

# **4th ComHEP: Colombian Meeting on High Energy Physics (Barranquilla, Colombia)**



## **Report of Contributions**

Contribution ID: 1

Type: **Talk**

## Sequentially loop-generated pattern of quark and lepton masses in models with extended symmetries.

*Tuesday 3 December 2019 14:00 (1 hour)*

I will discuss two models where SM fermion mass pattern is sequentially loop-generated. The first one is a nonrenormalizable model with minimal particle content, whereas the second one is an extension of the Inert Higgs doublet model (IDM) where the SM hierarchies are generated sequentially by radiative virtual corrections in a fully renormalisable way, i.e. without adding any non-renormalisable Yukawa terms or soft-breaking operators to the scalar potential. In particular, in that extended IDM, due to the presence of both continuous and discrete family symmetries, the top quark acquires a tree-level mass, lighter quarks and leptons get their masses at one- and two-loop order, while neutrino masses are generated at three-loop level. That extended IDM has a potential to explain the recently observed  $R_K$  and  $R_{K^*}$  anomalies, thanks to the non universal  $U_{1X}$  assignments of the fermionic fields that yield non universal  $Z'$  couplings to fermions. Furthermore such extended IDM can accommodate the experimental measurements of the muon anomalous magnetic moment and dark matter relic density.

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**Co-authors:** KOVALENKO, Sergey (UTFSM); PASECHNIK, Roman (Lund university); SCHMIDT, Ivan

**Presenter:** CÁRCAMO HERNÁNDEZ, Antonio Enrique (Universidad Técnica Federico Santa María)

Contribution ID: 2

Type: **Poster**

## Dark matter in Inert Doublet Model with one scalar singlet and $U(1)_X$ gauge symmetry

*Wednesday 4 December 2019 16:00 (5 minutes)*

The study of the abundance of dark matter is carried out in an extension of the standard model with an additional gauge symmetry  $U(1)_X$ . The considered extension includes two doublet and one complex singlet of scalar fields. The dark matter candidate arises from the second doublet scalar field meanwhile the singlet and first doublet scalar fields provide additional portals to the relic density. We also analyze in detail the stability of the dark matter candidate through the introduction of the discrete  $Z_2$  symmetry or with the same gauge symmetry  $U(1)_X$ . We find constraints on the model parameter space which are in agreement with (i) the most up-to-date experimental results reported by CMS and ATLAS collaborations, namely, signal strengths  $\mathcal{R}_{x\bar{x}}$ ; (ii) upper limit on WIMP-nucleon cross section imposed by XENON1T collaboration and (iii) upper limit on the production cross-section of a  $Z'$  gauge boson times the branching ratio of the  $Z'$  boson decaying into  $\ell^- \ell^+$ , with  $\ell = e, \mu$ . Subsequently these constraints are used to compute the relic density reported by the PLANCK collaboration and we find that also satisfy it. Considering all constraints, we find regions that include light, intermediate and heavy dark matter candidate mass.

**Authors:** ARROYO UREÑA, Marco Antonio; GAITÁN, Ricardo (Universidad Nacional Autónoma de México); MARTÍNEZ, Roberto; MONTES DE OCA YEMHA, José Halim

**Presenter:** ARROYO UREÑA, Marco Antonio

**Session Classification:** Poster session

Contribution ID: 3

Type: **Poster**

## Flavor changing neutral currents beyond the Standard Model

*Wednesday 4 December 2019 16:10 (5 minutes)*

Models beyond the standard model with extra scalars have been highly motivated by the discovery of the Higgs boson. The two Higgs doublet model type III considers the most general case for the scalar potential, allowing mixing between neutral CP-even and CP-odd scalar fields. This work presents the results of the study on the  $t \rightarrow c \gamma$ ,  $t \rightarrow c Z$ , and  $t \rightarrow c h_1$  decays, where  $h_1$  is the Standard Model Higgs boson. The neutral flavor changing is generated by top-charm-Higgs coupling given by the Yukawa matrix.

**Authors:** GAITAN LOZANO, Ricardo (Universidad Nacional Autónoma de México); MONTES DE OCA YEMHA, José Halim; MARTINEZ, Roberto (Universidad Nacional de Colombia)

**Presenter:** GAITAN LOZANO, Ricardo (Universidad Nacional Autónoma de México)

**Session Classification:** Poster session

Contribution ID: 4

Type: **Talk**

## Computational approach to study particle dark matter

*Thursday 5 December 2019 11:50 (20 minutes)*

One of the current challenges in high energy physics is to find a candidate for dark matter, which is viable with all experimental observations and also provides an estimate for future experiments. A practical way to carry out this study is through the existing computer packages. In this talk we will explain the implementation of the packages to calculate observable quantities related to dark matter.

**Authors:** HALIM, José (Universidad Nacional Autónoma de México); GAITÁN, Ricardo (Universidad Nacional Autónoma de México); ARROYO UREÑA, Marco Antonio

**Presenter:** HALIM, José (Universidad Nacional Autónoma de México)

Contribution ID: 5

Type: **Talk**

## Latest results from the NOvA experiment

*Tuesday 3 December 2019 11:30 (30 minutes)*

NOvA is a long-baseline experiment that uses the NuMI beam, at Fermilab, to study muon neutrino to electron neutrino oscillations. The experiment is located 14.6 mrad off the beam axis which allows access a narrow band of neutrino energies centered at 2 GeV. NOvA is a two-detector experiment with one located underground at Fermilab (Near Detector), and the other one located on the surface in northern Minnesota (Far Detector), 810 km away from Fermilab. The design of the two detectors is identical, varying only in their mass: 14 kton for the Far Detector, and 300 ton for the Near Detector. The experiment has made a  $4.4\sigma$ -significant observation of electron neutrino appearance using  $12.33 \times 10^{20}$  protons on target delivered to the Fermilab NuMI neutrino beamline. The experiment recorded 27 muon neutrino to electron neutrino candidates with a background of 10.3 and 102 muon neutrino to muon neutrino candidates. The new antineutrino data is combined with neutrino data to measure the oscillation parameters  $|\Delta m^2_{32}| = 2.48 \pm 0.11 - 0.06 \times 10^{-3} \text{ eV}^2/c^4$ ,  $\sin^2 \theta_{23} = 0.56 \pm 0.04 - 0.03$  in the normal neutrino mass hierarchy and upper octant and excludes most values near  $\delta_{CP} = \pi/2$  for the inverted mass hierarchy by more than  $3\sigma$ . The data favor the normal neutrino mass hierarchy by  $1.9\sigma$  and  $\theta_{23}$  values in the upper octant by  $1.6\sigma$ .

**Author:** ARRIETA DIAZ, Enrique (Universidad del Magdalena)

**Presenter:** ARRIETA DIAZ, Enrique (Universidad del Magdalena)

Contribution ID: 6

Type: **Talk**

## Effective Lagrangians for Lepton Flavor Violating interactions involving a boson

*Monday 2 December 2019 12:10 (20 minutes)*

We have developed the most general effective field theory describing LFV involving an additional boson ( $\chi$ ) up to dimension four terms. The effective couplings are constrained using current upper limits on the branching fractions of the  $L \rightarrow \ell\chi$  and  $L$  to  $3\ell$  decays. Within this setting, we examine the consequences on the electron and muon anomalous magnetic moments and on Higgs boson decays. We provide experimental signatures able to distinguish the spin and parity of the  $\chi$  boson.

