XIV Latin American Symposium on High Energy Physics

Monday, 14 November 2022 - Friday, 18 November 2022

Book of Abstracts

Contents

2

Welcome and opening

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / **5**

DNNs and Jet Substructure for Improved Double-Higgs Searches at the HL-LHC and Beyond

Author: Santiago Rafael Paredes Saenz[1]

[1] *Universite Libre de Bruxelles (BE)*

Corresponding Author: santiago.paredes@cern.ch

Searches for pairs of Higgs bosons will be, in all likelihood, important tools both to precisely measure the properties of the Higgs boson and to probe new physics at the High-Luminosity LHC and beyond. This process allows to measure the boson's self-coupling λ_{hhh}, which would reveal clues about the early universe and the dynamics of electroweak symmetry breaking. We extend current experimental techniques to search for this process in the $hh \to b\bar{b}b\bar{b}$ final state, in various ways, including the implementation of a deep-neural-network-based approach to separate signal and background where we apply recent advances in machine learning interpretability, and a comparison of the traditional 4 b-jet reconstruction to final states with 1 or 2 large-radius jets, among other factors.
Based on arXiv:2004.04240.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Plenary session / **7**

Astrophysics and fundamental physics from high-energy cosmic messengers

Author: Mauricio Bustamante[1]

[1] *Niels Bohr Institute*

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High-energy gamma rays, cosmic rays, and neutrinos are messengers of violent astrophysical phenomena and probes of fundamental physics at extreme energies. Tremendous experimental advance has unlocked vast potential for progress in both directions. First, I will present the basics of high-energy particle production at astrophysical sites. Then I will showcase the main lessons learned and their consequences for our understanding of high-energy astrophysics and fundamental physics. A rich experimental program, currently under planning, holds the promise of transformative understanding in the coming 10-20 years.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **8**

New Physics with Gravitational Waves

Author: James Dent[None]

Corresponding Author: jbdent@shsu.edu

This talk will touch on several searches for new physics with gravitational wave signatures including primordial black holes, superradiance, and first order phase transitions. An overview of present and future observational approaches to detecting gravitational waves across a broad range of frequencies will also be given.

Poster fallback option for rejected abstracts for parallel oral presentations:

Pizza and poster session / **9**

On the viability of a light scalar spectrum for 3-3-1 models

Author: Adriano Cherchiglia[1]

[1] *Universidade Estadual de Campinas*

Corresponding Author: alcherchiglia.fis@gmail.com

In this work we study an effective version of the 3-3-1 model, in which the particle content is the same of the 2HDM. We show that the inherited structure from the $SU(3)_C \otimes SU(3)_L \otimes U(1)_X$ gauge group has a series of consequences, the most relevant one being the prediction of the masses of the neutral scalar to be of the order or lower than the mass of the charged scalar. Given current constraints from collider searches, B-physics, as well as theoretical constraints such as perturbativity of quartic couplings and stability of the scalar potential, we find that the new scalars cannot be lighter than 350 GeV.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / **10**

Leptonic CP violation from a vector-like lepton

Authors: Adriano Cherchiglia[1]; Celso Nishi[2]; George De Conto Santos[3]

[1] *Universidade Estadual de Campinas*

[2] *UFABC, Santo André, SP, BRAZIL*

[3] *UNESP - Universidade Estadual Paulista (BR)*

Corresponding Author: alcherchiglia.fis@gmail.com

Leptonic CP violation is yet to be confirmed as an additional source of CP violation in fundamental interactions.

We study the case where leptonic CP violation is spontaneous and is induced by the mixing with a heavy charged vector-like lepton (VLL).
We show that the non-decoupling of this VLL is linked with the presence of CP violation and its coupling with the SM leptons are partly fixed from the SM Yukawas.
Due to the large leptonic mixing angles, these couplings are typically of the same order and there is no flavor preference.
Strong but not definitive constraints come from charged lepton flavor violating processes because the VLL can decouple from one or two leptonic flavors in very special points of parameter space.
These special points are very sensitive to the neutrino Majorana phases.

Poster fallback option for rejected abstracts for parallel oral presentations:

Plenary session / **11**

Black holes: on the universality of the Kerr hypothesis

Author: Carlos Herdeiro[1]

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To what extent are all astrophysical, dark, compact objects both black holes (BHs) and described by the Kerr geometry? We embark on the exercise of defying the universality of this remarkable idea, often called the "Kerr hypothesis". After establishing its rationale and timeliness, we define a minimal set of reasonability criteria for alternative models of dark compact objects. Then, as proof of principle, we discuss concrete, dynamically robust non-Kerr BHs and horizonless imitators, that 1) pass the basic theoretical, and in particular dynamical, tests, 2) match (some of the) state of the art astrophysical observables and 3) only emerge at some (macroscopic) scales. These examples illustrate how the universality (at all macroscopic scales) of the Kerr hypothesis can be challenged.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / **12**

Ultracompact stars with polynomial complexity by Gravitational Decoupling

Authors: Ernesto Contreras[1]; Mikaela Carrasco[1]

[1] *Universidad San Francisco de Quito*

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Ultracompact stars or "gravastars"were modeled firstly by Mazur and Mottola (MM) by the use of the Schwarzschild interior solution in a special case. Recently, the MM model has been extended to anisotropic domains by the Gravitational Decoupling (GD) through the Minimal Geometric Deformation (MGD) approach. In contrast to the original solution, the resulting configuration can be matched smoothly with a modified vacuum so the thin shell approach can be avoided
In this work we construct an ultracompact star configuration in the framework of Gravitational Decoupling by the Minimal Geometric Deformation approach. We use the complexity factor as a complementary condition to close the system of differential equations. It is shown that for a polynomial complexity the resulting solution can be matched with two different modified - vacuum geometries. The solution fulfill the requirements of a stable configuration, namely, i) the solution is regular at the origin, ii) the mass and the radius are well defined, iii) the density is positive everywhere and

decreases monotonically to the surface and iv) the radial pressure is non–uniform and monotonic as expected.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session B / 13

Traversable wormholes with like-Casimir complexity supported with arbitrarily small amount of exotic matter

Authors: Ernesto Contreras[1]; Ernesto Fuenmayor[None]; Roberto Avalos[None]

[1] *Universidad San Francisco de Quito*

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In this work we construct traversable wormholes geometries in the framework of the complexity factor. We provide the redshift function of a Casimir traversable wormhole which, in combination with a non-vanishing complexity factor, leads to a traversable wormhole with a minimum amount of exotic matter. The shape function and the embedding diagram are shown and discussed. The tidal accelerations and the time required to get through the wormholes are estimated.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Pizza and poster session / 14

Construction of a traversable wormhole from a suitable embedding function

Authors: Alejandro Rueda[1]; Ernesto Contreras[1]; Roberto Avalos[None]

[1] *Universidad San Francisco de Quito*

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In this work, we construct a traversable wormhole by providing a suitable embedding function ensuring the fulfilling of the flaring–out condition. The solution contains free parameters that are reduced through the study of the acceptable conditions of a traversable wormhole. We compute both the quantifier of exotic matter and the quasi–normal modes through the 13^{th} order WKB as a function of the remaining free parameters. We obtain that the wormhole geometry can be sustained by a finite amount of exotic matter and seems to be stable under scalar perturbations.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session B / **15**

A novel search for gravitational waves inspired by axion dark matter

Author: Camilo Alfredo García-Cely[1]

[1] *University of Valencia*

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Ideas originally developed for axion dark matter can be adopted to search for high-frequency gravitational waves. To illustrate this, I will discuss the Gertsenshtein effect, or the inter-conversion of gravitational waves into electromagnetic waves in the presence of external magnetic (or electric) fields. Exploiting the analogy with axions I will show that axion haloscopes based on lumped-element detectors can probe gravitational waves in the 100 kHz-100 MHz range. Finally, I will discuss the corresponding detection prospects of primordial-black-hole binaries.

Based on
Phys.Rev.Lett. 129 (2022) 4, 041101
Phys.Rev.Lett. 126 (2021) 2, 021104

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Plenary session / **16**

New physics tests in lepton decays

Author: Pablo Roig Garcés[None]

Corresponding Author: paroig@gmail.com

In the first part of the talk I will present our new analysis of Michel parameters in the presence of massive Dirac and Majorana neutrinos. In the second one I will summarize our improved radiative corrections for the one-meson tau decays and discuss the new physics tests (lepton universality, CKM unitarity and non-standard interactions) done with them.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session B / **17**

LA-CoNGA physics: a case study for open science education collaboration between Latin America and Europe

Author: Dennis Cazar Ramirez[1]

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In the era of information technology higher education and resarch is rapidly globalizing, links scientists institutions, society and industry are strengthened and discussions about adopting Open Science principles is on the table. Virtual Learning Comunities (VRLC) play a fundamental role in modernization and internationalization of higher education. VRLCs create new opportunities: interinstitutional links favoring internationalization and diversity, interconnected e-infrastructure, open data and increase scientific production. Moreover, VRLCs offer access to data and experimental facilities not available locally.

In Latin America, the communities of astrophysics, astronomers and particle physicists have been pioneers in establishing VRLCs, generating international collaborations based on virtual research environments.

