

T 16: Theorie: Beyond the Standard Model und Quantenfeldtheorie

Zeit: Montag 16:00–17:45

Raum: S16

T 16.1 Mo 16:00 S16

Cosmological Aspects of Multifield NMSSM Higgs Inflation — ●MICHAEL MATLIS^{1,2}, GUDRID MOORTGAT-PICK^{1,2}, and ALEXANDER WESTPHAL² — ¹University of Hamburg, Germany — ²DESY Theory Group, Hamburg, Germany

The inflationary NMSSM model (Next-to-Supersymmetric Standard Model) is considered to be the simplest extension to the Standard Model circumventing the μ -problem of the MSSM and thus being capable of giving inflation. As the MSSM model, it consists of two Higgs doublets and is augmented by one Higgs Singlet which is stabilized in Kähler moduli space. Research to date has focused on an effective single field description which in turn limits the range of possibilities for cosmological Observables and particle phenomenology. We have discovered that the previously assumed effective single field model can be described by an effective two-field model. The analysis has shown, that a clear distinction between single- and multi-field model can be made based on cosmological Observables that are constrained by Planck data leading to richer phenomenology.

T 16.2 Mo 16:15 S16

CosmoBit: Towards global fits of particle physics and cosmology for dark matter — ●PATRICK STÖCKER — Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen, Germany

The absence of a conclusive dark matter signal casts doubts on the conventional WIMP scenario. Alternative production mechanisms as well as models with an extended self interacting dark sector may explain the absence of a signal in these searches while opening up a new window of strong signals in cosmological observables like the primordial element abundances, the spectrum of the Cosmic Microwave Background as well as large scale structures.

In order to explore the parameter space of such models, it is therefore necessary to combine cosmological information with the constraints from traditional searches for particle dark matter. I will present the recent efforts to perform such a combination in the context of global fits within CosmoBit, a future part within the framework of GAMBIT (Global and Modular Beyond-the-Standard-Model Inference Tool).

T 16.3 Mo 16:30 S16

Testing post-inflation Axion Dark Matter using CMB Observations — ●ANDREAS PARGNER¹, MARTIN FEIX^{1,2}, JOHANN FRANK¹, ROBERT REISCHKE^{1,2}, BJOERN MALTE SCHAEFER², and THOMAS SCHWETZ¹ — ¹Institut für Kernphysik, Karlsruhe Institute of Technology, Karlsruhe, Germany — ²Zentrum für Astronomie der Universität Heidelberg, Astronomisches Recheninstitut, Heidelberg, Germany

We present a novel way of testing axion dark matter using cosmological observables in scenarios where Peccei-Quinn symmetry breaking happens after inflation. It is known that in these scenarios large isocurvature fluctuations in the axion energy density occur. For typical QCD axions, the scale of these fluctuations is too small to be cosmologically relevant and they are usually studied in the context of axion minicluster formation. However, we argue that for extremely light axions, also known as fuzzy dark matter, the isocurvature fluctuations can be quite sizable and have effects in large-scale observables. Relating the scale of the density fluctuations to the axion mass, we use CMB observations from the Planck mission to show that in certain scenarios fuzzy DM in the mass range $10^{-24} \text{eV} < m_a < 10^{-16} \text{eV}$ can already be ruled out. We also estimate the sensitivity of upcoming CMB Stage IV experiments and 21cm observations on the axion isocurvature fluctuations.

T 16.4 Mo 16:45 S16

Super-WIMP meets freeze-in — ●JAN HEISIG¹ and MATHIAS GARNY² — ¹Université catholique de Louvain — ²Technische Universität München

Non-thermalized dark matter is a cosmologically valid alternative to the paradigm of weakly interacting massive particles. For dark matter belonging to a Z_2 -odd sector that contains in addition a thermalized mediator particle, dark matter production proceeds in general via both the freeze-in and super-WIMP mechanism. We highlight their interplay and emphasize the connection to long-lived particles at colliders. For the explicit example of a colored t-channel mediator model we map out the entire accessible parameter space, cornered by bounds from the LHC, big bang nucleosynthesis and Lyman-alpha forest observations, respectively. We discuss prospects for the HL- and HE-LHC.

T 16.5 Mo 17:00 S16

Neutrino Portal Dark Matter via Freeze-In — ●MATHIAS BECKER — TU Dortmund

Models of Neutrino Portal Dark Matter (NPDM) utilize a right handed neutrino to couple the standard model to a dark sector. We discuss the parametrics of the relic density in the freeze-in regime of NPDM as well as constraints from dark matter stability and direct detection experiments.

T 16.6 Mo 17:15 S16

BSMPT - A Tool for the Electroweak Phase Transition in Extended Higgs Sectors — ●PHILIPP BASLER and MARGARETE MÜHLEITNER — Karlsruher Institut für Technologie, ITP, Karlsruhe, Deutschland

A first order electroweak phase transition (EWPT) is crucial for electroweak baryogenesis. Since all parameters determining the EWPT are at the electroweak scale, the collider phenomenology can be linked with the cosmological constraints. In this talk we present the code BSMPT. BSMPT can calculate the strength of the EWPT by considering the effective potential approach for a general extended Higgs sector. Further, it can calculate the global minimum of the potential at 1-loop order allowing to test the vacuum stability. Finally, BSMPT is able to determine the triple Higgs self-couplings at 1-loop order playing an important role in the search for new physics.

T 16.7 Mo 17:30 S16

On the High-Energy Behavior of Strong-Field QED in an Intense Plane Wave — ●TOBIAS PODSZUS and ANTONINO DI PIAZZA — Max Planck Institute for Nuclear Physics, Heidelberg, Germany

We study the mass and the polarization operator in an external plane-wave field for different parametric situations. Starting from the one-loop order contributions to the mass and to the polarization operator in a plane wave, we calculate analytically their leading order terms in the limit of different parametric situations (constant crossed field, high-energy and high intensity) [1]. We found that both operators show very different behaviors in the different parameter regions and we also compare the results with the corresponding vacuum expressions. We show that the presence of the plane wave changes the asymptotic behaviors of the radiative corrections and that some of the asymptotical limits do not commute.

[1] T. Podszus and A. Di Piazza, to be submitted.