

Korean activities and plans for ALICE

CERN, October 22, 2007

2nd CERN-Korea Committee meeting

Do-Won Kim, Kangnung National University

- 1. ALICE-Korea, background**
- 2. Assembly & Test of TOF detector**
- 3. GRID Computing**
- 4. Physics preparation**
- 5. ALICE-Korea budget**

1. ALICE-Korea, background

1998. MRPC R&D at CERN (CERN, Kangnung, Pohang, Rice)
D. Hatzifotidou, J. Valverde, C. Williams, E. Zebalos (CERN)
D.W. Kim, S.C. Lee (Kangnung), J. Choi (Pohang)
E. Platner, J. Roberts (Rice)

Produced a **big MRPC** with **1 ns time resolution**

Publication in NIM-A 'A very large multi-gap resistive plate chamber'

1999. thin gap MRPC, Obtained **time resolution of 70 ps**

Publication in NIM-A 'The multigap resistive plate chamber as a time-of-flight detector'

ALICE was looking for a TOF technology with **better than 100 ps** resolution. INFN-Bologna decided to take the full responsibility

Invitation of ALICE for Korean participation in ALICE-TOF project and also in Theoretical investigation of Heavy Ion phenomena

→ J. Schukraft visited Saclay(M. Rho), Postech(PAL), KIAS(M. Rho)

2000 ALICE-TOF Collaboration

INFN-Bologna, INFN-Salerno, ITEP-Moscow,
Kangnung National University / Pohang Accelerator Laboratory

Italy & Korean governments started helping Korean physicists (MoST-MAE)

2000 Korea-Italy Agreement in Rome for a cooperative research

2001-2004 'R&D of the TOF detector' → Reached 50 ps for 96 channel detector

2003 Korea-Italy Agreement in Seoul for the next step (MoST-MAE)

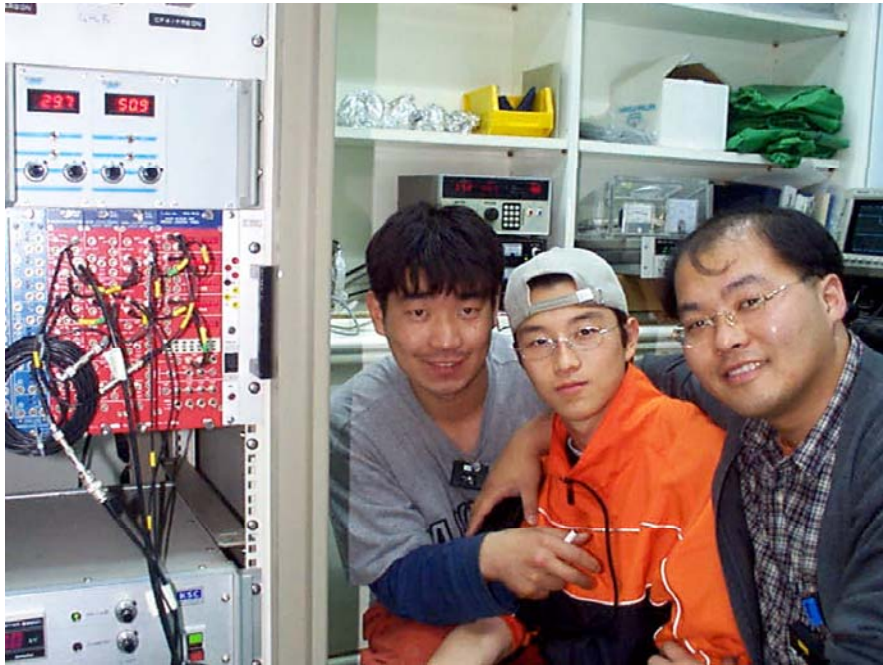
2004-2007 'Cooperation in the production of the ALICE-TOF detector'
→ Production of 160,000 detector sensors

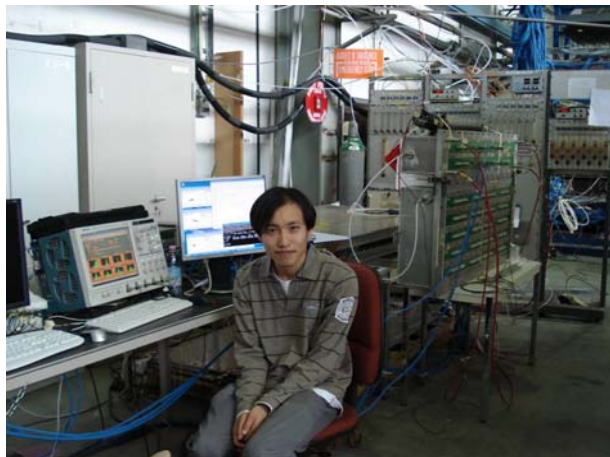
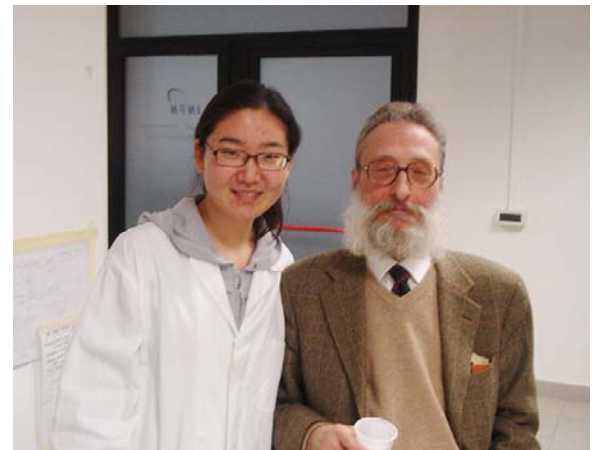
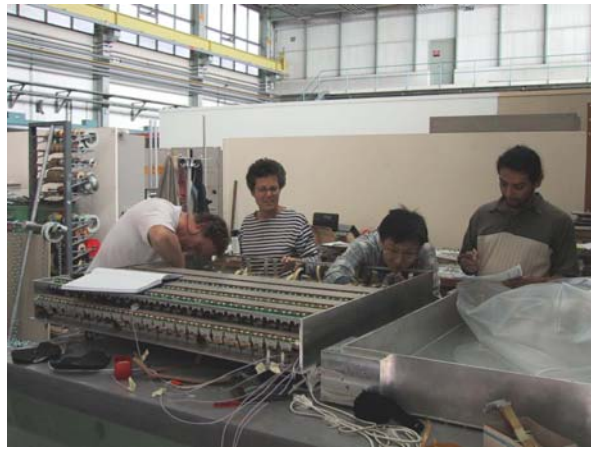
2004 Participation in EGEE/EU-FP6 project funded by KOSEF/MoST

