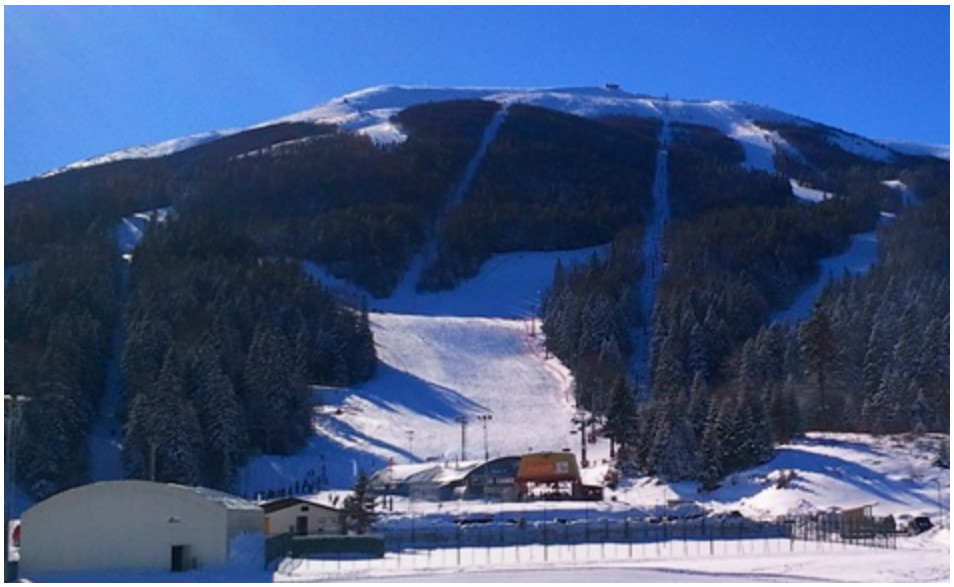
Excited QCD 2014

Sunday 2 February 2014 - Saturday 8 February 2014

Bjelasnica Mountain, Sarajevo



Book of Abstracts

Contents

The $\Sigma_{\pi N}$ Term, Chiral Multiplet Mixing and Hidden Strangeness in the Nucleon 1

Scalar photoproduction on the proton at CLAS and GlueX energies 1

The role of hadronization processes to determine the fragmentation functions 1

Charm production at HERA 2

The nature of diffractive production at HERA 2

Recent results from HERA on the proton structure 2

Exotic Hadrons and Large Nc QCD 3

Target mass and higher twist effects in polarized deep-inelastic scattering 3

N =4 super Yang-Mills plasma 3

Ghosts in Nonequilibium Quark-Gluon Plasma 4

Understanding confinement via instanton-monopoles 4

Low x evolution equation for proton Green function 4

Regge trajectory of the f0(500) resonance from a dispersive connection to its pole 5

Dynamic Holographic QCD 5

Recent BaBar studies of conventional and exotic quarkonium states 5

Studying and removing effects of fixed topology 6

Vortices and chiral symmetry breaking 6

Analytic solution to equations generalizing the Witten-Veneziano relation, and U(1)_A restoration 6

$a_0(980)$ as a dynamically generated resonance in the extended linear sigma model . . . 7

The PANDA experiment at FAIR 7

Recent KLOE results on hadronic physics 8

Exotic Hadron Spectroscopy 8

Infrared behaviour of propagators and running coupling in the conformal window of QCD . . . 8

Non-perturbative features of the three-gluon vertex in Landau gauge . . . 9

Why f0(500) must be narrower? . . . 9

Approaching the chiral point in two-flavour lattice simulations . . . 10

Magnetic Phenomena in holographic QCD . . . 10

Intriguing relations between the LECs of Wilson χ-PT and spectra of the Wilson Dirac operator . . . 10

Hadron dynamics with vector mesons: matching theory and experiment to identify new resonances and their nature . . . 11

Effects of divergent ghost loops on the Green's functions of QCD . . . 11

Dense nuclear matter in neutron stars . . . 12

Low vs high-lying modes for hadron mass generation . . . 12

Applications of the Sakai-Sugimoto Model to Hadron Spectroscopy . . . 12

Model-independent analysis of scenarios with vector-like quarks . . . 12

AdS/CFT and the axial sector of large-N Yang-Mills Theory . . . 13

Many-flavour QCD and the conformal window . . . 13

Probing nucleons with photons at the quark level . . . 13

Hot SU(2) Glue around Deconfinement . . . 13

Light meson production in nucleon-nucleon reactions . . . 14

The effect of polarized DIS hadronization pricess on the determination of polarized PDFs 14

