# 第十七届全国中高能核物理大会

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湖北宜昌

# Book of Abstracts

# Contents

**1**

# Initial energy density in pp collisions and AA collisions

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A previously known class of analytic, exact solutions of prefect relativistic hydrodynamics is utilized to fit the new results on the pseudorapidity distributions with an acceleration parameter $\lambda$. Those results include a broad centrality range for Cu+Cu, Au+Au, Pb+Pb at RHIC and LHC. Based on hydrodynamic description of the pseudo-rapidity distribution with acceleration effects taken into account, the energy density is estimated, and the ratio between the newly estimated energy density and the Bjorken estimate is found to depend on the pressure gradients and volume expanding in the hydrodynamical evolution.

**Summary**:

New results are shown in this paper on the pseudorapidity distributions and initial energy density estimate from the previous known exact solutions of accelerating hydrodynamic and Buda-Lund hydrodynamic model. We have extracted a series of acceleration parameter $\lambda$ for different systems at RHIC and LHC energies. Taking the acceleration effect into account and refining the typical Bjorken model, we got a general class of initial energy density $\varepsilon_{corr}$ for central collisions, which was found significantly lager based on the latest PHENIX and LHC transverse energy spectra.

An improved estimate for initial energy density is also discussed for the semi-central collisions. For peripheral collisions the estimate for the initial energy density is difficult based on the Bjorken model. Here we are able to find the approximation based on the MC-Glauber model and the initial accelerating time period. For the peripheral case there exist various qualitative and quantitative analyses, and the thermalization time, freeze-out time, transverse overlap, and volume expansion deserve more attention discussing the QGP medium initial energy density. The more detailed testing of QGP medium numerical solutions of peripheral collision will be done in the future.

It should be emphasized that in this paper our purpose is to discuss inhomogeneous flow from exact solution of relativistic hydrodynamics, and that the relativistic hydrodynamic Buda-Lund model can describe the experimental data stable and causally. Either analytically or numerically, the accelerating hydrodynamical description makes a difference on both the rapidity distribution and the energy density estimation.

**2**

# Compton scattering off proton in the nucleon resonance region

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**Summary**:

The Compton scattering off proton in the third resonance region is analyzed for the first time, owing to the full combined analysis of pion- and photo-induced reactions in a coupled-channel effective Lagrangian model with K-matrix approximation. Two isospin 3/2 resonances D33(1700) and F35(1930) are found to be essential in the range of 1.6 - 1.8 GeV. The recent beam asymmetry data of Compton scattering from the GRAAL facility are used to determine the helicity couplings of these resonances, and strong constraint comes also from data of πN and KΣ photoproduction. Possible role of new narrow resonances is discussed.

**3**

## Pion string evolving in a thermal bath

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**Summary**:

By using the symmetry improved Cornwall-Jackiw-Tomboulis effective formalism, we study a pion string of the $O(4)$ linear sigma model at finite temperature in chiral limit. In terms of the Kibble-Zurek mechanism we reconsider the production and evolution of the pion string in a thermal bath created in LHC heavy ion collision experiment. Finally, we estimate the pion string density and its possible signal during the chiral phase transition.

**4**

## Study on high rate and ultrahigh time resolution TOF

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**Summary**:

Time of flight system (TOF) based on MRPC technology is widely used in modern physics experiments, and it also plays an important role. With the increase of accelerator energy and brightness of Collider, TOF system is required to indentify definite particles precisely under high rate environment. Undoubtedly this is a big challenge for TOF technology. For example, the momentum upper limit of K/PI separation is around 7GeV/c for JLab-SoLID TOF system under high particle rate as high as 20kHz/cmˆ2. So it is imperative to develop high rate and ultrahigh time resolution TOF system. In this project, we will investigate international advanced technology and develop high rate narrow gap MRPC and corresponding readout electronics system. The electronics system is focused on wave form digitizer system, fast amplifier and discriminator. FPGA based TDC will also be studied. Our goal is to develop a new TOF prototype with time resolution around 20ps and rate capability of 20kHz/cmˆ2. This system will meet the urgent needs of physics experiments and it can also push the technology of high precision particle detection.

