Blois 2024: 35th Rencontres de Blois on "Particle Physics and Cosmology"

Report of Abstracts

https://indico.cern.ch/e/1335188

Abstract ID : **549**

First Results on Neutrinoless Double Beta Decay With the LEGEND Experiment

Content

The search for the neutrinoless double beta ($0\nu\beta\beta$) decay is considered the most promising way to prove the violation of the total lepton number of two units, demonstrate the Majorana nature of neutrinos, and provide an absolute mass scale for neutrinos.
The LEGEND (Large Enriched Germanium Detector for Neutrinoless $\beta\beta$ Decay) Collaboration aims at building a ^{76}Ge-based $0\nu\beta\beta$ experiment with a sensitivity on the decay half-life beyond 10^{28} years in a staged approach. The first phase, LEGEND-200, started operations at LNGS in 2023 with 142 kg of HPGe detectors and plans to install more in the coming months. The Collaboration analyzed this first dataset to evaluate the experiment's sensitivity and investigate the residual background.
In this contribution, an overview of the LEGEND project will be presented together with the first results on the $0\nu\beta\beta$ decay search applied to the first year of data taking.

Primary author: CALGARO, Sofia

Track Classification: Neutrinos

Status: SUBMITTED

Submitted by **CALGARO, Sofia** on **Thursday 22 August 2024**

Abstract ID : **550**

First Measurement of Solar 8B Neutrinos via Coherent Elastic Neutrino-Nucleus Scattering with XENONnT

Content

The XENONnT experiment, located at the INFN Laboratori Nazionali del Gran Sasso in Italy, is designed to detect a dark matter candidate—Weakly Interacting Massive Particles (WIMPs)—by observing their interactions with xenon nuclei. A particularly intriguing aspect of this search is the potential for coherent elastic neutrino-nucleus scattering (CEvNS) between Boron-8 neutrinos and xenon nuclei, which produces a signal similar to that of WIMPs. In this talk, I will present the analysis that led to the first measurement of solar neutrinos via CEvNS, based on data from XENONnT's first two science runs.

Primary author: XU, Dacheng

Track Classification: Astroparticles; Dark Matter; Neutrinos

Status: SUBMITTED

Submitted by **Mr XU, Dacheng** on **Wednesday 28 August 2024**

Abstract ID : **551**

Measurements of electroweak penguin and radiative B decays at Belle and Belle II

Content

The Belle and Belle II experiments have collected a 1.1 ab^{-1} sample of $e^+e^- \to B\bar{B}$ collisions at a centre-of-mass energy corresponding to the $\Upsilon(4S)$ resonance. These data, with low particle multiplicity and constrained initial state kinematics, are an ideal environment to search for rare electroweak penguin and radiative B decays. Results include those related to the following decays: $B \to K^+\nu\bar{\nu}$; $B \to K^*\tau^+\tau^-$; $B^0 \to K^0_S\tau^+\ell^-$, where ℓ is an electron or muon; $B^0 \to \gamma\gamma$; $B \to \rho\gamma$; and $B \to K^*\gamma$.

Primary author: VAHSEN, Sven (University of Hawaii (US))

Presenter: VAHSEN, Sven (University of Hawaii (US))

Track Classification: Flavour

Comments:

This abstract was submitted by S.V. for the Belle II Speakers Committee. If accepted, we will nominate a speaker from our collaboration.

Status: SUBMITTED

Submitted by **VAHSEN, Sven** on **Thursday 29 August 2024**

Abstract ID : **552**

Charm physics at Belle and Belle II

Content

The Belle and Belle II experiments have collected a $1.4\,\mathrm{ab}^{-1}$ sample of e^+e^- collision data at centre-of-mass energies near the $\Upsilon(nS)$ resonances. These samples contain a large number of $e^+e^- \to c\bar{c}$ events that produce charmed mesons and baryons. We present searches for rare flavour-changing neutral current $c \to u\ell^+\ell^-$ processes in several decay modes. Further, we study several decays of the Λ_c and Ξ_c to determine branching fractions, as well as CP asymmetries in singly Cabibbo-suppressed decays. Finally, we present measurements of several modes where the D-meson decays to a four-body final state. For the four-body decays, asymmetries in the distributions of triple and quadruple moments probe for CP violation.

Primary author: VAHSEN, Sven (University of Hawaii (US))

Presenter: VAHSEN, Sven (University of Hawaii (US))

Track Classification: Flavour

Comments:

This abstract was submitted by S.V. for the Belle II Speakers Committee. If accepted, we will nominate a speaker from our collaboration.

Status: SUBMITTED

Submitted by **VAHSEN, Sven** on **Thursday 29 August 2024**

Abstract ID : **553**

Measurements of τ decays at Belle and Belle II

Content

The Belle and Belle II experiments have collected a $1.4\ \mathrm{ab}^{-1}$ sample of e^+e^- collision data at centre-of-mass energies near the $\Upsilon(nS)$ resonances. This sample contains approximately 1.3 billion $e^+e^- \to \tau^+\tau^-$ events, which we use to search for lepton-flavour violating decays. We present searches for $\tau- \to \mu^-\mu^-\mu^+$, $\tau^- \to \Lambda\pi^-$, and $\tau^- \to \bar{\Lambda}\pi^-$. We also present world leading measurements of the τ mass and lepton-flavour universality in $\tau \to \ell\nu\bar{\nu}$ decay, where ℓ is an electron or a muon.

Primary author: VAHSEN, Sven (University of Hawaii (US))

Presenter: VAHSEN, Sven (University of Hawaii (US))

Track Classification: Flavour

Comments:

The Belle and Belle˜II experiments have collected a $1.4\ \mathrm{ab}^{-1}$ sample of e^+e^- collision data at centre-of-mass energies near the $\Upsilon(nS)$ resonances. These samples contain a large number of $e^+e^- \to c\bar{c}$ events that produce charmed mesons and baryons. We present searches for rare flavour-changing neutral current $c \to u\ell^+\ell^-$ processes in several decay modes. Further, we study several decays of the Λ_c and Ξ_c to determine branching fractions, as well as CP asymmetries in singly Cabibbo-suppressed decays. Finally, we present measurements of several modes where the D-meson decays to a four-body final state. For the four-body decays, asymmetries in the distributions of triple and quadruple moments probe for CP violation.

