중앙대학교
CHUNG-ANG UNIVERSITY

Summary of the 2026 Korea Neutrino ($Korea-\nu$) Symposium

On behalf of $Korea-\nu$ presenters



NNN 2026

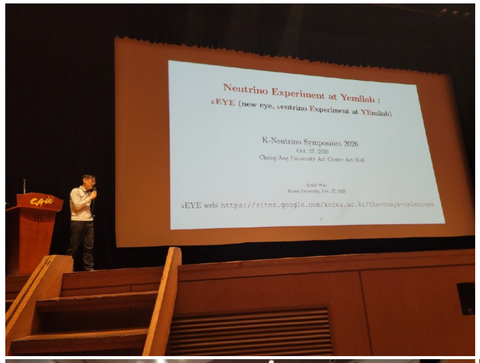
Chung-Ang University
Chang Hyon Ha

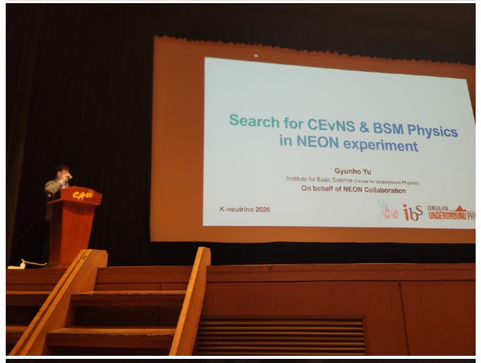
Photos

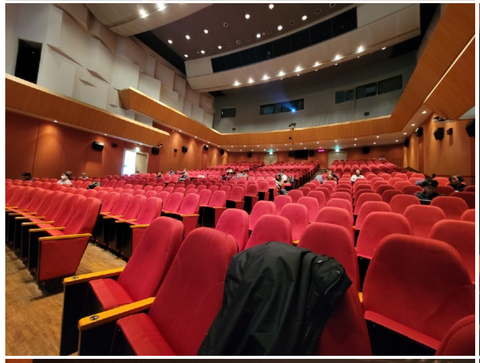
K-Neutrino Symposium 2026

Tuesday Oct 27, 2026, 8:00 AM → 7:10 PM Asia/Seoul
Chung-Ang University Art Center (Bldg. 301)



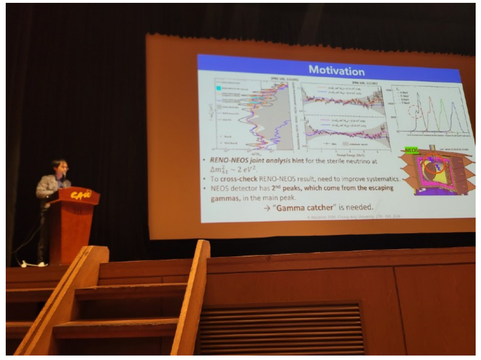


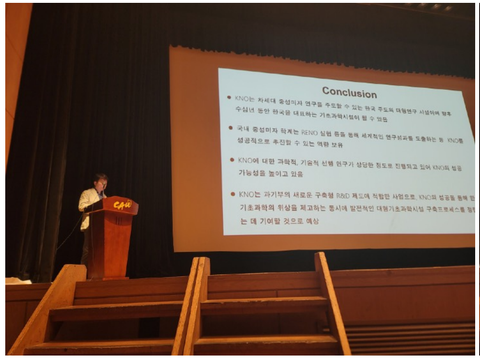


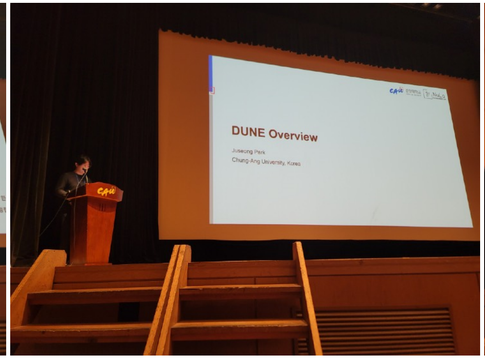


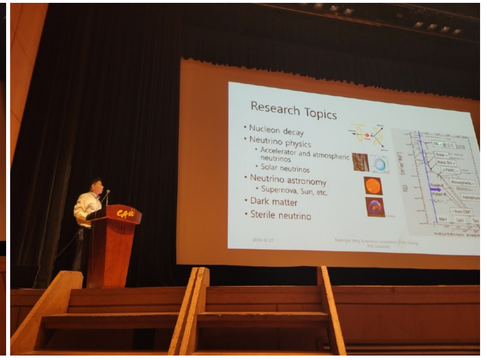


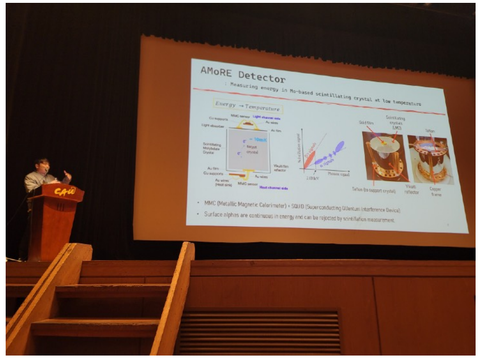












Goal and Organizations

- Provide a forum for **neutrino researchers in Korea to share their research activities** and recent results with the broader domestic community.
- Encourage presentations focusing on **ongoing research and scientific contributions within each experiment**, in addition to general experimental overviews.
- Promote communication and collaboration among neutrino researchers in Korea.

- Jointly organized by the Center for Precision Neutrino Research (CPNR) at Chonnam National University and the CAU High Energy Physics Center at Chung-Ang University.
- Combines the existing CPNR Workshop and Korean Neutrino Symposium (K-nu) into a single joint event.

Thanks!

■ Scientific Program Committee

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■ Local Organizing Committee

Sang Yong Kim (CNU), Ji Young Choi (CNU), Da Eun Jung (CNU)

Sun Kyu Lee (CNU), Sunwoo Gwon (CNU)

■ Hosting Institutes:

Chonnam National Univ. Center for Precision Neutrino Research (전남대 중성미자 정밀연구센터)
CAU HEP Center (중앙대 고에너지물리센터)
CAU NuLa (중앙대 중성미자 연구실)

■ Secretariat

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Program: https://indico.neutrino.or.kr/event/541/

43 participants, 13 talks, 5 posters

Session 1

9:00 AM — **Neutrino Theory**
Speaker: Prof. Sin Kyu Kang (Seoul National University of Science and Technology)

9:40 AM — **IceCube**
Speaker: Taeyun Kim (Sungkyunkwan University)

10:00 AM — **SK/HK**
Speaker: Byeongsu Yang (Chonnam National University)

10:20 AM — **KNO**
Speaker: Prof. Intae Yu (Sungkyunkwan University)

Break

Session 2

11:20 AM — **LiquidO**
Speaker: Yoomin Oh (Institute for Basic Science)

11:40 AM — **AMoRE**
Speaker: Woo Tae Kim (Institute for Basic Science)

12:00 PM — **DUNE**
Speaker: Juseong Park (Chung-Ang University)

Posters

Session 3

2:20 PM — **SND@LHC**
Speaker: Yeong Gyun Kim (Gwangju National University of Education)

2:40 PM — **JSNS^2**
Speaker: ChangDong Shin (Dongshin University)

3:00 PM — **COHERENT**
Speaker: Se Wook Oh (Seoul National University)

Break

Session 4

4:00 PM — **NEON**
Speaker: Gyunho Yu (Institute for Basic Science)

4:20 PM — **RENE**
Speaker: Sunkyu Lee (Chonnam National University)

4:40 PM — **nuEYE**
Speaker: Eunil Won (Korea University)

Posters

1:20 PM — **Distance- and Direction-Dependent Dose Responses of a Portable G-M Detector for Sealed ^{60}Co and ^{22}Na Sources** (1h)

Characterization of dose responses according to source-to-detector distance and measurement direction is important for interpreting radiation measurements involving sealed radioactive sources. In this study, a portable Geiger–Müller (G-M) tube detector was evaluated using sealed ^{60}Co and ^{22}Na sources under circumferential and distance-dependent measurement configurations. Measurements were performed at various distances and directions, including the front and rear orientations of the detector. The measured dose decreased markedly with increasing distance for both radionuclides. Direction-dependent variations were also observed at identical source-to-detector distances. In particular, the front and rear measurements exhibited different dose responses, indicating that the effective distance to the sensitive volume and the detector housing geometry influenced the measured values. These findings demonstrate that both distance and detector orientation significantly affect G-M tube responses. Therefore, the detector reference point and measurement direction should be clearly defined and consistently maintained to ensure accurate and reproducible measurements.

Speaker: Dr ByoungChan KIM (Chonnam National University)

2026 poster - bcki...

1:20 PM — **Extending Monopod Reconstruction for the IceCube Upgrade** (1h)

We present ongoing work to extend Monopod, a likelihood-based reconstruction algorithm, to electron neutrino events in the IceCube Upgrade. The multi-PMT optical modules require response models that account for individual PMT orientations and sensitivities. We develop photon-response tables and spline parameterizations of the expected light yield and arrival-time distributions for use in Monopod. This poster describes the implementation, preliminary validation with simulated electron neutrino events, and remaining challenges in incorporating Upgrade sensor information into the reconstruction.

Speaker: MinSu Kwak

1:20 PM — **Implications for Inelastic Dark Matter from the LUX-ZEPLIN Nuclear Recoil Event** (1h)

Recently, the LUX-ZEPLIN (LZ) experiment reported a high-energy nuclear-recoil event with a recoil energy of 248 keV.
Motivated by this event, we study the event-rate calculation for inelastic dark matter–nucleon scattering and apply the formalism to a toy dark matter model.
We investigate the allowed parameter space and compare our results with bounds from other direct-detection experiments.
This study provides a framework for exploring inelastic dark matter models in future direct-detection searches.

