STARS2017 - 4th Caribbean Symposium on Cosmology, Gravitation, Nuclear and Astroparticle Physics / SMFNS2017 - 5th International Symposium on Strong Electromagnetic Fields and Neutron Stars

Report of Contributions

Contribution ID: **1** Type: **Poster**

Deformed phase space in cosmology and the cosmological constant

Effects of noncommutativity of the phase space deformations are presented on Schwarzschild, Kerr black holes making a comparative study of their thermodynamicals properties. In the case of the cosmological constant, this idea has been previously studied in FRW cosmology where the noncommutativity provides a simple mechanism that can explain the origin of the comsological constant.

Primary authors: Dr MENA, Eri (Universidad de Guadalajara, Mexico); Dr SABIDO, Miguel (Universidad de Guanajuato, Mexico)

Presenter: Dr MENA, Eri (Universidad de Guadalajara, Mexico)

Track Classification: STARS2017

Contribution ID: **4** Type: **Talk**

2RXS - the most complete X-ray catalog ever made

Monday, 8 May 2017 16:00 (30 minutes)

We have revisited the all-sky survey carried out by the ROSAT satellite, to create a new image of the sky at X-ray wavelengths. Along with this, a revised and extended version of point-like sources has been released. The now published 2RXS catalogue provides the deepest and cleanest X-ray all-sky survey to date, which will only be superseded with the launch of the next generation X-ray survey satellite, eROSITA, which has been completed at MPE. With the new catalog, the astrophysical community will now be able to explore objects in the X-ray sky with more confidence, and with considerably more information.

Primary author: BOLLER, Thomas (MPE Garching, Germany)

Presenter: BOLLER, Thomas (MPE Garching, Germany)

Track Classification: STARS2017

Contribution ID: **6** Type: **Poster**

From the nonrelativistic Morse potential to a unified treatment of a large class of bound-state solutions of a modified D-dimensional Klein-Gordon equation

A large class of bound-state solutions of a modified D-dimensional Klein-Gordon equation, featuring an additional vector interaction nonminimally coupled, is obtained from the nonrelativistic bound-state solutions of the one-dimensional generalized Morse potential via Langer transformation. Some results found in the literature, including the so-called Klein-Gordon oscillator, are obtained as particular cases.

Primary authors: Prof. DE CASTRO, Antonio (UNESP, Universidade Estadual Paulista, Brazil); Prof. CASTRO, Luis (UFMA, Universidade Federal do Maranhão, Brazil); Prof. GARCIA, Marcelo (UNICAMP, Universidade de Campinas, Brazil); Prof. ALBERTO, Pedro (CFisUC, University of Coimbra, Portugal)

Presenter: Prof. DE CASTRO, Antonio (UNESP, Universidade Estadual Paulista, Brazil)

Track Classification: STARS2017

Contribution ID: **7** Type: **Poster**

Cosmological consequences of time varying Newton and cosmological constant

I will present some generalities about the time dependence of the Newton and cosmological 'constants' and discuss some of the cosmological consequences of introducing such dependence in general relativity.

Primary authors: HERNÁNDEZ ARBOLEDA, Alejandro (Universidad de los Andes, Bogotá, Colombia); Dr BARGUEÑO, Pedro (Universidad de los Andes, Bogotá, Colombia); Dr CONTRERAS, Ernesto (Universidad de los Andes, Bogotá, Colombia)

Presenter: HERNÁNDEZ ARBOLEDA, Alejandro (Universidad de los Andes, Bogotá, Colombia)

Track Classification: STARS2017

Contribution ID: **8** Type: **Talk**

Axisymmetric and spherical sources of Majumdar-Papapetrou type spacetimes

Monday, 8 May 2017 09:00 (20 minutes)

By starting with a seed Newtonian potential-density pair we construct axisymmetric and spherical relativistic sources for a Majumdar-Papapetrou type conformastatic spacetime. As a first example, we consider a family of Plummer-Hernquist type relativistic spherical sources (G. García-Reyes, Gen. Relativ. Gravit. 49, 3, 1-13 (2017)), and as a second application we construct relativistic galaxies models from a Miyamoto-Nagai potential-density pair. The models also include dark matter. We study the equatorial circular motion of test particles around such configurations. Also the stability of the orbits is analyzed for radial perturbation using an extension of the Rayleigh criterion. The models considered satisfying all the energy conditions.

Primary author: GARCÍA-REYES, Gonzalo (Universidad Tecnológica de Pereira, Colombia)

Presenter: GARCÍA-REYES, Gonzalo (Universidad Tecnológica de Pereira, Colombia)

Track Classification: STARS2017

Contribution ID: **9** Type: **Talk**

Cosmological implications of vector Galileons

Tuesday, 9 May 2017 09:00 (20 minutes)

Do you want to work with a really physical theory? Then your theory must be free of any kind of instability or pathology. Therefore you must, at least, work with a Galileon action. Galileons are scalar fields in a curved background whose action is built so that the field equations are second-order and the number of propagating degrees of freedom is the right one. We have built recently the vector Galileons (Galileons as vector fields) with and without gauge symmetries. The phenomenology is this case is much richer than in the scalar case and our purpose in this talk is to show our most recent advances on the cosmological implications of the vector Galileon actions.

Primary author: RODRIGUEZ GARCIA, Yeinzon (UAN & UIS, Bucaramanga, Colombia)

Presenter: RODRIGUEZ GARCIA, Yeinzon (UAN & UIS, Bucaramanga, Colombia)

Track Classification: STARS2017

Contribution ID: **10** Type: **Talk**

Predictions of the pseudo-complex General Relativity

Monday, 8 May 2017 11:00 (30 minutes)

A short review on the pseudo-complex General Relativity will be presented. Some predictions of the theory will be given and compared to the standard General Relativity. First, accretion disks around SrgA* and the black hole in M87 will be given, at the used observation frequency. Second, a comment will be given on the observation of gravitational waves, related to their origin.

Primary author: HESS, Peter (Instituto de Ciencias Nucleares, UNAM, C. Mexico, Mexico)

Presenter: HESS, Peter (Instituto de Ciencias Nucleares, UNAM, C. Mexico, Mexico)

Track Classification: STARS2017

Contribution ID: **11** Type: **Talk**

Astro-particle physics with the DUNE detector

Sunday, 7 May 2017 11:30 (30 minutes)

The long baseline neutrino community is constructing a 40 kiloton liquid argon imaging detector at the Sanford underground research facility in South Dakota about 1300 km from Fermilab. The primary goal of this project is to study the evolution of the neutrino beam to determine the neutrino mass hierarchy and CP violation in the neutrino sector. Additional goals include studies of proton decay, atmospheric neutrinos, supernova and dark matter.
This talk will focus on how the unique features of this detector can be used to enhance our understanding of supernova mechanisms, dark matter and other open questions in astrophysics.

Primary author: LOSECCO, John (University of Notre Dame du Lac, Physics Department, Indiana, United States)

Presenter: LOSECCO, John (University of Notre Dame du Lac, Physics Department, Indiana, United States)

Track Classification: STARS2017

Contribution ID: **12** Type: **Talk**

Boson stars solutions of the Einstein-Klein-Gordon equations in the sense of Colombeau-Egorov's theory of generalized functions

Friday, 12 May 2017 09:00 (20 minutes)

We present static spherically symmetric solutions of the equations of motion of a scalar field interacting with gravity (EKG equations) in the Colombeau-Egorov's sense of generalized functions. The scalar fields are confined within the interior region and the exterior fields are purely gravitational and coinciding with the Schwarzschild ones. The solution resembles the so called "gravastars" which had been discussed in the literature, where the scalar field plays a similar role as a varying cosmological constant, satisfying the Klein-Gordon equation. It is also argued that the usual "gravastar" solutions (corresponding to DeSitter internal space) also solve the Einstein equations in the Egorov's sense, but requiring the existence of an external infinite surface tension at the boundary. The presented solutions of the EKG equations open a possibility for the existence of static boson stars. The argue is based in designing a one parameter ϵ dependent family of radial dependencies of the metric and the scalar field, being infinitely differentiable. Afterwards, it is shown that in the limit $\epsilon \to 0$, the EKG equations are satisfied in the sense of the generalized functions. The solutions exhibit properties which qualitatively support their physical meaning. For example close to the boundary at the interior, the scalar field energy density piles up toward to the limit surface. On the other hand, also close to the separation surface, but on the outside, the known "non-hair" theorem, indicates that any scalar field perturbation also tends to be attracted to the boundary.

Primary authors: Dr CABO MONTES DE OCA , Alejandro (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba); SUAREZ FONTANELLA , Duvier (Facultad de Fisica, Universidad de La Habana, Cuba); Dr CABO-BIZET, Nana Geraldine (Division de Ciencias Exactas e Ingenierias, Campus Leon, Universidad de Guanajuato, Leon, Mexico)

Presenter: SUAREZ FONTANELLA , Duvier (Facultad de Fisica, Universidad de La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **13** Type: **Talk**

Hadron single spin asymmetry and polarization relation in reactions involving photons

Friday, 12 May 2017 16:00 (30 minutes)

A phenomenological model which has had some sucess in explaining polarization phenomena and left-right asymmetry in inclusive proton-protons reactions involving photons. In particular,the reactions (a) gamma+p ->H+X;(b) gamma+p(->) -> pi+X and (c)p(->)+p-> gamma + X are considered where gamma=resolved photon and hyperon H=Lambda, Sigma, etc. Predictions for hyperon polarization in (a)and the asymmetry (in(b)and(c)) provide further tests of this particular model. Feasibility of observing (b) at HERA and the effect of the polarization of the sea in the proton in p(->)+p -> pi+X is briefly discussed.

Primary author: SOLANO, Carlos (Universidad Nacional de Ingenieria, Lima, Peru)

Presenter: SOLANO, Carlos (Universidad Nacional de Ingenieria, Lima, Peru)

Track Classification: STARS2017

Contribution ID: **14** Type: **Talk**

Limits on intergalactic dust during reionization

Monday, 8 May 2017 17:00 (30 minutes)

We constrain the dust-to-gas ratio in the intergalactic medium (IGM) at high redshifts. We employ models for dust in the local universe to constrain the dust-to-gas ratio during the epoch of reionization at redshifts z˜6-10. The observed level of reddening of high redshift galaxies implies that the IGM was enriched to an intergalactic dust-to-gas ratio of less than 3% of the Milky Way value by a redshift of z=10.
We also show that infrared emission from intergalactic dust might compromise the ability of future experiments to detect subtle spectral distortions in the Cosmic Microwave Background (CMB) from the early universe. We provide the first estimate of foreground contamination of the CMB signal due to diffuse dust emission in the intergalactic medium. Using models of the extragalactic background light to calculate the intensity of IGM dust emission, we find that emission by intergalactic dust at z ⊠ 0.5 exceeds the sensitivity of the planned Primordial Inflation Explorer to CMB spectral distortions by 1-3 orders of magnitude.