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## Quantum pseudo electrodynamics in Schwinger’s method

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**Summary**:

In this talk, we’re going to show the quantum dynamics for constant pseudo electromagnetic field which couples to the chirality charges of fermions in the framework of Schwinger’s proper-time integration. Then, as a check of this quantum dynamics, the various anomalous phenomena under different circumstances with ordinary electromagnetic field are generalized to include pseudo electromagnetic field. Finally, as a further application of the quantum dynamics, the effect of pseudomagnetic field to chiral symmetry breaking is explored with Ginzburg-Landau approach and the pseudomagnetic anti-catalysis effect is discovered compared to the magnetic catalysis effect.

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## Collective flow in 2.76 and 5.02 A TeV Pb+Pb collisions

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**Summary**:

Collective flows are important observables to study the properties of the QGP in relativistic heavy ion collisions. Recently, the AILCE collaboration has measured many flow observables in 2.76 A TeV and 5.02 A TeV Pb+Pb collisions. In order to study and predict these flow observables, we run VISHNU hybrid model simulations with the TRENTo and AMPT initial conditions and with different forms of the QGP transport coefficients. More specifically, we calculate the integrated and differential $v_n$ of all charged and identified hadrons, the event-by-event $v_n$ distributions, the nonlinear response coefficients of higher-order flows harmonics, the event-plane correlations, the correlations between different flow harmonics, and $p_T$-dependtent factorization ratio,etc. We found some of the flow observables,
such as the integrated and differential $v_n$ of all charged and identified hadrons, which can be quantitatively described by the hybrid model simulations, are insensitive to the initial conditions used in our calculations as long as the transport coefficients are properly tuned. We also qualitatively explore the general properties of other flow observables, such as the flow correlations, the non-linear response coefficients of higher-order flow harmonics and $p_T$-dependtent factorization ratio with different initial conditions and
transport coefficients and hope such theoretical investigations and predictions could shed light to the experimental measurements in the future.

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## Identifying the presence of the critical end point in phase diagram by higher order susceptibilities

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## Solution to the evolution equation at NLL for high parton density QCD

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We analytically solve the full next-to-leading logarithmic Balitsky-Kovchegov equation in the saturation
regime, which includes corrections from quark and gluon loops, and large double transverse logarithms. The analytic result for the S-matrix in the saturation regime shows that the linear rapidity decrease with rapidity of the exponent in running coupling case is replaced by rapidity raised to power of 3/2 decreasing. The collinearly-improved Balitsky-Kovchegov equation are also analytically solved in the saturation regime. It shows that the double collinear logarithms do not contribute to the S-matrix and the solution is the same as the one obtained from the leading order Balitsky-Kovchegov equation. The numerical solutions to the leading order and full next-to-leading logarithmic Balitsky-Kovchegov equations are performed in order to test the analytic results derived in the saturation regime.

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## Analysis of the semileptonic decay $\Lambda_c \to ne^+\nu_e$

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The semileptonic weak decay process of the $\Lambda_c$ baryon to the neutron $\Lambda_c \to ne^+\nu_e$ is examined. The transition form factors are investigated with light-cone QCD sum rules. The differential decay rate is obtained in the dynamical area by fitting the sum rules-allowed results with the dipole formula. The decay width and the branching ratio are estimated to be $\Gamma(\Lambda_c \to ne^+\nu_e) = (1.69 \pm 0.23) \times 10^{-13}$ GeV and $\mathrm{Br}(\Lambda_c \to ne^+\nu_e) = 5.1 \pm 0.7\%$, respectively.

**Summary**:

The semileptonic decay of the $\Lambda_c$ baryon is a useful mode to test the standard model and the strong interaction. Considering the recent development in experiment on the channel $\Lambda_c \to ne^+\nu_e$, we investigate the weak decay form factors in the framework of light-cone QCD sum rules. We present the form factors on the momentum transfer in the region the sum rules are suitable. Furthermore, we fit the

form factors with dipole formula and extrapolate them into the whole dynamic region. The differential decay rate is given in the dynamic region. The decay rate is obtained by integrating the differential decay rate in the dynamic area to be $\Gamma(\Lambda_c \to ne^+\nu_e) = (8.57 \pm 0.41) \times 10^{-15}$ GeV and the branching ratio is estimate in aid of the mean life time of the $\Lambda_c$ baryon to be $\mathrm{Br}(\Lambda_c \to ne^+\nu_e) = 0.26 \pm 0.01\%$

