Contribution ID: **10** Type: **Poster**

Color superconductivity in general dimension via holography

We generalize the concept of holography for the color superconductivity (CSC) phase by considering a d-dimensional Anti de Sitter (AdS) space instead of the traditional 6 dimensions. The corresponding dual field theory is an arbitrary confining gauge theory with $SU(N_c)$ symmetry, like quantum chromodynamics (QCD) CSC. We then use a holographic model based on Einstein-Maxwell gravity in d-dimensional AdS spacetime to study this phenomenon in both confinement and deconfinement phase and we focus to study the confinement-deconfinement phase transition and the condition for the $N_c = 2$ CSC phase with the $d = 4$ case.

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Contribution ID: **17** Type: **Poster**

Quasiclassical and Quantum Radiation from the Graphene

In this paper, we study numerical solutions of a system of quantum kinetic equations and Maxwell's equations that describe: (a) the dynamics of charge carriers in a graphene monolayer under the action of a classical spatially homogeneous time-dependent electromagnetic field of linear polarization; (b) classical radiation caused by electric currents; (c) quantum radiation caused by the recombination of electrons and holes, as well as by their scattering. The quantities (quasiparticle number density, current density, radiation intensity and spectrum, absorption, reflection and transmission coefficients in a graphene monolayer) are calculated as functions of time and/or as functions of parameters of the external field, that is the amplitude and duration of electric field. Our results, obtained within the framework of the quantum kinetic equations, are compared with theoretical and experimental results of other research groups.

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Presenter: TSERYUPA, Vladislav

Contribution ID: **60** Type: **Poster**

The Thermodynamical Properties of Kiselev Black Hole

We are studying the thermodynamic properties of the Kiselev black hole for the equation-of-state parameter $\omega \in (0, 1]$. In this case, the black hole possesses two horizons, and we examine the behavior of the Hawking temperature during the processes of evaporation and accretion of charged particles. We have shown that as the mass of the black hole increases, the temperature does not always decrease but may also slightly increase.

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Presenter: GRIGORYEV, Maxim

Contribution ID: **61** Type: **Poster**

On Dirac's approach for the Hamiltonian formulation of gauge systems

In this work, we present an overview of Dirac's classical approach for obtaining the Hamiltonian formulation of gauge systems, with a particular focus on systems where "gauge hits twice", resulting in the simultaneous appearance of two first-class Hamiltonian constraints for every given pure gauge mode. The validity of the Dirac conjecture, which states that all first-class constraints serve as independent generators of gauge transformations, is examined. It is demonstrated that under the standard notion of gauge symmetry in field theory this conjecture does not hold when using the Total Hamiltonian but is valid in the Extended Hamiltonian approach. We show that, without a proper redefinition of the model, transitioning from the Total to the Extended Hamiltonian modifies its contents by converting constrained modes into pure gauge modes. After performing the aforementioned redefinition, the constrained modes are restored. This redefinition essentially involves a change of zero-momentum variables, which is similar to the Stueckelberg's trick. The results are illustrated with examples of Yang–Mills theories and the ADM formalism of GR, and are then generalized to all mechanical gauge systems.

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Contribution ID: **96** Type: **Poster**

On the late time behavior of thermal two point function in curved space-time

We investigate the late-time behavior of the thermal two-point function for a Bose gas in a curved space-time with a Killing horizon. We demonstrate that the late-time behavior undergoes a sharp transition at a critical temperature, reminiscent of a phase transition. Contrary to expectations for typical gases, the relaxation time does not vanish at high temperatures but instead saturates to a constant value that depends on the imaginary part of the lowest quasinormal modes.

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Contribution ID: **98** Type: **Poster**

Two-particle rapidity correlations in strongly intensive quantities within string model

Studies of the phase diagram of strongly interacting matter created in nuclear collisions are typically carried out using event-by-event fluctuations. The strongly intensive quantities form a family of promising observables that are free from trivial volume fluctuations. In the case of multiplicity fluctuations over separate rapidity intervals, the behavior of the corresponding strongly intensive quantity is analyzed using the color string approach. At short distances, it is mostly sensitive to the details of two-particle correlations due to string fragmentation. Conversely, long-range effects are dictated by collective interactions between strings.

In this report we model these two phenomena by the simulated annealing algorithm and string fusion. We present how interplay between short-range and long-range correlations breaks the property of strong intensity.

The author acknowledges Saint-Petersburg State University for a research project 103821868.

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Contribution ID: **104** Type: **Poster**

Analysis of the equations of motion for the fictitious matter of embedded gravity

Certain observed phenomena cannot be explained within the framework of General Relativity (GR) without the introduction of dark matter. One may attempt to avoid its introduction by moving to a modified theory of gravity—embedding gravity. Within this framework, a 4-dimensional spacetime is considered as a surface embedded in a 10-dimensional flat Minkowski space.

It turns out that it is possible to reformulate embedding gravity in such a way that a certain contribution, describing the fictitious matter of embedded gravity (FMEG), is added to the GR action. The equations of motion describing this matter prove to be excessively complex; therefore, to simplify the analysis, we employ the idea of expanding the embedding function into a Taylor series up to the quadratic contribution on a certain scale.

