%**	0.20%	**98.52%**	0.234%	**100.19%**	0.31%
	1.4-1.6	**94.33%**	0.23%	**95.09%**	0.250%	**100.81%**	0.36%
	1.6-1.8	**90.38%**	0.32%	**91.71%**	0.353%	**101.47%**	0.53%
	1.8-2.0	**89.30%**	0.33%	**91.00%**	0.353%	**101.91%**	0.54%
	2.0-2.5	**89.78%**	0.31%	**91.03%**	0.283%	**101.40%**	0.47%
	2.5-3.0	**89.56%**	0.40%	**90.93%**	0.423%	**101.53%**	0.66%
	3.0-5.0	**90.82%**	0.44%	**91.28%**	0.560%	**100.50%**	0.79%
			$L_{p-\pi} > 0.9$				
exp7	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.27%**	0.31%	**96.53%**	0.203%	**97.24%**	0.36%
	0.6-0.8	**99.45%**	0.26%	**95.74%**	0.265%	**96.27%**	0.37%
	0.8-1.0	**99.64%**	0.23%	**95.05%**	0.244%	**95.39%**	0.33%
	1.0-1.2	**99.22%**	0.24%	**96.41%**	0.243%	**97.16%**	0.34%
	1.2-1.4	**95.61%**	0.30%	**95.94%**	0.255%	**100.35%**	0.41%
	1.4-1.6	**89.43%**	0.37%	**90.36%**	0.372%	**101.04%**	0.59%
	1.6-1.8	**86.15%**	0.45%	**87.21%**	0.378%	**101.23%**	0.68%
	1.8-2.0	**85.62%**	0.51%	**85.49%**	0.397%	**99.86%**	0.75%
	2.0-2.5	**85.27%**	0.41%	**83.60%**	0.431%	**98.04%**	0.69%
	2.5-3.0	**85.62%**	0.60%	**84.05%**	0.662%	**98.17%**	1.04%
	3.0-5.0	**84.62%**	0.78%	**84.36%**	0.794%	**99.69%**	1.31%
exp9	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.46%**	0.10%	**96.69%**	0.521%	**97.22%**	0.53%
	0.6-0.8	**99.68%**	0.24%	**95.66%**	0.304%	**95.97%**	0.38%
	0.8-1.0	**99.68%**	0.23%	**95.43%**	0.274%	**95.74%**	0.35%
	1.0-1.2	**99.14%**	0.24%	**96.74%**	0.186%	**97.58%**	0.30%
	1.2-1.4	**95.79%**	0.29%	**95.81%**	0.304%	**100.02%**	0.44%
	1.4-1.6	**88.70%**	0.31%	**89.76%**	0.397%	**101.19%**	0.57%
	1.6-1.8	**86.53%**	0.38%	**87.93%**	0.451%	**101.61%**	0.68%
	1.8-2.0	**84.61%**	0.49%	**86.61%**	0.505%	**102.36%**	0.84%
	2.0-2.5	**84.16%**	0.43%	**83.65%**	0.467%	**99.40%**	0.75%
	2.5-3.0	**86.03%**	0.61%	**84.98%**	0.676%	**98.78%**	1.05%
	3.0-5.0	**85.98%**	0.76%	**86.11%**	1.055%	**100.15%**	1.52%
exp11	momentum	**mc%**	error	**data%**	error	**double %**	error
	0.4-0.6	**99.31%**	0.21%	**96.66%**	0.325%	**97.33%**	0.39%
	0.6-0.8	**99.62%**	0.16%	**95.79%**	0.217%	**96.15%**	0.27%
	0.8-1.0	**99.55%**	0.18%	**95.20%**	0.240%	**95.63%**	0.30%
	1.0-1.2	**99.35%**	0.17%	**96.72%**	0.195%	**97.35%**	0.26%
	1.2-1.4	**96.22%**	0.12%	**96.37%**	0.113%	**100.16%**	0.17%
	1.4-1.6	**89.56%**	0.28%	**90.43%**	0.277%	**100.98%**	0.45%
	1.6-1.8	**81.72%**	0.33%	**86.59%**	0.329%	**105.96%**	0.58%
	1.8-2.0	**79.54%**	0.43%	**85.09%**	0.393%	**106.98%**	0.77%
	2.0-2.5	**81.77%**	0.33%	**83.19%**	0.439%	**101.74%**	0.68%
	2.5-3.0	**81.83%**	0.49%	**83.42%**	0.489%	**101.94%**	0.85%
	3.0-5.0	**83.44%**	0.61%	**84.49%**	0.633%	**101.26%**	1.06%

Table 9.2: Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-K} > 0.2$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.90%**	0.38%	**99.93%**	0.429%	**100.03%**	0.58%
	0.6-0.8	**99.88%**	0.16%	**99.85%**	0.156%	**99.97%**	0.22%
	0.8-1.0	**99.81%**	0.20%	**99.71%**	0.230%	**99.90%**	0.30%
	1.0-1.2	**99.57%**	0.25%	**99.57%**	0.251%	**100.00%**	0.35%
	1.2-1.4	**99.06%**	0.15%	**99.15%**	0.273%	**100.10%**	0.32%
	1.4-1.6	**98.18%**	0.33%	**98.09%**	0.323%	**99.91%**	0.47%
	1.6-1.8	**96.60%**	0.36%	**96.73%**	0.380%	**100.13%**	0.54%
	1.8-2.0	**96.49%**	0.40%	**96.47%**	0.462%	**99.98%**	0.63%
	2.0-2.5	**96.25%**	0.31%	**96.17%**	0.305%	**99.91%**	0.45%
	2.5-3.0	**96.49%**	0.44%	**96.36%**	0.525%	**99.86%**	0.71%
	3.0-5.0	**95.94%**	0.60%	**95.78%**	0.777%	**99.83%**	1.02%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**100.06%**	0.41%	**100.12%**	0.496%	**100.06%**	0.64%
	0.6-0.8	**99.98%**	0.25%	**99.86%**	0.292%	**99.88%**	0.38%
	0.8-1.0	**99.89%**	0.26%	**99.79%**	0.276%	**99.91%**	0.38%
	1.0-1.2	**99.65%**	0.24%	**99.63%**	0.225%	**99.99%**	0.33%
	1.2-1.4	**99.19%**	0.28%	**99.16%**	0.282%	**99.97%**	0.40%
	1.4-1.6	**97.70%**	0.31%	**97.60%**	0.336%	**99.89%**	0.47%
	1.6-1.8	**96.46%**	0.24%	**96.34%**	0.372%	**99.88%**	0.46%
	1.8-2.0	**95.91%**	0.39%	**95.81%**	0.429%	**99.90%**	0.61%
	2.0-2.5	**96.07%**	0.30%	**95.72%**	0.355%	**99.64%**	0.48%
	2.5-3.0	**96.37%**	0.44%	**96.06%**	0.508%	**99.68%**	0.70%
	3.0-5.0	**96.35%**	0.38%	**96.32%**	0.705%	**99.97%**	0.83%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.89%**	0.277%	**99.91%**	0.344%	**100.02%**	0.44%
	0.6-0.8	**99.93%**	0.185%	**99.87%**	0.236%	**99.94%**	0.30%
	0.8-1.0	**99.85%**	0.174%	**99.69%**	0.183%	**99.83%**	0.25%
	1.0-1.2	**99.77%**	0.178%	**99.57%**	0.193%	**99.80%**	0.26%
	1.2-1.4	**99.41%**	0.165%	**99.51%**	0.243%	**100.10%**	0.30%
	1.4-1.6	**97.73%**	0.199%	**97.99%**	0.231%	**100.26%**	0.31%
	1.6-1.8	**95.79%**	0.270%	**95.96%**	0.267%	**100.18%**	0.40%
	1.8-2.0	**94.43%**	0.310%	**95.01%**	0.244%	**100.61%**	0.42%
	2.0-2.5	**94.68%**	0.241%	**94.96%**	0.176%	**100.29%**	0.32%
	2.5-3.0	**94.69%**	0.349%	**94.95%**	0.373%	**100.27%**	0.54%
	3.0-5.0	**94.99%**	0.374%	**95.35%**	0.495%	**100.39%**	0.65%
$L_{p-K} > 0.4$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.86%**	0.38%	**99.86%**	0.470%	**100.00%**	0.60%
	0.6-0.8	**99.81%**	0.26%	**99.73%**	0.362%	**99.92%**	0.45%
	0.8-1.0	**99.73%**	0.23%	**99.42%**	0.204%	**99.70%**	0.31%
	1.0-1.2	**99.55%**	0.24%	**99.28%**	0.250%	**99.73%**	0.35%
	1.2-1.4	**98.52%**	0.30%	**98.48%**	0.272%	**99.96%**	0.41%
	1.4-1.6	**96.77%**	0.37%	**96.73%**	0.319%	**99.96%**	0.50%
	1.6-1.8	**95.19%**	0.38%	**95.40%**	0.391%	**100.22%**	0.57%
	1.8-2.0	**95.18%**	0.41%	**94.73%**	0.454%	**99.53%**	0.64%
	2.0-2.5	**94.48%**	0.33%	**94.36%**	0.360%	**99.87%**	0.52%
	2.5-3.0	**94.58%**	0.39%	**93.89%**	0.563%	**99.28%**	0.72%
	3.0-5.0	**93.93%**	0.64%	**94.38%**	0.811%	**100.48%**	1.10%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.85%**	0.41%	**99.96%**	0.549%	**100.11%**	0.68%
	0.6-0.8	**99.93%**	0.25%	**99.78%**	0.290%	**99.85%**	0.38%
	0.8-1.0	**99.80%**	0.23%	**99.53%**	0.250%	**99.72%**	0.34%
	1.0-1.2	**99.44%**	0.22%	**99.26%**	0.253%	**99.82%**	0.34%
	1.2-1.4	**98.81%**	0.14%	**98.58%**	0.318%	**99.77%**	0.35%
	1.4-1.6	**96.00%**	0.35%	**96.13%**	0.351%	**100.13%**	0.52%
	1.6-1.8	**94.95%**	0.38%	**95.08%**	0.303%	**100.13%**	0.52%
	1.8-2.0	**93.91%**	0.31%	**93.97%**	0.456%	**100.06%**	0.59%
	2.0-2.5	**94.18%**	0.39%	**93.48%**	0.383%	**99.26%**	0.58%
	2.5-3.0	**94.95%**	0.47%	**93.68%**	0.555%	**98.67%**	0.76%
	3.0-5.0	**94.52%**	0.69%	**94.43%**	0.756%	**99.91%**	1.08%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.85%**	0.28%	**99.82%**	0.367%	**99.97%**	0.46%
	0.6-0.8	**99.91%**	0.18%	**99.81%**	0.259%	**99.90%**	0.32%
	0.8-1.0	**99.78%**	0.24%	**99.43%**	0.179%	**99.65%**	0.30%
	1.0-1.2	**99.65%**	0.17%	**99.19%**	0.183%	**99.53%**	0.25%
	1.2-1.4	**99.02%**	0.19%	**99.03%**	0.405%	**100.01%**	0.45%
	1.4-1.6	**96.58%**	0.24%	**96.64%**	0.240%	**100.06%**	0.35%
	1.6-1.8	**93.80%**	0.26%	**94.20%**	0.198%	**100.42%**	0.35%
	1.8-2.0	**91.88%**	0.34%	**93.24%**	0.334%	**101.48%**	0.52%
	2.0-2.5	**92.28%**	0.26%	**93.04%**	0.201%	**100.82%**	0.36%
	2.5-3.0	**92.15%**	0.30%	**92.90%**	0.400%	**100.81%**	0.55%
	3.0-5.0	**92.77%**	0.49%	**93.46%**	0.529%	**100.74%**	0.78%

Table 9.3: Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-K} > 0.6$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.31%**	0.38%	**96.61%**	0.105%	**97.29%**	0.39%
	0.6-0.8	**99.51%**	0.25%	**96.08%**	0.281%	**96.55%**	0.37%
	0.8-1.0	**99.62%**	0.23%	**97.58%**	0.246%	**97.96%**	0.34%
	1.0-1.2	**99.46%**	0.24%	**98.99%**	0.283%	**99.52%**	0.37%
	1.2-1.4	**97.92%**	0.28%	**97.85%**	0.273%	**99.93%**	0.40%
	1.4-1.6	**95.07%**	0.33%	**95.24%**	0.406%	**100.18%**	0.55%
	1.6-1.8	**92.59%**	0.40%	**92.97%**	0.411%	**100.41%**	0.62%
	1.8-2.0	**92.58%**	0.44%	**92.01%**	0.480%	**99.39%**	0.70%
	2.0-2.5	**92.63%**	0.31%	**92.06%**	0.411%	**99.39%**	0.55%
	2.5-3.0	**92.65%**	0.51%	**91.36%**	0.594%	**98.61%**	0.84%
	3.0-5.0	**91.70%**	0.68%	**92.03%**	1.036%	**100.36%**	1.35%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.39%**	0.39%	**96.65%**	0.494%	**97.24%**	0.63%
	0.6-0.8	**99.70%**	0.25%	**95.93%**	0.298%	**96.22%**	0.38%
	0.8-1.0	**99.72%**	0.23%	**97.79%**	0.259%	**98.07%**	0.34%
	1.0-1.2	**99.45%**	0.25%	**98.98%**	0.256%	**99.52%**	0.36%
	1.2-1.4	**98.04%**	0.27%	**97.98%**	0.296%	**99.94%**	0.41%
	1.4-1.6	**94.26%**	0.28%	**94.89%**	0.358%	**100.66%**	0.48%
	1.6-1.8	**91.97%**	0.43%	**92.72%**	0.413%	**100.82%**	0.65%
	1.8-2.0	**91.69%**	0.45%	**92.14%**	0.481%	**100.49%**	0.72%
	2.0-2.5	**91.84%**	0.36%	**91.43%**	0.403%	**99.55%**	0.59%
	2.5-3.0	**92.83%**	0.61%	**91.31%**	0.594%	**98.36%**	0.91%
	3.0-5.0	**92.67%**	0.68%	**92.31%**	0.796%	**99.61%**	1.12%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.33%**	0.33%	**96.73%**	0.261%	**97.38%**	0.42%
	0.6-0.8	**99.64%**	0.18%	**96.19%**	0.214%	**96.54%**	0.28%
	0.8-1.0	**99.63%**	0.17%	**97.82%**	0.190%	**98.19%**	0.25%
	1.0-1.2	**99.66%**	0.21%	**99.01%**	0.182%	**99.34%**	0.28%
	1.2-1.4	**98.33%**	0.20%	**98.52%**	0.234%	**100.19%**	0.31%
	1.4-1.6	**94.33%**	0.23%	**95.09%**	0.250%	**100.81%**	0.36%
	1.6-1.8	**90.38%**	0.32%	**91.71%**	0.353%	**101.47%**	0.53%
	1.8-2.0	**89.30%**	0.33%	**91.00%**	0.353%	**101.91%**	0.54%
	2.0-2.5	**89.78%**	0.31%	**91.03%**	0.283%	**101.40%**	0.47%
	2.5-3.0	**89.56%**	0.40%	**90.93%**	0.423%	**101.53%**	0.66%
	3.0-5.0	**90.82%**	0.44%	**91.28%**	0.560%	**100.50%**	0.79%
$L_{p-K} > 0.9$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.27%**	0.31%	**96.53%**	0.203%	**97.24%**	0.36%
	0.6-0.8	**99.45%**	0.26%	**95.74%**	0.265%	**96.27%**	0.37%
	0.8-1.0	**99.64%**	0.23%	**95.05%**	0.244%	**95.39%**	0.33%
	1.0-1.2	**99.22%**	0.24%	**96.41%**	0.243%	**97.16%**	0.34%
	1.2-1.4	**95.61%**	0.30%	**95.94%**	0.255%	**100.35%**	0.41%
	1.4-1.6	**89.43%**	0.37%	**90.36%**	0.372%	**101.04%**	0.59%
	1.6-1.8	**86.15%**	0.45%	**87.21%**	0.378%	**101.23%**	0.68%
	1.8-2.0	**85.62%**	0.51%	**85.49%**	0.397%	**99.86%**	0.75%
	2.0-2.5	**85.27%**	0.41%	**83.60%**	0.431%	**98.04%**	0.69%
	2.5-3.0	**85.62%**	0.60%	**84.05%**	0.662%	**98.17%**	1.04%
	3.0-5.0	**84.62%**	0.78%	**84.36%**	0.794%	**99.69%**	1.31%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.46%**	0.10%	**96.69%**	0.521%	**97.22%**	0.53%
	0.6-0.8	**99.68%**	0.24%	**95.66%**	0.304%	**95.97%**	0.38%
	0.8-1.0	**99.68%**	0.23%	**95.43%**	0.274%	**95.74%**	0.35%
	1.0-1.2	**99.14%**	0.24%	**96.74%**	0.186%	**97.58%**	0.30%
	1.2-1.4	**95.79%**	0.29%	**95.81%**	0.304%	**100.02%**	0.44%
	1.4-1.6	**88.70%**	0.31%	**89.76%**	0.397%	**101.19%**	0.57%
	1.6-1.8	**86.53%**	0.38%	**87.93%**	0.451%	**101.61%**	0.68%
	1.8-2.0	**84.61%**	0.49%	**86.61%**	0.505%	**102.36%**	0.84%
	2.0-2.5	**84.16%**	0.43%	**83.65%**	0.467%	**99.40%**	0.75%
	2.5-3.0	**86.03%**	0.61%	**84.98%**	0.676%	**98.78%**	1.05%
	3.0-5.0	**85.98%**	0.76%	**86.11%**	1.055%	**100.15%**	1.52%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.31%**	0.21%	**96.66%**	0.325%	**97.33%**	0.39%
	0.6-0.8	**99.62%**	0.16%	**95.79%**	0.217%	**96.15%**	0.27%
	0.8-1.0	**99.55%**	0.18%	**95.20%**	0.240%	**95.63%**	0.30%
	1.0-1.2	**99.35%**	0.17%	**96.72%**	0.195%	**97.35%**	0.26%
	1.2-1.4	**96.22%**	0.12%	**96.37%**	0.113%	**100.16%**	0.17%
	1.4-1.6	**89.56%**	0.28%	**90.43%**	0.277%	**100.98%**	0.45%
	1.6-1.8	**81.72%**	0.33%	**86.59%**	0.329%	**105.96%**	0.58%
	1.8-2.0	**79.54%**	0.43%	**85.09%**	0.393%	**106.98%**	0.77%
	2.0-2.5	**81.77%**	0.33%	**83.19%**	0.439%	**101.74%**	0.68%
	2.5-3.0	**81.83%**	0.49%	**83.42%**	0.489%	**101.94%**	0.85%
	3.0-5.0	**83.44%**	0.61%	**84.49%**	0.633%	**101.26%**	1.06%

Table 9.4: Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-\pi} > 0.2$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.37%**	0.38%	**99.35%**	0.394%	**99.98%**	0.55%
	0.6-0.8	**99.82%**	0.26%	**99.74%**	0.259%	**99.92%**	0.36%
	0.8-1.0	**99.82%**	0.24%	**99.57%**	0.250%	**99.76%**	0.35%
	1.0-1.2	**99.82%**	0.27%	**99.43%**	0.312%	**99.61%**	0.41%
	1.2-1.4	**98.77%**	0.31%	**98.62%**	0.230%	**99.85%**	0.39%
	1.4-1.6	**96.44%**	0.34%	**96.54%**	0.368%	**100.10%**	0.52%
	1.6-1.8	**94.45%**	0.40%	**94.50%**	0.400%	**100.05%**	0.60%
	1.8-2.0	**94.05%**	0.46%	**93.95%**	0.506%	**99.89%**	0.73%
	2.0-2.5	**95.21%**	0.31%	**94.50%**	0.389%	**99.26%**	0.52%
	2.5-3.0	**95.58%**	0.50%	**94.33%**	0.586%	**98.69%**	0.80%
	3.0-5.0	**94.90%**	0.64%	**95.25%**	0.784%	**100.38%**	1.07%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.63%**	0.33%	**99.92%**	0.200%	**100.29%**	0.38%
	0.6-0.8	**99.91%**	0.25%	**99.76%**	0.280%	**99.85%**	0.38%
	0.8-1.0	**99.79%**	0.24%	**99.67%**	0.254%	**99.88%**	0.35%
	1.0-1.2	**99.64%**	0.25%	**99.53%**	0.273%	**99.90%**	0.37%
	1.2-1.4	**98.77%**	0.19%	**98.82%**	0.307%	**100.05%**	0.37%
	1.4-1.6	**96.40%**	0.34%	**96.03%**	0.277%	**99.62%**	0.46%
	1.6-1.8	**94.37%**	0.41%	**94.72%**	0.448%	**100.37%**	0.65%
	1.8-2.0	**93.50%**	0.42%	**93.69%**	0.516%	**100.20%**	0.71%
	2.0-2.5	**94.65%**	0.35%	**93.90%**	0.426%	**99.21%**	0.58%
	2.5-3.0	**95.59%**	0.49%	**95.29%**	0.503%	**99.68%**	0.73%
	3.0-5.0	**95.87%**	0.44%	**95.42%**	0.833%	**99.54%**	0.98%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.45%**	0.440%	**99.41%**	0.081%	**99.96%**	0.45%
	0.6-0.8	**99.82%**	0.183%	**99.79%**	0.191%	**99.97%**	0.27%
	0.8-1.0	**99.84%**	0.054%	**99.63%**	0.189%	**99.78%**	0.20%
	1.0-1.2	**99.77%**	0.182%	**99.43%**	0.198%	**99.66%**	0.27%
	1.2-1.4	**99.10%**	0.209%	**98.87%**	0.209%	**99.77%**	0.30%
	1.4-1.6	**96.46%**	0.253%	**96.45%**	0.267%	**99.98%**	0.38%
	1.6-1.8	**93.34%**	0.317%	**93.49%**	0.339%	**100.16%**	0.50%
	1.8-2.0	**92.59%**	0.260%	**92.47%**	0.354%	**99.87%**	0.47%
	2.0-2.5	**93.22%**	0.277%	**92.58%**	0.277%	**99.31%**	0.42%
	2.5-3.0	**94.33%**	0.387%	**93.73%**	0.521%	**99.36%**	0.69%
	3.0-5.0	**97.68%**	0.445%	**97.26%**	0.495%	**99.58%**	0.68%
$L_{p-\pi} > 0.4$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.31%**	0.37%	**99.17%**	0.394%	**99.86%**	0.55%
	0.6-0.8	**99.74%**	0.25%	**99.43%**	0.270%	**99.69%**	0.37%
	0.8-1.0	**99.74%**	0.24%	**99.17%**	0.247%	**99.43%**	0.34%
	1.0-1.2	**99.80%**	0.25%	**99.18%**	0.240%	**99.38%**	0.35%
	1.2-1.4	**97.90%**	0.41%	**97.89%**	0.306%	**99.98%**	0.52%
	1.4-1.6	**94.49%**	0.36%	**94.88%**	0.377%	**100.41%**	0.55%
	1.6-1.8	**92.53%**	0.42%	**91.86%**	0.451%	**99.28%**	0.66%
	1.8-2.0	**91.93%**	0.49%	**91.53%**	0.525%	**99.56%**	0.78%
	2.0-2.5	**92.69%**	0.37%	**91.33%**	0.424%	**98.53%**	0.60%
	2.5-3.0	**93.40%**	0.54%	**91.45%**	0.625%	**97.92%**	0.88%
	3.0-5.0	**92.35%**	0.70%	**93.46%**	0.815%	**101.20%**	1.17%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.79%**	0.41%	**99.45%**	0.493%	**99.66%**	0.64%
	0.6-0.8	**99.91%**	0.25%	**99.36%**	0.278%	**99.46%**	0.37%
	0.8-1.0	**99.73%**	0.24%	**99.25%**	0.207%	**99.52%**	0.31%
	1.0-1.2	**99.53%**	0.27%	**99.18%**	0.273%	**99.64%**	0.38%
	1.2-1.4	**97.98%**	0.29%	**97.97%**	0.343%	**99.99%**	0.46%
	1.4-1.6	**94.21%**	0.36%	**94.01%**	0.517%	**99.79%**	0.67%
	1.6-1.8	**92.37%**	0.43%	**92.32%**	0.563%	**99.95%**	0.77%
	1.8-2.0	**91.35%**	0.48%	**91.37%**	0.542%	**100.02%**	0.79%
	2.0-2.5	**92.13%**	0.38%	**90.59%**	0.447%	**98.33%**	0.63%
	2.5-3.0	**93.47%**	0.53%	**92.50%**	0.464%	**98.96%**	0.75%
	3.0-5.0	**94.09%**	0.68%	**92.82%**	0.852%	**98.65%**	1.15%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.38%**	0.27%	**99.19%**	0.254%	**99.80%**	0.37%
	0.6-0.8	**99.75%**	0.18%	**99.53%**	0.191%	**99.78%**	0.26%
	0.8-1.0	**99.72%**	0.17%	**99.37%**	0.188%	**99.65%**	0.26%
	1.0-1.2	**99.77%**	0.08%	**98.99%**	0.196%	**99.23%**	0.21%
	1.2-1.4	**98.40%**	0.22%	**98.09%**	0.219%	**99.69%**	0.31%
	1.4-1.6	**94.32%**	0.27%	**94.66%**	0.277%	**100.37%**	0.41%
	1.6-1.8	**90.81%**	0.33%	**91.37%**	0.336%	**100.61%**	0.52%
	1.8-2.0	**89.97%**	0.38%	**90.08%**	0.384%	**100.13%**	0.60%
	2.0-2.5	**90.37%**	0.30%	**89.59%**	0.322%	**99.14%**	0.48%
	2.5-3.0	**92.21%**	0.42%	**90.91%**	0.447%	**98.59%**	0.66%
	3.0-5.0	**94.93%**	0.48%	**94.80%**	0.565%	**99.86%**	0.78%

