Invisibles 2021 Workshop

Report of Contributions

https://indico.cern.ch/e/911548

Contribution ID: **165** Type: **not specified**

”News from the Gravitational-Wave Sky: The Theory Side”

arXiv number (if applicable)

Presenter: BUONANNO, Alessandra

Contribution ID: **166** Type: **not specified**

”The future of collider physics: selected aspects”

Monday, May 31, 2021 3:30 PM (30 minutes)

arXiv number (if applicable)

Presenter: HEINEMANN, Beate (DESY and University of Freiburg (Germany))

Contribution ID: **167** Type: **not specified**

”Naturalness motivations for BSM physics”

Monday, May 31, 2021 4:00 PM (30 minutes)

Presenter: HOOK, Anson (University of Maryland)

Contribution ID: **168** Type: **not specified**

”Status of flavor physics”

Monday, May 31, 2021 5:00 PM (30 minutes)

Presenter: GROSSMAN, Yuval (Cornell)

Contribution ID: **169** Type: **not specified**

”Lepton Flavour in Colliders: status and prospects”

Monday, May 31, 2021 6:06 PM (30 minutes)

arXiv number (if applicable)

Presenter: BRESSLER, Shikma (Weizmann Institute of Science (IL))

Contribution ID: **170** Type: **not specified**

”Neutrino mass-mixing parameters, circa 2021”

Tuesday, June 1, 2021 3:00 PM (30 minutes)

Presenter: LISI, Eligio (INFN, Bari, Italy)

Contribution ID: **171** Type: **not specified**

”Physics with Forward LHC Neutrino Detectors”

Tuesday, June 1, 2021 4:00 PM (30 minutes)

Presenter: KLING, Felix (SLAC)

Contribution ID: **172** Type: **not specified**

“Coherent elastic neutrino-nucleus scattering: status and prospects”

Tuesday, June 1, 2021 5:00 PM (30 minutes)

Presenter: DORDEI, Francesca (Universita e INFN, Cagliari (IT))

Contribution ID: **173** Type: **not specified**

”Charting New Directions in the BSM Landscape with Neutrino Experiments”

Tuesday, June 1, 2021 6:00 PM (30 minutes)

arXiv number (if applicable)

Presenter: SHOEMAKER, Ian (Virginia Tech)

Contribution ID: **174** Type: **not specified**

”Solar Neutrinos: Is There a Future?”

Friday, June 4, 2021 3:00 PM (30 minutes)

Presenter: BEACOM, John (Ohio State University)

Contribution ID: **175** Type: **not specified**

”New Techniques for Direct Detection of Light Dark Matter”

Wednesday, June 2, 2021 4:00 PM (30 minutes)

Presenter: HOCHBERG, Yonit (Hebrew University)

Contribution ID: **176** Type: **not specified**

”Dark matter bound states”

Wednesday, June 2, 2021 5:00 PM (30 minutes)

Presenter: PETRAKI, Kalliopi (Sorbonne Université)

Contribution ID: **177** Type: **not specified**

"Primordial black hole dark matter"

Wednesday, June 2, 2021 6:00 PM (30 minutes)

Presenter: BALLESTEROS, Guillermo (IFT UAM-CSIC)

Contribution ID: **178** Type: **not specified**

”Novel signatures of dark matter bound formation”

Thursday, June 3, 2021 3:00 PM (30 minutes)

Presenter: POSPELOV, Maxim

Contribution ID: **179** Type: **not specified**

”Looking for Imprints of Microphysics on Large Scale Structure”

Thursday, June 3, 2021 4:00 PM (30 minutes)

Presenter: PRESCOD-WEINSTEIN, Chanda (University of New Hampshire)

Contribution ID: **180** Type: **not specified**

"An even lighter QCD axion"

Thursday, June 3, 2021 5:00 PM (30 minutes)

Presenter: QUILEZ LASANTA, Pablo (DESY)

Contribution ID: **181** Type: **not specified**

”Superconducting axion string and Cosmic axion background”

Thursday, June 3, 2021 5:30 PM (30 minutes)

Presenter: MURAYAMA, Hitoshi (CERN - DG/CS)

Contribution ID: **182** Type: **not specified**

”Indirect searches for dark matter”

Wednesday, June 2, 2021 3:00 PM (30 minutes)

Presenter: SLATYER, Tracy

Contribution ID: **183** Type: **not specified**

”Baryogenesis and Particle Oscillations”

Friday, June 4, 2021 4:00 PM (30 minutes)

Presenter: IPEK, Seyda (University of Washington)

Contribution ID: **184** Type: **not specified**

”Gravitational waves from the early Universe: challenges and opportunities”

Friday, June 4, 2021 5:00 PM (30 minutes)

Presenter: CROON, Djuna (University of Sussex)

Contribution ID: **185** Type: **not specified**

”Our Galactic Center: A Unique Laboratory for the Physics & Astrophysics of Black Holes”

Friday, June 4, 2021 5:30 PM (30 minutes)

The proximity of our Galaxy’s center presents a unique opportunity to study a galactic nucleus with orders of magnitude higher spatial resolution than can be brought to bear on any other galaxy. After more than a decade of diffraction-limited imaging on large ground-based telescopes, the case for a supermassive black hole at the Galactic center has gone from a possibility to a certainty, thanks to measurements of individual stellar orbits. The rapidity with which these stars move on small-scale orbits indicates a source of tremendous gravity and provides the best evidence that supermassive black holes, which confront and challenge our knowledge of fundamental physics, do exist in the Universe. This work was made possible through the use of speckle imaging techniques, which corrects for the blurring effects of the earth’s atmosphere in post-processing and allowed the first diffraction-limited images to be produced with these large ground-based telescopes.

Further progress in high-angular resolution imaging techniques on large, ground- based telescopes has resulted in the more sophisticated technology of adaptive optics, which corrects for these effects in real time. This has increased the power of imaging by an order of magnitude and permitted spectroscopic study at high resolution on these telescopes for the first time. With adaptive optics, high resolution studies of the Galactic center have shown that what happens near a supermassive back hole is quite different than what theoretical models have predicted, which changes many of our notions on how galaxies form and evolve over time. By continuing to push on the cutting-edge of high-resolution technology, we have been able to capture the orbital motions of stars with sufficient precision to test Einstein’s General theory of Relativity in a regime that has never been probed before.

arXiv number (if applicable)

Presenter: GHEZ, Andrea (University of California)

Contribution ID: **186** Type: **Poster session only**

Exploring Multilepton Signatures From Dark Matter at the LHC

While overwhelming cosmological evidences point to the existence of Dark Matter (DM), only its gravitational interaction has been experimentally confirmed. Limitations on the most general mono-X DM signature at colliders motivate searches beyond this. This could manifest in the form of a weak multiplet/doublet DM via weak interactions giving multilepton plus missing energy final states that can be probed at the LHC. Here we present our latest limits on inert 2-Higgs Doublet model (I2HDM) and Minimal Fermion Dark Matter model (MFDM) for 8/13 TeV pp collisions, producing 2-3 leptons plus missing energy final states, using CheckMATE.

arXiv number (if applicable)

Author: FREEGARD, Arran Charles (Queen Mary University of London (GB))

Co-authors: Prof. BELYAEV, Alexander (University of Southampton & Rutherford Appleton Laboratory); BLUMENSCHEIN, Ulla (University of London (GB)); MORETTI, Stefano (Science and Technology Facilities Council STFC (GB))

Presenter: FREEGARD, Arran Charles (Queen Mary University of London (GB))

Session Classification: Poster Session

Contribution ID: **187** Type: **Poster session only**

Hints for decaying dark matter from S8 measurements

Recent weak lensing surveys have revealed that the direct measurement of the parameter combination S8 = σ8 (Ωm/0.3)ˆ0.5– measuring the amplitude of matter fluctuations on 8 Mpc/h scales – is ~3σ discrepant with the value reconstructed from cosmic microwave background (CMB) data assuming the ΛCDM model. In this talk, I discuss that it is possible to resolve the tension if dark matter (DM) decays with a lifetime of Gammaˆ{-1} ~ 55 Gyrs into one massless and one massive product, and transfers a fraction ε ~ 0.7 % of its rest mass energy to the massless component. The velocity-kick received by the massive daughter leads to a suppression of gravitational clustering below its free-streaming length, thereby reducing the σ8 value as compared to that inferred from the standard ΛCDM model, in a similar fashion to massive neutrino and standard warm DM. Contrarily to the latter scenarios, the time-dependence of the power suppression and the free-streaming scale allows the 2-body decaying DM scenario to accommodate CMB, baryon acoustic oscillation, growth factor and uncalibrated supernova Ia data.

arXiv number (if applicable)

2008.09615

Author: FRANCO ABELLÁN, Guillermo (Laboratoire Univers et Particules de Montpellier (LUPM))

Co-authors: Dr MURGIA, Riccardo (LUPM, CNRS & Montpellier University); Dr POULIN, Vivian (LUPM, CNRS, France); LAVALLE, Julien (LUPM (CNRS / Univ. Montpellier II))

Presenters: FRANCO ABELLÁN, Guillermo (Laboratoire Univers et Particules de Montpellier (LUPM)); FRANCO ABELLÁN, Guillermo

Session Classification: Poster Session

Contribution ID: **188** Type: **Poster session only**

Search for a visible Z'dark boson in ☒☒☒☒ final state with Belle II

The Standard Model (SM) of particle physics is currently the best known description of the fundamental constituents of matter and their interactions. However, among other things, it cannot explain the existence of dark matter, and some experimental results deviate from SM predicitons, suggesting the possibility of including New Physics by extending the SM. Possible extensions are known as dark sector, and the $L_\mu - L_\tau$ model, introducing a Z' dark boson with $M \approx \mathcal{O}$(MeV-GeV), is particularly interesting. In this presentation, the analysis strategy and the preliminary results obtained on Monte Carlo for the search for the visible decay of a Z' with the Belle II detector in the process $e^+e^- \to \mu^+\mu^- Z$', Z' $\to \tau^+\tau^-$ will be presented. The Belle II experiment, located at the asymmetric e^+e^- collider SuperKEKB, is a substantial upgrade of the Belle/KEKB experiment. Belle II aims to record 50 ab^{-1} of data over the course of the project. During the first physics runs in 2018-2020, around 100 fb^{-1} of data were collected.

arXiv number (if applicable)

Author: CORONA, Luigi (INFN - National Institute for Nuclear Physics)

Presenter: CORONA, Luigi (INFN - National Institute for Nuclear Physics)

Session Classification: Poster Session

Contribution ID: **192** Type: **Poster session only**

nu Electroweak Baryogenesis

We investigate if the CP violation necessary for successful electroweak baryogenesis may be sourced by the neutrino Yukawa couplings. In particular, we consider an electroweak scale Seesaw realization with sizable Yukawas where the new neutrino singlets form (pseudo)-Dirac pairs, as in the linear or inverse Seesaw variants. We find that the baryon asymmetry obtained strongly depends on how the neutrino masses vary within the bubble walls. Moreover, we also find that flavour effects critically impact the final asymmetry obtained and that, taking them into account, the observed value may be obtained in some regions of the parameter space. This source of CP violation naturally avoids the strong constraints from electric dipole moments and links the origin of the baryon asymmetry of the Universe with the mechanism underlying neutrino masses. Interestingly, the mixing of the active and heavy neutrinos needs to be sizable and could be probed at the LHC or future collider experiments.

arXiv number (if applicable)

2007.11008]

Author: ROSAURO ALCARAZ, Salvador (Universidad Autónoma de Madrid)

Co-authors: OTA, Toshihiko (Universidad Autonoma de Madrid); FERNANDEZ MARTINEZ, Enrique; LOPEZ PAVON, Jacobo (IFIC, CSIC-Universitat de València)

Presenter: ROSAURO ALCARAZ, Salvador (Universidad Autónoma de Madrid)

Session Classification: Poster Session

Contribution ID: **193** Type: **Poster session only**

Scalar multiplet dark matter in non standard Universe.

