International Workshop on Baryon and Lepton Number Violation (BLV 2024)

Report of Contributions

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

Gamma Lines and Dark Matter from Anomaly Cancellation (17'+3')

Thursday, October 10, 2024 11:55 AM (20 minutes)

We discuss a simple theory for physics beyond the Standard Model where a Majorana dark matter is predicted from anomaly cancellation. We discuss in detail the minimal theory where the baryon number is a local symmetry spontaneously broken at the low scale. The correlation between the cosmological constraints on the dark matter relic density, the direct detection and collider bounds is investigated. We discuss in great detail the gamma lines from dark matter annihilation showing the possibility to test these predictions in the near future at gamma-ray telescopes such as CTA. We investigate all processes contributing to the total photon flux from dark matter annihilation and point out the unique features that can be used to test this theory for dark matter.

Authors: Mr DEBNATH, Hridoy (Case Western Reserve University); FILEVIEZ PEREZ, Pavel (CWRU); GONZALEZ QUESADA, Kevin (Case Western Reserve University)

Presenter: GONZALEZ QUESADA, Kevin (Case Western Reserve University)

Session Classification: Dark Matter

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

Dark Matter from Anomaly Cancellation at the LHC (17'+3')

We discuss a class of theories that predict a fermionic dark matter candidate from gauge anomaly cancellation.
As an explicit example, we study the predictions in theories where the global symmetry associated with baryon number is promoted to a local gauge symmetry.
In this context the symmetry-breaking scale has to be below the multi-TeV scale in order to be in agreement with the cosmological constraints on the dark matter
relic density. The new physical "Cucuyo" Higgs boson in the theory has very interesting properties, decaying mainly into two photons in the low mass region, and mainly into dark matter in the intermediate mass region.
We study the most important signatures at the Large Hadron Collider, evaluating the experimental bounds. We discuss the correlation between the dark matter relic density, direct detection and collider constraints.
We find that these theories are still viable, and are susceptible to being probed in current, and future high-luminosity, running.

Authors: Prof. BUTTERWORTH, Jon (University College London); DEBNATH, Hridoy (Case Western Reserve University); Prof. PEREZ, Pavel Fileviez (Case Western Reserve University); YEH, Yoran (University College London)

Presenter: DEBNATH, Hridoy (Case Western Reserve University)

Session Classification: Dark Matter

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

Heavy Sterile Neutrinos from B decays and new QCD Corrections to their Semi-Hadronic Decay Rates (17'+3')

Tuesday, October 8, 2024 5:15 PM (20 minutes)

In modern experiments on flavour physics it is possible to search for the decays of B's, D's, or τ's into final states with heavy neutrinos N (a.k.a. heavy neutral leptons). I present a common study of theorists and experimentalists from Belle II on constraints on $B- > D^*\ell N$. Next I discuss the status of the theory predictions of the various N decay rates. In scenarios in which N interacts with SM particles only through sterile-active neutrino mixing, the dependence of the lifetime on the relevant mixing angles is important to determine whether N decays in the detector or outside. To calculate the inclusive decay rate into semi-hadronic final states reliably one needs to include radiative QCD corrections. I present analytic results for the QCD-corrected decay rates and discuss their phenomenological impact.

Authors: Mr KRETZ, Tim (Karlsruher Institut für Technologie (KIT - TTP)); NIERSTE, Ulrich (Institut fuer Theoretische Teilchenphysik, KIT CS); FEDELE, Marco (Valencia University IFIC); BERNLOCHNER, Florian (University Bonn); PRIM, Markus (University Bonn)

Presenter: Mr KRETZ, Tim (Karlsruher Institut für Technologie (KIT - TTP))

Session Classification: Lepton flavor violating processes

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

Effects of Reheating on Charged Lepton Yukawa Equilibration and Leptogenesis (17'+3')

Wednesday, October 9, 2024 12:00 PM (20 minutes)

We show that the process of non-instantaneous reheating during the post-inflationary period can have a sizable impact on the charged lepton Yukawa equilibration temperature in the early Universe. This suggests relooking the effects of lepton flavors in the leptogenesis scenario where the production and decay of right-handed neutrinos take place within this prolonged era of reheating. We find this observation has the potential to shift the flavor regime(s) of leptogenesis compared to the standard thermal scenario.

