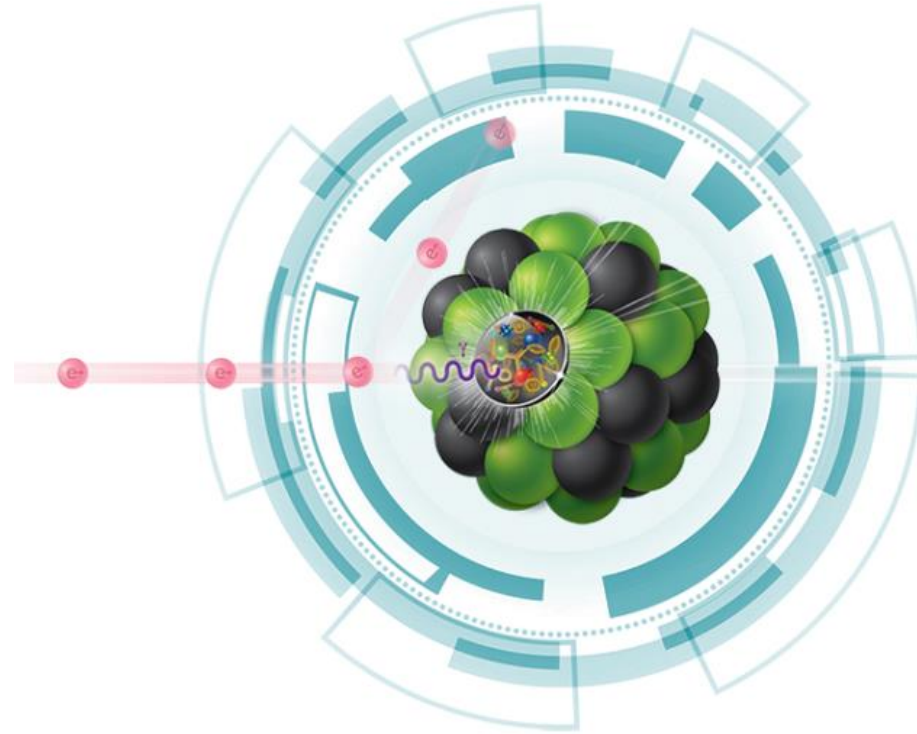


Opening Remarks and Presentation of CHEP

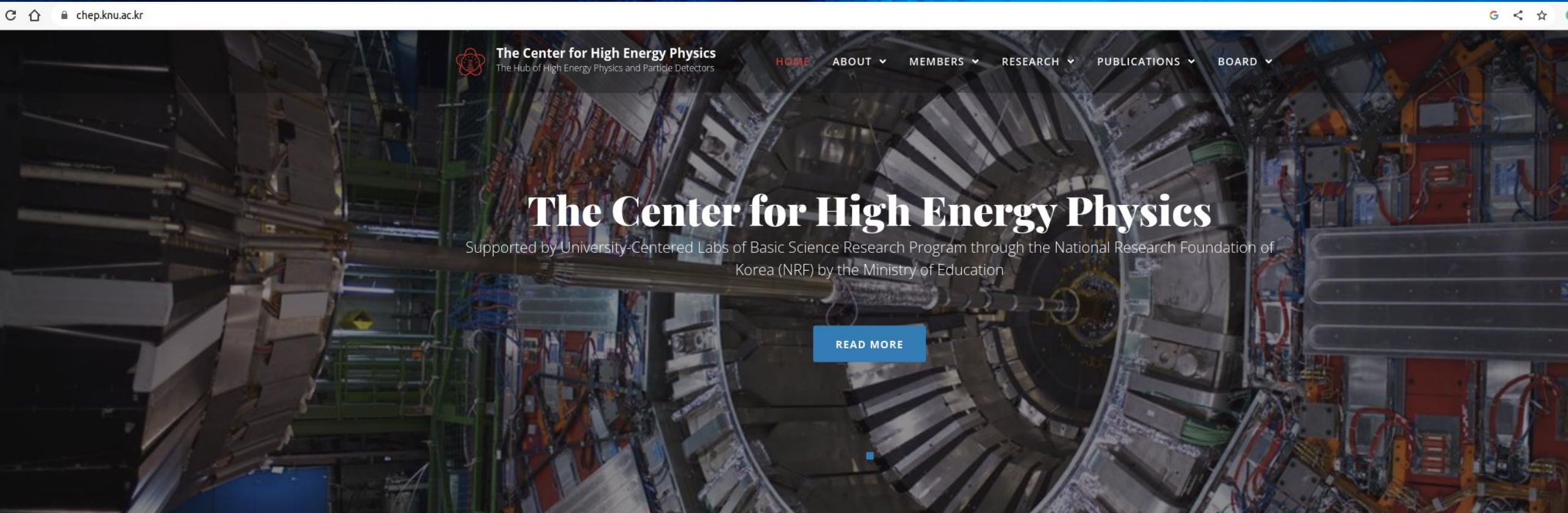


Hong Joo Kim

Department of Physics and Center for High Energy Physics , Kyungpook National University,