**10**

## new insights into the charmonium spectroscopy

**Author:** Dian-Yong Chen[1]

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**11**

## Meson Spectral Functions at Finite Temperature and Isospin Density with Functional Renormalization Group

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**Summary**:

The pion superfluid and the corresponding Goldstone and soft modes are investigated in two-flavor quark-meson model with functional renormalization group. By solving the flow equations for the effective potential and the meson two-point functions at finite temperature and isospin density, the critical temperature for the superfluid increases sizeably in comparison with solving the flow equation for the potential only. The spectral function for the soft mode shows clearly a transition from meson gas to quark gas with increasing temperature and a crossover from BEC to BCS pairing of quarks with increasing isospin density.

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## Coherent very low transverse momentum $e^+e^-$ production in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV and U+U collisions at $\sqrt{s_{NN}}$ = 193 GeV at STAR

**Author:** CHI YANG[1]

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**Summary**:

Recent ALICE collaboration measurements showed a significant excess in J/$\psi$ yield in the very low transverse momenta ($p_T$<0.3 GeV/$c$) in peripheral Pb+Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV. The same behavior of the J/$\psi$ production is observed at STAR in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV. These results are interpreted as coherent photoproduction of J/$\psi$ at the moment. The coherent photonproduction

scenario may also suggest there is an excess of photoproduced electron-positron production at the very low $p_T$ in peripheral collisions. It would be very interesting to investigate the electron-positron pair production in the full mass region ($M_{ee} < 4\text{GeV}/c^2$) at very low $p_T$ in heavy-ion collisions in different centrality bins. If the coherent photoproduction mechanism confirmed, the coherently photoproduced $e^+e^-$ pairs accompanying violent hadronic collisions may provide a novel probe of the hot and dense nuclear matter.

In this talk, we will present $e^+e^-$ invariant mass spectra in very low $p_T$ in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV and U+U collisions at $\sqrt{s_{NN}}$ = 193 GeV. The $p_T$ spectra from different mass regions (0.4-0.76, 1.2-2.6, and 2.8-3.2 GeV/$c^2$) will be reported. The structure of t (-t = $p_T^2$ ) distributions of these mass regions and comparisons with that in ultra-peripheral collisions will be shown. The centrality dependence of the $e^+e^-$ productions will be shown. Physics messages will be discussed.

**13**

# 重子激发态奇异性质研究

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**Summary**:

The hadron physics provides a powerful theatre to test our understanding of QCD in the nonperturbative region. Hence there are major theoretical, experimental and computational efforts which aim to explore both the spectrum and the structure of hadrons. In this talk, I will introduce a series work of production of hadron resonances in various processes, including J/ψ decays, γp, pp and pi-p collisions.

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# quantum evolution of heavy quark dipoles in the thermal bath of QGP in relativistic heavy ion collisions

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**Co-authors:** Ralf Rapp [2]; Xiaojian Du [2]

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In the dynamical evolutions of heavy ion collisions, heavy quark dipoles such as $c\bar{c}$ (or $b\bar{b}$) are produced from parton hard scatterings, and need a formation time to evolve into a certain bound states. Different from proton-proton collisions, the hot medium (called QGP) will affect the internal evolutions of heavy quark dipole due to color screening and parton inelastic collisions. This will change the fractions of $J/\psi$ and $\psi(2S)$ in a $c\bar{c}$ dipole. We employ the time-dependent Schr\"odinger equation to study the $c\bar{c}$ wavefunction evolution, with heavy quark potential to be color-screened potential from Lattice QCD and also an imaginary part for the dissociation of bound states. By projecting the wavefunction to eigenstates of Cornell potential, we obtain the time evolutions of J/ψ and ψ(2S) fractions in the $c\bar{c}$ dipole. Further more, we extend this calculations from the static medium to an

evolving system, where we can see a nontrival effect of this hot medim effect at different temperature regions. We present how color screening and parton scattering effects change the double ratio of $R_{AA}^{\psi(2S)}/R_{AA}^{J/\psi}$ in static medium and a cooling system.

