

# **e-Science Activities in Korea**

2022. 03. 22

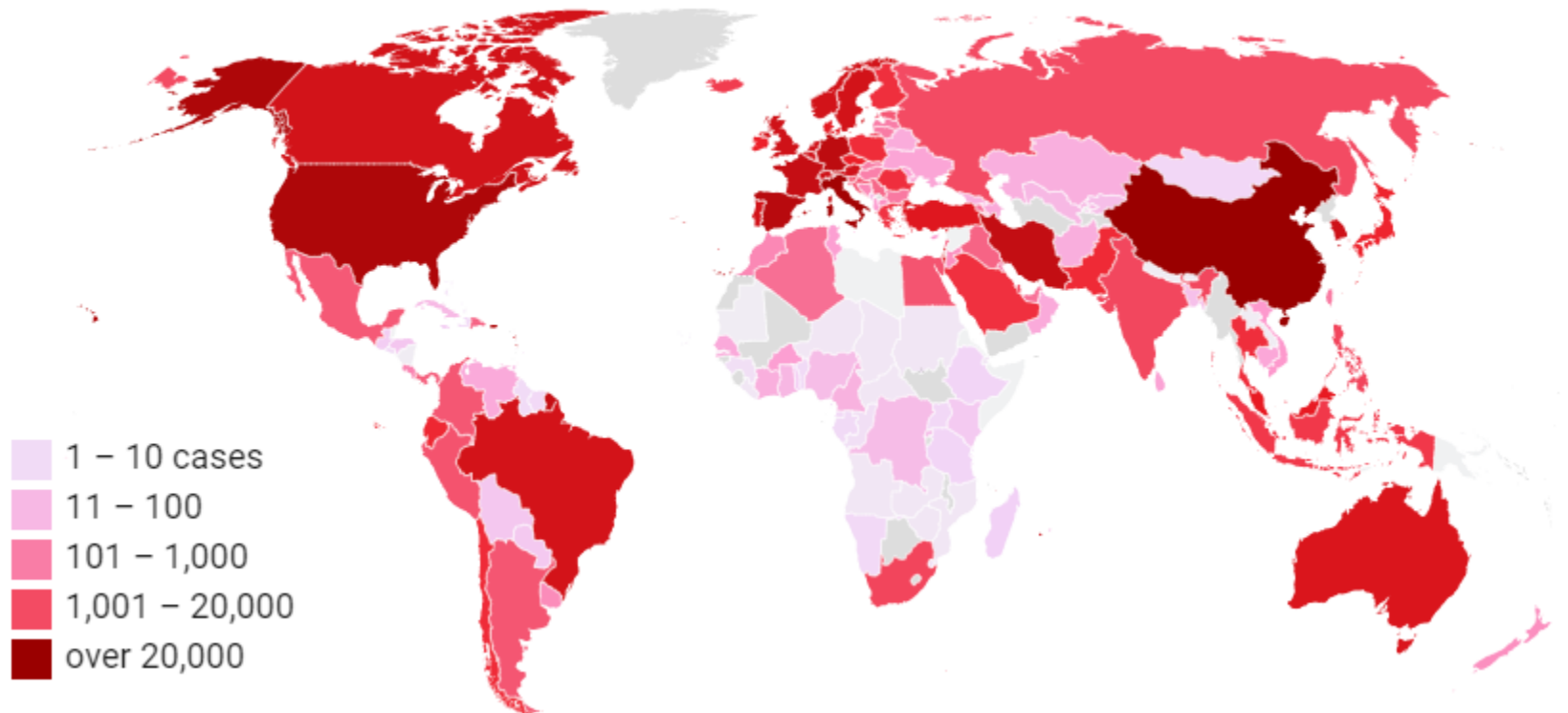
Kihyeon Cho (KISTI)

# Focus on HEP

- I. e-Science is coming back.
- II. Data production
- III. Data processing
- IV. Summary

# COVID 19

Total cases: **417,966** | Total deaths: **18,615** | As of: March 24, 8 PM eastern time  
*Hover over the map to see the number of cases and deaths per country*



Due to COVID-19 pandemic, we cannot be on-site laboratory.

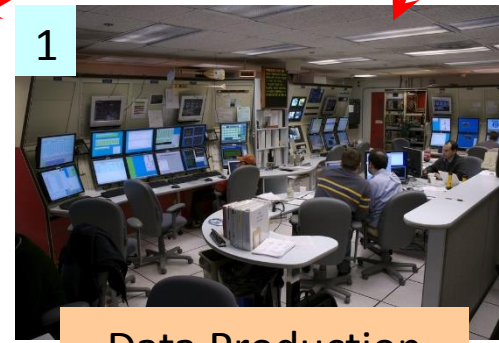
⇒ e-Science is coming back.

**I. e-Science is coming back.**

# e-Science for HEP

- To study High Energy Physics anytime, anywhere even if we are not on-site laboratories
- Virtual Laboratory enables us to research as if we were on-site.

