XVIII Mexican School of Particles and Fields
2018 University of Sonora School of High Energy Physics

Poster Sessions

Program

P1-01 $t \to c\gamma$ **top quark decay in one Higgs singlet and two Higgs doublets model**
MUNIVE VILLA, Erick (BUAP), TAVARES-VELASCO, Gilberto (BUAP)

The top quark is the heaviest elementary particle known, thus it has a wide range of decay modes. Studying this fermion phenomenology it could be possible to explore New Physics (NP) effects. If we consider the Standard Model (SM) Strong and Electro-Weak interactions, Flavor Changing mediated by Neutral Currents (FCNC) do not exist at tree level and such processes just can success at one loop level or higher orders but highly suppressed. However, this is not true at all in Beyond Standard Models (BSM), then it is possible that decay widths of processes with FCNC have an appreciable increment copared with SM decay widths. Therefore in this work we show a calculation of the $t \to c\gamma$ rare top quark decay with FCNC at one loop level. In particular, we focus in a neutral scalar bosson contribution with flavour changing couplings, which can rise in many BSMs. Along this work some particle physics concepts are exposed, such as: SM Lagrangian of weak interactions for quarks, top quark production and decay modes in a hadronic collider, FCNC, etc. Here we show the compute of the $t \to c\gamma$ decay width by using the Feynman parametrization method and we exemplified the numerical analysis of results obtained considering the case of one Higgs singlet and two Higgs doublets models, where FCNC at tree level exist in quark sector mediated by scalar a pseudoscalar neutral bosons.

P1-02 Contribution of a new neutral gauge boson Z' to the top quark decay $t \to c\gamma$ in extended gauge sector models

LOPEZ SANCHEZ, Jessica (BUAP), TAVARES-VELASCO, Gilberto (BUAP)

In this work we have studied the top quark decay $t \to c\gamma$ mediated by a neutral gauge boson V which produces flavour changing couplings at tree level. Such a boson can be induced in some theories beyond the Standard Model with an extended gauge group. $t \to c\gamma$ decay is induced by one loop and the amplitude is generated by three Feynman diagrams in the unitary norm: two bubble diagrams and one triangle diagram. We used the Feynman parametrization method to calculate the one loop integrals and we considered the dimensional regularization method in order to isolate the ultraviolet divergences and verify their cancellation. We have used tensorial integrals to obtain analytic expressions that contains parametric integrals for the A_L and A_R coefficients which are related to the $\sigma^{\mu\nu} q_\mu P_L$ and $\sigma^{\mu\nu} q_\mu P_R$ terms. We considered the Z' gauge boson contribution predicted in models with extended $U(1)'$ gauge symmetry. Finally we computed the branching ratio numerical analysis $BR(t \to c\gamma)$ as a function of Z' boson mass in the range of 500 GeV $< m_{Z'} <$ 1000 GeV.Contribution of a new neutral gauge boson Z' to the top quark decay $t \to c\gamma$ in extended gauge sector models.

P1-03 Thermodynamic properties of non-relaivistic magnetic boson gas at any temperature

SUAREZ, Lismary de la Caridad (ICIMAF), PEREZ-MARTINEZ, Aurora (ICIMAF), QUINTERO ANGULO, Gretel (Universidad de la Habana)

We study the thermodynamic properties of a non-relativistic vector boson gas, in presences of an external magnetic field. Bose-Einstein condensate is obtained and it depends on all the parameters involved in the problem: temperature, particle density and magnetic field. An spontaneous magnetization appears at low temperature as a consequence of the condensed state. Even in the non-relativistic case there is an anisotropy in equation of the state due to the presence of the magnetic field. Negative values of the perpendicular pressure are obtained that define a region of instability in the system.

P1-04 Compact objects: deformation due to the magnetic field

PEREZ-MARTINEZ, Aurora (ICIMAF), ALVEAR TERRERO, Diana (ICIMAF), QUINTERO ANGULO, Gretel (Universidad de la Habana), MANREZA PARET, Daryel (Universidad de la Habana), LOPEZ PEREZ, Samantha (ICIMAF), HERNANDEZ MEDEROS, Victoria (ICIMAF)

Magnetic fields are present in compact objects affecting its structure. The anisotropy produced by the magnetic field in the pressures suggests the necessity of using structure equations considering the axial symmetry of the magnetized system. In this work, we propose a model that generalizes the Tolman-Oppenheimer-Volkoff equations for the magnetized case

and discuss some preliminary results. Our calculations are based on the γ-metrics where the parameter γ relates the deformation with the anisotropy in the pressures.

P1-05 Chromomagnetic and chromoelectric dipole moments of the top quark in the 4GTHDM

HERNANDEZ JUAREZ, Alan Ignacio (BUAP), MOYOTL-ACUAHUITL, Agustin (Cinvestav), TAVARES-VELASCO, Gilberto (BUAP)

The chromomagnetic dipole moment (CMDM) and chromoelectric dipole moment (CEDM) of the top quark are calculated at the one-loop level in the framework of the two-Higgs doublet model with four fermion generations (4GTHDM), which is still consistent with experimental data and apart from new scalar bosons (H^0, A^0, and $H^\pm$) and quarks (b' and t') predicts new sources of CP violation via the extended 4×4 CKM matrix. Analytical expressions for the CMDM and CEDM of a quark are presented both in terms of Feynman parameter integrals, which are explicitly integrated, and Passarino-Veltman scalar functions, with the main contributions arising from loops carrying the scalar bosons accompanied by the third- and fourth-generation quarks. The current bounds on the parameter space of the 4GTHDM are discussed and a region still consistent with the LHC data on the 125 GeV Higgs boson and the oblique parameters is identified. It is found that the top quark CMDM, which is induced by all the scalar bosons, can reach values of the order of 10^{-2}–10^{-1}. As for the top quark CEDM, it only receives contributions from the charged scalar boson and can reach values of the order of 10^{-20}–10^{-19} ecm for relatively light $m_{H^\pm}$ and heavy $m_{b'}$, with the dominant contribution arising from the b quark. The CEDM would be the most interesting prediction of this model as it can be larger than the value predicted by the usual THDMs by one order of magnitude.

