

Korea-ALICE Activity Report 2011.01-2011.09

In-Kwon Yoo
Pusan National University
for KoALICE

Outline

- Members
- Activities
- Budgets
- Meetings & Workshops
- Summary & Plan

Korea-ALICE Members

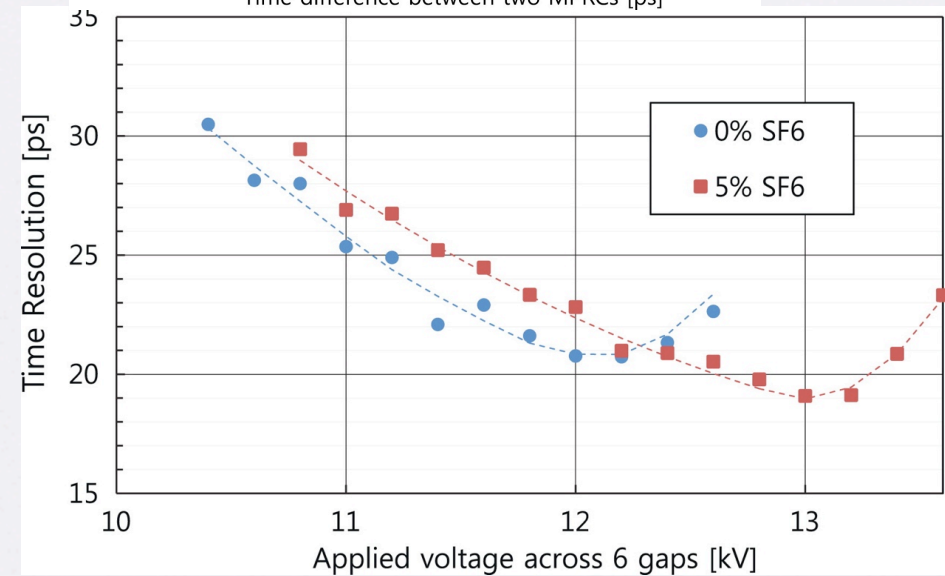
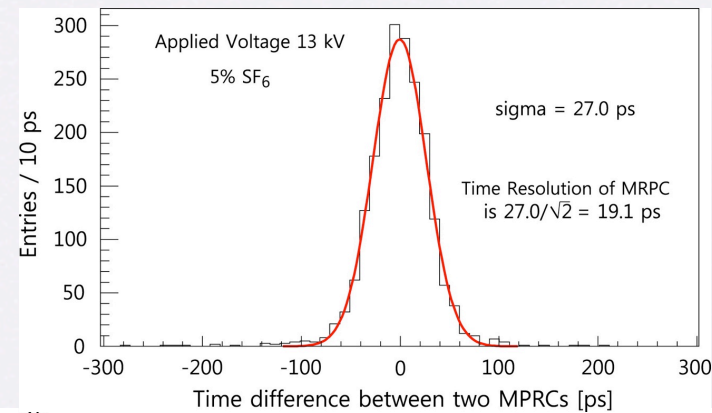
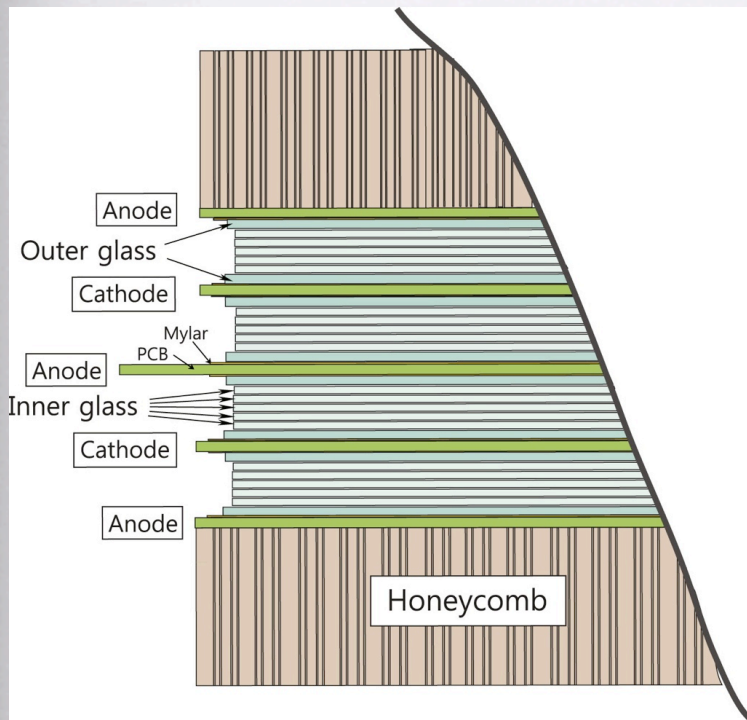
- Total : 39 Participants (12 PhDs, 10 PhD St., 12 MA St., 1 MA, 4 UG St.)
 - Gangnung-Wonju National University* : 6 PhDs, 6 PhD St., 2 MA St.
 - Pusan National University : 2 PhDs, 1 PhD St., 4 MA St., 2 UG St.
 - Sejong University : 2 PhDs, 0 PhD St., 1 MA
 - Yonsei University : 2 PhDs, 3 PhD St., 6 MA St., 2 UG St.
- Residents at CERN : 6 PhDs, 6 PhD St., 2 MA St., 1 MA.
- Residents at Korea : 6 Profs, 4 PhD St., 10 MA St., 4 UG St.
- 3 PhD + 3 PhD St. + 3 MA St. + 4 UG St. increased since 2010-02

