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Abstract: Workshop

Parton densities in QCD: Integrated and Unintegrated

Avsar, Emil

Di-lepton production in heavy ion collisions by full 3D hydrodynamic model

Akamatsu, Yukinao

The di-lepton production from the medium is calculated in the low invariant mass region using the full 3D hydrodynamic model. The spectral function of the vector current at all temperature is modeled with a constraint from the in-medium QCD sum rule. We show that the dependence of the di-lepton spectra on the equation of state is large and that it is one of the main causes for the discrepancy between the theoretical calculation and the experimental data of di-leptons at PHENIX.

Recent progress in Color Glass Condensate phenomenology at NLO

Albacete, Javier Lopez

The Color Glass Condensate is the effective theory of QCD for high energy scattering. The recent theoretical progress achieved through the calculation of next-to-leading order corrections to the small-x renormalization group equations has opened up a period for precision CGC phenomenology. I shall present CGC analyses of experimental data for the inclusive structure functions in electron-proton scattering as measured in HERA. Next I shall present a description of inclusive particle production measurements in high energy proton-proton, deuteron-gold and gold-gold collisions carried out at RHIC. Together, these works yield a consistent picture that present experiments can probe the non-linear part of the hadronic and nuclear wave functions at small-x, and that they can be successfully described by the CGC effective theory of QCD at high energies. Prospects for both the proton-proton and heavy ions programs at the LHC will be discussed.

Universal behavior of the gluon saturation scale at high energy including full NLL BFKL effects

Beuf, Guillaume

The universal travelling wave solution to the Balitsky-Kovchegov equation with running coupling (and other equations in the same universality class) is extended to subleading orders at large rapidity and k_t. The large rapidity expansion of $\log(Q_s(Y))$ is derived from that traveling wave solution. In addition to the two aldready known leading terms in $Y^{1/2}$ and $Y^{1/6}$, which are determined only by the LL BFKL kernel, the three following terms in Y^0, $Y^{-1/6}$ and $Y^{-1/3}$ are obtained. They are universal and sensitive to NLL BFKL effects. Initial condition dependence and NNLL BFKL effects would both start to appear only at the next order, which is in $Y^{-1/2}$.

Heavy-ion collisions – puzzles and hopes

Blaizot, Jean-Paul

A path integral for heavy quarks in a hot plasma

Blaizot, Jean-Paul

The scale dependences of TMD asymmetries

Boer, Daniel

The scale dependence of twist-three contributions to single spin asymmetries

Braun, Vladimir

We reexamine the scale dependence of twist-three correlation functions relevant for the single transverse spin asymmetry in the framework of collinear factorization. Evolution equations are derived for both the flavor–nonsinglet and flavor–singlet distributions and arbitrary parton momenta.

The NNPDF approach to parton determination: ideas and results

Forte, Stefano

From soft to hard QCD and back

Frankfurt, Leonid Lev

Peripheral and central pp collisions in soft and hard QCD and feasibility to disentangle them. Evidences at HERA on the dominance of double logarithmic evolution in hard diffractive processes. Double logarithmic QCD evolution as the residue for Pomeron and its length in rapidity space. Conflict of pQCD with probability conservation, black disc limit and energy dependence of structure functions. Some consequences for LHC physics. Preselection as the fake energy losses.

Onset of hydrodynamical flow in a system of strong fields

Gelis, Francois

Future polarized Drell-Yan Experiments

Goto, Yuji

Heavy Quarks in QGP from Lattice QCD – a review –

Hatsuda, Tetsuo

Novel diagrammatic method for computing transport coefficients and transport properties in the semi quark gluon plasma

Hidaka, Yoshimasa

Decay of Glasma and Equipartition of Momenta by Nielsen-Olesen Instability

Iwazaki, Aiichi

We discuss decay of glasma, that is, coherent color electric and magnetic fields produced in high energy heavy-ion collisions. The magnetic fields decay by Nielsen-Olesen instabilities and equipartition of longitudinal momenta is accomplished by the instabilities. In particular secondary instability of Nielsen-Olesen instabilities plays an important role on the equipartition. We also discuss generally with use of chiral anomaly that the electric field component of the glasma decays very rapidly by quark-antiquark pair productions.