Table 9.5: Anti-proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-\pi} > 0.6$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.84%**	0.35%	**95.60%**	0.398%	**96.73%**	0.53%
	0.6-0.8	**99.52%**	0.40%	**95.51%**	0.314%	**95.96%**	0.50%
	0.8-1.0	**99.66%**	0.24%	**97.26%**	0.257%	**97.59%**	0.35%
	1.0-1.2	**99.51%**	0.25%	**98.73%**	0.265%	**99.21%**	0.36%
	1.2-1.4	**96.83%**	0.30%	**96.90%**	0.250%	**100.07%**	0.40%
	1.4-1.6	**92.52%**	0.37%	**92.75%**	0.393%	**100.25%**	0.58%
	1.6-1.8	**89.36%**	0.47%	**88.85%**	0.460%	**99.43%**	0.74%
	1.8-2.0	**89.28%**	0.51%	**88.41%**	0.548%	**99.03%**	0.83%
	2.0-2.5	**90.55%**	0.40%	**88.60%**	0.435%	**97.85%**	0.65%
	2.5-3.0	**91.82%**	0.56%	**88.68%**	0.921%	**96.58%**	1.16%
	3.0-5.0	**89.62%**	0.60%	**90.97%**	0.918%	**101.50%**	1.23%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.96%**	0.41%	95.43%	0.47%	**96.44%**	0.62%
	0.6-0.8	**99.67%**	0.09%	95.31%	0.30%	**95.62%**	0.31%
	0.8-1.0	**99.66%**	0.28%	97.76%	0.29%	**98.10%**	0.40%
	1.0-1.2	**99.47%**	0.59%	98.80%	0.27%	**99.32%**	0.65%
	1.2-1.4	**97.33%**	0.19%	97.04%	0.16%	**99.71%**	0.26%
	1.4-1.6	**91.89%**	0.38%	92.07%	0.41%	**100.20%**	0.61%
	1.6-1.8	**89.21%**	0.46%	88.94%	2.46%	**99.69%**	2.81%
	1.8-2.0	**88.76%**	0.51%	88.97%	0.56%	**100.23%**	0.86%
	2.0-2.5	**89.82%**	0.34%	87.90%	0.47%	**97.87%**	0.64%
	2.5-3.0	**91.38%**	0.56%	90.00%	0.67%	**98.49%**	0.95%
	3.0-5.0	**91.86%**	0.74%	90.34%	0.89%	**98.35%**	1.25%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.77%**	0.27%	**95.31%**	0.319%	**96.49%**	0.42%
	0.6-0.8	**99.55%**	0.18%	**95.68%**	0.205%	**96.12%**	0.27%
	0.8-1.0	**99.61%**	0.17%	**97.77%**	0.194%	**98.15%**	0.26%
	1.0-1.2	**99.54%**	0.18%	**98.64%**	0.197%	**99.10%**	0.27%
	1.2-1.4	**97.66%**	0.22%	**97.16%**	0.224%	**99.49%**	0.32%
	1.4-1.6	**91.45%**	0.34%	**92.44%**	0.289%	**101.09%**	0.49%
	1.6-1.8	**87.18%**	0.41%	**88.30%**	0.330%	**101.28%**	0.61%
	1.8-2.0	**86.93%**	0.52%	**87.42%**	0.401%	**100.55%**	0.75%
	2.0-2.5	**87.60%**	0.31%	**87.09%**	0.308%	**99.42%**	0.50%
	2.5-3.0	**89.50%**	0.45%	**87.79%**	0.477%	**98.08%**	0.73%
	3.0-5.0	**92.57%**	0.70%	**92.46%**	0.720%	**99.89%**	1.09%
$L_{p-\pi} > 0.9$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.88%**	0.37%	**95.46%**	0.381%	**96.54%**	0.53%
	0.6-0.8	**99.47%**	0.25%	**95.06%**	0.275%	**95.57%**	0.37%
	0.8-1.0	**99.61%**	0.23%	**95.03%**	0.267%	**95.40%**	0.35%
	1.0-1.2	**99.05%**	0.25%	**96.24%**	0.281%	**97.16%**	0.38%
	1.2-1.4	**93.85%**	0.39%	**94.68%**	0.321%	**100.88%**	0.54%
	1.4-1.6	**86.21%**	0.41%	**86.88%**	0.415%	**100.78%**	0.68%
	1.6-1.8	**83.05%**	0.48%	**83.38%**	0.494%	**100.40%**	0.83%
	1.8-2.0	**82.36%**	0.56%	**81.36%**	0.588%	**98.79%**	0.98%
	2.0-2.5	**83.01%**	0.44%	**79.94%**	0.479%	**96.30%**	0.77%
	2.5-3.0	**83.90%**	0.65%	**79.24%**	0.807%	**94.45%**	1.21%
	3.0-5.0	**82.60%**	0.84%	**83.23%**	0.933%	**100.76%**	1.52%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.61%**	0.26%	**95.44%**	0.483%	**96.78%**	0.55%
	0.6-0.8	**99.68%**	0.24%	**94.91%**	0.298%	**95.22%**	0.38%
	0.8-1.0	**99.58%**	0.23%	**95.34%**	0.278%	**95.73%**	0.36%
	1.0-1.2	**99.24%**	0.25%	**96.43%**	0.293%	**97.16%**	0.38%
	1.2-1.4	**94.58%**	0.32%	**94.30%**	0.341%	**99.70%**	0.49%
	1.4-1.6	**85.73%**	0.42%	**86.15%**	0.444%	**100.49%**	0.72%
	1.6-1.8	**83.14%**	0.50%	**82.74%**	0.538%	**99.52%**	0.88%
	1.8-2.0	**81.54%**	0.52%	**82.76%**	0.485%	**101.50%**	0.88%
	2.0-2.5	**82.02%**	0.46%	**80.27%**	0.513%	**97.86%**	0.83%
	2.5-3.0	**83.81%**	0.66%	**81.87%**	0.757%	**97.69%**	1.19%
	3.0-5.0	**83.46%**	0.83%	**83.03%**	0.982%	**99.49%**	1.54%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.68%**	0.28%	**95.16%**	0.237%	**96.42%**	0.36%
	0.6-0.8	**99.51%**	0.09%	**95.28%**	0.205%	**95.75%**	0.22%
	0.8-1.0	**99.54%**	0.17%	**95.52%**	0.204%	**95.96%**	0.26%
	1.0-1.2	**99.22%**	0.18%	**96.38%**	0.209%	**97.14%**	0.27%
	1.2-1.4	**94.90%**	0.23%	**94.63%**	0.237%	**99.72%**	0.35%
	1.4-1.6	**86.27%**	0.31%	**86.72%**	0.315%	**100.53%**	0.52%
	1.6-1.8	**79.24%**	0.40%	**82.29%**	0.380%	**103.85%**	0.71%
	1.8-2.0	**77.02%**	0.45%	**81.47%**	0.434%	**105.77%**	0.84%
	2.0-2.5	**79.21%**	0.35%	**78.70%**	0.364%	**99.36%**	0.64%
	2.5-3.0	**82.12%**	0.52%	**79.62%**	0.587%	**96.95%**	0.94%
	3.0-5.0	**84.48%**	0.71%	**84.73%**	0.679%	**100.30%**	1.17%

Table 9.6: Anti-Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-K} > 0.2$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.28%**	0.35%	**99.17%**	0.359%	**99.90%**	0.51%
	0.6-0.8	**99.81%**	0.25%	**99.73%**	0.244%	**99.92%**	0.35%
	0.8-1.0	**99.87%**	0.24%	**99.76%**	0.243%	**99.89%**	0.34%
	1.0-1.2	**99.67%**	0.34%	**99.60%**	0.272%	**99.92%**	0.44%
	1.2-1.4	**99.05%**	0.29%	**98.79%**	0.313%	**99.73%**	0.43%
	1.4-1.6	**98.40%**	0.33%	**98.50%**	0.366%	**100.10%**	0.50%
	1.6-1.8	**97.78%**	0.37%	**97.39%**	0.400%	**99.60%**	0.55%
	1.8-2.0	**97.16%**	0.41%	**97.01%**	0.446%	**99.84%**	0.62%
	2.0-2.5	**94.39%**	0.35%	**94.06%**	0.379%	**99.65%**	0.55%
	2.5-3.0	**93.32%**	0.54%	**92.94%**	0.626%	**99.59%**	0.88%
	3.0-5.0	**88.82%**	0.76%	**88.92%**	0.879%	**100.12%**	1.31%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.86%**	0.41%	**99.63%**	0.526%	**99.77%**	0.67%
	0.6-0.8	**99.85%**	0.24%	**99.82%**	0.262%	**99.97%**	0.36%
	0.8-1.0	**99.88%**	0.23%	**99.86%**	0.247%	**99.98%**	0.34%
	1.0-1.2	**99.77%**	0.25%	**99.70%**	0.334%	**99.94%**	0.42%
	1.2-1.4	**99.41%**	0.31%	**99.30%**	0.315%	**99.89%**	0.44%
	1.4-1.6	**98.39%**	0.32%	**97.63%**	0.544%	**99.23%**	0.64%
	1.6-1.8	**98.03%**	0.35%	**97.16%**	0.423%	**99.11%**	0.56%
	1.8-2.0	**97.50%**	0.39%	**97.21%**	0.455%	**99.70%**	0.61%
	2.0-2.5	**94.59%**	0.35%	**94.76%**	0.393%	**100.18%**	0.55%
	2.5-3.0	**93.01%**	0.53%	**93.08%**	0.607%	**100.07%**	0.87%
	3.0-5.0	**89.60%**	0.79%	**89.06%**	0.942%	**99.41%**	1.37%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.33%**	0.257%	**99.26%**	0.314%	**99.93%**	0.41%
	0.6-0.8	**99.80%**	0.178%	**99.80%**	0.283%	**100.00%**	0.33%
	0.8-1.0	**99.90%**	0.174%	**99.84%**	0.231%	**99.94%**	0.29%
	1.0-1.2	**99.80%**	0.143%	**99.77%**	0.197%	**99.98%**	0.24%
	1.2-1.4	**99.75%**	0.126%	**99.15%**	0.337%	**99.40%**	0.36%
	1.4-1.6	**99.31%**	0.222%	**98.48%**	0.175%	**99.16%**	0.28%
	1.6-1.8	**98.80%**	0.250%	**98.01%**	0.178%	**99.20%**	0.31%
	1.8-2.0	**98.52%**	0.263%	**97.45%**	0.308%	**98.91%**	0.41%
	2.0-2.5	**94.02%**	0.267%	**94.62%**	0.180%	**100.64%**	0.34%
	2.5-3.0	**91.12%**	0.434%	**92.01%**	0.364%	**100.98%**	0.63%
	3.0-5.0	**88.66%**	0.583%	**90.01%**	0.457%	**101.52%**	0.84%
$L_{p-K} > 0.4$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.27%**	0.35%	**99.18%**	0.231%	**99.91%**	0.42%
	0.6-0.8	**99.81%**	0.28%	**99.72%**	0.246%	**99.91%**	0.37%
	0.8-1.0	**99.86%**	0.23%	**99.76%**	0.241%	**99.91%**	0.34%
	1.0-1.2	**99.67%**	0.29%	**99.43%**	0.271%	**99.76%**	0.40%
	1.2-1.4	**98.59%**	0.10%	**97.93%**	0.315%	**99.33%**	0.33%
	1.4-1.6	**97.08%**	0.34%	**96.36%**	0.374%	**99.26%**	0.52%
	1.6-1.8	**95.26%**	0.39%	**94.40%**	0.436%	**99.10%**	0.61%
	1.8-2.0	**92.88%**	0.45%	**91.85%**	0.519%	**98.88%**	0.74%
	2.0-2.5	**88.67%**	0.41%	**86.81%**	0.456%	**97.90%**	0.69%
	2.5-3.0	**86.77%**	0.63%	**86.24%**	0.732%	**99.40%**	1.11%
	3.0-5.0	**79.74%**	0.69%	**80.11%**	0.941%	**100.46%**	1.47%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.89%**	0.44%	**99.62%**	0.532%	**99.73%**	0.69%
	0.6-0.8	**99.85%**	0.24%	**99.81%**	0.260%	**99.96%**	0.35%
	0.8-1.0	**99.86%**	0.23%	**99.83%**	0.246%	**99.96%**	0.34%
	1.0-1.2	**99.61%**	0.25%	**99.53%**	0.274%	**99.92%**	0.37%
	1.2-1.4	**98.99%**	0.29%	**98.40%**	0.312%	**99.40%**	0.43%
	1.4-1.6	**97.10%**	0.33%	**95.83%**	0.391%	**98.69%**	0.53%
	1.6-1.8	**95.78%**	0.43%	**93.78%**	0.470%	**97.91%**	0.66%
	1.8-2.0	**93.91%**	0.31%	**91.62%**	0.563%	**97.56%**	0.68%
	2.0-2.5	**88.54%**	0.33%	**87.37%**	0.477%	**98.67%**	0.65%
	2.5-3.0	**86.23%**	0.64%	**85.35%**	0.799%	**98.98%**	1.18%
	3.0-5.0	**79.24%**	0.93%	**81.40%**	1.029%	**102.73%**	1.77%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.34%**	0.28%	**99.27%**	0.273%	**99.93%**	0.39%
	0.6-0.8	**99.80%**	0.18%	**99.79%**	0.183%	**99.99%**	0.26%
	0.8-1.0	**99.90%**	0.17%	**99.80%**	0.182%	**99.90%**	0.25%
	1.0-1.2	**99.83%**	0.18%	**99.58%**	0.212%	**99.75%**	0.28%
	1.2-1.4	**99.52%**	0.21%	**98.41%**	0.228%	**98.88%**	0.31%
	1.4-1.6	**98.95%**	0.23%	**96.70%**	0.271%	**97.73%**	0.35%
	1.6-1.8	**97.90%**	0.27%	**94.96%**	0.321%	**97.00%**	0.42%
	1.8-2.0	**97.01%**	0.29%	**92.15%**	0.509%	**94.99%**	0.60%
	2.0-2.5	**88.55%**	0.31%	**87.69%**	0.327%	**99.03%**	0.51%
	2.5-3.0	**80.64%**	0.68%	**85.11%**	0.524%	**105.54%**	1.10%
	3.0-5.0	**78.26%**	0.62%	**81.14%**	0.721%	**103.69%**	1.24%

Table 9.7: Anti-Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-K} > 0.6$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.73%**	0.30%	**97.13%**	0.269%	**98.38%**	0.41%
	0.6-0.8	**99.39%**	0.25%	**96.03%**	0.260%	**96.62%**	0.36%
	0.8-1.0	**99.53%**	0.23%	**94.23%**	0.271%	**94.68%**	0.35%
	1.0-1.2	**99.28%**	0.26%	**95.06%**	0.276%	**95.76%**	0.37%
	1.2-1.4	**97.87%**	0.30%	**95.72%**	0.265%	**97.80%**	0.40%
	1.4-1.6	**95.37%**	0.35%	**93.97%**	0.388%	**98.53%**	0.54%
	1.6-1.8	**91.54%**	0.43%	**89.25%**	0.474%	**97.50%**	0.69%
	1.8-2.0	**86.70%**	0.51%	**82.42%**	0.599%	**95.07%**	0.89%
	2.0-2.5	**79.43%**	0.48%	**72.51%**	0.524%	**91.28%**	0.86%
	2.5-3.0	**70.26%**	0.74%	**63.99%**	0.719%	**91.07%**	1.41%
	3.0-5.0	**67.09%**	0.87%	**64.91%**	1.031%	**96.74%**	1.98%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.24%**	0.47%	**97.58%**	0.578%	**98.33%**	0.75%
	0.6-0.8	**99.33%**	0.24%	**95.94%**	0.282%	**96.58%**	0.37%
	0.8-1.0	**99.28%**	0.24%	**94.08%**	0.284%	**94.77%**	0.36%
	1.0-1.2	**99.22%**	0.27%	**95.20%**	0.304%	**95.94%**	0.40%
	1.2-1.4	**98.32%**	0.28%	**96.16%**	0.328%	**97.80%**	0.44%
	1.4-1.6	**95.41%**	0.29%	**93.31%**	0.409%	**97.80%**	0.52%
	1.6-1.8	**92.02%**	0.48%	**88.96%**	0.518%	**96.68%**	0.75%
	1.8-2.0	**87.21%**	0.52%	**82.89%**	0.639%	**95.05%**	0.92%
	2.0-2.5	**78.44%**	0.50%	**71.42%**	0.571%	**91.04%**	0.93%
	2.5-3.0	**68.39%**	0.78%	**63.68%**	0.874%	**93.11%**	1.66%
	3.0-5.0	**65.49%**	1.03%	**66.84%**	1.104%	**102.07%**	2.32%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.80%**	0.22%	**97.34%**	0.234%	**98.53%**	0.33%
	0.6-0.8	**99.45%**	0.18%	**96.19%**	0.196%	**96.72%**	0.26%
	0.8-1.0	**99.40%**	0.17%	**94.30%**	0.162%	**94.86%**	0.23%
	1.0-1.2	**99.61%**	0.19%	**95.20%**	0.219%	**95.58%**	0.29%
	1.2-1.4	**99.18%**	0.20%	**96.19%**	0.198%	**96.99%**	0.28%
	1.4-1.6	**98.17%**	0.22%	**94.00%**	0.289%	**95.76%**	0.36%
	1.6-1.8	**95.76%**	0.25%	**90.06%**	0.354%	**94.05%**	0.44%
	1.8-2.0	**91.25%**	0.37%	**83.61%**	0.442%	**91.63%**	0.61%
	2.0-2.5	**75.96%**	0.35%	**73.34%**	0.398%	**96.55%**	0.69%
	2.5-3.0	**67.10%**	0.59%	**61.29%**	0.616%	**91.34%**	1.22%
	3.0-5.0	**66.71%**	0.74%	**65.79%**	0.817%	**98.62%**	1.64%
$L_{p-K} > 0.9$							
exp7	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.73%**	0.28%	**97.10%**	0.328%	**98.35%**	0.43%
	0.6-0.8	**99.39%**	0.25%	**96.02%**	0.259%	**96.60%**	0.35%
	0.8-1.0	**99.57%**	0.23%	**94.12%**	0.267%	**94.53%**	0.35%
	1.0-1.2	**98.77%**	0.26%	**94.41%**	0.293%	**95.58%**	0.39%
	1.2-1.4	**95.53%**	0.31%	**93.40%**	0.331%	**97.77%**	0.47%
	1.4-1.6	**88.88%**	0.39%	**86.75%**	0.424%	**97.61%**	0.64%
	1.6-1.8	**79.60%**	0.51%	**75.67%**	0.536%	**95.06%**	0.91%
	1.8-2.0	**70.22%**	0.63%	**61.88%**	0.658%	**88.13%**	1.22%
	2.0-2.5	**61.08%**	0.56%	**53.18%**	0.527%	**87.07%**	1.17%
	2.5-3.0	**54.57%**	0.77%	**52.71%**	0.801%	**96.59%**	2.00%
	3.0-5.0	**44.19%**	0.86%	**46.56%**	1.005%	**105.38%**	3.06%
exp9	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.34%**	0.47%	**97.69%**	0.579%	**98.34%**	0.75%
	0.6-0.8	**99.32%**	0.24%	**95.96%**	0.280%	**96.62%**	0.37%
	0.8-1.0	**99.24%**	0.23%	**94.00%**	0.283%	**94.72%**	0.36%
	1.0-1.2	**98.89%**	0.33%	**94.72%**	0.305%	**95.78%**	0.45%
	1.2-1.4	**96.10%**	0.29%	**93.35%**	0.346%	**97.13%**	0.47%
	1.4-1.6	**89.14%**	0.40%	**86.14%**	0.333%	**96.64%**	0.57%
	1.6-1.8	**79.75%**	0.53%	**73.84%**	0.595%	**92.59%**	0.97%
	1.8-2.0	**69.27%**	0.65%	**61.16%**	0.636%	**88.30%**	1.24%
	2.0-2.5	**60.64%**	0.54%	**51.55%**	0.573%	**85.01%**	1.21%
	2.5-3.0	**53.76%**	0.80%	**53.96%**	0.861%	**100.36%**	2.19%
	3.0-5.0	**43.21%**	1.02%	**47.82%**	1.104%	**110.67%**	3.65%
exp11	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.79%**	0.22%	**97.33%**	0.234%	**98.52%**	0.32%
	0.6-0.8	**99.43%**	0.18%	**96.18%**	0.331%	**96.73%**	0.37%
	0.8-1.0	**99.38%**	0.17%	**94.27%**	0.207%	**94.86%**	0.27%
	1.0-1.2	**99.50%**	0.18%	**94.68%**	0.225%	**95.16%**	0.29%
	1.2-1.4	**98.15%**	0.27%	**93.84%**	0.246%	**95.61%**	0.36%
	1.4-1.6	**94.28%**	0.26%	**87.43%**	0.320%	**92.74%**	0.42%
	1.6-1.8	**83.83%**	0.38%	**76.20%**	0.419%	**90.89%**	0.65%
	1.8-2.0	**69.31%**	0.48%	**63.69%**	0.501%	**91.88%**	0.97%
	2.0-2.5	**58.13%**	0.40%	**53.21%**	0.409%	**91.53%**	0.95%
	2.5-3.0	**47.75%**	0.60%	**51.40%**	0.610%	**107.65%**	1.87%
	3.0-5.0	**40.37%**	0.88%	**47.53%**	0.791%	**117.73%**	3.22%

Table 9.8: Anti-Proton identification efficiency and Data-MC ratio of Exp7-Exp11 in momentum 0.4-5GeV

$L_{p-\pi} > 0.2$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.84%**	0.24%	**99.81%**	0.233%	**99.96%**	0.33%
	0.6-0.8	**99.89%**	0.12%	**99.85%**	0.169%	**99.96%**	0.21%
	0.8-1.0	**99.82%**	0.11%	**99.68%**	0.146%	**99.86%**	0.18%
	1.0-1.2	**99.71%**	0.11%	**99.51%**	0.137%	**99.79%**	0.18%
	1.2-1.4	**99.04%**	0.06%	**99.08%**	0.150%	**100.04%**	0.16%
	1.4-1.6	**97.33%**	0.15%	**97.59%**	0.175%	**100.27%**	0.24%
	1.6-1.8	**95.83%**	0.17%	**95.71%**	0.221%	**99.87%**	0.29%
	1.8-2.0	**95.34%**	0.20%	**95.54%**	0.273%	**100.22%**	0.35%
	2.0-2.5	**95.65%**	0.14%	**95.70%**	0.236%	**100.05%**	0.29%
	2.5-3.0	**95.75%**	0.21%	**95.64%**	0.263%	**99.88%**	0.35%
	3.0-5.0	**95.95%**	0.21%	**95.74%**	0.271%	**99.78%**	0.35%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.82%**	0.18%	**99.79%**	0.265%	**99.97%**	0.32%
	0.6-0.8	**99.88%**	0.13%	**99.88%**	0.163%	**99.99%**	0.21%
	0.8-1.0	**99.82%**	0.12%	**99.65%**	0.121%	**99.83%**	0.17%
	1.0-1.2	**99.69%**	0.12%	**99.49%**	0.144%	**99.80%**	0.19%
	1.2-1.4	**98.83%**	0.13%	**98.97%**	0.146%	**100.14%**	0.20%
	1.4-1.6	**97.20%**	0.19%	**97.48%**	0.181%	**100.29%**	0.27%
	1.6-1.8	**95.50%**	0.18%	**95.96%**	0.210%	**100.48%**	0.29%
	1.8-2.0	**95.54%**	0.27%	**95.34%**	0.183%	**99.79%**	0.34%
	2.0-2.5	**95.92%**	0.14%	**95.86%**	0.181%	**99.93%**	0.24%
	2.5-3.0	**95.98%**	0.21%	**95.87%**	0.262%	**99.89%**	0.35%
	3.0-5.0	**95.97%**	0.24%	**95.78%**	0.496%	**99.81%**	0.58%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.82%**	0.107%	**99.83%**	0.118%	**100.01%**	0.16%
	0.6-0.8	**99.86%**	0.068%	**99.82%**	0.084%	**99.96%**	0.11%
	0.8-1.0	**99.81%**	0.064%	**99.65%**	0.073%	**99.83%**	0.10%
	1.0-1.2	**99.64%**	0.065%	**99.40%**	0.074%	**99.76%**	0.10%
	1.2-1.4	**98.88%**	0.072%	**98.94%**	0.087%	**100.07%**	0.11%
	1.4-1.6	**97.30%**	0.085%	**97.56%**	0.151%	**100.27%**	0.18%
	1.6-1.8	**95.87%**	0.075%	**96.02%**	0.107%	**100.15%**	0.14%
	1.8-2.0	**95.49%**	0.080%	**95.49%**	0.125%	**100.00%**	0.15%
	2.0-2.5	**95.65%**	0.078%	**95.55%**	0.085%	**99.89%**	0.12%
	2.5-3.0	**95.76%**	0.114%	**95.77%**	0.138%	**100.01%**	0.19%
	3.0-5.0	**95.62%**	0.095%	**95.60%**	0.187%	**99.99%**	0.22%
$L_{p-\pi} > 0.4$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.81%**	0.16%	**99.69%**	0.238%	**99.89%**	0.29%
	0.6-0.8	**99.87%**	0.13%	**99.71%**	0.154%	**99.84%**	0.20%
	0.8-1.0	**99.80%**	0.11%	**99.33%**	0.060%	**99.53%**	0.13%
	1.0-1.2	**99.61%**	0.11%	**99.11%**	0.137%	**99.50%**	0.18%
	1.2-1.4	**98.38%**	0.13%	**98.42%**	0.076%	**100.04%**	0.15%
	1.4-1.6	**95.62%**	0.16%	**96.40%**	0.184%	**100.82%**	0.25%
	1.6-1.8	**94.02%**	0.18%	**94.39%**	0.207%	**100.40%**	0.29%
	1.8-2.0	**93.08%**	0.22%	**93.49%**	0.243%	**100.43%**	0.35%
	2.0-2.5	**93.26%**	0.16%	**93.40%**	0.272%	**100.15%**	0.34%
	2.5-3.0	**93.51%**	0.23%	**93.38%**	0.279%	**99.85%**	0.39%
	3.0-5.0	**93.79%**	0.28%	**93.54%**	0.375%	**99.73%**	0.50%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.77%**	0.16%	**99.73%**	0.208%	**99.96%**	0.26%
	0.6-0.8	**99.87%**	0.13%	**99.77%**	0.161%	**99.90%**	0.21%
	0.8-1.0	**99.73%**	0.12%	**99.31%**	0.138%	**99.57%**	0.18%
	1.0-1.2	**99.60%**	0.12%	**99.17%**	0.142%	**99.57%**	0.18%
	1.2-1.4	**98.13%**	0.13%	**98.33%**	0.147%	**100.21%**	0.20%
	1.4-1.6	**95.46%**	0.16%	**96.28%**	0.186%	**100.86%**	0.26%
	1.6-1.8	**93.64%**	0.16%	**94.57%**	0.219%	**100.99%**	0.29%
	1.8-2.0	**93.38%**	0.26%	**93.33%**	0.251%	**99.94%**	0.38%
	2.0-2.5	**93.56%**	0.16%	**93.49%**	0.197%	**99.93%**	0.27%
	2.5-3.0	**93.89%**	0.24%	**93.82%**	0.291%	**99.93%**	0.40%
	3.0-5.0	**94.02%**	0.29%	**93.31%**	0.373%	**99.25%**	0.50%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.81%**	0.11%	**99.75%**	0.156%	**99.94%**	0.19%
	0.6-0.8	**99.83%**	0.07%	**99.67%**	0.083%	**99.84%**	0.11%
	0.8-1.0	**99.77%**	0.06%	**99.33%**	0.060%	**99.56%**	0.09%
	1.0-1.2	**99.53%**	0.06%	**99.03%**	0.073%	**99.50%**	0.10%
	1.2-1.4	**98.23%**	0.11%	**98.44%**	0.079%	**100.21%**	0.14%
	1.4-1.6	**95.56%**	0.09%	**96.27%**	0.098%	**100.75%**	0.14%
	1.6-1.8	**93.97%**	0.10%	**94.58%**	0.111%	**100.64%**	0.16%
	1.8-2.0	**93.47%**	0.15%	**93.57%**	0.117%	**100.12%**	0.20%
	2.0-2.5	**93.43%**	0.09%	**93.43%**	0.107%	**100.00%**	0.15%
	2.5-3.0	**93.44%**	0.12%	**93.52%**	0.150%	**100.08%**	0.21%
	3.0-5.0	**93.34%**	0.21%	**93.66%**	0.200%	**100.35%**	0.31%

Table 9.9: Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-\pi} > 0.6$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.24%**	0.19%	**96.50%**	0.259%	**97.24%**	0.32%
	0.6-0.8	**99.64%**	0.12%	**96.02%**	0.161%	**96.37%**	0.20%
	0.8-1.0	**99.69%**	0.11%	**97.60%**	0.107%	**97.90%**	0.15%
	1.0-1.2	**99.49%**	0.11%	**98.83%**	0.137%	**99.34%**	0.18%
	1.2-1.4	**97.58%**	0.13%	**97.74%**	0.153%	**100.17%**	0.21%
	1.4-1.6	**93.34%**	0.17%	**94.85%**	0.192%	**101.61%**	0.27%
	1.6-1.8	**89.98%**	0.20%	**91.60%**	0.222%	**101.80%**	0.34%
	1.8-2.0	**90.09%**	0.23%	**91.10%**	0.253%	**101.12%**	0.38%
	2.0-2.5	**90.89%**	0.17%	**91.05%**	0.200%	**100.17%**	0.29%
	2.5-3.0	**91.23%**	0.25%	**91.03%**	0.300%	**99.78%**	0.43%
	3.0-5.0	**91.31%**	0.28%	**91.95%**	0.392%	**100.70%**	0.53%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.27%**	0.10%	**96.58%**	0.205%	**97.29%**	0.23%
	0.6-0.8	**99.59%**	0.13%	**96.10%**	0.166%	**96.50%**	0.21%
	0.8-1.0	**99.61%**	0.11%	**97.77%**	0.122%	**98.15%**	0.17%
	1.0-1.2	**99.45%**	0.10%	**98.85%**	0.131%	**99.39%**	0.17%
	1.2-1.4	**97.29%**	0.12%	**97.72%**	0.157%	**100.44%**	0.20%
	1.4-1.6	**93.04%**	0.17%	**94.83%**	0.193%	**101.92%**	0.28%
	1.6-1.8	**89.84%**	0.21%	**91.62%**	0.233%	**101.99%**	0.35%
	1.8-2.0	**90.48%**	0.24%	**90.74%**	0.266%	**100.29%**	0.40%
	2.0-2.5	**91.14%**	0.18%	**91.07%**	0.211%	**99.93%**	0.30%
	2.5-3.0	**91.69%**	0.25%	**91.38%**	0.310%	**99.67%**	0.44%
	3.0-5.0	**91.41%**	0.31%	**91.02%**	0.418%	**99.57%**	0.57%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.28%**	0.08%	**96.50%**	0.137%	**97.20%**	0.16%
	0.6-0.8	**99.77%**	0.07%	**95.99%**	0.084%	**96.21%**	0.11%
	0.8-1.0	**99.63%**	0.06%	**97.71%**	0.074%	**98.07%**	0.10%
	1.0-1.2	**99.37%**	0.06%	**98.72%**	0.057%	**99.34%**	0.09%
	1.2-1.4	**97.35%**	0.05%	**97.83%**	0.079%	**100.49%**	0.10%
	1.4-1.6	**93.33%**	0.09%	**94.74%**	0.099%	**101.51%**	0.15%
	1.6-1.8	**90.21%**	0.11%	**91.75%**	0.118%	**101.71%**	0.18%
	1.8-2.0	**90.51%**	0.13%	**91.14%**	0.137%	**100.69%**	0.21%
	2.0-2.5	**90.97%**	0.09%	**90.99%**	0.099%	**100.02%**	0.15%
	2.5-3.0	**90.94%**	0.11%	**91.19%**	0.160%	**100.28%**	0.22%
	3.0-5.0	**91.01%**	0.17%	**91.58%**	0.239%	**100.63%**	0.32%
$L_{p-\pi} > 0.9$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.20%**	0.21%	**96.42%**	0.214%	**97.19%**	0.30%
	0.6-0.8	**99.61%**	0.12%	**95.70%**	0.177%	**96.07%**	0.21%
	0.8-1.0	**99.62%**	0.11%	**95.14%**	0.088%	**95.50%**	0.14%
	1.0-1.2	**99.11%**	0.13%	**96.59%**	0.143%	**97.45%**	0.19%
	1.2-1.4	**94.65%**	0.13%	**95.69%**	0.157%	**101.11%**	0.22%
	1.4-1.6	**87.11%**	0.19%	**89.37%**	0.191%	**102.59%**	0.31%
	1.6-1.8	**82.84%**	0.19%	**86.65%**	0.180%	**104.60%**	0.32%
	1.8-2.0	**81.65%**	0.26%	**84.37%**	0.278%	**103.33%**	0.47%
	2.0-2.5	**82.31%**	0.21%	**82.67%**	0.235%	**100.44%**	0.38%
	2.5-3.0	**83.27%**	0.30%	**83.31%**	0.342%	**100.06%**	0.55%
	3.0-5.0	**83.53%**	0.36%	**83.80%**	0.453%	**100.32%**	0.69%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.23%**	0.06%	**96.56%**	0.470%	**97.31%**	0.48%
	0.6-0.8	**99.55%**	0.13%	**95.73%**	0.158%	**96.17%**	0.20%
	0.8-1.0	**99.55%**	0.11%	**95.31%**	0.151%	**95.73%**	0.19%
	1.0-1.2	**99.04%**	0.12%	**96.67%**	0.124%	**97.61%**	0.17%
	1.2-1.4	**94.24%**	0.15%	**95.53%**	0.164%	**101.37%**	0.24%
	1.4-1.6	**86.60%**	0.20%	**89.77%**	0.190%	**103.66%**	0.32%
	1.6-1.8	**82.87%**	0.23%	**86.64%**	0.251%	**104.54%**	0.42%
	1.8-2.0	**81.79%**	0.25%	**83.58%**	0.281%	**102.18%**	0.47%
	2.0-2.5	**82.87%**	0.21%	**82.63%**	0.243%	**99.71%**	0.39%
	2.5-3.0	**83.71%**	0.31%	**83.67%**	0.358%	**99.96%**	0.56%
	3.0-5.0	**83.68%**	0.45%	**83.25%**	0.475%	**99.49%**	0.78%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.26%**	0.11%	**96.47%**	0.149%	**97.19%**	0.18%
	0.6-0.8	**99.75%**	0.07%	**95.62%**	0.086%	**95.87%**	0.11%
	0.8-1.0	**99.56%**	0.06%	**95.39%**	0.077%	**95.82%**	0.10%
	1.0-1.2	**98.85%**	0.09%	**96.51%**	0.077%	**97.63%**	0.12%
	1.2-1.4	**94.34%**	0.09%	**95.88%**	0.084%	**101.63%**	0.13%
	1.4-1.6	**86.77%**	0.09%	**89.70%**	0.095%	**103.38%**	0.15%
	1.6-1.8	**83.38%**	0.13%	**86.57%**	0.129%	**103.83%**	0.22%
	1.8-2.0	**82.14%**	0.15%	**83.95%**	0.164%	**102.21%**	0.27%
	2.0-2.5	**82.36%**	0.11%	**82.54%**	0.126%	**100.22%**	0.21%
	2.5-3.0	**82.79%**	0.16%	**83.51%**	0.185%	**100.87%**	0.30%
	3.0-5.0	**82.41%**	0.18%	**84.54%**	0.206%	**102.59%**	0.34%

