T 64: Theorie: Dunkle Materie

Zeit: Mittwoch 16:00–18:15 Raum: S16

T 64.1 Mi 16:00 S16

Dijet + Missing Energy in Extended Dark Matter Effective Theory — Florian Goertz, •Karla Tame-Narvaez, and Valentin Tenorth — Max-Planck-Institut für Kernphysik, Heidelberg,Germany

A search for dijet plus missing energy is discussed in the framework of an extended dark matter EFT. This signature offers a unique opportunity to probe the peculiar $SS\chi\chi$ operator, present in the setup. Prospects to extract its coefficient will be presented both for the High-Luminosity LHC and a future electron-proton collider, such as the FCC-eh, taking into account the major backgrounds.

T 64.2 Mi 16:15 S16

CP-Violating Scalar Dark Matter in the N2HDM — •Shruti Patel[1], Duarte Azevedo[2], Pedro Ferreira[3], Margarete Muhlleitner[4], Rui Santos[5], and Jonas Wittbrodt[6] — [1]ITP and IKP, Karlsruhe Institute of Technology, Germany — [2]Universidade de Lisboa, Portugal — [3]Universidade de Lisboa, Portugal — [4]ITP, Karlsruhe Institute of Technology, Germany — [5]Universidade de Lisboa, Portugal — [6]DESY, Hamburg Germany

Several extensions of the Standard Model (SM) containing an additional Higgs doublet and/or singlet provide viable dark matter (DM) candidates or beyond the SM sources of CP violation. However, singlet-doublet models which contain both a DM candidate as well as extra sources of CP violation are rare. In this talk we study such a model containing two scalar doublets and a scalar singlet with a discrete Z2 symmetry. Electroweak symmetry breaking in this model yields SM-like phenomenology, in addition to a hidden scalar sector containing a viable DM candidate. We show that a complex phase in the Lagrangian gives rise to CP violation exclusively in the hidden sector, and consider possible experimental signatures of CP violation. In particular, we study contributions to anomalous gauge couplings from the hidden scalars in the model.

T 64.3 Mi 16:30 S16

One-loop EW corrections to Direct Detection in the Vector Dark Matter Model — Seraina Glaus[1], Margarete Mühlleitner[1], •Jonas Müller[1], Shruti Patel[1], and Rui Santos[2,3,4] — [1]Karlsruher Institut für Technologie, ITP, Karlsruhe, Deutschland — [2]Instituto Politécnico de Lisboa, ISEL, Portugal — [3]Centro de Física Teórica e Computacional, Faculdade de Ciências, Portugal — [4]LIP, Departamento de Física, Universidade do Minho, Portugal

Recent dark matter (DM) direct searches place very stringent constraints on possible DM candidates proposed in extensions of the Standard Model (SM). Driven by the steadily increasing precision in DM direct detection searches, we present the one-loop electroweak corrections to the spin-independent DM scattering cross-section with nucleons in the simplified vector DM model (VDM). The VDM extends the SM with an additional complex singlet and a dark gauged $U(1)_X$ yielding a vector-like DM particle which is stabilised by a Z_2 symmetry. The loop corrections are essential to discuss the sensitivities of the direct detection experiments for the model prediction and might allow for reopening parameter space which is excluded by tree-level analyses.

T 64.4 Mi 16:45 S16

Dark matter in supersymmetrical Inverse-Seesaw models — •Yang Liu — Institute fuer Theoretische Physik und Astrophysik, Universitaet Wuerzburg, Deutschland

We consider two supersymmetrical models, where the neutrino masses and mixings can be explained by the additional sterile neutrinos. The first model is based on the Seesaw-I mechanism where the structure of the Yukawa coupling is the one of an Inverse-seesaw. In this model, the dark matter consists of two components: the lightest right-handed neutrino with a mass in keV range and the lightest sneutrino. We show that this model has two problems: (i) The results from *NuSTAR* collaboration constrain the mixing between the active and sterile neutrinos and therefore excludes this part of the parameterspace. (ii) The contribution from the sneutrino part is in this scenario too large.

The sneutrino contribution of the dark matter can be reduced through the resonance in the annhilation processes. Therefore we considered the former model as the effective model of a theory with expaned $U(1)_{B-L}$ gauge group. This model contains an additional lightest Higgs boson with a relative large coupling to the right-handed sneutrinos. We show that with help of a "Higgs-Funnel", the observed dark matter density can be explained while respecting the constraints from collider experiments.

T 64.5 Mi 17:00 S16

Triplet scalar and singlet–doublet fermion dark matter in a radiative model of neutrino masses — Juri Fiaschi[1], Michael Klasen[1], and •Simon May[1,2] — [1]Westfälische Wilhelms-Universität Münster — [2]Max-Planck-Institut für Astrophysik

We present a detailed study of a combined triplet scalar and singlet–doublet fermion model for dark matter. These models have only been studied separately in the past. Together, they form a simple extension of the Standard Model that can account for dark matter and explain the existence of neutrino masses, which are generated radiatively. However, this also implies the existence of lepton flavor-violating (LFV) processes. In addition, this particular model allows for gauge coupling unification. The new fields are odd under a new $\mathbb{Z}_2$ symmetry to stabilize the dark matter candidate.