Korea-ALICE Activities I

- Gangnung-Wonju National University

1. ALICE-ToF R&D, M&O (DWKim, JSKim)

- Multi-Gap RPC R&D : Time Resolution enhanced - 1 NIM paper



Korea-ALICE Activities I

- Gangnung-Wonju National University

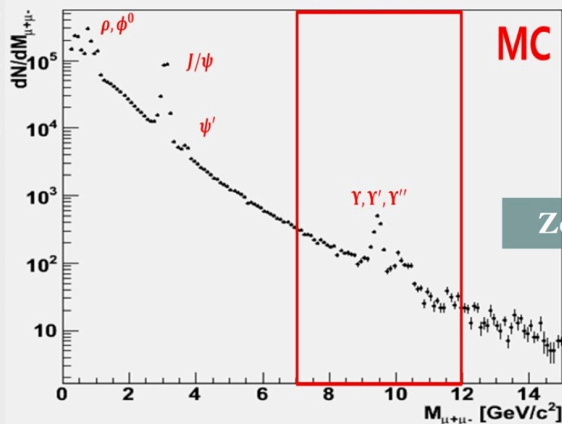
1. ALICE-ToF R&D, M&O (DWKim, JSKim)

- Multi-Gap RPC R&D : Time Resolution enhanced - 1 NIM paper

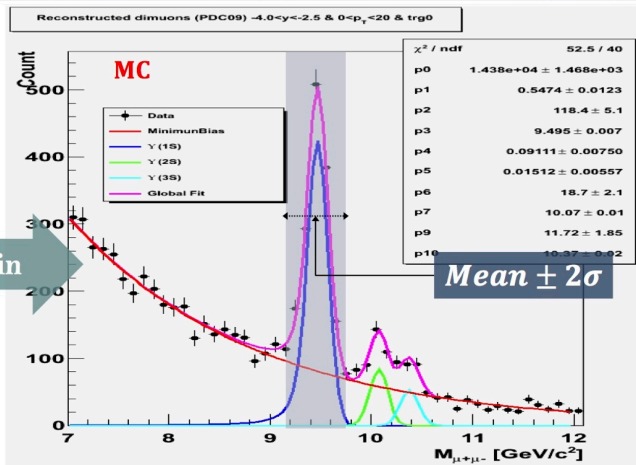
2. ALICE-Muon Detector M&O (YWBaek, JH...)

- Operation Leader : Dr. YWBaek
- Y Production Study : SUAhn

Reconstructed dimuons (PDC09)



Zoom in



Study of quarkonia production with ALICE Muon Spectrometer

On behalf of the ALICE Collaboration
Sang-Uk Ahn^{a,b}

^aDepartment of Physics, Konkuk University, Seoul, Korea
^bLaboratoire de Physique Corpusculaire, CNRS/IN2P3, Université Blaise Pascal, Clermont-Ferrand, France

Introduction

The CERN Large Hadron Collider, LHC is designed to collide two counter rotating beam of protons or heavy ions.

- p-p collisions at 14 TeV nominal energy
- Pb-Pb collisions at 5.5 TeV nominal energy

A Large Ion Collider Experiment, ALICE is a large detector dedicated to research in the field of physics of strongly interacting matter at extreme energy densities.

Such matter is created in relativistic heavy-ion collisions where a new phase, called the Quark-Gluon Plasma, is formed.

QCD Phase Diagram

QCD prediction:

- quarks and gluons are deconfined in QGP at high temperature
- for $\mu_B = 0$, $T_c \approx 170$ MeV $\approx 2 \times 10^{12}$ K

Observables in heavy-ion collisions

- Charged-particle multiplicities
- Soft hadron spectra: freeze-out, flow...
- Particle correlations
- Event by event fluctuations
- Jet quenching
- Heavy-quark/quarkonia production

Motivation

Υ : New probe to QGP study

Quarkonia yields suppression in heavy-ion collisions is one of the powerful probe to QGP search

- T Motul, A. Satz, Phys. Lett. B 178 (1986) 416
- Υ will be copiously produced at LHC and provide an additional probe
- In Pb-Pb collisions @ $\sqrt{s} = 5.5$ TeV, $N_{\Upsilon} @ \text{LHC} \approx 100 \times N_{\Upsilon} @ \text{RHIC}$

Same observables in p-p collisions as reference

ALICE Detector

Central detectors at $|\eta| < 0.9$

- Hadrons
- Electrons
- Photons

Muon Spectrometer at $-4 < \eta < 2.5$

- 10 high resolution tracking chambers
- L0 trigger up to 1kHz

General detectors at large η

- Interaction trigger
- Event centrality

Online reconstruction from the High Level Trigger

p-p & Pb+Pb collisions

- PbPb@2.76TeV
- PbPb@2.76TeV

Strategy for measuring the total cross section and differential cross section of Υ

1. Extracting N_{signal} (MC)
 - N_{signal} obtained by fitting data points in mass plot
 - Convolution of Gauss and Landau functions fits well for Υ analysis
 - Integral f_{signal} over a given range gives N_{signal}
2. p_{\perp} & y Spectra of Υ (MC)
 - Transverse momentum and rapidity distribution of Υ
3. Correcting N_{signal} (MC)
 - Important in the measurement of the cross-section: imperfection of apparatus, efficiency matrix and correction on data point
 - Correction Framework
 - Efficiency Matrix
 - Correcting on data point
4. Calculating the Cross-Section: branching ratio, min-bias normalization and integrated luminosity
5. Estimating Uncertainties: statistical and systematic

