Topics of Particle, Astro and Cosmo Frontiers (TOPAC 2023)

Report of Contributions

https://indico-tdli.sjtu.edu.cn/e/1637

Contribution ID: **1** Type: **Talk**

Precision test of the Zbb anomalous couplings at colliders

Sunday, June 4, 2023 10:30 AM (25 minutes)

The forward-backward asymmetry data for the bottom quark at LEP is in conflict with predictions from the standard model, and has been an unresolved issue for some time. It is important to address this discrepancy in order to conduct tests of both the standard model and any proposed theories beyond it. This presentation will provide an overview of recent efforts to investigate anomalous couplings in Zbb interactions at colliders, with the potential to either confirm or discount the LEP data and ultimately solve the A_{FB} mystery at upcoming events such as the LHC and EIC.

Primary author: Prof. YAN, Bin (IHEP)

Presenter: Prof. YAN, Bin (IHEP)

Session Classification: Collider

Contribution ID: **2** Type: **Talk**

Search for Primordial Non-Gaussianity with Cosmological Gravitational Wave Background

Sunday, June 4, 2023 10:30 AM (25 minutes)

The search for primordial non-Gaussianity is an important probe of the early universe and can provide valuable information about the physics of inflation. I will discuss the possibility of measuring primordial non-Gaussianity through space-borne measurements of the cosmological gravitational wave background. We focus on the scalar non-Gaussianity generated during inflation, which can leave an imprint on the induced gravitational wave background. We show that by measuring the auto-correlation function of the induced gravitational wave background, it is possible to constrain the amount of scalar non-Gaussianity present in the early universe. We will also discuss the impact of various astrophysical and instrumental effects on the measurement of primordial non-Gaussianity, and show that future space-based gravitational wave detectors such as LISA and DECIGO/BBO have the potential to significantly improve our understanding of the early universe.

Primary author: Prof. WANG, Sai (IHEP, CAS)

Presenter: Prof. WANG, Sai (IHEP, CAS)

Session Classification: GW

Contribution ID: **3** Type: **Talk**

Freeze-in of WIMP dark matter

Saturday, June 3, 2023 4:20 PM (25 minutes)

We propose a novel scenario for dark matter (DM) in which weakly interacting massive particles (WIMPs) can freeze-in due to a first-order phase transition (FOPT) in the early Universe. The FOPT dilutes the preexisting DM density to zero, and leads to a sudden change in DM mass that prevents WIMPs from re-equilibrating due to their large mass-to-temperature ratio. Following the FOPT, WIMPs are produced via a freeze-in process, even though their interactions are NOT feeble. We demonstrate this concept using a simplified model and then realize the scenario in a realistic model with a delayed electroweak phase transition. Our work extends the category of WIMP DM and opens up a new direction for the freeze-in mechanism.

Primary author: Prof. XIE, Ke-Pan (Beihang University)

Co-author: Ms WONG, Xiaorui (Peking University)

Presenter: Prof. XIE, Ke-Pan (Beihang University)

Session Classification: Cosmo

Contribution ID: **5** Type: **Talk**

Semileptonic Heavy-Hadron Decays in Quantum Chromodynamics

Saturday, June 3, 2023 3:30 PM (25 minutes)

QCD aspects of exclusive heavy-hadron decays will be discussed with an emphasis on the perturbative factorization properties for the resulting hadronic matrix elements in the heavy quark expansion and on the systematic discussions of the distinct dynamical mechanisms governing the flavor-changing form factors beyond the leading-power approximation. Phenomenological implications of the technical improvements for evaluating the heavy hadron decay amplitudes will be further elaborated with a number of interesting exclusive processes accessible at the LHCb and Belle II experiments.

Primary author: Prof. WANG, Yu-Ming (Nankai University)

Presenter: Prof. WANG, Yu-Ming (Nankai University)

Session Classification: SM/BSM

Contribution ID: **6** Type: **Talk**

Dark matter searches with the CMB

Friday, June 2, 2023 1:55 PM (25 minutes)

Dark matter candidates like the WIMPs and primordial black holes are involved in long-time scale energy emission processes, such as annihilation, decay, black hole evaporation and accretion. Such energy injection during the dark age of the Universe modifies the cosmic ionization and temperature evolution, which lead to observeable impacts on the anistropy spectrum of the cosmic microwave background, as well as in major CMB derivatives, like the 21cm signal, and precision cosmological fits. I will discuss the current status and near-future prospects of the these CMB-related methods for dark matter indirect searches.

Primary author: Dr GAO, Yu (IHEP)

Presenter: Dr GAO, Yu (IHEP)

Session Classification: DM

Contribution ID: **7** Type: **Talk**

Distinguishing the thermal history from structure formation

Friday, June 2, 2023 5:10 PM (25 minutes)

Structure formation has been used as a means to constrain the velocities of dark matter particles. For some typical models, such constraints are converted as constraints on dark-matter mass.
In this work, we explore the implications of these constraints on the thermal history of dark matter.
We find that they can constrain the decoupling temperatures in both the SM sector and the dark sector, but the constraints differ significantly between different scenarios such as relativistic/non-relativistic freeze-out, and freeze-in.
We also show that, given a model assumption, complementary information from different observations can help us determine the thermal history of dark matter.

Primary authors: Prof. YU, Jiang-Hao (ITP,CAS); Dr HUANG, Fei; Mr LI, Yuan-Zhen

Presenter: Mr LI, Yuan-Zhen

Session Classification: Cosmo

Contribution ID: **9** Type: **Talk**

Tests of modified gravitational wave propagations

Sunday, June 4, 2023 10:55 AM (25 minutes)

The direct discovery of gravitational waves (GWs) from the coalescence of compact binary components by the LIGO/Virgo/KAGRA Collaboration provides an unprecedented opportunity for exploring the underlying theory of gravity. The gravitational waves, after their generation, will be propagating at cosmological distances before they are detected and can provide invaluable information on the nature of gravity that drives their propagation. In this talk, I will briefly review the universal parameterized framework for describing the possible modified gravitational wave propagation in modified gravities and their signatures in the gravitational waveforms. And then discuss how to test them with signals of gravitational waves detected by LIGO/Virgo/KAGRA detectors.

Primary author: Prof. ZHU, Tao (Zhejiang University of Technology)

Presenter: Prof. ZHU, Tao (Zhejiang University of Technology)

Session Classification: GW

Contribution ID: **10** Type: **Talk**

axion, magnetic monopole and detection of new axion couplings

Friday, June 2, 2023 1:55 PM (25 minutes)

The Witten effect implies interaction between axion and magnetic monopole, and the quantum electromagnetodynamics (QEMD) properly describes electric charges, magnetic charges and photons. Based on the QEMD, a generic low-energy axion-photon effective field theory can be built. This generic axion-photon Lagrangian introduces the interactions between axion and two four-potentials, and leads to new axion-modified Maxwell equations. We properly solve the new axion-modified Maxwell equations and obtain the axion-induced electromagnetic fields given a static electric or magnetic field. I will also mention our proposals of new search strategies to measure the new axion couplings for sub-μeV axion in haloscope experiment.

Primary authors: LI, Tong (Nankai University); ZHANG, Rui-Jia (Nankai University); DAI, Chang-Jie (Nankai University)

Presenter: LI, Tong (Nankai University)

Session Classification: Axion

Contribution ID: **11** Type: **Talk**

Bumblebee Black Holes

Saturday, June 3, 2023 1:30 PM (25 minutes)

After obtaining black hole solutions in the bumblebee gravity theory, we put constraints on theory parameters with Solar system observations, black hole images, and extreme mass ratio inspirals.

Primary authors: Prof. SHAO, Lijing (Peking University); Dr XU, Rui; LIANG, Dicong; MAI, Zhan-Feng

Presenter: Prof. SHAO, Lijing (Peking University)

Session Classification: Astro

Contribution ID: **12** Type: **Talk**

GKZ hypergeometric systems of the three-loop vacuum Feynman integrals

Friday, June 2, 2023 2:45 PM (25 minutes)

We present the Gel'fand-Kapranov-Zelevinsky (GKZ) hypergeometric systems of the Feynman integrals of the three-loop vacuum diagrams with arbitrary masses, basing on Mellin-Barnes representations and Miller's transformation. The codimension of derived GKZ hypergeometric systems equals the number of independent dimensionless ratios among the virtual masses squared. Through GKZ hypergeometric systems, the analytical hypergeometric series solutions can be obtained in neighborhoods of origin including infinity. The linear independent hypergeometric series solutions whose convergent regions have non-empty intersection can constitute a fundamental solution system in a proper subset of the whole parameter space. The analytical expression of the vacuum integral can be formulated as a linear combination of the corresponding fundamental solution system in certain convergent region.

Primary author: Dr HAI-BIN, Zhang (Hebei University)

Co-author: Prof. TAI-FU, Feng (Hebei University)

Presenter: Dr HAI-BIN, Zhang (Hebei University)

Session Classification: Axion

Contribution ID: **13** Type: **Talk**

Muonphilic dark matter explanation of gamma-ray galactic center excess

Sunday, June 4, 2023 11:45 AM (25 minutes)

The Galactic center gamma-ray excess (GCE) is a long-standing unsolved problem. One of candidate solutions, the dark matter (DM) annihilation, has been recently tested with other astrophysical observations, such as AMS-02 electron-positron spectra, Fermi Dwarf spheroidal galaxies gamma-ray data, and so on. By assuming that the DM particles annihilate purely into a normal charged fermion pair, Di Mauro and Winkle (2021) claimed that only a muon-pair is compatible with the null detection of all the corresponding astrophysical measurements and can explain GCE simultaneously. On the other hand, a muonphilic DM model may also lead to a signal in the recent Fermilab muon g−2 measurement or be constrained by the latest PandaX-4T limit. In this work, we comprehensively study interactions between DM and muon, including various combinations of DM and mediator spins. In agreement with GCE (not only 2μ but also 4μ final states), we test these interactions against all the thermal DM constraints. Our results show that only the parameter space near the resonance region of mediator can explain GCE and relic density simultaneously, and larger parameter spaces are still allowed if other poorly-known systematic uncertainties are included. Regardless of the DM spin, only the interactions with the spin-0 mediator can explain the recent muon g−2 excess on top of GCE, relic density, and other DM and mediator constraints.

Primary authors: Prof. ABDUGHANI, Murat (Xinjiang University); Prof. FAN, Yi-Zhong (Purple Mountain Observatory); Prof. LU, Chih-Ting (Nanjing Normal University); TANG, Tian-Peng; TSAI, Yue-Lin Sming (Purple Mountain Observatory)

Presenter: Prof. LU, Chih-Ting (Nanjing Normal University)

Session Classification: GW

Contribution ID: **14** Type: **Talk**

Phase Transition and Gravitational Wave of Strongly Coupled Dark Sectors

Saturday, June 3, 2023 2:20 PM (25 minutes)

We go beyond the state-of-the-art by combining first principal lattice results and effective field theory approaches as Polyakov Loop model to explore the nonperturbative dark deconfinement-confinement phase transition and the generation of gravitational-waves in a dark Yang-Mills theory. We further include fermions with different representations in the dark sector. Employing the Polyakov-NambuJona-Lasinio (PNJL) model, we discover that the relevant gravitational wave signatures are highly dependent on the various representations. We also find a remarkable interplay between the deconfinement-confinement and chiral phase transitions. In both scenarios, the future Big Bang Observer and DECIGO experiment have a higher chance to detect the gravitational wave signals.

Primary author: WANG, Zhi-Wei (UESTC)

Presenter: WANG, Zhi-Wei (UESTC)

Session Classification: Astro

Contribution ID: **15** Type: **Talk**

Z boson mixing and the mass of the W boson

Saturday, June 3, 2023 4:20 PM (25 minutes)

We explore the possibility of explaining the W boson mass with an extra gauge boson mixing with the Z boson at tree level. Extra boson mixing with the Z boson will change the expression of the Z boson mass, thus altering the W boson mass. We explore two models in this work. We find that in the derivative portal dark matter model there are parameter spaces which can give the observed W boson mass, as well as the observed dark matter, relic density. These parameters' spaces can also fulfill the constraints from the electroweak oblique parameters and dark matter indirect detection. In the U(1) extension model, the kinetic mixing between extra boson and B boson can also give the observed W boson mass. However, to fulfill the electroweak oblique parameters' fit, the kinetic mixing in the U(1) model can only contribute about 27 MeV extra mass to the Standard Model W boson mass. Both models indicate the extra vector boson with the best fit mass around 120 GeV.

