29th International Symposium on Lepton Photon Interactions at High Energies

Report of Contributions

https://indico.cern.ch/e/688643

Contribution ID: **155** Type: **Parallel Session talk**

Belle2VR: An Interactive Virtual Reality Visualization of GEANT4 Event Histories

Thursday, August 8, 2019 11:45 AM (12 minutes)

Summary

I describe a novel interactive virtual reality visualization of the Belle II detector at KEK and the animation therein of GEANT4-simulated event histories. Belle2VR runs on Oculus and Vive headsets (as well as in a web browser and on 2D computer screens, in the absence of a headset). A user with some particle-physics knowledge manipulates a gamepad or hand controller(s) to interact with and interrogate the detailed GEANT4 event history over time, to adjust the visibility and transparency of the detector subsystems, to translate freely in 3D, to zoom in or out, and to control the event-history timeline (scrub forward or backward, speed up or slow down). A non-expert uses the app - during public outreach events, for example - to explore the world of subatomic physics via electron-positron collision events in the Belle II experiment at the SuperKEKB colliding-beam facility at KEK in Japan. Multiple simultaneous users, wearing untethered locomotive VR backpacks and headsets, walk about a room containing the virtual model of the Belle II detector and each others' avatars as they observe and control the simulated event history. Developed at Virginia Tech by an interdisciplinary team of researchers in physics, education, and virtual environments, the simulation is intended to be integrated into the undergraduate physics curriculum. I describe the app, including visualization features and design decisions, and illustrate how a user interacts with its features to expose the underlying physics in each electron-positron collision event.

Primary author: PIILONEN, Leo (Virginia Tech)

Presenter: PIILONEN, Leo (Virginia Tech)

Session Classification: Outreach & Theory (Parallel)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **156** Type: **Parallel Session talk**

Searches for ultra long-lived particles with MATHUSLA

Tuesday, August 6, 2019 2:45 PM (12 minutes)

Summary

With the current experiments at the particle accelerators, no search strategy will be able to observe the decay of neutral long-lived particles with masses above ˜GeV and lifetimes at the limit set by Big Bang Nucleosynthesis (BBN), $c\tau \sim 10^7$-10^8 m. The MATHUSLA detector concept (MAssive Timing Hodoscope for Ultra-Stable neutraL pArticles) will be presented. It can be implemented on the surface above ATLAS or CMS detectors in time for the high-luminosity LHC operations, to search for neutral long-lived particles with lifetimes up to the BBN limit. The large area of the detector allows MATHUSLA to make important contributions also to cosmic-ray physics. We will also report on the analysis of data collected by the test stand installed on the surface above the ATLAS detector, the on-going background studies, and plans
for the MATHUSLA detector.
The observation of neutral long-lived particles at the LHC would reveal physics beyond the Standard Model and could account for the many open issues in our understanding of our universe. Long-lived particle signatures are well motivated and can appear in many theoretical constructs that address the Hierarchy Problem, Dark Matter, Neutrino Masses and the Baryon Asymmetry of the Universe.

Primary authors: POLICICCHIO, Antonio (Sapienza Università di Roma and INFN ROMA1); ALPIGIANI, Cristiano (University of Washington, Seattle)

Presenter: DIAMOND, Miriam (SLAC National Laboratory)

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **158** Type: **Poster submission**

Hadronic charm decays at BESIII

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Presenter: LI, Shuaiying (IHEP)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **159** Type: **Parallel Session talk**

Semileptonic and leptonic charm decays at BESIII

Thursday, August 8, 2019 10:00 AM (12 minutes)

Summary

Primary authors: MA, Hailong; KE, Liu (Central China Normal University)

Presenter: KE, Liu (Central China Normal University)

Session Classification: Flavour Physics (Parallel)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **160** Type: **Poster submission**

Recent results of light hadron from BESIII

The world's largest sample of J/psi 1.3 billion events accumulated at the BESIII detector offers a unique opportunity to study light hadron spectroscopy and decays. In this presentation, recent results of the light hadron physics at BESIII will be highlighted. The BESIII experiment has made significant progresses on the light hadron spectroscopy in the J/psi decays, including the amplitude analyses of J/psi radiative and hadronic decays. The results on the light meson decays are also reported, including the observation of eta'-> rho+ pi-, precision study of eta'->gamma pi pi decay dynamics and the observation of a0(980)-f0(980) mixing.

Summary

Presenter: YANG, Shuangli

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **161** Type: **Poster submission**

Search for dark sector via charmonia decay at BESIII

Monday, August 5, 2019 3:40 PM (20 minutes)

Low energy, high luminosity e+ e- colliders are believed to be good places to search for exotic particles predicted in new physics models with dark sector phenomenology. BESIII, as the only running tau-charm factory, has great potential to probe these particles and models with the largest samples of directly produced charmonia. In this talk, we will report the recent results, including search for dark photon using the Jpsi decays in association with a pseudoscalar meson(eta, eta'). In both channels, no significant signal is observed in the mass region from 0.1 to 2.1(2.4) GeV/c2, and the upper limits at the 90% confidence level on the product branching fraction of charmonia to pseudoscalar mesons and the subsequent decay of dark photon to e+e- are set, together with the mixing strength, as a function of dark photon mass.

Summary

Presenter: SHI, Xiaodong (University of Science and Technology of China)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Dark Matter Searches

Contribution ID: **162** Type: **Poster submission**

Search for rare FCNC decays at BESIII

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Presenter: WANG, Dayong (Peking University (CN))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **165** Type: **Poster submission**

New results of the vector charmoniumlike states

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Presenter: SONG, Qingqing

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **166** Type: **Poster submission**

Observation 0f new charmonium decays

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Presenter: TONG, Liu (IHEP)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **171** Type: **Poster submission**

Neutrino CP Violation with the European Spallation Source neutrino Super Beam project

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

After measuring in 2012 a relatively large value of the neutrino mixing angle θ13, the door is now open to observe for the first time a possible CP violation in the leptonic sector. The measured value of θ13 also privileges the 2nd oscillation maximum for the discovery of CP violation instead of the usually used 1st oscillation maximum. The sensitivity at this 2nd oscillation maximum is about three times higher than for the 1st oscillation maximum inducing a lower influence of systematic errors. Going to the 2nd oscillation maximum necessitates a very intense neutrino beam with the appropriate energy. The world's most intense pulsed spallation neutron source, the European Spallation Source, will have a proton linac with 5 MW power and 2 GeV energy. This linac, under construction, also has the potential to become the proton driver of the world' s most intense neutrino beam with very high potential to discover a neutrino CP violation. The physics performance of that neutrino Super Beam in conjunction with a megaton underground Water Cherenkov neutrino detector installed at a distance of about 500 km from ESS has been evaluated. In addition, the choice of such detector will extent the physics program to proton–decay, atmospheric neutrinos and astrophysics searches. The ESS proton linac upgrades, the accumulator ring needed for proton pulse compression, the target station optimization and the physics potential are described. In addition to neutrinos, this facility will also produce at the same time a copious number of muons which could be used by a muon collider. The ESS neutron facility will be fully ready by 2023 at which moment the upgrades for the neutrino facility could start.

This project is supported by the COST Action CA15139 "Combining forces for a novel European facility for neutrino-antineutrino symmetry-violation discovery" (EuroNuNet). It has also received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 777419.

Primary author: DRACOS, Marcos (Centre National de la Recherche Scientifique (FR))

Presenter: DRACOS, Marcos (Centre National de la Recherche Scientifique (FR))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **174** Type: **Parallel Session talk**

The Status of the milliQan Experiment

Tuesday, August 6, 2019 2:30 PM (12 minutes)

Summary

The status of the milliQan experiment is discussed. milliQan is a proposed search for milli-charged particles produced at the LHC with expected sensitivity to charges of between 0.1e and 0.001e for masses in 0.1 - 100 GeV range. The proposed detector is an array of 4 stacks of 60 cm long plastic scintillator arrays read out by PMTs. It will be installed in an existing tunnel 33 m from the CMS interaction point at the LHC, with 17 m of rock shielding to suppress beam backgrounds. In the fall of 2017, a 1% scale "demonstrator"of the proposed detector was installed at the planned site in order to study the feasibility of the experiment, focusing on understanding various background sources such as radioactivity of materials, PMT dark current, cosmic rays, and beam-induced backgrounds. In this talk, I will discuss the general concept of the experiment, the results from the demonstrator, and the plan for the future.

Primary authors: HILL, Chris (Ohio State University (US)); HAAS, Andrew (New York University)

Presenter: HILL, Chris (Ohio State University (US))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **176** Type: **Parallel Session talk**

Muon collider: the Low EMittance Muon Accelerator (LEMMA) approach

Thursday, August 8, 2019 12:15 PM (12 minutes)

Summary

In order to further consolidate the present knowledge of the
Standard Model and to look for deviations from its predictions
that would signal new physics effects, a new generation of hadron-hadron or electron-positron colliders is put forward.
However also the idea of a muon collider seems to be attractive because such a machine would provide the high centre of mass energy typical of a hadron-hadron machine in the clean experimental environment typical of an electron-positron machine.
Hence the muon collider can explore the multi-TeV energy frontier as well as be used as a clean Higgs factory.
Clearly the muon collider has to face quite a few challenges.
One of these is the production of a low emittance muon (antimuon) beam to be fed into a suitable accelerator complex.
Recently the idea of getting such muons (antimuons) from collisions of an about 45 GeV low emittance positron beam on a fixed target has been put forward. The 45 GeV incident positron energy is chosen because it corresponds to the energy threshold of the process e+ e- -> mu+ mu-, which, at threshold, should give the wanted muon (antimuon) low emittance particles flux.
The experimental proof of this expectation is the goal of the
Low EMittance Muon Accelerator (LEMMA) collaboration who carried out in Summer 2017 and Summer 2018 dedicated tests with a 45 GeV positron beam at the CERN H4 (2017) and H2 (2018) experimental areas. These tests were based on a silicon telescope setup complemented by a dipole magnetic field, muon chambers and a set of calorimeters,
to tag electrons and positrons.
The ultimate goal of the LEMMA collaboration is the measurement of the emittance of the produced muon (antimuon) particles flux and of the corresponding cross section at threshold.
A description of the muon collider project and of the reaches
in terms of physics will be given first.
Then the concepts and the experimental setup used for the 2017 and 2018 emittance test beams will be presented together with a summary of the results reached so far.

Primary authors: BERTOLIN, Alessandro (Universita e INFN, Padova (IT)); BARTOSIK, Nazar (Universita e INFN Torino (IT))

Presenter: BARTOSIK, Nazar (Universita e INFN Torino (IT))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **179** Type: **Poster submission**

Physics Potential of the Jiangmen Underground Neutrino Observatory

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Jiangmen Underground Neutrino Observatory (JUNO) is an underground 20 kton liquid scintillator detector being built in the south of China and expected to start data taking in late 2021. JUNO has a physics programme focused on neutrino properties using electron anti-neutrinos emitted from two nuclear power plants at a baseline of about 53 km. Its primary aim is to address one of the main open questions in neutrino physics: the neutrino mass ordering.Targeting an unprecedented relative energy resolution of 3% at 1 MeV, JUNO will be able to determine the mass ordering with a statistical significance of 3-4 sigma within six years of running. It will also measure other oscillation parameters to which reactor neutrinos at a medium baseline offer sensitivity, with an accuracy better than 1%. Thanks to the expected detector performance, JUNO will be able to tackle a wide range of neutrino physics topics. These include solar and atmospheric neutrinos, study of near-by Supernovae explosions; and a search for nucleon decays in a complementary way to the Cherenkov-based experiments.

JUNO's physics potential will be described comprehensively in this talk, where we will showcase the latest expectations for the above-mentioned analyses.

Primary author: SALAMANNA, Giuseppe (Roma Tre Universita Degli Studi (IT))

Presenters: ANDRONICO, Giuseppe (Universita e INFN, Catania (IT)); ANDRONICO, Giuseppe (INFN)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **182** Type: **Poster submission**

Light detection in DUNE Dual Phase

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Proposed for construction 1.5km underground in the Sanford Underground Research Facility (South Dakota, US), the Deep Underground Neutrino Experiment (DUNE) will hold four 10 kton fiducial mass modules of liquid argon (LAr) to trap a beam of neutrinos sent from Fermilab, 1,300 km away. DUNE will perform precision measurements of the PMNS mixing parameters, determine unambiguously the MH and has the potential to discover leptonic CP violation. It also comprises a rich non-accelerator physics program as the detection of supernova neutrinos, nucleon decay and BSM physics.

In the first phase of DUNE, two LArTPC modules of different technologies are proposed to be built, with equivalent prototypes being assembled now at CERN (protoDUNEs): a first single-phase module, and a second dual-phase one with a gaseous argon phase to amplify the signal.

Inside the DUNE Dual Phase module, a light detection system (LDS) is being designed, consisting in an array of PMTs and a calibration system based in optical fibers. The LDS will be able to provide a trigger to non-beam events such as supernova neutrinos or proton decay candidates. It will also contribute to the calorimetric reconstruction, and will provide a t0 to the non-beam events. To fulfill the physics program, the LDS is aimed to comply with certain physics requirements. Those are to provide a detection efficiency of more than 90% for a Supernova Burst within the Milky Way and a t0 reconstruction efficiency of more than 90% across the active volume for proton decay event candidates, with a signal purity of 90%.

In this sense, simulation studies have been performed to ensure that the proposed design meets these requirements: A full simulation of the detector has been implemented, including the propagation of the light inside the detector, and the PMT response and digitization.

The proposed poster will summarize the status of the studies that are ongoing concerning the simulation of the light detection in DUNE Dual Phase, and the expected performace of the LDS, that will be part of the forthcoming Technical Design Report of DUNE.

Primary author: Mr SOTO-OTON, Jose (CIEMAT)

Presenter: Mr SOTO-OTON, Jose (CIEMAT)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **183** Type: **Parallel Session talk**

The search for light dark matter with the NEWS-G detector

Tuesday, August 6, 2019 4:30 PM (12 minutes)

Summary

The NEWS-G (New Experiments With Spheres –Gas) collaboration searches for light dark matter using spherical proportional counters (SPCs) located in deep underground laboratories. A choice of light gas targets (Ne, He, H) in conjunction with sub-KeV nuclear recoil thresholds allow for sensitivity to low-mass WIMPs (Weakly Interacting Massive Particles) down to 0.1 GeV/cˆ2. The recent results from SEDINE, a 60-cm diameter SPC located at LSM (Laboratoire Souterrain de Modane), set new constraints for WIMP masses lighter than 0.6 GeV/cˆ2 and will be presented. New gas quenching factor measurements obtained at the TUNL (Triangle Universities Nuclear Laboratory) facility and the status and outlook of the 1.4-metre diameter ultra-low background SPC project to be installed at SNOLAB will also be presented.

Primary author: GIROUX, Guillaume (Queen's University)

Presenter: GIROUX, Guillaume (Queen's University)

Session Classification: Astroparticle, Dark Matter (Parallel)

Track Classification: Dark Matter Searches

Contribution ID: **185** Type: **Parallel Session talk**

Application of Quantum Machine Learning to High Energy Physics Analysis at LHC using IBM Quantum Computer Simulators and IBM Quantum Computer Hardware

Thursday, August 8, 2019 11:15 AM (12 minutes)

Summary

Using IBM Quantum Computer Simulators and Quantum Computer Hardware, we have successfully employed the Quantum Support Vector Machine Method (QSVM) for a ttH (H to two photons), Higgs coupling to top quarks analysis at the LHC.

We will present our experiences and results of a study on LHC high energy physics data analysis with IBM Quantum Computer Simulators and IBM Quantum Computer Hardware using IBM Qiskit. The work is in the context of a Qubit platform. Taking into account the limitation of a low number of qubits, the result expressed in a ROC curve is comparable with the results using a classical machine learning method. This study is applied to a Higgs-coupling-to–two-top-quarks (ttH) physics analysis, one of the flagship physics channels at the LHC. Here the ROC curve is defined as the Receiver Operating Characteristics curve in the plane of background rejection versus signal efficiency. At our current stage, with 5 qubits and 800 events, we have reached an AUC of 0.86, which is similar to the AUC of 0.87 from a classical machine learning method (BDT), where the AUC is the area under the ROC curve. By the time of the conference, we expect to have results with 20 qubits.

In addition, collaborating with IBM Research Zurich, we have finished training with machine learning on the IBM Quantum Computer Hardware with 100 training events, 100 test events, and 5 qubits, again for a ttH (H to two photons) analysis at the LHC. Because of hardware access time and timeout limitations, we finished only a few iterations. By the time of the conference, we expect to have performed the study on 20 qubits hardware with a large number of iterations.

The work is performed by an international and interdisciplinary collaboration with high energy physicists (Physics Department, University of Wisconsin), computational scientists (Computing Science Department, University of Wisconsin and IT Department, CERN Openlab), and quantum computing scientists (IBM Research Zurich).

This work pioneers a close collaboration of academic institutions with industrial corporations in a High Energy Physics analysis effort.

Primary authors: CHAN, Jay (University of Wisconsin Madison (US)); GUAN, Wen (University of Wisconsin (US)); SUN, Shaojun (University of Wisconsin Madison (US)); WANG, Alex Zeng (University of Wisconsin Madison (US)); WU, Sau Lan (University of Wisconsin Madison (US)); ZHOU, Chen (University of Wisconsin Madison (US)); Prof. LIVNY, Miron (University of Wisconsin-Madison); DI MEGLIO, Alberto (CERN); CARMINATI, Federico (CERN); Dr BARKOUTSOS, Panagiotis; Dr TAVERNELLI, Ivano (IBM Research Zurich); Dr WOERNER, Stefan (IBM Research Zurich); Dr ZOUFAL, Christa (IBM Research Zurich)

Presenter: WANG, Alex Zeng (University of Wisconsin Madison (US))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **186** Type: **Poster submission**

About heavy neutrinos: Violation of lepton flavor in neutrinoless decays of leptons

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The fundamental description of nature, beyond the Standard Model (SM), may include heavy neutrinos that mix and thus allow processes in which lepton flavor is not preserved. We investigate the impact of charged currents that couple heavy gauge bosons to heavy neutrinos and SM leptons on neutrinoless lepton-flavor-violating decays of SM leptons into three charged leptons. We implement our expressions for the leading contributions to Br(l_\alpha - l_\beta l_\sigma l_\sigma), which hold for either Dirac or Majorana neutrinos, to the neutrinoless trilepton decay \mu - 3e, of the muon, and so determine sets of masses of heavy neutrinos and the heavy gauge boson, within GeVs to few TeVs, that are consistent with the upper bounds provided by the SINDRUM Collaboration. We utilize such parameters to find that the contributions to tau decays are the order of 10ˆ{-14}-10ˆ{-13}, well below bounds from B factories.

Primary authors: Dr NOVALES SÁNCHEZ, Héctor (Benemérita Universidad Autónoma de Puebla); Dr TOSCANO CHÁVEZ, J. Jesús (Benemérita Universidad Autónoma de Puebla); Ms SALINAS IBAÑEZ, Mónica (Benemérita Universidad Autónoma de Puebla)

Presenter: Ms SALINAS IBAÑEZ, Mónica (Benemérita Universidad Autónoma de Puebla)

Session Classification: Poster Session (Mon/Tue)

Contribution ID: **187** Type: **Parallel Session talk**

DUNE –Precision Neutrino Observatory of the Future

Thursday, August 8, 2019 9:00 AM (12 minutes)

Summary

Neutrinos are the most abundant matter, but most mysterious, particle in the universe. Contrary to the predictions of the Standard Model of Particle Physics, they have mass, and they can transition from one type to another. This phenomenon of neutrino oscillations may be different for neutrinos and anti-neutrinos and may help to explain the matter-dominated universe via leptogenesis.

The Deep Underground Neutrino Experiment (DUNE) will be a world-class neutrino observatory and nucleon decay detector designed to answer fundamental questions about the nature of elementary particles and their role in the universe. DUNE will consist of a far detector to be located about 1.5 km underground at the Sanford Underground Research Facility (SURF) in South Dakota, USA, at a distance of 1300 km from Fermilab, and a near detector to be located at Fermilab in Illinois. The far detector will be a modular liquid argon time-projection chamber (LArTPC) with a 40 kton fiducial mass. This LAr technology will make it possible to reconstruct interactions with image-like precision and unprecedented resolution. A high-precision near detector, located 575m from the neutrino source on the Fermilab site, will be used to characterise the intensity and energy spectrum of the world's most intense wide-band neutrino beam.

The underground location of the large DUNE far detector and its excellent energy and spatial resolution will allow also conducting non-accelerator physics programs predicted by GUT models, such as nucleon decay or n-nbar oscillations. Moreover, it will be sensitive to measure of the electron neutrino flux from a core-collapse supernova
providing valuable information on the mechanism of a supernova. This ambitious project involves worldwide contribution and extensive prototyping and testing program to guarantee that all parts of the technology are fully understood and well tested.

We will give an introduction to the experiment and report on the recent status.

Primary author: Prof. WEBER, Alfons (University of Oxford (GB))

Presenter: Prof. WEBER, Alfons (University of Oxford (GB))

Session Classification: Neutrino Physics (Parallel)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **189** Type: **Poster submission**

Scintillation light collection, production and propagation in the 4 tonne dual-phase demonstrator (data analysis and simulations)

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Deep Underground Neutrino Experiment (DUNE) is a new generation long-baseline neutrino detector pursuing the goals of measuring neutrino oscillations, investigating the presence of CP-violation, performing neutrino astrophysics studies, and nucleon decay searches. DUNE planned to install four 10-kton Liquid Argon (LAr) Time Projection Chambers (TPC) using both single and dual-phase (DP) technology. The latter provides charge amplification before collection in the gaseous phase.

The photon detection system in these detectors is crucial to provide the trigger signal for rare non-beam events, an absolute time reference for the charge and to complementary calorimetry. The testing and design optimization of the DP technology up to DUNE modules is following a scaling approach. A DUNE DP prototype (ProtoDUNE-DP) is currently being constructed at CERN to demonstrate the operation of the DP technology at large scale (6x6x6 m3 LAr volume). In 2017 a DP 4 tonne demonstrator of 3x1x1 m3 volume took cosmic data and exhibited good performance in terms of charge extraction and light collection.

The ProtoDUNE-DP light detection system has been designed based on the results from the 3x1x1 performance. In the demonstrator, 5 cryogenic photomultipliers were installed with different configurations in terms of PMT base polarity and wavelength shifting methods. During the 4-tonne demonstrator operation, scintillation light data have been collected during several months of operation in different drift and amplification fields configurations. In DP, on the top of the scintillation light produced in the liquid phase (S1 signal), a secondary light signal (S2) is generated in the gas phase during the charge amplification.

An overview of the 3x1x1 light detection system performance will be presented, confirming the good capability of the system to collect and characterize S1 and S2 signals, to monitor LAr purity, to measure the electron drift velocity and provide a trigger to the charge. The presence of external Cosmic Rays Taggers (CRT) allowed the reconstruction of the tracks in the fiducial volume and the study of the light signal also in absence of drift field. Data have been compared with MC simulations. The sensitivity to the LAr optical parameters not completely known such as Rayleigh scattering and light production mechanisms have been studied and will be presented in this poster.

Primary author: LASTORIA, Chiara Filomena (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Presenter: LASTORIA, Chiara Filomena (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Session Classification: Poster Session (Thu/Fri)

Contribution ID: **190** Type: **Poster submission**

Interpretable Deep Learning for Two-Prong Jet 2 Classication with Jet Spectra

Summary

Classification of jets with deep learning has gained significant attention in recent times.However, the performance of deep neural networks is often achieved at the cost of interpretability.
Here we propose an interpretable network trained on the jet spectrum S2(R) which is a two-point correlation function of the jet constituents. The spectrum can be derived from a functional Taylor series of an arbitrary jet classifier function of energy flows. An interpretable network can be obtained by truncating the series. The intermediate feature of the network is an infrared and collinear safe C-correlator which allows us to estimate the importance of a S2(R) deposit at an angular scale R in the classification. The performance of the architecture is comparable to that of a convolutional neural network (CNN) trained on jet images, although the number of inputs and complexity of architecture is significantly simpler than the CNN classifier. We consider two examples: one is the classification of two-prong jets which differ in color charge of the mother particle, and the other is a comparison between Pythia 8 and Herwig 7 generated jets.

