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BOOK OF ABSTRACTS

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Laboratoire de Physique Mathématique & de Physique Subatomique-LPMPS, Constantine, Algeria

The Abdus Salam International Centre for Theoretical Physics

Plenary Talks

XXIst Century Perspectives on the Micro & Macro Worlds

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We present a broad perspective on our (Early) XXIth century understanding of both the macro and micro worlds, and whether the dream embodied in the symbolism of Glashow's snake has been implemented to some degree or recessed away. Do we have a unified vision of the world at those extreme scales? What about the status of that «21 st century» theory «that fell accidentally into the 20th century." to quote E.Witten, and which is the «ideological» cement of very powerful aspiring-to-be paradigms like Cosmic Inflation, Multiverses, black holes… as well as the inspiration of most pre-Big Bang theories.

There is no question that the failure of physics to solve those big puzzles left over from XXth century physics is really stemming from the limitations of experimental particle physics as it stumbles on the «not high enough» energy limit of present day colliders which has put every beyond the Standard Model theory basically on hold. The hints we get from experiments are too feeble and we can't probe a high enough mass region where are possibly lurking other non-standard gauge bosons and Higgs, not talking about the SUSY zoo, ED particles and other exotic brands. Thus the great hope pinned on the UHE Cosmic Rays for their capability to cross the many orders of magnitude energy gap and reach for the physics of cosmic accelerators and whatever they might be spitting out of new exotic massive particles.

Now, unlike the 19th century physics whose two dark clouds as described by Lord Kelvin were pregnant with an amazing new synthesis around which much of the XXth century physics gravitated around, the big black clouds (Dark Matter, Dark Energy,…) of the twentieth century have not given way to any fertile synthesis but have rather become enshrouded into a thicker mystery.

If physicists from Lord Kelvin to Hawking were thinking that physics might be brought to completion within their lifetime, we now have another brand who entertains the idea that physics built on unambiguous facts and rock solid univocal explanations is foregone. That this physics stands to be replaced by one with flouted contours made of ever competing though incommensurate explanations, or worse, that we are entering an era of computer simulated physics to palliate the sparsity of data or the mere technical impossibility of carrying out some crucial experiments.

We will discuss along the way the fine tuning curse, the Cosmic Inflation and Multiverse Pandora's box, and other big mysteries perhaps of our own making, and propose that in our search for «truth», and to keep our sanity in the actual jungle, we be guided by the voice of reason which goes by the unpretentious name of under- determinacy of theories.

Multi messenger High Energy Astrophysics

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This talk will discuss the status and perspectives of the study of the "High Energy Universe", that is the ensemble of the astrophysical objects, environments and mechanism that generate high energy particles in our Galaxy and in the entire Universe.

This problem can be studied with four different messengers: Cosmic Rays, Photons, Neutrinos and Gravitational Waves, a remarkable expansion of the methods to study the cosmos The object of these studies can be the "laboratories" where we can study (in conditions that are not achievable in Earth based experiments) the fundamental laws of physics.

Neutrinos: from active to sterile

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Neutrinos are now well known particles and the last missing pieces of information will come in the near future. But new questions arise concerning the existence of additional types of neutrinos. The motivations will be presented and the experimental status summarized.

Solar neutrino results and future prospects with the Borexino detector

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Neutrinos coming from the Sun have played a crucial role in the discovery of the neutrino oscillations and they still are proving to be a unique and powerful tool in the investigation of the fusion reactions that power the stars and furthermore they represent a probe to study the basic neutrino properties.

The Borexino detector has started its acquisition data in 2007 in the underground Laboratori Nazionali del Gran Sasso in Italy.The main goal of Borexino is the real-time study of low energy neutrinos with an energy threshold as low as about 50 keV. A first phase named Borexino Phase-I started in 2007 and ended in 2010, then after a purification campaign, data taking resume in 2011 with the so-called Borexino Phase-II.

I will present the recent results of Borexino for the measurement of the four main solar neutrino components of the “pp” fusion chain (pp, pep, 7Be, 8B), and the upper limits on the remaining two solar neutrino fluxes (CNO and hep).

Beyond SM Physics and searches for SUSY at the LHC

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We review the TeV non-minimal supersymmetric extension of the Standard Model, where an Inverse Seesaw mechanism of light neutrino mass generation is naturally implemented and concentrate on its hallmark manifestations at the Large Hadron Collider (LHC).

Detecting Neutrinos with under water and under ice telescopes

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The field of neutrino astronomy has made a major step forward with the detection, in 2013, of diffuse-like high-energy emission of neutrinos (>TeV) across the whole sky, by the Ice Cube Collaboration. This great achievement opens the way towards a multimessenger astronomy where neutrinos can be key players. They indeed carry unique information on the astrophysical processes occurring at sources and are intimately linked to hadronic acceleration processes. Hence they could unravel the longstanding mystery of the origin of ultra high-energy cosmic rays. Part of the answer could arise from the recent compelling identification by Ice Cube

of the first extragalactic source, namely the blazar TXS 0506+056. Other usual suspects will be briefly mentioned as well.

The core of the presentation will then be focused on the Cherenkov detection technique requiring the instrumentation of a 3D grid of O(103) detection units called Optical Modules. These detectors can be buried in the transparent ice of Antarctica (Ice Cube Neutrino Telescope) or immersed deep in a Lake (Baikal-GVD) or in the Sea (ANTARES-KM3NeT). A brief status of each experiment will be given along with some selected scientific results. A particular attention will be given to the on-going activities in the Mediterranean Sea where the successor of ANTARES is currently being built: KM3NeT will consist of two ARCA ("Astroparticle Research with Cosmics in the Abyss") building blocks, optimized for very high-energy astrophysical neutrinos, and of the ORCA one ("Oscillation Research with Cosmics in the Abyss"), with main scientific goal to measure the mass ordering using atmospheric neutrinos.

Ultra High Energy Cosmic Rays

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Ultrahigh energy cosmic rays are the highest-energy particles in the Universe. Although known for more than half a century, their origin is still baffling scientists. They are most likely linked to some of the most violent astrophysical phenomena but the nature of their sources remains a mystery, as does the physical mechanism to accelerate particles to extreme energies. Here we present an up-to-date review of ultrahigh energy cosmic rays, emphasizing the important progress made over the past decade in our under-standing of these enigmatic particles.

Algerian e-infrastructures : ARN network and DZ e-Science GRID computing grid infrastructure

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The academic and research network ARN is an Algerian network dedicated to scientific institutions with interconnection to European research networks through GEANT and any other research net-work in the world. An additional service of Internet connection is also included which concerns Internet for professional needs for connected institutions.

The objectives set by the creation and development of ARN network are the establishment of a dedicated communication infrastructure. ARN includes also technological infrastructures for national federation services to be part of international Wifi roaming network as « eduroam » and trust authentication service to access European data resources as « eduGAIN » and scientific computing facilities as « grid and cloud » services.

DZ e-Science GRID infrastructure has been initiated in 2007 for development of computing grid services through ARN network. The goal is to enable scientists in different domains to access and use compute and data storage resources that are networked and shared by all scientists expressing this need. The approach of development of this grid infrastructure is a gradual approach which makes it possible to widen the number of clusters and their resources in terms of computing and storage which are available at several entities (universities, research centers). The level of availability must be a production level, this requires adequate technological conditions and adapted environments. Regarding the authentication and certification aspects, ARN operates Certification Authority and set up DZ e-Science CA which has been fully operational just after accreditation process obtained in 2011 with European certification trust EugridPMA. Currently, in the domain of HEP (High Energy Physics), DZ e-Science GRID is setting up a T2/T3 ATLAS and LHC_b cluster with the support of CERN.