**Summary**:

In the Quark-Gluon Plasma produced in heavy ion collisions, heavy quark dipoles will suffer color screening effect and parton inelastic scatterings. These will result in dissociations and transitions of bound states in a $c\bar{c}$ dipole produced from initial parton hard scatterings. We employ the time-dependent Schr\"odinger equation to study this quantum effect of thermal bath on the sub-system of $c\bar{c}$.

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## A study of the strange vector meson spin alignment with the AMPT model

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**Summary**:

Observables sensitive to the vorticity allow us to study the fundamental property of the hot and dense nuclear matter created in high-energy nuclear collisions.Global polarization parameters of identified particles can be extracted from the azimuthal distribution of particles with respect to the event plane.The spin alignment of vector meson such as $\phi$ meson and $K^{\star}$ could be sensitive to the vorticity of the colliding system and its space-time evolution.In this presentation, we will present results from a multi-phase transport (AMPT) model that is modified to include the spin alignment information of $\phi$ and $K^{\star}$ mesons. We will discuss the extraction of spin alignment parameters from event plane reconstruction, and study how hadron interactions could influence the spin alignment observables based on final state particles.

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## Calculations of coherent photon-nucleus and photon-photon interactions in hadronic A+A collisions at RHIC and LHC

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**Summary**:

The coherent photon-nucleus and photon-photon interactions has been studied in detail at RHIC and LHC to probe the gluon distribution in nucleus at low Feynman $x$ via relativistic heavy-ion collisions. These kind of interactions are traditionally thought to only exist in ultra-peripheral collisions, where there is no hadronic interactions. Recently, a significant excess of $J/\psi$ yield at very low transverse momentum ($p_T < 0.3$ GeV/c) was observed by the ALICE and STAR collaborations in peripheral A+A collisions, which points to evidence of coherent photoproduction of $J/\psi$ in violent hadronic interactions. The survival of photoproduced $J/\psi$ merits theoretical investigation. In addition, with respect

to the expectation of theoretical calculations, the excess yield of $J/\psi$ in hadroinc heavy-ion collisions may served as a good probe to test the cold and hot medium effects.

In this presentation we report on calculations of coherent photon-nucleus ($\gamma + A \rightarrow J/\psi + A$) and photon-photon ($\gamma + \gamma \rightarrow e^+ + e^-$) interactions in hadronic A+A collisions at RHIC and LHC energies. We also address the questions about how the electromagnetic field translates into a flux of equivalent photons in hadronic A+A collisions: if the photons is emitted from the whole nucleus, or if only the spectator fragments contribute to the photon emission. Similarly, for photon-nucleus interactions, it is not clear whether the whole nucleus or only spectator fragment act as photon target. The model used to calculate the cross section will be discussed and the expected yield will be compared with experimental results from RHIC and LHC. The differential centrality, rapidity and transverse momentum distributions from calculations will also be compared between different scenarios.

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## Calculating the TMD of electron in BLFQ method

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**Summary**:

Basis Light-Front Quantization (BLFQ) method is a non-perturbative theory. This method mainly solves Schrodinger equation with the full Hamiltonian. And we can product the wave function of physics electron which include the information of the electron's structures. over here, we want to use the wave function to calculate the TMDs of electron. and then we also calculate the two distribution functions of GTMD of electron.

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## 大科学装置 HIAF 上的中高能核物理

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在这个报告里，我们将介绍中科院近代物理研究所的大科学装置 HIAF 上可能的中高能核物理实验。

**Summary**:

在这个报告里，我们将介绍中科院近代物理研究所的大科学装置 HIAF 上可能的中高能核物理实验。

**19**

## Global Lambda polarization in heavy-ion collisions with AMPT model

**Author:** Hui Li[1]

**Co-authors:** LongGang Pang [2]; Qun Wang [3]; Xiaoliang Xia [1]

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**Summary**:

Abstract We study the global polarization of Lambda hyperons in peripheral Au+Au collisions in the energy range $\sqrt{s_{NN}} = 7.7 - 200$
GeV by the A Multi-Phase Transport (AMPT) model. Our results for the global $\Lambda$
polarization agree with recent STAR data. Furthermore we find a few features of the vorticity field in lower collisional energies which may contribute partially to the energy behavior of the $\Lambda$ polarization.

