Phoenix 2025

Report of Contributions

https://indico.global/e/14206

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

Left-right symmetric models with lepton portal dark matter

Wednesday 9 July 2025 09:30 (30 minutes)

I have proposed a simple model with (light) dark matters (DMs)
that interact with leptons via Yukawa couplings, with S. Okawa and S. Iguro.
The DMs can evade strong bounds from the DM direct detection experiments
and predict some specific signals at the LHC. In this talk, I review the work shortly, and
introduce a model with $SU(3) \times SU(2)_L \times SU(2)_R \times U(1)_{B-L}$ gauge symmetry and left-right (LR) symmetry, that can be interpreted as an underlying theory of the DM model.
LR symmetric models can solve the strong CP problem, but need realize DM and tiny neutrino masses. In our model, tiny neutrino masses are induced by loop corrections involving DM. We see correlation between the neutrino mass matrix and DM physics.

Presenter: OMURA, Yuji (Kindai University)

Session Classification: Plenary

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

TBA

Wednesday 9 July 2025 10:00 (30 minutes)

Presenter: RENTALA, Vikram (Indian Institute of Technology Bombay)

Session Classification: Plenary

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

Mixing of the photon with axion and axion-like particles

Wednesday 9 July 2025 10:30 (30 minutes)

Photons can mix with low-mass bosons in the presence of external electromagnetic fields. A known example is the hypothetical axion (spin 0) which can couple with the photon by a two-photon vertex. Other axion-like particles (ALP) have been proposed in many Beyond Standard Model (BSM) theories. In this talk we give a brief overview of the physics of axion and discuss the possibility of detecting axion and axion-like particles in different astrophysical observations and laboratory experiments. Constraints on the parameter space of axion mass and coupling are presented.

Presenter: ROY, Sourov (Indian Association for the Cultivation of Science, Kolkata)

Session Classification: Plenary

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

Higher order thermal corrections to dark matter annihilations processes

Wednesday 9 July 2025 11:30 (30 minutes)

We present results for higher order thermal corrections to both dark matter annihilation into fermion pairs, as well as annihilation along with photon absorption/emission. We show explicitly cancellation of soft and collinear divergences in the thermal theory and calculate the finite remainder. The corrections depend significantly on whether the dark matter particle is assumed to be Majorana or Dirac type particle.

Presenter: D., Indumathi

Session Classification: Plenary

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

High Energy Astrophysical Neutrinos

Wednesday 9 July 2025 12:00 (30 minutes)

Presenter: RAKSHIT, Subhendu (IIT Indore)

Session Classification: Plenary

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

Neutrino Oscillations & New Physics Effects

Wednesday 9 July 2025 12:30 (30 minutes)

Presenter: Dr DEVI, Moon Moon (Tezpur University, India)

Session Classification: Plenary

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

Baryogenesis from a Majorana Fermion Coupled to Quarks

Wednesday 9 July 2025 15:00 (30 minutes)

In the theory with a Majorana fermion coupled to quarks via a dimension-six four-fermion vector-vector interaction, we show that the observed baryon asymmetry of the Universe can be generated in the decay and scattering processes in the expanding early Universe. In viable parts of parameter space we discuss the observability of neutrino-antineutron oscillation in upcoming experiments.

Presenter: GOPALAKRISHNA, Shrihari (Institute of Mathematical Sciences)

Session Classification: Plenary

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

TBA

Wednesday 9 July 2025 15:30 (30 minutes)

Presenter: RAI, Santosh Kumar

Session Classification: Plenary

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

Exploring MeV-scale U(1) Lmu-Ltau Extra Dimension through DUNE and muon beam dumps

Wednesday 9 July 2025 17:00 (30 minutes)

In recent years, very weak interactions on the MeV scale, in particular the case of U(1) Lmu-Ltau, have attracted significant attention in the context of muon g-2, dark matter-mediated forces and others. This presentation will focus on how the extension of this U(1) symmetry to five dimensions can be explored in future new physics search experiments, concretely, the DUNE experiment and future muon beam dump experiments.

Presenter: NISHIWAKI, Kenji (Shiv Nadar Institute of Eminence)

Session Classification: Plenary

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

TBA

Wednesday 9 July 2025 17:30 (30 minutes)

Presenter: DEY, Ujjal Kumar (IISER Berhampur)

Session Classification: Plenary

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

BSM Phenomenology inspired by singlet-doublet dark matter

Wednesday 9 July 2025 18:00 (30 minutes)

In this talk I will give a detailed beyond standard model phenomenology inspired by singlet-doublet vector-like fermion dark matter. In particular, realization of radiative neutrino mass (Dirac as well as Majorana), anomalous g-2, W-mass anomaly, TeV-scale leptogenesis, dark matter self-interaction etc.

