# International Conference on the Physics of the Two Infinities

# Rapport sur les contributions

https://indico.in2p3.fr/e/28466

ID de Contribution: **1** Type: **Non spécifié**

# Mapping out the direct connection between leptogenesis and CP violation at low energies

*mercredi 29 mars 2023 10:15 (15 minutes)*

With the help of the exact seesaw formula and a complete Euler-like parametrization of the (3+3) active-sterile neutrino mixing, we establish the most explicit connection between the 18 original seesaw parameters and the 9 derivational parameters associated with the light Majorana neutrinos. Then we explore how thermal leptogenesis responsible for the matter-antimatter asymmetry of the Universe can be directly or indirectly related to CP violation in neutrino oscillations and to some other lepton-number-violating and lepton-flavor-violating processes at low energy scales.

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

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

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **2** Type: **Non spécifié**

# Alleviating the H0 and sigma8 tensions via general conformal coupling between dark energy and dark matter

*mercredi 29 mars 2023 12:05 (15 minutes)*

The purpose of this research is to study cosmological effects of the coupling between dark energy and dark matter through the general conformal transformations in which the coefficient of conformal depends on both scalar field and its kinetic term. Using dynamical analysis, the influence of general conformal coupling on the evolution of background universe is investigated. We found that the evolution of background universe has scaling fixed point corresponds to acceleration of the universe at late time. For suitable choices of parameters, the universe can evolve from radiation dominated epoch to ø-matter dominated epoch and reaching to scaling fixed point at late time. The effective equation of state during ø-matter dominated epoch is slightly positive. Therefore, the $H_0$ tension can be alleviated. Also, the effective gravitational coupling for dark matter perturbations in this model can be smaller than in ΛCDM model. Then, the growth rate of dark matter perturbations is less than in ΛCDM model. Thus, the $\sigma_8$ tension can be alleviated.

**Auteur principal:** SAPA, Stharporn (Northern College)

**Co-auteurs:** KARWAN, Khamphee (Naresuan University); THIPAKSORN, Wittaya (Thaksin University)

**Orateur:** SAPA, Stharporn (Northern College)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **4** Type: **Non spécifié**

# New physics effects on quantum correlations in neutrino oscillations

*mercredi 29 mars 2023 09:00 (15 minutes)*

We study the effects of new physics on several measures of quantum correlations in the context of neutrino oscillating systems for a number of accelerator and reactor experimental set-ups. Non-local correlations are generally measured in terms of Bell's inequality parameter. Recently, it was shown that the non-local advantage of quantum coherence (NAQC) is a stronger measure of non-locality as compared to the Bell's inequality parameter in the neutrino systems. We study the effects of nonstandard interaction (NSI) on these measures and observe that although NAQC is a stronger measure of non-locality, Bell's inequality parameter is more sensitive to NSI effects. We then study NSI effects on several measurements of entanglement such as entanglement of formation, concurrence, and negativity for three flavor neutrino oscillations. Finally, for the first time in the context of neutrino systems, we study accord which is a measure quantifying the deviation from the pure state.

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

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

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **5** Type: **Non spécifié**

# The European Spallation Source neutrino Super Beam project

*mercredi 29 mars 2023 10:00 (15 minutes)*

The European Spallation Source 5 MW proton linac will be the world's most powerful accelerator, enabling the production of the world's most intense neutron flux. The proton driver can also be used to produce a very intense neutrino beam for CP violation discovery and measurement in the leptonic sector, very important for the understanding of matter-antimatter asymmetry in the Universe. During the last four years an EU supported Design Study of an ESS neutrino Super Beam (ESSnuSB) has been successfully performed with the participation of physicists from 15 European institutions. Within this study it has been designed the upgrade of the linac required to increase its power to 10 MW by the provision of extra H- pulses between the proton linac pulses, of a 400 m circumference accumulator ring to compress the 3 ms long linac pulses to 1.3 μs, of a set of four high power neutrino targets with focusing horns and a kiloton near and a megaton far water Cherenkov neutrino detector, the latter at a distance of 360 km, at the location of the second neutrino oscillation maximum. The publication of the ESSnuSB Conceptual Design Report has been done in which all details are given including the facility costing. The physics performance obtained overpast all initial expectations. More recently a study of the use of the intense muon flux produced together with neutrinos has been started, aiming at a design of, in the first stage, of a low-energy nuSTORM facility for neutrino cross-section measurements, and ultimately a Muon Collider Higgs Factory. The plan for this High Intensity Frontier Initiative (HIFI) design work will also be presented.
Funded by the European Union. Views and opinions expressed are however those of the author only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them."

**Auteur principal:** DRACOS, Marcos (IPHC-IN2P3/CNRS)

**Orateur:** DRACOS, Marcos (IPHC-IN2P3/CNRS)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **6** Type: **Non spécifié**

# A viable model to explain the Fast radio burst using the Gertsenshtein-Zel'dovich effect

*mercredi 29 mars 2023 08:45 (15 minutes)*

Fast Radio Bursts (FRBs) are one of the super-energetic radio pulsed signals with a short (< 1 sec) time duration. In recent years, numerous theoretical explanations for the origin of FRBs have been proposed. However, even with exotic physics, models have been unable to universally explain the properties of these events, such as peak flux and pulse width. In this study, we present a novel model that explains the origin of FRBs of GHz frequency radio waves. The model has three ingredients: compact object, progenitor with very strong effective magnetic field strength, and GHz frequency gravitational waves (GWs). Due to the Gertsenshtein-Zel'dovich effect, when GWs pass through the magnetosphere of such compact objects, their energy is converted into electromagnetic waves. This conversion produces bursts of electromagnetic waves in the GHz range, leading to FRBs. Therefore, we infer that millisecond pulsars may be the origin of FRBs. Further, our model offers a novel perspective on the indirect detection of GWs at high-frequency beyond detection capabilities. (Based on arxiv:2202.00032)

**Auteurs principaux:** KUSHWAHA, Ashu (Indian Institute of Technology Bombay); Dr MALIK, Sunil (Indian Institute of Technology Bombay and Institut für Physik und Astronomie, Universität Potsdam); Prof. SHANKARANARAYANAN, S. (Indian Institute of Technology Bombay)

**Orateur:** KUSHWAHA, Ashu (Indian Institute of Technology Bombay)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Gravitational Waves

ID de Contribution: **7** Type: **Non spécifié**

# Detecting Supernova neutrino bursts in Super-Kamiokande

*mercredi 29 mars 2023 09:45 (15 minutes)*

The Super-Kamiokande experiment, with its 50 ktons gadolinium-loaded water Čerenkov detector, is expected to be one of the main neutrino detectors for the detection of neutrino bursts from galactic supernovae (SN). Main signals from SN neutrino bursts in a water Čerenkov detector are for ~90% inverse β decay (IBD) reactions, and for ~5% electron scattering (ES) interactions, which provides the direction toward the SN. In Super-Kamiokande, the presence of gadolinium (Gd), increasing the detectability of neutron production, allows to improve the identification of IBD reactions. This provides a clear signature of a SN burst event and allows to increase the purity of an ES selection, enhancing the performance of the SN direction reconstruction. Due to the presence of Gd, we will detect anti-neutrino interactions from the Si-layer burning in progenitor stars before the SN, if the progenitor is close enough. Such a detection will indicate an imminent SN core collapse a few hours before it happens.

In this presentation, we will report the recent progresses achieved by the Super-Kamiokande collaboration to improve its supernova monitoring capabilities.

**Auteur principal:** PRONOST, Guillaume (ILANCE CNRS/University of Tokyo)

**Orateur:** PRONOST, Guillaume (ILANCE CNRS/University of Tokyo)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **8** Type: **Non spécifié**

# CPTM symmetry and smallness of cosmological constant in framework of extended manifold

*mercredi 29 mars 2023 11:05 (15 minutes)*

A model of an extended manifold for the Dirac spinor field is considered. Two Lagrangians related by CPTM (charge-parity-time-mass) symmetry are constructed for a pair of the Dirac spinor fields with each spinor field defined in a separate manifold. An interaction between the matter fields in the manifolds is introduced through gravity. A fermionic effective action of the general system is constructed and a tadpole one-loop spinor diagram and part of the one-loop vacuum diagrams with two external gravitational off-shell fields which contribute to the effective action are calculated. It is demonstrated that among different versions of the second spinor Lagrangian there is a special one for which a cancellation of the mentioned diagrams in the total effective action takes place. As a result, the diagrams do not contribute to the cosmological constant, as well there is a zero contribution of the zero point energies of the spinor fields
to the action. The non-zero leading order value of the cosmological constant for each manifold in the framework is proportional to the matter density of each separated manifold or difference of the densities, depending on the chosen model of interaction of gravitational fields with fermions. An appearance of the dark matter in the model is shortly discussed as well as further applications of the approach.

**Auteur principal:** Prof. BONDARENKO, Sergey (Ariel University, Israel)

**Orateur:** Prof. BONDARENKO, Sergey (Ariel University, Israel)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **9** Type: **Non spécifié**

# On the Hubble constant tension in the Supernovae Ia Pantheon sample

*mercredi 29 mars 2023 11:20 (15 minutes)*

The long-standing Hubble constant (H0) tension is the discrepancy of more than 4σ between the local measurement of H0 through the Cepheids and Supernovae Ia (SNe Ia) and the cosmological value of H0 obtained with the Planck measurement of the Cosmic Microwave Background radiation. To investigate this tension, we performed an estimation of H0 in the standard ΛCDM and the w0waCDM models through a binned analysis of the Pantheon sample, a collection of more than 1000 SNe Ia (Scolnic et al. 2018). Dividing the Pantheon sample in 3, 4, 10, and 20 ordered in redshift bins, we found the value of H0 in each bin through a Monte Carlo Markov Chain approach where we left free to vary only the parameter H0 and fixing all the remaining cosmological parameters. Thus, the found H0 values were fitted with the following functional form: g(z)= H'0/(1+z)^ α, where z is the redshift, H'0= H0(z=0), and α is the evolutionary coefficient. We found that α is in the order of 10^-2 and is compatible with zero in the range 1.2σ-2.0σ (Dainotti et al. 2021). With this information, we extrapolated the value of H0 at the redshift of the Last Scattering Surface, zLSS=1100, finding a value compatible in 1σ with the measured one from Planck. In a subsequent analysis, we investigated if this effect could be due to the mono-dimensionality of the parameters space and the use of SNe Ia as the only probe. Therefore we added the Baryon Acoustic Oscillations (BAOs) to the Pantheon sample and we performed a division in 3 bins with the variation of two parameters per time: H0 and the total matter density parameter (Ωm) in the ΛCDM model, and H0 together with wa, namely the slope of the equation of state parameter in the CPL parametrization w(z)=w0 + wa (z/1+z) (Chevallier & Polarski 2001). We found that the slow decreasing trend of H0 is still visible through the aforementioned g(z) form, with α again in the order of 10^-2 and the compatibility with zero in a range 2.0σ-5.8σ (Dainotti et al. 2022). This trend, if not due to statistical effects, could be explained through the presence of hidden astrophysical biases, such as the effect of stretch evolution (Nicolas et al. 2021). If this is not the case, these results may require new theoretical models, for example, the f(R) theories of gravity.

**Auteur principal:** Prof. DAINOTTI, Maria (NAOJ; SOKENDAI)

**Co-auteurs:** DE SIMONE, Biagio (University of Salerno; INFN); M. SCHIAVONE, Tiziano (University of Pisa); Prof. MONTANI, Giovanni (ENEA; Sapienza University); Dr RINALDI, Enrico (University of Michigan; RIKEN); Prof. LAMBIASE, Gaetano (University of Salerno; INFN); Prof. BOGDAN, Malgorzata (University of Wroclaw; Lund University); M. UGALE, Sahil (Mithibai College)

**Orateur:** DE SIMONE, Biagio (University of Salerno; INFN)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Primordial Universe

ID de Contribution: **15** Type: **Non spécifié**

# Exploration of the Symmetry in Particle Physics with an Accelerator Neutrino Beam

*mercredi 29 mars 2023 10:50 (15 minutes)*

We report on our recent studies of symmetry in neutrinos using the neutrino beam at J-PARC. We are working on the J-PARC accelerator, the T2K neutrino oscillation experiment, and the NINJA experiment. We study the fundamental symmetry of neutrinos by combining all our efforts to improve the accelerator beam, understand neutrino interactions, and precisely measure neutrino oscillation parameters. In particular, we are focusing on the CP symmetry of neutrinos and how to search for new parameter regions. In this talk, we will review the new results from the J-PARC, T2K, and NINJA achieved by the A02 group in Grant-in-Aid for Scientific Research on Innovation Areas "Exploration of Particle Physics and Cosmology with Neutrinos".

**Auteur principal:** NAKAYA, Tsuyoshi (Kyoto University)

**Orateur:** NAKAYA, Tsuyoshi (Kyoto University)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **16** Type: **Non spécifié**

# Exploration of the Physics Beyond the Standard Model with Astrophysical Neutrinos

*mercredi 29 mars 2023 12:05 (15 minutes)*

In this talk, we will present the recent results from the IceCube collaboration and discuss the exploration of physics beyond the standard model using the cubic-kilometer scale neutrino observatory. The energy range of detection, from GeV to EeV, enables searches and measurements in various areas such as neutrino oscillation, dark matter, neutrino cross-sections, and the production and propagation of astrophysical neutrinos at cosmological distances. Additionally, we will highlight relevant studies on atmospheric neutrino modeling conducted by the A03 group in the Grant-in-Aid for Scientific Research on Innovation Areas "Exploration of Particle Physics and Cosmology with Neutrinos.

**Auteur principal:** ISHIHARA, Aya (IceHap, Chiba University)

**Orateur:** ISHIHARA, Aya (IceHap, Chiba University)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **22** Type: **Non spécifié**

# Development of calibration method of the new near detector SuperFGD in the T2K experiment using cosmic muons

The T2K experiment showed the strongest constraint on the CP violation phase in the lepton sector using neutrino oscillation and is seeking further improvement of the measurement sensitivity. To reduce systematic uncertainties, upgrades of the near detector are ongoing. In 2023, a new type of detector, called SuperFGD, is planned to be installed. SuperFGD is a high granular scintillator detector and has about 2 million scintillator cubes and more than 55 thousand channels. It is necessary to understand the detector properly for analysis such as cross-section measurement. To calibrate this detector, we plan to use cosmic muons as one of the approaches. To develop calibration methods for the light yield and timing, cosmic data were generated using Monte Carlo simulation, and reachable precision and required time were estimated. This poster presentation will give the current status and prospects for the development of calibration methods using cosmic muons.

**Auteur principal:** KODAMA, Shoma (The University of Tokyo)

**Orateur:** KODAMA, Shoma (The University of Tokyo)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **23** Type: **Non spécifié**

# The latest results of the CALorimetric Electron Telescope (CALET) on the International Space Station

*mercredi 29 mars 2023 15:45 (25 minutes)*

The CALorimetric Electron Telescope (CALET) space experiment which has been developed by Japan in collaboration with Italy and the United States, is a high-energy astroparticle physics mission installed on the International Space Station (ISS). The primary goals of the CALET mission include studying the details of galactic cosmic-ray acceleration and propagation, and searching for possible nearby sources of high-energy electrons and dark matter signatures. The CALET experiment will measure the flux of cosmic-ray electrons (including positrons) to 20 TeV, gamma-rays to 10 TeV and nuclei with Z=1 to 40 up to 1,000 TeV.
The instrument consists of two layers of segmented plastic scintillators for the identification of cosmic-rays via a measurement of their charge (CHD), a 3 radiation length thick tungsten-scintillating fiber imaging calorimeter (IMC) and a 27 radiation length thick lead-tungstate calorimeter (TASC). CALET has sufficient depth, imaging capabilities and excellent energy resolution to allow for a clear separation between hadrons and electrons, as well as between charged particles and gamma rays. The instrument was launched on August 19, 2015 to the ISS and installed on the Japanese Experiment Module-Exposed Facility (JEM-EF). Since the start of operations in mid-October, 2015, CALET has been in continuous observation mode over 7.5 years and mainly triggering on high energy (>10 GeV) cosmic-ray showers without any major interruption. The number of triggered events over 10 GeV is nearly 20 million per month.
By using the data obtained in 7 years on the ISS, we will have a summary of the latest results of CALET for 1) Electron+Positron energy spectrum, 2) Proton and Nuclei spectra, 3) Gamma-ray observations, with the characterization of on-orbit performance. Some results on the electromagnetic counterpart search for LIGO/Virgo gravitational wave events and the observations of solar modulation and gamma-ray bursts are also included.

**Auteur principal:** TORII, Shoji (Waseda University)

**Orateur:** TORII, Shoji (Waseda University)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **24** Type: **Non spécifié**

# A novel method for joint systematic correction and foreground cleaning and its application to the estimation of cosmic birefringence in Simons Observatory and LiteBIRD.

*mercredi 29 mars 2023 11:35 (15 minutes)*

The primordial B modes signal in the CMB is very faint and polluted by other polarised astrophysical signals. The future and present experiments that aim at constraining the tensor to scalar ratio are limited by the efficiency with which they are able to remove this contaminating signal. Furthermore, exquisite knowledge of the instrument is necessary to understand possible systematic effects that could bias the data. The interplay between systematic effects and foreground cleaning can be critical in the estimation of cosmological parameters.
I developed a generalisation of a parametric component separation method that allows for the estimation of systematic parameters alongside foreground spectral indices while taking into account their possible interplay, and that is described in Arxiv:2212.08007. I can then retrieve a CMB map that is foreground cleaned and corrected for systematic effects. Moreover the statistical error on the estimation of systematic parameters and spectral indices can be evaluated and propagated to the cosmological parameter estimation, making this method statistically robust.
In particular I focus on the joint estimation of the tensor to scalar ratio and isotropic cosmic birefringence. The latter is completely degenerate with the polarisation angle of the telescope. I demonstrate that using a calibration prior and the generalised component separation I am able to constrain the tensor to scalar ratio and the birefringence angle using the example of the Simons Observatory Small Aperture Telescopes or LiteBIRD. Moreover the tensor to scalar ratio can be retrieved without bias possibly caused by the polarisation angle of the telescope. And that, regardless of the priors' precisions or possible systematic biases. This method could then be used as an efficient, multi-frequency, foreground-robust, self-calibration.