BESIII latest results . . . 14

The CBM heavy-quark program . . . 15

Higgs discovery status from ATLAS . . . 15

Heavy Ion ATLAS . . . 15

Chair . . . 15

58

The $\Sigma_{\pi N}$ Term, Chiral Multiplet Mixing and Hidden Strangeness in the Nucleon

Author: Veljko Dmitrasinovic[1]

[1] *Institute of Physics Belgrade*

The nucleon Σ term's large "observed" value (> 55 MeV) has long been interpreted as a sign of hidden strangeness in the nucleon. We have calculated the $\Sigma_{\pi N}$ term on the basis of mixing of chiral multiplets, and using known constraints on the current quark masses m_u^0, m_d^0 and the flavor-singlet and isostriplet axial couplings. We show that the $[(1,1/2)\oplus(1/2,1)]$ chiral multiplet, that is necessary for the reproduction of the isotriplet axial coupling, makes a contribution enhanced by a factor of $\frac{19}{3}\simeq 6.33$, due to $SU_L(2)\times SU_R(2)$ algebra, that leads to $\Sigma_{\pi N}\geq\left(1+\frac{16}{3}\sin^2\theta\right)\frac{3}{2}\left(m_u^0+m_d^0\right)=60$ MeV, in general accord with "experimental" values of $\Sigma_{\pi N}$. The chiral mixing angle θ is given by $\sin^2\theta=\frac{3}{8}\left(g_A^{(0)}+g_A^{(3)}\right)$, where $g_A^{(0)}=0.33\pm 0.08$, or 0.28 ± 0.16, and $g_A^{(3)}=1.267$, are the flavor singlet and the isotriplet axial couplings, respectively. These results show there is no need for $q^4\bar{q}$ components, and in particular, no need for an $s\bar{s}$ component in the nucleon.

59

Scalar photoproduction on the proton at CLAS and GlueX energies

Author: Mario Luiz L da Silva[1]

Co-author: Magno Machado [2]

[1] *Universidade Federal de Pelotas*

[2] *Universidade Federal do Pampa*

Corresponding Author: mllsilva@gmail.com

In this work we present the results of a theoretical analysis of the data on photoproduction of $f_0(980)$ meson in the laboratory photon energy between 3.0 and 3.8 GeV. A comparison is done to the measurements performed by the CLAS collaboration at JLab accelerator for the exclusive reaction $\gamma p\to pf_0(980)$. In the analysis the partial S-wave differential cross section is described by a model based on Regge approach with reggeized exchanges and distinct scenarios for the $f_0(980)\to V\gamma$ coupling are considered. It is shown that such a process can provide information on the resonance structure and production mechanism. We also present the results for GlueX energies.

60

The role of hadronization processes to determine the fragmentation functions

Author: Maryam Soleymaninia[1]

[1] *Semnan university*

We are studying fragmentation functions (FFs) applying different hadronization processes and we are determining FFs from global analysis on single-inclusive electron-positron annihilation (SIA) and semi-inclusive deep inelastic scattering (SIDIS) data at NLO. We perform an improvement to the FFs

of pion and kaon at next-to-leading order (NLO), including very recently single-inclusive electron-positron annihilation data from BABAR and Belle at Q = 10.54 GeV and Q = 10.52 GeV, respectively. Our main purpose is to show that imposing these new data in our analysis how much improve the fragmentation functions of pion and kaon at NLO.

61

Charm production at HERA

Author: Uri Karshon[1]

[1] *Weizmann.Institute of Science*

The copious production of charm quarks at HERA has yielded a detailed understanding of QCD dynamics, the only measure of the charm contribution to the proton structure, as well as measurements of the charm mass and the fragmentation parameters of charmed hadrons. Several measurements of charm production in deep inelastic scattering, using different decay modes, are presented, both new individual measurements from the H1 and ZEUS collaborations, as well as combined data. These provide a powerful vindication of the form of the gluon density in the proton derived from scaling violations of inclusive deep inelastic scattering data. A QCD fit to the charm data leads to a measurement of the charm mass and also provides precise predictions for e.g. W and Z production at the LHC. Additionally, fragmentation fractions to the ground state charm hadrons are compared to e+e- data and previous
HERA results. The data have a precision similar to that of the e+e- data and support the hypothesis that fragmentation is independent of the production process.