P1-06 Electroweak extensions of Standard Model and scotogenic models

BLANDON URIBE, Dario J (University of Antioquia), ROJAS PEA, Eduardo (Universidad de Nario), RESTREPO QUINTERO, Diego A (Universidad de Antioquia)

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 $B \to K(K^*)\mu^+\mu^-$ decays, by fixing some parameters of the model.

P1-07 UDA for the $gg \to H$ in the heavy top-quark limit at NNLO

RENTERIA-OLIVO, Andrs Ernesto (FCFM-UAS), HERNANDEZ PINTO, Roger J. (FCFM-UAS), TORRES BOBADILLA, William J. (IFIC-UV), RODRIGO, Germn (IFIC-UV)

We present the study of Universal Dual Amplitudes (UDA) for the $gg \to H$ amplitude

in the heavy top-quark limit at NNLO from the Loop-Tree Duality (LTD) approach. The LTD approach is a novel perturbative method in QFT that establishes a relation between loop-level and tree level scattering amplitudes. From this approach we found a universal behaviour which allows us to write a compact form of the decay amplitude. We show that our result is in agreement with respect to the $H \to \gamma\gamma$ amplitude computed recently.

P1-08 Study of initial condition distributions in pp collisions at LHC energies in String Percolation Model

ALVARADO GARCIA, J. Ricardo (BUAP), BAUTISTA, Irais (BUAP), FERNANDEZ TELLEZ, Arturo (BUAP)

It is known that in high multiplicity nuclear collisions the mass spectra behave as a gamma function, while at low multiplicities a typical Poisson distribution is observed. We propose a dependent distribution of the parameters of the model that characterizes the fluctuations event by event depending on an effective number of initial strings (as a parameter of the centrality in pp collisions) that considers the growth of the total cross section as well as the corrections of initial geometry with impact parameter b, it is expected that the distributions relate to each other through a continuous limit.

P1-09 Correcciones radiativas a los decaimientos K_l3 con muón polarizado

SANCHEZ GONZALEZ, Mayra Jacaranda (ESFM-IPN), MARTINEZ, Alfonso (ESFM-IPM), NERI-ROSAS, Miguel (ESFM-IPN), TORRES, Juan José (ESCOM-IPN), TUN, Dionisio (ESFM-IPN)

En este trabajo presentamos las contribuciones dependientes de espín de las correcciones radiativas a los decaimientos semileptónicos de kaones con el muón saliente polarizado. Nuestros resultados, independientes de modelo a orden $(\alpha/\pi)(q/M_1)$, se presentan a nivel de grfica de Dalitz, como integrales que contribuyen a las componentes longitudinal y normal de la polarizacin del mun, as como de la componente perpendicular, la cual est ntimamente relacionada con violacin de T.

P1-10 Minimum bound of the principle of uncertainty and optimal states

PEREIRA, Goosline (Universidad Simón Bolívar), DIAZ, Sttiwuer (Universidad Simón Bolívar)

The uncertainty relation in a way to establish that the dispersion of two incompatible (non-interchangeable) observables can not go simultaneously to zero, which means that the observables in question can not be measured at the same time. Gamba and Castoldi found that the minimum bound in the Heisenberg uncertainty relation is increased by a term associated with the anticommutator of the observables involved. In this paper, it will be shown using the principle of canonical quantization and the principle of complementarity that this term corresponds to a statistical correlation derived from the Pearson correlation coefficient or

more specifically from the statistical joint covariance between two observables. Additionally, we find the optimal states (states for which the minimum bound of the uncertainty relation is obtained) of operators in finite and infinite dimensional spaces, taking as an example: spin, linear moment, position, among others; all this taking into account the domains of the observables and how this intervenes in the relationship of uncertainty of Heisenberg.

P1-11 Annihilation of Dipolar Dark Matter: $\chi\bar{\chi} \to \gamma\gamma$
ARELLANO CELIZ, Concepción (BUAP), BARRADAS GUEVARA, José Enrique (BUAP), DIAZ CRUZ, J. Lorenzo (BUAP), FELIX BELTRAN, Olga (BUAP)

In this work we study the annihilation of dark matter, considering it as a neutral particle with magnetic and/or electric moments not null. The calculation of the effective section of the process $\chi\bar{\chi} \to \gamma\gamma$ is made starting from a general form of coupling $\chi\bar{\chi}\gamma$ in the framework of an extension of the Standard Model. We found, when taking into account an annihilation of DDM-antiDDM to monoenergetic photons, that for small masses, $m_\chi \leq 10$ GeV, an electric dipole moment $\sim 10^{-16}$ e cm is required to satisfy the current residual density, while for the range of greater sensitivity of HAWC, 10 TeV $\leq E_\gamma \leq 20$ TeV, the electrical dipole moment must be of the order of 10^{-18} e cm.