**Authors:** Ms MARÍN OCHOA, Marcela (Cinvestav); Dr ROIG GARCÉS, Pablo (Cinvestav)

**Presenter:** Ms MARÍN OCHOA, Marcela (Cinvestav)

Contribution ID: 7

Type: **Talk**

# Ultraviolet Freeze-in and Non-Standard Cosmologies

*Thursday 5 December 2019 14:00 (1 hour)*

A notable feature of UV freeze-in is that the relic density is strongly dependent on the highest temperatures of the thermal bath, and a common assumption is that the relevant ‘highest temperature’ should be the reheating temperature after inflation  $T_{RH}$ . However, the temperature of the thermal bath can be significantly higher in certain scenarios, reaching a value denoted  $T_{max}$ , a fact which is only apparent away from the instantaneous decay approximation. Interestingly, it has been shown that if the operators are of sufficiently high mass dimension then the dark matter abundance can be enhanced by a ‘boost factor’ depending on  $(m_{max}/T_{RH})$  relative to naive estimates assuming instantaneous reheating. We highlight here that in non-standard cosmological histories the critical mass dimension of the operator above at which the instantaneous decay approximation breaks down, and the exponent of the boost factor, depend on the equation of state  $w$  prior to reheating. We highlight four examples in which the dark matter abundance receives a significant enhancement in the context of gravitino dark matter, the moduli portal, the Higgs portal, and the spin-2 portal (as might arise in bimetric gravity models). We comment on the transition from kinetic domination to radiation domination as a motivated example of non-standard cosmologies.

**Author:** BERNAL, Nicolás (Universidad Antonio Nariño)

**Presenter:** BERNAL, Nicolás (Universidad Antonio Nariño)



Contribution ID: 8

Type: **Poster**

## Dependence of the Z-production via ep-DIS on the choice of the parameter $Q^2$ involved in the PDF's

*Wednesday 4 December 2019 16:05 (5 minutes)*

We discuss Z-production in Deep Inelastic Scattering (DIS)  $e+p \rightarrow e+Z+X$  using the Parton Model (PM), in the context of the Standard Model (SM). In contrast to the Deep Inelastic ep -scattering ( $e+p \rightarrow e+X$ ), where  $Q^2$  the transferred momentum square is unique, in the case of boson production it depends upon the mechanism involved, that is related to the electroweak interaction. We present results for the total cross section rates for ep collisions with an electron energy of 60 GeV and the proton energy of 7 TeV, these energies are expected to be reached at LHeC. We use different assignments for  $Q^2$ ; namely  $Q^2$ ,  $Q^2_{\gamma^*}$ . We perform our calculations at NNLO by making use of the Calc-HEP package.

**Author:** GONZALEZ OLIVARES, Wendy Carolina (BUAP)

**Presenter:** GONZALEZ OLIVARES, Wendy Carolina (BUAP)

**Session Classification:** Poster session

Contribution ID: 12

Type: **not specified**

## Higgs-nucleons coupling and the Direct Search for Dark Matter

*Thursday 5 December 2019 15:00 (20 minutes)*

At tree-level the Higgs boson couplings with quarks through the Yukawa couples, which turn out to be quite small for the light valence quarks of the nucleons. We show that the effective Higgs-nucleon coupling can be described with a Dyson-Schwinger (DS) type equation, in analogy with the equations obeyed by the quark mass. There, the strong QCD effects can induce the generation of a dynamical quark mass even in the limit  $m_q \rightarrow 0$ ; similar effects can also induce an enhancement for the Higgs-nucleon coupling. One important application of this result is for dark matter ( $\chi$ ) direct search, where one looks for the collision of dark matter with nucleons  $\chi N \rightarrow \chi N$ . In many models such scattering amplitude is mediated by the Higgs boson, and in some cases it could even be the most important one. We analyze the cross section of the process  $\chi N \rightarrow \chi N$  within the dark matter-Higgs portal scenario using the DS ansatz (DSa), and then compare our results with those obtained using the Form factor Technique. We find that DSa provides a convenient parametrization to analyze the Higgs-nucleon coupling, which takes into account the low- $p^2$  effects.

**Author:** ARELLANO CELIZ , Concepción (FCFM-BUAP)

**Presenter:** ARELLANO CELIZ , Concepción (FCFM-BUAP)

Contribution ID: 14

Type: **Poster**

## Study of IceCube high energy neutrinos excess using unstable dark matter

*Wednesday 4 December 2019 16:15 (5 minutes)*

Recently the IceCube collaboration team reported an excess of 28 high energy neutrinos, which is well above the predicted number of the background events. A possible link between this neutrino signal and unstable dark matter has been suggested, namely, decay products of unstable weakly interacting massive particles making up the dark matter halo of our Milky Way galaxy may be responsible for this neutrino emission. In this work we set constraints on the lifetime of decaying dark matter candidates for a range of masses in order to our predictions to be consistent with IceCube data. Particularly, we focus in studying the excess of neutrinos due to decays of Dark Matter occurring at the galactic center of the Milky Way. In addition, we carried out numerical simulations by using publicly available CLUMPY code in order to generate the neutrino signal due to DM decays and to extract out the background coming from further galactic and extragalactic sources.

**Author:** LOPEZ , Jessica (BUAP)**Presenter:** LOPEZ , Jessica (BUAP)**Session Classification:** Poster session

Contribution ID: 17

Type: **Talk**

## Overspinning process in Kerr black holes

*Tuesday 3 December 2019 15:20 (20 minutes)*

It is shown that extremal and near-extremal Kerr black holes cannot be destroyed and obtain a naked singularity, in absorption processes where matter satisfies the null energy condition along the generators. This results rely on the calculation of second order corrections to the final mass of the black hole, in agreement with the weak cosmic censorship conjecture.

**Author:** VASQUEZ , Ivan (Universidad del Atlántico)

**Presenter:** VASQUEZ , Ivan (Universidad del Atlántico)

Contribution ID: 18

Type: **Poster**

## Majoron contribution to the invisible Higgs decays

*Wednesday 4 December 2019 16:20 (5 minutes)*

Nowadays, neutrino oscillations and Higgs boson existence has been confirmed. On the other hand, the possibility of extended scalars sectors as well neutrino mass origin are broad areas of research. Majoron minimal model consider both topics, which adds a complex singlet to Standard Model,  $\sigma = (f + \sigma^0 + iJ)/\sqrt{2}$  that carries a  $B - L$  charge 2. The pseudoscalar majoron  $J$ ,  $f$  being the expectation value of  $\sigma$ , and  $\sigma^0$  as the heavy CP-even majoron partner, are the new physics particles. In addition, three right-handed neutrinos are added, then, the Dirac and majorana neutrino mass term are allowed thanks to Higgs doublet and complex singlet, respectively. We are interested on the invisible Higgs decays probability to majorons and its possible detection in LHC.

**Author:** ZELENY MORA , Moises (BUAP)**Presenter:** ZELENY MORA , Moises (BUAP)**Session Classification:** Poster session

Contribution ID: **19**Type: **not specified**

## Higgs bosons production in the THDM-III at the LHC (Cancelled)

In this work we study different channels to produce Higgs bosons (charged and neutral) in Deep Inelastic Scattering (DIS) at energies reached on the LHC (14 TeV), all of that in the Two Higgs Doublet Model type-III (2HDM-III). We take into account for all the calculations that the 2HDM-III allows flavor changed couplings in the Yukawa sector at the tree level . We compute the hadronic cross section for the direct production processes of the charged and neutral Higgs bosons. Finally, we compare our results against the results reported by the ATLAS and CMS experiments.

**Author:** LÓPEZ GUERRERO, Víctor Manuel (BUAP)

**Presenter:** LÓPEZ GUERRERO, Víctor Manuel (BUAP)

Contribution ID: 20

Type: **Poster**

## Low Energy Theorems and the Higgs boson.

*Wednesday 4 December 2019 16:25 (5 minutes)*

Decayings that have a lepton flavor violation (LFV) are affected by the standard model (SM). However, from recent observations at the LHC, some limits have been found for these types of processes that show a change in flavor, up to a confidence level of 3%. In particular, the process  $h \rightarrow \mu\mu$  seems to maintain a higher decay ratio (branching ratio)  $\text{BR}(h \rightarrow \mu\mu) \approx 0.02$ , compared to other channels. In this work we study the width of decay  $\Gamma(h \rightarrow \mu\mu)$  and  $\text{BR}(h \rightarrow \mu\mu)$  for this decay. The specification of both parameters is made using the following premises: The theoretical framework is that of the SM, but considers the neutrinos with mass. Both, 't Hooft - Feynman, and Unitary gauges, are used in the calculation. The Low Energy Theorems (LETs) technique is used to make the calculus to a one loop approach. In the end, the result obtained is contrasted with other results reported in the literature that have been performed using some other calculation techniques.