62

The nature of diffractive production at HERA

Author: Grzegorz Pawel Gach[1]

[1] *AGH University of Science and Technology (PL)*

Data in which a proton is tagged along the beampipe after the primary interaction represents the cleanest way to measure diffraction. Data from both H1 and ZEUS collaborations on inclusive diffractive deep inelastic scattering, with a tagged proton, have been combined. Inclusive diffractive deep inelastic scattering can be considered as the exchange of a colourless object and is amenable to QCD fits in which the structure of this object, sometimes called a Pomeron, is determined. Given such processes are expected to factorise, such a Pomeron structure can be used to predict the rates of jet production in e.g. diffractive photoproduction. The comparison of jet data with the predictions of next-to-leading order QCD are discussed in the context of factorising breaking. Another way to study diffraction is through the production of vector mesons which is also characterised by a colourless exchange with the proton which in lowest order QCD is realised as a colourless gluon pair. Therefore consideration of the dependence of the J/psi cross section on the photon-proton centre-of-mass energy is related to the rise of the square of the gluon density towards low values of Bjorken x. Comparisons of HERA data with such theories and other data are presented.

63

Recent results from HERA on the proton structure

Author: Natasa Raicevic[1]

[1] *University of Montenegro*

ew precision measurements of the double-differential inclusive neutral-current cross section, measured with the ZEUS detector at HERA at a centre-of-mass energy of 318 GeV in e+p and e-p collisions are shown. They span the kinematic domain of high momentum transfer Qˆ2>650 GeVˆ2 and high Bjorken-x˜1.

Using the HERA data collected at three different centre-of-mass energies, both the collaborations H1 and ZEUS have updated their measurements of the longitudinal structure function F_L. The structure function is measured in the kinematic region of momentum transfer 1.5<Qˆ2<800 GeVˆ2 and Bjorken-x 3x10ˆ-4 <x<0.03. The measurements are compared to predictions from the Standard model, based on a variety of parton density functions.

65

Exotic Hadrons and Large Nc QCD

Author: Thomas Cohen[1]

[1] *University of Maryland*

Corresponding Author: cohen@physics.umd.edu

Exotic hadrons are those which cannot be described in a naive quark model. This talk discusses possible insights the large Nc limit of QCD can give us about exotics. The focus will be on tetraquark states. One key feature of the analysis is the fact there is more than one way to extrapolate to the large Nc limit.

66

Target mass and higher twist effects in polarized deep-inelastic scattering

Author: Sara Taheri Monfared[1]

[1] *Semnan University*

We perform a fit to all available experimental data of polarized structure functions in the framework of perturbative QCD, at next-to-leading order (NLO)
approximation. We include target mass correction and higher twist effects on our fitting procedure and study their effects on physically interesting quantities. Nuclear polarized structure functions are described based on our fit result. Moreover, sum rules are derived and compared with available theoretical and experimental results.

67

N =4 super Yang-Mills plasma

Author: Stanislaw Mrowczynski[1]

Co-author: Alina Czajka [2]

[1] *National Center of Nuclear Reserach, Warsaw, Poland*

[2] *Jan Kochanowski University, Kielce, Poland*

Corresponding Author: mrow@fuw.edu.pl

Motivated by the AdS/CFT duality, we study the N=4 super Yang-Mills plasma in the regime of weak coupling and compare it to the QCD plasma. Collective excitations and collisional processes are discussed. Since the Keldysh-Schwinger approach is used, the collective excitations in both equilibrium and non-equilibrium plasma are under consideration. The dispersion relations of gluon, fermion, and scalar fields are found in the Hard Loop Approximation and the corresponding effective action is given. The binary collisional processes, which occur at the lowest nontrivial order of the coupling constant, are reviewed and then the transport properties of the plasma are discussed.

For more see: A. Czajka and St. Mrowczynski, Phys. Rev. D 86, 025017 (2012).

68

Ghosts in Nonequilibium Quark-Gluon Plasma

Author: Alina Czajka[1]

Co-author: Stanislaw Mrowczynski [2]

[1] *UJK*

[2] *UJK & NCBJ*

Corresponding Author: czajka@ujk.edu.pl

The quark-gluon plasma at the early stage of relativistic heavy-ion collisions is out of equilibrium. The Keldysh-Schwinger formalism provides a natural framework to describe such a plasma, in particular when the plasma is weakly coupled and perturbative methods are applicable. However, a perturbative computation of various QCD characteristics requires Faddeev-Popov ghosts to cancel unphysical degrees which are present in a wide class of covariant gauges. The question thus arises how to introduce the ghosts for non-equilibrium QCD. Using the functional methods, we derive a relation analogous to the Slavnov-Taylor identity which expresses the ghost propagator of the Keldysh-Schwinger formalism through the gluon one. Then we show that the ghost propagator obtained in this way allows one to construct a gauge invariant perturbative expansion of various characteristics of non-equilibrium quark-gluon plasma.

