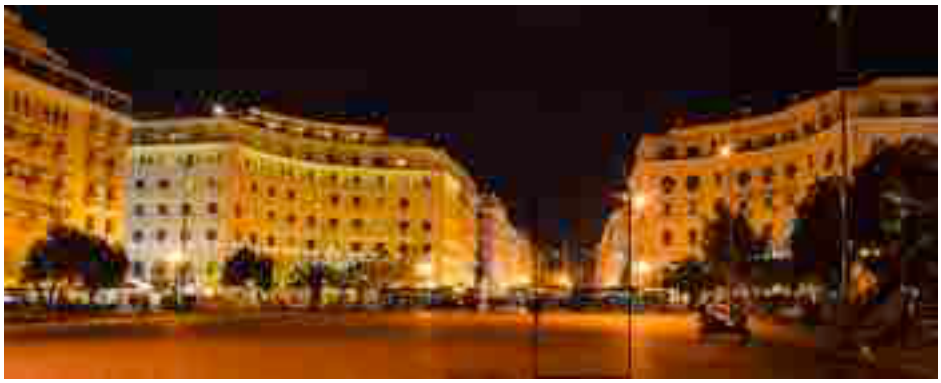
HEP2022 - 39th Conference on Recent Developments in High Energy Physics and Cosmology, Thessaloniki, Greece



Report of Abstracts

https://indico.physics.auth.gr/e/10

Abstract ID : **5**

The Control System of the New Small Wheel Electronics for the ATLAS experiment

Content

The present ATLAS Small Wheel Muon detector will be replaced with a New Small Wheel(NSW) detector in order to cope up with the future LHC runs of high luminosity.One crucial part of the integration procedure concerns the validation of the electronics for a system with more than 2.1 M electronic channels.The readout chain is based on optical link technology connecting the backend to the front-end electronics via the FELIX, which is a newly developed system that will serve as the next generation readout driver for ATLAS.For the configuration, calibration and monitoring path the various electronics boards are supplied with the GBT-SCA ASIC and its purpose is to distribute control and monitoring signals to the electronics.Due to its complexity,NSW electronics requires the development of a sophisticated Control System.The use of such a system is necessary to allow the electronics to function consistently, safely and as a seamless interface to all sub-detectors and the technical infrastructure of the experiment.The central system handles the transition between the probe's possible operating states while ensuring continuous monitoring and archiving of the system's operating parameters.

Primary author: TZANIS, Polyneikis (National Technical University of Athens)

Presenter: TZANIS, Polyneikis (National Technical University of Athens)

Status: SUBMITTED

Submitted by **TZANIS, Polyneikis** on **Wednesday 09 March 2022**

Abstract ID : **6**

Search for A->ZH->vvbb at sqrt(s) = 13 TeV with the ATLAS detector

Content

The extension of the scalar SM Higgs sector, as described in the Two Higgs Doublet Models (2HDMs), could lead to a cosmological first order electroweak phase transition, which is necessary to explain the origin of the matter-antimatter asymmetry in the early Universe. The existence of a second Higgs doublet results in five physical scalar fields, two charged (H±), a CP-odd (A) and two CP-even (h and H) neutral fields. A strong electroweak phase transition favours a heavy CP-odd scalar state A, together with a large mass splitting between the CP-odd A and CP-even H scalars. In this scenario, the A → ZH decay becomes dominant. In the present work, the A → ZH decay is investigated, with the H boson decaying to a pair of b-quarks and the Z boson decaying to neutrinos. The Z → νν̄ decay is examined, because of the expected increased sensitivity for large A masses. The optimisation studies for the A → ZH → νν̄bb̄ analysis are presented, along with the expected exclusion in the mH–mA plane, covering a previously unexplored region.

Primary authors: KALAITZIDOU, Ilia (University of Freiburg); Dr ARGYROPOULOS, Spyridon (Uninversity of Freiburg); Dr MOSKALETS, Tetiana (University of Freiburg); KÜSTERS, Roman (University of Freiburg)

Presenter: KALAITZIDOU, Ilia (University of Freiburg)

Status: SUBMITTED

Submitted by **KALAITZIDOU, Ilia** on **Friday 01 April 2022**

Abstract ID : **7**

Searches for dark matter in extended Higgs sectors with the ATLAS experiment

Content

While the existence of dark matter has been corroborated by a series of astronomical observations, its microscopic nature remains elusive. Theoretical arguments suggest that dark matter might be connected to the electroweak symmetry breaking mechanism, in which case the Higgs boson discovered at the LHC provides a unique tool in the search for dark matter.
This talk will present results from searches for dark matter in the final state with Higgs bosons with the ATLAS experiment and their combination.

Primary author: Dr SPYROS, Argyropoulos (University of Freiburg)

Presenter: Dr SPYROS, Argyropoulos (University of Freiburg)

Status: SUBMITTED

Submitted by **Prof. SAMPSONIDIS, Dimos** on **Monday 11 April 2022**

Abstract ID : **9**

Formulating E- & T-Model Inflation in Supergravity

Content

We present novel realizations of E- & T-model inflation within Supergravity which are largely associated with the existence of a pole of order one or two in the kinetic term of the inflaton superfield. This pole arises due to the selected logarithmic Kahler potentials K, which parameterize hyperbolic manifolds with scalar curvature related to the coefficient (-N)<0 of a logarithmic term. The associated superpotential W exhibits the same R charge with the inflaton-accompanying superfield and includes all the allowed terms. The role of the inflaton can be played by a gauge singlet or non-singlet superfield. Models with one logarithmic term in K for the inflaton, require N=2 and some tuning, of the order of 10^-5, between the terms of W and predict a tensor-to-scalar ratio r at the level of 0.001. The tuning can be totally eluded for more structured K's, with N values increasing with r and spectral index close or even equal to its present central observational value.