Fermilab, USA



# The components of e-Science

An example => Fermilab

On-Site



Data Analysis  
collaborative



Data Processing



Data Production

Data Center

KISTI



- Video Conference
  - ✓ EVO

- Distributed Computing

- ✓ GSDC
- ✓ KISTI-5 supercomputer

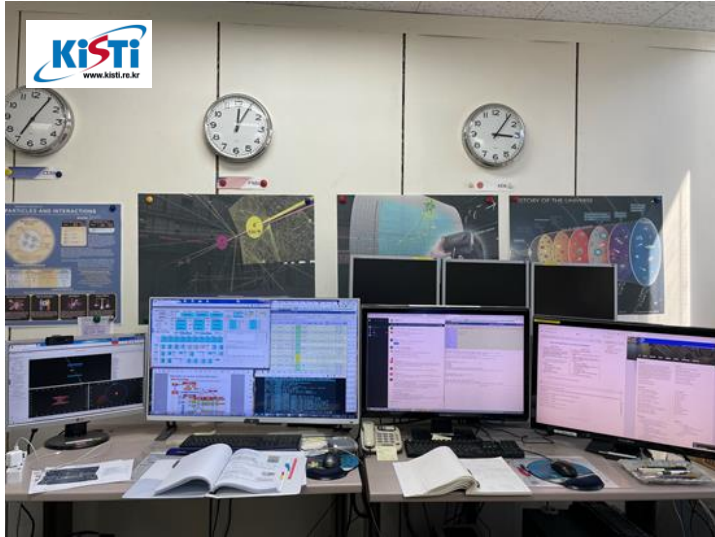
- Remote Control Room

- ✓ CDF
- ✓ Belle II

## **II. Data Production**



# Remote Control Room



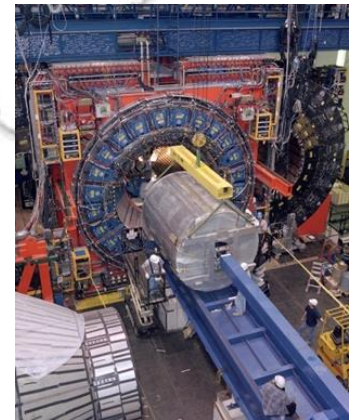
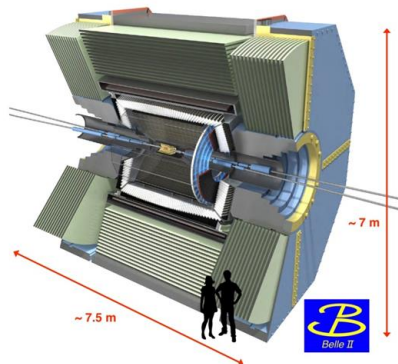
(Remote Control Room)



KEK(Belle II)  
(2019~ )

Fermilab(CDF)  
(2001~2011)

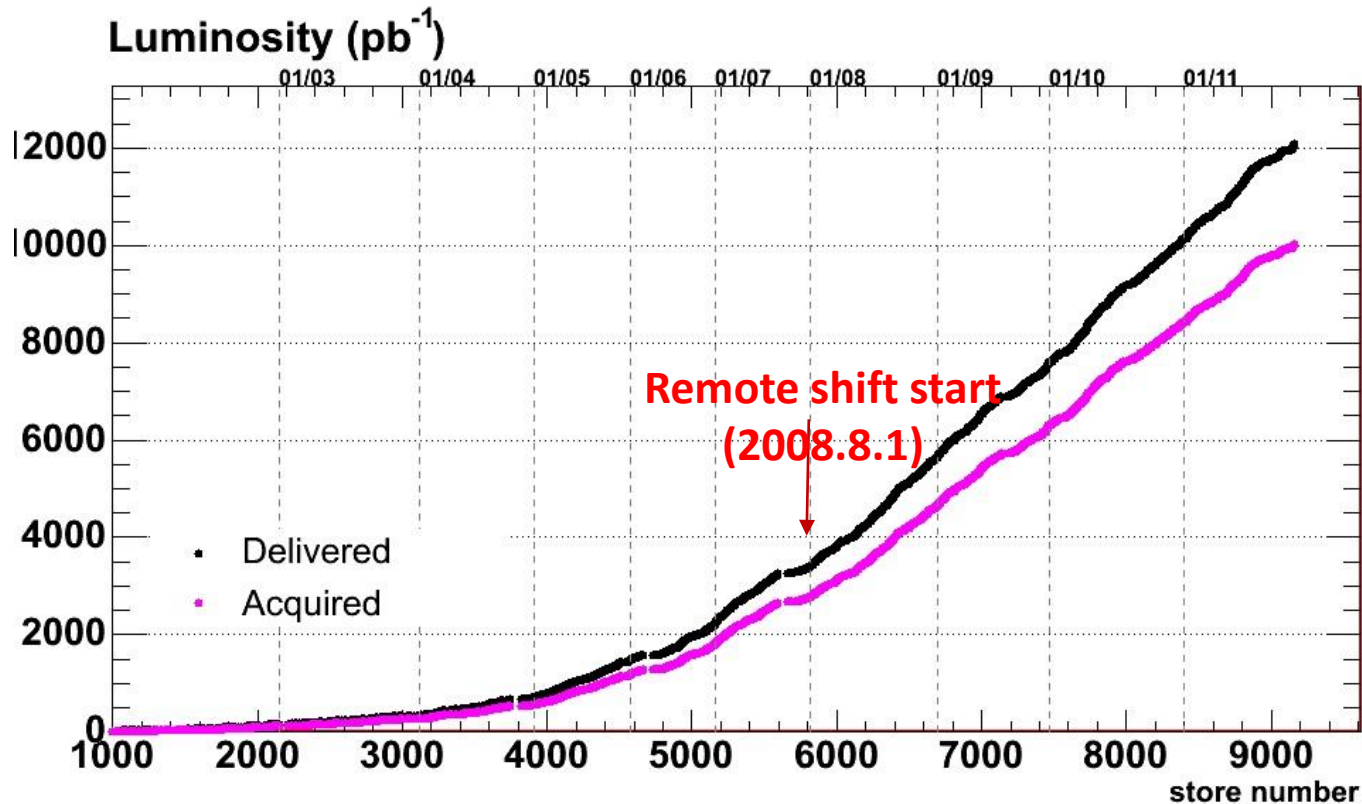
NET-  
WORK



Both On-line and Off-line shifts



# CDF Remote Control Room

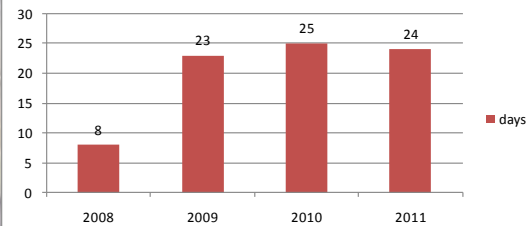


- During CDF run II (2001-2011), KISTI remote control room took data between (2008-2011) for 80 times.