Several activities related to following topics are performed as:

- Management of e-infrastructures in terms of policy and technical aspects,
- Follow up technological environments and platforms related to specifics of applications according to scientific domains (physics, chemistry, mathematics, engineering, ...),
- Dissemination through the organization of workshops and tutorials,
- Participation in regional projects in framework of European cooperation programs.

Research and Development at CDTA

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In this contribution, I will talk about the research and development in the «Centre de Développement des Technologies Avancées», commonly known as CDTA, located in Algiers. Recently, we celebrated its thirtieth anniversary, where an overview of the research infrastructure and products has been exposed to visitors. I will retrace the launch of the several disciplines and their evolution with time as well as the different ups and downs on its evolving path.

Disciplines relating to some topics of the conference will be emphasized, like microelectronics and semiconductor-based detectors.

XXIst cosmology with the cosmic microwave background

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The cosmic microwave background (CMB) is a pillar of modern, precision cosmology. In this talk, I will first briefly review of the essential physics underlying the CMB frequency spectrum and anisotropies. I will then highlight what we have learned about the Universe from past CMB missions, from COBE to WMAP and Planck. Finally, I will discuss the major puzzles remaining to be solved in 21st century cosmology, and looking forward, what upcoming and future CMB measurements could teach us.

Parallel Session Talks

Rare nonleptonic Bs meson decays as a probe for new physics beyond the standard model

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Recent measurements of various processes have turned up some intriguing discrepancies from the expectations of the standard model of particle physics. Recent model-independent theoretical analyses have in fact demonstrated that new physics could account for these anomalies. In view of the possibility that these tentative hints of new physics will be confirmed by upcoming experiments, we consider the possibility that a Z' boson is responsible for them. On the other hand Z' boson interactions with quarks can also affect rare nonleptonic decays of the B_S meson which are not yet observed, and their rates are expected to be relatively small in the standard model. After taking into account all relevant constraints on the Z' boson couplings to quarks, we find that there is parameter space in which Z' effects can both explain these anomalies and can greatly increase the rates of some rare nonleptonic decays of the B_S meson by as much as two orders of magnitude, with respect to the SM expectations.

Explaining the B decays anomalies in the SUSY models

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Recent measurements of certain B decays indicate deviation from the Standard Model predictions. We show that Supersymmetric effects increase both branching ratios of B -> $D_\tau\ \nu_\tau$ and B -> $D{*}\tau\ \nu_\tau$ with respect to the Standard Model predictions. Also we analyze the semileptonic decays b --> sl^+l^- in the framework of B-L extension of Minimal Supersymmetric Standard Model with Inverse Seesaw.

Non-Standard Higgs decays within a scale-invariant scotogenic model

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We study the phenomenology of a scale-invariant model extension of the SM in which neutrino mass appears at the three-loop level and the existence of a fermionic Dark matter (DM) candidate is possible. These models share some features with Higgs-portal dark matter model in which the dark matter can be connected to the SM particles via the Higgs scalar. The minimal implementation of this model is obtained by extending the SM to include three generations of gauge-singlet fermions, N_iR, a second SM-like scalar doublet, S, and a singlet scalar φ. After electroweak symmetry breaking, the model spectrum contains doublet scalar S, Majorana

neutrinos and the scalars h and φ mix to give two mass eigenstates, which we denote by h_1 and h_2.
In this work, we focus on the search for the nonstandard decays of the Higgs boson to a pair of new light particles h → h_2 h_2 in the range 1 GeV < m_h2 < m_h⁄₂ where the boson h2 decays to pairs of electrons and muons giving rise eeee , eeμμ and μμμμ final states. The prediction of this signature will allow us to identify the existence of dark sectors that are connected to the SM via the Higgs-portal. This search is performed in event samples enhanced in gluon gluon fusion Higgs boson production at LHC at √s =14 TeV. Signal and background processes were generated with Mad- Graph and interfaced with Pythia.

A Flipped SU $(3)_C$ ⊗ SU $(4)_L$ ⊗ U $(1)_X$ model

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An anomaly free flipped 341 model where leptons and quarks generations are arranged in new different SU(4)L representation is proposed. Fermions mixing as well as masses are discussed.

Oblique Parameters in Unparticles Gauged Model

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The oblique parameters S and T are calculated in a gauged unparticles model based on the electroweak group SU(2)×U(1) and it's parameters space is constrained using electroweak precision measurements.

Probing the nature of dark matter with the CMB

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Evidence for dark matter is ubiquitous, be it in rotation curves of galaxies, or in the shape of the angular power spectrum of the cosmic microwave background (CMB). The latter, in particular, has allowed to very precisely measure the abundance of dark matter. Yet, its nature remains a mystery, and one of the greatest fundamental questions of the time. After reviewing the physics underlying the CMB frequency spectrum and temperature and polarization anisotropies, I will discuss how the CMB can be used to tease out different dark matter model, whether they are new, weakly-interacting particles, or massive compact objects, such as primordial black holes. Specifically, I will discuss the possible effect of dark matter physics on (i) the frequency spectrum of the CMB, (ii) the recombination history, and (iii), the evolution of linear perturbations generated during inflation.

Interacting Chaplygin Gas Cosmology

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In this work, we study the interaction between the Chaplygin gas and the dark energy in F(R,T) gravity formalism, where T is the trace of the energy-momentum tensor, and R is the Ricci scalar. Assuming that the total energy density and the total pressure of the Universe as a combination of the dark energy and the Chaplygin gas. This study was carried out after writing down the modified Friedmann equations for the flat case and also, we investigated the behaviour of the dark energy density, the pressure and the equation of state (EoS) parameter for two interaction models, within the simple scenario of the universe. We discuss the effect of the bulk viscosity for each interacting model.

Dynamical study of ellipsoid universes

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A universe containing uniform magnetic fields, strings, or domain walls is shown to have an ellipsoidal expansion. This case has motivations from observational cosmology especially the anomaly concerning the low quadrupole amplitude compared to the best-fit ΛCDM prediction in WMAP data. It is shown that a universe with eccentricity at decoupling or order 10^(-2) can reduce the quadrupole amplitude without affecting higher multipoles of the angular power spectrum of the temperature anisotropy. The evolution of ellipsoidal universes is studied using dynamical system techniques for the first time. The determined critical points vary between saddle and past attractors depending on dark energy state equation parameter w_Λ, with no future attractors. Numerical integrations of this dynamical system done using several initial conditions are showing new important results. For instance, a tendency for high expansion differences between planar and perpendicular axes is observed which contradicts previous assumption on the evolution behavior of ellipsoid uni- verses. Models containing generalized Chaplygin gas are studied to constrain their parameters and their impact on the dynamical behavior of the Universe.

Lessons from Supersymmetric Black Holes

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It is widely known that black holes present challenges at the fundamental level of physics. These challenges are commonly known as black hole puzzles. We will concentrate on the black hole entropy puzzle and address it in a very special set up: supersymmetric black holes. We will try to give an overview of some of the common proposals for the origin of the entropy of a black hole, and discuss some of the lessons that can be generalized to more realistic cases.

New Physics search through dark matter signature in future electron-positron Colliders

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In this work, we consider the process e + + e – → b b + E such as ILC and CLIC, to look for the dark ma er (DM) effect, and iden fy its nature at two different center of mass energies E CM = 500 GeV and 1 TeV. For this purpose, we take two extensions of the standard model (SM), where the DM could be a real scalar or a heavy right-handed neutrino (RHN) similar to many models mo vated by neutrino mass. In the la er extension, the charged leptons are coupled to the RHN's via a lepton flavor viola ng (LFV) interac on that involves a charged singlet scalar. A er discussing different constraints, we define a set of kinema cal cuts that suppresses the background, and generate different distribu ons that are useful to iden fy the DM nature. The Use of polarized beams (like the polariza on P (e – , e +) = [+0.8, –0.3] at the ILC makes the signal detec on easier and the DM

identification more clear, where the sta s cal significance gets enhanced by twice (5 mes) for scalar (RHN) DM.

