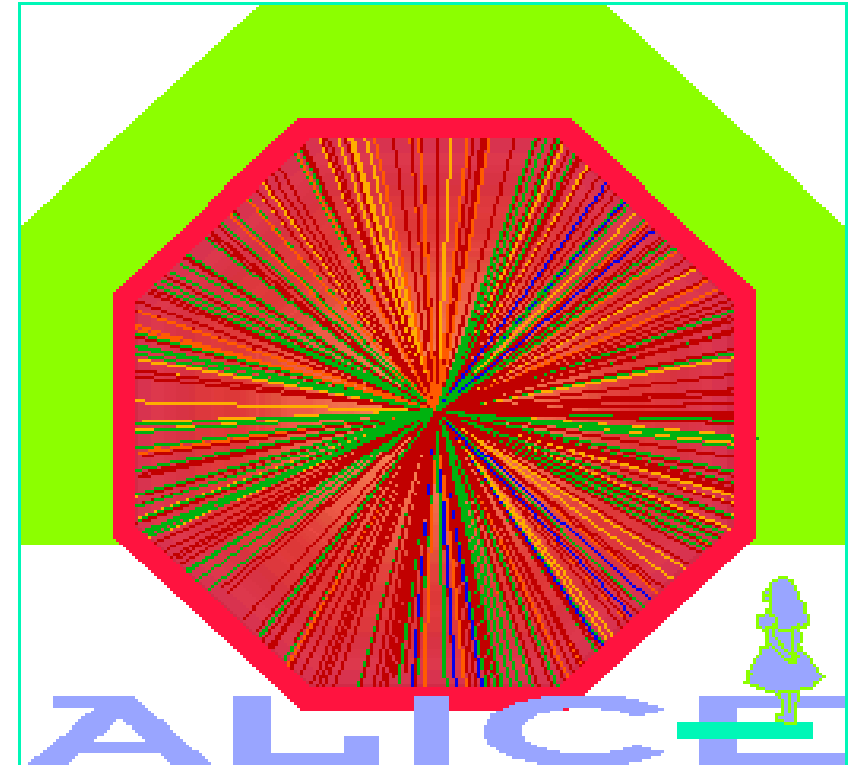


# ALICE Status

## 2<sup>nd</sup> CERN-Korea meeting

- ALICE
- Korean participation





# ALICE Physics Program

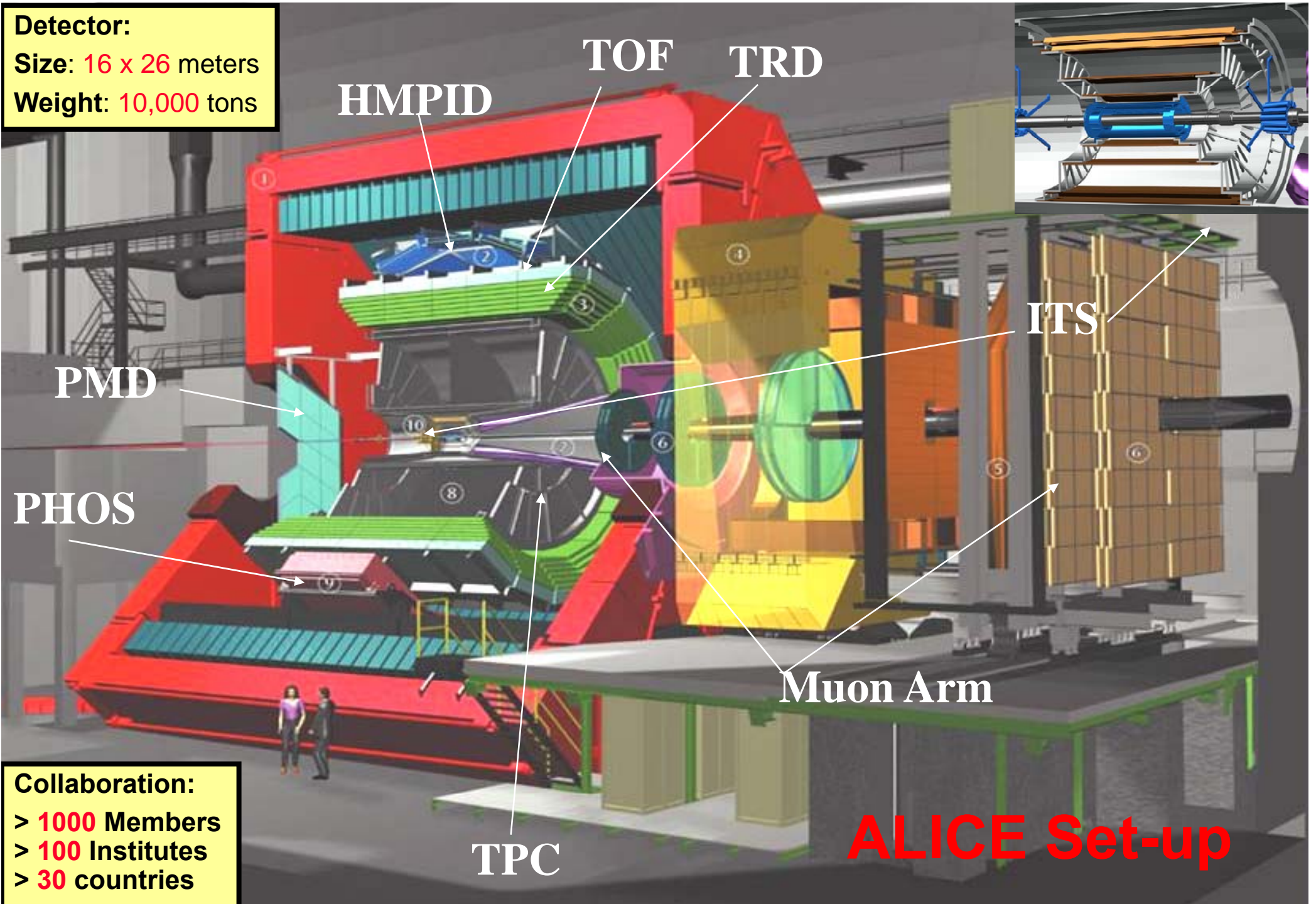


## ● Physics : study the state of matter in the early Universe

- ⇒ Collisions with **heavy ions** (Pb-Pb): 100 x energy of pp
  - ✦ energy is distributed over nuclei => **Temperature  $\sim 10^{12}$  K** (100,000 x  $T_{\text{SUN}}$ )
  - ✦ primordial state of matter,  $\sim 10^{-6}$  s after the Big Bang: **Quark-Gluon Plasma**
  
- ⇒ ALICE will also participate in the **pp running** at LHC
  - ✦ comparison data for heavy ion program
  - ✦ specific topics for which ALICE is particularly well suited

(complementary to ATLAS/CMS/LHCb)

