Gordon Research Seminar in Particle Physics: Pushing the Frontiers of Particle Physics During the LHC Run II Era

Report of Contributions

https://indico.cern.ch/e/597024

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

Electroweak monopoles and the electroweak phase transition

Electroweak monopoles are spherically symmetric configurations of the gauge fields that derive their stability from their topological nature. This talk discusses the effect of regularised Cho-Maison monopoles on the strength of the electroweak phase transition and the implications of this on electroweak baryogenesis.

Presenter: ARUNASALAM, Suntharan

Session Classification: Poster Session

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

Probing 6D Higgs Operators at Future e^{+}e^{-} Colliders

In an effective theory, the UV physics can be parametrized by a set of higher-dimensional operators. We explore the sensitivity potential at future e^-e^+ colliders to probe six-dinmensional operators which may deform Higgs physics at electroweak scale. Different from studies in literature, we (1) analyze the sensitivities of disentangling the single-operator contribution, under the assumption that a deviation from the SM prediction will have be observed in some observable, and (2) take into account correlations among these operators, which may result from either physics at cutoff or renormalization group running of their Wilson coefficients or both. In particular, we compare the sensitivities which might be achieved at future e^-e^+ colliders, such as CEPC, $\mathrm{Fcc}_{\mathrm{ee}}$ and ILC.

Presenter: CHIU, Wen Han

Session Classification: Poster Session

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

Probing the scale dependence of Non-Gaussianity through the CMB Spectral Distortion

Presenters: COX, Peter; EMAMI MEIBOGY, Razieh

Session Classification: Poster Session

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

Optimizing Boosted Decision Trees for SUSY Searches at ATLAS

With searches for new physics in the ATLAS experiment at the LHC, it is possible to encounter O(100000) background events compared to O(10) expected signal events. In the face of such challenging conditions, it can be difficult to do a traditional cut-based analysis to minimize background while still preserving reasonable signal efficiency such that the limits on new physics can be extended. The method of boosted decision trees (BDTs) is a machine learning-based multi-variable analysis technique which could offer potentially better performance. This poster will discuss what BDTs are, how they work, and how they are used and optimized in the search for electroweak SUSY in the two-lepton, same-sign channel at ATLAS.

Presenter: GALLARDO, Gabriel

Session Classification: Poster Session

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

How Does Leptonic Collider Indirectly Probe Neutralino Dark Matter?

We have calculated the one-loop effective action in the Standard Model dimension-6 operator basis by integrating out neutralinos and charginos in Minimal Supersymmetric Standard Model (MSSM) by using the Covariant Derivative Expansion (CDE) method. The results were verified by comparing the $h\gamma\gamma$ effective coupling from these effective operators and from loop calculation or low energy theorem. As a demonstration of the applications of these operators, we studied the effects of them on the future lepton colliders, to see how the high precisions of future electroweak and Higgs measurements can constrain the electroweak-ino sector of the MSSM.

Presenter: HAN, Huayong

Session Classification: Poster Session

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

Six-top qurark channel phenomenon

Multi-top quark signal is very important in LHC, and the existing paper just analysis two or four top quarks channel. Six quark channel is sometimes important for it's search can shed light to top partner discovery. We want to give the constrains of six top quark of recent experiment and give some hints for experimentalist on how to find them.

Presenter: HUANG, Li

Session Classification: Poster Session

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

Light Stops, Heavy Higgs, and Heavy Gluinos in Supersymmetric Standard Models with Extra Matters

We have explored the possibilities of scenarios with heavy gluinos and light stops in supersymmetric (SUSY) standard models with extra vector-like multiplets. If we assume the hierarchical structure for soft masses of the minimal supersymmetric standard model (MSSM) scalar fields and extra scalars, the light stop and the observed Higgs boson can be realized. While the stau is the lightest SUSY particle (LSP) in broad parameter space, we have found that the neutralino LSP is realized in the case that the non-zero soft parameters for the MSSM Higgs doublets or the non-universal gaugino masses are assumed.

Presenter: KUWAHARA, Takumi

Session Classification: Poster Session

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

The Maximally Symmetric Composite Higgs

Maximal symmetry is a novel tool for composite pseudo-Goldstone boson Higgs models: it is a remnant of an enhanced global symmetry of the composite fermion sector involving a twisting with the Higgs field. Maximal symmetry has far-reaching consequences: it ensures that the Higgs potential is finite and fully calculable, and also minimizes the tuning.

Presenter: MA, Teng

Session Classification: Poster Session

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

Top FCNC (tcH) Simulation Through Monte Carlo Generators

At the LHC, physicists have been looking for additional scalar particles since the discovery of the SM Higgs. This project investigates in the behaviour of an additional neutral scalar particle (flavon), based on a cosmological beyond standard model (BSM) scenario (Froggatt-Nielsen model), through a top flavour changing neutral current (FCNC) process (tcH) simulated by Monte Carlo (MC) generators. Under the cosmological BSM model, the additional scalar particle is allowed to go through FCNC at tree level, which makes it an intriguing signal to search for. This new scalar particle is assumed to possess the same quantum numbers as the standard model Higgs Boson but having a different mass. Signals are generated over a mass scan of the scalar particle through the low mass region (from 10 GeV to 120 GeV) in order to gain some insight on how the signal would behave if it exists.

Presenter: WANG, Jia Shian

Session Classification: Poster Session

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

Interference Study on ttbb Final State by Monte Carlo Event Generation for a Heavy Higgs Search at the ATLAS Experiment at the LHC

At the LHC, particle physicists have been actively searching for more Higgs bosons, since the discovery of one, at 126 GeV, in 2012. The 126 GeV Higgs boson behaves like the Standard Model (SM) described. However, it is uncertain whether it is the SM Higgs or a SM-like Higgs among a larger Higgs sector in some beyond Standard Model (BSM) theories. The HKU ATLAS group is interested in the simplest extended Higgs sector in the Two Higgs Doublet Model (2-HDM) and is looking for production of heavier Higgs bosons with ttbb final state from billions of proton-proton (p-p) collisions. Discovery of a heavy Higgs boson will prove the existence of an extended Higgs sector and eliminate some BSM theories. This project is a study of the effect of interference between different processes with ttbb final state by simulating p-p collisions with Monte Carlo method.