Primary authors: Prof. NOJIRI, Mihoko (Theory Center, IPNS, KEK); LIM, Sung Hak (KEK); Dr CHAKRABORTY, Amit (KEK)

Presenter: Prof. NOJIRI, Mihoko (Theory Center, IPNS, KEK)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **191** Type: **Poster submission**

ATLAS Muon Trigger performance

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Events containing muons in the final state are an important signature for many analyses being carried out at the Large
Hadron Collider (LHC), including both standard model measurements and searches for new physics. To be able to study such
events, it is required to have an efficient and well-understood muon trigger. The ATLAS muon trigger consists of a
hardware based system (Level 1), as well as a software based reconstruction (High Level Trigger). Due to the high
luminosity in Run 2, several improvements have been implemented to keep the trigger rate low, while still maintaining a
high efficiency. Some examples of recent improvements include requiring coincidence of hits in the muon spectrometer and
the calorimeter and optimised muon isolation. We will present an overview of how we trigger on muons, recent
improvements, the performance of the muon trigger in Run-2 data and an outlook for the improvements planned for run-3.

Presenter: NOGUCHI, Yohei (Kyoto University (JP))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **192** Type: **Poster submission**

Performance of the ATLAS tau-lepton trigger at the LHC in Run 2

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The ATLAS experiment has a rich physics program of Standard Model measurements and searches for physics Beyond the Standard Model involving tau leptons.
Most of these analyses depend on an efficient tau-lepton trigger that can cope with the overwhelming background from multi-jet events produced in proton-proton collisions at the Large Hadron Collider.
The ATLAS trigger system is composed of two stages.
At Level-1, tau leptons are reconstructed as energy deposits in neighbouring towers of calorimeter cells.
The High Level Trigger (HLT) exploits the full calorimeter granularity as well as inner-detector tracks, and runs reconstruction and identification algorithms similar to those used in the offline reconstruction.
The performance of the tau-lepton trigger in ATLAS Run-2 data will be discussed, and trigger efficiencies measured with a tag-and-probe method will be presented.
An emphasis will be made on the improved HLT algorithms deployed in 2018 and mentioned below.
The association of tracks to the energy deposit in the calorimeter was tightened to reduce the contamination from fake tracks at high pileup.
An energy calibration based on a Boosted Regression Tree with improved energy resolution has replaced the simpler calibration based on pileup subtraction and calorimeter response correction.
An identification algorithm based on a Recurrent Neural Network was also deployed, which provides increased jet rejection compared to the previously-used Boosted Decision Tree identification algorithm.

Presenter: ASIMAKOPOULOU, Eleni Myrto (Uppsala University (SE))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **193** Type: **Poster submission**

The ATLAS Electron and Photon Trigger Performance in Run 2

Thursday, August 8, 2019 10:30 AM (20 minutes)

Summary

ATLAS electron and photon triggers covering transverse energies from 5 GeV to several TeV are essential to record signals for a wide variety of physics: from Standard Model processes to searches for new phenomena in both proton-proton and heavy ion collisions. Main triggers used during Run 2 (2015-2018) for those physics studies were a single-electron trigger with ET threshold around 25 GeV and a diphoton trigger with thresholds at 25 and 35 GeV. Relying on those simple, general-purpose triggers is seen as a more robust trigger strategy, at a cost of slightly higher trigger output rates, than to use a large number of analysis-specific triggers. To cope with ever-increasing luminosity and more challenging pile-up conditions at the LHC, the trigger selections needed to be optimized to control the rates and keep efficiencies high. The ATLAS electron and photon performance during Run-2 data-taking is presented as well as work ongoing to prepare to even higher luminosity of Run 3 (2021-2023).

Presenter: Mr FLORES, Lucas Macrorie (University of Pennsylvania (US))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **194** Type: **Poster submission**

ATLAS Transverse Missing Momentum Trigger Performance

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Transverse missing momentum from non-interacting particles is one of the important characteristics for many analyses especially for Beyond Standard Model physics searches. To study these events at the Large Hadron Collider (LHC) with the ATLAS experiment an efficient trigger selection is needed. The ATLAS transverse missing momentum trigger uses calorimeter-based global energy sums together with specifically developed pile-up mitigation techniques. The high number of pile-up interactions was one of the major challenges faced during Run 2 and a continuous effort was needed to improve the pile-up rejection and to keep the trigger rate reasonable. This talk presents the techniques used to improve the Run 2 transverse missing momentum trigger performance, the full Run 2 performance and an outlook on further improvements for Run 3.

Presenter: STRUBIG, Antonia (Nikhef National institute for subatomic physics (NL))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **195** Type: **Poster submission**

The ATLAS Level-1 Topological Processor: experience and upgrade plans

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

During Run 2 the Large Hadron Collider (LHC) has provided, at the World's energy frontier, proton-proton collisions to the ATLAS experiment with high instantaneous luminosity (up to 2.1x10ˆ34 cmˆ-2sˆ-1), placing stringent operational and physical requirements on the ATLAS trigger system in order to reduce the 40 MHz collision rate to a manageable event storage rate of 1 kHz, while not rejecting interesting collisions.

The Level-1 trigger is the first rate-reducing step in the ATLAS trigger system with an output rate of up to 100 kHz and decision latency of less than 2.5 us. Until the end of 2018, an important role was played by the Level 1 Topological Processor (L1Topo). This innovative system consists of two blades designed in AdvancedTCA form factor, mounting four individual state-of-the-art processors, and providing high input bandwidth and low latency data processing. Up to 128 topological trigger algorithms can be implemented to select interesting events by applying kinematic and angular requirements on electromagnetic clusters, hadronic jets, muons and total energy reconstructed in the ATLAS apparatus. This resulted in a significantly improved background event rejection rate and improved acceptance of physics signal events, despite the increasing luminosity. The L1Topo system has become more and more important for physics analyses making use of low energy objects, commonly present in the Heavy Flavour or Higgs physics events for example.

In this presentation, an overview of the L1Topo architecture, simulation and performance results during Run 2 is discussed alongside with upgrade plans for the L1Topo system to be installed for the future data taking that will start in 2021.

Presenter: DAMP, Johannes Frederic (Johannes Gutenberg Universitaet Mainz (DE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **197** Type: **Poster submission**

ATLAS Level-1 Endcap Muon Trigger for Run 3

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The LHC is expected to increase its center-of-mass energy to 14 GeV and an instantaneous luminosity to 2.4×1034 cm-2s-1 for Run 3 scheduled from 2021 to 2023. In order to cope with the high event rate, an upgrade of the ATLAS trigger system is required.
The Level-1 Endcap Muon trigger system identifies muons with high transverse momentum by combining data from a fast muon trigger detector, TGC. In the ongoing Phase-I upgrade, new detectors called the New-Small-Wheel (NSW) and RPC-BIS78, will be installed in the inner station region for the endcap muon trigger. Finer track information from the NSW and RPC-BIS78 can be used as part of the muon trigger logic to enhance performance significantly.
In order to handle data from both TGC and NSW, some new electronics have been developed, including the trigger processor board known as Sector Logic (SL). The SL board has a modern FPGA to make use of Multi-Gigabit transceiver technology, which will be used to receive data from the NSW. The readout system for trigger data has also been re-designed, with the data transfer implemented with TCP/IP instead of a dedicated ASIC. This makes it possible to minimize the use of custom readout electronics and instead use some commercial PCs and network switches to collect, format and send the data. This presentation describes the aforementioned upgrades of the Level-1 Endcap Muon trigger system. Particular emphasis will be placed on the new algorithm in Sector Logic. The expected trigger performance will also be discussed.

Presenter: HIBI, Hiroaki (Kobe University (JP))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **198** Type: **Poster submission**

The ATLAS Run 2 Trigger Menu

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The ATLAS experiment aims at recording about 1 kHz of physics collisions, starting with an LHC design bunch crossing rate of 40 MHz. To reduce the significant background rate while maintaining a high selection efficiency for rare physics events (such as beyond the Standard Model physics), a two-level trigger system is used.

Events are selected based on physics signatures such as the presence of energetic leptons, photons, jets or large missing energy. The trigger system exploits topological information, as well as multivariate methods to carry out the necessary physics filtering for the many analyses that are pursued by the ATLAS community. In total, the ATLAS online selection consists of around 1500 individual triggers. A Trigger Menu is the compilation of these triggers, it specifies the physics selection algorithms to be used during data taking, and the rate and bandwidth a given trigger is allocated. Trigger menus must reflect the physics goals for a given run, and also must take into consideration the instantaneous luminosity of the LHC and limitations from the ATLAS detector readout and offline processing farm. For the 2017-2018 run, the ATLAS trigger has been enhanced to be able to handle higher instantaneous luminosities and to ensure the selection robustness against higher average multiple interactions per bunch crossing.

We will describe the design criteria for the trigger menu for Run 2. We discuss several aspects of the process of planning the trigger menu, starting from how ATLAS physics goals and the need for detector performance measurements enter the menu design, and how rate, bandwidth, and CPU constraints are folded in during the compilation of the menu. We present the tools that allow us to predict and optimize the trigger rates and CPU consumption for the anticipated LHC luminosities. We outline the online system that we implemented to monitor deviations from the individual trigger target rates and to quickly react to the changing LHC conditions and data taking scenarios. Finally, we give an overview of the 2015-2018 Trigger Menu and performance, allowing the audience to get a taste of the broad physics program that the trigger is supporting.

Presenter: WHALEN, Kate (University of Oregon (US))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **199** Type: **Parallel Session talk**

ATLAS Trigger and Data Acquisition Upgrades for the High Luminosity LHC

Thursday, August 8, 2019 9:45 AM (12 minutes)

Summary

The ATLAS experiment at CERN has started the construction of upgrades for the "High Luminosity LHC", with collisions due to start in 2026. In order to deliver an order of magnitude more data than previous LHC runs, 14 TeV protons will collide with an instantaneous luminosity of up to 7.5 × 1034 cm — 2s — 1, resulting in much higher pileup and data rates than the current experiment was designed to handle. While this is essential to realise the physics programme, it presents a huge challenge for the detector, trigger, data acquisition and computing. The detector upgrades themselves also present new requirements and opportunities for the trigger and data acquisition system.

The approved baseline design of the TDAQ upgrade comprises: a hardware-based low-latency real-time Trigger operating at 40 MHz, Data Acquisition which combines custom readout with commodity hardware and networking to deal with 5.2 TB/s input, and an Event Filter running at 1 MHz which combines offline-like algorithms on a large commodity compute service augmented by hardware tracking. Commodity servers and networks are used as far as possible, with custom ATCA boards, high speed links and powerful FPGAs deployed in the low-latency parts of the system. Offline-style clustering and jet-finding in FPGAs, and track reconstruction with Associative Memory ASICs and FPGAs are designed to combat pileup in the Trigger and Event Filter respectively.

This paper will report recent progress on the design, technology and construction of the system. The physics motivation and expected performance will be shown for key physics processes.

Primary authors: CORSO RADU, Alina (University of California Irvine (US)); CAMPLANI, Alessandra (University of Copenhagen (DK))

Presenter: CAMPLANI, Alessandra (University of Copenhagen (DK))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **200** Type: **Poster submission**

The ATLAS Hardware Track Trigger design towards first prototypes

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

In the High Luminosity LHC, planned to start with Run 4 in 2026, the ATLAS experiment will be equipped with the Hardware Track Trigger (HTT) system, a dedicated hardware system able to reconstruct tracks in the silicon detectors with short latency. This HTT will be composed of about 700 ATCA boards, based on new technologies available on the market, like high speed links and powerful FPGAs, as well as custom-designed Associative Memories ASIC (AM), which are an evolution of those used extensively in previous experiments and in the ATLAS Fast Tracker (FTK).

The HTT is designed to cope with the expected extreme high luminosity in the so called L0-only scenario, where HTT will operate at the L0 rate (1 MHz). It will provide good quality tracks to the software High-Level-Trigger (HLT), operating as coprocessor, reducing the HLT farm size by a factor of 10, by lightening the load of the software tracking.

All ATLAS upgrade projects are designed also for an evolved, so-called "L0/L1" architecture, where part of HTT is used in a low-latency mode (L1Track), providing tracks in regions of ATLAS at a rate of up to 4MHz, with a latency of a few micro-seconds. This second phase poses very stringent requirements on the latency budget and to the dataflow rates.

All the requirements and the specifications of this system have been assessed. The design of all the components has being reviewed and validated with preliminary simulation studies. After these validations are completed, the development of the first prototypes will start. In this paper we describe the status of the design review, showing challenges and assessed specifications, towards the preparation of the first slice tests with real prototypes.

Presenter: MOREIRA DE CARVALHO, Ana Luisa (LIP Laboratorio de Instrumentacao e Fisica Experimental de Part)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **201** Type: **Poster submission**

ATLAS Level-0 Endcap Muon Trigger for HL-LHC

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The design for the Level-0 endcap muon trigger of the ATLAS experiment at High-Luminosity LHC (HL-LHC) and the status of the development are presented. HL-LHC is planned to start the operation in 2026 with an instantaneous luminosity of 7.5 x 1034 cm-2s-1. In order to cope with the proton-proton collision rate higher than that of LHC, the trigger and readout system needs to be replaced. The new Level-0 endcap muon trigger system is required to reconstruct muon candidates with an improved momentum resolution to suppress the trigger rate with keeping the efficiency. That can be achieved by combining the signals from various subdetectors, thin gap chambers, resistive plate chambers, micromesh gaseous detectors, and scintillator-steel hadronic calorimeters, to form more offline-like tracks. The combined muon track reconstruction was demonstrated with Monte-Carlo simulation samples produced with the condition at HL-LHC. The efficiency was estimated to be greater than 90%, a few percent higher than the current system. The trigger rate was evaluated with proton-proton collision data taken with random trigger overlaid to account for a pileup of 200, which is expected at HL-LHC. The obtained value for momentum threshold of 20 GeV, primary threshold assumed for single muon trigger, is about 30 kHz, which constitutes only about 3% of the assumed total Level-0 trigger rate of 1 MHz. Hardware implementation is planned with ATCA blades. Each blade is designed to have a Virtex UltraScale+ FPGA with about hundred pairs of transceivers, which can be used to receive detector signals, and with huge memory resources suited for track reconstruction. The track reconstruction is based on a pattern matching algorithm using the detector hits and the predefined lists of hits corresponding to tracks. A memory resource UltraRAM integrated in the FPGA is exploited to store the predefined lists of hits. Initial test with the evaluation kit VCU118 showed high efficiency and angular resolution better than the requirement with reasonable memory resources. The bit error ratio of the data transmission with GTY transceivers was evaluated with transfer rates up to 25 Gbps. The power consumption of hundred pairs of transmitter and receiver of GTY running with 10 Gbps, which is an average transfer rate assumed for the system, was evaluated to be about 30 W.

Presenter: MINO, Yuya (Kyoto University (JP))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **202** Type: **Poster submission**

Implementation of the ATLAS trigger within the ATLAS Multi-Threaded Software Framework AthenaMT

Monday, August 5, 2019 3:30 PM (20 minutes)

Summary

Athena is the software framework used in the ATLAS experiment throughout the data processing path, from the software trigger system through offline event reconstruction to physics analysis. The shift from high-power single-core CPUs to multi-core systems in the computing market means that the throughput capabilities of the framework have become limited by the available memory per process. For Run 2 of the Large Hadron Collider (LHC), ATLAS has exploited a multi-process forking approach with the copy-on-write mechanism to reduce the memory use. To better match the increasing CPU core count and the, therefore, decreasing available memory per core, a multi-threaded framework, AthenaMT, has been designed and is now being implemented. The ATLAS High Level Trigger (HLT) system has been remodelled to fit the new framework and to rely on common solutions between online and offline software to a greater extent than in Run 2.

We present the implementation of the new HLT system within the AthenaMT framework, which will be used in ATLAS data-taking during Run 3 (2021-2023) of the LHC.

Presenter: ELLIOT, Alison (Queen Mary University of London (GB))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **203** Type: **Poster submission**

Jiangmen Underground Neutrino Observatory computing requirements and infrastructure

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Jiangmen Underground Neutrino Observatory (JUNO) is an underground 20 kton liquid scintillator detector being built in the south of China and expected to start data taking in late 2021. The JUNO physics program is focused on exploring neutrino properties, by means of electron antineutrinos emitted from two nuclear power complexes at a baseline of about 53km. Targeting an unprecedented relative energy resolution of 3% at 1 MeV, JUNO will be able to study neutrino oscillation phenomena and determine neutrino mass ordering with a statistical significance of 3-4 sigma within six years running time. These physics challenges are addressed by a large Collaboration localized in three continents. Different groups of the Collaboration, as simulation and offline groups, have started the evaluation of the requirements of the experiment for computing and the related resources. In this context, key to the success of JUNO will be the realization of a distributed computing infrastructure, which will satisfy its predicted computing needs. Upon its establishment, it is expected to deliver not less than 2 PB of data per year, to be stored in at least four data centers in China and Europe. Data analysis activities will be distributed in a joint effort. This contribution is meant to report how the JUNO computing infrastructure is going to be designed and which will be its main characteristics.

Primary authors: ANDRONICO, Giuseppe (INFN - National Institute for Nuclear Physics); ZHANG, xiaomei (IHEP,Beijing); Dr LI, Weidong (IHEP, Beijing)

Presenters: ANDRONICO, Giuseppe (INFN - National Institute for Nuclear Physics); ANDRONICO, Giuseppe (Universita e INFN, Catania (IT))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **205** Type: **Parallel Session talk**

The upgrade of the T2K Near Detector ND280

Tuesday, August 6, 2019 4:15 PM (12 minutes)

Summary

In view of the J-PARC program of upgrades of the beam intensity, the T2K collaboration is preparing towards an increase of the exposure aimed at establishing leptonic CP violation at 3 σ level for a significant fraction of the possible δ_{CP} values. To reach this goal, an upgrade of the T2K near detector ND280 has been launched, with the aim of reducing the overall statistical and systematic uncertainties at the appropriate level of better than 4\%.

We have developed an innovative concept for this neutrino detection system, comprising the totally active Super-Fine-Grained-Detector (SuperFGD), two High Angle TPC (HA-TPC) and six TOF planes.

The SuperFGD, a highly segmented scintillator detector, acting as a fully active target for the neutrino interactions, is a novel device, (JINST 13 (2018) no.02, P02006; NIM A923 (2019) 134), with dimensions of ˜2x1.8x0.6 m3 and a total mass of about 2 tons. It consists of about 2x106 small scintillator cubes each of 1 cm3. Each cube is covered by a chemical reflector. The signal readout from each cube is provided by wavelength shifting fibers inserted connected to micro-pixel avalanche photodiodes MPPCs. The total number of channels will be ˜60,000. We have demonstrated that this detector, providing three 2D projections, has excellent PID, timing and tracking performance, including a 4π angular acceptance, especially important for short proton and pion tracks.

The HA-TPC will be used for 3D track reconstruction, momentum measurement and particle identification. These TPC, with overall dimensions of 2x2x0.8 m3, will be equipped with 32 resistive Micromegas. The thin field cage (3 cm thickness, 4% rad. length) will be realized with laminated panels of Aramid and honeycomb covered with a kapton foil with copper strips. The 34x42 cm2 resistive bulk Micromegas will use a 500 kOhm/square DLC foil to spread the charge over the pad plane, each pad being appr. 1 cm2. The front-end cards, based on the AFTER chip, will be mounted on the back of the Micromegas and parallel to its plane.

The time-of-flight (TOF) detector will allow to reject events generated in the passive areas of the detector and improve particle identification. The TOF will consist of 6 planes with about 5 m2 surface area surrounding the SuperFGD and the TPCs. Each plane will be assembled with 2.2 m long cast plastic scintillator bars with light collected by arrays of large-area MPPCs from two ends. The time resolution at the bar centre is 150 ps.

In Summer 2018 we have tested prototypes of the SuperFGD, the resistive Micromegas and the TOF in a CERN PS test beam with excellent results.

We have recently completed the detailed TDR describing all the components of the ND280 Upgrade (arXiv:1901.03750). The project has been recently approved by CERN as part of the Neutrino Platform (NP07). In this talk we will report on the design of these detectors, their performance, the results of the test beam and the plan for the construction.

Primary author: ZITO, Marco (Université Paris-Saclay (FR))

Presenter: MCGREW, Clark (Stonybrook)

Session Classification: Rare Event Detectors (Parallel)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **206** Type: **Parallel Session talk**

Searches for charged lepton flavor violating muon decay, MEG/MEG II experiment

Thursday, August 8, 2019 10:15 AM (12 minutes)

Summary

The MEG experiment, which is to search for charged lepton flavor violating muon decay $\mu^+ \to e^+\gamma$, had been successfully finished in 2013.
The final sensitivity was 5.3×10^{-13}, and since the experiment did not find any signal, the upper limit of the branching ratio of the
$\mu^+ \to e^+\gamma$ was set to be 4.2×10^{-13} at 90\% CL.
This result is most stringent to date, and provides important constraints on the existence of the new physics beyond the standard model.
The MEG II experiment will improve the sensitivity by an order of magnitude with the new detector technologies.
The target sensitivity is 6×10^{-14} with three years data taking.
The full engineering run followed by the physics run will be started this year with all the detectors and the electronics.
In this talk, the MEG/MEG II experiments are introduced, and then the current status and the prospects of the MEG II experiment will be mainly discussed.

Primary author: IWAMOTO, Toshiyuki

Presenter: IWAMOTO, Toshiyuki

Session Classification: Flavour Physics (Parallel)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **209** Type: **Parallel Session talk**

Results from the CUORE experiment

Thursday, August 8, 2019 10:00 AM (12 minutes)

Summary

The Cryogenic Underground Observatory for Rare Events (CUORE) is the first bolometric experiment searching for neutrinoless double beta decay (0νββ) that has been able to reach the one-ton scale. The detector consists of an array of 988 TeO2 crystals arranged in a compact cylindrical structure of 19 towers. The construction of the experiment was completed in August 2016 with the installation of all towers in the cryostat. Following a cooldown, diagnostic, and optimization campaign, routine data-taking began in spring 2017. In this talk, we present the 0νββ results of CUORE from examining a total TeO2 exposure of 86.3 kg·yr, characterized by an average energy resolution of 7.7 keV FWHM and a background in the region of interest of 0.014 counts/(keV·kg·yr). In this physics run, CUORE placed the current best lower limit on the 130Te 0νββ half-life of > 1.3 × 10ˆ25 yr (90% C.L.). We then discuss the additional improvements in the detector performance achieved in 2018, the latest evaluation of the CUORE background budget, and we finally present the most precise measurement of the 130Te 2νββ half-life to date.

Primary author: Dr MARINI, Laura (University of California, Berkeley)

Presenter: Dr MARINI, Laura (University of California, Berkeley)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **214** Type: **Parallel Session talk**

Status of JUNO Experiment

Thursday, August 8, 2019 9:30 AM (12 minutes)

Summary

Jiangmen Underground Neutrino Observatory (JUNO), a next generation underground reactor antineutrino experiment, is proposed to determine the neutrino mass hierarchy and precisely measure neutrino oscillation parameters using a massive liquid scintillator detector underground. The experimental hall, spanning more than 50 meters, is under a granite mountain of over 700 m overburden. The central antineutrino detector, built with 35.4-meter diameter acrylic sphere, contains 20 kilotons of liquid scintillator and ˜18,000 20 inch PMTs (and ˜25,000 3 inch PMTs). The antineutrino detector is placed in a water pool shielding system which also functions as an active water Cherenkov veto detector. On the top of water pool is a Top Tracker system which further improves the muon track reconstruction. I will present status and design of JUNO experiment.

Primary author: LI, Xiaonan (IHEP, Beijing)

Presenters: LI, Xiaonan (IHEP, Beijing); CHEN, Shaomin (Tsinghua University)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **217** Type: **Parallel Session talk**

A Generative-Adversarial Network Approach for the Simulation of QCD Dijet Events at the LHC

Thursday, August 8, 2019 11:00 AM (12 minutes)

Summary

A Generative-Adversarial Network (GAN) based on convolutional neural networks is used to simulate the production of pairs of jets at the LHC. The GAN is trained on events generated using MadGraph5 + Pythia8, and Delphes3 fast
detector simulation. We demonstrate that a number of kinematic distributions both at Monte Carlo truth level and after the detector simulation can be reproduced by the generator network with a very good level of agreement. Preprint arXiv:1903.02433 [hep-ex]

Primary authors: DI SIPIO, Riccardo (University of Toronto (CA)); PALAZZO, Serena (The University of Edinburgh (GB)); KETABCHI, Sana (University of Toronto (CA)); FAUCCI GIANNELLI, Michele (University of Edinburgh)

Presenter: DI SIPIO, Riccardo (University of Toronto (CA))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **218** Type: **Parallel Session talk**

Capabilities of the DUNE Near Detector Complex

Tuesday, August 6, 2019 4:45 PM (12 minutes)

Summary

Among the Deep Underground Neutrino Experiment's main goals are the precise measurement of neutrino oscillation parameters using a beam consisting primarily of ν_μ or $\bar{\nu_\mu}$ but with contamination from wrong-sign and wrong-flavor neutrinos. The uncertainties on the flux predictions and the interaction cross sections are large and they will require experimental constraints in order for the DUNE experiment to have maximal sensitivity. Furthermore, biases in the energy scale of the DUNE far detector are sensitive to cross sections, especially for neutron production, that are currently poorly understood. The proposed detectors at the Fermilab near site are described – the pixel liquid-argon time projection chamber, a magnetized high-pressure gaseous argon time projection chamber with an integrated electromagnetic calorimeter, and a 3D scintillator-tracker. Each of these three detectors provides unique capabilities necessary to constrain the flux and cross section uncertainties necessary to make precise oscillation measurements.