Static condensations of FMEG arise only for values of the matter density (both ordinary and fictitious) that are below a certain critical value. Among the found static configurations, a “string” emerges—a solution for which the density function is independent of one of the coordinates. It is known from the mathematical literature that such a solution is the only one possible (and, moreover, radially symmetric), provided that the integral of the density over the plane transverse to the string converges. This assertion can be strengthened: it turns out to be sufficient to require a simple decrease of the density function in the transverse directions. This refinement may be important since the convergence of the density integral does not always occur in physical situations. For example, for another found static configuration, a “ball”, this integral diverges; and it is precisely such a slow decrease of the matter density in the dark halos of galaxies that provides the observed flatness of their rotation curves.

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Contribution ID: **105** Type: **Poster**

Weak gravity limit in the symmetric teleparallel gravity theory

Despite the fundamental contribution of general relativity (GR) to the understanding of gravity and cosmology, a number of problems remain unresolved. The most significant of these are related to the effects of dark matter and dark energy. In this regard, alternative theories are being actively studied, which, while maintaining the success of general relativity in explaining confirmed phenomena, could eliminate the need for "dark"components. Such modified theories should not only reproduce the predictive accuracy of Einstein's theory in proven areas, but also expand its applicability to more complex physical processes. One of the promising areas of research is symmetric teleparallel gravity. This approach uses a different geometric structure of space-time in terms of nonmetricity and a greater number of dynamic degrees of freedom. As a first step, it is necessary to analyze the limit of weak gravity, i.e. small perturbations around a trivial background. Therefore, the properties of vacuum equations of motion in the linear order of perturbation theory over a flat Minkowski space is studied in this paper. The result of the work is the analysis of field motion equations linearized by perturbations in scalar, vector and tensor sectors, as well as the selection and classification of realistic models.

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Contribution ID: **109** Type: **Poster**

Trident pair production and implications of unitarity in strong field QED

Particle interactions are strongly modified in the presence of intense background electromagnetic fields. Due to an exchange of energy and momentum with the field, some processes prohibited in its absence might become allowed. Besides, in a field some virtual particles might go on shell. Furthermore, intense background fields can create a vacuum instability (Schwinger pair production). It was also observed that a class of field-dressed radiative corrections grows as increasing powers of the background field strength. This implies that in a strong enough field the conventional perturbative expansion in QED might break down (Ritus-Narozhny conjecture). Studies of such a regime would require a (partial) all-order resummation.

Naturally, we are interested in probabilities of various QED processes. It would be more convenient, though, to extract them from the appropriate radiative corrections via the Cutkosky cutting rules. The latter are related to unitarity but have been rigorously established for a field-free QFT. Therefore, they might still require an explicit generalization to the presence of a strong background field.

To this end, here we compare the explicit expression for the non-exchange term in the probability of the trident process $e^{\pm} \to e^{\pm}e^{-}e^{+}$ with the two-loop bubble contribution to the mass operator. For the sake of definiteness and simplicity, we confine to a special case of a constant crossed field. For one, its symmetry makes the explicit calculations easier. Besides, such a field doesn't spontaneously produce pairs from the vacuum, thus allowing us to focus on the effects related to the Ritus-Narozhny conjecture. Explicit calculations are made by adopting the FeynCalc package.

Our findings are a step towards the study of the cutting rules in a background field and, more generally, the implications of the Ritus-Narozhny conjecture.

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Contribution ID: **131** Type: **Poster**

Search of exotic states in the radioactive decay of J/ψ meson

The work is focused on analyzing $J/\psi \to 4\pi_0 + \gamma$ decay reaction via partial-wave analysis on the Bes III experiment data. This analysis is relevant for the particle research due to the expected production of exotic resonances, in particular, glueballs. Glueballs are an important prediction of QCD, hypothetical particles consisting purely of gluons. The work covers all steps of reaction analysis: data selection and processing process, amplitude spin parts building in tensor angle momentum operators formalism and the fitting process via these amplitudes and Breit-Wigner formula. As a result, a good solution in terms of resonance parameters is achieved. To achieve the solution, it was necessary to insert additional resonances, which include ones presumably related to exotic states.

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Contribution ID: **154** Type: **Poster**

Cosmological perturbations and conformal transformations in the symmetric teleparallel equivalent of general relativity

General Relativity (GR), together with Quantum Theory, is a cornerstone of modern physics. However, for nearly a century there have existed observational phenomena, “dark matter” and “dark energy”, that cannot be explained within the framework of GR and our current understanding of particle physics. Attempts to detect dark matter particles have so far been unsuccessful, and explaining the nature of dark energy from the standpoint of quantum theory also remains challenging. A possible way forward is to modify or replace GR itself.

In this work, we develop one of the metric–affine modifications of GR, Symmetric Teleparallel Equivalent of General Relativity (STEGR). Unlike GR, in STEGR the only nontrivial geometric property of spacetime is non-metricity, which makes the covariant derivative of the metric nontrivial. Within our study, we reformulate the Einstein–Hilbert action, where curvature plays the key role, into the action of the symmetric teleparallel equivalent, and then modify it by introducing additional parameters of the theory. Using this formalism, we derive the equations of motion for cosmological perturbations in the Friedmann metric with conformal time. To obtain scalar perturbations, we employ the method of conformal transformations, which allows us to express the Einstein tensor for the Friedmann metric through quantities calculated for the perturbed Minkowski metric.

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