**Author:** GARCÍA, Roberto (BUAP)

**Presenter:** GARCÍA, Roberto (BUAP)

**Session Classification:** Poster session

Contribution ID: 21

Type: **Talk**

## Study of the neutrino nature through cross sections in the Left-Right Symmetric Model.

*Tuesday 3 December 2019 15:00 (20 minutes)*

Neutrinos are elementary particles with spin  $\frac{1}{2}$ . If neutrinos are different from their antiparticles, they would be Dirac particles, allowing process where the lepton number is conserved. Otherwise neutrinos would be Majorana particles, and some Non Standard processes, like the neutrinoless double beta decay, could occur. The nature of neutrinos is still to be determined and, in this study, the cross sections between neutrinos and antineutrinos is calculated, to see if there are differences for Majorana and Dirac neutrinos, in the framework of the Left-Right Symmetric Model (LRSM).

**Author:** BULA MARTINEZ, Frank (Universidad del Atlántico)

**Presenter:** BULA MARTINEZ, Frank (Universidad del Atlántico)



Contribution ID: 22

Type: **Talk**

## Measurement of B<sup>+</sup> production cross sections in pp collisions a 13 TeV

*Wednesday 4 December 2019 11:30 (20 minutes)*

The B<sup>+</sup>meson total and differential cross sections, as a function of transverse momentum p<sub>T</sub>, are measured in pp collisions at center-of-mass energy  $\sqrt{s}=13\text{TeV}$ , on the basis of a data sample collected by the CMS experiment in 2018, corresponding to an integrated luminosity of 61.3 fb<sup>-1</sup>. The measurement uses the exclusive decay channel B<sup>+</sup>J/K<sup>+</sup> with the J/ψ decaying to a pair of muons. The results are compared with the results obtained by CMS in 2016

**Author:** RODRIGUEZ, Manuel (Universidad de Antioquia)

**Presenter:** RODRIGUEZ, Manuel (Universidad de Antioquia)

Contribution ID: 23

Type: **Poster**

## Leptonic Decay of meson D

*Wednesday 4 December 2019 17:50 (5 minutes)*

Theoretical study of the leptonic decay of the D-meson, where the bound state of the two quarks decays through a W, results in two leptons, the branching fractions are calculated having very similar results to the experimental data.

**Author:** PORTILLA MANTILLA , Leidy Matilde (Universidad de Pamplona)

**Presenter:** PORTILLA MANTILLA , Leidy Matilde (Universidad de Pamplona)

**Session Classification:** Poster session

Contribution ID: 24

Type: **Talk**

## Vector Boson Fusion and monojet signatures in simplified dark matter models (Cancelled)

We study the differences among Vector Boson Fusion and monojet signatures in the simplified models approach for dark matter searches at the LHC. We develop an optimized selection for Vector Boson Fusion signature of the mentioned model and establish its exclusion reach in comparison to monojet searches.

**Author:** OCAMPO HENAO , Daniel (Universidad de Antioquia)

**Presenter:** OCAMPO HENAO , Daniel (Universidad de Antioquia)

Contribution ID: 25

Type: **Talk**

## Charged current $b \rightarrow c\tau\nu$ anomalies in a general $W'$ boson scenario

*Wednesday 4 December 2019 15:00 (20 minutes)*

The very recent experimental information obtained from Belle experiment, along with the one accumulated by the BABAR and LHCb experiments have shown the existence of anomalies in the ratios  $R(D)$  and  $R(D^*)$  associated with the charged current transition  $b \rightarrow c\tau\nu$ . We present a phenomenological study of parameter space allowed by the new experimental  $b \rightarrow c\tau\nu$  data and with the mono-tau signature  $pp \rightarrow \tau hX + \text{MET}$  at the LHC. For comparison, we include some of the  $W'$  boson NP realizations that have already been studied in the literature.

**Author:** GOMEZ, John (UdeA-ITM)

**Presenter:** GOMEZ, John (UdeA-ITM)

Contribution ID: 26

Type: **Talk**

## STUDY OF PROTONS IN PROTON CARBON COLLISIONS AT 4.2 GeV/C USING UrQMD MODEL

The transverse momentum spectra of protons participated in the collision processes calculated using UrQMD model simulations have been compared with the  $p_t$  spectra of participant protons, obtained experimentally in interactions of protons beam with carbon nuclei at momenta of 4.2 GeV/c. Spectral temperatures of negative pions obtained in the experimental and UrQMD model simulated interactions of protons beam with carbon nuclei have been calculated by fitting both spectra with four different fitting functions i.e. Hagedorn Thermodynamic, Boltzmann distribution, Gaussian and Exponential functions. These functions are used commonly for describing the hadrons spectra and their spectral temperatures. The most suitable fitting functions among these four functions have been recommended.

**Author:** KHAN , ALAMGIR (University Of Science And Technology KPK Pakistan)

**Presenter:** KHAN , ALAMGIR (University Of Science And Technology KPK Pakistan)

Contribution ID: 27

Type: **Poster**

## Measurement of the fragmentation fraction ratio $f_s/f_u$

*Wednesday 4 December 2019 17:40 (5 minutes)*

Knowledge of the fragmentation fractions of  $B_s^0$  ( $f_s$ ) hadron is essential for determining absolute branching fractions ( $\beta$ ) of decays of these hadrons in various (rare) processes at the LHC. One example is the rare disintegration  $B_s^0 \rightarrow u^+u^-$ , this fragmentation process can not be reliably predicted because it is driven by strong dynamics in the non-perturbative regime. Thus fragmentation functions for the various hadron species must be determined experimentally. The precise knowledge of the fragmentation fractions, in the kinematic phase space accessed by the experiment, is an important ingredient in the measurement of B-hadron properties. The work is developed within the context of the  $B_s^0 \rightarrow u^+u^-$  analysis, where the ratio  $f_s/f_u$  enters as a key function in the branching fraction measurement because of its ability to quantify the relative production rate of the  $B_s^0$  with respect to  $B^+$ . So  $f_s/f_u$  is crucial to achieve greater sensitivity in the search for physics beyond the standard model. The branching fractions of a large number of  $B^0$  and  $B^+$  decays have been measured with high precision in the factories of B (Bell, BABAR), but no branching fraction of  $B_s^0$  with an accuracy high enough to be used as a normalization channel is known. In the poster we will show a few preliminary results essential for the calculation of  $f_s/f_u$  at CMS experiment.

**Author:** Mr HERNANDEZ CASTRILLON , Diego Alexander (Universidad de Antioquia)

**Co-author:** MEJIA GUISAO, Jhovanny Andres (Universidad de Antioquia (CO))

**Presenter:** Mr HERNANDEZ CASTRILLON , Diego Alexander (Universidad de Antioquia)

**Session Classification:** Poster session

Contribution ID: 28

Type: **Poster**

## CP sensitivity Dalitz plot analysis of the decay $B^0 \rightarrow K_s^0 K^+ K^-$

*Wednesday 4 December 2019 17:55 (5 minutes)*

I study the weak three-body decay  $B^0 \rightarrow K_s^0 K^+ K^-$  at the LHCb experiment (Large Hadron Collider beauty) in the LHC (Large Hadron Collider) at CERN (Conseil Européen pour la Recherche Nucléaire). We validate the current results from Run 1 (2010-2012) and study the expected results for Run 2 (2015-2018) and Run 3 (2021-). The simulation of the experimental conditions like the tagging (flavour of the  $B^0$ ), the detector efficiency and the number of expected events will determine the sensitivity of the phase space density (Dalitz plot) to the isobar amplitudes for the many resonance modes in the three-body decay, expecting to determine the expected precision of the CP-violating asymmetries of the flavour specific modes.