**Detector:**  
**Size:** 16 x 26 meters  
**Weight:** 10,000 tons



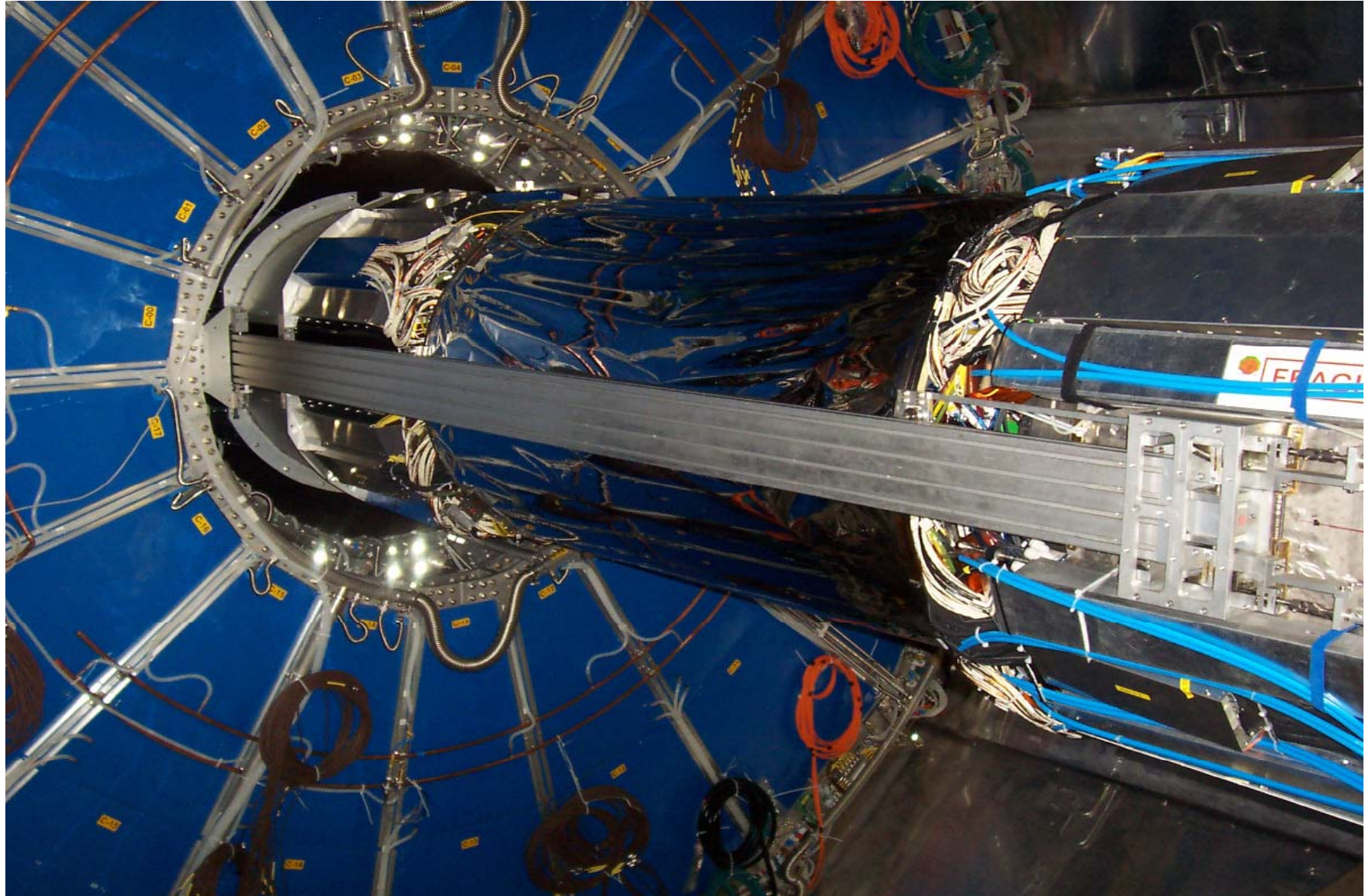
**Collaboration:**  
> 1000 Members  
> 100 Institutes  
> 30 countries

**ALICE Set-up**





# ITS barrel ready to enter inside TPC





# Heavy Ion Physics in Korea



## ● Korean involvement in Heavy Ion Physics

⇒ Korea has a number of **active** and **internationally recognized** groups in this field

★ CERN **SPS** fixed target (NA49, now finished): 1 group

★ USA **RHIC** (Star, Phenix): 7 groups

★ LHC **ALICE** : currently 2 groups

⇒ significant **theory community**

★ Andong, Pusan, Chonnam, Sejong, Kangnung, Yonsei, ...

⇒ with Prof. Mannque Rho a **very distinguished & internationally known Leader**

★ promoted heavy ion physics in Korea & initiated and supported LHC participation

## ● LHC provides a unified and long term perspective

⇒ **THE place** to do **frontline research**

⇒ ALICE has started a number of **initiatives & contacts** to **explore interest** in Korea

★ visits and workshops in 2000, 2004, 2006, 2007

★ regular meetings (HIM) and contacts between groups in Korea

⇒ goal: **broad, lively and coherent local community** involved with heavy ions @ LHC





# Korean participation I: TOF



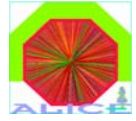
## ● Time-of-Flight Project (Kangung)

- ⇒ new technology, developed in ALICE, copied by many experiments worldwide
  - ★ as good or better than previous TOF detectors, but 10 times cheaper !
- ⇒ funded via MoST-Italy collaboration (2001-2007) and MoST – ALICE MoU (2006)
- ⇒ Korea participates in R&D (finished), construction, testing & commissioning of TOF
  - ★ very important manpower contribution, very satisfactory collaboration
  - ★ since 1999, ~10 students & postdocs from Korea involved in R&D, assembly & testing