Table 9.10: Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-K} > 0.2$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.62%**	0.09%	**99.55%**	0.106%	**99.93%**	0.14%
	0.6-0.8	**99.80%**	0.12%	**99.82%**	0.151%	**100.02%**	0.19%
	0.8-1.0	**99.83%**	0.08%	**99.79%**	0.132%	**99.96%**	0.16%
	1.0-1.2	**99.78%**	0.11%	**99.73%**	0.307%	**99.95%**	0.33%
	1.2-1.4	**99.49%**	0.16%	**99.23%**	0.148%	**99.74%**	0.22%
	1.4-1.6	**98.92%**	0.17%	**98.50%**	0.088%	**99.58%**	0.19%
	1.6-1.8	**98.45%**	0.16%	**97.79%**	0.188%	**99.33%**	0.25%
	1.8-2.0	**98.04%**	0.17%	**97.68%**	0.156%	**99.64%**	0.23%
	2.0-2.5	**94.56%**	0.15%	**94.91%**	0.175%	**100.38%**	0.24%
	2.5-3.0	**92.75%**	0.23%	**93.23%**	0.284%	**100.51%**	0.40%
	3.0-5.0	**88.94%**	0.32%	**88.74%**	0.361%	**99.78%**	0.54%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.55%**	0.19%	**99.57%**	0.299%	**100.02%**	0.35%
	0.6-0.8	**99.80%**	0.13%	**99.80%**	0.125%	**99.99%**	0.18%
	0.8-1.0	**99.78%**	0.11%	**99.78%**	0.137%	**100.00%**	0.18%
	1.0-1.2	**99.76%**	0.02%	**99.64%**	0.196%	**99.88%**	0.20%
	1.2-1.4	**99.32%**	0.09%	**99.18%**	0.178%	**99.85%**	0.20%
	1.4-1.6	**98.89%**	0.14%	**98.68%**	0.079%	**99.80%**	0.17%
	1.6-1.8	**98.27%**	0.16%	**97.91%**	0.200%	**99.63%**	0.26%
	1.8-2.0	**97.76%**	0.26%	**97.44%**	0.163%	**99.67%**	0.32%
	2.0-2.5	**94.62%**	0.16%	**94.98%**	0.182%	**100.38%**	0.25%
	2.5-3.0	**92.68%**	0.23%	**93.26%**	0.290%	**100.62%**	0.40%
	3.0-5.0	**89.32%**	0.33%	**90.32%**	0.432%	**101.12%**	0.61%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.59%**	0.052%	**99.58%**	0.088%	**99.99%**	0.10%
	0.6-0.8	**99.79%**	0.068%	**99.77%**	0.079%	**99.98%**	0.10%
	0.8-1.0	**99.80%**	0.059%	**99.79%**	0.071%	**99.99%**	0.09%
	1.0-1.2	**99.67%**	0.065%	**99.62%**	0.074%	**99.95%**	0.10%
	1.2-1.4	**99.34%**	0.072%	**99.15%**	0.080%	**99.81%**	0.11%
	1.4-1.6	**98.70%**	0.074%	**98.41%**	0.086%	**99.71%**	0.11%
	1.6-1.8	**98.21%**	0.087%	**97.85%**	0.094%	**99.63%**	0.13%
	1.8-2.0	**97.69%**	0.085%	**97.36%**	0.112%	**99.66%**	0.14%
	2.0-2.5	**94.60%**	0.084%	**94.99%**	0.095%	**100.41%**	0.13%
	2.5-3.0	**92.98%**	0.126%	**92.97%**	0.133%	**99.99%**	0.20%
	3.0-5.0	**89.11%**	0.175%	**90.28%**	0.284%	**101.31%**	0.38%
$L_{p-K} > 0.4$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.61%**	0.08%	**99.56%**	0.032%	**99.95%**	0.09%
	0.6-0.8	**99.80%**	0.12%	**99.80%**	0.150%	**100.01%**	0.19%
	0.8-1.0	**99.86%**	0.07%	**99.76%**	0.131%	**99.90%**	0.15%
	1.0-1.2	**99.73%**	0.13%	**99.57%**	0.031%	**99.84%**	0.13%
	1.2-1.4	**99.09%**	0.05%	**98.49%**	0.133%	**99.40%**	0.14%
	1.4-1.6	**97.84%**	0.10%	**96.86%**	0.596%	**99.00%**	0.62%
	1.6-1.8	**96.01%**	0.17%	**94.57%**	0.184%	**98.49%**	0.26%
	1.8-2.0	**94.13%**	0.21%	**92.80%**	0.467%	**98.59%**	0.54%
	2.0-2.5	**87.96%**	0.19%	**88.54%**	0.193%	**100.65%**	0.31%
	2.5-3.0	**86.29%**	0.27%	**86.90%**	0.329%	**100.71%**	0.50%
	3.0-5.0	**79.85%**	0.38%	**80.15%**	0.476%	**100.39%**	0.76%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.54%**	0.18%	**99.58%**	0.260%	**100.04%**	0.32%
	0.6-0.8	**99.80%**	0.13%	**99.79%**	0.157%	**99.98%**	0.20%
	0.8-1.0	**99.79%**	0.11%	**99.75%**	0.132%	**99.96%**	0.17%
	1.0-1.2	**99.67%**	0.12%	**99.50%**	0.081%	**99.84%**	0.14%
	1.2-1.4	**98.90%**	0.16%	**98.48%**	0.144%	**99.58%**	0.21%
	1.4-1.6	**97.45%**	0.21%	**96.93%**	0.185%	**99.47%**	0.29%
	1.6-1.8	**95.49%**	0.18%	**95.23%**	0.187%	**99.73%**	0.27%
	1.8-2.0	**93.46%**	0.22%	**92.75%**	0.257%	**99.24%**	0.36%
	2.0-2.5	**88.08%**	0.22%	**89.31%**	0.220%	**101.40%**	0.35%
	2.5-3.0	**85.96%**	0.29%	**87.10%**	0.274%	**101.32%**	0.47%
	3.0-5.0	**79.90%**	0.40%	**81.51%**	0.497%	**102.02%**	0.80%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.59%**	0.12%	**99.57%**	0.135%	**99.97%**	0.18%
	0.6-0.8	**99.78%**	0.07%	**99.77%**	0.080%	**99.99%**	0.11%
	0.8-1.0	**99.79%**	0.06%	**99.74%**	0.078%	**99.95%**	0.10%
	1.0-1.2	**99.58%**	0.06%	**99.47%**	0.074%	**99.89%**	0.10%
	1.2-1.4	**98.87%**	0.07%	**98.54%**	0.080%	**99.67%**	0.11%
	1.4-1.6	**97.39%**	0.07%	**96.90%**	0.093%	**99.49%**	0.12%
	1.6-1.8	**95.60%**	0.07%	**94.88%**	0.112%	**99.24%**	0.14%
	1.8-2.0	**93.78%**	0.11%	**92.52%**	0.134%	**98.66%**	0.19%
	2.0-2.5	**88.24%**	0.10%	**89.15%**	0.114%	**101.04%**	0.18%
	2.5-3.0	**86.45%**	0.15%	**86.84%**	0.178%	**100.45%**	0.27%
	3.0-5.0	**79.04%**	0.19%	**82.32%**	0.283%	**104.15%**	0.43%

Table 9.11: Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-K} > 0.6$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.21%**	0.06%	**97.58%**	0.222%	**98.35%**	0.23%
	0.6-0.8	**99.41%**	0.12%	**95.87%**	0.154%	**96.43%**	0.19%
	0.8-1.0	**99.49%**	0.11%	**94.17%**	0.145%	**94.66%**	0.18%
	1.0-1.2	**99.33%**	0.11%	**96.03%**	0.204%	**96.68%**	0.23%
	1.2-1.4	**98.32%**	0.13%	**96.82%**	0.161%	**98.47%**	0.21%
	1.4-1.6	**95.80%**	0.16%	**94.57%**	0.190%	**98.71%**	0.26%
	1.6-1.8	**91.18%**	0.20%	**89.76%**	0.238%	**98.44%**	0.34%
	1.8-2.0	**85.16%**	0.26%	**84.08%**	0.292%	**98.73%**	0.46%
	2.0-2.5	**75.46%**	0.21%	**75.45%**	0.255%	**99.99%**	0.44%
	2.5-3.0	**66.69%**	0.32%	**67.36%**	0.416%	**101.00%**	0.79%
	3.0-5.0	**65.78%**	0.37%	**66.16%**	0.526%	**100.59%**	0.98%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.11%**	0.13%	**97.70%**	0.219%	**98.58%**	0.26%
	0.6-0.8	**99.41%**	0.13%	**96.02%**	0.171%	**96.59%**	0.21%
	0.8-1.0	**99.41%**	0.11%	**94.30%**	0.173%	**94.86%**	0.21%
	1.0-1.2	**99.20%**	0.13%	**95.94%**	0.154%	**96.71%**	0.20%
	1.2-1.4	**97.99%**	0.14%	**96.92%**	0.162%	**98.91%**	0.21%
	1.4-1.6	**95.46%**	0.17%	**94.86%**	0.193%	**99.38%**	0.27%
	1.6-1.8	**90.71%**	0.22%	**90.76%**	0.242%	**100.05%**	0.36%
	1.8-2.0	**85.46%**	0.26%	**83.94%**	0.305%	**98.22%**	0.47%
	2.0-2.5	**76.77%**	0.33%	**76.58%**	0.231%	**99.75%**	0.53%
	2.5-3.0	**66.78%**	0.36%	**68.09%**	0.415%	**101.97%**	0.83%
	3.0-5.0	**66.17%**	0.45%	**68.84%**	0.479%	**104.04%**	1.01%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.20%**	0.07%	**97.64%**	0.137%	**98.42%**	0.15%
	0.6-0.8	**99.59%**	0.07%	**95.95%**	0.084%	**96.35%**	0.11%
	0.8-1.0	**99.39%**	0.07%	**94.37%**	0.077%	**94.95%**	0.10%
	1.0-1.2	**99.15%**	0.06%	**95.88%**	0.081%	**96.70%**	0.10%
	1.2-1.4	**98.02%**	0.07%	**96.94%**	0.048%	**98.89%**	0.09%
	1.4-1.6	**95.44%**	0.09%	**94.80%**	0.101%	**99.33%**	0.14%
	1.6-1.8	**91.47%**	0.07%	**90.88%**	0.089%	**99.36%**	0.13%
	1.8-2.0	**86.37%**	0.14%	**84.52%**	0.153%	**97.86%**	0.24%
	2.0-2.5	**77.16%**	0.12%	**76.54%**	0.137%	**99.19%**	0.24%
	2.5-3.0	**67.40%**	0.19%	**67.95%**	0.203%	**100.81%**	0.41%
	3.0-5.0	**65.11%**	0.22%	**68.76%**	0.235%	**105.61%**	0.50%
$L_{p-K} > 0.9$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.20%**	0.16%	**97.57%**	0.160%	**98.35%**	0.23%
	0.6-0.8	**99.40%**	0.12%	**95.84%**	0.155%	**96.42%**	0.20%
	0.8-1.0	**99.44%**	0.11%	**94.10%**	0.144%	**94.63%**	0.18%
	1.0-1.2	**98.97%**	0.12%	**95.56%**	0.139%	**96.55%**	0.18%
	1.2-1.4	**95.78%**	0.14%	**94.37%**	0.119%	**98.53%**	0.19%
	1.4-1.6	**87.30%**	0.19%	**87.58%**	0.214%	**100.32%**	0.33%
	1.6-1.8	**75.39%**	0.29%	**76.14%**	0.279%	**101.00%**	0.54%
	1.8-2.0	**64.74%**	0.30%	**64.12%**	0.331%	**99.05%**	0.69%
	2.0-2.5	**55.63%**	0.25%	**53.62%**	0.269%	**96.38%**	0.64%
	2.5-3.0	**51.05%**	0.36%	**51.82%**	0.406%	**101.51%**	1.07%
	3.0-5.0	**41.92%**	0.43%	**42.91%**	0.522%	**102.34%**	1.63%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.11%**	0.11%	**97.70%**	0.222%	**98.58%**	0.25%
	0.6-0.8	**99.42%**	0.13%	**96.00%**	0.162%	**96.56%**	0.20%
	0.8-1.0	**99.38%**	0.11%	**94.24%**	0.150%	**94.82%**	0.19%
	1.0-1.2	**98.76%**	0.12%	**95.45%**	0.162%	**96.66%**	0.20%
	1.2-1.4	**95.25%**	0.14%	**94.71%**	0.140%	**99.43%**	0.21%
	1.4-1.6	**87.32%**	0.20%	**88.45%**	0.220%	**101.29%**	0.34%
	1.6-1.8	**76.15%**	0.25%	**77.91%**	0.282%	**102.32%**	0.50%
	1.8-2.0	**65.84%**	0.31%	**64.89%**	0.347%	**98.55%**	0.70%
	2.0-2.5	**57.33%**	0.25%	**55.42%**	0.302%	**96.68%**	0.68%
	2.5-3.0	**51.26%**	0.37%	**54.09%**	0.402%	**105.51%**	1.10%
	3.0-5.0	**41.14%**	0.45%	**45.93%**	0.552%	**111.63%**	1.81%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.20%**	0.11%	**97.64%**	0.032%	**98.43%**	0.11%
	0.6-0.8	**99.57%**	0.07%	**95.95%**	0.084%	**96.36%**	0.11%
	0.8-1.0	**99.36%**	0.06%	**94.32%**	0.078%	**94.92%**	0.10%
	1.0-1.2	**98.68%**	0.08%	**95.41%**	0.074%	**96.68%**	0.11%
	1.2-1.4	**95.47%**	0.06%	**94.83%**	0.089%	**99.33%**	0.11%
	1.4-1.6	**87.96%**	0.11%	**88.83%**	0.112%	**100.98%**	0.18%
	1.6-1.8	**77.63%**	0.14%	**78.44%**	0.145%	**101.04%**	0.26%
	1.8-2.0	**67.43%**	0.17%	**66.13%**	0.154%	**98.07%**	0.33%
	2.0-2.5	**57.60%**	0.16%	**55.55%**	0.146%	**96.44%**	0.37%
	2.5-3.0	**51.37%**	0.20%	**53.35%**	0.220%	**103.86%**	0.58%
	3.0-5.0	**40.43%**	0.24%	**46.65%**	0.284%	**115.39%**	0.98%

Table 9.12: Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-\pi} > 0.2$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.28%**	0.11%	**99.23%**	0.215%	**99.95%**	0.25%
	0.6-0.8	**99.74%**	0.15%	**99.69%**	0.148%	**99.95%**	0.21%
	0.8-1.0	**99.77%**	0.12%	**99.57%**	0.142%	**99.79%**	0.18%
	1.0-1.2	**99.59%**	0.13%	**99.30%**	0.128%	**99.71%**	0.19%
	1.2-1.4	**98.55%**	0.14%	**98.59%**	0.164%	**100.03%**	0.22%
	1.4-1.6	**95.71%**	0.13%	**95.98%**	0.203%	**100.27%**	0.25%
	1.6-1.8	**93.32%**	0.20%	**93.43%**	0.232%	**100.13%**	0.33%
	1.8-2.0	**93.10%**	0.21%	**93.04%**	0.153%	**99.94%**	0.28%
	2.0-2.5	**94.37%**	0.15%	**94.02%**	0.149%	**99.63%**	0.23%
	2.5-3.0	**95.26%**	0.23%	**95.10%**	0.284%	**99.84%**	0.38%
	3.0-5.0	**95.91%**	0.28%	**95.60%**	0.419%	**99.68%**	0.53%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.28%**	0.33%	**99.18%**	0.246%	**99.90%**	0.41%
	0.6-0.8	**99.76%**	0.11%	**99.68%**	0.159%	**99.92%**	0.19%
	0.8-1.0	**99.77%**	0.12%	**99.56%**	0.117%	**99.79%**	0.17%
	1.0-1.2	**99.47%**	0.23%	**99.36%**	0.166%	**99.89%**	0.28%
	1.2-1.4	**98.44%**	0.12%	**98.55%**	0.116%	**100.12%**	0.17%
	1.4-1.6	**95.50%**	0.17%	**96.06%**	0.197%	**100.59%**	0.28%
	1.6-1.8	**93.40%**	0.19%	**93.43%**	0.288%	**100.03%**	0.37%
	1.8-2.0	**93.10%**	0.19%	**93.02%**	0.491%	**99.91%**	0.57%
	2.0-2.5	**94.65%**	0.17%	**94.47%**	0.210%	**99.81%**	0.28%
	2.5-3.0	**95.45%**	0.22%	**95.01%**	0.267%	**99.54%**	0.36%
	3.0-5.0	**95.92%**	0.30%	**95.54%**	0.447%	**99.61%**	0.56%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.23%**	0.103%	**99.23%**	0.111%	**100.00%**	0.15%
	0.6-0.8	**99.73%**	0.069%	**99.65%**	0.080%	**99.92%**	0.11%
	0.8-1.0	**99.73%**	0.064%	**99.52%**	0.074%	**99.79%**	0.10%
	1.0-1.2	**99.51%**	0.064%	**99.20%**	0.079%	**99.69%**	0.10%
	1.2-1.4	**98.28%**	0.077%	**98.36%**	0.094%	**100.09%**	0.12%
	1.4-1.6	**95.42%**	0.131%	**96.03%**	0.103%	**100.63%**	0.18%
	1.6-1.8	**93.63%**	0.209%	**93.78%**	0.132%	**100.15%**	0.26%
	1.8-2.0	**93.20%**	0.084%	**93.21%**	0.149%	**100.01%**	0.18%
	2.0-2.5	**94.35%**	0.082%	**94.11%**	0.115%	**99.74%**	0.15%
	2.5-3.0	**95.01%**	0.126%	**95.01%**	0.140%	**100.00%**	0.20%
	3.0-5.0	**95.46%**	0.171%	**95.51%**	0.201%	**100.04%**	0.28%
$L_{p-\pi} > 0.4$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.21%**	0.08%	**99.02%**	0.237%	**99.81%**	0.25%
	0.6-0.8	**99.68%**	0.12%	**99.41%**	0.147%	**99.73%**	0.19%
	0.8-1.0	**99.69%**	0.11%	**99.16%**	0.102%	**99.47%**	0.15%
	1.0-1.2	**99.41%**	0.16%	**98.81%**	0.148%	**99.40%**	0.22%
	1.2-1.4	**97.67%**	0.14%	**97.89%**	0.164%	**100.23%**	0.22%
	1.4-1.6	**93.33%**	0.19%	**93.98%**	0.204%	**100.69%**	0.30%
	1.6-1.8	**90.67%**	0.21%	**90.98%**	0.237%	**100.34%**	0.35%
	1.8-2.0	**90.42%**	0.24%	**90.57%**	0.279%	**100.16%**	0.40%
	2.0-2.5	**91.71%**	0.21%	**90.99%**	0.146%	**99.22%**	0.28%
	2.5-3.0	**92.97%**	0.25%	**92.45%**	0.300%	**99.44%**	0.42%
	3.0-5.0	**93.64%**	0.31%	**93.01%**	0.405%	**99.33%**	0.54%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.23%**	0.19%	**98.99%**	0.238%	**99.75%**	0.31%
	0.6-0.8	**99.69%**	0.13%	**99.36%**	0.088%	**99.67%**	0.16%
	0.8-1.0	**99.70%**	0.12%	**99.10%**	0.146%	**99.40%**	0.19%
	1.0-1.2	**99.32%**	0.17%	**98.93%**	0.170%	**99.61%**	0.25%
	1.2-1.4	**97.49%**	0.15%	**97.77%**	0.175%	**100.29%**	0.23%
	1.4-1.6	**93.03%**	0.11%	**94.26%**	0.214%	**101.32%**	0.26%
	1.6-1.8	**90.88%**	0.22%	**91.10%**	0.260%	**100.24%**	0.37%
	1.8-2.0	**90.69%**	0.24%	**90.72%**	0.293%	**100.04%**	0.42%
	2.0-2.5	**92.07%**	0.16%	**91.65%**	0.226%	**99.54%**	0.30%
	2.5-3.0	**93.37%**	0.21%	**92.46%**	0.275%	**99.03%**	0.37%
	3.0-5.0	**93.45%**	0.36%	**92.78%**	0.445%	**99.29%**	0.61%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.19%**	0.11%	**98.97%**	0.114%	**99.78%**	0.16%
	0.6-0.8	**99.66%**	0.07%	**99.34%**	0.080%	**99.68%**	0.11%
	0.8-1.0	**99.63%**	0.11%	**99.07%**	0.044%	**99.43%**	0.12%
	1.0-1.2	**99.32%**	0.07%	**98.71%**	0.078%	**99.39%**	0.10%
	1.2-1.4	**97.20%**	0.07%	**97.61%**	0.088%	**100.42%**	0.11%
	1.4-1.6	**92.94%**	0.10%	**94.20%**	0.109%	**101.35%**	0.16%
	1.6-1.8	**91.02%**	0.11%	**91.52%**	0.116%	**100.55%**	0.18%
	1.8-2.0	**90.68%**	0.12%	**90.79%**	0.167%	**100.12%**	0.23%
	2.0-2.5	**91.69%**	0.10%	**91.34%**	0.134%	**99.62%**	0.18%
	2.5-3.0	**92.36%**	0.10%	**92.69%**	0.162%	**100.35%**	0.21%
	3.0-5.0	**93.10%**	0.20%	**93.47%**	0.220%	**100.39%**	0.32%

Table 9.13: Anti-Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-\pi} > 0.6$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.60%**	0.18%	**95.44%**	0.208%	**96.80%**	0.28%
	0.6-0.8	**99.46%**	0.04%	**95.41%**	0.146%	**95.92%**	0.15%
	0.8-1.0	**99.61%**	0.11%	**97.52%**	0.108%	**97.90%**	0.16%
	1.0-1.2	**99.24%**	0.08%	**98.37%**	0.147%	**99.12%**	0.17%
	1.2-1.4	**96.58%**	0.14%	**96.97%**	0.166%	**100.41%**	0.23%
	1.4-1.6	**90.55%**	0.19%	**91.96%**	0.210%	**101.56%**	0.31%
	1.6-1.8	**86.42%**	0.24%	**87.90%**	0.284%	**101.71%**	0.43%
	1.8-2.0	**87.49%**	0.25%	**87.67%**	0.296%	**100.21%**	0.44%
	2.0-2.5	**88.98%**	0.20%	**88.07%**	0.167%	**98.98%**	0.29%
	2.5-3.0	**90.45%**	0.27%	**89.74%**	0.320%	**99.21%**	0.46%
	3.0-5.0	**90.84%**	0.34%	**90.69%**	0.425%	**99.84%**	0.60%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.74%**	0.14%	95.39%	0.25%	**96.61%**	0.28%
	0.6-0.8	**99.48%**	0.13%	95.47%	0.10%	**95.97%**	0.16%
	0.8-1.0	**99.56%**	0.12%	97.49%	0.15%	**97.92%**	0.19%
	1.0-1.2	**99.11%**	0.14%	98.57%	0.16%	**99.45%**	0.21%
	1.2-1.4	**96.27%**	0.15%	97.01%	0.15%	**100.78%**	0.22%
	1.4-1.6	**90.31%**	0.20%	92.32%	0.22%	**102.22%**	0.33%
	1.6-1.8	**86.71%**	0.23%	87.77%	0.27%	**101.22%**	0.42%
	1.8-2.0	**87.46%**	0.25%	88.00%	0.31%	**100.61%**	0.46%
	2.0-2.5	**89.35%**	0.20%	88.83%	0.19%	**99.41%**	0.30%
	2.5-3.0	**91.08%**	0.27%	89.53%	0.34%	**98.29%**	0.47%
	3.0-5.0	**90.94%**	0.35%	89.93%	0.47%	**98.89%**	0.65%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.69%**	0.11%	**95.29%**	0.128%	**96.56%**	0.17%
	0.6-0.8	**99.40%**	0.07%	**95.47%**	0.084%	**96.04%**	0.11%
	0.8-1.0	**99.53%**	0.06%	**97.50%**	0.039%	**97.96%**	0.07%
	1.0-1.2	**99.11%**	0.07%	**98.35%**	0.079%	**99.24%**	0.10%
	1.2-1.4	**96.06%**	0.05%	**96.80%**	0.089%	**100.77%**	0.10%
	1.4-1.6	**90.22%**	0.10%	**92.23%**	0.113%	**102.22%**	0.17%
	1.6-1.8	**87.09%**	0.15%	**88.30%**	0.136%	**101.38%**	0.23%
	1.8-2.0	**87.52%**	0.13%	**87.84%**	0.154%	**100.36%**	0.23%
	2.0-2.5	**89.01%**	0.10%	**88.54%**	0.120%	**99.47%**	0.18%
	2.5-3.0	**89.72%**	0.15%	**90.04%**	0.173%	**100.35%**	0.26%
	3.0-5.0	**90.41%**	0.19%	**91.35%**	0.225%	**101.05%**	0.33%
$L_{p-\pi} > 0.9$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.56%**	0.04%	**95.33%**	0.213%	**96.73%**	0.22%
	0.6-0.8	**99.44%**	0.12%	**95.00%**	0.154%	**95.54%**	0.19%
	0.8-1.0	**99.54%**	0.10%	**95.44%**	0.186%	**95.89%**	0.21%
	1.0-1.2	**98.74%**	0.27%	**96.11%**	0.122%	**97.34%**	0.30%
	1.2-1.4	**93.12%**	0.22%	**94.26%**	0.175%	**101.23%**	0.31%
	1.4-1.6	**83.09%**	0.21%	**86.04%**	0.225%	**103.56%**	0.38%
	1.6-1.8	**79.10%**	0.25%	**82.16%**	0.263%	**103.86%**	0.46%
	1.8-2.0	**78.94%**	0.28%	**81.01%**	0.315%	**102.62%**	0.54%
	2.0-2.5	**80.38%**	0.22%	**79.73%**	0.253%	**99.20%**	0.42%
	2.5-3.0	**82.67%**	0.38%	**80.95%**	0.367%	**97.93%**	0.63%
	3.0-5.0	**82.78%**	0.40%	**82.34%**	0.498%	**99.47%**	0.77%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.72%**	0.09%	**95.24%**	0.113%	**96.47%**	0.15%
	0.6-0.8	**99.47%**	0.13%	**95.03%**	0.155%	**95.54%**	0.20%
	0.8-1.0	**99.47%**	0.05%	**95.39%**	0.267%	**95.90%**	0.27%
	1.0-1.2	**98.49%**	0.12%	**96.39%**	0.222%	**97.86%**	0.26%
	1.2-1.4	**92.60%**	0.16%	**94.19%**	0.278%	**101.72%**	0.35%
	1.4-1.6	**83.10%**	0.21%	**86.48%**	0.237%	**104.06%**	0.39%
	1.6-1.8	**79.77%**	0.26%	**82.55%**	0.288%	**103.48%**	0.50%
	1.8-2.0	**78.93%**	0.29%	**80.93%**	0.333%	**102.54%**	0.56%
	2.0-2.5	**81.10%**	0.23%	**80.62%**	0.212%	**99.41%**	0.38%
	2.5-3.0	**82.53%**	0.32%	**81.48%**	0.394%	**98.74%**	0.61%
	3.0-5.0	**82.88%**	0.44%	**82.20%**	0.534%	**99.18%**	0.83%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.62%**	0.10%	**95.16%**	0.128%	**96.49%**	0.16%
	0.6-0.8	**99.38%**	0.07%	**95.04%**	0.084%	**95.64%**	0.11%
	0.8-1.0	**99.47%**	0.08%	**95.43%**	0.078%	**95.94%**	0.11%
	1.0-1.2	**98.49%**	0.07%	**96.10%**	0.074%	**97.58%**	0.10%
	1.2-1.4	**92.29%**	0.06%	**94.31%**	0.093%	**102.19%**	0.12%
	1.4-1.6	**83.00%**	0.11%	**86.49%**	0.122%	**104.21%**	0.21%
	1.6-1.8	**79.76%**	0.12%	**82.70%**	0.143%	**103.68%**	0.24%
	1.8-2.0	**79.28%**	0.15%	**80.87%**	0.168%	**102.01%**	0.29%
	2.0-2.5	**80.66%**	0.12%	**80.13%**	0.132%	**99.34%**	0.22%
	2.5-3.0	**81.25%**	0.17%	**82.23%**	0.184%	**101.20%**	0.31%
	3.0-5.0	**81.99%**	0.21%	**84.60%**	0.252%	**103.19%**	0.40%