We examine the impact of a faster expanding Universe on the phenomenology of scalar dark matter (DM) associated with SU(2) multiplets. Earlier works with radiation dominated Universe have reported the presence of desert region for both inert SU(2) doublet and triplet DM candidates where the DM is under abundant. We find that the existence of a faster expanding component before BBN can revive a major part of the desert parameter space consistent with relic density requirements and other direct and indirect search bounds. We also review the possible collider search prospects of the newly obtained parameter space and show that such region can be probed at the future colliders with improved sensitivity via a stable charged track.

arXiv number (if applicable)

2101.10175

Author: SAHA, Abhijit Kumar (IIT Guwahati)

Presenter: SAHA, Abhijit Kumar (IIT Guwahati)

Session Classification: Poster Session

Contribution ID: **194** Type: **Poster session only**

Search for muonic dark force at Belle II

In this presentation, I will talk about the prospects to search for a muonic dark force at Belle II in events with four muons in the final state. These events could be due to a new gauge boson Z′ which couples only to the second and third lepton family. A short description of the background suppression technique, based on artificial neural networks, and the fitting strategies for the extraction of our discovery potential will be given. I will also introduce the possibilities to identify possible displaced vertex signatures, in case of a long-lived Z′ boson.

keywords : Dark force, neural networks, long-lived

arXiv number (if applicable)

Author: MAITI, Rajesh Kumar (Austrian Academy of Sciences (AT))

Presenter: MAITI, Rajesh Kumar (Austrian Academy of Sciences (AT))

Session Classification: Poster Session

Contribution ID: **195** Type: **PhD forum talk + poster**

Searches for Dark Photons at Belle II

Wednesday, June 2, 2021 3:36 PM (6 minutes)

Belle II is a B-Factory experiment designed to produce precision measurements of CP violation in the weak sector as well as search for Beyond the Standard Model particle physics. The e^+e^- collisions are created by the SuperKEKB accelerator which has achieved a world record of instantaneous luminosity of $2.4 \times 10^{34}\text{cm}^{-2}\text{s}^{-1}$. One of the highest priorities for the early data of the experiment is the search for dark photons that decay to dark matter. A dark photon is a mediator within the dark sector which mixes with the Standard Model (SM) photon. The experimental signature is a single energetic photon observed in the detector. A dark photon would produce an excess of events in the single photon recoil mass. A particularly challenging case is when the visible photon carries the full beam energy, which corresponds to a low-mass dark photon. There is a significant background from the SM process $e^+e^- \to \gamma\gamma$, where one of the photons is missed due to detector imperfections. This has motivated us to study the structure of the sub-detectors and compare the data and Monte Carlo response. By understanding the photon detection sensitivity of the sub-detectors, we will estimate the background for dark photon studies. This talk will discuss the ''single photon search" and the approach to quantifying this background.

arXiv number (if applicable)

Author: WAKAI, Miho (University of British Columbia)

Presenter: WAKAI, Miho (University of British Columbia)

Session Classification: PhD Forum

Contribution ID: **196** Type: **Poster session only**

Singlet-Doublet Majorana Dark Matter and Neutrino Mass in a Type-I Seesaw Scenario

In a bid to simultaneous explanation of dark matter (DM) and tiny but non-zero masses of left-handed neutrinos, we propose a minimal extension of the Standard Model (SM) by a vector-like fermion doublet and three right handed (RH) singlet neutrinos. The DM arises as a mixture of the neutral component of the fermion doublet and one of the RH neutrinos, both assumed to be odd under an additional $\mathcal{Z}_2$ symmetry. As a result, the DM emerges to be a dominantly Majorana particle and escapes from Z-mediated direct search constraints to mark a significant difference from singlet-doublet Dirac DM. The other two $\mathcal{Z}_2$ even heavy RH neutrinos give rise masses and mixing of light neutrinos via Type-I Seesaw mechanism. The particle content automatically allows us to extend the model by a gauged $U(1)_{B-L}$ symmetry, which is anomaly free and brings an additional portal between DM and SM particles. Relic density and direct search allowed parameter space for both the cases are investigated through detailed numerical scan, while collider search strategies are also indicated.

arXiv number (if applicable)

2009.00885

Author: Mr DUTTA, Manoranjan (Indian Institute of Technology Hyderabad)

Co-authors: Dr BHATTACHARYA, Subhaditya (Indian institute of Technology Guwahati); Dr SAHU, Narendra (Indian Institute of Technology Hyderabad); Dr GHOSH, Purusottam (Harish-Chandra Research Institute, Allahabad.)

Presenter: Mr DUTTA, Manoranjan (Indian Institute of Technology Hyderabad)

Session Classification: Poster Session

Contribution ID: **197** Type: **PhD forum talk + poster**

Novel signatures of pseudo-Goldstone dark matter

Thursday, June 3, 2021 3:48 PM (6 minutes)

In my talk and poster, I will motivate dark matter from composite Higgs models. In this framework, the dark matter candidate is a pseudo-Nambu Goldstone boson (pNGB) of a spontaneously broken symmetry, that lies naturally at the electroweak scale. In non-minimal scenarios, other pNGBs arise which can be lighter than the dark matter candidate and therefore affect its phenomenology significantly (a possibility which has been often disregarded in the literature). I will motivate this scenario in concrete composite Higgs models and discuss the emerging signatures at direct and indirect detection experiments. I will finally present the complementarity between these and future collider probes.

arXiv number (if applicable)

Author: RAMOS, Maria

Presenters: RAMOS, Maria; RAMOS, Maria (LIP)

Session Classification: PhD Forum

Contribution ID: **198** Type: **Poster session only**

Heavy decaying dark matter at future neutrino radio telescopes

In the next decade, ultra-high-energy neutrinos in the EeV-ZeV energy range will be potentially detected by next-generation neutrino telescopes. Although their primary goals are to observe cosmogenic neutrinos and to gain insight into extreme astrophysical environments, they have the great potential of indirectly probing the nature of dark matter. In this talk, we study the projected sensitivity of up-coming radio neutrino telescopes, such as RNO-G, GRAND and IceCube-gen2 radio array, to decaying dark matter scenarios. We investigate different dark matter decaying channels and masses, from 10^7 to 10^{15} GeV. By assuming the observation of cosmogenic or newborn pulsar neutrinos, we forecast conservative constraints on the lifetime of heavy dark matter particles. We find that these limits are competitive with and highly complementary to previous multi-messenger analyses.

arXiv number (if applicable)

2103.03254

Author: Mr HAJJAR MUÑOZ, Rasmi Enrique (Scuola Superiore Meridionale, University of Naples Federico II)

Co-authors: Mr FIORILLO, Damiano F.G. (University of Naples, Federico II); Prof. MIELE, Gennaro (University of Naples, Federico II); Dr CHIANESE, Marco (University of Naples, Federico II); Dr SAVIANO, Ninetta (INFN, Napoli); Prof. MORISI, Stefano (University of Naples Federico II, INFN)

Presenter: Mr HAJJAR MUÑOZ, Rasmi Enrique (Scuola Superiore Meridionale, University of Naples Federico II)

Session Classification: Poster Session

Contribution ID: **200** Type: **PhD forum talk + poster**

GeV scale neutrinos: meson interactions and DUNE sensitivity

Tuesday, June 1, 2021 3:48 PM (6 minutes)

The simplest extension of the SM to account for the observed neutrino masses and mixings is the addition of at least two singlet fermions (or right-handed neutrinos). If their masses lie at or below the GeV scale, such new fermions would be produced in meson decays. Similarly, provided they are sufficiently heavy, their decay channels may involve mesons in the final state. Although the couplings between mesons and heavy neutrinos have been computed previously, significant discrepancies can be found in the literature. The aim of this paper is to clarify such discrepancies and provide consistent expressions for all relevant effective operators involving mesons with masses up to 2 GeV. Moreover, the effective Lagrangians obtained for both the Dirac and Majorana scenarios are made publicly available as FeynRules models so that fully differential event distributions can be easily simulated. As an application of our setup, we numerically compute the expected sensitivity of the DUNE near detector to these heavy neutral leptons.

arXiv number (if applicable)

2007.03701

Author: GONZÁLEZ-LÓPEZ, Manuel (Universidad Autónoma de Madrid)

Presenter: GONZÁLEZ-LÓPEZ, Manuel (Universidad Autónoma de Madrid)

Session Classification: PhD Forum

Contribution ID: **201** Type: **Poster session only**

Supernovae neutrino detection via coherent scattering off silicon nuclei

Low-energy neutrinos are clean messengers from supernovae explosions and probably carry unique insights into the process of stellar evolution. We estimate the expected number of events considering coherent elastic scattering of neutrinos off silicon nuclei, as would happen in Charge Coupled Devices (CCD) detectors. The number of expected events, integrated over a window of about 18 s, is ~ 4 if we assume 10 kg of silicon and a supernovae 1 kpc away. For a distance similar to the red supergiant Betelgeuse, the number of expected events increases to ~ 30 – 120, depending on the supernovae model. We argue that silicon detectors can be effective for supernovae neutrinos, and might possibly distinguish between models for certain target masses and distances.

arXiv number (if applicable)

2005.13068

Author: FOGUEL , Ana Luisa (Universidade de São Paulo)

Co-authors: Dr FRAGA, Eduardo (Instituto de Física, UFRJ); Dr BONIFAZI, Carla (Instituto de Física, UFRJ)

Presenter: FOGUEL , Ana Luisa (Universidade de São Paulo)

Session Classification: Poster Session

Contribution ID: **202** Type: **Poster session only**

New developments in MadDM - lines and loops

We present a new module of MadDM that enables the complete automation of the computation of loop-induced processes, relevant for indirect detection of dark matter. The interface between MadDM and MadLoop allows for the calculation of any annihilation cross-section of dark matter into γX, where $X = \gamma, Z, H$ or a new unstable particle contained in the dark matter model, odd under the dark symmetry. For the first time in dark matter numerical tools, the relevant loop-induced processes are fully automated for any generic NLO dark matter model in the UFO format. These new theoretical predictions are confronted with Fermi-LAT gamma-ray line searches from the galactic centre, which extend the experimental likelihood database of MadDM. We present the validation of this new module by comparing our results to existing analytical formulae available in the literature. We additionally perform an updated scan of an interesting part of the Inert Doublet model parameter space, which is currently hiding from LHC and direct dark matter searches.

arXiv number (if applicable)

Author: Mr MASSARO, Daniele (Università di Bologna)

Co-authors: ARINA, Chiara (CP3 UCLouvain); Prof. MALTONI, Fabio (Universite Catholique de Louvain (UCL) (BE) and Università di Bologna); Dr HEISIG, Jan (Université catholique de Louvain (UCL)); MATTELAER, Olivier (UCLouvain)

Presenter: Mr MASSARO, Daniele (Università di Bologna)

Session Classification: Poster Session

Contribution ID: **203** Type: **Poster session only**

Multi-charged TeV scale scalars and fermions in the framework of a radiative seesaw model

Explaining the tiny neutrino masses and non-zero mixings have been one of the key motivations for going beyond the framework of the Standard Model (SM). We discuss a collider testable model for generating neutrino masses and mixings via radiative seesaw mechanism. That the model does not require any additional symmetry to forbid tree-level seesaws makes its collider phenomenology interesting. The model includes multi-charged fermions/scalars at the TeV scale to realize the Weinberg operator at 1-loop level. After deriving the constraints on the model parameters resulting from the neutrino oscillation data as well as from the upper bound on the absolute neutrino mass scale, we discuss the production, decay and resulting collider signatures of these TeV scale fermions/scalars at the Large Hadron Collider (LHC). We consider both Drell-Yan and photo production. The bounds from the neutrino data indicate the possible presence of a long-lived multi-charged particle (MCP) in this model. We obtain bounds on these long-lived MCP masses from the ATLAS search for abnormally large ionization signature. When the TeV scale fermions/scalars undergo prompt decay, we focus on the 4-lepton final states and obtain bounds from different ATLAS 4-leptonsearches. We also propose a 4-lepton event selection criteria designed to enhance the signal to background ratio in the context of this model.

arXiv number (if applicable)

2007.01766v1

Author: Mr ., Avnish (Institute of Physics)

Presenter: Mr ., Avnish (Institute of Physics)

Session Classification: Poster Session

Contribution ID: **204** Type: **PhD forum talk + poster**

Cuspy to cored galaxy profiles from late-time dark matter oscillations

Friday, June 4, 2021 3:42 PM (6 minutes)

The reason why dwarf spheroidal and other galaxies appear to have a lower central density than predicted from N-body simulations based on LCDM cosmology is still an open question.
Apart from the possibility that baryonic physics could play a leading role in shaping the inner density profile of galaxies, the most popular new-physics explanation is to assume heat transfer caused by dark matter (DM) self-interactions.
Here, we present a novel mechanism of solving the core-cusp problem through reactivation of DM annihilation in galaxies at late times. This can happen in asymmetric DM models when there is a very small DM-number violating mass term that causes oscillations between DM and its antiparticle.
Using analytical methods as well as N-body galactic simulations, we show that this mechanism can convert cuspy DM profiles into cored ones for light fermionic DM with mass in the range (0.1 – 1) GeV and a lighter mediator into which the DM can annihilate.
We identify regions of parameter space where annihilation of DM particles is more efficient than elastic scattering at reducing the inner density of the DM profile. Dark matter annihilation is therefore a qualitatively distinct alternative to the mechanism of elastic self-interacting dark matter for addressing the cusp-core problem.

arXiv number (if applicable)

2010.12583

Author: PUEL, Matteo (McGill University)