Primary author: IMARA, Nia (Harvard University, CfA, Cambridge, United States)

Presenter: IMARA, Nia (Harvard University, CfA, Cambridge, United States)

Track Classification: STARS2017

Contribution ID: **15** Type: **Talk**

Could low braking-index pulsar J1734-3333 evolve into a magnetar?

Friday, 12 May 2017 09:20 (40 minutes)

In this work, we present a possible interpretation for very small braking index of PSR J1734-3333, which challenges the current theories of braking mechanisms in pulsars, and estimate some initial parameters. According to our suggestions, this pulsar could be born with a superhigh internal magnetic field ˜ $10^{14} - 10^{16}$ G, and could undergo a supercritical accretion soon after its formation in a supernova. This strong magnetic field has been buried under the surface, and is relaxing out of the surface at present due to Ohmic diffusion. The increasing of surface dipole magnetic field results in the small braking index of 0.9. Keep the current field-growth index, the surface dipole field would reach a magnitude of 10^{14} G within t ˜ 50 kyrs, and would reach the maximum of the internal magnetic field strength in a few hundred kyrs, which implies that this pulsar is a potential magnetar.

Primary author: GAO, Zhifu (Xinjiang Astronomical Observatary, CAS, Xinjiang, China)

Presenter: GAO, Zhifu (Xinjiang Astronomical Observatary, CAS, Xinjiang, China)

Track Classification: SMFNS2017

Contribution ID: **16** Type: **Talk**

Holography & quasinormal modes - tools for strongly coupled far from equilibrium dynamics

Tuesday, 9 May 2017 11:00 (30 minutes)

We briefly review the holographic (gauge/gravity correspondence) techniques allowing to study strongly coupled systems far from equilibrium and near equilibrium. Then we compute the quasi-normal mode frequencies of gauge field and metric perturbations around black branes which are electrically and magnetically charged. By use of the gauge/gravity correspondence, these fluctuations are dual to conserved current operators of a particular class of strongly coupled field theories with a chiral anomaly. Within such a theory, we consider a thermal charged plasma state subjected to an external magnetic field. Quasi-normal mode frequencies are dual to the poles in the two-point functions of these conserved currents, encoding information about transport and dissipation in the plasma. For comparison, we also compute the same two-point functions in the hydrodynamic limit with field-theoretic methods. Together, these two approaches reveal various effects of the magnetic field and chiral anomaly on the location of the hydrodynamic poles (in analogy to the chiral magnetic and chiral vortical effects expected in Quantumchromodynamics), as well as transport effects far beyond the hydrodynamic approximation. We conjecture qualitative conclusions for heavy-ion collision experiments.

Primary authors: AMMON, Martin (Max-Planck Institute for Physics, Germany); KAMINSKI, Matthias (University of Alabama, Tuscaloosa, United States); Mr KOIRALA, Roshan (University of Alabama, Tuscaloosa, United States); Mr LEIBER, Julian (University of Jena, Germany); Dr WU, Jackson (University of Alabama, Tuscaloosa, United States)

Presenter: KAMINSKI, Matthias (University of Alabama, Tuscaloosa, United States)

Track Classification: STARS2017

Contribution ID: **17** Type: **Poster**

A comprehensive library of X-ray pulsars in the Small Magellanic Cloud: time evolution of their luminosities and spin periods

We have collected and analyzed the complete archive of XMM-Newton (116), Chandra (151), and RXTE\/ (952) observations of the Small Magellanic Cloud (SMC), spanning 1997-2014. The resulting observational library provides a comprehensive view of the physical, temporal and statistical properties of the SMC pulsar population across the luminosity range of $L_X = 10^{31.2}$–10^{38}~erg~s^{-1}. From a sample of 67 pulsars we report ∼1599 individual pulsar detections, yielding ∼1256 pulse period measurements. Our pipeline generates a suite of products for each pulsar detection: spin period, flux, event list, high time-resolution light-curve, pulse-profile, periodogram, and X-ray spectrum. Upper-limits are estimated for all non-detections bringing the combined database to ∼37,000 entries. Combining all three satellites, we generated complete histories of the spin periods, pulse amplitudes, pulsed fractions and X-ray luminosities. Many of the pulsars show variations in pulse period due to the combination of orbital motion and accretion torques. Long-term spin-up/down trends are seen in 11/7 pulsars respectively, pointing to sustained transfer of mass and angular momentum to the neutron star on decadal timescales. Of the sample 35 pulsars have relatively very small spin period derivative and may be close to equilibrium spin. The distributions of pulse-detection and flux as functions of spin-period provide interesting findings: mapping boundaries of accretion-driven X-ray luminosity, and showing that fast pulsars (P <10 s) are rarely detected, yet are more prone to giant outbursts. Accompanying this paper is an initial public release of the library so that it can be used by other researchers. We intend the database and pulse profile library to be useful in driving improved models of neutron star magnetospheres and accretion physics.

Primary authors: Ms YANG, Jun (Harvard-Smithsonian Center for Astrophysics, Cambridge, United States); Prof. LAYCOCK, Silas (Lowell Center for Space Science and Technology and Department of Physics and Applied Physics, University of Massachusetts, Lowell, United States); Dr DRAKE, Jeremy (Harvard-Smithsonian Center for Astrophysics, Cambridge, United States); Dr HONG, JaeSub (Harvard-Smithsonian Center for Astrophysics, Cambridge, United States); Prof. MALCOLM, Coe (Physics & Astronomy, University of Southampton, United Kingdom)

Presenter: Ms YANG, Jun (Harvard-Smithsonian Center for Astrophysics, Cambridge, United States)

Track Classification: STARS2017

Contribution ID: **18** Type: **Talk**

High energy scattering in QCD at small Bjorken x: from ultra-high energy neutrinos and cosmic rays to high energy heavy ion collisions

Monday, 8 May 2017 17:30 (30 minutes)

After a brief introduction to QCD at small x_{Bj} we show that the wave function of a hadron or nucleus at small x contain a large number of gluons. We argue that this kinematics dominates high energy scattering and that the hadron/nucleus can be describes as a strong classical color field from which a parton in the projectile scatters. We apply this formalism to particle production in Deep Inelastic Scattering off of protons and nuclei as well as to proton-nucleus collisions at RHIC and the LHC and elucidate the connections to scattering of cosmic rays.

Primary author: JALILIAN-MARIAN, Jamal (Baruch College-CUNY and Ecole Polytechnique, New York, United States)

Presenter: JALILIAN-MARIAN, Jamal (Baruch College-CUNY and Ecole Polytechnique, New York, United States)

Track Classification: STARS2017

Contribution ID: **19** Type: **Talk**

Why could 3- flavor strange matter be "superluminal"?

Friday, 12 May 2017 11:00 (30 minutes)

The strangeon (strange nucleon) matter is sometimes denounced for "superluminal"due to its stiff matter state. However, in this paper, we obtain a new expression of sound speed with the method in control theory, and show that even in such stiff matter, the signal propagation speed is still less than speed of light. Then, the "superluminal"problem no longer exists, and the pulsar can naturally be strangeon star.

Primary authors: LU, Jiguang (Peking University, Beijing, China); ZHOU, Enping (Peking University, Beijing, China); XU, Renxin (Peking University, Beijing, China); LAI, Xiaoyu (Hubei University of Education, Wuhan, China)

Presenter: LU, Jiguang (Peking University, Beijing, China)

Track Classification: SMFNS2017

Contribution ID: **20** Type: **Talk**

The nature of dark energy from high z supernova observations

I will review the ongoing tests for the nature of dark energy along redshift. Observations of Type Ia supernovae at redshift z beyond 1 test both the density of dark energy and the evolution of the equation of state. Is there evidence of an evolution or are we having a constant dark energy behaviour such as the one expected if dark energy is the cosmological constant? I will discuss the results by various surveys.

Primary author: RUIZ LAPUENTE, Pilar (IFF/CSIC and I-Barcelona ICC, Barcelona, Spain)

Presenter: RUIZ LAPUENTE, Pilar (IFF/CSIC and I-Barcelona ICC, Barcelona, Spain)

Track Classification: STARS2017

Contribution ID: **21** Type: **Talk**

Strangeness and charm production at FAIR energies

Sunday, 7 May 2017 15:00 (30 minutes)

We present recent results on the sub- and near threshold production of multi-strange hadrons and of charmed hadrons. These particle allow to explore multi-step processes in dense hadronic matter. We provide an alternative explanation for the observed transparency ratios of Phi-mesons and show how the observed enhanced Cascade production at HADES energies can be explained. For the near and sub-trehsold production of charmed hadrons, we present the first estimates for the SIS-100 energies, indicating that charm studies might still be feasable, even without SIS-300.

Primary authors: BLEICHER, Marcus (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany); Dr STEINHEIMER, Jan (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Presenter: BLEICHER, Marcus (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Track Classification: STARS2017

Contribution ID: **23** Type: **Talk**

Cross-tests of CMB features in the primordial spectra

Thursday, 11 May 2017 16:30 (30 minutes)

The Planck data on the CMB power spectrum marginally support deviations from scale invariance at several multipole ranges. We examine the implications of such features for the scalar bispectrum and the tensor power spectrum providing several consistency relations and templates while highlighting the power of joint analysis of spectra in search for features.

Primary authors: Prof. PALMA, Gonzalo (FCFM, Universidad de Chile, Santiago, Chile); Dr GONG, Jinn-Ouk (Asia Pacific Center for Theoretical Physics (APCTP), Pohang, S. Korea); SYPSAS, Spyros (FCFM, Universidad de Chile, Santiago, Chile)

Presenter: SYPSAS, Spyros (FCFM, Universidad de Chile, Santiago, Chile)

Track Classification: STARS2017

Contribution ID: **27** Type: **Talk**

The very best limits on cosmological magnetic fields

Thursday, 11 May 2017 11:30 (30 minutes)

I will review the very best limits on cosmological magnetic fields, and how these limits can be improved with future-generation facilities. Cosmological (extragalactic) magnetic fields are bound to be weaker than around 1 nG, coherent across a Jeans' length. These limits are obtained from rotation measures data, and as such they do not depend on the epoch at which the fields were generated.