2nd APCTP Workshop on the Physics of Electron Ion Collider: ePIC Physics and Detectors
Nov 30 - Dec 2, 2023, Grand Hotel, Daegu, Korea

Home page : <http://chep.knu.ac.kr>



The Center for High Energy Physics
The Hub of High Energy Physics and Particle Detectors

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The Center for High Energy Physics

Supported by University-Centered Labs of Basic Science Research Program through the National Research Foundation of Korea (NRF) by the Ministry of Education

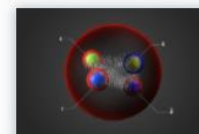
[READ MORE](#)

- Since 1998
- 4 research department
- 32 researchers
- 3 Technicians and 2 Secretary
- 30 PhD/Master students
- 25 funding project

Notice

Title	Date
ICHHE Workshop December 2022	2022.12.14
Reimel Workshop: Polarization phenomena and Lorentz sy...	2022.09.01
APCTP Workshop on the Physics of Electron Ion Collider, 1-...	2022.08.01
Exotics and Exotic phenomena in Heavy Ion Collision (ExHIC...	2022.08.01

Research



Research
Field



Research
Project

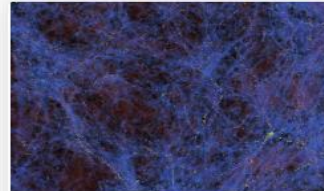


Support
Project

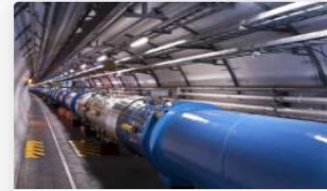
Research Field



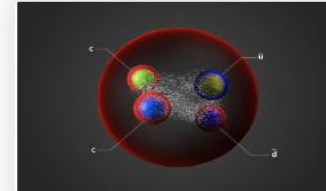
Cosmic ray experiments



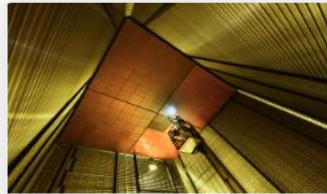
Dark matter search



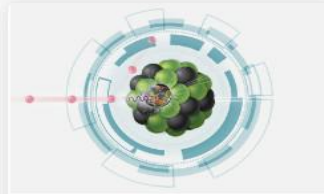
High Energy Collider Physics



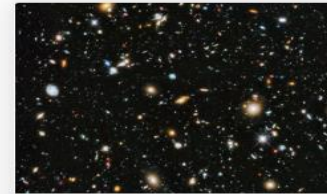
Exotic particle search



Neutrino experiments

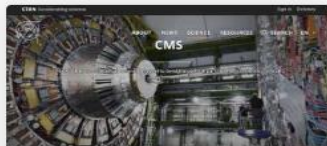


Nuclear Theory
/Experiment



Cosmology and Astronomy

Research Project



CMS



AMS

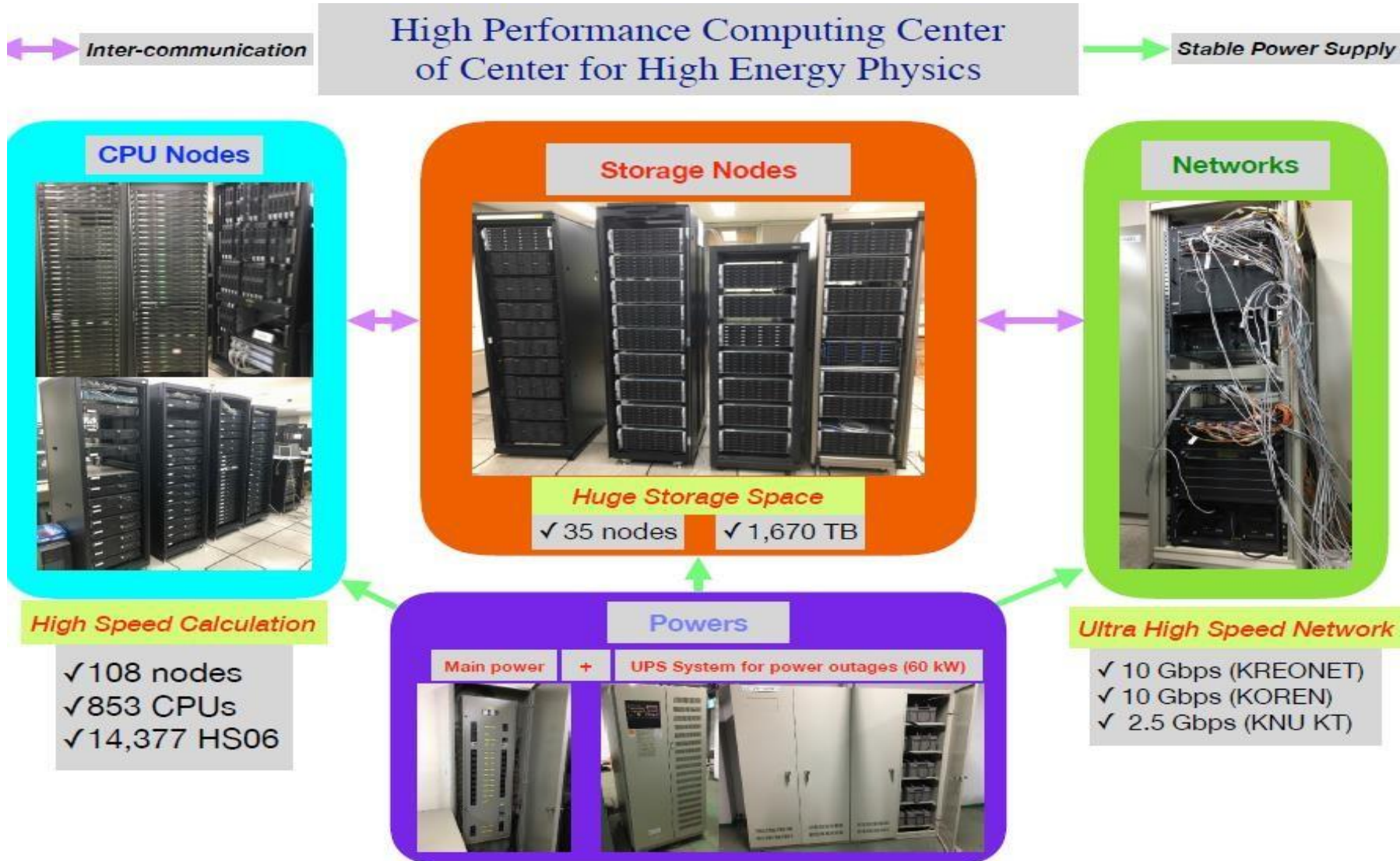


AMoRE



COSINE

COMPUTING FOR DEEP LEARNING & BIG DATA (Tier-3)