# Korean participation II: Computing



## ● Participation in LHC Computing Grid (Sejong)

- ⇒ funded via EU FP6 (2004-2007) and MoST – ALICE MoU (2006)
- ⇒ Korea participates in software development/deployment and provides computing resources
  - ★ **manpower:** installation/tuning of software in Korea; operation support
  - ★ **resources:** in Sejong & KISTI: **at (or above) the pledged level; very high availability**

Report on ALICE groups' activity (01.09.2007 - 30.09.2007)															
Group	Pledged		Delivered		Occupancy		Efficiency		Job statistics			Storage		Service availability	
	KSI2K	CPU	Wall	Wall/Pledged	CPU/Wall	Assigned	Completed	Efficiency	Size	Used	Usage	SAM	AllEn		
1. CERN	1285	453.8	582.8	45.36%	77.87%	91089	67607	74.22%	307 TB	304.1 TB	99.08%	38.31%	98.18%		
2. Czech Republic	25	69.49	80.94	323.7%	85.86%	8794	6636	75.46%	1.267 TB	0.371 GB	0.029%	40.57%	99.85%		
3. Germany	992	974.4	1014	102.3%	96.04%	98127	71027	72.38%	8.513 TB	8.513 TB	100%	39.35%	99.18%		
4. Greece	5	1.684	1.927	38.54%	87.4%	816	196	24.02%	-	-	-	0%	89.25%		
5. Hungary	32	30.09	32.48	101.5%	92.62%	3661	2681	73.23%	-	-	-	37.08%	70.34%		
6. IN2P3	662	2325	2454	370.8%	94.72%	176561	131262	74.34%	6 TB	6 TB	100%	23.22%	79.49%		
7. INFN	1020	913.7	1073	105.2%	85.15%	129191	67353	52.13%	-	-	-	9.571%	71.16%		
8. India	266	31.45	32.02	12.04%	98.24%	3591	2506	69.79%	-	-	-	0%	0%		
9. Mexico	22	12.79	13.36	60.74%	95.7%	2467	1820	73.77%	-	-	-	-	89.06%		
10. NDGF	357	147	152.3	42.67%	96.48%	31196	21473	68.83%	3.545 GB	3.545 GB	100%	-	83.97%		
11. Other	5	-	-	-	-	-	-	-	-	-	-	0%	0%		
12. Poland	155	28.34	47.95	30.94%	59.11%	10388	5046	48.58%	-	-	-	34.74%	94.89%		
13. RDIG	707	555.1	610.9	86.41%	90.87%	44218	28538	64.54%	-	-	-	12.85%	91.04%		
14. Romania	443	279.2	296	66.82%	94.32%	64286	23876	37.14%	3.166 TB	2.575 TB	81.32%	-	99.53%		
15. Slovakia	25	5.581	5.721	22.89%	97.54%	2489	2317	93.09%	-	-	-	-	70.53%		
16. South Africa	10	0	0	-	-	-	-	-	-	-	-	-	99.73%		
17. South Korea	82	96.97	100.5	122.6%	96.5%	7419	4946	66.67%	-	-	-	33.47%	93.24%		
18. Spain	232	30.59	31.53	35.45%	58.58%	14048	8170	58.18%	-	-	-	-	95.26%		
19. The Netherlands	160	58.41	60.43	37.77%	96.65%	5761	3386	58.77%	2 TB	2 TB	100%	37.08%	61.63%		
20. UK	163	55.39	59.03	36.21%	93.83%	5111	3456	67.62%	4 TB	4 TB	100%	0%	63.83%		
21. US	230	116.5	124.8	54.25%	93.39%	20260	9791	48.33%	-	-	-	-	97.05%		
22. Ukraine	420	13.83	14.55	3.463%	95.08%	16477	896	5.438%	-	-	-	-	49.04%		
<b>Total</b>	<b>7298</b>	<b>6259</b>	<b>6849</b>			<b>736550</b>	<b>462983</b>		<b>331.9 TB</b>	<b>327.2 TB</b>					

