

Activity of the Korean community for EIC

Yongsun Kim (Sejong Univ.)

PSQ@EIC meeting

2021.07.19

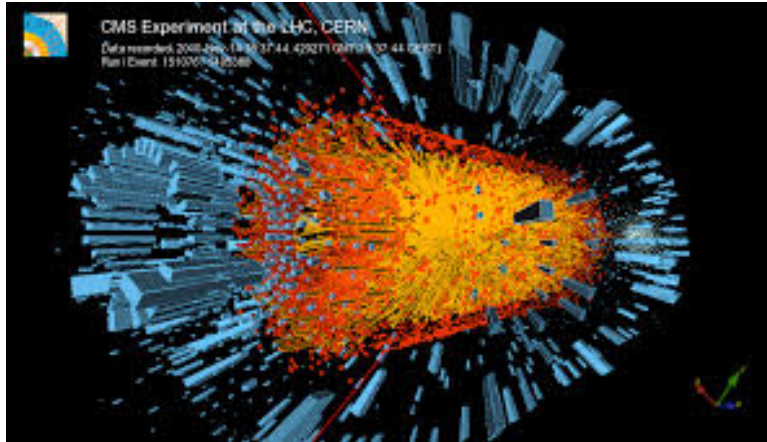
Outline

- Expression of Interest
- Current and prospective contribution for EIC

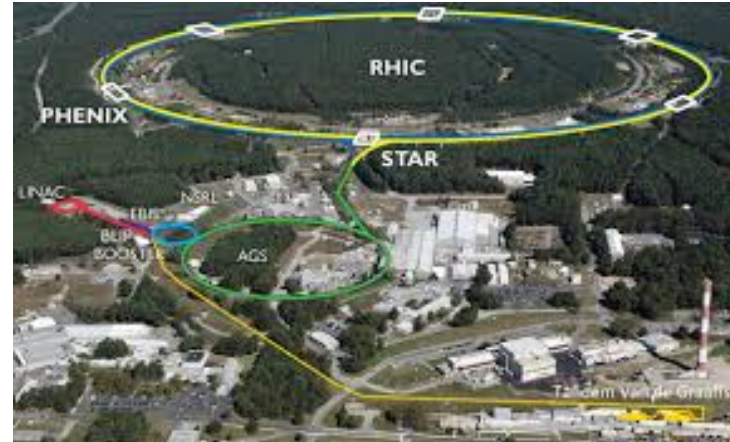


Experimental background Korean nuclear physics groups

CMS, ALICE



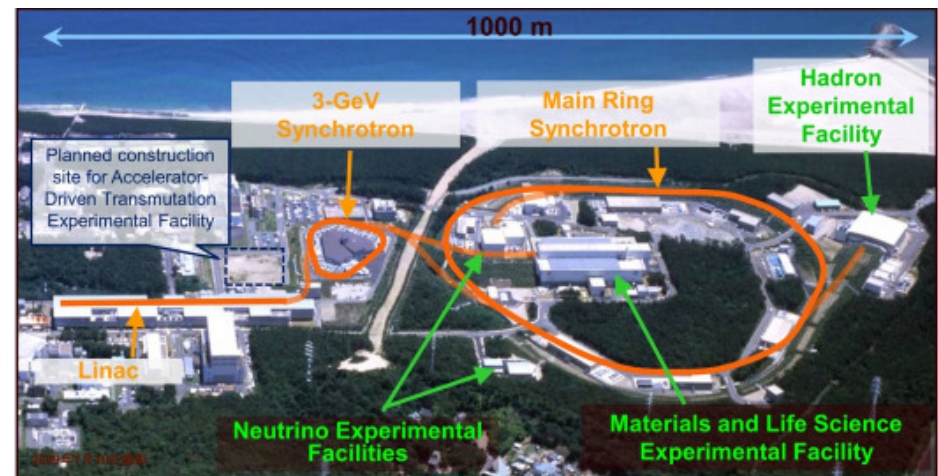