Summary

Heavy quarkonium measurements provide promising tools for the characterization of QGP

ALICE has collected data in p+p and Pb+Pb collisions at 7 TeV and 2.76 TeV, respectively

Analysis framework for Υ is prepared and tested with MC production: Ready to analyze the real data for Υ

Korea-ALICE Activi

- Gangnung-Wonju National University

1. ALICE-ToF R&D, M&O (DWKim, JSKim)

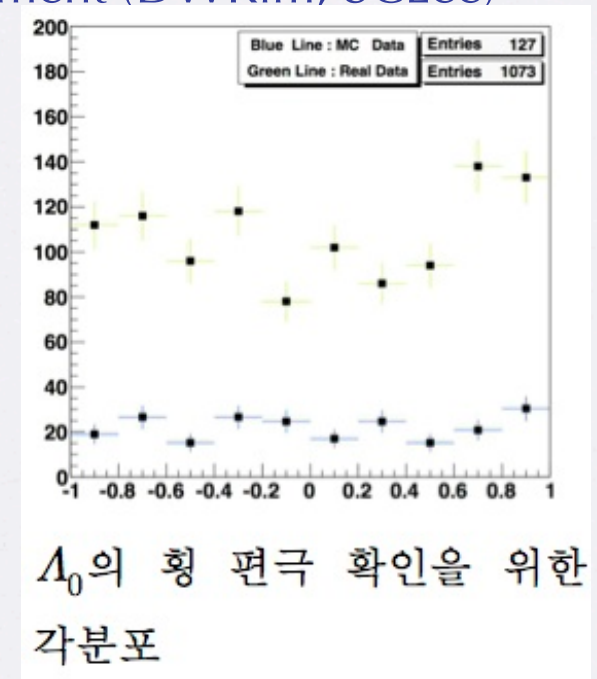
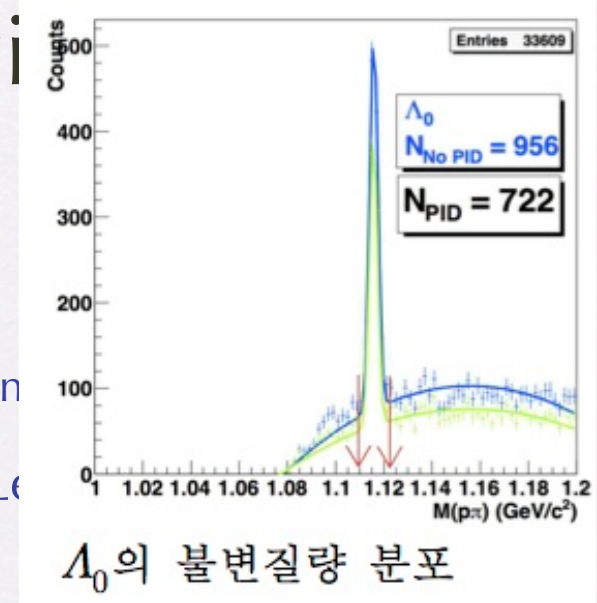
- Multi-Gap RPC R&D : Time Resolution enhan

2. ALICE-Muon Detector M&O (YWBaek, JHL

- Operation Leader : Dr. YWBaek
- Y Production Study : SUAhn

3. Particle Reconstruction Algorithm Development (DWKim, SCLee)

- Λ_0 polarization in pp@7 TeV



Korea-ALICE Activities II

- Pusan National University

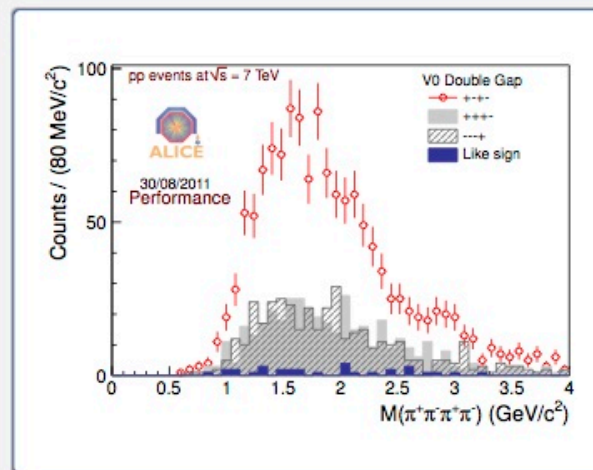
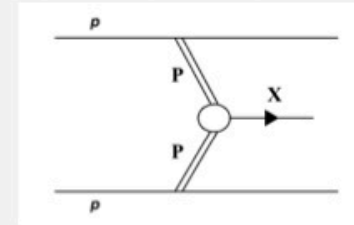
1. Exotic Particle ($J^{PC} = 1^{-+}$) Search (SUChung, JWSeo)

- Double Pomeron Interactions, 4 pion events in pp@7TeV
- A Representative talk for Diffractive Physics Group of ALICE at Diff.Phys.School (WE-Heraeus) Sep. 2011

Central production study Outlook of ALICE for exotic meson search Process of pp collision in ALICE

