

# Korean activity and prospect

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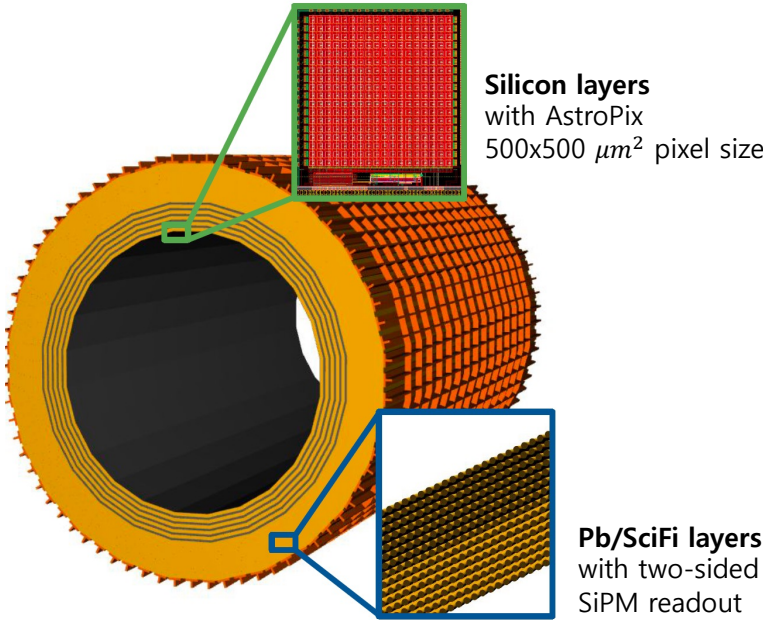
EIC-ASIA workshop

NCKU Tainan, 2024.01.29



# Barrel Imaging Calorimeter (BIC)

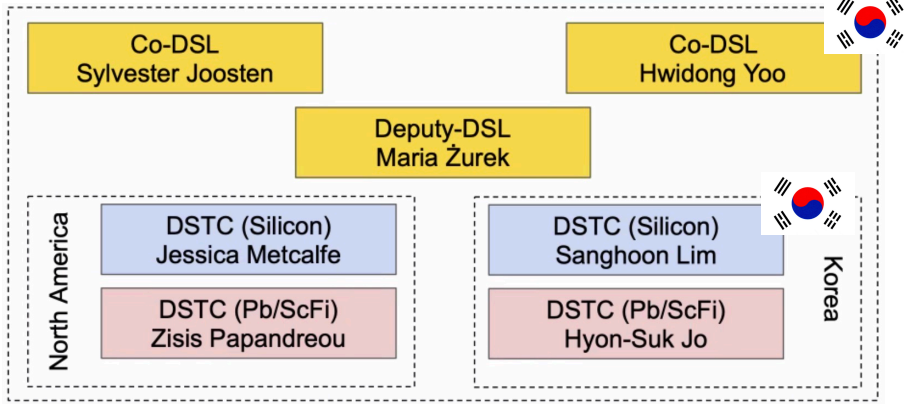
- Korea-bECAL group aims to make substantial contribution to R&D and construction of BIC
- Si chips : designing, mass production and wire-bonding
- Pb/SciFi: Developing prototypes and working on beam tests at SPS
- Getting support from NP and HEP society in Korea