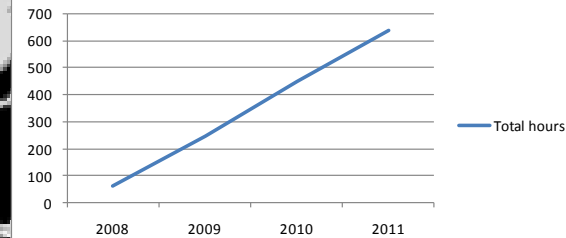
# CDF Remote Control Room



CDF Remote Control Room  
(2011.10.1)



CDF Remote Control Room  
Total used hours (2011.10.1)



Fermilab CDF Control Room



KISTI Remote Control Room



We take shifts at KISTI even if we are not at Fermilab.

# CDF vs. Belle II

Component	CDF On-line shift	Belle II On-line shift
Number of shifter	2 Local (SciCO and Ace), 1 local or remote shifter (CO)	1 Local, 2 Remote shifters
Communication	Polycom	SpeakApp / Rocket Chat
Method	Forwarding display	web
Monitoring panel	web	web
Control Panel	concon	VPN/daqnet
OS	Linux	Window
Security	Fermilab Kerberos	KEK VPN
Network	GLORIAD	GLORIAD-JGN-X
Log	e-log	e-log