New Analysis of the Single Transverse-Spin Asymmetry for Hadron Production at RHIC

Kanazawa, Koichi

We study the Single transverse-Spin Asymmetry(SSA) for pion and kaon productions in the pp collision based on the twist-3 mechanism in QCD. By taking into account of the soft-gluon-pole(SGP) and the soft-fermion-pole(SFP) contributions associated with the quark-gluon correlation functions in the polarized proton, we perform a fit to the experimental data at RHIC. From this analysis we find that all the RHIC data for SSA including its P_T dependence can be well described by the combination of the two effects, while it is difficult to explain all the data by one of them. In this talk, I will also discuss the roles of the SGP and SFP contributions from each quark-flavor in details.

Photon parton distribution functions and mass effects

Kitadono, Yoshio

Photon PDFs can be predicted by pQCD. It will be useful to study the behavior of QCD at high energy. Though massless photon PDFs have been studied by many authors, mass effects on photon PDFs are important. We consider the several way to treat mass effects. Such a study might be useful to understand PDFs in the nucleon.

Using HERA Data to Determine the Infrared Behaviour of the BFKL Amplitude

Kowalski, Henri

I describe the determination of the infrared behaviour of the BFKL forward amplitude for gluon-gluon scattering. This amplitude leads to an excellent description of the new combined inclusive HERA data at low values of $x(< 0.01)$ and at the same time determines the unintegrated gluon density inside the proton, for squared transverse momenta of the gluon less than 100 GeV^2. The phases of this amplitude are sensitive to the non-perturbative gluonic dynamics and to the presence of Beyond-the-Standard-Model particles at very high energies. arXiv:1005.0355

Polarized PDFs and Higher Twist

Leader, Elliot

Leader, Sidorov and Stamenov (LSS) have finally developed the numerical tools needed to carry out a joint analysis of inclusive DIS and semi-inclusive DIS. I will present the results of our first analysis. Compared with the DSSV study, we do not analyse RHIC pp, but have a larger data set for DIS and SIDIS. Further we handle the kinematics more accurately, and include target mass and dynamical higher twist corrections in the DIS part of the analysis. Broadly speaking our results for the sea quarks are consistent with those of DSSV ,but for the polarized gluon we find two kinds of solution, one with a node, the other purely positive. The SIDIS data seem to have no effect on the proton HT terms, but modify the neutron values.

A factorized approach to hard jet modification in dense matter

Majumder, Abhijit

Study of thermalization in AdS/CFT

Mueller, Berndt

Kadanoff-Baym Approach to Thermalization of Gluonic Matter

Nishiyama, Akihiro

Recent phenomenological analysis in relativistic heavy ion collisions at RHIC in terms of ideal hydrodynamics suggests that local thermalization is achieved very rapidly in the dense gluonic system created by the collision. The thermalization time scale is much earlier than the time scale which has been expected from naïve parton picture. The Boltzmann equation that describes dilute gas systems can not explain the early thermalization processes with usual binary collision and should not be applied for the dense gluonic system which appears in the formation processes of the collision. Hence we try to apply the relativistic Kadanoff-Baym (KB) theory to describe the time evolution of the gluonic matter produced in relativistic heavy ion collision. The merit of this approach is that it can incorporate the off-shell quantum processes of partons, such as particle number changing processes, memory effects, etc, in the collision processes. These off-shell effects are usually ignored in the classical Boltzmann approach. In the presentation we first introduce our study on non-equilibrium quantum evolution of the model systems described by scalar field theories. We present the analytic proof of the H-theorem with the relativistic KB equation. Second we show the numerical results that describe the entropy production and thermalization of quantum fields due to off-shell effects. Finally we apply our analysis to nonequilibrium gluonic matter. Based on the trial to prove the H-theorem for the gauge theory, we discuss nonequilibrium property of gluonic system, such as entropy production, isotropization, kinetic equilibrium, chemical equilibrium, due to off-shell effects by numerical simulations.

Understanding Jet Energy Loss in QCD at Weak and Strong Coupling

Noronha, Jorge

After reviewing the major discoveries related to the quenching of jets at RHIC, I will discuss the main assumptions behind the different energy loss formalisms defined at weak coupling. Then, I will show how the gauge/string duality can be used to describe jet quenching in a strongly-coupled plasma whose thermodynamic properties match lattice QCD results. Predictions based on the gauge/string duality for the nuclear modification factor of heavy quark jets at RHIC and the LHC will be compared with the corresponding state-of-the-art, Monte-Carlo perturbative calculations based on the Gyulassy-Levai-Vitev formalism.