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

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

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Primordial Universe

ID de Contribution: **26** Type: **Non spécifié**

# Performance evaluation of 50cm PMTs for calibration of the Hyper-Kamiokande detector

Hyper-Kamiokande (HK) is the next-generation large-scale water Cherenkov detector currently under construction. It is planned to be an order of magnitude bigger than its predecessor, Super-Kamiokande (SK), and will house approximately 20,000 50-cm photomultiplier tubes (PMT) in the inner detector. In order to calibrate the HK detector precisely, it is necessary to understand the PMT response and establish a method to evaluate its performance before the installation. One of the necessary items for PMT performance evaluation is to study PMT response variation with respect to the light incident position. We are evaluating the position dependence of the 1 photo-electron charge distribution by injecting light into various positions on a PMT placed in a dark box.
In addition, though the PMTs will be operated in water in the actual HK detector, pre-installation calibration will be performed in air. Then it is necessary to systematically investigate the difference of the PMT responses between the cases it is placed in air and in water. We are currently building a setup to evaluate this difference.
This poster presents the current status and future plans for these measurements.

**Auteur principal:** WATANABE, Eiichiro

**Orateur:** WATANABE, Eiichiro

**Classification de Session:** Poster session

ID de Contribution: **27** Type: **Non spécifié**

# Exploring the new era of particle physics through the observation of natural neutrinos and the proton decay search

*mercredi 29 mars 2023 11:20 (15 minutes)*

We studied various kinds of natural neutrinos produced in the atmosphere and stars, including the sun and supernova, to understand the nature of neutrinos using Super-Kamiokande (SK). Recently, we upgraded the SK detector, and now we can identify neutrons with high efficiency with the help of the introduced gadolinium. We are also searching for proton decay with SK. Proton decay is one of the rare experimental proofs of the grand unification theory.
We review the latest results using the SK data achieved by the A01 group in Grant-in-Aid for Scientific Research on Innovation Areas "Exploration of Particle Physics and Cosmology with Neutrinos."
We are currently constructing the next generation of a gigantic neutrino detector, Hyper-Kamiokande (HK). We have been developing the detector components to maximize its physics capability. We also report the latest status of HK with our achievements.

**Auteur principal:** HAYATO, Yoshinari (Kamioka Observatory, ICRR, The University of Tokyo)

**Orateur:** HAYATO, Yoshinari (Kamioka Observatory, ICRR, The University of Tokyo)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **28** Type: **Non spécifié**

# The LEGEND experiment in a search for neutrinoless double beta decay

*mercredi 29 mars 2023 09:15 (15 minutes)*

LEGEND (Large Enriched Germanium Experiment for Neutrinoless Double Beta Decay) is an experimental program with a goal to search for the hypothesised neutrinoless double beta decay of Ge-76. If discovered, neutrinoless double-beta decay would be an evidence of lepton number violation, Majorana nature of neutrinos and will open a window for the broad study of neutrinos and symmetries of our universe. LEGEND combines knowledge and experimental techniques developed by MAJORANA and GERDA experiments in one multinational collaboration. The LEGEND-200 detector is currently being commissioned in the LNGS underground laboratory in Italy. Following the original plan, it will house up to 200 kg of germanium detectors and will take data for about five years.
The LEGEND-1000 experiment is designed to use 1 ton of enriched, large-mass, high-purity germanium crystals. Sensitivity of such an experiment strongly depends on the background reduction techniques like implemented liquid argon detector surrounding germanium crystals array. Because of the quasi-background free design of LEGEND-1000 (i.e. less than one background count expected in a $4\sigma$ Region of Interest with 10 t y exposure) and deep underground location, the potential of this experiment reaches beyond the $0\nu\beta\beta$ searches. In this talk we will present the LEGEND experimental physics program and briefly describe the current detector design focusing on solutions implemented for the background suppression.

**Auteur principal:** HARANCZYK, Malgorzata (Jagiellonian University)

**Orateur:** HARANCZYK, Malgorzata (Jagiellonian University)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **29** Type: **Non spécifié**

# A study of applications of neutron capture signal for the T2K experiment

T2K is a long-baseline neutrino oscillation experiment in Japan, with an accelerator and a near detector facility at J-PARC and the Super-Kamiokande far detector. The T2K experiment has measured neutrino oscillation parameters and is working towards the observation of CP violation in the leptonic sector. Furthermore, since high efficiency neutron tagging is now available with the Gd-loaded Super-Kamiokande detector, the application of neutron information to T2K data to improve oscillation sensitivity is important. The neutrino energy resolution can be degraded due to the contamination of charged current non-quasi-elastic (CC non-QE) processes in the CCQE-like sample. In this presentation, we show a study to remove background in the 1-ring muon-like (1R$\mu$) samples used in the T2K oscillation analysis, using tagged neutron information at T2K.

**Auteur principal:** TAIRAFUNE, Seidai (Tohoku University)

**Co-auteurs:** Prof. ICHIKAWA, Atsuko (Tohoku University); Dr NAKAJIMA, Yasuhiro (Tokyo University); Dr AKUTSU, Ryosuke (KEK); M. HAN, Seungho (Tokyo University ICRR); Dr WENDELL, Roger (Kyoto University); Prof. KOSHIO, Yusuke (Okayama University); Mlle MEHTA, Pruthvi (University of Liverpool); Dr BERNS, Lukas (Tohoku University); Dr QUILAIN, Benjamin (LLR, École Polytechnique)

**Orateur:** TAIRAFUNE, Seidai (Tohoku University)

**Classification de Session:** Poster session

ID de Contribution: **30** Type: **Non spécifié**

# Pioneering Noble Gas detectors for neutrinoless double beta decay search

*mercredi 29 mars 2023 11:05 (15 minutes)*

We are developing new techniques using noble gas detectors with the aim of overcoming the current limitations in the search for the neutrinoless double beta decay(0νββ).
The 0νββ occurs only if the neutrino is a Majorana type. And whether neutrinos are Majorana particles or not is a key problem to understand why neutrinos are so light and whether neutrinos are the reason why the universe is filled with matter (origin of the matter-dominated universe).
Our detector, AXEL (A Xenon ElectroLuminescence), is a high-pressure xenon gas time projection chamber. In this talk, we will show the performance obtained with the 180-L prototypes, status of the construction of the new 1000-L detector and an study result of an interesting new technique.

**Auteur principal:** ICHIKAWA, Atsuko (Tohoku University)

**Orateur:** ICHIKAWA, Atsuko (Tohoku University)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **31** Type: **Non spécifié**

# Joint Pre-Supernova Neutrino Monitor with Super-Kamiokande and KamLAND

Neutrinos, almost the smallest objects to our knowledge, however play an important role in the life of massive stars. As a massive star approaching core-collapse supernova, the rate of electron anti-neutrinos ($\bar{\nu}_e$) emission and the $\bar{\nu}_e$ energy are increasing. When such a pre-supernova (pre-SN) star enters the silicon burning phase, which is considered a few days preceding core-collapse, a significant fraction of emitted $\bar{\nu}_e$ exceed the energy threshold for inverse beta decay interactions. This is a chance for both liquid-scintillator detectors (e.g. KamLAND) and water-Cherenkov detectors (e.g. Super-Kamiokande) to capture pre-SN neutrino signals, and thus to issue an early warning of a supernova. KamLAND and Super-Kamiokande have established pre-SN neutrino monitors in 2015 and 2021, respectively. To further improve the sensitivity and warning time ahead of supernova, a joint alert system with the two detectors is developed. We present the structure of the joint alert system, as well as the improvement on sensitivity to pre-SN neutrinos resulted from the combination of the measurements from both experiments.

**Auteur principal:** HU, Zhuojun (Kyoto University)

**Orateur:** HU, Zhuojun (Kyoto University)

**Classification de Session:** Poster session

ID de Contribution: **35** Type: **Non spécifié**

# New View of Particle Physics from Neutrinos and Phenomena Beyond the Standard Model

*mercredi 29 mars 2023 12:20 (15 minutes)*

We report on our theoretical studies of neutrino physics. Neutrino physics is a key to clarifying the new physics beyond the standard model. In this talk, we will review our recent study on new analysis of neutrino oscillation and charged lepton flavor violation, new approach for the neutrino mass model, and also new models for lepton/baryon number violation by the C02 group in Grant-in-Aid for Scientific Research on Innovation Areas "Exploration of Particle Physics and Cosmology with Neutrinos".

**Auteur principal:** TSUMURA, Koji (Kyushu University)

**Orateur:** TSUMURA, Koji (Kyushu University)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **36** Type: **Non spécifié**

# Studying neutrinos with lead perovskites

The recent discovery of Coherent Elastic neutrino-Nucleus Scattering (CE$\nu$NS) has created new opportunities to detect and study neutrinos. The interaction cross-section in CE$\nu$NS scales quadratically with the number of neutrons, making heavy-nuclei targets attractive. Lead perovskites have emerged in the last decade as revolutionary materials for radiation detection due to their heavy and flexible element composition and their unique optoelectronic properties that result in an excellent energy resolution at an economic cost. We propose lead perovskites as highly promising lead-based active materials for neutrino research by means of the study of CE$\nu$NS.

**Auteur principal:** Dr JESÚS-VALLS, César (Kavli IPMU)

**Co-auteur:** Prof. SÁNCHEZ, Federico (University of Geneva)

**Orateur:** Dr JESÚS-VALLS, César (Kavli IPMU)

**Classification de Session:** Poster session

ID de Contribution: **37** Type: **Non spécifié**

# The PIONEER experiment for precise measurements of lepton flavor universality

*mercredi 29 mars 2023 10:00 (15 minutes)*

Recently, several measurement results suggesting a violation of lepton universality in B meson decays have been published, attracting attention as possible evidence of a new physics.
In the PIONEER experiment , the charged pion decay $\pi+ \longrightarrow e+\nu$ will precisely be measured to obtain the decay ratio $Re/\mu = B(\pi+ \longrightarrow e+\nu)/B(\pi+ \longrightarrow \mu+\nu)$ with an accuracy of 0.01%, which is an order of magnitude better than the previous measurements, to verify lepton universality to the limit of theoretical sensitivity. This corresponds to the search for new particles with PeV-scale masses through quantum effects.

In the second stage of the PIONEER experiment, we will also perform a precise measurement of the beta decay $\pi+ \longrightarrow \pi0e+\nu$ of charged pions to verify the CKM unitarity.

The excellent measurement accuracy required for the experiment will be achieved by making full use of the liquid xenon total absorption calorimeter technology developed for the MEG experiment at the University of Tokyo and KEK. In addition, the development of an active target using the latest LGAD technology is underway internationally in order to accurately suppress the reaction near the decay point.

The proposal for the PIONEER experiment was approved by the Paul Scherrer Institute (PSI) in Switzerland in 2022, and is being developed and prepared in international collaboration with Japan, the United States, Canada, Switzerland, Germany, and other countries.

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

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

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **38** Type: **Non spécifié**

# The average SMBH accretion properties of star-forming galaxies and their cosmic evolution over 4≤z≤7.

There is a positive correlation between the mass of SMBHs ($M_{\rm BH}$) and the stellar mass of their host galaxies ($M_{\rm star}$) in the local Universe, suggesting that SMBHs and galaxies have co-evolved. Studying distant galaxies is vital to understand the co-evolution process. Although it is difficult to measure $M_{\rm BH}$ in distant galaxies except for quasars, its time derivative, $dM_{\rm BH}/dt$ (black hole accretion rate: BHAR), is relatively easily obtained from X-ray observations. For many galaxies without individual X-ray detection, an average BHAR (<BHAR>) can be obtained by stacking X-ray images. However, there are few studies of accretion properties for galaxies beyond $z \sim 4$.

In this study, we examine the average accretion properties of about 12,000 Lyman break galaxies at 4 ≤ z ≤ 7 in the COSMOS field from the Hyper Suprime-Cam Subaru Strategic Program, where the deep X-ray image of the Chandra Legacy Survey is available. We constrain the <BHAR> for UV-magnitude-binned subsamples by X-ray stacking. We find that both <BHAR>/<SFR> and <BHAR>/<HAR> (average halo accretion rate) are much lower than the corresponding mass ratios ($M_{\rm BH}/M_{\rm star}$ and $M_{\rm BH}/M_{\rm h}$) of local galaxies. We also compare the results with quasars' accretion properties and cosmological simulations.

**Auteur principal:** MATSUI, Suin (The University of Tokyo)

**Co-auteurs:** Prof. SHIMASAKU, Kazuhiro (The University of Tokyo); M. TANAKA, Takumi (The University of Tokyo)

**Orateur:** MATSUI, Suin (The University of Tokyo)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **39** Type: **Non spécifié**

# Early Universe with CMB B-mode: observational challenges

*mercredi 29 mars 2023 12:35 (15 minutes)*

The large-scale $B$-mode polarisation of the Cosmic Microwave Background (CMB) represents one of the most powerful sources of information about the high-energy physics taking place in the early Universe. If detected, the most likely explanation for this signature would be the emission of primordial gravitational waves after the Big Bang, which would carry valuable information about the physics that gave rise to it. Detecting this signature is challenging, however, due to the presence of $B$-mode-emitting Galactic foregrounds and the exquisite precision with which different instrumental systematics must be kept under control in order to tease out this faint signal. In this talk, I will briefly generally describe how these challenges affect our observations within the context of current and forthcoming CMB experiments. In particular, I will present novel methods for the removal of foregrounds and the characterisation of the impact of a variety of instrumental effects on the final cosmological signal.

**Auteur principal:** AZZONI, Susanna (University of Oxford / Kavli IPMU)

**Orateur:** AZZONI, Susanna (University of Oxford / Kavli IPMU)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **40** Type: **Non spécifié**

# Status of the Simons Array Experiment

*mercredi 29 mars 2023 11:50 (15 minutes)*

Simons Array is one of experiments that are observing the cosmic microwave background to proof the existence of the primordial gravitational wave and inflation. Currently, the data taking of the first telescope and the deployment of the second telescope on Atacama Desert in Chile is proceeded on parallel.
In this presentation, the status of the Simons Array experiment will be reported focusing on the analysis pipeline development and the deployment of the second telescope.

**Auteur principal:** TAKEUCHI, Atsuto (University of Tokyo)

**Orateur:** TAKEUCHI, Atsuto (University of Tokyo)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Primordial Universe

ID de Contribution: **41** Type: **Non spécifié**

# Measurement of the charge ratio and the spin polarization of the cosmic-ray muons with the Super-Kamiokande

Cosmic-ray muons are generated from the showers of secondary particles via the interactions of primary cosmic particles with air nuclei at the top of the atmosphere. Pions and kaons mostly decay into muons immediately, reflecting the details of the hadronic interactions depending on their energy. The charge ratio of the cosmic-ray muons can be used to constrain high energy hadronic interaction models in the atmosphere and the atmospheric neutrino/anti-neutrino ratio. Also, the spin polarization of the cosmic-ray muons constrains the spectrum shape of atmospheric neutrinos. In this poster presentation, we will report the result of the measurement of the charge ratio and spin polarization of the cosmic-ray muons using about 10 years of data collected by the Super-Kamiokande.

**Auteur principal:** TADA, Tomoaki (Okayama Univ.)

**Co-auteurs:** KITAGAWA, Hussain (Okayama University); KOSHIO, Yusuke (Okayama University); Dr NAKANO, Yuuki (Kamioka observatory)

**Orateur:** TADA, Tomoaki (Okayama Univ.)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **42** Type: **Non spécifié**

# HKROC: an integrated front-end ASIC to readout photomultiplier tubes for large neutrino experiments

*mercredi 29 mars 2023 08:45 (15 minutes)*

The HKROC ASIC was originally designed to readout the photomultiplier tubes for the Hyper-Kamiokande experiment. HKROC is an innovative ASIC capable of readout a large number of channels satisfying stringent requirements in terms of noise, speed and dynamic range.
Each HKROC channel features a low-noise preamplifier and shapers, a 10-bit successive approximation Analog-to-Digital Converter (SAR-ADC) for the charge measurement (up to 2500 pC) and a Time-to-Digital Converter (TDC) for the Time-of-Arrival (ToA) measurement with 25 ps binning. HKROC is auto-triggered and includes all necessary ancillary services as bandgap circuit, PLL (Phase-locked loop) and threshold DACs (Digital to Analog Converters).
The key feature of HKROC is its "waveform digitization"capability: it dynamically opens acquisition windows for internal digitization. It enables new possibilities in terms of double pulse triggering with a low dead time (below 50 ns) and in terms of triggering rate with its adaptive readout to cope with supernovae events.
The presentation will describe the ASIC architecture and the experimental results of the second HKROC prototype received in December 2022.

**Auteur principal:** DULUCQ, Frederic (OMEGA)

**Orateur:** DULUCQ, Frederic (OMEGA)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **43** Type: **Non spécifié**

# Comparison of cross section models for neutrino-induced single pion production

It is important to measure neutrinos in the energy range from a few hundreds of MeV to several GeV for the study of neutrino oscillation by atmospheric neutrino observation and long baseline experiments. It is also important for proton decay search as the major background is atmospheric neutrinos in the energy region. In this intermediate energy region charged-current quasi-elastic scattering (CCQE), single pion production, and deep inelastic scattering (DIS) coexist with comparable contributions. The T2K experiment selects CCQE events from single ring samples to measure neutrino oscillations, while single pion production events become the background in case a pion is not identified. However, T2K aims to update their analysis to use multi-ring samples which include single pion production events in order to increase statistics. Single pion production is crucial in the NOvA experiment and the DUNE experiment in the future as they measure the neutrino oscillation at higher energy than T2K with the longer baseline. Similarly, single pion production can be a background in proton decay searches at Super-Kamiokande and future experiments, including Hyper-Kamiokande. Therefore, it is important to understand the cross section and kinematics of single pion production to improve the precision of the neutrino oscillation measurement and proton decay searches. For this purpose, we evaluated a new model for single pion production, called the dynamical coupled-channels model (DCC, S.X. Nakamura, H. Kamano, and T. Sato). We compared it with the Berger-Sehgal model, which is currently used in the NEUT neutrino interaction generator. The results and future perspectives will be presented.

**Auteur principal:** YAMAUCHI, Koki (Tokyo University of Science)

**Co-auteurs:** ISHITSUKA, Masaki (Tokyo University of Science); HAYATO, Yoshinari (Kamioka Observatory, ICRR, The University of Tokyo)

**Orateur:** YAMAUCHI, Koki (Tokyo University of Science)

**Classification de Session:** Poster session

ID de Contribution: **45** Type: **Non spécifié**

# Geoneutrinos

Geoneutrinos are antineutrinos originating from the radioactive decays of long-lived isotopes naturally present in the crust and mantle. Geoneutrinos can be used as a unique direct probe in order to determine the amount of long-lived radioactive elements inside our planet and to constrain the radiogenic contribution to the terrestrial heat. Up to date, only two experiments in the world, Borexino (Italy) and KamLAND (Japan), have observed geoneutrinos. In this talk, I will give an overview of the geoneutrino field, concentrating on the latest measurements and recent sensitivity studies of future experiments, such as Theia.