LA-CoNGA physics (Latin American alliance for Capacity buildiNG in Advance physics) is a VRLC with Open Science education and Open Data are at the heart of its operations. LA-CoNGA physics community is composed by 11 universities (3 in Europe and 8 in Latin America) and 12 research and industrial partners developing an innovative e-learning platform distributed in 8 universities in Venezuela, Colombia, Ecuador and Peru. LA-CoNGA Physics will offer open access tools, interconnected laboratories, and a flexible problem-solving-oriented curriculum in a network of academic and industrial partners. The project is co-founded by the Erasmus+ Capacity Building program.

This work describes the importance, results and challenges of these networks in the context of higher education and research in Latin America and the Caribbean and in the crisis context we are living today.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Plenary session / **18**

The Higgs after LHC: from the HL-LHC to future colliders

Author: Laura Reina[1]

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Almost half a century after it was predicted, the LHC delivered the Higgs boson in spectacular style. Over the next 15-20 years, the machine and its luminosity upgrade will continue to enable ATLAS and CMS to make great strides in understanding the Higgs-boson's properties. But to fully explore the scalar sector and its possible connections with the SM's most mysterious features, and thus to fully exploit the discovery of the Higgs boson and fully explore its mysterious relation to new physics beyond the EW scale, the luminosities and energies of future colliders will be needed.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session B / **19**

Quantum thermodynamics of coronal heating

Authors: Alejandro Jenkins[1]; Robert Alicki[2]

[1] *Universidad de Costa Rica*

[2] *University of Gdansk*

Corresponding Author: alejandro.jenkins@gmail.com

We show that convection cells in the stellar photosphere generate plasma waves by a process akin to sonic booms and Zeldovich superradiance. Our theoretical approach is based on the Markovian master equation for each mode of the quantum field corresponding to such waves. For the Sun, this mechanism is most efficient in quiet regions with small magnetic fields. Energy is mostly carried by Alfven waves with frequencies in the megahertz range. These waves scatter elastically until they reach a height at which they can dissipate via mode conversion. This gives the right power flux for coronal heating and can account for chromospheric evaporation, leading to impulsive heat transport in the corona. Our results may also help to clarify why quantum foundations are necessary to describe properly the statistical physics of irreversible process involving the interaction of macroscopic waves with thermal environments.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Parallel session B / **20**

Forecasts on the speed of gravitational waves at high z.

Author: Alexander Bonilla[None]

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The observation of GW170817 binary neutron star (BNS) merger event has imposed strong bounds on the speed of gravitational waves (GWs) locally, inferring that the speed of GWs propagation is equal to the speed of light. Current GW detectors in operation will not be able to observe BNS merger to long cosmological distance, where possible cosmological corrections on the cosmic expansion history are expected to play an important role, specially for investigating possible deviations from general relativity. Future GW detectors designer projects will be able to detect many coalescences of BNS at high z, such as the third generation of the ground GW detector called Einstein Telescope (ET) and the space-based detector deci-hertz interferometer gravitational wave observatory (DECIGO). In this paper, we relax the condition $c_T/c = 1$ to investigate modified GW propagation where the speed of GWs propagation is not necessarily equal to the speed of light. Also, we consider the possibility for the running of the Planck mass corrections on modified GW propagation. We parametrize both corrections in terms of an effective GW luminosity distance and we perform a forecast analysis using standard siren events from BNS mergers, within the sensitivity predicted for the ET and DECIGO. We find at high z very strong forecast bounds on the running of the Planck mass, namely $\mathcal{O}(10^{-1})$ and $\mathcal{O}(10^{-2})$ from ET and DECIGO, respectively. Possible anomalies on GW propagation are bound to $|c_T/c - 1| \leq 10^{-2}$ (10^{-2}) from ET (DECIGO), respectively. We discuss our results on modified gravity.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / **22**

Neutron Inelastic Cross Section Measurement on Argon with ProtoDUNE Single-Phase

Author: David Orlando Rivera Jr[1]

[1] *Los Alamos National Laboratory (US)*

Corresponding Author: rivera@lanl.gov

The Deep Underground Neutrino Experiment (DUNE) is a long baseline, neutrino oscillation experiment designed to measure Charge Parity Violation in the neutrino sector using liquid argon as the primary detector medium. DUNE's main physics program is centered around measuring the flavor profile of beams in neutrino and anti-neutrino modes, as a function of energy, both at the near and the far detector, and will rely on accurate event reconstruction to do so. Understanding the detector response to neutrons will be critical for performing neutrino oscillation analyses in DUNE because they can elude detection resulting in missing energy. In addition to the primary neutrons produced in neutrino interactions, subsequent interactions of any charged hadrons produced can result in secondary neutrons. ProtoDUNE Single-Phase sits in a testbeam and is a 770-ton prototype of the DUNE far detector designed to validate technology and measure charged hadron cross sections at the relevant energies for DUNE; therefore, it is ideal for studying the secondary neutron component. This talk presents a search for neutrons produced in 1 GeV/c pion interactions and then shows a neutron inelastic cross section measurement in liquid argon using a sample of selected neutrons.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / 23

From initial gluon saturation to final state hadrons: quantum entanglement in particle collisions

Author: Rene Bellwied[1]

[1] *University of Houston (US)*

Corresponding Author: rene.bellwied@cern.ch

I will review the latest hadronization studies in the strange and charm sector based on LHC/RHIC rare particle production measurements. I will show a new approach that might link an initially entangled parton state to final state hadron multiplicities. This initial state can also serve as a seemingly thermalized system to explain the necessary basis for the hydrodynamical evolution of deconfined matter.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Parallel session A / 24

Effective Dirac neutrino masses in local Abelian symmetries

Author: DIEGO ALEJANDRO RESTREPO QUINTERO[None]

Corresponding Author: restrepo@udea.edu.co

In local Abelian symmetries extra SM-singlet chiral fermions must be introduced to cancel out the anomalies. We study the conditions to choose a subset of them as the right-handed companions of effective Dirac neutrino masses along with the dark matter candidates on dark sectors that also can generate the required asymmetry between matter and antimatter in the Universe

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / **25**

The X17 boson anomaly: status and prospects

Author: Enrico Nardi[1]

[1] *INFN Laboratori Nazionali di Frascati*

Corresponding Authors: enrico.nardi@cern.ch, enrico.nardi@lnf.infn.it

Certain anomalies observed in the angular correlation spectra of electron/positron pairs produced in nuclear transitions of ⁸Be, ⁴He and ¹²C can be interpreted as the emission of a bosonic particle with a mass of 17 MeV, that promptly decays into e⁺e[−]. I review the current status of these anomalies and the theoretical interpretation for the hypothetical new particle. I will also describe the experimental prospects for validating or disproving the X17 hypothesis, and I will stress the importance of verifying the experimental nuclear physics hint by means of a particle physics experiment.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Pizza and poster session / **26**

Seeking $SU(3)_c \otimes SU(3)_L \otimes U(1)_X$ models without exotic electrical charges

Author: Yithsbey Giraldo Úsuga[1]

Co-authors: Richard Benavides ; WILLIAM ANTONIO PONCE GUTIERREZ ; Luis Muñoz [2]; Eduardo Rojas

[1] *Universidad de Nariño*

[2] *ITM*

Corresponding Author: yithsbey@gmail.com

We review in a systematic way how anomaly free $SU(3)_c \otimes SU(3)_L \otimes U(1)_x$ models without exotic electric charges can be constructed, using as basis closed sets of fermions which includes each one the particles and antiparticles of all the electrically charged fields. Our analysis reproduces not only the known models in the literature, but also shows the existence of several more independent models for one and three families not considered so far. A phenomenological analysis of the new models is done, where the lowest limits at a 95 \% CL on the gauge boson masses are presented.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / **29**

Ultra-Light Dark Matter models and some observational probes

Author: Diana Laura Lopez Nacir[1]

[1] *Universidad de Buenos Aires (AR)*

Corresponding Author: dnacir@df.uba.ar

I will consider some examples of Dark Matter (DM) models where the DM can be described by a collection of oscillating (scalar, vector or tensor) waves. I will present the basic phenomenology and recent results on some observational probes that are useful to probe models of ultra-light DM.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Pizza and poster session / 30

Five texture zeros in the lepton sector and neutrino oscillations at DUNE

Author: Richard Benavides[None]

Co-authors: Alejandro Rico [1]; Alex Tapia [2]; David Vanegas [2]; Jose Muñoz [3]; Luis Muñoz [1]

[1] *ITM*

[2] *UdeM*

[3] *EIA*

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In this work, we have assumed special structures for the charged and neutral mass matrices in the lepton sector, inspired by structures for the up and down quark mass matrices that result by assuming a certain number of symmetrical zeros in their entries named texture zeros. A prediction of the lepton mixing matrix results from the rotation matrices that diagonalize the mass matrices in the neutral and charged lepton sectors. The use of texture zeros reduces the number of spurious parameters to the minimal ones needed to explain observations i.e. charged lepton masses and neutrino oscillation parameters. Specifically, we have considered the case of five texture zeros and we have confronted the resulted lepton mixing matrices with current measurements in the neutrino sector. Finally, sensitivities to the independent parameters in the mixing predicted by the nonequivalent forms were studied using simulated events at the DUNE neutrino oscillation experiment. We have found that DUNE is sensitive to non-zero CP-violation allowed in the models

Poster fallback option for rejected abstracts for parallel oral presentations:

