Many manifestations of nonperturbative QCD

Report of Contributions

Contribution ID: **2** Type: **not specified**

Opening remarks by the organizers

Presenter: Prof. EL-BENNICH, Bruno (Cruzeiro do Sul University)

Contribution ID: **3** Type: **Invited Talk**

Non-perturbative study of spectral function in light of Quark-Gluon Plasma

This talk will contain studies of properties quark-gluon plasma, using some non-perturbative techniques. It will contain a brief introduction of quark-gluon plasma (QGP) and discussion on various signatures like Dilepton Production Rate (DPR) and Quark Number Susceptibilities (QNS) along with a motivation for this work. In the main work Operator Product Expansion (OPE), Gribov-Zwanziger (GZ) action and hot magnetized medium will be used to incorporate the non-perturbative dynamics of QCD. The impact of these non-perturbative effects on the DPR and QNS will be studied and its important consequences will be discussed. Most of the non-perturbative results will be compared with those of the perturbative ones and lattice QCD.

Primary author: Dr BANDYOPADHYAY, Aritra

Presenter: Dr BANDYOPADHYAY, Aritra

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

Neutron matter in the unitary limit and effective nuclear forces

We analyze the unitary Fermi gas in its ground state from an implicit renormalization point of view and compute the effective range dependence of the Bertsch parameter. The tenet of the theory is the scale separation between low and high momentum which we take as the Fermi momentum, and the assumption that energy phenomena below it can be re-parameterized into the low momentum coefficients of the interaction. This choice of separation scale reduces the calculation to the mean field level. After imposing the physical renormalization conditions on the pseudo-potential, given by contact interactions in momentum space, we obtain $\xi = 0.42$ for a vanishing effective range. The result holds for a wide range of systems, including ultra-cold atoms interacting through van der Waals forces and assumes that there are no many-body forces. We analyze departures from the unitary limit due to finite range and scattering length corrections for the case of neutron matter considering a set of contact interactions up to NNLO. We also review some aspects of renormalization of two-nucleon chiral forces.

Primary author: Prof. TIMÓTEO, Varese (UNICAMP)

Presenter: Prof. TIMÓTEO, Varese (UNICAMP)

Contribution ID: **5** Type: **Invited Talk**

Perspective on Nuclear Physics at Jefferson Lab, from 12 GeV to EIC - Why should we be excited?

Primary author: ENT, Rolf

Presenter: ENT, Rolf

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

Effects of the ghost sector in gluon mass dynamics

In this work we investigate the effects of the ghost sector on the dynamical mass generation for the gauge boson of a pure Yang-Mills theory.
The generation of a dynamical mass for the boson is realized by the Schwinger mechanism, which is triggered by the existence of longitudinally coupled massless poles in the fundamental vertices of the theory.
The appearance of such poles occur by purely dynamical reasons and is governed by a set of Bethe-Salpeter equations.
In previous studies, only the presence of massless poles in the background-gauge three-gluon vertex was considered.
Here, we include the possibility for such poles to appear also in the corresponding ghost-gluon vertex.
Then, we solve the resulting Bethe-Salpeter system, which reveals that the contribution associated with the poles of the ghost-gluon vertex is suppressed with respect to those originating from the three-gluon vertex.

Primary authors: FIGUEIREDO, Clara; Prof. AGUILAR, Arlene Cristina (University of Campinas - Unicamp)

Presenter: FIGUEIREDO, Clara

Contribution ID: **7** Type: **Invited Talk**

Experimental determination of pion and kaon form factors and structure functions

Primary author: Prof. HORN, Tanja (Catholic University of America)

Presenter: Prof. HORN, Tanja (Catholic University of America)

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

The Linear Sigma Model coupled to quarks to locate the critical endpoint

We use the linear sigma model coupled to quarks to compute the effective potential beyond the mean field approximation, including the contribution of the ring diagrams at finite temperature and baryon density. We determine the model couplings and use them to study the phase diagram in the baryon chemical potential-temperature plane and then we specifically localize the critical end point .

Primary authors: HERNANDEZ, Luis Alberto (Instituto de Ciencias Nucleares, UNAM); Prof. AYALA, Alejandro (Instituto de Ciencias Nucleares, Universidad Nacional Autonoma de Mexico); Dr HERNANDEZ-ORTIZ, Saul (Instituto de Ciencias Nucleares, UNAM)

Presenter: HERNANDEZ, Luis Alberto (Instituto de Ciencias Nucleares, UNAM)

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

Bound-states and resonances in the DSE/BSE approach

Primary author: WILLIAMS, Richard (University of Giessen)

Presenter: WILLIAMS, Richard (University of Giessen)

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

Baryon spectroscopy and structure with Dyson-Schwinger equations

Primary author: Dr EICHMANN, Gernot

Presenter: Dr EICHMANN, Gernot

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

Conventional and exotic mesons in the DSE/BSE framework

Primary author: Prof. FISCHER, Christian (JLU Gießen)