Table 9.14: Anti-Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-K} > 0.2$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.05%**	0.21%	**99.08%**	0.215%	**100.03%**	0.30%
	0.6-0.8	**99.68%**	0.12%	**99.68%**	0.142%	**100.00%**	0.19%
	0.8-1.0	**99.77%**	0.12%	**99.76%**	0.160%	**99.99%**	0.20%
	1.0-1.2	**99.68%**	0.13%	**99.62%**	0.145%	**99.93%**	0.20%
	1.2-1.4	**99.24%**	0.13%	**99.03%**	0.165%	**99.78%**	0.21%
	1.4-1.6	**98.59%**	0.18%	**98.29%**	0.188%	**99.70%**	0.26%
	1.6-1.8	**97.94%**	0.16%	**97.57%**	0.203%	**99.62%**	0.27%
	1.8-2.0	**97.47%**	0.18%	**96.97%**	0.237%	**99.49%**	0.31%
	2.0-2.5	**94.04%**	0.16%	**94.14%**	0.195%	**100.11%**	0.27%
	2.5-3.0	**92.23%**	0.25%	**91.79%**	0.301%	**99.52%**	0.42%
	3.0-5.0	**88.63%**	0.36%	**88.70%**	0.351%	**100.08%**	0.57%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.97%**	0.18%	**99.01%**	0.234%	**100.05%**	0.30%
	0.6-0.8	**99.69%**	0.13%	**99.72%**	0.167%	**100.02%**	0.21%
	0.8-1.0	**99.75%**	0.12%	**99.76%**	0.143%	**100.01%**	0.19%
	1.0-1.2	**99.67%**	0.13%	**99.60%**	0.134%	**99.93%**	0.18%
	1.2-1.4	**99.34%**	0.14%	**98.90%**	0.175%	**99.56%**	0.23%
	1.4-1.6	**98.69%**	0.16%	**98.00%**	0.224%	**99.31%**	0.28%
	1.6-1.8	**97.85%**	0.17%	**97.42%**	0.226%	**99.56%**	0.29%
	1.8-2.0	**97.29%**	0.15%	**96.69%**	0.244%	**99.39%**	0.30%
	2.0-2.5	**93.98%**	0.17%	**94.40%**	0.204%	**100.45%**	0.28%
	2.5-3.0	**92.12%**	0.26%	**91.99%**	0.333%	**99.85%**	0.46%
	3.0-5.0	**88.65%**	0.37%	**89.60%**	0.491%	**101.07%**	0.70%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.01%**	0.099%	**98.99%**	0.114%	**99.99%**	0.15%
	0.6-0.8	**99.67%**	0.067%	**99.66%**	0.076%	**99.99%**	0.10%
	0.8-1.0	**99.74%**	0.014%	**99.75%**	0.073%	**100.01%**	0.07%
	1.0-1.2	**99.58%**	0.069%	**99.52%**	0.079%	**99.94%**	0.11%
	1.2-1.4	**99.00%**	0.075%	**98.87%**	0.088%	**99.87%**	0.12%
	1.4-1.6	**98.25%**	0.036%	**98.09%**	0.095%	**99.84%**	0.10%
	1.6-1.8	**97.56%**	0.096%	**97.03%**	0.090%	**99.47%**	0.13%
	1.8-2.0	**97.10%**	0.098%	**96.63%**	0.172%	**99.51%**	0.20%
	2.0-2.5	**94.08%**	0.093%	**94.34%**	0.094%	**100.27%**	0.14%
	2.5-3.0	**92.37%**	0.162%	**92.51%**	0.161%	**100.14%**	0.25%
	3.0-5.0	**88.28%**	0.198%	**89.28%**	0.214%	**101.14%**	0.33%
$L_{p-K} > 0.4$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.04%**	0.19%	**99.08%**	0.317%	**100.04%**	0.37%
	0.6-0.8	**99.70%**	0.12%	**99.66%**	0.140%	**99.96%**	0.18%
	0.8-1.0	**99.79%**	0.12%	**99.76%**	0.135%	**99.97%**	0.18%
	1.0-1.2	**99.63%**	0.12%	**99.32%**	0.146%	**99.69%**	0.19%
	1.2-1.4	**98.83%**	0.14%	**98.15%**	0.184%	**99.31%**	0.23%
	1.4-1.6	**97.24%**	0.16%	**96.49%**	0.198%	**99.23%**	0.26%
	1.6-1.8	**95.07%**	0.15%	**94.02%**	0.242%	**98.90%**	0.30%
	1.8-2.0	**93.09%**	0.22%	**91.57%**	0.278%	**98.37%**	0.38%
	2.0-2.5	**87.09%**	0.20%	**87.22%**	0.234%	**100.15%**	0.36%
	2.5-3.0	**85.14%**	0.30%	**84.49%**	0.264%	**99.23%**	0.47%
	3.0-5.0	**78.26%**	0.41%	**79.74%**	0.499%	**101.90%**	0.83%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.97%**	0.24%	**99.02%**	0.216%	**100.06%**	0.32%
	0.6-0.8	**99.69%**	0.12%	**99.69%**	0.192%	**100.00%**	0.23%
	0.8-1.0	**99.77%**	0.12%	**99.75%**	0.166%	**99.98%**	0.20%
	1.0-1.2	**99.51%**	0.15%	**99.41%**	0.221%	**99.89%**	0.27%
	1.2-1.4	**98.88%**	0.08%	**98.10%**	0.176%	**99.21%**	0.20%
	1.4-1.6	**97.16%**	0.17%	**96.30%**	0.209%	**99.12%**	0.28%
	1.6-1.8	**95.00%**	0.14%	**94.03%**	0.244%	**98.98%**	0.29%
	1.8-2.0	**93.10%**	0.21%	**91.36%**	0.289%	**98.13%**	0.38%
	2.0-2.5	**87.02%**	0.21%	**87.86%**	0.245%	**100.96%**	0.37%
	2.5-3.0	**85.10%**	0.31%	**86.12%**	0.381%	**101.20%**	0.58%
	3.0-5.0	**78.23%**	0.44%	**80.60%**	0.548%	**103.03%**	0.91%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**99.01%**	0.10%	**98.99%**	0.081%	**99.98%**	0.13%
	0.6-0.8	**99.68%**	0.07%	**99.65%**	0.074%	**99.98%**	0.10%
	0.8-1.0	**99.73%**	0.06%	**99.73%**	0.073%	**100.00%**	0.10%
	1.0-1.2	**99.49%**	0.06%	**99.29%**	0.079%	**99.80%**	0.10%
	1.2-1.4	**98.36%**	0.08%	**98.10%**	0.089%	**99.74%**	0.12%
	1.4-1.6	**96.73%**	0.08%	**96.33%**	0.099%	**99.59%**	0.13%
	1.6-1.8	**94.61%**	0.10%	**93.56%**	0.083%	**98.89%**	0.14%
	1.8-2.0	**92.58%**	0.12%	**91.12%**	0.147%	**98.42%**	0.21%
	2.0-2.5	**87.06%**	0.11%	**87.47%**	0.124%	**100.47%**	0.19%
	2.5-3.0	**85.18%**	0.17%	**85.99%**	0.189%	**100.95%**	0.30%
	3.0-5.0	**77.63%**	0.23%	**80.25%**	0.266%	**103.38%**	0.46%

Table 9.15: Anti-Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

$L_{p-K} > 0.6$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.48%**	0.11%	**97.00%**	0.296%	**98.50%**	0.32%
	0.6-0.8	**99.34%**	0.11%	**95.15%**	0.118%	**95.79%**	0.16%
	0.8-1.0	**99.36%**	0.10%	**94.44%**	0.149%	**95.05%**	0.18%
	1.0-1.2	**99.10%**	0.12%	**95.26%**	0.156%	**96.12%**	0.19%
	1.2-1.4	**97.83%**	0.14%	**96.31%**	0.165%	**98.44%**	0.22%
	1.4-1.6	**94.96%**	0.17%	**93.88%**	0.206%	**98.86%**	0.28%
	1.6-1.8	**89.98%**	0.23%	**89.09%**	0.249%	**99.02%**	0.37%
	1.8-2.0	**84.01%**	0.24%	**82.17%**	0.322%	**97.81%**	0.48%
	2.0-2.5	**74.21%**	0.24%	**73.71%**	0.274%	**99.33%**	0.49%
	2.5-3.0	**64.79%**	0.37%	**64.25%**	0.416%	**99.17%**	0.85%
	3.0-5.0	**63.72%**	0.47%	**65.02%**	0.544%	**102.04%**	1.14%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.49%**	0.16%	**96.98%**	0.229%	**98.47%**	0.28%
	0.6-0.8	**99.34%**	0.12%	**95.54%**	0.151%	**96.18%**	0.19%
	0.8-1.0	**99.31%**	0.12%	**94.35%**	0.164%	**95.01%**	0.20%
	1.0-1.2	**98.93%**	0.13%	**95.47%**	0.167%	**96.50%**	0.21%
	1.2-1.4	**97.94%**	0.10%	**96.20%**	0.235%	**98.22%**	0.26%
	1.4-1.6	**94.95%**	0.18%	**93.96%**	0.215%	**98.95%**	0.29%
	1.6-1.8	**90.20%**	0.22%	**89.43%**	0.269%	**99.15%**	0.38%
	1.8-2.0	**84.98%**	0.27%	**82.40%**	0.308%	**96.97%**	0.48%
	2.0-2.5	**75.16%**	0.25%	**74.33%**	0.290%	**98.90%**	0.50%
	2.5-3.0	**65.72%**	0.38%	**65.90%**	0.456%	**100.28%**	0.90%
	3.0-5.0	**64.42%**	0.48%	**66.83%**	0.595%	**103.75%**	1.21%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.50%**	0.08%	**96.96%**	0.088%	**98.44%**	0.12%
	0.6-0.8	**99.25%**	0.06%	**95.44%**	0.068%	**96.17%**	0.09%
	0.8-1.0	**99.28%**	0.04%	**94.43%**	0.082%	**95.12%**	0.09%
	1.0-1.2	**98.98%**	0.07%	**95.20%**	0.084%	**96.18%**	0.11%
	1.2-1.4	**97.37%**	0.08%	**96.25%**	0.075%	**98.85%**	0.11%
	1.4-1.6	**94.48%**	0.10%	**93.98%**	0.110%	**99.47%**	0.15%
	1.6-1.8	**90.16%**	0.10%	**88.93%**	0.174%	**98.64%**	0.22%
	1.8-2.0	**85.06%**	0.15%	**82.52%**	0.156%	**97.01%**	0.25%
	2.0-2.5	**75.46%**	0.11%	**74.25%**	0.145%	**98.40%**	0.24%
	2.5-3.0	**65.35%**	0.20%	**66.41%**	0.222%	**101.63%**	0.46%
	3.0-5.0	**64.18%**	0.27%	**66.59%**	0.230%	**103.76%**	0.56%
$L_{p-K} > 0.9$							
exp33	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.45%**	0.12%	**96.97%**	0.087%	**98.50%**	0.15%
	0.6-0.8	**99.33%**	0.12%	**95.12%**	0.149%	**95.76%**	0.19%
	0.8-1.0	**99.34%**	0.12%	**94.38%**	0.119%	**95.00%**	0.17%
	1.0-1.2	**98.68%**	0.12%	**94.66%**	0.157%	**95.93%**	0.20%
	1.2-1.4	**95.21%**	0.09%	**93.72%**	0.177%	**98.43%**	0.21%
	1.4-1.6	**86.31%**	0.21%	**86.30%**	0.227%	**99.98%**	0.36%
	1.6-1.8	**73.53%**	0.26%	**75.00%**	0.285%	**101.99%**	0.53%
	1.8-2.0	**63.36%**	0.29%	**62.46%**	0.353%	**98.58%**	0.72%
	2.0-2.5	**54.89%**	0.25%	**52.79%**	0.282%	**96.16%**	0.68%
	2.5-3.0	**49.49%**	0.41%	**49.67%**	0.420%	**100.36%**	1.18%
	3.0-5.0	**40.78%**	0.46%	**42.64%**	0.501%	**104.57%**	1.71%
exp35	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.49%**	0.16%	**96.98%**	0.212%	**98.47%**	0.27%
	0.6-0.8	**99.33%**	0.12%	**95.51%**	0.157%	**96.16%**	0.20%
	0.8-1.0	**99.25%**	0.12%	**94.31%**	0.132%	**95.02%**	0.17%
	1.0-1.2	**98.36%**	0.12%	**94.88%**	0.224%	**96.46%**	0.26%
	1.2-1.4	**95.19%**	0.15%	**93.73%**	0.194%	**98.46%**	0.25%
	1.4-1.6	**86.46%**	0.21%	**87.09%**	0.240%	**100.73%**	0.37%
	1.6-1.8	**74.73%**	0.27%	**75.44%**	0.337%	**100.95%**	0.58%
	1.8-2.0	**65.26%**	0.32%	**63.04%**	0.373%	**96.59%**	0.74%
	2.0-2.5	**56.04%**	0.26%	**54.55%**	0.298%	**97.33%**	0.70%
	2.5-3.0	**50.16%**	0.38%	**52.83%**	0.454%	**105.32%**	1.21%
	3.0-5.0	**40.27%**	0.43%	**44.17%**	0.587%	**109.68%**	1.86%
exp37	momentum	**mc%**	%+-	data%	%+-	**double %**	double% erro
	0.4-0.6	**98.48%**	0.06%	**96.95%**	0.111%	**98.44%**	0.13%
	0.6-0.8	**99.25%**	0.07%	**95.44%**	0.078%	**96.15%**	0.10%
	0.8-1.0	**99.24%**	0.06%	**94.35%**	0.075%	**95.07%**	0.10%
	1.0-1.2	**98.43%**	0.07%	**94.67%**	0.085%	**96.18%**	0.11%
	1.2-1.4	**94.54%**	0.08%	**93.84%**	0.095%	**99.26%**	0.13%
	1.4-1.6	**86.63%**	0.11%	**87.60%**	0.121%	**101.12%**	0.19%
	1.6-1.8	**75.95%**	0.12%	**76.21%**	0.155%	**100.34%**	0.26%
	1.8-2.0	**65.90%**	0.17%	**64.26%**	0.180%	**97.52%**	0.37%
	2.0-2.5	**56.39%**	0.13%	**54.56%**	0.151%	**96.76%**	0.35%
	2.5-3.0	**50.12%**	0.18%	**52.99%**	0.226%	**105.73%**	0.59%
	3.0-5.0	**39.92%**	0.25%	**44.90%**	0.289%	**112.49%**	1.01%

Table 9.16: Anti-Proton identification efficiency and Data-MC ratio of Exp33-Exp37 in momentum 0.4-5GeV

Chapter 10

Table2

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.28%**	0.80%	**99.29%**	0.83%	**1.000**	0.012
0.6-0.8	**99.53%**	0.62%	**99.68%**	0.66%	**1.001**	0.009
0.8-1.0	**99.57%**	0.62%	**99.29%**	0.58%	**0.997**	0.008
1.0-1.2	**99.75%**	0.16%	**99.68%**	1.06%	**0.999**	0.011
1.2-1.4	**98.82%**	0.47%	**97.87%**	0.69%	**0.990**	0.008
1.4-1.6	**97.44%**	0.73%	**96.30%**	1.48%	**0.988**	0.017
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.30%**	0.78%	**99.23%**	1.14%	**0.999**	0.014
0.6-0.8	**99.56%**	0.62%	**99.70%**	0.66%	**1.001**	0.009
0.8-1.0	**99.53%**	0.62%	**99.36%**	0.57%	**0.998**	0.008
1.0-1.2	**99.86%**	0.61%	**99.71%**	0.59%	**0.998**	0.008
1.2-1.4	**97.75%**	0.76%	**96.50%**	0.77%	**0.987**	0.011
1.4-1.6	**94.99%**	0.63%	**93.46%**	0.99%	**0.984**	0.012
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.32%**	0.36%	**99.22%**	1.07%	**0.999**	0.011
0.6-0.8	**99.48%**	0.61%	**99.67%**	0.66%	**1.002**	0.009
0.8-1.0	**99.53%**	0.62%	**99.40%**	0.57%	**0.999**	0.008
1.0-1.2	**99.75%**	0.61%	**99.64%**	0.66%	**0.999**	0.009
1.2-1.4	**96.38%**	0.68%	**95.18%**	0.79%	**0.988**	0.011
1.4-1.6	**90.48%**	0.97%	**88.28%**	1.85%	**0.976**	0.023
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.52%**	0.81%	**99.28%**	1.13%	**0.998**	0.014
0.6-0.8	**99.14%**	0.39%	**99.47%**	0.65%	**1.003**	0.008
0.8-1.0	**99.45%**	0.67%	**99.58%**	0.56%	**1.001**	0.009
1.0-1.2	**99.32%**	0.61%	**99.50%**	0.60%	**1.002**	0.009
1.2-1.4	**94.56%**	0.80%	**93.51%**	0.81%	**0.989**	0.012
1.4-1.6	**78.67%**	1.13%	**81.93%**	1.21%	**1.041**	0.021
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 10.1: Proton identification efficiency and Data-MC ratio of SVD1-Bin1 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.53%**	0.91%	**99.27%**	0.98%	**0.997**	0.013
0.6-0.8	**99.13%**	0.25%	**99.43%**	0.56%	**1.003**	0.006
0.8-1.0	**99.40%**	0.61%	**99.60%**	0.56%	**1.002**	0.008
1.0-1.2	**99.26%**	0.60%	**99.14%**	0.61%	**0.999**	0.009
1.2-1.4	**91.85%**	0.83%	**91.78%**	0.83%	**0.999**	0.013
1.4-1.6	**62.50%**	1.20%	**72.57%**	1.30%	**1.161**	0.031
1.6-1.8	—-	—-	—-	—-	—-	—-
1.8-2.0	—-	—-	—-	—-	—-	—-
2.0-2.5	—-	—-	—-	—-	—-	—-
2.5-3.0	—-	—-	—-	—-	—-	—-
3.0-5.0	—-	—-	—-	—-	—-	—-
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.54%**	0.83%	**99.26%**	1.05%	**0.997**	0.013
0.6-0.8	**99.13%**	0.66%	**99.48%**	0.65%	**1.004**	0.009
0.8-1.0	**99.27%**	0.61%	**99.59%**	0.56%	**1.003**	0.008
1.0-1.2	**98.90%**	0.61%	**98.72%**	0.59%	**0.998**	0.009
1.2-1.4	**88.39%**	0.86%	**89.79%**	0.85%	**1.016**	0.014
1.4-1.6	**46.28%**	1.18%	**62.86%**	1.34%	**1.358**	0.045
1.6-1.8	—-	—-	—-	—-	—-	—-
1.8-2.0	—-	—-	—-	—-	—-	—-
2.0-2.5	—-	—-	—-	—-	—-	—-
2.5-3.0	—-	—-	—-	—-	—-	—-
3.0-5.0	—-	—-	—-	—-	—-	—-
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.55%**	0.94%	**99.22%**	1.04%	**0.997**	0.014
0.6-0.8	**99.12%**	0.59%	**99.50%**	0.84%	**1.004**	0.010
0.8-1.0	**99.25%**	0.61%	**99.55%**	0.55%	**1.003**	0.008
1.0-1.2	**98.76%**	0.59%	**98.25%**	0.62%	**0.995**	0.009
1.2-1.4	**83.79%**	0.90%	**85.93%**	0.73%	**1.026**	0.014
1.4-1.6	**30.42%**	1.06%	**50.10%**	1.33%	**1.647**	0.072
1.6-1.8	—-	—-	—-	—-	—-	—-
1.8-2.0	—-	—-	—-	—-	—-	—-
2.0-2.5	—-	—-	—-	—-	—-	—-
2.5-3.0	—-	—-	—-	—-	—-	—-
3.0-5.0	—-	—-	—-	—-	—-	—-
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.58%**	0.81%	**99.22%**	1.03%	**0.996**	0.013
0.6-0.8	**99.17%**	0.11%	**99.42%**	0.65%	**1.003**	0.007
0.8-1.0	**99.23%**	0.57%	**99.51%**	0.31%	**1.003**	0.007
1.0-1.2	**97.70%**	0.61%	**97.69%**	0.88%	**1.000**	0.011
1.2-1.4	**73.63%**	0.82%	**80.62%**	0.93%	**1.095**	0.018
1.4-1.6	**15.66%**	0.83%	**14.98%**	1.29%	**0.956**	0.097
1.6-1.8	—-	—-	—-	—-	—-	—-
1.8-2.0	—-	—-	—-	—-	—-	—-
2.0-2.5	—-	—-	—-	—-	—-	—-
2.5-3.0	—-	—-	—-	—-	—-	—-
3.0-5.0	—-	—-	—-	—-	—-	—-

Table 10.2: Proton identification efficiency and Data-MC ratio of SVD1-Bin1 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.87%**	0.74%	**97.91%**	0.82%	**1.000**	0.011
0.6-0.8	**99.28%**	0.49%	**99.09%**	0.67%	**0.998**	0.008
0.8-1.0	**99.74%**	0.60%	**99.57%**	0.66%	**0.998**	0.009
1.0-1.2	**99.74%**	0.65%	**99.74%**	0.28%	**1.000**	0.007
1.2-1.4	**98.57%**	0.75%	**97.31%**	0.51%	**0.987**	0.009
1.4-1.6	**98.24%**	0.99%	**96.67%**	1.38%	**0.984**	0.017
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.87%**	0.68%	**97.91%**	0.82%	**1.000**	0.011
0.6-0.8	**99.37%**	0.63%	**99.11%**	0.66%	**0.997**	0.009
0.8-1.0	**99.82%**	0.59%	**99.57%**	0.66%	**0.998**	0.009
1.0-1.2	**99.47%**	0.65%	**99.85%**	0.72%	**1.004**	0.010
1.2-1.4	**98.27%**	1.14%	**96.98%**	0.91%	**0.987**	0.015
1.4-1.6	**95.38%**	0.77%	**93.54%**	1.50%	**0.981**	0.018
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.87%**	0.55%	**97.92%**	0.82%	**1.001**	0.010
0.6-0.8	**99.43%**	0.62%	**99.12%**	0.66%	**0.997**	0.009
0.8-1.0	**99.80%**	0.59%	**99.56%**	0.65%	**0.998**	0.009
1.0-1.2	**99.38%**	0.64%	**99.85%**	0.72%	**1.005**	0.010
1.2-1.4	**97.51%**	0.77%	**94.67%**	0.94%	**0.971**	0.012
1.4-1.6	**90.86%**	1.00%	**87.85%**	1.60%	**0.967**	0.021
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.92%**	0.71%	**98.34%**	0.77%	**1.004**	0.011
0.6-0.8	**99.18%**	0.61%	**98.85%**	0.65%	**0.997**	0.009
0.8-1.0	**99.84%**	0.58%	**99.55%**	0.64%	**0.997**	0.009
1.0-1.2	**99.10%**	0.64%	**99.68%**	0.71%	**1.006**	0.010
1.2-1.4	**95.46%**	0.78%	**92.89%**	0.96%	**0.973**	0.013
1.4-1.6	**80.65%**	1.15%	**80.48%**	1.66%	**0.998**	0.025
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 10.3: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin1 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.93%**	0.65%	**98.37%**	0.77%	**1.004**	0.010
0.6-0.8	**99.14%**	0.61%	**98.82%**	0.65%	**0.997**	0.009
0.8-1.0	**99.98%**	0.57%	**99.51%**	0.64%	**0.995**	0.009
1.0-1.2	**98.94%**	0.63%	**99.47%**	0.71%	**1.005**	0.010
1.2-1.4	**92.54%**	0.82%	**91.26%**	0.97%	**0.986**	0.014
1.4-1.6	**61.71%**	1.23%	**71.25%**	1.66%	**1.154**	0.035
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.96%**	0.48%	**98.39%**	0.77%	**1.004**	0.009
0.6-0.8	**99.19%**	0.61%	**98.83%**	0.64%	**0.996**	0.009
0.8-1.0	**100.00%**	0.57%	**99.54%**	0.26%	**0.995**	0.006
1.0-1.2	**98.64%**	0.81%	**99.22%**	0.71%	**1.006**	0.011
1.2-1.4	**89.51%**	0.84%	**89.04%**	1.01%	**0.995**	0.015
1.4-1.6	**47.60%**	1.20%	**59.85%**	1.95%	**1.257**	0.052
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.97%**	0.71%	**98.39%**	0.62%	**1.004**	0.010
0.6-0.8	**99.24%**	0.61%	**98.84%**	0.64%	**0.996**	0.009
0.8-1.0	**99.93%**	0.57%	**99.55%**	0.64%	**0.996**	0.009
1.0-1.2	**98.27%**	0.64%	**98.97%**	0.70%	**1.007**	0.010
1.2-1.4	**84.41%**	0.93%	**85.66%**	1.02%	**1.015**	0.016
1.4-1.6	**33.12%**	1.10%	**46.97%**	1.57%	**1.418**	0.067
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.96%**	0.71%	**98.41%**	0.77%	**1.005**	0.011
0.6-0.8	**99.13%**	0.61%	**98.76%**	0.64%	**0.996**	0.009
0.8-1.0	**100.03%**	0.56%	**99.40%**	0.63%	**0.994**	0.008
1.0-1.2	**97.82%**	0.89%	**98.26%**	1.07%	**1.005**	0.014
1.2-1.4	**74.44%**	0.75%	**79.46%**	1.07%	**1.068**	0.018
1.4-1.6	**17.07%**	0.87%	**31.61%**	1.38%	**1.851**	0.124
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 10.4: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin1 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.86%**	0.15%	**99.85%**	0.21%	**1.000**	0.003
0.6-0.8	**99.86%**	0.11%	**99.81%**	0.14%	**0.999**	0.002
0.8-1.0	**99.77%**	0.11%	**99.51%**	0.08%	**0.997**	0.001
1.0-1.2	**99.65%**	0.10%	**99.57%**	0.07%	**0.999**	0.001
1.2-1.4	**99.11%**	0.10%	**99.00%**	0.13%	**0.999**	0.002
1.4-1.6	**98.27%**	0.12%	**98.04%**	0.15%	**0.998**	0.002
1.6-1.8	**97.28%**	0.11%	**96.91%**	0.19%	**0.996**	0.002
1.8-2.0	**96.24%**	0.29%	**96.00%**	0.21%	**0.998**	0.004
2.0-2.5	**94.50%**	0.19%	**94.17%**	0.17%	**0.997**	0.003
2.5-3.0	**90.53%**	0.35%	**91.01%**	0.44%	**1.005**	0.006
3.0-5.0	**85.24%**	0.68%	**87.08%**	1.08%	**1.022**	0.015
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.84%**	0.13%	**99.82%**	0.24%	**1.000**	0.003
0.6-0.8	**99.85%**	0.11%	**99.78%**	0.15%	**0.999**	0.002
0.8-1.0	**99.73%**	0.10%	**99.31%**	0.07%	**0.996**	0.001
1.0-1.2	**99.59%**	0.10%	**99.40%**	0.11%	**0.998**	0.002
1.2-1.4	**98.86%**	0.11%	**98.75%**	0.09%	**0.999**	0.001
1.4-1.6	**97.77%**	0.13%	**97.24%**	0.15%	**0.995**	0.002
1.6-1.8	**96.38%**	0.16%	**95.70%**	0.25%	**0.993**	0.003
1.8-2.0	**94.98%**	0.15%	**94.59%**	0.21%	**0.996**	0.003
2.0-2.5	**92.38%**	0.18%	**92.05%**	0.21%	**0.996**	0.003
2.5-3.0	**86.60%**	0.40%	**87.66%**	0.51%	**1.012**	0.008
3.0-5.0	**79.50%**	0.75%	**82.15%**	1.14%	**1.033**	0.017
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.82%**	0.15%	**99.77%**	0.18%	**1.000**	0.002
0.6-0.8	**99.83%**	0.11%	**99.72%**	0.12%	**0.999**	0.002
0.8-1.0	**99.69%**	0.10%	**99.18%**	0.12%	**0.995**	0.002
1.0-1.2	**99.56%**	0.10%	**99.33%**	0.11%	**0.998**	0.001
1.2-1.4	**98.61%**	0.17%	**98.40%**	0.13%	**0.998**	0.002
1.4-1.6	**97.20%**	0.15%	**96.52%**	0.15%	**0.993**	0.002
1.6-1.8	**95.39%**	0.16%	**94.27%**	0.20%	**0.988**	0.003
1.8-2.0	**93.25%**	0.21%	**92.48%**	0.24%	**0.992**	0.003
2.0-2.5	**90.00%**	0.20%	**88.98%**	0.27%	**0.989**	0.004
2.5-3.0	**82.57%**	0.41%	**83.98%**	0.54%	**1.017**	0.008
3.0-5.0	**74.22%**	0.80%	**77.95%**	1.18%	**1.050**	0.020
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.51%**	0.16%	**97.20%**	0.21%	**0.977**	0.003
0.6-0.8	**99.69%**	0.12%	**97.38%**	0.14%	**0.977**	0.002
0.8-1.0	**99.68%**	0.10%	**99.03%**	0.12%	**0.994**	0.002
1.0-1.2	**99.46%**	0.16%	**98.94%**	0.11%	**0.995**	0.002
1.2-1.4	**98.27%**	0.18%	**97.94%**	0.15%	**0.997**	0.002
1.4-1.6	**96.61%**	0.14%	**95.67%**	0.23%	**0.990**	0.003
1.6-1.8	**94.01%**	0.17%	**92.58%**	0.21%	**0.985**	0.003
1.8-2.0	**91.05%**	0.22%	**89.63%**	0.35%	**0.984**	0.004
2.0-2.5	**86.02%**	0.20%	**83.84%**	0.28%	**0.975**	0.004
2.5-3.0	**75.83%**	0.46%	**76.28%**	0.59%	**1.006**	0.010
3.0-5.0	**68.84%**	0.80%	**73.90%**	1.21%	**1.074**	0.022