Primary author: URBAN, Federico (KBFI, Tallinn, Estonia)

Presenter: URBAN, Federico (KBFI, Tallinn, Estonia)

Track Classification: SMFNS2017

Contribution ID: **28** Type: **Talk**

Supporting the existence of the QCD critical point by compact star observations

Sunday, 7 May 2017 17:30 (30 minutes)

In order to prove the existence of a critical end point (CEP) in the QCD phase diagram it is sufficient to demonstrate that at zero temperature $T = 0$ a first order phase transition exists as a function of the baryochemical potential μ, since it is established knowledge from ab-initio lattice QCD simulations that at $\mu = 0$ the transition on the temperature axis is a crossover.
We present the argument that the observation of a gap in the mass-radius relationship for compact stars which proves the existence of a so-called third family (aka "mass twins") will imply that the $T = 0$ equation of state of compact star matter exhibits astrong first order transition with a latent heat that satisfies $\Delta\epsilon/\epsilon_c > 0.6$. Since such a strong first order transition under compact star conditions will remain first order when going to symmetric matter, the observation of a disconnected branch (third family) of compact stars in the mass-radius diagram proves the existence of a CEP in QCD. Modelling of such compact star twins is based on a QCD motivated NJL quark model with high order interactions together with the hadronic DD2-MEV model fulfilling nuclear observables. Furthermore we show results of a Bayesian analysis (BA) using disjunct M-R constraints for extracting probability measures for cold, dense matter equations of state. In particular this study reveals that measuring radii of the neutron star twins has the potential to support the existence of a first order phase transition for compact star matter.

Primary authors: ALVAREZ CASTILLO, David Edwin (Joint Institute for Nuclear Research (JINR), Dubna, Russia); BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Presenter: ALVAREZ CASTILLO, David Edwin (Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Track Classification: STARS2017

Contribution ID: **29** Type: **Poster**

Search for flavor changing neutral currents in rare top decays

Models beyond the Standard Model with extra scalars have been highly motivated by the recent discovery of a 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 $\longrightarrow$ cγ, t$\longrightarrow$ c Z, and t $\longrightarrow$ c gluon decays at one loop level if neutral flavor changing is generated by top-charm-Higgs coupling given by the Yukawa matrix.

Primary authors: Dr GARCES , Estela (Instituto de Fisica, UNAM, C. Mexico, Mexico); Dr MONTES DE OCA, José Halim (FES-Cuatitlan UNAM, Estado de Mexico, Mexico); Dr GAITAN, Ricardo (FES-Cuatitlan UNAM, Estado de Mexico, Mexico); Dr MARTÍNEZ, Roberto (Universidad Nacional de Colombia, Bogota D.C., Colombia)

Presenter: Dr GAITAN, Ricardo (FES-Cuatitlan UNAM, Estado de Mexico, Mexico)

Track Classification: STARS2017

Contribution ID: **31** Type: **Talk**

Evidence of vacuum birefringence in the polarisation of the optical emission of an isolated neutron star

RX J1856.5-3754 ia a radio-quiet Isolated Neutron Stars (INSs) discovered in the soft X-rays through their purely thermal surface emission. Owing to its large inferred magnetic fields ($B \approx 10^{13}$ G), radiation from this source is expected to be substantially polarised, independently on the mechanism actually responsible for the thermal emission. A large observed polarisation degree is, however, expected only if quantum-electrodynamics (QED) polarisation effects are present in the magnetised vacuum around the star. Here, we report on the measurement of optical linear polarisation for RX J1856.5-3754 ($V \sim 25.5$), obtained with the Very Large Telescope. We measured a polarisation degree $\mathrm{P.D.} = 16.43\% \pm 5.26\%$, large enough to support the presence of vacuum birefringence, as predicted by QED.

Primary author: MIGNANI, Roberto (INAF/IASF, Milan, Italy)

Presenter: MIGNANI, Roberto (INAF/IASF, Milan, Italy)

Track Classification: SMFNS2017

Contribution ID: **33** Type: **Talk**

An emergent Van der Waals-like description of black hole entropy

Tuesday, 9 May 2017 09:40 (20 minutes)

A semiclassical statistical mechanical approach to black hole entropy based on Van der Waals horizon thermodynamics for the Schwarzschild–de Sitter solution has been developed. Emphasis on the emergence of spacetime atoms and their relationship with particular observers have lead us to propose a simple physical model through which areas are quantized in accordance with other approaches.

Primary authors: BARGUENO, Pedro (Universidad de los Andes, Bogota, Colombia); Dr CONTRERAS, Ernesto (Universidad de los Andes, Bogota, Colombia); Mr VARGAS, Andres (Universidad de los Andes, Bogota, Colombia)

Presenter: BARGUENO, Pedro (Universidad de los Andes, Bogota, Colombia)

Track Classification: STARS2017

Contribution ID: **34** Type: **Talk**

Fluxtube dynamics in neutron star cores

Friday, 12 May 2017 11:30 (30 minutes)

Although the detailed structure of neutron stars remains unknown, their equilibrium temperatures lie well below the Fermi temperature of dense nuclear matter, suggesting that the nucleons in the stars' interior form Cooper pairs and exhibit macroscopic quantum behaviour. In this talk, I will focus on the superconducting protons in the outer core, which are expected to show type-II properties. The presence of such a quantum condensate could impact on the neutron stars' large scale properties, because the magnetic field is no longer locked to the charged plasma but instead confined to fluxtubes. The motion of these structures thus governs the dynamics of the interior magnetic field. In order to examine if core magnetic field evolution could be driven on observable timescales, I will address several mechanisms that affect the fluxtube distribution in the outer core and determine their characteristic timescales for realistic neutron star equations of state. The results suggest that the timescale for each mechanism is not constant (as often assumed) but can vary by several orders of magnitude for different densities inside the star, being generally shortest close to the crust-core interface.

Primary author: GRABER, Vanessa (McGill University, Montreal, Canada)

Presenter: GRABER, Vanessa (McGill University, Montreal, Canada)

Track Classification: SMFNS2017

Contribution ID: **35** Type: **Talk**

eROSITA - status and scientific prospects

Monday, 8 May 2017 15:00 (30 minutes)

eROSITA (extended ROentgen Survey with an Imaging Telescope Array) is the core instrument on the Russian Spektrum-Roentgen-Gamma (SRG) mission which is currently scheduled for launch in fall 2017. eROSITA will perform a deep survey of the entire X-ray sky. In the soft band (0.5-2 keV), it will be about 30 times more sensitive than ROSAT, while in the hard band (2-8 keV) it will provide the first ever true imaging survey of the sky. The design driving science is the detection of large samples of galaxy clusters to redshifts z > 1 in order to study the large scale structure in the Universe and test cosmological models including Dark Energy. In addition, eROSITA is expected to yield a sample of a few million AGN, including obscured objects, revolutionizing our view of the evolution of supermassive black holes. The survey will also provide new insights into a wide range of astrophysical phenomena, including neutron stars and pulsars, X-ray binaries, active stars and diffuse emission from supernova remnants. The talk reports on the status of eROSITA and its scientific prospects with the main focus on pulsars and supernova remnants.

Primary author: BECKER, Werner (Max-Planck Institut for extraterr. Physics and Ludwig-Maximilians Universität München, Germany)

Presenter: BECKER, Werner (Max-Planck Institut for extraterr. Physics and Ludwig-Maximilians Universität München, Germany)

Track Classification: STARS2017

Contribution ID: **36** Type: **Talk**

Electromagnetic emissivity of hot and dense matter

Sunday, 7 May 2017 14:00 (30 minutes)

The QCD matter produced initially in ultra-relativistic nucleus-nucleus collisions is expected to represent a high temperature plasma, which should be evidenced in its electromagnetic radiation. We analyze the production of real and virtual photons from the strongly-coupled QGP in the initial stages of the collisions as well as the ('corona') radiation from the interacting mesons and baryons after hadronization using the parton-hadron-string dynamics (PHSD) transport approach. The description of the bulk evolution in the microscopic PHSD approach is independently controlled by abundances, spectra and flow of final particles, which is found to be in agreement with experimental observation. In this contribution, we will provide a brief description of the relevant physics assumptions within the PHSD approach and give details on the implementation of the photon radiation in partonic and hadronic interactions and decays. Our calculations successfully describe the production of photons and dileptons in proton-proton as well as nucleus-nucleus collisions from SIS to RHIC and LHC energies.

Primary author: BRATKOVSKAYA, Elena (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Presenter: BRATKOVSKAYA, Elena (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Track Classification: STARS2017

Contribution ID: **38** Type: **Talk**

Neutral vector bosons in a constant magnetic field

Friday, 12 May 2017 14:30 (30 minutes)

The thermodynamical potential as well as all thermodynamical quantities of a neutral boson gas bearing a magnetic moment in presence of a constant magnetic field are calculated in the low temperature limit. The Bose Einstein Condensation (BEC) is studied. For the weak field regime the gas shows a usual BEC whereas for the strong field regime a diffuse BEC appears. This diffuse BEC is characterized for the nonexistence of a definite critical temperature below which the population of the ground state starts to grow. We have also found that the gas magnetization is positive, increases with the field and diverges when B reaches certain critical field. For particle densities under a critical value Nc the self-magnetization condition is fulfilled and the gas can self-generate a magnetic field and the system shows a ferromagnetic behavior. The above describe phenomenology is manifested for magnetic fields and particle densities in the order of those typical of compacts objects. Thus, this work could be useful to model the mechanisms that sustain the strong magnetic fields showed by astrophysical objects. In this regard, a discussion of the presence of magnetic neutral vector bosons as a part of the structure of jets or boson stars is presented.

Primary authors: QUINTERO ANGULO, Gretel (Facultad de Física, Universidad de La Habana, Cuba); PEREZ MARTINEZ, Aurora (Instituto de Cibernetica Matematica y Fisica (ICIMAF), La Habana, Cuba); PEREZ ROJAS, Hugo Celso (Instituto de Cibernetica Matematica y Fisica (ICIMAF), La Habana, Cuba)

Presenter: QUINTERO ANGULO, Gretel (Facultad de Física, Universidad de La Habana, Cuba)

Track Classification: SMFNS2017

Contribution ID: **40** Type: **Poster**

Test of non-Newtonian forces at micrometer range

In an effort to unify gravity with the other three fundamental forces, many theoretical models have predicted the existence of non-Newtonian gravitational forces at sub-millimeter range or closer. The current constraints at micrometer range were mostly derived from the precision measurements of the Casimir force. However, the reliability of this method depends on the theoretical calculation of the Casimir force and the evaluation of the patch electrostatic force, both of them are still under debate. We performed an isoelectronic test of non-Newtonian forces at micrometer range by sensing the lateral force between a gold sphere and a density modulation source mass using a soft cantilever. Two-dimensional force mapping, in combination with in situ topographic imaging, is applied to verify the isoelectronic property of the surface. The force signal is found to be electrostatic force dominated, which is correlated with the density modulation structure for thinner gold coating and reduced by thicker gold coating and thermal annealing. Maximum likelihood estimation is used to extract the constraint on the hypothetical force based on the 2D data. The experiment sets a constraint on the Yukawa force without subtraction of the model dependent force background.