Presenter: SAHU, Narendra (Indian Institute of Technology Hyderabad)

Session Classification: Plenary

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

Collider and gravitational wave signals for electroweak phase transition

Thursday 10 July 2025 09:00 (30 minutes)

The knowledge of the Higgs potential is crucial for understanding the origin of mass and the thermal history of our Universe. We show how collider measurements and observations of stochastic gravitational wave signals can complement each other to explore the multiform scalar potential in the two Higgs doublet model. In our investigation, we analyze critical elements of the Higgs potential to understand the phase transition pattern. Specifically, we examine the formation of the barrier and the uplifting of the true vacuum state, which play crucial roles in facilitating a strong first-order phase transition. Furthermore, we explore the potential gravitational wave signals associated with this phase transition pattern and investigate the parameter space points that can be probed with LISA. Finally, we compare the impact of different approaches to describing the bubble profile on the calculation of the baryon asymmetry.

Presenter: GONÇALVES, dorival (Oklahoma State University)

Session Classification: Plenary

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

TBA

Thursday 10 July 2025 09:30 (30 minutes)

Presenter: GHOSH, Tathagata (HRI)

Session Classification: Plenary

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

TBA

Thursday 10 July 2025 10:00 (30 minutes)

Presenter: ROY, Tuhin (Tata Institute of Fundamental Research)

Session Classification: Plenary

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

ENUBET and SBN@CERN proposal

Thursday 10 July 2025 12:00 (30 minutes)

The poor knowledge of neutrino cross sections at the sub-GeV scale will represent the main systematic uncertainty for the next-generation oscillation experiments. SBN@CERN is a proposal for a short baseline neutrino beam with proper instrumentation along the beamline and in the decay tunnel, based on ENUBET and NuTag projects, which will enable flux monitoring at the percent level and provide a neutrino energy determination independent of final state particle reconstruction at the neutrino detector. As a result, it eliminates the two primary sources of systematic uncertainty in cross-section measurements: flux normalization and energy bias caused by nuclear effects. This talk will focus on the ENUBET project and how it came to be a part of SBN@CERN proposal. It will also show the physics potential of the full proposed SBN@CERN facility for the cross-section measurement.

Presenter: KLICEK, Budimir

Session Classification: Plenary

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

Physics potential of the ESSnuSBplus setup

Thursday 10 July 2025 12:30 (30 minutes)

In this talk, I will discuss the physics potential of ESSnuSBplus setup on behalf of the ESSnuSB collaboration. ESSnuSB is an upcoming neutrino oscillation experiment to be based in Sweden. The ESSnuSBplus set up will consist of three neutrino sources i.e., the main neutrino beam from the ESS linac, low energy neutrinos from a monitored beam (LEMNB), and low energy neutrinos from a muon storage ring (LEnuSTORM). The neutrinos from the ESS linac will be detected at a distance of 360 km using a far detector (FD) to study neutrino oscillations at the second oscillation maximum. This far detector will be also used to study neutrinos from Sun, Earth's atmosphere and future supernova explosion. The neutrinos from LEMNB will be detected at a near detector (LEMMOND) located at a distance of 50 m to measure cross-section to reduce the systematic uncertainties. Whereas the neutrinos from LEnuSTORM, will be detected both at LEMMOND and another near detector (END) located at a distance of 250 m. This beam will be used to measure cross-sections as well to study light sterile neutrinos. In this talk, I will present some of our results for this whole setup, showcasing the capability of this powerful ESSnuSBplus setup.

Presenter: GHOSH, Monojit (Ruder Boskovic Institute, Zagreb)

Session Classification: Plenary

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

Anomalies in Hadronic B Meson Decays

Friday 11 July 2025 09:00 (30 minutes)

Large SU(3) breaking has been observed in some hadronic B decays. This observation may eventually pave the way for challenging Standard Model inspired hypotheses in these decay modes. I will provide an update on these hadronic anomalies. I will include additional decay channels that may also shed light on this new puzzle.

