□□□□□□□□□□□□ - The Fifth Workshop on Frontiers of Particle Physics

Report of Contributions

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

Indirect search for new physics at LHCb

Sunday, 14 April 2024 08:30 (25)

In this talk, I will review indirect searches for new physics at LHCb.

Primary author(s) : HE, Jibo (University of Chinese Academy of Sciences)

Presenter(s) : HE, Jibo (University of Chinese Academy of Sciences)

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

Helicity amplitudes without gauge cancellation for electroweak processes

Sunday, 14 April 2024 14:25 (25)

Multiple EW vector boson amplitudes are known to have bad energy behavior for individual Feynman diagrams, which causes many problems for numerical and theoretical analysis. Based on Goldstone equivalence theorem(GET), we introduce a new representation of Feynman rules that makes GET manifest, while reproduces the exact results of the amplitudes. The new helicity has no subtle gauge cancellation, every diagram has a specific physical interpretation, when the pole approaches on-shell. We implement this new Feynman rules into numerical codes of HELAS (Helicity Amplitude Subroutines) and study several process with the new HELAS.

Primary author(s) : CHEN, Junmou (Jinan University); HAGIWARA, Kaoru; KANZAKI, Junichi; MAWATARI, Kentarou

Presenter(s) : CHEN, Junmou (Jinan University)

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

Higgs properties and new physics beyond the SM

Monday, 15 April 2024 16:00 (25)

The discovery of the Higgs boson at the Large Hadron Collider (LHC) has opened a new era in particle physics. Precise measurements of the properties of the Higgs boson are crucial for addressing several fundamental questions
in the field. These include understanding the mechanism behind electroweak symmetry breaking, unraveling the origin of particle masses, and exploring potential sources of CP violation that could explain the matter-antimatter asymmetry in the universe, and so on. In this talk, I will provide an overview of the recent advancements in Higgs physics, both within the framework of the Standard Model (SM) and beyond. By examining the latest research, we will gain insights into the properties and behavior of the Higgs boson,
shedding light on the fundamental workings of the universe.

Primary author(s) : Prof. YAN, Bin (IHEP)

Presenter(s) : Prof. YAN, Bin (IHEP)

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

Possible Dark Matter Signals from White Dwarfs

Monday, 15 April 2024 10:30 (25)

In our galaxy, the white dwarfs (WDs) will inevitably capture the dark matter (DM) particles streaming through them, if there exist interactions between DM particles and nuclei/electrons. At the same time, these DM particles can also be evaporated by the nuclei/electrons in a WD if they have proper mass and the WD is not too cold. The evaporation of DM particles will lead to a faster cooling evolution than that predicted by the stellar evolution theory.
In this work, we ascribe the faster cooling evolution of three observed WDs to the capture and evaporation of DM particles, and get the possible DM particle's mass and DM-electron cross section.
The results are beyond the detection capabilities of current direct detection experiments and should be cross checked by more novel scenarios in the future.

Primary author(s) : NIU, Jia-Shu (Shanxi University)

Co-author(s) : Dr XUE, Hui-Fang (Taiyuan Normal University)

Presenter(s) : NIU, Jia-Shu (Shanxi University)

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

Recent progress of Dark SHINE R&D

Monday, 15 April 2024 15:15 (25)

Dark SHINE is a newly proposed fixed-target experiment at SHINE (Shanghai high repetition rate XFEL and extreme light facility, being the 1st hard X-ray FEL in China) under construction targeting completion in 2026. Dark SHINE aims to search for the new mediator, Dark Photon, bridging the Dark sector and the ordinary matter. In this work and presentation, we present the idea of this new project and 1st prospective study in search for Dark Photon decaying into light dark matter. It also provides the opportunity to incorporate broader scope of BSM search ideas such as ALP, utilizing the fixed-target experiment of this type.