2004-2007 'ALICE GRID Computing and bioinformatics' (Sejong University)
→ ALICE GRID computing and Cooperation with KISTI

2004 CERN's former DG L. Maiani and ALICE delegation visited Korea. HIM started.

2005 Sejong University joined ALICE Collaboration. Contribution to ALICE Computing and Theoretical works.







*Linux clusters in
Sejong University..
and
C.Y. Choi at CERN*



Official request of MoST for concentration in LHC activities

보낸 사람: 장홍태
날짜: 2007년 3월 2일 금요일 오후 3:10
받는 사람: dwkim@kangnung.ac.kr

한-CERN 협력사업 추진계획

□ 참여자 연구전념도 확보

○ 박사급이상 연구원의 경우 70% 이상, 학생의 경우 100%로 제한하여 연구의 효율성 제고

- 현재 타 연구사업에 참여하고 있는 박사급 이상 연구원이 실험 연구에 참여하기를 희망하는 경우 1~2년간 한시적으로 30%의 참여율을 인정하고 참여율에 따라 연구비 지급

※ 유예기간(1~2년) 내에 CERN 이외의 연구 정리

Termination of participation in PHENIX (Kangnung)

- Letter to PHENIX

제 목	[FWD]list of PHENIX institutions	헤더보기	자동분류	인쇄화면	이메일 아이콘
보낸 사람	dowonkim@mail.cern.ch	주소록 추가	수신 거부		
받는 사람	brant@bnl.gov				

보낸 사람: Brant Johnson [brant@bnl.gov] 보낸 날짜: 2007-07-31 (화) 오전 12:50
받는 사람: Do-Won Kim
참조: joonhn@most.go.kr; changht@most.go.kr; njcho88@most.go.kr; Tiziano Camporesi; Diether Blechschmidt; Jurgen Schukraft; jacak@skipper.physics.sunysb.edu
제목: Re: [FWD]list of PHENIX institutions
첨부 파일:

Dear Do-Won,

We are sorry to learn of the departure from PHENIX, of Kangnung National University. We thank you for your numerous contributions to PHENIX and we wish you and your colleagues great success on the ALICE experiment at the LHC.

Best regards, Brant

P.S. Informally, we can consider your institutional status as inactive immediately. However, formal recognition that the number of PHENIX participating institutions has changed will need to wait until our next Institutional Board meeting at BNL in December.

ALICE-Korea MoU, Terms of Collaboration

2 Terms of Collaboration

2.1 As their particular field of interest, the Korean institutes, have chosen:

1. Construction, production, test and commissioning of the Time-of-Flight (TOF) detector
2. R&D of Multigap Resistive Plate Chambers (MRPC, completed in 2004).
3. Development and construction of a Computing Grid in the Korean Institutes, simulations, signal prediction, event reconstruction, data analysis and detection of QGP signals in ALICE.
4. Theoretical study of quark matter, QGP properties, and QGP signals.

2. Assembly & Test of TOF detector

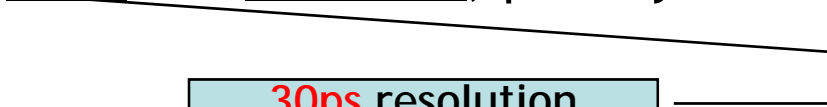
Korean Group based at CERN + visitors from Kangnung

1 Senior : Yong Wook Baek, paid by **MoST(KICOS)**

Ph.D at LAPP-Annecy with CMS ECAL (2000)
ALICE-TOF R&D at CERN (2000-2002)
CMS CSC+RPC installation (2003-2007)

1 student : J.S Kim, paid by **MoST(KICOS)**

2 students : Y. Jo and M.M. Kim, paid by World Laboratory



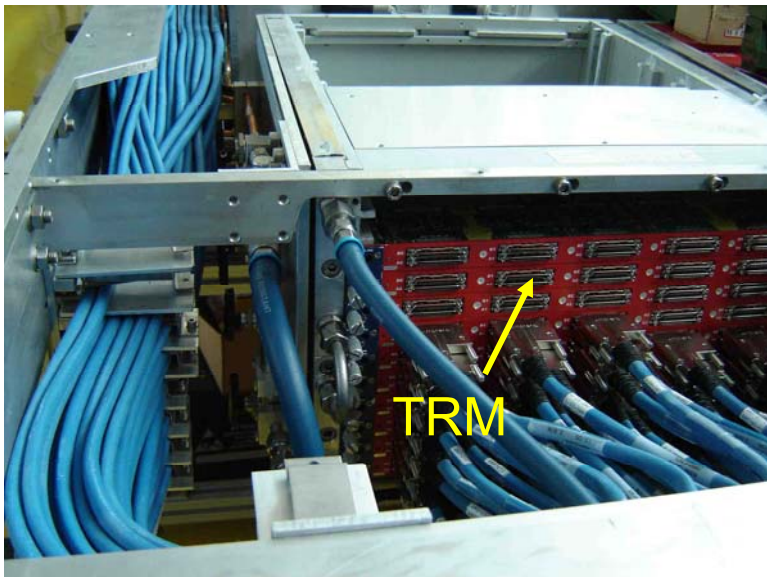
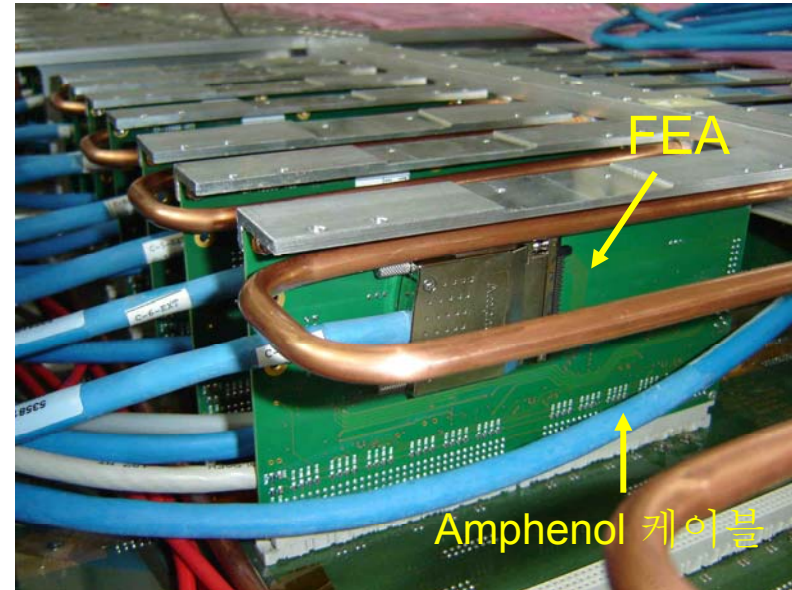
30ps resolution
with 24 gap MRPC

