T 23: Theoretische Astroteilchenphysik und Kosmologie 2

Convenor: Heinrich Päs

Zeit: Dienstag 16:45–18:45 Raum: M114

T 23.1 Di 16:45 M114

Solving the η-Problem in Hybrid Inflation with Heisenberg Symmetry and Stabilized Modulus — Stefan Antusch[1], Mar Bastero-Gil[2], Koushik Dutta[1], Steve King[3], and •Philipp Kostka[1] — [1]Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), Föhringer Ring 6, 80805 München, Germany — [2]Departamento de Fisica Teorica y del Cosmos and Centro Andaluz de Fisica de Particulas Elementales, Universidad de Granada, 19071 Granada, Spain — [3]School of Physics and Astronomy, University of Southampton, Southampton, SO17 1BJ, United Kingdom

We present a new class of models in which the η-problem of supersymmetric hybrid inflation is resolved using a Heisenberg symmetry, where the associated modulus field is stabilized and made heavy with the help of the large vacuum energy during inflation without any finetuning. A natural candidate for the inflaton in this class of models is the right-handed sneutrino which is massless during the inflationary epoch, and subsequently acquires a large mass at the end of inflation.

T 23.2 Di 17:00 M114

Inflationary perturbation spectra from Lorentz violating dissipative models — •Julian Adamek[1], David Campo[1], Jens Niemeyer[1], and Renaud Parentani[2] — [1]ITPA Universität Würzburg, Würzburg, Germany — [2]LPT CNRS Université Paris-Sud 11, Orsay Cedex, France

Trans-Planckian redshifts in cosmology and the question of initial conditions for primordial fluctuations are addressed in the context of a phenomenological model that breaks Lorentz invariance by dissipative effects above an energy scale Λ. These effects are dynamically obtained by coupling the fluctuation modes to additional degrees of freedom which are unobservable below Λ. When these degrees of freedom are in their ground state (vacuum), and when the Hubble rate H is much smaller than Λ (scale separation), the standard prediction for the spectral power remains robust. For a large class of dissipative models, using analytical and numerical methods, we show that the leading modification (in an expansion in H/Λ) is linear in the decay rate evaluated at horizon exit, and that high frequency superimposed oscillations are not generated. The modification is negative when the decay rate decreases slower than the cube of H, which means that there is a loss of power on the largest scales.

T 23.3 Di 17:15 M114

The cosmological QCD phase transition in a more general setting — •Tillmann Boeckel — Universität Heidelberg

We study the QCD phase transition in the early universe in a more general setting than it has been previously done. The common expectation nowadays is that this transition was probably a smooth crossover with little observable consequences for cosmology. We show that this is not necessarily true and that the impact on structure formation, properties of dark matter, production of primordial magnetic fields and gravitational waves can in fact be larger than it has been previously calculated and that it can influence a wide range of cosmological scales. Furthermore we give an outlook on how we will refine the ansatz within a field theoretical approach.

T 23.4 Di 17:30 M114

Kadanoff-Baym and Boltzmann Equations for a Toy Model of Leptogenesis — •Andreas Hohenegger, Alexander Kartavtsev, and Manfred Lindner — Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg

We investigate the influence of quantum effects on leptogenesis. These aspects are usually neglected in treatments of this mechanism for the generation of the baryon asymmetry of the universe. To this end we consider a toy model consisting of two real and one complex scalar fields and derive the corresponding system of Kadanoff–Baym and Boltzmann equations valid in the expanding Universe. In the expanding universe the CP–violating parameter becomes a function of time; the time–dependence is analyzed analytically and numerically. We also present numerical solutions of the system of Boltzmann equations and compare them to solutions of the corresponding system of integrated Boltzmann equations.

T 23.5 Di 17:45 M114

Leptogenesis is hot! - Thermal corrections — •Clemens Kiessig — Max-Planck-Institut für Physik, München

Leptogenesis is an attractive model for explaining the baryon asymmetry of the universe, since efforts to explain the smallness of neutrino masses via the seesaw mechanism automatically point to this specific baryogenesis model. As calculations have become more refined, thermal corrections need to be taken into account using thermal field theory methods. As thermal masses have been used as kinematical masses, it is desirable to check this approximation via a more consistent field theoretical treatment. I will give an overview of thermal corrections and present some results concerning the use of thermal masses and the HTL (hard thermal loop) approximation.

T 23.6 Di 18:00 M114

Dirac-Leptogenese auf mehreren Throats — •Andreas Bechinger, Reinhold Rückl und Gerhart Seidl — Institut für Theoretische Physik und Astrophysik, Julius-Maximilians-Universität Würzburg

Wir betrachten Dirac-Leptogenese auf einer Geometrie mit drei 5D Throats im flachen Limes. Dieses Modell vermag einerseits die Kleinheit der Dirac-Neutrinomassen durch eine dynamische Lokalisierung der rechtshändigen Neutrinos und andererseits die beobachtete Baryonenasymmetrie des Universums durch den Zerfall schwerer Kaluza-Klein-Moden zu erklären. Eine wichtige Rolle spielen dabei diskrete Austauschsymmetrien zwischen den Throats. Diese erlauben es uns die relevanten Parameter für die Dirac-Leptogenese in direkte Beziehung zu den beobachteten Massen- und Mischungsparametern der Neutrinos zu bringen. Im Rahmen des Modells wird der gültige Parameterbereich, der sich im Einklang mit kosmologischen Schranken wie der primordialen Nukleosynthese befindet, bis hin zum resonanten Limes untersucht.

T 23.7 Di 18:15 M114

Phenomenology of Hybrid Scenarios of Neutrino Dark Energy — Stefan Antusch[1], Subinoy Das[2], and •Koushik Dutta[1] — [1]Max Planck Institute for Physics, Fohringer Ring 6, 80805, Munich, Germnay — [2]University of British Columbia, Department of Physics and Astronomy, 6224 Agricultural Rd, Vancouver, B.C, V6T 1Z1, Canada

We study the phenomenology of hybrid scenarios of neutrino dark energy, where in addition to a so-called Mass Varying Neutrino (MaVaN) sector a cosmological constant (from a false vacuum) is driving the accelerated expansion of the universe today. We calculate the effective equation of state parameter $w_{eff}(z)$ for general power law potentials in terms of the neutrino mass scale and show that $w_{eff}(z)$ is predicted to become smaller than -1 for z>0. We show that the hybrid scenario allows to realize neutrino dark energy with a high-scale seesaw and it can potentially evade the stability problem of neutrino dark energy models with non-relativistic neutrinos.

T 23.8 Di 18:30 M114

The smallness of the cosmological constant Λ — •Jürgen Brandes — Danziger Str. 65, 76307 Karlsbad

'To explain the smallness of the cosmological constant Λ is one of the most outstanding challenges in modern theoretical physics' because $\Lambda_{observed} = 10^{-122}\ \Lambda_{theoretical}$ and 'thus wrong by 122 orders of magnitude' [1]. One possible solution is given by the Robertson-Walker-Metric (RWM) since it describes two different scenarios: (a) Expansion of the universe together with creation of time and space at big bang, (b) expansion of a meta-galaxy similar to a dust-like star but within space and time [2]. In this case the non-empty vacuum exists before big bang and $\Lambda_{obs} = \Lambda_{theo}$(changed by big bang) - Λ_{theo}(before big bang), possibly small or even zero. In case (a) the non-empty vacuum is created during expansion and this means $\Lambda_{obs} = \Lambda_{theo}$ and the problem above remains.

Questions to be discussed: Observable universe possibly an expanding meta-galaxy [2], Λ_{theo} changeable in the manner of quintessence models?