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## Quark mass correction to chiral separation effect and pseudoscalar condensate

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**Summary**:

We derived an analytic structure of the quark mass correction to chiral separation effect (CSE) in small mass regime. We confirmed this structure by a D3/D7 holographic model study in a finite density, finite magnetic field background. The quark mass correction to CSE can be related to correlators of pseudoscalar condensate, quark number density and quark condensate in static limit. We found scaling relations of these correlators with spatial momentum in the small momentum regime. They characterize medium responses to electric field, inhomogeneous quark mass and chiral shift. Beyond the small momentum regime, we found existence of normalizable mode, which possibly leads to formation of spiral phase. The normalizable mode exists beyond a critical magnetic field, whose magnitude decreases with quark chemical potential.

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## Glueball spectrum from $N_f = 2$ lattice QCD study on anisotropic lattices

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**Co-authors:** Chuan Liu [3]; Jian-Bo Zhang [4]; Jian-Ping Ma [5]; Ming Gong [2]; Yu-Bin Liu [6]; Zhaofeng LIU Zhaofeng [7]

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**Summary**:

The spectrum of the lowest-lying glueballs are investigated on the lattice with two flavors of degenerate quarks. We generate large ensembles of gauge configurations on anisotropic lattices at two pion masses, $m_\pi \sim 650\ MeV$ and $m_\pi \sim 938\ MeV$. We focus on the ground states of the scalar, pseudoscalar and tensor glueballs, which are measured by gluonic operators constructed from different prototypes of Wilson loops. We also investigate the pseudoscalar channel using the topological charge density as the interpolation field operator, which are defined through Wilson loops and smeared by the Wilson flow technique. The masses of the lowest state derived in this way are much lighter (around 1GeV) and compatible with the expected masses of the flavor singlet $q\bar{q}$ meson. This provides a strong hint that the operator $\epsilon_{ijk}TrB_iD_jB_k$ and the topological charge density (proportional to $Tr\mathbf{E}\cdot\mathbf{B}$) couple very differently to the glueball states and $q\bar{q}$ mesons.

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## Role of a triangle singularity in the γp→K+Λ(1405) reaction

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**23**

## Wake potential in a strong coupling plasma from the AdS=CFT correspondence

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With the dielectric function obtained from AdS/CFT correspondence, we investigate the strong-coupling wake potentials induced by the fast-moving charged particles with velocities v=0.55c and v=0.99c, respectively, and compare them with those in the weak-coupling case. We find that for v= 0.99c, the remarkable oscillation akin to Cherenkov-like radiation and the Mach cone in the

weak-coupling wake potential does not appear in the strong-coupling wake potential, which may indicate that the phase velocity of the strong-coupling plasmon mode will not be lower than the speed of light. Besides this prominent difference, the wake potentials in strong and weak coupling are qualitatively similar except for some detailed discrepancies. For example, when v= 0.55c, the strong-coupling wake potential shows a deeper negative minimum in the backward direction than that in the weakcoupling wake potential, the depths and positions of the negative minimum for strong- and weak-coupling wake potentials display opposite variation tendencies with the increase of particle velocity, and the wake potential in strong coupling is less sensitive to the particle velocity than the weak-coupling wake potential.

**Summary**:

With the dielectric function computed from the AdS/CFT correspondence, we studied the wake potential induced by a fast moving charge in a strong-coupling plasma and compared it with the weak-coupling wake potential for different particle velocities as v= 0.55c and v=0.99c. The most prominent difference between strong and weak wake potential is that, when v=0.99c, the remarkable oscillation due to Cerenkov-like radiation and the Mach cone in weak coupling disappears in strong coupling, which implies that the plasmon mode with phase velocity lower than the speed of light dose not exist in thestrong-coupling plasma.

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## Quantifying pre-thermal chiral magnetic effect with chiral kinetic theory

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**Summary**:

Chiral anomaly is a fundamental aspect of the quantum theory for chiral fermions. In a many-body system containing chiral fermions, such as the hot quark-gluon plasma created in heavy ion collisions at RHIC and the LHC, the chiral anomaly leads to macroscopic anomalous transport effects. A notable example is the chiral magnetic effect (CME), in which a vector current is generated along an external magnetic field given a nonzero imbalance between right-handed and left-handed fermions in the system. An observation of the CME is of great interest and significant efforts have been made. Current experimental data show encouraging evidences, but suffer from backgrounds. Realistic and quantitative modeling of CME signal is thus critically needed. The magnetic field in heavy ion collisions, however, is likely very short-lived, with its life time shorter than the onset time of hydrodynamics. It is thus a most pressing issue to simulate the CME in the pre-thermal stage in heavy ion collisions. The theoretical tool to do this, is the so-called chiral kinetic theory. We report the first attempt to utilize this tool for quantifying the pre-thermal CME. Exact solutions for collision-less case as well as the relaxation-time-approximation are obtained and used to compute two different CME-induced consequences: a pre-thermal charge separation across reaction plane, as well as a nonzero anomalous current along B field direction. We discuss the integration of these CME-induced initial conditions with subsequent hydrodynamic evolutions, and the implication of such results for the description of experimental data.

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## The strange quark-antiquark asymmetry of the nucleon

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**Summary**:

The question wether there is a quark-antiquark asymmetry of the nucleon is an important issue concerning the basic structure of matter. I present a review on the studies concerning the nucleon strangeness quark-antiquark asymmetry. Our studies show that the nucleon strangeness asymmetry might be positive and could be large enough to explain a number of experimental observations: the NuTeV anomaly; with heavy quark recombination to give a sizable influence on the measurement of the nucleon strangeness asymmetry in CCFR and NuTeV dimuon measurements; the difference between Lambda and anti-Lambda spin transfers.

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## Charmonium production in ultra-peripheral heavy ion collisions with two-photon processes

**Authors:** Gong-Ming Yu[1]; Jian-Song Wang[1]

**Co-authors:** Yue-Chao Yu [2]; Yun-De Li [3]

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[2] *Department of Physics, Yunnan University,*

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**Summary**:

We calculate the production of large-pT charmonium and narrow resonance state (exotic charmonium) in proton-proton, proton-nucleus, and nucleusnucleus collisions with the semi-coherent two-photon interactions at Relativistic Heavy Ion Collider (RHIC), Large Hadron Collider (LHC), and Future Circular Collider (FCC) energies. Using the large quasi-real photon fluxes, we present the \gamma\gamma⟶H differential cross section for charmonium and narrow resonance state production at large transverse momentum in ultraperipheral heavy ion collisions. The numerical results demonstrate that the experimental study of ultra-peripheral collisions is feasible at RHIC, LHC, and FCC energies.

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## Continuum-coupling effects in heavy meson spectroscopy and structure

**Authors:** Elena Santopinto[1]; Jacopo Ferretti[2]

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**Summary**:

Continuum coupling effects can play an important role in heavy meson spectroscopy and structure, especially in the case of mesons close to open- or hidden-flavor meson-meson decay thresholds. I will discuss some of the most relevant cases, including the X(3872) and the χb(3P) system, and show how the presence of these thresholds can induce mass shifts with respect to naïve QM predictions for the bare meson masses. I will also discuss how continuum coupling effects can be introduced in the QM formalism to calculate some of these mesons' main decay modes.

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## Magnetic and vorticity fields in heavy ion collisions

**Author:** Xiaoliang Xia[1]

**Co-authors:** Qun Wang [2]; 慧李 [2]

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**Summary**:

Strong magnetic and vorticity fields in heavy ion collisions can induce anomalous transport effects such as CME, CVE, CMW and CVW. We study the vorticity fields of the colliding system at energies $\sqrt{s} = 7.7 - 200$ GeV by AMPT model. Our results show a non-trivial spatial distribution of vorticity, and are consistent with the recent measurement of global Lambda polarization by STAR Collaboration. In this presentation, we will discuss the anomalous transport effects induced by such a non-trivial vorticity distribution. We also discuss the corresponding effects caused by magnetic field.

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## Anisotropic transverse flow generated by Chiral anomaly in heavy ion collision

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**Summary**:

The properties of matter at extreme densities and temperatures where quarks and gluons which so-called Quark Gluon Plasma (QGP) are very fundamental questions in Quantum Chromo Dynamics (QCD). The recent Heavy Ion collision experiment (i.e.Heavy Ion Collider (RHIC) and the CERN Large Hadron Collider (LHC)) allow us to create and study the properties of the QGP matter in the laboratory. The anisotropy of produced particles is one of the probes of the properties of the GQP matter. In this talk we will discuss the anisotropic transverse flow generated by chiral anomaly which is from Pion decay

to photons. The result maybe useful to explain the problem of the large experiment data of elliptic flow compare with recent theoretical predictions.