Speaker: Jeonghak Han (Chung-Ang University)

1:20 PM — **Simulation and Computing Status of the RENE Experiment** (1h)

The Reactor Experiment for Neutrinos and Exotics (RENE) is a short-baseline reactor neutrino experiment aimed at searching for sterile neutrinos through oscillation measurements at the Hanbit Nuclear Power Plant in Yeonggwang, Korea. The detector consists of a 0.5% gadolinium-loaded liquid scintillator target surrounded by a liquid scintillator gamma catcher and is equipped with 20-inch photomultiplier tubes (PMTs). Currently, the RENE detector is installed at the RENO far site and is taking commissioning physics data. This poster presents the current status of Monte Carlo simulation studies for the RENE experiment. An overview of the computing environment is also provided.

Speaker: Eungyu Yun (Chonnam National University)

RENE Simulation ...

1:20 PM — **Transformer for IceCube** (1h)

Transformer for IceCube

Speaker: Hani Kimku (Chung-Ang University)

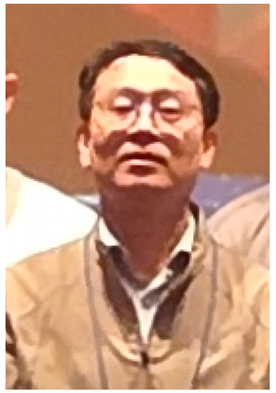
IceCube Upgrade ...

Highlights

Theory

Conclusions

- Neutrino oscillations have been established by many experiments over a wide range of neutrino energies.
  → **Neutrino physics has entered the precision era.**



Sin Kyu Kang

Tri-bimaximal Mixing: A Hint of Discrete Symmetry

Before measuring θ_{13} , tri-bimaximal mixing (TBM) hypothesis :

- $U^{TBM} = \begin{pmatrix} \frac{2}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & 0 \\ \frac{1}{\sqrt{6}} & \frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{6}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} \end{pmatrix}$

Harrison & Perkins & Scott (2002)

$\theta_{13} \approx 0; \quad \theta_{23} \approx 45^\circ; \quad \theta_{12} = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right) \approx 35.3^\circ$

→ TBM pattern can be derived from discrete symmetries but ruled out

- Modifications of TBM :

$$U_{\mathrm{TM1}} = \begin{pmatrix} \frac{2}{\sqrt{6}} & \frac{\cos\theta}{\sqrt{3}} & \frac{\sin\theta}{\sqrt{3}}e^{-i\phi} \\ -\frac{1}{\sqrt{6}} & \frac{\cos\theta}{\sqrt{3}} - \frac{\sin\theta}{\sqrt{2}}e^{i\phi} & \frac{\cos\theta}{\sqrt{2}} + \frac{\sin\theta}{\sqrt{3}}e^{-i\phi} \\ \frac{1}{\sqrt{6}} & -\frac{\cos\theta}{\sqrt{3}} - \frac{\sin\theta}{\sqrt{2}}e^{i\phi} & \frac{\cos\theta}{\sqrt{2}} - \frac{\sin\theta}{\sqrt{3}}e^{-i\phi} \end{pmatrix} \qquad U_{\mathrm{TM2}} = \begin{pmatrix} \frac{2\cos\theta}{\sqrt{6}} & \frac{1}{\sqrt{3}} & \frac{2\sin\theta}{\sqrt{6}}e^{-i\phi} \\ -\frac{\cos\theta}{\sqrt{6}} - \frac{\sin\theta}{\sqrt{2}}e^{i\phi} & \frac{1}{\sqrt{3}} & \frac{\cos\theta}{\sqrt{2}} - \frac{\sin\theta}{\sqrt{6}}e^{-i\phi} \\ \frac{\cos\theta}{\sqrt{6}} - \frac{\sin\theta}{\sqrt{2}}e^{i\phi} & -\frac{1}{\sqrt{3}} & \frac{\cos\theta}{\sqrt{2}} + \frac{\sin\theta}{\sqrt{6}}e^{-i\phi} \end{pmatrix}$$

JUNO θ_{12} Already Tests Flavor-Symmetry Predictions

There exist correlations between the angles :

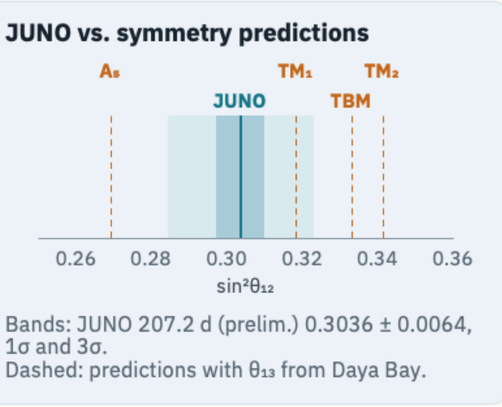
$$\sin^2\theta_{12}^{\mathrm{TM1}} = \frac{1}{3} - \frac{2}{3}\tan^2\theta_{13}^{\mathrm{TM1}}, \quad \sin^2\theta_{12}^{\mathrm{TM2}} = \frac{1}{3} + \frac{1}{3}\tan^2\theta_{13}^{\mathrm{TM2}}$$

JUNO 207.2 days (prelim.): $\sin^2\theta_{12} = 0.3036 \pm 0.0064$

Pattern	$\sin^2\theta_{12}$	vs JUNO
TM_1 (1st TBM column)	0.318	≈ 2.2σ
TBM	1/3	4.6σ (and $\theta_{13} \neq 0$)
TM_2 ($\|U_{e2}\|^2 = 1/3$)	0.341	≈ 5.8σ
Some modular A_5 cases	≈ 0.269	outside 3σ

$\sin^2 2\theta_{13}$	0.0851 ± 0.0024 (Daya Bay)

Some predictions are disfavored !



A discrete symmetry is established by correlations among θ_{12}, θ_{13}, θ_{23} and δ, not by large angles.



With Francis Halzen · Madison, Fall 2026



K-IceCube Workshop, Feb. 2026

Chung-Ang University

Low-energy / particle physics

Atmospheric neutrinos and oscillations, Upgrade reconstruction, and event selection



Chang Hyon Ha
Institutional lead



Hani Kimku
Student



Minsu Kwak
Student



Sooa Kim
Student

Sungkyunkwan University

High-energy / multi-messenger astrophysics

Neutrino source searches, reconstruction, and calibration



Chang Dong Rho
Institutional lead



Youngwan Son
Postdoc

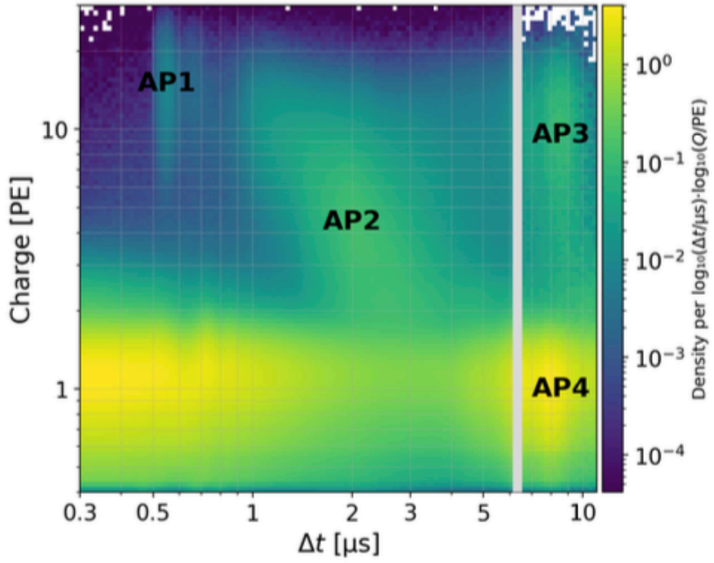


Taeyun Kim
Student

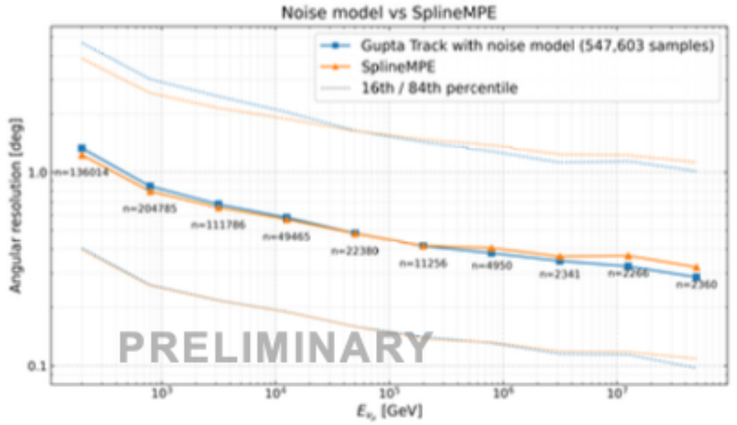


Minji Shin
Student

In-situ IceCube data

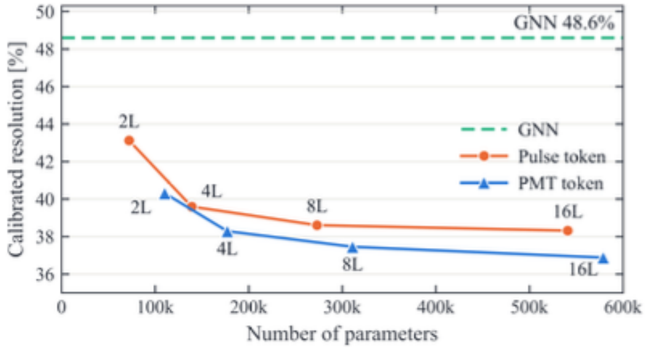


Angular resolution



IceCube Upgrade Transformer

Task energy and direction at a few GeV
Token one per pulse, or one per hit PMT
Next self-supervised pretraining