Presenter: WONG, Wing Yan

Session Classification: Poster Session

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

The ALP miracle: unified inflaton and dark matter

We propose a scenario where both inflation and dark matter are described by a single axion-like particle (ALP) in a unified manner. In a class of the minimal axion hilltop inflation, the effective masses at the maximum and mimimum of the potential have equal magnitude but opposite sign, so that the ALP inflaton is light both during inflation and in the true vacuum. After inflation, most of the ALPs decay and evaporate into plasma through a coupling to photons, and the remaining ones become dark matter. We find that the observed CMB and matter power spectrum as well as the dark matter abundance point to an ALP of mass m=O(0.01) eV and the axion photon coupling g=O(10ˆ-11) GeVˆ-1: the ALP miracle. The suggested parameter region is within the reach of the next generation axion helioscope, IAXO. Furthermore, thermalized ALPs contribute to hot dark matter and its abundance is given in terms of the effective number of extra neutrino species, Neff\simeq0.03, which can be tested by the future CMB experiments.

Presenter: DAIDO, Ryuji

Session Classification: Poster Session

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

Probing the scale dependence of Non-Gaussianity through the CMB Spectral Distortion

Presenter: EMAMI MEIBOGY, Razieh

Session Classification: Poster Session

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

TBD

TBD

Presenter: D'AMICO, Guido

Session Classification: Poster Session

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

Increasing signal for Pulsar timing by two types of ultralight scalar axions

Pulsar timing array is an effective method to detect low-frequency gravitational waves. Khmelnitsky and Rubakov (2013) have proved that the oscillations in the arrival time could also be induced by the oscillations in pressure of ultralight scalar dark matter with mass around 10ˆ{-22}. However, for simplicity, only one type of dark matter was taken into account. In this presentation, we consider the situation of two types dark matter using the same method with an expectation that the signal can be significantly improved. Additionally, we also discuss the possibility of generating dark energy from the potential of two axion fields.

Presenter: LUU, Hoang Nhan

Session Classification: Poster Session

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

Observation of a Baryonium Candidate at BES

Baryonium (proton-antiproton bound state) was predicted by theory long ago but not confirmed in experiment. In this talk, we will give a brief review of observation of a baryonium candidate at the BESII and BESIII experiments. Using 58 million J/psi decay events, the BESII experiment observed the proton-antiproton mass threshold enhancement X(ppbar) in J/psi->gamma p pbar and the X(1835) in J/psi->gamma eta' pi+ pi-. Many theorists believe these two states are two different manifestations of a baryonium state. But due to the limit of statics, no affirmative conclusion can be made. With huge J/psi data sample collected at the BESIII experiment, the spins and parities of X(ppbar) and X(1835) were both determined to be 0-+. Also with this huge data sample, the BESIII experiment firstly established the direct connection between the X(ppbar) and the X(1835) and the the new observation supports the existence of a proton-antiproton bound state or molecule like state with significance larger than 7 sigma.

Presenter: MIN, Tianjue

Session Classification: Poster Session

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

Constraining axion-photon coupling from the light

We explore axion modified photon propagating property, which put non-trivial constraints on the axion-photon coupling. It also requires the presence of additional spin-0 CP even particles such as saxion or dilaton. This discussion helps constructing theory about axion dark matter or axion inflation.

Presenter: SUN, Sichun

Session Classification: Poster Session

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

Interpreting the 3 TeV WH resonance as a W' boson

Motivated by a local 3.2-3.4 sigma resonance in WH and ZH in the ATLAS Run 2 data, we attempt to interpret the excess in terms of a W' boson in a SU(2)_1 \times SU(2)_2 \times U(1)_X model. We stretch the deviation from the alignment limit of the Equivalence Theorem, so as to maximize WH production while keeping the WZ production rate below the experimental limit. We found a viable though small region of parameter space that satisfies all existing constraints on dijet, diboson, as well as the precision Higgs data. The cross section of W' to WH that we obtain is about 5-6 fb.

Presenter: TSENG, Po-Yen

Session Classification: Poster Session

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

3 Ways of Dark Matter Search at XMASS

The XMASS program at Kamioka Observatory of Japan uses a self-shielding liquid xenon scintillator for the direct detection of dark matter and many other rare processes. The current running XMASS-I features 832kg ultra clean liquid xenon. Combined with low energy threshold of 0.3keV, XMASS-I is sensitive to low mass WIMPs and annual modulation search of dark matter.

Presenter: XU, Benda

Session Classification: Poster Session

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

Anomalous Triple Gauge Boson Coupling and Higgs Photoproduction Measurements at LHeC

Understanding the electroweak sector of the Standard Model is one of the most important tasks in particle physics. We discuss its precise measurement at the proposed Large Hadron electron Collider(LHeC) with a focus on vector boson fusion processes. The first example is measuring charged anomalous triple gauge boson coupling(aTGC) in single W boson production process. Angular distributions of final state electrons, jets and W boson decay products are used to construct kinematic angles. We find that these angles could effectively put constrain on aTGC parameters, especially when different beam energy options are available. We also study the possibility to use Higgs boson photoproduction rate to constrain the Higgs-two photon vertex at this ep machine. We find negative results in different Higgs decay channels when including background processes with both photon-photon and photon-gluon initial states.

Presenter: XU, Tao

Session Classification: Poster Session

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

A Tale of Two Portals: Testing Light, Hidden New Physics at Future e^+e^- Colliders

We investigate the prospects for producing new, light, hidden states at a future e^+e^- collider in a Higgsed dark $U(1)_D$ model, which we call the Double Dark Portal model. The simultaneous presence of both vector and scalar portal couplings immediately modifies the Standard Model Higgsstrahlung channel, $e^+e^- \to Zh$, at leading order in each coupling. In addition, each portal leads to complementary signals which can be probed at direct and indirect detection dark matter experiments. After accounting for current constraints from LEP and LHC, we demonstrate that a future e^+e^- Higgs factory will have unique and leading sensitivity to the two portal couplings by studying a host of new production, decay, and radiative return processes. Besides the possibility of exotic Higgs decays, we highlight the importance of direct dark vector and dark scalar production at e^+e^- machines, whose invisible decays can be tagged from the recoil mass method.