Primary authors: Prof. LUO, Pengshun (Huazhong University of Science & Technology, Wuhan, China); Dr WANG, Jianbo (Huazhong University of Science & Technology, Wuhan, China)

Presenter: Prof. LUO, Pengshun (Huazhong University of Science & Technology, Wuhan, China)

Track Classification: STARS2017

Contribution ID: **42** Type: **Talk**

Kicks of magnetized strange quarks induced by anisotropic emission of neutrinos

Thursday, 11 May 2017 10:00 (20 minutes)

Beta disintegration is studied in the presence of a magnetic field, which imposes a preferential direction on the emission of neutrinos. It is explored the possibility that this anisotropy in neutrino emission can account for observed Neutron (Quarks) Star velocities (kicks). The conditions under which the anisotropic emission of neutrinos (due to the magnetic field present in the system) causes a "kick" of the compact star are discussed. The matrix element for the beta decay process is computed from first principles taking into account the W boson propagator in presence of a strong magnetic field. The neutrino emissivity is also computed.

Primary authors: MANREZA PARET, Daryel (Facultad de Física, Universidad de la Habana, Cuba & Instituto de Ciencias Nucleares ICN-UNAM, Mexico); PEREZ MARTINEZ, Aurora (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba); AYALA MERCADO, Alejandro (Instituto de Ciencias Nucleares ICN-UNAM, Mexico); PICCINELLI BOCHI , Gabriella (Facultad de Estudios Superiores FES Aragón-UNAM, Mexico); SANCHEZ, A (Facultad de Ciencias, UNAM, Mexico)

Presenter: MANREZA PARET, Daryel (Facultad de Física, Universidad de la Habana, Cuba & Instituto de Ciencias Nucleares ICN-UNAM, Mexico)

Track Classification: SMFNS2017

Contribution ID: **45** Type: **Talk**

Black holes as tools - AdS/CFT and the holographic principle (Lecture I)

Wednesday, 3 May 2017 09:00 (1h 20m)

Modeling matter at high densities, high temperatures, and at large values of the relevant coupling constant(s) is a quite challenging task. In these lectures, we are going to introduce the AdS/CFT correspondence (more generally called gauge/gravity correspondence or holography), which allows us to map challenging quantum problems at strong coupling to classical gravity problems at small curvature values of spacetime. Applications to heavy ion collisions and neutron star physics will be discussed.

Primary author: KAMINSKI, Matthias (University of Alabama, Tuscaloosa, United States)

Presenter: KAMINSKI, Matthias (University of Alabama, Tuscaloosa, United States)

Contribution ID: **46** Type: **Talk**

Black holes as tools - AdS/CFT and the holographic principle (Lecture II)

Wednesday, 3 May 2017 10:40 (1h 20m)

Modeling matter at high densities, high temperatures, and at large values of the relevant coupling constant(s) is a quite challenging task. In these lectures, we are going to introduce the AdS/CFT correspondence (more generally called gauge/gravity correspondence or holography), which allows us to map challenging quantum problems at strong coupling to classical gravity problems at small curvature values of spacetime. Applications to heavy ion collisions and neutron star physics will be discussed.

Primary author: KAMINSKI, Matthias (University of Alabama, Tuscaloosa, United States)

Presenter: KAMINSKI, Matthias (University of Alabama, Tuscaloosa, United States)

Contribution ID: **47** Type: **Talk**

Effective model for quark-hadron matter in compact stars (Lecture I)

Thursday, 4 May 2017 09:00 (1h 20m)

Starting from model Lagragians of the Nambu-Jona-Lasinio(NJL) type that share basic symmetries with the QCD Lagrangian we demonstrate in these lectures how to use the Path-Integral formalism in order to obtain dynamical chiral symmetry breaking and color superconductivity at the mean-field level of description and how to describe the formation and dissociation of hadronic bound states of quarks when going beyond that approximation. The status of the quest for a unified equation of state for quark-hadron matter is discussed and its importance for applications to simulations of heavy-ion collisions and the evolution of compact stars and their mergers is outlined.

Primary author: BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Presenter: BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Contribution ID: **48** Type: **Talk**

Effective model for quark-hadron matter in compact stars (Lecture II)

Thursday, 4 May 2017 10:40 (1h 20m)

Starting from model Lagragians of the Nambu-Jona-Lasinio (NJL) type that share basic symmetries with the QCD Lagrangian we demonstrate in these lectures how to use the Path-Integral formalism in order to obtain dynamical chiral symmetry breaking and color superconductivity at the mean-field level of description and how to describe the formation and dissociation of hadronic bound states of quarks when going beyond that approximation. The status of the quest for a unified equation of state for quark-hadron matter is discussed and its importance for applications to simulations of heavy-ion collisions and the evolution of compact stars and their mergers is outlined.

Primary author: BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Presenter: BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Contribution ID: **49** Type: **Talk**

Modeling extreme matter in heavy-ion collisions (Lecture I)

Friday, 5 May 2017 09:00 (1h 20m)

We discuss different approaches to model various stage of relativistic heavy ion reactions. We will start from straightforward hydrodynamic descriptions and will then turn to multi-fluid hydrodynamics and hybrid approaches where a Boltzmann transport equation is coupled to hydrodynamics. The main physics results are discussed with a focus on elliptic flow and di-lepton production.

Primary author: BLEICHER, Marcus (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Presenter: BLEICHER, Marcus (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Contribution ID: **50** Type: **Talk**

Modeling extreme matter in heavy-ion collisions (Lecture II)

Friday, 5 May 2017 10:40 (1h 20m)

We discuss different approaches to model various stage of relativistic heavy ion reactions. We will start from straightforward hydrodynamic descriptions and will then turn to multi-fluid hydrodynamics and hybrid approaches where a Boltzmann transport equation is coupled to hydrodynamics. The main physics results are discussed with a focus on elliptic flow and di-lepton production.

Primary author: BLEICHER, Marcus (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Presenter: BLEICHER, Marcus (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Contribution ID: **53** Type: **Talk**

Hartle's slow rotation effects in magnetized white dwarfs

Friday, 12 May 2017 15:00 (30 minutes)

Slowly rotating magnetized white dwarfs are studied within the framework of general relativity using Harte's formalism. Matter inside magnetized white dwarfs is described by an equation of state of particles under the action of a constant magnetic field, which breaks the SO(3) symmetry and introduces a splitting of the pressure into one parallel and other perpendicular to the magnetic field. Our research comprises typical densities of white dwarfs and values of magnetic field below 10^{13} G -a threshold for the maximum interior magnetic field supported by white dwarfs, obtained from cylindrical metric solution in previous studies-. The effects of rotation and magnetic field combined are discussed and relevant magnitudes such as the moment of inertia, quadrupole moment and eccentricity are computed.

Primary authors: ALVEAR TERRERO, Diana (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba); Dr MANREZA PARET, Daryel (Facultad de Física, Universidad de la Habana, Cuba & Instituto de Ciencias Nucleares ICN-UNAM, Mexico); PEREZ MARTINEZ, Aurora (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba)

Presenter: ALVEAR TERRERO, Diana (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba)

Track Classification: SMFNS2017

Contribution ID: **54** Type: **Talk**

The SVOM gamma-ray burst mission

Monday, 8 May 2017 16:30 (30 minutes)

The Chinese-French space mission SVOM (Space-based multi-band astronomical Variable Objects Monitor) is mainly designed to detect and localize Gamma-Ray Burst events (GRBs). The satellite, to be launched late 2021, embarks a set of gamma-ray, X-ray and optical imagers. Thanks to its pointing strategy, quick slew capability and fast data connection to earth, ground based observations with large telescopes will allow us to measure redshifts for an unprecedented number of GRBs. While the association of long GRBs with core-collapse SNe is well established, short GRBs are most likely due to NS-NS or NS-BH mergers and are thus expected to occur simultaneously with bursts of gravitational waves. I will discuss the overall science goals of the SVOM mission in the framework of the multi-wavelength and multi-messenger panorama of the next decade.

Primary author: MOTCH, Christian (CNRS, Observatoire Astronomique de Strasbourg, France)

Co-author: SVOM CONSORTIUM

Presenter: MOTCH, Christian (CNRS, Observatoire Astronomique de Strasbourg, France)

Track Classification: STARS2017

Contribution ID: **57** Type: **Talk**

Habitability of the Milky Way revisited

Saturday, 13 May 2017 09:00 (20 minutes)

The discoveries of the last three decades on deep sea and deep crust of planet Earth show that life can thrive in many places where solar radiation does not reach, using chemosynthesis instead of photosynthesis for primary production. Underground life is relatively well protected from hazardous ionizing cosmic radiation, so above mentioned discoveries reopen the habitability budget of the Milky Way, turning potentially habitable even planetary bodies without atmosphere. Considering this, in this work the habitability potential of the Milky Way is reconsidered.

Primary author: CARDENAS, Rolando (Universidad Central "Marta Abreu" de Las Villas, Cuba)

Presenter: CARDENAS, Rolando (Universidad Central "Marta Abreu" de Las Villas, Cuba)

Track Classification: STARS2017

Contribution ID: **58** Type: **Talk**

Uniformly accelerated point charge: cusp radiation

Sunday, 7 May 2017 09:20 (20 minutes)

A curious uniformly accelerated point charge, which moves neither in a straight line nor in a circle, but in a cusp, is investigated. We find the angular distribution of the Larmor radiation, the constant power, and the intensity in the maximal direction. We also confirm that the vacuum excitation spectra of quantized field detectors on the world line is analytic and hotter than rectilinear acceleration radiation.

Primary authors: GOOD, Michael (Nazarbayev University, Astana, Kazakhstan); Prof. OIKONOMOU, Thomas (Nazarbayev University, Astana, Kazakhstan); Ms AKHMETZHANOVA, Gaukhar (Nazarbayev University, Astana, Kazakhstan)

Presenter: GOOD, Michael (Nazarbayev University, Astana, Kazakhstan)

Track Classification: STARS2017

Contribution ID: **59** Type: **Talk**

Ultra-relativistic heavy ion physics highlights –past, present and future

Sunday, 7 May 2017 16:00 (30 minutes)

Ultra-relativistic collisions of heavy nuclei at the Large Hadron Collider (LHC) at CERN in Geneva (Switzerland) and the Relativistic Heavy Ion Collider (RHIC) in New York (US) create sufficiently high temperatures that nuclear matter melts into a "soup"of quarks and gluons called the quark-gluon plasma (QGP). Thousands of particles and anti-particles are created in a single event with temperatures reaching T ˜ 2 x 10**12 K, some 200,000 times hotter than the sun's core and expected only within the first microseconds after the Big Bang. Normal hadrons cannot exist at these temperatures. The soup is observed to flow easily, with extremely low viscosity, suggesting a nearly perfect liquid of quarks and gluons. New results have extended the study of the QGP to higher temperatures and penetrating probes. Measurements of very energetic jets, extremely large transverse momentum particles, and heavy flavors indicate a very dense and highly interacting system that is opaque to energetic probes. I will present a motivation for physics in this field, an overview and interpretation of the results, and the elucidate the "big questions"remaining to be answered. I will also offer a perspective on the future of the field as it is presently envisioned.