Co-authors: CLINE, James (McGill University, (CA)); GAMBINI, Guillermo (IFGW-Unicamp); MCDERMOTT, Samuel

Presenter: PUEL, Matteo (McGill University)

Session Classification: PhD Forum

Contribution ID: **206** Type: **PhD forum talk + poster**

Mergers as a Probe of Particle Dark Matter

Wednesday, June 2, 2021 5:54 PM (6 minutes)

Unusual masses of black holes being discovered by gravitational wave experiments pose fundamental questions about the origin of these black holes. More interestingly, black holes with masses smaller than the Chandrasekhar limit ($\sim 1.4\ M_\odot$) are essentially impossible to produce through any standard stellar evolution. Primordial black holes, with fine-tuned parameters and with no well-established formation mechanisms, are the most discussed explanation of these objects. In this talk, I will discuss a simple production channel of these low mass black holes. Particle dark matter with no antiparticle counterpart, owing to their interaction with stellar nuclei, can catastrophically accumulate inside compact stars and eventually transmute them to sub-Chandrasekhar mass black holes, ordinarily forbidden by the Chandrasekhar limit. I will point out several avenues to test the origin of these low mass black holes, concentrating on the cosmic evolution of the binary merger rate. I will show that binary merger rates especially at high redshift are distinctively different for primordial and transmuted black holes, and measurement of these merger rates by the imminent gravitational wave detectors can conclusively test the origin of low mass black holes.

arXiv number (if applicable)

2009.01825

Author: RAY, Anupam (Tata Institute of Fundamental Research, India)

Co-authors: DASGUPTA, Basudeb (Tata Institute of Fundamental Research, Mumbai); Dr LAHA, Ranjan (Indian Institute of science (IN))

Presenter: RAY, Anupam (Tata Institute of Fundamental Research, India)

Session Classification: PhD Forum

Contribution ID: **207** Type: **PhD forum talk + poster**

An on-shell perspective on neutrino oscillations and non-standard interactions

Tuesday, June 1, 2021 3:30 PM (6 minutes)

We apply on-shell amplitude techniques to the study of neutrino oscillations in vacuum, focussing on processes involving W bosons. We start by determining the 3-point amplitude involving one neutrino, one charged lepton and one W boson, highlighting all the allowed kinematic structures. The result we obtain contains terms generated at all orders in an expansion in the cutoff scale of the theory, and we explicitly determine the lower dimensional operators behind the generation of the different structures. We then use this amplitude to construct the 4-point amplitude in which neutrinos are exchanged in the s-channel, giving rise to oscillations. We also study in detail how flavor enters in the amplitudes, and how the PMNS matrix emerges from the on-shell perspective.

arXiv number (if applicable)

2103.16362

Authors: MASSONI SALLA, Gabriel (Sao Paulo University); FIGUEIREDO SEVERIANO ALVES, Gustavo (Universidade de Sao Paulo (BR)); BERTUZZO, enrico (Scuola Normale Superiore)

Presenter: MASSONI SALLA, Gabriel (Sao Paulo University)

Session Classification: PhD Forum

Contribution ID: **208** Type: **Poster session only**

The Singly-Charged Scalar Singlet as the Origin of Neutrino Masses

We consider the generation of neutrino masses via a singly-charged scalar singlet. Under general assumptions we identify two distinct structures for the neutrino mass matrix. This yields a constraint for the antisymmetric Yukawa coupling of the singly-charged scalar singlet to two left-handed lepton doublets, irrespective of how the breaking of lepton-number conservation is achieved. The constraint disfavours large hierarchies among the Yukawa couplings. We study the implications for the phenomenology of lepton-flavour universality, measurements of the W-boson mass, flavour violation in the charged-lepton sector and decays of the singly-charged scalar singlet. We also discuss the parameter space that can address the Cabibbo Angle Anomaly.

arXiv number (if applicable)

2102.09898

Author: FELKL, Tobias (University of New South Wales)

Co-authors: SCHMIDT, Michael (UNSW Sydney); Mr HERRERO, Juan (IFIC, UV/CSIC)

Presenter: FELKL, Tobias (University of New South Wales)

Session Classification: Poster Session

Contribution ID: **209** Type: **Poster session only**

Relativistic Freeze-in with Scalar Dark Matter in a Gauged $B-L$ Model and Electroweak Symmetry Breaking.

We explore relativistic freeze-in production of scalar dark matter in gauged $B-L$ model, where we focus on the production of dark matter from the decay and annihilation of Standard Model (SM) and $B-L$ Higgs bosons. We consider the Bose-Einstein (BE) and Fermi-Dirac (FD) statistics, along with the thermal mass correction of the SM Higgs boson in our analysis. We show that in addition to the SM Higgs boson, the annihilation and decay of the $B-L$ scalar can also contribute substantially to the dark matter relic density. Potential effects of electroweak symmetry breaking (EWSB) and thermal mass correction in BE framework enhance the dark matter relic substantially as it freezes-in near EWSB temperature via scalar annihilation. However, such effects are not so prominent when the dark matter freezes-in at a later epoch than EWSB, dominantly by decay of scalars. The results of this analysis are rather generic, and applicable to other similar scenarios.

arXiv number (if applicable)

Author: Mr ROY, Abhishek (Institute Of Physics, Bhubaneswar, India)

Co-authors: Dr MITRA, Manimala (Institute of Physics, Bhubaneswar); Dr BANDYOPADHYAY, Priyotosh (Indian Institute of Technology Hyderabad)

Presenter: Mr ROY, Abhishek (Institute Of Physics, Bhubaneswar, India)

Session Classification: Poster Session

Contribution ID: **210** Type: **Poster session only**

CP Violation in the Minimal Linear σ Model

The Minimal Linear σ Model is a useful theoretical laboratory. One can investigate in a perturbative renormalisable model the properties of the Higgs boson as a pseudo-Goldstone boson, the phenomenological effects of the radial mode of the field s which spontaneously breaks the global $SO(5)$ symmetry and the validity of conclusions based on the Effective Field Thery (EFT) approach with the field s in the spectrum, after the decoupling of heavy degrees of freedom. In this paper all those issues are discussed in the framework of the Minimal Linear σ Model with CP violating phases leading to pseudoscalar components in the effective Standard Model Yukawa couplings. Also the character of the electroweak phase transition in the presence of the field s is investigated.

arXiv number (if applicable)

2012.03990

Author: Mr ALONSO GONZÁLEZ, Javier (Instituto de Física Teórica UAM-CSIC)

Presenter: Mr ALONSO GONZÁLEZ, Javier (Instituto de Física Teórica UAM-CSIC)

Session Classification: Poster Session

Contribution ID: **211** Type: **PhD forum talk + poster**

More light on Higgs flavor at the LHC: Higgs couplings to light quarks through h+γ production

Monday, May 31, 2021 5:48 PM (6 minutes)

Higgs production in association with a photon at hadron colliders is a rare process, not yet observed at the LHC. We show that this process is sensitive to significant deviations of Higgs couplings to first and second generation SM quarks (particularly the up-type) from their SM values, and use a multivariate neural network analysis to derive the prospects of the High Luminosity LHC to probe deviations in the up and charm Higgs Yukawa couplings through $h + \gamma$ production.

arXiv number (if applicable)

2008.12538

Author: CANO, Jose Manuel (IFT UAM-CSIC)

Presenter: CANO, Jose Manuel (IFT UAM-CSIC)

Session Classification: PhD Forum

Contribution ID: **212** Type: **Poster session only**

A Tale of Two U(1)s: Kinetic Mixing from Lattice WGC States

We point out that the states required by the Lattice Weak Gravity Conjecture, along with certain genericity conditions, imply the existence of non-vanishing kinetic mixing between massless Abelian gauge groups in the low-energy effective theory. We carry out a phenomenological estimate using a string-inspired probability distribution for the masses of superextremal states and compare the results to expectations from string theory and field theory, estimating the magnitude of kinetic mixing in each case. In the string case, we compute the kinetic mixing in an ensemble of 1858 MSSM-like heterotic orbifolds. From the field theory perspective, we consider compactifications of a $5D$ gauge theory. Finally, we discuss potential loopholes that can evade the bounds set by our estimates.

arXiv number (if applicable)

Author: PARIKH, Aditya (Harvard University)

Presenter: PARIKH, Aditya (Harvard University)

Session Classification: Poster Session

Contribution ID: **213** Type: **Poster session only**

Probing Light RHN via Displaced Neutrino Jet Signature at LHeC

We explore the discovery prospect of a relatively light right handed neutrino (RHN) state at the proposed ep collider LHeC, which is planned to operate with 60 GeV electron beam and 7 TeV proton beam. We consider $\tilde{R}_2$ class of leptoquark model, which offers a large production cross-section of RHN along with a jet. For the chosen mass range, the RHN is boosted and can undergoes displaced decay. Therefore, our model signature is unique in nature, which comprises of a prompt jet along with a displaced fat-jet. We use different kinematic variables to separate signal from background, where we show that the ratio variables with respect to energy/number of displaced and prompt tracks can be useful in the identification of displaced decays. We also explore this signature with positron beam, which enhances the detection prospect of a light RHN at LHeC by one order of magnitude.

arXiv number (if applicable)

Author: PADHAN, ROJALIN (Institute of Physics, Bhubaneswar)

Co-authors: COTTIN, Giovanna; FISCHER, Oliver; MANDAL, Sanjoy; MITRA, Manimala

Presenter: PADHAN, ROJALIN (Institute of Physics, Bhubaneswar)

Session Classification: Poster Session

Contribution ID: **214** Type: **PhD forum talk + poster**

Accidental Dark Matter models

Wednesday, June 2, 2021 5:30 PM (6 minutes)

In this talk I will give an overview of my research work on Accidental Dark Matter models. I briefly discuss some general aspects of Dark Matter model building and I show examples of specific models I have studied.

arXiv number (if applicable)

Author: LANDINI, Giacomo (INFN - National Institute for Nuclear Physics)

Presenter: LANDINI, Giacomo (INFN - National Institute for Nuclear Physics)

Session Classification: PhD Forum

Contribution ID: **215** Type: **Poster session only**

Neutrino Masses and Hubble Tension via a Majoron in MFV

The recent tension between local and early measurements of the Hubble constant can be explained in a particle physics context. A mechanism is presented where this tension is alleviated due to the presence of a Majoron, arising from the spontaneous breaking of Lepton Number. The lightness of the active neutrinos is consistently explained. Moreover, this mechanism is shown to be embeddable in the Minimal (Lepton) Flavour Violating context, providing a correct description of fermion masses and mixings, and protecting the flavour sector from large deviations from the Standard Model predictions. A QCD axion is also present to solve the Strong CP problem. The Lepton Number and the Peccei-Quinn symmetries naturally arise in the Minimal (Lepton) Flavour Violating setup and their spontaneous breaking is due to the presence of two extra scalar singlets. The Majoron phenomenology is also studied in detail. Decays of the heavy neutrinos and the invisible Higgs decay provide the strongest constraints in the model parameter space.

arXiv number (if applicable)

2009.01848

Author: ARIAS ARAGÓN, Fernando (Universidad Autónoma de Madrid)

Presenter: ARIAS ARAGÓN, Fernando (Universidad Autónoma de Madrid)

Session Classification: Poster Session

Contribution ID: **216** Type: **Poster session only**

A study of the T1-2A model

I will present an extensive study of a rather generic model of the scotogenic type, providing a solution to the dark matter problem while including radiative generation of neutrino masses. After a short introduction to the model, I will in particular present results based on a Markov Chain Monte Carlo analysis of the associated parameter space in view of numerous constraints from experimental data. Special focus will be given to dark matter phenomenology as well as lepton-flavour violating processes. Finally, I will discuss the viable parameter regions as well as associated signatures of the model.

arXiv number (if applicable)

Author: SARAZIN, Maud

Presenter: SARAZIN, Maud

Session Classification: Poster Session

Contribution ID: **217** Type: **PhD forum talk + poster**

A negative cosmological constant in the dark sector?