Primary author(s) : Dr SUN, Tong (TDLI, SJTU)

Presenter(s) : Dr SUN, Tong (TDLI, SJTU)

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

Recent Dark Matter combination summary from ATLAS

Saturday, 13 April 2024 14:50 (25)

Ref: https://arxiv.org/abs/2306.00641

Results from a wide range of searches targeting different experimental signatures with and without missing transverse momentum (E_T^{miss}) are used to constrain a Two-Higgs-Doublet Model (2HDM) with an additional pseudo-scalar mediating the interaction between ordinary and dark matter (2HDM+a). The analyses use up to 139 fb^{-1} of proton-proton collision data at a centre-of-mass energy $\sqrt{s}$ = 13 TeV recorded with the ATLAS detector at the Large Hadron Collider between 2015-2018. The results from three of the most sensitive searches are combined statistically. These searches target signatures with large EmissT and a leptonically decaying Z boson; large E_T^{miss} and a Higgs boson decaying to bottom quarks; and production of charged Higgs bosons in final states with top and bottom quarks, respectively. Constraints are derived for several common as well as new benchmark scenarios within the 2HDM+a.

Primary author(s) : Dr VU, Ngoc Khanh (Tsung-Dao Lee Institute, Shanghai Jiao Tong University)

Presenter(s) : Dr VU, Ngoc Khanh (Tsung-Dao Lee Institute, Shanghai Jiao Tong University)

Session Classification : Parallel session II

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

[illegible]Z/Z'[illegible]

Sunday, 14 April 2024 16:50 (25)

[illegible]Z'[illegible]Z'[illegible]Z[illegible]Z'[illegible]Z[illegible]Z'[illegible]Z[illegible]
Z[illegible]Z'[illegible]CEPC[illegible]

Primary author(s) : TANG, Yi-Lei ([illegible])

Presenter(s) : TANG, Yi-Lei ([illegible])

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

Probing Ultralight Dark Matter with Laser Interferometers in Space

Sunday, 14 April 2024 10:55 (25)

Ultralight bosonic fields (ULBFs) are predicted by various theories beyond the standard model of particle physics and are viable candidates of cold dark matter. There have been increasing interests to search for the ULBFs in physical and astronomical experiments. In this paper, we investigate the sensitivity of several planned space-based gravitational-wave interferometers to ultralight scalar and vector fields. Using time-delay interferometry (TDI) to suppress the overwhelming laser frequency noise, we derive the averaged transfer functions of different TDI combinations to scalar and vector fields, and estimate the impacts of bosonic field's velocities. We obtain the sensitivity curves for LISA, Taiji and TianQin, and explore their projected constraints on the couplings between ULBFs and standard model particles, illustrating with the ULBFs as dark matter.

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

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

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

When scalar-induced gravitational waves meet pulsar timing arrays

Saturday, 13 April 2024 14:25 (25)

The recently released data by pulsar timing array collaborations present strong evidence for a stochastic signal consistent with a gravitational-wave background. In this talk, I will discuss some implications for scalar-induced gravitational waves with pulsar timing arrays.

Primary author(s) : Dr LIU, lang (Beijing Normal University)

Presenter(s) : Dr LIU, lang (Beijing Normal University)

Session Classification : Parallel session I

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

Evaluating Feynman integrals by hypergeometric function method

Sunday, 14 April 2024 14:00 (25)

We evaluate Feynman integrals by hypergeometric function method.

Primary author(s) : Prof. ZHANG, Hai-Bin (Hebei University)

Co-author(s) : Prof. FENG, Tai-Fu

Presenter(s) : Prof. ZHANG, Hai-Bin (Hebei University)

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

Electroweak corrections to double Higgs production at the LHC

Sunday, 14 April 2024 15:15 (25)

We present the results for the complete next-to-leading order electroweak corrections to pp → HH at the Large Hadron Collider, focusing on the dominant gluon-gluon fusion process. While the corrections at the total cross-section level are approximately −4%, those near the energy of HH production threshold exceed +15%, and corrections at the high-energy region are around −10%, leading to a shape distortion for the differential distributions. Our findings substantially diminish the theoretical uncertainties associated with this pivotal process, providing valuable input for understanding the shape of the Higgs boson potential upon comparison with experimental measurements.