Presenter: YU, Felix

Session Classification: Poster Session

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

Nonstandard neutrino interactions at the MOMENT

The proposed MuOn-decay MEdium baseline NeuTrino beam experiment (MOMENT) is one of the neutrino experiments to measure the unknown 3-flavour frame parameter CP-violating phase. We consider the discovery reach of leptonic CP violation at MOMENT confronting with Non-standard neutrino Interactions (NSIs). We find that NSIs can induce bias in CP-violating phase measurements. We are able to exclude larger parameter regions induced by source and detector NSIs at the MOMENT. Furthermore, we compare the constraints for NSI parameters at MOMENT with limits expected from future superbeam experiments like T2HHK and DUNE.

Presenter: ZHANG, Yibing

Session Classification: Poster Session

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

Higgs Boson Properties with ATLAS in (H -> ZZ*)

Saturday 24 June 2017 19:30 (15 minutes)

Presenter: LIE, Ki

Session Classification: The "energy frontier": LHC and future colliders

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

Exploring the DNN Performance in Jet Physics

Saturday 24 June 2017 19:45 (15 minutes)

Since the machine learning techniques are improving rapidly, it has been shown that the image recognition technique can be used to detect jet substructure. And it turns out that deep neural networks can match or outperform traditional approach. To push it further, we investigate the Recursive Neural Networks (RecNN), which embeds jet clustering history recursively as in natural language processing, with particle flow information implemented. In this way, we can have the data input in a most complete and effective way. We show its performance in jet observables and indicate its potential in helping detect Higgs signals at the LHC.

Presenter: CHENG, Taoli

Session Classification: The "energy frontier": LHC and future colliders

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

Disassembling the clockwork mechanism

Saturday 24 June 2017 20:00 (15 minutes)

The original clockwork theories (1511.00132 and 1511.01827) comprise an N-site quiver of N axions, with symmetry breaking interactions arranged between them to leave a single massless mode with exponentially suppressed and (lattice) position dependent couplings to different sites. We study both clockwork's group-theoretic generalisation to quivers with different symmetry groups, and also its continuum limit (i.e. the possibility of obtaining the quiver from the deconstruction of a 5D theory). Contradicting some existing statements in the literature, we find that 'clockwork' is a strictly Abelian phenomenon (ruling out clockwork theories of composite Higgses and gravitons), and that it is realised in 5D by a bulk field in flat space with bulk and brane mass terms to localise its zero mode (it cannot be realised by a massless bulk field, regardless of the choice of warp factors in the metric).

Presenter: SUTHERLAND, David

Session Classification: The "energy frontier": LHC and future colliders

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

top-quark mass from diphoton mass spectrum

Saturday 24 June 2017 20:15 (15 minutes)

We calculate the $gg \to \gamma\gamma$ amplitude by including the $t\bar{t}$ bound-state effects near their mass threshold. In terms of the non-relativistic expansion of the amplitude, the LO contribution is an energy-independent term in the one-loop amplitude. We include the NLO contribution described by the non-relativistic Green function and part of the NNLO contribution. Despite a missing NLO piece which can be accomplished with the two-loop-level amplitude via massive quarks, the shape of the diphoton mass spectrum is predicted with a good accuracy. Thanks to the simple and clean nature of the observable, its experimental measurement can be a direct method to determine the short-distance mass of the top quark at hadron colliders.

Presenter: YOKOYA, Hiroshi

Session Classification: The "energy frontier": LHC and future colliders

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

Testing Naturalness

Saturday 24 June 2017 20:30 (15 minutes)

Solutions to the electroweak hierarchy problem typically introduce a new symmetry to stabilize the quadratic ultraviolet sensitivity in the self-energy of the Higgs boson. The new symmetry is either broken softly or collectively, as for example in supersymmetric and little Higgs theories. At low energies such theories contain naturalness partners of the Standard Model fields which are responsible for canceling the quadratic divergence in the squared Higgs mass. Post the discovery of any partner-like particles, we propose to test the aforementioned cancellation by measuring relevant Higgs couplings. Using the fermionic top partners in little Higgs theories as an illustration, we construct a simplified model for naturalness and initiate a study on testing naturalness. After electroweak symmetry breaking, naturalness in the top sector requires a_T = - ?_tˆ2 at leading order, where ?_t and a_T are the Higgs couplings to a pair of top quarks and top partners, respectively. Using a multivariate method of Boosted Decision Tree to tag boosted particles in the Standard Model, we show that, with a luminosity of 30 abˆ{-1} at a 100 TeV pp-collider, naturalness could be tested with a precision of 10 % for a top partner mass up to 2.5 TeV.

Presenter: HAJER, Jan

Session Classification: The ”energy frontier”: LHC and future colliders

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

Testing naturalness through precision measurements

Saturday 24 June 2017 20:45 (15 minutes)

Symmetry-based solutions of the hierarchy problem generically predict new states to cancel the Standard Model one-loop quadratic divergence of the Higgs mass. Phenomenological investigations are generally focused on the top-partners, expected to be at the TeV scale by naturalness arguments, and with model-dependent quantum numbers. While direct LHC searches have so far turned empty-handed regarding the presence of such new particles, loop-induced observables provide complementary probes and may prove essential to fully characterize their properties. In this work, we evaluate the contributions of a selection of top-partners representations to quantities such as the Peskin-Teukachi parameters and the loop-induced Higgs couplings. In particular, we investigate whether such observables can provide a test of the required relation between the top Yukawa and top-partner couplings needed to insure the loop cancellation.