Friday, June 4, 2021 3:54 PM (6 minutes)

Following theoretical (high-energy physics) considerations, we explore the possibility that our Universe contains a *negative cosmological constant*, dubbed λ, on top of an additional component X accounting for the late-time accelerated stage of expansion. In this talk, I will present some of the cosmological implications of introducing λ. In particular, we will assess the viability of such models when considering Baryon Acoustic Oscillations, SNeIa and CMB (geometrical) measurements. We estimate the Bayesian evidence in various cosmological scenarios through a nested sampling of the parameter space, and compare it to base-ΛCDM for model selection. We will briefly comment on their capability to address the current Hubble tension when a high-H_0 is taken into account.

arXiv number (if applicable)

2008.10237

Author: CALDERON, Rodrigo (University of Montpellier)

Co-authors: Dr GANNOUJI, Radouane; Dr L'HUILLIER, Benjamin; Prof. POLARSKI, David (Laboratoire Charles Coulomb, Université de Montpellier)

Presenter: CALDERON, Rodrigo (University of Montpellier)

Session Classification: PhD Forum

Contribution ID: **219** Type: **PhD forum talk + poster**

Abundance of LIGO/Virgo Black Holes from Quasar Microlensing

Friday, June 4, 2021 3:48 PM (6 minutes)

Could Dark Matter (DM) be made of Primordial Massive Black Holes (PMBHs) with such mass as detected by LIGO? The amplitude and frequency of gravitational microlensing can be used to detect PBHs. However, they can be mixed with the normal stellar population that can also contribute to microlensing. To separate the contributions from both populations, we perform numerical simulations to study the possible degeneracy of a bimodal distribution of masses with a single-mass function plus a smooth component. This degeneracy is supported by analytical calculations in the low mass surface density case but needs to be studied with numerical simulations in the general case. From this analysis and the experimental microlensing results by Mediavilla et al. (2017), we discuss the possible existence of a PBHs population mixed with the stellar component.

arXiv number (if applicable)

2011.05751

Authors: ESTEBAN GUTIÉRREZ, Ana; Prof. MEDIAVILLA GRADOLPH , Evencio (IAC); Prof. JIMÉNEZ VICENTE, Jorge (UGR)

Presenters: ESTEBAN GUTIÉRREZ, Ana; ESTEBAN GUTIÉRREZ, Ana

Session Classification: PhD Forum

Contribution ID: **221** Type: **PhD forum talk + poster**

Fermion mass hierarchies from vector-like families with an extended 2HDM and a possible explanation for the electron and muon anomalous magnetic moments

Monday, May 31, 2021 5:54 PM (6 minutes)

We study an extended 2 Higgs doublet model (2HDM) in which the Standard Model (SM) Yukawa interactions are forbidden due to a global $U(1)'$ symmetry, but may arise via mixing with vector-like families. In this model, the hierarchical structure of Yukawa couplings of quarks and leptons in the SM arises from the heavy masses of the fourth and fifth vector-like families. Within this model, we consider various non-standard contributions to the electron and muon anomalous magnetic moments. We first consider the W exchange at one-loop level, consistent with the $\mu \to e\gamma$ constraint, and show that it yields a negligible contribution to both electron and muon anomalous magnetic moments. We then consider Higgs scalar exchange, together with vector-like leptons, at one-loop level and show that it is possible to have non-standard contributions to the electron and muon anomalous magnetic moments within the 1σ constraint of certain experiments. We present some benchmark points for both the muon and the electron anomalies, together with some numerical scans around these points, which indicate the mass regions of the Higgs scalars of the 2HDM in this scenario.

arXiv number (if applicable)

2101.05819

Authors: CÁRCAMO HERNÁNDEZ, Antonio Enrique (Universidad Técnica Federico Santa María); LEE, Huchan (The university of Southampton); KING, Stephen F (University of Southampton)

Presenter: LEE, Huchan (The university of Southampton)

Session Classification: PhD Forum

Contribution ID: **222** Type: **PhD forum talk + poster**

Positivity bounds on Minimal Flavor Violation

Monday, May 31, 2021 5:30 PM (6 minutes)

Effective field theories are a very powerful mean to describe theories at energies well below a certain cutoff scale. However, not all points in the parameter space spanned by their coefficients allow for a UV completion that is both unitary and analytic, and various bounds have been derived in the literature. These bounds attain particular phenomenological relevance when applied to the Standard Model Effective Field Theory. The latter is a framework to which any BSM model containing modes heavier than the EW scale, where the Higgs phase transition happen, can be reduced at sufficiently low energies. I will discuss to what extent are these constraints in the Standard Model Effective Field Theory compatible with the Minimal Flavor Violation hypothesis. Since in this setting the coefficients of higher dimensional operators are expressed in terms of Yukawa matrices, I will show how this dependence reflects on the final parameter space the theory is allowed to span.

arXiv number (if applicable)

2011.12855

Authors: GENDY ABD EL SAYED, Emanuele (DESY); BONNEFOY, Quentin (DESY); GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin))

Presenter: GENDY ABD EL SAYED, Emanuele (DESY)

Session Classification: PhD Forum

Contribution ID: **224** Type: **PhD forum talk + poster**

Constraining the tau-neutrino transition magnetic moment at DUNE

Tuesday, June 1, 2021 3:42 PM (6 minutes)

Current limits for the tau-neutrino transition magnetic moment to a sterile neutrino are far weaker than its electron and muon counterparts. In this poster/talk I discuss on-going work to investigate possible constraints on the transition magnetic moment between the tau neutrino and an O(MeV) sterile neutrino at DUNE: the proposed neutrino-beam experiment at FermiLab. I compare this with existing limits and limits at proposed neutrino experiments such as SHiP.

arXiv number (if applicable)

Authors: ZHOU, Albert (KIT); Prof. SCHWETZ-MANGOLD, Thomas (IAP, KIT); Dr ZHU, Jing-Yu (IAP, KIT)

Presenter: ZHOU, Albert (KIT)

Session Classification: PhD Forum

Contribution ID: **225** Type: **PhD forum talk + poster**

Phenomenological consequences of an interacting multicomponent dark sector

Wednesday, June 2, 2021 3:30 PM (6 minutes)

We consider a dark sector with multiple dark fermions interacting under a dark U(1) gauge interaction, mediated by a massless dark photon, with no kinetic mixing. Apart from this self interaction, a portal interaction, mediated by scalar messengers, exists between dark fermions and SM fermions. The species which contribute to the total matter relic density of the Universe, are the stable dark fermions. To complement the existing limits on such a dark sector framework coming from precision physics, astrophysics, and collider physics, we assess the viability of this setup using cosmological observables and current direct detection limits. In studying the early Universe history under this scenario, we track both the number densities of the dark fermions, and the temperatures of the dark and visible sector reservoirs, by numerically solving a system of Boltzmann equations which account for number-changing processes and entropy exchanges between the reservoirs. We determine the couplings and masses in the dark sector framework which are consistent with the known matter relic density and CMB constraint on extra radiation components. Meanwhile, potential signals from direct detection searches are assumed to be mainly driven by dipole and charge radius interactions, between the dominant dark matter component and nuclei, mediated by long-range SM and dark photon mediators. We find that limits on these DM-nuclei effective interaction operators from null results on direct detection, are competitive with projected limits from the magnetic dipole moment of leptons and cooling of stellar systems.

arXiv number (if applicable)

arXiv:2005.04146

Authors: ACUÑA, Jan Tristram (SISSA); FABBRICHESI, Marco (INFN - National Institute for Nuclear Physics); ULLIO, Piero (SISSA)

Presenter: ACUÑA, Jan Tristram (SISSA)

Session Classification: PhD Forum

Contribution ID: **226** Type: **PhD forum talk + poster**

Primordial gravitational waves revealed by a spinning axion

Thursday, June 3, 2021 3:54 PM (6 minutes)

A fast-spinning axion can dominate the Universe at early times and generates the so-called kination era. The presence of kination imprints a smoking-gun spectral enhancement in the primordial gravitational-wave (GW) background. Current and future-planned GW observatories could constrain particle theories that generate the kination phase. Surprisingly, the viable parameter space allows for a kination era at the TeV scale and generates a peaked spectrum of GW from either cosmic strings or primordial inflation, which lies inside ET and CE windows.

arXiv number (if applicable)

Author: SIMAKACHORN, Peera (Universität Hamburg and DESY)

Co-authors: SERVANT, Geraldine (Deutsches Elektronen-Synchrotron (DE)); Dr GOUTTENOIRE, Yann (Deutsches Elektronen-Synchrotron DESY)

Presenter: SIMAKACHORN, Peera (Universität Hamburg and DESY)

Session Classification: PhD Forum

Contribution ID: **227** Type: **PhD forum talk + poster**

Supernova constraints on dark flavor sectors

Friday, June 4, 2021 3:36 PM (6 minutes)

I will present recent application of the SN 1987A cooling bound to set a constraint on dark flavored sectors. This is possible thanks to the fact that the protoneutron stars are hot and dense environments where hyperons can be efficiently produced. Therefore a decay of the form Λ⟶nX0, where Xˆ0 is a new bosonic dark particle, will be severely constrained. I will explain the ingredients required and the application to flavored (massless) dark photons, axions and ALPs.

arXiv number (if applicable)

2012.11632

Author: TEROL CALVO, Jorge (Inst. Astrophys. of Canary Islands (ES))

Presenter: TEROL CALVO, Jorge (Inst. Astrophys. of Canary Islands (ES))

Session Classification: PhD Forum

Contribution ID: **228** Type: **Poster session only**

The Anomalous Case of Axion EFTs and Massive Chiral Gauge Fields

We study axion effective field theories (EFTs), with a focus on axion couplings to massive chiral gauge fields. We investigate the EFT interactions that participate in processes with an axion and two gauge bosons, and we show that, when massive chiral gauge fields are present, such interactions do not entirely originate from the usual anomalous EFT terms. When applied to the case of the Standard Model (SM) electroweak sector, our results imply that anomaly-based sum rules between EFT interactions are violated when chiral matter is integrated out, which constitutes a smoking gun of the latter. As an illustration, we study a UV-complete chiral extension of the SM, containing an axion arising from an extended Higgs sector and heavy fermionic matter that obtains most of its mass by coupling to the Higgs doublets. We assess the viability of such a SM extension through electroweak precision tests, bounds on Higgs rates and direct searches for heavy charged matter. At energies below the mass of the new chiral fermions, the model matches onto an EFT where the electroweak gauge symmetry is non-linearly realised.

arXiv number (if applicable)

2011.10025

Author: ROSSIA, Alejo (Deutsches Elektronen-Synchrotron DESY)

Co-authors: BONNEFOY, Quentin (DESY); DI LUZIO, Luca (Deutsches Elektronen-Synchrotron DESY); GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin)); Dr PAUL, Ayan (DESY, Hamburg and Humboldt Universität zu Berlin)

Presenter: ROSSIA, Alejo (Deutsches Elektronen-Synchrotron DESY)

Session Classification: Poster Session

Contribution ID: **229** Type: **Poster session only**

New physics from oscillations: sensitivity for the DUNE near detector

We study the capabilities of the DUNE near detector to probe deviations from unitarity of the leptonic mixing matrix, the 3+1 sterile formalism and NSI in detection and production, clarifying the relation and possible mappings among the three formalisms. We add to the current analyses in the literature the use of the charged current events for the $\nu\tau$ appearance channel and the consideration of the energy spectral uncertainty (shape uncertainty) of the background. We find that this plays an important role on the results, and is usually overlooked in the literature. Even with this more conservative and realistic approach, we still obtain an improvement in the sensitivity with respect to the current bounds.

arXiv number (if applicable)

Author: URREA, salvador (Instituto de Física Corpuscular(IFIC) Valencia)

Co-authors: LOPEZ PAVON, Jacobo (IFIC, CSIC-Universitat de València); COLOMA, Pilar (Instituto de Fisica Teorica UAM/CSIC)

Presenter: URREA, salvador (Instituto de Física Corpuscular(IFIC) Valencia)

Session Classification: Poster Session

Contribution ID: **230** Type: **PhD forum talk + poster**

Dark Photon Searches at the PADME Experiment

Wednesday, June 2, 2021 3:48 PM (6 minutes)

Massive photon-like particles are predicted in many extensions of the Standard Model as possible portals to a hidden sector where Dark Matter is secluded [1]. They are vector bosons mediating the interaction between ordinary and dark matter and can be produced in different processes through a feeble mixing to the photon. The PADME experiment [2], conducted at Laboratori Nazionali di Frascati of INFN, searches for a signal of a Dark Photon A' in the reaction $e^+e^- \rightarrow \gamma A$' in a positron-on-target experiment. For this purpose, the missing mass spectrum of annihilation final states with a single photon is analysed. Collecting approximately 1013 POT, a sensitivity on the interaction strength down to 0.001 is achievable in the mass region M(A') <23.7 MeV.
In addition, the PADME approach allows searches for any new particle produced in e^+e^- collisions through a virtual off-shell photon, such as long lived Axion-Like-Particles (ALPs), proto-phobic X bosons, Dark Higgs, etc. In the talk, the scientific program of the experiment and its current status will be illustrated.