On-site

SciCO



Ace

Polycom

KISTI site

CO

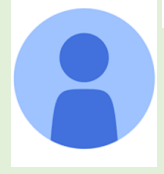


Local shifter



SpeakApp

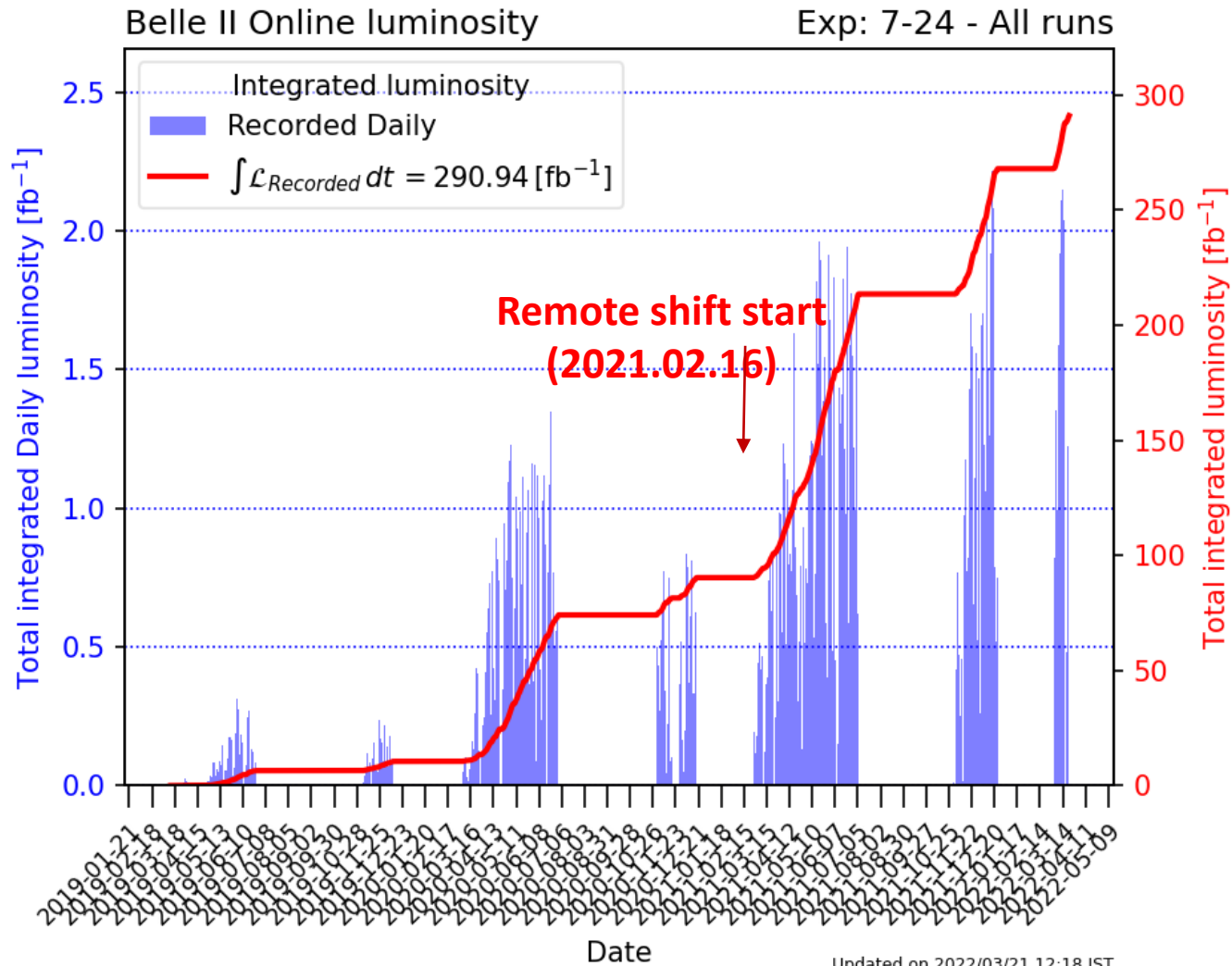
Rocket chat



2 Remote shifters



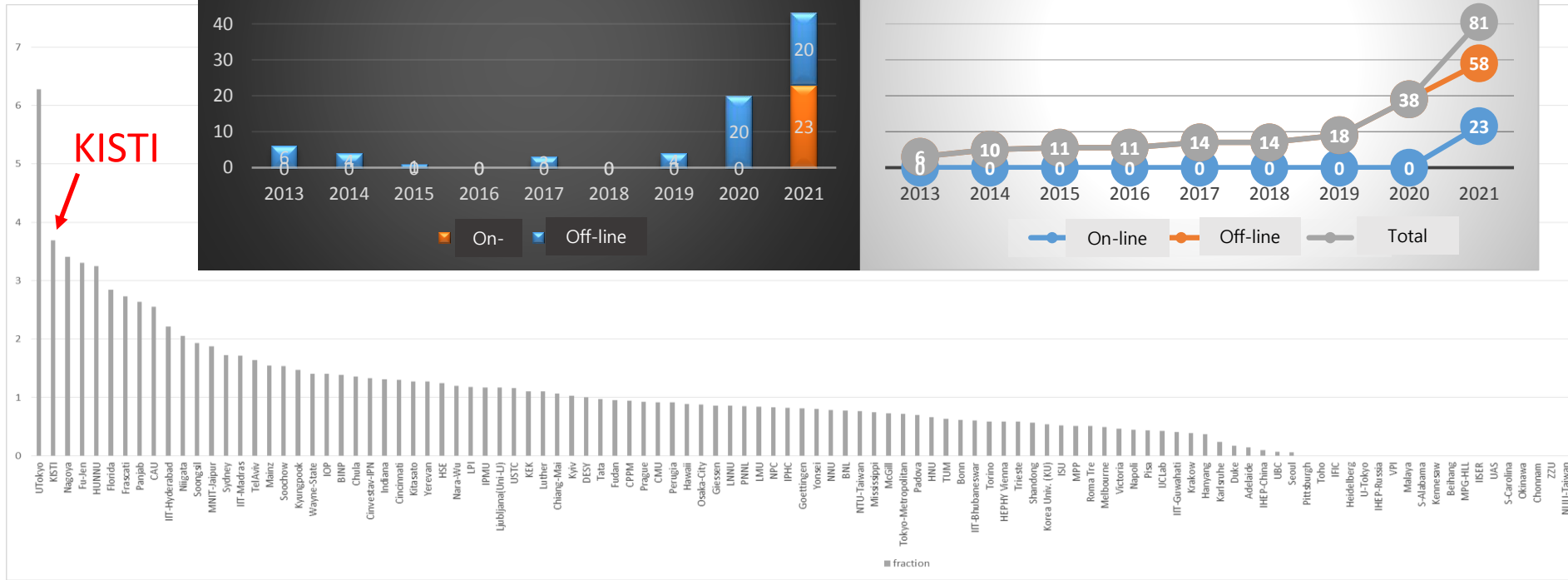
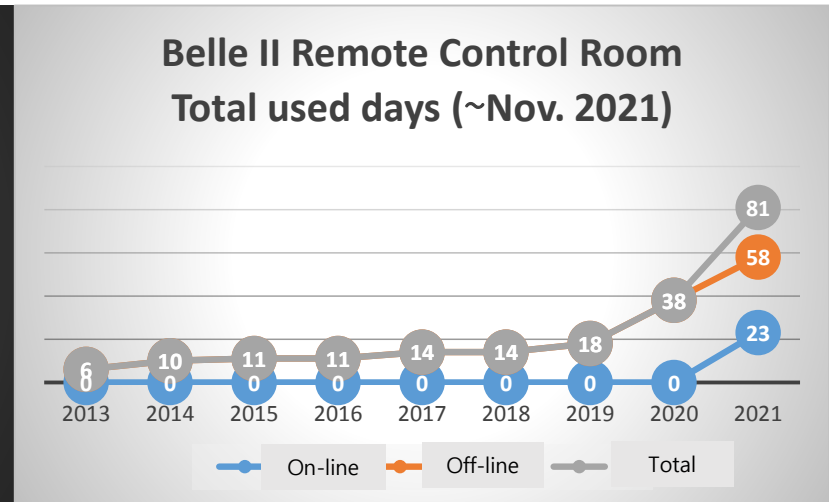
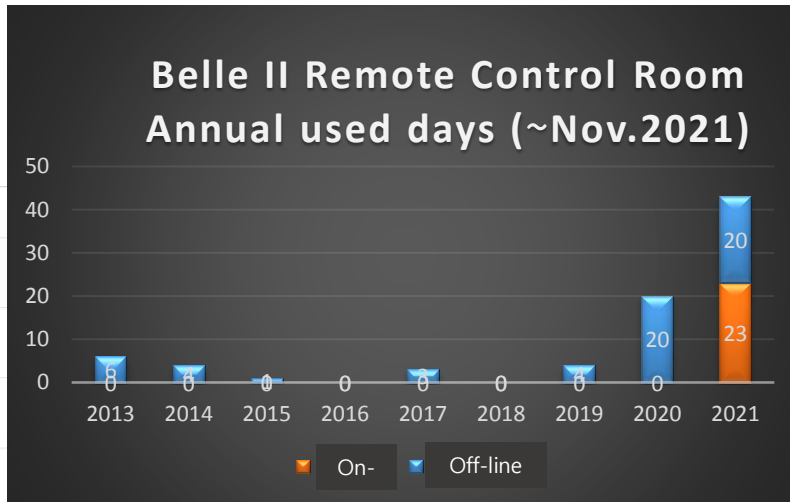
# Belle II Remote Control Room



- During Belle II (2019~ ), KISTI remote control room has taken data since Feb. 16, 2021.

