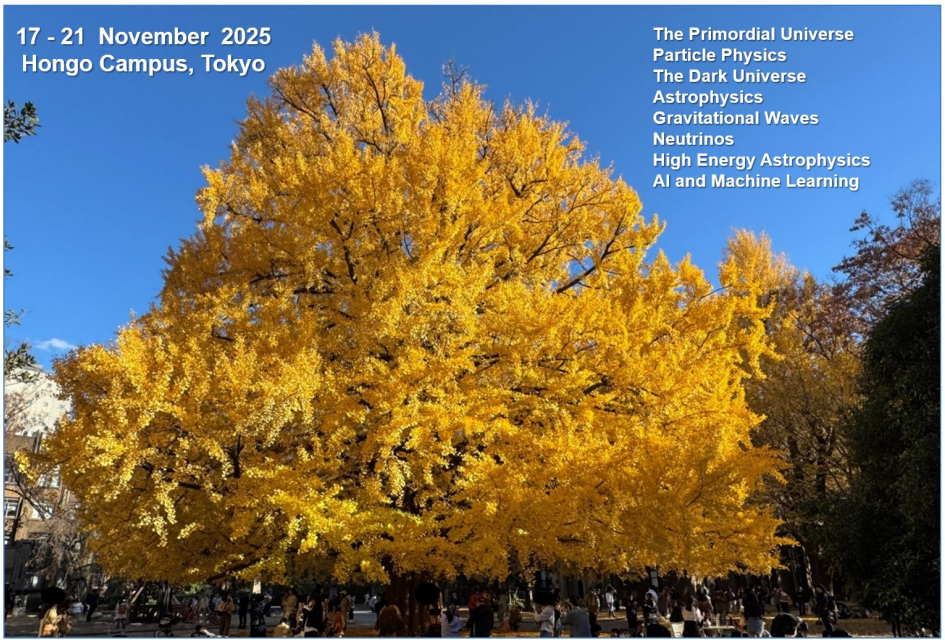
# Second International Conference on the Physics of the Two Infinities




# Rapport sur les contributions

https://indico.in2p3.fr/e/35255

ID de Contribution: **174** Type: **Non spécifié**

# Cosmic magnetic monopole search experiment SCEP

*mercredi 19 novembre 2025 17:00 (15 minutes)*

The existence of magnetic monopoles (MMs) remains one of the most enduring questions in particle physics. They are theorized to play a crucial role in explaining the quantization of electric charge. According to the Grand Unified Theory (GUT), MMs were produced during the separation of the strong and electroweak forces, an event that occurred shortly after the Big Bang. Previous efforts to detect these GUT-MMs relied on superconducting coils or large low-background detectors, which require ultra-low temperatures or underground environments. In this talk, I will introduce the SCEP experiment, which aims to detect coincidental signals of MMs using high-precision magnetometers and plastic scintillators simultaneously. I will also present the latest progress of the experiment R&D effort.

**Auteur:** Prof. LIN, Qing (University of Science and Technology of China)

**Orateur:** Prof. LIN, Qing (University of Science and Technology of China)

**Classification de Session:** Particle Physics

ID de Contribution: **175** Type: **Non spécifié**

# Recent Measurements from ProtoDUNE-SP

LArTPC-based neutrino experiments such as the Short Baseline Neutrino program at Fermi National Accelerator Laboratory and the upcoming Deep Underground Neutrino Experiment (DUNE) rely neutrino-nucleus event generators to predict interaction rates within their detectors. A key uncertainty in these simulations is the rate of interactions within the nucleus of particles emitted from primary neutrino interactions. Hadron-argon cross section measurements help constrain this uncertainty and provide a better understanding of how various particles interact within the nucleus. This talk will focus on several recently-published results from ProtoDUNE-SP, a large-scale prototype of DUNE's horizontal drift (HD) far detector, using data from test beam hadrons at CERN. It will also provide an outlook for ongoing analyses from ProtoDUNE-SP, as well as the progress of the more recent HD prototype ProtoDUNE-HD and the vertical drift prototype ProtoDUNE-VD.

**Auteur:** CALCUTT, Jacob (Brookhaven National Lab)

**Orateur:** CALCUTT, Jacob (Brookhaven National Lab)

**Classification de Session:** Neutrinos

ID de Contribution: **176** Type: **Non spécifié**

# Investigating merger histories using global HI profile asymmetries

This project will focus on developing, testing and implementing new, more sophisti- cated methods of quantifying asymmetries in the HI spectra of the ALFALFA galaxies. Methods will be developed that better trace asymmetries as a function of radial ve- locity (relative to the galaxy's systemic velocity). The approaches will be based on using the lopsidedness (Nathan Deg et al 2017) and (Bok et 2015) to model a given galaxy's HI spectrum, and then use that model to accurately measure the asymmetries. After that, we are going to compare two different approaches to properly validate the asymmetries.Once the asymmetries of the ALFALFA galaxies have been measured, the properties of the environments in which the galaxies reside will be measured. This will be done by utilising the optical counterparts to which the ALFALFA galaxies have been reliably cross-matched. Every optical counterpart will come with a slew of observational information from Data Release 10 of the DeCaLs As such, the environmental densities - in addition to other properties - will be determined for the ALFALFA galaxies. Doing so will allow for the MSc project's main science question to be: What evidence does the full ALFALFA sample offer for the presence of merger-induced asymmetries in the HI spectra of galaxies in the nearby Universe ? What is the best approach to calculate the asymmetry?

**Auteur:** PEKO, Yandisa (University of the Western Cape)

**Orateur:** PEKO, Yandisa (University of the Western Cape)

ID de Contribution: **179** Type: **Non spécifié**

# JUNO facility and status of detector

*mercredi 19 novembre 2025 14:00 (15 minutes)*

Jiangmen Underground Neutrino Observatory (JUNO), a next generation underground reactor antineutrino experiment, is proposed to determine the neutrino mass hierarchy and precisely measure neutrino oscillation parameters using a massive liquid scintillator detector underground. The experimental hall, spanning more than 50 meters, is under a granite mountain of over 700 m overburden. The central antineutrino detector, built with 35.4-meter diameter acrylic sphere, contains 20 kilotons of liquid scintillator and ~18,000 20 inch PMTs (and ~25,000 3 inch PMTs). The antineutrino detector is placed in a water pool shielding system which also functions as an active water Cherenkov veto detector. On the top of water pool is a Top Tracker system which further improves the muon track reconstruction. The talk will present the project construction status

**Auteur:** LI, Xiaonan (Institute of High Energy Physics, Chinese Academy of Sciences, Beijing)

**Orateur:** LI, Xiaonan (Institute of High Energy Physics, Chinese Academy of Sciences, Beijing)

**Classification de Session:** Neutrinos

ID de Contribution: **180** Type: **Non spécifié**

# Investigating the electromagnetic moments of dark matter with direct detection experiments

*mercredi 19 novembre 2025 14:00 (15 minutes)*

Observationally, we only know that dark matter (DM) interacts gravitationally. Much experimental and observational effort is spent probing further DM-induced signals, particularly interactions between DM and the visible sector. One of these search efforts includes dedicated underground laboratories, trying to measure DM particles scattering off of targets. In this talk, I will discuss the possibility of spin-1/2 dark matter candidates interacting with the photon, whose strength is parameterized by four unique form factors. For small momentum transfers, these form factors can effectively be modeled by the electromagnetic moments (EM) of DM, so its direct detection phenomenology can be fully quantified via these EM moments. I will discuss the sensitivity of direct detection experiments such as XENON1T and PICO-60 on individual EM operators and their induced interference effects. These experimental findings are then translated into the parameter space of a t-channel toy model of spin-1/2 DM interacting with tau-leptons via scalar bosons. Direct detection experiments can probe a large region in the underlying parameter space, particularly if the toy model contains strong CP violation. Finally, I will discuss the implications for a thermal relic in this toy model.

**Auteurs:** IBARRA, Alejandro (Technical University of Munich); TOMAR, Gaurav (APJ Abdul Kalam Technological University); REICHARD, Merlin (Technical University of Munich)

**Orateur:** REICHARD, Merlin (Technical University of Munich)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **181** Type: **Non spécifié**

# New measurement of $K^+ \to \pi^+\nu\bar{\nu}$ branching ratio at the NA62 experiment

*mercredi 19 novembre 2025 16:15 (15 minutes)*

The $K^+ \to \pi^+\nu\bar{\nu}$ decay is a golden mode for flavour physics. Its branching ratio is predicted with high precision by the Standard Model to be less than $10^{-10}$, and this decay mode is highly sensitive to indirect effects of new physics up to the highest mass scales. A new measurement of the $K^+ \to \pi^+\nu\bar{\nu}$ decay by the NA62 experiment at the CERN SPS is presented, using data collected in 2021 and 2022. This new dataset was collected after modifications to the beamline and detectors and at a higher instantaneous beam intensity with respect to the previous 2016-2018 data taking. Using the NA62 datasets from 2016-2022, a new measurement of $\mathcal{B}(K^+ \to \pi^+\nu\bar{\nu}) = \left(13.0^{+3.3}_{-2.9}\right) \times 10^{-11}$ is reported, and for the first time the $K^+ \to \pi^+\nu\bar{\nu}$ decay is observed with a significance exceeding $5\sigma$.

**Auteur:** KUCEROVA, Zuzana (CERN)

**Orateur:** KUCEROVA, Zuzana (CERN)

**Classification de Session:** Particle Physics

ID de Contribution: **182** Type: **Non spécifié**

# Precision measurements of kaon and pion decays at NA62

*mercredi 19 novembre 2025 17:30 (15 minutes)*

The NA62 experiment at CERN collected the world's largest dataset of charged kaon decays, leading to the most precise measurement of the branching ratio of the ultra-rare $K^+ \to \pi^+\nu\bar{\nu}$ decay. In this talk NA62 reports recent results from precision measurements of kaon and pion decays, using data samples collected in 2017-2018.
A sample of $K^+ \to \pi^+\gamma\gamma$ decays is collected using a minimum-bias trigger, and the results include measurement of the branching ratio, study of the di-photon mass spectrum, and the first search for production and prompt decay of an axion-like particle with gluon coupling in the process $K^+ \to \pi^+ A$, $A \to \gamma\gamma$. A sample of $\pi^0 \to e^+e^-$ decay candidates is collected using a dedicated scaled down di-electron trigger, and a preliminary result of the branching fraction measurement is presented. The radiative kaon decay $K^+ \to \pi^0 e^+\nu\gamma$ (Ke3g) is studied with a data sample of O(100k) Ke3g candidates with sub-percent background contaminations. Results with the most precise measurements of the Ke3g branching ratios and T-asymmetry are presented. The $K^+ \to \pi^+\mu^+\mu^-$ sample comprises about 27k signal events with negligible background contamination, and the presented analysis results include the most precise determination of the branching ratio and the form factor.

**Auteur:** BICIAN, Lubos

**Orateur:** BICIAN, Lubos

**Classification de Session:** Particle Physics

ID de Contribution: **184** Type: **Non spécifié**

# Dark Energy and Neutrino Mass –Measurements from DESI DR2 using BAO

*lundi 17 novembre 2025 17:25 (25 minutes)*

The DESI collaboration (Dark Energy Spectroscopic Instrument) confirmed its groundbreaking results on dynamical dark energy through the largest 3-dimensional Universe map it observed. This talk highlights how DESI Data Release 2 further challenges the ΛCDM paradigm: Baryon Acoustic Oscillation (BAO) measurements reveal a 2-4σ preference for dynamical dark energy, particularly when combined with external cosmic microwave background (CMB) data and Supernovae Ia (SNIa) data. Additionally, DESI sets the tightest upper limit on neutrino mass (Σm<0.064eV) under ΛCDM, though the posterior distributions intriguingly favour negative values. The dynamical dark energy model relaxes neutrino mass constraints and leaves open the possibility of inverted mass ordering. DESI will release its findings on cosmological parameters and primordial non-Gaussianity with its DR2 in the coming year. These results will further improve our understanding of the dark energy nature, neutrino mass ordering and early-Universe physics.

**Auteur:** DESI COLLABORATION

**Co-auteur:** Dr YU, Jiaxi (Kavli IPMU)

**Orateur:** Dr YU, Jiaxi (Kavli IPMU)

ID de Contribution: **186** Type: **Non spécifié**

# Two coincidences are a clue: Probing a GeV-scale dark sector

The similarity between dark matter and baryon energy densities suggests the existence of a dark QCD sector analogous to the visible QCD sector. Moreover, small-scale structure issues can be addressed by self-interacting dark matter with a cross section comparable to that of QCD. These two observations together hint at a GeV-scale dark QCD sector. In this talk, I will present how a Chiral Asymmetric Dark Baryon model can address both issues, resulting in a predictive dark sector that can be tested in future direct detection and beam dump experiments.

**Auteur:** Dr CHUNG, Yi (Max-Planck-Institut für Kernphysik)

**Orateur:** Dr CHUNG, Yi (Max-Planck-Institut für Kernphysik)

ID de Contribution: **187** Type: **Non spécifié**

# Probing lepton number violation with same-sign muon colliders

*mercredi 19 novembre 2025 13:45 (15 minutes)*

Lepton number violation (LNV) is a key signal of physics beyond the Standard Model, often linked to neutrino mass generation and baryogenesis. In this talk, I will present our study of dimension-seven $\Delta L = 2$ SMEFT operators at a same-sign muon collider, focusing on the process $\mu^+\mu^+ \to W^+W^+/W^+qq'$ at $\sqrt{s} = 2$ TeV with 1 ab$^{-1}$ luminosity, inspired by the $\mu$TRISTAN proposal. We analyze final states with two fat jets, targeting hadronic W decays to probe eight distinct LNV operators. The clean environment and unique initial state make this channel highly sensitive, with minimal Standard Model background. We estimate the collider's reach for each operator and compare it with current LHC bounds and future FCC projections. Our results show that same-sign muon colliders offer a powerful and complementary probe of TeV-scale LNV, and can significantly advance our understanding of new physics beyond the Standard Model.

**Auteur:** SARKAR, Abhik (Indian Institute of Technology Guwahati)

**Orateur:** SARKAR, Abhik (Indian Institute of Technology Guwahati)

**Classification de Session:** Particle Physics

ID de Contribution: **189** Type: **Non spécifié**

# Non-Resonant Anomaly Detection for Semi-Visible Jets with Leptonic Decays at the Large Hadron Collider

In this study, we explore the capabilities of Non-Resonant Anomaly Detection techniques, Reweight and Generate, for identifying semi-visible jets (SVJ) within the Hidden Valley (HV) dark sector model. Using simulated events generated from PYTHIA, MadGraph5, and Delphes, we trained a Boosted Decision Tree (BDT) to select optimal features for distinguishing the signal from QCD backgrounds. With an AUC value of $0.998$, the features selected are $H_T$, MET, $m_{jj}$, and $N$-subjettiness ratios ($\tau_{21}$ and $\tau_{32}$). Our results confirm that both Reweight and Generate provide reliable background extrapolation, as validated by Wasserstein distance metrics. Additionally, the Reweight method improves the detection significance from $2.6\sigma$ to approximately $5\sigma$, demonstrating its potential for enhancing sensitivity in non-resonant searches.

**Auteur:** FLORES, Marvin (National Institute of Physics, University of the Philippines Diliman)

**Co-auteur:** M. JUMAWAN, Francis Lance (National Institute of Physics, University of the Philippines Diliman)

**Orateur:** FLORES, Marvin (National Institute of Physics, University of the Philippines Diliman)

ID de Contribution: **190** Type: **Non spécifié**

# Cold Atom Quantum Technology to Explore Fundamental Physics

*mardi 18 novembre 2025 10:15 (25 minutes)*

In this presentation, I will outline the scientific opportunities presented by a multi-stage programme based on cold atom quantum technology. The central objectives of this programme include the search for ultra-light dark matter, the exploration of gravitational waves in the mid-frequency range—specifically between the peak sensitivities of LISA and LIGO/Virgo/KAGRA/INDIGO/Einstein Telescope/Cosmic Explorer experiments—and the investigation of other frontiers in fundamental physics. This programme will complement other planned dark matter searches, probe mergers involving intermediate-mass black holes, and explore early-universe cosmology.

I will particularly focus on key activities in this field, such as the AION project in the UK and the international Terrestrial Very-Long-Baseline Atom Interferometry (TVLBAI) initiative, which is currently in the process of forming a proto-collaboration. The TVLBAI initiative aspires to establish a global network of large-scale atom interferometers designed to detect ultra-light dark matter and gravitational waves, with the ultimate aim of deploying kilometre-scale detectors by the mid-2030s. This collaboration is dedicated to developing a comprehensive roadmap, which will outline the scientific and technological milestones essential for the success of these groundbreaking detectors.

Relevant References:
• AION Collaboration. (2020). "AION: An Atom Interferometer Observatory and Network."Journal of Cosmology and Astroparticle Physics, 2020(05), 011. arXiv:1911.11755
• Abend, S., et al. (2024). "Terrestrial Very-Long-Baseline Atom Interferometry: Workshop Summary."AVS Quantum Science, 6(2), 024701. arXiv:2310.08183
• Abdalla, A., Abe, M., Abend, S., et al. (2025). "Terrestrial Very-Long-Baseline Atom Interferometry: Summary of the Second Workshop."EPJ Quantum Technology, 12(1), Article 42. https://doi.org/10.1140/epjqt/s40507-025-00344-3

**Auteur:** BUCHMUELLER, Oliver (Imperial College London)

**Orateur:** BUCHMUELLER, Oliver (Imperial College London)

ID de Contribution: **191** Type: **Non spécifié**

# Unravelling dark matter halo dynamics: from prompt cusps to universal profiles

*mercredi 19 novembre 2025 14:15 (15 minutes)*

The study of dark matter halos is pivotal in unravelling the nature of dark matter particles, their detection and structure formation in the universe. Our work aims to track and investigate dark matter halo dynamics, from the initial collapse of tiny perturbations forming prompt cusps to the gradual evolution of their profiles into the universal NFW(Einasto) profile. We examine a specific set of earth mass and solar system sized microhalos, generated from initial conditions composed of Gaussian random fields and crossed sin-waves, in numerical simulations using Ramses-N body and ColDICE-Vlasov codes. We analyze the cusp's density profile, test analytical predictions for its slope, and track its extent and stability in the face of continuous accretion and mergers. Furthermore, we verify predictions for the profile in various spatial regions of the halo, study the effects of angular momentum and tidal fields and specifically, what leads to the universal NFW profile. We also investigate phase-space distribution, velocity and anisotropy parameter profiles to study the dynamics including numerical artefacts like radial orbit instabilities. Analytical studies of the complex multi-stream dynamics inside a collapsed halo using self-similar models already exist with predictions for the particle trajectories, phase space distribution, mass and density profiles. Moreover, prior numerical studies claim that the halos accrete largely onto intermediate and large radii with little to no impact on the inner cusp, eventually reaching the universal NFW(Einasto) profile. We test these claims and construct a qualitative description of halo dynamics and its evolution through different phases.

**Auteur:** PARICHHA, Abineet (Institut d'Astrophysique de Paris - Sorbonne Université)

**Orateur:** PARICHHA, Abineet (Institut d'Astrophysique de Paris - Sorbonne Université)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **192** Type: **Non spécifié**

# Reevaluating Constant-Roll Dynamics in Warm Inflation

*mercredi 19 novembre 2025 14:15 (15 minutes)*

Testing the limits of the inflationary paradigm can be achieved by moving beyond the standard slow-roll conditions. One approach is to constrain the dynamics of the inflaton field with a constant rate of roll, known as the constant-roll scenario, where the acceleration of the inflaton field satisfies $\ddot{\phi} \propto H\dot{\phi}$. This scenario has been studied extensively in the context of cold inflation . Here , we examine this possibility within a variant of the inflationary scenario called Warm Inflation (WI). We present the necessary conditions for achieving constant-roll in WI models that sustain inflation for at least 60 e-folds, transition gracefully out of the constant-roll phase, and preserve the system near thermal equilibrium, an essential feature of WI in the slow-roll regime.

**Auteurs:** Prof. BHATTACHARYA, Kaushik (Indian Institute of Technology Kanpur); BISWAS, Sandip (Indian Institute of Technology Kanpur); Dr DAS, Suratna (Ashoka University)

**Orateur:** BISWAS, Sandip (Indian Institute of Technology Kanpur)

**Classification de Session:** Cosmology

ID de Contribution: **194** Type: **Non spécifié**

# Searches for Axions and Other light particles at ATLAS

Searches for axion-like-particles (ALPs) are presented using LHC collision data collected by the ATLAS experiment during Run 2 and Run 3. The searches use novel reconstruction and identification techniques, covering a mass range of ALPs below the Z-boson mass.

**Auteur:** COLLABORATION, ATLAS (CERN)

**Orateur:** COLLABORATION, ATLAS (CERN)

**Classification de Session:** Particle Physics

ID de Contribution: **195** Type: **Non spécifié**

# Search for proton decay into a single charged antilepton and a massless invisible particle using the full pure water data set of Super-Kamiokande

*mercredi 19 novembre 2025 14:15 (15 minutes)*

Grand Unified Theories (GUTs) viewed as the extension of Standard Model (SM) are proposed and unify the strong, weak, and electromagnetic interactions at the order of $10^{15}$-$10^{16}$ GeV which is unreachable by accelerators. Since the three interactions are described by a single coupling constant in the GUTs, the violation of baryon number is allowed, and rare processes such as proton decay are predicted as one of the most important signatures. To probe the processes, Super-Kamiokande (SK) is a large water Cherenkov detector which is designed for precise observation of neutrinos and search for proton decay.
In order to search for the direct evidence of GUTs, two simplest general 2-body decays are considered. We search for $p \to l^+ + X$ (where $l^+$ is a positron or an antimuon, and $X$ is a neutral massless and invisible particle) using the entire pure water detector phase of SK (0.401 Mton·year). By performing a spectral fit technique, new results are set for $p \to e^+ + X$ and $p \to ^+ + X$, respectively.