Primary author: HARRIS, John W. (Yale University, Branford, United States)

Presenter: HARRIS, John W. (Yale University, Branford, United States)

Track Classification: STARS2017

Contribution ID: **60** Type: **Talk**

Dark matter and dark energy as quantum entities

Thursday, 11 May 2017 14:30 (30 minutes)

We derive a relativistic model of matter-wave duality. The model turns out to be qualitatively similar to the well-known de Broglie-Bohm's model. It prescribes that the total energy of a body in a state of motion relative to an observer, is carried cooperatively by the body corpuscular matter, and its dual wave. At very low velocities ($\beta \ll 1$), the wave component diminishes, and the body total energy becomes equal to the Newtonian Kinetic energy. At very high velocities ($\beta \longrightarrow 1$), the kinetic energy of the body corpuscular matter diminishes, and the bulk of the body energy is carried by its dual wave. Our model is insensitive to the magnitude of the moving body. This crucially important characteristic is utilized to construct a quantum cosmology, which suggests that dark matter and dark energy are, respectively, quantum matter, and dual wave energy at cosmic scales.

Primary author: SULEIMAN, Ramzi (University of Haifa, Israel)

Presenter: SULEIMAN, Ramzi (University of Haifa, Israel)

Track Classification: STARS2017

Contribution ID: **62** Type: **Talk**

(2+1) Scale dependent gravity coupled to a non-linear electrodynamic source

Tuesday, 9 May 2017 09:20 (20 minutes)

We study a scale-dependent gravitational model coupled to a nonlinear electrodynamic source. An analytic black hole solution is obtained which differs from the classical model in which the scale dependence is absent. Certain properties, such as horizon structure and thermodynamics are discussed.

Primary authors: CONTRERAS, Ernesto (Departamento de Física, Universidad de los Andes, Apartado Aéreo 4976, Bogotá, Distrito Capital, Colombia); RINCÓN, Angel (Instituto de Física, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Santiago, Chile); Dr BARGUEÑO, Pedro (Departamento de Física, Universidad de los Andes, Apartado Aéreo 4976, Bogotá, Distrito Capital, Colombia); Dr KOCH, Benjamin (Instituto de Física, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Santiago, Chile); Dr PANOTOPOULOS, Grigorios (CENTRA, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco País 1, Lisboa, Portugal); HERNÁNDEZ, Alejandro (Departamento de Física, Universidad de los Andes, Apartado Aéreo 4976, Bogotá, Distrito Capital, Colombia)

Presenter: CONTRERAS, Ernesto (Departamento de Física, Universidad de los Andes, Apartado Aéreo 4976, Bogotá, Distrito Capital, Colombia)

Track Classification: STARS2017

Contribution ID: **63** Type: **Poster**

Graviton production by two-photon processes in TeV scale gravitational interactions

In this contribution the production of gravitons via two photon fusion process is considered using the scale of the gravitational interactions around a few TeV. We focus on the expected energy of the International Linear Collider (ILC) with a center of mass energy at TeV scale. The number of events is predicted and the background from Standard Model is analyzed.

Primary author: MACHADO, Magno (Instituto de Fisica - UFRGS, Porto Alegre, Brazil)

Presenter: MACHADO, Magno (Instituto de Fisica - UFRGS, Porto Alegre, Brazil)

Track Classification: STARS2017

Contribution ID: **64** Type: **Talk**

Configurations of rotating compact stars

Friday, 12 May 2017 10:00 (30 minutes)

With a compactness slightly smaller than that of the black hole, pulsar provides a perfect natural laboratory for us to learn gravity and strong interaction. However, due to non-perturbative effect of strong interaction at low energy levels, it's impossible to verify the interior structure of compact stars from QCD calculations. Therefore, the equation of state of dense matter such as compact stars is still in hot debate. Apart from the conventional neutron star model, the existences of hyperon/free quarks in compact stars are also suggested. Models such as solid quark cluster stars can also explain many puzzling observations of pulsars. In order to distinguish between different equation of states, I focus on the rigidity of typical neutron stars and quark cluster stars. For instance, neutron stars and quark cluster stars will have different deformation in external tidal fields or when they are spinning really fast. In my talk, I will to explain how to describe the deformability of a compact star with the tool of numerical relativity. I will also show the difference in the deformability between different EoSs and how we are going to test these differences by observation.

Primary author: ZHOU, Enping (Peking University, Beijing, China)

Presenter: ZHOU, Enping (Peking University, Beijing, China)

Track Classification: SMFNS2017

Contribution ID: **65** Type: **Talk**

Measuring Ω_M with gamma-ray bursts

Thursday, 11 May 2017 16:00 (30 minutes)

Here, we review the use of the Ep,i-Eiso correlation of GRBs to measure the cosmological density parameter Ω_M. We show that the present data set of GRBs, coupled with the assumption that we live in a flat universe, can provide independent evidence, from Supernovae-Ia, that $\Omega_M \sim 0.3$. We show that current (e.g. Swift, Fermi/GBM, Konus-WIND) and forthcoming gamma ray burst (GRB) experiments (e.g. CALET/GBM, SVOM, Lomonosov/UFFO, LOFT/WFM) will allow us to constrain Ω_M with an accuracy comparable to that currently exhibited by Type Ia supernovae (SNe-Ia) and to study the properties of dark energy and their evolution with time.

Primary author: DELLA VALLE, Massimo (Capodimonte Astronomical Observatory - INAF, Naples, Italy)

Presenter: DELLA VALLE, Massimo (Capodimonte Astronomical Observatory - INAF, Naples, Italy)

Track Classification: STARS2017

Contribution ID: **67** Type: **Poster**

Gravity and thermodynamics: a realization in spherically symmetric spacetimes

We propose a thermodynamic framework to obtain exact solutions of Einstein's field equations for spherically symmetric spacetimes based on identifying Komar energy as thermodynamical energy and gravitational entropy as proportional to horizon area. The approach is justified by considering gravitational path integrals with finite boundaries and allows us to understand at which extent the fundamental equation for the entropy can determine the geometry of the spacetime. With this framework, the Schwarzschild, Reissner-Nordström, and de Sitter solutions are derived. Finally, the equations of state corresponding to the mentioned spacetimes are obtained and discussed in the context of emergent gravity.

Primary authors: Mr VILLALBA, Fabián (Universidad de los Andes, Bogotá, Colombia); Dr BARGUEÑO, Pedro (Departamento de Física, Universidad de los Andes, Bogotá, Colombia); Dr CONTRERAS, Ernesto (Universidad de los Andes, Bogotá, Colombia); Mr VARGAS, Andres (Universidad de los Andes, Bogotá, Colombia)

Presenter: Mr VILLALBA, Fabián (Universidad de los Andes, Bogotá, Colombia)

Track Classification: STARS2017

Contribution ID: **68** Type: **Talk**

A new class of quark-hadron hybrid equation of state for astrophysics

Saturday, 13 May 2017 10:00 (30 minutes)

We explore systematically a new class of two-phase equations of state (EoS) for hybrid stars that is characterized by three main features : (1) stiffening of the nuclear EoS at supersaturation densities due to quark exchange effects (Pauli blocking) between hadrons, modelled by an excluded volume correction, (2) stiffening of the quark matter EoS at high densities due to multiquark interactions and (3) possibility for a strong first order phase transition with an early onset and large density jump. The third feature results in high-mass twin stars characterized by the same gravitational mass but different radii. We perform a Bayesian analysis and demonstrate that the observation of such a pair of high-mass twin stars would have a sufficient discriminating power to favor hybrid EoS with a strong first order phase transition over alternative EoSs. The new class of hybrid EoS can be straightforwardly generalized to finite temperatures and proves very interesting for astrophysical applications.

Primary author: BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Presenter: BLASCHKE, David (University of Wroclaw, Poland and Joint Institute for Nuclear Research (JINR), Dubna, Russia)

Track Classification: STARS2017

Contribution ID: **69** Type: **Poster**

Low energy interaction in the Fock-Tani formalism

The Fock-Tani formalism is a first principle method to obtain effective interactions from microscopic Hamiltonians. Originally derived for meson-meson or baryon-baryon scatttering, we present the corresponding equations for meson-baryon scattering and annihilation for a KN interaction.

Primary authors: Mrs FOLADOR, Bruna (Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil); Dr HADJIMICHEF, Dimiter (Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil)

Presenter: Mrs FOLADOR, Bruna (Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil)

Track Classification: STARS2017

Contribution ID: **70** Type: **Talk**

Exact General Relativity contrasted with cosmological perturbations and Newtonian gravity

Monday, 8 May 2017 10:00 (30 minutes)

We examine the relation between non-perturbative General Relativity, cosmological perturbations (linear and non-linear) and Newtonian gravity by means of an exact non-spherical solution of Einstein's equations (the Szekeres models) that allows for a non-trivial modeling of realistic cosmic structure. We show that the exact dynamics of cosmological perturbations for dust sources (at all approximation orders and in the isochronous gauge) is fully contained in the exact dynamics of the models. We also show that the models provide a fully relativistic (and exact) generalization of the Zeldovich approximation that is widely used in Newtonian dynamics. These comparison and equivalences can be very useful to assess the role of relativistic corrections to many cosmological calculations to fit observations that are done by perturbations and by Newtonian gravity.

Primary author: SUSSMAN, Roberto (ICN-UNAM, Mexico)

Presenter: SUSSMAN, Roberto (ICN-UNAM, Mexico)

Track Classification: STARS2017

Contribution ID: **71** Type: **Talk**

What can magnetar QPOs tell us about the NS EoS

Sunday, 7 May 2017 09:40 (20 minutes)

Magneto-elastic Oscillations of neutron stars are believed to be observed as quasi-periodic oscillations in the decaying tail of the giant flares of magnetars. Significant efforts in the theoretical modelling from different groups have increased our understanding of this phenomenon significantly. Here we will discuss some constraints on the matter in neutron stars that arise if the interpretation of the observations in terms of superfluid, magneto-elastic oscillations is correct.

Primary author: GABLER, Michael (Max Plank Institute for Astrophysics, Garching, Germany)

Presenter: GABLER, Michael (Max Plank Institute for Astrophysics, Garching, Germany)

Track Classification: STARS2017

Contribution ID: **72** Type: **Talk**

Modulating magnetar emission by resonant cyclotron scattering

Thursday, 11 May 2017 11:00 (30 minutes)

We present a new numerical tool to calculate the emission of highly magnetized neutron stars (magnetars) and apply it to describe the quasi-periodic oscillations (QPOs) observed in magnetar giant flares. In previous work we have developed a model of magneto-elastic oscillations of magnetars that allows to reproduce the observed frequencies. These QPOs can couple to the star's exterior through the magnetic field and induce currents in the magnetosphere that provide scattering targets for resonant cyclotron scattering of the photons. The scattering is calculated with a Monte-Carlo approach and it is coupled to a code that calculates the momentum distribution of the charge carriers as an one-dimensional accelerator problem. As a first test of the method we calculate the modulation of the quiescent emission of the neutron star by the magneto-elastic QPOs for a prescribed momentum distribution of the charge carriers.