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## Charm physics at BESIII

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**Summary**:

Based on 2.93, 0.5 and 0.57 fb−1 data taken at the center-of-mass energies of √s = 3.773, 4.01, and 4.6 GeV with the BESIII detector at the BEPCII collider, we will report the precise measurements of decay constant fD+ and FDs+, CKM elements |Vcs| and |Vcd|, form factors in D semileptonic decays as well as the measurements on strong phases. These measurements are important in testing the SM models and provide important experimental information in probing for new physics. We will also report some important works in Lambadac+ physics performed at BESIII, such as the first absolute measurements of the branching fractions for the Lambdac+ semileptonic decays as well as hadronic decays.

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## 手征微扰论与轻赝标介子的有限温度效应

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**Summary**:

本报告介绍在 U(3) 手征微扰论框架下，对 QCD 轻味赝标介子质量和衰变常数的次次领头阶计算，以及探讨相关格点 QCD 数值结果的手征延拓。报告将着重讨论 eta-eta’ 粒子的混合问题，尤其是深入揭示双混合角度的理论机制，以及混合参量同手征耦合常数的关系。另外，我们也将在手征微扰论中引入有限温度的效应，进而给出模型无关的轻味赝标介子质量和衰变常数对温度的依赖结果

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## Cumulants of net-charge distribution and net-proton distribution from iEBE-VISHNU hybrid model

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**Summary**:

Non-Gaussian moments and their products of fluctuations of conserved quantities, e.g. net charges and net baryons, are proposed to be sensitive observables for probing the signature of Quantum Chromodynamic phase transition and locating the critical point. In this article, we investigate the the centrality dependence of cumulants/cumulants products of net–chargeand net-proton distributions for Au+Au collisions at $\sqrt{s_{NN}} = 7.7$ ,39 and 200 GeV by using the iEBE-VISHNU hybrid model. The effects of volume corrections (volume distributions and volume fluctuations), hydrodynamics evolution, resonance/weak decays,
as well as realistic acceptance cuts for both reference particles and fluctuation measures have been embodied in the iEBE-VISHNU hybrid model. With Poisson approximation for the products particles at the Cooper-Frye hypersurface and some realistic acceptance cuts for the final particles of interest, the iEBE-VISHNU model show resonable descriptions for net-charge and net-proton data reported by the STAR collaboration.

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## From baryon to dibaryon

**Author:** Jialun Ping[1]

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Gaussian expansion method (GEM) is a powerful method with high precision for few-body problems. The baryon and dibaryon are investigated in the framework of constituent quark model by using GEM.

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## Proton Cumulants and Correlation Functions in Au + Au Collisions at RHIC BES Energies from UrQMD Model

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**Summary**:

In this work, we will discuss the proton cumulants and correlation functions in UrQMD model. Our calculation is performed at energies of RHIC BES which $\sqrt{s_{\rm NN}}$ are 7.7, 11.5, 19.6, 27, 39, 62.4 and 200 GeV. We analysis the dependence of rapidity and acceptance of cumulants, as well as the correlation functions, which extract the information of 2, 3 or 4-particle correlation. At last we study the energy dependence and compare our calculation to the STAR preliminary results. The comparison suggests that there is other dynamics which leads to the enhancement of 2 or 4 particles correlation and the fourth order cumulants beyond our numerical calculation.

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## A dynamic study on 5-quark systems in chiral quark model.

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**Summary**:

The pentaquark $P_c^+(4380)$ and $P_c^+(4450)$ have been just observed in the decay of $\Lambda_b^0$, $\Lambda_b^0 \to J/\Psi K^- P$ by the LHCb collaboration in 2015. The interesting in 5-quark systems is revived again just followed the report of $\Theta^+$ in 2003. Based on these facts, a dynamic study on 5-quark systems is performed in chiral quark model with the help of Gaussian expansion method(GEM). A review on the non-strangeness part of 5-quark systems, along with the $sssu\bar{u}$, $sssdd\bar{}$ systems with all possible quantum(IJ) in negative parity are presented. Five $\Omega_c^0$ excited states($\Omega_c(3000)^0, \Omega_c(3050)^0, \Omega_c(3066)^0, \Omega_c(3090)^0, \Omega_c(3119)^0$) discovered also by the LHCb experiment, recently, is investigated in the framework of $sscu\bar{u}$, $sscdd\bar{}$.