Primary author: Dr PALLIS, Constantinos (AUTH)

Presenter: Dr PALLIS, Constantinos (AUTH)

Status: SUBMITTED

Submitted by **PALLIS, Constantinos** on **Wednesday 13 April 2022**

Abstract ID : **10**

The NSW High Voltage Infrastructure

Content

The ATLAS Muon Spectrometer is going through upgrades on the Phase-I in order to achieve higher rates for the upcoming LHC runs. One of the main projects of this upgrade is the New Small Wheel (NSW), which is expected to complement the ATLAS Muon Spectrometer (MS) in the Endcap regions. The NSW is the combination of two prototype detector technologies, the small Thin Gap Chambers (sTGC) and resistive Micromegas (MM), and it will replace the Small Wheel (SW). In order to operate smoothly the two technologies, a dedicated hardware infrastructure has been installed and modified accordingly based on the needs of each system. The MM system has a direct approach by hosting the HV boards on the mainframes; in total 6 mainframes (3 per side) provide power and service to all the HV channels. The sTGC follows the daisy chain logic, where one mainframe hosts four branch controllers (two per side). Each branch controller handles two easy crates and one 48 V ACDC Generator, and the chain closes with the installed HV boards on the crates. All the HV boards have been validated on surface before the installation at the ATLAS cavern. In order to control and monitor the hardware for both technologies a Detector Control System (DCS) has been developed, following the architecture of the legacy Muon sub-systems. Aim of this work is the presentation of the development and implementation of a DCS for the HV infrastructure.

Primary author: DRIVAS-KOULOURIS, Ioannis (National Technical University of Athens)

Co-author: Dr KARENTZOS, Efstathios (Albert Ludwigs Universitaet Freiburg (DE))

Presenters: DRIVAS-KOULOURIS, Ioannis (National Technical University of Athens); Dr KARENTZOS, Efstathios (Albert Ludwigs Universitaet Freiburg (DE))

Status: SUBMITTED

Submitted by **DRIVAS-KOULOURIS, Ioannis** on **Thursday 14 April 2022**

Abstract ID : **11**

CMB polarization B-mode search with QUBIC and CMB-S4

Content

One of the major challenges of modern cosmology is the detection of primordial B-mode polarization anisotropies in the CMB, a smoking gun for inflation.
The primordial B-modes (as opposed to E-modes) is the unique direct observational signature of the inflationary phase that is thought to have taken place in the early Universe, generating primeval perturbations, producing Standard Model elementary particles and giving its generic features to our Universe (flatness, homogeneity. . .). Science aims at testing models of inflation by measuring or putting upper limits on r, the ratio of tensor fluctuations to scalar fluctuations. The simplest models that naturally explain the observed departure from scale invariance of the density perturbations predict r > 0:001, and a particularly well-motivated subclass of these models predicts r > 0:003.

Results from BICEP2, Planck and other collaborations have shown how challenging is the search for primordial B-mode polarization because of many difficulties: smallness of the expected signal, instrumental systematics that could possibly induce polarization leakage from the large E signal into B, polarized foregrounds (dust) larger than anticipated reducing to zero the initial hope of finding sky regions clean enough to have a direct primordial B-modes observation.

A short review of results and existing projects will be given, with emphasis on two projects:
- QUBIC, now with the technical demonstrator in installation phase, designed to address all aspects of this challenge with a novel kind of instrument, a Bolometric Interferometer, combining the sensitivity of Transition-Edge-Sensors and the control of systematics through the observation of interference fringe patterns while operating at two frequencies to disentangle polarized foregrounds from primordial B polarization.
- CMB-Stage 4, a much bigger project, will be able to detect primordial gravitational waves for r > 0:003 at greater than 5 sigma. Such a detection would yield the first evidence of quantization of gravity and point to inflationary physics near the energy scale associated with grand unified theories, probing energy scales far beyond the reach of the LHC or any conceivable collider experiment, and providing additional evidence in favor of the idea of the unification of forces. The measurement of the energy scale of inflation would have broad implications for many other aspects of fundamental physics, including key aspects of string theory. In the absence of a detection, the upper limit of r < 0:001 at 95% CL achievable by CMB-S4 would significantly advance our understanding of inflation.

Primary author: LOUCATOS, Sotiris (IRFU CEA-Univ Paris-Saclay and APC Univ Paris Cité)

Presenter: LOUCATOS, Sotiris (IRFU CEA-Univ Paris-Saclay and APC Univ Paris Cité)

Status: SUBMITTED

Submitted by **Prof. SAMPSONIDIS, Dimos** on **Thursday 28 April 2022**

Abstract ID : **12**

Beyond the cosmological standard model

Content

The standard model of cosmology assumes that the universe is isotropic and homogeneous when averaged on large scales. The dipole anisotropy of the CMB is attributed to our peculiar (non-Hubble) motion, due to local inhomogeneities, wrt the cosmic rest frame in which the CMB looks isotropic. There should then be a corresponding dipole in the skymap of high redshift sources. Using catalogues of radio sources & quasars we find that the observed dipole does not match what is expected. This calls into question the standard assumption of the FLRW metric and the consequent inference that the universe is dominated by a Cosmological Constant.

Primary author: Prof. SARKAR, Subir (University of Oxford)

Presenter: Prof. SARKAR, Subir (University of Oxford)

Comments:

Dear Kostas, this is the title/abstract for my invited talk (25+5 min). Please schedule me on 15, 16 or 17 June. Best - Subir

Status: SUBMITTED

Submitted by **Prof. SARKAR, Subir** on **Saturday 30 April 2022**

Abstract ID : **13**

Higgs boson pair production searches in ATLAS

Content

One of the primary goals of the LHC physics programme is the measurement of the Higgs boson trilinear self-coupling (λHHH), which is essential for probing the Higgs mechanism and the nature of electroweak symmetry breaking. This coupling is accessible through pair Higgs boson production. The cross-section for this process is also sensitive to enhancements from new physics, while several beyond the SM theories predict new heavy scalars psrticles decaying to a pair of Higgs bosons. Recent ATLAS results on Higgs boson pair production searches are presented, focusing on the bbtautau final state.