References
[1] B. Holdom, Phys. Lett B 166, 196 (1986).
[2] V. Kozuharov and M. Raggi, Adv. High Energy Phys. 2014, 959802 (2014).

arXiv number (if applicable)

Author: LONG, Elizabeth (Sapienza Univerisity of Rome, INFN - National Institute for Nuclear Physics)

Presenter: LONG, Elizabeth (Sapienza Univerisity of Rome, INFN - National Institute for Nuclear Physics)

Session Classification: PhD Forum

Contribution ID: **231** Type: **Poster session only**

ENUBET: a monitored neutrino beam for the precision era of neutrino physics

The ENUBET experiment, included in the CERN Neutrino Platform effort as NP06/ENUBET, is developing a new neutrino beam based on conventional techniques in which the flux and the flavor composition are known with unprecedented precision ($\mathcal{O}(1\%)$). Such a goal is accomplished monitoring the associated charged leptons produced in the decay region of the ENUBET facility. Positrons and muons from kaon decays are measured by a segmented calorimeter instrumenting the walls of the decay tunnel, while muon stations after the hadron dump can be used to monitor the neutrino component from pion decays. Furthermore, the narrow momentum width (<10%) of the beam provides a precise measurement ($\mathcal{O}(10\%)$) of the neutrino energy on an event by event basis, thanks to its correlation with the radial position of the interaction at the neutrino detector. ENUBET is therefore an ideal facility for a high precision neutrino cross-section measurement at the GeV Scale, that could enhance the discovery potential of the next-generation of long baseline experiments. It is also a powerful tool for testing the sterile neutrino hypothesis and to investigate possible non-standard interactions.

In this contribution the design of the beamline and of the monitoring instrumentation will be shown. A demonstrator of the instrumented decay tunnel is currently being built and will be exposed to particle beams at CERN in 2022 to prove the effectiveness of the approach. Progress on the full simulation of the ENUBET facility and of the lepton reconstruction, towards the full assessment of neutrino flux systematics, will be also reported, together with the physics potential of the ENUBET beam.

arXiv number (if applicable)

Author: Mr EVGENII LUTSENKO (Università degli Studi dell'Insubria and INFN - Sezione di Milano Bicocca)

Presenter: Mr EVGENII LUTSENKO (Università degli Studi dell'Insubria and INFN - Sezione di Milano Bicocca)

Session Classification: Poster Session

Contribution ID: **232** Type: **PhD forum talk + poster**

Search for neutrinoless double beta decay of 128-Te with the CUORE experiment

Tuesday, June 1, 2021 5:36 PM (6 minutes)

The CUORE experiment is a ton-scale array of TeO_2 cryogenic bolometers located at the underground Gran Sasso National Laboratories, in Italy. The CUORE detector consists of 988 crystals operated as source and detector at a base temperature of $\sim$10 mK. The primary goal of CUORE is the search for neutrinoless double beta ($0\nu\beta\beta$) decay of ^{130}Te, but thanks to its large target mass and ultra-low background it is suitable for the study of other rare processes as well, one of these being the $0\nu\beta\beta$ decay of another tellurium isotope: the ^{128}Te. The ^{128}Te is an attractive candidate for the search of this process, due to its high natural isotopic abundance of 31.75%. The transition energy at $Q_{\beta\beta} = (866.6 \pm 0.9)$ keV lies in a highly populated region of the energy spectrum, dominated by the contribution of the $2\nu\beta\beta$ decay of ^{130}Te and the natural γ background due to environmental radioactivity. With its ton-scale mass, CUORE is able to achieve a factor >10 higher sensitivity to the $0\nu\beta\beta$ decay of this isotope with respect to past direct experiments.

arXiv number (if applicable)

Author: DOMPÈ, Valentina (GSSI / INFN-LNGS / La Sapienza Università di Roma)

Presenters: DOMPÈ, Valentina (GSSI / INFN-LNGS / La Sapienza Università di Roma); DOMPÈ, Valentina

Session Classification: PhD Forum

Contribution ID: **233** Type: **PhD forum talk + poster**

Flavoured leptogenesis and type-II seesaw mechanism with two Higgs triplet scalars

Tuesday, June 1, 2021 3:54 PM (6 minutes)

Type-II seesaw mechanism has been widely studied already as the link between neutrino mass generation beyond Standard Model (SM) and leptogenesis. In this study, the SM is minimally extended by two triplet Higgs scalars (with hypercharge $Y = 2$), with one triplet having complex vacuum expectation value (vev) to impose generality. The triplet vevs are bounded by the ρ-parameter constraint as, ω_1, $\omega_2 \ll v$, where v is the vev of the SM Higgs doublet. The neutrino mass gets generated by two massive triplet Higgs, without any right-handed neutrino in this model. On the other hand, purely flavoured leptogenesis is achieved when the triplet Higgs scalar of mass $M_T \sim 10^9$ GeV, undergoes out-of-equilibrium bi-lepton decay, specially through lepton loop. The lepton asymmetries further get converted into baryon asymmetry via nonperturbative sphaleron process. This study shows the efficiency of phenomenologically promising type-II seesaw mechanism with two triplet scalars, in order to estimate the baryon asymmetry through fully flavoured leptogenesis. Here, baryon asymmetry of the order $\sim 10^{-10}$ is achieved through the stated model, which falls within the experimentally obtained range. The dependence of the baryon asymmetry on the branching ratios of triplet scalar is also studied here. To further increase the predictability of the mechanism, two-zero texture- B_2 is introduced in the neutrino mass matrix. The neutrino mass matrix elements are bounded by the latest neutrino oscillation parameter data and the sum of neutrino mass is taken to be $\Sigma_i m_i < 0.16$ eV. The efficacy of two-zero texture B_2 in two Higgs triplet scenario is mentioned.

arXiv number (if applicable)

Authors: CHONGDAR, Sreerupa (National Institute of Technology Rourkela, India); Prof. MISHRA, Sasmita (Department of Physics and Astronomy, National Institute of Technology Rourkela)

Presenter: CHONGDAR, Sreerupa (National Institute of Technology Rourkela, India)

Session Classification: PhD Forum

Contribution ID: **234** Type: **PhD forum talk + poster**

Relaxing Cosmological Neutrino Mass Bounds with Unstable Neutrinos

Tuesday, June 1, 2021 5:54 PM (6 minutes)

At present, cosmological observations set the most stringent bound on the neutrino mass scale. Within the standard cosmological model (ΛCDM), the Planck collaboration reports $\sum m_\nu < 0.12\,\text{eV}$ at 95 % CL. This bound, taken at face value, excludes many neutrino mass models. However, unstable neutrinos, with lifetimes shorter than the age of the universe $\tau_\nu \leq t_U$, represent a particle physics avenue to relax this constraint.
Motivated by this fact, we present a taxonomy of neutrino decay modes, categorizing them in terms of particle content and final decay products. Taking into account the relevant phenomenological bounds, our analysis shows that 2-body decaying neutrinos into BSM particles are a promising option to relax cosmological neutrino mass bounds.
We then build a simple extension of the type I seesaw scenario by adding one sterile state ν_4 and a Goldstone boson ϕ, in which $\nu_i \to \nu_4\,\phi$ decays can loosen the neutrino mass bounds up to $\sum m_\nu \sim 1\,\text{eV}$, without spoiling the light neutrino mass generation mechanism. Remarkably, this is possible for a large range of the right-handed neutrino masses, from the electroweak up to the GUT scale. We successfully implement this idea in the context of minimal neutrino mass models based on a $U(1)_{\mu-\tau}$ flavor symmetry, which are otherwise in tension with the current bound on $\sum m_\nu$.

arXiv number (if applicable)

2007.04994

Authors: SANDNER, Stefan (IFIC); RIUS, Nuria; LOPEZ PAVON, Jacobo (IFIC, CSIC-Universitat de València); ESCUDERO, Miguel (Technical University of Munich)

Presenter: SANDNER, Stefan (IFIC)

Session Classification: PhD Forum

Contribution ID: **237** Type: **PhD forum talk + poster**

Revisiting K⟶πa decay

Thursday, June 3, 2021 3:36 PM (6 minutes)

The theoretical calculation for pseudo–scalars hadronic decays $P \to Ma$, with the Axion-Like-Particle escaping
the detection, is reviewed. While one-loop penguin contributions are usually considered, tree-level processes have
most often been overlooked in literature. Following the Brodsky/Lepage approach the tree-level contribution to the
ALP pseudo–scalar decay is estimated. Assuming generic ALP couplings to SM fermions, the latest NA62 results for
the $K^+ \to \pi^+ a$ decay and the present and future KOTO results for the $K^0 \to \pi^0 a$ decay are used to
study the tree-level vs one-loop interplay and provide updated bounds on the ALP–fermion Lagrangian sector.

arXiv number (if applicable)

Authors: GUERRERA, Alfredo Walter Mario (University of Padua); RIGOLIN, Stefano

Presenter: GUERRERA, Alfredo Walter Mario (University of Padua)

Session Classification: PhD Forum

Contribution ID: **238** Type: **Poster session only**

BINGO: Bi-Isotope 0nBB Next Generation Observatory

The observation of neutrinoless double beta decay ($2\beta0\nu$) would be a breakthrough in our understanding of particle physics. It could give an answer on the nature of neutrinos (Dirac or Majorana Particles), prove the violation of the lepton number, and explain the asymmetry matter/antimatter. This is why, since many years, physicists are thinking and building huge experiments with the goal to detect this theoretical process and prove one more time the limitation of the Standard Model of particle physics.

In case of the so-called mass mechanism, the half-life of the $2\beta0\nu$ is directly linked to the so-called Majorana effective mass m that depends strongly on the neutrino mass eigenstate hierarchy. So, putting a limit on the half-life is equivalent to explore a region of the possible values for m. Three challenging requirements are important for those experiments to enhance the sensitivity to the detection of this process: A large isotope mass, an excellent energy resolution and finally almost zero background events in the region of interest. Current generation experiments are using different detection methods combined with different isotopes each of them having their advantages/disadvantages. The best limits for the half-life of the order of 10^{26} years corresponding to m < 100 meV. Experiments like CUPID (using bolometers and ^{100}Mo as isotope) foresee to improve this sensitivity down to m < 10 meV allowing for the full exploration of the inverted hierarchy in the next decade. However, neutrino oscillation experiments suggest that the normal hierarchy is more likely, and It is in this context that the BINGO project takes its place: to develop and test new methods to improve further the sensitivity to the half-life of the bolometric experiments and be able to detect $2\beta0\nu$ even in this case.

The bolometric technique has already proved its excellent energy resolution, detection efficiency and reproducibility to large scales. But the main sensitivity limitation is due to the background level: knowing the extreme rarity of the searched process, all the radioactivity in the detector environment is a major problem and several techniques are used to get rid of it. For example, using a scintillator crystal as a principal bolometer coupled to another smaller Ge bolometer acting as a light detector allows for the rejection of alpha particles events by reading in coincidence the scintillation light and the heat signals.

The main goal of BINGO is then to reduce further the rate of background events by using innovative methods and technologies.

For the first time in bolometric experiments, a large cryogenic active veto surrounding closely the detector will be developed and studied. It will be composed of ZWO or BGO scintillating crystal bars where the light emitted will be read by bolometric light detectors at their extremities. The main expected improvement coming from this veto is the rejection of γ's from outside the detector structure (i.e from the remaining natural radioactivity of the surrounding) leading to important background events rejection in the region of interest.