P1-12 Towards a gauge description of the Standard Model parameters
RAMIREZ ALVARADO, Carolina (BUAP), DIAZ CRUZ, J. Lorenzo (BUAP), FELIX BELTRAN, Olga Guadalupe (BUAP)

We present a qualitative and quantitative analysis of the Yukawa matrices generation, as well as, the Standard Model quartic Higgs couplings expressed as functions of the gauge parameters within the framework of MSSM. In this extension, the quartic Higgs couplings can be regulated through D-terms and it is also possible to generate radiatively the Yukawa matrices for the light generations as functions of the gauge couplings. One compares the experimental restrictions that the LHC has imposed on the masses of the supersymmetric particles, to verify the viability of this solution to the Yukawa matrices. Finally we will try to make predictions around the SUSY search at LHC.

P1-13 Flavor violation in in $\mu^+\mu^- \to \gamma l l'$ in an effective context.
GUIOT, Marianne (BUAP), BOLANOS, Azucena (Universidad Iberoamericana Puebla), TAVARES-VELASCO, Gilberto (BUAP)

Thanks to the discovery of the Higgs Boson, the door has opened to new studies regarding Higgs Boson Physics. An ideal and novel place to carry out such studies are the muon colliders, for which the interest to focus on the feasibility of processes in the Muon Accelerator Program (MAP) arose: muon collider proposed in Fermilab whose objective is to reach energies up to 4 TeV. The study of flavor violation is carried out in a process of collision of

two muons to a photon and two different flavor leptons. In particular, the calculation of the probability amplitude and the cross-section was made considering that the resulting leptons are an electron and a tau, within the framework of Effective Lagrangians and considering tree-level operators.

P1-14 Flavor changing neutral current decays $t \to cV$ $V = \gamma, Z$ and $t \to cH$ via scalar leptoquarks

SANCHEZ VELEZ, Ricardo (BUAP), TAVARES VELASCO, Gilberto (BUAP)

A study of the flavor changing decays $t \to cV$ ($V = \gamma, Z$) and $t \to cH$ is presented in the framework of a minimal scalar leptoquark model in which the standard model is augmented with a single scalar leptoquark doublet with $SU(3)_c \times SU(2)_L \times U(1)_Y$ quantum numbers $(3, 2, 7/6)$. This model predicts a non-chiral charge $5/3e$ leptoquark coupling to up quarks, and a chiral charge $2/3e$ leptoquark coupling to down quarks. The constraints on leptoquark couplings are briefly analyze for a non-chiral leptoquark which contributes to $(g-2)_\mu$ and $\tau \to \mu\gamma$ processes via a chirality-flipping term proportional to the mass of the virtual fermion. The constraints from the tau lepton decay are very strong when only one leptoquark contribution is considered. However, a significant cancellation is possible between two leptoquark contributions. In this scenario the decays $t \to c\gamma$ (Z) and $t \to cH$ can reach values up to $10^{-8} - 10^{-7}$ for a leptoquark massas of $m_{LQ} = 700$ GeV and $m_{LQ} = 1500$ GeV respectively.

P1-15 Implications of SSB in the Higgs potential in $SM \otimes S_3$

BARRADAS GUEVARA, Enrique (BUAP), FELIX BELTRAN, Olga Guadalupe (BUAP), MONTANO-PEDRAZA, Javier (Universidad de Sonora), RODRIGUEZ-JAUREGUI, Ezequiel (Universidad de Sonora)

We analyze the spontaneous symmetry breaking SSB in the Higgs potential corresponding to the standard model extension with the horizontal symmetry group S_3 ($SM \otimes S_3$), including Charged-Parity symmetry breaking (CPB) sources. In this context, we study the repercussions on the Higgs physics, as well as, the implications on CPB symmetry. In particular, one works taken into a count the complex Higgs vacuum expectation values. CPB effects contribute to the Higgs mass matrix as well as up and down quark mass matrices and the trilinear Higgs coupling.

P1-16 Extension tests of the Standard Model with Symmetry U(1) through Rare Processes

FLORES MERAZ, Yesica Sonia (ESFM-IPN), HERNANDEZ GALEANA, Albino (ESFM-IPN)

Precise flavor observable measurements are an indirect and powerful evidence of Physics

Beyond the Standard Model (BSM). Flavor observables are sensitive to high energy scales and to direct searches of new particles. A very important observable can be the partial decay reason, which can be studied in four important groups: leptonic and semileptic decays at tree level, rare purely leptonic decays, electroweak penguins and other observables of flavor. The processes of Neutral Currents with Change of Flavor (FCNC) play a role very important, since they are strongly suppressed by the experiment. Motived by flavor non-universality and anomalies in semileptonic B meson decays, we present a BSM with $U(1)$ symmetry under which there are new particles, one of them is a gauge boson Z'. The new gauge boson could explain the recent hints of Lepton Flavor Universality (LFU) Violation at LHC.