We analyze the dark matter, neutrino mass and LFV aspects both separately and in conjunction, exploring the model's viable parameter space. This is done using numerical random scans imposing the relic density, neutrino mass and Higgs mass constraints. We discover differing properties of the scalar and fermion dark matter candidates in this model and discuss this model's features in contrast with earlier studies of its separate components and of similar radiative neutrino mass models.

T 64.6 Mi 17:15 S16

MadDM v.3.0: Towards a Comprehensive Tool for Dark Matter Studies — •Jan Heisig[1], Federico Ambrogi[2], Chiara Arina[1], Mihailo Backovic[1], Fabio Maltoni[1], Luca Mantani[1], Olivier Mattelaer[1], and Gopolang Mohlabeng[3] — [1]Universite catholique de Louvain — [2]University of Vienna — [3]Brookhaven National Laboratory

We present MadDM v.3.0, a numerical tool to compute particle dark matter observables. The new version features a comprehensive and automated framework for dark matter searches at the interface of collider physics, astrophysics and cosmology and is deployed as a plugin of the MadGraph5_aMC@NLO platform, inheriting most of its features. With respect to the previous version, MadDM v.3.0 now provides predictions for indirect dark matter signatures in astrophysical environments, such as the annihilation cross section at present time and the energy spectra of prompt photons, cosmic rays and neutrinos resulting from dark matter annihilation. MadDM indirect detection features support both $2 \to 2$ and $2 \to n$ dark matter annihilation processes. In addition, the ability to compare theoretical predictions with experimental constraints is extended by including the Fermi-LAT likelihood for gamma-ray constraints from dwarf spheroidal galaxies.

T 64.7 Mi 17:30 S16

Resummed photon spectrum from dark matter annihilation for intermediate energy resolution — Martin Beneke[1], Alessandro Broggio[2,3], Caspar Hasner[1], •Kai Urban[1], and Martin Vollmann[1] — [1]Physik-Department T31 ,TU München, Germany — [2]University of Milano-Bicocca, Italy — [3]INFN Milano, Italy

The annihilation cross section for TeV-scale weakly interacting massive particles χ_0 into photons is affected by large quantum corrections such as Sudakov logarithms and the Sommerfeld effect. In previous work the effective field theory setup and resummation of Sudakov logarithms of the semi-inclusive photon energy spectrum in $\chi_0\chi_0 \to \gamma + X$ was calculated for narrow resolutions $E^\gamma_{\rm res} \sim m_W^2/m_\chi$ with NLL' accuracy. In this talk, I will discuss the extension to intermediate resolutions of order m_W. I will show the matching of the two effective field theory descriptions for the wino dark matter model in an overlap region, thereby providing an accurate description of the energy spectrum for γ-ray telescopes for energy resolutions of about 300 GeV from the endpoint.

T 64.8 Mi 17:45 S16

Majoron Dark Matter and Constraints on the Majoron-

Neutrino Coupling — •Tim Brune and Heinrich Päs — Otto-Hahn Straße 4, 44227 Dortmund

We revisit a singlet Majoron model in which neutrino masses arise from the spontaneous violation of lepton number. If the Majoron obtains a mass of order MeV, it can play the role of dark matter. We discuss constraints on the couplings of the massive Majoron to neutrinos from supernova data and from neutrinoless double beta decay with Majoron emission. The combination of both constraints excludes a large range of Majoron-Neutrino couplings in the mass range of intererest for Majoron dark matter.

T 64.9 Mi 18:00 S16

Impact of SUSY parameters on dark matter prediction — •Marten Berger — II. Institute of Theoretical Physics, University of Hamburg, 22761 Hamburg, Germany

The Minimal Supersymmetric Standard Model (MSSM) is one of the best motivated extensions of the Standard Model (SM): it is of high predictive power and can explain the main open questions of the SM. For instance, if offers a well-motivated cold dark matter candidate. A crucial question is therefore whether this model can explain the correct amount of relic density with its cold dark matter candidate. For calculations of the relic density within the MSSM information about the mass of the lightest supersymmetric particle (LSP) as well as the mass of other particles which play a key role in the dominant mechanisms of annihilation are needed. Since the mixing character can rapidly change depending on the actual parameter point and consequently has immediate influence on the relic density contribution it is necessary to include one-loop corrections in the calculations of the dark matter observables. In this talk the determination of the fundamental SUSY parameter determinations from chargino production at a linear collider will be discussed with the focus on its impact on the contribution on the corresponding relic density.