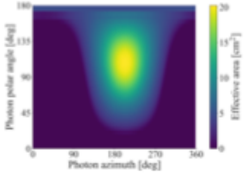
1-10 GeV energy resolution

Per-PMT photon tables

Goal expected light and timing at every PMT
Sim photon propagation in South Pole ice
Fit smooth spline tables, one per PMT



DOM · 1 PMT mDOM · 24 PMTs D-Egg · 2 PMTs



Simulated angular response of one mDOM PMT

SK-Korean group: 6 institutes, 19 researchers

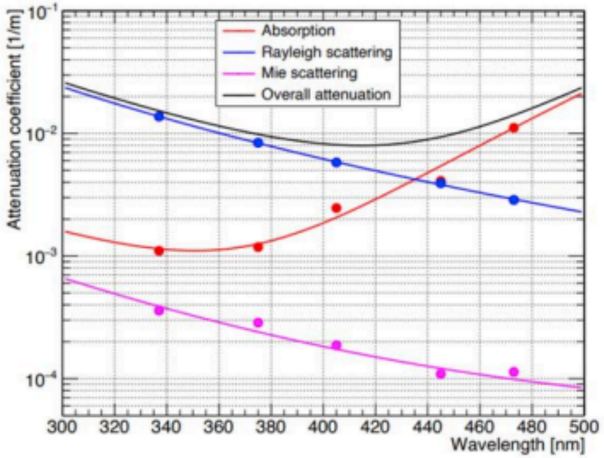
- CNU
  - D.E. Jung
  - D.H. Moon
  - R.G. Park
  - B.S. Yang: A co-convener of calibration group
- GIST
  - J.S. Jang
- IBS/CUP
  - K. Choi
- KNU
  - J.S. Park
  - 1 graduate student
- SNU
- SNU
  - J.H. Yoo: Country Board
  - 5 graduate students
- SKKU
  - E.H. Kwon
  - J.W. Seo
  - I.T. Yoo
  - 2 graduate students

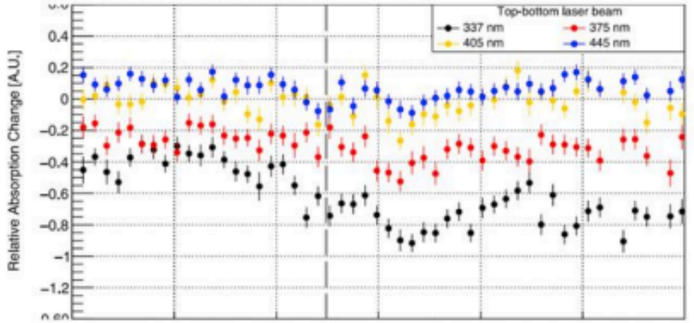


Korean contribution for Super-K

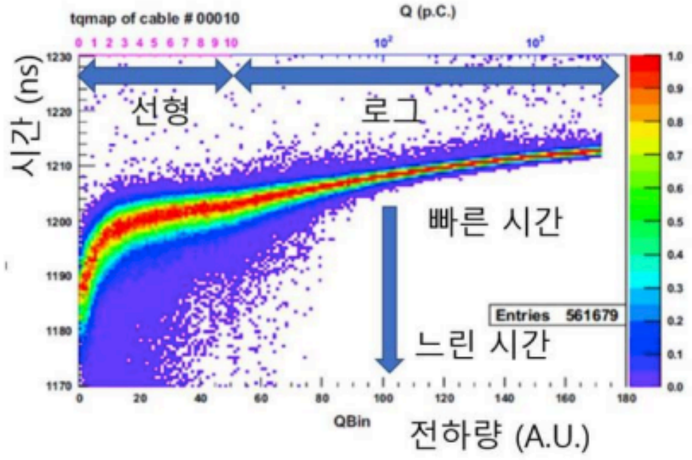
Byeongsu Yang

- Calibration
  - Water parameter measurement
  - Monitoring attenuation length of Gd-loaded water
  - PMT timing-charge (time walk) calibration and timing monitoring



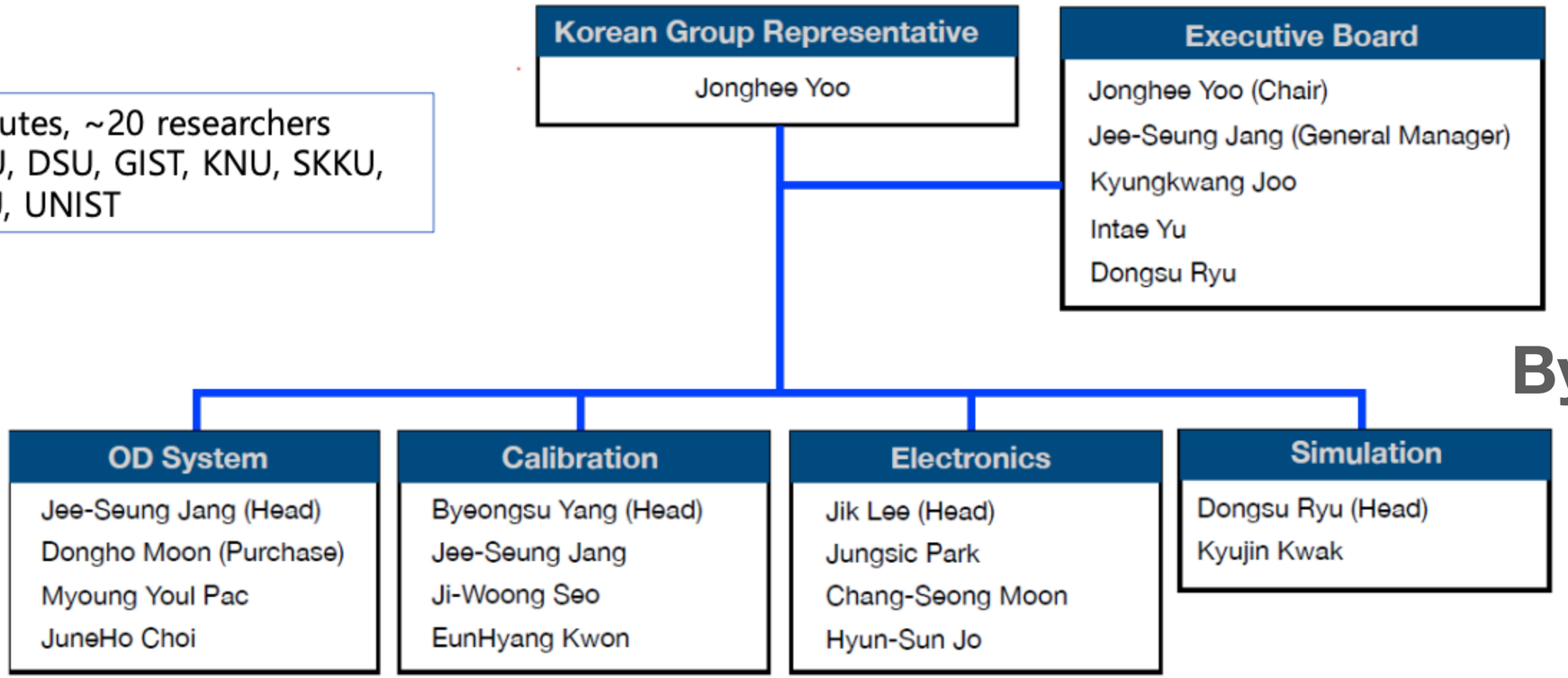


TQ map



HK Korean group

7 institutes, ~20 researchers
- CNU, DSU, GIST, KNU, SKKU, SNU, UNIST



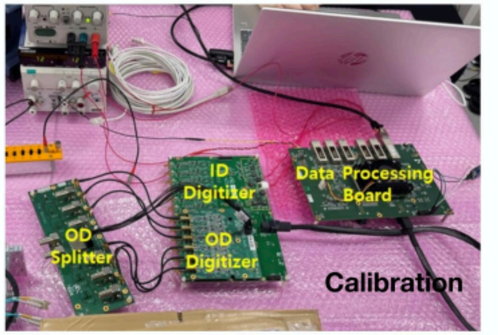


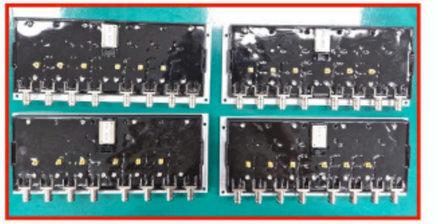
Byeongsu Yang

- OD electronics
- Inner PMT pre-calibrations
- Laser calibration system

Korean contribution: PMT pre-calibration

- PMT test before installation
  - Measure position dependence of QE×CE, gain, timing, charge, SPE response
  - Study QE dependence on angle, polarization, wavelength
- Collaboration among Japan, Korea, and Australia
  - Calibration devices developed by Korean and Australian groups
  - Tested in CNU and the device being installed in Jikkento (Kamioka-Cho)
  - Pre-calibration will start for ~400 PMTs.

