# KEK Theory Meeting on Particle Physics Phenomenology (KEK-PH2026winter)

# Report of Contributions

https://conference-indico.kek.jp/e/334

Contribution ID: **1** Type: **not specified**

# TBA

*Monday, 16 February 2026 10:10 (40 minutes)*

**Presenter:** SPANNOWSKY, Michael

**Session Classification:** plenary: Michael Spannowsky, Jure Zupan

Contribution ID: **2** Type: **not specified**

# TBA

*Monday, 16 February 2026 10:50 (40 minutes)*

**Presenter:** ZUPAN, Jure

**Session Classification:** plenary: Michael Spannowsky, Jure Zupan

Contribution ID: **3** Type: **not specified**

# Current Status and Future Prospects of Belle II

*Monday, 16 February 2026 13:00 (40 minutes)*

**Presenter:** NAKAZAWA, Yu

**Session Classification:** plenary: Yu Nakazawa, Zoltan Ligeti

Contribution ID: **4** Type: **not specified**

# TBA

*Monday, 16 February 2026 13:40 (40 minutes)*

**Presenter:** LIGETI, Zoltan

**Session Classification:** plenary: Yu Nakazawa, Zoltan Ligeti

Contribution ID: **5** Type: **not specified**

# The EIC and ePIC Experiments: Current Status and Synergies with High-Energy Physics

*Monday, 16 February 2026 14:50 (40 minutes)*

**Presenter:** KAWADE, Kentaro

**Session Classification:** plenary: Kentaro Kawade

Contribution ID: **6** Type: **not specified**

# Walking-Dilaton Hybrid Inflation in a Model with Dynamical Scalegenesis

*Monday, 16 February 2026 16:00 (20 minutes)*

We propose a hybrid inflationary scenario based on eight-flavor hidden QCD with the hidden colored fermions being in part gauged under B–L gauge symmetry. This hidden QCD is almost scale-invariant, so-called walking, and predicts the light scalar meson (the walking dilaton) associated with the spontaneous scale breaking, which develops the Coleman-Weinberg (CW) type potential as the consequence of the nonperturbative scale anomaly, hence plays the role of an inflaton of the small-field inflation. The B–L Higgs is coupled to the walking dilaton inflaton, which is dynamically induced from the so-called bosonic seesaw mechanism. We explore the hybrid inflation system involving the walking dilaton inflaton and the B–L Higgs as a waterfall field. We find that observed inflation parameters tightly constrain the B–L breaking scale as well as the walking dynamical scale to be around 10^9GeV and 10^{14}GeV, respectively, so as to make the waterfall mechanism worked. The lightest walking pion mass is then predicted to be around 500GeV.

**Presenter:** ISHIDA, HIROYUKI

**Session Classification:** parallel session A: Cosmo

Contribution ID: **7** Type: **not specified**

# Emission of Nambu-Goldstone bosons from semilocal string networks

*Monday, 16 February 2026 16:20 (20 minutes)*

Cosmic strings arise from the spontaneous breaking of a $U(1)$ symmetry, which can be either global or local, leading to distinct classes of string solutions. Their energy-loss mechanisms are known to differ significantly, which results in qualitatively different spectra of particles emitted from the string networks. Semilocal strings arise when global and local symmetries are simultaneously broken and combine characteristic features of both local and global strings. As a result, their particle-emission properties cannot be straightforwardly characterized as those of global or local string networks. In this talk, we present results from numerical lattice simulations of semilocal string networks, focusing on their particle-emission properties for the first time. We find that semilocal string networks can efficiently emit Nambu-Goldstone bosons, with particle-emission properties similar to those of axion emission from global string networks. Motivated by this result, we discuss a scenario in which the Nambu-Goldstone bosons acquire a soft-breaking mass and account for the observed dark matter abundance via non-thermal production from the string networks. This work is based on arXiv: 2510.07894.

**Presenter:** KANDA, Yukihiro

**Session Classification:** parallel session A: Cosmo

Contribution ID: **8** Type: **not specified**

# Relaxing Cosmological Constraints on the Minimal $U(1)_{L_\mu - L_\tau}$ Model with One-Loop Corrections

*Monday, 16 February 2026 16:40 (20 minutes)*

Recently, Ref.~\cite{...} showed that the minimal gauged $U(1)_{L_\mu - L_\tau}$ model is constrained by cosmological bounds on the sum of neutrino masses.
In this work, we compute the one-loop corrections to the neutrino mass matrix in this model and examine whether these cosmological constraints can be relaxed.

**Presenter:** MIYAMOTO, Jun

**Session Classification:** parallel session A: Cosmo

Contribution ID: **9** Type: **not specified**

# Higgs production in association with a Z boson at TeV-scale lepton colliders

*Monday, 16 February 2026 16:00 (20 minutes)*

We study the neutrino-associated Zh production process at lepton colliders, whose cross section exceeds that of Zh production in the multi-TeV energy regime.
The scattering amplitudes are classified into three main groups according to the topology of the corresponding Feynman diagrams, and their interference patterns are systematically analyzed.
We demonstrate that the delicate gauge cancellations appearing at high energies in the unitary gauge are absent in the recently proposed Feynman-diagram gauge, which enables a transparent interpretation of physical distributions in terms of contributions from each subgroup.
In particular, we show that the interference among amplitudes in the Feynman-diagram gauge provides a clear physical understanding of the observed kinematic features.

**Presenter:** FURUSATO, Hiroyuki

**Session Classification:** parallel session B: Higgs

Contribution ID: **10** Type: **not specified**

# Chasing Long-lived Scalars at the Future Lepton Colliders

*Monday, 16 February 2026 16:20 (20 minutes)*

In this talk, I will discuss novel strategies to search for long-lived scalars at future lepton colliders in the context of the Type-II seesaw model. In the low-mass range, and for an appropriate choice of the triplet vev, these scalars can become long-lived, leading to displaced-vertex signatures. Depending on the proposed center-of-mass energy, we consider the pair production of these scalars at the ILC and at future muon colliders. Taking into account the relevant theoretical and experimental constraints, we explore this possibility in multi-lepton plus missing-energy final states. While displaced-vertex signatures highlight the long-lived nature of the scalars, the invariant-mass distribution of same-sign dileptons can be used to discover the non-standard charged Higgs at the ILC and muon colliders.