The second main innovation will be the development of new bolometric light detectors sensitive to only a few photons per event. At this purpose, the Neganov-Luke effect will be used: electrodes are added to the surface of a regular bolometric Ge light detector in order to establish an electrical field in the absorber. The charges created by an event will then be drifted to the electrodes, leading to an amplification of the signal. The performances of such a detector are then much better than the ones of those currently used. It will allow to reach a low threshold, really interesting when coupled to the veto to maximize its efficiency. Moreover, it allows detecting the Cherenkov light in the case of a poor scintillating crystal making, like TeO_2, which is one of the most promising

compounds for $2\beta0\nu$ search thanks to the high natural abundance of ^{130}Te.
In this talk (and poster), I will present the first results obtained in the BINGO project on the veto and light detectors.

arXiv number (if applicable)

Author: ARMATOL, Antoine (CEA IRFU/DPhP)

Presenter: ARMATOL, Antoine (CEA IRFU/DPhP)

Session Classification: Poster Session

Contribution ID: **239** Type: **Poster session only**

The upgraded low-background germanium counting facility Gator for high-sensitivity γ-ray spectrometry

The Astroparticle Physics Group at the University of Zurich operates a high-purity germanium (HPGe) spectrometer (Gator) in a low-background environment underground at the Laboratori Nazionali del Gran Sasso (LNGS) in Italy. The 2.2 kg γ-ray spectrometer is one of the world's most sensitive HPGe detectors with an integrated count rate of (85.0 ± 0.9) events/(day kg) in the energy region 100–2700 keV. It is used to screen and select materials for rare-event search experiments such as XENON, DARWIN, GERDA and LEGEND. We describe the general facility, the recent upgrades and their impact on the background level. We also demonstrate its sensitivity by presenting the results for several material samples.

arXiv number (if applicable)

Author: Mr BISMARK, Alexander (University of Zurich)

Co-authors: Ms RODRIGUES ARAUJO, Gabriela (University of Zurich); Prof. BAUDIS, Laura (University of Zurich); Dr GALLOWAY, Michelle (University of Zurich); Ms BIONDI, Yanina (University of Zurich)

Presenter: Mr BISMARK, Alexander (University of Zurich)

Session Classification: Poster Session

Contribution ID: **240** Type: **Poster session only**

Reactor antineutrino anomaly in light of new reactor flux models

We study the status of the reactor antineutrino anomaly in light of new reactor flux models from both conversion and summation methods. We find that both the reactor rate and fuel evolution data are consistent with the predictions both from the conversion model of Kopeikin et al. and the summation model of Estienne et al. The convergence of both model predictions indicatesthe rebustness for the solution to the reactor anomaly in terms of flux model refinements.

arXiv number (if applicable)

Author: XIN, Zhao (Institute of High Energy Physics)

Co-authors: GIUNTI, Carlo (INFN); LI, Yufeng (Institute of High Energy Physics, Chinese Academy of Sciences); TERNES, Christoph Andreas (INFN, Sezione di Torino)

Presenter: XIN, Zhao (Institute of High Energy Physics)

Session Classification: Poster Session

Contribution ID: **241** Type: **PhD forum talk + poster**

Dark Matter in light flavored U(1)' gauge models

Wednesday, June 2, 2021 3:54 PM (6 minutes)

In this talk I will discuss the possibility of obtaining a viable Dark Matter candidate in the context of a gauged, anomaly-free, flavor dependent U(1)' symmetry. I will discuss the relic density constraints, as well as the direct detection and neutrino physics input to the model. Possible detection at future experiments, such as SuperCDMS SNOLAB, is also considered.

arXiv number (if applicable)

Authors: MANUEL GARCÍA DE LA VEGA, León (Universidad Nacional Autonoma de Mexico); PEINADO, Eduardo (Universidad Nacional Autonoma de Mexico); NATH, Newton (Instituto de Fisica, National Autonomous University of Mexico); Dr FLORES, Luis J. (Universidad Nacional Autonoma de Mexico)

Presenter: MANUEL GARCÍA DE LA VEGA, León (Universidad Nacional Autonoma de Mexico)

Session Classification: PhD Forum

Contribution ID: **243** Type: **PhD forum talk + poster**

Charting the Fifth Force Landscape

Monday, May 31, 2021 6:00 PM (6 minutes)

In recent years particle physics research has undergone somewhat of a phase transition, looking increasingly towards hidden sectors and the feebly interacting frontier. In this talk I will introduce a new approach to parameterising dark sector forces, underpinned by the Källén-Lehman representation, in which the effects of any general scalar fifth force are captured by a single positive-definite spectral function. Using this language, I will demonstrate how the effects of loop-level forces can be simply obtained, without needing to explicitly perform loop calculations. I will also show how experimental observables can be expressed in completely general terms, facilitating the straightforward extraction of limits to any specific model. Finally, I will discuss how this framework opens the possibility to speculatively probe violations of unitarity, causality or locality within hidden sectors

arXiv number (if applicable)

arXiv:2009.12399

Authors: BANKS, Hannah (University of Cambridge); MCCULLOUGH, Matthew (CERN)

Presenter: BANKS, Hannah (University of Cambridge)

Session Classification: PhD Forum

Contribution ID: **244** Type: **PhD forum talk + poster**

Easing the sigma8-tension with nu-DM interactions

Friday, June 4, 2021 3:30 PM (6 minutes)

The σ_8-tension of Planck data with weak lensing and redshift surveys is one of the main problems with the ΛCDM model of cosmology. We show that the tension can be alleviated by introducing an interaction between dark matter and neutrinos. We model the interaction using a linear Boltzmann treatment, introducing a novel implementation that for the first time uses the full massive neutrino hierarchy. We also provide upper limits on the interaction cross-section between neutrinos and dark matter.

arXiv number (if applicable)

2011.04206

Author: MOSBECH, Markus Rasmussen (The University of Sydney)

Presenter: MOSBECH, Markus Rasmussen (The University of Sydney)

Session Classification: PhD Forum

Contribution ID: **245** Type: **PhD forum talk + poster**

NUCLEUS outer veto prototype for the CEυNS detection at nuclear reactors

Tuesday, June 1, 2021 5:30 PM (6 minutes)

The detection of Coherent Elastic Neutrino-Nucleus Scattering (CEυNS) represents an experimental challenge because of its unique signature: a nuclear recoil with low energy in range of 10 to 100 eV on average.
This process, largely unexplored until today, could probe physics beyond the Standard Model such as non-standard neutrino interactions and electromagnetic form factors.

NUCLEUS is a nuclear reactor neutrino experiment conceived for CEυNS detection using a new type of ultra-low energy threshold (below 20 eV) cryogenic calorimeters based on the CRESST technology.

Thanks to the greatly enhanced CEυNS cross-section (10 to 1000 times greater than the standard neutrino detection channels), NUCLEUS is aiming for its first phase to develop a miniaturized detector of only 10 g target mass.

The detector will be installed at the Very Near Site (VNS), a shallow depth experimental hall located in between of the 2 nuclear reactors of the Chooz B power plant in France, with reactor baselines of 72 m and 102 m.
At this location with shallow-overburden, a highly efficient background suppression system will be fundamental.

It will include an active cryogenic outer veto designed to work in anti-coincidence with the target detector in order to identify and reject gammas due to the environmental radioactivity and neutron interactions, events that can mimic the CEυNS signal.
In this "talk+poster" I will present the preliminary promising results obtained with our cryogenic outer veto prototype.

arXiv number (if applicable)

Author: BEATRICE MAURI (CEA/IRFU/DPhP)

Presenter: BEATRICE MAURI (CEA/IRFU/DPhP)

Session Classification: PhD Forum

Contribution ID: **246** Type: **PhD forum talk + poster**

Lepton universality tests with dineutrino modes

Monday, May 31, 2021 5:42 PM (6 minutes)

$SU(2)_L$-invariance links charged dilepton $\bar{q}\,q'\,\bar{\ell}\,\ell$ and dineutrino $\bar{q}\,q'\,\bar{\nu}\,\nu$ couplings.
This connection can be established using SMEFT and holds model-independently if only SM-like left-handed light neutrinos are present. This allows to perform complementary experimental tests of lepton universality and charged lepton flavour conservation with flavour-summed dineutrino observables.
It was recently shown in arXiv:2010.02225 that rare $|\Delta c| = |\Delta u| = 1$ dineutrino transitions constitute excellent null tests of the SM and signals of new physics can be just around the corner.

In this talk we present the phenomenological implications of this interplay between dineutrino and dilepton modes in different flavour systems, including charm and B-physics, and provide predictions
for i) universality and ii) for charged lepton flavour conservation that can be tested at e^+e^--machines including Belle II.

arXiv number (if applicable)

2010.02225

Authors: Prof. HILLER, Gudrun (TU Dortmund); Dr GISBERT, Hector (TU Dortmund); Mr GOLZ, Marcel (TU Dortmund); BAUSE, Rigo (TU Dortmund)

Presenter: BAUSE, Rigo (TU Dortmund)

Session Classification: PhD Forum

Contribution ID: **247** Type: **Poster session only**

Horndeski and the Sirens

In dark-energy models where a scalar field is nonminimally coupled to the spacetime geometry, gravitational waves are expected to be supplemented with a scalar mode. Such scalar waves may interact with the standard tensor waves, thereby affecting their observed amplitude and polarization. Understanding the role of scalar waves is thus essential in order to design reliable gravitational-wave probes of dark energy and gravity beyond general relativity. In this talk, I will discuss gravitational wave propagation signatures from a large classe of alternative gravity theories and some possible limitations.

arXiv number (if applicable)

2009.11827, 1912.06117, 1906.12333

Author: DALANG, Charles (University of Geneva)

Co-authors: Prof. LOMBRISER, Lucas (University of Geneva); Dr FLEURY, Pierre (Universidad Autonoma de Madrid)

Presenter: DALANG, Charles (University of Geneva)

Session Classification: Poster Session

Contribution ID: **248** Type: **Poster session only**

Estimation of the internal radiation background of Sn-Bi bolometers for TIN.TIN

The India-based tin detector (TIN.TIN) proposes to explore neutrinoless double beta decay in the isotope ^{124}Sn by employing an array of cryogenic tin-based bolometers which will be operated at ˜10 mK. However, pure tin is susceptible to tin pest, an allotropic phase transition of tin near ambient conditions which results in the mechanical failure of the tin sample. This poses a concern for the longevity of the bolometer array. Sn-Bi alloys are resistant to tin pest and suitable for the fabrication of superconducting bolometers.

The present work reports the evaluation of the anticipated internal background from Sn-Bi bolometers. ^{209}Bi can decay by emitting an α particle of ˜3.1 MeV. However, the α decay is extremely rare, having a half-life of $2 \times 10^{19}y$ (comparable to the typical half-life of a $\beta\beta$ candidate). The background from surface α radiation of ^{209}Bi was estimated using GEANT4 simulations. The anticipated internal background from U/Th impurities was also simulated and compared to the background from ^{209}Bi α decay. The α decay from ^{214}Bi (product of the ^{238}U chain) was found to be the limiting background, while the radioactivity of ^{209}Bi had negligible effect on the background (˜$10^{-5} cts.keV^{-1}.kg^{-1}.y^{-1}$).

arXiv number (if applicable)

Author: APARAJITA , Mazumdar (Tata Institute of Fundamental Research)

Co-authors: REBECCA PACHUAU (DNAP, Tata Institute of Fundamental Research); V. VATSA (INO, Tata Institute of Fundamental Research); A. REZA (DNAP, Tata Institute of Fundamental Research); V. NANAL (DNAP, Tata Institute of Fundamental Research); R. G. PILLAY (Department of Physics, IIT Ropar); A. SHRIVASTAVA (NPD, Bhabha Atomic Research Centre and Homi Bhabha National Institute); A. THAMIZHAVEL (DCMP&MS, Tata Institute of Fundamental Research)

Presenter: APARAJITA , Mazumdar (Tata Institute of Fundamental Research)

Session Classification: Poster Session

Contribution ID: **249** Type: **Poster session only**

Offshell ALP Searches Vector Boson Scattering at the LHC

Non-resonant searches take advantage on the derivative nature of the interaction between Axion-Like particles and the particles in the Standard Model. In this talk I would like to review the work carried out by our group (ALPs & Colliders IFT-UAM) on the matter of VBS as a key channel to probe electroweak ALP couplings (independently of gluon-ALP coupling).

arXiv number (if applicable)

Author: MACHADO RODRÍGUEZ, Jonathan (Instituto de Física Teórica - UAM)

Presenter: MACHADO RODRÍGUEZ, Jonathan (Instituto de Física Teórica - UAM)

Session Classification: Poster Session

Contribution ID: **250** Type: **Poster session only**

The neutrino gravitational memory from a core collapse supernova: phenomenology and physics potential

General Relativity predicts that the passage of matter or radiation from an asymmetrically-emitting source should cause a permanent change in the local space-time metric. This phenomenon, called the \emph{gravitational memory effect}, has never been observed, however supernova neutrinos have long been considered a promising avenue for its detection in the future. With the advent of deci-Hertz gravitational wave interferometers, observing the supernova neutrino memory will be possible, with important implications for multi messenger astronomy and for tests of gravity. In this work, we develop a phenomenological (analytical) toy model for the supernova neutrino memory effect, which is overall consistent with the results of numerical simulations. This description is then generalized to several case studies of interest. We find that, for a galactic supernova, the dimensionless strain, $h(t)$, is of order $\sim 10^{-22} - 10^{-21}$, and develops over a typical time scale that varies between $\sim 0.1 - 10$ s, depending on the time-evolution of the anisotropy of the neutrino emission. The characteristic strain, $h_c(f)$, has a maximum at a frequency $f_{max} \sim \mathcal{O}(10^{-1}) - \mathcal{O}(1)$ Hz. The detailed features of the time- and frequency-structure of the memory strain will inform us of the matter dynamics near the collapsed core, and allow to distinguish between different stellar collapse scenarios. Next generation gravitational wave detectors like DECIGO and BBO will be sensitive to the neutrino memory effect for supernovae at typical galactic distances and beyond; with Ultimate DECIGO exceeding a detectability distance of 10 Mpc.

arXiv number (if applicable)

Author: MAINAK MUKHOPADHYAY (ASU)

Co-authors: Dr CARLOS CARDONA (Arizona State University (ASU)); Prof. CECILIA LUNARDINI (Arizona State University (ASU))

Presenter: MAINAK MUKHOPADHYAY (ASU)