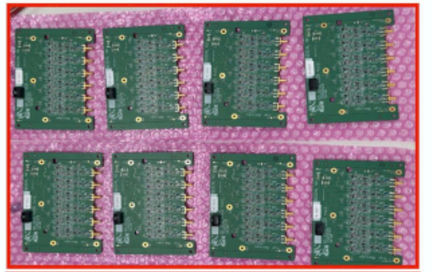


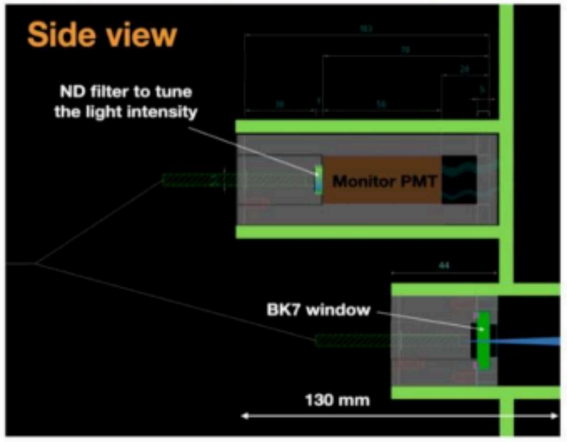


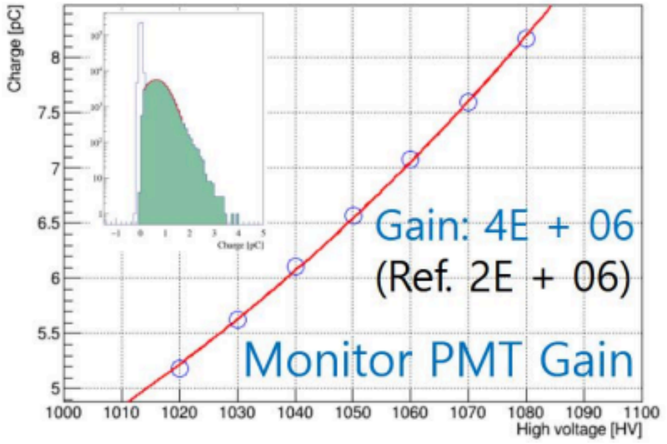


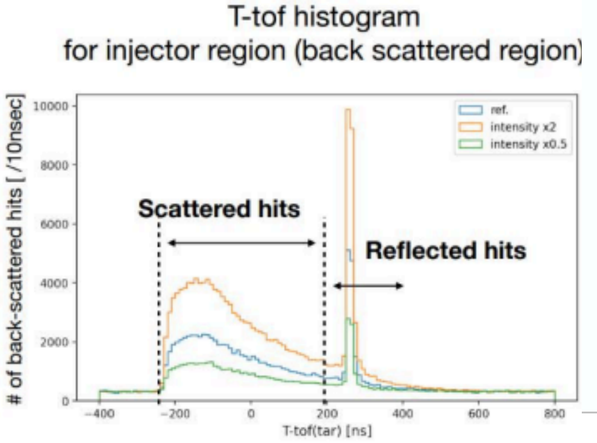


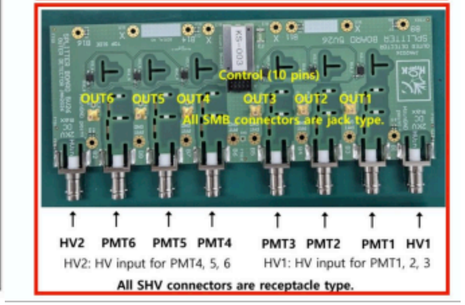














Large Scale Domestic projects applied

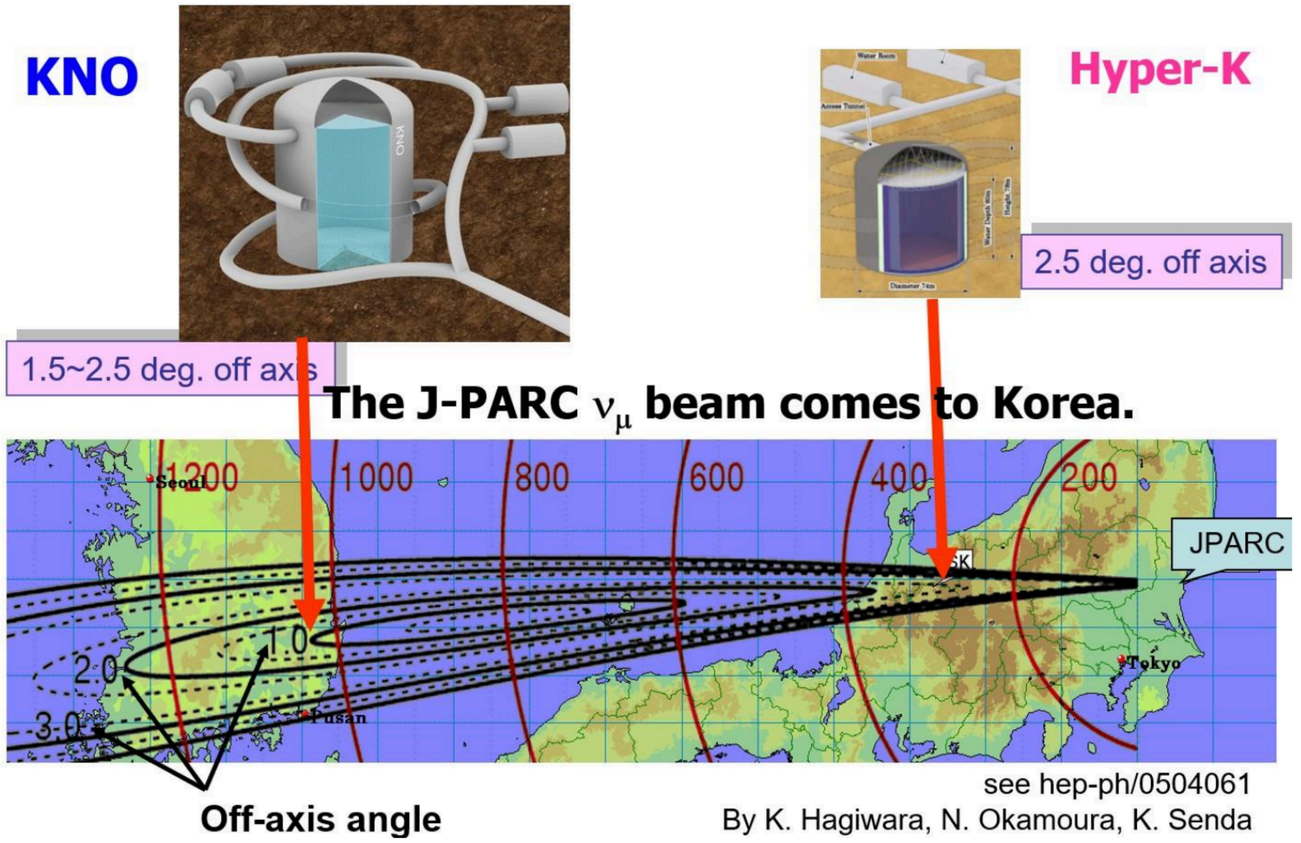
KNO Organization

- KNO working groups have been organized
- Currently 14 institutions are participating in KNO project
- KNO plans to use ν_μ and $\overline{\nu_\mu}$ beams from J-PARC in Japan