Primary author(s) : BI, Huan-Yu; HUANG, Li-Hong; HUANG, Rui-Jun; MA, Yan-Qing; YU, Huai-Min

Presenter(s) : BI, Huan-Yu

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

α generalized no-scale inflation

Monday, 15 April 2024 11:20 (25)

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Primary author(s) : WU, Lina (Xi'an Technological University)

Co-author(s) : LI, Tianjun (Institute of Theoretical Physics, Chinese Academy of Sciences)

Presenter(s) : WU, Lina (Xi'an Technological University)

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

[illegible]

Saturday, 13 April 2024 11:20 (25)

[illegible]

Primary author(s) : GUO, Huaike (University of Chinese Academy of Sciences)

Presenter(s) : GUO, Huaike (University of Chinese Academy of Sciences)

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

Complementary LHC searches for UV resonances of 0νββ decay operators

Saturday, 13 April 2024 14:00 (25)

ΔL = 2 lepton number violation at the TeV scale connects $0\nu\beta\beta$ decay (intensity frontier), LHC searches (energy frontier), and leptogenesis (cosmic frontier). I will focus on some progress on the promising UV completions of $0\nu\beta\beta$ decay operators, which can be diagnosed with complementary searches at the HL-LHC and HE-LHC.

Primary author(s) : Mr □, □ (□□□□)

Co-author(s) : □, □ (□□□□); □, □□ (□□□□□□□□□□□□□)

Presenter(s) : Mr □, □ (□□□□)

Session Classification : Parallel session II

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

Primordial black holes and non-Gaussianity in the gravitational-wave era

Saturday, 13 April 2024 10:55 (25)

[illegible]

Primary author(s) : Prof. WANG [illegible], Sai [illegible] (IHEP-CAS)

Presenter(s) : Prof. WANG [illegible], Sai [illegible] (IHEP-CAS)

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

Axions in electromagnetodynamics and their detection

Saturday, 13 April 2024 15:15 (25)

The Witten effect implies the electromagnetic interactions between axions and magnetic monopoles. Based on the quantum electromagnetodynamics, a generic low-energy axion-photon effective field theory was built by introducing two four-potentials (A^μ and B^μ) to describe a photon. More anomalous axion-photon interactions and couplings (g_{aAA}, g_{aBB} and g_{aAB}) arise in contrary to the ordinary axion coupling $g_{a\gamma\gamma}aF^{\mu\nu}\tilde{F}_{\mu\nu}$. As a consequence, the conventional axion Maxwell equations are further modified.

In this talk, I mainly discuss the theoretical framework of axion electromagnetodynamics. I will also show two axion searching strategies in the framework of QEMD, and give the corresponding sensitivity of couplings in different axion mass region.

Primary author(s) : Dr LI, Tong (Nankai University); ZHANG, Rui-jia (Nankai University); DAI, Chang-jie (Nankai University)

Presenter(s) : ZHANG, Rui-jia (Nankai University)

Session Classification : Parallel session I

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

Primordial black hole formation in slow phase transitions

Saturday, 13 April 2024 11:45 (25)

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Primary author(s) : XIE (□), Ke-Pan (□□) (Beihang University)

Presenter(s) : XIE (□), Ke-Pan (□□) (Beihang University)

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

Bubble-free first-order phase transitions

Monday, 15 April 2024 14:00 (25)

Traditionally a cosmic first-order phase transition proceeds by nucleating handful of bubbles through quantum tunneling. However, the presence of domain walls during the transition may greatly enrich the way phase transitions are completed. In this talk we develop the bubble-free mechanism, which constitutes a competing means of accomplishing the phase transition where bubble nucleation is inefficient or absolutely prohibited.

Primary author(s) : JIANG, Yun (Sun Yat-sen University); WEI, dongdong (□□□□)

Presenter(s) : JIANG, Yun (Sun Yat-sen University)

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

[illegible]

Monday, 15 April 2024 14:25 (25)

[illegible]Dimensional Reduction[illegible]SMEFT[illegible]Dimensional Reduction[illegible] Reduction[illegible]sphaleron energy[illegible] Reduction[illegible]

Primary author(s) : [illegible], [illegible] ([illegible])

Presenter(s) : [illegible], [illegible] ([illegible])

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

Non-thermal leptogenesis from inflaton decay

Monday, 15 April 2024 14:50 (25)

There is growing evidence that the early Universe experienced inflationary expansion, yet no consensus has been drawn on the details. Meanwhile, neutrino physics is entering a precision era, making more information on masses and mixings available. We consider a neutrino path to the early Universe confronting the situation above. With right-handed neutrinos (RHNs) coupling to the inflaton, the baryon-antibaryon asymmetry may connect to inflationary observables, leading to a testable framework for particle physics and cosmology. We investigate non-thermal leptogenesis from inflaton decays in the type-I seesaw model, where a complex scalar is introduced to generate the Majorana mass of the RHNs. We find four characteristic limits with working conditions to identify them and show the combined parameter space.