Process of pp collision in ALICE

- Double-Pomeron Exchange(DPE) is dominant process in pp collision
- $X \rightarrow \pi^+ \pi^-, \pi^+ \pi^- \pi^+ \pi^-, K\bar{K}\pi \dots$
- $G\text{-parity} = +1, C = +1 \rightarrow I = 0 (\because G = C(-1)^I)$



- 6% of 2010 pp data at 7 TeV
 $L_{\text{int}}(\text{MB}) = 460 \mu\text{b}^{-1}$
- Statistical error only
- Similar to BNL result
- 1350 events $p+p \rightarrow p+\pi^+ \pi^- \pi^+ \pi^- +p$ out of 28M events
- ~ 20k events: expected for whole 7 TeV pp data

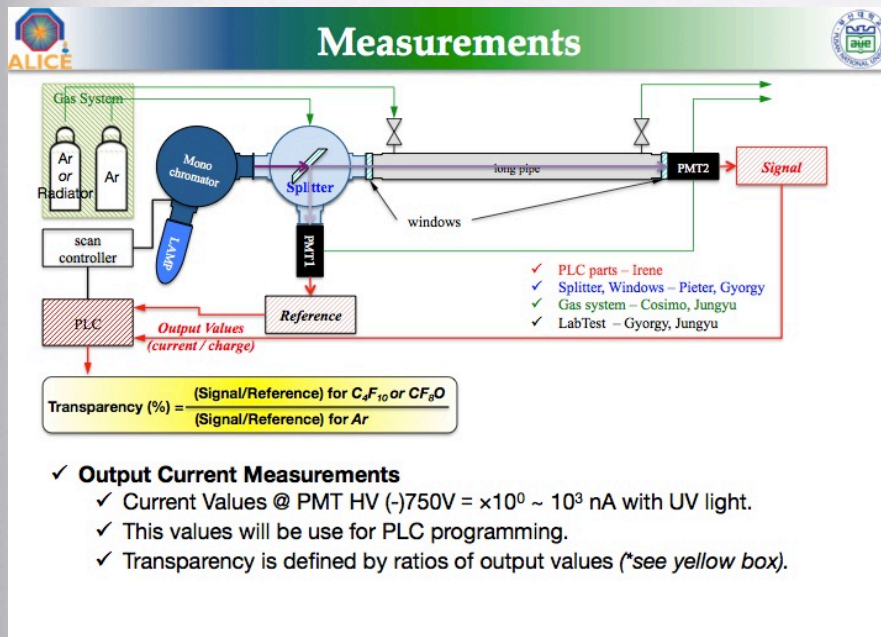
$L_{\text{int}}(\text{MB})$: MB integrated luminosity

Korea-ALICE Activities II

- Pusan National University

1. Exotic Particle ($J^{PC} = 1^{-+}$) Search (SUChung, JWSeo)
2. VHMPID upgrade R&D (IKYoo, JGYi, JHSong)

- Online Transparency-meter



ALICE-VHMPID Meeting, 20110826

Status of the Transparency Meter - J.Yi

4/9

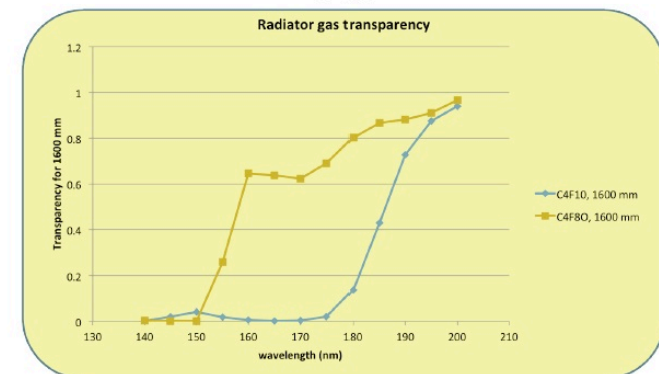
Setup in bldg.1-R031

<General View>

- Constructions completed... and Struggle with,
 - Leaks → Flushing w/ Ar, ~40L/h, ~ 2 weeks to remove contaminants
 - O₂ analyzer device should be calibrate
- **It's still not perfect. But, can be used!!**

