Bright ideas for a dark universe

Report of Contributions

https://indico.desy.de/e/26540

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

Tau-sleptons - a key role in dark matter coannihilations?

Thursday, 23 September 2021 10:05 (15 minutes)

We investigated stau-antistau annihilation into heavy quarks in the phenomenological MSSM within the DM@NLO collaboration. This SUSY-QCD precision calculation, enhanced by a QED Sommerfeld resummation, turned out to have several interesting applications: Claiming the lightest neutralino to be a main dark matter constituent, there are promising, non-excluded SUSY scenarios that demand higher-order corrections of stau-coannihilations when computing the relic density. On the other hand, also in gravitino dark matter physics we show the important role of the staus, whose NLO corrections are inevitable for reliable predictions.
Moreover, we illustrate the often neglected dependence of the cross section on renormalisation scheme and scale. Our variations aim to show how strongly the prediction of the dark matter relic density is affected by such theoretical uncertainties, which can be cured by taking higher-order corrections into account.

Summary

The talk aims to illustrate the important role of stau (co-)annihilation for both neutralino and gravitino dark matter physics, especially taking theoretical uncertainties of renormalisation schemes and scales at different orders into account.

Primary author: Mr BRANAHL, Johannes (WWU Münster)

Co-author: Prof. KLASEN, Michael (WWU Münster)

Presenter: Mr BRANAHL, Johannes (WWU Münster)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

(Rel-)axion fragmentation

Tuesday, 21 September 2021 09:50 (15 minutes)

I will discuss the growth of quantum fluctuations of an axion field rolling down a potential with multiple minima. This effect is particularly relevant for the relaxion mechanism, in which provides an alternarive stopping mechanism, thus modifying the relevant parameter space. I will present new lattice results, and discuss some cosmological aspects.

Summary

Primary author: MORGANTE, Enrico (JGU Mainz)

Presenter: MORGANTE, Enrico (JGU Mainz)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

IceCube constraints on the scotogenic model

Tuesday, 21 September 2021 11:15 (15 minutes)

In radiative seesaw models such as the famous scotogenic model, neutrino masses are generated through loop contributions involving dark matter (DM) particles. We study the capture of these DM candidates in the Sun as well as their subsequent annihilation into SM neutrinos and compute the expected event rates at IceCube in its 86-string configuration. In particular, in the scotogenic model the two scalar components have a naturally small mass splitting, so that also inelastic scattering mediated by Z-bosons must be taken into account. Using a random scan, we find that for mass splittings below 500 keV the event rates reach 10 to 10^6 events per year and can thus be tested in a dedicated IceCube analysis. Direct detection is found to be less sensitive in the inelastic scenario due to the limited DM velocity on Earth. Depending on time, other models and constraints will also be discussed.

Summary

Do you wish to attend the workshop on-site?

Primary author: DE BOER, Thede

Co-authors: KLASEN, Michael (WWU Münster); KAPPES, Alexander (University Münster); BUSSE, Raffaela; ZEINSTRA, Sybrand

Presenter: DE BOER, Thede

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Reshuffled SIMP Dark Matter

Wednesday, 22 September 2021 14:45 (15 minutes)

In this talk, we reanalyze the multi-component strongly interacting massive particle (mSIMP) scenario using an effective operator approach. As in the single-component SIMP case, the total relic abundance of mSIMP dark matter (DM) is determined by the coupling strengths of $3 \to 2$ processes achieved by a five-point effective operator. Intriguingly, we find that there is an unavoidable $2 \to 2$ process induced by the corresponding five-point interaction in the dark sector, which would reshuffle the mass densities of SIMP DM after the chemical freeze-out. We dub this DM scenario as reshuffled SIMP (rSIMP). Given this observation, we then numerically solve the coupled Boltzmann equations including the $3 \to 2$ and $2 \to 2$ processes to get the correct yields of rSIMP DM. It turns out that the masses of rSIMP DM must be nearly degenerate for them to contribute sizable abundances. On the other hand, we also introduce effective operators to bridge the dark sector and visible sector via a vector portal coupling. Since the signal strength of detecting DM is proportional to the individual densities, thereby, obtaining the right amount of DM particles is crucial in the rSIMP scenario. The cosmological and theoretical constraints for rSIMP models are discussed as well.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: Dr LU, Chih-Ting (Korea Institute for Advanced Study); KO, Pyungwon (Korea Inst for Advanced Study (KIAS)); HO, Shu-Yu (Korea Institute for Advanced Study)

Presenter: HO, Shu-Yu (Korea Institute for Advanced Study)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Holography, 1-Form Symmetries, and Confinement

Tuesday, 21 September 2021 10:15 (15 minutes)

I will discuss confinement in 4d $\mathcal{N} = \infty$ $SU(N)$ Super-Yang Mills from a holographic point of view, focusing on the 1-form symmetry and its relation to chiral symmetry breaking. We will see how to identify the topological couplings that determine the 1-form symmetry and its 't Hooft anomalies from the 5d supergravity dual, obtained by truncation of the Klebanov-Strassler solution. One such coupling is a mixed 0-/1-form symmetry anomaly closely related to chiral symmetry breaking in gapped confining vacua. Finally, we will derive the IR 4d topological field theory, which realises chiral symmetry breaking and matches the mixed anomaly, from the dual gravity description.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: VAN BEEST, Marieke (University of Oxford); APRUZZI, Fabio (University of Oxford); SCHAFER-NAMEKI, Sakura (University of Oxford); S. W. GOULD, Dewi (University of Oxford)

Presenter: VAN BEEST, Marieke (University of Oxford)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Localization and protected subsectors

Wednesday, 22 September 2021 17:45 (15 minutes)

In general it is extremely difficult to obtain exact non-perturbative information about the operator product expansion (OPE) of a given CFT. In this quest protected sectors play an incredibly important role as in some cases they allow us to obtain the full answer for a subset of the operators in the theory. Important examples of this phenomenon occur in 4d $\mathcal{N} = 2$ and 6d $\mathcal{N} = (2, 0)$ SCFT in which the correlation functions for a subset of operators are governed by a chiral algebra. In this talk I will focus on the 6d case and show how this chiral algebra can be obtained through localization. This approach allows us to extend our computations to CFTs in different backgrounds beyond flat space.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: BOMANS, Pieter (University of Padova); Prof. BOBEV, Nikolay (KU Leuven); Dr GAUTASON, Fridrik (University of Iceland)

Presenter: BOMANS, Pieter (University of Padova)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

The FL bound and its implications

Wednesday, 22 September 2021 14:00 (20 minutes)

The Festina Lente (FL) bound arises from demanding that very large charged black holes in universes with a positive cosmological constant must decay without becoming singular. The FL bound states that the mass of all charged states is bounded from below by a scale set by the vacuum energy.
In this talk, I will first review the argument for the FL bound from charged black hole decay. I will discuss some of the pheno applications of the FL bound such as to the electroweak hierarchy problem and to Higgs physics. I will discuss the FL bound in a string theory context and go over what it implies for string compactifications with a positive cosmological constant generally and antibrane uplifts specifically.

Based on 1910.01648 and 2106.07650 .

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: VENKEN, Gerben (ITP Heidelberg)

Presenter: VENKEN, Gerben (ITP Heidelberg)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Long-lived particles and portal EFTs

Thursday, 23 September 2021 11:15 (20 minutes)

Long-lived particles appear in the Standard Model (SM) and are a common feature of its hidden sector extensions.
The accelerator phenomenology of such models is dominated by the often long-lived messenger fields, as they interact directly with the SM.
Portal effective field theories, extend the usual effective theories of the SM to include generic interactions with messenger fields to arbitrary hidden sectors.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: HAJER, Jan (UCLouvain)

Presenter: HAJER, Jan (UCLouvain)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Islands in Multiverse Models

Wednesday, 22 September 2021 16:15 (15 minutes)

We consider multiverse models in two-dimensional linear dilaton-gravity theories as toy models of false vacuum eternal inflation. Coupling conformal matter we calculate the Von Neumann entropy of subregions. When these are sufficiently large we find that an island develops covering most of the rest of the multiverse, leading to a Page-like transition. This resonates with a description of multiverse models in semiclassical quantum cosmology, where a measure for local predictions is given by saddle point geometries which coarse-grain over any structure associated with eternal inflation beyond one's patch.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: AGUILAR GUTIERREZ, Sergio Ernesto (KU Leuven); Prof. HERTOG, Thomas (KU Leuven); Dr CHATWIN-DAVIES, Aidan (U. of British Columbia; KU Leuven); Dr PINZANI-FOKEEVA, Natalia (MIT; Florence U); Dr ROBINSON, Brandon (KU Leuven)

Presenter: AGUILAR GUTIERREZ, Sergio Ernesto (KU Leuven)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Supernova bounds on axion-like particles coupled with nucleons and electrons

Wednesday, 22 September 2021 14:15 (15 minutes)

We investigate the potential of type II supernovae (SNe) to constrain axion-like particles (ALPs) coupled simultaneously to nucleons and electrons. ALPs coupled to nucleons can be efficiently produced in the SN core via nucleon-nucleon bremsstrahlung and, for a wide range of parameters, leave the SN unhindered, producing a large ALP flux.
For masses exceeding 1 MeV, these ALPs would decay into electron-positron pairs, generating a positron flux. In the case of Galactic SNe, the annihilation of the created positrons with the electrons present in the Galaxy would contribute to the 511 keV annihilation line. Using the SPI (SPectrometer on INTEGRAL) observation of this line, allows us to exclude a wide range of the axion-electron coupling, $10^{-19} < g_{ae} < 10^{-11}$, for $g_{ap} \sim 10^{-9}$. Additionally, ALPs from extra-galactic SNe decaying into electron-positron pairs would yield a contribution to the cosmic X-ray background. In this case, we constrain the ALP-electron coupling down to $g_{ae} \sim 10^{-20}$.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: LUCENTE, Giuseppe (University of Bari, INFN Bari); CARENZA, Pierluca (Università degli Studi di Bari); CALORE, Francesca (CNRS, LAPTh); Prof. GIANNOTTI, Maurizio (Barry University); Prof. JOERG, Jaeckel (Institut fur theoretische Physik, Universitat Heidelberg); MIRIZZI, Alessandro (University of Bari)

Presenter: LUCENTE, Giuseppe (University of Bari, INFN Bari)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

S-folds : global issues and symmetry breaking

Thursday, 23 September 2021 10:15 (15 minutes)

Non-geometric solutions of type IIB supergravity - called S-folds - have recently attracted a lot of attention. They are of particular interest as they can easily be seen as solutions of 4D and 5D gauged maximal supergravity. Moreover, they are conjectured to be the holographic dual of certain localized interfaces in SYM_4.
In this talk we will review such solutions and focus on their symmetry breaking pattern by exactly marginal deformations. Using Exceptional Field Theory this will reveal a surprising behavior as apparently non-compact deformations in 4D are realized as periodic deformations of the 10D uplift. We will characterize the monodromy-induced patterns of symmetry breaking as classified by the mapping torus $T_h(S^5)$.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: STERCKX, Colin (Université Libre de Bruxelles)

Presenter: STERCKX, Colin (Université Libre de Bruxelles)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Three-Body Effective Potential in General Relativity at 2PM and Resulting PN Contributions

Thursday, 23 September 2021 09:15 (20 minutes)

In this talk, I will talk about the Post-Newtonian expansion of the gravitational three-body effective potential at the 2nd Post-Minkowskian order. At order 2PM a formal result is given in terms of a differential operator acting on the maximal generalized cut of the one-loop triangle integral. We perform the PN expansion unambiguously at the level of the integrand. Finding agreement with the 2PN three-body potential after integration, we explicitly present new G^2 v^4-contributions at order 3PN and outline the generalization to G^2 v^{2n}. The integrals that represent the essential input for these results respect a non-local Yangian symmetry and are obtained by applying the recent bootstrapping method directly to their ε-expansion around three dimensions. The coordinate space Yangian generator that we employ to obtain these integrals can be understood as a special conformal symmetry in a dual momentum space. If time permits, I will also talk about our work in progress on finding such integrals of generic half-integer propagator powers.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: WANG, Tianheng (Humboldt-Universität zu Berlin)

Co-authors: Prof. PLEFKA, Jan (Humboldt-Universität zu Berlin); Dr LOEBBERT, Florian (Humboldt-Universität zu Berlin); Mr SHI, Canxin (Humboldt-Universität zu Berlin)

Presenter: WANG, Tianheng (Humboldt-Universität zu Berlin)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Primordial black holes in an early matter-dominated era and stochastic inflation

Wednesday, 22 September 2021 16:30 (15 minutes)

We consider the possibility that the majority of dark matter in our Universe consists of black holes of primordial origin. We examine the effects of stochastic inflation and an early matter-dominated era on the abundance of these black holes. We show that the power spectrum of comoving curvature perturbations computed in stochastic inflation matches the result obtained by solving the Mukhanov-Sasaki equation at the linear level, even in the presence of an ultra-slow-roll phase. We also find a significant reduction in the required tuning of the parameters of the inflationary potential in the matter-dominated scenario, in contrast to the standard case of formation during radiation domination. We show that the stochastic background of primordial gravitational waves resulting from this mechanism could be detected by future space-based observatories.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: REY, Julian (IFT-UAM)

Presenter: REY, Julian (IFT-UAM)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Small Field Polynomial Inflation

Wednesday, 22 September 2021 16:45 (15 minutes)

In this talk, we will present a renormalizable polynomial inflation model, focusing on the small field scenario. We show that the CMB data can be fitted perfectly with a perturbated inflection-point. In particular, the running of the spectral index is predicted to be $\alpha \simeq -1.43 \times 10^{-3}$, which could be tested by next generation CMB experiment. We also analyze reheating through perturbative inflaton decays to either fermionic or bosonic final states via a trilinear coupling. We obtain a full parameter space by considering BBN constraint on reheating temperature and radiative stability of the inflaton potential. We find that the inflationary scale within the parameter space can be as low as $H_{\rm inf} \sim 1$ MeV, or as high as $\sim 10^{10}$ GeV. Similarly, the reheating temperature can lie between its lower bound of ~ 4 MeV and about 4×10^8 (10^{11}) GeV for fermionic (bosonic) inflaton decays. Our model is renormalizable and very simple, and can thus serve as the inflationary sector of some well motivated BSM scenarios.