Primary author(s) : Prof. ZHANG, Xinyi (Hebei University)

Presenter(s) : Prof. ZHANG, Xinyi (Hebei University)

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

[redacted]

Sunday, 14 April 2024 16:25 (25)

TBD

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

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

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

Bootstrapping the Chiral Anomaly at Large Nc

Sunday, 14 April 2024 16:00 (25)

TBD

Primary author(s) : Prof. MA, Teng (UCAS)

Presenter(s) : Prof. MA, Teng (UCAS)

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

The new physics implication for the recent Belle II observation of B^+ ⟶ K^+ $\nu\bar{\nu}$

Monday, 15 April 2024 09:45 (25)

no.

Primary author(s) : MA, Xiao-Dong (scnu)

Presenter(s) : MA, Xiao-Dong (scnu)

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

Higgs and beyond at the CMS experiment

Saturday, 13 April 2024 09:35 (25)

TBD

Primary author(s) : Prof. SUN, Xiaohu

Presenter(s) : Prof. SUN, Xiaohu

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

phase transition catalyzed by primordial black hole

Saturday, 13 April 2024 15:15 (25)

We investigate the first-order phase transition catalyzed by primordial black holes~(PBHs) in the early Universe. We find that super-horizon curvature perturbations generated in this scenario lead to the production of gravitational waves when the scalar modes re-enter the horizon. If PBHs with masses about $10^{-13}M_{\odot}$ constitute all dark matter, the first-order electroweak phase transition catalyzed by PBHs can explain the gravitational wave signal observed by pulsar timing array collaborations without the overproduction of PBHs.

Primary author(s) : Mr ZHENMIN, Zeng (ITP-CAS); Prof. ZONGKUAN, Guo (ITP-CAS)

Presenter(s) : Mr ZHENMIN, Zeng (ITP-CAS)

Session Classification : Parallel session II

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

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Sunday, 14 April 2024 10:30 (25)

TBD

Primary author(s) : Prof. LI, Zuhao (IHEP)

Presenter(s) : Prof. LI, Zuhao (IHEP)

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

Macroscopic States as Dark Matter Candidates

Saturday, 13 April 2024 14:25 (25)

Despite that weakly interacting massive particles are still very well-motivated dark matter candidates, the null-results of direct detection experiments are hints and encouragements that we may need to think of other dark matter paradigms. In this talk, I will discuss the possibility that dark matter consists completely or partially of macroscopic states. It turns out that macroscopic dark matter candidates can arise in many different theories, either fermionic or bosonic. They can be produced in the early universe through a cosmic phase transition, and later evolution may change their masses, sizes and abundance. Given that macroscopic dark matters occupy a very different parameter space from that of particle dark matters, they are in general indifferent to direct detection. While on the other hand, this also enables these large objects to provide unique and interesting signatures for phenomenological studies.

Primary author(s) : LU, Sida (HKUST)

Presenter(s) : LU, Sida (HKUST)

Session Classification : Parallel session II

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

Search for dark matter with XENONnT

Monday, 15 April 2024 10:55 (25)

The XENONnT experiment, located in Laboratori Nazionali del Gran Sasso (LNGS), is a direct detection experiment designed to search for Weakly Interacting Massive Particles (WIMPs) using a dual-phase time projection chamber with 8.5 tonnes of xenon. The experiment began collecting science data in 2021 and is currently in operation. In its first science run (SR0), the experiment achieved an electronic recoil background of 15.8 events/(tonne-year-keV) below 30 keVee, establishing a new benchmark as the lowest background recorded in a dark matter detector. This achievement was made possible by reducing the amounts of radioactive Kr-85 and Rn-222 to an unprecedented low level. With the SR0 data, XENONnT has excluded new physics interpretations of the XENON1T excess and released the first WIMP search results. In this talk, I will present the first two results from XENONnT and the experiment's outlook.