**Auteur:** LIU, Yu-Ming (Keio University)

**Orateur:** LIU, Yu-Ming (Keio University)

**Classification de Session:** Neutrinos

ID de Contribution: **196** Type: **Non spécifié**

# The Dark Universe with the Subaru Telescope

*lundi 17 novembre 2025 17:50 (25 minutes)*

With its wide-field observing capability, the Subaru Telescope has been one of the most powerful telescopes in probing the dark Universe with the gravitational lensing effect. In this talk, I will describe the status of cosmological studies using the Subaru Telescope data.

**Auteur:** OGURI, Masamune (Chiba University)

**Orateur:** OGURI, Masamune (Chiba University)

ID de Contribution: **197** Type: **Non spécifié**

# Status of the Hyper-Kamiokande experiment

*lundi 17 novembre 2025 14:10 (25 minutes)*

The Hyper-Kamiokande (Hyper-K) is a next generation long baseline neutrino experiment. The Hyper-K water Cherenkov far detector is designed to succeed the Super-Kamiokande (SK) detector. Currently under construction in Japan, the construction and commissioning of the experiment is expected to be finalized by the end of 2027, with data-taking starting in 2028. Compared to its predecessors, the Hyper-K far detector extended capabilities will amount to a fiducial volume nearly one order of magnitude higher (260 kton total, 190 kton fiducial). It will be instrumented with 20000 high-efficiency 50 cm photodetectors, 1000 multi-photodetectors, electronics and DAQ, that associated with new calibration and monitoring approach, with deliver a broader spectrum of measurement possibilities and higher level of data quality when compared to existing data. Combined with a MegaWatt-class beamline located at the J-PARC accelerator facility and a complex of near and intermediate detectors, the experiment will collect unprecedented number of neutrino interactions for a very broad physics program that includes: the discovery of CP-violation in the lepton sector; precise measurements of neutrino flavor oscillation parameters; testing of Grand Unified Theories with proton decay search; probing for new physic scenarios in the upturn region of solar neutrinos; constraining supernova mechanisms and cosmic star-formation history by observing neutrinos from both individual and diffuse supernova sources (DSNB). The advancement status of Hyper-K far and near detectors including the Intermediate Water Cherenkov Detector (IWCD) will be reported in this presentation, along with its physics goals.

**Auteur:** PÉRISSÉ, Lorenzo (ILANCE - IN2P3 & UTokyo)

**Orateur:** PÉRISSÉ, Lorenzo (ILANCE - IN2P3 & UTokyo)

ID de Contribution: **198** Type: **Non spécifié**

# Recent results and status of the SNO+ experiment on its journey towards Neutrinoless Double Beta Decay

SNO+ is a large, multi-purpose neutrino detector located 2 km underground at SNOLAB, Canada, with the main goal of searching for the neutrinoless double beta decay ($0\nu\beta\beta$) of $^{130}$Te. The detector is currently operating with 780 tonnes of liquid scintillator as its active target mass. The combination of high light yield, low intrinsic background levels, and steadily increasing livetime enables the SNO+ collaboration to pursue a broad physics program. This includes measurements of solar neutrinos, detection of antineutrinos from nuclear reactors and from the Earth, as well as searches for other rare processes.

SNO+ performed the first observation of the charged-current interaction of solar neutrinos with $^{13}$C, marking a significant milestone in low-energy neutrino detection and demonstrating the detector's sensitivity to rare interaction channels. In parallel, the spectral analysis of reactor antineutrino oscillation led SNO+ to obtain the second-most precise determination of $\Delta m^2_{21}$ and to perform the first measurement of the flux of geoneutrinos in the Western Hemisphere.

The scintillator data is also being used to quantify backgrounds and understand the detector response in preparation for the search of neutrinoless double beta decay. In a first phase, SNO+ will perform this search with 0.5% of natural tellurium by weight, targeting a predicted half-life sensitivity of $2 \times 10^{26}$ years (90% CL) with 3 years of livetime, followed by higher tellurium loadings, up to 3%, for sensitivities above $10^{27}$ years. In this talk I will present the most recent physics results from the analysis of the SNO+ scintillator data, and will discuss the status and prospects for the neutrinoless double beta decay search.

**Auteur:** INACIO, Ana Sofia (University of Oxford)

**Orateur:** INACIO, Ana Sofia (University of Oxford)

ID de Contribution: **199** Type: **Non spécifié**

# The Universe at z > 10 and the first population of stars and galaxies

*jeudi 20 novembre 2025 14:25 (25 minutes)*

The discovery of UV-bright galaxies at redshifts z > 10 by JWST, now complemented by ALMA detections of dust and gas emission, has opened an observational window onto the first few hundred million years of cosmic history. These galaxies appear more numerous, more massive, and more evolved than predicted by standard ΛCDM-based models of early structure formation. Their existence poses a tension with theoretical expectations based on the limited time available for halo growth, star formation, and metal enrichment.

In this talk, I will review the current observational landscape: the rapidly increasing sample of high-z galaxy candidates, constraints from their UV luminosity functions, and spectroscopic confirmations. I will emphasize the implications for models of early galaxy formation, including star formation efficiency, feedback. ALMA observations add further weight to the puzzle by revealing significant dust and metal content at unexpectedly early time but no confirmed detections of the very first generation of stars.

This tension—between what we see and what standard theory allows—invites a broader reflection on the interface between observational cosmology and fundamental physics. Are these galaxies outliers, or are we witnessing early hints that physics at the largest scales is probing constraints rooted in the microphysics of the early Universe? This question lies at the heart of the physics of the two infinities.

**Auteur:** BURGARELLA, Denis (Laboratoire d'Astrophysique de Marseille)

**Co-auteurs:** Prof. FINKELSTEIN, Steve (Univ. Texas at Austin); Prof. DICKINSON, Mark (NOIRLab); JWST-CAPERS; JWST-CEERS

**Orateur:** BURGARELLA, Denis (Laboratoire d'Astrophysique de Marseille)

ID de Contribution: **200** Type: **Non spécifié**

# Oscillation Physics with Reactor Antineutrinos in JUNO

*mercredi 19 novembre 2025 14:30 (15 minutes)*

The Jiangmen Underground Neutrino Observatory (JUNO) is a next-generation, multi-purpose neutrino experiment currently under construction in the South of China. Located in an underground laboratory 700 meter deep (1800~m.w.e.), JUNO features a 20-kiloton liquid scintillator (LS) target enclosed in a 35.4-meter-diameter acrylic sphere. The central detector is instrumented with 17,612 20-inch and 25,600 3-inch photomultiplier tubes, providing about 78% optical coverage.

JUNO's primary goals are to determine the neutrino mass ordering (NMO) and to perform high-precision measurements of the oscillation parameters $\Delta m^2_{21}$ and $\sin^2(\theta_{12})$, using reactor antineutrinos emitted by eight nuclear reactors located approximately 52.5~km away. The detector's design is optimized to achieve an unprecedented energy resolution of 3% at 1~MeV and to have an uncertainty on non-linearities in the energy scale to better than 1%.

Thanks to its optimized baseline, which corresponds to the first solar oscillation maximum, JUNO can simultaneously probe both solar and atmospheric oscillation effects. The energy-dependent phase shift in the oscillated spectrum provides sensitivity to the NMO in vacuum-dominant conditions, enabling a $3\sigma$ determination with about 7 years of data-taking, corresponding to an exposure of 6.5~years~$\times$~26.6~$GW_{th}$.

Furthermore, JUNO's large target mass and excellent energy resolution will allow it to independently measure four oscillation parameters ($\Delta m^2_{21}$, $\Delta m^2_{31}$, $\sin^2(\theta_{12})$, and $\sin^2(\theta_{13})$) reaching sub-percent precision for the first three, within the first two years of data taking.

This talk will focus on probing neutrino oscillation physics with reactor antineutrinos in JUNO and its potential in this new era of sub percent measurements in the neutrino sector.

**Auteur:** PERCALLI, Elisa (INFN)

**Orateur:** PERCALLI, Elisa (INFN)

**Classification de Session:** Neutrinos

ID de Contribution: **201** Type: **Non spécifié**

# First searches for axion and dark photon dark matter with MADMAX prototypes

*mercredi 19 novembre 2025 14:30 (15 minutes)*

The QCD axion is a well-motivated hypothetical particle that simultaneously addresses the strong CP problem and constitutes a compelling cold dark matter candidate. The MADMAX experiment (Magnetized Disk and Mirror Axion Experiment) is designed to search for dark matter axions and similar particles (axion-like particles and dark photons) in the mass range of 40–400 μeV by boosting the microwave radiation in the range of 10-100 GHz induced by the inverse Primakoff effect in a dielectric haloscope. Several small scale prototype systems have been tested these last three years, allowing to validate the dielectric haloscope concept and obtain competitive results of axion and dark photon dark matter searches. This talk will present an overview of the MADMAX experiment, summarize the recent results, the ongoing research and development and the remaining challenges.

**Auteur:** MIYAZAKI, Akira (CNRS/IN2P3/IJCLab)

**Orateur:** MIYAZAKI, Akira (CNRS/IN2P3/IJCLab)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **202** Type: **Non spécifié**

# Newest results from Super-Kamiokande

*jeudi 20 novembre 2025 16:50 (25 minutes)*

The Super-Kamiokande (SK) experiment is a world-leading, 50-kton water Cherenkov detector in Japan. Since the last iteration of the P2I Conference in 2023, several important results have been made public by SK, and we explore highlights here. These include the newest analysis of solar neutrinos, the hunt for the Diffuse Supernova Neutrino Background, and latest atmospheric neutrino oscillation results. We will also underline the important impact of introducing gadolinium sulfate into the water at 0.01% and 0.03% Gd-loading by mass in 2020 and 2022, respectively.

**Auteur:** SANTOS, Andrew

**Orateur:** SANTOS, Andrew

ID de Contribution: **204** Type: **Non spécifié**

# Measurement of the branching ratio of 16N, 15C, and 12B isotopes

*mercredi 19 novembre 2025 14:45 (15 minutes)*

The Super-Kamiokande detector has measured solar neutrinos for more than 25 years.The sensitivity to solar neutrino measurement is limited by the uncertainties of energy scale and the background modeling. One of the major background events is the spallation products created by the cosmic ray muons in the detector water tank. Some of the negative muons stop in the tank and are captured by the oxygen nuclei. Decays of unstable isotopes with relatively long half-life through the nuclear muon capture, such as $^{16}$N, $^{15}$C, and $^{12}$B, are detected as background events of solar neutrino observations.
In this study, we developed the method to form a pair of parent-stopping muon and decay candidate events and evaluated the production rates of such unstable isotopes. We then measured their branching ratio considering their production rates and the estimated number of nuclear muon capture.
The result of $^{16}$N is the world-leading precision measurement at present and the results of $^{15}$C and $^{12}$B are the first branching ratio measurements of those isotopes.
These measurement results are useful for improving simulations for muon capture processes.

**Auteur:** MAEKAWA, YUTO

**Co-auteurs:** Prof. NISHIMURA, Yasuhiro (Keio University); Dr NAKANO, Yuuki (Toyama University)

**Orateur:** MAEKAWA, YUTO

**Classification de Session:** Neutrinos

ID de Contribution: **205** Type: **Non spécifié**

# Recent Highlights in Top Quark Physics at CMS

The high center-of-mass energy and luminosity of the LHC have enabled the production of millions of top quarks, providing an unprecedented opportunity to study top quark properties and related observables with high precision. As the heaviest known elementary particle, the top quark plays a unique role in the Standard Model and is a sensitive probe for potential new physics. This talk will present recent experimental highlights associated with the top quark from the CMS experiment.

**Auteurs:** COLLABORATION, CMS; AZZURRI, Paolo

**Orateur:** COLLABORATION, CMS

ID de Contribution: **206** Type: **Non spécifié**

# KM3NeT: from deep-sea technology to high-energy neutrino discoveries

*lundi 17 novembre 2025 14:35 (25 minutes)*

KM3NeT is a cutting-edge neutrino observatory under construction in the Mediterranean Sea, aimed at exploring fundamental questions in neutrino physics and high-energy astrophysics. The project features two deep-sea Cherenkov detectors: ARCA, located off the coast of Sicily and optimized for detecting cosmic neutrinos in the TeV–PeV range, and ORCA, situated near the French coast, which focuses on precise measurements of atmospheric neutrinos and oscillation parameters in the GeV energy range.

Although still under construction, both detectors are already operational and producing competitive scientific results. A landmark achievement is the recent detection by KM3NeT/ARCA of an ultra-high energy neutrino event, referred to as KM3-230213A, with a reconstructed energy of 220 PeV. This observation, representing the highest-energy neutrino ever recorded, marks a significant milestone for the experiment, opening new avenues for studying extreme astrophysical environments and the origin of cosmic neutrinos. In addition to its core scientific program, KM3NeT actively participates in the realm of multi-messenger astronomy, contributing real-time neutrino alerts to global networks and enabling prompt follow-up observations in electromagnetic and gravitational waves.

This presentation will provide an update on the status of the KM3NeT infrastructure and its deployment, highlight the latest scientific findings —particularly the implications of the recent high-energy neutrino detection —and outline the potential for future discoveries with the full-scale detector arrays.

**Auteur:** BIAGI, Simone (INFN - LNS)

**Orateur:** BIAGI, Simone (INFN - LNS)

ID de Contribution: **208** Type: **Non spécifié**

# RELICS: A liquid xenon time projection chamber for reactor CEvNS

*mercredi 19 novembre 2025 15:00 (15 minutes)*

The neutrino-nucleus coherent scattering (CEvNS) has the largest cross-section among all interaction channels for MeV neutrinos, making it a promising way to monitor nuclear reactors remotely. Liquid xenon time projection chamber (LXeTPC) is a promising technology for CEvNS search, thanks to its low background and low energy threshold. The RELICS (REactor neutrino LIquid xenon Coherent Scattering) experiment aims at reactor CENS detection using an LXeTPC. At a baseline of 25 meters, RELICS will precisely measure the CEvNS cross-section to understand fundamental properties of neutrinos, and search for new physics beyond the Standard Model, such as axions. In this talk, I will introduce the status of the RELICS experiment and discuss its physics potential.

Author

**Auteur:** LI, Shengchao (Westlake University)

**Orateur:** LI, Shengchao (Westlake University)

**Classification de Session:** Neutrinos

ID de Contribution: **209** Type: **Non spécifié**

# Unveiling the Sky with Gravitational Waves: Discoveries from GWTC-4

*mercredi 19 novembre 2025 14:45 (15 minutes)*

The detection of gravitational waves emitted by binary mergers has opened a new window onto the Universe, offering a unique probe of compact objects across cosmic history. The LIGO-Virgo-KAGRA collaboration has recently released the fourth Gravitational-Wave Transient Catalog (GWTC-4), featuring over 200 confidently identified events, primarily from binary black hole mergers. This unprecedented dataset enables detailed population studies, providing insights into the mass, spin, and redshift distributions of compact binaries and offering clues about their astrophysical origin and formation channels. Beyond population inferences, GWTC-4 also delivers updated constraints on the Hubble constant and allows for stringent tests of general relativity in the strong-field regime. This presentation will highlight these key scientific results, along with the improved detector sensitivity and analysis techniques that made them possible.

**Auteur:** OUZRIAT, Amazigh (IP2I)

**Orateur:** OUZRIAT, Amazigh (IP2I)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **210** Type: **Non spécifié**

# The Euclid mission and the quest for dark energy

*mardi 18 novembre 2025 12:15 (25 minutes)*

After introducing the scientific and observational concepts on which the instruments of Euclid have been based, I will present an overview of ongoing and forthcoming surveys, outlining their key characteristics and timelines for observations and data releases. Particular emphasis will be placed on revisiting the mission's core scientific objectives, with a focus on the specific probes and observables employed to constrain the dark energy properties. In particular, I will explore how Euclid's observations can be used to gain insights into our understanding of the development of gravitational instabilities accros cosmic scales and time.

**Auteur:** Prof. BERNARDEAU, Francis (IPhT Saclay)

**Orateur:** Prof. BERNARDEAU, Francis (IPhT Saclay)

ID de Contribution: **211** Type: **Non spécifié**

# Probing New Physics through Space-Time Variation of Fundamental Constants

*mercredi 19 novembre 2025 17:30 (15 minutes)*

We investigate potential variations in fundamental constants—such as the fine-structure constant (α), the proton-to-electron mass ratio (μ), and Newton's gravitational constant (G)—as a probe of physics beyond the Standard Model. Using high-resolution ultraviolet spectra of Fe V in the white dwarf G191-B2B from HST/STIS, combined with precise laboratory data, we constrain the time variation of G to $\dot{G}/G = (0.038 \pm 0.118) \times 10^{-15}$ yr$^{-1}$ in a gravitational potential ~$10^4$ times that of Earth. These findings, alongside constraints from other astrophysical and cosmological probes, test the constancy of nature's laws across space-time, challenge the equivalence principle, and provide insights into new physics such as scalar fields, extra dimensions, or varying coupling frameworks.

**Auteur:** Dr TD, Le (Dong Nai Technology University)

**Orateur:** Dr TD, Le (Dong Nai Technology University)

**Classification de Session:** Cosmology

ID de Contribution: **212** Type: **Non spécifié**

# LHCb overview

*vendredi 21 novembre 2025 10:15 (25 minutes)*

Latest results from LHCb and future perspectives will be presented.

**Auteur:** BARSUK, Sergey (IJCLab)

**Orateur:** BARSUK, Sergey (IJCLab)

ID de Contribution: **213** Type: **Non spécifié**

# Recent Progress of PandaX-4T

*mercredi 19 novembre 2025 17:15 (15 minutes)*

PandaX-4T is a multi-tonne-scale dark matter direct searching experiment, utilizing 3.7 tonne liquid xenon as target material in sensitive volume. The experiment is located at China Jinping Underground Laboratory, with overburden of 2400 meter water equivalent. In 2024, the PandaX-4T experiment has released various search results. And this report will introduce the recent progress of searches for dark matter and neutrinos.

**Auteur:** LUO, Yunyang (University of Science and Technology of China)

**Orateur:** LUO, Yunyang (University of Science and Technology of China)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **214** Type: **Non spécifié**

# Mapping the Dark Universe: Prospects for Dark Matter Science with Euclid

*vendredi 21 novembre 2025 11:50 (25 minutes)*

The Euclid space telescope, launched by the European Space Agency, is set to transform our understanding of the dark sector by delivering high-precision measurements of weak gravitational lensing and galaxy clustering across 15,000 square degrees of the sky. This unprecedented data set will enable detailed mapping of the large-scale structure of the Universe and provide powerful tools to probe the nature of dark matter beyond the standard cold dark matter paradigm. Euclid's sensitivity to the matter distribution over cosmic time opens up the possibility to test models involving warm dark matter, ultra-light scalar fields, self-interacting dark matter, and other non-standard scenarios. In this talk, I will present an overview of the scientific potential of Euclid for dark matter research, focusing on the observational strategies and theoretical frameworks being developed ahead of the mission's first data release. I will highlight how Euclid's photometric and spectroscopic capabilities can be combined with other probes, including cosmic microwave background data, strong lensing, and stellar stream studies, to constrain the clustering, interactions, and microphysical properties of dark matter.

**Auteur:** BLOT, Linda (CD3, Kavli IPMU)

**Orateur:** BLOT, Linda (CD3, Kavli IPMU)

ID de Contribution: **215** Type: **Non spécifié**

# The Muon g-2: New Results, Theoretical Challenges, and the Role of Hadron Physics

*mercredi 19 novembre 2025 14:00 (15 minutes)*

The anomalous magnetic moment of the muon, or muon $g-2$, stands as one of the most precise tests of the Standard Model and a sensitive probe for potential new physics. With the final results from the Fermilab E989 experiment released in June 2025, and the second White Paper of the Muon $g-2$ Theory Initiative published in May 2025, the status of muon $g-2$ has entered a new and critical phase.

The current theoretical prediction is now more precise than ever, yet key challenges remain, as the main source of uncertainty continues to be the hadronic contributions. While recent progress in lattice QCD calculations – now precise enough to serve as a reference – has resolved the long-standing discrepancy between theory and experiment, a new tension has emerged between different theoretical approaches. In particular, data-driven dispersive methods based on measurements of electron–positron annihilation into hadrons show results that are not fully consistent with lattice predictions or among themselves. These discrepancies raise important questions about the interpretation of existing data and the reliability of various experimental inputs.

This talk will review the full current status of the muon $g-2$, with a particular emphasis on the theoretical predictions and the data-driven methods that use cross-section measurements of $e^+e^- \to \text{hadrons}$ to calculate hadronic contributions. I will discuss the sources of the current tensions, the latest developments in the dispersive approach, and what they imply for the overall interpretation of muon $g-2$ as a probe of fundamental physics.