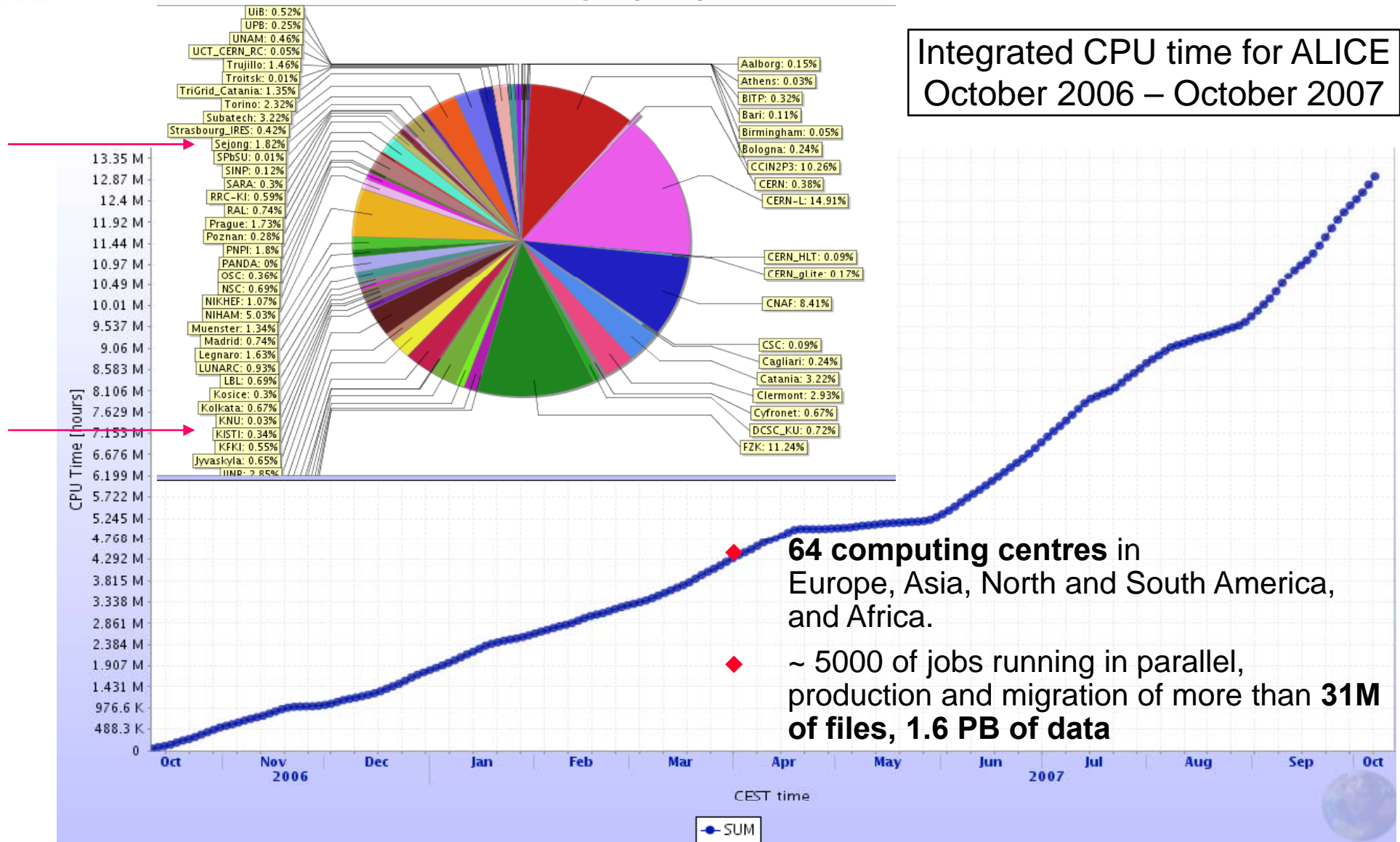






# ALICE Physics Data Challenge 07

Distributed production of Monte-Carlo data for physics studies



**Korea (Sejong + Kisti) ~ 2% of ALICE resources in PDC 07**





# Korean participation III: Physics

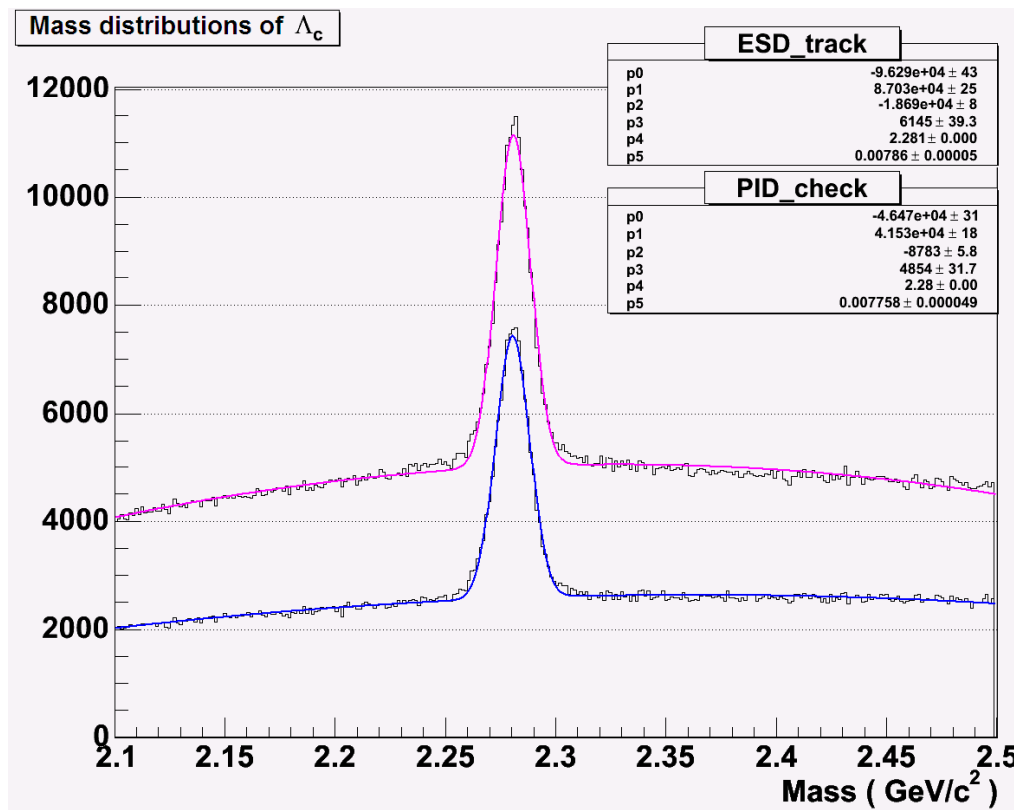


## ● Physics preparations, Theory (Kangung + Sejong)

- ⇒ very important work to be well prepared for data and physics exploitation
- ⇒ participate in physics group 2 (soft physics) and 3 (heavy flavour production)
  - ☆ simulations, background studies, analysis strategy, theory predictions

## Study of $\Lambda_c \rightarrow pK\pi$ in pp collision

W. W. Jung and S.C. Lee



Pink line : all ESD tracks	Blue line : after PID check
N_lambda_c = 75631	N_lambda_c = 58995
Efficiency = 18.84 %	Efficiency = 14.7 %
Resolution = 7.9 MeV/c <sup>2</sup>	Resolution = 7.8 MeV/c <sup>2</sup>



# Near Term Plans (transparency from April '07)



## ● Gradually increase Korean participation in ALICE

- ⇒ by a few strong, experienced & recognized groups in the coming years
  - ★ currently one group (Yonsei) has expressed strong interest to join ALICE
- ⇒ **centered around physics analysis**
  - ★ participation in **GRID computing** infrastructure
  - ★ new hardware limited to participation in detector commissioning & operation

## ● Financial implications

- ⇒ **no new construction** responsibilities are envisaged
  - ★ some increase in GRID computing capacity in Korea could be discussed
- ⇒ **one-time 50 kCHF** contribution to the Common Fund per new Institute
- ⇒ **operation expenses**
  - ★ M&O A (~13 KCHF/year per PhD)
  - ★ group operation (travel, students, ....)

## ● Procedure

- ⇒ ALICE would like to **discuss** with and **get advice** from **Korean Funding Agency**
  - ★ **if** such a gradual increase in Korean participation may be supported
  - ★ **how** and **on which time scale** this could be implemented



# M&O in ALICE



## ● M&O funds the operation of the ALICE experiment

⇒ budget scrutinized & approved yearly by RRB

⇒ **cost shared** equally by members with PhD

☆ number of people in ALICE increased by 10% since 2005

=> cost per person decreased by 10% !