Status: SUBMITTED

Submitted by **VAHSEN, Sven** on **Thursday 29 August 2024**

Abstract ID : **554**

Physics Prospects and Detector Design for a Future Multi-TeV Muon Collider

Content

A Multi-TeV muon collider stands out as a leading contender for advancing High Energy Particle physics beyond the High Luminosity LHC era.
This machine will represent an invaluable opportunity to probe the most intimate nature of the Standard Model (SM) and the Electroweak Symmetry Breaking mechanism with unprecedented precision as well as to access unexplored regions of the parameter space of new physics models.
However, designing an appropriate detection apparatus presents significant technological challenges due to the unstable nature of the muons. The decay products of muons interacting with the machine elements can generate an intense flux of background particles that could ultimately reach the detector and impact its performance.
This contribution will present an overview of the physics motivation of this project and the most recent advancements on the design of the experimental apparatus.

Primary authors: RADOGNA, Raffaella (Universita e INFN, Bari (IT)); VENDITTI, Rosamaria (Universita e INFN, Bari (IT))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

On behalf of the International Muon Collider Collaboration

Status: SUBMITTED

Submitted by **VENDITTI, Rosamaria** on **Friday 30 August 2024**

Abstract ID : **555**

Current status of direct dark matter searches with XENONnT

Content

The XENONnT experiment, operational since 2020 at the Laboratori Nazionali del Gran Sasso in Italy, is one of the leading projects in the direct detection of dark matter, with a primary focus on Weakly Interacting Massive Particles (WIMPs). Utilizing a Time Projection Chamber inside a 5.9-tonne liquid xenon target, alongside advanced background suppression techniques such as active veto systems and sophisticated purification methods, XENONnT has achieved unprecedented levels of sensitivity. This talk will focus on the ongoing search for WIMPs within the XENONnT experiment, highlighting the methodologies in data analysis and discussing the latest results of this search.

Primary author: GRIGAT, Jaron

Track Classification: Dark Matter

Status: SUBMITTED

Submitted by **GRIGAT, Jaron** on **Friday 30 August 2024**

Abstract ID : **556**

DARWIN: On the Path to the Ultimate Liquid-Xenon Astroparticle Observatory

Content

Dual-phase liquid xenon time projection chambers (TPCs) have proven to be the leading detector technology to search for Weakly Interacting Massive Particles (WIMPs) in the GeV/c^2 to TeV/c^2 mass range. The current generation of detectors uses O(10) tonnes of liquid xenon to reach sensitivities of 10^{-48} cm^2 . Leveraging ultra-low background levels, the new generation of experiments opens new avenues for investigating rare physical phenomena beyond WIMPs search. This includes probing the Majorana nature of neutrinos, searching for solar axions and axion-like particles, and measuring solar neutrino fluxes.The DARWIN, LZ and XENON collaborations have recently joined forces to form the XLZD collaboration. The ultimate goal of XLZD is to fully probe the WIMP parameter space down into the neutrino fog. This next-generation experiment will require a significant increase in target mass, around 60 tonnes of liquid xenon contained in a TPC with unprecedented dimensions of 3 meters in both height and width. The DARWIN program aims to develop and validate the necessary technology to tackle the challenges involved in constructing and operating such a large detector. In this talk, I will provide an overview of the DARWIN program's ongoing R&D efforts, which are essential to the successful implementation of a 60-tonne TPC envisioned by the XLZD collaboration. This detector is set to become not only the most sensitive dark matter detector but also a comprehensive astroparticle observatory.

Primary author: Dr PIERRE, Maxime (Nikhef)

Track Classification: Dark Matter; Neutrinos

Status: SUBMITTED

Submitted by **Dr PIERRE, Maxime** on **Saturday 31 August 2024**

Abstract ID : **557**

The Darkside-20k experiment and the Future Liquid Argon Dark Matter program

Content

Darkside-20k is a global direct dark matter search experiment situated underground at LNGS (Italy), designed to reach a total exposure of 200 tonne-years free from instrumental backgrounds. The core of the detector is a dual-phase Time Projection Chamber (TPC) filled with 50 tonnes of low-radioactivity liquid argon.

The entire TPC wall is surrounded by a polymethylmethacrylate (PMMA), which acts as a neutron veto, immersed in a second low-radioactivity liquid argon bath enclosed in a stainless steel vessel. The entire detector is enclosed in a ProtoDUNE-like cryostat filled with 600 tons of atmospheric argon. TPC and neutron veto are equipped with large-area Silicon Photomultiplier (SiPM) array detectors. SiPMs are arranged in a compact design meant to minimise the material used for the circuit boards, cables and connectors: a photo-detection unit.

The Darkside-20k construction has commenced and the data-taking will start in 2026. The talk will describe the current status of Darkside-20k development and construction, and the future program of liquid argon dark matter experiments.

The talk will also give an overview of the recently published results on dark matter limits posed by the predecessor DarkSide-50 experiment, in particular on dark matter-nucleon interactions via Migdal effect, electron final states and the revised low-mass dark matter WIMPs search with the full dataset.

Primary authors: Dr FRANCHINI, Paolo (Royal Holloway University of London - Lancaster University); SANTONE, Daria (University of Oxford)

Track Classification: Dark Matter

Status: SUBMITTED

Submitted by **Dr FRANCHINI, Paolo** on **Sunday 1 September 2024**

Abstract ID : **558**

QUEST-DMC: detection of sub-GeV dark matter with nanowires in a superfluid He-3 calorimeter

Content

Dark matter is a hypothetical new form of matter that does not interact with the electromagnetic field and has a very weak interaction with ordinary matter. WIMPs are prime dark matter candidates, but most experiments are constrained to spin-independent interactions in the 10-100 GeV/c^2 mass range.