HERA: an electron-proton collider at DESY in Hamburg, Germany



2 collider experiments

--> H1 and ZEUS

2 fixed target experiments

--> HERA-B and HERMES

HERA I: 1992-2000

~130 pb⁻¹ taken by **ZEUS**, H1

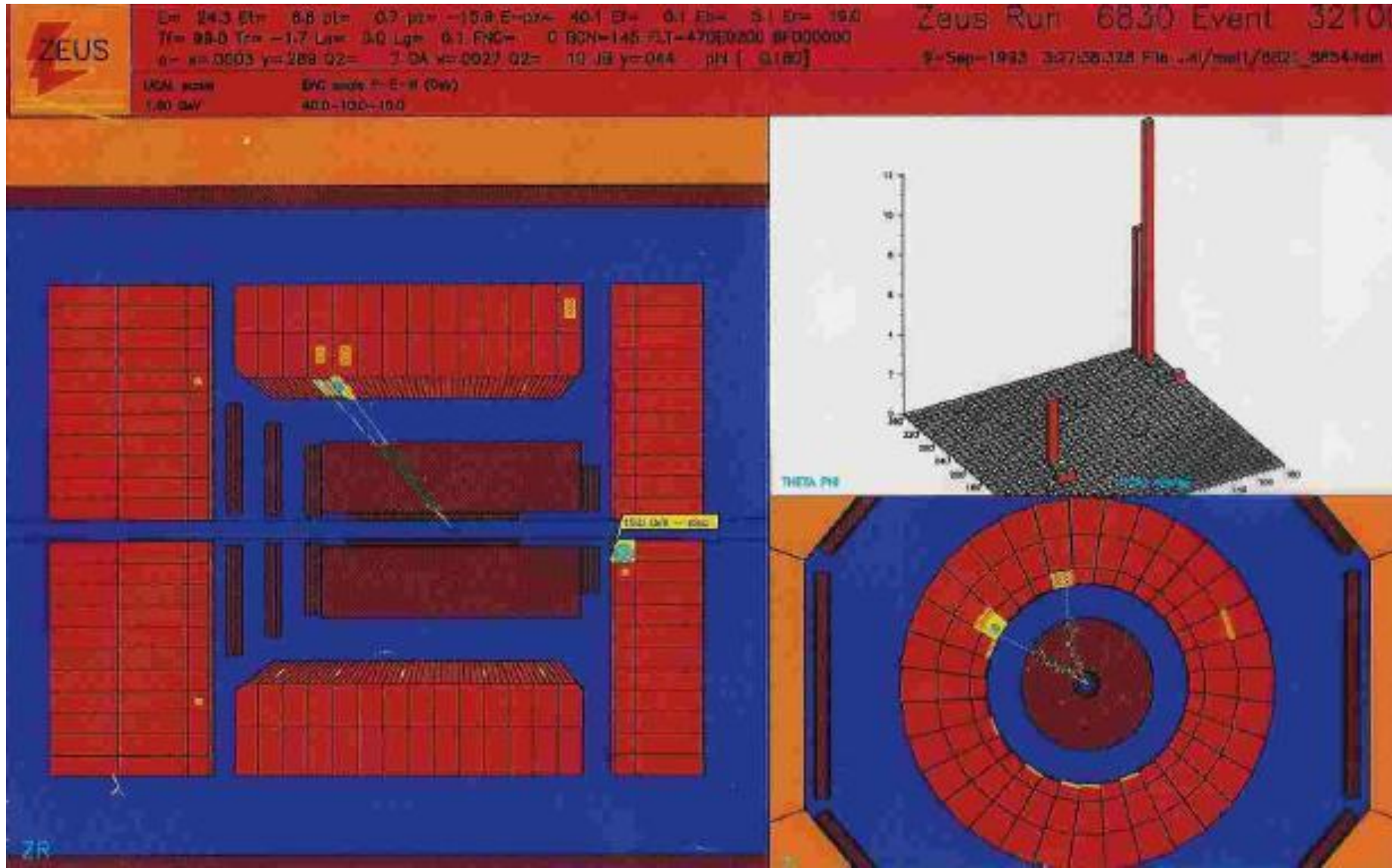
2000-2002 Luminosity Upgrade

HERA II: 2003-2007

Projected Luminosity: $L^{\text{sum}} \dots 500 \text{ pb}^{-1}$

- 820/920 GeV protons
- 27.5 GeV e[±]
- 300/318 GeV c.o.m. energy
- 220 bunches, 96ns. crossing time
- 90 mA protons, 40 mA positrons
- Instantaneous luminosity: $L^{\text{inst}} = 1.8 \times 10^{31} \text{ cm}^{-2} \text{ s}^{-1}$