**Auteur principal:** Dr BAGDASARIAN, Zara (University of California, Berkeley)

**Orateur:** Dr BAGDASARIAN, Zara (University of California, Berkeley)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **46** Type: **Non spécifié**

# Revised summation calculations of reactor antineutrino fluxes and spectra

*mercredi 29 mars 2023 09:30 (15 minutes)*

Over the last decades, Inverse Beta Decay (IBD) antineutrino experiments conducted at short and long baselines from nuclear reactors have revealed significant discrepancies on both the rate and shape of measured spectra compared to state-of-the-art predictions. No evidence for an experimental bias has been detected, and the sterile neutrino interpretation of the reactor antineutrino anomaly has been mostly excluded by recent very short baseline reactor experiments. The validity of the predictions is then seriously questioned as the source of the observed discrepancies. This last lead has motivated a thorough revision of reactor antineutrino spectrum modeling, which is also relevant in view of the forthcoming new generation of reactor experiments aiming at measuring neutrinos through the Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) process.

This revised summation modeling includes significant refinements to the beta decay formalism used to compute the thousands of beta branches making up a reactor spectrum, and a comprehensive and exhaustive uncertainty budget is presented in regards to the modeling of the formalism and to input evaluated nuclear data. This presentation will especially detail the many improvements this new prediction brings over past state-of-the-art predictions, and will then compare the new prediction to IBD datasets collected by recent short and long baseline reactor experiments. Finally, the low energy portion of the reactor antineutrino spectrum will be discussed in regards to the current experimental effort aiming at observing CEvNS at reactors.

**Auteur principal:** Dr PÉRISSÉ, Lorenzo (ILANCE - CNRS)

**Co-auteurs:** ONILLON, Anthony (TUM); Dr VIVIER, Matthieu (CEA Saclay, DRF/IRFU/DPhP); MOUGEOT, Xavier (CEA / LIST / LNHB)

**Orateur:** Dr PÉRISSÉ, Lorenzo (ILANCE - CNRS)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **47** Type: **Non spécifié**

# Looking forward to New Physics and Neutrinos with FASER at the LHC

*mercredi 29 mars 2023 09:30 (15 minutes)*

FASER, the ForwArd Search ExpeRiment, is an LHC experiment located 480 m downstream of the ATLAS interaction point, along the beam collision axis. FASER and its sub-detector FASERnu have two physics goals: (1) to detect and study TeV-energy neutrinos, the most energetic neutrinos ever detected from a human-made source, and (2) to search for new light and very weakly-interacting particles. FASER was designed, constructed, installed, and commissioned during 2019-2022 and has been taking physics data since the start of LHC Run 3 in July 2022. This talk will present the status of the experiment, including detector design and first detector performance results from Run 3 data.

**Auteur principal:** INADA, Tomohiro (Tsinghua University)

**Orateur:** INADA, Tomohiro (Tsinghua University)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **48** Type: **Non spécifié**

# Recent highlights of very-high-energy gamma-ray observations by the MAGIC telescopes

*mercredi 29 mars 2023 08:30 (15 minutes)*

Observations of very-high-energy (above a few tens of GeV) gamma rays from the universe play an important role to deepen our understanding of physics in extreme environments and of fundamental physics. MAGIC is a system of two 17-m diameter imaging atmospheric Cherenkov telescopes and provides a broad energy coverage, detecting gamma rays from 50 GeV and up to 100 TeV. In this contribution, I will present a selection of the recent scientific results obtained by the MAGIC telescopes, such as the discovery of TeV emission from the gamma-ray burst GRB 190114C, the evidence for proton acceleration in the nova RS Ophiuchi, and the results of TeV-scale dark matter searches.

**Auteur principal:** SUDA, Yusuke (Hiroshima University)

**Orateur:** SUDA, Yusuke (Hiroshima University)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **49** Type: **Non spécifié**

# Improvement in PID methods for selecting electron neutrino events in the upgraded near detector of T2K

The T2K experiment aims to verify leptonic CP violation by precisely measuring the neutrino oscillation probability. From the previous data analysis, leptonic CP violation is confirmed at 95% C.L. To further improve the experiment sensitivity up to the 3σ C.L. a major accelerator upgrade has been done with the goal of increasing the neutrino beam intensity beyond 1 MW. Moreover, also the reduction of the neutrino cross section systematic uncertainty becomes crucial. Hence, the measurement of the electron neutrino cross section with a high precision is necessary. Since electron neutrino contribute to only about 1% of the neutrino beam, to achieve the goals, electron neutrino interaction events have to be selected with both high purity and efficiency.
A new detector, called SuperFGD, is currently being assembled and will start collecting neutrino data in 2023. It is composed of about 2 million scintillator cubes and is able to reconstruct tracks of charged particles and, at the same time, perform particle identification (PID). As a result, it is possible to reconstruct electromagnetic showers caused by electron neutrino interactions in detail. In this poster presentation, the current status of the PID method of electron neutrino selection in SuperFGD will be discussed.

**Auteur principal:** OKINAGA, Wataru

**Orateur:** OKINAGA, Wataru

**Classification de Session:** Poster session

ID de Contribution: **50** Type: **Non spécifié**

# Enhancement of parity-violation in chiral molecules and the origin of homochirality in nature

It has been theoretically shown that the integrated value of electron chirality density over the whole molecule is generally a nonzero value. The reaction rate of weak interactions is higher in one enantiomer than in the other due to the different number of left-handed electrons between the enantiomers. From this fact, a theory for the origin of homochirality, which is the enantiomeric excess in nature, has been proposed from the viewpoint of Electron Chirality in Chiral Molecules (ECCM).

The parity-violating energy difference (PVED) between the enantiomers of a chiral molecule is caused by the Z boson exchange between electrons and nucleons, and is proportional to the difference in electron chirality at the nuclear positions between the enantiomers. The PVED has not been observed yet experimentally because of its small value. We found numerically that the PVED is significantly enhanced in several electronic excited states for chiral molecules. To explain this enhancement of the PVED, we proposed a hypothesis named the cancellation breaking enhancement (CBE). CBE can explain the enhancement of the PVED in the first electronic excited state by focusing on the imbalance of the cancellation of contributions between molecular orbitals to the PVED.

In this study, we numerically show that not only PVED but also ECCM increases in the electronic excited states of chiral molecules. Using the CBE hypothesis, the ECCM enhancement is compared to the PVED enhancement.

**Auteurs principaux:** Dr SENAMI, Masato (Kyoto University); M. KURODA, Naoya (Kyoto University)

**Orateur:** M. KURODA, Naoya (Kyoto University)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **51** Type: **Non spécifié**

# Black-hole mass distributions of the most distant low-luminosity quasars

*mercredi 29 mars 2023 10:50 (15 minutes)*

Exploration of black holes across the cosmic history not only has astrophysical values, but also represents key steps toward better understanding of putative primordial black holes, sources of gravitational waves, and other topics belonging to fundamental physics. We present the first statistical investigation of the black hole properties of low-luminosity quasars in the early cosmic epoch. Combination of optical and near-infrared surveys successfully constructed high-z (redshifts z > 6) quasar samples and are accelerating studies in many directions, such as the physics of growing supermassive black holes (SMBHs), intergalactic medium, UV photon sources that caused cosmic reionization, and the large-scale structure. These quasars have masses up to 10-billion solar masses, at the cosmic epochs as early as several 100 mega-years since the Big Bang. On the other hand, previous surveys were mostly sensitive to the brightest quasars in the rest-UV wavelengths, due to observation limits. According to the latest measurement of the quasar luminosity function, such bright quasars are very rare among the whole high-z quasars population. We are carrying out a project to look for less-luminous quasars with Hyper Suprime-Cam installed on the Subaru Telescope, based on the imaging survey data featuring an excellent combination of depths and field areas. Spectroscopic follow-up observations have been performed at Subaru and other 8-10m telescopes. However, the spectra we obtained contain only Ly-alpha emission lines, without any black hole mass estimators. That is, we haven't understood the mass distribution of these early quasars except for the brighter quasars currently known. In order to conquer this issue, we devised a method to estimate black hole masses of high-z quasars via low-z analogues found from a large spectroscopic sample in Sloan Digital Sky Survey. Through the obtained distribution of black hole masses and mass-accretion efficiencies, we obtained constraints on the nature of their seed populations. This new method would enable us to explore the population properties of the distant quasars and to trace the formation history of SMBHs throughout the cosmic history, and would also be useful for upcoming surveys.

**Auteur principal:** TAKAHASHI, Ayumi

**Orateur:** TAKAHASHI, Ayumi

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **52** Type: **Non spécifié**

# Measurement of cosmogenic Li-9 in SK-Gd

We measured $^{9}$Li isotopic nuclei produced by muon spallation using the data taken from 2020 to 2022 by the Super-Kamiokande detector with 0.011% gadolinium concentration in water. $^{9}$Li is a long-lived radioactive isotope with a lifetime of about 0.26 seconds. It emits an electron and a neutron at a branching ratio of 50.8%, which is difficult to distinguish from the inverse beta decay caused by anti-electron neutrinos. Therefore, $^{9}$Li is one of the main background sources. In this study, the energy spectrum of the electrons was measured with a threshold at 4.5 MeV which is lowered from the previous result with 7.5MeV threshold measured with pure water. We will report the measurement method and analysis status in this poster.

**Auteur principal:** SHINOKI, Masataka (Tokyo University of Science)

**Co-auteur:** COLLABORATION, Super-Kamiokande

**Orateur:** SHINOKI, Masataka (Tokyo University of Science)

**Classification de Session:** Poster session

ID de Contribution: **53** Type: **Non spécifié**

# A Noise Reduction Analysis of Photomultiplier Tubes for Neutron Tagging at Super-Kamiokande

In this poster, I report the efficient noise rejection method for improvement of a neutron tagging by developing photomultiplier tubes (PMTs) noise simulation with noise investigation.

Super-Kamiokande (Super-K) is a large water Cherenkov detector to observe Cherenkov rings by large aperture PMTs. The reconstruction performance can be degraded by a noise from a thermal electron and scintillation light, where the latter caused by radioactive contaminations of PMTs. A neutron tagging at Super-K, detecting low-energy gamma rays from a neutron capture, is affected by the noise as well.

I investigated noise hit charge and time structure from Super-K measured data. Then, I implemented the scintillation light and after pulse into the detector simulation as the PMT hit noise. The realistic noise simulation allows to develop a noise reduction analysis for each PMT based on characteristics of the scintillation hit noise.

An average of the Super-K PMT noise hit in 2020 was evaluated to be about 6 kHz. This simulation revealed that scintillation light accounts for 2 kHz of noise hit rate.
An improvement of a neutron tagging by developing PMT noise reduction analysis is presented.

**Auteur principal:** MAEKAWA, YUTO

**Co-auteur:** NISHIMURA, Yasuhiro

**Orateur:** MAEKAWA, YUTO

**Classification de Session:** Poster session

ID de Contribution: **54** Type: **Non spécifié**

# Lower Energy Extension in Anti-Electron Neutrino Measurement for DSNB Search

We have upgraded the Super-Kamiokande in 2020 with Gd to enhance neutron tagging for anti- or normal-neutrino distinction. This neutron tagging method requires a special trigger and is limited to the higher energy of neutrino than around 8 MeV due to the energy of a 2.2 MeV gamma ray via hydrogen capture in the pure water phase. After the upgrade of doping Gd, this requirement is relaxed in principle because the neutron tagging uses several gamma rays from Gd capture whose summed energy is 8 MeV. We are developing a new anti-electron neutrino selection algorithm using lower energy triggers. This scheme will have a capability above 3 MeV. I will present the current status and prospects of the near future DSNB analysis.

**Auteur principal:** M. IZUMIYAMA, Shota (Tokyo Institute of Technology)

**Orateur:** M. IZUMIYAMA, Shota (Tokyo Institute of Technology)

**Classification de Session:** Poster session

ID de Contribution: **55** Type: **Non spécifié**

# Searching for Close Binary System in Milky Way Galaxy as Potential Gravitational Wave Sources

Close White Dwarf Binary systems in Miky Way Galaxy are important in two major fields of astrophysics. 1) Potential source of background gravitational wave and 2) Potential progenitors of Type Ia supernovae.

1) Potential Source of Gravitational Wave Background
Although the individual contribution is small, integrating numerous white dwarf systems may contribute to a gravitational wave background. By combining GAIA and Sloand Digital Sky Survey Data, we can study the census of binary populations.

2) Type Ia supernova (SNIa) plays a critical role on the study of dark energy. After 30 years of intensive study of SNIa, we still do not know the identity of the progenitor system, and we are still debating single or double degenerate systems. By studying the close white dwarf binary systems in Milky Way, we can estimate the yields of SNIa from Milky Way Galaxy.

We will present our ongoing census of binary systems in Milky Way.

**Auteur principal:** SUZUKI, Nao (Lawrence Berkeley National Laboratory)

**Orateur:** SUZUKI, Nao (Lawrence Berkeley National Laboratory)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **56** Type: **Non spécifié**

# Classification of CP-violating operators in SMEFT

*mercredi 29 mars 2023 09:45 (15 minutes)*

In particle physics, the Standard Model (SM) makes extremely accurate predictions, but experimental and observational results suggest the existence of physics beyond the Standard Model (BSM). For example, the SM cannot explain the baryon number asymmetry because the CP violation in the SM is very small. Therefore, the BSM must have more CP-violating sources than the SM.

We have developed a method to systematically classify operators in the Standard Model Effective Field Theory (SMEFT) based on their CP properties. In this talk, I will explain how the Hilbert series technique can be used in our method.

**Auteur principal:** OKABE, Risshin (Kavli IPMU / U Tokyo)

**Co-auteurs:** M. KONDO, Dan (Kavli IPMU); MURAYAMA, Hitoshi (BerkeleyUSA)

**Orateur:** OKABE, Risshin (Kavli IPMU / U Tokyo)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **57** Type: **Non spécifié**

# Study of energy scale calibration and monitoring of detector stability using cosmogenic neutron in SK-Gd

Super-Kamiokande is the world's largest underground water Cherenkov detector placed 1000m underground in Kamioka. The experiment aims to observe neutrinos from various sources as well as nucleon decays. In 2020, the new phase of Super-Kamiokande, SK-Gd, was started by dissolving gadolinium to pure water to about 0.01% concentration. Furthermore, in 2022, additional gadolinium was introduced, increasing its concentration from 0.01% to 0.03%. This significantly increased neutron detection efficiency, thanks to gadolinium's large thermal neutron capture cross section and following gamma-ray emission with the total energy of ~8 MeV. We are developing a new energy scale calibration method and monitoring the stability of detector response using spallation neutrons produced by cosmic-ray muons. Using spallation neutrons has advantages that they are uniformly distributed across the entire detector and that they have large statistics. I will present the status of these studies in this poster.

**Auteur principal:** SHIMA, Shizuka (Tokyo University)

**Co-auteurs:** SHINOKI, Masataka (Tokyo University of Science); NAKAJIMA, Yasuhiro (The University of Tokyo)

**Orateur:** SHIMA, Shizuka (Tokyo University)

**Classification de Session:** Poster session

ID de Contribution: **58** Type: **Non spécifié**

# LHC bounds on MUED after Run 2

*mercredi 29 mars 2023 11:20 (15 minutes)*

We present updated LHC limits on the minimal universal extra dimensions (MUED) model from the Run 2 searches. We scan the parameter space against a number of searches implemented in the public code CheckMATE and derive up-to-date limits on the MUED parameter space from 13 TeV searches. The strongest constraints come from a search dedicated to squarks and gluinos with one isolated lepton, jets and missing transverse energy. In the procedure we take into account initial state radiation and stress its importance in the MUED searches, which is not always appreciated.

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

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

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **59** Type: **Non spécifié**

# Development of the Electronics for Hyper-Kamiokande

Hyper-Kamiokande starts its operation in 2027, and we are in the final stage of the development of the electronics. The large scale and high precision of the Hyper-Kamiokande require high performance and reliability on the electronics. We have developed frontend electronics such as digitizer, communication module and HV/LV module. And we plan to deploy the frontend electronics in water-tight cases under water. We report on the development and the prospects towards mass production and installation.

**Auteur principal:** KATAOKA, Yousuke (The University of Tokyo, ICRR)

**Orateur:** KATAOKA, Yousuke (The University of Tokyo, ICRR)

**Classification de Session:** Poster session

ID de Contribution: **60** Type: **Non spécifié**

# Precise measurement of Neutrino Interactions at J-PARC in the NINJA experiment

*mercredi 29 mars 2023 17:45 (25 minutes)*

Precise measurement of neutrino oscillations is believed to be the key to opening up new physics, such as revealing the origin of the matter-dominated universe and discovering new particles outside of the Standard Model called sterile neutrinos. A deep understanding of neutrino-nucleus interactions is essential for the precise measurement of neutrino oscillations in sub-multi-GeV regions to reduce systematic uncertainties.
The NINJA experiment aims to precisely measure neutrino-nucleus interactions using nuclear emulsion as the main detector at J-PARC. Thanks to sub-micron spatial resolution of nuclear emulsion, it allows us to observe the interaction vertex clearly. Therefore, this enables precise measurement including short-track particles that have been difficult to measure so far.
Since 2014, we have carried out pilot/detector run to evaluate our detector performance at J-PARC. Then neutrino beam exposure and emulsion data taking for our first physics run with a 250 kg target including a 75 kg water target which is the same target as a large water Cherenkov detector was completed. In this talk, I will give some results and analysis status.

**Auteur principal:** FUKUDA, Tsutomu (Nagoya University)

**Orateur:** FUKUDA, Tsutomu (Nagoya University)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **61** Type: **Non spécifié**

# Status of the XENONnT experiment

*mercredi 29 mars 2023 09:30 (15 minutes)*

With the primary goal of direct dark matter search, the operation of the XENONnT experiment is ongoing.
The experiment, operated at the Laboratori Nazionali del Gran Sasso in Italy, uses a two-phase xenon time projection chamber with 6 tons of liquid xenon (8.6 tons in total).
I will present low-background techniques and the current status of XENONnT experiment.