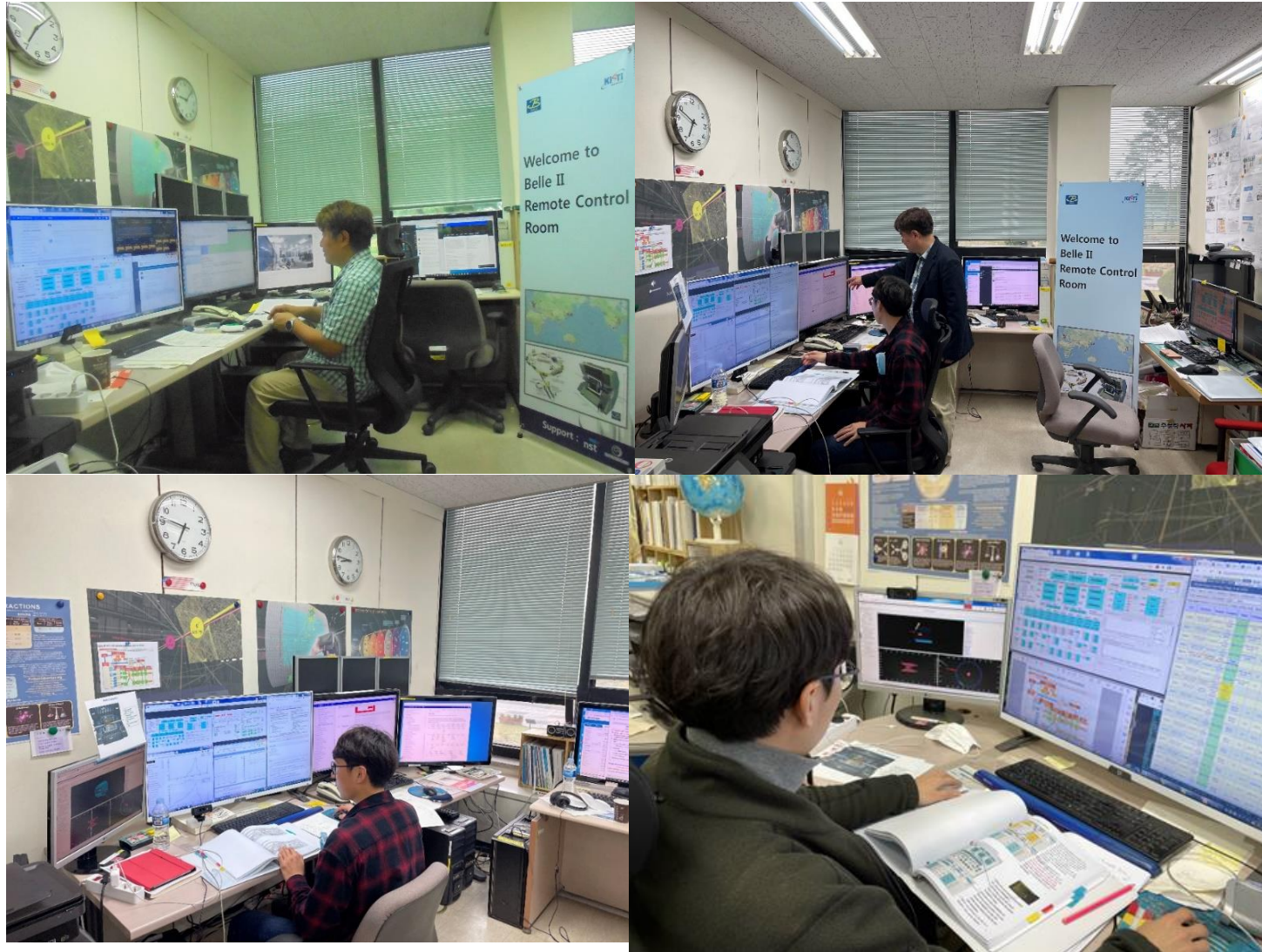
# 2021 Shift Ranking

## # Fraction: 2<sup>nd</sup> rank (KISTI)

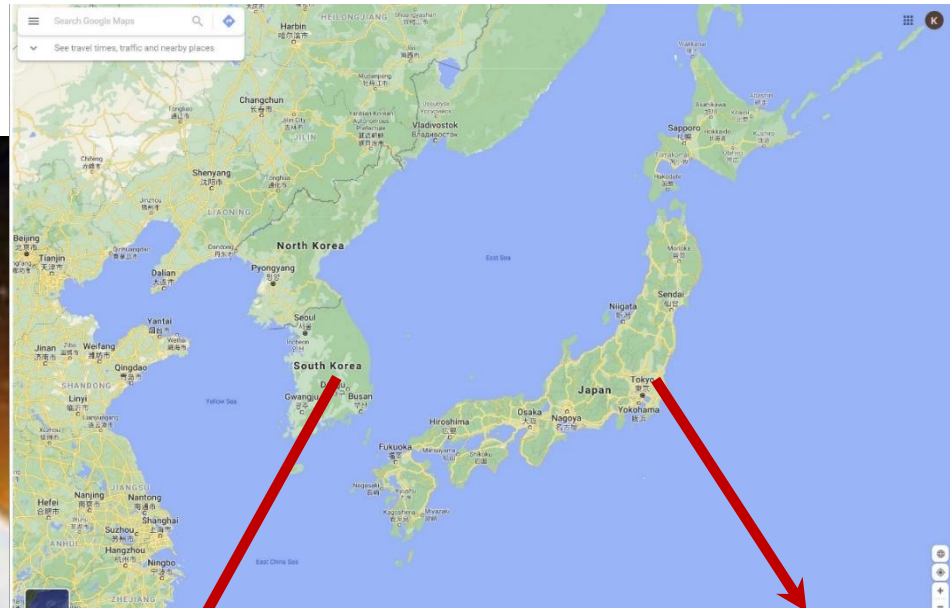




# Belle II On-line shift @ KISTI



# Belle II Remote Control Room



KISTI Remote Control Room



KEK Belle II Control Room