Progress Reports in Yong Wook's CERN home page:

<http://baek.home.cern.ch/baek/>

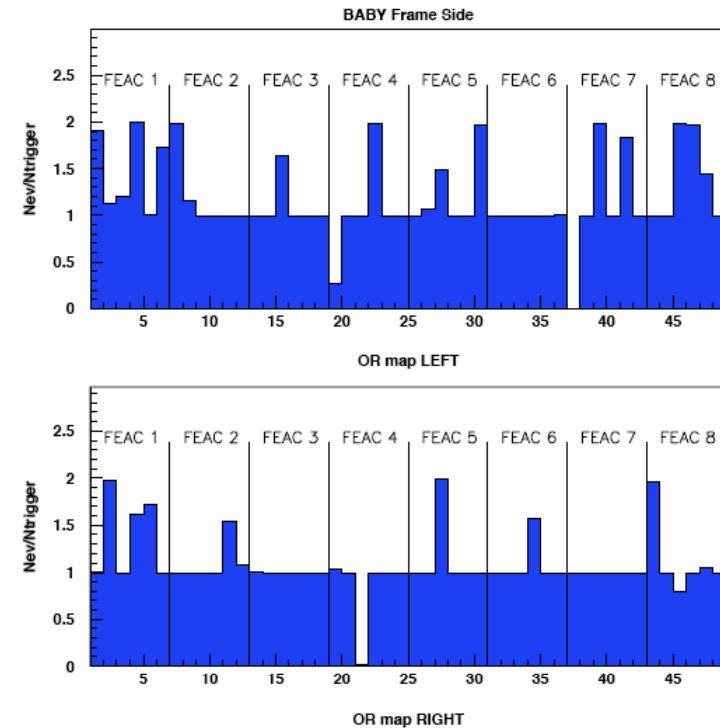
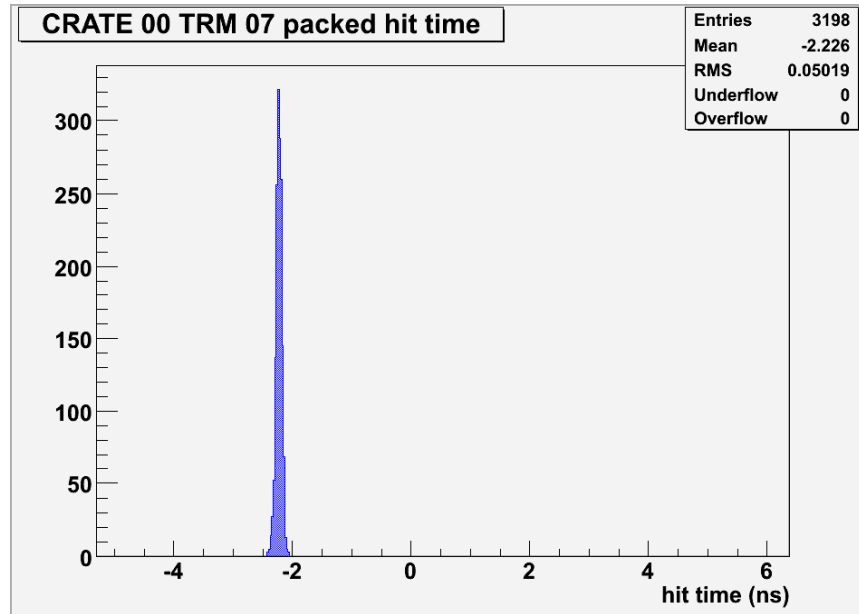
- [CERN-ALICE-Supermodule-Report-24-08-2007.ppt](#)
- [CERN-ALICE-Supermodule-Report-24-09-2007.ppt](#)
- [Extreme Energy Events\(EEE\) project.pdf \(draft version\)](#)

7월 활동 내용 : SM9 조립 과정



- 364개의 Amphenol 신호 케이블 연결: Front-end Asic 카드(364개의 FEA 카드/SM) --> TDC Readout Module(36개의 TRM/SM)

7월 활동 내용 : SM9 pulser 테스트



- Pulser 테스트

- Time jitter 테스트 : 입력 펄스에 의한 FEA 응답 시간 분포 (특정 FEA의 시간 측정을 기준으로 얻은 값, ~50ps)
- Trigger efficiency 테스트 : 사건 수/pulse ~ 1(leading edge or trailing edge) or 2(both edge)

3. GRID Computing

(i) Sejong

ALICECE cluster is running 58 nodes.