Do you wish to attend the workshop on-site?

no

Summary

A simple and renormalizable inflation model will be presented which is very predictive and can fit the CMB data perfectly.

Primary authors: Prof. DREES, Manuel (University of Bonn); XU, Yong (Bethe Center for Theoretical Physics, Universität Bonn)

Presenter: XU, Yong (Bethe Center for Theoretical Physics, Universität Bonn)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Supersymmetric Alignment Models for muon g-2

Wednesday, 22 September 2021 17:15 (15 minutes)

Hierarchical masses of quarks and leptons are addressed by imposing horizontal symmetries. In supersymmetric Standard Models, the same symmetries play a role in suppressing flavor violating processes induced by supersymmetric particles. Combining the idea of spontaneous CP violation to control contributions to electric dipole moments (EDMs), the mass scale of supersymmetric particles can be lowered. We present supersymmetric models with U(1) horizontal symmetries and discuss CP and flavor constraints. Models with two U(1) symmetries are found to give a viable solution to the muon g−2 anomaly. Interestingly, the parameter space to explain the anomaly will be probed by future electron EDM experiments.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: SUZUKI, Motoo (ICRR, The University of Tokyo); Prof. NAKAI, Yuichiro (SJYU&TDLI); Prof. REECE, Matthew (Harvard U.)

Presenter: SUZUKI, Motoo (ICRR, The University of Tokyo)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

The Third Way to Interacting p-form Theories

Thursday, 23 September 2021 10:30 (15 minutes)

In three spacetime dimensions certain gravitational and gauge theories are 'third way' consistent. This means that their equations of motion are only on-shell consistent and do not come from the variation of an action which contains the dynamical field alone. Although this mechanism is not special to 3d, no higher dimensional third way consistent theory was known. In this talk, I will introduce the third way by presenting the 3d theories and show how we recover them by shifting a flat gauge connection. Applying the same method in higher dimensions, we find a new class of interacting $(d-2)$-form theories and I will discuss various generalisations of them. Our result proves that the third way can be realised in dimensions higher than three, and I will conclude by discussing the possibility of constructing new third way consistent theories of gravity.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: BROCCOLI, Matteo (AEI Potsdam); DEGER, Sadik; THEISEN, Stefan (AEI)

Presenter: BROCCOLI, Matteo (AEI Potsdam)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Production of Thermal Axions in the Early Universe

Tuesday, 21 September 2021 10:20 (15 minutes)

We study the thermal production of axions over different scales especially around the QCD and electroweak phase transitions in the early universe. We focus on the most motivated axion models (KSVZ and DFSZ) and investigate how the thermal history can influence on the production rate of hot axion as dark radiation. This can lead to predictions for the future measurements of the cosmic microwave background by experiments like CMB-S4.

Do you wish to attend the workshop on-site?

yes

Summary

Based on arXiv:2108.04259 and arXiv:2108.05371

Primary author: Dr HAJKARIM, Fazlollah (University of Padova, INFN)

Co-authors: Prof. D'ERAMO, Francesco (University of Padova, INFN); Dr YUN, Seokhoon (University of Padova, INFN)

Presenter: Dr HAJKARIM, Fazlollah (University of Padova, INFN)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Cosmic Birefringence Triggered by Dark Matter Domination

Wednesday, 22 September 2021 14:30 (15 minutes)

Recently, the Planck 2018 polarization data of cosmic microwave background (CMB) radiation suggested the non-zero rotation angle of CMB polarization plane $\beta = 0.35 \pm 0.14\mathrm{deg}$, which is called cosmic birefringence. Cosmic birefringence is predicted if an axion-like particle (ALP) moves after the recombination. We show that this naturally happens if the ALP is coupled to the dark matter density because it then acquires a large effective mass after the matter-radiation equality. Our scenario applies to a broad range of the ALP mass, even smaller than the present Hubble constant. We give a simple model to realize this scenario where dark matter is made of hidden monopoles which give the ALP such a large effective mass through the Witten effect. The mechanism works if the ALP decay constant is of order the GUT scale without a fine-tuning of the initial misalignment angle.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: NAKAGAWA, Shota (Tohoku University); Prof. TAKAHASHI, Fuminobu (Tohoku University); YAMADA, Masaki (Tohoku University)

Presenter: NAKAGAWA, Shota (Tohoku University)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Calculation of the solar axion flux and the KSVZ axion model landscape

Tuesday, 21 September 2021 11:00 (15 minutes)

The calculation of the solar axion flux has recently generated much attention, and it has been realised that axions can be powerful tools for studying solar metal abundances and magnetic fields.

The feasibility of such studies depends on our ability to accurately predict the solar axion flux. In this talk, I will present an overview of solar models and opacity codes and summarise the statistical and systematic uncertainties of the solar axion flux calculation from Primakoff, ABC, and plasmon interactions. I will discuss how previous calculations can be improved further e.g. by including electron degeneracy effects.

As a direct application, IAXO's ability to distinguish KSVZ axion benchmark models its prospects to tackle the solar abundance problem will be discussed. I will also comment on the broader landscape of KSVZ models and our recent efforts to catalogue them.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: HOOF, Sebastian (Georg-August-Universität Göttingen)

Co-authors: JAECKEL, Joerg (ITP Heidelberg); THORMAEHLEN, Lennert (Institute for Theoretical Physics Heidelberg); Mr PLAKKOT, Vaisakh (Georg-August-Universität Göttingen)

Presenter: HOOF, Sebastian (Georg-August-Universität Göttingen)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

High-redshift cosmology with intensity mapping

Thursday, 23 September 2021 11:35 (15 minutes)

Intensity Mapping (IM) of line emission targets the Universe from present time up to redshifts beyond ten when the Universe reionized and the first galaxies formed, from small to largest scales. Similar to CMB measurements, the power spectra of intensity fluctuations inform about the underlying cosmology; imagine the information encoded in thousands of intensity maps at different redshifts and for multiple emission lines, forming full tomographic lightcones. In this talk I review IM as a test for cosmology and fundamental physics during cosmic dawn and the epoch of reionization. I show how power and cross-power spectra as well as global temperature measurements probe our cosmology, properties of dark matter and of astrophysical sources. The measurement of deviations from the gravitational constant G and a possible dark matter –dark energy coupling are highlighted in general modified gravity scenarios. The ability of upcoming instruments like the SKA to constrain these modifications is demonstrated. If time permits, going beyond 'traditional' summary statistics, I furthermore show how neural networks are able to directly infer e.g. dark matter and astrophysical properties from such tomographic line fluctuation lightcones without an underlying Gaussian assumption.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: HENEKA, Caroline Samantha (not set)

Presenter: HENEKA, Caroline Samantha (not set)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

A tale of two horizons and two cutoffs

Thursday, 23 September 2021 11:15 (20 minutes)

Based on reasonable assumptions, we propose a new expression for Lloyd's bound, which confines the complexity growth of charged black holes. We then compute the holographic complexity for charged black branes in the presence of a finite cutoff using complexity = action proposal. We argue that a behind-the-horizon cutoff is inevitable. Using the proposed Lloyd's bound, we find a relation between the ultraviolet and the behind-the-horizon cutoffs. This relation is found to be consistent with the factorization of the partition function at leading order in large N. We argue that the result may be thought of as a holographic realization of strong cosmic censorship.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: BANERJEE, Souvik (University of Würzburg)

Co-authors: ALISHAHIHA, Mohsen; KAMES-KING, Joshua; LOOS, Emma

Presenter: BANERJEE, Souvik (University of Würzburg)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

CP violating phases in the strong interaction

Wednesday, 22 September 2021 14:35 (15 minutes)

We derive correlation functions for massive fermions with a complex mass in the presence of a general vacuum angle. For this purpose, we first build the Green's functions in the one-instanton background and then sum over the configurations of background instantons. The quantization of topological sectors follows for saddle points of finite Euclidean action in an infinite spacetime volume and the fluctuations about these. For the resulting correlation functions, we therefore take the infinite-volume limit before summing over topological sectors. In contrast to the opposite order of limits, the chiral phases from the mass terms and from the instanton effects come out to be aligned.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: CRUZ, Juan S. (Technical University Munich); TAMARIT, Carlos (Technische Universität München); Prof. GARBRECHT, Björn (TUM); Dr AI, Wen-yuan (Université catholique de Louvain)

Presenter: CRUZ, Juan S. (Technical University Munich)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Standard Model EFTs and On-Shell Techniques

Friday, 24 September 2021 10:15 (15 minutes)

I will review the Standard Model Effective Field Theories (SMEFT) from purely on-shell arguments. Starting from few basics assumptions such as Poincaré invariance and locality, it is possible to classify all the renormalizable and non-renormalizable interactions at the lowest order in the couplings. From these building blocks, locality and unitarity enforce Lie algebra structures to appear in the S-matrix elements together with relations among couplings (and hypercharges). Furthermore, on-shell techniques allowed us to compute any higher-point amplitude (or form factor) in generic EFTs. Finally, using known amplitudes techniques I will show the computation of the mixing matrix of SMEFT marginal interactions up to mass dimension 8, to linear order in the effective interactions.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: DE ANGELIS, Stefano (Queen Mary University of London); ACCETTULLI HUBER, Manuel (Queen Mary University of London)

Presenter: DE ANGELIS, Stefano (Queen Mary University of London)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Gravitational wave echo of relaxion trapping

Tuesday, 21 September 2021 10:05 (15 minutes)

To solve the hierarchy problem, the relaxion must remain trapped in the correct minimum, even if the electroweak symmetry is restored after reheating. In this scenario, the relaxion starts rolling again until the backreaction potential, with its set of local minima, reappears. Depending on the time of barrier reappearance, Hubble friction alone may be insufficient to retrap the relaxion in a large portion of the parameter space. Thus, an additional source of friction is required, which might be provided by coupling to a dark photon. The dark photon experiences a tachyonic instability as the relaxion rolls, which slows down the relaxion by backreacting to its motion, and efficiently creates anisotropies in the dark photon energy-momentum tensor, sourcing gravitational waves. We calculate the spectrum of the resulting gravitational wave background from this new mechanism, and evaluate its observability by current and future experiments. We further investigate the possibility that the coherently oscillating relaxion constitutes dark matter and present the corresponding constraints from gravitational waves.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: BANERJEE, Abhishek (Weizmann Institute of Science); Dr MADGE, Eric (Weizmann Institute of Science); Prof. PEREZ, Gilad (Weizmann Institute of Science); RATZINGER, Wolfram (Johannes Gutenberg University Mainz); Prof. SCHWALLER, Pedro (University of Mainz)

Presenter: Dr MADGE, Eric (Weizmann Institute of Science)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

SuperWimp Baryogenesis in MSSM

Tuesday, 21 September 2021 12:00 (15 minutes)

In this work, we have studied the production of baryon asymmetry and gravitino dark matter in contemporary times from the decay of the same source. In accomplishing a physical model to study these phenomenologies we have considered R-parity violating SUSY and the decay of Bino like neutralino which generates the baryon asymmetry and DM. In continuation of the previous work, we have added here the up squark contribution in addition to the down squark contribution in the present work. Moreover, we have also considered mixing cases among down or up squarks or in both the sectors with the most general complex mixing matrix having complex phases as well. Due to the presence of the complex phases in the mixing matrices besides bino and gluino phases, it can generate more asymmetry than the previous work. We have shown that we can lower the Bino and consequently the Gluino mass which can be accessed at the current collider setup at LHC. In addition to collider detection, we can access the model parameter space, which generates the correct value of the baryon asymmetry and DM abundance, in the near future at the neutron anti-neutron oscillation experiments by determining the oscillation time.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: Dr ARCADI, Giorgio (University of Rome 3); Prof. COVI, Laura (University of Goettingen); KHAN, Sarif (Goettingen University)