**Auteur principal:** ABE, Ko (Kamioka Observatory, ICRR, The Univ. of Tokyo)

**Orateur:** ABE, Ko (Kamioka Observatory, ICRR, The Univ. of Tokyo)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **64** Type: **Non spécifié**

# Status of anti-chain-implosion cover for 20inch PMT in Hyper-Kamiokande

Hyper-Kamiokande is a next generation water Cherenkov detector which has a fiducial volume of approximately 10 times larger than that of the on-going Super-Kamiokande detector.

In a deep water tank one of critical issue is prevention of chain implosion of large photosensors. If a glass bulb crashes under high pressure in deep water a rapid cracking run over the whole glass in very short time, a few ms. The shape of the bulb suddenly disappears and water rushes into the void and collisions consequently generate the shockwave.

Concept of the anti-chain-implosion cover of PMT is to control the water flow into the cover and prevent the generation of the shockwave. Flow of the water into the cover is moderated via inlets to avoid the hard collisions of water.

This presentation will focus on the current status of the development of the anti-chain-implosion cover for Hyper-Kamiokande.

**Auteur principal:** KAMEDA, Jun (Institute for Cosmic ray research, The University of Tokyo)

**Orateur:** KAMEDA, Jun (Institute for Cosmic ray research, The University of Tokyo)

**Classification de Session:** Poster session

ID de Contribution: **66** Type: **Non spécifié**

# Development of a Gaseus photomultiplier with a 20-ps single photon time resolution

Scaling up the size and performance of particle detectors is necessary to explore the cutting edge of particle physics and nuclear physics. Common requirements for photodetectors used for such particle detectors are high time resolution, large detection area, and low cost.

To satisfy those requirements, we have developed a gaseous photodetector, GasPM. It consists of a photocathode, a resistive plate, a high voltage electrode and an anode electrode. The photocathode and resistive plate delimit a gas gap of 210 um, where photoelectrons from the photocathode are amplified by an avalanche process. GasPM is expected to have a great time resolution because of the fast avalanche amplification. GasPM has a uniform structure and it is easy to scale up without losing the time resolution. Because the structure is very simple compared to other photodetectors, GasPM can be constructed at a low cost.

In this study, we developed a prototype to demonstrate the great time resolution of GasPM. The photocathode used in the prototype is LaB6. The QE of LaB6 drops in the air, but it is enough high to detect single photon signals in the test, and high resistance to the air is a great advantage to develop the prototype. The gas for the prototype is a mixture of 90% R134a and 10% SF6 which is commonly used in resistive plate chambers. To test time resolution, a test bench was developed. In the test, a pico-second pulse laser with wavelength of 375 nm was spotted at the GasPM, and the signal was recorded as a waveform using a DRS4 evaluation board. The single-photon signal was successfully obtained, and the timing was extracted by waveform fitting. The time resolution is $\sigma = 36.0 \pm 0.9$ ps. The width of the laser pulse and the time resolution of the readout system are 27 ps and 14 ps, respectively, and the intrinsic time resolution of the GasPM prototype is $\sigma$=19.2 ps.

This was the first study of the GasPM using a prototype and demonstrated that GasPM has a great time resolution. GasPM has potential to explore the cutting edge of physics through its great time resolution, large photo coverage, and low cost.

**Auteur principal:** OKUBO, Ryogo

**Co-auteurs:** MATSUOKA, Kodai (KEK); ADACHI, Yuya (Nagoya University)

**Orateur:** OKUBO, Ryogo

**Classification de Session:** Poster session

ID de Contribution: **67** Type: **Non spécifié**

# Betting to reconstruct Cherenkov rings in large neutrino detectors

*mercredi 29 mars 2023 08:30 (15 minutes)*

Within the context of the ongoing Super-Kamiokande experiment, and in preparation for the Hyper-Kamiokande experiment, I will present a new paradigm to reconstruct Cherenkov rings events inside water detectors viewed by photo-sensors. Using concepts from information theory, an environment for reinforcement learning can be set to classify the recorded hits of an event, similarly to ranking and betting on these hits with respect to the arrival time of Cherenkov photons.

This project is part of ongoing work for treating systematic uncertainties in a computationally efficient and comprehensive manner, by speeding up the simulations and event reconstruction to vary detector parameters for large water-Cherenkov detectors. Consistent propagation of systematic error uncertainties, based on many nuisance parameters, is a persistent difficulty in particle physics and astrophysics experiments. Where low-level effects are not amenable to simple parameterization or re-weighting, analyses often rely on discrete simulation sets to quantify the effects of nuisance parameters on key analysis observables. Such methods may become computationally untenable for analyses requiring high statistics Monte Carlo with many parameters, especially in cases where these parameters are described with a continuous distribution.

**Auteur principal:** ZSOLDOS, Stephane (King's College London)

**Orateur:** ZSOLDOS, Stephane (King's College London)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **68** Type: **Non spécifié**

# Search for neutrinos associated with solar flares in the Super-Kamiokande detector

Search for neutrinos produced during solar flares has been discussed for the last 60 years while clear signals of neutrinos associated with solar flares (solar flare neutrinos) have not been identified yet. Since neutrinos are not affected by the interplanetary magnetic field, solar flare neutrinos may give a hint of particle acceleration mechanism in solar flares. According to some theoretical predictions, the flux of the solar flare neutrino depends on the releasing energy and the location, where solar flares occur on the surface of the Sun. To minimize the background for the solar flare neutrino searches, data of solar satellites (GOES, RHESSI, and Geotail) were analyzed and windows for solar flare neutrino searches on the visible side were defined. On the other hand, Coronal Mass Ejection event catalogs were used to determine the search windows for solar flare neutrinos on the invisible side of the Sun. The Super-Kamiokande (SK) is the world's largest underground water Cherenkov detector in Japan. The SK experiment has been started in 1996 and its data set covers the period of solar cycles 23 and 24. In this presentation, the results of solar flare neutrino searches using data set from 1996 to 2018 are presented according to arXiv:2210.12948.

**Auteur principal:** Dr NAKANO, Yuuki (Kamioka observatory)

**Orateur:** Dr NAKANO, Yuuki (Kamioka observatory)

**Classification de Session:** Poster session

ID de Contribution: **71** Type: **Non spécifié**

# Atmospheric neutrino reconstruction and oscillation analysis with neutron detection in SK-Gd

Super-Kamiokande (SK) is the 50 kton water Cherenkov detector located at Kamioka mine in Japan. In 2020, we dissolved gadolinium sulfate in the SK water and started SK-Gd phase with 0.01% Gd, where neutron detection efficiency and resolution for neutron capture vertex are improved. Detection efficiency got even higher at the second Gd loading to 0.03% Gd in June 2022. In atmospheric neutrino oscillation analysis, aiming mainly at mass ordering determination, SK-Gd will benefit (i) neutrino / anti-neutrino discrimination, (ii) neutrino energy correction with number of detected neutrons, (iii) neutrino energy and direction correction with neutron vertex. We will report how sensitivities can be improved in oscillation study in SK-Gd.

**Auteur principal:** M. MIKI, Shintaro (Institute for Cosmic Ray Research, University of Tokyo)

**Orateur:** M. MIKI, Shintaro (Institute for Cosmic Ray Research, University of Tokyo)

**Classification de Session:** Poster session

ID de Contribution: **72** Type: **Non spécifié**

# Fast birefringence measurement and compensation using a pair of identical liquid crystals.

*mercredi 29 mars 2023 08:30 (15 minutes)*

KAGRA operates at cryogenic temperature, therefore uses sapphire substrates as its test-masses. Next generation of gravitational wave detectors will also use crystalline substrates, possibly sapphire or silicon. All these materials are birefringent which can spoil both the sensitivity and duty-cycle of the detectors and therefore substrates with lowest possible birefringence are mandatory.

KAGRA collaboration has two experiments which measure the birefringence of the 22kg sapphire substrates within a duration of weeks. It is planned to increase the mass of the test-masses to the hundred-kg scale making the current birefringence characterization measurements impractical.

Here, we propose to use a pair of identical liquid crystals to measure and compensate birefringence of substrates with arbitrary size. We are now developing such experiment which will decrease the characterization duration by at least a factor of two and possibly down to the second scale while demonstrating for the first time birefringence compensation for gravitational wave detectors.

**Auteurs principaux:** EISENMANN, Marc (National Astronomical Observatory of Japan); Prof. LEONARDI, Matteo (University of Trento, Italy); SINGH, Shalika (National Astronomical Observatory of Japan)

**Orateur:** SINGH, Shalika (National Astronomical Observatory of Japan)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Gravitational Waves

ID de Contribution: **73** Type: **Non spécifié**

# A new alignment control scheme to mitigate birefringence effects for KAGRA and next-generation gravitational wave detectors.

*mercredi 29 mars 2023 09:00 (15 minutes)*

KAGRA is often referred as a 2.5-generation gravitational wave detector as it operates underground with test-masses at cryogenic temperature; features that will be implemented in future gravitational waves detectors. One of the constraints of operating at cryogenic temperature is that it requires the use crystalline test-masses. KAGRA test-masses substrates are therefore 22kg sapphire crystal. However, the birefringence of sapphire substrates was found to affect both the the sensitivity and duty-cycle of KAGRA during the joint observation run with GEO600; mainly due to the birefringence coupling to the KAGRA alignment control.

We propose to use a new alignment control scheme that should allow to properly reconstruct both the alignment signal and the birefringence coupling. We are now working on the table-top demonstration before its implementation in the KAGRA detector.

**Auteur principal:** EISENMANN, Marc (National Astronomical Observatory of Japan)

**Orateur:** EISENMANN, Marc (National Astronomical Observatory of Japan)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Gravitational Waves

ID de Contribution: **74** Type: **Non spécifié**

# Progress of the COMET Experiment at J-PARC

*mercredi 29 mars 2023 09:15 (15 minutes)*

The COMET experiment aims at searching for a conversion of the muon to the electron without emission of the neutrinos. The process is strongly suppressed in the Standard Model of the Particle Physics (SM) and its discovery is a proof of the physics beyond SM. The construction and commissioning of the COMET experiment is ongoing at J-PARC. The proton beam acceleration and the extraction were performed utilizing existing beamline in the Hadron Hall and we measured the extinction factor of the bunched proton beam. Recently the primary proton beamline for the COMET experiment was constructed and is waiting for the beam operation. The first beam will be delivered to the COMET experimental hall in this February mainly for the commissioning of the beamline. At the same time, we plan to verify the secondary muon beam using the superconducting Transport Solenoid Magnet. We will report the current progress of the COMET experiment at the conference.

**Auteur principal:** FUKAO, Yoshinori (KEK IPNS)

**Orateur:** FUKAO, Yoshinori (KEK IPNS)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **75** Type: **Non spécifié**

# Assembly status of a new T2K near detector SuperFGD

The T2K experiment is a long baseline neutrino oscillation experiment aiming to discover CP violation in neutrino mixing. A new detector, SuperFGD, will be installed in the near detector to reduce systematic errors in the neutrino oscillation analysis. It consists of about 2 million 1 cm scintillator cubes, about 56,000 wavelength shifting fibers penetrating them from three directions, and an equal number of photodetector MPPCs. In this poster, we report the status of the SuperFGD assembly work at J-PARC, which started in October 2022.

**Auteur principal:** TANIGAWA, Hikaru (KEK)

**Orateur:** TANIGAWA, Hikaru (KEK)

**Classification de Session:** Poster session

ID de Contribution: **76** Type: **Non spécifié**

# Symmetry and Cosmology Probed by Neutrinos

*mercredi 29 mars 2023 11:50 (15 minutes)*

The goal of the C01 group is to propose new ideas for models that solve unsolved problems of the Standard Model, with particular attention to symmetry. With those new ideas, we aim to expand the range of new physics that can be explored in neutrino physics. In this talk, I will report on our recent activities, including new ideas for Grand Unified Theory, dark matter models, and magnetic monopoles.

**Auteur principal:** IBE, Masahiro (Institute for Cosmic Ray Research)

**Orateur:** IBE, Masahiro (Institute for Cosmic Ray Research)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **77** Type: **Non spécifié**

# Indirect detection of Dark Matter with radio observation

*mercredi 29 mars 2023 09:45 (15 minutes)*

Weakly Interacting Massive Particles(WIMPs) are most promising candidate of Dark Matter and annihilation of WIMPs could produce high-energy electrons.
In the presence of magnetic field, these high energy electrons emit synchrotron radiation.
Dwarf spheroidal galaxies (dSphs) are known to be Dark Matter dominated and low background object. Therefore dSphs are appealing candidates of indirect detection of Dark Matter.
We present the feasibility study of indirect detection of Dark Matter through radio observations against local dSphs.
The result of our analysis of archival radio data toward the Draco dwarf galaxy at 650MHz using GMRT and a proposal for new observations using e.g., JVLA will be presented.

**Auteur principal:** KAWAI, Chikara (University of Tokyo)

**Co-auteurs:** HATSUKADE, Bunyo (University of Tokyo); KOHNO, Kotaro (University of Tokyo); ASAI, Shoji (University of Tokyo); OSHIMA, Tai (National Astronomical Observatory of Japan); TAKEKOSHI, Tatsuya (Kitami Institute of Technology); NAMBA, Toshio (University of Tokyo)

**Orateur:** KAWAI, Chikara (University of Tokyo)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **78** Type: **Non spécifié**

# Nuclear emulsion in neutrino precise measurements.

*mercredi 29 mars 2023 11:35 (15 minutes)*

We report on the nuclear emulsion production facility and several neutrino and related experiments using nuclear emulsion produced at the facility. NINJA: neutrino study in GeV and sub GeV energy range at J-PARC, DsTau: tau neutrino production study in CERN SPS 400 GeV proton interactions, FASERnu and SND at LHC: high energy neutrino production/interaction study in forward from LHC collisions. This time, we will forcus on the performance in high energy experiments. The spatial and angular resolution of nuclear emulsion is suitable for short lived particle analysis like charms or tau particles. By tracking in the nuclear emulsion, an electron pair and an electron track can be recognized without mixing each other, then electron neutrinos can be identified almost free from NC+pi0 or background. The experiments using emulsion films can detect all three types of neutrinos separately through their CC interaction.The charm production studies in hadron interactions or neutrino interaction is subject of the experiments. In this talk, we will present the performance of our nuclear emulsion product by B02 group in Grant-in-Aid for Scientific Research on Innovation Areas “Exploration of Particle Physics and Cosmology with Neutrinos”.

**Auteur principal:** SATO, osamu (resercher)

**Orateur:** SATO, osamu (resercher)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **79** Type: **Non spécifié**

# Status of J-PARC Muon g-2/EDM experiment

*mercredi 29 mars 2023 09:00 (15 minutes)*

Preparations of a new experiment which aims to measure the muon's anomalous magnetic moment (g–2) and its electric dipole moment (EDM) at the J-PARC muon facility at MLF, MUSE, are underway.
Apart from conventional experimental method as E821(BNL) or E989(FNAL), dedicated muon beam line, we have developed a brand-new experimental method, and we expect the sensitivity goal is 0.46 parts per million (ppm) in the begining (~2028), aiming for 0.1 ppm as a ultimate goal.
In this presentation, overview of new challenges of very low-emittance muon beam line, beam storage method in MRI-sized storage magnet and tracking detector which realize reconstruction of muon beam's motion in the precisely adjusted magnetic field, as well as a current status of beam line construction.

**Auteur principal:** Prof. IINUMA, Hiromi

**Orateur:** Prof. IINUMA, Hiromi

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **80** Type: **Non spécifié**

# VHE gamma follow-up programs of HE neutrino alerts

*mercredi 29 mars 2023 08:45 (15 minutes)*

A decade has passed since high-energy astrophysical neutrinos have
been discovered by IceCube, although their progenitors are not yet
fully known. The reported coincidence of the high-energy IceCube-170922A with the gamma-ray blazar TXS 0506+056 has not definitively proven that these type of sources are the dominant high-energy neutrino emitters in the Universe.
In fact, IceCube recently announced a second correlation at a nearby
Seyfert galaxy, NGC 1068, which is not the same type as the
gamma-emitting blazars. The hunt for counterparts of the IceCube
neutrinos using gamma-ray telescopes started in 2012.
Nonetheless, these efforts will continue with the next-generation gamma-ray telescopes, such as the CTA Large Size Telescopes (LSTs), by means of
an improved and revised observation strategy. These new observations
will allow us to detect enough sources in order to elucidate the
mystery of the neutrino emitters.
In this contribution, we summarize the efforts made thus far in the
search for gamma-ray counterpart of high-energy IceCube events,
focusing on alerts made of multiple neutrinos events, and present an
idea for improvements in the observational strategies proposed from
the gamma-ray telescopes that will become operational in the coming decade.

**Auteurs principaux:** Dr FIASSON, Armand (LAPP - Annecy); NODA, Koji (Chiba University); ARTERO, Manuel

**Orateur:** NODA, Koji (Chiba University)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **82** Type: **Non spécifié**

# Quantum squeezing for Virgo and future generation gravitational-wave detectors

*mercredi 29 mars 2023 09:15 (15 minutes)*

The 2nd generation gravitational wave detectors network, including LIGO, Virgo, and KAGRA, ushered the era of gravitational wave (GW) astronomy, detecting more than 90 GW signals in the last years from the merging of binary compact objects. They are expected to start their fourth observation run (O4) in May this year, with improved sensitivity. The main limitation to the sensitivity comes from the quantum vacuum fluctuation coupling to the interferometer through the detector dark port. In the last observation run (O3) both LIGO and Virgo implemented a sophisticated technology (known as squeezing), in which vacuum fluctuations are modified to reduce their impact on the sensitivity. This led to an improvement in the detection rate of up to 50%. However, this technique allows for improving only the high-frequency part of the quantum noise spectrum. In order to achieve a broadband improvement it is necessary to reflect squeezed states by a long optical cavity and obtain the so-called frequency-dependent squeezing (FDS). For this reason, an FDS system, including a 285 m cavity, was constructed in Virgo and is currently under commissioning. In this presentation, after recalling the theory of quantum squeezing for gravitational-wave detectors, I will report on the recent results achieved with this system and on the expected impact on Virgo sensitivity. Finally, I will explain how the squeezing should be improved for future generation gravitational-wave detectors.

**Auteur principal:** ZHAO, Yuhang

**Co-auteurs:** CAPOCASA, Eleonora; DING, Jacques; BARSUGLIA, Matteo (AstroParticule et Cosmologie)

**Orateur:** ZHAO, Yuhang

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Gravitational Waves

ID de Contribution: **83** Type: **Non spécifié**

# Cosmological constraints on neutrinos and other light relics

*jeudi 30 mars 2023 14:25 (25 minutes)*

In this talk I will discuss how observations of the cosmic microwave background and of cosmological large-scale structures can be used to constrain the properties of neutrinos and other light relics. I will focus on “new physics” scenarios (e.g. beyond-standard-model neutrino interactions, axion-like particles….). I will further discuss detection prospects from forthcoming cosmological observations.