PHENIX, sPHENIX, RHICf



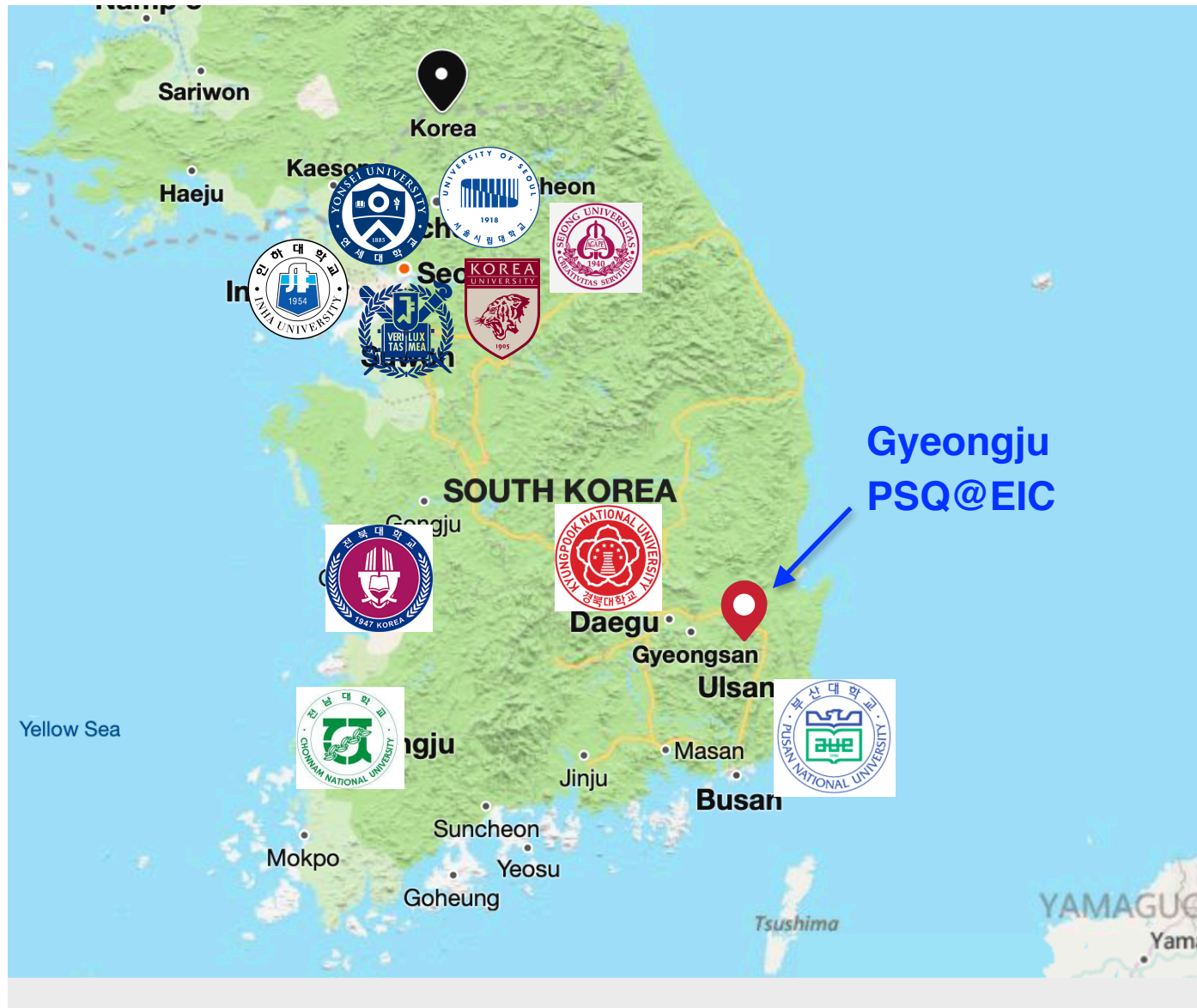
JLab



J-PARC



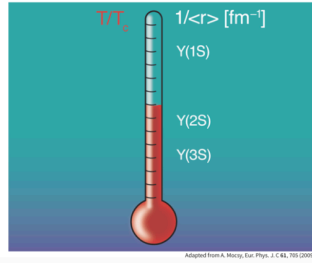
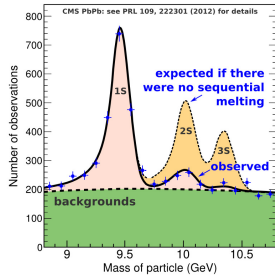
Experimental background Korean nuclear physics groups



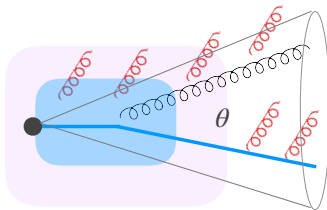
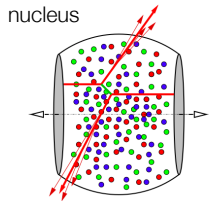
Physics interest of Korean NPS