Plenary session / 31

ALICE Recent Results and Perspectives for Run 3

Author: Marcelo Gameiro Munhoz[1]

[1] *Universidade de Sao Paulo (BR)*

Corresponding Author: munhoz@if.usp.br

One of the main goals of the ALICE (A Large Ion Collider Experiment) collaboration is the precise study of the properties of the so-called quark–gluon plasma (QGP), the state of deconfined nuclear matter produced in heavy-ions collisions at relativistic energies. The ALICE experiment design was optimized to study this kind of collision with detectors able to identify hadrons, leptons and photons with pristine particle identification and high precision track reconstruction in a large phase space taking care of thousands of particles produced simultaneously. Additionally, measurements of several observables in proton-proton and proton-lead collisions provide important references for the QGP studies and extend the scope of the experiment to several topics beyond the deconfined nuclear matter. In this talk, I will present an overview of the most recent results of the ALICE experiment and the perspectives regarding the LHC Run 3.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **33**

QCD Equation of State

Author: Claudia Ratti[None]

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I will review the status of the QCD equation of state from first principles lattice QCD simulations. I will discuss a new expansion scheme, which allows to significantly extend the chemical potential coverage. I will also talk abourt phenomenological methods to extrapolate to the neutron star merger regime.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Pizza and poster session / **34**

Model-independent radiative corrections to particle decay $\Omega^- \to \Xi^0 + \bar{\nu}_{e^-} + e^-$

Authors: Miguel Neri Rosas[1]; Albino Hernández Galeana[None]; Marco Antonio Pulido Solis[None]

[1] *ESFM-IPN*

Corresponding Author: mapulido1989@gmail.com

We calculate radiative corrections to the differential decay rate of the process $\Omega^- \to \Xi^0 + \bar{\nu}_{e^-} + e^-$ following the method used by Sirlin. Radiative corrections can be separated into model-independent and model-dependent parts. Here we consider only the independent part of the model and the Dalitz plot of this decay is obtained from it. This method has been implemented in the analysis of decays of mesons and spin 1/2 baryons obtaining several physical observables of these processes that, when compared with experimental results, it was possible to obtain information on some parameters such as shape factors. In our work, this method is used for the decay of Ω^-, which is a spin 3/2 particle, in order to obtain information on parameters that can be determined experimentally.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Pizza and poster session / **35**

Faddeev-Jakiw Formulation to Schwinger Model on the Null-Plane

Author: German Ramos Zambrano[1]

Co-author: Bruto Max Pimentel [2]

[1] *Universidad de Nariño*

[2] *Instituto de Fisica Teòrica (IFT/UNESP), UNESP - Sao Paulo State University*

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We study the Schwinger Model on the null-plane using the Faddeev-Jackiw procedure for constrained systems. The generalized symplectic formalism quantization method determine the zero modes of the symplectic matrix and the generators of the gauge transformation. After fixing the null-plane gauge, the generalized brackets are calculated and the commutation relations of the theory are deduce.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / **36**

B-meson anomalies and the Triplet vector boson model.

Authors: Eduardo Rojas[None]; José Herman Muñoz[1]; José Miguel Cabarcas[2]; Nestor Quintero Poveda[3]

[1] *Universidad del Tolima*

[2] *Universidad Santo Tomás*

[3] *Universidad Santiago de Cali*

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The triplet vector boson (TVB) is a simplified new physics model involving massive vector bosons transforming as a weak triplet vector, which it has been proposed as a combined explanation to the anomalous $b \to s\mu^+\mu^-$ and $b \to c\tau\bar{\nu}_\tau$ data (the so-called B meson anomalies). In this work, we carry out an updated view of the TVB model, including the Belle II perspectives. We perform a global fit to explore the allowed parameter space by the most current $b \to s\mu^+\mu^-$ and $b \to c\tau\bar{\nu}_\tau$ data, by considering all relevant low-energy flavor observables. Our results are confronted with the most recent LHC constraints. We also incorporate in our study the first measurement on the ratio $R(\Lambda_c) = \mathrm{BR}(\Lambda_b \to \Lambda_c\tau\bar{\nu}_\tau)/\mathrm{BR}(\Lambda_b \to \Lambda_c\mu\bar{\nu}_\mu)$ very recently obtained by LHCb. In particular, we show that the TVB model can provide an explanation to the B meson anomalies; however, this framework is in strong tension with LHC bounds. In respect to future flavor measurements at Belle II, our results suggest that a small new physics window would be allowed to solely explain the $b \to c\tau\bar{\nu}_\tau$ data in agreement with LHC constraints. Furthermore, the implications of our phenomenological analysis of the TVB model to some known flavor parametrizations are also discussed.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 38

Quarkophobic W' for LHC searches

Authors: Alfredo Gurrola[1]; Jose Ruiz[2]

[1] *Vanderbilt University (US)*

[2] *Universidad de Antioquia (CO)*

Corresponding Author: jose.ruiz@cern.ch

We consider a simplified model where a W' boson is added to the standard model with negligible couplings to quarks, but generic couplings to leptons and electroweak bosons. We study the implications of such a model for LHC searches. Consequently, we propose an LHC search through the vector boson fusion topology which would have sensitivity for such a new particle with the current proton-proton collisions's energy and available luminosity.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Parallel session B / 39

Performance and Geant4 simulation of particle detection with low-cost CMOS technology

Authors: Miguel Bonnett[1]; Rodrigo Helaconde[1]; Carlos Soncco[1]; Jose Bazo[2]; Alberto Gago[1]; José Bazo[None]

[1] *Pontificia Universidad Catolica del Peru*

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Low-cost imaging technology is widely used for particle detection. In this work, we test the performance of an Omnivision 5 Mp CMOS sensor for measuring radioactive sources (Sr90 and Cs137). Our experimental setup includes a light-tight box, a lift table and a Raspberry Pi 3 for data taking using fixed camera settings. To reduce the background we apply a correlated double sampling method for the fixed pattern and 3 sigma threshold in ADC. We developed a detailed Geant4 simulation of the sensor and the radioactive sources given their activities. The matrix of deposited energy in the sensor's pixels is converted into 10-bit ADC values via an electron-hole transformation. In addition, we include the crosstalk caused by inter-pixel capacitance with a two-dimensional symmetry model. Using the OpenCV libraries, clusters, representing particle tracks, are searched for in all images. For each cluster we get its size, mean, maximum and total ADC signal. We find a good agreement between measured data and simulations for these parameters and their correlations, and for the fluxes at different distances. However, it is not possible to distinguish between radioactive sources using this method.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Plenary session / 40

Cosmology with state-of-the-art photometric galaxy surveys - Dark Energy Survey and Legacy Survey of Space and Time

Author: Rogerio Rosenfeld[1]

[1] *Instituto de Física Teórica - UNESP & ICTP-SAIFR*

Corresponding Author: rogerio.rosenfeld@unesp.br

I will present the cosmological results from the Dark Energy Survey (DES) analysis of data collected over three years, the so-called DES-Y3 data, focusing on the contributions from our group. These results arise from studying three combinations of two-point angular correlation functions (the so-called 3x2pt analysis) involving the distribution of galaxies and the distortions in their images due to weak gravitational lensing, as well as the detection of the baryon acoustic oscillation (BAO) feature. DES will be succeeded by the Rubin Observatory Legacy Survey of Space and Time and I will discuss the opportunities for our community in this project.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session A / 41

Improving Signal Significance of SUSY Compressed Scenarios by Machine Learning Algorithms

Author: Jorge Fernando Fraga Flores[1]

Co-authors: Carlos Arturo Avila Bernal [2]; Jesus Solano ; Juan Molano ; Ronald Rodriguez

[1] *Universidad de los Andes (CO)*

[2] *Universidad de los Andes*

Corresponding Author: jf.fraga@uniandes.edu.co

In this study we evaluate the performance of various machine learning (ML) algorithms for discriminating a SUSY signal from its standard model backgrounds in order to enhance the significance of finding these hypothetical particles. For this aim, we use a case of study of Monte Carlo production of SUSY top squarks from proton collisions at $\sqrt{s} = 13$ TeV with a luminosity of 140 fb^{-1}, following the LHC-Run2 data-taking conditions. We focus on the semileptonic channel of the top squark decay, with mass points along the so-called compressed scenarios. Four ML algorithms have been probed trying to cover different mathematical approaches, for instance: a Logistic Regression (LR), a Random Forest (RF), a Gradient Boost (GB) and a neural network (NN). We compare the performance at maximizing the significance of these ML classifiers with respect to a standard cut-and-count method. As a result we observe that the NN and XG have the best performances with $\sim$17\% improvements followed by the RF algorithm. On the other hand, the LR shows the poorest performance with significances even lower than the reported by the cut-and-count method.