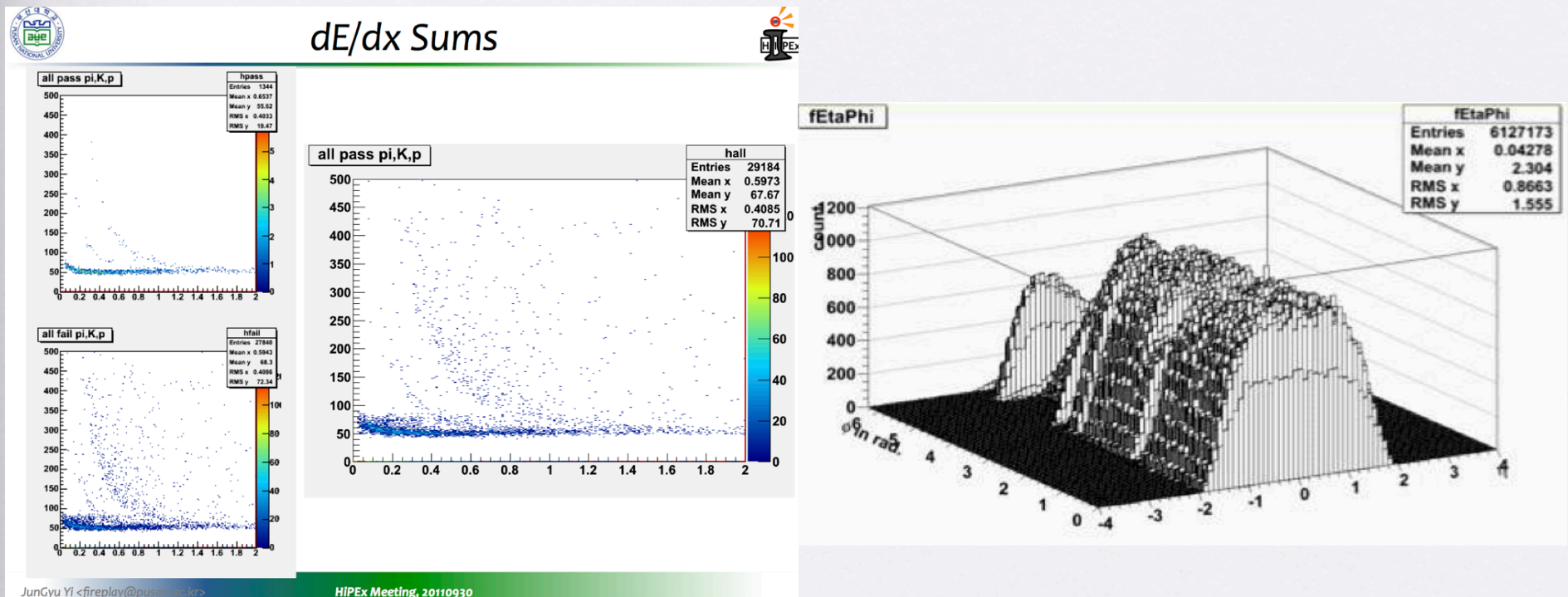
First measurement with the transparency meter

Jungyu



Korea-ALICE Activities III

- Pusan National University
 1. Exotic Particle ($J^{PC} = 1^{-+}$) Search (SUChung, JWSeo)
 2. VHMID upgrade R&D (IKYoo, JGYi, JHSong)
 - Online Transparency-meter
 3. KK Femtoscropy Analysis started (IKYoo, JGYi)
 - PID coding study

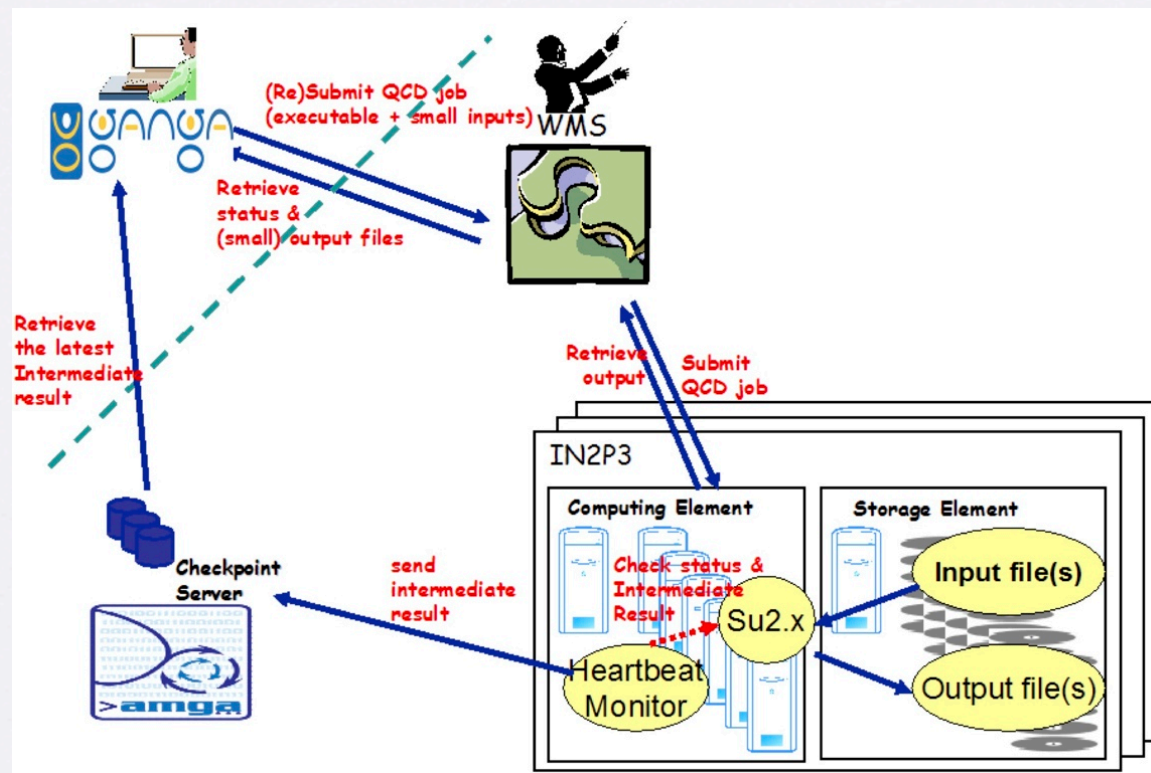


Korea-ALICE Activities III

- Sejong University

1. ALICE Computing GRID Operation R&D

- GRID performance R&D with 2-color QCD simulation using Ganga
- A Report in Computer Physics Communication