Presenters: MCFARLAND, Kevin (University of Rochester); MCFARLAND, Kevin (University of Rochester); MCFARLAND, Kevin (University of Rochester)

Session Classification: Rare Event Detectors (Parallel)

Contribution ID: **219** Type: **Poster submission**

Vertex Reconstruction and Deep Learning Applications in JUNO

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

In this talk, I will present two algorithms for the vertex reconstruction in JUNO : Maximum Likelihood Method and Deep Learning Method.

Primary author: Dr ZIYUAN, LI (SUN YAT-SEN University)

Presenter: Dr ZIYUAN, LI (SUN YAT-SEN University)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Other

Contribution ID: **221** Type: **Parallel Session talk**

Results and future plans of the NEXT double beta decay experiment

Thursday, August 8, 2019 10:15 AM (12 minutes)

Summary

The Neutrino Experiment with a Xenon TPC (NEXT) searches for the neutrino-less double beta decay of 136Xe using a high pressure xenon gas time projection chamber. This detector technology has several key advantages, including excellent energy resolution, powerful event classification based on track topology, and favorable mass scalability. It also offers the tantalising possibility of tagging the daughter ion produced in the decay. The current stage of the experiment, NEXT-White, has been been taking data at the Laboratorio Subterráneo de Canfranc (LSC) in Spain since late 2016.

In this talk, we will review recent results from NEXT-White after the first year of low-background operations using both xenon depleted in the 136Xe isotope as a direct measure of background, and enriched xenon data to measure the two neutrino mode. Results form dedicated calibration runs to study detector performance will also be shown. Finally, we will conclude by discussing the experiment's prospects, starting from the NEXT-100 detector to be commissioned in 2020.

Primary author: LAING, Andrew (University of Texas Arlington)

Presenter: LAING, Andrew (University of Texas Arlington)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **225** Type: **Parallel Session talk**

TeV particle direct detection in space - Recent results from the DAMPE mission

Tuesday, August 6, 2019 5:00 PM (12 minutes)

Summary

Since its successful launch to a Low Earth Orbit in December 2015, the DAMPE (DArk Matter Particle Explorer) satellite mission has been preforming excellently, which allows the experiment to collect a large high quality data sample of high energy cosmic rays directly in space. With a relatively large acceptance, a thick BGO homogeneous calorimeter, and a precise silicon tracker, DAMPE is designed to measure multi-TeV particles in space with unprecedented precision. A first measurement of electron plus positron total flux up to 4.6 TeV based on the first 18 months of data has been published. Other results, including proton and Helium fluxes up to 100 TeV/nucleon, are becoming available.

In this talk, the in-orbit performance of the DAMPE detector as well as the latest DAMPE data analysis results will be presented.

Primary authors: WU, Xin (Universite de Geneve (CH)); MARSELLA, Giovanni (INFN Lecce e Universita del Salento (IT)); MARSELLA, Giovanni (Università del Salento and INFN)

Presenters: MARSELLA, Giovanni (INFN Lecce e Universita del Salento (IT)); MARSELLA, Giovanni (Università del Salento and INFN)

Session Classification: Astroparticle, Dark Matter (Parallel)

Track Classification: Multi-Messenger Astroparticle Physics

Contribution ID: **226** Type: **Poster submission**

Study of quark GTMDs for kaon in light-cone quark model

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

We investigate the generalized transverse momentum dependent quark distributions (GTMDs) for kaon in light-cone quark model. The leading twist GTMDs are evaluated from the quark-quark correlator by considering the unpolarized, longitudinally-polarized and transversely-polarized quark in unpolarized kaon. For the evaluation of GTMDs, the overlap representation of light-cone wavefunctions is used. We observe the variation of GTMDs with longitudinal momentum fraction (x) at different values of quark transverse momentum.

Primary authors: KAUR, Satvir (Dr. B.R. Ambedkar National Institute of Technology, Jalandhar); DAHIYA, Harleen (Dr. B.R. Ambedkar National Institute of Technology)

Presenter: KAUR, Satvir (Dr. B.R. Ambedkar National Institute of Technology, Jalandhar)

Session Classification: Poster Session (Thu/Fri)

Contribution ID: **228** Type: **Parallel Session talk**

Particle Discovery Opportunities at the International Linear Collider

Tuesday, August 6, 2019 2:00 PM (12 minutes)

Summary

Future e+e- colliders will offer possibilities to search for new particles in a manner very complementary to the searches planned for HL-LHC. ILC, in particular, will operate triggerlessly, with sensitivity to very small energy depositions, and with beam polarization to both control and measure crucial backgrounds. In this contribution we will discuss the potential of ILC to discover new particles both in e+e- pair production and in Higgs boson decays. Examples will be give for models of dark matter, SUSY, and extended Higgs sectors, as well as for general light particle searches.

Primary authors: EIGEN, Gerald (University of Bergen (NO)); LIST, Jenny (Deutsches Elektronen-Synchrotron (DE))

Presenter: LIST, Jenny (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **229** Type: **Parallel Session talk**

The Super Charm-Tau Factory at Novosibirsk

Thursday, August 8, 2019 12:15 PM (12 minutes)

Summary

Conceptual designs of the collider based on crab-waist technique and universal detector are developed and presented. The preliminary physics program of the project is considered. Progresses of the physics simulation, detector parametric simulation and system prototyping are given.

Primary author: BARNIAKOV, Alexander (Budker Institute of Nuclear Physics (RU) & Novosibirsk State University (RU))

Presenters: BARNIAKOV, Alexander (Novosibirsk State University (RU)); BARNIAKOV, Alexander (Budker Institute of Nuclear Physics (RU) & Novosibirsk State University (RU))

Session Classification: Flavour Physics (Parallel)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **230** Type: **Poster submission**

Measurement of hadronic cross sections at CMD-3

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The CMD-3 experiment at the VEPP-2000 collider in Novosibirsk carries out a comprehensive study of the exclusive cross-sections of e+e- -> hadrons in the center-of-mass energy range from the threshold to 2E<2 GeV. The CMD-3 results provide an important input for calculation of the hadronic contribution to the muon anomalous magnetic moment. Currently there are world-wide efforts to improve the accuracy of this calculation to match the expected precision of the new experiment at Fermilab to measurement of muon (g-2), now taking data. The best precision is still achieved by integrating the measured total cross-section of e+e- -> hadrons. The calculation is strongly dominated by low-energy data, in particular, by data at 2E<2 GeV. Other interesting topics of the CMD-3 physics program include a study of hadron cross-sections at the nucleon-antinucleon threshold and a search for two-photon production of C-even resonances.

The energy scan of the whole energy range was performed in 2011-2013 and, after detector and collider upgrade and increase in luminosity by factor 2-3, in 2017-2019. The total luminosity integral collected so far is 200 1/pb. Here we present the survey of results of data analysis, including various modes of electron-positron annihilation with up to seven pions or two kaons and pions in the final state.

Primary author: LOGASHENKO, Ivan (BINP)

Presenter: LOGASHENKO, Ivan (BINP)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **231** Type: **Parallel Session talk**

Properties of Primary Cosmic Ray Protons, Helium, Carbon and Oxygen Nuclei Measured with the Alpha Magnetic Spectrometer on the ISS

Tuesday, August 6, 2019 5:30 PM (12 minutes)

Summary

We present precision high statistics measurements of primary cosmic ray protons, helium, carbon and oxygen fluxes by Alpha Magnetic Spectrometer in the rigidity range from 2 GV to 3 TV. These measurements are based on 1 billion of protons, 125 million of Helium, 14 million of Carbon and 12 million of Oxygen nuclei collected by AMS during the first 7 years of operation aboard the International Space Station. The properties of these primary cosmic rays will be discussed.

Primary authors: PHAN, Huy Duc (Massachusetts Inst. of Technology (US)); CHOUTKO, Vitaly (Massachusetts Inst. of Technology (US)); YAN, Qi (Massachusetts Inst. of Technology (US)); OLIVA, Alberto (Centro de Investigaciones Energéti cas Medioambientales y Tecno); JIA, Yi (Massachusetts Inst. of Technology (US)); QIN, Xiaoting (Massachusetts Inst. of Technology (US)); Dr PANICCIA, Mercedes (Universite de Geneve (CH)); FORMATO, Valerio (Universita e INFN, Perugia (IT))

Presenter: JIA, Yi (Massachusetts Inst. of Technology (US))

Session Classification: Astroparticle, Dark Matter (Parallel)

Track Classification: Multi-Messenger Astroparticle Physics

Contribution ID: **239** Type: **Poster submission**

Probing the dark sector via searches for invisible decays of the Higgs boson at the ILC

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

To unravel the nature of dark matter is one of the most important goals in particle physics today. The Higgs field may well be the portal that couples to a whole new dark sector in which the dark matter candidate particle is accommodated. Searches for invisible decays of the Higgs boson, which may originate from the Higgs boson decaying to dark matter directly or via some mediator, would give us a clear signal of new physics. At e+e- colliders, taking advantage of the recoil mass technique, the 4-momentum of the Higgs boson can be fully reconstructed even though it decays invisibly. A specific advantage of the ILC are the polarized beams which help to suppress the background significantly. We will report our studies based on the full simulation of the ILD detector concept, using the e+e- -> ZH with Z->qq/ll channels. We obtain a sensitivity to BR(H->invisible) of 0.3% (95% C.L. upper limit) at the ILC 250 GeV with an integrated luminosity of 2 ab-1. We will also discuss the impact of center-of-mass energy, beam spectrum, ISR, and detector performance for the Higgs to invisible measurement.

Primary author: TIAN, Junping (The University of Tokyo)

Co-author: KAWAGOE, Kiyotomo (Kyushu University (JP))

Presenter: ISHIKAWA, Akimasa (KEK)

Session Classification: Poster Session (Thu/Fri)

Contribution ID: **240** Type: **Poster submission**

Production and electroweak couplings of 3rd generation quarks at the ILC

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The 3rd generation quarks are, due to their large mass, highly sensitive probes for new physics connected to the electroweak symmetry breaking. Linear e+e- colliders allow for clean measurements of heavy quark final states between the Z-Pole and the TeV scale with sensitivities to different aspects of the manifestations of new physics in the extracted electroweak couplings. At the same time these processes are ideal benchmarks for the optimisation of detectors at linear colliders. This includes for example the event-by-event distinction between b and anti-b quarks indispensable for the proper measurement of differential observables. The contribution will outline with full simulation studies the capabilities of the ILD concept. An efficiency of 30% has been achieved for the charge measurements in bb final states, which is about a factor three better than presented earlier. We will also present new results using the fully hadronic tt final state. Finally quantitative estimations of the reach in detecting the onset of new physics will be given.

Primary author: POESCHL, Roman (Centre National de la Recherche Scientifique (FR))

Co-author: KAWAGOE, Kiyotomo (Kyushu University (JP))

Presenter: OKUGAWA, Yuichi

Session Classification: Poster Session (Thu/Fri)

Contribution ID: **241** Type: **Poster submission**

The ILC as a natural SUSY discovery machine and precision microscope: From light higgsinos to tests of unification

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The requirement of electroweak naturalness in simple supersymmetric models motivates the existence of a cluster of four light higgsinos with mass 100-300 GeV, the lighter the better. While such light compressed spectra may be challenging to observe at LHC, future e+e- colliders with sqrt(s) > 2m(higgsino) would serve as both a SUSY discovery machine and a precision microscope.
We study higgsino pair production signatures at the ILC based on full, Geant4-based simulation of the ILD detector concept. We examine several benchmark scenarios that may or may not be accessible to HL-LHC searches, with mass di?fferences between the higgsino states between 20 and 4 GeV. Assuming
sqrt(s)=? 500 GeV and 1000 fbˆ-1 of integrated luminosity, the individual higgsino masses can be measured to 1-2% precision in case of the larger mass diff?erences, and still at the level of 5% for the smallest mass diff?erence case. The higgsino mass splittings are sensitive to the electroweak gaugino masses and can allow extraction of gaugino masses to ? 3 - 20% (depending on the model).
Extrapolation of gaugino masses via renormalization group running can test the hypothesis of gaugino mass uni?cation. We also examine a case with natural generalized mirage mediation where the uni?cation of gaugino masses at an intermediate scale apparently gives rise to a natural SUSY spectrum somewhat beyond the reach of HL-LHC.

Primary author: LIST, Jenny (Deutsches Elektronen-Synchrotron (DE))

Co-author: KAWAGOE, Kiyotomo (Kyushu University (JP))

Presenter: BERGGREN, Mikael (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **242** Type: **Parallel Session talk**

First look at time dependent CP violation using early Belle II data

Thursday, August 8, 2019 9:45 AM (12 minutes)

Summary

The Belle II experiment at the SuperKEKB energy-asymmetric e^+e^- collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is 8×10^{35} cm^{-2}s^{-1} and the Belle II experiment aims to record 50 ab^{-1} of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of 5.5×10^{33} cm^{-2}s^{-1}, and Belle II has recorded a data sample of about 0.5 fb^{-1}. Main operation of SuperKEKB has started in March 2019. In this presentation we report a measurement of the time-dependent CP violation parameter for $B^0(\bar{B}^0) \to J/\psi K^0_S$ using this early data set. One neutral B meson is reconstructed in the $J/\psi K^0_S$ CP-eigenstate decay channel and the flavor of the accompanying B meson is identified to be either B^0 or $\bar{B}^0$ from its decay products. We present a new concept for the time-dependent CP violation fit together with initial results for the parameters of B^0 mixing-induced phenomena and the lifetime of B^0.

Primary authors: PERUZZI, Ida (Laboratori Nazionali di Frascati dell'INFN); CERVENKOV, Daniel (Charles University in Prague)

Presenter: CERVENKOV, Daniel (Charles University in Prague)

Session Classification: Flavour Physics (Parallel)

Contribution ID: **243** Type: **Parallel Session talk**

B lifetime and $B^0 - \bar{B}^0$ mixing results from early Belle II data

Thursday, August 8, 2019 9:30 AM (12 minutes)

Summary

The Belle II experiment at the SuperKEKB energy-asymmetric e^+e^- collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is 8×10^{35} cm^{-2}s^{-1} and the Belle II experiment aims to record 50 ab^{-1} of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of 5.5×10^{33} cm^{-2}s^{-1}, and Belle II has recorded a data sample of about 0.5 fb^{-1}. Main operation of SuperKEKB has started in March 2019. We use this dataset to characterize the performance of the detector regarding the tracking of charged particles, the reconstruction of known resonances, and the capability of identifying displaced decay vertices. To assess the B Physics capabilities of the experiment, one of the first benchmarks consists in the measurement of the lifetime of B mesons and of the $B^0 - \bar{B}^0$ mixing frequency. We present the first results, based on samples of B mesons that decay to hadronic and semileptonic final states.

Primary author: PERUZZI, Ida (Laboratori Nazionali di Frascati dell'INFN)

Presenter: Ms RASHEED, reem (IPHC)

Session Classification: Flavour Physics (Parallel)

Contribution ID: **245** Type: **Poster submission**

Semileptonic and leptonic B decay results from early Belle II data

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Belle II experiment at the SuperKEKB energy-asymmetric e^+e^- collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is 8×10^{35} cm^{-2}s^{-1} and the Belle II experiment aims to record 50 ab^{-1} of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of 5.5×10^{33} cm^{-2}s^{-1}, and Belle II has recorded a data sample of about 0.5 fb^{-1}. Main operation of SuperKEKB has started in March 2019. In this presentation we show first results from studying missing energy signatures, such as leptonic and semileptonic B meson decays based on early Belle II data. We report first studies on re-measuring important standard candle processes, such as the abundant inclusive $B \to X\ell\nu$ and $B \to D^*\ell\nu$ decays. Furthermore, we will also present an overview of the semileptonic B decays that will be measured in the upcoming years at Belle II and discuss prospects for important B-anomalies like R(D) and R(D*), as well as other tests of lepton flavor universality.

Presenter: FODOR, Andrea (McGill University)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **247** Type: **Parallel Session talk**

Exotic and Conventional Quarkonium Physics Prospects at Belle II

Thursday, August 8, 2019 12:00 PM (12 minutes)

Summary

The Belle II experiment at the SuperKEKB energy-asymmetric e^+e^- collider is a substantial upgrade of the B factory facility at KEK in Tsukuba, Japan. It aims to record a factor of 50 times more data than its predecessor. The experiment completed a commissioning run in 2018, and began full operation in early 2019. Belle II is uniquely capable of studying the so-called "XYZ" particles: heavy exotic hadrons consisting of more than three quarks. First discovered by Belle, these now number in the dozens, and represent the emergence of a new category within quantum chromodynamics. This talk will present the prospects of Belle II to explore both exotic and conventional quarkonium physics.

Primary author: PERUZZI, Ida (Laboratori Nazionali di Frascati dell'INFN)

Presenter: FULSOM, Bryan (Pacific Northwest National Laboratory)

Session Classification: Flavour Physics (Parallel)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **248** Type: **Parallel Session talk**

Dark Sector Physics with Belle II

Tuesday, August 6, 2019 3:00 PM (12 minutes)

Summary

Primary authors: PERUZZI, Ida (Laboratori Nazionali di Frascati dell'INFN); CAMPAJOLA, marcello (INFN and University of Naples "Federico II"); CAMPAJOLA, marcello (Univ. of Naples "Federico II" - INFN)

Presenters: CAMPAJOLA, marcello (INFN and University of Naples "Federico II"); CAMPAJOLA, marcello (Univ. of Naples "Federico II" - INFN)

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **250** Type: **Poster submission**

Prospects for doubly charged scalar at the future colliders

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

We studied various possibilities of doubly charged scalar frameworks in the light of low energy constraints, i.e., muon (g-2) and lepton flavor violation etc. First, we have
calculated the contribution of doubly charged scalar to these low energy processes assuming some model independent couplings. The minimal BSM scenario involving doubly charged scalar is Higgs Triplet Model.
We examined HTM with type-II seesaw mechanism, not restricted by custodial symmetry.
We discussed the relationship between vacuum expectation value of the triplet v_Δ and $H^{\pm\pm}$ couplings with
leptons, taking into account constraints on v_Δ
coming from low energy studies connected with the ρ-parameter, muon g-2, lepton flavor violation (LFV) processes and neutrino oscillations (normal and inverse mass scenarios). $H^{\pm\pm}$
pair production and four-lepton final state at proton-proton LHC and e+ e- collider within both the frameworks are analyzed and compared.
Another popular model containing doubly charged scalar is Left-Right symmetry model. We study the prospects of doubly charged scalar in minimal Left-Right symmetric model at the future colliders hadrons and leptons.

Primary authors: Mr SRIVASTAVA, TRIPURARI (TRIPURARI); Ms KORDIACZYSKA, Magdalena (Institute of Physics, University of Silesia, Katowice, Poland); Prof. GLUZA, Janusz (Institute of Physics, University of Silesia, Katowice, Poland)

Presenter: Mr SRIVASTAVA, TRIPURARI (TRIPURARI)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **252** Type: **Parallel Session talk**

Search for Dark Sector Physics at the NA64 experiment in the context of the Physics Beyond Colliders Projects

Tuesday, August 6, 2019 2:30 PM (12 minutes)

Summary

The NA64 electron beam program comprises of a high sensitivity search for visible and invisible decays of the hypothetical dark photon, A', with a goal to either observe the sub- GeV Dark Matter mediator or exclude most of the model parameter space. The visible channel search also includes clarification of the origin of the 8Be anomaly observed by
the Atomki experiment. The NA64 collaboration further aims to expand its searches with a proposal to use the muon beam at the CERN M2 beam line which will focus on the unique possibility to search for new scalar or vector states weakly coupled predominantly to muons, e.g. a new Zμ gauge boson of Lμ - L⊠ symmetry, which might explain the long standing muon (gμ-2) anomaly. It will also include searches for the Zμ as a vector mediator of Dark Matter production. Within the Conventional Beam Working Group of the Physics Beyond Colliders (PBC) study, several projects for the muon beamline (M2) in the CERN North Area were proposed. The different experimental requirements and the various technical feasibility studies performed by the group will be presented together
with the combined results of NA64 electron beam run between 2016-2018, its future plans and the muon proposal with its planned searches.

Primary author: BANERJEE, Dipanwita (Univ. Illinois at Urbana Champaign (US))

Presenter: BANERJEE, Dipanwita (Univ. Illinois at Urbana Champaign (US))

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **253** Type: **Parallel Session talk**

New results from the DANSS experiment

Tuesday, August 6, 2019 3:15 PM (12 minutes)

Summary

Recently the MiniBooNE collaboration observed electron (anti)neutrino appearance in the muon (anti)neutrino beams. The significance of the effect reaches 6.0σ level when combined with the LSND result. Even more recently the NEUTRINO-4 collaboration claimed the observation of electron antineutrino oscillations to sterile neutrinos with a significance of about 3σ. If these results are confirmed, New Physics beyond the Standard Model would be required.

On the other hand, the DANSS experiment and several other reactor experiments at short baselines obtained quite strict limits on the hypothetical sterile neutrino parameters. We present new results of the DANSS experiment on the searches for sterile neutrinos. They are based on more than 2.3 million of inverse beta decay events collected at 10.7, 11.7 and 12.7 meters from the reactor core of the 3.1 GW Kalinin Nuclear Power Plant in Russia. This data sample is 2.4 times larger than the data sample in the previous DANSS publication. The neutrino spectrum dependence on the fuel composition is also presented. We have also measured the reactor power using the IBD event rate during 17 months with the statistical accuracy 1.5% in 2 days and with the relative systematic uncertainty of about 0.5%.

Primary authors: Prof. DANILOV, Mikhail (Lebedev Physical Institute RAS); DANSS COLLABORATION

Presenter: SHITOV, Yury

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **254** Type: **Poster submission**

Latest ALICE results on coherent J/psi photoproduction in ultra-peripheral Pb-Pb collisions at the LHC

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The high flux of photons from lead ions at the LHC allows us to study photon-induced reactions in ultra-peripheral collisions (UPC) of Pb-Pb nuclei in a new kinematic regime. The study of these collisions, where projectiles do not overlap and hence hadronic interactions are suppressed, provides information about the initial state of nuclei. Coherent charmonium photoproduction is of particular interest since it is sensitive to poorly known gluon shadowing effects in target Pb ions. The newest ALICE results on vector meson photoproduction in UPC Pb-Pb collisions from LHC Run 2 are presented and are compared to current models describing nuclear gluon shadowing. In addition, prospects for heavy vector meson photoproduction measurements in LHC Run 3 and 4 will be presented.

Presenter: HERMAN, Tomas (Czech Technical University (CZ))

Session Classification: Poster Session (Thu/Fri)

Contribution ID: **258** Type: **Parallel Session talk**

Recent Cross-section Measurements from MicroBooNE

Tuesday, August 6, 2019 2:45 PM (12 minutes)

Summary

MicroBooNE is a liquid argon time projection chamber in the Booster Neutrino Beam at Fermilab. The large event rate and 3 mm wire spacing of the detector provide high-statistics, precise-resolution imaging of neutrino interactions leading to low-threshold, high-efficiency event reconstruction with full angular coverage. As such, this is an ideal place to probe neutrino-argon interactions in the hundreds-of- MeV to few-GeV energy range, and to study the impact of nuclear effects through detailed measurements of hadronic final states. This talk will present recent measurements of neutrino interactions in MicroBooNE, including inclusive charged- current interactions, neutral-pion production, and measurements of low-energy protons.