P1-17 Effective field theory analysis of the $\tau \to \pi\pi\nu_\tau$ decays
MIRANDA HERNANDEZ, Jesús Alejandro (Cinvestav), ROIG, Pablo (Cinvestav)

We perform an effective field theory analysis of the $\tau^- \to \pi^-\pi^0\nu_\tau$ decays, that includes the most general interactions between Standard Model fields up to dimension six, assuming left-handed neutrinos. We constrain as much as possible the necessary Standard Model hadronic input using chiral symmetry, dispersion relations, data and asymptotic QCD properties. As a result, we set precise (competitive with low-energy and LHC measurements) bounds on (non-standard) charged current tensor interactions, finding a very small preference for their presence, according to Belle data. Belle-II near future measurements can thus be very useful in either confirming or further restricting new physics tensor current contributions to these decays. For this, the spectrum in the di-pion invariant mass turns out to be particularly promising. Distributions in the angle defined by the τ^- and π^- momenta can also be helpful if measured with less than 10% accuracy, both for non-standard scalar and tensor interactions.

P1-18 Spin-one Dark Matter-SM mediators
FORTUNA, Fabiola (Cinvestav), ROIG, Pablo (Cinvestav)

We consider Dark Matter-SM interactions mediated by spin-one fields, in a general EFT framework. We constrain some of the Lagrangian couplings using the Z invisible width and compute the relevant annihilation cross-sections among dark matter pairs. Relic abundance of these will be computed soon, to search for viable explanations of the measured dark matter energy density.

P1-19 New Physics possibilities in D_0 to e^+e^- decays
RAMIREZ, Enrique (Cinvestav), ROIG, Pablo (Cinvestav)

Motivated by the observation that there is ample room for new physics in $B_0/B_{0s} \to e^+e^-$ decays (despite the accurate measurement of $B_s \to \mu\mu$ and the limits on $B \to \mu\mu$, in nice agreement with the SM, this fact is due to helicity suppression in these decays) we study the corresponding problem in D_0 decays, with the interplay between long-distance and short-

distance effects complicates the theoretical description.

P1-20 Effective field theory analysis of the $\tau \to K\pi\nu_\tau$ decays
RENDON, Javier (Cinvestav), ROIG, Pablo (Cinvestav)

We consider the most general description of $\tau \to K\pi\nu_\tau$ decays including SM operators up to dimension six with massless neutrinos. All hadron form factors are built on chiral perturbation theory by using dispersion relations and lattice input. Of particular interest are the following observables: CPV in $\tau \to K_S\pi\nu_\tau$ decays (unexplained BaBar anomaly), the $K^-\pi^0$ spectrum (particularly the first few Belle data points that cannot be explained within the SM), Dalitz plot analyses and angular distributions and asymmetries. Preliminary results will be presented.

P1-21 Effective field theory analysis of LFV mediated by an unknown particle
MARIN, Bibiana Marcela (Cinvestav), ROIG, Pablo (Cinvestav)

We perform an effective field theory analysis of the $L \to l'X(\gamma)$ decays, where $L = \tau, \mu$; $l' = \mu, e$ and X is an unknown particle with spin 0 or 1 and with either parity, which mediates LFV processes. This mechanism of LFV decays may also explain (for reasonable values of M_X and its couplings) the muon g-2 anomaly. We analyze angular observables that can unveil the underlying structure of such interaction and that will be studied at Belle(-II).

P1-22 Spin Portal to Dark Matter
HERNANDEZ ARELLANO, Haydee (Universidad de Guanajuato), NAPSUCIALE, Mauro (Universidad de Guanajuato), RODRIGUEZ, Simón (Universidad Autónoma de Coahuila)

In this work we present preliminary results on the possible description of dark matter as spin-one matter fields, i.e. fields transforming in the $(1, 0) \oplus (0, 1)$ representation of the Homogeneous Lorentz Group. Considering dark matter as standard model singlets we find three possible dimension-four terms in the effective theory. Using experimental data on direct and indirect detection experiments, we constrain the involved coupling constants.

P1-23 Liouville Model in Polymer Quantum Mechanics
HERNANDEZ, Johann (UASLP), MOLGADO, Alberto (UASLP)

Polymer quantum mechanics is a toy model for Loop Quantum Gravity that take some techniques from this theory and apply them to mechanical systems with finite degrees of freedom. In this work we apply polymer formalism to the Liouville Model.

Poster Session 2 (Tuesday, October 23, 2018)

P2-1 Resonant suppression on ultra high energy astrophysical neutrino

MORALES, América (Universidad de Guanajuato), BARRANCO, Juan (Universidad de Guanajuato)

Recent observations of extragalactic neutrinos flow detected by IceCube differ from the theoretical predictions, as the number of events recorded in the detector is lower than expected by some theoretical models. This naturally raises the question, "What processes may be reducing the flow of extragalactic neutrinos coming to earth?" Since neutrinos are coupled with other matter only through the weak force, a possible interaction with the interstellar neutrino medium is not considered a likely source of the decreased flow of extragalactic neutrinos. We discuss the dispersion of extragalactic neutrinos with three diferent flux of neutrinos in process mediated by the Z boson, and we show that en the standard model it is no possible that the flow of extragalactic neutrinos can be reduced due the interaction whith other neutrino fluxes.

P2-2 Uncovering dark matter-fermion interactions with direct detection experiments

MILLAN, Fernando (Univerisdad de Guanajuato), BARRANCO, Juan (Universidad de Guanajuato)

We have fitted the direct detection experiments result by using the current bounds on the cross sections of DAMA/LIBRA, XENON1T, CDMS and PICO60 in terms of a Weakly Interacting Massive Particle (WIMP) signal, parameterizing the interaction with nuclei in terms of fermions-scalar interaction. Delimiting the parameter space of the different collaborations we come to a shared region.

