

Bled 2024: International Workshop on Lepton Number Violation

Monday 17 June 2024 - Sunday 23 June 2024

Plemljeva villa

Book of Abstracts

Contents

Arrival and welcome	1
Didar Dobur: Experimental Search for Heavy Neutral Leptons at LHC	1
Jan Hajer: Heavy Neutrino-Antineutrino Oscillations	1
Richard Ruiz: Light mesons from light heavy neutrinos at colliders	1
Discussion	1
Fabrizio Nesti: something with left-right symmetry at colliders	1
Jonathan Kriewald: What's next in Left-Right	1
Afternoon talk	2
Boat Trip to the Bled Island	2
Jernej Debevc: Experimental searches for type-II and type-III seesaw heavy leptons with the ATLAS detector	2
Lara Čalić: Type II, Type III and tau fakes and background estimation (ABCD method)	2
Suchita Kulkarni: Exploring neutrino phenomenology in B-L extensions	2
Discussion	2
Antonio Sidoti: Lepton Number Violation searches in ATLAS	2
Daniele Barducci: The effective theory of right-handed neutrinos at collider	3
Afternoon talk	3
Chayan Majumdar: Exploring Alternative Left-Right Model: Neutrinoless double beta decay and Leptogenesis	3
Discussion	3
Arsenii Titov: Long-lived HNLs at the LHC: four-fermion operators	4
Blaž Leban: LRSM: Search for Doubly Charged Higgs bosons with the ATLAS detector + LNV Higgs decays	4
Miha Mali	4

Patrick Bolton: Probing Heavy Neutrino Magnetic Moments at the LHC Using Non-Pointing Photon Signatures	4
Chandan Hati: Lepton Number Violation Beyond Dimension 5 Weinberg Operator . . .	4
Closing and Farewell	4

7

Arrival and welcome

8

Didar Dobur: Experimental Search for Heavy Neutral Leptons at LHC

10

Jan Hajer: Heavy Neutrino-Antineutrino Oscillations

11

Richard Ruiz: Light mesons from light heavy neutrinos at colliders

In the context of the Phenomenological Type I Seesaw, we investigate the LHC's sensitivity to exclusive, mesonic decay modes of long-lived, light (Dirac and Majorana) heavy neutrinos N when they are produced in the decays of W bosons. We present a new framework that combines massless QCD to describe N 's production up to NLO in QCD via weak bosons with a low-energy effective field theory to describe N 's decays to mesons. We provide a prescription for fast, numerical determination of N 's partial and total widths for any mass and accounts for mesonic decay modes.

12

Discussion

13

Fabrizio Nesti: something with left-right symmetry at colliders

14

Jonathan Kriewald: What's next in Left-Right

15

Afternoon talk

16

Boat Trip to the Bled Island

17

Jernej Debevc: Experimental searches for type-II and type-III see-saw heavy leptons with the ATLAS detector

18

Lara Čalić: Type II, Type III and tau fakes and background estimation (ABCD method)

19

Suchita Kulkarni: Exploring neutrino phenomenology in B-L extensions

20

Discussion

21

Antonio Sidoti: Lepton Number Violation searches in ATLAS

Lepton number is conserved in the Standard Model, therefore, any evidence for its violation would indicate the existence of new physics. This talk presents a review of the latest Lepton Number Violation searches performed by ATLAS at the LHC concerning Lepton Number Violation based on Run2 data.

22

Daniele Barducci: The effective theory of right-handed neutrinos at collider

The see-saw model is the minimal framework which is able to explain the observed pattern of neutrino masses and oscillations. Right-handed neutrinos around the GeV scale are an ideal target for high-energy and high-intensity experiments. While intense experimental efforts have deeply tested this hypothesis, there remain the possibility that the origin of the neutrino sector lies in a more involved theory beyond the Standard Model, whose effect at the electroweak scale can be parametrized in terms of effective operators involving Standard Model and right-handed neutrino fields. I will discuss the associated phenomenology and show the prospects for detecting right-handed neutrinos effective interactions at present and future experimental facilities.

23

Afternoon talk

24

Chayan Majumdar: Exploring Alternative Left-Right Model: Neutrinoless double beta decay and Leptogenesis

Left-Right (LR) theories are one of the successful beyond Standard Model scenarios to provide a unified explanation to the origin of small neutrino masses and low-energy parity violation. However, conventional LR theory faces stringent constraints due to Flavor Changing Neutral Currents (FCNCs). We have explored an Alternative LR model (ALRM) that avoids FCNC constraints and introduces new physics signatures in decay and leptogenesis. We have shown that the new type of vector-scalar diagram contributes significantly in Neutrinoless Double Beta decay (NDBD). When the relevant charged Higgs boson has mass around 200 GeV, the half-life of decaying nucleus is approximately 10^{26} years for both Ge-76 and Xe-136, which falls well within the anticipated sensitivity of future NDBD experiments. Moreover, this model has the potential to explain the correct baryogenesis, even in the presence of small Dirac CP phase in right-handed neutrino sector and without requiring any more fine-tuning, by invoking the resonant leptogenesis.

25

Discussion

26

Arsenii Titov: Long-lived HNLs at the LHC: four-fermion operators

27

Blaž Leban: LRSM: Search for Doubly Charged Higgs bosons with the ATLAS detector + LNV Higgs decays

28

Miha Mali

29

Patrick Bolton: Probing Heavy Neutrino Magnetic Moments at the LHC Using Non-Pointing Photon Signatures

30

Chandan Hati: Lepton Number Violation Beyond Dimension 5 Weinberg Operator

31

Closing and Farewell