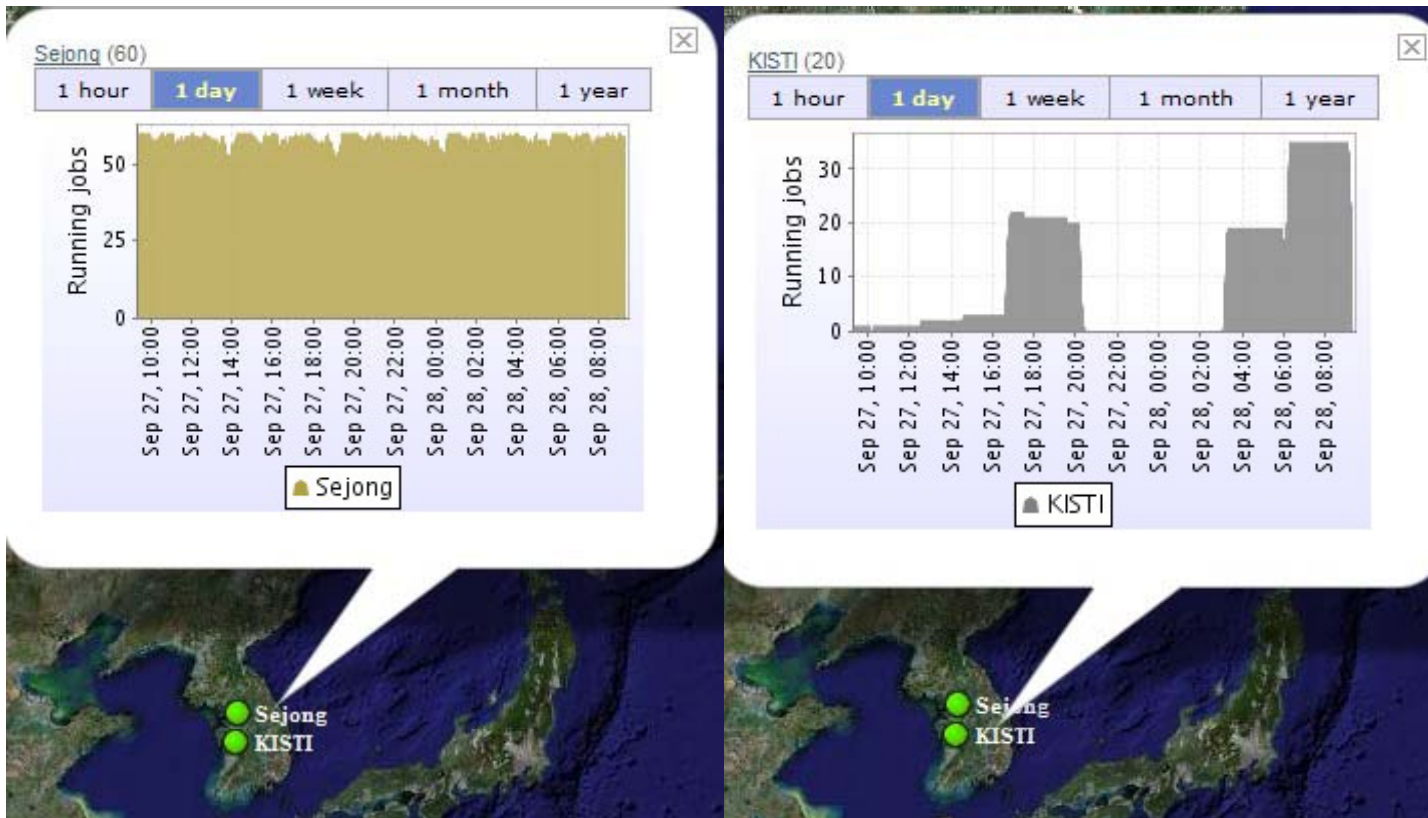
Seyong Kim, Byunghee Han, Hyunggyu Kim

(ii) KISTI

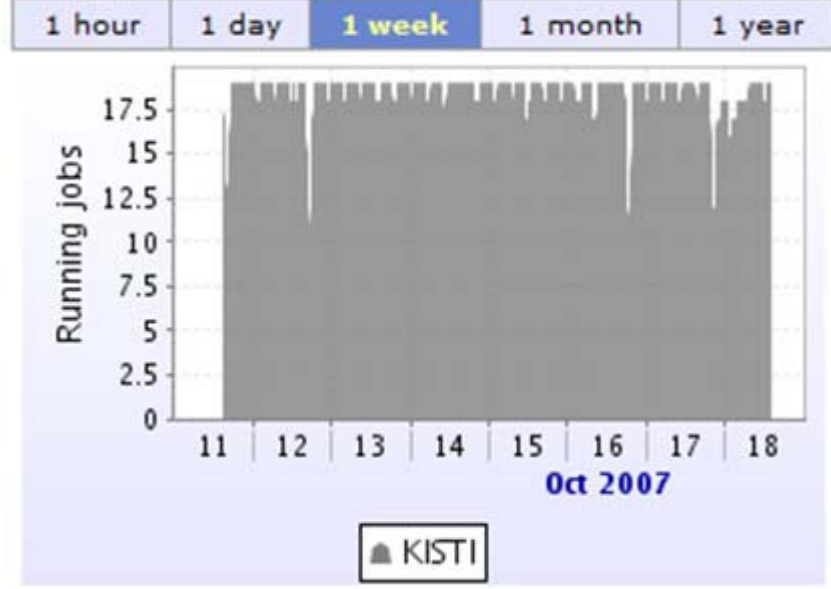
VENUS cluster is running 36 nodes.

Soonwook Hwang, Bupkyun Kim

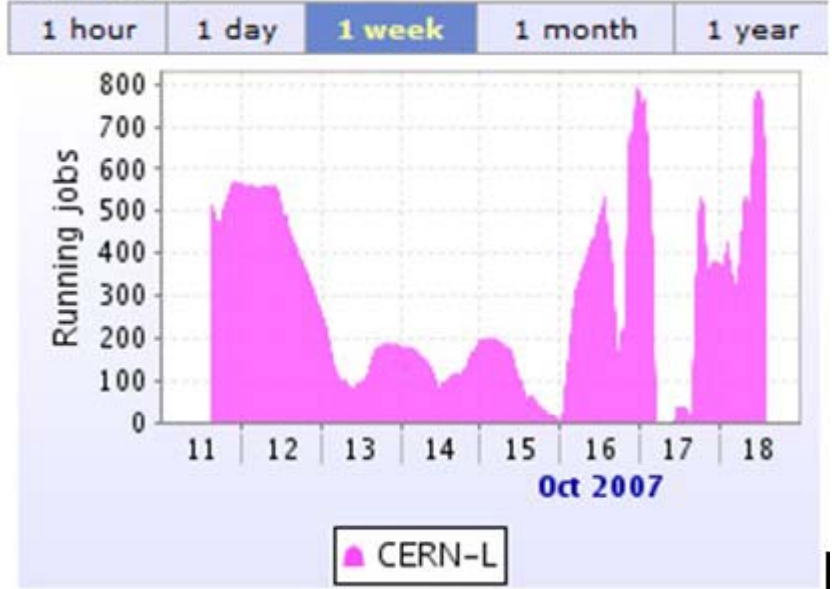
Daily monitoring report from CERN(Y.W. Baek)



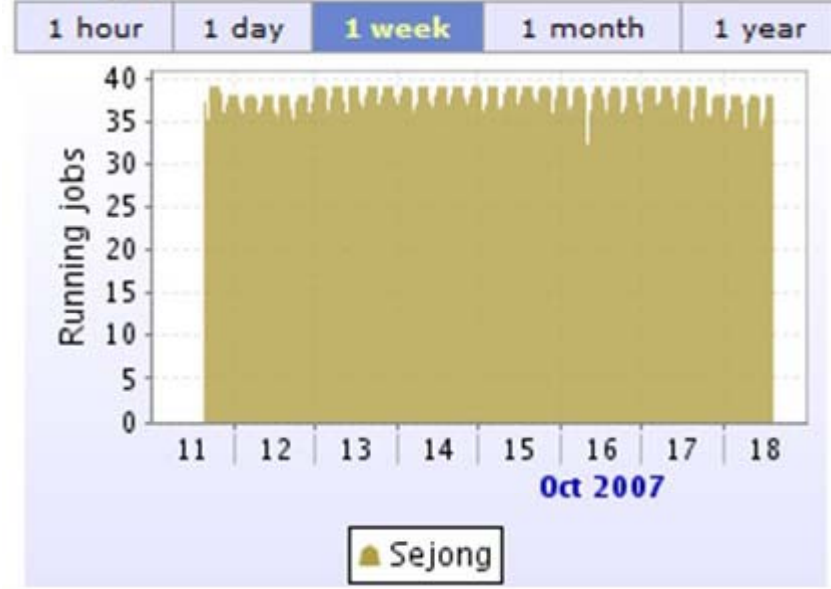
KISTI (19)