Session Classification: Poster Session

Contribution ID: **251** Type: **Poster session only**

Axion dark matter from fragmentation

Axion fragmentation may serve as a mechanism to produce the observed DM abundance, which makes it possible for axion DM to appear with lower values of the decay constant than those allowed by the conventional misalignment mechanism. Specifically, regions of parameter space accessible to a range of experiments may contain such viable DM candidates. Fragmentation can take place if a light scalar field, such as an ALP or QCD axion, is given an initial velocity, which can lead to parametric resonance as the field traverses the potential barriers. The setup is similar to that assumed by the Affleck–Dine mechanism or the kinetic misalignment mechanism, and fragmentation may take place instead of the latter.

arXiv number (if applicable)

Author: SØRENSEN, Philip (DESY / University of Hamburg)

Co-authors: Dr ERONCEL, Cem (DESY); SATO, Ryosuke (Deutsches Elektronen-Synchrotron DESY); SERVANT, Geraldine (Deutsches Elektronen-Synchrotron (DE))

Presenter: SØRENSEN, Philip (DESY / University of Hamburg)

Session Classification: Poster Session

Contribution ID: **252** Type: **PhD forum talk + poster**

Lepton Flavor Violation in b⟶sℓ1ℓ2 processes

Monday, May 31, 2021 5:36 PM (6 minutes)

Some New Physics scenarios that can explain the hints of Lepton Flavor Universality Violation (LFUV) observed in the B-meson decays also predict Lepton Flavor Violating (LFV) decay modes. We explore minimalistic scenarios involving leptoquark states at the $\mathcal{O}(\mathrm{TeV})$ scale which are consistent with low energy flavor physics observables. We show that the upper bound on LFV decay modes is already close to the experimental limit. Additionally the direct searches at LHC translate into a lower bound on $B \to K^{(*)}\mu\tau$ or $\Lambda_b \to \Lambda\mu\tau$ channels, a prediction that can be probed experimentally to test the validity of the proposed scenarios.

arXiv number (if applicable)

Author: JAFFREDO, Florentin (CNRS)

Co-author: BECIREVIC, Damir (Université Paris-Saclay (FR))

Presenter: JAFFREDO, Florentin (CNRS)

Session Classification: PhD Forum

Contribution ID: **253** Type: **PhD forum talk + poster**

Invisible traces of conformal symmetry breaking

Wednesday, June 2, 2021 5:48 PM (6 minutes)

In our work we study the cosmological phase transition (PT) in a conformal extension of the Standard Model (SM). The model considered is called SU(2)cSM, it extends the SM gauge group by an additional hidden $SU(2)_X$ gauge group, and a scalar doublet (whilist singlet under SM gauge group). The tree-level potential has no mass terms, all the masses are generated via the Coleman-Weinberg mechanism. The new gauge boson X can be considered as a dark matter candidate, also the model may be extended in order to include a mechanism of baryogenesis as well. Due to the large supercooling a strong gravitational waves (GWs) signal can be generated during the PT.
We carefully investigate the PT, taking into account recent developments in order to improve existing results and provide meaningful information for the forthcoming LISA searches.
We study the RG improved potential, distinguish between percolation and nucleation temperature of the bubbles, discuss the hydrodynamics, i.e possible runaway, and present resulting GW spectra.
We briefly comment on the dark matter phenomenology.

arXiv number (if applicable)

Author: KIERKLA, Maciej (University of Warsaw)

Co-authors: KARAM, Alexandros; SWIEZEWSKA, Bogumila (University of Warsaw)

Presenter: KIERKLA, Maciej (University of Warsaw)

Session Classification: PhD Forum

Contribution ID: **254** Type: **PhD forum talk + poster**

Neutrinoless Double Beta Decay with R-Parity Violating SUSY and Light Neutralinos

Tuesday, June 1, 2021 5:48 PM (6 minutes)

The exotic contributions of sfermions, neutralinos, and gluinos to neutrinoless double beta decay ($0\nu\beta\beta$) in the presence of R-parity violating (RPV) couplings have been known for some time. In this talk and poster, we update the sensitivity of $0\nu\beta\beta$ to the lightest mostly-bino neutralino over the neutralino mass range 0.1 MeV - 10 TeV, constraining the RPV coupling in a way that is compatible with collider searches for SUSY partners. A neutralino lighter than the average momentum transfer of $0\nu\beta\beta$ has not been constrained in this way before. We compare to other experimental constraints on the RPV coupling and neutralino mass.

arXiv number (if applicable)

Authors: BOLTON, Patrick (University College London); Prof. DEPPISCH, Frank (University College London); Dr DEV, Bhupal (Washington University in St. Louis)

Presenters: BOLTON, Patrick (University College London); BOLTON, Patrick

Session Classification: PhD Forum

Contribution ID: **255** Type: **PhD forum talk + poster**

Searching for pseudo-Nambu-Goldstone boson dark matter production in association with top quarks

Thursday, June 3, 2021 3:42 PM (6 minutes)

Pseudo-Nambu-Goldstone bosons (pNGBs) are attractive dark matter (DM) candidates since they are coupled to the Standard Model (SM) predominantly through derivative interactions. Thereby, they naturally evade the strong existing limits inferred from DM direct detection experiments. Working in an effective field theory that includes both derivative and non-derivative DM-SM operators, we perform a detailed phenomenological study of the Large Hadron Collider reach for pNGB DM production in association with top quarks. Drawing on motivated benchmark scenarios as examples, we compare our results to other collider limits as well as the constraints imposed by DM (in)direct detection experiments and the relic abundance. Furthermore, we explore implications on the viable parameter space of pNGB DM. In particular, we demonstrate that the sensitivity of DM direct detection experiments can be achieved via loop-induced interactions. The search strategies we discuss can serve as a starting point for dedicated experimental analyses by the ATLAS and CMS collaborations.

arXiv number (if applicable)

Authors: POLESELLO, Giacomo (INFN, Sezione di Pavia (IT)); SCHULTE, Stefan (Max Planck Institute for Physics (Munich)); HAISCH, Ulrich (Max Planck Institute for Physics (Munich))

Presenter: SCHULTE, Stefan (Max Planck Institute for Physics (Munich))

Session Classification: PhD Forum

Contribution ID: **256** Type: **Poster session only**

Novel multi-lepton signatures in meson decays from MeV QCD axions and dark sectors

We point out novel kaon and pion decays to several leptons pairs that can probe states beyond the Standard Model at the MeV scale. In particular, modes like K $\longrightarrow \pi$ 2(e+e-) have never been measured or considered before and could be used to search for MeV axions, as well as multi-component dark sectors. In particular, the "17 MeV QCD axion" is robustly tested with these signatures, as it predicts a branching ratio for $\pi 0 \longrightarrow$ 3(e+e-) at the level of 0.1%, much above the double-Dalitz mode.

arXiv number (if applicable)

https://arxiv.org/abs/2012.02142

Author: HOSTERT, Matheus (University of Minnesota)

Co-author: POSPELOV, Maxim

Presenter: HOSTERT, Matheus (University of Minnesota)

Session Classification: Poster Session

Contribution ID: **257** Type: **PhD forum talk + poster**

A model independent probe for elusive dark sectors at future experiments

Wednesday, June 2, 2021 5:42 PM (6 minutes)

The existence of a SM-neutral and light dark sector coupled to the visible sector via irrelevant portal interactions was considered in 2012.08537. Such scenarios tend to be common in dark matter models arising as various extensions of the Standard Model.
The authors of 2012.08537 use the conformal behaviour of this dark sector at energies $\Lambda_{IR} << E << \Lambda_{UV}$ to study their phenomenology in a model independent way, where Λ_{UV} is the scale at which the heavy mediator exchange generates the portal operators and Λ_{IR} is the infrared scale.
Our work extends the work of 2012.08537 as we derive bounds from various classes of future facilities aimed at detecting long lived particles (transverse detectors like MATHUSLA, CODEX-b etc. as well as fixed target experiments like SHiP etc.) to complement the bounds obtained in 2012.08537 by showing an improved reach on small Λ_{IR}.
We hope this study would encourage that future experimental analyses be performed for generic dark sectors without a focus on a particular benchmark model.

arXiv number (if applicable)

Authors: COSTA, Marco (Scuola Normale Superiore Pisa); MISHRA, Rashmish (Harvard University); VERMA, Sonali (Scuola Normale Superiore Pisa)

Presenter: VERMA, Sonali (Scuola Normale Superiore Pisa)

Session Classification: PhD Forum

Contribution ID: **258** Type: **Poster session only**

Gravity waves from nonlinear axion-likie particle dynamics

Axion-like particles (ALPs) play an important role for inflationary model building, as well as are well motivated dark matter candidates. The out-of-equilibrium initial conditions, combined with their possibly nontrivial potentials, allow for a rich nonlinear dynamics of such fields in the early universe.

We consider coherent oscillations of an ALP field in a wiggly potential and investigate the scenario when the fluctuations on top of the homogeneous field are dynamically amplified, leading to its complete fragmentation. If the potential contains several local minima, separated by barriers, transitions to lower minima can be induced via bubble nucleation and we study the nonthermal nature of this process and the impact of fragmentation. The above mentioned dynamics is accompanied by the production of a stochastic gravitational wave background, possibly within reach of future detectors.

arXiv number (if applicable)

2004.07844, in preparation

Author: CHATRCHYAN, Aleksandr (Deutsches Elektronen-Synchrotron DESY)

Presenter: CHATRCHYAN, Aleksandr (Deutsches Elektronen-Synchrotron DESY)

Session Classification: Poster Session

Contribution ID: **259** Type: **PhD forum talk + poster**

Semi-visible dark photons as a solution to (g−2)μ

Wednesday, June 2, 2021 3:42 PM (6 minutes)

In light of the recent measurement of the anomalous muon magnetic moment which confirms a tension with the standard model, we revisit the light vector boson explanation of this discrepancy and show that there is still available parameter space in the context of models with co-annihilating dark matter or dark heavy neutral fermions. Reinterpreting the bounds from B factories with a semi-visible dark photon, we show that they may be an excellent place to look for hints of this new physics.

arXiv number (if applicable)

Authors: ABDULLAHI, Asli (University of Durham); Dr HOSTERT, Matheus; Mr MASSARO, Daniele; Prof. PASCOLI, Silvia

Presenter: ABDULLAHI, Asli (University of Durham)

Session Classification: PhD Forum

Contribution ID: **260** Type: **Poster session only**

The holographic correspondence at finite temperature

In the context of holography, a black hole horizon is commonly introduced to model finite temperatures. However, this choice is not unique. We investigate the minimal features that a more general metric should display in order to describe a system at a finite temperature, using semi-analytical techniques and well-established holographic superconductor models as our testing ground. The conclusions of our analysis can be generalised to holographic QCD and beyond the SM strongly-coupled models and could potentially add to the current computational efforts in particle physics.

arXiv number (if applicable)

Author: ENGUITA-VILETA, Víctor (Universidad de Valencia)

Co-authors: Prof. SANZ GONZALEZ, Veronica; DONINI, Andrea (Consejo Superior Investigaciones Científicas); ESSER, Fabian (IFIC Universidad de Valencia)

Presenter: ENGUITA-VILETA, Víctor (Universidad de Valencia)

Session Classification: Poster Session

Contribution ID: **261** Type: **PhD forum talk + poster**

Constraints on CP-Violating Higgs Portal Majorana Dark Matter

Wednesday, June 2, 2021 5:36 PM (6 minutes)

In this talk I discuss the viability of higgs portal majorana dark matter in light of current constraints, considering parameter ranges motivated by the thermal relic abundance and the potential GCE annihilation signal. Typically in these types of models, the mass of the dark matter is tuned so that annihilation occurs through the higgs resonance, in order to get a large enough annihilation signal while avoiding direct detection constraints. By considering a CP violating coupling, I explore an alternative possibility where this hierarchy between annihilation and scattering strengths can be achieved by tuning the phase of the dark matter higgs coupling, since the imaginary part of the coupling controls annihilation while the real part controls scattering. By analyzing both the dark matter EFT and several UV completions, I will show there is viable parameter space in the minimal singlet-doublet case, despite strong EDM constraints on the CP violating phase.

arXiv number (if applicable)

2010.15129

Author: FRASER, Katherine (Harvard University)

Co-authors: XU, Linda; PARIKH, Aditya (Harvard University)

Presenter: FRASER, Katherine (Harvard University)

Session Classification: PhD Forum

Contribution ID: **262** Type: **PhD forum talk + poster**

Novel Active Noise Cancellation Algorithms for CUORE

Tuesday, June 1, 2021 5:42 PM (6 minutes)