**Authors:** NUNEZ PALACIO, Rafael David (Universidad Nacional de Colombia (CO)); MILANES CARRENO, Diego (Universidad Nacional de Colombia (CO))

**Presenter:** NUNEZ PALACIO, Rafael David (Universidad Nacional de Colombia (CO))

**Session Classification:** Poster session

Contribution ID: 29

Type: **Talk**

## Spontaneous Breaking and Flat directions in Supersymmetry

*Monday 2 December 2019 16:30 (20 minutes)*

In order to reproduce the CMB density fluctuations, inflationary models require an inflaton scalar field  $\phi$  such that the potential is sufficiently flat near  $\phi = 0$ , and acquires a large curvature around the minimum. In supersymmetric models these flat directions appear naturally in the superpotentials, finding conditions on the fields so the  $F$  and  $D$  terms are zero. On the other hand, when supersymmetry is spontaneously broken, these directions gain a large enough curvature to produce the field oscillations required in the inflationary scenario. The supersymmetric formalism is constructed from a Super-poincaré symmetry group composed by a Poincaré Subgroup and a fermionic symmetry subgroup, and its algebra is given by Coleman-Mandula and Haag-Lopuszanski Sohnius theorems. The representations on fields are obtained through the coset Super-Poincaré/Lorentz and the Lagrangians for scalar and vector fields can be constructed. Hereinafter, conditions for spontaneous breaking of Supersymmetry in the Wess-Zumino, O'Raifeartaigh and Fayet-Iliopoulos models are analyzed in order to obtain the mass-spectra of the fields involved. Finally, two simple superpotentials for the inflaton are showed to fulfill asymptotic behaviour that could give rise to inflation.

**Authors:** GARCIA SANDOVAL, Diana (Universidad Nacional de Colombia); MARTINEZ, Roberto (Universidad Nacional de Colombia)

**Presenter:** GARCIA SANDOVAL, Diana (Universidad Nacional de Colombia)



Contribution ID: 30

Type: **Talk**

## A theoretical framework for multicomponent dark matter

*Thursday 5 December 2019 11:30 (20 minutes)*

We show that a single  $Z_N$  symmetry, which may be a remnant of a spontaneously broken  $U(1)$  gauge symmetry, allows to simultaneously stabilize several dark matter particles. We systematically study scenarios with various scalar fields charged under a  $Z_N$  and find that it is possible to get two ( $N \geq 4$ ), three ( $N \geq 6$ ), four ( $N \geq 8$ ), or even more dark matter (stable) particles. A generic feature of these models is that the number of stable particles is not determined by the model but depends on the relation between the masses of the different fields.

**Author:** E. YAGUNA, Carlos**Presenter:** E. YAGUNA, Carlos

Contribution ID: 31

Type: **Talk**

## General Solutions for minimal non-universal $Z'$ gauge bosons

*Monday 2 December 2019 17:10 (20 minutes)*

By allowing gauge anomaly cancellation between fermions in different families we find nonuniversal solutions for  $Z'$  models with the same content of fermions of the standard model plus three right-handed neutrinos. We also impose constraints from the Yukawa interaction terms reducing the number of free parameters. Our solutions contain as particular cases well-known models in the literature. As an application, we report a model which evades LHC constraints, flavor changing neutral currents and low energy constraints. Simultaneously, the model is able to explain the flavor anomalies in the Wilson coefficients  $C_9(\mu)$  and  $C_{10}(\mu)$  without modifying the corresponding Wilson coefficients for the first family. In our approach, this procedure is always possible for  $Z'$  masses smaller than  $\sim 2.5$  TeV.

**Author:** Dr ROJAS, Eduardo (Universidad de Antioquia)

**Presenter:** Dr ROJAS, Eduardo (Universidad de Antioquia)

Contribution ID: 32

Type: **Talk**

## Vector Boson Fusion as a dark matter signature in simplified dark matter models with scalar mediators

*Thursday 5 December 2019 12:10 (20 minutes)*

We study the characteristics of the vector boson fusion signature in simplified dark matter model with a scalar mediator. We develop a selection for searches at the LHC and show the possible exclusion reach of such a search

**Author:** DUQUE ESCOBAR, Andres Santiago (Universidad de Antioquia)

**Presenter:** DUQUE ESCOBAR, Andres Santiago (Universidad de Antioquia)

Contribution ID: 33

Type: **Talk**

## Lensing convergence and anisotropic dark energy in galaxy redshift surveys

*Thursday 5 December 2019 15:20 (20 minutes)*

Analyses of upcoming galaxy surveys will require careful modelling of relevant observables such as the power spectrum of galaxy counts in harmonic space  $C_\ell(z, z')$ . We investigate the impact of disregarding relevant relativistic effects by considering a model of dark energy including constant sound speed, constant equation of state  $w_0$ , and anisotropic stress. Here we show that neglecting the effect of lensing convergence will lead to substantial shifts in cosmological parameters such as the galaxy bias  $b_0$ , the value of the dark energy equation of state today  $w_0$ , and the Hubble constant  $H_0$ . Interestingly, neglecting the effect of lensing convergence in this kind of models results in shifting  $H_0$  downwards, something which could shed light on the current tension between local and CMB determinations of the Hubble constant.

**Authors:** Dr CARDONA, Wilmar (Universidad del Valle); Mr ARJOJA, Ruben (IFT); Prof. NESSERIS, Savvas (IFT)

**Presenter:** Dr CARDONA, Wilmar (Universidad del Valle)

Contribution ID: 34

Type: **Poster**

## Alcance del modelo isobar en la desintegración de 3 cuerpos

*Wednesday 4 December 2019 17:45 (5 minutes)*

En física de sabores pesados, las desintegraciones a tres cuerpos son ampliamente utilizadas en el estudio de la dinámica fuerte, así como en la extracción de fases fuertes y débiles, por ejemplo, medidas de violación CP. El modelo isobar, describe este tipo de desintegraciones como una suma de procesos de desintegración a dos cuerpos mediados por resonancias, pero deja por fuera efectos de la interacción fuerte a bajas energías como interacción de estado final y rescattering. La gran estadística alcanzada en los experimentos a día de hoy, motiva la construcción de modelos más complejos que tengan en cuenta los efectos mencionados. En este sentido, este trabajo busca exponer los problemas del modelo isobar y mostrar alternativas a este.

**Author:** Mr ORDOÑEZ SOTO, Juan Sebastian (Universidad Nacional de Colombia)

**Presenter:** Mr ORDOÑEZ SOTO, Juan Sebastian (Universidad Nacional de Colombia)

**Session Classification:** Poster session

Contribution ID: 35

Type: **Poster**

## Comparisson between a muon and a high energy tau particle as seen on IceCube detector array

*Wednesday 4 December 2019 16:30 (5 minutes)*

We present a study of the possible traits that can help to determine the difference between a muon and a high energy tau article regarding their in-ice energy losses. The study consists on muons and tau particles simulated on the atmosphere with an array of different energies ranging from 1 TeV to 1 EeV, and propagated in air and in-ice using PROPOSAL (Monte-Carlo lepton propagator), we keep track of the catastrophic energy losses caused by the ionization, pair production, photonuclear interaction and bremsstrahlung. This gives us information about the behavior of the tracks of energy losses for both types of particles. There are differences in the fluctuations of energy losses, for tau particles there will be more fluctuations of  $dE/dx$  and this will be a start point for a future algorithm that classifies the tracks according to the particle type.