69

Understanding confinement via instanton-monopoles

Author: Tin Sulejmanpasic[1]

[1] *Regensburg U*

The problem of confinement is a long lasting problem in physics. Recently however there has been great progress in understanding confinement in a large class of locally 4D supersymmetric and non-supersymmetric theories with the help of instanton-monopoles. I will discuss how these can help us understand confinement in pure YM and QCD.

70

Low x evolution equation for proton Green function

Author: Andrey Grabovskiy[1]

[1] *Budker Institute of Nuclear Physics (RU)*

Corresponding Author: andrey.grabovskiy@cern.ch

The derivation, properties, and application of the low x evolution equation for proton Green function are discussed.

71

Regge trajectory of the f0(500) resonance from a dispersive connection to its pole

Author: Jose R. Pelaez[1]

Co-authors: Adam Szczepaniak [2]; J.Timothy Londergan [3]; Jennifer Nebreda [4]

[1] *Universidad COmplutense*

[2] *Indiana University*

[3] *Indiana U*

[4] *Madrid U*

Our results on obtaining the Regge trajectory of a resonance from its pole in a scattering process and from analytic constraints in the complex angular momentum plane will be presented. The method, suited for resonances that dominate an elastic scattering amplitude, has been applied to the rho(770) and the f0(500) resonances. Whereas for the former we obtain a linear Regge trajectory, characteristic of ordinary quark-antiquark states, for the latter we find a non-linear trajectory with a much smaller slope at the resonance mass. We also show that if a linear trajectory with a slope of typical size is imposed for the f0(500), the corresponding amplitude is at odds with the data.

73

Dynamic Holographic QCD

Author: Nick Evans[1]

[1] *U*

I present a simple AdS/QCD model in which the formation of the chiral condensate is dynamically determined. The gauge dynamics is input through the running of the quark bilinear's anomalous dimension, gamma. The condensate provides a dynamically generated infra-red wall in the computation of mesonic bound state masses and decay constants. As an example, I use the model, with perturbative computations of the running of gamma, to study SU(3) gauge theory with a continuous number of quark flavours, Nf. We follow the behaviour of the spectrum as we approach the conformal window through a walking gauge theory regime. The phase diagram of the theory is also computable in this model.

74

Recent BaBar studies of conventional and exotic quarkonium states

Author: Guy Wormser[1]

[1] *LAL Orsay*

The B factories provide a unique playground for the study of the properties of conventional and exotic quarkonium states,
We report on a variety of recent results obtained using the full data set collected with the BaBar detector at the PEPII e+e- collider.
In particular, we present measurements of the prompt production of J/psi or psi(2S) in association with a second charmonium state at a center-of-mass energy of 10.58 GeV, searches for exotic neutral and charged charmonium-like states, studies of charmonium production in two-photon fusion and initial state radiation processes,
as well as studies of radiative transitions between bottomonium states.

75

Studying and removing effects of fixed topology

Author: Arthur Dromard[1]

Co-author: Marc Wagner [2]

[1] *Goethe University*

[2] *Goethe University Frankfurt*

Corresponding Author: dromard@th.physik.uni-frankfurt.de

At small lattice spacing, or when using e.g. overlap fermions, lattice QCD simulations tend to become stuck in a single topological sector. Physical observables, e.g. hadron masses, then differ from their full QCD counterparts by 1/V corrections, where V is the space-time volume. These corrections can be calculated order by order using the saddle point method. We calculate all corrections proportional to 1/Vˆ2 and 1/Vˆ3 and test the resulting equations for several models: an analytically solvable quantum mechanical model, the Schwinger model, and pure SU(2) Yang Mills theory

76

Vortices and chiral symmetry breaking

Author: Manfried Faber[1]

[1] *Vienna UT*

We analyze the creation of near-zero modes from would-be zero modes of various topological charge contributions from classical center vortices in $SU(2)$ lattice gauge theory. We show that colorful spherical vortex and instanton configurations have very similar Dirac eigenmodes and also vortex intersections are able to give rise to a finite density of near-zero modes, leading to chiral symmetry breaking via the Banks-Casher formula. We discuss the influence of magnetic vortex fluxes on quarks and how center vortices may break chiral symmetry.