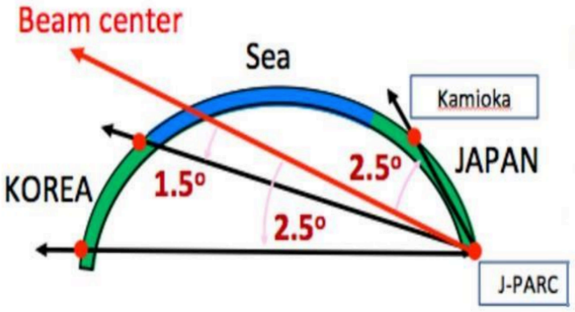


Intae Yu

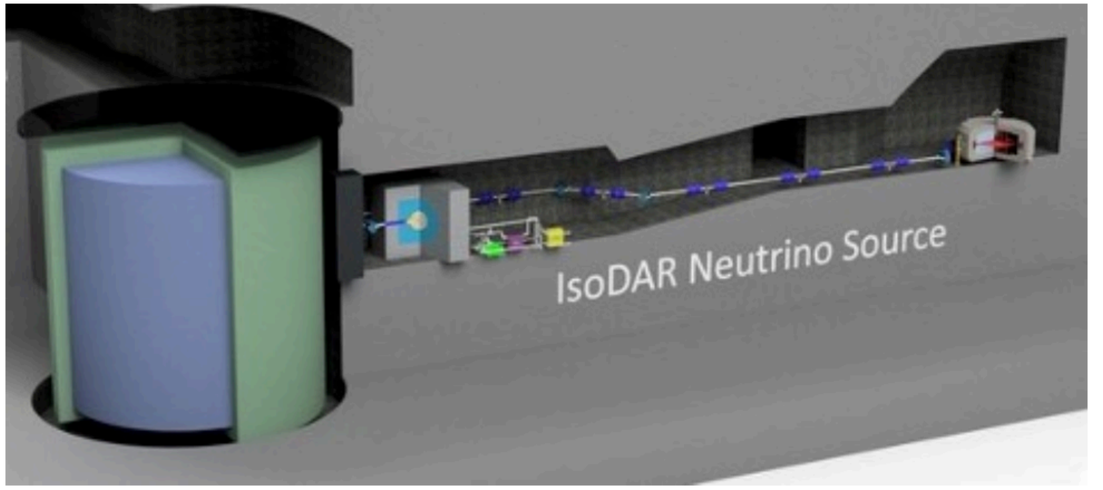
500 kt
1000 m
2035-

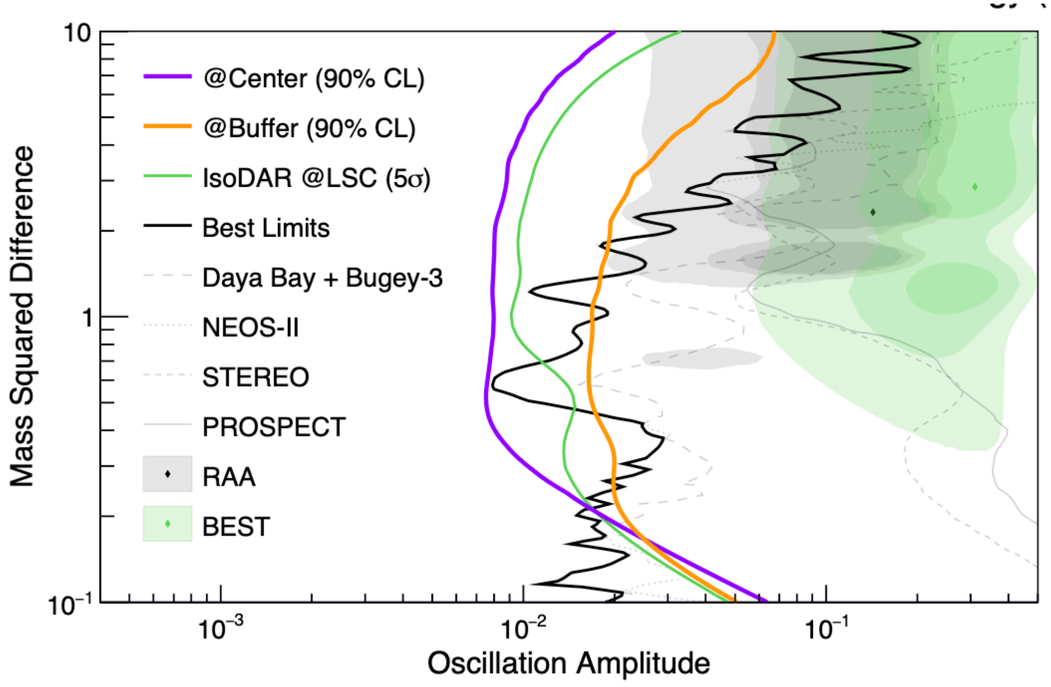


- KNO and HK share J-PARC beam
- Baseline from J-PARC to KNO is about 3 times longer than HK







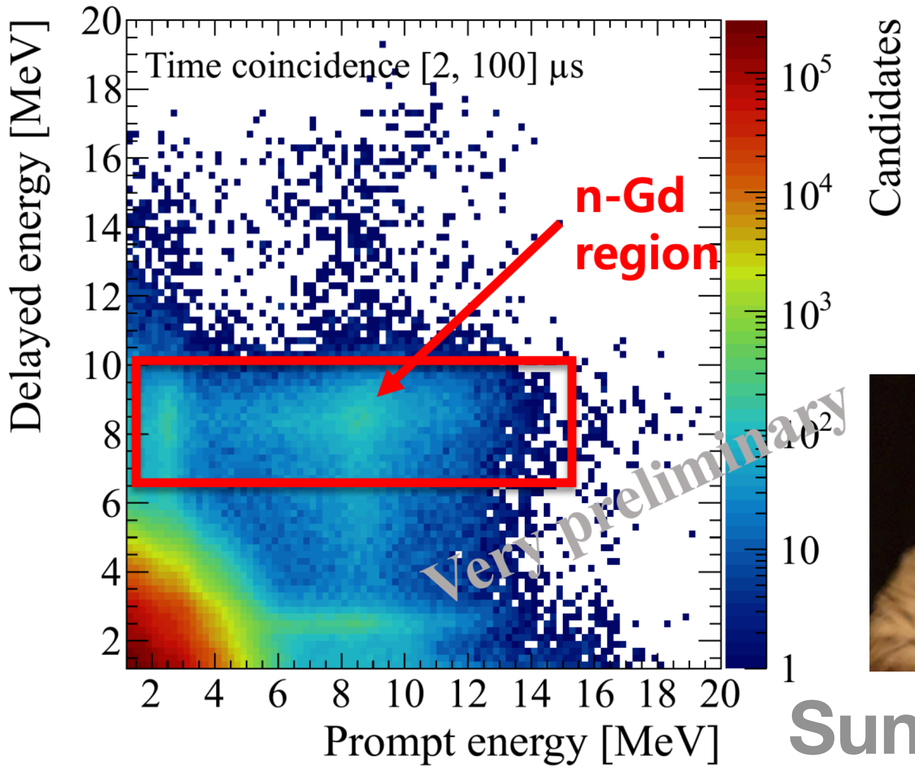


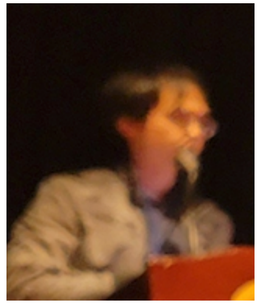
- 1 tonne prototype preparation

Tent, outer/iner containers
Purification system
Readout/DAQ all prepared.



RENE



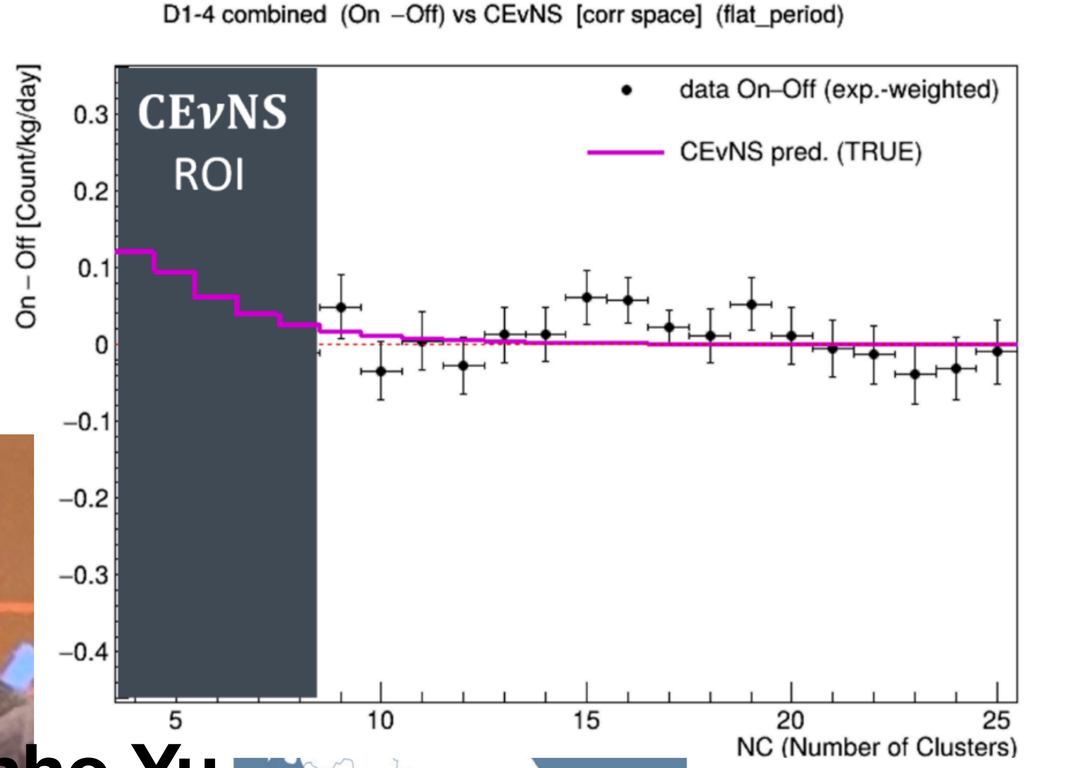


Sunkyu Lee



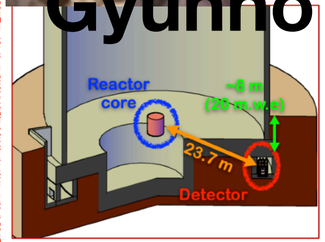


NEON



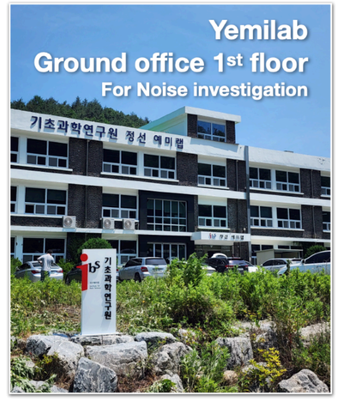


Gyunho Yu











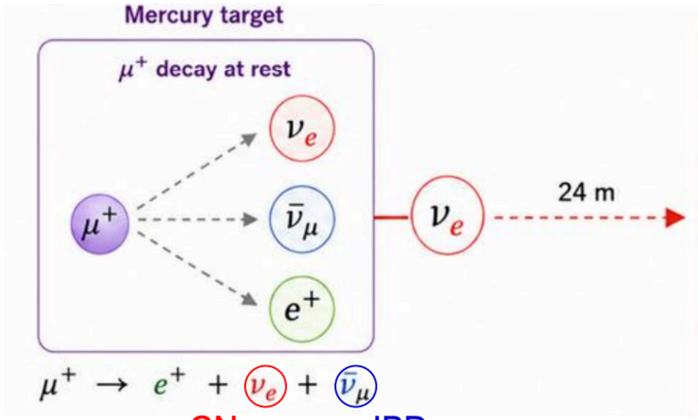
JSNS²

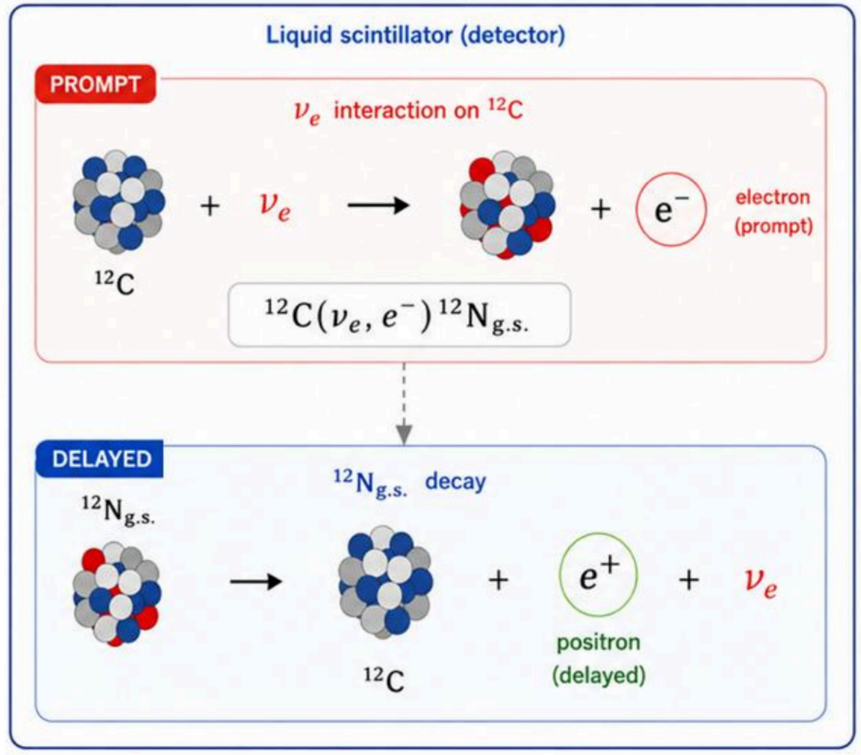
J-PARC Sterile Neutrino Search at J-PARC Spallation Neutron Source