Author: Dr ROSHAN, Rishav (University Of Southampton)

Presenter: Dr ROSHAN, Rishav (University Of Southampton)

Session Classification: Baryogenesis mechanisms

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

Not-so-inelastic Dark Matter (17'+3')

Thursday, October 10, 2024 12:15 PM (20 minutes)

Models of inelastic (or pseudo-Dirac) Dark Matter (DM) commonly assume an accidental symmetry between the left-handed and right-handed mass terms in order to suppress diagonal couplings. We point out that this symmetry is unnecessary, because for Majorana fermions the diagonal couplings are not strongly constrained. Removing the requirement of such an accidental ad-hoc symmetry instead relaxes the relic density constraint due to additional annihilation modes.

In the talk, I will introduce a simple UV-complete model realizing the new asymmetric set-up. Then, I will explain how traditional constraints from (in)direct detection, beam dump experiments and colliders are modified indicating two viable mass regions for the DM particle, around a few hundred MeV and around a few GeV. The former region will be fully tested by near-future analyses of NA64 and Belle II data, while the latter turns out to be challenging to explore even with future experiments.

Authors: DALLA VALLE GARCIA, Giovani (IAP - KIT); KAHLHOEFER, Felix (KIT); OVCHYNNIKOV, Maksym (Karlsruhe Institute of Technology); SCHWETZ-MANGOLD, Thomas (KIT)

Presenter: DALLA VALLE GARCIA, Giovani (IAP - KIT)

Session Classification: Dark Matter

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

Unraveling the Lepton Number Violation in the EFT and Beyond (17'+3')

The new particle physics underlying any potential lepton-number-violating signal can be parametrized within the framework of effective field theory in terms of a set of higher-dimensional operators triggering a variety of distinct mechanisms for neutrinoless double beta decay (0vbb). While it appears to be challenging to unravel the dominant source of lepton number violation from the observation of this rare nuclear process itself, the (non-)conservation of lepton number can be also tested in a variety of other experiments. After going over the complementary probes of lepton number violation and their interplay with 0vbb within the framework of Standard Model Effective Field Theory (SMEFT), I will also discuss the possible UV realizations and the limits imposed on these scenarios.

Author: GRAF, Lukas (Nikhef)

Presenter: GRAF, Lukas (Nikhef)

Session Classification: Lepton number violation in low energy processes

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

New Physics and Primordial Neutrinos Decoupling: a DSMC Approach (17'+3')

Wednesday, October 9, 2024 4:25 PM (20 minutes)

Primordial neutrinos are important messengers from the Early Universe, affecting several key observables such as primordial nuclear abundances and cosmic microwave background. If some new physics existed at the time around neutrino decoupling, it would have left imprints on the neutrino distribution function, which requires solving the neutrino Boltzmann equation. Existing approaches have limitations that prevent using them in a universal way for the cases with new physics particles decaying into neutrinos. Addressing this issue, we present a novel approach to studying the interactions of neutrinos based on Direct Simulation Monte Carlo (DSMC). In particular, we resolve the existing discrepancies between the Boltzmann codes regarding the impact of highly non-thermal neutrinos on Neff, and study the interplay of possible large lepton asymmetries in the neutrino sector and injections of high-energy neutrinos.

Authors: OVCHYNNIKOV, Maksym (Karlsruhe Institute of Technology); Dr SYVOLAP, Vsevolod (Leiden University)

Presenter: OVCHYNNIKOV, Maksym (Karlsruhe Institute of Technology)

Session Classification: Neutrino physics

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

Long-lived Neutral Fermions at the DUNE near Detector (17'+3')

Wednesday, October 9, 2024 4:45 PM (20 minutes)

At the Deep Underground Neutrino Experiment (DUNE), a proton beam hits a fixed target leading to large production rates of mesons. These mesons can decay and potentially provide a source of long-lived neutral fermions. Examples of such long-lived fermions are heavy neutral leptons which can mix with the standard-model active neutrinos, and the bino-like lightest neutralino in R-parity-violating supersymmetry. We show that the Standard Model Effective Field Theory extended with right-handed singlet neutrinos can simultaneously describe heavy neutral leptons and bino-like neutralinos in a unified manner. We use the effective-field-theory framework to determine the sensitivity reach of the DUNE near detector in probing various scenarios of long-lived neutral fermions.