**Auteur principal:** LATTANZI, Massimiliano (Istituto Nazionale di Fisica Nucleare)

**Orateur:** LATTANZI, Massimiliano (Istituto Nazionale di Fisica Nucleare)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **84** Type: **Non spécifié**

# Modeling the cooling water of the magnetic horn system in the T2K neutrino beam line using image analysis for the improvement of the neutrino flux estimation

T2K is a long baseline neutrino oscillation experiment and search for CP violation in leptons using neutrino oscillation.For improving the result, it is very important to consider about the neutrino flux in Super Kamiokande (SK). Neutrino flux estimation is using neutrino beam simulation and one of the largest effects of the flux uncertainty is the cooling water for the magnetic horn : the device to focus pions for making neutrino beam. To estimate the water distribution in more detail from current estimation, we made the horn's mock-up and measured the water thickness with image analysis. As the method of image analysis, Edge detection is used in this study. We talk mainly about how to estimate the water distribution with the image analysis in the session.

**Auteur principal:** Mlle NISHIMORI, Sakiko (KEK)

**Co-auteur:** Prof. NAKADAIRA, Takeshi (KEK)

**Orateurs:** Mlle NISHIMORI, Sakiko (KEK); Prof. NAKADAIRA, Takeshi (KEK)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **85** Type: **Non spécifié**

# Status of squeezing and quantum enhancement for gravitational wave detection at NAOJ

*lundi 27 mars 2023 15:50 (25 minutes)*

The detection of gravitational waves uses highly sensitive interferometers that are now limited by quantum uncertainty of photon amplitude and phase. Advanced gravitational wave detectors employ the use of squeezed vacuum injection to reduce quantum noise across a broad band of detection frequencies. In the TAMA facility at the National Astronomical Observatory of Japan we maintain the 300m suspended cavity that was used as an initial demonstration of the viability of frequency dependent squeezing for gravitational wave detectors. In this presentation I will give an overview of the current outlook of the squeezing experiment as well as other possible avenues of quantum enhancement that could be investigated at our facility.

**Auteur principal:** PAGE, Michael (National Astronomical Observatory of Japan)

**Orateur:** PAGE, Michael (National Astronomical Observatory of Japan)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **86** Type: **Non spécifié**

# The next generation of CMB observation that will realize the neutrino mass measurement and the exploration of super-TeV physics

*mercredi 29 mars 2023 12:35 (15 minutes)*

We report on our recent research on cosmic microwave background observations (CMB) and development toward future experiments. We pursue new CMB measurements using POLARBEAR/Simons Array and GroundBIRD experiments. We also conduct research and development for next-generation CMB experiments in the areas of superconducting detectors and their readout, microwave optical elements, and analysis methodologies. In this talk, we will review the achievement and implications of these research by the A04 group in Grant-in-Aid for Scientific Research on Innovation Areas "Exploration of Particle Physics and Cosmology with Neutrinos".

**Auteur principal:** KUSAKA, Akito (The University of Tokyo / Lawrence Berkeley National Laboratory)

**Orateur:** KUSAKA, Akito (The University of Tokyo / Lawrence Berkeley National Laboratory)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **87** Type: **Non spécifié**

# Proton decay matrix element in lattice QCD on the physical point

We report the recent lattice QCD result of proton decay matrix element, which is QCD contribution to baryon number violating process, with PACS collaboration. We compute 12 relevant matrix elements on the physical point in lattice QCD, and this regards a more reliable value compared with the previous one computed from chiral extrapolation. In this poster, we show the systematic study to evaluate the systematic error and compare our result with other recent work in RBC collaboration.

**Auteur principal:** SHINTANI, Eigo (Tsukuba University)

**Orateur:** SHINTANI, Eigo (Tsukuba University)

**Classification de Session:** Poster session

**Classification de thématique:** Particle Physics

ID de Contribution: **88** Type: **Non spécifié**

# Highlights of Galactic observations with the MAGIC telescopes

*lundi 27 mars 2023 17:50 (25 minutes)*

There are several types of Galactic sources that can potentially accelerate charged particles up to GeV and TeV energies. These accelerated particles can produce Very High Energy (E>100 GeV) gamma-ray emission through different non-thermal processes such as inverse Compton scattering of ambient photon fields by accelerated electrons or pion decay after proton-proton collisions. Here we present highlight results of observations with the MAGIC telescopes on Galactic sources: millisecond pulsars, supernova remnants (SNRs), pulsar wind nebulae (PWNe), novae and binary systems. In particular, we present the promising PeVatron candidate SNR G106.3+2.7 containing an energetic PWN named Boomerang. Also, in the ongoing search for new source classes we looked for very-high-energy emission from the millisecond pulsar PSR J0218+4232 that has long been considered as one of the best candidates. Furthermore, we present the observations during an exceptionally bright X-ray outburst from the low mass X-ray binary MAXI J1820+070.
Finally, we highlight the MAGIC results of the first nova detected at very high energies: RS Ophiuchi, a recurrent symbiotic nova located in the Milky Way. The detection with the MAGIC telescopes proves a hadronic origin of the the gamma-ray emission, and helps in understanding the contribution of novae to the cosmic ray budget.

**Auteur principal:** HADASCH, Daniela

**Orateur:** HADASCH, Daniela

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **89** Type: **Non spécifié**

# Development of an ultra-fast, likelihood-based, distance inference, for the next generation of type-Ia supernovae surveys

As of today, the Hubble diagram, which maps the luminosity distance-redshift relation for type-Ia supernovae (SNe Ia), allows us to infer cosmological parameters such as the Dark Energy equation of state (w) with an accuracy reaching a few per cent. Upcoming SNIa samples with O(30,000) SNe (30 times the current worldwide statistics), will allow us to reach the per cent level and start probing potential evolutions of w with the redshift. To reach this goal, an effort has to be made to push the level of the systematic uncertainties affecting the distance measurements down to ~0.1%. In particular, luminosity distances are affected by a selection bias called 'Malmquist bias'. Being able to see only the most luminous supernovae at high distances decreases the apparent mean magnitude of the population and therefore, negatively biases the estimation of distances at high redshifts.

In current analyses, the value of this bias is determined by time-consuming simulations based on either a Bayesian framework or a multiple-time fitting approach. As a faster alternative, we propose a maximum likelihood-based method relying on a fast computation of the truncated likelihood function and its first and second-order derivatives. This new method allows us for a given survey to simultaneously estimate the luminosity distances of supernovae and the selection function of the survey. This prevents the distances from being biased and eases the propagation of uncertainties as all the parameters of the model are fitted at the same time. Eventually, we expect the inference of luminosity distances to be faster by a few orders of magnitude when compared to a classic Bayesian framework. This is essential to be able to deal with the 30-fold increase of statistics expected within the next decade.

**Auteur principal:** KUHN, Dylan

**Orateur:** KUHN, Dylan

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **90** Type: **Non spécifié**

# The quest for new correlations in the realm of the Gamma-Ray Burst – Supernova connection

Gamma-Ray Bursts (GRBs) are very energetic cosmological transients. Long GRBs are usually associated with Type Ib/c Supernovae (SNe), and we refer to them as GRB-SNe. Since the associated SN for a given GRB is observed only at low redshift, a possible selection effect exists when we consider intrinsically faint sources which cannot be observed at high redshift. Thus, it is important to explore the possible relationships between GRB and SN parameters after these have been corrected for astrophysical biases due to the instrumental selection effects and redshift evolution of the variables involved. So far, only GRB prompt emission properties have been checked against the SNe Ib/c properties without considering the afterglow (AG). This work investigates the existence of relationships among GRB's prompt and AG and associated SN properties. We investigate 91 bidimensional correlations among the SN and GRB observables before and after their correction for selection biases and evolutionary effects. As a result of this investigation, we find hints of a new correlation with a Pearson correlation coefficient > 0.50 and a probability of being drawn by chance < 0.05. This correlation is between the luminosity at the end of the GRB optical plateau emission and the rest-frame peak time of the SN. According to this relation, the brightest optical plateaus are accompanied by the largest peak times. This correlation is corrected for selection biases and redshift evolution and may provide new constraints for the astrophysical models associated with the GRB-SNe connection.

**Auteur principal:** DAINOTTI, Maria (NAOJ; SOKENDAI)

**Co-auteurs:** Prof. GANGOPADHYAY, Anjasha (Hiroshima University); DE SIMONE, Biagio (University of Salerno; INFN); M. KAWAGUCHI, Kenzaburo (Kumamoto University); M. ISLAM, Khadir M. (University of Constantine 1); TOMINAGA, Nozomu (Konan University); Prof. MORIYA, Takashi (NAOJ; SOKENDAI; Monash University); Prof. TAKIWAKI, Tomoya (NAOJ; SOKENDAI)

**Orateur:** DE SIMONE, Biagio (University of Salerno; INFN)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **91** Type: **Non spécifié**

# Multi-messenger observations of the high-energy transient sky

*jeudi 30 mars 2023 11:00 (25 minutes)*

The last years have brought about unprecedented breakthroughs and discoveries in high-energy astrophysics. Most of them are related to transient phenomena and involve an increasing number of cosmic messengers ranging now from radiation across the full electromagnetic spectrum, to high-energy neutrino and gravitational waves. Due to their high sensitivity and increasingly optimized response to transient phenomena, high-energy gamma-ray observatories are playing a major role in this new field of time-domain and multi-messenger astrophysics at the highest energies.
In this presention I will review some of the recent highlights involving transient multi-messenger phenomena with a focus on studies using Imaging Atmospheric Cherenkov Telescopes. I will present current state-of-the-art target-of-opportunity observations searching for high-energy gamma-ray emission from a variety of sources including gamma-ray bursts, gravitational waves, and high-energy neutrinos.

**Auteur principal:** SCHUSSLER, Fabian (CEA/Irfu)

**Orateur:** SCHUSSLER, Fabian (CEA/Irfu)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **92** Type: **Non spécifié**

# Concluding Remarks

*jeudi 30 mars 2023 16:05 (25 minutes)*

In these concluding remarks, I will recall the considerable progress made recently on questions related to the physics of the two infinities, elaborate on new questions as they are coming and on how they might be experimentally addressed.

**Auteur principal:** SPIRO, Michel (in2p3)

**Orateur:** SPIRO, Michel (in2p3)

**Classification de Session:** Session

ID de Contribution: **93** Type: **Non spécifié**

# Prime Focus Spectrograph - A Subaru's next-generation facility instrument under commissioning

*lundi 27 mars 2023 11:25 (25 minutes)*

Prime Focus Spectrograph (PFS) is a very wide-field, highly multiplexed optical-NIR spectrometer on the Subaru telescope being developed by the international collaboration led by Kavli IPMU. Since Sep 2021, engineering observations are being carried out several times and the Engineering First Light was accomplished in Sep 2022. In this presentation, I will give an overview of the achievements in the system integration and engineering observations and will summarize the future perspectives to the science operation.

**Auteur principal:** TAMURA, Naoyuki (Kavli IPMU, the University of Tokyo)

**Orateur:** TAMURA, Naoyuki (Kavli IPMU, the University of Tokyo)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **98** Type: **Non spécifié**

# Latest results and perspectives for Super-Kamiokande

*mardi 28 mars 2023 11:50 (25 minutes)*

Super-Kamiokande is a highly versatile multi-purpose experiment, with capability to explore variety of topics in the MeV - TeV energy range. This includes, among others, physics related to solar and atmospheric neutrinos, supernovae neutrinos, diffuse supernovae neutrino background (DSNB), neutrino astrophysics, and the study of dark matter as well as proton decay and other baryon number-violating processes. The SK detector also serves as far detector for T2K which is a long baseline neutrino oscillation experiment. The latest results regarding solar, atmospheric and beam neutrinos will be discussed in the talk. In August 2020 the SK collaboration finished adding Gadolinium (Gd) to the 50 ktons of water of its tank. The addition of Gd allows to unambiguously differentiate neutrinos from antineutrinos by discriminating neutrons from protons improving the already excellent sensitivity of the experiment. The perpectives of this new phase of SK will be discussed with a focuss on the search for the DSNB.

**Auteur principal:** MUELLER, Thomas (CNRS / IN2P3 / LLR)

**Orateur:** MUELLER, Thomas (CNRS / IN2P3 / LLR)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **99** Type: **Non spécifié**

# A whirlwind tour of the Milky Way in gamma rays

*mardi 28 mars 2023 17:55 (25 minutes)*

Observations have revealed a rich and diverse set of objects in the Milky Way capable of accelerating particles and emitting gamma rays. Pulsars and their wind nebulae are established as the dominant source classes in the GeV and TeV domains, respectively. Supernova remnants and compact binary systems are the other long-known source classes, with the most recent additions of globular clusters, massive star-forming regions, pulsars halos, and novae. In this presentation I will provide an overview of Galactic gamma-ray sources, with highlights on some recent results. I will also discuss tantalizing signals potentially related to dark-matter annihilation in the central regions of the Milky Way or to antistars.

**Auteur principal:** TIBALDO, Luigi (IRAP/Université Toulouse III)

**Orateur:** TIBALDO, Luigi (IRAP/Université Toulouse III)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **100** Type: **Non spécifié**

# Interplay between Cosmology and Neutrinos Physics

*lundi 27 mars 2023 10:40 (25 minutes)*

The intersection of the cosmic and neutrino frontiers is a rich field where much discovery space still remains. When convolved with results from terrestrial experiments, cosmology can probe new physics related to neutrinos or even beyond the Standard Model. Any discordance between laboratory and cosmological data sets may reveal new physics in the neutrino sector or suggest alternative models of cosmology. In this talk, examples of the intersection between terrestrial and cosmological probes in the neutrino sector will be given.

**Auteur principal:** GERBINO, Martina (INFN Ferrara)

**Orateur:** GERBINO, Martina (INFN Ferrara)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **101** Type: **Non spécifié**

# Quality control of wavelength shifting fibers during assembly for a new T2K near detector SuperFGD

T2K is a long baseline neutrino oscillation experiment in Japan. We are constructing a new tracking detector SuperFGD which consists of 2 million plastic scintillator cubes. The detector will enable us to measure neutrino interactions more precisely.
Approximately 55,000 wavelength shifting fibers are inserted into the cubes to read out the scintillation light. It is important to identify the damaged fibers when the transmission efficiency gets worse during insertion work. To find bad fibers quickly and control the quality of the insertion work continuously, we have developed a dedicated system which can be operated in parallel with the fiber insertion work. I will report a method and a result of quality control conducted for the actual detector.

**Auteur principal:** KAWAUE, Masaki (Kyoto U)

**Orateur:** KAWAUE, Masaki (Kyoto U)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **103** Type: **Non spécifié**

# Advanced Virgo+ Status and Perspectives

*jeudi 30 mars 2023 15:15 (25 minutes)*

The Virgo detector contributed to the observations in the O3 observing run and increased its sensitivity from the initial 46 up to 60 Mpc during the run.
The detector has undergone to a series of improvements since the end of the O3 observing run in view of O4, that will last 18 months, at present planned to start on 24 May 2023 preceded by an engineering run.
The major upgrades with respect to the Advanced Virgo configuration are the implementation of an additional recycling cavity at the output of the interferometer –the Signal Recycling cavity (SRC) –to broaden the sensitivity band and the Frequency Dependent Squeezing (FDS) to reduce quantum noise at all frequencies, and a new higher power laser.
The interferometer is still in the commissioning phase and some criticalities have emerged mainly due to the presence in Virgo of marginally stable cavities with respect to the stable recycling cavities present in the LIGO detectors, which increases the difficulty in controlling the interferometer in presence of defects as those introduced by the higher power on the mirrors.
A new stop of about 2 yr is planned between O4 and O5 starting in 2027, to implement new upgrades (phase II). The more invasive change, to improve the behaviour at high power, is the installation of larger and heavier new generation mirrors with the consequences on suspensions and a more powerful laser. The aim is to reach a 200Mpc sensitivity.
Plans are being made for the post-O5 period as a bridge between 2nd and 3rd generation detectors and a new collaborative effort has born under the name of Virgo_nEXT with the aim to keep and push the infrastructure and maintain alive the community.

**Auteur principal:** GARUFI, Fabio (Università degli Studi di Napoli Federico II and INFN Napoli)

**Orateur:** GARUFI, Fabio (Università degli Studi di Napoli Federico II and INFN Napoli)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **104** Type: **Non spécifié**

# Particle physics with muons

*jeudi 30 mars 2023 08:55 (25 minutes)*

The muon has played an important role in establishing the SM of the particle physics and is now a good probe into physics at very high energy. A variety of exeperiments are ongoing or about to start at high-intensity muon facilities in the world. In this talk, a review of these experiments, including both charged-lepton-flavor conserving and violating processes, will be given.

**Auteur principal:** UCHIYAMA, Yusuke (ICEPP, UTokyo)

**Orateur:** UCHIYAMA, Yusuke (ICEPP, UTokyo)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **105** Type: **Non spécifié**

# Exploring the primordial Universe with QUBIC

*mardi 28 mars 2023 11:25 (25 minutes)*

The Q & U Bolometric Interferometer for Cosmology (QUBIC) is a novel kind of CMB polarimeter, installed on the Puna plateau in Argentina and inaugurated at the end of 2022. QUBIC is optimized for the measurement of the B-mode polarization of the CMB, one of the major challenges of observational cosmology. The signal is expected to be of the order of a few tens of nK, prone to instrumental systematic effects and polluted by various astrophysical foregrounds which can only be controlled through multichroic observations. QUBIC is designed to address these observational issues with a novel approach, Bolometric Interferometry, that combines the advantages of interferometry in terms of control of instrumental systematic effects with those of bolometric detectors in terms of wide-band, background-limited sensitivity. The QUBIC synthesized beam has a frequency-dependent shape that results in the ability to produce maps of the CMB polarization in multiple sub-bands within the two physical bands of the instrument (150 and 220 GHz). Alternatively, QUBIC offers the possibility to perform component separation directly at the map-making stage, incorporating external information in a modular fashion. These features make QUBIC complementary to other instruments and makes it particularly well suited to characterize and remove Galactic foreground contamination.