Table 10.5: Proton identification efficiency and Data-MC ratio of SVD1-Bin2 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.89%**	0.14%	**94.60%**	0.21%	**0.957**	0.003
0.6-0.8	**99.44%**	0.11%	**94.33%**	0.15%	**0.949**	0.002
0.8-1.0	**99.41%**	0.12%	**91.64%**	0.13%	**0.922**	0.002
1.0-1.2	**99.24%**	0.10%	**97.17%**	0.12%	**0.979**	0.002
1.2-1.4	**97.97%**	0.11%	**97.05%**	0.14%	**0.991**	0.002
1.4-1.6	**95.68%**	0.14%	**94.50%**	0.17%	**0.988**	0.002
1.6-1.8	**92.23%**	0.19%	**90.71%**	0.22%	**0.983**	0.003
1.8-2.0	**88.24%**	0.26%	**86.67%**	0.29%	**0.982**	0.004
2.0-2.5	**80.72%**	0.23%	**78.15%**	0.30%	**0.968**	0.005
2.5-3.0	**67.59%**	0.49%	**67.10%**	0.62%	**0.993**	0.012
3.0-5.0	**62.96%**	0.86%	**68.34%**	1.19%	**1.085**	0.024
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.89%**	0.15%	**94.58%**	0.20%	**0.956**	0.003
0.6-0.8	**99.44%**	0.11%	**94.30%**	0.11%	**0.948**	0.002
0.8-1.0	**99.40%**	0.10%	**91.62%**	0.12%	**0.922**	0.002
1.0-1.2	**99.19%**	0.08%	**97.07%**	0.09%	**0.979**	0.001
1.2-1.4	**97.59%**	0.12%	**96.66%**	0.14%	**0.991**	0.002
1.4-1.6	**94.63%**	0.15%	**93.39%**	0.20%	**0.987**	0.003
1.6-1.8	**90.49%**	0.20%	**88.75%**	0.29%	**0.981**	0.004
1.8-2.0	**85.22%**	0.26%	**83.56%**	0.30%	**0.980**	0.005
2.0-2.5	**76.43%**	0.27%	**73.30%**	0.32%	**0.959**	0.005
2.5-3.0	**62.13%**	0.47%	**61.43%**	0.63%	**0.989**	0.013
3.0-5.0	**56.26%**	0.88%	**61.23%**	1.25%	**1.088**	0.028
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.89%**	0.15%	**94.58%**	0.19%	**0.956**	0.002
0.6-0.8	**99.44%**	0.11%	**94.29%**	0.15%	**0.948**	0.002
0.8-1.0	**99.38%**	0.10%	**91.61%**	0.12%	**0.922**	0.002
1.0-1.2	**99.11%**	0.08%	**96.95%**	0.12%	**0.978**	0.001
1.2-1.4	**97.04%**	0.13%	**96.06%**	0.14%	**0.990**	0.002
1.4-1.6	**93.22%**	0.16%	**91.93%**	0.19%	**0.986**	0.003
1.6-1.8	**88.18%**	0.19%	**86.19%**	0.25%	**0.977**	0.003
1.8-2.0	**81.97%**	0.27%	**80.12%**	0.34%	**0.977**	0.005
2.0-2.5	**72.04%**	0.27%	**68.92%**	0.33%	**0.957**	0.006
2.5-3.0	**55.20%**	0.51%	**54.21%**	0.64%	**0.982**	0.015
3.0-5.0	**48.52%**	1.26%	**52.26%**	1.25%	**1.077**	0.038
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.88%**	0.22%	**94.58%**	0.15%	**0.956**	0.003
0.6-0.8	**99.44%**	0.11%	**94.29%**	0.11%	**0.948**	0.002
0.8-1.0	**99.36%**	0.10%	**91.57%**	0.14%	**0.922**	0.002
1.0-1.2	**98.89%**	0.10%	**96.70%**	0.12%	**0.978**	0.002
1.2-1.4	**96.02%**	0.09%	**95.04%**	0.15%	**0.990**	0.002
1.4-1.6	**90.91%**	0.17%	**89.48%**	0.20%	**0.984**	0.003
1.6-1.8	**84.89%**	0.22%	**82.64%**	0.26%	**0.973**	0.004
1.8-2.0	**77.99%**	0.29%	**75.64%**	0.34%	**0.970**	0.006
2.0-2.5	**65.74%**	0.31%	**62.72%**	0.34%	**0.954**	0.007
2.5-3.0	**44.72%**	0.51%	**44.09%**	0.63%	**0.986**	0.018
3.0-5.0	**35.09%**	0.83%	**39.08%**	1.19%	**1.114**	0.043

Table 10.6: Proton identification efficiency and Data-MC ratio of SVD1-Bin2 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.36%**	0.17%	**99.28%**	0.15%	**0.999**	0.002
0.6-0.8	**99.83%**	0.10%	**99.72%**	0.13%	**0.999**	0.002
0.8-1.0	**99.84%**	0.10%	**99.42%**	0.12%	**0.996**	0.002
1.0-1.2	**99.66%**	0.09%	**99.46%**	0.12%	**0.998**	0.001
1.2-1.4	**98.85%**	0.11%	**98.51%**	0.17%	**0.997**	0.002
1.4-1.6	**97.21%**	0.14%	**96.67%**	0.18%	**0.994**	0.002
1.6-1.8	**95.48%**	0.17%	**94.88%**	0.22%	**0.994**	0.003
1.8-2.0	**94.76%**	0.20%	**94.33%**	0.27%	**0.995**	0.003
2.0-2.5	**93.39%**	0.18%	**93.18%**	0.29%	**0.998**	0.004
2.5-3.0	**90.77%**	0.35%	**90.87%**	0.54%	**1.001**	0.007
3.0-5.0	**85.36%**	0.59%	**86.95%**	1.27%	**1.019**	0.017
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.34%**	0.14%	**99.22%**	0.16%	**0.999**	0.002
0.6-0.8	**99.82%**	0.11%	**99.59%**	0.13%	**0.998**	0.002
0.8-1.0	**99.79%**	0.10%	**99.17%**	0.12%	**0.994**	0.002
1.0-1.2	**99.59%**	0.10%	**99.29%**	0.12%	**0.997**	0.002
1.2-1.4	**98.48%**	0.12%	**98.04%**	0.15%	**0.995**	0.002
1.4-1.6	**96.35%**	0.15%	**95.55%**	0.22%	**0.992**	0.003
1.6-1.8	**94.36%**	0.18%	**93.32%**	0.19%	**0.989**	0.003
1.8-2.0	**93.39%**	0.34%	**92.24%**	0.32%	**0.988**	0.005
2.0-2.5	**91.16%**	0.20%	**90.95%**	0.28%	**0.998**	0.004
2.5-3.0	**87.12%**	0.38%	**88.06%**	0.57%	**1.011**	0.008
3.0-5.0	**78.93%**	0.81%	**83.03%**	1.23%	**1.052**	0.019
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.28%**	0.14%	**99.04%**	0.04%	**0.998**	0.001
0.6-0.8	**99.77%**	0.11%	**99.43%**	0.13%	**0.997**	0.002
0.8-1.0	**99.72%**	0.10%	**98.98%**	0.12%	**0.992**	0.002
1.0-1.2	**99.54%**	0.11%	**99.09%**	0.15%	**0.995**	0.002
1.2-1.4	**98.17%**	0.26%	**97.57%**	0.15%	**0.994**	0.003
1.4-1.6	**95.57%**	0.15%	**94.50%**	0.19%	**0.989**	0.003
1.6-1.8	**93.26%**	0.19%	**91.80%**	0.18%	**0.984**	0.003
1.8-2.0	**91.58%**	0.20%	**89.74%**	0.26%	**0.980**	0.004
2.0-2.5	**88.60%**	0.21%	**87.41%**	0.30%	**0.987**	0.004
2.5-3.0	**83.02%**	0.43%	**84.70%**	0.60%	**1.020**	0.009
3.0-5.0	**74.04%**	0.85%	**79.37%**	1.27%	**1.072**	0.021
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.98%**	0.14%	**96.39%**	0.17%	**0.974**	0.002
0.6-0.8	**99.66%**	0.11%	**96.71%**	0.14%	**0.970**	0.002
0.8-1.0	**99.69%**	0.10%	**98.78%**	0.05%	**0.991**	0.001
1.0-1.2	**99.42%**	0.05%	**98.39%**	0.13%	**0.990**	0.001
1.2-1.4	**97.85%**	0.08%	**96.91%**	0.16%	**0.990**	0.002
1.4-1.6	**94.72%**	0.16%	**93.31%**	0.20%	**0.985**	0.003
1.6-1.8	**91.82%**	0.19%	**89.95%**	0.25%	**0.980**	0.003
1.8-2.0	**89.27%**	0.22%	**87.02%**	0.32%	**0.975**	0.004
2.0-2.5	**84.74%**	0.24%	**82.22%**	0.32%	**0.970**	0.005
2.5-3.0	**76.01%**	0.47%	**76.86%**	0.54%	**1.011**	0.009
3.0-5.0	**69.29%**	0.88%	**74.26%**	1.31%	**1.072**	0.023

Table 10.7: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin2 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.17%**	0.14%	**92.68%**	0.17%	**0.944**	0.002
0.6-0.8	**99.34%**	0.11%	**92.97%**	0.15%	**0.936**	0.002
0.8-1.0	**99.37%**	0.10%	**91.72%**	0.15%	**0.923**	0.002
1.0-1.2	**99.11%**	0.06%	**95.94%**	0.14%	**0.968**	0.002
1.2-1.4	**97.40%**	0.12%	**95.75%**	0.16%	**0.983**	0.002
1.4-1.6	**93.72%**	0.13%	**92.09%**	0.20%	**0.983**	0.003
1.6-1.8	**90.04%**	0.27%	**87.73%**	0.26%	**0.974**	0.004
1.8-2.0	**86.66%**	0.26%	**83.80%**	0.36%	**0.967**	0.005
2.0-2.5	**79.91%**	0.26%	**76.53%**	0.34%	**0.958**	0.005
2.5-3.0	**67.96%**	0.51%	**66.99%**	0.65%	**0.986**	0.012
3.0-5.0	**63.43%**	0.90%	**67.63%**	1.35%	**1.066**	0.026
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.14%**	0.15%	**92.59%**	0.17%	**0.943**	0.002
0.6-0.8	**99.33%**	0.11%	**92.88%**	0.15%	**0.935**	0.002
0.8-1.0	**99.37%**	0.07%	**91.69%**	0.15%	**0.923**	0.002
1.0-1.2	**99.03%**	0.10%	**95.78%**	0.14%	**0.967**	0.002
1.2-1.4	**96.95%**	0.13%	**95.20%**	0.16%	**0.982**	0.002
1.4-1.6	**92.56%**	0.17%	**90.74%**	0.21%	**0.980**	0.003
1.6-1.8	**88.25%**	0.21%	**85.61%**	0.27%	**0.970**	0.004
1.8-2.0	**83.89%**	0.27%	**80.74%**	0.35%	**0.962**	0.005
2.0-2.5	**75.90%**	0.27%	**71.89%**	0.34%	**0.947**	0.006
2.5-3.0	**62.39%**	0.52%	**61.95%**	0.70%	**0.993**	0.014
3.0-5.0	**56.63%**	0.92%	**55.63%**	1.97%	**0.982**	0.038
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.12%**	0.13%	**92.55%**	0.18%	**0.943**	0.002
0.6-0.8	**99.33%**	0.11%	**92.82%**	0.15%	**0.934**	0.002
0.8-1.0	**99.36%**	0.09%	**91.66%**	0.15%	**0.923**	0.002
1.0-1.2	**98.93%**	0.09%	**95.63%**	0.13%	**0.967**	0.002
1.2-1.4	**96.24%**	0.13%	**94.38%**	0.16%	**0.981**	0.002
1.4-1.6	**91.12%**	0.15%	**89.06%**	0.28%	**0.977**	0.003
1.6-1.8	**86.07%**	0.22%	**83.00%**	0.28%	**0.964**	0.004
1.8-2.0	**80.30%**	0.29%	**77.57%**	0.36%	**0.966**	0.006
2.0-2.5	**71.50%**	0.28%	**67.39%**	0.36%	**0.943**	0.006
2.5-3.0	**55.16%**	0.53%	**55.70%**	0.77%	**1.010**	0.017
3.0-5.0	**47.46%**	0.92%	**53.45%**	1.30%	**1.126**	0.035
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.09%**	0.13%	**92.50%**	0.18%	**0.943**	0.002
0.6-0.8	**99.33%**	0.10%	**92.80%**	0.15%	**0.934**	0.002
0.8-1.0	**99.33%**	0.10%	**91.62%**	0.15%	**0.922**	0.002
1.0-1.2	**98.66%**	0.10%	**95.32%**	0.14%	**0.966**	0.002
1.2-1.4	**94.97%**	0.10%	**93.01%**	0.15%	**0.979**	0.002
1.4-1.6	**88.77%**	0.19%	**86.35%**	0.19%	**0.973**	0.003
1.6-1.8	**82.68%**	0.24%	**79.39%**	0.30%	**0.960**	0.005
1.8-2.0	**76.28%**	0.43%	**73.32%**	0.36%	**0.961**	0.007
2.0-2.5	**65.44%**	0.28%	**61.60%**	0.37%	**0.941**	0.007
2.5-3.0	**44.29%**	0.53%	**42.99%**	0.77%	**0.971**	0.021
3.0-5.0	**35.48%**	0.87%	**42.18%**	1.04%	**1.189**	0.041

Table 10.8: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin2 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.82%**	0.24%	**99.80%**	0.17%	**1.000**	0.003
0.6-0.8	**99.92%**	0.15%	**99.90%**	0.21%	**1.000**	0.003
0.8-1.0	**99.93%**	0.05%	**99.86%**	0.18%	**0.999**	0.002
1.0-1.2	**99.74%**	0.03%	**99.19%**	0.18%	**0.995**	0.002
1.2-1.4	**99.04%**	0.16%	**99.00%**	0.19%	**1.000**	0.003
1.4-1.6	**97.26%**	0.18%	**97.40%**	0.21%	**1.001**	0.003
1.6-1.8	**95.92%**	0.21%	**95.79%**	0.23%	**0.999**	0.003
1.8-2.0	**95.23%**	0.24%	**95.15%**	0.25%	**0.999**	0.004
2.0-2.5	**95.12%**	0.15%	**94.99%**	0.21%	**0.999**	0.003
2.5-3.0	**92.88%**	0.23%	**93.48%**	0.27%	**1.006**	0.004
3.0-5.0	**89.08%**	0.31%	**89.71%**	0.38%	**1.007**	0.006
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.82%**	0.23%	**99.78%**	0.12%	**1.000**	0.003
0.6-0.8	**99.87%**	0.17%	**99.81%**	0.05%	**0.999**	0.002
0.8-1.0	**99.88%**	0.15%	**99.71%**	0.18%	**0.998**	0.002
1.0-1.2	**99.67%**	0.16%	**98.70%**	0.18%	**0.990**	0.002
1.2-1.4	**98.73%**	0.17%	**98.70%**	0.23%	**1.000**	0.003
1.4-1.6	**96.40%**	0.19%	**96.68%**	0.21%	**1.003**	0.003
1.6-1.8	**94.71%**	0.22%	**94.43%**	0.24%	**0.997**	0.003
1.8-2.0	**93.85%**	0.24%	**93.67%**	0.27%	**0.998**	0.004
2.0-2.5	**93.58%**	0.16%	**93.42%**	0.19%	**0.998**	0.003
2.5-3.0	**90.85%**	0.25%	**91.23%**	0.29%	**1.004**	0.004
3.0-5.0	**84.48%**	0.35%	**86.27%**	0.41%	**1.021**	0.006
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.80%**	0.24%	**99.70%**	0.23%	**0.999**	0.003
0.6-0.8	**99.85%**	0.17%	**99.68%**	0.21%	**0.998**	0.003
0.8-1.0	**99.79%**	0.16%	**99.52%**	0.18%	**0.997**	0.002
1.0-1.2	**99.59%**	0.10%	**98.39%**	0.18%	**0.988**	0.002
1.2-1.4	**98.52%**	0.17%	**98.39%**	0.19%	**0.999**	0.003
1.4-1.6	**95.46%**	0.20%	**95.94%**	0.22%	**1.005**	0.003
1.6-1.8	**93.71%**	0.22%	**93.31%**	0.24%	**0.996**	0.004
1.8-2.0	**92.34%**	0.25%	**92.03%**	0.27%	**0.997**	0.004
2.0-2.5	**91.60%**	0.19%	**90.90%**	0.21%	**0.992**	0.003
2.5-3.0	**88.19%**	0.27%	**89.03%**	0.31%	**1.009**	0.005
3.0-5.0	**79.54%**	0.40%	**82.16%**	0.44%	**1.033**	0.008
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.71%**	0.22%	**99.57%**	0.28%	**0.999**	0.004
0.6-0.8	**99.82%**	0.17%	**99.43%**	0.15%	**0.996**	0.002
0.8-1.0	**99.75%**	0.16%	**99.22%**	0.18%	**0.995**	0.002
1.0-1.2	**99.52%**	0.16%	**98.18%**	0.28%	**0.987**	0.003
1.2-1.4	**98.22%**	0.22%	**98.05%**	0.19%	**0.998**	0.003
1.4-1.6	**94.62%**	0.20%	**95.21%**	0.22%	**1.006**	0.003
1.6-1.8	**92.50%**	0.23%	**91.96%**	0.18%	**0.994**	0.003
1.8-2.0	**90.65%**	0.26%	**89.98%**	0.28%	**0.993**	0.004
2.0-2.5	**88.28%**	0.20%	**86.58%**	0.23%	**0.981**	0.003
2.5-3.0	**82.12%**	0.31%	**82.48%**	0.37%	**1.004**	0.006
3.0-5.0	**72.41%**	0.42%	**75.14%**	0.48%	**1.038**	0.009

Table 10.9: Proton identification efficiency and Data-MC ratio of SVD1-Bin3 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.98%**	0.16%	**96.94%**	0.27%	**0.979**	0.003
0.6-0.8	**99.50%**	0.17%	**95.19%**	0.10%	**0.957**	0.002
0.8-1.0	**99.59%**	0.22%	**95.50%**	0.19%	**0.959**	0.003
1.0-1.2	**99.33%**	0.15%	**92.31%**	0.25%	**0.929**	0.003
1.2-1.4	**97.73%**	0.13%	**96.31%**	0.20%	**0.985**	0.002
1.4-1.6	**93.72%**	0.21%	**94.24%**	0.22%	**1.006**	0.003
1.6-1.8	**91.01%**	0.33%	**90.60%**	0.23%	**0.995**	0.004
1.8-2.0	**88.61%**	0.27%	**87.69%**	0.30%	**0.990**	0.005
2.0-2.5	**83.76%**	0.22%	**81.49%**	0.25%	**0.973**	0.004
2.5-3.0	**74.27%**	0.33%	**71.04%**	0.38%	**0.957**	0.007
3.0-5.0	**65.75%**	0.44%	**67.40%**	0.51%	**1.025**	0.010
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.99%**	0.16%	**96.92%**	0.30%	**0.979**	0.003
0.6-0.8	**99.50%**	0.17%	**95.19%**	0.22%	**0.957**	0.003
0.8-1.0	**99.60%**	0.03%	**95.50%**	0.19%	**0.959**	0.002
1.0-1.2	**99.28%**	0.16%	**92.23%**	0.22%	**0.929**	0.003
1.2-1.4	**97.30%**	0.17%	**96.06%**	0.21%	**0.987**	0.003
1.4-1.6	**92.70%**	0.21%	**93.35%**	0.23%	**1.007**	0.003
1.6-1.8	**89.46%**	0.25%	**89.15%**	0.27%	**0.997**	0.004
1.8-2.0	**86.26%**	0.29%	**84.90%**	0.31%	**0.984**	0.005
2.0-2.5	**80.36%**	0.23%	**77.76%**	0.26%	**0.968**	0.004
2.5-3.0	**71.57%**	0.36%	**68.59%**	0.40%	**0.958**	0.007
3.0-5.0	**59.84%**	0.45%	**61.24%**	0.50%	**1.023**	0.011
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.99%**	0.15%	**96.91%**	0.40%	**0.979**	0.004
0.6-0.8	**99.50%**	0.14%	**95.17%**	0.12%	**0.957**	0.002
0.8-1.0	**99.60%**	0.16%	**95.51%**	0.20%	**0.959**	0.003
1.0-1.2	**99.20%**	0.23%	**92.18%**	0.15%	**0.929**	0.003
1.2-1.4	**96.64%**	0.18%	**95.59%**	0.20%	**0.989**	0.003
1.4-1.6	**91.12%**	0.18%	**92.01%**	0.24%	**1.010**	0.003
1.6-1.8	**87.43%**	0.26%	**87.29%**	0.27%	**0.998**	0.004
1.8-2.0	**83.51%**	0.30%	**81.95%**	0.33%	**0.981**	0.005
2.0-2.5	**77.99%**	0.24%	**75.12%**	0.27%	**0.963**	0.005
2.5-3.0	**68.02%**	0.37%	**65.61%**	0.44%	**0.964**	0.008
3.0-5.0	**52.83%**	0.45%	**54.63%**	0.53%	**1.034**	0.013
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.99%**	0.27%	**96.91%**	0.28%	**0.979**	0.004
0.6-0.8	**99.50%**	0.07%	**95.16%**	0.22%	**0.956**	0.002
0.8-1.0	**99.60%**	0.16%	**95.48%**	0.19%	**0.959**	0.002
1.0-1.2	**99.05%**	0.16%	**92.06%**	0.21%	**0.929**	0.003
1.2-1.4	**95.54%**	0.18%	**94.80%**	0.16%	**0.992**	0.003
1.4-1.6	**88.82%**	0.27%	**89.95%**	0.25%	**1.013**	0.004
1.6-1.8	**84.24%**	0.28%	**84.48%**	0.29%	**1.003**	0.005
1.8-2.0	**80.46%**	0.32%	**78.43%**	0.34%	**0.975**	0.006
2.0-2.5	**75.59%**	0.25%	**72.61%**	0.28%	**0.961**	0.005
2.5-3.0	**62.04%**	0.38%	**59.76%**	0.42%	**0.963**	0.009
3.0-5.0	**41.97%**	0.45%	**44.41%**	0.52%	**1.058**	0.017

Table 10.10: Proton identification efficiency and Data-MC ratio of SVD1-Bin3 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.52%**	0.20%	**99.53%**	0.24%	**1.000**	0.003
0.6-0.8	**99.82%**	0.16%	**99.78%**	0.18%	**1.000**	0.002
0.8-1.0	**99.81%**	0.16%	**99.79%**	0.18%	**1.000**	0.002
1.0-1.2	**99.63%**	0.16%	**99.09%**	0.33%	**0.995**	0.004
1.2-1.4	**98.65%**	0.08%	**98.34%**	0.21%	**0.997**	0.002
1.4-1.6	**96.02%**	0.23%	**95.96%**	0.24%	**0.999**	0.003
1.6-1.8	**93.59%**	0.24%	**93.26%**	0.17%	**0.996**	0.003
1.8-2.0	**92.70%**	0.21%	**92.24%**	0.30%	**0.995**	0.004
2.0-2.5	**93.33%**	0.15%	**92.66%**	0.19%	**0.993**	0.003
2.5-3.0	**92.27%**	0.28%	**92.32%**	0.30%	**1.001**	0.004
3.0-5.0	**87.94%**	0.35%	**88.69%**	0.41%	**1.009**	0.006
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.49%**	0.27%	**99.44%**	0.20%	**1.000**	0.003
0.6-0.8	**99.78%**	0.16%	**99.62%**	0.19%	**0.998**	0.002
0.8-1.0	**99.77%**	0.16%	**99.59%**	0.18%	**0.998**	0.002
1.0-1.2	**99.59%**	0.16%	**98.64%**	0.20%	**0.990**	0.003
1.2-1.4	**98.14%**	0.19%	**97.91%**	0.21%	**0.998**	0.003
1.4-1.6	**94.68%**	0.22%	**94.78%**	0.16%	**1.001**	0.003
1.6-1.8	**91.99%**	0.29%	**91.31%**	0.29%	**0.993**	0.004
1.8-2.0	**91.04%**	0.27%	**90.15%**	0.31%	**0.990**	0.005
2.0-2.5	**91.53%**	0.26%	**90.21%**	0.21%	**0.986**	0.004
2.5-3.0	**89.91%**	0.28%	**90.00%**	0.32%	**1.001**	0.005
3.0-5.0	**83.38%**	0.38%	**84.63%**	0.47%	**1.015**	0.007
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.42%**	0.21%	**99.21%**	0.24%	**0.998**	0.003
0.6-0.8	**99.74%**	0.16%	**99.41%**	0.19%	**0.997**	0.002
0.8-1.0	**99.73%**	0.20%	**99.35%**	0.18%	**0.996**	0.003
1.0-1.2	**99.52%**	0.16%	**98.28%**	0.09%	**0.988**	0.002
1.2-1.4	**97.77%**	0.18%	**97.54%**	0.12%	**0.998**	0.002
1.4-1.6	**93.39%**	0.23%	**93.65%**	0.25%	**1.003**	0.004
1.6-1.8	**90.72%**	0.22%	**89.63%**	0.30%	**0.988**	0.004
1.8-2.0	**89.37%**	0.28%	**88.20%**	0.32%	**0.987**	0.005
2.0-2.5	**89.27%**	0.22%	**87.31%**	0.25%	**0.978**	0.004
2.5-3.0	**86.95%**	0.29%	**87.47%**	0.34%	**1.006**	0.005
3.0-5.0	**78.52%**	0.42%	**80.29%**	0.50%	**1.023**	0.008
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.35%**	0.12%	**98.86%**	0.25%	**0.995**	0.003
0.6-0.8	**99.67%**	0.08%	**99.03%**	0.10%	**0.994**	0.001
0.8-1.0	**99.69%**	0.15%	**99.15%**	0.18%	**0.995**	0.002
1.0-1.2	**99.42%**	0.16%	**97.97%**	0.14%	**0.985**	0.002
1.2-1.4	**97.29%**	0.18%	**97.06%**	0.15%	**0.998**	0.002
1.4-1.6	**92.16%**	0.23%	**92.51%**	0.26%	**1.004**	0.004
1.6-1.8	**89.18%**	0.28%	**88.06%**	0.31%	**0.988**	0.005
1.8-2.0	**87.59%**	0.32%	**85.79%**	0.34%	**0.980**	0.005
2.0-2.5	**85.58%**	0.22%	**82.52%**	0.29%	**0.964**	0.004
2.5-3.0	**80.28%**	0.32%	**80.31%**	0.35%	**1.000**	0.006
3.0-5.0	**71.68%**	0.45%	**73.69%**	0.53%	**1.028**	0.010