This work has been submitted for publication to International Journal of Modern Physics A (IJMPA) and a preprint has been uploaded to \hyperlink{https://arxiv.org/abs/2106.06813}{arXiv:2106.06813}

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 42

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

Authors: ATLAS Collaboration[None]; Dan Guest[1]

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In the Standard Model, the ground state of the Higgs field is not found at zero but instead corresponds to one of the degenerate solutions minimising the Higgs potential. In turn, this spontaneous electroweak symmetry breaking provides a mechanism for the mass generation of nearly all fundamental particles. The Standard Model makes a definite prediction for the Higgs boson self-coupling and thereby the shape of the Higgs potential. Experimentally, both can be probed through the production of Higgs boson pairs (HH), a rare process that presently receives a lot of attention at the LHC. In this talk, the latest HH searches by the ATLAS experiment are reported, with emphasis on the results obtained with the full LHC Run 2 dataset at 13 TeV. Non-resonant HH search results are interpreted both in terms of sensitivity to the Standard Model and as limits on the Higgs boson self-coupling. The Higgs boson self-coupling can be also constrained by exploiting higher-order electroweak corrections to single Higgs boson production. A combined measurement of both results yields the overall highest precision, and reduces model dependence by allowing for the simultaneous determination of the single Higgs boson couplings. Results for this combined measurement are also presented.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 43

Searching for new symmetries in the Higgs sector at ATLAS

Authors: ATLAS Collaboration[None]; Adriana Milic[1]

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The discovery of the Higgs boson with the mass of 125 GeV confirmed the mass generation mechanism via spontaneous electroweak symmetry breaking and completed the particle content predicted by the Standard Model. Even though this model is well established and consistent with many experimental measurements, it is not capable of solely explaining some observations. Many extensions of the Standard Model introduce additional scalar fields to account for the electroweak symmetry breaking and thereby extra Higgs-like bosons, which can be either neutral or charged. This talk presents recent searches for additional low- and high-mass Higgs bosons, as well as decays of the 125 GeV Higgs boson to new light scalar particles, using LHC collision data at 13 TeV collected by the ATLAS experiment in Run 2.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 44

Recent searches for new phenomena with the ATLAS detector

Authors: ATLAS Collaboration[None]; Sebastien Rettie[1]

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Many theories beyond the Standard Model (BSM) have been proposed to address several of the Standard Model shortcomings, such as the origin of dark matter and neutrino masses, the fine-tuning of the Higgs boson mass, or the observed pattern of masses and mixing angles in the quark and lepton sectors. Many of these BSM extensions predict new particles or interactions directly accessible at the LHC. This talk will present some highlights on recent searches based on the the full Run 2 data collected by the ATLAS detector at the LHC with a centre-of-mass energy of 13 TeV. These include searches for leptoquarks and vector-like fermions, new high mass resonances and lepton flavour violating decays, dark sector searches, as well as searches for new phenomena giving unconventional and/or long-lived particle signatures.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 47

ATLAS searches for supersymmetry with prompt particles

Authors: ATLAS Collaboration[None]; David Miller[1]

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Supersymmetry (SUSY) provides elegant solutions to several problems in the Standard Model, and searches for SUSY particles are an important component of the LHC physics program. This talk will present the latest results from SUSY searches conducted by the ATLAS experiment. The searches target multiple final states and different assumptions about the decay mode of the produced SUSY particles, including searches for both R-parity conserving models and R-parity violating models and their possible connections with the recent observation of the favour and muon g-2 anomalies. The talk will also highlight the employment of novel analysis techniques, including advanced machine learning techniques and special object reconstruction, that are necessary for many of these analyses to extend the sensitivity reach to challenging regions of the phase space.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 48

ATLAS searches for supersymmetry with long-lived particles

Authors: ATLAS Collaboration[None]; Risa Ushioda[1]

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Various Supersymmetry (SUSY) scenarios, including split SUSY and anomaly or gravity-mediated SUSY-breaking scenarios, lead to signatures with long-lived particles. Searches for these processes may target either the long lived particle itself or its decay products at a significant distance from the collision point. These signatures provide interesting technical challenges due to their special reconstruction requirements as well as their unusual backgrounds. This talk will present recent results in long-lived SUSY searches using ATLAS Run 2 data.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 49

A highlight of multiboson interactions, their polarization and photon-induced access to tau g-2 at ATLAS

Authors: ATLAS Collaboration[None]; Prachi Atmasiddha[1]

[1] *University of Michigan, Ann Arbor*

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Measurements of multiboson production at the LHC are fundamental probes of the electroweak gauge structure of the Standard Model. With the large data samples from the LHC, processes involving quartic gauge boson couplings are now accessible. In this talk we present recent ATLAS results of quartic interactions including measurements with three gauge bosons in the final state. These results are interpreted via an Effective Field Theory analysis of anomalous quartic gauge self-interaction. In addition we will present a first measurement of di-boson polarization at the LHC. Finally, we will show how high statistics measurements of photon-induced tautau production in lead-lead collisions provide a precise and unique opportunity to investigate fundamental parameters like tau lepton's anomalous magnetic dipole moment.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session A / 50

Higgs boson property measurements at the ATLAS experiment

Authors: ATLAS Collaboration[None]; Gabriel Facini[1]

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Very detailed measurements of Higgs boson properties can be performed with the Run 2 13 TeV pp collision dataset collected by the ATLAS experiment. This talk presents a review of the latest measurements of the Higgs boson properties, including its mass, CP, differential cross-sections . Furthermore, couplings combining measurements targeting various production modes and decay channels are reported. Specific results on production mode cross sections, Simplified Template Cross Sections, and their interpretations are presented. These measurements are used to test specific scenarios of physics beyond the Standard Model, as well as its extension in the framework of Effective Field Theories.

Poster fallback option for rejected abstracts for parallel oral presentations:

Plenary session / 51

LHCb status and perspectives for Run 3

Author: Irina Nasteva[1]

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The LHCb detector at the LHC is a forward spectrometer designed for the study of CP violation and rare decays of c- and b-hadrons. During Runs 1 and 2, it accumulated the largest samples of these hadrons in the world and contributed to a broad range of physics topics beyond its original purpose. The status of the experiment is discussed, together with a review of the latest physics results, such as CP violation in beauty and charm decays, exotic hadron spectroscopy and lepton flavour universality tests. We also present the recently completed Upgrade I of the LHCb detector and the perspectives for Run 3.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session A / **52**

Status and perspectives of the CONNIE experiment

Author: Irina Nasteva[1]

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The Coherent Neutrino-Nucleus Interaction Experiment (CONNIE) aims to detect the coherent elastic neutrino-nucleus scattering (CEvNS) of reactor antineutrinos off silicon nuclei using fully depleted high-resistivity charge-coupled devices (CCDs). The detector is located at a distance of 30 m from the core of the 3.8 GW Angra 2 nuclear reactor in Rio de Janeiro, Brazil. With an active mass of 50 g, a readout noise better than 2 e- RMS and using data from 2016-2018, it was possible to set a 95% C.L. upper limit on the coherent scattering rate, which was used to place stringent constraints on simplified extensions of the Standard Model with light mediators. During 2019 and 2020 new data were acquired using a hardware rebinning approach in order to achieve a better signal-to-noise ratio, lowering the energy threshold to 50 eV. In 2021, the experiment was upgraded to host 2 skipper CCDs that are operating with a readout noise lower than 0.2 e- RMS in a stable mode. The recent results on CEvNS searches will be presented, and the performance of the new skipper CCD detectors and future prospects will be discussed.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / **53**

VSR Linearized Gravity:A Gauge-Invariant Graviton Mass

Author: JORGE ALFARO[1]

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Linearized gravity in the Very Special Relativity (VSR) framework is considered. We prove that this theory allows for a non-zero graviton mass m_g without breaking gauge invariance nor modifying the relativistic dispersion relation. We find the analytic solution for the new equations of motion in our gauge choice, verifying as expected the existence of only two physical degrees of freedom. Finally, through the geodesic deviation equation, we confront some results for classic gravitational waves (GW) with the VSR ones: we see that the ratios between VSR effects and classical ones are proportional to $(m_g/E)^2$, E being the energy of a graviton in the GW. For GW detectable by the

interferometers LIGO and VIRGO this ratio is at most 10^{-20}. However, for GW in the lower frequency range of future detectors, like LISA, the ratio increases signficantly to 10^{-10}, that combined with the anisotropic nature of VSR phenomena may lead to observable effects.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / 54

Status of the construction of a Muon Tomography Detector for the Study of Geophysical Objects

Authors: Alexander Trujillo Ochoa[1]; CESAR M. CASTROMONTE FLORES[2]; Franz Danylo Machado Perez[None]; Gerald Salazar Quiroz[None]; Juan Vega Martínez[3]; Luis Otiniano[None]

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In the last two decades, cosmic ray muon-based imaging, or muongraphy, has undergone tremendous development and has found applications in different fields that require penetrating probes in large or high-density volumes. The unique characteristics of this technique make it particularly important for applications including nuclear non-proliferation, spent nuclear reactor fuel monitoring, cargo scanning and imaging of geological structures (volcanoes, mountains, etc.), among others. In this presentation we will show the status of the construction of a muon tomography detector, which is a project developed by the National Commission for Aerospace Research and Development (CONIDA) and the National University of Engineering (UNI) in Lima, Peru.