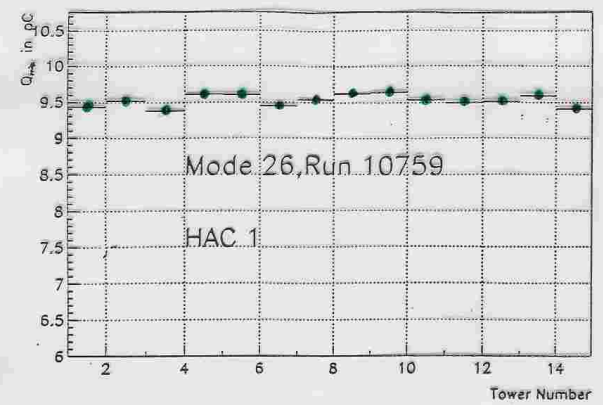
ZEUS Experiment



ZEUS Barrel ECAL construction

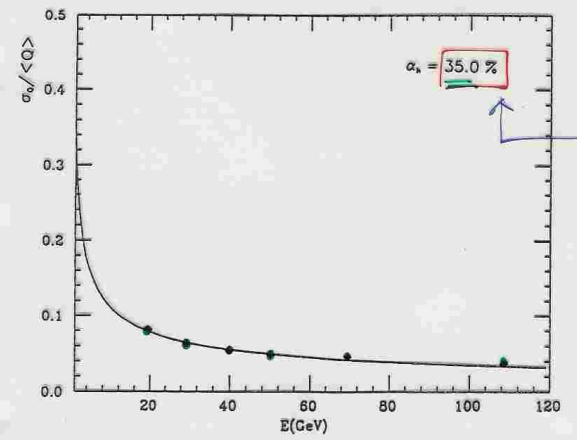


Fermi Lab E790 Test results.