QUEST-DMC (Quantum Enhanced Superfluid Technologies for Dark Matter and Cosmology) is a collaboration, between Lancaster, Oxford, Royal Holloway University of London, and Sussex Universities, supported through the Quantum Technologies for Fundamental Physics UK programme.

QUEST-DMC will use superfluid He-3 as a dark matter collision target, aiming to reach the world-leading sensitivity to spin-dependent interactions of 0.1-1 GeV/c^2 mass dark matter candidates.

Here we discuss the development of superfluid He-3 bolometers, arguing that recoil energy of <10 eV can be detected using nanomechanical resonators, controlling the dominant sources of background and using quantum sensors.

Primary author: Dr FRANCHINI, Paolo (Royal Holloway University of London - Lancaster University)

Track Classification: Dark Matter

Status: SUBMITTED

Submitted by **Dr FRANCHINI, Paolo** on **Sunday 1 September 2024**

Abstract ID : **559**

Recent results from the NA62 experiment at CERN

Content

Rare kaon decays are among the most sensitive probes of both heavy and light new physics beyond the Standard Model description thanks to high precision of the Standard Model predictions, availability of very large datasets, and the relatively simple decay topologies. The NA62 experiment at CERN is a multi-purpose high-intensity kaon decay experiment, and carries out a broad rare-decay and hidden-sector physics programme. NA62 has collected a large sample of K^+ decays in flight during Run 1 in 2016-2018, and the ongoing Run 2 which started in 2021. Recent NA62 results on searches for hidden-sector mediators and searches for violation of lepton number and lepton flavour conservation in kaon decays based on the Run 1 dataset are presented.

In this talk NA62 also reports recent results from precision measurements of rare kaon and pion decays, using data collected in Run 1. A sample of $K^+ \to \pi^+\gamma\gamma$ decays was collected using a minimum-bias trigger, and the results include measurement of the branching ratio, study of the di-photon mass spectrum, and the first search for production and prompt decay of an axion-like particle with gluon coupling in the process $K^+ \to \pi^+ A$, $A \to \gamma\gamma$. A sample of $\pi^0 \to e^+e^-$ decay candidates was collected using a dedicated scaled down di-electron trigger, and a preliminary result of the branching fraction measurement is presented.

The NA62 experiment can be run as a "beam-dump" experiment by removing the kaon production target and moving the upstream collimators into a "closed" position. In this configuration 400˜GeV protons are dumped on an absorber and New Physics (NP) particles, including dark photons, dark scalars and axion-like particles, may be produced and reach a decay volume beginning 80˜m downstream of the absorber. More than 10^{17} protons on target have been collected in "beam-dump" mode by NA62 in 2021. Recent results from analysis of this data, with a particular emphasis on Dark Photon and Axion-like particle Models, are presented.

Primary authors: ROMANO, Angela (University of Birmingham (GB)); SPEAKER, OTHER

Presenter: SPEAKER, OTHER

Track Classification: Beyond the Standard Model; Dark Matter; Flavour

Comments:

The abstract is submitted on behalf of the NA62 Collaboration by A. Romano, chair of the NA62 Conference Committee. If it will be accepted as a talk, a speaker will be appointed as soon as possible.

Status: SUBMITTED

Submitted by **ROMANO, Angela** on **Thursday 5 September 2024**

Abstract ID : **560**

New measurement of $K^+ \to \pi^+ \nu\bar{\nu}$ branching ratio at NA62

Content

The $K \to \pi\nu\bar{\nu}$ decay is a "golden mode" for flavour physics. Its branching ratio is predicted with high precision by the Standard Model to be less than 10^{-10}, and this decay mode is highly sensitive to indirect effects of new physics up to the highest mass scales. The NA62 experiment at the CERN SPS is designed to study the $K^+ \to \pi^+ \nu\bar{\nu}$ decay, and provided the world's most precise investigation of this decay using 2016–18 data. Building on this success, the first results from a significantly improved analysis of new data, taken in 2021–22 after beam-line and detector upgrades, are presented, along with the combination with the 2016–18 results.

Primary authors: ROMANO, Angela (University of Birmingham (GB)); SPEAKER, OTHER

Presenter: SPEAKER, OTHER

Track Classification: Beyond the Standard Model; Flavour

Comments:

The abstract is submitted on behalf of the NA62 Collaboration by A. Romano, chair of the NA62 Conference Committee. If it will be accepted as a talk, a speaker will be appointed as soon as possible.

Status: SUBMITTED

Submitted by **ROMANO, Angela** on **Thursday 5 September 2024**

Abstract ID : **561**

Beyond the Standard Model in the Higgs sector

Content

The discovery of the Higgs boson with the mass of about 125 GeV completed the particle content predicted by the Standard Model. Even though this model is well established and consistent with many measurements, it is not capable to solely explain some observations. Many extensions of the Standard Model addressing such shortcomings introduce additional Higgs bosons, beyond-the-Standard-Model couplings to the Higgs boson, or new particles decaying into Higgs bosons. In this talk, the latest searches in the Higgs sector by the ATLAS experiment are reported, with emphasis on the results obtained with the full LHC Run 2 dataset at 13 TeV. (Resonant HH/SH searches are covered in a different talk)

Primary author: CHEREPANOVA, Elizaveta (Nikhef National institute for subatomic physics (NL))

Track Classification: Beyond the Standard Model; Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **562**

Searches for BSM physics using challenging and long-lived signatures with the ATLAS detector

Content

Various theories beyond the Standard Model predict new, long-lived particles with unique signatures which are difficult to reconstruct and for which estimating the background rates is also a challenge. Signatures from displaced and/or delayed decays anywhere from the inner detector to the muon spectrometer, as well as those of new particles with fractional or multiple values of the charge of the electron or high mass stable charged particles are all examples of experimentally demanding signatures. The talk will focus on the most recent results using 13 TeV pp collision data collected by the ATLAS detector.