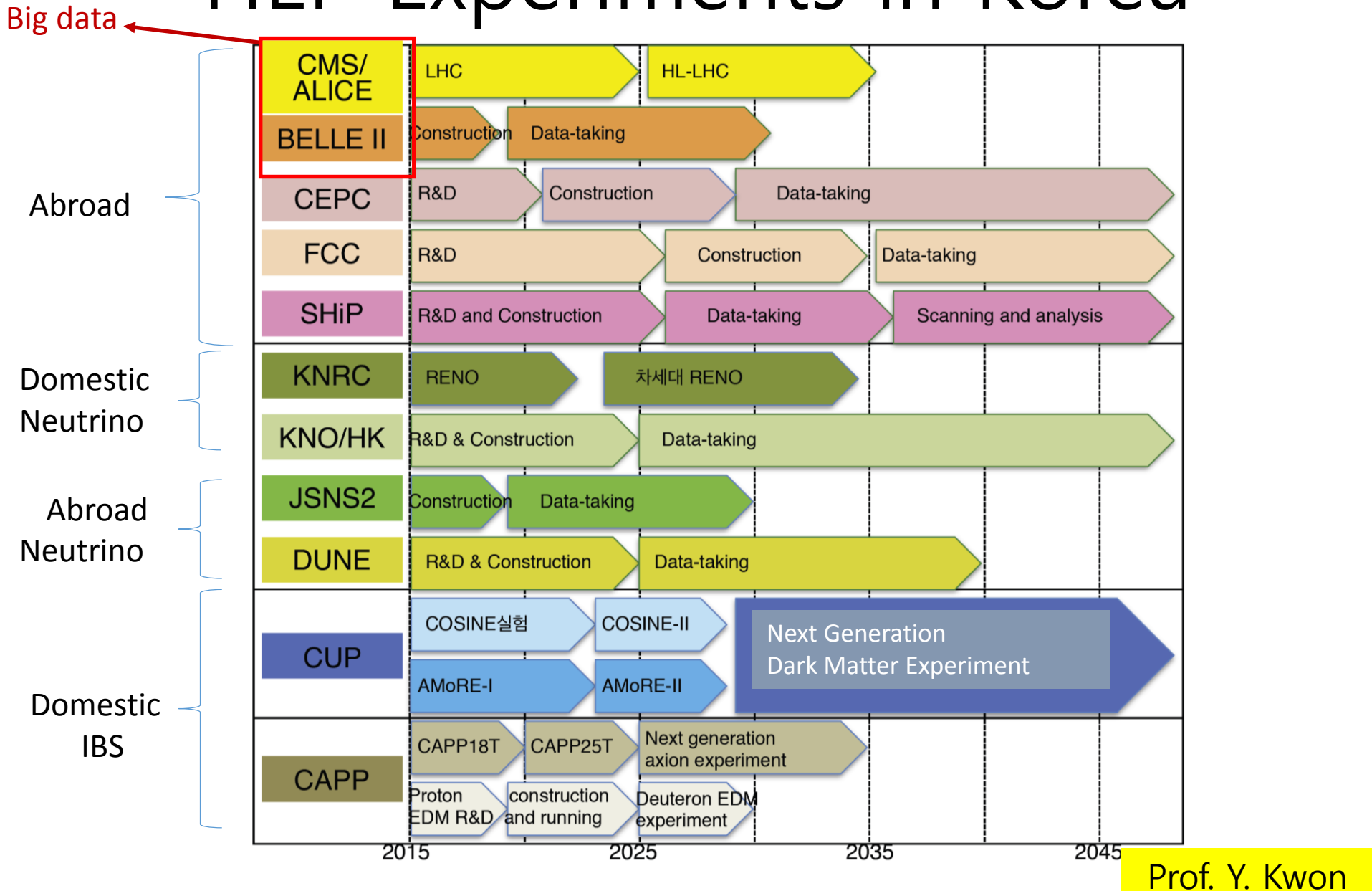


We take shifts at KISTI even if we are not at KEK.

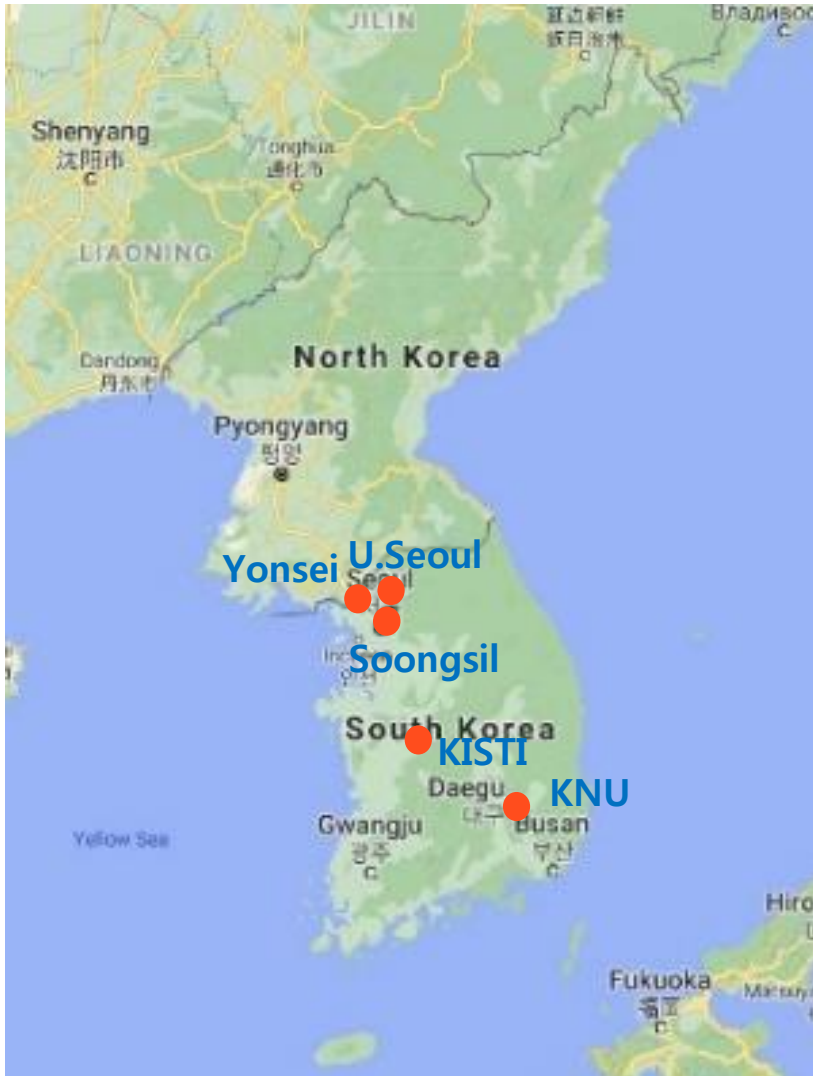


# **III. Data Processing**

# HEP Experiments in Korea



# HEP Computing in Korea



## Data processing

- From Grid Farm

- Soongsil U., Yonsei U.