Primary author: BELLOS, Panagiotis (University of Birmingham)

Presenter: BELLOS, Panagiotis (University of Birmingham)

Status: SUBMITTED

Submitted by **BELLOS, Panagiotis** on **Monday 09 May 2022**

Abstract ID : **14**

Bottom-Up Reconstruction of Viable GW170817 Compatible Einstein-Gauss-Bonnet Theories

Content

In this work we shall use a bottom-up approach for obtaining viable inflationary Einstein-Gauss-Bonnet models which are also compatible with the GW170817 event. Specifically, we shall use a recently developed theoretical framework in which we shall specify only the tensor-to-scalar ratio, in terms of the e-foldings number. Starting from the tensor-to-scalar ratio, we shall reconstruct from it the Einstein-Gauss-Bonnet theory which can yield such a tensor-to-scalar ratio, finding the scalar potential and the Gauss-Bonnet coupling scalar function as functions of the e-foldings number. Accordingly, the calculation of the spectral index of the primordial scalar perturbations, and of the tensor spectral index easily is greatly simplified and these observational indices can easily be found. After presenting the general formalism for the bottom-up reconstruction, we exemplify our findings by presenting several Einstein-Gauss-Bonnet models of interest which yield a viable inflationary phenomenology. These models have also an interesting common characteristic, which is a blue tilted tensor spectral index. We also investigate the predicted energy spectrum of the primordial gravitational waves for these Einstein-Gauss-Bonnet models, and as we show, all the models yield a detectable primordial wave energy power spectrum

Primary authors: KATZANIS, Panagiotis (Aristotle University of Thessaloniki); Dr OIKONOMOU, Vasilis (Aristotle University of Thessaloniki); Mr PAPADIMITRIOU, Ilias (Aristotle University of Thessaloniki)

Presenter: KATZANIS, Panagiotis (Aristotle University of Thessaloniki)

Comments:

I might speak about non minimally coupled Einstein Gauss Bonnet theories also

Status: SUBMITTED

Submitted by **KATZANIS, Panagiotis** on **Monday 09 May 2022**

Abstract ID : **15**

Air shower radio signal electric field orientation as measured with the Astroneu Cosmic Ray telescope.

Content

The Astroneu cosmic ray telescope is a small scale hybrid array consisting of both scintillator counters and radio frequency (RF) antenna detectors operating at the Hellenic Open University campus near the city of Patra in Greece. In the present development phase, the Astroneu telescope includes two stations consisting of 3 scintillation detectors modules (SDM) and one RF antenna while a third station includes 3 particle detectors and 4 RF antennas (3SDM-4RF).
In this context we present the resent results from both the 3SDM-4RF autonomous station and simulations related to the estimation of the direction of the electric field emitted during the air shower development. The electric field measured in the ground level is the superposition of the two dominant emission mechanism, the time depended transverse current induced by the geomagnetic field and the net negative charge variation at the shower front. Since the electric field emitted by the two contributions is polarized in different directions the measured electric field in the ground encloses information about the charge-excess to geomagnetic ratio (CGR). Furthermore the orientation of the electric field emitted by charge-excess mechanism is strongly depends from the distance to the shower core (the intersection of the shower axis with the ground level). In this study we use the core information as reconstructed using the radio data and simulations. The estimated charge-excess to geomagnetic ratio is in agreement with previous studies which reveals that the shower core reconstruction method is efficient. Finally we calculate the CGR for background noise events and show that this ratio can be used to eliminate noise events.

Primary author: Dr NONIS, Stavros (Hellenic Open University)

Presenter: Dr NONIS, Stavros (Hellenic Open University)

Status: SUBMITTED

Submitted by **NONIS, Stavros** on **Wednesday 11 May 2022**

Abstract ID : **16**

Direct Dark Matter searches with the DarkSide-20k experiment

Content

DarkSide-20k is a next-generation direct dark matter search experiment under construction at the Gran Sasso National Laboratory (LNGS) in Italy. The core of the detector is a two-phase liquid argon time projection chamber designed to probe WIMP interactions down to the neutrino floor, with an exposure goal of ˜100 tonne-years in expectation of a WIMP-nucleon cross section of 10^{-47} cm^2 for a WIMP mass of 1 TeV/c^2 during a 5-year run. In order to ensure zero instrumental backgrounds, low-radioactivity underground argon (depleted in ^{39}Ar) is used as the detector medium. This reduces the internal background, while a 25 cm^2 Silicon Photo Multiplier (SiPM) modules capable of resolving single photoelectrons are developed and will be installed in both the active detector volume and the veto system. An overview of the DarkSide experimental program and the DarkSide-20k detector will be presented with a focus on the SiPM construction and testing procedures.

Primary author: MANTHOS, Ioannis (University of Birmingham (GB))

Presenter: MANTHOS, Ioannis (University of Birmingham (GB))

Status: SUBMITTED

Submitted by **MANTHOS, Ioannis** on **Friday 13 May 2022**

Abstract ID : **17**

Measurement of the Higgs quartic coupling c2v from di-Higgs Vector Boson Fusion in the bbττ channel

Content

The Brout Englert Higgs (BEH) mechanism of electroweak symmetry breaking and mass generation was experimentally confirmed after the discovery of the Higgs boson at the Large Hadron Collider in 2012.
The BEH mechanism not only predicts the existence of a massive scalar particle, but also requires this scalar particle to couple to itself. Double Higgs production provides a unique handle, since it allows the extraction of the trilinear Higgs self-coupling.
VBF di-Higgs production also probes the quartic Higgs bosons to vector bosons coupling (c2V). In this topic the effort on setting constraints on c2V will be discussed.
Event selection and reconstruction will be illustrated as well as a Neural Network desinged to identify VBF events.

Primary author: PARASKEVOPOULOS, Christos

Presenter: PARASKEVOPOULOS, Christos

Status: SUBMITTED

Submitted by **PARASKEVOPOULOS, Christos** on **Friday 13 May 2022**

Abstract ID : **18**

MIGDAL: Towards an unambiguous observation of the Migdal effect in nuclear scattering

Content

Despite the lack of experimental confirmation of the Migdal effect, several underground direct dark matter experiments are exploiting this rare atomic phenomenon to extend their sensitivity to light WIMP-like candidates. However, this effect is yet to be observed in nuclear scattering. The Migdal in Galactic Dark mAtter expLoration (MIGDAL) experiment aims to make the first unambiguous particle detector-based observation of the Migdal effect. An Optical Time Projection Chamber (OTPC) will be used to image ionisation tracks originating from the same vertex, one belonging to a nuclear recoil and the other to an electron, which is the Migdal event signature. The nuclear recoils will be generated inside the detector's gaseous volume by the scattering of fast neutrons from intense DT and DD generators, allowing the effect to be explored across a wide range of nuclear recoil energies. The OTPC is outfitted with two glass-GEMs that enable high gain operation in a 50-Torr CF4-based gas mixture, as well as a photomultiplier tube and a fast low-noise CMOS camera to collect light from the initial ionisation and avalanche processes, respectively. A charge readout consisting of a 120 ITO strip anode is also included in the detector for timing information. The MIGDAL OTPC configuration enables precise three-dimensional reconstruction of electron and nuclear recoil ionisation tracks and the use of low-pressure gas allows for the reconstruction of electron tracks down to 5 keV. The design of the experiment will be presented along with the results from end-to-end detailed simulations and estimates of signal and background yields, as well as the current status of activities at the Rutherford Appleton Laboratory's Neutron Irradiation Laboratory for Electronics (NILE), where the experiment is housed.