Hard Probes

Quarkonia modification

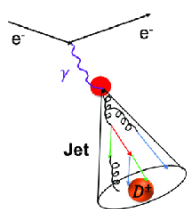


Jet quenching

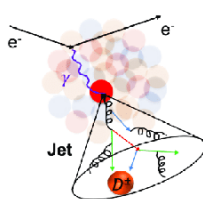


Heavy flavor

$$e^- + p \rightarrow e^- + jet(D^\pm) + X$$

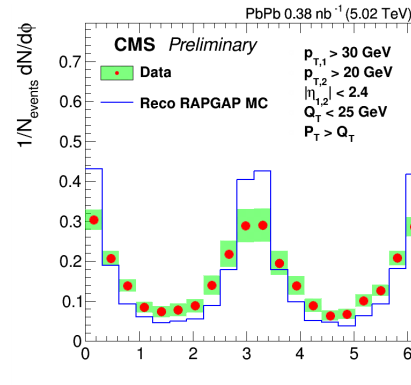


$$e^- + Au \rightarrow e^- + jet(D^\pm) + X$$

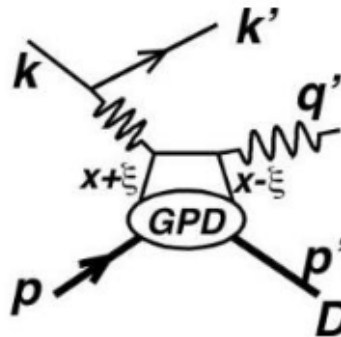


Electromagnetic probes

Photo-production in UPC



Electron scattering



Precedent contribution for international collaboration

RPC gap production for CMS

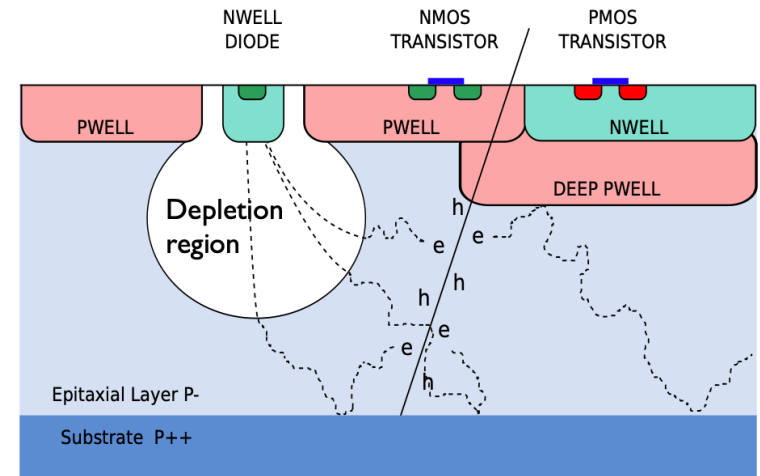
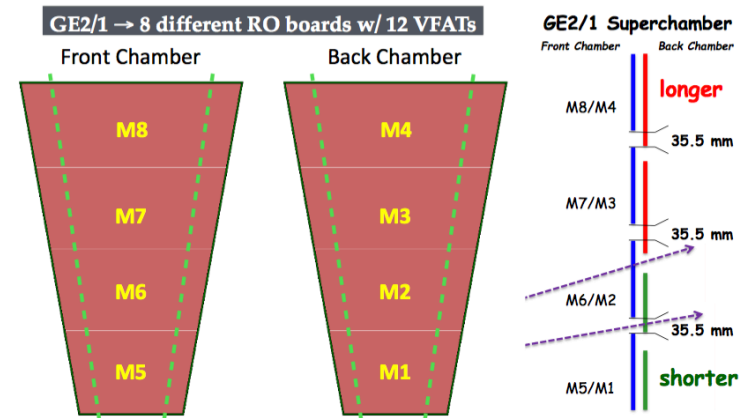
- A longstanding hardware activity from 1990s by Korean high energy & nuclear physics groups

GEM foil for CMS

- CMS phase2 upgrade
- R&D from 2014 by K-CMS group

MAPS upgrade for ALICE ITS

- R&D for Pixel chip design and beam test
- Ko-ALICE groups - Inha Univ., Yonsei Univ., Pusan Natl. Univ.



Expression of Interest

- 13 faculties from 9 institutes
- Primary contact: Prof. Yongseok Oh (KNU)

Group	Devoted to	Institutions	Faculties
A	Forward Calorimeter	Korea University	Byungsik Hong Jung Keun Ahn
		Sejong University	Yongsun Kim
		Chonnam National University	Dongho Moon
B	Pixel Tracker	Jeonbuk National University	Eun-Joo Kim
		Pusan National University	Sanghoon Lim
		Yonsei University	Youngil Kwon
		Inha University	Minjung Kweon
C	Dual-Readout Calorimeter	Kyungpook National University	Hyon-Suk Jo Sehwook Lee
		University of Seoul	Jason Lee
		Yonsei University	Hwidong Yoo

Expression of Interest

Group A (Forward Cal)	R&D of forward calorimeters, including neutron detectors at the very forward region.
Group B (Pixel Tracker)	Development, test, and production of silicon pixel detector
Group C (Dual-Readout)	single component calorimeter technique including entire functionalities of both electromagnetic and hadronic calorimeters

- **Group A (forward calorimeter)**
 - Development of prototypes and electronics for the forward calorimeters, including the very forward neutron detector.
 - Inspired by the physics interest of the heavy ion groups involved in CMS, PHENX, and RHICf
 - Open to collaboration with other institutions (RIKEN, ISU, KU)

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- Group B (pixel tracker)
 - R&D of silicon sensor and production
 - Institutions in this group have also been participating in sPHENIX and ALICE
 - Basic R&D infrastructures for ALICE ITS2 and ITS3 upgrade projects in Korea can be utilized for the EIC project as well.

