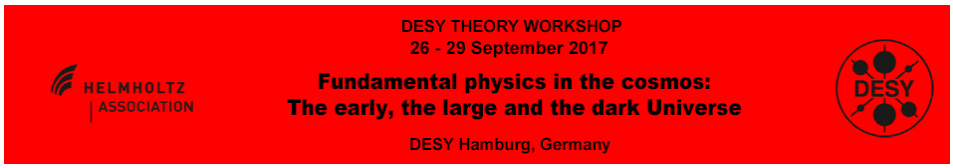
Fundamental physics in the cosmos: The early, the large and the dark Universe



Report of Contributions

https://indico.desy.de/e/17479

Contribution ID: **0** Type: **not specified**

Welcome

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

Leptogenesis via Weinberg operator

Wednesday 27 September 2017 16:22 (17 minutes)

The simplest description of Majorana neutrino masses is the dimension-5 lepton-number-violating Weinberg operator. It automatically provides out-of-equilibrium dynamics in the early Universe due to the suppression of neutrino masses. Three Sakharov conditions are satisfied if there is a CP-violating phase transition. The latter is strongly motivated by the breaking of some underlying symmetries, such as the B-L symmetry and flavour symmetries. During the phase transition, the coupling of Weinberg operator is time-dependent, and the lepton asymmetry is generated by the interference of Weinberg operator at different times. This mechanism differs from classical leptogenesis as a specific seesaw model, and its UV completion, need not be specified.

Primary author: Dr ZHOU, Ye-Ling (IPPP Durham)

Co-authors: Dr TURNER, Jessica (Fermilab & IPPP Durham); Prof. PASCOLI, Silvia (IPPP Durham)

Presenter: Dr ZHOU, Ye-Ling (IPPP Durham)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Baryogenesis

Track Classification: Cosmology & Astroparticle Physics

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

First SUSY results with GAMBIT

Wednesday 27 September 2017 14:00 (17 minutes)

I will give a brief introduction to the public software package GAMBIT (the Global and Modular Beyond-the-Standard-Model Inference Tool) and present the first SUSY results from the BSM science programme currently being pursued with it. We have performed global fit analyses of both GUT-scale and weak-scale parameterisations of the MSSM. Our analyses improve on existing results in terms of the number of observables included, the level of detail in the treatment of these, and the employed scanning techniques.

Primary author: KVELLESTAD, Anders (Nordita)

Presenter: KVELLESTAD, Anders (Nordita)

Session Classification: Parallel Session: Particle Phenomenology - 1a

Track Classification: Particle Phenomenology

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

PROBING OF STRONG INTERACTIONS AND HADRON MATTER WITH CHARMONIUM-LIKE STUDIES

Wednesday 27 September 2017 16:56 (17 minutes)

The spectroscopy of charmonium-like mesons with masses above the DD\bar threshold has been full of surprises, and their nature remains poorly understood [1]. The currently most compelling theoretical descriptions of the mysterious XYZ mesons attributes them to higher lying charmonium states [2], hybrid structure with a tightly bound diquark [3, 4] or a tetraquark [3, 5] core that strongly couples to S-wave D*D*\bar molecule-like structures. In this picture, the production of a XYZ particle in high energy hadron collisions and its decays into light hadron plus charmonum final states proceed via the core component of the meson, while decays to pairs of open charmed mesons proceed via the D*D*\bar component. Until now charmonium-like spectroscopy represents a good testing tool for the theories of strong interactions, including: QCD in both the perturbative and non perturbative regimes, LQCD, potential models and phenomenological models [6 - 8]. The experiments with antiproton-proton annihilation planned at FAIR and proton-proton collisions planned at NICA are well suited for a comprehensive spectroscopy program, in particular, the spectroscopy of charmonium-like exotic states. These states can be produced abundantly in both processes, and their properties can be studied in detail
[6 - 8]. This research is of great importance in hadron physics and astrophysics.

References

[1] S.L. Olsen, Front. Phys. 10, (2015) 101401
[2] M.Yu. Barabanov, A.S. Vodopyanov, S.L. Olsen, Physics of Atomic Nuclei, V.77, N.1, (2014) 126
[3] M.Yu. Barabanov, A.S. Vodopyanov, S.L. Olsen , Physica Scripta, T 166 (2015) 014019
[4] S. Takeuchi, K. Shimizu, M. Takizawa, Prog. Theor. Exp. Phys (2015) 079203
[5] A. Esposito, A. Pilloni, A.D. Polosa, arXiv:1603.07667 [hep-ph]
[6] W. Erni et al., arXiv:0903.3905v1 [hep-ex] (2009) 63
[7] N. Brambilla et al., European Physical Journal C 71:1534, (2011) 1
[8] J. Beringer et al., Review of Particle Physic, Physical. Review, D 86, (2012)

Primary author: Dr MIKHAIL, Barabanov (JINR)

Presenter: Dr MIKHAIL, Barabanov (JINR)

Session Classification: Parallel Session: Particle Phenomenology - 2a

Track Classification: Particle Phenomenology

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

Simplified models for dark matter direct detection at one loop

Thursday 28 September 2017 14:00 (17 minutes)

Given the stringent upper limits from direct detection experiments, one possibility is that dark matter scatters with nuclei only at the loop level. In the first part of the talk, I will discuss direct detection signals of simplified models. We impose current limits and analyse how next generation experiments can constrain the dark matter parameter space. In the second part, I analyse the case of a fermion singlet, where neutrino masses can be easily generated at one loop. I will present the results of our study of the phenomenology of the model, including lepton flavour violating processes.

Primary author: Dr HERRERO GARCIA, Juan (University of Adelaide, CoEPP)

Presenter: Dr HERRERO GARCIA, Juan (University of Adelaide, CoEPP)

Session Classification: Parallel Session: Particle Phenomenology 1a

Track Classification: Particle Phenomenology

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

Precise Higgs mass calculations in supersymmetry

Wednesday 27 September 2017 14:17 (17 minutes)

In several supersymmetric (SUSY) models the Higgs mass is predicted to be smaller than the Z boson mass. Therefore, in order for a SUSY model to predict the correct Higgs mass of 125 GeV, large loop corrections are required. Such large loop corrections are achieved in scenarios with large stop masses and/or a large stop mixing. However, the large loop corrections lead to a slow convergence of the perturbation series and therefore to a large truncation error.

In this talk I present different approaches to calculate the lightest CP-even Higgs mass in the MSSM and compare their precision. Afterwards, FlexibleEFTHiggs is presented, a general method to resum large logarithmic corrections and at the same time include all non-logarithmic 1-loop terms. FlexibleEFTHiggs therefore provides a precise Higgs mass prediction for both small and large SUSY masses.

Primary author: Dr VOIGT, Alexander (RWTH Aachen)

Co-authors: Prof. STÖCKINGER, Dominik (TU Dresden); Dr PARK, Jae-hyeon (KIAS); Dr ATHRON, Peter (COEPP); Mr STEUDTNER, Tom (University of Sussex)

Presenter: Dr VOIGT, Alexander (RWTH Aachen)

Session Classification: Parallel Session: Particle Phenomenology - 1a

Track Classification: Particle Phenomenology

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

Primordial black holes from inflaton and spectator field perturbations in a matter-dominated era

Thursday 28 September 2017 16:56 (17 minutes)

We study production of primordial black holes (PBH) during an early matter-dominated phase. As a source of perturbations, we consider either the inflaton field with a running spectral index or a spectator field that has a blue spectrum and thus provides a significant contribution to the PBH production at small scales. First, we identify the region of the parameter space where a significant fraction of the observed dark matter can be produced, taking into account all current PBH constraints. Then, we present constraints on the amplitude and spectral index of the spectator field as a function of the reheating temperature. We also derive constraints on the running of the inflaton spectral index, which are comparable to those from the Planck satellite for a scenario where the spectator field is absent.

Primary author: Dr TENKANEN, Tommi (Queen Mary University of London)

Co-authors: Prof. CARR, Bernard (Queen Mary University of London); Dr VASKONEN, Ville (Estonian National Institute of Chemical Physics and Biophysics)

Presenter: Dr TENKANEN, Tommi (Queen Mary University of London)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

A new search for simplified models of dark matter at the LHC

Thursday 28 September 2017 14:34 (17 minutes)

We introduce a new set of simplified models to address the effects of 3-point interactions between the dark matter particle, its dark co-annihilation partner, and the Standard Model degree of freedom, which we take to be the tau lepton. We investigate these effects as well as the discovery potential for dark matter co-annihilation partners at the LHC. A small mass splitting between the dark matter and its partner is preferred by the co-annihilation mechanism and suggests that the co-annihilation partners may be long-lived (stable or meta-stable) at collider scales. It is argued that such long-lived electrically charged particles can be looked for at the LHC in searches of anomalous charged tracks.

Primary authors: PLASCENCIA, Alexis (Durham University, IPPP); SAKURAI, Kazuki (Warsaw University); KHOZE, Valentin (Durham University, IPPP)

Presenter: PLASCENCIA, Alexis (Durham University, IPPP)

Session Classification: Parallel Session: Particle Phenomenology 1a

Track Classification: Particle Phenomenology

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

Constraining warm inflation from the Planck data

Thursday 28 September 2017 16:22 (17 minutes)

The dissipative mechanism in warm inflation scenario can provide the inflating universe with a warm exit to the radiation dominated era rather than a supercooled exit to a reheating phase. In this work, we constrain the model parameters for warm inflation from Planck 2015 data. In addition, the reheating era can be optimized by varying the number of e-folds of inflation. Best fit values for the model parameters are estimated with and without the contribution to fluctuation from thermal excitations.

Primary author: Ms BHATTACHARYA, Sukannya (Saha Institute of Nuclear Physics)

Co-authors: Prof. DUTTA, Koushik (Saha Institute of Nuclear Physics); Prof. BASTERO GIL, Mar (University of Granada)

Presenter: Ms BHATTACHARYA, Sukannya (Saha Institute of Nuclear Physics)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Spectral features from light dark matter decay via gravity portal interactions

Wednesday 27 September 2017 15:26 (16 minutes)

One of the key properties of dark matter particles is their longevity. However, even if dark matter is absolutely stable against decay in flat spacetime, as commonly assumed in the literature, the presence of nonminimal couplings to gravity of the dark matter field can spoil this stability in curved spacetime, with potentially remarkable phenomenological implications. More specifically, a scalar dark matter candidate with a mass in the MeV-GeV range, destabilized through a linear coupling to the Ricci scalar, can decay into electron-positron pairs and photons. In this case, observations of the cosmic microwave background by the Planck satellite and of the extragalactic isotropic gamma-ray background by COMPTEL, EGRET and Fermi LAT can be used to constrain the size of the nonminimal coupling parameter.

Primary authors: IBARRA, Alejandro (TU of Munich); CATÀ, Oscar (LMU, Munich); INGENHÜTT, Sebastian (TU of Munich and MPP, Munich)

Presenter: INGENHÜTT, Sebastian (TU of Munich and MPP, Munich)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Higgsino Dark Matter at Collider

Thursday 28 September 2017 14:51 (17 minutes)

The Higgsino is the most promising candidate for the dark matter.
The almost pure Higgsino, however, is known to be a very challenging target at the LHC.
I will show that improvement of tracking technique of disappearing tracks can significantly increase the sensitivity for the Higgsino.
I will also discuss a future 33 TeV collider can probe the 1 TeV Higgsino, which is the most interesting for the thermal relic density.