Primary author: KATSIOULAS, Ioannis (University of Birmingham)

Presenter: KATSIOULAS, Ioannis (University of Birmingham)

Status: SUBMITTED

Submitted by **KATSIOULAS, Ioannis** on **Friday 13 May 2022**

Abstract ID : **19**

R^2 Quantum Corrected Scalar Field Inflation

Content

String theory enjoys an elevated role among quantum gravity theories, since it seems to be the mostconsistent UV completion of general relativity and the Standard Model. However, it is hard to verifythe existence of this underlying theory on terrestrial accelerators. One way to probe string theory is to study its imprints on the low-energy effective inflationary Lagrangian, which are quantified in terms of high energy correction terms. It is highly likely, thus, to find higher order curvature terms combined with string moduli, that is scalar fields, since both these types of interactions and matter fields appear in string theory. In this work considered a well motivated quantum corrected canonical scalar field theory, with the quantum corrections being of the R^2 type.The reason for choosing minimally coupled scalar theory is basically because if scalar fields are evaluated in their vacuum configuration, they will either be minimally coupled or conformally coupled. We chose the former case, and the whole study was performed in the string frame (Jordan frame), in contrast to similar studies in theliterature where the Einstein frame two scalar theory is considered. The field equations of the quantum-corrected theory at leading order and the occuring form of the slow-roll indices will be presented. Our theoretical framework will be exemplified by using the quadratic inflation model, and as it is going to be shown, the R^2 quantum corrected quadratic inflation model produces a viable inflationary phenomenology, in contrast with the simple quadratic inflation model.

Primary authors: Dr OIKONOMOU , Vasileios (Department of Physics, Aristotle University of Thessaloniki); GIANNAKOUDI, Ifigeneia (Aristotle University of Thessaloniki)

Presenter: GIANNAKOUDI, Ifigeneia (Aristotle University of Thessaloniki)

Comments:

If convenient, I would like to present in one of the afternoon sessions (after 16:00) of any day except of Wednesday June 15.

Status: SUBMITTED

Submitted by **GIANNAKOUDI, Ifigeneia** on **Sunday 15 May 2022**

Abstract ID : **20**

An ATCA Processor for Level-1 Trigger Primitive Generation and Readout of the CMS Barrel Muon Detectors

Content

An ATCA processor was designed to instrument the first layer of the CMS Barrel Muon Trigger. The processor receives and processes DT and RPC data and produces muon track segments. Furthermore, it provides readout for the DT detector. The ATCA processor is based on a Xilinx XCVU13P FPGA, it receives data via 10 Gbps optical links and transmits track segments via 25 Gbps optical links. The processor is instrumented with a Zynq Ultrascle+ SoM connected with an SSD which provides for enhanced monitoring and control information. The design of the board as well as results on its performance are presented.

Primary author: BESTINTZANOS, Ioannis (UoI)

Presenter: BESTINTZANOS, Ioannis (UoI)

Status: SUBMITTED

Submitted by **BESTINTZANOS, Ioannis** on **Sunday 15 May 2022**

Abstract ID : **21**

The Barrel Muon Trigger system of CMS in Phase-2 - Design and Performane

Content

The CMS Phase-2 Upgrade system of the Level-1 Trigger will soon reach the end of pre-production stage. At this point, both hardware and the corresponding firmware of the trigger processor algorithms have matured, offering the opportunity to perform system slice tests on individual trigger paths. The task of the Barrel Muon Trigger (BMT) subsystem is to reconstruct muon candidates in the CMS barrel region. On the surface of the CMS experimental area a setup has been installed that includes a slice of all detector and hardware components starting from the muon Drift Tube chamber up to Layer-2, where muon track reconstruction is performed. The University of Ioannina, in collaboration with the National Kapodistrian University of Athens, is in charge of the hardware of BMT Layer-1, the system that generates muon Trigger Primitives (track segments) and transmits them to Layer-2. Currently, trigger primitives produced by real cosmic muons are received and readout by the Layer-2 board, validating the correct performance of the slice chain. Details about the integration of the setup and results of its performance are presented here.

Primary author: ADAMIDIS, Kosmas (University of Ioannina)

Presenter: ADAMIDIS, Kosmas (University of Ioannina)

Status: SUBMITTED

Submitted by **ADAMIDIS, Kosmas** on **Sunday 15 May 2022**

Abstract ID : **22**

Measurement of the double-differential dijet mass cross section at 13TeV with CMS

Content

The double-differential inclusive dijet production cross section is measured as a function of the invariant dijet mass of the two leadin jets in the event. The phase space is divided in five regions in terms of the maximum absolute rapidity of the dijet system and ranges from 0.0 to 2.5, and for dijet mass up to 10 TeV. The data were collected by the CMS detector at the CERN Large Hadron Collider and correspond to an integrated luminosity of 36.3 fbˆ(-1) in proton-proton collisions at sqrt(s) = 13 TeV. Jet reconstruction is achieved the anti-kt clustering algorithm with the distance parameter R = 0.8. The measured cross-section is compared with both the predictions of Monte Carlo event generators and the fixed order calculations of perturbative quantum chromodynamics, the latter, calculated up to next-to-next-to-leading order.