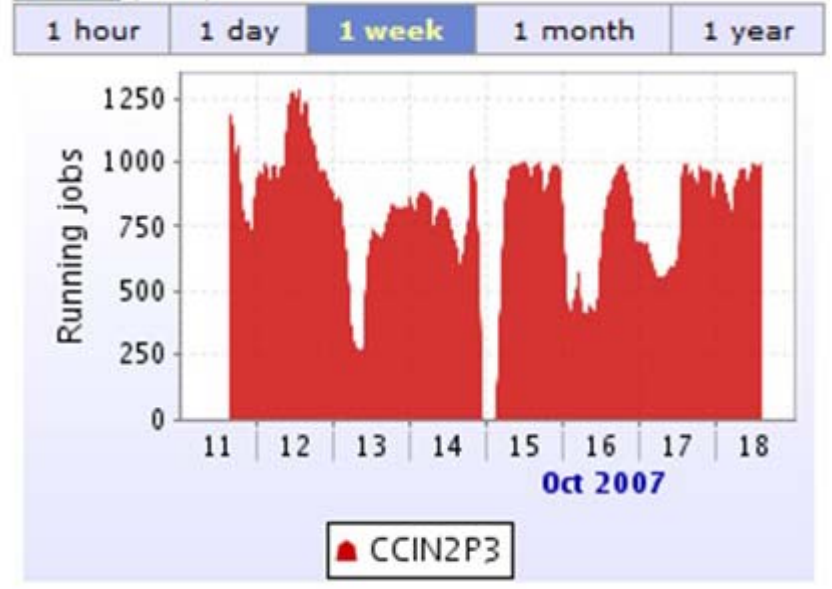
CERN-L (661)



Sejong (38)



CCIN2P3 (1000)



4. Physics preparation (Analysis and Theory)

- Lambda_c decay analyses : $p K \pi$, $p K_L^0$

- PWG3 presentation in June by S.C. Lee

<http://indico.cern.ch/conferenceDisplay.py?confId=8422>

- Lambda polarization study

- Spin asymmetries in jet-hyperon production at LHC

(D.Boer, D.S. Hwang et al., accepted for publication in Phys. Lett. B)

- PWG2 presentation in October by S. Kim

<http://indico.cern.ch/conferenceDisplay.py?confId=9953>

<http://indico.cern.ch/materialDisplay.py?contribId=2&materialId=slides&confId=21166>

- Related topics in hadron physics

- Transverse momentum dependences of distribution and fragmentation functions (D.S. Hwang and D. Kim) WSPC Proceedings

Study of $\Lambda_c \rightarrow pK\pi$ in pp collision at $\sqrt{s} = 14\text{TeV}$