Primary author: SHIRAI, Satoshi (Kavli IPMU)

Co-authors: FUKUDA, Hajime (Kavli IPMU); OTONO, Hidetoshi (Kyushu University); NAGATA, Natsumi (University of Tokyo)

Presenter: SHIRAI, Satoshi (Kavli IPMU)

Session Classification: Parallel Session: Particle Phenomenology 1a

Track Classification: Particle Phenomenology

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

Primordial black hole constraints for extended mass functions

Thursday 28 September 2017 16:22 (17 minutes)

I will discuss the cosmological and astrophysical constraints on the fraction of the dark matter in primordial black holes (PBHs). First, I will describe a general method for extracting constraints for extended PBH mass functions from those for monochromatic ones, demonstrating that the constraints become more stringent in the extended case than the monochromatic one [1]. Then, I will discuss the production of PBH binaries and the projected constraints on PBH abundance from non-detection of the resulting stochastic gravitational wave background [2].

[1] B. Carr, M. Raidal, T. Tenkanen, V. Vaskonen and H. Veermäe, arXiv:1705.05567.
[2] M. Raidal, V. Vaskonen and H. Veermäe, arXiv:1707.01480.

Primary author: Dr VASKONEN, Ville (NICPB)

Presenter: Dr VASKONEN, Ville (NICPB)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

Electroweak Vacuum Stability During and After Inflation

Thursday 28 September 2017 14:51 (17 minutes)

Currently favoured values of the Standard Model parameters show that the model can be consistently extended all the way up to the Planck scale. The only required new physics at high energies being inflation. However, those values also indicate that at high energies the SM potential might have another, much deeper negative minimum. We show, that apparent negative states do not exclude high energy inflation. The compulsory Higgs-inflaton interactions can stabilise the vacuum. And even if the same interactions tend to destabilise it via the resonant Higgs production after inflation, we show that there is a large parameter space where this can be avoided.

Primary author: Dr KARČIAUSKAS, Mindaugas (University of Jyväskylä)

Presenter: Dr KARČIAUSKAS, Mindaugas (University of Jyväskylä)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation

Track Classification: Cosmology & Astroparticle Physics

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

Hunting the dark Higgs

Thursday 28 September 2017 15:08 (17 minutes)

I will discuss a novel signature of dark matter production at the LHC resulting from the emission of an additional Higgs boson in the dark sector. The presence of such a dark Higgs boson is motivated simultaneously by the need to generate the masses of the particles in the dark sector and the possibility to relax constraints from the dark matter relic abundance by opening up a new annihilation channel. If the dark Higgs boson decays into Standard Model states via a small mixing with the Standard Model Higgs boson, one obtains characteristic large-radius jets in association with missing transverse momentum that can be used to efficiently discriminate signal from backgrounds. I will present the sensitivities achievable in LHC searches for dark Higgs bosons with already collected data and demonstrate that such searches can probe large regions of parameter space that are inaccessible to conventional mono-jet or di-jet searches.

Primary author: DUERR, Michael (DESY)

Presenter: DUERR, Michael (DESY)

Session Classification: Parallel Session: Particle Phenomenology 1a

Track Classification: Particle Phenomenology

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

A new halo independent approach for direct dark matter searches

Wednesday 27 September 2017 14:00 (17 minutes)

Recent results from N-body simulations point towards the existence of non-virialized structures in the dark matter halo. This weakens the assumptions of the Standard Halo Model and increases the need for ways to analyze results of direct dark matter searches without specifying a halo model. We propose a numerical method that compares an arbitrary number of results from direct detection experiments and neutrino telescopes and quantifies the compatibility of those results in a halo independent way. It takes into account the changing alignment of the earth's velocity with respect to the sun's over the course of the year. When applying our numerical method to experimental data, we find that it is important to take into account the impact of the velocity distribution on the interpretation of direct dark matter searches.

Primary author: Mr RAPPELT, Andreas (Technische Universität München)

Co-author: Prof. IBARRA, Alejandro (Technische Universität München)

Presenter: Mr RAPPELT, Andreas (Technische Universität München)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Testing Modified Gravity with Merging Neutron Stars

Thursday 28 September 2017 16:56 (17 minutes)

The recent first direct detection of gravitational waves by the Laser Interferometer Gravitational-Wave Observatory (LIGO) has marked the dawn of a new era for probing the theory of general relativity (GR) as well as possible modifications of it. To test gravity at extreme conditions, current and future gravitational wave detectors are targeted to explore merging binary systems of black holes and/or neutron stars. Motivated by this, we study the final stages of evolution of a neutron star binary system and investigate how modifications of GR can effect the emitted gravitational wave signal. Already for the simplest $f(R)$ theory of modified gravity, R^2 gravity, we find characteristic features in the gravitational wave signal that make it clearly distinguishable from the one in GR and that should be detectable with LIGO.

Primary authors: Dr ZHANG, Jun (York University / Perimeter Institute); Dr SAGUNSKI, Laura (York University / Perimeter Institute); Prof. LEHNER, Luis (Perimeter Institute); Prof. SAKELLARIADOU, Mairi (King's College London); Prof. JOHNSON, Matthew (York University / Perimeter Institute)

Presenter: Dr SAGUNSKI, Laura (York University / Perimeter Institute)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Probing inflationary primordial black holes for the LIGO gravitational wave events

Thursday 28 September 2017 17:13 (17 minutes)

Primordial black holes (PBHs) are one of the candidates to explain the gravitational wave (GW) signals observed by the LIGO detectors. Among several phenomena in the early Universe, cosmic inflation is a major example to generate PBHs. In this case, the primordial curvature perturbation should be large enough to generate a sizable amount of PBHs, and thus we have several other probes to test this scenario. We point out that the current pulsar timing array (PTA) experiments already put severe constraints on GWs generated via the second-order effects, and that the observation of the cosmic microwave background (CMB) offers tight bounds on its small-scale distortions, such as mu-distortion. In particular, for simple inflation models, it is found that the scalar power spectrum should have a sharp peak at k ~ 10^6 Mpc^-1 to fulfill the required abundance of PBHs while evading constraints from the PTA experiments and the mu-distortion.

Primary author: Dr MUKAIDA, Kyohei (Kavli IPMU)

Presenter: Dr MUKAIDA, Kyohei (Kavli IPMU)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

Direct Detection of Ultralight Dark Matter

Thursday 28 September 2017 15:25 (17 minutes)

Ultralight bosonic particle is one of the dark matter and called fuzzy dark matter.
Its astrophysical properties are interesting and have been recently studied.
On the other hand, the detection method is less discussed. We propose a new method to detect them using the motions of heavenly bodies.

(This is a work in progress)

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Co-authors: MATSUMOTO, Shigeki (Kavli IPMU); YANAGIDA, Tsutomu (Kavli IPMU)

Presenter: Mr FUKUDA, Hajime (Kavli IPMU)

Session Classification: Parallel Session: Particle Phenomenology 1a

Track Classification: Particle Phenomenology

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

Gravitational Wave Oscillations in Bigravity

Thursday 28 September 2017 17:47 (17 minutes)

With the first detection of a gravitational wave signal in September 2015 by the LIGO collaboration, a new era in physics has begun. Gravitational wave astronomy allows us to probe the contents and properties of our Universe in a completely new manner, accessing so far inaccessible scales and phenomena.

In this talk I will present one such phenomenon, dubbed gravitational wave oscillations, which, in full analogy to neutrino oscillations, arises in theories of multi-metric gravity, where the matter and propagation bases do not coincide. It is illustrated how the presence of more than one tensor field modifies the wave form observed in a detector on the Earth and how this can be used to put constraints on the parameter space of the model.

Primary author: Mr PLATSCHER, Moritz (Max-Planck-Institut fuer Kernphysik)

Co-authors: Dr SMIRNOV, Juri (INFN divisione di Firenze); Mr MAX, Kevin (Scuola Normale Superiore)

Presenter: Mr PLATSCHER, Moritz (Max-Planck-Institut fuer Kernphysik)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Dark-Matter Bound States

Thursday 28 September 2017 14:00 (17 minutes)

I will discuss the importance of bound-state formation in the dark matter sector.
On the one hand as we have shown in a recent publication, the effect of unstable bound states is crucial for the correct computation of WIMP relic abundances. On the other hand capture photon detection from late time bound state formation will provide a new search method for heavy, multi-TeV dark matter. I will present for the first time, WIMP annihilation spectra containing information about the gauge group structure.
Additionally, I will demonstrate that dark matter as a composite state of new heavy fermions is well motivated theoretically and present methods to study the relic abundance and detection signals in the composite models.

Primary author: Dr SMIRNOV, Juri (INFN Firenze)

Co-authors: Prof. STRUMIA, Alessandro (CERN and Pisa University); Mr MITRIDATE, Andrea (Pisa Scuola Normale); Dr REDI, Michele (INFN Firenze)

Presenter: Dr SMIRNOV, Juri (INFN Firenze)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Loop effects in QED in the presence of a Schwarzschild black hole

Thursday 28 September 2017 16:39 (17 minutes)

Black holes can manifest themselves in local electromagnetic phenomena. This appears to be a consequence of the formation of the event horizon. In this talk, we shall discuss several local imprints of black holes in the far-from- and near-horizon region.

Primary author: Dr EMELYANOV, Viacheslav (Karlsruhe Institute of Technology, Institute of Theoretical Physics)

Presenter: Dr EMELYANOV, Viacheslav (Karlsruhe Institute of Technology, Institute of Theoretical Physics)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

Dark matter constraints from antiprotons in the light of AMS-02

Wednesday 27 September 2017 16:05 (17 minutes)

I will discuss the implication for dark matter (DM) indirect searches of the recent precise measurements of cosmic-ray (CR) antiprotons from AMS-02 .
With respect to previous works we use a new updated CR propagation model
consistent with the AMS-02 data.
Furthermore, we fit at the same time, in a self-consistent way,
both DM and the propagation parameters.
We find a significant indication of a DM signal for DM masses near 80 GeV,
which, interestingly, is also compatible with the similar excess present in the Galactic center in gamma rays. Possible systematic effects will be also discussed.
In terms of DM exclusion limits, we find stringent constraints a factor of 4-5
stronger than limits from gamma-ray observations of dwarf galaxies.

Primary author: Dr CUOCO, Alessandro (RWTH Aachen TTK)

Presenter: Dr CUOCO, Alessandro (RWTH Aachen TTK)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Measuring mediator masses with low-threshold direct detection experiments

Wednesday 27 September 2017 14:17 (17 minutes)

One of the simplest particle physics realizations of self-interacting dark matter is a WIMP interacting with a MeV-scale scalar mediator. While this scenario is already largely excluded for dark matter masses above ~5 GeV by null searches from various direct detection experiments, future low-threshold detectors such as CRESST and CDMS could be sensitive to so far unexplored regions of the parameter space in which the WIMP has a mass of only a few GeV. In this talk I will demonstrate that by combining spectral information from several targets, these future experiments could be able to simultaneously reconstruct both the dark matter and mediator mass, and thereby offer the exciting possibility to probe astrophysical properties of dark matter using direct detection searches.

Primary author: Dr WILD, Sebastian (DESY)

Presenter: Dr WILD, Sebastian (DESY)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Belle-II sensitivity for axion-like particles

Thursday 28 September 2017 14:17 (17 minutes)

Light pseudoscalars interacting dominantly with Standard Model
gauge bosons (so-called axion-like particles or ALPs) occur frequently in extensions of the Standard Model. There is consequently a great interest in searches for ALPs both at the energy frontier and at the intensity frontier. In my talk I will review these different strategies and present an overview of existing constraints. I will then discuss the potential impact of Belle-II, which can search for both visibly and invisibly decaying ALPs. The latter case allows to explore an interesting class of dark matter models, in which ALPs mediate the
interactions between the Standard Model and dark matter.