Presenter: Prof. FISCHER, Christian (JLU Gießen)

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

Prospects for Hyperon Physics

Primary author: Prof. JOHANSSON, Tord (Uppsala Universiyt)

Presenter: Prof. JOHANSSON, Tord (Uppsala Universiyt)

Contribution ID: **15** Type: **Poster**

The infrared dynamics of the three-gluon vertex

The infrared behavior of the three gluon vertex is one of the most prominent subjects of study in current non perturbative QCD, playing a central role in dynamical gluon mass generation through the Schwinger mechanism and being an essential ingredient in the Bethe-Salpeter equation which governs glueballs. However, the analysis of this vertex through Schwinger-Dyson equations (SDEs) is difficult, due to its rich tensor structure and the complexity of the SDE that it satisfies. Instead, in this preliminary study we aim to determine the non-transverse part of the three gluon vertex by solving the Slavnov-Taylor identity (STI) that relates it to the ghost-gluon scattering kernel. The later is computed by solving a truncated SDE that is much simpler than that of the three gluon vertex. When the ghost-gluon scattering kernel is then used as input for the STI of the three gluon vertex, we obtain for its non transverse form factors results that are in qualitative agreement with those found in lattice simulations and, in particular, display a zero-crossing, a feature that has been widely discussed in recent literature.

Primary authors: Mr SOARES NARCISO FERREIRA, Antonio Mauricio (University of Campinas); Prof. AGUILAR, Arlene Cristina (University of Campinas - Unicamp)

Presenters: Mr SOARES NARCISO FERREIRA, Antonio Mauricio (University of Campinas); Prof. AGUILAR, Arlene Cristina (University of Campinas - Unicamp)

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

Puzzles in Hadron Physics and their Experimental Investigations

Primary author: WIEDNER, Ulrich (Ruhr-Universitaet Bochum (DE))

Presenter: WIEDNER, Ulrich (Ruhr-Universitaet Bochum (DE))

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

Magnetic corrections to $\pi - \pi$ scattering lengths in the linear sigma model.

We consider the magnetic corrections to pi-pi scattering lengths in the linear sigma model. For this purpose we consider all the one loop corrections in the s, t and u channels, associate to the insertion of a Schwinger propagator for the charged pions, working in the region of small values of the magnetic field. In our calculation we make use of an appropriate expansion of the propagators in this regime. The leading scattering length, $l = 0$, in the s-channel, isospin channel $I = 2$, increases for an increasing value of the magnetic field, whereas the opposite effect is found for the isospin channel $I = 0$. The isospin channel does not receive any corrections. This behavior is is opposite with respect to the thermal corrections reported previously in the literature for the scattering lengths.

Presenter: Prof. LOEWE, Marcelo (Pontificia Universidad Católica de Chile)

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

Quark matter within the NJL model: An alternative regularization scheme

Primary author: Prof. FARIAS, Ricardo (UFSM)

Presenter: Prof. FARIAS, Ricardo (UFSM)

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

Relativistic BEC-BCS crossover in a cold/magnetized NJL model

Primary author: Dr DUARTE, Dyana (Instituto Tecnológico de Aeronáutica, Universidade Federal de Santa Maria)

Presenter: Dr DUARTE, Dyana (Instituto Tecnológico de Aeronáutica, Universidade Federal de Santa Maria)

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

Nucleons under the electron microscope: Deeply Virtual Compton Scattering at JLab in the 6 GeV and 11 GeV eras

Primary author: SOKHAN, Daria (University of Glasgow, UK)

Presenter: SOKHAN, Daria (University of Glasgow, UK)

Contribution ID: **22** Type: **Invited Talk**

To grow or not to grow: Thermo-magnetic behavior of the strong coupling

The properties of strongly interacting matter at finite temperature in a magnetized medium have received a great deal of attention in recent years. This is mainly due to the so called Inverse Magnetic Catalysis (IMC) phenomenon found by LQCD calculations, whereby the pseudo critical quiral phase transition temperature and the quark condensate above this transition temperature decrease as a function of the magnetic field intensity. In this talk I report on recent findings on the strong coupling properties when its temperature and magnetic field dependence are considered. By means of a renormalization group analysis, I show that when the magnetic field intensity is the dominant scale, the strong coupling increases as a function of the field strength. However, when the temperature is the dominant scale the strong coupling decreases as a function of the field strength. I also argue that this phenomenon is linked to the IMC phenomenon.