**Presenter:** GHOSH, Nivedita

**Session Classification:** parallel session B: Higgs

Contribution ID: **11** Type: **not specified**

# Impact of quark flavor violating SUSY on h(125) decays at future lepton colliders

*Monday, 16 February 2026 16:40 (20 minutes)*

We study the CP-even neutral Higgs boson decays $h^0 \to c\bar{c}, b\bar{b}, b\bar{s}, \gamma\gamma, gg$ in the Minimal Supersymmetric Standard Model (MSSM) with general quark flavor violation (QFV) due to squark generation mixings, identifying the $h^0$ as the Higgs boson with a mass of 125 GeV. We compute the widths of the $h^0$ decays to $c\bar{c}, b\bar{b}, b\bar{s}$ at full one-loop level. For the $h^0$ decays to $\gamma\gamma$ and $gg$ we compute the widths at NLO QCD level. For the first time, we perform a systematic MSSM parameter scan for these widths respecting all the relevant theoretical and experimental constraints, such as those from B-meson data, and the 125 GeV Higgs boson data from recent LHC experiments, as well as the limits on Supersymmetric (SUSY) particle (sparticle) masses from the LHC experiments. We also take into account the expected sparticle mass limits from the future HL-LHC experiment in our analysis. In strong contrast to the usual studies in the MSSM with Minimal Flavor Violation (MFV), we find that the deviations of these MSSM decay widths from the Standard Model (SM) values can be quite sizable and that there are significant correlations among these deviations. All of these sizable deviations in the $h^0$ decays are mainly due to large scharm-stop mixing and large sstrange-sbottom mixing. Such sizable deviations from the SM can be observed at high signal significance in future lepton colliders such as ILC, CLIC, CEPC, FCC-ee and muon collider EVEN AFTER the failure of SUSY particle discovery at the HL-LHC. In case the deviation pattern shown here is really observed at the lepton colliders, then it would strongly suggest the discovery of QFV SUSY (the MSSM with general QFV).
Authors: H. Eberl, K. Hidaka, E. Ginina;
Reference: arXiv:2511.20523 (to be published in Phys. Rev. D);
Link: https://arxiv.org/pdf/2511.20523

**Presenter:** HIDAKA, Keisho

**Session Classification:** parallel session B: Higgs

Contribution ID: **12** Type: **not specified**

# Searching for dark matter in the gamma-ray sky

*Tuesday, 17 February 2026 09:00 (40 minutes)*

**Presenter:** HORIUCHI, Shunsaku

**Session Classification:** plenary: Shunsaku Horiuchi, Toshiya Namikawa

Contribution ID: **13** Type: **not specified**

# A brief overview of ACT DR6 results

*Tuesday, 17 February 2026 09:40 (40 minutes)*

**Presenter:** NAMIKAWA, Toshiya

**Session Classification:** plenary: Shunsaku Horiuchi, Toshiya Namikawa

Contribution ID: **14** Type: **not specified**

# Analysis of Monopoles Associated with Multi-Step Spontaneous Breaking of Gauge Symmetries

*Tuesday, 17 February 2026 10:40 (20 minutes)*

The ’t Hooft–Polyakov monopole is absent in the Standard Model, yet Cho and Maison revealed that the electroweak sector admits a spherically symmetric magnetic monopole solution. The resulting Cho–Maison monopole exhibits unresolved theoretical issues, most notably an energy divergence at the spatial origin. In this work, we analyze a scenario in which a ’t Hooft–Polyakov monopole arising in a high-energy completion is mapped onto the Cho–Maison monopole in the low-energy effective theory, thereby providing a unified understanding of monopole configurations across energy scales.

**Presenter:** MIYA, Fukutaro

**Session Classification:** parallel session A: Theory

Contribution ID: **15** Type: **not specified**

# Supersymmetric Gauge Theories with Confining Phases

*Tuesday, 17 February 2026 11:00 (20 minutes)*

Confinement is one of the unresolved problems in modern physics. rgies. The analysis of confinement requires non-perturbative approaches due to asymptotic freedom. Supersymmetric gauge theories provide a powerful framework in which such non-perturbative analyses can be carried out. They are more tractable than their non-supersymmetric counterparts.In particular, the holomorphy of the superpotential enables various exact calculations, including non-perturbative effects. Motivated by the goal of deepening our understanding of the confinement mechanism, we classify supersymmetric gauge theories that possess confining phases in the strict sense. Then, we identify condensation of some operators in each case, which must be related to confinement. If possible, we also discuss the consequences of supersymmetry breaking in these theories.

**Presenter:** ISHIKAWA, Riku

**Session Classification:** parallel session A: Theory

Contribution ID: **16** Type: **not specified**

# Generalized CP from non-invertible selection rules

*Tuesday, 17 February 2026 11:20 (20 minutes)*

In this talk, we propose a framework in which fields are labeled by basis elements of a fusion algebra with non-invertible fusion rules. In particular, we consider the case where fields are labeled by conjugacy classes of a finite group rather than its irreducible representations.
When the fusion rules possess a Z2 symmetry identified with charge conjugation, a CPinvariant system can be consistently defined together with parity transformation. Furthermore, it is found that combining group-based flavor symmetries underlying non-invertible selection rules with CP symmetry naturally leads to a generalized CP transformation. We also demonstrate the possibility of spontaneous CP violation in this framework and discuss its implications for Yukawa textures.

**Presenter:** OTSUKA, Hajime

**Session Classification:** parallel session A: Theory

Contribution ID: **17** Type: **not specified**

# Thermal precondensation in gauge-fermion theories and its cosmological implications

*Tuesday, 17 February 2026 10:40 (20 minutes)*

**Presenter:** PASTOR GUTIERREZ, Alvaro

**Session Classification:** parallel session B: Cosmo

Contribution ID: **18** Type: **not specified**

# Electromagnetic leptogenesis in an effective field theory

*Tuesday, 17 February 2026 11:00 (20 minutes)*

We present a unified, gauge-invariant EFT analysis of low-scale electromagnetic leptogenesis sourced by CP-violating neutrino–gauge dipole interactions. We first match UV-complete models onto the dimension-six effective operator, and evaluate the decay widths, CP asymmetries, and the corresponding transport equations in the electroweak-broken phase. We then show that the suppression arising from the competition between the CP asymmetry and washout can be overcome by the resonant enhancement induced by self-energy resummation in a quasi-degenerate heavy-neutrino spectrum.

**Presenter:** TAKADA, Rin

**Session Classification:** parallel session B: Cosmo

Contribution ID: **19** Type: **not specified**

# Screening Effects of Finite-Mass Fermions in Monopole Baryogenesis Scenario

*Tuesday, 17 February 2026 11:20 (20 minutes)*

To investigate the finite mass effects in recently proposed monopole baryogenesis scenario, this study analyzes screening effect for the electric monopole charge, induced by CP-violating theta term, within a ‘t Hooft-Polyakov monopole background. Utilizing partial wave expansion and bosonized effective field theory for the massive charged fermions, we demonstrate that fermion finite masses lead to distinct screening behaviors compared to the original scenario, which provides crucial insights into baryogenesis mechanisms with realistic fermion dynamics.