Authors: GÜNTHER, Julian (Universität Bonn); Prof. DE VRIES, Jordy (University of Amsterdam, NIKHEF); Prof. DREINER, Herbi (Universität Bonn); Dr WANG, Zeren Simon (National Tsing Hua University); Dr ZHOU, Guanghui (Beijing, Institute of Theoretical Physics)

Presenter: GÜNTHER, Julian (Universität Bonn)

Session Classification: Neutrino physics

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

Spontaneous Leptogenesis with sub-GeV Axion Like Particles (17'+3')

Wednesday, October 9, 2024 12:20 PM (20 minutes)

A derivative coupling of an axion-like particle (ALP) with a B-L current can lead to the baryon asymmetry of the universe through spontaneous leptogenesis, provided there is a lepton number-breaking interaction in thermal equilibrium. Typically, this requires heavy ALPs and a high reheating temperature, as the lepton number-breaking is also linked to neutrino mass generation. In this study, we propose leveraging an inert Higgs doublet to facilitate the lepton number-violating operator, reducing this constraint. This enables the generation of lepton asymmetry (via freeze-in/out processes) at a much lower reheating temperature, accommodating light (sub-GeV) ALPs that are sensitive to current and future ALP searches.

Author: MANNA, Soumen Kumar (Indian Institute of Technology Guwahati)

Co-authors: Dr DATTA, Arghyajit (Kyungpook National University, Daegu); Prof. SIL, Arunansu (Indian Institute of Technology Guwahati)

Presenter: MANNA, Soumen Kumar (Indian Institute of Technology Guwahati)

Session Classification: Baryogenesis mechanisms

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

Prospects for Discovering LNV at the FCC (20'+5')

Wednesday, October 9, 2024 9:30 AM (25 minutes)

Whether lepton number is a conserved or violated symmetry of nature remains one of the most pressing questions today, with far-reaching consequences across astrophysics, particle physics, and nuclear physics. If lepton number is indeed violated, it is also unknown whether it occurs at a scale accessible with laboratory experiments. The discovery of lepton number violation in the laboratory would have a monumental impact on understanding what lies beyond the Standard Model of Particle Physics. This talk gives a broad overview of the (current) projected sensitivity to discovering lepton number violation at the proposed Future Circular Collider program at CERN.

Author: RUIZ, Richard (IFJ PAN)

Presenter: RUIZ, Richard (IFJ PAN)

Session Classification: B and L violation at current or future colliders

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

Bounds on Ultra Heavy HNLs (17'+3')

Tuesday, October 8, 2024 4:55 PM (20 minutes)

Heavy Neutral Leptons (HNLs) are hypothetical particles that are able to explain neutrino oscillations. The presence of HNLs induces charged lepton flavor violating (cLFV) processes. Non-observations of these processes puts the strongest limits on parameters of HNL much heavier than the electroweak scale.
We demonstrate that for such HNLs, the branching ratio of cLFV processes is actually mass-dependent. Given this fact, we improve current bounds on HNL mass and mixing angle. Furthermore, we perform a perturbative unitarity analysis to identify the domain of validity of our results.

Author: Mr URQUÍA-CALDERÓN, Kevin Alberto (Niels Bohr Institute)

Co-authors: Dr TIMIRYASOV, Inar (Niels Bohr Institute); Dr RUCHAYSKIY, Oleg (Niels Bohr Institute)

Presenter: Mr URQUÍA-CALDERÓN, Kevin Alberto (Niels Bohr Institute)

Session Classification: Lepton flavor violating processes

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

Testing the Standard Model with Most Accurate Muon g-2 Measurements (17'+3')

Tuesday, October 8, 2024 5:35 PM (20 minutes)

The magnetic moment anomaly of the muon, that relates the cyclotron and spin precession frequency, provides one of the most stringent tests of the Standard Model of Particle Physics since it is measured and theoretically predicted to very high precision. Deviations between theoretical prediction and experimental measurements can be used to investigate tensions in the methods or can be interpreted as hints for physics beyond the Standard Model. In August 2023, the Fermilab Muon g-2 experiment reported its result from measurement campaigns 2 and 3, which in combination with run 1 increased the precision to now 200 ppb. The increase in precision is both due to increased statistics and reduced systematics. This milestone puts the Muon g-2 experiment well on its way to surpass its design precision of 140 ppb with final statistics. In this contribution we review the measurement principle of the Muon g-2, point out experimental improvements in the recent measurement and put the measurement in the context of the current theoretical effort.