Presenter: BERNON, Jeremy

Session Classification: The "energy frontier": LHC and future colliders

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

Quark-gluon discrimination in the search for gluino pair production at the LHC

Saturday 24 June 2017 21:00 (15 minutes)

We study the impact of including quark- and gluon-initiated jet discrimination in the search for strongly interacting supersymmetric particles at the LHC. Taking the example of gluino pair production, considerable improvement is observed in the LHC search reach on including the jet substructure observables to the standard kinematic variables within a multivariate analysis. In particular, quark and gluon jet separation has higher impact in the region of intermediate mass-gap between the gluino and the lightest neutralino, as the difference between the signal and the standard model background kinematic distributions is reduced in this region. We also compare the predictions from different Monte Carlo event generators to estimate the uncertainty originating from the modelling of the parton shower and hadronization processes.

Presenter: SAKAKI, Yasuhito

Session Classification: The "energy frontier": LHC and future colliders

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

Measurement of Correlation between Inclusively Produced Lambda0-anti-Lambda0, Lambda0-Lambda0, and anti-Lambda-anti-Lambda0 Hyperon Pairs at sqrt(s) = 7 TeV in the LHC ATLAS Experiment

Saturday 24 June 2017 21:15 (15 minutes)

We report here measurements of correlations between Lambda0-anti-Lambda0, Lambda0-Lambda0, and anti-Lambda-anti-Lambda0 hyperon pairs produced inclusively at the LHC. The analysis is based on hyperon pairs selected using the muon and minimum bias sample collected at the ATLAS experiment from proton-proton collisions at a center-of-mass energy of 7 TeV in 2010. Dynamical correlations between the hyperon pairs have been explored through a correlation function defined as the ratio of two-particle to single-particle densities. Positive correlation is observed for Lambda0-anti-Lambda0 events and anticorrelation is observed for Lambda0-Lambda0 and anti-Lambda-anti-Lambda0 events for Q in [0,2] GeV. The structure replicates similar correlations in ppbar, pp, and pbarpbar events in PYTHIA generator as predicted by the string model. Parameters of the ''popcorn" mechanism implemented in the PYTHIA generator are tuned and are found to have little impact on the structure observed. The spin composition of the sample is extracted using a data-driven reference sample built by event mixing. Appropriate correction is made to the kinematic distributions in the reference sample by kinematic weighting to make sure that the detector effects are well modeled. The Pearson's chi-squared test statistics is calculated for the decay angle distributions to determine the best-fitted value of spin correlation parameter for data. The results are consistent with zero for both like-type and unlike-type hyperon pairs for Q in [0,10] GeV and [1,10] GeV respectively. Data statistics for Q in [0,1] GeV is too low for the estimation of the emitter size for Fermi-Dirac correlation.

Presenter: CHENG, Hok Chuen

Session Classification: The "energy frontier": LHC and future colliders

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

Search for neutrinoless double beta decay with the KamLAND-Zen experiment

Sunday 25 June 2017 09:00 (15 minutes)

Neutrinoless double beta decay is an extremely rare nuclear transition which could establish the nature of neutrino (Majorana or Dirac particle), determine the absolute neutrino mass and the neutrino-mass hierarchy, check the lepton number conservation and possible contribution of right-handed admixture to weak interaction, existence of Nambu-Goldstone bosons (majorons) and other effects beyond the Standard Model. The KamLAND-Zen experiment is searching for neutrinoless double beta decay of Xe-136 by using xenon-loaded liquid scintillator inside the KamLAND detector. The experiment is located in the Kamioka underground laboratory (Hida, Japan) at the depth of approximately 2700 m.w.e. In the KamLAND-Zen 400 phase of the experiment the detector consisted of 13 tons of Xe-loaded liquid scintillator contained in a 3.08-m-diameter spherical inner balloon placed at the center of the KamLAND detector. The amount of the enriched xenon gas was almost 400 kg. The KamLAND-Zen 400 experiment was finished at the end of 2015 with the currently best limit on neutrinoless double beta decay of Xe-136. Using commonly adopted nuclear matrix element calculations, the corresponding upper limits on the effective Majorana neutrino mass are in the range of 61–165 meV. Currently we are preparing the next phase of the experiment called KamLAND-Zen 800 with an expansion of the detector volume up to ˜ 800 kg of enriched Xe. The R&D for the KamLAND2-Zen –the further detector upgrade –will be also presented.

Presenter: CHERNYAK, Dmitry

Session Classification: The ”intensity frontier”: high intensity experiments, rare processes and precision tests

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

Towards a Precise Determination of the Reactor Antineutrino Flux at Daya Bay

Sunday 25 June 2017 09:15 (15 minutes)

In recent years, a discrepancy between the measured and the predicted antineutrino flux at nuclear reactors, the so-called "Reactor Antineutrino Anomaly"(RAA), has emerged. This implies either a bias in the theoretical calculation of the flux, or neutrino oscillation beyond the three-neutrino paradigm. A more precise determination of the antineutrino flux can shed light onto the origin of the RAA. Utilizing the powerful reactors as antineutrino sources, and eight functionally identical underground detectors, the Daya Bay Reactor Neutrino Experiment has collected more than 2.5 million inverse beta decay events. An elaborate neutron calibration campaign was performed at Daya Bay in order to improve the precision of the antineutrino detection efficiency. This poster will present the status of the related analysis as well as its potential to address the RAA problem.

Presenter: GU, Wenqiang

Session Classification: The "intensity frontier": high intensity experiments, rare processes and precision tests

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

Dark Matter Search Results from PandaX

Sunday 25 June 2017 09:30 (15 minutes)

The Particle and Astrophysical Xenon (PandaX) project is a series of xenon-based ultra-low background experiments in the China JinPing Underground Laboratory (CJPL) targeting the unknown physics of dark matter and neutrinos. The first and second stage experiments (PandaX-I and II) both utilize dual-phase xenon time projection chamber to carry out direct search for the dark matter particles. PandaX-II, a half-ton scale experiment, is currently under operation. I will present an overview of the PandaX project and the latest spin independent and spin dependent result from the first 98.7-day run of PandaX-II.