**Auteur:** LEPLUMEY, Thomas (LLR)

**Orateur:** LEPLUMEY, Thomas (LLR)

**Classification de Session:** Particle Physics

ID de Contribution: **216** Type: **Non spécifié**

# Search for B Mesogenesis and Dark Matter at BABAR

*mercredi 19 novembre 2025 14:15 (15 minutes)*

We present the most recent BABAR searches for reactions that could simultaneously explain the presence of dark matter and the matter-antimatter asymmetry in the Universe. This scenario predicts exotic B-meson decays into an ordinary-matter baryon and a dark-sector anti-baryon D with branching fractions accessible at the B factories. The results are based on the full data set of about 430 fb−1 collected at the Y(4S) resonance by the BABAR detector at the PEP-II collider. We search, in particular, for decays like B à D B where B is a baryon (proton,  or c). The hadronic recoil method has been applied with one of the B mesons from Y(4S) decay fully reconstructed, while only one baryon is present in the signal B-meson side. The missing mass of signal B meson is considered as the mass of the dark particle D. Stringent upper limits on the decay branching fraction are derived for D masses between 0.5 and 4.3 GeV/c2.

**Auteur:** Prof. EIGEN, Gerald

**Orateur:** Prof. EIGEN, Gerald

**Classification de Session:** Particle Physics

ID de Contribution: **217** Type: **Non spécifié**

# Spatial cross-correlation study of IceCube neutrino alerts and high energy gamma-ray catalogues

Since 2019, the IceCube Neutrino Observatory has issued real-time neutrino alerts via the General Coordinates Network (GCN), following the successful identification of a high-energy neutrino event, IceCube-170922A, in association with a multiwavelength flare from the blazar TXS~0506+056. Although many high-energy neutrinos have been observed since then, their astrophysical counterparts remain largely unidentified. This work investigates potential associations between IceCube neutrinos and gamma-ray emitting active galactic nuclei (AGNs), utilizing recently compiled, independently curated AGN catalogues and the latest list of IceCube alert events. We employed complementary statistical approaches to identify statistically significant AGN subclasses that are promising sources of neutrinos. We performed both direct spatial cross-matching between neutrino alerts and AGN positions and conducted a likelihood ratio test to assess the significance of the associations. The results from this study will be presented.

**Auteur:** Prof. MAJUMDAR, Pratik (Saha Institute of Nuclear Physics)

**Orateur:** Prof. MAJUMDAR, Pratik (Saha Institute of Nuclear Physics)

**Classification de Session:** Neutrinos

ID de Contribution: **218** Type: **Non spécifié**

# Discriminating Binary Neutron Star Population Models with Gamma-Ray Burst Data

The joint detection of a Binary Neutron Star (BNS) merger (GW170817) with gravitational and gamma-ray detectors was a milestone achievement for multimessenger astronomy, representing evidence of BNS as progenitors of short gamma-ray bursts (sGRB). While there are ~40–50 sGRBs detected annually by Fermi/GBM, only 2 confirmed BNS mergers (GW170817 and candidate GW190425) detected by LVK to date. This discrepancy challenges the assumption that BNS mergers are the sole source of sGRBs.

We present MAGGPY (Multimessenger Astronomy using GRBs and Gravitational Waves in Python), an efficient code built on the emcee Markov Chain Monte Carlo sampler used to study the connection between BNS and sGRBs. Using real GRB data from Fermi/GBM detections, the code is designed to simultaneously constrain BNS populations and high-energy emission models. Given that the sampler infers the parameter distributions necessary for the GRB emission models we can also generate mock GRB data which can be used to predict the performance of current and next generation detector networks.

By comparing 15 different population synthesis models we show how the code can be leveraged to prefer certain physical scenarios. By comparing the mock data generated from the learned distributions of each population to real data, we can constrain properties related to BNS mergers such as the local merger rate or more interestingly we can constrain the parameter representing the fraction of orbital energy converted into kinetic energy.

**Auteur:** DE SANTIS, Alessio Ludovico

**Orateur:** DE SANTIS, Alessio Ludovico

ID de Contribution: **219** Type: **Non spécifié**

# Reconstruction Status on the Hyper Kamiokande with Graph Neural Networks

*mercredi 19 novembre 2025 13:30 (15 minutes)*

The Hyper-Kamiokande Detector represents the next generation of neutrino observatories, following in the lineage of the Kamiokande and Super-Kamiokande experiments. With significantly enhanced sensitivity, Hyper-Kamiokande will support a diverse and ambitious physics program, including searches for proton decay, studies of solar neutrinos under non-standard scenarios, and the potential first observation of leptonic CP violation.
Designed to contain 260 kilotons of water and equipped with 20,000 photomultiplier tubes (PMTs), the scale and complexity of Hyper-Kamiokande necessitate the development of advanced event reconstruction algorithms. Existing techniques, originally developed for Super-Kamiokande, are beginning to show their limitations in this new experimental context.
In this presentation, we explore how next-generation approaches from the field of deep learning—specifically, Deep Neural Networks—can enhance reconstruction performance for Hyper-Kamiokande. Particular emphasis will be placed on the application of Graph Neural Networks (GNNs), presenting early promising results, and a performance comparison with the current reconstruction algorithms used in Super-Kamiokande adapted for Hyper-Kamiokande

Erwan Le Blévec
Phd Student at ILANCE / LLR

**Auteur:** LE BLEVEC, Erwan

**Orateur:** LE BLEVEC, Erwan

**Classification de Session:** Neutrinos

ID de Contribution: **220** Type: **Non spécifié**

# Entropic Cosmology

*mercredi 19 novembre 2025 14:45 (15 minutes)*

The thermodynamics of black holes inspired the concept of black hole entropy, linking gravity and thermodynamics. When applied to cosmology, this leads to the standard Friedmann equations, which face challenges in explaining the universe's evolution. Modified entropies have been proposed to resolve these issues. A recently introduced four-parameter generalized entropy unifies several known forms. Studying this framework offers insights into which entropic models align with observational data. It also allows for consistent cosmological evolution, including inflation, potentially matching Planck results even with scalar field potentials previously ruled out by standard models.

**Auteur:** D'ONOFRIO, Simone (ICE-CSIC)

**Co-auteurs:** Prof. ODINTSOV, Sergei; Dr PAUL, Tanmoy

**Orateur:** D'ONOFRIO, Simone (ICE-CSIC)

**Classification de Session:** Cosmology

ID de Contribution: **221** Type: **Non spécifié**

# Future sensitivity of the T2K experiment with its upgraded neutrino beam and optimisation of neutrino/antineutrino running modes

*mercredi 19 novembre 2025 17:30 (15 minutes)*

T2K is a long-baseline neutrino oscillation experiment located in Japan. Its aim is to undertake precise measurements of the atmospheric parameters $|\Delta m^2_{23}|$, $\sin^2\theta_{23}$ and to search for CP-violation within the leptonic sector, which would manifest as a discrepancy between neutrino and antineutrino oscillations. Thanks to its focusing horns, the T2K experiment has the faculty to produce low-background fluxes in neutrino and anti-neutrino modes, separately. The complementary use of these two modes is crucial to help break degeneracies between oscillation parameters, notably in the search for CP-violation. Hence, the ratio between neutrino and antineutrino beam modes has to be tuned on the basis of the physics goals of the experiment. We conducted a new sensitivity study to address this question, in particular taking into account the effects of the recent upgrade of the focusing horn current, increased from 250kA to 320kA. The study implements a novel algebraic method in order to estimate the constraining power of future near detector data as a function of statistics. The sensitivity is estimated for all the oscillation parameters accessible at T2K and considering different possible values of such parameters. In some cases, the objective of reaching a 3sigma evidence of CP-violation proves to be promisingly close. The detailed study of the degeneracies between the different oscillation parameters paves the way for the next high-statistics era of
long-baseline experiments. While the impact of the ND constraints is quantified in a simplistic way in these studies, the importance of the new capabilities of the upgrade of the ND280 detector in reducing systematics uncertainties will be discussed, opening the door for further analysis improvements.

**Auteur:** LEPLUMEY, Thomas (LLR)

**Orateur:** LEPLUMEY, Thomas (LLR)

**Classification de Session:** Neutrinos

ID de Contribution: **222** Type: **Non spécifié**

# Measurements of electroweak penguin and lepton-flavour violating $B$ decays to final states with missing energy at Belle and Belle II

The Belle and Belle II experiments have collected a 1.2 ab$^{-1}$ sample of $e^+e^- \to B\bar{B}$ collisions at a centre-of-mass energy corresponding to the $\Upsilon(4S)$ resonance. These data, with low particle multiplicity and constrained initial state kinematics, are an ideal environment to search for rare electroweak penguin $B$ decays and lepton-flavour-violating $B$ decays to final states with missing energy from neutrinos. Results from $b \to s\nu\bar{\nu}$ processes and their interpretation are presented. In addition, we present searches for the processes $B \to K^{(*)}\tau^+\tau^-$. Finally, we present our searches for the lepton-flavour violating decays $B \to K^{(*)}\tau^\pm\ell^\mp$, where $\ell$ is an electron or muon.

**Auteur:** ROBERTSON, Steven (IPP / UofA)

**Orateur:** ROBERTSON, Steven (IPP / UofA)

ID de Contribution: **223** Type: **Non spécifié**

# Measurements of the Cabibbo-Kobayashi-Maskawa quark-mixing matrix at Belle and Belle II

The Belle and Belle II experiment have collected a 1.2 ab$^{-1}$ sample of $e^+e^- \to B\bar{B}$ decays at a centre-of-mass energy corresponding to the $\Upsilon(4S)$ resonance. The SuperKEKB collider is asymmetric, providing a boost to the $B$ mesons in the laboratory frame, so we can perform measurements of time-dependent $CP$ violation. Among the new results, we measure $CP$-violating parameters related to the determination of the least well-known angle of the unitarity triangle $\alpha$ using the decay $B^0 \to \rho^+\rho^-$. In addition, we present a measurement of $B^0 \to K^0_S\pi^+\pi^-\gamma$, which is sensitive to beyond-the-standard-model physics. Combined with theoretical inputs, measurements of both inclusive and exclusive semileptonic decays, as well as fully-leptonic decays, yield information about the Cabibbo-Kobayashi-Maskawa matrix elements $V_{cb}$ and $V_{ub}$. Our latest results based on the Belle and Belle II data sets are reviewed.

**Auteur:** ROBERTSON, Steven (IPP / UofA)

**Orateur:** ROBERTSON, Steven (IPP / UofA)

ID de Contribution: **224** Type: **Non spécifié**

# Dark sector and tau physics at Belle and Belle II

The Belle and Belle II experiment have collected samples of $e^+e^-$ collision data at centre-of-mass energies near the $\Upsilon(nS)$ resonances. These data have constrained kinematics and low multiplicity, which allow searches for dark sector particles in the mass range from a few MeV to 10 GeV. Using a 365 fb$^{-1}$ sample collected by Belle II, we search for inelastic dark matter. Using a 711 fb$^{-1}$ sample collected by Belle, we search for $B \to h + \text{invisible}$ decays, where $h$ is a $\pi$, $K$, $D$, $D_s$ or $p$, and $B \to Ka$, where $a$ is an axion-like particle. Furthermore, the combined Belle and Belle II samples contain approximately 1.5 billion $e^+e^- \to \tau^+\tau^-$ events, which we use to search for lepton-flavour violating decays and make precision measurements of $\tau$ properties. We review our latest $\tau$ measurements.

**Auteur:** ROBERTSON, Steven (IPP / UofA)

**Orateur:** ROBERTSON, Steven (IPP / UofA)

ID de Contribution: **225** Type: **Non spécifié**

# Quantum Correlations in the Presence of Non-Standard Interactions in Neutrino Oscillations

We explore the imprints of non-standard interactions (NSI) on quantum correlations in the three-flavor neutrino oscillation framework using two complementary approaches. In the first study, we investigate tripartite entanglement measures, entanglement of formation, concurrence, and negativity, across reactor and accelerator experiments. We find that accelerator-based setups like DUNE exhibit enhanced sensitivity to NSI, with quantum entanglement measures revealing significant deviations from standard oscillation behavior, especially at moderate to high neutrino energies. In the second study, motivated by the recent tension between T2K and NO$\nu$A results, we analyze the violation of Leggett-Garg-type inequalities (LGtI) under complex NSI parameters $\epsilon_{e\mu}$ and $\epsilon_{e\tau}$. Our findings demonstrate that LGtI violations are significantly amplified in DUNE and NO$\nu$A, particularly for $\epsilon_{e\tau}$ in the normal ordering scenario, offering a possible signature of new CP-violating effects. Together, these results emphasize the power of quantum information theoretic tools, both spatial and temporal in probing new physics in the neutrino sector.

**Auteur:** YADAV, Bhavna (Indian Institute of Technology Jodhpur, Rajasthan, India)

**Orateur:** YADAV, Bhavna (Indian Institute of Technology Jodhpur, Rajasthan, India)

ID de Contribution: **226** Type: **Non spécifié**

# FURAX - the JAX powered framework for cosmological analysis

FURAX is a python framework created to utilize the functionality of JAX in modern cosmological analysis with its ever increasing complexity and resource requirements. In particular, the ability to run on GPU clusters, hardware acceleration, Just-In-Time compilation, and automatic differentiation. This framework has already found its application in MEGATOP, a component-separation pipeline for Simons Observatory. We expand its functionality and applications by providing optimized, modular, and easy-to-use interface in an open-source environment.

**Auteur:** BASYROV, Artem (APC, CNRS)

**Orateur:** BASYROV, Artem (APC, CNRS)

**Classification de Session:** Cosmology

ID de Contribution: **227** Type: **Non spécifié**

# Test of the seesaw mechanism with neutrino oscillations

With the help of a full Euler-like block parametrization of the flavor structure for the canonical seesaw mechanism, we present the first general and explicit analytical calculations of the light neutrino mass-squared differences, flavor mixing angles and leptonic CP violation responsible for the primary behaviors of neutrino oscillations. Such model-independent results will pave the way for testing the seesaw mechanism and probing its original parameter space at low energies.

**Reference 1:** *Mapping the sources of CP violation in neutrino oscillations from the seesaw mechanism*, **Zhi-zhong Xing**, *Phys. Lett. B 856 (2024) 138909*; **Reference 2:** *Confronting the seesaw mechanism with neutrino oscillations: A general and explicit analytical bridge*, **Zhi-zhong Xing**, **Jing-yu Zhu**, *Nucl. Phys. B 1018 (2025) 117041*

**Auteur:** Prof. XING, Zhi-zhong (Institute of High Energy Physics, Chinese Academy of Sciences)

**Orateur:** Prof. XING, Zhi-zhong (Institute of High Energy Physics, Chinese Academy of Sciences)

ID de Contribution: **228** Type: **Non spécifié**

# Neutrino oscillations: challenges and perspectives from an experimentalist point of view

*vendredi 21 novembre 2025 11:00 (25 minutes)*

Since the discovery of neutrino oscillations at the end of the 20th centuries, experiments studying the have reached a number of milestones and measured most of the parameters of the standard 3 flavor oscillation model with increasing precision. Experiments are now trying to address the remaining open questions (CP symmetry in oscillations and neutrino mass ordering in particular) which require measuring more subtle variations in the oscillation patterns. In this presentation, we will look at some of the specific challenges faced by these experiments and ideas proposed to address them, as well as perpectives in terms of both measuring parameters of the model, and testing the standard oscillation framework in search of new physics.

**Auteur:** BRONNER, Christophe (Yokohama National University)

**Orateur:** BRONNER, Christophe (Yokohama National University)

ID de Contribution: **229** Type: **Non spécifié**

# First results of the LEGEND experiment in the quest for Neutrinoless Double-Beta Decay

*mercredi 19 novembre 2025 16:15 (15 minutes)*

The search for neutrinoless double beta ($0\nu\beta\beta$) decay is considered as the most promising way to prove the Majorana nature of neutrinos as well as to give an indication on the mass hierarchy and on the absolute mass scale. The discovery of $0\nu\beta\beta$ decay would moreover open the way for theories predicting the observed matter anti-matter asymmetry of the Universe being a consequence of lepton number violation through leptogenesis.

Building upon the success of GERDA and MAJORANA experiments, the LEGEND (Large Enriched Germanium Detector for Neutrinoless $\beta\beta$ Decay) Collaboration aims at building a $^{76}$Ge-based $0\nu\beta\beta$ experiment to fully span the inverted neutrino mass ordering region.
The LEGEND project will proceed in two steps. The first phase, LEGEND-200, began operations at Gran Sasso National Laboratory in Italy in the spring of 2023, employing 142 kg of high-purity, enriched germanium detectors. Plans are in place to install additional mass in the coming months. By combining an initial exposure of 76.1 kg·yr with data from GERDA and MAJORANA experiments, the highest half-life sensitivity to date in the search for $0\nu\beta\beta$ decay in $^{76}$Ge has been achieved.
In the second phase, the enriched germanium mass will be increased up to 1000 kg in a new experimental setup. With a background index of $\sim 10^{-5}$ cts/(keV·kg·year) and with an exposure of 10 t·yr, LEGEND-1000 will be able to reach a $3\sigma$ half-life discovery sensitivity of $1.3 \times 10^{28}$yr.

This talk will highlight the performance of the experiment and present the first $0\nu\beta\beta$ decay results obtained from the initial year of data collected by LEGEND-200. Lastly, an update on the status of the future LEGEND-1000 phase will be provided.

This work is supported by the U.S. DOE, and the NSF, the LANL, ORNL and LBNL LDRD programs; the European ERC and Horizon programs; the German DFG, BMBF, and MPG; the Italian INFN; the Polish NCN and MNiSW; the Czech MEYS; the Slovak RDA; the Swiss SNF; the UK STFC; the Canadian NSERC and CFI; the LNGS and SURF facilities.

**Auteur:** CESARANO, Raoul (Gran Sasso Science Institute (GSSI))

**Orateur:** CESARANO, Raoul (Gran Sasso Science Institute (GSSI))

**Classification de Session:** Neutrinos

ID de Contribution: **230** Type: **Non spécifié**

# The Einstein Telescope: challenges and opportunities of a third-generation detector

*vendredi 21 novembre 2025 14:25 (25 minutes)*

The Einstein Telescope (ET) is a European project for a third-generation gravitational-wave detector designed to increase the sensitivity of present interferometers by approximately one order of magnitude.
Two reference designs are currently under investigation: a triangular-shaped detector with 10 km arms, and a configuration with two L-shaped detectors with 15 km arms, both located in Europe. Each arm will host a 'xylophone'setup of two interferometers: one optimized for high frequencies, the other, cryogenic, for low frequencies. This design will significantly expand the observable volume of the Universe and improve source parameter estimation.
In this contribution, we outline the scientific program of the ET, tracing the project's evolution, current status, and prospects. We give an overview of the technological challenges, especially for the low-frequency instrument, and the scientific reach of a third-generation detector like ET, highlighting the potential for discoveries in fundamental physics, multi-messenger astrophysics, and cosmology.

**Auteur:** DUPLETSA, Ulyana (HEPHY - OEAW)

**Orateur:** DUPLETSA, Ulyana (HEPHY - OEAW)

ID de Contribution: **232** Type: **Non spécifié**

# Early X-ray emission of short Gamma-Ray Bursts: GRB physics and multi-messenger

*mercredi 19 novembre 2025 15:00 (15 minutes)*

Accurate modeling of the early X-ray emission in short GRBs is essential for probing the GRB engine, understanding jet physics, and improving electromagnetic follow-up of gravitational wave signals from binary neutron star mergers in the context of multi-messenger astronomy.
Thanks to the operation of the Swift satellite over the last 20 years, we now have access to an extensive archive of GRB X-ray observations. The early X-ray light curves often present a bright and steep decay phase, whose physical origin remains poorly understood. In short GRBs, this phase is particularly prominent, as their fainter forward-shock emission, resulting from lower energy release and a less dense circumburst environment compared to long GRBs, makes the steep decay easier to detect. Short GRBs thus offer a unique opportunity to monitor the steep decline for an extended duration, up to 15 minutes.
In this talk, I will present our systematic analysis of the early X-ray emission of short GRBs, including both the temporal and spectral evolution. We introduce a new modeling technique that accounts for both the curvature and the intrinsic evolution of the GRB spectrum in Swift/XRT data. For the first time, we fit the synchrotron emission model to the GRB spectra during the steep decay phase, enabling us to track the evolution of the synchrotron cooling frequency and the bolometric flux. Our study reveals a tight correlation between the synchrotron cooling frequency and the isotropic equivalent luminosity. This relation enables us to infer the intrinsic properties of short GRBs and assess the detectability of their early X-ray emission by wide-field X-ray cameras. In particular, our work can help to interpret the nature of some fast X-ray transients detected by Einstein Probe and suggest observational multi-messenger strategies.

**Auteur:** IERARDI, Annarita (Gran Sasso Science Institute)

**Co-auteurs:** Dr BANERJEE, Biswajit (Gran Sasso Science Institute); Dr OGANESYAN, Gor (Gran Sasso Science Institute); Prof. BRANCHESI, Marica (Gran Sasso Science Institute); Dr ASCENZI, Stefano (Gran Sasso Science Institute)

**Orateur:** IERARDI, Annarita (Gran Sasso Science Institute)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **233** Type: **Non spécifié**

# Low-Energy-beyond-the-Standard-Model Experiments

*jeudi 20 novembre 2025 14:50 (25 minutes)*

I will review the low energy experiments which will look for new physics beyond the Standard Model.

**Auteur:** IWAMOTO, Toshiyuki (The University of Tokyo)

**Orateur:** IWAMOTO, Toshiyuki (The University of Tokyo)

ID de Contribution: **234** Type: **Non spécifié**

# Gravittational wave science with LISA

*mardi 18 novembre 2025 09:50 (25 minutes)*

The LISA mission will detect milliHertz gravitational waves from space. In this band, we expect to observe thousands of white dwarf binaires in the Milky Way as well as supermassive black holes in the distant Universe. Certain detections should allow new tests of fundamental physics and cosmology measurements. In this presentation I will review the science objectives of the mission and some aspects of data analysis.