- Belle II Farm

- KNU, U. of Seoul

- CMS Tier-3

- KISTI-GSDC

- ALICE Tier-1,3

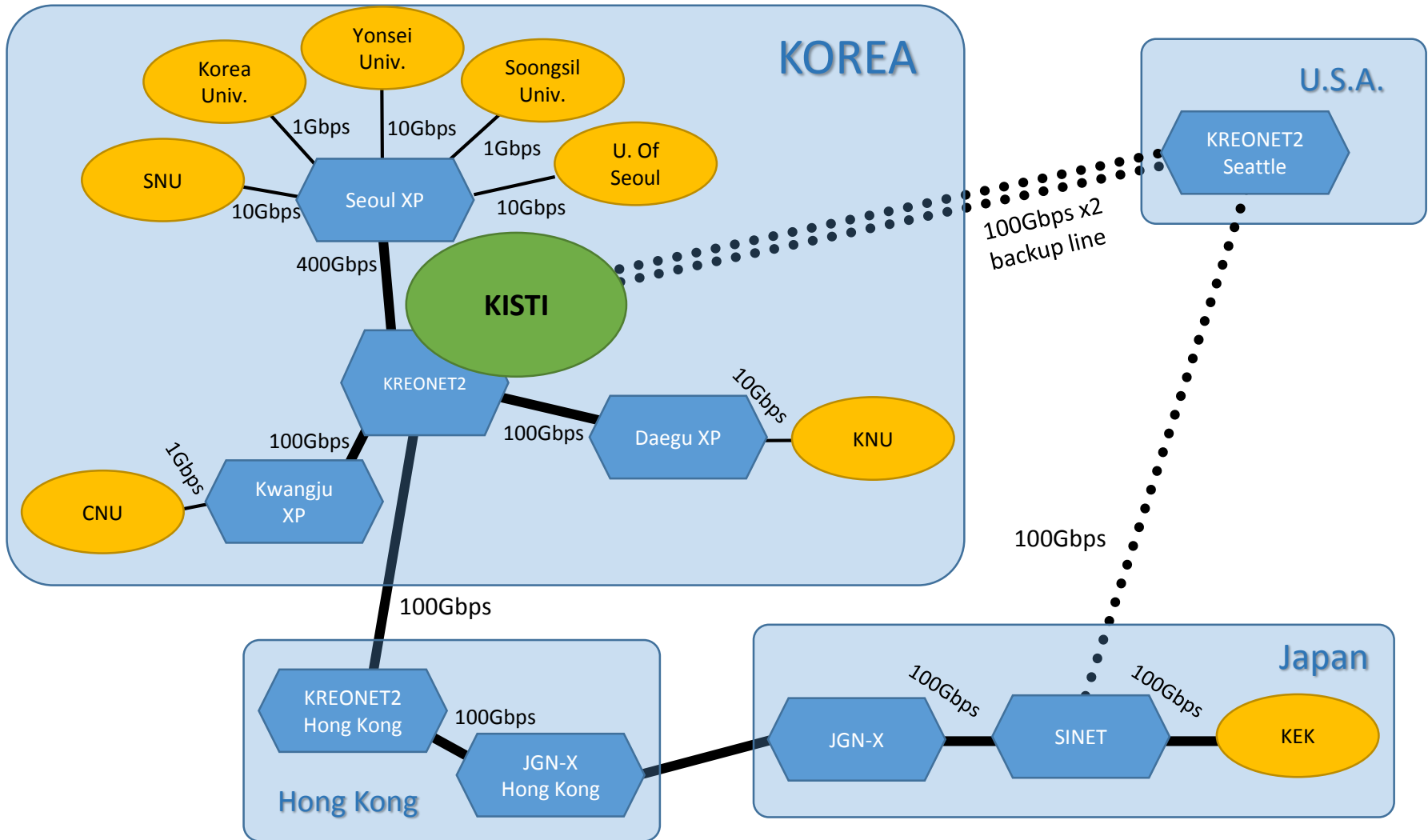
- CMS Tier-2,3

- Belle II Farm, LIGO, RENO etc.