Presenter: YAN, Binbin

Session Classification: The ”intensity frontier”: high intensity experiments, rare processes and precision tests

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

Leptogenesis from oscillations of heavy neutrinos with large mixing angles

Sunday 25 June 2017 09:45 (15 minutes)

The extension of the Standard Model by heavy right-handed neutrinos can simultaneously explain the observed neutrino masses via the seesaw mechanism and the baryon asymmetry of the Universe via leptogenesis. If the mass of the heavy neutrinos is below the electroweak scale, they may be found at the LHC, BELLE II, NA62, the proposed SHiP experiment or a future high-energy collider. In this mass range, the baryon asymmetry is generated via CP -violating oscillations of the heavy neutrinos during their production. We study the generation of the baryon asymmetry of the Universe in this scenario from first principles of non-equilibrium quantum field theory, including spectator processes and feedback effects. We eliminate several uncertainties from previous calcula-tions and find that the baryon asymmetry of the Universe can be explained with larger heavy neutrino mixing angles, increasing the chance for an experimental discovery. For the limiting cases of fast and strongly overdamped oscillations of right-handed neutrinos, the generation of the baryon asymmetry can be calculated analytically up to corrections of order one.

Presenter: KLARIC, Juraj

Session Classification: The ”intensity frontier”: high intensity experiments, rare processes and precision tests

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

D leptonic decays at BESIII

Sunday 25 June 2017 10:00 (15 minutes)

The world's largest e+e- collision samples at 3.773, 4.009 and 4.18 GeV have been collected at BESIII. By analyzing the decays of D(s)+ to l+v (l=mu,tau), D to K(pi)-l+v(l=e,mu), we report the determinations of CKM matrix elements |Vcs(d)|, D(s)+ decay constants, form factors of D semi-leptonic decays. These are important to calibrate the LQCD calculations of decay constant and form factors and to test the CKM unitarity. We will also report the studies of the rare decays D0(+) -> f_0(980)0(-)e+v, D+ -> K/pi ee, D0 e+v and gamma e+v, which can be used to search for new physics beyond the standard model.

Presenter: MA, Tian

Session Classification: The "intensity frontier": high intensity experiments, rare processes and precision tests

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

Exploring hadronization mechanisms in deep-inelastic scattering

Sunday 25 June 2017 10:15 (15 minutes)

Hadronization is process that lays in the heart of QCD and refers to the formation of hadrons from quarks and gluons. Occurred shortly after the Big Bang when quark-gluon plasma cooled, it is currently explored using accelerator facilities and high energy collisions. Following the collision, a highly virtual parton radiates gluons or splits into a quark-antiquark pair - a process, known as fragmentation, it is successfully described by QCD evolution equations. Due to color confinement, the colored partons recombine into colorless objects and at this point the process is dominated by non-perturbative QCD effects which can not be addressed theoretically. For this reason, description of hadronization process relies on phenomenology whose model predictions need to be tested against an actual data. Over the past couple decades, a wealth of data have become available from DESY, Jefferson Lab, Fermilab, and RHIC which all bring different kinds of information on parton propagation and hadron formation. The most direct information on hadron formation comes from Deep-Inelastic Scattering (DIS) and will be discussed in the present talk in the context of Jefferson Lab data obtained using a 5 GeV electron beam and CEBAF Large Acceptance Spectrometer (CLAS) in Hall B. It is to be hoped that the studies of cold QCD matter, once matured, can influence the interpretation of what is seen in the hot dense systems (LHC), in addition to their intrinsic interest for QCD.

Presenter: MINEEVA, Taisiya

Session Classification: The ”intensity frontier”: high intensity experiments, rare processes and precision tests

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

Neutrino Mass Sum Rules

Sunday 25 June 2017 10:30 (15 minutes)

Neutrino mass sum rules are an important class of predictions in flavour models relating the Majorana phases to the neutrino masses. This leads, for instance, to enormous restrictions on the effective mass as probed in experiments on neutrinoless double beta decay. While up to now these sum rules have in practically all cases been taken to hold exactly, we will go here beyond that. After a discussion of the types of corrections that could possibly appear and elucidating on the theory behind neutrino mass sum rules, we estimate and explicitly compute the impact of radiative and model corrections. The radiative corrections generally appear and thus hold for whole groups of models. The model corrections instead strongly depend on the concrete model. We discuss all neutrino mass sum rules currently present in the literature, which together have realisations in more than 50˜explicit neutrino flavour models. We find that, while the effect of the renormalisation group running can be visible, the qualitative features do not change. This changes somewhat for the model dependent corrections which might alter even the qualitative predictions but only for large corrections and a high neutrino mass scale close to the edge of the current limits. This finding backs up the solidity of the predictions derived in the literature apart from some exceptions, and it thus marks a very important step in deriving testable and reliable predictions from neutrino flavour models.

Presenter: SPINRATH, Martin

Session Classification: The ”intensity frontier”: high intensity experiments, rare processes and precision tests

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

COMET muon to electron conversion experiment in J-PARC

Sunday 25 June 2017 10:45 (15 minutes)

COMET experiment at J-PARC, Japan is aiming for the observation of charged lepton flavor violation (CLFV) process in which muon converts into electron without neutrinos. The expected single event sensitivity for this process is 3.1×10ˆ(-15) for Phase-1 and 2.6×10ˆ(-17) for Phase-2, which are the improvements of two and four orders of magnitude, respectively. In this presentation, recent progress in facility, detector R&D will be presented with a special focus on the tracking method. The feasibility of observing the muon to positron conversion, which is the charged lepton number and flavor violation process (CLNFV), will also be addressed as an available physics program of COMET Phase-1, planned in 2018.