Primary author: KOSMOGLOU KIOSEOGLOU, Polidamas Georgios

Presenter: KOSMOGLOU KIOSEOGLOU, Polidamas Georgios

Status: SUBMITTED

Submitted by **KOSMOGLOU KIOSEOGLOU, Polidamas Georgios** on **Sunday 15 May 2022**

Abstract ID : **23**

Testing Lepton Flavour Universality in rare B-decays

Content

Prompted by the persisting deviations from the Standard Model expectations of the Lepton Flavour Universality (LFU) measurements by the LHCb experiment, the CMS experiment at the LHC has collected a large sample of generic B decays to provide a competitive and independent measurement of LFU. The proton-proton collision data used were collected during 2018 run and contain more than 10 billion unbiased B decays, triggered by an opposite-side-tag strategy. This presentation focuses mostly on the measurement of the B -> μμK Branching ratio, though it will also present the analysis details of the electron decay B -> eeK as well. Furthermore, a detailed description of the trigger strategy is included.

Primary authors: KARATHANASIS, Georgios; Mr MELACHROINOS, Georgios (National and Kapodistrian University of Athens)

Presenters: KARATHANASIS, Georgios; Mr MELACHROINOS, Georgios (National and Kapodistrian University of Athens)

Status: SUBMITTED

Submitted by **KARATHANASIS, Georgios** on **Sunday 15 May 2022**

Abstract ID : **24**

NEWS-G: Search for Light Dark Matter with a Spherical Proportional Counter

Content

The NEWS-G collaboration is searching for light dark matter candidates using an innovative gaseous detector concept, the spherical proportional counter. Access to the dark matter mass range from 0.05 to 10 GeV is enabled by the combination of low energy threshold, light gaseous targets (H, He, Ne), and highly radio-pure detector construction. A 1.4 m in diameter detector, constructed using 4N copper with 500 μm electroplated inner layer, is currently undergoing commissioning in SNOLAB, Canada. The current status and recent results of the experiment will be presented. Furthermore, recent measurements of quenching factors in gases used will be discussed, in addition to complementary efforts towards using a nitrogen-filled spherical proportional counter to directly measure in-situ neutron backgrounds. NEWS-G is currently conducting R&D for the next stages of the experiment, which will utilise detectors that are fully electroformed underground, to suppress dominant backgrounds. The status of these projects will be given, including current efforts for ECuME, a 1.4 m in diameter detector, and planning for the future, larger-scale detector with reduced-background shielding, DarkSPHERE.

Primary author: KNIGHTS, Patrick (University of Birmingham (UK))

Presenter: KNIGHTS, Patrick (University of Birmingham (UK))

Status: SUBMITTED

Submitted by **KNIGHTS, Patrick** on **Sunday 15 May 2022**

Abstract ID : **25**

Tilted cosmological model as an alternative to cosmic acceleration

Content

No real observers in the universe follow the smooth Hubble expansion but we all move relative to it. The Local Group of galaxies, for example, drifts at approximately 600km/s with respect to the Hubble flow. Such peculiar motions dominate the kinematics of the local universe. Recently, peculiar velocity surveys have reported the existence of bulk flows extending out to several hundreds of Mpc, in excess of those predicted by the standard cosmological model. This work looks into the implications of large-scale peculiar velocities from the viewpoint of a tilted cosmological model equipped with two families of observers. The first one follows the Hubble flow, while the second family consists of real observers residing in a typical galaxy (like our Milky Way) and moving relative to the universal expansion with non-relativistic peculiar velocities. We study a parametrization of the deceleration parameter in the tilted model using the Pantheon compilation of Type Ia supernovae. By means of a Markov Chain Monte Carlo (MCMC) method, we show that a tilted Einstein-de Sitter model, having one or two additional parameters that describe the assumed velocity flows, can reproduce the late-time cosmic acceleration without the need of a cosmological constant or dark energy. From our statistical analysis, we find that the tilted model performs similarly to the standard ΛCDM paradigm in the context of model selection criteria (Akaike information criterion and Bayesian information criterion).

Primary author: ASVESTA, Kerkyra (Aristotle University of Thessaloniki)

Presenter: ASVESTA, Kerkyra (Aristotle University of Thessaloniki)

Status: SUBMITTED

Submitted by **ASVESTA, Kerkyra** on **Sunday 15 May 2022**

Abstract ID : **32**

Performance studies of Micromegas electronics in a high radiation environment at the CERN Gamma Irradiation Facility (GIF++)

Content

The innermost wheel-shaped end-cap stations (Small Wheels, SWs) of the ATLAS' Muon Spectrometer were replaced by the New Small Wheels (NSWs) to cope with the high data rate and background radiation (up to 22kHz/cm2) expected at the High Luminosity LHC (HL-LHC) accelerator. The two NSWs employ two novel micro-pattern gaseous detector technologies; the Micromesh Gaseous Structure (Micromegas, MM) and the small strip Thin Gap Chambers (sTGC), primarily for tracking and trigger, respectively.

Each NSW consists of eight Large and eight Small Sectors, comprising two wedges of quadruplet layers for each detector technology. The readout of each sector is segmented into two modules; an inner (close to the beam pipe) and an external module that host the PCBs number 1,2,3,4,5, and the PCBs number 6,7,8, respectively.

The Micromegas Front-End electronics are attached to the modules and bear three types of new radiation-tolerant ASICs; the Venetios Micromegas (VMM) that receive the analog signal from the detectors, the Readout Controller (ROC), and the Slow Control Adapter. Besides, two types of electronic boards reside on the modules hosting GigaBit Transceivers ASICs (GBTX) that handle the data exchange between the on-detector and off-detector electronics and the ART ASIC that collects the trigger data from the VMMs.

Extensive tests have been carried out to evaluate the performance of the Micromegas electronics under the HL-LHC conditions at the new CERN Gamma Irradiation Facility (GIF++). The GIF++ provides high energy muon beams combined with a 14 TBq Cesium-137 source.

Two MM modules, the Small Module 1 (SM1) and the Large Module 2 (LM2), were used for the tests, placing the electronics at the PCBs number 2,3 and the PCBs number 6,7, respectively.

The effect of the gamma radiation as equivalent to the expected background at the HL-LHC accelerator for different source intensities has been tested. The modules' hit occupancy versus the rate has proven to be linear up to ˜20KHz/cm2.