Barrel Calorimeter tower to tower uniformity by μ



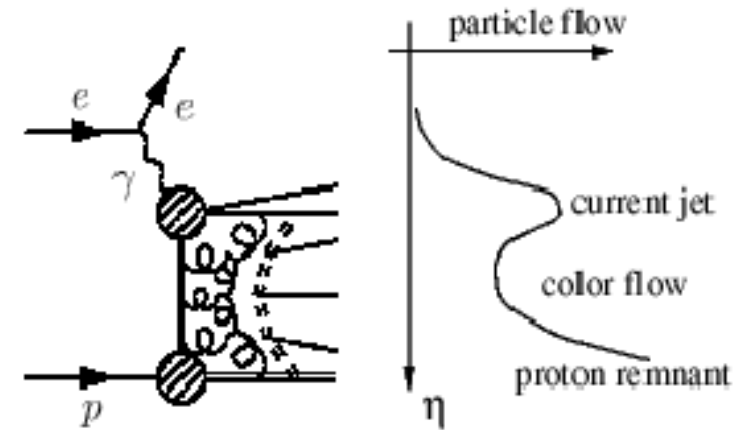
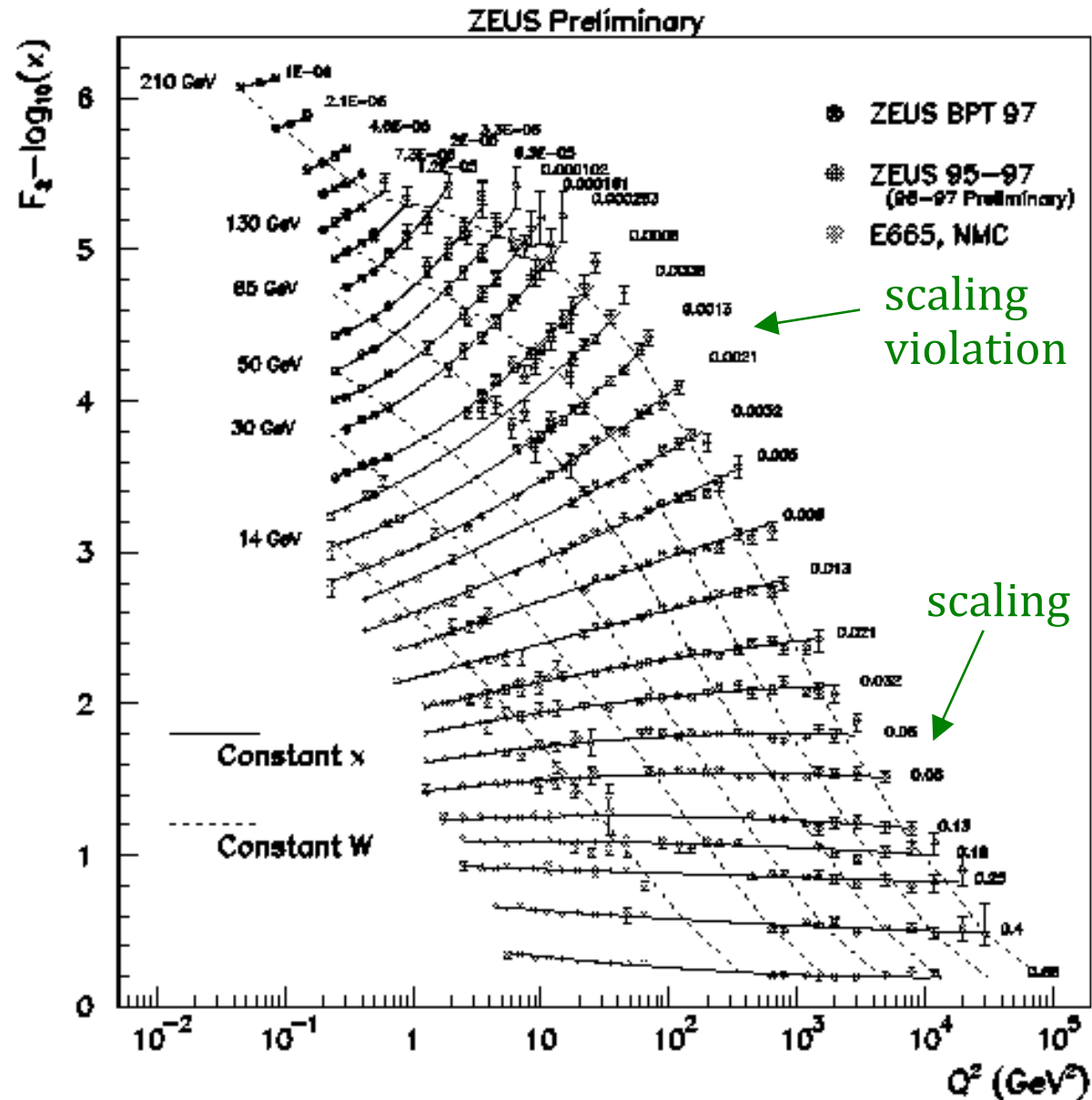
$\sim 1\%$
LSU