Primary author: Prof. SPITZ, Joshua (University of Michigan)

Presenter: GARDINER, Steven (Fermi National Accelerator Laboratory)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **259** Type: **Parallel Session talk**

Detector Physics with MicroBooNE

Tuesday, August 6, 2019 4:00 PM (12 minutes)

Summary

With many current and future neutrino experiments relying on Liquid Argon Time Projection Chamber (LArTPC) technology, characterizing the performance of these detectors is critical. The MicroBooNE experiment is capable of performing numerous measurements to better understand the technology. These include identification and filtering of excess TPC noise, signal calibration, recombination, and measurements of drift electron attenuation. MicroBooNE, residing on the surface, can also provide important information about cosmic ray induced space charge in the TPC volume and the subsequent deformations to the electric field. This talk will provide a detailed overview of the subtleties of understanding LArTPC technology and developing calibration techniques towards extracting physics measurements.

Primary author: Prof. SPITZ, Joshua (University of Michigan)

Presenters: SHARANKOVA, Ralitsa (Tufts University); SHARANKOVA, Ralitsa (Tufts University)

Session Classification: Rare Event Detectors (Parallel)

Contribution ID: **260** Type: **Parallel Session talk**

Search for New Physics with semi-leptonic B Decays at Belle

Thursday, August 8, 2019 9:15 AM (12 minutes)

Summary

Semi-leptonic B decays B -> D(*) tau nu have been of interest because of the high sensitivity to the New Physics.
Recent indication of a discrepancy of R(D) and R(D*) (branching ratio of B → D(*) tau nu over B → D(*) l nu where l + e, mu) from the Standard Model prediction can be a hint for the New Physics effect.
In this talk, the new measurement of R(D*) and R(D) based on semileptonically tagged B\to D^{(*)} \tau^+ \nu decays as well as the first measurement of the D^* polarization in B\to D^*\tau^+\nu decays are presented.
This talk also covers new Belle search for the purely leptonic decay B \to \mu^+ \nu.
The analyses are based on the full data set recorded by the Belle detector at the KEKB e^+ e^- collider containing 772 million B\bar{B} pair events.

Primary authors: NISHIDA, Shohei (KEK); ADAMCZYK, Karol

Presenter: ADAMCZYK, Karol

Session Classification: Flavour Physics (Parallel)

Contribution ID: **262** Type: **Parallel Session talk**

The Super Cryogenic Dark Matter Search (SuperCDMS) at SNOLAB

Tuesday, August 6, 2019 4:15 PM (12 minutes)

Summary

To detect energy potentially deposited by the large flux of dark matter particles streaming through the earth, dark matter direct search experiments deploy sensitive low-background calorimeters. By compounding various techniques, SuperCDMS calorimeters obtain world-leading eV-scale energy resolution. An array of 24 SuperCDMS detectors will be deployed in a new low-background cryogenic facility under construction at SNOLAB in Sudbury, Canada. These detectors will improve sensitivity to light dark matter particles by orders of magnitude compared to existing experiments.

An overview of SuperCDMS detectors, models for light dark matter that SuperCDMS will explore, the status of detector construction, and plans for operation will be presented.

Primary author: ROBINSON, Alan (Université de Montréal)

Presenter: ROBINSON, Alan (Université de Montréal)

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **263** Type: **Parallel Session talk**

Latest three-flavor neutrino oscillation results from NOvA

Tuesday, August 6, 2019 2:30 PM (12 minutes)

Summary

The NOvA experiment is a long-baseline neutrino oscillation experiment that uses the upgraded NuMI beam from Fermilab to detect both electron appearance and muon disappearance. NOvA employs two functionally identical detectors: a Near Detector, located at Fermilab, and a Far Detector, located at Ash River, Minnesota over an 810 km baseline. NOvA's primary physics goals include precision measurements of neutrino oscillation parameters, such as the large neutrino mixing angle. and the atmospheric mass-squared splitting, along with probes of the mass hierarchy and the CP violating phase. This talk will present the latest NOvA measurements of the neutrino oscillation parameters using neutrino and antineutrino disappearance and appearance.

Primary author: Dr DAVIES, Gavin (Indiana University)

Presenter: Dr DAVIES, Gavin (Indiana University)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **265** Type: **Poster submission**

Effective Lagrangian Approach to Top Decay via Flavor Changing Neutral Current

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

We study possible non-standard tuZ and tcZ interactions, which induce flavor-changing neutral-current decays of the top quark, in the effective-Lagrangian framework. The corresponding Lagrangian consists of four kinds of non- standard couplings coming from SU(3)xSU(2)xU(1) invariant dimension-6 effective operators. The four coupling constants in each interaction are treated as complex numbers independent of each other, and constraints on them are derived by using the present experimental limits of the branching fractions for t -> u Z and t -> c Z processes. Future improvements of those constraints are also discussed as well as possibilities of measurements of these couplings at the High-Luminosity Large Hadron Collider. In addition, correlations of non-standard couplings reproducing experimental results are presented.

Primary authors: OHKUMA, Kazumasa (Okayama University of Science); HIOKI, Zenro (University of Tokushima); Dr UEJIMA, Akira (Okayama University of Science)

Presenter: OHKUMA, Kazumasa (Okayama University of Science)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **266** Type: **Parallel Session talk**

The Phase-II upgrade of the ATLAS Muon Spectrometer

Thursday, August 8, 2019 10:00 AM (12 minutes)

Summary

The muon spectrometer of the ATLAS detector will undergo a major upgrade during the Long Shutdown 3, in order to cope with the operational conditions at the high-luminosity LHC. The trigger and readout electronics for the Resistive Plate Chambers (RPC), Thin Gap Chambers (TGC), and Monitored Drift Tube (MDT) chambers will be replaced to make them compatible with a new trigger scheme with higher trigger rates and longer latencies. MDT precision chambers, that at the moment are not included in the hardware trigger, will be integrated into the level-0 trigger in order to sharpen the momentum threshold. The MDT front-end electronics will also be replaced. New-generation RPC chambers will be installed in the inner barrel layer to increase the acceptance and robustness of the trigger. Some of the MDT chambers in the inner barrel layer will be replaced with new small-diameter MDTs. New TGC triplet chambers in the barrel-endcap transition region will replace the current TGC doublets to suppress the high trigger rate from random coincidences in this region. A major upgrade of the power system is also planned. The Phase-II upgrade concludes the process of adapting the muon spectrometer to the ever increasing performance of the LHC, which started with the Phase-I upgrade New Small Wheel (NSW) project that will replace the innermost endcap wheels.

Primary author: ATLAS COLLABORATION

Presenters: ZHU, Junjie (Stony Brook) (University of Michigan); ZHU, Junjie (University of Michigan (US))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **267** Type: **Poster submission**

The Phase-II upgrade of the ATLAS Monitored Drift Tube Detector and Frontend electronics

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

ATLAS plans to replace the present barrel innermost station of Monitored Drift Tube (MDT) chambers with an integrated system of thin-gap Resistive Plate Chambers (RPC) and small diameter muon drift-tube (sMDT) chambers to improve the muon trigger efficiency in the barrel region. In addition, to cope with large amount of data and high event rate expected from the planned LHC upgrades, the present MDT readout electronics will be replaced and the MDT detector will be used at the first-level trigger. For chambers, we will present the design, construction, and tests of the new sMDT and RPC chambers as well as the status of series production. For electronics, we will show present the overall trigger and readout design and focus on latest results from prototypes of ASICs and frontend boards.

Presenter: KROHA, Hubert (Max-Planck-Institut fur Physik (DE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **270** Type: **Parallel Session talk**

Small-Strip Thin Gap Chambers for the Muon Spectrometer Upgrade of the ATLAS Experiment

Thursday, August 8, 2019 10:15 AM (12 minutes)

Summary

The instantaneous luminosity of the Large Hadron Collider at CERN will be increased by about a factor of five with respect to the design value by undergoing an extensive upgrade program over the coming decade. The largest phase-1 upgrade project for the ATLAS Muon System is the replacement of the present first station in the forward regions with the New Small Wheels (NSWs) during the long-LHC shutdown in 2019/20. Along with Micromegas, the NSWs will be equipped with eight layers of small-strip thin gap chambers (sTGC) arranged in multilayers of two quadruplets, for a total active surface of more than 2500 m^2. To retain the good precision tracking and trigger capabilities in the high background environment of the high luminosity LHC, each sTGC plane must achieve a spatial resolution better than 100 μm to allow the Level-1 trigger track segments to be reconstructed with an angular resolution of approximately 1mrad. The basic sTGC structure consists of a grid of gold-plated tungsten wires sandwiched between two resistive cathode planes at a small distance from the wire plane. The precision cathode plane has strips with a 3.2mm pitch for precision readout and the cathode plane on the other side has pads for triggering. The sTGC design, performance, construction and integration status will be discussed, along with results from tests of the chambers with nearly final electronics with beams, cosmic rays and high-intensity radiation sources.

Primary author: ATLAS COLLABORATION

Presenter: LEFEBVRE, Benoit (TRIUMF (CA))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **271** Type: **Poster submission**

Frontend and backend electronics for the ATLAS New Small Wheel Upgrade

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The Phase-I and Phase-II upgrades of the LHC accelerator will increase the LHC instantaneous luminosity to 2×1034 cm−2s−1 and 7.5×1034 cm−2s−1, respectively. The luminosity increase drastically impacts the ATLAS trigger and readout data rates. The present ATLAS small wheel muon detector will be replaced with a New Small Wheel (NSW) detector in 2019. The NSW will feature two new detector technologies, Resistive Micromegas (MM) and small strip Thin Gap Chambers (sTGC) conforming a system of ˜2.4 million readout channels. Both detectors will be used for muon triggering and precision tracking. A common readout path and two separate trigger paths are developed for these two detector technologies. The frontend electronics will be implemented in about 8000 boards including the design of 4 custom ASICs capable of driving trigger and tracking primitives to the backend trigger processor and readout system. The readout data flow is designed through a high-throughput network approach. The large number of readout channels, short time available to prepare and transmit trigger data, large volume of output data, harsh radiation environment, and the need of low power consumption all impose great challenges on the system design. We will present the overall design along with the status of all ASIC and board prototypes.

Presenter: LINDLEY, Rachel Elizabeth (University of Arizona (US))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **272** Type: **Poster submission**

Calibration and Performance of the ATLAS Tile Calorimeter During the LHC Run 2

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The Tile Calorimeter (TileCal) is the central section of the hadronic calorimeter of the ATLAS experiment and provides
important information for reconstruction of hadrons, jets, hadronic decays of tau leptons and missing transverse energy.
It also assists in muon identification. This sampling calorimeter uses steel plates as absorber and scintillating tiles as active medium.
The light produced by the passage of charged particles is transmitted by wavelength shifting fibres to photomultiplier tubes (PMTs).
The readout is segmented into about 5000 cells (longitudinally and transversally), each of them being read out by two PMTs in parallel.
TileCal exploits several calibration systems:
a Cs radioactive source that illuminates the scintillating tiles directly,
a laser light system to directly test the PMT response,
and a charge injection system (CIS) for the front-end electronics.
These systems together with data collected during proton-proton collisions provide
extensive monitoring of the instrument and a means for equalizing the calorimeter response at each stage of the signal propagation.
The performance of the calorimeter has been established with cosmic ray muons and the large sample of the proton-proton collisions.
The response of high momentum isolated muons is used to study the energy response at the electromagnetic scale,
isolated hadrons are used as a probe of the hadronic response. The calorimeter time resolution is studied with multijet events.
A description of the different TileCal calibration systems and the results on the calorimeter performance during the LHC Run 2 will be presented.
The results on the pile-up noise and response uniformity studies with MC will also be discussed.

Presenter: PETUKHOVA, Krystsina (Charles University (CZ))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **273** Type: **Poster submission**

Upgrade of the ATLAS Tile Calorimeter for the High Luminosity LHC

Thursday, August 8, 2019 10:40 AM (20 minutes)

The Tile Calorimeter (TileCal) is the hadronic calorimeter covering the central region of the ATLAS experiment. TileCal is a sampling calorimeter with steel as absorber and scintillators as active medium. The scintillators are read-out by wavelength shifting fibers coupled to photomultiplier tubes (PMTs). The analogue signals from the PMTs are amplified, shaped, digitized by sampling the signal every 25 ns and stored on detector until a trigger decision is received. The High-Luminosity phase of LHC (HL-LHC) expected to begin in year 2026 requires new electronics to meet the requirements of a 1 MHz trigger, higher ambient radiation, and for better performance under high pileup. Both the on- and off-detector TileCal electronics will be replaced during the shutdown of 2024-2025. PMT signals from every TileCal cell will be digitized and sent directly to the back-end electronics,
where the signals are reconstructed, stored, and sent to the first level of trigger at a rate of 40 MHz. This will provide better precision of the calorimeter signals used by the trigger system and will allow the development of more complex trigger algorithms. Changes to the electronics will also contribute to the data integrity and reliability of the system.

Results are presented from a prototype of the new electronics
(ìdemonstratorî) that was inserted in a TileCal module and tested in CERNís H8 beamline with electrons, muons, and hadrons. The demonstrator is undergoing extensive testing and will be inserted in the ATLAS detector during the current shutdown.

Summary

Parallel talk or a poster

Presenter: PETUKHOVA, Krystsina (Charles University (CZ))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **274** Type: **Parallel Session talk**

Search for low-mass New Physics states at BABAR

Tuesday, August 6, 2019 3:15 PM (12 minutes)

Summary

Many extensions of the Standard Model include the possibility of light new particles, such as axions or dark matter candidates. These scenarios can be probed using the large data sets collected by B-factories, complementing measurements performed at the LHC. The BABAR collaboration has conducted an extensive program to search for axions in B decays, for self-interacting or non-miminal dark forces, as well as for six-quark dark matter candidates. In this talk, we'll report on the most recent results.

Primary author: ANULLI, Fabio (Sapienza Universita e INFN, Roma I (IT))

Presenter: KOWALEWSKI, Bob (University of Victoria (CA))

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **275** Type: **Parallel Session talk**

Search for LFV and LNV decays of the D^0 meson and observation of $D^0 \to K^-\pi^+e^+e^-$

Thursday, August 8, 2019 9:00 AM (12 minutes)

Summary

Decay modes with two oppositely charged leptons of different flavor correspond to lepton flavor violating (LFV) decays and are essentially forbidden in the Standard Model (SM) because they can occur only through lepton mixing. Decay modes with two leptons of the same charge are lepton-number violating (LNV) decays and are forbidden in the SM. Hence, decays of the form $D^0 \to hh'll$' provide sensitive tools to investigate new mediators or couplings in physics beyond the SM. In this talk, we report on a search for decays of the type $D^0 \to hh'll$' (with $h, h' = K/\pi$ and $l, l' = e/\mu$) using data collected by the BABAR experiment at the PEP-II e^+e^- collider at the SLAC National Accelerator Laboratory. Upper limits on the branching fractions are improved by up to two orders of magnitude. We also report the observation of the rare decay $D^0 \to K^-\pi^+e^-e^+$. We measure $\mathcal{B}(D^0 \to K^-\pi^+e^-e^+) = (4.0 \pm 0.5) \times 10^{-6}$ in the di-lepton mass range $0.675 < m(e^+e^-) < 0.875$ GeV/c^2, where the production of the intermediate state $\rho \to e^+e^-$ dominates, and set upper limits for decays outside this interval where long-distance effects are not expected to be significant.

Primary author: ANULLI, Fabio (Sapienza Universita e INFN, Roma I (IT))

Presenters: WILSON, Fergus (Science and Technology Facilities Council STFC (GB)); WILSON, Fergus (STFC - Science & Technology Facilities Council (GB))

Session Classification: Flavour Physics (Parallel)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **276** Type: **Poster submission**

Search for SUSY with missing transverse momentum and multiple b-jets

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

A search for supersymmetry involving the pair production of gluinos decaying via third generation squarks into the lightest neutralino (chi_{01}) is performed. The final state contains large missing transverse momentum and several energetic jets (including at least three b-tagged jets). This poster summarizes the recent ATLAS result on this search which was performed with LHC pp collision data at a center-of-mass energy sqrt(s) = 13 TeV, with an integrated luminosity of 79.8 fb-1.

Presenter: GHASEMI BOSTANABAD, Meisam (University of Victoria (CA))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **277** Type: **Poster submission**

Search for squarks and gluinos in final states with jets and missing transverse momentum at $\sqrt{s}$ = 13 TeV using 139 fb^{-1} data with the ATLAS detector

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Supersymmetry is one of the most promising theories which extends the Standard Model in order to solve the dark matter and the hierarchy problems. The squark and gluino are one of primary targets in supersymmetry searches, as their pair production has a large cross section at the LHC via strong interaction. In a search for squarks and gluinos in final states with jet and missing transverse momentum, multi-bin and multivariate techniques are newly introduced. In this talk, recent ATLAS results with these techniques using the full Run 2 dataset corresponding to 139 fb^{-1} are shown.

Presenter: UNO, Kenta (University of Tokyo (JP))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Standard Model (Higgs, Top, Electroweak, QCD)

Contribution ID: **278** Type: **Parallel Session talk**

Observation of electroweak W±Z boson pair production in association with two jets in p p collisions at sqrt(s) = 13 TeV with the ATLAS detector and prospects for New Physics

Tuesday, August 6, 2019 5:15 PM (12 minutes)

Summary

The observation of electroweak W±Z production in association with two jets in the fully leptonic channel in proton–proton collisions is presented. The data collected by the ATLAS detector at the Large Hadron Collider in 2015 and 2016 at a centre-of-mass energy of sqrt(s) = 13 TeV are used, corresponding to an integrated luminosity of 36.1 fb−1. Prospects for New Physics through the Effective Field Theory interpretation for this channel will be presented.

Primary authors: ATLAS COLLABORATION; SAMPSONIDOU, Despoina (Aristotle University of Thessaloniki (GR))

Presenter: SAMPSONIDOU, Despoina (Aristotle University of Thessaloniki (GR))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **279** Type: **Parallel Session talk**

Search for Higgs boson decays to beyond-the-Standard-Model light bosons in four-lepton events with the ATLAS detector at sqrt(s) = 13 TeV

Tuesday, August 6, 2019 3:15 PM (12 minutes)

Summary

Current measurements permit the branching ratio of the SM Higgs to BSM particles to be as high as approximately 30%. Such exotic decays of the Higgs are well-motivated theoretically. Of particular interest is the decay of h to one or two dark sector particles called Zd. This decay occurs in models where h interacts with a dark sector which could have a rich and interesting phenomenology like the SM. A dark sector could naturally address many of the questions left unanswered by the SM.

A search is conducted for the 125 GeV Higgs decaying to one or two new BSM bosons that finally decay to four leptons (l = e, mu). The search uses pp collision data collected with the ATLAS detector at the LHC with an integrated luminosity of 36.1 fb-1. Improvements to the search using the full 2015-8 data-set are also presented.

Primary authors: ATLAS COLLABORATION; CHIU, Yu Him Justin (University of Victoria (CA)); CHIU, Justin (University of Victoria (CA))

Presenters: CHIU, Yu Him Justin (University of Victoria (CA)); CHIU, Justin (University of Victoria (CA))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **280** Type: **Parallel Session talk**

Freeze-in production of dark matter through spin-1 and spin-2 portals

Thursday, August 8, 2019 11:00 AM (12 minutes)

Summary

We consider two scenarios where the out-of-equilibrium production of dark matter (DM) particles in the early universe is expected. In the first one, we extend the standard model (SM) of particle physics by a U(1)' gauge group under which all the SM particles are neutral. We then consider DM candidates interacting only with the new spin-1 gauge boson, a heavy Z'. We assume the presence of heavy beyond the SM fermions charged under both U(1)' and SM SU(3), allowing for a feeble connection between DM and SM particles. In the second scenario, we assume that the interaction between DM and SM particles are only mediated by gravitons and massive spin-2 fields, being therefore suppressed by the Planck and an intermediate scales respectively. In both models, we show that the SM particles are able to produce the right amount of DM via freeze-in at most in the early stages of the radiation era. We show that the high temperature dependence of the DM production rates implies that the DM relic density is established during the post-inflationary reheating. Moreover, neglecting the on-shell production of mediators while entropy is being injected into the thermal bath might lead us to underestimate the DM relic density by many orders of magnitude.

Primary authors: Ms DUTRA, Maíra (Carleton University); BERNAL, Nicolás (Universidad Antonio Nariño); Mr MAMBRINI, Yann (LPT-Orsay); OLIVE, Keith A. (University of Minnesota (US)); PELOSO, Marco (University of Minnesota); Dr PIERRE, Mathias (IFT-Madrid); BHATTACHARYYA, Gautam (Saha Institute of Nuclear Physics)

Presenter: Ms DUTRA, Maíra (Carleton University)

Session Classification: Outreach & Theory (Parallel)

Contribution ID: **281** Type: **Parallel Session talk**

Beyond the Standard Model searches at HERA

Tuesday, August 6, 2019 2:15 PM (12 minutes)

Summary

The search for physics beyond the Standard Model was pursued at the HERA ep collider, both for dedicated channels and general searches using the data on deep inelastic scattering. High precision and wide kinematic range of the data collected by the H1 and ZEUS experiments not only allowed determination of the proton distribution functions (PDFs) from HERA data only, but also for simultaneous fits to be performed of PDFs with parameters of the models beyond the Standard Model (BSM), providing an unbiased search for "new physics". Such a final simultaneous analysis was performed in the framework of eeqq contact interactions, including leptoquarks, and BSM modifications of the weak couplings. No statistically significant deviation from the Standard Model was observed and the most stringent limits from HERA on the considered models were set. Limits on the compositeness scale of the general contact interactions and mass scale of the heavy-leptoquark scenarios were obtained in the TeV range. The results are compared to those from the LHC.

Primary authors: TURKOT, Oleksii (Deutsches Elektronen-Synchrotron (DE)); WING, Matthew (UCL)

Presenter: TURKOT, Oleksii (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **282** Type: **Parallel Session talk**

Reactor Antineutrino Flux and Spectrum Measurement at Daya Bay

Tuesday, August 6, 2019 2:15 PM (12 minutes)

Summary

This talk presents the latest results of reactor antineutrino flux and spectrum measurement at Daya Bay. The Daya Bay Reactor Neutrino Experiment uses an array of eight underground detectors to study antineutrinos from six reactor cores with different baselines. Four antineutrino detectors in two near experimental halls were used for the measurements. An improved reactor antineutrino flux measurement will be reported. A new measurement of the prompt energy spectrum of reactor antineutrinos shows a global discrepancy compared with the Huber-Mueller model prediction and in the energy range of 4-6 MeV a local deviation is observed. The individual spectra of U-235 and Pu-239 were decomposed from the evolution of IBD prompt energy spectra, thanks to the reactor fuel fission evolution data from the nuclear power plant. The individual IBD yield of U-235 and Pu-239 were also obtained.

Presenter: WANG, Zhe (Tsinghua University)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **283** Type: **Poster submission**

Latest Reactor Oscillation Results from the Daya Bay Experiment

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Daya Bay reactor neutrino experiment is located next to six commercial nuclear reactors, each of which has a max thermal power of 2.9 GW. The experiment consists of two near experimental halls and one far experimental hall. The power-weighted baselines to the six power reactors are about 500 m and 1.7 km for the near and far halls, respectively. Each near hall has two antineutrino detectors (ADs) and the far hall has four ADs. All eight ADs have an identically designed nested structure with 20 tons of gadolinium-loaded liquid scintillator in the innermost zone, 22 tons of liquid scintillator in the middle zone, and 40 tons of mineral oil in the outermost zone. In 2012, the Daya Bay experiment made the first statistically significant observation of a non-zero neutrino oscillation parameter theta_13. Later on the oscillation result was validated by an independent neutron captured on hydrogen result. Since the beginning of data taking, the experiment has accumulated nearly 4 million reactor neutrino candidates in about 2000 days. The statistical and systematic uncertainties have both been improved. In this talk, I will present the latest Daya Bay oscillation results.

Primary author: Dr WANG, Zhe (Tsinghua University)

Presenter: Dr WANG, Zhe (Tsinghua University)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **285** Type: **Parallel Session talk**

Latest Results on the Radiation Tolerance of Diamond Detectors

Thursday, August 8, 2019 11:30 AM (12 minutes)

Summary

As nuclear and high energy facilities around the world are upgraded and move to higher and higher intensities, the detectors in use at these facilities must become more radiation tolerant. Diamond is a material in use at many facilities due to its inherent radiation tolerance and ease of use. In this talk, we will present the results of recent radiation tolerance measurements of the highest quality poly-crystalline Chemical Vapor Deposition (pCVD) diamond material for a range of proton energies, pions and neutrons up to a fluence of 2 x 10ˆ16 particles/cmˆ2. From this data we are able to derive the damage constants as a function of energy and particle species and compare with theoretical models. We will also present the recent measurements of the rate dependence of pulse height for non-irradiated and irradiated pCVD diamond pad and pixel detectors. The results we will present include detectors tested over a range of particle fluxes up to 20 MHz/cm^2 with both pad and pixel readout electronics. Our results indicate the pulse height of unirradiated poly-crystalline CVD diamond detectors and the neutron irradiated poly-crystalline CVD diamond detectors measured with the pad readout show no dependence on the particle flux.