I will present the status of QUBIC, calibration results, the first real sky observations as well as forecasts for B-modes detection. I will insist on the specific spectral-imaging feature that allows Bolometric Interferometry to identify foreground contamination in a unique manner, even in the pessimistic case of Galactic dust exhibiting frequency domain decorrelation

**Auteur principal:** HAMILTON, Jean-Christophe (APC)

**Orateur:** HAMILTON, Jean-Christophe (APC)

**Classification de Session:** Session

**Classification de thématique:** Primordial Universe

ID de Contribution: **106** Type: **Non spécifié**

# Exploring ”dark” side of galaxy formation in the early Universe

*lundi 27 mars 2023 09:50 (25 minutes)*

I will report on the latest progress of observational studies of high-redshift galaxies using optical to radio facilities including Atacama Large Millimeter/submillimeter Array (ALMA), Subaru Telescope, Hubble Space Telescope (HST), Spitzer Space Telescope (SST) and James Webb Space Telescope (JWST). Specifically, I will focus on (1) the formation of super-massive black holes in the early universe and (2) the nature of near-infrared invisible, heavily obscured galaxies uncovered by ALMA with the assistance of gravitational lensing.

**Auteur principal:** KOHNO, Kotaro (University of Tokyo)

**Orateur:** KOHNO, Kotaro (University of Tokyo)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **107** Type: **Non spécifié**

# What can we learn from gravitational waves ?

*lundi 27 mars 2023 15:00 (25 minutes)*

The new cosmic window opened by gravitational waves is expected to further expand in the future. The aspect of gravitational wave astronomy, which captures astrophysical phenomena related to compact stars, is in the spotlight, but the understanding of fundamental aspects of physics using gravitational waves is also steadily in progress. We will discuss what kind of information can be extracted from gravitational wave observations, including expectations for future development.

**Auteur principal:** TANAKA, Takahiro (Department of Physics, Kyoto University)

**Orateur:** TANAKA, Takahiro (Department of Physics, Kyoto University)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **108** Type: **Non spécifié**

# Physics and status of the Hyper-Kamiokande experiment

*lundi 27 mars 2023 11:50 (25 minutes)*

Hyper-Kamiokande is the next generation neutrino observatory to be built in Japan, and the successor of the Kamiokande and Super-Kamiokande detectors. It will be a 260 kton water Cherenkov detector, equiped with 20,000 PMTs, that has been considerably improved compared to the previous generation. It will allow the Hyper-Kamiokande experiment to have an extremely broad physics program: probing Grant Unified Theories through nucleon decay search, testing non-standard scenario observing solar neutrinos, constrain the supernovae models and star formation rate, or discover the leptonic CP violation for the very first time.
In this presentation, we will explore the physics program of Hyper-Kamiokande in details, as well as present the status of the Hyper-Kamiokande construction that should be finalized in 2027.

**Auteur principal:** QUILAIN, Benjamin (CNRS In2p3, Ecole Polytechnique, Laboratoire Leprince-Ringuet)

**Orateur:** QUILAIN, Benjamin (CNRS In2p3, Ecole Polytechnique, Laboratoire Leprince-Ringuet)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **109** Type: **Non spécifié**

# Straight to the Future - Physics Program and Status of the International Linear Collider

*mardi 28 mars 2023 14:40 (25 minutes)*

Ever since its discovery at the LHC in 2012, the Higgs boson is regarded as a messenger from yet charted realms of particle physics, beyond the so-called Standard Model. It is thus expected to play a unique role in understanding many open questions about our universe - from the electroweak phase transition and its relation to baryogenesis to the nature of dark matter and the origin of the mass and flavour hierarchy among quarks and leptons. A precise characterization of the Higgs boson's properties and interactions at a dedicated type collider, with capabilities complementary to those of the HL-LHC, will provide crucial clues to solving these puzzles. The technologically most mature project for such a "Higgs factory" is the International Linear Collider (ILC), a global project with strong ties to Japan. This contribution will review the physics program of the ILC, including the resulting challenges for the detectors and the status of the accelerator design.

**Auteur principal:** LIST, Jenny (DESY)

**Orateur:** LIST, Jenny (DESY)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **110** Type: **Non spécifié**

# Observations at the tera-electronvolt of the extragalactic sky: a selection of important results

*lundi 27 mars 2023 17:25 (25 minutes)*

With the current generation of Cherenkov telescopes, a new window at the tera-electronvolt has been opened. Important discoveries were made over les that decade such as observations of fast variability of blazars, new class of emitters such as Radio-galaxies or Gamma-ray bursts. In this presentation, I will discuss a selection of important results and what are the main question that the next generation will have to answer.

**Auteur principal:** SANCHEZ, David (LAPP/IN2P3)

**Orateur:** SANCHEZ, David (LAPP/IN2P3)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **111** Type: **Non spécifié**

# JUNO physics prospects

*mardi 28 mars 2023 12:15 (25 minutes)*

The Jiangmen Underground Neutrino Observatory (JUNO) is a multipurpose observatory under construction in China. The JUNO detector consists of a 20kton liquid scintillator target monitored by about 18k 20 inch PMT and about 26k 3 inch PMT. This detector is strategically located 53 km from the Taishan and Yangjiang Nuclear Power Plants in order to precisely measure reactor anti-neutrino oscillations. With these measurements JUNO will be able to achieve sub-percent precision on several oscillation parameters as well as determination of the neutrino mass ordering to 3 sigma in 6 years of operation. Besides reactor anti-neutrinos, JUNO will also be able to study neutrinos from several other sources, such as solar or supernova neutrinos, and to search for BSM physics. This talk will provide an overview on JUNO's physics potential.

**Auteur principal:** ATHAYDE MARCONDES DE ANDRE, Joao Pedro (IPHC)

**Orateur:** ATHAYDE MARCONDES DE ANDRE, Joao Pedro (IPHC)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **112** Type: **Non spécifié**

# Cosmology with Subaru HSC/PFS

*mardi 28 mars 2023 16:40 (25 minutes)*

The Hyper Suprime-Cam (HSC) and the Prime Focus Spectrograph (PFS) at the 8.2m Subaru Telescope are powerful instruments enabling wide-area imaging and spectroscopic surveys of galaxies. The international team, being led by Kavli IPMU, are using the HSC data to estimate cosmological parameters, and also envision that we will start the PFS survey in 2024. In this talk I report the cosmological results using the interim HSC data and discuss the prospect of cosmology with the combined HSC and PFS data of the same region of the sky.

**Auteur principal:** TAKADA, Masahiro (Kavli IPMU)

**Orateur:** TAKADA, Masahiro (Kavli IPMU)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **113** Type: **Non spécifié**

# Machine learning for gravitational wave inference

*mardi 28 mars 2023 09:00 (25 minutes)*

A major bottleneck in the analysis of current and future gravitational wave detector data is the computational cost of parameter inference. This is largely driven by the cost of computing physically complete gravitational waveforms. There are various ways that this problem can be tackled, ranging from accelerating the evaluation of waveform models to reducing the number of waveform evaluations needed in any given parameter estimation calculation. In recent years machine learning methods have been applied to this problem and these are starting to reach maturity. In this talk I will describe DINGO, a machine learning method based on normalising flows that can directly generate samples from GW parameter posteriors given observed data as input. I will show that DINGO can produce results indistinguishable from those generated by standard approaches, but in a small fraction of the time. I will discuss techniques for verifying these results, and outline prospects for the future extension of this work.

**Auteur principal:** GAIR, Jonathan (AEI Potsdam)

**Orateur:** GAIR, Jonathan (AEI Potsdam)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **114** Type: **Non spécifié**

# Instrumentation Technology Development at KEK

*mardi 28 mars 2023 15:05 (25 minutes)*

A new test beam line for detector development was built at KEK,
and currently is under commissioning. A new group, Instrumentation
Technology Development Center (ITDC), has been also formed
under Institute for Particle and Nuclear Studies to drive the new
test beam line, and to be an international hub for technology development.
We present the overview and status of the test beam line and ITDC.

**Auteur principal:** HANAGAKI, Kazunori (KEK)

**Orateur:** HANAGAKI, Kazunori (KEK)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **115** Type: **Non spécifié**

# Binary Neutron Stars: from macroscopic collisions to microphysics

*mardi 28 mars 2023 18:20 (25 minutes)*

I will argue that if black holes represent one the most fascinating implications of Einstein's theory of gravity, neutron stars in binary system are arguably its richest laboratory, where gravity blends with astrophysics and particle physics. I will discuss the rapid recent progress made in modelling these systems and show how the gravitational signal can provide tight constraints on the equation of state and sound speed for matter at nuclear densities, as well as on one of the most important consequences of general relativity for compact stars: the existence of a maximum mass. Finally, I will discuss how the merger may lead to a phase transition from hadronic to quark matter. Such a process would lead to a signature in the post-merger gravitational-wave signal and open an observational window on the production of quark matter in the present Universe.

**Auteur principal:** REZZOLLA, Luciano (University of Frankfurt)

**Orateur:** REZZOLLA, Luciano (University of Frankfurt)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **116** Type: **Non spécifié**

# The Einstein Telescope project

*lundi 27 mars 2023 15:25 (25 minutes)*

The direct detection of gravitational waves (GWs), with breakthrough discoveries of merging black holes and neutron stars over the past years has revolutionized our understanding of the Universe. This success of second-generation laser-interferometric detectors have ushered scientists into the new era of gravitational-wave astronomy. This scientific field is now attracting more and more interest around the world. Building on the success of the ongoing LIGO, Virgo and KAGRA projects, the Einstein Telescope (ET) is an underground infrastructure project to host a third-generation GW observatory in Europe. ET has the great ambition to detect GW sources throughout cosmic history up to the primordial Universe just after the Big Bang, increasing from about 100 per year to several hundred thousand per year the number of detections of black hole and neutron star mergers. ET has been recently included in the ESFRI roadmap, and the ET collaboration has officially been formed in June 2022, bringing together 1300 scientists from almost 100 institutes. This contribution will give an overview of the Einstein Telescope project, both on the scientific and technological aspects.

**Auteur principal:** VERDIER, Patrice (IP2I Lyon - IN2P3)

**Orateur:** VERDIER, Patrice (IP2I Lyon - IN2P3)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **117** Type: **Non spécifié**

# GRAINE project: Cosmic gamma-ray observation by balloon-borne emulsion telescope

*mercredi 29 mars 2023 16:30 (25 minutes)*

GRAINE (Gamma-Ray Astro-Imager with Nuclear Emulsion) is GeV/sub-GeV cosmic gamma-ray observation project with balloon-borne nuclear emulsion telescope. It can determine incident gamma ray angle via pair creation, with small material thickness (.002 radiation length par film). Angular resolution can reach close to the kinematical limit, which is 0.1° for 1 GeV gamma-ray (1.0° for 100 MeV), and polarization information can also be provided. By repeating balloon flights with emulsion telescopes having large aperture area ($10m^2$) and wide viewing angle (zenith to 45°), GRAINE will provide qualitatively new data with finer resolution and polarization information in the field of gamma ray astronomy in GeV/sub-GeV band. The current status and future prospects are introduced.

**Auteur principal:** AOKI, Shigeki (Kobe University)

**Orateur:** AOKI, Shigeki (Kobe University)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **118** Type: **Non spécifié**

# Current status and future physics potential of the DUNE experiment

*jeudi 30 mars 2023 11:50 (25 minutes)*

The Deep Underground Neutrino Experiment (DUNE) is a next-generation long-baseline neutrino oscillation experiment that will employ large-scale cutting-edge liquid argon time projection chamber detectors and the most intense neutrino beam in the world to answer fundamental open questions in particle physics. The experiment's main goals include precision measurement of neutrino oscillation parameters, notably the CP violating phase delta, that could account for the imbalance between matter and antimatter in the universe, and the unambiguous determination of the neutrino mass hierarchy. DUNE will also be sensitive to electron neutrinos from a core-collapse galactic supernova burst, to measuring atmospheric neutrino oscillation, and it will perform a broad range of additional searches beyond the Standard Model. In this talk I will give an overview of the DUNE experiment, including its detector technology, physics programme, current status and future physics potential.

**Auteur principal:** BRUNETTI, Maria Brigida (University of Warwick)

**Orateur:** BRUNETTI, Maria Brigida (University of Warwick)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **119** Type: **Non spécifié**

# Machine Learning for cosmology: expectations with galaxy surveys

*mardi 28 mars 2023 11:00 (25 minutes)*

In this presentation I will talk about current pathways of machine learning in cosmology, leveraging classical as well as more recent techniques. I will show along some selected examples under the prism of the recent and upcoming galaxy surveys.

**Auteur principal:** BOUCAUD, Alexandre (APC / IN2P3)

**Orateur:** BOUCAUD, Alexandre (APC / IN2P3)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **120** Type: **Non spécifié**

# KamLAND-Zen Experiment

*mercredi 29 mars 2023 17:20 (25 minutes)*

KamLAND-Zen is a double beta decay experiment with the enriched xenon-loaded liquid scintillator. Increasing the number of double beta-decay nucleus is a key to improve the sensitivity on the neutrinoless decay mode. Among a dozen of target nuclei, xenon gas is easily solved in the liquid scintillator by about 3 wt%, so the experiment with 380 kg xenon (KamLAND-Zen 400) became feasible early and demonstrated excellent sensitivity. To enhance the sensitivity, the KamLAND-Zen detector was upgraded to larger volume containing 745 kg xenon(KamLAND-Zen 800), corresponding to a twofold increase. Based on the improved analysis with 1 ton-year exposure, KamLAND-Zen has provided the most stringent on the effective neutrino mass, and started probing the inverted mass ordering region for the first time.

**Auteur principal:** SHIMIZU, Itaru (Tohoku University)

**Orateur:** SHIMIZU, Itaru (Tohoku University)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **121** Type: **Non spécifié**

# The LiteBIRD space mission

*jeudi 30 mars 2023 11:25 (25 minutes)*

LiteBIRD, the Lite (Light) satellite for the study of B-mode polarization and Inflation from cosmic background Radiation Detection, is a space mission for the exploration of primordial cosmology. The Japan Aerospace Exploration Agency (JAXA) selected LiteBIRD in 2019 as a strategic Large-class mission expected to be launched at the end of the decade. LiteBIRD will orbit the Lagrangian point L2 of the Sun-Earth system, observing the CMB polarization across the entire sky for three years. The primary scientific goal of LiteBIRD is to measure the tensor-to-scalar ratio with a precision of 0.001, allowing to probe the physics of the very early Universe to find relics of primordial gravitational waves produced during the hypothetical inflationary phase of the Universe. LiteBIRD will observe in 15 frequency bands from 34 to 448 GHz distributed over three telescopes, achieving an unprecedented total sensitivity of 2.2 μK-arcmin, with an angular resolution of 0.5° at 100 GHz. In this presentation, I will give an overview of the project, giving details about the status of the mission, its scientific goals, current instrument design and requirements.

**Auteur principal:** LELOUP, Clément (Kavli IPMU)

**Orateur:** LELOUP, Clément (Kavli IPMU)

**Classification de Session:** Session

**Classification de thématique:** Primordial Universe

ID de Contribution: **122** Type: **Non spécifié**

# Recent Results of Fermi

*lundi 27 mars 2023 18:15 (25 minutes)*

Fermi Gamma-ray Space Telescope is an international space mission. It consists of two instruments, Large Area Telescope (LAT) and Gamma-ray Burst Monitor (GBM). Since its launch in 2008, Fermi has played a crucial role in astrophysics. In this contribution, I will describe the recent results of Fermi.

**Auteur principal:** MIZUNO, Tsunefumi (Hiroshima University)

**Orateur:** MIZUNO, Tsunefumi (Hiroshima University)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **123** Type: **Non spécifié**

# SND@LHC : Scattering and Neutrino Detector at the LHC

*jeudi 30 mars 2023 09:45 (25 minutes)*

SND@LHC is a compact and stand-alone experiment to perform measurements with neutrinos produced at the LHC in a hitherto unexplored pseudo-rapidity region of 7.2 < ⍰ < 8.6, complementary to all the other experiments at the LHC. The experiment is located 480 m downstream of IP1 in the unused TI18 tunnel. The detector is composed of a hybrid system based on an 800 kg target mass of tungsten plates, interleaved with emulsion and electronic trackers, followed downstream by a calorimeter and a muon system. The configuration allows efficiently distinguishing between all three neutrino flavours, opening a unique opportunity to probe physics of heavy flavour production at the LHC in the region that is not accessible to ATLAS, CMS and LHCb. This region is of particular interest also for future circular colliders and for predictions of very high-energy atmospheric neutrinos. The detector concept is also well suited to searching for Feebly Interacting Particles via signatures of scattering in the detector target. The first phase aims at operating the detector throughout LHC Run 3 to collect a total of 290 fb−1. The experiment was recently installed in the TI18 tunnel at CERN and has seen its first data. A new era of collider neutrino physics is just starting.

**Auteur principal:** LEE, Kang Young (Gyeongsang National University)

**Orateur:** LEE, Kang Young (Gyeongsang National University)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **124** Type: **Non spécifié**

# What are the key open questions in particle physics ?

*jeudi 30 mars 2023 14:50 (25 minutes)*

In this talk, I will review the most important problems in particle physics and give my perspective on how they are connected.

**Auteur principal:** PESKIN, Michael (SLAC)

**Orateur:** PESKIN, Michael (SLAC)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **125** Type: **Non spécifié**

# Preparation for the second telescope of the Simons Array CMB polarization experiment

The cosmic microwave background (CMB) has a variety of information that is useful for understanding the early universe. The Simons Array, an ongoing ground-based CMB experiment, is located in the Atacama plateau in northern Chile. Its second telescope receiver has been installed and is being prepared at the site, including the set-up of the ambient temperature equipment and readout testing, and it expects the first light soon. In this poster, I discuss the status of the telescope and observation.

**Auteur principal:** SAKAGURI, Kana (The University of Tokyo)

**Orateur:** SAKAGURI, Kana (The University of Tokyo)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **126** Type: **Non spécifié**

# Machine learning in High Energy Physics

*jeudi 30 mars 2023 09:20 (25 minutes)*

Machine learning has come a long way from classification and regression tasks in science and in particle physics in particular. It has made formidable quantum leaps on several fronts in the recent years which open ever more doors for breakthroughs in science. The talk will discuss the opportunities in High Energy Physics for machine learning to facilitate better use of human and computational resources and to improve the capacity to extract information from the unique LHC data set. Examples will include the computational challenge to simulate billions of LHC particle collisions, the search for feeble anomalous signals in a deluge of data or inferring the underlying theory of nature by use of data which has been convolved with complex detector responses.