Volume and Boundary Face Area of a Regular Tetrahedron in a Constant Curvature Space

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An example of the volume and boundary face area of a curved polyhedron for the case of regular spherical and hyperbolic tetrahedron is discussed. An exact formula is explicitly derived as a function of the scalar curvature and the edge length. This work can be used in loop quantum gravity and Regge calculus in the context of a non-vanishing cosmological constant

Equivalence principle of electromagnetic interaction

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The general theory of relativity is one of the most important and fundamental theories due to its applications in physics, in addition to its contributions and predictions in astrophysics and cosmology. The positive aspect of the theory manifests in its description of gravitational effect in a geometrical framework. Many researches were conducted to extend the theory to include electromagnetism as well as to generalize the equivalence principle to the non-gravitational interactions. In the present work, the full analogy between gravity and electromagnetism in weak field limit has been taken into consideration. For the description of electromagnetism as a geometrical phenomenon, we need to generalize the equivalence principle to the electromagnetism interaction, so that the path of charged particle becomes a geodesic in a spacetime that is curved by the effect of electromagnetic field. The metric in static spherical symmetry was determined, and the orbit of charged particle has a perihelion advance, with the aspiration to apply this approach to the microscopic scale.

Mending the broken PT-symmetry via a non-unitary time dependent transformation

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Parity-time (PT) symmetry, the invariance under parity time reflection, is an important concept in physics recently developed in application to optical systems. Of particular interest for a non- Hermitian Hamiltonian is the situation when all quasi energies are imaginary and constant. We demonstrate that non-Hermitian Hamiltonian systems with spontaneously broken PT-symmetry and imaginary eigenvalue spectrum can be made meaningful in a quantum mechanical sense when one introduces an explicit time-dependent non unitary transformation into the Schrodinger equation for the non Hermitian Hamiltonian H. For a meaningful physical picture one only needs to guarantee now that the expectation values of the obtained new Hamiltonian H' (t) are real and instead identify a new symmetry (pseudo-hermiticity) to be responsible for this property.

Study of the Effects of the Curvature Term in the Density of States on Some Physical Quantities Characterizing the Deconfining Phase Transition to a "color singlet" QGP

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In the present work, we study the effect of including the curvature term, in addition to the volume term, in the density of states used in the calculation of the projected color-singlet partition function of the Quark-Gluon Plasma (QGP), on some features characterizing the phase transition to this phase of matter. This is a continuation of our previous study of the thermally driven deconfining phase transition from a hadronic gas of pions to a QGP phase with massless u and d quarks, in a finite volume, at zero chemical potential, where we have used a color-singlet QGP partition function derived with a density of states containing the volume term only. By investigating the behavior of some physical quantities well describing the mixed system with temperature for varying volume, we especially examine the behavior with volume of the shift of the effective transition temperature in a finite volume from the true one, to determine the corresponding scaling exponent. We compare the present results to those obtained in our previous works.

The exact solution of the three body problem of Calogero type by SUSY-QM and SGA methods

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Analytic expressions for the eigenvalues of non-relativistic Hamiltonians, which are shape Invariant for three-body problem of the Calogero type and some generalization of three-body problems, can be derived using both the well-known method of supersymmetric quantum mechanics SUSY QM and an independent group theoretic method. We demonstrate the equivalence between the two methods: the SUSY QM method and the spectrum generating algebra SGA method by developing an algebraic framework for shape invariant Hamiltonians with a change of parameters, which involves nonlinear extensions of Lie Algebra.

Fermionic string theories with deformed dispersion relations

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In this work, we construct fermionic string theories with deformed dispersion relations, which are energy dependent. These theories can be reformulated as a non-commutative space-time or deformed special relativity models. We use the square roots of the deformed bosonic string con- strains to construct the closed algebra of the bosonic and fermionic constraints of this system. The locale supersymmetry transformations on the world-sheet obtained depend on the total energy of the string. Following the canonical quantization of constrained Hamiltonian systems, we find that the properties of the spectrum change with respect to the total energy functions of the deformations. In particular, in the Neveu-Schwarz sector and with some choices of these functions, the tachyonic ground state can be eliminated before the GSO projection.

Light Cone Quantization of Open and Closed String theories in a constant NS B-Field

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The main results of a bosonic string theory in presence of a N-S B-Field are the fact that the equations of motion do not depend on the B-field while the Noether currents do. In particular, the momentum P depend on the B-field. A great number of works have investigated the covariant quantization of this theory and shows that the coordinates are non-commutative and that the physical states are subject to the Virasoro conditions, which depend on the B-Field. The B-field dependence of the P momentum makes difficult the definition of the light cone gauge. This difficulty is resolved for the closed bosonic string when it wraps a compactified dimension. The periodicity conditions allow then the use of the light cone gauge. In this work, we study the coherence of this model through the study of the spectrum and its degeneracy compared to the development of the partition function. New physical states are possible depending on the P quantum number and the number of wrapping of the closed string on the compactified direction. In the second step, we have investigated the open string case. The absence of the periodicity condition added to the boundary conditions, which depend on the B-field, makes the light cone gauge difficult to define. We have proposed one approach based on the results of the covariant quantization and the use of the light cone coordinates system (in progress).

The electrodynamic in R-Minkowski space-time

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In this work, we have studied the dynamic laws of a free particle in R-Minkowski space-time, where this latter reproduces the Fock coordinate transformation, then we extend our study in more general case with the presence of an external electromagnetic field; This work has been done in a new perspective: the Faddeev-Jackiw approach, also in order to visualize the effects of Fock transformation on the motion of charged particle we defined the Lorentz force, as well we determine the trajectories perturbatively in presence of electric field.

The Von Neumann Boson-Antiboson Pair Creation Quantum Entanglement Entropy in NC Bianchi I Space-time

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The Von Neumann Boson-antiboson pair creation quantum entanglement entropy (Q.E.) is studied. It is shown that its behavior is strongly dependent on the value of the non-commutativity θ parameter, k-modes frequencies and the structure as well as the anisotropy of the space-time. Thermodynamical properties and their relationship with Q.E. are also discussed.

Real Time Ultrasoft Fermion Self Energy at Next-to-leading order in Hot QED

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Subsequent studies of the behavior of the gluon and quark damping rates in the imaginary-time formalism have indicated that there are difficulties in the infrared sector. To look further into the infrared behavior, we propose to calculate the next-to-leading order dispersion relations for slow- moving Fermions at high-temperature quantum electrodynamics (QED) in real-time formalism. We determine a compact analytic expression for the complete next-to-leading contribution to the retarded fermion self-energy with ultrasoft momentum in the framework of hard-thermal-loop (HTL)- summed perturbation of massless QED at high temperature. The calculation is done using real-time formalism. The next-to-leading order fermion self-energy is written in terms of three and four HTL- dressed vertex functions. The real part and the opposite of the imaginary part of the retarded fermion self-energy are related to the next-to-leading order contributions of energy and damping rate respectively.

Collective modes of Bose mixtures droplet at Finite Temperature

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Self-bound quantum droplets are a newly discovered phase in the context of ultra cold atoms. By following the original proposal by Petrov [Phys.Rev. Lett. 115, 155302 (2015)], and by the consideration of an attractive bosonic mixture, We study in this work the properties of droplet at finite temperature. we write the equilibrium density of droplet state at finite temperature, we also discuss the effect of temperature at the collective modes of droplet state.