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## Measurement of Hadron Form Factor at BESIII

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**Summary**:

Form factor of proton has been measured with scan data which result was published
in Physics Review D. There are also preliminary results on Lambda form factors based on
2011 and 2012 scan data. Comparison with other experiments, our results are more preciser.
BESIII preformed a unique high luminorsity scan (˜555pbˆ{-1}) in the energy region from 2.0 to 3.08 GeV
, mainly in order to measure baryon form factor with higher precision.

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## Phenomenological study of the hadron correlation and fluctuation in relativistic heavy ion collisions

**Author:** Jun Song[1]

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**Summary**:

The presentation is concentrated on the multiple correlations among the multiplicities of identified hadrons. We report our recent results of the correlation and fluctuation of identified hadrons in quark combination model. By comparing the predictions with existing and/or future experimental data of AA collisions at LHC and RHIC, we discuss how to test the model itself and obtain deep insights into the microscopic mechanism of hadron production at hadronization.

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## $\eta' \to \eta\pi\pi$ decays within one-loop $U(3)$ resonance chiral theory and its unitarisation

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**Summary**:

In this work we examine the hadronic $\eta' \to \eta\pi\pi$ decays.
Our study is carried out within the framework of $U(3)_L \otimes U(3)_R$ ChPT including, for the first time, both the complete one-loop corrections and resonances states.
The amplitude is projected in partial waves and unitarised by means of the $N/D$ method resumming $\pi\pi$ and $\pi\eta$ final state interactions.
Our parameterization is suited to obtain, from fits to experimental data, the corresponding Dalitz plot parameters as well as to determine the parameters, mass and width, of the participating scalar resonances driving the decay.

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## U A (1) symmetry broken and anomaly current in a parallel electromagnetic field

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**Summary**:

In this paper, we're going to explore the $U_A(1)$ symmetry broken and anomaly current in a parallel electromagnetic field.We relax the SU(2) Nambu-Jona-Lasinio (NJL) model to investigate the condensations induced by electromagnetic field which contains chiral condensation, $\pi^0$, $\eta$ condensation and mass splitting. We also calculate the $U_A(1)$ susceptibility, which reflects the degree of the $U_A(1)$ symmetry broken.

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## rho meson generalized parton distributions with light-front constituent quark model

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## The study of Chiral Magnetic Current in heavy ion collisions

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## Refractive index in quark-gluon plasma

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## $B_s\pi$–$B\bar{K}$ interaction in finite volume and the nature of $X(5568)$

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Recently, the observation of the X(5568) by the D0 Collaboration has attracted a lot of interest both theoretically and experimentally. In a previous study(arXiv:1309.4743[hep-ph]), based on a fit to the lattice QCD scattering lengths of $DK$ and its coupled channels,
unitary chiral perturbation theory (UChPT) can dynamically generate the $D_{s0}(2317)$. Inspired by that work and the recent work of Albaladejo and Eulogio where
one could tune the interaction such that the X(5568) can be generated within UChPT (arXiv:1603.09230 [hep-ph]),
we performed a coupled channel calculation on X(5568) in UChPT
considering the $B_s\pi$ and $B\bar{K}$ coupled channels. Further more, we computed the discrete energy levels of the $B_s\pi$ and $B\bar{K}$ system in finite volume.
Our results show that the $B_s\pi$ and $B\bar{K}$ interaction is weak and the X(5568) cannot be a $B_s\pi$ and $B\bar{K}$

molecular state. Therefore, the X(5568) and the $D_{s0}(2317)$ cannot simultaneously be of molecular nature, from the perspective of heavy quark symmetry and chiral symmetry. The comparison with the latest lattice QCD simulations, which disfavors the existence of the X(5568), supports our picture. In addition, we show that the (generalized) Weinberg compositeness condition also indicates that the X(5568) cannot be a molecular state made from $B_s\pi$ and $B\bar{K}$ interactions.

**Summary**:

We report on a recent study of the $B_s\pi$ and $B\bar{K}$ interactions in finite volume and the nature of the X(5568) (arXiv:1607.06327[hep-ph])