Primary author: Dr KAHLHOEFER, Felix (DESY)

Presenter: Dr KAHLHOEFER, Felix (DESY)

Session Classification: Parallel Session: Particle Phenomenology 1a

Track Classification: Particle Phenomenology

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

Higgs Dynamics During And After Inflation

Thursday 28 September 2017 15:08 (17 minutes)

Current measurements of the Higgs boson and top quark mass favor metastability of the electroweak vacuum in the Standard Model. This raises some questions when we consider the evolution of our universe: how the Higgs ended up in such an energetically disfavored state? Why it remained there during inflation? These problems can be addressed by assuming that the Higgs couples directly to the inflaton and/or interacts non-minimally with gravity. In this talk I will review the effects of these interactions on the dynamics of the Higgs field during the inflationary period and the subsequent period of particle production, namely reheating. I will show that there exists a favorable range of parameters that allows to explain why the Higgs remained in the electroweak vacuum during the evolution of the universe.

Primary author: ZATTA, Marco (University of Helsinki)

Presenter: ZATTA, Marco (University of Helsinki)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation

Track Classification: Cosmology & Astroparticle Physics

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

Sensitivity of the triple Higgs coupling to heavy sterile neutrinos

Wednesday 27 September 2017 14:34 (17 minutes)

Massive neutrinos are required to explain the observation of neutrino oscillations. One of the simplest extension of the Standard Model that can successfully generate neutrino masses and mixing is the addition of fermionic gauge singlets or heavy sterile neutrinos. If an approximate lepton number symmetry is present, these sterile neutrinos can have a mass close to the TeV-scale with large Yukawa couplings, leading to a rich phenomenology. In a first study, we showed that they can induce corrections to the triple Higgs coupling as large as 30% in a simplified 3+1 model with Dirac neutrinos. These effects are potentially larger in low-scale seesaw models, as we showed by considering the inverse seesaw. I will discuss how fermionic singlets induce large corrections to the triple Higgs coupling and how they can be used to probe neutrino mass models in a regime otherwise difficult to access.

Primary authors: Dr WEILAND, Cedric (IPPP Durham University); Dr BAGLIO, Julien (ITP University of Tübingen)

Presenter: Dr WEILAND, Cedric (IPPP Durham University)

Session Classification: Parallel Session: Particle Phenomenology - 1a

Track Classification: Particle Phenomenology

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

Testing the low scale seesaw and leptogenesis

Wednesday 27 September 2017 16:05 (17 minutes)

Heavy neutrinos with masses below the electroweak scale can simultaneously generate the light neutrino masses via the seesaw mechanism and the baryon asymmetry of the universe via leptogenesis. The requirement to explain these phenomena imposes constraints on the mass spectrum of the heavy neutrinos, their flavour mixing pattern and their CP properties. We first combine bounds from different experiments in the past to map the viable parameter regions in which the minimal low scale seesaw model can explain the observed neutrino oscillations, while being consistent with the negative results of past searches for physics beyond the Standard Model. We then study which additional predictions for the properties of the heavy neutrinos can be made based on the requirement to explain the observed baryon asymmetry of the universe. Finally, we comment on the perspectives to find traces of heavy neutrinos in future experimental searches at the LHC, NA62, BELLE II, T2K, SHiP or a future high energy collider, such as ILC, CEPC or FCC-ee. If any heavy neutral leptons are discovered in the future, our results can be used to assess whether these particles are indeed the common origin of the light neutrino masses and the baryon asymmetry of the universe. If the magnitude of their couplings to all Standard Model flavours can be measured individually, and if the Dirac phase in the lepton mixing matrix is determined in neutrino oscillation experiments, then all model parameters can in principle be determined from this data. This makes the low scale seesaw a fully testable model of neutrino masses and baryogenesis.

Primary author: Mr KLARIĆ, Juraj (Technical University Munich)

Presenter: Mr KLARIĆ, Juraj (Technical University Munich)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Baryogenesis

Track Classification: Cosmology & Astroparticle Physics

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

CMB constraints on the inflaton couplings in α-attractor models

Thursday 28 September 2017 14:00 (17 minutes)

We show that the parameter space of single field models of inflation contains viable regions in which the inflaton couplings to radiation can be determined from the properties of CMB temperature fluctuations, in particular the spectral index. This may be the only way to measure these fundamental microphysical parameters, which shaped the universe by setting the initial temperature of the hot big bang and contain important information about the embedding of a given model of inflation into a more fundamental theory of physics. We apply the method to α-attractor models in which the inflaton couples to other scalars or fermions.

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Presenter: Dr DREWES, Marco (Université catholique de Louvain)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation

Track Classification: Cosmology & Astroparticle Physics

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

Charged Composite Scalar Dark Matter

Thursday 28 September 2017 14:17 (17 minutes)

We consider a composite model where both the Higgs and a complex scalar χ, which is the Dark Matter (DM) candidate, arise as light pseudo Nambu-Goldstone bosons (pNGBs) from a strongly coupled sector with TeV scale confinement. The global symmetry structure is SO(7)/SO(6), and the DM is charged under an exact U(1) DM $\subset$ SO(6) that ensures its stability. Depending on whether the χ shift symmetry is respected or broken by the coupling of the top quark to the strong sector, the DM can be much lighter than the Higgs or have a weak-scale mass. Here we focus primarily on the latter possibility. We introduce the lowest-lying composite resonances and impose calculability of the scalar potential via generalized Weinberg Sum Rules. Compared to previous analyses of pNGB DM, the computation of the relic density is improved by fully accounting for the effects of the fermionic top partners. This plays a crucial role in relaxing the tension with the current DM direct detection constraints. The spectrum of resonances contains exotic top partners charged under the U(1) DM , whose LHC phenomenology is analyzed. We identify a region of parameters with f = 1.4 TeV and 200 GeV < mχ < 400 GeV that satisfies all existing bounds. This DM candidate will be tested by XENON1T in the near future.

Primary author: Mr RUHDORFER, Maximilian (Technische Universität München)

Co-authors: Prof. WEILER, Andreas (Technische Universität München); Dr SALVIONI, Ennio (Technische Universität München); Mr BALKIN, Reuven (Technische Universität München)

Presenter: Mr RUHDORFER, Maximilian (Technische Universität München)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

The ALP miracle: unified inflaton and dark matter

Thursday 28 September 2017 16:39 (17 minutes)

We propose a scenario where both inflation and dark matter are described by a single axion-like particle (ALP) in a unified manner. In a class of the minimal axion hilltop inflation, the effective masses at the maximum and minimum of the potential have equal magnitude but opposite sign, so that the ALP inflaton is light both during inflation and in the true vacuum. After inflation, most of the ALPs decay and evaporate into plasma through a coupling to photons, and the remaining ones become dark matter. We find that the observed CMB and matter power spectrum as well as the dark matter abundance point to an ALP of mass mφ = O(0.01)-O(0.1)eV and the axion-photon coupling gφγγ = O(10^{−11})GeV^{−1}: the ALP miracle. The suggested parameter region is within the reach of the next generation axion helioscope, IAXO, and high-intensity laser experiments in the future. Furthermore, thermalized ALPs contribute to hot dark matter and its abundance is given in terms of the effective number of extra neutrino species, ΔNeff ⊠ 0.03, which can be tested by the future CMB and BAO observations.

Primary author: Dr YIN, Wen (IHEP in Chinese Academy of Sciences)

Co-authors: Prof. TAKAHASHI, Fuminobu (Department of Physics, Tohoku University); Mr DAIDO, Ryuji (Department of Physics, Tohoku University)

Presenter: Dr YIN, Wen (IHEP in Chinese Academy of Sciences)

Session Classification: Parallel Session: Particle Phenomenology 1b

Track Classification: Particle Phenomenology

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

Effects of equation of state in the Standard Model on the primordial gravitational wave spectrum

Thursday 28 September 2017 17:30 (17 minutes)

The existence of relic gravitational waves (GWs) is one of the most important predictions of inflationary models, and the knowledge about their detailed spectrum will become indispensable in future direct detection experiments. In this work, we investigate thermodynamic properties of high temperature plasma composed of elementary particles of the Standard Model, and identify how such properties affect the spectrum of primordial GWs. The evolution of the equation of state of radiations with interacting particles is estimated based on the latest results of perturbative and non-perturbative calculations, and the effective degrees of freedom for the energy density and the entropy density as a function of temperature are obtained. After obtaining the effective degrees of freedom, we numerically compute the spectrum of GWs by taking account of the evolution of the Standard Model equation of state. It is shown that the spectrum of GWs at high frequencies is corrected due to the effect of particle interactions, and that such corrections are relevant to future high sensitivity experiments.

Primary author: SAIKAWA, Ken'ichi (DESY)

Co-author: SHIRAI, Satoshi (Kavli IPMU)

Presenter: SAIKAWA, Ken'ichi (DESY)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Primordial Black-Holes from Critical Higgs Inflation

Thursday 28 September 2017 17:48 (17 minutes)

The question of the origin of the dark matter (DM) remains as one of the most fundamental mysteries of modern physics. LIGO detections may be the first observations of a large population of primordial black-holes (PBHs) that could constitute today the dominant component of the DM. These PBHs arise naturally in models of Critical Higgs Inflation (CHI), where there is a peak in the spectrum associated to the near-critical value of the running of both the Higgs self-coupling and its non-minimal coupling to gravity. The CMB spectrum at large scales of this model is in agreement with Planck-2015 data, with a relatively large tensor-to-scalar ratio that may be detected soon with B-mode polarization experiments. Moreover, it predicts a broad lognormal PBH mass distribution that is consistent with the present constraints on PBH. The stochastic background of gravitational waves coming from the unresolved black-hole-binary mergings could be detected by LISA or PTA. The PBH-CHI scenario opens a new portal to test fundamental physics above the LHC scale.

Primary author: EZQUIAGA, Jose María (Instituto de Física Teórica UAM-CSIC)

Presenter: EZQUIAGA, Jose María (Instituto de Física Teórica UAM-CSIC)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

Extranatural Inflation and CMB observations

Thursday 28 September 2017 15:25 (17 minutes)

The success of a given inflationary model crucially depends upon two features: its predictions for observables such as those of the Cosmic Microwave background (CMB) and its insensitivity to the unknown ultraviolet (UV) physics such as quantum gravitational effects. Extranatural inflation is a well motivated scenario which is insensitive to UV physics by construction. In this five dimensional model, the fifth dimension is compactified on a circle and the zero mode of the fifth component of a bulk U(1) gauge field acts as the inflaton. In this talk, I will present simple variations of the minimal extranatural inflation model which help in improving its CMB predictions while retaining its numerous merits. As will be presented, it is possible to obtain CMB predictions identical to those of e.g. Starobinsky model of inflation and show that this can be done in the most minimal way by having two additional light fermionic species in the bulk, with the same U(1) charges. I would then present the constraints that CMB observations impose on the parameters of the model. Finally, I would comment on the connections of this to the Weak Gravity Conjecture.

Primary author: Dr GOSWAMI, Gaurav (Ahmedabad University)

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Presenter: Dr GOSWAMI, Gaurav (Ahmedabad University)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation

Track Classification: Cosmology & Astroparticle Physics

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

Improved constraints on lepton asymmetry from the \\ cosmic microwave background

Wednesday 27 September 2017 15:08 (17 minutes)

The lepton asymmetry of the Universe is one of the most weakly constrained cosmological parameters. Whereas the
baryon asymmetry is tightly constrained to be at the order $\mathcal{O}(10^{-9})$, the lepton asymmetry could be larger by
many orders of magnitude.