P2-3 Study of the Global temperature fluctuations in pp collisions at LHC energies

LOZA, Edgar (Universidad de Guadalajara), BAUTISTA, Irais (BUAP), DE LA FUENTE, Eduardo (Universidad de Guadalajara)

Fluctuations may arise from initial state fluctuations and thermodynamical fluctuations, as temperature fluctuations which is an important quantity that allows to probe the fluctuations at early stages of the reaction and to understand QCD transition order for small collision systems. A large number of particles produced at high multiplicity events on pp collisions where signals of collectivity have been found allows to construct the mT spectra for every event and to obtain an effective Temperature for each event and study its properties. We show a study for event-by-event basis Global Temperature fluctuations on pp collisions at high multiplicities for LHC energies in terms of the production of color sources.

P2-4 On CP violation in a flavored $\nu 2HDM$

ZELENY MORA, Moisés (BUAP), GONZALEZ CANALES, Félix (BUAP), FELIX BEL-TRAN, Olga Guadalupe (BUAP), DIAZ CRUZ, J. Lorenzo (BUAP), BARRADAS GUEVARA, Enrique (BUAP)

In this work we propose an extension to the Standard Model in which we consider the model $2HDM$ type-III plus massive neutrinos and the horizontal flavor symmetry S_3 ($\nu 2HDM \otimes S_3$). In the above framework and with the explicit breaking of flavor symmetry S_3, the Yukawa matrices in the flavor adapted basis are represented by means of a matrix with two texture zeroes. Also, the active neutrinos are considered as Majorana particles and their masses are generated through type-I seesaw mechanism. The unitary matrices that diagonalize the mass matrices, as well as the flavor mixing matrices, are expressed in terms of fermion mass ratios. Consequently, in the mass basis the entries of the Yukawa matrices naturally acquire the form of the so-called *Cheng-Sher ansatz*. For the leptonic sector of $\nu 2HDM \otimes S_3$, we compare, through a χ^2 likelihood test, the theoretical expressions of the flavor mixing angles with the masses and flavor mixing leptons current experimental data. The results obtained in this χ^2 analysis are in very good agreement with the current experimental data. We also obtained an allowed value ranges for the "Dirac-like" phase factor, as well as for the two Majorana phase factors. Furthermore, we study the phenomenological implications of these numerical values of the CP-violation phases on the neutrinoless double beta decay, and for Long Base-Line neutrino oscillation experiments such as T2K, NOνA, and DUNE.

P2-5 About heavy neutrinos: violation of lepton flavor in neutrinoless decays of leptons

SALINAS IBANEZ, Mónica (BUAP), NOVALES SANCHEZ, Héctor (BUAP), TOSCANO CHAVEZ, J. Jesús (BUAP)

The fundamental description of nature, beyond the Standard Model (SM), may include heavy neutrinos that mix and thus allow processes in which lepton flavor is not preserved. We investigate the impact of charged currents that couple heavy gauge bosons to heavy neutrinos and SM leptons on neutrinoless lepton-flavor-violating decays of SM leptons into three charged leptons. We implement our expressions for the leading contributions to Br($l\alpha \to l\beta l\sigma l\sigma$), which hold for either Dirac or Majorana neutrinos, to neutrinoless trilepton decays of the muon and so determine sets of masses of heavy neutrinos and the heavy gauge boson, within GeVs to few TeVs, that are consistent with the upper bounds provided by the SINDRUM Collaboration.

P2-6 Dark matter effects on neutrino oscillations and fitting on IceCube data

BRIBIESCA SAMANO, Max (Universidad de Guanajuato), BARRANCO, Juan (Universidad de Guanajuato)

In this work we are going to study how the neutrino oscillations are affected by dark matter (DM). We made an analysis for two cases: DM interactions with standard model neutrino and DM with sterile neutrino interactions. The main objectives of this work are: to establish a bound on the strength of the neutrino-DM interaction and in the case of the sterile neutrino we include three different DM density profiles and we show the difference on the oscillation probability with respect to the constant density profile previously reported in the literature. We also fitted one of this profiles on IceCube's events data trying to interpret the neutrinos deficiency.

P2-7 Charged Higgs Production in Deep Inelastic Scattering at the LHC

LOPEZ GUERRERO, Víctor Manuel (BUAP), FELIX BELTRAN, Olga Guadalupe (BUAP), DIAZ CRUZ, J. Lorenzo (BUAP), ROSADO SANCHEZ, Alfonso (BUAP)

In this work we study different ways to produce a charged Higgs H^+ in Deep Inelastic Scattering (DIS) at energies reached on the LHC accelerator, all of that in the Two Higgs Doublet Model type III (2HDM-III). We compute the total cross section for the direct production process $p + p \longrightarrow H^+ + X$ and also one obtain the differential cross section for the process $q_i + q_j \to H^\pm x + X$ ($x = W^\pm, Z^0, H^\pm, \gamma, g, q, \varphi^0$). This one is computed as a function of the parameters m_{H^+}, $\tan \beta$, $\tilde{\chi}^{u,d}$. We show the flavor changed process involved on the the charged Higgs production. Finally, we compare the results for the H^+ production against the W^+ production.