We will discuss some issues that may influence the final result of the geophysical imaging experiment: the muon energy and time spectrum arriving at different zenith angles and the model of muon propagation through matter. We also describe in detail the simulation chain developed to calculate the flux of cosmic ray muons arriving at sea level in order to estimate the most convenient locations and exposure time of the muon telescope to study a small mountain near the National Engineering University. Although this technology is not new, this is the first time such a project has been developed in the country.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Pizza and poster session / 56

Estimation of the Electron Shaking Probability of Low-Energy 7Be Decay Spectra in Superconducting Quantum Sensors for the BeEST Sterile Neutrino Search Experiment

Author: Sergio Oscar Nuñez Silva[1]

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The BeEST experiment uses Superconducting Tunnel Junction (STJ) particle
detectors to search for sub-MeV neutrino masses states by precisely measuring the daughter recoil energy following the Electron Capture (EC) decay of 7Be. In order to study systematic errors of the detector, we have estimated the Electron Shaking Probability (ESP) in the L-capture peak of the 7Be nuclear EC decay spectra. This probability has a purely physical origin, then its value must be the same for all pixels in the detector. Its quantification allows us to understand systematic errors, improve the calibration method, data processing, efficiency of future pixels, and the sensitivity of the detector. This poster presents the mathematical modeling, fitting process, and analysis method used to estimate the ESP in the 7Be nuclear EC decay spectrum, and the most recent result achieved by the BeEST collaboration, which is consistent with the previous bibliography.

The BeEST experiment is supported by the DOE-SC Office of Nuclear Physics, Lawrence Livermore National Laboratory, TRIUMF, and the European Metrology Programme for Innovation and Research (EMPIR).

Poster fallback option for rejected abstracts for parallel oral presentations:

Pizza and poster session / **57**

The Ecuadorian experience with the CMS open data initiative and future projects

Authors: Daniela Merizalde Aguirre[1]; Jose David Ochoa Flores[1]; Luis Andres Chicaiza Chuquitarco[2]; Pamela Llerena Delgado[2]; Xavier Tintin[2]

Co-authors: Edgar Fernando Carrera Jarrin [1]; Edy Rodrigo Ayala Amaya [2]; Roberto Andrade Paredes [2]

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To date, the CMS Collaboration has published a large part of its data collected during the LHC's Run1 and early Run 2 epochs.
These data have provided an unprecedented opportunity for academic groups, from regions without a long tradition in high-energy physics studies, to expand their research in the area of particle physics and related topics. This poster summarizes the experience of Ecuadorian groups using CMS open data and their contributions to the initiative, their current status and future plans.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Pizza and poster session / **60**

Machine learning applied to particle classification in LAGO Water Cherenkov Detectors

Authors: Ticiano Jorge Torres Peralta[None]; Maria Graciela Molina[1]; Luis Otiniano[None]; Hernán Asorey[None]; Ivan Sidelnik[2]; Alvaro Taboada[3]; Rafael Mayo-García[4]; Antonio Juan Rubio Montero[5]; Sergio Dasso[6]; Luis Otiniano[None]

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Astroparticles impinging on the Earth atmosphere cause a flux of secondary particles composed of three main components: electromagnetic, muonic and hadronic. When entering a Water Cherenkov Detector (WCD), these particles create Cherenkov radiation that is measured by photomultiplier sensors. The raw information captured by WCDs provides valuable insights into the temporal evolution of the cosmic rays flux, but not enough to differentiate each type of secondary particle contribution. In this work, we applied unsupervised Machine Learning (ML) techniques to find patterns in the data and applied clustering to provide this differentiation.

The data processing pipeline included the following stages: data acquisition, preprocessing, feature engineering and selection, modeling, and validation. Data acquisition involved using already available raw data from the WCD "Nahuelito" working at the LAGO site in Bariloche, Argentina. The preprocessing stage cleaned the data to result in pulses that resembled its expected Fast-Rise-Exponential-Decay form. After performing the feature engineering and selection, the resulting feature space was noisy which is especially challenging for most clustering algorithms. Thus, we propose the use of a density-based hierarchical clustering algorithm called Ordering Points to Identify the Clustering Structure (OPTICS) to tackle the complex feature space. OPTICS cluster the data according to regions of high density separated by regions of low density. Through its unique use of the reachability measure, several values were tested to result in clusters that could correspond to different secondary particles. Results look promising as clusters are located where secondary particle contributions are primarily expected to appear.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session B / 61

Gravitational collapse with torsion and Universe in a black hole

Author: Nikodem Poplawski[None]

Co-author: Francisco Guedes [1]

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We consider gravitational collapse of a fluid sphere with torsion generated by spin, which forms a black hole.
We use the Tolman metric and the Einstein-Cartan field equations with a relativistic spin fluid as a source.
We show that gravitational repulsion of torsion prevents a singularity, replacing it with a nonsingular bounce.
Quantum particle creation during contraction prevents shear from overcoming torsion.
Particle creation during expansion can generate a finite period of inflation and produce large amounts of matter.
The resulting closed universe on the other side of the event horizon may have several bounces.
Such a universe is oscillatory, with each cycle larger than the preceding cycle, until it reaches a size

at which dark energy dominates and expands indefinitely.
Our universe might have therefore originated from a black hole existing in another universe.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Pizza and poster session / **62**

Response of a modular scintillation detector to a secondary cosmic ray muon flux

Authors: CESAR M. CASTROMONTE FLORES[1]; Juan Vega Martínez[2]; Luis Otiniano[None]; Luis Otiniano[None]

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Muography is a non-invasive scanning technique that uses the directional flux of secondary atmospheric muons as a source to scan the density variations of objects on scales ranging from hundreds to thousands of meters. Cosmic ray detectors for muography use two or more planar detectors divided into several detection pixels (on the order of a few square centimeters) operating in coincidence mode. To achieve the temporal and spatial resolution required for different applications, these detectors have total detection areas of, at least, a few square meters.

A modular detector was built based on earlier developments of plastic scintillation muongraphy detectors. The module consists of four small crossbars (41mm x 10mm x 82mm each) with a wavelength scintillation fiber placed on top of each bar, similar to those used by the AMIGA project.

This array generates four detection pixels. The output signals are measured by silicon photomultipliers placed at one end of each fiber, in order to maximize the collection of photons produced by charged particles passing through the array. To characterize the response of the module to the muon flux from secondary atmospheric cosmic rays, we compare a simulation based on Geant4 and CORSIKA with real data. The characterization of the module will allow us to study the modular scaling of the detector in order to increase the detection area for studies related to geophysics, civil structures, vetoes at underground laboratories, safeward and nuclear materials.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session B / **65**

Axially symmetric systems, rotating black holes, and gravitational decoupling.

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This talk shows a general procedure to construct hairy rotating black holes by deforming a spherically symmetric solution following the Gravitational Decoupling approach. We demonstrate that, in comparison with the well-known Newman-Janis algorithm (with and without complexification), the application of our protocol is straightforward. We provide a particular example of a solution that reduces to the Kerr one, once the primary hair associated with it is turned off.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Parallel session B / **66**

Observing the magnetoelectric effect in classical and quantum electrodynamics.

Author: Mauro Cambiaso Harb[1]

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Whenever new states of matter are discovered, or a new energy window is opened, there is need and interest to look for new physics. Phases of matter described by topological order have attracted such attention. On the one hand they seem promising for applications such as quantum computation or spintronics and on the other they may shed some lights on axion physics, or on possible magnetic-monopole-like behaviour of certain materials, or on a novel kind of light-matter interaction. In this talk I will present some results regarding the electromagnetic response of topological insulators (TI), Weyl semimetals and chiral metamaterials in configurations that are highly sensitive to the boundary conditions. In all the cases commented, minute, yet observable magnetoelectric effects are predicted. Special attention will be paid to the case of a system comprised of a TI and a quantum dot (QD), both immersed in an external magnetic field. The quantum mechanical interaction is such that a novel topological entanglement between the states of the QD and those of the plasmons induced at the TI's surface is found.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Pizza and poster session / **68**

Modified Pati-Salam model for flavor anomalies

Authors: Oscar Rosero[1]; Eduardo Rojas[None]

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We present a detailed study of a proposed model to explain the experimental hints of new physics in B meson decays within the frameork of the Pati-Salam unification. The model is based on the local gauge group $\mathrm{SU}(4)_L \otimes \mathrm{SU}(4)_R \otimes \mathrm{SU}(2)_L \otimes \mathrm{U}(1)'$ and part of its gauge bosons are $(3,1)_{2/3}$ vector leptoquarks. The key feature of the model is that $\mathrm{SU}(4)_R$ is broken at a high energy scale, which suppresses right-handed lepton flavor changing currents at the low energy scale. The constraints imposed on the model by independent measurements show that the mass of the leptoquark can be as low as 10 TeV, not requiring the introduction of quarks or leptons mixings with new vector-like fermions. We obtain constraints from the C_9 and C_{10} pseudo-observables for this model and contrast them against a model-independent analysis.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Pizza and poster session / **69**

Machine Learning Techniques and Algorithms used in HEP

Authors: Roberto Andrade Paredes[1]; Xavier Tintin[1]

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Subsequent to the release of CERN Open Data, the emergence of a variety of challenges awakened the curiosity and interests of scientists from different disciplines to attack them from their own expertise, among them computer science. The past few years have seen a high growth in the take-up of ML by the accelerator community in Deep Learning developments, for ML is noticeably a key tool to help meet demands in LHC applications, both in simulations and operations. This poster summarizes the study of Machine Learning Techniques and Algorithms used in HEP.