JSNS²-II

J-PARC Sterile Neutrino Search at J-PARC Spallation Neutron Source





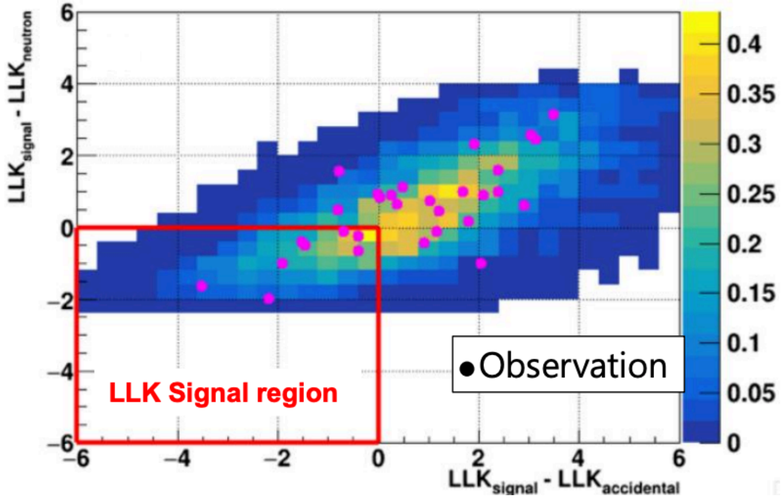


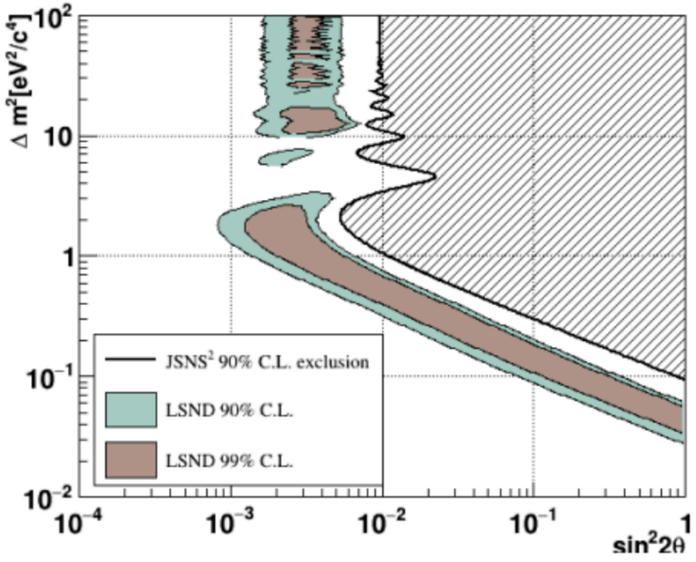
Chang Dong Shin



CNgs serves as a data-driven constraint on the ν_e yield from $\mu +/p$

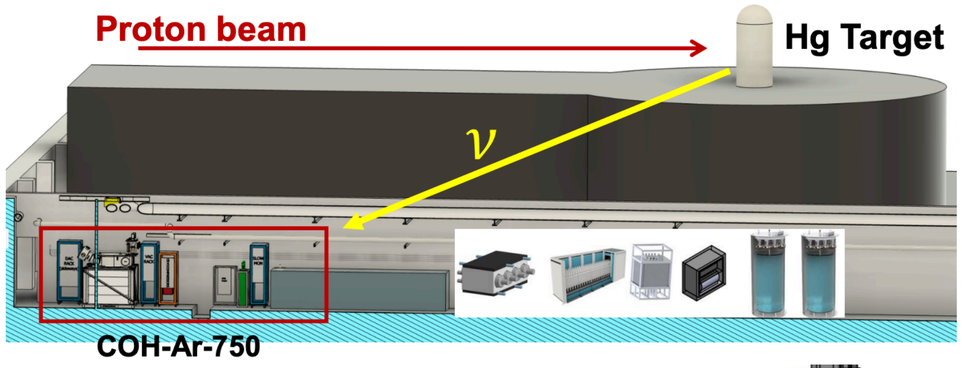
- provides an in-situ measurement of the ν_e flux
- Constrain the **IBD normalization**

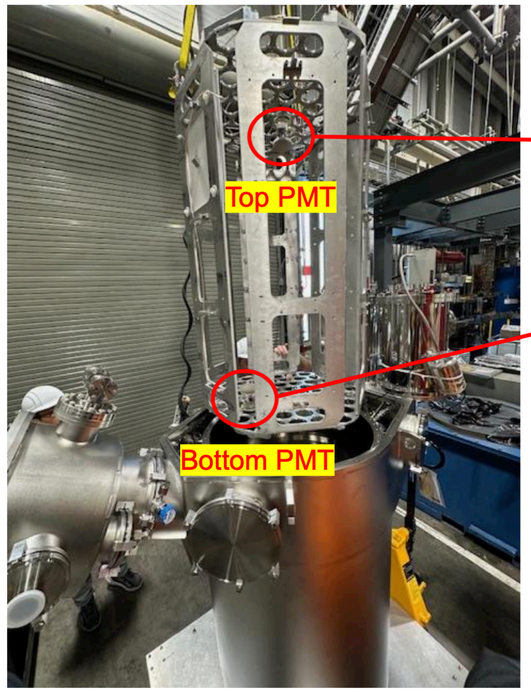


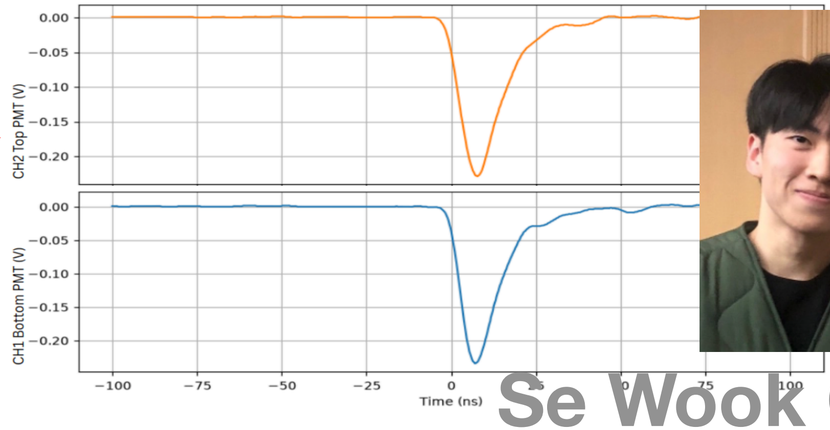


2022 +2024 Physics data

	observation	prediction
Total	8	8.9±1.6
JSNS total BKG.		6.1±1.0
LSND excess (scale)		2.8±1.3

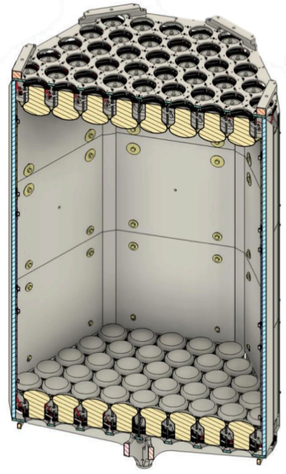


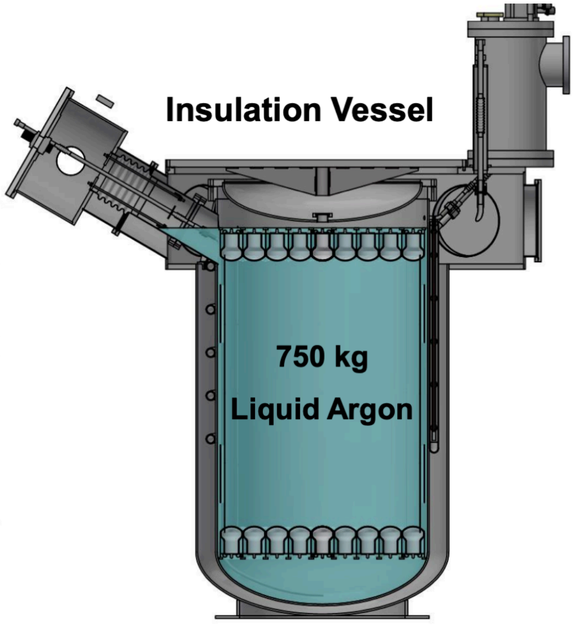




Se Wook Oh

Optical Package
122 PMTs

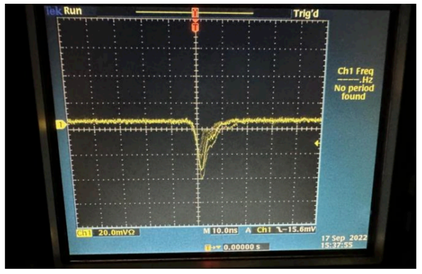




PMT Readout Test

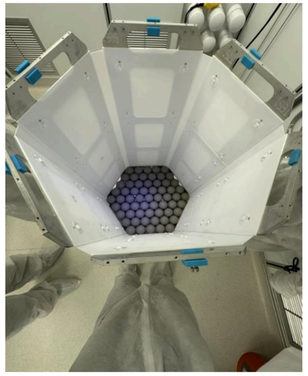
- Test conditions: 1360 V, no LAr purification
- Installed two PMTs and performed a cosmic-muon signal test after cooldown and LAr filling
- Coincident top-bottom PMT signals consistent with cosmic-muon events