**Auteur:** LAMBERTS, Astrid (Observatoire de la Côte d'Azur)

**Orateur:** LAMBERTS, Astrid (Observatoire de la Côte d'Azur)

ID de Contribution: **235** Type: **Non spécifié**

# JWST: A Game Changer for the Study of Exoplanets

*vendredi 21 novembre 2025 16:25 (25 minutes)*

Are we alone in the universe? For decades, scientists have sought to place our Solar System in a broader cosmic context. A major breakthrough occurred in 1995, when Michel Mayor and Didier Queloz discovered the first exoplanet orbiting a Sun-like star—a milestone that earned them the 2019 Nobel Prize in Physics. Since then, over 6,000 exoplanets have been detected, revealing an astonishing diversity: from hot Jupiters in close orbits to super-Earths, lava worlds, ocean planets —many with no equivalent in our Solar System.
While the search for new exoplanets continues, a new chapter is now being written, thanks to the James Webb Space Telescope (JWST): the characterization of exoplanet atmospheres. In this talk, I will briefly review what we have learned so far about the atmospheres of giant exoplanets, and then focus on rocky exoplanets. I will show how the measurement of the temperature of exoplanets can help determining whether or not they possess an atmosphere. In particular, I will highlight recent findings from the TRAPPIST-1 system—a remarkable system of a very small star surrounded by seven Earth-sized planets, three of which lie in the so-called “habitable zone.” I will end by looking ahead the next-generation observatories that will be specially designed to search for biosignatures in the atmosphere of Earth-like exoplanet orbiting Sun-like stars.

**Auteur:** Dr LAGAGE, Pierre-Olivier (CEA)

**Orateur:** Dr LAGAGE, Pierre-Olivier (CEA)

ID de Contribution: **236** Type: **Non spécifié**

# AI and Machine Learning for Neutrino Physics

*jeudi 20 novembre 2025 16:00 (25 minutes)*

Neutrino experiments around the world are entering a regime where statistical uncertainties are no longer dominant, placing new emphasis on controlling systematics. Alongside advances in detector technology, this shift demands unprecedented precision in detector modeling, simulation, event reconstruction, analysis, and experimental design and operations. Future techniques must be rapid, scalable, and capable of addressing high-dimensional data by extracting maximal information from complex event topologies while mitigating mismodeling effects. This talk surveys the key challenges facing neutrino physics and highlights emerging AI/ML approaches that offer promising solutions.

**Auteur:** DE PERIO, Patrick (Kavli IPMU, University of Tokyo)

**Orateur:** DE PERIO, Patrick (Kavli IPMU, University of Tokyo)

ID de Contribution: **237** Type: **Non spécifié**

# The Hubble Tension

*mardi 18 novembre 2025 15:15 (25 minutes)*

The Hubble constant (H0) is a key parameter in cosmology that sets the expansion rate and the age of the Universe. Independent determinations of H0 are important to ascertain the possible need of new physics beyond the standard cosmological model, given the tension in current H0 measurements from the cosmic microwave background observations of Planck and the local distance ladder from the SH0ES program. I will give an overview of recent H0 measurements from different methods, with a focus on strong gravitational lensing as a competitive cosmological probe.

**Auteur:** SUYU, Sherry (Max Planck Institute for Astrophysics / Technical University of Munich)

**Orateur:** SUYU, Sherry (Max Planck Institute for Astrophysics / Technical University of Munich)

ID de Contribution: **238** Type: **Non spécifié**

# Advances in Reactor Neutrino Measurements

*jeudi 20 novembre 2025 16:25 (25 minutes)*

The intense and well-characterized neutrino flux produced by the beta decays of fission products in nuclear reactors offers a powerful tool to study the properties of these elusive particles. This talk will present an overview of recent advances from reactor neutrino experiments at short baselines, including precision measurements of neutrino oscillation parameters and searches for physics beyond the Standard Model.

**Auteur:** OCHOA-RICOUX, J. Pedro (University of California, Irvine)

**Orateur:** OCHOA-RICOUX, J. Pedro (University of California, Irvine)

ID de Contribution: **240** Type: **Non spécifié**

# 12 Years of Discoveries from the IceCube Neutrino Observatory

*vendredi 21 novembre 2025 11:25 (25 minutes)*

The IceCube Neutrino Observatory has made milestone observations in neutrino astronomy, multi-messenger astronomy, cosmic-ray physics, and particle physics for over a decade. This talk will cover historic triumphs, including those that started the field of neutrino astronomy, as well as recent highlights such as the observation of the Galactic Plane in neutrinos, the emergence of Seyfert galaxy NGC 1068 as a steady high-energy neutrino source, and competitive neutrino oscillation parameter measurements. The ongoing IceCube Upgrade deploys newly developed detector modules and will increase our understanding of our detector and the properties of the instrumented ice. The effort also leads the way to a future generation neutrino observatory, IceCube-Gen2, with capabilities to answer many questions raised by these discoveries.

**Auteur:** KURAHASHI NEILSON, Naoko (Drexel University)

**Orateur:** KURAHASHI NEILSON, Naoko (Drexel University)

ID de Contribution: **241** Type: **Non spécifié**

# Heavy Flavour Physics results by the CMS experiment

In this talk we present the status of searches and measurements in the flavour sector at CMS. The topic discussed will comprise measurements and searches of rare decays, searches for lepton flavour and lepton flavour universality violation, and production cross sections measurements.

**Auteur:** MANZONI, Riccardo (ETH Zurich)

**Orateur:** MANZONI, Riccardo (ETH Zurich)

ID de Contribution: **242** Type: **Non spécifié**

# Exploring Non-Standard Interaction Effects on Entanglement in Three-Flavor Neutrino Oscillations

*mercredi 19 novembre 2025 16:30 (15 minutes)*

Neutrino oscillations (NOs), known for their nonclassical behavior via violations of the Leggett–Garg inequality, offer potential for quantum information applications. Motivated by recent anomalies in NO$\nu$A and T2K suggesting physics beyond the Standard Model, we explore entanglement in three-flavor NOs under the influence of off-diagonal non-standard interactions (NSIs). Focusing on the parameters $\epsilon_{e\mu}$, $\epsilon_{e\tau}$, and $\epsilon_{\mu\tau}$ with complex phases, we express Entanglement of Formation (EOF), Concurrence, and Negativity in terms of oscillation probabilities within the DUNE experimental setup. Our results show that NSI effects are strongest at low energies, with Negativity being the most sensitive across all energy ranges. While $\epsilon_{e\mu}$ and $\epsilon_{e\tau}$ primarily impact the appearance channel, $\epsilon_{\mu\tau}$ dominates the disappearance channel. Notably, Negativity shows the highest sensitivity to the CP-violating phase $\delta_{CP}$, revealing clear energy dependent structures in the [$E$ - $\delta_{CP}$] plane.

**Auteurs:** Mlle KONWAR, Lekhashri (Indian Institute Of Technology Jodhpur); Mlle PANDA, Papia; Prof. MOHANTA, Rukmani

**Orateur:** Mlle KONWAR, Lekhashri (Indian Institute Of Technology Jodhpur)

**Classification de Session:** Neutrinos

ID de Contribution: **243** Type: **Non spécifié**

# Mapping Dark Matter to the Lyman-$\alpha$ Forest with Neural Networks

*mercredi 19 novembre 2025 17:15 (15 minutes)*

We present a machine learning framework that uses neural networks to predict Lyman-$\alpha$ forest spectra from dark matter density fields. Trained on simulations with varying cosmological parameters, our network learns the complex, non-linear transformation from the underlying matter distribution and velocity fields to transmitted flux. We demonstrate that the network accurately reconstructs the Lyman-$\alpha$ absorption features along sightlines within the same simulation box and speculate that this approach can enable fast and accurate generation of Lyman-$\alpha$ spectra, offering a powerful tool for emulating large-scale structure observables and accelerating parameter inference in cosmology.

**Auteur:** ARYA, Bhaskar (IIT Kanpur)

**Orateur:** ARYA, Bhaskar (IIT Kanpur)

**Classification de Session:** Cosmology

ID de Contribution: **244** Type: **Non spécifié**

# Hunting gravitational waves with Virgo: status, results and future prospects.

*lundi 17 novembre 2025 16:10 (25 minutes)*

Since the first gravitational-wave (GW) detection in 2015, GW astronomy has undergone a remarkable expansion, culminating in 90 events observed during the first three observing runs of the Advanced LIGO and Virgo detectors and more than 200 public alerts from the still ongoing fourth observing run. In these discoveries, Virgo played an important role, providing crucial contributions to source localization and parameter estimation. In this talk, I will present an up-to-date overview of the Virgo interferometer, emphasizing its impact within the global network of ground-based detectors. I will also explore the range of ongoing searches, showcasing notable recent results, and conclude with a perspective on forthcoming upgrades.

**Auteur:** Dr DI GIOVANNI, Matteo (Scuola Normale Superiore)

**Orateur:** Dr DI GIOVANNI, Matteo (Scuola Normale Superiore)

ID de Contribution: **245** Type: **Non spécifié**

# Fast radio bursts as precursor radio emission from monster shocks

*jeudi 20 novembre 2025 11:25 (25 minutes)*

It has been proposed recently that the breaking of MHD waves in the inner magnetosphere of strongly magnetized neutron stars can power different types of high-energy transients. Motivated by these considerations, we study the steepening and dissipation of a strongly magnetized fast magnetosonic wave propagating in a declining background magnetic field, by means of particle-in-cell simulations that encompass MHD scales. Our analysis confirms the formation of a monster shock, that dissipates about half of the fast magnetosonic wave energy. It also reveals, for the first time, the generation of a high-frequency precursor wave by a synchrotron maser instability at the monster shock front, carrying a fraction of 0.1% of the total energy dissipated at the shock. The spectrum of the precursor wave exhibits several sharp harmonic peaks, with frequencies in the GHz band under conditions anticipated in magnetars. Such signals may appear as fast radio bursts.

**Auteur:** VANTHIEGHEM, Arno (Observatoire de Paris)

**Orateur:** VANTHIEGHEM, Arno (Observatoire de Paris)

ID de Contribution: **246** Type: **Non spécifié**

# Cosmological Non-Gaussianity from Neutrino Seesaw Mechanism

*mercredi 19 novembre 2025 16:45 (15 minutes)*

The tiny neutrino masses are most naturally explained by seesaw mechanism through singlet right-handed neutrinos, which can further explain the matter-antimatter asymmetry in the universe. In this work, we propose a new approach to study cosmological signatures of neutrino seesaw through the interaction between inflaton and right-handed neutrinos, which arises from a dimension-5 operator respecting shift symmetry. In our framework, after inflation the inflaton predominantly decays into right-handed neutrinos and its decay rate is modulated by the fluctuations of Higgs field which act as the source of curvature perturbations. This gives a new realization of Higgs modulated reheating, and it produces primordial non-Gaussian signatures which can be measured by the forthcoming large-scale structure surveys. We find that these surveys have the potential to probe a large portion of the neutrino seesaw parameter space within our framework, opening up a new window for testing the high scale seesaw mechanism.

**Auteurs:** M. HAN, Chengcheng (Sun Yat-Sen University); M. HE, Hong-Jian (Shanghai Jiao Tong University); YOU, Jingtao (Shanghai Jiao Tong University); M. SONG, Linghao (Shanghai Jiao Tong University)

**Orateur:** YOU, Jingtao (Shanghai Jiao Tong University)

**Classification de Session:** Neutrinos

ID de Contribution: **247** Type: **Non spécifié**

# JWST Constraints on Early Galaxy and Black Hole Formation

*lundi 17 novembre 2025 17:00 (25 minutes)*

The field of galaxy formation and evolution is undergoing a transformative renaissance, driven by groundbreaking observational advances. The James Webb Space Telescope (JWST) is revolutionizing our view of the early universe, offering unprecedented insights into the timing and mechanisms behind the formation of the first galaxies and black holes. In this talk, I will present ongoing efforts to build a comprehensive picture of early galaxy and black hole formation, and to understand how the earliest galaxies reshaped the baryonic content of the universe during the epoch of Cosmic Reionization. At the same time, JWST has uncovered a surprising population of black holes at high redshifts, whose masses and abundance challenge existing models of black hole formation and growth.

**Auteur:** ATEK, Hakim (Institut d'astrophysique de Paris)

**Orateur:** ATEK, Hakim (Institut d'astrophysique de Paris)

ID de Contribution: **248** Type: **Non spécifié**

# Cosmology and Hubble tension from Gravitational-Wave Observations

*lundi 17 novembre 2025 12:20 (25 minutes)*

A persistent tension exists between the Hubble constant values inferred from early-Universe observations—such as the cosmic microwave background and baryon acoustic oscillations—and those obtained from local distance-ladder measurements. Gravitational waves (GWs) from compact binary coalescences provide a direct measurement of the luminosity distance from the waveform, offering an independent probe of the cosmic expansion, known as "standard sirens." For neutron-star binaries, source redshifts can be determined through electromagnetic follow-up observations of counterparts detected in coincidence with GW events. In contrast, stellar-mass binary black holes lack electromagnetic counterparts, requiring alternative approaches to obtain redshift information. For ground-based detectors, two such approaches are currently in use: the dark siren and spectral siren methods.
In this talk, I will briefly review the methods used for the current GW observation and present recent results from the first part of the fourth LIGO–Virgo–KAGRA observing run. I will also discuss future prospects for cosmological measurements using GW observations.

**Auteur:** NISHIZAWA, Atsushi (Hiroshima University)

**Orateur:** NISHIZAWA, Atsushi (Hiroshima University)

ID de Contribution: **249** Type: **Non spécifié**

# Probing DM-baryon interactions Using JWST data

*mercredi 19 novembre 2025 16:30 (15 minutes)*

James Webb Space Telescope (JWST) has revealed a surprisingly high number of UV-bright galaxies at $z \geq 10$. The UV luminosity function at these high redshifts is an excellent probe for studying structure formation on small scales and at high redshifts. Dark matter (DM) and baryon interactions have been tested through direct detection experiments, as well as astrophysical and cosmological observations. DM-baryon interactions will affect both the Cosmic Microwave Background (CMB) and the matter power spectrum (MPS). As the baryons are tightly coupled to the photons, they perceive the radiation pressure. As a result, an interaction between the DM and baryon can transfer the pressure from the baryons to the DM, which impedes the clustering of the DM, and consequently the structure formation at various scales. Depending on the interaction strength, this can suppress the matter power spectrum at nonlinear scales. As JWST is observing structure formation at small scales by observing high redshift galaxies, we aim to use these observations as a new probe of DM-baryon interactions. Changes in the power spectrum aided by these interactions will influence the halo mass function, which characterizes the distribution of dark matter halo masses. We will probe the underlying particle physics parameter and test the viability of this model. Our work highlights the potential of JWST as a powerful tool for providing insights into cosmic structures and offering a pathway to novel discoveries in the Beyond the Standard Model (BSM) sector.

**Auteur:** MONDOL, Ranjini

**Orateur:** MONDOL, Ranjini

**Classification de Session:** Cosmology

ID de Contribution: **252** Type: **Non spécifié**

# Gravitational Radiation at Conformal Infinity

In an ongoing project, we are analyzing the response of a static black hole to (non-linear) perturbations by gravitational waves in the asymptotic regime. We now look to analyze what happens when the ingoing gravitational wave carries linear momentum and to compute the linear Bondi-Sachs momentum in the emitted radiation. In this talk, we will discuss some of the numerical set-up, and our approach towards computing the cross-section of the scattering process.
**References:**

1. Camden, B., Frauendiener, J., Galinski, J. *et al.* A numerical framework for studying asymptotic quantities. *Gen Relativ Gravit*, **57**, 64 (2025).
2. Frauendiener, J. and Stevens, C. A new look at the Bondi–Sachs energy–momentum. *Class. Quantum Grav.* **39** 025007 (2022).

**Auteur:** PILLAY, Kaushal (University of Otago.)

**Orateur:** PILLAY, Kaushal (University of Otago.)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **253** Type: **Non spécifié**

# Yemilab (a deep underground laboratory in Korea) Physics

*mardi 18 novembre 2025 09:25 (25 minutes)*

Yemilab is a new underground laboratory in Jeongseon, South Korea, completed in September 2022. Situated at a depth of 1,000 m with an experimental area of 3,000 m², the facility is poised to host world-leading experiments in astroparticle physics. This talk will provide an overview of Yemilab's infrastructure and its pivotal physics programs, which are set to explore some of the most profound questions beyond the Standard Model.

The flagship experiments at Yemilab are AMORE-II and COSINE-100U. The AMORE-II experiment will search for neutrinoless double beta decay in Mo-100 nuclei using molybdate-based scintillating crystals operated at millikelvin temperatures. Its goal is to probe the Majorana nature of neutrinos, with an ultimate sensitivity reaching an effective Majorana mass of 17-30 meV, which could provide crucial insights into the matter-antimatter asymmetry of the universe.

The COSINE-100U experiment is a direct dark matter search designed to unambiguously verify the long-standing annual modulation signal reported by the DAMA/LIBRA collaboration. This upgraded experiment will utilize the existing low-background NaI(Tl) crystals, but with a novel encapsulation technique that significantly improves light collection by approximately 45%. Operating at low temperatures, COSINE-100U will feature enhanced sensitivity, especially for low-mass dark matter searches.

Furthermore, Yemilab features a 6,300 m³ multipurpose cavern intended to house a next-generation large-scale neutrino detector. This future facility will enable a broad physics program, including high-precision measurements of solar neutrinos and searches for sterile neutrinos and dark photons. This presentation will cover the status and scientific goals of these key projects, highlighting Yemilab's role in advancing the frontiers of fundamental physics.

**Auteur:** LEE, Hyunsu (Institute for Basic Science)

**Orateur:** LEE, Hyunsu (Institute for Basic Science)

ID de Contribution: **254** Type: **Non spécifié**

# Novel Test of Dark Energy through High-Redshift Cosmography

*mercredi 19 novembre 2025 15:15 (15 minutes)*

In this work we introduce a high-redshift cosmographic framework based on a new Padé expansion, providing improved accuracy at $z$
$gtrsim 1$. We estimate the cosmographic parameters $H(z)$, $q(z)$, $j(z)$, $s(z)$ at different fixed redhsift values by combining DESI BAO data (calibrated with Planck's sound horizon scale $r_d$), the Pantheon Plus and DESy5 Type Ia supernova samples, and cosmic-chronometer measurements of $H(z)$. Our analysis yields precise constraints on cosmographic parameters and highlights deviations from the $\Lambda$CDM model. We also reconstruct the deceleration parameter $q(z)$, from which we obtain information about the dark-energy equation of state $w(z)$ in a fully model-independent way. These measurements provide a powerful tool to test cosmological models and to investigate the late-time expansion history of the Universe and the nature of dark energy.

**Auteurs:** FAZZARI, ELISA (Sapienza University of Rome); Dr GIARÈ, William (University of Sheffield); Dr DI VALENTINO, Eleonora (University of Sheffield)

**Orateur:** FAZZARI, ELISA (Sapienza University of Rome)

**Classification de Session:** Cosmology

ID de Contribution: **257** Type: **Non spécifié**

# ATLAS results on Higgs Physics and Electroweak Symmetry Breaking

*lundi 17 novembre 2025 11:55 (25 minutes)*

This talk will review recent ATLAS results on Higgs Physics and Electroweak Symmetry Breaking

**Auteur:** BROOIJMANS, Gustaaf (Columbia University)

**Orateur:** BROOIJMANS, Gustaaf (Columbia University)

ID de Contribution: **258** Type: **Non spécifié**

# The Simons Observatory: Status and Early Data

*lundi 17 novembre 2025 09:30 (25 minutes)*

The Simons Observatory (SO) is a cosmic microwave background survey experiment located in the Atacama Desert in Chile. SO consists of multiple small-aperture telescopes (SATs) carrying out a focused small-area survey, as well as a large-aperture telescope (LAT) conducting a wide-field, high-resolution survey.
The SATs are searching specifically for primordial B-mode polarization sourced by tensor perturbations in the early Universe. LAT science goals include constraining primordial non-Gaussianity and the effective number of relativistic species in the early Universe; measuring the integrated mass, electron pressure and electron momentum distributions in the late-time Universe; constraining neutrino mass and the growth of cosmic structure; producing a galaxy cluster catalogue and measuring the environments around clusters; and other transient, Galactic, and Solar System science goals.
The SO mid-frequency SATs saw first light in late 2023, as did the LAT in early 2025; both have since been conducting commissioning and initial science observations. I will present the current status and early results from both surveys.

**Auteur:** ROSENBERG, Erik (University of Manchester)

**Orateur:** ROSENBERG, Erik (University of Manchester)

ID de Contribution: **259** Type: **Non spécifié**

# Probing DM-radiation interactions from high-redshift galaxy observations by JWST

*mercredi 19 novembre 2025 16:15 (15 minutes)*

The James Webb Space Telescope (JWST) has opened up new vistas to the very distant universe hitherto inaccessible. We make use of the UV Luminosity Functions deduced from JWST high-redshift observations to put constraints on the cross section of dark matter interacting with radiation. We find that though we only have little data from JWST as of now, the constraints are already competitive with the state of the art.