**Presenter:** KATO, Yukito

**Session Classification:** parallel session B: Cosmo

Contribution ID: **20** Type: **not specified**

# TBA

*Tuesday, 17 February 2026 13:00 (40 minutes)*

**Presenter:** KANEMURA, Shinya

**Session Classification:** plenary: Shinya Kanemura, Yannis Georis

Contribution ID: **21** Type: **not specified**

# Testable leptogenesis with three right-handed neutrinos

*Tuesday, 17 February 2026 13:40 (40 minutes)*

**Presenter:** GEORIS, Yannis

**Session Classification:** plenary: Shinya Kanemura, Yannis Georis

Contribution ID: **22** Type: **not specified**

# Phenomenology of electroweakly interacting spin-1 dark matter with Sommerfeld enhancement

*Tuesday, 17 February 2026 14:50 (20 minutes)*

Weakly Interacting Massive Particles (WIMPs) are leading candidates for dark matter and have been widely studied. However, direct detection experiments have placed stringent constraints on many WIMP models. Some scenarios, such as Higgsino, Wino, and minimal dark matter, can evade these constraints. In these models, the dark sector contains an SU(2)_L multiplet, and the dark matter candidate is one of its components. Such candidates are typically assumed to be either spin-0 or spin-1/2. In this talk, I focus on a spin-1 electroweakly interacting dark matter model proposed in Ref. 2004.00884 and discuss its phenomenology, including the effects of Sommerfeld enhancement. We determine the mass spectrum of the new particles required to reproduce the measured value of the dark matter energy density and also discuss prospects for indirect detection.

**Presenter:** ABE, Tomohiro

**Session Classification:** parallel session A: DM

Contribution ID: **23** Type: **not specified**

# Minimal Dark Matter in the sky: updated Indirect Detection probes

*Tuesday, 17 February 2026 15:10 (20 minutes)*

Minimal Dark Matter is among the simplest and most predictive Dark Matter frameworks, with the Majorana SU(2) 5-plet as its smallest accidentally stable real representation. We present a comprehensive reassessment of its indirect-detection signals. The γ-ray flux from both Sommerfeld-enhanced annihilations and bound-state formation is calculated, incorporating next-to-leading-order corrections and next-to-leading-log resummation of the relevant electroweak effects. In the Milky Way halo, bound-state formation dominates the flux near 100 GeV. The corresponding low-energy spectrum is used to place constraints based on Fermi-LAT observations of Galactic diffuse emission, while the high-energy part of the spectrum is employed to forecast the required observation time for several of the Milky Way's dwarf spheroidal galaxies using the Cherenkov Telescope Array Observatory (CTAO). Fermi-LAT data strongly disfavor the lower edge of the thermal mass window, even under conservative assumptions about the inner Galaxy density profile. Furthermore, several hundred hours of forthcoming CTAO observations of northern dwarfs should be sufficient to probe the central mass value.

**Presenter:** AGHAIE, Mohammad

**Session Classification:** parallel session A: DM

Contribution ID: **24** Type: **not specified**

# Dark matter explanations for the neutrino emission from the Seyfert galaxy NGC 1068

*Tuesday, 17 February 2026 15:30 (20 minutes)*

We investigate the possibility that the high-energy neutrino flux observed from the Seyfert galaxy NGC 1068 originates from dark matter annihilations within the density spike surrounding the supermassive black hole at its center. The comparatively lower gamma-ray flux is attributed to a dark sector that couples predominantly to Standard Model neutrinos. To explain the absence of a corresponding neutrino signal from the center of the Milky Way, we propose two scenarios: (i) the disruption of the dark matter spike at the Milky Way center due to stellar heating, or (ii) the annihilation into a dark scalar that decays exclusively into neutrinos, with a decay length longer than the size of the Milky Way but shorter than the distance from Earth to NGC 1068.

**Presenter:** AKITA, Kensuke

**Session Classification:** parallel session A: DM

Contribution ID: **25** Type: **not specified**

# Light neutrinophilic thermal dark matter

*Tuesday, 17 February 2026 15:50 (20 minutes)*

No signal of the electroweak (EW) scale WIMP has been observed so far, and the lighter WIMP, whose mass is much lighter than the EW scale, attracts attention. However, light WIMP receives severe constraints from cosmological (CMB and BBN) observation when the WIMP couples mainly to electromagnetically interacting particles. We constructed a model where the light WIMP interacts mainly with harmless particles (i.e., neutrinos) in a simple B-L extension of the standard model. It turns out that the model evades not only the cosmological constraint but also those from dark matter searches, such as the direct, indirect, and collider dark matter detections while explaining the observed dark matter abundance vis the well-known freeze-out mechanism and solving the small-scale crisis vis its self-interaction.

**Presenter:** AONASHI, Tatsuya

**Session Classification:** parallel session A: DM

Contribution ID: **26** Type: **not specified**

# Two Higgs doublet models with a new U(1) gauge symmetry

*Tuesday, 17 February 2026 14:50 (20 minutes)*

In this talk, we discuss two Higgs doublet models in which a new U(1) gauge symmetry is introduced. We investigate if these models are allowed by current phenomenological data without introducing a scalar field except for two Higgs doublet ones. We find they are excluded by constraints from scalar boson decays associated with new gauge boson Z'. Then a dark vector-like fermion is introduced to modify branching ratio of Z' and we searched for allowed parameter region taking all the phenomenological constraints into account. Finally we show allowed region that can avoid all the constraints.

**Presenter:** NOMURA, Takaaki

**Session Classification:** parallel session B: Higgs

Contribution ID: **27** Type: **not specified**

# Testing the Higgs triplet model via 125GeV Higgs boson decays with radiative corrections

*Tuesday, 17 February 2026 15:10 (20 minutes)*

The complex Higgs triplet model (CHTM) can explain the neutrino masses via the Type II seesaw mechanism. A feature of CHTM is that the electroweak rho parameter (\rho) deviates from unity at the tree-level. Thereby, how one renormalize electroweak sector is different from models with \rho=1. In this talk, we discuss imact of the radiative corrections to the 125 GeV Higgs boson decays in CHTM. We demonstrate that the CHTM is distinguishable from other simple extended Higgs models by investigating the pattern of deviations from the standard model in the Higgs decays.