Primary author: RAMIREZ-BEREND, Ian Alejandro (Carleton University (CA))

Track Classification: Beyond the Standard Model

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **563**

Exotic Searches at ATLAS (prompt)

Content

Many theories beyond the Standard Model (SM) have been proposed to address several of the SM shortcomings, such as explaining why the Higgs boson is so light, the origin of neutrino masses, or the observed pattern of masses and mixing angles in the quark and lepton sectors. Many of these beyond-the-SM extensions predict new particles or interactions directly accessible at the LHC. This talk will present some highlights on recent searches based on Run 2 data collected by the ATLAS detector at the LHC with a center-of-mass energy of 13 TeV (not including long-lived particle and unconventional searches).

Primary author: RUBIO JIMENEZ, Adrian (Univ. of Valencia and CSIC (ES))

Track Classification: Beyond the Standard Model

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **564**

Measurements of Higgs boson properties (mass, width, and Spin/CP) with the ATLAS detector

Content

This talk presents precise measurement of the properties of the Higgs boson, including its mass, total width, spin, and CP quantum number. The measurements are performed in various Higgs boson production and decay modes, and provide stringent tests of the predictions of the Standard Model. Results are based on the full Run 2 proton-proton collision dataset collected by the ATLAS experiment at 13 TeV.

Primary author: MUNOZ PEREZ, David (Univ. of Valencia and CSIC (ES))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **565**

New techniques for reconstructing, calibrating and identifying hadronic objects with ATLAS

Content

Experimental uncertainties related to hadronic object reconstruction can limit the precision of physics analyses at the LHC, and so improvements in performance have the potential to broadly increase the impact of results. Recent refinements to reconstruction, calibration and identification procedures for ATLAS jets and MET result in reduced uncertainties, improved pileup stability and other performance gains. In this contribution, highlights of these developments will be presented.

Primary author: MENKE, Sven (Max Planck Society (DE))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **566**

ATLAS measurements of Drell Yan processes

Content

ATLAS has used the W and Z boson production processes to perform a range of precision measurements providing important tests of perturbative QCD and information about the parton distribution functions for quarks within the proton. This talk will present recent, measurements of the Drell-Yan cross section as a function of transverse momentum based on low pileup data, total W- and Z-boson cross section measurements at 13.6 TeV, and measurements of differential cross sections for the production of missing transverse momentum plus jets. In addition, the production of a Z boson in association with b- or c-jets is studied differentially and compared to theoretical predictions with different choices of flavour schemes of the initial partons. Finally, the LHC pp collision data collected by the ATLAS experiment at sqrt(s)=7 TeV is revisited to measure the W boson mass and width.

Primary author: XIE, Mingzhe (University of Science and Technology of China (CN))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **567**

Electroweak measurements of multiboson production with the ATLAS experiment

Content

Measurements of multiboson production at the LHC are important probes of the electroweak gauge structure of the Standard Model and can constrain anomalous gauge boson couplings. In this talk, recent measurements of diboson and triboson production by the ATLAS experiment at 13 TeV and 13.6 TeV are presented. Studies of gauge-boson polarisation and their correlation are also presented. In WZ events, these studies have been extended to a phase space with high transverse momentum Z bosons. Measurements of diboson production in association with two additional jets at the LHC probe interactions between electroweak vector bosons predicted by the Standard Model and test contributions from anomalous quartic gauge couplings. The ATLAS experiment has recently performed such measurements in a variety of final states, amongst them semileptonic final states of W boson pairs, Z boson pairs, as well as WZ pairs, and the scattering into a massive electroweak gauge boson and a photon. The production of three massive electroweak gauge bosons will be discussed as well.

Primary author: WANG, Zhichen (University of Michigan)

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **568**

QCD measurements with ATLAS

Content

The ATLAS experiment has performed a range of QCD measurements in final states with jets. Jet cross-section ratios between inclusive bins of jet multiplicity are measured differentially in variables that are sensitive to either the energy-scale or angular distribution of hadronic energy flow in the final state. Several improvements to the calibration of jets are described, which result in significant improvements in the overall jet energy scale uncertainty. The measurements are compared to state-of-the-art NLO and NNLO predictions. Using charged particles inside jets, the Lund plane is reconstructed and measured in top quark pair production, separately for jets from hadronic decays of the W boson and for b-quark jets. A differential measurement of the sub-jet multiplicities in dijet events and a measurement of non-perturbative jet track functions are presented. The measured distributions are compared to a range of hadronisation models and can be used to tune and improve them in the future. Finally, properties of the underlying-event are studied in events with strange hadrons reconstructed in minimum-bias collisions data, and used to construct underlying-event observables in azimuthal regions computed relative to the leading charged-particle jet in the event.

Primary author: RESCIA, Alberto (DESY (DE) & Università di Genova (IT))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions…)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **569**

Searches for strong production of supersymmetric particles

Content

Supersymmetry (SUSY) provides elegant solutions to several problems in the Standard Model, and searches for SUSY particles are an important component of the LHC physics program. Naturalness arguments favour supersymmetric partners of the gluons and third-generation quarks with masses light enough to be produced at the LHC. This talk will present the latest results of searches conducted by the ATLAS experiment which target gluino and squark production, including stop and sbottom, in a variety of decay modes.

Primary author: GRAVILI, Francesco Giuseppe (INFN Lecce e Universita del Salento (IT))

Track Classification: Beyond the Standard Model

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **570**

Searches for electroweak production of supersymmetric particles with the ATLAS detector

Content

The direct production of electroweak SUSY particles, including sleptons, charginos, and neutralinos, is a particularly interesting area with connections to dark matter and the naturalness of the Higgs mass. The small production cross-sections and challenging experimental signatures, often involving compressed spectra, lead to difficult searches. This talk will highlight the most recent results of searches performed by the ATLAS experiment for supersymmetric particles produced via electroweak processes, including analyses targeting small mass splittings between SUSY particles. Recent results involving the combination of searches and in the context of the pMSSM are also presented.

Primary author: HODKINSON, Ben (University of Oxford (GB))

Track Classification: Beyond the Standard Model

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **571**

Highlights on top quark physics with the ATLAS experiment at the LHC

Content

The large top quark samples collected with the ATLAS experiment at the LHC have yielded measurements of the production cross section of unprecedented precision and in new kinematic regimes. They have also enabled new measurements of top quark properties that were previously inaccessible, enabled the observation of many rare top quark production processes predicted by the Standard Model and boosted searches in the Top sector. In this contribution the highlights of the ATLAS top quark physics program are presented.