Presenter: YEO, Beomki

Session Classification: The ”intensity frontier”: high intensity experiments, rare processes and precision tests

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

Distinguishing between warm dark matter and late kinetic decoupling using CMB spectral distortions

Sunday 25 June 2017 13:30 (15 minutes)

The damping of perturbations in the early universe produces a distortion in the energy spectrum of the CMB photons which depends intimately on the properties of the photon temperature transfer functions. Here we propose a new method for probing dark matter models on extremely small-scales by looking at how these models affect the evolution of the photon transfer functions. We explore the dependance of the distortion on different dark matter models including warm dark matter and dark matter with elastic scattering off a relativistic species (we consider both photons and neutrinos). The photon temperature transfer functions are determined for each model and used to calculate the heating rate of the CMB photons and the distortion signatures in each case. We place constraints on the dark matter-radiation elastic scattering cross-sections and show the projected constraints for future experiments. We show that the distortion signal differs between all 3 dark matter models under consideration and can thus shed light on the small-scale problems associated with conventional Cold Dark Matter models.

Presenter: DIACOUMIS, James

Session Classification: The "cosmic frontier" and the search for New Physics in outer space

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

Light Dark Matter in the SHiP experiment

Sunday 25 June 2017 13:45 (15 minutes)

The baryon asymmetry of the Universe could originate from the lepton asymmetry which was produced at relatively low temperatures. Using a model with three right-handed neutrinos (νMSM) as an example, we demonstrate how to obtain a kinetic equation for the baryon number density and show in which cases this accurate treatment could be important.

Presenter: TIMIRYASOV, Inar

Session Classification: The "cosmic frontier" and the search for New Physics in outer space

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

The cosmic lepton asymmetry and neutrino flavor transformation

Sunday 25 June 2017 14:00 (15 minutes)

A cosmic lepton asymmetry much larger than its baryonic counterpart is a prerequisite for the resonant production of sterile neutrino dark matter and is associated with a number of baryogenesis mechanisms. Incidentally, a lepton asymmetry can also dramatically affect the flavor transformation of the active neutrinos in the early universe. I will explain how a lepton asymmetry renders the problem of neutrino flavor evolution into a subtle, nonlinear one, and I will present results on the various regimes of flavor transformation that emerge. Many of these flavor phenomena occur prior to or during neutrino decoupling and therefore may leave signatures in the primordial nuclide abundances. I will report briefly on an ongoing program to gauge the impact of this neutrino physics on cosmological observables.

Presenter: JOHNS, Lucas

Session Classification: The ”cosmic frontier” and the search for New Physics in outer space

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

Stochastic gravitational wave background from binary primordial black hole mergers

Sunday 25 June 2017 14:15 (15 minutes)

The Advanced LIGO's discovery of gravitational-wave events GW150914 and GW151226 has stimulated extensive studies on the origin of binary black holes. Supposing the gravitational-wave events could be explained by binary primordial black hole mergers, we investigated the corresponding stochastic gravitational-wave background and pointed out the possibility to detect this background by the Advanced LIGO in the near future. We used the non-detection of stochastic gravitational-wave background to give a new independent constraint on the abundance of primordial black holes in dark matter. The recent progress will be presented here.

Presenter: WANG, Sai

Session Classification: The "cosmic frontier" and the search for New Physics in outer space

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

Evaluation and Conclusion

Sunday 25 June 2017 14:30 (30 minutes)

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

Interference Study on ttbb Final State by Monte Carlo Event Generation for a Heavy Higgs Search at the ATLAS Experiment at the LHC

Saturday 24 June 2017 16:30 (5 minutes)

At the LHC, particle physicists have been actively searching for more Higgs bosons, since the discovery of one, at 126 GeV, in 2012. The 126 GeV Higgs boson behaves like the Standard Model (SM) described. However, it is uncertain whether it is the SM Higgs or a SM-like Higgs among a larger Higgs sector in some beyond Standard Model (BSM) theories. The HKU ATLAS group is interested in the simplest extended Higgs sector in the Two Higgs Doublet Model (2-HDM) and is looking for production of heavier Higgs bosons with ttbb final state from billions of proton-proton (p-p) collisions. Discovery of a heavy Higgs boson will prove the existence of an extended Higgs sector and eliminate some BSM theories. This project is a study of the effect of interference between different processes with ttbb final state by simulating p-p collisions with Monte Carlo method.

Presenter: WONG, Wing Yan

Session Classification: Short oral presentations

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

Probing 6D Higgs Operators at Future e^{+}e^{-} Colliders

Saturday 24 June 2017 16:35 (5 minutes)

In an effective theory, the UV physics can be parametrized by a set of higher-dimensional operators. We explore the sensitivity potential at future e^-e^+ colliders to probe six-dinmensional operators which may deform Higgs physics at electroweak scale. Different from studies in literature, we (1) analyze the sensitivities of disentangling the single-operator contribution, under the assumption that a deviation from the SM prediction will have be observed in some observable, and (2) take into account correlations among these operators, which may result from either physics at cutoff or renormalization group running of their Wilson coefficients or both. In particular, we compare the sensitivities which might be achieved at future e^-e^+ colliders, such as CEPC, $\mathrm{Fcc}_{\mathrm{ee}}$ and ILC.

Presenter: CHIU, Wen Han

Session Classification: Short oral presentations

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

Optimizing Boosted Decision Trees for SUSY Searches at ATLAS

Saturday 24 June 2017 16:40 (5 minutes)

With searches for new physics in the ATLAS experiment at the LHC, it is possible to encounter O(100000) background events compared to O(10) expected signal events. In the face of such challenging conditions, it can be difficult to do a traditional cut-based analysis to minimize background while still preserving reasonable signal efficiency such that the limits on new physics can be extended. The method of boosted decision trees (BDTs) is a machine learning-based multi-variable analysis technique which could offer potentially better performance. This poster will discuss what BDTs are, how they work, and how they are used and optimized in the search for electroweak SUSY in the two-lepton, same-sign channel at ATLAS.

Presenter: GALLARDO, Gabriel

Session Classification: Short oral presentations

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

How Does Leptonic Collider Indirectly Probe Neutralino Dark Matter?

Saturday 24 June 2017 16:45 (5 minutes)

We have calculated the one-loop effective action in the Standard Model dimension-6 operator basis by integrating out neutralinos and charginos in Minimal Supersymmetric Standard Model (MSSM) by using the Covariant Derivative Expansion (CDE) method. The results were verified by comparing the $h\gamma\gamma$ effective coupling from these effective operators and from loop calculation or low energy theorem. As a demonstration of the applications of these operators, we studied the effects of them on the future lepton colliders, to see how the high precisions of future electroweak and Higgs measurements can constrain the electroweak-ino sector of the MSSM.