Primary author: ZENG, Yu-Pan (Guangdong Ocean University)

Co-authors: Dr CAI, Chengfeng (Sun Yat-sen University); Mr SU, Yu-Hang (Sun Yat-sen University); ZHANG, Hong-Hao

Presenter: ZENG, Yu-Pan (Guangdong Ocean University)

Session Classification: SM/BSM

Contribution ID: **17** Type: **Talk**

Probing EWPT in 2HDM with LHC and Future Lepton Colliders

Sunday, June 4, 2023 10:55 AM (25 minutes)

tudying the properties of Standard Model (SM) –like Higgs boson becomes one important window to explore the physics beyond the SM. In our works, we present studies about the implications of the Higgs and Z-pole precision measurements at current LHC and future Higgs Factories. We perform a global fit to various Higgs search channels to obtain the 95% C.L. constraints on the model parameter spaces of Two Higgs Double Model (2HDM). In the 2HDM, we analyse tree level effects as well as one-loop contributions from the heavy Higgs bosons. The strong constraints on cos(β − α), mΦ and heavy Higgs mass splitting can be complementary to direct search of the LHC and Z pole precision measurements. Our works also scrutinize the relationship between SFOPT required by baryogenesis and SM-Higgs coupling deviation at LHC and future lepton colliders.

Primary authors: SU, Wei (SYSU); ZHANG, Mengchao (Jinan University); Dr SONG, Huayang (ITP); Prof. WILLIAMS, Anthony (Uni of Adelaide)

Presenter: SU, Wei (SYSU)

Session Classification: Collider

Contribution ID: **18** Type: **Talk**

The Neutrino Magnetic Moment Portal and Supernovae: New Constraints and Multimessenger Opportunities

Saturday, June 3, 2023 2:20 PM (25 minutes)

We scrutinize the hypothesis that gauge singlet fermions - sterile neutrinos - interact with Standard Model particles through the transition magnetic moment portal. These interactions lead to the production of sterile neutrinos in supernovae followed by their decay into photons and active neutrinos which can be detected at γ-ray telescopes and neutrino detectors, respectively. We find that the non-observation of active neutrinos and photons from sterile-neutrino decay associated to
SN1987A yields the strongest constraints to date on magnetic-moment-coupled sterile neutrinos if their masses are inside a 0.1 − 100 MeV window. Assuming a near-future galactic supernova explosion, we estimate the sensitivity of several present and near-future experiments, including Fermi-LAT, e-ASTROGAM, DUNE, and Hyper-Kamiokande, to magnetic-moment-coupled sterile neutrinos. We also study the diffuse photon and neutrino fluxes produced in the decay of magneticmoment coupled sterile neutrinos produced in all past supernova explosions and find that the absence of these decay daughters yields the strongest constraints to date for sterile neutrino masses inside a 1 − 100 keV window.

Primary authors: BRDAR, Vedran; GOUVˆEA, Andr´e; LI, Yingying (USTC); MACHADO, Pedro

Presenter: LI, Yingying (USTC)

Session Classification: Neutrino

Contribution ID: **19** Type: **Talk**

SO(10) 大统一理论中的费米子质量、重子生成和引力波

Sunday, June 4, 2023 11:20 AM (25 minutes)

大统一理论旨在统一电磁、强和弱三种基本相互作用。其经典预言是质子衰变。目前尚未发现质子衰变的迹象，这对大统一能标带来较强的限制。在 SO(10) 大统一理论中，由于标准模型费米子都是安排在一个不可约表示下，夸克和轻子的质量与味混合是相互关联的。伴随着中微子实验进入精确测量时代，来自费米子味混合的实验数据对大统一的限制开始逐渐被慎重对待。此外，SO(10) 大统一模型还可以产生宇宙弦并辐射出引力波，这使得我们还可以从宇宙学观测的角度去认识大统一理论。我将讨论上面提及的不同类型的实验限制，并给出目前符合所有实验数据的大统一模型。

Primary author: ZHOU, Ye-Ling (HIAS-UCAS)

Presenter: ZHOU, Ye-Ling (HIAS-UCAS)

Session Classification: GW

Contribution ID: **20** Type: **Talk**

Interpretable machine learning in HEP analysis

Sunday, June 4, 2023 11:20 AM (25 minutes)

Machine learning methods have proved powerful in particle physics, but without interpretability there is no guarantee the outcome of a learning algorithm is correct or robust. Thus the interpretable machine learning (IML) framework become necessary in the HEP large data era. I am demonstraintg how the IML framework can be achieved with detailed analysis on a few LHC processes as example, and explaining further application and interpretation concepts.

Primary author: QIAN, Zhuoni (Hangzhou Normal University)

Presenter: QIAN, Zhuoni (Hangzhou Normal University)

Session Classification: Collider

Contribution ID: **21** Type: **Poster**

Exploring Mirror Twin Higgs Cosmology with Present and Future Weak Lensing Surveys

Friday, June 2, 2023 7:30 PM (5 minutes)

We explore the potential of precision cosmological data to study non-minimal dark sectors by updating the cosmological constraint on the mirror twin Higgs model (MTH). The MTH model addresses the Higgs little hierarchy problem by introducing dark sector particles. In this work, we perform a Bayesian global analysis that includes the latest cosmic shear measurement from the DES three-year survey and the Planck CMB and BAO data. In the early Universe, the mirror baryon and mirror radiation behave as dark matter and dark radiation, and their presence modifies the Universe's expansion history. Additionally, the scattering between mirror baryon and photon generates the dark acoustic oscillation process, suppressing the matter power spectrum from the cosmic shear measurement. We demonstrate how current data constrain these corrections to the ΛCDM cosmology and find that for a viable solution to the little hierarchy problem, the proportion of MTH dark matter cannot exceed about 30% of the total dark matter density, unless the temperature of twin photon is less than 30% of that of the standard model photon. While the MTH model is presently not a superior solution to the observed H_0 tension compared to the ΛCDM+$\Delta N_{\rm eff}$ model, we demonstrate that it has the potential to alleviate both the H_0 and S_8 tensions, especially if the S_8 tension persists in the future and approaches the result reported by the Planck˜SZ˜(2013) analysis. In this case, the MTH model can relax the tensions while satisfying the DES power spectrum constraint up to $k < 10\ h{\rm Mpc}^{-1}$. If the MTH model is indeed accountable for the S_8 and H_0 tensions, we show that the future China Space Station Telescope (CSST) can determine the twin baryon abundance with a 10% level precision.

Primary authors: ZU, Lei (Purple Mountain Observatory); ZHANG, Chi (Purple Mountain Observatory)

Presenter: ZHANG, Chi (Purple Mountain Observatory)

Session Classification: Poster session and buffer dinner

Contribution ID: **23** Type: **Talk**

Dark matter from hot big bang black holes

Saturday, June 3, 2023 1:55 PM (25 minutes)

If the temperature of the hot thermal plasma in the Early Universe was within a few orders of magnitude of the quantum gravity scale, then the hoop conjecture predicts the formation of microscopic black holes from particle collisions in the plasma. These black holes may evaporate and produce the dark matter relic abundance observed today for a wide variety of dark matter masses. We study the production of dark matter in standard cosmology and in the scenario of low-scale quantum gravity such as large extra dimensions. In the former case black holes evaporate instantly, while in the latter case dark matter may accrete and become macroscopic, leading to rich phenomena in the late Universe.

Primary author: SONG, Ningqiang (Institute of Theoretical Physics, Chinese Academy of Sciences)

Presenter: SONG, Ningqiang (Institute of Theoretical Physics, Chinese Academy of Sciences)

Session Classification: Astro

Contribution ID: **24** Type: **Talk**

Testing lepton number violation beyond the approach of EFTs

Saturday, June 3, 2023 1:55 PM (25 minutes)

In this talk, I will discuss the test of lepton number violation beyond the approach of effective field theories. In the UV completion, one can study LNV interactions with neutrinoless double beta decay, collider searches and low energies precision experiments complementarily.

Primary author: LI, Gang (Sun Yat-sen University)

Presenter: LI, Gang (Sun Yat-sen University)

Session Classification: Neutrino

Contribution ID: **25** Type: **Talk**

Inflation and Dark Matter with Weyl Symmetry

Friday, June 2, 2023 3:55 PM (25 minutes)

The cosmological observations of cosmic microwave background and large-scale structure indicate that our universe has a nearly scaling invariant power spectrum of the primordial perturbation. However, the exact origin for this primordial spectrum is still unclear. We present a theoretical framework and several viable models to explain cosmic inflation and dark matter simultaneously, both are important ingredients for the formation of cosmic structures. We also discuss the connection with standard Starobinsky inflation and difference in the prediction on the magnitude of primordial gravitational waves, which may be probed by future experiments on cosmic microwave background.

Primary author: Prof. TANG, Yong (University of Chinese Academy of Sciences)

Presenter: Prof. TANG, Yong (University of Chinese Academy of Sciences)

Session Classification: Cosmo

Contribution ID: **26** Type: **Talk**

Possible detection of positrons from an accreting X-ray pulsar?

Saturday, June 3, 2023 10:30 AM (25 minutes)

Insight-HXMT is China’s 1st X-ray astronomy satellite launched in 2017 and still working nominally in orbit. With its broad energy band (1-250 keV) and large effective area (about 400, 1000, 5000 cmˆ2 in three energy bands), it has been used to make many new discoveries with its observations on accreting X-ray pulsars, such as the highest energy cyclotron absorption features above 100 keV. Positrons are known to be produced in the Milky Way through some well-known mechanisms, however, unambiguous identifications of positron sources are still rare. In this talk, I will report the detection of a hard X-ray spectral component above 100 keV with the Insight-HXMT observations on an accreting X-ray pulsar with strong surface magnetic fields, on top of the cut-off powerlaw spectrum usually detected from such systems. This new spectral component can be modelled by the positronium continuum or electron-positron annihilation signals in a pair plasma.

Primary author: ZHANG, Shuang-Nan (Institute of High Energy Physics)

Presenter: ZHANG, Shuang-Nan (Institute of High Energy Physics)

Session Classification: Astro

Contribution ID: **27** Type: **Poster**

Quantum calculation of axion-photon transition in electromagnetodynamics for cavity haloscope

Friday, June 2, 2023 6:00 PM (5 minutes)

The Witten effect implies the presence of electric charge of magnetic monopole and possible relationship between axion and dyon. The axion-dyon dynamics can be reliably built based on the quantum electromagnetodynamics (QEMD) which was developed by Schwinger and Zwanziger in 1960’s. A generic low-energy axion-photon effective field theory can also be realized in the language of “generalized symmetries” with higher-form symmetries and background gauge fields. In this work, we implement the quantum calculation of axion-single photon transition rate inside a homogeneous electromagnetic field in terms of the new axion interaction Hamiltonian in QEMD. This quantum calculation can clearly imply the enhancement of conversion rate through resonant cavity in axion haloscope experiments. We also show the promising potentials on the cavity search of new axion-photon couplings in QEMD.