Primary authors: KAGAN, Harris (Ohio State University (US)); BAENI, Lukas (ETH Zurich (CH))

Presenter: BAENI, Lukas (ETH Zurich (CH))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **286** Type: **Parallel Session talk**

New beam test results of 3D pixel detectors constructed with poly-crystalline CVD diamond

Thursday, August 8, 2019 11:45 AM (12 minutes)

Summary

Detectors based on Chemical Vapor Deposition (CVD) diamond have been used extensively and successfully in beam conditions/beam loss monitors as the innermost detectors in the highest radiation areas of Large Hadron Collider (LHC) experiments. For future experiments at the LHC it is expected that the innermost detectors will accumulate an order of magnitude larger fluence than present experiments. This trend of increasing required
radiation tolerance is now common in areas where sources and beams are developed with higher energy or higher intensity to reach new regimes of physics. As a result an enormous effort is ongoing to find detector materials that operate after fluences of >10ˆ{16} particles/cmˆ2.

Diamond is one candidate for such a material primarily due to its large displacement energy which enhances its inherent radiation tolerance. Over the last two years the RD42 collaboration has constructed a series of 3D pixel detectors using CVD diamond as the active material and laser fabricated columns in the bulk and characterized them in test beams. This talk presents beam test results of 3D pixel detectors fabricated with poly-crystalline CVD diamonds. The cells of the devices had a size of 50μm x 50μm with columns 2.6μm in diameter. The cells were ganged in a 1 x 5 and 3 x 2 pattern to match the layouts of the pixel read-out electronics currently used in the ATLAS and CMS experiments at the LHC, respectively. In beam tests, using tracks reconstructed with a high precision tracking telescope, a tracking efficiency of 99.3% was achieved. The efficiency of both devices plateaus at a bias voltage of 30V. In addition to the test beam results, this talk will also discuss the effects on charge collection in poly-crystalline CVD 3D diamond pixel devices due to radiation.

Primary authors: KAGAN, Harris (Ohio State University (US)); REICHMANN, Michael Philipp (ETH Zurich (CH))

Presenter: REICHMANN, Michael Philipp (ETH Zurich (CH))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **287** Type: **Parallel Session talk**

Search for axion dark matter at IBS/CAPP

Tuesday, August 6, 2019 4:45 PM (12 minutes)

Summary

The axion, a consequence of the PQ mechanism proposed to solve the strong-CP problem of particle physics, has been considered as a compelling candidate for cold dark matter. The Center for Axion and Precision Physics Research (CAPP) of the Institute for Basic Science (IBS) has been establishing state of the art axion search experiments in Korea since 2013. Relying on the haloscope technique, where axions are resonantly converted into microwave photons in a strong magnetic field, our strategy is to run multiple experiments in parallel to explore a wide space of the axion parameter space. The ultimate goal is to probe axion dark matter in the mass range up to 100 μeV with sensitivities of the QCD axion models. The current approaches to achieve this goal are in two folds –1) utilizing well-advanced technologies, including high field superconducting (SC) magnets, cryogenic dilution refrigerators, quantum-limited noise amplifiers, and 2) developing unique features, such as high-Q SC cavities under high magnetic fields, and efficient cavity design for high-frequency axion search. We present the status and future prospects of the experiments and discuss the R&D activities at IBS/CAPP.

Primary authors: YOUN, Sung Woo (Institute for Basic Science); Prof. SEMERTZIDIS, Yannis (IBS/CAPP and KAIST in Republic of Korea (South Korea))

Presenter: YOUN, Sung Woo (Institute for Basic Science)

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **288** Type: **Parallel Session talk**

Darkside-50 Results and the Future Liquid Argon Dark Matter Program

Tuesday, August 6, 2019 4:00 PM (12 minutes)

Summary

DarkSide uses a dual-phase Liquid Argon Time Projection Chamber to search for WIMP dark matter. The talk will present the world leading result on the search for low mass ($M_{WIMP} < 20GeV/c^2$) and high mass ($M_{WIMP} > 100GeV/c^2$) WIMPs from the current experiment, DarkSide-50, running since mid 2015 a 50-kg-active-mass TPC, filled with argon from an underground source. The next stage of the DarkSide program will be a new generation experiment involving a global collaboration from all the current Argon based experiments.
DarkSide-20k, is designed as a 20-tonne fiducial mass TPC with SiPM based photosensors, expected to be free of any instrumental background for an exposure of >100 ton x years. Like its predecessor DarkSide-20k will be housed at the Gran Sasso (LNGS) underground laboratory, and it is expected to attain a WIMP-nucleon cross section exclusion sensitivity of $10^{-47}\,cm^2$ for a WIMP mass of $1TeV/c^2$ in a 5 yr run.
A subsequent objective, towards the end of the next decade, will be the construction of the ultimate detector, ARGO, with a 300 t fiducial mass to push the sensitivity to the neutrino floor region for high mass WIMPs.
The combination of the three experiments, part of a single family, will cover completely the WIMP hypothesis from 1GeV/c2 to several hundreds of TeV/c2 masses.

Primary authors: DARKSIDE COLLABORATION; Dr IPPOLITO, Valerio (INFN Sezione di Roma (IT))

Presenter: Dr IPPOLITO, Valerio (INFN Sezione di Roma (IT))

Session Classification: Astroparticle, Dark Matter (Parallel)

Track Classification: Dark Matter Searches

Contribution ID: **289** Type: **Parallel Session talk**

Towards Understanding the Origin of Cosmic-Ray Positrons

Tuesday, August 6, 2019 5:15 PM (12 minutes)

Summary

Precision measurements of cosmic ray positrons are presented up to 1 TeV based on 1.9 million positrons collected by the Alpha Magnetic Spectrometer on the International Space Station. The positron flux exhibits complex energy dependence. Its distinctive properties are: (a) a significant excess starting from 25.2 GeV compared to the lower-energy, power-law trend; (b) a sharp drop-off above 284 GeV; (c) in the entire energy range the positron flux is well described by the sum of a term associated with the positrons produced in the collision of cosmic rays, which dominates at low energies, and a new source term of positrons, which dominates at high energies; and (d) a finite energy cutoff of the source term at 810 GeV is established with a significance of more than 4σ. These experimental data on cosmic ray positrons show that, at high energies, they predominantly originate either from dark matter annihilation or from other astrophysical sources.

Primary authors: WENG, Zhili (Massachusetts Inst. of Technology (US)); XU, Weiwei (Massachusetts Inst. of Technology (US)); DURANTI, Matteo (Universita e INFN, Perugia (IT)); LI, Zuhao (Chinese Academy of Sciences (CN)); ZIMMERMANN, Nikolas (Rheinisch Westfaelische Tech. Hoch. (DE)); KOUNINE, Andrei (Massachusetts Inst. of Technology (US))

Presenter: XU, Weiwei (Massachusetts Inst. of Technology (US))

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **290** Type: **Parallel Session talk**

Low Radioactivity Argon for Dark Matter and Rare Event Searches

Tuesday, August 6, 2019 5:15 PM (12 minutes)

Summary

The DarkSide-50 dark matter search experiment demonstrated that argon derived from deep underground sources can be highly reduced in 39Ar, and since then the demand for this commodity has risen. Several fundamental physics experiments require argon reduced in 39Ar as well as 42Ar, as well as other rising needs in other scientific fields (e.g., age-dating). With the expanded needs come the questions of availability and how to approach the challenges associated with its production and characterization.

This talk will provide a global picture of low-radioactivity underground argon procurement, from its production to quality control and quality assurance. We will detail the DarkSide-20k plan for extracting more argon from the DarkSide-50 source through a project called Urania, as well as another project which will serve to isotopically separate 39Ar from 40Ar, called Aria.Finally DART is a small (˜1 L) chamber that will measure the depletion factor of 39Ar in UAr. The detector will be immersed in the LAr active volume of ArDM (LSC, Spain), which will act as a veto for gammas, allowing a precise measurement of the 39Ar residual activity.

Primary author: DARKSIDE AND GLOBAL ARGON DARK MATTER COLLABORATIONS

Presenter: RAHAF AJAJ, Dr.

Session Classification: Rare Event Detectors (Parallel)

Contribution ID: **296** Type: **Parallel Session talk**

Anisotropy of Elementary Particle Fluxes in Primary Cosmic Rays Measured with the Alpha Magnetic Spectrometer on the ISS

Tuesday, August 6, 2019 5:45 PM (12 minutes)

Summary

Presenter: GEBAUER, Iris (KIT - Karlsruhe Institute of Technology (DE))

Session Classification: Astroparticle, Dark Matter (Parallel)

Track Classification: Multi-Messenger Astroparticle Physics

Contribution ID: **298** Type: **Poster submission**

Search for Dark Matter produced in association with a jet with the ATLAS detector

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The astrophysical evidence of dark matter provides some of the most compelling clues to the nature of physics beyond the Standard Model. If it interacts weakly with the Standard Model, Dark Matter can be produced directly at the LHC. This talk presents the results of the search for dark matter using events with large missing transverse momentum produced in association with jets using the full run-2 13 TeV ATLAS data.

Presenter: LINDON, Jack (University of Birmingham (GB))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Dark Matter Searches

Contribution ID: **299** Type: **Parallel Session talk**

Observation of H->bb decays in the VH production mode and first differential measurement with the ATLAS detector

Tuesday, August 6, 2019 4:15 PM (12 minutes)

Summary

H ->bb decays allow to probe the Yukawa coupling of the Higgs boson to down type quarks. Observing these processes at the LHC is extremely challenging due to the large multi-jet background; however, this can be greatly suppressed by triggering on Missing Transverse Energy and charged leptons coming from the decay of a weak vector boson produced together with the Higgs. In this talk, the latest search for H->bb decays associated with a W or Z boson with the ATLAS detector will be presented. Furthermore, the first VH->bb differential measurement in bins of transverse momentum of the vector bosons will be discussed; this type of differential measurement is particularly sensitive to Beyond Standard Model physics, as probed through an Effective Field Theory approach.

Primary authors: ATLAS COLLABORATION; AMBROZ, Luca (University of Oxford (GB)); AMBROZ, luca

Presenters: AMBROZ, Luca (University of Oxford (GB)); AMBROZ, luca

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **300** Type: **Poster submission**

Search for low-mass Dark Matter mediator decaying to jets with the ATLAS detector

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

An important part of the ATLAS dark matter (DM) search programme is comprised of searches for new resonances decaying to either DM or hadronic final states. This talk will give an overview of this class of search, followed by a more in-depth look at one such anaysis: the recently-published search for low-mass dark-matter mediators decaying to jets, with an associated high-pT photon. This search triggers on an associated photon in order to significantly extend the sensitive region of ATLAS for dark matter mediators and generic resonances.

Presenter: CORRIGAN, Eric Edward (Lund University (SE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Dark Matter Searches

Contribution ID: **303** Type: **Poster submission**

Measurements of the Higgs production cross section in the $H \to \tau\tau$ decay channel with the ATLAS experiment

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The Higgs to tau tau decay is a considerably important decay channel because it allows to directly measure the Yukawa coupling to fermions and to measure the Higgs boson properties. During the Run 2 of the LHC the energy has increased to $\sqrt{s} = 13$ TeV and the luminosity has increased as well. This improvement leads to more precise measurements and with higher significance, in particular for the $H \to \tau\tau$ process. In this work the most recent measurements in this channel will be presented, with a focus on the $H \to \tau\tau$ production cross section measurement using data collected by the ATLAS experiment during 2015 and 2016. Furthermore the separate measurement of the Higgs production through Gluon Fusion and through Vector Boson Fusion has also been possible. The combined measurement with the Run 1 data, which leads to the first observation of $H \to \tau\tau$ in the ATLAS experiment, will be presented as well.

Presenter: MURRONE, Alessia (Università degli Studi e INFN Milano (IT))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Standard Model (Higgs, Top, Electroweak, QCD)

Contribution ID: **305** Type: **Parallel Session talk**

Physics at FCC-ee

Tuesday, August 6, 2019 5:45 PM (12 minutes)

Summary

The future circular collider (FCC) study released a conceptual design report (CDR) in January 2019. An electron machine is considered as a first step (FCC-ee) with up to four detectors. FCC-ee is capable of very high luminosities in a wide center-of-mass (ECM) spectrum from 90 to 365 GeV. FCC-ee provides a clean experimental environment, produces high luminosity for precision measurements of the Higgs boson, W and Z bosons, and the top-quark. Precision searches will test the consistency of the Standard Model and push the sensitivity to new physics at high scales.

Primary author: KLUTE, Markus (Massachusetts Inst. of Technology (US))

Presenter: KLUTE, Markus (Massachusetts Inst. of Technology (US))

Session Classification: Collider SM & BSM (Parallel)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **306** Type: **Parallel Session talk**

FCC-ee machine performance

Thursday, August 8, 2019 12:00 PM (12 minutes)

Summary

The future circular collider (FCC) study released a conceptual design report (CDR) in January 2019. An electron machine is considered as a first step (FCC-ee). FCC-ee is capable of very high luminosities in a wide center-of-mass (ECM) spectrum from 90 to 365 GeV. This allows the very precise study of the Z, W, and H bosons as well as the top quark, allowing for meaningful precision tests of the closure of the Standard Model with sensitivity to new physics at high scales. In this talk, we will discuss the design and performance of FCC-ee.

Primary authors: KLUTE, Markus (Massachusetts Inst. of Technology (US)); DAM, Mogens (University of Copenhagen (DK))

Presenter: DAM, Mogens (University of Copenhagen (DK))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **311** Type: **Parallel Session talk**

Latest results of the STEREO sterile neutrino search at the ILL Grenoble

Thursday, August 8, 2019 9:45 AM (12 minutes)

Summary

STEREO is a coarsely segmented, Gd-loaded liquid scintillator calorimeter studying anti-neutrinos produced by the compact, nearly pure ^{235}U nuclear reactor core of the Institut Laue-Langevin at Grenoble (France). The experiment has been designed to test the light sterile neutrino explanation of the Reactor Antineutrino Anomaly (RAA) by comparing the neutrino energy spectra recorded by its six detector cells. The cells are located between 9 and 11 m away from the centre of the reactor core.

Using data collected since 2016, the STEREO experiment excludes a significant fraction of the RAA favoured region in the $\Delta m^2_{41} - \sin^2(2\theta_{ee})$ parameter space, rejecting the RAA best-fit point at >99.8 % C.L. We also measure the total anti-neutrino flux coming from the reactor. Finally, we present our first measurement of the energy spectrum of the reactor anti-neutrinos. A good agreement with the predicted spectrum is observed up to 6 MeV.

Primary authors: PESSARD, Henri (LAPP-IN2P3-CNRS); BONHOMME, Aurélie (IRFU-CEA)

Presenter: BONHOMME, Aurélie (IRFU-CEA)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **312** Type: **Parallel Session talk**

PHYSICS BEYOND SM WITH KAONS AT NA62

Thursday, August 8, 2019 11:45 AM (12 minutes)

Summary

The decay K+⟶π+νν, with a very precisely predicted branching ratio of less than 10exp[-10], is one of the best candidates to reveal indirect effects of new physics at the highest mass scales. The NA62 experiment at the CERN SPS is designed to measure the branching ratio of the K+⟶π+νν with a decay-in-flight technique. NA62 took data so far in 2016-2018. Statistics collected in 2016 allowed NA62 to reach the Standard Model sensitivity for K+⟶π+νν, entering the domain of 10exp[-10] single event sensitivity and showing the proof of principle of the experiment. Thanks to the statistics collected in 2017, NA62 surpasses the present best sensitivity. The analysis strategy is reviewed and the preliminary result from the 2017 data set is presented.

The NA62 experiment at CERN collected a large sample of charged kaon decays into final states with multiple charged particles in 2016-2018. The sensitivity to a range of lepton flavour and lepton number violating kaon decays provided by this data set improves over the previously reported measurements. Results from the searches for these processes with a partial NA62 data sample are presented.

Primary authors: CENCI, Patrizia (INFN Perugia (IT)); Mr MARCHEVSKI, Radoslav Ivanov (Johannes Gutenberg Universitaet Mainz (DE))

Presenter: Mr MARCHEVSKI, Radoslav Ivanov (Johannes Gutenberg Universitaet Mainz (DE))

Session Classification: Flavour Physics (Parallel)

Contribution ID: **313** Type: **Poster submission**

SEARCH FOR EXOTIC DECAYS WITH NA62

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The features of the NA62 experiment at the CERN SPS –high-intensity setup, trigger-system flexibility, high-frequency tracking of beam particles, redundant particle identification, and ultra-high-efficiency photon vetoes –make NA62 particularly suitable to search for long-lived, weakly-coupled particles within Beyond the Standard Model (BSM) physics, using kaon and pion decays as well as operating the experiment in dump mode.
The NA62 sensitivity for production and decay searches of Heavy Neutral Lepton, Axion-Like Particles (ALP) and Dark Photons (DP) are presented, together with prospects for future data taking at the NA62 experiment.

Presenter: JERHOT, Jan (Charles University (CZ))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Dark Matter Searches

Contribution ID: **314** Type: **Parallel Session talk**

Direct top-quark decay width measurement at √s=13 TeV with the ATLAS experiment

Tuesday, August 6, 2019 4:30 PM (12 minutes)

Summary

Precise measurements of the properties of the top quark test the Standard Model (SM) and can be used to constrain new physics models. ATLAS collaboration performed a direct measurement of the decay width of the top quark using ttbar events in the lepton+jets and dilepton final states. The data sample was collected by the ATLAS detector at the LHC in proton-proton collisions at a centre-of-mass energy of 13 TeV and corresponds to an integrated luminosity of 140 fb−1. A multivariate technique is employed in the lepton+jets channel to resolve the ambiguity of the jet-to-parton assignment. The decay width of the top quark is extracted from the data using a profile likelihood method using the distributions of variables sensitive to the top-quark decay width in $t\bar{t}$ pair production.

Primary authors: ATLAS COLLABORATION; DADO, Tomas (Comenius University (SK))

Presenter: DADO, Tomas (Comenius University (SK))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **316** Type: **Poster submission**

High-energy DIS at CERN: The Large Hadron-electron Collider

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Large Hadron-electron Collider (LHeC) is a proposed upgrade of the LHC at CERN. An Energy Recovery Linac in racetrack configuration will provide 50-60 GeV energy electrons to collide with the HL-LHC proton and ion beams and, eventually, with those from the HE-LHC and the FCC-hh. Such configurations will yield electron-proton (nucleus) collisions with per nucleon centre-of-mass energies 1.3-3.5 (0.8-2.2) TeV and luminosities $\sim 10^{34(33)}$ cm^{-2}s^{-1}. The LHeC has a far reaching physics programme, as on QCD, electroweak or top physics, a large discovery potential and competitive prospects for precision Higgs physics. It thus strengthens the exploitation of the LHC. Energy frontier deep inelastic scattering (DIS) provides the necessary insight into the structure and dynamics inside hadrons which is crucial for interpreting physics at the LHC and its possible higher energy hh collider successors. Realising future high-energy DIS scattering is vital for the future of particle physics in general. In this talk we will review the status of the accelerator and detector designs, present the physics programme and discuss the prospects for its realisation.

Primary author: ARMESTO PEREZ, Nestor (Universidade de Santiago de Compostela (ES))

Presenter: CURTIN, David (University of Toronto)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **317** Type: **Parallel Session talk**

Dispersive Two-Loop Calculations: Theory and Applications

Thursday, August 8, 2019 11:30 AM (12 minutes)

Summary

As the new-generation precision experiments such as MOLLER and P2 look for physics beyond Standard Model, it is becoming increasingly important to evaluate the higher-order electroweak radiative corrections to a sub-percent level of uncertainty. However, due to propagators with different masses and higher-order tensor Feynman integrals, the two-loop calculations involving thousands of Feynman graphs becomes a demanding task requiring novel computational approaches. In this talk, we describe our dispersive sub-loop insertion approach and develop two-loop integrals using two-point functions basis which is applicable to wide range of processes.

Primary author: Prof. ALEKSEJEVS, Aleksandrs (Memorial University of Newfoundland)

Co-author: Prof. BARKANOVA, Svetlana (Grenfell Campus of Memorial University)

Presenter: Prof. ALEKSEJEVS, Aleksandrs (Memorial University of Newfoundland)

Session Classification: Outreach & Theory (Parallel)

Contribution ID: **318** Type: **Poster submission**

Toward realistic implementation of large imaging calorimeters

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The next generation of collider detectors will most likely make full use of Particle Flow algorithms, requiring precision tracking and imaging calorimeters. The latter, with granularity 2 to 3 orders of magnitude above existing devices, have been developed during the last 15 years by the CALICE collaboration and are now approaching maturity. The state-of-the-art and the remaining challenges will be presented for all the investigated readouts: silicon diodes and scintillator for a tungsten electromagnetic calorimeter, gaseous with semi-digital readout and scintillator with SiPM readout for a hadronic one. We will describe the commissioning, including beam tests, of large scale technological prototypes and where applicable, raw performances such as energy resolution and linearity and studies exploiting the distinct features of granular calorimeters regarding pattern recognition. Beyond these prototypes, the design of experiments addressing the requirements and potential of imaging calorimetry will be commented on. In addition, less established but promising techniques for dedicated devices will also be highlighted.

Presenter: KAWAGOE, Kiyotomo (Kyushu University (JP))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **319** Type: **Poster submission**

Exploring the structure of hadronic showers and hadronic energy reconstruction with highly granular calorimeters

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Prototype imaging electromagnetic and hadronic calorimeters developed and operated by the CALICE collaboration provide an unprecedented wealth of highly granular data of hadronic showers for a variety of active sensor elements and different absorber materials. In this presentation, we discuss detailed measurements of the spatial and the time structure of hadronic showers to characterise the different stages of hadronic cascades in the calorimeters, which are confronted with GEANT4 - based simulations using different hadronic physics models. These studies also make use of the two different absorber materials, steel and tungsten, used in the prototypes. The high granularity of the detectors is also exploited in the reconstruction of hadronic energy, both in individual detectors and combined electromagnetic and hadronic systems, making use software compensation and semi-digital energy reconstruction. We will report on the performance of these reconstruction techniques for different electromagnetic and hadronic calorimeters, with silicon, scintillator and gaseous active elements.

Presenter: KAWAGOE, Kiyotomo (Kyushu University (JP))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **320** Type: **Poster submission**

Dynamic Structure of Hadrons in ChPT

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Chiral Perturbation Theory (ChPT) has been very successful in describing low-energy hadronic properties in the non-perturbative regime of Quantum Chromodynamics. The results of ChPT, many of which are currently under active experimental investigation, provide stringent predictions of many fundamental properties of hadrons, including quantities such as electromagnetic polarizabilities.

The talk describes our semi-automated calculation methods in ChPT, the corresponding results for the electric and magnetic dynamical polarizabilities of the SU(3) hadron octet and our predictions for Compton and Primakoff cross sections.

Primary authors: ALEKSEJEVS, Aleksandrs (Memorial University of Newfoundland); BARKANOVA, Svetlana (Grenfell Campus of Memorial University)

Presenter: BARKANOVA, Svetlana (Grenfell Campus of Memorial University)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Theory

Contribution ID: **321** Type: **Parallel Session talk**

Subatomic Physics Education and Outreach in Newfoundland

Thursday, August 8, 2019 12:15 PM (12 minutes)

Summary

A physics education provides students with a valuable and flexible skill set that opens doors to a wide variety of career paths, including industry, education and finance. However, physics is almost universally unpopular in our local schools, especially among girls. The talk will describe a long-term scientific and cultural outreach program we developed for youth in Canada, Newfoundland, especially rural youth, girls and Indigenous students. We feature female and Indigenous role models, engage Indigenous story-telling, discuss a wide range of career opportunities, and emphasise a diverse set of skills required in modern science such as cooperation and communication. As these students enter our physics program which is specifically developed to focus on subatomic physics, we engage them in research as early as their second year, making sure they are well prepared to continue at graduate schools in both theory and experiment.