**Presenter:** SAKURAI, Kodai

**Session Classification:** parallel session B: Higgs

Contribution ID: **28** Type: **not specified**

# Probing Compressed Inert Scalars with Forward Muon Tagging at the Muon Collider

*Tuesday, 17 February 2026 15:30 (20 minutes)*

The compressed mass spectrum of the electroweak inert scalar models pose a significant challenge for current collider experiments, as the soft visible decay products and suppressed production rates hinder conventional search strategies. In this talk, I will explore the discovery prospects of such a compressed electroweak sector at a future high energy Muon Collider operating at 10 TeV. Focusing on vector boson fusion (VBF) production of inert scalar pairs, I will demonstrate how forward muon tagging provides a powerful handle to isolate signal events in scenarios where traditional missing energy based searches fail. After reviewing the relevant dark matter and experimental constraints on the model parameter space, I will present a detailed collider analysis using both cut-based methods and multivariate techniques. The impact of detector energy resolution will be discussed, highlighting the importance of precision instrumentation. Our results show that even in highly compressed and experimentally challenging scenarios, the clean environment and forward coverage of the Muon Collider can significantly enhance discovery potential, making it a compelling probe of dark sectors.

**Presenter:** SEN, Chandrima

**Session Classification:** parallel session B: Higgs

Contribution ID: **29** Type: **not specified**

# Probing spontaneous CP-violation through precision Higgs observables

*Tuesday, 17 February 2026 15:50 (20 minutes)*

Spontaneous CP-violation (SCPV) is one of the interesting possibilities for explaining observed CP-violation. As a simple realization of SCPV, we consider 2 Higgs doublet models (2HDMs), where complex phases of the Higgs doublets can be a source of SCPV. We discuss two important phenomenological consequences of the SCPV 2HDMs,
i.e., non-decoupling nature of extra Higgs bosons and constrained Yukawa structure. We also discuss how we can explore such a scenario at High-Luminosity LHC.

**Presenter:** YAGYU, Kei

**Session Classification:** parallel session B: Higgs

Contribution ID: **30** Type: **not specified**

# Revisiting Bino-slepton Coannihilation Dark Matter in Light of Recent Experimental Results

*Tuesday, 17 February 2026 16:40 (20 minutes)*

Despite being a simple and well-motivated thermal relic scenario, coannihilation dark matter (DM) has remained largely unexplored experimentally due to the difficulty of probing its nearly degenerate mass spectrum. Recent LHC searches, however, have improved sensitivity, enabling broader explorations of the parameter space. We revisit the Bino-slepton coannihilation scenario in Supersymmetric
(SUSY) models, incorporating the latest experimental results. We first focus on the minimal scenario, in which only the Bino-like neutralino and left- or right-handed sleptons are light (O(100) GeV), with all other SUSY particles decoupled. We find that the dark matter mass is constrained to be in the range of about 210–350 GeV (150–425 GeV) for left-handed (right-handed) slepton coannihilation, with lower bounds set by recent LHC searches. We then investigate scenarios with light Higgsino, where direct detection experiments impose strong constraints on the Higgsino mass. Finally, we discuss the implications of these constraints for the muon g − 2 in the BHR, BHL, and BLR scenarios, and find that the combined LHC and LZ limits constrain the SUSY contribution to $|\Delta a_\mu| \boxtimes 1.2 \times 10{-}9$

**Presenter:** TO, Alethea

**Session Classification:** parallel session A: DM

Contribution ID: **31** Type: **not specified**

# Forbidden Dark Matter with Sommerfeld Enhancement

*Tuesday, 17 February 2026 17:00 (20 minutes)*

We discuss the Sommefeld enhancement of the annihilation cross section of dark matter into heavier unstable particles which have long-range interaction with each other. Since annihilation products become non-relativistic near kinematical threshold, the wave function is modified from the plain wave, and significant enhancement of the annihilation cross section can be induced. In this talk, we discuss the formulation of the Sommerfeld enhancement from the annihilation products, and show that the finite decay width of the annihilation products induces resonances of bound-states near threshold in analogy with top-antitop pair production.

**Presenter:** YAMANAKA, Takumu

**Session Classification:** parallel session A: DM

Contribution ID: **32** Type: **not specified**

# Asymmetric Dark Matter from Low-Scale Spontaneous Leptogenesis

*Tuesday, 17 February 2026 17:20 (20 minutes)*

"We investigate a novel type of asymmetric dark matter (ADM) model in which the dark matter asymmetry and the baryon asymmetry in our universe (BAU) are produced simultaneously via low-scale spontaneous leptogenesis, where the mass scale of right-handed neutrino is much lower than the Davidson-Ibarra bound $M_1 \ll 10^9$
$mrGeV$.
In our scenario, both asymmetries are predominantly sourced by a dynamical $CP$ phase, namely the majoron.
Its kinetic misalignment provides a sufficiently large, time-dependent effective $CP$ phase, allowing efficient asymmetry production even for low-scale right-handed neutrinos.
In our framework, the sources of $CP$ violation responsible for the BAU and ADM are correlated with each other, leading to a predictive relation for the dark matter mass. In particular, when the dark matter asymmetry reaches its equilibrium value before freeze-out, the dark matter mass is typically predicted to lie in the range
$\mathcal{O}(0.1)$ GeV
$lesssimm_\chi$
$lesssim\mathcal{O}(100)$ GeV,
which lies within the sensitivity of direct detection experiments.
On the other hand, if the dark matter asymmetry does not reach its equilibrium value due to weak coupling, the allowed mass range extends over a broader interval,
$\mathcal{O}(0.1)$ GeV
$lesssimm_\chi$
$lesssim\mathcal{O}(10)$
$mrTeV$."

**Presenter:** TAKAHASHI, Hiroki

**Session Classification:** parallel session A: DM

Contribution ID: **33** Type: **not specified**

# Possible scenarios for baryogenesis in the presence of a lepton number violating operator in the rare meson decays

*Tuesday, 17 February 2026 16:40 (20 minutes)*

We discuss lepton number violating operators motivated by the flavor-changing rare meson decays, B -> Kvv and K ->πvv.
They can erase a pre-existing baryon asymmetry via electroweak sphaleron, and we analyze their impacts on baryon number washout in the early Universe,
We also discuss other topics related to the lepton number violation, the Majorana masses of the active neutrinos and the neutrinoless double beta decay, which are induced by such operators.
Combining constraints from those experimental data, we identify regions of parameter space where sizable effects in the rare meson decays are compatible with successful baryogenesis.

**Presenter:** MURA, Yushi

**Session Classification:** parallel session B: Flavor

Contribution ID: **34** Type: **not specified**

# Rare meson decay constraints on dark photon and the like

*Tuesday, 17 February 2026 17:00 (20 minutes)*

We evaluate constraints from flavor changing rare meson decays to a light vector boson X, followed by the decay of the on-shell X into the SM fermions. Our theoretical evaluation of the branching ratio of charged B meson decay and charged kaon decay is compared to experimental results, and we derive new constraints for dark photon, U(1)B–L and U(1)R models.