Hadronic energy resolution



$$\frac{\sigma}{E} \approx \frac{0.35}{\sqrt{E}}$$

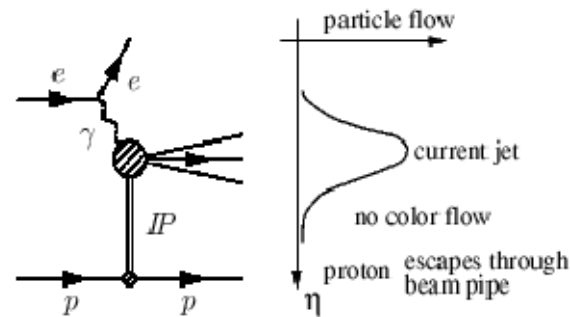
ZEUS F2 structure function



Diffractive ρ

Diffractive DIS

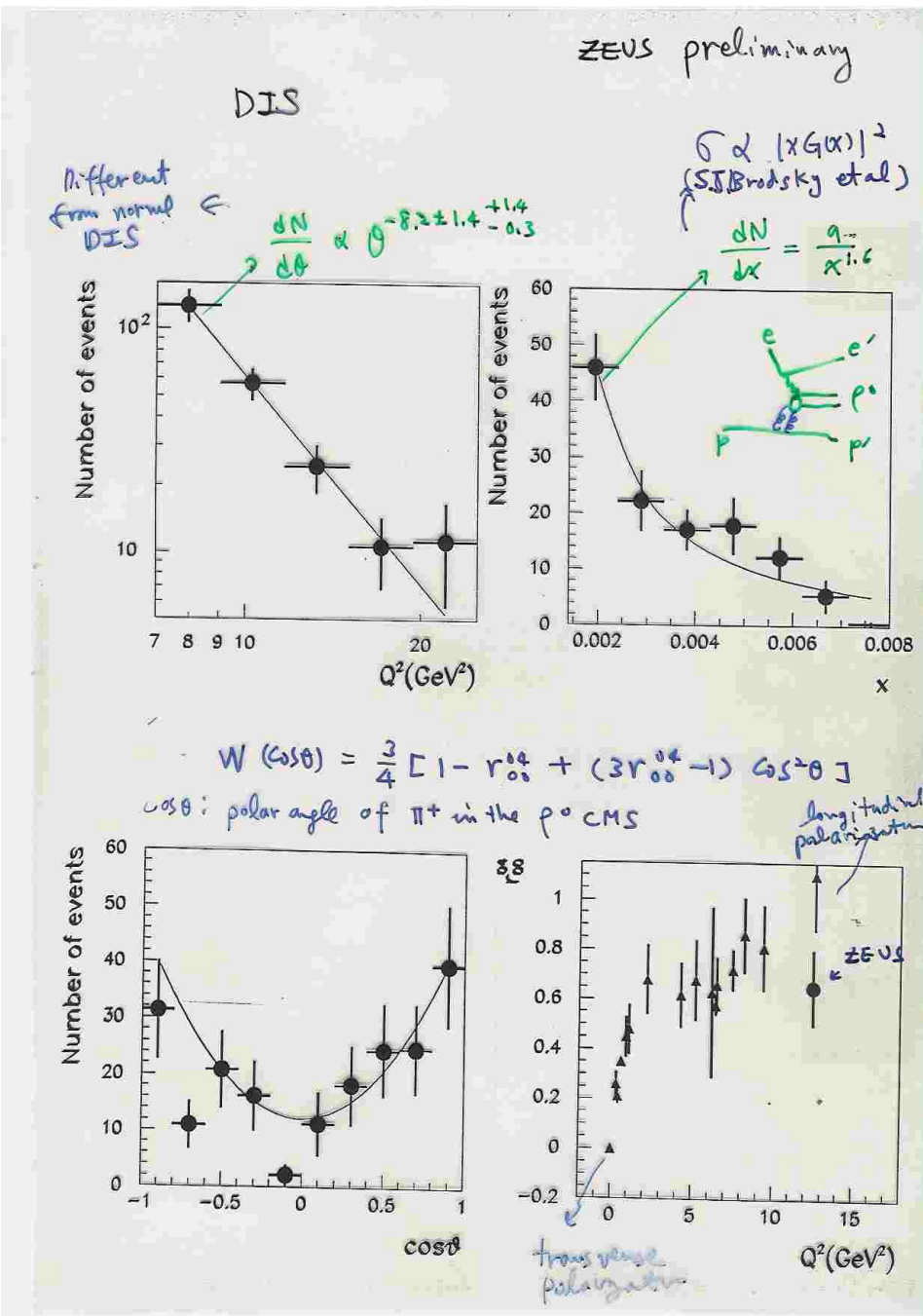
Vector Meson : $\rho, \phi, J/\Psi$



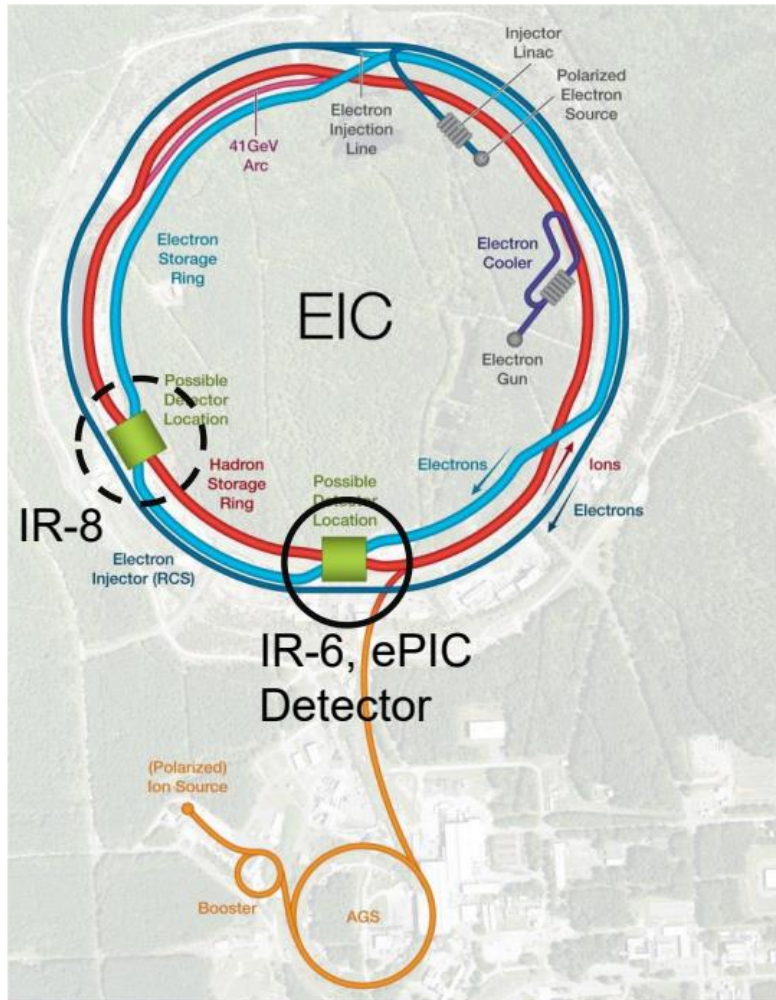
PLB 356, 1995

PLB 389, 1996

There are some discussion on e / p polarization and heavy ion instead proton but never been realized



The Electron-Ion Collider (EIC) at BNL



Brookhaven National Laboratory (BNL)

A high luminosity ($10^{33} - 10^{34} \text{ cm}^{-2}\text{s}^{-1}$) polarized electron proton/ion collider

The EIC luminosity will be a factor 100 to 1000 higher than at HERA.

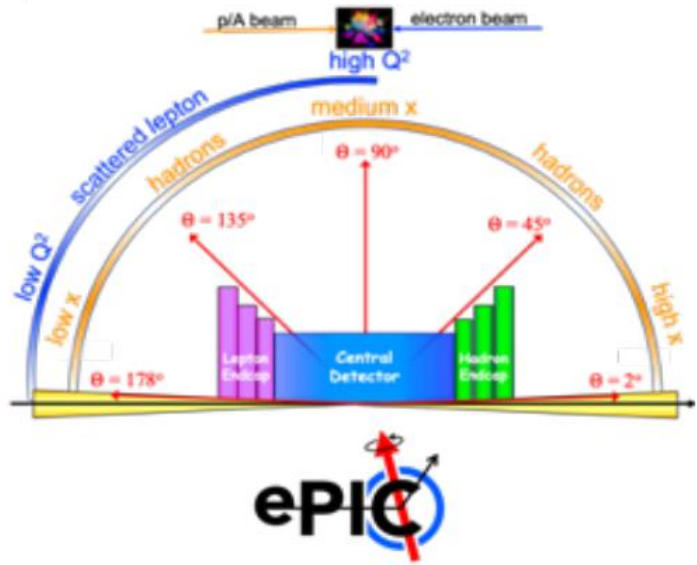
Both electrons and protons / light nuclei will be highly polarized (70%).