**Authors:** Prof. SECKEL, David (University of Delaware); PENA-MARTINEZ, Santiago (Universidad Nacional de Colombia)

**Presenter:** PENA-MARTINEZ, Santiago (Universidad Nacional de Colombia)

**Session Classification:** Poster session

Contribution ID: 36

Type: **Poster**

## THE ANOMALOUS MAGNETIC MOMENT OF THE MUON $g - 2$ IN THE STANDARD MODEL AND IN SOME OF ITS EXTENSIONS

*Wednesday 4 December 2019 17:00 (5 minutes)*

The anomalous magnetic moment of the muon  $g - 2$  is a very special quantity that reflects almost the entire spectrum of effects incorporated in the Standard Model (SM) of particles, in addition to being one of the quantities measured with greater precision. Currently there is a deviation of  $3 - 4\sigma$  between theory and experimental results, discrepancy that is waiting to be well established by current experiments such as muon  $g - 2$  in Fermilab and J-PARC in Japan. We calculate the  $g - 2$  of the muon, as it is also known, to a loop in quantum electrodynamics (QED). Then we will study some extensions of the standard model that may be sensitive to the theoretical value of the anomalous magnetic moment of the muon.

**Author:** BALLESTEROS BARRERA, Santiago (Universidad Pedagógica y Tecnológica de Colombia (UPTC))

**Co-author:** E. YAGUNA, Carlos

**Presenter:** BALLESTEROS BARRERA, Santiago (Universidad Pedagógica y Tecnológica de Colombia (UPTC))

**Session Classification:** Poster session

Contribution ID: 37

Type: **Talk**

## U(1)' coupling constant at low energies from heterotic orbifolds

*Tuesday 3 December 2019 15:40 (20 minutes)*

Extensions of the Standard Model include frequently an additional U(1) gauge symmetry. Such scenarios are known as Z' or dark photon models and are relevant to address issues such as the meta-stability of the Higgs vacuum, the nature of DM or the muon g-2 anomaly. In the context of  $E_8 \times E_8$  heterotic string compactifications, MSSM-like models with extra U(1) can be found, so that Z' models can be realized in the low energy limit. We study such string vacua, obtained from a  $\mathbb{Z}_8$  toroidal orbifold compactification, and characterize the Z' coupling at low energies under certain assumptions. We find Z' coupling values around 0.44-0.7 and argue that a sample model may have the required properties to stabilize the Higgs vacuum.

**Authors:** OLGUÍN TREJO, Yessenia (Instituto de Física, UNAM); PÉREZ FIGUEROA, Omar (Instituto de Física, UNAM); PÉREZ MARTÍNEZ, Ricardo (Instituto de Física, UNAM and Facultad de Ciencias Físico-Matemáticas, Universidad Autónoma de Coahuila); Dr RAMOS SÁNCHEZ, Saúl (Instituto de Física, UNAM)

**Presenter:** PÉREZ FIGUEROA, Omar (Instituto de Física, UNAM)



Contribution ID: 38

Type: **Poster**

## Search for gamma-ray counterparts of newly discovered radio astrophysical sources

We study two newly discovered classes of radio sources: the highly energetic, short-lived events, known as Fast Radio Bursts (FRBs), and a new category of compact sources known as Fanaroff-Riley type 0 radio galaxies (FR0s). Due to a possible catastrophic event origin for the FRBs and a previous correlation found with an FR0 in the gamma ray spectrum, it is possible that these radio sources could also emit high energy photons in the Fermi-LAT satellite energy range (20 MeV - 300GeV). We present an exhaustive time-dependent and spatial search of all up-to-date observed FRBs and FR0s, respectively. We perform a likelihood analysis of the radio sources by modeling the excess flux of gamma rays with a varying index power law function using data from Fermi-LAT and the 4FGL catalog. Sources with test statistic greater than 16 (corresponding to about 4 sigma) were further analyzed including 2 FRBs and 7 FR0s. No correlations with more than 5 sigma were found after taking into account nearby sources. Therefore, upper limits for all sources were calculated.

**Author:** BEST REYES, Sergio Andre (Pontificia Universidad Catolica del Peru (PE))

**Co-author:** BAZO ALBA, Jose Luis (Pontificia Universidad Catolica del Peru (PE))

**Presenter:** BEST REYES, Sergio Andre (Pontificia Universidad Catolica del Peru (PE))

**Session Classification:** Poster session

Contribution ID: 39

Type: **Poster**

## ELECTROMAGNETIC PROPERTIES OF THE "GHOST PARTICLE".

*Wednesday 4 December 2019 17:05 (5 minutes)*

Neutrinos are very interesting fundamental particles, interact very weakly and their masses are very small. In many extensions of the Standard Model neutrinos acquire electromagnetic properties through quantum loops effects, hence the study of neutrino electromagnetic interactions is a tool in the search of the fundamentals of particle physics. Neutrino electromagnetic properties can be used to distinguish Dirac and Majorana neutrinos and also gives a path to new physics beyond the standard model. The consequences of these properties affect the fields of science, such as astrophysics, since in certain circumstances, such as the core-collapse supernovae the influence of the electromagnetic properties of the neutrino must be considered.

**Author:** ANDRES JUNCA MOLANO, YHARON (Universidad pedagógica y tecnológica de Colombia)

**Presenter:** ANDRES JUNCA MOLANO, YHARON (Universidad pedagógica y tecnológica de Colombia)

**Session Classification:** Poster session

Contribution ID: 40

Type: **Talk**

## Heavy quarks within the electroweak multiplet

*Wednesday 4 December 2019 15:20 (20 minutes)*

Standard-model fields and their associated electroweak Lagrangian are equivalently expressed in a shared spin basis. The scalar-vector terms are written with scalar-operator components acting on quark-doublet elements, and shown to be parametrization-invariant. Such terms, and the t- and b-quark Yukawa terms are linked by the identification of the common mass-generating Higgs operating upon the other fields, after acquiring a vacuum expectation value  $v$ . Thus, the customary vector masses are related to the fermions', fixing the t-quark mass  $m_t$  with the relation  $m_t^2 + m_b^2 = v^2/2$  either for maximal hierarchy, or given the b-quark mass  $m_b$ . A sum rule is derived for all quark masses that generalizes this restriction. An interpretation follows that electroweak bosons and heavy quarks belong in a multiplet.

**Authors:** Prof. BESPROSVANY, Jaime (Instituto de Física, Universidad Nacional Autónoma de México); Dr ROMERO, Ricardo (Ciencias Básicas e Ingeniería, Universidad Autónoma Metropolitana)

**Presenter:** Prof. BESPROSVANY, Jaime (Instituto de Física, Universidad Nacional Autónoma de México)

Contribution ID: 41

Type: **Talk**

## Constaints for a $Z'$ boson with non-universal couplings in a supersymmetric model

*Monday 2 December 2019 16:50 (20 minutes)*

We explored in a supersymmetric extension to a  $U(1)_X$  non-universal model (Phys. Rev. D 100, 055037) some features regarding the fermion mass hierarchy and the Higgs mass at tree level. The  $Z'$  boson included within the non-universal symmetry involves D-terms in the Lagrangian that can predict a 125 GeV Higgs boson, avoiding the necessity of large radiative corrections. In the present work we discuss how this is possible. Additionally, we compare our results with CMS and ATLAS upper bounds on dilepton  $l^+l^-$  and diboson  $W^+W^-$  production and derive with it some constraints for the  $Z'$  mass.

**Author:** DIAZ JARAMILLO, Carlos Eduardo (Universidad Nacional de Colombia, sede Bogotá)

**Co-authors:** MARTINEZ, Roberto (Universidad Nacional de Colombia); ALVARADO GALEANO, Juan Sebastian (Universidad Nacional de Colombia)

**Presenter:** DIAZ JARAMILLO, Carlos Eduardo (Universidad Nacional de Colombia, sede Bogotá)

Contribution ID: 42

Type: **Poster**

## Neutrino oscillations in perspective, what do we know?

*Wednesday 4 December 2019 16:55 (5 minutes)*

Neutrino oscillations are one of the few physical evidences beyond the standard model. From Pontecorvo's idea of representing neutrinos as a linear combination of mass states, we want to review the formalism of neutrino oscillations in the image of the three known flavors to date.