P2-8 Charged particle motion in electric and magnetic field

GUZMAN ALCALA, Ricardo (Universidad de Guadalajara), DIAZ VELEZ, Juan Carlos (Wisconsin IceCube Particle and Astrophysics Center), DE LA FUENTE ACOSTA, Eduardo (Universidad de Guadalajara)

With the aim of reconstruct the trayectory of cosmic ray in the interstellar magnetic field and find the source of such particles, in the present work we simulate the motion of a charged particle in a magnetic fiel by using a Runge Kutta method. First we find the equations of motion through a lagrangian formalism then we solve the system making use of a Runge Kutta fourth order. For the results some initial conditions were set for diferent magnetic fields, the anaytical cases were comparing with the numericall ones. finally, as a illustrative example, we simulated the trajectories of a charged particle in a dipole magnetic field plus a constant magnetic field (B_0), for distinct values of (B_0) and dipole moment (μ).

P2-9 Probing the electromagnetic dipole moments of the tau-neutrino in the $U(1)_{B-L}$ model at the ILC and CLIC Energies

LLAMAS BUGARIN, María Alejandra (Universidad Autónoma de Zacatecas), GUTIERREZ-RODRIGUEZ, Alejandro (Universidad Autónoma de Zacatecas), HERNANDEZ RUIZ, M.

A. (Universidad Autónoma de Zacatecas)

In this work we study the sensitivity on the anomalous magnetic and electric dipole moments of the tau-neutrino in the framework of the $SU(2)_L \times U(1)_Y \times U(1)_{B-L}$ electroweak model at future e^+e^- linear colliders as the ILC and CLIC. For our study we consider the process $e^+e^- \to (Z, Z', \gamma) \to \nu_\tau \bar{\nu}_\tau \gamma$. For center-of-mass energies of $\sqrt{s} = 1000 - 3000\, GeV$ and integrated luminosities of $\mathcal{L} = 500 - 2000\, fb^{-1}$, we derive 95% C.L. limits on the dipole moments $|\mu_{\nu_\tau}(\mu_B)| \leq 6.28 \times 10^{-9}$ and $|d_{\nu_\tau}(ecm)| \leq 1.21 \times 10^{-21}$ improve the existing limits by two or three orders of magnitude. Our study complements other studies on the dipole moments of the tau-neutrino at hadron and e^+e^- colliders.

P2-10 Computation of rotation curve of the Milky Way using diferent stellar density profiles in the context of ψ-DM.

BURNETT-AGUILAR, Alan (Universidad de Guanajuato), BARRANCO, Juan (Universidad de Guanajuato), BERNAL-BAUTISTA, Argelia (Universidad de Guanajuato)

Determination of the mass distribution in the galaxy is one of the most fundamental task in the field of galactic astronomy and can be obtained by analyzing the corresponding rotation curves. Milky Way - one of the most studied galaxies- is a galaxy of which we have a better knowledge about values of this rotation curve, with an accuracy that has been improved over the years.

Moreover, there are different stellar density profiles describing any spherically symmetric distribution of matter consistent with the experimental data of rotation curve. The most outstanding stellar density profiles are: Plummer, homogeneous sphere, Isocronic, isothermal, Hernquist, Jaffe, Navarro-Frenk-White (NFW). Each of them has their own different features, advantages and disadvantages.

On the other hand, the cosmological model Λ-CDM has been successed predicting many aspects of large-scale structure of the Universe. However, at scales ~ 10 kpc, he has managed to verify very few theoretical predictions. One of the prominent models, the so-called Fuzzy Cold Dark Matter (FDM) or ψ-DM, assumes an extremely light boson ($\approx 10^{-22}$ eV), having a de Broglie wavelength $\lambda \sim 1$ kpc. Hence, we can find a solution to the cuspy-halo problem (core-cusp problem) in which the uncertainly principle counters gravity below a Jeans scale, resulting in a suppression of halos below $10^{10} M_\odot$ and a flat density profile within the range of the centers of galaxies.

In this work, we compute the typical rotation velocities obtained in the context of FDM model using different mass density profiles and compare the values obtained theoretically with those obtained experimentally from rotation curve of the Milky Way, in order to find consistency among the theoretical dark matter model, selected stellar density profile and current experimental data.

P2-11 A study of the magnetic field produced in heavy ion collisions at NICA

energies

GUIRADO GARCIA, Alejandro (Universidad de Sonora), TEJEDA-YEOMANS, Maria Elena (Universidad de Colima)

In this work, we use the Lienard-Wiechert electromagnetic field equations to calculate the magnetic field event by event in heavy ion collisions and to find a relationship between the magnetic field created with the impact parameter in the collision. We then implement our results using a Monte-Carlo Glauber model of heavy ion collisions to simulate Au-Au collisions relevant for the Multi Purpose Detector (MPD) at the Nuclotron-based Ion Collider fAcility (NICA) experiment. Finally, we show the relation between the initial conditions of the collision and the properties of the magnetic field that emerges at early times of the evolution.

P2-12 Study of the event plan resolution for the in Au-Au collisions with the beam monitor detector of MPD-NICA experiment at JINR

REYNA ORTIZ, Valeria Zelina (BUAP), RODRIGUEZ CAHUANTZI, Mario (BUAP)

The Nuclotron Ion Collider fAcility (NICA) accelerator complex is currently under construction at the Joint Institute for Nuclear Research (JINR, Russia). The main goal of NICA is to collider heavy ion nuclei to study the properties of the phase diagram of strongly interacting matter at high baryon density. Two big particle detectors are planned to be installed: Spin Physics Detector (SPD) and Multi-Purpose Detector (MPD). The main goal of the Mexican grup at the MPD (MexNICA group) is to develop a beam monitoring detector, which we called BEBE. In heavy ion collisions it is necessary to measure two observables for the study of such events, the impact parameter and the reaction plane. In this work we show the BEBE capabilities to reconstruct the event plane resolution.