Primary author(s) : Prof. YE, Jingqiang (The Chinese University of Hong Kong, Shenzhen)

Presenter(s) : Prof. YE, Jingqiang (The Chinese University of Hong Kong, Shenzhen)

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

Family tree decomposition of cosmological correlators

Saturday, 13 April 2024 10:30 (25)

The correlation functions of large-scale fluctuations are crucial observables in modern cosmology. There have been considerable efforts in the analytical study of cosmological correlators in recent years. In this talk, I will introduce the basic structure of cosmological correlators and several analytical methods we recently proposed for computing them. In particular, I will describe the family tree decomposition of arbitrary nested time integrals. With this method, we largely solve the problem of analytical computation of massive tree amplitudes in dS and conformal scalar tree amplitudes in a power-law FRW universe.

Primary author(s) : Prof. ZHONG-ZHI, Xianyu (Tsinghua University)

Presenter(s) : Prof. ZHONG-ZHI, Xianyu (Tsinghua University)

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

Axion-pion scattering at finite temperature in chiral perturbation theory and its influence in axion thermalization

Saturday, 13 April 2024 14:50 (25)

Axion-pion scattering amplitudes at finite temperatures are calculated within SU(2) chiral perturbation theory up to one loop level. Unitarization procedure is implemented to these amplitudes in order to extend the applicable range of energy and temperature. The influence of the thermal axion-pion scattering amplitudes on the $a\pi \to \pi\pi$ cross sections and the axion thermalization rate is investigated, with the emphasis on the comparison with the zero-temperature-amplitude case. A brief discussion on the cosmological implication of the axion thermalization rate, that is calculated by using the $a\pi \to \pi\pi$ amplitudes at finite temperatures, is also given. The thermal corrections to the axion-pion scattering amplitudes can cause around a 10% shift of the determination of the axion decay constant f_a and its mass m_a, comparing with the results by using the $a\pi \to \pi\pi$ amplitudes at zero temperature.

Primary author(s) : □, □□ (□□□□□); GUO, Zhi-Hui; Dr ZHOU, Hai-Qing (Southeast University, NanJing)

Presenter(s) : □, □□ (□□□□□)

Session Classification : Parallel session I

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

[redacted]

Sunday, 14 April 2024 14:50 (25)

[redacted]

Primary author(s) : Prof. LONG-BIN, Chen

Presenter(s) : Prof. LONG-BIN, Chen

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

[redacted]

Sunday, 14 April 2024 09:45 (25)

TBD

Primary author(s) : Prof. WANG, Xiaoping

Presenter(s) : Prof. WANG, Xiaoping

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

Explaining the CDF W-mass shift and (g-2) mu in a Z prime scenario and its implications for the b to s llprocesses

Monday, 15 April 2024 09:20 (25)

TBD

Primary author(s) : YUAN, Xing-Bo (Central China Normal University)

Presenter(s) : YUAN, Xing-Bo (Central China Normal University)

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

X-ray polarimetric features of Gamma-ray Bursts across varied redshifts and hints for Axion-Like-Particles

Monday, 15 April 2024 08:30 (25)