Primary authors: Dr LI, TONG (Nankai University); ZHANG, RUIJIA (Nankai University)

Presenter: ZHANG, RUIJIA (Nankai University)

Session Classification: Poster session and buffer dinner

Contribution ID: **28** Type: **Talk**

Nuclear decay anomalies as a signature of axion dark matter

Sunday, June 4, 2023 9:45 AM (25 minutes)

A number of nuclear decay anomalies have been reported in the literature, which purport to show periodic variations in the decay rates of certain radioisotopes. If these reports reflect reality, they would necessitate a seismic shift in our understanding of fundamental physics. We provide the first mechanism to explain these findings, via the misalignment mechanism of QCD axion dark matter, wherein oscillations of the effective θ angle induce periodic variation in nuclear binding energies and hence decay rates. As we expect this effect to be most pronounced in low-Q systems, we analyse 12 years of tritium decay data ($Q \simeq 18.6$ keV) taken at the European Commission's Joint Research Centre. Finding no statistically significant excess, we exclude axion decay constants below $9.4\times10^{12}-1.8\times10^{10}$ GeV (95 \% confidence level) for masses in the $1.7\times10^{-23}-8.7\times10^{-21}$ eV range.

Primary author: LI, Tianjun (Institute of Theoretical Physics, Chinese Academy of Sciences)

Presenter: LI, Tianjun (Institute of Theoretical Physics, Chinese Academy of Sciences)

Session Classification: Collider

Contribution ID: **29** Type: **Talk**

Probing Cosmic Beam-dump DM in Direct Detections

Friday, June 2, 2023 1:30 PM (25 minutes)

In this talk, I will talk about the production of sub-GeV DM from the cosmic ray collision with the atmosphere and the prospects in direct detection. I will highlight the importance of quasi-elastic scattering in the earth-stopping effect.

Primary author: WU, Lei (Nanjing Normal Univeristy)

Presenter: WU, Lei (Nanjing Normal Univeristy)

Session Classification: DM

Contribution ID: **30** Type: **Talk**

Flavor Gauged 2HDM after RK 2022 Release

Friday, June 2, 2023 3:30 PM (25 minutes)

Does the updated lepton non-universality parameter, given by LHCb in December 2022, imply that new physics in b to s window has faded way? In this work, we aim to answer this question by making global fits of Wilson coefficients in four different scenarios taking into account 196 observables in leptonic and semileptonic decays of B mesons and bottom baryons. We find that new physics opportunities in some of the Wilson coefficients still exist. We further discuss a type of 2HDM accommodated with flavor symmetries combing constraints from RD and g-2 and relevant parameter space is also explored.

Primary author: Prof. XU, Fanrong (Jinan University)

Presenter: Prof. XU, Fanrong (Jinan University)

Session Classification: Flavor

Contribution ID: **31** Type: **Poster**

CP Violating Dark Photon Kinetic Mixing and Type-III Seesaw

Friday, June 2, 2023 6:15 PM (5 minutes)

The hypothetical dark photon portal connecting the visible and dark sectors of the Universe has received considerable attention in recent years, with a focus on CP-conserving kinetic mixing between the Standard Model (SM) hypercharge gauge boson and a new $U(1)_X$ gauge boson. In the effective field theory context, one may write down non-renormalizable CP-violating kinetic mixing interactions involving the X and $SU(2)_L$ gauge bosons.
We construct for the first time a renormalizable model for CP-violating kinetic mixing that induces CP-violating non-Abelian kinetic mixing at mass dimension five.
The model grows out of the type-III seesaw model, with the lepton triplets containing right-handed neutrinos playing a crucial role in making the model renormalizable and providing
a bridge to the origin of neutrino mass. This scenario also accommodates
electron electric dipole moments (EDM) as large as current experimental bound, making future EDM searches an important probe of this scenario.

Primary author: SUN, Jin (Shanghai Joao Tong University)

Presenter: SUN, Jin (Shanghai Joao Tong University)

Session Classification: Poster session and buffer dinner

Contribution ID: **32** Type: **Talk**

Asymmetric dark matter with a spontaneously broken U(1)': self-interaction and gravitational waves

Friday, June 2, 2023 2:20 PM (25 minutes)

Motivated by the collisionless cold dark matter small scale structure problem, we propose an asymmetric dark matter model where dark matter particle interact with each other via a massive dark gauge boson. This model easily avoid the strong limits from cosmic microwave background (CMB) observation, and have a large parameter space to be consistent with small scale structure data. We focus on a special scenario where portals between dark sector and visible sector are too weak to be detected by traditional methods. We find that this scenario can increase the effective number of neutrinos (N_{eff}).In addition, the spontaneous $U(1)$ symmetry breaking process, which makes dark gauge boson massive, can generate stochastic gravitational waves with peak frequency around 10^{-6}—10^{-7} Hz.

Primary author: ZHANG, Mengchao (Jinan University)

Presenter: ZHANG, Mengchao (Jinan University)

Session Classification: DM

Contribution ID: **33** Type: **Talk**

Detecting High-Frequency Gravitational Waves in Planetary Magnetosphere

High-frequency gravitational waves (HFGWs) carry a wealth of information on the early Universe with a tiny comoving Hubble horizon and astronomical objects of small scale but with dense energy. We demonstrate that the nearby planets, such as Earth and Jupiter, can be utilized as a laboratory for detecting the HFGWs. These GWs are then expected to convert to signal photons in the planetary magnetosphere, across the frequency band of astronomical observation. As a proof of concept, we present the first limits from the existing low-Earth-orbit satellite for specific frequency bands and project the sensitivities for the future more-dedicated detections. The first limits from Juno, the latest mission orbiting Jupiter, are also presented. Attributed to the long path of effective GW-photon conversion and the wide angular distribution of signal flux, we find that these limits are highly encouraging, for a broad range of frequencies including a large portion unexplored before.

Primary author: REN, Jing (Institute of High Energy Physics)

Presenter: REN, Jing (Institute of High Energy Physics)

Session Classification: Astro

Contribution ID: **34** Type: **Poster**

Light Fermionic Dark Matter Absorption on Electron Targets

Friday, June 2, 2023 7:35 PM (5 minutes)

The direct detection of light dark matter (DM) is a big challenge. The kinetic energy of halo light DM is so small that the energy transfer through elastic scattering with nuclei can hardly exceed the detection threshold. In addition to using electron target, one possible way of overcoming this difficulty is fermionic DM absorption. Being converted to a massless neutrino, the light DM releases all its mass into energy for the final-state neutrino and electron. Even O(10)keV DM can already leave large enough electron recoil energy, thanks to the efficient mass conversion to energy. It also gives a unique signal with clear peak in the electron recoil spectrum whose shape is largely determined by the atomic effects. Terrestrial direct detection experiments, such as PandaX-II and Xenon1T, can be sensitive to this absorption signal. In addition, the DM overproduction, its invisible and visible decay effects on the cosmological evolution and the astrophysical X(gamma)-ray are thoroughly explored to give up-to-date constraints. Recently, the PandaX group uses the latest result with 0.63 tonne-year exposure from Panda-4T to put a stringent constraint. The result gives the first DM direct detection probe whose sensitivity already exceeds the indirect ones from astrophysical and cosmological observations, especially in the mass range from 25 to 45 (35 to 50) keV for an axial-vector (vector) interaction, respectively. This talk will elaborate the direct and indirect searches for this unique scenario of fermionic DM absorption on electron targets, including the second quantization treatment of the atomic effects.

Primary author: SHENG, Jie (Shanghai Jiao Tong University, Tsung-Dao Lee Institute)

Co-authors: Prof. GE, Shao-Feng (TDLI-SJTU); Prof. HE, Xiao Gang (Shanghai Jiao Tong University, Tsung-Dao Lee Institute); MA, Xiao-Dong (TDLI)

Presenter: SHENG, Jie (Shanghai Jiao Tong University, Tsung-Dao Lee Institute)

Session Classification: Poster session and buffer dinner

Contribution ID: **35** Type: **Poster**

Lightest Higgs boson decays h→MZ in the μ from ν supersymmetric standard model

Friday, June 2, 2023 6:30 PM (5 minutes)

We study the lightest Higgs boson decays $h \to MZ$ in the μ from ν supersymmetric standard model ($\mu\nu$SSM), where M is a vector meson $(\rho, \omega, \phi, J/\Psi, \Upsilon)$. Compared to the minimal supersymmetric standard model (MSSM), the $\mu\nu$SSM introduces three right-handed neutrino superfields, which lead to the mixing of the Higgs doublets with the right-handed sneutrinos. The mixing affects the lightest Higgs boson mass and the Higgs couplings. In suitable parameter space, the $\mu\nu$SSM can give large new physics (NP) contributions to the signal strengths of $h \to MZ$ and $h \to \gamma\gamma$, which may be detected by a 100 TeV collider or the other future high energy colliders.

Primary author: LIU, Changxin

Co-authors: FENG, Tai-Fu; YANG, Jin-Lei; ZHANG, Hai-Bin; ZHAO, Shu-Min

Presenter: LIU, Changxin

Session Classification: Poster session and buffer dinner

Contribution ID: **36** Type: **Talk**

Axion Cavity at Quantum Level

Friday, June 2, 2023 1:30 PM (25 minutes)

We show that at the quantum level the single axion-photon conversion rate is enhanced by the cavity quality factor Q, and quantitatively larger than the classical result by a factor $\pi/2$. Thus, the axion cavity can be considered as a quantum device emitting single-photons with temporal separations. This differs from the classical picture in which axions transition in batches and the converted energy accumulates in the electromagnetic field inside the cavity.

Primary authors: Prof. GAO, Yu; Prof. PENG, Zhihui; YANG, Qiaoli

Presenter: YANG, Qiaoli

Session Classification: Axion

Contribution ID: **37** Type: **Talk**

Charmless two-body B decays from the perturbative QCD approach

Friday, June 2, 2023 3:55 PM (25 minutes)

In this presentation we would first introduce the basic idea of transversal momentum dependent (k_T) factorization theorem and its application in B meson decays, then we would show our recent calculation of charmless $B \to PP, PV, VV$ decay with including all the known next-to-leading-order QCD corrections, the πK puzzle would also be mentioned.

Primary author: CHENG, Shan (Hunan University)

Presenter: CHENG, Shan (Hunan University)

Session Classification: Flavor

Contribution ID: **38** Type: **Poster**

The electromagnetic decays of X(3823) as the ”ψ” _(_ _)state and its radial excited states

Friday, June 2, 2023 6:40 PM (5 minutes)

We study the electromagnetic (EM) decays of $X(3823)$ as the $\psi_2(1^3D_2)$ state by using the relativistic Bethe-Salpeter method. Our results are $\Gamma[X(3823) \to \chi_{c0}\gamma] = 1.2$ keV, $\Gamma[X(3823) \to \chi_{c1}\gamma] = 265$ keV, $\Gamma[X(3823) \to \chi_{c2}\gamma] = 57$ keV and $\Gamma[X(3823) \to \eta_c\gamma] = 1.3$ keV. The ratio $calB[X(3823) \to \chi_{c2}\gamma]/calB[X(3823) \to \chi_{c1}\gamma] = 0.22$, agrees with the experimental data. Similarly, the EM decay widths of $\psi_2(n^3D_2)$, $n = 2, 3$, are predicted, and we find the dominant decays channels are $\psi_2(n^3D_2) \to \chi_{c1}(nP)\gamma$, where $n = 1, 2, 3$. The wave function include different partial waves, which means the relativistic effects are considered. We also study the contributions of different partial waves.

Primary author: LI, Wei (He Bei University)

Co-authors: WANG, Guo-Li; Mr WANG, Tian Hong

Presenter: LI, Wei (He Bei University)

Session Classification: Poster session and buffer dinner

Contribution ID: **39** Type: **Poster**

Improving CP Measurement with Muon Decay At Rest

Friday, June 2, 2023 7:40 PM (5 minutes)

We explore the possibility of using the recently proposed THEIA detector to measure the $\bar{\nu}_\mu \to \bar{\nu}_e$ oscillation with neutrinos from a muon decay at rest (μDAR) source to improve the leptonic CP phase measurement. Due to its intrinsic low-energy beam, this μTHEIA configuration (μDAR neutrinos at THEIA) is only sensitive to the genuine leptonic CP phase δ_D and not contaminated by the matter effect. With detailed study of neutrino energy reconstruction and backgrounds at the THEIA detector, we find that the combination with the high-energy DUNE can significantly reduce the CP uncertainty, especially around the maximal CP violation cases $\delta_D = \pm 90^\circ$. Both the μTHEIA-25 with 17 kt and μTHEIA-100 with 70 kt fiducial volumes are considered. For DUNE + μTHEIA-100, the CP uncertainty can be better than 8°.