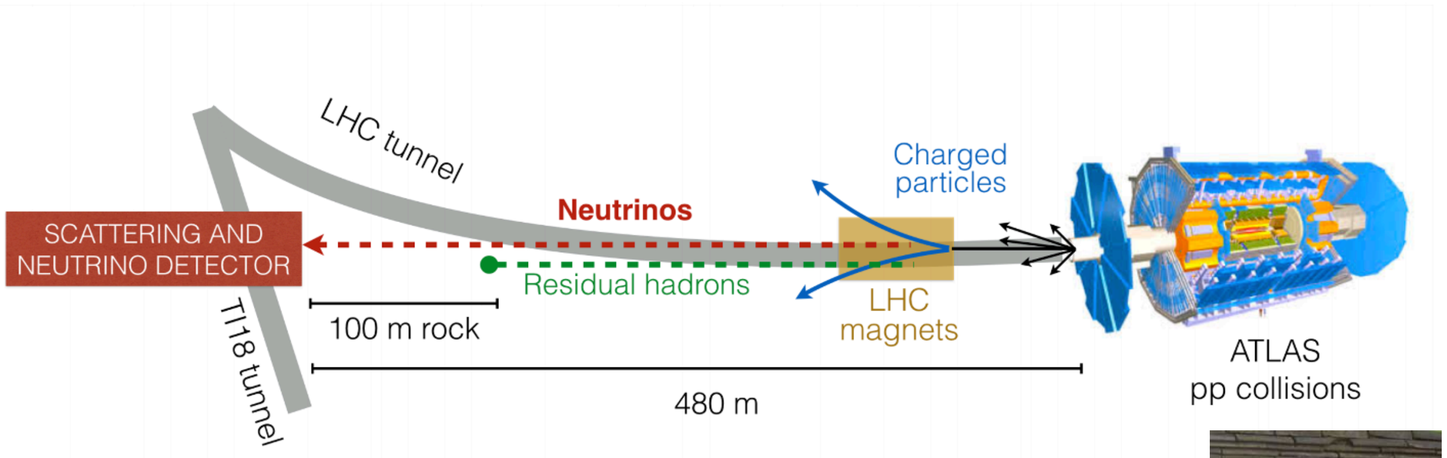


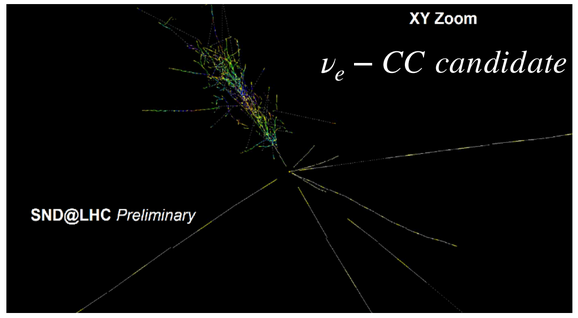


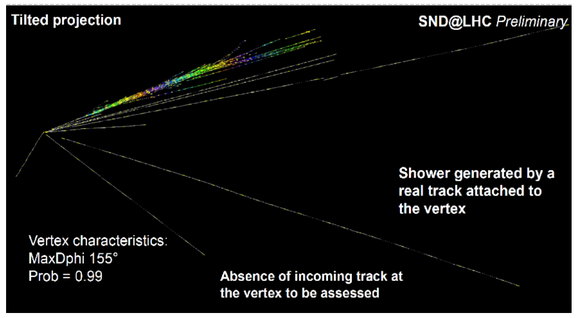




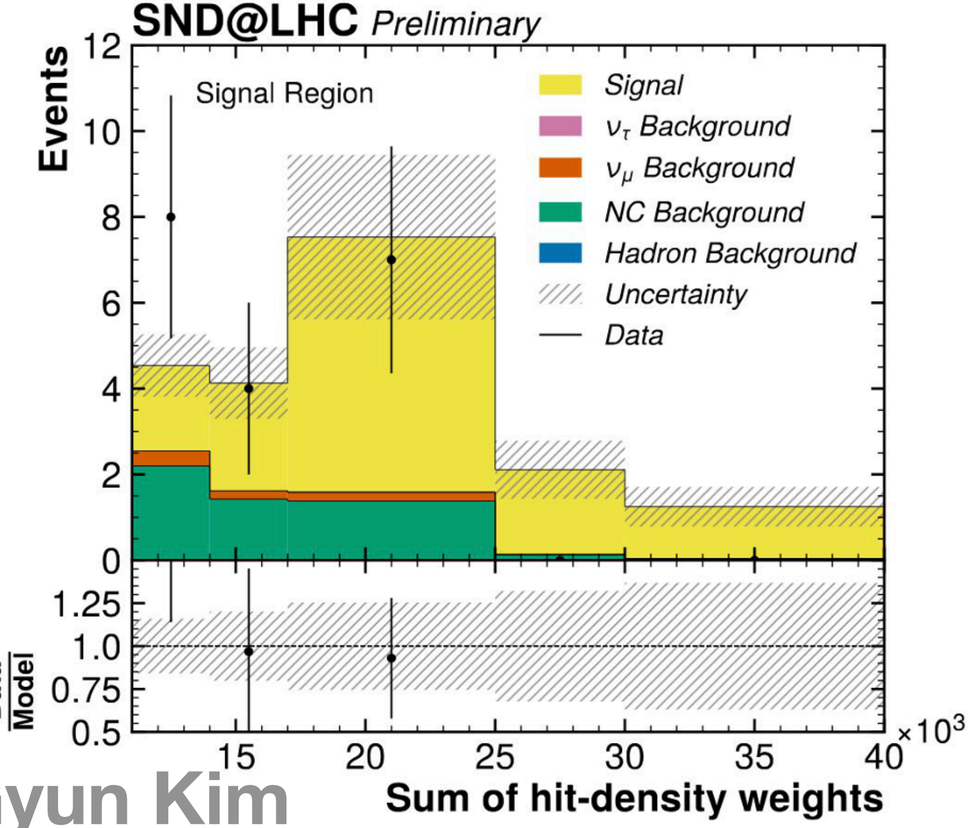
Scattering and Neutrino Detector at the LHC