Table 10.11: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin3 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.74%**	0.23%	**95.75%**	0.25%	**0.970**	0.003
0.6-0.8	**99.35%**	0.16%	**94.81%**	0.20%	**0.954**	0.003
0.8-1.0	**99.45%**	0.18%	**95.66%**	0.20%	**0.962**	0.003
1.0-1.2	**99.23%**	0.25%	**92.67%**	0.23%	**0.934**	0.003
1.2-1.4	**96.67%**	0.13%	**95.02%**	0.23%	**0.983**	0.003
1.4-1.6	**90.94%**	0.23%	**91.24%**	0.26%	**1.003**	0.004
1.6-1.8	**87.58%**	0.29%	**86.48%**	0.31%	**0.987**	0.005
1.8-2.0	**85.62%**	0.30%	**83.31%**	0.35%	**0.973**	0.005
2.0-2.5	**80.98%**	0.24%	**77.42%**	0.31%	**0.956**	0.005
2.5-3.0	**71.96%**	0.43%	**67.92%**	0.43%	**0.944**	0.008
3.0-5.0	**64.50%**	0.47%	**65.32%**	0.56%	**1.013**	0.011
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.74%**	0.25%	**95.71%**	0.25%	**0.969**	0.004
0.6-0.8	**99.34%**	0.17%	**94.78%**	0.23%	**0.954**	0.003
0.8-1.0	**99.45%**	0.16%	**95.68%**	0.20%	**0.962**	0.003
1.0-1.2	**99.17%**	0.19%	**92.64%**	0.23%	**0.934**	0.003
1.2-1.4	**96.07%**	0.17%	**94.52%**	0.22%	**0.984**	0.003
1.4-1.6	**89.60%**	0.24%	**90.03%**	0.27%	**1.005**	0.004
1.6-1.8	**86.08%**	0.28%	**84.71%**	0.32%	**0.984**	0.005
1.8-2.0	**83.04%**	0.32%	**80.47%**	0.36%	**0.969**	0.006
2.0-2.5	**77.75%**	0.25%	**73.79%**	0.30%	**0.949**	0.005
2.5-3.0	**69.36%**	0.38%	**65.50%**	0.44%	**0.944**	0.008
3.0-5.0	**58.37%**	0.48%	**59.77%**	0.57%	**1.024**	0.013
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.73%**	0.27%	**95.68%**	0.25%	**0.969**	0.004
0.6-0.8	**99.33%**	0.17%	**94.78%**	0.20%	**0.954**	0.003
0.8-1.0	**99.44%**	0.16%	**95.66%**	0.20%	**0.962**	0.002
1.0-1.2	**99.08%**	0.13%	**92.54%**	0.23%	**0.934**	0.003
1.2-1.4	**95.25%**	0.20%	**93.89%**	0.23%	**0.986**	0.003
1.4-1.6	**87.89%**	0.25%	**88.59%**	0.27%	**1.008**	0.004
1.6-1.8	**83.89%**	0.29%	**82.45%**	0.33%	**0.983**	0.005
1.8-2.0	**80.39%**	0.33%	**77.50%**	0.37%	**0.964**	0.006
2.0-2.5	**75.39%**	0.27%	**71.51%**	0.30%	**0.949**	0.005
2.5-3.0	**66.06%**	0.39%	**62.35%**	0.44%	**0.944**	0.009
3.0-5.0	**51.82%**	0.48%	**53.45%**	0.57%	**1.032**	0.015
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.73%**	0.22%	**95.64%**	0.25%	**0.969**	0.003
0.6-0.8	**99.33%**	0.16%	**94.78%**	0.19%	**0.954**	0.002
0.8-1.0	**99.43%**	0.14%	**95.66%**	0.20%	**0.962**	0.002
1.0-1.2	**98.91%**	0.13%	**92.35%**	0.23%	**0.934**	0.003
1.2-1.4	**93.76%**	0.20%	**92.81%**	0.24%	**0.990**	0.003
1.4-1.6	**85.14%**	0.26%	**86.23%**	0.29%	**1.013**	0.005
1.6-1.8	**80.69%**	0.26%	**79.22%**	0.34%	**0.982**	0.005
1.8-2.0	**77.33%**	0.34%	**74.30%**	0.39%	**0.961**	0.007
2.0-2.5	**72.99%**	0.27%	**69.19%**	0.31%	**0.948**	0.005
2.5-3.0	**60.45%**	0.39%	**57.54%**	0.42%	**0.952**	0.009
3.0-5.0	**41.71%**	0.47%	**44.50%**	0.56%	**1.067**	0.018

Table 10.12: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin3 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.42%**	0.49%	**99.34%**	0.62%	**0.999**	0.008
0.6-0.8	**99.66%**	0.35%	**99.63%**	0.39%	**1.000**	0.005
0.8-1.0	**99.70%**	0.34%	**99.65%**	0.38%	**1.000**	0.005
1.0-1.2	**99.53%**	0.36%	**99.44%**	0.41%	**0.999**	0.005
1.2-1.4	**98.86%**	0.43%	**98.67%**	0.22%	**0.998**	0.005
1.4-1.6	**94.63%**	0.36%	**95.18%**	0.47%	**1.006**	0.006
1.6-1.8	**89.94%**	0.52%	**89.26%**	0.56%	**0.992**	0.008
1.8-2.0	**89.58%**	0.69%	**89.37%**	0.58%	**0.998**	0.010
2.0-2.5	**80.62%**	0.44%	**83.86%**	0.43%	**1.040**	0.008
2.5-3.0	**84.70%**	0.51%	**86.20%**	0.54%	**1.018**	0.009
3.0-5.0	**86.49%**	0.55%	**86.66%**	0.60%	**1.002**	0.009
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.39%**	0.49%	**99.33%**	0.66%	**0.999**	0.008
0.6-0.8	**99.61%**	0.34%	**99.61%**	0.39%	**1.000**	0.005
0.8-1.0	**99.76%**	0.34%	**99.65%**	0.38%	**0.999**	0.005
1.0-1.2	**99.62%**	0.36%	**99.19%**	0.39%	**0.996**	0.005
1.2-1.4	**98.44%**	0.26%	**98.47%**	0.41%	**1.000**	0.005
1.4-1.6	**92.64%**	0.27%	**93.32%**	0.48%	**1.007**	0.006
1.6-1.8	**86.26%**	0.54%	**85.44%**	0.58%	**0.990**	0.009
1.8-2.0	**85.40%**	0.71%	**84.64%**	0.61%	**0.991**	0.011
2.0-2.5	**72.52%**	0.44%	**78.56%**	0.44%	**1.083**	0.009
2.5-3.0	**79.15%**	0.58%	**81.94%**	0.56%	**1.035**	0.010
3.0-5.0	**82.18%**	0.57%	**83.05%**	0.63%	**1.011**	0.010
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.38%**	0.24%	**99.31%**	0.61%	**0.999**	0.007
0.6-0.8	**99.62%**	0.34%	**99.60%**	0.39%	**1.000**	0.005
0.8-1.0	**99.71%**	0.34%	**99.61%**	0.37%	**0.999**	0.005
1.0-1.2	**99.65%**	0.35%	**99.02%**	0.42%	**0.994**	0.005
1.2-1.4	**98.06%**	0.39%	**98.05%**	0.36%	**1.000**	0.005
1.4-1.6	**90.86%**	0.36%	**91.73%**	0.51%	**1.010**	0.007
1.6-1.8	**83.24%**	0.54%	**81.58%**	0.39%	**0.980**	0.008
1.8-2.0	**79.74%**	0.72%	**78.28%**	0.63%	**0.982**	0.012
2.0-2.5	**65.68%**	0.46%	**73.48%**	0.46%	**1.119**	0.010
2.5-3.0	**73.24%**	0.56%	**77.96%**	0.59%	**1.064**	0.011
3.0-5.0	**77.52%**	0.50%	**79.49%**	0.65%	**1.025**	0.011
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.39%**	0.48%	**99.24%**	0.61%	**0.998**	0.008
0.6-0.8	**99.67%**	0.33%	**99.52%**	0.21%	**0.998**	0.004
0.8-1.0	**99.64%**	0.33%	**99.52%**	0.38%	**0.999**	0.005
1.0-1.2	**99.57%**	0.35%	**99.06%**	0.41%	**0.995**	0.005
1.2-1.4	**97.46%**	0.39%	**97.39%**	0.45%	**0.999**	0.006
1.4-1.6	**88.60%**	0.53%	**89.43%**	0.50%	**1.009**	0.008
1.6-1.8	**78.58%**	0.55%	**77.83%**	0.60%	**0.990**	0.010
1.8-2.0	**71.09%**	0.73%	**69.40%**	0.65%	**0.976**	0.013
2.0-2.5	**57.49%**	0.46%	**66.60%**	0.46%	**1.158**	0.012
2.5-3.0	**63.13%**	0.58%	**70.40%**	0.60%	**1.115**	0.014
3.0-5.0	**70.98%**	0.52%	**73.59%**	0.67%	**1.037**	0.012

Table 10.13: Proton identification efficiency and Data-MC ratio of SVD1-Bin4 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.39%**	0.27%	**99.24%**	0.61%	**0.998**	0.007
0.6-0.8	**99.65%**	0.34%	**99.50%**	0.38%	**0.998**	0.005
0.8-1.0	**99.63%**	0.33%	**99.55%**	0.37%	**0.999**	0.005
1.0-1.2	**99.37%**	0.36%	**99.02%**	0.41%	**0.996**	0.005
1.2-1.4	**96.54%**	0.39%	**96.61%**	0.45%	**1.001**	0.006
1.4-1.6	**85.69%**	0.48%	**86.84%**	0.32%	**1.013**	0.007
1.6-1.8	**72.20%**	0.56%	**72.50%**	0.61%	**1.004**	0.011
1.8-2.0	**58.50%**	0.72%	**58.66%**	0.64%	**1.003**	0.017
2.0-2.5	**47.81%**	0.45%	**57.56%**	0.47%	**1.204**	0.015
2.5-3.0	**51.19%**	0.51%	**59.64%**	0.62%	**1.165**	0.017
3.0-5.0	**65.17%**	0.62%	**67.57%**	0.68%	**1.037**	0.014
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.41%**	0.46%	**99.22%**	0.61%	**0.998**	0.008
0.6-0.8	**99.67%**	0.17%	**99.50%**	0.43%	**0.998**	0.005
0.8-1.0	**99.64%**	0.34%	**99.49%**	0.37%	**0.999**	0.005
1.0-1.2	**99.26%**	0.35%	**98.91%**	0.41%	**0.996**	0.005
1.2-1.4	**95.61%**	0.39%	**95.80%**	0.43%	**1.002**	0.006
1.4-1.6	**82.24%**	0.41%	**83.93%**	0.51%	**1.021**	0.008
1.6-1.8	**62.54%**	0.57%	**65.44%**	0.61%	**1.046**	0.014
1.8-2.0	**40.91%**	0.65%	**44.83%**	0.62%	**1.096**	0.023
2.0-2.5	**37.84%**	0.43%	**48.53%**	0.46%	**1.283**	0.019
2.5-3.0	**46.49%**	0.57%	**56.80%**	0.62%	**1.222**	0.020
3.0-5.0	**59.85%**	0.63%	**62.76%**	0.66%	**1.049**	0.016
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.40%**	0.48%	**99.15%**	0.61%	**0.997**	0.008
0.6-0.8	**99.67%**	0.31%	**99.51%**	0.21%	**0.998**	0.004
0.8-1.0	**99.62%**	0.33%	**99.50%**	0.37%	**0.999**	0.005
1.0-1.2	**99.04%**	0.35%	**98.68%**	0.41%	**0.996**	0.005
1.2-1.4	**94.09%**	0.40%	**94.78%**	0.39%	**1.007**	0.006
1.4-1.6	**76.50%**	0.50%	**79.53%**	0.53%	**1.040**	0.010
1.6-1.8	**48.71%**	0.56%	**55.69%**	0.61%	**1.143**	0.018
1.8-2.0	**20.48%**	0.49%	**27.29%**	0.53%	**1.332**	0.041
2.0-2.5	**27.02%**	0.38%	**35.84%**	0.43%	**1.326**	0.025
2.5-3.0	**42.58%**	0.56%	**54.40%**	0.62%	**1.278**	0.022
3.0-5.0	**53.96%**	0.63%	**58.25%**	0.62%	**1.079**	0.017
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.35%**	0.48%	**99.11%**	0.61%	**0.998**	0.008
0.6-0.8	**99.70%**	0.34%	**99.52%**	0.30%	**0.998**	0.005
0.8-1.0	**99.61%**	0.33%	**99.53%**	0.36%	**0.999**	0.005
1.0-1.2	**98.81%**	0.29%	**98.38%**	0.41%	**0.996**	0.005
1.2-1.4	**91.06%**	0.41%	**92.65%**	0.45%	**1.017**	0.007
1.4-1.6	**66.36%**	0.52%	**72.15%**	0.52%	**1.087**	0.012
1.6-1.8	**26.03%**	0.46%	**39.04%**	0.57%	**1.500**	0.034
1.8-2.0	**3.26%**	0.18%	**7.89%**	0.31%	**2.423**	0.162
2.0-2.5	**7.91%**	0.23%	**11.55%**	0.28%	**1.461**	0.055
2.5-3.0	**34.69%**	0.54%	**49.89%**	0.61%	**1.438**	0.028
3.0-5.0	**41.50%**	0.60%	**50.83%**	0.68%	**1.225**	0.024

Table 10.14: Proton identification efficiency and Data-MC ratio of SVD1-Bin4 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	%	%+-	%	%+-	**double %**	double%+-
0.4-0.6	**98.92%**	0.43%	**98.91%**	0.28%	**1.000**	0.005
0.6-0.8	**99.46%**	0.33%	**99.47%**	0.10%	**1.000**	0.003
0.8-1.0	**99.57%**	0.34%	**99.49%**	0.40%	**0.999**	0.005
1.0-1.2	**99.46%**	0.39%	**99.45%**	0.46%	**1.000**	0.006
1.2-1.4	**98.59%**	0.20%	**98.39%**	0.48%	**0.998**	0.005
1.4-1.6	**91.63%**	0.62%	**92.53%**	0.54%	**1.010**	0.009
1.6-1.8	**85.47%**	0.57%	**84.96%**	0.62%	**0.994**	0.010
1.8-2.0	**85.03%**	0.69%	**84.46%**	0.65%	**0.993**	0.011
2.0-2.5	**77.35%**	0.44%	**79.81%**	0.48%	**1.032**	0.009
2.5-3.0	**83.53%**	0.55%	**83.74%**	0.57%	**1.002**	0.010
3.0-5.0	**85.14%**	0.58%	**85.08%**	0.62%	**0.999**	0.010
$L_p > 0.3$						
momentum	%	%+-	%	%+-	**double %**	double%+-
0.4-0.6	**98.92%**	0.44%	**98.94%**	0.55%	**1.000**	0.007
0.6-0.8	**99.41%**	0.31%	**99.44%**	0.38%	**1.000**	0.005
0.8-1.0	**99.58%**	0.38%	**99.55%**	0.40%	**1.000**	0.006
1.0-1.2	**99.51%**	0.38%	**99.44%**	0.45%	**0.999**	0.006
1.2-1.4	**97.75%**	0.43%	**97.94%**	0.41%	**1.002**	0.006
1.4-1.6	**89.19%**	0.51%	**89.96%**	0.55%	**1.009**	0.008
1.6-1.8	**81.69%**	0.58%	**81.20%**	0.63%	**0.994**	0.011
1.8-2.0	**81.14%**	0.71%	**79.22%**	0.67%	**0.976**	0.012
2.0-2.5	**68.80%**	0.47%	**73.67%**	0.49%	**1.071**	0.010
2.5-3.0	**78.02%**	0.57%	**79.43%**	0.59%	**1.018**	0.011
3.0-5.0	**80.24%**	0.60%	**80.62%**	0.66%	**1.005**	0.011
$L_p > 0.4$						
momentum	%	%+-	%	%+-	**double %**	double%+-
0.4-0.6	**98.94%**	0.44%	**98.92%**	0.55%	**1.000**	0.007
0.6-0.8	**99.40%**	0.17%	**99.39%**	0.38%	**1.000**	0.004
0.8-1.0	**99.58%**	0.32%	**99.57%**	0.40%	**1.000**	0.005
1.0-1.2	**99.44%**	0.21%	**99.38%**	0.45%	**0.999**	0.005
1.2-1.4	**97.11%**	0.42%	**97.55%**	0.47%	**1.004**	0.007
1.4-1.6	**86.63%**	0.49%	**87.66%**	0.56%	**1.012**	0.009
1.6-1.8	**78.04%**	0.59%	**77.71%**	0.64%	**0.996**	0.011
1.8-2.0	**75.69%**	0.72%	**72.90%**	0.82%	**0.963**	0.014
2.0-2.5	**61.42%**	0.48%	**68.16%**	0.49%	**1.110**	0.012
2.5-3.0	**71.81%**	0.59%	**75.42%**	0.60%	**1.050**	0.012
3.0-5.0	**75.67%**	0.62%	**76.69%**	0.68%	**1.014**	0.012
$L_p > 0.5$						
momentum	%	%+-	%	%+-	**double %**	double%+-
0.4-0.6	**98.91%**	0.42%	**99.02%**	0.51%	**1.001**	0.007
0.6-0.8	**99.26%**	0.32%	**99.32%**	0.37%	**1.001**	0.005
0.8-1.0	**99.49%**	0.31%	**99.53%**	0.55%	**1.000**	0.006
1.0-1.2	**99.20%**	0.38%	**99.25%**	0.45%	**1.000**	0.006
1.2-1.4	**96.38%**	0.42%	**96.84%**	0.47%	**1.005**	0.007
1.4-1.6	**84.02%**	0.65%	**85.12%**	0.57%	**1.013**	0.010
1.6-1.8	**73.41%**	0.59%	**73.25%**	0.65%	**0.998**	0.012
1.8-2.0	**67.59%**	0.73%	**65.77%**	0.69%	**0.973**	0.015
2.0-2.5	**53.65%**	0.47%	**61.88%**	0.50%	**1.153**	0.014
2.5-3.0	**61.58%**	0.59%	**67.55%**	0.62%	**1.097**	0.015
3.0-5.0	**69.72%**	0.67%	**71.04%**	0.69%	**1.019**	0.014

Table 10.15: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin4 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.90%**	0.41%	**99.05%**	0.51%	**1.001**	0.007
0.6-0.8	**99.26%**	0.11%	**99.30%**	0.37%	**1.000**	0.004
0.8-1.0	**99.43%**	0.34%	**99.52%**	0.39%	**1.001**	0.005
1.0-1.2	**98.95%**	0.38%	**99.09%**	0.45%	**1.001**	0.006
1.2-1.4	**95.57%**	0.42%	**96.12%**	0.47%	**1.006**	0.007
1.4-1.6	**80.88%**	0.54%	**81.95%**	0.58%	**1.013**	0.010
1.6-1.8	**67.75%**	0.59%	**68.69%**	0.65%	**1.014**	0.013
1.8-2.0	**56.32%**	0.71%	**55.01%**	0.65%	**0.977**	0.017
2.0-2.5	**44.48%**	0.46%	**53.22%**	0.50%	**1.197**	0.017
2.5-3.0	**50.54%**	0.54%	**56.21%**	0.55%	**1.112**	0.016
3.0-5.0	**63.61%**	0.65%	**65.23%**	0.71%	**1.026**	0.015
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.92%**	0.42%	**99.03%**	0.55%	**1.001**	0.007
0.6-0.8	**99.25%**	0.30%	**99.32%**	0.37%	**1.001**	0.005
0.8-1.0	**99.44%**	0.34%	**99.52%**	0.39%	**1.001**	0.005
1.0-1.2	**98.96%**	0.38%	**99.04%**	0.45%	**1.001**	0.006
1.2-1.4	**94.38%**	0.43%	**95.42%**	0.48%	**1.011**	0.007
1.4-1.6	**77.49%**	0.60%	**78.59%**	0.58%	**1.014**	0.011
1.6-1.8	**58.89%**	0.59%	**61.81%**	0.65%	**1.050**	0.015
1.8-2.0	**40.17%**	0.65%	**42.07%**	0.69%	**1.047**	0.024
2.0-2.5	**35.67%**	0.43%	**44.65%**	0.49%	**1.252**	0.020
2.5-3.0	**45.89%**	0.60%	**53.53%**	0.61%	**1.167**	0.020
3.0-5.0	**58.37%**	0.65%	**60.00%**	0.65%	**1.028**	0.016
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.92%**	0.68%	**99.05%**	0.51%	**1.001**	0.009
0.6-0.8	**99.25%**	0.32%	**99.30%**	0.37%	**1.001**	0.005
0.8-1.0	**99.39%**	0.33%	**99.49%**	0.39%	**1.001**	0.005
1.0-1.2	**98.89%**	0.38%	**99.03%**	0.45%	**1.001**	0.006
1.2-1.4	**92.99%**	0.43%	**94.06%**	0.48%	**1.011**	0.007
1.4-1.6	**72.58%**	0.54%	**74.28%**	0.59%	**1.023**	0.011
1.6-1.8	**46.55%**	0.57%	**52.76%**	0.64%	**1.133**	0.020
1.8-2.0	**21.15%**	0.51%	**26.32%**	0.57%	**1.244**	0.040
2.0-2.5	**25.68%**	0.39%	**33.31%**	0.45%	**1.297**	0.026
2.5-3.0	**42.17%**	0.59%	**51.40%**	0.63%	**1.219**	0.023
3.0-5.0	**52.01%**	0.65%	**55.22%**	0.71%	**1.062**	0.019
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.93%**	0.42%	**99.06%**	0.51%	**1.001**	0.007
0.6-0.8	**99.24%**	0.32%	**99.31%**	0.14%	**1.001**	0.003
0.8-1.0	**99.33%**	0.33%	**99.57%**	0.14%	**1.002**	0.004
1.0-1.2	**98.65%**	0.38%	**98.90%**	0.44%	**1.003**	0.006
1.2-1.4	**90.09%**	0.43%	**92.11%**	0.51%	**1.022**	0.007
1.4-1.6	**62.92%**	0.44%	**67.65%**	0.60%	**1.075**	0.012
1.6-1.8	**26.49%**	0.48%	**38.14%**	0.60%	**1.440**	0.034
1.8-2.0	**2.99%**	0.20%	**7.70%**	0.34%	**2.575**	0.207
2.0-2.5	**7.77%**	0.23%	**10.97%**	0.29%	**1.412**	0.056
2.5-3.0	**34.18%**	0.56%	**47.01%**	0.61%	**1.376**	0.029
3.0-5.0	**39.49%**	0.62%	**48.17%**	0.69%	**1.220**	0.026

Table 10.16: Anti-Proton identification efficiency and Data-MC ratio of SVD1-Bin4 in momentum 0.4-5GeV

Chapter 11

Table3

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**98.94%**	0.24%	**98.91%**	0.47%	**1.000**	0.005
0.6-0.8	**99.37%**	0.23%	**99.34%**	0.13%	**1.000**	0.003
0.8-1.0	**99.48%**	0.35%	**99.36%**	0.24%	**0.999**	0.004
1.0-1.2	**99.14%**	0.24%	**99.18%**	0.43%	**1.000**	0.005
1.2-1.4	**97.61%**	0.31%	**97.29%**	0.20%	**0.997**	0.004
1.4-1.6	**97.18%**	0.34%	**97.06%**	0.38%	**0.999**	0.005
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.93%**	0.35%	**98.93%**	0.40%	**1.000**	0.005
0.6-0.8	**99.32%**	0.25%	**99.32%**	0.29%	**1.000**	0.004
0.8-1.0	**99.45%**	0.27%	**99.34%**	0.24%	**0.999**	0.004
1.0-1.2	**98.97%**	0.28%	**98.97%**	0.21%	**1.000**	0.004
1.2-1.4	**96.14%**	0.29%	**96.20%**	0.17%	**1.001**	0.004
1.4-1.6	**94.64%**	0.39%	**94.35%**	0.47%	**0.997**	0.006
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.95%**	0.34%	**98.93%**	0.47%	**1.000**	0.006
0.6-0.8	**99.31%**	0.16%	**99.33%**	0.18%	**1.000**	0.002
0.8-1.0	**99.43%**	0.06%	**99.31%**	0.24%	**0.999**	0.002
1.0-1.2	**98.77%**	0.25%	**98.80%**	0.25%	**1.000**	0.004
1.2-1.4	**94.47%**	0.34%	**94.88%**	0.35%	**1.004**	0.005
1.4-1.6	**89.29%**	0.46%	**90.31%**	0.49%	**1.011**	0.008
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.56%**	0.17%	**98.66%**	0.12%	**1.001**	0.002
0.6-0.8	**99.12%**	0.23%	**98.90%**	0.14%	**0.998**	0.003
0.8-1.0	**99.17%**	0.20%	**99.16%**	0.22%	**1.000**	0.003
1.0-1.2	**98.23%**	0.24%	**98.53%**	0.26%	**1.003**	0.004
1.2-1.4	**92.43%**	0.35%	**93.26%**	0.26%	**1.009**	0.005
1.4-1.6	**78.22%**	0.54%	**83.06%**	0.55%	**1.062**	0.010
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 11.1: Proton identification efficiency and Data-MC ratio of SVD2-Bin1 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.56%**	0.26%	**98.71%**	0.18%	**1.002**	0.003
0.6-0.8	**99.14%**	0.21%	**98.91%**	0.29%	**0.998**	0.004
0.8-1.0	**99.14%**	0.27%	**99.15%**	0.37%	**1.000**	0.005
1.0-1.2	**97.98%**	0.24%	**98.21%**	0.26%	**1.002**	0.004
1.2-1.4	**89.54%**	0.29%	**91.58%**	0.34%	**1.023**	0.005
1.4-1.6	**63.84%**	0.52%	**73.16%**	0.60%	**1.146**	0.013
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.58%**	0.35%	**98.71%**	0.44%	**1.001**	0.006
0.6-0.8	**99.13%**	0.24%	**98.94%**	0.28%	**0.998**	0.004
0.8-1.0	**99.11%**	0.23%	**99.14%**	0.24%	**1.000**	0.003
1.0-1.2	**97.58%**	0.25%	**97.89%**	0.24%	**1.003**	0.004
1.2-1.4	**85.96%**	0.40%	**89.13%**	0.39%	**1.037**	0.007
1.4-1.6	**48.44%**	0.59%	**61.40%**	0.66%	**1.268**	0.021
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.56%**	0.18%	**98.70%**	0.45%	**1.001**	0.005
0.6-0.8	**99.13%**	0.24%	**98.94%**	0.23%	**0.998**	0.003
0.8-1.0	**99.06%**	0.18%	**99.13%**	0.23%	**1.001**	0.003
1.0-1.2	**97.05%**	0.23%	**97.40%**	0.26%	**1.004**	0.004
1.2-1.4	**80.56%**	0.43%	**85.69%**	0.50%	**1.064**	0.008
1.4-1.6	**33.46%**	0.52%	**48.58%**	0.63%	**1.452**	0.029
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.55%**	0.28%	**98.68%**	0.26%	**1.001**	0.004
0.6-0.8	**99.17%**	0.20%	**98.94%**	0.06%	**0.998**	0.002
0.8-1.0	**99.00%**	0.15%	**99.08%**	0.23%	**1.001**	0.003
1.0-1.2	**95.83%**	0.26%	**96.63%**	0.27%	**1.008**	0.004
1.2-1.4	**70.69%**	0.46%	**79.66%**	0.47%	**1.127**	0.010
1.4-1.6	**18.82%**	0.45%	**33.35%**	0.58%	**1.772**	0.053
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 11.2: Proton identification efficiency and Data-MC ratio of SVD2-Bin1 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**97.37%**	0.38%	**97.35%**	0.37%	**1.000**	0.005
0.6-0.8	**99.17%**	0.11%	**99.18%**	0.27%	**1.000**	0.003
0.8-1.0	**99.33%**	0.24%	**99.37%**	0.26%	**1.000**	0.004
1.0-1.2	**99.25%**	0.30%	**99.24%**	0.30%	**1.000**	0.004
1.2-1.4	**97.51%**	0.30%	**97.63%**	0.38%	**1.001**	0.005
1.4-1.6	**96.58%**	0.36%	**96.45%**	0.47%	**0.999**	0.006
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.41%**	0.33%	**97.33%**	0.38%	**0.999**	0.005
0.6-0.8	**99.14%**	0.22%	**99.19%**	0.28%	**1.000**	0.004
0.8-1.0	**99.29%**	0.24%	**99.35%**	0.26%	**1.001**	0.004
1.0-1.2	**99.02%**	0.30%	**98.82%**	0.17%	**0.998**	0.003
1.2-1.4	**95.82%**	0.18%	**96.12%**	0.39%	**1.003**	0.004
1.4-1.6	**93.41%**	0.42%	**92.83%**	0.53%	**0.994**	0.007
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.38%**	0.33%	**97.34%**	0.38%	**1.000**	0.005
0.6-0.8	**99.16%**	0.22%	**99.21%**	0.27%	**1.001**	0.003
0.8-1.0	**99.31%**	0.24%	**99.27%**	0.26%	**1.000**	0.004
1.0-1.2	**98.78%**	0.26%	**98.51%**	0.34%	**0.997**	0.004
1.2-1.4	**93.79%**	0.31%	**94.20%**	0.41%	**1.004**	0.005
1.4-1.6	**87.37%**	0.49%	**87.63%**	0.59%	**1.003**	0.009
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.39%**	0.30%	**97.15%**	0.36%	**0.998**	0.005
0.6-0.8	**99.10%**	0.22%	**98.89%**	0.27%	**0.998**	0.003
0.8-1.0	**99.21%**	0.33%	**98.93%**	0.27%	**0.997**	0.004
1.0-1.2	**98.24%**	0.26%	**98.15%**	0.29%	**0.999**	0.004
1.2-1.4	**91.49%**	0.36%	**92.40%**	0.42%	**1.010**	0.006
1.4-1.6	**76.85%**	0.55%	**79.49%**	0.64%	**1.034**	0.011
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 11.3: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin1 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.38%**	0.30%	**97.14%**	0.35%	**0.998**	0.005
0.6-0.8	**99.08%**	0.11%	**98.90%**	0.27%	**0.998**	0.003
0.8-1.0	**99.17%**	0.23%	**98.86%**	0.26%	**0.997**	0.003
1.0-1.2	**97.92%**	0.26%	**97.95%**	0.30%	**1.000**	0.004
1.2-1.4	**88.64%**	0.36%	**90.21%**	0.43%	**1.018**	0.006
1.4-1.6	**61.73%**	0.59%	**69.44%**	0.69%	**1.125**	0.015
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.37%**	0.30%	**97.16%**	0.35%	**0.998**	0.005
0.6-0.8	**99.09%**	0.24%	**98.90%**	0.28%	**0.998**	0.004
0.8-1.0	**99.14%**	0.23%	**98.80%**	0.25%	**0.997**	0.003
1.0-1.2	**97.53%**	0.26%	**97.58%**	0.30%	**1.000**	0.004
1.2-1.4	**85.00%**	0.39%	**87.72%**	0.35%	**1.032**	0.006
1.4-1.6	**47.18%**	0.59%	**58.31%**	0.78%	**1.236**	0.023
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.39%**	0.30%	**97.16%**	0.35%	**0.998**	0.005
0.6-0.8	**99.10%**	0.24%	**98.88%**	0.27%	**0.998**	0.004
0.8-1.0	**99.16%**	0.23%	**98.77%**	0.25%	**0.996**	0.003
1.0-1.2	**97.07%**	0.26%	**97.23%**	0.30%	**1.002**	0.004
1.2-1.4	**79.40%**	0.42%	**84.13%**	0.47%	**1.060**	0.008
1.4-1.6	**33.14%**	0.55%	**45.16%**	0.64%	**1.363**	0.030
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.37%**	0.30%	**97.11%**	0.35%	**0.997**	0.005
0.6-0.8	**99.06%**	0.24%	**98.89%**	0.27%	**0.998**	0.004
0.8-1.0	**99.08%**	0.23%	**98.77%**	0.25%	**0.997**	0.003
1.0-1.2	**96.00%**	0.14%	**96.44%**	0.30%	**1.005**	0.003
1.2-1.4	**70.51%**	0.45%	**77.78%**	0.49%	**1.103**	0.010
1.4-1.6	**19.03%**	0.45%	**29.82%**	0.62%	**1.567**	0.050
1.6-1.8	**—-**	—-	**—-**	—-	**—-**	—-
1.8-2.0	**—-**	—-	**—-**	—-	**—-**	—-
2.0-2.5	**—-**	—-	**—-**	—-	**—-**	—-
2.5-3.0	**—-**	—-	**—-**	—-	**—-**	—-
3.0-5.0	**—-**	—-	**—-**	—-	**—-**	—-