Primary author: KONG, Chuifan

Presenter: KONG, Chuifan

Session Classification: Poster session and buffer dinner

Contribution ID: **40** Type: **Talk**

Four-body baryonic $B \to \mathbf{B_1 B_1' B_2 B_2'}$ decays

Friday, June 2, 2023 11:20 AM (25 minutes)

We would like to present our recent study of the four-body baryonic $B \to \mathbf{B_1 B_1' B_2 B_2'}$ decay. We explain the branching fraction of $\bar{B}^0 \to p\bar{p}p\bar{p}$ measured by LHCb as small as 2.2×10^{-8}. We also predict the following branching fractions: $calB(B^- \to n\bar{p}p\bar{p}) = (8.4^{+2.1}_{-1.0} \pm 0.4^{+3.4}_{-1.9}) \times 10^{-8}$, $calB(B^- \to \Lambda\bar{p}p\bar{p}) = (3.7^{+0.3}_{-0.1} \pm 0.02^{+1.8}_{-1.3}) \times 10^{-7}$ and $calB(\bar{B}^0_s \to \Lambda\bar{\Lambda}p\bar{p}) = (1.9^{+0.3}_{-0.1} \pm 0.01^{+1.1}_{-0.6}) \times 10^{-7}$, with several being accessible to experimental facilities.

Primary author: HSIAO, Yu-Kuo (Shanxi Normal University)

Presenter: HSIAO, Yu-Kuo (Shanxi Normal University)

Session Classification: Flavor

Contribution ID: **41** Type: **Talk**

Gravitational waves from phase transitions during inflation

Sunday, June 4, 2023 1:55 PM (25 minutes)

Due to the large excursion of the inflaton field. The parameters, such as mass and couplings of the fields coupled to the inflaton field, may change dastically during inflation. And thus phase transitions may be induced. In this talk, I am going to discuss the gravitational wave signals produced by phase transitions during inflation. For first-order phase transitions, I will show that the gravitational wave spectrum has a unique oscillation feature. For second-order phase transitions, I will show that topological defects produced during the phase transition will produce detectable gravitational waves.

Primary author: Prof. AN, Haipeng (Tsinghua University)

Presenter: Prof. AN, Haipeng (Tsinghua University)

Session Classification: GW

Contribution ID: **42** Type: **Poster**

Guage-invariant Electroweak Interaction Parameters and Their oblique corrections in The B-LSSM

Friday, June 2, 2023 6:10 PM (5 minutes)

Using Pinch technique, we calculate the one-loop level vertices of weak interactions in the B-LSSM and add their Pinch contributions to the self energy of gauge bosons, whose gauge invariance is thereby guaranteed. Compared with low-energy effective Lagrangian of weak interaction, new Z' neutral current which appears in B-LSSM can not be well matched. Therefore, we add some terms to the effective Lagrangian to solve this trouble. Considering the limitations from the current experiments, parameters of the model should be confined.

Primary author: 崔, 生恺 (HeBei University)

Presenter: 崔, 生恺 (HeBei University)

Session Classification: Poster session and buffer dinner

Contribution ID: **43** Type: **Talk**

Particle Physics Studies with Gravitational Waves: Three Approaches

Friday, June 2, 2023 4:20 PM (25 minutes)

I will briefly go over the three approaches of particle physics studies with gravitational waves: early universe phase transitions, topological and non-topological solitons and environmental effects, and highlight some recent developments on the theory side and on experimental detection that we have made in each of the fields.

Primary author: GUO, Huaike (UCAS (ICTP-AP))

Presenter: GUO, Huaike (UCAS (ICTP-AP))

Session Classification: Cosmo

Contribution ID: **44** Type: **Talk**

Analytical methods and results for inflation correlators

Friday, June 2, 2023 3:30 PM (25 minutes)

Inflation correlators encode ultra-high-energy physics at the inflation scale and are promising targets for future cosmological observations. Theory-wise, these objects are boundary correlators of bulk dS quantum fields, which play crucial roles in our understanding of QFT in dS. However, the analytical computation of dS correlators is notoriously difficult, and significant progress has been made only in recent years. In this talk, I shall introduce our recent efforts in understanding and computing inflation correlators. I shall describe new analytical tools we have developed, including the partial Mellin-Barnes representation, the bootstrap equations, and the spectral decomposition. I shall also present new results and insights we obtained with these techniques, including exact and analytical expressions for a wide range of inflation correlators at both tree and 1-loop levels, a 1-loop factorization theorem, the cutting rule, and the boundary OPE.

Primary author: XIANYU, Zhong-Zhi (Tsinghua University)

Presenter: XIANYU, Zhong-Zhi (Tsinghua University)

Session Classification: Cosmo

Contribution ID: **45** Type: **Poster**

Bootstrapping One-loop Inflation Correlators with the Spectral Decomposition

Friday, June 2, 2023 7:45 PM (5 minutes)

Phenomenological studies of cosmological collider physics in recent years have identified many 1-loop inflation correlators as leading channels for discovering heavy new particles around or above the inflation scale. However, complete analytical results for these massive 1-loop correlators are currently unavailable. In this work, we embark on a program of bootstrapping inflation correlators with massive exchanges at 1-loop order, with the input of tree-level inflation correlators and the techniques of spectral decomposition in dS. As a first step, we present for the first time the complete and analytical results for a class of 4-point and 3-point inflation correlators mediated by massive scalar fields at the 1-loop order. Using the full result, we provide simple and reliable analytical approximations for the signals and the background in the squeezed limit. We also identify configurations of the scalar trispectrum where the oscillatory signal from the loop is dominant over the background.

Primary authors: XIANYU, Zhong-Zhi (Tsinghua University); ZHANG, Hongyu

Presenter: ZHANG, Hongyu

Session Classification: Poster session and buffer dinner

Contribution ID: **46** Type: **Talk**

Millicharged particles from proton bremsstrahlung in the atmosphere

Friday, June 2, 2023 2:20 PM (25 minutes)

Light millicharged particles can be copiously produced from meson decays in cosmic ray collisions with the atmosphere, leading to detectable signals in large underground neutrino detectors. In this paper we study a new channel to produce millicharged particles in the atmosphere, the proton bremsstrahlung process. We find that the proton bremsstrahlung channel can produce a much larger flux of millicharged particles than the previously studied meson decay channel, resulting in an improvement on the SuperK limit by nearly one order of magnitude. Consequently, SuperK can probe new parameter space beyond the current leading limits from ArgoNeuT. We further note that the study on the proton bremsstrahlung process can be extended to other atmospherically produced light particles, and to millicharged particle searches in proton accelerators.

Primary author: Prof. LIU, Zuowei (Nanjing University)

Presenter: Prof. LIU, Zuowei (Nanjing University)

Session Classification: Axion

Contribution ID: **48** Type: **Poster**

Production and attenuation of cosmic-ray boosted dark matter

Friday, June 2, 2023 7:25 PM (5 minutes)

Light sub-GeV halo dark matter (DM) particles up-scattered by high-energy cosmic-rays (CRs) (referred to as CRDM) can be energetic and become detectable by conventional DM direct detection experiments. We perform a refined analysis on the exclusion bounds of the spin-independent DM-nucleon scattering cross section $\sigma_{\chi p}$ in this approach. For the exclusion lower bounds, we determine the parameter of the effective distance $D_{\rm eff}$ for CRDM production using spatial-dependent CR fluxes and including the contributions from the major heavy CR nuclear species. We obtain $D_{\rm eff} \approx 9$ kpc for CRDM particles with kinetic energy above ~ 1 GeV, which pushes the corresponding exclusion lower bounds down to $\sigma_{\chi p} \sim 4 \times 10^{-32}$ cm^2 for DM particle mass at MeV scale and below. For the exclusion upper bounds from Earth attenuation, previous estimations neglecting the nuclear form factor leaded to typical exclusion upper bounds of $\sigma_{\chi p} \sim \mathcal{O}(10^{-28})$ cm^2 from the XENON1T data. Using both the analytic and numerical approaches, we show that for CRDM particles, the presence of the nuclear form factor strongly suppresses the effect of Earth attenuation. Consequently, the cross section that can be excluded by the XENON1T data can be a few orders of magnitude higher, which closes the gap in the cross sections excluded by the XENON1T experiment and that by the astrophysical measurements such that for the cosmic microwave background (CMB), galactic gas cloud cooling, and structure formation, etc.

Primary authors: Dr XIA, Chen (Tsung-Dao Lee Institute, Shanghai Jiao Tong University); Dr XU, Yan-Hao; ZHOU, Yu-Feng

Presenter: Dr XIA, Chen (Tsung-Dao Lee Institute, Shanghai Jiao Tong University)

Session Classification: Poster session and buffer dinner

Contribution ID: **49** Type: **Talk**

Improving heavy Dirac neutrino prospects at future hadron colliders using machine learning

Sunday, June 4, 2023 11:45 AM (25 minutes)

In this work, by using machine learning methods, we study the sensitivities of heavy pseudo-Dirac neutrino N in the inverse seesaw at the high-energy hadron colliders. The production process for the signal is $pp \to \ell^{\pm} N \to 3\ell + E_T^{\rm miss}$, while the dominant background is $pp \to W^{\pm} Z \to 3\ell + E_T^{\rm miss}$. We use either the Multi-Layer Perceptron or the Boosted Decision Tree with Gradient Boosting
to analyze the kinematic observables and optimize the signal/background discrimination. It is found that the reconstructed Z boson mass and heavy neutrino mass from the charged leptons and missing transverse energy play crucial roles to separate the signal/background events. We estimate the prospects of heavy-light neutrino mixing $|V_{\ell N}|^2$ (with $\ell = e,\ \mu$) using machine learning at the hadron colliders with $\sqrt{s} = 14$ TeV, 27 TeV, and 100 TeV, and find that $|V_{\ell N}|^2$ can be improved up to $calO(10^{-6})$ for heavy neutrino mass $m_N = 100$ GeV and $calO(10^{-4})$ for $m_N = 1$ TeV.

Primary authors: FENG, Jie (Sun Yat-sen University (CN)); ZHANG, Hong-Hao; ZENG, Yu-Pan (Guangdong Ocean University); ZHANG, Yongchao (Washington University in St. Louis); YAN, Qi-Shu (University of Chinese Academy of Sciences)

Presenter: FENG, Jie (Sun Yat-sen University (CN))

Session Classification: Collider

Contribution ID: **50** Type: **Talk**

粒子物理和早期宇宙对称性破缺

Saturday, June 3, 2023 3:55 PM (25 minutes)

强一阶电弱相变为解释正反物质不对称提供了必要条件，宇宙弦和畴壁是很多大统一等新物理模型的普遍预言。它们是太极和天琴计划、脉冲星计时阵列等的重要科学目标之一。我将在此报告中跟大家交流一下粒子物理模型与早期宇宙对称性破缺，及相应的随机引力波产出与探测方面的研究进展。

Primary author: Prof. BIAN, Ligong (Chongqing University)

Presenter: Prof. BIAN, Ligong (Chongqing University)

Session Classification: Cosmo

Contribution ID: **51** Type: **Poster**

Lepton Colliders and Study of Neutrino CP violation

Friday, June 2, 2023 7:20 PM (5 minutes)

As known neutrino oscillation is one the most important problems beyond standard model physics. Its observations enable us to infer that neutrinos have masses, although tiny. Another crucial problem within neutrino physics is the violation of Charge and Parity conservation, or namely CP violation. Here in our proposal we examine possible sensitivity on CP violating phase through oscillation mdoes of ν_μ, ν_e and their antineutrinos into tau neutrino. Interfacing with long baseline neutrino detectors such as DUNE or T2K, this proposal can be used to measure CP violating phase, $\delta_{\rm CP}$ and also serve as bright τ_ν factory. The symmetric muon and anti-muon beams produces symmetric neutrino and anti-neutrino sources and importantly, signals for neutrino and antineutrino oscillation can be collected simultaneously. With rich flux of muon sources, 5σ deviations of sensitivity can be easily reached for CP phase as $|\pi/2|$, within only 1-2 years of data taking.