Presenter: KHAN, Sarif (Goettingen University)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Holographic defect correlators from (almost) thin air

Tuesday, 21 September 2021 09:35 (20 minutes)

The AdS/CFT duality provides a correspondence between correlation functions at weak coupling on the gravity side and at strong coupling for its field theory counterpart. However correlation functions are notably hard to compute in this regime, and I report on how modern analytical bootstrap methods can be used in order to derive defect two-point functions up to next-to-leading order, by using minimal input from supergravity. I will specifically show how to obtain the correlator of two chiral primary operators in the presence of a Wilson-line defect in $\mathcal{N} = 4$ SYM.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: BARRAT, Julien (Humboldt-Universität zu Berlin); GIMENEZ-GRAU, Aleix (DESY); LIENDO CORDOVA, Pedro (T (Stringtheory))

Presenter: BARRAT, Julien (Humboldt-Universität zu Berlin)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Dark Sector Spectroscopy at Neutrino Telescopes with Quantum-Gravitational Decoherence

Wednesday, 22 September 2021 17:30 (15 minutes)

We discuss the interplay of wave package decoherence and decoherence induced by quantum gravity via interactions with spacetime foam for high energy astrophysical neutrinos. In this context we point out a compelling consequence of the expectation that quantum gravity should break global symmetries, namely that quantum-gravity induced decoherence can provide both a powerful tool for the search for new particles, including totally decoupled backgrounds interacting only gravitationally, and at the same time a window into the intricacies of black hole information processing.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: PAES, Heinrich (TU Dortmund); Mr HELLMANN, Dominik (TU Dortmund); Mrs RANI, Erika (TU Dortmund)

Presenter: PAES, Heinrich (TU Dortmund)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

QED factorization of two-body non-leptonic and semi-leptonic B to charm decays

Wednesday, 22 September 2021 16:30 (15 minutes)

Two-body non-leptonic B decays with heavy-light final states, like $B_s \to D\pi$ and $B \to DK$, are among the theoretically cleanest non-leptonic decays as penguin loops do not contribute. They can be described using QCD factorization which relies on the heavy quark expansion. Advancing the theoretical calculations of such decays requires also a careful analysis of QED effects. In this talk we present a treatment of both virtual and ultrasoft real QED effects within a QCD $\times$ QED factorization framework of the non-leptonic and semi-leptonic B to D decays. In particular, due to recent discrepancies between theory and experimental data, we focus on ratios of non-leptonic over semi-leptonic decay rates, which are theoretically clean observables as the form factor dependence drops significantly. We found QED corrections to the amplitude to be at the sub-percent level, while at the level of the rate, ultrasoft photon effects can produce a correction up to a few percent, requiring a careful treatment of such effects in the experimental analyses.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: BENEKE, Martin (Physik Department T31, TUM); FINAURI, Gael (Physik Department T31, TUM); BÖER, Philipp (Physik Department T31, TUM); VOS, K. Keri (Nikhef, Amsterdam. GWFP, Maastricht University)

Presenter: FINAURI, Gael (Physik Department T31, TUM)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Fractional Dark Energy

Thursday, 23 September 2021 10:00 (15 minutes)

The fractional dark energy (FDE) model describes the accelerated expansion of the Universe through a non-relativistic gas of particles with a non-canonical kinetic term. This term is proportional to the absolute value of the three-momentum to the power of 3w, where w is simply the dark energy equation of state parameter, and the corresponding energy leads to an energy density that mimics the cosmological constant. This inverse momentum operator appears in fractional quantum mechanics and it is the inverse of the Riesz fractional derivative. The observed vacuum energy can be obtained through the integral of the Fermi-Dirac (or Bose-Einstein) distribution and the lowest allowed energy of the particles. Furthermore, a system of FDE particles may present negative absolute temperatures (NAT). NAT are possible in quantum systems and in cosmology, if there exists an upper bound on the energy. This maximum energy is one ingredient of the FDE model and indicates a connection between FDE and NAT, if FDE is composed of fermions. In this scenario, the equation of state parameter is equal to minus one and the transition from positive to negative temperatures could happen in the early Universe.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: LANDIM, Ricardo (Techinical University of Munich)

Presenter: LANDIM, Ricardo (Techinical University of Munich)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Listening to hot dark sector phase transitions

Wednesday, 22 September 2021 17:00 (15 minutes)

The observation of stochastic gravitational wave backgrounds from first-order phase transitions in the early Universe is promising to become a feasible test for high energy physics. In this talk, I will show how observable signals can be obtained from strong first-order phase transitions in a dark sector. If the dark sector is initially without thermal contact to the particle species of the Standard Model (SM), it can possibly have a higher temperature than the SM bath during the phase transition which will, in turn result in more energy being emitted in the form of gravitational radiation. However, the resulting signals will be diluted by the entropy injected into the SM bath when the dark sector decays. To illustrate these competing effects, I will consider a U(1) extension to the SM that allows for a phase transition testable with LISA and the Einstein Telescope.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: TASILLO, Carlo (RWTH Aachen University)

Co-authors: KAHLHOEFER, Felix (RWTH Aachen University); ERTAS, Fatih (RWTH Aachen)

Presenter: TASILLO, Carlo (RWTH Aachen University)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Primordial Black Holes from Confinement

Wednesday, 22 September 2021 17:15 (15 minutes)

A mechanism for the formation of primordial black holes is proposed. Here, heavy quarks of a confining gauge theory produced by de Sitter fluctuations are pushed apart by inflation and get confined after horizon re-entry. The large amount of energy stored in the QCD string connecting the quark pair leads to black-hole formation. These are much lighter and can be of higher spin than those produced by standard collapse of horizon-size inflationary overdensities. Other difficulties exhibited by such mechanisms are also avoided. Phenomenological features of the new mechanism are discussed as well as accounting for both the entirety of the dark matter and the super-massive black holes in the galactic centres. Under proper conditions, the mechanism can be realised in a generic confinement theory, including ordinary QCD. We discuss a possible string-theoretic realisation via D-branes. Interestingly, for conservative values of the string scale, the produced gravity waves are within the range of recent NANOGrav events. Simple generalisations of the mechanism allow for the existence of a significant scalar component of gravity waves with distinct observational signatures.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: ZANTEDESCHI, Michael (Max Planck Institute for Physik, Munich); Prof. DVALI, Gia (Max Planck Institute for Physics, Munich); Dr KÜHNEL, Florian (LMU, Munich)

Presenter: ZANTEDESCHI, Michael (Max Planck Institute for Physik, Munich)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Spin-2 mediated Dark Matter in Warped Extra-Dimensions

Thursday, 23 September 2021 10:20 (15 minutes)

We present a study of spin-2 mediated scalar dark matter. As a blueprint, we work in a warped extra-dimensional model such that the mediator(s) are the massive spin-2 Kaluza-Klein (KK) modes of the 5D graviton. On top of Standard Model particles, we focus on dark matter annihilations into KK-gravitons. Due to the longitudinal modes of the massive gravitons, any truncation of the KK-tower leads to a tremendous growth of the amplitude at large center of mass energies √s, which heavily impacts any phenomenological analysis. For the first time, we include the full KK-tower in this dark matter production process and find that this growth is unphysical and cancels once the full field content of the extra-dimensional theory is taken into account. Interestingly, this implies that it is not possible to approximate the results obtained in the full theory with a reduced set of effective interactions once √s is greater than the lightest massive graviton. This casts some doubt on the universal applicability of previous studies with spin-2 mediators within an EFT framework and prompts us to revisit the phenomenological allowed parameter space.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: Mr DE GIORGI, Arturo (Institute of Theoretical Physics - IFT (Madrid))

Co-author: VOGL, Stefan (Max-Planck-Institut für Physik)

Presenter: Mr DE GIORGI, Arturo (Institute of Theoretical Physics - IFT (Madrid))

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

SU(6) Gauge-Higgs Grand Unification

Friday, 24 September 2021 09:30 (15 minutes)

In this proposed talk, we present a gauge-Higgs grand unification setup that employs 5D warped space with a SU(6) bulk gauge field that includes both a SU(5) grand unified theory (GUT) and a Higgs sector as a scalar component of the 5D vector field, solving the hierarchy problem. By appropriately breaking the gauge symmetry on the boundaries of the extra dimension the issue of light exotic new states, appearing generically in such models, is eliminated and the SM fermion spectrum is naturally reproduced. The Higgs potential is computed at one-loop, finding straightforward solutions with a realistic $m_h = 125$ GeV. The problem of proton decay is addressed by showing that baryon number is a hidden symmetry of the model. The presence of a scalar leptoquark and a scalar singlet, whose potential we also compute at one-loop, is highlighted which might play a role in solving further problems of the SM. Finally, the X and Y gauge bosons from SU(5) GUTs are found at collider accessible masses, opening a window to the unification structure at low energies.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: BALLY, Andreas (Max Planck Institute for Nuclear Physics, Heidelberg); Dr ANGELESCU, Andrei (Max Planck Institute for Nuclear Physics, Heidelberg); GOERTZ, Florian (MPIK); Dr BLASI, Simone (Vrije Universiteit Brussel (VUB), Belgium)

Presenter: BALLY, Andreas (Max Planck Institute for Nuclear Physics, Heidelberg)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Direct detection of light dark matter from evaporating primordial black holes

Wednesday, 22 September 2021 15:00 (15 minutes)

The direct detection of sub-GeV dark matter interacting with nucleons is hampered by the low recoil energies induced by scatterings in the detectors. This experimental difficulty is avoided in the scenario of boosted dark matter where a component of dark matter particles is endowed with large kinetic energies. In this Letter, we point out that the current evaporation of primordial black holes with masses from 10^{14} to 10^{16} g is a source of boosted light dark matter with energies of tens to hundreds of MeV. Focusing on the XENON1T experiment, we show that these relativistic dark matter particles could give rise to a signal orders of magnitude larger than the present upper bounds. Therefore, we are able to significantly constrain the combined parameter space of primordial black holes and sub-GeV dark matter. In the presence of primordial black holes with a mass of 10^{15} g and an abundance compatible with present bounds, the limits on DM-nucleon cross-section are improved by four orders of magnitude.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: CHIANESE, Marco (University of Naples, Federico II)

Co-authors: FIORILLO, Damiano Francesco Giuseppe (University of Naples "Federico II"); SAVIANO, Ninetta (INFN); Mrs CALABRESE, Roberta (University of Naples Federico II)

Presenter: CHIANESE, Marco (University of Naples, Federico II)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Fuzzy Dark Matter Candidates from Strings

Thursday, 23 September 2021 11:55 (15 minutes)

We provide a string theoretical explanation of fuzzy dark matter as composed by ultra-light axions coming from the compactification of type IIB string theory on Calabi-yau manifolds. In particular, we consider C_4 axions stabilased in a Large Volume Scenario, and thraxions, axionic modes living in warped throats of the internal manifold. Based on the latest bounds, we study how likely is for dark matter to be composed of such particles and in which abundance. We provide predictions on the preferred ranges of masses and decay constants when string axions behave as FDM. Moreover, requiring those axions to lie in the FDM range imposes constraints on the features of the internal manifold. We also comment on implications for the Weak Gravity Conjecture.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: RIGHI, Nicole (DESY)

Presenter: RIGHI, Nicole (DESY)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

NLO electroweak potentials for minimal DM and beyond

Thursday, 23 September 2021 09:50 (15 minutes)

In this talk, I will discuss the one-loop correction to the static potential induced by photon, Z or W-boson exchange at tree-level for arbitrary SM multiplets. The correction is relevant, e.g., in the Sommerfeld effect calculation for heavy WIMP annihilation. We discuss the "Casimir-like" scaling of the result that makes the NLO correction a "low-energy" property of the SM gauge bosons. Furthermore, we present the phenomenology of the NLO correction and the analytically known asymptotic limits.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: URBAN, Kai (TU Munich)

Presenter: URBAN, Kai (TU Munich)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Euclidean axion wormholes do not contribute to the path integral

Thursday, 23 September 2021 12:10 (15 minutes)

Axion fields coupled to gravity allow non-trivial Euclidean saddle points that correspond to wormholes. Their possible role in the path integral of quantum gravity has been a puzzle for over 30 years. In this talk I will first explain that these saddle points are unstable in a Euclidean sense even when additional axion or saxion fields are added. Secondly, the meaning of these instabilities will also be discussed.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: Prof. HERTOG, Thomas (KU Leuven); TIELEMANS, Rob (KU Leuven); Prof. VAN RIET, Thomas (KU Leuven)

Presenter: TIELEMANS, Rob (KU Leuven)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

A Gravitino Distance Conjecture

Thursday, 23 September 2021 12:25 (15 minutes)

We conjecture that in a consistent supergravity theory with non-vanishing gravitino mass, the limit $m_{3/2}\to 0$ is at infinite distance. In particular one can write $m_{tower} \sim m_{3/2}$ so that as the gravitino mass goes to zero, a tower of KK states as well as emergent strings becomes tensionless. This conjecture may be motivated from the Weak Gravity Conjecture as applied to strings and membranes and implies in turn the AdS Distance Conjecture. Some evidence in type IIA vacua and F-theory settings will be presented. Moreover, we obtain general lower bounds $1/3, 1/4$ for Calabi–Yau threefolds and fourfolds, respectively. The conjecture has important phenomenological implications, both for particle physics and cosmology.
Based on 2104.10181 [Castellano, A., Font, A., Herráez, A. et al. A gravitino distance conjecture. J. High Energ. Phys. 2021, 92 (2021). https://doi.org/10.1007/JHEP08(2021)092].