Author: REIMANN, René (Johannes Gutenberg University, Mainz)

Presenter: REIMANN, René (Johannes Gutenberg University, Mainz)

Session Classification: Lepton flavor violating processes

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

Lepton Number Violation and Neutrino Masses in N_RSMEFT (17'+3')

Friday, October 11, 2024 11:05 AM (20 minutes)

In this talk, we discuss tree-level UV completions for dimension 6 and 7 operators in the Standard Model Effective Field Theory extended with right-handed neutrinos (N_RSMEFT). We reveal that every model generating lepton number violating (LNV) operators with right-handed neutrinos also leads to the formation of active neutrino masses. This intrinsic connection between LNV processes and the existence of Majorana masses for SM neutrinos allows us to derive constraints on dimension 7 operators from the observed neutrino masses. Importantly, we demonstrate that these operators may not always be suppressed, suggesting their potential observability in future experiments.

Author: BELTRÁN, Rebeca (IFIC - University of Valencia and CSIC (Spain))

Presenter: BELTRÁN, Rebeca (IFIC - University of Valencia and CSIC (Spain))

Session Classification: Lepton number violation in low energy processes

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

On Lepton Number Violation in Type II Seesaw (17'+3')

Wednesday, October 9, 2024 9:55 AM (20 minutes)

We determine the prospect of observing genuine lepton number violating (LNV) signals at hadron colliders in the context of type II seesaw.
The model features smoking gun signals with same-sign di-leptons and jets that may be the primary observable channel in a certain portion of parameter space.
The charged lepton flavour composition in the minimal model relates to the origin of neutrino mass
and correlates with other rare processes, such as neutrinoless double beta decay.
We review the existing collider limits and provide sensitivity estimates of LNV signals, with degenerate masses and with mass splittings, for the upcoming runs at the LHC.

Author: KRIEWALD, Jonathan (IJS)

Presenter: KRIEWALD, Jonathan (IJS)

Session Classification: B and L violation at current or future colliders

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

Hunting for Two Right-Handed Neutrinos at Low Scales (17'+3')

Friday, October 11, 2024 11:25 AM (20 minutes)

The addition of two gauge singlet right-handed neutrinos to the Standard Model is a minimal extension that can potentially solve multiple open questions at once, including the observed neutrino masses via the Type-I seesaw mechanism, and the baryon asymmetry of the universe via leptogenesis. We show that combining the constraints from low-scale leptogenesis and the current non-observation of neutrinoless double beta decay ($0\nu\beta\beta$) proves to be a powerful complement to the limits obtained from Big Bang Nucleosynthesis and collider searches in order to constrain the masses and mixings of heavy neutrinos. Improved limits on $0\nu\beta\beta$ from next-generation experiments will restrict the allowed parameter space to narrow bands in the mass-mixing plane in case of inverted neutrino mass ordering, which could be probed by future collider programs, making such models with MeV-GeV range heavy neutrinos fully testable.

Authors: Prof. DE VRIES, Jordy (University of Amsterdam, NIKHEF); Prof. DREWES, Marco; GEORIS, Yannis; Dr KLARIC, Juraj; PLAKKOT, Vaisakh

Presenter: PLAKKOT, Vaisakh

Session Classification: Lepton number violation in low energy processes

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

Boosting the Production of Sterile Neutrino Dark Matter with Self-Interactions (17'+3')

Wednesday, October 9, 2024 4:05 PM (20 minutes)

Sterile neutrinos are well-motivated and simple dark matter (DM) candidates. However, sterile neutrino DM produced through oscillations by the Dodelson-Widrow mechanism is excluded by current X-ray observations and bounds from structure formation. One minimal extension, that preserves the attractive features of this scenario, is self-interactions among sterile neutrinos. In this work, we analyze how sterile neutrino self-interactions mediated by a scalar affect the production of keV sterile neutrinos for a wide range of mediator masses. We find four distinct regimes of production characterized by different phenomena, including partial thermalization for low and intermediate masses and resonant production for heavier mediators. We show that significant new regions of parameter space become available which provide a target for future observations.