Spin Hall effect in deformed space

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We propose the investigation of the intrinsic spin Hall Effect without an external magnetic field in deformed space- Kempf Algebra-. This approach is used for a decoupled harmonic oscillator with the evaluating of the spin Hall conductivity. The interpretation of this physics phenomena is realized according to the non-commutativity of the coordinates.

On the Dynamics of Spinning Particles in General relativity

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In order to study the dynamics of spinning particles in general relativity, we used the Dirac formalism for Hamiltonian analysis of constraint system and expended it to curved space-time by finding the structure of the phase space, and then used a proper form of the Lagrangian which allowed us to find the equations of motion that describes the dynamics of spinning particles. After that we analyzed the results in the case of the R-Minkowski space-time which correspond to De Sitter space-time.

Latest results and future prospects of the Pierre Auger Observatory

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The Pierre Auger Observatory is the largest observatory for the detection of ultra-high energy cosmic rays (UHECRs). It allows a detailed measurement of the energy spectrum, the mass composition and the arrival directions of the primary cosmic rays with energy above 100 PeV. The data collected with the Pierre Auger Observatory show a suppression of the cosmic ray flux at energies above 40 EeV but the nature of this suppression is still unclear; according to theoretical prediction it could be caused by the interaction of cosmic rays with the CMB or by energy limitation of the cosmic rays sources.
Another puzzle concerns the origin of UHECRs. Some indications can be obtained from studying the distribution of their arrival directions. Recently a dipole anisotropy has been observed which indicates that UHECRs have an extragalactic origin.
I will present the recent results of the Pierre Auger Observatory about the energy spectrum, the mass composition and the arrival directions of UHECRs. I will also present the future prospects of the Observatory.

A Comparative Study by TCAD Simulation for Two Different n- on-p Silicon Particle Detectors

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The level of radiation damage expected during the detector lifetime implies very high bias voltages for the detector operation. Planar pixel structure use guard rings to redistribute the electric field over a larger distance along the detector edge, thus preventing breakdown along the detector edge at large bias voltages. The detector is thus operated at much larger biases than the initial full depletion voltage. In this work we present a comparative study for two different n-on-p silicon particle detector structures with and without radiation damage in the purpose of evaluating the breakdown voltage for high luminosity applications. The two structures based on the n-on-p technology with and without p-stop isolation between guard rings have been simulated on high resistivity silicon wafers with and without radiation damage using Silvaco TCAD simulation software. The simulated electrical characteristics current-voltage, for both structures, are compared for various parameters like, substrate thickness, substrate doping, guard ring depth, guard ring doping, oxide thickness, and oxide charge, under similar conditions. The bulk radiation damage model used in this analysis is based on the so called Perugia three level traps model, where irradiation generates two acceptor levels, positioned slightly above the mid band gap, and one donor level, located below the mid band gap.

New C++ code design for simulating particles through matter: Application to EUSO-SPB2 and Mini-EUSO for optical photons

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Simulations of particles through matter is being a very active research and application area since the good understanding of particles and their interactions with matter. Several simulators of particles transport through matter are used widely over the world, as e.g., Geant4, MCNP, EGS4/5 and FLUKA. In our contribution we aim to present a new C++ simulation software (Particles Through Matter, or PTM shortly) aiming at simulating particle transport and interactions through matter. The development of PTM software is at its early stage, where only electromagnetic processes (e.g., Bremsstrahlung, Compton scattering, Photoelectric effect, … etc) are implemented so far. Optical photons and their corresponding processes are included as well. As an application, simulation of the EUSO-SPB2 and Mini-EUSO telescopes ray-tracing will be presented.

Dynamic evolution of ionization and recombination processes and ion front acceleration in the presence of nonthermal and trapped electrons

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Abstract: The dynamic evolution of ionization, three-body and radiative recombination processes in high intensity laser ion acceleration mechanisms, has been studied. For that, the expansion of a collisional thin plasma slab in vacuum is modeled using mixture hydrodynamic fluids equations for ions and neutral atoms, in the presence of fast non-thermal and slow trapped electrons, obeying a Cairns-Gurevich distribution. In addition, the characteristics of ion front acceleration and ion gained energy profiles are obtained, for three types of accelerated ions (H+, C+ and Al+). It is proved that, ionization and recombination processes are responsible for the energy transfer between plasma particles. These processes are also strongly influenced by the impact of electron non-thermal phenomena, generated by the interaction of an intense laser pulse with the target. On the other hand, parametric studies have proved that ion energy profiles, maximum electric fields and ion energies at the ion front acceleration are also significantly affected by these phenomena. This study is useful in applications involving the creation of energetic ion beams, such as proton therapy.

The hydrodynamic evolution and their light curves for a new GRB-Afterglows model

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A model of a hydrodynamic evolution of an external shock produced by the deceleration of a relativistic jet ejected by a progenitor of the gamma ray burst is proposed and studied. The model shows new aspects and gives the most realistic description of the radiation energy produced by the fireball. The properties of the light curve of the GRB- Afterglows are also discussed.

A general study of charged particles dynamics near magnetic planets

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A general study of the Störmer problem is carried taking into account the combined effect of the dipolar and quadrupolar magnetic terms. The resulted trajectories as well as the critical states for various kinds of charged dust grains are studied.

DZ e-Scieled GRID enabled computing and data processing for Astrophysics domain

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Scientific research is becoming increasingly global and has to address challenges that cannot be man- aged by small groups or single researchers. Such global research initiatives are often facing the lack of computing and storage resources needed to solve scientific problems at large scales.

This paper investigates the potentials of using DZ e-Science GRID Infrastructure in the field of Astrophysics domain. DZ e-Science GRID is part of the computing & data grid infrastructure supported by ARN "Algerian Research Network" entity from Networks Division at CERIST. The use case considered in this paper, is an astrophysics application which uses XSPEC (an X-Ray Spectral Fitting Package) from HEAsoft. XSPEC is used to analyze data generated by X-rays telescopes such as Einstein Observatory, XMM-Newton, NuSTAR, INTEGRAL, etc. When studying Active Galactic Nuclei (AGN), the x-rays data is very large |(|more than 1Gb), and the fitting step takes a long time to complete on a single computer. One way to speedup this computation is to use supercomputers to exploit the inherent parallelism of the application. To achieve this goal, we have deployed the XSPEC software on CVMFS Service (CernVM File systems) available on DZ e-Science GRID. The introduction of XSPEC package to the DZ e-Science Grid services could be regarded as a great facilitation for researchers. This can open the way to further integration of astrophysics packages into the DZ e-Science Grid allowing them to take advantage of the national distributed resources computing, storage, data, tools and applications.

A New Noncommutative 331 Model and Higgs Phenomenological Aspects

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Gravitational waves from the compact 341 strong first order phase transition

A new noncommutative 331 model is constructed. Some phenomenological aspects of the model are discussed namely the scalar sector taking into account contributions of the new Non-commutative interactions. Moreover, it is shown from signal strengths, branching ratios of the various Higgs decay modes analysis and the LHC constraints that there is a room for this BSM model and it is viable. New bound on the non-commutativity parameter is also derived.

Bound on non-commutative standard model

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We study phenomenological consequences of non-commutative extension of the standard model. We explore the idea that space-time can become non-commutative at high energy. We investigate the effect of space-time non-commutativity on some scattering processes with the ansatz for the non- commutative parameter $\Theta_{\mu\nu}$ that we have assumed and considering different machine energy. We find that the polar distribution deviates largely from the standard model distribution for the non- commutative scale.