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: CASTELLANO MORA, Alberto (IFT UAM/CSIC); Prof. IBÁÑEZ, Luis E. (IFT UAM/CSIC); Prof. FONT, Anamaría (Universidad Central de Venezuela & Max Planck Institute); Dr HERRAÉZ, Alvaro (IPhT Saclay)

Presenter: CASTELLANO MORA, Alberto (IFT UAM/CSIC)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Pure Spinors and 11D Supergravity

Wednesday, 22 September 2021 17:05 (20 minutes)

11D supergravity has been conjectured to be the low-energy limit of a fundamental theory, also known as M-Theory, which would contain non-perturbative information of string theory. In this talk, I will discuss the so-called 11D pure spinor superparticle whose quantization describes 11D supergravity in its antifield formulation. Since scattering amplitudes require the introduction of vertex operators carrying different ghost numbers, I will explain how such operators are constructed and the obstacle found when trying to define a ghost number zero operator, as well as the consequence of this issue on the pure spinor description of M-Theory.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: GUILLEN, Max (Uppsala University)

Presenter: GUILLEN, Max (Uppsala University)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Primordial Black Hole Dark Matter evaporating on the Neutrino Floor

Thursday, 23 September 2021 09:30 (15 minutes)

Primordial black holes hypothetically generated in the first instants of life of the Universe are potential dark matter candidates. Focusing on primordial black holes masses in the range $[5 \times 10^{14}{-}5{\times}10^{15}]$g, we point out that the neutrinos emitted by primordial black holes evaporation can interact through the coherent elastic neutrino-nucleus scattering producing an observable signal in multi-ton dark matter direct detection experiments. We show that with the high exposures envisaged for the next-generation facilities, it will be possible to set bounds on the fraction of dark matter composed by Primordial black holes improving the existing neutrino limits obtained with Super-Kamiokande. We also quantify to what extent a signal originating from a small fraction of dark matter in the form of primordial black holes would modify the so-called "neutrino floor", the well-known barrier towards detection of weakly interacting massive particles as the dominant dark matter component.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: CALABRESE, Roberta (Università degli studi di Napoli "Federico II"); FIORILLO, Damiano Francesco Giuseppe (University of Naples "Federico II"); MORISI, stefano (na); Prof. MIELE, Gennaro; Prof. PALAZZO, Antonio

Presenter: CALABRESE, Roberta (Università degli studi di Napoli "Federico II")

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Gauged 2-form symmetries in 6D SCFTs coupled to Gravity

Wednesday, 22 September 2021 14:20 (20 minutes)

6D SCFTs admit a plethora of global symmetries that
specify subtle global properties, such as 2-form symmetries.
When coupled to gravity those symmetries are expected to be
either broken or gauged.
In this talk I present a simple geometric condition for the
later option to be the case that is applicable to (2,0) and
(1,0) theories. I give further evidence by relating such examples to gauged
1-form symmetries in lower dimensions via dualities.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: OEHLMANN, Paul-Konstantin (Uppsala University); BRAUN, Andreas (Durham University); Dr LARFORS, Magdalena (Uppsala University)

Presenter: OEHLMANN, Paul-Konstantin (Uppsala University)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Landau Discriminant

Wednesday, 22 September 2021 16:00 (20 minutes)

Scattering amplitudes in quantum field theories have intricate analytic properties as functions of the energies and momenta of the scattered particles. In perturbation theory, their singularity structure is governed by nonlinear polynomial systems known as *Landau equations*. In this work we introduce several tools from computational algebraic geometry to solving Landau equations for any individual Feynman diagram. Singularity locus of the associated Feynman integral is made precise with the notion of the *Landau discriminant*. In order to solve it, we discuss two basic approaches from classical elimination theory, as well as a new algorithm based on tools from numerical nonlinear algebra such as homotopy continuation. These methods allow us to compute Landau discriminants of various Feynman diagrams up to 3 loops, including the envelope diagram whose Landau discriminant is a reducible surface of degree 45 in the space of kinematic invariants $\mathbb{P}^3$. In addition, we construct *Landau polytopes* in order to study degenerations of Landau equations and exemplify them on the family of banana diagrams. As a byproduct, we provide an efficient algorithm for the computation of the number of master integrals based on the connection to algebraic statistics.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: MIZERA, Sebastian (IAS Princeton); Dr TELEN, Simon (MPI for Mathematics in the Sciences, Leipzig)

Presenter: MIZERA, Sebastian (IAS Princeton)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Easing the sigma8-tension with neutrino-DM interactions

Thursday, 23 September 2021 11:50 (15 minutes)

The σ_8-tension of Planck data with weak lensing and redshift surveys is one of the main problems with the ΛCDM model of cosmology. We show that the tension can be alleviated by introducing an interaction between dark matter and neutrinos. We model the interaction using a linear Boltzmann treatment, introducing a novel implementation that for the first time uses the full massive neutrino hierarchy. We also provide upper limits on the interaction cross-section between neutrinos and dark matter.

Based on arXiv:2011.04206

Do you wish to attend the workshop on-site?

no

Summary

Primary author: MOSBECH, Markus (The University of Sydney)

Presenter: MOSBECH, Markus (The University of Sydney)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Feynman Integrals and Calabi-Yau Mathematics

Thursday, 23 September 2021 09:55 (20 minutes)

In this talk I will show how concepts from Calabi-Yau geometry and especially Calabi-Yau motives can be used for computations of multi-loop Feynman integrals. This will be exemplified with the so called banana graphs. First, I will give a short introduction to Feynman integrals and Calabi-Yau manifolds. Then we will see how the mathematics of Calabi-Yau manifolds (variations of Hodge structures, Griffiths transversality, $\widehat{\Gamma}$-class, …) constrain or even determine the corresponding Feynman integral, here the banana graphs. At the end I will also shortly explain how the banana integrals can be solved in dimensional regularization in the equal- as well as in the generic-mass case.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: Prof. KLEMM, Albrecht (Bethe Center for Theoretical Physics); NEGA, Christoph (BCTP, University of Bonn); DUHR, Claude (CERN); Mr FISCHBACH, Fabian (Bethe Center for Theoretical Physics); Mr BÖNISCH, Kilian (Max-Plank-Institut für Mathematik Bonn)

Presenter: NEGA, Christoph (BCTP, University of Bonn)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Scale-separated AdS4 vacua of IIA orientifolds and M-theory

Wednesday, 22 September 2021 15:15 (15 minutes)

Obtaining string compactifications where the KK scale is much higher than the cosmological constant scale is quite challenging. Such a separation of scales is however necessary for the theory to be genuinely lower-dimensional.
In massive type IIA string theory there are such scale-separated vacua, e.g. the DGKT AdS_4 solutions. It has been shown recently that the classical orientifold backreaction in these vacua can be tuned small. In this talk I show that massless IIA on the other hand allows both weakly and strongly coupled AdS_4 vacua that exhibit scale separation and for which the backreaction can be tuned small as well. I will give evidence that the strongly coupled solutions can be lifted to scale separated and sourceless (but classically singular) geometries in 11D supergravity.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: VAN HEMELRYCK, Vincent (KU Leuven)

Presenter: VAN HEMELRYCK, Vincent (KU Leuven)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Defects in 3d N = 2 superconformal theories

Tuesday, 21 September 2021 11:15 (15 minutes)

The conformal bootstrap is a powerful, nonperturbative method to study
conformal field theories (CFTs). Advancements in especially the numerical bootstrap have led to extremely precise results for the computation of critical exponents in various CFTs, and the conformal bootstrap
has gained a lot of attention in recent years. The conformal bootstrap can be
generalized/modified to include defect CFTs: CFTs with extended objects that break the (super-)conformal symmetry group into a smaller (super-
)conformal subgroup. Defect theories appear in many places in theoretical
physics: from Wilson lines in high-energy string theory, to boundary CFTs
found in low-energy condensed matter physics.
We studied three-dimensional CFTs with N = 2 supersymmetry equipped
with different 1/2-BPS defects (boundary and line). Such theories allow two
types of boundaries, of which one can be analytically continued to d = 4, and
we bootstrapped the observables in the 4 − ε expansion. They also allow one
type of (twisted) line defect, of which we computed several observables using
numerical techniques.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: VLIET, Philine Julia van (DESY)

Presenter: VLIET, Philine Julia van (DESY)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Absorption from Primordial Black Holes as source of baryon asymmetry

Friday, 24 September 2021 09:35 (15 minutes)

We propose a new mechanism for baryogenesis, in which baryon asymmetry is generated by absorption of a new particle X carrying baryon number onto Primordial Black Holes (PBHs). Due to CP violation of X and $\overline{X}$ scattering with the plasma surrounding PBHs, the two conjugate particles are differently absorbed by PBHs, leading to the production of an asymmetry in the X sector. The production is halted by PBH evaporation, after which the asymmetry is transferred into the baryonic sector via X decay. We show that this mechanism can produce the correct amount of asymmetry without violating the known constraints on PBHs concentration. Furthermore, we provide a systematic study of the parameter space, identifying the regions leading to the production of the correct baryon asymmetry

Do you wish to attend the workshop on-site?

no

Summary

Primary author: FIORILLO, Damiano F. G. (University of Naples "Federico II")

Co-authors: AMBROSONE, Antonio (University of Naples "Federico II"); CALABRESE, Roberta (University of Naples "Federico II"); MIELE, Gennaro (University of Naples "Federico II"); MORISI, Stefano (University of Naples "Federico II")

Presenter: FIORILLO, Damiano F. G. (University of Naples "Federico II")

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Dark Matter and Electroweak Phase Transition in the Inert Doublet Model

Wednesday, 22 September 2021 16:00 (15 minutes)

In this talk, we will provide a comprehensive analysis of the prospect to realize Dark Matter (DM) and to enhance the Electroweak PhaseTransition (EWPhT) with an Inert Doublet. Taking the latest constraints from collider physics and direct-detection experiments into account, we will investigate the possibility of a strong first-order EWPhT via one or two steps in combination with a significant amount of the measured DM abundance both in the low-mass and in the high-mass regime, exploring also new regions of parameter space. We will find that the low-mass regime leads to a parameter space providing a significant DM abundance as well as to a strong first-order EWPhT without or with an intermediate stage during the EWPhT. On the contrary, the high-mass regime gives rise either to a significant amount of DM or to a strong first-order EWPhT, the latter being an integral part of EW baryogenesis to explain the present baryon-antibaryon asymmetry.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: Mr FABIAN, Sven (Max-Planck-Institut für Kernphysik); GOERTZ, Florian (MPIK); Dr JIANG, Yun (MOE Key Laboratory of TianQin Mission, TianQin Research Center for Gravitational Physics & School of Physics and Astronomy, Frontiers Science Center for TianQin, CNSA Research Center for Gravitational Waves, Sun Yat-sen University)

Presenter: Mr FABIAN, Sven (Max-Planck-Institut für Kernphysik)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Phenomenological Impact of Non-Perturbative Effects for Colored Dark Sectors

Wednesday, 22 September 2021 15:20 (15 minutes)

We demonstrate the impact of non-perturbative effects on the Dark Matter (DM) production mechanism in simplified t-channel DM models. Specifically, we study the case of a Majorana fermion DM, coupled to the standard model (SM) quarks via a colored scalar.
For DM masses in the GeV-TeV range, direct detection experiments strongly constrain the DM coupling to the SM quarks. From a cosmological point of view, however, a large coupling to the SM is not mandatory if the mass splitting between the colored scalar and the DM candidate is sufficiently small. This region of the parameter space is subject to non-perturbative effects, namely the Sommerfeld effect and bound state formation via gluon emission, which can significantly enhance the effective DM (co)annihilation cross-section.
We present the impact of these effects on current and upcoming collider searches as well as on direct detection experiments.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: COPELLO, Emanuele; BECKER, Mathias (TU Dortmund); HARZ, Julia (Technical University of Munich (TUM)); MOHAN, Kirtimaan (MSU); SENGUPTA, Dipan (UC San Diego)