Primary author: RUZI, Alim (Peking University)

Presenter: RUZI, Alim (Peking University)

Session Classification: Poster session and buffer dinner

Contribution ID: **52** Type: **Talk**

Progress on cosmic rays model and implicaitons on dark matter

Saturday, June 3, 2023 11:20 AM (25 minutes)

Cosmic rays propagation makes important progress in recent years. The progress implies different dark matter properties from previously expected. In the new model, the antiproton flux fits the AMS data well and no contribution from dark matter is needed and severe constraints on the dark matter annihilation are gotten. In the new model, the dark matter explanation for positron exess is relaxed by smaller annihilaiton cross section and consistent with the constraints by gamma ray observation from Fermi-LAT.

Primary author: 毕, 效军 (中科院高能所)

Presenter: 毕, 效军 (中科院高能所)

Session Classification: Astro

Contribution ID: **53** Type: **Talk**

A global analysis for determined and undetermined hadronic two body weak decays of anti-triplet charmed baryons

Saturday, June 3, 2023 4:45 PM (25 minutes)

Primary author: XING, zhi-peng (TDLI)

Presenter: XING, zhi-peng (TDLI)

Session Classification: SM/BSM

Contribution ID: **54** Type: **Talk**

Revisiting Xi_Q–Xi_Qˆprime mixing in QCD sum rules

In this work, we perform a QCD sum rules analysis on the $\Xi_Q - \Xi'_Q$ mixing. Contributions from up to dimension-6 four-quark operator are considered. However, it turns out that, only dimension-4 and dimension-5 operators contribute, which reveals the non-perturbative nature of mixing. Especially we notice that only the diagrams with the two light quarks participating in gluon exchange contribute to the mixing. Our results indicate that the mixing angle $\theta_c = (1.2 \sim 2.8)^\circ$ for the $Q = c$ case and $\theta_b = (0.28 \sim 0.34)^\circ$ for the $Q = b$ case. Our prediction of θ_c is consistent with the most recent Lattice QCD result within error. Such a small mixing angle seems unlikely to resolve the tension between experimental measurement and Lattice QCD calculation for the semileptonic decay $\Xi_c^0 \to \Xi^- e^+ \nu_e$.

Primary author: 赵, 振兴 (内蒙古大学)

Presenter: 赵, 振兴 (内蒙古大学)

Contribution ID: **55** Type: **Poster**

Lepton flavor violating decays lj → liɣ in the U(1)XSSM model within the Mass Insertion Approximation

Friday, June 2, 2023 6:20 PM (5 minutes)

Three singlet new Higgs superfields and right-handed neutrinos are added to MSSM to obtain U(1)XSSM model. Its local gauge group is SU(3)C × SU(2)L × U(1)Y × U(1)X. In the framework of U(1)XSSM, we study muon anomalous magnetic moment and lepton flavor violating decays lj → liɣ(j = 2, 3;i = 1, 2) within the Mass Insertion Approximation(MIA). Through the MIA method, we can find the parameters that directly affect the analytical result of the lepton flavor violating decays lj → liɣ, which make our work more convenient. We want to provide a set of simple analytic formulas for the form factors and the associated effective vertices, that may be very
useful for future phenomenological studies of the lepton flavor violating decays. According to the accuracy of the numerical results which the influence of different sensitive parameters, we come to
the conclusion that the non-diagonal elements which correspond to the generations of the initial lepton and final lepton are main sensitive parameters and lepton flavor violation(LFV) sources. This work can provide a clear signal of new physics(NP).

Primary authors: 王, 彤彤 (河北大学); Mr 赵, 树民 (河北大学)

Presenter: 王, 彤彤 (河北大学)

Session Classification: Poster session and buffer dinner

Contribution ID: **56** Type: **Talk**

Primordial Black Hole Dark Matter

Saturday, June 3, 2023 11:45 AM (25 minutes)

TBA

Primary author: Prof. HUANG, Qing-Guo (ITP)

Presenter: Prof. HUANG, Qing-Guo (ITP)

Session Classification: Astro

Contribution ID: **57** Type: **Talk**

暗物质间接探测进展及中子星内部的夸克物质

Sunday, June 4, 2023 2:45 PM (25 minutes)

暗物质与夸克物质是两类极端物态，前者的物理本质尚不清楚，后者是否能够在中子星内部存在也是一个前沿科学问题。报告中我将介绍近几年暗物质间接探测的相关研究进展，对一些候选疑似信号进行重点讨论；我还将介绍现阶段基于多信使数据的中子星物态方程的研究，特别是关于最重的中子星内部存在夸克物质的可能性。

Primary author: Mr 范, 一中 (紫金山天文台)

Presenter: Mr 范, 一中 (紫金山天文台)

Session Classification: GW

Contribution ID: **58** Type: **Talk**

Particle cosmology at TianQin

Sunday, June 4, 2023 2:20 PM (25 minutes)

We systematically discuss the deep connection between TianQin and the fundamental problems in particles cosmology, including the gravitational wave detection of dark matter, electroweak baryogenesis and so on.

Primary author: HUANG, Fa Peng (Sun Yat-sen University)

Presenter: HUANG, Fa Peng (Sun Yat-sen University)

Session Classification: GW

Contribution ID: **59** Type: **Talk**

Modular symmetry approach to lepton mixing

Saturday, June 3, 2023 1:30 PM (25 minutes)

Modular symmetry is a promising approach to address the flavor structure of Standard model. I shall present the recent development on modular symmetry in this talk.

Primary author: DING, Gui-Jun (University of Science and Technology of China)

Co-authors: Prof. KING, Stephen (Southampton University); Prof. LI, Cai-Chang (Northwest University); Dr LIU, Xiang-Gan (University of California, Irvine); Dr LU, Jun-Nan (University of Science and Technology of China)

Presenter: DING, Gui-Jun (University of Science and Technology of China)

Session Classification: Neutrino

Contribution ID: **60** Type: **Poster**

Soft Scattering Evaporation of Dark Matter Subhalos by Inner Galactic Gases

Friday, June 2, 2023 6:35 PM (5 minutes)

The large gap between a galactic dark matter subhalo's velocity and its own gravitational binding velocity creates the situation that small subhalos can be evaporated before dark matter thermalize with baryons due to the low binding velocity. In case dark matter acquires an electromagnetic dipole moment, the survival of low-mass subhalos requires stringent limits on the photon-mediated soft scattering. Within the current direct detection limits, we calculate the DM kinetic decoupling temperature in the Early Universe and evaluate the smallest protohalo mass. In the late Universe, low-mass subhalos can be evaporated via soft collision by ionizied gas and accelerated cosmic rays. We calculate the subhalo evaporation rate via dipole-charge scattering and place an upper limit on the DM's dipole form factor by assuming the survival of subhalos in the ionized Galactic interior.

Primary author: LIN, Yugen (IHEP,CAS)

Presenter: LIN, Yugen (IHEP,CAS)

Session Classification: Poster session and buffer dinner

Contribution ID: **61** Type: **Talk**

Exploring the universe with hydrogen atoms

Hydrogen atoms in the universe emit radiation at a wavelength of 21 cm in the radio band, making the 21-cm radiation a powerful tool for exploring the cosmos. 21-cm line observations open a new window for cosmological investigations. By utilizing the 21-cm signal, we can probe the entire evolutionary history of the universe after the recombination epoch and perform a tomographic exploration for the cosmic history. I will discuss the role of 21-cm observations in fundamental physics research, particularly in the exploration of dark matter and dark energy. In the early universe (during the reionization epoch), the 21-cm forest can be employed to simultaneously measure the warm dark matter mass and the cosmic heating history. In the late universe (post-reionization era), intensity mapping surveys can be conducted to measure the equation of state of dark energy. I will also address the technical challenges and solutions in 21-cm cosmology, cosmological signal detection, China's experimental efforts and advancements, and the crucial role that future 21-cm intensity mapping will play in constructing precise cosmological probes of the late universe.

Primary author: Prof. ZHANG, Xin (Northeastern University)

Presenter: Prof. ZHANG, Xin (Northeastern University)

Session Classification: GW

Contribution ID: **62** Type: **Talk**

dark matter searches with PandaX experiment

Friday, June 2, 2023 9:20 AM (25 minutes)

PandaX experiment uses xenon as target to detect weak and rare physics signals, including dark matter and neutrinos. We are running a new generation detector with 4-ton xenon in the sensitive volume, PandaX-4T. The commissioning run data has pushed the constraints on WIMP-nucleon scattering cross section to a new level. In this talk, I will give an overview of PandaX-4T latest results on dark matter physics, with some novel channels to explore the physics capability of xenon detector. I will also briefly discuss the future prospects of PandaX.

Primary author: ZHOU, Ning (Shanghai Jiao Tong University)

Presenter: ZHOU, Ning (Shanghai Jiao Tong University)

Session Classification: DM

Contribution ID: **63** Type: **Talk**

Neutrino Physics with PandaX

Saturday, June 3, 2023 8:30 AM (25 minutes)

Large liquid xenon Time Projection Chambers (TPC) with multi-ton of active mass, such as PandaX-4T, are becoming a powerful tool for neutrino physics. The detector has 350 kg of Xe-136 and can be used to precisely measure the double beta decay spectrum and search for neutrinoless double beta decay (NLDBD). PandaX-4T also has a large amount of another NLDBD candidate isotope, Xe-134 for related searches. As a large, low-background, low-threshold detector, PandaX-4T can detect solar neutrinos, including those from pp chain and B-8 decays. We will present the detector performance at high energy and the physics potential to neutrino physics with PandaX.

Primary author: HAN, Ke (SJTU)

Presenter: HAN, Ke (SJTU)

Session Classification: Neutrino

Contribution ID: **65** Type: **Talk**

Vacuum stability limit from cosmological history

Saturday, June 3, 2023 8:55 AM (25 minutes)

The vacuum stability problem is usually studied assuming that at zero temperature the universe is in the electroweak-breaking vacuum. This may not be the case, however, as seen by checking the evolution history of the early universe in theories beyond the Standard Model. In such models the transition to the electroweak-breaking vacuum may not be possible and/or the universe may have evolved into a different vacuum state. Consequently, it is necessary to analyze the cosmological history to obtain the correct vacuum stability limit. We reveal that the above situations exist even in the simplest singlet extension of the Standard Model, propose a general procedure to identify them, and delineate the parameter space where this happens. We find that checking cosmological history can provide a more stringent and sometimes computationally cheaper limit of vacuum stability on new physics models than the traditional method.

Primary author: YANG, Jin Min (ITP, CAS, Beijing)

Presenter: YANG, Jin Min (ITP, CAS, Beijing)

Session Classification: Neutrino

Contribution ID: **66** Type: **Talk**

An inter-galactic magnetic field strength of ~4e-17 G inferred with GRB 221009A

Saturday, June 3, 2023 2:45 PM (25 minutes)

The delayed GeV–TeV cascade emission from extragalactic TeV–PeV sources are regarded as an ideal probe of the inter-galactic magnetic fields. Recently, LHAASO has detected ˜10 TeV emission of the extraordinary powerful GRB 221009A within ˜2000 s after the burst. Here we report the detection of a ˜400 GeV photon, without accompanying prominent low-energy emission, by Fermi-LAT in the direction of GRB 221009A with the time delay of 0.4 days. Such a hard spectrum can be generated from electromagnetic cascades initiated by early primary ˜10 TeV photons in the intergalactic space. An inter-galactic magnetic field strength of BIGMF~4e-17 G, comparable to limits from TeV blazars, can naturally account for the arrival time of the ˜400 GeV photon as well as the HAWC non-detection. Such a strength will be stringently tested by the upcoming CTA.