Presenter: Prof. BHATTACHARYA, Bhubanjyoti (Lawrence Technological University)

Session Classification: Plenary

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

TBA

Friday 11 July 2025 09:30 (30 minutes)

Presenter: MOHANTA, Dr. Rukmani

Session Classification: Plenary

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

TBA

Friday 11 July 2025 10:00 (30 minutes)

Presenter: GHOSH, kirtiman

Session Classification: Plenary

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

Non-decoupling Heavy Higgs Bosons as a Probe of Spontaneous CP-Violation

Friday 11 July 2025 10:30 (30 minutes)

CP-violation is essential for understanding the matter-antimatter asymmetry in the Universe and serves as a key component of physics beyond the Standard Model (SM). Extensions in the Higgs sector permit CP violations beyond the CKM phase. However, the origin of CP-violation remains unknown, as both spontaneous and explicit violations are feasible. In this talk, I present the phenomenological implications of Spontaneous CP-violation (SCPV) in the Two-Higgs Doublet Model (2HDM). There are two significant aspects in the SCPV 2HDM, i.e., non-decoupling nature of heavy Higgs bosons and flavor-violating structure of the additional Yukawa couplings. I will show that the non-decoupling nature leads to a considerable deviation and correlation in the self-coupling for the 125 GeV Higgs and its di-photon decay. I also discuss flavour-changing decays of the heavy Higgs bosons.

Presenter: Dr MONDAL, Tanmoy (Birla Institute of Technology & Science (BITS Pilani))

Session Classification: Plenary

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

Axions at the fundamental frontiers

Friday 11 July 2025 11:30 (30 minutes)

Presenter: CHAKRABORTY, Sabyasachi (Florida State University)

Session Classification: Plenary

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

Horizontal three Higgs-doublet model

Friday 11 July 2025 12:00 (30 minutes)

I will present a variant of the 3HDM, referred to as the BGL-3HDM, incorporating a horizontal U(1)×U(1) symmetry, which can distinguish the primary sources of mass for different fermion generations. In the version considered here, the Yukawa matrices in the down-quark and charged lepton sectors are diagonal, thereby eliminating tree-level FCNCs in these sectors. FCNC interactions mediated by neutral nonstandard Higgses are confined to the up-quark sector only. No new BSM parameters are introduced by the Yukawa sector of the model, making it as economical as the NFC versions of 3HDM with a U(1)×U(1) symmetry in terms of the number of free parameters. However, even in the down-quark and in the charged lepton sectors, flavor diagonal but nonuniversal Higgs couplings set this model apart from the NFC versions of the 3HDM.

Presenter: Dr DAS, Dipankar (Indian Institute of Technology, Indore)

Session Classification: Plenary

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

WIMP searches at LHC and future colliders

Friday 11 July 2025 12:30 (30 minutes)

Presenter: SAHA, Ipsita (IIT Madras)

Session Classification: Plenary

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

TBA

Friday 11 July 2025 14:30 (30 minutes)

Presenter: Dr DAS, Debottam (Institute of Physics)

Session Classification: Plenary

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

New Physics search prospects at the future colliders

Friday 11 July 2025 15:00 (30 minutes)

New Physics, if weakly coupled to the Standard Model, is often easier to search at the electron-positron machines, than at the LHC. In this talk, I will discuss a few examples concerning dark matter, Higgs effective operators, lepton number and flavor violating interactions.

Presenter: BHATTACHARYA, Subhaditya

Session Classification: Plenary

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

Preheating and Baryogenesis in Higgs-Starobinsky Inflation

Friday 11 July 2025 15:30 (30 minutes)

In this talk, I will discuss the impact of preheating on baryogenesis in Higgs-Starobinsky inflation. I will show that if the Ricci scalar couples with the U(1) hypercharge density, it can explain the observed matter-antimatter asymmetry of the Universe.

Presenter: MODAK, Tanmoy (IISER Berhampur)

Session Classification: Plenary

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

Muon g – 2 and W-mass in a framework of colored scalars: an LHC perspective

Friday 11 July 2025 16:30 (20 minutes)

A color octet isodoublet can have esoteric origins and it complies with minimal flavour violation. In this study, we take a scenario where the well known Type-X Two-Higgs doublet model is augmented with a color octet isodoublet. We shed light on how such a setup can predict the recently observed value for the W-boson mass. The two-loop Barr-Zee contributions to muon g-2 stemming from the colored scalars are evaluated. It is subsequently found that the parameter space compatible with the observed muon g-2 gets relaxed w.r.t. what it is in the pure Type-X 2HDM by virtue of the contribution from the colored scalars. The extended parameter region therefore successfully accounts for both the W-mass and muon g-2 anomalies simultaneously. Finally, a collider signature leading to a relevant final state is explored at the 14 TeV LHC using both cut-based and multivariate techniques. Such a signal can confirm the existence of both colorless as well colored scalars that are introduced by this framework.