## K-BECAL members (10 faculties)

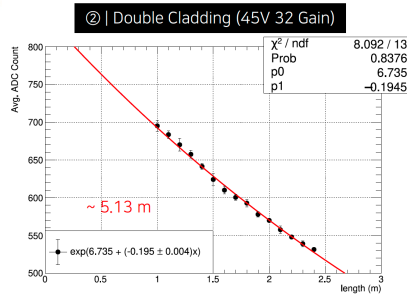
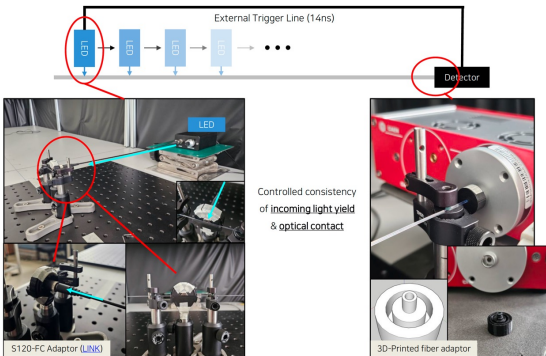
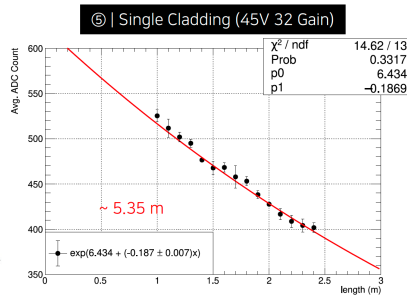
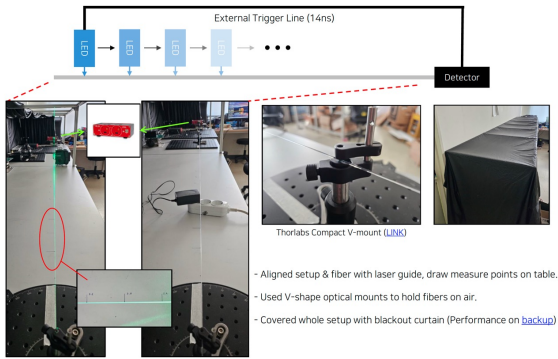
							
H.D. Yoo CMS	H.J. Kim S.W. Lee H.S. Jo CMS	S.H. Lee CMS	S.H. Lim ALICE	S.Y. Choi CMS	B.K. Kim ALICE	B.G. Cheon BELLE	M.S. Kim CMS

## Managements in bECAL



## • Fiber attenuation measurement

- Comparison between single and double cladding
- Under development of automated process

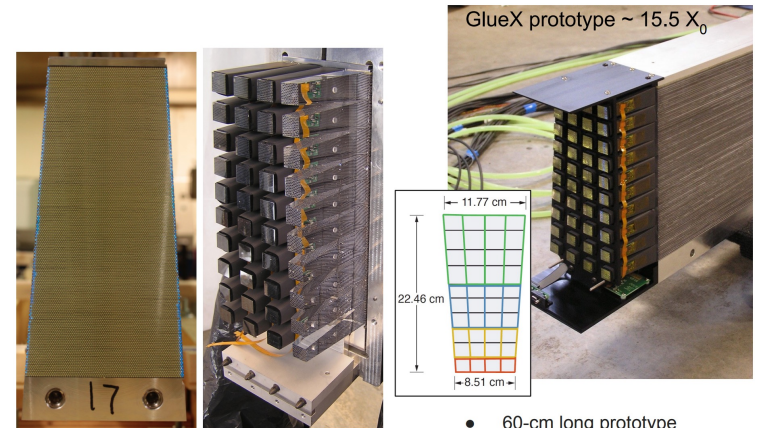


	SC	DC
Avg.	5.19 m	4.87 m
Stdev.	0.45 m (~9%)	0.18 m (~4%)

Measured Attenuation length

## • Prototype Pb/SciFi production

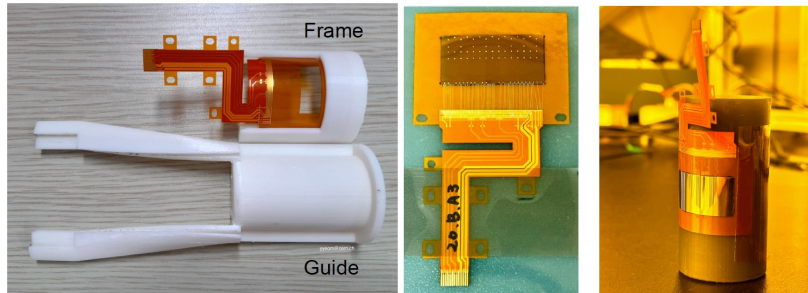
- Similar design of the GlueX prototype
- Under development of processing Pb layers
- Prototype can be used for further developing read-out box and testing with silicon layers



