T 67: Neutrinophysik / theoretische Astroteilchenphysik

Zeit: Mittwoch 16:30–18:50 Raum: Z6 - SR 2.011

T 67.1 Mi 16:30 Z6 - SR 2.011

Radiate Neutrino masses, keV-scale DM and viable Leptogenesis via sub-TeV new physics — •Sven Baumholzer[1], Vedran Brdar[1], Pedro Schwaller[1], and Joachim Kopp[2] — [1]Johannes Gutenberg-Universität, Mainz — [2]MPI-K, Heidelberg

In this talk we will present a realization of the Scotogenic model which can explain the observed DM abundance and baryon asymmetry and also the masses of Neutrinos. All this can be achieved within the model without introducing new physics beyond the TeV scale.

We achieve this by adding 3 sterile neutrinos N_i and an additional Higgs doublet Σ to the SM and imposing a Z_2 symmetry under which all new particles are charged and whose masses are below the TeV-scale.

Our DM candidate is the lightest sterile neutrino N_1 which mass is $\mathcal{O}$(keV) while N_2 and N_3 have masses of $\mathcal{O}$(few GeV). Finally the scalar masses are considered to be at $\mathcal{O}$(TeV).

Due to the Z_2 symmetry neutrino masses are generated at one loop level therefore leading to higher possible Yukawa couplings compared to generic seesaw models. The production of DM is governed by Freeze In of N_1 and contributions coming from the decay ofN_2. Baryon asymmetry is explained via resonant Leptogenesis based on L-violating decays of Σ to N_i and leptons.

T 67.2 Mi 16:45 Z6 - SR 2.011

Gravitinos in Inflation Models — •Sebastian Prenzel — Universität Hamburg, Hamburg, Deutschland

In this talk I try to constrain the mass of the gravitino in two different cases of a NMSSM model embedded in supergravity and consistent with inflation.
I will introduce a Jordan frame Supergravity in which an NMSSM model arising from a superconformal ansatz is embedded. This model will then also be suitable for inflation.
The general assumptions for canonical superconformal supergravity models are presented and how the NMSSM can be constructed from this set of models.
The first case considers a NMSSM model with a hidden sector that determines the gravitino mass. By investigating vacuum and parameter conditions the mass can be constrained to $10MeV \lesssim m_{3/2} \lesssim 100GeV$.
The second case investigates an NMSSM model without a hidden sector with and without vacuum tuning. Without vacuum tuning it turns out that a hidden sector is necessary to generate soft breaking terms, thus SUSY is broken and the Higgs fields acquire VEV's. Here the gravitino mass can be constrained to $10^{-23}eV \lesssim m_{3/2} \lesssim 10GeV$.
Adding an extra term to the superpotential to tune the vacuum generates soft breaking-like terms and thus a hidden sector is not needed to break SUSY and the gravitino mass can be constrained to $m_{3/2} \gtrsim 1MeV$.

T 67.3 Mi 17:00 Z6 - SR 2.011

Nonequilibrium Dynamics of Inhomogeneous Quantum Fields — •Thomas Garratt — Julius-Maximilians-Universitaet Wuerzburg

The dynamics of inhomogeneous quantum fields out of equilibrium are especially relevant for the study of first-order phase transitions. It is our aim to calculate how critical bubble configurations of the new phase, that form in such a process, propagate and locally approach thermal equilibrium. The Electroweak phase transition in the early universe is of particular interest, since Baryogenesis can potentially explain the matter-antimatter asymmetry in the Universe for fitting dynamical properties of the phase transition and the bubble collisions result in gravitational waves that could be observed by the new generation of detectors. To calculate the dynamics of quantum bubbles we have developed a program that solves the non-equilibrium equations of motion, the so called *Kadanoff-Baym Equations*. As a starting point we investigate the dynamics of bubbles in (1+1)-dimensional toy models.

T 67.4 Mi 17:15 Z6 - SR 2.011

Multifield aspects of NMSSM-inspired Higgs inflation — •Michael Matlis, Alexander Westphal, Gudrid Moortgat-Pick, Jonathan Frazer, and Mafalda Dias — Deutsches Elektronen-Synchrotron DESY, Theory Group, D-22603 Hamburg, Germany

The NMSSM model is one of the simplest extensions to the standard model capable of describing inflation. The model has an extended Higgs sector which can lead to multifield inflation, however, most studies to date focus on the single field regime, which constitutes only a small fraction of the total parameter space. Very little is known about the multifield regime which can in principle give rise to much richer phenomenology. In this work we consider the full multifield dynamics, ultimately seeking constraints over the full parameter space.