**Presenter:** SETO, Osamu

**Session Classification:** parallel session B: Flavor

Contribution ID: **35** Type: **not specified**

# Radiative Corrections to $D_s \to \ell\nu$ and CKM Unitarity Test

*Tuesday, 17 February 2026 17:20 (20 minutes)*

Recently, a violation of the CKM unitarity condition has been reported in the latest charm-meson data and the latest lattice results, once the universal electroweak correction is taken into account. In this talk, we analytically derive for the first time the complete one-loop electroweak (EW) and QED corrections to the $D_s^+ \to \ell^+\nu_\ell$ decays for $\ell = \mu, \tau$. Our analysis incorporates both short-distance EW-QED corrections, which are beyond the leading-logarithmic approximation (the so-called Sirlin factor), and long distance soft photon corrections depending on the maximum total energy of undetected photons with their resummation. Although the inclusive photon QED corrections to the meson leptonic decays are well known, they do not match the actual measurement circumstances in $D_s^+ \to \mu^+\nu_\mu$. We find $|V_{cs}|_{D_s} = 0.991 \pm 0.007$ from the latest data on $D_s^+$ leptonic decays. We show that properly including these radiative corrections is essential to bring the second-column CKM unitarity tests into agreement with the Standard Model expectation. The study emphasizes that the current limiting factor in confirming CKM unitarity is the precision of QED corrections, and it points out that improving lattice simulations, taking the QED corrections into account, would be desirable for a more robust confirmation.

**Presenter:** SASAKI, Kota

**Session Classification:** parallel session B: Flavor

Contribution ID: **36** Type: **not specified**

# TBA

*Wednesday, 18 February 2026 09:00 (40 minutes)*

**Presenter:** HARZ, Julia

**Session Classification:** plenary: Julia Harz, Yohei Ema

Contribution ID: **37** Type: **not specified**

# TBA

*Wednesday, 18 February 2026 09:40 (40 minutes)*

**Presenter:** EMA, Yohei

**Session Classification:** plenary: Julia Harz, Yohei Ema

Contribution ID: **38** Type: **not specified**

# Sommerfeld Enhancement in the light of Halo gamma-ray excess

*Wednesday, 18 February 2026 10:40 (20 minutes)*

We examine Sommerfeld enhancement in dark matter annihilation as a potential origin of the halo-like gamma-ray excess near E ~ 20 GeV reported by Totani. A minimal model with a light CP-even scalar mediator naturally produces a velocity-dependent annihilation cross section consistent with thermal freeze-out, the Milky Way excess, and limits from dwarf spheroidal galaxies. We discuss future prospects on this issue with other Galactic gamma-ray and cosmic ray excess.

**Presenter:** JHO, Yongsoo

**Session Classification:** parallel session A: DM

Contribution ID: **39** Type: **not specified**

# Composite Asymmetric Dark Matter from Primordial Black Holes

*Wednesday, 18 February 2026 11:00 (20 minutes)*

We investigate a cogenesis scenario for composite asymmetric dark matter framework: a dark sector has a similar strong dynamics to quantum chromodynamics in the standard model, and the dark-sector counterpart of baryons is the dark matter candidate. The Hawking evaporation of primordial black holes plays the role of a source of heavy scalar particles whose CP-violating decay into quarks and dark quarks provides particle-antiparticle asymmetries in baryons and dark matter, respectively. Primordial black holes should evaporate after the electroweak phase transition and before the big-bang nucleosynthesis for explaining the baryon asymmetry of the Universe and for consistent cosmology. We find that this scenario explains the observed values for both baryon and dark matter energy densities when the heavy scalar particles have a mass of 10^6 - 10^9 GeV and the primordial black holes have masses of 10^7 - 10^9 g.

**Presenter:** KUWAHARA, Takumi

**Session Classification:** parallel session A: DM

Contribution ID: **40** Type: **not specified**

# Probing Reheating through Dark Matter Freeze-Out at Lepton Colliders

We explore the potential of future lepton colliders to shed light on the reheating era through the detection of dark matter (DM) that undergoes freeze-out during this phase of the Universe. In this framework, DM interacts with the Standard Model (SM) primarily via leptophilic effective operators, exhibiting highly suppressed couplings to quarks and gluons, consistent with the null results from LHC and direct searches. Departing from conventional WIMP scenarios, we consider the freeze-out to occur amid a prolonged reheating phase driven by inflaton decay. The ensuing entropy production modifies the thermal history, rendering the relic abundance sensitive to reheating dynamics. We perform a detailed signal–background analysis for mono-Higgs plus missing energy signatures at future lepton colliders, considering both polarized and unpolarized beams. Our analysis shows that collider observations, combined with cosmological constraints, can provide indirect information on the reheating temperature and the early thermal history of the Universe.

**Presenter:** MONDAL, Niloy

**Session Classification:** parallel session A: DM

Contribution ID: **41** Type: **not specified**

# Quintessence with a sudden transitional feature and its late-time cosmological signals

*Wednesday, 18 February 2026 10:40 (20 minutes)*

Combinations of recent cosmological observations, including Dark Energy Spectroscopic Instrument, show hints of a dynamical nature for dark energy. While the data suggest the possibility of the phantom crossing, it is worth exploring thoroughly quintessence models. As phenomenological parametrizations of the equation-of-state parameter $w(a)$ with a sharp transitional feature fit the data well, we study the realization of such models by quintessence. In the late Universe, the quintessence field begins to oscillate abruptly, changing the behavior of $w$. Naturally, such a model entails tachyonic instability, and particle production modifies $w$. We perform numerical lattice simulations to study the time dependence of $w$. In addition, the violent particle production produces significant density perturbations and the stochastic gravitational-wave background, whose characteristic scale depends on the mass scale of the quintessence around the minimum of the potential.
We discuss the observability of these late-time cosmological signals through cosmic microwave background, quasar astrometry, pulsar timing arrays, and others.

**Presenter:** TERADA, Takahiro

**Session Classification:** parallel session B: Cosmo

Contribution ID: **42** Type: **not specified**

# Gravitational Wave signatures of Reheating after Warm Axion Inflation

*Wednesday, 18 February 2026 11:00 (20 minutes)*

Before the Big Bang, the Universe experienced an era of accelerated expansion known as inflation. Reheating is the process that bridges this inflationary phase to the hot Big Bang, and it also provides one of the few opportunities for information from the inflaton sector to survive into the later Universe. Although many details of the inflaton's interactions are erased as the Universe thermalizes, gravitational waves offer a uniquely robust channel capable of preserving these microscopic imprints.