Primary author: GABLER, Michael (Max Plank Institute for Astrophysics, Garching, Germany)

Presenter: GABLER, Michael (Max Plank Institute for Astrophysics, Garching, Germany)

Track Classification: SMFNS2017

Contribution ID: **73** Type: **Talk**

Propagation of photon in a diluted medium moving parallel to the magnetic field: Faraday rotation angle

Thursday, 11 May 2017 09:00 (20 minutes)

We investigate the Quantum Faraday Rotation starting from the photon self-energy in the presence of a constant magnetic field. The angle is calculated for a weak non degenerate limit for engage a discussion related to the constraints of the magnetic field constraints imposed by Planck. The origin of the Faraday angle is studied and is compared with classical limit.

Primary authors: CRUZ RODRÍGUEZ, Lidice (Facultad de Fisica, Universidad de la Habana, Cuba); Dr PÉREZ MARTÍNEZ, Aurora (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba); Dr RODRIGUEZ QUERTS, Elizabeth (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba); Dr PICCINELLI, Gabriella (FES-Aragón UNAM, Estado de Mexico, Mexico)

Presenter: CRUZ RODRÍGUEZ, Lidice (Facultad de Fisica, Universidad de la Habana, Cuba)

Track Classification: SMFNS2017

Contribution ID: **74** Type: **Talk**

Chiral effects in gauge theories

Thursday, 11 May 2017 09:20 (20 minutes)

We study the chiral effects in QED in the magnetized vacuum and medium. We report the generation of a pseudovector electric current having imbalanced chirality in an electron-positron strongly magnetized gas in QED. It propagates along the external applied magnetic field B as a chiral magnetic effect in QED. It is triggered by a perturbative electric field parallel to B, associated to a pseudovector longitudinal mode propagating along B. An electromagnetic chemical potential was introduced, but our results remain valid even when it vanishes. A nonzero fermion mass was assumed, which is usually considered vanishing in the literature. In the quantum field theory formalism at finite temperature and density, an anomaly relation for the axial current was found for a medium of massive fermions. It bears some analogy to the Adler-Bell-Jackiw anomaly. From the expression for the chiral current in terms of the photon self-energy tensor in a medium, it is obtained that to pair creation contribute to the chiral current due to longitudinal photons (out of light cone). This demonstrates that to pair creation creates a chiral asymmetry in a magnetized medium. In the static limit, an electric pseudovector current is obtained in the lowest Landau level. We also study the chiral effects in QCD and its relation with the strong CP problem. Finally, we discuss about the introduction of a chiral chemical potential in the quantum field theory formalism at finite temperature and density.

Primary authors: ACOSTA AVALO, Jorge Luis (Instituto Superior de Tecnologias y Ciencias Aplicadas (InSTEC), La Habana, Cuba); Prof. PEREZ ROJAS, Hugo Celso (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba)

Presenter: ACOSTA AVALO, Jorge Luis (Instituto Superior de Tecnologias y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Track Classification: SMFNS2017

Contribution ID: **75** Type: **Talk**

The magnetic field profile in strongly magnetized neutron stars

Thursday, 11 May 2017 10:40 (20 minutes)

We report a realistic calculation of the magnetic field profile for the equation of state inside strongly magnetized neutron stars. Unlike previous estimates, which are widely used in the literature, we find that magnetic fields increase relatively slowly with increasing baryon chemical potential (or baryon density) of magnetized matter. More precisely, the increase is polynomial instead of exponential, as previously assumed. Through the analysis of several different realistic models for the microscopic description of matter in the star (including hadronic, hybrid and quark models) combined with general relativistic solutions endowed with a poloidal magnetic field obtained by solving Einstein-Maxwell's field equations in a self-consistent way, we generate a phenomenological fit for the magnetic field distribution in the stellar polar direction to be used as input in microscopic calculations.

Primary author: DEXHEIMER, Veronica (Kent State University, Kent, United States)

Presenter: DEXHEIMER, Veronica (Kent State University, Kent, United States)

Track Classification: SMFNS2017

Contribution ID: **77** Type: **Talk**

Scalar boson decay in presence of magnetic fields

Thursday, 11 May 2017 09:40 (20 minutes)

We analyze the decay of a heavy scalar boson to two light charged scalars, in presence of a uniform, constant magnetic field. The effect of magnetic fields on a particle decay process have been studied in many contexts, in presence of different ingredients and with a variety of methods. We will review here some results that can be found in the literature, discussing their differences. We then present our results and their possible application.

Primary authors: Prof. SÁNCHEZ CECILIO, Ángel (Facultad de Ciencias, Universidad Nacional Autónoma de México (UNAM), Mexico); PICCINELLI, Gabriella (FES-Aragón UNAM, Mexico)

Presenter: PICCINELLI, Gabriella (FES-Aragón UNAM, Mexico)

Track Classification: STARS2017

Contribution ID: **78** Type: **Talk**

IceCube: A wide view on astro-particles

Sunday, 7 May 2017 10:00 (30 minutes)

The IceCube Neutrino Observatory, located at the geographical South Pole, has a rich scientific program covering a wide range of topics from multi-messenger astrophysics to particle physics. Evidence for the existence of an astrophysical flux of neutrinos was presented in 2013, opening a new window into the cosmos. Since then, a variety of follow-up studies have strengthened the case. Neutrino arrival directions, as well as the time correlation between neutrino detection and transient phenomena, are analyzed in an attempt to identify and constrain the possible neutrino sources. The IceCube detector also detects cosmic rays with IceTop, its surface component. The cosmic ray spectrum, composition and arrival direction distribution is determined by combining the measurements done at the surface with those made in the ice. We review these and other recent results from IceCube and their implications on our understanding of neutrinos and cosmic rays. We finish by describing the view for future developments.

Primary author: GONZALEZ, Javier (Bartol Research Institute, Univ. Delaware, Newark, United States)

Presenter: GONZALEZ, Javier (Bartol Research Institute, Univ. Delaware, Newark, United States)

Track Classification: STARS2017

Contribution ID: **79** Type: **Talk**

Gravitational and electromagnetic signatures of accretion into a black hole

Tuesday, 9 May 2017 10:00 (30 minutes)

We present the derivation and the solutions to the coupled electromagnetic and gravitational perturbations with sources in a charged black hole background. We consider as source of the perturbations the infall of radial currents. In this way, we study a system in which it is provoked a response involving both, gravitational and electromagnetic waves, which allows us to analyze the dependence between them. We solve numerically the wave equations that describe both signals, characterize the waveforms and study the relation between the input parameters of the infalling matter with those of the gravitational and electromagnetic responses.

Primary authors: MORENO, Claudia (Universidad de Guadalajara, Mexico); Dr DEGOLLADO, Juan Carlos (Universidad Autonoma de Mexico (UNAM), Mexico); Dr NUÑEZ, Dario (Universidad Autonoma de Mexico (UNAM), Mexico)

Presenter: MORENO, Claudia (Universidad de Guadalajara, Mexico)

Track Classification: STARS2017

Contribution ID: **80** Type: **Talk**

Stealth configurations in a generalized scalar-tensor gravity

Monday, 8 May 2017 09:20 (20 minutes)

We explore the existence of stealth configurations in a modified gravity model including a linear coupling between a scalar field and the Gauss–Bonnet invariant.

Primary authors: Prof. AYÓN BEATO, Eloy (Departamento de Física, CINVESTAV-IPN, C. Mexico, Mexico); RODRÍGUEZ QUERTS, Elizabeth (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba & Departamento de Física, CINVESTAV-IPN, C. Mexico, Mexico); Dr VELÁZQUEZ RODRÍGUEZ, Gerardo (Departamento de Física, CINVESTAV-IPN, C. Mexico, Mexico)

Presenter: RODRÍGUEZ QUERTS, Elizabeth (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba & Departamento de Física, CINVESTAV-IPN, C. Mexico, Mexico)

Track Classification: STARS2017

Contribution ID: **81** Type: **Poster**

Casimir effect and the evolution of an extended brane world scenario

We study the consequences of Casimir effect on the evolution of the brane world scenario with both warped and compact extra dimensions.

Primary authors: BENÍTEZ, Rafael (Facultad de Fisica, Universidad de la Habana, Cuba); Dr RODRÍGUEZ QUERTS, Elizabeth (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba & Departamento de Física, CINVESTAV-IPN, C. Mexico, Mexico)

Presenter: BENÍTEZ, Rafael (Facultad de Fisica, Universidad de la Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **82** Type: **Talk**

Radiative MHD simulations of disk accretion onto neutron stars

Friday, 12 May 2017 12:00 (30 minutes)

The discovery of pulsations in ultra luminous X-ray sources (ULXs) revealed a new class of neutron stars. These possibly strongly magnetized stars accrete matter at prodigious (super-Eddington) rates and are subject to very high spin-up torques. Other classes of sources such as the Z sources (e.g., Sco X-1) have accretion disks radiating at nearly Eddington luminosity. Recent computing advances allow for the first time to include radiation in magnetohydrodynamic simulations of accretion flows in general relativity. I will present radiative GRMHD simulations of accretion disks and discuss their relevance to neutron star sources.

Primary author: KLUZNIAK, Wlodek (Copernicus Astronomical Center, Warszawa, Poland)

Presenter: KLUZNIAK, Wlodek (Copernicus Astronomical Center, Warszawa, Poland)

Track Classification: SMFNS2017

Contribution ID: **83** Type: **Talk**

Overview of Cherenkov Telescope Array (CTA)

Monday, 8 May 2017 14:00 (30 minutes)

CTA is a global initiative to build the world's largest and most sensitive very high-energy gamma-ray observatory. To this end a consortium of participating institutions, bringing together scientists from 32 countries, has been set up. The Cherenkov Telescope Array will provide unprecedented opportunities for observing the energetic universe in the "Tera electron Volt window,"which will extend from 20 GeV to 300 TeV for the CTA. The CTA project and its capabilities will be described with an emphasis on the expected scientific returns of the project. An overview of the known classes of TeV sources will be given as well.