Primary author: HIRSCHBUEHL, Dominic (Bergische Universitaet Wuppertal (DE))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **572**

Probing the nature of electroweak symmetry breaking with Higgs boson pairs in ATLAS

Content

In the Standard Model, the ground state of the Higgs field is not found at zero but instead corresponds to one of the degenerate solutions minimising the Higgs potential. In turn, this spontaneous electroweak symmetry breaking provides a mechanism for the mass generation of nearly all fundamental particles. The Standard Model makes a definite prediction for the Higgs boson self-coupling and thereby the shape of the Higgs potential. Experimentally, both can be probed through the production of Higgs boson pairs (HH), a rare process that presently receives a lot of attention at the LHC. In this talk, the latest HH searches by the ATLAS experiment are reported, with emphasis on the results obtained with the full LHC Run 2 dataset at 13 TeV. Non-resonant HH search results are interpreted both in terms of sensitivity to the Standard Model and as limits on the Higgs boson self-coupling and the quartic VVHH coupling. A combination of non-resonant searches are presented. Similarly resonant searches for X->HH/SH (where one of the Higgs is replaced by a Scalar S).

Primary author: ZABINSKI, Bartlomiej Henryk (Polish Academy of Sciences (PL))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Comments:

Submitted by Carlo Dallapiccola (ATLAS speaker committee)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 5 September 2024**

Abstract ID : **573**

High precision neutrino cross sections with ENUBET: studies for an experiment at CERN

Content

The ENUBET project recently concluded the R&D for a site independent design of a monitored neutrino beam for high precision cross section measurements, in which the neutrino flux is inferred from the measurement of charged leptons in an instrumented decay tunnel. In this phase three fundamental results were obtained and will be discussed in this talk: 1) a beamline not requiring a horn and relying on static focusing elements allows to perform a ν_e cross section measurement in the DUNE energy range with 1% statistical uncertainty employing 10^{20} 400 GeV protons on target (pot) and a moderate mass neutrino detector of the size of protoDUNE; 2) the instrumentation of the decay tunnel, based on a cost effective sampling calorimeter solution, has been tested with a large scale prototype achieving the performance required to identify positrons and muons from kaon decays with high signal-to-noise ratio; 3) the systematics budget on the neutrino flux is constrained at the 1% level by fitting the charged leptons observables measured in the decay tunnel. Based on these successful results ENUBET is now pursuing a study for a site dependent implementation at CERN in the framework of Physics Beyond Colliders. In this context a new beamline, able to enrich the neutrino flux at the energy of HK and to reduce by more than a factor 3 the needed pot, has been designed and is being optimized. The civil engineering and radioprotection studies for the siting of ENUBET in the North Area towards the two protoDUNEs are also in the scope of this work, with the goal of proposing a neutrino cross section experiment in 2026. The combined use of both the neutrino detectors and of the improved beamline would allow to perform cross section measurements with unprecedented precision in about 5 years with a proton request compatible with the needs of other users after CERN Long Shutdown 3. An update on the status of these studies and future plans will be presented.

Primary author: PUPILLI, Fabio (Universita e INFN, Padova (IT))

Presenter: PUPILLI, Fabio (Universita e INFN, Padova (IT))

Track Classification: Neutrinos

Comments:

on behalf of the ENUBET Collaboration that will select a speaker if accepted

Status: SUBMITTED

Submitted by **PUPILLI, Fabio** on **Friday 6 September 2024**

Abstract ID : **574**

Implications of f(Q) Gravity on Cosmological Parameters

Content

In this poster, we investigate the impact of f(Q) gravity on key cosmological parameters, extending beyond the framework of General Relativity (GR) by incorporating non-metricity. We analyze the modified Friedmann equations derived from this theory to understand the evolution of the Hubble parameter, energy density, pressure, and the equation of state parameter. Our findings suggest that f(Q) gravity shows promise as an alternative to GR, particularly in explaining the accelerated expansion of the universe. By solving these modified Friedmann equations, we present a comprehensive set of differential equations that describe the cosmological evolution within the FLRW model under f(Q) gravity. These results pave the way for further exploration of modified gravity theories and their potential to address unresolved challenges in cosmology.

Primary author: KARAM, Chaymae (Mohammed V University of Rabat, Faculty of Sciences (High Energy Physics Team - Modeling and Simulation))

Track Classification: Cosmology

Status: SUBMITTED

Submitted by **KARAM, Chaymae** on **Saturday 7 September 2024**

Abstract ID : **575**

Recent results for LHC simulations matched with Parton Shower using MiNNLOPS

Content

In scattering processes, fixed-order computations capture the kernel of the hard interaction and can be interfaced with a Shower Monte Carlo in order to obtain a realistic simulation of LHC events. MiNNLOPS is a method which uses different jet-multiplicities in order to perform QCD predictions at next-to-next-to-leading (NNLO) order which are naturally combined with Parton Shower.
MiNNLOPS was formulated for color singlet (F) production with several phenomenological applications. It was the first NNLOPS method to be reformulated for heavy-quark pair production (QQ) and recently adapted for the association production with a colour singlet (QQF).
We show an overview of recent applications of the method from diboson to heavy-quark processes. In addition, we end the talk by focusing on the Higgs production via bottom fusion. It represents an interesting case of study: two different schemes that require respectively the original and the QQF formulation can be employed. We present results in the two schemes where the NNLOPS results agree at inclusive level.