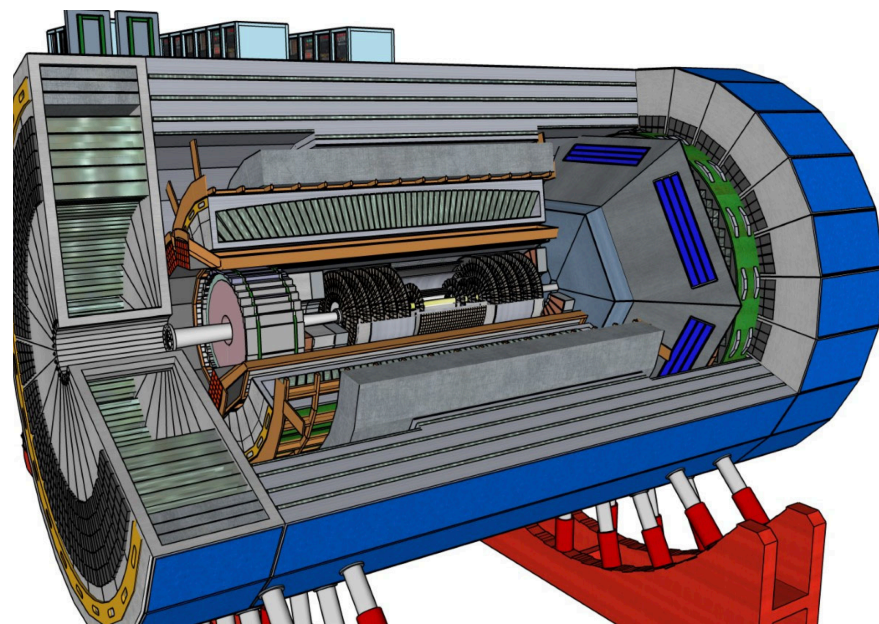
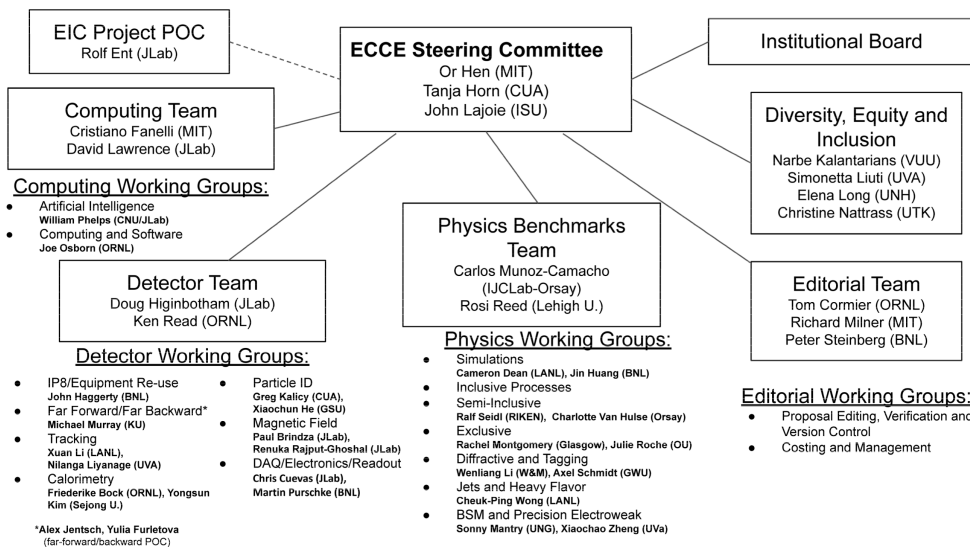
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- Group C (dual-readout)
 - Well established hardware facilities
 - HEP detector facility at Kyungpook Natl. Univ. (KNU)
 - DRC R&D center at Yonsei University
 - Supercomputing centers at KNU and Univ. of Seoul
 - Currently building prototype detector of dual-readout calorimeter
 - 5-year Funding for dual-readout R&D is secured (\$2M for 2020 - 2025)