Author: VOGL, Stefan

Presenter: VOGL, Stefan

Session Classification: Neutrino physics

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

Probing Light Sterile Neutrinos in Left-Right Symmetric Models with Displaced Vertices and Neutrinoless Double Beta Decay (17'+3')

Thursday, October 10, 2024 5:00 PM (20 minutes)

An investigation of relatively light (GeV-scale), long-lived right-handed neutrinos is performed within minimal left-right symmetric models using the neutrino-extended Standard Model Effective Field Theory framework. Light sterile neutrinos can be produced through rare decays of kaons, D-mesons, and B-mesons at the Large Hadron Collider (LHC) and the Long-Baseline Neutrino Facility (LBNF) of Fermilab. Their decays could result in displaced vertices, which can be reconstructed. By performing Monte-Carlo simulations, we assess the sensitivities of the future LHC far-detector experiments ANUBIS, CODEX-b, FACET, FASER(2), MoEDAL-MAPP1(2), MATHUSLA, the recently approved beam-dump experiment SHiP, and the upcoming neutrino experiment DUNE at the LBNF, to the right-handed gauge-boson mass M_{W_R} as functions of neutrino masses. We find that DUNE and SHiP could be sensitive to right-handed gauge-boson masses up to ~ 25 TeV. We compare this reach to indirect searches such as neutrinoless double beta decay, finding that displaced-vertex searches are very competitive.

Author: GROOT, Jelle (University of Amsterdam)

Co-authors: Prof. DE VRIES, Jordy (University of Amsterdam, NIKHEF); Dr WANG, Zeren Simon (National Tsing Hua University); GÜNTHER, Julian (Universität Bonn); DREINER, Herbert (University of Bonn)

Presenter: GROOT, Jelle (University of Amsterdam)

Session Classification: B and L violation at current or future colliders

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

Searching for LNV in Rare Meson Decays (17'+3')

Friday, October 11, 2024 11:45 AM (20 minutes)

We investigate the possibility of disentangling different new physics contributions to the rare meson decays $K \to \pi$+invisible and $B \to K(K^*)$+invisible through kinematic distributions in the missing invariant mass squared. We employ dimension-6 operators within the Low-Energy Effective Field Theory (LEFT), identifying the invisible part of the final state as either active or sterile neutrinos. Special emphasis is given to lepton-number violating (LNV) operators. We show analytically that contributions from vector, scalar, and tensor quark currents can be uniquely determined from experimental data of kinematic distributions. As there could a priori also be new invisible particles in the final states, we include dark-sector operators giving rise to two dark scalars, fermions, or vectors in the final state. We show that careful measurements of kinematic distributions make it theoretically possible to disentangle the contribution from LEFT operators from most of the dark-sector operators, even when multiple operators are contributing. Finally, we point out that an excess in rare meson decays consistent with a LNV hypothesis would point towards highly flavor non-democratic physics in the UV, and could put high-scale leptogenesis under tension.

Authors: Prof. HARZ, Julia; MOJAHED, Martin (JGU/ TUM); Prof. BURAS, Andrzej

Presenter: MOJAHED, Martin (JGU/ TUM)

Session Classification: Lepton number violation in low energy processes

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

Searches for Hidden Sectors and Lepton Flavour Violation in Kaon Decays (17'+3')

Tuesday, October 8, 2024 4:35 PM (20 minutes)

Rare kaon decays are among the most sensitive probes of both heavy and light new physics beyond the Standard Model description thanks to high precision of the Standard Model predictions, availability of very large datasets, and the relatively simple decay topologies. The NA62 experiment at CERN is a multi-purpose high-intensity kaon decay experiment, and carries out a broad rare-decay and hidden-sector physics programme. NA62 has collected a large sample of K^+ decays in flight during Run 1 in 2016-2018, and the ongoing Run 2 which started in 2021. Recent NA62 results on searches for hidden-sector mediators and searches for violation of lepton number and lepton flavour conservation in kaon decays based on the Run 1 dataset are presented. Future prospects of these searches are discussed.

Presenter: FANTECHI, Riccardo (INFN - Sezione di Pisa)

Session Classification: Lepton flavor violating processes

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

Impact of Non-Standard Interactions on Low-Scale Leptogenesis and Neutrinoless Double Beta Decay (17'+3')

Thursday, October 10, 2024 3:20 PM (20 minutes)

In this talk, we investigate the interplay between the observation of lepton number violating processes and the generation of the baryon asymmetry of the Universe via low-scale leptogenesis. We focus on the impact of non-standard interactions, beyond the usual Majorana mass term, on the observation of neutrinoless double beta decay and the resulting parameter space for successful leptogenesis. Parameterizing these effects in a model independent way, we showcase how additional operators can influence the final baryon asymmetry.