Diffraction at the LHC and the ATLAS Forward Physics project

Royon, Christophe

The proton spin and the muon spin

Saito, Naohito

Hadron Structure from Lattice QCD

Schierholz, Gerrit

Lattice calculations of hadronic structure have now reached the point where simulations at physical quark masses on lattices large enough to accommodate the pion are feasible. In this talk I review the recent progress that has been made in this exciting area. Among the topics being discussed are form factors, moments of polarized and unpolarized parton distributions, transversity and contributions of higher twist.

Diphoton production in hadron collisions

Schlegel, Marc

The production of photon pairs in hadron collisions is discussed for TMD-factorization as well as for collinear factorization at larger transverse diphoton momenta. We focus in particular on the Sivers effect and present numerical predictions for the PHENIX and STAR experiments.

Open problems in hot QCD: lattice and continuum

Schroeder, York

I discuss the status of weak-coupling approaches to QCD thermodynamics, and highlight the open problems that that need to be attacked in the near future.

Hadrons in Holographic QCD (review)

Sugimoto, Shigeki

Initial state eccentricity from AdS/CFT

Taliotis, Anastasios S

We investigate the Stress-Energy (SE) tensor that is produced in heavy Ion collisions at early proper times using tools from AdS/CFT. The ultimate goal is to look for thermalization. For this reason, we calculated the SE tensor of the gauge Theory by reconstructing the corresponding metric tensor in the dual theory. In particular we construct an expansion of the SE tensor in powers of the proper time. We show to correspond on the gravity side to a perturbative expansion of the metric in graviton exchanges. The calculation of the Leading Order (LO) term in the graviton exchanges was performed and reproduced our earlier results. The Einstein equations are solved by using as initial conditions, two shock waves colliding in an AdS5 background representing the colliding nuclei. It is found that they stop after the collision. In the gauge theory side this would imply a complete nuclear stopping due to strong coupling effects, likely

leading to Landau hydrodynamics. The stopping is not instantaneous and hence this avoids the standard counter-arguments in the literature. Higher order terms in the expansion have been calculated and it has Been shown that the SE tensor of the produced medium is encoded in a single function; a result consistent with the symmetries of the problem. In addition the problem of proton-Nucleus was solved. There, through a more accurate calculation it was verified that the proton stops probably yielding to Landau hydrodynamics and confirmed our earlier conclusions. Finally, we incorporate transverse dynamics in the problem through a simple model in order to mimic more realistically the collisions.

On the twist-3 mechanism for single transverse-spin asymmetry in semi-inclusive DIS

Tanaka, Kazuhiro

We discuss the single-spin asymmetry in semi-inclusive DIS, $ep^{\uparrow} \to e\pi X$, based on the twist-3 mechanism in the collinear factorization relevant for the pion production with the large transverse-momentum. This updates our previous study by including, in particular, the contributions induced by the novel partonic subprocesses, and allows us to derive the entire formula for the corresponding single-spin asymmetry associated with a complete set of the twist-3 quark-gluon correlation functions in the transversely polarized nucleon. We discuss the correspondence with the results obtained by the transverse-momentum-dependent factorization relevant for the pion production with the low transverse-momentum.

Particle production from expanding electric fields

Tanji, Naoto

Particle production via the Schwinger mechanism from an electric field which expands to the longitudinal direction in a boost-invariant way is investigated as a matter formation mechanism in the early stage of heavy-ion collisions. I will discuss the effects of expanding geometry on pair creation. Due to the boost-invariant configuration of the electric field, particles created from the field have non-trivial multi-particle correlations in momentum space.

What do we really know about the origin of the proton spin?

Thomas, Anthony William

I will discuss the tremendous progress made in unerstanding the spin of the proton in terms of quark spin and orbital angular momentum. I will also explain the limits of that knowledge, especially in regard to current lattice calculations.

(1) The role of orbital angular momentum in the proton spin (2) On gauge-invariant decomposition of nucleon spin

Wakamatsu, Masashi

Unified presentation of the above two papers. (1) Eur. Phys. J. A44 (2010) 297 ; arXiv : 0908.0972 (2) arXiv : 1004.0268

Recent STAR Results on Angular Correlations

Wang, Fuqiang

I will present recent results from RHIC/STAR on hadron angular correlations. In particular I will focus on the jet-like correlations and the long range pseudo-rapidity correlations, and the roles of the medium and the jet-medium interactions. I will discuss what we may learn from these correlation measurements about the properties of the medium created at RHIC.