Table 11.4: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin1 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.81%**	0.08%	**99.80%**	0.11%	**1.000**	0.001
0.6-0.8	**99.86%**	0.06%	**99.81%**	0.08%	**0.999**	0.001
0.8-1.0	**99.79%**	0.05%	**99.48%**	0.06%	**0.997**	0.001
1.0-1.2	**99.60%**	0.07%	**99.45%**	0.07%	**0.999**	0.001
1.2-1.4	**98.95%**	0.05%	**98.85%**	0.07%	**0.999**	0.001
1.4-1.6	**97.80%**	0.07%	**97.60%**	0.09%	**0.998**	0.001
1.6-1.8	**96.65%**	0.08%	**96.50%**	0.09%	**0.998**	0.001
1.8-2.0	**95.82%**	0.12%	**95.61%**	0.13%	**0.998**	0.002
2.0-2.5	**94.13%**	0.10%	**93.87%**	0.12%	**0.997**	0.002
2.5-3.0	**90.98%**	0.19%	**90.84%**	0.27%	**0.999**	0.004
3.0-5.0	**85.62%**	0.38%	**86.94%**	0.63%	**1.015**	0.009
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.80%**	0.09%	**99.77%**	0.12%	**1.000**	0.002
0.6-0.8	**99.85%**	0.05%	**99.74%**	0.08%	**0.999**	0.001
0.8-1.0	**99.76%**	0.05%	**99.22%**	0.03%	**0.995**	0.001
1.0-1.2	**99.51%**	0.08%	**99.30%**	0.07%	**0.998**	0.001
1.2-1.4	**98.68%**	0.06%	**98.45%**	0.04%	**0.998**	0.001
1.4-1.6	**97.03%**	0.07%	**96.76%**	0.09%	**0.997**	0.001
1.6-1.8	**95.53%**	0.09%	**95.15%**	0.11%	**0.996**	0.002
1.8-2.0	**94.31%**	0.11%	**93.85%**	0.14%	**0.995**	0.002
2.0-2.5	**91.92%**	0.10%	**91.53%**	0.14%	**0.996**	0.002
2.5-3.0	**86.85%**	0.21%	**87.20%**	0.29%	**1.004**	0.004
3.0-5.0	**79.56%**	0.39%	**82.58%**	0.66%	**1.038**	0.010
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.77%**	0.08%	**99.71%**	0.12%	**0.999**	0.001
0.6-0.8	**99.82%**	0.06%	**99.67%**	0.08%	**0.999**	0.001
0.8-1.0	**99.73%**	0.05%	**99.05%**	0.04%	**0.993**	0.001
1.0-1.2	**99.44%**	0.06%	**99.15%**	0.06%	**0.997**	0.001
1.2-1.4	**98.36%**	0.06%	**98.06%**	0.06%	**0.997**	0.001
1.4-1.6	**96.23%**	0.07%	**95.90%**	0.06%	**0.997**	0.001
1.6-1.8	**94.21%**	0.10%	**93.72%**	0.13%	**0.995**	0.002
1.8-2.0	**92.41%**	0.11%	**91.40%**	0.14%	**0.989**	0.002
2.0-2.5	**89.05%**	0.13%	**88.29%**	0.15%	**0.991**	0.002
2.5-3.0	**82.71%**	0.22%	**83.09%**	0.31%	**1.005**	0.005
3.0-5.0	**74.52%**	0.44%	**77.95%**	0.68%	**1.046**	0.011
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.48%**	0.09%	**97.20%**	0.12%	**0.977**	0.001
0.6-0.8	**99.67%**	0.06%	**97.26%**	0.08%	**0.976**	0.001
0.8-1.0	**99.70%**	0.05%	**98.87%**	0.12%	**0.992**	0.001
1.0-1.2	**99.33%**	0.06%	**98.77%**	0.07%	**0.994**	0.001
1.2-1.4	**97.98%**	0.06%	**97.59%**	0.05%	**0.996**	0.001
1.4-1.6	**95.35%**	0.08%	**94.97%**	0.10%	**0.996**	0.001
1.6-1.8	**92.58%**	0.10%	**92.00%**	0.10%	**0.994**	0.002
1.8-2.0	**89.74%**	0.12%	**88.08%**	0.17%	**0.982**	0.002
2.0-2.5	**84.66%**	0.13%	**82.77%**	0.13%	**0.978**	0.002
2.5-3.0	**75.76%**	0.25%	**75.03%**	0.34%	**0.990**	0.006
3.0-5.0	**68.91%**	0.46%	**73.36%**	0.70%	**1.064**	0.012

Table 11.5: Proton identification efficiency and Data-MC ratio of SVD2-Bin2 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.94%**	0.06%	**94.62%**	0.12%	**0.956**	0.001
0.6-0.8	**99.38%**	0.06%	**94.23%**	0.08%	**0.948**	0.001
0.8-1.0	**99.44%**	0.09%	**91.71%**	0.08%	**0.922**	0.001
1.0-1.2	**99.10%**	0.06%	**97.04%**	0.05%	**0.979**	0.001
1.2-1.4	**97.51%**	0.06%	**96.82%**	0.08%	**0.993**	0.001
1.4-1.6	**94.33%**	0.09%	**93.87%**	0.10%	**0.995**	0.001
1.6-1.8	**90.57%**	0.11%	**89.72%**	0.13%	**0.991**	0.002
1.8-2.0	**86.79%**	0.14%	**84.80%**	0.17%	**0.977**	0.003
2.0-2.5	**79.27%**	0.14%	**76.57%**	0.15%	**0.966**	0.003
2.5-3.0	**66.95%**	0.27%	**65.80%**	0.35%	**0.983**	0.007
3.0-5.0	**62.62%**	0.47%	**67.46%**	0.71%	**1.077**	0.014
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.93%**	0.09%	**94.59%**	0.08%	**0.956**	0.001
0.6-0.8	**99.38%**	0.06%	**94.20%**	0.04%	**0.948**	0.001
0.8-1.0	**99.43%**	0.06%	**91.70%**	0.08%	**0.922**	0.001
1.0-1.2	**99.00%**	0.06%	**96.92%**	0.07%	**0.979**	0.001
1.2-1.4	**97.01%**	0.07%	**96.34%**	0.08%	**0.993**	0.001
1.4-1.6	**93.14%**	0.09%	**92.63%**	0.09%	**0.994**	0.001
1.6-1.8	**88.54%**	0.11%	**87.44%**	0.14%	**0.988**	0.002
1.8-2.0	**83.74%**	0.15%	**81.32%**	0.15%	**0.971**	0.002
2.0-2.5	**74.62%**	0.15%	**71.43%**	0.18%	**0.957**	0.003
2.5-3.0	**61.20%**	0.28%	**59.21%**	0.36%	**0.967**	0.007
3.0-5.0	**55.91%**	0.48%	**59.81%**	0.71%	**1.070**	0.016
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.93%**	0.08%	**94.58%**	0.13%	**0.956**	0.001
0.6-0.8	**99.38%**	0.06%	**94.18%**	0.07%	**0.948**	0.001
0.8-1.0	**99.42%**	0.06%	**91.67%**	0.08%	**0.922**	0.001
1.0-1.2	**98.86%**	0.06%	**96.74%**	0.05%	**0.979**	0.001
1.2-1.4	**96.36%**	0.07%	**95.60%**	0.05%	**0.992**	0.001
1.4-1.6	**91.57%**	0.09%	**91.01%**	0.12%	**0.994**	0.002
1.6-1.8	**86.02%**	0.12%	**84.61%**	0.14%	**0.984**	0.002
1.8-2.0	**80.15%**	0.15%	**77.50%**	0.19%	**0.967**	0.003
2.0-2.5	**69.94%**	0.15%	**66.19%**	0.18%	**0.946**	0.003
2.5-3.0	**54.06%**	0.28%	**51.61%**	0.36%	**0.955**	0.008
3.0-5.0	**47.25%**	0.48%	**50.54%**	0.71%	**1.070**	0.019
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.92%**	0.09%	**94.57%**	0.12%	**0.956**	0.001
0.6-0.8	**99.37%**	0.06%	**94.17%**	0.08%	**0.948**	0.001
0.8-1.0	**99.41%**	0.04%	**91.63%**	0.08%	**0.922**	0.001
1.0-1.2	**98.59%**	0.06%	**96.43%**	0.04%	**0.978**	0.001
1.2-1.4	**95.11%**	0.07%	**94.31%**	0.08%	**0.992**	0.001
1.4-1.6	**88.91%**	0.10%	**88.23%**	0.14%	**0.992**	0.002
1.6-1.8	**82.54%**	0.13%	**80.82%**	0.15%	**0.979**	0.002
1.8-2.0	**75.69%**	0.17%	**72.45%**	0.20%	**0.957**	0.003
2.0-2.5	**63.60%**	0.16%	**58.81%**	0.17%	**0.925**	0.004
2.5-3.0	**43.23%**	0.28%	**40.01%**	0.35%	**0.925**	0.010
3.0-5.0	**34.10%**	0.45%	**35.91%**	0.78%	**1.053**	0.027

Table 11.6: Proton identification efficiency and Data-MC ratio of SVD2-Bin2 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.31%**	0.08%	**99.28%**	0.09%	**1.000**	0.001
0.6-0.8	**99.79%**	0.04%	**99.67%**	0.07%	**0.999**	0.001
0.8-1.0	**99.76%**	0.03%	**99.37%**	0.07%	**0.996**	0.001
1.0-1.2	**99.51%**	0.06%	**99.29%**	0.07%	**0.998**	0.001
1.2-1.4	**98.45%**	0.05%	**98.23%**	0.04%	**0.998**	0.001
1.4-1.6	**96.42%**	0.07%	**96.29%**	0.11%	**0.999**	0.001
1.6-1.8	**95.20%**	0.07%	**94.96%**	0.13%	**0.997**	0.002
1.8-2.0	**94.08%**	0.11%	**94.01%**	0.15%	**0.999**	0.002
2.0-2.5	**93.07%**	0.12%	**93.04%**	0.14%	**1.000**	0.002
2.5-3.0	**90.08%**	0.17%	**90.69%**	0.28%	**1.007**	0.004
3.0-5.0	**85.38%**	0.40%	**86.33%**	0.66%	**1.011**	0.009
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.29%**	0.08%	**99.19%**	0.09%	**0.999**	0.001
0.6-0.8	**99.77%**	0.06%	**99.53%**	0.07%	**0.998**	0.001
0.8-1.0	**99.72%**	0.06%	**99.04%**	0.13%	**0.993**	0.001
1.0-1.2	**99.41%**	0.06%	**99.07%**	0.07%	**0.997**	0.001
1.2-1.4	**98.05%**	0.07%	**97.76%**	0.08%	**0.997**	0.001
1.4-1.6	**95.42%**	0.09%	**95.12%**	0.11%	**0.997**	0.001
1.6-1.8	**93.81%**	0.15%	**93.37%**	0.15%	**0.995**	0.002
1.8-2.0	**92.41%**	0.10%	**92.03%**	0.21%	**0.996**	0.003
2.0-2.5	**90.72%**	0.11%	**90.55%**	0.15%	**0.998**	0.002
2.5-3.0	**86.14%**	0.27%	**86.96%**	0.30%	**1.010**	0.005
3.0-5.0	**79.19%**	0.44%	**81.67%**	0.64%	**1.031**	0.010
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.24%**	0.08%	**98.99%**	0.09%	**0.997**	0.001
0.6-0.8	**99.73%**	0.06%	**99.35%**	0.07%	**0.996**	0.001
0.8-1.0	**99.67%**	0.06%	**98.82%**	0.07%	**0.992**	0.001
1.0-1.2	**99.34%**	0.06%	**98.86%**	0.07%	**0.995**	0.001
1.2-1.4	**97.64%**	0.08%	**97.23%**	0.09%	**0.996**	0.001
1.4-1.6	**94.47%**	0.09%	**94.11%**	0.11%	**0.996**	0.001
1.6-1.8	**92.35%**	0.11%	**91.87%**	0.13%	**0.995**	0.002
1.8-2.0	**90.36%**	0.12%	**89.52%**	0.17%	**0.991**	0.002
2.0-2.5	**87.62%**	0.12%	**87.31%**	0.16%	**0.996**	0.002
2.5-3.0	**82.06%**	0.23%	**83.46%**	0.32%	**1.017**	0.005
3.0-5.0	**73.69%**	0.47%	**77.23%**	0.70%	**1.048**	0.012
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.92%**	0.08%	**96.35%**	0.10%	**0.974**	0.001
0.6-0.8	**99.60%**	0.06%	**96.61%**	0.08%	**0.970**	0.001
0.8-1.0	**99.65%**	0.06%	**98.59%**	0.09%	**0.989**	0.001
1.0-1.2	**99.17%**	0.06%	**98.25%**	0.04%	**0.991**	0.001
1.2-1.4	**97.13%**	0.07%	**96.60%**	0.09%	**0.995**	0.001
1.4-1.6	**93.40%**	0.14%	**93.06%**	0.11%	**0.996**	0.002
1.6-1.8	**90.70%**	0.12%	**89.87%**	0.14%	**0.991**	0.002
1.8-2.0	**87.77%**	0.17%	**86.35%**	0.16%	**0.984**	0.003
2.0-2.5	**83.14%**	0.13%	**81.97%**	0.16%	**0.986**	0.003
2.5-3.0	**74.61%**	0.26%	**75.16%**	0.35%	**1.007**	0.006
3.0-5.0	**68.04%**	0.49%	**72.40%**	0.71%	**1.064**	0.013

Table 11.7: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin2 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.14%**	0.08%	**92.74%**	0.10%	**0.945**	0.001
0.6-0.8	**99.25%**	0.04%	**93.16%**	0.08%	**0.939**	0.001
0.8-1.0	**99.33%**	0.06%	**91.87%**	0.08%	**0.925**	0.001
1.0-1.2	**98.86%**	0.05%	**95.91%**	0.13%	**0.970**	0.001
1.2-1.4	**96.58%**	0.07%	**95.60%**	0.09%	**0.990**	0.001
1.4-1.6	**92.25%**	0.10%	**91.82%**	0.11%	**0.995**	0.002
1.6-1.8	**88.65%**	0.12%	**87.55%**	0.18%	**0.988**	0.002
1.8-2.0	**84.84%**	0.13%	**83.05%**	0.19%	**0.979**	0.003
2.0-2.5	**77.90%**	0.16%	**76.08%**	0.18%	**0.977**	0.003
2.5-3.0	**65.90%**	0.28%	**66.62%**	0.37%	**1.011**	0.007
3.0-5.0	**62.48%**	0.50%	**66.41%**	0.72%	**1.063**	0.014
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.11%**	0.07%	**92.66%**	0.10%	**0.944**	0.001
0.6-0.8	**99.25%**	0.05%	**93.08%**	0.08%	**0.938**	0.001
0.8-1.0	**99.32%**	0.05%	**91.82%**	0.08%	**0.924**	0.001
1.0-1.2	**98.74%**	0.04%	**95.74%**	0.08%	**0.970**	0.001
1.2-1.4	**95.96%**	0.06%	**94.94%**	0.08%	**0.989**	0.001
1.4-1.6	**90.91%**	0.09%	**90.49%**	0.12%	**0.995**	0.002
1.6-1.8	**86.63%**	0.11%	**85.23%**	0.15%	**0.984**	0.002
1.8-2.0	**81.81%**	0.19%	**79.69%**	0.20%	**0.974**	0.003
2.0-2.5	**73.48%**	0.15%	**71.54%**	0.18%	**0.974**	0.003
2.5-3.0	**60.37%**	0.28%	**60.58%**	0.33%	**1.003**	0.007
3.0-5.0	**55.16%**	0.50%	**59.92%**	0.73%	**1.086**	0.016
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.10%**	0.08%	**92.63%**	0.10%	**0.944**	0.001
0.6-0.8	**99.25%**	0.06%	**93.02%**	0.32%	**0.937**	0.003
0.8-1.0	**99.30%**	0.06%	**91.79%**	0.08%	**0.924**	0.001
1.0-1.2	**98.57%**	0.06%	**95.50%**	0.06%	**0.969**	0.001
1.2-1.4	**95.10%**	0.08%	**94.03%**	0.09%	**0.989**	0.001
1.4-1.6	**89.21%**	0.12%	**88.68%**	0.12%	**0.994**	0.002
1.6-1.8	**84.17%**	0.12%	**82.60%**	0.16%	**0.981**	0.002
1.8-2.0	**78.48%**	0.16%	**76.35%**	0.20%	**0.973**	0.003
2.0-2.5	**69.09%**	0.16%	**67.00%**	0.19%	**0.970**	0.004
2.5-3.0	**53.67%**	0.29%	**53.64%**	0.37%	**1.000**	0.009
3.0-5.0	**46.42%**	0.56%	**51.40%**	0.72%	**1.107**	0.020
$L_P > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.09%**	0.08%	**92.59%**	0.05%	**0.944**	0.001
0.6-0.8	**99.25%**	0.06%	**93.00%**	0.08%	**0.937**	0.001
0.8-1.0	**99.29%**	0.06%	**91.72%**	0.08%	**0.924**	0.001
1.0-1.2	**98.23%**	0.06%	**95.07%**	0.08%	**0.968**	0.001
1.2-1.4	**93.56%**	0.08%	**92.54%**	0.12%	**0.989**	0.002
1.4-1.6	**86.40%**	0.10%	**85.80%**	0.13%	**0.993**	0.002
1.6-1.8	**80.79%**	0.14%	**78.90%**	0.16%	**0.977**	0.003
1.8-2.0	**74.13%**	0.17%	**72.00%**	0.21%	**0.971**	0.004
2.0-2.5	**62.66%**	0.16%	**60.59%**	0.18%	**0.967**	0.004
2.5-3.0	**43.04%**	0.42%	**42.82%**	0.36%	**0.995**	0.013
3.0-5.0	**33.96%**	0.47%	**37.91%**	0.80%	**1.116**	0.028

Table 11.8: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin2 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.71%**	0.15%	**99.71%**	0.17%	**1.000**	0.002
0.6-0.8	**99.87%**	0.09%	**99.86%**	0.11%	**1.000**	0.001
0.8-1.0	**99.86%**	0.06%	**99.85%**	0.10%	**1.000**	0.001
1.0-1.2	**99.65%**	0.08%	**99.06%**	0.10%	**0.994**	0.001
1.2-1.4	**98.69%**	0.05%	**98.72%**	0.10%	**1.000**	0.001
1.4-1.6	**96.67%**	0.11%	**97.03%**	0.07%	**1.004**	0.001
1.6-1.8	**95.25%**	0.12%	**95.31%**	0.08%	**1.001**	0.001
1.8-2.0	**94.92%**	0.12%	**94.88%**	0.14%	**1.000**	0.002
2.0-2.5	**94.72%**	0.09%	**94.63%**	0.10%	**0.999**	0.001
2.5-3.0	**93.27%**	0.13%	**93.24%**	0.14%	**1.000**	0.002
3.0-5.0	**88.66%**	0.17%	**89.37%**	0.21%	**1.008**	0.003
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.69%**	0.02%	**99.68%**	0.17%	**1.000**	0.002
0.6-0.8	**99.84%**	0.09%	**99.78%**	0.06%	**0.999**	0.001
0.8-1.0	**99.79%**	0.08%	**99.68%**	0.08%	**0.999**	0.001
1.0-1.2	**99.55%**	0.08%	**98.56%**	0.10%	**0.990**	0.001
1.2-1.4	**98.32%**	0.09%	**98.40%**	0.08%	**1.001**	0.001
1.4-1.6	**95.60%**	0.11%	**96.25%**	0.12%	**1.007**	0.002
1.6-1.8	**93.75%**	0.12%	**94.01%**	0.13%	**1.003**	0.002
1.8-2.0	**93.28%**	0.17%	**93.35%**	0.14%	**1.001**	0.002
2.0-2.5	**92.95%**	0.10%	**92.96%**	0.12%	**1.000**	0.002
2.5-3.0	**91.23%**	0.13%	**91.12%**	0.16%	**0.999**	0.002
3.0-5.0	**84.06%**	0.18%	**85.48%**	0.23%	**1.017**	0.003
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.67%**	0.13%	**99.59%**	0.14%	**0.999**	0.002
0.6-0.8	**99.81%**	0.09%	**99.63%**	0.14%	**0.998**	0.002
0.8-1.0	**99.74%**	0.08%	**99.47%**	0.04%	**0.997**	0.001
1.0-1.2	**99.49%**	0.09%	**98.20%**	0.10%	**0.987**	0.001
1.2-1.4	**97.93%**	0.07%	**98.11%**	0.09%	**1.002**	0.001
1.4-1.6	**94.62%**	0.11%	**95.51%**	0.12%	**1.009**	0.002
1.6-1.8	**92.47%**	0.12%	**92.84%**	0.20%	**1.004**	0.002
1.8-2.0	**91.58%**	0.14%	**91.68%**	0.15%	**1.001**	0.002
2.0-2.5	**90.55%**	0.11%	**90.50%**	0.11%	**1.000**	0.002
2.5-3.0	**88.64%**	0.18%	**88.49%**	0.17%	**0.998**	0.003
3.0-5.0	**78.88%**	0.21%	**81.24%**	0.24%	**1.030**	0.004
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.61%**	0.03%	**99.40%**	0.22%	**0.998**	0.002
0.6-0.8	**99.75%**	0.09%	**99.33%**	0.11%	**0.996**	0.001
0.8-1.0	**99.68%**	0.08%	**99.26%**	0.10%	**0.996**	0.001
1.0-1.2	**99.41%**	0.08%	**98.03%**	0.11%	**0.986**	0.001
1.2-1.4	**97.47%**	0.09%	**97.78%**	0.08%	**1.003**	0.001
1.4-1.6	**93.59%**	0.12%	**94.73%**	0.12%	**1.012**	0.002
1.6-1.8	**90.99%**	0.13%	**91.58%**	0.14%	**1.006**	0.002
1.8-2.0	**89.68%**	0.15%	**89.63%**	0.16%	**0.999**	0.002
2.0-2.5	**86.82%**	0.12%	**86.19%**	0.13%	**0.993**	0.002
2.5-3.0	**81.83%**	0.18%	**81.67%**	0.19%	**0.998**	0.003
3.0-5.0	**71.22%**	0.23%	**74.17%**	0.27%	**1.041**	0.005

Table 11.9: Proton identification efficiency and Data-MC ratio of SVD2-Bin3 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.02%**	0.09%	**96.58%**	0.16%	**0.975**	0.002
0.6-0.8	**99.46%**	0.09%	**95.05%**	0.32%	**0.956**	0.003
0.8-1.0	**99.51%**	0.08%	**95.62%**	0.06%	**0.961**	0.001
1.0-1.2	**99.23%**	0.08%	**92.43%**	0.12%	**0.932**	0.001
1.2-1.4	**96.93%**	0.10%	**96.10%**	0.10%	**0.991**	0.001
1.4-1.6	**92.54%**	0.12%	**93.82%**	0.10%	**1.014**	0.002
1.6-1.8	**89.49%**	0.12%	**90.26%**	0.14%	**1.009**	0.002
1.8-2.0	**87.51%**	0.12%	**87.40%**	0.16%	**0.999**	0.002
2.0-2.5	**82.39%**	0.13%	**80.86%**	0.14%	**0.981**	0.002
2.5-3.0	**72.32%**	0.19%	**70.86%**	0.22%	**0.980**	0.004
3.0-5.0	**63.80%**	0.24%	**65.89%**	0.28%	**1.033**	0.006
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.01%**	0.13%	**96.56%**	0.18%	**0.975**	0.002
0.6-0.8	**99.46%**	0.09%	**95.03%**	0.12%	**0.956**	0.001
0.8-1.0	**99.50%**	0.04%	**95.61%**	0.10%	**0.961**	0.001
1.0-1.2	**99.15%**	0.08%	**92.36%**	0.12%	**0.932**	0.001
1.2-1.4	**96.37%**	0.06%	**95.75%**	0.16%	**0.994**	0.002
1.4-1.6	**91.30%**	0.14%	**92.83%**	0.17%	**1.017**	0.002
1.6-1.8	**87.73%**	0.14%	**88.59%**	0.13%	**1.010**	0.002
1.8-2.0	**85.00%**	0.16%	**84.79%**	0.16%	**0.998**	0.003
2.0-2.5	**78.69%**	0.13%	**77.17%**	0.14%	**0.981**	0.002
2.5-3.0	**69.50%**	0.20%	**67.95%**	0.22%	**0.978**	0.004
3.0-5.0	**57.74%**	0.25%	**59.30%**	0.29%	**1.027**	0.007
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.00%**	0.08%	**96.55%**	0.18%	**0.975**	0.002
0.6-0.8	**99.46%**	0.09%	**95.02%**	0.12%	**0.955**	0.001
0.8-1.0	**99.50%**	0.08%	**95.60%**	0.11%	**0.961**	0.001
1.0-1.2	**99.02%**	0.09%	**92.29%**	0.12%	**0.932**	0.001
1.2-1.4	**95.63%**	0.10%	**95.29%**	0.16%	**0.997**	0.002
1.4-1.6	**89.65%**	0.13%	**91.59%**	0.10%	**1.022**	0.002
1.6-1.8	**85.52%**	0.15%	**86.56%**	0.14%	**1.012**	0.002
1.8-2.0	**82.10%**	0.17%	**82.07%**	0.18%	**1.000**	0.003
2.0-2.5	**75.97%**	0.14%	**74.54%**	0.15%	**0.981**	0.003
2.5-3.0	**66.05%**	0.20%	**64.18%**	0.21%	**0.972**	0.004
3.0-5.0	**50.70%**	0.25%	**52.39%**	0.29%	**1.033**	0.008
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.00%**	0.11%	**96.55%**	0.18%	**0.975**	0.002
0.6-0.8	**99.46%**	0.05%	**95.02%**	0.08%	**0.955**	0.001
0.8-1.0	**99.50%**	0.08%	**95.59%**	0.10%	**0.961**	0.001
1.0-1.2	**98.79%**	0.09%	**92.14%**	0.11%	**0.933**	0.001
1.2-1.4	**94.17%**	0.11%	**94.49%**	0.12%	**1.003**	0.002
1.4-1.6	**86.97%**	0.13%	**89.53%**	0.16%	**1.029**	0.002
1.6-1.8	**82.31%**	0.15%	**83.64%**	0.16%	**1.016**	0.003
1.8-2.0	**78.83%**	0.20%	**78.66%**	0.19%	**0.998**	0.003
2.0-2.5	**73.29%**	0.14%	**71.82%**	0.15%	**0.980**	0.003
2.5-3.0	**60.14%**	0.23%	**57.92%**	0.23%	**0.963**	0.005
3.0-5.0	**40.46%**	0.24%	**42.30%**	0.28%	**1.046**	0.009