Authors: WEBER, Sascha (JGU Mainz); Prof. HARZ, Julia; FUYUTO, Kaori (Los Alamos National Laboratory)

Presenter: WEBER, Sascha (JGU Mainz)

Session Classification: Baryogenesis mechanisms

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

Wash-in Leptogenesis with Dirac Neutrino Scatterings (20'+5')

Wednesday, October 9, 2024 11:35 AM (25 minutes)

We present a Dirac leptogenesis model in which the only out-of-equilibrium particles are right-handed neutrinos undergoing asymmetric scatterings. They are produced from a negligible initial abundance and their density freezes in soon after reheating. Even though the asymmetry source term vanishes, we demonstrate that opposite asymmetries of right-handed neutrinos and standard model leptons are washed in.

Authors: HEISIG, Jan (RWTH Aachen University, University of Virginia); HEECK, Julian (University of Virginia); MATÁK, Peter (Comenius University in Bratislava); BLAŽEK, Tomáš (Comenius University in Bratislava); ZAUJEC, Viktor (Comenius University in Bratislava)

Presenter: MATÁK, Peter (Comenius University in Bratislava)

Session Classification: Baryogenesis mechanisms

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

Quasi-Dirac HNLs in the Left-Right Symmetric Model (17'+3')

Thursday, October 10, 2024 4:40 PM (20 minutes)

A quasi-Dirac pair of Heavy Neutral Leptons possesses a number of features that make it an appealing target for search in the GeV mass scale at future collider experiments. This scenario is studied in the Left-Right Symmetric Model. Predictions for the HNL couplings to different lepton flavors are derived, and the possible probes of the model based on the LNV signature are considered.

Author: MIKULENKO, Oleksii (Leiden University)

Presenter: MIKULENKO, Oleksii (Leiden University)

Session Classification: B and L violation at current or future colliders

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

Global Analysis of Oscillation Data in the Presence of BSM Neutrino Properties (25'+5')

Wednesday, October 9, 2024 2:00 PM (30 minutes)

Presenter: MALTONI, Michele (Instituto de Fisica Teorica UAM/CSIC)

Session Classification: Neutrino physics

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

Some Novel Searches for Neutrino Dipole Moments (17'+3')

Wednesday, October 9, 2024 10:15 AM (20 minutes)

Presenter: FRIGERIO, Michele

Session Classification: B and L violation at current or future colliders

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

Probing the Neutrino Mass and Beyond with the KATRIN Experiment (17'+3')

Wednesday, October 9, 2024 2:55 PM (20 minutes)

The Karlsruhe Tritium Neutrino (KATRIN) experiment aims to measure the effective electron antineutrino mass using ultra-high precision spectroscopy of tritium β-decay in the kinematic endpoint region. The most stringent upper limit on the neutrino mass was recently placed at $m_\nu c^2 < 0.45\,\mathrm{eV}$ (90 % CL), using a fraction of the final dataset and improved operational conditions.

Processes that impact the decay kinematics or alter the interaction structure can cause spectral features beyond the neutrino mass. KATRIN investigates new physics scenarios such as mixing with an eV-scale sterile neutrino, the capture of cosmic relic neutrinos on tritium nuclei, and signatures of Lorentz-invariance violation. Additionally, the experiment probes non-standard interactions contributing in the decay structure and explores the coupling of eV-scale BSM bosons to the final state leptons.

This talk will review the latest result of KATRIN and present a selection of the aforementioned searches beyond the neutrino mass.