Poster fallback option for rejected abstracts for parallel oral presentations:

Pizza and poster session / **71**

Testing the feasibility to measure acausally wrong displaced vertices from Lee-Wick particle decays with CMS experiment open data

Author: Jonathan Sanchez[None]

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Lee-Wick (LW) standard model (LWSM) renormalizes the Standard model with the addition of new partner fields with negative metric. The model predicts a phenomenon denominated as wrong displaced vertices (WDV) also known as acuasally displaced vertices. In this work, we modeled and characterized the signal coming from the pair production of electron LW-partners (LW-electrons) emitted from the neutral current sector of LWSM, allegedly the best candidates to be observed with nowadays experiments. We calculated the cross-section and average flight distances for a mass value of the LW-electron equal to 200 GeV; these values amount to 5.97 fb-1 and 2.7e-2 mm, respectively. We found that the signal for mass values of 300, 400, and 500 GeV are less likely to be observed. The studied signal was obtained given that each LW-electron decays into one electron and a Z-boson in a vertex wrongly displaced from the point of interaction. The signal data was simulated for a proton-proton collisions at 8 TeV using the full CMS experiment software infrastructure. We partially characterized the final topology, and we contrasted the results with similar simulated topologies and experimental CMS open data. For the first time, we defined the quantity parellelity as the dot product between total momentum of the decaying products and vector connecting the point of interaction with the displaced vertex. Predominant negative values in the parallelity distribution suggest the feasibility to identify acausally displaced vertices at the LHC, if present.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Pizza and poster session / **72**

Calculation of masses and amplitudes of pseudoscalar mesons

Author: Ruben Hernando Criollo Estrella[1]

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From Quantum Field Theory (QFT) for non-perturbative systems, the Schiwnger-Dyson equations (SDE) are obtained, which are analogous to the Euler-Lagrange equations in QFT, since they are the equations of motion of the Green's functions . The SDEs are an infinite set of integral equations coupled to each other and it is only possible to solve them by means of a truncation scheme. The Bethe-Salpeter equations (BSE) have as a solution the wave function of the states bound to a system of two particles. The BSEs are obtained from a covariant relativistic formalism. We solve abelian models for quantum chromodynamics (QCD) at low energies, which rules allow us to obtain the spectrum of pseudoscalar mesons Jp =0- and the decay constants.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / **73**

Fermionic dark matter in a Left-Right Model with mirror fermions

Authors: José Halim[1]; Mario Lamprea[2]; Ricardo Gaitán[1]

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In this work we investigate an extension of the SM with Left-Right symmetry that includes additional mirror fermions, copies of the SM fermions with opossite quirality and charged under the $SU(2)_R$. The motivation for introducing these mirror fields in a Left-Right extension is to analyse the well known CP problem. We have propose a candidate for dark matter which arises from the mixture of mirror and sterile neutrinos. We have obtain the allowed parameter region for the model in accordance with the thermal relic density and the direct detection constraints. We also disscuss the possibility of further constraint the parameter region via collider data.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / **75**

Hubble tension and matter inhomogeneities: a theoretical perspective

Authors: Carlos Rubio Flores[1]; Marco San Martín[None]

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We have studied how local density perturbations could reconcile the Hubble tension. We reproduced a local void through a perturbed FLRW metric with a potential Φ which depends on both time and space. This method allowed us to obtain a perturbed luminosity distance, which is compared with both local and cosmological data. We got a region of local parameters, $q_0^{\rm Lo}$ and $j_0^{\rm Lo}$, which are in agreement with a local void of $\Omega_{m,\rm void} = (-0.30 \pm 0.15)\Omega_m$ explaining the differences between the local H_0 and the Planck H_0. However, when constraining local cosmological parameters with previous results, we found that neither ΛCDM nor $\Lambda(\omega)$CDM could solve the Hubble tension.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Pizza and poster session / **77**

An analysis of the Ruppeiner geometry and the thermodynamics of extremal black holes

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The aim of this study is to investigate the correlation of the Ruppeiner geometry with recent conclusions about the thermodynamics of extremal black holes, focusing on the Reissner-Nordström solution. First, we studied the Ruppeiner geometry with respect to the "enthalpic" energy M and the internal energy $\tilde{M}$, similar to the van der Walls-Maxwell model, this geometry allows us to understand the underlying properties of the statistical thermodynamics system. Then the relation between the Ricci scalar and the thermodynamics properties of the charged black hole were explored, as the modification from another black hole solution to the Reissner-Nordström black hole. This process was useful to avoid the flat information obtained, $R = 0$, when we valued the Ricci scalar for the charged solution with the variable set $\{M, S, Q\}$. The relation with Ruppeiner and black

holes can not be applied directly, nevertheless, we observe that the thermodynamics properties can be associated with the scalar behavior but some divergence with the modification values showed up.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session B / **79**

Decoding Holographic Dark Energy in the structure formation

Authors: MIGUEL ANTONIO SABOGAL GARCIA[1]; Wilmar Cardona[2]

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We implemented in the popular Boltzmann solver **CLASS** a holographic dark energy **(HDE)** model with two infrared (IR) cut-offs: the Ricci scalar curvature **(RDE)** and its more general version the Granda-Oliveros **(GO)**. For the background, we show that the HDE density using the GO cut-off can exhibit radiation, matter, or DE behavior depending on the component that dominates the energy budget, while the RDE density can only be matter-like or DE-like. We also study the impact of HDE on linear order perturbations, for which we assumed DE is associated to a fluid with constant sound speed squared $\hat{c}_{\rm s}^2$ in the rest-frame and vanishing anisotropic stress. We found analytical approximate solutions for matter and DE perturbations in the matter dominance epoch. Our findings show that matter perturbations behave slightly differently with respect to the standard cosmological model and the HDE clusters proportional to matter perturbations. Since our Equation of state might cross the phantom divide, we use the Parameterized Post-Friedmann **(PPF)** formalism for the evolution of perturbations, so that cosmological constraints could be computed. We consider the latest cosmological data, including supernovae, BAO, and CMB. Our investigation found that $\hat{c}_{\rm s}^2 = 1$ is excluded at 3σ, which indicates that might not be an appropriate assumption about DE. Finally, we also found that RDE constraints show a preference for higher H_0 values in agreement with local model-independent measurements, and lower values of σ_8 than in the ΛCDM model in good agreement with DES results, therefore our results seem to simultaneously relieve the current tensions.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / **80**

Oscillation tomography study of Earth's composition with atmospheric neutrinos

Authors: Ismael Romero[1]; José Arnulfo Herrera Lara[2]; Juan Carlos D'Olivo Saez[2]; Oscar Alfredo Sampayo[1]

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Knowledge of the Earth's interior composition is highly relevant to many geophysical and geochemical problems. Neutrino oscillations are modified in a non-trivial way by the matter effects. They can provide valuable and unique information not only on the density but also on the chemical and isotopic composition of the deep regions of the planet. In this presentation, we examine the possibility of performing an oscillation tomography of the Earth with atmospheric neutrinos to obtain information on the composition and density of the outer core and the mantle, complementary to that obtained by geophysical methods. Particular attention is paid to the D'' layer above the core-mantle boundary and the water (hydrogen) content in the mantle transition zone. Our analysis is based on a Monte-Carlo simulation of the energy and azimuthal angle distribution of μ-like events generated by neutrinos. Taking as reference a model of the Earth consisting of 55 concentric layers with constant densities determined from the PREM, we evaluate the effect on the number of events due to changes in the composition and density of the outer core and the mantle. Additionally, we examine the capacity of a detector like ORCA to resolve such variations.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / 81

Diffeomorphism breaking and background fields in modified gravity

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We present the Hamiltonian formulation of the gravitational sector of the Standard-Model-Extension, which introduces the breaking of diffeomorphism symmetry through explicit background fields. The modified gravity theory is shown to require an extension of the Gibbons-Hawking-York boundary term and to produce Hamilton-Jacobi equations of motion that are equivalent to the projected modified Einstein equation of motion, according to the foliation of spacetime and the ADM decomposition. We discuss further studies that may have consequences for the study of cosmology and black hole physics.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Plenary session / 83

SWGO: The project for a future wide-field gamma-ray observatory in South America

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High-elevation particle detectors have opened a new observational window in Astronomy, significantly increasing the number of detected gamma-ray sources in the very- to ultra-high energy

range. In particular, these instruments were able to achieve unprecedented sensitivity above 100 TeV and detected gamma-ray emission from sources up to PeV. The recent successes have all been obtained from the Northern sky, motivating the development of a new instrument in the South, from where many prominent targets such as the Galactic Center can be accessed. The Southern Wide-field Gamma-ray Observatory (SWGO) will be a new extensive air shower array in South America for the observation of VHE to UHE gamma rays, and the SWGO Collaboration is engaged in the design and prototyping work towards the realisation of this future facility. SWGO will use an array of water Cherenkov-based particle detectors to provide a wide-field and high-duty cycle view of the southern sky, complementing CTA and the existing arrays of the Northern Hemisphere, such as HAWC and LHAASO. Towards the lower energies, SWGO aims to push the observational range of wide-field ground-based gamma-ray facilities down to 100 GeV, bridging the gap with space-based instruments in monitoring the VHE sky. In this contribution, we will provide an overview of the status of the project, which has a strong contingent of Latin American participation, with candidate host sites present in Argentina, Chile, Peru and Bolivia. We will also present performance expectations and science goals, as well as technological developments and future plans for observatory construction.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session A / 84

Assessment of the dimension-5 seesaw portal and impact of exotic Higgs decays on non-pointing photon searches

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The Dimension-5 Seesaw Portal is a Type-I Seesaw model extended by $d = 5$ operators involving the sterile neutrino states, leading to new interactions between all neutrinos and the Standard Model neutral bosons. In this work we focus primarily on the implications of these new operators at the GeV-scale. In particular, we recalculate the heavy neutrino full decay width, up to three-body decays. We also review bounds on the dipole operator, and revisit LEP constraints on its coefficient. Finally, we turn to heavy neutrino pair production from Higgs decays, where the former are long-lived and disintegrate into a photon and a light neutrino. We probe this process by recasting two ATLAS searches for non-pointing photons, showing the expected event distribution in terms of arrival time t_γ and pointing variable $|\Delta z_\gamma\ |$.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / 85

Magnetic Monopoles and Monopolium in pp Collisions

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The aim is to review the theory developments for the production of the Dirac magnetic monopole,and the monopolium,and establish their limits for pp collisions.The mass range used for the monopole is based on recent results of ATLAS and MoEDAL, and the simulations are made for the current LHC anergies and for the energies of the future colliders HE-LHC and FCC. The cross sections are calculated for the usual velocity dependent coupling, and the magnetic moment dependent coupling, more recently proposed. It will also be discussed the advantages in using each one of the couplings, and the monopolium as an indirect measure .