78

Analytic solution to equations generalizing the Witten-Veneziano relation, and U(1)_A restoration

Author: Dubravko Klabucar[1]

[1] *University of Zagreb, Physics Departrment*

Corresponding Author: klabucar@oberon.phy.hr

A set of equations generalizing the Witten-Veneziano relation is studied. We present an analytic solution thereof which gives results, such as eta and eta' masses and decay constants, in agreement with results previously obtained numerically. The analytic solution improves the understanding of the description of the eta-eta' complex. It also supports our approach to U(1)_A restoration, which links it to the chiral symmetry restoration.

79

$a_0(980)$ as a dynamically generated resonance in the extended linear sigma model

Author: Thomas Wolkanowski[1]

[1] *Johann Wolfgang Goethe-Universität*

We study basic properties of scalar hadronic resonances within the so-called extended linear sigma model (eLSM), which is an effective model of QCD based on chiral symmetry and dilatation invariance. In particular, we focus on the mass and decay width of the isovector state $a_0(1450)$ and perform a numerical study of the propagator pole(s) on the unphysical Riemann sheets. Here, the $a_0(1450)$ is understood as a seed state explicitly included in the eLSM – this is in fact not true for the corresponding resonance below 1 GeV, the $a_0(980)$, which is sometimes interpreted as a kaonic (i.e., dynamically generated) bound state. In our work we want to clarify if the yet not included $a_0(980)$ can be found as a propagator pole generated by hadronic loop contributions. From such an investigation one could learn more about the general dependence of the eLSM – and effective field models in general – on strongly coupled hadronic intermediate states, possibly giving new insight into the low-energy regime, scalar resonances and both its theoretical description and physical interpretation.

80

The PANDA experiment at FAIR

Author: Tobias Stockmanns[1]

[1] *Forschungszentrum Jülich GmbH*

The PANDA experiment is one of the key components of the future "Facility for Antiproton and Ion Research" at Darmstadt. Its goal is to study the features of the strong force in the transition region between perturbative and non-perturbative QCD. Therefore it utilizes the phase space cooled antiproton beam with a beam momentum between 1.5 GeV/c and 15 GeV/c to do precision measurements in the charmonium mass range.

The physics program of PANDA covers a wide field of different topics: charmonium and charmed/multi-strange baryon spectroscopy, the search for hybrids and glueballs as well as the study of electromagnetic processes, single and double hypernuclei and hadrons in nuclear matter.

To do these demanding measurements a complex experimental setup is needed using state-of-the-art detector technologies.

During this presentation an overview of the physics program as well as the experimental setup will be given.

81

Recent KLOE results on hadronic physics

Author: Paolo Gauzzi[1]

[1] *INFN*

Corresponding Author: paolo.gauzzi@roma1.infn.it

KLOE collected most of the data in 2004-2006, whit 2.5 fb-1 of integrated luminosity at the peak of the ϕ resonance, and about 250 pb-1 off-peak, at 1 GeV center of mass energy.
Recent results obtained in light hadron physics concern the coupling of $\pi 0$ and η mesons to photons, that are interesting for the effective theories based on Chiral Perturbation Theory, and for their extensions to the transition region from low energy non perturbative QCD to high energies where the perturbative QCD can be used.
We measured the time-like Transition Form Factors by detecting the Dalitz decays $\phi \longrightarrow \eta$ e+e− and $\phi \longrightarrow \pi 0$ e+e− , while the coupling of the η meson to space-like photon has been obtained from γ-γ interactions (e+e− $\longrightarrow$ e+e− η).
These quantities are also interesting for the evaluation of the Light-by-Light scattering contribution to the anomalous magnetic moment of the muon.
With gamma-gamma interactions we detected also the $\pi 0$ $\pi 0$ final state to study the production of the $\sigma(500)$ scalar meson.
Also a new measurement of $\eta \longrightarrow \pi + \pi - \pi 0$ Dalitz plot will be presented, of interest for the determination of fundamental parameters like the light quark masses.
The prospects for the new KLOE-2 data-taking aiming to collect 5 fb-1 in the next three years will be reviewed

82

Exotic Hadron Spectroscopy

Author: Alessandro Pilloni[1]

[1] *Sapienza U.*

Corresponding Author: alessandro.pilloni@roma1.infn.it

Since ten years experiments have been observing a host of exotic states decaying into heavy quarkonia. The interpretation of most of them still remains uncertain and, in some cases, controversial, notwithstanding a considerable progress has been made on the quality of the experimental information available and a number of ideas and models have been put forward to explain the observations. In this talk we will expose the state-of-the-art of exotic spectroscopy, and will review the most promising theoretical interpretations.

