Roadmap of Dark Matter models for Run 3

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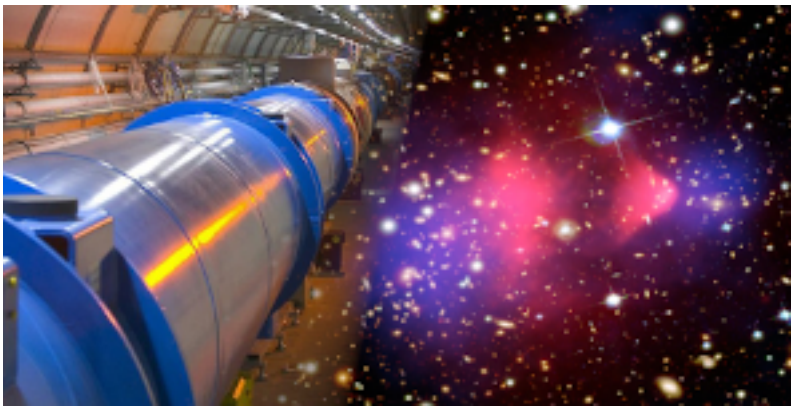

Book of Abstracts

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Update on the CODEX-b Experiment

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The High Luminosity LHC will be a tremendous opportunity to search for long lived particles (LLPs) from an extended hidden/dark sector, feebly connected to the known SM sector. Such LLP searches will require special detectors, placed far away from the proton-proton collision point and shielded against SM backgrounds. The CODEX-b detector, to be placed behind a thick shielding wall inside the LHCb cavern, around 25m from the LHCb interaction point, provides a novel solution. On the journey to construction of the full detector, a demonstrator (CODEX-β) is foreseen for installation and operation during LHC Run 3. This talk will present the latest developments and will focus on the status and plans for CODEX-β.

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SIFTing for dark shower signals

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I present ongoing work seeking to identify the presence of dark shower phenomena in otherwise ordinary-seeming jets using jet substructure techniques with a particular focus on the recently-proposed SIFT algorithm. The aim is to explicitly identify the mass scale signature of the dark shower products which then promptly decay back into SM quarks, giving effectively normal-looking SM jets. This is the most challenging case for detecting dark shower activity; if we can differentiate this from QCD the same tools should be useful to sharpen semi-visible or emerging jet searches as well.

s-channel mediators and Higgs to invisible / 5

Beyond the Dark matter effective field theory and a simplified model approach at colliders

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In this talk, I will review the importance of "Gauge invariance" in the search for Dark matter at the High Energy Collider including LHC.

The major topics I will include will be
1) The limit of effective field theory / simplified model approach at the High Energy collider
2) Dark matter showering at the High Energy collider

s-channel mediators and Higgs to invisible / **6**

Is the light neutralino thermal dark matter in the pMSSM ruled out?

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We explore the parameter space of the phenomenological Minimal Supersymmetric Standard Model (pMSSM) with a light neutralino thermal dark matter ($M\tilde{}\chi 01 \leq Mh/2$) that is consistent with current collider and astrophysical constraints. We identify that a narrow region with light Higgsinos having masses between 125-160 GeV survives the present constraints for the $\mu < 0$ scenario, including the electroweakino searches implemented in recast frameworks like SModelS and CheckMATE, where μ is the Higgsino mass parameter. This hints towards either a gap in the present LHC searches or the unavailability of its proper recasting. We select benchmarks from this region, and our analysis using the machine learning framework of XGBOOST shows that these are well within the reach of the Run-3 of LHC, and dedicated efforts to probe this region should be pursued. We observe that the recent experimental results from the LHC and direct detection searches for dark matter by the LUX-ZEPLIN collaboration put the $\mu > 0$ scenario under severe tension. We further investigate the impact of light staus on the parameter space, provide benchmarks that can be interesting for Run-3 of LHC, and analyse these benchmarks at the LHC using XGBOOST. Finally, we also discuss the effect of non-standard cosmology on the parameter space.

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LLP-DM overview: linking searches to models, and LLP experiment reach for DM model space

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Multiple track signatures

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Signatures with MET

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Pair-produced LLPs (to jets, leptons, photons...)