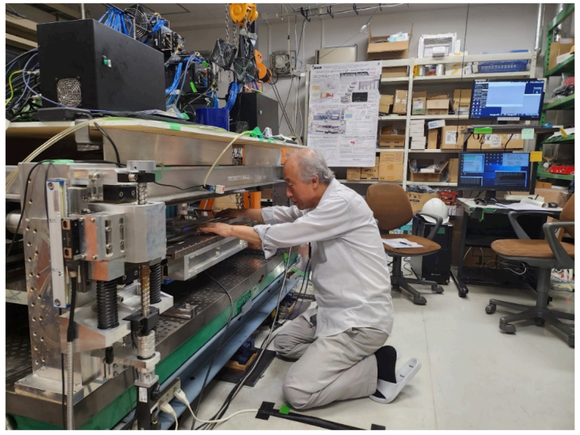


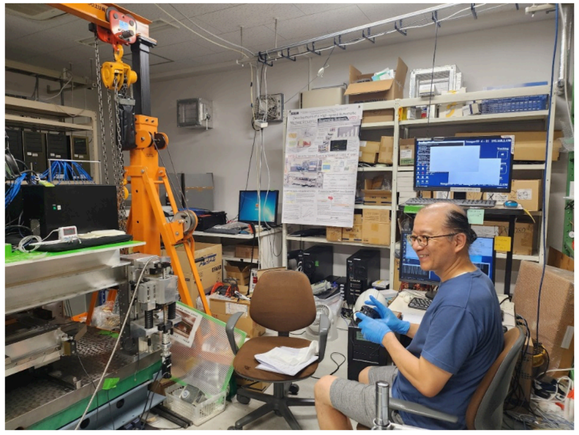




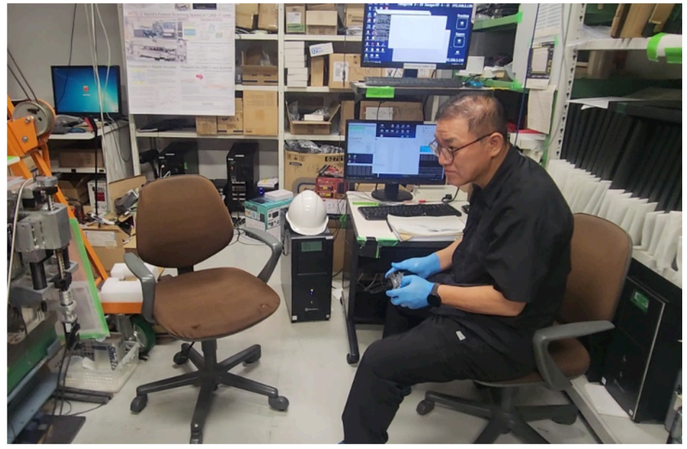


Yeong Gyun Kim





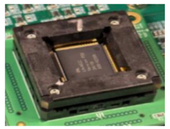




Emulsion scanning using HTS2 for SND@LHC

Korea DUNE Activity

Research Activities

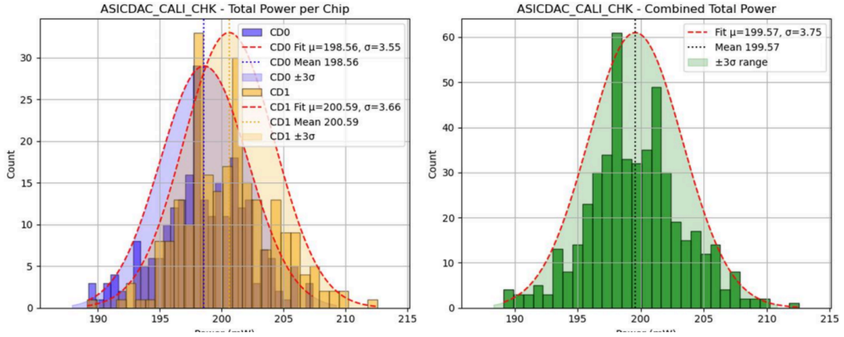

DUNE Cold Electronics Hardware : COLDATA, LArASIC, FEMB

Collaboration with BNL Electronic Detector Group



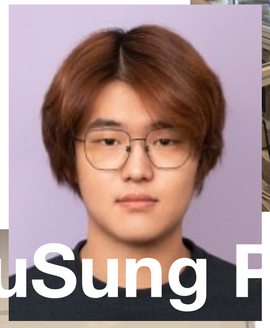
- Cold electronics chip testing for the DUNE Far Detector
- Robotics testing

Technical note in DUNE database :
Comprehensive QC Testing and Data Analysis of Cold Electronics

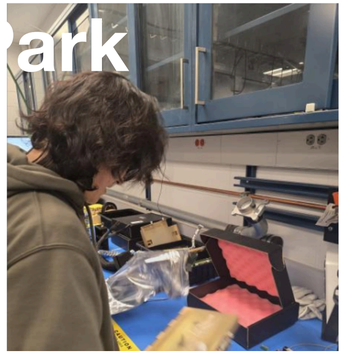




Summer DUNE camp at JEJU
July 13 to July 24, 2026









Members of DUNE

Chung-Ang University
CAU Neutrino LAB (CAU NULA)
Prof. Kim Siyeon

PostDoc	**Sunwoo Gwon** (FD4 R&D, WbLS)
Ph.D student	**Juseong Park** (ND analysis)
Master's student	**Hokyeong Nam** (FD ProtoDUNE) **Sunhong Kim** (ND analysis) **Yujin Park** (FD ProtoDUNE)

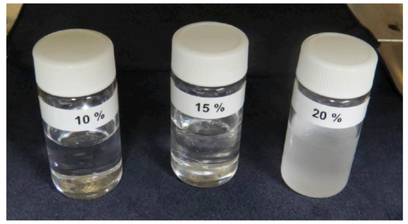
Jeonbuk Univ.
Prof. Seodong Shin

New Members Since the last K-Neutrino Symposium

SEOULTECH
Prof. Myeonghun Park

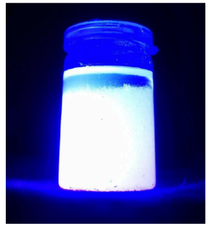
Jeju Univ.
Prof. YoungJu Ko

Hanyang Univ.
Prof. Sungbin Oh



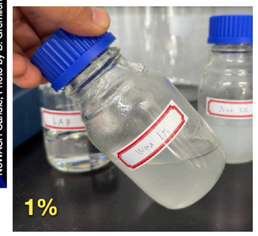


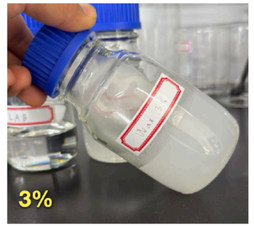
↑ LS (LAB) + Paraffin wax (NoWaSH),
↓ μ-crystal

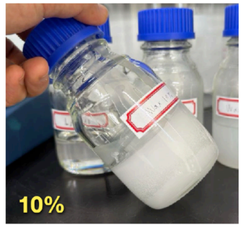




↑ LS (DIN) + water+surfactant







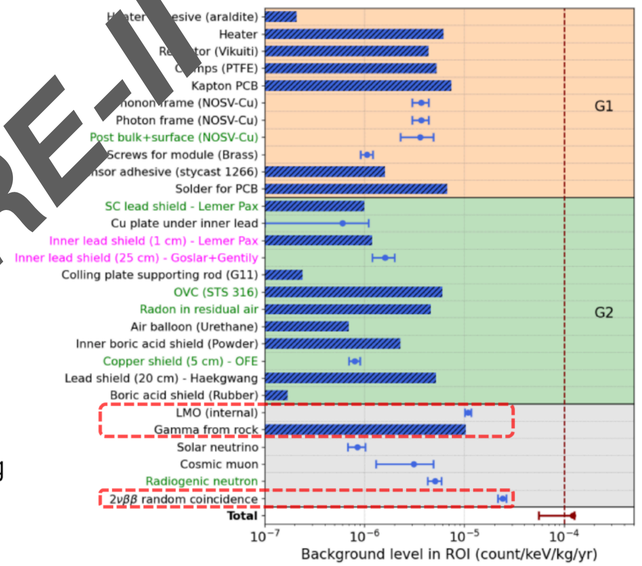
JINST 14 (2019) P11007
NIM A 1071 (2024) 170075
arxiv:1807.00628

Opacity / fluidity can be controlled by temperature, too.

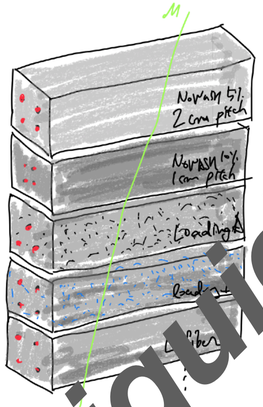


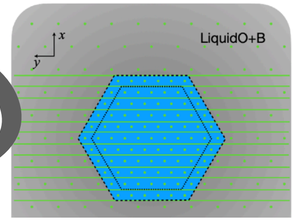
Woo Tae Kim

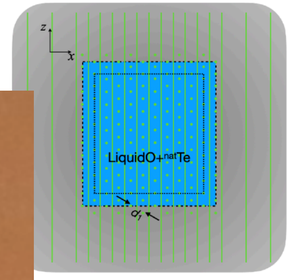
AMoRE-II



LiquidO



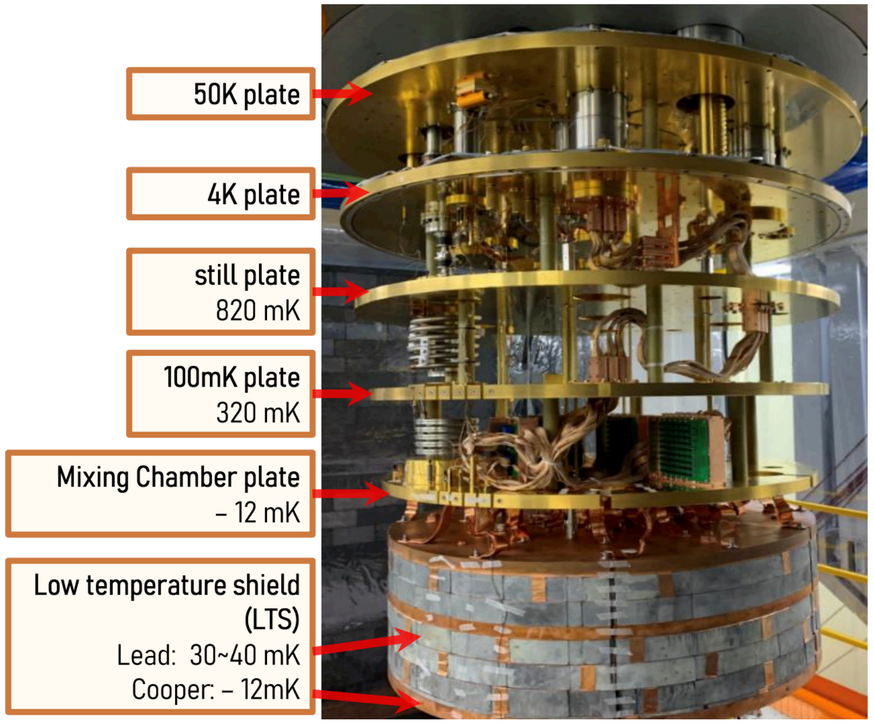






Yoomin Oh

AMoRE-II dilution refrigerator



- Large dilution refrigerator from Leiden.
  - With Three Pulse Tube Refrigerators
  - Cooling power: 5 μW @ 10 mK (w/o wiring), ~ 2.7 μW @ 8 mK (w/ wiring)
  - Base temperature at H.Q (measured) : 6 mK (w/o wiring), 7 mK (w/ wiring)
  - Base temperature with LTS (Low temperature shield) : ~ 12 mK
- Including vibration damping systems.
- Cabling: 27 wires x 360 detectors.
- Several DR Performance tests are ongoing.

Summary of summary

Korean Neutrino Physicists are busy

- They are typically involved with at least two or three experiments.
- Large scale domestic R&D funding program has been launched and two neutrino experiments (KNO, νEYE) applied.
- Running : IceCube, Super-K, SND@LHC, JSNS^2, NEON
- Coming : IceCube-Upgrade, Hyper-K, DUNE, COH-Ar-750, RENE, AMoRE-II
- Planning : LiquidO, NEON-II, JSNS^2-II, KNO, νEYE
- (I am) Thinking … Solar thermal neutrinos or $C\nu B$, BBN-ν detectors in Korea?