The heavy quark mass effect on the longitudinal photon structure function $F_L(x, Q^2, m^2)$

Watanabe, Norihisa

The longitudinal photon structure function $F_L(x, Q^2, m^2)$ is investigated in the massive quark parton model with one-gluon exchange. The phase space integrals are performed by using the Cutkosky rules. The infrared and ultraviolet divergences are regularized by the n-dimensional method. The algorithm FIRE is applied to reduce the two-loop integrals into a linear combination of a few master integrals. Finally, the dependence of $F_L(x, Q^2, m^2)$ on the heavy quark mass is discussed.

STAR Physics Program at RHIC

Xu, Nu

Probing triple-gluon correlations by ep and pp collisions

Yoshida, Shinsuke

Large single spin asymmetries(SSA) are one of the unsolved problems in high energy hadron scatterings. A study of SSA is now considered as a good way to investigate the effect of multi-parton correlations in the nucleon, which has been neglected in the conventional parton model. So far there has been lots of studies on the role the quark-gluon correlations in the literature. In this talk, I will discuss the contribution from purely gluonic correlations represented by the triple-gluon correlation functions in the nucleon. To probe this triple gluon correlation, SSA for the D-meson production in ep and pp scatterings is an appropriate process, since $c\bar{c}$ pair is created mostly from photon-gluon or gluon-gluon fusion processes. We will present a cross section for this process from the triple gluon correlations and discuss its characteristics. I will also comment on the previous study on the same subject.

Abstract: Symposium

Experimental study of Quark Gluon Plasma at RHIC

Akiba, Yasuyuki

Experimental results of RHIC in its first decade firmly established that hot dense partonic matter, a quark gluon plasma (QGP), is formed in heavy ion collisions at RHIC. Unlike some early expectation, the QGP formed at RHIC is not a weakly-coupled gas of quark and gluons, but instead appears to be a strongly-coupled liquid with very low viscosity. RHIC is now moving into an exciting phase of quantitatively characterizing the properties of the "strongly-coupled" QGP. Experimental results of RHIC are reviewed.

Nucleon parton distributions for collider physics

Alekhin, Sergey

We discuss phenomenological determinations of the parton distribution functions (PDFs) in the nucleon based on the global fits of PDFs to the selected set of the hard-scattering processes. The basics and the state of art of the global PDF fits are described. The remaining uncertainties in the modern PDFs are discussed and impact of these uncertainties on the standard candle processes cross section at the LHC and Tevatron collider is reviewed.

Particle physics at the LHC start

Altarelli, Guido

A status report on particle physics and an overview of possible discoveries at the LHC

The TOTEM experiment at the LHC

Avati, Valentina

Non-linear evolution in CCFM and the saturation of the saturation scale

Avsar, Emil

HERA physics highlights review

Behnke, Olaf

I will present physics highlights from the two collider experiments H1 and ZEUS at HERA. The worldwide only electron proton collider HERA stopped in mid 2007 its operation. The analysis of the almost 1 fb-1 data taken in total by H1+ZEUS is still going on. I will show some recent and new high precision results in the area of hard QCD and structure functions.

Transverse (spin) structure of hadrons

Burkardt, Matthias

Parton distributions in impact parameter space, which are obtained by Fourier transforming GPDs, are exhibit a significant deviation from axial symmetry when the target and/or quark is transversely polarized. In combination with the final state interactions, this transverse deformation provides a natural mechanism for naive-T odd transverse single-spin asymmetries in semi-inclusive DIS. The deformation can also be related to the transverse force acting on the active quark in polarized DIS at higher twist.

Quarkonium in a non-ideal QCD plasma

Dumitru, Adrian

I discuss effects due to non-vanishing plasma viscosity and partial deconfinement (non-trivial Polyakov loop) on the static potential and on quarkonium bound states

Parton saturation: from HERA to LHC

Golec-Biernat, Krzysztof Jan

I will give an overview of experimental aspects of parton saturation effects based on existed and planned analyses.

Heavy quark and quarkonia production in high energy nucleus-nucleus collisions at RHIC and LHC

Gunji, Taku

Recent experimental progress in heavy quark and quarkonia production in p+p, p+A and A+A collisions at RHIC and LHC is reviewed. Future pespectives at RHIC and LHC will be also covered in this talk.

Physics to be explored at the LHC

Hagiwara, Kaoru

I wish to explain what I expect LHC to show us.