The study of polarimetric features during the prompt phase of Gamma-ray Bursts (GRBs) has been essential for elucidating the debated emission mechanisms and gaining insight into the inner structure of GRBs. However, the potential impact of photon-Axion-Like-Particles (ALPs) mixing in extragalactic magnetic fields, leading to significant modifications in the initial polarization, has been overlooked in discussions concerning prompt phase constraints. In this article, we first examine the statistical characteristics of linear polarization degree (Π_L) in GRBs, utilizing data from updated polarimetric missions focusing on sub-MeV emissions. Our analysis, conducted with a restricted sample of GRBs spanning various redshifts, reveals a diverse distribution of Π_L, which currently shows no correlation with spectral parameters or properties of candidate host galaxies. Furthermore, we explore alternations to the initial Π_L due to photon-ALP mixing within a domain-like structure of the intergalactic magnetic field ($\mathbf{B}_{\rm IGM}$), considering various parameter sets associated with ALPs and $\mathbf{B}_{\rm IGM}$. With the existence of ALPs with mass m_a $lesssim$ 10^{-14} eV and photon-ALP coupling constant $g_{a\gamma}\simeq 0.5 \times 10^{-11}$ GeV^{-1}, we show that for GRBs with redshifts above approximately 1, fully linearly polarized photons may experience a polarization reduction of up to 20%, whereas for unpolarized photons, the mixing can increase polarization by up to ~40%. To ensure that the effect of mixing is small enough to be negligible, there is a strong constraint on the mixing term $\Delta_{a\gamma}$ should be less than $1.5 \times 10^{-4}{\rm Mpc}^{-1}$. Currently, the number of GRBs with both sub-MeV polarization measurements and redshift confirmation remains very limited. Harf of the GRBs with available polarization data have a Π_L of less than 30\%. Certification of redshift for this subset of GRBs would aid in further constraining the parameter space of low-mass ALPs or providing an independent means to determine the upper limit on $\mathbf{B}_{\rm IGM}$

Primary author(s) : Dr HUANG, Feng (Xiamen University)

Presenter(s) : Dr HUANG, Feng (Xiamen University)

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

Matter Asymmetry Genesis in the Z_N-companion Dark Matter Models

Monday, 15 April 2024 08:55 (25)

Ref.~\cite{Guo:2021rre} proposes a class of $Z_{N\geq 3}$-symmetric WIMP dark matter characterized by the semi-annihilation into the companion of dark matter, evading the stringent direct detection constraint. In this work, we point out that such kind of models naturally provides the three Sakharov elements necessary for dark matter asymmetry, and moreover this asymmetry can be transferred to the visible sector with a proper link to the leptonic or quark sector. In our minimal Z_3 example, the migration to the leptonic sector is via the asymmetric companion decay into neutrinos, and the lepton asymmetry can be further transferred to the quark sector for heavy dark matter (
$gtrsim$3TeV). In particular, the CP violation parameter in our model is suppressed in the limit of static annihilation of dark matter, and we, for the first time, study the lift from thermal motion. We make a preliminary numerical analysis based on the Boltzmann equations, to find that both correct relic density of dark matter and baryon asymmetry can be accommodated.

Primary author(s) : KANG, Zhaofeng

Presenter(s) : KANG, Zhaofeng

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

Analysis of the top-quark pair production via the e^+e^- annihilation near the threshold region using the Principle of Maximum Conformality

Monday, 15 April 2024 11:45 (25)

We present an improved analysis of the top-quark pair production via the process $e^+e^- \to \gamma^* \to t\bar{t}$ near the threshold region up to next-to-next-to-next-to-leading order (N^{3}LO) QCD corrections. Near the threshold region, the top-quark velocity v tends to zero, leading to Coulomb singularity. To achieve a reasonable prediction in the threshold region, we reconstruct the analytical expression for the Coulomb-terms up to N^{3}LO accuracy by using the PSLQ lgorithm, whose numerical values agree well with the previous N^{3}LO-level calculations. It is found that the N^{3}LO series still has sizable renormalization scale dependence, and to improve the precision of the series, we apply the Principle of Maximum Conformality to eliminate such scale dependence. After that, the Coulomb part is resummed into a Sommerfeld-Gamow-Sakharov factor, which finally leads to a much more reasonable behavior near the threshold region.

Primary author(s) : YAN, Jiang (Chongqing University)

Co-author(s) : Prof. WU, Xing-Gang (Chongqing University); Mr ZHOU, Hua (Southwest University of Science and Technology); Mr WU, Zhi-Fei (Chongqing University); Dr SHAN, Jing-Hao (Chongqing University)

Presenter(s) : YAN, Jiang (Chongqing University)

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

Consequences of phase transitions happened during inflation

Saturday, 13 April 2024 08:45 (25)

TBD

Primary author(s) : AN, Haipeng (Tsinghua University)

Presenter(s) : AN, Haipeng (Tsinghua University)

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

Axion Bose-Einstein Condensate

Sunday, 14 April 2024 11:20 (25)

Axions, or in general axion-like particles, are popular dark matter candidates. They could form Bose-Einstein condensate in our universe. In this talk, I will discuss two different types of condensates: axion stars and black-hole superradiantaxion clouds. These condensates could emit radio-frequency photons as well as gravitational waves. The unique signatures of these signals will also be discussed.