[Group C] Participation in ECCE consortium

ECCE Consortium



5/10/2021

ECCE 4th IB Meeting

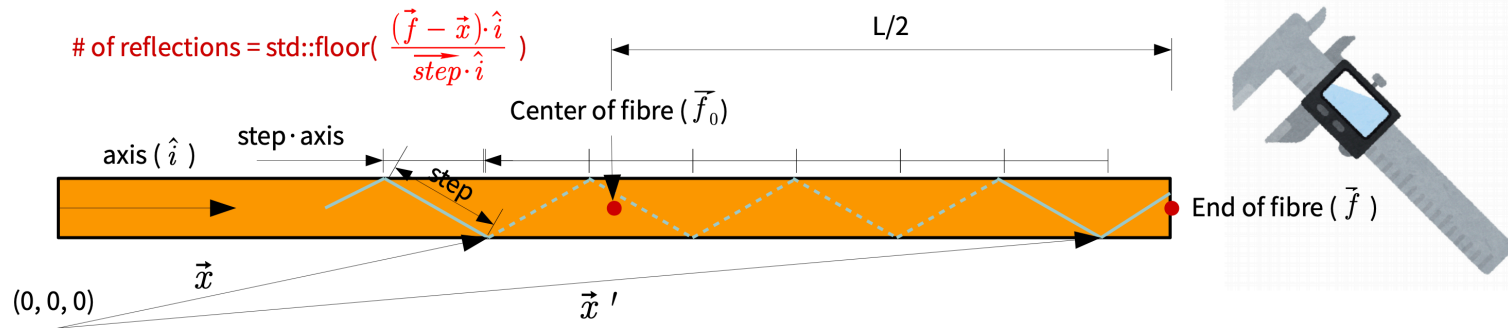
- **EIC Comprehensive Chromodynamics Experiment** ecce-eic.org
- Proposed to build detector on the foundation of existing infrastructure at RHIC and JLab
- Group C (dual-readout) is actively involved in the forward calorimeter studies

Implementation of DRC in ECCE simulation

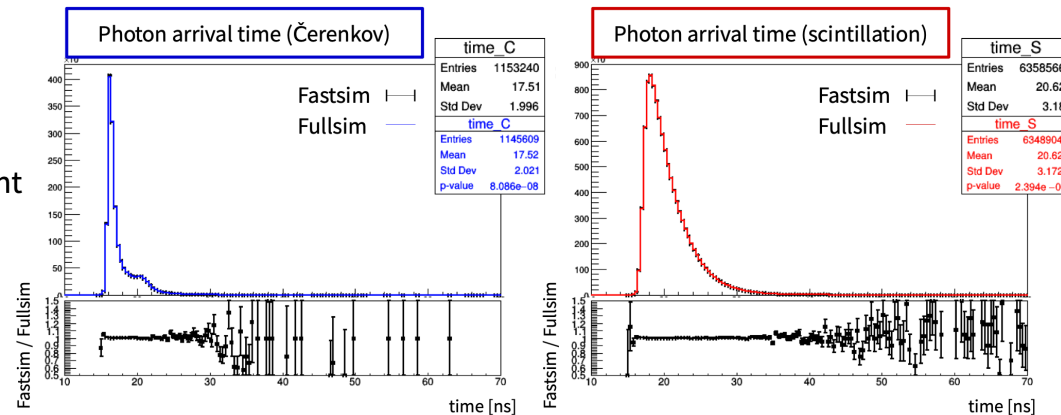
- Study of reconstruction performance for hadron and jet using fast simulation tool for DRC (H. Yoo)

Developing fast simulation for optical photon tracking

- Simulating photon propagation is necessary, but dominates CPU consumption
 - Yet, propagation of optical photons in fibres can be estimated, skipping full tracking
- Developing a fast simulation module presented at GEANT4 R&D meeting [\[link\]](#)



- Preliminary Fastsim model shows excellent agreement with Fullsim
- Takes ~ 4 mins to simulate an event of 20 GeV e-
→ more efforts for further improvement on-going



Summary

- The Korean nuclear physics society has big interest in the physics research with EIC
- Three subgroups interested in detector R&D
 - Group A - forward and far-forward calorimeters
 - Group B - Silicon pixel tracker
 - Group C - Application of dual readout calorimetry
- To realize the Eol, we are...
 - seeking for substantial funding for long-term R&D and significant contribution for EIC detector construction
 - initiating discussion in the nuclear physics division of KPS for the coordination of EIC participation and for the inflow of new manpower

BACKUP