The first results from ALICE

Hamagaki, Hideki

Test of universal rise of hadronic total cross sections based on pi p, Kp and anti-p p, pp scatterings

Ishida, Muneyuki

Recently there are several evidences of the hadronic total cross section sigma(tot) to be proportional to B (log s)2 consistent with the Froissart unitarity bound. The COMPETE collaborations have further assumed sigma(tot) = B (log s/s0)2 + Z to extend its universal rise with the common value of B and s0 for all hadronic scatterings to reduce the number of adjustable parameters. The coefficient B was suggested to be universal in the arguments of colour glass condensate (CGC) of QCD in recent years. There has been, however, no rigorous proof yet based only on QCD. We attempt to investigate the value of B for pi+- p, K+- p and pbar p,pp scatterings respectively through the search for the simultaneous best fit to the experimental sigma(tot) and rho ratios at high energies. The sigma(tot) at the resonance and intermediate energy regions has also been exploited as a duality constraint based on the special form of finite-energy sum rule(FESR). We estimate the values of B, s0 and Z individually for pi+- p, K+- p and pbar p,pp scatterings without using the universality hypothesis. It turs out that the values of B are mutually consistent within one standard deviation. It has to be stressed that we cannot obtain such a definite conclusion without the duality constraint. It is also interesting to note that the values of Z for pi p, Kp and pbar(p)p approximately satisfy the ratio 2:2:3 predicted by the quark model. The obtained value of B for pbar(p)p is Bpp = 0.280 +- 0.015 mb, which predicts sigma(tot)(pp) =108.0 +- 1.9mb and rho(pp) =0.131+- 0.0025 at the LHC energy $s^{0.5}$ =14 TeV.

The first result from LHCf experiment

Itow, Yoshitaka

The LHCf experiment measures neutral particle production at 0 degree of LHC dedicated to verify hadron interaction models used for air shower simulation of very high energy cosmic rays. The first result is forseen.

The color glass condensate: signatures and probes in high energy nuclear collisions

Jalilian-Marian, Jamal

After an overview of saturation physics and the Color Glass Condensate (CGC), I go over the signatures of CGC and how it may be probed in high energy nuclear collisions, for example, at RHIC and LHC.

Shock wave collisions and thermalization in AdS_5

Kovchegov, Yuri V

We construct a model of high energy heavy ion collisions as two ultrarelativistic shock waves colliding in AdS_5. Using AdS/CFT correspondence we argue that this setup corresponds to describing a heavy ion collision at strong coupling. We argue that expansion of the energy density of the medium produced in the collision in the powers of proper time squared corresponds on the gravity side to a perturbative expansion of the metric in graviton exchanges. We point out that shock waves corresponding to physical energy-momentum tensors of the nuclei completely stop almost immediately after the collision in AdS_5, which, on the field theory side, corresponds to complete nuclear stopping due to strong coupling effects, likely leading to Landau hydrodynamics. Since in real-life heavy ion collisions the large Bjorken-x part of nuclear wave functions continues to move along the light cone trajectories of the incoming nuclei leaving the small-x partons behind, we conclude that a pure large coupling approach is not likely to adequately model nuclear collisions. We also perform a trapped surface analysis and show that production of a black hole is unavoidable in shock wave collisions, corresponding to production of a thermal medium in the gauge theory.

Gluon correlations in the Glasma

Lappi, Tuomas

The physics of the initial conditions of heavy ion collisions is dominated by the nonlinear gluonic interactions of QCD. These lead to the concepts of parton saturation and the Color Glass Condensate (CGC). This talk concentrates on recent progress in calculating multi-gluon correlations in this framework. We argue that in some respect these correlations are easier to compute in a dense system (nucleus-nucleus) than a dilute one (proton-proton). This is caused by the fact that in the dense case the correlations at high energy are dominated by large logarithms of the energy that can be resummed by high energy evolution of the nuclear wavefunctions.

High-energy hadron-hadron (dipole-dipole) scattering on the lattice

Meggiolaro, Enrico

I will discuss how the problem of the high-energy hadron-hadron (dipole-dipole) scattering at low momentum transfer can be approached from the point of view of lattice QCD, by means of Monte Carlo numerical simulations. In the first part, I will give a brief review of how high-energy scattering amplitudes can be reconstructed, using a functional integral approach, in terms of certain correlation functions of two Wilson loops and I will briefly recall some relevant analyticity and crossing-symmetry properties of these loop-loop correlation functions, when going from Euclidean to Minkowskian theory. In the second part, I will show how these (Euclidean) loop-loop correlation functions can be evaluated in lattice QCD and how numerical results compare with some nonperturbative analytical estimates appeared in the literature, discussing in particular the question of the analytic continuation from Euclidean to Minkowskian theory and its relation to the still unsolved problem of the asymptotic s-dependence of the hadron-hadron total cross sections.