**Auteur principal:** GOLLING, Tobias (University of Geneva)

**Orateur:** GOLLING, Tobias (University of Geneva)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **127** Type: **Non spécifié**

# New optical testing method using a power-tunable millimeter-wave source for laboratory characterization of TES detector systems for CMB observation

Observing the degree-scale polarization pattern called “B-mode”in the cosmic microwave background radiation (CMB) map is expected to be proof of primordial gravitational wave and a key to revealing the inflationary universe. Recently, CMB polarization observation experiments with higher experimental sensitivities are in progress or planned.
For such precise CMB polarization observations, it is essencial to control systematic effects caused by the instruments of the telescopes because the B-mode signal is very faint. Understanding the optical characteristic of the detector system carefully is one of the important points to mitigate such systematics. In highly sensitive CMB observation experiments, minor nonidealities in the optical characteristics may affect the observation over several years.
Measuring the optical characteristic so deeply that such minor nonidealities can be found requires a high dynamic range of the measurement. But the transition-edge sensor (TES), which is one major type of detector in the recent CMB observations, makes it difficult because of its low dynamic range.
In this poster presentation, I propose a new optical testing method that employs an artificial power-tunable millimeter-wave source and is feedback-controlled to extend the dynamic range of the measurement. I show the concept of the method, a demonstration in a laboratory using a room-temperature diode detector, and prospects for application to the actual CMB observation experiments.

**Auteur principal:** HIROSE, Haruaki (Yokohama National University)

**Orateur:** HIROSE, Haruaki (Yokohama National University)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **128** Type: **Non spécifié**

# Detection of Supernova Neutrinos with KM3NeT

*mercredi 29 mars 2023 14:55 (25 minutes)*

The discovery of 25 neutrinos coming from the SN1987A core-collapse supernova (CCSN) by the Super-Kamiokande, IMB and Baksan experiments marked the beginning of neutrino astronomy. A new observation of supernova neutrinos with current or upcoming detectors could provide key insight into the underlying mechanism of CCSNe, which is currently poorly understood. Due to the low interaction rate of neutrinos, these detectors are however only sensitive to supernovae occurring in our galaxy or its immediate surroundings. Since such events are quite rare, it is crucial to optimize the detection channels of all sensitive experiments. In this contribution, we discuss the current supernova detection and characterization techniques of the KM3NeT telescopes, ARCA and ORCA, currently under construction and taking data in the Mediterranean Sea. We demonstrate how KM3NeT's optical module design will allow the detector to be sensitive to most supernovae in the galaxy, and to characterize neutrino emission spectra and luminosity curves. Finally, we discuss KM3NeT's contributions to thethe SuperNova Early Warning System (SNEWS), notably for triangulation analyses.

**Auteur principal:** EL HEDRI, Sonia

**Co-auteurs:** DORNIC, Damien (CPPM); VANNOYE, Godefroy; GOOS, Isabel Astrid; BENDAHMAN, Meriem; KULIKOVSKIY, Vladimir (CPPM)

**Orateur:** EL HEDRI, Sonia

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **129** Type: **Non spécifié**

# Characterization of an HWP for CMB circular polarization measurement with POLARBEAR

A half-wave plate (HWP) is often used as a modulator to suppress systematic error in cosmic microwave background (CMB) polarization measurements. An HWP can also be used to measure circular polarization through its optical leakage from circular to linear polarization. The circular polarization of the CMB is predicted to be produced by interactions in the Universe, such as interactions with supernova remnants of population III stars.
In this presentation, I show the results of HWP characterization in the POLARBEAR experiment using data taken in the laboratory, including the optical leakage between circular and linear polarization. I also show the prediction of the circular polarization measurement estimated from the noise level of the previous POALRBEAR result.

**Auteur principal:** FUJINO, Takuro (Yokohama National University)

**Orateur:** FUJINO, Takuro (Yokohama National University)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **130** Type: **Non spécifié**

# Imaging dark energy at Subaru and Rubin.

*mardi 28 mars 2023 17:05 (25 minutes)*

Cosmic shear refers to the subtle distortion of distant galaxy shapes due to the spatial matter density fluctuations between these galaxies and the observer. From these measurements, one can constrain both the expansion history and the evolution of density perturbations in the late universe. Confronting these two aspects allows one to test GR on large spatial scales, and, assuming GR, and to constraint the nature of Dark Energy. I will describe some of the challenges of the probe, the analyses performed on the data of the Subaru Strategic Program, and the approaches being developed for Rubin/LSST.I will also also review the status of the high-z supernova survey on the Subaru and HST.

**Auteur principal:** ASTIER, Pierre (LPNHE)

**Orateur:** ASTIER, Pierre (LPNHE)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **131** Type: **Non spécifié**

# Review on the Interplay between Particle Physics Results and Cosmology

*lundi 27 mars 2023 16:35 (25 minutes)*

The study of particle physics and cosmology are closely intertwined, as they both seek to understand the fundamental workings of the Universe.
Particle physics experiments at colliders such as the Large Hadron Collider have provided crucial information about the properties of fundamental particles
In this talk, we will review the latest results in particle physics and their implications for cosmology.
Topics covered will include the search for dark matter, the discovery of the Higgs boson, and the measurement of the Higgs potential.
We will also discuss the ways in which particle physics and cosmology can be used to test fundamental theories, such as inflation and supersymmetry.
Finally, we will look ahead to future experiments and observations, and speculate on the exciting discoveries that may lie ahead.

**Auteur principal:** SALERNO, Roberto (LLR)

**Orateur:** SALERNO, Roberto (LLR)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **132** Type: **Non spécifié**

# SMILE project: balloon experiments for observations of cosmic MeV gamma-rays

*mercredi 29 mars 2023 16:55 (25 minutes)*

MeV gamma-ray is a unique window for direct observation of nucleosynthesis in the universe. But there is not any big progress after COMPTEL, which was launched in 1991, because the observation in MeV gamma-ray band is obstructed by many backgrounds produced in the interaction between cosmic rays and detector materials. To open the MeV gamma-ray window, we are developing an electron-tracking Compton camera (ETCC). This ETCC consists of a gaseous electron tracker and the surrounding pixel scintillators, and it detects the momentum of incident gamma-ray with the complete construction of Compton scattering, event by event. In 2018, we launched 2nd balloon (SMILE-2+) to confirm the observation ability of celestial objects using an ETCC. Additionally, the results of SMILE-2+ suggest that the galactic diffuse gamma-ray is very bright and large spreading. In this talk, we present our SMILE project and SMILE-2+ results.

**Auteur principal:** TAKADA, Atsushi (Kyoto University)

**Orateur:** TAKADA, Atsushi (Kyoto University)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **133** Type: **Non spécifié**

# Simons Array and Simons Observatory; probing cosmic inflation and particle physics from Chile

*lundi 27 mars 2023 10:15 (25 minutes)*

The frontier of cosmic microwave background (CMB) studies is to measure the CMB polarization. It provides a unique and powerful way to explore cosmic inflation, neutrino masses, and other possible light relics such as Axions.
In this talk, I will present an overview and status of two CMB polarization projects in the Atacama Desert, Chile; Simons Array and Simons Observatory.

**Auteur principal:** HASEGAWA, Masaya (KEK)

**Orateur:** HASEGAWA, Masaya (KEK)

**Classification de Session:** Session

**Classification de thématique:** Primordial Universe

ID de Contribution: **134** Type: **Non spécifié**

# Sterile Neutrino searches

*lundi 27 mars 2023 12:15 (25 minutes)*

In this communication, we will briefly recall the motivation for sterile neutrino searches, including the LSND and Gallium anomalies, as well as the Reactor Antineutrino Anomaly, before reviewing recent experimental results on short and very short baseline oscillation experiments using reactor and accelerator neutrinos and decay-at-rest set-ups, too. We will touch on what global fits of oscillation data have to say about the status of the sterile neutrino hypothesis, and finally we will discuss the expected sensitivities of future experiments.

**Auteur principal:** DEL AMO SANCHEZ, Pablo (LAPP, Université Savoie Mont Blanc, IN2P3 - CNRS)

**Orateur:** DEL AMO SANCHEZ, Pablo (LAPP, Université Savoie Mont Blanc, IN2P3 - CNRS)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **135** Type: **Non spécifié**

# The Quest for Cosmic Dawn: latest Results from J. Webb Space Telescope

*mardi 28 mars 2023 10:15 (25 minutes)*

One of the most exciting challenges of modern extragalactic astronomy is to understand how the first galaxies emerged from a dark Universe and how their physical properties evolved with time. Huge advances have been made over the last decade thanks to the arrival of new telescopes and instruments (e.g. ALMA, MOSFIRE, MUSE, JWST) and new deep and wide surveys (e.g. Frontier Fields, UltraVISTA, CANDELS). In 10 years, the observational frontiers of the Universe have been pushed from z~8 (2012) to z~17(2022), the number of spectroscopically confirmed z>6 galaxies jump from a dozen (2012) to several hundreds (2022), including a dozen at z>9 ! By combining all the data obtained by several instruments over a large range of wavelength, it is now possible to determine for individual high-z galaxy some key physical properties such as their age, escape fraction, size, radiation field or metallicity. By studying the whole population of very high-redshift galaxies, we can also constrain when the first generation of galaxies formed in the early Universe (aka Cosmic Dawn) and their contribution to the Epoch of Reionisation. In this talk, I will describe some of the latest results on the physical properties of the first generation of galaxies

**Auteur principal:** LAPORTE, Nicolas (University of Cambridge)

**Orateur:** LAPORTE, Nicolas (University of Cambridge)

**Classification de Session:** Session

**Classification de thématique:** Primordial Universe

ID de Contribution: **136** Type: **Non spécifié**

# Development of a Cryogenic Half-wave Plate for Simons Observatory

Simons Observatory (SO) is the largest ground-based CMB experiment in history. SO is developing Small Aperture Telescopes (SATs) to detect the primordial B-mode signal. The cryogenic half-wave plate (CHWP) is an optical device for SAT which decreases systematic errors in the polarimetry. CHWP modulates polarized signals separating from unpolarized signals; the polarization modulation reduces atmospheric $1/f$ noise and other uncertainties. The CHWP designed for 225/280 GHz band was fabricated and evaluated its performance. Now the CHWP was integrated to the SAT detector. I will report the summary of the CHWP lab tests and the integration test in LBNL.

**Auteur principal:** SUGIYAMA, Junna (the University of Tokyo)

**Co-auteurs:** M. YAMADA, Kyohei (the University of Tokyo); Dr SAKURAI, Yuki (Okayama University); M. BIXLER, Bryce (UC San Diego); Prof. KUSAKA, Akito (the University of Tokyo)

**Orateur:** SUGIYAMA, Junna (the University of Tokyo)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **137** Type: **Non spécifié**

# Status on H0

*jeudi 30 mars 2023 15:40 (25 minutes)*

In this presentation, I will provide an overview on where we stand concerning the H0-tension. I will discuss the various direct measurements, their disagreement (or not) with respect to the Lambda-CDM prediction anchored on CMB-epoch data. I will particularly focus on the Type Ia Supernovae probe for they are central in this analysis.

**Auteur principal:** RIGAULT, Mickael (IP2I)

**Orateur:** RIGAULT, Mickael (IP2I)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **138** Type: **Non spécifié**

# Recent Results from the IceCube Neutrino Observatory

*mardi 28 mars 2023 15:30 (25 minutes)*

The IceCube Neutrino Observatory, located in the ice beneath the geographic South Pole, can study neutrinos of atmospheric, galactic, and extragalactic origin. Such neutrinos may be used to answer a number of open questions in physics. For instance, identifying the sources of the highest energy neutrinos will shed light on the engines that generate such extreme energies, which could resolve the century-old question of the origin of cosmic rays. Furthermore, since neutrino oscillations violate the Standard Model (SM), careful studies of them may guide the search for physics beyond the SM. In this talk, I will summarize recent IceCube results with a particular focus on searches for neutrino sources and physics beyond the SM.

**Auteur principal:** LAZAR, Jeffrey

**Orateur:** LAZAR, Jeffrey

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **139** Type: **Non spécifié**

# LIGO-Virgo-KAGRA Observational Results and Outlook

*mardi 28 mars 2023 09:25 (25 minutes)*

This presentation will summarize recent results from observations of gravitational-waves by the LIGO-Virgo-KAGRA collaboration. We will look ahead to the upcoming O4 science run, and what kind of new results might be expected. Finally, we will consider what the longer-term plans for future observations might be.

**Auteur principal:** CANNON, Kipp (University of Tokyo)

**Orateur:** CANNON, Kipp (University of Tokyo)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **140** Type: **Non spécifié**

# SuperChooz Exploration: Reactor & Solar Neutrino Physics

*mardi 28 mars 2023 15:55 (25 minutes)*

A new Europe-based flagship neutrino experiment potential opens by exploiting a unique opportunity effectively hidden in the Chooz nuclear reactor site (France). The **SuperChooz** project's birth is tied to the dismantling of the EDF Chooz-A nuclear reactor complex. Built around the 60s and unknown to most scientists, the Chooz-A site offers an underground volume of up to 50,000m3 available for fundamental neutrino science using the EDF Chooz-B, two most powerful N4-PWR nuclear reactors located at ~1km away. The combination embodies the third generation of possible fundamental science at Chooz —Europe's most renowned site for reactor neutrino research —while this time, detectors may reach a scale comparable to the world's largest neutrino detector, such as the SuperKamiokande (Japan). The main experimental challenge is the site's shallow overburden (~100m) demanding the use of the novel **LiquidO** technology, originally pioneered around 2012 by the CNRS (France) and now led by the homonymous international consortium. The new detection methodology heralds the unprecedented active background rejection needed for detection beyond reactor neutrinos only, thus enabling unique solar neutrino detection. The SuperChooz physics programme is designed to address some of the world's most precise measurements, additionally probing a few of the most insightful building-block symmetries of the Standard Model, enabling possible discovery potential. SuperChooz programme also offers synergy potential allowing to boost the sensitivities of other world neutrinos flagship experiments, such as DUNE (US), JUNO (China) and HyperKamiokande (Japan).

The exploitation of the Chooz-A site for fundamental science has been in active discussion between CNRS and EDF since 2018, upon the completion of the Double Chooz experiment, whose results grant vast data-based knowledge for the accurate design of SuperChooz. The first neutrino reactor-based physics studies were released at the EPS-HEP-2019 conference (Ghent, Belgium). Since September 2022, CNRS and EDF have signed the cooperation agreement, officially starting the so-called **SuperChooz Pathfinder** era to address the project's technical feasibility. The approved **AntiMatter-OTech** project, funded by the EU-EIC (France, Germany, Spain) and UKRI (UK), will address the specific LiquidO's performance demonstration within the same time scale while establishing a new experiment in fundamental physics called **νCLOUD** at Chooz, including the direct participation of EDF in neutrino-based innovation for the first time.

**Auteur principal:** CABRERA, Anatael (CNRS - IJC (Orsay) / LNCA (Chooz) Laboratories)

**Orateur:** CABRERA, Anatael (CNRS - IJC (Orsay) / LNCA (Chooz) Laboratories)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **141** Type: **Non spécifié**

# GroundBIRD – CMB polarization observation with continuously high-speed rotation

*mardi 28 mars 2023 09:50 (25 minutes)*

GroundBIRD is a millimeter-wave telescope to observe the polarization patterns of the cosmic microwave background (CMB) at the Teide Observatory in the Canary Islands with 150-GHz and 220-GHz frequency bands. This telescope is designed to achieve the highest sensitivity at large angular scales, $\ell = 6 - 300$. For wide-sky observations, continuous scanning at a high rotation speed ($120^\circ/\mathrm{s}$) was developed to suppress atmospheric fluctuations. Microwave kinetic inductance detectors (MKID) are utilized as focal-plane detectors due to their fast time response and easy multiplexing.

GroundBIRD telescope is now being commissioned with observations by a remote operation system to check the instrument performances. Calibration studies are also being evaluated by using Moon observation datasets. We will present an overview of the GroundBIRD project, show the current status, and forecast GroundBIRD sensitivity.

**Auteur principal:** HONDA, Shunsuke (University of Tsukuba)

**Orateur:** HONDA, Shunsuke (University of Tsukuba)

**Classification de Session:** Session

**Classification de thématique:** Primordial Universe

ID de Contribution: **142** Type: **Non spécifié**

# Gamma-ray bursts in the multi-messenger era

*jeudi 30 mars 2023 14:00 (25 minutes)*

Gamma-ray bursts are the brightest electromagnetic phenomena known in the universe. They are associated with an ultra-relativistic jet emitted by a newly formed accreting black hole following the collapse of a massive star or the coalescence of a binary neutron star system. Several new observational windows have recently opened for these extreme phenomena: the first multi-messenger observation of a binary neutron star merger associated with a short gamma-ray burst (170817) and, since 2018, several detections of gamma-ray bursts at very high energy (TeV). Hopefully, we will also see in the coming years the detection of high-energy neutrinos associated with a gamma-ray burst. I will show in this talk how these recent detections allow important progress in the understanding of these phenomena, in particular for the physics of the jet and its emission. I will also discuss the prospects for new multi-messenger and/or very high energy detections in the short and mid-term. Finally, I will discuss the applications of such observations to related fields such as stellar physics in binary systems of massive stars or cosmology.

**Auteur principal:** DAIGNE, Frédéric (Institut d'Astrophysique de Paris - Sorbonne Université)

**Orateur:** DAIGNE, Frédéric (Institut d'Astrophysique de Paris - Sorbonne Université)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **143** Type: **Non spécifié**

# Neutrino Mass Ordering from Early Supernova Neutrinos

*mercredi 29 mars 2023 12:20 (15 minutes)*

Neutrinos emitted from the core collapse supernovae (CCSNe) can be generally studied to explore both the supernova explosion mechanism and neutrino properties. One of the most interesting properties is the neutrino mass ordering (NMO). Large scale liquid scintillator (LS) detectors, i.e., with tens of kiloton scale, show superior on CCSNe neutrino detection especially benefited from the large target mass and low detection threshold. The Mikheyev-Smirnov-Wolfenstein effect in the mantle of CCSNe alters neutrino flavor composition differently under two NMO scenarios, which can be reflected in the early time profiles of flavor-sensitive channels like electron elastic scattering (eES) and inverse beta decay (IBD). Besides, the early neutronization burst dominated stage may get rid of model dependency largely compared to the latter phases. The low energy threshold of LS detectors also allows the detection of proton elastic scattering (pES). Such neutral current interaction is blind to NMO directly and will advance the precise determination of the neutronization burst time with relative high statistics, which helps to increase the NMO sensitivity remarkably. Our recent work evaluated the potential of NMO determination with CCSNe neutrinos at large LS detectors, and will be submitted to arXiv soon.