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Mass-independent searches

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Recasting wishlist

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Discussion

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Unexplored signatures & wildcard ideas / 15

Search for Anti Quark Nuggets via their interaction with the LHC beam: A reanalysis of stored data from the 4000 LHC monitors [12+3]

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Anti-quark nuggets, AQNs, (ZHITNITSKY, 2003), have been suggested to solve the dark matter (DM) and the missing antimatter problem in the universe, and have been proposed as an explanation of various observations.

Their size is in the μm range and their density equal to the nuclear density with an expected flux of about 1 / km2 / year. For the typical velocity of DM constituents (˜250 km/s), the solar system bodies act as highly performing gravitational lenses; Here we assume that DM streams or clusters are impinging, e.g., on the Earth, as was worked out for DM axions and WIMPs.

Interestingly, in the LHC beam, unforeseen beam losses are triggered by so-called UFOs (Unidentified Falling Objects), which are believed to be constituted of dust particles with a size in the μm range and a density several orders of magnitude lower than AQNs.

Prezeau suggested that streaming DM constituents incident on the Earth should result in jet-like structures ("hairs") exiting the Earth. Such ideas open up novel directions in the search for DM.

This talk suggests a new analysis of the UFO results at the LHC, assuming that they are eventually, at least partly, due to AQNs. Specifically, a reanalysis of the existing data from the ˜4000 beam monitors since the beginning of the LHC is proposed, arguing that dust and AQNs should behave differently. The feasibility of this idea has been discussed with three CERN accelerator experts and other collaborators.

Extended Higgs sectors / **17**

Novel signatures in the Type-I 2HDMa model (12'+3')

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The 2HDMa model is one of the main models used in the Dark Matter searches at the LHC. So far, all the 2HDMa benchmarks used by the LHC experiments feature a Type-II Yukawa sector with degenerate Higgses ($m_A = m_H = m_{H^\pm}$). The latter implies, together with the fact that flavour observables put lower bounds on the mass of the charged Higgses, that the $A/H/H^\pm$ bosons are all constrained to be heavy (
$gtrsim$600 GeV).
In this talk, we present the first detailed study of a 2HDMa model with a Type-I Yukawa sector, which, for moderate values of $\tan\beta$, lifts the constraints from flavour observables, allowing the extra Higgs bosons to be even lighter than the SM Higgs boson. We discuss four benchmarks with degenerate and non-degenerate Higgses and the signatures that arise in this model, some of which have not yet been explored by the LHC experiments. The talk will present the dominant channels in these benchmarks and the expected sensitivity in Run 2 data using a truth-level analysis and will discuss potential improvements in the experimental searches for Run 3.

Dark Higgs / **18**

Search for inelastic dark matter in association with a dark Higgs boson at Belle II [15+5]

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Belle II has a unique reach for a broad class of models that postulate the existence of dark matter particles in the MeV-GeV mass range. One scenario is a model which involves inelastic dark matter,

consisting of two dark matter states with a mass splitting between them and the presence of a dark Higgs boson. This model has a signature of up to two displaced vertices, one from the resonant decay of the dark Higgs and another non-resonant one emerging from the decay of the involved dark matter particles. This talk will present studies of an ongoing search for such signatures using Belle II simulation, which is not only challenging due to the presence of displaced vertices but also because of the seven-dimensional parameter space of the model.

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Darkonia at Colliders

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Dark matter bound states may exist within the dark sector, characterized by a substantial dark force. Depending on the spins and parity properties of the force carriers, Standard Model particles may primarily couple with either the lowest or excited bound states. We discuss the associated collider signatures at the LHC for various simplified models.

Unexplored signatures & wildcard ideas / 20

The Triggerless Search for Exotic DM at Run-3 with the MoEDAL-MAPP Experiment

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The MoEDAL-MAPP experiment at Run-3 incorporates the MoEDAL and MAPP-1 (MoEDAL Apparatus for Penetrating Particles) detectors deployed at IP8 and in the UA83 tunnel on the LHC Ring, respectively. The passive, triggerless, MoEDAL detector has been taking data at Run-1 and Run-2 and is a world leader in the direct search for Highly Ionizing Particles (HIPs) at a Collider. HIP avatars of new physics include several exotic dark matter candidates including magnetic monopoles, Q-balls, nuclearites, microscopic black-hole remnants and lepton-like multi-charged constituents of composite dark matter, etc.