P2-13 Higgs Boson Production Associated with a Top Quark Pair as a Probe of the U(1) B-L Model at e^+e^- linear colliders

RAMIREZ-SANCHEZ, Francisco (Universidad Autónoma de Zacatecas), GUTIERREZ-RODRIGUEZ, Alejandro (Universidad Autónoma de Zacatecas)

We study the production sensitivity of Higgs bosons h and H in relation with the possible existence of a Z' boson and a top quark pair at the energy scales that will be reached in the near future at projected e^+e^- linear colliders. We focus in the resonance and non-resonance effects of the annihilation processes $e^+e^- \to (\gamma, Z, Z') \to \bar{t}th$ and $e^+e^- \to (\gamma, Z, Z') \to \bar{t}tH$. Furthermore, we develop and present novel analytical formulas to assess the total cross-section involved in the production of Higgs bosons. We find that the possibility of performing precision measurements for the Higgs bosons h, H and for the Z' boson is very promising at future e^+e^- linear colliders.

P2-14 Portable ultraviolet radiation detector to obtain the rate of particles at different heights

PONCE, Epifanio (Moscow State University & BUAP), SALAZAR, Humberto (BUAP), MARTINEZ, Oscar (BUAP)

The nature and origin of cosmic rays remains one of the greatest puzzles of modern astrophysics after more than fifty years since their first registration. Several ground experiments have reported the rate registered at its height of operation. To continue with the study of cosmic rays, we propose obtain the rate at different heights in the Earth's atmosphere, developing a small and portable ultraviolet radiation detector, consisting of a scintillation plastic, a PMT, and a fast DAQ system. In this work, we present the design and construction of the UV detector, the energy of the events and the rate recorded during the journey from university of BUAP campus to Pico de Orizaba national park in Mexico, covering a range of heights 2200-4200 m.a.s.l, approximately. The rate obtained will compared with the number of registered particles per second, provided by experiments operating at heights known as AUGER, LAGO, and others know.

P2-15 Some UV Transient Luminous Events observed with a terrestrial pinhole camera

HERNANDEZ MARISCAL, Saúl (BUAP), PONCE, Epifanio (Moscow State University & BUAP)

Recent satellite missions have shown that the UV light background is more complex than previous models. Therefore, the observation of transient luminous events TLEs at the upper atmosphere will be important. Information about the time and space evolution of this very fast events may need to be recorded, this impose requirements of a wide field of view and the largest focus depth. The simplest optical design, a pinhole camera fulfills this characteristics. This pinhole camera have a multianode photomultiplier of eight by eight pixels, that allow us to register 2d images of TLEs of about milliseconds. In this work we present the observations of some events recorded from Sierra Negra Volcano in Mexico and its capabilities in order to use it as a monitoring device.

P2-16 The CUORE Cryogeny Monitor and Control System (CMCS)

CAPPELLI, Luigi (University of Berkeley & INFN-LNGS), PAGLIARONE, Carmine Elvezio (INFN-LNGS & DICEM-UNICLAM)

The Cryogenic Underground Experiment for Rare Events (CUORE) is an experiment, in operation from the beginning of 2017, held at the Laboratori Nazionali del Gran Sasso (LNGS) of the Istituto Nazionale di Fisica Nucleare (INFN), in Italy. It has been designed to mainly search for Neutrino-less Double Beta Decay even if, because of the excellent energy resolution, low threshold and low background, it is also sensitive to nuclear recoils, allowing

searching for Dark Matter and Axion interactions. The CUORE-Cryogeny Monitor and Control System (CMCS) is a NI LabVIEW-based software package that acts as Slow Control of the whole CUORE Cryogenic System. It has been continuously monitoring and controlling the cryogenic performances of CUORE along the last years. It remotely accesses hundreds of parameters of more than 40 different instruments and apparatus (cryogenic, vacuum, thermometry, etc). The software runs in NI LabVIEW Real-Time® on a RT target, setting emergency alarms and passing the most relevant information to the CUORE Online Run Control (CORC).

P2-17 Associated production of Higgs boson and a pair of top quark at LHC

MAY, Miguel (Universidad Autónoma de Yucatán), LARIOS, Francisco (Cinvestav Unidad Mérida), CANTUN, Karla (Universidad Autónoma de Yucatán)

We present the calculation of the cross section for the associated production process of the Higgs boson with a pair of top quark, $pp \rightarrow t\bar{t}H$ at different centre-of-mass energies to compare with recent measurements at LHC. Using CalcHEP at leading order calculations we found a good a aproximation in comparison with other values calculated to higher order presented in the literature.

P2-18 Simulación del efecto de contraste de fase de Rayos X mediante el programa GEANT4

DE LA CRUZ VICENCIO, Marcos Gael (Cinvestav), HERRERA CORRAL, Gerardo Antonio (Cinvestav), RAMIREZ REYES, Abdiel (Universidad Autónoma de Ciudad Juárez), LEON MONZON, Ildefonso (Universidad Autónoma de Sinaloa)

La técnica por excelencia para obtener imágenes hoy en día del interior de un objeto, es por medio de radiación electromagnética del tipo Rayos X; no existe otra técnica 100% estudiada que supere a la imagen por rayos X debido a la amplia gama de aplicaciones en investigación, en industria, comercio, transporte, medicina, etc, siendo ademas una tecnología muy accesible y practica. Sin embargo dicha técnica como cualquier otra, se puede mejorar, es por eso que desde ya hace algunos aos se ha propuesto una variante a la técnica, conocida como contraste de fase de rayos X la cual aprovecha fenómenos de difracción para producir mejores imágenes que una radiografía convencional, ayudándonos a visualizar de manera más precisa detalles que con una radiográfica convencional no logramos observar. Ocupando el programa GEANT4 que comunmente se utiliza en física de altas energías, logramos simular mediante un complejo arreglo experimental la técnica de contraste de fase de rayos X.