Poster fallback option for rejected abstracts for parallel oral presentations:

Plenary session / **86**

LAGO: The Latin American Giant Observatory: Status and Perspectives

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The Latin American Giant Observatory (LAGO) is an extended cosmic ray observatory composed by a network of water-Cherenkov detectors (WCD) spanning over different sites located at significantly different altitudes (from sea level up to more than 5000\,m a.s.l.) and latitudes across Latin America, covering a huge range of geomagnetic rigidity cut-offs and atmospheric absorption/reaction levels. The LAGO WCD is simple and robust, and incorporated several integrated devices to allow time synchronization, autonomous operation, on board data analysis, and even remote control and automated data transfer.

This detection network is designed to measure the temporal evolution of the radiation flux coming from outer space at ground level with extreme detail. LAGO is mainly oriented to perform basic research in three branches: high energy phenomena, space weather and atmospheric radiation at ground level. It is an observatory designed, built and operated by the LAGO Collaboration, a non-centralized collaborative union of more than 30 institutions from ten countries.

In this work we will describe the scientific and academic primary goals of LAGO, by showing its current results, present status and future perspectives.

Poster fallback option for rejected abstracts for parallel oral presentations:

Pizza and poster session / **87**

Anomaly-free abelian gauge symmetries with neutrino mass models

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In this work we show a study of the generation of neutrino masses is carried out from the Seesaw type II Mechanism for Dirac neutrinos. These mechanisms not only explain the mass of the neutrino but also its small value compared to charged quarks and leptons. Therefore, a model is proposed to obtain the small neutrino masses by extending the visible content of the Standard Model (SM) with a hidden sector composed of a scalar singlet S and two right-handed singlet neutrinos (ν_{R_1}, ν_{R_2}). These right-handed neutrinos are charged under a new symmetry $U(1)_X$. In addition, it is necessary to add a heavy scalar doublet to play the role of messenger between the visible sector (SM) and the hidden sector.
Extending the SM with a new abelian symmetry automatically violates the invariant of Lorentz, therefore the following conditions must
\begin{equation}
\sum_{\alpha=1}^{N'} n_{\alpha} + 3m =0 \„
\end{equation}

\begin{equation}
\sum_{\alpha=1}^{N'} n'^{3}_{\alpha} +3m^{3} = 0\„
\end{equation}

If the SM is extended with and additional dark $U(1)_D$ gauge symmetry (under which it is uncharged), and N right-handed chiral fields singlets under the SM group, the $U(1)_D$ is not anomalous if the Diophantine equations

\begin{align}
\sum_{\alpha=1}^{N} n_{\alpha} =&0\„ &
\sum_{\alpha=1}^{N} n'^{3}_{\alpha} =& 0\„
\end{align}

Therefore, we only have to worry about the solutions of the dark symmetry $U(1)_D$ since they contain the solutions of the active symmetries. To solve these equations, a computer program in Python is implemented that generates the possible charge values that the chiral fermions acquire.

Poster fallback option for rejected abstracts for parallel oral presentations:

Pizza and poster session / 89

LAGO studies to detect Gamma-Ray Burst and High Energy Astrophysics sources using water Cherenkov detector arrays

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The Latin American Giant Observatory (LAGO) operates a network of water Cherenkov detectors (WCD) at different sites in Latin America. Spanning over different latitudes, altitudes and geomagnetic rigidity cutoffs. LAGO detectors at high altitudes have good sensitivity to electromagnetic secondary radiation that is the expected signature of this kind of high energy events. The spanning of LAGO sites results in a very wide Field of View that alongside the WCDs characteristics makes a large aperture and high duty cycle Observatory.

GRBs are of the brightest transients detected, with typical energies in their prompt phase ranging from keV to several tens of GeV. Recently GRB190114C was the first GRB detected at TeV energies by the MAGIC experiment.

We present results for the LAGO sensitivity as using small arrays of WCDs for the detection of events like GRB190114C. We also pretend to extend this study to other galactic sources that are known to be gamma steady emitters in the TeV range. Also we show the simulatation of the expected response of a small array of three equispaced LAGO WCD to this kind of transients or steady gamma sources that are being deployed at four FOV-overelaped, high-altiutude LAGO sites in the Andes range (h>4000 m.asl.). The simulation was done using ARTI, a toolkit developed by LAGO for calculating the expected background and the secondaries expected due to different astrophysical phenomena and OneDataSim, the new high-performance computing and cloud-based implementation of our simulation framework.

Poster fallback option for rejected abstracts for parallel oral presentations:

Pizza and poster session / 90

A New Method for noise rejection in the Water Cherenkov Detectors of the LAGO project through Muon Decay measurement

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The Latin American Giant Observatory (LAGO) project consists of an extensive non-centralized network of Water Cherenkov Detectors (WCD) operated by a collaborative network of Universities and Research Institutes in Iberoamerica. The detectors of the network are built on the basis of commercial water containers, so they could have different geometries (but mostly cylindricals), different water purification methods, and different electronic-background sources. All these features generate distinctive profiles in the response to air shower particles measured by our detectors.

The most common sources of noise in the LAGO WCD detectors are related to the photomultiplier tube operation and detector aging. Noise is characterized for very short pulses at the LAGO data acquisition system level, imposing several challenges for its detection and correction. In this work we show a new noise rejection method based on the implementation of a secondary trigger validated through the calculation of the muon decay lifetime and the Michel's secondary electron spectrum. Energy calibration of the Michel's spectrum is supported by a dedicated instance of the LAGO ARTI framework to estimate the expected flux of secondary particles at each detector site and an implementation of each WCD in the Meiga framework, a new Geant4-based flexible simulator used in this case to estimate the WCDs response to the air shower particles flux.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session B / 91

Physical acceptability of anisotropic compact objects

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One of the most used strategies to model compact objects is considering equations of state that outline the most important physical processes among their thermodynamic variables. Perturbation analysis of its physical variables allows discerning between stable and unstable configurations, providing models that could describe observed objects.

In this work, we studied the physical acceptability of relativistic static anisotropic spheres to represent simplified models of neutron stars. The acceptability of a model emerges from geometric and physical restrictions that make it feasible. The implemented models assume a generalized polytropic equation of state, $P = \rho^{1+1/n} + \alpha\rho - \beta$, where P is radial pressure, ρ is energy density, n is the polytrope index, and α, β are constants parameter. The models considered are anisotropic, i.e. unequal radial and tangential stresses introduced using heuristic methods. As a result, we identified the parameter space region that yielded physically acceptable models. We also propose two pulsar candidates: J0737-3039 and 1518+49. Also, we explore the physical acceptability of configurations with a known density profile and different strategies to introduce anisotropy. This later study allows us to infer which ways of introducing anisotropy are most relevant to the existence of realistic anisotropic models.

Poster fallback option for rejected abstracts for parallel oral presentations:

Parallel session B / 92

The swampland in string theory and the generalized geometric flow

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In the context of String theory, the Swampland is the set of consistent field theories that cannot be completed into quantum gravity in the ultraviolet regime. Thus, the string theories lead to huge amount of effective-low energy theories, and the swampland is the collection of effective theories that cannot come from string theory. Therefore, it is very useful to find constraints over the swampland. One of the most established conjectures is the distance conjecture in the Moduli space of the theory. The generalization of this conjecture to general fields is called the generalized distance conjecture. We use the Generalized Ricci flow for calculating the distance between spacetime metrics. We use the generalized Perelman entropies for defining that distance. Finally, going from the space of metrics to the space of probability densities we use the Wasserstein distance from the optimal transport theory for defining a new distance. We discuss its properties and how it can be used to give some light into the solution of the Generalized distance conjecture.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Parallel session B / 93

Classical and Quantum Stable Emergent Universe in a Jordan-Brans-Dicke Theory

Author: Pedro Alberto Labraña Moraga[1]

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The study of Emergent Universe models (EU) is based on the assumption that the universe emerges from a past eternal Einstein static state (ES) towards an inflationary phase. The EU is an attractive scenario since it avoids the initial singularity and provides a smooth transition towards an inflationary period.

In this context, it has been pointed out by Mithani-Vilenkin that certain Emergent Universe scenarios which have a classically stable ES could present a semiclassically instability and collapse.