Primary author: KLUZNIAK, Wlodek (Copernicus Astronomical Center, Warszawa, Poland)

Presenter: KLUZNIAK, Wlodek (Copernicus Astronomical Center, Warszawa, Poland)

Track Classification: STARS2017

Contribution ID: **85** Type: **Talk**

Measurement of antiproton production in p-He collisions at LHCb to constrain the secondary cosmic antiproton flux

Sunday, 7 May 2017 16:30 (30 minutes)

The flux of cosmic ray antiproton is a powerful tool for indirect detection of dark matter. The sensitivity is limited by the uncertainty on the predicted antiproton flux from scattering of primary protons on the interstellar medium. This is in turn limited by the knowledge of antiproton production cross sections, notably in p-He scattering. Thanks to its internal gas target SMOG, LHCb performed the first measurement of antiproton production from collisions of LHC proton beams on He nuclei at rest. Results and prospects are presented.

Primary author: GRAZIANI, Giacomo (INFN, Sezione di Firenze, Italy)

Presenter: GRAZIANI, Giacomo (INFN, Sezione di Firenze, Italy)

Track Classification: STARS2017

Contribution ID: **86** Type: **Talk**

Generic General Relativity from action principle and general principle of relativity

Monday, 8 May 2017 11:30 (30 minutes)

We derive the generic portion of the theory of General Relativity which emerges by presuming merely the action principle and the general principle of relativity to hold. Hence, we isolate those physical theories whose action functional is invariant in its form under arbitrary transformations of the reference frame. Transformations of the dynamical variables which maintain the form of the action functional constitute the group of canonical transformations. In the case of a dynamical spacetime, not only the transformation of the physical fields, but also the mapping of the quantities determining the spacetime geometry must be canonical in order to maintain the form of the action functional.
Following the reasoning of gauge theories, the corresponding locally form-invariant system is worked out by means of a canonical transformation. We thus encounter an amended Hamiltonian with the property to be form-invariant under arbitrary spacetime transformations. The amended system then complies with the general principle of relativity and describes both the dynamics of the given physical system's fields and their coupling to the quantities describing the spacetime geometry. This way, we uniquely determine how spin-0 and spin-1 matter fields couple to spacetime dynamics.

Primary authors: STRUCKMEIER, Juergen (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany); MUENCH, J. (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany); VASAK, D. (Frankfurt Institute for Advanced Studies (FIAS), Frankfurt, Germany); KIRSCH, J. (Frankfurt Institute for Advanced Studies (FIAS), Frankfurt, Germany); HANAUSKE, M. (University of Frankfurt, Frankfurt, Germany); STOECKER, H. (GSI and Frankfurt Institute for Advanced Studies (FIAS), Frankfurt, Germany)

Presenter: STRUCKMEIER, Juergen (Frankfurt Institute for Advanced Studies (FIAS) and University of Frankfurt, Frankfurt, Germany)

Track Classification: STARS2017

Contribution ID: **87** Type: **Talk**

The Deep Underground Neutrino Experiment - DUNE: the precision era of neutrino physics

Sunday, 7 May 2017 11:00 (30 minutes)

The last decade was remarkable for neutrino physics. In particular, the phenomenon of neutrino flavor oscillations has been firmly established by a series of independent measurements. All parameters of the neutrino mixing are now known and we have elements to plan a judicious exploration of new scenarios that are opened by these recent advances. With precise measurements we can test the 3-neutrino paradigm, neutrino mass hierarchy and CP asymmetry in the lepton sector. The future long-baseline experiments are considered to be a fundamental tool to deepen our knowledge of electroweak interactions. The Deep Underground Neutrino Experiment –DUNE will detect a broad-band neutrino beam from Fermilab in an underground massive Liquid Argon Time-Projection Chamber at an L/E of about 10ˆ3 km / GeV to reach good sensitivity for CP-phase measurements and the determination of the mass hierarchy. The dimensions and the depth of the Far Detector also create an excellent opportunity to look for rare signals like proton decay to study violation of baryonic number, as well as supernova neutrino bursts, broadening the scope of the experiment to astrophysics and associated impacts in cosmology. In this presentation, we will discuss the physics motivations and the main experimental features of the DUNE project required to reach its scientific goals.

Primary author: KEMP, Ernesto (University of Campinas, Brazil)

Presenter: KEMP, Ernesto (University of Campinas, Brazil)

Track Classification: STARS2017

Contribution ID: **88** Type: **Talk**

A new transport approach for heavy ion collisions

Sunday, 7 May 2017 14:30 (30 minutes)

I present a new transport approach for heavy ion collisions based on a n-body transport theory and called PHQMD. In contradistinction to all other approaches it allows to study the production of fragments as well as of hypernuclei in the energy range from $E_{Lab} = 500$ AMeV to $\sqrt{s} = 13$ TeV. First tests show that indeed fragments are product at all energies (as seen experimentally) and that the new approach reproduces almost all the fragmentation data which are available right now. All so the multiplicity and spectra of the produced mesons and baryons are well reproduced.

Primary author: AICHELIN, Joerg (Subatech/CNRS, Nantes, France)

Presenter: AICHELIN, Joerg (Subatech/CNRS, Nantes, France)

Track Classification: STARS2017

Contribution ID: **89** Type: **Talk**

Latest results from Telescope Array

Monday, 8 May 2017 14:30 (30 minutes)

I will present the latest results on Ultrahigh Energy Cosmic Ray observations from the Telescope Array observatory. This will include measurement of the flux spectrum, the chemical composition and searches for anisotropy. In particular, the status of the TA "hot spot" will be discussed and how events in the hot spot region contribute to the flux spectrum.

Primary author: BERGMAN, Douglas (University of Utah, Salt Lake City, United States)

Presenter: BERGMAN, Douglas (University of Utah, Salt Lake City, United States)

Track Classification: STARS2017

Contribution ID: **90** Type: **Talk**

Color transparency in nuclear matter

Sunday, 7 May 2017 17:00 (30 minutes)

In this contribution, a model to explain color transparency in QCD is discussed. This model focuses on recreating the interaction of color dipole created from the quantum oscillations of the virtual photons of high energies that intervene in the ultra-peripheral collisions as a consequence of its exchange with the vacuum presented in the VDM model. The interaction of the small size configuration with nucleons the nuclear medium are taken into account by the Feynman diagrams associated to the two-gluon exchange approximation and the color saturation model. In this way, one can calculate the interaction cross section between color dipole and the gluon sea of the nucleon. The calculations are focused on the production of charmonium at small x scenario.

Primary authors: ARREBATO, D. Y. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); FRAGOSO, J. A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); BELL, A. (Centro de Isotópos (CENTIS), La Habana, Cuba); HERNANDEZ, D. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); RODRIGUEZ, A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); CASTRO, F. (Universidad de las Ciencias Informaticas (UCI), La Habana, Cuba); GUZMÁN, F. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Presenter: ARREBATO, D. Y. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **91** Type: **Talk**

Sensitivity studies of color reconnection in top underlying events measurements

Saturday, 13 May 2017 09:40 (20 minutes)

Sensitivities studies of color reconnection (CR) effects in top-antitop underlying events (UE) were performed for the fully leptonic and fully hadronic final states (FLFS and FHFS respectively) events. A new Tune for the new CR [1] reconnection model parameters implemented in PYTHIA [2] is tested based on Rivet [3] routines. Effects of CR were studied based on a new Rivet Analysis. Differences between predictions with and without CR were observed of ˜ 8-15% for two of the investigated observables, as well as for predictions considering a variation of the fragmentation parameters. For different color reconnection models, effects around 5% were observed. No differences for predictions with and without CR between FLFS and FHFS were found for all the observables. A comparison between the prediction of the new CR model and the former one is presented through the application of the Rivet Analysis. This study shows the sensitivity of the UE observables to CR effects and may help to lower the uncertainties due to the UE simulation in top mass measurements.

Primary authors: RODRIGUEZ, A. (Instituto Superior de Tecnologías y Ciencias Aplicadas, La Habana, Cuba); DOMÍNGUEZ , D. (Deutsches Elektronen-Synchroton (DESY), Germany); GUNNELLINI, Paolo (Deutsches Elektronen-Synchroton (DESY), Germany); GUZMÁN, F. (Instituto Superior de Tecnologías y Ciencias Aplicadas, La Habana, Cuba)

Presenter: RODRIGUEZ, A. (Instituto Superior de Tecnologías y Ciencias Aplicadas, La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **92** Type: **Poster**

Surface coalescence model for proton-nucleus high energy collisions

The cluster formation is not a fully understanding process until today, several theoretical models are emerging with the intention of explaining the phenomenon and reproducing the experimental data. The main objective of this work is to conceive a new method based on first physical principles independent on experimental parameters. Taking as scenario of this work the nuclear reactions p-197Au and p-208Pb moderated by intranuclear cascades model, a theoretical model is proposed to describe fragments productions (for example deuteron, triton, 3He, 4He and other light ions) at the fast stage of the nuclear reactions at high energies. In particular, the process of coalescence is considered on the surface of the target nucleus. The potential of Wood-Saxon is used to establish the criteria of neighborhood corresponding to the distance and the relative moments between nucleons. For the probabilities and the cross sections calculations we work in the quantum mechanical phase space of the Wigner distribution.

Primary authors: BELL, A. (Centro de Isotópos (CENTIS), La Habana, Cuba); ARREBATO, D. Y. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); RODRIGUEZ, A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); ALFONSO, S. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); HERNANDEZ, D. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); FRAGOSO, J. A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); VEGA, L. (Universidad de las Ciencias Informaticas (UCI), La Habana, Cuba); CASTRO, F. (Universidad de las Ciencias Informaticas (UCI), La Habana, Cuba); GUZMÁN, F. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Presenter: BELL, A. (Centro de Isotópos (CENTIS), La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **93** Type: **Poster**

Search for Lorentz invariance violation through short-range gravity experiments

General relativity offers an impressive description of gravity at the classical level. A key ingredient in its construction is local Lorentz invariance, which insures rotation and boost symmetry in a freely falling frame. However, achieving a consistent unification of gravity with quantum physics may require modifications of the foundations of general relativity. These modifications could induce observable violations of Lorentz invariance. With the analysis of testing gravitational inverse-square law at millimeter ranges carried in our laboratory, we studied the limits on putative Lorentz invariance violation coefficients in the pure gravity sector. This study showed that the Lorentz violating signal is suppressed in the planar test mass geometry employed in the experiment, based on which we further proposed a periodic, striped test mass geometry design of a short-range torsion pendulum experiment to enhanced sensitivity to possible Lorentz violating signals.