Quantum relativistic oscillator in non-commutative complex phase space and statistical properties

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We obtain exact solutions to the two-dimensional Klein-Gordon oscillator in a non-commutative complex phase space to first order in the non-commutativity parameter. We derive the exact non- commutative energy levels and show that the energy levels split to 2m levels. We find that the non-commutativity plays the role of a magnetic field interacting automatically with the spin of a particle induced by the non-commutativity of complex phase space. The effect of the non-commutativity parameter on the thermal properties is discussed. It is found that the dependence of the heat capacity CV on the non-commutative parameter gives rise to a negative quantity. Phenomenologically, this effectively confirms the presence of the effects of self-gravitation induced by the non-commutativity of complex phase space.

Non-commutative Scalar Field and Particle Production in Curved Space-time

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The purpose of this talk is to study the particle production mechanism based on the non-commutative massive scalar particles by considering the conjugate coupling of gravitation and non-commutativity in curved space-time. Our goal is to calculate the number density of particles created under the effect of non-commutativity and in the presence of a gravitational field (De Sitter space-time with static coordinates) using vacuum mode solutions. We show how the non-commutativity effects influence particle creation. The important new result in this work is that non-commutativity doesn't contribute to the particle creation process.

Path Integral Treatment of a System with Variable Mass

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As part of the path integral approach and by using Duru-Kleinert spatio-temporal transformation method our interest is focused on the dissipative problems described by the non quadratic forms where the mass and the potential depend not only on the position but also on the time.
The harmonic oscillator case for a particular form of mass depending on time and position was treated.

Phase Space Path Integral for Modified Pöschl-Teller Potential

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The phase space path integral for a particle inside the modified Pöschl-Teller potential hole (MPT) is exactly evaluated by using the delta functional technique. The bound-state energy-levels and the corresponding suitably normalized wave functions are derived.

Path Integral Formulation for Position –Time Dependent Mass Systems

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The problem of position-time dependent mass with general time-dependent potential is treated in the framework of the phase space path integral approach. By means of an appropriate point canonical transformation the problem is converted into that relative to a constant mass with stationary potential. Particular examples are also considered.

Topological Quantum Computing

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Topological quantum computation is concerned with two-dimensional quantum systems that support excitations with fractional statistics called anyons. Anyons have exchange properties that are different from those of fermions and bosons. A system of N non-abelian anyons has an exponentially large topologically protected Hilbert space, and quantum information can be processed by braiding the anyons.

Techniques for measurement and analysis of natural and anthropogenic radioactivity using high resolution gamma spectrometry

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The majority of exposure to radiation comes from natural sources. The ionizing radiations emitted by natural and eventually anthropogenic radionuclides are present in various degrees in all different geological formations in the environment and existed in soil, rocks, sediments, plants, water and other sites which directly affect human beings and contribute significantly to gamma radiation exposure in long term. Therefore, the knowledge of radionuclide distribution and radiation levels in these elements is important. The objective of this contribution is based on the presentation of the gamma ray spectrometry analysis and measure technique in low background configuration using a high resolution HPGe semi-conductor detector located in different experimental sites. Some types of investigated samples are presented with theirs analyzes.

Keywords: Primordial radionuclides, anthropogenic radioactivity, Gamma spectrometry, HPGe De- tector, Modane underground laboratory.

Adaptive approach in VMAT radiotherapy on Head and Neck Cancer - A Dosimetric and Volumetric Study

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The recent development of new dynamic modulation techniques, and the advent of on-board imaging systems in treatment rooms, has highlighted the need to adapt radiotherapy of the anatomical variations along the treatment.
"VMAT" is a volumetric radiotherapy technology that delivers a fast and precise sculpted 3D dose distribution with a single 360- degree rotation of the linear accelerator gantry in order to improve the standard of care and treatment
However head and neck cancer (HNC) patients in general, and NPC patients in particular, were found to have changes in anatomical structures during the course of RT due to the shrinkage of the primary tumor and/or the lymph nodes, or due to changes in body contour following profound body weight loss
The aim of this study was to quantify the anatomic variations and the dosimetric effects occurring during VMAT radiotherapy for head and neck cancer and to estimate benefit of replanning in them. Key words: Adaptative radiotherapy, VMAT, anatomical changes, head and neck cancers.

Treatment of medulloblastoma cancer by new irradiation technique

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Medulloblastoma is a relatively radiosensitive tumor. The combination of treatment with radiotherapy, surgery and chemotherapy generally provides good results. However, medulloblastoma are delicate cancers since a risk of spreading may occur through the cerebrospinal fluid to the brain and spinal cord. In this work, we propose a new technique for large and complex targets. We have acted on the fields programming and table parameters. By this new method of radiotherapy, thirty patients have been treated since 2015. Interesting results have been obtained, and the state of health of twenty-nine patients has been improved.

KEYWORDS: medulloblastoma cancer, radiotherapy, new irradiation technique

GEANT4 Simulation on human body

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Simulation plays a fundamental role in various domains and phases of an experimental physics. Nowadays, Geant4 is the only open-source, free and general Monte Carlo code for radiation physics research. Geant4 for (GEometry ANd Tracking) is a Monte Carlo simulation Toolkit, modeling the interactions of particles with matter.
The Geant4 object oriented toolkit is a full set of libraries written in C++ allowing the user to simulate his own detector system. It has initially been developed for the simulation of next generation HEP detectors (ATLAS, Alice, CMS, LHCb…), today, it is used widely by the space and medical Physics communities.
The aim of our work is to reproduce radiation therapy treatment in part of human body obtained by computerized tomography-CT imaging and compare with clinical data to perform calculation algorithm using in pacification systems.

Keywords: Geant4, Simulation, radiation therapy.

Shell Model Study of Zinc isotopic chain in the pfg model space

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Shell model calculations have been performed to study the energy levels, reduced transition probabilities, deformation parameter and some other spectroscopic properties for even-even 58-80Zn isotopes by employing an effective interaction derived on the basis of the similarity. The Hamiltonian of original interaction is derived from the Kuo-Lee-Ratcliff (KLR) folder diagram expansion in terms of the vertex function Qˆ box. It is obtained by removing terms at first order in Vlow-k .
Calculations have been realized using the NuShellS@MSU code, taking the core56Ni for all considered nuclei, and 78Ni core to calculate the 80Zn nucleus in order to observe the changing of properties with respect of the model space. Our results are compared with the experimental data and also with calculations using the well- known jj44pn and jun45 effective interactions

Keywords: NushellX@MSU Shell model code, effective interaction, deformation parameter, transition probabilities.

Three Body effect on Odd isotopes Nuclear Structure in 78N i mass region

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In this work, some spectroscopic calculations are realized in order to understand the nuclear properties: Spectra and Electromagnetic properties of elements in the south east part of the nuclear chart. The study is based on the three body effect in the vicinity of 78N i doubly magic core. The calculations are carried out in the frame work of the nuclear shell model using NuShellX@MSU code, by means of a residual interaction derived from mkh effective interaction and applied on odd nuclei in the studied region. The getting results are compared with the available experimental data.

Posters

Non-stationary dark energy around a black hole

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In this work we treat numerical simulations of the accretion of test scalar fields with non-standard kinetic terms (the k-essence type) onto a Schwarschild black hole and we find a dynamical solutions for the spherical accretion of a Dirac - Born - Infield , the simulation show that the accretion eventually settles down to a well-known stationary solution. We also find that a ghost condensate model settles down to stationary solution during the accretion process.

Stability study of FRW universe in a Finsler geometry and confrontation with observations

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Dynamical behaviors and stability properties of a Friedmann-Robertson-Walker like universe in a Finsler geometry filled with a generalized Chaplygin fluid are studied. Moreover, compared with the more recent data, our results of the Hubble parameter as a function of the redshift are in a good agreement.

W-prime boson physics at the LHC

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Many theories beyond the standard model require the existence of heavy gauge bosons as the W- prime. In this presentation, I investigate the physics of the W-prime boson at the LHC. I employ a model independent framework and I use MadGraph@MCNLO to calculate the cross section and the differential distributions at NLO and NLO+PS for the process pp—> tbbar+tbar b.