W. W. Jung and S.C. Lee

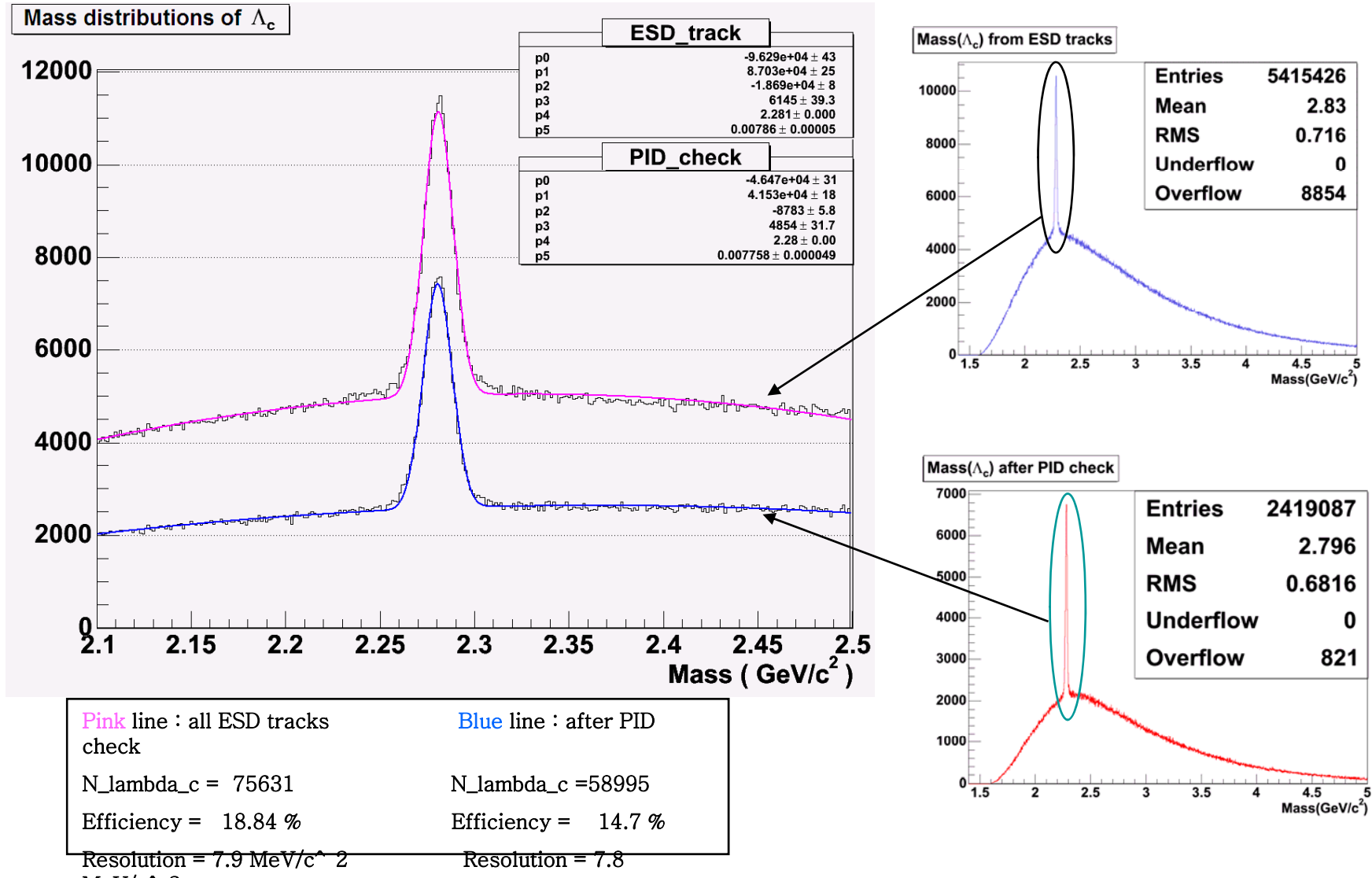
Kangnung National University

in collaboration with

Alessandro Pesci

INFN-Bologna

Invariant Mass distribution of Λ_c from signal events



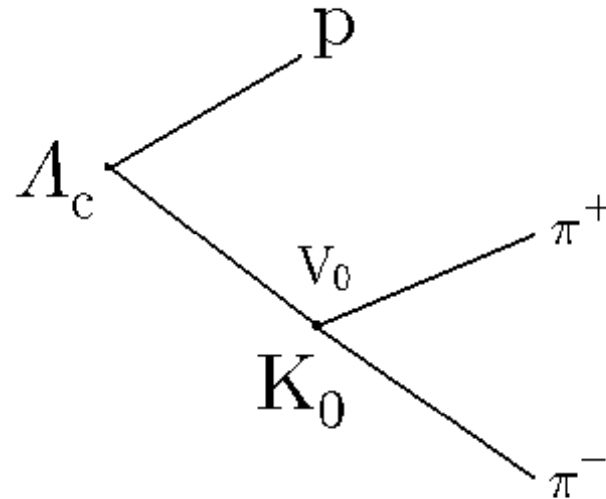
Λ_c Decay to $p K_0L$ (D.W. Kim and H.T. Jung)

$$\Lambda_c \rightarrow p K_0 \quad : 2.3 \pm 0.6\%$$
$$\quad \quad \quad \downarrow \rightarrow K_S^0 \rightarrow \pi^+ \pi^- \quad : 50\% \times 68.61\%$$

Λ_c lifetime = 0.2 ps ($c\tau = 0.06\text{mm}$)

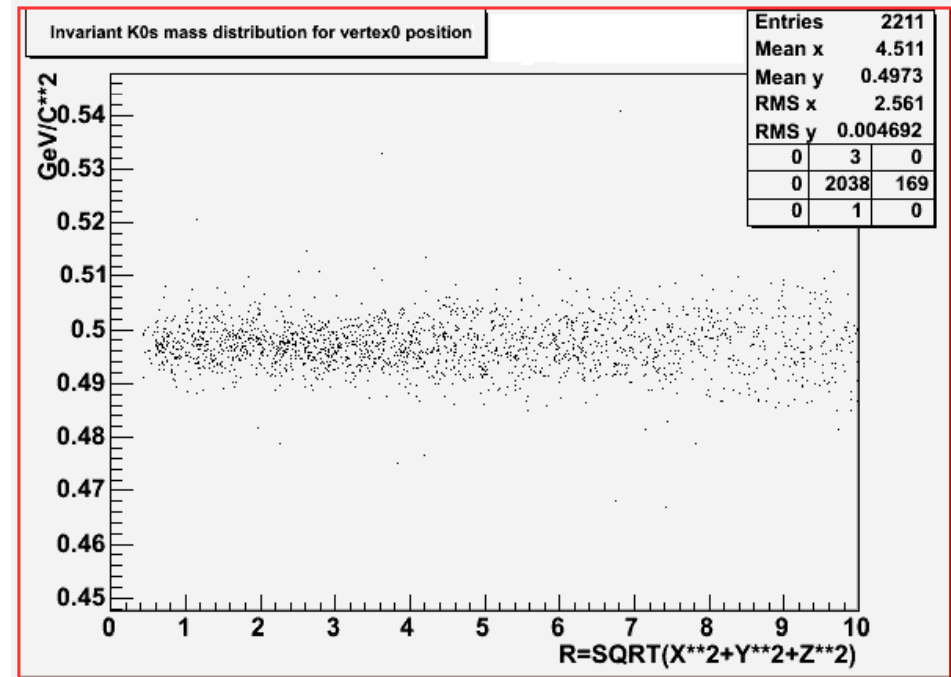
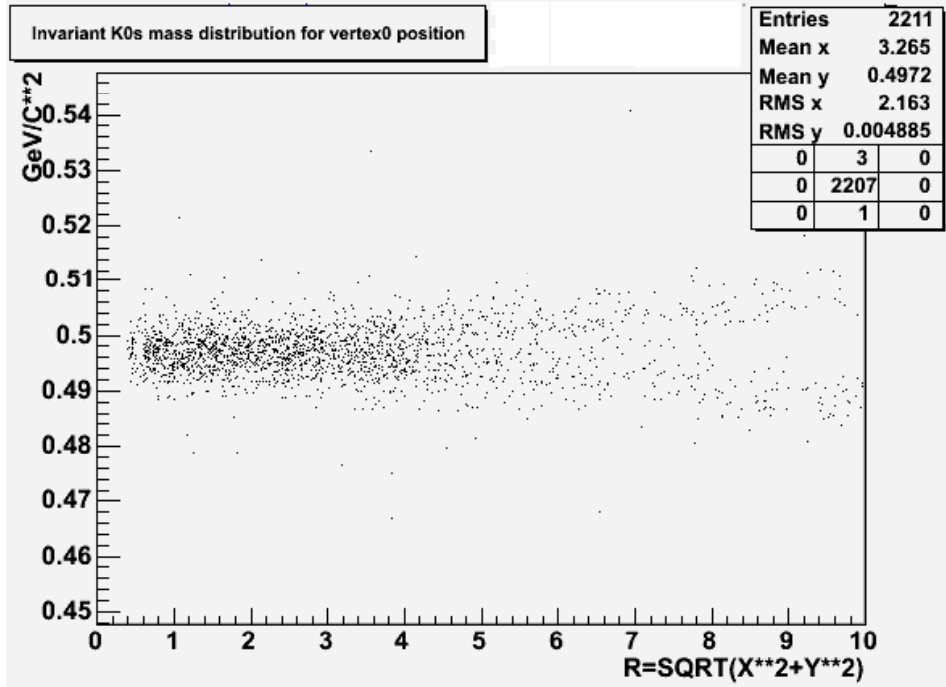
K^0 s lifetime = 89 ps ($c\tau = 27\text{mm}$)

well separated secondary vertex (V0 from the K^0 s decay)