The Cryogenic Underground Observatory for Rare Events (CUORE) experiment is an ongoing search for neutrinoless double beta decay located at the Gran Sasso National Laboratory (LNGS) in Italy. Recent work has found that the CUORE calorimeters are sensitive to acoustic and seismic events originating from outside the detector at LNGS. To measure the effect of these mechanical disturbances on the calorimeter signals, microphones and accelerometers were installed around the CUORE cryostat. Existing adaptive algorithms which use auxiliary devices (e.g. accelerometers) to remove microphonic noise from high-purity germanium detectors may be changed to remove excess noise from low-temperature calorimeters. Here I will present how said changes can be implemented for noise removal from calorimeters instrumented with neutron transmutation doped (NTD) germanium detectors or transition edge sensors (TES) and demonstrate how this new adaptive algorithm improves the energy resolution of these devices.

arXiv number (if applicable)

Authors: VETTER, Kenny (University of California, Berkeley); ZIMMERMANN, Sergio (Lawrence Berkeley National Laboratory); WELLIVER, Bradford (Lawrence Berkeley National Laboratory); SINGH, Vivek (University of California, Berkeley); HUANG, Roger (UC Berkeley); KOLOMENSKY, Yury (Lawrence Berkeley National Laboratory); HANSEN, Erin (Drexel University)

Presenter: VETTER, Kenny (University of California, Berkeley)

Session Classification: PhD Forum

Contribution ID: **263** Type: **Poster session only**

Exploring Earth's Matter Effect in High-Precision Long-Baseline Experiments

A detailed understanding of Earth's Matter effect is inevitable to correctly analyze the data from the upcoming high-precision long-baseline experiments to resolve the remaining fundamental unknowns such as neutrino mass ordering, leptonic CP violation and precision measurements of the oscillation parameters. In this paper, for the first time, we explore in detail the capability of Deep Underground Neutrino Experiment (DUNE) to establish the matter oscillation as a function of δCP and θ23 by excluding the vacuum oscillation. We find that DUNE is sensitive to Earth's matter effect at more than 2σ C.L. irrespective of the choice of the oscillation parameters. The relative 1σ precision in the measurement of line-averaged constant Earth matter density (ρavg) for maximal CP-violating choices of δCP is around 10% to 15% depending on the choice of neutrino mass ordering. If δCP turns out to be around -90◦ or 90◦ , the precision in measuring ρavg is better in DUNE as compared to what are achievable from the Super-K atmospheric data, combined data from Solar and KamLand, and full exposure of T2K and NOvA. We also observe new interesting degeneracies among ρavg , δCP , and θ23 and notice that the present uncertainty in δCP dilutes more the measurement of ρavg compared to θ23 . To lift these degeneracies, we incorporate the prospective data from the upcoming Tokai to Hyper-Kamiokande (T2HK) and T2HK with a second detector in Korea (T2HKK) experiments. With a relatively shorter baseline and high statistics at first oscillation maximum, T2HK offers unprecedented sensitivity to establish genuine CP violation and to measure δCP, whereas in the T2HKK setup, the second detector in Korea with a roughly four times longer baseline is more sensitive to Earth's matter effect and provides crucial information on δCP working at second oscillation maximum. We explore interesting complementarities among these possible setups and find that the combined data from DUNE and T2HKK can establish Earth' s matter effect at more than 5σ C.L. irrespective of the choices of mass ordering, δCP, and θ23 .

arXiv number (if applicable)

Author: MASOOM SINGH (Institute of Physics and Utkal University)

Co-author: SANJIB KUMAR AGARWALLA

Presenter: MASOOM SINGH (Institute of Physics and Utkal University)

Session Classification: Poster Session

Contribution ID: **264** Type: **PhD forum talk + poster**

Enhanced violation of Leggett-Garg Inequality in three flavour neutrino oscillations via non-standard interactions

Tuesday, June 1, 2021 3:36 PM (6 minutes)

Neutrino oscillations occur due to non-zero masses and mixings and most importantly they are believed to maintain quantum coherence even over astrophysical length scales. In the present study, we explore the quantumness of three flavour neutrino oscillations by studying the extent of violation of Leggett-Garg inequalities (LGI) if non-standard interactions are taken into account. We report an enhancement in violation of LGI with respect to the standard scenario for appropriate choice of NSI parameters.

arXiv number (if applicable)

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Presenter: SHEEBA SHAFAQ (School of Physical Sciences, Jawaharlal Nehru University)

Session Classification: PhD Forum

Contribution ID: **265** Type: **Poster session only**

Signatures of ultralight scalars in neutrino oscillations

Ultralight bosonic dark matter can induce temporal variation in the masses and coupling of the Standard Model. A coupling between this dark matter candidate and neutrinos could lead to three different signatures in oscillation experiments: a time modulation of the signal, a distortion in the oscillation probability or it could manifest as a fast-varying matter potential.

arXiv number (if applicable)

2007.03590

Author: PABLO , Martínez Miravé (UVEG)

Presenter: PABLO , Martínez Miravé (UVEG)

Session Classification: Poster Session

Contribution ID: **266** Type: **Poster session only**

A New Approach to Probe Non-Standard Interactions in Atmospheric Neutrino Experiments

We propose a new approach to explore the neutral-current non-standard neutrino interactions (NSI) in atmospheric neutrino experiments using oscillation dips and valleys in reconstructed muon observables, at a detector like ICAL. We show that the non-zero value of NSI parameter $\varepsilon_{\mu\tau}$ shifts the oscillation dip locations in L/E distributions of the up/down event ratios of reconstructed μ^- and μ^+ in opposite directions. We introduce a new variable Δd representing the difference of dip locations in μ^- and μ^+, which is sensitive to $\varepsilon_{\mu\tau}$, and is independent of the value of Δm^2_{32}. We further note that the oscillation valley in the $(E, \cos\theta)$ plane of the reconstructed muon observables bends in the presence of NSI, its curvature having opposite signs for μ^- and μ^+. We illustrate how the measurement of contrast in the curvatures of valleys in μ^- and μ^+ can be used to estimate $\varepsilon_{\mu\tau}$. Using these proposed oscillation dip and valley measurements, the achievable precision on $|\varepsilon_{\mu\tau}|$ at 90\% C.L. is about 2\% with 500 kt·yr exposure including the effects of statistical fluctuations, systematic errors, and uncertainties in oscillation parameters.

arXiv number (if applicable)

2101.02607

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Session Classification: Poster Session

Contribution ID: **267** Type: **Poster session only**

How does antimatter fall? : focus on the GBAR experiment (CERN)

One of the main questions of fundamental physics is the problem of the asymmetry matter/antimatter in the universe and the action of gravity on antimatter. Tests on antimatter gravity have currently a limited precision, with the sign of gravity acceleration not yet known experimentally. Ambitious projects are developed at CERN facilities to produce low energy antihydrogen with the aim of measuring the free fall of antihydrogen atoms. Among them, the GBAR experiment (Gravitational Behaviour of Antihydrogen at Rest) aims at measuring the gravity acceleration of antihydrogen atoms during a free fall in Earth's gravitational field. The simulation of the free-fall chamber includes the Monte-Carlo generation of trajectories and the statistical analysis. A precision of the measurement beyond the % level is confirmed by taking into account the experimental design. We also propose a new method using quantum reflection of antiatoms above a reflecting mirror followed by a classical free fall; the quantum interference pattern obtained at detection improves the accuracy of the experiment by approximately 3 orders of magnitude.

arXiv number (if applicable)

Author: OLIVIER , Rousselle ((Laboratoire Kastler Brossel, Sorbonne Université, France))

Presenters: ROUSSELLE, Olivier (Laboratoire Kastler Brossel (FR)); OLIVIER , Rousselle ((Laboratoire Kastler Brossel, Sorbonne Université, France))

Session Classification: Poster Session

Contribution ID: **270** Type: **PhD forum talk + poster**

One-loop corrections to ALPs effective couplings

Thursday, June 3, 2021 3:30 PM (6 minutes)

I present the one-loop contributions to ALP-SM couplings stemming from effective ALP operators, including all finite corrections. The complete leading-order (dimension five) effective linear Lagrangian is considered. These corrections can become a useful tool to test ALP-SM interactions which are hard to measure via their loop impact on other observables that are more experimentally constrained. As an example, ALP-WW interaction is hardly observed at tree level, but competitive constraints are obtained via its contribution to ALP-γγ interaction at one-loop order. These results are of particular impact on non-resonant LHC and accelerator searches of ALP coupling to γγ, ZZ, Zγ, WW and fermions.

arXiv number (if applicable)

Author: JESÚS , Bonilla (UAM/ IFT)

Presenters: JESÚS , Bonilla (UAM/ IFT); BONILLA, Jesus

Session Classification: PhD Forum

Contribution ID: **271** Type: **Poster session only**

The muon magnetic moment: to the 2HDM and beyond

The recent measurement of the muon g−2 anomaly continues to defy a Standard Model explanation. Although such anomaly can be accommodated within the framework of two Higgs doublet models, one of the most popular scalar sector extensions, the allowed parameter space has been further restricted due to conflicts with several constraints. However, if one includes extra fermion content in the form of a generation of vector-like leptons that do not mix with the muon, the allowed parameter range that explains the anomaly is further extended, with previous issues being avoided. However, a new one appears. In this work we update previous analyses within the 2HDM alone and extend them with a new generation of vector-like leptons.

arXiv number (if applicable)

https://arxiv.org/abs/2104.03367

Author: Mr GONÇALVES , Bernardo (CFTP/IST Lisbon)

Presenter: Mr GONÇALVES , Bernardo (CFTP/IST Lisbon)

Session Classification: Poster Session

Contribution ID: **272** Type: **Poster session only**

Sterile neutrinos with inverse seesaw and the simplest flavour symmetries

We study the phenomenology of the minimal inverse-seesaw model composed of two 'right-handed neutrinos'and two sterile singlet fermions, besides the Standard Model (SM) particle content. The model is supplemented with Abelian flavour symmetries to ensure maximal predictability and establish the most restrictive flavour patterns which can be realised by those symmetries. This setup requires the addition of a second scalar doublet and two complex scalar singlets to the SM enabling us to implement spontaneous CP violation. Such CP-violating effects can be successfully communicated to the lepton sector by means of the scalar singlets couplings with the new sterile fermions. The Majorana and Dirac CP phases are correlated, and the active-sterile neutrino mixing is fully determined by the active neutrino masses, mixing angles and CP phases. We investigate the constraints imposed on the model by the current experimental limits as well as future projected sensitivities on charged lepton flavour-violating decays and searches sensitive to the presence of heavy sterile neutrinos.

arXiv number (if applicable)

2012.04557

Author: Mr FERNANDES DE NORONHA BRITO CÂMARA, Henrique Pedro (Centro de Física Teórica de Partículas' (CFTP))

Presenter: Mr FERNANDES DE NORONHA BRITO CÂMARA, Henrique Pedro (Centro de Física Teórica de Partículas' (CFTP))

Session Classification: Poster Session

Contribution ID: **273** Type: **Poster session only**

Enhancing jet taggers with Mass Unspecific Supervised Tagging (MUST)

We introduce a new approach for training jet taggers based on multivariate methods, where the mass and transverse momentum are input variables, along with jet substructure observables, varying over wide ranges. Known as Mass Unspecific Supervised Tagging (MUST), this strategy allows the development of taggers that are sensitive to different types of signal and efficient across large kinematical regions. Additionally, it provides an optimal solution to the mass correlation problem that affects other supervised taggers. We build MUST-inspired generic taggers using neural networks which, when tested with various multi-pronged signals, perform much better than variables commonly used in experiments to discriminate signal from background. These taggers can also spot signals not used in training with a good efficiency. Taggers built upon MUST can be designed to identify the prongness of a jet, which could be extremely useful in a scenario where a new physics signal is discovered.

arXiv number (if applicable)

2008.12792

Author: Mr FONSECA SEABRA, João (Instituto Superior Técnico (Lisbon, Portugal))

Presenter: Mr FONSECA SEABRA, João (Instituto Superior Técnico (Lisbon, Portugal))

Session Classification: Poster Session

Contribution ID: **274** Type: **Poster session only**

Neutrino masses from simple scoto-seesaw model with spontaneous CP violation

I will present our recent work on a simple scoto-seesaw model that accounts for dark matter and neutrino masses with spontaneous CP violation. This is achieved with a single horizontal Z8 discrete symmetry, broken to a residual Z2 subgroup responsible for stabilizing dark matter. CP is broken spontaneously via the complex vacuum expectation value of a scalar singlet, inducing leptonic CP-violating effects. We find that the imposed Z8 symmetry pushes the values of the Dirac CP phase and the lightest neutrino mass to ranges already probed by ongoing experiments.

arXiv number (if applicable)

2012.05189

Author: Mrs MARQUES BARREIROS, Débora (CFTP/IST, Universidade de Lisboa)

Presenter: Mrs MARQUES BARREIROS, Débora (CFTP/IST, Universidade de Lisboa)

Session Classification: Poster Session

Contribution ID: **281** Type: **not specified**

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