A cosmic lepton asymmetry affects the primordial helium
abundance and the expansion rate of the early Universe. Both of these effects have an impact on the anisotropies of the
cosmic microwave background. We derive constraints on the neutrino chemical potentials from the Planck 2015 data,
assuming equal lepton flavour asymmetries and negligible neutrino masses. Our constraints on the lepton asymmetry are significantly stronger than previous constraints from CMB data analysis and we argue that they are more robust than those from primordial light element abundances. The resulting constraints on the primordial helium and deuterium abundances are consistent with those from direct measurements.

Primary author: Ms OLDENGOTT, Isabel M. (Universität Bielefeld)

Co-author: Prof. SCHWARZ, Dominik J. (Universität Bielefeld)

Presenter: Ms OLDENGOTT, Isabel M. (Universität Bielefeld)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Neutrinos

Track Classification: Cosmology & Astroparticle Physics

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

CP-violation and baryon-asymmetry from varying Yukawas at the weak scale.

Wednesday 27 September 2017 17:13 (17 minutes)

Varying Yukawas open new possibilities for electroweak baryogenesis. In this talk I will focus on the CP-violation and the baryon-asymmetry. Starting from first principles, I will derive the general form of the CP-violating semiclassical force and the diffusion equations for models with varying Yukawa couplings. This represents a very general framework to determine the baryon-asymmetry generated in a given model. I will discuss the necessary ingredients for successful baryogenesis and I will apply this framework to different models and discuss the CP-violation and the amount of baryon-asymmetry produced.

Primary author: Mr BRUGGISSER, Sebastian (DESY Theory-Group)

Presenter: Mr BRUGGISSER, Sebastian (DESY Theory-Group)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Baryogenesis

Track Classification: Cosmology & Astroparticle Physics

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

Primordial Black Holes and Gravitational waves from Axion Inflation

Thursday 28 September 2017 17:30 (18 minutes)

In my talk I discuss the phenomenology of models in which a pseudoscalar inflaton is coupled to some abelian gauge fields. The coupling between the inflaton and the gauge fields induces an instability in the theory which gives rise to a wide range of potentially observable signatures. In particular, I focus on the possibility of generating chiral gravitational waves in the range of direct gravitational wave detectors and primordial black holes which can account for a part (or all) of the dark matter observed in the Universe. The results of this analysis can be used to extract information on the microphysics of inflation.

Primary author: Dr PIERONI, Mauro (Instituto de Fisica Teorica)

Co-authors: Dr MUIA, Francesco (University of Oxford); Dr T. WITKOWSKI, Lukas (APC Paris); Dr DOMCKE, Valerie (APC Paris)

Presenter: Dr PIERONI, Mauro (Instituto de Fisica Teorica)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

The Dark Sequential Z' portal: Collider and Direct Detection Experiments

Thursday 28 September 2017 17:30 (19 minutes)

We revisit the status of a Majorana fermion as a dark matter candidate, when a sequential Z' gauge boson dictates the dark matter phenomenology. Direct dark matter detection signatures rise from dark matter-nucleus scatterings at bubble chamber and liquid xenon detectors, and from the flux of neutrinos from the Sun measured by the IceCube experiment, which is governed by the spin-dependent dark matter-nucleus scattering. On the collider side, LHC searches for dilepton and mono-jet + missing energy signals play an important role. The relic density and perturbativity requirements are also addressed. By exploiting the dark matter complementarity we outline the region of parameter space where one can successfully have a Majorana dark matter particle in light of current and planned experimental sensitivities.

Primary author: Mr CAMPOS, Miguel (Max-Planck-Institut für Kernphysik)

Co-authors: Prof. MASIERO, Antonio (Istituto Nazionale Fisica Nucleare); Dr QUEIROZ, Farinaldo (Max-Planck-Institut für Kernphysik); Dr ARCADI, Giorgio (Max-Planck-Institut für Kernphysik); Prof. LINDNER, Manfred (Max-Planck-Institut für Kernphysik)

Presenter: Mr CAMPOS, Miguel (Max-Planck-Institut für Kernphysik)

Session Classification: Parallel Session: Particle Phenomenology 1b

Track Classification: Particle Phenomenology

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

Displaced vertices from Pseudo-Dirac Dark Matter

Displaced vertices are a striking yet under-exploited signature of beyond-SM physics at the LHC. Pseudo-Dirac DM includes two new Majorana fermions, the lighter of which is a DM candidate. The model gives the correct relic abundance while having a suppressed annihilation and scattering rate today, and without suppressing the LHC production rate. This evades current constraints while offering particularly promising prospects at LHC, especially at the high-luminosity run. Intriguingly, the parameters yielding the correct relic abundance can also yield observable displaced vertices in upcoming runs of the LHC, as the heavier fermion decays into DM plus quarks.

Primary author: Dr JACQUES, Thomas (SISSA)

Co-authors: Mr DAVOLI, Alessandro (SISSA); Dr DE SIMONE, Andrea (SISSA); Dr SANZ, Veronica (University of Sussex)

Presenter: Dr JACQUES, Thomas (SISSA)

Track Classification: Particle Phenomenology

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

Cosmological neutrino weighing with the next generation of surveys

Wednesday 27 September 2017 14:51 (17 minutes)

Cosmological experiments are exceptionally sensitive to the sum of neutrino masses. Future surveys have the potential to provide a precise measurement of the total neutrino mass, or to establish the neutrino hierarchy. To reliably estimate this, it is crucial to properly account for parameter degeneracies, i.e. how measurements improve or deteriorate with different physical models, such as dynamical dark energy or extra relativistic species. With this in mind, I will present sensitivity forecasts for CMB and LSS surveys, and updated bounds from current data.

Primary author: Mr BRINCKMANN, Thejs (RWTH Aachen)

Co-author: Prof. LESGOURGUES, Julien (RWTH Aachen)

Presenter: Mr BRINCKMANN, Thejs (RWTH Aachen)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Neutrinos

Track Classification: Cosmology & Astroparticle Physics

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

Damping of gravitational waves by matter

Thursday 28 September 2017 17:13 (17 minutes)

We develop a unified description via the Boltzmann equation, of damping of gravitational waves by matter incorporating collisions. We identify two physically distinct damping mechanisms – collisional and Landau damping. Maximal collisional damping of a gravitational wave, independent of the details of the matter collisions is significant only when its wavelength is comparable to the size of the horizon. Thus damping by intergalactic or interstellar matter for all but primordial gravitational radiation can be neglected. Although collisions in matter lead to a shear viscosity, they also act to erase anisotropic stresses, thus suppressing the damping of gravitational waves. Damping of primordial gravitational waves remains possible. We generalize Weinberg's calculation of gravitational wave damping, now including collisions and particles of finite mass and interpret the collisionless limit in terms of Landau damping. We comment on the possible processing of primordial gravitational waves during matter domination in scenarios of ultra-light dark matter.

Primary author: Dr PATIL, Subodh (Niels Bohr Institute)

Presenter: Dr PATIL, Subodh (Niels Bohr Institute)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Realizing the relaxion mechanism with particle production

Thursday 28 September 2017 16:56 (17 minutes)

In this talk I will analyze realizations of the relaxion mechanism in which quantum excitations of an auxiliary field slow down the relaxion and fix the Higgs vev at the electro-weak scale.

Primary author: MORGANTE, Enrico (DESY)

Presenter: MORGANTE, Enrico (DESY)

Session Classification: Parallel Session: Particle Phenomenology 1b

Track Classification: Particle Phenomenology

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

Dealing with axion monodromy and other oscillating inflationary models

Thursday 28 September 2017 16:39 (17 minutes)

Despite the increasingly more precise constraints on the amplitude and tilt of the primordial power spectrum, the shape of the inflaton potential is still largely unconstrained. This allows for potentials with oscillating contributions, such as the string theory motivated axion monodromy inflation. However, dealing with these models is computationally expensive, and as such analytical approximations are generally used. In this talk I will discuss the first fully numerical treatment of axion monodromy inflation using the Boltzmann code CLASS, emphasising the noticeable differences with the analytical methods, as well as presenting the most recent constraints for this model obtained with the Planck data.

Primary author: Ms HOOPER, Deanna C. (RWTH Aachen, TTK Institute)

Co-author: Prof. LESGOURGUES, Julien (RWTH Aachen, TTK Institute)

Presenter: Ms HOOPER, Deanna C. (RWTH Aachen, TTK Institute)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Kinetic decoupling of dark matter: how it affects the relic abundance

Wednesday 27 September 2017 15:08 (17 minutes)

Kinetic interaction (e.g., elastic scatterings) between dark matter particles and those in the thermal bath does not change the dark matter number, but it may affect the relic density of dark matter.
In particular it plays an essential role in determining the relic abundance of strongly interacting massive particles, which may solve issues in the (sub-)galactic structure formation of the conventional cold dark matter model (e.g., weakly interacting massive particles).
In this talk we see how the kinetic interaction can be important for the dark matter freeze-out.
Proposed portals, which kinetically connect the strongly interacting massive particles to the standard model plasma, are also discussed.

Primary author: KAMADA, Ayuki (IBS-CTPU)

Presenter: KAMADA, Ayuki (IBS-CTPU)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Entanglement Entropy in a holographic model for the QCD critical point

Wednesday 27 September 2017 17:13 (17 minutes)

We study a holographic Einstein-Maxwell-dilaton model, which is adjusted to lattice QCD data for 2+1 flavors and physical quark masses for the equation of state and quark number susceptibility at zero baryo-chemical potential, to explore the resulting phase diagram over the temperature-chemical potential plane. A first-order phase transition sets in at a temperature of about 112 MeV and a baryo-chemical potential of 612 MeV. We estimate the accuracy of the critical point position by considering different low-temperature asymptotics for the second-order quark number susceptibility and characterize the phase transition by analyzing the critical pressure and behavior of isentropes.
In addition, we calculate the holographic entanglement entropy for this model and compare its phase diagram to that of the thermodynamic entropy and find a strong agreement in the vicinity of the critical point. Thus, the holographic entanglement entropy qualifies to characterize different phase structures. The scaling behavior near the critical point is analyzed through the calculation of critical exponents.

Primary author: Mr KNAUTE, Johannes (Technische Universität Dresden, Helmholtz-Zentrum Dresden-Rossendorf)

Co-author: Prof. KÄMPFER, Burkhard (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter: Mr KNAUTE, Johannes (Technische Universität Dresden, Helmholtz-Zentrum Dresden-Rossendorf)

Session Classification: Parallel Session: Particle Phenomenology - 2a

Track Classification: Particle Phenomenology

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

Search for Secluded Dark Matter with H.E.S.S. and Fermi-LAT Telescopes

Thursday 28 September 2017 14:34 (17 minutes)

Secluded dark matter models feature dark matter annihilations into a metastable mediator which then decays into Standard Model fermions. In this work, we test these models using current data from the Fermi-LAT (6-year observation of dwarf spheroidal galaxies) and the H.E.S.S.~(10-year observation of the Galactic center) instrument. Assuming that the metastable mediator shortly decays into charged leptons we derive constraints on the annihilation cross section {\it vs} dark matter mass. In particular, for decays into taus, we exclude $\sigma v \sim 4 \times 10^{-27} \mathrm{cm}^3/\mathrm{s}$ for dark matter mass of 10~GeV using Fermi-LAT, and $\sigma v \sim 3 \times 10^{-25} \mathrm{cm}^3/\mathrm{s}$ for 1TeV dark matter mass with H.E.S.S.. Our findings supersede previous constraints using Fermi-LAT data and constitute the first time limits on secluded dark sectors using H.E.S.S telescope.