K^0 s mass vs V0 position(0.5~10cm)

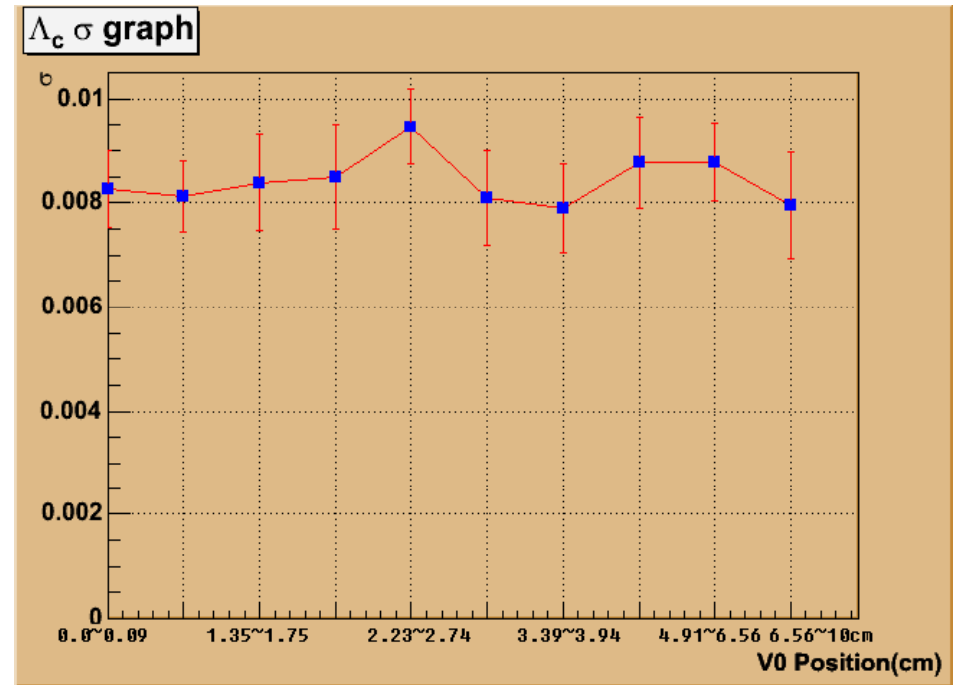
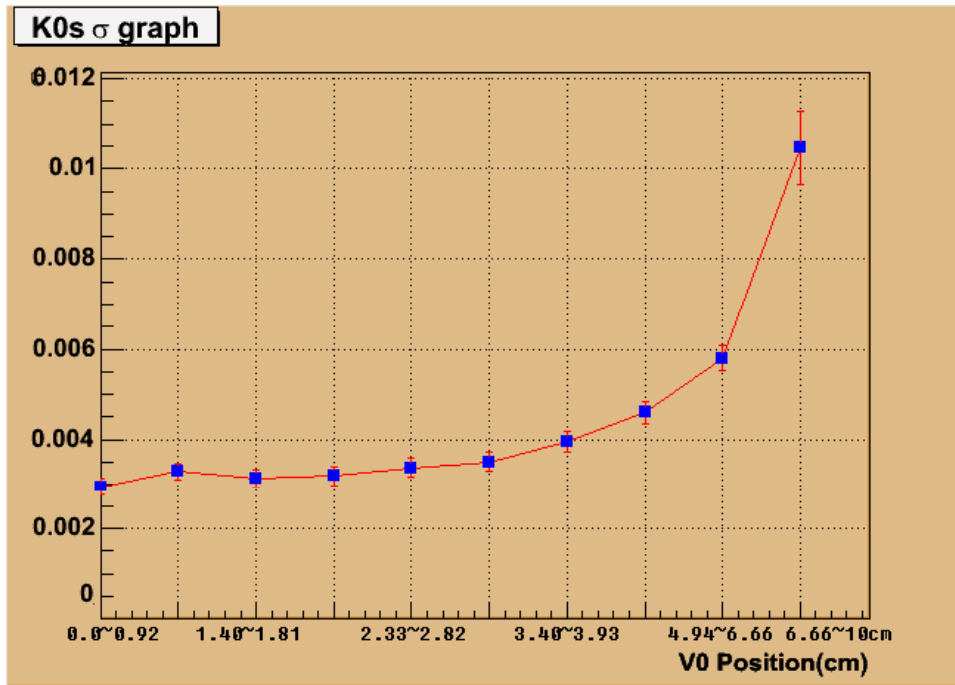
(left: using track momenta, right: using V0 momentum)



- K^0 s mass splitting at high V0 distance
- Using V0 energy & momentum removes the splitting

Left: K^0_s resolution vs V0 distance

Right: Λ_c mass resolution vs V0 distance



nominal K^0_s mass is used in Λ_c mass calculation

D.S. Hwang *et al.*

Spin asymmetries in jet-hyperon production at LHC

D. Boer,^{1,*} C.J. Bomhof,^{1,†} D.S. Hwang,^{2,‡} and P.J. Mulders^{1,§}

¹ *Department of Physics and Astronomy, Vrije Universiteit Amsterdam,
NL-1081 HV Amsterdam, the Netherlands*

² *Department of Physics, Sejong University,
Seoul 143-747, South Korea*

(Dated: September 7, 2007)

We consider polarized Λ hyperon production in proton-proton scattering, $pp \rightarrow (\Lambda^\uparrow \text{jet}) \text{ jet } X$, in the kinematical region of the LHC experiments, in particular the ALICE experiment. We present a new Λ polarization observable that arises from the Sivers effect in the fragmentation process. It can be large even at midrapidity and therefore, is of interest for high energy collider experiments. Apart from its potential to shed light on the mechanisms behind the phenomenon of Λ polarization arising in unpolarized hadronic collisions, the proposed observable in principle also allows to test the possible color flow dependence of single spin asymmetries and the (non)universality of transverse momentum dependent fragmentation functions.