The MAPP-1 detector is currently being installed on the LHC ring and is primarily designed to search for Weakly Ionizing Particle (WIPs) messengers of new physics. However, it also has sensitivity to very long-lived charged and neutral particles (LLPs) exemplars of physics beyond the Standard Model, decaying to charged and photonic states. The MAPP-1 data acquisition rate is low enough that all data can be stored subject to optional "software a trigger"cuts. In this sense MAPP-1 is triggerless. The MAPP-1 detector will also be used in the search for exotic DM messengers of new physics such as: millicharged particles, dark Higgs, light neutralinos and sterile neutrinos.

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Reinterpretation an ATLAS search into Dark Minimal Flavour Violation models

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The existence of a new type of non-baryonic matter in the Universe, also called Dark Matter (DM), is supported by compelling astrophysical and cosmological evidence. Considerations on its measured relic density favour the hypothesis that Dark Matter is composed primarily of Weakly Interacting Massive Particles (WIMPs). Unfortunately, numerous experiments targeting the detection of these DM particles have not found any evidence of their existence. A possible solution to this tension is provided by flavoured DM models proposing a non-trivial flavour structure in the Dark Sector. Amongst all of them, particularly interesting are theories proposing top-flavoured dark matter and flavour violating couplings between the dark sector and the SM. In these Dark Minimal Flavour Violation models, several constraints on WIMPs from direct and LHC experiments are lifted at the same time that new signatures are proposed to look for Dark matter at LHC experiments. These signatures include final states with large missing transverse momentum, a top-quark and an additional quark (q) with different flavour, such as charm, bottom or lighter quarks. This contribution presents a reinterpretation of a recent published ATLAS search looking for signs of the pair production of two top-spartners in a final state with tops, charm and large missing transverse momentum in the context of these DMFV models. First limits using the ATLAS software are derived on four benchmark scenarios of these models. These results are derived using 139 fb-1 of Run-2 LHC collision data registered by the ATLAS detector.

Dark showers / **23**

Reinterpretation of CMS emerging jets for Higgs-mediated dark showers

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In this talk we will present the reinterpretation of the CMS emerging jets (that is, long-lived dark pions belonging to a strongly interacting dark sector), published in JHEP 01 (2024) 034 (arXiv:207.04847) and will show that particularly this search can set meaningful bounds on scenarios where the SM Higgs boson mediates between the visible and dark sectors. In particular we find that for dark pion lifetimes between 5-100 mm the reintepretation of this search, while suboptimal, would be more sensitive than the extrapolation of the BSM Higgs search (2.5 - 4 %, depending on the assumed systematics).

Hence, this talk combines:

a) dark showers, and in particular emerging jets, which is a LLP signature subset (and how to reinterpretate them)
b) s-channel mediators (the Higgs)
c) Higgs to invisible (or actually to “undetected”, as we do expect the dark pions to decay into the SM).

Dark showers / **24**

Probing new signatures for semi-visible jets at the LHC

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The Hidden Valley scenario consists of a set of models where the Standard Model is accompanied by a Hidden Sector and connected with it via a heavy mediator or a weak coupling. If realised in nature, the Hidden Valley scenario may result in unusual and little-studied phenomena at the LHC. Under the assumption of a QCD-like confining dark sector, novel experimental signatures emerge, characterized by sprays of particles resembling hadronic jets containing stable invisible dark matter bound states. The resulting signature is characterised by missing momentum aligned with one of the jets, defining an orthogonal phase-space compared to traditional WIMPs searches. These semi-visible jets have been studied theoretically and experimentally in the fully hadronic signature where the unstable composite dark bound states can only decay promptly back to Standard Model quarks. We present a set of new simplified models allowing the decays of the unstable dark bound states to leptons, photons and b-quarks. The new resulting signatures are semi-visible jets characterised by an enhanced presence of non-isolated leptons or photons, coming directly from dark bound states decays or from subsequent decays of tau leptons or B mesons. We discuss possible constraints from previous searches from the CMS and ATLAS experiments, as well as propose possible realistic analysis strategies for Run2 and Run3 leveraging the enhanced leptonic or photon content of these anomalous jets.