In this work, presented in arXiv:2108.09524, we study the classical and quantum stability of the ES regime of Emergent Universes in the context of a Jordan-Brans-Dicke theory. In particular, we show that when considering these models it is possible to have in the past both, classical and semiclassically stability without taking into account the instability pointed out by Mithani-Vilenkin.

Poster fallback option for rejected abstracts for parallel oral presentations:

No

Plenary session / 94

CMS status and perspectives for Run 3

Author: Carlos Andres Florez Bustos[1]

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The CMS experiment has a broad physics program that includes precision measurements on standard model physics and searches for new physics that could explain some of the open conundrums in particle physics today. The talk will cover some of the latest results from CMS, including Higgs, Supersymmetry, dark matter, heavy resonances, Leptoquarks, among others, using data collected at the LHC during the Run 2. In addition, some of the current plans and interesting physics scenarios of main focus for Run 3 will be outlined.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **96**

The electron-ion collider – A world wide unique collider to unravel the mysteries of visible matter

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Understanding the properties of nuclear matter and its emergence through the underlying partonic structure and dynamics of quarks and gluons requires a new experimental facility in hadronic physics known as the Electron-Ion Collider (EIC). The EIC will address some of the most profound questions concerning the emergence of nuclear properties by precisely imaging gluons and quarks inside protons and nuclei such as their distributions in space and momentum, their role in building the nucleon spin and the properties of gluons in nuclei at high energies. In January 2020 the EIC received CD-0 and Brookhaven National Laboratory was selected as site, and June 2021 CD-1. This presentation will give highlights on the EIC science program, introduce the experimental equipment and its integration into the accelerator and give the status of the EIC project, as well what are the next major steps.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **98**

The ANDES project

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ANDES (Agua Negra Deep Experiment Site) is an underground laboratory proposed to be built inside the Agua Negra road tunnel that will connect Chile (IV Region) with Argentina (San Juan Province) under the Andes Mountains. The Lab will be 1750 meters under the rock, becoming the 3rd deepest underground lab in the world, the first in South America and the largest in the Southern Hemisphere. ANDES will be an international Lab, managed by an international Consortium. It will host experiments in Particle Physics such as Neutrino and Dark Matter detection, in Geophysics, Seismology and Biology. It will also promote the development of low background instrumentation. In this talk we will present general features of the proposed Lab, the current status of the project.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **102**

New Computing and Software Frontiers in Particle Physics

Author: Gordon Watts[1]

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CERN's Large Hadron Collider has just started Run 3 of data collection. And in 2029 it will commence the High-Luminosity (HL-LHC) phase of running - expected to last almost a decade. The amount of data collected during the HL-LHC is unprecedented in High Energy Physics. Collecting, processing, calibrating and analyzing that volume of data to the precision required is forcing the community to reevaluate many of its current paradigms.

The Community Whitepaper Process was started in 2017 to gather grassroots solutions to the problems facing the field, and that lead to a strategic plan in 2019. Many organizations around the world, like IRIS-HEP, were funded around that strategic plan. Now, almost 5 years later, the strategic plan is being updated. This talk will discuss some of the forces forcing us to modernize how we process data, the progress we've made since 2017, and where we go from here. Particular attention will be paid to how the process enables the global participation of groups small and large.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **103**

Multi-component dark matter

Author: Oscar Zapata[None]

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The dark matter may consist not of one elementary particle but of different species, each of them contributing a fraction of the observed dark matter density. Scenarios for multi-component dark matter based on a single ZN (N≥4) symmetry are simple and well-motivated. In this talk we will discuss the phenomenology of several two component dark matter models and analyze their detection prospects. We will show that, thanks to the new interactions allowed by the ZN symmetry, current experimental constraints can be satisfied over a wider range of dark matter masses, and that these scenarios may lead to observable signals in direct and indirect detection experiments.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **104**

Neutrinos at 66

Authors: Gabriela Alejandra Barenboim Szuchman Not Supplied[1]; Gabriela Barenboim[None]

[1] *University of Valencia & IFIC (UV-CSIC)*

In this talk, I will review what have we learned in neutrino physics in the last years and what we hope to learn in the coming ones.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Parallel session B / 105

Measuring soil moisture level using cosmic rays neutron detectors

Authors: Dennis Cazar Ramirez[None]; Luis Alberto Nuñez[None]

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Cosmic rays are high-energy subatomic particles that reach Earth from outer space. Interacting with the atmosphere forms Extensive Air Showers of particles (EAS), also called secondary cosmic rays, which can be detected with different techniques, among them are Water Cerenkov Detectors (WCD) such as those developed by the LAGO Collaboration.

The hadronic component of EAS contains neutrons that interact with hydrogen present in the soil and atmosphere creating epithermal neutrons with energy between 0.1 and $100keVs$. The abundance of epithermal neutrons is inversely proportional to the amount of hydrogen and therefore to the moisture of the soil and the surrounding atmosphere. This phenomenon can be used to build Cosmic Rays Neutron detectors (CRND) that are used for monitoring soil moisture level, information that can be used to develop smart-irrigation systems in agriculture or monitoring wetlands and biomass among other applications.

Present work analyzes the principal cosmic rays neutron detection techniques for applications in agriculture and presents preliminary studies for the implementation of a neutron detection system based on a WCD detector modified for the effect in order to collect data on the total neutron flux from secondary cosmic rays that can be used as a reference for calibration and optimization of a CRND for soil moisture monitoring.

Poster fallback option for rejected abstracts for parallel oral presentations:

Yes

Parallel session A / 106

Measurements and searches for Higgs boson decays to bottom and charm quarks with the CMS Experiment

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The most recent measurements and searches for the Higgs boson decaying into a pair of bottom or charm quarks by the CMS Collaboration will be presented. The results are obtained using the entire Run 2 LHC data collected in proton-proton collisions at a center of mass energy of 13 TeV, targeting the associated production of the Higgs boson with a Vector boson (W or Z boson) and the gluon fusion production mechanism. These analyses exploit the different transverse momentum regimes of the Higgs boson, and different reconstruction strategies and background estimation techniques have been adopted to increase the sensitivity of these searches. The Higgs to charm decays results represent the world's most stringent constraints on Higgs-charm Yukawa coupling.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **107**

Higgs physics in the LHC Era

Author: Carlos E.M. Wagner[None]

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I will discuss the current status of the precision measurements in the Higgs sector, and its implications for extensions of the Standard Model. I will also present the properties of the Higgs sector within simple or well motivated extensions of the Standard Model and the possible hints of the presence of extra Higgs bosons at the weak scale.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **108**

ATLAS status and perspectives for Run 3

Author: Fernando Monticelli[1]

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The ATLAS experiment at the Large Hadron Collider (LHC) at CERN is a general-purpose detector designed to exploit the full discovery potential of the LHC. It is composed of a tracking detector in the innermost region around the interaction point, surrounded by calorimeters and muon chambers, featuring full 4π coverage to measure precisely the energies, directions and identity of all the particles produced in proton-proton collisions. This allows ATLAS to carry out a very broad and ambitious physics program covering precision measurements of standard model, and searches for new physics. In this talk, an overview of ATLAS Run-2 results covering several analysis of the ATLAS physics program is shown including detector performance, standard model measurements and searches for new physics. Prospects of Run-3 is also presented.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **109**

The DUNE experiment

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DUNE (Deep Underground Neutrino Experiment) represents one of the most important experimental programs in the current and future scenario of neutrino physics. It will be the first mega-science project on the US sole, involving more than 1,300 physicists and more than 200 Institutions. DUNE will shade light on some of the crucial open questions in neutrino physics: the CP violation in the leptonic sector, the hierarchy of neutrino masses and the octant of θ23. DUNE will make use of a strong and wideband neutrino beam, of a sophisticated near detector, both located at Fermilab (USA) and of a gigantic far detector based on liquid argon technology, installed at the Sanford Underground Research Facility in South Dakota, 1300 km faraway and 1,5km deep underground.
The huge active mass of the far detector will also allow to develop a rich program of non-accelerator physics, such as proton decay searches, supernova neutrinos detection and atmospheric neutrinos detection. New discoveries will be enabled by a broad range of new technologies with unprecedented precision and sensitivity. The photon detection system (PDS), a fundamental component of the far detector, is based on a device, the ARAPUCA, conceived in Brazil and developed with the collaboration of several Latin American Institutions.
The physics program and the status of the DUNE experiment will be presented, with a particular emphasis on the PDS.

Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

Plenary session / **110**

New opportunities for Electroweak Baryogenesis

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Poster fallback option for rejected abstracts for parallel oral presentations:

Does not apply

LAA-HECAP General Assembly / **112**

General LAA-HECAP presentation

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LAA-HECAP General Assembly / **113**

Activity Report and approval of Plan of Activities

Corresponding Author: dnacir@df.uba.ar

LAA-HECAP General Assembly / **114**

Statistics Committee presentation

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LAA-HECAP General Assembly / 115

Communication Committee presentation

Corresponding Author: arturos@cern.ch

LAA-HECAP General Assembly / 116

Selection of the next SILAFAE site (presentation of proposals)

Corresponding Authors: ecarrera@cern.ch, paroig@gmail.com

Poster fallback option for rejected abstracts for parallel oral presentations:

LAA-HECAP General Assembly / 117

AOB