Korea-ALICE Activities III

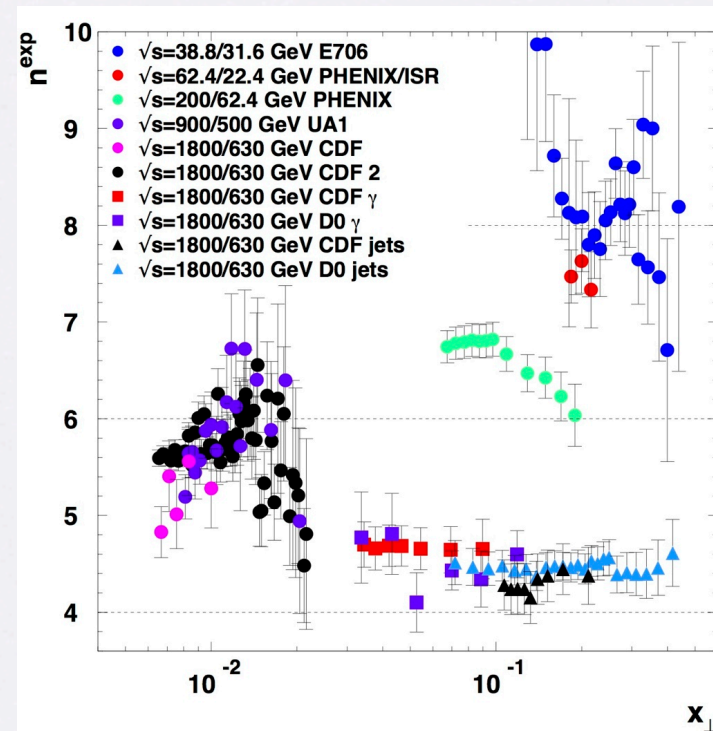
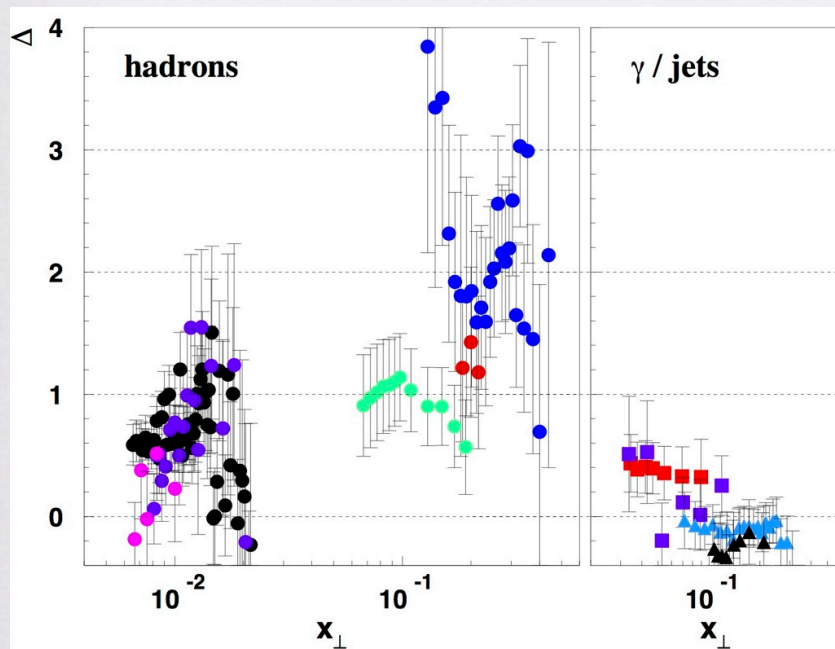
- Sejong University

1. ALICE Computing GRID Operation R&D

- GRID performance R&D with 2-color QCD simulation using Ganga
- A Report in Computer Physics Communication

2. Theoretical Calculation on Hadron Phenomena at LHC

- Finite Temperature/Density Lattice Field Theory vs. Experiments -> A Paper in PRL
- Bottomium above deconfinement in lattice QCD -> A Paper in PRL