Presenter: HAN, Huayong

Session Classification: Short oral presentations

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

Six-top qurark channel phenomenon

Saturday 24 June 2017 16:50 (5 minutes)

Multi-top quark signal is very important in LHC, and the existing paper just analysis two or four top quarks channel. Six quark channel is sometimes important for it's search can shed light to top partner discovery. We want to give the constrains of six top quark of recent experiment and give some hints for experimentalist on how to find them.

Presenter: HUANG, Li

Session Classification: Short oral presentations

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

Light Stops, Heavy Higgs, and Heavy Gluinos in Supersymmetric Standard Models with Extra Matters

Saturday 24 June 2017 16:55 (5 minutes)

We have explored the possibilities of scenarios with heavy gluinos and light stops in supersymmetric (SUSY) standard models with extra vector-like multiplets. If we assume the hierarchical structure for soft masses of the minimal supersymmetric standard model (MSSM) scalar fields and extra scalars, the light stop and the observed Higgs boson can be realized. While the stau is the lightest SUSY particle (LSP) in broad parameter space, we have found that the neutralino LSP is realized in the case that the non-zero soft parameters for the MSSM Higgs doublets or the non-universal gaugino masses are assumed.

Presenter: KUWAHARA, Takumi

Session Classification: Short oral presentations

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

The Maximally Symmetric Composite Higgs

Saturday 24 June 2017 17:00 (5 minutes)

Maximal symmetry is a novel tool for composite pseudo-Goldstone boson Higgs models: it is a remnant of an enhanced global symmetry of the composite fermion sector involving a twisting with the Higgs field. Maximal symmetry has far-reaching consequences: it ensures that the Higgs potential is finite and fully calculable, and also minimizes the tuning.

Presenter: MA, Teng

Session Classification: Short oral presentations

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

Top FCNC (tcH) Simulation Through Monte Carlo Generators

Saturday 24 June 2017 17:05 (5 minutes)

At the LHC, physicists have been looking for additional scalar particles since the discovery of the SM Higgs. This project investigates in the behaviour of an additional neutral scalar particle (flavon), based on a cosmological beyond standard model (BSM) scenario (Froggatt-Nielsen model), through a top flavour changing neutral current (FCNC) process (tcH) simulated by Monte Carlo (MC) generators. Under the cosmological BSM model, the additional scalar particle is allowed to go through FCNC at tree level, which makes it an intriguing signal to search for. This new scalar particle is assumed to possess the same quantum numbers as the standard model Higgs Boson but having a different mass. Signals are generated over a mass scan of the scalar particle through the low mass region (from 10 GeV to 120 GeV) in order to gain some insight on how the signal would behave if it exists.

Presenter: WANG, Jia Shian

Session Classification: Short oral presentations

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

Electroweak monopoles and the electroweak phase transition

Saturday 24 June 2017 17:10 (5 minutes)

Electroweak monopoles are spherically symmetric configurations of the gauge fields that derive their stability from their topological nature. This talk discusses the effect of regularised Cho-Maison monopoles on the strength of the electroweak phase transition and the implications of this on electroweak baryogenesis.

Presenter: ARUNASALAM, Suntharan

Session Classification: Short oral presentations

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

Interpreting the 3 TeV WH resonance as a W' boson

Sunday 25 June 2017 11:00 (5 minutes)

Motivated by a local 3.2-3.4 sigma resonance in WH and ZH in the ATLAS Run 2 data, we attempt to interpret the excess in terms of a W' boson in a SU(2)_1 \times SU(2)_2 \times U(1)_X model. We stretch the deviation from the alignment limit of the Equivalence Theorem, so as to maximize WH production while keeping the WZ production rate below the experimental limit. We found a viable though small region of parameter space that satisfies all existing constraints on dijet, diboson, as well as the precision Higgs data. The cross section of W' to WH that we obtain is about 5-6 fb.

Presenter: TSENG, Po-Yen

Session Classification: Short oral presentations

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

A Tale of Two Portals: Testing Light, Hidden New Physics at Future e^+e^- Colliders

Sunday 25 June 2017 11:05 (5 minutes)

We investigate the prospects for producing new, light, hidden states at a future e^+e^- collider in a Higgsed dark $U(1)_D$ model, which we call the Double Dark Portal model. The simultaneous presence of both vector and scalar portal couplings immediately modifies the Standard Model Higgsstrahlung channel, $e^+e^- \to Zh$, at leading order in each coupling. In addition, each portal leads to complementary signals which can be probed at direct and indirect detection dark matter experiments. After accounting for current constraints from LEP and LHC, we demonstrate that a future e^+e^- Higgs factory will have unique and leading sensitivity to the two portal couplings by studying a host of new production, decay, and radiative return processes. Besides the possibility of exotic Higgs decays, we highlight the importance of direct dark vector and dark scalar production at e^+e^- machines, whose invisible decays can be tagged from the recoil mass method.

Presenter: YU, Felix

Session Classification: Short oral presentations

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

Observation of a Baryonium Candidate at BES

Sunday 25 June 2017 11:10 (5 minutes)

Baryonium (proton-antiproton bound state) was predicted by theory long ago but not confirmed in experiment. In this talk, we will give a brief review of observation of a baryonium candidate at the BESII and BESIII experiments. Using 58 million J/psi decay events, the BESII experiment observed the proton-antiproton mass threshold enhancement X(ppbar) in J/psi->gamma p pbar and the X(1835) in J/psi->gamma eta' pi+ pi-. Many theorists believe these two states are two different manifestations of a baryonium state. But due to the limit of statics, no affirmative conclusion can be made. With huge J/psi data sample collected at the BESIII experiment, the spins and parities of X(ppbar) and X(1835) were both determined to be 0-+. Also with this huge data sample, the BESIII experiment firstly established the direct connection between the X(ppbar) and the X(1835) and the the new observation supports the existence of a proton-antiproton bound state or molecule like state with significance larger than 7 sigma.