84

Infrared behaviour of propagators and running coupling in the conformal window of QCD

Author: Markus Hopfer[1]

Co-authors: Christian Fischer [2]; Reinhard Alkofer [3]

[1] *University of Graz*

[2] *Justus-Liebig Universitaet Giessen*

[3] *U*

Corresponding Author: markus.hopfer@uni-graz.at

Using the Dyson-Schwinger approach we investigate QCD with a relatively large number of quark flavors in the chiral limit.
A self-consistent treatment of the corresponding propagator equations enables us to study unquenching effects directly via the quark loop diagram in the gluon equation.
Above the critical number of fermion flavors the non-perturbative running coupling develops a plateau over a wide momentum range. Correspondingly, the propagators follow a power law behavior in this momentum range indicating conformal behavior.
Our value $N_f^{crit} = 4.5$ is strongly sensitive to the details of the quark-gluon vertex calling for more detailed investigations in future studies.

85

Non-perturbative features of the three-gluon vertex in Landau gauge

Author: Richard Williams[1]

Co-authors: Gernot Eichmann ; Milan Vujinovic [2]; Reinhard Alkofer [3]

[1] *Karl Franzens University Graz*

[2] *Karl-Franzens University, Graz*

[3] *U*

Corresponding Author: djurakomarac@yahoo.com

Self-consistent solutions for the three-gluon vertex in Landau gauge QCD using a Bose-symmetric truncation of Dyson-Schwinger equations are presented. A detailed discussion of the symmetry properties of the vertex and its basis decomposition is made, together with suitable fits for phenomenological applications. Increasing the number of light quark flavors leads to a qualitative change of the vertex properties in a way as expected for the conformal window.

86

Why f0(500) must be narrower?

Author: Robert Kaminski[1]

[1] *Institute of Nuclear Physics PAN*

Corresponding Author: robert.kaminski@ifj.edu.pl

Recent works on the pion-pion scattering amplitudes done with use of one-subtracted dispersion relations [1] led to large modification of the f0(500) parameters, especially its width [2].

Immediately it led to long waited significant changes in the Particle Data Group Tables (Particle Listings and "Note on scalar mesons below 2 GeV" in [3]).
Such changes resulted in the need to redefine a number of amplitudes used in the theoretical and experimental works.
Sometimes, however, their authors doubt the necessity of introducing such changes and even question correctness of analyses confirming new parameters f0(500). Making example of reanalysis of such amplitudes and showing why dispersion relations with imposed crossing symmetry need narrower f0(500) one can easily once again prove the validity of the changes in the f0(500) parameters.

[1] "The Pion-pion scattering amplitude. IV: Improved analysis with once subtracted Roy-like equations up to 1100 MeV",
R. Garcia-Martin, R. Kaminski, J. R. Pelaez, J. Ruiz de Elvira and F.J. Yndurain, Phys. Rev. D83, 074004 (2011)

[2] "Precise determination of the f0(600) and f0(980) pole parameters from a
dispersive data analysis"
R. Garcia-Martin, R. Kaminski, J.R. Pelaez, J. Ruiz de Elvira
Phys. Rev. Lett. 107 (2011) 072001

[3] J. Beringer et al. (Particle Data Group), Phys. Rev. D86, 010001 (2012).

87

Approaching the chiral point in two-flavour lattice simulations

Author: Stefano Lottini[1]

[1] *D*

Corresponding Author: lumidoro@gmail.com

We investigate the behaviour of the pion decay constant and the pion mass in two-flavour lattice QCD, with the physical and chiral points as ultimate goal. Measurements come from the ensembles generated by the CLS initiative using the O(a)-improved Wilson formulation, with lattice spacing down to about 0.05 fermi and pion masses as low as 190 MeV. The applicability of SU(2) chiral perturbation theory is investigated, and various functional forms, and their range of validity, are compared. Among the studied observables are also some related to a third, heavier valence quark ("strange"), which enables examination of kaon-related observables.

88

Magnetic Phenomena in holographic QCD

Author: Gilad Lifschytz[1]

[1] *University of Haifa at Oranim*

Corresponding Author: giladl@research.haifa.ac.il

I will review various effects connected to magnetic fields in the context of holographic QCD. These will include magnetic catalysis, new phases of matter and new phase transitions.