Table 11.10: Proton identification efficiency and Data-MC ratio of SVD2-Bin3 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**99.28%**	0.11%	**99.28%**	0.15%	**1.000**	0.002
0.6-0.8	**99.76%**	0.09%	**99.71%**	0.11%	**0.999**	0.001
0.8-1.0	**99.81%**	0.08%	**99.75%**	0.10%	**0.999**	0.001
1.0-1.2	**99.46%**	0.03%	**98.87%**	0.11%	**0.994**	0.001
1.2-1.4	**98.10%**	0.10%	**98.10%**	0.11%	**1.000**	0.002
1.4-1.6	**94.90%**	0.12%	**95.43%**	0.17%	**1.006**	0.002
1.6-1.8	**92.89%**	0.17%	**93.01%**	0.15%	**1.001**	0.002
1.8-2.0	**92.35%**	0.15%	**92.26%**	0.16%	**0.999**	0.002
2.0-2.5	**93.01%**	0.09%	**92.91%**	0.12%	**0.999**	0.002
2.5-3.0	**92.55%**	0.14%	**92.45%**	0.13%	**0.999**	0.002
3.0-5.0	**87.63%**	0.19%	**88.78%**	0.23%	**1.013**	0.003
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.26%**	0.12%	**99.21%**	0.15%	**1.000**	0.002
0.6-0.8	**99.72%**	0.09%	**99.55%**	0.11%	**0.998**	0.001
0.8-1.0	**99.75%**	0.09%	**99.56%**	0.12%	**0.998**	0.001
1.0-1.2	**99.34%**	0.12%	**98.26%**	0.11%	**0.989**	0.002
1.2-1.4	**97.52%**	0.10%	**97.61%**	0.11%	**1.001**	0.002
1.4-1.6	**93.43%**	0.12%	**94.31%**	0.14%	**1.009**	0.002
1.6-1.8	**90.74%**	0.14%	**91.10%**	0.14%	**1.004**	0.002
1.8-2.0	**90.36%**	0.15%	**90.21%**	0.19%	**0.998**	0.003
2.0-2.5	**90.89%**	0.11%	**90.63%**	0.12%	**0.997**	0.002
2.5-3.0	**90.17%**	0.15%	**89.97%**	0.18%	**0.998**	0.003
3.0-5.0	**82.84%**	0.22%	**84.81%**	0.25%	**1.024**	0.004
$L_P > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.19%**	0.12%	**99.00%**	0.15%	**0.998**	0.002
0.6-0.8	**99.68%**	0.09%	**99.28%**	0.11%	**0.996**	0.001
0.8-1.0	**99.70%**	0.07%	**99.27%**	0.10%	**0.996**	0.001
1.0-1.2	**99.27%**	0.09%	**97.86%**	0.11%	**0.986**	0.001
1.2-1.4	**96.95%**	0.06%	**97.14%**	0.12%	**1.002**	0.001
1.4-1.6	**92.04%**	0.13%	**93.23%**	0.14%	**1.013**	0.002
1.6-1.8	**89.20%**	0.14%	**89.42%**	0.16%	**1.003**	0.002
1.8-2.0	**88.41%**	0.16%	**88.09%**	0.17%	**0.996**	0.003
2.0-2.5	**87.97%**	0.12%	**87.53%**	0.14%	**0.995**	0.002
2.5-3.0	**87.26%**	0.16%	**87.09%**	0.19%	**0.998**	0.003
3.0-5.0	**77.28%**	0.23%	**80.21%**	0.26%	**1.038**	0.005
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**99.09%**	0.12%	**98.67%**	0.12%	**0.996**	0.002
0.6-0.8	**99.60%**	0.11%	**98.86%**	0.11%	**0.993**	0.002
0.8-1.0	**99.65%**	0.09%	**99.03%**	0.10%	**0.994**	0.001
1.0-1.2	**99.16%**	0.09%	**97.59%**	0.11%	**0.984**	0.001
1.2-1.4	**96.43%**	0.13%	**96.69%**	0.12%	**1.003**	0.002
1.4-1.6	**90.69%**	0.12%	**92.20%**	0.14%	**1.017**	0.002
1.6-1.8	**87.45%**	0.13%	**87.69%**	0.16%	**1.003**	0.002
1.8-2.0	**86.25%**	0.16%	**85.76%**	0.22%	**0.994**	0.003
2.0-2.5	**84.09%**	0.13%	**82.54%**	0.14%	**0.982**	0.002
2.5-3.0	**79.91%**	0.19%	**80.01%**	0.21%	**1.001**	0.003
3.0-5.0	**70.08%**	0.24%	**73.06%**	0.28%	**1.043**	0.005

Table 11.11: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin3 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.54%**	0.12%	**95.40%**	0.15%	**0.968**	0.002
0.6-0.8	**99.28%**	0.10%	**94.56%**	0.12%	**0.952**	0.001
0.8-1.0	**99.43%**	0.09%	**95.66%**	0.11%	**0.962**	0.001
1.0-1.2	**98.91%**	0.09%	**92.40%**	0.12%	**0.934**	0.001
1.2-1.4	**95.68%**	0.09%	**94.72%**	0.12%	**0.990**	0.002
1.4-1.6	**89.25%**	0.13%	**91.02%**	0.14%	**1.020**	0.002
1.6-1.8	**85.70%**	0.15%	**86.01%**	0.17%	**1.004**	0.003
1.8-2.0	**83.97%**	0.17%	**83.38%**	0.19%	**0.993**	0.003
2.0-2.5	**79.57%**	0.14%	**77.51%**	0.22%	**0.974**	0.003
2.5-3.0	**70.33%**	0.21%	**69.32%**	0.23%	**0.986**	0.004
3.0-5.0	**62.93%**	0.26%	**65.00%**	0.30%	**1.033**	0.006
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.53%**	0.18%	**95.33%**	0.16%	**0.968**	0.002
0.6-0.8	**99.27%**	0.09%	**94.54%**	0.12%	**0.952**	0.001
0.8-1.0	**99.43%**	0.09%	**95.66%**	0.11%	**0.962**	0.001
1.0-1.2	**98.80%**	0.08%	**92.29%**	0.12%	**0.934**	0.001
1.2-1.4	**94.86%**	0.15%	**94.26%**	0.12%	**0.994**	0.002
1.4-1.6	**87.67%**	0.11%	**89.78%**	0.15%	**1.024**	0.002
1.6-1.8	**83.87%**	0.16%	**84.24%**	0.17%	**1.004**	0.003
1.8-2.0	**81.22%**	0.18%	**80.84%**	0.19%	**0.995**	0.003
2.0-2.5	**76.07%**	0.14%	**74.16%**	0.16%	**0.975**	0.003
2.5-3.0	**67.66%**	0.21%	**66.69%**	0.23%	**0.986**	0.005
3.0-5.0	**56.74%**	0.26%	**58.85%**	0.30%	**1.037**	0.007
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.52%**	0.12%	**95.31%**	0.15%	**0.967**	0.002
0.6-0.8	**99.28%**	0.09%	**94.53%**	0.12%	**0.952**	0.001
0.8-1.0	**99.42%**	0.09%	**95.64%**	0.13%	**0.962**	0.002
1.0-1.2	**98.65%**	0.11%	**92.18%**	0.12%	**0.934**	0.002
1.2-1.4	**93.74%**	0.08%	**93.60%**	0.09%	**0.999**	0.001
1.4-1.6	**85.78%**	0.14%	**88.18%**	0.12%	**1.028**	0.002
1.6-1.8	**81.41%**	0.20%	**82.12%**	0.18%	**1.009**	0.003
1.8-2.0	**78.48%**	0.18%	**78.17%**	0.20%	**0.996**	0.003
2.0-2.5	**73.41%**	0.14%	**71.89%**	0.16%	**0.979**	0.003
2.5-3.0	**64.43%**	0.21%	**63.36%**	0.23%	**0.983**	0.005
3.0-5.0	**50.17%**	0.27%	**52.11%**	0.30%	**1.039**	0.008
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.51%**	0.12%	**95.28%**	0.16%	**0.967**	0.002
0.6-0.8	**99.28%**	0.09%	**94.51%**	0.09%	**0.952**	0.001
0.8-1.0	**99.41%**	0.09%	**95.62%**	0.07%	**0.962**	0.001
1.0-1.2	**98.36%**	0.07%	**92.01%**	0.12%	**0.935**	0.001
1.2-1.4	**91.86%**	0.12%	**92.39%**	0.09%	**1.006**	0.002
1.4-1.6	**82.74%**	0.15%	**85.67%**	0.13%	**1.035**	0.002
1.6-1.8	**78.28%**	0.17%	**79.26%**	0.17%	**1.013**	0.003
1.8-2.0	**75.34%**	0.17%	**75.13%**	0.20%	**0.997**	0.004
2.0-2.5	**70.96%**	0.16%	**69.44%**	0.16%	**0.979**	0.003
2.5-3.0	**58.79%**	0.22%	**57.68%**	0.24%	**0.981**	0.005
3.0-5.0	**40.22%**	0.26%	**42.27%**	0.30%	**1.051**	0.010

Table 11.12: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin3 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**98.74%**	0.27%	**98.79%**	0.32%	**1.001**	0.004
0.6-0.8	**99.46%**	0.16%	**99.38%**	0.19%	**0.999**	0.002
0.8-1.0	**99.46%**	0.16%	**99.52%**	0.17%	**1.001**	0.002
1.0-1.2	**99.26%**	0.08%	**99.22%**	0.19%	**1.000**	0.002
1.2-1.4	**97.93%**	0.25%	**98.14%**	0.29%	**1.002**	0.004
1.4-1.6	**93.78%**	0.22%	**94.33%**	0.20%	**1.006**	0.003
1.6-1.8	**89.58%**	0.26%	**89.15%**	0.28%	**0.995**	0.004
1.8-2.0	**89.29%**	0.18%	**89.09%**	0.22%	**0.998**	0.003
2.0-2.5	**79.84%**	0.21%	**82.91%**	0.23%	**1.038**	0.004
2.5-3.0	**85.65%**	0.28%	**86.14%**	0.39%	**1.006**	0.006
3.0-5.0	**86.13%**	0.26%	**86.58%**	0.31%	**1.005**	0.005
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.72%**	0.26%	**98.76%**	0.35%	**1.000**	0.004
0.6-0.8	**99.44%**	0.17%	**99.37%**	0.21%	**0.999**	0.003
0.8-1.0	**99.47%**	0.16%	**99.49%**	0.19%	**1.000**	0.002
1.0-1.2	**99.20%**	0.17%	**99.15%**	0.18%	**0.999**	0.003
1.2-1.4	**97.38%**	0.21%	**97.60%**	0.22%	**1.002**	0.003
1.4-1.6	**91.39%**	0.22%	**92.26%**	0.22%	**1.010**	0.003
1.6-1.8	**85.45%**	0.26%	**85.41%**	0.29%	**1.000**	0.005
1.8-2.0	**84.47%**	0.28%	**84.44%**	0.32%	**1.000**	0.005
2.0-2.5	**71.13%**	0.23%	**77.24%**	0.23%	**1.086**	0.005
2.5-3.0	**80.68%**	0.20%	**82.20%**	0.29%	**1.019**	0.004
3.0-5.0	**81.88%**	0.28%	**82.91%**	0.32%	**1.013**	0.005
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.71%**	0.26%	**98.78%**	0.33%	**1.001**	0.004
0.6-0.8	**99.44%**	0.15%	**99.37%**	0.21%	**0.999**	0.003
0.8-1.0	**99.48%**	0.18%	**99.49%**	0.19%	**1.000**	0.003
1.0-1.2	**99.09%**	0.17%	**99.03%**	0.20%	**0.999**	0.003
1.2-1.4	**96.65%**	0.19%	**97.11%**	0.22%	**1.005**	0.003
1.4-1.6	**88.92%**	0.26%	**90.25%**	0.25%	**1.015**	0.004
1.6-1.8	**81.40%**	0.27%	**81.24%**	0.29%	**0.998**	0.005
1.8-2.0	**77.72%**	0.30%	**77.87%**	0.34%	**1.002**	0.006
2.0-2.5	**63.72%**	0.23%	**71.69%**	0.24%	**1.125**	0.006
2.5-3.0	**75.72%**	0.27%	**78.51%**	0.29%	**1.037**	0.005
3.0-5.0	**77.59%**	0.29%	**79.50%**	0.33%	**1.025**	0.006
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.40%**	0.25%	**98.44%**	0.32%	**1.000**	0.004
0.6-0.8	**99.15%**	0.07%	**99.11%**	0.17%	**1.000**	0.002
0.8-1.0	**99.15%**	0.16%	**99.19%**	0.20%	**1.000**	0.003
1.0-1.2	**98.89%**	0.23%	**98.85%**	0.20%	**1.000**	0.003
1.2-1.4	**95.67%**	0.19%	**96.46%**	0.22%	**1.008**	0.003
1.4-1.6	**86.27%**	0.15%	**88.04%**	0.26%	**1.020**	0.004
1.6-1.8	**76.16%**	0.28%	**76.58%**	0.25%	**1.006**	0.005
1.8-2.0	**68.43%**	0.32%	**68.98%**	0.35%	**1.008**	0.007
2.0-2.5	**55.88%**	0.23%	**64.73%**	0.24%	**1.158**	0.006
2.5-3.0	**65.70%**	0.27%	**70.84%**	0.30%	**1.078**	0.006
3.0-5.0	**71.52%**	0.30%	**74.17%**	0.34%	**1.037**	0.006

Table 11.13: Proton identification efficiency and Data-MC ratio of SVD2-Bin4 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.40%**	0.25%	**98.45%**	0.36%	**1.000**	0.004
0.6-0.8	**99.15%**	0.12%	**99.09%**	0.19%	**0.999**	0.002
0.8-1.0	**99.14%**	0.16%	**99.18%**	0.18%	**1.000**	0.002
1.0-1.2	**98.53%**	0.16%	**98.56%**	0.12%	**1.000**	0.002
1.2-1.4	**94.34%**	0.20%	**95.50%**	0.22%	**1.012**	0.003
1.4-1.6	**82.62%**	0.24%	**85.17%**	0.26%	**1.031**	0.004
1.6-1.8	**68.35%**	0.29%	**70.58%**	0.30%	**1.033**	0.006
1.8-2.0	**54.80%**	0.32%	**56.35%**	0.35%	**1.028**	0.009
2.0-2.5	**46.76%**	0.25%	**55.67%**	0.25%	**1.191**	0.008
2.5-3.0	**54.02%**	0.29%	**60.52%**	0.32%	**1.120**	0.009
3.0-5.0	**65.40%**	0.31%	**68.00%**	0.32%	**1.040**	0.007
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.41%**	0.25%	**98.48%**	0.36%	**1.001**	0.004
0.6-0.8	**99.14%**	0.16%	**99.08%**	0.20%	**0.999**	0.003
0.8-1.0	**99.13%**	0.16%	**99.19%**	0.19%	**1.001**	0.002
1.0-1.2	**98.41%**	0.23%	**98.47%**	0.22%	**1.001**	0.003
1.2-1.4	**93.05%**	0.12%	**94.55%**	0.22%	**1.016**	0.003
1.4-1.6	**78.09%**	0.25%	**81.84%**	0.26%	**1.048**	0.005
1.6-1.8	**58.57%**	0.27%	**62.73%**	0.31%	**1.071**	0.007
1.8-2.0	**39.57%**	0.30%	**41.28%**	0.33%	**1.043**	0.011
2.0-2.5	**37.96%**	0.19%	**46.00%**	0.24%	**1.212**	0.009
2.5-3.0	**48.90%**	0.29%	**57.68%**	0.31%	**1.180**	0.010
3.0-5.0	**60.39%**	0.31%	**63.16%**	0.39%	**1.046**	0.008
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.41%**	0.25%	**98.51%**	0.33%	**1.001**	0.004
0.6-0.8	**99.14%**	0.16%	**99.07%**	0.04%	**0.999**	0.002
0.8-1.0	**99.13%**	0.16%	**99.18%**	0.19%	**1.000**	0.002
1.0-1.2	**98.18%**	0.15%	**98.31%**	0.20%	**1.001**	0.003
1.2-1.4	**91.21%**	0.20%	**93.43%**	0.29%	**1.024**	0.004
1.4-1.6	**71.32%**	0.22%	**77.16%**	0.26%	**1.082**	0.005
1.6-1.8	**45.89%**	0.28%	**52.03%**	0.30%	**1.134**	0.010
1.8-2.0	**21.32%**	0.24%	**23.17%**	0.27%	**1.087**	0.018
2.0-2.5	**27.73%**	0.19%	**33.17%**	0.22%	**1.196**	0.011
2.5-3.0	**44.92%**	0.29%	**55.17%**	0.32%	**1.228**	0.011
3.0-5.0	**53.98%**	0.31%	**58.43%**	0.35%	**1.082**	0.009
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**98.42%**	0.25%	**98.51%**	0.29%	**1.001**	0.004
0.6-0.8	**99.13%**	0.16%	**99.05%**	0.16%	**0.999**	0.002
0.8-1.0	**99.11%**	0.13%	**99.16%**	0.19%	**1.001**	0.002
1.0-1.2	**97.69%**	0.17%	**98.02%**	0.20%	**1.003**	0.003
1.2-1.4	**87.21%**	0.21%	**91.21%**	0.23%	**1.046**	0.004
1.4-1.6	**60.21%**	0.26%	**69.04%**	0.28%	**1.147**	0.007
1.6-1.8	**26.82%**	0.24%	**34.84%**	0.28%	**1.299**	0.016
1.8-2.0	**4.08%**	0.12%	**5.89%**	0.15%	**1.444**	0.055
2.0-2.5	**8.74%**	0.11%	**9.67%**	0.13%	**1.107**	0.020
2.5-3.0	**38.73%**	0.28%	**49.24%**	0.31%	**1.271**	0.012
3.0-5.0	**42.30%**	0.30%	**50.54%**	0.35%	**1.195**	0.012

Table 11.14: Proton identification efficiency and Data-MC ratio of SVD2-Bin4 in momentum 0.4-5GeV

$L_p > 0.2$						
momentum	**MC%**	%+-	**DATA%**	%+-	**double %**	double%+-
0.4-0.6	**97.67%**	0.26%	**97.67%**	0.30%	**1.000**	0.004
0.6-0.8	**99.09%**	0.17%	**99.11%**	0.20%	**1.000**	0.003
0.8-1.0	**99.22%**	0.16%	**99.24%**	0.20%	**1.000**	0.003
1.0-1.2	**98.87%**	0.18%	**98.87%**	0.21%	**1.000**	0.003
1.2-1.4	**96.98%**	0.16%	**97.30%**	0.24%	**1.003**	0.003
1.4-1.6	**90.29%**	0.24%	**91.34%**	0.27%	**1.012**	0.004
1.6-1.8	**84.50%**	0.19%	**84.34%**	0.31%	**0.998**	0.004
1.8-2.0	**84.59%**	0.29%	**84.36%**	0.34%	**0.997**	0.005
2.0-2.5	**77.67%**	0.23%	**79.79%**	0.25%	**1.027**	0.004
2.5-3.0	**83.59%**	0.27%	**83.91%**	0.25%	**1.004**	0.004
3.0-5.0	**85.64%**	0.29%	**85.59%**	0.33%	**0.999**	0.005
$L_p > 0.3$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.68%**	0.23%	**97.70%**	0.33%	**1.000**	0.004
0.6-0.8	**99.07%**	0.17%	**99.12%**	0.20%	**1.000**	0.003
0.8-1.0	**99.22%**	0.16%	**99.29%**	0.20%	**1.001**	0.003
1.0-1.2	**98.72%**	0.18%	**98.71%**	0.21%	**1.000**	0.003
1.2-1.4	**96.06%**	0.16%	**96.72%**	0.23%	**1.007**	0.003
1.4-1.6	**87.02%**	0.18%	**88.74%**	0.28%	**1.020**	0.004
1.6-1.8	**79.84%**	0.29%	**79.53%**	0.32%	**0.996**	0.005
1.8-2.0	**79.25%**	0.32%	**78.64%**	0.29%	**0.992**	0.005
2.0-2.5	**68.77%**	0.24%	**73.03%**	0.20%	**1.062**	0.005
2.5-3.0	**78.28%**	0.28%	**79.44%**	0.30%	**1.015**	0.005
3.0-5.0	**81.38%**	0.30%	**81.60%**	0.24%	**1.003**	0.005
$L_p > 0.4$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.66%**	0.25%	**97.69%**	0.16%	**1.000**	0.003
0.6-0.8	**99.06%**	0.17%	**99.10%**	0.17%	**1.000**	0.002
0.8-1.0	**99.20%**	0.16%	**99.31%**	0.19%	**1.001**	0.003
1.0-1.2	**98.65%**	0.38%	**98.64%**	0.09%	**1.000**	0.004
1.2-1.4	**95.05%**	0.22%	**96.07%**	0.19%	**1.011**	0.003
1.4-1.6	**83.98%**	0.26%	**86.16%**	0.28%	**1.026**	0.005
1.6-1.8	**75.11%**	0.30%	**75.16%**	0.32%	**1.001**	0.006
1.8-2.0	**72.11%**	0.33%	**72.00%**	0.36%	**0.998**	0.007
2.0-2.5	**60.97%**	0.24%	**67.09%**	0.25%	**1.100**	0.006
2.5-3.0	**73.49%**	0.29%	**75.29%**	0.30%	**1.025**	0.006
3.0-5.0	**77.13%**	0.31%	**77.51%**	0.35%	**1.005**	0.006
$L_p > 0.5$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.57%**	0.24%	**97.64%**	0.27%	**1.001**	0.004
0.6-0.8	**98.80%**	0.19%	**98.91%**	0.19%	**1.001**	0.003
0.8-1.0	**98.96%**	0.16%	**98.97%**	0.17%	**1.000**	0.002
1.0-1.2	**98.45%**	0.18%	**98.53%**	0.21%	**1.001**	0.003
1.2-1.4	**93.97%**	0.21%	**95.36%**	0.25%	**1.015**	0.003
1.4-1.6	**80.90%**	0.26%	**83.55%**	0.29%	**1.033**	0.005
1.6-1.8	**69.75%**	0.30%	**69.85%**	0.32%	**1.001**	0.006
1.8-2.0	**63.07%**	0.34%	**62.84%**	0.36%	**0.996**	0.008
2.0-2.5	**52.85%**	0.24%	**59.76%**	0.25%	**1.131**	0.007
2.5-3.0	**63.49%**	0.27%	**67.47%**	0.37%	**1.063**	0.007
3.0-5.0	**71.09%**	0.35%	**72.20%**	0.36%	**1.016**	0.007

Table 11.15: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin4 in momentum 0.4-5GeV

$L_p > 0.6$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.57%**	0.23%	**97.64%**	0.30%	**1.001**	0.004
0.6-0.8	**98.81%**	0.16%	**98.93%**	0.19%	**1.001**	0.003
0.8-1.0	**98.94%**	0.13%	**98.97%**	0.17%	**1.000**	0.002
1.0-1.2	**98.03%**	0.18%	**98.13%**	0.23%	**1.001**	0.003
1.2-1.4	**92.49%**	0.21%	**94.23%**	0.26%	**1.019**	0.004
1.4-1.6	**77.10%**	0.26%	**80.12%**	0.28%	**1.039**	0.005
1.6-1.8	**62.85%**	0.30%	**63.76%**	0.32%	**1.015**	0.007
1.8-2.0	**50.72%**	0.33%	**50.36%**	0.36%	**0.993**	0.010
2.0-2.5	**43.99%**	0.23%	**51.12%**	0.25%	**1.162**	0.008
2.5-3.0	**51.69%**	0.31%	**56.47%**	0.32%	**1.093**	0.009
3.0-5.0	**64.98%**	0.29%	**65.98%**	0.27%	**1.015**	0.006
$L_p > 0.7$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.55%**	0.24%	**97.67%**	0.19%	**1.001**	0.003
0.6-0.8	**98.79%**	0.16%	**98.93%**	0.19%	**1.001**	0.003
0.8-1.0	**98.94%**	0.10%	**98.98%**	0.19%	**1.000**	0.002
1.0-1.2	**97.86%**	0.18%	**98.03%**	0.21%	**1.002**	0.003
1.2-1.4	**91.04%**	0.22%	**93.40%**	0.24%	**1.026**	0.004
1.4-1.6	**72.90%**	0.26%	**76.65%**	0.28%	**1.052**	0.005
1.6-1.8	**53.92%**	0.29%	**56.03%**	0.32%	**1.039**	0.008
1.8-2.0	**35.92%**	0.30%	**35.96%**	0.33%	**1.001**	0.012
2.0-2.5	**35.35%**	0.22%	**42.06%**	0.24%	**1.190**	0.010
2.5-3.0	**46.73%**	0.27%	**53.78%**	0.41%	**1.151**	0.011
3.0-5.0	**59.77%**	0.34%	**60.86%**	0.28%	**1.018**	0.007
$L_p > 0.8$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.52%**	0.23%	**97.65%**	0.23%	**1.001**	0.003
0.6-0.8	**98.79%**	0.22%	**98.92%**	0.19%	**1.001**	0.003
0.8-1.0	**98.94%**	0.16%	**98.95%**	0.21%	**1.000**	0.003
1.0-1.2	**97.52%**	0.18%	**97.91%**	0.21%	**1.004**	0.003
1.2-1.4	**89.00%**	0.21%	**92.05%**	0.23%	**1.034**	0.004
1.4-1.6	**66.54%**	0.26%	**71.45%**	0.29%	**1.074**	0.006
1.6-1.8	**41.56%**	0.28%	**45.90%**	0.31%	**1.104**	0.011
1.8-2.0	**19.69%**	0.23%	**20.37%**	0.27%	**1.034**	0.018
2.0-2.5	**25.81%**	0.20%	**30.44%**	0.19%	**1.179**	0.012
2.5-3.0	**42.78%**	0.30%	**51.61%**	0.32%	**1.206**	0.011
3.0-5.0	**53.41%**	0.34%	**56.16%**	0.36%	**1.052**	0.009
$L_p > 0.9$						
momentum	**%**	%+-	**%**	%+-	**double %**	double%+-
0.4-0.6	**97.52%**	0.23%	**97.64%**	0.29%	**1.001**	0.004
0.6-0.8	**98.80%**	0.16%	**98.93%**	0.22%	**1.001**	0.003
0.8-1.0	**98.93%**	0.15%	**98.94%**	0.16%	**1.000**	0.002
1.0-1.2	**97.03%**	0.18%	**97.66%**	0.21%	**1.006**	0.003
1.2-1.4	**85.33%**	0.22%	**89.43%**	0.25%	**1.048**	0.004
1.4-1.6	**55.96%**	0.27%	**63.14%**	0.29%	**1.128**	0.007
1.6-1.8	**24.71%**	0.24%	**30.70%**	0.28%	**1.242**	0.016
1.8-2.0	**3.80%**	0.12%	**5.08%**	0.15%	**1.336**	0.056
2.0-2.5	**8.20%**	0.12%	**9.15%**	0.12%	**1.116**	0.023
2.5-3.0	**36.68%**	0.29%	**46.29%**	0.33%	**1.262**	0.013
3.0-5.0	**41.90%**	0.29%	**48.32%**	0.36%	**1.153**	0.012

Table 11.16: Anti-Proton identification efficiency and Data-MC ratio of SVD2-Bin4 in momentum 0.4-5GeV

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