Dark Higgs / **25**

Review of Benchmark Models Used for Z'+MET Searches [15+5]

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We present a review of the models used for the search for a new leptonically decaying neutral vector boson in association with missing transverse energy by ATLAS, which was published as a conference note (ATLAS-CONF-2023-045) in August 2023. Three signal regions were defined as bins in the E_T^{miss} significance, and the search was performed by scanning across the dilepton invariant mass spectrum in each of these regions. No significant excess above the expected Standard Model background was observed, and limits were set on two benchmark models referred to as light-vector and dark-Higgs. It has been established that the particular benchmarks used in this search do not reproduce the observed dark-matter relic density, and we investigate possibilities for adjusting the models to satisfy the relic-density constraints. We also consider the impact on these models from other search constraints, in particular the s-channel constraints from the dark-matter summary effort by ATLAS (ATL-PHYS-PUB-2023-018), which for example includes limits from the inclusive dilepton and dijet searches. Plans are also made to provide fiducial cross-section limits for the signal regions used in the search in order ease reinterpretations of the search, but it is at the moment unclear if these limits will be available in time for this presentation.

Dark showers / **26**

Exploration of b-philic SVJ and new discriminating observables

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After the first round of SVJ experimental results, the focus has shifted to exploring more specific topologies, as well as attempts to design more sensitive observables. In this presentation, we will cover an exploratory study of SVJs produced preferentially with bottom quarks, including looking at the sensitivity from current public results. The advantage of using variable radius jets will be discussed. In the second part, we will cover our attempts to discriminate SVJs better, by designing observables less sensitive to specifics of Pythia8 HV modelling.

Extended Higgs sectors / **27**

Sensitivity of 2HDMa searches to Inert Doublet Model

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Recasting is an extremely powerful tool to derive limits on new physics
models. With so many NP models at our disposal, recasting makes it easy to use the limits derived on certain models by experimental searches, to
constrain any model of our choice. However, this method can fail, if
the model of our interest not only differs from the one it is being
recasted from, in terms of event rates, but also leads to significantly different final state kinematics. In such cases, the experimental search, optimized for a specific model may become completely insensitive to the new model under study. A dedicated search would then be necessary to probe interesting regions of the new model. We present such a case for DM models, namely Inert Doublet Model with di-lepton+MET final state and its recasting from 2HDMa, using ATLAS full run-2 data.

Low mass signatures, ALPs, dark photons / **28**

Mono-X Signatures of a Fermionic Dark Matter at the LHC

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Searching for absorbed fermionic dark matter by nuclei is being taken more and more attention. In stead of the energy recoil signal at direct detection experiments, dark matter appears always as missing energy at high energy colliders. For such a fermionic

dark matter, its production is always accompanied by an invisible neutrino. Mono-X (photon, jet and Z boson) productions are promising channels for probing such event topology. Furthermore, at high energy colliders, a much wider range of the dark matter mass, as long as it is kinematical allowed, can be investigated. In this work, we study model-independent constraints on a generic fermionic dark fermion in the full accessible mass range at the LHC. Interplay between the collider search and the direct detection experiments for a light dark matter is discussed.

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Extended Higgs Sector in Singlet-Triplet Fermionic Model for Dark Matter and Neutrino Mass

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Singlet-Triplet Fermionic Model (νSTFM) with an extended fermion and Higgs sector is a well motivated model which explains both neutrino masses and dark matter (DM). Two of the triplet $\rho_{1,2}$ and singlet fermionic fields $N_{1,2}$ contribute to neutrino mass generation via seesaw mechanism, while, the remaining triplet ρ_3 and singlet N_3 fields are the constituents of the dark sector. The DM in this model can either be a WIMP or a FIMP candidate, depending on whether triplet ρ or singlet N state is the lightest Z_2 odd state. The Higgs sector consists of a real scalar triplet Δ and the SM Higgs doublet field ϕ_h, with a non-zero mixing $\sin\alpha$ between the BSM neutral Higgs state H_2 and the physical SM Higgs boson H_1. In addition to the CP even neutral Higgs, the model also contains charged Higgs state $H^\pm$. The BSM Higgs states play a major role in determining the DM relic density. The mass of the states ρ, N and H_2 are denoted as M_ρ, M_N and M_{H_2}, respectively. We further consider the charged Higgs $H^\pm$ and H_2 share the same mass. We consider the model parameters in this following range and explore the DM production:

$10^{-12} \leq Y_{\rho\Delta} \leq 10^{-8}$,
$10^{-3} \leq \sin\alpha \leq 10^{-1}$,
300 GeV $\leq M_\rho \leq$ 1200 GeV,
10^{-4} GeV $\leq M_N \leq$ 100 GeV,
125 GeV$\leq M_{H_2} \leq$ 1000 GeV