Key words: NLO QCD, W-prime

The Higgs-gauge boson couplings at Leptonic Colliders

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The bb_bar+E_{miss} channel important for the precision measurements of the Higgs properties, especially through future lepton colliders in aim of reach expected New Physics (NP). In an in- dependent Higgs model, the Higgs boson coupling to W/Z gauge bosons is under proper within bb_bar+E_{miss} channel, which is produced via ZH and WH productions at a circular or linear lep- ton collider such as CEPC, FCC-ee(TLEP), ILC,... In center of mass energy of 250 GeV and 500 GeV with an integrated luminosity of 250 fb^{-1} and 500 fb^{-1} respectively.

Resummation of non-global clustering logs in electron positron to dijets events at LEP

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We consider the process electron positron to dijets at the LEP and calculate the invariant jet mass distribution of the outgoing hard jet. We show how both non-global and clustering logs up to 4 loops may be computed and estimate their size to all orders. We compare our predictions with numerical Monte-Carlo results as well as with results from parton showers (Pythia and Herwig).

Soft gluons and non-global logarithms

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We analytically compute the fourth order contribution of the Non-global logarithms to the hemisphere jet mass distribution .Taking the process e+e- into di-jet event as an example and working at finite N_c and in the eikonal approximation, the 4-loop contribution is extracted from a soft gluon evolution equation and the result is then compared to previous findings in the literature, finally we discuss the possibility of an all order resummation of these NGLs in perturbation theory.

Particle creation phenomena in gravitational fields

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In this work, we study the particle creation in the presence of strong gravitational field during the inflationary phase of the universe. For that, we solve the Dirac equation and discuss the particle creation phenomena for critical values of the gravitational field.

Violation of the Lepton Flavor Universality in the Compact 341 Model

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Lepton Flavor Universality Violation (LFUV) is investigated in the context of the compact 341 model. It is shown that in order to explain LFUV for certain leptonic transitions currently observed in B- decays and accommodate the theoretical results to the global model independent analysis, some additional constraints have to be set on the allowed regions of the Wilson coefficients and the mixing parameters of the model.

Can Non Commutative Geometry Explain Baryogenesis?

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A cosmological model in curved non commutative geometry is proposed. As a byproduct it is found that if for massless particles propagating in this space-time a net asymmetry between neutrino and antineutrino arises at the thermodynamical equilibrium leading to a new mechanism explaining matter-antimatter asymmetry.

Next-to-Leading Order Self-Energy for Longitudinal Gluons with Soft Momentum in HTL QCD

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We present the analytic expression of the next-to-leading order self-energy for longitudinal gluons with soft momentum. We use the closed time path-formulation of the real-time formalism of the finite temperature quantum field theory. The retarded component of the NLO self-energy for longitudinal gluons is written in terms of three and four dressed vertex functions. The solid-angle integrals involved in the hard-thermal-loop vertex functions are expressed using the Feynman parameterization.

Effect of Curvature on the Nucleation of Quark-Gluon Plasma Droplets from a Hadronic Gas

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In the present work, we study the nucleation of quark-gluon plasma (QGP) droplets in a hadronic gas phase (HG). This process is driven by statistical fluctuations, which are determined by the difference in free energy in the QGP and hadronic gas phases. We investigate this difference in free energy by modeling it in two cases; when considering the curvature term of the QGP bubble and without considering it. We calculate the free energies of both hadronic gas consisting of massive pions and plasma droplet with up and down quarks and gluons, for different SU(3) color representations of the QGP, namely the color singlet, color octet, and color 27-plet. The behavior of the obtained change in free energy is examined with varying radius of the QGP bubble, in the two cases. The results obtained with and without the curvature contribution are compared, and the effects of curvature on the nucleation of QGP (ud) droplets from a pionic gas are analyzed.

Sphalerons from the minimal 331 model and baryogenesis

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The sphaleron energy and rate are investigated within the minimal 331 model. It is shown, that the constraint leading to the first order phase transition is satisfied for both spontaneous symmetry breaking vacuum of the model. A comparison with the economical model study is also made.

A research strategy by a combination of electromagnetic and gravitational wave data

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The era of multi-messenger astronomy has officially begun on August 17, 2017, with the detection of gravitational waves GW170817 produced by the fusion of two neutron stars. This collision generated an electromagnetic counterpart event, GRB170817A, alongside a jet of light of all wavelengths of the spectrum (visible, X, and gamma… etc..). In this work, we will use light curves taken from catalogs and following the afterglow model, we will develop a strategy to improve gravitational waves parameter estimation in the presence of electromagnetic information.

Ultra high energy cosmic rays simulated with CONEX code

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Today, many experiments around the world (Auger Observatory, Telescope Array, and soon Jem- Euso experiment…) are tracking ultra-high energy cosmic rays. They try to collect some exceptional data that would lift the veil on this type of cosmic rays, mainly to answer why does their energies exceed the GZK cutoff without pointing to astrophysical sources close to our galaxy. Further-more, we do not really know neither the identity nor the acceleration processes that can provide them with such colossal energy. We have performed, using the CONEX program version 2r6.40 coupled to different hadronic interaction models (QGSJET01, EPOS LHC , SIBYLL 2.1 and QGSJETII-04) simulations focused on the shower maximum slant depth longitudinal profile X_{max} and the charged particle number N_{max}. These parameters and their fluctuations are very sensitive to the primary particle mass (identity) and energy. The obtained results are compared for proton and iron primaries at the energy range 10^{18}–10^{21}eV.

Simulation of the fluorescence signal detected by a space\\ telescope for extreme energy cosmic ray observation

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The experimental technique of fluorescence light measurement is used for indirect observation of cosmic ray particles at very high energies. Extensive Air Showers (EAS) initiated by Extreme Energy Cosmic Rays (EECRs), up to 100 EeV and entering the Earth's atmosphere, are simulated with the CORSIKA package. Influence of different simulation parameters on the EAS characteristics is studied, especially on longitudinal distribution of charged particles, depth of shower maximum and energy released to the air. By taking the atmospheric scattering of light into account, the number of fluorescence photons, with wavelengths between 300-430 nm, and their arrival time distribution to an ideal space telescope are calculated.

Shell-model study of silicon isotopes at excitations relevant to the nucleosynthesis in classical novae

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A major challenge has been to find ways to determine reaction rates at energies relevant for burning in explosive stellar environments, such as classical novae that occur on the white dwarf star. Thermonuclear radiative capture reactions on unstable nuclei determine the path of nucleosynthesis towards the proton drip line. These capture reactions represented a fruitful source of nuclear structure information. As it is the eighth most abundant element in the Universe, silicon has a significant astrophysical interest. This element plays a crucial role in the comprehension of nucleosynthesis, especially, the galactic chemical evolution. The main silicon isotopes produced in space, in massive stars or by radiative capture reactions, are those with A = 26 to 30. Studying the nuclear structure properties of such isotopes is important in understanding these reactions as well as the calculation

TCAD simulation of small-pitch 3D sensors for pixel detector upgrades at High Luminosity LHC

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Applications at the High Luminosity LHC (HL-LHC) have required the development of a new generation of 3D pixel sensors with increased pixel granularity, extreme radiation hardness, and low material budget. To this purpose, new 3D pixels have small pitch (e.g., 50×50 or 25×100 m2) and reduced active thickness (~100 m). Owing to the small inter-electrode spacing (~28 m in the most aggressive designs), these 3D pixels are expected to be radiation hard even after irradiation at the hadron fluences of interest for the innermost tracking layers of ATLAS and CMS (~2×1016 neq cm-2), and beyond.