In this talk, I will show that when the inflaton is an axion coupled to a dark gauge sector, the reheating dynamics become inherently non-trivial. The axion's Chern–Simons coupling activates strong gauge-field production, glueball formation, and a delayed transfer of energy into light degrees of freedom. A key consequence is that integrating out the heavy glueballs induces effective higher-curvature operators, enabling the inflaton to decay directly into gravitons—an effect that cannot arise in standard Einstein gravity. This mechanism leads to a characteristic enhancement of the high-frequency gravitational-wave background.
I will present the resulting gravitational-wave spectrum and discuss possible cosmological implications.

**Presenter:** TSUJI, Tenta

**Session Classification:** parallel session B: Cosmo

Contribution ID: **43** Type: **not specified**

# Quantum sensing of high-frequency gravitational waves with ion traps

*Wednesday, 18 February 2026 11:20 (20 minutes)*

**Presenter:** TAKAI, Ryoto

**Session Classification:** parallel session B: Cosmo

Contribution ID: **44** Type: **not specified**

# TBA

*Wednesday, 18 February 2026 13:00 (40 minutes)*

**Presenter:** NAKAHAMA, Yu

**Session Classification:** plenary: Yu Nakahama, Daichi Yoshikawa

Contribution ID: **45** Type: **not specified**

# The recent progress from FASER, focusing on the Axion-Like Particle search and Dark Photon search

*Wednesday, 18 February 2026 13:40 (40 minutes)*

FASER (the ForwArd Search ExpeRiment) is an experiment at the CERN Large Hadron Collider (LHC) designed to measure Standard Model neutrinos and to search for light, weakly interacting Beyond the Standard Model (BSM) particles. These particles are produced at the ATLAS interaction point in the forward direction and subsequently decay inside the FASER detector.
In this talk, we present the latest progress from FASER on searches for dark photons and for axion-like particles (ALPs).

**Presenter:** YOSHIKAWA, Daichi

**Session Classification:** plenary: Yu Nakahama, Daichi Yoshikawa

Contribution ID: **46** Type: **not specified**

# Three-body entanglement and nonlocality in particle decays

*Wednesday, 18 February 2026 14:50 (20 minutes)*

The investigation and collider measurement of quantum information generated in elementary particle interactions have attracted growing interest in recent years. To date, most studies have focused on bipartite systems, for example, spin correlations in top-quark pair production, while the rich structure of multipartite quantum correlations remains largely unexplored in high-energy physics.
In this talk, based on 2310.01477 and 2502.19470, I will present a novel framework for analysing genuine three-body quantum correlations in 1 \to 3 particle decays. In particular, I will discuss the monogamy of entanglement and demonstrate the presence of two distinct classes of nonlocality in tripartite quantum systems.

**Presenter:** SAKURAI, Kazuki

**Session Classification:** parallel session A: EW

Contribution ID: **47** Type: **not specified**

# An Analytic Prescription for t-channel Singularities

*Wednesday, 18 February 2026 15:10 (20 minutes)*

The t-channel singularity is a divergence in the scattering amplitude which occurs when a stable particle propagating in t-channel scattering process becomes an on-shell state. Such situations appear either in the system of collider experiments or in the context of the cosmological particle production. No scheme which is generally applicable is known. In this work, we propose a new formulation to identify and remove the source of the divergence. The scheme is fully analytical and various applications can be expected. This work provides a valuable tool in this research field. This talk Based on Phys.Rev.D 112 (2025) 7, 076020.

**Presenter:** SATO, Ryusei

**Session Classification:** parallel session A: EW

Contribution ID: **48** Type: **not specified**

# Searching for Leptoquarks at Future Circular Colliders

*Wednesday, 18 February 2026 15:30 (20 minutes)*

We study the sensitivities of the Future Circular Collider (FCC) under electron-positron collision and hadron-hadron collision scenarios for the search of Leptoquarks. In particular, we focus on the Z-factory mode and the high-pT mode. For the Z-factory mode, we summarize past analytical works on Z-boson decays introducing Leptoquarks at loop-level. For the high-pT mode, we update the current search status of Leptoquarks at the Large Hadron Collider(LHC) and project the sensitivity for the Future Circular Collider based on it. We also comment on the potential for FCC to probe flavour anomalies via leptoquarks.

**Presenter:** HEIDERIJK, Christian

**Session Classification:** parallel session A: EW

Contribution ID: **49** Type: **not specified**

# Enhancing dark matter search using multi-level system

Quantum sensing with qubits has advanced fundamental physics searches,
but higher dimensional systems offer untapped potential. We present a universal qutrit framework that yields a sequence-independent fourfold increase in quantum Fisher information and a twofold gain in sensitivity. In ultralight dark matter searches, spin-1 NV-center qutrits can enhance the axion-electron coupling reach by an order of magnitude beyond qubits. Finally, we outline a general formalism for multilevel quantum sensors, providing a systematic pathway toward exploiting higher-dimensional Hilbert spaces for
precision measurements.

**Presenter:** MA, Xiaolin

**Session Classification:** parallel session B: Flavor/Baryogenesis

Contribution ID: **50** Type: **not specified**

# Machine learning the likelihoods

*Wednesday, 18 February 2026 15:10 (20 minutes)*

Searches for BSM Physics have produced many theoretical ideas, but only a few can be directly tested at the LHC. Reinterpreting existing results is therefore essential for constraining a wider range of models. Independent of the specific reinterpretation method, the final step always involves statistical analysis and hypothesis testing. Accurate tests require detailed information on correlations between signal regions and detector-related nuisance parameters. Although ATLAS provides this information, using the full statistical model is computationally expensive. In this talk, I will present a project that builds NN-based surrogates of ATLAS statistical models. These surrogates reproduce log-likelihoods with high accuracy while reducing computation time by several orders of magnitude, making large parameter scans much more feasible.

**Presenter:** MASELEK, Rafal

**Session Classification:** parallel session B: ML

Contribution ID: **51** Type: **not specified**

# Systematic mapping of $U(1)_{L_e-L_{mu}-L_{tau}}$ flavor model via reinforcement learning

*Wednesday, 18 February 2026 15:30 (20 minutes)*

Recent studies actively apply machine learning to the exploration of flavor physics. In analyzing the flavor structure of the lepton sector, we apply reinforcement learning to a $U(1)$ flavor model with $L_e - L_{mu} - L_{tau}$ charges. By testing multiple architectures to explore charge combinations, we develop a strategy to efficiently achieve high-precision solutions. It turns out that the proposed approach successfully finds parameter sets that reproduce the observed lepton masses and mixing angles.