Primary author(s) : Prof. ZHANG, Hong

Presenter(s) : Prof. ZHANG, Hong

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

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Saturday, 13 April 2024 08:20 (25)

TBD

Primary author(s) : BI, Xiaojun (IHEP)

Presenter(s) : BI, Xiaojun (IHEP)

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

Neutrino Mass Measurement with Cosmic Gravitational Focusing

Sunday, 14 April 2024 09:20 (25)

We thoroughly explore the cosmic gravitational focusing of cosmic neutrino fluid (CvF) by dark matter (DM) halo using both general relativity for a point source of gravitational potential and Boltzmann equations for continuous overdensities. Derived in the most general way for both relativistic and non-relativistic neutrinos, our results show that the effect has fourth power dependence on the neutrino mass and temperature. With nonlinear mass dependence which is different from the cosmic microwave background (CMB) and large scale structure (LSS) observations, the cosmic gravitational focusing can provide an independent cosmological way of measuring the neutrino mass and ordering. We take DESI as an example to illustrate that the projected sensitivity as well as its synergy with existing terrestrial neutrino oscillation experiments and other cosmological observations can significantly improve the neutrino mass measurement.

Primary author(s) : GE (□), Shao-Feng (□□) (Tsung-Dao Lee Institute (TDLI), Shanghai Jiao Tong University (SJTU))

Presenter(s) : GE (□), Shao-Feng (□□) (Tsung-Dao Lee Institute (TDLI), Shanghai Jiao Tong University (SJTU))

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

Neutrino Mass Sum Rules from Modular A4 Symmetry

Sunday, 14 April 2024 11:45 (25)

Modular symmetries offer a dynamic approach to understanding the flavour structure of leptonic mixing. Using the modular A4 flavour symmetry integrated in a type-II seesaw, we propose a simple and minimalistic model that restricts the neutrino oscillation parameter space and, most importantly, introduces a sum rule in the physical neutrino masses. When combined with the mass squared differences observed in neutrino oscillations, this sum rule determines the absolute neutrino mass scale. This has significant implications for cosmology, neutrinoless double beta decay experiments and direct neutrino mass measurements. In particular, the model predicts $\sum_i m_i \approx 0.1$ eV for both normal and inverted ordering, and thus can be fully probed by the current generation of cosmological probes in the upcoming years.

Primary author(s) : Prof. POPOV, Oleg

Presenter(s) : Prof. POPOV, Oleg

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

Highlights of Recent Physics Results from the ATLAS experiment

Saturday, 13 April 2024 09:10 (25)

This talk will present some of interesting physics results recently acheived by the ATLAS experiment. The focus will be on measurements of Standard Model processes and Higgs properties, but examples of new physics searches will be covered as well. Methodologies and possible future directions will also be discussed.

Primary author(s) : Prof. WU, Yusheng

Presenter(s) : Prof. WU, Yusheng

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

Novel methods for analytic Feynman integral computation based on algebraic geometry

Saturday, 13 April 2024 14:00 (25)

Feynman integrals are key objects in quantum field theory. They are crucial for the perturbative evaluation of scattering amplitudes, which leads to observables in high-energy experiments. Recently, multi-loop Feynman integral computation has become a popular field. It corresponds to high-precision predictions for experiments. Thus, they are very important for higher-order validation of the Standard Model (SM) and in the search for clues to new physics beyond the SM. Nowadays, multi-loop Feynman integral evaluation is facing challenges brought by its heavy computation. These challenges prevent us from evaluating the Feynman integrals necessary for high-precision experimental processes. In this talk, I will introduce some efforts that we have made to face these challenges. I will demonstrate that some new mathematical tools, like algebraic geometry, are very helpful in developing new algorithms, which, in a great manner, decrease the computation expense for some bottleneck steps in Feynman integral computations. I will also show the latest development of new packages based on these algorithms.

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