In order to estimate the charge collection efficiency (CCE) after irradiation, TCAD simulations can be conveniently used, providing useful information for the optimization of sensor design and fabrication technology. Within the AIDA-2020 project, with reference to the new single-sided 3D technology from FBK (Trento, Italy), we have simulated the CCE of pixel sensors with different inter- electrode spacing irradiated at different fluences. For these simulations, a 2D domain was used, consisting of an horizontal slice taken at half the depth of a 3D sensor. Simulations consider the hit of a minimum ionizing particle, described by the Heavy Ion model, at different points within the active area. In addition, bulk radiation damage is accounted for by using advanced deep-level trap models.
At the Conference, we will report a comprehensive description of the simulation results, also in comparison to experimental results from pixel sensors and test structures.

Keywords : 3D pixel sensors , TCAD simulations, High Luminosity, small-pitch

Determination of error sources in linear accelerator commissioning

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The commissioning of linear accelerator (LINAC) is a crucial step in radiotherapy. In this work, we have

studied the error sources for LINAC in Algeria. The investigation was essential since the slight- est error may greatly influence the quality of cancer treatment. We have taken into account different parameters and we have verified their effect on the accuracy of the computed dose. The data were obtained during the installation, test procedure and commissioning of the linear accelerator. We have performed many tests in the commissioning of treatment planning system (TPS) and obtained important results. By minimizing the error sources, TPS predictions were in agreement with experimental measurements.

KEYWORDS: commissioning, linear accelerator, treatment planning system

Study of (100 keV) As+ ions interaction with Si(100) targets

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A series of {100} silicon targets were submitted to (100keV) As+ radiation to a dose of 1.5x1016As+cm-2. The targets were maintained at room temperature during the process. To recover the damage radiation and to activate arsenic atoms, annealing treatments (at 900°C during 30min.) were carried out. In this work, we were particularly interested by the fraction of arsenic which was implanted in the samples. The phenomenon was investigated by simulation using the CRYSTAL-TRIM code. Several ion implantation parameters, such as Rp (projected range),ΔRp (standard deviation) and the depth of defects, were estimated with a good accuracy. The samples were analyzed by different experimental techniques namely X-ray diffraction and electrical measurements. For as-implanted specimens, an increasing of the tensile strain was noticed in the Si layer. After the annealing treatment, a good recovery of defects was obtained. The electrical measurements were in agreement with X-ray analysis. We note that the obtained results were in agreement with literature.

Key word: interaction of radiation with matter, ion implantation, arsenic, silicon

Gamma radiation analysis and radiological hazards assessment in commonly used sands in Algeria

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Sands are commonly used in Algerian building constructions; they are classified as a source of hazardous contamination because of their naturally occurring radionuclides content, mainly Uranium and Thorium families and the radioactive isotope of Potassium. The presence of such primordial radionuclides in sands is due to their natural origin from divided rocks and minerals. In order to estimate the harmful effects of ionizing radiations emitted by this material, broad investigation of natural radioactivity levels must be established. In this study, nine samples were collected from quarries and construction sites. The samples measurements were undertaken by gamma spectrometry, using a high-resolution HPGe semiconductor detector with (1.8 keV for 60Co 1332.5 keV line). The spectra were analyzed using the Genie 2000 software dedicated to the processing of gamma spectra. The activity concentrations of radionuclides of interest 232Th, 226Ra and 40K were determined, they were found to be lower than the worldwide average values. The presence of artificial radionuclide 137Cs was found in some samples with low concentrations, which indicate that they are contaminated. Radiation hazard parameters such as radium equivalent, representative level index, internal and external indexes besides absorbed dose rate, annual effective dose equivalent and annual gonadal dose equivalent were elaborated in order to assess the radiological hazard associated to this material.

Keywords: Sand, radionuclides, HPGE detector, activity concentrations, radiological hazards.

Modeling of Back and Front Illuminated Bifacial NPP+ Silicon Solar Cells

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The aim of this work was a theoretical study and modeling, by MATLAB, of bifacial single crystalline silicon solar cells. We elaborated a program under MATLAB for the optimization of technological and geometrical parameters under the standard conditions. We took into account the two cases corresponding to the illumination of the cell from the front and rear sides. Interesting results have been obtained by the developed program. We succeeded to determine the parameters of each area corresponding to the best characteristics of the cells (the emitter: Nd=3×10E24 (m-3), thickness, Xj=0 .5µm ; the base : Na=7×10E20 (m-3), thickness, Wb=188 µm ; the BSF area: Nbsf=5×10E25 (m- 3), thickness, Wbsf=0 .7µm).

Key Words: silicon, bifacial solar cell, modeling.

FB asymetry in the Seiberg-Witten space-time non-commutative Standard Model

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A pure non-commutative analytical expression for the forward backward asymmetry (FB) of the top quark pair production via the quark-antiquark annihilation sub-process is derived. Confronting the obtained theoretical results to the recent Tevatron experimental data, a new lower bound on the non-commutative geometry parameter is deduced. .

Superqubits for Superquantum computing

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A quantum computation using superqubits, creation of superteleportation algorithm and superdense coding is also investigated, morever a Deutch like algorithm using superqubits is proposed.

The Design of Optimal Reversible comparator Circuit Using New Quantum Gates

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This paper presents novel approach for designing reversible n-bit comparator based on new quantum gates. Their quantum equivalent implementations are also proposed. The design of comparator circuits is completed by using existing reversible gates and the above new reversible circuits. The comparative results are presented in terms of quantum cost, delay and garbage outputs.

Schwinger effect with the help of a non-minimal coupling

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The influence of non-minimal interactions on the creation of charged particles from vacuum by an electric field is studied. The relativistic field equation with varying electric field and constant magnetic one is solved. The Bogoliubov transformation method is applied to calculate the pair creation probability and the number density of created particles. It is shown that such interactions influence drastically the creation of charged particles.

Hawking Temperature and Tunneling Probabilities from Rotating Charged Cosmic Strings within the Seiberg-Witten Noncom- mutative Geometry

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The radiation of fermions from charged and rotating cosmic strings in the context of the quantum tunneling approach and space-time noncommutative geometry formalism is investigated. Moreover, using WKB approximation and Hamilton-Jacobi method, the related Hawking temperature and tunneling probabilities of incoming and outgoing fermions are derived. A comparison with the com- mutative case is also made.

Field theory noncommutative and Renormalization

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We consider the non-commutative spaceR_θ^3, a deformation of R^3 for which the star product is closed for the trace function. We study the IR and UV properties of a 2-point function loop for real non-commutative scalar field theories with quartic interactions and Laplacian on R^3 as kinetic operator. We find that the 2-point functions for these Non-commutative scalar field theories have no IR singularities in the external monmenta, indicating the absence of UV / IR mixing.

Rotonization of the excitation spectrum of a two-component dipolar Bose-Einstein condensate in quasi-1D geometries

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We consider a binary mixture of two homogeneous dipolar Bose-Einstein condensates in quasi-1D. We analyze the excitation spectrum when the orientation of the magnetic moments is varied. This is performed by solving two coupled Gross-Pitaevskii equations and Bogoliubov-De Gennes equations. This allows us to explore the stability of the mixture when varying the tilting angles and the dipolar couplings. It is shown that the spectrum admits a roton minimum at finite momentum.

Quantum Teleportation with Nonlinear Two-Mode Squeezed Vacuum States

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We construct a new class of nonlinear two-mode squeezed vacuum states based on a non-linearity function derived from Tsallis's q-exponential function. The special cases q = 2 and q -> 1 recover the well-known pair coherent states and the two-mode squeezed vacuum states, respectively. Then, we evaluate the quantum entanglement of these states using the linear entropy. Finally, we investigate continuous variable quantum teleportation of a coherent state using a nonlinear two-mode squeezed vacuum state as a shared entangled resource. It is shown that the fidelity of teleportation depends on the non-linearity function f(n) and recovers its standard expression in the linear limit f(n) = 1.