Primary author: BIELLO, Christian (Max-Planck Institute for Physics)

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **BIELLO, Christian** on **Tuesday 10 September 2024**

Abstract ID : **576**

NNLO QCD corrections to polarized and unpolarized semi-inclusive deep-inelastic scattering

Content

The production of identified hadrons in lepton-proton scattering (semi-inclusive deep inelastic scattering, SIDIS) allows for detailed analyses of the parton-to-hadron fragmentation functions. Furthermore, with polarized SIDIS, stronger constrains on the spin structure of the proton can be obtained compared to fully inclusive processes. We present our calculation of the full set of next-to-next-to leading order (NNLO) QCD corrections to the polarized and unpolarized SIDIS coefficient functions. We analyse the numerical impact of our results and compare to a wealth of SIDIS data available from fixed-target experiments. Our results enable for the first time a fully consistent treatment of hadron fragmentation processes in DIS at NNLO and provide the basis for studies of the proton spin structure and hadron fragmentation at colliders.

Primary author: BONINO, Leonardo

Presenter: BONINO, Leonardo

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **BONINO, Leonardo** on **Monday 16 September 2024**

Abstract ID : **578**

Real-time measurements of atmospheric transmission using the spectrometer on LSST's auxiliary telescope: how they can improve the photometric quality of the main telescope

Content

The ratio of spectrophotometric standard spectra (CALSPEC) measured on the ground and from space allows to deduce the parameters - precipitable water vapor, grey absorption, ozone, aerosols - that characterize atmospheric transmission as a function of wavelength, and to deduce LSST's instantaneous effective passbands. This knowledge will enable us to relate LSST's photometric measurements to standard atmospheric conditions, taking into account the color vector (ugrizy) of the objects. The aim is to achieve millimagnitude photometric reproducibility after compensation.

I will present the slitless spectrograph with its holographic disperser element that equips the LSST auxiliary telescope, the analysis of the 7000 spectra acquired since January 2023, the current performance of the system, and the action plan in terms of data analysis and data-taking strategy.

Primary author: MONIEZ, Marc

Co-authors: NEVEU, jeremy; CHEVALIER, joseph; LE GUILLOU, Laurent; RODRIGUEZ-MONROY, Martin; PAUNA, Nicoletta; DAGORET-CAMPAGNE, Sylvie; GRIS, Philippe; RAVOUX, Corentin

Presenter: MONIEZ, Marc

Track Classification: Cosmology

Status: SUBMITTED

Submitted by **MONIEZ, Marc** on **Monday 16 September 2024**

Abstract ID : **579**

Studies of heavy-quark hadronisation in pp collisions with ALICE

Content

Measurements of charm- and beauty-hadron production in proton-proton (pp) collisions at the LHC are crucial for investigating heavy-quark hadronisation and testing perturbative Quantum Chromodynamics (pQCD) calculations. Recently, heavy-flavour baryon-to-meson ratios in pp collisions have been measured to be significantly larger than those observed in electron-positron and electron-proton collisions. These findings challenge the universality of the charm and beauty fragmentation functions across different collision systems, an assumption used in theoretical calculations based on the factorisation approach.

In this talk, charm and beauty hadronization are studied through measurements of the meson-to-meson and meson-to-baryon ratios. Additionally, the first studies of non-prompt fractions of charm hadrons in pp collisions at $\sqrt{s} = 13.6$ TeV from the LHC Run 3 data are discussed. Preliminary results on the production of $\Sigma_c^{0,++}(2455)$ and $\Sigma_c^{0,++}(2520)$ baryon resonances in the same collision system are also presented.

The results are compared with predictions from novel theoretical models that consider different hadronisation mechanisms beyond in-vacuum fragmentation.

Primary author: KARWOWSKA, Maja (Warsaw University of Technology (PL))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **KARWOWSKA, Maja** on **Monday 16 September 2024**

Abstract ID : **617**

Flavour Deconstructing the Composite Higgs

Content

In this talk, we present a flavour non-universal UV completion of the Standard Model aimed at addressing the Higgs hierarchy problem and the flavour puzzle. In the UV, a flavour non-universal gauge sector is spontaneously broken down by non-perturbative dynamics. The Higgs emerges as a light pseudo-Nambu-Goldstone boson of the broken symmetry, and its potential is radiatively generated by explicit symmetry-breaking terms. We will provide a detailed description of the model and its appealing features in addressing the Higgs hierarchy problem and the flavour puzzle, in particular the positive impact of combining flavour non-universality with Higgs compositeness and a relatively close-by symmetry-breaking scale to the SM. We will also explore the model's rich phenomenology at the TeV scale and the related constraints from EWPOs, flavour observables and Higgs couplings modifications. We stress that our model is compatible with current experimental bounds and can provide TeV scale New Physics that simultaneously stabilizes the Higgs mass and addresses the flavour puzzle while evading the stringent flavour and Electroweak constraints.

Primary authors: COVONE, Sebastiano (UZH); DAVIGHI, Joseph Enea; ISIDORI, Gino (University of Zurich (CH)); PESUT, Marko (University of Zürich)

Presenter: PESUT, Marko (University of Zürich)

Track Classification: Beyond the Standard Model

Status: SUBMITTED

Submitted by **PESUT, Marko** on **Tuesday 17 September 2024**

Abstract ID : **618**

Early Universe and Bounce from Gravitational Waves

Content

We use the latest measurements from NANOGrav to constrain the Universe's reheating equation of state w_{re}, the reheating temperature T_{re}, the tensor to scalar ratio r, and the tensor tilt n_t. Assuming the constant equation of state w_{re} responsible for reheating phase, we find preference for instant reheating, $w_{re} = 0.36^{+0.15}_{-0.28}$, and a very blue tilt $n_t = 1.94^{+0.43}_{-0.88}$. In all cases where the reheating temperature is constrained, it is constrained to be very low with $T_{re} \leq 10^5\, GeV$. We further find that a scale-invariant spectrum as suggested by inflation implies a stiff equation of state $w_{re} = 19/3$. Moreover, We study the primordial spectra and the gravitational-wave background (GWB) of a semi-classical gravity model where the big bang is replaced by a bounce and the primordial tensor spectrum is blue: ekpyrotic universe with fast-rolling Galileons. We find that the ekpyrotic scenario with Galileons does not produce a GWB amplitude detectable by present or third-generation interferometers.

