T 21: Theorie und Experiment in Kosmologie und Neutrinophysik

Zeit: Montag 11:00–12:30 Raum: VMP9 SR 30

T 21.1 Mo 11:00 VMP9 SR 30

Electroweak supersymmetric dark matter annihilation in DM@NLO — •Saskia Schmiemann[1], Michael Klasen[1], Karol Kovarik[1], Björn Herrmann[2], Julia Harz[3], and Patrick Steppeler[1] — [1]Institut für theoretische Physik, Universität Münster, Wilhelm-Klemm-Straße 9,D-48149 Münster, Germany — [2]LAPTh, Université Savoie Mont Blanc, CNRS, 9 Chemin de Bellevue, B.P. 110, F-74941 — [3]Sorbonne Universités, Institut Lagrange de Paris (ILP), 98 bis Boulevard Arago, 75014 Paris, France Sorbonne Universités, UPMC Univ Paris 06, UMR 7589, LPTHE, F-75005, Paris, France CNRS, UMR 7589, LPTHE, F-75005, Paris, France

Today there are several pieces of evidence for dark matter. One well-known experiment is the measurement of the Dark Matter relic density by the Planck satellite. The talk introduces the *Dark Matter at next-to-leading order* (DM@NLO) project which provides predictions for the dark matter relic density in the MSSM including higher-order corrections.

After an introduction of the project DM@NLO, I will shortly speak about the calculation of the electroweak processes. The main focus will lie on the effects of the electroweak tree-level processes on the relic density of neutralinos within selected scenarios.

T 21.2 Mo 11:15 VMP9 SR 30

Significant gamma-ray lines from dark matter annihilation — •Michael Duerr[1], Pavel Fileviez Perez[2], and Juri Smirnov[2] — [1]DESY, Notkestraße 85, 22607 Hamburg, Germany — [2]Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany

Gamma-ray lines from dark matter annihilation are commonly seen as a “smoking gun” for the particle nature of dark matter. However, in many dark matter models the continuum background from tree-level annihilations makes such a line invisible. I present two simple extensions of the Standard Model where the continuum contributions are suppressed and the gamma-ray lines are easily visible over the continuum background.

T 21.3 Mo 11:30 VMP9 SR 30

Strong Washout Approximation to Resonant Leptogenesis — Björn Garbrecht, Florian Gautier, and •Juraj Klaric — Physik Department T70, James-Franck-Straße, Techniche Universität München, 85748 Garching, Germany

We study resonant Leptogenesis with two sterile neutrinos with masses M_1 and M_2, Yukawa couplings Y_1 and Y_2, and a single active flavor. Specifically, we focus on the strong washout regime, where the decay width dominates the mass splitting of the two sterile neutrinos.

We show that one can approximate the effective decay asymmetry by it's late time limit $\varepsilon = X \sin(2\varphi)/(X^2 + \sin^2\varphi)$, where $X = 8\pi\Delta/(|Y_1|^2+|Y_2|^2)$, $\Delta = 4(M_1-M_2)/(M_1+M_2)$, and $\varphi = \arg(Y_2/Y_1)$, and establish criteria for the validity of this approximation. We compare the approximate results with numerical ones, obtained by solving the mixing and oscillations of the sterile neutrinos.

We generalize the formula to the case of several active flavors, and demonstrate how it can be used to calculate the lepton asymmetry in phenomenological scenarios which are in agreement with the neutrino oscillation data. We find that that using the late time limit is an applicable approximation throughout the phenomenologically viable parameter space.

T 21.4 Mo 11:45 VMP9 SR 30

Consequences of a gravitational θ-term in the neutrino sector — •Lena Funcke[1,2] and Gia Dvali[1,2,3] — [1]Arnold Sommerfeld Center for Theoretical Physics, Ludwig Maximilian University, Theresienstr. 37, 80333 Munich, Germany — [2]Max Planck Institute for Physics, Foehringer Ring 6, 80805 Munich, Germany — [3]Center for Cosmology and Particle Physics, Department of Physics, New York University, 4 Washington Place, New York, NY 10003, USA

It is known that non-perturbative effects in QCD break chiral symmetry and give rise to the η' meson. As widely believed, also gravity violates global symmetries, since microscopic black holes or wormholes may take away global charges from our universe. Based on a topological 3-form formulation of gravity, it was recently shown that the consequent gravitational θ-term inevitably leads to a new pseudoscalar degree of freedom in the neutrino sector, analogous to the η'. The appearance of such a "Goldstone" boson due to anomaly is a general feature of the topological 3-form language and not necessarily related to the confining characteristics of QCD.

In the current research project, we investigate the rich theoretical and experimental consequences of this new topological degree of freedom in the neutrino sector.

T 21.5 Mo 12:00 VMP9 SR 30

Corrections to Neutrino Mass Rules — •Julia Gehrlein[1], Alexander Merle[2], and Martin Spinrath[1] — [1]Institut für Theoretische Teilchenphysik, Karlsruhe Institute of Technology, Engesserstraße 7, D-76131 Karlsruhe, Germany — [2]Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), Föhringer Ring 6, D-80805 München, Germany

Neutrino mass sum rules are a common class of predictions in flavour models relating the Majorana phases to the neutrino masses. This leads, for instance, to strong restrictions on the effective mass probed in experiments on neutrinoless double beta decay. We will discuss generic corrections to these neutrino mass sum rules which arise for example from renormalization group evolution and present the effect of the corrections on the predictions from all sum rules found in the literature. Most of the predictions are rather robust under renormalization group effects, for example the lower bound on the lightest neutrino mass does not change significantly.

T 21.6 Mo 12:15 VMP9 SR 30

Novel Computational Approaches for the Analysis of Cosmic Magnetic Fields — •Andrey Saveliev — Universität Hamburg, Hamburg, Deutschland — Keldysh Institut, Moskau, Russland

In order to give a consistent picture of cosmic, i.e. galactic and extragalactic, magnetic fields, different approaches are possible and often even necessary. Here we present three of them: First, a semi-analytic analysis of the time evolution of primordial magnetic fields from which their properties and, subsequently, the nature of present-day intergalactic magnetic fields may be deduced. Second, the use of high-performance computing infrastructure by developing powerful algorithms for (magneto-)hydrodynamic simulations and applying them to astrophysical problems. We are currently developing a code which applies kinetic schemes in massive parallel computing on high performance multiprocessor systems in a new way to calculate both hydro- and electrodynamic quantities. Finally, as a third approach, astroparticle physics might be used as magnetic fields leave imprints of their properties on charged particles transversing them. Here we focus on electromagnetic cascades by developing a software based on CR-Propa which simulates the propagation of particles from such cascades through the intergalactic medium in three dimensions. This may in particular be used to obtain information about the helicity of extragalactic magnetic fields.