Primary author: YUAN, Qiang (Purple Mountain Observatory)

Presenter: YUAN, Qiang (Purple Mountain Observatory)

Session Classification: Astro

Contribution ID: **67** Type: **Poster**

The Higgs boson masses and Higgs decays in the B-LSSM with explicit CP violation

Friday, June 2, 2023 6:45 PM (5 minutes)

We calculate one-loop radiation corretions to the mass matrix of the neutral Higgs boson in the B-L Supersymmetric Standard Model (B-LSSM) with explicit CP violation. Within the effective potential methods,the masses of the neutral Higgs-boson are calculated at the one-loop level by taking into account the contributions of the following loops of ordinary particles and superparticles: the top quarks,the bottom quarks,the scalar top quarks and the scalar bottom quarks. At the same time,we also calculate the lightest Higgs decays $h^0 \to \gamma\gamma$,$h^0 \to f\bar{f}$,$h^0 \to VV^*$(V=W,Z),$h^0 \to gg$ in the B-L supersymmetric standard model (B-LSSM) with explicit CP violation.

Primary author: ZHANG, Wen-Hui (河北大学)

Co-authors: FENG, Tai-Fu; YANG, Jin-Lei; ZHANG, Hai-Bin

Presenter: ZHANG, Wen-Hui (河北大学)

Session Classification: Poster session and buffer dinner

Contribution ID: **68** Type: **Talk**

CP asymmetries in □ ⟶ □_□□□_□ decays

The τ lepton is the only known lepton massive enough to decay into hadrons. Besides serving as a clean laboratory for studying various low-energy aspects of the strong interactions, the hadronic τ decays may also allow us to explore CP-violating effects both within and beyond the SM. In this talk, I will discuss the CP asymmetries in $\tau \to K_S\pi\nu_\tau$ decays, which arise due to the CP violation in $K^0 - \bar{K}^0$ mixing within the SM. Within a generic effective field theory framework, I will then discuss the CP asymmetries induced by the beyond-the-SM four-fermion operators up to dimension-6. Interesting observations as well as the correlations among different observables will be presented. These studies are relevant to the Belle II experiment as well as the proposed Tera-Z and STCF facilities.

Primary author: Prof. LI, Xin-Qiang (Central China Normal Univerisy)

Presenter: Prof. LI, Xin-Qiang (Central China Normal Univerisy)

Session Classification: Flavor

Contribution ID: **69** Type: **Poster**

On the possibility of mixed axion/neutralino dark matter in specific SUSY DFSZ axion models

Friday, June 2, 2023 6:55 PM (5 minutes)

We introduce four supersymmetric (SUSY) axion models in which the strong CP problem and the μ problem are solved with the help of the Peccei-Quinn mechanism and the Kim-Nilles mechanism, respectively. The axion physics enriches the SUSY model by introducing axion as a dark matter candidate and, therefore, the lightest supersymmetric particle (LSP) could just be a part of the total dark matter. For this reason, axion relieves the tensions between SUSY models and numerous experimental measurements, such as the dark matter direct detection experiments and the precise measurements of anomalous magnetic moment of the muon a_μ. In the present paper, we consider the constraints from the latest a_μ data and the LZ-2022 bound on the relic density of higgsino-like LSP, and discuss the possibility that axion is the rest of dark matter.

Primary author: YANG, Zhong Jun

Presenter: YANG, Zhong Jun

Session Classification: Poster session and buffer dinner

Contribution ID: **70** Type: **Talk**

Perspective on the Emergence of Mass

Friday, June 2, 2023 11:45 AM (25 minutes)

Atomic nuclei lie at the core of everything we can see; and at the first level of approximation, their atomic weights are simply the sum of the masses of all the neutrons and protons (nucleons) they contain. Each nucleon has a mass mN ≈ 1 GeV, i.e. approximately 2000-times the electron mass. The Higgs boson - discovered at the large hadron collider in 2012 - produces the latter, but what generates the masses of the neutron and proton? This is a pivotal question. Modern theory suggests that the answer lies within quantum chromodynamics (QCD), the strong-interaction piece of the Standard Model. Yet, it is far from obvious. In fact, removing Higgs-boson couplings into QCD, one arrives at a scale invariant theory, which, classically, can't support any masses at all. This presentation will sketch forty years of developments in theory that suggest a solution to the puzzle and highlight an array of experiments that can validate the picture.

Primary author: ROBERTS, Craig

Presenter: ROBERTS, Craig

Session Classification: Flavor

Contribution ID: **71** Type: **Poster**

Two-loop corrections to b⟶sɣ in TNMSSM

Friday, June 2, 2023 6:50 PM (5 minutes)

The rare decay b⟶sɣ is important to research new physics beyond the standard model(SM).In this work, we investigate two loop electroweak
corrections to b⟶sɣ in the next to minimal supersymmetric extension of the SM with adding two triplets and one singlet(TNMSSM).In this framework,new particles and new definition of squarks can affect the theoretical predictions of the process, with respect to the MSSM. Considering the constraints from updated experimental data, the numerical results show that the TNMSSM can fit the experimental data for the branching ratios of b⟶sɣ.The results of the rare decays also further constrain the parameter space of the TNMSSM.

Primary author: 陈, 海翔

Presenter: 陈, 海翔

Session Classification: Poster session and buffer dinner

Contribution ID: **72** Type: **Poster**

Electronweak baryogensis and electron EDM in the lleft-right supersymmetric model

Friday, June 2, 2023 8:10 PM (5 minutes)

It would be natural to imagine that both the particle and antiparticle equally exist in the Universe. However, looking around our Universe, everything is made of the particle.No one knows why only the particle is left in the current Universe, which is one of the mysteries our Universe holds. Electroweak baryogenesis (EWB) and electric dipole moment (EDM) have close relation with the new physics beyond the standard model (SM), because the SM CP-violating (CPV) interactions are not sufficient to provide the baryon asymmetry of the universe by many orders of magnitude, and the theoretical predictions for the EDM of electron in the SM are too tiny to be detected in near future.

Primary author: 胡, 怀聪

Presenter: 胡, 怀聪

Session Classification: Poster session and buffer dinner

Contribution ID: **73** Type: **Talk**

Recent progress on neutrino astronomy and the TRIDENT project

Saturday, June 3, 2023 9:45 AM (25 minutes)

With IceCube's discovery of an extragalactic diffuse neutrino flux and first identification of compelling evidence for corresponding sources, TXS0506+056 and NGC 1068, neutrino astronomy is at the tipping point for major breakthroughs. In this talk, I will give a brief overview on the current status of the nascent field of high-energy neutrino astronomy and then discuss the progress on the newly proposed next-gen neutrino telescope to be built in South China Sea – the TRIDENT project.

Primary author: Prof. XU, Donglian (T D Lee Institute)

Presenter: Prof. XU, Donglian (T D Lee Institute)

Session Classification: Neutrino

Contribution ID: **74** Type: **Poster**

Light-cone distribution amplitudes of a light baryon in large-momentum effective theory

Friday, June 2, 2023 7:10 PM (5 minutes)

Momentum distributions of quarks/gluons inside a light baryon in a hard exclusive process are encoded in the light-cone distribution amplitudes (LCDAs). In this work, we point out that the leading twist LCDAs of a light baryon can be obtained through a simulation of a quasi-distribution amplitude calculable on lattice QCD within the framework of the large-momentum effective theory. We calculate the one-loop perturbative contributions to LCDA and quasi-distribution amplitudes and explicitly demonstrate the factorization of quasi-distribution amplitudes at the one-loop level. Based on the perturbative results, we derive the matching kernel in the MS scheme and regularization invariant momentum-subtraction scheme. Our result provides a first step to obtaining the LCDA from first principle lattice QCD calculations in the future.
Momentum distributions of quarks/gluons inside a light baryon in a hard exclusive process are encoded in the light-cone distribution amplitudes (LCDAs). In this work, we point out that the leading twist LCDAs of a light baryon can be obtained through a simulation of a quasi-distribution amplitude calculable on lattice QCD within the framework of the large-momentum effective theory. We calculate the one-loop perturbative contributions to LCDA and quasi-distribution amplitudes and explicitly demonstrate the factorization of quasi-distribution amplitudes at the one-loop level. Based on the perturbative results, we derive the matching kernel in the MSbar scheme and regularization invariant momentum-subtraction scheme. Our result provides a first step to obtaining the LCDA from first principle lattice QCD calculations in the future.

Primary authors: DENG, Zhifu; HAN, Chao; WANG, Wei; Dr ZENG, Jun (Shanghai Jiao Tong University); Mr ZHANG, Jia-Lu (Shanghai Jiao Tong University)

Presenter: Dr ZENG, Jun (Shanghai Jiao Tong University)

Session Classification: Poster session and buffer dinner

Contribution ID: **75** Type: **Poster**

Transverse-momentum-dependent wave functions and soft functions at one-loop in large momentum effective theory

Friday, June 2, 2023 7:05 PM (5 minutes)

In large-momentum effective theory (LaMET), the transverse-momentum dependent (TMD) light-front wave functions and soft functions can be extracted from the simulation of a four-quark form factor and equal-time correlation functions. In this work, using expansion by regions we provide a one-loop proof of TMD factorization of the form factor. For the one-loop validation, we also present a detailed calculation of O(α s) perturbative corrections to these quantities, in which we adopt a modern technique for the calculation of the TMD form factor based on the integration by part and differential equation. The one-loop hard functions are then extracted. Using lattice data from Lattice Parton Collaboration on quasi-TMDWFs, we estimate the effects from the one-loop matching kernel and find that the perturbative corrections depend on the operator to define the form factor, but are less sensitive to transverse separation. These results will be helpful in precisely extracting the soft functions and TMD wave functions from the first principle in the future.

Primary authors: DENG, Zhifu; Dr ZENG, Jun (Shanghai Jiao Tong University)

Presenter: DENG, Zhifu

Session Classification: Poster session and buffer dinner

Contribution ID: **76** Type: **Talk**

Symbol Letters of Feynman Integrals

Sunday, June 4, 2023 8:55 AM (25 minutes)

In this talk, I introduce some recent developement in the construction of symbol letters of Feynman integrals using Baikov representations and intersection theory.

Primary author: YANG, Lilin

Presenter: YANG, Lilin

Session Classification: Collider

Contribution ID: **77** Type: **Talk**

Extreme mass ratio inspirals

Sunday, June 4, 2023 1:30 PM (25 minutes)

Extreme mass ratio inspirals (EMRIs) are among the
most promising sources for space-based gravitational wave detectors. For EMRIs, the small compact object spends the last few years inspiralling deep inside the strong gravitational field around the massive BH with a highly relativistic speed. The emitted GWs from EMRI/IMRI encode rich information about the spacetime geometry around the MBH and the environment of the host galaxy, so they can be used to confirm whether the MBH is a Kerr BH predicated by GR. In this talk, I will talk about the probe of scalar and vector charges carried by the secondary BHs in EMRIs with space-based gravitational wave detector.

Primary author: GONG, Yungui (Huazhong University of Science and Technology)

Presenter: GONG, Yungui (Huazhong University of Science and Technology)

Session Classification: GW

Contribution ID: **79** Type: **Talk**

Explaining the CDF W-mass shift and (g-2)_\mu in a Zˆ\prime scenario and its implications for the b \to s \ellˆ+ \ellˆ- processes

Saturday, June 3, 2023 3:55 PM (25 minutes)

In the past few years, several indirect hints for New Physics beyond the SM arose in precision measurements, e.g., $(g-2)_\mu$ and the W-boson mass. In this work, we consider a model containing new vector-like Fermion partner gauged under a new $U(1)'$ symmetry. It is found that the latest CDF m_W measurement and $(g-2)_\mu$ can be simultaneously accommodated. We have also considered several other experimental constraints, including the neutrino trident production, $Z \to \mu\mu$ decay, dimuon resonance searches at the LHC, etc. Implications for the $b \to s\ell^+\ell^-$ process will be discussed. (This work is based on 2205.02205 and some recent developments.)