Presenter: LAUER, Joscha (KIT)

Session Classification: Neutrino physics

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

Observable Leptogenesis (25'+5')

Wednesday, October 9, 2024 11:05 AM (30 minutes)

Presenter: RIUS, Nuria (IFIC, CSIC-Valencia University)

Session Classification: Baryogenesis mechanisms

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

Electroweak Baryogenesis (25'+5')

Thursday, October 10, 2024 2:00 PM (30 minutes)

Presenter: POSTMA, Marieke (Nikhef, Amsterdam, Netherlands)

Session Classification: Baryogenesis mechanisms

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

Tracking Minima, Phase Transitions and Gravitational Waves with BSMPTv3 (17'+3')

Thursday, October 10, 2024 2:30 PM (20 minutes)

Presenter: BIERMANN, Lisa (Institute for Theoretical Physics, Karlsruhe Institute of Technology)

Session Classification: Baryogenesis mechanisms

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

Gravitational Particle Production and Leptogenesis (25'+5')

Thursday, October 10, 2024 2:50 PM (30 minutes)

Presenter: PEREZ-GONZALEZ, Yuber F (IPPP, Durham University)

Session Classification: Baryogenesis mechanisms

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

Hyperkamiokande (25'+5')

Tuesday, October 8, 2024 9:15 AM (30 minutes)

Presenter: TAKHISTOV, Volodymyr (QUP, KEK)

Session Classification: Baryon number violating processes

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

Recent Theory Developments on Baryon Number Violating Processes in the Context of GUTs (25'+5')

Tuesday, October 8, 2024 9:45 AM (30 minutes)

Presenter: MALINSKÝ, Michal (IPNP, Charles University, Prague)

Session Classification: Baryon number violating processes

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

Recent Experimental Activities in Neutron-Antineutron Oscillations (25'+5')

Tuesday, October 8, 2024 10:15 AM (30 minutes)

Presenter: MILSTEAD, David (Fysikum, Stockholms Universitet)

Session Classification: Baryon number violating processes

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

Dark Matter Catalyzed Baryon Destruction (20'+5')

Tuesday, October 8, 2024 12:05 PM (25 minutes)

Presenter: EMA, Yohei

Session Classification: Baryon number violating processes

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

Novel Proton Decay Signatures (20'+5')

Friday, October 11, 2024 9:00 AM (25 minutes)

Presenter: DREINER, Herbert (University of Bonn)

Session Classification: Baryon number violating processes

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

Destabilizing Matter through a Long-Range Force (20'+5')

Tuesday, October 8, 2024 11:40 AM (25 minutes)

Presenter: DAVOUDIASL, HOOMAN (Brookhaven National Laboratory)

Session Classification: Baryon number violating processes

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

Baryon Number Violation EFT (20'+5')

Tuesday, October 8, 2024 11:15 AM (25 minutes)

Presenter: GARGALIONIS, John (IFIC)

Session Classification: Baryon number violating processes

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

Review of Neutrinoless Double Beta-Decay Experiments (25'+5')

Friday, October 11, 2024 9:25 AM (30 minutes)

Presenter: GRUSZKO, Julieta (UNC Chapel Hill/TUNL)

Session Classification: Lepton number violation in low energy processes

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

Exploring neutrinoless double beta decay with the DARWIN observatory (17'+3')

Friday, October 11, 2024 9:55 AM (20 minutes)

Presenter: Dr CUENCA GARCIA, Jose (University of Zurich)

Session Classification: Lepton number violation in low energy processes

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

Neutrinoless double-beta decay phenomenology (17'+3')

Friday, October 11, 2024 10:15 AM (20 minutes)

Presenter: ZHU, Jing-Yu

Session Classification: Lepton number violation in low energy processes

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

LNV in SMEFT (20'+5')

Presenter: Prof. HARZ, Julia

Session Classification: Lepton number violation in low energy processes

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

Lepton Flavour Violation (25'+5')

Tuesday, October 8, 2024 2:15 PM (30 minutes)

Presenter: TEIXEIRA, Ana M. (LPC Clermont)

Session Classification: Lepton flavor violating processes

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

Is Cosmology in Conflict with Neutrino Oscillations? (17'+3')

Wednesday, October 9, 2024 3:15 PM (20 minutes)

Presenter: NAREDO, Daniel (IFT-UAM/CSIC)

Session Classification: Neutrino physics

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

Probing CLFV with the Mu2e Experiment at Fermilab (17'+3')

Tuesday, October 8, 2024 3:25 PM (20 minutes)

Presenter: MÜLLER, Stefan E. (Helmholtz-Zentrum Dresden-Rossendorf)

Session Classification: Lepton flavor violating processes

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

Search for LFV and Light New Physics at Belle-II (17'+3')

Tuesday, October 8, 2024 4:15 PM (20 minutes)

Presenter: KWON, Youngjoon (Department of Physics, Yonsei University)

Session Classification: Lepton flavor violating processes

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

Review of Left-Right Symmetry and its Experimental Signatures (25'+5')