T 67.5 Mi 17:30 Z6 - SR 2.011

Multi-messenger emission in GRB internal shock models — •Annika Rudolph, Anatoli Fedynitch, and Walter Winter — DESY

Because of their high luminosities, Gamma-Ray Bursts are considered possible sources of Ultra High Energy Cosmic Rays (UHECR) and high energy neutrinos. In the fireball internal shock scenario, the prompt high energy emission is generated in collisions between regions of the jet with different Lorentz factors. In this talk, I will discuss the production of multiple astrophysical messengers within the internal shock scenario while including different models on the collision process.

T 67.6 Mi 17:45 Z6 - SR 2.011

Axion minicluster power spectrum and mass function — •Andreas Pargner and Thomas Schwetz — Institut für Kernphysik, Karlsruher Institut für Technologie (KIT), 76021 Karlsruhe, Germany

We present a semi-analytical method to calculate the average axion energy density, as well as the power spectrum, from the re-alignment mechanism in a scenario where the Peccei-Quinn symmetry breaking happens after inflation. Furthermore, we develop a modified Press & Schechter approach, suitable to describe the collapse of non-linear density fluctuations during radiation domination. This allows us to make a prediction for the distribution of mass and size of axion miniclusters.

Gruppenbericht T 67.7 Mi 18:00 Z6 - SR 2.011

Recent results of the Double Chooz reactor neutrino experiment — •Denise Hellwig for the Double Chooz-Collaboration — III. Physikalisches Institut B, RWTH Aachen University

Double Chooz is a reactor antineutrino disappearance experiment located in Chooz, France, to measure the neutrino mixing angle θ_{13}. By detecting the unique inverse beta decay (IBD) prompt-delayed signal antineutrinos can be precisely identified. The experiment consists of two liquid scintillator detectors of identical design; a far detector at a distance of about 1 km is operating since 2011; a near detector at a distance of about 400 m is operating since begin 2015. This double-detector setup with iso-flux configuration allows to fit the far detector data to the near detector data without relying on the reactor neutrino flux prediction where systematic uncertainties are suppressed to per mill level. Statistical uncertainties are reduced by not only using the delayed signal of neutron capture on Gadolinium but adding neutron captures on Hydrogen yielding a statistics increase of more than a factor of two.

Apart from a precise measurement of θ_{13}, the combination of the two detectors also offers sensitivity to sterile neutrino mixing parameters. Sterile neutrinos are neutrino mass states not taking part in weak interactions, but may mix with known neutrino states. This induces additional mixing angles and mass differences.

This contribution will present the latest θ_{13} results of the Double Chooz collaboration as well as the results of the sterile analysis.

T 67.8 Mi 18:20 Z6 - SR 2.011

Latest advances in the development of a poissonian based likelihood fit for the Double Chooz experiment — Denise Hellwig[1], Philipp Kampmann[2], Stefan Schoppmann[3], •Philipp Soldin[1], Achim Stahl[1], and Christopher Wiebusch[1] — [1]III. Physikalisches Institut B, RWTH Aachen University — [2]IKP Jülich — [3]MPIK Heidelberg

Double Chooz is a reactor neutrino disappearance experiment with the purpose of a precise measurement of the neutrino mixing angle θ_{13}. The experimental setup consists of two identical liquid scintillator detectors at average baselines of about 400m and 1km to two reactor

cores at the nuclear power plant in Chooz, France. The neutrinos are detected by measuring the signature of the inverse beta decay (IBD), which consists of a prompt positron signal and a delayed neutron capture signal. By performing a simultaneous poissonian based likelihood fit of both detector neutrino rates, energy spectral shapes and all relevant backgrounds, the neutrino mixing angle θ_{13} can be obtained. The method, design and latest advances of such a likelihood fit are presented in this talk. Furthermore, a crosscheck for the latest final fit results is shown.

T 67.9 Mi 18:35 Z6 - SR 2.011

Investigations of the Sensitivity of the Double Chooz Experiment to sterile Neutrinos in a 3+2 Scenario — Denise Hellwig, Philipp Soldin, •Yannic Sommer, Achim Stahl, and Christopher Wiebusch — III. Physikalisches Institut B, RWTH Aachen University

The Double Chooz experiment is a reactor neutrino disappearance experiment for the precise measurement of the neutrino mixing angle θ_{13}. Two identical liquid scintillator detectors with baselines of 1050 m and 400 m are installed at the nuclear power plant in Chooz, France. These are measuring the flux of antineutrinos from two reactor cores utilizing the signature of the inverse beta decay (IBD). To explain the deviation from the measured data to the theoretically predicted neutrino flux, one possibility would be non weakly-interacting sterile neutrinos. A study of the sensitivity to a scenarion with two additional sterile neutrinos will be presented.