- 60-cm long prototype
- 40 light guides on either side
- 40 SiPMs per side

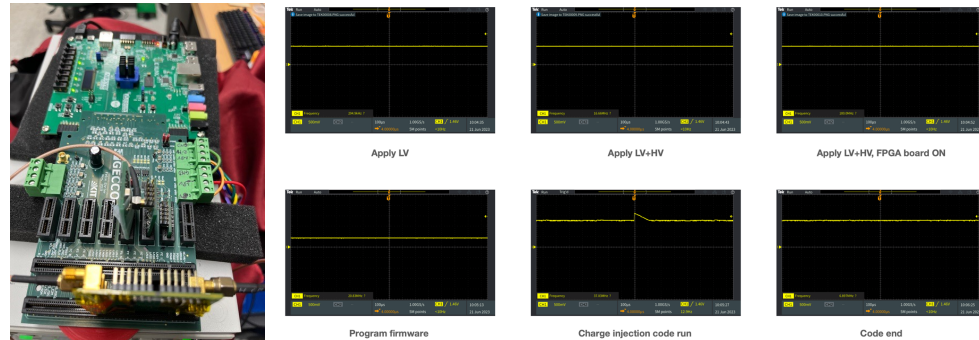
## *Silicon detector R&D for ALICE ITS3*

Mini-telescope with ALPIDE and APTS



- **Testbench with AstroPix v2**

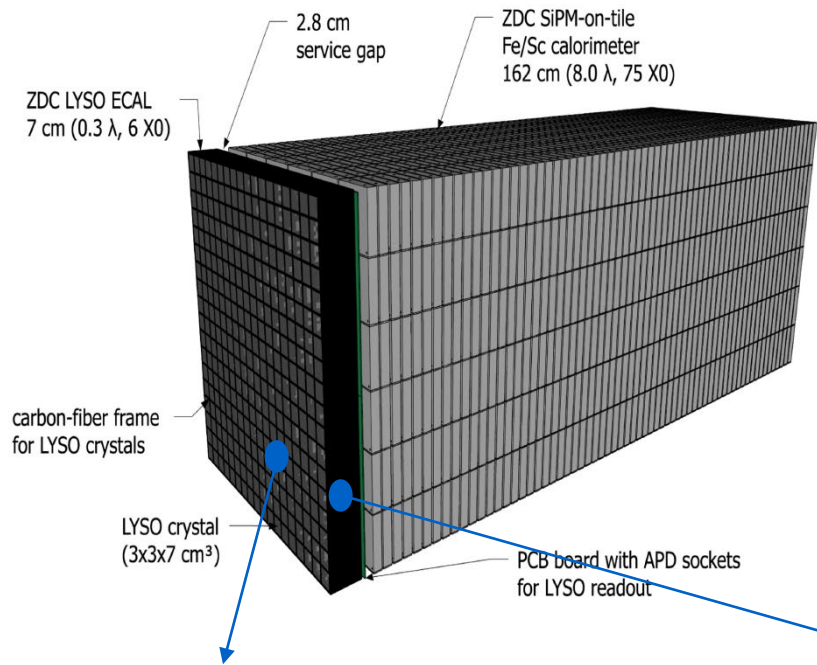
- Built a testbench and performed a basic operation with charge injection



- **Testbeam with ALPIDE telescope**

- 6 ALPIDE layers for reference track:  
Excellent tracking with position resolution of 5  $\mu\text{m}$
- DUT (AstroPix v3 or v4):  
Position resolution and tracking efficiency
- DAQ with a common external trigger
- Possibly having a regular testbeam at KEK with Japanese institutions in ALICE

*In collaboration with MEMSPACK, a local company*



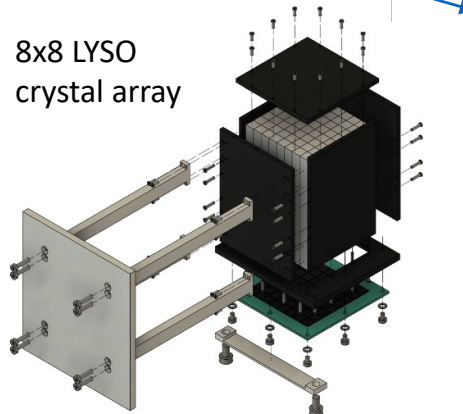
- Korean ZDC group has been working in the FoCAL-like detector study
- inspired by common interest in ALICE FoCAL
- 3 faculties from Korea University and Sejong University, possible addition from Ko-ALICE electronics people
- Collaborating with Japanese and Taiwanese groups
- Beam test scheduled in Feb 19-21 at ELPH