**Presenter:** NISHIMURA, Satsuki

**Session Classification:** parallel session B: ML

Contribution ID: **52** Type: **not specified**

# The Electric Dipole Moment of electron induced by Electroweak Multiplets at full Three-loop

*Wednesday, 18 February 2026 16:20 (20 minutes)*

There has been remarkable progress in recent years in the electric dipole moment (EDM) measurements of electron using paramagnetic atom or molecule. In a previous study, we calculated the contribution to the electron EDM induced by the CP-violating Yukawa interaction of electroweak multiplets at the three-loop level in effective field theory. We found that this contribution might reach the sensitivity of future EDM experiments. However, this calculation involves an uncertainty relating to threshold corrections that cannot be evaluated in the effective field theory. In this study, we calculate the electron EDM induced by electroweak multiplets at full three-loop. As a result, we found that the threshold correction contributes at the same order as the result of the effective field theory and that the full result is larger than the previous study.

**Presenter:** OGAWA, Kiyoto

**Session Classification:** parallel session A: EW/Theory

Contribution ID: **53** Type: **not specified**

# Access to UV information from effective field theories

*Wednesday, 18 February 2026 16:40 (20 minutes)*

We establish a new connection between low-energy and high-energy theories utlizing the analyticity of physical observables and the inverse Laplace transform. We demonstrate that, starting from the low-energy expansion of a physical observable, equivalent to an effective field theoretical description, one can investigate the sign of the beta function and the dynamical scale of the UV theory, as long as a few assumptions are satisfied. We can also extrapolate physical observables to high energies far beyond the cutoff of the low-energy expansion.

**Presenter:** TAKAURA, Hiromasa

**Session Classification:** parallel session A: EW/Theory

Contribution ID: **54** Type: **not specified**

# Toponium at the LHC

*Wednesday, 18 February 2026 17:00 (20 minutes)*

We review the signature of toponium formation at the LHC. A color-singlet bound state effect at the threshold region is included in the MonteCarlo simulation. The top pair dileptonic decay final states distributions shows distinctive signature in the small dilepton correlation region. We also discuss the potential effects of P wave contribution.

**Presenter:** ZHENG, Ya-Juan

**Session Classification:** parallel session A: EW/Theory

Contribution ID: **55** Type: **not specified**

# Exploring Lepton Flavor Structures with a Latent Diffusion Model

*Wednesday, 18 February 2026 14:50 (20 minutes)*

In this talk, we present a model-independent analysis based on a latent diffusion model to address the flavor structure of leptons. The latent diffusion model combines a diffusion model with a variational autoencoder as a generative AI framework. By generating a wide variety of parameter sets consistent with experimental observations, we find non-trivial features characterizing lepton flavor structures.

**Presenter:** KITAGAWA, Haruto

**Session Classification:** parallel session B: ML

Contribution ID: **56** Type: **not specified**

# Probing Scalar-Mediator Quark Couplings via CLFV Lepton-Nucleon Scattering

*Wednesday, 18 February 2026 16:40 (20 minutes)*

We investigate charged lepton flavor violating (CLFV) deep-inelastic scattering, focusing on the gluon-initiated subprocess $\ell_i g \to \ell_j g$ via the gluon effective operator $\phi\, G^a_{\mu\nu} G_a^{\mu\nu}$, and demonstrate how to probe the nature of the CLFV mediator $\phi$, specifically its mass and interaction with quarks. We consider two benchmark scenarios for the mediator-quark coupling: (i) $h$-like scenario, in which the mediator couples to heavy quarks in proportion to their masses, and (ii) $b$-only scenario, where the coupling is restricted to bottom quark only. We demonstrate that these scenarios can be discriminated by examining the dependence of the differential cross section on the momentum transfer. Furthermore, we show that the peak position of the differential cross section exhibits a pronounced sensitivity to both the mass of the mediator and the coupling strengths with quarks.

**Presenter:** YAMANAKA, Masato

**Session Classification:** parallel session B: Flavor/Baryogenesis

Contribution ID: **57** Type: **not specified**

# A TeV-scale model for neutrino mass, dark matter and baryon asymmetry of the universe and its phenomenology

*Wednesday, 18 February 2026 16:20 (20 minutes)*

The Standard Model successfully describes particle physics but cannot explain neutrino oscillations, the baryon asymmetry of the universe (BAU), and dark matter. The Aoki-Kanemura-Seto (AKS) model is a new physics model that can explain these three phenomena simultaneously at TeV scale testable by future experiments. However, in the original model published in 2009, the baryon number was not evaluated. In the present work [Enomoto, Kanemura, Taniguchi, JHEP06(2025)036], we introduced CP violation to the original AKS model for evaluating the baryon number and found a benchmark scenario to avoid the current constraint on the electron electric dipole moment while keeping a large enough CP-violating phase for electroweak baryogenesis. In this talk, we evaluate the baryon number in this model, using the previously found viable parameter regions. Furthermore, we present benchmark points that can simultaneously explain neutrino masses, dark matter, and BAU, under various experimental and theoretical constraints. We also discuss prospects for testing the model at future experiments. The new particles predicted by the AKS model, including $S^{\pm}$ and the additional Higgs bosons $H_2$ and $H_3$, could be produced at future collider experiments such as the High-Luminosity LHC and electron-positron Higgs factories, and are expected to be tested there. In addition, since electroweak baryogenesis requires a strong first-order electroweak phase transition, which can generate characteristic gravitational wave signals, we also explore the potential for detection of such signals by future space-based observatories such as DECIGO.

**Presenter:** TANIGUCHI, Sora

**Session Classification:** parallel session B: Flavor/Baryogenesis

Contribution ID: **58** Type: **not specified**

# New Axion Bounds from Big Bang Nucleosynthesis

*Thursday, 19 February 2026 09:00 (40 minutes)*

**Presenter:** TOBIOKA, Kohsaku

**Session Classification:** plenary: Kohsaku Tobioka, Christiane Scherb

Contribution ID: **59** Type: **not specified**

# Sweeping the pion chimney for axion-like particles with KOTO

*Thursday, 19 February 2026 09:40 (40 minutes)*

**Presenter:** SCHERB, Christiane

**Session Classification:** plenary: Kohsaku Tobioka, Christiane Scherb

Contribution ID: **60** Type: **not specified**

# Superheavy Supersymmetric Dark Matter

*Thursday, 19 February 2026 10:40 (20 minutes)*

We propose an explanation for the recently reported ultrahigh-energy neutrino signal at KM3NeT, which shows no clear association with known astrophysical sources. While decaying dark matter in the Galactic Center is a natural candidate, the observed arrival direction strongly suggests an extragalactic origin. We introduce a multicomponent dark matter scenario in which the components are part of a supermultiplet, with supersymmetry ensuring a nearly degenerate mass spectrum among the fields with different spins. In this setup, a cosmologically long-lived fermionic state decays into a slightly lighter bosonic dark matter state, producing a boosted neutrino spectrum with energy around 100 PeV, determined by the mass difference. The heavy-to-light decay occurs at a cosmological redshift of $\mathcal{O}$ =a few or higher, leading to an isotropic directional distribution of the signal.