Presenter: COPELLO, Emanuele

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

The Virasoro-Shapiro amplitude in AdS5xS5 and level splitting of 10d conformal symmetry

Friday, 24 September 2021 09:35 (20 minutes)

I will report on recent progress in bootstrapping the α'-expansion of the genus-zero four-point superstring amplitude on AdS_5, dual to correlation functions of N=4 SYM at strong coupling. The construction of these amplitudes goes hand in hand with a deeper understanding of the spectrum of double-trace operators. As I will explain, at the level of supergravity these operators exhibit an interesting pattern of residual degeneracy, which is then lifted by the tower of string corrections in a controlled fashion.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: PAUL, Hynek (IPhT Saclay)

Presenter: PAUL, Hynek (IPhT Saclay)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Weak gravity vs charged massless gravitini in de Sitter

Thursday, 23 September 2021 11:35 (20 minutes)

We argue that in extended supergravity, de Sitter ctitical points with light charged gravitini violate the magnetic weak gravity conjecture. We prove this statement in general for N=2 matter-coupled gauged supergravity and demonstrate the result and its caveats through various examples. This result is required by the "festina lente" bound, but is derived independently, and thus serves as a non-trivial consistency check.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: EMELIN, Maxim (University of Padua)

Co-authors: Prof. GALL'AGATA, Gianguido; Dr FARAKOS, Fotis (University of Padua); MORITTU, Matteo

Presenter: EMELIN, Maxim (University of Padua)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

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

Complementarity of muon charged lepton flavour violating processes in the MRSSM

Wednesday, 22 September 2021 17:00 (15 minutes)

The Minimal R-symmetric Supersymmetric Standard Model possesses interesting features, which makes it an attractive alternative to the MSSM. Some of them can be observed in and are reflected by the lepton flavour violation processes. Notably, there is no $\tan\beta$-enhancement for $g-2$ of the muon and other dipole operators, resulting in very different predictions for lepton observables compared to the MSSM.

In the view of forthcoming experiments the bounds obtained from muon $g-2$ and flavour violating observables on the model parameter regions are studied. In particular, we consider the influence of Yukawa-like lambda parameters of the superpotential and the off-diagonal entries of slepton mass matrices. Different scenarios are discussed, depending also on the mass spectra of the model and additional restrictions, imposed by the anomalous magnetic moment of the muon. We focus on the interplay between $\mu \to e\gamma$, $\mu \to e$ conversion and $\mu \to 3e$ and $g-2$ of the muon and show that all of these observables are important to constrain the parameter space.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: STÖCKINGER, Dominik (TU Dresden); Dr STÖCKINGER-KIM , Hyejung (TU Dresden); KHASIANEVICH, Uladzimir (TU Dresden); KOTLARSKI, Wojciech (TU Dresden)

Presenter: KHASIANEVICH, Uladzimir (TU Dresden)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Statistical Analysis of the NDW=1 QCD Axion Mass Window from Topological Defects

Tuesday, 21 September 2021 11:15 (15 minutes)

This talk would be based on the paper by Sebastian Hoof, David J. E. Marsh and myself, that was uploaded on arXiv recently (https://arxiv.org/abs/2108.09563).

We review results from QCD axion string and domain wall simulations and propagate the associated uncertainties into the calculation of the axion relic density. This allows us to compare different
results in the literature and, using cosmological constraints, to perform statistical inference on the axion mass window in the post-inflationary Peccei–Quinn symmetry breaking scenario. For dark matter axions, this leads to a median dark matter axion mass of 0.50 meV, while the 95% credible interval at highest posterior density is between 0.48 and 0.52 meV. For simulations including string-domain wall decays, these numbers are 0.22 meV and [0.16, 0.27] meV. Relaxing the condition
that axions are all of the dark matter, the axion mass window is completed by an upper bound of around 80 meV, which comes from hot dark matter constraints. This demonstrates, at least from the statistical perspective, that the axion mass can be constrained rather precisely once it is possible
to overcome the much larger systematic uncertainties.

Do you wish to attend the workshop on-site?

no

Summary

I present the results from a statistical analysis of the QCD axion mass
for N_DM = 1 including axions from topological defects,
which was done by Sebastian Hoof, David J. E. Marsh and myself. We found
that the axion mass can be constrained rather precisely
once systematic uncertainties are overcome. We further compare two
results of string emission spectrum simulations.

Primary author: HOOF, Sebastian (Georg-August-Universität Göttingen)

Co-authors: MARSH, David (University of Goettingen); RIESS, Jana (Universtiy of Göttingen)

Presenter: RIESS, Jana (Universtiy of Göttingen)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

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

Small size instanton effects in composite axion models

Friday, 24 September 2021 09:45 (15 minutes)

We examine phenomenological properties of a heavy axion by considering small size instanton effects coming from an additional axicolor non-Abelian gauge group. To properly take instanton effects into account, we develop a new method to derive and diagonalize the mass matrix of pseudoscalar fields of the theory. Applying our new method for theories without axicolor instanton effects leads to good agreement with established effective field theory calculations. Using our method on axion models with additional non-Abelian gauge symmetries, the small size instanton effects shifts the electromagnetic decay constant F_a and axion mass m_a, which we show as new bands in the \{$m_a, G_{a\gamma\gamma}$\}-plane. Our results show that the axion can be heavy and still solve the Strong CP-problem. Such an axion is unconstrained by stellar cooling bounds and could be probed by future colliders such as FCC.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: KIVEL, Alexey (Johannes Gutenberg University, Physics Institute); YU, Felix (JGU Mainz); LAUX, Julien (Universität Mainz)

Presenter: KIVEL, Alexey (Johannes Gutenberg University, Physics Institute)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

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

Concordant approaches to resonant leptogenesis: comparison for a scalar prototype

Friday, 24 September 2021 09:50 (15 minutes)

In the recent years, Leptogenesis and Electroweak Baryogenesis have been a developing ground for non-equilibrium thermal quantum field theory techniques. In particular, the generation of a CP asymmetry can be described in terms of the Schwinger-Dyson (SD) equations evaluated over a closed time path (CTP) in the Schwinger-Keldysh formalism. Based on this SD approach the equations of motion for the propagators of the theory appear as non-linear integro-differential equations. A few strategies to reduce these equations into something solvable have been developed based on different choices for the representation of the two arguments of the propagators. The most common approaches use two times (2T) in coordinate space or a hybrid description of momenta and coordinates in Wigner space. Although qualitative comparisons for these two approaches have been made, a systematic and detailed analysis has never been carried out thus far. In this work we perform this inspection for the first time using a simple scalar model, with particular focus on flavour mixing and oscillations of the fields corresponding to sterile neutrinos. We find that, when aiming for the leading accuracy in the produced CP asymmetry, these approaches are in agreement across the whole mass-parameter space ranging from the extremely degenerate mass spectrum to the hierarchical regime. To achieve this, we upgrade the state of the art for the Wigner space solutions and provide a comprehensive description that is valid for all possible mass spectra.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: ZATTERA, Giovanni (Technical University of Munich); GARBRECHT, Björn (Technische Universität München); MILLINGTON, Peter (University of Nottingham); GARNY, Mathias (Desy)

Presenter: ZATTERA, Giovanni (Technical University of Munich)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **64** Type: **not specified**

Multipoint Conformal Blocks from Gaudin models

Tuesday, 21 September 2021 11:00 (15 minutes)

In this talk, I will review our recent progress on the characterization of multipoint conformal blocks in any spacetime dimension d and any OPE channel.
Our approach extends the standard four-point Casimir equations, introduced by Dolan and Osborn, to a set of higher-point eigenvalue equations of commuting operators that also measure quantum numbers associated with vertices of OPE diagrams.
We obtained the relevant set of commuting operators from special limits of Hamiltonians of Gaudin models, and we showed that in $d \geq 3$ their solutions require a distinguished basis of three-point tensor structures at every vertex. In the simplest example of comb-channel vertices, this basis corresponds to eigenfunctions of an elliptic Calogero-Sutherland-Moser model originally discovered by Etingof, Felder, Ma, and Veselov.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: QUINTAVALLE, Lorenzo (DESY)

Co-authors: SCHOMERUS, Volker (T (Theorie)); LACROIX, Sylvain (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik)); MANN, Jeremy (DESY); BURIC, Ilija (DESY)

Presenter: QUINTAVALLE, Lorenzo (DESY)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **65** Type: **not specified**

Primordial gravitational waves revealed by a spinning axion

Tuesday, 21 September 2021 11:30 (15 minutes)

A fast-spinning axion can dominate the Universe at early times and generates the so-called kination era. The presence of kination imprints a smoking-gun spectral enhancement in the primordial gravitational wave (GW) background. Current and future-planned GW observatories could constrain particle theories that generate the kination phase. Surprisingly, the viable parameter space allows for a kination era at the PeV-EeV scale and generates a peaked spectrum of GW from either cosmic strings or primordial inflation, which lies inside ET and CE windows.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: SIMAKACHORN, Peera (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik)); SERVANT, Geraldine (T (Cosmology)); GOUTTENOIRE, Yann (not set)

Presenter: SIMAKACHORN, Peera (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **66** Type: **not specified**

Bubble wall velocities in local thermal equilibrium

Thursday, 23 September 2021 09:15 (15 minutes)

The bubble wall velocity in first-order cosmological phase transitions is crucial for phenomenological studies of, for example, the production of stochastic gravitational waves and electroweak baryogenesis. It is commonly expected that a friction force on the bubble wall can only arise from out-of-equilibrium effects. Here we study the bubble wall motion in local thermal equilibrium. We resolve some apparent contradictions in the calculations and their interpretation and show that the recently proposed effective friction in local equilibrium originates from inhomogeneous temperature distributions. Further, we propose a new matching condition from local entropy conservation. With this, we are able to determine the bubble velocities in local equilibrium numerically.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: AI, Wen-Yuan; Prof. GARBRECHT, Björn (Technische Universität München); Dr TAMARIT, Carlos (Technische Universität München)

Presenter: AI, Wen-Yuan

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **67** Type: **not specified**

N-point correlators in 1d CFT

Tuesday, 21 September 2021 12:00 (15 minutes)

One dimensional CFTs are an exceptional laboratory in which we can test novel techniques in order to solve higher dimensional CFTs. They are also interesting from an holographic point of view, as in the case of conformal line defects in 4d N=4 Super Yang-Mills. In this short talk, I will present a recursive prescription to compute, up to one loop, 4d N=4 SYM n-point correlation functions realised inserting protected operators on a 1/2-BPS Wilson line. Surprisingly, this relation also contains all the information needed to obtain any correlation function of non-protected operators and to extract their anomalous dimension.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: BARRAT, Julien (Humboldt-Universität zu Berlin); LIENDO CORDOVA, Pedro (T (Stringtheory)); PEVERI, Giulia (Humboldt-Universität zu Berlin); PLEFKA, Jan (Humboldt University Berlin)

Presenter: PEVERI, Giulia (Humboldt-Universität zu Berlin)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **69** Type: **not specified**

Cosmic Birefringence Signal from Axion-Like Dark Matter

Tuesday, 21 September 2021 11:45 (15 minutes)

Axion-like particles (ALPs) are leading dark matter candidates originally motivated by the strong CP problem and also arise in theories of string compactifications. We present a sensitive probe for ALPs as ultra-light dark matter - the birefringence in the cosmic microwave background (CMB). Birefringence arises from the oscillating ALP field's inhomogeneity and is also relevant for laboratory axion searches.
New constraints on the ALP-photon coupling are derived by theoretical treatment of oscillating ALPs across recombination and local observation along with comparison to observations. Our results give orders of magnitude improvement over prior constraints (CAST 2017), with even further prospects for upcoming cosmological birefringence observations. These limits, in hitherto unconstrained regions of the coupling vs. ALP mass parameter-space, are independent of assumed magnetic fields and relatively robust to ALP dark matter fraction.
Furthermore, recent tentative hints of a detection of cosmic birefringence in the CMB would imply the presence of parity-violating ALPs at specific combinations of ultra-light mass and ALP-photon coupling.

Do you wish to attend the workshop on-site?

yes

Summary

Our new theoretical analysis of CMB birefringence improves ALP-photon coupling constraints by several orders. It also has exciting implications in the context of recent cosmic parity violation hints (Planck 18 data).