For the mass hierarchy $M_N < M_\rho$ and $M_{H_2} < M_\rho + M_N$, N is the DM candidate. In the subsequent discussion, we consider N as a FIMP candidate having feeble interactions with ρ and Δ. The interaction strength is governed by the respective Yukawa coupling $Y_{\rho\Delta} \sim \mathcal{O}(10^{-11})$ between N, ρ and Δ states. The primary contribution to relic density comes from $\rho \to NH_{1,2}$, where both the thermal contribution and late decay contribution can be significant. We find that, for a BSM Higgs state H_2 having mass in between 200 GeV-1 TeV, as large as 60% contribution to relic density can also come from annihilation processes of the SM/BSM particles $AB \to \rho N$ mediated via H_2, where $A, B = W^\pm, Z, \rho^\pm, H_{1,2}, H^\pm$ states. Such lighter BSM Higgs states can be constrained from a number of LHC searches and can have detectable signatures at the Run-3 of the LHC with the full integrated luminosity.

We consider three different types of LHC constraints, a) Higgs signal strength measurement, b) direct BSM Higgs searches, such as $pp \to H_2 \to W^+W^-, ZZ, H_1H_1$, and c) SM Higgs to di-photon measurement. We find that the chosen parameter space is consistent with the above searches.

We further point out the possible signatures of the BSM CP even neutral Higgs and charged Higgs states at the LHC. The primary production for them is the Drell Yan production $pp \to H^+H^-$ and $H_2H^\pm$, as gluon fusion and VBF are suppressed due to a small $H_2 - H_1$ mixing. In the mass range $200\text{GeV} < M_{H_2} < 375\text{GeV}$, the dominant decay mode is $H^+ \to t\bar{b}$ while in the mass range $375\text{GeV} < M_{H_2} < 500\text{GeV}$, the dominant mode is $H^+ \to W^+Z$. Therefore, for the lower mass range the signature from H^+H^- production at LHC would be $4j+4b$ and $2l+4b$+MET. On the other hand for the mass range $375\text{GeV} < M_{H_2} < 500\text{GeV}$, the final states are $6l + \text{MET}, 2\text{l} + \text{MET}, 4\text{j} + 4\text{l}, 4\text{j} + \text{MET}$. For H_2 the dominant decay mode is W^+W^- in the entire mass range.Therefore, one can search for $pp \to H^+H_2$ in the following final states $6j + 2b, 5l$+MET. The typical cross-section for 13.6 TeV LHC varies in between 60 fb-1 fb for the pair and associated production $pp \to H^+H^-, H_2H^\pm$ in the mass range $M_{H_2} = M_{H^\pm} \sim 200\text{GeV} - 500$ GeV. This leads to $\sigma \sim 10 - 0.1$ fb for $4j + 4b$ final state, $3.2 - 0.03$ fb for $2l + 4b$+MET final state. Similar cross-section can also be obtained for the final states 4j + 4l, 4j + MET. The existing searches such as multi-jet+MET or multi-lepton+MET can be utilised to constrain this model. Another important characteristic of this model is the presence of $5l$ final states associated alongwith MET $pp \to H_2H^\pm \to W^+W^-W^\pm Z \to 5l$+MET. For lighter mass such as 200 GeV the cross-section is about 0.2 fb. However the presence of 5 leptons may provide added benefit for background suppression at the LHC run-3.

Dark showers / 30

Strongly-interacting dark sectors and DM relic density: an overview

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Unexplored signatures & wildcard ideas / 31

Production of Kaluza-Klein States at LHC and Implication for Dark Matter [12+3]

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t has been proposed that, in the large radius compactification (LRC) scenario, the Kaluza-Klein states might be considered as dark matter (DM) candidates. The universal extra dimension (UED) hypothesis, together with the LRC paradigm, holds the prospect of observing KK states at LHC if masses lie in the accessible LHC energy scale. If observed, they might be possible DM candidates, provided LKP is protected by a conservation law not to decay to SM particles. This work is based on axiomatic field theory approach to derive upper bound on production cross sections and bounds on near forward differential cross sections. These bounds are obtained without appealing to perturbation theory, i.e. cross-section bounds are obtained nonperturbatively. The bounds are based on principles of local field theories such as Lorentz invariance, causality and uniqueness of vacuum (respected by all local field theories). We shall depict the growth properties of relevant cross sections as a function of energy. It is speculated that KK states might be observed in cosmic ray experiments.