Primary authors: Dr YAGUNA, Carlos (Escuela de Física, Universidad Pedagógica y Tecnológica de Colombia (UPTC)); Dr WENIGER, Christoph (University of Amsterdam); SIQUEIRA, Clarissa (Max Planck Institut für Kernphysik); Dr QUEIROZ, Farinaldo (Max Planck Institut für Kernphysik); Dr SILK, Joseph (University of Oxford)

Presenter: SIQUEIRA, Clarissa (Max Planck Institut für Kernphysik)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Warped Relaxion

Thursday 28 September 2017 17:13 (17 minutes)

The relaxion idea is a new alternative to justify the smallness of the Higgs mass. In this framework, the effective Higgs mass is scanned by a scalar field (the relaxion) starting at some large value which slowly decreases during inflation. We propose a UV completion for this mechanism in the context of warped extra dimension scenarios. In our construction, the warp factor can naturally explain the large hierarchy between the decay constants in the relaxion potential.

Primary author: FONSECA, Nayara (DESY)

Presenter: FONSECA, Nayara (DESY)

Session Classification: Parallel Session: Particle Phenomenology 1b

Track Classification: Particle Phenomenology

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

Searching for WIMPs with charged cosmic rays

Wednesday 27 September 2017 16:22 (17 minutes)

I discuss the indirect search for dark matter in the light of the lastest AMS-02 results.

Primary author: Dr WINKLER, Martin (Nordita Stockholm)

Presenter: Dr WINKLER, Martin (Nordita Stockholm)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Contraints on the Standard Model from the Weak Gravity Conjecture

Wednesday 27 September 2017 14:20 (20 minutes)

It is known that there are AdS vacua obtained from compactifying the Standard Model to 2 or 3 dimensions. However, using the Weak Gravity Conjecture, it has been recently argued by Ooguri and Vafa that non supersymmetric stable AdS vacua are incompatible with quantum gravity. By requiring the absence of these vacua we can put constraints on the SM spectra, obtaining a lower bound for the cosmological constant in terms of the neutrino masses. This can also be translated into an upper bound for the EW scale around the TeV range, bringing a new perspective into the issue of the EW hierarchy.

Primary author: Ms VALENZUELA, Irene (Utrecht University)

Co-authors: IBANEZ, Luis (IFT UAM/CSIC); VICTOR, Martin-Lozano (Bonn University)

Presenter: Ms VALENZUELA, Irene (Utrecht University)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Constraining particle dark matter using local galaxy distribution

Wednesday 27 September 2017 16:39 (17 minutes)

It has been long discussed that cosmic rays may contain signals of dark matter. In the last couple of years an anomaly of cosmic-ray positrons has drawn a lot of attentions, and recently an excess in cosmic-ray anti-proton has been reported by AMS-02 collaboration. Both excesses may indicate towards decaying or annihilating dark matter with a mass of around 1–10 TeV. In this article we study the gamma rays from dark matter and constraints from cross correlations with distribution of galaxies, particularly in a local volume. We find that gamma rays due to inverse-Compton process have large intensity, and hence they give stringent constraints on dark matter scenarios in the TeV scale mass regime. Taking the recent developments in modeling astrophysical gamma-ray sources as well as comprehensive possibilities of the final state products of dark matter decay or annihilation into account, we show that the parameter regions of decaying dark matter that are suggested to explain the excesses are excluded. We also discuss the constrains on annihilating scenarios.

Primary author: ISHIWATA, Koji (Kanazawa University)

Co-author: ANDO, Shin'ichiro (GRAPPA Institute, University of Amsterdam)

Presenter: ISHIWATA, Koji (Kanazawa University)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Cosmological attractors and universal predictions

Wednesday 27 September 2017 17:13 (15 minutes)

We consider different types of single field inflationary models such as Higgs inflation-types and the attractors models. We discuss their unitarity and renormalizability properties. Once quantum corrections are considered, new physics is demanded. As a matter of fact, to consistently connect the low and high energy regimes of the effective field theories (described in terms of Standard model and inflationary parameters respectively), some threshold corrections are needed. This raises the question: how are the predictions sensitive to the required UV completion?
We show under which circumstances the observables predicted by the model are insensitive to the UV completion.

Primary author: FUMAGALLI, Jacopo (Nikhef)

Co-author: Dr POSTMA, Marieke (Nikhef)

Presenter: FUMAGALLI, Jacopo (Nikhef)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Axion Dark Matter Miniclusters

Thursday 28 September 2017 14:51 (17 minutes)

If the PQ phase transition happens after inflation, the axion energy density will have density fluctuations of order one. The size of the fluctuations is set by the horizon size at the QCD phase transition. Those fluctuations lead to the formation of gravitationally bound objects called miniclusters. A significant fraction of axion dark matter bound in miniclusters would have severe implication for axion dark matter search experiments. We present a semi-analytic method to calculate the power sepctrum of the axion miniclusters and provide an estimate for the mass function at the time of matter-radiation equality.

Primary author: SCHWETZ-MANGOLD, Thomas (KIT)

Co-authors: PARGNER, Andreas (KIT); ENANDER, Jonas (KIT)

Presenter: SCHWETZ-MANGOLD, Thomas (KIT)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Electroweak baryogenesis from dimension 6 operators

Wednesday 27 September 2017 16:39 (17 minutes)

Effective field theory is an attractive framework to study Electroweak Baryogenesis in a model-independent way. We add a dimension-six operator to the Higgs potential in order to have a strongly first order phase transition, which is necessary for successful baryogenesis. Another necessary ingredient is CP-violation, which can be provided by dimension-six interactions between the Higgs and the top quark. We study two of these operators that are related by the equations of motion. In our study, we compare the parameters that are needed for successful baryogenesis with the experimental constraints and we test the applicability of the effective field theory framework.

Primary author: Ms VAN DE VIS, Jorinde (Nikhef)

Co-authors: Mr WHITE, Graham (Monash University); Dr DE VRIES, Jordy (Nikhef); Dr POSTMA, Marieke (Nikhef)

Presenter: Ms VAN DE VIS, Jorinde (Nikhef)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Baryogenesis

Track Classification: Cosmology & Astroparticle Physics

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

Parton distributions from high-precision collider data

Wednesday 27 September 2017 16:22 (17 minutes)

The latest update in the NNPDF series of PDF determinations, NNPDF3.1, includes
a great deal of new experimental information on proton structure determined by collaborations at the LHC and Tevatron. Several of these new datasets provide particular challenges to PDF fitters due to their high-precision nature. We shall discuss the impact upon PDF fits of these new measurements, including W and Z production and asymmetry data, new inclusive jet data and top-quark pair differential measurements. In addition to the expanded dataset, we now extend our analysis to fitting the charm PDF alongside the light quark and gluon distributions. We shall discuss the impact this change has upon LHC phenomenology alongside the differences due to the updated dataset.

Primary author: HARTLAND, Nathan (NIKHEF)

Presenter: HARTLAND, Nathan (NIKHEF)

Session Classification: Parallel Session: Particle Phenomenology - 2a

Track Classification: Particle Phenomenology

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

Quantum corrections to conformally coupled scalars

Thursday 28 September 2017 16:05 (17 minutes)

I will discuss quantum corrections during inflation in general.
And in particular, I will talk about our recent work on the one loop order corrections of gravitons to scalar mode functions which is conformally coupled to gravity.

Primary author: Ms BORAN, SİBEL (Istanbul Technical University)

Co-authors: Prof. KAHYA, EMRE ONUR (Istanbul Technical University); Dr PARK, Sohyun (KASI)

Presenter: Ms BORAN, SİBEL (Istanbul Technical University)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation + Gws

Track Classification: Cosmology & Astroparticle Physics

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

Effective Field Theory phenomenology for an extended Dark Sector

Thursday 28 September 2017 15:08 (17 minutes)

In previous works, effective field theories (EFT) have been used to scan the relevant parameter space for single dark sector particle. We have extended upon that work to include co-annihilation as well as Sommerfeld enhancement. To this end, we have calculated solutions to the Boltzmann equation for the case of a more complex dark sector with arbitrary mass spectrum, interactions and particle spin/parity. We can readily compare the resulting relic density with the measured one to exclude a wide range of possible configurations. Further observational (indirect dark matter searches) and experimental data
(direct dark matter searches, collider data) are used to narrow down the relevant parameters which would provide a consistent model. The underlying computations have been programmed in a stand-alone Fortran package which is however designed to interface with other packages.

Primary author: Mr ZHANG, Chao (IEXP/Univ.Hamburg)

Co-author: Prof. HORNS, Dieter (IEXP/Univ.Hamburg)

Presenter: Mr ZHANG, Chao (IEXP/Univ.Hamburg)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Quantifying CP-violation in the 2HDM

Wednesday 27 September 2017 14:51 (17 minutes)

The complex two-Higgs doublet model is one of the simplest ways to extend the scalar sector of the Standard Model to include a new source of CP-violation. This can address the matter antimatter asymmetry in the universe through electroweak baryogenesis and can also lead to interesting collider phenomenology.
Quantifying the amount of CP-violation, however, remains a surprisingly non-trivial task. Using our parameter scan of the complex 2HDM we present interesting phenomenological consequences of CP-violation. We compare the theoretical Jarlskog-like invariants to experimental observables quantifying the amount of CP-violation. This leads to the conclusion that most of these quantifications are weakly correlated at best, so the derived amount of CP-violation depends strongly on where you are looking for it.

Primary authors: WITTBRODT, Jonas (DESY); MÜHLLEITNER, Margarete (KIT); SANTOS, Rui (University of Lisbon)

Co-authors: FONTES, Duarte (University of Lisbon); SILVA, Joao P. (University of Lisbon); ROMAO, Jorge C. (University of Lisbon)

Presenter: WITTBRODT, Jonas (DESY)

Session Classification: Parallel Session: Particle Phenomenology - 1a

Track Classification: Particle Phenomenology

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

A global view on the Higgs self-coupling

Wednesday 27 September 2017 15:08 (17 minutes)

The Higgs self-coupling is notoriously intangible at the LHC. It was recently proposed to probe the trilinear Higgs interaction through its radiative corrections to single-Higgs processes. This approach however requires to disentangle these effects from those associated to deviations of other Higgs-couplings to fermions and gauge bosons. We show that a global fit exploiting only single-Higgs inclusive data suffers from degeneracies that prevent one from extracting robust bounds on each individual coupling. We show how the inclusion of double-Higgs production via gluon fusion, and the use of differential measurements in the associated single-Higgs production channels WH, ZH and ttH, can help to overcome the deficiencies of a global Higgs-couplings fit. In particular, we bound the variations of the Higgs trilinear self-coupling relative to its SM value to the interval [0.1, 2.3] at 68% confidence level at the high-luminosity LHC, and we discuss the robustness of our results against various assumptions on the experimental uncertainties and the underlying new physics dynamics. We also study how to obtain a parametrically enhanced deviation of the Higgs self-couplings and we estimate how large this deviation can be in a self-consistent effective field theory framework.

Primary author: Mr VANTALON, Thibaud (IFAE/DESY)

Co-authors: GROJEAN, Christophe (DESY/Humboldt U.); PANICO, Giuliano (IFAE); RIEMBAU, Marc (DESY); DI VITA, Stefano (DESY)

Presenter: Mr VANTALON, Thibaud (IFAE/DESY)

Session Classification: Parallel Session: Particle Phenomenology - 1a

Track Classification: Particle Phenomenology

Contribution ID: **63** Type: **not specified**

Thermalizing sterile neutrino dark matter

Wednesday 27 September 2017 14:17 (17 minutes)

Sterile neutrinos produced through resonant or non-resonant oscillations are a well motivated dark matter candidate, but recent constraints from observations have ruled out most of the parameter space. Based on general considerations we find a thermalization mechanism which can increase the yield after resonant and non-resonant production. At the same time, it alleviates the growing tensions with structure formation and X-ray observations and even revives simple non-resonant production as a viable way to produce sterile neutrino dark matter. We investigate the parameters required for the realization of the thermalization mechanism in a representative model and find that a simple estimate based on energy- and entropy conservation describes the mechanism well.