First results from the LHCb experiment

Pellegrino, Antonio

Probing hadron structure with a polarized hadron beam

Qiu, Jianwei

Jet physics at Tevatron and LHC / The ATLAS forward physics project : the search for Higgs boson and anomalous couplings

Royon, Christophe

Overview

Schaefer, Andreas

The determination of GPDs is one of the most cited motivations for a number of new experiments and accelerators (COMPASS, JLab 12 GeV upgrade, EIC, ELIC etc. A status report is given on how well this can be done in practice, using pQCD analysis, global fits and lattice results.

Experimental aspects of diffraction

Schoeffel, Laurent

The important results on hadronic diffractive phenomena obtained at HERA and Tevtaron are reviewed. The lattest precision measurements for inclusive diffractive structure fonctions are presented in details. These results are discussed in the context of QCD fits and new diffractive PDFs from HERA as well as in a dipole model approach based on the idea of saturation. Then, issues on the potential impact of saturation effects in diffractive phenomena are proposed. Exclusive diffractive processes in ep collisions complement these results and views with the interesting outcome of nucleon tomography. All these results, now final from HERA, are presented. In the continuity from HERA and Tevtatron experiments, some challenges for understanding diffraction at the LHC are outlined.

NNLO hard thermal loop thermodynamics

Strickland, Michael

I will discuss a recently completed calculation of the NNLO calculation of the HTL-reorganized thermodynamics for QCD. I will review the basic idea of reorganization of finite temperature perturbation theory and motivate why this hard work is necessary. The final result will be a comparison of the NNLO calculation for the pressure, energy density, and entropy. I will show that the HTL-reorganized calculation agrees quite well with available lattice data down to temperatures on the order of 2 to 3 times the critical temperature. Finally, I will present an outlook for the application of the method to real time quantities such as transport coefficients, heavy quark drag/diffusion, etc.

Transverse structure of the nucleon and mutiparton interactions

Strikman, Mark

I will review theory of leading shadowing and its predictions for nuclear pdfs, diffraction and inelastic states. Signals for onset of black regime will be reviewed as well.

High energy scattering after AdS/CFT

Tan, Chung-I

First physics results from CMS

Thea, Alessandro

Latest results from ATLAS

Tsuno, Soshi

We present the latest results from ATLAS. We report the first observation of W/Z bosons, and several physics results in 7TeV pp collisions as well as the performances of the particle identification in ATLAS detector. Also we discuss the minimum bias results, which indicates strong interaction by the soft QCD events.

Unveiling the nuclear structure at small x with pA collisions

Tuchin, Kirill

Jet physics in heavy-ion collisions

Vitev, Ivan Mateev

The connection between particle and nuclear physics is, arguably, most strongly manifested at the high-energy frontier. In recent years, advances in QCD theory have allowed the calculation of many processes that include jets, heavy flavor and electroweak final states at next-to-leading order and, in some cases, at next-to-next-to-leading order. At the same time, the many-body theory of parton and hadron in-medium interactions has shed light on the stopping power of large nuclei and strongly-interacting quark-gluon plasmas for such energetic particles. Today these developments come together to provide the basis for the ongoing and future searches for new forms of matter: from the elusive dark matter to the phase transitions that are conjectured to have occurred in the early universe. I will discuss the recent advances in QCD theory in light of the current and upcoming experimental opportunities in particle and nuclear physics at RHIC and at the LHC

Jet and electromagnetic tomography of dense matter in high-energy heavy-ion collisions

Wang, Xin-Nian

In the search for quark-gluon plasma in high-energy heavy-ion collisions, hard and electromagnetic processes during the reaction serve as excellent probes of the dense matter. These large transverse momentum jets and photons are initiated by hard scatterings of the beam partons, whose luminosities inside the relativistic nuclei can be calibrated in proton-proton and proton-nucleus collisions. These energetic jets will interaction with the bulk quark-gluon plasma that is formed shortly after the initial nuclear collision. Studies of the distortion of jet and photon spectra, termed as jet and electromagnetic tomography (JET), due to the strong interaction between jets and the quark-gluon plasma will provide important information on the properties of the dense matter and the dynamics of quark-gluon plasma evolution. I will give an overview of the experimental status and recent theoretical development in JET and its potential in the future high-energy heavy-ion studies.

Forward rapidity at RHIC: Spin asymmetries and saturation physics

Yuan, Feng