**Auteurs:** SINGH, Abhijeet (Indian Institute of Science); Mlle MONDOL, Ranjini (Indian Institute of Science); M. LAHA, Ranjan (Indian Institute of Science); M. DAS, Souradeep

**Orateur:** SINGH, Abhijeet (Indian Institute of Science)

**Classification de Session:** Cosmology

ID de Contribution: **260** Type: **Non spécifié**

# Latest results from XENONnT Experiment

*mercredi 19 novembre 2025 13:45 (15 minutes)*

The XENONnT experiment, located at the INFN Laboratori Nazionali del Gran Sasso (LNGS) in Italy, is a direct dark matter search experiment using a dual-phase xenon Time Projection Chamber (TPC) with a total active mass of 8.6 tonnes. Thanks to its ultra-low background and low-energy threshold, XENONnT is optimized for the detection of Weakly Interacting Massive Particles (WIMPs), while also being sensitive to a broad range of rare-event physics. In this talk, I will present the latest results from XENONnT, focusing on the WIMP search using the combined data from the first two science runs, corresponding to a total exposure of approximately 3.5 tonne-years. I will also highlight the first observation of nuclear recoils from astrophysical $^{8}$B solar neutrinos via Coherent Elastic Neutrino-Nucleus Scattering (CEvNS), marking the first detection of such neutrinos in a ton-scale detector. These results highlight the sensitivity of the XENONnT detector, not only for dark matter searches but also for exploring other rare-event searches.

**Auteur:** PRAJAPATI, Atul Ashok (University of L'Aquila)

**Orateur:** PRAJAPATI, Atul Ashok (University of L'Aquila)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **261** Type: **Non spécifié**

# Towards GPU-accelerated multimessenger inference of neutron star mergers and dense matter physics

Mergers of neutron stars offer a unique probe of ultra-dense nuclear matter, far beyond the reach of terrestrial experiments. However, fully exploiting the multimessenger nature of these events, combining gravitational waves, electromagnetic counterparts, and dense matter physics, poses a major computational challenge. This burden will become even more pressing with next-generation observatories such as the Einstein Telescope, which are expected to deliver high-precision data at unprecedented rates. In this talk, we present our ongoing efforts in accelerating the likelihood-based parameter estimation of these events by using normalizing flows, differentiable programming, and GPU hardware accelerators. Beyond speed, these methods enable a deeper exploration of systematic uncertainties arising from modeling choices, paving the way to more robust and comprehensive constraints on neutron star physics.

**Auteur:** WOUTERS, Thibeau (Utrecht University)

**Orateur:** WOUTERS, Thibeau (Utrecht University)

ID de Contribution: **262** Type: **Non spécifié**

# Dark Matter Direct Detection Using Bilayer Graphene

A variety of detection techniques employing different materials has been suggested for the direct detection of low-mass galactic dark matter particles, which fall below the sensitivity of traditional direct detection experiments. Bilayer graphene is one such material that has been proposed for the detection of sub-MeV mass dark matter particles through electronic excitations. In this work, we extend the calculations for dark matter–electron scattering via a massive mediator in bilayer graphene. Using a tight-binding model of bilayer graphene, we calculate its dielectric function in the random phase approximation and project its sensitivity for a 10 mg year exposure, assuming zero backgrounds. We also show the sidereal daily modulation of the scattering rate and its dependence on the orientation of bilayer graphene with respect to the galactic dark matter wind. This modulation in scattering rate can be used to separate the dark matter signal from backgrounds.

**Auteur:** M. SHERPA, Rinchen (Indian Institute of Science)

**Co-auteurs:** Dr DAS, Anirban (Saha Institute of Nuclear Physics); M. SARKAR, Anuvab (Indian Institute of Science); Dr DUTTA, Paramita (Physical Research Laboratory); Dr LAHA, Ranjan (Indian Institute of Science); Dr MAITY, Tarak Nath (University of Sydney)

**Orateur:** M. SHERPA, Rinchen (Indian Institute of Science)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **263** Type: **Non spécifié**

# Astrophysical and cosmological neutrinos: A window to new physics

*lundi 17 novembre 2025 09:55 (25 minutes)*

Nature has provided us with powerful neutrino sources, with explosive or violent events, such as core-collapse supernovae that mark the end of the life of massive stars, or binary compact object mergers, like binary neutron star mergers. Neutrinos are intriguing elementary particles with mixings, that weakly interact with matter, which makes them unique messengers of events far in space and time. While neutrinos have already played a remarkable role historically in shaping, since the premises of neutrino astronomy, fundamental knowledge, they keep having a unique role in astrophysical and cosmological environments.

In this talk, I will highlight the impact neutrinos have on longstanding open issues such as on the core-collapse supernova explosion mechanism, or on nucleosynthesis processes e.g. the r-process, in relation with supernovae and binary neutron-star merger remnants. I will mention the fact that understanding how neutrinos change flavor in such dense environments is still an open problem. I will discuss the crucial role of future observations, also for the search for new physics. Interestingly, neutrinos from supernovae and binary neutron-star mergers have many similarities with neutrinos in the early Universe, in particular at the MeV epoch.

Finally, I will emphasize the importance of discovering the diffuse supernova background from past supernova explosions, which will open a new window in low energy neutrino astrophysics and will constitute a unique laboratory for astrophysics, neutrino physics and the search for new physics. As for the cosmological neutrino background, its observation remains extremely challenging.

**Auteur:** Dr VOLPE, Cristina (APC)

**Orateur:** Dr VOLPE, Cristina (APC)

ID de Contribution: **264** Type: **Non spécifié**

# Cosmic Inflation: From Small to Large Scales

*mardi 18 novembre 2025 11:50 (25 minutes)*

Structures in the universe can be formed because of small inhomogeneities at a very early time. These inhomogeneities originate from quantum fluctuations stretched by cosmic inflation. As we know from wave mechanics, fluctuations are characterized by amplitude and wavelength. Fluctuations with wavelength as long as observable universe, with amplitude around 0.00001, can explain cosmic microwave background observations and galaxies density correlations in large-scale structures. However, for the short-wavelength one, so far there have been no observational constraints on the amplitude. If the amplitude exceeds 0.1, they can collapse to form primordial black holes. These primordial black holes can have interesting consequences, such as explaining dark matter or LIGO-Virgo-KAGRA black holes. So far, these theoretical predictions rely on linear perturbation theory. However, it is reasonable to expect large nonlinearities due to large fluctuations, which are manifested in coupling between small and large scales. In this talk, I will review primordial black holes formation in single-field inflation and recent progress on nonlinear computation. I will argue that large amplitudes of short-wavelength fluctuations can coherently amplify the long-wavelength one by loop corrections. I will also explain some issues on regularization and renormalization of these loops.

**Auteur:** KRISTIANO, Jason (Kyoto University)

**Orateur:** KRISTIANO, Jason (Kyoto University)

ID de Contribution: **265** Type: **Non spécifié**

# Searching for Leptoquarks at Future Circular Colliders

We study the sensitivities of the Future Circular Collider under electron-positron collision (FCC-ee) and hadron-hadron collision (FCC-hh) scenarios for the search of leptoquarks. In particular, we focus on the Z-factory mode and the high-$p_T$ mode. For the Z-factory mode, we summarize past works that matched leptoquark couplings to the Standard Model effective field theory operators (SMEFT) for the Z-boson coupling to the leptoquarks up to one-loop order. For the high-$p_T$ mode, we update the current search status of leptoquark at the Large Hadron Collider and project the sensitivity for the FCC-hh based on it. We also comment on the potential for the FCC to address the flavour anomalies.

**Auteur:** HEIDERIJK, Christian (City University of Hong Kong)

**Co-auteurs:** Dr ZHONG, Yiming (City University of Hong Kong); Prof. SCHMALTZ, Martin (Boston University)

**Orateur:** HEIDERIJK, Christian (City University of Hong Kong)

ID de Contribution: **266** Type: **Non spécifié**

# Recent Results from the MicroBooNE experiment

*mercredi 19 novembre 2025 13:45 (15 minutes)*

MicroBooNE is an 85-tonne liquid argon time projection chamber (LArTPC) at Fermilab. It collected data from two different neutrino beam lines between 2015 and 2020 and has since released a large number of results. These include searches for beyond the standard model (BSM) physics, including investigation into an anomalous excess of low energy (LEE) electromagnetic activity observed by the MiniBooNE experiment. MicroBooNE has looked for the LEE across various channels, including dark photons, single-photon, and electron neutrinos. MicroBooNE also has a vast program of neutrino-argon cross-section measurements that will provide input into the modelling of neutrino-argon nucleus interaction modelling in advance of the future LArTPC-based experiment DUNE.
In particular, MicroBooNE has produced first charged pion production measurements which will be one of the main interaction channels at DUNE's beam energies, and electron neutrino measurements which will be the appearance channel for DUNE's neutrino oscillation program, complementing muon disappearance channels to allow for a CP violation measurement.
This talk will discuss the most recent BSM results and cross-section measurements from MicroBooNE.

**Auteur:** MELLET, Lucile

**Orateur:** MELLET, Lucile

**Classification de Session:** Neutrinos

ID de Contribution: **267** Type: **Non spécifié**

# Combining Parametric Methods and Observation Matrices for Foreground Cleaning in the context of Simons Observatory

*mercredi 19 novembre 2025 14:30 (15 minutes)*

The Simons Observatory (SO) is a new generation CMB experiment located in the Atacama Desert and is currently taking data. One of the main scientific goals of the SO Small Aperture Telescopes (SATs) is to measure traces of inflation in the primordial B-modes in the CMB polarization, whose amplitude is parameterized by r.
This signal would be extremely faint, and its detection depends on removing contaminating emission from Galactic foregrounds and exercising exquisite control over systematic effects—particularly those introduced when filtering spurious signals from the data, which can distort the reconstructed maps.
I will present the parametric map-based method that we are developing as one of the pipelines for foreground cleaning in the SATs. This approach allows us to handle complex foregrounds, inhomogeneous noise, and is capable of reaching σ(r=0) ⊠ 0.003 (Wolz et al. 2024). To manage the filtering, we are using an observation matrix-based technique (Ade et al. 2016), which is directly incorporated into the foreground cleaning. For a survey as large as SO and observing from Chile, this matrix will be large and complex. This method has never been used under such conditions, necessitating the development of new algorithms to handle it.

**Auteur:** JOST, Baptiste (IPMU)

**Orateur:** JOST, Baptiste (IPMU)

**Classification de Session:** Cosmology

ID de Contribution: **268** Type: **Non spécifié**

# Flavored Leptogenesis with MeV–GeV Dark Matter

*mercredi 19 novembre 2025 13:30 (15 minutes)*

We explore flavored resonant leptogenesis embedded in a neutrinophilic 2HDM. The mass pattern of the right-handed neutrinos~(RHNs) is generated by invoking a softly broken U(1) lepton family number difference symmetry. Such a symmetry features two degenerate heavy RHNs and a massless one. The soft breaking then generates a small splitting between the two heavier one, while also generating mass for the lightest one. If the heavier two RHNs are at TeV scale, the resulting spectrum for the lightest one is naturally placed at MeV–GeV mass, lies below the sphaleron freeze-out temperature and is stable, serving as a dark matter candidate – another feature that conventional leptogenesis can not accomodate. On the other hand, the heavier two enable TeV-scale leptogenesis also avoids the extreme mass degeneracy typically plagued conventional resonant leptogenesis.

Baryon asymmetry, neutrino masses, and potentially even dark matter relic density can be addressed within a unified, experimentally testable framework, shedding light onto matter-dark matter coincidence puzzle.

**Auteur:** ZHANG, Kairui (University of Oklahoma)

**Co-auteur:** Prof. HUANG, Peisi (University of Nebraska-Lincoln)

**Orateur:** ZHANG, Kairui (University of Oklahoma)

**Classification de Session:** Particle Physics

ID de Contribution: **270** Type: **Non spécifié**

# Exploring the beginning of the Universe.

*mercredi 19 novembre 2025 16:45 (15 minutes)*

I will discuss current and future observational probes which could bring new clues about the first moments of the Universe and the physics at the extreme energies, emphasizing their uniqueness and complementarity. The first part of the talk will cover the still-unexplored scientific potential of the cosmic microwave background polarized anisotropy observations. I will discuss the prospects and highlight challenges and difficulties in exhaustive exploitation of this currently most advanced probe of the very early Universe. In the second part I will then focus on more futuristic ideas, which I will review in some detail

**Auteur:** STOMPOR, Radek (CNRS, AstroParticule et Cosmologie)

**Orateur:** STOMPOR, Radek (CNRS, AstroParticule et Cosmologie)

**Classification de Session:** Cosmology

ID de Contribution: **271** Type: **Non spécifié**

# Hybrid Delta-map: Combining Harmonic and Real-space Methods for CMB Foreground Removal

*mercredi 19 novembre 2025 17:00 (15 minutes)*

The B-mode polarization of the cosmic microwave background (CMB) is a sensitive probe of primordial gravitational waves. A precise measurement of the tensor-to-scalar ratio $r$ enables stringent tests of inflation, yet the B-mode signal is hidden beneath Galactic foregrounds. Delta-map approximates the line-of-sight dependence of the foreground spectral energy distribution to first order, capturing spatial variation in frequency scaling. We present Hybrid Delta-map, which retains Delta-map's first-order line-of-sight expansion of the foreground SED while modeling the foregrounds in a spherical-harmonic basis restricted to the multipoles actually retained in the analysis ($\ell \leq \ell_{\rm max}$), and then projects back to real space to build the likelihood. This preserves the advantages of real-space analysis (e.g., flexible masking), enforces strict control of $\ell_{\rm max}$, and removes the mismatch that arises when fully pixel-space fits at high resolution carry more free parameters than a band-limited data set ($\ell \leq \ell_{\rm max}$) can support—an imbalance that can bias $r$. In realistic multi-frequency simulations including beams, sky masking, and instrument noise, Hybrid Delta-map shows no statistically significant bias in estimates of $r$ at the reionization bump (within our simulation precision) and reduces computational cost.
![Estimates of $r$ from the Extended Delta-map (red) and the Hybrid Delta-map (blue)

**Auteur:** M. IKUMA, Kiyoshi (Okayama University)

**Co-auteurs:** Prof. ICHIKI, Kiyotomo (Nagoya University); Prof. ISHINO, Hirokazu (Okayama University)

**Orateur:** M. IKUMA, Kiyoshi (Okayama University)

**Classification de Session:** Cosmology

ID de Contribution: **272** Type: **Non spécifié**

# Supernova and transient science with the telescope network including Subaru

*jeudi 20 novembre 2025 14:00 (25 minutes)*

Recent development in transient observations has revealed a rich diversity of a transient zoo. Discovering new transients and characterize their natures requires global telescope networks involving various telescopes and instruments at different locations. The Subaru telescope has been playing unique roles in the network, including (1) the capability of performing a deep and wide survey to discover new transients with a different parameter space than other survey telescopes with the smaller diameter, (2) the potential in search for optical counterparts of transients discovered either in different wavelengths or different messengers (e.g., gravitational wave), and (3) deep follow-up observations of transients with different modes (e.g., polarization). In this talk, I will introduce some recent activities of transient observations including the findings obtained with the Subaru telescope in these aspects, especially focusing on the emerging diversity of supernova explosions that calls for a major update in the stellar evolution theory.

**Auteur:** MAEDA, Keiichi (Kyoto University)

**Orateur:** MAEDA, Keiichi (Kyoto University)

ID de Contribution: **273** Type: **Non spécifié**

# Searches for physics beyond SM at DANSS

*mercredi 19 novembre 2025 15:15 (15 minutes)*

DANSS is a 1 m3 solid scintillator detector placed on a movable platform at the distances of 10.9 to 12.9 meters from the reactor core center at the Kalinin NPP in Russia. DANSS collected the largest sample of antineutrino events in the world of more than 10 millions. In a search for Large Extra Dimensions (LED) the best fit point in a model with one dominant LED has a statistical significance of 2 standard deviations only. Therefore, no statistically significant evidence for LED was found. The established upper limits on the model parameters (the size of the extra dimension and the mass of the lightest neutrino) are the best in the world in some areas. They exclude a large fraction of parameters preferred by the LED interpretation of the Gallium anomaly and Reactor anomaly including the best fit points. The limits are based on the comparison of the Inverse beta decay spectra at 10.9 and 12.9 meters from the reactor core center. They do not depend on the assumptions about the reactor antineutrino spectrum. Searches for sterile neutrinos were updated using additional 1.5 million of neutrino events. Limits obtained in a model independent way exclude practically all sterile neutrino parameters preferred by the recent BEST results for Δm2 below 5 eV2. The limits are the best in the world in this region. Using model predictions for the neutrino flux DANSS excludes practically the whole sterile neutrino parameter space preferred by the BEST experiment.

**Auteur:** DANILOV, Mikhail

**Orateur:** DANILOV, Mikhail

**Classification de Session:** Neutrinos

ID de Contribution: **274** Type: **Non spécifié**

# From Particles to the Cosmos at Colliders

*lundi 17 novembre 2025 15:00 (25 minutes)*

The discovery of the Higgs boson by the ATLAS and CMS experiments at CERN in 2012 revolutionised our understanding of the origin of matter and interactions in the universe. The proof of the existence of a scalar field supports the hypothesis of a spontaneous electroweak symmetry breaking mechanism responsible for the appearance of the mass of the Z0 and W± vector bosons in the very early moments. The discovery by ATLAS and CMS in 2015 of the existence of Yukawa couplings between elementary fermions and the Higgs field highlighted the importance of the "substance"of the vacuum for the story of our universe. Old questions are being exacerbated and new questions are emerging that could offer opportunities for discoveries at large colliders, in conjunction with cosmological observations, in the coming decades.

**Auteur:** SIROIS, Yves (Laboratoire Leprince-Ringuet, Ecole Polytechnique, Palaiseau)

**Orateur:** SIROIS, Yves (Laboratoire Leprince-Ringuet, Ecole Polytechnique, Palaiseau)

ID de Contribution: **275** Type: **Non spécifié**

# Detector Technology

*jeudi 20 novembre 2025 15:15 (25 minutes)*

Detectors play a pivotal role in advancing particle physics. The evolution of detector technologies starting from on-going experiments at the LHC, and outlines the emerging trends shaping the design of next-generation collider detectors will be reviewed. Key developments include increased granularity with low material, low power consumption, and the integration of real-time data processing will be discussed.
Then, I will highlight recent progress on low temperature sensors, which are essential technology for future experiments. Review on needs of temperature for particle physics experiments and their technology to achieve the environment. Development plan in Japan, including cryo-CMOS and low-cost cryogenics system will be discussed.

**Auteur:** ENARI, Yuji (KEK IPNS)

**Orateur:** ENARI, Yuji (KEK IPNS)

ID de Contribution: **276** Type: **Non spécifié**

# Status and prospects of JUNO

*lundi 17 novembre 2025 10:20 (25 minutes)*

The Jiangmen Underground Neutrino Observatory (JUNO) is a 20-kiloton multipurpose liquid scintillator detector located in Guangdong province, China, designed to address key open questions in neutrino physics. After completing construction in 2024, JUNO entered a commissioning phase with water filling, followed by a six-month liquid scintillator filling campaign. Full data-taking is expected to begin around September 2025.
The detector is situated at an optimized baseline of about 52.5 km from both the Yangjiang and Taishan Nuclear Power Plants, which together provide a high flux of reactor antineutrinos. This location maximizes sensitivity to JUNO's primary goal: determining the neutrino mass ordering (NMO). By precisely measuring oscillation-induced modulations in the energy spectrum, JUNO aims to determine the NMO with a significance of about 3σ in roughly seven years. Its large target mass, low background, and unprecedented 3% energy resolution at 1 MeV will also enable sub-percent precision measurements of the oscillation parameters Δm^{2}*{21}, sin^{2}(2θ){12}, and Δm^{2}*{31} simultaneously.
Beyond reactor antineutrino measurement, JUNO has a broad physics program, including the detection of neutrinos from natural sources such as the Sun, the Earth, the atmosphere, and potential galactic core-collapse supernovae.
This talk will present an overview of JUNO's design and detection principles, highlight its primary and complementary scientific goals, and discuss its prospects for its contributions to neutrino physics in the coming decade.

**Auteur:** PELICCI, Luca (Università degli Studi di Milano and INFN Milano)

**Orateur:** PELICCI, Luca (Università degli Studi di Milano and INFN Milano)

ID de Contribution: **277** Type: **Non spécifié**

# Hot QCD in the laboratory: the ALICE upgrades for LHC Run 4 and beyond

*mercredi 19 novembre 2025 14:45 (15 minutes)*

At extreme temperature and energy density conditions, achievable in the laboratory by colliding heavy nuclei at ultra-relativistic energies, strongly-interacting matter undergoes a transition from its condensed, hadronic phase to the deconfined, partonic phase named quark-gluon plasma (QGP). The main goal of the ALICE physics program is to investigate the properties of the QGP at the CERN LHC, and to understand how its properties emerge from the fundamental interactions governed by quantum chromodynamics (QCD).

A major upgrade was performed on the ALICE detector during the LHC Long Shutdown 2 (2019–2022), and further improvements, including the upgrade of the inner tracker (ITS3) and the installation of a forward calorimeter (FoCal), are planned for the Long Shutdown 3 (2026-2029). For the future, beyond LHC Run 4, the ALICE Collaboration pursues developments for a next-generation detector, named ALICE 3, optimized for high-precision tracking and particle identification in heavy-ion collisions

The proposed ALICE 3 detector exploits a new superconducting magnet and consists of a large pixel-based tracking system covering eight units of pseudorapidity, complemented by multiple systems for particle identification, including silicon time-of-flight layers, a ring-imaging Cherenkov detector, and a muon identification system. Cutting-edge technologies are under development to pursue a track-pointing resolution better than 10 microns for particles with transverse momentum above 200 MeV/$c$, achievable by designing the vertex detector as a retractable structure inside the beam pipe.