Category	2008	2009	2010	2011
Detector related costs	1,959	1,967	1,967	1,967
Secretariat	269	278	288	288
Communications	10	10	10	10
On-line computing	797	1,154	1,230	2,024
Off-line computing	427	427	427	427
Test beams & calibration facilities	147	107	107	107
Laboratory operations	360	310	310	310
General services	621	615	606	606
<i>Total without Power</i>	4,591	4,868	4,945	5,738
Power	2,592	2,592	2,592	2,592
<i>Grand Total</i>	7,183	7,459	7,537	8,330

## ● M&O is required from all participating senior scientists

⇒ participating in the **physics exploitation** requires participation in **cost sharing**

⇒ M&O list is linked to author list in publications (students however don't have to pay)

## ● Funding for M&O

⇒ **in general** by a government Funding Agency, providing some long term perspective

⇒ **in special cases** by other funding agents (eg University or Institute)

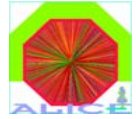
☆ eg some US Institutes funded by NSF grants, Japanese Universities funded by MEXT grant, GSI via Institute budget, ..

☆ not ideal, because grants usually lack predictability and long term stability





# Status October '07

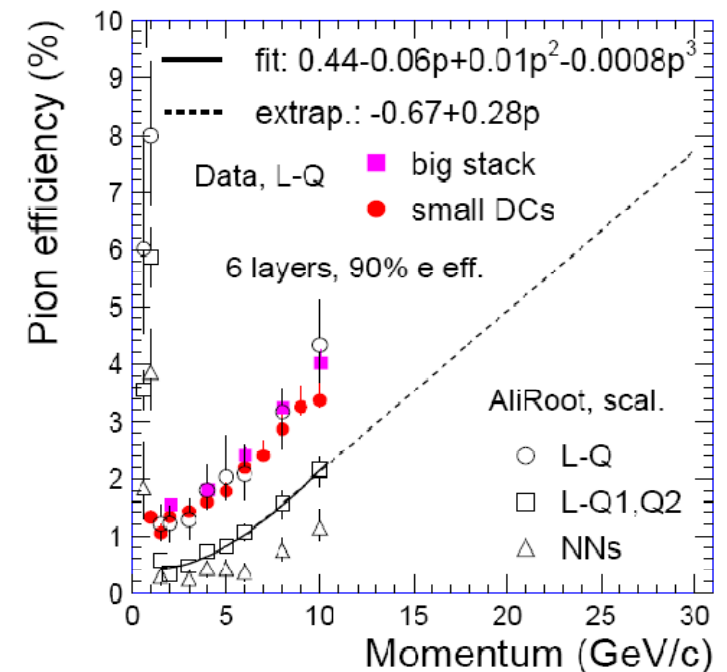


## ● Application of Yonsei University

- ⇒ currently funded via grant by University/MoE
- ⇒ main interest: Physics and Analysis studies
  - ★ installation of ALICE software at Yonsei
  - ★ Physics: direct photons via mass lepton pairs (experience from PHENIX at RHIC/USA)
  - ★ Analysis: advanced software for TRD => factor 4 improvement of TDR performance
- ⇒ Collaboration with the TPC/TRD projects (GSI/Heidelberg in Germany)
  - ★ 1 student for 1 year at GSI, working on Detector Control software
  - ★ 2 students working on physics and analysis
- ⇒ German Institutes applied for grants (DAAD) for German-Korean collaboration

## ● Discussions during summer ALICE-Yonsei-MoST

- ⇒ further steps concerning formal participation await guidance from MoST





# Summary



## ● ALICE detector

- ⇒ installation & commissioning **progressing on schedule**
- ⇒ looking forward to **first physics in 2008**

## ● Korean participation in ALICE

- ⇒ very **successful and satisfactory** collaboration with Kangung/Sejong
  - ☆ important contribution to **TOF project** (R&D, participation in assembly & commissioning)
  - ☆ **GRID computing** in Korea well integrated & efficient
  - ☆ **physics** preparations ongoing
- ⇒ secured **additional funding** via **international sources**
  - ☆ Korea-Italy, World Lab, MoST <-> EU FP6, maybe Germany DAAD in the future

## ● Future Collaboration ALICE - Korea

- ⇒ ALICE sees the potential and **would welcome a gradual increase** of basis in Korea
  - ☆ concentrated on **physics analysis** and **computing**
  - ☆ **no additional construction funding requested or implied !**