T 22: Theoretische Astroteilchenphysik und Kosmologie 1

Convenor: Heinrich Päs

Zeit: Montag 17:00–18:45 Raum: M114

T 22.1 Mo 17:00 M114

A successful cosmological model with selfinteracting Dark Matter — •Rainer Stiele[1] and Jürgen Schaffner-Bielich[2] — [1]Institut für Theoretische Physik, Goethe-Universität Frankfurt am Main — [2]Institut für Theoretische Physik, Ruprecht-Karls-Universität Heidelberg

We investigated a model with interactions between Dark Matter particles whose crucial consequences are additive contributions to energy density and pressure. Their differing scaling behaviour from the common ones of radiation and matter results in an epoch prior to the radiation-dominated era where energy density and pressure of the universe were dominated by the contributions of the selfinteraction. Friedman equations together with the equation of state of the selfinteraction and its proportionality to the Dark Matter particle density necessitate that the selfinteracting Dark Matter decoupled while still relativistic. Hence to reach standard Warm Dark Matter particle masses additional degrees of freedom in thermal equilibrium at decoupling to those of the standardmodell particles are required. Tracking the evolution of the selfinteracting Dark Matter energy density depending on the Dark Matter parameters together with the restrictions on the total energy density at primordial nucleosynthesis allow to restrain the selfinteraction strength. The surprising result is that even interactions between Dark Matter particles of the strength of the strong interaction cannot be excluded. Furthermore the consequences on Dark Matter decoupling and structure formation in a selfinteracting dominated universe were explored.

T 22.2 Mo 17:15 M114

Hidden gauginos of an unbroken $U(1)$: Cosmological constraints and phenomenological prospects — Alejandro Ibarra[1], Andreas Ringwald[2], and •Christoph Weniger[2] — [1]Physik Department T30, Technische Universität München, Garching — [2]Deutsches Elektronen-Synchrotron DESY, Hamburg

An unbroken hidden $U(1)$ gauge group which interacts with the standard model only via a small kinetic mixing with hypercharge decouples from the observable sector and is completely unconstrained by current experiments. We point out that this decoupling is elevated in the supersymmetric counterpart of this scenario, due to effects of supersymmetry breaking, and derive constraints from cosmological and astrophysical arguments. We firstly concentrate on the case where the gaugino of the hidden $U(1)$ gauge group is the LSP and makes up all of the observed dark matter. We show constraints on the model parameters from avoiding overclosure of the Universe and from requiring successful Big Bang Nucleosynthesis and structure formation. Secondly, in scenarios with a light gravitino as the LSP and the hidden $U(1)$ gaugino as the NLSP, we show that the bounds on the reheating temperature that come from potentially long lived charged MSSM relics are considerably relaxed. Finally, we consider the case of an anomalously small mixing parameter, where $\chi \ll 10^{-16}$, and discuss signatures from cosmic rays.

T 22.3 Mo 17:30 M114

Neutrino Signals from Unstable Gravitino Dark Matter — •Michael Grefe — DESY, Theory Group, Notkestraße 85, D-22603 Hamburg

The gravitino is a promising supersymmetric dark matter candidate, which does not require exact R-parity conservation. In fact, even with some small R-parity breaking, gravitinos are sufficiently long-lived to constitute the dark matter of the universe, while yielding a cosmological scenario consistent with primordial nucleosynthesis and the high reheating temperature required for thermal leptogenesis.

In this talk we discuss the neutrino flux from direct gravitino decay in a simple scenario with bilinear R-parity breaking and have a look at the possibility to detect such signal in present and future neutrino experiments. If detected, this distinctive signal might bring significant support to the scenario of decaying gravitino dark matter.

(Based on arXiv:0809.5030.)

T 22.4 Mo 17:45 M114

Cosmic-Ray e^+/e^- Anomalies and Decaying Dark Matter — Alejandro Ibarra and •David Tran — Technische Universität München

The PAMELA collaboration recently reported a significant excess of high-energy cosmic-ray positrons over the astrophysical expectations. In addition, the discovery of an unexpected spectral feature in the combined positron and electron fluxes at about 700 GeV was reported by the ATIC/PPB-BETS collaborations. We discuss interpretations of these observations in terms of dark matter and the resulting implications for the properties of the dark matter particles. In particular, we examine different scenarios with unstable dark matter that decays into charged leptons at late times, providing a possible explanation of the observed cosmic-ray anomalies.

T 22.5 Mo 18:00 M114

Status and perspective of CRPropa — •Jörg Kulbartz — II. Institut für theoretische Physik, Universität Hamburg, Luruper Chaussee 149, D-22761 Hamburg, Germany

To understand the origin of ultrahigh-energy cosmic rays (UHECRs), it is required to model their propagation through the universe in a realistic way, including inhomogeneous distribution of sources and effects of large scale cosmic magnetic fields. For this purpose the publicly-available numerical package CRPropa was developed. We present in this talk some recent simulations as well as highlight some of the ongoing development.

T 22.6 Mo 18:15 M114

Analyse hochenergetischer Proton-Proton Wechselwirkungen — •Tobias Fischer-Wasels für die IceCube-Kollaboration — TU Dortmund

Behandelt wird die Wechselwirkung hochenergetischer Protonen. Mithilfe der Parametrisierung nach Kelner/Aharonian/Bugayov (Phys. Rev. D 74/3, 034018) werden verschiedene Monte Carlo-Generatoren für hochenergetische Protonen getestet. Analysiert werden die Energiespektren und Wirkungsquerschnitte der verschiedenen Sekundärteilchen. Die Ergebnisse sind insbesondere relevant für die Berechnung von Flüssen hochenergetischer Neutrinos und Myonen in IceCube.

T 22.7 Mo 18:30 M114

Neue zweiseitige Schranke an den lorentzverletzenden Parameter der isotropen modifizierten Maxwell-Theorie — Frans Klinkhamer[1] und •Marco Schreck[2] — [1]Institut für Theoretische Physik, Universität Karlsruhe, Deutschland — [2]Institut für Theoretische Physik, Universität Karlsruhe, Deutschland

Zerfallserscheinungen in der lorentzverletzenden modifizierten Maxwelltheorie werden betrachtet. Wir beschränken uns auf den räumlich isotropen Bereich, der durch einen einzigen lorentzverletzenden Parameter im Photonsektor charakterisiert ist. Für den Prozess der Cherenkov-Strahlung im Vakuum $p^{\pm} \to p^{\pm}\gamma$ und den Photonzerfall $\gamma \to p^+p^-$ werden die Zerfallsbreiten und Schwellenenergien im Rahmen dieses Modells berechnet. Aus Daten des Pierre-Auger-Observatoriums und der Teleskope des High Energy Stereoscopic System (HESS) kann mittels der Schwellenenergien der betrachteten Prozesse eine zweiseitige Schranke für den lorentzverletzenden Parameter der Theorie ermittelt werden.