With the confirmation of the oscillations, we're searching to describe the phenomenon of the neutrino oscillation of the mixing matrix PMNS, its role in the expressions of the (anti) neutrino state and the value of the oscillation parameters observed in the most important experiments.

**Author:** FONSECA, Paula (UPTC)

**Co-author:** E. YAGUNA, Carlos

**Presenter:** FONSECA, Paula (UPTC)

**Session Classification:** Poster session

Contribution ID: 43

Type: **Talk**

## A non-universal $U(1)_X$ gauge extension to the MSSM

*Monday 2 December 2019 11:50 (20 minutes)*

We propose a supersymmetric extension of the anomaly-free and three families nonuniversal  $U(1)$  model, with the inclusion of four Higgs doublets and four Higgs singlets. The quark sector is extended by adding three exotic quark singlets, while the lepton sector includes two exotic charged lepton singlets, three right-handed neutrinos and three sterile Majorana neutrinos to obtain the fermionic mass spectrum. By implementing an additional  $\mathbb{Z}_2$  symmetry, the Yukawa coupling terms are suited in such a way that the fermion mass hierarchy is obtained without fine-tuning. The effective mass matrix for SM neutrinos is fitted to current neutrino oscillation data to check the consistency of the model with experimental evidence, obtaining that the normal-ordering scheme is preferred over the inverse ones. The electron and up, down and strange quarks are massless at tree level, but they get masses through radiative correction at one loop level coming from the sleptons and Higgsinos contributions. We show that the model predicts a like-Higgs SM mass at electroweak scale by using the VEV according to the symmetry breaking and fermion masses.

**Authors:** Mr ALVARADO GALEANO, Juan Sebastian (Universidad Nacional de Colombia); Mr DIAZ JARAMILLO, Carlos Eduardo (Universidad Nacional de Colombia); Prof. MARTINEZ MARTINEZ, Roberto Enrique (Universidad Nacional de Colombia)

**Presenter:** Mr ALVARADO GALEANO, Juan Sebastian (Universidad Nacional de Colombia)

Contribution ID: 44

Type: **Poster**

## Massive neutrinos and fermion mass hierarchy in a non-universal $U(1)_X$ extension with an invisible axion

*Wednesday 4 December 2019 18:00 (5 minutes)*

We present a non-universal  $U(1)_X$  extension and an additional global anomala Peccei-Quinn (PQ) symmetry to the standard model (SM). The scheme proposed allow us to distinguish among fermion families without introducing additional discrete symmetries and generating the correct ansatz of mass matrix to obtain the fermionic mass spectrum in SM. The symmetry breakdown is performed by two scalar Higgs doublets and two scalar singlets, where one of these has the excitation associated with the axion-particle which turns out to be a candidate for dark matter. The exotic sector is composed of an invisible axion  $a$ , one up-type  $T$  and two down-type  $J^{1,2}$  heavy quarks, two heavy charged leptons  $E, \mathcal{E}$  and one right-handed  $\nu_R^{e,\mu,\tau}$  additional neutrino per family. In addition, the large energy scale associated with the spontaneously breaking (SSB) of the PQ-symmetry provides a solution to the strong CP-problem, also giving masses to the right neutrinos in such manner that the active neutrinos acquire  $eV$ -mass values due to the see-saw mechanism implementation. We comment on the implications of the proposed model with electroweak baryogenesis.

**Authors:** GARNICA, Yadir (Universidad Nacional de Colombia); MARTINEZ, Roberto (Universidad Nacional de Colombia)

**Presenter:** GARNICA, Yadir (Universidad Nacional de Colombia)

**Session Classification:** Poster session

Contribution ID: 45

Type: **Poster**

## INFLATION MODELS AND ITS IMPLICATIONS

*Wednesday 4 December 2019 16:50 (5 minutes)*

Although inflation theory modifies our understanding of the first fraction of a second in the history of the universe, when combined with the standard Big Bang theory it preserves all the successes of the previous theory and complements it. Scientific literature shows that it is not really a single theory, but that there are a multitude of scenarios with names such as old inflation, new inflation, chaotic inflation, among others. The new Data, specifically those from the Planck satellite, can put restrictions, and even discard some of them. This project consists of a review of the theories of single field slow roll inflation and its current state.

**Author:** PULIDO GUZMÁN, Daniel Fernando**Co-author:** E. YAGUNA, Carlos**Presenter:** PULIDO GUZMÁN, Daniel Fernando**Session Classification:** Poster session



Contribution ID: 46

Type: **Poster**

## The 3-3-1 economical model with right-handed neutrinos using SARAH tool

*Wednesday 4 December 2019 16:35 (5 minutes)*

We analyzed the 3-3-1 economical model with right-handed neutrinos using the software SARAH, we show the analytical results are correct when we compare them with the literature, besides, we can build the vertices necessary to close the loops diagrams and explore the possibility of to have masses to one up-quark and two quarks-down types to radiative level.

**Author:** Mr BENAVIDES, Richard (ITM)

**Presenter:** Mr BENAVIDES, Richard (ITM)

**Session Classification:** Poster session

Contribution ID: 47

Type: **Talk**

## A model independent study of CP violation in decays of charmed mesons to three-body final states

*Wednesday 4 December 2019 11:50 (20 minutes)*

CP violation arises on the Standard Model from the complex phase of the CKM matrix. Here the asymmetries for B meson decays are expected to be of the order of  $10^{-1}$ . For the charm system its expected to be much smaller, of the order of  $10^{-4} - 10^{-3}$ . Measurements for B decays seem to be in accordance with SM expected values and recent measurements from the LHCb collaboration indicate that so does the D system. These asymmetries can be enhanced in New Physics models, providing a valuable test of the SM. Dalitz Plot analysis for the determination of CP violation on three-body decays has been used most commonly within the Isobar method to model intermediate states. As an alternative, other methods have been studied recently that address the model dependence. In this work we propose an implementation of the Miranda Procedure on for the decays  $D_{(s)}^+ \rightarrow K^- K^+ \pi^+$ .

**Author:** JAIMES ELLES, Sergio (Universidad Nacional de Colombia)

**Presenter:** JAIMES ELLES, Sergio (Universidad Nacional de Colombia)

Contribution ID: 48

Type: **Talk**

## Study of the $B+c \rightarrow [(\eta c \rightarrow pp^-) \mu^+ \nu_\mu]$ decay

*Wednesday 4 December 2019 12:10 (20 minutes)*

Lepton universality implies that vector bosons are coupled equally to the three families of leptons. This feature is implicit in the standard model which is our current model in particle physics. Lepton universality tests seek to find some anomaly. We are interested in perform a lepton universality test studying the decay  $B+c \rightarrow [(\eta c \rightarrow pp^-) l^+ \nu_l]$ . We have started studying the  $B+c \rightarrow [(\eta c \rightarrow pp^-) \mu^+ \nu_\mu]$  decay to subsequently measure its branching fraction. We are using data from the LHCb of the run 2 pp collision of the years 2016 and 2017.

**Author:** GOMEZ ARIAS, Santiago**Presenter:** GOMEZ ARIAS, Santiago

Contribution ID: 49

Type: **Poster**

## Non Abelian SQED4 in the null-plane gauge

*Wednesday 4 December 2019 16:40 (5 minutes)*

We are going to study the non-abelian SQED4 on the null-plane coordinates. The constraint structure of the theory is analyzed and appropriated boundary conditions on the field are imposed to fix the hidden subset first class constraint which generated improper gauge transformations and obtain an unique inverse of the second class constraints.