Primary author: Dr TRIVEDI, Pranjal (University of Hamburg)

Co-author: SIGL, Guenter (University of Hamburg)

Presenter: Dr TRIVEDI, Pranjal (University of Hamburg)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **71** Type: **not specified**

Integrability and chaos in sYM theories from the anomalous-dimenison spectrum

Friday, 24 September 2021 09:55 (20 minutes)

The discovery of integrability in planar N=4 sYM theory led to considerable advances in the computation of planar anomalous dimensions. In this talk I will discuss universal statistical properties of anomalous-dimension spectra in sYM theories in the planar limit and at finite rank of the gauge group. I will show how they can give insight into the nature of the underlying model, in particular we will see integrability manifest itself in spectra of integrable spin chains, while non-planar spectra, as well as spectra of non-integrable spin chains, can be described by random matrix theory.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: SPIERING, Anne (Trinity College Dublin)

Presenter: SPIERING, Anne (Trinity College Dublin)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **72** Type: **not specified**

Dark Matter from Exponential Growth

Wednesday, 22 September 2021 15:15 (15 minutes)

We propose a novel mechanism for the production of dark matter (DM) from a thermal bath, based on the idea that DM particles χ can transform heat bath particles ψ: $\chi\psi \to \chi\chi$. For a small initial abundance of χ this leads to an exponential growth of the DM number density, in close analogy to other familiar exponential growth processes in nature. We demonstrate that this mechanism complements freeze-in and freeze-out production in a generic way, opening new parameter space to explain the observed DM abundance, and we discuss observational prospects for such scenarios.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: Dr HUFNAGEL, Marco (ULB); Dr SCHMIDT-HOBERG, Kai (DESY); Dr BRINGMANN, Torsten (Oslo University); Dr DEPTA, Frederik (T (Phenomenology)); Dr RUDERMAN, Joshua

Presenter: Dr HUFNAGEL, Marco (ULB)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **74** Type: **not specified**

Dark matter phenomenology in two higgs doublet model with a complex scalar singlet

Thursday, 23 September 2021 09:35 (15 minutes)

Extensions of the two higgs doublet models with a singlet scalar can easily accommodate all current experimental constraints and are highly motivated candidates for Beyond Standard Model Physics. It can successfully provide a dark matter candidate, explain baryogenesis and provide gravitational wave signals. In this work, we focus on the dark matter phenomenology of the two higgs doublet model extended with a complex scalar singlet which serves as the dark matter candidate. We study the variations of the dark matter observables, i.e relic density and direct detection cross-section, with respect to the model parameters. We obtain a few benchmark points in the light and heavy dark matter mass region. We are also currently studying possible signatures of this model at current and future colliders and the possibility to distinguish this model from
other new physics scenarios.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: DUTTA, Juhi (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

Co-authors: Prof. MOORTGAT-PICK, Gudrid (DESY & University of Hamburg); Ms SCHREIBER, Merle (University of Hamburg)

Presenter: DUTTA, Juhi (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **75** Type: **not specified**

Bootstrapping Monodromy Defects in the Wess-Zumino Model

Tuesday, 21 September 2021 11:30 (15 minutes)

We use analytical bootstrap techniques to study supersymmetric monodromy defects in the critical Wess-Zumino model. In preparation for our main result we first study two related systems which are interesting on their own: general monodromy defects (no susy), and the ε–expansion bootstrap for the Wess-Zumino model (no defects). For general monodromy defects we discuss some subtleties specific to the codimension two case. In particular, conformal blocks and the Lorentzian inversion formula have to be slightly modified in order to accommodate odd-spin operators that can have a non-zero one-point function. In the Wess-Zumino model we initiate the ε–expansion bootstrap for four-point functions of chiral operators, with the goal of obtaining spectral information about the bulk theory. We then proceed to tackle the harder technical problem of analyzing monodromy defects in the presence of supersymmetry. We use inversion formula technology and spectral data coming from our four-point function analysis, in order to completely bootstrap two-point functions of chiral operators at leading order in ε. Our result can be written in terms of novel special functions which we analyze in detail, and allows us to efficiently extract the CFT data that characterizes
the correlator.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: GIMENEZ GRAU, Aleix (DESY)

Co-author: PEDRO, Liendo (DESY)

Presenter: GIMENEZ GRAU, Aleix (DESY)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **76** Type: **not specified**

Neutron-antineutron oscillation as a probe of baryogenesis

Friday, 24 September 2021 10:05 (15 minutes)

Neutron-antineutron (n\-$\bar{n}$) oscillation is a baryon number violating process that will be probed at an unprecedented sensitivity in near future experiments at ESS and DUNE. We study potential impacts of the n\-$\bar{n}$ oscillation mechanism on the baryon asymmetry of the Universe. Using an effective field theory framework, as well as a simplified model for one of two possible UV-complete topologies of the n\-$\bar{n}$ operator, we connect a potential n\-$\bar{n}$ oscillation discovery to baryogenesis, and show the overlap with resonant production at the LHC. We find that successful baryogenesis can be realised in regions of parameter space that are currently unexplored but will be probed by future n\-$\bar{n}$ oscillation experiments.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: HATI, Chandan (Technische Universität München, James-Franck-Straße 1, D-85748 Garching, Germany); HARZ, Julia (Technical University of Munich (TUM)); FRIDELL, Kåre (Technical University of Munich)

Presenter: FRIDELL, Kåre (Technical University of Munich)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **77** Type: **not specified**

Opening up the axion dark matter window with axion fragmentation

Wednesday, 22 September 2021 14:00 (15 minutes)

Fragmentation of the axion field may produce the observed DM abundance, which makes it possible for ALP DM to appear with lower values of the axion decay constant than those allowed by the conventional misalignment mechanism. Previously, kinetic misalignment has been proposed to open up this parameter space. We find that for a large range of parameters the field becomes fragmented before kinetic misalignment can take place. Additionally, we demonstrate how the initial velocity necessary for fragmentation can be delivered and study how the process may be constrained or tested via cosmological observables such as BBN and structure formation.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: SOERENSEN, Philip (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

Co-authors: SERVANT, Geraldine (T (Cosmology)); ERÖNCEL, Cem (DESY); SATO, Ryosuke (T (Cosmology))

Presenter: SOERENSEN, Philip (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **78** Type: **not specified**

Charming ALPs

Friday, 24 September 2021 10:00 (15 minutes)

Axion-like particles (ALPs) are ubiquitous in models of new physics explaining some of the most pressing puzzles of the Standard Model. However, until relatively recently, little attention has been
paid to its interplay with flavour. In this work, we study in detail the phenomenology of ALPs that exclusively interact with up-type quarks at the tree-level, which arise in some well-motivated ultra-violet completions such as QCD-like dark sectors or Froggatt-Nielsen type models of flavour. Our study is performed in the low-energy effective theory to highlight the key features of these scenarios in a model independent way. We derive all the existing constraints on these models and demonstrate how upcoming experiments at fixed-target facilities and the LHC can probe regions of
the parameter space which are currently not excluded by cosmological and astrophysical bounds. Possible signatures of flavour violating displaced decays are discussed. We
also emphasize how a future measurement of the currently unavailable meson decay $D \longrightarrow \pi$+invisible could complement these upcoming searches.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: SCHERB, Christiane (Johannes Gutenberg-Universität Mainz)

Presenter: SCHERB, Christiane (Johannes Gutenberg-Universität Mainz)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **79** Type: **not specified**

Melting cosmic strings and gravitational waves

Thursday, 23 September 2021 10:30 (15 minutes)

Appearance of cosmic strings in the early Universe is a common manifestation of new physics typically linked to some high energy scale. In this talk, I will discuss a different situation, where a model underlying cosmic string formation is approximately scale free. String tension is naturally related to the square of the temperature of the hot primordial plasma in such a setting, and hence decreases with (cosmic) time. With gravitational backreaction neglected, the dynamics of these melting strings in an expanding Universe is equivalent to the dynamics of constant tension strings in a Minkowski spacetime. I will provide an estimate for the emission of gravitational waves from string loops. Contrary to the standard case, the resulting spectrum is markedly non-flat and has a characteristic falloff at frequencies below the peak one. The peak frequency is defined by the underlying model and lies in the range accessible by the future detectors for very weak couplings involved.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: RAMAZANOV, Sabir

Presenter: RAMAZANOV, Sabir

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **81** Type: **not specified**

Six-Loops in N=4 super-Yang-Mills Theory

Thursday, 23 September 2021 09:35 (20 minutes)

We construct the complete (planar and non-planar) integrand for the six-loop four-point amplitude in maximal $D \leq 10$ super-Yang-Mills. This construction employs new advances to help combat the proliferation of state-sums and loops in the evaluation of multi-loop D-dimensional unitarity cuts. Concretely, we introduce two graph-based approaches, applicable in a range of theories, to evaluating generalized unitarity cuts in D dimensions: 1) recursively from lower-loop cuts, or 2) directly from known higher-loop planar cuts. Neither method relies on explicit state sums or any sewing of tree-level amplitudes. The first method meshes particularly well with the Method of Maximal Cuts to allow direct construction of the complete six-loop integrand

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: EDISON, Alex (Uppsala University)

Co-authors: CARRASCO, John Joseph (Northwestern University & CEA-Saclay); Prof. JOHANSSON , Henrik (Uppsala university)

Presenter: EDISON, Alex (Uppsala University)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **82** Type: **not specified**

The Hypersimplex VS the Amplituhedron via T-Duality

Wednesday, 22 September 2021 16:20 (20 minutes)

This work is about a duality between two seemingly unrelated objects. The *hypersimplex* $\Delta_{k+1,n}$ – a polytope of dimension $n-1$ in $\mathbb{R}^n$ – has been the center of attention of both mathematicians and physicists, in connection with the moment map, torus orbits in the Grassmannian, tropical geometry and cluster algebras. Meanwhile, the *amplituhedron* $\mathcal{A}_{n,k,2}$ – a full-dimensional subset of the Grassmannian $\text{Gr}_{k,k+2}$ (not a polytope!) – was introduced by A.Hamed and Trnka in the context of the physics of *scattering amplitudes* in $\mathcal{N}=4$ super Yang-Mills theory (SYM). Surprisingly, as was first discovered in the work by Lukowski-Parisi-Williams [LPW], these two objects are closely related by a combinatorial-geometric incarnation of *T-duality* from String Theory, responsible for the Amplitudes/Wilson loops duality in $\mathcal{N}=4$ SYM.
In this work, exploiting T-duality, we both draw new striking connections between $\Delta_{k+1,n}$ and $\mathcal{A}_{n,k,2}$ and discover new properties of them. We show that inequalities cutting out *positroid polytopes* – images of positroid cells in the hypersimplex – translate into sign conditions characterizing the T-dual *Grasstopes* – images of positroid cells in the amplituhedron. Moreover, we subdivide the amplituhedron into *chambers*, just as the hypersimplex can be subdivided into simplices - both enumerated by the Eulerian numbers, and related by T-duality. We use these properties to prove the main conjecture of [LPW]: a collection of positroid polytopes triangulates the hypersimplex if and only if the collection of T-dual Grasstopes triangulates the amplituhedron. As corollaries, some class of nice triangulations can be obtained from *BCFW recursions* and the *positive tropical Grassmannian* $\text{Trop}^+\text{Gr}_{k+1,n}$ – both central in computations of scattering amplitudes.
Along the way, we also prove several more conjectures: Arkani-Hamed–Thomas–Trnka's conjecture that $\mathcal{A}_{n,k,2}$ can be characterized using sign-flips, Lukowski–Parisi–Spradlin–Volovich's conjectures about *generalized triangles* (Grasstopes in a triangulation of $\mathcal{A}_{n,k,2}$), and (a generalization of) $m=2$ *cluster adjacency*. Finally, we discover novel cluster-algebraic structures in the amplituhedron – motivated by finding a geometric origin to *cluster phenomena* appearing in $\mathcal{N}=4$ SYM, and beyond.

This is based on joint work with M. Sherman-Bennett and L. K. Williams (Preprint, arXiv: 2104.08254).