Primary author: BARKANOVA, Svetlana (Grenfell Campus of Memorial University)

Presenter: BARKANOVA, Svetlana (Grenfell Campus of Memorial University)

Session Classification: Outreach & Theory (Parallel)

Track Classification: Outreach and Diversity in HEP

Contribution ID: **326** Type: **Parallel Session talk**

CP violation and mixing in charm with LHCb

Thursday, August 8, 2019 11:30 AM (12 minutes)

Summary

Recent results on time-dependent and time-integrated measurements of CP violation and of meson mixing in the charm sector are presented, including the first observation of CP violation in the charm system. Prospects for future sensitivities are discussed.

Primary authors: LHCB COLLABORATION; MACCOLINI, Serena (Universita e INFN, Bologna (IT))

Presenter: MACCOLINI, Serena (Universita e INFN, Bologna (IT))

Session Classification: Flavour Physics (Parallel)

Contribution ID: **327** Type: **Parallel Session talk**

CP violation and mixing in beauty with LHCb

Thursday, August 8, 2019 11:15 AM (12 minutes)

Summary

Recent results on time-dependent and time-integrated measurements of CP violation and of meson mixing in the beauty sector are presented, along with prospects for future sensitivities.

Primary authors: LHCB COLLABORATION; SANTAMARINA RIOS, Cibran (Universidade de Santiago de Compostela (ES))

Presenter: SANTAMARINA RIOS, Cibran (Universidade de Santiago de Compostela (ES))

Session Classification: Flavour Physics (Parallel)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **328** Type: **Parallel Session talk**

Prospects for electromagnetic dipole moments of short-lived particles at the LHC

Thursday, August 8, 2019 11:00 AM (12 minutes)

Summary

Magnetic and electric dipole moments of fundamental particles are powerful probes for physics within and beyond the Standard Model. However, these have not been experimentally accessible to date for the case of short-lived particles, due to the difficulties imposed by their short lifetimes. In the recent years, the possibility of directly measuring the electromagnetic dipole moments of heavy baryons and ultimately the tau lepton, produced in fixed-target collisions at the LHC and channelled in bent crystals, has been considered. This talk will discuss the feasibility of the proposed experiment based on the upgraded LHCb detector, along with the physics opportunities using the dedicated fixed-target, proton-gas and proton-proton collisions. Perspectives for different luminosity scenarios will be outlined.

Primary authors: LHCB COLLABORATION; NERI, Nicola (Università degli Studi e INFN Milano (IT))

Presenter: NERI, Nicola (Università degli Studi e INFN Milano (IT))

Session Classification: Flavour Physics (Parallel)

Contribution ID: **330** Type: **Poster submission**

Study of Physics Performances at Muon Collider

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The Muon Collider is a possible option for the next generation of high energy collider machines. It would permit to achieve the energy frontier in leptons collisions, without occurring in significative synchrotron radiation losses as in electrons rings.
Among the technological challenges in the realization of such machine, the treatment of the beam-induced background is one of the most critical issues.
Since the muon beams must be very intense to reach high luminosity, the muons decay products and subsequent particles from secondary interactions with the environment can reach the interaction point, limiting the physical performances of the detector. This talk presents a reconstruction strategy for a benchmark process, H->bb-bar, with the beam-induced background superimposed obtained after the optimization of the machine-detector interface.

Primary authors: LUCCHESI, Donatella (INFN Padova); SESTINI, Lorenzo (Universita e INFN, Padova (IT)); CASARSA, Massimo (INFN, Trieste (IT)); BARTOSIK, Nazar (Universita e INFN Torino (IT)); GIANELLE, Alessio (Universita e INFN, Padova (IT)); PASTRONE, Nadia (INFN); BERTOLIN, Alessandro (Universita e INFN, Padova (IT)); Dr COLLAMATI, Francesco (INFN Roma I (IT)); MOKHOV, Nikolai (Fermi National Accelerator Lab. (US)); TERENTIEV, Nikolai (Carnegie Mellon U.)

Presenter: BARTOSIK, Nazar (Universita e INFN Torino (IT))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **332** Type: **Parallel Session talk**

MINERvA's Medium Energy Physics Program

Thursday, August 8, 2019 9:15 AM (12 minutes)

Summary

The MINERvA experiment has recently completed its physics run in the 6-GeV, on-axis NuMI beam at Fermilab. The experiment received a total of 12E20 protons on target in both neutrino and antineutrino mode running, which allow for a new level of statistical precision in neutrino interaction measurements, both in comparisons of interaction channels on a range of nuclei and in expansion to kinematic phase space that has not been accessible in previous data sets. In order to make the most of this jump in statistics, a new level of precision in flux prediction is also required. This talk will cover MINERvA's Medium Energy physics program, including the new regimes that are now accessible, and will discuss the new precision reached in flux uncertainty through neutrino-electron scattering.

Primary authors: HARRIS, Deborah; MINERVA COLLABORATION

Presenters: MCFARLAND, Kevin (University of Rochester); MCFARLAND, Kevin (University of Rochester); MCFARLAND, Kevin (University of Rochester)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **334** Type: **Parallel Session talk**

Recent T2K Neutrino Oscillation Results

Tuesday, August 6, 2019 2:00 PM (12 minutes)

Summary

T2K is a long baseline neutrino experiment producing a beam of muon neutrinos at the Japan Particle Accelerator Research Centre on the East coast of Japan and measuring their oscillated state 295 km away at the Super Kamiokande detector. Since 2016 T2K has doubled its data in both neutrino and antineutrino beam modes. Coupled with improvements in analysis techniques this has enabled the experiment to make world leading measurements of the PMNS oscillation parameters \Delta_mˆ{2}*{32}, sinˆ2(\theta*{23}) and the CP violating phase \delta_{CP}. In particular the CP conserving values of \delta_{CP} now appear to be disfavoured at the 95\% CL and there are regions of parameter space excluded at the 99.7\% CL. This talk will describe these results and the analysis improvements that have enabled them.

Primary author: MANLY, Steven Laurens (University of Rochester (US))

Presenter: O'KEEFFE, Helen (Lancaster University)

Session Classification: Neutrino Physics (Parallel)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **340** Type: **Parallel Session talk**

Measurement of the charged-current electron (anti-)neutrino cross-section on plastic with the T2K neutrino beam in the off-axis near detector ND280

Summary

The intrinsic electron neutrino contamination of the T2K neutrino beam provides the single largest background in the measurement of electron neutrino appearance at the far detector. These electron neutrinos can be measured directly in the T2K near detector, ND280. With the transition to antineutrino running the selection of both electron neutrinos and electron anti-neutrinos are important. Measurements of the intrinsic electron (anti-)neutrino backgrounds from both neutrino and antineutrino beam mode will be presented with details on the event selection and rejection of the large backgrounds of muons, photons, protons and pions. The selected events are used to measure the inclusive charged-current electron neutrino and electron anti-neutrino cross-sections, the latter being the first measurement since 1979.

Primary author: MANLY, Steven Laurens (University of Rochester (US))

Presenter: MANLY, Steven Laurens (University of Rochester (US))

Session Classification: Rare Event Detectors (Parallel)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **345** Type: **Parallel Session talk**

Near Detectors for the Hyper-K Experiment

Tuesday, August 6, 2019 4:30 PM (12 minutes)

Summary

The neutrino oscillation measurement program of Hyper-K requires unprecedented accuracy for the modeling of neutrino fluxes and neutrino-nucleus interaction cross sections. The Hyper-K experiment will include a suite of near detectors to control systematic uncertainties on neutrino flux and interaction models. In this talk we will describe the baseline Hyper-K near detector suite, which includes beam direction measurement detectors, a magnetized tracking detector, and a kiloton scale water Cherenkov detector. We will discuss the measurements these detectors will make to control systematic errors for the accelerator-based neutrino oscillation program, as well as the atmospheric neutrino and nucleon decay programs of Hyper-K.

Primary authors: HARTZ, Mark; HYPER-K COLLABORATION

Presenter: HARTZ, Mark

Session Classification: Rare Event Detectors (Parallel)

Contribution ID: **346** Type: **Parallel Session talk**

Variational Autoencoders for New Physics Mining at the Large Hadron Collider

Thursday, August 8, 2019 9:00 AM (12 minutes)

Summary

Using deep autoencoders trained on known physics processes, we develop a one-side p-value test to isolate previously unseen event topologies as outlier events. Since the autoencoder training does not depend on any specific new physics signature, the proposed procedure has a weak dependence on underlying assumptions about the nature of new physics. Such a strategy can be exploited to extend the sensitivity of the LHC to new physics. We provide two practical examples: a trigger application that selects otherwise lost anomalous events, stored for visual inspection and to guide future searches; a technique to turn each LHC search to final states including jets into a model-independent and data-driven search for new physics. These studies and future applications of autoencoders to high energy physics will contribute to the robustness of the LHC physics program and could be extended easily beyond collider physics.

Primary authors: VLIMANT, Jean-Roch (California Institute of Technology (US)); WOZNIAK, Kinga Anna (University of Vienna (AT)); SPIROPULU, Maria (California Institute of Technology (US)); PIERINI, Maurizio (CERN); CERRI, Olmo (California Institute of Technology (US)); NGUYEN, Thong (California Institute of Technology (US))

Presenter: CERRI, Olmo (California Institute of Technology (US))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **347** Type: **Parallel Session talk**

Multi-component dark matter from a hidden gauged SU(3)

Tuesday, August 6, 2019 2:00 PM (12 minutes)

Summary

We study Dark Matter (DM) phenomenology with multiple DM species consisting of both scalar and vector DM particles.
More specifically, we study the Hidden Gauged SU(3) model of Arcadi et al. In the Hidden Gauged SU(3) model,
because of the large parameter space, we restrict ourselves to three representative benchmark points, each with multiple DM species. The relic densities for the benchmark points were found using a program developed to solve the coupled Boltzmann equations for an arbitrary number of interacting DM species with two particles in the final state. For each case, we varied the mass of the DM particles and then found the value of the dark SU(3) gauge coupling that gives the correct relic density. We found that in some sets of parameter values DM would be difficult to observe in direct detection experiments but would be easier to observe in indirect detection experiments while for other sets of parameter values the situation was reversed so that measurements from both types of experiments complement each other and could help pinpoint the details of the hidden SU(3) model.

Primary author: Prof. GODFREY, Stephen (Carleton University)

Co-author: Mr POULIN, Alexandre (Carleton University)

Presenter: Prof. GODFREY, Stephen (Carleton University)

Session Classification: Astroparticle, Dark Matter (Parallel)

Track Classification: Dark Matter Searches

Contribution ID: **348** Type: **Parallel Session talk**

Dark Matter, Galactic Dynamics, and Gaia

Summary

We are in an age of large precision astrometric datasets, most recently thanks to ESA's Gaia mission, which has already measured the full 6-dimensional phase space of over 7 million stars. One of the many exciting physics outcomes of Gaia is the ability to measure the Milky Way's gravitational potential, as inferred from stellar kinematics. This can be leveraged to make precise statements about the underlying fundamental theory that governs the dynamics of our galaxy. In this talk, I will discuss how Gaia can be used to strongly test models of collisionless dark matter against alternative theories such as low-acceleration modifications to gravity and emergent long-range forces. I will also discuss recent efforts to reconcile measurements of the local dark matter density via the Jeans equation with the recent observations in the Gaia dataset indicating that stars in the Milky Way's disk are not in equilibrium.

Primary author: MOSCHELLA, Matthew (Princeton University)

Co-authors: NECIB, Lina (California Institute of Technology); LISANTI, Mariangela (Princeton University); OUTMEZGUINE, Nadav (Tel-Aviv University); SLONE, Oren (Princeton University)

Presenter: MOSCHELLA, Matthew (Princeton University)

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **350** Type: **Parallel Session talk**

Boosted Dark Matter Searches via Dark-Strahlung

Tuesday, August 6, 2019 2:15 PM (12 minutes)

Summary

We propose an unprecedented search channel for boosted dark matter (BDM) signals coming from the present universe, which are distinct from simple neutrino signals including those coming from the pair-annihilation or decay of dark matter. The signal process is initiated by the scattering of high-energy BDM off an electron/nucleon. If the dark matter is dark-sector U(1)-charged, the scattered BDM may emit a dark gauge boson (called "dark-strahlung") decaying into a Standard Model fermion pair. We, for the first time, point out that the existence of this channel may allow for the interpretation that the associated signal stems from BDM, not from the (dark-matter-origin) neutrinos. We find that despite its subleading nature, the BDM with a large boost factor may induce an O(10-20%) event rate of the lowest-order simple elastic scattering of BDM, in the parameter regions unreachable by typical beam-produced dark matter. We further find that the dark-strahlung channel may even outperform the leading-order channel in BDM searches, especially when the latter is plagued by substantial background contamination. We argue that cosmic-origin BDM searches readily fall in such a case, hence taking full advantage of dark-strahlung. As a practical application, we study experimental sensitivities at DUNE far detectors, showing remarkable usefulness of dark-strahlung.

Primary authors: Dr KIM, Doojin (University of Arizona); Prof. PARK, Jong-Chul (Chungnam National University); Dr SHIN, Seodong (Yonsei University)

Presenter: Prof. PARK, Jong-Chul (Chungnam National University)

Session Classification: Astroparticle, Dark Matter (Parallel)

Contribution ID: **353** Type: **Poster submission**

Performance of the CMS Electromagnetic Calorimeter in LHC Run2

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Many physics analyses using the Compact Muon Solenoid (CMS) detector at the LHC require accurate, high resolution electron and photon energy measurements. Excellent energy resolution is crucial for studies of Higgs boson decays with electromagnetic particles in the final state, as well as searches for very high mass resonances decaying to energetic photons or electrons. The CMS electromagnetic calorimeter (ECAL) is presently operating at the LHC with proton-proton collisions at 13 TeV center-of-mass energy, 25 ns bunch spacing, and an unprecedented instantaneous luminosity. High pileup levels (simultaneous collisions) and the ageing of crystals from exposure to large particle fluences necessitate a retuning of the ECAL readout, trigger thresholds, and reconstruction algorithms, to maintain the best possible performance in these increasingly challenging conditions. In addition, the energy response of the detector must be precisely calibrated and monitored, injecting laser light to correct for crystal transparency changes due to irradiation. A dedicated calibration of each detector channel is performed with physics events exploiting electrons from W and Z boson decays, photons from pi0/eta decays, and from the azimuthally symmetric energy distribution of minimum bias events. This talk presents the new reconstruction algorithm and calibration strategies that have been implemented and the excellent performance achieved by the CMS ECAL with the ultimate calibration of Run II data, in terms of energy scale stability and energy resolution.

Presenter: BARTOSIK, Nazar (Universita e INFN Torino (IT))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **354** Type: **Parallel Session talk**

The CMS ECAL Upgrade for High Precision Timing and Energy Measurements in HL-LHC

Thursday, August 8, 2019 9:30 AM (12 minutes)

Summary

The Electromagnetic Calorimeter (ECAL) of the Compact Muon Solenoid (CMS) experiment will be upgraded for the High-Luminosity phase of the LHC (HL-LHC). Data taking will begin in 2026 for the HL-LHC, where the number of simultaneous proton-proton collisions (pile-up) will reach 200 and a challenging increase in data rate is expected. The current lead tungstate crystals and avalanche photodiode detectors in the barrel region of the ECAL will remain, while the front-end and off-detector read-out electronics of the calorimeter will be upgraded. The new electronics will have to fulfill the requirements of the upgraded Level 1 hardware trigger system, in terms of increased latency and data bandwidth, in order to preserve detector performance despite the increased instantaneous luminosity (more than a factor 5 to the design luminosity). The upgrade will provide single crystal granularity for the hardware trigger and will enable a full read out of the detector. A crucial characteristic of the new design will be the capability to measure the timing of electrons and photons with an unprecedented precision, of the order of 30 ps for energies above 10 GeV. This excellent time resolution will improve the overall CMS physics performance under the expected pile-up conditions. For example, the precision timing information will improve the determination of the location of the production vertex for Higgs boson decays to two photons, a crucial channel for the measurement of Higgs properties. The status of the ongoing R&D activities will be presented, together with the latest beam test results with prototypes, and the development plan for the project up to installation.

Primary author: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE))

Presenter: MARINELLI, Nancy (University of Notre Dame (US))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **355** Type: **Parallel Session talk**

Precision Timing with the CMS MIP Timing Detector

Thursday, August 8, 2019 9:15 AM (12 minutes)

Summary

The Compact Muon Solenoid (CMS) detector at the CERN Large Hadron Collider (LHC) is undergoing an extensive Phase II upgrade program to prepare for the challenging conditions of the High-Luminosity LHC (HL-LHC). In particular, a new timing layer with hermetic coverage up to a pseudo-rapidity of |η|=3 will measure minimum ionizing particles (MIPs) with a time resolution of ˜30ps. This MIP Timing Detector (MTD) will consist of a central barrel region based on LYSO:Ce crystals read out with SiPMs and two end-caps instrumented with radiation-tolerant Low Gain Avalanche Detectors. The precision time information from the MTD will reduce the effects of the high levels of pile-up expected at the HL-LHC and will bring new and unique capabilities to the CMS detector. The time information assigned to each track will enable the use of 4D reconstruction algorithms and will further discriminate interaction vertices within the same bunch crossing to recover the track purity of vertices in current LHC conditions. For instance, in the analysis of di-Higgs boson production, a timing resolution of 30-40 ps is expected to improve the effective luminosity by about 25% through gains in b-tagging and isolation efficiency. We present motivations for precision timing at the HL-LHC and overview the MTD design, while also highlighting specific physics studies benefiting from the improved timing information.

Primary authors: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE)); MARTINEZ RUIZ DEL ARBOL, Pablo (Universidad de Cantabria and CSIC (ES))

Presenter: MARTINEZ RUIZ DEL ARBOL, Pablo (Universidad de Cantabria and CSIC (ES))

Session Classification: Detectors/Accelerators/Computing (Parallel)

Contribution ID: **356** Type: **Poster submission**

Study of the Effects of Radiation at the CERN Gamma Irradiation Facility on the CMS Drift Tubes Muon Detector for the HL-LHC

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The CMS drift tubes (DT) muon detector, built for standing up the LHC expected integrated and instantaneous luminosities, will be used also in the High Luminosity LHC (HL-LHC) at a 5 times larger instantaneous luminosity and, consequently, much higher levels of radiation, reaching about 10 times the LHC integrated luminosity. Initial irradiation tests of a spare DT chamber at the CERN gamma irradiation facility (GIF++), at large (˜O(100)) acceleration factor, showed aging effects resulting in a degradation of the DT cell performance [1]; however, full CMS simulations have shown almost no impact in the muon reconstruction efficiency over the full barrel acceptance and for the full integrated luminosity. A second spare DT chamber was moved inside the GIF++ bunker in October 2017. The chamber was being irradiated at lower acceleration factors, and only 2 out of the 12 layers of the chamber are switched at working voltage when the radioactive source is active, being the other layers in standby. In this way the other non-aged layers are used as reference and as a precise and unbiased telescope of muon tracks for the efficiency computation of the aged layers of the chamber, when set at working voltage for measurements. An integrated dose equivalent to two times the expected integrated luminosity of the HL-LHC run has been absorbed by this second spare DT chamber and the final impact on the muon reconstruction efficiency is under study. Direct inspection of some extracted aged anode wires presented a melted resistive deposition of materials. Investigation on the outgassing of cell materials and of the gas components used at the GIF++ are underway. Strategies to mitigate the aging effects are also being developed. From the long irradiation measurements of the second spare DT chamber, the effects of radiation in the performance of the DTs expected during the HL-LHC run will be presented.

References: [1] CMS-TDR-016, The Phase-2 Upgrade of the CMS Muon Detectors

Presenter: ALVAREZ GONZALEZ, Barbara (Universidad de Oviedo (ES))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **357** Type: **Poster submission**

Luminosity Measurement of proton-proton collisions at the CMS experiment

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Precision luminosity calibration is critical to determine fundamental parameters of the standard model and to constrain or to discover beyond-the-standard-model phenomena at LHC. The luminosity determination at the LHC interaction point 5 with the CMS detector, using proton-proton collisions at 13 and 5.02 TeV during Run 2 of the LHC (2015–2018), is reported. The absolute luminosity scale is obtained using beam-separation ("van der Meer") scans. The dominant sources of systematic uncertainty are related to the knowledge of the scale of the beam separation provided by LHC magnets and the non-factorizability between the spatial components of the proton bunch density distributions in the transverse direction. When applying the van der Meer calibration to the entire data-taking period, a substantial contribution to the total uncertainty in the integrated luminosity originates from the measurement of the linearity and stability of the CMS luminometers. The reported integrated luminosity in 2015–2016 is among the most precise luminosity measurements at bunched-beam hadron colliders. Prospects for luminosity precision for LHC Run 3 and HL-LHC are also discussed.

Presenter: TURKOT, Oleksii (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **358** Type: **Poster submission**

High-Speed Electrical Links on Low Mass Cables for CMS Inner Tracker Phase-2 Upgrade

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

In the High Luminosity-LHC, the CMS Tracker will deliver data with gigabit rate. We present the requirements, design, and performance of low-mass, high bandwidth electrical links that will transfer the data at the speed of 1.28 Gbps from CMS Pixel readout chip to a low power gigabit transceiver. This transceiver will further send the serialized data at the rate of 10 Gbps through optical links to the Tracker backend electronics.

Presenter: KHALIL, Sadia (The University of Kansas (US))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **364** Type: **Poster submission**

Rare decays at CMS

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

We report new results on rare decays involving heavy flavors and tau leptons, using pp collision data collected by the CMS experiment at the LHC during the Run 2. The most recent measurements of on angular variables in B -> K(*)mm decays are also presented.

Presenter: WANG, Dayong (Peking University (CN))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **365** Type: **Poster submission**

Searches for supersymmetry in events with photons at CMS

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

We present searches for new physics in events with one or more photons and missing transverse momentum produced in proton-proton collision data recorded by the CMS experiment during the LHC Run2 operations (2016). The results of four searches are statistically combined and interpreted in the context of gauge-mediated supersymmetry models.

Presenter: SCHULZ, Johannes (Rheinisch Westfaelische Tech. Hoch. (DE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **366** Type: **Parallel Session talk**

Performance of the protoDUNE-SP liquid argon detector from a particle test-beam

Tuesday, August 6, 2019 5:00 PM (12 minutes)

Summary

The protoDUNE-SP detector is located at CERN's neutrino platform facility and serves as a prototype to validate the technology for the huge liquid argon detectors for DUNE. With a total mass of 770 tons, it is the largest monolithic liquid argon single-phase time projection chamber in the world. ProtoDUNE-SP was exposed to a variety of test-beam particles (electrons, pions, kaons, and protons) last autumn collecting data in a broad range of momenta, from 0.3 - 7 GeV/c. With the experience gained during the construction and operation of the detector, some preliminary results regarding the performance of protoDUNE-SP will be discussed. In particular, the measurements of the energy depositions from test-beam and cosmic particles and the treatment of space-charge effect, caused by the electric field distortions from the slow ion signal produced by a large number of cosmic ray particles entering the detector, will be presented.

Primary authors: Dr CHRISTODOULOU, Georgios (CERN); WHITEHEAD, Leigh Howard (University of Cambridge (GB)); WHITEHEAD, Leigh (University of Warwick)

Presenters: WHITEHEAD, Leigh Howard (University of Cambridge (GB)); WHITEHEAD, Leigh (University of Warwick)

Session Classification: Rare Event Detectors (Parallel)

Contribution ID: **367** Type: **Poster submission**

Search for Supersymmetry with a compressed mass spectrum in vector boson fusion topology with 1-lepton and 0-lepton final states in pp collisions at $\sqrt{s}$ = 13 TeV with CMS

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Supersymmetry (SUSY) is one of the major physics goals of the Large Hadron Collider. A large number of physics analyses are being performed in CMS (and ATLAS) experiments to detect signatures of Susy particles. The search presented here aims for observing Susy particles produced in the Vector Boson Fusion (VBF) topology, leading to the final state having zero or one lepton, large missing ET, and two jets with high p^T with large rapidity separation. The analysis is performed using 35.9 fb $^{-1}$ of proton-proton collision data collected with CMS detector during the year 2016 at a center-of-mass energy of 13 TeV. The background estimation is performed using data-driven/semi data-driven techniques and the observed dijet invariant mass, as well as lepton transverse mass spectra, are found to be consistent with the standard model predictions, but no signal observed. Hence, the upper limits are set on the cross sections for chargino $\tilde{\chi}_1^{\pm}$ and neutralino $\tilde{\chi}_2^0$ production along with two associated jets, assuming the lightest scalar leptons to be lighter than the $\tilde{\chi}_1^{\pm}$. For a compressed mass spectra in which mass difference between Lightest Supersymmetric Particle (LSP) $\tilde{\chi}_1^0$ and the mass-degenerate particles $\tilde{\chi}_1^{\pm}$ and $\tilde{\chi}_2^0$ is 30 (1) GeV, the most stringent mass upper limit to date is set for the latter two particles.