Science Program: An EIC can uniquely address three profound questions about nucleons - neutrons and protons - and how they are assembled to form the nuclei of atoms:

- How does the mass of the nucleon arise?
- How does the spin of the nucleon arise?
- What are the emergent properties of high-density systems of gluons?



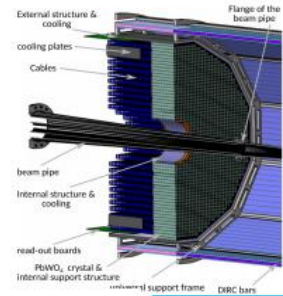
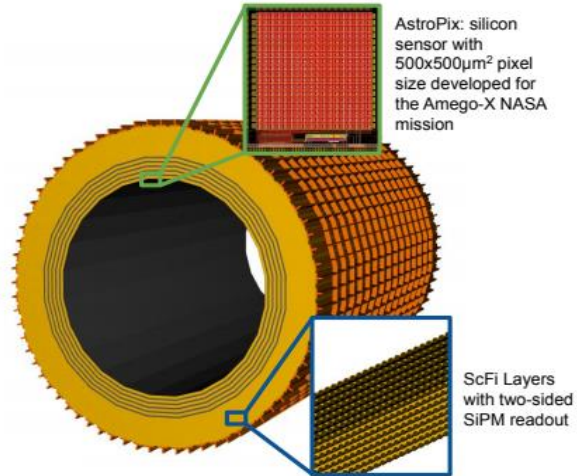
2. Imaging barrel ECAL for EIC



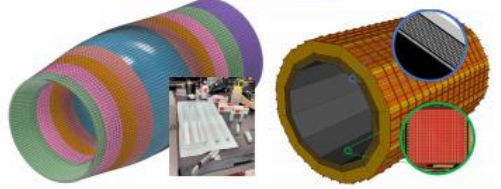
Insert layers of monolithic AstroPix sensors (inexpensive ultra-low-power silicon sensor developed for NASA) in the first half of the calorimeter to capture a 3-D image of the developing shower



Start from mature layered Pb/ScFi technology with side-readout (same as the GlueX calorimeter) for state-of-the-art sampling calorimeter performance