Primary author: Prof. 兴博, 袁 (Central China Normal University)

Presenter: Prof. 兴博, 袁 (Central China Normal University)

Session Classification: SM/BSM

Contribution ID: **80** Type: **Poster**

Forbidden Dark Matter Combusted Around Supermassive Black Hole

Friday, June 2, 2023 7:00 PM (5 minutes)

The forbidden dark matter cannot annihilate into a pair of heavier partners, either SM particles or its partners in the dark sector, at the late stage of cosmological evolution by definition. We point out the possibility of reactivating the forbidden annihilation channel around supermassive black holes. Being attracted towards a black hole, the forbidden dark matter is significantly accelerated to overcome the annihilation threshold. The subsequent decay of the annihilation products to photon leaves a unique signal around the black hole, which can serve as a smoking gun for the forbidden dark matter. For illustration, the Fermi-LAT data around Sgr A* provides a preliminary constraint on the thermally averaged cross section of the reactivated forbidden annihilation that is consistent with the DM relic density requirement.

Primary author: CHENG, Yu

Presenter: CHENG, Yu

Session Classification: Poster session and buffer dinner

Contribution ID: **81** Type: **Talk**

Dark matter constraints from the observations of synchrotron emission

Friday, June 2, 2023 4:45 PM (25 minutes)

Synchrotron related process has been widely used to explore the properties of the dark sector. In this talk, I will discuss two examples: constraining dark matter annihilation from the Event Horizon Telescope observations of M87 and from Planck observations of Galactic synchrotron foreground.

Primary author: DING, Ran

Presenter: DING, Ran

Session Classification: Cosmo

Contribution ID: **82** Type: **Talk**

QCD axion dark matter and the cosmic dipole problem

QCD axion dark matter and the cosmic dipole problem

Primary author: HAN, Chengcheng (Sun Yat-sen university)

Presenter: HAN, Chengcheng (Sun Yat-sen university)

Session Classification: Axion

Contribution ID: **83** Type: **Talk**

Status and Physics Prospects of JUNO experiment

Saturday, June 3, 2023 2:45 PM (25 minutes)

The Jiangmen Underground Neutrino Observatory (JUNO) is a 20 kton liquid scintillator detector currently being built in an underground laboratory in South China. The construction is expected to be completed by the end of 2023. JUNO will feature a remarkable energy resolution of 3% at 1 MeV, a large detector volume, and exceptional background control. With these advantages, JUNO will become a flagship experiment in the coming decades, primarily focused on determining the neutrino mass ordering, and precise measurements of the neutrino oscillation parameters using reactor antineutrinos. Additionally, JUNO's versatility as a multi-purpose neutrino observatory, positions it as a strong contender in the searches for diffuse supernova neutrino background (DSNB), the core-collapse supernova (CCSN) neutrinos, solar neutrino, atmospheric neutrinos, geo-neutrinos, nucleon rare decays and other new physics beyond the Standard Model. This presentation will provide an update on the status of the JUNO experiment and the latest evaluations of JUNO's physics goals.

Primary author: CHENG （程）, Jie （捷）(North China Electric Power University)

Presenter: CHENG （程）, Jie （捷）(North China Electric Power University)

Session Classification: Neutrino

Contribution ID: **84** Type: **Talk**

Recent updates of Higgs properties measurement in the ATLAS and CMS experiments

Sunday, June 4, 2023 8:30 AM (25 minutes)

The Standard Model of particle physics has proven incredibly successful at describing many features of nature that we observe in our experiments. The Brout-Englert-Higgs mechanism that took place in the early Universe, less than a picosecond after the Big Bang, led to the electromagnetic and the weak interactions becoming distinct in their actions. In the SM, this mechanism introduces a complex scalar field that permeates the entire Universe. Its quantum manifestation, the Higgs Boson, was observed by the ATLAS and CMS experiments at the Large Hadron Collider in 2012. 10 years after the Higgs Boson discovery, its properties have been measured at good precision. Higgs self-coupling strength, which has profound implications on the mechanism of the electroweak phase transition the universe underwent shortly after the Big Bang and on the ultimate fate of the universe itself, has also been determined via single Higgs plus di-Higgs combination. In this talk, I will present recent updates of Higgs properties measurement in the ATLAS and CMS experiments.

Primary author: LIU, Kun (TDLI/SPA, SJTU)

Presenter: LIU, Kun (TDLI/SPA, SJTU)

Session Classification: Collider

Contribution ID: **85** Type: **Poster**

Black Hole Hyperaccretion in Collapsars: GRB Timescale

Friday, June 2, 2023 7:15 PM (5 minutes)

Gamma-ray bursts (GRBs) are classified into long and short populations (i.e., LGRBs and SGRBs) based on the observed bimodal distribution of duration T90. Multimessenger observations indicate that most SGRBs and LGRBs should be powered by ultrarelativistic jets launched from black hole (BH) hyperaccretion in compact-object mergers and massive collapsars, respectively. However, the duration criterion sometimes cannot correctly reflect the physical origin of a particular GRB. In the collapsar scenario, a GRB can be observed when the jet breaks out from the envelope and circumstellar medium successfully. The observed GRB duration reflects only the time the engine operates after the jet breaks out. This work studies the propagation of jets driven by the neutrino annihilation or Blandford–Znajek mechanism in massive collapsars. The signatures of the progenitors producing LGRBs, SGRBs, and failed GRBs in the collapsar scenario are exhibited. The competition between the mass supply onto the BH hyperaccretion and jet propagation into the envelope is definitely dependent on the density profiles of the collapsars. We show that duration and isotropic energy of GRBs can help constrain the density profiles of collapsars. Finally, we propose that a collapsar-origin SGRB, GRB 200826A, might originate from a neutrino-annihilation-dominated jet launched by a ˜10 solar mass collapsar whose progenitor ' s envelope has been stripped.

Primary author: WEI, Yunfeng (Xiamen University)

Presenter: WEI, Yunfeng (Xiamen University)

Session Classification: Poster session and buffer dinner

Contribution ID: **86** Type: **Talk**

Anisotropies in the gravitational-wave background as a probe of ultralight boson dark matter

Saturday, June 3, 2023 4:45 PM (25 minutes)

Massive scalar field around a Kerr black hole can induce superradiant instabilities, resulting in the formation of a boson cloud around the black hole. Since rotating stellar-mass black holes are ubiquitous in every galaxy, the gravitational waves (GWs) emitted by their associated boson clouds together constitute a stochastic background on the sky, if cosmological dark matter consists of ultralight bosons. Here we study the anisotropy signal of this GW background (GWB). We demonstrate that the GWB anistropies trace large-scale dark matter fluctuations and thus serve as an indirect probe of ultralight boson dark matter.

Primary author: LI, Bohua (Guangxi University)

Presenter: LI, Bohua (Guangxi University)

Session Classification: Cosmo

Contribution ID: **87** Type: **Talk**

利用超导谐振腔测量超轻暗物质

Presenter: SHU, Jing

Session Classification: DM

Contribution ID: **90** Type: **Talk**

Flavor Physics at CEPC - A General Perspective

Friday, June 2, 2023 10:55 AM (25 minutes)

Pulsar timing arrays (PTAs) consisting of widely distributed and well-timed millisecond pulsars can serve as a galactic interferometer to detect gravitational waves. With the same data acquired for PTAs, we propose (https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.130.121401) to develop pulsar polarization arrays (PPAs), to explore astrophysics and fundamental physics. As in the case of PTAs, PPAs are best suited to reveal temporal and spatial correlations at large scales that are hard to mimic by local noises.

As one scientific case for the PPAs, we consider the detection of axion-like wave dark matter (WDM). Because of its tiny mass, the axion-like WDM can be generated as a Bose-Einstein condensate, characterized by a strong wave nature. It can also affect the polarization of pulsar light via its Chern-Simons coupling, yielding an effect of "birefringence", while the light travels across the halo. In this talk, the speaker will demonstrate the excellent capability of PPAs; and their complementarity with the PTAs in such a scientifically important task.

Presenter: Prof. LIU, Tao (HKUST)

Session Classification: Flavor

Contribution ID: **91** Type: **Talk**

Anisotropy of the dark matter flux and the related direct detection

Friday, June 2, 2023 8:30 AM (25 minutes)

Presenter: ZHOU, Yu-Feng

Session Classification: DM

Contribution ID: **92** Type: **Talk**

TBD

Presenter: Prof. LI, Haibo

Session Classification: Flavor

Contribution ID: **93** Type: **Talk**

U(1)_{Y'} universal seesaw

Saturday, June 3, 2023 9:20 AM (25 minutes)

Presenter: GU, Pei-Hong (Southeast University)

Session Classification: Neutrino

Contribution ID: **94** Type: **Talk**

Recent progress in muon electric and magnetic dipole moments

Friday, June 2, 2023 10:30 AM (25 minutes)

Presenter: Prof. KHAW, Kim Siang (TDLI/SJTU)

Session Classification: Flavor

Contribution ID: **95** Type: **Talk**

Revisiting Xi_Q–Xi_Qˆprime mixing in QCD sum rules

Friday, June 2, 2023 4:20 PM (25 minutes)

Presenter: Prof. ZHAO, Zhen-Xing

Session Classification: Flavor

Contribution ID: **99** Type: **Talk**

Dynamics of electroweak phase transitions and gravitational wave production from domain walls

Saturday, June 3, 2023 3:30 PM (25 minutes)

Presenter: JIANG, Yun

Session Classification: Cosmo

Contribution ID: **100** Type: **Talk**

Dark Photon search at SHINE facility

Sunday, June 4, 2023 9:20 AM (25 minutes)

Dark SHINE is a new initiative to search for Dark Photon invisible decays into light dark matter particles utilizing the high repetition rate single electron beam to be deployed at the SHINE facility. This talk will show the Dark SHINE project in general and moreover the related BSM searches for Dark Photon at selected experiments at the energy and intensity frontiers.

Presenter: LI, Shu (TDLI, SJTU)

Session Classification: Collider

Contribution ID: **101** Type: **Talk**

暗物质间接探测进展及中子星内部的夸克物质

Presenter: Prof. FAN, Yi-Zhong (Purple Mountain Observatory)

Session Classification: GW

Contribution ID: **102** Type: **Poster**

Inflation Correlators at Tree and Loop Levels

Friday, June 2, 2023 7:50 PM (5 minutes)

During cosmic inflation, massive particles can be spontaneously produced due to quantum fluctuations, leaving imprints in the correlator of (nearly) massless inflaton fluctuations. Information about physics at the inflation scale is then encoded in such inflation correlators and is hopefully recovered by future cosmic observations. However, our understanding of inflation correlators is very limited compared to their Minkowskian counterparts, namely the scattering amplitudes in flat spacetime. In recent years, several methods are developed for the analytic calculations of inflation correlators, including the partial Mellin-Barnes representation and a modified version of cosmological bootstrap. For tree-level processes, full results of 4pt correlators are derived. We also obtain new closed-form results for 3pt and 2pt correlators via bootstrap equations. At the loop level, we derived a factorization theorem and a cutting rule using the partial Mellin-Barnes representation. With the factorization theorem, we calculate the nonlocal signals (nonanalytic parts) of typical 1-loop processes.

Primary author: QIN, Zhehan (Tsinghua University)

Presenter: QIN, Zhehan (Tsinghua University)

Session Classification: Poster session and buffer dinner

Contribution ID: **103** Type: **Talk**

GKZ hypergeometric systems of the three-loop vacuum Feynman integrals

Presenter: ZHANG, Hai-Bin (Hebei University)

Contribution ID: **104** Type: **Poster**

Searching for high-frequency axion in quantum electromagnetodynamics through interface haloscopes

Friday, June 2, 2023 7:55 PM (5 minutes)

The so-called Witten effect implies a close relationship between axion and magnetic monopole. A sound quantization in the presence of magnetic monopoles, called quantum electromagnetodynamics (QEMD), was utilized to construct a more generic axion-photon Lagrangian in the low-energy axion effective field theory. This generic axion-photon Lagrangian introduces the interactions between axion and two four-potentials, and leads to new axion-modified Maxwell equations. The interface haloscopes place an interface between two electromagnetic media with different properties and are desirable to search for high-mass axions $m_a \geq \mathcal{O}(10)$ μeV. In this work, for the generic axion-photon couplings built under QEMD, we perform comprehensive calculations of the axion-induced propagating waves and energy flux densities in different interface setups. We also obtain the sensitivity to new axion-photon couplings for high-mass axions.