Primary author: Dr VOGL, Stefan (Max-Planck-Institut für Kernphysik)

Presenter: Dr VOGL, Stefan (Max-Planck-Institut für Kernphysik)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Neutrinos

Track Classification: Cosmology & Astroparticle Physics

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

Universal predictions from inflation

Thursday 28 September 2017 14:34 (17 minutes)

An ultraviolet-complete description of inflation may not be simple. Indeed, our best paradigm for physics at high energies seems to point towards a low-energy effective potentials with a large number of degrees of freedom. Cosmological data however shows a very simple primordial distribution of matter. I will discuss how complex inflation can give rise to universal simple predictions by analysing two distinct scenarios —one with random manyfield potential and one with poles in the kinetic terms.

Primary author: DIAS, Mafalda (DESY)

Presenter: DIAS, Mafalda (DESY)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation

Track Classification: Cosmology & Astroparticle Physics

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

Stochastic Methods for Inflation Model Building

Thursday 28 September 2017 14:17 (17 minutes)

Incorporating stochastic methods into the model building process can significantly improve our understanding of how to reliably compute predictions. In addition, as high energy physics models of inflation continue to improve, it is expected that they will become increasingly complex. This again makes the use of stochastic methods an appealing option, as they present a wealth of new tools for gaining analytic control. At the heart of both of these perspectives is the idea that we can take advantage of universal behaviour that emerges when a system becomes sufficiently complex.

Primary author: Dr FRAZER, Jonathan (DESY)

Presenter: Dr FRAZER, Jonathan (DESY)

Session Classification: Parallel Sessions: Cosmology & Astroparticle Physics - Inflation

Track Classification: Cosmology & Astroparticle Physics

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

Towards de Sitter from 10D

Wednesday 27 September 2017 15:20 (20 minutes)

Using a 10D lift of non-perturbative volume stabilization in type IIB string theory we find that the simplest KKLT vacua cannot be uplifted to de Sitter upon inclusion of SUSY breaking sources like anti-branes. Rather, the uplift is flattened due to stronger back-reaction on the volume modulus than has previously been anticipated such that the resulting vacua are always AdS. We find that this issue can be circumvented in setups such as racetrack stabilization and reveal its physical origin from the 10D perspective.

Primary authors: Dr WESTPHAL, Alexander (DESY); Dr RETOLAZA, Ander (DESY); Mr MORITZ, Jakob (DESY)

Presenter: Mr MORITZ, Jakob (DESY)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

Contribution ID: **68** Type: **not specified**

Anti-brane induced inflation

Wednesday 27 September 2017 15:00 (20 minutes)

We develop a new class of supergravity cosmological models where inflation is induced by terms in the Kähler potential which mix a nilpotent superfield S with a chiral sector Φ. As the new terms are non-(anti)holomorphic, and hence cannot be removed by a Kähler transformation, these models are intrinsically Kähler potential driven. Such terms could arise for example due to a backreaction of an anti-D3 brane on the string theory bulk geometry. We show that this mechanism is very general and allows for a unified description of inflation and dark energy, with controllable SUSY breaking at the vacuum. When the internal geometry of the bulk field is hyperbolic, we prove that small perturbative Kähler corrections naturally lead to α-attractor behaviour, with inflationary predictions in excellent agreement with the latest Planck data.

Primary author: Dr SCALISI, Marco (KU Leuven)

Presenter: Dr SCALISI, Marco (KU Leuven)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

The Sommerfeld Effect at Finite Temperature

Wednesday 27 September 2017 14:34 (17 minutes)

The understanding of theoretical uncertainties in the production mechanism of dark matter (DM) particles in the Early Universe has become an important topic from the viewpoint of the percent-level accuracy in the observational determination of the relic abundance. We consider the case where heavy DM self-interacts via t-channel exchange of a light gauge boson, leading to a Sommerfeld-enhanced annihilation rate during the freeze-out. The refinement of the relic abundance prediction including this effect has extensively been studied in the literature and is well understood in the context of the standard computation in vacuum. However, it is conceptionally less known to what extent the hot and dense plasma environment influences the DM gauge-boson exchange during the freeze-out process. We developed a comprehensive ab initio derivation of the Sommerfeld effect at finite temperature in the framework of non-equilibrium quantum field theory. After sketching this novel derivation, I discuss various approximation and solution strategies of this most general result. In certain limits we recover among the standard vacuum case also the equilibrium case, where the finite temperature corrections we obtain are compatible with the results recently derived from linear response theory estimates (see M. Laine et. al. in 2017). I briefly discuss the limitation of the latter approach and finally present phenomenological consequences and the physical origin of the leading finite temperature corrections to the Sommerfeld effect.

Primary authors: MUKAIDA, Kyohei (Kavli IPMU, Tokyo); COVI, Laura (ITP, Goettingen University); Mr BINDER, Tobias (ITP, Goettingen University)

Presenter: Mr BINDER, Tobias (ITP, Goettingen University)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Dark Matter in SO(10) GUT

Thursday 28 September 2017 15:25 (17 minutes)

SO(10) grand unified theories can ensure the stability of new particles in terms of the gauge group structure itself, and in this respect are well suited to motivate and accommodate dark matter (DM) candidates in the form of new stable massive particles. I will give an overview of DM scenarios and related phenomenology within the framework of non-supersymmetric SO(10). In the last part of the talk I will present recent development with SO(10)xU(1), where the abelian part arises from E6 grand unification. This framework offers a rich and varied DM phenomenology.

Primary author: Dr BOUCENNA, Sofiane (KTH Royal Institute of Technology)

Presenter: Dr BOUCENNA, Sofiane (KTH Royal Institute of Technology)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Early Kinetic Decoupling —a case when the standard thermal dark matter relic density calculation fails

Wednesday 27 September 2017 14:51 (17 minutes)

Today's standard formalism to calculate the abundance of thermally produced dark matter particles relies on the underlying assumption that annihilating dark matter particles are in kinetic equilibrium throughout the freeze-out period. I will point out that this assumption does not have to be fulfilled in general and then present two methods on how to generalize the formalism in order to deal with the situation when kinetic decoupling happening so early that it interferes with the chemical decoupling process. One is an approximate method, where two coupled differential equations describe the leading momentum moments of the dark matter distribution, and one is a numerical procedure that enables to solve the Boltzmann equation at the full phase-space level. To illustration the implications, the methods are applied to the renown Scalar Singlet dark matter candidate where it's shown that even in such a simple model the dark matter abundance predictions can be affected by up to one order of magnitude.

Primary author: Dr GUSTAFSSON, Michael (Göttingen University)

Presenter: Dr GUSTAFSSON, Michael (Göttingen University)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **73** Type: **not specified**

Low scale neutrino mass models from High scale

Thursday 28 September 2017 16:22 (17 minutes)

Neutrino masses generated by physics around the weak-scale offer the advantage of testability, however from the model-building viewpoint they appear to be ad-hoc. I will present two classes of models which predict a radiative seesaw formula for neutrino masses and the presence of weakly interacting stable dark matter from (non-supersymmetric) SO(10) Grand Unified Theories. The model achieves precision unification and offers experimental tests.

Primary author: Dr BOUCENNA, Sofiane (KTH Royal Institute of Technology)

Presenter: Dr BOUCENNA, Sofiane (KTH Royal Institute of Technology)

Session Classification: Parallel Session: Particle Phenomenology 1b

Track Classification: Cosmology & Astroparticle Physics

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

Resummed differential cross sections for top-quark pairs at the LHC

Wednesday 27 September 2017 16:05 (17 minutes)

Top quark physics has now entered the precision era with billions of top pairs expected to be produced over the lifetime of the LHC. As such, the need for ever more accurate theory predictions continues to grow. Using a formalism derived from Soft Collienar Effective Theory (SCET), we present predictions for differential cross sections which incorporate the simultaneous resummation of soft and small mass logarithms matched to standard threshold resummation. Building on previous work, results given to NNLO+NNLL′ accuracy for the top pair invariant mass and top quark p_T distributions. We will examine the effects the resummation has compared to fixed order as well as assess the impact of the choice of factorisation scale.

Primary author: Mr SCOTT, Darren (IPPP Durham)

Presenter: Mr SCOTT, Darren (IPPP Durham)

Session Classification: Parallel Session: Particle Phenomenology - 2a

Track Classification: Particle Phenomenology

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

B-physics anomalies

Thursday 28 September 2017 16:05 (17 minutes)

Several deviations from Standard Model expectations have been observed in decays of B mesons in recent years, including hints for violation of lepton flavour universality in b->c and b->s transitions and deviations in branching ratios and angular observables in exclusive semileptonic rare decays. While these “anomalies” could be explained by a combination of statistical fluctuations in some observables and underestimated hardonic uncertainties in others, they can also be consistently explained in terms of physics beyond the Standard Model. This talk will discuss the status of these deviations and possible new physics models explaining them.

Primary author: Dr STRAUB, David (TUM)

Presenter: Dr STRAUB, David (TUM)

Session Classification: Parallel Session: Particle Phenomenology 1b

Track Classification: Particle Phenomenology

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

Anomalous gauge couplings in diboson production

Wednesday 27 September 2017 16:39 (17 minutes)

Diboson production at the LHC is already setting competitive bounds on anomalous triple gauge couplings (aTGC) for certain types of theories due to the increase in energy. Within the SMEFT, the leading contributions at high energy to this process depend on a combination of aTGC plus other operators. Until now the contribution of these other operators was negligible due to being very constrained by LEP. Recent works have pointed out that a reevaluation of this assumption may be necessary due to the increase in accuracy of the aTGC. In this work we study the impact of these previously neglected operators on the aTGC bounds and find that they may be non-negligible in certain cases. We also make some projections and estimate their impact on future aTGC studies. While doing this, we also notice that a global fit of LEP + Diboson (@LHC) may improve the current constrains on certain vertex corrections (when set only using LEP).

Presenter: MONTULL, Marc (DESY)

Session Classification: Parallel Session: Particle Phenomenology - 2a

Track Classification: Particle Phenomenology

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

Can Primordial Black Holes be the Dark Matter?

Thursday 28 September 2017 16:05 (17 minutes)

Since the detection by Advanced LIGO/VIRO of gravitational waves emitted by black holes with masses beyond most expectations, primordial black holes (PBH) have seen a revival of interest as a possible Dark Matter candidate, supported by the coincidence between inferred merging rates by LIGO and the expected rates for PBH abundances comparable to the Dark Matter. I will review the recent and less recent observations that constrain or support the existence of Primordial Black Holes in the mass range [1-100] Msun, as well as the future observational perspectives.