To further validate the studies, measurements have been obtained when the high-energy muon beam (at a rate of ˜12kHz) passes close to the Cesium-137 source allowing the study of the detector's performance while being irradiated at high adjustable rates (in which the possibility of photons' interaction with the detector is increased).

Furthermore, the measurements have verified that PCB number 2 has a higher (20-30%) hit occupancy than PCB number 3 since it is closer to the beampipe.

Primary author: KOLITSI, Foteini (University of West Attica)

Co-authors: BITA, Daniel (University of West Attica); IOANNIS, Mesolongitis (University of West Attica); KITSAKI, Chara (National Technical University of Athens); THEODOROS , Alexopoulos (National Technical University of Athens); KYRIAKIS-BITZAROS, Efstathios (University of West Attica); ZACHARIADOU, Katerina (University of West Attica)

Presenter: KOLITSI, Foteini (University of West Attica)

Status: SUBMITTED

Submitted by **KOLITSI, Foteini** on **Thursday 19 May 2022**

Abstract ID : **87**

EFT re-interpretation of WZ Vector Boson Scattering production

Content

Vector Boson Scattering in the WZ fully leptonic channel is being studied in ATLAS with the full Run 2 data of 139 fb-1. The importance of the channel for indirect New Physics searches beyond the Standard Model will be presented, and the procedure for an Effective Field Theory interpretation of the existence of quartic gauge couplings will be shown. Expected limits on couplings related to dimension-8 operators, which are relevant to the process, will be presented and discussed.

Primary author: KASIMI, Eirini (AUTH)

Presenter: KASIMI, Eirini (AUTH)

Status: SUBMITTED

Submitted by **KASIMI, Eirini** on **Saturday 28 May 2022**

Abstract ID : **88**

CMS Searches for new physics in hadronic final states

Content

Many new physics models and Standard Model extensions like, additional symmetries and forces, compositeness, extra dimensions, extended Higgs sectors, supersymmetry, dark sectors and dark matter particles, are expected to manifest themselves in final states with hadronic jets. This talk will present recent searches for new phenomena in such final states using the full Run II luminosity corresponding to 138 fb-1 collected with the CMS detector at the CERN LHC.

Primary author: TZIAFERI, Eirini (National and Kapodistrian University of Athens (GR))

Presenter: TZIAFERI, Eirini (National and Kapodistrian University of Athens (GR))

Status: SUBMITTED

Submitted by **TZIAFERI, Eirini** on **Saturday 28 May 2022**

Abstract ID : **89**

Sterile neutrinos from D-brane models

Content

We describe the appearance of the sterile neutrino (SN) candidates from D-brane Standard model like string models. We are using an intersecting D6-brane model, with gauged baryon number, which accommodates the Standard Model with right handed neutrinos. The same class of models has been shown to satisfy b-> s l+l- anomalies seen by LHCb experiment in : A. Celis, Feng, W.Feng and D.Lust, "Stringy explanation of b-> s l^{+} l^{–} anomalies", JHEP02(2016)007, eprint:1512.02218[hep-ph]

Primary author: KOKORELIS, CHRISTOS (AMERICAN UNIVERSITY OF MALTA)

Presenter: KOKORELIS, CHRISTOS (AMERICAN UNIVERSITY OF MALTA)

Comments:

To sxetiko paper einai sxedon etoimo kai prokeitai na emfanistei mesa ston Iounio, se sinergasia me ton Ignatio Antoniadi.

Status: SUBMITTED

Submitted by **KOKORELIS, CHRISTOS** on **Saturday 28 May 2022**

Abstract ID : **90**

The CMS Trigger System

Content

The CMS experiment at CERN uses a two-stage triggering system composed of the Level-1 (L1), instrumented by custom-designed hardware boards with an output rate of 100 kHz, and the High Level Trigger (HLT), streamlined version of the offline software reconstruction that runs on the computer farm, having around 1.5 kHZ or rate stored. New trigger algorithms and new features, as well as optimized trigger menu at both L1 and HLT are mandatory in order to be able to successfully record the events at higher data loads due to increasing luminosity and pileup at the LHC in Run 3. Many measurements and searches will profit from the updates implemented in the CMS trigger. The highlights of Run 2 CMS trigger results will be given in this talk, together with the improvements for Run 3.

Primary authors: DORDEVIC, Milos (Vinca Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade); ON BEHALF OF THE CMS COLLABORATION

Presenter: DORDEVIC, Milos (Vinca Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade)

Comments:

The talk will be given on behalf of the CMS Collaboration at CERN.

Status: SUBMITTED

Submitted by **DORDEVIC, Milos** on **Saturday 28 May 2022**

Abstract ID : **91**

Searching for Dark Matter Signals from the Center of the Milky Way

Content

The Galactic center excess (GCE) remains one of the most intriguing discoveries from the Fermi Large Area Telescope (LAT) observations. I will revisit characteristics of the GCE tested under an updated set of high-resolution galactic diffuse gamma-ray emission templates. This diffuse emission, which accounts for the bulk of the observed gamma rays, is ultimately due to cosmic-ray interactions with the interstellar medium. Using recent high-precision cosmic-ray observations, in addition to the continuing Fermi-LAT observations and observations from lower energy photons, we constrain the properties of the galactic diffuse emission. A large set of diffuse gamma-ray emission templates has been used which account for a very wide range of initial assumptions on the physical conditions in the inner galaxy. I will give an update on the spectral and morphological properties of the GCE and their physical implications. In particular, a high-energy tail is found at a higher significance than previously reported. This tail is very prominent in the northern hemisphere, and less so in the southern hemisphere. This strongly affects one prominent interpretation of the excess: known millisecond pulsars are incapable of producing this high-energy emission, even in the relatively softer southern hemisphere, and are therefore disfavored as the sole explanation of the GCE. The annihilation of dark matter particles of mass 40^{+10}_{-7} GeV (95% CL) to b quarks with a cross-section of $\sigma v = 1.4^{+0.6}_{-0.3} \times 10^{-26}$ cm^3 s^{-1} provides a good fit to the excess especially in the relatively cleaner southern sky. Dark matter of the same mass range annihilating to b quarks or heavier dark matter particles annihilating to heavier Standard Model bosons can combine with millisecond pulsars to provide a good fit to the southern hemisphere emission as well, as can a broken power-law spectrum which would be related to recent cosmic-ray burst activity.