89

Intriguing relations between the LECs of Wilson χ-PT and spectra of the Wilson Dirac operator

Author: Savvas Zafeiropoulos[1]

Co-authors: Jacobus Verbaarschot [2]; Mario Kieburg [3]

[1] *Universite Blaise Pascal*

[2] *Department of Physics and Astronomy, Stony Brook University*

[3] *Fakultät für Physik-Universität Bielefeld*

Corresponding Author: savvaslz@gmail.com

We discuss the behavior of the spectral densities of the non-Hermitian Wilson Dirac operator and we derive interesting relations for the leading order physical and Wilson LECs of Wilson χ-PT. These relations can be used to determine the LECs from lattice simulations.

90

Hadron dynamics with vector mesons: matching theory and experiment to identify new resonances and their nature

Author: Eulogio Oset[None]

In this talk I shall address chiral dynamics and its extension to the vector sector with the local hidden gauge approach. I shall show how some resonances are dynamically generated in the approach from meson meson and meson baryon interactions. Then will address two very recent reactions, gamma p -> Kˆ0 Sigmaˆ+ , with its peculiar energy dependence close to the Kˆ*Lambda threshold, from where we deduce evidence of one of the baryon resonances predicited before, around 2030 MeV. Then I shall address the J/psi - > eta Kˆ Kˆ*bar from where we find evidence of a h_1 resonance around 1830 MeV, also predicted from the vector vector interaction. Some short review of the status of the molecular states in the charm and beauty sectors will follow.

91

Effects of divergent ghost loops on the Green's functions of QCD

Author: Daniele Binosi[1]

[1] *ECT* Fondazione Bruno Kessler*

I discuss certain characteristic features encoded in some of the fundamental QCD Green's functions, whose origin can be traced back to the (Landau gauge) nonperturbative masslessness of the ghost field. Specifically, the ghost loops that contribute to these Green's functions display infrared divergences, akin to those encountered in the perturbative treatment, in contradistinction to the gluonic loops, whose perturbative divergences are tamed by the dynamical generation of an effective gluon mass. In d=4, the aforementioned divergences are logarithmic, thus causing a relatively mild impact, whereas in d=3 they are linear, giving rise to enhanced effects. In the case of the gluon propagator, these effects do not interfere with its finiteness, but make its first derivative diverge at the origin, and introduce a maximum in the region of infrared momenta. The three-gluon vertex is also affected, and the induced divergent behavior is clearly exposed in certain special kinematic configurations, usually considered in lattice simulations; the sign of the corresponding divergence is unambiguously determined.
The picture that emerges is finally compared to the available lattice data.

92

Dense nuclear matter in neutron stars

Author: Giuseppe Pagliara[None]

I will discuss recent measurements of neutron stars masses and radii and their implications for the equation of state of high density matter. I will focus in particular on the possible appearance of delta resonances, hyperons and strange quark matter and the dynamics of the formation process of such “exotic” degrees of freedom. Finally, I will present diffusion simulations of the cooling of newly formed strange stars.

93

Low vs high-lying modes for hadron mass generation

Author: Leonid Glozman[1]

[1] *Graz U*

We study the effect of the chiral symmetry breaking low-lying modes of the Dirac operator and of the higher-lying modes on the hadron mass generation and on symmetries of hadrons in lattice QCD simulations.

94

Applications of the Sakai-Sugimoto Model to Hadron Spectroscopy

Author: Frederic Brünner[1]

Co-authors: Anton Rebhan [1]; Denis Parganlija

[1] *Vienna UT*

Corresponding Author: denisp@hep.itp.tuwien.ac.at

Some aspects of the Sakai-Sugimoto model, a holographic top-down approach capturing many features of quantum chromodynamics, are presented. Meson spectra, finite-temperature and finite-baryon-density effects are discussed. Furthermore, the description of glueballs within this framework is revisited and possible directions for future developments are discussed.

95

Model-independent analysis of scenarios with vector-like quarks

Author: Luca Panizzi[1]

[1] *University of Southampton*

Vector-like quarks are predicted in various scenarios of new physics, and their peculiar signatures from both pair and single production have been already investigated in detail. However no signals

of vector-like quarks have been detected so far, pushing limits on their masses above 600-700 GeV, depending on assumptions on their couplings. Experimental searches consider specific final states to pose bounds on the mass of a vector-like quark, usually assuming it is the only particle that contributes to the signal of new physics in that specific final state. However, realistic scenarios predict the existence of multiple vector-like quarks, possibly with similar masses. The reinterpretation of mass bounds from experimental searches is therefore not always straightforward. I will describe a method to perform a combined analysis of experimental searches, considering different final states, to determine the exclusion limit of scenarios where any number of vector-like quarks can contribute to the signal of new physics, as it is usually the case with realistic models of new physics.