- To evolving computing architecture

- KISTI-5 supercomputer

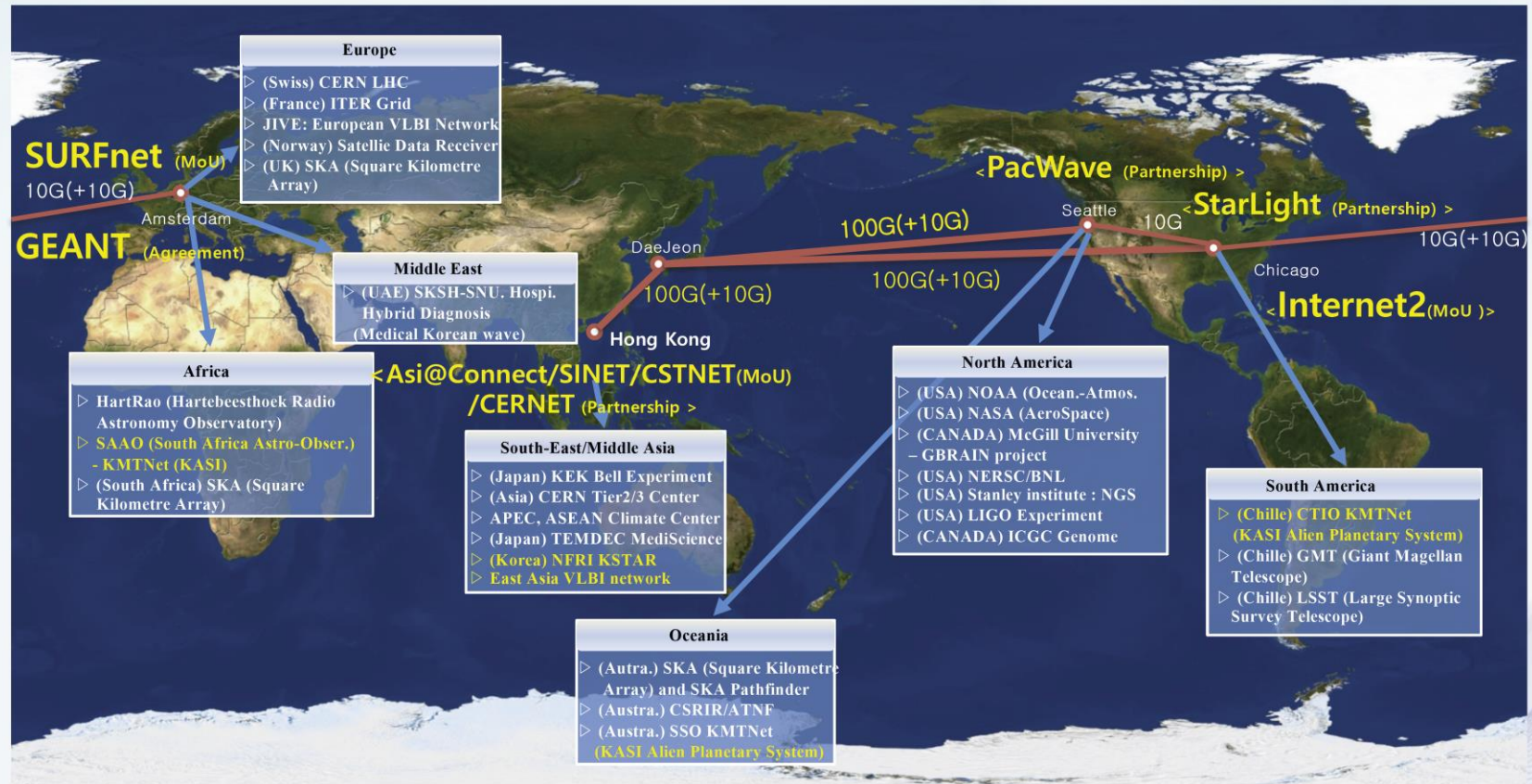
# Domestic Network



- KISTI is connected to each domestic institute at 1~10 Gbps.
- KISTI is connected to KEK at 100 Gbps.

# International Network

## GLOBAL Research Network & Collaboration



- KISTI is connected to Fermilab at 2X100 Gbps.
- KISTI is connected to CERN with 10 Gbps.

# From Grid Computing: KISTI-GSDC



Dr. S.-U. Ahn

	CPU (Physical core)	DISK (TB)	Tape (TB)
ALICE T1	1940	4000	3200
CMS T2	500	1000	
ALICE T3	400	1300	
CMS T3	1000	1000	
LIGO	996	550	
Belle II	156	107	
RENO	432	1100	



Structural Biology  
Data Sharing Platform

Tape Storage

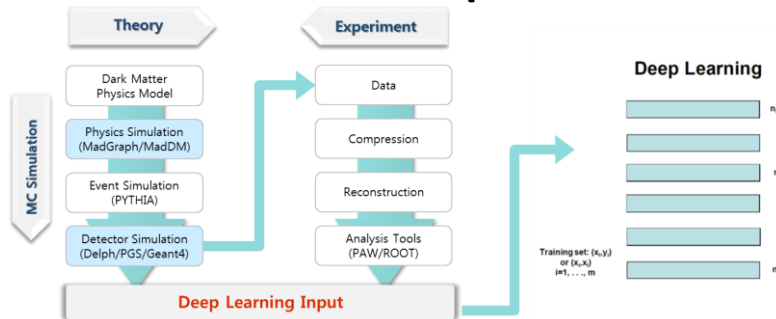
Disk Storage

Computing node

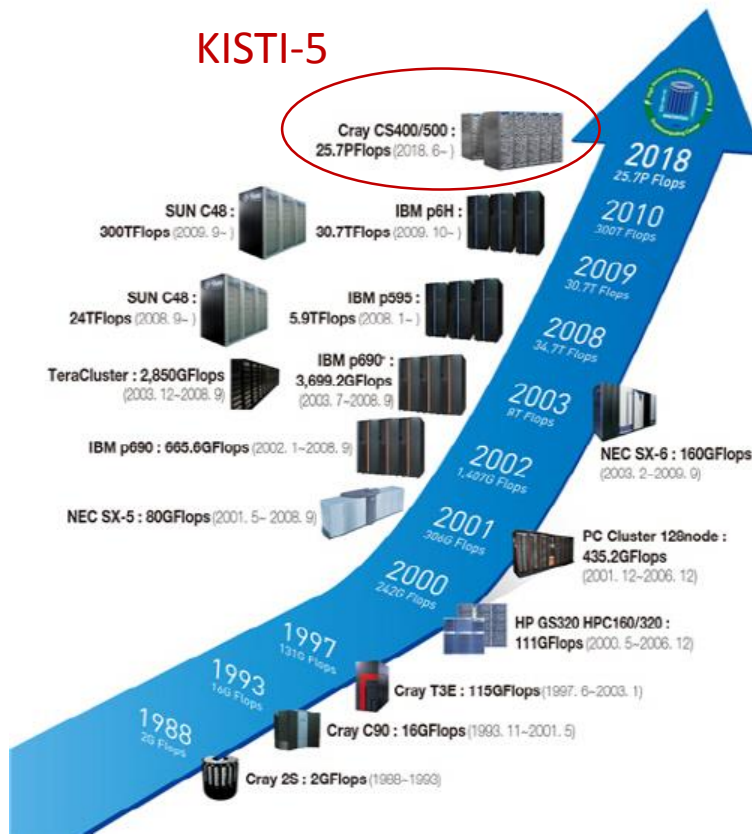




# To Evolving Computing Architecture: KISTI-5 supercomputer



- CPU 25.7PF
  - Heterogeneous: 25.3PF CS400 w/KNL
  - CPU-only: 0.4PF CS500 w/Skylake
- Storage
  - 21PB SPS
  - 10PB Archive
- Launched in November 2018
  - ranked 11<sup>th</sup> of Top 500





## **IV. Summary**

# Summary

- KISTI provides e-Science to study high energy physics anytime, anywhere even if we are not on-site.
- Due to COVID-19, we cannot go to on-site. Therefore, e-Science is absolutely needed.

⇒ Now, e-Science is coming back.

**Thank you.**  
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