Primary author: Mr CLESSE, Sebastian (RWTH Aachen)

Presenter: Mr CLESSE, Sebastian (RWTH Aachen)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - PBH

Track Classification: Cosmology & Astroparticle Physics

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

Magnetic Fields, Baryon Asymmetry and Gravitational Waves from Pseudoscalar Inflation

Wednesday 27 September 2017 16:56 (17 minutes)

In models of inflation driven by an axion-like pseudoscalar field, the inflaton, a, may couple to the standard model hypercharge gauge field via a Chern-Simons-type interaction, $L \supset a F \tilde{F}$. This coupling results in the explosive production of hypermagnetic fields during inflation, which has two interesting consequences: (1) The primordial hypermagnetic field is maximally helical and, thus, capable of sourcing the generation of nonzero baryon number around the electroweak phase transition (via the chiral anomaly in the standard model). (2) The gauge field production during inflation feeds back into the spectra of primordial perturbations, which leaves an imprint in the stochastic background of gravitational waves (GWs). In this talk, I am going to discuss the correlation between these two phenomena. To this end, I will (a) present an updated study of baryogenesis via hypermagnetic fields after pseudoscalar inflation and (b) describe the corresponding implications for GWs. As it turns out, successful baryogenesis is feasible – provided the axion couples to the gauge fields with a particular strength. Moreover, in the case of successful baryogenesis, one expects a characteristic peak in the GW spectrum at frequencies in the MHz range.

Primary author: Mr SCHMITZ, Kai

Presenter: Mr SCHMITZ, Kai

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Baryogenesis

Track Classification: Cosmology & Astroparticle Physics

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

Sterile neutrinos with secret interactions

Wednesday 27 September 2017 14:00 (17 minutes)

The motivation for new non-standard interactions in the sterile neutrino sector arises from the tension between oscillation experiments and cosmological results. Indeed the former point towards the existence of one (or more) sterile neutrino in the eV mass range, while the latter disfavor additional thermalized light particles with high statistical significance. However a partial thermalization induced by secret interactions can solve this tension, making eV sterile neutrinos fully consistent with big bang nucleosynthesis, cosmic microwave background and large scale structure constraints.
In this talk I will present a pseudoscalar model of secret interactions which provides a simple and elegant way of reconciling eV sterile neutrinos with precision cosmology. I will also mention how the hidden interactions can be extended to the dark matter sector and might mitigate the small scale problems of the standard cold dark matter paradigm.

Primary author: Mrs ARCHIDIACONO, Maria (RWTH Aachen)

Presenter: Mrs ARCHIDIACONO, Maria (RWTH Aachen)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Neutrinos

Track Classification: Cosmology & Astroparticle Physics

Contribution ID: **80** Type: **not specified**

The dark side of neutrinos

Wednesday 27 September 2017 14:34 (17 minutes)

The O(1) relationship between the standard model and dark matter relic abundances suggests a connection that is more than just gravitational. If the main portal between the dark and visible sectors is not via charged particles, but rather via neutrinos, then both cosmological phenomenology and search methods here on Earth must be modified. I will discuss the impact of DM-neutrino interactions in the early universe including BBN, CMB and structure formation, as well as on the newly-discovered astrophysical neutrinos seen by the IceCube Neutrino Observatory, and show the great complementarity that exists between these two probes.

Primary author: Mr VINCENT, Aaron (Imperial College London)

Presenter: Mr VINCENT, Aaron (Imperial College London)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Neutrinos

Track Classification: Cosmology & Astroparticle Physics

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

Axions, global symmetries and gravity.

Wednesday 27 September 2017 15:25 (17 minutes)

It is commonly believed that no global symmetries can exist in a consistent theory of quantum gravity.
This "folk argument" can be put on more solid and quantitative ground by explicitly constructing non-perturbative gravitational instanton solutions.
In this talk, I will review such solutions in the case of an axion field minimally coupled to Einstein gravity. I will discuss both theoretical and phenomenological implications, with a special focus on the case of the QCD axion.

Primary author: Dr URBANO, Alfredo (CERN)

Presenter: Dr URBANO, Alfredo (CERN)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Neutrinos

Track Classification: Cosmology & Astroparticle Physics

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

Testing the CDM paradigm with the CMB

Wednesday 27 September 2017 16:56 (17 minutes)

Dark Matter (DM) is a crucial component of the universe and, for calculations of the cosmic microwave background (CMB), is successfully modelled as a pressureless perfect fluid within General Relativity (GR).
With data from Planck it becomes possible to test generalisations of this model, searching for DM properties beyond the pressureless perfect fluid and thereby testing the CDM paradigm itself.
Although there is no unique way to generalise a pressureless perfect fluid, the Generalised Dark Matter (GDM) model has proven useful in CMB applications. The 3 new parameters of the model describe DM is an imperfect fluid with pressure and shear viscosity. Furthermore we construct a second and more general model, based on the Parametrized Post Friedmann (PPF) parametrization.
We present our constraints from Planck data for constant and generally time dependent GDM parameters, finding no evidence for DM properties beyond that of a pressureless perfect fluid.
PPF has more freedom than GDM and encompasses more drastic deviations from CDM in which DM effects are a manifestation of modifying GR rather than that of a matter field.
Using PPF, we show that in the case of purely modified gravity, where the DM phenomenon is not associated with any degree of freedom, Planck data cannot be fit without fine-tuning.

Primary author: Dr KOPP, Michael (Institute of Physics of the Czech Academy of Sciences)

Presenter: Dr KOPP, Michael (Institute of Physics of the Czech Academy of Sciences)

Session Classification: Parallel Session: Cosmology & Astroparticle Physics - Dark Matter

Track Classification: Cosmology & Astroparticle Physics

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

Ultra-light axion dark matter

Tuesday 26 September 2017 14:10 (30 minutes)

Presenter: HUI, Lam

Session Classification: Plenary Session

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

Axionic Dark Matter

Tuesday 26 September 2017 14:50 (30 minutes)

Presenter: RINGWALD, Andreas

Session Classification: Plenary Session

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

Dark Matter constraints from astroparticle experiments

Tuesday 26 September 2017 15:30 (30 minutes)

Presenter: CALORE, Francesca

Session Classification: Plenary Session

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

Large Scale Structure experiments and consequences for fundamental physics

Tuesday 26 September 2017 16:40 (30 minutes)

Presenter: PERCIVAL, Will

Session Classification: Plenary Session

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

PBH as DM

Tuesday 26 September 2017 17:20 (30 minutes)

Presenter: GARCIA-BELLIDO, Juan

Session Classification: Plenary Session

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

Welcome

Tuesday 26 September 2017 14:00 (10 minutes)

Presenter: TBA

Session Classification: Welcome

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

Relaxing the cosmological constant

Wednesday 27 September 2017 09:10 (30 minutes)

Presenter: CREMINELLI, Paolo

Session Classification: Plenary Session

Contribution ID: **90** Type: **not specified**

Cosmological Bounces and Wormholes from Vorticity

Wednesday 27 September 2017 09:50 (30 minutes)

Presenter: KAPLAN, David (U. Johns Hopkins)

Session Classification: Plenary Session

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

Light bosons and black hole super radiance

Wednesday 27 September 2017 10:30 (30 minutes)

Presenter: BARYAKHTAR, Masha

Session Classification: Plenary Session

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

Modified Einstein Gravity

Presenter: BAKER, Tessa

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

Modified Einstein Gravity

Wednesday 27 September 2017 11:40 (30 minutes)

Presenter: BAKER, Tessa

Session Classification: Plenary Session

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

Introduction to Bimetric Theory

Wednesday 27 September 2017 12:20 (30 minutes)

Presenter: SCHMIDT-MAY, Angnis (LMU Munich)

Session Classification: Plenary Session

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

Hertz Lecture - Inflationary Cosmology: Is Our Universe Part of a Multiverse?

Wednesday 27 September 2017 18:00 (1 hour)

Presenter: GUTH, Alan

Session Classification: Hertz Lecture

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

Cosmology beyond thermal equilibrium

Thursday 28 September 2017 09:10 (30 minutes)

Presenter: CHLUBA, Jens

Session Classification: Plenary Session

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

Planck results and connection with particle physics

Thursday 28 September 2017 09:50 (30 minutes)

Presenter: LESGOURGUES, Julien

Session Classification: Plenary Session

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

Future of CMB observations and potential implications for fundamental physics

Thursday 28 September 2017 10:30 (30 minutes)

Presenter: FLAUGER, Raphael

Session Classification: Plenary Session

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

Particle cosmology

Thursday 28 September 2017 11:40 (30 minutes)

Presenter: SERPICO, Pasquale

Session Classification: Plenary Session

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

Light dark sectors

Thursday 28 September 2017 12:20 (30 minutes)

Presenter: BATELL, Brian

Session Classification: Plenary Session

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

Current experimental limits on gravity waves

Friday 29 September 2017 09:00 (30 minutes)

Presenter: CHRISTENSEN, Nelson

Session Classification: Plenary Session

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

Cosmology with the LISA interferometer

Friday 29 September 2017 11:30 (30 minutes)

Presenter: CAPRINI, Chiara (APC Paris)

Session Classification: Plenary Session

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

Astrophysical sources of GWs and future prospects for their detection

Friday 29 September 2017 09:40 (30 minutes)

Presenter: MANDEL, Ilya

Session Classification: Plenary Session

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

TBA

Presenter: ARVANITAKI, Asimina

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

News ideas on inflation

Friday 29 September 2017 12:05 (30 minutes)

Presenter: HEBECKER, Arthur

Session Classification: Plenary Session

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

EFT approach to gravitational radiation by astrophysical sources

Friday 29 September 2017 10:20 (30 minutes)

Presenter: PORTO, Rafael

Session Classification: Plenary Session

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

How general is holography? Flat space limit and soft hairs in higher spin gravity

Thursday 28 September 2017 14:40 (20 minutes)

It is still an open question how general holographic dualities are, and what they possibly tell us about quantum gravity in asymptotically flat spacetimes. In this talk I will focus on a concrete example of an holographic duality involving higher spin gravity. In particular, I report on recent progress within three-dimensional higher spin gravity concerning the flat space limit and the soft hair proposal therein. I present a new set of boundary conditions for higher spin gravity, inspired by a recent "soft Heisenberg hair"-proposal for General Relativity. The asymptotic symmetry algebra consists of set of affine u(1) current algebras. Its associated canonical charges generate higher spin soft hair. The generators of the three-dimensional higher spin version of the Bondi-Metzner-Sachs algebra arise from composite operators of the affine u(1) currents through a twisted Sugawara-like construction.

Primary author: AMMON, Martin (Univ. of Jena)

Presenter: AMMON, Martin (Univ. of Jena)

Session Classification: Parallel Session: Strings & Mathematical Physics

Track Classification: String & Mathematical Physics

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

A complexity/fidelity susceptibility g-theorem for AdS3/BCFT2

Thursday 28 September 2017 16:05 (20 minutes)

I use a recently proposed holographic Kondo model as a well-understood example of AdS/boundary CFT (BCFT) duality and show explicitly that in this model the bulk volume decreases along the RG flow. I then obtain a proof that this volume loss is indeed a generic feature of AdS/BCFT models of the type proposed by Takayanagi in 2011. According to recent proposals holographically relating bulk volume to such quantities as complexity or fidelity susceptibility in the dual field theory, this suggests the existence of a complexity or fidelity susceptibility analogue of the Affleck-Ludwig g-theorem, which famously states the decrease of boundary entropy along the RG flow of a BCFT.

Primary author: FLORY, Mario (MPI Munich & Jagellonian Univ.)

Presenter: FLORY, Mario (MPI Munich & Jagellonian Univ.)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

The toric SO(10) F-theory landscape (part I)

Thursday 28 September 2017 17:25 (20 minutes)

We will discuss a full classification of toric F-theory models with gauge group SO(10) in six dimensions and a subclass of models that might lead to interesting phenomenological applications within 6d flux compactifications.