Primary authors: Dr BEN-DAYAN, Ido (Ariel University); Mr KUMAR, Utkarsh (Ariel University); Mr THATTARAMPILLY, Udaykrishna (Ariel University); VERMA, Amresh (Ariel University)

Track Classification: Astroparticles; Cosmology

Status: SUBMITTED

Submitted by **VERMA, Amresh** on **Tuesday 17 September 2024**

Abstract ID : **620**

The fate of the spike at the Milky Way center and new sources of boosted dark matter from self-interactions

Content

A characteristic prediction of scenarios with dark matter (DM) self-interactions is the existence of number changing processes that convert n initial DM particles into m final ones ($n \to m$ process), possibly in association with Standard Model particles. We argue that the $n \to m$ processes could be probed in the DM spike at the Milky Way center, where the high density may allow sizable rates. We systematically study the implications of the $n \to m$ processes in the DM spike, including other possible processes involving DM, such as annihilation and self-scattering. We find that for $n \geq 3$, the spike is significantly depleted for $n \to m$ cross sections favored by DM production via thermal freeze-out. On the other hand, the semi annihilation of two DM particles into one DM particle and one Standard Model particle preserves in general the structure of the spike. Furthermore, this process turns the DM spike into a source of boosted DM, which may induce observable signatures at direct detection and neutrino experiments. We show that both the CRESST and XENONnT experiments could be sensitive to boosted DM coming from the spike for DM mass of 0.01 GeV and 0.1 GeV, respectively; setting competitive limits on the nucleon-DM scattering cross section. We also estimate that the upcoming experiments DARWIN and DUNE could probe and set strong limits on masses m
$gtrsim0.1$ GeV and
$gtrsim1$ GeV, respectively.

Primary author: BETANCOURT KAMENETSKAIA, Boris (Technical University of Munich)

Co-authors: Dr FUJIWARA, Motoko (Technical University of Munich); Dr IBARRA, Alejandro (Technical University of Munich); Dr TOMA, Takashi (Kanazawa University)

Presenter: BETANCOURT KAMENETSKAIA, Boris (Technical University of Munich)

Track Classification: Astroparticles; Beyond the Standard Model; Dark Matter

Status: SUBMITTED

Submitted by **BETANCOURT KAMENETSKAIA, Boris** on **Thursday 19 September 2024**

Abstract ID : **621**

Lepton Flavor Violation in Heavy Flavor decays at CMS

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...); Flavour

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **622**

Measurement of alpha_S at CMS: status and prospects

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **623**

High-precision measurement of the W boson mass at CMS

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **624**

Associated production of top quarks with vector bosons in CMS

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **625**

Top quark properties in CMS

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **626**

Higgs differential cross section and STXS measurements at CMS

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **627**

Searches for rare Higgs boson productions and decays at CMS

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **628**

CMS Muon Object Performance in Run 3

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **629**

Particle production in the LHC forward direction: intersecting Astrophysics and BSM

Content

submitted by Enrique Palencia Cortezón for CMS speakers committee

Primary author: CMS SPEAKER

Track Classification: Astroparticles; Beyond the Standard Model; Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Thursday 19 September 2024**

Abstract ID : **630**

First Constraints on the Diffuse Supernova Neutrino Background through the CEνNS process from the LZ experiment

Content

We report the limits on the diffuse supernova neutrino background (DSNB) flux and the fundamental DSNB parameters measured from the first science run of the LUX-ZEPLIN (LZ) experiment, a dual-phase xenon detector located at the Sanford Underground Research Facility in Lead, South Dakota, USA. This is the first time the DSNB limit is measured through the process of the coherent elastic scattering of neutrinos on nuclei (CEνNS). Using an exposure of 60 live days and a fiducial mass of 5.5t, the upper limit on the DSNB ν_x (each of ν_μ, ν_τ, $\bar{\nu}_\mu$, $\bar{\nu}_\tau$) flux from LZ is comparable to the best existing limit, with further improvements expected after data collection from an estimated 1000 live days of exposure in the future.

Primary author: XIA, Qing

Track Classification: Astroparticles; Dark Matter; Neutrinos

Status: SUBMITTED

Submitted by **XIA, Qing** on **Monday 23 September 2024**

Abstract ID : **631**

Measurements of Higgs boson production and decay rates with the ATLAS detector

Content

submitted by Carlo Dallapiccola (speakers committee)

Primary author: HERRMANN, Lena Maria (University of Bonn (DE))

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **DUMARCHEZ, Jacques** on **Monday 23 September 2024**

Abstract ID : **632**

How new physics affects primordial neutrinos decoupling: Direct Simulation Monte Carlo approach

Content

Cosmological observations from Big Bang Nucleosynthesis and the Cosmic Microwave Background (CMB) offer crucial insights into the Early Universe, enabling us to trace its evolution back to lifetimes as short as 0.01 seconds. Upcoming CMB spectrum measurements, such as those underway at the Simons Observatory, will achieve unprecedented precision, allowing for more accurate extraction of information about the properties of the primordial plasma and, in particular, primordial neutrinos. This provides an opportunity to test whether these properties align with the predictions of the standard cosmological model or indicate the presence of new physics that influenced the evolution of the MeV-temperature plasma. A key component in understanding how new physics may have affected primordial neutrinos is solving the neutrino Boltzmann equation. In this talk, we present a novel approach to solving this equation that offers model independence, transparency, and computational efficiency - features that current state-of-the-art methods lack. We demonstrate a proof-of-concept implementation and apply it to several toy scenarios, showcasing key aspects of the primordial plasma's evolution in the presence of new physics.

Primary authors: OVCHYNNIKOV, Maksym (CERN); Mr SYVOLAP, Vsevolod (Leiden University)

Presenter: OVCHYNNIKOV, Maksym (CERN)

Track Classification: Astroparticles; Beyond the Standard Model; Cosmology; Neutrinos

Status: SUBMITTED

Submitted by **OVCHYNNIKOV, Maksym** on **Monday 23 September 2024**

Abstract ID : **633**

New physics decaying into metastable particles in primordial plasma: what happens next

Content

In this talk, we consider hypothetical unstable new physics particles decaying in the MeV plasma of the Early Universe. In particular, we study the case when their decay products include relatively long-lived particles like $Y = \mu, \pi^{\pm}, K$. We demonstrate that Ys may undergo various interactions, including kinetic energy loss, annihilations, and interactions with nucleons, which substantially affect the way they distribute their energy among the neutrino and electromagnetic sectors. efficiently disappear because of the processes of annihilation and interaction with nucleons, making it possible to study the system with the help of integrated equations. We apply our findings to the models of Higgs-like scalars and axion-like particles, studying their impact on primordial neutrino population.