**Presenter:** PARK, Seong Chan

**Session Classification:** parallel session A: DM

Contribution ID: **61** Type: **not specified**

# Diffuse Multi-messenger Signals of Dark Matter Powered Stars

*Thursday, 19 February 2026 11:00 (20 minutes)*

Dark matter (DM) annihilation can power the first generation of stars as long lived dark stars (DSs) that grow to supermassive scales $M_{\rm DS}$
$gtrsim 10^5 M_\odot$ and eventually collapse into heavy black holes that could seed the supermassive black holes observed at high redshifts. We compute the electromagnetic and neutrino emission from these objects and determine the diffuse background flux from a population which would seed supermassive black holes. Using data from Fermi-LAT, Super-K, and IceCube, we draw constraints on this scenario of SMBH production in terms of the DM models which power the stars.

**Presenter:** SCHWEMBERGER, Tom

**Session Classification:** parallel session A: DM

Contribution ID: **62** Type: **not specified**

# MeV-Scale Sterile Neutrino Dark Matter and Future Detection

*Thursday, 19 February 2026 11:20 (20 minutes)*

Sterile neutrinos are well-motivated candidates for dark matter. In particular, sterile neutrino dark matter in the MeV mass range has recently attracted increasing attention due to the prospects of future indirect detection experiments. In this work, we focus on the Compton Spectrometer and Imager (COSI) as a next-generation gamma-ray detector and investigate the detectability of MeV-scale sterile neutrino dark matter.
By exploiting the complementary sensitivity of the 511 keV line associated with positronium decay and a monochromatic gamma-ray line from radiative decays, COSI is expected to explore previously unexplored regions of parameter space for MeV-scale sterile neutrino dark matter. Furthermore, we show that within part of this parameter space, COSI has the capability to simultaneously probe sterile neutrino dark matter through both the 511 keV and monochromatic gamma-ray signals.

**Presenter:** FUJISAWA, Subaru

**Session Classification:** parallel session A: DM

Contribution ID: **63** Type: **not specified**

# Constraints on MeV Axion Models from Kaon Decays with KTeV Data

*Thursday, 19 February 2026 10:40 (20 minutes)*

The QCD axion is a compelling mechanism for solving the strong CP problem. Most studies have focused on axion models with a large decay constant, $f_a$
$gtrsim 10^9$, GeV. However, recent work has pointed out that viable axion models may also exist in the low-scale regime, $f_a \sim \mathcal{O}(1)$, GeV, corresponding to an axion mass in the MeV range.

In this mass range, the axion can be produced in kaon decays such as $K_L \to \pi^0\pi^0 a$, followed by the prompt decay $a \to e^+e^-$. As a result, the final-state signature coincides with that of the rare decay $K_L \to \pi^0\pi^0 e^+e^-$. The KTeV experiment has placed a stringent upper bound on this channel, $\mathrm{Br}(K_L \to \pi^0\pi^0 e^+e^-) < 6.6 \times 10^{-9}$, which can therefore be directly reinterpreted as a strong constraint on MeV-scale QCD axion models. In our work, we perform a dedicated analysis of this reinterpretation and derive stringent limits on the axion parameter space from kaon decay measurements.

**Presenter:** IWAI, Takaya

**Session Classification:** parallel session B: Flavor/Cosmo

Contribution ID: **64** Type: **not specified**

# Residual Flavor Symmetries at the Modular Self-Dual Point: Predictive Insights into Neutrino Masses and Mixing

*Thursday, 19 February 2026 11:00 (20 minutes)*

"We explore the theoretical consequences of residual symmetries that persist at the modular self-dual point $\tau = i$ within modular-invariant frameworks. Assuming the three generations of lepton doublets form an irreducible representation of a finite modular group $\Gamma_N$, and that the light neutrino masses arise from the Weinberg operator constructed from modular forms, we demonstrate that the neutrino mass matrix naturally acquires a residual flavor symmetry or antisymmetry, dictated by the modular weight. In the antisymmetric case, one neutrino remains massless, while the remaining two can become degenerate when the mass matrix is real—an outcome independent of the modular level $N$.

By imposing a compatible residual symmetry in the charged-lepton sector, the structure of the leptonic mixing matrix becomes partially determined, fixing one of its columns and yielding predictive relations among the mixing angles and the Dirac CP phase. These residual (anti)symmetries enable the application of conventional flavor-symmetry techniques within a modular setting, offering a systematic approach to phenomenological predictions. A comprehensive survey over all viable $\Gamma_N$ groups indicates that the resulting fixed column typically contains $\mathcal{O}(1)$ entries, leading naturally to large lepton mixing. This framework thus provides a symmetry-driven, modular origin of testable patterns in neutrino observables and establishes a bridge between modular symmetry structures and measurable parameters in the lepton sector."

**Presenter:** KASHAV, Monal

**Session Classification:** parallel session B: Flavor/Cosmo

Contribution ID: **65** Type: **not specified**

# Thermal Lepton Oscillations in Leptogenesis

*Thursday, 19 February 2026 11:20 (20 minutes)*

Oscillation phenomena occur in both active and sterile neutrinos, where the oscillation phases are triggered by vacuum mass difference. Before the electroweak gauge symmetry breaking, leptons are massless, and cannot oscillate in the conventional way. However, they can still oscillate in the background plasma. Using the flavor-covariant nonequilibrium quantum field theory, I will discuss how oscillations appear from thermal leptons at finite temperatures, and present new ideas that may have significant impacts on leptogenesis.

**Presenter:** LI, Shaoping

**Session Classification:** parallel session B: Flavor/Cosmo

Contribution ID: **66** Type: **not specified**

# TBA

*Thursday, 19 February 2026 13:00 (40 minutes)*

**Presenter:** JINNO, Ryusuke

**Session Classification:** plenary: Ryusuke Jinno, Mihoko Nojiri

Contribution ID: **67** Type: **not specified**

# TBA

*Thursday, 19 February 2026 13:40 (30 minutes)*

**Presenter:** NOJIRI, Mihoko

**Session Classification:** plenary: Ryusuke Jinno, Mihoko Nojiri