Unexplored signatures & wildcard ideas / **32**

A smoking gun signature of the 3HDM [20+10]

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Fermionic Portal to Vector Dark Matter [20+10]

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We suggest a new class of models - Fermionic Portal Vector Dark Matter (FPVDM) which extends the Standard Model (SM) with SU(2)_D dark gauge sector. While FPVDM does not require kinetic mixing and Higgs portal. It is based on the Vector-Like (VL) fermionic doublet which couples the dark sector with the SM sector through the Yukawa interaction. The FPVDM framework provides a vector Dark Matter (DM) with Z_2 odd parity ensuring its stability. Multiple realisations are allowed depending on the VL partner and scalar potential, which explain not only DM but also could provide solutions of various BSM hints, including (g-2)_mu, flavour anomalies, W-boson mass measurement by CDF, etc.

Two examples will be discussed. One of them is the FPVDM realisation with only a VL top partner, which provides interesting and promising implications for DM direct and indirect detection experiments, relic density and collider searches. Another realisation of the FPDM framework with a doublet of new vector-like partners of muon can simultaneously explain DM relic density together with (g-2)_mu anomaly which has been in close focus of the HEP community over two decades. It predicts the mass of vector DM to be below GeV as well as the mass of the muon partner to be below 1 TeV, and provides novel multi-lepton signatures at the LHC.

The talk is based on 2203.04681, 2204.03510 arXiv papers as well as the new one which is coming this March-April.

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Inelastic Dark Matter at the LHC Lifetime Frontier [20+10]

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Search for Dark Matter with Anomaly Detection Techniques [20+10]

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Low mass signatures, ALPs, dark photons / **36**

Dark Photon Searches on LHCb (20'+10')

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Dark Photon Searches on CMS (20'+10')

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Dark Photon Searches on ATLAS (20'+10')

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Recasting Dark Photon Searches (20'+10')

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Mono-X Signatures of a Fermionic Dark Matter at the LHC (15'+5')

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Dark Photon Theory Landscape (25'+10')

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Low mass signatures, ALPs, dark photons / **42**

Dark Photon Exploration Beyond the LHC (25'+10')

Corresponding Author: echenard@caltech.edu

Extended Higgs sectors / 43

Experimental introdution to extended higgs models: an ATLAS perspective (20'+10')

Corresponding Author: katharina.behr@cern.ch

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Experimental introdution to extended higgs models: a CMS perspective (20'+10')

Corresponding Author: danyer.perez.adan@cern.ch

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Theory introduction to extended higgs models: a collider perspective (20'+10')

Corresponding Authors: josemi.no@uam.es, j.m.no@sussex.ac.uk

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Theory introduction to extended higgs models: a dark matter phenomenology perspective (20'+10')

Corresponding Authors: giorgiobusoni@busoni.it, giorgio.busoni@anu.edu.au

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Extended Higgs Sector in Singlet-Triplet Fermionic Model for Dark Matter and Neutrino Mass (12'+3')

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Sensitivity of 2HDMa searches to Inert Doublet Model (12'+3')

Corresponding Author: jayita.lahiri@desy.de

Extended Higgs sectors / **49**

Panelist discussion (invited speakers + session chairs) (45')

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Dark showers / **50**

Introduction

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Dark showers / **51**

Experimental results: ATLAS

Corresponding Author: dilia.maria.portillo.quintero@cern.ch

Dark showers / **52**

Experimental results: CMS

Corresponding Author: long.wang@cern.ch

Dark showers / **53**

Dark sector glueballs

Corresponding Author: caleb.gemmell@mail.utoronto.ca

Dark showers / **54**

Foundation Models as a new tool to uncover the dark sector?

Corresponding Author: joschka.birk@cern.ch

Dark showers / **55**

SIFTing for dark shower signals

Author: William Shepherd[None]

Co-author: Joel Walker [1]

[1] *Sam Houston State University*

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I present ongoing work seeking to identify the presence of dark shower phenomena in otherwise ordinary-seeming jets using jet substructure techniques with a particular focus on the recently-proposed SIFT algorithm. The aim is to explicitly identify the mass scale signature of the dark shower products which then promptly decay back into SM quarks, giving effectively normal-looking SM jets. This is the most challenging case for detecting dark shower activity; if we can differentiate this from QCD the same tools should be useful to sharpen semi-visible or emerging jet searches as well.