Primary authors: Mr AKITA, Kensuke (University of Tokyo); Mr BAUR, Gideon (Karlsruhe Institute of Technology); OVCHYNNIKOV, Maksym (CERN); Mr SCHWETZ-MANGOLD, Thomas (Karlsruhe Institute of Technology); Mr SYVOLAP, Vsevolod (Leiden university)

Presenter: OVCHYNNIKOV, Maksym (CERN)

Track Classification: Astroparticles; Beyond the Standard Model; Cosmology; Neutrinos

Status: SUBMITTED

Submitted by **OVCHYNNIKOV, Maksym** on **Monday 23 September 2024**

Abstract ID : **634**

Revising laboratory search for long-lived vector mediatiors in GeV scale

Content

A systematic and unified study of the ability of lifetime frontier experiments to explore the parameter space of hypothetical long-lived particles is one of the main steps in defining their parameter space. Such an analysis has not been conducted for vector mediators – hypothetical massive particles that couple to SM vector currents. Existing studies have varied in their assumptions about their phenomenology, often using outdated models that do not reflect recent advancements. In this talk, we present a unified calculation of the parameter space for GeV-scale medistors probed by lifetime frontier experiments, delineating the regions excluded by past experiments and those accessible to future experiments. Our approach incorporates the latest advances in studying their production mechanisms, including proton bremsstrahlung and mixing with neutral mesons, and utilizes the full palette of hadronic decays. Additionally, we explore the impact of uncertainties in proton bremsstrahlung on the probed parameter space, and find that they may severely affect the reach of many past and future experiments, including the maximal probed mass. The results are provided in a publicly accessible format, specifically through the implementation of the updated phenomenological models in \texttt{SensCalc} - a unified tool for calculating event rates of new physics particles at lifetime frontier experiments, that has been supplemented by the module \texttt{EventCalc} that samples events similar to traditional Monte Carlo generators.

Primary authors: Mr KYSELOV, Yehor (Taras Shevchenko University); OVCHYNNIKOV, Maksym (CERN)

Presenter: OVCHYNNIKOV, Maksym (CERN)

Track Classification: Beyond the Standard Model; Collider physics (EW, Higgs, top, QCD, Heavy ions...)

Status: SUBMITTED

Submitted by **OVCHYNNIKOV, Maksym** on **Monday 23 September 2024**

Abstract ID : **635**

Fragmentation function studies at BESIII

Content

Fragmentation Function (FF) plays a crucial role in describing the hadronization process. We report the measurements of normalized differential cross sections of inclusive π_0, K_s, and η production as a function of hadron momentum at six energy points with q^2 transfer from 5 to 13 GeV^2 at BESIII. The results of π_0 and K_s with a relative hadron energy coverage from 0.1 to 0.9 significantly deviate from several theoretical calculations based on existing fragmentation functions.

Primary author: ROSINI, Francesco

Presenter: ROSINI, Francesco

Track Classification: Collider physics (EW, Higgs, top, QCD, Heavy ions...); Flavour

Status: SUBMITTED

Submitted by **ROSINI, Francesco** on **Wednesday 25 September 2024**

Abstract ID : **636**

Recent results from the LUX-ZEPLIN (LZ) dark matter experiment

Content

The LZ experiment, the largest liquid xenon time-projection chamber (TPC) built to date, continues to provide world leading sensitivity to WIMP dark matter candidates. In this talk, I will present the most recent results searching for WIMP dark matter from the combined 2022-2024 exposure. In addition to the increased exposure, the latest result showcases a number of refinements to LZ's background modelling, such as a radon tagging analysis, that reduces the dominant background by 60%, and detailed modelling and in-situ measurement of charge attenuation of ¹²⁴Xe decay via double electron capture.

Primary author: BAKER, Albert (King's College London)

Track Classification: Astroparticles; Dark Matter

Status: SUBMITTED

Submitted by **BAKER, Albert** on **Thursday 26 September 2024**

Abstract ID : **637**

What do we know about cosmic rays with energies above 5 EeV?

Content

Cosmic rays begin to reveal their secrets at energies above $5\,\mathrm{EeV}$. Beyond this characteristic energy, known as the spectral "ankle", the arrival-direction data from the Pierre Auger Observatory show anisotropy of increasing amplitude with energy on large angular scales. This discovery provides observational evidence that cosmic rays beyond the ankle originate outside the Milky Way, as expected from the weak Galactic confinement and the high luminosity required for the sources. Synthetic models of extragalactic source populations emitting fully ionized atoms have allowed us to reproduce the cosmic-ray flux beyond the ankle for almost a decade. These models capture the various slope breaks in the spectrum at ultra-high energies, including the spectral "toe" at $\sim 45\,\mathrm{EeV}$ and the recently measured feature at $\sim 14\,\mathrm{EeV}$, known as the spectral "instep". Such slope breaks are understood as changes in nuclear composition, with the average atomic mass increasing with energy. The population of astrophysical sources responsible for accelerating these nuclei, presumably in proportion to their charge, remains unidentified, although serious contenders have been identified. Particularly instructive are the latest searches at the highest energies for anisotropies correlated with the flux patterns expected from galaxies outside the Local Group, which, as this talk will emphasize, are approaching $5\,\sigma$.

Primary author: BITEAU, Jonathan (Université Paris-Saclay, CNRS/IN2P3, IJCLab, 91405 Orsay, France)

Track Classification: Astroparticles

Comments:

Highlight talk on behalf of the Pierre Auger Collaboration

Status: SUBMITTED

Submitted by **BITEAU, Jonathan** on **Friday 27 September 2024**