Primary author: AYALA, Alejandro (Instituto de Ciencias Nucleares, Universidad Nacional Autonoma de Mexico)

Presenter: AYALA, Alejandro (Instituto de Ciencias Nucleares, Universidad Nacional Autonoma de Mexico)

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

Pion photoproduction reactions on the deuteron and the extraction of neutron observables

Primary author: NAKAMURA, Satoshi (Osaka University)

Presenter: NAKAMURA, Satoshi (Osaka University)

Contribution ID: **24** Type: **Invited Talk**

Hadron Physics: Charmonium hadronic two and three body B_s decays

Primary author: Mr VERA, Carlos (Universidad del Tolima)

Presenter: Mr VERA, Carlos (Universidad del Tolima)

Contribution ID: **25** Type: **Invited Talk**

Pseudoscalar meson excitations in Holographic QCD

In this talk, I will discuss how and why the leptonic decay constants of the excited states of the pseudoscalar mesons, in particular the pion, vanish in the chiral limit in Holographic QCD.

Primary author: Dr MILLER, Carlisson (IFT)

Co-authors: Dr BAYONA, Alfonso (IFT); Dr KREIN, Gastão (IFT)

Presenter: Dr MILLER, Carlisson (IFT)

Contribution ID: **26** Type: **Invited Talk**

Chiral Symmetry breaking with non-abelian Ball-Chiu vertex

In this talk, I will present some the current efforts to understand the phenomenon of chiral symmetry breaking and the generation of a dynamical quark mass. To do that, we will use the framework of the Schwinger-Dyson equations. We will solve the coupled system of integral equations formed by the quark propagator and the complete non-transverse structure of the quark-gluon vertex, which is formed by four independent form factors. Particular attention is dedicated to guarantee the correct renormalization group behavior of the quark dynamical mass and in the extraction of the phenomenological parameters such as pion constant decay.

Primary author: Prof. AGUILAR, A. C. (University of Campinas - Unicamp)

Presenter: Prof. AGUILAR, A. C. (University of Campinas - Unicamp)

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

An approach in Minkowski space to hadron structure: the mock pion

Primary author: FREDERICO, Tobias (Instituto Tecnologico de Aeronautica)

Presenter: FREDERICO, Tobias (Instituto Tecnologico de Aeronautica)

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

Nuclei to Neutron Stars: Starting at the Quark Level

Primary author: THOMAS, Anthony (University of Adelaide)

Presenter: THOMAS, Anthony (University of Adelaide)

Contribution ID: **29** Type: **Invited Talk**

Covariant extension of the GPD overlap representation at low Fock states

Primary author: MOUTARDE, Hervé

Presenter: MOUTARDE, Hervé

Contribution ID: **30** Type: **Invited Talk**

Strong interaction from quarks to nuclei

Primary author: GOTHE, Ralf (University of South Carolina)

Presenter: GOTHE, Ralf (University of South Carolina)

Contribution ID: **32** Type: **Invited Talk**

Spin-1 and perturbative QCD

Primary author: Prof. DE MELO, João Pacheco (Universidade Cruzeiro do Sul)

Presenter: Prof. DE MELO, João Pacheco (Universidade Cruzeiro do Sul)

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

Relativistic approaches for the $\gamma^* N \to N^*$ transition form factors at intermediate and large momentum transfer

We present estimates of transition form factors for some nucleon resonances N^*, based on two independent frameworks. We start with the presentations of results based on light-front holography, for the nucleon and the Roper. Later on, we discuss some results based on a covariant quark model for several resonances N^*. In general the estimates compare well with data for intermediate and large square momentum transfer ($Q^2 > 2$ GeV^2).

Primary author: RAMALHO, Gilberto (Universidade Cruzeiro do Sul)

Presenter: RAMALHO, Gilberto (Universidade Cruzeiro do Sul)

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

Effective field theory for the quarkonium-nucleon system

Primary author: KREIN, Gastao (UNESP)

Presenter: KREIN, Gastao (UNESP)

Contribution ID: **36** Type: **Poster**

Quark-gluon vertex and flavour-dependence of dynamical chiral symmetry breaking

In this work, we examine the flavour-dependence of dynamical chiral symmetry breaking (DCSB) due to the effect of different model kernels in the gap equation. For that, we have computed the quark's sigma term and its ratio to the Euclidean constituent mass, that computes the DCSB contribution.

Primary authors: SERNA, Fernando (IFT-UNEPS); Prof. EL-BENNICH, Bruno (Cruzeiro do Sul University)

Presenter: SERNA, Fernando (IFT-UNEPS)

Contribution ID: **37** Type: **Invited Talk**

Phi meson in nuclear matter and nuclei

Primary author: Dr COBOS-MARTÍNEZ, Javier (Cinvestav-IPN)

Presenter: Dr COBOS-MARTÍNEZ, Javier (Cinvestav-IPN)

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

Novel Features of Spin-one Particles

Presenter: CLOET, Ian (Argonne National Laboratory)

Contribution ID: **40** Type: **Invited Talk**

Hadron Spectrum and Form Factors ☒in Continuum QCD

Presenter: Prof. EL-BENNICH, Bruno (Cruzeiro do Sul University)