P2-19 Prospects for tau physics at the Belle II experiment

DE YTA HERNANDEZ, Alejandro (Cinvestav), DE LA CRUZ BURELO, Eduard (Cinvestav), HEREDIA DE LA CRUZ, Ivan (Cinvestav)

The e^+e^- B Factories, owing to the large cross section for producing tau lepton pairs, are also "tau factories". In particular, the Belle II experiment will offer fantastic possibilities to study tau physics with high precision, in fact since the decays of tau leptons involve neutrinos in the final state their study is very difficult at hadron colliders such as LHC. The tau lepton is the only lepton that can decay into hadrons, thus providing a perfect laboratory to study QCD effects in the 1 GeV energy region. Moreover, the tau lepton is an extremely convenient probe to search for new Physics beyond the Standard Model because of the well-understood mechanisms tha govern its production and decay in electroweak interactions.

P2-20 RPC Background Simulations in the CMS Experiment at the HL-LHC
CARPINTEYRO, Severiano (BUAP), URIBE ESTRADA, Cecilia (BUAP), CASTANEDA HERNANDEZ, Alfredo (Universidad de Sonora), SALAZAR, Humberto (BUAP)

The high luminosity expected from the HL-LHC will be a challenge for the CMS detector. The increased rate of particles coming from the collisions and the radioactivity induced in the material of the detector could cause significant damage and could result in progressive degradation of its performance. Simulation studies are very useful in these scenarios as they allow one to study difficult radiation environments and the impact on the detectors. GEANT4 is used to study the sensitivity of the RPCs to different kinds of radiation particles as a function of their energy.

P2-21 Multiple parton interaction and colour reconnection and their effects on forward-backward multiplicity correlations
DOMINGUEZ ROSAS, Edgar (ICN-UNAM), CUAUTLE, Eleazar (ICN-UNAM)

The strength of forward-backward multiplicity correlations have been studied in electron-positron, proton-proton and more recently in lead-lead collisions. The experimental results in proton-proton on these correlations and its comparison to different models reveals an incomplete understanding of the phenomena physical associated with these correlations. In this work, we present a study of forward backward multiplicity correlations in proton-proton collisions using PYTHIA event generator, at LHC energies. Detailed analysis is presented splitting data samples into soft and hard QCD processes, as well as, their comparisons of the correlation computed for short and long range pseudorapidity regions. Each region is analyzed taking into account effects on the colour reconnection and independently multiple parton interactions. We show that a combination of those effects are required to explain last measurements on proton-proton data, furthermore, the extraction of the strength of colour reconnection brings us also the possibility to predict the results to energies not reached in the experiment.

P2-22 Study of collectivity on strangeness production in proton proton collisions
MALDONADO, Ivonne (ICN-UNAM)

The latest LHC data on pp collisions indicates a signature of flow through the measurements of transverse momentum distributions. Different models attempt to describe these phenomena using for instance hydrodinamical models, however it is known that it is not possible since microscopic systems are created as a result of the collisions. The present work use multiple parton interactions as an alternative model to introduce flow like effects on small colliding systems. Within this approach is possible to explain some general characteristics of the events. Another approach is introduced in the color reconnection model which allow to describe average transverse momentum distribution. Combining these two approachs we will show some results allowing to get a better understanding of the pp collision's events. Finally using the event shape variables, like spherocity, we present detail results on strangeness.

P2-23 Search for anomalous Higgs Yukawa coupling in single top quark associated Higgs production with H→ $\gamma\gamma$ in proton-proton collisions at $\sqrt{s} = 13$ TeV
PAREDES, Antonio (Universidad de Sonora), MURILLO QUIJADA, Javier Alberto (Universidad de Sonora)

Preliminary studies on selection and reconstruction of events with single top quark associated Higgs production with H $\rightarrow \gamma\gamma$ from proton-proton (pp) collisions have been performed. Events have been simulated with collision energy set at $\sqrt{s} = 13$ TeV. Simulation with the response of the CMS detector has been included. Basic reconstruction at detector level of top quark and Higgs masses has been implemented. Future step of this analysis is the study of the relative relationship of the tH production categories defined by: the top-Higgs Yukawa coupling (tHq) and the vector-boson-Higgs coupling (tHW) searching for an anomalous ratio beyond the Standard Model prediction.

P2-24 Search for production of a Higgs boson and a single top quark using $\mu\mu$ final state in proton collisions at $\sqrt{s} = 13$ TeV
DAMIAN, Hiram (Universidad de Sonora), BENITEZ, José (Universidad de Sonora)

We present a study about production of $t\bar{t}h + th$ in two lepton channel ($\mu\mu$). Here we used 2016 data corresponding to 35.9 fb^{-1}. Using `RooFit`, we make a fit for the BDT distribution to obtain the $t\bar{t}h + th$ signal events.