Primary author: Dr CHOLIS, Ilias (Oakland University)

Co-authors: Dr ZHONG, Yi-Ming (Kavli Institute for Cosmological Physics); Dr MCDERMOTT, Samuel (Fermi National Accelerator Laboratory); Mr SURDUTOVICH, Joseph (Carleton College)

Presenter: Dr CHOLIS, Ilias (Oakland University)

Comments:

OI am requesting an online talk as I will be in the US at that time.

Status: SUBMITTED

Submitted by **CHOLIS, Ilias** on **Saturday 28 May 2022**

Abstract ID : **92**

Precision measurement of the W boson mass using the full CDF Run II data set

Content

The mass of the W boson, a mediator of the weak force between elementary particles, is tightly constrained by the symmetries of the standard model of particle physics. After the observation of the Higgs boson, the last missing component of the model, the measurement of the W boson mass provides a stringent test of the model. A measurement of the W boson mass will be presented, which used data corresponding to 8.8 inverse femtobarns of integrated luminosity collected in proton-antiproton collisions at a 1.96 TeV center-of-mass energy with the CDF II detector at the Fermilab Tevatron collider. A sample of approximately 4 million W boson candidates was used to obtain a W boson mass of 80,433.5±6.4(stat)±6.9(syst)=80,433.5±9.4 MeV, the precision of which exceeds that of all previous measurements combined. This measurement is in significant tension with the standard model expectation.

Primary author: Prof. VELLIDIS, Konstantinos (National and Kapodistrian University of Athens)

Presenter: Prof. VELLIDIS, Konstantinos (National and Kapodistrian University of Athens)

Status: SUBMITTED

Submitted by **VELLIDIS, Konstantinos** on **Sunday 29 May 2022**

Abstract ID : **93**

Contribution to the waveform analysis of the ENUBET calorimeter

Content

The ENUBET experiment (Enhanced NeUtrino BEams from kaon Tagging) is an approved Neutrino Platform CERN project, as NP06/ENUBET, aiming at the development of a monitored neutrino beam where the flux and the flavor composition of the beam are known with an uncertainty below 1%. The production of neutrinos is monitored by measuring the rate of leptons in the decay tunnel. The charged leptons can be instrumented in the decay tunnel of the ENUBET facility, using a segmented calorimeter, where the positrons and muons from kaon decays can be measured. Decayed muons from pions can be detected by muon stations at the hadron dump. With a physics goal of reducing the uncertainty on the ν_e and ν_μ flux, ENUBET will allow high precision cross section measurement, at the GeV scale of interest of next-generation long baseline experiments.
We report here signal processing methods to address the pile up effects and development of advanced timing techniques to improve the time resolution of the ENUBET calorimeter. These methods are applied on the simulated waveforms datasets and the efficiency along with the timing resolution for each layer of the calorimeter are reported.

Primary author: ANGELIS, Ioannis (Aristotle University of Thessaloniki)

Presenter: ANGELIS, Ioannis (Aristotle University of Thessaloniki)

Status: SUBMITTED

Submitted by **ANGELIS, Ioannis** on **Tuesday 31 May 2022**

Abstract ID : **94**

The CDR of the innovative FEL design, by COMPACT LIGHT Collaboration

Content

Synchrotron Radiation (SR) is a fundamental and indispensable research tool in a wide spectrum of scientific and technological fields and their applications, including materials science, condensed matter physics, atomic and molecular physics, life science and medicine, chemistry, and environmental sciences. For this reason, the use of synchrotron radiation has increased tremendously in the last decades, as testified by the number of synchrotron light sources built to serve the users' communities across a multitude of scientific and engineering disciplines. The latest generation of SR sources is based on Free Electron Lasers (FELs) driven by linacs. These facilities, with sub-picosecond pulse-lengths and wavelengths down to the hard X-ray range, feature unprecedented performance in terms of peak brightness, exceeding by many orders of magnitude that of third generation synchrotrons and enabling important complementary research opportunities. Despite the great scientific and technological benefits that X-ray FELs can provide, only very few such facilities are currently in operation worldwide, due to the high costs and complexity preventing their wide diffusion. Presently only major accelerator laboratories have the resources and expertise to construct and operate them. With the launch of this H2020 design study, funded by the European Commission under GA No. 777431, the CompactLight Collaboration aims to facilitate the widespread development of X-ray FEL facilities across Europe and beyond, by making them more affordable to construct and operate, through an optimum combination of emerging and innovative accelerator technologies. A partnership of 23 international laboratories and academic institutions, 3 private companies and 5 third parties, which brings together the world's leading experts in this field, has been created for this purpose. The FEL specifications, on which this design study is based, have been driven by the demands of its potential users, taking into account the photon characteristics required by their current and desired future experiments. For reaching these objectives, the CompactLight Conceptual Design Report (CDR)
has been based on the latest concepts for bright electron photoinjectors, high-gradient X-band structures at 12 GHz, and innovative short-period undulators.
Compared to existing facilities, for the same operating wavelengths, the technical solutions adopted ensure that the CompactLight facility can operate with a lower electron beam energy and will have a significantly more compact footprint—the total length of the facility is just over 480 m, which is, for
example, more than 250m less than the total length of SwissFEL. All of these enhancements make the proposed facility more attractive and more affordable to build and operate. Suggested by the users' wish list, the key elements considered for the design study have been the following:

- High FEL stability in pulse energy and pulse duration
- FEL synchronization better than 10 fs
- Photon pulse duration less than 50 fs
- A repetition rate from 1 Hz up to 1 kHz
- FEL pump-probe capabilities with a large photon energy difference
- Small focused spot size
- Variable polarization, linear and elliptical
- Tunability up to higher photon energies
- Two-bunch operation
- Two-color pulse generation

Primary author: GAZIS, Evangelos (National Technical University of Athens)

Co-authors: Prof. ALEXOPOULOS, Theodoros (NTUA); Dr GAZIS , Nikolaos (ESS-ERIC); Mr BIGNAMI, Andrea (ESS-ERIC); Mr TRACHANAS, Emmanuil (ESS-ERIC); Dr KOTSOPOULOS, Dimosthenis (AUEB); Dr KARAGIANNAKI, Angeliki (AUEB)