The ALICE 3 detector represents a unique opportunity to address key questions in the QGP physics which will be left open at the end of the LHC Run 4, and will offer important physics opportunities in other areas of QCD and beyond. The physics program in the QGP sector will focus on heavy-flavor measurements at low-$p_{\mathrm{T}}$, including beauty hadrons, multi-charm baryons and charm-charm correlations, as as well as on precise multi-differential measurements of dielectron emission to probe the mechanism of chiral-symmetry restoration and the time-evolution of the QGP temperature. Besides QGP studies, ALICE 3 is expected to give unique contributions to hadronic physics, with femtoscopic studies of the interaction potentials between charm mesons and searches for nuclei with charm, and to fundamental physics, by testing the Low's theorem for ultra-soft photon emission.

This presentation will provide an overview of the planned ALICE upgrades, discussing the physics potential out of reach with other existing or planned experiments, and the status of the R&D for the chosen technologies.

**Auteur:** Dr URAS, Antonio (IP2I Lyon)

**Orateur:** Dr URAS, Antonio (IP2I Lyon)

**Classification de Session:** Particle Physics

ID de Contribution: **278** Type: **Non spécifié**

# Neutrino Mass from Cosmology: Beyond Two-Point Clustering

*mercredi 19 novembre 2025 17:45 (15 minutes)*

Determining the absolute mass of neutrinos remains a major challenge in cosmology and particle physics. Recent DESI DR1/DR2 results suggest potential deviations from the standard ΛCDM model and indicate that conventional two-point statistics may be insufficient to robustly detect Mν –sparking controversial hints of a negative neutrino mass. To overcome these limitations, we introduce robust, alternative higher-order clustering approaches grounded in cosmic-web analysis based on critical points and persistent homology. These methods capture complex clustering patterns in large-scale surveys and can reveal subtle neutrino signatures missed by traditional two-point analyses. Supported by advanced cosmological simulations, our techniques show great potential in enhancing sensitivity to neutrino effects on the cosmic web. Our methods are particularly relevant for ongoing and upcoming large-volume redshift surveys, including DESI, Euclid, and Rubin-LSST, providing new pathways to directly detect the mass of neutrinos or place reliable and competitive constraints on their total mass and hierarchy.

**Auteur:** Prof. ROSSI, Graziano (Sejong University)

**Orateur:** Prof. ROSSI, Graziano (Sejong University)

**Classification de Session:** Cosmology

ID de Contribution: **279** Type: **Non spécifié**

# Gravitational Waves: A New Tool for Understanding the Universe

*mercredi 19 novembre 2025 16:30 (15 minutes)*

Next-generation gravitational wave observatories like the Einstein Telescope and Cosmic Explorer will open new windows into cosmology. On one hand Gravitational Waves can trace the large-scale structure of the universe, working alongside traditional galaxy surveys to enhance our ability to test and refine cosmological models. On the other hand, as standard sirens, gravitational wave sources provide an independent method to measure cosmic distances, enabling tests of key assumptions in the LCDM model when combined with electromagnetic probes. An important test case is the distance duality relation (DDR), whose violation could signal new physics beyond the standard cosmological framework.

**Auteur:** DE LEO, CHIARA (Sapienza, University of Rome)

**Orateur:** DE LEO, CHIARA (Sapienza, University of Rome)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **280** Type: **Non spécifié**

# Status and perspectives of KAGRA

*vendredi 21 novembre 2025 09:00 (25 minutes)*

KAGRA is an underground interferometric gravitational-wave detector located in Kamioka, Gifu, Japan. It began observations in 2020 and achieved its first joint run with LIGO and Virgo in 2025. In this talk, I will present the current status of KAGRA and discuss its future prospects.

**Auteur:** MORISAKI, Soichiro (Research Center for the Early Universe, the University of Tokyo, Japan.)

**Orateur:** MORISAKI, Soichiro (Research Center for the Early Universe, the University of Tokyo, Japan.)

ID de Contribution: **281** Type: **Non spécifié**

# Search for resonant di-Higgs production in channels involving diphoton at CMS

The H⟶gammagamma decay channel provides a clean final-state topology that allows the mass of a Higgs boson to be reconstructed with high precision. This presentation will show the latest results of the search for resonant di-Higgs production where one of the Higgs bosons decays to diphoton, using CMS data.

**Auteur:** COLLABORATION, CMS

**Orateur:** COLLABORATION, CMS

ID de Contribution: **282** Type: **Non spécifié**

# The DarkSide-20k experiment sensitivity to Dark Matter candidates

*mercredi 19 novembre 2025 15:15 (15 minutes)*

Dark matter constitutes approximately 85 % of the Universe's total mass, yet its particle nature remains unresolved. While several astrophysical observations support its existence, the underlying constituent has evaded direct identification. Weakly Interacting Massive Particles (WIMPs) represent a leading class of candidates, motivating a sustained experimental program over the past decade that has progressively tightened exclusion limits on the WIMP–nucleon interaction cross-section and WIMP mass.

The Global Argon Dark Matter Collaboration (GADMC) contributes to this direct-detection effort through its forthcoming apparatus, DarkSide-20k, following the successful DarkSide-50 experiment, which implements a dual-phase liquid-argon time-projection chamber (LAr TPC) encased within two active veto systems. The entire assembly resides in an $8 \times 8 \times 8\,\mathrm{m}^3$ cryostat installed at the Laboratori Nazionali del Gran Sasso (LNGS), an underground laboratory inside the Gran Sasso mountain providing a natural shielding from cosmic-rays. The detector is designed to minimize background events and achieve a nearly background-free operation by employing strategies to suppress unwanted signals such as neutrons, beta particles, and gamma rays. Liquid argon offers intrinsic discrimination between electronic recoils (β/γ) and nuclear recoils (neutrons, potential WIMP interactions) via pulse-shape discrimination (PSD), thereby enabling efficient rejection of dominant backgrounds.

Taking advantage of the intrinsic PSD capability of liquid argon, the NR background from the detector components is one order of magnitude smaller compared to the irriducibile contribution due to CEvNS from neutrinos. With a target mass of 20 t of active argon and an exposure of 200 t·yr, DarkSide-20k is expected to achieve a 90 % confidence-level upper limit on the spin-independent WIMP–nucleon cross-section of $7.4 \times 10^{-48}\,\mathrm{cm}^2$ for a $1\,\mathrm{TeV/c}^2$ WIMP. At lower masses ($\approx 10\,\mathrm{GeV/c}^2$), the experiment retains competitive sensitivity, reaching $1 \times 10^{-42}\,\mathrm{cm}^2$ and with 10 years exposure, the neutrino fog can be reached for WIMP masses around $5\,\mathrm{GeV/c}^2$.

**Auteur:** KUNZE, Pablo

**Orateur:** KUNZE, Pablo

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **283** Type: **Non spécifié**

# ATLAS Results on Quark and Lepton Flavor Physics

*jeudi 20 novembre 2025 09:25 (25 minutes)*

Measurements by the ATLAS Experiment of quark and lepton flavor processes, using the LHC Run 2 data, are presented. These include differential cross section measurements of charmed mesons and a new precision measurement of the neutral B meson lifetime. They also include tests of lepton flavor universality in W-boson decays and in the context of high mass top pair-lepton pair production, as well as a search for charged lepton flavor violation in top quark production.

**Auteur:** SEIDEL, Sally (University of New Mexico)

**Orateur:** SEIDEL, Sally (University of New Mexico)

ID de Contribution: **284** Type: **Non spécifié**

# CMS Results on the Higgs Boson and Electroweak Physics

*vendredi 21 novembre 2025 09:50 (25 minutes)*

In this presentation, we explore the production mechanisms of W, Z, and Higgs bosons, alongside the top quark, at the Large Hadron Collider (LHC). We examine how these particles are detected using the capabilities of the CMS Experiment. The talk will highlight the latest advancements in Higgs boson physics, focusing on detailed measurements of its production rates across various decay channels. Additionally, we will present recent significant findings in electroweak physics involving W, Z, and top particles. These results offer valuable insights into fundamental particle interactions and contribute to our understanding of the Standard Model.

**Auteur:** POZDNYAKOV, Andrey (RWTH Aachen University)

**Orateur:** POZDNYAKOV, Andrey (RWTH Aachen University)

ID de Contribution: **285** Type: **Non spécifié**

# 20 GeV halo-like excess of the Galactic diffuse emission: Evidence for dark matter annihilation?

*mercredi 19 novembre 2025 16:15 (15 minutes)*

Fifteen years of the Fermi Large Area Telescope (LAT) data in the halo region of the Milky Way (MW) are analyzed to search for gamma rays from dark matter annihilation. Gamma-ray maps within the region of interest (|l|≤60 deg, 10≤|b|≤60 deg) are modeled using point sources, the GALPROP models of cosmic-ray interactions, isotropic background, and templates of Loop I and the Fermi bubbles, and then the presence of a halo-like component is further examined. A statistically significant halo-like excess is found with a sharp peak around 20 GeV, while its flux is consistent with zero below 2 GeV and above 200 GeV. Examination of the fit residual maps indicates that a spherically symmetric halo component fits the map data well. The radial profile agrees with annihilation by the smooth NFW density profile, and may be slightly shallower than this, especially in the central region. Various systematic uncertainties are investigated, but the 20 GeV peak remains significant. In particular, the halo excess with a similar spectrum is detected even relative to the LAT standard background model, which does not depend on GALPROP or other model templates. The halo excess can be fitted by the annihilation spectrum with a mass m_χ~ 0.5-0.8 TeV and annihilation cross section ⟨συ⟩~ (5-8)×10^{-25} cm^3 s^{-1} for the bb⁻ channel. This cross section is larger than the upper limits from dwarf galaxies and the canonical thermal relic value, but considering various uncertainties, especially the density profile of the MW halo, the dark matter interpretation of the 20 GeV “Fermi halo” remains feasible. The prospects for verification through future observations are briefly discussed.

**Auteur:** TOTANI, Tomonori (Dept. Astronomy, Univ. Tokyo)

**Orateur:** TOTANI, Tomonori (Dept. Astronomy, Univ. Tokyo)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **286** Type: **Non spécifié**

# Can Future CMB Data Discriminate Between a Cosmological Constant and Dynamical Dark Energy ?

*mercredi 19 novembre 2025 13:30 (15 minutes)*

Recent cosmological analyses combining Planck CMB data with baryon acoustic oscillation (BAO) measurements from the DESI collaboration have revealed a statistically significant preference for evolving dark energy (DE) models over the standard cosmological constant. In particular, fits using the Chevallier–Polarski–Linder (CPL) parameterization indicate a $\sim 4\sigma$ deviation from a constant equation of state, suggesting a possible departure from the $\Lambda$CDM paradigm. In this work, we investigate whether forthcoming cosmic microwave background (CMB) experiments such as CMB-S4 and Simons Observatory (SO) can independently discriminate between $\Lambda$CDM and these dynamical dark energy scenarios without relying on external low-redshift data. We perform a detailed Fisher matrix forecast and mock likelihood analysis using fiducial cosmologies consistent with current DESI+Planck-preferred CPL models. Our results show that, under realistic experimental assumptions, next-generation CMB data can place meaningful constraints on DE evolution parameters $w_0$ and $w_a$, and potentially detect departures from a cosmological constant at the $\sim 2$–$3\sigma$ level. We discuss the implications for model selection and the robustness of CMB-based probes in testing extensions to the standard cosmological model.

**Auteur:** FERRI, Anna Chiara (Sapienza University of Rome)

**Orateur:** FERRI, Anna Chiara (Sapienza University of Rome)

**Classification de Session:** Cosmology

ID de Contribution: **287** Type: **Non spécifié**

# The mass in the Galactic Center

*jeudi 20 novembre 2025 09:50 (25 minutes)*

Near-infrared observations of individual stellar orbits have revealed that the Galactic Center hosts a compact mass of around 4.3 million solar masses, honored with the Nobel prize in physics in 2020. By the advent of near-infread interferometry, the resolution and astrometric precision have been increased recently by almost an order of magnitude, turning the stellar system around Sgr A*into a laboratory for testing general relativity aorund a large mass. Further, stellar orbits probe the Newtonian mass content in the Galactic Center, and provide stringent constraints on how much dark objects can reside around Sgr A*, and constitutes thus a test case for the dynamical modelling used to predict extreme-mass ratio inspiral rates for gravitational wave observations.

**Auteur:** GILLESSEN, Stefan (MPE)

**Co-auteur:** GRAVITY(+) COLLABORATION

**Orateur:** GILLESSEN, Stefan (MPE)

ID de Contribution: **288** Type: **Non spécifié**

# Short, long, and ultra-long MeV transients

*mercredi 19 novembre 2025 13:30 (15 minutes)*

Gamma-ray bursts (GRBs) are typically observed as brief flashes of MeV radiation. Short-duration GRBs (< 2 s) are commonly associated with neutron star mergers, making them prime multi-messenger sources with gravitational waves. Long-duration GRBs (~20 s), on the other hand, are linked to certain classes of collapsars. Despite this broad dichotomy, recent discoveries have revealed puzzling cases. GRB 211211A and GRB 230307A are long-duration events (> 30 s) that nonetheless show clear kilonova signatures. I will discuss the distinctive features of these "odd-balls"in comparison with historical long GRBs.
A further subclass is the ultra-long GRBs. I will present the properties of the recently detected GRB 250702D/B/E, which persisted for more than three hours. Its MeV emission, followed by a rapid X-ray decline, suggests an origin in a relativistic jet powered by the tidal disruption of a star by an intermediate-mass black hole. Although rare, such tidal disruption events are compelling as potential sources of low-frequency gravitational waves.

**Auteur:** OGANESYAN, Gor (Gran Sasso Science Institute)

**Orateur:** OGANESYAN, Gor (Gran Sasso Science Institute)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **289** Type: **Non spécifié**

# Test2

test

**Auteur:** Dr GONIN, Michel (IN2P3-University of Tokyo-ILANCE)

**Orateur:** Dr GONIN, Michel (IN2P3-University of Tokyo-ILANCE)

ID de Contribution: **290** Type: **Non spécifié**

# Toponium at the LHC

*mercredi 19 novembre 2025 16:30 (15 minutes)*

Toponium is the color-singlet bound state of top quark and antitop quark. We study the signature of toponium formation at the LHC.

**Auteur:** ZHENG, Ya-Juan

**Orateur:** ZHENG, Ya-Juan

**Classification de Session:** Particle Physics

ID de Contribution: **291** Type: **Non spécifié**

# Measurements of antineutrino spectra for 235U and 239Pu at an industrial reactor and reactor monitoring using antineutrinos

*mercredi 19 novembre 2025 17:15 (15 minutes)*

DANSS is a scintillator detector of antineutrinos located on a lifting platform below the 4th reactor core of the Kalinin NPP in Russia. The detector position below the reactor core provides advantages of high neutrino rate and an overburden of 50 m w.e., which suppresses atmospheric muon flux by a factor of 5–6. The detector was commissioned in April 2016 and it has been operating continuously since October 2016. The antineutrino statistic is the largest in the world and exceeds 10M Inverse Beta Decay (IBD) events. The IBD spectrum dependence on the 239Pu fission fraction is presented. It agrees with the predictions of the Huber-Mueller model. Using this dependence, the ratio of IBD rates for 235U and 239Pu was extracted. It also agrees with the Huber-Mueller model and somewhat larger than in other experiments. The reactor power was measured using the IBD event rate during 7.5 years with a statistical accuracy of 1.0% in a week and with the relative systematic uncertainty of less than 0.8%. The fraction of the reactor antineutrino yield with energies above 10 MeV was measured. Such antineutrinos are important for searches of neutrino coherent scattering. Fission fractions of 239Pu and 235U during reactor campaigns were measured using a fit of the IBD positron spectra. They agree within better than 3% accuracy with the fission fractions obtained using neutron flux simulations in the reactor. Antineutrino spectra from 239Pu and 235U were reconstructed. Both spectra show evidence for a 6 MeV bump in comparison with the Huber-Mueller model.

**Auteur:** Dr SKROBOVA, Nataliya

**Orateur:** Dr SKROBOVA, Nataliya

**Classification de Session:** Neutrinos

ID de Contribution: **292** Type: **Non spécifié**

# A measurement of atmospheric circular polarization with POLARBEAR

*mercredi 19 novembre 2025 14:00 (15 minutes)*

Although the cosmic microwave background (CMB) is assumed to be only linearly polarized due to the Thomson scattering, some exotic theories predict the generation of circular polarization in the CMB during its propagation. E.g., Faraday conversion due to the supernovae remnants of first stars[1], the scattering by cosmic neutrino background[2], and Lorentz violation[3]. Thus, the circular polarization of the CMB could be the new search tool of the universe.
Since most current CMB experiments aim to detect the primordial B-mode linear polarization, it is fine to introduce the optical device to convert circular polarization to linear polarization for the quick observation of the circular polarization. We focused on the leakage between linear and circular polarization due to the frequency dependence of the half-wave plate (HWP). We used the observed data of the POLARBEAR experiment with a continuously-rotating HWP, and confirmed the observation method by detecting the atmospheric circular polarization whose intensity is much stronger than the noise level of the experiment[4]. In this presentation, we will show the analysis method and results of this observation. This is the first result of the circular polarization detection using a continuously rotating HWP.
[1] S. De and H. Tashiro, Phys. Rev. D 92, 123506 (2015)
[2] R. Mohammadi, Eur. Phys. J. C 74, 3102 (2014)
[3] L. Caloni et al, JCAP 03, 018 (2023)
[4] T. Fujino et al, ApJ 981, 15 (2025)

**Auteur:** FUJINO, Takuro (High energy accelerator research organization)

**Co-auteur:** Dr TAKAKURA, Satoru (UTokyo)

**Orateur:** FUJINO, Takuro (High energy accelerator research organization)

**Classification de Session:** Cosmology

ID de Contribution: **294** Type: **Non spécifié**

# Recent results of the T2K experiment

*mardi 18 novembre 2025 09:00 (25 minutes)*

T2K is a neutrino experiment that measures neutrino and antineutrino oscillations using a long baseline of 295km, from the neutrino beam source at JPARC in Japan, to the Super-Kamiokande detector in Kamioka. The ND280 near detector at JPARC measures the properties of the neutrino beam prior to oscillations, while SuperK measures the beam after oscillations.
In this talk, the most recent results of neutrino oscillations will be presented, featuring world-leading sensitivities on the search of Charge-Parity violation, by comparing oscillation measurements of neutrinos and antineutrinos. Measurements of the atmospheric oscillation parameters also extracted by observing the disappearance of muon neutrinos and the appearance of electron neutrinos. Combinations with other experiments such as SuperK and NOvA are also presented.

**Auteur:** BLANCHET, Adrien (CERN EP-NU)

**Orateur:** BLANCHET, Adrien (CERN EP-NU)

ID de Contribution: **295** Type: **Non spécifié**

# LiquidO for Reactor Antineutrinos: Topology-Driven PID and Background Rejection in Opaque Scintillator Detectors

*mercredi 19 novembre 2025 16:00 (15 minutes)*

LiquidO is a novel detector technology that uses the stochastic confinement of scintillation light in an opaque medium allowing for the capture of distinct event topologies. To collect this light a lattice of wavelength-shifting fibers run through the medium, which are then read out using silicon photomultipliers (SiPMs). By leveraging the distinct event topologies observed, we can increase the efficiency of particle identification (PID) down to the MeV scale. Combining this with the prompt delayed coincident signal of inverse beta decay events, LiquidO technology will be ideal for reactor antineutrino detection. Alongside improved rejection of background sources such as cosmogenic muons and spallation neutrons a LiquidO style detector could be deployed at a on surface reactor site. At the University of Sussex prototype detectors have been and are being built to develop and mature the technology. Simulations of the LiquidO detectors are carried out in the Geant4-based RATPAC 2 framework, which produce high statistics event response datasets that map scintillation light transport within the opaque medium, quantify detector response and inform studies of light propagation characteristics. Building on this foundation, we have developed and validated efficient particle identification algorithms and machine learning classifiers that exploit distinctive light pattern signatures for robust signal discrimination and background rejection. In this presentation, I will give an overview of the LiquidO technology, discuss my work on simulations of LiquidO detectors and their applications in reactor antineutrino physics.

**Auteur:** CATTERMOLE, Ben (University of Sussex)

**Orateur:** CATTERMOLE, Ben (University of Sussex)

**Classification de Session:** Neutrinos

ID de Contribution: **296** Type: **Non spécifié**

# Recent results and future prospects from the Belle II experiment

*mardi 18 novembre 2025 11:25 (25 minutes)*

The Belle and Belle II experiments have collected a combined sample of 1.2 ab$^{-1}$ of $e^+e^- \to B\overline{B}$ collisions at a centre-of-mass energy corresponding to the $\Upsilon(4S)$ resonances. These data, with low particle multiplicity and constrained initial state kinematics, are an ideal environment for studying the properties of bottom mesons, such as semileptonic and rare electroweak penguin decays to final states with missing energy from neutrinos, and search for dark sector particles in the mass range from a few MeV to 10 GeV. In addition, the boost provided by the asymmetric SuperKEKB collider allows to perform measurements of time-dependent CP violation. These samples also contain a large number of $e^+e^- \to c\bar{c}$ and $e^+e^- \to \tau^+\tau^-$ pairs, which are used to study the properties of charm hadrons and tau leptons. In this talk we will present recent results and future prospects from several areas of the Belle II physics program.