PACS numbers: 12.38.-t; 13.85.Ni; 13.88.+e

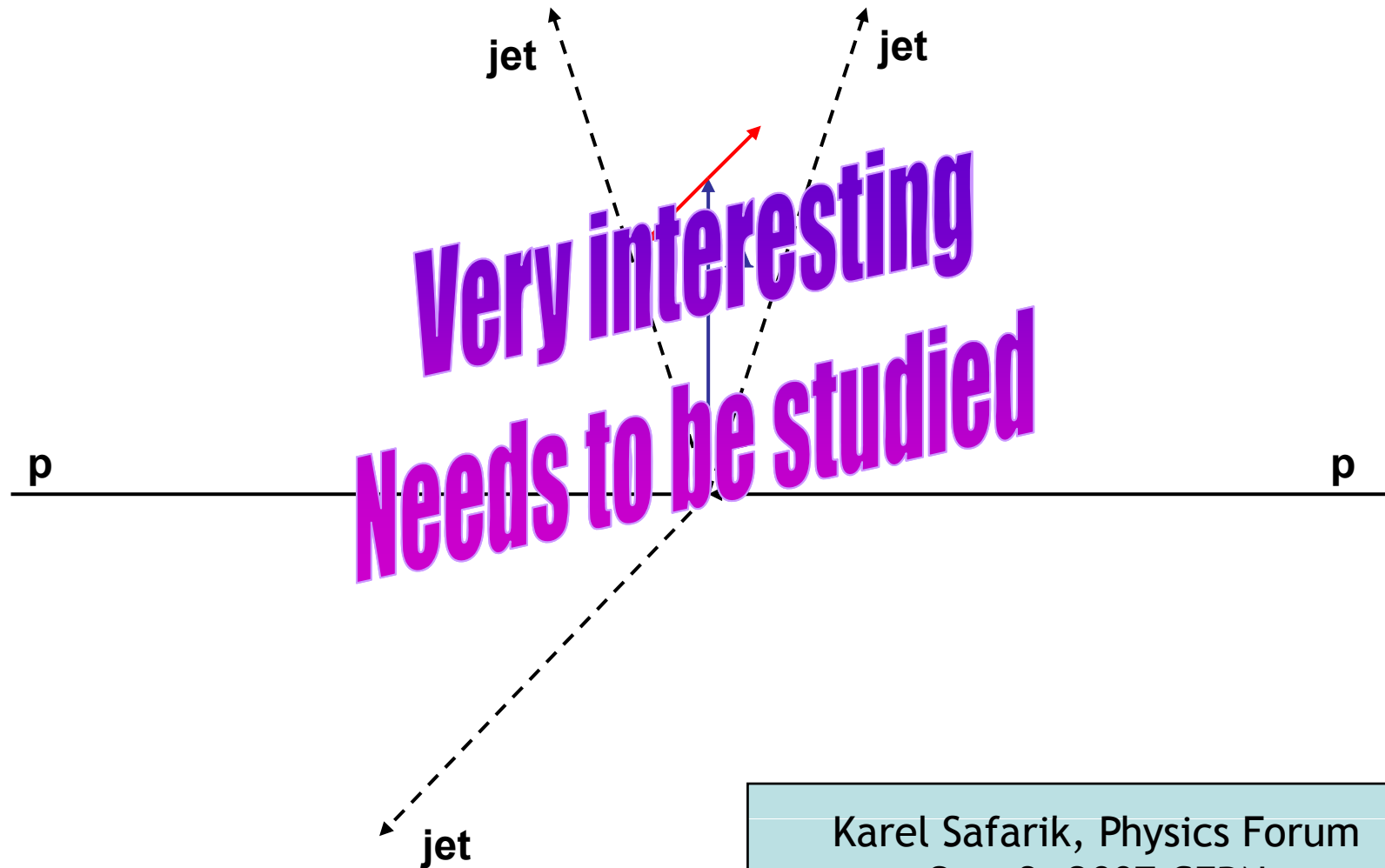
Accepted for publication in Physics Letters B.

I. INTRODUCTION

Since the observation of large transverse polarization of produced Λ hyperons in the inclusive reactions $pp \rightarrow \Lambda^\uparrow X$ [1] and $p Be \rightarrow \Lambda^\uparrow X$ [2] in the middle of the 1970's, there have been many experimental and theoretical investigations

Λ polarization measurement

Seyong Kim, Sejong University



Karel Safarik, Physics Forum
Oct. 3, 2007 CERN

D.S. Hwang and D. Kim

1

TRANSVERSE MOMENTUM DEPENDENCES OF DISTRIBUTION AND FRAGMENTATION FUNCTIONS

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We study the transverse momentum dependent distribution functions of the up and down quarks inside the proton using the spectator model by Jakob et al. We calculate the double spin asymmetry for the setups of COMPASS, HERMES, and JLab. We investigate the differences between the spectator model and the model based on factorization ansatz.

Plan for the 2nd half of the FY 2007

ALICE-TOF

- Assembly and Installation continued
- 1st installation period: October - November 2007 (8 supermodules)
- 2nd installation period: February 2008 (8 more supermodules)
- Preparation of MRPC paper (Y.W. Baek and J.S. Kim → Ph.D. thesis)

ALICE Computing

- Running Linux clusters in Sejong, monitoring, closer contact with KISTI for ALICE Tier 2 operation

Physics Analysis and Theory

- Lambda_c : background study (p K pi and p K0L)
- Lambda_0 polarization : implementation of polarization in Monte Carlo simulation (PYTHIA)

Thinking about new ALICE-Korea collaborators (we're becoming old..)

- New generation physicists with fresh idea and scientific mind, task (not profit) oriented..
- Role of the funding agency is very important
- Task of the new Korean government (end 2007 and on)

5. ALICE–Korea budget 2007 (2008)

CERN (100,000k won) KICOS → T273755 (118,000k won in 2008)

ALICE Common Fund: ½ of 100,000 CHF	40,000k won (1CHF=0.8k won)
	(40,000k)
Salary and insurance, 1 Ph.D. (9.5 months)	38,000k won
12 months	(50,000k)
Salary and insurance, 1 student (7.5 months)	15,000k won
12 months	(25,000k)
PCs, travel, telephone..	7,000k won
	(3,000k)

Korea (100,000k won) KICOS → Kangnung (82,000k won in 2008)

Salary, 4 students (4 in Kangnung)	29,000k won
2 students (1 Kangnung + 1 Sejong)	(24,000k)
Travel, 5 Ph.D.s + 4 students	51,000k won
5 Ph.D.s + 2 students	(46,000k)
PCs, consumables, training, seminar	10,000k won
	(1,800k)
Overhead	10,000k won
	(8,200k)

Summary

ALICE-Korea performs

1. ALICE-TOF Assembly, Test, Installation
(Y.W. Baek)
1. ALICE GRID Computing (S. Kim)
2. Physics preparation
(D.S. Hwang, D. Kim, D.W. Kim, S.C. Lee)

ALICE budget is used according to the plan $\frac{1}{2}$ at CERN, $\frac{1}{2}$ in Korea. Budget at CERN will increase in 2008, total fixed

ALICE-Korea members wish to acknowledge ALICE Management for its support to Koreans in ALICE:
Y. Schutz, F. Carminati, F. Antinori, J. Schukraft