## LYSO Crystals

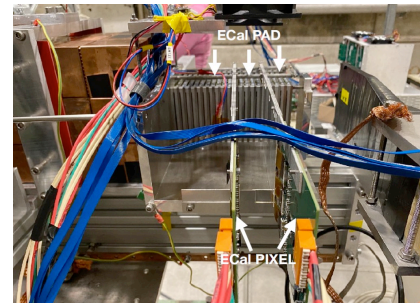


## 8x8 LYSO crystal array

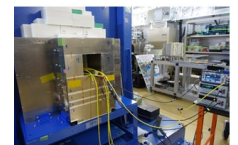
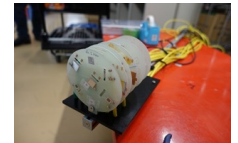


## W+Si pad Layers for tracking (ALICE-FOCAL)

ALICE-FoCAL beam test@CERN

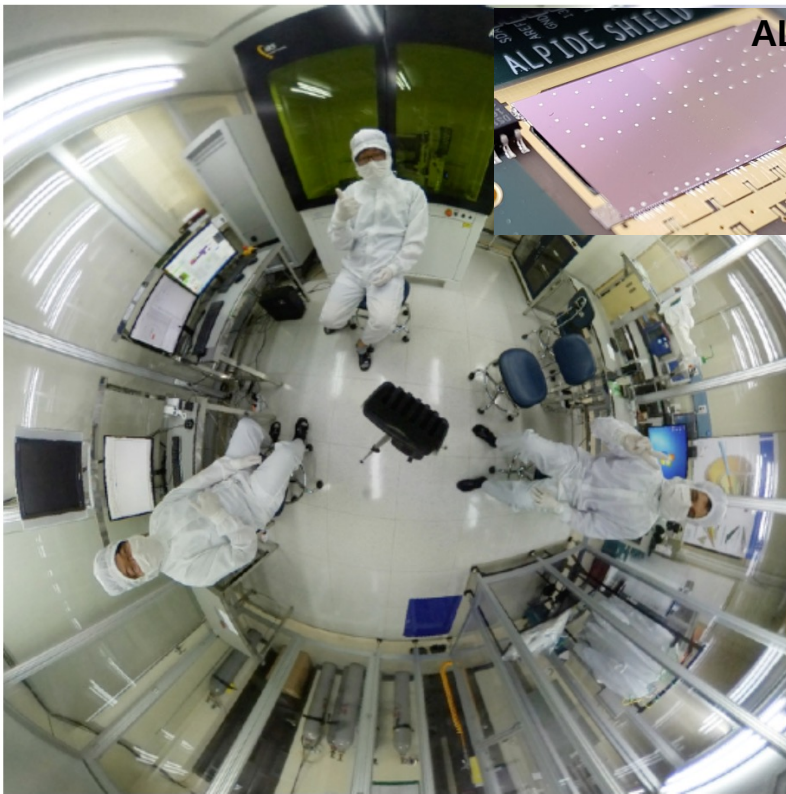


Neutron irradiation  
RIKEN RANS



# R&D resources in Korea

- BIC
  - KoALICE labs for ITS3 R&D (PNU, Inha U, Yonsei U)
  - Calorimeter labs for IDEA @ FCC (Yonsei U, KNU)



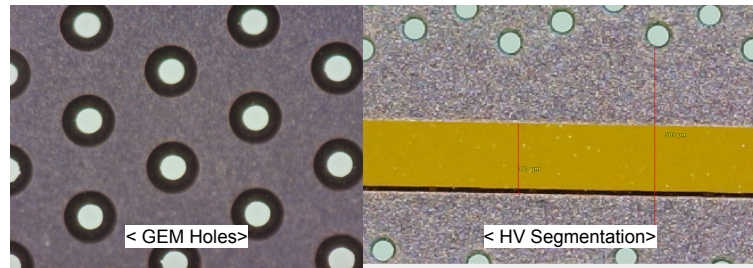
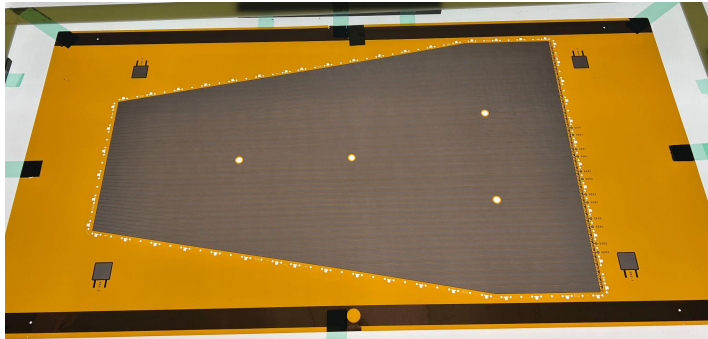
*PNU/Inha University*