**Auteur:** VERONESI, Michele

**Orateur:** VERONESI, Michele

ID de Contribution: **297** Type: **Non spécifié**

# Magnetothermal evolution of neutron stars with the new 3D code MATINS

*mercredi 19 novembre 2025 16:00 (15 minutes)*

Abstract: Neutron stars are compact objects formed from the gravitational collapse of massive stellar cores. They are among the most extreme objects in the Universe, with central densities exceeding nuclear saturation density and magnetic fields that are the strongest known in nature. Rather than constituting a uniform class, neutron stars display a broad diversity in their observational properties, leading to their classification into several phenomenological sub-classes characterized by similar features. These sub-classes may represent distinct populations or different evolutionary phases within a unified framework.

Understanding the thermal and magnetic evolution of neutron stars is essential to uncover possible evolutionary connections among these sub-classes. It is also crucial for interpreting their spectral and temporal behavior and for placing constraints on the dense matter equation of state. To this end, a detailed numerical treatment of heat diffusion and magnetic field evolution is required, incorporating realistic microphysical inputs such as neutrino emissivity, thermal and electrical conductivity.

Moreover, to capture the effects of asymmetries—expected to produce non-uniform temperature distributions on the stellar surface—a full three-dimensional solution of the magneto-thermal evolution equations is necessary.

In this talk, I will present MATINS, our new 3D code designed to solve the magneto-thermal evolution of neutron stars with the most comprehensive microphysical treatment currently available.

**Auteur:** ASCENZI, Stefano (Gran Sasso Science Institute (GSSI))

**Orateur:** ASCENZI, Stefano (Gran Sasso Science Institute (GSSI))

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **298** Type: **Non spécifié**

# Looking for the new physics in the $\Lambda_c^- \to \Lambda\mu^-\bar{\nu}_\mu$ decay

*mercredi 19 novembre 2025 15:15 (15 minutes)*

We present a model independent study of the semileptonic decay $\Lambda_c^- \to \Lambda\mu^-\bar{\nu}_\mu$ in the presence of right-handed neutrinos, focusing on possible new physics contributions to the second-generation transition $\bar{c} \to \bar{s}\mu^-\nu_\mu$. Our analysis is carried out within the Standard Model Effective Field Theory (SMEFT) framework, where we parameterize new physics through a set of vector and scalar four-fermion operators. Using currently available measurements, we perform a global fit of the effective operators employing a $\chi^2$ minimization method. To assess the phenomenological impact of the allowed parameter space, we study the differential branching fraction, forward–backward asymmetry, and the polarization asymmetries of both the $\Lambda$ and muon. In addition, we investigate two lepton flavor universality (LFU) observables $A_{FB}^{\mu e}$ and $R_\Lambda^{\mu e}$. Our results highlight the potential sensitivity of these observables to new physics effects, and we emphasize the role of future measurements of $\Lambda_c^- \to \Lambda\mu^-\bar{\nu}_\mu$ at LHCb and Belle II in further constraining or uncovering such contributions.

**Auteur:** BOORA, Priyanka (Malaviya National Institute of Technology Jaipur)

**Co-auteurs:** Dr KUMAR, Dinesh (University of Rajasthan, Jaipur); Dr LALWANI, Kavita (Malaviya National Institute of Technology Jaipur); M. KARMAKAR, Siddhartha (Tata Institute of Fundamental Research Mumbai)

**Orateur:** BOORA, Priyanka (Malaviya National Institute of Technology Jaipur)

**Classification de Session:** Particle Physics

ID de Contribution: **299** Type: **Non spécifié**

# Quantum and classical properties of interacting primordial inhomogeneities

*mercredi 19 novembre 2025 13:45 (15 minutes)*

The statistical properties of the CMB anisotropies, reflecting the curvature inhomogeneities in the early Universe, are very well accounted for by assuming that they emerged from amplified vacuum fluctuations.
Being the result of a genuine quantum process, it is natural to wonder which properties of these primordial inhomogeneities are quantum, and which, if any, persisted until their observations despite interactions that decohered, i.e. classicalised, them. I will review the latest progress on these questions, emphasising the quantum information approaches.

**Auteur:** MICHELI, Amaury (RIKEN iTHEMS)

**Orateur:** MICHELI, Amaury (RIKEN iTHEMS)

**Classification de Session:** Cosmology

ID de Contribution: **300** Type: **Non spécifié**

# Strong-Field Tests of Gravity with Gravitational Waves: Current Status and Future Directions

*vendredi 21 novembre 2025 09:25 (25 minutes)*

Gravitational waves provide a unique window into the strong-field regime of gravity, offering powerful opportunities to test general relativity and explore possible deviations. In this talk, I will review the current status of gravitational-wave–based tests of gravity and summarize the key insights gained so far. I will then discuss how upcoming observations with next-generation detectors will enhance these tests, and what new physics we may uncover in the near future.

**Auteur:** YAGI, Kent (University of Virginia)

**Orateur:** YAGI, Kent (University of Virginia)

ID de Contribution: **301** Type: **Non spécifié**

# ATLAS results on Beyond the Standard Model Physics

*mardi 18 novembre 2025 11:00 (25 minutes)*

Many theories beyond the Standard Model (SM) have been proposed to address several of the SM shortcomings, such as explaining why the Higgs boson is so light, the origin of neutrino masses, or the observed pattern of masses and mixing angles in the quark and lepton sectors. Many of these beyond-the-SM extensions predict new particles or interactions directly accessible at the LHC. This talk will present some highlights on recent searches based on Run 2 and Run 3 data collected by the ATLAS collaboration.

**Auteur:** IPPOLITO, Valerio (Istituto Nazionale di Fisica Nucleare)

**Orateur:** IPPOLITO, Valerio (Istituto Nazionale di Fisica Nucleare)

ID de Contribution: **302** Type: **Non spécifié**

# Search for resonant di-Higgs production in channels involving diphoton at CMS

*mercredi 19 novembre 2025 16:45 (15 minutes)*

The H⟶gammagamma decay channel provides a clean final-state topology that allows the mass of a Higgs boson to be reconstructed with high precision. This presentation will show the latest results of the search for resonant di-Higgs production where one of the Higgs bosons decays to diphoton, using CMS data.

**Auteur:** SONG, Shaowei

**Orateur:** SONG, Shaowei

**Classification de Session:** Particle Physics

ID de Contribution: **303** Type: **Non spécifié**

# Production of Hyperons, Charmed Baryons, and Hadronic Molecule Candidates in Neutrino–Proton Reaction

*mercredi 19 novembre 2025 17:45 (15 minutes)*

We investigate the production of hyperons, charmed baryons, and potential hadronic molecular states in neutrino–proton reaction, a process characterized by a particularly clean final state. Employing effective Lagrangians, chiral perturbation theory, and a hadronic molecular model, we perform theoretical calculations for several relevant channels, including those leading to the formation of the hadronic molecular candidate. Our results indicate that future neutrino facilities could serve as a complementary platform for exploring exotic baryonic states and provide valuable insights into the dynamics of strong interactions in the strange and charm sectors.

**Auteurs:** ZOU, Bing-Song (Tsinghua University); M. QIAO, Kai-Sa (ITP, CAS)

**Orateur:** ZOU, Bing-Song (Tsinghua University)

**Classification de Session:** Neutrinos

ID de Contribution: **304** Type: **Non spécifié**

# DUNE Science and Status

Neutrino oscillations are firmly established experimentally, but two major unknowns remain: the ordering of the three masses and whether charge-parity symmetry is violated. The Deep Underground Neutrino Experiment (DUNE) is a next-generation long-baseline neutrino oscillation experiment that aims to address these and other fundamental questions in particle physics and astrophysics. DUNE is the first experiment to measure neutrinos and antineutrinos as a function of energy over a broad spectrum spanning the first two oscillations. DUNE's very long 1300 km baseline breaks the degeneracy between the asymmetry caused by the matter effect and that potentially caused by CP violation, yielding a clean determination of the mass ordering. DUNE's liquid-argon technology provides exquisite imaging, enabling excellent flavor and energy determination. All of this combines to make DUNE a unique neutrino oscillation experiment.
Unique features of DUNE include the powerful high-intensity neutrino beam from the PIP-II accelerator upgrade at Fermilab, a complex near-detector system, and four massive liquid-argon time-projection chambers (LArTPCs) at the far site. In addition to beam-based physics, DUNE will carry out a rich non-beam program, including the detection of neutrinos from supernovae, the Sun, and cosmic-ray interactions in the atmosphere.
As of 2025, excavation at the far site is complete, and infrastructure work is ongoing in preparation for detector installation. ProtoDUNE modules at CERN and Fermilab have demonstrated the DUNE detector technologies. The physics program is expected to begin in phases, with non-beam physics starting as early as 2029 and full beam-based operations with the near detector commencing around 2031. This presentation provides an overview of the experimental design, status, and anticipated physics reach of DUNE.

**Auteur:** DJURCIC, Zelimir (Argonne National Laboratory)

**Orateur:** DJURCIC, Zelimir (Argonne National Laboratory)

ID de Contribution: **305** Type: **Non spécifié**

# Recent Results in Very High Energy Gamma-Ray Astronomy

*lundi 17 novembre 2025 16:35 (25 minutes)*

In this contribution, I will review recent developments in very high energy (VHE; 30 GeV–100 TeV) gamma-ray astronomy. I will highlight key observational results obtained with the current generation of imaging atmospheric Cherenkov telescopes such as H.E.S.S., MAGIC, and VERITAS.
The talk will focus on new insights gained from observations of a wide variety of astrophysical sources, both Galactic and extragalactic, and will discuss how these findings advance our understanding of non-thermal processes in the Universe. I will give also an outlook on first results obtained by upcoming instruments of the Cherenkov Telescope Array Observatory (CTAO).

**Auteur:** Dr FIASSON, Armand (LAPP - Annecy)

**Orateur:** Dr FIASSON, Armand (LAPP - Annecy)

ID de Contribution: **306** Type: **Non spécifié**

# Radio Detection: Advances, Challenges, and Future Directions

*jeudi 20 novembre 2025 11:00 (25 minutes)*

Pioneered in the early 2000's, radio is now an established technique for the detection of ultra-high energy particles of cosmic origin. I will introduce the basic concepts of radio emission by the extensive particle showers induced by the interaction in the atmosphere of these cosmic messengers, and the detection of these electromagnetic radiations by radio antennas. I will present the experimental status of the main projects in the field, stress the challenges specific to autonomous radio detection, and review the prospects in the field for the next decade.

**Auteur:** MARTINEAU, Olivier (LPNHE)

**Orateur:** MARTINEAU, Olivier (LPNHE)

ID de Contribution: **307** Type: **Non spécifié**

# Primordial black holes from inflation and their observational imprints

Primordial black holes (PBH) have recently emerged as a very interesting candidate for the cold dark matter in the universe. We study their generation in a single field inflationary model with an inflection point potential and found that PBHs can be produced in our scenario in the asteroid-mass window with a nearly monochromatic mass fraction, accounting for the total dark matter in the universe. Further, we study the induced stochastic gravitational waves background (ISGWB) arising from the second order scalar perturbations. We found that the ISGWB in our scenario can be generated in the frequencies range from nanoHz to kHz that covers the observational scales corresponding to future space based GW observatories such as IPTA, LISA, DECIGO and ET as well as Advanced LIGO and BBO. Moreover, we also explore various observational imprints on ISGWB due to the Hawking evaporation of ultralight PBH and from the memory burden effect.

**Auteur:** JAIN, Rajeev Kumar (Indian Institute of Science, Bangalore, India)

**Orateur:** JAIN, Rajeev Kumar (Indian Institute of Science, Bangalore, India)

**Classification de Session:** Cosmology

ID de Contribution: **308** Type: **Non spécifié**

# Multi-Messenger Astronomy

*vendredi 21 novembre 2025 16:00 (25 minutes)*

In the age of ground-based and space telescopes it has been well established that multi-wavelength observations of astrophysical sources are a crucial observing strategy to unravel their physics. What began once with the multi-wavelength study of the messenger of the electromagnetic force has advanced in the last decades also towards the messengers of the other three fundamental forces: the gravitational, weak and strong nuclear forces.
In this talk I will give a general overview of this now established field known as “Multi-Messenger Astronomy” with a focus on very fast rotating and highly magnetized neutron stars known as pulsars as well as black holes.

**Auteur:** Dr LEWANDOWSKA, Natalia (State University of New York at Oswego)

**Orateur:** Dr LEWANDOWSKA, Natalia (State University of New York at Oswego)

ID de Contribution: **309** Type: **Non spécifié**

# Forming the Earliest SMBHs through Dark Capture in Pop-III Stars

The existence of supermassive black holes (SMBHs) at high redshifts remains a significant challenge for standard black hole formation models. In this work, we explore the scenario where non-annihilating dark matter (DM) interacts non-gravitationally with Standard Model (SM) particles and accumulates within early Population III (Pop-III) stars. Such accumulation can lead to the untimely death of these stars, resulting in early black hole formation. Over cosmic time, these black holes could efficiently accrete mass, giving rise to SMBHs observed in the early Universe. We demonstrate that certain allowed regions in the parameter space of asymmetric dark matter models can explain some of these observed SMBHs. Additionally, we discuss the unique gravitational wave signatures from mergers of these SMBHs, highlighting the potential of forthcoming experiments such as LISA and pulsar timing array (PTA) to probe this scenario.

**Auteur:** BOSE, Debajit (CHEP, IISc Bengaluru, India)

**Co-auteurs:** Mlle DOLIYA, Jaya (CHEP, IISc Bengaluru, India); Prof. LAHA, Ranjan (CHEP, IISc Bengaluru, India); Mlle BHATTACHARYA, Sulagna (TIFR, India)

**Orateur:** BOSE, Debajit (CHEP, IISc Bengaluru, India)

ID de Contribution: **310** Type: **Non spécifié**

# Vera C. Rubin Observatory : future of cosmology with the world's largest digital camera

*vendredi 21 novembre 2025 14:00 (25 minutes)*

The NSF-DOE Vera C. Rubin Observatory revealed its first images to the world on June 23 2025, taken with the world's largest digital camera. With a field of view of 9.6 deg², this 3200-megapixel camera will scan the entire southern sky in only three nights and in six color bands over a period of ten years. Combined with wide-field optics, the Vera C. Rubin camera will produce images of unprecedented depth, revealing very distant and faint objects that have not yet been observed. This ten-years survey called LSST (Large Survey of Space and Time) is expected to drive significant progress in cosmology and astrophysics, particularly in constraining dark matter and dark energy.

After presenting the observatory with a focus on French contributions, I will provide an overview of the scientific topics that will be addressed using Rubin data. I will place particular emphasis on cosmological analyses that can be performed using the weak lensing probe, highlighting the importance of photometric and astrometric calibration in order to achieve the high-precision objectives.

**Auteur:** VAN DEN ABEELE, Enya

**Orateur:** VAN DEN ABEELE, Enya

ID de Contribution: **311** Type: **Non spécifié**

# The Physics of the two Infinities; a personal view from an experimental physicist

*vendredi 21 novembre 2025 16:50 (25 minutes)*

I will present what I think are important to further understand the smallest particles and the largest Universe as seen as an experimental physicist.

**Auteur:** Prof. KAJITA, Takaaki (University Tokyo)

**Orateur:** Prof. KAJITA, Takaaki (University Tokyo)

ID de Contribution: **312** Type: **Non spécifié**

# Role of interstellar bubbles and molecular filaments in the formation of stars

*jeudi 20 novembre 2025 10:15 (25 minutes)*

Star formation is a continuous cycle of interchange of matter and energy between stars and the interstellar medium of galaxies. As a result of a complex interplay between gravitational, kinetic, and magnetic energies, shock compressions, and heating/cooling processes, the matter is assembled from the diffuse, large-scales to the dense, small-scales, where gravity prevails over the pressure forces, thereby driving the gravitational collapse into dense cores, the seeds of future stars. In this presentation, I will review recent theoretical and observational works proposing a comprehensive physical scenario for the growth of dense structures from giant interstellar bubbles driven by stellar feedback on ~50-100 pc scales to parsec-scale molecular filaments down to <0.1pc dense cores and 100-1000 au scale protoplanetary disks, where new planets form.

**Auteur:** ARZOUMANIAN, Doris (Kyushu University)

**Orateur:** ARZOUMANIAN, Doris (Kyushu University)

ID de Contribution: **313** Type: **Non spécifié**

# Questions in Cosmology for the Decades Ahead

*lundi 17 novembre 2025 09:05 (25 minutes)*

Cosmology is entering a new era of powerful surveys across many wavelengths. I will highlight some of the key challenges for the decades ahead: how to resolve current tensions in our data, how to combine information across different probes through cross-correlation, and how to make the best use of modern tools like machine learning. Together, these advances can open new windows on the Universe and shape the next generation of cosmological discovery.

**Auteur:** Prof. LIU, Jia (Kavli IPMU)

**Orateur:** Prof. LIU, Jia (Kavli IPMU)

ID de Contribution: **314** Type: **Non spécifié**

# Search for dark matter annihilation with a combined analysis of dwarf spheroidal galaxies from Fermi-LAT, HAWC, H.E.S.S., MAGIC and VERITAS

*mercredi 19 novembre 2025 16:45 (15 minutes)*

Dwarf spheroidal galaxies (dSphs) are among the most dark matter (DM) dominated objects, with negligible expected astrophysical gamma-ray emission. This makes nearby dSphs ideal targets for indirect searches of a DM particle signal. The accurate knowledge of their DM content makes it possible to derive robust constraints on the velocity-weighted cross section of DM annihilation. We report on a joint analysis of 20 dSphs observed by Fermi-LAT, HAWC, H.E.S.S., MAGIC, and VERITAS using a common maximum likelihood approach in order to maximize the sensitivity of DM searches towards these targets. Results for seven annihilation channels and spanning a range of DM masses from 5 GeV to 100 TeV will be presented. Furthermore, the systematic uncertainties coming from the astrophysical J-factor calculated from the dSph dark matter distribution will be discussed by comparing results obtained from two different sets of J-factors.

**Auteur:** KERSZBERG, Daniel (LPNHE, CNRS/IN2P3)

**Orateur:** KERSZBERG, Daniel (LPNHE, CNRS/IN2P3)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **315** Type: **Non spécifié**

# Recent Highlights in Top Quark Physics at CMS

*mercredi 19 novembre 2025 15:00 (15 minutes)*

The high center-of-mass energy and luminosity of the LHC have enabled the production of millions of top quarks, providing an unprecedented opportunity to study top quark properties and related observables with high precision. As the heaviest known elementary particle, the top quark plays a unique role in the Standard Model and is a sensitive probe for potential new physics. This talk will present recent experimental highlights associated with the top quark from the CMS experiment.

**Auteur:** CHEN, Kai-Feng (National Taiwan University)

**Orateur:** CHEN, Kai-Feng (National Taiwan University)

**Classification de Session:** Particle Physics

ID de Contribution: **316** Type: **Non spécifié**

# Primordial Gravitational Wave Measurement with the LiteBIRD Space Mission

*mardi 18 novembre 2025 14:00 (25 minutes)*

LiteBIRD (Lite satellite for the study of B-mode polarization and Inflation from cosmic background Radiation Detection) is a JAXA-led space mission designed to probe the primordial universe by measuring the polarization of the cosmic microwave background (CMB) with unprecedented sensitivity. Scheduled for launch in the 2030s, LiteBIRD aims to detect the imprint of primordial gravitational waves through large-scale B-mode polarization, providing a powerful test of inflationary cosmology. The mission will carry out a full-sky survey over three years from the second Lagrange point (L2), with broad frequency coverage and high sensitivity—both essential for disentangling the cosmological signal from other polarized emissions.
In this talk, I will present LiteBIRD's scientific goals, observation strategy, instrument technology and design, as well as the challenges involved in extracting the tiny B-mode signal from the data. These include separating polarized Galactic emissions—primarily thermal dust and synchrotron radiation—and characterizing and mitigating instrumental systematics.

**Auteur:** PATANCHON, Guillaume (ILANCE)

**Orateur:** PATANCHON, Guillaume (ILANCE)

ID de Contribution: **317** Type: **Non spécifié**

# CMS Results on Beyond the Standard Model Physics

*lundi 17 novembre 2025 15:25 (25 minutes)*

Search for new physics Beyond Standard Model (BSM) is one of the major goals of the CMS physics program at the LHC. A variety of searches beyond SM signatures, including exotic models, BSM particles decaying to top quarks, Higgs bosons, gauge bosons, will be presented.

**Auteur:** KAADZE, Ketino (Kansas State University)

**Orateur:** KAADZE, Ketino (Kansas State University)

ID de Contribution: **318** Type: **Non spécifié**

# Dark Matter: the odds have changed

*vendredi 21 novembre 2025 12:15 (25 minutes)*

The strongest experimental evidence for dark matter is the Galactic Center gamma-ray excess observed by the Fermi telescope and even predicted prior to discovery as a potential dark matter signature via WIMP dark matter self-annihilations. However, an equally compelling explanation of the excess gamma-ray flux appeals to a population of old millisecond pulsars that also accounts for the observed boxy morphology inferred from the bulge old star population. We employ a set of Milky Way-like galaxies found in the Hestia constrained simulations of the local universe to explore the rich morphology of the central dark matter distribution, motivated by the GAIA discovery of a vigorous early merging history of the Milky Way galaxy. We predict a significantly non-spherical gamma-ray morphology from the WIMP interpretation. Future experiments, such as the Cherenkov Telescope Array, that extend to higher energies, should distinguish between the competing interpretations.