Thursday, October 10, 2024 4:10 PM (30 minutes)

Presenter: NEMEVŠEK, Miha (Jožef Stefan Institute)

Session Classification: B and L violation at current or future colliders

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

Heavy Neutrino-Antineutrino Oscillations at Collider Experiments (25'+5')

Wednesday, October 9, 2024 9:00 AM (30 minutes)

Presenter: ANTUSCH, Stefan (University of Basel)

Session Classification: B and L violation at current or future colliders

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

Matter-Antimatter Asymmetry and Dark Matter Stability from Baryon Number Conservation (25'+5')

Thursday, October 10, 2024 9:00 AM (30 minutes)

Presenter: IBARRA, Alejandro (Technical University of Munich)

Session Classification: Dark Matter

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

Cosmic Axion Background from the Primordial Bath (20'+5')

Thursday, October 10, 2024 9:30 AM (25 minutes)

Presenter: D'ERAMO, Francesco (University of Padua & INFN Padua)

Session Classification: Dark Matter

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

Strongly-Interacting Massive Particles and Dark Matter Capture in Celestial Bodies (17'+3')

Thursday, October 10, 2024 11:15 AM (20 minutes)

Presenter: SMIRNOV, Juri (University of Liverpool)

Session Classification: Dark Matter

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

Direct Detection of Light DM (17'+3')

Thursday, October 10, 2024 11:35 AM (20 minutes)

Presenter: HERRERA, Gonzalo (Virginia Tech)

Session Classification: Dark Matter

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

Neutrino Mass Ordering (20'+5')

Wednesday, October 9, 2024 2:30 PM (25 minutes)

Presenter: Prof. ZUKANOVICH FUNCHAL, Renata

Session Classification: Neutrino physics

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

Concluding Talk (25'+5')

Friday, October 11, 2024 12:05 PM (30 minutes)

Presenter: Prof. PASCOLI, Silvia

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

Dark Matter Decay (20'+5')

Thursday, October 10, 2024 9:55 AM (25 minutes)

Presenter: LOPEZ-HONOREZ, Laura

Session Classification: Dark Matter

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

Axion Haloscopes for Gravitational Wave Searches (20'+5')

Thursday, October 10, 2024 10:20 AM (25 minutes)

Presenter: Dr GARCIA CELY, Camilo

Session Classification: Dark Matter

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

The Latest Results of the MEG II Experiment (17'+3')

Tuesday, October 8, 2024 3:05 PM (20 minutes)

Presenter: DAL MASO, Giovanni (Psul Sherrer Insitut - PSI)

Session Classification: Lepton flavor violating processes

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

Left-Right Symmetric Model with Double Seesaw Mechanism: Its LNV and LFV Imprints (17'+3')

Thursday, October 10, 2024 5:20 PM (20 minutes)

Presenter: PRITIMITA, Prativa (Indian Institute of Science, Bangalore)

Session Classification: B and L violation at current or future colliders

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

Lepton Flavor Violation by Two Units (17'+3')

Tuesday, October 8, 2024 2:45 PM (20 minutes)

Presenter: HEECK, Julian (University of Virginia)

Session Classification: Lepton flavor violating processes

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

Sources of CP Violation for Electroweak Baryogenesis (17'+3')

Tuesday, October 8, 2024 12:30 PM (20 minutes)

A persistent issue in electroweak baryogenesis calculations is the significant disparity in predictions yielded by different approaches, with variations spanning several orders of magnitude. In this study, we examine a system comprising two fermion flavours, proposing the existence of two sources of CP-violating. The semiclassical force and a new resonantly enhanced mixing source can be derived from the collisionless Kadanoff-Baym equation. The two sources are derived using the semiclassical approximation and the VEV insertion approximation. A Higgsino-Bino toy model shows that the new resonantly enhanced mixing source generates sufficient asymmetry to evade EDM bounds. In addition, a ready-to-plug equation for the source is prepared so phenomenologist can use it in their favourite model.

Presenter: ILYAS, Bahaa (Technical University of Munich)

Session Classification: Baryon number violating processes

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

Testing Neutrino Mass Origins with Supernova Neutrinos (17'+3')

Wednesday, October 9, 2024 5:05 PM (20 minutes)

Presenter: KONG, Chui-Fan

Session Classification: Neutrino physics