96

AdS/CFT and the axial sector of large-N Yang-Mills Theory

Author: Francesco Nitti[None]

In holographic models of large-N gauge theories, the pure-glue axial sector is described in terms of a massless pseudoscalar field, dual to the topological density operator. I will outline how this duality can be used to compute observables such as axial glueball masses and decay constants, as well as correlation functions and transport coefficients in the axial sector. I will focus especially on phenomenological holographic models, and discuss potential connections with observation and lattice results.

97

Many-flavour QCD and the conformal window

Author: Agostino Patella[1]

[1] *CERN*

As the number of flavours in QCD is increased beyond some threshold, chiral symmetry is restored and long-distance physics becomes scale invariant. The region of parameter space in which this happens is called “conformal window”. The phenomenology of theories in the conformal window or close to it is very different from real-world QCD, and clearly shows how rich gauge theories can be. As these theories are inherently non-perturbative, lattice simulation provide a unique setup to investigate them from first principles. In this talk I will review the main results and open questions in this field, the challenges ahead, and the techniques used.

98

Probing nucleons with photons at the quark level

Author: Gernot Eichmann[None]

I will review recent progress on nucleon form factor calculations and nucleon Compton scattering in the Dyson-Schwinger approach. By specifying a quark-gluon interaction kernel, the framework allows for a systematic calculation of hadron masses, form factors and nucleon-photon scattering processes from the quark-gluon level. I will present results for a variety of observables and discuss the current limitations and future directions of the approach.

99

Hot SU(2) Glue around Deconfinement

Author: Tereza Mendes[1]

[1] *University of Sao Paulo*

We investigate on the lattice the properties of electric and magnetic gluon propagators for finite-temperature SU(2) theory around the deconfinement transition. Special care is taken to handle the very strong systematic effects that arise in the critical region.

100

Light meson production in nucleon-nucleon reactions

Author: Khaled Teilab[1]

[1] *Frankfurt U*

We study the production of mesons in nucleon-nucleon reactions at center-of-mass momenta of a few GeV using an $N_f = 2$ linear sigma model, extended by including the $N_f = 2$ multiplets of (pseudo-) scalar and (axial-) vector mesons and a doublet of the nucleon together with its chiral partner (the $N^*(1535)$ or $N^*(1650)$ resonance).

101

The effect of polarized DIS hadronization pricess on the determination of polarized PDFs

Author: Fatemeh Arbabifar[1]

[1] *Semnan university*

We present our new determination of polarized PDFs of the nucleon at NLO accuracy performing a QCD fit on the global set of newest combined inclusive deep inelastic scattering (DIS) and the semi-inclusive polarized deep inelastic scattering (SIDIS) data. Considering SIDIS data, which comes from the hadronization of polarized DIS process, helps us to break SU(2) and SU(3) symmetry and light sea-quark decomposition happens. Our results are compared with the experimental data and the most precise theoretical models obtained by recent analyses. The latest COMPASS2010 SIDIS data, which were not available for the previous analyses, are employed in the current analysis and the effect of them is studied in detail.

102

BESIII latest results

Author: Marco Maggiora[1]

[1] *Univ. + INFN*

The latest result by BES III at BEPC are presented.

103

The CBM heavy-quark program

Author: Iouri Vassiliev[1]

[1] *GSI Helmholtzzentrum für Schwerionenforschung*

The Compressed Baryonic Matter (CBM) experiment at FAIR is designed to explore the QCD phase diagram in the region of high baryon densities and moderate temperatures. The key CBM observables include particles containing hidden charm –J/psi and Psi', open charm –D0, D+ , D* and Lambda_c, low-mass vector mesons decaying into leptons and multi-strange hyperons. Particularly demanding is the measurement of open charm particles with very low multiplicities, which is based on the real time selection of displaced vertices with an accuracy of about 50 μm. In the talk we discuss the problems of the detection of heavy-quark particles in fixed target experiments with relativistic heavy ion collisions.

104

Higgs discovery status from ATLAS

Author: Kalliopi Iordanidou[1]

[1] *UOA (GR) / Brookhaven National Laboratory (US)*

An overview of the Higgs boson search latest results in the ATLAS experiment at the LHC, after the discovery, is presented. The various decay channels in the context of the Standard Model and BSM searches are discussed. Latest results on the properties of the boson are given, with focus on the mass measurement, spin, parity and
production mechanisms.

107

Heavy Ion ATLAS

108

Chair

Corresponding Author: cohen@physics.umd.edu