Primary author: DIERIGL, Markus (DESY)

Presenter: DIERIGL, Markus (DESY)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

The toric SO(10) F-theory landscape (part II)

Thursday 28 September 2017 17:45 (20 minutes)

We present a full classification of SO(10) theories that can be represented as a toric hypersurface. These models generically exhibit additional Abelian, non-Abelian and discrete symmetries that can be used for phenomenological applications. We compute all charges and 6D multiplicities as well as anomaly coefficients base independently. These theories have a rich structure, such as non-Kodaira Fibers in codimension three as well as connections via higgsings and superconformal matter transitions.

Primary author: OEHLMANN, Paul (DESY)

Presenter: OEHLMANN, Paul (DESY)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Quantum Groups behind the AdS/CFT S-Matrix

Wednesday 27 September 2017 16:45 (20 minutes)

Beisert's S-matrix was fixed by centrally extended sl(2|2) symmetry. Here we examine q-deformed centrally extended sl(2|2) and its sl(2) automorphisms for which we obtain the Hopf structure and the universal R-matrix. In addition, we consider this algebra as a contraction limit of the exceptional Lie superalgebra d(2,1,\alpha). This is closely related to 3D kappa-Poincaré for which we find a new free parameter of the Hopf algebra.

Primary author: HECHT, Reimar (ETH Zurich)

Presenter: HECHT, Reimar (ETH Zurich)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

BMS4 at spatial infinity

Thursday 28 September 2017 15:20 (20 minutes)

A few years ago Strominger argued that the BMS4 algebra, usually defined at null infinity, should be regarded as a true symmetry of gravitational evolution of asymptotically flat space-times. This implies the existence of an infinite tower of conserved quantities and brings new insight to various problems like gravitational scattering or black-holes evaporation. In this talk, I will show how BMS4 algebra arises as a symmetry at spatial infinity and prove the associated conservation laws conjectured by Strominger

Primary author: TROESSAERT, Cedric (MPI-AEI Golm)

Presenter: TROESSAERT, Cedric (MPI-AEI Golm)

Session Classification: Parallel Session: Strings & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Circuit complexity in QFT

Thursday 28 September 2017 16:45 (20 minutes)

Motivated by recent studies of holographic complexity, we examine the question of circuit complexity in quantum field theory. We provide a quantum circuit model for the preparation of Gaussian states, in particular the ground state, in a free scalar field theory for general dimensions. Applying the geometric approach of Nielsen to this quantum circuit model, the complexity of the state becomes the length of the shortest geodesic in the space of circuits. We compare the complexity of the ground state of the free scalar field to the analogous results from holographic complexity, and find some surprising similarities.

Primary author: JEFFERSON, Ro (AEI Golm)

Presenter: JEFFERSON, Ro (AEI Golm)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

No smooth beginning for spacetime

Thursday 28 September 2017 14:00 (20 minutes)

I will discuss a fundamental obstruction to any theory of the beginning of the universe, formulated as a semiclassical path integral. Hartle and Hawking's no boundary proposal and Vilenkin's tunneling proposal are examples of such theories. Each may be formulated as the quantum amplitude for obtaining a final 3-geometry by integrating over 4-geometries. The result is obtained using a new mathematical tool - Picard-Lefschetz theory - for defining the semiclassical path integral for gravity. The Lorentzian path integral for quantum cosmology with a positive cosmological constant is meaningful in this approach, but the Euclidean version is not. Framed in this way, the resulting framework and predictions are unique. Unfortunately, the outcome is that primordial tensor (gravitational wave) fluctuations are unsuppressed. One can prove a general theorem to this effect, in a wide class of theories.

Primary author: LEHNERS, Jean - Luc (AEI Golm)

Presenter: LEHNERS, Jean - Luc (AEI Golm)

Session Classification: Parallel Session: Strings & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Yangian Symmetry of Fishnet Feynman Graphs

Wednesday 27 September 2017 17:25 (20 minutes)

We consider an all-loop conformal Yangian symmetry of four-dimensional fishnet Feynman integrals being built from four-valent vertices which are connected via scalar massless propagators. We will discuss the implications of the Yangian symmetry in terms of differential equations for these graphs and also comment on their relation to observables in an integrable bi-scalar field theory in four dimensions. Finally, we will discuss generalizations to fishnet graphs in three and in six dimensions.

Primary author: MÜLLER, Dennis (HU Berlin)

Presenter: MÜLLER, Dennis (HU Berlin)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Regge limit of scattering amplitudes from an anomalous dimension.

Wednesday 27 September 2017 17:05 (20 minutes)

We study massive scattering amplitudes in N=4 super-Yang-Mills in the planar limit, where the mass is generated through a Higgs mechanism. The scattering amplitudes we consider are those of massless gauge bosons interacting through loops of massive W bosons. In such a model it is known that at leading power, both the Regge limit, as well as the soft divergences are controlled by the anomalous dimension of a Wilson loop with a cusp. We show that in the Regge limit the first power suppressed term is governed by a single power law. Furthermore we provide perturbative evidence at two loop accuracy that the exponent of this power law is given by the anomalous dimension of a Wilson loop with a scalar operator inserted at the cusp.

Primary author: BRUESER, Robin (Univ. Mainz)

Presenter: BRUESER, Robin (Univ. Mainz)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Are tiny gauge couplings out of the Swampland?

Wednesday 27 September 2017 14:00 (20 minutes)

Consistency with quantum gravity and black hole physics puts significant constraints on low-energy effective field theories. In fact, most EFT's do not satisfy these criteria, and are said to be in the "Swampland". Most Swampland constraints remain conjectural, supported mainly by a plethora of stringy examples. In this talk I will discuss a rigorous example of a Swampland constraint, in the context of the AdS/CFT correspondence: A bound on the gauge coupling of any U(1) theory coupled to gravity in AdS space. This equivalent to a bound on the two-point coefficient of holographic large N theories. The same logic leads to a logarithmic bound involving the gauge coupling, the cutoff of the effective field theory, the AdS radius, and Planck's mass.

Primary author: MONTERO, Miguel (Utrecht)

Presenter: MONTERO, Miguel (Utrecht)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Constrained superfields in string cosmology

Wednesday 27 September 2017 14:40 (20 minutes)

I will discuss how a better understanding of non-linearly realized supergravity has led to interesting progress and an improved understanding of dS vacua and inflation in supergravity and string flux compactifications.

Primary author: WRASE, Timm (Vienna)

Presenter: WRASE, Timm (Vienna)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Algebraic properties of the monopole formula

Thursday 28 September 2017 15:00 (20 minutes)

In this talk, I will discuss how the two geometric notions “fan” and “monoid” can be very fruitful for the understanding of the Coulomb branch Hilbert series (the monopole formula) for 3d N=4 gauge theories. After a brief reminder of the monopole formula, I will introduce the matter fan and reorganise the monopole formula accordingly. I then discuss the resulting algebraic properties and their implications.

Primary author: SPERLING, Marcus (Univ. Vienna)

Presenter: SPERLING, Marcus (Univ. Vienna)

Session Classification: Parallel Session: Strings & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Trigonometric Quantum Spectral Curve

Wednesday 27 September 2017 16:25 (20 minutes)

I will report on the construction of the Quantum Spectral Curve (QSC) for the eta-deformation of the AdS_5 x S^5 superstring. The Quantum Spectral Curve is a very simple set of equations and boundary conditions that describe the spectrum of the deformed string theory. It can be regarded as a trigonometrisation of the QSC that formed the ultimate simplification of the spectral problem of the N=4 super Yang-Mills theory dual to superstring theory on AdS_5 x S^5 through the AdS/CFT correspondence: in contrast to other constructed QSC's, the eta-deformed QSC is real periodic, i.e. defined on a cylinder. This causes the derivation of this QSC to be very different from all previously known cases with regards to its analytic properties. I will discuss this derivation while highlighting the new features of this QSC. In particular, I will touch upon spectral theory for periodic functions and illustrate how one derives the boundary conditions for this QSC.

Primary author: KLABBERS, Rob (Univ. of Hamburg)

Presenter: KLABBERS, Rob (Univ. of Hamburg)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Integrable strings beyond symmetric spaces and AdS/CFT

Wednesday 27 September 2017 16:05 (20 minutes)

Strings moving in symmetric spaces are integrable models and can be "solved" exactly. Such strings play an important role in furthering our understanding of the AdS/CFT correspondence. In recent years many further integrable string theories were discovered, based on deformations of symmetric space strings. I will give an overview of these integrable models, their interpretation in terms of string theory, and their interpretation in AdS/CFT.

Primary author: VAN TONGEREN, Stijn (HU Berlin)

Presenter: VAN TONGEREN, Stijn (HU Berlin)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Quantum Transitions through Cosmological Singularities

Thursday 28 September 2017 14:20 (20 minutes)

We study quantum mechanical tunneling using complex solutions of the classical field equations. Simple visualization techniques allow us to unify and generalize previous treatments, and straightforwardly show the connection to the standard approach using Euclidean instanton solutions. Applying these techniques to quantum cosmology we describe transitions between classical patches of the configuration space on which the universe's quantum state is defined.
In particular we calculate the quantum transition, in the saddle point approximation connecting asymptotically classical, inflating as well as ekpyrotic histories. This supplies probabilities for how a classical history on one side transitions and branches into a range of classical histories on the opposite side. We find a small quantum probability to bounce even when the classical extrapolation of the incoming history is singular.

Primary author: BRAMBERGER, Sebastian (MPI-AEI Golm)

Presenter: BRAMBERGER, Sebastian (MPI-AEI Golm)

Session Classification: Parallel Session: Strings & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Holographic lattice field theories

Thursday 28 September 2017 16:25 (20 minutes)

Recent developments in tensor network models (which are, roughly speaking, quantum circuits designed to produce analogues of the ground state in a conformal field theory) have led to speculation that such networks provide a natural discretization of the AdS/CFT correspondence. This raises many questions: just to begin, is there any sort of lattice field theory model underlying this connection? And how much of the usual AdS/CFT dictionary really makes sense in a discrete setting? I'll give a brief overview of some recent work that proposes a setting in which such questions can perhaps be addressed: a discrete spacetime whose bulk isometries nevertheless match its boundary conformal symmetries. Many of the first steps in the AdS/CFT dictionary carry over without much alteration to lattice field theories in this background, and one can even consider natural analogues of BTZ black hole geometries.

Primary author: SABERI, Ingmar (Univ. Heidelberg)

Presenter: SABERI, Ingmar (Univ. Heidelberg)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Gaugino Condensation and Holomorphic BF Theory

Thursday 28 September 2017 17:05 (20 minutes)

Pure N = 1 supersymmetric gauge theory with a simple gauge group G is widely believed to have k massive vacua, where k is the dual Coxeter number of the Lie algebra corresponding to G. The vacua are distinguished by the phase of the gaugino condensate. The appearance of the dual Coxeter number is a hint of the role of affine Lie algebras. A holomorphic twist of pure N = 1 gauge theory is known to be equivalent to holomorphic BF theory. It is natural to wonder if the perturbative physics of holomorphic BF theory has any relation to the non-perturbative dynamics of the full physical theory. We study the classical spectrum of local observables in holomorphic BF theory and find that an index cons! tructed out of the local operators can be expressed in terms of the orbits of an affine Weyl group corresponding to G. The index can also be expressed as quotients of Dedekind's eta-function and in the case of E_8 it is intricately connected with Monstrous Moonshine.

Primary author: EAGER, Richard (Univ. Heidelberg)

Presenter: EAGER, Richard (Univ. Heidelberg)

Session Classification: Parallel Session: String & Mathematical Physics

Track Classification: String & Mathematical Physics

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

Particle Fever - Short, the movie, presented by David Kaplan

Tuesday 26 September 2017 18:00 (30 minutes)

Presenter: KAPLAN, David