Presenter: MIN, Tianjue

Session Classification: Short oral presentations

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

Nonstandard neutrino interactions at the MOMENT

Sunday 25 June 2017 11:15 (5 minutes)

The proposed MuOn-decay MEdium baseline NeuTrino beam experiment (MOMENT) is one of the neutrino experiments to measure the unknown 3-flavour frame parameter CP-violating phase. We consider the discovery reach of leptonic CP violation at MOMENT confronting with Non-standard neutrino Interactions (NSIs). We find that NSIs can induce bias in CP-violating phase measurements. We are able to exclude larger parameter regions induced by source and detector NSIs at the MOMENT. Furthermore, we compare the constraints for NSI parameters at MOMENT with limits expected from future superbeam experiments like T2HHK and DUNE.

Presenter: ZHANG, Yibing

Session Classification: Short oral presentations

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

The ALP miracle: unified inflaton and dark matter

Sunday 25 June 2017 11:20 (5 minutes)

We propose a scenario where both inflation and dark matter are described by a single axion-like particle (ALP) in a unified manner. In a class of the minimal axion hilltop inflation, the effective masses at the maximum and mimimum of the potential have equal magnitude but opposite sign, so that the ALP inflaton is light both during inflation and in the true vacuum. After inflation, most of the ALPs decay and evaporate into plasma through a coupling to photons, and the remaining ones become dark matter. We find that the observed CMB and matter power spectrum as well as the dark matter abundance point to an ALP of mass m=O(0.01) eV and the axion photon coupling g=O(10ˆ-11) GeVˆ-1: the ALP miracle. The suggested parameter region is within the reach of the next generation axion helioscope, IAXO. Furthermore, thermalized ALPs contribute to hot dark matter and its abundance is given in terms of the effective number of extra neutrino species, Neff\simeq0.03, which can be tested by the future CMB experiments.

Presenter: DAIDO, Ryuji

Session Classification: Short oral presentations

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

Anomalous Triple Gauge Boson Coupling and Higgs Photoproduction Measurements at LHeC

Sunday 25 June 2017 11:25 (5 minutes)

Understanding the electroweak sector of the Standard Model is one of the most important tasks in particle physics. We discuss its precise measurement at the proposed Large Hadron electron Collider(LHeC) with a focus on vector boson fusion processes. The first example is measuring charged anomalous triple gauge boson coupling(aTGC) in single W boson production process. Angular distributions of final state electrons, jets and W boson decay products are used to construct kinematic angles. We find that these angles could effectively put constrain on aTGC parameters, especially when different beam energy options are available. We also study the possibility to use Higgs boson photoproduction rate to constrain the Higgs-two photon vertex at this ep machine. We find negative results in different Higgs decay channels when including background processes with both photon-photon and photon-gluon initial states.

Presenter: XU, Tao

Session Classification: Short oral presentations

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

Probing the scale dependence of Non-Gaussianity through the CMB Spectral Distortion

Sunday 25 June 2017 11:30 (5 minutes)

Presenter: EMAMI MEIBOGY, Razieh

Session Classification: Short oral presentations

Contribution ID: **59** Type: **not specified**

3 Ways of Dark Matter Search at XMASS

Sunday 25 June 2017 11:35 (5 minutes)

The XMASS program at Kamioka Observatory of Japan uses a self-shielding liquid xenon scintillator for the direct detection of dark matter and many other rare processes. The current running XMASS-I features 832kg ultra clean liquid xenon. Combined with low energy threshold of 0.3keV, XMASS-I is sensitive to low mass WIMPs and annual modulation search of dark matter.

Presenter: XU, Benda

Session Classification: Short oral presentations

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

New physics in multi-Higgs final states in 14 and 100 TeV colliders:

Sunday 25 June 2017 11:40 (5 minutes)

I am going to introduce how to parametrize the Standard Model and generic new-physics contributions by an effective Lagrangian that includes higher-dimensional operators. The selected subset of operators is motivated by composite-Higgs and Higgs-inflation models. The new physics effect can be potentially discovered in multi-Higgs final states in both 14 and future 100 TeV colliders.
In the Standard Model, we perform both a parton-level and a detector-level analysis for triple-Higgs final states. The sizable contributions from new effective operators can largely increase the cross section and/or modify the kinematics of the Higgs bosons in the final state. Taking into account the projected constraints from single and double Higgs-boson production, we propose benchmark points in the new physics models for the measurement of the triple-Higgs boson final state for future collider projects.

Presenter: SUN, Sichun

Session Classification: Short oral presentations

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

Intermediate Mass Black Holes with Mirror Matter

Sunday 25 June 2017 11:45 (5 minutes)

Mirror dark matter can potentially solve outstanding problems in structure formation, concerning the formation of small-scale structure on dwarf galaxy scales. We show that via its impact on residual ionization when early structure formation occurs, fragmentation into stars is naturally suppressed. The resulting formation of intermediate mass black holes in the mirror sector provides a new form of feedback for the observed dwarf galaxies that provides new insights into the paucity, the too-big- to-fail problem, the core/cusp issue and the baryon fraction of dwarf galaxies, as well as the seeding of supermassive black holes at high redshift.

Presenter: D'AMICO, Guido

Session Classification: Short oral presentations

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

Increasing signal for Pulsar timing by two types of ultralight scalar axions

Sunday 25 June 2017 11:50 (5 minutes)

Pulsar timing array is an effective method to detect low-frequency gravitational waves. Khmelnitsky and Rubakov (2013) have proved that the oscillations in the arrival time could also be induced by the oscillations in pressure of ultralight scalar dark matter with mass around 10ˆ{-22}. However, for simplicity, only one type of dark matter was taken into account. In this presentation, we consider the situation of two types dark matter using the same method with an expectation that the signal can be significantly improved. Additionally, we also discuss the possibility of generating dark energy from the potential of two axion fields.

Presenter: LUU, Hoang Nhan

Session Classification: Short oral presentations