Quantum Computation with Anyons

Ismail Akkouche[1] ; Radja Mermoul [1] ; Taha Rouabah[1] ; Achour Benslama [1]
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Non Abelian anyons promise to provide a fault tolerant way to perform quantum computation since the information is stored in topological i.e. non-local features of the system of anyons making the system resilient to decoherence.

Topological Quantum Algorithms

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A topological quantum computer is capable of performing the action of any unitary quantum algorithm.
The main goal of our work is the express the well-known quantum algorithms in the terms of braids and weaves. Our work is focused particularly on topological Shor factoring algorithm and Aharonov, Jones and Landau (AJL) algorithm.

The complex KdV equation with power law non-linearity studied via the Functional Variable Method

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We derived the soliton solution of the complex KdV in plasmas with power law non-linearity using the functional variable method [1-5] in order to reveal the dynamical parameters and to show the effectiveness of this method. The study shows that our results are in agreement with ref [6].
Keywords: One soliton solution; Power law non-linearity; Functional Variable.
The complex KdV equation with power law nonlinearity is given by [6,7]
(U){t}+a(t)|U|^{m}(U){x}+b(t)(U){xxx}=i{(t)U+(t)(U){xx}} (1) m: the power law non-linearity
a(t) real valued function of time represents the coefficient of nonlinear term b(t) real valued function of time represents the coefficient of dispersion term
(t) represents the coefficient of damping and (t) represents the coefficient of filters Using the hypothesis:
U(x,t)=V(x,t) exp[iφ(x,t)] with φ(x,t)= - k(t)x+tω(t)+ (t) (2)

Nonlinear Klein–Gordon equation and the stability criteria via the multiple-scales method

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This article addresses two main objectives: The first goal is how to obtain the nonlinear Klein Gordon equation in fluid mechanics and the second objective is to use the multiple scales method to find complex solutions in this problem. It is a difficult mathematical problem. we propose to study a asymptotic weakly nonlinear wave propagation of free surface sloshing of a magnetic fluid in a rectangular tank subjected to an external magnetic field. The influence of both surface tension, gravity force and magnetic permeability is taken into account. The method of multiple scales is used to obtain uniform solutions of the first order system as well as the second order. The first order makes it possible to obtain the dispersion relation of the linear problem and the second order on the Klein-Gordon equation with complex coefficients for the nonlinear problem, describing the behavior of the system. The stability and instability of the system is discussed both analytically in both cases, and the corresponding stability conditions are obtained.

The q-deformed Swanson model: Non hermiticity and perturbations corrections

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A q-deformed Swanson model where the perturbative and non perturbative parts of the Hamiltonian are both pseudo hermitian is investigated in the configuration space. An analytical expression of the modified metric is derived. Moreover, a general prescription for the perturbation theory concerning the spectrum and eigenstates is presented.

Q-deformation versus non hermiticity:Case of the harmonic oscillator

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A q-deformed harmonic oscillator is shown to be pseudo Hermitian in the leading order approximation of the perturbation theory. A generalized form of the metric is constructed and the spectrum as well as eigenstates is derived explicitly. Some applications to statistical mechanics are also discussed.

Fermion Tunneling from Dynamical Horizons and Hawking radiation

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Seiberg-Witten spacetime non-commutativity is investigating for an expanding curved universe. It is shown that can generate a pair creation process near an evolving black hole leading to a Hawking like-radiation. Depending on the various cases of the resulted dynamical apparent horizons, the corresponding Hawking temperature is derived.

Dark Matter Model as a Bose-Einstein Condensate with Anomalous Effects

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One of the best suggested dark matter candidates is a Bose Einstein condensate. In this work, we study this BEC dark matter model by means of the Gross–Pitaevskii equation with a self-consistent gravitational potential. By using the local density approximation, we introduce the anomalous correlations that mimic beyond one body effects. We compare our results with literature and discuss some astrophysical consequences.

Scalar particles creation by a time-dependent electric field in de sitter universe

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The phenomenon of particles creation in De- Sitter universe when a time-dependent electric field is present, is analyzed. We have used the Bogoliubov transformations method to calculate the number density of the scalar created particles. The results have been interpreted.

Paramétrisation du facteur de croissance dans un espace plat

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Abstract not available in English

Metric-affine gravity : Overview and perspectives

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The main purpose of the poster is to give an overview of ''a" generalization of the theory of general relativity (GR), namely metric-affine gravity (MAG for short). We present the geometrical arena of this (may be considered as) alternative (or extension) of GR which can describe the microworld. We put a link between the latter approach and the continuum microstructure's one. As a gauge theory of gravitation, MAG may be considered as an upshot of a gauging procedure of the affine group, i.e. GA(4,R), or its double covering. A historical approach of such a theory is also contained including the key results.
One concludes with some perspectives on the calculus of topological observables in MAG viewed as topological gravity theory.

Analytic solution to the BMS equation for the hemisphere mass distribution

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In this paper an infrared and collinear safe non-global QCD event shape observable, the right hemisphere distribution in the e−e+ annihilation into dijets, is defined. Besides to the Sudakov logarithms, at single logarithmic accuracy such type of observables receive a set of contributions associated with energy ordered large angle secondary gluons emissions, termed non-global logarithms. However their resummation is a challenging task in perturbation theory and thus only the leading nonglobal logarithms can be reproduced both numerically and analytically. In this work we want to approximate the analytical solution of a nonlinear differential equation, have been derived by Banfi, Marchesini and Smye (BMS) which resumes both the Sudakov and non-global logarithms in the large Nc limit. Proposing an exponential being a series in the strong coupling alpha s. By substituting into the BMS equation, we have obtained recurrence relations which allow us to calculate the coefficient of each term in the series in the exponent.

Investigating the Similarity Between the Behavior of the Order Parameter Derivatives and that of the Cumulants of the Probability Density for the thermal Deconfining Phase Transition at Zero Chemical Potential

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In this work, we study the temperature driven deconfining phase transition, at zero chemical potential, in a statistical way, by means of the probability distribution of finding the mixed hadronic gas-QGP phase system in a finite volume, in a specific state defined by a parameter lying between 0 and 1, whose mean value represents the order parameter of the studied system. We calculate mean values of other characteristic quantities, called response functions, which are mainly the second, third and fourth cumulants of the probability distribution representing the variance, skewness and kurtosis respectively, as well as the three first thermal derivatives of the order parameter. Integral expressions are obtained for all these quantities, and their evaluation is done numerically, and the such obtained results are adequately translated into graphs, illustrating the variations of the response functions with temperature, for various volumes. By examining their behavior, we notice a striking similarity between the behavior of the order parameter derivative and that of the cumulant, at the same order. We investigate this similarity and try to deeply analyze it, to obtain some important features characterizing the occurring deconfining phase transition.

Quantum entanglement of Dirac particles in the presence of a constant electric field in an anisotropic Bianch1 and De Sitter universes

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The von Neumann Quantum entanglement entropy for Dirac particles pairs created by a constant constant electric field is studied in both an anisotropic Bianch1 and De Sitter universes using the quantum field theory approach and Bogoliubov transformations. It is shown that its behavior is strongly dependent on the curved space-time structure and the electric field. Other features are also discussed

Path integral solution for K-G particle in a coulomb field

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Exact Green function related to a K-G particle submitted to a Coulomb field in (2+1) dimensions is analytically calculated via path integral formalism which describe the dynamics via the Gitman model. The energy spectrum, as well as the corresponding normalized wave functions, are extracted following this approach. According to the symmetric form for the Green function, it is shown that the non-relativistic limit of the K-G particle is undertaken with much ease.

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