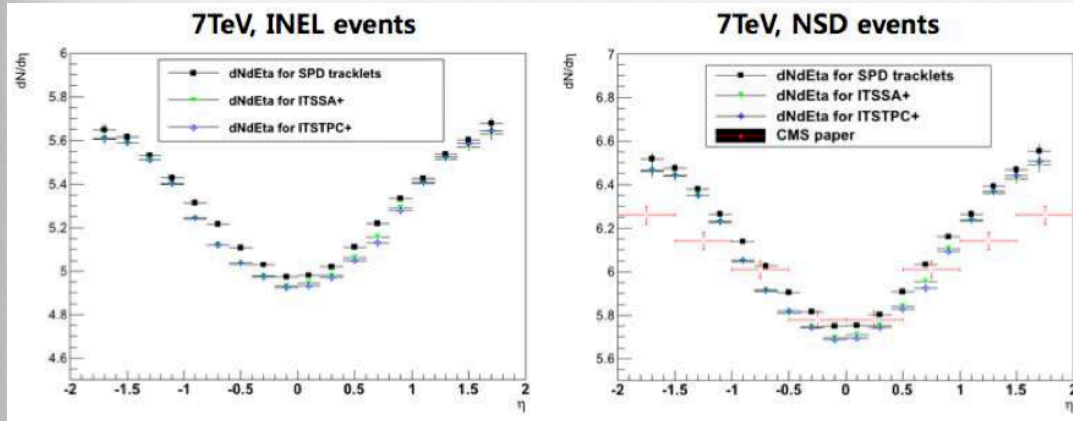


Korea-ALICE Activities IV

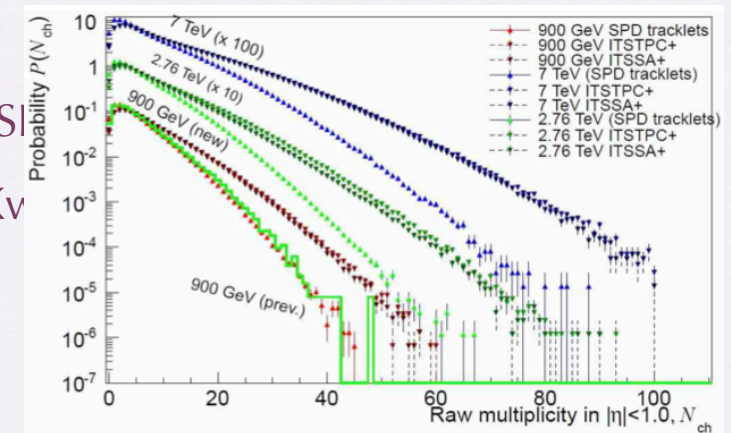
- Yonsei University

- Data Analysis in PWG0

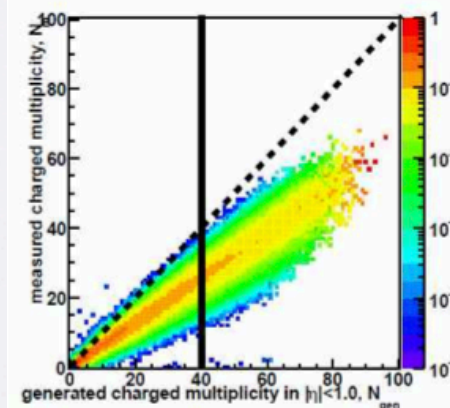
- $dN/d\eta$ distributions in pp (JKang, BKKim)
- MC study on Multiplicity distributions (JKang, MWKim)



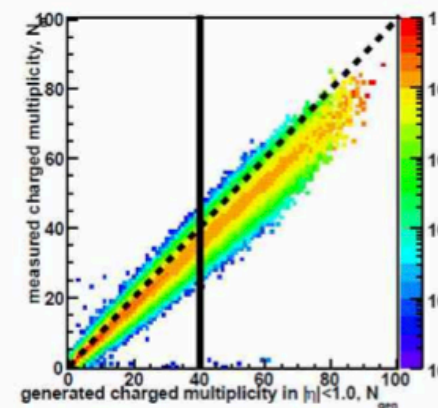
ig, TSI
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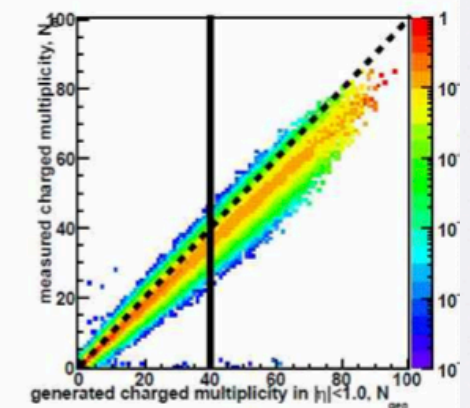
Response for SPD tracklets method



Response for ITSSA+ method



Response for ITSTPC+ method



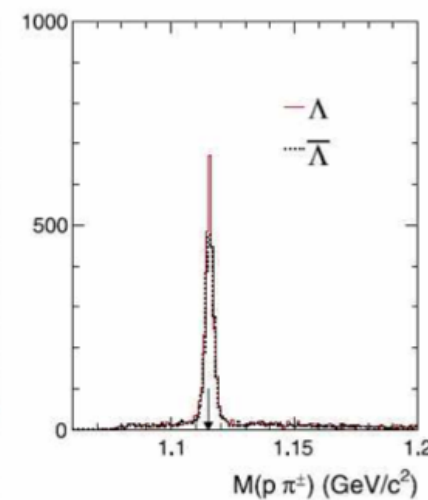
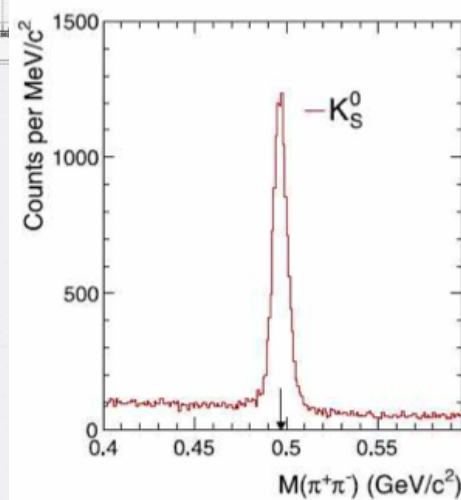
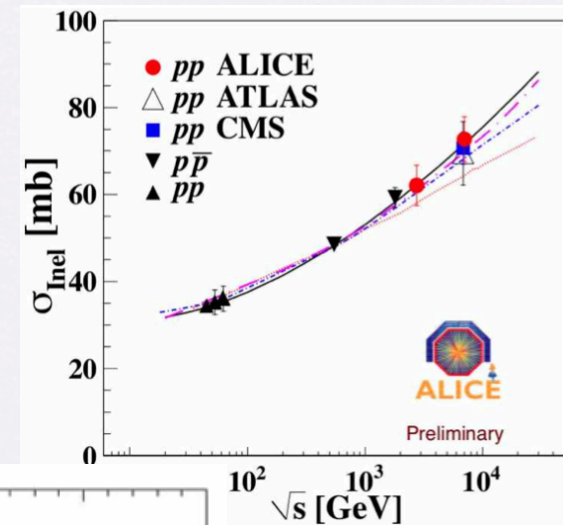
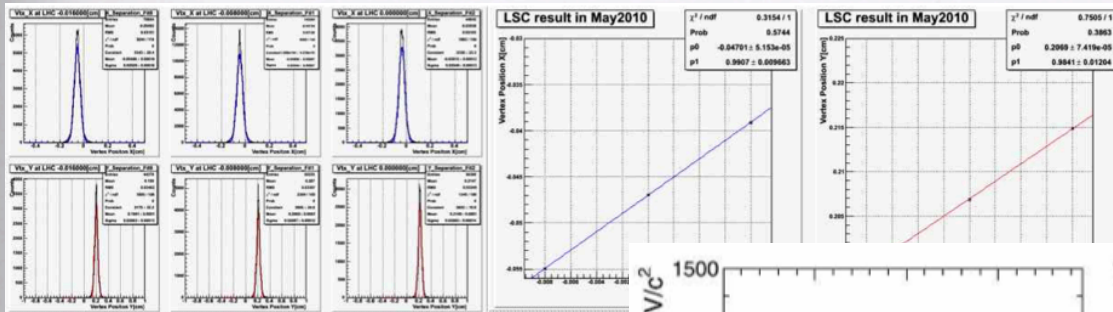
Korea-ALICE Activities IV