Presenter: CHAKRABORTY, Indrani (University of Calcutta)

Session Classification: Plenary

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

Fermi-ball in a multicomponent dark matter framework and its gravitational wave signatures

Friday 11 July 2025 16:50 (20 minutes)

It has been known that underabundant dark matter density of an inert doublet
can be replenished by an additional dark matter component, say, a fermion. We find that such a scenario can lead to the formation of stable Fermi-balls through
coexisting minima of the finite temperature scalar potential. More importantly, we demonstrate that the Fermi-balls contribute sizeably to the dark matter relic density.
In addition, the aforesaid coexisting minima open up the possibility of a first-order phase transition. This, in turn, triggers emission of gravitational waves that can be tested at the proposed BBO and U-DECIGO detectors. Therefore, the present study becomes a concrete setup to embed Fermi-balls in a realistic two-component dark matter model, and, to test the same using gravitational wave signatures.

Presenter: CHAKRABARTY, Nabarun (H)

Session Classification: Plenary

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

Confronting new physics with early universe cosmology

Friday 11 July 2025 17:10 (20 minutes)

In this talk I shall elucidate how early universe cosmology, together with gravity, can provide a window in exploring physics beyond the Standard Model (SM). Typically, I will focus on two long-standing puzzles of particle-cosmology, namely, dark matter and matter-antimatter asymmetry. In this context I will also discuss the role of the primordial gravitational wave (GW), having different origins, in testing such scenarios at the (futuristic) GW experimental facilities.

Presenter: BARMAN, Basabendu

Session Classification: Plenary

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

Isospin Violating Dark Sector: Direct Detection Prospects

Friday 11 July 2025 17:30 (20 minutes)

"Dark matter direct detection is now standing at an interesting juncture, where the SM neutrino background and the upper bound on dark matter signal cross section are starting to overlap in a region of DM mass $\sim$ 10˜GeV.
The neutrino floor, which defines the extent of the neutrino background, can get modified in different BSM set up. We work in a BSM set up that is a very natural dark sector extension of the SM visible sector where isospin violation is already established. In this isopsin violating dark sector, both the dark matter and neutrino interaction have isospin violating interactions, through a newly added U(1) gauge boson (Z'). In a parts of the parameter space we see the neutrino nucleus scattering (CEνNS) cross section goes down, while it goes up in some parameter space. Amount of isospin violation plays a crucial role in determining the allowed parameter space as we take into account the re-scaling of the DM experimental upper bound due to the isospin violation. We discuss different scenarios related to dark matter detection prospects. "

Presenter: SADHUKHAN, Soumya (Ramakrishna Mission Residential College (Autonomous), Narendrapur)

Session Classification: Plenary

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

Singlet Scalar Dark Matter Model Featuring Dual High-Scale Minima

Friday 11 July 2025 17:50 (20 minutes)

We analyze various dark matter models featuring additional scalars and fermions. The scalar quartic and Yukawa couplings play key roles in achieving the correct relic density via Freeze-out and Freeze-in mechanisms. In addition to the SM-like high-scale minimum along the Higgs direction, new minima can arise along the extended scalar direction, depending on the dark matter parameter space. We explore the full parameter space to identify regions of interest.

Presenter: Dr KHAN, Najimuddin (Harish-Chandra Research Institute (HRI))

Session Classification: Plenary

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

Sifting through the Standard Model for the hints of an ALP

Friday 11 July 2025 18:10 (20 minutes)

Flavor experiments commissioned to provide precise measurements of the Standard Model (SM) parameters are excellent laboratories to look for hypothesised particles, especially those with masses less than a GeV. In this talk, I discuss some experiments related to semi-leptonic charged current amplitudes, which can be veritable smoking guns for axion-like particles (ALPs). I show that the bounds obtained from such an exercise are only loosely sensitive to the mass of the ALP. I discuss results from NA48/2, Belle, and BaBar and also discuss how Belle-II projected sensitivities for tau to K decays can give bounds on the Wilson-coefficient space stronger than existing ones. I also discuss sum-rules arising from the modifications to chiral perturbation theory in the presence of an ALP, a framework that we have used to derive the results.

Presenter: BANDYOPADHYAY, Triparno (SRMIST, Chennai)

Session Classification: Plenary

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

TBA

Wednesday 9 July 2025 14:30 (30 minutes)

Presenter: GUCHAIT, Manoranjan

Session Classification: Plenary

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

TBA

Wednesday 9 July 2025 16:30 (30 minutes)

Presenter: HINDMARSH, Mark

Session Classification: Plenary

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

TBA

Thursday 10 July 2025 10:30 (30 minutes)

Presenter: BHATTACHARJEE, Biplob

Session Classification: Plenary

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

TBA

Thursday 10 July 2025 11:30 (30 minutes)

Presenter: MUKHERJEE, Swagata

Session Classification: Plenary

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

Closing Session

Friday 11 July 2025 18:30 (30 minutes)

Presenter: Dr BANDYOPADHYAY, Priyotosh (Indian Institute of Technology Hyderabad)

Session Classification: Closing Session