**Auteur:** Prof. SILK, Joe (IAP)

**Orateur:** Prof. SILK, Joe (IAP)

ID de Contribution: **320** Type: **Non spécifié**

# Probing the Nature of Neutrino Mass

*mardi 18 novembre 2025 16:50 (25 minutes)*

The discovery of neutrino oscillation has shown that neutrinos have non-zero mass but the nature of neutrino mass and the absolute mass scale remain unknown. Neutrinoless double beta decay ($0\nu\beta\beta$) is uniquely suited to probe the Majorana nature of neutrinos and determine the effective neutrino mass. CUORE, the Cryogenic Underground Observatory for Rare Events (CUORE) and its upgrade CUPID aim to search for $0\nu\beta\beta$ down to the level of the inverted mass ordering using the world's largest bolometric detector. Project 8 represents a novel approach to directly measure the absolute neutrino mass using cyclotron radiation emission spectroscopy. In this talk. I will present the latest results from CUORE, the plans for CUPID, and the prospect for measuring the neutrino mass with Project 8

**Auteur:** Prof. HEEGER, Karsten (Yale University)

**Orateur:** Prof. HEEGER, Karsten (Yale University)

ID de Contribution: **321** Type: **Non spécifié**

# ALICE Highlights and Upgrade Plans

*jeudi 20 novembre 2025 09:00 (25 minutes)*

A Large Ion Collider Experiment (ALICE) is one of the four major experiments at the Large Hadron Collider (LHC). It was designed to study the properties of the quark-gluon plasma (QGP) - a state of extremely hot and dense matter in which quarks and gluons are deconfined. This state is created in high-energy heavy-ion collisions and resembles the conditions of the early universe moments after the Big Bang.

Since 2009, ALICE has successfully collected data from various collision systems, including A–A (Pb–Pb, Xe–Xe, O–O), p–A (p–Pb, p–O), and pp. This presentation will review recent highlights from ALICE and outline its ambitious short- and long-term upgrade plans.

**Auteur:** OTWINOWSKI, Jacek (Institute of Nuclear Physics Polish Academy of Sciences)

**Orateur:** OTWINOWSKI, Jacek (Institute of Nuclear Physics Polish Academy of Sciences)

ID de Contribution: **322** Type: **Non spécifié**

# Testing ΛCDM cosmological model with Genetic Algorithms

*mercredi 19 novembre 2025 15:00 (15 minutes)*

The quest to understand the cosmos has led to the remarkable discovery that the universe is expanding at an accelerating rate. This revelation necessitated the integration of dark energy into the standard cosmological model, known as ΛCDM. While ΛCDM model has achieved remarkable success in explaining various observations, it still faces challenges and uncertainties related to dark energy and dark matter. To assess its validity, researchers have employed various methodologies, including consistency checks, tests of general relativity, and model-independent approaches. In this work, we propose the use of Genetic Algorithms, a machine learning technique, to test the ΛCDM model by comparing its predictions with observational data. Specifically, we utilize genetic algorithms to analyse cosmic observables, such as the Hubble rate parameter H(z) and the growth rate of cosmological structures f(z), in order to obtain two independent reconstructions of the dark energy equation of state w(z) for testing the standard model independently of theoretical assumptions. We conduct a comparative analysis by applying genetic algorithms to real data, and examine the results obtained comparing those with the ones resulted from other machine learning techniques. We find that current data is not precise enough for robust reconstruction of the two forms of w. Then we perform extensive tests of the ΛCDM model using simulated datasets, considering future survey observations, and we find that genetic algorithms represent a strong technique to do model-independent tests based on stage IV surveys because of a resulting robust reconstruction.

**Auteur:** PERONACI, MATTEO

**Orateur:** PERONACI, MATTEO

**Classification de Session:** Cosmology

ID de Contribution: **323** Type: **Non spécifié**

# Classical–Quantum Simulations for Optimized Shielding Against Solar Particle Events in Space Applications

*mercredi 19 novembre 2025 17:00 (15 minutes)*

Space radiation poses a significant challenge for long-duration human space missions, with primary sources including Galactic Cosmic Rays (GCRs), Solar Particle Events (SPEs), and trapped particles within the Van Allen belts. These high-energy radiations induce severe biological effects on astronauts and degrade spacecraft systems, making effective shielding a critical requirement. Traditionally, passive shielding materials such as aluminum have been employed; however, their limitations, particularly the production of secondary radiation, necessitate the exploration of better alternatives.

In this study, the performance of shielding materials including lithium hydride, polyethylene, lithium borohydride, beryllium borohydride, and ammonia borane is evaluated in GCR and SPE environments using OLTARIS, a NASA-developed simulation tool. The October 1989 SPE is selected to analyze particle flux and dose distributions. Shielding effectiveness is found to vary depending on the radiation environment: beryllium borohydride demonstrates superior performance against SPEs, whereas lithium hydride provides the lowest dose under GCR exposure. In the SPE environment, shielding performance is strongly correlated with hydrogen content. The effect of solar modulation on GCR dose is also examined, revealing that higher modulation reduces both GCR intensity and radiation dose.

The complex nature of high-energy space radiation, combined with material interactions, introduces significant computational challenges. To address this, the material selection problem is formulated as a Quadratic Unconstrained Binary Optimization (QUBO) and solved using the Variational Quantum Eigensolver (VQE) and Quantum Approximate Optimization Algorithm (QAOA). By mapping OLTARIS simulation data onto the Ising model and applying these hybrid quantum-classical approaches, optimized shielding configurations that minimize radiation dose are identified. The results demonstrate strong agreement between OLTARIS simulations and quantum optimization outcomes across both GCR and SPE environments.

**Auteurs:** LALWANI, Kavita (MNIT Jaipur, INDIA); Mlle V V, Sreedevi V V (MNIT Jaipur, INDIA)

**Orateur:** Mlle V V, Sreedevi V V (MNIT Jaipur, INDIA)

**Classification de Session:** Astrophysics & Multi-messenger

ID de Contribution: **324** Type: **Non spécifié**

# Future Accelerators Projects

*vendredi 21 novembre 2025 14:50 (25 minutes)*

While the HL-LHC will be the only high-energy collider running in the next decade, the need for a deeper understanding of the electroweak symmetry breaking and the searches for physics beyond the Standard Model call for a next generation of accelerators. The concensus in the particle physics community is that of a Higgs factory and an exploration machine in the 10-TeV energy regime.

The ongoing process of the Update of the European Strategy for Particle Physics provides an opportunity to compare these projects for the post-LHC era: circular e+e- and hadron colliders, linear e+e- colliders, and muon colliders.

This presentation will review the various future accelerator projects proposed, in terms of physics programme, challenges, and timescales. A particular focus will be put on CERN's Future Circular Collider, whose feasibility study was successfully completed for the Strategy Update.

**Auteur:** MORANGE, Nicolas (IJCLab)

**Orateur:** MORANGE, Nicolas (IJCLab)

ID de Contribution: **325** Type: **Non spécifié**

# Neutrino Physics with the Strong Scattering Scintillating Medium Detectors

*mercredi 19 novembre 2025 17:00 (15 minutes)*

The strong scattering scintillation medium detector is a novel concept for next-generation position-sensitive detectors requiring no segmentation. Its operating principle is based on localizing scintillation light near its emission point using an optically scattering medium. Our design employs a solid granular organic scintillator coupled with an array of wavelength-shifting fibers and SiPMs for light collection. This report presents the results of the MC simulation, optimized using data from a beam test conducted on a 10 cm-scale prototype. Key characteristics and procedures, including energy and spatial resolutions, as well as event and track reconstruction, are discussed.

**Auteurs:** KRAPIVA, Artemiy (LPI); SVIRIDA, Dmitry (LPI)

**Orateur:** KRAPIVA, Artemiy (LPI)

**Classification de Session:** Neutrinos

ID de Contribution: **326** Type: **Non spécifié**

# Outlook on Neutrino Theory and Phenomenology

*mardi 18 novembre 2025 16:00 (25 minutes)*

The discovery of neutrino oscillations, and hence of nonzero neutrino masses, provides one of the clearest indications of physics beyond the Standard Model. In this talk, we will review theoretical developments that address the origin of neutrino masses and discuss their phenomenological implications.

**Auteur:** ROSAURO ALCARAZ, Salvador (INFN Sezione di Bologna)

**Orateur:** ROSAURO ALCARAZ, Salvador (INFN Sezione di Bologna)

ID de Contribution: **327** Type: **Non spécifié**

# Observing gravitational waves with Pulsar Timing Array

*jeudi 20 novembre 2025 11:50 (25 minutes)*

Several Pulsar Timing Array (PTA) collaborations are currently searching for gravitational waves (GWs) in the nano-Hz frequency band by monitoring a network of millisecond pulsars. This review will first introduce the fundamental principles behind detecting GWs through long-term timing of pulsars. We then briefly discuss different GW sources accessible to PTAs and the detection of the emerging stochastic GW signal. Finally, we focus on GWs produced by a population of supermassive black hole binaries and explore their expected properties using insights from the large-scale hydrodynamic simulation Horizon-AGN.

**Auteur:** BABAK, Stanislav (APC)

**Orateur:** BABAK, Stanislav (APC)

ID de Contribution: **328** Type: **Non spécifié**

# Physics and Status of Linear e+e- Higgs factory projects

*mardi 18 novembre 2025 17:15 (25 minutes)*

Development of linear e+e- collider with >= 250 GeV center-of-mass energy has a long history. One of the milestones is the publishment of ILC technical design report in 2013, proposing a global ILC project. Recently for the coming European strategy update, a LC facility at CERN is also proposed and is under discussion as a possible flagship project at CERN. In this talk I will present the physics and technology aspects of linear Higgs factory projects, with a highlight to comparison as well as synergies to the circular options, and possible ways to proceed.

**Auteur:** Dr SUEHARA, Taikan (ICEPP, The University of Tokyo)

**Orateur:** Dr SUEHARA, Taikan (ICEPP, The University of Tokyo)

ID de Contribution: **329** Type: **Non spécifié**

# Unlocking the Non-Thermal Universe: Future Gamma-Ray Discoveries with CTAO

*mardi 18 novembre 2025 14:50 (25 minutes)*

The Cherenkov Telescope Array Observatory (CTAO) will be the world's first open, ground-based gamma-ray observatory, offering full-sky coverage through two sites —the Northern site at the Observatorio Roque de los Muchachos (La Palma, Spain), and the Southern site at the ESO Observatorio Paranal (Chile). Designed for a 30-year operation, CTAO will deliver groundbreaking insights across a wide range of topics —from cosmic rays acceleration process, to the nature of extreme astrophysical environments, and probes of fundamental physics. CTAO will significantly surpass the sensitivity, angular resolution, and energy coverage of current imaging Cherenkov telescope arrays. The Large-Sized Telescope 1 (LST-1), operational since 2018, is hinting full CTAO array capabilities through early results on gamma-ray bursts (GRBs), active galactic nuclei (AGNs), pulsars, and novae. Once the full array is operational, CTAO will cover an energy range from 20 GeV to 300 TeV with unprecedented precision.

This contribution presents an update on the status of the CTAO project and outlines its broad scientific capabilities. Special attention will be given to its performance in the time multi-messenger domain. CTAO's design enables rapid slewing, a large effective collecting area, and high temporal resolution, uniquely positioning the observatory to capture fast transients and respond in real time to multi-messenger events. Its role in time-domain, multi-wavelength, and multi-messenger astrophysics will be crucial to unlocking the dynamic, non-thermal universe.

**Auteur:** SEGLAR-ARROYO, Monica (Institut de Fisica d'Altes Energies (IFAE))

**Orateur:** SEGLAR-ARROYO, Monica (Institut de Fisica d'Altes Energies (IFAE))

ID de Contribution: **330** Type: **Non spécifié**

# Gravitational-wave astronomy using ground-based detectors

*mardi 18 novembre 2025 14:25 (25 minutes)*

Recent detections of gravitational waves (GWs) have ushered in a new branch of astronomy. During their past observing runs, the LIGO and Virgo detectors have observed over two hundred mergers of compact binaries involving black holes and neutron stars. These discoveries have enabled novel tests of general relativity, offered new probes of cosmology and dense nuclear matter, and posed intriguing questions about the astrophysical formation mechanisms of compact binaries. This talk will present an overview of the key results from GW observations to date and discuss future prospects in this rapidly evolving field.

**Auteur:** Prof. PARAMESWARAN, Ajith (Tata Institute of Fundamental Research, Bangalore)

**Orateur:** Prof. PARAMESWARAN, Ajith (Tata Institute of Fundamental Research, Bangalore)

ID de Contribution: **331** Type: **Non spécifié**

# New Perspectives onto the Universe in the Era of Multi-Messenger Astrophysics

*lundi 17 novembre 2025 12:45 (25 minutes)*

Since the revolutionary discovery of gravitational wave (GW) emission from a binary black hole merger in 2015, the remarkable GW detectors LIGO, Virgo and KAGRA have detected at least 220 compact object mergers. These events are transforming modern astronomy. In particular, the first binary neutron star merger, dubbed GW170817, was observed in both gravitational and electromagnetic radiation, thus opening up a new era in multi-messenger astrophysics. The multi-messenger characterisation of such an event has enabled major advances into diverse fields of modern physics from gravity, high-energy astrophysics, nuclear physics, to cosmology. In this talk, I will discuss our work in strong-field gravity astrophysics and how combining observations, theory and experiment have been key in making progress in this field. I will present the challenges and the opportunities that have emerged in multi-messenger astrophysics, particularly in the past 8 years, and what the future holds in this new era

**Auteur:** Prof. NISSANKE, Samaya (DESY)

**Orateur:** Prof. NISSANKE, Samaya (DESY)

ID de Contribution: **333** Type: **Non spécifié**

# Recent NOvA Results and the Joint NOvA–T2K Analysis

*jeudi 20 novembre 2025 12:15 (25 minutes)*

NOvA is one of the two leading long-baseline neutrino oscillation experiments currently in operation. It uses the 700 kW NuMI neutrino beam at Fermilab directed towards northern Minnesota in the US with two functionally identical scintillator-based detectors placed 810 km apart at off-axis locations. An arrangement that largely cancels common systematic uncertainties in neutrino oscillation measurements. By analyzing neutrino charged-current interactions in these detectors, the NOvA experiment studies muon neutrino disappearance and electron neutrino appearance to probe still undetermined physics parameters, such as the neutrino mass ordering, CP violation and the octant of the large mixing angle. NOvA can also study the disappearance of all three known neutrino flavors by analyzing neutral current interactions, thus enabling searches for physics beyond the three-flavor paradigm, such as mixing with light sterile neutrinos. In this talk, I will present the latest NOvA results and discuss the joint analysis performed together with the T2K collaboration, which combines the data sets of both experiments to enhance sensitivity to CP violation and neutrino mass ordering.

**Auteur:** SANCHEZ, Mayly (Florida State University)

**Orateur:** SANCHEZ, Mayly (Florida State University)

ID de Contribution: **334** Type: **Non spécifié**

# Recent results and status of the SNO+ experiment on its journey towards Neutrinoless Double Beta Decay

*mardi 18 novembre 2025 16:25 (25 minutes)*

SNO+ is a large, multi-purpose neutrino detector located 2 km underground at SNOLAB, Canada, with the main goal of searching for the neutrinoless double beta decay ($0\nu\beta\beta$) of $^{130}$Te. The detector is currently operating with 780 tonnes of liquid scintillator as its active target mass. The combination of high light yield, low intrinsic background levels, and steadily increasing livetime enables the SNO+ collaboration to pursue a broad physics program. This includes measurements of solar neutrinos, detection of antineutrinos from nuclear reactors and from the Earth, as well as searches for other rare processes.

SNO+ performed the first observation of the charged-current interaction of solar neutrinos with $^{13}$C, marking a significant milestone in low-energy neutrino detection and demonstrating the detector's sensitivity to rare interaction channels. In parallel, the spectral analysis of reactor antineutrino oscillation led SNO+ to obtain the second-most precise determination of $\Delta m^2_{21}$ and to perform the first measurement of the flux of geoneutrinos in the Western Hemisphere.

The scintillator data is also being used to quantify backgrounds and understand the detector response in preparation for the search of neutrinoless double beta decay. In a first phase, SNO+ will perform this search with 0.5% of natural tellurium by weight, targeting a predicted half-life sensitivity of $2 \times 10^{26}$ years (90% CL) with 3 years of livetime, followed by higher tellurium loadings, up to 3%, for sensitivities above $10^{27}$ years. In this talk I will present the most recent physics results from the analysis of the SNO+ scintillator data, and will discuss the status and prospects for the neutrinoless double beta decay search.

**Auteur:** PARKER, Will (University of Oxford)

**Orateur:** PARKER, Will (University of Oxford)

ID de Contribution: **335** Type: **Non spécifié**

# Beyond the Standard Model (Theoretical overview)

*vendredi 21 novembre 2025 15:15 (25 minutes)*

I review the current status of Beyond the Standard Model physics. From the perspectives of flavor, electroweak interactions, QED, QCD, gravity, and cosmology, I discuss the theoretical frameworks suggested by these viewpoints and explore how they can be tested experimentally.

**Auteur:** KITANO, Ryuichiro (YITP, Kyoto U.)

**Orateur:** KITANO, Ryuichiro (YITP, Kyoto U.)

ID de Contribution: **336** Type: **Non spécifié**

# Welcome Adress

*lundi 17 novembre 2025 09:00 (5 minutes)*

**Auteur:** Prof. GONIN, Michel (IN2P3 & The University of Tokyo - ILANCE)

**Co-auteur:** Prof. ISHINO, Masaya (The University of Tokyo)

**Orateurs:** Prof. ISHINO, Masaya (The University of Tokyo); Prof. GONIN, Michel (IN2P3 & The University of Tokyo - ILANCE)

ID de Contribution: **337** Type: **Non spécifié**

# CMS results on Quark and lepton Flavor Physics

*mardi 18 novembre 2025 17:40 (25 minutes)*

CMS results on Quark and lepton Flavor Physics

**Auteur:** Dr MANZONI, Riccardo (ETH Zurich)

**Orateur:** Dr MANZONI, Riccardo (ETH Zurich)

ID de Contribution: **338** Type: **Non spécifié**

# Accelerator Based Physics Research

Accelerator Based Physics Research

**Auteur:** Prof. KADO, Marumi (CERN)

**Orateur:** Prof. KADO, Marumi (CERN)

ID de Contribution: **339** Type: **Non spécifié**

# Measurements of electroweak penguin and lepton-flavour violating $B$ decays to final states with missing energy at Belle and Belle II

*mercredi 19 novembre 2025 17:15 (15 minutes)*

Measurements of electroweak penguin and lepton-flavour violating $B$ decays to final states with missing energy at Belle and Belle II

**Auteur:** Dr TIWARY, Rahul (IN2P3)

**Orateur:** Dr TIWARY, Rahul (IN2P3)

**Classification de Session:** Particle Physics

ID de Contribution: **340** Type: **Non spécifié**

# Measurements of the Cabibbo-Kobayashi-Maskawa quark-mixing matrix at Belle and Belle II

*mercredi 19 novembre 2025 16:00 (15 minutes)*

Measurements of the Cabibbo-Kobayashi-Maskawa quark-mixing matrix at Belle and Belle II

**Auteur:** MEHTA, Rishabh (KEK)

**Orateur:** MEHTA, Rishabh (KEK)

**Classification de Session:** Particle Physics

ID de Contribution: **341** Type: **Non spécifié**

# Dark sector and tau physics at Belle and Belle II

*mercredi 19 novembre 2025 14:30 (15 minutes)*

Dark sector and tau physics at Belle and Belle II

**Auteur:** DEY, Sourav (KEK)

**Orateur:** DEY, Sourav (KEK)

**Classification de Session:** Particle Physics

ID de Contribution: **342** Type: **Non spécifié**

# FURAX - the JAX powered framework for cosmological analysis

*mercredi 19 novembre 2025 16:00 (15 minutes)*

FURAX is a python framework created to utilize the functionality of JAX in modern cosmological analysis with its ever increasing complexity and resource requirements. In particular, the ability to run on GPU clusters, hardware acceleration, Just-In-Time compilation, and automatic differentiation. This framework has already found its application in MEGATOP, a component-separation pipeline for Simons Observatory. We expand its functionality and applications by providing optimized, modular, and easy-to-use interface in an open-source environment

**Auteur:** Prof. ERRARD, Josquin (APC)

**Orateur:** Prof. ERRARD, Josquin (APC)

**Classification de Session:** Cosmology

ID de Contribution: **343** Type: **Non spécifié**

# The Next Frontiers in Particle Physics: from the LHC to the FCC

*lundi 17 novembre 2025 11:30 (25 minutes)*

With the third update of the European Strategy for Particle Physics soon reaching its conclusion, CERN and the field of high energy physics are at a pivotal and high-stakes moment. The third run of the LHC superb operations will also soon come to an end and yield to the installation of the upgrades of the machine and the experiments during a long shutdown period. With these data, the LHC project has far exceeded its initial expectations, both in terms of data collected and physics results. In this talk, I will discuss the prospects for the High-Luminosity upgrade of the LHC and the FCC projects in the light of the outstanding achievements of the LHC

**Auteur:** Prof. KADO, Marumi (CERN)

**Orateur:** Prof. KADO, Marumi (CERN)