- Yonsei University

1. Data Analysis in PWG0

- $dN/d\eta$ distributions in pp (JKang, BKKim)
- MC study on Multiplicity distributions (JKang, MWKim)
- Cross-section Study (JKang, JIYoon)
- V0 and Cascade Reconstruction (JKang, TSKim)

2. Keep participating FOCAL R&D (upgrade) (YKwon)



Korea-ALICE Budget 2011

- 2011 Total : 550 M KRW
 - Only 275 M KRW in Aug. 2011
 - NRF -> CERN : 369 M
 - only 184.5 M sent
 - exchange-loss : 26 M
 - resident / visiting cut
 - almost no R&D money
 - local at PNU : 181 M
 - salary / local travel
 - admin. / overhead
 - 48% done / Anxiety further exch.loss
 - Activities increased, but ...!

- 2011 M&O-A : 10
 - GWNNU : 4
 - PNU : 2
 - Sejong : 2
 - Yonsei : 2
- R&D Money for ALICE upgrade 2016
 - 500 M/yr x 5 yr proposed
 - ▶ VHMPID (PNU, KWNNU)
 - ▶ FOCAL (Yonsei)
 - ▶ implemented to Lols
 - reflected in 2012 budget
 - ▶ > 170M in 2012
 - Reflection in budget 2013 - 2016 needed

Korea-ALICE Meetings

- Steering Committee Meeting : 4 Rep. from 4 Institutions ([KoALICE Web.](#))
 - STC 2011-05-13
 - ▶ 2011 Budget Plan (100 M KRW overloaded)
 - ▶ Post-Doctoral Contract Rule (max. $(2+2) \times 2 < 8$ yr)
 - ▶ Discussion on participation of ALICE upgrade in 2016-17
 - STC 2011-08-26 (regular)
 - ▶ Budget retuned (Overloaded + Exchange-loss)
 - ▶ M&O-A Self-Evaluation : Decision of 10 M&O-A 2012
 - ▶ keep supporting ToF M&O-B until 2013 (JSKim)
- KoALICE Regular Meeting : CERN coordinator + all researchers + EVO
 - Report who is doing what when where how and why
 - Get-together Dinner
 - Archive [KoALICE-Indico Web.](#)

Korea-ALICE Workshops

- APCTP LHC Workshop : Aug. 2011 in Konkuk Univ.
 - ALICE & CMS Korean Activities collected
- 60 Presentations since Jan. 2011
 - 46 PWG Presentations + 2 ALICE week talk by stud.
 - 5 Talks in ALICE-Asian upgrade workshop
 - 6 Official Presentations
- The Workshop for ALICE upgrades by Asian countries
 - Mar. 2011 in Yonsei Univ.
 - 30 participants from Korea-China-Japan
 - <http://ynpl.yonsei.ac.kr/alice-workshop/>

Summary and Plan

- KGNU
 - ToF & Muon M&O
 - New member of VHMPID R&D
 - Data Analysis : Lambda Polarization, Upsilon
- PNU
 - VHMPID R&D
 - Data Analysis : Exotic Particle Search, Femtoscopy
- Sejong U
 - Computer Physics with Lattice QCD
 - Phenomenology study for LHC
- Yonsei U
 - Data Analysis : PWG0 (Spectra)
 - FOCAL R&D

KISTI - ALICE Tier2 Activity

- Goal
 - M&O of ALICE Tier2 / Service
 - PROOF R&D with CERN
- Budget : 200M/yr
- Manpower : 4 PhD, MA 2
- CERN visit : 2 PhDs total 9 wks
- Main Activity
 - Provide 150k SI2K, 50TB
 - PROOF Development --> included to ROOT v5.30/00
- Issues
 - Renewal WLCG MoU for 2013 - 2017 (every 5Y)
 - Budget for HW/upgrade (every 5Y)

KISTI-GSDC ALICE Tier1/2

CERN ALICE Tier-1, Tier-2 and KiAF