**Author:** Mr RAMOS, German (Universidad de Nariño)

**Presenter:** Mr RAMOS, German (Universidad de Nariño)

**Session Classification:** Poster session

Contribution ID: 50

Type: **Poster**

## S.Q.E.D.2 on the null plane using Faddeev-Jackiw quantization

*Wednesday 4 December 2019 16:45 (5 minutes)*

Half a century ago Dirac has proposed three different forms of relativistic dynamics depending on the types of surfaces where independent modes were initiated. The first possibility when a space-like surface is chosen (instant form) has been used most frequently so far and is usually called equal-time quantization. The second choice is to take a surface of a single light wave (front form or null-plane). The third possibility is to take a branch of hyperbolic surface (point form). In this paper we are going to study S.Q.E.D.2 on the null-plane and we will show that one of the first class constraints of the theory has a contribution provided by the scalar sector and in addition the theory has a second class constraint in the scalar sector which is manifest in the free case. It is not natural in the instant form. The Faddeev-Jackiw procedure for constrained system is applied to calculate the commutation relations of the theory.

**Author:** Mr RAMOS, German (Universidad de Nariño)

**Presenter:** Mr RAMOS, German (Universidad de Nariño)

**Session Classification:** Poster session

Contribution ID: 51

Type: **Talk**

## Perspectives in Particle Physics

*Monday 2 December 2019 09:20 (1 hour)*

<https://vidyoportal.cern.ch/join/kueKFENNmpBd>

**Presenter:** ELLIS, Jonathan R. (University of London (GB))

Contribution ID: 52

Type: **Talk**

## Gravitational Wave Astronomy

*Monday 2 December 2019 10:20 (1 hour)*

**Presenter:** Prof. STURANI , Riccardo (International Institute of Physics)

Contribution ID: 53

Type: **Talk**

## **Searches for exotic signatures with the ATLAS detector**

*Monday 2 December 2019 14:00 (1 hour)*

**Presenter:** NAVARRO, Gabriela Alejandra (Universidad Antonio Narino (CO))



Contribution ID: 54

Type: **Talk**

## CMS Highlights

*Monday 2 December 2019 15:00 (1 hour)*

**Presenter:** AVILA BERNAL, Carlos (Universidad de los Andes (CO))

Contribution ID: 55

Type: **Talk**

## DUNE Highlights

*Tuesday 3 December 2019 09:00 (1 hour)*

**Presenter:** MORENO LOPEZ, Deywis (Universidad Antonio Narino (CO))

Contribution ID: 56

Type: **Talk**

## Neutrinos from reactors

*Tuesday 3 December 2019 10:00 (1 hour)*

**Presenter:** Prof. MARTINEZ, David (South Dakota School of Mines and Technology)

Contribution ID: 57

Type: **Talk**

## Cosmic rays

**Presenter:** Dr TAPIA, Alex (University of Medellin)

Contribution ID: 59

Type: **Talk**

## **Profesores Colombianos en el CERN**

*Tuesday 3 December 2019 16:30 (20 minutes)*

**Presenter:** Ms RESNICK, Johanna

**Session Classification:** Colombian Network status

Contribution ID: **60**

Type: **Talk**

## **Suratómica y la Red Colombiana de Altas Energías**

*Tuesday 3 December 2019 16:50 (20 minutes)*

**Presenter:** Ms RIVERA, Natalia

**Session Classification:** Colombian Network status

Contribution ID: **61**

Type: **Talk**

## **Red Colombiana de Altas Energías: Actualidad y Prospectos**

*Tuesday 3 December 2019 17:30 (20 minutes)*

**Presenter:** SANDOVAL USME, Carlos (Universidad Antonio Narino (CO))

**Session Classification:** Colombian Network status

Contribution ID: **62**

Type: **Talk**

## Discusión

*Tuesday 3 December 2019 17:50 (40 minutes)*

**Presenter:** SANDOVAL USME, Carlos (Universidad Antonio Narino (CO))

**Session Classification:** Colombian Network status



Contribution ID: **63**

Type: **Talk**

## **CP violation in charm quark physics**

*Wednesday 4 December 2019 09:00 (1 hour)*

**Presenter:** Mr RAMIREZ, Carlos (Universidad de los Andes)

Contribution ID: **64**

Type: **Talk**

## **Heavy Flavor measurements and production studies at CMS**

*Wednesday 4 December 2019 10:00 (1 hour)*

**Presenter:** MEJIA GUISAO, Jhovanny Andres (Universidad de Antioquia (CO))

Contribution ID: 65

Type: **Talk**

## Particle physics by means of lattice simulations

*Wednesday 4 December 2019 14:00 (1 hour)*

**Presenter:** BIETENHOLZ, Wolfgang (UNAM, Mexico)

Contribution ID: **66**

Type: **Talk**

## **Dark Matter: theory**

*Thursday 5 December 2019 09:00 (1 hour)*

**Presenter:** LINEROS, Roberto A. (Instituto de Fisica Corpuscular U.Valencia/CSIC)

Contribution ID: 67

Type: **Talk**

## Searches for Dark Matter at the LHC

*Thursday 5 December 2019 10:00 (1 hour)*

**Presenter:** ALBERT, Andreas (Boston University (US))

Contribution ID: **69**

Type: **Talk**

## Cosmology

*Thursday 5 December 2019 16:10 (1 hour)*

**Presenter:** ROSENFELD, Rogerio (UNESP - Universidade Estadual Paulista (BR))

Contribution ID: **70**

Type: **Talk**

## Closing

*Thursday 5 December 2019 17:10 (20 minutes)*

**Presenter:** SANDOVAL USME, Carlos (Universidad Antonio Narino (CO))

Contribution ID: 71

Type: **Talk**

## Opening

*Monday 2 December 2019 09:00 (20 minutes)*

**Presenter:** ACERO-ORTEGA, Mario A (Universidad del Atlantico)



Contribution ID: 72

Type: **Poster**

## Estudio de la sensibilidad de la violación de simetría CP en los decaimientos $\pi^+ \rightarrow \pi^0 \ell^+ \ell^-$

*Wednesday 4 December 2019 17:10 (5 minutes)*

Se presenta un estudio preliminar sobre la violación de la simetría CP en los decaimientos  $\pi^+ \rightarrow \pi^0 \ell^+ \ell^-$ , donde a partir de un Monte Carlo se hace una simulación de estos decaimientos en un Dalitz Plot, y se realiza mediante el modelo Isobar un análisis de la amplitud para para los decaimientos del  $\pi^+$ .

**Author:** Mr APONTE, Andres (Universidad Distrital Francisco Jose de Caldas)

**Presenter:** Mr APONTE, Andres (Universidad Distrital Francisco Jose de Caldas)

**Session Classification:** Poster session

Contribution ID: 73

Type: **Poster**

## An approach to Dirac neutrino masses through the use of texture zeros

*Wednesday 4 December 2019 17:15 (5 minutes)*

In this work, we consider some phenomenological consequences of having neutrinos with Dirac masses instead of Majorana masses as assumed in most of the current literature. In order to carry out this analysis, we propose new five-zero textures for the mass matrices of the leptonic sector. From our approach, we find new values for the neutrino masses in both, the normal and inverted hierarchy. These zero textures reproduce the  $U_{pmns}$  mixing matrix and deliver relationships between the mixing angles and the leptonic sector masses.

**Author:** Prof. LUCAS GIRALDO USUGA, Yithsbey

**Presenter:** Prof. LUCAS GIRALDO USUGA, Yithsbey

**Session Classification:** Poster session

Contribution ID: 74

Type: **Poster**

## Superconformal invariance on finite supersymmetric grand unification theories

*Wednesday 4 December 2019 17:20 (5 minutes)*

In the context of grand unification supersymmetric theories, we treated the properties of finite theories (finite on sense of his absence of UV divergences at any order in perturbative expansion) and his implementation to construct a model phenomenological viable and consistent with the supersymmetric version of the standard model (MSSM). One of the most interesting theoretical properties of these theories is the existence of a superconformal manifold generated by the operators of the finite theory in 3+1 space-time dimensions and  $\mathcal{N} = 1$ , and the fact that these two characteristics (finiteness and superconformal invariance). To prove that affirmation we focus our attention on the renormalization group functions  $\beta_g$ ,  $\beta_y$  and  $\gamma_i$ , his relation with scale invariance and his role to identify generators of the superconformal manifold. This result is consistent with work of D. I. Kazakov, in the case of  $\mathcal{N} = 4$ .