Dark showers / **56**

Discussion and wrap up

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Dark Higgs / **57**

Searches for Extra Higgs Bosons and the 95 GeV Excess [25+5]

Corresponding Author: thomas.biekoetter@kit.edu

Dark Higgs / **58**

Theory and Motivation of dark Higgs Bosons [25+5]

Corresponding Author: giorgio.arcadi@unime.it

Dark Higgs / **59**

Searches for Dark Higgs Bosons at ATLAS [15+5]

Corresponding Author: changqiao.li@cern.ch

Dark Higgs / **60**

Searches for Dark Higgs Bosons at CMS [15+5]

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Dark Higgs / **61**

Light Higgs Bosons ATLAS+CMS [15+5]

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Dark Higgs / **62**

Discussion Session - Presentation of Dark Higgs Results

Corresponding Author: kahlhoefer@kit.edu

t-channel mediators / **63**

Cosmological perspectives and constraints on t-channel models [20'+10']

Corresponding Author: chiara.arina@uclouvain.be

t-channel mediators / **64**

A theory overview on t-channel models and their LHC phenomenology [30'+10']

Corresponding Author: luca.panizzi@physics.uu.se

t-channel mediators / **65**

LHC Signatures of Flavoured Dark Matter [25'+10']

Corresponding Author: monika.blanke@kit.edu

t-channel mediators / **66**

Experimental bounds on t-channel models with heavy flavours [15'+5']

Corresponding Author: deborah.pinna@cern.ch

t-channel mediators / **67**

Long-lived particles and t-channel models [20'+10']

Corresponding Authors: jan.heisig@uclouvain.be, heisig.hep@gmail.com

t-channel mediators / **68**

t-channel dark matter, flavour anomalies and top flavour-changing neutral currents [20'+5']

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s-channel mediators and Higgs to invisible / **69**

ATLAS Higgs to invisible plans and summary

Corresponding Author: diallo.boye@cern.ch

s-channel mediators and Higgs to invisible / **70**

CMS Higgs to invisible plans and summary

Corresponding Author: andrea.malara@cern.ch

s-channel mediators and Higgs to invisible / **71**

ATLAS & CMS legacy s-channel results

Corresponding Author: matteo.bauce@cern.ch

s-channel mediators and Higgs to invisible / **72**

New experimental directions for s-channel

Corresponding Author: dryu@fnal.gov

s-channel mediators and Higgs to invisible / **73**

Coffee break

s-channel mediators and Higgs to invisible / **74**

EFT theory for Higgs to invisible

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Unexplored signatures & wildcard ideas / **75**

The Triggerless Search for Exotic DM at Run-3 with the MoEDAL-MAPP Experiment [12+3]

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The MoEDAL-MAPP experiment at Run-3 incorporates the MoEDAL and MAPP-1 (MoEDAL Apparatus for Penetrating Particles) detectors deployed at IP8 and in the UA83 tunnel on the LHC Ring, respectively. The passive, triggerless, MoEDAL detector has been taking data at Run-1 and Run-2 and is a world leader in the direct search for Highly Ionizing Particles (HIPs) at a Collider. HIP avatars of new physics include several exotic dark matter candidates including magnetic monopoles, Q-balls, nuclearites, microscopic black-hole remnants and lepton-like multi-charged constituents of composite dark matter, etc.

The MAPP-1 detector is currently being installed on the LHC ring and is primarily designed to search for Weakly Ionizing Particle (WIPs) messengers of new physics. However, it also has sensitivity to very long-lived charged and neutral particles (LLPs) exemplars of physics beyond the Standard Model, decaying to charged and photonic states. The MAPP-1 data acquisition rate is low enough that all data can be stored subject to optional "software a trigger"cuts. In this sense MAPP-1 is triggerless. The MAPP-1 detector will also be used in the search for exotic DM messengers of new physics such as: millicharged particles, light neutralinos and sterile neutrinos.

Unexplored signatures & wildcard ideas / **76**

Wrap-up and Discussion

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Organisational details

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Discussion

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Close out

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