Primary authors: LI, TONG (Nankai University); 代, 昌杰 (Nankai University); ZHANG, RUIJIA (Nankai University)

Presenter: 代, 昌杰 (Nankai University)

Session Classification: Poster session and buffer dinner

Contribution ID: **105** Type: **Talk**

New physics in s->d semileptonic transitions: rare hyperon vs. kaon decays

Presenter: Dr RUIXIANG, Shi (Beihang University)

Session Classification: Flavor

Contribution ID: **106** Type: **Talk**

New physics in s->d semileptonic transitions: rare hyperon vs. kaon decays

Friday, June 2, 2023 4:45 PM (25 minutes)

Rare semi-leptonic decays of kaon and hyperon play an important role in testing the standard model of particle physics and searching for new physics. Based on the recent progresses from BESIII, NA48/2 and LHCb Collaboration, in this work we studied two kinds of semi-leptonic decays of kaon and hyperon, which are characterized as $s \to d\nu\bar{\nu}$ and $s \to d\mu^+\mu^-$ transitions at the quark level. We have applied the low-energy effective Hamiltonian approach to calculate the branching ratios and angular observables of relevant decay channels and used the isospin symmetry and chiral perturbation theory to address the non-perturbative contributions. By analyzing advantages and disadvantages of two types of semi-leptonic kaon and hyperon decays for constraint on new physics, we found that the anticipated BESIII data of the hyperon decays can better constrain the effect of new physics compared to kaon decays of the same kind. However, the conclusion will change when considering the effect of renormalization group evolution. It indicates that the loop effects from renormalization group evolution are important in this context, when relating the low-energy effective field theory to new physics models in the UV.

Primary authors: Prof. 耿, 立升 (北京航空航天大学); Prof. MARTIN CAMALICH, Jorge (La Laguna University); Dr 史, 瑞祥 (北京航空航天大学)

Presenter: Dr 史, 瑞祥 (北京航空航天大学)

Session Classification: Flavor

Contribution ID: **107** Type: **Talk**

Probing Mirror Twin Higgs with Present and Future Weak Lensing Surveys

Friday, June 2, 2023 2:45 PM (25 minutes)

We explore the potential of precision cosmological data to study non-minimal dark sectors by updating the cosmological constraint on the mirror twin Higgs model (MTH). The MTH model addresses the Higgs little hierarchy problem by introducing dark sector particles. In the early Universe, the mirror baryon and mirror radiation behave as dark matter and dark radiation, and their presence modifies the Universe's expansion history. Additionally, the scattering between mirror baryon and photon generates the dark acoustic oscillation process, suppressing the matter power spectrum from the cosmic shear measurement. We demonstrate how current weak lensing data constrain these corrections to the ΛCDM cosmology and find that for a viable solution to the little hierarchy problem, the proportion of MTH dark matter cannot exceed about 30% of the total dark matter density, unless the temperature of twin photon is less than 30% of that of the standard model photon. While the MTH model is presently not a superior solution to the observed H_0 tension compared to the ΛCDM+$\Delta N_{\rm eff}$ model, we demonstrate that it has the potential to alleviate both the H_0 and S_8 tensions, especially if the S_8 tension persists in the future and approaches the result reported by the Planck˜SZ˜(2013) analysis. In this case, the MTH model can relax the tensions while satisfying the DES power spectrum constraint up to $k < 10\ h{\rm Mpc}^{-1}$. If the MTH model is indeed accountable for the S_8 and H_0 tensions, we show that the future China Space Station Telescope (CSST) can determine the twin baryon abundance with a 10% level precision.

Primary authors: ZU, Lei (Purple Mountain Observatory); 张, 弛 (中国科学院紫金山天文台); TSAI, Yue-Lin Sming (Purple Mountain Observatory); Prof. FAN, Yi-Zhong (Purple Mountain Observatory)

Presenter: TSAI, Yue-Lin Sming (Purple Mountain Observatory)

Session Classification: DM

Contribution ID: **108** Type: **Talk**

Status and prospects of CDEX

Friday, June 2, 2023 8:55 AM (25 minutes)

The China Dark Matter Experiment (CDEX) pursues direct searches of light dark matter particles and neutrinoless double beta decay at the China Jinping Underground Laboratory (CJPL), which is the deepest operating laboratory for astroparticle research.
The CDEX employs germanium semi-conductor detector which has low energy threshold and excellent energy resolution. We report the latest novel physics results from CDEX-1 and CDEX-10 and describe the physics goals, progress and key technologies of the ongoing CDEX-50m and CDEX-300u programs, which are aimed at the dark matter search and neutrinoless double beta decay, respectively.

Primary author: Mr LIU, Shukui (Sichuan University)

Presenter: Mr LIU, Shukui (Sichuan University)

Session Classification: DM

Contribution ID: **109** Type: **Poster**

The Higgs decay in the B-L SSM

In the past decades the Standard Model(SM), have got tremendous success. But there are still questions beyond the SM. Such as the Dark matter, muon g-2, the mass of the neutrinos etc. Thus we automatically think that there is a model beyond the SM will resolve these problems. The minimal super symmetry model has been talked a lot. In this work I will investigate some questions using the B-L SSM instead of the MSSM.

The B-LSSM is a expanding of the SUSY Models, where B stands for the baryon number While the L is the Lepton number. I will talk about this model in detail in the first section.The Low energy theorem is discussed in the next section. and we also use the pinch technique to compute the vertex contributions. The box diagram contribution is ignorged cause in the one loop order the box contributions is zero.

Primary author: 洁, 李

Presenter: 洁, 李

Session Classification: Registration

Contribution ID: **110** Type: **Poster**

Dark Matter Freeze-out via Catalyzed Annihilation

Friday, June 2, 2023 8:15 PM (5 minutes)

We present a new paradigm of dark matter freeze-out, where the annihilation of dark matter particles is catalyzed. We discuss in detail the regime that the depletion of dark matter proceeds via $2\chi \to 2A'$ and $3A' \to 2\chi$ processes, in which χ and A' denote dark matter and the catalyst respectively. In this regime, the number density of dark matter decreases in power-law before freeze-out, rather than an exponential decrease due to Boltzmann suppression, as is the case with classical WIMPs and SIMPs. The paradigm applies for a secluded weakly interacting dark sector with a dark matter in the $\mathrm{MeV} - \mathrm{TeV}$ mass range. It is consistent with constraints from both the Cosmic Microwave Background (CMB) and Big Bang Nucleosynthesis (BBN), and it predicts enhanced signals for indirect detection.

Primary author: XING, Chuan-Yang

Presenter: XING, Chuan-Yang

Session Classification: Poster session and buffer dinner

Contribution ID: **111** Type: **Poster**

Scalarization by matter effect around black hole mimickers

Friday, June 2, 2023 8:20 PM (5 minutes)

Various theories predict the existence of light scalar particles. When considering the finite temperature and density corrections to the scalar potential, scalar fields can be sourced by a variety of stellar objects and mediate additional long-range scalar forces. Since the scalar field is only sourced in certain environments, this provides a complementary way to probe the parameter space compared to the fifth force constraints. In this study, we investigate the possibility of sourcing a light scalar field from various stellar objects through finite temperature and density effects. Particularly, we consider horizonless ultracompact object, 2-2-holes, an interesting candidate of black hole mimickers. Their interiors feature trans-Planckian temperature and ultra-high density, providing an extreme environment for generating this phenomenon. For the simple scalar model considered, we find that the scalar charge of ordinary star is extremely small in the allowed parameter space, while it could be large for 2-2-hole for certain types of scalar models. The induced force and scalar radiation could be detected by gravitational wave observations of binaries formed by 2-2-holes.

Primary authors: LI (李), Ximeng (西蒙) (Institute of High Energy Physics); REN, Jing (Institute of High Energy Physics)

Presenter: LI (李), Ximeng (西蒙) (Institute of High Energy Physics)

Session Classification: Poster session and buffer dinner

Contribution ID: **112** Type: **Talk**

Precise Hyperon Physics at BESIII

Friday, June 2, 2023 5:10 PM (25 minutes)

With the large datasets on eˆ+ eˆ- annihilation at the J/ψ and ψ(3686) resonances collected at the BESIII experiment, multi-dimensional analyses making use of polarization and entanglement can shed new light on the production and decay properties hyperon-antihyperon pairs. In a series of recent studies performed at BESIII, significant transverse polarization of the (anti)hyperons has been observed in J/ψ and ψ(3686) to $\Lambda\bar{\Lambda}$,$\Sigma\bar{\Sigma}$,$\Xi\bar{\Xi}$ and $\Omega\bar{\Omega}$. The decay parameters for the most common hadronic weak decay modes were measured, and due to the non-zero polarization, the parameters of hyperon and antihyperon decays could be determined independently of each other for the first time. Comparing the hyperon and antihyperon decay parameters yields precise tests of direct, ΔS=1 CP-violation that complement studies performed in the kaon sector.

Presenter: ZHANG, Jianyu

Session Classification: Flavor

Contribution ID: **113** Type: **Talk**

LHAASO and the Observation of the Brightest GRB 221009A

Saturday, June 3, 2023 10:55 AM (25 minutes)

I’ ll briefly introduce the LHAASO as an gamma ray astronomical experiment and its historic detection of the brightest GRB 221009A since GRB was discovered 60 years ago. Enormous number of photons are collected during the burst of 2000 seconds by LHAASO water Cherenkov detector array. This allows us to measure the complete afterglow in high energy band, including it silent period, onset, growth and decay phases. Before it is fading away, LHAASO has recorded a sudden reduction in fluence that indicates a “jet break” . All the detailed measurements reveal many interesting features that have not been detected before in the GRB investigation history.

Presenter: CAO, Zhen

Session Classification: Astro

Contribution ID: **114** Type: **Poster**

A global analysis for determined and undetermined hadronic two body weak decays of anti-triplet charmed baryons

Friday, June 2, 2023 8:00 PM (5 minutes)

Presenter: 黄, 飞 (SJTU)

Session Classification: Poster session and buffer dinner

Contribution ID: **115** Type: **Poster**

Ξc-Ξ′cmixingFromLatticeQCD

Friday, June 2, 2023 8:05 PM (5 minutes)

Presenter: 刘, 航 (sjtu)

Session Classification: Poster session and buffer dinner

Contribution ID: **116** Type: **Poster**

Probing “pure” Right-Handed Sleptons at colliders

Friday, June 2, 2023 6:05 PM (5 minutes)

Presenter: ZHANG, Wenxing

Session Classification: Poster session and buffer dinner

Contribution ID: **117** Type: **Talk**

LHAASO and the Observation of the Brightest GRB 221009A

I’ ll briefly introduce the LHAASO as an gamma ray astronomical experiment and its historic detection of the brightest GRB 221009A since GRB was discovered 60 years ago. Enormous number of photons are collected during the burst of 2000 seconds by LHAASO water Cherenkov detector array. This allows us to measure the complete afterglow in high energy band, including it silent period, onset, growth and decay phases. Before it is fading away, LHAASO has recorded a sudden reduction in fluence that indicates a “jet break” . All the detailed measurements reveal many interesting features that have not been detected before in the GRB investigation history.

Primary author: CAO, Zhen

Presenter: CAO, Zhen

Contribution ID: **118** Type: **Poster**

Type-II seesaw triplet scalar effects on neutrino trident scattering

Friday, June 2, 2023 8:25 PM (5 minutes)

Presenter: LI, Ming-Wei (Tsung-Dao Lee Institute)

Session Classification: Poster session and buffer dinner