**Author:** Mr REYES RODRÍGUEZ, Luis Enrique (Instituto de Física, UNAM)

**Presenter:** Mr REYES RODRÍGUEZ, Luis Enrique (Instituto de Física, UNAM)

**Session Classification:** Poster session

Contribution ID: 75

Type: **Poster**

## The implementation of the Type III seesaw mechanism for neutrino masses in the context 2HDM

*Wednesday 4 December 2019 17:25 (5 minutes)*

The seesaw mechanism has remained the most elegant scheme to explain the smallness of the neutrino masses without having to unnaturally fine tune the Yukawa couplings to arbitrary small values. In the so-called type-III seesaw, three triplet fermions under  $SU(2)$  are added to the standard model particle contents. Once these heavy leptons are integrated out from the theory, the dimension-5 Weinberg operator is generated. After electroweak symmetry breaking Majorana neutrino masses are generated from this operator. The smallness of the neutrino mass is explained by the largeness of the heavy fermion mass and without having to fine tune the Yukawa couplings to very small values.

**Author:** Mr GUTIERREZ, Julian Steven (Universidad Nacional de Colombia)

**Presenter:** Mr GUTIERREZ, Julian Steven (Universidad Nacional de Colombia)

**Session Classification:** Poster session

Contribution ID: 76

Type: **Poster**

## CHARACTERIZATION OF PLANAR SENSORS BONDED TO RD53A READOUT CHIP FOR CMS PHASE 2 INNER TRACKER SYSTEM

*Wednesday 4 December 2019 17:30 (5 minutes)*

One of the challenges of the CMS detector is to get a good and reliable data, hence it is necessary to work with more versatile, more compact and resistance devices, so the CMS collaboration scheduled from 2024 to mid-2026 an upgrade program called High-Luminosity LHC (HL-LHC) Phase 2, CMS detector will have a completely new silicon tracking detector. The work proposed is to carry out test beam studies of planar sensors exposed to a 120 GeV proton beam at FTBF (Fermilab Test Beam Facility) in order to analyse efficiency, cluster size and hit resolution before and after radiation leading to choose an optimal operation of these sensors.

**Author:** GUERRERO LAOS, Alvaro Javier (University of Puerto Rico (PR))

**Presenter:** GUERRERO LAOS, Alvaro Javier (University of Puerto Rico (PR))

**Session Classification:** Poster session

Contribution ID: 77

Type: **Poster**

## Charm baryon spectroscopy with D0p and D+p final states at LHCb experiment

*Wednesday 4 December 2019 17:35 (5 minutes)*

We study several  $D^0p$  and  $D^+p$  prompt systems, inclusively produced from pp collisions at the LHCb experiment, in order to perform singly charmed hadron spectroscopy studies. We have observed a structure near at the threshold on  $D^0p$  sample, and a hint of structure on  $D^+p$  sample connected with its Isospin partner on  $D^0p$ . Measurements of their masses and widths are reported.

**Author:** MONROY CANON, Ignacio Alberto (Universidad Nacional de Colombia (CO))

**Presenter:** MONROY CANON, Ignacio Alberto (Universidad Nacional de Colombia (CO))

**Session Classification:** Poster session

Contribution ID: 78

Type: **not specified**

## **Public seminar: Los diminutos mensajeros del universo**

*Wednesday 4 December 2019 18:00 (1 hour)*

**Presenter:** LINEROS, Roberto A. (Instituto de Física Corpuscular U.Valencia/CSIC)

Contribution ID: 79

Type: **not specified**

## Social Dinner



Contribution ID: **80**

Type: **Talk**

## Dark sectors from Dirac radiative neutrino masses

*Tuesday 3 December 2019 12:00 (20 minutes)*

Dark sectors emerging from an extra Abelian gauge symmetry can be defined by the way in which Dirac neutrino masses are generated at the radiative level.

**Authors:** Prof. RESTREPO, Diego (Universidad de Antioquia); RUIZ, Jose (Universidad de Antioquia (CO))

**Presenter:** Prof. RESTREPO, Diego (Universidad de Antioquia)

Contribution ID: 81

Type: **Talk**

## Singlet-Doublet Dirac Dark Matter and Neutrino Masses

We examine an extension of the Standard Model that addresses the dark matter puzzle and generates Dirac neutrinos masses through the radiative seesaw mechanism. The new field content includes a scalar field that plays an important role in setting the relic abundance of dark matter. We analyze the phenomenology in the light of direct, indirect, and collider searches of dark matter. In this framework, the dark matter candidate is a Dirac particle that is a mixture of new singlet-doublet fields with mass 1.1 TeV. We find that the allowed parameter space of this model is broader than the well-known Majorana dark matter scenario.

**Author:** Dr RIVERA ROMERO, Andrés Felipe (Universidad de Antioquia)

**Co-authors:** RESTREPO, Diego (Universidad de Antioquia); TANGARIFE, Walter (Loyola University Chicago)

**Presenter:** Dr RIVERA ROMERO, Andrés Felipe (Universidad de Antioquia)

Contribution ID: 82

Type: Poster

## Neutrino cosmology and trident production at the Deep Underground Neutrino Experiment

New experiments with the possibility to measure the effective number of degrees of freedom in the early universe, such as CMB-S4 or Planck+BAO, can probe the effect of new thermalized light particles and beyond Standard Model interactions involving Dirac neutrinos. The presence of these neutrinos enables the description of different physical phenomena, such as the smallness of neutrino masses and the matter-antimatter asymmetry. Moreover, the presence of right-handed chirality partners for neutrinos allows the calculation of deviations in the effective number  $\Delta N_{eff}$ . These models, besides addressing the cosmological problems, may also be useful in the description of different phenomena observed on terrestrial experiments involving neutrino oscillations, trident production, and neutrino-electron elastic scattering. We discuss a well-motivated model in which, in addition to right-handed neutrinos, a neutral gauge boson appears. We consider a U(1) anomaly free theory to incorporate these new fermionic and bosonic states, studying the trident production of pairs electron-positron and muon-antimuon at the near detector of DUNE (Deep Underground Neutrino Experiment). We analyze the consequences of having new U(1) interactions in the measurements of  $(g - 2)_\mu$  anomaly as well as in the leptogenesis mechanism. Finally we consider the sensitivity of DUNE in constraining these models along with the parameter restriction given by measuring  $\Delta N_{eff}$ , in order to obtain new limits on the effective degrees of freedom that have not yet been reported.

**Authors:** Mr ARCILA, Juan (Universidad Nacional de Colombia); Mr PEDRAZA, Miguel (Universidad Nacional de Colombia)

**Co-authors:** Mr CASTILLO, Andres (Universidad Nacional de Colombia); Prof. CASTAÑEDA, Leonardo (Universidad Nacional de Colombia)

**Presenters:** Mr ARCILA, Juan (Universidad Nacional de Colombia); Mr PEDRAZA, Miguel (Universidad Nacional de Colombia)

Contribution ID: 83

Type: **Poster**

## Electroweak extensions of Standard Model and scotogenic models

We study the dark matter stability due to the existence of an additional  $U(1)$  gauge symmetry. Furthermore, we generate neutrino masses at the radiative level via an effective dimension five Weinberg operator. The presence of an extra Abelian symmetry allows accommodating the recent LHCb anomalies in  $B \rightarrow K(K^*)\mu^+\mu^-$  decays, by fixing some parameters of the model.

**Author:** Mr BLANDON, Dario (Universidad de Antioquia)

**Presenter:** Mr BLANDON, Dario (Universidad de Antioquia)

**Session Classification:** Poster session

Contribution ID: **84**

Type: **Talk**

## **LASF4RI update**

*Tuesday 3 December 2019 17:10 (20 minutes)*

**Presenter:** RESTREPO, Diego (Universidad de Antioquia)

**Session Classification:** Colombian Network status