Presenter: Dr GAZIS , Nikolaos (ESS-ERIC)

Comments:

On behalf of the Compact Light Collaboration

Status: SUBMITTED

Submitted by **GAZIS, Evangelos** on **Tuesday 31 May 2022**

Abstract ID : **95**

Search for resonant X⟶ WZ⟶lvll Production in Run-2 of the LHC Proton-Proton Collisions at sqrt(s) = 13TeV with ATLAS Detector

Content

In this presentation we are going to show the results of the search for a resonant W Z diboson production using data collected by the ATLAS detector, where only the leptonic final states (e or μ) are considered for the W and Z boson decays.
The search for diboson resonances is an essential probe for understanding the source of electroweak
symmetry breaking (EWSB). In the Standard Model (SM), the strength of the coupling of the Higgs scalar to vector boson pairs is well predicted, but it is well known that the low mass of the Higgs boson leads to hierarchy and naturalness problems suggesting that the SM is only an effective theory at low mass. Grand Unified theories , and theories of dynamical EWSB , Little Higgs models , Technicolor ,
or more generic Composite Higgs models , and theories with extra dimensions also predict vector boson pair resonances at high mass.

This search focus on resonances predicted by two distinct signal hypothesis: a spin-1 W' from the Parametrization of heavy vector triplet (HVT) Lagrangians and a spin-0 charged higgs H ± , predicted by Georgi-Machacek (GM) model.

In the present analysis we have used the 139 fb −1 data collected at 13 TeV center of mass energy by the ATLAS detector at the LHC. Limits on the production cross-section times branching ratio are obtained as a function of the resonance mass for resonances arising from two different models, Heavy
Vector Triplet and Georgi-Machacek model. Two different production modes are considered,
the vector boson fusion and the Drell-Yan process (quark- anti quark fusion), on which independent limits are set. Although the dicriminating variable for the limits setting procedure is the invariant mass of the WZ system, alternative options are examined too.

Primary author: TSOPOULOU, Maria-Evanthia (Aristotle University of Thessaloniki)

Co-author: Prof. PETRIDOU, Chara (Aristotle University of Thessaloniki)

Presenter: TSOPOULOU, Maria-Evanthia (Aristotle University of Thessaloniki)

Status: SUBMITTED

Submitted by **TSOPOULOU, Maria-Evanthia** on **Tuesday 31 May 2022**

Abstract ID : **96**

Segment Linking: A Highly Parallelizable Track Reconstruction Algorithm for HL-LHC

Content

The High Luminosity upgrade of the Large Hadron Collider (HL-LHC) will produce particle collisions with up to 200 simultaneous proton-proton interactions. These unprecedented conditions will create a combinatorial complexity for charged-particle track reconstruction that is expected to surpass the projected performance of conventional CPUs. Motivated by this and taking into account the success of heterogeneous computing in cutting-edge High Performance Computing projects, we propose an efficient, fast and highly parallelizable bottom-up approach to track reconstruction for HL-LHC, along with an associated implementation on GPUs, in the context of the Phase 2 CMS outer tracker. Our algorithm, called Segment Linking, takes advantage of localized track stub creation, combining individual stubs to progressively form higher level objects that are subject to kinematical and geometrical requirements compatible with genuine physics tracks. The local nature of the algorithm makes it ideal for parallelization under the Single Instruction, Multiple Data paradigm, as hundreds of objects can be built simultaneously. The computing and physics performance of the algorithm has been tested on an NVIDIA Tesla V100 GPU, already yielding efficiency and timing measurements that are on par with the latest, multi-CPU versions of existing CMS tracking algorithms.

Primary authors: CHANG, Philip (Univ. of California San Diego (US)); ELMER, Peter (Princeton University (US)); GU, Yanxi (Univ. of California San Diego (US)); KRUTELYOV, Vyacheslav (Univ. of California San Diego (US)); NIENDORF, Gavin (Cornell University (US)); REID III, Michael G. (Cornell University (US)); SATHIA NARAYANAN, Balaji Venkat (Univ. of California San Diego (US)); TADEL, Matevž (Univ. of California San Diego (US)); VOURLIOTIS, Emmanouil (Univ. of California San Diego (US)); WANG, Bei (Princeton University (US)); WITTICH, Peter (Cornell University (US)); YAGIL, Avi (Univ. of California San Diego (US))

Presenter: VOURLIOTIS, Emmanouil (Univ. of California San Diego (US))

Status: SUBMITTED

Submitted by **VOURLIOTIS, Manos** on **Tuesday 31 May 2022**

Abstract ID : **97**

Development of a Simulation Model and Precise Timing Techniques for PICOSEC-MicroMegas Detectors

Content

The PICOSEC-MicroMegas Detector offers the potential for precise timing at a picosecond level accuracy. This contribution, besides the short introduction of the detector and the data taken concept, aims to the development of signal processing algorithms that explore the properties of the detector and offer the ability for online, precise timing. Their performance is evaluated by a variety of tests using experimental data, coming from Laser Beam Test at CEA/IRAMIS-Saclay, corresponding to single and multi-photoelectron pulses. We propose alternative algorithms based on Constant Threshold Discrimination, using multi-Charge above threshold to correct for systematic timing effects. Furthermore, a timing technique using Artificial Neural Networks(ANN) has been advanced and evaluated. To generate an appropriate learning set for the ANN, a novel simulation model has also been developed. This uses the single photoelectron pulses to emulate ones similar to the multi-photoelectron response of PICOSEC-MicroMegas Detector. The second data-set comprising of waveforms of the multi-photoelectron response was used to evaluate the ANN performance, and the ANN proved to give same results as the full offline signal processing analysis, achieving a timing precision of 18.3±0.6\,ps.

Primary author: Ms KALLITSOPOULOU, Alexandra (CEA-Université Paris-Saclay)

Co-authors: Prof. TZAMARIAS , Spyros (AUTH); Dr MANIATIS , Ioannis (CERN); TSIAMIS, Angelos (AUTH)

Presenter: Ms KALLITSOPOULOU, Alexandra (CEA-Université Paris-Saclay)

Status: SUBMITTED

Submitted by **KALLITSOPOULOU, ALEXANDRA** on **Saturday 04 June 2022**