Do you wish to attend the workshop on-site?

no

Summary

Primary author: PARISI, Matteo (University of Oxford)

Co-authors: Dr SHERMAN-BENNETT, Melissa (University of Michigan); Prof. WILLIAMS, Lauren (Harvard University)

Presenter: PARISI, Matteo (University of Oxford)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **83** Type: **not specified**

Moduli stabilization near the boundary

Wednesday, 22 September 2021 15:00 (15 minutes)

In this talk we discuss a novel approach to moduli stabilization in Type IIB flux compactifications. Our strategy relies on recent insights about Calabi-Yau moduli spaces based on asymptotic Hodge theory. The crucial observation is that exponential corrections must be present near most boundaries in these moduli spaces. We then use these corrections to engineer new flux vacua with an exponentially small superpotential. These vacua are particularly relevant from the perspective of the KKLT scenario, and moreover feature interesting hierarchies in the masses of the moduli.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: VAN DE HEISTEEG, Damian (Utrecht University)

Presenter: VAN DE HEISTEEG, Damian (Utrecht University)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **84** Type: **not specified**

Boundaries and Topological Twists of 3d N=4 SCFTs

Tuesday, 21 September 2021 09:55 (20 minutes)

3d N=4 theories are of particular interest as they admit various types of twists (topological-holomorphic). A framework with interesting implications is the one of topologically twisted 3d N=4 theories with *holomorphic* boundaries/defects. The significance of these configurations relies on the fact that local boundary operators form special Vertex operator algebras, the study of which can shed light on the structure of the topological bulk theory. A central question is the compatibility of such holomorphic boundary conditions with the bulk topological twist. In this talk I will discuss about certain aspects of such configurations using purely string theoretical and field theoretical approaches. *To appear, in collaboration with I. Brünner and I. A. Saberi.*

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: LAVDAS, Ioannis (LMU Munich); Prof. BRÜNNER, Ilka; Dr SABERI, Ingmar

Presenter: LAVDAS, Ioannis (LMU Munich)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **85** Type: **not specified**

Beyond freeze-in: Dark Matter via Inverse Phase Transition and Gravitational Waves

Friday, 24 September 2021 10:20 (15 minutes)

I will discuss a recently proposed class of models where Dark Matter (DM) is produced via an inverse phase transition. The inverse phase transition can be caused by coupling to some cosmological field. For instance, this field can be the Ricci scalar, as in e-Print: 2004.03410; primordial magnetic field, as in e-Print: 2010.03383; or thermal fluctuations of other fields, as in e-Print: 2104.13722. In this most recent work we proposed a novel scenario of DM production tidy connected with generation of gravitational waves. DM is modelled as a real scalar, which interacts with the hot primordial plasma through a portal coupling to another scalar field. For a particular sign of the coupling, this system exhibits an inverse phase transition. The latter leads to an abundant DM production, even if the portal interaction is so weak that the freeze-in mechanism is inefficient. The model predicts domain wall formation in the early Universe, long before the inverse phase transition. These domain walls have a tension decreasing with time, and completely disappear at the inverse phase transition, so that the problem of overclosing the Universe is avoided. The domain wall network emits gravitational waves with characteristics defined by those of DM. In particular, the peak frequency of gravitational waves is determined by the portal coupling constant, and falls in the observable range for currently planned gravitational wave detectors.

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: VIKMAN, Alexander

Presenter: VIKMAN, Alexander

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **86** Type: **not specified**

Finding sound shells in LISA mock data

Thursday, 23 September 2021 10:15 (15 minutes)

I discuss to what extend LISA can observe features of gravitational wave spectra originating from cosmological first-order phase transitions. I focus on spectra which are of the form of double-broken power laws. These spectra are predicted by hydrodynamic simulations and also analytical models such as the sound shell model. I argue that the ratio of the two break frequencies is an interesting observable since it can be related to the wall velocity while overall amplitude and frequency range are often degenerate for the numerous characteristics of the phase transition. The analysis uses mock data obtained from the power spectra predicted by the simplified simulations and the sound shell model and analyzes the detection prospects using chi^2 -minimization and likelihood sampling. I point out that the prospects of observing two break frequencies from the electroweak phase transition is hindered by a shift of the spectrum to smaller frequencies for strong phase transitions.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: VAN DE VIS, Jorinde Marjolein (T (Cosmology)); KONSTANDIN, Thomas (T (Cosmology)); GIESE, Felix (T (Cosmology))

Presenter: VAN DE VIS, Jorinde Marjolein (T (Cosmology))

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **87** Type: **not specified**

Loops in (A)dS/CFT

Wednesday, 22 September 2021 16:40 (15 minutes)

In this talk we will analyse loop corrections to a conformally coupled scalar field with a quartic self-interaction in $(A)dS_4$ from a holographic perspective. First we will remark on the similarities and differences of quantum field theory in AdS and dS. We will then calculate the quantum corrections to the four point function and give a formula for the anomalous dimensions of the dual double trace operators. The method we use is a direct evaluation of the corresponding Witten diagrams which is in contrast to the usual method using Mellin space techniques. We will conclude by comparing both methods. This talk is partially based on JHEP 02 (2021) 151

Do you wish to attend the workshop on-site?

yes

Summary

Primary author: HECKELBACHER, Till (LMU Munich)

Presenter: HECKELBACHER, Till (LMU Munich)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **88** Type: **not specified**

The νDFSZ Axion model dubbed 2hdSMASH

Friday, 24 September 2021 10:15 (15 minutes)

The Standard Model (SM) suffers from five shortcomings: Dark Matter, Neutrino masses and mixing, Baryon asymmetry, Strong CP-Problem and Inflation. The latter is regarded as the seeds for structure formation. In this talk, we introduce an inflationary νDFSZ-type model which is dubbed 2hdSMASH(Two-Higgs-Doublet SM*Axion*Seesaw*Higgs-Portal-Inflation). 2hdSMASH aims at giving a complete and unified picture of the universe evolution from the inflationary epoch to today. In particular, we focus on parameter constraints coming from the inflationary epoch which provide in the low energy limit phenomenologically viable scalar masses that can be tested at LHC, HL-LHC or future colliders.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: MATLIS, Michael Maxim (DESY); RINGWALD, Andreas (ALPS (Any Light Particle Search)); MOORTGAT-PICK, Gudrid (FLC (Technol. zukuenft. Teilchenph. Experim.)); DUTTA, Juhi (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

Presenter: MATLIS, Michael Maxim (DESY)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **89** Type: **not specified**

Portal Chiral Perturbation Theory

Thursday, 23 September 2021 11:55 (15 minutes)

Hidden sector induced light meson transitions are a powerful probe for new physics at low-energy fixed target experiments such as NA62. To help study such interactions, we use the portal effective theory framework to construct a portal chiral perturbation theory at leading order that couples the light pseudoscalar mesons to a gauge-singlet messenger of spin 0, 1/2, or 1. We then compute general transition amplitudes of three golden channels for hidden sector searches at fixed-target experiments.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: Dr KLOSE, Philipp (Bern University); Dr HAJER, Jan (UCLouvain); Dr ARINA, Chiara (UCLouvain)

Presenter: Dr KLOSE, Philipp (Bern University)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **91** Type: **not specified**

Understanding the spectrum of GRB 190114C

Thursday, 23 September 2021 12:05 (15 minutes)

The recent very-high-energy (VHE) gamma-ray observations of gamma-ray bursts (GRBs) in their afterglow phase motivate a review of the established fireball model in which a relativistic blast wave accelerates electrons in the forward shock, which then radiate via the synchrotron process and inverse Compton scattering on these synchrotron photons (synchrotron self-Compton). We use the rich observations of GRB 190114C ranging from X-ray (keV) to VHE gamma-rays (TeV) to investigate the properties of the radiating electron distribution assuming a single emitting zone. We present preliminary modeling considering the landscape of solutions finding consistency with the multi-wavelength observations, and consider the implications of these different solution groups.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: KLINGER, Marc (Z_THAT (Theoretische Astroteilchenphysik)); TAYLOR, Andrew (Z_THAT (Theoretische Astroteilchenphysik)); WINTER, Walter (DESY)

Presenter: KLINGER, Marc (Z_THAT (Theoretische Astroteilchenphysik))

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **92** Type: **not specified**

Probing Leptogenesis using Gravitational Waves

Thursday, 23 September 2021 09:45 (15 minutes)

Breaking of a $U(1)_{B-L}$ local symmetry, a feature that occurs in a wide variety of the Standard Model ultraviolet completions, can lead to generation of cosmic strings which can lead to an observable signal in gravitational waves (GWs). In this talk we will discuss how the GWs can be used to probe leptogenesis mechanism due to heavy neutrino decay. In particular, we will look into the impact of the cosmic string decay and the presence of a scalar field, that breaks the $U(1)_{B-L}$ symmetry and can decay into heavy neutrinos, on the thermal leptogenesis parameter space in the context of a potential positive GW signal at the upcoming experiments.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: HEGER, Florian

Co-authors: HARZ, Julia (Technical University of Munich (TUM)); HATI, Chandan (Technische Universität München, James-Franck-Straße 1, D-85748 Garching, Germany); FRIDELL, Kåre (Technical University of Munich)

Presenter: HEGER, Florian

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **93** Type: **not specified**

Energy minima as a model for Dark Matter haloes

Thursday, 23 September 2021 12:20 (15 minutes)

Analytical models of structure formation are an important tool, complementary to N-body simulations, to investigate the formation of Dark Matter structures and the dependence of their statistics on cosmological parameters. They rely on some non-linear map, typically inferred from spherical collapse, to relate topological features of the initial density field (number of maxima, minima, saddles, critical points…) to different types of structures and events (halos, voids, filaments, mergers…) in the cosmic web.
Conventional models are based on the heuristic assumption that virialized structures originate from initial regions that are maxima of the smoothed matter density field.
I will describe how shifting the focus from the initial density to the initial energy field, and characterizing protohalos from the minimization of the energy, provides: 1) a more physically sound model, 2) a better mathematical behavior, and 3) a better description of the location and shape of protohalo patches found in N-body simulations.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: MUSSO, Marcello (T (Theorie)); Prof. SHETH, Ravi (University of Pennsylvania)

Presenter: MUSSO, Marcello (T (Theorie))

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **94** Type: **not specified**

Light-cone distribution amplitudes in QCD×QED

Wednesday, 22 September 2021 14:20 (15 minutes)

Light-cone distribution amplitudes (LCDAs) of light and heavy mesons are universal hadronic objects that form an essential part of factorization theorems for hard exclusive particle decays. These are relevant for precise calculations of Standard Model processes which play an important role in the search for New Physics. Like parton distribution functions, LCDAs are process-independent quantities that contain non-perturbative information about the inner meson structure and evolve under the renormalization group. The standard definition of the LCDAs assumes the presence of QCD-only, neglecting electromagnetic effects at low energies. However, with the increasing precision of measurements at LHCb and Belle II, QED effects need to be considered. For non-leptonic, charmless B-meson decays, we recently generalized the definition of the LCDAs to QCD×QED, leading to qualitatively new features. In this talk we present, mostly for light mesons, how QED affects the solution of the LCDA under scale evolution. In particular, we discuss the modification of the endpoint behaviour and the size of QED corrections for the inverse moments, which enter on the level of physical observables.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: TOELSTEDE, Jan-Niklas (Technical University of Munich); Prof. BENEKE, Martin (Technical University of Munich); Dr BÖER, Philipp (Technical University of Munich); Prof. VOS, Keri (Maastricht University)

Presenter: TOELSTEDE, Jan-Niklas (Technical University of Munich)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **95** Type: **not specified**

Probing Dirac vs Majorana nature of neutrinos at CEνNS experiments

Tuesday, 21 September 2021 11:30 (15 minutes)

Coherent Elastic Neutrino Nucleus Scattering (CEνNS) provide a novel window to probe new physics connected with the well established non-vanishing neutrino masses. In this talk we will discuss how in the presence of a transition magnetic moment of neutrinos the CE⊠NS experiments have the potential to shed light on the nature of neutrinos: Dirac vs Majorana. In particular, we will take the NUCLEUS experiment as an example to demonstrate that through a study of differential energy distribution of the final states the CEνNS experiments can potentially achieve such a feat.

Do you wish to attend the workshop on-site?

yes

Summary

Primary authors: HATI, Chandan (Technische Universität München, James-Franck-Straße 1, D-85748 Garching, Germany); BOLTON, Patrick (UCL); DEPPISCH , Frank (UCL); FRIDELL, Kare (TUM); HARZ, Julia (TUM); KULKARNI, Suchita (University of Graz)

Presenter: HATI, Chandan (Technische Universität München, James-Franck-Straße 1, D-85748 Garching, Germany)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **96** Type: **not specified**

Worldsheet Correlators in AdS3

Wednesday, 22 September 2021 17:25 (20 minutes)

We revisit the computation of string correlation functions in AdS3 with pure NS-NS flux from a worldsheet point of view. These correlators contain all the perturbative information about the spacetime CFT and the existence of winding strings in AdS3 makes them very rich. We propose a solution to the problem of computing these correlators. The winding correlators encode information about branched covering maps from the worldsheet to the boundary of AdS3. Consistency of this proposal leads to many new and non-trivial relations for branched covering maps. I will discuss the properties of the correlators in detail. In some limiting cases one can compute the full string correlators and explore the spacetime CFT directly.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: EBERHARDT, Lorenz (IAS Princeton)

Presenter: EBERHARDT, Lorenz (IAS Princeton)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **97** Type: **not specified**

Gravitational waves as probes of new physics

Tuesday, 21 September 2021 14:10 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: SCHWALLER, Pedro

Session Classification: Plenary Sessions

Contribution ID: **98** Type: **not specified**

Gravitational waves from cosmic inflation

Tuesday, 21 September 2021 14:40 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: DOMCKE, Valerie

Session Classification: Plenary Sessions

Contribution ID: **99** Type: **not specified**

Gravitational waves from first order phase transitions in the early Universe.