**Auteurs principaux:** WEN, Liangjian (Institute of High Energy Physics, CAS); Mlle YU, Miao (Institute of High Energy Physics, CAS & Wuhan University); M. ZHOU, Shun (Institute of High Energy Physics, CAS); M. XU, Xunjie (Institute of High Energy Physics, CAS)

**Orateur:** Mlle YU, Miao (Institute of High Energy Physics, CAS & Wuhan University)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **144** Type: **Non spécifié**

# Energy Response Model for Liquid Scintillator Detectors

Liquid scintillator (LS) detectors, composed of LS and photosensors, such as photomultiplier tubes (PMTs), have been widely used in neutrino experiments. Precise calibration of energy response (energy nonlinearity and energy resolution) for different particles in LS detectors is crucial for spectral analysis. For LS detectors used in reactor neutrino experiments, $e^+$ from the inverse beta decay interaction are the target signals, while $\gamma$s instead of $\beta$s are the most common calibration sources. Therefore, a calibration-based model connecting energy response of $e^+$ with that of $\gamma$ is strongly motivated. Once done that, the positron energy response can be calibrated with the existing sources. In this poster, a unified model for both nonlinearity and resolution in LS detectors is presented. The energy resolution contributions by scintillation light and Cherenkov light have been studied in details. Also the utilization of high energy samples, Michel electrons, has been discussed as a potential method for a better description at the high energy range. Besides, the effectiveness and robustness of the proposed method has been verified with different simulated LS detector configurations. This work has already been published as arXiv 2211.02467 and submitted to European Physical Journal C.

**Auteurs principaux:** WEN, Liangjian (Institute of High Energy Physics, CAS); YU, Miao (Institue of High Energy Physics, Chinese Academy of Science); Prof. LUO, Wuming (IHEP-CAS); Prof. ZHOU, Xiang (Wuhan University)

**Orateur:** YU, Miao (Institue of High Energy Physics, Chinese Academy of Science)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **145** Type: **Non spécifié**

# Status of the CTA Project

*mercredi 29 mars 2023 15:20 (25 minutes)*

The CTA is a big international project that facilitates the extensive array of imaging Cherenkov telescope telescopes in two sites, Paranal in Chile and La Palma in Spain, to observe the high energy gamma rays sky in the all-sky with high sensitivity from 20GeV to 300TeV. We will discuss the project and three types of telescopes that allow the coverage of a wide energy range. Especially the construction of Large Size Telescopes in La Palma is progressing fast, and the first telescope is already in scientific operation since 2020; the preliminary results will be presented.

**Auteur principal:** TESHIMA, Masahiro (Institute for Cosmic Ray Research, The University of Tokyo)

**Orateur:** TESHIMA, Masahiro (Institute for Cosmic Ray Research, The University of Tokyo)

**Classification de Session:** Session

**Classification de thématique:** High Energy Astrophysics

ID de Contribution: **146** Type: **Non spécifié**

# Overview of ANTARES, the first Submarine Neutrino Telescope

*mercredi 29 mars 2023 18:10 (25 minutes)*

ANTARES has been the first neutrino telescope to be operated in the deep sea. Comprising 12 detection lines standing on the sea floor, each equipped with 25 triplets of optical modules, for 16 years it has surveyed the sky, looking for neutrinos from galactic and extragalactic sources or generated from the annihilation of dark matter, and has investigated neutrino oscillation and non standard neutrino interactions. It has also served as a long-term observatory for marine sciences and geosciences. Furthermore, it has provided a solid experience for designing the next generation of submarine neutrino telescopes. An overview of the main results and of the legacy of ANTARES will be presented in this talk.

**Auteur principal:** CIRCELLA, Marco (INFN Bari)

**Orateur:** CIRCELLA, Marco (INFN Bari)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **147** Type: **Non spécifié**

# Development of ionized electron readout system in AXEL experiment

A Xenon Electroluminescence (AXEL) experiment aims to overcome the current limitations in the search for the neutrinoless double beta decay from $^{136}$Xe using high pressure gas xenon TPC. In order to read out ionized electrons, we are developing a unique readout system for the AXEL group, the electroluminescence light collection cell (ELCC). Ionized electrons are drifted to ELCC, and they are more accelerated in it to emit electroluminescence light, which is counted to measure energy. Because the emission is the linear amplification process, we can suppress the gain fluctuation and expect to achieve a great energy resolution.
In this poster, I will talk about the problems of the present ELCC and the solution to them.

**Auteur principal:** HIKIDA, Junya (Kyoto univercity)

**Orateur:** HIKIDA, Junya (Kyoto univercity)

**Classification de Session:** Poster session

**Classification de thématique:** No track

ID de Contribution: **148** Type: **Non spécifié**

# Status and Perspectives of Direct Dark Matter Searches

*mardi 28 mars 2023 17:30 (25 minutes)*

The direct search for dark matter particle interactions is one of the top priorities in astroparticle physics. A positive measurement will provide the most unambiguous confirmation of the particle nature of dark matter in the Universe. A review of the experimental programme of direct detection searches of particle dark matter is presented. It focuses mostly on current and planned activities in the field. This review shows also how the hunt for dark matter particle strongly overlaps with the subject of new physics beyond the standard model and it links with several other areas of particle physics, including neutrinos.

**Auteur principal:** SCOTTO LAVINA, Luca (LPNHE Paris)

**Orateur:** SCOTTO LAVINA, Luca (LPNHE Paris)

**Classification de Session:** Session

**Classification de thématique:** Dark Universe

ID de Contribution: **149** Type: **Non spécifié**

# Flavor Physics and the Belle II Experiment

*lundi 27 mars 2023 17:00 (25 minutes)*

Belle II is a flavor physics experiment at the asymmetric $e^+e^-$ collider SuperKEKB in Japan. Belle II aims to record an order of magnitude more data than the previous Belle experiment. Belle II started operation in 2019 and has accumulated $430\ \mathrm{fb}^{-1}$ of data to date. I will present the status and plans of the Belle II experiment, and review its recent results, including those on rare B meson decays, CP violation and lepton flavor violation. This talk also covers other flavor physics programs, including that of LHCb at CERN.

**Auteur principal:** NISHIDA, Shohei (KEK)

**Orateur:** NISHIDA, Shohei (KEK)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **150** Type: **Non spécifié**

# Highlights of BSM searches in ATLAS and CMS (including EFT interpretations and Dark Matter results)

*jeudi 30 mars 2023 10:10 (25 minutes)*

Despite successfully predicting the outcome of hundreds of measurements at colliders and other experiments, the standard model of particle physics cannot be the final theory of nature. Searches for beyond-the-standard model (BSM) physics are now a major component of the research program at the ATLAS and CMS experiments at the Large Hadron Collider (LHC). This talk presents highlights of BSM searches at the LHC, including dark matter, long-lived particles, heavy resonances, leptoquarks, supersymmetric particles, BSM decays of SM particles, and other exotic phenomena. Experimental methodologies, sophisticated analysis tools including machine learning, experimental results, and phenomenological interpretations including Effective Field Theories are presented.

**Auteur principal:** LINDON, Jack (University of Alberta/CERN)

**Orateur:** LINDON, Jack (University of Alberta/CERN)

**Classification de Session:** Session

**Classification de thématique:** Particle Physics

ID de Contribution: **151** Type: **Non spécifié**

# The T2K Near Detector upgrade

*mercredi 29 mars 2023 10:15 (15 minutes)*

Neutrino oscillation physics has now entered the precision era. In parallel with needing larger detectors to collect more data, future experiments further require a significant reduction of systematic uncertainties with respect to what is currently available. In the neutrino oscillation measurements from the T2K experiment the systematic uncertainties related to neutrino interaction cross sections are currently dominant. To reduce this uncertainty a significantly improved understanding of neutrino-nucleus interactions is required. In particular, it is crucial to better characterise the nuclear effects that can alter the final state topology and kinematics of neutrino interactions in such a way that can bias neutrino energy reconstruction and therefore bias measurements of neutrino oscillations.
The upgraded ND280 detector will consist of a totally active Super-Fine-Grained-Detector (Super-FGD) composed of 2 million 1 cm3 scintillator cubes with three 2D readouts, two High Angle Time Projection Chambers (HA-TPC) instrumented with resistive MicroMegas modules, and six Time-of-Flight (TOF) planes. It will directly confront our naivety of neutrino interactions thanks to its full polar angle acceptance and a much lower proton tracking threshold. Furthermore, neutron tagging capabilities in addition to precision timing information will allow the upgraded detector to estimate neutron kinematics from neutrino interactions. Such improvements permit access to a much larger kinematic phase space which correspondingly allows techniques such as the analysis of transverse kinematic imbalances to offer remarkable constraints of the pertinent nuclear physics for T2K analyses.
New reconstruction algorithms are being developed to fully benefit from the improved capabilities of the sFGD and of the HA-TPC and will be described in this talk together with the expected performances of the ND280 upgrade.

**Auteur principal:** Dr JESÚS-VALLS, César (Kavli IPMU)

**Orateur:** Dr JESÚS-VALLS, César (Kavli IPMU)

**Classification de Session:** Neutrinos

**Classification de thématique:** Neutrinos

ID de Contribution: **152** Type: **Non spécifié**

# Recent results and future prospects from the T2K experiment

*mercredi 29 mars 2023 14:30 (25 minutes)*

T2K is a long-baseline neutrino oscillation experiment in Japan. Muon neutrinos are generated by the J-PARC proton beam, and are detected by near detector, ND280, and far detector, Super-Kamiokande. The main purposes are a precise measurement of neutrino mixing parameters and a search for the CP violation in the lepton sector.
In 2022, there were significant updates in the analysis of the neutrino oscillation. The neutrino flux prediction and neutrino interaction models were improved based on the latest knowledge and experimental data. In addition, new samples and event selections were added to the near and far detectors. As a result, the CP violation in the lepton sector was indicated at the 90% confidence level.
In order to improve the precision, upgrades of the T2K experiment are ongoing. The J-PARC accelerator and neutrino beamline are being upgraded to increase the beam power. In addition, a construction of the new near detector is ongoing to reduce systematic errors mainly due to uncertainties of the neutrino interaction models.
In this talk, we will report the recent results and future prospects from the T2K experiment.

**Auteur principal:** KIKAWA, Tatsuya (Kyoto University)

**Orateur:** KIKAWA, Tatsuya (Kyoto University)

**Classification de Session:** Session

**Classification de thématique:** Neutrinos

ID de Contribution: **153** Type: **Non spécifié**

# Recent Belle II results related to flavor anomalies

*mercredi 29 mars 2023 11:50 (15 minutes)*

Persistent anomalies reported by various experiments in $b \to c$ and $b \to s\ell\ell$ transitions hint at possible violation of lepton-flavor universality. The Belle II experiment at the SuperKEKB collider probes the relevant effects using observables complementary to those explored elsewhere. This talk reports recent results from a sensitive search for $B^+ \to K^+\nu\bar{\nu}$ decays, and an inclusive determination of the branching fraction of bottom mesons into hadrons and tau leptons, relative to that into hadrons and light leptons.

**Auteur principal:** KOJIMA, Kazuki (Nagoya University)

**Orateur:** KOJIMA, Kazuki (Nagoya University)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **154** Type: **Non spécifié**

# Recent highlights from the Belle II experiment

*mercredi 29 mars 2023 11:05 (15 minutes)*

The Belle II experiment at the SuperKEKB collider has now collected approximately 400 million bottom-antibottom meson pairs at the Y(4S) resonance. We report a selection of recent results in bottom, charm and tau-lepton physics that probe non-standard-model dynamics and refine our understanding of the electroweak and strong interactions.

**Auteur principal:** FILLINGER, Tristan

**Orateur:** FILLINGER, Tristan

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **157** Type: **Non spécifié**

# Opening statements

*lundi 27 mars 2023 09:40 (10 minutes)*

**Orateur:** TSUYOSHI NAKAYA, Michel Gonin,

**Classification de Session:** Session

ID de Contribution: **158** Type: **Non spécifié**

# Welcome address

*lundi 27 mars 2023 09:30 (10 minutes)*

**Orateur:** KAJITA, Takaaki (ICRR and IPMU, Univ. of Tokyo)

**Classification de Session:** Session

ID de Contribution: **160** Type: **Non spécifié**

# Optical Performance of the Sparse Wire Grid Calibrator for Simons Observatory

Polarization of cosmic microwave background (CMB) is the best probe for primordial gravitational waves. In Simons Observatory, using the Sparse Wire Grid Calibrator, we can evaluate/reduce optical systematic errors on Small Aperture Telescopes (SATs). In this poster presentation, we will introduce an initial analysis for the optical performance of the calibrator

**Auteur principal:** NAKATA, Hironobu (Kyoto University)

**Orateur:** NAKATA, Hironobu (Kyoto University)

**Classification de Session:** Poster session

**Classification de thématique:** Primordial Universe

ID de Contribution: **161** Type: **Non spécifié**

# KAGRA: Large Cryogenic Gravitational Wave Antenna

*jeudi 30 mars 2023 12:15 (25 minutes)*

KAGRA is a 3-km interferometric Gravitational-ave antenna placed at the underground site of Kamioka, Gifu, Japan. The test-mass mirrors are cooled down to cryogenic temperature to suppress the effect of thermal noise. KAGRA started the observation run in 2020, and now preparing for the next observation run, O4, together with LIGO and VIRGO. In this talk, science, design, and current status will be presented.

**Auteur principal:** ANDO, Masaki (University of Tokyo)

**Orateur:** ANDO, Masaki (University of Tokyo)

**Classification de Session:** Session

**Classification de thématique:** Gravitational Waves

ID de Contribution: **162** Type: **Non spécifié**

# Standard Model measurements by ATLAS and CMS

*mercredi 29 mars 2023 11:35 (15 minutes)*

Measurements of Standard Model (SM) processes at the LHC range from the production of jets and photons, or precision measurements with single W and Z bosons, to measurements of rare multiboson processes that only recently became experimentally accessible. In this talk, recent measurements of such processes from the ATLAS and CMS collaborations are presented. They are used to determine fundamental parameters of the SM, such as the coupling constant of the strong interactions, constrain the parton content of the proton, or to set limits on non-SM electroweak gauge couplings. In all cases, the measurements are compared to state-of-the-art theoretical calculations.

**Auteur principal:** CAMPANELLI, Mario (UCL)

**Orateur:** CAMPANELLI, Mario (UCL)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **167** Type: **Non spécifié**

# b-physics results by ATLAS and CMS

*mercredi 29 mars 2023 12:05 (15 minutes)*

The ATLAS and CMS experiments has collected large datasets for B meson quarkonia production and decay. Recent results in this field from CMS and ATLAS are presented.

**Auteur principal:** ZHANG, Jingqing (Nanjing Normal University & Tsinghua University)

**Orateur:** ZHANG, Jingqing (Nanjing Normal University & Tsinghua University)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **168** Type: **Non spécifié**

# Results by ATLAS and CMS on standard model Higgs boson and top quark

*mercredi 29 mars 2023 12:20 (15 minutes)*

On overview of the status of LHC measurements of the standard model Higgs boson and top quark sectors is presented, with focus on the most recent results.

**Auteur principal:** AZZURRI, Paolo (INFN Pisa)

**Orateur:** AZZURRI, Paolo (INFN Pisa)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **169** Type: **Non spécifié**

# Recent dark-sector results from Belle II

*mercredi 29 mars 2023 10:00 (15 minutes)*

The Belle II experiment at the SuperKEKB collider has a unique sensitivity to a broad class of models that postulate the existence of dark matter particles with MeV—GeV masses. This talk presents recent world-leading physics results from Belle II searches for long-lived scalar particles and Z'decays; as well as the near-term prospects for other dark-sector searches.

**Auteur principal:** ISHIKAWA, Akimasa (KEK)

**Orateur:** ISHIKAWA, Akimasa (KEK)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **170** Type: **Non spécifié**

# Results by ATLAS and CMS on searches for BSM Higgs bosons and dark matter

*mercredi 29 mars 2023 10:15 (15 minutes)*

We present the latest ATLAS and CMS probes for new physics in searches for Dark Matter (DM) and Beyond the Standard Model (BSM) Higgs bosons at the Large Hadron Collider (LHC). The existence of dark matter, which constitutes a large majority of the matter in the Universe, is well established through various astrophysical observations. However, its nature is still unknown. Models predicting new Higgs-like bosons have been proposed to address this and other open questions in physics, making BSM Higgs searches a top priority of the LHC experimental program. The talk presents a selection of the latest results based on the full LHC Run 2 dataset, collected from 2015 to 2018, as well as a prospect for DM and BSM Higgs searches in the ongoing third of the LHC.

**Auteur principal:** PAREDES SAENZ, Santiago (Université Libre de Bruxelles)

**Orateur:** PAREDES SAENZ, Santiago (Université Libre de Bruxelles)

**Classification de Session:** Dark and Primordial Universe & Gravitational Waves

**Classification de thématique:** Dark Universe

ID de Contribution: **171** Type: **Non spécifié**

# Searches for heavy resonances by ATLAS and CMS

*mercredi 29 mars 2023 10:50 (15 minutes)*

Many new physics models predict the existence of new, heavy particles. This talk summarizes recent ATLAS and CMS searches for Beyond-the-Standard-Model heavy resonances which decay to pairs of bosons, heavy quarks, or leptons, using Run 2 data collected at the LHC. The experimental methods are explained, including the jet substructure techniques used in some searches to disentangle the hadronic decay products in highly boosted configurations

**Auteur principal:** AL KHOURY, Konie (Columbia University)

**Orateur:** AL KHOURY, Konie (Columbia University)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics

ID de Contribution: **172** Type: **Non spécifié**

# Searches for challenging and long-lived signatures by ATLAS and CMS

*mercredi 29 mars 2023 12:35 (15 minutes)*

The large-hadron collider (LHC) provides a valuable opportunity to directly search for new physics signals from proton-proton collisions at TeV energy scale. This talk gives an overview of the recent searches for new physics that leave experimentally challenging signatures such as long-lived new particles, performed by ATLAS and CMS collaborations. Given that no clear indication of new physics has been observed in the extensive and many searches based on conventional signatures, these challenging searches are attracting more interests in recent.

**Auteur principal:** NAGANO, Kunihiro (KEK)

**Orateur:** NAGANO, Kunihiro (KEK)

**Classification de Session:** High Energy Astrophysics & Particle Physics

**Classification de thématique:** Particle Physics