Presenter: KUMARI, Priyanka (Panjab University (IN))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **370** Type: **Poster submission**

Searches for additional Higgs bosons at CMS

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The searches for additional Higgs bosons at CMS will be summarised. The analyses are performed using data collected with the CMS experiment at the LHC from pp collisions at centre-of-mass energy of 13 TeV.

Presenter: TAO, Junquan (Institute of High Energy Physics, Chinese Academy of Sciences (CN))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **371** Type: **Parallel Session talk**

Results for strongly produced SUSY at CMS

Tuesday, August 6, 2019 2:45 PM (12 minutes)

Summary

Supersymmetry (SUSY) remains one of the most well motivated models for physics beyond the Standard Model. With the conclusion of LHC Run 2, we have recorded a data set of 137 fbˆ{-1} of integrated luminosity which will remain the largest 13 TeV data set of pp colllisions for the next few years. This talk will cover results of the first analyses utilizing the full data set in searching over a wide phase space of possible final state signatures characteristic of strongly produced SUSY.

Primary authors: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE)); OVCHAROVA, Ana Krasimirova (Univ. of California Santa Barbara (US))

Presenter: OVCHAROVA, Ana Krasimirova (Univ. of California Santa Barbara (US))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **372** Type: **Parallel Session talk**

Search for strong production of vector-like quarks coupling to third generation quarks at CMS (13TeV)

Tuesday, August 6, 2019 3:00 PM (12 minutes)

Summary

We present results of searches for strong production of pairs of vector-like quarks using proton-proton collision data collected with the CMS detector at the CERN LHC at a center-of-mass energy of 13 TeV. Vector-like quarks are postulated as a mechanism to solve the Hierarchy problem of the standard model and stabilize the Higgs mass. We search here for vector-like quarks that would decay to a standard model boson and a third generation quark. Several analyses target different decay modes and are optimized for various final state event contents, from multi-leptonic to fully hadronic. In the latter, substructure techniques are used to identify hadronically decaying top quarks and bosons, to resolve these boosted final states and increase the sensitivity of the searches.

Primary authors: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE)); KHALIL, Sadia (The University of Kansas (US))

Presenter: KHALIL, Sadia (The University of Kansas (US))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **373** Type: **Parallel Session talk**

Searching for resonant HH production at CMS

Tuesday, August 6, 2019 4:00 PM (12 minutes)

Summary

New, massive bosons could be found with the LHC. Theories with warped extra dimensions and supersymmetry predict the existence of such resonances, which for some model parameters, have a significant branching fraction to two Higgs bosons. Searches for these predicted new resonances decaying to two Higgs bosons with the CMS detector are presented. Jet substructure techniques and lepton identification are used to search for massive bosons decaying to the bbbb, bbtautau, and the bblnuqq final states. The results are based on data collected during Run 2 of the LHC at a centre-of-mass energy of 13 TeV.

Primary authors: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE)); MC COLL, Nickolas (University of California Los Angeles (US))

Presenter: MC COLL, Nickolas (University of California Los Angeles (US))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **374** Type: **Poster submission**

Prospects for HH measurements at the HL-LHC with CMS

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The LHC machine is planning an upgrade program which will smoothly bring the luminosity at about 5*10ˆ34cm-2s-1 in 2028, to possibly reach an integrated luminosity of 3000-4000 fb-1 by the end of 2037. This High Luminosity LHC scenario, HL-LHC, will require a preparation program of the LHC detectors known as Phase-2 upgrade. The prospects for the study of Higgs boson pair production at the HL-LHC with the upgraded CMS detector are presented, in five decay channels, bbbb, bbWW, bbττ, bbγγ, and bbZZ.

Presenter: DELCOURT, Martin (Universite Catholique de Louvain (UCL) (BE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **375** Type: **Parallel Session talk**

Top quark cross sections in CMS

Tuesday, August 6, 2019 4:45 PM (12 minutes)

Summary

Latest results on inclusive and differential top quark pair and single top quark production cross sections are presented using proton-proton collision data collected by CMS. Results from top quark pair produced in association with b and light jets are also presented. The differential cross sections are measured as a function of various kinematic observables of the top quarks and the jets and leptons of the event final state. The results are confronted with precise theory calculations and used to constrain Standard Model parameters.

Primary authors: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE)); PERROTTA, Andrea (Universita e INFN, Bologna (IT)); PERROTTA, Andrea (Istituto Nazionale di Fisica Nucleare (INFN))

Presenters: PERROTTA, Andrea (Universita e INFN, Bologna (IT)); PERROTTA, Andrea (Istituto Nazionale di Fisica Nucleare (INFN))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **376** Type: **Parallel Session talk**

Rare top quark production in CMS: ttZ, ttW, ttgamma, tZ, tgamma, and tttt production

Tuesday, August 6, 2019 5:00 PM (12 minutes)

Summary

A comprehensive set of measurements of top quark pair and single top quark production in association with EWK bosons (W, Z or γ) is presented. The results are compared to theory predictions and re-interpreted as searches for new physics inducing deviations from the standard model predictions using an effective field theory approach. The status of the search for four top quark production, to which the LHC experiments are starting to be sensitive, and that has important BSM re-interpretations, is also reported.

Primary authors: MEYER, Arnd (Rheinisch Westfaelische Tech. Hoch. (DE)); DOBUR, Didar (Ghent University (BE))

Presenter: DOBUR, Didar (Ghent University (BE))

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **383** Type: **Poster submission**

Communicating ATLAS: adapting to an ever-changing media landscape

Thursday, August 8, 2019 10:59 AM (1 minute)

Summary

Communicating the status and achievements of the ATLAS Experiment has been a core objective of the ATLAS Collaboration since its founding. To match an ever-changing media landscape, ATLAS has tailored its communication strategy to produce content that effectively targets key audiences. The comprehensive approach of ATLAS communications is explored, with a focus on strategic themes, effective distribution channels, and message. The success of this approach is examined and the effect on user experience is evaluated.

Primary author: GOLDFARB, Steven (University of Melbourne (AU))

Presenter: RODRIGUEZ VERA, Ana Maria (York University (CA))

Session Classification: Poster Session (Thu/Fri)

Contribution ID: **386** Type: **Parallel Session talk**

Recent Reactor Antineutrino Results from the PROSPECT Experiment

Tuesday, August 6, 2019 3:00 PM (12 minutes)

Summary

Abstract: Current models of antineutrino production in nuclear reactors predict absolute detection rates and energy spectra at odds with the existing body of direct reactor antineutrino measurements. If these discrepancies are taken seriously, then they must be indicative of a misunderstanding of neutrino production in nuclear reactor cores and/or the fundamental properties of neutrinos. New short-baseline reactor antineutrino measurements performed at highly-enriched uranium reactors will enable independent testing of these two explanations for existing flux and spectrum anomalies. The PROSPECT experiment is currently operating a 4 ton segmented lithium-doped liquid scintillator detector covering baseline ranges of ˜7-11 meters from the U235-enriched High Flux Isotope Reactor at Oak Ridge National Laboratory. In this talk, I will focus on recent reactor antineutrino measurements performed by the PROSPECT experiment, which have demonstrated the feasibility of precision on-surface reactor antineutrino detection, advanced understanding of antineutrino production by the primary fission isotope U235, and placed world-leading limits on sterile neutrino oscillations.

Primary authors: Prof. LITTLEJOHN, Bryce (Illinois Institute of Technology); PALOMINO, Jose (Illinois Institute of Technology)

Presenter: PALOMINO, Jose (Illinois Institute of Technology)

Session Classification: Neutrino Physics (Parallel)

Contribution ID: **387** Type: **Parallel Session talk**

Evolution of Regional, Age and Gender Demographics in the ATLAS Collaboration

Thursday, August 8, 2019 12:00 PM (12 minutes)

Summary

The ATLAS Collaboration consists of more than 5000 members, from about 100 different countries. This study presents data showing aspects of the regional, age and gender demographics of the collaboration, including the time evolution over the lifetime of the experiment. In particular the relative fraction of women is discussed, including their share of contributions, recognition and positions of responsibility, and showing how this depends on other demographic measures.

Primary author: WELLS, Pippa (CERN)

Presenter: RODRIGUEZ VERA, Ana Maria (York University (CA))

Session Classification: Outreach & Theory (Parallel)

Track Classification: Outreach and Diversity in HEP

Contribution ID: **388** Type: **Poster submission**

Decay of a bound muon to a bound electron

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

A bound muon in the presence of a nucleus can decay to an electron, which has either continuous or discrete (bound) energy spectrum. The underlying physics in both cases differ a lot, and so is their importance. The Standard Model decay of a bound muon to an outgoing energetic electron provides a background in the experimental searches for the lepton- flavor-violating $\mu \longrightarrow e$ conversions in the field of a nucleus, whereas the decay to a bound electron for large value of Z has its analogy with the QCD due to the strong electromagnetic coupling constant. The second case is the focus of this talk. This decay proceeds through the free muon decay in the presence of a spinless nucleus. The results of the decay rate calculated in two different approaches will be presented. In order to see if the two approaches coincide in certain approximations, we have considered two limiting cases: the muon and electron masses being almost equal and the small $Z\alpha$ limit. In these limiting cases, it is found that the two approaches are in good agreement.

Primary authors: Prof. CZARNECKI, Andrzej; Dr JAMIL ASLAM, Muhammad (University of Alberta); Dr ZHANG, Guangpeng; Ms MOROZOVA, Anna (University of Alberta)

Presenter: Dr JAMIL ASLAM, Muhammad (University of Alberta)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **389** Type: **Parallel Session talk**

Precision electroweak physics with polarized beams at SuperKEKB

Tuesday, August 6, 2019 5:30 PM (12 minutes)

Summary

Consideration is being given to upgrading the SuperKEKB e+e- collider with polarized electron beams, which would open a new program of precision electroweak physics at the Y(4S). These measurements include sin2 theta_W obtained via left-right asymmetry measurements of e+e- transitions to pairs of electrons, muons, taus, charm and b-quarks. The precision obtainable at SuperKEKB will match that of the LEP/SLC world average but at the centre-of-mass energy of 10.58GeV, thereby probing the neutral current couplings with unprecedented precision at a new energy scale sensitive to the running of the couplings. World average measurements of the individual neutral current vector coupling constants to b- and c-quarks and muons in particular will be substantially improved and the residual 3sigma discrepancy between the SLC ALR measurements and LEP AFBb measurements will be addressed. This paper will include a discussion of the necessary upgrades to SuperKEKB. This program opens an exciting new window in searches for physics beyond the standard model.

Primary author: RONEY, Michael (University of Victoria)

Presenter: RONEY, Michael (University of Victoria)

Session Classification: Collider SM & BSM (Parallel)

Contribution ID: **390** Type: **Parallel Session talk**

Electric Dipole Moments From Dark Sectors

Thursday, August 8, 2019 11:15 AM (12 minutes)

Summary

We examine the sensitivity of electric dipole moments (EDMs) as precision observables for new CP-violating physics in a hidden (or dark) sector. Assuming that the dominant mediation channel is via one or more of the vector, Higgs or neutrino portals, we examine the leading EDM contributions. The dominant contributions arise at two-loop order, and EDMs can provide sensitivity to portal couplings that is complementary to direct probes at the intensity frontier or high energy colliders. In particular, we identify a significant two-loop contribution to the electron EDM, mediated through the singlet (Higgs plus neutrino) portal, for which EDMs already provide new and complementary sensitivity in the regime of large singlet neutrino masses.

Primary author: OKAWA, Shohei (University of Victoria)

Co-authors: POSPELOV, Maxim (University of Victoria (CA)); RITZ, Adam

Presenter: OKAWA, Shohei (University of Victoria)

Session Classification: Outreach & Theory (Parallel)

Contribution ID: **392** Type: **Poster submission**

Searching for high-mass dilepton resonances in the full Run-2 ATLAS dataset

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Having enabled discoveries of Standard Model resonances in previous decades, the dilepton invariant mass spectrum remains a vital experimental probe of today's high energy frontier. Multiple benchmark scenarios beyond the Standard Model anticipate new high-mass neutral mediators whose clean signatures in the dilepton final state have been a prime target for searches at the Large Hadron Collider. My poster describes the procedure, findings, and implications of the latest search for such signatures leveraging the full Run-2 dataset recorded by the ATLAS detector.

Presenter: DREYER, Etienne (Simon Fraser University (CA))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **393** Type: **Poster submission**

Vector Boson Scattering in Semi-leptonic Final States with the ATLAS Detector

Thursday, August 8, 2019 10:40 AM (20 minutes)

The scattering of electroweak vector bosons is an important process for the study of the non-abelian gauge-structure of the electroweak sector as well as the nature of electroweak symmetry breaking. Many new physics situations provide amplification of this process and the decay channels which are most sensitive to these effects are the semi-leptonic channels, where one boson decays hadronically and the other leptonically. Searches in these final states exploits novel developments in the use of jet-substructure and machine learning to provide strong signal-to-background separation. This poster will show the results of the search for vector boson scattering in the semi-leptonic channels with 36/fb of 13TeV ATLAS data.

Summary

The scattering of electroweak vector bosons is an important process for the study of the non-abelian gauge-structure of the electroweak sector as well as the nature of electroweak symmetry breaking. Many new physics situations provide amplification of this process and the decay channels which are most sensitive to these effects are the semi-leptonic channels, where one boson decays hadronically and the other leptonically. Searches in these final states exploits novel developments in the use of jet-substructure and machine learning to provide strong signal-to-background separation. This poster will show the results of the search for vector boson scattering in the semi-leptonic channels with 36/fb of 13 TeV ATLAS data.

Presenter: LES, Robert (University of Toronto (CA))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **395** Type: **Plenary Talk**

News from ICFA

Saturday, August 10, 2019 9:00 AM (20 minutes)

Summary

Presenter: TAYLOR, Geoffrey (University of Melbourne)

Session Classification: Future

Contribution ID: **396** Type: **Plenary Talk**

News from C11

Saturday, August 10, 2019 9:20 AM (20 minutes)

Summary

Presenter: SCHELLMAN, Heidi Marie (Oregon State University (US))

Session Classification: Future

Contribution ID: **397** Type: **Plenary Talk**

European Strategy Status

Saturday, August 10, 2019 9:40 AM (30 minutes)

Summary

Presenter: VACHON, Brigitte (McGill University, (CA))

Session Classification: Future

Contribution ID: **398** Type: **Plenary Talk**

Future of Neutrino Beam Facilties

Saturday, August 10, 2019 11:40 AM (30 minutes)

Summary

Presenter: SEKIGUCHI, Tetsuro (KEK)

Session Classification: Future

Contribution ID: **399** Type: **Plenary Talk**

Future of Underground Laboratories

Saturday, August 10, 2019 12:10 PM (30 minutes)

Summary

Presenter: SMITH, Nigel (SNOLab)

Session Classification: Future

Contribution ID: **400** Type: **Plenary Talk**

Future of Flavour Factories

Saturday, August 10, 2019 12:40 PM (30 minutes)

Summary

Presenter: NAKADA, Tatsuya (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: Future

Contribution ID: **401** Type: **Plenary Talk**

Advances in Particle Detectors

Saturday, August 10, 2019 10:10 AM (30 minutes)

Summary

Presenter: JUNJI, Haba (KEK)

Session Classification: Future

Contribution ID: **402** Type: **Plenary Talk**

Welcome Address

Monday, August 5, 2019 9:00 AM (15 minutes)

Summary

Session Classification: Opening Session

Contribution ID: **403** Type: **Plenary Talk**

Overview of the ATLAS Experiment

Monday, August 5, 2019 9:15 AM (30 minutes)

Summary

Presenter: SAVARD, Pierre (University of Toronto (CA))

Session Classification: Opening Session

Contribution ID: **404** Type: **Plenary Talk**

Overview of the CMS Experiment

Monday, August 5, 2019 9:45 AM (30 minutes)

Summary

Presenter: MCBRIDE, Patricia (Fermi National Accelerator Lab. (US))

Session Classification: Opening Session

Contribution ID: **405** Type: **Plenary Talk**

Status and Plans for the CERN Accelerator Complex

Monday, August 5, 2019 11:10 AM (30 minutes)

Summary

Presenter: COLLIER, Paul (CERN)

Session Classification: Opening Session

Contribution ID: **406** Type: **Plenary Talk**

Status of the Chinese electron Collider

Monday, August 5, 2019 11:40 AM (30 minutes)

Summary

Presenter: BARREIRO GUIMARAES DA COSTA, Joao (Chinese Academy of Sciences (CN))

Session Classification: Opening Session

Contribution ID: **407** Type: **Plenary Talk**

Recent News from Belle-II

Monday, August 5, 2019 12:10 PM (30 minutes)

Summary

Presenter: BROWDER, Tom (University of Hawaii)

Session Classification: Opening Session

Contribution ID: **408** Type: **Plenary Talk**

Mapping Dark Matter with the Gaia Satellite

Monday, August 5, 2019 2:00 PM (30 minutes)

Summary

Presenter: LISANTI, Mariangela (Stanford University)

Session Classification: Dark Matter/Astro

Contribution ID: **409** Type: **Plenary Talk**

Direct Detection of Dark Matter (WIMPS)

Monday, August 5, 2019 2:30 PM (30 minutes)

Summary

Presenter: Prof. LEVY, Cecilia (University at Albany, SUNY)

Session Classification: Dark Matter/Astro

Contribution ID: **410** Type: **Plenary Talk**

Direct Detection of Dark Matter (light masses)

Monday, August 5, 2019 3:00 PM (30 minutes)

Summary

Presenter: FERNANDEZ MORONI, Guillermo

Session Classification: Dark Matter/Astro

Contribution ID: **411** Type: **Plenary Talk**

Cosmological Parameter Space (Dark Matter/Dark Energy Observations)

Monday, August 5, 2019 4:30 PM (30 minutes)

Summary

Presenters: Prof. BENZVI, Segev (University of Rochester); BENZVI, Segev (University of Rochester)

Session Classification: Dark Matter/Astro

Contribution ID: **412** Type: **Plenary Talk**

Multimessenger Searches

Monday, August 5, 2019 5:00 PM (30 minutes)

Summary

Presenter: Dr EGBERTS, Kathrin (Potsdam University)

Session Classification: Dark Matter/Astro

Contribution ID: **413** Type: **Plenary Talk**

Astronomical Neutrino Sources

Friday, August 9, 2019 4:00 PM (30 minutes)

Summary

Presenter: KIRYLUK, Joanna (Stony Brook University)

Session Classification: Neutrino Physics

Contribution ID: **414** Type: **Plenary Talk**

Gravitational Wave Observations

Monday, August 5, 2019 5:30 PM (30 minutes)

Summary

Presenter: Dr HASTER, Carl-Johan (Massachusetts Institute of Technology)

Session Classification: Dark Matter/Astro

Contribution ID: **415** Type: **Plenary Talk**

Beam Based Dark Matter Searches

Monday, August 5, 2019 4:00 PM (30 minutes)

Summary

Presenter: NELSON, Timothy Knight (SLAC National Accelerator Laboratory (US))

Session Classification: Dark Matter/Astro

Contribution ID: **416** Type: **Plenary Talk**

Higgs and Electroweak Physics at the LHC

Tuesday, August 6, 2019 9:00 AM (30 minutes)

Summary

Presenter: STRANDBERG, Jonas (KTH Royal Institute of Technology (SE))

Session Classification: Collider/Standard Model Physics

Contribution ID: **417** Type: **Plenary Talk**

Higgs/Electroweak Theory

Tuesday, August 6, 2019 9:30 AM (30 minutes)

Summary

Presenter: VRYONIDOU, Eleni (CERN)

Session Classification: Collider/Standard Model Physics

Contribution ID: **418** Type: **Plenary Talk**

Top Quark Properties from the LHC

Tuesday, August 6, 2019 11:00 AM (30 minutes)

Summary

Presenter: ALDAYA MARTIN, Maria (DESY)

Session Classification: Collider/Standard Model Physics

Contribution ID: **419** Type: **Plenary Talk**

Top Quark Theory

Tuesday, August 6, 2019 11:30 AM (30 minutes)

Summary

Presenters: WESTHOFF, Susanne (Heidelberg University); WESTHOFF, Susanne (Heidelberg University)

Session Classification: Collider/Standard Model Physics

Contribution ID: **420** Type: **Plenary Talk**

Electroweak Parameter Fits

Tuesday, August 6, 2019 10:00 AM (30 minutes)

Summary

Presenter: DE BLAS, Jorge (INFN-Padova)

Session Classification: Collider/Standard Model Physics

Contribution ID: **421** Type: **Plenary Talk**

Heavy Ion Physics

Tuesday, August 6, 2019 12:00 PM (30 minutes)

Summary

Presenter: PRINO, Francesco (Universita e INFN Torino (IT))

Session Classification: Collider/Standard Model Physics

Contribution ID: **422** Type: **Plenary Talk**

Beyond Standard Model theories

Thursday, August 8, 2019 3:00 PM (30 minutes)

Summary

Presenter: HOCHBERG, Yonit (Hebrew University)

Session Classification: (Beyond) SM

Contribution ID: **423** Type: **Plenary Talk**

QCD at the LHC

Thursday, August 8, 2019 2:00 PM (30 minutes)

Summary

Presenter: TOMPKINS, Lauren Alexandra (Stanford University (US))

Session Classification: (Beyond) SM

Contribution ID: **424** Type: **Plenary Talk**

QCD Theory for Colliders

Thursday, August 8, 2019 2:30 PM (30 minutes)

Summary

Presenter: HUSS, Alexander Yohei (CERN)

Session Classification: (Beyond) SM

Contribution ID: **425** Type: **not specified**

Conference Closes

Saturday, August 10, 2019 1:10 PM (2 minutes)

Summary

Presenters: TANAKA, Hirohisa (SLAC National Accelerator Laboratory (US)); TRISCHUK, William (University of Toronto (CA))

Contribution ID: **426** Type: **Plenary Talk**

Supersymmetry at the LHC

Thursday, August 8, 2019 4:00 PM (30 minutes)

Summary

Presenter: MOORTGAT, Filip (CERN)

Session Classification: (Beyond) SM

Contribution ID: **427** Type: **Plenary Talk**

Dark Matter Searches at the LHC

Thursday, August 8, 2019 4:30 PM (30 minutes)

Summary

Presenter: LOWETTE, Steven (Vrije Universiteit Brussel (BE))

Session Classification: (Beyond) SM

Contribution ID: **428** Type: **Plenary Talk**

Exotic Searches at the LHC

Thursday, August 8, 2019 5:00 PM (30 minutes)

Summary

Presenter: ETZION, Erez (Tel Aviv University (IL))

Session Classification: (Beyond) SM

Contribution ID: **429** Type: **Plenary Talk**

BSM Constraints from Leptons

Friday, August 9, 2019 9:30 AM (30 minutes)

Summary

Presenter: KIBURG, Brendan (Fermilab)

Session Classification: Flavour Physics

Contribution ID: **430** Type: **Plenary Talk**

CKM and CP constraints from B-decays

Friday, August 9, 2019 11:00 AM (30 minutes)

Summary

Presenter: NISHIDA, Shohei (KEK)

Session Classification: Flavour Physics

Contribution ID: **431** Type: **Plenary Talk**

B flavour constraints on BSM

Friday, August 9, 2019 10:00 AM (30 minutes)

Summary

Presenter: ARCHILLI, Flavio (Ruprecht Karls Universitaet Heidelberg (DE))

Session Classification: Flavour Physics

Contribution ID: **432** Type: **Plenary Talk**

Rare Decays of B hadrons

Friday, August 9, 2019 11:30 AM (30 minutes)

Summary

Presenter: MARIN BENITO, Carla (Centre National de la Recherche Scientifique (FR))

Session Classification: Flavour Physics

Contribution ID: **433** Type: **Plenary Talk**

Constraints on New Physics from B decays

Friday, August 9, 2019 12:00 PM (30 minutes)

Summary

Presenter: BLANKE, Monika (Karlsruhe Institute of Technology)

Session Classification: Flavour Physics

Contribution ID: **434** Type: **Plenary Talk**

Long Baseline Neutrinos

Friday, August 9, 2019 2:00 PM (30 minutes)

Summary

Presenters: MESSIER, Mark (Fermi National Accelerator Laboratory); MESSIER, Mark (IU)

Session Classification: Neutrino Physics

Contribution ID: **435** Type: **Plenary Talk**

Short Baseline Neutrinos

Friday, August 9, 2019 2:30 PM (30 minutes)

Summary

Presenter: LITTLEJOHN, Bryce (Illinois Institute of Technology)

Session Classification: Neutrino Physics

Contribution ID: **436** Type: **Plenary Talk**

Neutrinoless Double Beta Decay

Friday, August 9, 2019 4:30 PM (30 minutes)

Summary

Presenter: DOLINSKI, Michelle (Drexel University)

Session Classification: Neutrino Physics

Contribution ID: **437** Type: **Plenary Talk**

Theoretical Interpretations of Neutrino Properties

Friday, August 9, 2019 3:00 PM (30 minutes)

Summary

Presenter: ZUKANOVICH FUNCHAL, renata (Universidade de São Paulo)

Session Classification: Neutrino Physics

Contribution ID: **438** Type: **Plenary Talk**

Atmospheric Neutrinos and Proton Decay

Friday, August 9, 2019 5:00 PM (30 minutes)

Summary

Presenter: WENDELL, Roger (Kyoto University)

Session Classification: Neutrino Physics

Contribution ID: **439** Type: **Plenary Talk**

Outreach/Education Initiatives

Saturday, August 10, 2019 10:40 AM (30 minutes)

Summary

Presenter: Dr ASSAMAGAN, Ketevi Adikle (Brookhaven National Laboratory (US))

Session Classification: Future

Contribution ID: **440** Type: **Plenary Talk**

Lepton Flavour Violation

Friday, August 9, 2019 9:00 AM (30 minutes)

Summary

Presenter: HISANO, Junji (Nagoya university)

Session Classification: Flavour Physics

Contribution ID: **441** Type: **Plenary Talk**

Neutrino Interactions

Friday, August 9, 2019 5:30 PM (30 minutes)

Summary

Presenters: BETANCOURT, Minerba (Fermilab); BETANCOURT, Minerba

Session Classification: Neutrino Physics

Contribution ID: **442** Type: **Poster submission**

Search for Heavy Neutral Leptons with CMS detector

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The smallness of neutrino masses provides a tantalizing allusion to physics beyond the standard model (SM). Heavy neutral leptons (HNL), such as hypothetical sterile neutrinos, accommodate a way to explain this observation, through the see-saw mechanism. If they exist, HNL could also provide answers about the dark matter nature, and baryon asymmetry of the universe. A search for the production of HNL at the LHC, originating from leptonic W boson decays through the mixing of the HNL with SM neutrinos, is presented. The search focuses on signatures with three leptons, providing a clean signal for probing the production of the HNL in a wide mass range never explored before at the LHC: down to 1 GeV, and up to 1.2 TeV. The sample of pp collisions collected by the CMS detector throughout 2016 is used, amounting to a volume of 35.9/fb.