Backwards EMCal PbWO₄ crystals
 BECAL: SciGlass or Imaging Calorimeter

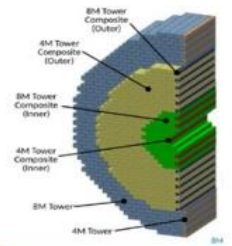


Barrel HCAL (SPHENIX re-use)



Calorimetry

Leading Korean activity on EIC



High granularity W/SciFi EMCal
 Longitudinally separated HCAL with high- η insert

A large, international collaboration with extensive expertise in calorimetry, silicon sensors, and large detector systems
The Imaging Calorimeter for ePIC



EIC-Korea Consortium

EIC-Canada Consortium

European Institutions

US Institutions

Argonne NATIONAL LABORATORY

NSERC CRSNG INNOVATION

1398

1881

1864

1981

APCTP PSQ@EIC & Science Opportunities with EIC

Date : July 18(Sun.) ~ 24(Sat.), 2021 Venue : Hilton Gyeongju Sponsor : apctp

*The APCTP is supported by the Korean Government through the Science and Technology Promotion Fund and Lottery Fund and strives to maximise social value through its various activities.
아시아태평양 이론티어센터는 정부의 과학기술진흥기금 및 복권기금 지원으로 사회적 가치 개고에 힘쓰고 있습니다.*

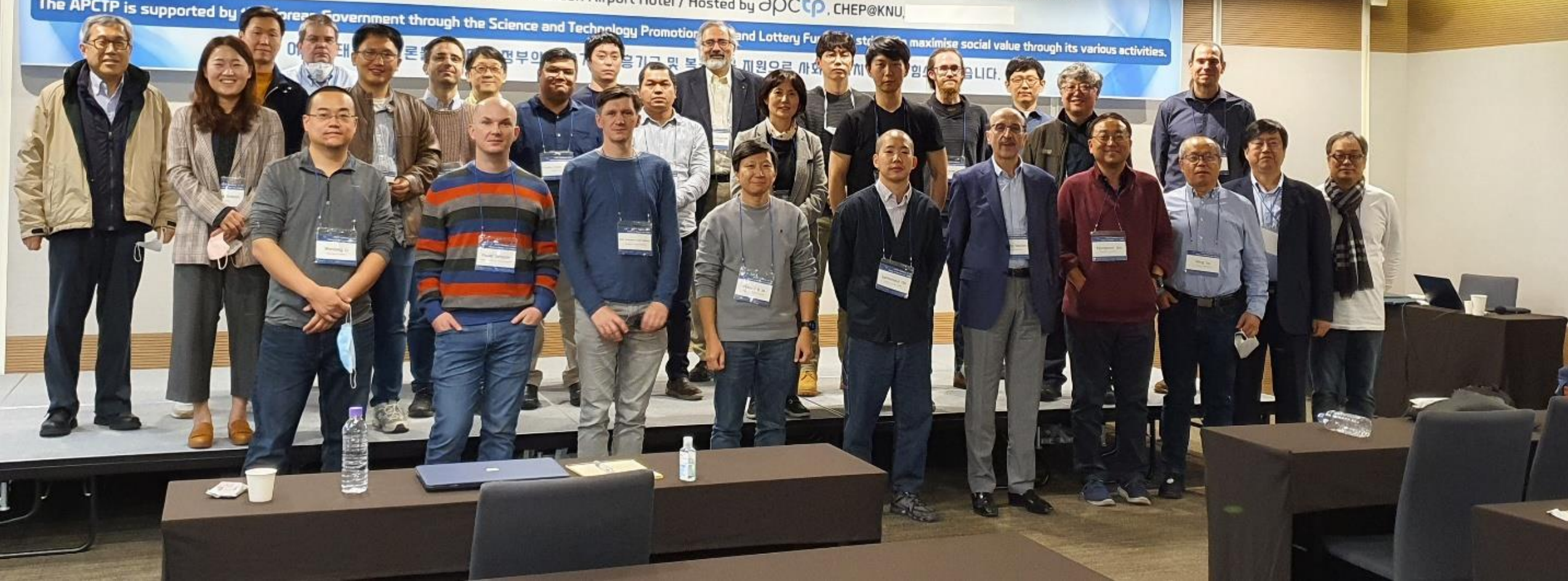


APCTP Workshop on the Physics of Electron Ion Collider

November 2-4, 2022 / Howard Johnson Incheon Airport Hotel / Hosted by \mathcal{APCTP} , CHEP@KNU,

The APCTP is supported by the Korean Government through the Science and Technology Promotion and Lottery Fund activities to maximise social value through its various activities.

이 대회는 과학기술정보통신부와 문화체육관광부의 지원을 받아 APCTP가 주최하고, 한국과학기술연구원(KIST)이 후원합니다.





CHARLES B. WANG CENTER

Welcome to the
Electron-Ion Collider
Resource Review Board
Meeting
April 3-4, 2023

April 3, 2023
Stony Brook U.



We will remember,
never forget
Prof. Oh and continue
to work on EIC project