Tuesday, 21 September 2021 15:10 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: HINDMARSH, Mark

Session Classification: Plenary Sessions

Contribution ID: **100** Type: **not specified**

New Perspectives onto the Universe in the multi-messenger era

Tuesday, 21 September 2021 16:45 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: NISSANKE, Samaya

Session Classification: Plenary Sessions

Contribution ID: **101** Type: **not specified**

Cosmology and new physics from large-scale structure.

Tuesday, 21 September 2021 16:15 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: SIMONOVIC, Marko

Session Classification: Plenary Sessions

Contribution ID: **102** Type: **not specified**

Cosmology and astrophysics into the next decade.

Tuesday, 21 September 2021 18:00 (1 hour)

Over the past decades we have seen remarkable improvements in our understanding of the Cosmos. We have been able to determine the composition of the Universe, its age and expansion history with outstanding precision. We have gathered very interesting clues about the initial conditions of the hot Big Bang and developed models that can explain them. We have discovered new phenomena and exotic objects and have been able to use them as tools to learn about Cosmology. This lecture will summarize our current understanding of the properties and history of our Universe and focus on some of the open questions in the field and describe some of the ongoing efforts to try to answer them.

Presenter: ZALDARRIAGA, Matias

Session Classification: Hertz Lecture

Contribution ID: **103** Type: **not specified**

Neutrinos in cosmology.

Wednesday, 22 September 2021 09:15 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: WONG, Yvonne

Session Classification: Plenary Sessions

Contribution ID: **104** Type: **not specified**

Directional DM detection.

Wednesday, 22 September 2021 09:45 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: O'HARE, Ciaran

Session Classification: Plenary Sessions

Contribution ID: **105** Type: **not specified**

Black Holes.

Wednesday, 22 September 2021 10:15 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: CARDOSO, Vitor

Session Classification: Plenary Sessions

Contribution ID: **106** Type: **not specified**

On dark matter from a hidden sector.

Wednesday, 22 September 2021 11:45 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: TYTGAT, Michel

Session Classification: Plenary Sessions

Contribution ID: **107** Type: **not specified**

Progress with thermal rates for dark matter and leptogenesis.

Wednesday, 22 September 2021 11:15 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: LAINE, Mikko

Session Classification: Plenary Sessions

Contribution ID: **108** Type: **not specified**

New Physics with Gravitational Waves

Wednesday, 22 September 2021 12:15 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: BAUMANN, Daniel

Session Classification: Plenary Sessions

Contribution ID: **109** Type: **not specified**

Dark universe from (primordial) black holes

Thursday, 23 September 2021 09:15 (20 minutes)

Do you wish to attend the workshop on-site?

Summary

Primary author: PETROSSIAN-BYRNE, Rudin (University of Oxford)

Presenter: PETROSSIAN-BYRNE, Rudin (University of Oxford)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **110** Type: **not specified**

Simulating and unfolding LHC event with generative networks

Tuesday, 21 September 2021 09:30 (20 minutes)

Do you wish to attend the workshop on-site?

Summary

Primary author: BUTTER, Anja (ITP Heidelberg)

Presenter: BUTTER, Anja (ITP Heidelberg)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **111** Type: **not specified**

The on-shell SMEFTs

Wednesday, 22 September 2021 14:00 (20 minutes)

Do you wish to attend the workshop on-site?

Summary

Primary author: DURIEUX, Gauthier (CERN)

Presenter: DURIEUX, Gauthier (CERN)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **112** Type: **not specified**

Looking Forward to New Physics with the Forward Physics Facility

Thursday, 23 September 2021 11:35 (20 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: KLING, Felix (DESY)

Presenter: KLING, Felix (DESY)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **113** Type: **not specified**

Interplay of dineutrino modes with semileptonic rare B-decays

Wednesday, 22 September 2021 16:45 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: GISBERT MULLOR, Hector (TU Dortmund)

Presenter: GISBERT MULLOR, Hector (TU Dortmund)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **114** Type: **not specified**

Anomaly detection with CATHODE

Tuesday, 21 September 2021 09:50 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: SCHLAFFER, Matthias (University of Chicago)

Presenter: SCHLAFFER, Matthias (University of Chicago)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **115** Type: **not specified**

(g-2)☒, B anomalies and DM: a loop model tale

Wednesday, 22 September 2021 16:00 (15 minutes)

In this talk I will review how the anomalous magnetic moment of the muon and the B anomalies can be addressed by a combined explanation, by means of loop models characterized by minimal field content. Moreover, I will show how some of these model can also provide a viable DM candidate, accounting for the measured relic density while evading direct and indirect DM constraints.

Do you wish to attend the workshop on-site?

Summary

Primary author: FEDELE, Marco (KIT)

Presenter: FEDELE, Marco (KIT)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **116** Type: **not specified**

Mesogenesis

Friday, 24 September 2021 09:15 (15 minutes)

Do you wish to attend the workshop on-site?

Summary

Primary author: ELOR, Gilly (JGU Mainz)

Presenter: ELOR, Gilly (JGU Mainz)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **117** Type: **not specified**

Neutrino magnetic moment – mass conundrum in the Light of Recent Experiments

Tuesday, 21 September 2021 11:00 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: JANA, Sudip (Max-Planck-Institut für Kernphysik)

Presenter: JANA, Sudip (Max-Planck-Institut für Kernphysik)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **118** Type: **not specified**

Autoencoders for unsupervised anomaly detection in high energy physics

Tuesday, 21 September 2021 10:05 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: MORANDINI, Alessandro (RWTH Aachen University)

Presenter: MORANDINI, Alessandro (RWTH Aachen University)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **119** Type: **not specified**

Explaining B-Anomalies from flavorful U(1)' extensions, safely

Wednesday, 22 September 2021 16:15 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: STEUDTNER, Tom (TU Dortmund)

Presenter: STEUDTNER, Tom (TU Dortmund)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **120** Type: **not specified**

Dark Matter Phenomenology of 1-Loop Solutions to the R_K anomaly

Thursday, 23 September 2021 10:35 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: BECKER, Mathias (TU Dortmund)

Presenter: BECKER, Mathias (TU Dortmund)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **121** Type: **not specified**

Top-quark fragmentation into a Higgs boson with next-to-leading order accuracy

Wednesday, 22 September 2021 14:50 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: BRANCACCIO, Colomba (RWTH)

Presenter: BRANCACCIO, Colomba (RWTH)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **122** Type: **not specified**

GAZELLE, a long-baseline detector for Belle II

Thursday, 23 September 2021 12:10 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: SCHÄFER, Ruth (U. Heidelberg)

Presenter: SCHÄFER, Ruth (U. Heidelberg)

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **123** Type: **not specified**

Fate of the Electroweak Symmetry in the Early Universe in Multi-Higgs models

Tuesday, 21 September 2021 11:45 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: OLEA ROMACHO, Maria Olalla (T (Phenomenology))

Presenter: OLEA ROMACHO, Maria Olalla (T (Phenomenology))

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **124** Type: **not specified**

Towards automated SM NLO corrections for all colliders

Wednesday, 22 September 2021 15:05 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: BREDT, Pia (T (Phenomenology))

Presenter: BREDT, Pia (T (Phenomenology))

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **125** Type: **not specified**

Cosmology from GW.

Thursday, 23 September 2021 14:30 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: STEER, Danièle

Session Classification: Plenary Sessions

Contribution ID: **126** Type: **not specified**

Is the Hubble Tension Signaling New Physics?

Thursday, 23 September 2021 15:00 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: FREEDMAN, Wendy

Session Classification: Plenary Sessions

Contribution ID: **127** Type: **not specified**

New developments in indirect dark matter searches.

Thursday, 23 September 2021 15:30 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: SLATYER, Tracy

Session Classification: Plenary Sessions

Contribution ID: **128** Type: **not specified**

Stringy cosmology and DM.

Thursday, 23 September 2021 16:30 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: REECE, Matthew

Session Classification: Plenary Sessions

Contribution ID: **129** Type: **not specified**

Axions from the cosmos to the laboratory.

Thursday, 23 September 2021 17:00 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: SAFDI, Ben

Session Classification: Plenary Sessions

Contribution ID: **130** Type: **not specified**

Future CMB Probes of the Dark Universe.

Thursday, 23 September 2021 17:30 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: GREEN, Daniel

Session Classification: Plenary Sessions

Contribution ID: **131** Type: **not specified**

Statistics of Axion Physics in the Landscape

Friday, 24 September 2021 11:00 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: CICOLI, Michele

Session Classification: Plenary Sessions

Contribution ID: **132** Type: **not specified**

Dark energy and gravitational waves.

Friday, 24 September 2021 11:30 (30 minutes)

Do you wish to attend the workshop on-site?

Summary

Presenter: VERNIZZI, Filippo

Session Classification: Plenary Sessions

Contribution ID: **133** Type: **not specified**

Recent Discoveries on Very High Energy Emission from GRBs.

Friday, 24 September 2021 12:00 (30 minutes)

Presenter: TAYLOR, Andrew

Session Classification: Plenary Sessions

Contribution ID: **136** Type: **not specified**

The anomaly that was not meant IIB

Wednesday, 22 September 2021 14:40 (20 minutes)

Type IIB supergravity famously has a discrete duality group, which is an exact symmetry of the full type IIB string theory. This symmetry has potential quantum anomalies, which could render the theory inconsistent. In this talk I will describe how we computed these anomalies in recent work, and show they are nonvanishing, but remarkably, they can be cancelled by a subtle modification of the IIB Chern-Simons term in what amounts to a new variant of the Green-Schwarz mechanism. This can only happen because of some "miraculous cancellations" that depend on the details of the IIB supergravity spectrum. I will also describe alternative ways to cancel this anomaly, presenting variant versions of IIB string theory which have the same IIB supergravity as the low-energy limit, but which differ at the nonperturbative level. These theories may or may not be in the Swampland.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: MONTERO, Miguel (Harvard)

Presenter: MONTERO, Miguel (Harvard)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **137** Type: **not specified**

Double Descent and Contrastive Learning

Tuesday, 21 September 2021 10:20 (15 minutes)

N/A

Do you wish to attend the workshop on-site?

Summary

Primary author: GUIDETTI, Veronica (T (Cosmology))

Presenter: GUIDETTI, Veronica (T (Cosmology))

Session Classification: Parallel Session: Phenomenology

Track Classification: Particle Phenomenology

Contribution ID: **138** Type: **not specified**

Correlators from unitarity in 1D CFT

Tuesday, 21 September 2021 11:45 (15 minutes)

In this brief talk I will show how to compute the CFT data and the four-point function in 1D CFTs from unitarity. First I will review the OPE inversion formula, which allows to recover the spectrum and OPE coefficients from the double discontinuity of a Regge bounded four-point function. Then I will explain how to use it to find the CFT data in a perturbative expansion around Generalized Free Field theory. In particular, I will focus on the computation of the contact diagram in theory up to one loop.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: BONOMI, Davide (London City College)

Presenter: BONOMI, Davide (London City College)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **139** Type: **not specified**

Towards Celestial Holography

Friday, 24 September 2021 09:15 (20 minutes)

Universal relationships between asymptotic symmetries, QFT soft theorems, and low energy observables have reinvigorated attempts at formulating a holographic correspondence for flat spacetimes. In this talk, I will review recent advances in the celestial holography proposal, where the 4d S-matrix is reconsidered as a 2d correlator on the celestial sphere at null infinity.

Do you wish to attend the workshop on-site?

no

Summary

Primary author: DONNAY, Laura (Vienna)

Presenter: DONNAY, Laura (Vienna)

Session Classification: Parallel Sessions: String & Mathematical Physics

Track Classification: Strings & Mathematical Physics

Contribution ID: **140** Type: **not specified**

Dark Photon and CMB data in our inhomogeneous universe

Tuesday, 21 September 2021 09:30 (20 minutes)

…

Do you wish to attend the workshop on-site?

no

Summary

Primary author: CAPUTO, Andrea (Tel Aviv University and Weizmann Institute)

Presenter: CAPUTO, Andrea (Tel Aviv University and Weizmann Institute)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **142** Type: **not specified**

Cosmological tensions: hints for a new concordance model?

Thursday, 23 September 2021 11:15 (20 minutes)

Do you wish to attend the workshop on-site?

no

Summary

Primary author: DI VALENTINO, Eleonora (Durham University)

Presenter: DI VALENTINO, Eleonora (Durham University)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **143** Type: **not specified**

Uniting low-scale leptogenesis mechanisms

Friday, 24 September 2021 09:15 (20 minutes)

Do you wish to attend the workshop on-site?

no

Summary

Primary author: KLARIC, Juraj (É. P. F. de Lausanne)

Presenter: KLARIC, Juraj (É. P. F. de Lausanne)

Session Classification: Parallel Sessions: Cosmology

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **144** Type: **not specified**

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Session Classification: Parallel Sessions: Cosmology