*Yonsei University*

# Utilization of existing resources in Korea

- GEM facility for ePIC gas tracker provider?
- K-CMS group has made GEM layers for forward trackers (GE21 & ME0)
- Recently relocated to RAON, rare isotope accelerator facility in Daejeon, and built a new production line
- MoU between RAON and CMS by arbitration of MIST



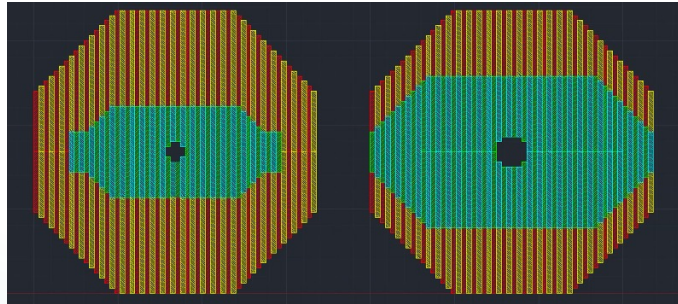
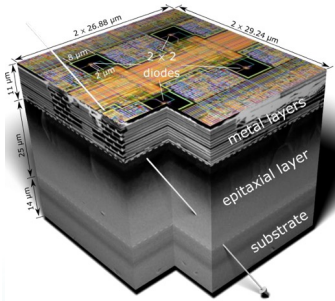
# Utilization of existing resources in Korea



- The laboratory and the researchers's expertise has the potential to significantly contribute to the MPGD construction
- KCMS researchers are very interested in making prototype  $\mu$ RWELL

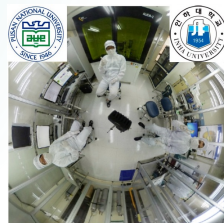
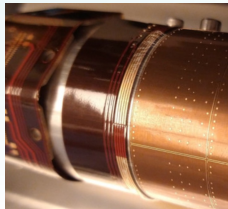
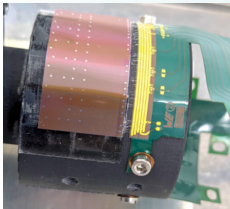


# Silicon detector

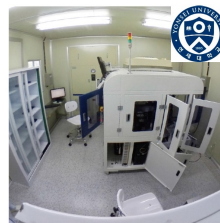


- Actively involved in designing of ALICE ITS3 and will extend the current R&D for ePIC
- Expertise in thinning, dicing, wire-bonding and mass production test
- Participated in the ALPIDE chip design and the ALICE ITS2 outer barrel HIC mass production
- Developing MAPS chips in China (Top-metal series chips, MIC series chips, etc.)
- Contributing to sPHENIX MVTX (MAPS) related readout, trigger and DAQ.

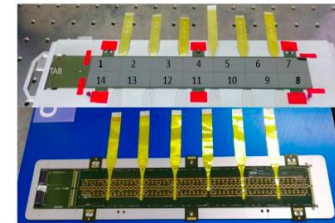
**ALICE ITS3**  
(bent MAPS, 65nm, wafer-size sensor)



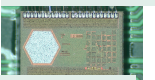
PNU/Inha University



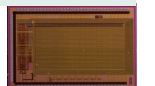
Yonsei University



Topmetal-S



MIC4/5



# Theoretical activities

- Korean Had-th (HaPHY) community began organized activity for EIC physics
  - 7 PhD's from Inha U, Kyungpook Nat U in collaboration with NC state U
  - Mechanical structure of the SU(3)-flavor hadrons from chiral effective models
  - Nucleon properties within the chiral quark-soliton model
  - Backward hard exclusive reactions and transition distribution amplitudes
  - Pion factor, TMDs and PDFs in the light-front quark model
  
- Formation of lattice QCD collaboration
  - Growing consensus on the necessity of ab initio calculations
  - Aims to compute physical observables - form factors & HF production at EIC
  - 5 PhD's from Sejong U, PKNU, IBS



# Summary

- 15 faculties in 10 institutes in Korea are actively working for ePIC detector R&Ds, in close collaboration with the US and Asian institutes
  - BIC R&D on track
  - ZDC R&D engaged with FoCAL study
- Seeking for further contribution - MPGD, endcap tracker, and LAGD
- began organized activity for theoretical studies
- Funding from Korean government for detector R&D is promising