Primary authors: Prof. SHAO, Chenggang (Huazhong University of Science & Technology, Wuhan, China); Dr TAN, Yujie (Huazhong University of Science & Technology, Wuhan, China)

Presenter: Prof. SHAO, Chenggang (Huazhong University of Science & Technology, Wuhan, China)

Track Classification: STARS2017

Contribution ID: **94** Type: **Talk**

Constraining the prebiotic cell size limits in extremely hostile UV environments: Implications for the Early Earth

Saturday, 13 May 2017 09:20 (20 minutes)

The potential of organic vesicles to harbor a population of an elemental chemical replicator in an extremely hostile UV environment is considered. In this case, the vesicle acts as an effective shield against the harmful effects of the UV radiation, whereas in the external medium, the molecules of the replicator are readily destroyed. According to our results, replicators in the vesicle only exist when the radius exceeds some critical value Rc being, in general, a function of the internal parameters of the system. The viability of chemical replicators in a hostile radiative environment could be relevant to understand the origin of the first primitive cells on the early Earth and the ulterior development of life in our planet.

Primary authors: MARTÍN, Osmel (Universidad Central de las Villas, Cuba); CARDENAS, Rolando (Universidad Central "Marta Abreu" de Las Villas)

Presenter: CARDENAS, Rolando (Universidad Central "Marta Abreu" de Las Villas)

Track Classification: STARS2017

Contribution ID: **97** Type: **Talk**

Can the symmetry breaking in the SM be caused by the top-Higgs Yukawa interaction?

In reference [1] a simple SU(3) gauge model including a Yukawa interaction with a scalar field, was considered. Its two loop effective potential for the scalar field, predicted a 126 GeV Higgs mass after the minimum of the potential was fixed at a mean scalar field giving a 173 GeV Top quark mass. A high value of the strong coupling value was required to obtain these results (α close to 1). Therefore, in the present investigation, we are considering a running strong coupling, in order to decide whether or not, the usual values of the strong interactions can justify the former determination of the physical values of the Higgs and top quark masses in [1]. The results of this ongoing search will exposed. A positive outcome of the study will suggests the possibility of basing the SM breaking of symmetry on the so called "second minimum"of this model, also might support an important role of QCD in determining the particle's mass spectrum and consequently a radical reformulation of the SM.

[1] A. Cabo Montes de Oca, Eur. Phys. J. C 71, 1620 (2011)

Primary authors: SUAREZ CORTINA, Jose Carlos (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); ARREBATO, D. Y. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); CABO, Alejandro (Instituto de Cibernetica, Matematica y Fisica (ICIMAF), La Habana, Cuba)

Presenter: SUAREZ CORTINA, Jose Carlos (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **98** Type: **Poster**

Role of color reconnection (CR) in proton - nucleus collisions at relativistic energies

One of the surprises of the results coming from the LHC was the correlation between charge particle multiplicity and the mean transversal momentum. At first, these results in Pb-Pb collisions were attributed to the collective hydrodynamical properties of the Pb-Pb system. Then, for some observables, it was not surprising that the same behavior came out of p-Pb experiments, as similar collective properties were thought to appear. Surprisingly, even p-p collisions showed similar behaviors of those of p-Pb for some observables, which can not be understood in the same base as Pb-Pb. In this regard, a model is discussed treating the proton-nucleus collision, as a proton-in-medium-proton collision by using the PYTHIA Monte Carlo event Generator, changing the parton function distribution (PDF) of one the protons involved in the collision for a nucleus parton function distribution (nPDF). This approach would allow recreating the medium interaction in the primary collision. One of the observables analyzed under this approach is the balance function which was proposed by Bass as a way to determine the correlation of positive and negative charged particles produced during a relativistic heavy-ion collisions.

Primary authors: FRAGOSO, J. A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); ARREBATO, D. Y. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); RODRIGUEZ, A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); ALFONSO, S. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); HERNANDEZ, D. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); BELL, A. (Centro de Isotópos (CENTIS), La Habana, Cuba); VEGA, L. (Universidad de las Ciencias Informaticas (UCI), La Habana, Cuba); CASTRO, F. (Universidad de las Ciencias Informaticas (UCI), La Habana, Cuba); GUZMÁN, F. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Presenter: FRAGOSO, J. A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **99** Type: **Poster**

Charged particle multiplicities in hard process

In this contribution, we explore the behavior of charged-particle pseudorapidity density in heavy ion collisions taking as a basis the results reported by the ALICE collaboration with regard to a more large range of the impact parameter. The main objective is to analyze the connexion of the total number of charged particles produced in Pb–Pb collisions in comparison with the p-p collisions at different cm - energies. The role of the hard process of the hard process to the total charged-particle multiplicity is evaluated by means of the PYTHIA code. The results of the calculations are compared with the experimental results above mentioned.

Primary authors: ALFONSO, S. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); ARREBATO, D. Y. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); RODRIGUEZ, A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); FRAGOSO, J. A. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); HERNANDEZ, D. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); BELL, A. (Centro de Isotópos (CENTIS), La Habana, Cuba); CASTRO, F. (Universidad de las Ciencias Informaticas (UCI), La Habana, Cuba); GUZMÁN, F. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Presenter: ALFONSO, S. (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **100** Type: **Talk**

News from the Pierre Auger Observatory

Sunday, 7 May 2017 12:00 (30 minutes)

The Pierre Auger Observatory is currently the world's largest cosmic ray observatory, designed to explore the energy range from 10^{17} eV up to and beyond 10^{20} eV. This also provides us with access to center of mass energies for particle collisions beyond those available to current accelerators. We will present recent results from the Pierre Auger Observatory, which cover the areas of astrophysics and particle physics, covering aspects of mass composition, anisotropy, and modeling of particle interactions. We will also discuss some ways how results constrain source models and propagation of cosmic rays. Finally, we will present the upgrade program, AugerPrime, to enhance the abilities of the Observatory.

Primary author: NELLEN, Lukas (Universidad Nacional Autonoma de Mexico (UNAM), Mexico)

Presenter: NELLEN, Lukas (Universidad Nacional Autonoma de Mexico (UNAM), Mexico)

Track Classification: STARS2017

Contribution ID: **101** Type: **Talk**

Heavier and darker: spin-2 dark matter

Thursday, 11 May 2017 15:00 (30 minutes)

The ghost-free massive spin-2 field of bigravity turns out to be an amusing Dark Matter candidate. I will review the theoretical foundations of bigravity, and outline the qualities and phenomenology of spin-2 gravitational dark matter.

Primary author: URBAN, Federico (KBFI, Tallinn, Estonia)

Presenter: URBAN, Federico (KBFI, Tallinn, Estonia)

Track Classification: STARS2017

Contribution ID: **102** Type: **Poster**

Channeling of proton beams through bundles of chiral carbon nanotubes

High brightness beam manipulation is an important topic in several applications of accelerators in medicine and other industrial and scientific areas. The key question is dealing with the emittance control through the whole accelerator system including the tools for focusing and bending. In recent years, particular efforts are paid to improve the quality of the beams by means of nanostructures in order to obtain low emittance in micro and nanobeams. This contribution is dedicated to the simulation of the channeling of charged particles in nanotubes and to the presentation of them as a possible technique to be used in determining the emitance of nanobeams in the accelerator systems. The simulation is based on a dynamical continuum approach for the interaction potential along the nanotube axis taking into account the nanotube symmetry and the particle energy. Monte Carlo methods are used for the beam generation, the particle multi-scattering (on the electron cloud) contribution, and for the stopping power during the channeling process. Finally, it is discussed the effects on emittance in channeling by chiral carbon nanotubes.

Primary authors: S. GARCIA, Alejandro (Centro de Aplicaciones Tecnológicas y Desarrollo Nuclear (CEADEN), La Habana, Cuba); HERNÁNDEZ, D. (Instituto Superior de Tecnologias y Ciencias Aplicadas (InSTEC), La Habana, Cuba); GUZMAN, Fernando (Instituto Superior de Tecnologias y Ciencias Aplicadas (InSTEC), La Habana, Cuba); CRUZ, Carlos M. (Centro de Aplicaciones Tecnológicas y Desarrollo Nuclear (CEADEN), La Habana, Cuba)

Presenter: S. GARCIA, Alejandro (Centro de Aplicaciones Tecnológicas y Desarrollo Nuclear (CEADEN), La Habana, Cuba)

Track Classification: STARS2017

Contribution ID: **103** Type: **Talk**

The neutrino flavor puzzle

Sunday, 7 May 2017 09:00 (20 minutes)

A remarkable breakthrough in neutrino physics has been witnessed in recent years. Neutrino oscillation experiments have firmly established the existence of neutrino masses and leptonic mixing, which represents a solid evidence of physics beyond the Standard Model. We present a brief overview of the neutrino flavor puzzle, with emphasis on theoretical approaches to address this problem. A possible path towards the solution of this puzzle consists on requiring some of the elements in the leptonic mass matrices to vanish. Such texture zeros can be enforced by means of Abelian symmetries. We present some examples of the implementation of maximally restrictive texture zeros in the context of two-Higgs-doublet models with Majorana neutrinos. We also discuss the ultraviolet completion of these models in the framework of the seesaw mechanism for neutrino masses.

Primary author: GONZÁLEZ FELIPE, Ricardo (Instituto Superior de Engenharia de Lisboa (ISEL), Instituto Politécnico de Lisboa and Centro de Física Teórica de Partículas (CFTP), Instituto Superior Técnico, Universidade de Lisboa, Portugal)

Presenter: GONZÁLEZ FELIPE, Ricardo (Instituto Superior de Engenharia de Lisboa (ISEL), Instituto Politécnico de Lisboa and Centro de Física Teórica de Partículas (CFTP), Instituto Superior Técnico, Universidade de Lisboa, Portugal)

Track Classification: STARS2017

Contribution ID: **104** Type: **Talk**

MaGiC

Monday, 8 May 2017 12:00 (30 minutes)

Matter at the highest baryon compression is transiently formed and can be probed directly in both, relativistic collisions of two neutronstars (NS- mergers) and in relativistic collisions of two heavy ions. Observables sensitive to the properties of superdense matter, like flow and yields of ejected particles (nuclei, strange hadrons, neutrinos, photons, dileptons) are since recently complemented by gravitational waves in relativistic collisions of neutron stars. Future measurements of the EoS through novel signatures have a high potential to reveal the structure of the nuclear and quark matter phase diagram.

Primary authors: HANAUSKE, Matthias (FiAS and Goethe Universität Frankfurt am Main, Germany); STEINHEIMER, Jan (FiAS and Goethe Universität Frankfurt am Main, Germany); VOVCHENKO, Volodymyr (FiAS and Goethe Universität Frankfurt am Main, Germany); REZZOLLA, Luciano (FiAS and Goethe Universität Frankfurt am Main, Germany); STOECKER, Horst (GSI, FiAS and Goethe Universität Frankfurt am Main, Germany)

Presenter: STOECKER, Horst (GSI, FiAS and Goethe Universität Frankfurt am Main, Germany)

Track Classification: STARS2017

Contribution ID: **105** Type: **Talk**

TBA

Friday, 12 May 2017 16:30 (30 minutes)

Primary author: SULAK, Lawrence (Boston University, United States)

Presenter: SULAK, Lawrence (Boston University, United States)

Track Classification: SMFNS2017