Presenter: VIT, Martina (Ghent University (BE))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Beyond Standard Model Searches

Contribution ID: **443** Type: **Poster submission**

Luminosity determination in pp collisions at sqrt(s)=13 TeV using the ATLAS detector at the LHC

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The preliminary calibration of the integrated luminosity for the Run-2 ATLAS data sample of pp collisions at sqrt(s)=13 TeV is described. The absolute luminosity scale is determined using van der Meer scans during dedicated running periods in each year, and extrapolated to the physics data-taking regime using complementary measurements from several ATLAS subdetectors. The total uncertainties on the integrated luminosities are 2.0-2.4% for each individual year, and 1.7% on the full Run-2 data sample.

Presenter: CARTER, Joseph (University of Toronto (CA))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **444** Type: **not specified**

Introduction and C11 matters

Wednesday, August 7, 2019 1:00 PM (20 minutes)

Presenters: CANELLI, Florencia (Universitaet Zuerich (CH)); SCHELLMAN, Heidi Marie (Oregon State University (US)); NOJIRI, Mihoko (Theory Center, IPNS, KEK)

Session Classification: C11 meeting

Contribution ID: **445** Type: **not specified**

Report from Neutrino Series

Wednesday, August 7, 2019 1:20 PM (10 minutes)

Summary

Presenter: BETANCOURT, Minerba

Session Classification: C11 meeting

Contribution ID: **446** Type: **not specified**

Report from LHCP Series

Wednesday, August 7, 2019 1:30 PM (10 minutes)

Presenter: OLSEN, Jim (Princeton University (US))

Session Classification: C11 meeting

Contribution ID: **447** Type: **not specified**

Report from Baldin Series

Wednesday, August 7, 2019 1:45 PM (10 minutes)

Session Classification: C11 meeting

Contribution ID: **448** Type: **not specified**

Report from ICHEP2018

Wednesday, August 7, 2019 1:55 PM (20 minutes)

Summary

Presenter: CHOI, Su Yong (Korea University (KR))

Session Classification: C11 meeting

Contribution ID: **449** Type: **not specified**

LP2019 in progress report

Wednesday, August 7, 2019 2:15 PM (20 minutes)

Presenter: TRISCHUK, William (University of Toronto (CA))

Session Classification: C11 meeting

Contribution ID: **450** Type: **not specified**

LP2019 in progress report

Presenter: TRISCHUK, William (University of Toronto (CA))

Session Classification: C11 meeting

Contribution ID: **451** Type: **not specified**

ICH2020 Prague update

Wednesday, August 7, 2019 2:45 PM (20 minutes)

Presenter: DOLEZAL, Zdenek (Charles University (CZ))

Session Classification: C11 meeting

Contribution ID: **452** Type: **Parallel Session talk**

TIPP 2020 Vancouver update

Wednesday, August 7, 2019 2:35 PM (10 minutes)

Summary

Presenter: RETIERE, Fabrice (TRIUMF)

Session Classification: C11 meeting

Contribution ID: **453** Type: **not specified**

LP2021 - Manchester

Wednesday, August 7, 2019 3:30 PM (20 minutes)

Presenter: GERSABECK, Marco (University of Manchester (GB))

Session Classification: C11 meeting

Contribution ID: **454** Type: **not specified**

Proposals for ICHEP2024/LP2023

Wednesday, August 7, 2019 4:05 PM (15 minutes)

Session Classification: C11 meeting

Contribution ID: **455** Type: **not specified**

ICFA report - executive session

Wednesday, August 7, 2019 4:35 PM (20 minutes)

Summary

Presenter: TAYLOR, Geoffrey (University of Melbourne)

Session Classification: C11 meeting

Contribution ID: **456** Type: **not specified**

Executive session

Wednesday, August 7, 2019 4:55 PM (1 hour)

Session Classification: C11 meeting

Contribution ID: **457** Type: **not specified**

IPAC2020

Wednesday, August 7, 2019 3:20 PM (10 minutes)

Session Classification: C11 meeting

Contribution ID: **458** Type: **not specified**

ICHEP 2022 Bologna

Wednesday, August 7, 2019 3:50 PM (15 minutes)

Summary

Presenter: GIACOMELLI, Paolo (Universita e INFN, Bologna (IT))

Session Classification: C11 meeting

Contribution ID: **459** Type: **Poster submission**

Measurement of the Higgs boson production in association with a ttbar pair in the Higgs to diphoton decay channel, and search for the dimuon decay of the Higgs boson in pp collisions at a center-of-mass energy of 13 TeV with the ATLAS detector.

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Primary authors: FERRANDO, James Edward (Deutsches Elektronen-Synchrotron (DE)); ZHOU, Chen (University of Wisconsin Madison (US))

Presenter: WANG, Alex Zeng (University of Wisconsin Madison (US))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Standard Model (Higgs, Top, Electroweak, QCD)

Contribution ID: **460** Type: **Poster submission**

Taishan Antineutrino Observatory

Many reactor neutrino experiments observed a ˜6% deficit in the reactor antineutrino flux compare with the prediction. In addition, Daya Bay confirmed a new anomaly "5-MeV bump"in the spectrum shape. These anomalies require an accurate measurement of the reactor antineutrino spectrum.

The high energy resolution measurement will provide an essential reference spectrum to the JUNO experiment. Taishan Antineutrino Observatory(TAO) will have an energy resolution better than 3%/sqrt(E). It will help to reduce the model dependence for JUNO to determine the mass hierarchy. Except serve to JUNO, TAO will observe the fine structure of reactor neutrino spectrum, to provide a benchmark to nuclear databases.

TAO will use several tons of Gd-LS as target material to detect antineutrinos via inverse beta decay (IBD). SiPM, with photon detection efficiency ˜50%, is used as photon sensor which collects about 4500 photoelectrons at 1MeV energy. The detector including the Gd-LS, container (nylon ball contain, acrylic ball support), SiPM, etc will operate at -50oC to lower the dark noise of SiPM. TAO will be placed at 30m from the reactor core which has a thermal power of 4.6 GW.
This poster will present the simulation of TAO detector and the R&D progress.

Summary

Presenter: Dr WANG, Wei (IHEP)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **461** Type: **Plenary Talk**

Equity, Diversity and Inclusion in STEM: What it is, why you want it and how to get it

Monday, August 5, 2019 10:15 AM (35 minutes)

Summary

Presenter: Prof. COE, Imogen (Ryerson University)

Session Classification: Opening Session

Contribution ID: **462** Type: **Poster submission**

First physics run of the WAGASCI-BabyMIND detector with full setup

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

The WAGASCI experiment aims to measure the neutrino/anti-neutrino cross-section on water, hydrocarbon and their ratio with high detection efficiency for large-angle escaping muons. This is a phase-space region that is still largely unexplored by direct measurement. We plan to acquire enough statistics to measure both flux-integrated and differential cross-sections.

The purpose of this experiment is to constrain the main non-canceling systematic error for the neutrino oscillation analysis at T2K due to neutrino cross-section uncertainties. The WAGASCI detector was devised to get around some of the shortcomings of the ND280 detector, such as low sensitivity for side and backward going muons and relatively low H2O/CH ratio. Due to a novel 3D grid-like arrangement of scintillator strips creating water cells we achieve 4pi acceptance with an 80/20 H2O/CH ratio.

My poster, on behalf of the WAGASCI collaboration, describes in detail the new WAGASCI-BabyMIND setup. We already had a commissioning run last year with only a subset of the detectors. Aiming at the November 2019 Physics run, two side-going muon range detectors (Side MRD) and a forward-going magnetized muon spectrometer (Baby MIND) were added. Moreover, the DAQ and calibration software has been completely overhauled and improved (last year the WAGASCI detector operated with only minimal calibration).

Summary:
• Side MRDs: larger angular acceptance for outgoing muons;
• Baby MIND: charge ID for downstream muons to quantify wrong-sign backgrounds;
• 1-year data taking >5x10ˆ20 POT/year for each mode: ν & anti-ν;
• 1.5° off-axis studies: charge current σ(H2O), σ(CH), ratio σ(H2O)/σ(CH);
• Ready to take beam from November 2019;

Primary author: Mr PINTAUDI, Giorgio (Yokohama National University)

Presenter: Mr PINTAUDI, Giorgio (Yokohama National University)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **463** Type: **Poster submission**

Latest LHCb measurements of semileptonic b-hadron decays

Monday, August 5, 2019 3:48 PM (12 minutes)

Summary

Semileptonic b-hadron decays proceed via charged-current interactions and provide powerful probes for testing the Standard Model of particle physics and for for searching for New Physics effects. The large branching fractions, coupled with excellent particle identification capability and accurate reconstruction of decay vertices, enable the LHCb experiment to perform high-precision measurements of many key quantities, such as CKM matrix elements, b-hadron properties, and Lepton Universality. In this contribution, recent results, essential for testing Lepton Universality and understanding hadronic effects, are presented.

Primary author: MACCOLINI, Serena (Universita e INFN, Bologna (IT))

Presenter: MACCOLINI, Serena (Universita e INFN, Bologna (IT))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **464** Type: **Poster submission**

Flavour Physics at the High Luminosity LHC: LHCb Upgrade II

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The LHCb Collaboration is planning an Upgrade II, a flavour physics experiment for the high luminosity era. This will be installed in LS4 (2030) and targets an instantaneous luminosity of 1.5 x10ˆ34 cm-2 s-1, and an integrated luminosity of at least 300fb-1. Modest consolidation of the current experiment will also be introduced in LS3 (2025). Physics goals include probing new physics scenarios in lepton flavour universality, obtaining unprecedented precision on CKM tests, and expanding the LHCb programme into new measurement areas such as Higgs decays to charm. The detector design options include the introduction of timing information, with opportunities in vertexing and tracking, electromagnetic calorimetery, and hadron particle identification. Preliminary studies for the LHC suggest that the luminosity goals will be achievable. Following the issue of a physics case and accelerator note in 2018, the collaboration has been approved by the LHCC to proceed to the preparation of a TDR.

Primary author: MARIN BENITO, Carla (Centre National de la Recherche Scientifique (FR))

Presenter: MARIN BENITO, Carla (Centre National de la Recherche Scientifique (FR))

Session Classification: Poster Session (Mon/Tue)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **465** Type: **Poster submission**

Elastic neutrino-electron scattering within the effective field theory approach

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Elastic neutrino-electron scattering provides an important tool for normalizing neutrino flux in modern experiments. This process is subject to large radiative corrections. We determine the Fermi effective theory performing the one-loop matching to the Standard model at the electroweak scale with subsequent running down to low energies. Based on this theory, we analytically evaluate virtual corrections and distributions with one radiated photon beyond the electron energy spectrum and provide the resulting scattering cross sections quantifying errors for the first time. We discuss the relevance of radiative corrections depending on conditions of modern accelerator-based neutrino experiments.

Primary authors: Dr TOMALAK, Oleksandr (University of Kentucky); Prof. HILL, Richard (University of Kentucky and Fermilab)

Presenter: Dr TOMALAK, Oleksandr (University of Kentucky)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **466** Type: **Poster submission**

Vapour pressure differences of the Xenon Isotopes

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

A central topic in the development of understanding of the nature of neutrinos is the search for neutrinoless double beta decay. As increasingly sensitive detectors are required for such searches, a major cost and feasibility concern is the availability of sufficient separated isotope for the chosen target. 136Xe is a very attractive target for these studies. At present this isotope is only available from the Centrifuge systems in Russia. We are exploring the feasibility of doing this enrichment using distillation. To start this study we require the vapour pressure differences of the xenon isotopes which have not been measured to date. This paper will describe the measurement of these vapour pressures using a tall cryogenic distillation process.

Primary authors: ALAMRE, Amal (Carleton University); BADHREES, Ibtesam (Section de Physique); DEATH, Brandon Douglas (Carleton University (CA)); FARINE, Jacques (Laurentian University); LICCIARDI, Caio (Laurentian University); SINCLAIR, David (Carleton University)

Presenter: ALAMRE, Amal (Carleton University)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP

Contribution ID: **467** Type: **Poster submission**

Predicting the T2K far detector event rate using near detector data

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The Tokai to Kamioka (T2K) experiment is a long baseline neutrino oscillation experiment, using a nearly pure muon neutrino beam produced by the J-PARC accelerator. The neutrinos are produced on the east coast of Japan and then detected after travelling 295 km to the far detector, Super-Kamiokande (SK). A suite of detectors located 280 meters from the neutrino production target is used to measure both the neutrino beam direction and the neutrino interaction rate. Together these provide the predicted, unoscillated event rate at SK with a total uncertainty of around 6%. This talk will present the results of the T2K near detector fit used for this prediction, describing the fit method, how it informs the T2K neutrino interaction model and the expected improvements for future T2K oscillation analyses.

Primary author: HARTZ, Mark

Presenter: HARTZ, Mark

Session Classification: Poster Session (Mon/Tue)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **468** Type: **Poster submission**

LEGEND: Searching for Neutrinoless Double-Beta Decay in ^{76}Ge

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Neutrinoless Double-Beta Decay ($0\nu\beta\beta$) is a hypothetical process that violates lepton number, and whose observation would unambiguously indicate that neutrinos are Majorana fermions. Because of the long half-life of the decay–current experimental limits indicate $T_{1/2}^{0\nu\beta\beta} > 10^{26}$˜yr–at least a tonne-year of isotopic exposure with ultra-low background index of < 0.1˜counts/(FWHM-t-yr) in the region of interest of the decay are required. GERDA and the \textsc{Majorana Demonstrator} are currently operating experiments searching for $0\nu\beta\beta$ in ^{7}6Ge. Both experiments consist of arrays of P-type Point Contact (PPC) High-Purity Germanium (HPGe) detectors enriched in ^{7}6Ge and operating underground. These experiments have achieved the lowest background indexes and best energy resolution of any current-generation $0\nu\beta\beta$ search. By combining the techniques and technologies developed by these experiments, LEGEND (Large Enriched Germanium Experiment for Neutrinoless $\beta\beta$ Decay) will continue the search for $0\nu\beta\beta$ in ^{7}6Ge. LEGEND-200 is a 200-kg array of PPC HPGe detectors that will begin operating at LNGS with repurposed GERDA infrastructure in 2021, with a background goal of < 0.6˜counts/(FWHM-t-yr). LEGEND-1000 is a planned tonne-scale array that is currently undergoing R\&D.

Primary author: GUINN, Ian (University of North Carolina at Chapel Hill)

Presenter: GUINN, Ian (University of North Carolina at Chapel Hill)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **469** Type: **Poster submission**

CURRENT STATUS OF LEGEND

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

Neutrinoless double-beta (0νββ) decay is one of the most promising approaches to answer the question of whether neutrinos are Majorana particles. In the standard inverted-ordering neutrino mass scenario, the minimum possible value of mββ corresponds to a half-life around 10ˆ28 years for 0νββ decay in 76Ge, which is a target for next generation of 76Ge-based experiments.

GERDA and MAJORANA DEMONSTRATOR are the current generation of experiments searching for 0νββ decay in 76Ge. These experiments use high-purity germanium (HPGe) detectors that are highly-enriched in 76Ge. They have achieved the best intrinsic energy resolution and the lowest background rate in the signal search region among all 0νββ experiments.

Taking advantage of these successes, a new international collaboration - the Large Enriched Germanium Experiment for Neutrinoless ββ Decay (LEGEND) - has been formed to build, following a phased approach, a ton-scale experiment with discovery potential reaching a half-life of 1028 years or longer. The preparation for the first phase of LEGEND, where a 200 kg 76Ge detectors array will be deployed, is currently underway. In this talk, I will present the status of the ongoing efforts and an overview of the planning development and execution of LEGEND.

Primary author: LOPEZ, Mariano

Presenter: LOPEZ, Mariano

Session Classification: Poster Session (Mon/Tue)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **470** Type: **Parallel Session talk**

Measurement of Double Electron Capture of Xe-124 with XENON1T

Tuesday, August 6, 2019 5:30 PM (12 minutes)

Summary

Searches for dark matter use detectors that can measure the rarest events ever recorded. The XENON1T detector uses a dual phase liquid xenon time projection chamber (TPC) to search for dark
matter collisions with xenon atoms, but by reaching the lowest background ever achieved at the keV scale, it is also sensitive to other rare physics phenomena. The double electron capture of xenon-124 is one such phenomenon, and XENON1T was able to observe this decay and provide a half-life measurement for this decay of 1.8 X 10^22 years, the longest half-life ever directly observed experimentally.

Primary author: BROWN, Ethan

Presenter: BROWN, Ethan

Session Classification: Rare Event Detectors (Parallel)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **471** Type: **Poster submission**

Early physics prospects for radiative and electroweak penguin decays at Belle II

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

In the recent years, several measurements of B-decays with flavor changing neutral currents, i.e. $b \to s$ transitions hint at deviations from the Standard Model (SM) predictions.These decays are forbidden at tree-level in the SM and can only proceed via suppressed loop level diagrams. Rare decays of B mesons are an ideal probe to search for phenomena beyond the SM, since contributions from new particles can affect the decays on the same level as SM particles.

The Belle II experiment is a substantial upgrade of the Belle detector and operates at the SuperKEKB energy-asymmetric e^+e^- collider. Early physics goals of the Belle II physics program are to rediscover these rare decays. Especially radiative $b \to s\gamma$ decays can be rediscovered with only a small dataset and in near future Belle II can provide independent tests of recent anomalies in $b \to s\ell\ell$ decays. Ultimately, the unique setup at Belle II allows to study of modes with missing energies like $B \to K^*\nu\bar{\nu}$.

Primary author: YONENAGA, Masanobu (Tokyo Metropolitan University)

Presenter: YONENAGA, Masanobu (Tokyo Metropolitan University)

Session Classification: Poster Session (Thu/Fri)

Track Classification: Quark/Lepton Flavour Physics

Contribution ID: **472** Type: **Poster submission**

Precision Higgs Physics at the International Linear Collider

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The precision study of the 125 GeV Higgs boson offers a new window into the search for new physics beyond the Standard Model. To confront the predictions of models with new interactions, it is important that the experimental program be designed to achieve 1% precision over the full spectrum of Higgs boson couplings, with minimal model-dependence in the analysis and with tight control of systematic errors. This talk will explain how a precision Higgs program with these capabilities can be achieved at the proposed International Linear Collider. We will compare the capabilities of the ILC to those of the high-luminosity LHC and to those of other e+e- Higgs factory proposals.

Primary author: TIAN, Junping (The University of Tokyo)

Presenter: TIAN, Junping (The University of Tokyo)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Collider – Standard Model (Higgs, Top, Electroweak, QCD)

Contribution ID: **473** Type: **Poster submission**

Efficient Neutrino Oscillation Parameter Inference with Gaussian Processes

Thursday, August 8, 2019 10:40 AM (20 minutes)

Summary

Neutrino oscillation is so far the only experimental observation beyond the standard model. Many experiments have been set-up to measure the parameters governing the oscillation probabilities. Feldman-Cousins method is a unified approach to create frequentist confidence intervals near physical limits or with low statistics. It is broadly used in neutrino oscillation parameter extraction. However, the Feldman-Cousins method is very computationally expensive, on the order of tens of millions of CPU hours. In this work, we propose an iterative method using Gaussian Process to efficiently estimate a frequentist confidence contour for the neutrino oscillation parameters and show that it produces the same results at a small fraction of the computation cost of the standard Feldman-Cousins method.

Primary author: BIAN, Jianming (University of California Irvine (US))

Presenter: BIAN, Jianming (University of California Irvine (US))

Session Classification: Poster Session (Thu/Fri)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **474** Type: **Poster submission**

A proposed five kilo-ton Cherenkov scintillation detector at CJPL

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

We propose to build a Cherenkov scintillation detector with five kilo-ton target mass in the China Jinping Underground Laboratory (CJPL). The deepest vertical overburden and the longest distance to any commercial nuclear power plants enable us to carry out advance low-energy neutrino experiments for solar neutrino, geo-neutrino and supernova neutrino physics studies. Simulation studies have been done on the physics sensitivities and background sources. We have made progress on the development of the slow scintillation technique and the optimization of the detector geometry. Results on a prototype detector running in CJPL are also presented.

Primary author: LUO, Wentai (University of Chinese Academy of Sciences)

Presenter: LUO, Wentai (University of Chinese Academy of Sciences)

Session Classification: Poster Session (Mon/Tue)

Track Classification: Neutrino Oscillations and Masses

Contribution ID: **475** Type: **not specified**

Neutrino panel update - Executive session

Wednesday, August 7, 2019 4:20 PM (15 minutes)

Presenter: SMITH, Nigel (SNOLab)

Session Classification: C11 meeting

Contribution ID: **476** Type: **Poster submission**

Vector Boson Scattering in Semi-leptonic Final States with the ATLAS Detector

Friday, August 9, 2019 6:08 PM (4 minutes)

Summary

Presenter: LES, Robert (University of Toronto (CA))

Session Classification: Prize Winners from Poster Session

Contribution ID: **477** Type: **Poster submission**

Light detection in DUNE Dual Phase

Friday, August 9, 2019 6:00 PM (4 minutes)

Summary

Presenter: SOTO-OTÓN, Jose Alfonso (ciemat)

Session Classification: Prize Winners from Poster Session

Contribution ID: **478** Type: **Poster submission**

Calibration and Performance of the ATLAS Tile Calorimeter During the LHC Run 2

Friday, August 9, 2019 6:04 PM (4 minutes)

Summary

Presenter: PETUKHOVA, Krystsina (Charles University (CZ))

Session Classification: Prize Winners from Poster Session

Contribution ID: **479** Type: **Poster submission**

Flavour Physics at the High Luminosity LHC: LHCb Upgrade II

Friday, August 9, 2019 6:12 PM (4 minutes)

Summary

Presenter: MARIN BENITO, Carla (Centre National de la Recherche Scientifique (FR))

Session Classification: Prize Winners from Poster Session